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Data handbook

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Electronic
components
and materials

Semiconductors

Book S11 1985

Microwave transistors

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Microwave transistors

S11 1985

MICROWAVE TRANSISTORS

page

Selection guide

Type number survey, alphanumerical, with main characteristics

General

Device data in alphanumerical sequence

DATA HANDBOOK SYSTEM

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

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

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

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

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

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

Information on current Data Handbooks and on how to obtain a subscription for future issues is available from any of the Organizations listed on the back cover.
Product specialists are at your service and enquiries will be answered promptly.

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks comprises:

T1	**Tubes for r.f. heating**	
T2a	**Transmitting tubes for communications, glass types**	
T2b	**Transmitting tubes for communications, ceramic types**	
T3	**Klystrons**	
T4	**Magnetrons for microwave heating**	
T5	**Cathode-ray tubes** Instrument tubes, monitor and display tubes, C.R. tubes for special applications	
T6	**Geiger-Müller tubes**	
T7	**Gas-filled tubes** (will not be reprinted)	
T8	**Colour display systems** Colour TV picture tubes, colour data graphic display tube assemblies, deflection units	
T9	**Photo and electron multipliers**	
T10	**Plumbicon camera tubes and accessories**	
T11	**Microwave semiconductors and components**	
T12	**Vidicon and Newvicon camera tubes**	
T13	**Image intensifiers**	Data collations on these subjects are available now. Data Handbooks will be published in 1985.
T14	**Infrared detectors**	
T15	**Dry reed switches**	
T16	**Monochrome tubes and deflection units** Black and white TV picture tubes, monochrome data graphic display tubes, deflection units	

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks comprises:

S1	**Diodes** Small-signal germanium diodes, small-signal silicon diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes
S2a	**Power diodes**
S2b	**Thyristors and triacs**
S3	**Small-signal transistors**
S4a	**Low-frequency power transistors and hybrid modules**
S4b	**High-voltage and switching power transistors**
S5	**Field-effect transistors**
S6	**R.F. power transistors and modules**
S7	**Surface mounted semiconductors**
S8	**Devices for optoelectronics** Photosensitive diodes and transistors, light-emitting diodes, displays, photocouplers, infrared sensitive devices, photoconductive devices.
S9	**Power MOS transistors**
S10	**Wideband transistors and wideband hybrid IC modules**
S11	**Microwave transistors**
S12	**Surface acoustic wave devices**

INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks comprises:

EXISTING SERIES		Superseded by:
IC1	**Bipolar ICs for radio and audio equipment**	IC01N
IC2	**Bipolar ICs for video equipment**	IC02Na and IC02Nb
IC3	**ICs for digital systems in radio, audio and video equipment**	IC01N, IC02Na and IC02Nb
IC4	**Digital integrated circuits** CMOS HE4000B family	
IC5	**Digital integrated circuits – ECL** ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs	IC08N
IC6	**Professional analogue integrated circuits**	
IC7	**Signetics bipolar memories**	
IC8	**Signetics analogue circuits**	IC11N
IC9	**Signetics TTL logic**	IC09N and IC15N
IC10	**Signetics Integrated Fuse Logic (IFL)**	IC13N
IC11	**Microprocessors, microcomputers and peripheral circuitry**	

NEW SERIES

IC01N	**Radio, audio and associated systems** Bipolar, MOS	(published 1985)
IC02Na	**Video and associated systems** Bipolar, MOS Types MAB8031AH to TDA1524A	(published 1985)
IC02Nb	**Video and associated systems** Bipolar, MOS Types TDA2501 to TEA1002	(published 1985)
IC03N	**Integrated circuits for telephony**	(published 1985)
IC04N	**HE4000B logic family** CMOS	
IC05N	**HE4000B logic family – uncased ICs** CMOS	(published 1984)
IC06N	**High-speed CMOS; PC54/74HC/HCT/HCU** Logic family	(published 1985)
IC07N	**High-speed CMOS; PC54/74HC/HCT/HCU – uncased ICs** Logic family	
IC08N	**ECL 10K and 100K logic families**	(published 1984)
IC09N	**TTL logic series**	(published 1984)
IC10N	**Memories** MOS, TTL, ECL	
IC11N	**Linear LSI**	(published 1985)
IC12N	**Semi-custom gate arrays & cell libraries** ISL, ECL, CMOS	
IC13N	**Semi-custom** Integrated Fuse Logic	(published 1985)
IC14N	**Microprocessors, microcontrollers & peripherals** Bipolar, MOS	
IC15N	**FAST TTL logic series**	(published 1984)

Note

Books available in the new series are shown with their date of publication.

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks comprises:

C1	**Programmable controller modules** PLC modules, PC20 modules
C2	**Television tuners, coaxial aerial input assemblies, surface acoustic wave filters**
C3	**Loudspeakers**
C4	**Ferroxcube potcores, square cores and cross cores**
C5	**Ferroxcube for power, audio/video and accelerators**
C6	**Synchronous motors and gearboxes**
C7	**Variable capacitors**
C8	**Variable mains transformers**
C9	**Piezoelectric quartz devices**
C10	**Connectors**
C11	**Non-linear resistors** Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)
C12	**Potentiometers, encoders and switches**
C13	**Fixed resistors**
C14	**Electrolytic and solid capacitors**
C15	**Ceramic capacitors**
C16	**Permanent magnet materials**
C17	**Stepping motors and associated electronics**
C18	**Direct current motors**
C19	**Piezoelectric ceramics**
C20	**Wire-wound components for TVs and monitors**
C21*	**Assemblies for industrial use** HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices
C22	**Film capacitors**

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* Will be issued in 1985.

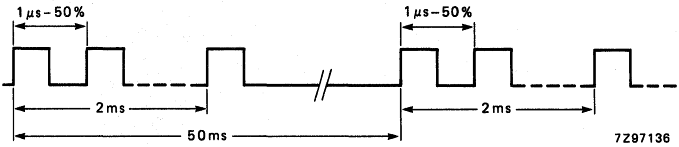
SELECTION GUIDE

GaAs FETs
bipolar transistors

MICROWAVE GaAs FIELD-EFFECT TRANSISTORS

type	f GHz	V_{DS} V	I_D A	P_{L1} (1) mW	N_F dB	G_{po} (2) dB	G_a dB	page
CFX13 (3)	10	3	10	–	2,2	–	8	29
	12	3	10	–	2,5	–	7,5	
CFX21	8	6	40	80	–	10	–	35
	11	6	40	65	–	7,5	–	
CFX30	11	8	50	125	–	8	–	41
CFX31	11	8	100	280	–	8	–	47
CFX32	6	8	180	550	–	8,5	–	53
	8,5	8	180	550	–	7,5	–	
CFX33	6	8	370	1100	–	7,0	–	57
	8,5	8	370	1100	–	5,5	–	

(1) Load power for 1 dB compressed power gain.
(2) Low-level power gain associated with P_{L1}.
(3) Low-noise type.



DABS pulse definition.
(relating to "avionics" transistors on next page)

BIPOLAR MICROWAVE TRANSISTORS

1. Radar pulsed power transistors

1.1 L-band

type	f GHz	V_{CE} V	t_p at δ μs	 %	P_L W	G_p dB	η_C %	page
RZ1214B35Y	1,2 to 1,4	42	50	10	40	7,8	40	293
	1,2 to 1,4	50	300	10	40	7	35	
RZ1214B65Y	1,2 to 1,4	42	50	10	80	7	38	301
	1,2 to 1,4	50	300	10	80	7	30	
RZ1214B125Y	1,2 to 1,4	42	50	10	150	7	38	307
	1,2 to 1,4	50	300	10	150	7	30	
RZ1214B150Y	1,2 to 1,4	42	50	10	200	7	38	313
	1,2 to 1,4	50	300	10	200	7	35	
RZZ1214B300Y	1,2 to 1,4	42	50	10	380	7	40	337
	1,2 to 1,4	50	300	10	380	7	35	
RX1214B300Y	1,2 to 1,4	50	150	4	300	7	35	285
	1,2 to 1,4	50	300	10	300	7,5	30	

1.2 S-band

type	f GHz	V_{CE} V	t_p at δ μs	 %	P_L W	G_p dB	η_C %	page
RZ2833B45W	2,8 to 3,3	40	100	10	45	5,5	25	319
	2,7 to 3,1	40	50	5	55	6,5	30	
	2,9 to 3,1	42	50	5	65	7,0	30	
RV3135B5X	3,1 to 3,5	24	100	10	5,6	5,7	47	281
RZ3135B15W	3,1 to 3,5	42	100	10	18	5,5	33	325
RZ3135B30W	3,1 to 3,5	42	100	10	34	5,5	33	325

2. Avionics pulsed power transistors

type	f GHz	V_{CE} V	t_p at δ μs	 %	P_L W	G_p dB	η_C %	page
RZB12100Y	1,09	50	100	10	100	10	45	329
	1,09	50	300	10	100	10	40	
	1,09	50	DABS*		100	9	40	
RZB12250Y	1,09	50	100	10	250	7,5	25	333
	1,09	50	300	10	200	7,0	30	
	1,09	50	DABS*		200	7,0	30	
RXB12350Y	1,09	50	100	10	350	7,8	38	289
	1,09	50	300	10	300	7,5	35	
	1,09	50	DABS*		300	7,8	38	

* See Fig. on preceding page.

3. **Linear power transistors**

3.1 Class-A medium power

type	f GHz	V_{CE} V	I_C mA	P_{L1} (1) mW	N_F dB	G_{po} (2) dB	G_a dB	page
LAE6000Q*	2	10	4	–	1,8	–	12	79
LBE2003S	2	18	30	250	–	11	–	85
LCE2003S	2	18	30	250	–	11	–	85
LBE2009S	2	18	110	900	–	9,8	–	85
LCE2009S	2	18	110	900	–	9,8	–	85
LWE2015R	2,3	16	250	1600	–	8,1	–	161
LWE2025R	2,3	16	400	2800	–	7,8	–	167
LAE4001R	4	15	25	110	–	9,5	–	67
LAE4002S	4	18	30	160	–	8	–	73
LTE42005S	4,2	18	110	550	–	7,2	–	119
LTE42008R	4,2	16	250	940	–	7,5	–	119
LTE42012R	4,2	16	400	1250	–	7	–	129

* Low-noise type.

3.2 Class-A high power

type	f GHz	V_{CE} V	I_C A	P_{L1} (1) W	G_{po} (2) dB	page
LZ1418E100R	1,4 to 1,8	16	2	11	11	173
LV1721E50R	1,7 to 2,1	16	1,1	5,5	8	135
LV2024E45R	2,0 to 2,4	16	1,1	5	7	141
LV2327E40R	2,3 to 2,7	16	1	5	8	147
LV3742E16R	3,7 to 4,2	16	0,5	2	5,5	151
LV3742E24R	3,7 to 4,2	16	0,8	2,4	6,5	157

(1) Load power for 1 dB compressed power gain.

(2) Low-level power gain associated with P_{L1}.

4. c.w. power transistors

4.1 Class-C medium power

type	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	page
PTB23001X	2	24	1,8	9	50	225
PTB23003X	2	24	4,0	10	50	225
PTB23005X	2	24	7,0	11	50	225
PTB32001X	3	24	1,8	9,5	45	229
PTB32003X	3	24	3,5	9,5	40	229
PTB32005X	3	24	5,5	9,5	40	229
PTB42001X	4,2	24	1,0	6	33	233
PTB42002X	4,2	24	2,0	6	35	233
PTB42003X	4,2	24	3,0	6	33	237
PVB42004X	1	24	15	13	60	247
	2	24	11	10	55	
	3	24	8	8	45	
	4	24	5	6	30	

4.2 Class-C high power

type	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	page
PZ1418B15U	1,4 to 1,8	28	15	7,8	45	251
PZ1418B30U	1,4 to 1,8	28	35	8,4	45	261
PZB16035U	1,55	28	38	9,8	50	271
PZ1721B12U	1,7 to 2,1	28	16	8	45	251
PZ1721B25U	1,7 to 2,1	28	30	7,8	41	261
PZ2024B10U	2,0 to 2,4	28	12	6,8	45	251
PZ2024B20U	2,0 to 2,4	28	26	7	42	261
PZB27020U	1	28	70	10	62	277
	2	28	40	7,8	48	
	3	28	22	5	25	
PV3742B4X	3,7 to 4,2	24	4,5	7,4	32	241

5. Oscillator power transistors

type	f GHz	V_{CE} V	I_C mA	P_L mW	envelope	page
PPC5001T	5	20	200	450	FO-102	221
PQC5001T	5	20	200	450	FO-85	221

GaAs field-effect transistors

type	f GHz	V_{DS} V	I_D A	P_{L1} (1) mW	N_F dB	G_{po} (2) dB	G_a dB	page
CFX13 (3)	10	3	10	–	2,2	–	8	29
	12	3	10	–	2,5	–	7,5	
CFX21	8	6	40	80	–	10	–	35
	11	6	40	65	–	7,5	–	
CFX30	11	8	50	125	–	8	–	41
CFX31	11	8	100	280	–	8	–	47
CFX32	6	8	180	550	–	8,5	–	53
	8,5	8	180	550	–	7,5	–	
CFX33	6	8	370	1100	–	7,0	–	57
	8,5	8	370	1100	–	5,5	–	

(1) Load power for 1 dB compressed power gain.
(2) Low-level power gain associated with P_{L1}.
(3) Low-noise type.

Bipolar class-A transistors

type number	f GHz	V_{CE} V	I_C mA	P_{L1} (1) W	G_{po} (2) dB	page
LAE2001R	2	15	35	0,12	8	63
LAE4000Q	4	15	30	0,09	6,5	65
LAE4001R	4	15	25	0,11	9,5	67
LAE4002S	4	18	30	0,16	8	73
LAE6000Q*	2	10	4	–	–	79
LBE1004R	1	15	100	0,5	10	83
LBE1010R	1	15	200	1	9	83
LBE2003S	2	18	30	0,25	11	85
LBE2005Q	1,65	12	80	0,4	9	93
LBE2008T	1,65	20	150	1,1	8	95
LBE2009S	2	18	110	0,9	9,8	85
LCE1004R	1	15	100	0,5	10	83
LCE1010R	1	15	200	1	9	83
LCE2003S	2	18	30	0,25	11	85
LCE2005Q	1,65	12	80	0,4	9	93
LCE2008T	1,65	20	150	1,1	8	95
LCE2009S	2	18	110	0,9	9,8	85
LJE42002T	4	20	65	0,2	7	97
LKE1004R	1	15	100	0,4	11	99
LKE2002T	2	15	70	0,2	8	101
LKE2004T	2	15	140	0,4	7	103
LKE2015T	2	20	200	1,6	8	105
LKE21004R	2,1	15	140	0,6	10	107
LKE21015T	2,1	20	300	1,75	10	109
LKE21050T	2,1	20	1200	5,5	9	111
LKE27010R	2,7	16	200	0,8	9	113
LKE27025R	2,7	16	650	2,5	7	115
LKE32002T	3	20	65	0,31	11,2	117
LKE32004T	3	20	130	0,71	11,0	117
LTE42005S	4,2	18	110	0,55	7,2	119
LTE42008R	4,2	16	250	0,94	7,5	119
LTE42012R	4,2	16	400	1,25	7	129
LV1721E50R	1,7 – 2,1	16	1100	5,5	8	135
LV2024E45R	2,0 – 2,4	16	1100	5	7	141
LV2327E40R	2,3 – 2,7	16	1000	5	8	147
LV3742E16R	3,7 – 4,2	16	500	2	5,5	151
LV3742E24R	3,7 – 4,2	16	800	2,4	6,5	157
LWE2015R	2,3	16	250	1,6	8,1	161
LWE2025R	2,3	16	400	2,8	7,8	167
LZ1418E100R	1,4 – 1,8	16	2000	11	11	173

* Low-noise: N_F = 1,8 dB; G_a = 12 dB.

(1) Load power for 1 dB compressed power gain.

(2) Low-level power gain associated with P_{L1}.

Bipolar class-B and pulsed power transistors

type number	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	page
MKB12040WS	1,09	45	38 (1)	11 (1)	47	179
MKB12100WS	1,09	45	72 (1)	7,6 (1)	40	181
MKB12140W	1,09	45	120 (1)	9,8 (1)	49	183
M06075B200Z	0,6 – 0,75	48	180 (1)	8,6 (1)	45	185
M06075B400Z	0,6 – 0,75	48	420 (1)	7,2 (1)	40	187
MRB12175YR	1,09	50	200 (1)	9 (1)	50	189
MRB12350YR	1,09	50	460 (1)	8 (1)	36	191
MS1011B700Y	1,025 – 1,150	50	700 (1)	6,7 (1)	35	193
MS7075B800Z	0,6 – 0,75	48	850 (1)	7,5 (1)	35	195
MSB12900Y	1,09	50	900 (1)	7,8 (1)	35	197
MZ0912B75Y	0,960 – 1,215	50	90 (2)	8,6 (2)	34	199
MZ0912B150Y	0,960 – 1,215	50	175 (2)	7,7 (2)	34	201
PDE1001U	1	28	2	6,4	60	203
PDE1003U	1	28	4,2	6,3	54	203
PDE1005U	1	28	7,6	5,8	58	203
PDE1010U	1	28	11	7,4	68	203
PEE1001U	1	28	2	6,4	60	203
PEE1003U	1	28	4,2	6,3	54	203
PEE1005U	1	28	7,6	5,8	58	203
PEE1010U	1	28	11	7,4	68	203
PKB3001U	3	28	1,2	10	33	205
PKB3003U	3	28	3,5	7	35	207
PKB3005U	3	28	5	5,2	29	209
PKB12005U	1,2	28	6,5	10,5	45	211
	0,960 – 1,215	28	5 (2)	9 (2)	45	
PKB20010U	1	28	25	11	58	213
	2	28	10	6	42	
PKB23001U	1	28	2,5	9,5	45	215
	2	28	1,5	7	32	
PKB23003U	1	28	5	11	70	215
	2	28	3,4	9,3	50	
PKB23005U	1	28	19	11	58	215
	2	28	8	7,2	53	
PKB25006T	2,3	21	9	10	40	217
	2,45	21	8	9	35	
PKB32001U	3	28	1,3	8,1	34	219
PKB32003U	3	28	3,2	6,3	33	219
PKB32005U	3	28	5	5,2	31	219
PPC5001T	5	20	0,45	in oscillator	–	221
PQC5001T	5	20	0,45	circuits	–	221

(1) P_L and G_p under pulsed condition: $t_{on} = 10\ \mu s$, $\delta = 1\%$.

(2) P_L and G_p under pulsed condition: $t_{on} = 10\ \mu s$, $\delta = 10\%$.

Bipolar class-B and pulsed power transistors

type number	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	page
PTB23001X	2	24	1,8	9	50	225
PTB23003X	2	24	4,0	10	50	225
PTB23005X	2	24	7,0	11	50	225
PTB32001X	3	24	1,8	9,5	45	229
PTB32003X	3	24	3,5	9,5	40	229
PTB32005X	3	24	5,5	9,5	40	229
PTB42001X	4,2	24	1	6	33	233
PTB42002X	4,2	24	2	6	35	233
PTB42003X	4,2	24	3	6	33	237
PV3742B4X	3,7 – 4,2	24	4,5	7,4	32	241
PVB42004X	3	24	8	8	45	247
PZ1418B15U	1,4 – 1,8	28	15	7,8	45	251
PZ1418B30U	1,4 – 1,8	28	35	8,4	45	261
PZ1721B12U	1,7 – 2,1	28	16	8	45	251
PZ1721B25U	1,7 – 2,1	28	30	7,8	41	261
PZ2024B10U	2,0 – 2,4	28	12	6,8	45	251
PZ2024B20U	2,0 – 2,4	28	26	7	42	261
PZB16035U	1,55	28	38	9,8	50	271
PZB27020U	3	28	22	5	25	277
RV3135B5X	3,1 – 3,5	24	5,6 (1)	5,7 (1)	47	281
RX1214B300Y	1,2 – 1,4	50	300 (2)	7,5 (2)	30	285
RXB12350Y	1,09	50	300 (2)	7,5 (2)	35	289
RZ1214B35Y	1,2 – 1,4	50	40 (2)	7 (2)	35	293
RZ1214B60W	1,2 – 1,4	42	60 (1)	7,8 (1)	31	299
RZ1214B65Y	1,2 – 1,4	42	80 (2)	7 (2)	30	301
RZ1214B125W	1,2 – 1,4	42	125 (1)	6,2 (1)	29,5	299
RZ1214B125Y	1,2 – 1,4	50	150 (2)	7 (2)	30	307
RZ1214B150Y	1,2 – 1,4	50	200 (2)	7 (2)	35	313
RZ2833B45W	2,7 – 3,1	40	45 (1)	5,5 (1)	25	319
RZ3135B15U	3,1 – 3,5	30	13 (1)	4,3 (1)	36	323
RZ3135B15W	3,1 – 3,5	42	8 (1)	5,5 (1)	33	325
RZ3135B25U	3,1 – 3,5	30	28 (1)	4,4 (1)	30	323
RZ3135B30W	3,1 – 3,5	42	34 (1)	5,5 (1)	33	325
RZB12100Y	1,09	50	100 (2)	10 (2)	40	329
RZB12250Y	1,09	50	250 (2)	7 (2)	30	333
RZZ1214B300Y	1,2 – 1,4	42	380 (2)	7 (2)	35	337

(1) P_L and G_p under pulsed condition: $t_{on} = 100\ \mu s$, $\delta = 10\%$.
(2) P_L and G_p under pulsed condition: $t_{on} = 300\ \mu s$, $\delta = 10\%$.

GENERAL

Type designation code
General recommendations
Mounting recommendations
  for flange envelopes
Mounting recommendations
  for capstan envelopes
Rating systems
Letter symbols
s-parameters

TYPE DESIGNATION CODE FOR SILICON POWER BIPOLAR TRANSISTORS

X : Letter
0 : Number
a) XXX 0000X : transistors without matching cell
b) XXX 00000X : transistors with input matching cell
c) XX 0000X 00X
000X } transistors with input and output matching cell

X LETTERS

- First letter: mode of operation
  L : Linear
  M : Short pulse
  P : CW class B
  R : Long pulse
- Second letter: encapsulation
  A : SOT-100
  B : FO-45
  C : FO-46
  D : FO-58
  E : FO-38
  J : FO-41A
  K : FO-53
  O : FO-57B
  P : FO-102
  Q : FO-85
  R : FO-67A/B
  S : FO-96
  T : FO-41B
  V : FO-83
  W : FO-93
  X : FO-91
  Z : FO-57C
  ZZ : 2xFO-57C
- Third letter: common potential
  E : Common emitter
  B : Common base
  C : Common collector
- Fourth letter: supply voltage
  (suffix)
  Q : 10 - 12 V
  R : 15 - 16 V
  S : 18 V
  T : 20 (18 - 21) V
  U : 28 - 30 V
  W : 45 V
  X : 24 V
  Y : 50 V
  Z : 48 V

0 NUMBERS

a) Transistors without matching cell

- first number: frequency of measurement (GHz)
- 2nd, 3rd, 4th numbers: power
  - in watts (W) for P - M and R mode of operation
  - in 100 mW for L mode of operation

b) Transistors with input matching cell

- first and second numbers: frequency of measurement (x 0,1 GHz)
- 2nd, 3rd, 4th numbers: power
  - in watts (W) for P - M and R mode of operation
  - in 100 mW for L mode of operation

c) Transistors with input and output matching cell

- first and second number: lower frequency of use (in 0,1 GHz)
- third and fourth numbers: higher frequency of use (in 0,1 GHz)
- last numbers: power
  - in watt (W) for P - M and R mode of operation
  - in 100 mW for L mode operation

SILICON BIPOLAR TRANSISTORS
GENERAL OPERATIONAL RECOMMENDATIONS

INTRODUCTION

These devices operate at high frequencies and high powers. To avoid damage or destruction, it is advisable to follow the advice given below during testing, setting-up procedures and final operation.

MECHANICAL

1. Good thermal and electrical conductivity is essential for efficient operation. Any metallic interface may introduce local overheating and an increase in contact resistance. It is therefore essential to use an adequate heatsink and heatsink compound between the rear face of the transistor or its flange and the heatsink.
2. Connections between the test jig or amplifier circuitry must be as short as possible, in any case not more than 100 μm. Special care must be taken to use the shortest possible high frequency earth (ground) connection.
3. When mounting the transistor on its heatsink, the recommended torque must not be exceeded.

POLARIZATION

1. When testing transistors in a new circuit, it is recommended that the supply voltage is reduced to approximately 70% of its nominal value and that series emitter or collector resistors are used (for common base and common emitter configurations respectively). After initial tests have been made, the series resistors may be decreased and the voltage increased.
2. The use of high value capacitors must be avoided as far as possible. If their use cannot be avoided, series resistors of a few ohms must be inserted.

OPERATION

1. Input power

   While the circuit is not optimized, it is recommended that the power input should be at a lower level than that specified.
2. Output waveform

   It is advisable to check the output waveform with a spectrum analyzer or similar equipment to ensure that no parasitic effects are introduced by the power supply or earth (ground) connections, thus causing unwanted modulation.
3. Junction temperature

   If the circuit design is likely to cause a large temperature rise, it is advisable to check the temperature rise with a pulsed input before applying full power.

RECOMMENDATIONS FOR MOUNTING FLANGE R.F. POWER TRANSISTORS

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

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

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

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

Screw threads, diameter and nuts:

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

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

- Diameter of the mounting hole in the heatsink:

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

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

- Mounting nut torque:

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

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

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

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

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

RATING SYSTEMS

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

DEFINITIONS OF TERMS USED

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

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

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

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

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

Note
Limiting conditions may be either maxima or minima.

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

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

ABSOLUTE MAXIMUM RATING SYSTEM

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

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

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

DESIGN MAXIMUM RATING SYSTEM

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

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

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

DESIGN CENTRE RATING SYSTEM

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

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

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

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

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

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

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

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

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

a) continuous (d.c.) values (without signal)
Example I_B

b) instantaneous total values
Example i_B

c) average total values
Example $I_{B(AV)}$

d) peak total values
Example I_{BM}

e) root-mean-square total values
Example $I_{B(RMS)}$

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

a) instantaneous values
Example i_b

b) root-mean-square values
Example $I_{b(rms)}$

c) peak values
Example I_{bm}

d) average values
Example $I_{b(av)}$

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

Additional rules for subscripts

Subscripts for currents

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

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

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

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

Subscripts for voltages

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

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

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

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

Subscripts for supply voltages or supply currents

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

Examples: V_{CC}, I_{EE}

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

Example : V_{CCE}

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

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

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

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

Subscripts for multiple devices

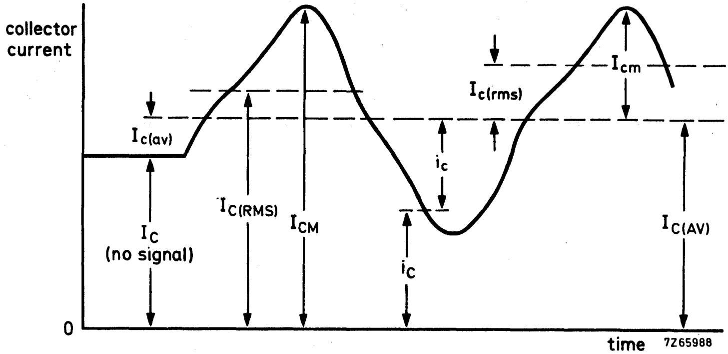
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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

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

Application of the rules

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



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

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

Basic letters

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

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

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

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

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

Subscripts

General subscripts

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

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

Examples: Z_S, h_f, h_F

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

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

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

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

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration
$Z_e = R_e + jX_e$ = small-signal value of the external impedance

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

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

Subscripts for four-pole matrix parameters

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

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

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

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

Distinction between real and imaginary parts

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

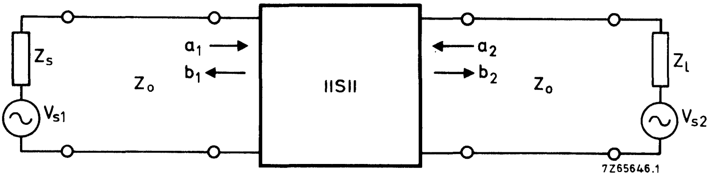
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

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

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

SCATTERING PARAMETERS

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



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

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

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

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$
$$b_2 = s_{21}a_1 + s_{22}a_2$$

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

$$s_i = s_{11} = \left.\frac{b_1}{a_1}\right| a_2 = 0$$
$$s_r = s_{12} = \left.\frac{b_1}{a_2}\right| a_1 = 0$$
$$s_f = s_{21} = \left.\frac{b_2}{a_1}\right| a_2 = 0$$
$$s_o = s_{22} = \left.\frac{b_2}{a_2}\right| a_1 = 0$$

---

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

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

$s_i = s_{11}$ = Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.
The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

$s_f = s_{21}$ = Forward transmission coefficient.
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$

$s_o = s_{22}$ = Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

DEVICE DATA

GaAs field-effect transistors

N-CHANNEL LOW-NOISE Ku-BAND GaAs FET

The transistor is housed in a miniature ceramic encapsulation and is specified in a low-noise amplifier circuit.

Features:

- Self-aligned process: high conformity and short gate length (0,5 μm);
- TiPtAu metallization ensures long life;
- Hermetically sealed encapsulation protects the chip to provide long term performance stability.

Also available in chip version (CFX13X).

QUICK REFERENCE DATA

Typical values in common-source configuration at T_{case} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	F_{opt} dB	G_a dB	g_m* mA/V
c.w.	10	3	10	2,2	8	28
	12	3	10	2,5	7,5	28

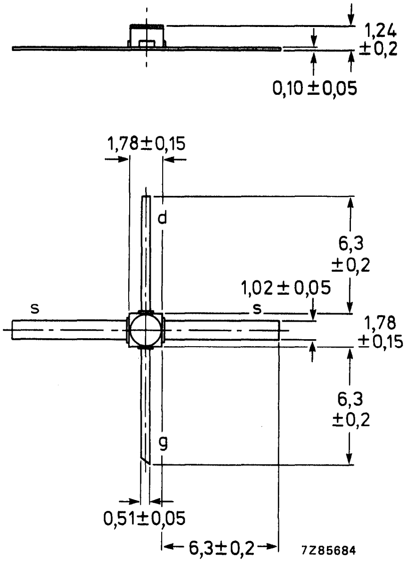
* Measuring conditions: $-1\ V < V_{GS} < 0$

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-92.

Source connected to metallized lid



RATINGS

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

Drain-source voltage	V_{DS}	max.	5	V
Gate-source voltage	$-V_{GS}$	max.	6	V
Saturated drain current	I_{DSS}	max.	100	mA
Total power dissipation up to T_{case} = 115 °C	P_{tot}	max.	300	mW
Storage temperature	T_{stg}	−65	to + 175	°C
Channel temperature	T_{ch}	max.	175	°C
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} \leqslant 8$ s	T_{sld}	max.	250	°C

THERMAL RESISTANCE

From channel to case	$R_{th\ ch\text{-}c}$	=	200	K/W*

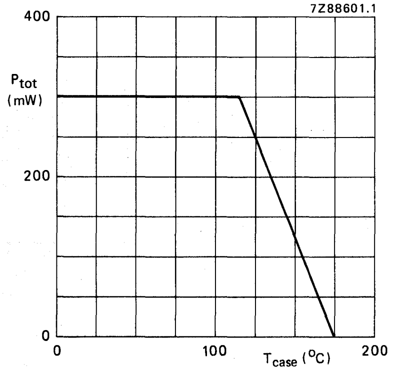


Fig. 2 Power derating curve as a function of case temperature.

CHARACTERISTICS

T_{amb} = 25 °C

Gate-source cut-off current V_{DS} = 3 V; I_D = 200 μA	I_G	typ. <	1 5	μA μA
Saturated drain current V_{DS} = 3 V; V_{GS} = 0	I_{DSS}		35 to 100	mA
Pinch-off voltage V_{DS} = 3 V; I_D = 200 μA	$-V_{(P)GS}$	typ. 1,5 to	3 4	V V
Mutual transconductance V_{DS} = 3 V; $-1\ V < V_{GS} < 0$	g_m	> typ.	25 28	mA/V mA/V
Maximum available gain V_{DS} = 3 V; I_D = 35 mA; f = 10 GHz	G_{AM}	typ.	10,5	dB
V_{DS} = 3 V; I_D = 35 mA; f = 12 GHz	G_{AM}	typ.	9,0	dB

* K/W is SI unit for °C/W.

s-parameters (common source)

Typical values; $V_{DS} = 3$ V; $I_D = 10$ mA; $T_{amb} = 25$ °C; $Z_o = 50\ \Omega$

f GHz	s_{is}	s_{rs}	s_{fs}	s_{os}
6	0,91/−102°	0,027(−31,5)/27°	1,16(1,26)/81°	0,75/ −71°
7	0,89/−113°	0,025(−31,9)/28°	1,08(0,67)/68°	0,75/ −81°
8	0,88/−123°	0,025(−32,1)/32°	1,05(0,45)/57°	0,76/ −90°
9	0,86/−136°	0,026(−31,8)/38°	1,04(0,36)/44°	0,76/−100°
10	0,85/−151°	0,028(−31,2)/46°	1 (0)/31°	0,77/−108°
11	0,83/+160°	0,031(−30,1)/57°	0,94(−0,58)/20°	0,77/−114°
12	0,82/+165°	0,036(−28,9)/69°	0,87(−1,19)/12°	0,77/−117°

The figures given between brackets are values in dB.

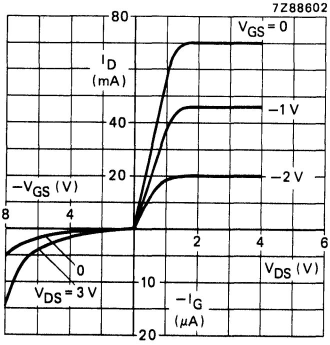


Fig. 3 Drain current as a function of drain-source voltage and gate cut-off current as a function of gate-source voltage. Typical values; $T_{case} = 25$ °C.

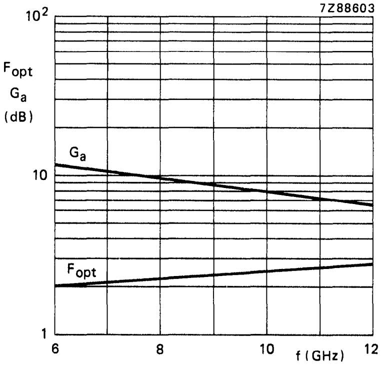


Fig. 4 Noise and associated gain as a function of frequency. Typical values; $V_{DS} = 3$ V; $I_D = 10$ mA.

APPLICATION INFORMATION

Low-noise amplifier (common-source) at $T_{case} = 25$ °C

mode of operation	f GHz	V_{DS} V	I_D mA	F_{opt} dB	G_a dB
c.w.	12	3	10	< 3,0	> 6,5

Linear amplifier (common-source) at $T_{case} = 25$ °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB
c.w.	10	3	35	> 10	typ. 10

Conditions for Figs 5 and 6:
$V_{DS} = 3$ V; $I_D = 10$ mA;
$T_{case} = 25$ °C.

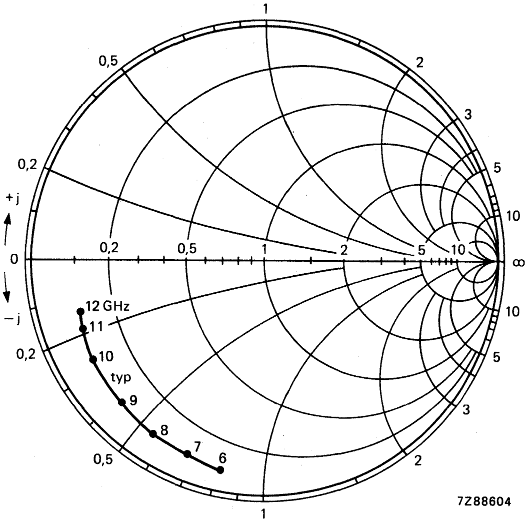


Fig. 5 Input impedance derived from input reflection coefficient s_{is} co-ordinates in ohm x 50.

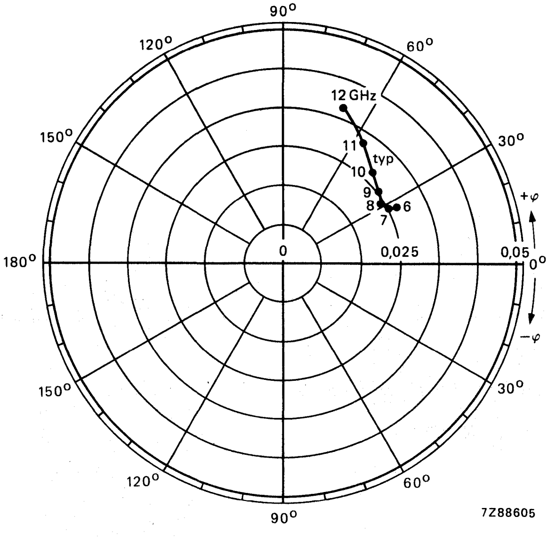


Fig. 6 Reverse transmission coefficient s_{rs}.

Conditions for Figs 7 and 8:
$V_{DS} = 3$ V; $I_D = 10$ mA;
$T_{case} = 25$ °C.

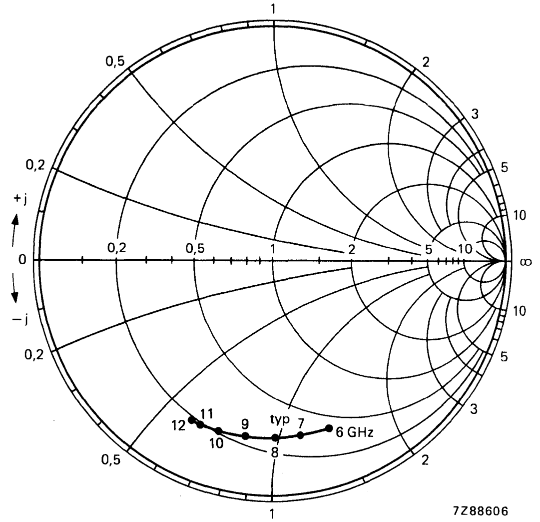


Fig. 7 Output impedance derived from output reflection coefficient s_{os} co-ordinates in ohm x 50.

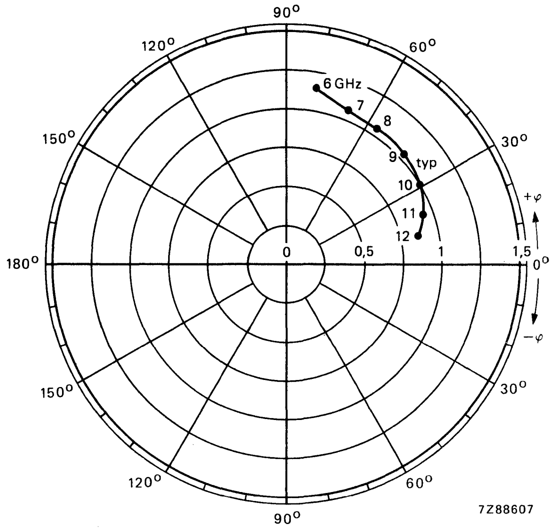


Fig. 8 Forward transmission coefficient s_{fs}.

N-CHANNEL LOW-POWER X-BAND GaAs FET

The transistor is housed in a miniature ceramic encapsulation and is specified in a linear amplifier circuit.

Features:

- Self-aligned process: high conformity and short gate length (0,8 μm);
- TiPtAu metallization ensures long life;
- Hermetically sealed encapsulation protects the chip to provide high temperature stability.

Also available in chip version (CFX21X).

QUICK REFERENCE DATA

Typical values in common-source configuration at T_{case} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB	g_m* mA/V
c.w.	8	6	40	80	10	23
	11	6	40	65	7,5	23

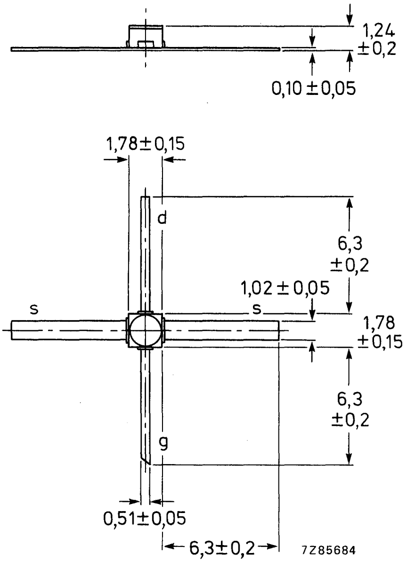
* Measuring conditions: V_{DS} = 3 V; −1 V $< V_{GS} <$ 0

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-92.

Source connected to metallized lid.



RATINGS

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

Drain-source voltage	V_{DS}	max.	8 V
Gate-source voltage	$-V_{GS}$	max.	6 V
Saturated drain current	I_{DSS}	max.	110 mA
Total power dissipation up to T_{case} = 75 °C	P_{tot}	max.	500 mW
Storage temperature	T_{stg}	−65 to	+ 175 °C
Channel temperature	T_{ch}	max.	175 °C
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} \leqslant 8$ s	T_{sld}	max.	250 °C

THERMAL RESISTANCE

From channel to case	$R_{th\ ch\text{-}c}$	=	200 K/W*

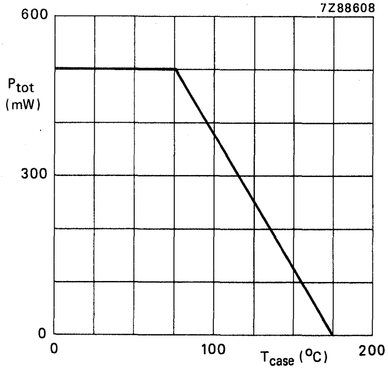


Fig. 2 Power derating curve as a function of case temperature.

CHARACTERISTICS

T_{case} = 25 °C

Saturated drain current $V_{DS} = 3$ V; $V_{GS} = 0$	I_{DSS}	50 to 110 mA
Pinch-off voltage $V_{DS} = 3$ V; $I_D = 200$ μA	$-V_{(P)GS}$	1,5 to 5 V
Mutual transconductance $V_{DS} = 3$ V; -1 V $< V_{GS} < 0$	g_m	> 20 mA/V

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* K/W is SI unit for °C/W.

s-parameters (common source)

Typical values; V_{DS} = 6 V; I_D = 40 mA; T_{amb} = 25 °C; Z_o = 50 Ω

f GHz	s_{is}	s_{rs}	s_{fs}	s_{os}
6	0,87/−119°	0,010(−40,4)/63°	1,18(1,44)/68°	0,86/−69°
7	0,85/−132°	0,012(−38,3)/79°	1,08(0,66)/54°	0,87/−79°
8	0,82/−146°	0,018(−34,8)/89°	1,02(0,15)/40°	0,87/−89°
9	0,81/−162°	0,028(−31,1)/91°	0,96(−0,35)/26°	0,88/ −98°
10	0,80/−177°	0,038(−28,4)/89°	0,88(−1,12)/12°	0,90/−107°
11	0,78/+175°	0,051(−25,9)/87°	0,80(−1,97)/ 2°	0,91/−111°
12	0,76/+171°	0,065(−23,8)/88°	0,73(−2,73)/−5°	0,92/−113°

The figures given between brackets are values in dB.

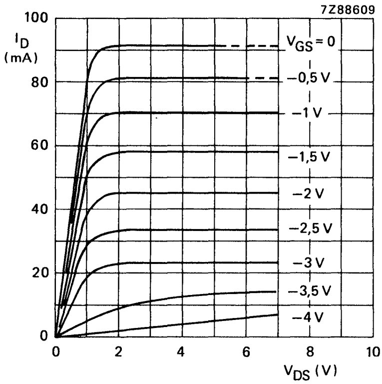


Fig. 3 Typical values; T_{case} = 25 °C.

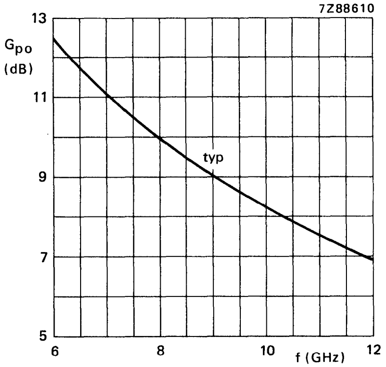


Fig. 4 Linear gain as a function of frequency. V_{DS} = 6 V; I_D = 40 mA.

APPLICATION INFORMATION

Linear amplifier (common-source) at T_{case} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB	g_m mA/V
c.w.	11	6	40	> 50	> 7	> 20

Low-noise amplifier (common-source) at T_{case} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	F dB	G_a dB
c.w.	10	3	10	typ. 3,5	typ. 7

Conditions for Figs 5 and 6:
$V_{DS} = 6$ V; $I_D = 40$ mA;
$T_{case} = 25$ °C.

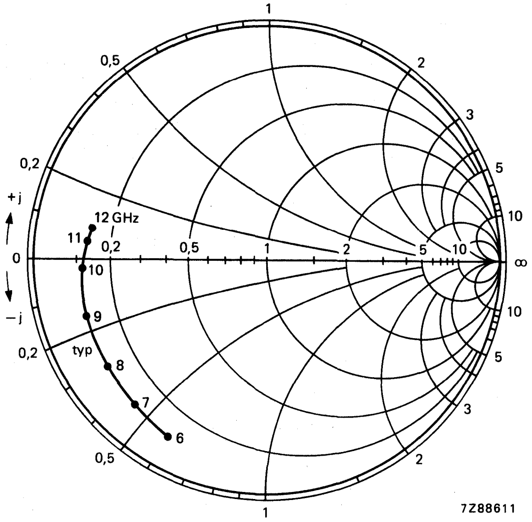


Fig. 5 Input impedance derived from input reflection coefficient s_{is} co-ordinates in ohm x 50.

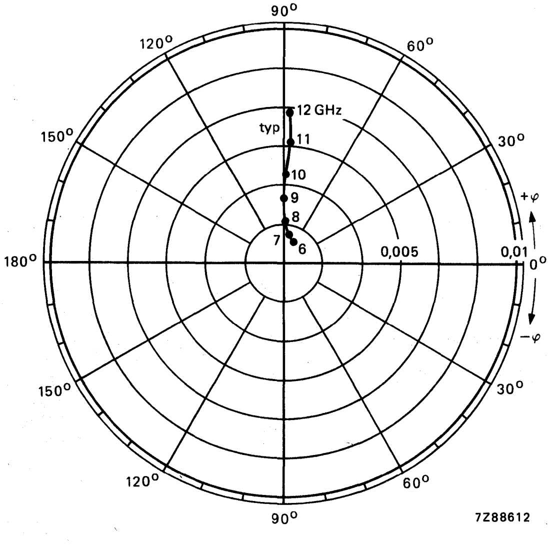


Fig. 6 Reverse transmission coefficient s_{rs}.

Conditions for Figs 7 and 8:

$V_{DS} = 6$ V; $I_D = 40$ mA;
$T_{case} = 25$ °C.

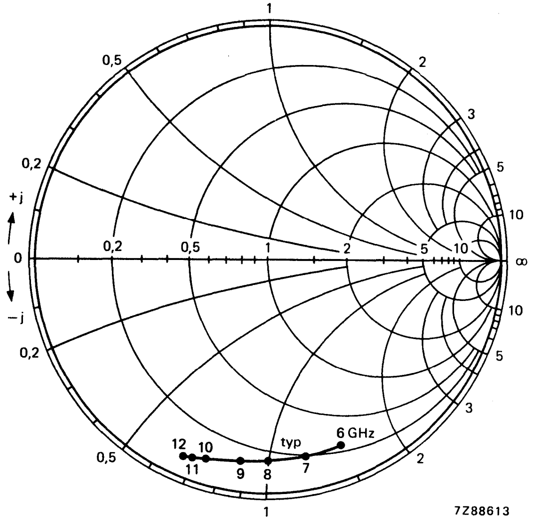


Fig. 7 Output impedance derived from output reflection coefficient s_{os} co-ordinates in ohm x 50.

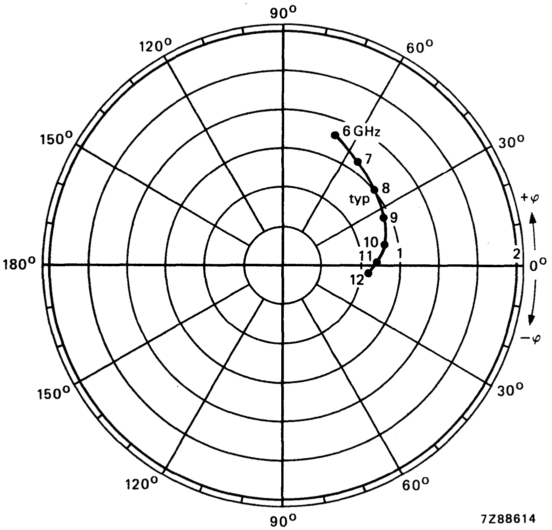


Fig. 8 Forward transmission coefficient s_{fs}.

N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier circuit and can be used at frequencies up to 15 GHz.

Features:

- Self-aligned recessed gate structure;
- TiPtAu metallization;
- hermetically sealed encapsulation

Also available in chip version (CFX30X).

QUICK REFERENCE DATA

Typical values in common source configuration at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB	g_m* mA/V
c.w.	11	8	50	125	8	60

* Measuring conditions: $-1\ V < V_{GS} < 0$

MECHANICAL DATA

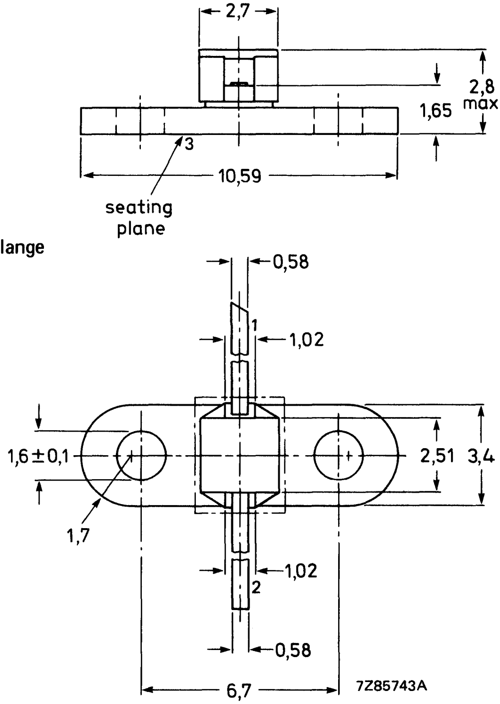
Dimensions in mm

Fig. 1 FO-85.

Leaf reference

1 Gate
2 Drain
3 Source (flange)

Source connected to flange



RATINGS

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

Drain-source voltage	V_{DS}	max.	15 V
Gate-source voltage	$-V_{GS}$	max.	12 V
Saturated drain current	I_{DSS}	max.	130 mA
Gate current	I_G	max.	3 mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	1650 mW
Storage temperature	T_{stg}	−65 to + 175 °C	
Channel temperature	T_{ch}	max.	175 °C
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} < 8$ s	T_{sld}	max.	250 °C

THERMAL RESISTANCE

From channel to mounting base	$R_{th\ ch\text{-}mb}$	90 K/W*

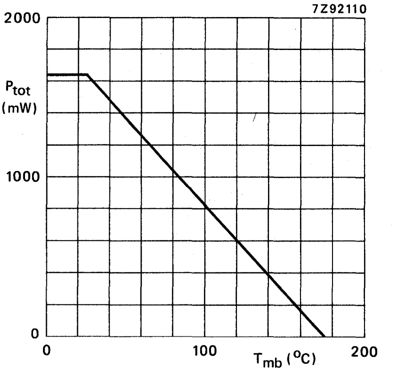


Fig. 2 Power derating curve vs. mounting base temperature.

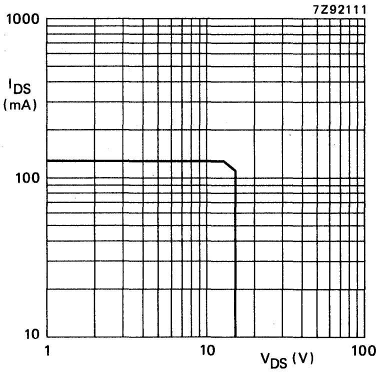


Fig. 3 D.C. SOAR at T_{mb} = 25 °C.

CHARACTERISTICS

T_{mb} = 25 °C

Saturated drain current $V_{DS} = 3$ V; $V_{GS} = 0$	I_{DSS}	typ. 60 to	80 mA 130 mA
Pinch-off voltage $V_{DS} = 3$ V; $I_D = 1$ mA	$-V_{(P)GS}$	typ. 1,2 to	2,0 V 4,0 V
Mutual transconductance $V_{DS} = 3$ V; $-1\ V < V_{GS} < 0$	g_m	> typ.	40 mA/V 60 mA/V
Gate-source leakage current $V_{DS} = 3$ V; $I_D = 200\ \mu A$	I_{GS}	typ.	20 μA

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* K/W is SI unit for °C/W.

S-parameters (common source)

Typical values; V_{DS} = 8 V; I_D = 50 mA; T_{mb} = 25 °C; Z_o = 50 Ω.

f GHz	s_{is}	s_{rs}	s_{fs}	s_{os}
2	0,89/ −93°	0,062(−24,2)/ 22°	2,72(8,69)/ 101°	0,65/ −66°
3	0,86/−121°	0,067(−23,5)/ 0°	2,23(6,97)/ 73°	0,66/ −88°
4	0,84/−148°	0,069(−23,2)/ −19°	1,84(5,30)/ 48°	0,67/−106°
5	0,82/−165°	0,070(−23,1)/ −35°	1,58(3,97)/ 26°	0,68/−123°
6	0,79/ 176°	0,071(−23,0)/ −48°	1,46(3,29)/ 6°	0,69/−138°
7	0,77/ 154°	0,072(−22,9)/ −62°	1,40(2,92)/ −15°	0,69/−155°
8	0,74/ 131°	0,071(−23,0)/ −75°	1,35(2,61)/ −37°	0,70/−170°
9	0,72/ 108°	0,069(−23,2)/ −86°	1,27(2,08)/ −59°	0,69/ 175°
10	0,68/ 89°	0,070(−23,1)/ −94°	1,21(1,66)/ −79°	0,68/ 160°
11	0,62/ 67°	0,071(−23,0)/−103°	1,29(2,21)/ −96°	0,68/ 152°
12	0,56/ 37°	0,074(−22,6)/−112°	1,40(2,92)/−116°	0,70/ 147°

The figures given between brackets are values in dB.

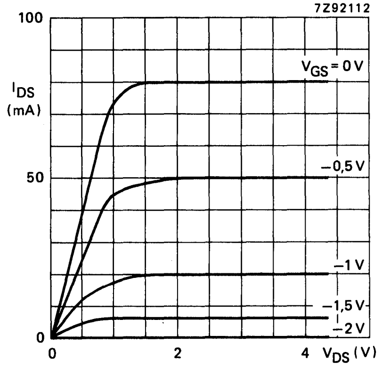


Fig. 4 Typ. values; T_{mb} = 25 °C.

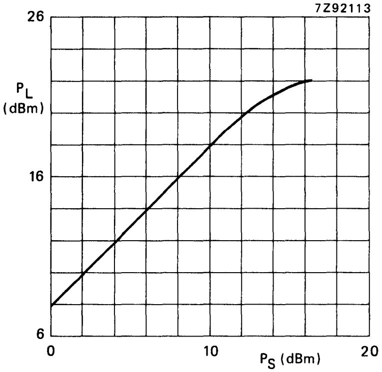


Fig. 5 Load power vs. source power; typ. values; V_{DS} = 8 V; I_{DS} = 50 mA; f = 11 GHz; T_{mb} = 25 °C.

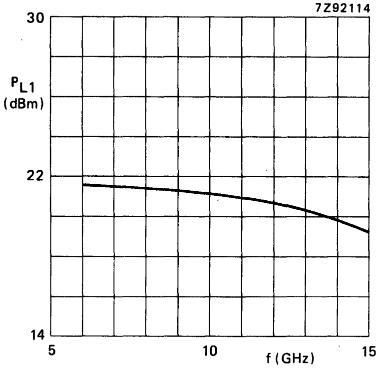


Fig. 6 Load power at 1 dB gain compression vs. frequency; V_{DS} = 8 V; I_{DS} = 50 mA; T_{mb} = 25 °C.

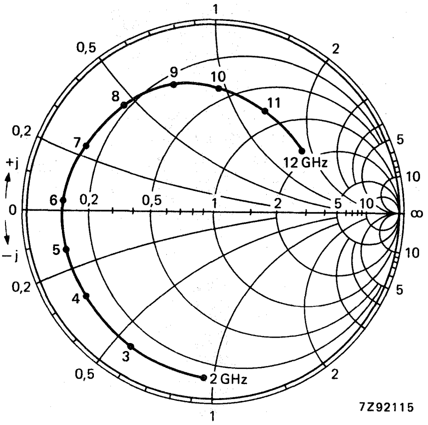


Fig. 7 Input reflection coefficient s_{is}.

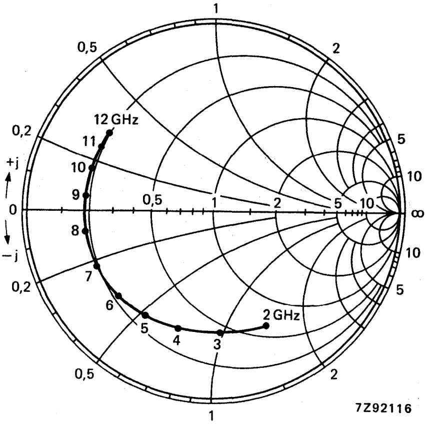


Fig. 8 Output reflection coefficient s_{os}.

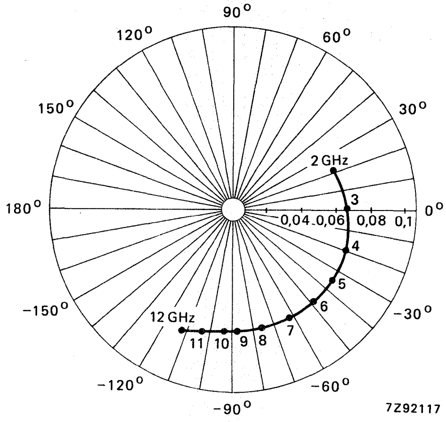


Fig. 9 Reverse transmission coefficient s_{rs}.

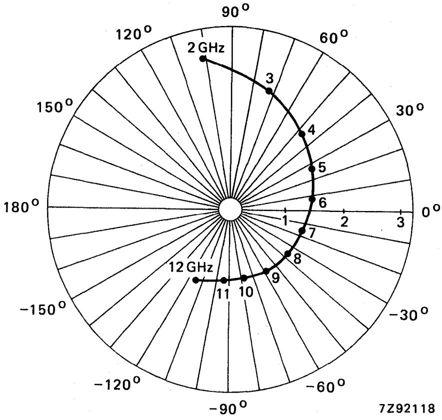


Fig. 10 Forward transmission coefficient s_{fs}.

Conditions for Figs 7, 8, 9 and 10: V_{DS} = 8 V; I_{DS} = 50 mA.

APPLICATION INFORMATION

Linear amplifier (common source) at $T_{mb} = 25\ ^{o}C$

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB
c.w.	8	8	50	> 100	> 8
	11	8	50	> 100	> 7

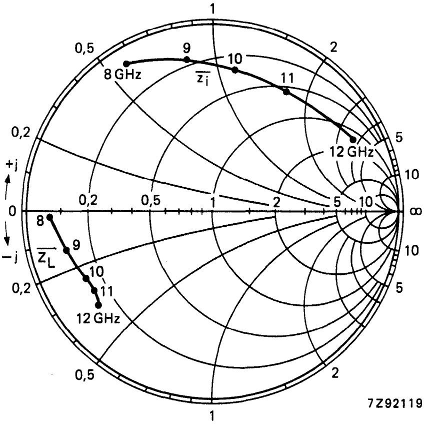


Fig. 11 Input impedance (z_i) and optimum load impedance (Z_L) vs. frequency (calculated from s-parameters); V_{DS} = 8 V; I_D = 50 mA; $Z_o = 50\ \Omega$.

N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier circuit and can be used at frequencies up to 15 GHz.

Features:

- self-aligned recessed gate structure;
- TiPtAu metallization;
- hermetically sealed encapsulation.

Also available in chip version (CFX31X).

QUICK REFERENCE DATA

Typical values in common-source configuration at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB	g_m* mA/V
c.w.	11	8	100	280	8	60

* Measuring conditions; $-1\ V < V_{GS} < 0$

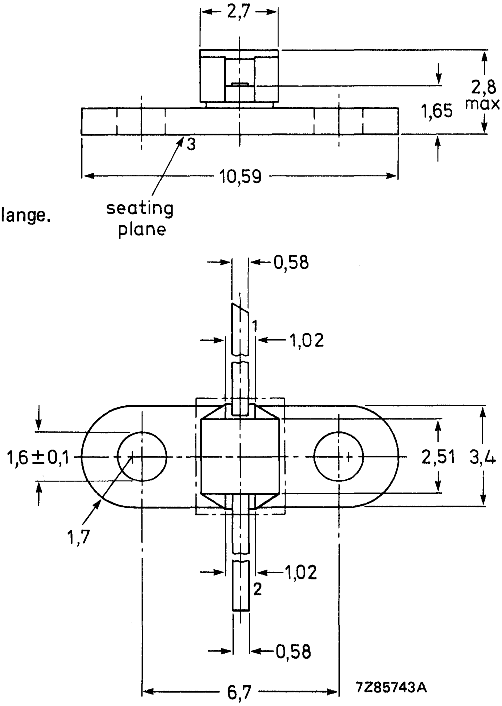
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-85.

Lead reference

1 Gate
2 Drain
3 Source (flange)
Source connected to flange.



RATINGS

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

Drain-source voltage	V_{DS}	max.	15	V
Gate-source voltage	$-V_{GS}$	max.	12	V
Saturated drain current	I_{DSS}	max.	250	mA
Gate current	I_G	max.	3	mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	1650	mW
Storage temperature	T_{stg}	−65 to +175		°C
Channel temperature	T_{ch}	max.	175	°C
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} < 8$ s	T_{sld}	max.	250	°C

THERMAL RESISTANCE

From channel to mounting base	$R_{th\ ch\text{-}mb}$	90	K/W*

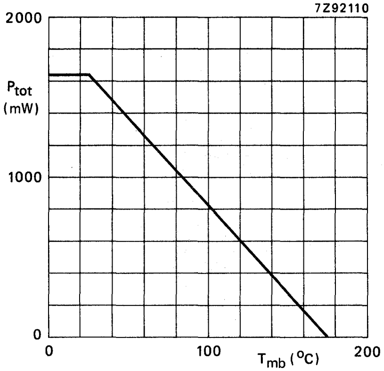


Fig. 2 Power derating curve vs. mounting base temperature.

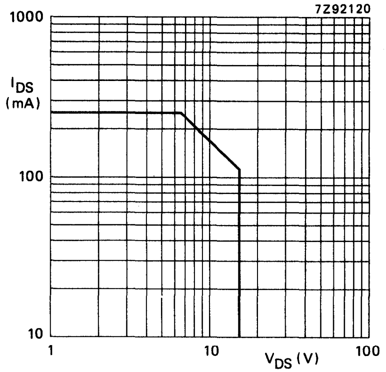


Fig. 3 D.C. SOAR at T_{mb} = 25 °C.

CHARACTERISTICS

T_{mb} = 25 °C

Saturated drain current V_{DS} = 3 V; V_{GS} = 0	I_{DSS}	typ. 130	 to	160 250	mA mA
Pinch-off voltage V_{DS} = 3 V; I_D = 1 mA	$-V_{(P)GS}$	typ. 2,5	 to	4,0 6,0	V V
Mutual transconductance V_{DS} = 3 V; $-1\ V < V_{GS} < 0$	g_m	> typ.		40 60	mA/V mA/V
Gate-source leakage current V_{DS} = 3 V; I_D = 200 μA	I_{GS}	typ.		20	μA

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* K/W is SI unit for °C/W.

S-parameters (common-source)

Typical values; V_{DS} = 8 V; I_D = 100 mA; T_{mb} = 25 °C; Z_o = 50 Ω.

f GHz	s_{is}	s_{rs}	s_{fs}	s_{os}
2	0,89/ −95°	0,061(−24,3)/ 21°	2,63(8,40)/ 100°	0,59/ −66°
3	0,87/−122°	0,065(−23,7)/ −1°	2,16(6,69)/ 73°	0,64/ −88°
4	0,86/−146°	0,067(−23,5)/ 21°	1,78(5,01)/ 47°	0,65/−107°
5	0,84/−166°	0,068(−23,4)/ −37°	1,55(3,81)/ 25°	0,67/−124°
6	0,82/+175°	0,069(−23,2)/ −51°	1,41(2,98)/ 5°	0,68/−140°
7	0,79/+153°	0,070(−23,1)/ −65°	1,33(2,48)/ −17°	0,69/−156°
8	0,78/+130°	0,069(−23,2)/ −79°	1,27(2,08)/ −38°	0,69/−172°
9	0,75/+110°	0,066(−23,6)/ −92°	1,20(1,58)/ −59°	0,68/+173°
10	0,72/ +92°	0,064(−23,9)/−101°	1,15(1,21)/ −78°	0,68/+159°
11	0,68/ +71°	0,064(−23,9)/−109°	1,20(1,58)/ −95°	0,69/+150°
12	0,63/ +48°	0,066(−23,6)/−115°	1,30(2,28)/−112°	0,70/+145°

The figures given between brackets are values is dB.

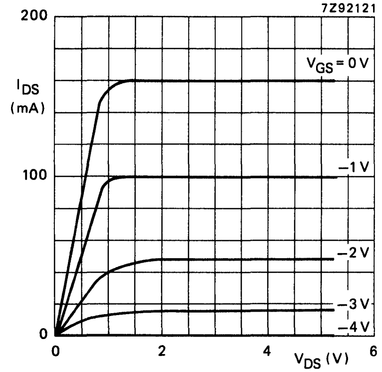


Fig. 4 Typ. values; T_{mb} = 25 °C.

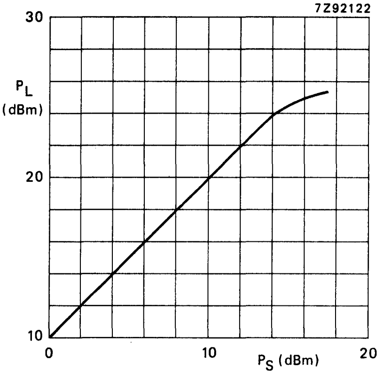


Fig. 5 Load power vs. source power; typ. values; V_{DS} = 8 V; I_{DS} = 100 mA; f = 11 GHz; T_{mb} = 25 °C.

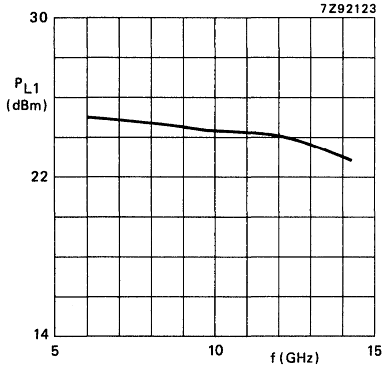


Fig. 6 Load power at 1 dB gain compression vs. frequency; V_{DS} = 8 V; I_{DS} = 100 mA; T_{mb} = 25 °C.

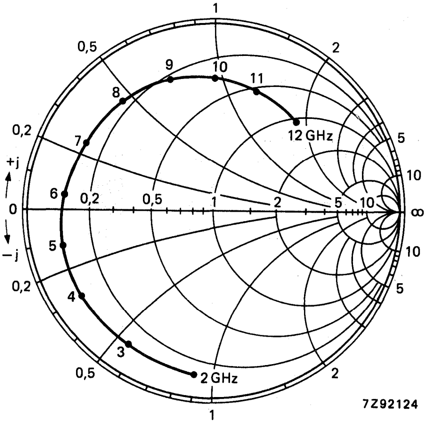


Fig. 7 Input reflection coefficient s_{is}.

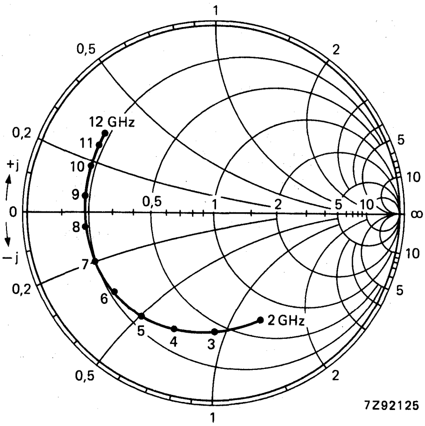


Fig. 8 Output reflection coefficient s_{os}.

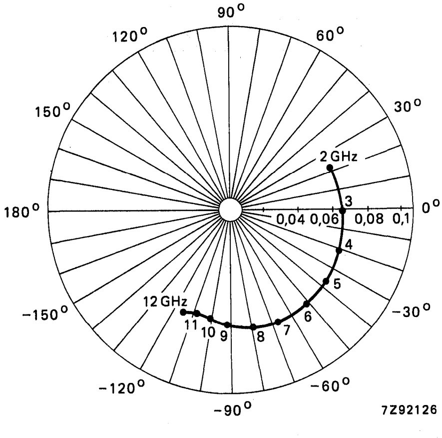


Fig. 9 Reverse transmission coefficient s_{rs}.

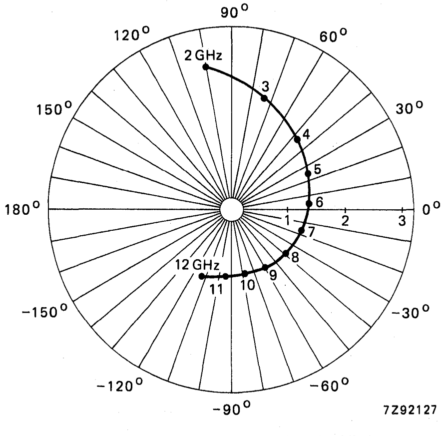


Fig. 10 Forward transmission coefficient s_{fs}.

Conditions for Figs 7, 8, 9 and 10: $V_{DS} = 8$ V; $I_{DS} = 100$ mA.

APPLICATION INFORMATION

Linear amplifier (common source) at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB
c.w.	8	8	100	> 250	> 8
	11	8	100	> 250	> 7

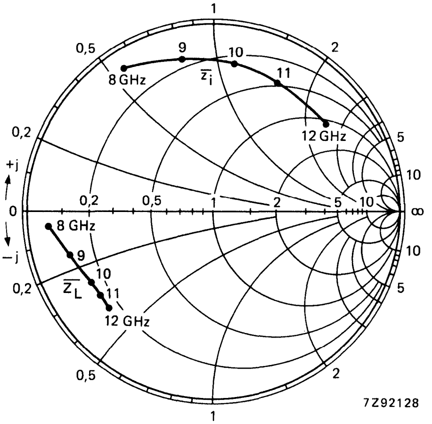


Fig. 11 Input inpedance ($\overline{z}_i$) and optimum load impedance ($\overline{Z}_L$) vs. frequency (calculated from s-parameters); V_{DS} = 8 V; I_D = 100 mA; Z_o = 50 Ω.

N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier and can be used at frequencies up to the X-band.

Features:

- recessed gate giving a high maximum drain-source voltage rating;
- TiPtAu metallization ensuring long life;
- hermetically sealed encapsulation protecting the chip to provide high temperature stability.

Also available in chip version (CFX32X).

QUICK REFERENCE DATA

Typical values in common-source configuration at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB	g_m* mA/V
c.w.	6,0	8	180	550	8,5	120
	8,5	8	180	550	7,5	120

* Measuring conditions: $-1\ V < V_{GS} < 0$

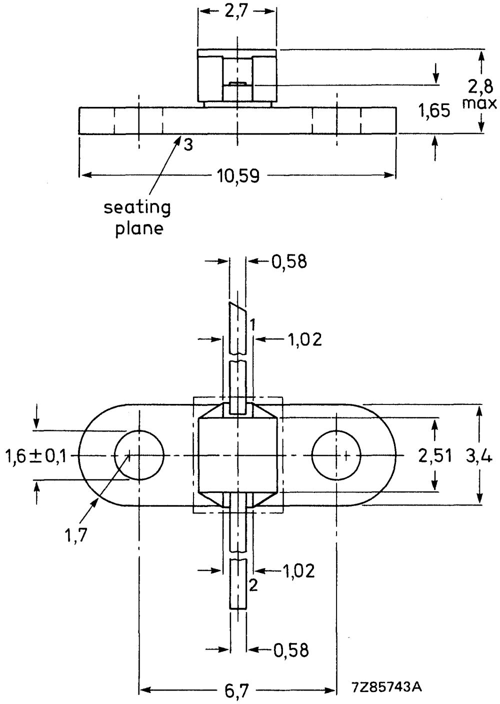
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-85.

Lead reference

1 Gate
2 Drain
3 Source (flange)



RATINGS

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

Drain-source voltage	V_{DS}	max.	15 V
Gate-source voltage	$-V_{GS}$	max.	12 V
Saturated drain current	I_{DSS}	max.	500 mA
Gate current	I_G	max.	5 mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	2,5 W
Storage temperature	T_{stg}	−65 to	+175 °C
Channel temperature	T_{ch}	max.	175 °C
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} \leqslant 8$ s	T_{sld}	max.	250 °C

THERMAL RESISTANCE

From channel to mounting base	$R_{th\ ch\text{-}mb}$	60 K/W*

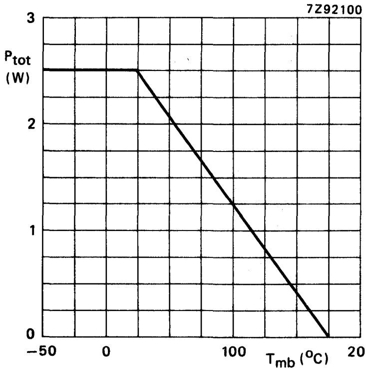


Fig. 2 Power derating curve vs. mounting base temperature.

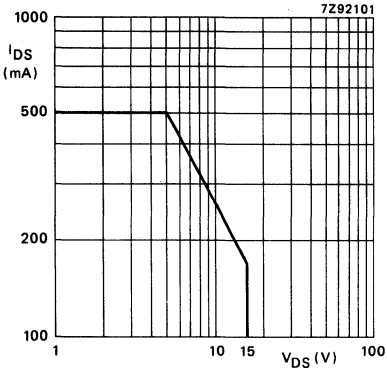


Fig. 3 D.C. SOAR at T_{mb} = 25 °C.

CHARACTERISTICS

T_{mb} = 25 °C

Saturated drain current V_{DS} = 3 V; V_{GS} = 0	I_{DSS}	typ.	350 mA
Pinch-off voltage V_{DS} = 3 V; I_D = 3 mA	$-V_{(P)GS}$	typ.	4 V 2 to 6 V
Mutual transconductance V_{DS} = 3 V; $-1\ \mathrm{V} < V_{GS} < 0$	g_m	min. typ.	80 mA/V 120 mA/V

---

* K/W is SI unit for °C/W.

S-parameters (common source)

Typical values; V_{DS} = 8 V; I_D = 180 mA; T_{mb} = 25 °C; Z_o = 50 Ω

f GHz	s_{is}	s_{rs}	s_{fs}	s_{os}
2	0,84/−117°	0,067(−23,5)/ 46°	3,25(10,2)/ 91°	0,34/ −99°
3	0,81/−144°	0,069(−23,5)/ 2°	2,59(8,28)/ 64°	0,37/−117°
4	0,79/−168°	0,069(−23,2)/ −19°	2,12(6,52)/ 39°	0,41/−134°
5	0,76/ 176°	0,069(−23,2)/ −34°	1,82(5,21)/ 17°	0,43/−148°
6	0,73/ 148°	0,069(−23,2)/ −47°	1,65(4,37)/ −3°	0,45/−162°
7	0,70/ 122°	0,069(−23,2)/ −60°	1,55(3,82)/ −28°	0,46/−177°
8	0,69/ 96°	0,067(−23,4)/ −73°	1,46(3,31)/ −52°	0,47/ 169°
9	0,67/ 72°	0,065(−23,8)/ −84°	1,38(2,81)/ −75°	0,46/ 152°
10	0,64/ 44°	0,063(−24,0)/ −94°	1,34(2,52)/ −98°	0,45/ 138°
11	0,62/ 3°	0,061(−24,4)/−106°	1,33(2,48)/−122°	0,45/ 129°
12	0,63/ −33°	0,056(−25,0)/−119°	1,34(2,54)/−148°	0,44/ 126°

The figures given between brackets are values in dB..

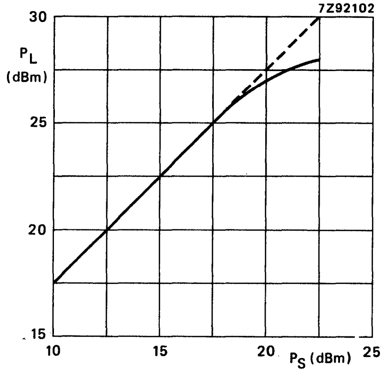


Fig. 4 Load power vs. source power; typ. values;
V_{DS} = 8 V; I_{DS} = 180 mA; f = 8,5 GHz; T_{mb} = 25 °C.

APPLICATION INFORMATION

Linear amplifier (common source) at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB
c.w.	8,5	8	180	⩾ 500	⩾ 7

N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier and can be used at frequencies up to the X-band.

Features:

- recessed gate giving a high maximum drain-source voltage rating;
- TiPtAu metallization ensuring long life;
- hermetically sealed encapsulation protecting the chip to provide high temperature stability.

Also available in chip version (CFX33X).

QUICK REFERENCE DATA

Typical values in common-source confifuration at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB	g_m* mA/V
c.w.	6,0	8	370	1100	7,0	230
	8,5	8	370	1100	5,5	230

* Measuring conditions: $-1\ V < V_{GS} < 0$

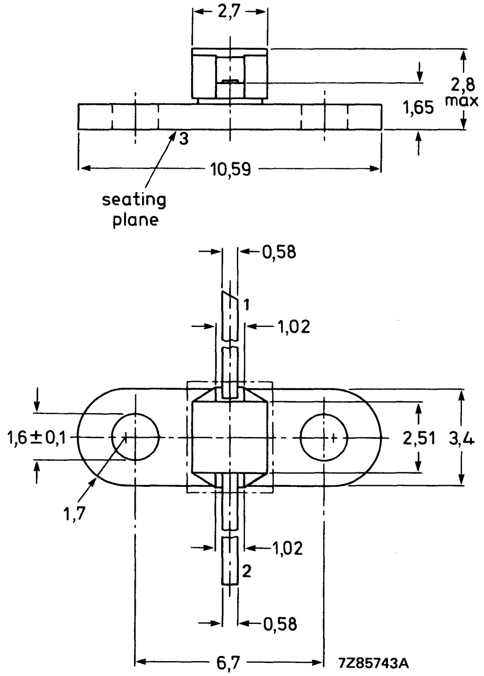
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-85.

Lead reference

1 Gate
2 Drain
3 Source (flange)



RATINGS

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

Drain-source voltage	V_{DS}	max.	15 V
Gate-source voltage	$-V_{GS}$	max.	12 V
Saturated drain current	I_{DSS}	max.	1000 mA
Gate current	I_G	max.	8 mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	5 W
Storage temperature	T_{stg}	−65 to +175 °C	
Channel temperature	T_{ch}	max.	175 °C
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} \leqslant 8$ s	T_{sld}	max.	250 °C

THERMAL RESISTANCE

From channel to mounting base	$R_{th\ ch\text{-}mb}$	30 K/W*

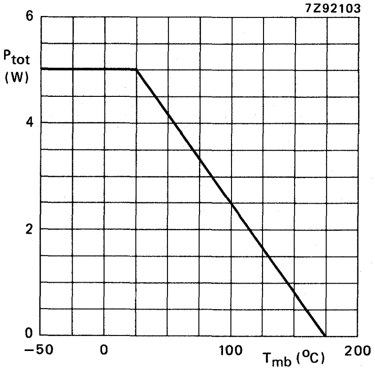


Fig. 2 Power derating curve vs. mounting base temperature.

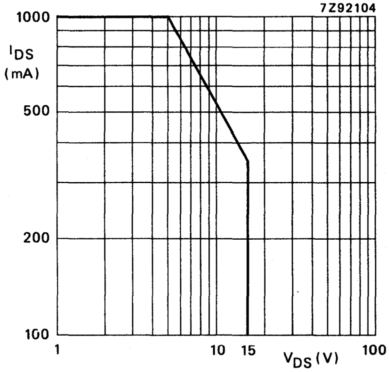


Fig. 3 D.C. SOAR at T_{mb} = 25 °C.

CHARACTERISTICS

T_{mb} = 25 °C

Saturated drain current V_{DS} = 3 V; V_{GS} = 0	I_{DSS}	typ.	700 mA
Pinch-off voltage V_{DS} = 3 V; I_D = 5 mA	$-V_{(P)GS}$	typ.	4 V 2 to 6 V
Mutual transconductance V_{DS} = 3 V; $-1\ V < V_{GS} < 0$	g_m	min. typ.	160 mA/V 240 mA/V

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* K/W is SI unit for °C/W.

s-parameters (common source)

Typical values; V_{DS} = 8 V; I_D = 370 mA; T_{mb} = 25 °C; Z_o = 50 Ω

f GHz	s_{is}	s_{rs}	s_{fs}	s_{os}
2	0,82/−160°	0,060(−24,4)/ 7°	2,99(9,52)/ 71°	0,33/−155°
3	0,81/ 180°	0,060(−24,4)/ −4°	2,26(7,10)/ 47°	0,36/−165°
4	0,79/ 159°	0,062(−24,2)/ −14°	1,78(5,03)/ 24°	0,39/−175°
5	0,78/ 139°	0,065(−23,8)/ −22°	1,52(3,62)/ 2°	0,41/ 179°
6	0,75/ 117°	0,070(−23,1)/ −31°	1,37(2,75)/ −20°	0,43/ 164°
7	0,74/ 91°	0,076(−22,4)/ −42°	1,26(2,04)/ −43°	0,44/ 150°
8	0,74/ 66°	0,082(−21,7)/ −54°	1,17(1,36)/ −67°	0,45/ 135°
9	0,72/ 42°	0,009(−21,0)/ −66°	1,09(0,78)/ −90°	0,45/ 118°
10	0,71/ 13°	0,098(−20,2)/ −82°	1,05(0,44)/−115°	0,45/ 104°
11	0,71/ −10°	0,102(−19,9)/ −99°	1,02(0,18)/−141°	0,42/ 93°
12	0,74/ −63°	0,102(−19,8)/−118°	0,99(-,01)/−169°	0,38/ 85°

The figures given between brackets are values in dB.

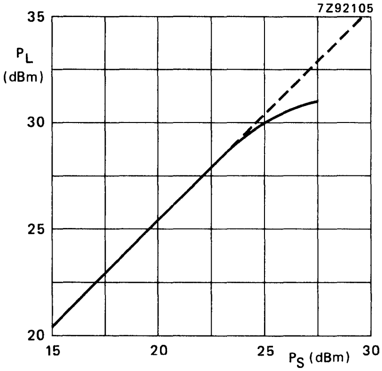


Fig. 4 Load power vs. source power; typ. values; V_{DS} = 8 V; I_{DS} = 370 mA; f = 8,5 GHz; T_{mb} = 25 °C.

APPLICATION INFORMATION

Linear amplifier (common source) at T_{mb} = 25 °C

mode of operation	f GHz	V_{DS} V	I_D mA	P_{L1} mW	G_{po} dB
c.w.	8,5	8	370	⩾ 1000	⩾ 5

DEVICE DATA

Silicon bipolar transistors

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages.

- Interdigited structure: high emitter efficiency
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has a SOT-100 metal ceramic package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

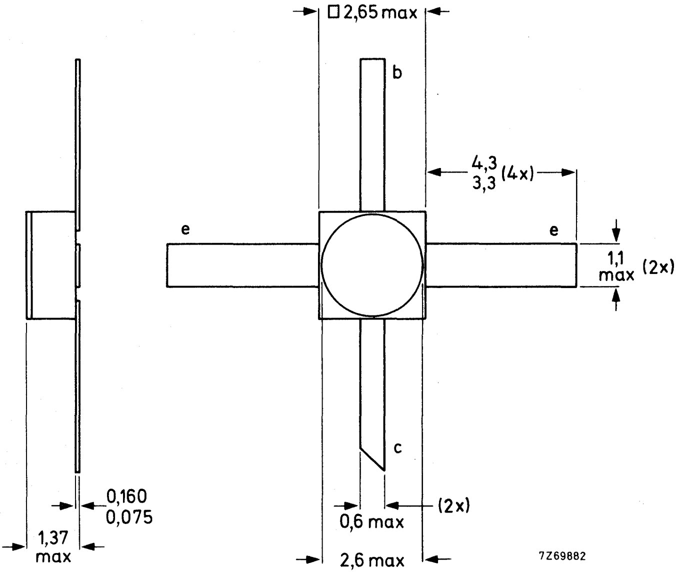
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB
c.w. class-A	2	15	35	120	8

MECHANICAL DATA

SOT-100 (see Fig. 1)

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-100.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35	V
Collector-emitter voltage (R_{BE} = 50 Ω)	V_{CER}	max.	30	V
(open base)	V_{CEO}	max.	22	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5	V
Collector current	I_C	max.	60	mA
Total power dissipation	P_{tot}	max.	0,8	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	+200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	+235	°C

THERMAL RESISTANCE

From junction to case	$R_{th\ j\text{-}c}$		180	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 4 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an SOT-100 metal ceramic package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

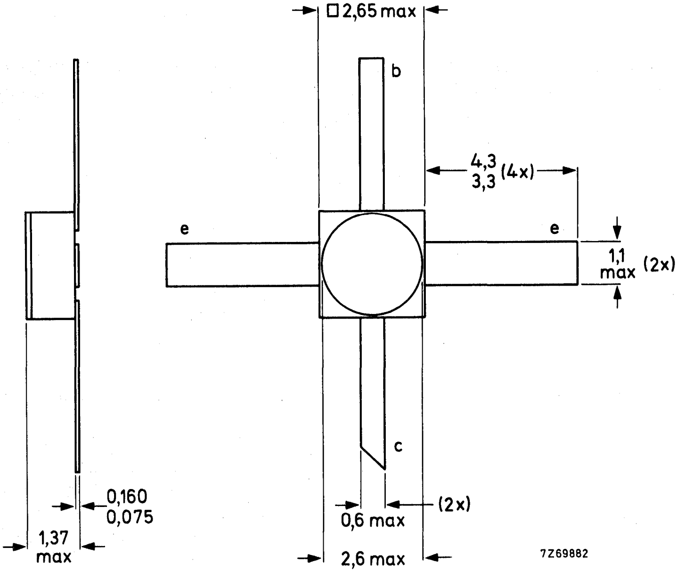
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-A	4	15	30	90	6,5	8 + j28	10 + j28

MECHANICAL DATA

SOT-100 (see Fig. 1)

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-100.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 220 Ω)	V_{CER}	max.	25	V
(open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	140	mA
Total power dissipation (T_{mb} = 75 °C)	P_{tot}	max.	700	mW
Junction temperature	T_j		−65 to 200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	+235	°C

THERMAL RESISTANCE

From junction to case	$R_{th\ j\text{-}c}$		180	K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for common-emitter class-A linear power amplifiers up to 4 GHz. Self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	4	15	25	typ. 110	typ. 9,5	typ. 7 + j22	typ. 10 + j38

MECHANICAL DATA

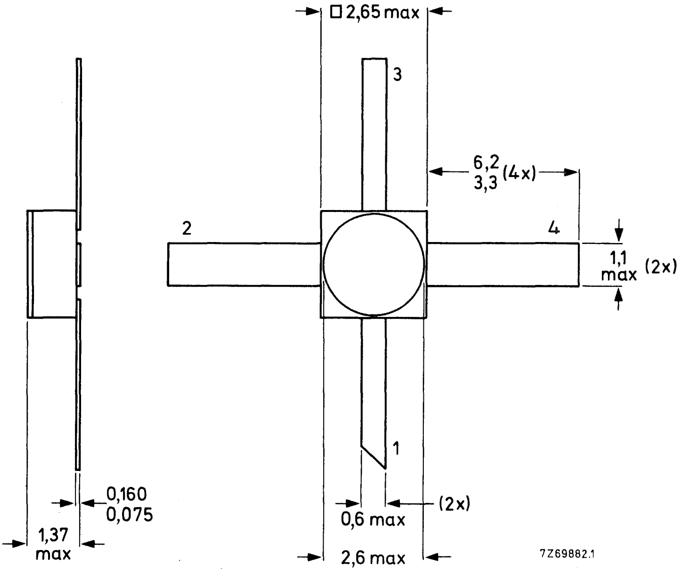
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

1 = collector
2 = emitter
3 = base
4 = emitter



Marking code

R8 = LAE4001R

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134).

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 220 Ω)	V_{CER}	max.	25	V
(open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (d.c.)	I_C	max.	80	mA
Total power dissipation up to T_{case} = 100 °C	P_{tot}	max.	480	mW
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

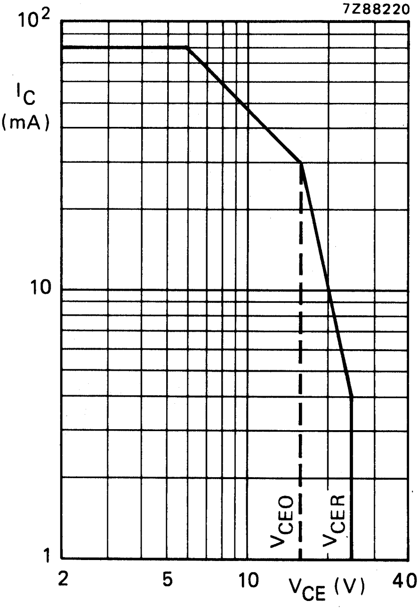


Fig. 2 D.C. SOAR at $T_{case} \leqslant 100$ °C; $R_{BE} < 220$ Ω.

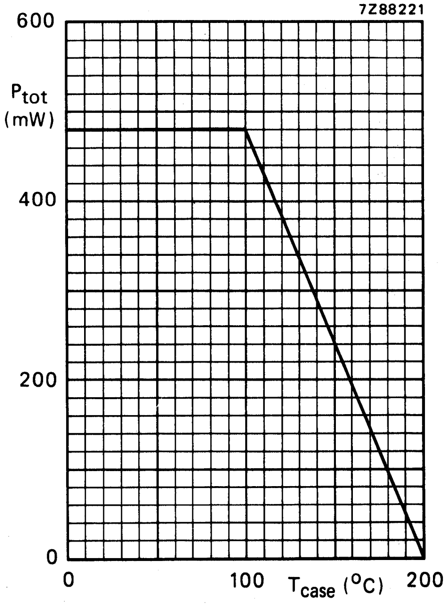


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE

From junction to case $R_{th\ j\text{-}c}$ = 210 K/W*

*K/W is SI unit for °C/W.

CHARACTERISTICS

T_{case} = 25 °C

Collector cut-off current				
$I_E = 0; V_{CB} = 15$ V	I_{CBO}	<	100	nA
$I_E = 0; V_{CB} = 30$ V	I_{CBO}	<	100	μA
$V_{CB} = 25$ V; $R_{BE} = 220\ \Omega$	I_{CER}	<	500	μA
Emitter cut-off current				
$I_C = 0; V_{EB} = 1{,}5$ V	I_{EBO}	<	35	nA
$I_C = 0; V_{EB} = 2{,}0$ V	I_{EBO}	<	0,15	μA
D.C. current gain				
$I_C = 25$ mA; $V_{CE} = 5$ V	h_{FE}		20 to 220	
Collector-base capacitance at f = 1 MHz				
$I_E = I_C = 0; V_{CB} = 15$ V; $V_{EB} = 1{,}5$ V	C_{cb}	typ.	0,25	pF
Collector-emitter capacitance at f = 1 MHz				
$I_E = I_C = 0; V_{CE} = 15; V_{EB} = 1{,}5$ V	C_{ce}	typ.	0,5	pF
Emitter-base capacitance at f = 1 MHz				
$I_E = I_C = 0; V_{EB} = 1{,}0$ V; $V_{CB} = 15$ V	C_{eb}	typ.	1,3	pF
Forward power gain				
$I_C = 25$ mA; $V_{CE} = 15$ V; f = 2 GHz	$\lvert s_{fe}\rvert^2$	typ.	9,6	dB
$I_C = 25$ mA; $V_{CE} = 15$ V; f = 4 GHz	$\lvert s_{fe}\rvert^2$	typ.	3,8	dB
Maximum available gain				
$I_C = 25$ mA; $V_{CE} = 15$ V; f = 2 GHz	G_{AM}	typ.	16	dB
$I_C = 25$ mA; $V_{CE} = 15$ V; f = 4 GHz	G_{AM}	typ.	10	dB

s-parameters (common emitter)

Typical values; V_{CE} = 15 V; I_C = 25 mA; T_{case} = 25 °C; Z_o = 50 Ω

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
500	0,63/−165°	0,014(−37,1)/47°	10,7 (20,6)/ 101°	0,59/− 28°
600	0,64/−171°	0,015(−36,2)/47°	9,01(19,1)/ 96°	0,58/− 29°
700	0,65/−177°	0,018(−35,1)/47°	8,03(18,1)/ 89°	0,56/− 30°
800	0,65/ 180°	0,019(−34,5)/47°	7,08(17,0)/ 84°	0,55/− 31°
900	0,65/ 176°	0,021(−33,7)/48°	6,31(16,0)/ 80°	0,54/− 32°
1000	0,66/ 172°	0,023(−32,9)/49°	5,75(15,2)/ 76°	0,53/− 34°
1200	0,67/ 167°	0,026(−31,8)/50°	4,85(13,7)/ 69°	0,53/− 37°
1400	0,67/ 163°	0,030(−30,5)/50°	4,17(12,4)/ 62°	0,52/− 41°
1600	0,67/ 155°	0,034(−29,3)/50°	3,67(11,3)/ 56°	0,52/− 44°
1800	0,67/ 150°	0,038(−28,4)/51°	3,31(10,4)/ 50°	0,52/− 49°
2000	0,68/ 146°	0,043(−27,4)/50°	3,02(9,6)/ 45°	0,52/− 53°
2500	0,70/ 134°	0,053(−25,5)/47°	2,46(7,8)/ 31°	0,52/− 64°
3000	0,72/ 123°	0,064(−23,9)/43°	2,05(6,2)/ 18°	0,51/− 76°
3500	0,74/ 113°	0,075(−22,5)/38°	1,76(4,9)/ 3°	0,50/− 90°
4000	0,76/ 104°	0,085(−21,4)/33°	1,55(3,8)/ −11°	0,50/−105°
4500	0,77/ 95°	0,095(−20,4)/26°	1,37(2,7)/ −23°	0,51/−123°
5000	0,79/ 88°	0,107(−19,4)/19°	1,19(1,5)/ −35°	0,52/−141°
5500	0,80/ 81°	0,120(−18,4)/12°	1,06(0,5)/ −48°	0,57/−158°
6000	0,80/ 75°	0,133(−17,5)/ 6°	0,96(−0,4)/ −60°	0,62/−173°

The figures given between brackets are values in dB.

APPLICATION INFORMATION

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

mode of operation	f GHz	V_{CE}(1) V	I_C(1) mA	P_{L1}(2) mW(dBm)	G_{po}(3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	4	15	25	> 85(19,3) typ. 110(20,4)	> 8,5 typ. 9,5	typ.7+j22	typ.10+j38

Notes
1 I_C and V_{CE} regulated.
2 Load power for 1 dB compressed power gain.
3 Low-level power gain associated with P_{L1}.

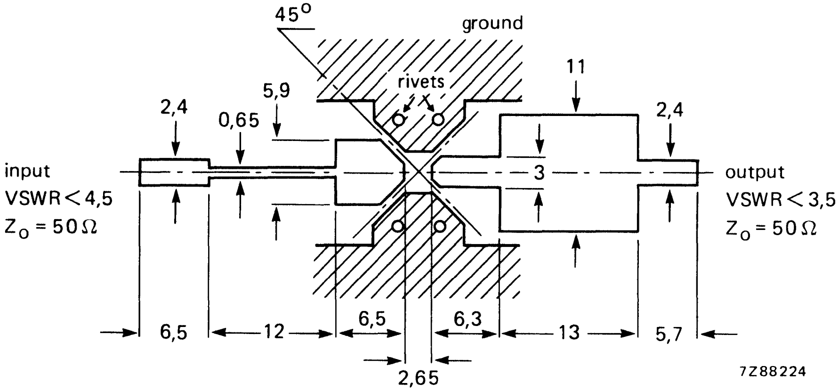


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.

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* Circuit consists of prematching circuit board in combination with input and output slug tuners.

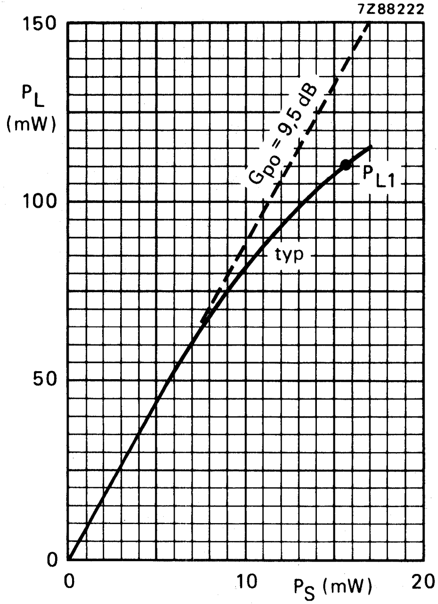


Fig. 5 V_{CE} = 15 V; I_C = 25 mA; f = 4 GHz; T_{case} = 25 °C.

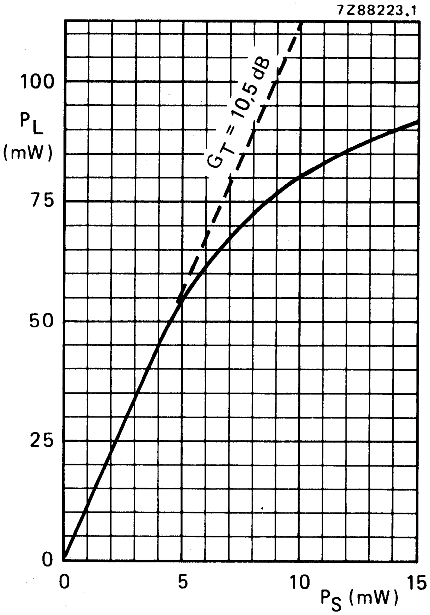


Fig. 6 V_{CE} = 15 V; I_C = 25 mA; f = 4 GHz; maximum low-level linear power gain.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for common-emitter class-A linear power amplifiers up to 4 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	4	18	30	typ. 160	typ. 8	typ. 4 + j23	typ. 6,5 + j32

MECHANICAL DATA

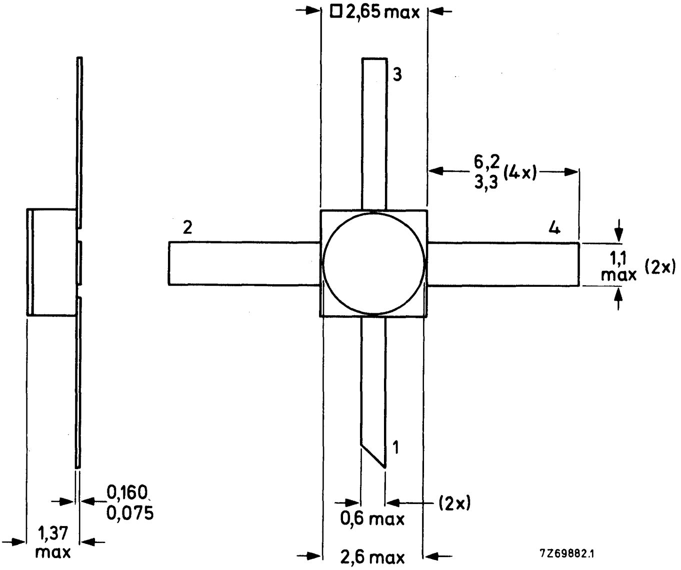
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

1 = collector
2 = emitter
3 = base
4 = emitter



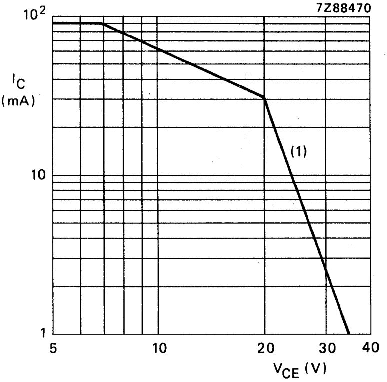
Marking code

R9 = LAE4002S

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40	V
Collector-emitter voltage				
(R_{BE} = 220 Ω)	V_{CER}	max.	35	V
(open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	90	mA
Total power dissipation up to T_{case} = 75 °C	P_{tot}	max.	625	mW
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{case} \leqslant 75$ °C; $R_{BE} < 220\ \Omega$.

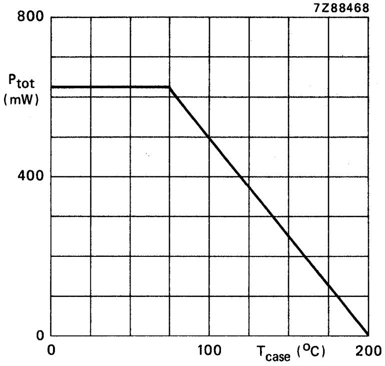


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE

From junction to case $R_{th\ j\text{-}c}$ = 200 K/W*

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* K/W is SI unit for °C/W.

CHARACTERISTICS

$T_{case} = 25\ ^{o}C$

Collector cut-off current			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	100 nA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	150 μA
$V_{CB} = 35$ V; $R_{BE} = 220\ \Omega$	I_{CER}	<	500 μA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	<	50 nA
$I_C = 0$; $V_{EB} = 3{,}0$ V	I_{EBO}	<	25 μA
D.C. current gain			
$I_C = 30$ mA; $V_{CE} = 5$ V	h_{FE}		15 to 150
Collector-base capacitance at f = 1 MHz			
$I_E = I_C = 0$; $V_{CB} = 18$ V; $V_{EB} = 1{,}5$ V	C_{cb}	typ.	0,3 pF
Collector-emitter capacitance at f = 1 MHz			
$I_E = I_C = 0$; $V_{CE} = 18$ V; $V_{EB} = 1{,}5$ V	C_{ce}	typ.	0,55 pF
Emitter-base capacitance at f = 1 MHz			
$I_E = I_C = 0$; $V_{EB} = 1{,}0$ V; $V_{CB} = 18$ V	C_{eb}	typ.	1,8 pF
Forward power gain			
$I_C = 30$ mA; $V_{CE} = 18$ V; f = 2 GHz	$\|s_{fe}\|^2$	typ.	8,8 dB
$I_C = 30$ mA; $V_{CE} = 18$ V; f = 4 GHz	$\|s_{fe}\|^2$	typ.	2,8 dB
Maximum available gain			
$I_C = 30$ mA; $V_{CE} = 18$ V; f = 2 GHz	G_{AM}	typ.	14 dB
$I_C = 30$ mA; $V_{CE} = 18$ V; f = 3 GHz	G_{AM}	typ.	11 dB

s-parameters (common emitter)

Typical values; V_{CE} = 18 V; I_C = 30 mA; T_{case} = 25 °C; Z_o = 50 Ω

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
500	0,63/−153°	0,023(−32,7)/38°	9,89(19,9)/98°	0,55/−34°
600	0,63/−161°	0,024(−32,2)/38°	8,22(18,3)/94°	0,53/−35°
700	0,63/−168°	0,026(−31,6)/38°	7,33(17,3)/87°	0,51/−36°
800	0,64/−173°	0,028(−30,9)/38°	6,46(16,2)/82°	0,50/−37°
900	0,64/−177°	0,030(−30,4)/38°	5,82(15,3)/78°	0,50/−38°
1000	0,64/179°	0,032(−29,9)/40°	5,25(14,4)/74°	0,49/−40°
1200	0,64/172°	0,035(−29,0)/40°	4,47(13,0)/66°	0,48/−44°
1400	0,65/165°	0,039(−28,1)/41°	3,80(11,6)/59°	0,48/−49°
1600	0,65/159°	0,044(−27,1)/41°	3,35(10,5)/52°	0,48/−53°
1800	0,65/154°	0,048(−26,3)/41°	3,02(9,6)/46°	0,48/−59°
2000	0,66/147°	0,053(−25,5)/40°	2,75(8,8)/40°	0,48/−64°
2500	0,67/134°	0,064(−23,9)/37°	2,24(7,0)/25°	0,48/−77°
3000	0,70/122°	0,076(−22,4)/33°	1,84(5,3)/11°	0,48/−91°
3500	0,71/111°	0,088(−21,1)/28°	1,58(4,0)/−4°	0,48/−108°
4000	0,73/101°	0,101(−19,9)/22°	1,38(2,8)/−12°	0,50/−125°
4500	0,75/92°	0,112(−19,0)/16°	1,21(1,7)/−32°	0,52/−143°
5000	0,76/85°	0,125(−18,1)/8°	1,05(0,4)/−45°	0,56/−161°
5500	0,77/78°	0,138(−17,2)/2°	0,92(−0,7)/−58°	0,61/−178°
6000	0,77/71°	0,150(−16,5)/−4°	0,81(−1,8)/−69°	0,67/168°

Typical values; V_{CE} = 15 V; I_C = 15 mA; T_{case} = 25 °C; Z_o = 50 Ω

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
500	0,63/−145°	0,030(−30,5)/36°	9,22(19,3)/103°	0,58/−38°
600	0,63/−154°	0,031(−30,1)/35°	7,76(17,8)/97°	0,56/−39°
700	0,63/−161°	0,033(−29,6)/33°	6,92(16,8)/90°	0,52/−40°
800	0,64/−167°	0,035(−29,2)/33°	6,16(15,8)/85°	0,51/−41°
900	0,64/−172°	0,036(−28,8)/32°	5,56(14,9)/81°	0,50/−42°
1000	0,64/−177°	0,038(−28,4)/32°	5,01(14,0)/76°	0,49/−44°
1200	0,65/176°	0,041(−27,8)/33°	4,26(12,6)/68°	0,48/−48°
1400	0,65/170°	0,045(−27,0)/36°	3,67(11,3)/61°	0,47/−53°
1600	0,65/162°	0,048(−26,3)/34°	3,23(10,2)/55°	0,47/−57°
1800	0,65/157°	0,052(−25,7)/35°	2,92(9,3)/48°	0,47/−63°
2000	0,66/149°	0,056(−25,0)/33°	2,66(8,5)/42°	0,47/−67°
2500	0,67/136°	0,066(−23,6)/32°	2,14(6,6)/26°	0,47/−80°
3000	0,69/124°	0,076(−22,3)/28°	1,78(5,0)/12°	0,47/−95°
3500	0,71/112°	0,089(−21,0)/24°	1,53(3,7)/−2°	0,47/−112°
4000	0,73/102°	0,100(−20,0)/20°	1,29(2,2)/−17°	0,49/−130°
4500	0,75/93°	0,112(−19,0)/13°	1,16(1,3)/−31°	0,52/−148°
5000	0,76/86°	0,125(−18,1)/6°	1,01(0,1)/−43°	0,56/−166°
5500	0,77/78°	0,136(−17,3)/0°	0,88(−1,1)/−56°	0,61/−177°
6000	0,77/72°	0,148(−16,6)/−7°	0,79(−2,1)/−67°	0,67/168°

The figures given between brackets are values in dB.

s-parameters (common emitter)

Typical values; V_{CE} = 18 V; I_C = 10 mA; T_{case} = 25 °C; Z_o = 50 Ω

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
500	0,65/−135°	0,032(−29,8)/34°	8,41(18,5)/105°	0,64/ −34°
600	0,65/−147°	0,033(−29,5)/33°	7,16(17,1)/100°	0,62/ −36°
700	0,65/−154°	0,036(−28,9)/30°	6,46(16,2)/ 92°	0,59/ −37°
800	0,65/−161°	0,037(−28,6)/29°	5,68(15,1)/ 87°	0,57/ −38°
900	0,65/−166°	0,038(−28,3)/28°	5,13(14,2)/ 82°	0,56/ −40°
1000	0,65/−172°	0,040(−28,0)/28°	4,68(13,4)/ 78°	0,55/ −42°
1200	0,65/ 180°	0,042(−27,5)/29°	3,98(12,0)/ 69°	0,54/ −46°
1400	0,65/ 174°	0,045(−27,0)/29°	3,43(10,7)/ 62°	0,53/ −50°
1600	0,65/ 165°	0,048(−26,4)/29°	3,06(9,7)/ 55°	0,53/ −55°
1800	0,66/ 159°	0,051(−25,9)/30°	2,75(8,8)/ 48°	0,53/ −61°
2000	0,67/ 152°	0,054(−25,4)/30°	2,49(7,9)/ 42°	0,53/ −65°
2500	0,68/ 138°	0,063(−24,1)/29°	2,02(6,1)/ 25°	0,53/ −78°
3000	0,69/ 125°	0,072(−22,8)/27°	1,67(4,5)/ 12°	0,52/ −93°
3500	0,71/ 114°	0,083(−21,6)/24°	1,44(3,2)/ −4°	0,53/−109°
4000	0,74/ 103°	0,095(−20,4)/20°	1,26(2,0)/−19°	0,55/−127°
4500	0,75/ 94°	0,106(−19,5)/14°	1,10(0,8)/−32°	0,57/−145°
5000	0,76/ 86°	0,118(−18,6)/ 7°	0,94(−0,5)/−44°	0,61/−163°
5500	0,77/ 79°	0,132(−17,6)/ 0°	0,83(−1,7)/−57°	0,65/−179°
6000	0,77/ 72°	0,145(−16,8)/−6°	0,72(−2,8)/−68°	0,71/ 168°

The figures given between brackets are values in dB.

APPLICATION INFORMATION

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

mode of operation	f GHz	V_{CE}(¹) V	I_C(¹) mA	P_{L1}(²) mW(dBm)	G_{po}(³) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	4	18	30	> 126(21) typ. 160(22)	> 7,5 typ. 8,0	typ. 4 + j23	typ. 6,5 + j32

Notes

1. I_C and V_{CE} regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1}.

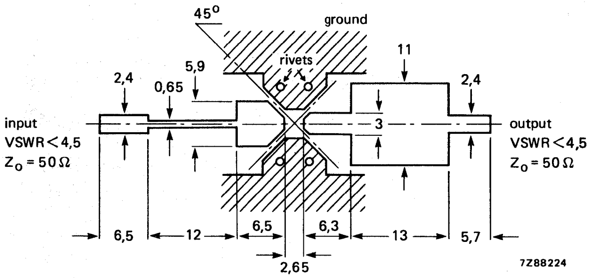


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.

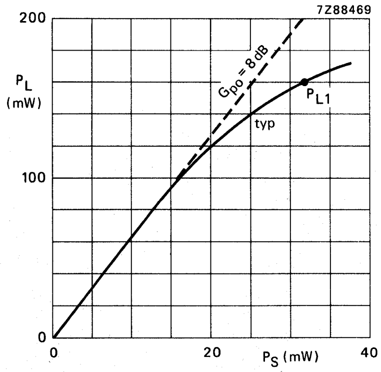


Fig. 5 V_{CE} = 18 V; I_C = 30 mA; f = 4 GHz; T_{case} = 25 °C.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

LOW-NOISE MICROWAVE TRANSISTOR

N-P-N transistor for common-emitter class-A low-noise amplifiers up to 4 GHz. Self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	F_{min} dB	G_a dB
c.w.; linear amplifier	2	10	4	typ. 1,8	typ. 12

MECHANICAL DATA

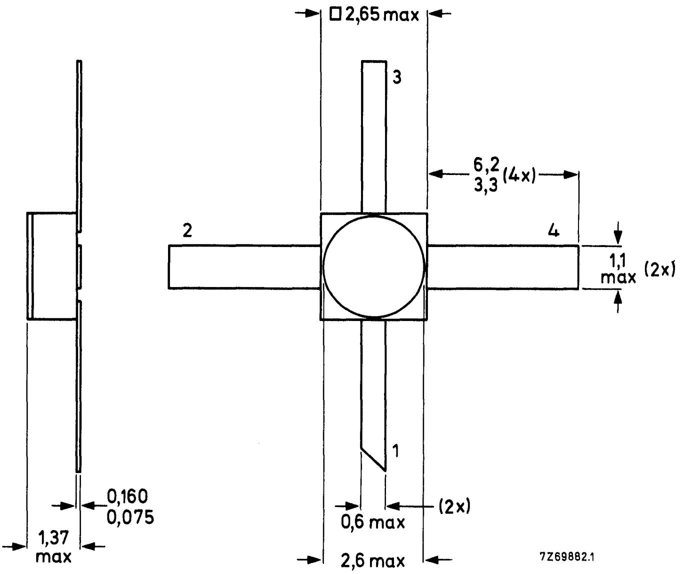
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

1 = collector
2 = emitter
3 = base
4 = emitter



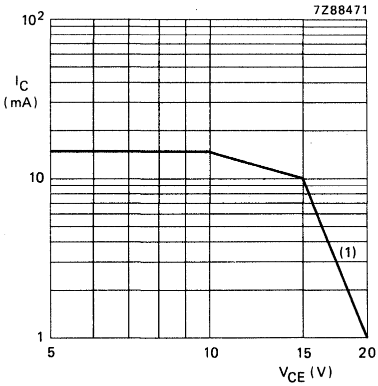
Marking code

R7 = LAE6000Q

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage				
(R_{BE} = 150 Ω)	V_{CER}	max.	20	V
(open base)	V_{CEO}	max.	12	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (d.c.)	I_C	max.	15	mA
Total power dissipation up to T_{case} = 150 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}	−65 to +	200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{case} \leqslant 150$ °C; $R_{BE} \leqslant 150$ Ω.

THERMAL RESISTANCE

From junction to case	$R_{th\ j\text{-}c}$	=	300	K/W*

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* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{case} = 25 °C

Collector cut-off current $I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	<	100 nA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	<	15 nA
D.C. current gain $I_C = 4$ mA; $V_{CE} = 10$ V	h_{FE}		20 to 250
Collector-base capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CB} = 10$ V	C_{cb}	typ.	0,15 pF
Collector-emitter capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CE} = 10$ V	C_{ce}	typ.	0,50 pF
Emitter-base capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{EB} = 1,0$ V; $V_{CB} = 10$ V	C_{eb}	typ.	0,70 pF

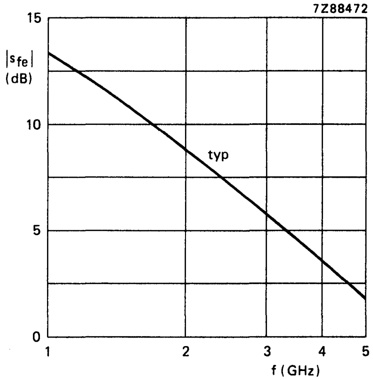


Fig. 3 V_{CE} = 10 V; I_C = 4 mA; T_{case} = 25 °C; Z_o = 50 Ω.

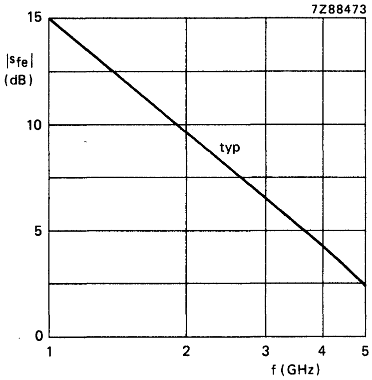


Fig. 4 V_{CE} = 10 V; I_C = 8 mA; T_{case} = 25 °C; Z_o = 50 Ω.

s-parameters (common emitter)

Typical values; V_{CE} = 10 V; I_C = 4 mA; T_{case} = 25 °C; Z_o = 50 Ω

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
500	0,65/ −78°	0,025(−32,1)/50°	6,53(16,4)/126°	0,83/ −16°
600	0,62/ −94°	0,028(−30,9)/47°	6,16(15,8)/121°	0,83/ −18°
700	0,59/−100°	0,032(−30,0)/43°	5,82(15,3)/113°	0,83/ −25°
800	0,57/−111°	0,034(−29,4)/39°	5,40(14,6)/107°	0,80/ −27°
900	0,56/−120°	0,036(−29,0)/36°	5,00(14,0)/101°	0,79/ −29°
1000	0,55/−129°	0,039(−28,6)/34°	4,71(13,5)/ 96°	0,78/ −31°
1200	0,53/−143°	0,040(−27,9)/32°	4,19(12,4)/ 86°	0,76/ −34°
1400	0,52/−156°	0,042(−27,5)/29°	3,70(11,4)/ 77°	0,74/ −40°
1600	0,51/−168°	0,045(−26,8)/28°	3,35(10,5)/ 70°	0,74/ −41°
1800	0,51/−176°	0,047(−26,5)/28°	3,04(9,7)/ 62°	0,73/ −45°
2000	0,51/ 175°	0,049(−26,1)/27°	2,78(8,9)/ 56°	0,73/ −49°
2500	0,51/ 156°	0,055(−25,2)/26°	2,30(7,3)/ 41°	0,71/ −57°
3000	0,52/ 139°	0,062(−24,2)/24°	1,95(5,8)/ 27°	0,70/ −68°
3500	0,55/ 126°	0,069(−23,3)/22°	1,70(4,6)/ 12°	0,70/ −80°
4000	0,57/ 114°	0,076(−22,0)/20°	1,54(3,7)/ −2°	0,70/ −93°
4500	0,60/ 104°	0,084(−21,5)/14°	1,38(2,8)/−15°	0,70/−108°
5000	0,61/ 95°	0,094(−20,5)/ 8°	1,22(1,8)/−29°	0,70/−124°
5500	0,63/ 87°	0,105(−19,6)/ 3°	1,11(0,8)/−42°	0,71/−141°
6000	0,63/ 80°	0,114(−18,9)/−3°	1,00(0)/−55°	0,74/−157°

Typical values; V_{CE} = 10 V; I_C = 8 mA; T_{case} = 25 °C; Z_o = 50 Ω

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
500	0,52/−111°	0,019(−34,6)/47°	9,43(19,5)/117°	0,80/ −21°
600	0,51/−126°	0,020(−33,9)/45°	8,19(18,3)/109°	0,78/ −23°
700	0,50/−134°	0,022(−33,1)/43°	7,53(17,5)/102°	0,76/ −25°
800	0,50/−143°	0,024(−32,5)/42°	6,70(16,5)/ 97°	0,74/ −26°
900	0,50/−150°	0,025(−32,0)/42°	6,17(15,8)/ 92°	0,73/ −28°
1000	0,50/−157°	0,027(−31,4)/41°	5,68(15,1)/ 87°	0,73/ −29°
1200	0,50/−168°	0,030(−30,5)/41°	4,88(13,8)/ 79°	0,72/ −33°
1400	0,50/−176°	0,033(−29,7)/43°	4,22(12,5)/ 70°	0,70/ −38°
1600	0,50/ 173°	0,036(−28,8)/39°	3,76(11,5)/ 64°	0,70/ −39°
1800	0,50/ 167°	0,039(−28,1)/40°	3,40(10,6)/ 58°	0,70/ −43°
2000	0,50/ 160°	0,042(−27,5)/41°	3,08(9,8)/ 52°	0,70/ −47°
2500	0,52/ 144°	0,050(−26,0)/38°	2,54(8,1)/ 38°	0,69/ −56°
3000	0,54/ 131°	0,060(−24,5)/35°	2,13(6,6)/ 24°	0,68/ −66°
3500	0,56/ 119°	0,068(−23,3)/32°	1,86(5,4)/ 10°	0,67/ −78°
4000	0,59/ 108°	0,078(−22,2)/28°	1,66(4,4)/ −4°	0,67/ −91°
4500	0,61/ 99°	0,086(−21,3)/22°	1,48(3,4)/−17°	0,67/−106°
5000	0,63/ 91°	0,098(−20,2)/14°	1,31(2,4)/−30°	0,67/−122°
5500	0,64/ 84°	0,110(−19,2)/ 8°	1,19(1,5)/−43°	0,69/−139°
6000	0,64/ 77°	0,119(−18,5)/ 2°	1,07(0,6)/−56°	0,73/−155°

The figures given between brackets are values in dB.

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N bipolar transistors for use in a common-emitter class-A linear power amplifier up to 1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

The **LBE1004R** and **LBE1010R** have a metal ceramic studless envelope.
The **LCE1004R** and **LCE1010R** have a metal ceramic capstan envelope.

QUICK REFERENCE DATA

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

type number	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
LBE/LCE1004R	c.w.; linear amplifier	1	15	100	typ. 500	typ. 10	5 + j10	25 + j25
LBE/LCE1010R	c.w.; linear amplifier	1	15	200	typ. 1000	typ. 9	4 + j9	20 + j15

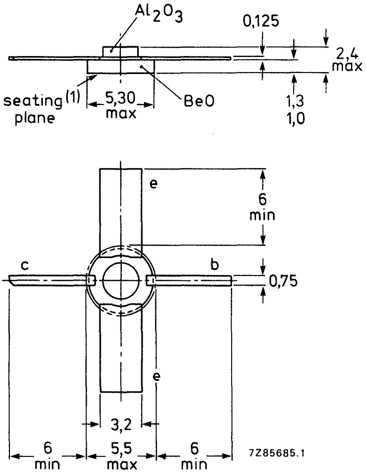
MECHANICAL DATA

Dimensions in mm

Fig. 1a **LBE1004R** and **LBE1010R** (FO-45).

Marking code

RTC109 = LBE1004R
RTC143 = LBE1010R



(1) Metallized.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA (continued) Dimensions in mm

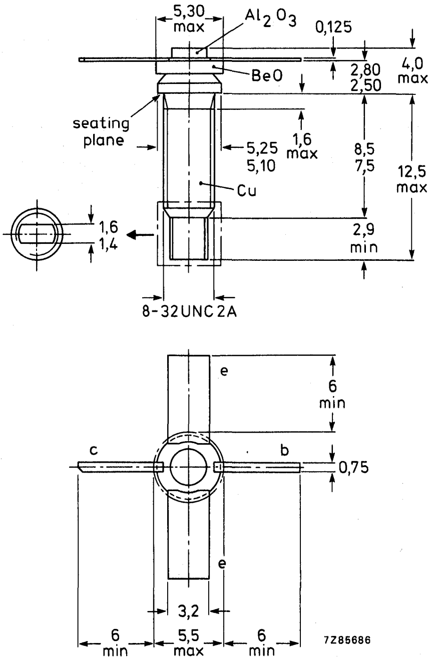
→ Fig. 1b **LCE1004R** and **LCE1010R** (FO-46).

Marking code

RTC108 = LCE1004R
RTC142 = LCE1010R

Torque on nut: min. 0,75 Nm
0,85 Nm

Diameter of clearance hole
in heatsink: max. 4,2 mm.



RATINGS

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

			LBE/LCE 1004R	LBE/LCE 1010R	
Collector-base voltage open emitter	V_{CBO}	max.	30	30	V
Collector-emitter voltage R_{BE} = 250 Ω	V_{CER}	max.	–	30	V
R_{BE} = 500 Ω	V_{CER}	max.	30	–	V
open base	V_{CEO}	max.	14	14	V
Emitter-base voltage open collector	V_{EBO}	max.	3	3	V
Collector current d.c.	I_C	max.	400	800	mA
peak value; f > 1 MHz	I_{CM}	max.	800	1600	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	3	6	W
Storage temperature	T_{stg}		–65 to + 150		°C
Operating junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from the case; t_{sld} = 10 s	T_{sld}	max.	235		°C

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 4 GHz.

Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold metallization ensure an optimum temperature profile, excellent performance and reliability.

The **LBE2003S** and **LBE2009S** have a metal ceramic studless envelope.
The **LCE2003S** and **LCE2009S** have a metal ceramic capstan envelope.

QUICK REFERENCE DATA

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

type number	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
LBE/LCE2003S	c.w.; linear amplifier	2	18	30	typ. 250	typ. 11	6,2 + j30	17,5 + j7
LBE/LCE2009S	c.w.; linear amplifier	2	18	110	typ. 900	typ. 9,8	7,5 + j15	17,5 + j39

MECHANICAL DATA

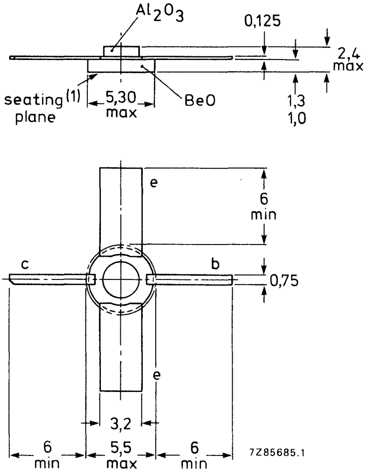
Dimensions in mm

Fig. 1a **LBE2003S** and **LBE2009S.**

FO-45

Marking code

RTC407 = LBE2003S
RTC409 = LBE2009S



PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA (continued)

Dimensions in mm

Fig. 1b **LCE2003S** and **LCE2009S.**

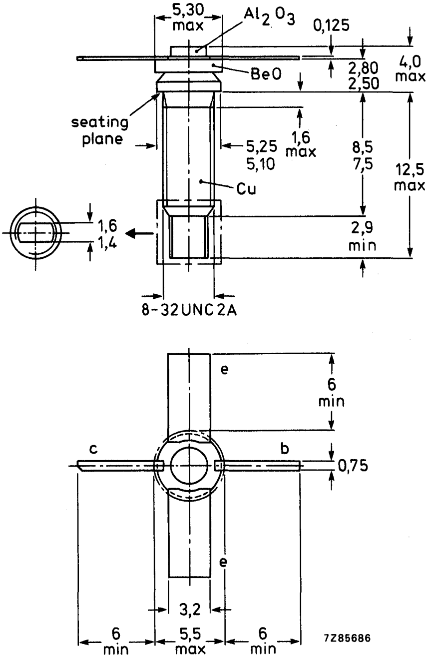
FO-46

Marking code

RTC406 = LCE2003S
RTC408 = LCE2009S

Torque on nut: min. 0,75 Nm
max. 0,85 Nm

Diameter of clearance hole in heatsink: max. 4,2 mm.

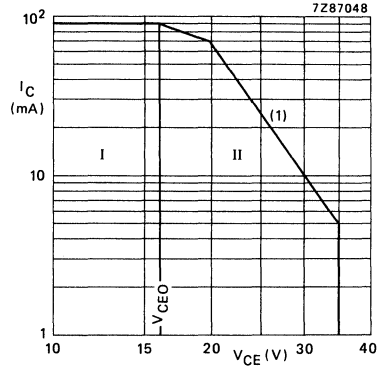


RATINGS

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

			LBE/LCE 2003S	LBE/LCE 2009S	
Collector-base voltage (open emitter)	V_{CBO}	max.	40	40	V
Collector-emitter voltage R_{BE} = 100 Ω	V_{CER}	max.	–	35	V
R_{BE} = 220 Ω	V_{CER}	max.	35	–	V
(open base)	V_{CEO}	max.	16	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	3	V
Collector current (d.c.)	I_C	max.	90	250	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	1,4	3,5	W
Storage temperature	T_{stg}		−65 to + 150		°C
Operating junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from the case; t_{sld} = 10 s	T_{sld}	max.	235		°C

LBE/LCE2003S



(1) Second breakdown limit
(independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 220\ \Omega$.

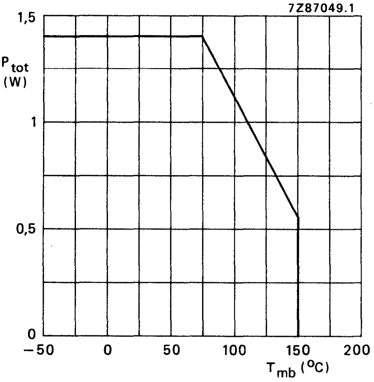
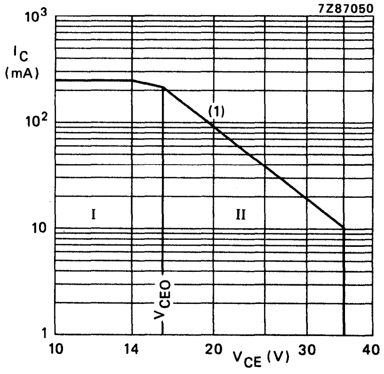


Fig. 3 Power derating curve vs. mounting base temperature.

LBE/LCE2009S



(1) Second breakdown limit
(independent of temperature).

Fig. 4 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 100\ \Omega$.

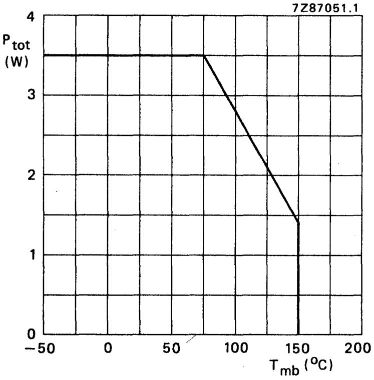


Fig. 5 Power derating curve vs. mounting base temperature.

THERMAL RESISTANCE

			LBE/LCE 2003S	LBE/LCE 2009S	
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	65	36	K/W*
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	1,5	1,5	K/W*

CHARACTERISTICS

$T_{mb} = 25\ ^oC$

			LBE/LCE 2003S	LBE/LCE 2009S	
Collector cut-off current					
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	0,1	0,1	μA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	150	250	μA
$V_{CB} = 35$ V; $R_{BE} = 220\ \Omega$	I_{CER}	<	500	–	μA
$V_{CB} = 35$ V; $R_{BE} = 100\ \Omega$	I_{CER}	<	–	1000	μA
Emitter cut-off current					
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	<	0,05	0,2	μA
$I_C = 0$; $V_{EB} = 3,0$ V	I_{EBO}	<	25	50	μA
D.C. current gain					
$I_C =$ 30 mA; $V_{CE} = 5$ V	h_{FE}	> <	15 150	– –	
$I_C = 110$ mA; $V_{CE} = 5$ V	h_{FE}	> <	– –	15 150	
Collector-base capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{CB} = 18$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	0,3	0,6	pF
Collector-emitter capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{CE} = 18$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	0,45	0,6	pF
Emitter-base capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{EB} = 1$ V; $V_{CB} = 10$ V	C_{eb}	typ.	1,7	3,3	pF

---

* K/W is SI unit for $^oC/W$.

s-parameters (common emitter)

LBE/LCE2003S: Typical values; V_{CE} = 18 V*; I_C = 30 mA*; T_{mb} = 25 °C; Z_o = 50 Ω

f GHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
0,5	0,56/−143°	0,037(−28,6)/ 41°	9,50(19,6)/101°	0,56/ −34°
0,6	0,55/−154°	0,040(−28,0)/ 39°	8,28(18,4)/ 93°	0,51/ −35°
0,7	0,55/−164°	0,040(−27,9)/ 40°	7,13(17,1)/ 88°	0,50/ −36°
0,8	0,55/−171°	0,041(−27,7)/ 40°	6,35(16,1)/ 82°	0,49/ −37°
0,9	0,55/−178°	0,043(−27,4)/ 41°	5,69(15,1)/ 77°	0,47/ −38°
1,0	0,55/+176°	0,045(−26,9)/ 40°	5,14(14,2)/ 72°	0,46/ −39°
1,1	0,55/+170°	0,048(−26,4)/ 40°	4,72(13,5)/ 68°	0,46/ −39°
1,2	0,55/+165°	0,051(−25,9)/ 41°	4,37(12,8)/ 64°	0,45/ −41°
1,3	0,56/+159°	0,056(−25,1)/ 41°	4,05(12,2)/ 60°	0,44/ −44°
1,4	0,55/+158°	0,060(−24,5)/ 41°	3,76(11,5)/ 57°	0,45/ −46°
1,5	0,55/+149°	0,062(−24,2)/ 40°	3,52(10,9)/ 53°	0,43/ −48°
1,6	0,55/+146°	0,065(−23,8)/ 42°	3,33(10,5)/ 50°	0,43/ −50°
1,7	0,56/+142°	0,068(−23,3)/ 42°	3,15(10,0)/ 46°	0,43/ −53°
1,8	0,57/+137°	0,070(−23,1)/ 41°	2,96(9,4)/ 42°	0,43/ −54°
1,9	0,57/+132°	0,072(−22,9)/ 40°	2,80(8,9)/ 39°	0,43/ −56°
2,0	0,58/+128°	0,074(−22,7)/ 40°	2,66(8,5)/ 36°	0,42/ −57°
2,2	0,60/+121°	0,081(−21,8)/ 39°	2,43(7,7)/ 28°	0,41/ −61°
2,4	0,62/+114°	0,091(−20,8)/ 37°	2,24(7,0)/ 23°	0,40/ −67°
2,6	0,64/+108°	0,099(−20,1)/ 36°	2,08(6,4)/ 16°	0,39/ −75°
2,8	0,66/+102°	0,105(−19,6)/ 33°	1,90(5,6)/ 10°	0,38/ −82°
3,0	0,68/ +96°	0,108(−19,4)/ 31°	1,79(5,1)/ 4°	0,39/ −87°
3,2	0,71/ +92°	0,124(−18,7)/ 29°	1,63(4,3)/ −2°	0,37/ −94°
3,4	0,73/ +89°	0,125(−18,0)/ 27°	1,58(4,0)/ −7°	0,40/−101°
3,6	0,75/ +86°	0,137(−17,3)/ 25°	1,46(3,3)/−13°	0,39/−112°
3,8	0,76/ +82°	0,142(−17,0)/ 23°	1,40(2,9)/−18°	0,38/−120°
4,0	0,77/ +79°	0,149(−16,6)/ 20°	1,31(2,3)/−24°	0,38/−128°
4,2	0,78/ +75°	0,155(−16,2)/ 17°	1,25(1,9)/−28°	0,38/−133°
4,4	0,80/ +73°	0,167(−15,5)/ 15°	1,20(1,6)/−34°	0,39/−142°
4,6	0,81/ +69°	0,177(−15,0)/ 12°	1,14(1,1)/−38°	0,39/−151°
4,8	0,81/ +68°	0,187(−14,6)/ 10°	1,10(0,8)/−43°	0,42/−159°
5,0	0,81/ +65°	0,194(−14,3)/ 6°	1,04(0,4)/−47°	0,44/−165°
5,2	0,80/ +60°	0,203(−13,8)/ 4°	1,03(0,3)/−53°	0,47/−169°
5,4	0,81/ +56°	0,219(−13,2)/ −1°	0,98(−0,2)/−57°	0,48/−175°
5,6	0,81/ +51°	0,229(−12,8)/ −3°	0,97(−0,3)/−62°	0,49/+178°
5,8	0,81/ +48°	0,243(−12,3)/ −8°	0,92(−0,7)/−68°	0,51/+171°
6,0	0,80/ +44°	0,245(−12,2)/−12°	0,90(−0,9)/−72°	0,55/+165°

The figures given between brackets are values in dB.

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* V_{CE} and I_C regulated.

s-parameters (common emitter)

LBE/LCE2009S: Typical values; V_{CE} = 18 V*; I_C = 110 mA*; T_{mb} = 25 °C; Z_o = 50 Ω

f GHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
0,5	0,70/177°	0,029(−30,7)/50°	7,55(17,6)/ 83°	0,25/ −48°
0,6	0,70/171°	0,033(−29,6)/51°	6,43(16,2)/ 77°	0,22/ −50°
0,7	0,70/168°	0,036(−29,0)/53°	5,46(14,6)/ 73°	0,23/ −52°
0,8	0,70/163°	0,039(−28,4)/54°	4,80(13,6)/ 68°	0,22/ −54°
0,9	0,71/159°	0,041(−27,8)/54°	4,27(12,6)/ 64°	0,22/ −56°
1,0	0,71/155°	0,045(−27,0)/55°	3,84(11,7)/ 60°	0,21/ −59°
1,1	0,71/151°	0,049(−26,2)/54°	3,53(11,0)/ 56°	0,21/ −62°
1,2	0,71/148°	0,054(−25,4)/54°	3,27/10,3)/ 52°	0,21/ −65°
1,3	0,71/144°	0,060(−24,5)/53°	3,01(9,6)/ 48°	0,20/ −74°
1,4	0,72/143°	0,066(−23,6)/54°	2,80(9,0)/ 45°	0,20/ −79°
1,5	0,72/136°	0,070(−23,1)/52°	2,61(8,3)/ 41°	0,21/ −80°
1,6	0,72/133°	0,075(−22,5)/53°	2,47(7,9)/ 38°	0,21/ −83°
1,7	0,72/130°	0,080(−21,9)/51°	2,33(7,3)/ 34°	0,22/ −87°
1,8	0,73/127°	0,084(−21,5)/49°	2,18(6,8)/ 30°	0,22/ −90°
1,9	0,73/123°	0,087(−21,2)/48°	2,05(6,3)/ 26°	0,22/ −94°
2,0	0,74/120°	0,090(−20,9)/46°	1,97(5,9)/ 23°	0,22/ −97°
2,2	0,75/114°	0,100(−20,0)/43°	1,78(5,0)/ 15°	0,22/−109°
2,4	0,77/108°	0,112(−19,0)/40°	1,63(4,3)/ 10°	0,21/−122°
2,6	0,79/103°	0,123(−18,2)/37°	1,51(3,6)/ 2°	0,24/−133°
2,8	0,80/ 97°	0,129(−17,8)/33°	1,36(2,7)/ −4°	0,25/−143°
3,0	0,81/ 92°	0,134(−17,5)/30°	1,28(2,1)/−11°	0,27/−151°
3,2	0,83/ 88°	0,143(−16,9)/26°	1,15(1,2)/−17°	0,28/−163°
3,4	0,85/ 85°	0,152(−16,4)/24°	1,10(0,9)/−21°	0,30/−173°
3,6	0,86/ 82°	0,163(−15,8)/20°	1,00(0)/−28°	0,34/+178°
3,8	0,87/ 79°	0,168(−15,5)/17°	0,96(−0,4)/−32°	0,37/+173°
4,0	0,88/ 75°	0,175(−15,2)/14°	0,88(−1,1)/−39°	0,41/+168°
4,2	0,88/ 71°	0,180(−14,9)/11°	0,83(−1,6)/−42°	0,42/+162°
4,4	0,89/ 69°	0,193(−14,3)/ 8°	0,79(−2,1)/−48°	0,45/+155°
4,6	0,90/ 66°	0,200(−14,0)/ 5°	0,74(−2,6)/−51°	0,48/+149°
4,8	0,90/ 64°	0,211(−13,5)/ 2°	0,71(−3,0)/−56°	0,52/+145°
5,0	0,90/ 61°	0,214(−13,4)/−2°	0,66(−3,6)/−59°	0,55/+144°

The figures given between brackets are values in dB.

---

* V_{CE} and I_C regulated.

APPLICATION INFORMATION

Microwave performance in c.w. operation for the **LBE/LCE2003S** up to T_{mb} = 25 °C in an unneutralized common-emitter class-A circuit*.

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW(dBm)	G_{po} (3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
2	18	30	⩾ 200(23) typ. 250(24)	⩾ 10 typ. 11	6,2 + j30	17,5 + j7

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1}.

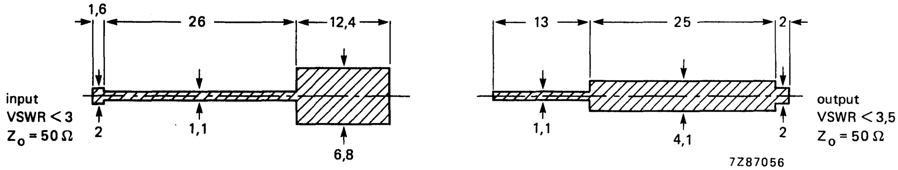

Fig. 6 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r \approx 2,54$); thickness 0,8 mm.

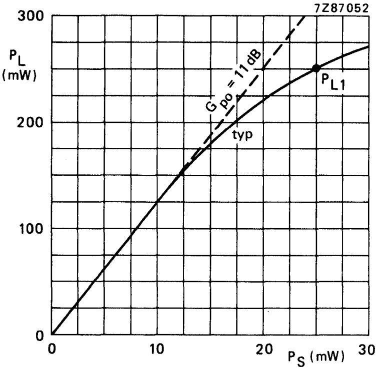

Fig. 7 V_{CE} = 18 V; I_C = 30 mA; f = 2 GHz; T_{mb} = 25 °C.

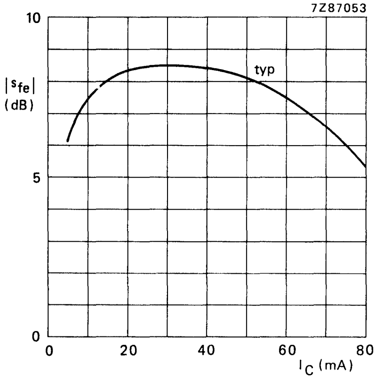

Fig. 8 V_{CE} = 18 V; class-A operation; f = 2 GHz; T_{mb} = 25 °C.

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* Circuit consists of prematching circuit board in combination with input and output slug tuners.

APPLICATION INFORMATION

Microwave performance in c.w. operation for the **LBE/LCE2009S** up to T_{mb} = 25 °C in an unneutralized common-emitter class-A circuit*.

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW(dBm)	G_{po} (3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
2	18	100	⩾ 700(28,5) typ. 900(29,5)	⩾ 9 typ. 9,8	7,5 + j14,5	17,5 + j38,5

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1}.

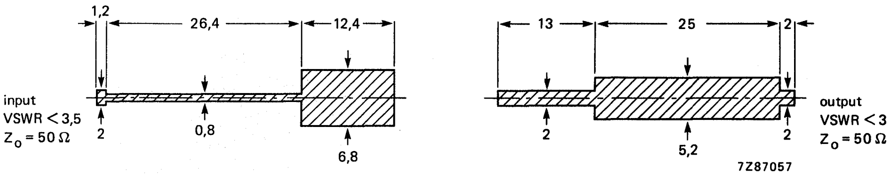


Fig. 9 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r \approx 2,54$); thickness 0,8 mm.

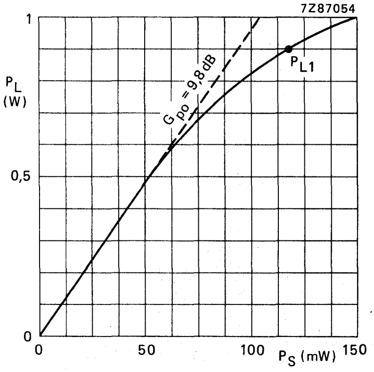


Fig. 10 V_{CE} = 18 V; I_C = 110 mA; f = 2 GHz; T_{mb} = 25 °C.

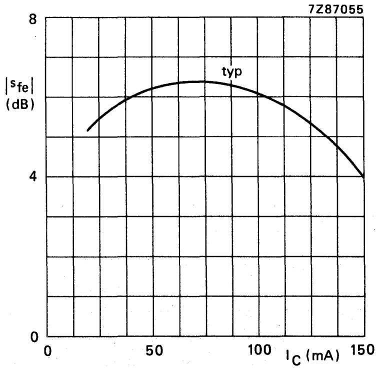


Fig. 11 V_{CE} = 18 V; class-A operation; f = 2 GHz; T_{mb} = 25 °C.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

LBE2005Q has an FO 45 metal ceramic studless package.

LCE2005Q has an FO 46 metal ceramic capstan package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-A	1,65	12	80	400	9	7,5 + j9	18 + j31

MECHANICAL DATA

FO-45 and FO-46 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1a LBE2005Q (FO-45).

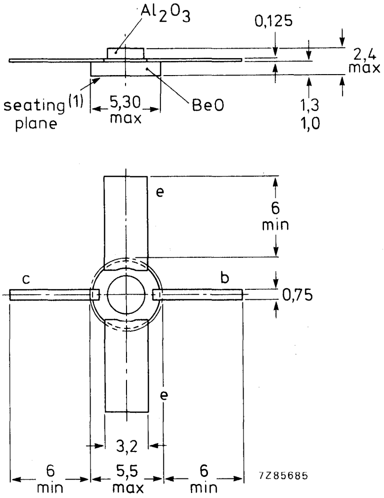
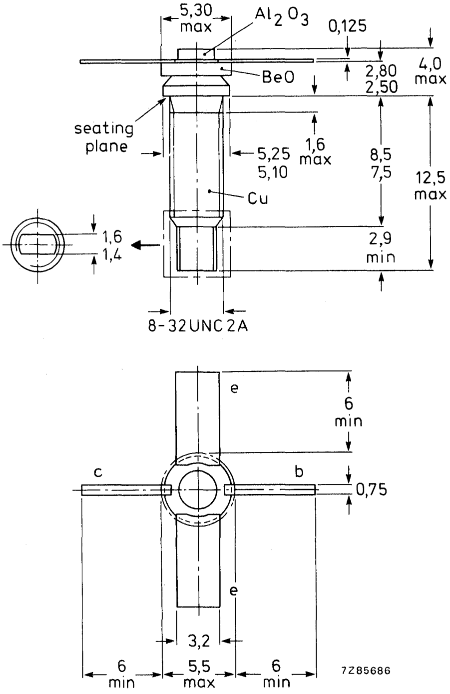


Fig. 1b LCE2005Q (FO-46).



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	200	mA
Total power dissipation ($T_{mb} \leqslant 75^oC$)	P_{tot}	max.	1,5	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	45	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

LBE2008T has an FO 45 metal ceramic studless package.
LCE2008T has an FO 46 metal ceramic capstan package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	F GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-A	1,65	20	150	1100	8	4,5 + j14,5	12,5 + j38

MECHANICAL DATA

FO-45 and FO-46 (see Fig. 1)

PRODUCT SAFETY

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

MECHANICAL DATA

Dimensions in mm

Fig. 1a LBE2008T (FO-45).

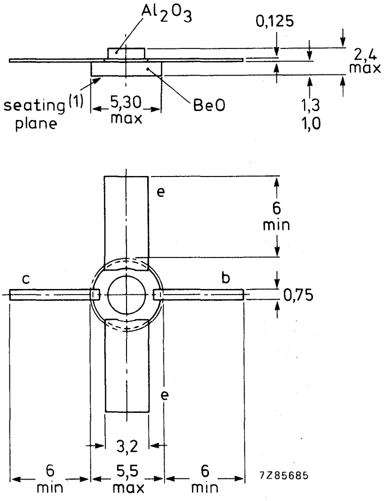
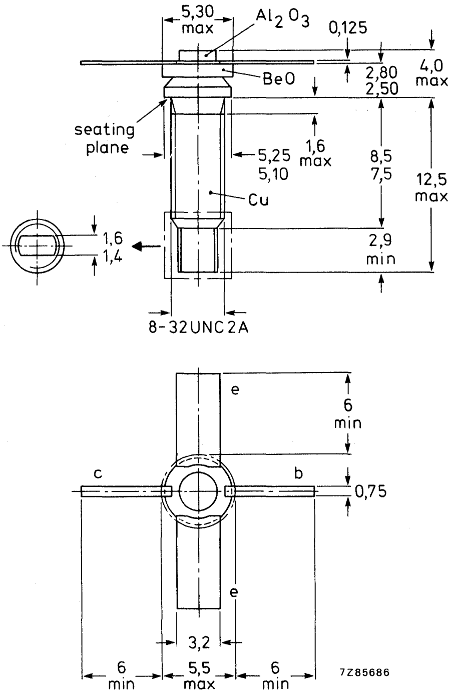


Fig. 1b LCE2008T (FO-46).



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 150 Ω)	V_{CER}	max.	21	V
(open base)	V_{CEO}	max.	14	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	0,3	mA
Total power dissipation ($T_{mb} \leq 75$ °C)	P_{tot}	max.	3,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	230	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	26	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 4 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 41A metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w.; class-A	4	20	65	200	7	50 + j65	2,5 + j6

MECHANICAL DATA

FO-41A (see Fig. 1).

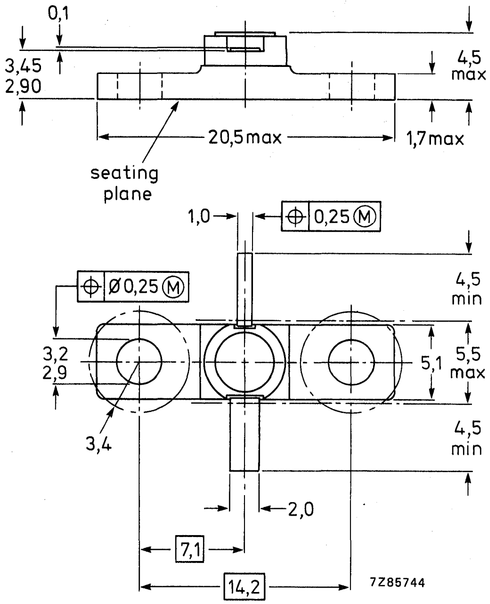
PRODUCT SAFETY

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

MECHANICAL DATA

Fig. 1 FO-41A.

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (R_{BE} = 220 Ω)	V_{CER}	max.	25	V
(open base)	V_{CEO}	max.	20	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current	I_C	max.	400	mA
Total power dissipation ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	1,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	41 K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 1 GHz.

Diffused emitter ballasting resistors, interdigited structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	1	15	100	typ. 400	typ. 11	6,5 + j4	13 + j23

MECHANICAL DATA

Dimensions in mm

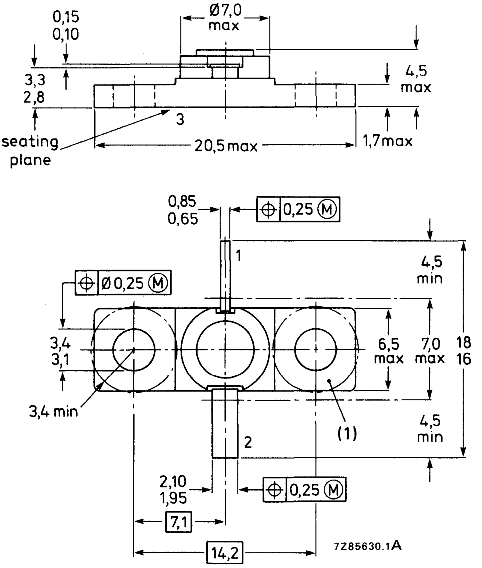
Fig. 1 FO-53.

Emitter connected to flange.

Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code

RTC112 = LKE1004R



(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage				
$R_{BE} \leqslant 500\ \Omega$	V_{CER}	max.	30	V
open base	V_{CEO}	max.	14	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	400	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	3	W
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	30	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w.; class-A	2	15	70	200	8	5 + j19	10 + j38

MECHANICAL DATA

FO-53 (see Fig. 1).

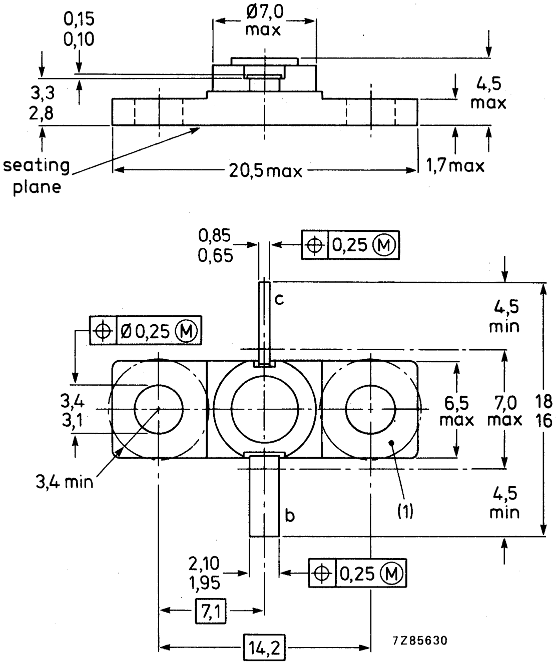
PRODUCT SAFETY

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

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (R_{BE} = 330 Ω)	V_{CER}	max.	20	V
(open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	80	mA
Total power dissipation ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	1,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	45	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-A	2	15	140	400	7	2,5 + j15	12 + j23

MECHANICAL DATA

FO-53 (see Fig. 1)

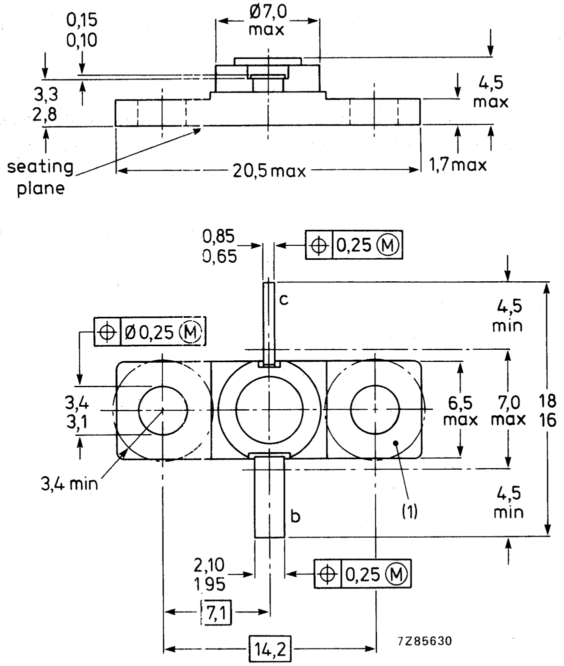
PRODUCT SAFETY

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 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (R_{BE} = 220 Ω)	V_{CER}	max.	20	V
(open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	160	mA
Total power dissipation ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	3,0	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	22 K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	2	20	200	typ. 1,6	typ. 8	2,5 + j12	4 + j4

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

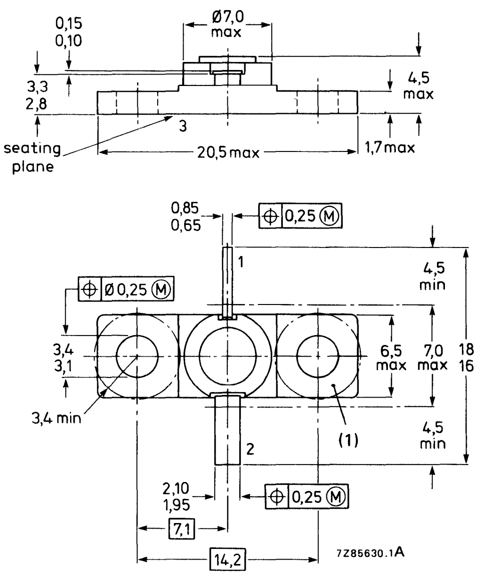
Emitter connected to flange

Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC144 = LKE2015T



(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage				
$R_{be} = 120\ \Omega$	V_{CER}	max.	25	V
open base	V_{CEO}	max.	20	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	800	mA
Total power dissipation up to $T_{mb} = 75\ ^oC$	P_{tot}	max.	8	W
Storage temperature	T_{stg}	−65 to + 200		^oC
Junction temperature	T_j	max.	200	^oC
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	11	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2,1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	2,1	15	140	typ. 600	typ. 10	6 + j8	4 + j8

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

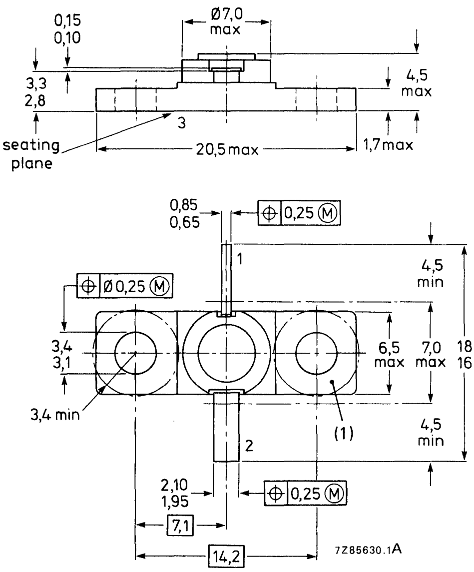
Emitter connected to flange

Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC146 = LKE21004R



(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage				
R_{be} = 500 Ω	V_{CER}	max.	20	V
open base	V_{CEO}	max.	14	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	600	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	2,8	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	22	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2,1 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-A	2,1	20	300	1750	10	5 + j15	3 − j1

MECHANICAL DATA

FO-53 (see Fig. 1)

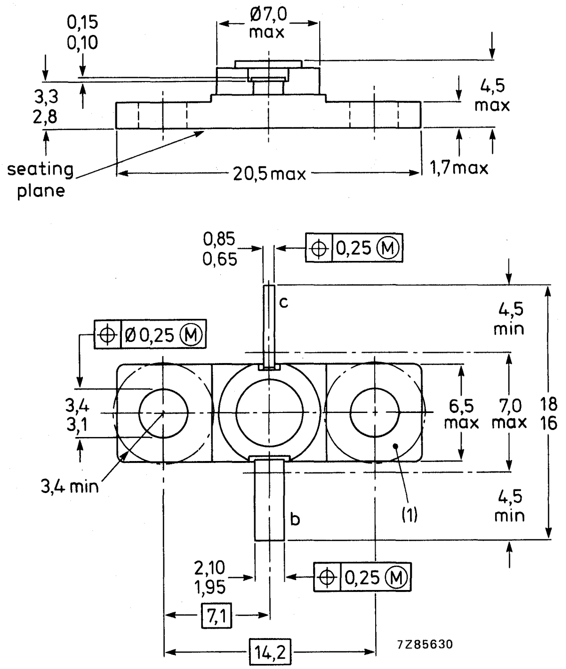
PRODUCT SAFETY

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 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	40	V
(open base)	V_{CEO}	max.	22	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current	I_C	max.	800	mA
Total power dissipation ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	8	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	11	K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2,1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An internal input matching network facilitates wideband operation.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	2,1	20	1,2	typ. 5,5	typ. 9	2,5 + j8	2,5 − j7

MECHANICAL DATA

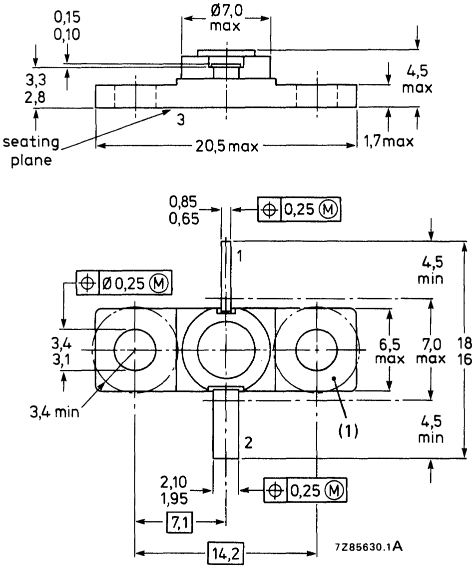
Dimensions in mm

Fig. 1 FO-53.

Emitter connected to flange.

Torque on nut: max. 0,5 Nm

Rceommended screw: M3



(1) Flatness of this area ensures full thermal contact with bolt head.

Marking code

RTC190 = LKE21050T

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage				
R_{be} = 47 Ω	V_{CER}	max.	40	V
open base	V_{CEO}	max.	22	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	3	A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	30	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN transistor for use in a common-emitter class-A linear power amplifier up to 3,3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold metallization ensure an optimum temperature profile and excellent performance at such frequencies.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w.; linear amplifier	2,7	16	200	typ. 800	typ. 9	4 + j10	4 − j3

MECHANICAL DATA

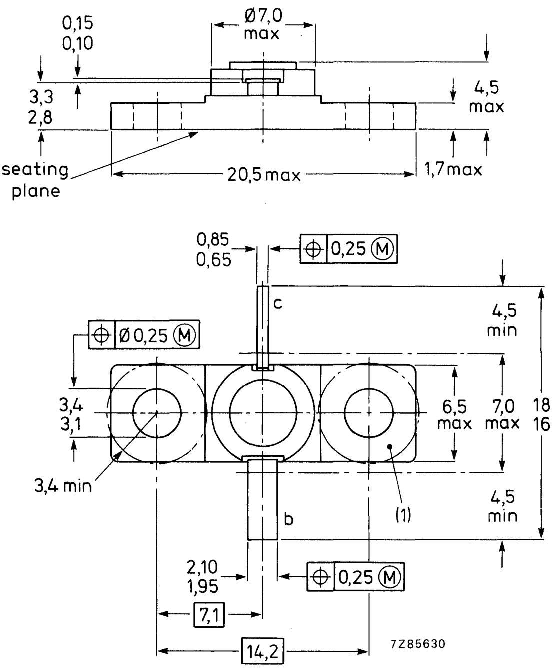
Dimensions in mm

Fig. 1 FO-53.

Emitter connected to flange.

Marking code:

174 = LKE27010R



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

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35	V
Collector-emitter voltage ($R_{BE} \leqslant 150\ \Omega$)	V_{CER}	max.	25	V
(open base)	V_{CEO}	max.	12	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	550	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	230	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	12	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2,7 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

Internal input prematching ensures good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-A	2,7	16	650	2,5	7	2,5 + j11	2 – j9

MECHANICAL DATA

FO-53 (see Fig. 1)

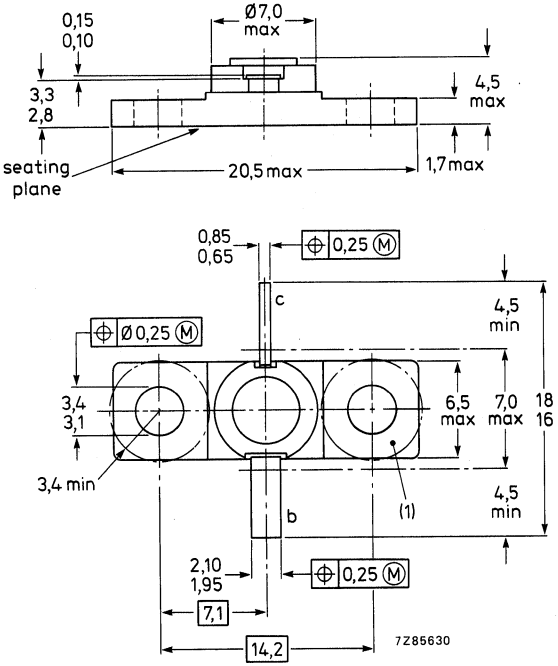
PRODUCT SAFETY

This device contains 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 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	35 V
(open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	1,5 A
Total power dissipation	P_{tot}	max.	15 W
Storage temperature	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	+200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	+235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	6 K/W

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input matching cell improves the input impedance and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

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

type no.	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
LKE32002T	c.w.; linear amplifier	3	20	65	typ. 310	typ. 11,2	19 + j44	3,0 + j12
LKE32004T	c.w.; linear amplifier	3	20	130	typ. 710	typ. 11,0	7,5 + j22	2,5 + j5

MECHANICAL DATA

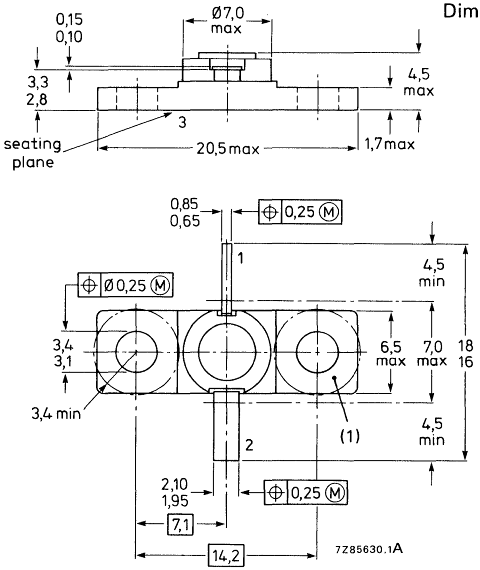
Dimensions in mm

Fig. 1 FO-53.

Emitter connected to flange.

Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC114 = LKE32002T
RTC116 = LKE32004T

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

			LKE32002T	LKE32004T	
Collector-base voltage open emitter	V_{CBO}	max.	45	45	V
Collector-emitter voltage R_{BE} = 220 Ω	V_{CER}	max.	25	25	V
open base	V_{CEO}	max.	20	20	V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	V
Collector current (d.c.)	I_C	max.	400	800	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	1,5	3	W
Storage temperature	T_{stg}		−65 to + 200		°C
Junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from the case; t_{sld} = 10 s	T_{sld}	max.	235		°C

THERMAL RESISTANCE

			LKE32002T	LKE32004T	
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	45	22	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 4,2 GHz.

Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input matching cell improves the input impedance and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

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

type no.	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
LTE42005S	c.w. linear ampl.	4,2	18	110	typ. 550	typ. 7,2	100 + j40	4 + j4
LTE42008R	c.w. linear ampl.	4,2	16	250	typ. 940	typ. 7,5	17 + j12	3 − j9

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.

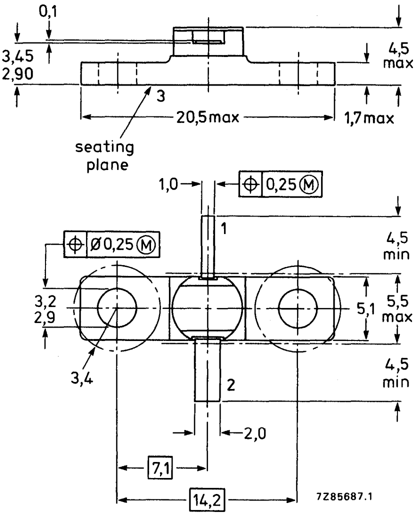
Emitter and metallic cap are connected to the seating plane.

Torque on nut: max. 0,4 Nm

Recommended screw: M2,5

Marking code

RTC502 = LTE42005S
RTC196 = LTE42008R



(1) Flatness of this area ensures full thermal contact with bolt head.

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

RATINGS

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

			LTE42005S	LTE42008R	
Collector-base voltage (open emitter)	V_{CBO}	max.	40	40	V
Collector-emitter voltage					
R_{BE} = 100 Ω	V_{CER}	max.	35	–	V
R_{BE} = 250 Ω	V_{CER}	max.	–	20	V
(open base)	V_{CEO}	max.	16	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	3,5	V
Collector current (d.c.)	I_C	max.	250	450	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	4	6	W
Storage temperature	T_{stg}		–65 to +200		°C
Junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from the case; t_{sld} = 10 s	T_{sld}	max.	235		°C

THERMAL RESISTANCE

			LTE42005S	LTE42008R	
From junction to mounting base	$R_{th\,j\text{-}mb}$	=	36	12	K/W*
From mounting base to heatsink	$R_{th\,mb\text{-}h}$	=	0,7	0,7	K/W*

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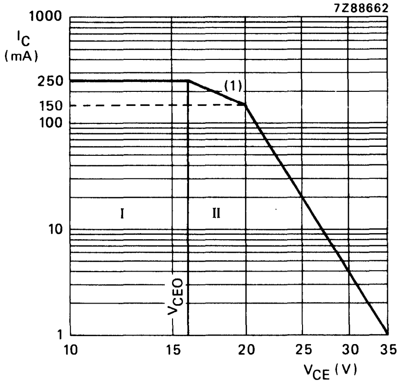
* K/W is SI unit for °C/W.

LTE42005S



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 100\ \Omega$.

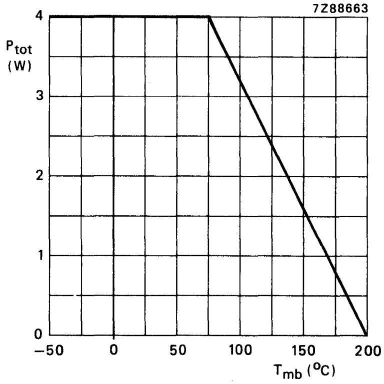
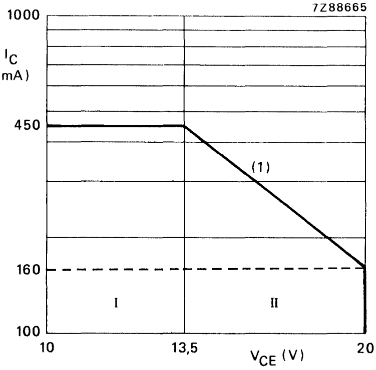


Fig. 3 Power derating curve vs. mounting base temperature.

LTE42008R



(1) Second breakdown limit (independent of temperature).

Fig. 4 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 250\ \Omega$.

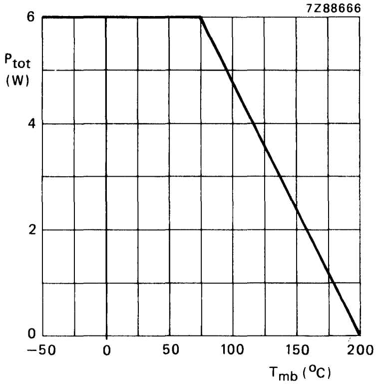


Fig. 5 Power derating curve vs. mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C

			LTE42005S	LTE42008R	
Collector cut-off current					
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	0,1	150	µA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	0,25	1	mA
Emitter cut-off current					
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	<	200	400	nA
$I_C = 0$; $V_{EB} = 3,5$ V	I_{EBO}	<	50	200	µA
D.C. current gain					
$I_C = 110$ mA; $V_{CE} = 5$ V	h_{FE}	>	15	–	
		<	150		
$I_C = 250$ mA; $V_{CE} = 5$ V	h_{FE}	>	–	15	
		<	–	150	
Collector-base capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{CB} = 20$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	0,5	–	pF
$I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	–	2	pF
Collector-emitter capacitance at f = 1 MHz					
$I_C = I_E = 0$; $V_{CE} = 20$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	1,5	–	pF
$I_C = I_E = 0$; $V_{CE} = 16$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	–	1,5	pF
Emitter-base capacitance at f = 1 MHz					
$I_C = I_E = 0$; $V_{EB} = 1$ V; $V_{CB} = 10$ V	C_{eb}	typ.	6,5	20	pF

LTE42005S

s-parameters (common-emitter)

V_{CE} = 18 V
I_C = 110 mA } regulated; T_{mb} = 25 °C; Z_o = 50 Ω; typical values.

f GHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
0,5	0,76/–176°	0,022(–33,2)/37°	8,13(18,2)/85°	0,35/–62°
0,6	0,75/+180°	0,023(–32,8)/37°	6,95(16,8)/78°	0,34/–66°
0,7	0,76/+177°	0,023(–32,8)/40°	5,95(15,5)/73°	0,34/–71°
0,8	0,76/+174°	0,024(–32,5)/41°	5,25(14,4)/67°	0,35/–75°
0,9	0,76/+171°	0,024(–32,3)/42°	4,69(13,4)/62°	0,35/–79°
1,0	0,75/+168°	0,026(–31,8)/43°	4,23(12,5)/57°	0,36/–83°
1,1	0,75/+165°	0,028(–31,0)/43°	3,88(11,8)/53°	0,37/–87°
1,2	0,74/+163°	0,031(–30,1)/43°	3,61(11,2)/49°	0,39/–90°
1,3	0,75/+160°	0,035(–29,2)/43°	3,36(10,5)/44°	0,40/–95°
1,4	0,74/+162°	0,037(–28,5)/44°	3,12(9,9)/41°	0,43/–98°
1,5	0,73/+157°	0,041(–27,8)/46°	2,95(9,4)/37°	0,43/–101°
1,6	0,73/+155°	0,045(–27,0)/46°	2,83(9,0)/32°	0,45/–104°
1,7	0,71/+154°	0,047(–26,5)/44°	2,70(8,6)/28°	0,47/–107°
1,8	0,70/+151°	0,049(–26,1)/43°	2,56(8,2)/23°	0,48/–110°
1,9	0,69/+148°	0,050(–25,9)/42°	2,44(7,7)/19°	0,50/–114°
2,0	0,68/+143°	0,051(–25,9)/39°	2,34(7,4)/ 14°	0,51/–116°
2,2	0,67/+138°	0,058(–24,7)/36°	2,16(6,7)/ 4°	0,55/–124°
2,4	0,65/+134°	0,067(–23,5)/34°	2,02(6,1)/ –2°	0,59/–129°
2,6	0,62/+129°	0,077(–22,3)/31°	1,95(5,8)/–12°	0,64/–134°
2,8	0,57/+122°	0,082(–21,7)/25°	1,84(5,3)/–21°	0,68/–138°
3,0	0,52/+113°	0,086(–21,3)/21°	1,78(5,0)/–32°	0,72/–143°
3,2	0,49/+104°	0,093(–20,6)/16°	1,67(4,5)/–42°	0,74/–150°
3,4	0,45/ +99°	0,102(–19,8)/13°	1,62(4,2)/–52°	0,80/–157°
3,6	0,38/ +92°	0,113(–18,9)/ 8°	1,52(3,6)/–64°	0,80/–163°
3,8	0,29/ +83°	0,119(–18,5)/ 6°	1,43(3,1)/–76°	0,82/–170°
4,0	0,24/ +69°	0,137(–17,3)/ 2°	1,27(2,1)/ –88°	0,80/–179°
4,2	0,20/ +54°	0,165(–15,7)/ –5°	1,08(0,7)/ –98°	0,68/+171°
4,4	0,15/ +28°	0,202(–13,9)/–20°	0,92(–0,8)/–100°	0,51/+172°
4,6	0,12/ –36°	0,206(–13,7)/–38°	0,93(–0,6)/–102°	0,52/–174°
4,8	0,17/ –86°	0,195(–14,2)/–52°	0,97(–0,3)/–110°	0,63/–171°
5,0	0,24/–114°	0,177(–15,0)/–65°	0,97(–0,3)/–122°	0,73/–174°
5,2	0,31/–137°	0,164(–15,7)/–73°	0,93(–0,6)/–133°	0,79/–180°
5,4	0,41/–152°	0,154(–16,2)/–83°	0,88(–1,1)/–145°	0,83/+174°
5,6	0,48/–161°	0,134(–17,4)/–90°	0,81(–1,8)/–156°	0,85/+166°
5,8	0,53/–168°	0,122(–18,2)/–97°	0,77(–2,3)/–167°	0,87/+160°
6,0	0,56/–179°	0,105(–19,6)/–104°	0,70(–3,1)/–178°	0,89/+154°

The figures given between brackets are values in dB.

LTE42008R

s-parameters (common-emitter)

V_{CE} = 16 V; I_C = 250 mA regulated; T_{mb} = 25 °C; Z_o = 50 Ω; typical values.

f GHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
0,5	0,91/175°	0,021(–33,6)/50°	4,25(12,6)/76°	0,42/–177°
0,6	0,91/173°	0,024(–32,5)/52°	3,59(11,1)/72°	0,42/–180°
0,7	0,91/171°	0,027(–31,4)/53°	3,11(9,9)/68°	0,42/+179°
0,8	0,90/169°	0,030(–30,4)/53°	2,75(8,8)/64°	0,42/+178°
0,9	0,90/167°	0,033(–34,7)/54°	2,45(7,8)/59°	0,42/+177°
1,0	0,89/165°	0,036(–28,8)/53°	2,21(6,9)/55°	0,42/+176°
1,1	0,88/163°	0,039(–28,1)/54°	2,02(6,1)/53°	0,43/+174°
1,2	0,88/162°	0,042(–27,4)/54°	1,88(5,5)/49°	0,43/+174°
1,3	0,88/160°	0,046(–26,8)/53°	1,75(4,9)/46°	0,43/+174°
1,4	0,89/159°	0,048(–26,3)/54°	1,64(4,3)/42°	0,43/+173°
1,5	0,89/158°	0,054(–25,4)/57°	1,55(3,9)/40°	0,43/+173°
1,6	0,89/157°	0,059(–24,6)/54°	1,52(3,7)/36°	0,43/+172°
1,7	0,89/155°	0,063(–24,0)/52°	1,47(3,3)/32°	0,43/+172°
1,8	0,88/153°	0,066(–23,6)/50°	1,40(2,9)/28°	0,44/+171°
2,0	0,88/151°	0,076(–22,4)/49°	1,30(2,3)/22°	0,44/+169°
2,2	0,87/147°	0,085(–21,4)/47°	1,23(1,8)/ 15°	0,46/+168°
2,4	0,87/144°	0,092(–20,7)/44°	1,16(1,3)/ 8°	0,47/+168°
2,6	0,86/142°	0,102(–19,8)/42°	1,15(1,2)/ 2°	0,49/+170°
2,8	0,85/139°	0,110(–19,2)/37°	1,11(0,9)/ –7°	0,49/+170°
3,0	0,83/135°	0,119(–18,5)/34°	1,12(1,0)/–15°	0,50/+169°
3,2	0,82/129°	0,125(–18,1)/29°	1,08(0,7)/–25°	0,54/+166°
3,4	0,81/126°	0,132(–17,6)/26°	1,08(0,7)/–33°	0,57/+165°
3,6	0,79/122°	0,138(–17,2)/21°	1,06(0,5)/–44°	0,62/+165°
3,8	0,76/120°	0,143(–16,9)/19°	1,08(0,6)/–55°	0,65/+165°
4,0	0,73/117°	0,148(–16,6)/13°	1,07(0,6)/–69°	0,70/+160°
4,2	0,69/115°	0,147(–16,7)/10°	1,04(0,4)/ –85°	0,76/+155°
4,4	0,67/112°	0,147(–16,6)/ 7°	1,00(0,0)/–104°	0,83/+149°
4,6	0,67/112°	0,140(–17,1)/ 6°	0,88(–1,1)/–122°	0,90/+142°
4,8	0,70/112°	0,147(–16,7)/ 9°	0,75(–2,5)/–142°	0,93/+134°
5,0	0,72/114°	0,152(–16,3)/10°	0,59(–4,6)/–164°	0,92/+125°

The figures given between brackets are values in dB.

APPLICATION INFORMATION

R.F. performance in c.w. operation for the **LTE42005S** up to T_{mb} = 25 °C in an unneutralized common-emitter class-A circuit*

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW (dBm)	G_{po} (3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
4,2	18	110	⩾ 450(26,5) typ. 550(27,4)	⩾ 6,6 typ. 7,2	100 + j40	4 + j4

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1}.

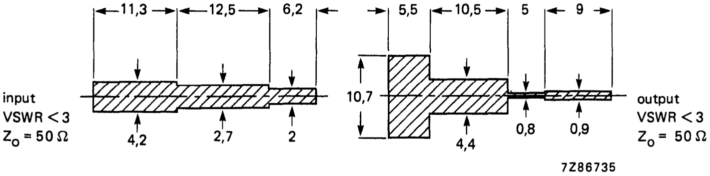


Fig. 6 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 1,6 mm.
Output striplines on a double Cu=clad Rexolite printed-circuit board with dielectric (ϵ_r = 2,4); thickness 0,25 mm.

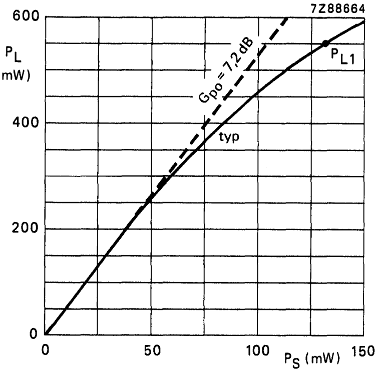


Fig. 7 Load power as a function of source power. f = 4,2 GHz; T_{mb} = 25 °C;
V_{CE} = 18 V } regulated
I_C = 110 mA

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* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.

APPLICATION INFORMATION

R.F. performance in c.w. operation for the **LTE42008R** up to T_{mb} = 25 °C in an unneutralized common-emitter class-A circuit*.

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW (dBm)	G_{po} (3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
4,2	16	250	⩾ 800(29) typ. 940(29,7)	⩾ 7 typ. 7,5	17 + j12	3 – j9

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1}.

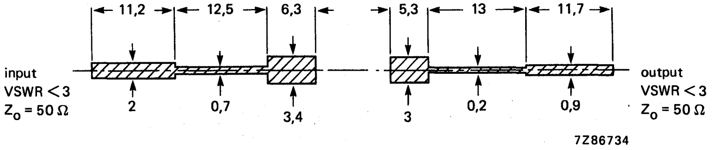

Fig. 8 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.
Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric (ϵ_r = 2,4); thickness 0,25 mm.

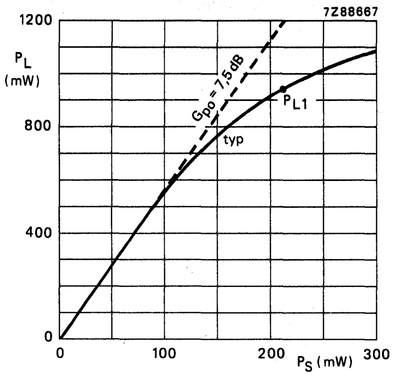

Fig. 9 Load power as a function of source power at 4,2 GHz.

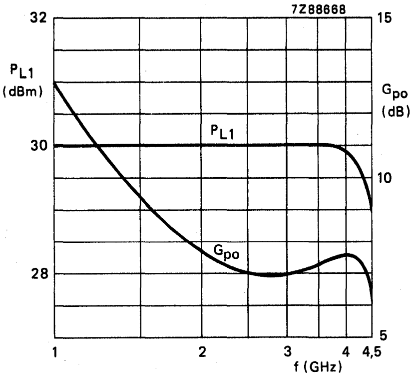

Fig. 10 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 9 and 10:

V_{CE} = 16 V, I_C = 250 mA } regulated; typical values; T_{mb} = 25 °C.

* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.

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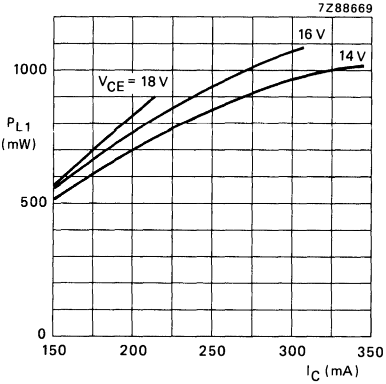


Fig. 11 Load power associated with 1 dB compressed power gain, as a function of collector current.

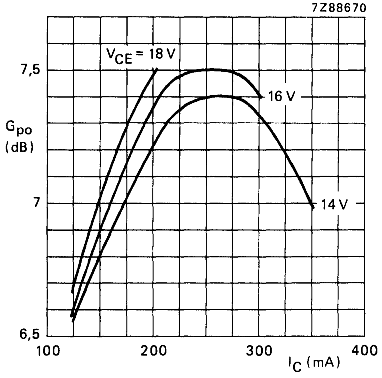


Fig. 12 Low-level power gain associated with P_{L1} as a function of collector current.

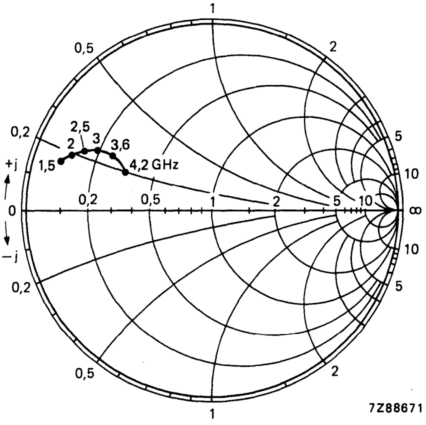


Fig. 14 Optimum load impedance as a function of frequency for P_{L1}.

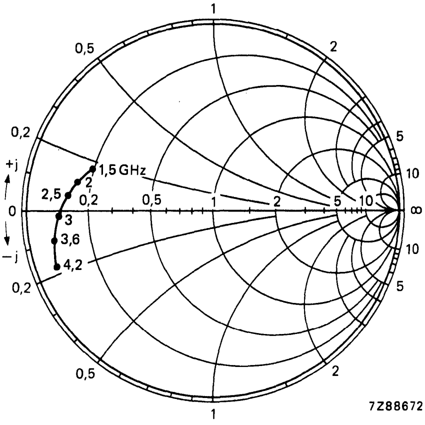


Fig. 13 Input impedance as a function of frequency for P_{L1}.

Conditions for Figs 11 and 12:

V_{CE} and I_C regulated; typical values; T_{mb} = 25 °C.

Conditions for Figs 13 and 14:

V_{CE} = 16 V, I_C = 250 mA } regulated; typical values; Z_o = 50 Ω; T_{mb} = 25 °C.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to a frequency of 4,2 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- An input matching cell improving the input impedance and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 41B).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier, typical values.

mode of operation	f GHz	V_{CE} V	P_{L1} mW	G_{po} dB	I_C mA	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	4,2	16	1250	7	400	7,5+j12	4–j8

MECHANICAL DATA

FO-41B (see Fig. 1).

PRODUCT SAFETY

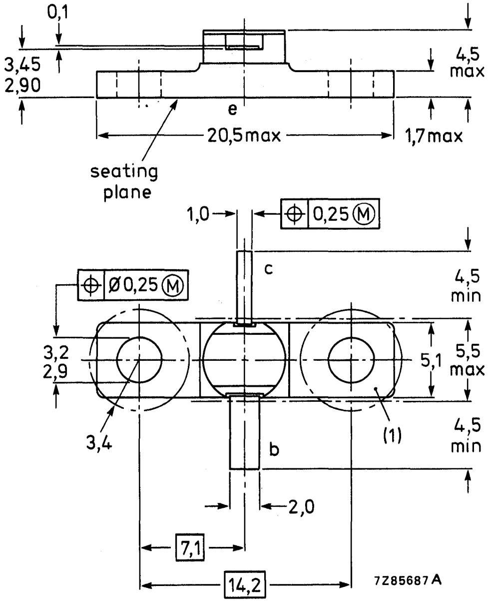
This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.

Emitter and metallic cap connected to flange.



Torque on screw: max. 0,4 Nm

Recommended screw : M2,5

Marking code: RTC198

(1) Flatness of this area ensures full thermal contact with bolt head.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage,			
open base	V_{CEO}	max.	16 V
$R_{BE} = 70\ \Omega$	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	800 mA
Total power dissipation up to $T_{mb} = 75\ ^oC$	P_{tot}	max.	8 W
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature			
at 0,1 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

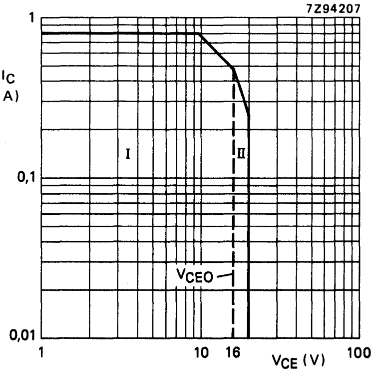


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75\ ^oC$.
I Region of permissible d.c. operation
II Permissible extension provided
1 $R_{BE} \leqslant 70\ \Omega$

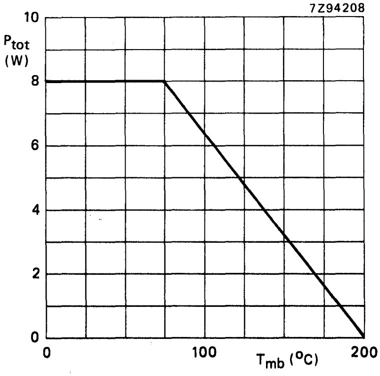


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	10 K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	$\leqslant$	200 μA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	600 nA
D.C. current gain			
$I_C = 400$ mA; $V_{CE} = 5$ V	h_{FE}	typ.	80
Collector-base capacitance at f = 1 MHz			
$I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	3 pF

s-parameters (common-emitter)

Typical values; V_{CE} = 16 V; I_C = 400 mA; Z_O = 50 Ω; T_{mb} = 25 °C.

f GHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
0,5	0,94/176°	0,017(−35,4)/ 43°	2,79(8,9)/ 81°	0,49/−173°
0,6	0,94/174°	0,018(−34,7)/ 46°	2,39(7,6)/ 77°	0,54/−173°
0,7	0,94/173°	0,019(−34,4)/ 47°	2,07(6,3)/ 72°	0,52/−176°
0,8	0,93/172°	0,020(−34,1)/ 49°	1,85(5,3)/ 68°	0,52/−177°
0,9	0,93/170°	0,021(−33,8)/ 49°	1,66(4,4)/ 64°	0,53/−179°
1,0	0,93/168°	0,022(−33,3)/ 50°	1,50(3,5)/ 60°	0,53/ 179°
1,1	0,92/167°	0,023(−32,6)/ 50°	1,39(2,9)/ 57°	0,53/ 179°
1,2	0,93/166°	0,026(−31,6)/ 50°	1,31(2,4)/ 53°	0,54/ 177°
1,3	0,93/164°	0,029(−30,6)/ 49°	1,23(1,8)/ 49°	0,54/ 176°
1,4	0,93/167°	0,032(−29,9)/ 54°	1,16(1,3)/ 48°	0,55/ 179°
1,5	0,93/163°	0,037(−28,7)/ 54°	1,11(0,9)/ 43°	0,54/ 176°
1,6	0,93/162°	0,040(−27,9)/ 53°	1,07(0,6)/ 39°	0,55/ 175°
1,7	0,93/161°	0,042(−27,5)/ 51°	1,03(0,3)/ 35°	0,55/ 176°
1,8	0,92/159°	0,043(−27,3)/ 49°	0,99(−0,1)/ 30°	0,56/ 174°
2,0	0,88/151°	0,046(−26,7)/ 46°	0,99(−0,1)/ 22°	0,56/ 170°
2,2	0,89/148°	0,052(−25,7)/ 43°	0,92(−0,7)/ 14°	0,57/ 168°
2,4	0,90/147°	0,059(−24,6)/ 41°	0,88(−1,1)/ 9°	0,58/ 168°
2,6	0,90/147°	0,069(−23,2)/ 38°	0,90(−0,9)/ 1°	0,59/ 168°
2,8	0,87/142°	0,073(−22,8)/ 32°	0,88(−1,1)/ −8°	0,60/ 169°
3,0	0,83/134°	0,075(−22,5)/ 26°	0,90(−0,9)/ −18°	0,61/ 168°
3,2	0,82/129°	0,077(−22,2)/ 21°	0,87(−1,2)/ −27°	0,63/ 166°
3,4	0,83/130°	0,085(−21,4)/ 18°	0,90(−1,0)/ −37°	0,65/ 165°
3,6	0,80/130°	0,091(−20,8)/ 11°	0,91(−0,8)/ −50°	0,69/ 165°
3,8	0,73/127°	0,091(−20,8)/ 3°	0,94(−0,5)/ −64°	0,74/ 164°
4,0	0,69/122°	0,087(−21,2)/ −7°	0,95(−0,5)/ −82°	0,79/ 162°
4,2	0,67/122°	0,078(−22,2)/−15°	0,89(−1,0)/−100°	0,84/ 157°
4,4	0,69/126°	0,071(−23,0)/−19°	0,83(−1,7)/−121°	0,89/ 150°
4,6	0,72/130°	0,059(−24,6)/−18°	0,70(−3,1)/−141°	0,92/ 143°
4,8	0,76/128°	0,054(−25,4)/−11°	0,60(−4,4)/−160°	0,94/ 136°

The figures between brackets are values in dB.

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective circuit

mode of operation	f GHz	V_{CE} V	P_{L1} mW	G_{po} dB	I_C mA	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w.; class-A	4,2	16	> 1000	> 6	400	7,5+j12	4−j8

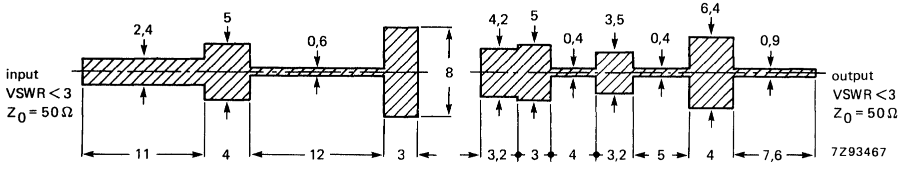


Fig. 4 Prematching test circuit board for c.w.; class-A application (dimensions in mm).

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass of thickness 0,8 mm at input side and Rexolite fibre-glass of thickness 0,25 mm at the output side.

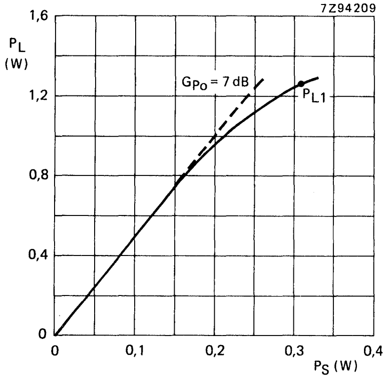


Fig. 5 Load power versus input power; V_{CE} = 16 V and I_C = 400 mA regulated; f = 4,2 GHz.

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* Circuit consists of prematching boards in combination with complementary input and output slug tuners.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 1,7 GHz to 2,1 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology.

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_l}$ Ω
c.w.; class-A	1,7 to 2,1	16	1,1	typ. 5,5	typ. 8	see Fig. 6	

MECHANICAL DATA

Dimensions in mm

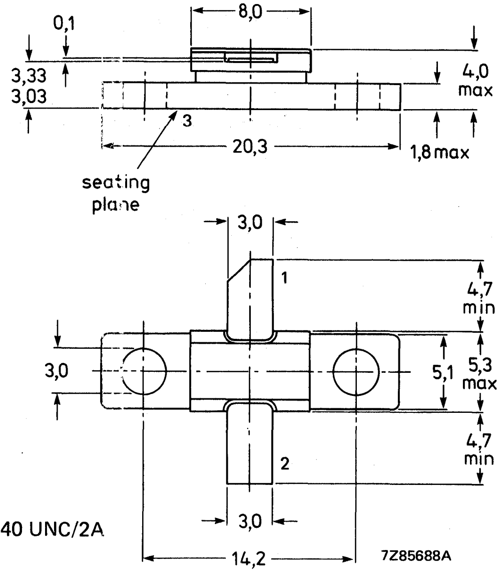
FO-83 (see Fig. 1).

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 FO-83.



Pinning:

1 = collector
2 = base
3 = emitter

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or cheesehead 4-40 UNC/2A

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage				
open base	V_{CEO}	max.	15	V
R_{BE} = 47 Ω	V_{CER}	max.	20	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	2	A
Total power dissipation				
up to T_{mb} = 75 °C	P_{tot}	max.	18	W
Storage temperature	T_{stg}	−65 to +	200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature				
at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

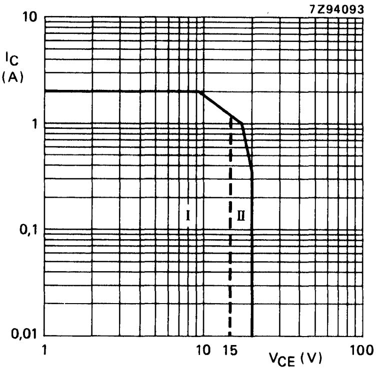


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75\ ^oC$.

I Region of permissible d.c. operation
II Permissible extension provided $R_{BE} \leqslant 47\ \Omega$.

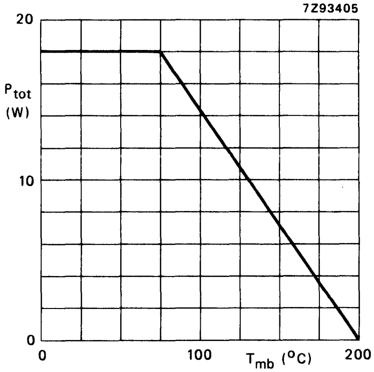


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7 K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Collector cut-off currents			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	$\leqslant$	0,5 mA
$I_E = 0$; $V_{CB} = 40$ V		$\leqslant$	2,5 mA
$V_{CE} = 20$ V; $R_{BE} = 47\ \Omega$	I_{CER}	$\leqslant$	25 mA
$V_{CE} = 15$ V; $I_B = 0$	I_{CEO}	$\leqslant$	2 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	100 μA
$I_C = 0$; $V_{EB} = 3{,}5$ V		$\leqslant$	500 μA
D.C. current gain			
$I_C = 1$ A; $V_{CE} = 3$ V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	1,7 to 2,1	16	1,1	≥ 5	≥ 7	see Fig. 6	

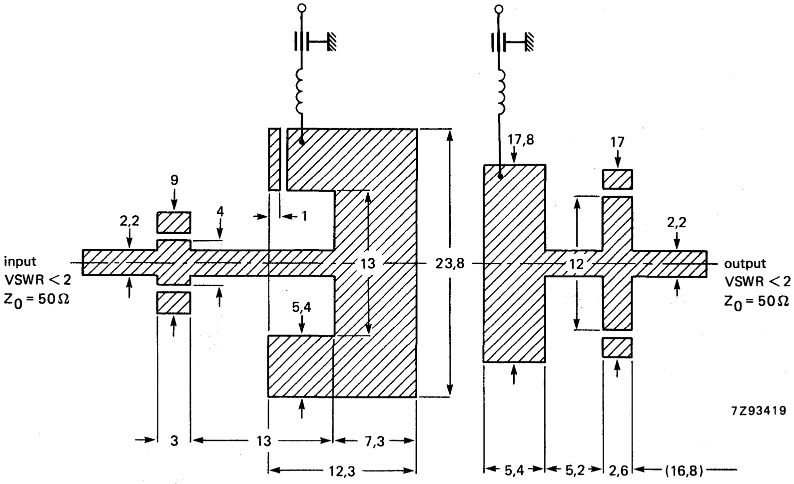


Fig. 4 Prematching test circuit board for 1,7 to 2,1 GHz, c.w., class-A application (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass (ϵ_r = 2,5); thickness 0,8 mm. (Dimensions in mm).

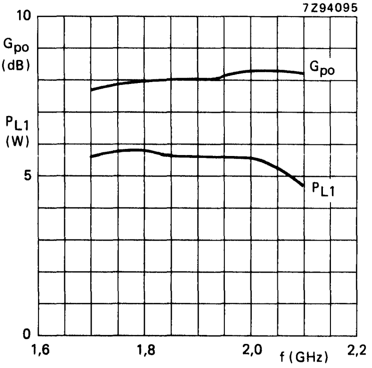


Fig. 5 Load power and power gain versus frequency; V_{CE} = 16 V; I_C = 1,1 A; V_{CE} and I_C regulated.

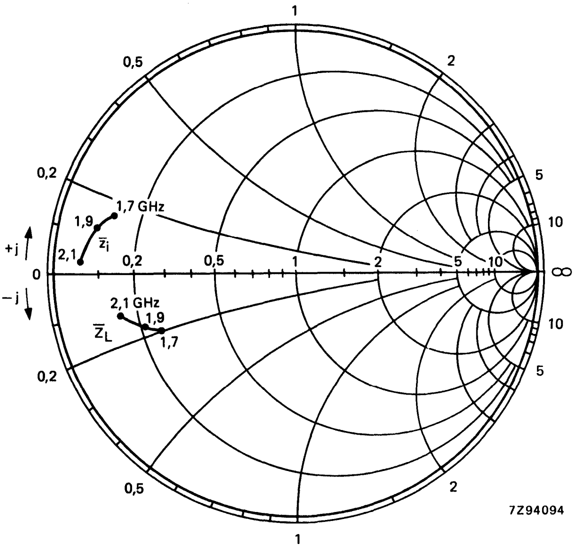


Fig. 6 Input and optimum load impedances versus frequency; P_{L1} = 5,5 W; Z_o = 50 Ω; typical values.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 2,0 GHz to 2,4 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,0 to 2,4	16	1,1	typ. 5	typ. 7	see Fig. 6	

MECHANICAL DATA

Dimensions in mm

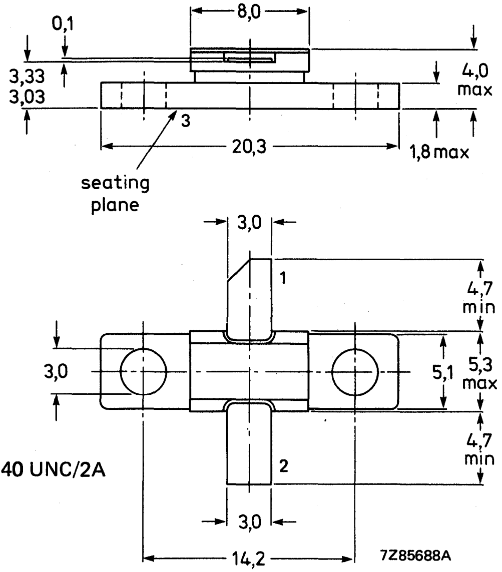
FO-83 (see Fig. 1).

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 FO-83.



Pinning:

1 = collector
2 = base
3 = emitter

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or cheesehead 4-40 UNC/2A

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage, open base				
open base	V_{CEO}	max.	15	V
$R_{BE} = 47\ \Omega$	V_{CER}	max.	20	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	2	A
Total power dissipation up to $T_{mb} = 75\ ^oC$	P_{tot}	max.	18	W
Storage temperature	T_{stg}		−65 to + 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

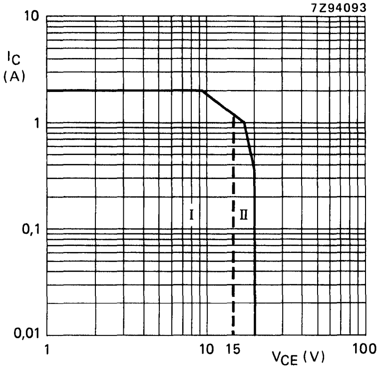


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75$ °C.
I Region of permissible d.c. operation
II Permissible extension provided $R_{BE} \leqslant 47\ \Omega$.

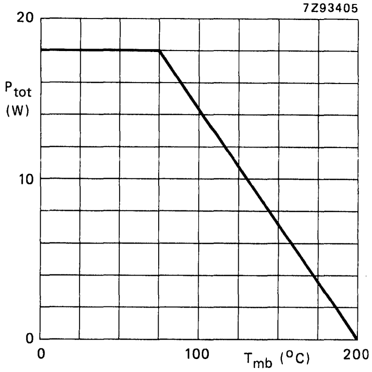


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7 K/W

CHARACTERISTICS

$T_{mb} = 25$ °C unless otherwise specified

Collector cut-off currents			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	$\leqslant$	0,5 mA
$I_E = 0$; $V_{CB} = 40$ V		$\leqslant$	2,5 mA
$V_{CE} = 20$ V; $R_{BE} = 47\ \Omega$	I_{CER}	$\leqslant$	25 mA
$V_{CE} = 15$ V; $I_B = 0$	I_{CEO}	$\leqslant$	2 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	100 μA
$I_C = 0$; $V_{EB} = 3{,}5$ V		$\leqslant$	500 μA
D.C. current gain			
$I_C = 1$ A; $V_{CE} = 3$ V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,0 to 2,4	16	1,1	⩾ 4	⩾ 6	see Fig. 6	

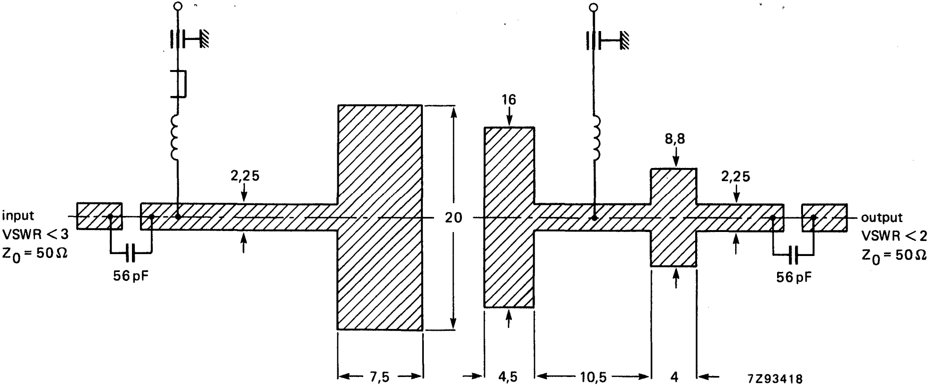


Fig. 4 Wideband test circuit board, class-A application. (Dimensions in mm).

Striplines on a Cu-clad printed circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,55), thickness 0,8 mm.

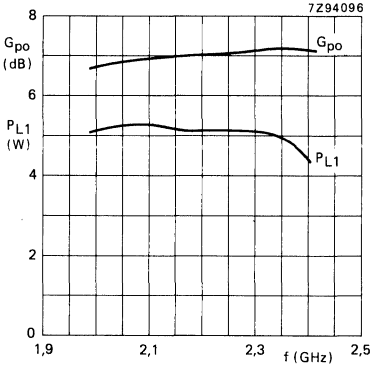


Fig. 5 Load power and power gain versus frequency; V_{CE} = 16 V; I_C = 1,1 A; V_{CE} and I_C regulated.

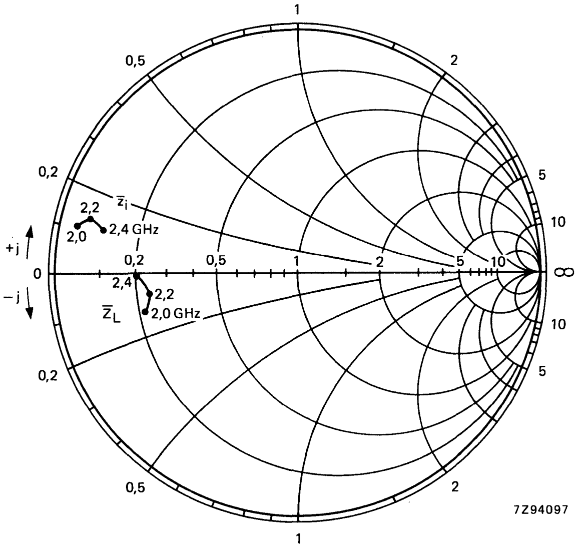


Fig. 6 Input and optimum load impedance versus frequency; Z_o = 50 Ω; typical values.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear wideband power amplifier from 2,3 to 2,7 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input and output matching cell improves the impedances and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	2,3 to 2,7	16	1	typ. 5	typ. 8	11 + j3	7,5–j9

MECHANICAL DATA

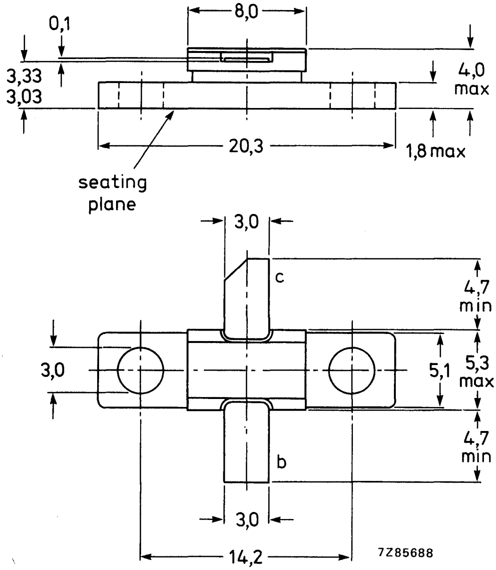
Dimensions in mm

Fig. 1 FO-83.

Metallic cap is connected to the flange

Torque on nut: max. 0,4 Nm

Recommended screw: M2,5



Marking code

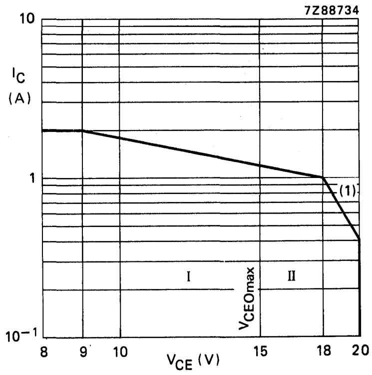
RTC2327E40R = LV2327E40R

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

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40	V
Collector-emitter voltage				
R_{BE} = 47 Ω	V_{CER}	max.	20	V
open base	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	2	A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	18	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C



(1) Second breakdown limit
(independent of temperature)

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.

II Permissible extension provided $R_{BE} \leqslant 47\ \Omega$.

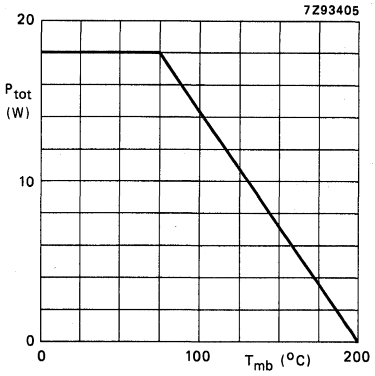


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\,j\text{-}mb}$	=	4 K/W
From mounting base to heatsink	$R_{th\,mb\text{-}h}$	=	0,7 K/W

CHARACTERISTICS

T_{case} = 25 °C unless otherwise specified

Collector cut-off currents			
$V_{CB} = 20$ V; $I_E = 0$	I_{CBO}	$\leqslant$	0,5 mA
$V_{CB} = 40$ V; $I_E = 0$	I_{CBO}	$\leqslant$	2,5 mA
$V_{CE} = 15$ V; $R_{BE} = 47\ \Omega$	I_{CER}	$\leqslant$	25 mA
$V_{CE} = 15$ V; $I_B = 0$	I_{CEO}	$\leqslant$	2 mA
Emitter cut-off current			
$V_{EB} = 1{,}5$ V; $I_C = 0$	I_{EBO}	$\leqslant$	100 μA
$V_{EB} = 3{,}5$ V; $I_C = 0$	I_{EBO}	$\leqslant$	500 μA
D.C. current gain		$\geqslant$	15
$V_{CE} = 3$ V; $I_C = 1$ A	h_{FE}	$\leqslant$	100

APPLICATION INFORMATION

R.F. performance in c.w. operation up to T_{case} = 25 °C in an unneutralized wideband common-emitter class-A circuit

mode of operation	f GHz	V_{CE}(1) V	I_C(1) mA	P_{L1}(2) mW	G_{po}(3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w. class-A	2,3 to 2,7	16	1000	⩾ 4000	⩾ 7	typ. 11 + j3	typ. 7,5 − j9

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1}.

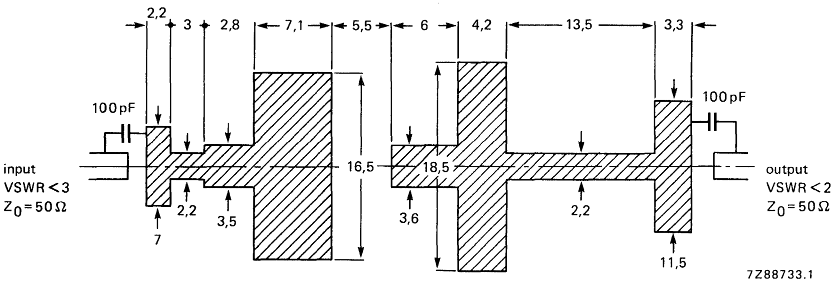


Fig. 4 Prematching test circuit board for 2,3 to 2,7 GHz. (Dimensions in mm).

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,55); thickness 0,8 mm.

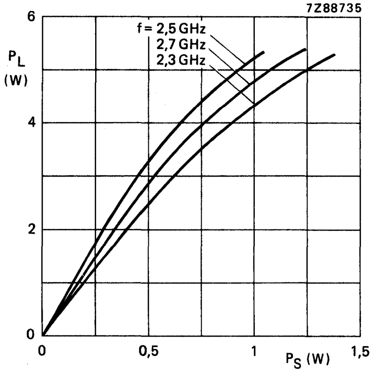


Fig. 5 Load power as a function of source power.

Conditions for Fig. 5:

V_{CE} = 16 V; I_C = 1 A } regulated; typical values; T_{case} = 25 °C.

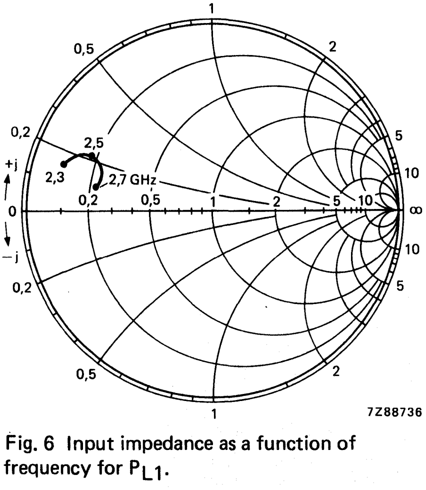


Fig. 6 Input impedance as a function of frequency for P_{L1}.

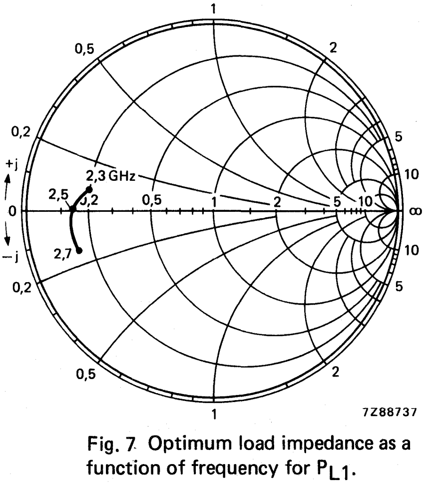


Fig. 7 Optimum load impedance as a function of frequency for P_{L1}.

Conditions for Figs 6 and 7:

V_{CE} = 16 V; I_C = 1 A } regulated; typical values; Z_o = 50 Ω; T_{case} = 25 °C.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 3,7 GHz to 4,2 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	3,7 to 4,2	16	500	typ. 2	typ. 5,5	see Fig. 6	

MECHANICAL DATA

Dimensions in mm

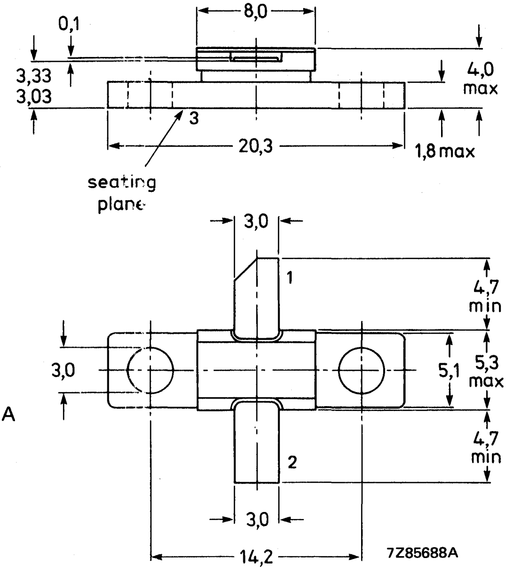
FO-83 (see Fig. 1).

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 FO-83.



Pinning:

1 = collector
2 = base
3 = emitter

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or 4-40 UNC/2A

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage			
open base	V_{CEO}	max.	16 V
R_{BE} = 10 Ω	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1 A
Total power dissipation	P_{tot}	max.	10 W
Storage temperature	T_{stg}	−65 to + 200	°C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

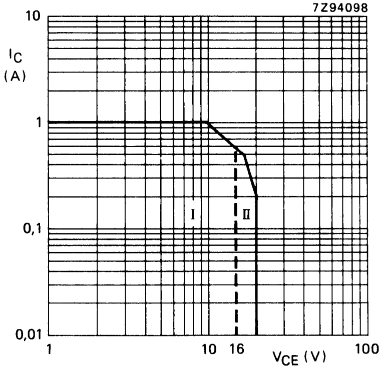


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75$ °C.

I Region of permissible D.C. operation.

II Permissible extension provided $R_{BE} \leqslant 10\ \Omega$.

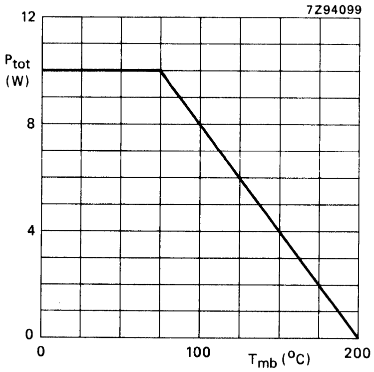


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	6,5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7 K/W

CHARACTERISTICS

$T_{mb} = 25$ °C unless otherwise specified

Collector cut-off currents			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	$\leqslant$	300 μA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	$\leqslant$	2 mA
$V_{CE} = 28$ V; $R_{BE} = 10\ \Omega$	I_{CER}	$\leqslant$	20 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	0,8 μA
$I_C = 0$; $V_{EB} = 3{,}5$ V		$\leqslant$	0,4 mA
D.C. current gain			
$I_C = 0{,}5$ A; $V_{CB} = 3$ V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifer.

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	3,7 to 4,2	16	500	≤ 1,6	≤ 5,0	see Fig. 6	

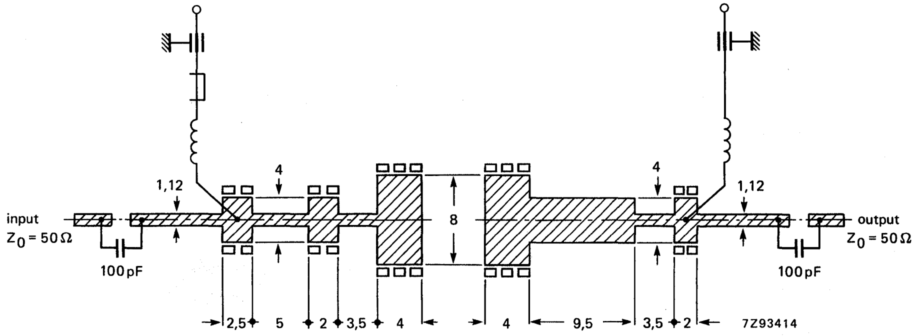


Fig. 4 Prematching test circuit board for 3,7 to 4,2 GHz; c.w., class-A application (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass (ϵ_r = 2,55), thickness 0,4 mm.

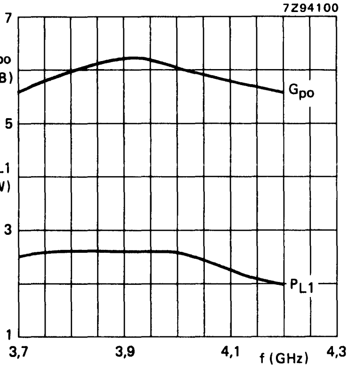


Fig. 5 Load power and power gain versus frequency; T_{amb} = 25 °C; typical values.

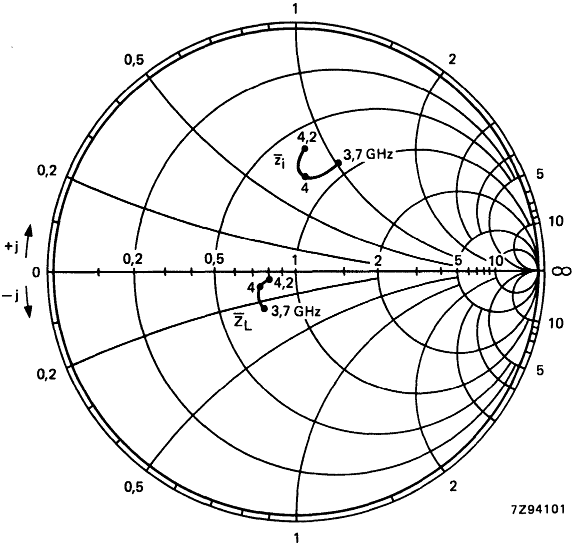


Fig. 6 Input and optimum load impedance versus frequency;
V_{CE} = 16 V, I_C = 0,5 A regulated; Z_o = 10 Ω; typical values.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier from 3,7 to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input and output matching cell improves the impedances and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to T_{case} is 25 °C in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	3,7 to 4,2	16	800	typ. 2,4	typ. 6,5	6 + j7,5	5,5 − j1

MECHANICAL DATA

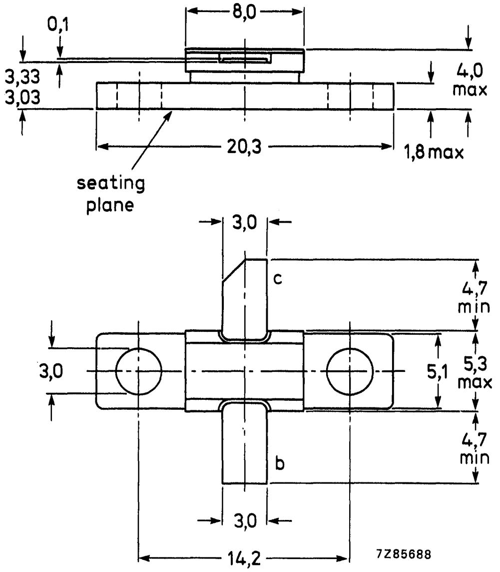
Dimensions in mm

Fig. 1 FO-83.

Metallic cap is connected to the flange

Torque on nut: max. 0,4 Nm

Recommended screw: M3



Marking code

RTC3742E24R = LV3742E24R

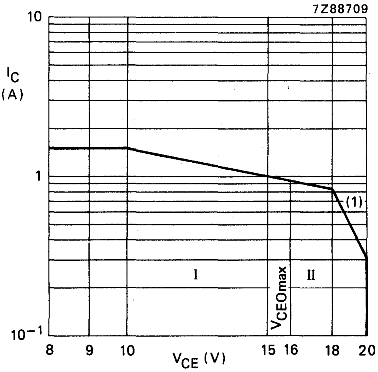
PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40	V
Collector-emitter voltage				
$R_{BE} = 47\ \Omega$	V_{CER}	max.	20	V
open base	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	1,5	A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	15	W
Storage temperature	T_{stg}	−65 to +	200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 47\ \Omega$.

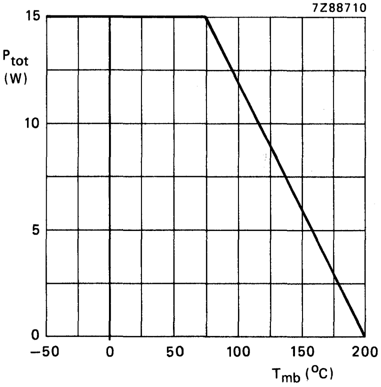


Fig. 3 Power derating curve vs. mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0,7 K/W

CHARACTERISTICS

T_{case} = 25 °C

Collector cut-off current $I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	0,4 mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	<	1,2 μA
Collector-base capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1$ V	C_{cb}	typ.	6 pF
Collector-emitter capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CE} = 16$ V; $V_{EB} = 1$ V	C_{ce}	typ.	66 pF
Emitter-base capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1$ V	C_{eb}	typ.	66 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation up to T_{case} = 25 °C in an unneutralized common-emitter class-A circuit

f GHz	V_{CE}(1) V	I_C (1) mA	P_{L1} (2) W (dBm)	G_{po} (3) dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
3,7 to 4,2	16	800	≥ 2 (33) typ. 2,4 (33,8)	≥ 5 typ. 6,5	6 + j7,5	5,5 − j1

Notes

1 V_{CE} and I_C regulated.
2 Load power for 1 dB compressed power gain.
3 Low-level power gain associated with P_{L1}.

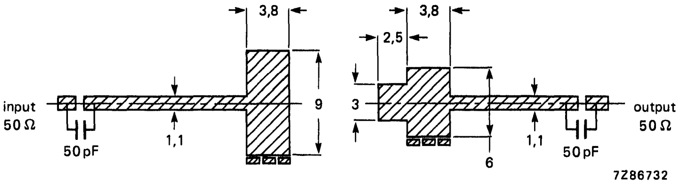


Fig. 4 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,55); thickness 0,4 mm.

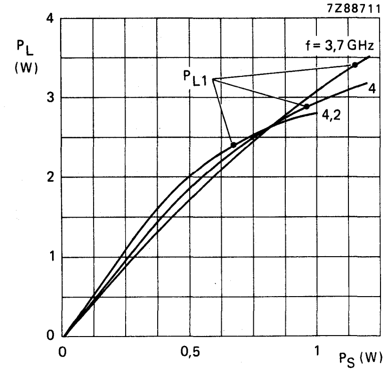


Fig. 5 Load power as a function of source power.

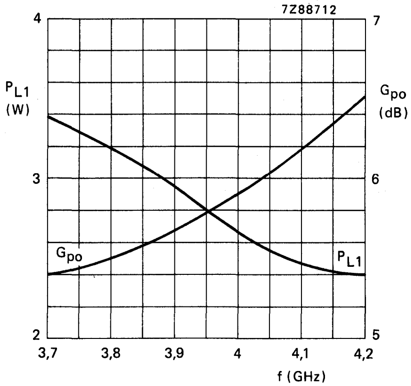


Fig. 6 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 5 and 6:

V_{CE} = 16 V, I_C = 800 mA } regulated; typical values; T_{case} = 25 °C.

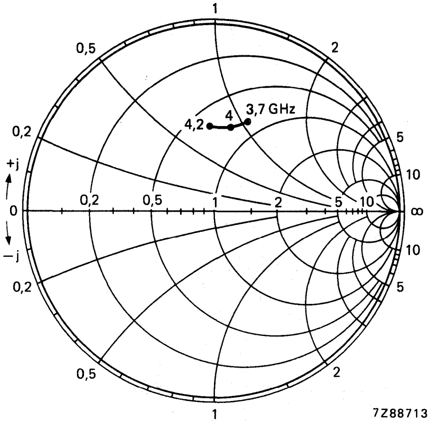


Fig. 7 Input impedance as a function of frequency for P_{L1}.

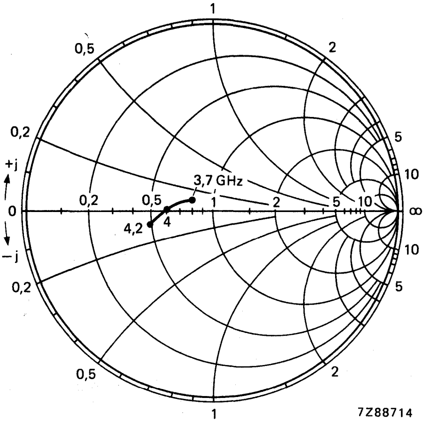


Fig.8 Optimum load impedance as a function of frequency for P_{L1}.

Conditions for Figs 7 and 8:

V_{CE} = 16 V, I_C = 800 mA } regulated; typical values; Z_o = 10 Ω; T_{case} = 25 °C.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to 2,3 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic studless envelope (FO 93).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,3	16	250	typ. 1,6	typ. 8,1	3,5 + j11	6,4 + j2

MECHANICAL DATA

Dimensions in mm

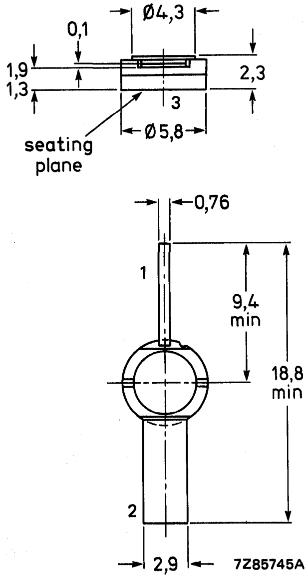
FO-93 (see Fig. 1).

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 FO-93.



Pinning:

1 = collector
2 = base
3 = emitter

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	35	V
Collector-emitter voltage				
open base	V_{CEO}	max.	16	V
R_{BE} = 70 Ω	V_{CER}	max.	20	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	450	mA
Total power dissipation				
up to T_{mb} = 75 °C	P_{tot}	max.	6	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Soldering temperature				
at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

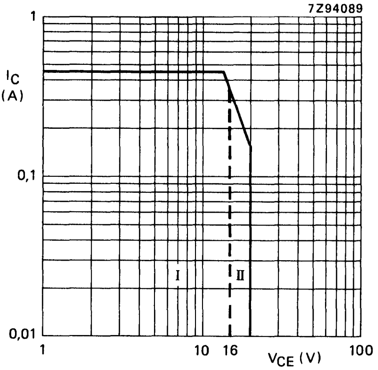


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation
II Permissible extension at $R_{BE} \leqslant 70\ \Omega$.

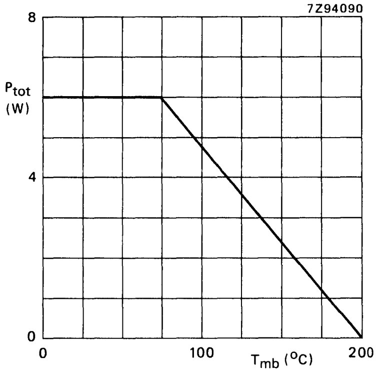


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	12 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0; V_{CB} = 25$ V	I_{CBO}	$\leqslant$	10 μA
$I_E = 0; V_{CB} = 35$ V		$\leqslant$	500 μA
Emitter cut-off current			
$I_C = 0; V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	10 μA
$I_C = 0; V_{EB} = 3{,}5$ V		$\leqslant$	100 μA
D.C. current gain			
I_C = 230 mA; V_{CE} = 5 V	h_{FE}	typ.	40
Collector-base capacitance			
$I_E = I_C = 0; V_{CB} = 16$ V; $V_{EB} = 1{,}5$ V	C_{cb}	typ.	2 pF
Collector-emitter capacitance			
$I_E = I_C = 0; V_{CE} = 16$ V; $V_{EB} = 1{,}5$ V	C_{ce}	typ.	2 pF
Emitter-base capacitance			
$I_E = I_C = 0; V_{CB} = 10$ V; $V_{EB} = 1$ V	C_{eb}	typ.	15 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier*.

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,3	16	250	⩾ 1,2	⩾ 7,5	3,5 + j11	6,4 + j2

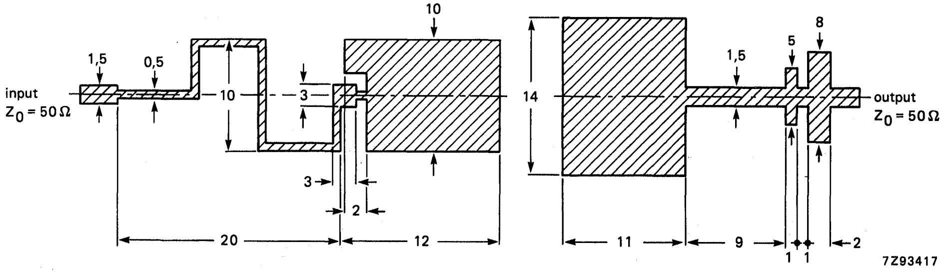


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54), thickness 0,8 mm.

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* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

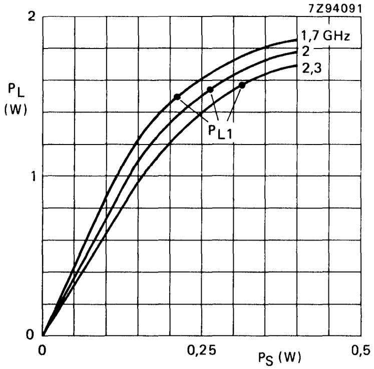


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

V_{CE} = 16 V
I_C = 250 mA
regulated; typical values.

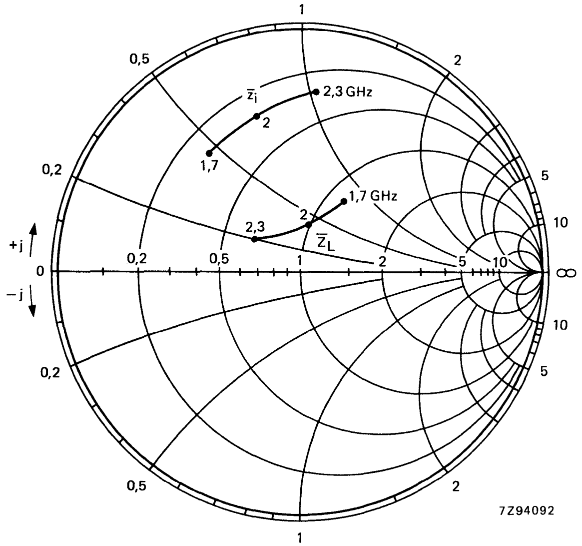


Fig. 6 Input and optimum load impedances versus frequency; Z_o = 10 Ω; P_{L1} = 1,6 W; T_{mb} = 25 °C.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to 2,3 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.W.S.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic studless envelope (FO 93).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,3	16	400	typ. 2,8	typ. 7,8	2 + j8	5,5 – j1,8

MECHANICAL DATA

Dimensions in mm

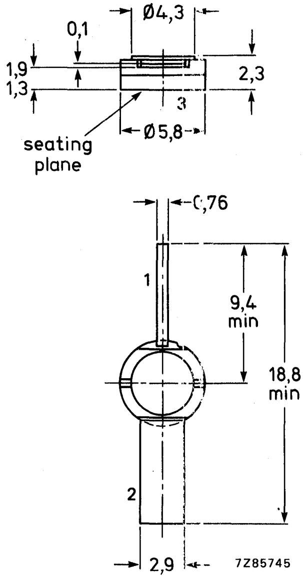
FO-93 (see Fig. 1).

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 FO-93.



Pinning:

1 = collector
2 = base
3 = emitter

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	35	V
Collector-emitter voltage				
open base	V_{CEO}	max.	16	V
$R_{BE} = 70\ \Omega$	V_{CER}	max.	20	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	800	mA
Total power dissipation up to $T_{mb} = 75\ ^{o}C$	P_{tot}	max.	8	W
Storage temperature	T_{stg}	−65 to + 200		^{o}C
Junction temperature	T_j	max.	200	^{o}C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^{o}C

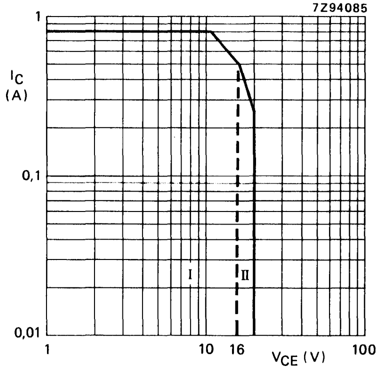


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75\ ^{\circ}C$.

I Region of permissible d.c. operation

II Permissible extension provided $R_{BE} \leqslant 70\ \Omega$.

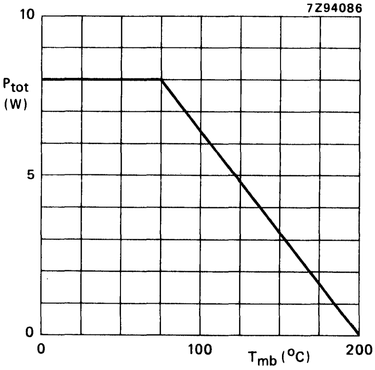


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\,j\text{-}mb}$	=	8 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 25$ V	I_{CBO}	$\leqslant$	15 μA
$I_E = 0$; $V_{CB} = 35$ V		$\leqslant$	700 μA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	15 μA
$I_C = 0$; $V_{EB} = 3,5$ V		$\leqslant$	150 μA
D.C. current gain			
$I_C = 400$ mA; $V_{CE} = 5$ V	h_{FE}	typ.	40
Collector-base capacitance			
$I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	3 pF
Collector-emitter capacitance			
$I_E = I_C = 0$; $V_{CE} = 16$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	2,2 pF
Emitter-base capacitance			
$I_E = I_C = 0$; $V_{CB} = 10$ V; $V_{EB} = 1$ V	C_{eb}	typ.	83 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A selective amplifier*

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,3	16	400	⩾ 2	⩾ 7	2 + j8	5,5 − j1,8

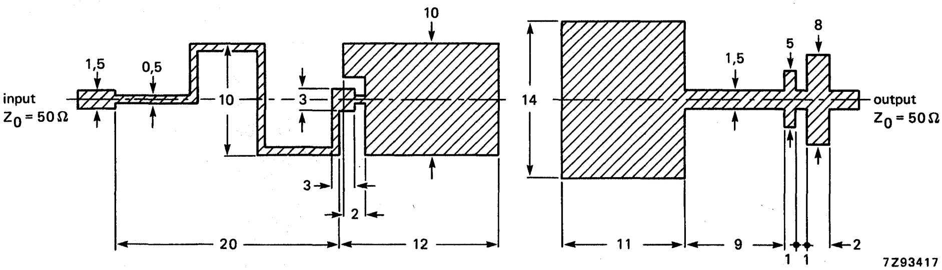


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54), thickness 0,8 mm.

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* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

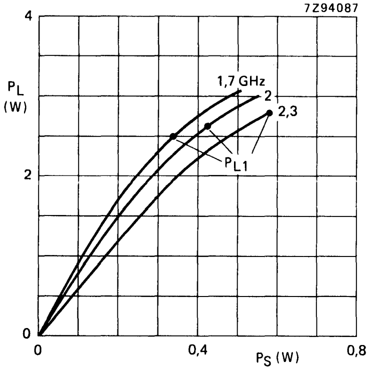


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

V_{CE} = 16 V } regulated; typical values.
I_C = 400 mA }

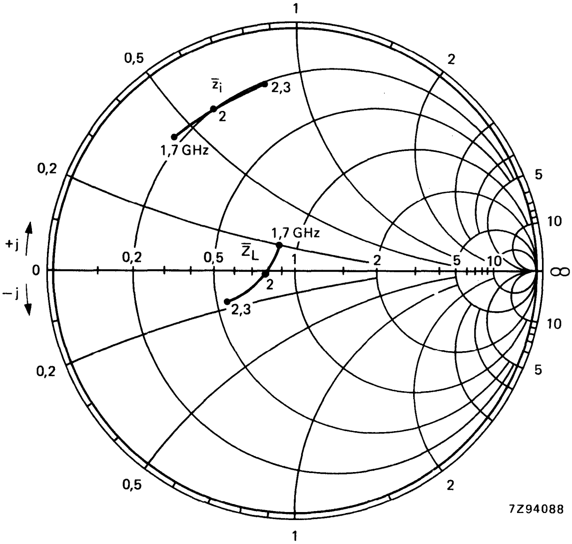


Fig. 6 Input and optimum load impedance versus frequency; $Z_o = 10\ \Omega$; $T_{mb} = 25\ ^{o}C$.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 1,4 GHz to 1,8 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier, typical values

mode of operation	f GHz	V_{CE} V	P_{L1} W	G_{po} dB	I_C A	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w.; class-A	1,4 to 1,8	16	11	11	2	see Fig. 7	

MECHANICAL DATA

FO-57C (see Fig. 1).

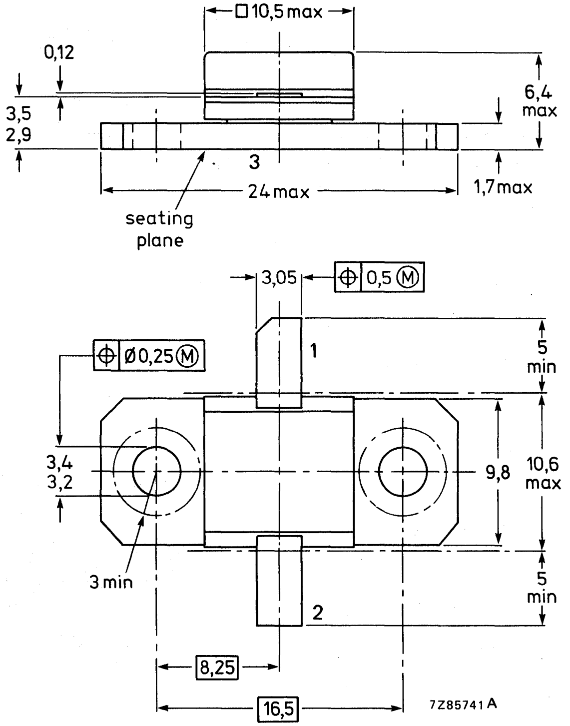
PRODUCT SAFETY

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 FO-57C.



Pinning:

1 = collector
2 = base
3 = emitter

Torque on screw: max. 0,5 Nm
Recommended screw: M3

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage				
open base	V_{CEO}	max.	15	V
$R_{BE} = 47\ \Omega$	V_{CER}	max.	20	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	4	A
Total power dissipation up to $T_{mb} = 75\ ^oC$	P_{tot}	max.	36	W
Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from flange; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

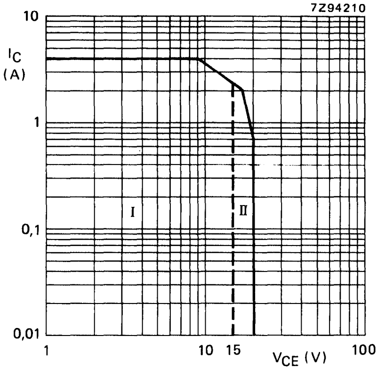


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75\ ^{o}C$.

I Region of permissible D.C. operation

II Permissible extension provided $R_{BE} \leqslant 47\ \Omega$

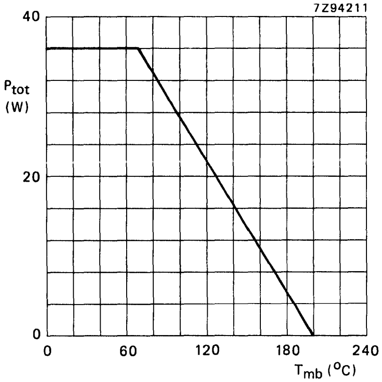


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base $R_{th\ j\text{-}mb}$ = 2,2 K/W

From mounting base to heatsink $R_{th\ mb\text{-}h}$ = 0,5 K/W

CHARACTERISTICS

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

Collector cut-off current			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	$\leqslant$	1 mA
$I_E = 0$; $V_{CB} = 30$ V		$\leqslant$	5 mA
$V_{CE} = 20$ V; $R_{BE} = 47\ \Omega$	I_{CER}	$\leqslant$	50 mA
$V_{CE} = 15$ V; $I_B = 0$	I_{CEO}	$\leqslant$	4 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	200 μA
$I_C = 0$; $V_{EB} = 3$ V		$\leqslant$	1 mA
D.C. current gain			
$I_C = 2$ A; $V_{CE} = 3$ V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A wideband amplifier *

mode of operation	f GHz	V_{CE} V	P_{L1} W	G_{po} dB	I_C A	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w.; class-A	1,4 to 1,8	16	⩾ 9	⩾ 10	2	see Fig. 7	

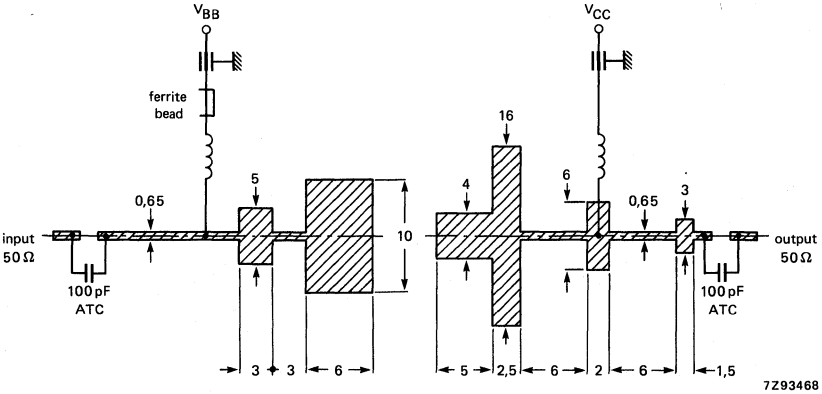


Fig. 4 Prematching test circuit board for 1,4 to 1,8 GHz, c.w, class-A application (dimensions in mm). Epsilam p.c. board, thickness 0,635 mm, ϵ_r = 10.

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* Amplifier consists of test circuit board without any additional tuning.

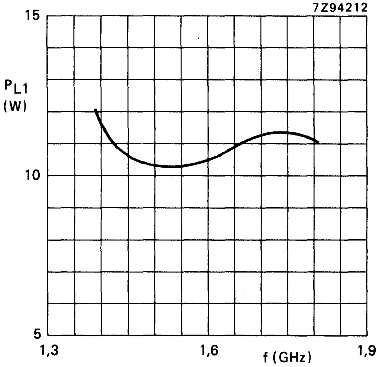


Fig. 5 Load power versus frequency.

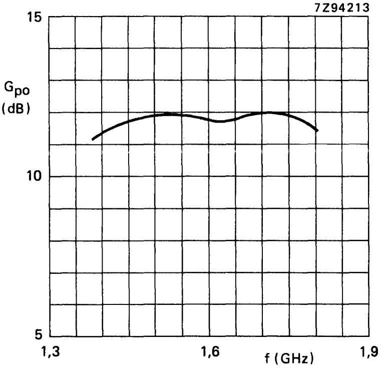


Fig. 6 Linear power gain versus frequency.

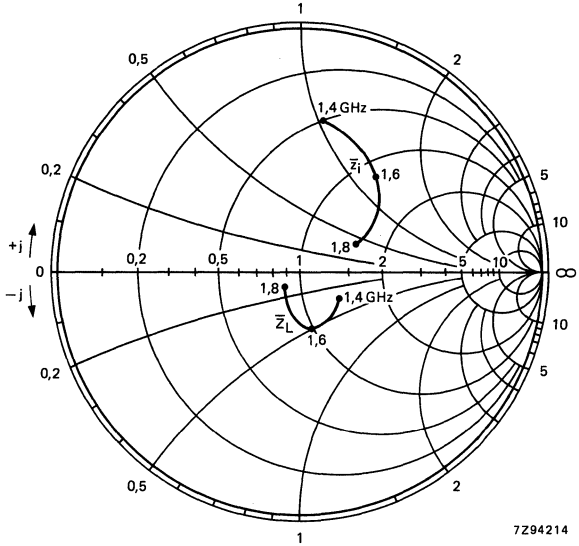


Fig. 7 Input and load impedances versus frequency; Z_O = 5 Ω; typical values.

Conditions for Figs 5 to 7:

V_{CE} = 16 V
I_C = 2 A
regulated; T_{mb} = 25 °C; typical values.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 μs δ = 1%	1,09	45	38	11	47	2,2 + j6,4	6 + j3

MECHANICAL DATA

FO-53 (see Fig. 1)

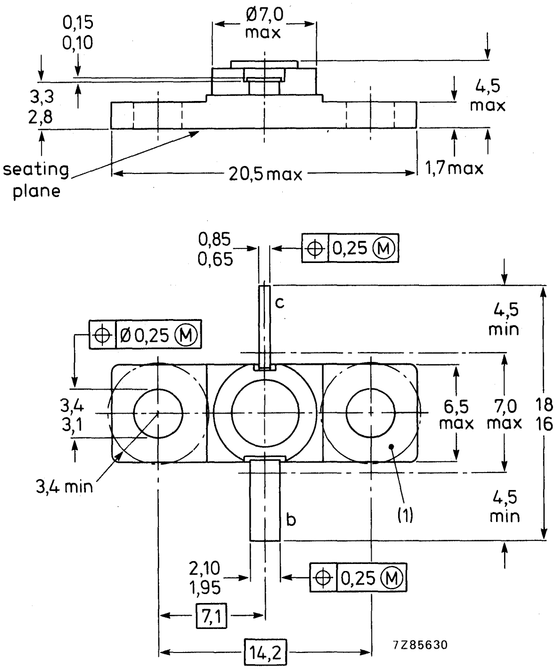
PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA Dimensions in mm

Fig. 1 FO-53.

Marking code:
RTC 1040 S



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	55	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	50	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	3	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	60	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{on} = 10\ \mu s$, $\delta = 1\%$	$R_{th\ j\text{-}mb}$	8	K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 µs δ = 1%	1,09	45	72	7,6	40	2,2 + j4	4,3 − j1

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

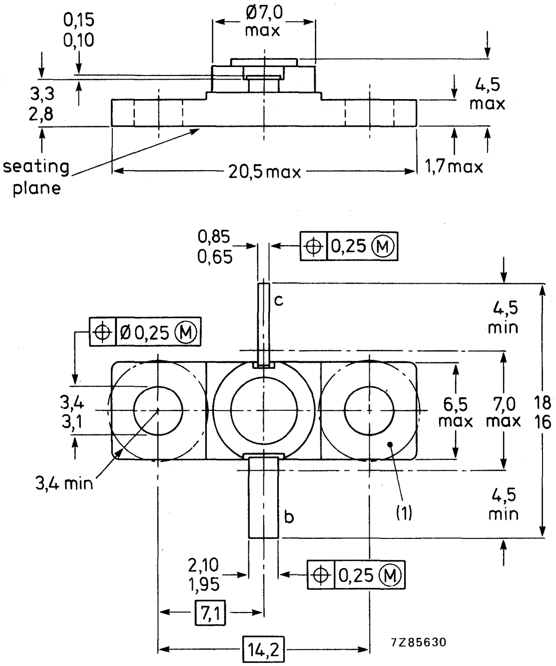
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:
RTC 1100 S



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 (R_{BE} = 10 Ω)	V_{CER}	max.	45	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	6	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	140	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	3,5 K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 μs δ = 1%	1,09	45	120	9,8	49	1,4 + j5	3 – j4

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

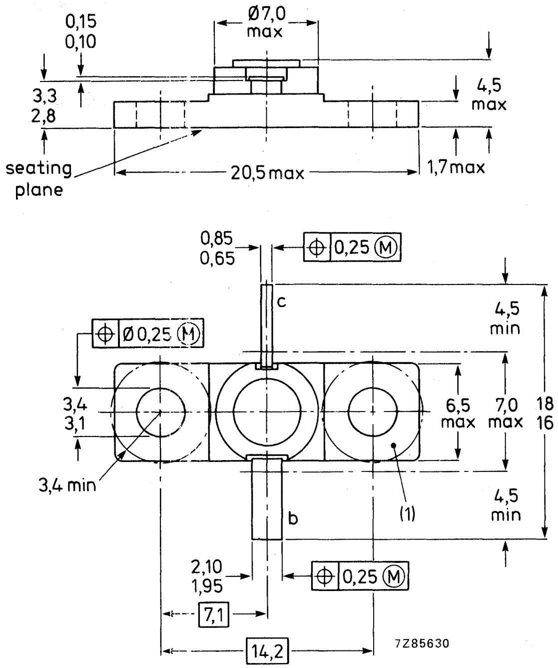
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:
RTC 1140 S



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	55	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	50	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	8	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75$ °C)	P_{tot}	max.	190	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{on} = 10\ \mu s$, $\delta = 1\%$	$R_{th\ j\text{-}mb}$	2,5	K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 B metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed t_{on} = 10 μs δ = 1%	0,6 to 0,75	48	180	8,6	45

MECHANICAL DATA

FO-57B (see Fig. 1)

PRODUCT SAFETY

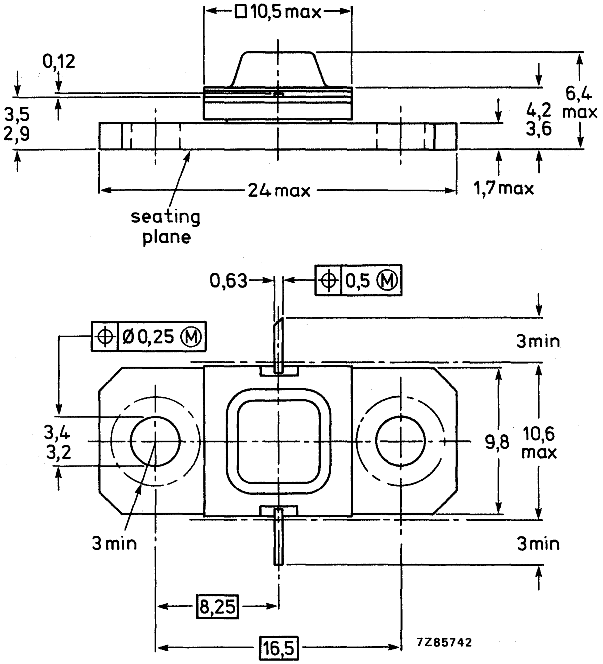
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA Dimensions in mm

Fig. 1 FO-57B.

Marking code:

RTC MO 6075 B 200 Z



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	C_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10$ µs, $\delta \leqslant 1\%$)	I_C	max.	10	A
Total power dissipation ($t_{on} \leqslant 10$ µs, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75$ °C)	P_{tot}	max.	500	W
Storage temperature	T_{stg}		–65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 µs, δ = 1%	$R_{th\ j\text{-}mb}$	0,075	K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 B metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed t_{on} = 10 μs δ = 1%	0,6 to 0,75	48	420	7,2	40

MECHANICAL DATA

FO-57B (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

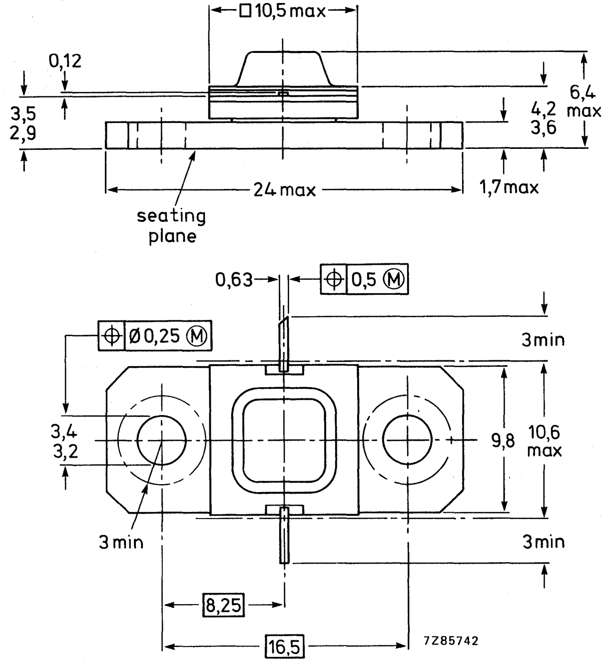
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57B.

Marking code:

RTC MO 6075 B 400 Z



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	32	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, T_{mb} = 75 °C)	P_{tot}	max.	1200	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,04 K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 67 A metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f HGz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 μs δ = 1%	1,09	50	200	9	50	3,5 + j9	1,5 – j2

MECHANICAL DATA

FO-67A (see Fig. 1)

PRODUCT SAFETY

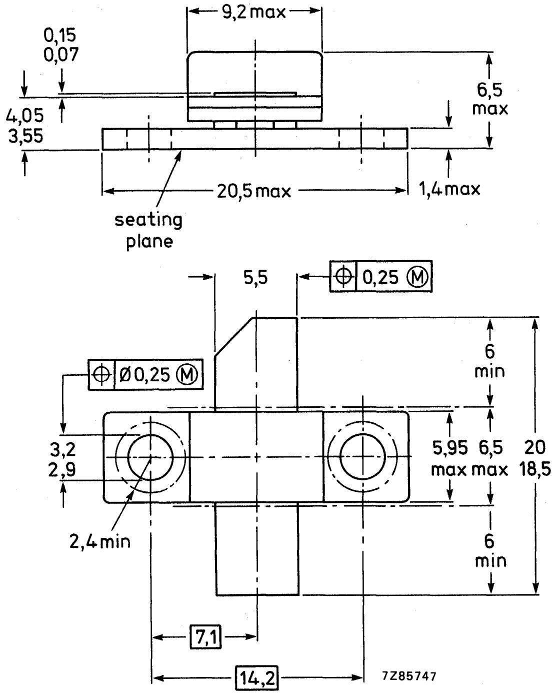
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the B_eO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67A.

Marking code:
RTC 12 175 YR



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	12,5	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	500	W
Storage temperature	T_{stg}		–65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,08 K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 67 A metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 µs δ = 1%	1,09	50	460	8	36	1,9 + j4,5	0,9 – j2

MECHANICAL DATA

FO-67A (see Fig. 1)

PRODUCT SAFETY

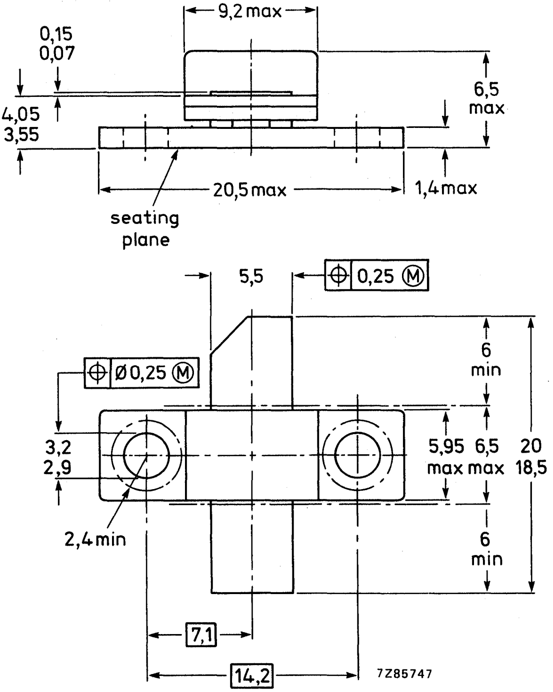
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67A.

Marking code:
RTC 12 350 YR



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65 V
(open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	25 A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75$ °C)	P_{tot}	max.	1000 W
Storage temperature	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base uder pulsed conditions; t_{on} = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,04 K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for DME applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed t_{on} = 10 μs δ = 1%	1,025 to 1,150	50	700	6,7	35

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

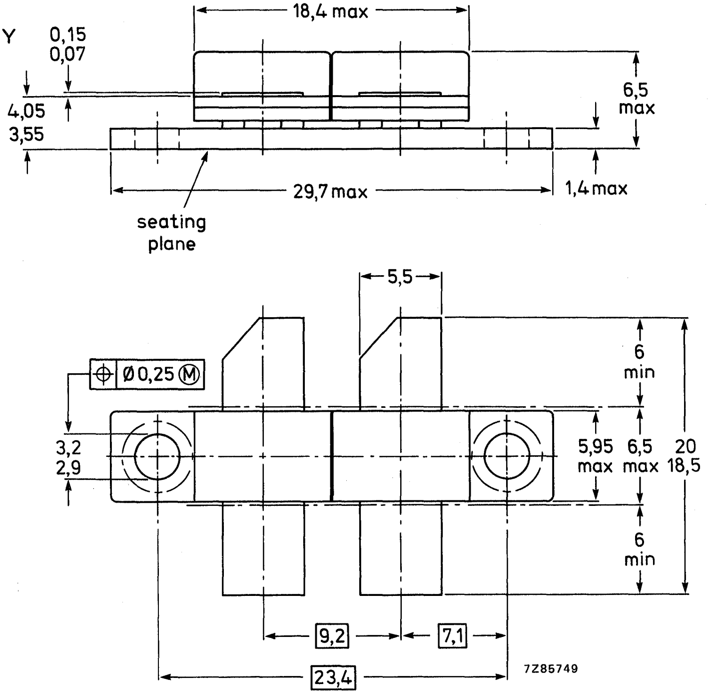
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

Marking code:
RTC MS 1011 B 700 Y



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	50	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	2000	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{on} = 10\ \mu s$, $\delta = 1\%$	$R_{th\ j\text{-}mb}$	0,02	K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed t_{on} = 10 μs δ = 1%	0,6 to 0,75	48	850	7,5	35

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

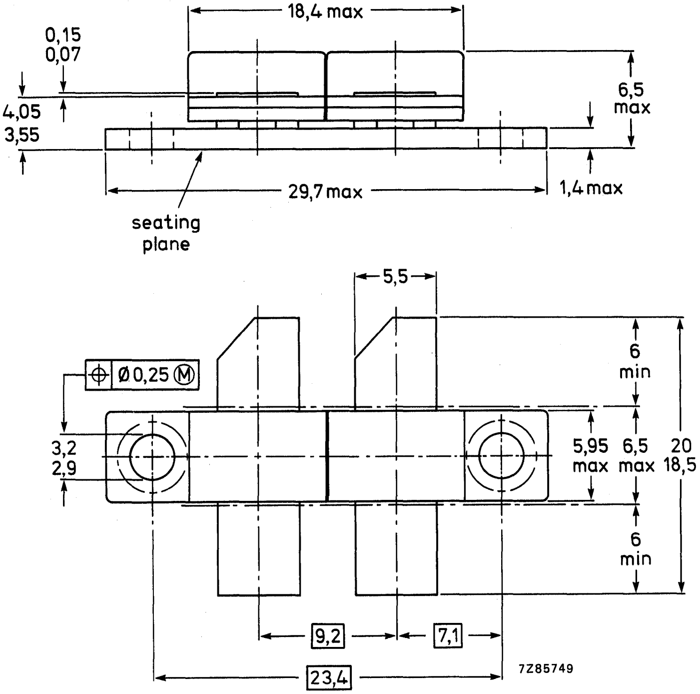
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

Marking code:
MS 6075 B 800 Z



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	50	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	1800	W
Storage temperature	T_{stg}		–65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,02	K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in a unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 μs δ = 1%	1,09	50	900	7,8	35	2,5 + j4	10 – j11

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

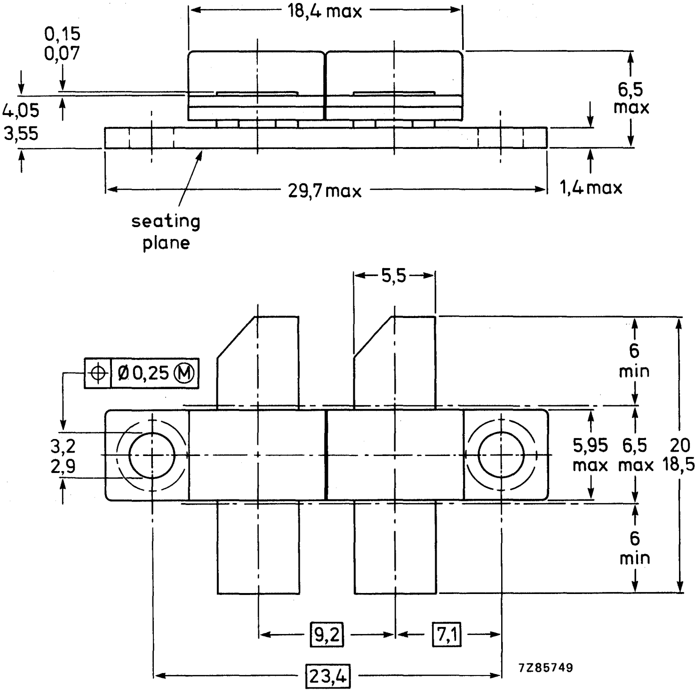
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

Marking code:

RTC MSB 12 900 Y



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	50	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	2000	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,02	K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for TACAN applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 C metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

Internal input and output prematching ensure a good stability and easy broadband using.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed t_{on} = 10 μs δ = 10%	0,960 to 1,215	50	90	8,6	34

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY

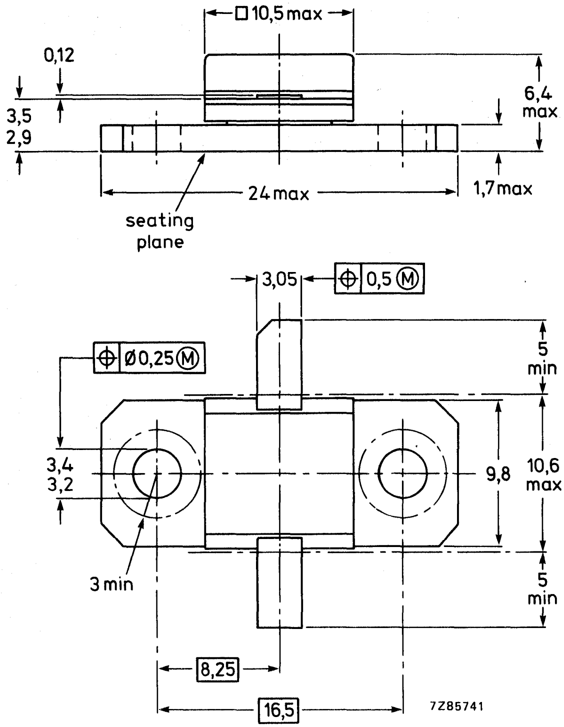
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

Marking code:
RTC MZ 0912 B 75 Y



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 10\%$)	I_C	max.	7	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 10\%$, $T_{mb} \leqslant 75\ ^oC$	P_{tot}	max.	300	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 μs, δ = 10%	$R_{th\ j\text{-}mb}$	0,2 K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for TACAN applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 C metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

Internal input and output prematching ensure a good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
pulsed t_{on} = 10 μs δ = 10%	0,960 to 1,215	50	175	7,7	34

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY

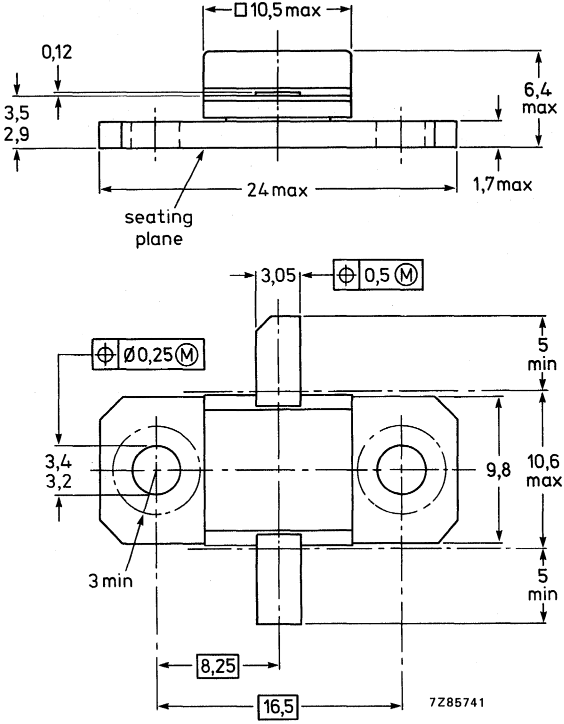
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

Marking code:
RTC MZ 0912 B 150 Y



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 10\%$)	I_C	max.	14	A
Total power dissipation ($t_{on} \leqslant 10\ \mu s$, $\delta \leqslant 10\%$, $T_{mb} \leqslant 75$ °C)	P_{tot}	max.	600	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{on} = 10\ \mu s$, $\delta = 10\%$	$R_{th\ j\text{-}mb}$	0,1	K/W

MAINTENANCE TYPES ←
(for new design use PEE/PDE1001X, PEE/PDE1003X, PEE/PDE1005X and PEE/PDE1010X)

PEE1001U
PDE1001U
FAMILIES

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in space, military and professional applications.

They offer the following technological advantages:
- Interdigitated structure: high emitter efficiency.
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR.
- Gold metallization realizes very good stability of the characteristics and excellent lifetime.
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

The PEE family has an envelope with stud to be mounted with a nut and the PDE family an envelope without stud to be soldered directly onto the heatsink.

Transistors are mounted in a common-emitter configuration in class-B but they also can operate in class-A or C.

QUICK REFERENCE DATA

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

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %
PEE1001U **PDE1001U**	c.w.	1	28	typ. 2	typ. 6,4	typ. 60
PEE1003U **PDE1003U**	c.w	1	28	typ. 4,2	typ. 6,3	typ. 54
PEE1005U **PDE1005U**	c.w.	1	28	typ. 7,6	typ. 5,8	typ. 58
PEE1010U **PDE1010U**	c.w.	1	28	typ. 11	typ. 7,4	typ. 68

MECHANICAL DATA

FO-38

FO-58

Dimensions in mm

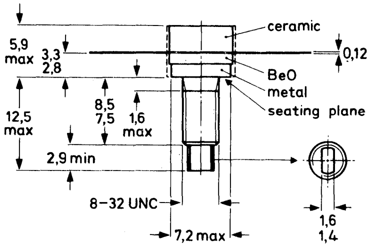
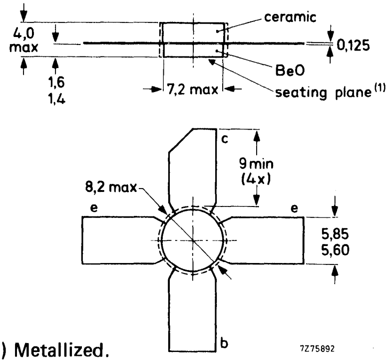


Fig. 1a For top view see Fig. 1b.

Torque on nut: min. 0,75 Nm
max. 0,85 Nm

Diameter of clearance hole in heatsink: max. 4,2 mm.



(1) Metallized.

Fig. 1b.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

			PEE/PDE1001U	1003U	1005U	1010U	
Collector-base voltage open emitter	V_{CBO}	max.	39	39	39	45	V
Collector-emitter voltage R_{BE} = 10 Ω	V_{CER}	max.	39	39	39	45	V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	3,5	3,5	V
Collector current (peak value)	I_{CM}	max.	250	450	900	1000	mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	5	7	12,5	20	W
Storage temperature	T_{stg}		−65 to +150				°C
Operating junction temperature	T_j	max.	200				°C
Lead soldering temperature at 0,7 mm from ceramic; $t_{sld} \leq 10$ s	T_{sld}	max.	235				°C

THERMAL RESISTANCE

			PEE/PDE1001U	1003U	1005U	1010U	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	25	18	10	6	K/W

MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-B	3	28	1,2	10	33	50 + j30	2,5 + j5

MECHANICAL DATA

FO-53 (see Fig. 1)

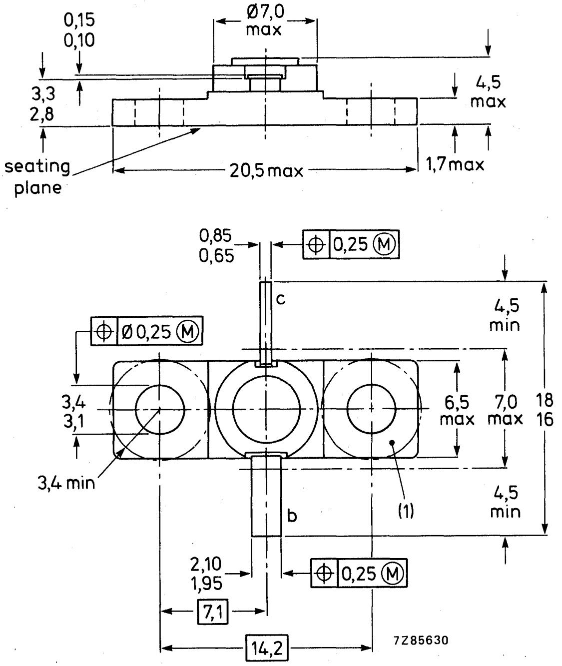
PRODUCT SAFETY

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

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



Torque on nut: max 0,4 Nm
Recommended screw: M2,5

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (open base)	V_{CEO}	max.	20	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	160	mA
Total power dissipation T_{mb} = 75 °C	P_{tot}	max.	4,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	22	K/W

MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-B	3	28	3,5	7	35	9 + j18	2 – j6

MECHANICAL DATA

FO-53 (see Fig. 1)

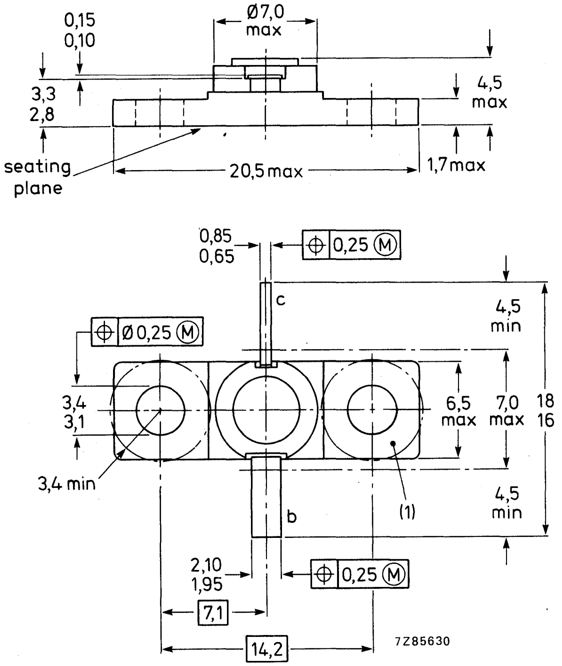
PRODUCT SAFETY

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

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



Torque on nut: max 0,4 Nm
Recommended screw: M2,5

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (open base)	V_{CEO}	max.	20	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	900	mA
Total power dissipation	P_{tot}	max.	11	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	11	K/W

MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-B	3	28	5	5,2	29	5 + j25	1 + j14

MECHANICAL DATA

FO-53 (see Fig. 1)

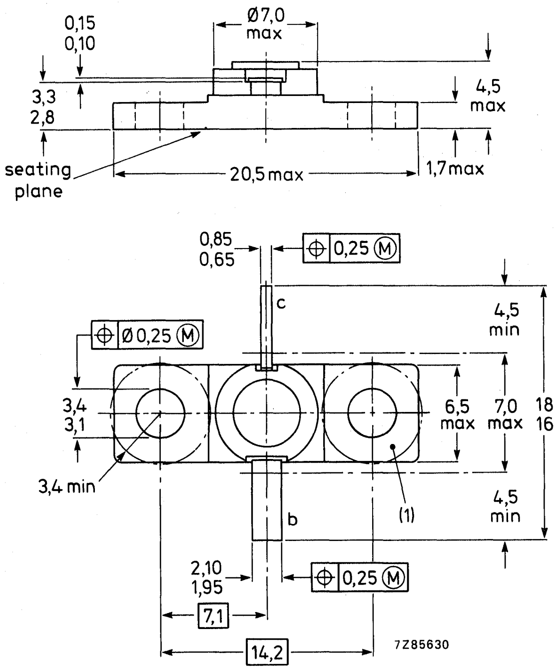
PRODUCT SAFETY

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 FO-53.



Torque on nut: max. 0,4 Nm
Recommended screw: M2,5

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45	V
(open base)	V_{CEO}	max.	20	V
Emitter-base voltage	V_{EBO}	max.	3	V
Collector current	I_C	max.	1500	mA
Total power dissipation	P_{tot}	max.	18	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	7 K/W

C.W. AND PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. and pulsed conditions and is recommended for NAVAID applications (IFF, DME, TACAN) in common-base class-B amplifier up to 1,3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed and c.w. conditions.

Internal input prematching ensures a good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
pulsed t_{on} = 10 µs δ = 10%	0,960 to 1,215	28	5	9	45	7 + 5,5 (at f = 1,09 GHz)	8 + j13
c.w.	1,2	28	6,5	10,5	45	–	–

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

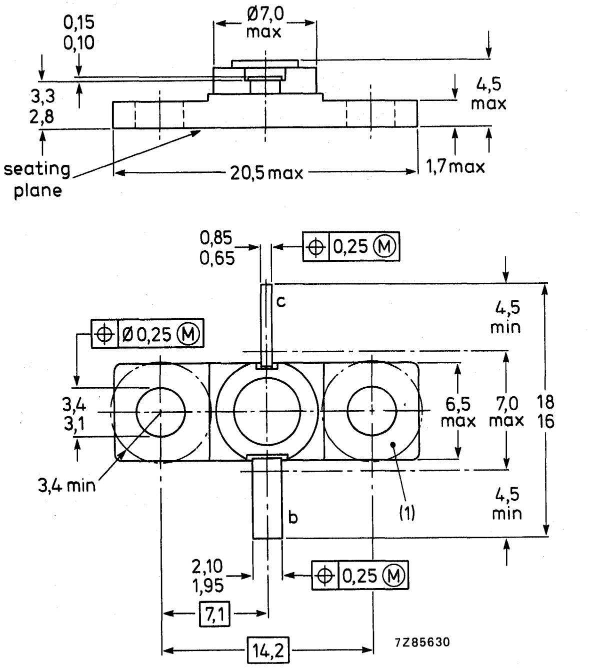
This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:
RTC1005M



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	40	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current ($t_{on} \leqslant 10$ μs, $\delta \leqslant 10\%$)	I_C	max.	1,2	A
Total power dissipation ($t_{on} \leqslant 10$ μs, $\delta \leqslant 10\%$, $T_{mb} \leqslant 75$ °C)	P_{tot}	max.	17,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0.1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	7,5 K/W

MAINTENANCE TYPE ←
(for new design use PVB23010X)

MICROWAVE POWER TRANSISTOR

N-P-N silicon transistor for use in space, military and professional applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency.
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR.
- Gold metallization realizes very good stability of the characteristics and excellent lifetime.
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_c %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.	1	28	typ. 25	typ. 11	typ. 58	2 + j6,5	5 + j1
c.w.	2	28	typ. 10	typ. 6	typ. 42	7 + j6,75	1,5 − j7

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Base connected to flange

Pinning ;
1 = collector
2 = emitter
3 = base

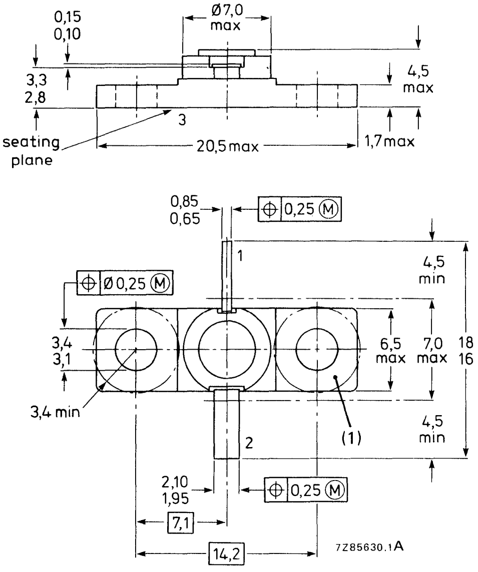
Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC2010M = PKB20010U

(1) Flatness of this area ensures full thermal contact with bolt head.



PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40	V
Collector-emitter voltage				
$R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	40	V
open base	V_{CEO}	max.	22	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	2	A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	25	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

MICROWAVE POWER TRANSISTORS

NPN silicon transistors primarily intended for use in space, military and professional applications up to 2 GHz.

They offer the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistors have an FO 53 metal ceramic hermetic flange package.

Transistors are mounted in a common-base configuration specified in class-B and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

R.F. performances, common-base, class-B.

Typical values

type	mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
PKB23001U	c.w. class-B	1	28	2,5	9,5	45	6 + j2	33 + j22
		2		1,5	7	32	8 + j0	10 + j14
PKB23003U	c.w. class-B	1	28	5	11	70	4 + j4	17 + j19
		2		3,4	9,3	50	7 + j5	4 + j2
PKB23005U	c.w. class-B	1	28	19	11	58	3,5 + j6,5	10 + j6
		2		8	7,2	53	6 + j8	3 − j1,5

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO disc is not damaged.

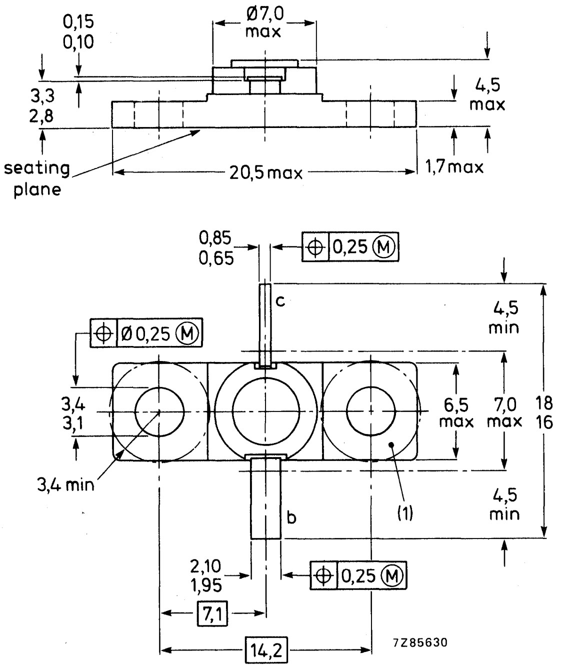
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:

PKB23001U:	2001M
PKB23003U:	2003M
PKB23005U:	2005M



RATINGS

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

			PKB23001U	PKB23003U	PKB23005U	
Emitter-base voltage (open collector)	V_{EBO}	max.	3	3	3	V
Collector-base voltage (open emitter)	V_{CBO}	max.	45	45	45	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45	45	45	V
Collector-emitter voltage (open base)	V_{CEO}	max.	20	20	20	V
Collector current	I_C	max.	0,3	0,6	1,5	A
Total power dissipation class-B; $T_{mb} \leqslant 75\ ^oC$	P_{tot}	max.	4	7,5	18	W
Junction temperature	T_j	max.	200	200	200	°C
Storage temperature	T_{stg}	min.	−65	−65	−65	°C
		max.	200	200	200	°C
Soldering temperature (d = 0,7 mm; t_{sld} = 10 s	T_{sld}	max.	235	235	235	°C

THERMAL RESISTANCE

Junction-mounting base	$R_{th\ j\text{-}mb}$	30	18	7	K/W
From mounting base to heatsink (torque on nut: 0,5 Nm with M3 screw)	$R_{th\ mb\text{-}h}$	0,7	0,7	0,7	K/W

MICROWAVE POWER TRANSISTOR

NPN bipolar transistor intended for use in common-base class-B power amplifiers up to 2,45 GHz. Diffused emitter ballasting resistors, multicell geometry, interdigited structure, localized thick oxide and gold metallization ensure an optimum temperature profile and excellent performances at such frequencies.

The transistor has an FO 53 metal ceramic hermetic package.

QUICK REFERENCE DATA

R.F. performances, common-base, class-B

Typical values

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_c %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
c.w. class-B	2,3	21	9	10	40	5 + j10	2,5 – j5
c.w. class-B	2,45	21	8	9	35	7,5 + j25	2,5 – j6,5

MECHANICAL DATA

FO-53 (see Fig. 1).

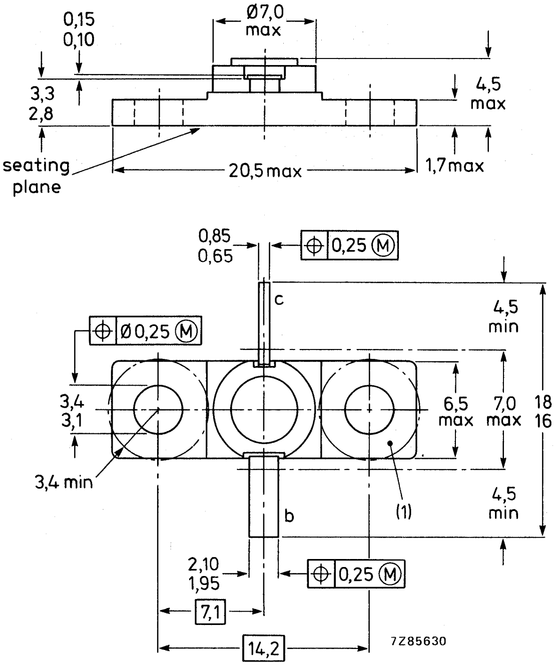
PRODUCT SAFETY

These devices contain beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	35	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	1,7	A
Total power dissipation ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	16,5	W
Storage temperature	T_{stg}	min.	−65	°C
		max.	200	°C
Operating junction temperature	T_j	max.	200	°C
Soldering temperature at 0,7 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	230	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	6	K/W
From mounting base to heatsink (torque on nut: 0,5 Nm with M3 screw)	$R_{th\ mb\text{-}h}$	=	0,7	K/W

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

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

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
PKB32001U	c.w.	3	28	typ. 1,3	typ. 8,1	typ. 34	11 + j1,8	3 + j3,5
PKB32003U	c.w.	3	28	typ. 3,2	typ. 6,3	typ. 33	14 – j4	2,5 – j1
PKB32005U	c.w.	3	28	typ. 5	typ. 5,2	typ. 31	13 + j2	2 – j4

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

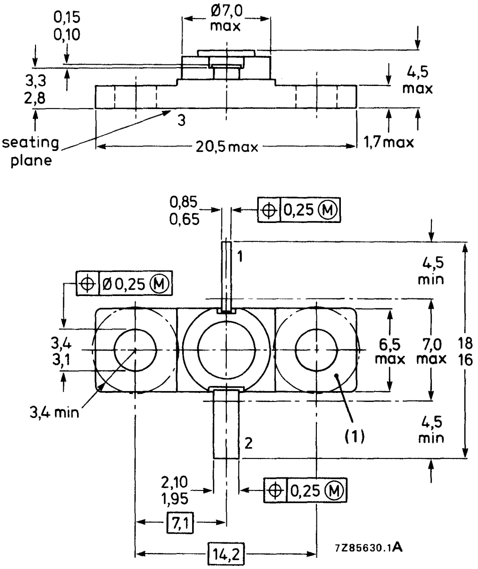
Base connected to flange

Pinning ;

1 = collector
2 = emitter
3 = base

Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC3001M = PKB32001U
RTC3003M = PKB32003U
RTC3005M = PKB32005U

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

			PKB32001U	32003U	32005U	
Collector-base voltage open emitter	V_{CBO}	max.	45	45	45	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$	V_{CER}	max.	45	45	45	V
Emitter-base voltage open collector	V_{EBO}	max.	3	3	3	V
Collector current (d.c.)	I_C	max.	0,4	0,8	2	A
R.F. power dissipation ($f > 1$ MHz) up to $T_{mb} = 75$ °C	P_{rf}	max.	4,5	9	15	W
Storage temperature	T_{stg}	max.	−65 to + 200			°C
Junction temperature	T_j	max.	200			°C
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235			°C

THERMAL RESISTANCE

			PKB32001U	32003U	32005U	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	11	6,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	0,7	K/W

PPC5001T
PQC5001T

MICROWAVE POWER TRANSISTORS

N-P-N silicon power transistor for use in a common-collector oscillator circuits in military and professional applications.

The transistors operate in c.w. conditions and are recommended for applications up to 8 GHz.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology.

The PPC5001T is housed in a metal ceramic flange envelope (FO-102).
The PQC5001T is housed in a metal ceramic flange envelope (FO-85).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an oscillator circuit up to 5 GHz.

mode of operation	f GHz	V_{CE} V	I_C mA	P_L mW
class-B; c.w.	5	20	200	450

MECHANICAL DATA

Dimensions in mm

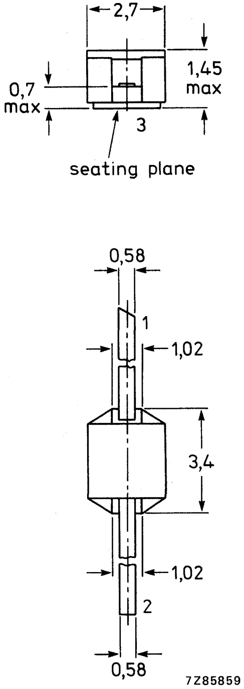
PPC5001T FO-102 (see Fig. 1a)
PQC5001T FO-85 (see Fig. 1b).

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

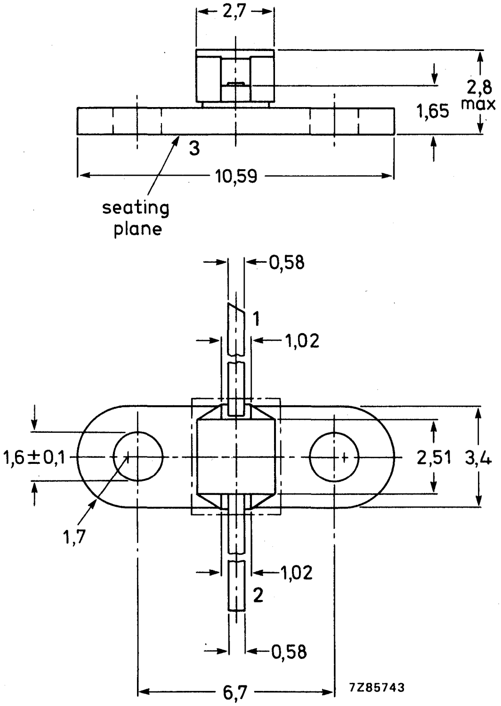
Fig. 1a FO-102.
PPC5001T



Pinning:

1 = base
2 = emitter
3 = collector

Fig. 1b FO-85.
PQC5001T



Pinning:

1 = base
2 = emitter
3 = collector

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage,			
R_{BE} = 70 Ω	V_{CER}	max.	35 V
open emitter	V_{CEO}	max.	16 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current, d.c.	I_C	max.	0,25 A
Total power dissipation up to T_{amb} = 75 °C	P_{tot}	max.	4 W
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from the case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

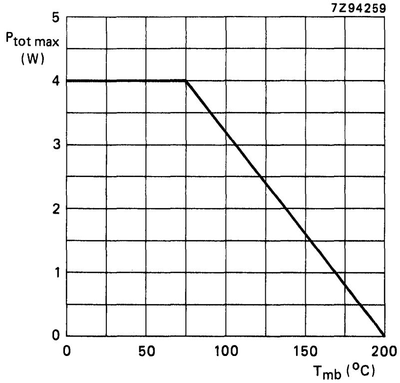


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	24 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages			
I_C = 500 μA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	40 V
I_C = 2,5 mA; R_{BE} = 70 Ω	$V_{(BR)CER}$	$\geqslant$	35 V
I_C = 0; I_E = 100 μA	$V_{(BR)EBO}$	$\geqslant$	3,5 V
Collector cut-off current I_E = 0; V_{CB} = 24 V	I_{CBO}	$\leqslant$	100 μA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	0,2 μA
Collector-base capacitance at f = 1 MHz $I_E = I_C$ = 0; V_{CB} = 18 V; V_{EB} = 1,5 V	C_{cb}	typ.	1,4 pF

Emitter-base capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{EB} = 1$ V; $V_{CB} = 10$ V	C_{eb}	typ.	5,5 pF
Collector-emitter capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CE} = 18$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	0,9 pF

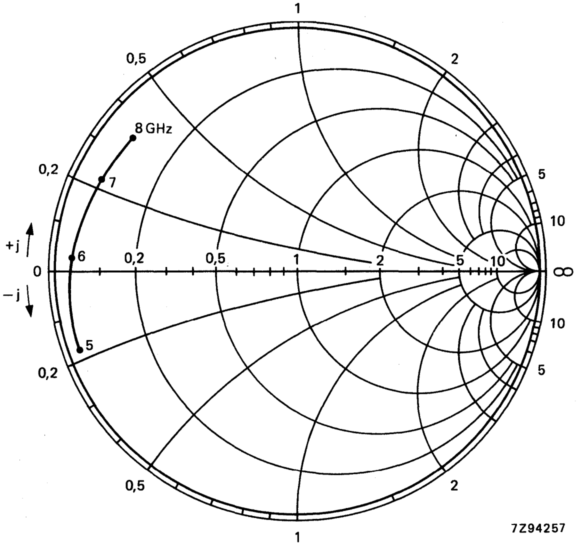


Fig. 3 Emitter reflection coefficient.

Conditions for Figs 3 and 4:
$V_{CE} = 20$ V; $I_C = 200$ mA;
$Z_0 = 50\ \Omega$

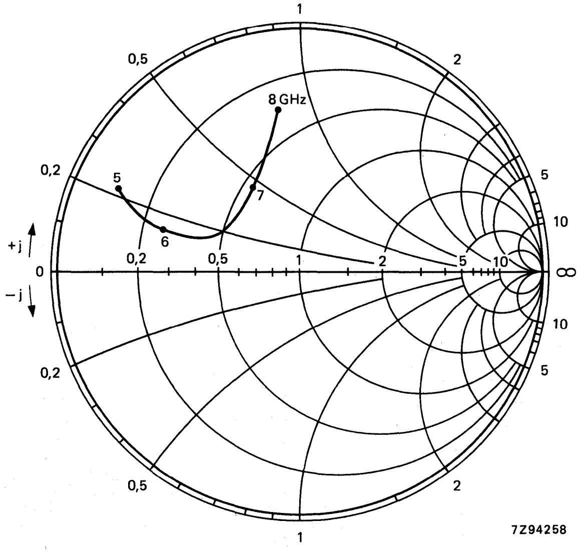


Fig. 4 Base reflection coefficient.

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

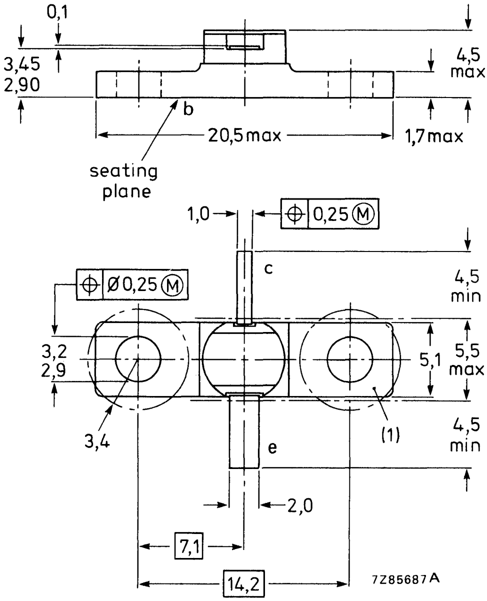
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
PTB23001X	c.w.	2	24	typ. 1,8	typ. 9	typ. 50	8 + j14	8 + j20
PTB23003X	c.w.	2	24	typ. 4,0	typ. 10	typ. 50	2,5 + j14	8 + j6
PTB23005X	c.w.	2	24	typ. 7,0	typ. 11	typ. 50	1,9 + j12	3 + j20

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.



Base and metallic cap connected to flange.

Torque on screw: max. 0,5 Nm
Recommended screw: M2,5

Marking code: 23001 X
23003 X
23005 X

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

			PTB23001X	23003X	23005X	
Collector-base voltage open emitter	V_{CBO}	max.	40	40	40	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$	V_{CER}	max.	40	40	40	V
open base	V_{CEO}	max.	15	15	15	V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	3,5	V
Collector current (d.c.)	I_C	max.	0,25	0,5	0,75	A
Total power dissipation ($f > 1$ MHz) up to $T_{mb} = 75\ ^oC$	P	max.	5,5	10	14,5	W
Storage temperature	T_{stg}		−65 to + 200			
Junction temperature	T_j	max.	200			
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235			^oC

THERMAL RESISTANCE

			PTB23001X	23003X	23005X	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	12	8,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	0,7	K/W

PTB23001X

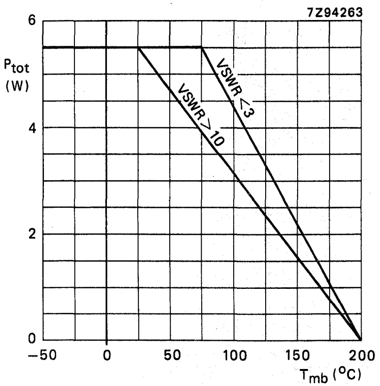


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.

PTB23003X

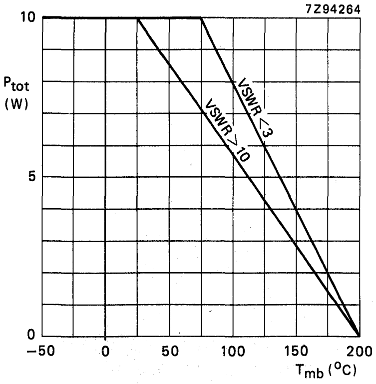
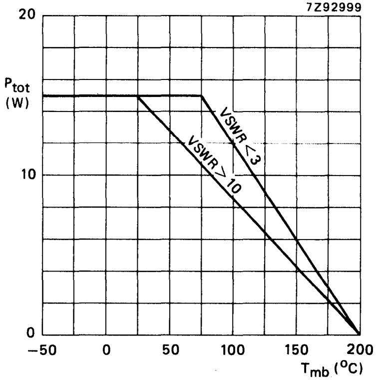


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.



PTB23005X

Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

CHARACTERISTICS

			PTB23001X	23003X	23005X	
Collector-base breakdown voltage						
open emitter; I_C = 1 mA	$V_{(BR)CBO}$	⩾	40	–	–	V
open emitter; I_C = 2 mA		⩾	–	40	–	V
open emitter; I_C = 3 mA		⩾	–	–	40	V
Collector-emitter breakdown voltage						
R_{BE} = 10 Ω; I_C = 10 mA	$V_{(BR)CER}$	⩾	40	40	40	V
Emitter-base breakdown voltage						
open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	⩾	3,5	–	–	V
open collector; I_E = 1,0 mA		⩾	–	3,5	–	V
open collector; I_E = 1,5 mA		⩾	–	–	3,5	V
Collector cut-off current						
I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	10	20	30	μA
Emitter cut-off current						
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	0,2	0,4	0,6	μA
Collector-base capacitance at f = 1 MHz						
I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{cb}	typ.	2,2	3	3,8	pF
Collector-emitter capacitance at f = 1 MHz						
I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{ce}	typ.	0,3	0,6	0,9	pF

DEVELOPMENT DATA

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

PTB32001X
PTB32003X
PTB32005X

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

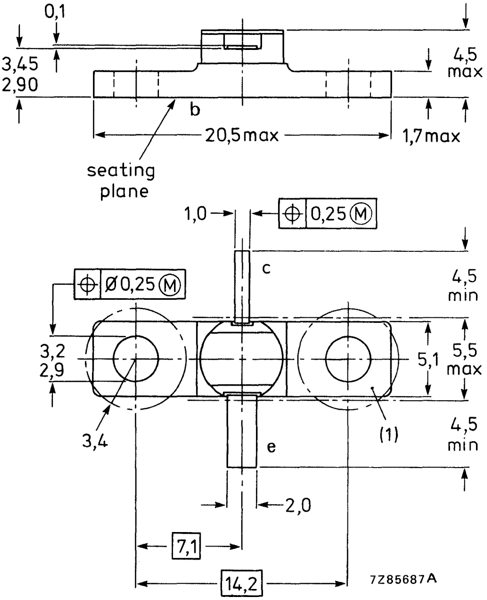
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
PTB32001X	c.w.	3	24	typ. 1,8	typ. 9,5	typ. 45	15 + j31	5,5 + j10
PTB32003X	c.w.	3	24	typ. 3,0	typ. 9,5	typ. 40	5,5 + j29	5 − j2,2
PTB32005X	c.w.	3	24	typ. 5,5	typ. 9,5	typ. 40	8,5 + j48	4 − j7

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.



Base and metallic cap
connected to flange.

Torque on screw: max. 0,5 Nm
Recommended screw: M 2,5

Marking code: 32001X
32003X
32005X

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

			PTB32001X	32003X	32005X	
Collector-base voltage open emitter	V_{CBO}	max.	40	40	40	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$	V_{CER}	max.	40	40	40	V
open base	V_{CEO}	max.	15	15	15	V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	3,5	V
Collector current (d.c.)	I_C	max.	0,25	0,5	0,75	A
Total power dissipation ($f > 1$ MHz) up to $T_{mb} = 75\ ^{\circ}C$	P	max.	5,5	10	14,5	W
Storage temperature	T_{stg}		−65 to + 200			
Junction temperature	T_j	max.	200			
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235			°C

THERMAL RESISTANCE

			PTB32001X	32003X	32005X	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	12	8,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	0,7	K/W

PTB32001X

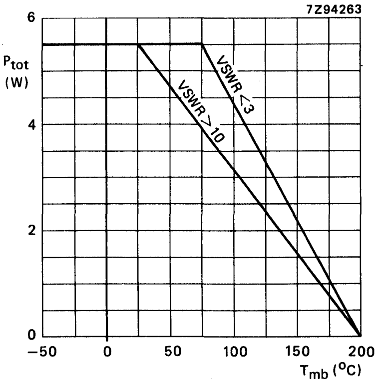


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB32003X

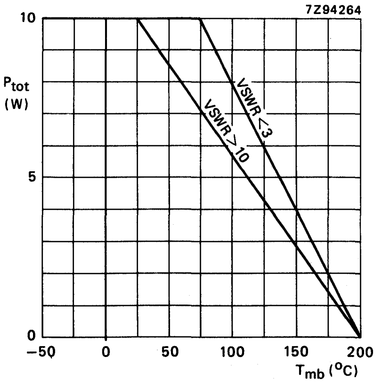
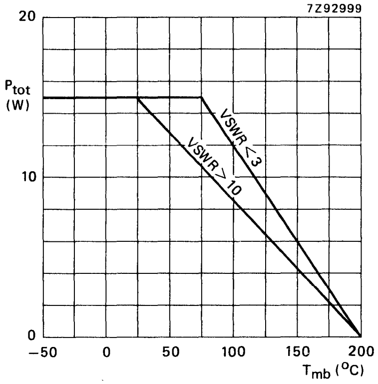


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.



PTB23005X

Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

CHARACTERISTICS

			PTB32001X	32003X	32005X	
Collector-base breakdown voltage						
open emitter; I_C = 1 mA		⩾	40	–	–	V
open emitter; I_C = 2 mA	$V_{(BR)CBO}$	⩾	–	40	–	V
open emitter; I_C = 3 mA		⩾	–	–	40	V
Collector-emitter breakdown voltage						
R_{BE} = 10 Ω; I_C = 10 mA	$V_{(BR)CER}$	⩾	40	40	40	V
Emitter-base breakdown voltage						
open collector; I_E = 0,5 mA		⩾	3,5	–	–	V
open collector; I_E = 1,0 mA	$V_{(BR)EBO}$	⩾	–	3,5	–	V
open collector; I_E = 1,5 mA		⩾	–	–	3,5	V
Collector cut-off current						
I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	10	20	30	μA
Emitter cut-off current						
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	0,2	0,4	0,6	μA
Collector-base capacitance at f = 1 MHz						
I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{cb}	typ.	2,2	3	3,8	pF
Collector-emitter capacitance at f = 1 MHz						
I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{ce}	typ.	0,3	0,6	0,9	pF

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

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

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
PTB42001X	c.w.	4,2	24	typ. 1,0	typ. 6	typ. 33	235 + j0	3,3 – j5,8
PTB42002X	c.w.	4,2	24	typ. 2,0	typ. 6	typ. 35	44,5 + j85	2,4 – j15,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.

Base and metallic cap connected to flange.

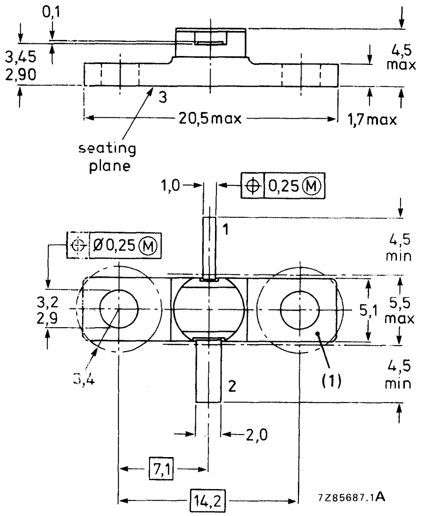
Pinning ;

1 = collector
2 = emitter
3 = base

Torque on nut: max. 0,4 Nm
Recommended screw: M2,5

Marking code

RTC4001M = PTB42001X
RTC4002M = PTB42002X



(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

			PTB42001X	42002X	
Collector-base voltage open emitter	V_{CBO}	max.	40	40	V
Collector-emitter voltage R_{BE} = 10 Ω	V_{CER}	max.	40	40	V
open base	V_{CEO}	max.	15	15	V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	V
Collector current (d.c.)	I_C	max.	0,25	0,5	A
R.F. power dissipation (f > 1 MHz) up to T_{mb} = 75 °C	P_{tot}	max.	5,5	10	W
Storage temperature	T_{stg}		−65 to + 200		°C
Junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235		°C

PTB42001X

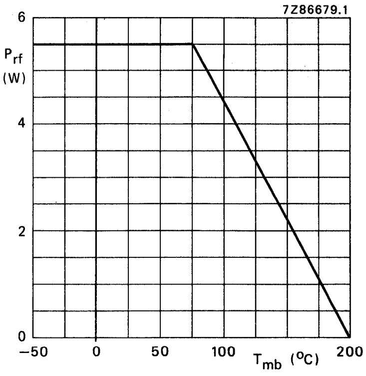


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB42002X

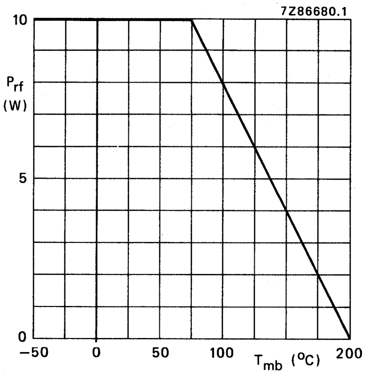


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

THERMAL RESISTANCE

			PTB42001X	42002X	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	12	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	K/W

CHARACTERISTICS

			PTB42001X	42002X	
Collector-base breakdown voltage					
open emitter; I_C = 1 mA	$V_{(BR)CBO}$	⩾	40	–	V
open emitter; I_C = 2 mA	$V_{(BR)CBO}$	⩾	–	40	V
Collector-emitter breakdown voltage					
R_{BE} = 10 Ω; I_C = 10 mA	$V_{(BR)CER}$	⩾	40	40	V
Emitter-base breakdown voltage					
open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	⩾	3,5	–	V
open collector; I_E = 1,0 mA	$V_{(BR)EBO}$	⩾	–	3,5	V
Collector cut-off current					
I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	10	20	μA
Emitter cut-off current					
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	0,2	0,4	μA
Collector-base capacitance at f = 1 MHz					
I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{cb}	typ.	2,2	3	pF
Collector-emitter capacitance at f = 1 MHz					
I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{ce}	typ.	0,3	0,6	pF

APPLICATION INFORMATION (see also next page)

PTB42001X

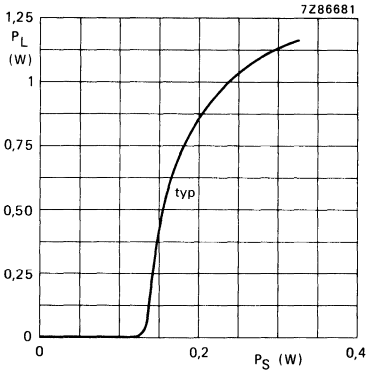


Fig. 4 Load power as a function of source power.

PTB42002X

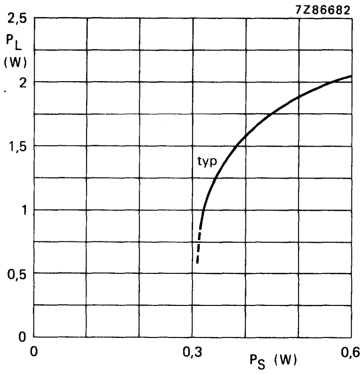


Fig. 5 Load power as a function of source power.

Conditions for Figs 4 and 5:

Class-B operation; V_{CE} = 24 V; f = 4,2 GHz; T_{mb} = 25 °C.

APPLICATION INFORMATION (see also previous page)

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

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
PTB42001X	c.w.	4,2	24	> 0,8 typ. 1,0	> 5 typ. 6	> 28 typ. 33	235 + j0	3,3 – j5,8
PTB42002X	c.w.	4,2	24	> 1,6 typ. 2,0	> 5 typ. 6	> 28 typ. 35	44,5 + j85	2,4 – j15,5

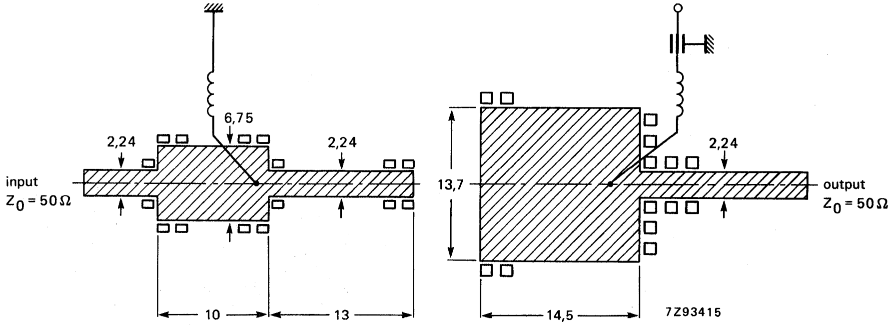


Fig. 6 Prematching test circuit boards for the **PTB42001X** at 4,2 GHz (Dimensions in mm.)

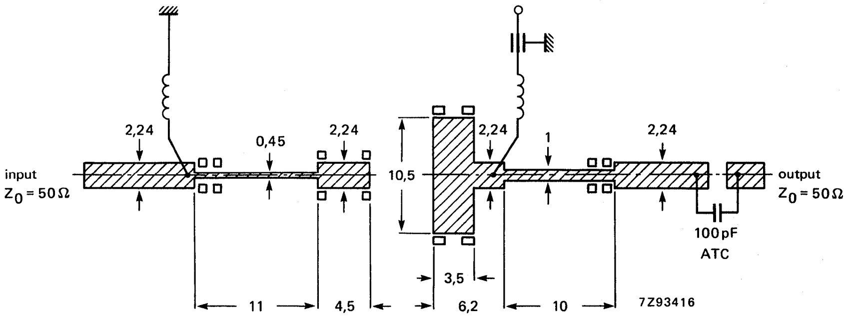


Fig. 7 Prematching test circuit boards for the **PTB42002X** at 4,2 GHz. (Dimensions in mm.)

→ Circuits on a double Cu-clad printed-circuit board PTFE fibre-glass dielectric (ϵ_r = 2,5); thickness 0,8 mm.

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* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-C amplifier up to a frequency of 4,2 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- An input matching cell improving the input impedance and allowing an easier design of wideband circuits

The transistor is housed in a metal ceramic flange envelope (FO 41B).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-C selective amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-C	4,2	24	typ. 3,0	typ. 3,0	typ. 33	12 + j35	2,5 − j10

MECHANICAL DATA

Dimensions in mm

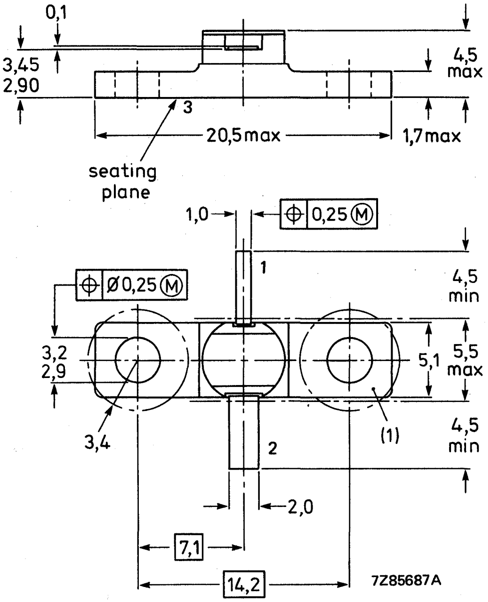
FO-41B (see Fig. 1).

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 FO-41B.



Base and metallic cap connected to flange

Pinning:

1 = collector
2 = base
3 = emitter

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or 4-40 UNC/2A

Marking code: RTC 4203X

(1) Flatness of this area ensures full thermal contact with bolt head.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage				
open base	V_{CEO}	max.	15	V
$R_{BE} = 10\ \Omega$	V_{CER}	max.	40	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	0,75	A
Total power dissipation	P_{tot}	max.	14,5	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Soldering temperature				
at 0,1 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

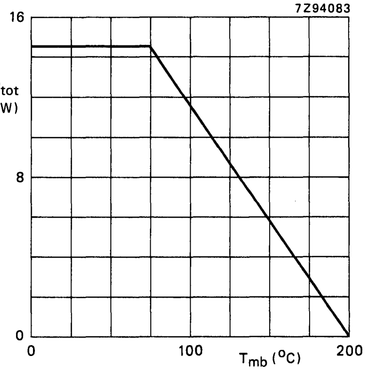


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	8,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

CHARACTERISTICS

$T_{mb} = 25$ °C unless otherwise specified

Breakdown voltages				
$I_C = 3$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	40	V
$I_C = 10$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	$\geqslant$	40	V
$I_C = 0$; $I_E = 1$ mA	$V_{(BR)EBO}$	$\geqslant$	3,5	V
Collector cut-off current				
$I_E = 0$; $V_{CB} = 24$ V	I_{CBO}	$\leqslant$	30	μA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	0,6	μA
Collector-base capacitance				
$I_E = I_C = 0$; $V_{CB} = 24$ V	C_{cb}	typ.	3,8	pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-C selective amplifier*

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-C	4,2	24	⩾ 2,5	⩾ 5	⩾ 28	12 + j35	2,5 – j10

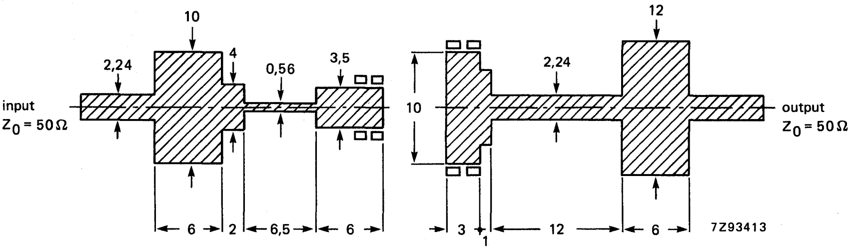


Fig. 3 Prematching test circuit board for 4,2 GHz. (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54), thickness 0,8 mm.

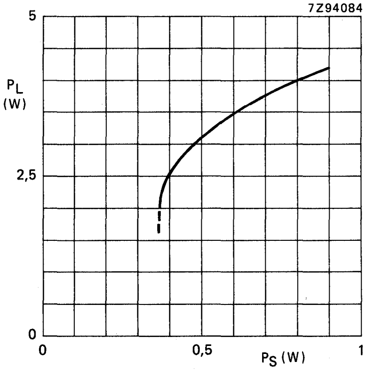


Fig. 4 Load power versus source power.

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* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

MICROWAVE POWER TRANSISTOR

N-P-N silicon transistor for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

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

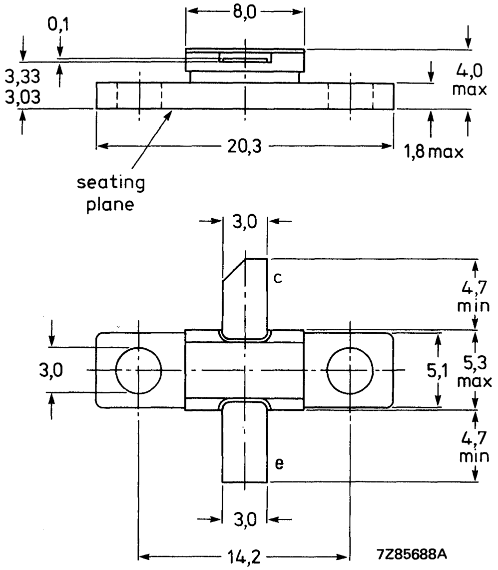
mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.	3,7 to 4,2	24	typ. 4,5	typ. 7,4	typ. 32	35 + j15	6 + j2

MECHANICAL DATA

Dimensions in mm

Fig.1 FO-83.

Base connected to flange



Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC3742B4X = PV3742B4X

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

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage ($R_{BE} \leqslant 10\ \Omega$)	V_{CER}	max.	40 V
(open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1 A
Total r.f. power dissipation up to T_{mb} = 75 °C	P_{rf}	max.	18 W
Storage temperature	T_{stg}	−65 to	+200 °C
Junction temperature	T_j	max.	200 °C
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

→

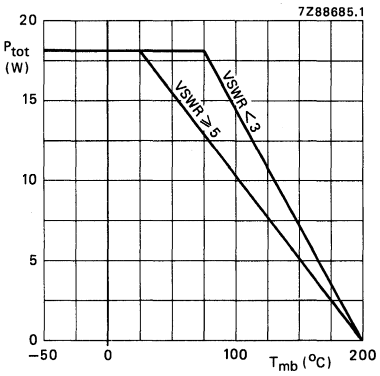


Fig. 2 Maximum permissible r.f. power dissipation as a function of mounting base temperature. f > 3,6 GHz; V_{CE} = 24 V.

→ THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	6,5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0,7 K/W

CHARACTERISTICS

T_{mb} = 25 °C

Collector-emitter breakdown voltage R_{BE} = 10 Ω; I_C = 30 mA	$V_{(BR)CER}$	⩾	40 V
Emitter-base breakdown voltage open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	⩾	3,5 V
Collector cut-off current I_E = 0; V_{CB} = 24 V	I_{CBO}	<	50 μA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	<	0,75 μA
Collector-base capacitance at f = 1 MHz I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{cb}	typ.	50 pF
Collector-emitter capacitance at f = 1 MHz I_E = I_C = 0; V_{CE} = 24 V; V_{EB} = 1,5 V	C_{ce}	typ.	1,2 pF
Emitter-base capacitance at f = 1 MHz I_E = I_C = 0; V_{EB} = 1 V; V_{CB} = 24 V	C_{eb}	typ.	30 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation up to T_{mb} = 25 °C in an unneutralized common-base class-B circuit *

f GHz	V_{CE} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
3,7 to 4,2	24	> 4 typ. 4,5	> 6,0 typ. 7,4	> 25 typ. 32	35 + j15	6 + j2

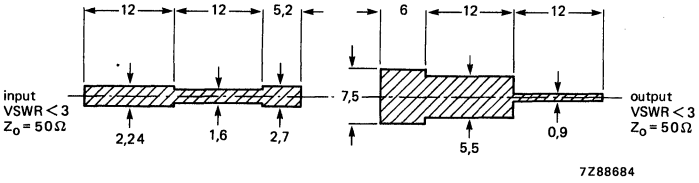


Fig. 3 Prematching test circuit boards for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,55); thickness 0,8 mm.
Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric (ϵ_r = 2,4); thickness 0,25 mm.

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* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.

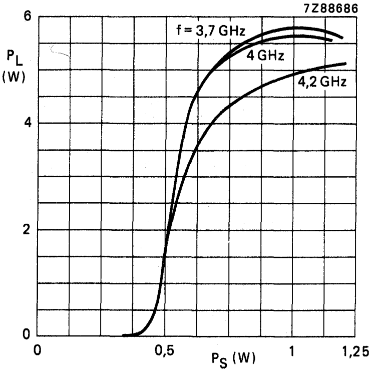


Fig. 4 Load power as a function of source power measured in a selective test circuit.

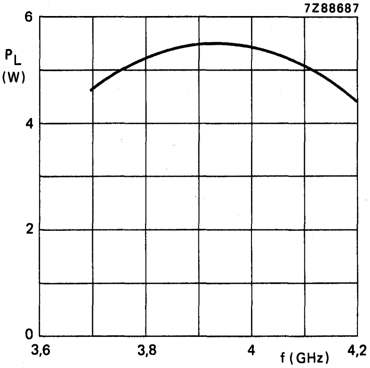


Fig. 5 Load power as a function of frequency measured in a wideband test circuit. VSWR at input ≤ 3.

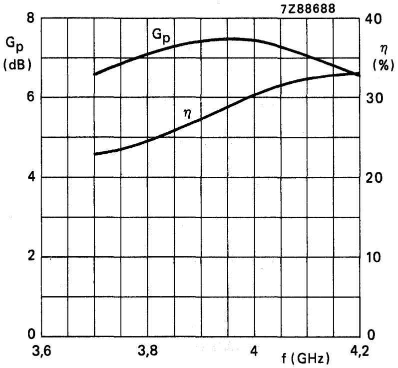


Fig. 6 Power gain and efficiency as a function of frequency measured in a wideband test circuit. VSWR at input ≤ 3.

Conditions for Figs 4, 5 and 6:

Typical values; class-B operation; V_{CE} = 24 V; T_{mb} = 25 °C.

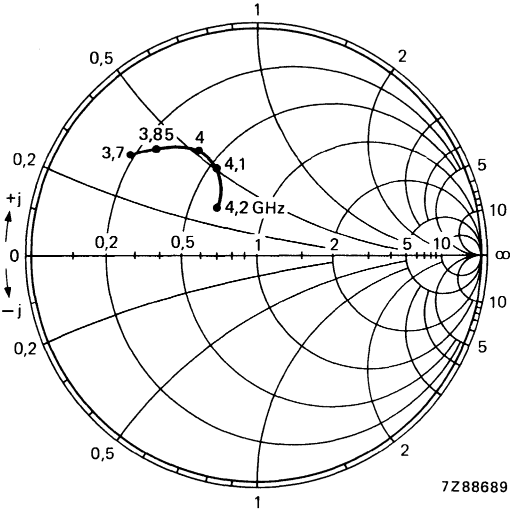


Fig. 7 Input impedance as a function of frequency.

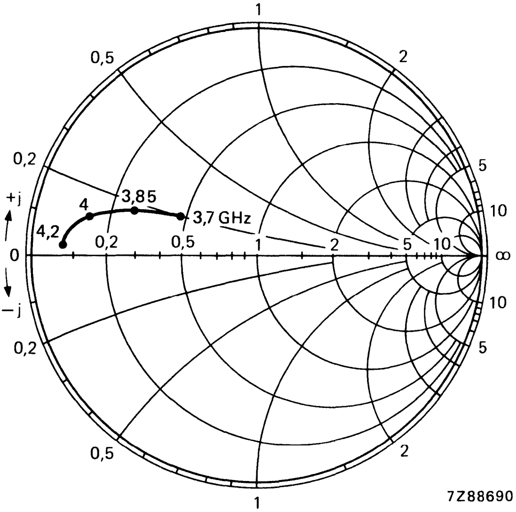


Fig. 8 Optimum load impedance as a function of frequency.

Conditions for Figs 7 and 8:

Typical values; class-B operation; V_{CE} = 24 V; T_{mb} = 25 °C; Z_o = 50 Ω.

MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B power amplifier up to 4,2 GHz.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Local thick oxide and gold sandwich metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-83).

QUICK REFERENCE DATA

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

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %
class-B; c.w.	1	24	typ. 15	typ. 13	typ. 60
	2	24	typ. 11	typ. 10	typ. 55
	3	24	typ. 8	typ. 8	typ. 45
	4	24	typ. 5	typ. 6	typ. 30

MECHANICAL DATA

Dimensions in mm

FO-83 (see Fig. 1).

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

MECHANICAL DATA

Dimensions in mm

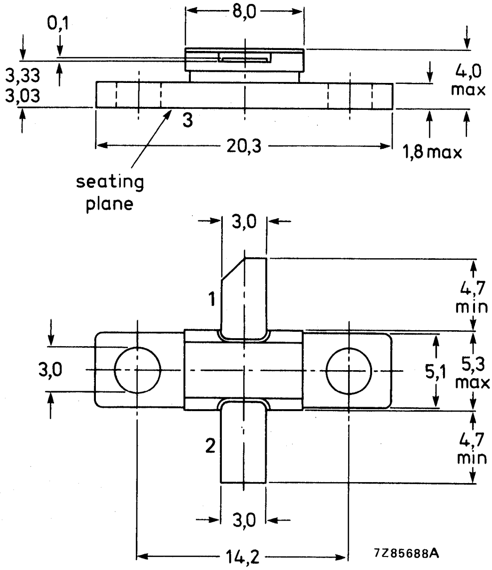
Fig. 1 FO-83.

Base connected to flange.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on nut: 0,4 Nm
Recommended screw: M2,5



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage				
open base	V_{CEO}	max.	15	V
$R_{BE} = 10\ \Omega$	V_{CER}	max.	40	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	1	A
Total power dissipation up to $T_{mb} = 75\ ^{o}C$	P_{tot}	max.	18	W
Storage temperature	T_{stg}		−65 to 200	^{o}C
Junction temperature	T_j	max.	200	^{o}C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^{o}C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	6,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

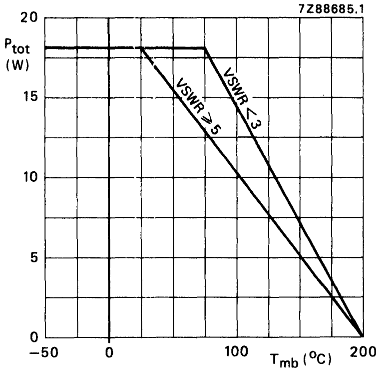


Fig. 2 Power derating curve versus mounting base temperature; V_{CE} = 24 V; f > 1 MHz.

DEVELOPMENT DATA

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-emitter breakdown voltage I_C = 30 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	40 V
Emitter-base breakdown voltage I_C = 0; I_E = 0,5 mA	$V_{(BR)EBO}$	⩾	3,5 V
Collector cut-off current I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	50 mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	1,5 mA
Collector-base capacitance at f = 1 MHz I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{cb}	typ.	50 pF
Collector-emitter capacitance at f = 1 MHz I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{ce}	typ.	1,2 pF
Emitter-base capacitance at f - 1 MHz I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1 V	C_{eb}	typ.	30 pF

LARGE SIGNAL IMPEDANCES

f MHz	$\bar{z}_i$ Ω	$\bar{z}_L$ Ω
2,5	4,5 + j15,5	2,5 + j2,5
2,7	6 + j19	2,5 + j0

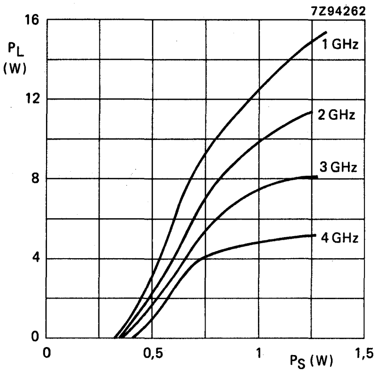


Fig. 3 Load power versus input power; V_{CE} = 24 V.

MICROWAVE POWER TRANSISTORS FOR BROADBAND

N-P-N transistors for use in common-base, class-B, wideband amplifiers under c.w. conditions in military and professional applications and intended to drive PZ1418B30U/PZ1721B25U/PZ2024B20U family.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistors are housed in a ceramic flange envelope (F057C).

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier (typical values).

type number	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	z_i Ω	Z_L Ω
PZ1418B15U	1,4 to 1,8	28	typ. 15	typ. 7,8	typ. 45	see Fig. 6	see Fig. 7
PZ1721B12U	1,7 to 2,1	28	typ. 16	typ. 8	typ. 45	see Fig. 11	see Fig. 12
PZ2024B10U	2,0 to 2,4	28	typ. 12	typ. 6,8	typ. 45	see Fig. 16	see Fig. 17

MECHANICAL DATA

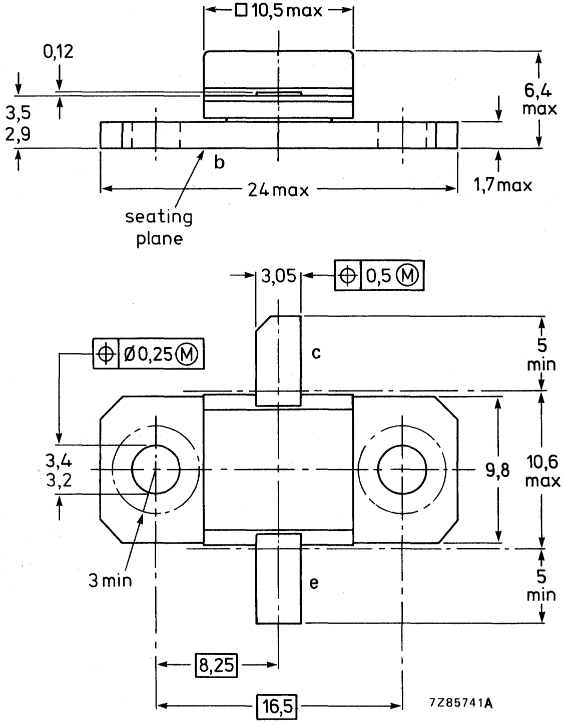
Dimensions in mm

FO-57C (see Fig. 1)

PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

Fig. 1 FO-57C.

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage R_{BE} = 10 Ω	V_{CER}	max.	35	V
open base	V_{CEO}	max.	15	V
Emitter-base voltage open collector	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	2	A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	27	W
Storage temperature	T_{stg}	−65 to	+ 200	°C
Junction temperature	T_j	max.	+ 200	°C
Lead soldering temperature	T_{sld}	max.	+ 235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4	K/W

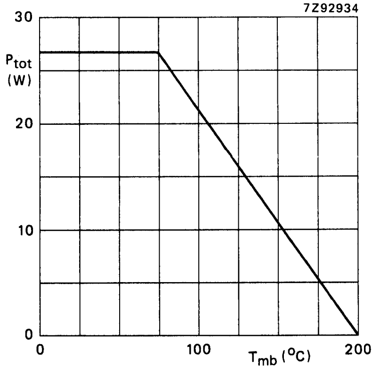


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C

Collector cut-off current			
$I_E = 0$; $V_{CB} = 30$ V	I_{CBO}	<	2,5 mA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	5 mA
$R_{BE} = 10\ \Omega$; $V_{CE} = 35$ V	I_{CER}	<	25 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	<	100 µA
$I_C = 0$; $V_{EB} = 3$ V	I_{EBO}	<	0,5 mA

APPLICATION INFORMATION (type PZ1418B15U)

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
PZ1418B15U	1,4 to 1,8	28	> 12,5	> 7	> 38	see Fig. 6	see Fig. 7

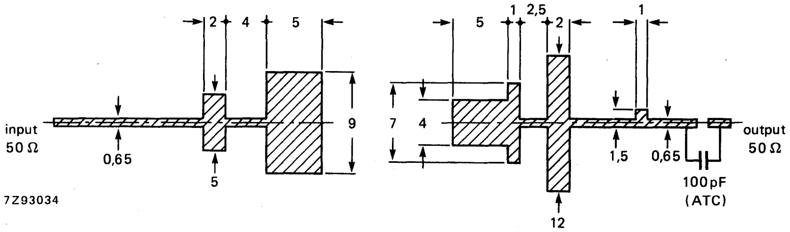


Fig. 3 Prematching test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

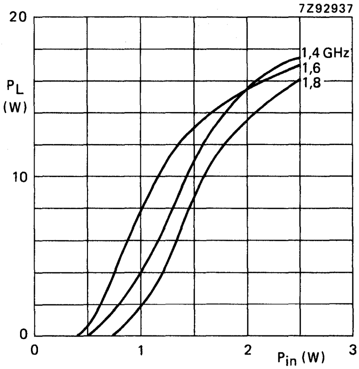


Fig. 4 Load power vs. input power; typical values.

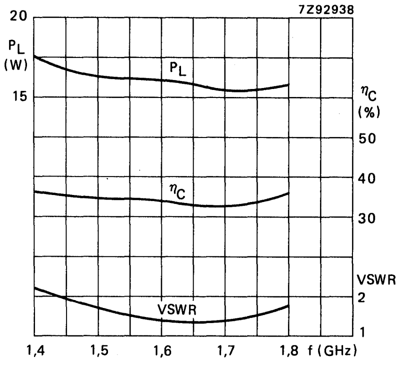


Fig. 5 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 2,5 W.

Conditions for Figs 4 and 5:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

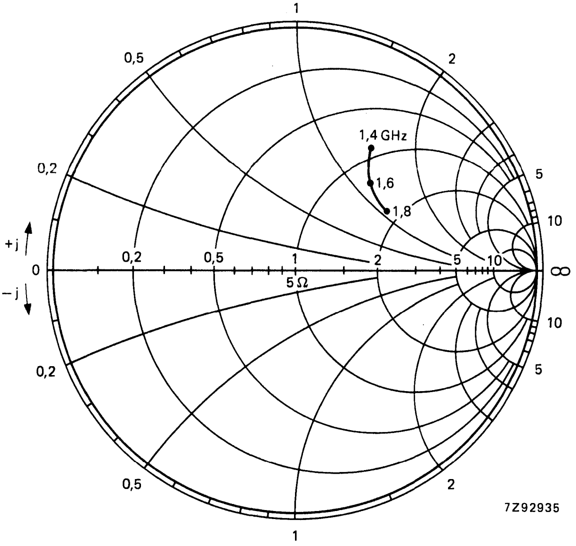


Fig. 6 Input impedance vs. frequency; typical values; Z_O = 5 Ω.

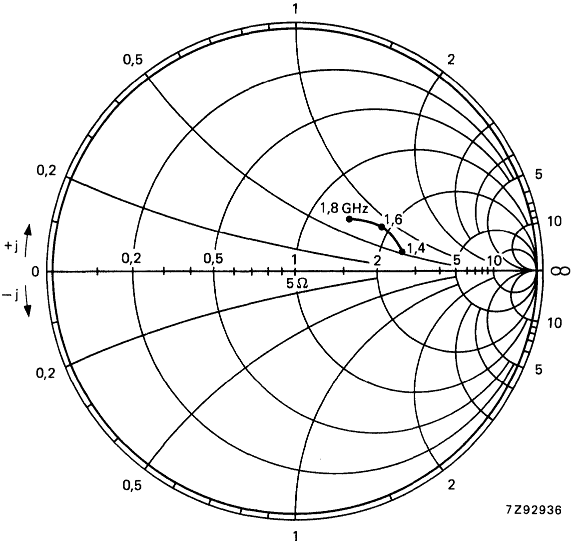


Fig. 7 Optimum load impedance vs. frequency; typical values; Z_O = 5 Ω.

APPLICATION INFORMATION (type PZ1721B12U)

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
PZ1721B10U	1,7 to 2,1	28	> 12	> 6,8	> 35	see Fig. 11	see Fig. 12

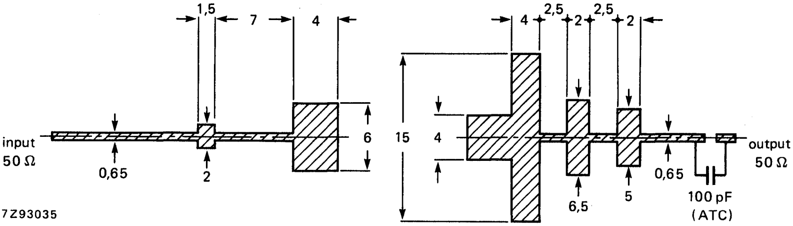


Fig. 8 Prematching test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

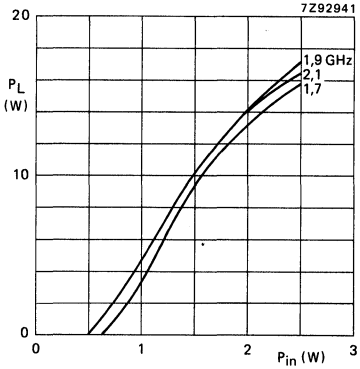


Fig. 9 Load power vs. input power; typical values.

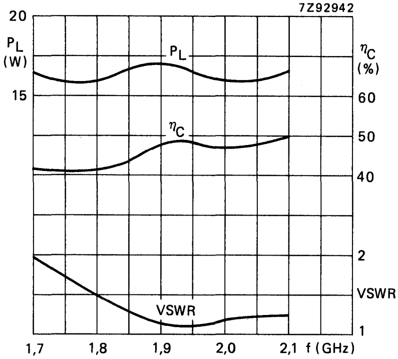


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 2,5 W.

Conditions for Figs 9 and 10:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

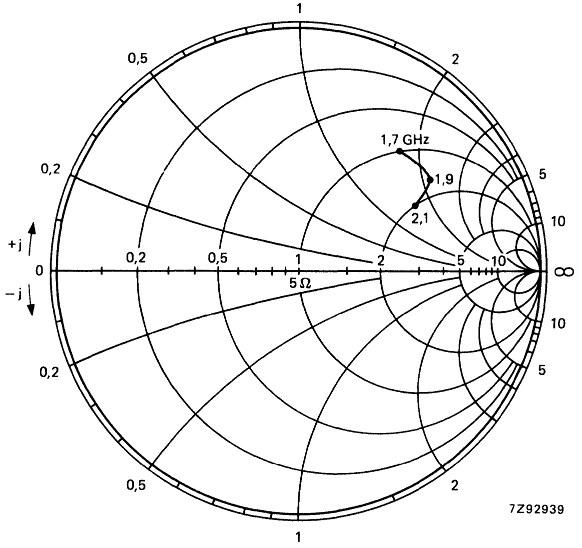


Fig. 11 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

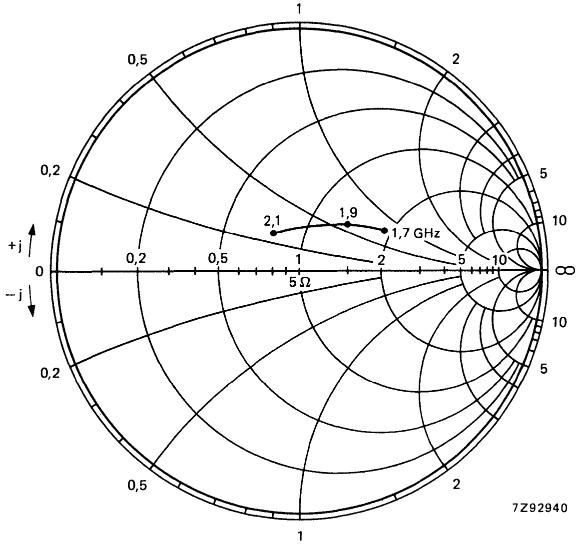


Fig. 12 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

APPLICATION INFORMATION (type PZ2024B10U)

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
PZ2024B10U	2,0 to 2,4	28	> 9	> 5,6	> 30	see Fig. 16	see Fig. 17

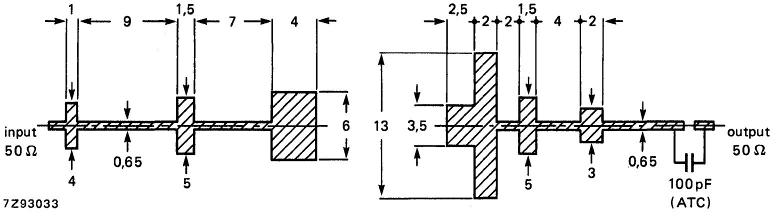


Fig. 13 Prematching test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

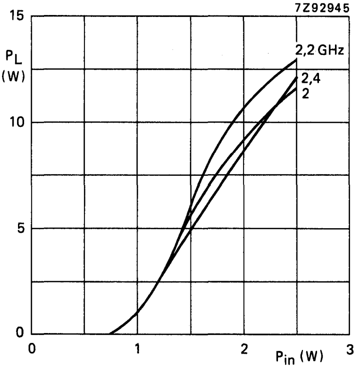


Fig. 14 Load power vs. input power. typical values.

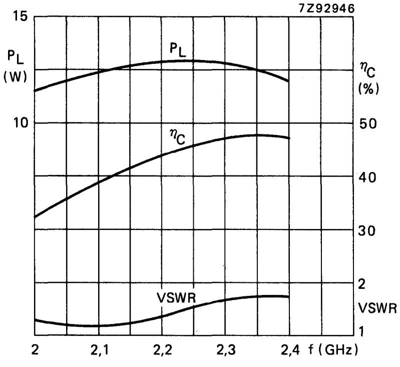


Fig. 15 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 2,5 W.

Conditions for Figs 14 and 15:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

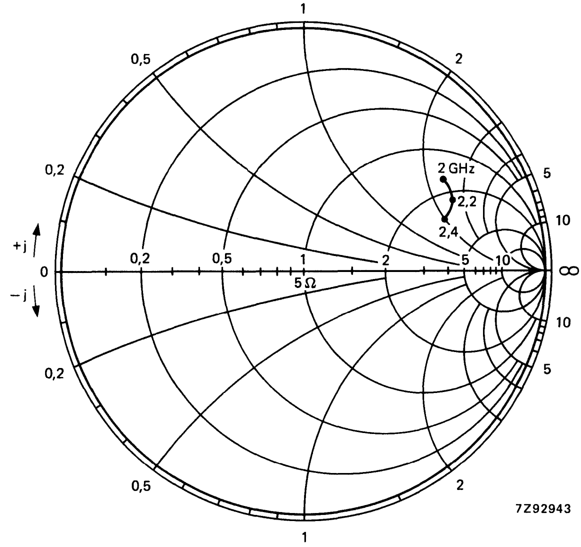


Fig. 16 Input impedance vs. frequency; typical values; Z_O = 5 Ω.

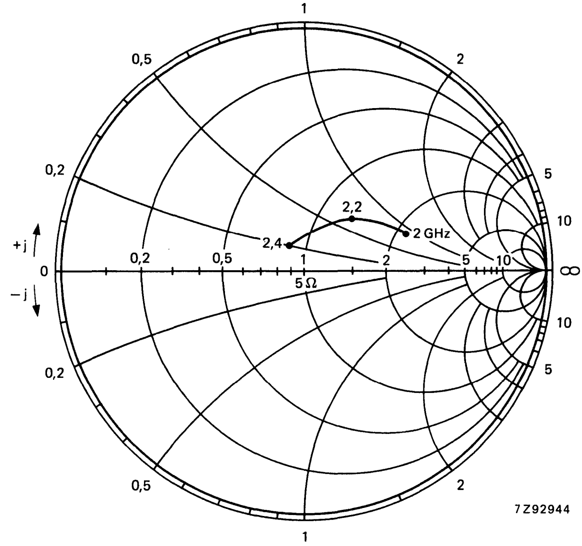


Fig. 17 Optimum load impedance vs. frequency; typical values; Z_O = 5 Ω.

MICROWAVE POWER TRANSISTORS FOR WIDEBAND

N-P-N transistors for use in common-base, class-B, broadband amplifiers under c.w. conditions in military and professional applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realising a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistors are housed in a ceramic flange envelope.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier (typical values).

type number	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
PZ1418B30U	1,4 to 1,8	28	typ. 35	typ. 8,4	typ. 45	see Fig. 6	see Fig. 7
PZ1721B25U	1,7 to 2,1	28	typ. 30	typ. 7,8	typ. 41	see Fig. 11	see Fig. 12
PZ2024B20U	2,0 to 2,4	28	typ. 26	typ. 7	typ. 42	see Fig. 16	see Fig. 17

MECHANICAL DATA

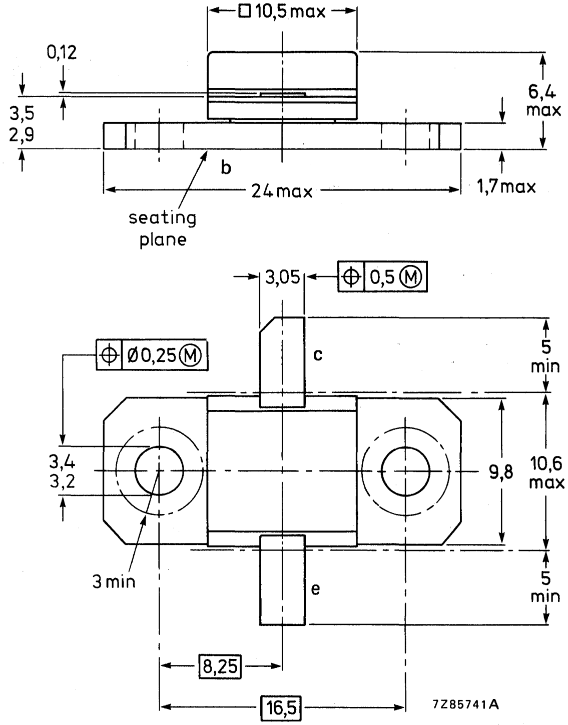
Dimensions in mm

FO-57C (see Fig. 1)

PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

Fig. 1 FO-57C.

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage R_{BE} = 10 Ω	V_{CER}	max.	35 V
open base	V_{CEO}	max.	15 V
Emitter-base voltage open collector	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	4 A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	45 W
Storage temperature	T_{stg}	−65 to	+ 200 °C
Junction temperature	T_j	max.	+ 200 °C
Lead soldering temperature	T_{sld}	max.	+ 235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	2,2 K/W

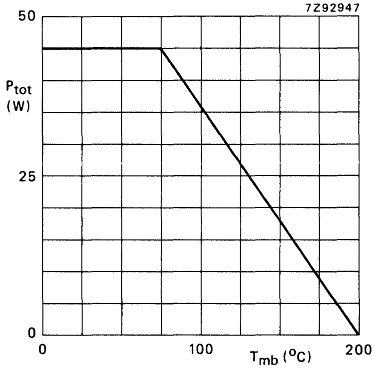


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

$T_{mb} = 25\ ^{\circ}C$

Collector cut-off current				
$I_E = 0$; $V_{CB} = 30$ V	I_{CBO}	$<$	5	mA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	$<$	10	mA
$R_{BE} = 10\ \Omega$; $V_{CE} = 35$ V	I_{CER}	$<$	50	mA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$<$	200	μA
$I_C = 0$; $V_{EB} = 3$ V	I_{EBO}	$<$	1	mA

APPLICATION INFORMATION (type PZ1418B30U)

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
PZ1418B30U	1,4 to 1,8	28	> 27	> 7,3	> 38	see Fig. 6	see Fig. 7

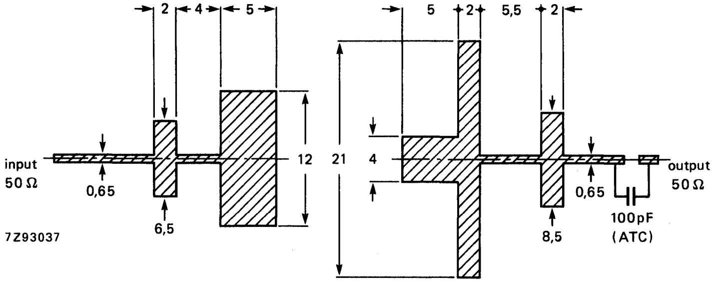


Fig. 3 Prematching test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

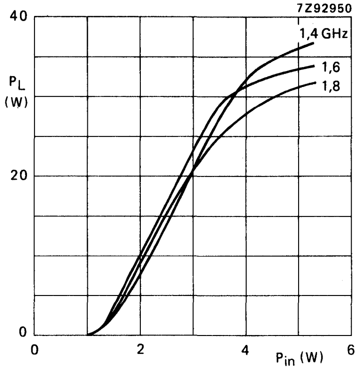


Fig. 4 Load power versus input power; typical values.

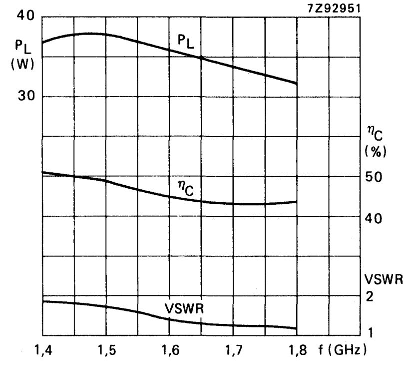


Fig. 5 Load power, efficiency and VSWR versus frequency; typical values; P_{in} = 5 W.

Conditions for Figs 4 and 5:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

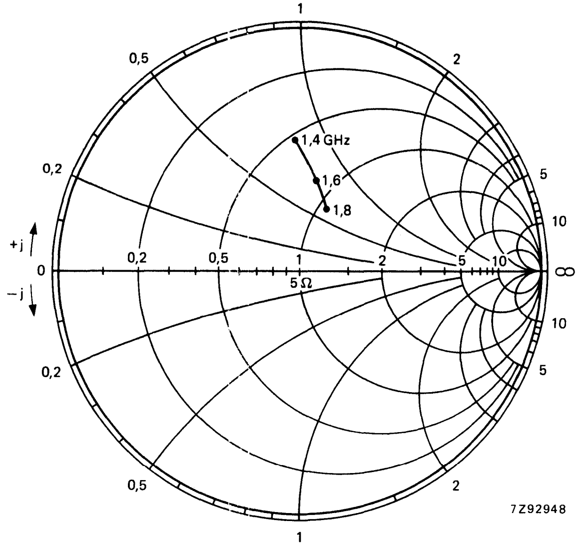


Fig. 6 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

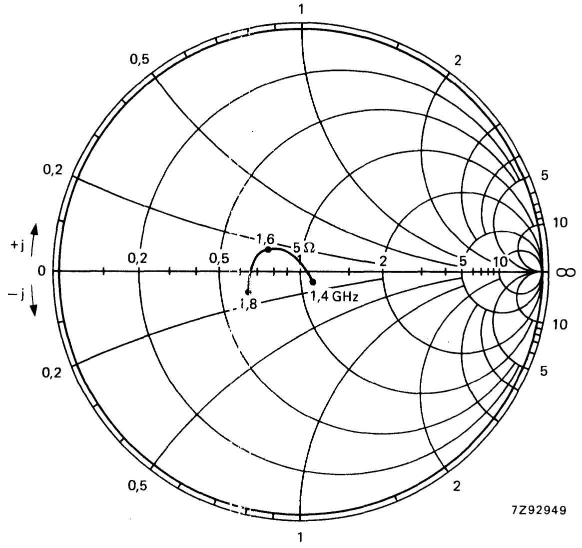


Fig. 7 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

APPLICATION INFORMATION (type PZ1721B25U)

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
PZ1721B25U	1,7 to 2,1	28	> 25	> 7	> 35	see Fig. 11	see Fig. 12

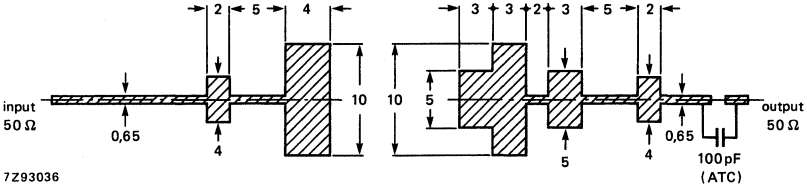


Fig. 8 Prematching test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

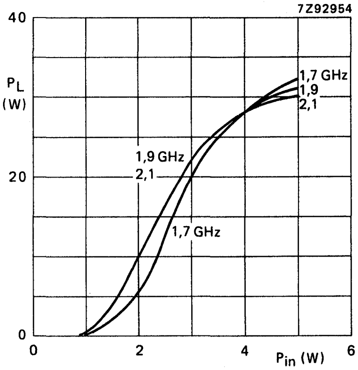


Fig. 9 Load power vs. input power; typical values.

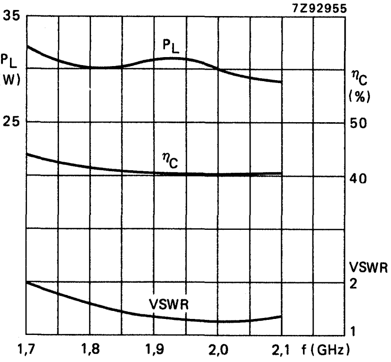


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 5 W.

Conditions for Figs 9 and 10:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

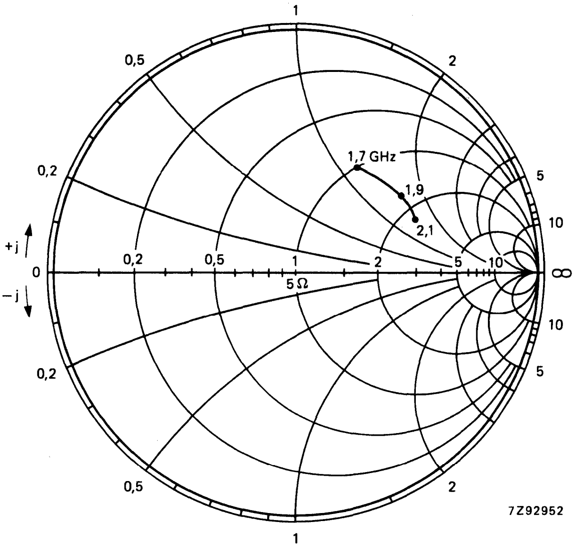


Fig. 11 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

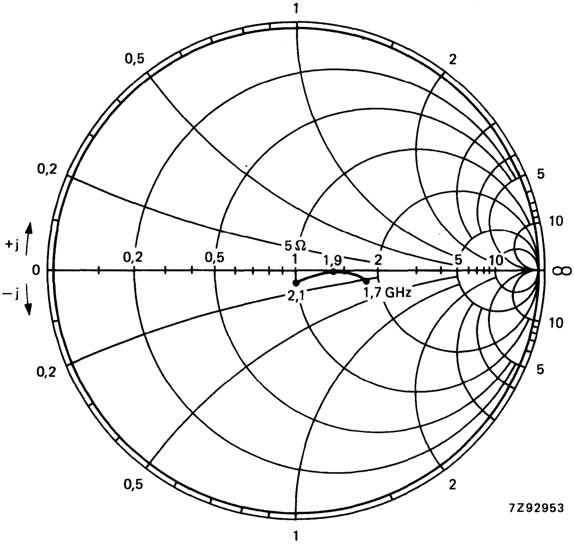


Fig. 12 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

APPLICATION INFORMATION (type PZ2024B20U)

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	z_i Ω	Z_L Ω
PZ2024B20U	2,0 to 2,4	28	> 20	> 6	> 35	see Fig. 16	see Fig. 17

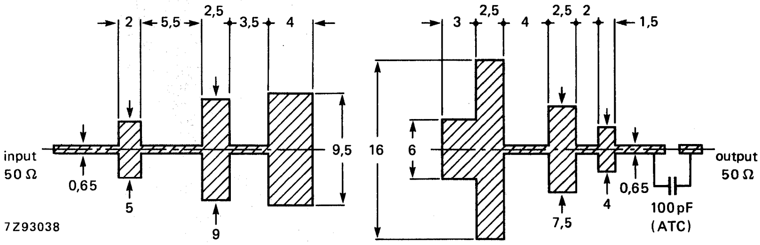


Fig. 13 Prematching test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

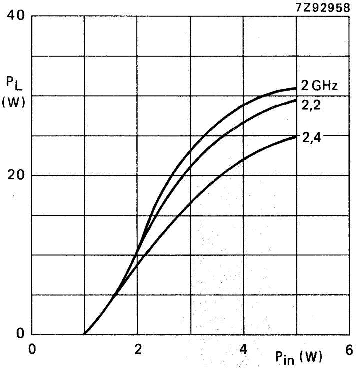


Fig. 14 Load power versus input power; typical values.

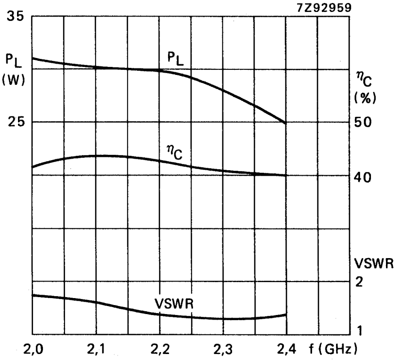


Fig. 15 Load power, efficiency and VSWR versus frequency; typical values; P_{in} = 5 W.

Conditions for Figs 14 and 15:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

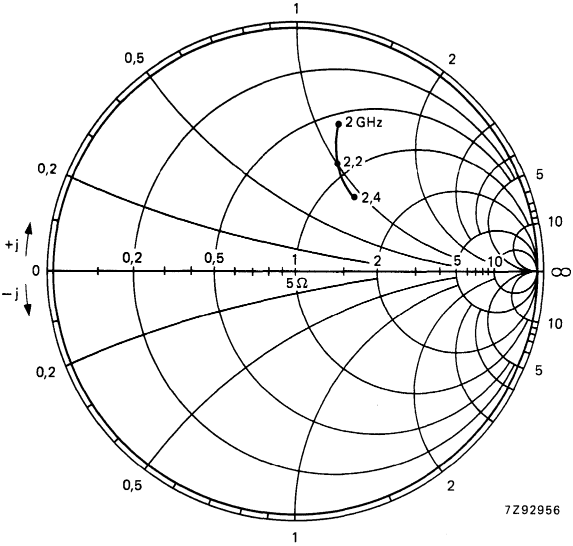


Fig. 16 Input impedance vs. frequency; typical values; Z_O = 5 Ω.

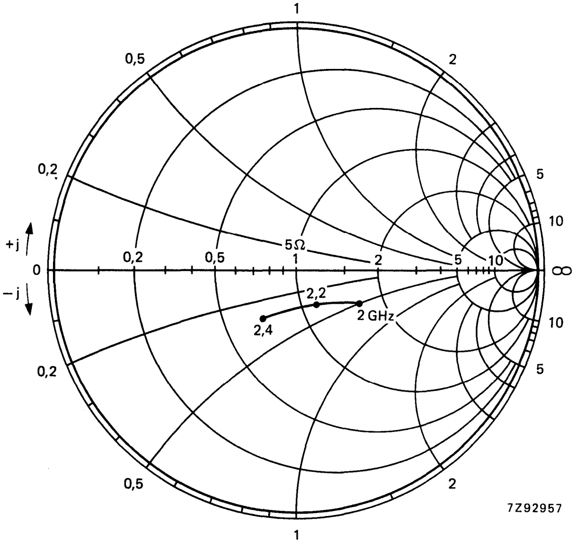


Fig. 17 Optimum load impedance vs. frequency; typical values; Z_O = 5 Ω.

MICROWAVE POWER TRANSISTORS

N-P-N transistor for use in common-base, class-B, amplifier under c.w. conditions in military and professional applications up to 1,6 GHz.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a ceramic flange envelope.

An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

Envelope	F057C			
Mode of operation	c.w.; class-B			
Frequency	f		1,55	GHz
Collector-emitter voltage	V_{CE}	typ.	28	V
Load power	P_L	typ.	38	W
Power gain	G_p	typ.	9,8	dB
Collector efficiency	η_C	typ.	50	%
Input impedance	z_i	typ.	2 + j4,5	Ω
Load impedance	Z_L	typ.	1,5 + j0	Ω

MECHANICAL DATA

Dimensions in mm

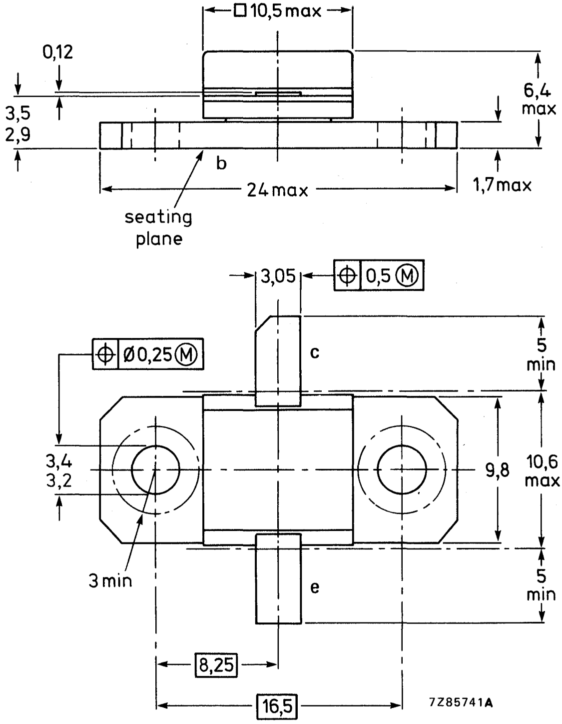
FO-57C (see Fig. 1)

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.

Fig. 1 FO-57C.

Torque on nut: max. 0,5 Nm

Recommended screw: M3



RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage R_{BE} = 10 Ω	V_{CER}	max.	35 V
open base	V_{CEO}	max.	15 V
Emitter-base voltage open collector	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	4 A
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	45 W
Storage temperature	T_{stg}	−65 to	+ 200 °C
Junction temperature	T_j	max.	+ 200 °C
Lead soldering temperature $>$ 0,1 mm from flange; $t_{sld} < 10$ s	T_{sld}	max.	+ 235 °C

THERMAL RESISTANCE

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

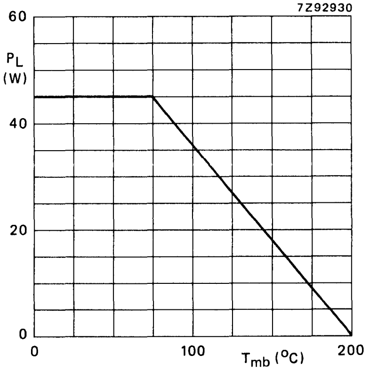


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off currents			
V_{CB} = 40 V; I_E = 0	I_{CBO}	≤	10 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	≤	5 mA
V_{CER} = 35 V; R_{BE} = 10 Ω	I_{CER}	≤	50 mA
Emitter cut-off currents			
V_{EB} = 3 V; I_C = 0	I_{EBO}	≤	1 mA
V_{EB} = 1,5 V; I_C = 0	I_{EBO}	≤	200 μA
Collector-base capacitance			
I_E = I_C = 0; V_{CB} = 28 V	C_{cb}	typ.	17 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.*

mode of operation	f GHz	V_{CC} V	P_L W	G_P dB	η_C %	z_i Ω	Z_L Ω
C.W. class-B	1,55	28	> 35	> 8	> 45	2 + j4,5 typ. value	1,5 + j0 typ. value

* Amplifier consists of pre-matching test circuit with complementary input and output slug tuners.

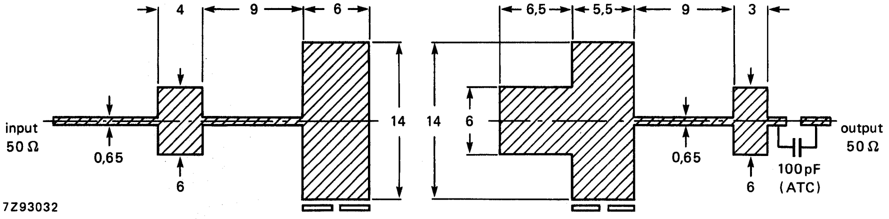


Fig. 3 Prematching test circuit boards, c.w., class-B at 1,55 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,65 mm; ϵ_r = 10.

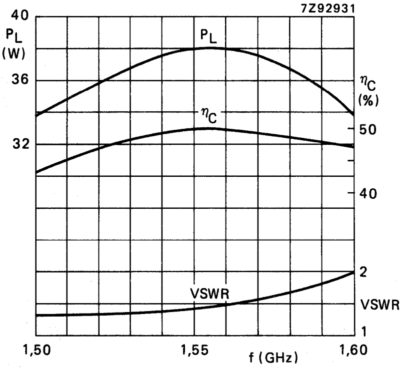


Fig. 4 Load power, efficiency and VSWR versus frequency; V_{CE} = 28 V; T_{mb} = 25 °C; class-B operation; typical values.

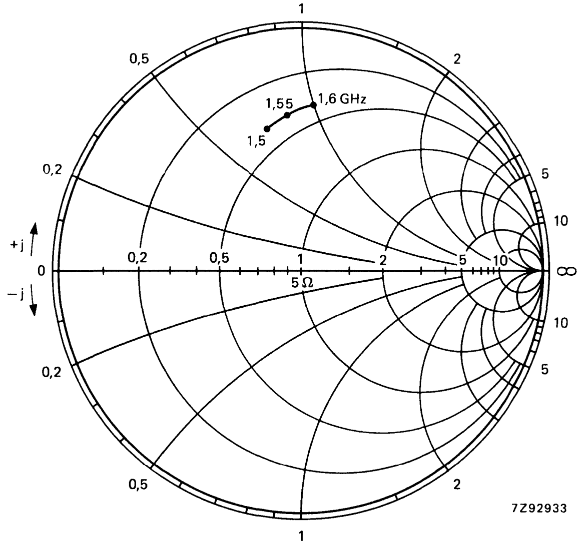


Fig. 5 Input impedance versus frequency; P_L = 38 W; Z_O = 5 Ω; typical values.

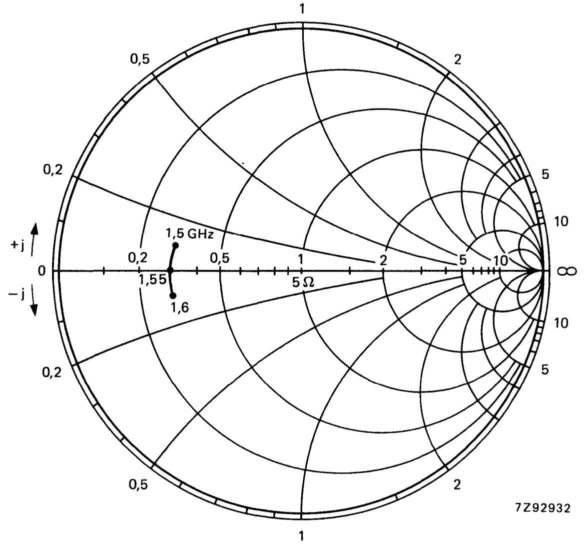


Fig. 6 Optimum load impedance versus frequency; P_L = 38 W; Z_O = 5 Ω; typical values.

MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B amplifier up to a frequency of 3 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ $\bar{Z}_L$ Ω
c.w.; class-B	1	28	typ. 70	typ. 10	typ. 62	see Fig. 5
	2	28	typ. 40	typ. 7,8	typ. 48	
	3	28	typ. 22	typ. 5	typ. 25	

MECHANICAL DATA

Dimensions in mm

FO-57C (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

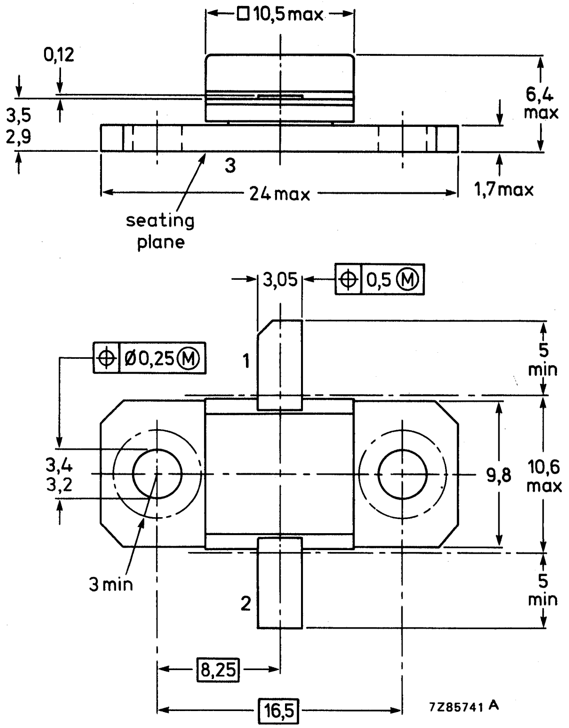
Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm

Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40	V
Collector-emitter voltage, open base	V_{CEO}	max.	15	V
$R_{BE} = 10\ \Omega$	V_{CER}	max.	35	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	6	A
Total power dissipation up to $T_{mb} = 75$ °C	P_{tot}	max.	67,5	W
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

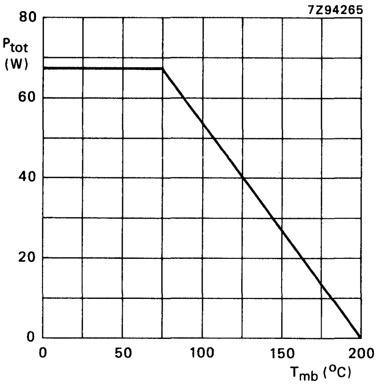


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base $R_{th\ j\text{-}mb}$ = 1,8 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off currents				
V_{CB} = 40 V; I_E = 0	I_{CBO}	⩽	20	mA
V_{CB} = 30 V; I_E = 0		⩽	10	mA
V_{CER} = 35 V; R_{BE} = 10 Ω	I_{CER}	⩽	100	mA
Emitter cut-off currents				
V_{EB} = 3 V; I_C = 0	I_{EBO}	⩽	2	mA
V_{EB} = 1,5 V; I_C = 0		⩽	400	μA
Collector-base capacitance				
I_E = I_C = 0; V_{CB} = 28 V	C_{cb}	typ.	23	pF

APPLICATION INFORMATION

Microwave performance at T_{mb} = 25 °C in an unneutralized common-base class-C selective circuit consisting of a test circuit p.c. board with complementary output slug tuner.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %
c.w. class-C	2,7	28	> 19	> 5	> 20

DEVELOPMENT DATA

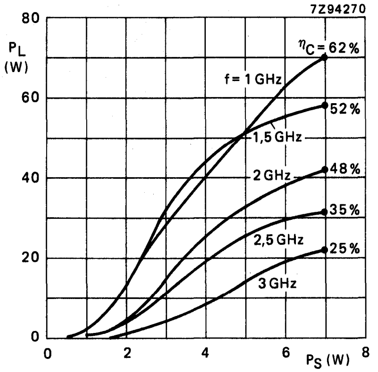


Fig. 3 Load power versus source power; V_{CE} = 28 V; c.w. conditions.

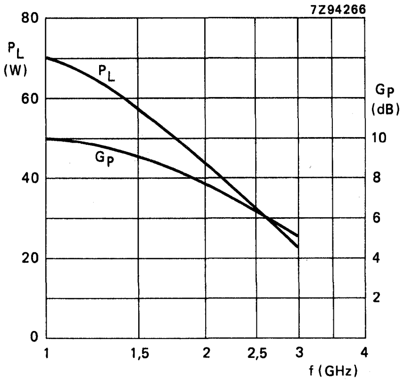


Fig. 4 Load power and gain versus frequency; V_{CE} = 28 V; P_L = 7 W; c.w. conditions.

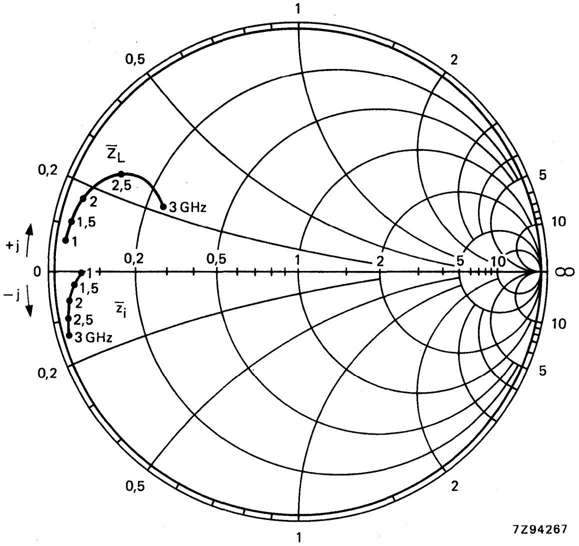


Fig. 5 Input and optimum load impedances versus frequency; Z_0 = 50 Ω; typical values.

PULSED POWER TRANSISTOR FOR S-BAND RADAR

N-P-N transistor for use in common-base pulsed power amplifiers for S-band radar (3,1 to 3,5 GHz).

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to T_{mb} = 25 °C in an unneutralized wideband common-base class-B circuit under pulse conditions.

mode of operation	f GHz	V_{CC} V	t_{on} μs	δ %	P_L W	G_p dB	η_C %
class-B	3,1 to 3,5	24	100	10	typ. 5,6	typ. 5,7	typ. 47

MECHANICAL DATA

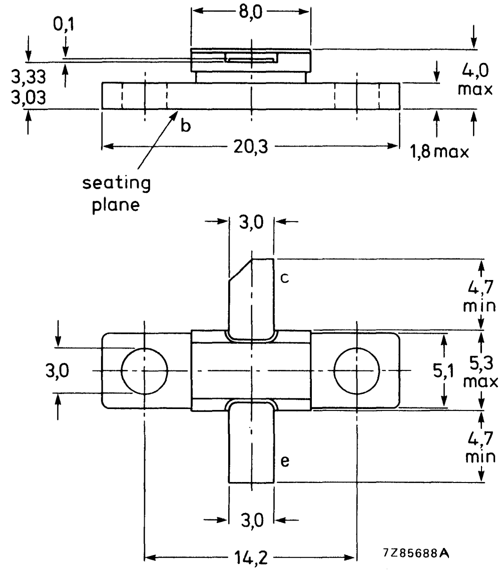
Dimensions in mm

Fig. 1 FO-83.

Base connected to flange

Torque on nut: max. 0,5 Nm

Recommended screw: M3



PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35	V
Collector-emitter voltage				
($R_{BE} = 10\ \Omega$)	V_{CER}	max.	35	V
(open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.) ($t_{on} = 100\ \mu s$; $\delta = 10\%$)	I_C	max.	1	A
Total power dissipation up to $T_{mb} = 75\ ^oC$ ($t_{on} = 100\ \mu s$; $\delta = 10\%$)	P_{tot}	max.	25	W
Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC
Lead soldering temperature at 0,3 mm from the case $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	6,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,6	K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$

Collector-base breakdown voltage $I_C = 3$ mA; open emitter	$V_{(BR)CBO}$	$\geqslant$	35	V
Collector-emitter breakdown voltage $R_{BE} = 10\ \Omega$; $I_C = 3$ mA	$V_{(BR)CER}$	$\geqslant$	35	V
Emitter-base breakdown voltage $I_E = 0{,}5$ mA; open collector	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current $I_E = 0$; $V_{CB} = 24$ V	I_{CBO}	$\leqslant$	0,1	mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	10	μA

APPLICATION INFORMATION

R.F. performance up to T_{mb} = 25 °C in an unneutralized wideband common-base class-B circuit under pulse conditions.

type number	f GHz	V_{CC} V	t_{on} µs	δ %	P_L W	G_p dB	η_C %
RV3135B5X	3,1 to 3,5	24	100	10	> 4 typ. 5,6	> 4,3 typ. 5,7	> 30 typ. 47

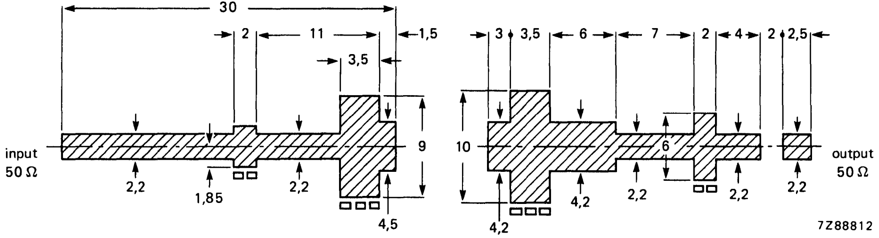


Fig. 2 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.

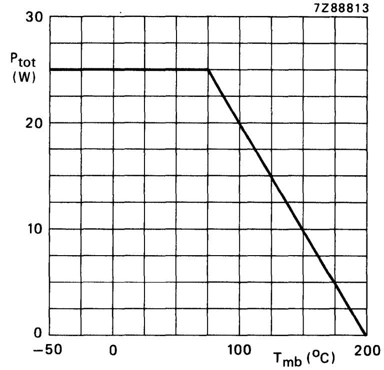


Fig. 3

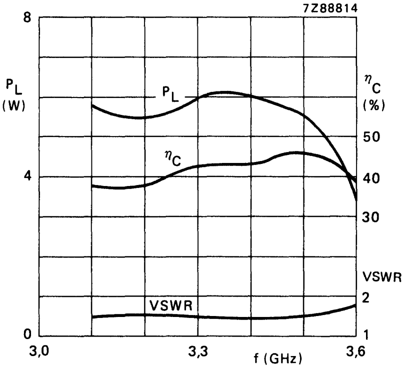


Fig. 4.

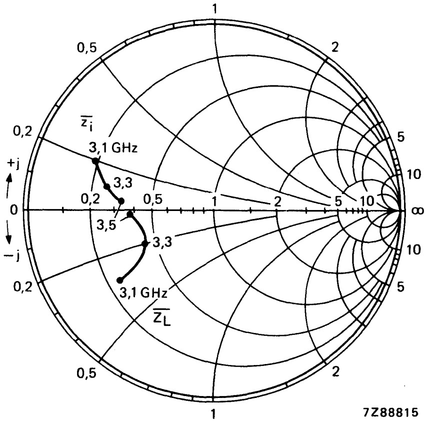


Fig. 5.

Fig. 3 Power derating curve vs. mounting base temperature; t_{on} = 100 µs; δ = 10%.

Fig. 4 Load power, collector efficiency and VSWR vs. frequency; P_{in} = 1,5 W.

Fig. 5 Input and optimum load impedance vs. frequency; typical values; Z_o = 50 Ω; T_{mb} = 25 °C.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 91).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %
class-B; t_p = 150 μs; δ = 4%	1,2 to 1,4	50	typ. 300	typ. 7	typ. 35
class-B; t_p = 300 μs; δ = 10%	1,2 to 1,4	50	typ. 300	typ. 7,5	typ. 30

MECHANICAL DATA

Dimensions in mm

FO-91 (see Fig. 1).

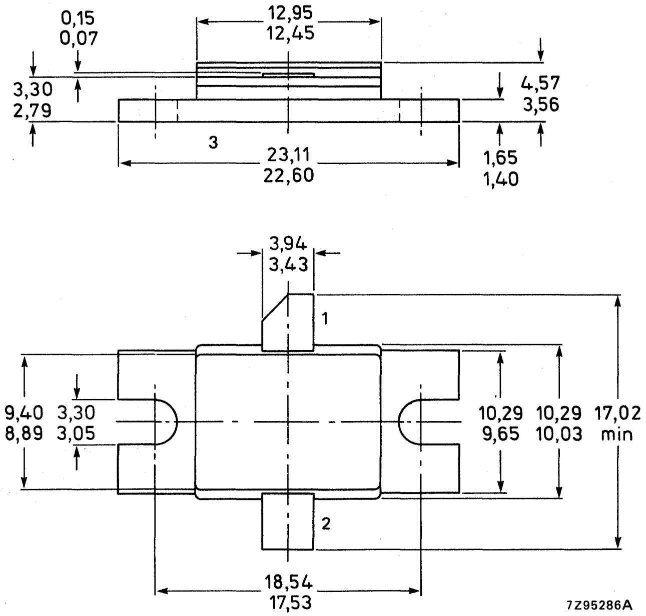
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-91.

Pinning :

1= collector
2= emitter
3= base



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	I_C	max.	21 A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	P_{tot}	max.	630 W
Storage temperature	T_{stg}		−65 to 200 ^oC
Junction temperature	T_j	max.	200 ^oC
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 ^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	0,7 K/W
Transient thermal impedance, $t_p = 50\ \mu s$, single pulse	Z_{th}	typ.	0,06 K/W

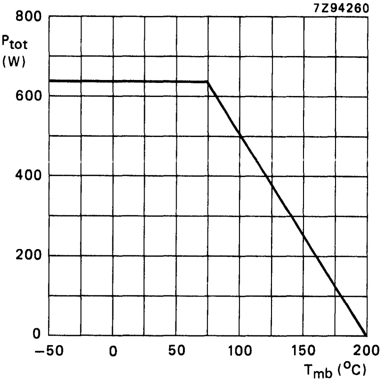


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions: t_p = 50 μs, δ = 10 %.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 14 mA; I_E = 0	$V_{(BR)CBO}$	⩾	60 V
Collector-emitter breakdown voltage I_C = 14 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	60 V
Emitter-base breakdown voltage I_C = 0; I_E = 1,4 mA	$V_{(BR)EBO}$	⩾	3 V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	⩽	7 mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	0,5 mA

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B wideband amplifier in military and professional applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\overline{z_i}$ $\overline{Z_L}$ Ω
class-B						see table
t_p = 100 μs, δ = 10%	1,09	50	typ. 350	typ. 7,8	typ. 38	
t_p = 300 μs, δ = 10%	1,09	50	typ. 300	typ. 7,5	typ. 35	
DABS (see Fig. 2)	1,09	50	typ. 300	typ. 7,8	typ. 38	

MECHANICAL DATA

Dimensions in mm

FO-91 (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

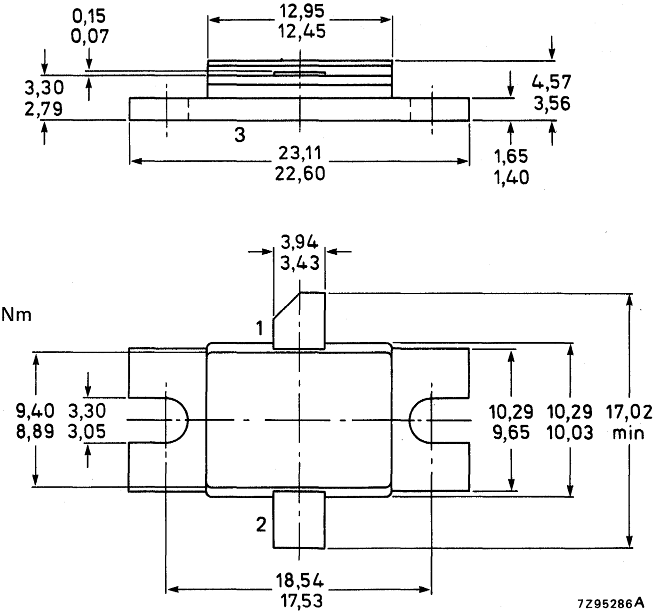
Dimensions in mm

Fig. 1 FO-91.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



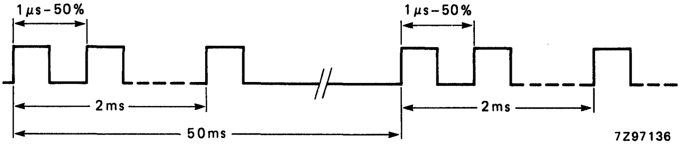


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, R_{BE} = 10 Ω	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V

Collector current (d.c.) t_p = 50 μs, $\delta \leqslant$ 10%	I_C	max.	21	A
Total power dissipation up to T_{mb} = 75 °C t_p = 50 μs, $\delta \leqslant$ 10%	P_{tot}	max.	630	W
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from the case, $t_{sld} \leqslant$ 10 s	T_{sld}	max.	235	°C

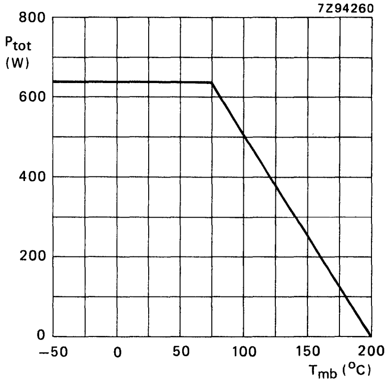


Fig. 3 Power derating curve versus mounting base temperature; t_p = 50 μs, δ = 10%.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	0,7	K/W
Transient thermal impedance, t_p = 50 μs	Z_{th}	typ.	0,06	K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages				
I_C = 14 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60	V
I_C = 14 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	$\geqslant$	60	V
I_C = 0; I_E = 1,4 mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	7	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	0,5	mA

IMPEDANCES

frequency GHz	input ($\overline{z}_i$) Ω	load ($\overline{Z}_L$) Ω
1,03	1,45 + j3,71	0,72 − j1,09
1,09	1,7 + j3,93	0,68 − j1,13

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; t_p = 50 μs; δ = 10 %	1,2 to 1,4	42	typ. 40	typ. 7,8	typ. 40	see Fig. 6	
class-C; t_p = 300 μs; δ = 10 %	1,2 to 1,4	50	typ. 40	typ. 7	typ. 35	see Fig. 6	

MECHANICAL DATA

FO-57C (see Fig. 1).

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

MECHANICAL DATA

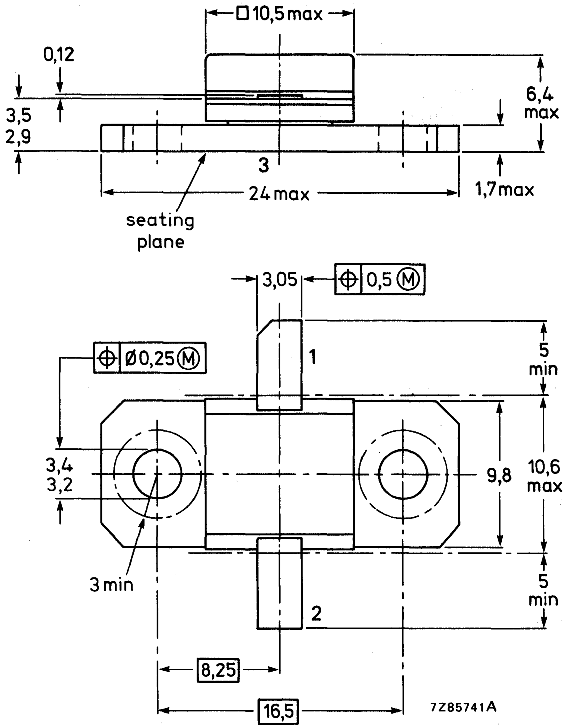
Dimensions in mm

Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	I_C	max.	3 A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	P_{tot}	max.	90 W
Storage temperature	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	200 °C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	5,0 K/W
Transient thermal impedance; $t_p = 50\ \mu s$, single pulse	Z_{th}	typ.	0,6 K/W

DEVELOPMENT DATA

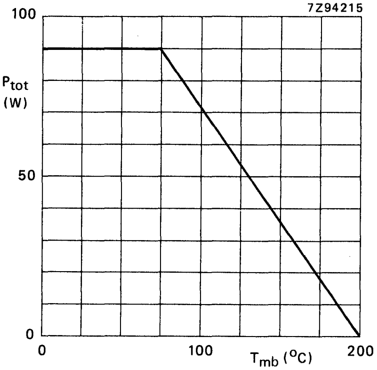


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: $t_p = 50\ \mu s$, $\delta = 10\ \%$).

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Collector-base breakdown voltage $I_C = 2$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	60 V
Collector-emitter breakdown voltage $I_C = 2$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	$\geqslant$	60 V
Emitter-base breakdown voltage $I_C = 0$; $I_E = 0{,}2$ mA	$V_{(BR)EBO}$	$\geqslant$	3 V
Collector cut-off current $I_E = 0$; $V_{CB} = 50$ V	I_{CBO}	$\leqslant$	1 mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	50 µA

PRODUCT TEST

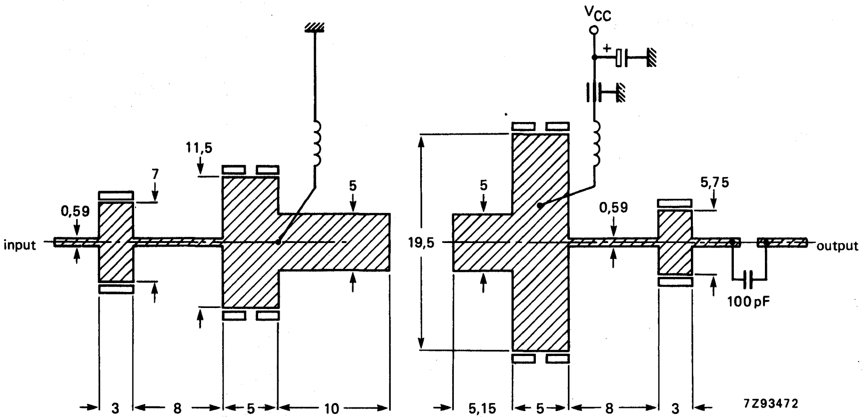


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, ϵ_r = 10.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; t_p = 50 µs; δ = 10 %	1,2 to 1,4	42	> 35	> 7	> 35	see Fig. 6	

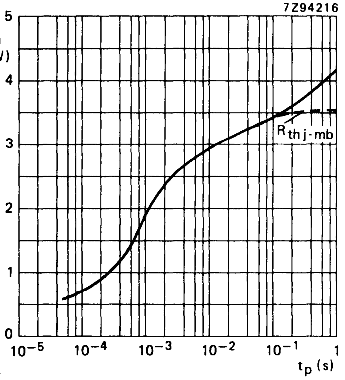


Fig. 4 Transient thermal impedance.

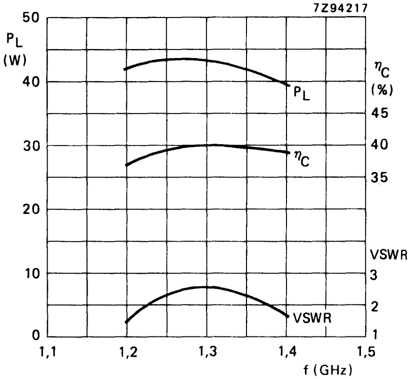


Fig. 5 Load power, collector efficiency and VSWR versus frequency; V_{CE} = 42 V; P_S = 7 W.

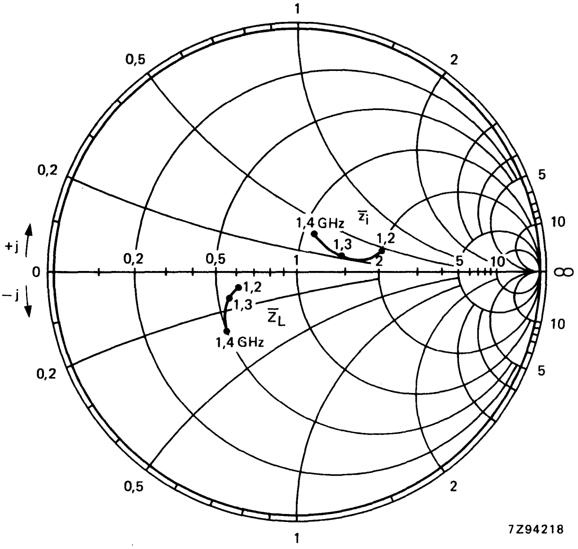


Fig. 6 Input and optimum load impedances versus frequency; Z_O = 5 Ω.

Conditions for Fig. 6:

V_{CE} = 42 V; P_L = 35 W; t_p = 50 μs; δ = 10 %; class-C operation.

PULSED MICROWAVE POWER TRANSISTORS FOR L-BAND RADAR

N-P-N transistors for use in common-base, class-B, pulsed power amplifiers for L-band radar (1,2 to 1,4 GHz) in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance.

The transistors are housed in a ceramic flange envelope.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier under pulse conditions of t_{on} = 100 μs and δ = 10%.

type number	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
RZ1214B60W	1,2 to 1,4	42	60	7,8	31
RZ1214B125W			125	6,2	29,5

MECHANICAL DATA

Dimensions in mm

FO-57C (see Fig. 1).

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

Base connected to flange.

Torque on nut: max. 0,5 Nm
Recommended screw: M3

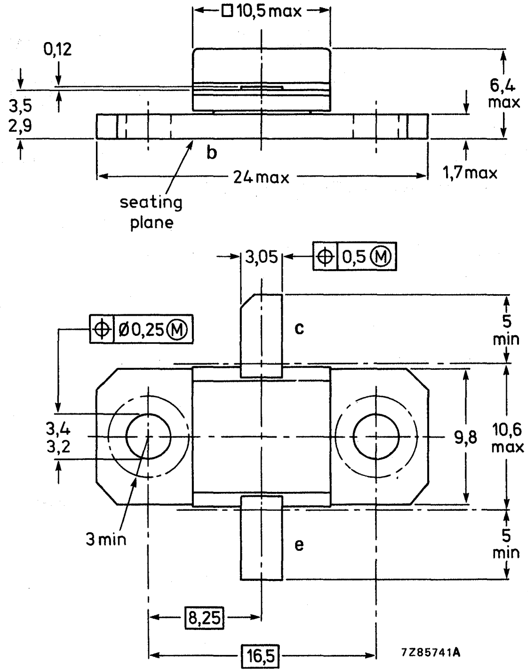


Fig. 1 FO-57C.

RATINGS

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

			RZ1214B60W	RZ1214B125W	
Collector-base voltage open emitter	V_{CBO}	max.	50	50	V
Collector-emitter voltage $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	50	50	V
open base	V_{CEO}	max.	35	35	V
Emitter-base voltage open collector	V_{EBO}	max.	3	3	V
Collector current (d.c.) $t_{on} \leqslant 100\ \mu s$; $\delta \leqslant 10\%$	I_C	max.	7,5	15	A
Total power dissipation up to T_{mb} = 75 °C $t_{on} \leqslant 100\ \mu s$; $\delta \leqslant 10\%$	P_{tot}	max.	275	550	W
Storage temperature	T_{stg}		−65 to 200		°C
Junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235		°C

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-B; t_p = 50 μs; δ = 10 %	1,2 to 1,4	42	typ. 80	typ. 7	typ. 38	see Fig. 6	
class-B; t_p = 300 μs; δ = 10 %	1,2 to 1,4	50	typ. 80	typ. 7	typ. 30	see Fig. 6	

MECHANICAL DATA

FO-57C (see Fig. 1).

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

MECHANICAL DATA

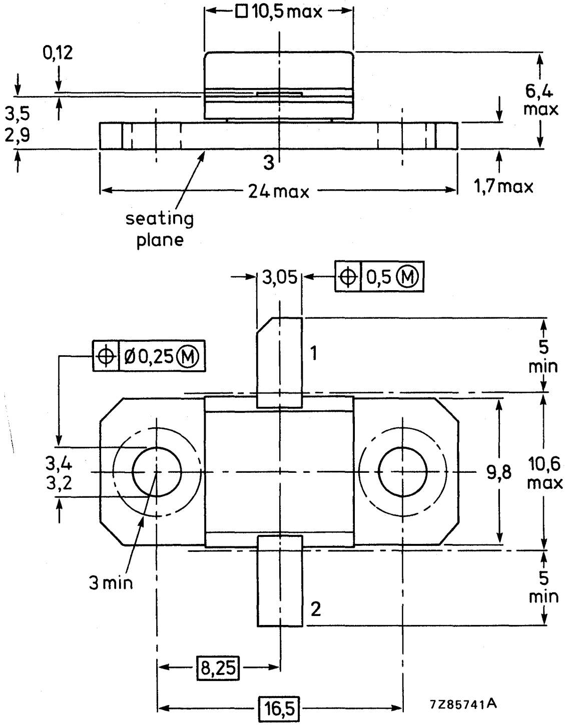
Dimensions in mm

Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60	V
Collector-emitter voltage, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	I_C	max.	6	A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	P_{tot}	max.	180	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,5	K/W
Transient thermal impedance, t_p = 50 μs, (single pulse)	Z_{th}	typ.	0,3	K/W

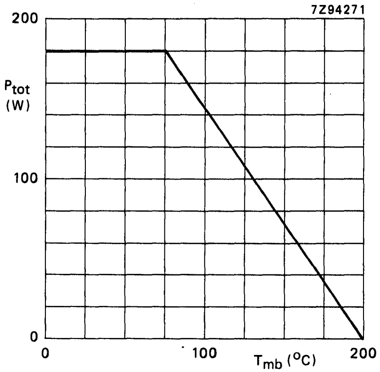


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: t_p = 50 μs, δ = 10 %).

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 4 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60	V
Collector-emitter breakdown voltage I_C = 4 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	$\geqslant$	60	V
Emitter-base breakdown voltage I_C = 0; I_E = 0,4 mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	2	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	100	μA

PRODUCT TEST

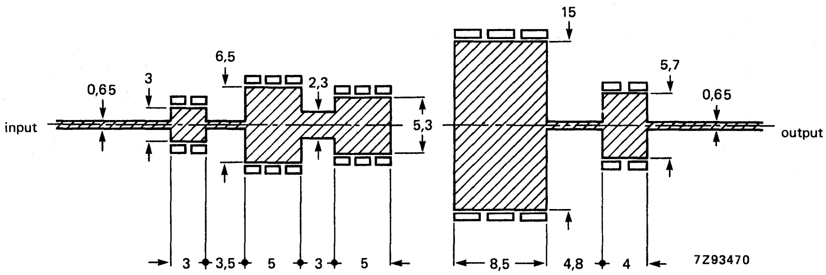


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
class-C; $t_p = 50\ \mu s$; $\delta = 10\ \%$	1,2 to 1,4	42	> 65	> 6	> 32	see Fig. 6	

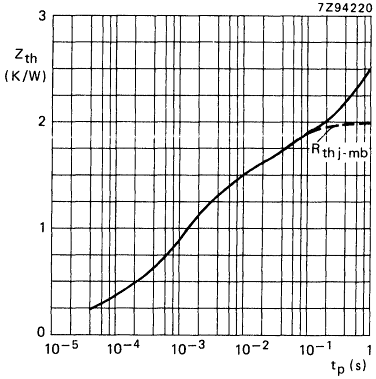


Fig. 4 Transient thermal impedance.

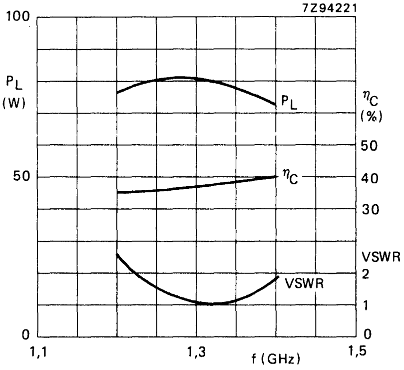


Fig. 5 Load power (at P_S = 16 W), and collector efficiency and VSWR (at P_L = 65 W) versus frequency; V_{CE} = 42 V.

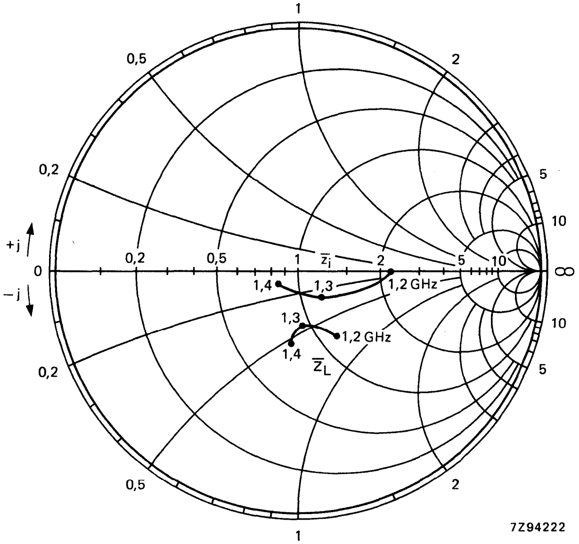


Fig. 6 Input and optimum load impedance versus frequency; Z_O = 5 Ω.

Conditions for Fig. 6:

V_{CE} = 42 V; P_L = 65 W; t_p = 50 μs; δ = 10 %; class-C operation.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; t_p = 50 μs; δ = 10 %	1,2 to 1,4	42	typ. 150	typ. 7	typ. 38	see Fig. 7	
class-C; t_p = 300 μs; δ = 10 %	1,2 to 1,4	50	typ. 150	typ. 7	typ. 30	see Fig. 7	

MECHANICAL DATA

FO-57C (see Fig. 1).

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

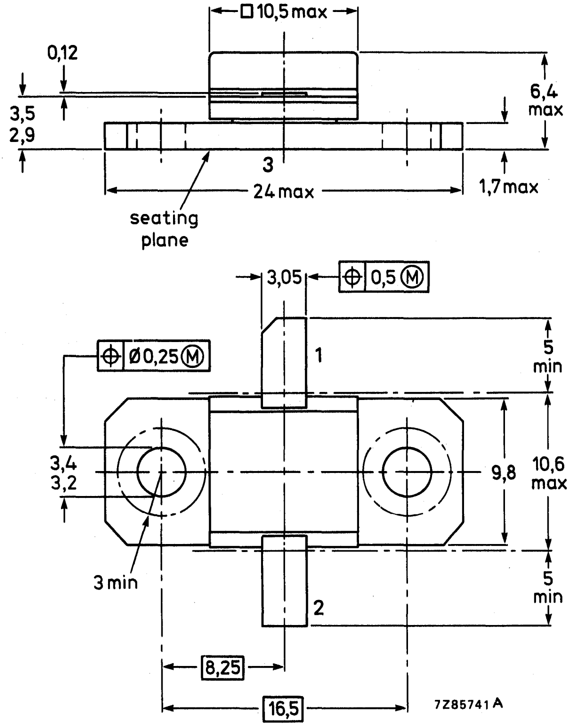
MECHANICAL DATA Dimensions in mm

Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60	V
Collector-emitter voltage, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	I_C	max.	12	A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	P_{tot}	max.	360	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,25	K/W
Transient thermal impedance, t_p = 50 μs single pulse	Z_{th}	typ.	0,15	K/W

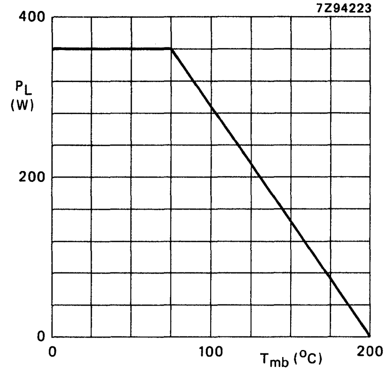


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions, t_p = 50 μs, δ = 10 %.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 8 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60	V
Collector-emitter breakdown voltage I_C = 8 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	$\geqslant$	60	V
Emitter-base breakdown voltage I_C = 0; I_E = 0,8 mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	4	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	200	μA

PRODUCT TEST

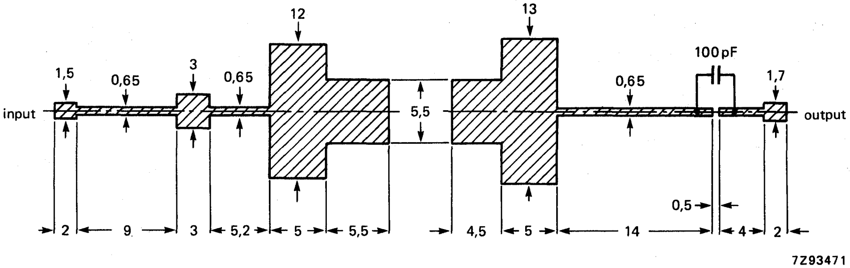


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; $t_p = 50\ \mu s$; $\delta = 10\ \%$	1,2 to 1,4	42	> 125	> 6	38	see Fig. 7	

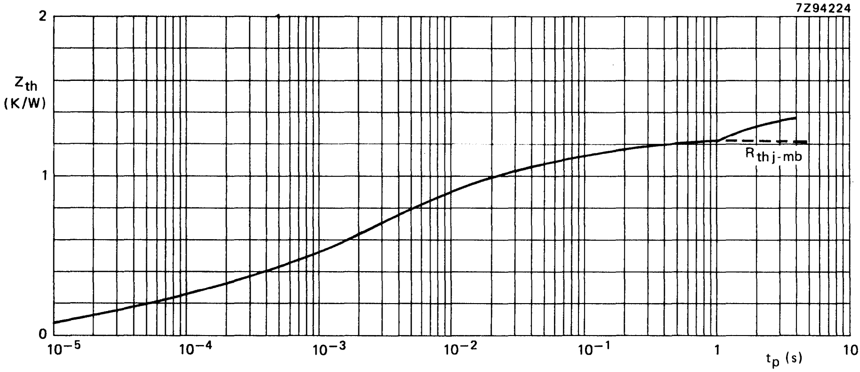


Fig. 4 Transient thermal impedance.

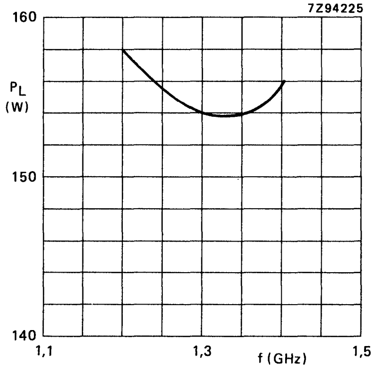


Fig. 5 Load power versus frequency; $P_S = 30$ W.

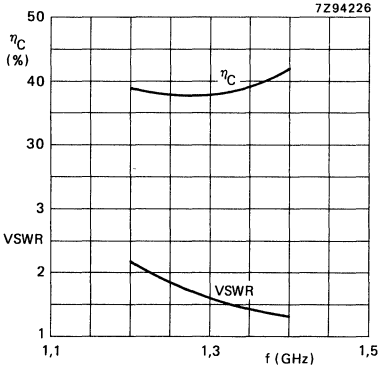


Fig. 6 Collector efficiency and VSWR versus frequency; $P_L = 125$ W.

Conditions for Figs 5 and 6:

$V_{CE} = 42$ V; $t_p = 50\ \mu s$, $\delta = 10$ %.

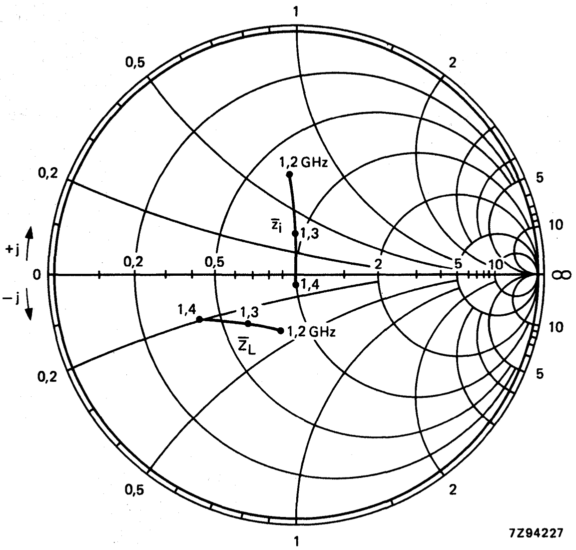


Fig. 7 Input and optimum load impedance versus frequency; $Z_O = 5\ \Omega$.

Conditions for Fig. 7:

$V_{CE} = 42$ V; $P_L = 125$ W; $t_p = 50\ \mu$s, $\delta = 10$ %; class-C operation.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; t_p = 50 μs; δ = 10 %	1,2 to 1,4	42	typ. 200	typ. 7	typ. 38	see Fig. 6	
class-C; t_p = 300 μs; δ = 10 %	1,2 to 1,4	50	typ. 200	typ. 7	typ. 35	see Fig. 6	

MECHANICAL DATA

FO-57C (see Fig. 1).

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

MECHANICAL DATA

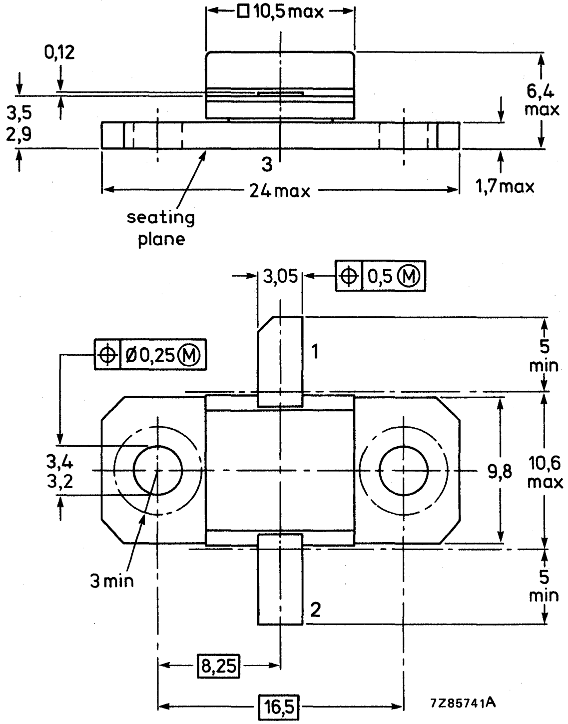
Dimensions in mm

Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



DEVELOPMENT DATA

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60	V
Collector-emitter voltage, $R_{BE} \leqslant 10\,\Omega$	V_{CER}	max.	60	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.) $t_p \leqslant 50\,\mu s$; $\delta \leqslant 10\,\%$	I_C	max.	15	A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 50\,\mu s$; $\delta \leqslant 10\,\%$	P_{tot}	max.	450	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,0	K/W
Transient thermal impedance, t_p = 50 μs single pulse	Z_{th}	typ.	0,1	K/W

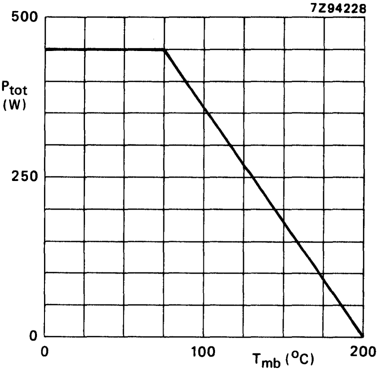


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions: t_p = 50 μs, δ = 10 %.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 10 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60	V
Collector-emitter breakdown voltage I_C = 10 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	$\geqslant$	60	V
Emitter-base breakdown voltage I_C = 0; I_E = 1 mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	5	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	0,25	mA

PRODUCT TEST

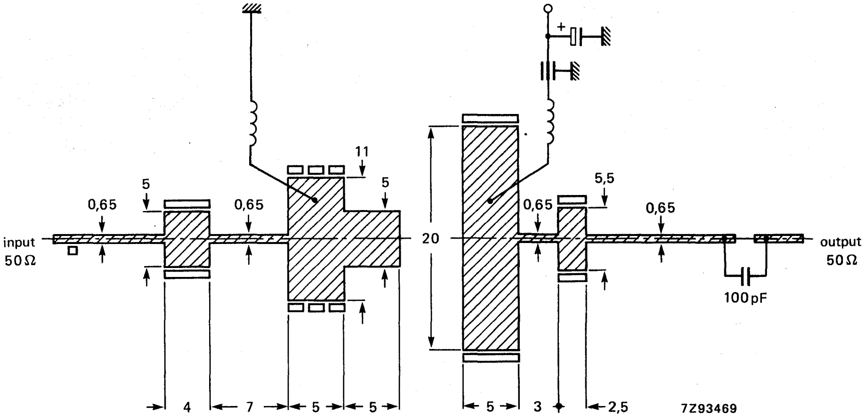


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; $t_p = 300\ \mu s$; $\delta = 10\ \%$	1,2 to 1,4	50	> 160	> 6	> 30	see Fig. 6	

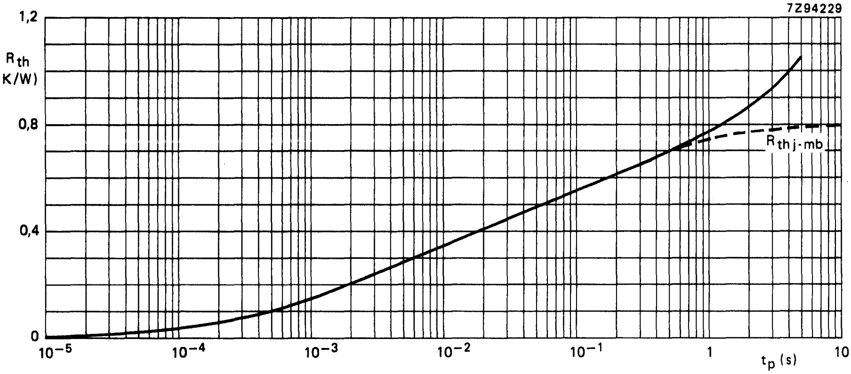


Fig. 4 Transient thermal impedance.

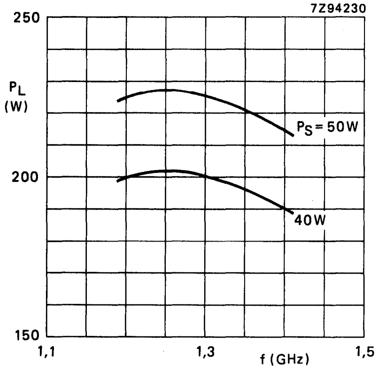


Fig. 5 Load power versus frequency.
V_{CE} = 50 V; t_{on} = 300 μs, δ = 10 %.

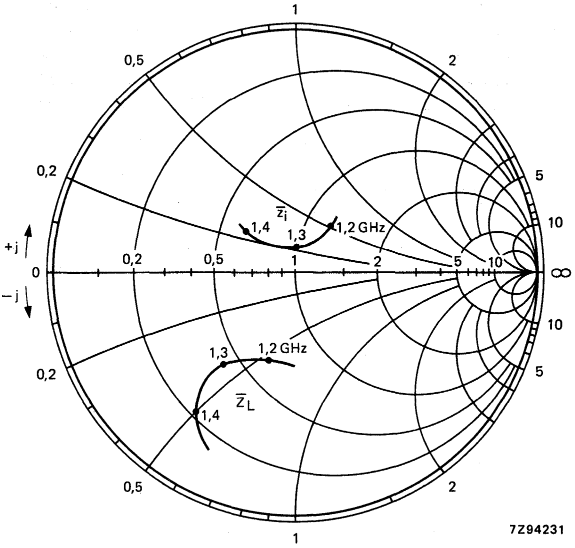


Fig. 6 Input and optimum load impedances versus frequency; $Z_O = 5\ \Omega$.

Conditions for Fig. 6:
$V_{CE} = 50$ V; $P_L = 150$ W; $t_p = 300\ \mu s$; $\delta = 10$ %.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in military and professional applications especially in radar amplifiers operating between 2,7 and 3,5 GHz.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- TiPtAu sandwich metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B test circuit.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ $\bar{Z}_L$ Ω
class-B						see Fig. 5.
t_p = 100 μs, δ = 10%	2,8 – 3,3	40	typ. 45	typ. 5,5	typ. 25	
t_p = 50 μs, δ = 5%	2,7 – 3,1	40	typ. 55	typ. 6,5	typ. 30	
t_p = 50 μs, δ = 5%	2,9 – 3,1	42	typ. 65	typ. 7,0	typ. 30	

MECHANICAL DATA

Dimensions in mm

FO-57C (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

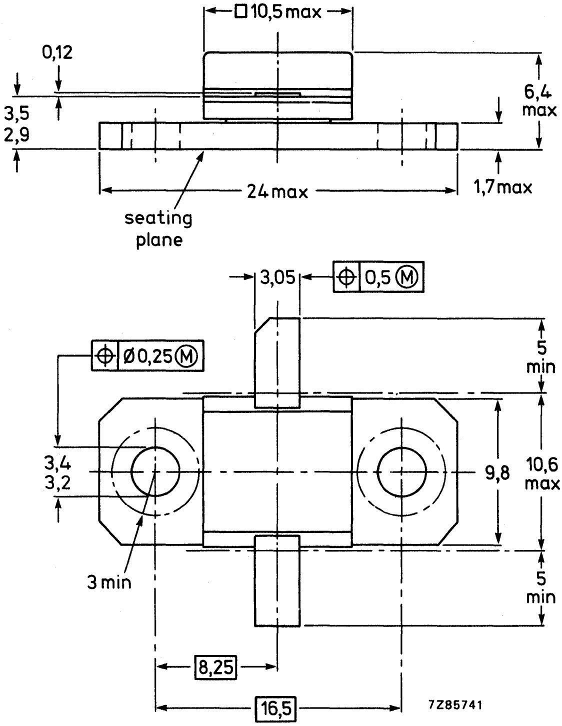
Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm

Recommended screw: M3



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.	20	V
$R_{BE} = 10\ \Omega$	V_{CER}	max.	50	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current; $t_p = 100\ \mu s$, $\delta = 10\%$	I_C	max.	6	A
Total power dissipation up to $T_{mb} = 75\ ^oC$	P_{tot}	max.	175	W
Storage temperature	T_{stg}		−55 to +200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

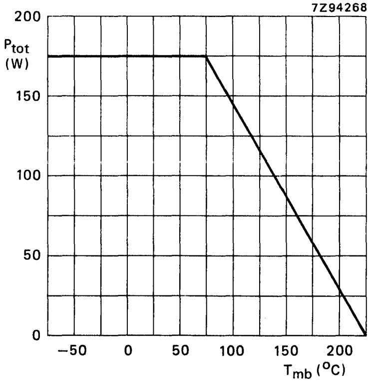


Fig. 2 Power derating curve versus mounting base temperature (t_p = 100 μs, δ = 10%).

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2 K/W
Transient thermal impedance; t_p = 100 μs	Z_{th}	typ.	0,3 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltages			
I_C = 5 mA, open emitter	$V_{(BR)CBO}$	$\geqslant$	50 V
I_C = 1 mA, open emitter		$\geqslant$	3 V
Collector-emitter breakdown voltage			
I_C = 10 mA, open base	$V_{(BR)CEO}$	$\geqslant$	20 V
Emitter cut-off current			
V_{EB} = 3 V; I_C = 0	I_{EBO}	$\leqslant$	1 mA
Collector cut-off current			
V_{CB} = 40 V; I_C = 0	I_{CBO}	$\leqslant$	1 mA

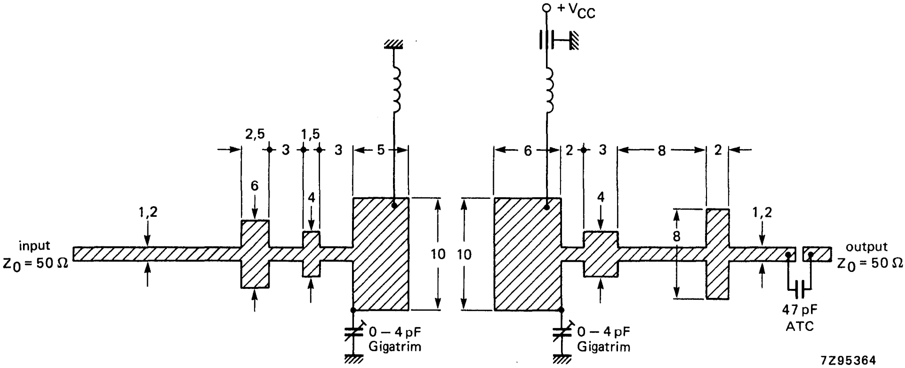


Fig. 3 Wideband test circuit board for 2,7 – 3,1 GHz and for 2,9 – 3,3 GHz. Teflon fibreglass p.c. board; thickness 0,4 mm (all dimensions in mm).

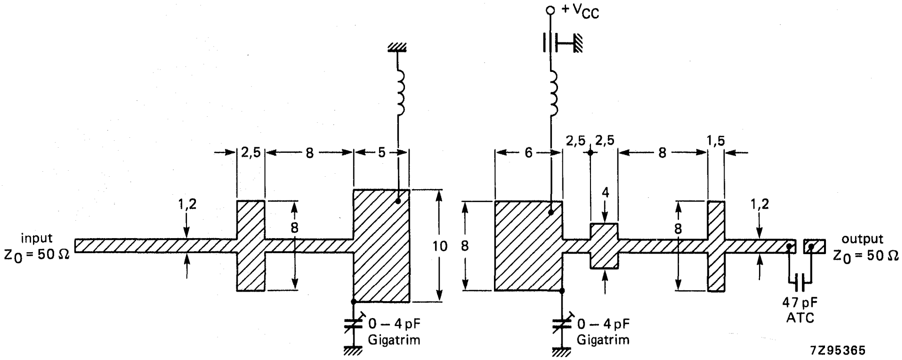


Fig. 4 Wideband test circuit board for 2,8 – 3,3 GHz. Teflon fibreglass p.c. board; thickness 0,4 mm (all dimensions in mm).

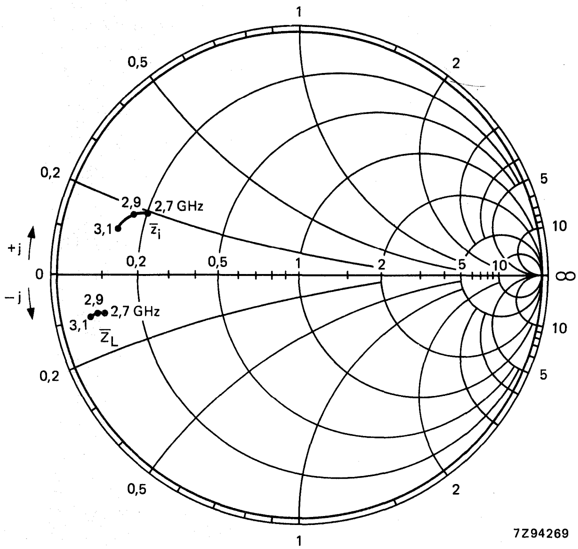


Fig. 5 Input and optimum load impedances versus frequency; $Z_0 = 50\ \Omega$; typical values.

MAINTENANCE TYPE ←

(for new design use RZ3135B15W
RZ3135B30W)

RZ3135B15U
RZ3135B25U

PULSED POWER TRANSISTORS FOR S-BAND RADAR

N-P-N transistors for use in common-base pulsed power amplifiers for S-band radar (3,1 to 3,5 GHz).

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to T_{mb} = 25 °C in an unneutralized wideband common-base class-B circuit under pulse conditions

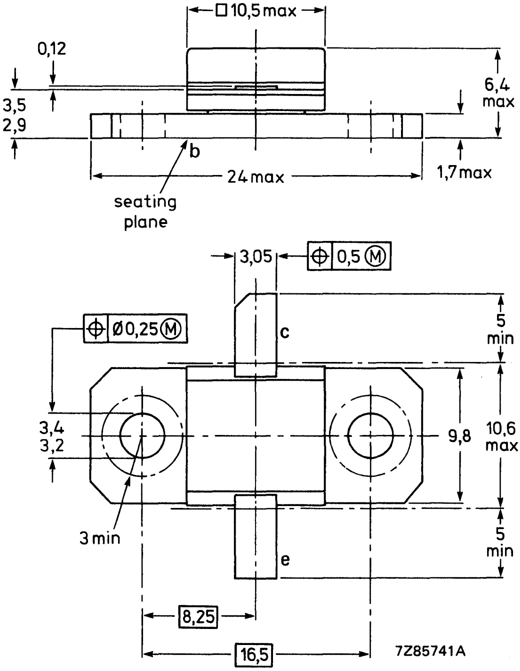
type number	f GHz	V_{CC} V	t_{on} μs	δ %	P_L W	G_p dB	η_C %
RZ3135B15U	3,1 to 3,5	30	100	10	typ. 13	typ. 4,3	typ. 36
RZ3135B25U	3,1 to 3,5	30	100	10	typ. 28	typ. 4,4	typ. 39

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

Torque on nut: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

			RZ3135B15U	RZ3135B25U
Collector-base voltage open emitter	V_{CBO}	max.	40	40 V
Collector-emitter voltage $R_{BE} = 10\ \Omega$	V_{CER}	max.	40	40 V
open base	V_{CEO}	max.	25	25 V
Emitter-base voltage open collector	V_{EBO}	max.	2	2 V
Collector current (d.c.) $t_{on} = 100\ \mu s$; $\delta = 10\%$	I_C	max.	2	4 A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_{on} = 100\ \mu s$; $\delta = 10\%$	P_{tot}	max.	53	105 W
Storage temperature	T_{stg}		−65 to +200 °C	
Junction temperature	T_j	max.	200 °C	
Lead soldering temperature at 0,3 mm from the case $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C	

THERMAL RESISTANCE

			RZ3135B15U	RZ3135B25U
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	3,5	1,75 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,3	0,3 K/W

CHARACTERISTICS

			RZ3135B15U	RZ3135B25U
$T_{mb} = 25\ ^oC$				
Collector-base breakdown voltage open emitter; $I_C = 5$ mA	$V_{(BR)CBO}$	$\geqslant$	40	V
open emitter; $I_C = 10$ mA	$V_{(BR)CBO}$	$\geqslant$		40 V
Collector-emitter breakdown voltage $R_{BE} = 10\ \Omega$; $I_C = 5$ mA	$V_{(BR)CER}$	$\geqslant$	40	V
$R_{BE} = 10\ \Omega$; $I_C = 10$ mA	$V_{(BR)CER}$	$\geqslant$		40 V
Emitter-base breakdown voltage open collector; $I_E = 0,5$ mA	$V_{(BR)EBO}$	$\geqslant$	2	V
open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	$\geqslant$		2 V
Collector cut-off current $I_E = 0$; $V_{CB} = 30$ V	I_{CBO}	$\leqslant$	0,5	1 mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	100	200 μA

PULSED POWER TRANSISTORS FOR S-BAND RADAR

N-P-N transistors for use in common-base pulsed power amplifiers for S-band radar (3,1 to 3,5 GHz).

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

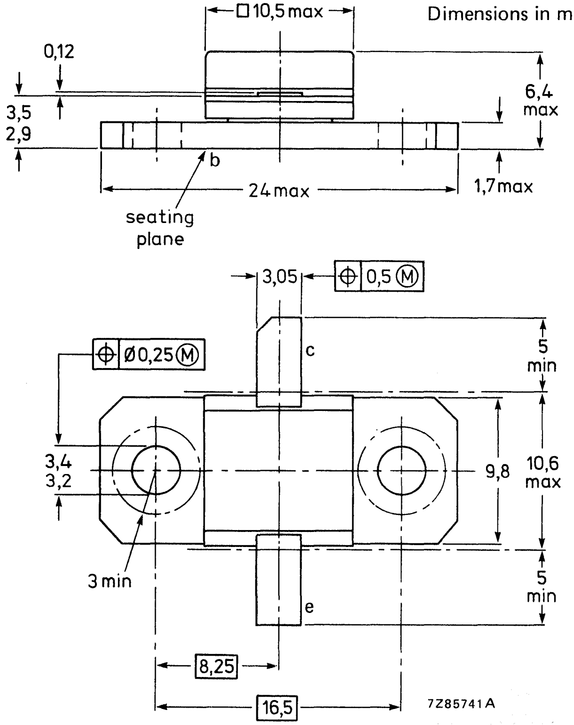
R.F. performance up to T_{mb} = 25 °C in an unneutralized wideband common-base class-B circuit under pulse conditions

type number	f GHz	V_{CC} V	t_{on} μs	δ %	P_L W	G_p dB	η_C %
RZ3135B15W	3,1 to 3,5	42	100	10	typ. 18	typ. 5,5	typ. 33
RZ3135B30W	3,1 to 3,5	42	100	10	typ. 34	typ. 5,5	typ. 33

MECHANICAL DATA

Fig. 1 FO-57C.

Dimensions in mm



Torque on nut: max. 0,5 Nm
Recommended screw: M3

RATINGS

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

			RZ3135B15W	RZ3135B30W
Collector-base voltage				
open emitter	V_{CBO}	max.	50	50 V
Collector-emitter voltage				
$R_{BE} = 10\ \Omega$	V_{CER}	max.	50	50 V
open base	V_{CEO}	max.	20	20 V
Emitter-base voltage				
open collector	V_{EBO}	max.	2	2 V
Collector current (d.c.)				
$t_{on} = 100\ \mu s$; $\delta = 10\%$	I_C	max.	2	4 A
Total power dissipation				
up to $T_{mb} = 75\ ^oC$				
$t_{on} = 100\ \mu s$; $\delta = 10\%$	P_{tot}	max.	53	105 W
Storage temperature	T_{stg}		−65 to +200 °C	
Junction temperature	T_j	max.	200 °C	
Lead soldering temperature				
at 0,3 mm from the case				
$t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C	

THERMAL RESISTANCE

			RZ3135B15W	RZ3135B30W
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	3,5	1,75 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,3	0,3 K/W

CHARACTERISTICS

			RZ3135B15W	RZ3135B30W
$T_{mb} = 25\ ^oC$				
Collector-base breakdown voltage				
open emitter; $I_C = 5$ mA	$V_{(BR)CBO}$	$\geqslant$	50	V
open emitter; $I_C = 10$ mA	$V_{(BR)CBO}$	$\geqslant$		50 V
Collector-emitter breakdown voltage				
$R_{BE} = 10\ \Omega$; $I_C = 5$ mA	$V_{(BR)CER}$	$\geqslant$	50	V
$R_{BE} = 10\ \Omega$; $I_C = 10$ mA	$V_{(BR)CER}$	$\geqslant$		50 V
Emitter-base breakdown voltage				
open collector; $I_E = 0{,}5$ mA	$V_{(BR)EBO}$	$\geqslant$	2	V
open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	$\geqslant$		2 V
Collector cut-off current				
$I_E = 0$; $V_{CB} = 30$ V	I_{CBO}	$\leqslant$	0,5	1 mA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	100	200 μA

APPLICATION INFORMATION (type RZ3135B15W)

R.F. performance up to T_{mb} = 25 °C in an unneutralized wideband common-base class-B circuit under pulse conditions.

type number	f GHz	V_{CC} V	t_{on} μs	δ %	P_L W	G_p dB	η_C %
RZ3135B15W	3,1 to 3,5	42	100	10	> 15 typ. 18	> 5 typ. 5,5	> 30 typ. 33

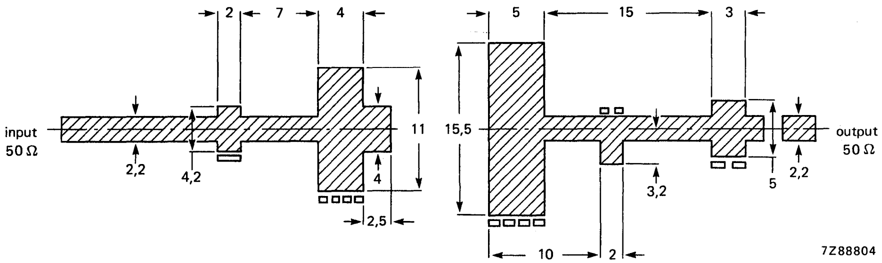


Fig. 2 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.

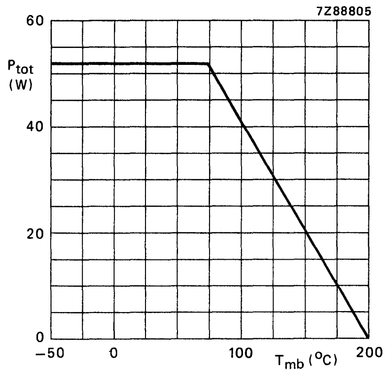


Fig. 3 Power derating curve vs. mounting base temperature; t_{on} = 100 μs; δ = 10%.

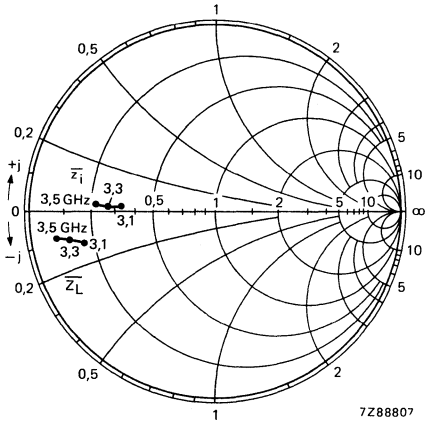


Fig. 4 Input and optimum load impedance vs. frequency; typical values; Z_o = 50 Ω; T_{mb} = 25 °C.

APPLICATION INFORMATION (type RZ3135B30W)

R.F. performance up to T_{mb} = 25 °C in an unneutralized wideband common-base class-B circuit under pulse conditions.

type number	f GHz	V_{CC} V	t_{on} µs	δ %	P_L W	G_p dB	η_C %
RZ3135B30W	3,1 to 3,5	42	100	10	> 30 typ. 34	> 5 typ. 5,5	> 30 typ. 33

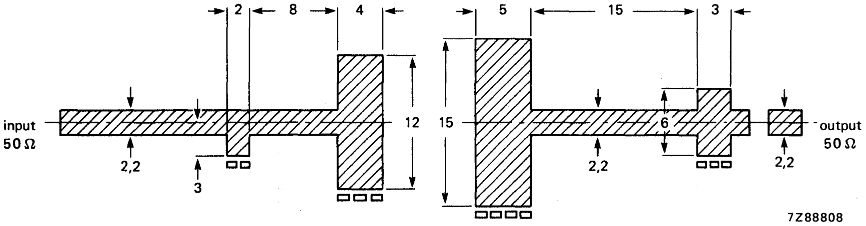


Fig. 5 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.

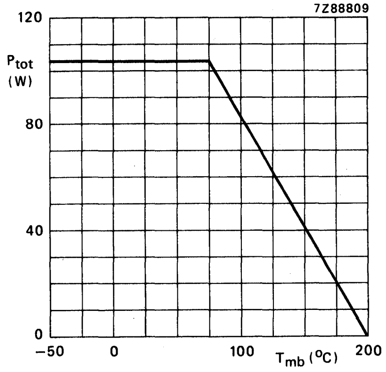


Fig. 6 Power derating curve vs. mounting base temperature; t_{on} = 100 µs; δ = 10%.

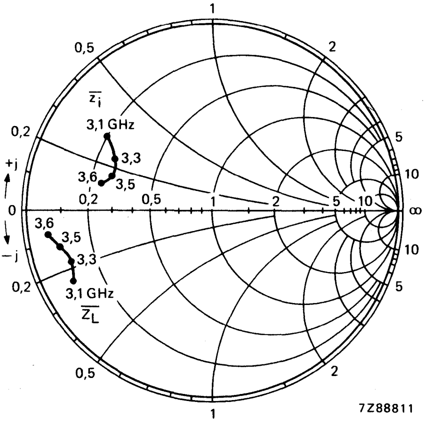


Fig. 7 Input and optimum load impedance vs. frequency; typical values; Z_o = 50 Ω; T_{mb} = 25 °C.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B wideband amplifier in military and professional applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ $\bar{Z}_L$ Ω
class-B						see table
t_p = 100 μs, δ = 10%	1,09	50	typ. 100	typ. 10	typ. 45	
t_p = 300 μs, δ = 10%	1,09	50	typ. 100	typ. 10	typ. 40	
DABS (see Fig. 2)	1,09	50	typ. 100	typ. 9	typ. 40	

MECHANICAL DATA

Dimensions in mm

FO-57C (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

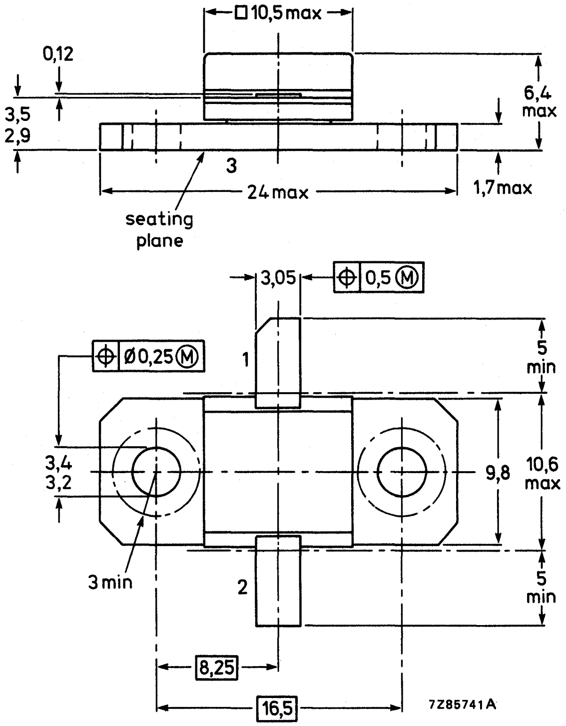
Dimensions in mm

Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



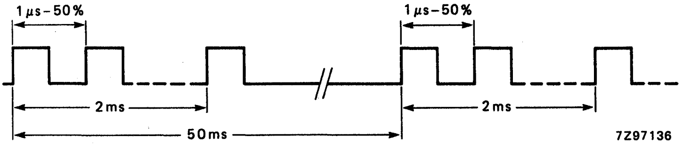


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V

Collector current (d.c.) $t_p = 50\ \mu s$, $\delta \leqslant 10\%$	I_C	max.	6	A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_p = 50\ \mu s$, $\delta \leqslant 10\%$	P_{tot}	max.	180	W
Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from the case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

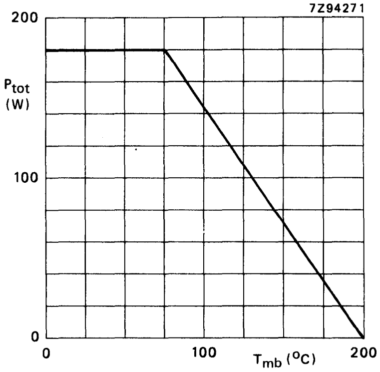


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 50\ \mu s$, $\delta = 10\%$.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,5	K/W
Transient thermal impedance, $t_p = 50\ \mu s$	Z_{th}	typ.	0,3	K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Breakdown voltages				
$I_C = 4$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	60	V
$I_C = 4$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	$\geqslant$	60	V
$I_C = 0$; $I_E = 0,4$ mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current $I_E = 0$; $V_{CB} = 60$ V	I_{CBO}	$\leqslant$	2	mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	100	μA

IMPEDANCES

frequency GHz	input ($\bar{z}_i$) Ω	load ($\bar{Z}_L$) Ω
1,03	3,5 + j4,5	2,6 + j1,75
1,09	4,2 + j4,5	1,9 − j0,9

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B wideband amplifier in military and professional applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\overline{z_i}$ $\overline{Z_L}$ Ω
class-B						see table
t_p = 100 μs, δ = 10%	1,09	50	typ. 250	typ. 7,5	typ. 25	
t_p = 300 μs, δ = 10%	1,09	50	typ. 200	typ. 7,0	typ. 30	
DABS (see Fig. 2)	1,09	50	typ. 200	typ. 7,0	typ. 30	

MECHANICAL DATA

Dimensions in mm

FO-57C (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

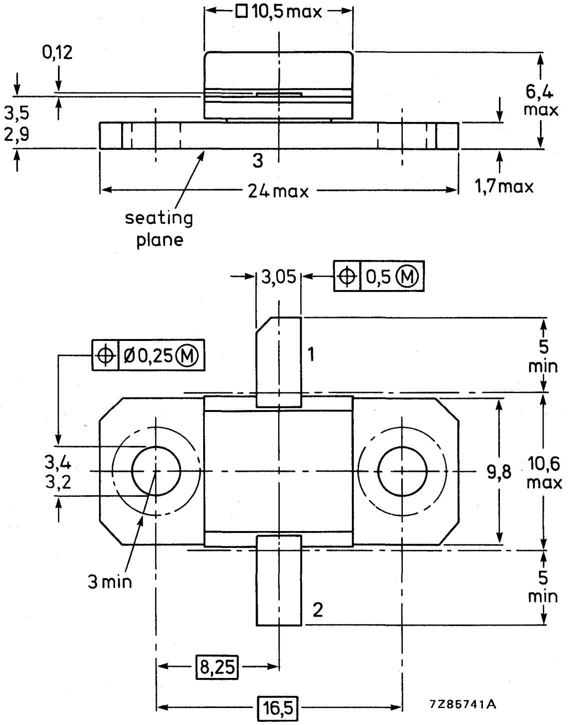
Dimensions in mm

Fig. 1 FO-57C.

Pinning:

1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3



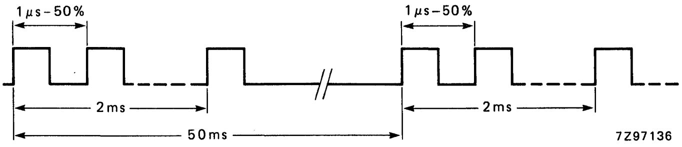


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V

Collector current (d.c.) $t_p = 50\ \mu s$, $\delta \leqslant 10\%$	I_C	max.	15	A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_p = 50\ \mu s$, $\delta \leqslant 10\%$	P_{tot}	max.	450	W
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from the case. $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

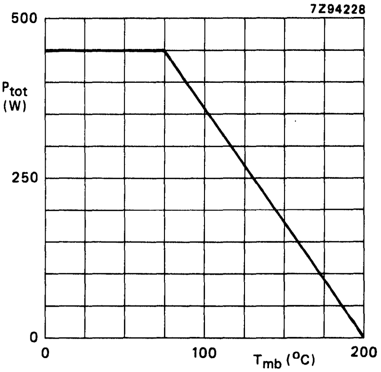


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 50\ \mu s$, $\delta = 10\%$.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1	K/W
Transient thermal impedance, $t_p = 50\ \mu s$	Z_{th}	typ.	0,1	K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Breakdown voltages				
$I_C = 10$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	60	V
$I_C = 10$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	$\geqslant$	60	V
$I_C = 0$; $I_E = 1$ mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current $I_E = 0$; $V_{CB} = 50$ V	I_{CBO}	$\leqslant$	5	mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	0,25	mA

IMPEDANCES

frequency GHz	input ($\overline{z_i}$) Ω	load ($\overline{Z}_L$) Ω
1,03	1,9 + j4	1,3 − j1
1,09	2,3 + j4,5	1,1 − j1,8

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits

The transistor is housed in a metal ceramic flange envelope (2F057C).

QUICK REFERENCE DATA

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
class-C; t_p = 50 μs; δ = 10%	1,2 to 1,4	42	typ. 380	typ. 7	typ. 40	see Fig. 7	
class-C; t_p = 300 μs; δ = 10%	1,2 to 1,4	50	typ. 380	typ. 7,5	typ. 35	see Fig. 7	

MECHANICAL DATA

Dimensions in mm

2FO-57C (see Fig. 1)

MECHANICAL DATA

Dimensions in mm

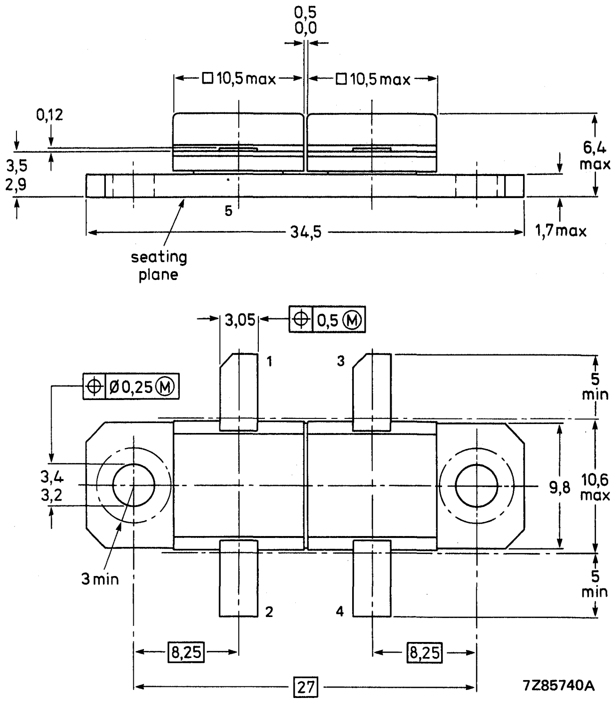
Fig. 1 2FO-57C.

Base and metallic cap connected to flange;

Pinning:
1 = collector
2 = emitter
3 = collector
4 = emitter
5 = base

Torque on screw: max. 0,5 Nm

Recommended screw: M3



DEVELOPMENT DATA

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60	V
Collector-emitter voltage, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.), per transistor section $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\%$	I_C	max.	15	A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\%$	P_{tot}	max.	2 x 450	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE *

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	0,5	K/W
Transient thermal impedance, t_p = 50 μs, single pulse	Z_{th}	max.	0,05	K/W

* Dissipation of either transistor section shall not exceed half rated power.

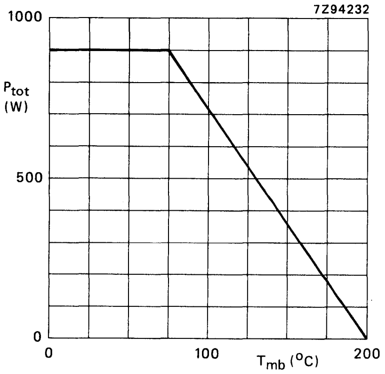


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions: t_p = 50 μs, δ = 10%.*

CHARACTERISTICS (per transistor section)

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 10 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60	V
Collector-emitter breakdown voltage I_C = 10 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$ $V_{(BR)CER}$	$\geqslant$	60	V
Emitter-base breakdown voltage I_C = 0; I_E = 1 mA	$V_{(BR)EBO}$	$\geqslant$	3	V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	5	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	250	μA

PRODUCT TEST

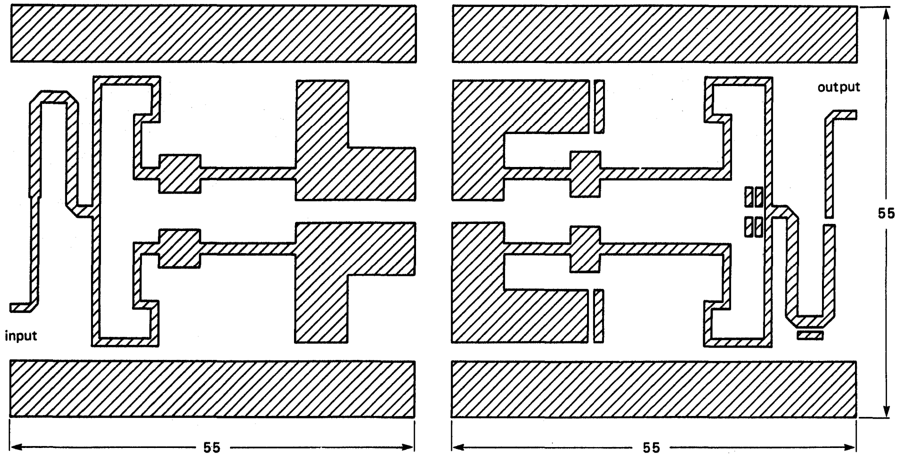


Fig. 3 Wideband test circuit.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
class-C; t_p = 300 μs; δ = 10%	1,2 to 1,4	50	⩾ 300	⩾ 6,5	⩾ 30	see Fig. 7	

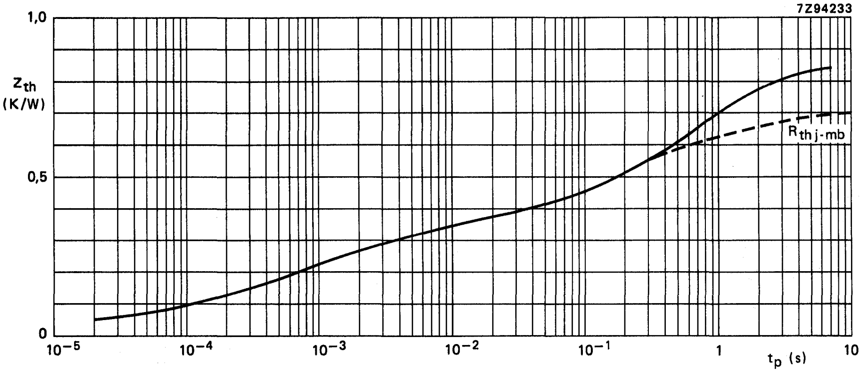


Fig. 4 Transient thermal impedance.
(per transistor section)

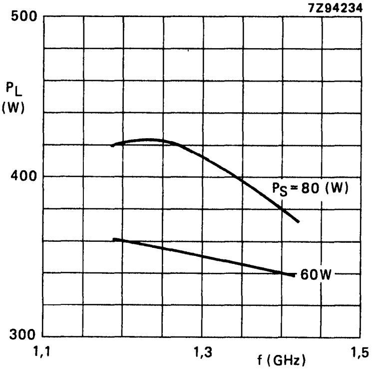


Fig. 5 Load power versus frequency.

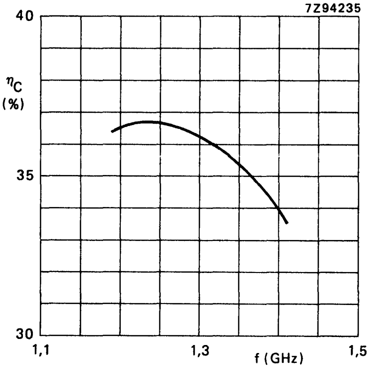


Fig. 6 Collector efficiency versus frequency.

DEVELOPMENT DATA

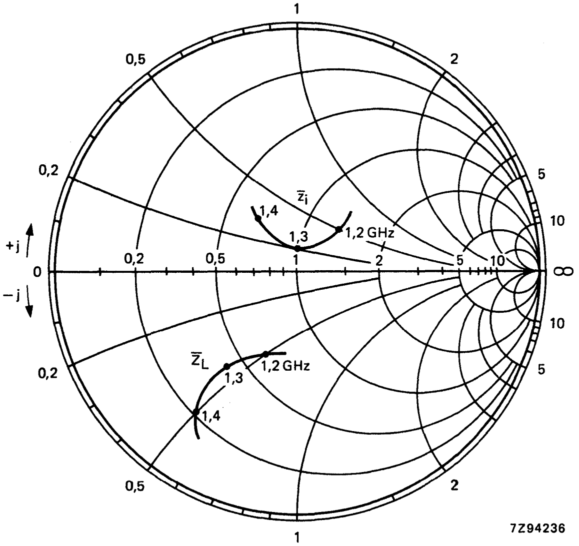
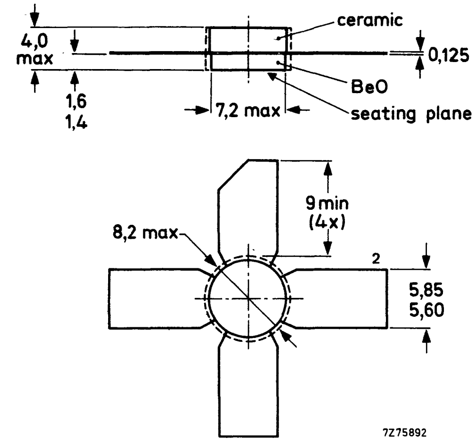
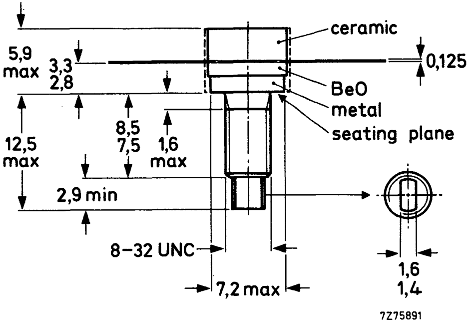


Fig. 7 Input and optimum load impedance versus frequency per transistor section. V_{CE} = 50 V; P_L = 300 W; t_p = 300 μs, δ = 10%; class-C operation; Z_o = 5 Ω.

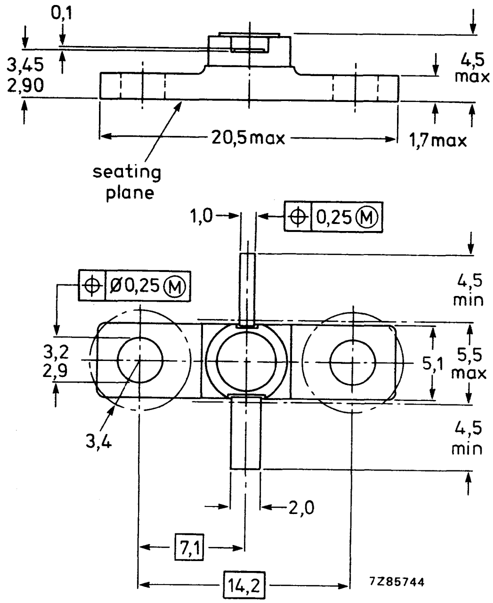
Dimensions in mm

FO-38.



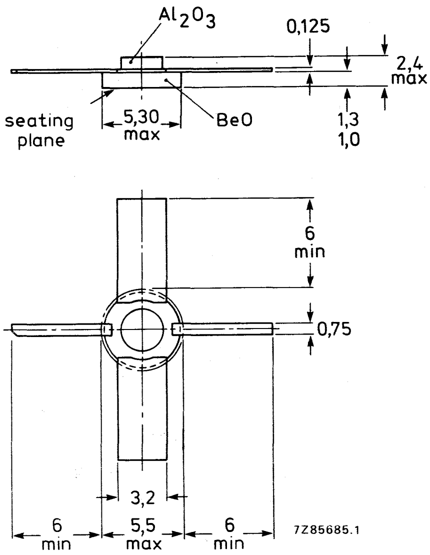


FO-41A.



Dimensions in mm

FO-41B.



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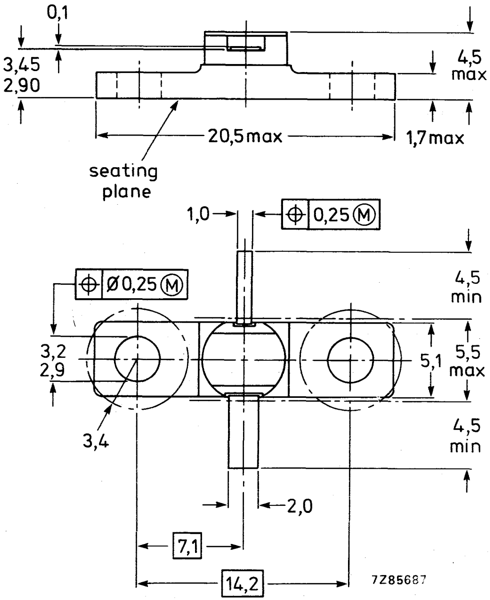
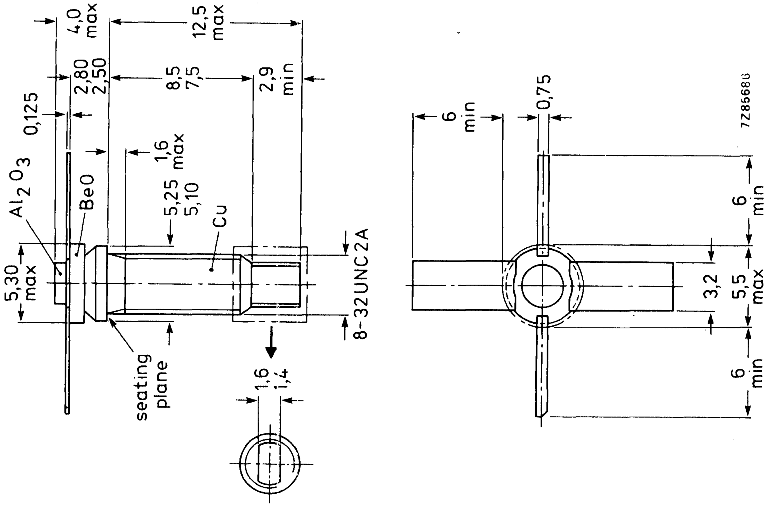


MECHANICAL DATA

Dimensions in mm

FO-49A.



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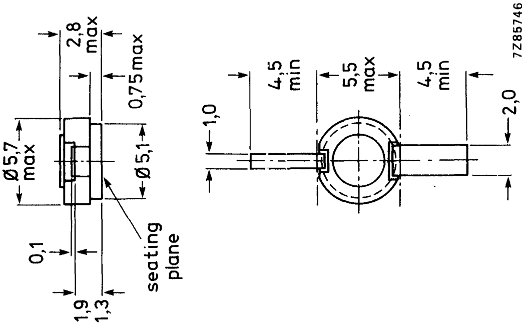
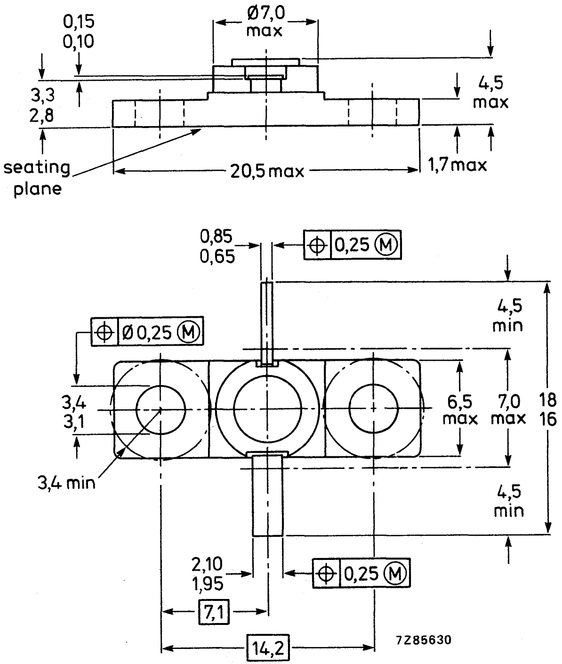
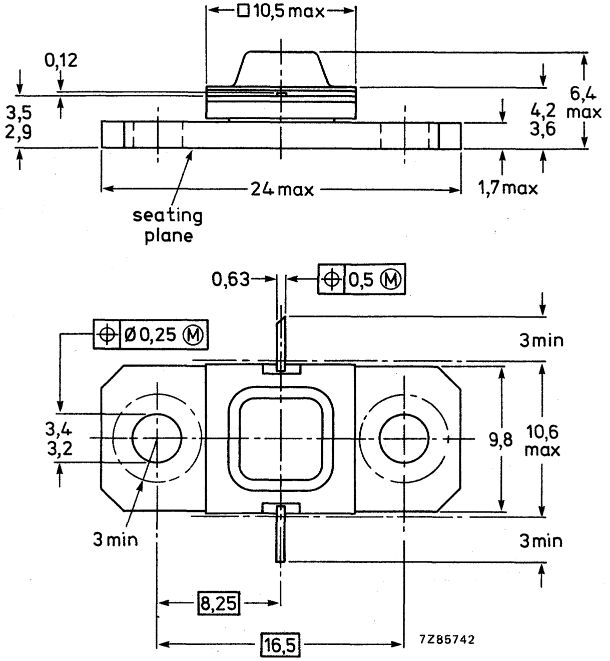


Dimensions in mm

FO-53.

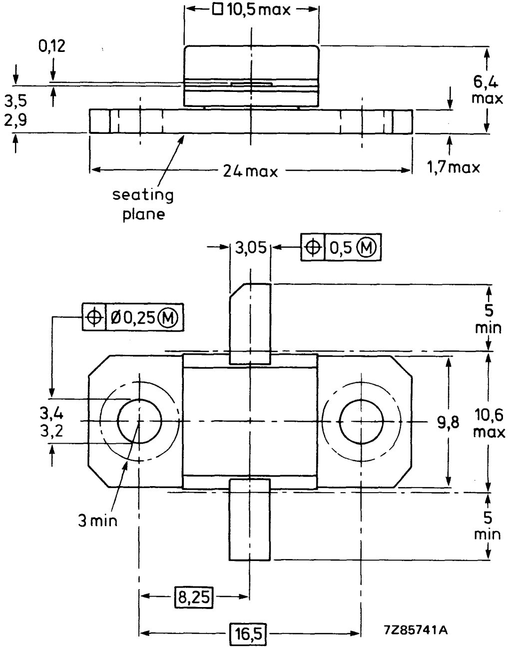


FO-57B.



Dimensions in mm

FO-57C.



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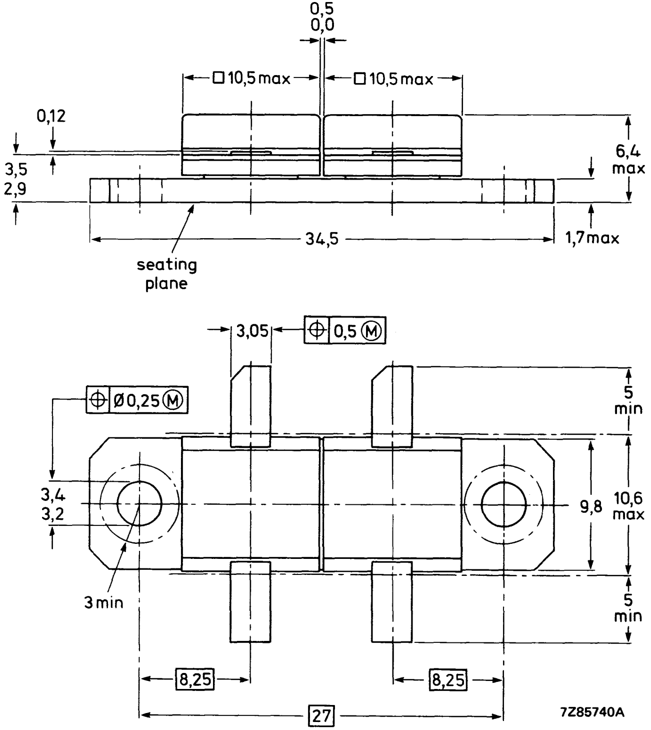
2FO-57C.

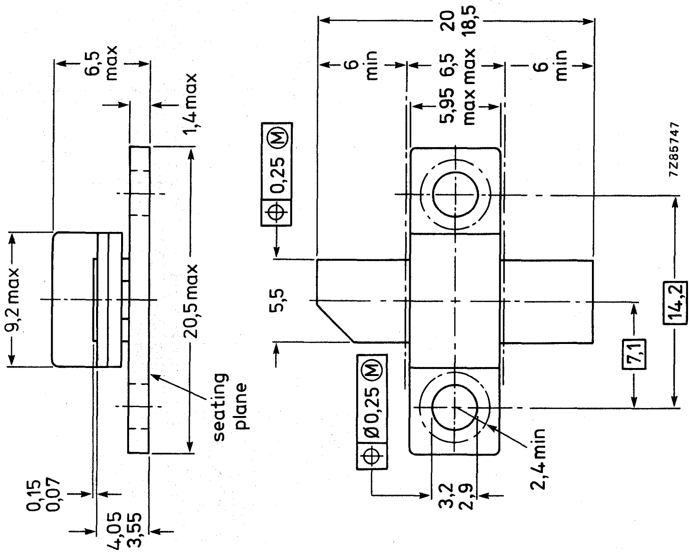


7Z85740A

MECHANICAL DATA

Dimensions in mm

FO-67A.



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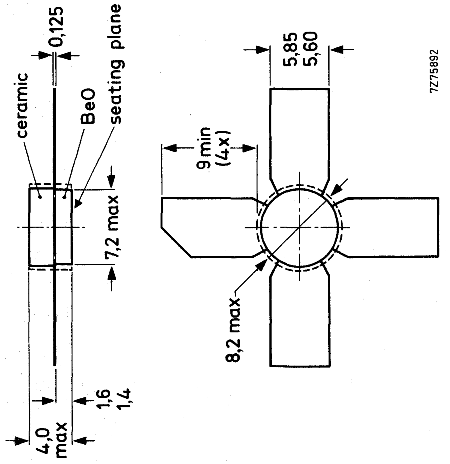
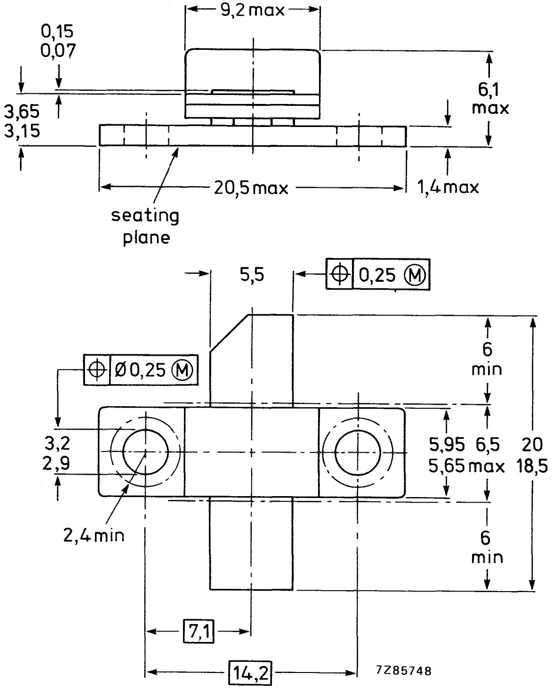


Dimensions in mm

FO-67B.



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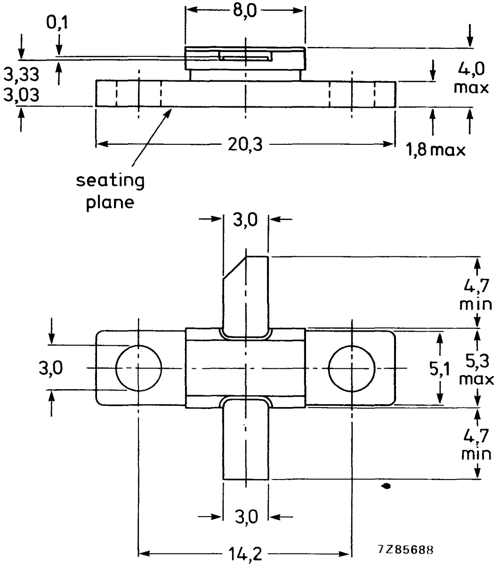

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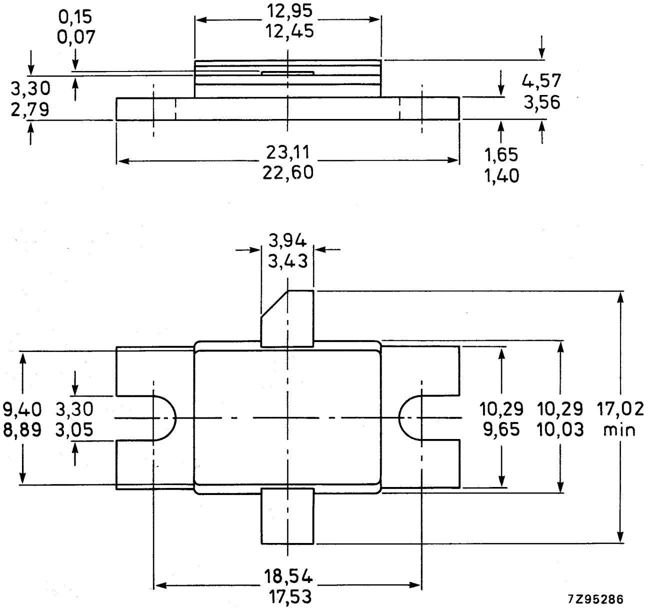

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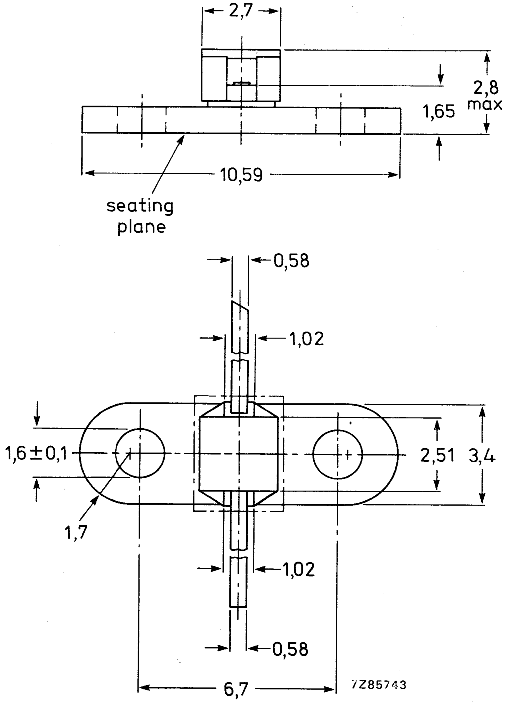
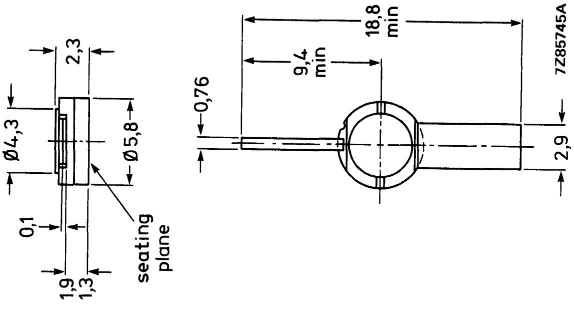


Dimensions in mm

MECHANICAL DATA

Dimensions in mm

FO-93.



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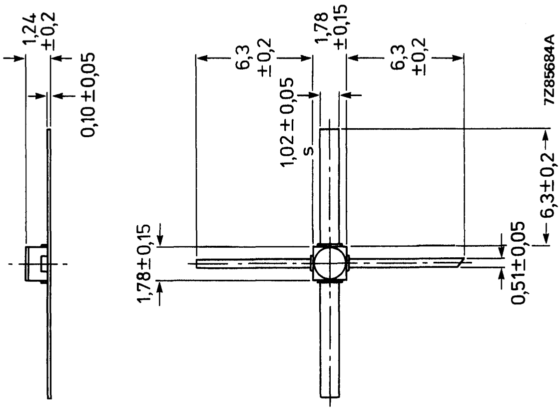
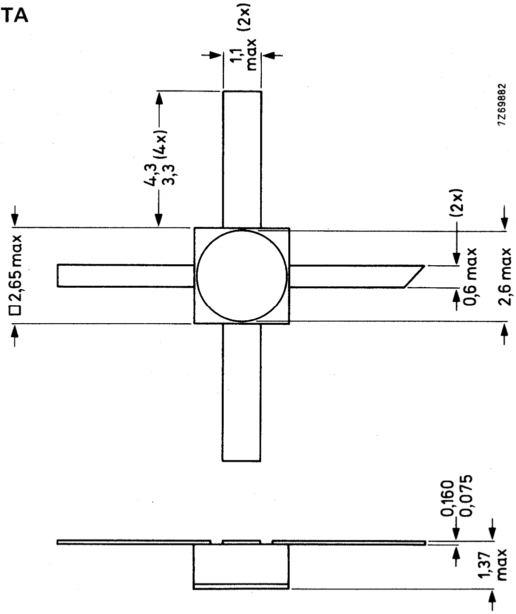


MECHANICAL DATA

Dimensions in mm

SOT-100.



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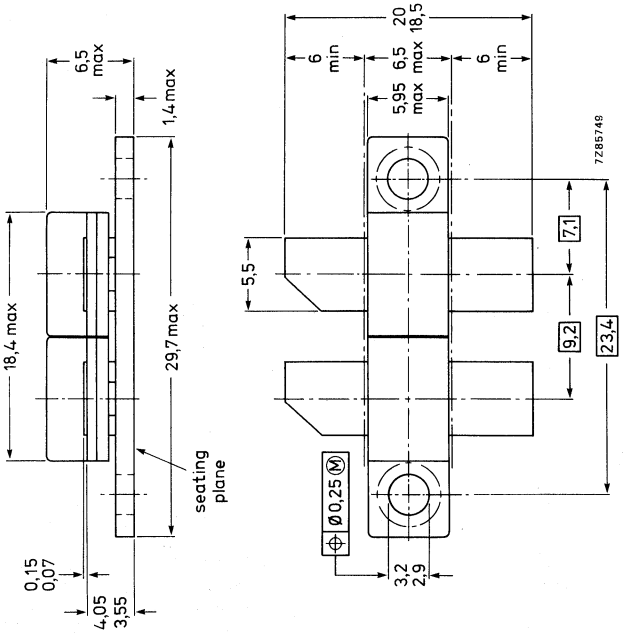
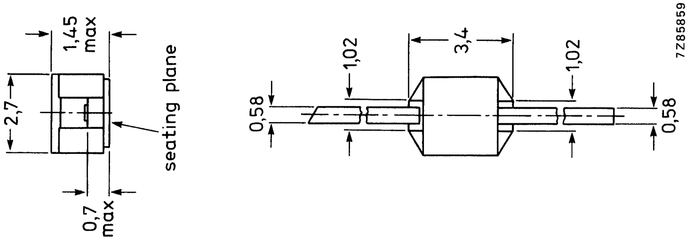


MECHANICAL DATA

Dimensions in mm

FO-102.



INDEX OF TYPE NUMBERS

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

type no.	book	section
BA220	S1	SD
BA221	S1	SD
BA223	S1	T
BA281	S1	SD
BA314	S1	Vrg
BA315	S1	Vrg
BA316	S1	SD
BA317	S1	SD
BA318	S1	SD
BA423	S1	T
BA480	S1	T
BA481	S1	T
BA482	S1	T
BA483	S1	T
BA484	S1	T
BA682	S1	T
BA683	S1	T
BAS11	S1	SD
BAS15	S1	SD
BAS16	S7/S1	Mm/SD
BAS17	S7/S1	Mm/Vrg
BAS19	S7/S1	Mm/SD
BAS20	S7/S1	Mm/SD
BAS21	S7/S1	Mm/SD
BAS28	S7/S1	Mm/SD
BAS29	S7/S1	Mm/SD
BAS31	S7/S1	Mm/SD
BAS32	S7/S1	Mm/SD
BAS35	S7/S1	Mm/SD
BAS45	S1	SD
BAS56	S1	SD
BAT17	S7/S1	Mm/T
BAT18	S7/S1	Mm/T
BAT54	S1	SD
BAT74	S1	SD
BAT81	S1	T
BAT82	S1	T
BAT83	S1	T
BAT85	S1	T
BAT86	S1	T
BAV10	S1	SD
BAV18	S1	SD
BAV19	S1	SD
BAV20	S1	SD
BAV21	S1	SD
BAV23	S7/S1	Mm/SD
BAV45	S1	Sp
BAV70	S7/S1	Mm/SD
BAV99	S7/S1	Mm/SD
BAV100	S7/S1	Mm/SD
BAV101	S7/S1	Mm/SD
BAV102	S7/S1	Mm/SD
BAV103	S7/S1	Mm/SD
BAW56	S7/S1	Mm/SD
BAW62	S1	SD
BAX12	S1	SD
BAX14	S1	SD
BAX18	S1	SD
BAY80	S1	SD
BB112	S1	T
BB119	S1	T
BB130	S1	T
BB204B	S1	T
BB204G	S1	T
BB212	S1	T
BB405B	S1	T
BB417	S1	T
BB809	S1	T
BB909A	S1	T
BB909B	S1	T
BBY31	S7/S1	Mm/T
BBY40	S7/S1	Mm/T
BC107	S3	Sm
BC108	S3	Sm
BC109	S3	Sm

Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes
Sm = Small-signal transistors

INDEX

type no.	book	section
BC140	S3	Sm
BC141	S3	Sm
BC146	S3	Sm
BC160	S3	Sm
BC161	S3	Sm
BC177	S3	Sm
BC178	S3	Sm
BC179	S3	Sm
BC200	S3	Sm
BC264A	S5	FET
BC264B	S5	FET
BC264C	S5	FET
BC264D	S5	FET
BC327;A	S3	Sm
BC328	S3	Sm
BC337;A	S3	Sm
BC338	S3	Sm
BC368	S3	Sm
BC369	S3	Sm
BC375	S3	Sm
BC376	S3	Sm
BC546	S3	Sm
BC547	S3	Sm
BC548	S3	Sm
BC549	S3	Sm
BC550	S3	Sm
BC556	S3	Sm
BC557	S3	Sm
BC558	S3	Sm
BC559	S3	Sm
BC560	S3	Sm
BC635	S3	Sm
BC636	S3	Sm
BC637	S3	Sm
BC638	S3	Sm
BC639	S3	Sm
BC640	S3	Sm
BC807	S7	Mm
BC808	S7	Mm
BC817	S7	Mm
BC818	S7	Mm
BC846	S7	Mm
BC847	S7	Mm
BC848	S7	Mm
BC849	S7	Mm
BC850	S7	Mm
BC856	S7	Mm
BC857	S7	Mm
BC858	S7	Mm
BC859	S7	Mm
BC860	S7	Mm
BC868	S7	Mm
BC869	S7	Mm
BCF29;R	S7	Mm
BCF30;R	S7	Mm
BCF32;R	S7	Mm
BCF33;R	S7	Mm
BCF70;R	S7	Mm
BCF81;R	S7	Mm
BCV61	S7	Mm
BCV62	S7	Mm
BCV71;R	S7	Mm
BCV72;R	S7	Mm
BCW29;R	S7	Mm
BCW30;R	S7	Mm
BCW31;R	S7	Mm
BCW32;R	S7	Mm
BCW33;R	S7	Mm
BCW60*	S7	Mm
BCW61*	S7	Mm
BCW69;R	S7	Mm
BCW70;R	S7	Mm
BCW71;R	S7	Mm
BCW72;R	S7	Mm
BCW81;R	S7	Mm
BCW89;R	S7	Mm
BCX17;R	S7	Mm
BCX18;R	S7	Mm
BCX19;R	S7	Mm
BCX20;R	S7	Mm
BCX51	S7	Mm
BCX52	S7	Mm
BCX53	S7	Mm
BCX54	S7	Mm
BCX55	S7	Mm
BCX56	S7	Mm
BCX68	S7	Mm
BCX69	S7	mm
BCX70*	S7	Mm
BCX71*	S7	Mm
BCY56	S3	Sm
BCY57	S3	Sm
BCY58	S3	Sm
BCY59	S3	Sm
BCY70	S3	Sm
BCY71	S3	Sm
BCY72	S3	Sm
BCY78	S3	Sm
BCY79	S3	Sm
BCY87	S3	Sm
BCY88	S3	Sm
BCY89	S3	Sm
BD131	S4a	P
BD132	S4a	P
BD135	S4a	P
BD136	S4a	P
BD137	S4a	P
BD138	S4a	P
BD139	S4a	P
BD140	S4a	P
BD201	S4a	P
BD202	S4a	P
BD203	S4a	P
BD204	S4a	P
BD226	S4a	P
BD227	S4a	P
BD228	S4a	P
BD229	S4a	P
BD230	S4a	P
BD231	S4a	P

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors

type no.	book	section
BD233	S4a	P
BD234	S4a	P
BD235	S4a	P
BD236	S4a	P
BD237	S4a	P
BD238	S4a	P
BD239	S4a	P
BD239A	S4a	P
BD239B	S4a	P
BD239C	S4a	P
BD240	S4a	P
BD240A	S4a	P
BD240B	S4a	P
BD240C	S4a	P
BD241	S4a	P
BD241A	S4a	P
BD241B	S4a	P
BD241C	S4a	P
BD242	S4a	P
BD242A	S4a	P
BD242B	S4a	P
BD242C	S4a	P
BD243	S4a	P
BD243A	S4a	P
BD243B	S4a	P
BD243C	S4a	P
BD244	S4a	P
BD244A	S4a	P
BD244B	S4a	P
BD244C	S4a	P
BD329	S4a	P
BD330	S4a	P
BD331	S4a	P
BD332	S4a	P
BD333	S4a	P
BD334	S4a	P
BD335	S4a	P
BD336	S4a	P
BD337	S4a	P
BD338	S4a	P
BD433	S4a	P
BD434	S4a	P
BD435	S4a	P
BD436	S4a	P
BD437	S4a	P
BD438	S4a	P
BD645	S4a	P
BD646	S4a	P
BD647	S4a	P
BD648	S4a	P
BD649	S4a	P
BD650	S4a	P
BD651	S4a	P
BD652	S4a	P
BD675	S4a	P
BD676	S4a	P
BD677	S4a	P
BD678	S4a	P
BD679	S4a	P
BD680	S4a	P
BD681	S4a	P
BD682	S4a	P
BD683	S4a	P
BD684	S4a	P
BD813	S4a	P
BD814	S4a	P
BD815	S4a	P
BD816	S4a	P
BD817	S4a	P
BD818	S4a	P
BD825	S4a	P
BD826	S4a	P
BD827	S4a	P
BD828	S4a	P
BD829	S4a	P
BD830	S4a	P
BD839	S4a	P
BD840	S4a	P
BD841	S4a	P
BD842	S4a	P
BD843	S4a	P
BD844	S4a	P
BD845	S4a	P
BD846	S4a	P
BD847	S4a	P
BD848	S4a	P
BD849	S4a	P
BD850	S4a	P
BD933	S4a	P
BD934	S4a	P
BD935	S4a	P
BD936	S4a	P
BD937	S4a	P
BD938	S4a	P
BD939	S4a	P
BD940	S4a	P
BD941	S4a	P
BD942	S4a	P
BD943	S4a	P
BD944	S4a	P
BD945	S4a	P
BD946	S4a	P
BD947	S4a	P
BD948	S4a	P
BD949	S4a	P
BD950	S4a	P
BD951	S4a	P
BD952	S4a	P
BD953	S4a	P
BD954	S4a	P
BD955	S4a	P
BD956	S4a	P
BDT20	S4a	P
BDT21	S4a	P
BDT29	S4a	P
BDT29A	S4a	P
BDT29B	S4a	P
BDT29C	S4a	P
BDT30	S4a	P
BDT30A	S4a	P

P = Low-frequency power transistors

P = Low-frequency power transistors

type no.	book	section
BDX92	S4a	P
BDX93	S4a	P
BDX94	S4a	P
BDX95	S4a	P
BDX96	S4a	P
BDY90	S4a	P
BDY90A	S4a	P
BDY91	S4a	P
BDY92	S4a	P
BF198	S3	Sm
BF199	S3	Sm
BF240	S3	Sm
BF241	S3	Sm
BF245A	S5	FET
BF245B	S5	FET
BF245C	S5	FET
BF247A	S5	FET
BF247B	S5	FET
BF247C	S5	FET
BF256A	S5	FET
BF256B	S5	FET
BF256C	S5	FET
BF324	S3	Sm
BF370	S3	Sm
BF410A	S5	FET
BF410B	S5	FET
BF410C	S5	FET
BF410D	S5	FET
BF419	S4b	HVP
BF420	S3	Sm
BF421	S3	Sm
BF422	S3	Sm
BF423	S3	Sm
BF450	S3	Sm
BF451	S3	Sm
BF457	S4b	HVP
BF458	S4b	HVP
BF459	S4b	HVP
BF469	S4b	HVP
BF470	S4b	HVP
BF471	S4b	HVP
BF472	S4b	HVP
BF483	S3	Sm
BF485	S3	Sm
BF487	S3	Sm
BF494	S3	Sm
BF495	S3	Sm
BF496	S3	Sm
BF510	S7/S5	Mm/FET
BF511	S7/S5	Mm/FET
BF512	S7/S5	Mm/FET
BF513	S7/S5	Mm/FET
BF536	S7	Mm
BF550;R	S7	Mm
BF569	S7	Mm
BF579	S7	Mm
BF620	S7	Mm
BF621	S7	Mm
BF622	S7	Mm
BF623	S7	Mm
BF660;R	S7	Mm
BF689K	S10	WBT
BF763	S10	WBT
BF767	S7	Mm
BF819	S4b	HVP
BF820	S7	Mm
BF821	S7	Mm
BF822	S7	Mm
BF823	S7	Mm
BF824	S7	Mm
BF857	S4b	HVP
BF858	S4b	HVP
BF859	S4b	HVP
BF869	S4b	HVP
BF870	S4b	HVP
BF871	S4b	HVP
BF872	S4b	HVP
BF926	S3	Sm
BF936	S3	Sm
BF939	S3	Sm
BF960	S5	FET
BF964	S5	FET
BF966	S5	FET
BF967	S3	Sm
BF970	S3	Sm
BF979	S3	Sm
BF980	S5	FET
BF981	S5	FET
BF982	S5	FET
BF989	S7/S5	Mm/FET
BF990	S7/S5	Mm/FET
BF991	S7/S5	Mm/FET
BF992	S7/S5	Mm/FET
BF994	S7/S5	Mm/FET
BF996	S7/S5	Mm/FET
BFG23	S10	WBT
BFG32	S10	WBT
BFG34	S10	WBT
BFG51	S10	WBT
BFG65	S10	WBT
BFG90A	S10	WBT
BFG91A	S10	WBT
BFG96	S10	WBT
BFP90A	S10	WBT
BFP91A	S10	WBT
BFP96	S10	WBT
BFQ10	S5	FET
BFQ11	S5	FET
BFQ12	S5	FET
BFQ13	S5	FET
BFQ14	S5	FET
BFQ15	S5	FET
BFQ16	S5	FET
BFQ17	S7	Mm
BFQ18A	S7	Mm
BFQ19	S7	Mm
BFQ22S	S10	WBT
BFQ23	S10	WBT
BFQ23C	S10	WBT
BFQ24	S10	WBT

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors
WBT = Wideband transistors

type no.	book	section
BFQ32	S10	WBT
BFQ32C	S10	WBT
BFQ32S	S10	WBT
BFQ33	S10	WBT
BFQ34	S10	WBT
BFQ34T	S10	WBT
BFQ42	S6	RFP
BFQ43	S6	RFP
BFQ51	S10	WBT
BFQ51C	S10	WBT
BFQ52	S10	WBT
BFQ53	S10	WBT
BFQ63	S10	WBT
BFQ65	S10	WBT
BFQ66	S10	WBT
BFQ68	S10	WBT
BFQ136	S10	WBT
BFR29	S5	FET
BFR30	S7/S5	Mm/FET
BFR31	S7/S5	Mm/FET
BFR49	S10	WBT
BFR53;R	S7	Mm
BFR54	S3	Sm
BFR64	S10	WBT
BFR65	S10	WBT
BFR84	S5	FET
BFR90	S10	WBT
BFR90A	S10	WBT
BFR91	S10	WBT
BFR91A	S10	WBT
BFR92;R	S7	Mm
BFR92A;R	S7	Mm
BFR93;R	S7	Mm
BFR93A;R	S7	Mm
BFR94	S10	WBT
BFR95	S10	WBT
BFR96	S10	WBT
BFR96S	S10	WBT
BFR101A;B	S7/S5	Mm/FET
BFS17;R	S7	Mm
BFS18;R	S7	Mm
BFS19;R	S7	Mm
BFS20;R	S7	Mm
BFS21	S5	FET
BFS21A	S5	FET
BFS22A	S6	RFP
BFS23A	S6	RFP
BFT24	S10	WBT
BFT25;R	S7	Mm
BFT44	S3	Sm
BFT45	S3	Sm
BFT46	S7/S5	Mm/FET
BFT92;R	S7	Mm
BFT93;R	S7	Mm
BFW10	S5	FET
BFW11	S5	FET
BFW12	S5	FET
BFW13	S5	FET
BFW16A	S10	WBT
BFW17A	S10	WBT
BFW30	S10	WBT
BFW61	S5	FET
BFW92	S10	WBT
BFW92A	S10	WBT
BFW93	S10	WBT
BFX29	S3	Sm
BFX30	S3	Sm
BFX34	S3	Sm
BFX84	S3	Sm
BFX85	S3	Sm
BFX86	S3	Sm
BFX87	S3	Sm
BFX88	S3	Sm
BFX89	S10	WBT
BFY50	S3	Sm
BFY51	S3	Sm
BFY52	S3	Sm
BFY55	S3	Sm
BFY90	S10	WBT
BG2000	S1	RT
BG2097	S1	RT
BGD102	S10	WBM
BGD102E	S10	WBM
BGD104	S10	WBM
BGD104E	S10	WBM
BGX11*	S2b	ThM
BGX12*	S2b	ThM
BGX13*	S2b	ThM
BGX14*	S2b	ThM
BGX15*	S2b	ThM
BGX17*	S2b	ThM
BGX25	S2a	ThM
BGY22	S6	RFP
BGY22A	S6	RFP
BGY23	S6	RFP
BGY23A	S6	RFP
BGY32	S6	RFP
BGY33	S6	RFP
BGY35	S6	RFP
BGY36	S6	RFP
BGY40A	S6	RFP
BGY40B	S6	RFP
BGY41A	S6	RFP
BGY41B	S6	RFP
BGY43	S6	RFP
BGY45A	S6	RFP
BGY45B	S6	RFP
BGY46A	S6	RFP
BGY46B	S6	RFP
BGY47*	S6	RFP
BGY50	S10	WBM
BGY51	S10	WBM
BGY52	S10	WBM
BGY53	S10	WBM
BGY54	S10	WBM
BGY55	S10	WBM
BGY56	S10	WBM
BGY57	S10	WBM
BGY58	S10	WBM
BGY58A	S10	WBM

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
ThM = Thyristor modules
WBM = Wideband hybrid IC modules
WBT = Wideband transistors

type no.	book	section
BGY59	S10	WBM
BGY60	S10	WBM
BGY61	S10	WBM
BGY65	S10	WBM
BGY67	S10	WBM
BGY67A	S10	WBM
BGY70	S10	WBM
BGY71	S10	WBM
BGY74	S10	WBM
BGY75	S10	WBM
BGY84	S10	WBM
BGY84A	S10	WBM
BGY85	S10	WBM
BGY85A	S10	WBM
BGY93A	S6	RFP
BGY93B	S6	RFP
BGY93C	S6	RFP
BLU20/12	S6	RFP
BLU30/12	S6	RFP
BLU45/12	S6	RFP
BLU50	S6	RFP
BLU51	S6	RFP
BLU52	S6	RFP
BLU53	S6	RFP
BLU60/12	S6	RFP
BLU97	S6	RFP
BLU98	S6	RFP
BLU99	S6	RFP
BLV10	S6	RFP
BLV11	S6	RFP
BLV20	S6	RFP
BLV21	S6	RFP
BLV25	S6	RFP
BLV30	S6	RFP
BLV30/12	S6	RFP
BLV31	S6	RFP
BLV32F	S6	RFP
BLV33	S6	RFP
BLV33F	S6	RFP
BLV36	S6	RFP
BLV37	S6	RFP
BLV45/12	S6	RFP
BLV57	S6	RFP
BLV59	S6	RFP
BLV75/12	S6	RFP
BLV80/28	S6	RFP
BLV90	S6	RFP
BLV91	S6	RFP
BLV92	S6	RFP
BLV93	S6	RFP
BLV94	S6	RFP
BLV95	S6	RFP
BLV96	S6	RFP
BLV97	S6	RFP
BLV98	S6	RFP
BLV99	S6	RFP
BLW29	S6	RFP
BLW31	S6	RFP
BLW32	S6	RFP
BLW33	S6	RFP
BLW34	S6	RFP
BLW50F	S6	RFP
BLW60	S6	RFP
BLW60C	S6	RFP
BLW76	S6	RFP
BLW77	S6	RFP
BLW78	S6	RFP
BLW79	S6	RFP
BLW80	S6	RFP
BLW81	S6	RFP
BLW82	S6	RFP
BLW83	S6	RFP
BLW84	S6	RFP
BLW85	S6	RFP
BLW86	S6	RFP
BLW87	S6	RFP
BLW89	S6	RFP
BLW90	S6	RFP
BLW91	S6	RFP
BLW95	S6	RFP
BLW96	S6	RFP
BLW97	S6	RFP
BLW98	S6	RFP
BLW99	S6	RFP
BLX13	S6	RFP
BLX13C	S6	RFP
BLX14	S6	RFP
BLX15	S6	RFP
BLX39	S6	RFP
BLX65	S6	RFP
BLX65E	S6	RFP
BLX67	S6	RFP
BLX68	S6	RFP
BLX69A	S6	RFP
BLX91A	S6	RFP
BLX91CB	S6	RFP
BLX92A	S6	RFP
BLX93A	S6	RFP
BLX94A	S6	RFP
BLX94C	S6	RFP
BLX95	S6	RFP
BLX96	S6	RFP
BLX97	S6	RFP
BLX98	S6	RFP
BLY85	S6	RFP
BLY87A	S6	RFP
BLY87C	S6	RFP
BLY88A	S6	RFP
BLY88C	S6	RFP
BLY89A	S6	RFP
BLY89C	S6	RFP
BLY90	S6	RFP
BLY91A	S6	RFP
BLY91C	S6	RFP
BLY92A	S6	RFP
BLY92C	S6	RFP
BLY93A	S6	RFP
BLY93C	S6	RFP
BLY94	S6	RFP
BLY97	S6	RFP

RFP = R.F. power transistors and modules
WBM = Wideband hybrid IC modules

type no.	book	section
BPF10	S8	PDT
BPF24	S8	PDT
BPW22A	S8	PDT
BPW50	S8	PDT
BPX25	S8	PDT
BPX29	S8	PDT
BPX40	S8	PDT
BPX41	S8	PDT
BPX42	S8	PDT
BPX71	S8	PDT
BPX72	S8	PDT
BPX95C	S8	PDT
BR100/03	S2b	Th
BR101	S3	Sm
BRY39	S3	Sm
BRY56	S3	Sm
BRY61	S7	Mm
BRY62	S7	Mm
BS107	S5	FET
BS170	S5	FET
BSD10	S5	FET
BSD12	S5	FET
BSD20	S5/7	FET
BSD22	S5/7	FET
BSD212	S5	FET
BSD213	S5	FET
BSD214	S5	FET
BSD215	S5	FET
BSR12;R	S7	Mm
BSR13;R	S7	Mm
BSR14;R	S7	Mm
BSR15;R	S7	Mm
BSR16;R	S7	Mm
BSR17;R	S7	Mm
BSR17A;R	S7	Mm
BSR18;R	S7	Mm
BSR18A;R	S7	Mm
BSR30	S7	Mm
BSR31	S7	Mm
BSR32	S7	Mm
BSR33	S7	Mm
BSR40	S7	Mm
BSR41	S7	Mm
BSR42	S7	Mm
BSR43	S7	Mm
BSR50	S3	Sm
BSR51	S3	Sm
BSR52	S3	Sm
BSR56	S7/S5	Mm/FET
BSR57	S7/S5	Mm/FET
BSR58	S7/S5	Mm/FET
BSR60	S3	Sm
BSR61	S3	Sm
BSR62	S3	Sm
BSS38	S3	Sm
BSS50	S3	Sm
BSS51	S3	Sm
BSS52	S3	Sm
BSS60	S3	Sm
BSS61	S3	Sm
BSS62	S3	Sm
BSS63;R	S7	Mm
BSS64;R	S7	Mm
BSS68	S3	Sm
BSS83	S5/7	FET/Mm
BST15	S7	Mm
BST16	S7	Mm
BST39	S7	Mm
BST40	S7	Mm
BST50	S7	Mm
BST51	S7	Mm
BST52	S7	Mm
BST60	S7	Mm
BST61	S7	Mm
BST62	S7	Mm
BST70A	S5	FET
BST72A	S5	FET
BST74A	S5	FET
BST76A	S5	FET
BST78	S5	FET
BST80	S5	FET
BST82	S5	FET
BST84	S5	FET
BST86	S5	FET
BST90	S5	FET
BST97	S5	FET
BST100	S5	FET
BST110	S5	FET
BST120	S5	FET
BST122	S5	FET
BSV15	S3	Sm
BSV16	S3	Sm
BSV17	S3	Sm
BSV52;R	S7	Mm
BSV64	S3	Sm
BSV78	S5	FET
BSV79	S5	FET
BSV80	S5	FET
BSV81	S5	FET
BSW66A	S3	Sm
BSW67A	S3	Sm
BSW68A	S3	Sm
BSX19	S3	Sm
BSX20	S3	Sm
BSX45	S3	Sm
BSX46	S3	Sm
BSX47	S3	Sm
BSX59	S3	Sm
BSX60	S3	Sm
BSX61	S3	Sm
BSY95A	S3	Sm
BT136*	S2b	Tri
BT137*	S2b	Tri
BT138*	S2b	Tri
BT139*	S2b	Tri
BT149*	S2b	Th
BT151*	S2b	Th
BT152*	S2b	Th
BT153	S2b	Th
BT155*	S2b	Th

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
Sm = Small-signal transistors
PDT = Photodiodes or transistors
Th = Thyristors
Tri = Triacs

type no.	book	section
BT157*	S2b	Th
BTV24*	S2b	Th
BTV34*	S2b	Tri
BTV58*	S2b	Th
BTV59*	S2b	Th
BTV60*	S2b	Th
BTW23*	S2b	Th
BTW38*	S2b	Th
BTW40*	S2b	Th
BTW42*	S2b	Th
BTW43*	S2b	Tri
BTW45*	S2b	Th
BTW58*	S2b	Th
BTW59*	S2b	Th
BTW63*	S2b	Th
BTW92*	S2b	Th
BTX18*	S2b	Th
BTX94*	S2b	Tri
BTY79*	S2b	Th
BTY91*	S2b	Th
BU208A	S4b	SP
BU208B	S4b	SP
BU326	S4b	SP
BU326A	S4b	SP
BU426	S4b	SP
BU426A	S4b	SP
BU433	S4b	SP
BU505	S4b	SP
BU508A	S4b	SP
BU705	S4b	SP
BU806	S4b	SP
BU807	S4b	SP
BU824	S4b	SP
BU826	S4b	SP
BUS11;A	S4b	SP
BUS12;A	S4b	SP
BUS13;A	S4b	SP
BUS14;A	S4b	SP
BUT11;A	S4b	SP
BUV82	S4b	SP
BUV83	S4b	SP
BUV89	S4b	SP
BUW11;A	S4b	SP
BUW12;A	S4b	SP
BUW13;A	S4b	SP
BUW84	S4b	SP
BUW85	S4b	SP
BUX46;A	S4b	SP
BUX47;A	S4b	SP
BUX48;A	S4b	SP
BUX80	S4b	SP
BUX81	S4b	SP
BUX82	S4b	SP
BUX83	S4b	SP
BUX84	S4b	SP
BUX85	S4b	SP
BUX86	S4b	SP
BUX87	S4b	SP
BUX88	S4b	SP
BUX90	S4b	SP
BUX98	S4b	SP
BUX98A	S4b	SP
BUY89	S4b	SP
BUZ10	S9	PM
BUZ10A	S9	PM
BUZ11	S9	PM
BUZ11A	S9	PM
BUZ14	S9	PM
BUZ15	S9	PM
BUZ20	S9	PM
BUZ21	S9	PM
BUZ23	S9	PM
BUZ24	S9	PM
BUZ25	S9	PM
BUZ30	S9	PM
BUZ31	S9	PM
BUZ32	S9	PM
BUZ33	S9	PM
BUZ34	S9	PM
BUZ35	S9	PM
BUZ36	S9	PM
BUZ40	S9	PM
BUZ41A	S9	PM
BUZ42	S9	PM
BUZ43	S9	PM
BUZ44A	S9	PM
BUZ45	S9	PM
BUZ45A	S9	PM
BUZ45B	S9	PM
BUZ45C	S9	PM
BUZ46	S9	PM
BUZ50A	S9	PM
BUZ50B	S9	PM
BUZ53A	S9	PM
BUZ54	S9	PM
BUZ54A	S9	PM
BUZ60	S9	PM
BUZ60B	S9	PM
BUZ63	S9	PM
BUZ63B	S9	PM
BUZ64	S9	PM
BUZ71	S9	PM
BUZ71A	S9	PM
BUZ72	S9	PM
BUZ72A	S9	PM
BUZ73A	S9	PM
BUZ74	S9	PM
BUZ74A	S9	PM
BUZ76	S9	PM
BUZ76A	S9	PM
BUZ80	S9	PM
BUZ80A	S9	PM
BUZ83	S9	PM
BUZ83A	S9	PM
BUZ84	S9	PM
BUZ84A	S9	PM
BY228	S1	R
BY229*	S2a	R
BY249*	S2a	R
BY260*	S2a	R

* = series
PM = Power MOS transistors
R = Rectifier diodes
SP = Low-frequency switching power transistors
Th = Thyristors
Tri = Triacs

INDEX

* = series
Mm = Microminiature semiconductors for hybrid circuits
R = Rectifier diodes

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

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type no.	book	section
BZY96*	S2a	Vrg
CFX13	S11	M
CFX21	S11	M
CFX30	S11	M
CFX31	S11	M
CFX32	S11	M
CFX33	S11	M
CNX21	S8	PhC
CNX35	S8	PhC
CNX36	S8	PhC
CNX37	S8	PhC
CNX38	S8	PhC
CNX44	S8	PhC
CNX48	S8	PhC
CNX62	S8	PhC
CNY50	S8	PhC
CNY52	S8	PhC
CNY53	S8	PhC
CNY57	S8	PhC
CNY57A	S8	PhC
CNY62	S8	PhC
CNY63	S8	PhC
CQ209S	S8	D
CQ216X	S8	D
CQ216Y	S8	D
CQ327;R	S8	D
CQ330;R	S8	D
CQ331;R	S8	D
CQ332;R	S8	D
CQ427;R	S8	D
CQ430;R	S8	D
CQ431;R	S8	D
CQ432;R	S8	D
CQF24	S8	Ph
CQL10A	S8	Ph
CQL13	S8	Ph
CQL13A	S8	Ph
CQL14A	S8	Ph
CQL14B	S8	Ph
CQN10	S8	LED
CQN11	S8	LED
CQT10	S8	LED
CQT11	S8	LED
CQT12	S8	LED
CQV60(L)	S8	LED
CQV60A(L)	S8	LED
CQV61A(L)	S8	LED
CQV62(L)	S8	LED
CQV70(L)	S8	LED
CQV70A(L)	S8	LED
CQV71A(L)	S8	LED
CQV72(L)	S8	LED
CQV80L	S8	LED
CQV80AL	S8	LED
CQV81L	S8	LED
CQV82L	S8	LED
CQW10(L)	S8	LED
CQW10A(L)	S8	LED
CQW10B(L)	S8	LED
CQW11A(L)	S8	LED
CQW11B(L)	S8	LED
CQW12(L)	S8	LED
CQW12B(L)	S8	LED
CQW20A	S8	LED
CQW21	S8	LED
CQW22	S8	LED
CQW24(L)	S8	LED
CQW54	S8	LED
CQX10	S8	LED
CQX11	S8	LED
CQX12	S8	LED
CQX24(L)	S8	LED
CQX51	S8	LED
CQX54(L)	S8	LED
CQX64(L)	S8	LED
CQX74(L)	S8	LED
CQX74Y	S8	LED
CQY11B	S8	LED
CQY11C	S8	LED
CQY24B(L)	S8	LED
CQY49B	S8	LED
CQY49C	S8	LED
CQY50	S8	LED
CQY52	S8	LED
CQY54A	S8	LED
CQY58A	S8	LED
CQY89A	S8	LED
CQY94	S8	LED
CQY94B(L)	S8	LED
CQY95B	S8	LED
CQY96(L)	S8	LED
CQY97A	S8	LED
LAE2001R	S11	M
LAE4001Q	S11	M
LAE4001R	S11	M
LAE4002S	S11	M
LAE6000Q	S11	M
LBE1004R	S11	M
LBE1010R	S11	M
LBE2003S	S11	M
LBE2005Q	S11	M
LBE2008T	S11	M
LBE2009S	S11	M
LCE1010R	S11	M
LCE2003S	S11	M
LCE2005Q	S11	M
LCE2008T	S11	M
LCE2009S	S11	M
LJE42002T	S11	M
LKE1004R	S11	M
LKE2002T	S11	M
LKE2004T	S11	M
LKE2015T	S11	M
LKE21004R	S11	M
LKE21015T	S11	M
LKE21050T	S11	M
LKE27010R	S11	M
LKE27025R	S11	M
LKE32002T	S11	M
LKE32004T	S11	M

* = series
D = Displays
LED = Light-emitting diodes
M = Microwave transistors
Ph = Photoconductive devices
PhC = Photocouplers
Vrg = Voltage regulator diodes

FET = Field-effect transistors
M = Microwave transistors
P = Low-frequency power transistors
Ph = Photoconductive devices
R = Rectifier diodes
SEN = Sensors
Sm = Small-signal transistors
St = Rectifier stacks
WBM = Wideband hybrid IC modules

type no.	book	section
RPY76B	S8	Ph
RPY86	S8	I
RPY87	S8	I
RPY88	S8	I
RPY89	S8	I
RPY90*	S8	I
RPY91*	S8	I
RPY93	S8	I
RPY94	S8	I
RPY95	S8	I
RPY96	S8	I
RPY97	S8	I
RV3135B5X	S11	M
RX1214B300Y	S11	M
RXB12350Y	S11	M
RZ1214B35Y	S11	M
RZ1214B60W	S11	M
RZ1214B65Y	S11	M
RZ1214B125W	S11	M
RZ1214B125Y	S11	M
RZ1214B150Y	S11	M
RZ2833B45W	S11	M
RZ3135B15U	S11	M
RZ3135B15W	S11	M
RZ3135B25U	S11	M
RZ3135B30W	S11	M
RZB12100Y	S11	M
RZB12350Y	S11	M
RZZ1214B300Y	S11	M
1N821;A	S1	Vrf
1N823;A	S1	Vrf
1N825;A	S1	Vrf
1N827;A	S1	Vrf
1N829;A	S1	Vrf
1N914	S1	SD
1N916	S1	SD
1N3879	S2a	R
1N3880	S2a	R
1N3881	S2a	R
1N3882	S2a	R
1N3883	S2a	R
1N3889	S2a	R
1N3890	S2a	R
1N3891	S2a	R
1N3892	S2a	R
1N3893	S2a	R
1N3909	S2a	R
1N3910	S2a	R
1N3911	S2a	R
1N3912	S2a	R
1N3913	S2a	R
1N4001G	S1	R
1N4002G	S1	R
1N4003G	S1	R
1N4004G	S1	R
1N4005G	S1	R
1N4006G	S1	R
1N4007G	S1	R
1N4148	S1	SD
1N4150	S1	SD
1N4151	S1	SD
1N4153	S1	SD
1N4446	S1	SD
1N4448	S1	SD
1N4531	S1	SD
1N4532	S1	SD
1N5059	S1	R
1N5060	S1	R
1N5061	S1	R
1N5062	S1	R
1N5832	S2a	R
1N5833	S2a	R
1N5834	S2a	R
1N6097	S2a	R
1N6098	S2a	R
2N918	S10	WBT
2N929	S3	Sm
2N930	S3	Sm
2N1613	S3	Sm
2N1711	S3	Sm
2N1893	S3	Sm
2N2219	S3	Sm
2N2219A	S3	Sm
2N2222	S3	Sm
2N2222A	S3	Sm
2N2297	S3	Sm
2N2368	S3	Sm
2N2369	S3	Sm
2N2369A	S3	Sm
2N2483	S3	Sm
2N2484	S3	Sm
2N2904	S3	Sm
2N2904A	S3	Sm
2N2905	S3	Sm
2N2905A	S3	Sm
2N2906	S3	Sm
2N2906A	S3	Sm
2N2907	S3	Sm
2N2907A	S3	Sm
2N3019	S3	Sm
2N3020	S3	Sm
2N3053	S3	Sm
2N3375	S6	RFP
2N3553	S6	RFP
2N3632	S6	RFP
2N3822	S5	FET
2N3823	S5	FET
2N3866	S6	RFP
2N3903	S3	Sm
2N3904	S3	Sm
2N3905	S3	Sm
2N3906	S3	Sm
2N3924	S6	RFP
2N3926	S6	RFP
2N3927	S6	RFP
2N3966	S5	FET
2N4030	S3	Sm
2N4031	S3	Sm
2N4032	S3	Sm
2N4033	S3	Sm

* = series
FET = Field-effect transistors
I = Infrared devices
M = Microwave transistors
Ph = Photoconductive devices
R = Rectifier diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
Vrf = Voltage reference diodes
WBT = Wideband transistors

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A = Accessories
FET = Field-effect transistors
I = Infrared devices
Ph = Photoconductive devices
Sm = Small-signal transistors

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