

# Semiconductors

Book S11

1985

Microwave transistors



# MICROWAVE TRANSISTORS

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- 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**
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IC4	Digital integrated circuits CMOS HE4000B family	
IC5	Digital integrated circuits – ECL ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs	IC08N
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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	<b>Radio, audio and associated systems</b> Bipolar, MOS	(published 1985)
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IC02Nb	<b>Video and associated systems</b> Bipolar, MOS Types TDA2501 to TEA1002	(published 1985)
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IC06N	<b>High-speed CMOS; PC54/74HC/HCT/HCU</b> Logic family	(published 1985)
IC07N	<b>High-speed CMOS; PC54/74HC/HCT/HCU – uncased ICs</b> Logic family	
IC08N	<b>ECL 10K and 100K logic families</b>	(published 1984)
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- 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**

\* Will be issued in 1985.

## SELECTION GUIDE

**GaAs FETs**  
**bipolar transistors**

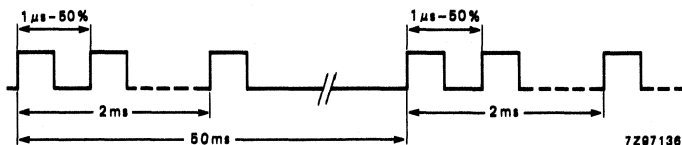
## MICROWAVE GaAs FIELD-EFFECT TRANSISTORS

type	f GHz	V <sub>DS</sub> V	I <sub>D</sub> A	P <sub>L1</sub> (1) mW	N <sub>F</sub> dB	G <sub>po</sub> (2) dB	G <sub>a</sub> 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<sub>L1</sub>.

(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 <sub>CE</sub> V	t <sub>p</sub> at $\delta$ $\mu$ s %	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta$ <sub>C</sub> %	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 <sub>CE</sub> V	t <sub>p</sub> at $\delta$ $\mu$ s %	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta$ <sub>C</sub> %	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 <sub>CE</sub> V	t <sub>p</sub> at $\delta$ $\mu$ s %	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta$ <sub>C</sub> %	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 <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> (1) mW	N <sub>F</sub> dB	G <sub>po</sub> (2) dB	G <sub>a</sub> 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 <sub>CE</sub> V	I <sub>C</sub> A	P <sub>L1</sub> (1) W	G <sub>po</sub> (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<sub>L1</sub>.

## 4. c.w. power transistors

## 4.1 Class-C medium power

type	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	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 <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	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 <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L</sub> mW	envelope	page
PPC5001T	5	20	200	450	FO-102	221
PQC5001T	5	20	200	450	FO-85	221

# TYPE NUMBER SURVEY

## GaAs field-effect transistors

type	f GHz	V <sub>DS</sub> V	I <sub>D</sub> A	P <sub>L1</sub> (1) mW	N <sub>F</sub> dB	G <sub>po</sub> (2) dB	G <sub>a</sub> 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<sub>L1</sub>.

(3) Low-noise type.

Bipolar class-A transistors

type number	f GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> (1) W	G <sub>po</sub> (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<sub>F</sub> = 1,8 dB; G<sub>a</sub> = 12 dB.

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

(2) Low-level power gain associated with P<sub>L1</sub>.

# TYPE NUMBER SURVEY

## Bipolar class-B and pulsed power transistors

type number	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	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	3	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<sub>L</sub> and G<sub>p</sub> under pulsed condition: t<sub>on</sub> = 10  $\mu$ s,  $\delta$  = 1%.

(2) P<sub>L</sub> and G<sub>p</sub> under pulsed condition: t<sub>on</sub> = 10  $\mu$ s,  $\delta$  = 10%.

Bipolar class-B and pulsed power transistors

type number	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	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<sub>L</sub> and G<sub>p</sub> under pulsed condition: t<sub>on</sub> = 100  $\mu$ s,  $\delta$  = 10%.

(2) P<sub>L</sub> and G<sub>p</sub> under pulsed condition: t<sub>on</sub> = 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

∅ : Number

- a) XXX ∅∅∅∅X : transistors without matching cell
- b) XXX ∅∅∅∅∅X : transistors with input matching cell
- c) XX ∅∅∅∅X ∅∅X  
∅∅∅X } 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	K : FO-53	T : FO-41B
B : FO-45	O : FO-57B	V : FO-83
C : FO-46	P : FO-102	W : FO-93
D : FO-58	Q : FO-85	X : FO-91
E : FO-38	R : FO-67A/B	Z : FO-57C
J : FO-41A	S : FO-96	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	W : 45 V
R : 15 - 16 V	X : 24 V
S : 18 V	Y : 50 V
T : 20 (18 - 21) V	Z : 48 V
U : 28 - 30 V	

**∅ 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  $\mu\text{m}$ . 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  $R_a < 0,5 \mu\text{m}$  (preferably by grinding or lapping).
- The sparing use of evenly distributed heatsink compound on the transistor flange is recommended. Suitable heatsink compound brands are: Dow Corning 340, Eccotherm TC-5 (E&C), Wakefield 120.
- The screws through the flange holes should first both be tightened to 0,05 Nm (finger tight), and then tightened to 0,6 to 0,75 Nm, to achieve the published thermal resistance between the mounting base and heatsink.
- When a transistor is removed from the heatsink, the flange will almost certainly have been distorted by the joint pressure. Grinding or lapping of the flange according to the information above is necessary if the transistor is remounted.

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

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

Screw threads, diameter and nuts:

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

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

– Diameter of the mounting hole in the heatsink:

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

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

– Mounting nut torque:

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

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

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

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

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

## 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 As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

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

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

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

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

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

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

**Additional rules for subscripts**

Subscripts for currents

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

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

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

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

Subscripts for voltages

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

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

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

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

Subscripts for supply voltages or supply currents

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

Examples:  $V_{CC}$ ,  $I_{EE}$

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

Example:  $V_{CCE}$

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

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

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

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

Subscripts for multiple devices

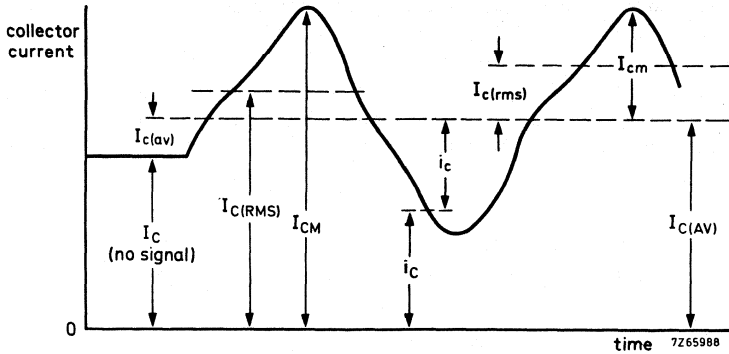
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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

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

**Application of the rules**

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



**LETTER SYMBOLS FOR ELECTRICAL PARAMETERS**

**Definition**

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

**Basic letters**

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

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

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

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

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

### Subscripts

#### General subscripts

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

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

Examples:  $Z_S$ ,  $h_f$ ,  $h_F$

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

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

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

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

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

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

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

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

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

Subscripts for four-pole matrix parameters

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

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

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

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

**Distinction between real and imaginary parts**

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

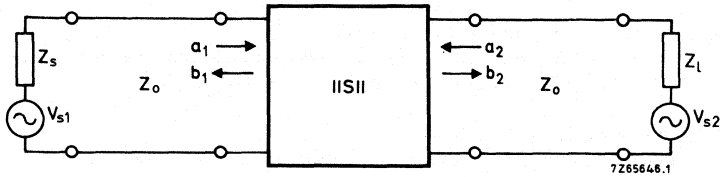
Examples:  $Z_i = R_i + jX_i$   
 $y_{fe} = g_{fe} + jb_{fe}$

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

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

## SCATTERING PARAMETERS

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



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

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

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

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

1)

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

$V_i$  = incident voltage

$V_r$  = reflected (generated) voltage

The four-pole equations for s-parameters are:

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

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

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

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

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

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

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

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

## S-PARAMETERS

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

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

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

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

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

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

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

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

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



**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 ( $0,5 \mu\text{m}$ );
- 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  $T_{\text{case}} = 25 \text{ }^\circ\text{C}$

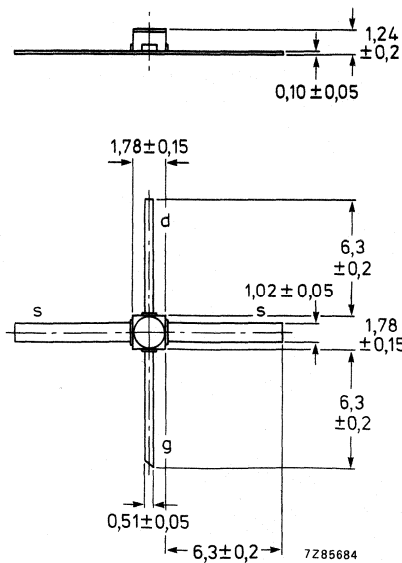
mode of operation	f GHz	$V_{\text{DS}}$ V	$I_{\text{D}}$ mA	$F_{\text{opt}}$ dB	$G_{\text{a}}$ dB	$g_{\text{m}}^*$ mA/V
c.w.	10	3	10	2,2	8	28
	12	3	10	2,5	7,5	28

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

### MECHANICAL DATA

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 $T_{case} = 115\text{ }^{\circ}\text{C}$	$P_{tot}$	max.	300 mW
Storage temperature	$T_{stg}$		$-65$ to $+175\text{ }^{\circ}\text{C}$
Channel temperature	$T_{ch}$	max.	$175\text{ }^{\circ}\text{C}$
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{slid} \leq 8\text{ s}$	$T_{slid}$	max.	$250\text{ }^{\circ}\text{C}$

## THERMAL RESISTANCE

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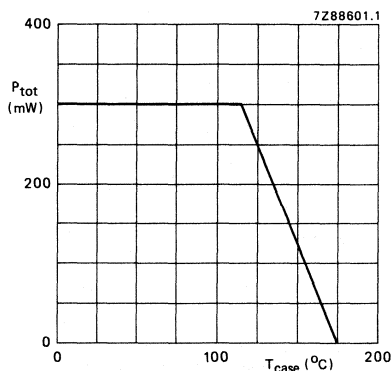


Fig. 2 Power derating curve as a function of case temperature.

## CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$

Gate-source cut-off current  
 $V_{DS} = 3\text{ V}; I_D = 200\text{ }\mu\text{A}$

$I_G$	typ.	1 $\mu\text{A}$
	<	5 $\mu\text{A}$

Saturated drain current  
 $V_{DS} = 3\text{ V}; V_{GS} = 0$

$I_{DSS}$		35 to 100 mA
-----------	--	--------------

Pinch-off voltage

$V_{DS} = 3\text{ V}; I_D = 200\text{ }\mu\text{A}$

$-V(P)GS$	typ.	3 V
		1,5 to 4 V

Mutual transconductance

$V_{DS} = 3\text{ V}; -1\text{ V} < V_{GS} < 0$

$g_m$	>	25 mA/V
	typ.	28 mA/V

Maximum available gain

$V_{DS} = 3\text{ V}; I_D = 35\text{ mA}; f = 10\text{ GHz}$

$G_{AM}$	typ.	10,5 dB
----------	------	---------

$V_{DS} = 3\text{ V}; I_D = 35\text{ mA}; f = 12\text{ GHz}$

$G_{AM}$	typ.	9,0 dB
----------	------	--------

\* K/W is SI unit for  $^{\circ}\text{C}/\text{W}$ .

s-parameters (common source)

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

f GHz	$s_{11}$	$s_{rs}$	$s_{fs}$	$s_{os}$
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.

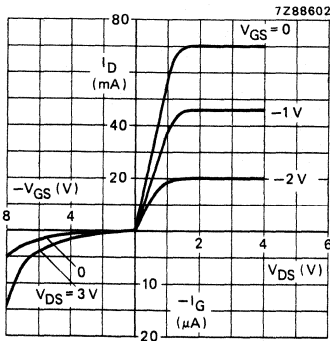


Fig. 3 Drain current as a function of drain-source voltage and gate cut-off current as a function of gate-source voltage. Typical values;  $T_{case} = 25\text{ }^\circ\text{C}$ .

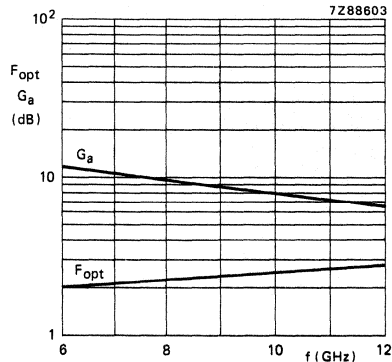


Fig. 4 Noise and associated gain as a function of frequency. Typical values;  $V_{DS} = 3\text{ V}$ ;  $I_D = 10\text{ mA}$ .

APPLICATION INFORMATION

Low-noise amplifier (common-source) at  $T_{case} = 25\text{ }^\circ\text{C}$

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  $T_{case} = 25\text{ }^\circ\text{C}$

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:

$V_{DS} = 3\text{ V}$ ;  $I_D = 10\text{ mA}$ ;  
 $T_{case} = 25\text{ }^\circ\text{C}$ .

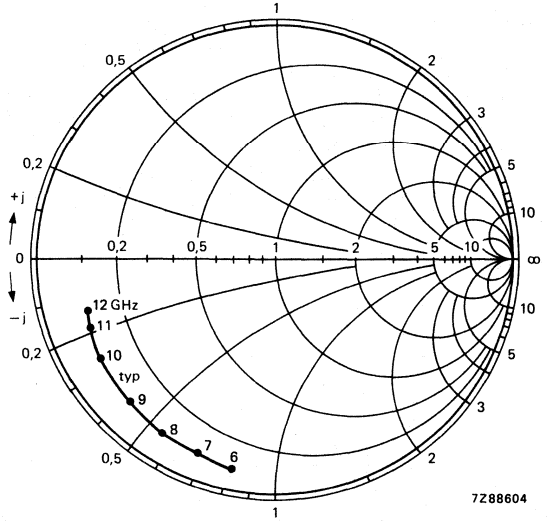


Fig. 5 Input impedance derived from input reflection coefficient  $s_{1S}$  co-ordinates in ohm x 50.

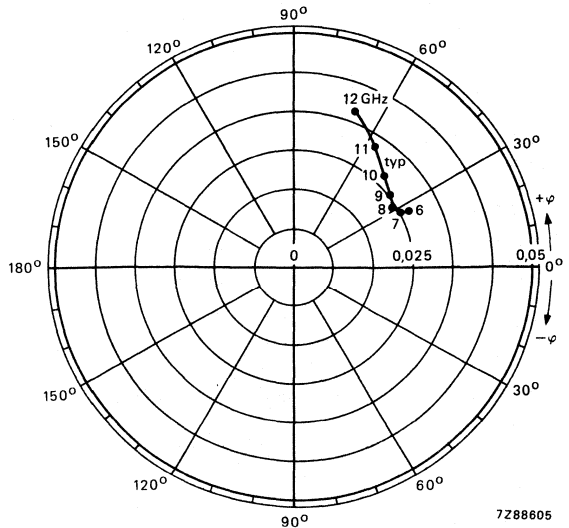


Fig. 6 Reverse transmission coefficient  $s_{rS}$ .

Conditions for Figs 7 and 8:

$V_{DS} = 3 \text{ V}; I_D = 10 \text{ mA};$

$T_{\text{case}} = 25 \text{ }^\circ\text{C}.$

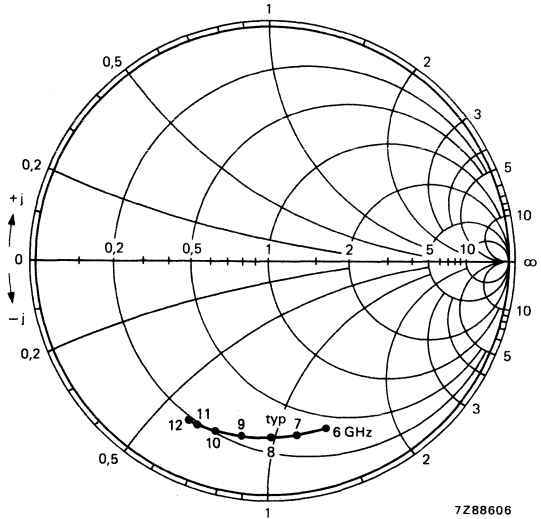


Fig. 7 Output impedance derived from output reflection coefficient  $s_{OS}$  co-ordinates in ohm x 50.

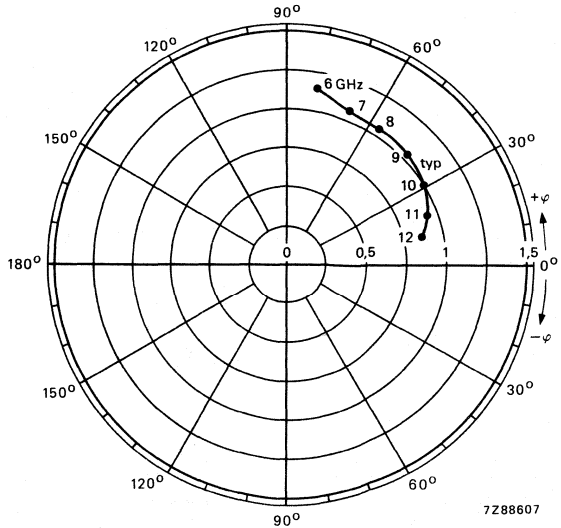


Fig. 8 Forward transmission coefficient  $s_{fs}$ .





## 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 ( $0,8 \mu\text{m}$ );
- 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  $T_{\text{case}} = 25 \text{ }^\circ\text{C}$

mode of operation	f GHz	$V_{\text{DS}}$ V	$I_{\text{D}}$ mA	$P_{\text{L1}}$ mW	$G_{\text{po}}$ dB	$g_{\text{m}}^*$ mA/V
c.w.	8	6	40	80	10	23
	11	6	40	65	7,5	23

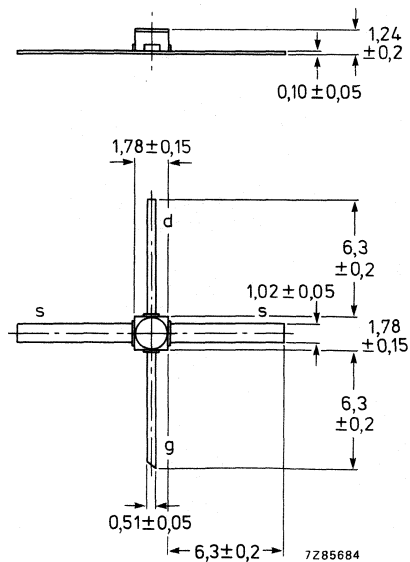
\* Measuring conditions:  $V_{\text{DS}} = 3 \text{ V}$ ;  $-1 \text{ V} < V_{\text{GS}} < 0$

### MECHANICAL DATA

Fig. 1 FO-92.

Source connected to metallized lid.

Dimensions in mm



**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 $T_{case} = 75\text{ }^{\circ}\text{C}$	$P_{tot}$	max.	500 mW
Storage temperature	$T_{stg}$		-65 to +175 $^{\circ}\text{C}$
Channel temperature	$T_{ch}$	max.	175 $^{\circ}\text{C}$
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{slid} \leq 8\text{ s}$	$T_{slid}$	max.	250 $^{\circ}\text{C}$

**THERMAL RESISTANCE**

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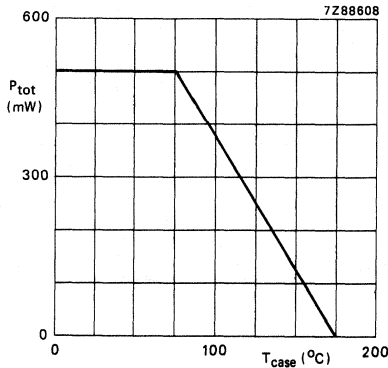


Fig. 2 Power derating curve as a function of case temperature.

**CHARACTERISTICS**

$T_{case} = 25\text{ }^{\circ}\text{C}$

Saturated drain current

$V_{DS} = 3\text{ V}; V_{GS} = 0$

$I_{DSS}$	50 to 110 mA
-----------	--------------

Pinch-off voltage

$V_{DS} = 3\text{ V}; I_D = 200\text{ }\mu\text{A}$

$-V_{(P)GS}$	1,5 to 5 V
--------------	------------

Mutual transconductance

$V_{DS} = 3\text{ V}; -1\text{ V} < V_{GS} < 0$

$g_m$	$> 20\text{ mA/V}$
-------	--------------------

\* K/W is SI unit for  $^{\circ}\text{C/W}$ .

s-parameters (common source)

Typical values;  $V_{DS} = 6\text{ V}$ ;  $I_D = 40\text{ mA}$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$ ;  $Z_o = 50\text{ }\Omega$

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.

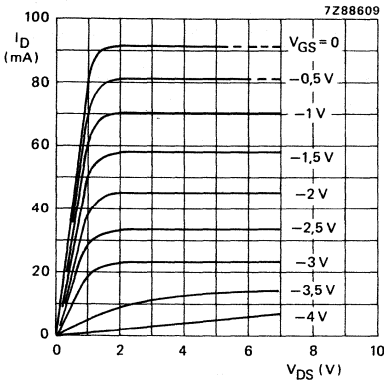


Fig. 3 Typical values;  $T_{case} = 25\text{ }^\circ\text{C}$ .

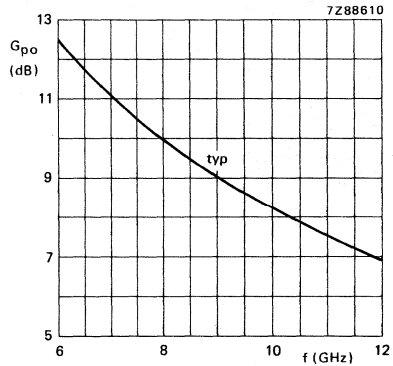


Fig. 4 Linear gain as a function of frequency.  $V_{DS} = 6\text{ V}$ ;  $I_D = 40\text{ mA}$ .

APPLICATION INFORMATION

Linear amplifier (common-source) at  $T_{case} = 25\text{ }^\circ\text{C}$

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  $T_{case} = 25\text{ }^\circ\text{C}$

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:  
 $V_{DS} = 6 \text{ V}$ ;  $I_D = 40 \text{ mA}$ ;  
 $T_{\text{case}} = 25 \text{ }^\circ\text{C}$ .

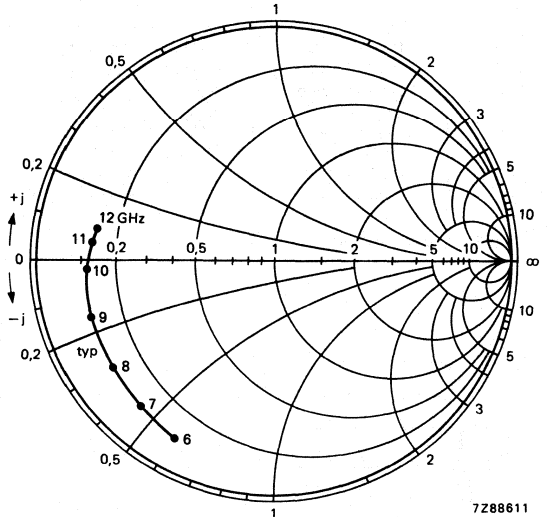


Fig. 5 Input impedance derived from input reflection coefficient  $s_{1S}$  co-ordinates in ohm x 50.

7Z88611

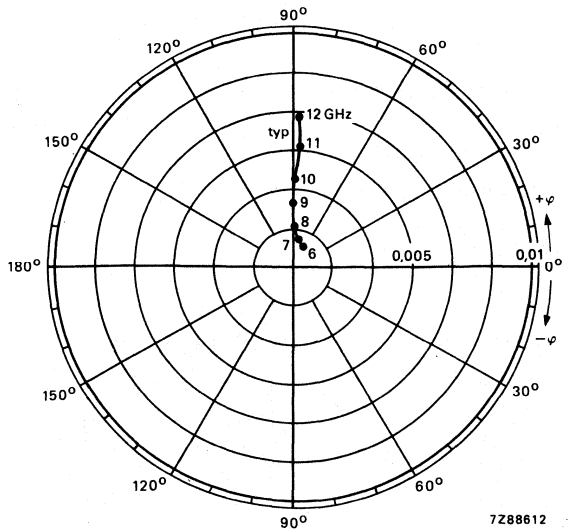


Fig. 6 Reverse transmission coefficient  $s_{rS}$ .

7Z88612

Conditions for Figs 7 and 8:

$V_{DS} = 6 \text{ V}$ ;  $I_D = 40 \text{ mA}$ ;

$T_{case} = 25 \text{ }^\circ\text{C}$ .

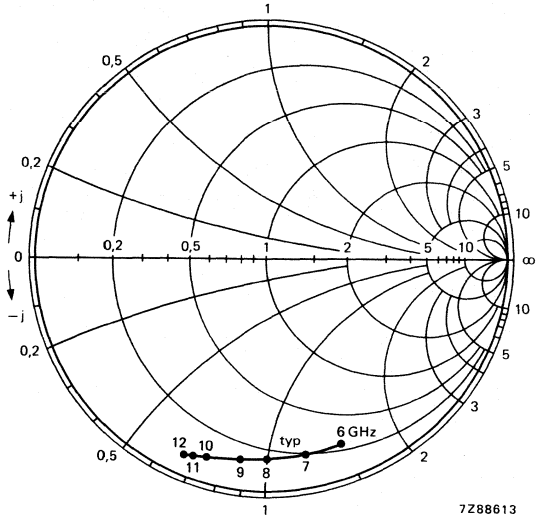


Fig. 7 Output impedance derived from output reflection coefficient  $s_{OS}$  co-ordinates in ohm x 50.

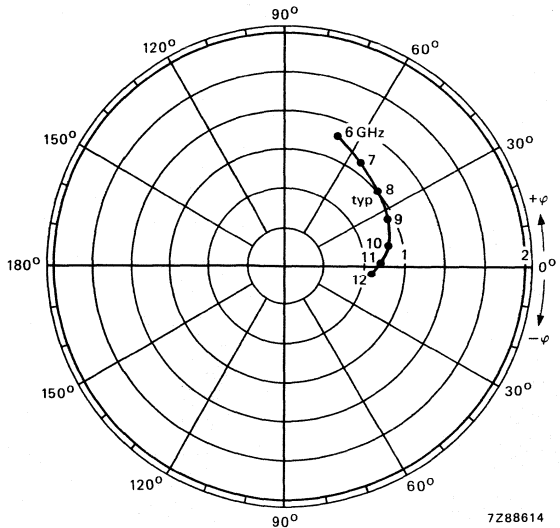


Fig. 8 Forward transmission coefficient  $s_{FS}$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$

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:  $-1\text{ V} < V_{GS} < 0$

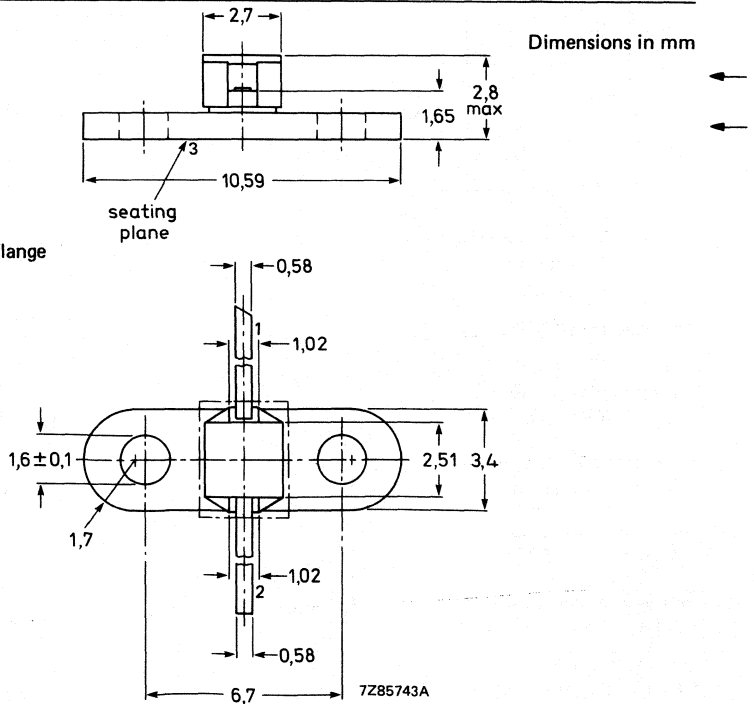
### MECHANICAL DATA

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 $T_{mb} = 25^\circ C$	$P_{tot}$	max.	1650 mW
Storage temperature	$T_{stg}$		$-65$ to $+175^\circ C$
Channel temperature	$T_{ch}$	max.	$175^\circ C$
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} < 8$ s	$T_{sld}$	max.	$250^\circ C$

**THERMAL RESISTANCE**

From channel to mounting base

$R_{th\ ch-mb}$  90 K/W\*

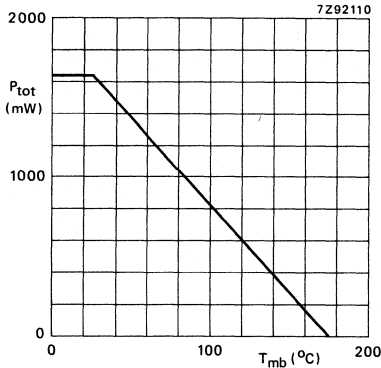


Fig. 2 Power derating curve vs. mounting base temperature.

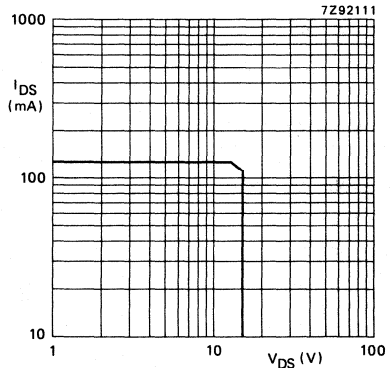


Fig. 3 D.C. SOAR at  $T_{mb} = 25^\circ C$ .

**CHARACTERISTICS**

$T_{mb} = 25^\circ C$

Saturated drain current  
 $V_{DS} = 3$  V;  $V_{GS} = 0$

$I_{DSS}$  typ. 80 mA  
60 to 130 mA

Pinch-off voltage  
 $V_{DS} = 3$  V;  $I_D = 1$  mA

$-V(P)_{GS}$  typ. 2,0 V  
1,2 to 4,0 V

Mutual transconductance  
 $V_{DS} = 3$  V;  $-1$  V  $< V_{GS} < 0$

$g_m$   $>$  40 mA/V  
typ. 60 mA/V

Gate-source leakage current  
 $V_{DS} = 3$  V;  $I_D = 200$   $\mu A$

$I_{GS}$  typ. 20  $\mu A$

\* K/W is SI unit for  $^\circ C/W$ .



S-parameters (common source)

Typical values;  $V_{DS} = 8\text{ V}$ ;  $I_D = 50\text{ mA}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ ;  $Z_0 = 50\text{ }\Omega$ .

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

The figures given between brackets are values in dB.

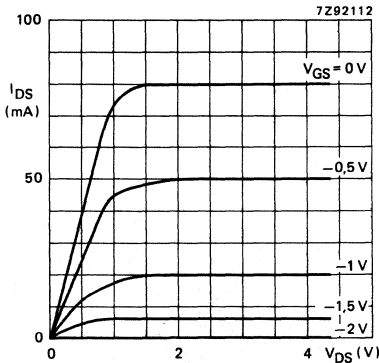


Fig. 4 Typ. values;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

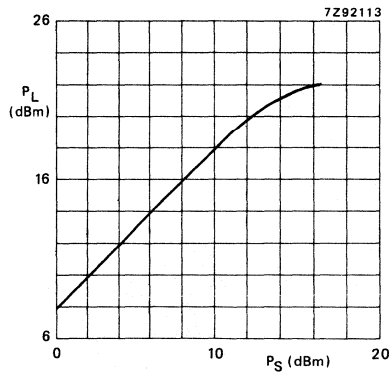


Fig. 5 Load power vs. source power; typ. values;  $V_{DS} = 8\text{ V}$ ;  $I_{DS} = 50\text{ mA}$ ;  $f = 11\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

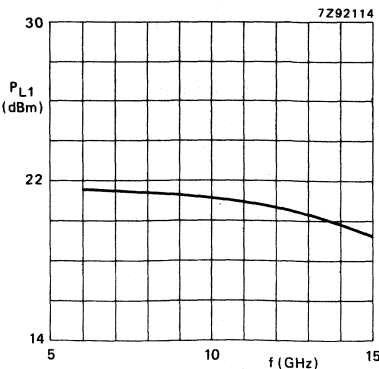


Fig. 6 Load power at 1 dB gain compression vs. frequency;  $V_{DS} = 8\text{ V}$ ;  $I_{DS} = 50\text{ mA}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

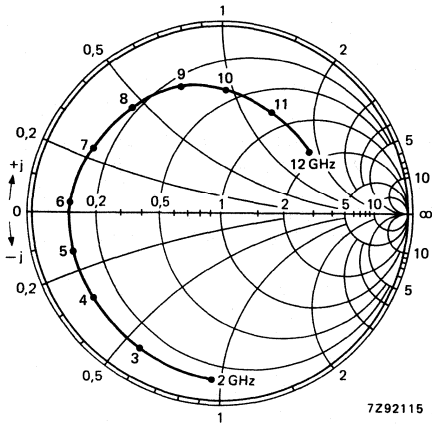


Fig. 7 Input reflection coefficient  $s_{1S}$ .

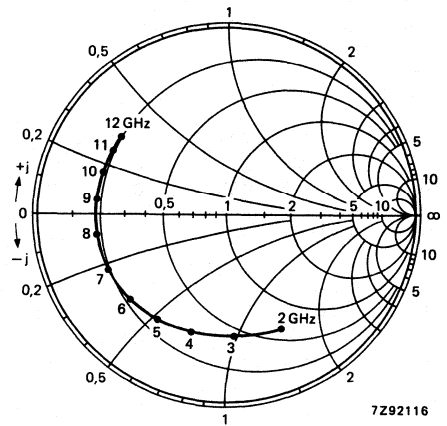


Fig. 8 Output reflection coefficient  $s_{0S}$ .

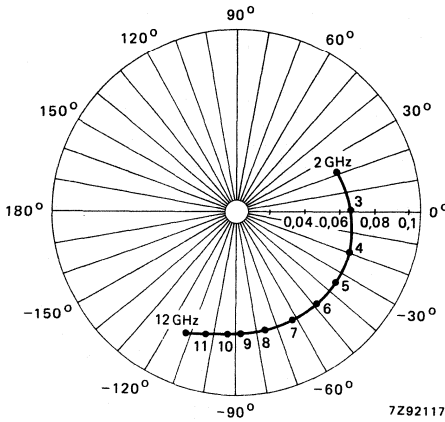


Fig. 9 Reverse transmission coefficient  $s_{1S}$ .

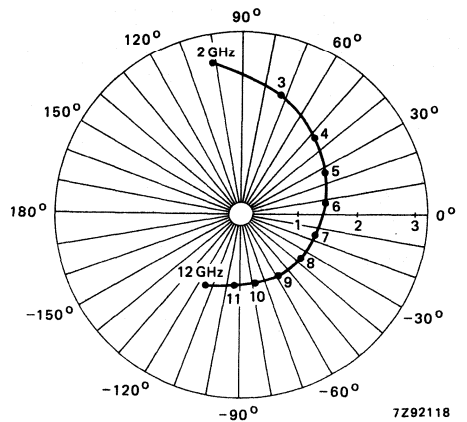


Fig. 10 Forward transmission coefficient  $s_{1S}$ .

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

**APPLICATION INFORMATION**

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

mode of operation	f GHz	$V_{DS}$ V	$I_D$ mA	$P_{L1}$ mW	$G_{p0}$ dB
c.w.	8	8	50	> 100	> 8
	11	8	50	> 100	> 7

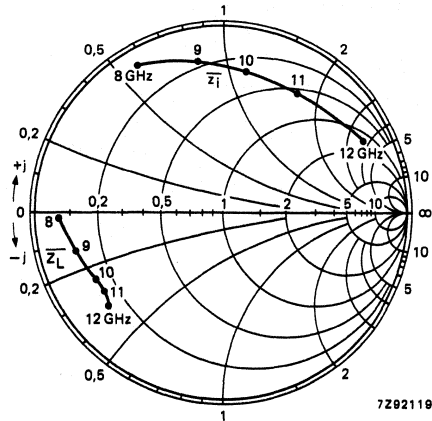


Fig. 11 Input impedance ( $z_i$ ) and optimum load impedance ( $Z_L$ ) vs. frequency (calculated from s-parameters);  $V_{DS} = 8\text{ V}$ ;  $I_D = 50\text{ mA}$ ;  $Z_0 = 50\text{ }\Omega$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$

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:  $-1\text{ V} < V_{GS} < 0$

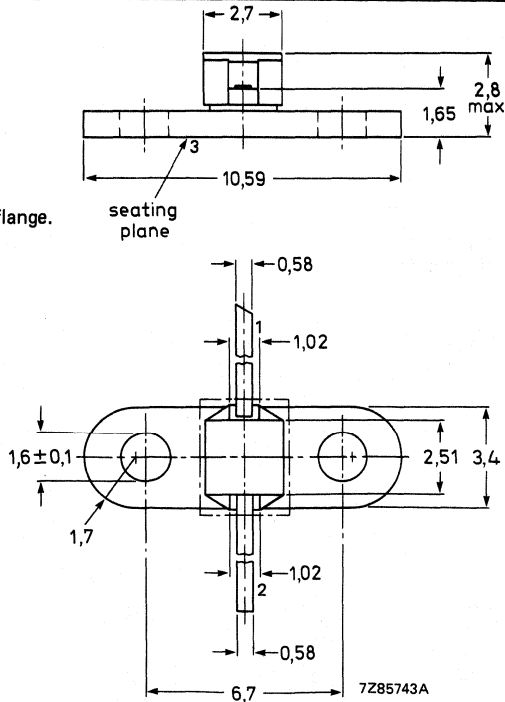
### MECHANICAL DATA

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 $T_{mb} = 25\text{ }^\circ\text{C}$	$P_{tot}$	max.	1650 mW
Storage temperature	$T_{stg}$		-65 to +175 $^\circ\text{C}$
Channel temperature	$T_{ch}$	max.	175 $^\circ\text{C}$
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} < 8\text{ s}$	$T_{sld}$	max.	250 $^\circ\text{C}$

**THERMAL RESISTANCE**

From channel to mounting base

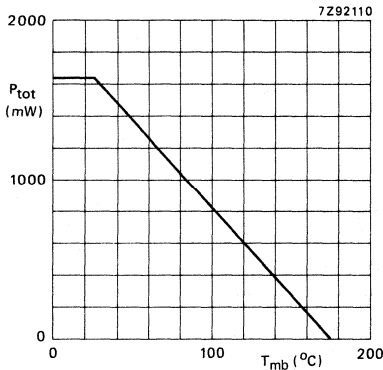


Fig. 2 Power derating curve vs. mounting base temperature.

$R_{th\ ch-mb}$  90 K/W\*

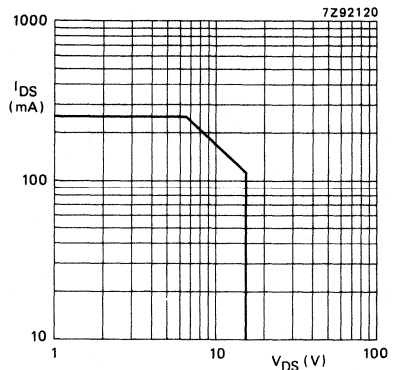


Fig. 3 D.C. SOAR at  $T_{mb} = 25\text{ }^\circ\text{C}$ .

**CHARACTERISTICS**

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

Saturated drain current

$V_{DS} = 3\text{ V}; V_{GS} = 0$

$I_{DSS}$	typ.	160 mA
	130 to	250 mA

Pinch-off voltage

$V_{DS} = 3\text{ V}; I_D = 1\text{ mA}$

$-V(P)GS$	typ.	4,0 V
	2,5 to	6,0 V

Mutual transconductance

$V_{DS} = 3\text{ V}; -1\text{ V} < V_{GS} < 0$

$g_m$	$>$	40 mA/V
	typ.	60 mA/V

Gate-source leakage current

$V_{DS} = 3\text{ V}; I_D = 200\text{ }\mu\text{A}$

$I_{GS}$	typ.	20 $\mu\text{A}$
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\* K/W is SI unit for  $^\circ\text{C}/\text{W}$ .

S-parameters (common-source)

Typical values;  $V_{DS} = 8\text{ V}$ ;  $I_D = 100\text{ mA}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ ;  $Z_0 = 50\text{ }\Omega$ .

f GHz	$S_{11}$	$S_{rs}$	$S_{fs}$	$S_{os}$
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 in dB.

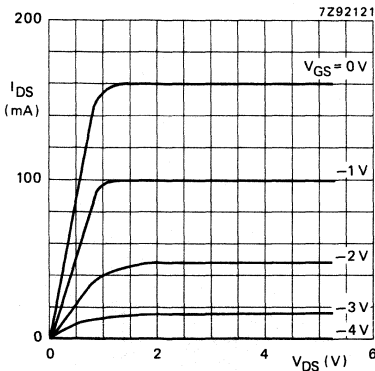


Fig. 4 Typ. values;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

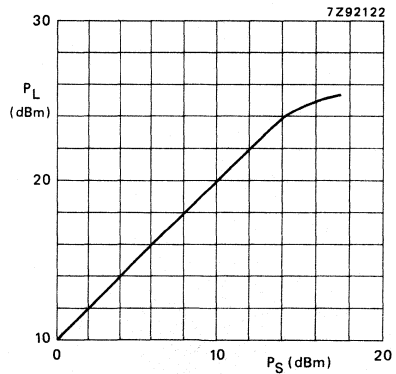


Fig. 5 Load power vs. source power; typ. values;  $V_{DS} = 8\text{ V}$ ;  $I_{DS} = 100\text{ mA}$ ;  $f = 11\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

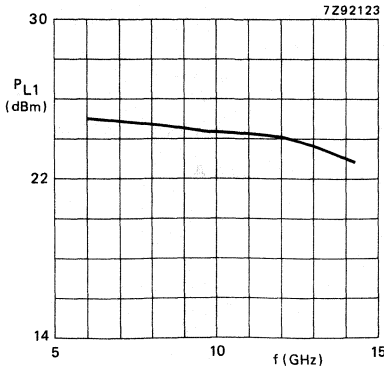


Fig. 6 Load power at 1 dB gain compression vs. frequency;  $V_{DS} = 8\text{ V}$ ;  $I_{DS} = 100\text{ mA}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

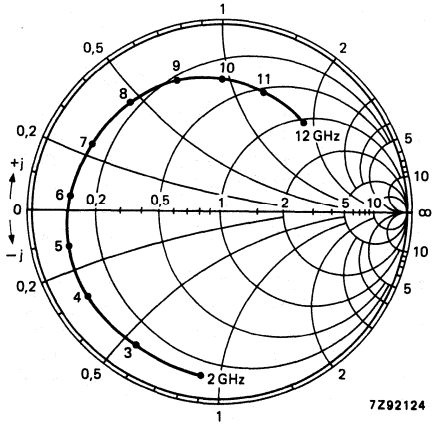


Fig. 7 Input reflection coefficient  $s_{ig}$ .

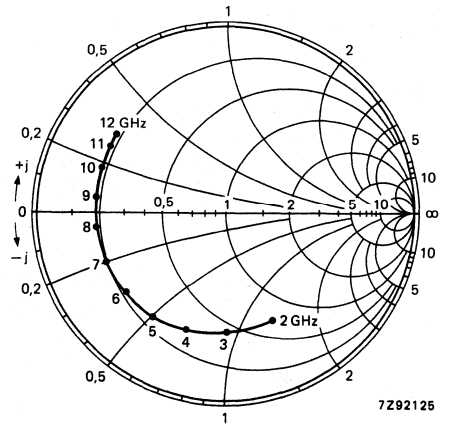


Fig. 8 Output reflection coefficient  $s_{0s}$ .

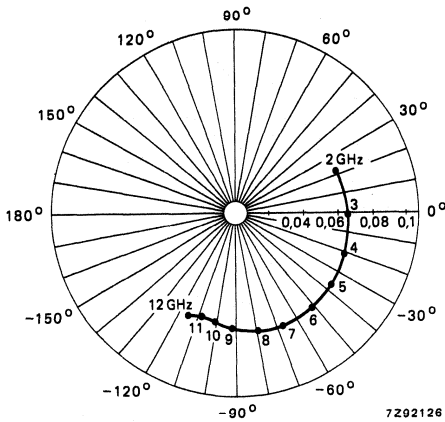


Fig. 9 Reverse transmission coefficient  $s_{rs}$ .

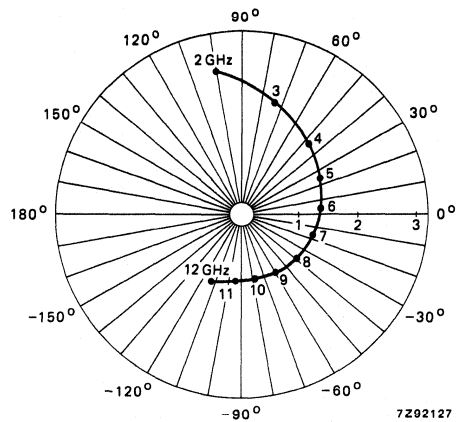


Fig. 10 Forward transmission coefficient  $s_{fs}$ .

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



**APPLICATION INFORMATION**

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

mode of operation	f GHz	V <sub>DS</sub> V	I <sub>D</sub> mA	P <sub>L1</sub> mW	G <sub>po</sub> dB
c.w.	8	8	100	> 250	> 8
	11	8	100	> 250	> 7

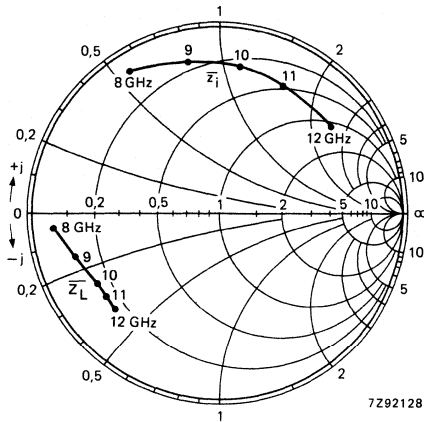


Fig. 11 Input impedance ( $\bar{Z}_i$ ) and optimum load impedance ( $\bar{Z}_L$ ) vs. frequency (calculated from s-parameters);  $V_{DS} = 8\text{ V}$ ;  $I_D = 100\text{ mA}$ ;  $Z_o = 50\text{ }\Omega$ .





**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 $T_{mb} = 25\text{ }^\circ\text{C}$	$P_{tot}$	max.	2,5 W
Storage temperature	$T_{stg}$		-65 to +175 $^\circ\text{C}$
Channel temperature	$T_{ch}$	max.	175 $^\circ\text{C}$
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} \leq 8\text{ s}$	$T_{sld}$	max.	250 $^\circ\text{C}$

**THERMAL RESISTANCE**

From channel to mounting base

$R_{th\ ch-mb}$  60 K/W\*

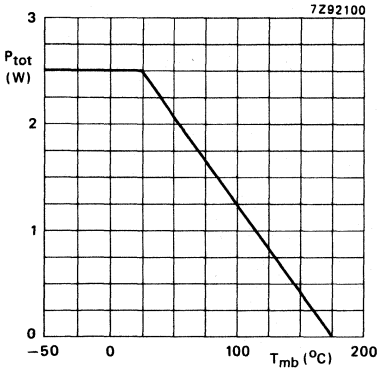


Fig. 2 Power derating curve vs. mounting base temperature.

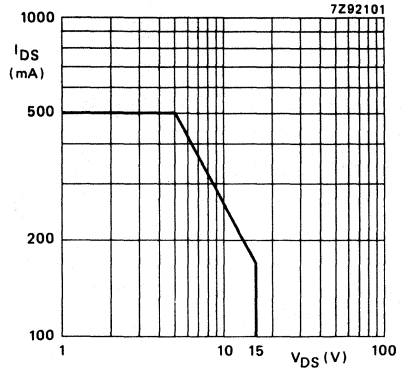


Fig. 3 D.C. SOAR at  $T_{mb} = 25\text{ }^\circ\text{C}$ .

**CHARACTERISTICS**

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

Saturated drain current

$V_{DS} = 3\text{ V}; V_{GS} = 0$

$I_{DSS}$  typ. 350 mA

Pinch-off voltage

$V_{DS} = 3\text{ V}; I_D = 3\text{ mA}$

$-V_{(P)GS}$  typ. 4 V  
2 to 6 V

Mutual transconductance

$V_{DS} = 3\text{ V}; -1\text{ V} < V_{GS} < 0$

$g_m$  min. 80 mA/V  
typ. 120 mA/V

\* K/W is SI unit for  $^\circ\text{C}/\text{W}$ .

S-parameters (common source)

Typical values;  $V_{DS} = 8\text{ V}$ ;  $I_D = 180\text{ mA}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ ;  $Z_o = 50\text{ }\Omega$

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..

DEVELOPMENT DATA

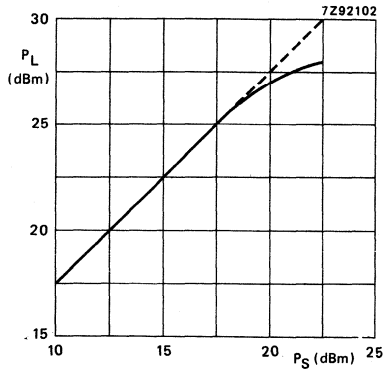


Fig. 4 Load power vs. source power; typ. values;  
 $V_{DS} = 8\text{ V}$ ;  $I_{DS} = 180\text{ mA}$ ;  $f = 8,5\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

APPLICATION INFORMATION

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

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



# DEVELOPMENT DATA

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

CFX33

## 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 configuration at  $T_{mb} = 25\text{ }^{\circ}\text{C}$

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

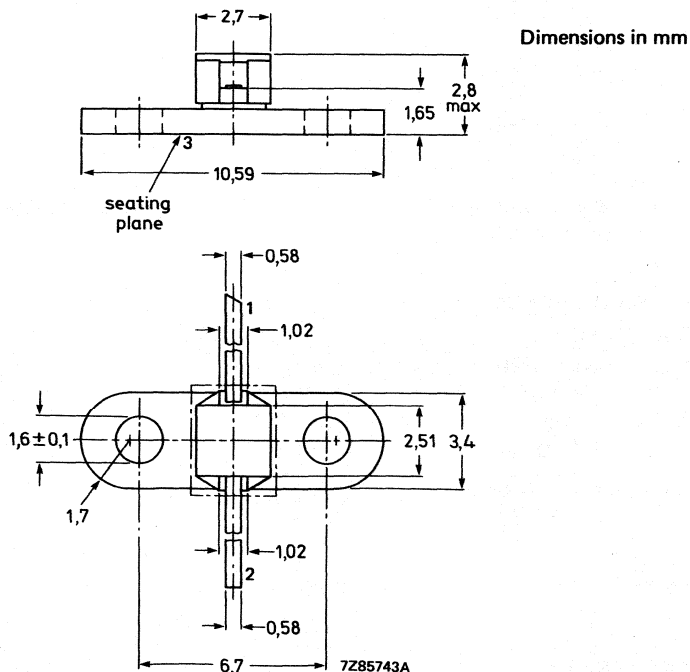
\* Measuring conditions:  $-1\text{ V} < V_{GS} < 0$

### MECHANICAL DATA

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.	1000 mA
Gate current	$I_G$	max.	8 mA
Total power dissipation up to $T_{mb} = 25\text{ }^\circ\text{C}$	$P_{tot}$	max.	5 W
Storage temperature	$T_{stg}$		$-65$ to $+175\text{ }^\circ\text{C}$
Channel temperature	$T_{ch}$	max.	$175\text{ }^\circ\text{C}$
Lead soldering temperature up to 0,1 mm from transistor edge; $t_{sld} \leq 8\text{ s}$	$T_{sld}$	max.	$250\text{ }^\circ\text{C}$

**THERMAL RESISTANCE**

From channel to mounting base

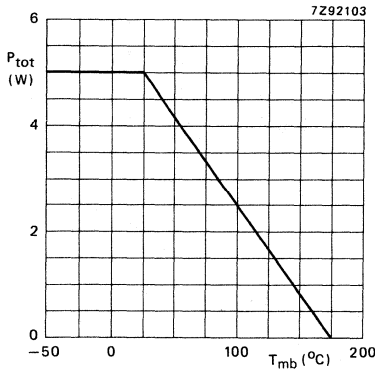


Fig. 2 Power derating curve vs. mounting base temperature.

$R_{th\ ch-mb}$  30 K/W\*

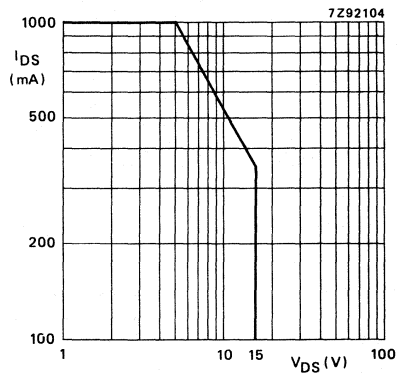


Fig. 3 D.C. SOAR at  $T_{mb} = 25\text{ }^\circ\text{C}$ .

**CHARACTERISTICS**

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

Saturated drain current

$V_{DS} = 3\text{ V}; V_{GS} = 0$

$I_{DSS}$	typ.	700 mA
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Pinch-off voltage

$V_{DS} = 3\text{ V}; I_D = 5\text{ mA}$

$-V(P)_{GS}$	typ.	4 V
		2 to 6 V

Mutual transconductance

$V_{DS} = 3\text{ V}; -1\text{ V} < V_{GS} < 0$

9m	min.	160 mA/V
	typ.	240 mA/V

\* K/W is SI unit for  $^\circ\text{C}/\text{W}$ .



s-parameters (common source)

Typical values;  $V_{DS} = 8\text{ V}$ ;  $I_D = 370\text{ mA}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ ;  $Z_0 = 50\text{ }\Omega$

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.

DEVELOPMENT DATA

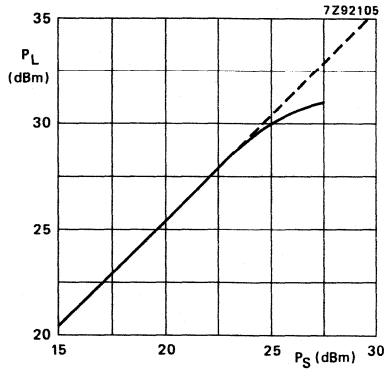


Fig. 4 Load power vs. source power; typ. values;  
 $V_{DS} = 8\text{ V}$ ;  $I_{DS} = 370\text{ mA}$ ;  $f = 8,5\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

APPLICATION INFORMATION

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

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



## **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.

- Interdigitated 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	$V_{CE}$ V	$I_C$ mA	$PL_1$ mW	$G_{po}$ dB
c.w. class-A	2	15	35	120	8

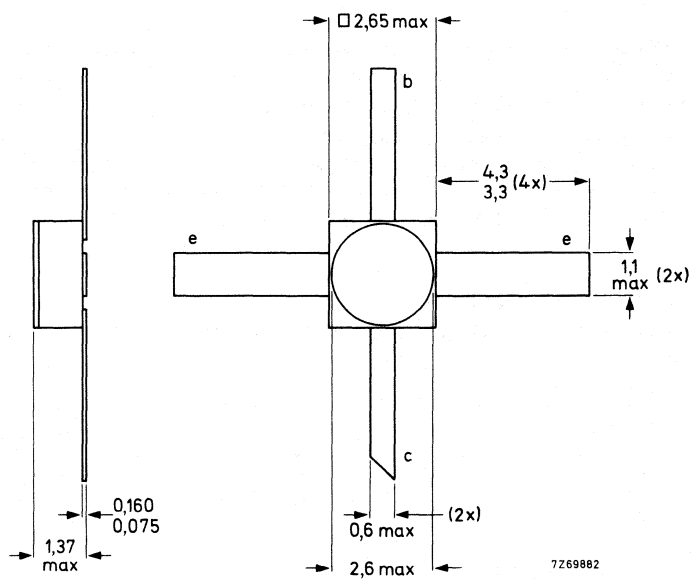
### MECHANICAL DATA

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 ( $R_{BE} = 50 \Omega$ ) (open base)	$V_{CER}$	max.	30 V
	$V_{CEO}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	+235 °C

THERMAL RESISTANCE

From junction to case	$R_{th\ j-c}$	180 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	4	15	30	90	6,5	$8 + j28$	$10 + j28$

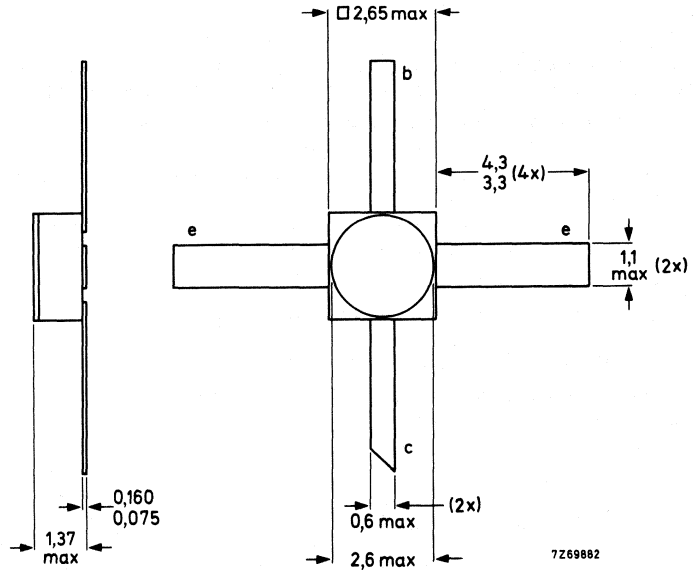
### MECHANICAL DATA

SOT-100 (see Fig. 1)

**MECHANICAL DATA**

Fig. 1 SOT-100.

Dimensions in mm



7269882

**RATINGS**

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

Collector-base voltage (open emitter)	$V_{CB0}$	max.	30 V
Collector-emitter voltage ( $R_{BE} = 220 \Omega$ ) (open base)	$V_{CER}$	max.	25 V
	$V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3 V
Collector current	$I_C$	max.	140 mA
Total power dissipation ( $T_{mb} = 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	700 mW
Junction temperature	$T_j$		-65 to 200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	+235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to case	$R_{th \text{ j-c}}$	180 K/W
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## 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  $T_{\text{case}} = 25^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	$V_{\text{CE}}$ V	$I_{\text{C}}$ mA	$P_{\text{L1}}$ mW	$G_{\text{po}}$ dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; linear amplifier	4	15	25	typ. 110	typ. 9,5	typ. $7 + j22$	typ. $10 + j38$

### MECHANICAL DATA

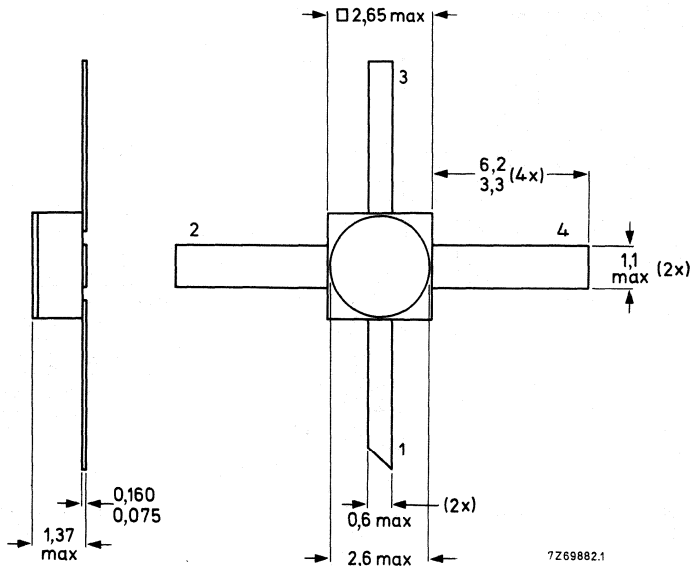
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

#### Pinning :

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



7Z69882.1

#### 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 ( $R_{BE} = 220 \Omega$ ) (open base)	$V_{CER}$	max.	25 V
	$V_{CEO}$	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 $T_{case} = 100^\circ C$	$P_{tot}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	235 °C

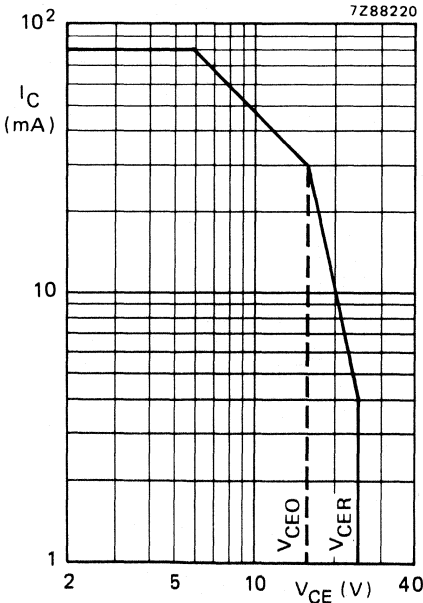


Fig. 2 D.C. SOAR at  $T_{case} \leq 100^\circ C$ ;  
 $R_{BE} < 220 \Omega$ .

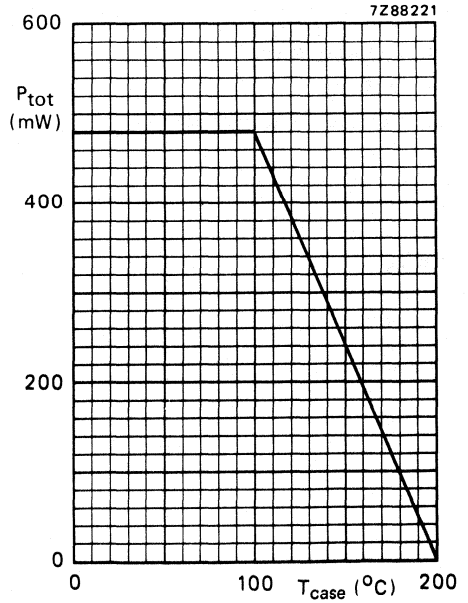


Fig. 3 Power derating curve vs. temperature.

**THERMAL RESISTANCE**

From junction to case

$R_{th\ j-c} = 210\ K/W^*$

\*K/W is SI unit for  $^\circ C/W$ .

## CHARACTERISTICS

 $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ 

Collector cut-off current

 $I_E = 0; V_{CB} = 15\text{ V}$  $I_{CBO} < 100\text{ nA}$  $I_E = 0; V_{CB} = 30\text{ V}$  $I_{CBO} < 100\text{ }\mu\text{A}$  $V_{CB} = 25\text{ V}; R_{BE} = 220\text{ }\Omega$  $I_{CER} < 500\text{ }\mu\text{A}$ 

Emitter cut-off current

 $I_C = 0; V_{EB} = 1,5\text{ V}$  $I_{EBO} < 35\text{ nA}$  $I_C = 0; V_{EB} = 2,0\text{ V}$  $I_{EBO} < 0,15\text{ }\mu\text{A}$ 

D.C. current gain

 $I_C = 25\text{ mA}; V_{CE} = 5\text{ V}$  $h_{FE} \quad 20\text{ to }220$ Collector-base capacitance at  $f = 1\text{ MHz}$  $I_E = I_C = 0; V_{CB} = 15\text{ V}; V_{EB} = 1,5\text{ V}$  $C_{cb} \quad \text{typ.} \quad 0,25\text{ pF}$ Collector-emitter capacitance at  $f = 1\text{ MHz}$  $I_E = I_C = 0; V_{CE} = 15; V_{EB} = 1,5\text{ V}$  $C_{ce} \quad \text{typ.} \quad 0,5\text{ pF}$ Emitter-base capacitance at  $f = 1\text{ MHz}$  $I_E = I_C = 0; V_{EB} = 1,0\text{ V}; V_{CB} = 15\text{ V}$  $C_{eb} \quad \text{typ.} \quad 1,3\text{ pF}$ 

Forward power gain

 $I_C = 25\text{ mA}; V_{CE} = 15\text{ V}; f = 2\text{ GHz}$  $|s_{fe}|^2 \quad \text{typ.} \quad 9,6\text{ dB}$  $I_C = 25\text{ mA}; V_{CE} = 15\text{ V}; f = 4\text{ GHz}$  $|s_{fe}|^2 \quad \text{typ.} \quad 3,8\text{ dB}$ 

Maximum available gain

 $I_C = 25\text{ mA}; V_{CE} = 15\text{ V}; f = 2\text{ GHz}$  $G_{AM} \quad \text{typ.} \quad 16\text{ dB}$  $I_C = 25\text{ mA}; V_{CE} = 15\text{ V}; f = 4\text{ GHz}$  $G_{AM} \quad \text{typ.} \quad 10\text{ dB}$

## s-parameters (common emitter)

Typical values;  $V_{CE} = 15 \text{ V}$ ;  $I_C = 25 \text{ mA}$ ;  $T_{\text{case}} = 25 \text{ }^\circ\text{C}$ ;  $Z_0 = 50 \text{ } \Omega$ 

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  $T_{case} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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  $P_{L1}$ .

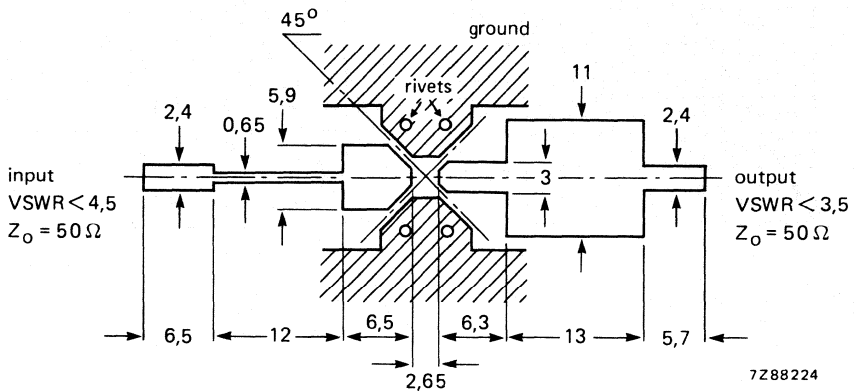


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

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

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

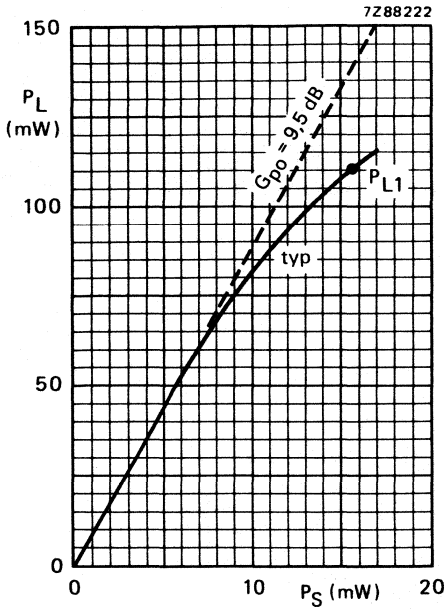


Fig. 5  $V_{CE} = 15 \text{ V}$ ;  $I_C = 25 \text{ mA}$ ;  $f = 4 \text{ GHz}$ ;  $T_{case} = 25^\circ\text{C}$ .

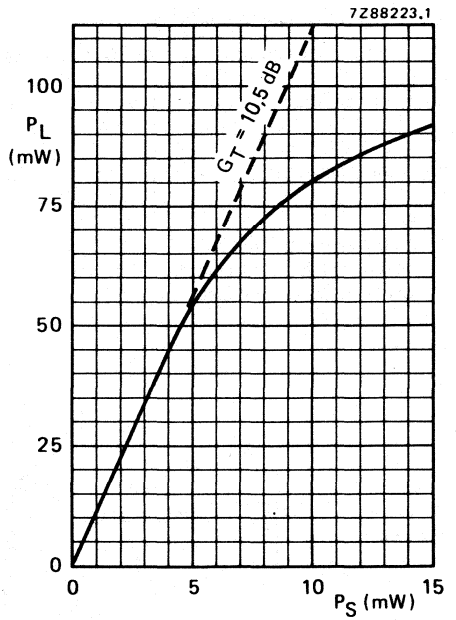


Fig. 6  $V_{CE} = 15 \text{ V}$ ;  $I_C = 25 \text{ mA}$ ;  $f = 4 \text{ GHz}$ ; maximum low-level linear power gain.

## 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  $T_{case} = 25\text{ }^{\circ}\text{C}$  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	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; linear amplifier	4	18	30	typ. 160	typ. 8	typ. $4 + j23$	typ. $6,5 + j32$

### MECHANICAL DATA

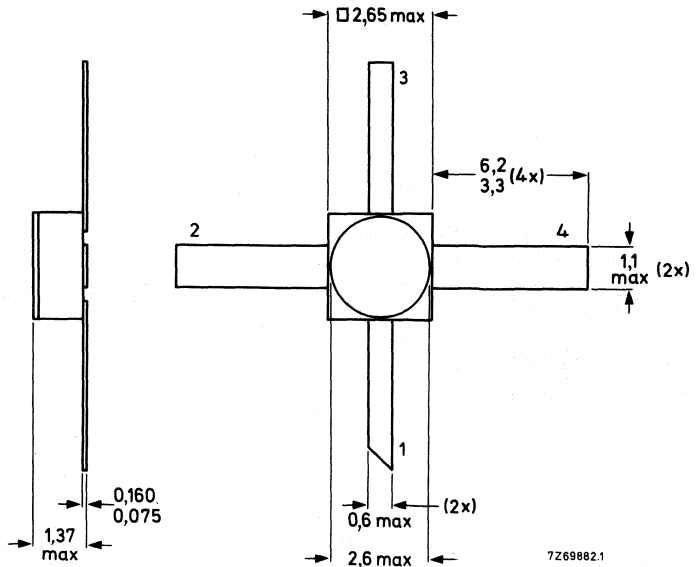
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

#### Pinning :

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



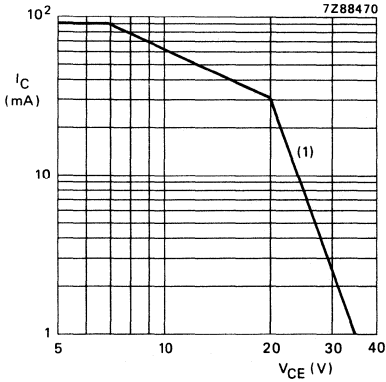
#### Marking code

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 ( $R_{BE} = 220 \Omega$ ) (open base)	$V_{CER}$	max.	35 V
	$V_{CEO}$	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 $T_{case} = 75^\circ C$	$P_{tot}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	235 °C



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

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

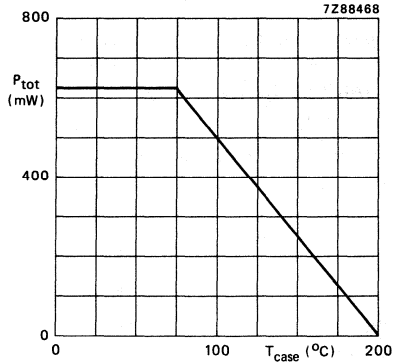


Fig. 3 Power derating curve vs. temperature.

**THERMAL RESISTANCE**

From junction to case

$$R_{th\ j-c} = 200\ K/W^*$$

\* K/W is SI unit for °C/W.



## CHARACTERISTICS

 $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ 

Collector cut-off current

 $I_E = 0; V_{CB} = 20\text{ V}$  $I_{CBO} < 100\text{ nA}$  $I_E = 0; V_{CB} = 40\text{ V}$  $I_{CBO} < 150\text{ }\mu\text{A}$  $V_{CB} = 35\text{ V}; R_{BE} = 220\text{ }\Omega$  $I_{CER} < 500\text{ }\mu\text{A}$ 

Emitter cut-off current

 $I_C = 0; V_{EB} = 1,5\text{ V}$  $I_{EBO} < 50\text{ nA}$  $I_C = 0; V_{EB} = 3,0\text{ V}$  $I_{EBO} < 25\text{ }\mu\text{A}$ 

D.C. current gain

 $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$  $h_{FE} \quad 15\text{ to }150$ Collector-base capacitance at  $f = 1\text{ MHz}$  $I_E = I_C = 0; V_{CB} = 18\text{ V}; V_{EB} = 1,5\text{ V}$  $C_{cb} \quad \text{typ.} \quad 0,3\text{ pF}$ Collector-emitter capacitance at  $f = 1\text{ MHz}$  $I_E = I_C = 0; V_{CE} = 18\text{ V}; V_{EB} = 1,5\text{ V}$  $C_{ce} \quad \text{typ.} \quad 0,55\text{ pF}$ Emitter-base capacitance at  $f = 1\text{ MHz}$  $I_E = I_C = 0; V_{EB} = 1,0\text{ V}; V_{CB} = 18\text{ V}$  $C_{eb} \quad \text{typ.} \quad 1,8\text{ pF}$ 

Forward power gain

 $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 2\text{ GHz}$  $|s_{fe}|^2 \quad \text{typ.} \quad 8,8\text{ dB}$  $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 4\text{ GHz}$  $|s_{fe}|^2 \quad \text{typ.} \quad 2,8\text{ dB}$ 

Maximum available gain

 $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 2\text{ GHz}$  $G_{AM} \quad \text{typ.} \quad 14\text{ dB}$  $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 3\text{ GHz}$  $G_{AM} \quad \text{typ.} \quad 11\text{ dB}$

s-parameters (common emitter)

Typical values;  $V_{CE} = 18\text{ V}$ ;  $I_C = 30\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  $Z_o = 50\text{ }\Omega$

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;  $V_{CE} = 15\text{ V}$ ;  $I_C = 15\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  $Z_o = 50\text{ }\Omega$

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;  $V_{CE} = 18 \text{ V}$ ;  $I_C = 10 \text{ mA}$ ;  $T_{case} = 25 \text{ }^\circ\text{C}$ ;  $Z_o = 50 \text{ } \Omega$ 

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  $T_{case} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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  $P_{L1}$ .

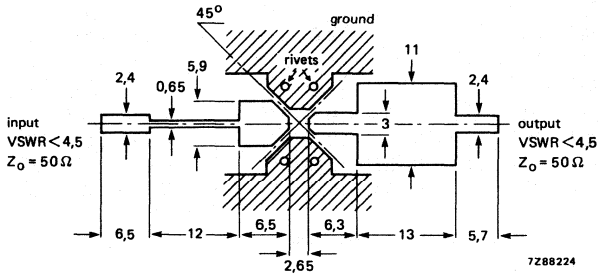


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

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

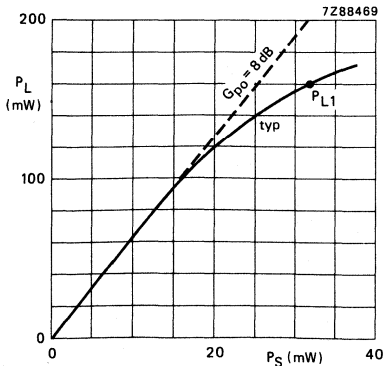


Fig. 5  $V_{CE} = 18\text{ V}$ ;  $I_C = 30\text{ mA}$ ;  
 $f = 4\text{ GHz}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ .

\* 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  $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	$V_{\text{CE}}$ V	$I_{\text{C}}$ mA	$F_{\text{min}}$ dB	$G_{\text{a}}$ dB
c.w.; linear amplifier	2	10	4	typ. 1,8	typ. 12

### MECHANICAL DATA

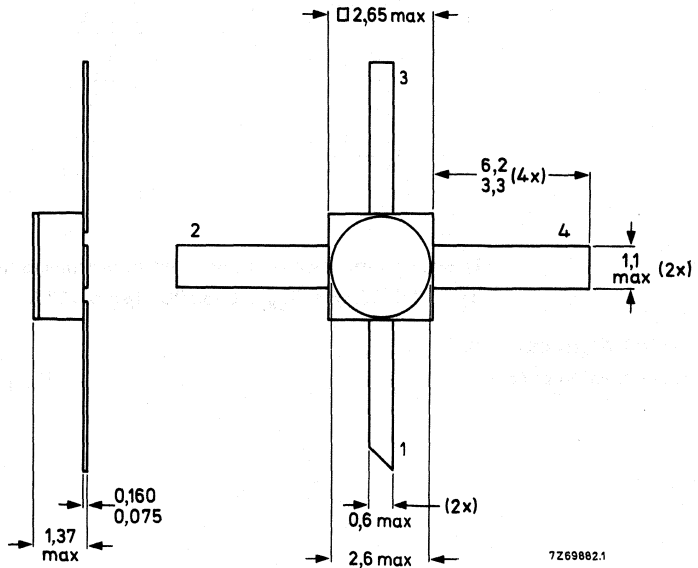
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

#### Pinning :

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



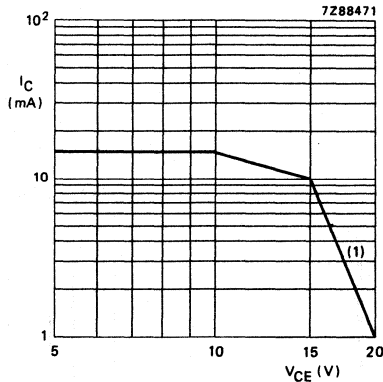
#### Marking code

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 ( $R_{BE} = 150 \Omega$ ) (open base)	$V_{CER}$ $V_{CEO}$	max. max.	20 V 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 $T_{case} = 150 \text{ }^\circ\text{C}$	$P_{tot}$	max.	150 mW
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$



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

Fig. 2 D.C. SOAR at  $T_{case} \leq 150 \text{ }^\circ\text{C}$ ;  $R_{BE} \leq 150 \Omega$ .

**THERMAL RESISTANCE**

From junction to case

$$R_{th\ j-c} = 300 \text{ K/W}^*$$

\* K/W is SI unit for  $^\circ\text{C/W}$ .

**CHARACTERISTICS**

$T_{case} = 25\text{ }^{\circ}\text{C}$

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

$I_{CBO} < 100\text{ nA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_{EBO} < 15\text{ nA}$

D.C. current gain

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

$h_{FE} \quad 20\text{ to }250$

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

$I_E = I_C = 0; V_{CB} = 10\text{ V}$

$C_{cb} \quad \text{typ. } 0,15\text{ pF}$

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

$I_E = I_C = 0; V_{CE} = 10\text{ V}$

$C_{ce} \quad \text{typ. } 0,50\text{ pF}$

Emitter-base capacitance at  $f = 1\text{ MHz}$

$I_E = I_C = 0; V_{EB} = 1,0\text{ V}; V_{CB} = 10\text{ V}$

$C_{eb} \quad \text{typ. } 0,70\text{ pF}$

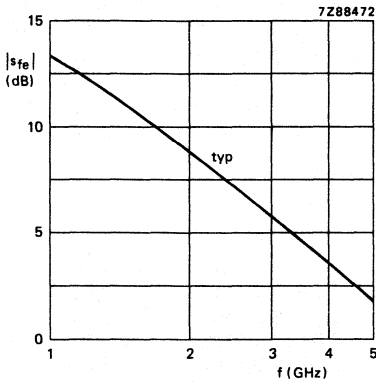


Fig. 3  $V_{CE} = 10\text{ V}; I_C = 4\text{ mA}; T_{case} = 25\text{ }^{\circ}\text{C}; Z_0 = 50\text{ }\Omega$ .

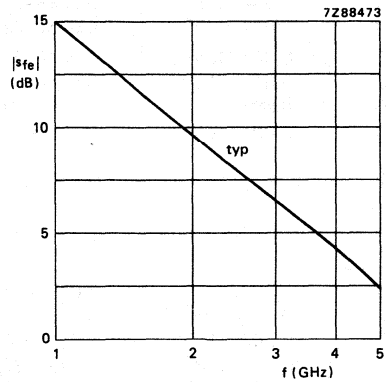


Fig. 4  $V_{CE} = 10\text{ V}; I_C = 8\text{ mA}; T_{case} = 25\text{ }^{\circ}\text{C}; Z_0 = 50\text{ }\Omega$ .

s-parameters (common emitter)

Typical values;  $V_{CE} = 10\text{ V}$ ;  $I_C = 4\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  $Z_0 = 50\text{ }\Omega$

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;  $V_{CE} = 10\text{ V}$ ;  $I_C = 8\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  $Z_0 = 50\text{ }\Omega$

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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
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

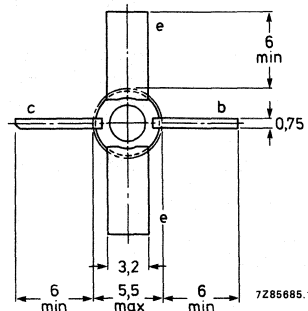
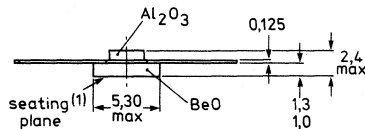
Dimensions in mm

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).

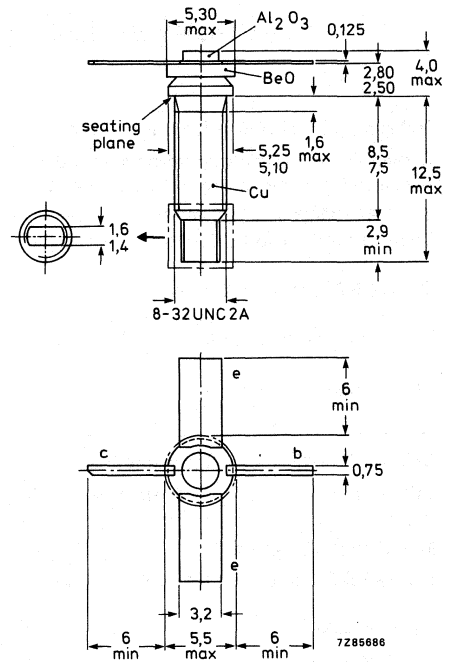
Marking code

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 $R_{BE} = 250 \Omega$ $R_{BE} = 500 \Omega$ open base	$V_{CER}$	max. —	30	V
	$V_{CER}$	max. 30	—	V
	$V_{CEO}$	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 $T_{mb} = 75^\circ C$	$P_{tot}$	max. 3	6	W
Storage temperature	$T_{stg}$	-65 to +150		$^\circ C$
Operating junction temperature	$T_j$	max.	200	$^\circ C$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10$ s	$T_{sld}$	max.	235	$^\circ C$

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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

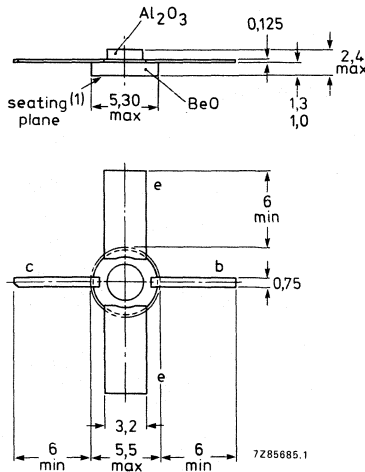
Fig. 1a LBE2003S and LBE2009S.

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)**

Fig. 1b LCE2003S and LCE2009S.

→ FO-46

**Marking code**

RTC406 = LCE2003S

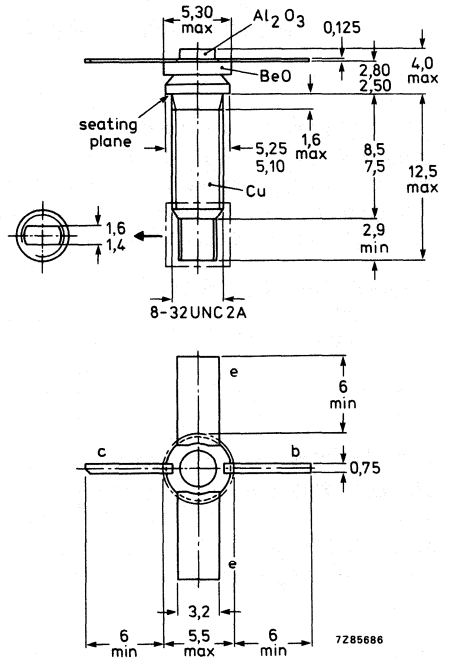
RTC408 = LCE2009S

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

→

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

Dimensions in mm

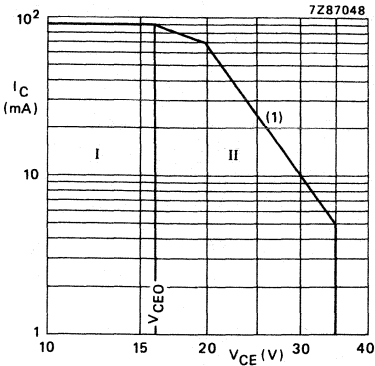


**RATINGS**

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 $R_{BE} = 100 \Omega$	$V_{CER}$	max.	—	35	V
$R_{BE} = 220 \Omega$ (open base)	$V_{CER}$	max.	35	—	V
Emitter-base voltage (open collector)	$V_{CEO}$	max.	16	16	V
Collector current (d.c.)	$I_C$	max.	3	3	V
Total power dissipation up to $T_{mb} = 75^\circ C$	$P_{tot}$	max.	90	250	mA
Storage temperature	$T_{stg}$		1,4	3,5	W
Operating junction temperature	$T_j$	max.	-65 to +150		$^\circ C$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10 s$	$T_{sld}$	max.	200		$^\circ C$
			235		$^\circ C$

LBE/LCE2003S



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

Fig. 2 D.C. SOAR at  $T_{mb} \leq 75^\circ\text{C}$ .

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

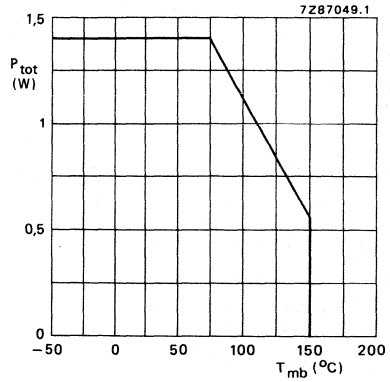
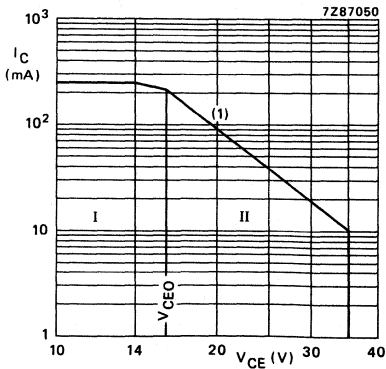


Fig. 3 Power derating curve vs. mounting base temperature.

LBE/LCE2009S



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

Fig. 4 D.C. SOAR at  $T_{mb} \leq 75^\circ\text{C}$ .

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

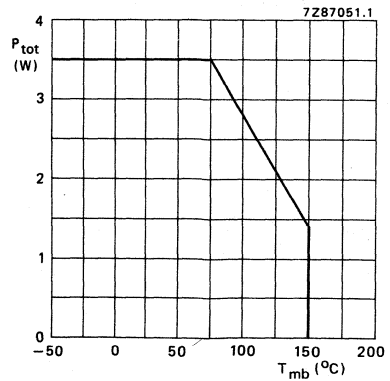


Fig. 5 Power derating curve vs. mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base  
From mounting base to heatsink

		LBE/LCE 2003S	LBE/LCE 2009S	
$R_{th\ j-mb}$	=	65	36	K/W*
$R_{th\ mb-h}$	=	1,5	1,5	K/W*

**CHARACTERISTICS**

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

**Collector cut-off current**

$I_E = 0; V_{CB} = 20\ \text{V}$

$I_E = 0; V_{CB} = 40\ \text{V}$

$V_{CB} = 35\ \text{V}; R_{BE} = 220\ \Omega$

$V_{CB} = 35\ \text{V}; R_{BE} = 100\ \Omega$

		LBE/LCE 2003S	LBE/LCE 2009S	
$I_{CBO}$	<	0,1	0,1	$\mu\text{A}$
$I_{CBO}$	<	150	250	$\mu\text{A}$
$I_{CER}$	<	500	—	$\mu\text{A}$
$I_{CER}$	<	—	1000	$\mu\text{A}$

**Emitter cut-off current**

$I_C = 0; V_{EB} = 1,5\ \text{V}$

$I_C = 0; V_{EB} = 3,0\ \text{V}$

$I_{EBO}$	<	0,05	0,2	$\mu\text{A}$
$I_{EBO}$	<	25	50	$\mu\text{A}$

**D.C. current gain**

$I_C = 30\ \text{mA}; V_{CE} = 5\ \text{V}$

$I_C = 110\ \text{mA}; V_{CE} = 5\ \text{V}$

$h_{FE}$	>	15	—	
$h_{FE}$	<	150	—	
$h_{FE}$	>	—	15	
$h_{FE}$	<	—	150	

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

$I_E = I_C = 0; V_{CB} = 18\ \text{V}; V_{EB} = 1,5\ \text{V}$

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

$I_E = I_C = 0; V_{CE} = 18\ \text{V}; V_{EB} = 1,5\ \text{V}$

**Emitter-base capacitance at  $f = 1\ \text{MHz}$**

$I_E = I_C = 0; V_{EB} = 1\ \text{V}; V_{CB} = 10\ \text{V}$

$C_{cb}$	typ.	0,3	0,6	pF
$C_{ce}$	typ.	0,45	0,6	pF
$C_{eb}$	typ.	1,7	3,3	pF

\* K/W is SI unit for  $^\circ\text{C}/\text{W}$ .

## s-parameters (common emitter)

LBE/LCE2003S: Typical values;  $V_{CE} = 18 \text{ V}^*$ ;  $I_C = 30 \text{ mA}^*$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  $Z_o = 50 \text{ } \Omega$ 

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)/ 86°	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.

\*  $V_{CE}$  and  $I_C$  regulated.

LBE/LCE2003S  
LBE/LCE2009S

s-parameters (common emitter)

LBE/LCE2009S: Typical values;  $V_{CE} = 18 \text{ V}^*$ ;  $I_C = 110 \text{ mA}^*$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  $Z_O = 50 \text{ } \Omega$

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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit\*.

f GHz	$V_{CE}$ (1) V	$I_C$ (1) mA	$P_{L1}$ (2) mW(dBm)	$G_{p0}$ (3) dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
2	18	30	$\geq 200(23)$ typ. 250(24)	$\geq 10$ typ. 11	$6,2 + j30$	$17,5 + j7$

**Notes**

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

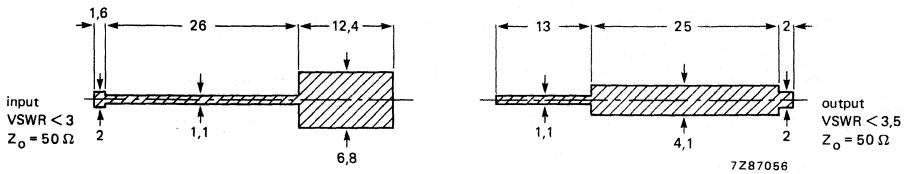


Fig. 6 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

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

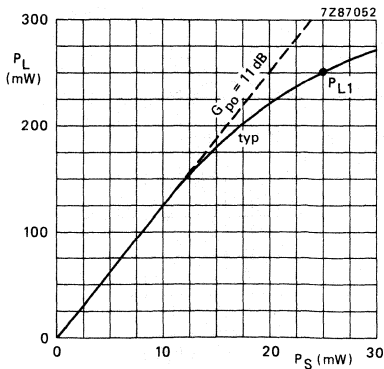


Fig. 7  $V_{CE} = 18\text{ V}$ ;  $I_C = 30\text{ mA}$ ;  
 $f = 2\text{ GHz}$ ;  $T_{mb} = 25\text{ }^{\circ}\text{C}$ .

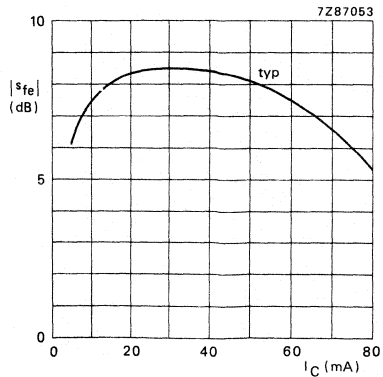


Fig. 8  $V_{CE} = 18\text{ V}$ ; class-A  
operation;  $f = 2\text{ GHz}$ ;  $T_{mb} = 25\text{ }^{\circ}\text{C}$ .

\* 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  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-emitter class-A circuit\*.

f GHz	$V_{CE}$ (1) V	$I_C$ (1) mA	$P_{L1}$ (2) mW(dBm)	$G_{p0}$ (3) dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
2	18	100	$\geq 700(28,5)$ typ. 900(29,5)	$\geq 9$ typ. 9,8	$7,5 + j14,5$	$17,5 + j38,5$

**Notes**

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

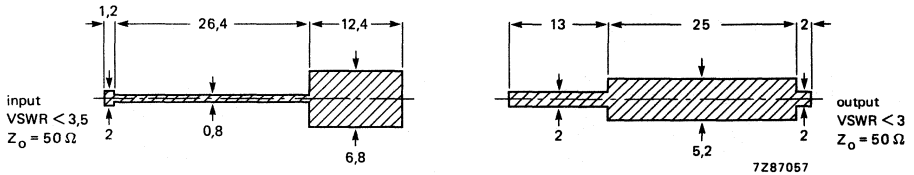


Fig. 9 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

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

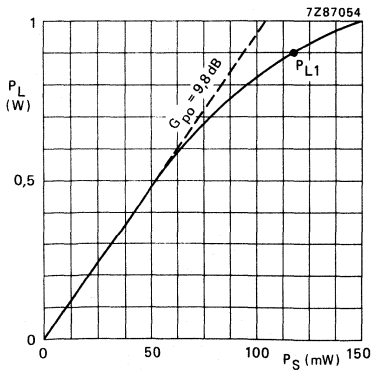


Fig. 10  $V_{CE} = 18\text{ V}$ ;  $I_C = 110\text{ mA}$ ;  
 $f = 2\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

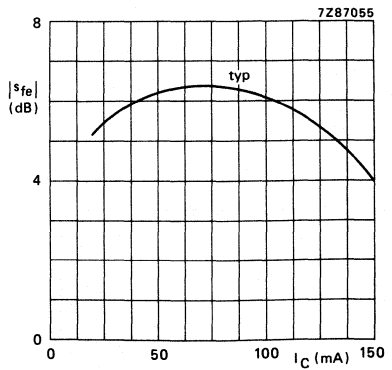


Fig. 11  $V_{CE} = 18\text{ V}$ ; class-A  
operation;  $f = 2\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

\* 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	1,65	12	80	400	9	$7,5 + j9$	$18 + j31$

### MECHANICAL DATA

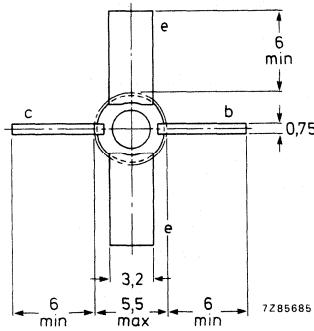
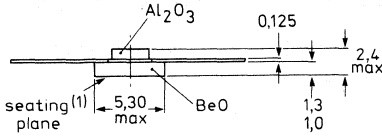
FO-45 and FO-46 (see Fig. 1)

### 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.

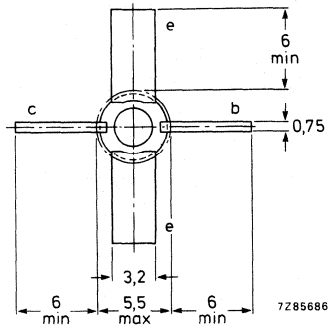
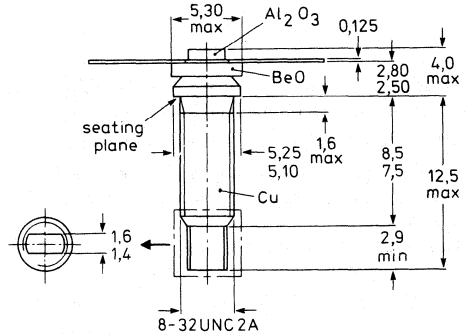
MECHANICAL DATA

Fig. 1a LBE2005Q (FO-45).



Dimensions in mm

Fig. 1b LCE2005Q (FO-46).



RATINGS

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

Collector-base voltage (open emitter)	V <sub>CBO</sub>	max.	30 V
Collector-emitter voltage (open base)	V <sub>CEO</sub>	max.	16 V
Emitter-base voltage (open collector)	V <sub>EBO</sub>	max.	3 V
Collector current	I <sub>C</sub>	max.	200 mA
Total power dissipation (T <sub>mb</sub> ≤ 75°C)	P <sub>tot</sub>	max.	1,5 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	200 °C
Soldering temperature at 0,1 mm from case; t <sub>sl</sub> d ≤ 10 s	T <sub>sl</sub> d	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	R <sub>th j-mb</sub>	45 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	F GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> mW	G <sub>po</sub> dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	1,65	20	150	1100	8	4,5 + j14,5	12,5 + j38

### MECHANICAL DATA

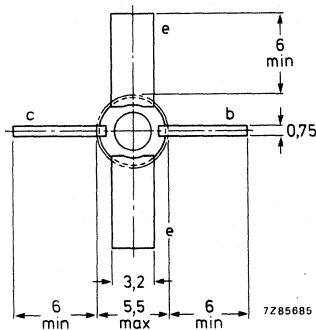
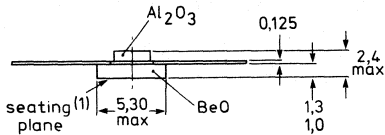
FO-45 and FO-46 (see Fig. 1)

### 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.

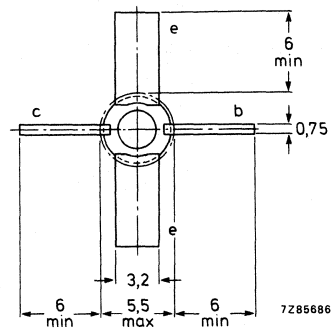
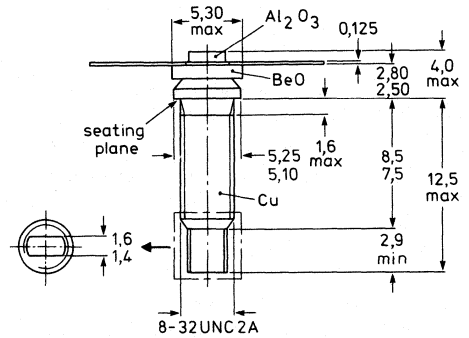
**MECHANICAL DATA**

Fig. 1a LBE2008T (FO-45).



Dimensions in mm

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

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th j-mb}$	26 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; class-A	4	20	65	200	7	$50 + j65$	$2,5 + j6$

### MECHANICAL DATA

FO-41A (see Fig. 1).

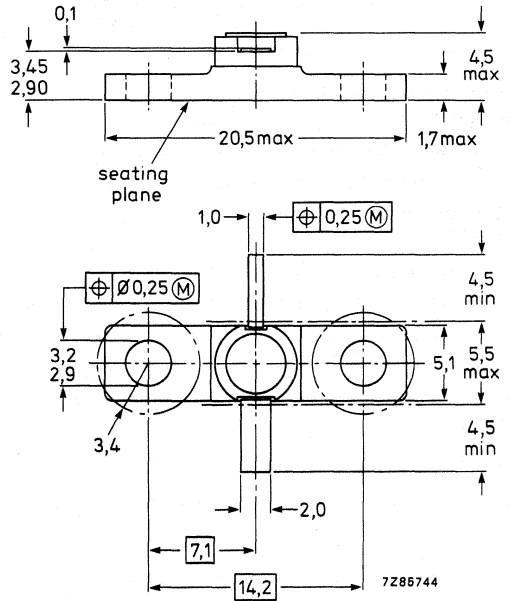
### PRODUCT SAFETY

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

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	41 K/W
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## 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, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

### QUICK REFERENCE DATA

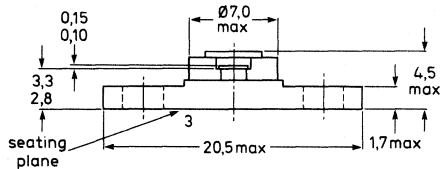
R.F. performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit.

mode of operation	f GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> mW	G <sub>po</sub> dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; linear amplifier	1	15	100	typ. 400	typ. 11	6,5 + j4	13 + j23

### MECHANICAL DATA

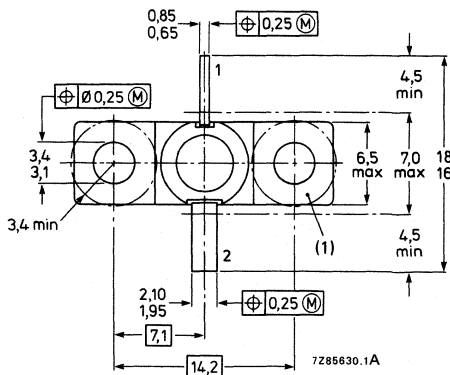
Fig. 1 FO-53.

Emitter connected to flange.



Dimensions in mm

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)	$V_{CB0}$	max.	30 V
Collector-emitter voltage	$V_{CER}$	max.	30 V
$R_{BE} \leq 500 \Omega$	$V_{CEO}$	max.	14 V
open base	$V_{EBO}$	max.	3 V
Emitter-base voltage (open collector)	$I_C$	max.	400 mA
Collector current (d.c.)	$P_{tot}$	max.	3 W
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	$T_{stg}$	-65 to +200 $^\circ\text{C}$	
Storage temperature	$T_j$	max.	200 $^\circ\text{C}$
Junction temperature	$T_{sld}$	max.	235 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$			

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	=	30 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> mW	G <sub>po</sub> dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; class-A	2	15	70	200	8	5 + j19	10 + j38

### MECHANICAL DATA

FO-53 (see Fig. 1).

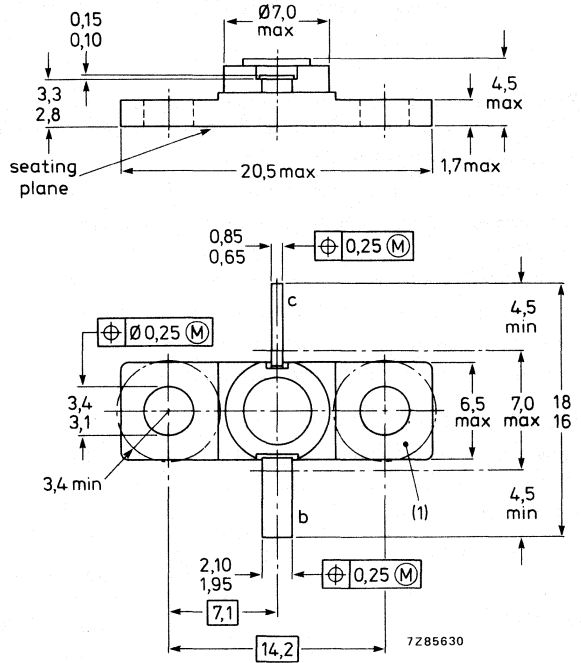
### PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the beryllium oxide 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 ( $R_{BE} = 330 \Omega$ ) (open base)	$V_{CER}$	max.	20 V
	$V_{CEO}$	max.	18 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3 V
Collector current	$I_C$	max.	80 mA
Total power dissipation ( $T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	1,5 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	45 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	2	15	140	400	7	$2,5 + j15$	$12 + j23$

### MECHANICAL DATA

FO-53 (see Fig. 1)

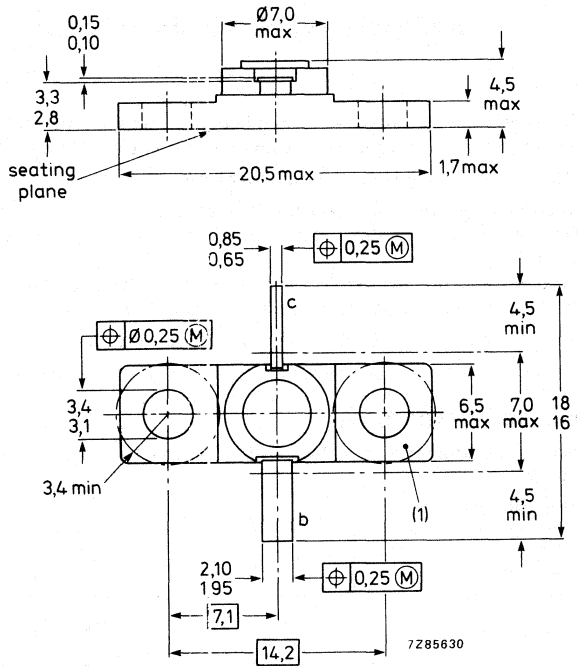
### PRODUCT SAFETY

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)	$V_{CB0}$	max.	45 V
Collector-emitter voltage ( $R_{BE} = 220 \Omega$ ) (open base)	$V_{CER}$	max.	20 V
	$V_{CEO}$	max.	18 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3 V
Collector current	$I_C$	max.	160 mA
Total power dissipation ( $T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	3.0 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	22 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit

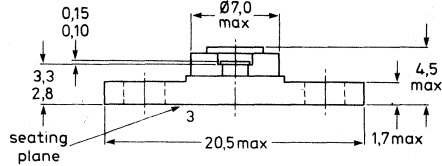
mode of operation	f GHz	$V_{CE}$ V	$I_C$ mA	$P_{L1}$ W	$G_{po}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; linear amplifier	2	20	200	typ. 1,6	typ. 8	$2,5 + j12$	$4 + j4$

### MECHANICAL DATA

Dimensions in mm

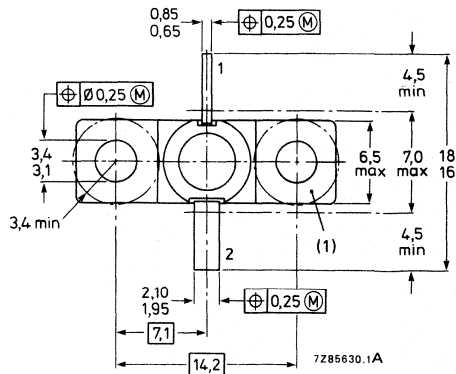
Fig. 1 FO-53.

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)	$V_{CB0}$	max.	45 V
Collector-emitter voltage	$V_{CER}$	max.	25 V
$R_{be} = 120 \Omega$	$V_{CEO}$	max.	20 V
open base	$V_{EBO}$	max.	3,5 V
Emitter-base voltage (open collector)	$I_C$	max.	800 mA
Collector current (d.c.)	$P_{tot}$	max.	8 W
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	$T_{stg}$		-65 to + 200 $^\circ\text{C}$
Storage temperature	$T_j$	max.	200 $^\circ\text{C}$
Junction temperature	$T_{slid}$	max.	235 $^\circ\text{C}$
Lead soldering temperature			
at 0,3 mm from the case; $t_{slid} \leq 10 \text{ s}$			

**THERMAL RESISTANCE**

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





**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 $R_{be} = 500 \Omega$ open base	$V_{CER}$	max.	20 V
	$V_{CEO}$	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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	2,8 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	=	22 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> mW	G <sub>po</sub> dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	2,1	20	300	1750	10	5 + j15	3 - j1

### MECHANICAL DATA

FO-53 (see Fig. 1)

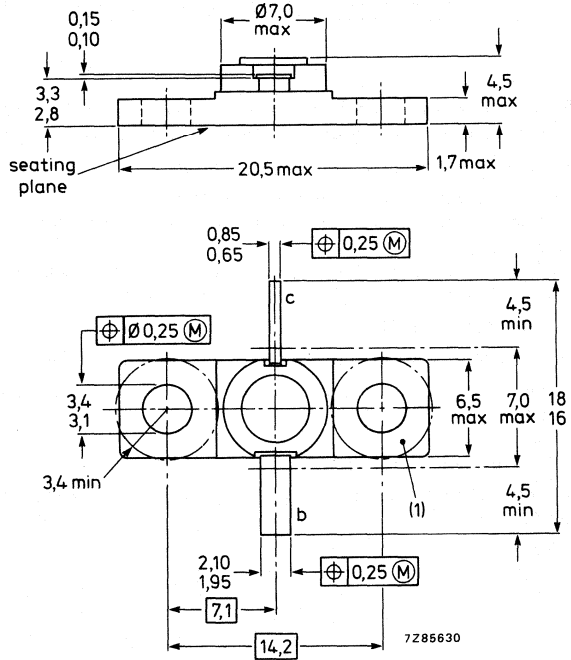
### PRODUCT SAFETY

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

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	11 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit

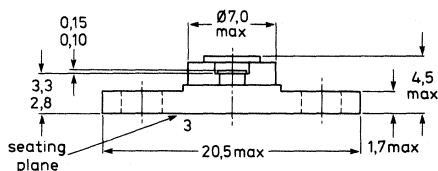
mode of operation	f GHz	$V_{CE}$ V	$I_C$ A	$P_{L1}$ W	$G_{po}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; linear amplifier	2,1	20	1,2	typ. 5,5	typ. 9	$2,5 + j8$	$2,5 - j7$

### MECHANICAL DATA

Dimensions in mm

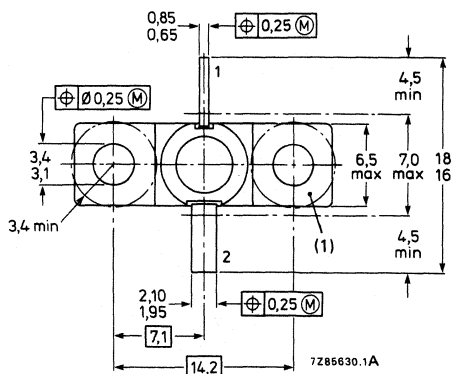
Fig. 1 FO-53.

Emitter connected to flange.



Torque on nut: max. 0,5 Nm

Recommended screw: M3



### Marking code

RTC190 = LKE21050T

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

## THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	4 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; linear amplifier	2,7	16	200	typ. 800	typ. 9	$4 + j10$	$4 - j3$

### MECHANICAL DATA

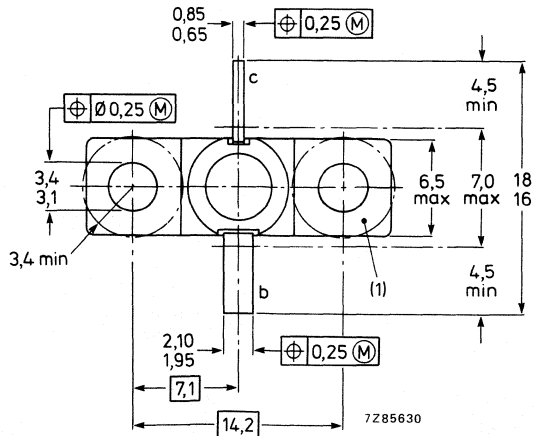
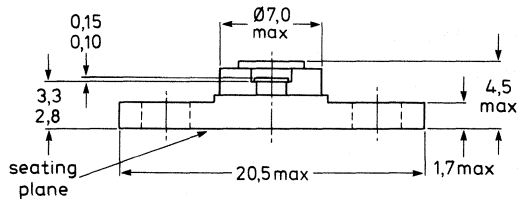
Dimensions in mm

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)	$V_{CB0}$	max.	35 V
Collector-emitter voltage ( $R_{BE} \leq 150 \Omega$ ) (open base)	$V_{CER}$	max.	25 V
	$V_{CEO}$	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 $T_{mb} = 75^\circ\text{C}$	$P_{tot}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	230 °C

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th\ j-mb}$	12 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	0,7 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> W	G <sub>po</sub> dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	2,7	16	650	2,5	7	2,5 + j11	2 - j9

### MECHANICAL DATA

FO-53 (see Fig. 1)

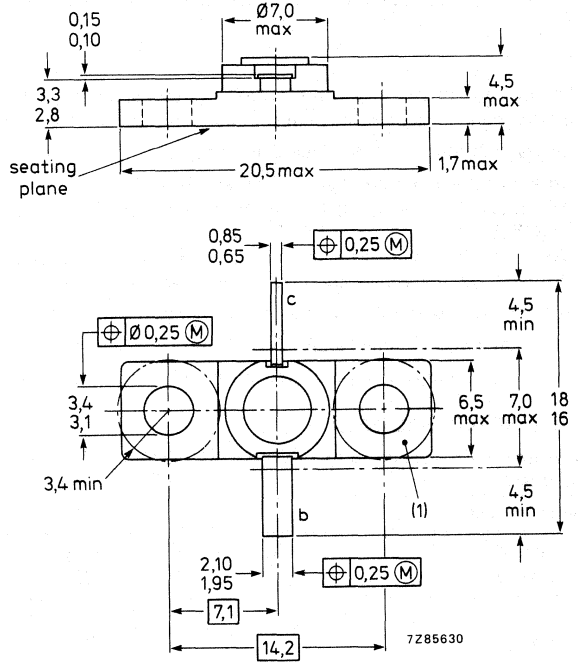
### PRODUCT SAFETY

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 <sub>CB0</sub>	max.	35 V
Collector-emitter voltage (R <sub>BE</sub> = 10 Ω) (open base)	V <sub>CER</sub>	max.	35 V
	V <sub>CEO</sub>	max.	15 V
Emitter-base voltage (open collector)	V <sub>EBO</sub>	max.	3 V
Collector current	I <sub>C</sub>	max.	1,5 A
Total power dissipation	P <sub>tot</sub>	max.	15 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	+200 °C
Soldering temperature at 0,1 mm from case; t <sub>sld</sub> ≤ 10 s	T <sub>sld</sub>	max.	+235 °C

**THERMAL RESISTANCE**

From junction to mounting base	R <sub>th j-mb</sub>	6 K/W
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## 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

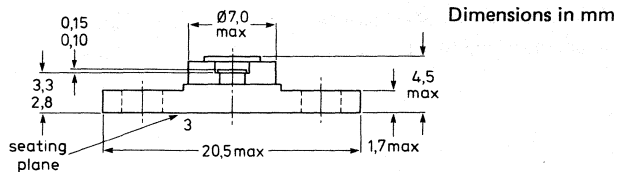
R.F. performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit

type no.	mode of operation	f GHz	$V_{CE}$ V	$I_C$ mA	$P_{L1}$ mW	$G_{po}$ dB	$\bar{Z}_1$ $\Omega$	$\bar{Z}_L$ $\Omega$
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

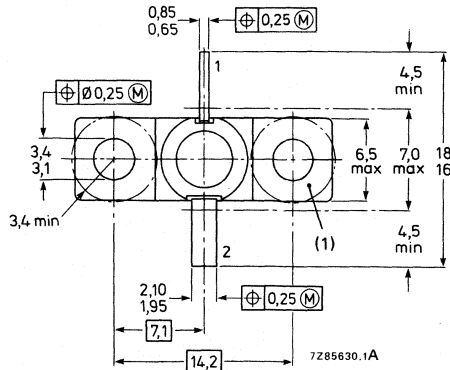
Fig. 1 FO-53.

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 <sub>CBO</sub> max. 45	45	V
Collector-emitter voltage R <sub>BE</sub> = 220 Ω	V <sub>CER</sub> max. 25	25	V
open base	V <sub>CEO</sub> max. 20	20	V
Emitter-base voltage open collector	V <sub>EBO</sub> max. 3,5	3,5	V
Collector current (d.c.)	I <sub>C</sub> max. 400	800	mA
Total power dissipation up to T <sub>mb</sub> = 75 °C	P <sub>tot</sub> max. 1,5	3	W
Storage temperature	T <sub>stg</sub>	-65 to + 200	°C
Junction temperature	T <sub>j</sub> max.	200	°C
Lead soldering temperature at 0,3 mm from the case; t <sub>sld</sub> = 10 s	T <sub>sld</sub> max.	235	°C

**THERMAL RESISTANCE**

	LKE32002T	LKE32004T	
From junction to mounting base	R <sub>th j-mb</sub> =	45	22 K/W
From mounting base to heatsink	R <sub>th mb-h</sub> =	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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A circuit.

type no.	mode of operation	f GHz	V <sub>CE</sub> V	I <sub>C</sub> mA	P <sub>L1</sub> mW	G <sub>po</sub> dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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

Fig. 1 FO-41B.

Emitter and metallic cap are connected to the seating plane.

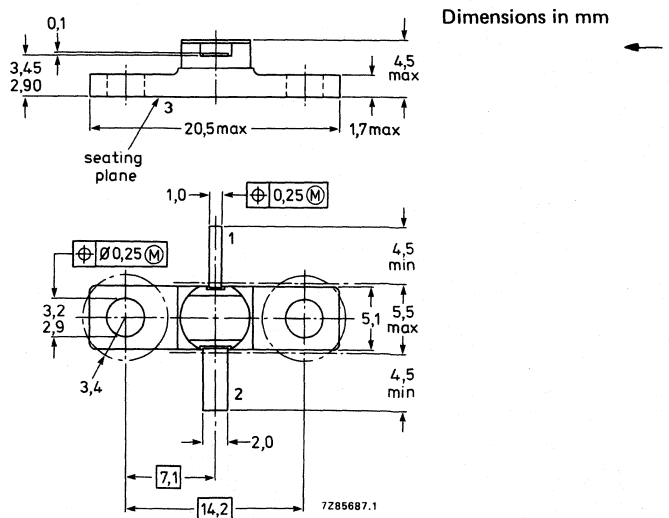
Torque on nut: max. 0,4 Nm

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)

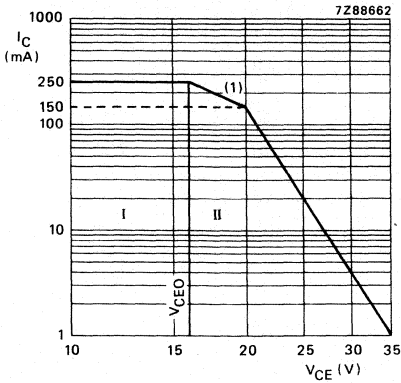
		LTE42005S		LTE42008R	
Collector-base voltage (open emitter)	$V_{CBO}$	max.	40		40 V
Collector-emitter voltage $R_{BE} = 100 \Omega$ $R_{BE} = 250 \Omega$ (open base)	$V_{CER}$	max.	35		— V
	$V_{CER}$	max.	—		20 V
	$V_{CEO}$	max.	16		16 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3		3,5 V
Collector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

**THERMAL RESISTANCE**

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

\* K/W is SI unit for  $^\circ\text{C}/\text{W}$ .

LTE42005S



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

Fig. 2 D.C. SOAR at  $T_{mb} \leq 75^\circ\text{C}$ .

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

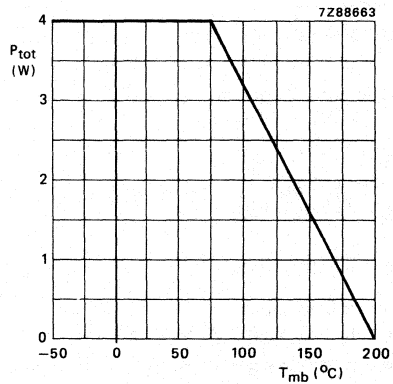
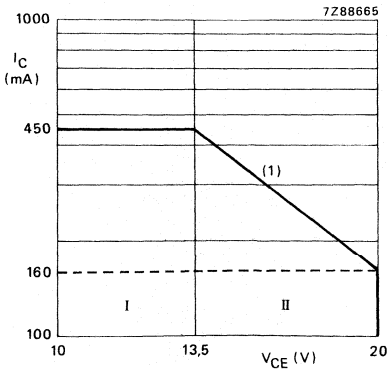


Fig. 3 Power derating curve vs. mounting base temperature.

LTE42008R



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

Fig. 4 D.C. SOAR at  $T_{mb} \leq 75^\circ\text{C}$ .

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

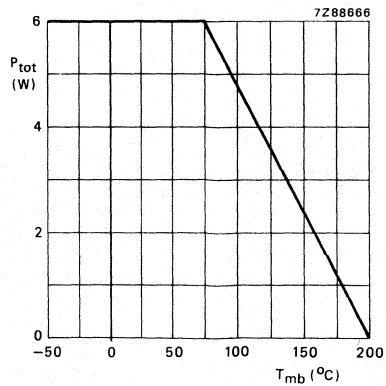


Fig. 5 Power derating curve vs. mounting base temperature.

LTE42005S  
 LTE42008R

CHARACTERISTICS

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

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

	LTE42005S		LTE42008R	
$I_{CBO}$	<	0,1		150 $\mu\text{A}$
$I_{CBO}$	<	0,25		1 mA

$I_E = 0; V_{CB} = 40\text{ V}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_{EBO}$	<	200		400 nA
$I_{EBO}$	<	50		200 $\mu\text{A}$

$I_C = 0; V_{EB} = 3,5\text{ V}$

D.C. current gain

$I_C = 110\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE}$	>	15		—
	<	150		

$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE}$	>	—		15
	<	—		150

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

$I_E = I_C = 0; V_{CB} = 20\text{ V}; V_{EB} = 1,5\text{ V}$

$C_{cb}$	typ.	0,5		— pF
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$I_E = I_C = 0; V_{CB} = 16\text{ V}; V_{EB} = 1,5\text{ V}$

$C_{cb}$	typ.	—		2 pF
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Collector-emitter capacitance at  $f = 1\text{ MHz}$

$I_C = I_E = 0; V_{CE} = 20\text{ V}; V_{EB} = 1,5\text{ V}$

$C_{ce}$	typ.	1,5		— pF
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$I_C = I_E = 0; V_{CE} = 16\text{ V}; V_{EB} = 1,5\text{ V}$

$C_{ce}$	typ.	—		1,5 pF
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Emitter-base capacitance at  $f = 1\text{ MHz}$

$I_C = I_E = 0; V_{EB} = 1\text{ V}; V_{CB} = 10\text{ V}$

$C_{eb}$	typ.	6,5		20 pF
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## LTE42005S

s-parameters (common-emitter)

 $V_{CE} = 18 \text{ V}$   
 $I_C = 110 \text{ mA}$  } regulated;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  $Z_o = 50 \text{ } \Omega$ ; 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)

$V_{CE} = 16\text{ V}$   
 $I_C = 250\text{ mA}$  } regulated;  $T_{mb} = 25\text{ }^\circ\text{C}$ ;  $Z_O = 50\text{ }\Omega$ ; 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  $T_{mb} = 25\text{ }^\circ\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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  $P_{L1}$ .

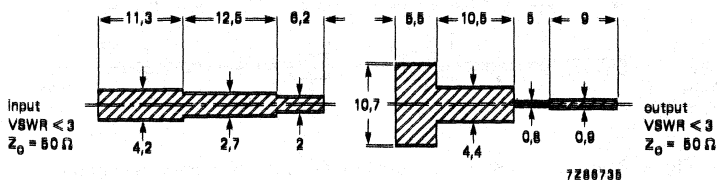


Fig. 6 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,54$ ); thickness 1,6 mm.

Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ( $\epsilon_r = 2,4$ ); thickness 0,25 mm.

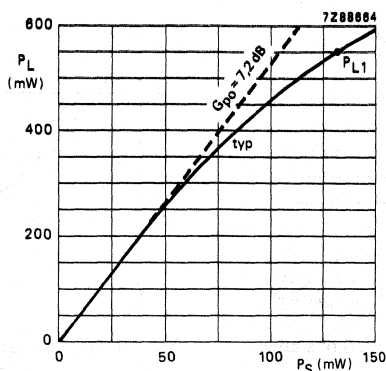


Fig. 7 Load power as a function of source power.  $f = 4,2\text{ GHz}$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ ;  
 $V_{CE} = 18\text{ V}$   
 $I_C = 110\text{ mA}$  } regulated

\* 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  $T_{mb} = 25\text{ }^\circ\text{C}$  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	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
4,2	16	250	$\geq 800$ (29) typ. 940 (29,7)	$\geq 7$ 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  $P_{L1}$ .

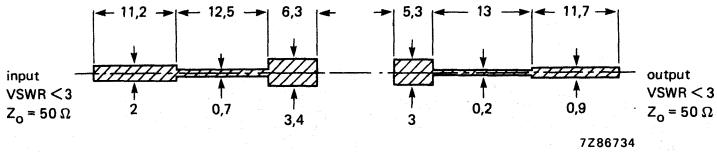


Fig. 8 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

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

Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ( $\epsilon_r = 2,4$ ); thickness 0,25 mm.

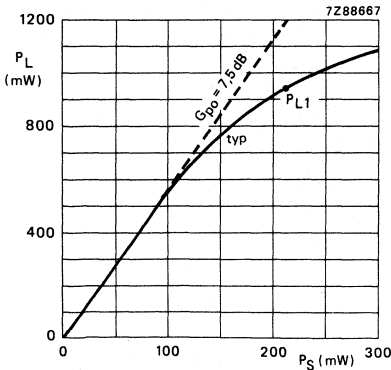


Fig. 9 Load power as a function of source power at 4,2 GHz.

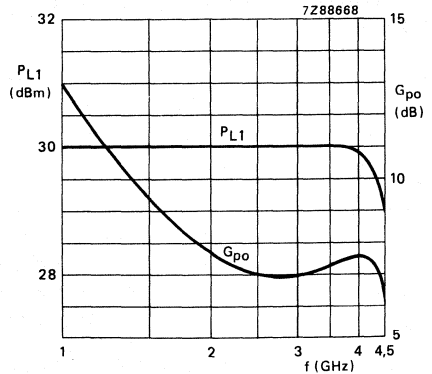


Fig. 10 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 9 and 10:

$V_{CE} = 16\text{ V}$   
 $I_C = 250\text{ mA}$  } regulated; typical values;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

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

LTE42008R

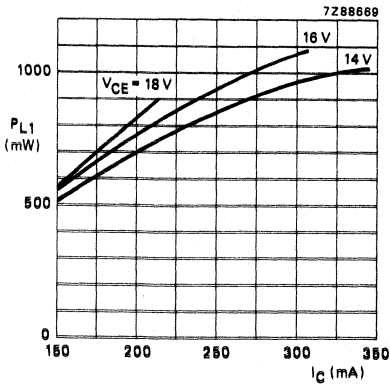


Fig. 11 Load power associated with 1 dB compressed power gain, as a function of collector current.

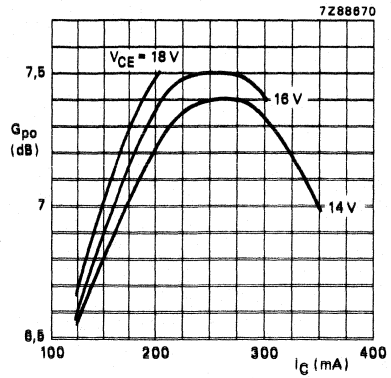


Fig. 12 Low-level power gain associated with  $P_{L1}$  as a function of collector current.

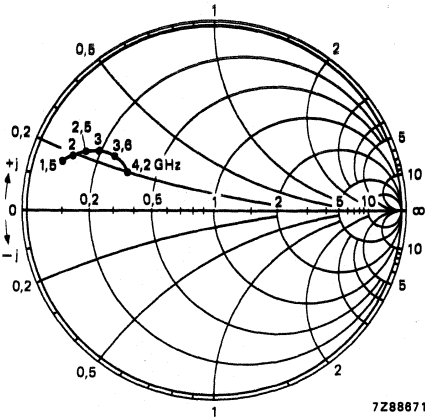


Fig. 14 Optimum load impedance as a function of frequency for  $P_{L1}$ .

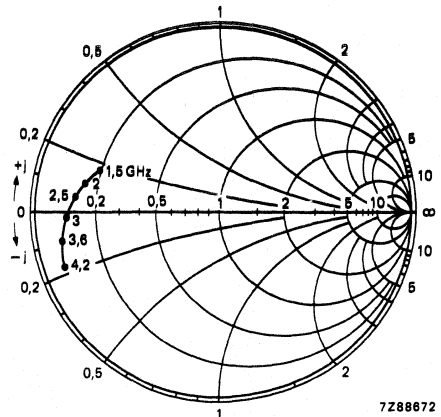


Fig. 13 Input impedance as a function of frequency for  $P_{L1}$ .

Conditions for Figs 11 and 12:

$V_{CE}$  and  $I_C$  regulated; typical values;  $T_{mb} = 25^\circ C$ .

Conditions for Figs 13 and 14:

$V_{CE} = 16 V$   
 $I_C = 250 mA$  } regulated; typical values;  $Z_o = 50 \Omega$ ;  $T_{mb} = 25^\circ C$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; class-A	4,2	16	1250	7	400	7,5+j12	4-j8

### MECHANICAL DATA

FO-41B (see Fig. 1).

### PRODUCT SAFETY

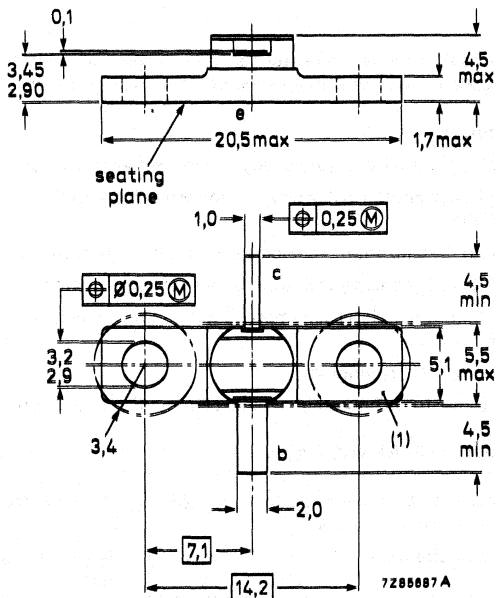
This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

**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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	8 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from ceramic; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

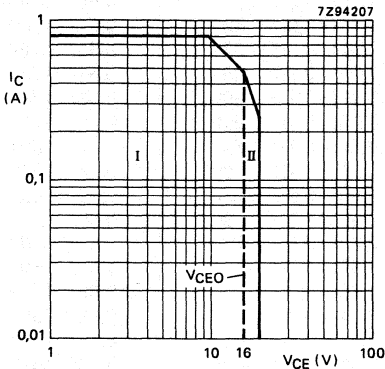


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75 \text{ }^\circ\text{C}$ .  
 I Region of permissible d.c. operation  
 II Permissible extension provided  
 $R_{BE} \leq 70 \Omega$

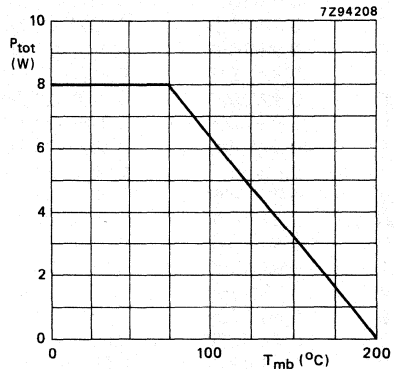


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th \text{ j-mb}} = 10 \text{ K/W}$

**CHARACTERISTICS**

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

Collector cut-off current

$I_{E=0}; V_{CB} = 20 \text{ V}$

$I_{CBO} \leq 200 \mu\text{A}$

Emitter cut-off current

$I_{C=0}; V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 600 \text{ nA}$

D.C. current gain

$I_C = 400 \text{ mA}; V_{CE} = 5 \text{ V}$

$h_{FE} \text{ typ. } 80$

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

$I_E = I_C = 0; V_{CB} = 16 \text{ V}; V_{EB} = 1,5 \text{ V}$

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

s-parameters (common-emitter)

Typical values;  $V_{CE} = 16\text{ V}$ ;  $I_C = 400\text{ mA}$ ;  $Z_O = 50\ \Omega$ ;  $T_{mb} = 25\ ^\circ\text{C}$ .

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°	1,68( 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(-32,8)/ 50°	1,39( 2,9)/ 57°	0,53/ 179°
1,2	0,93/166°	0,028(-31,8)/ 50°	1,31( 2,4)/ 53°	0,54/ 177°
1,3	0,93/164°	0,029(-30,8)/ 49°	1,23( 1,8)/ 49°	0,54/ 178°
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/ 178°
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/ 178°
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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	4,2	16	> 1000	> 6	400	$7,5+j12$	$4-j8$

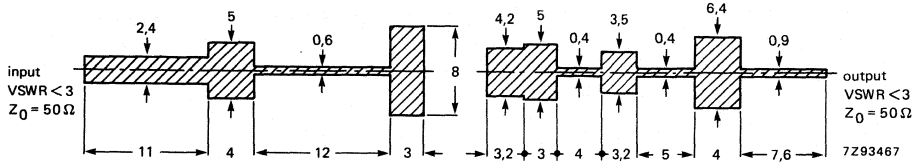


Fig. 4 Prematching test circuit board for c.w.; class-A application (dimensions in mm).

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.

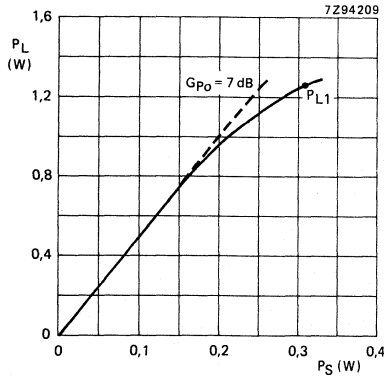


Fig. 5 Load power versus input power;  $V_{CE} = 16\text{ V}$  and  $I_C = 400\text{ mA}$  regulated;  $f = 4,2\text{ GHz}$ .

\* 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_l$ $\Omega$
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

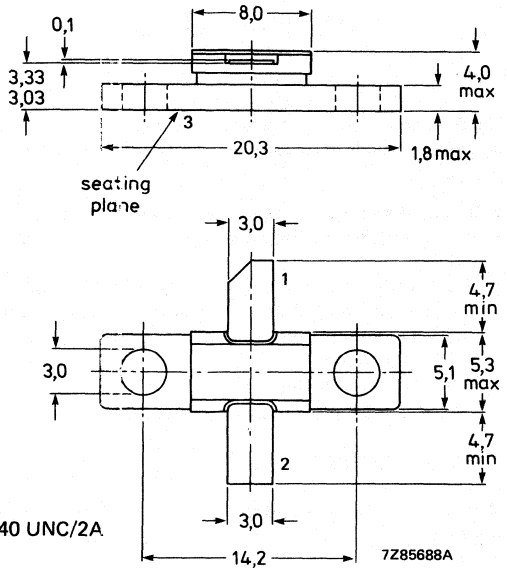
FO-83 (see Fig. 1).

**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**

Fig. 1 FO-83.

Dimensions in mm



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
$R_{BE} = 47 \Omega$	$V_{CER}$	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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	18 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

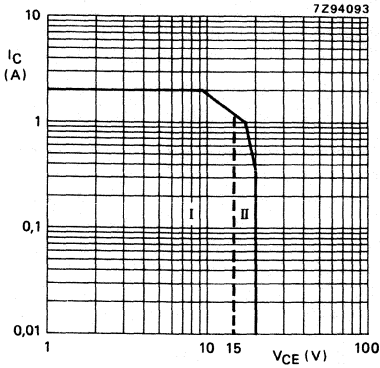


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75^\circ\text{C}$ .  
 I Region of permissible d.c. operation  
 II Permissible extension provided  
 $R_{BE} \leq 47 \Omega$ .

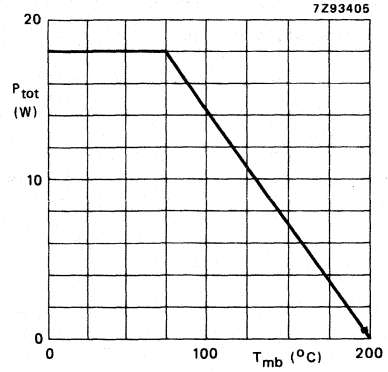


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base  
 From mounting base to heatsink

$R_{th\ j-mb} = 4\ \text{K/W}$   
 $R_{th\ mb-h} = 0,7\ \text{K/W}$

**CHARACTERISTICS**

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

Collector cut-off currents

$I_E = 0; V_{CB} = 20\ \text{V}$   
 $I_E = 0; V_{CB} = 40\ \text{V}$   
 $V_{CE} = 20\ \text{V}; R_{BE} = 47\ \Omega$   
 $V_{CE} = 15\ \text{V}; I_B = 0$

$I_{CBO} \leq 0,5\ \text{mA}$   
 $I_{CER} \leq 2,5\ \text{mA}$   
 $I_{CEO} \leq 2\ \text{mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\ \text{V}$   
 $I_C = 0; V_{EB} = 3,5\ \text{V}$

$I_{EBO} \leq 100\ \mu\text{A}$   
 $I_{EBO} \leq 500\ \mu\text{A}$

D.C. current gain

$I_C = 1\ \text{A}; V_{CE} = 3\ \text{V}$

$h_{FE} = 15\ \text{to}\ 100$

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	$V_{CE}$ V	$I_C$ A	$P_{L1}$ W	$G_{p0}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	1,7 to 2,1	16	1,1	$\geq 5$	$\geq 7$	see Fig. 6	

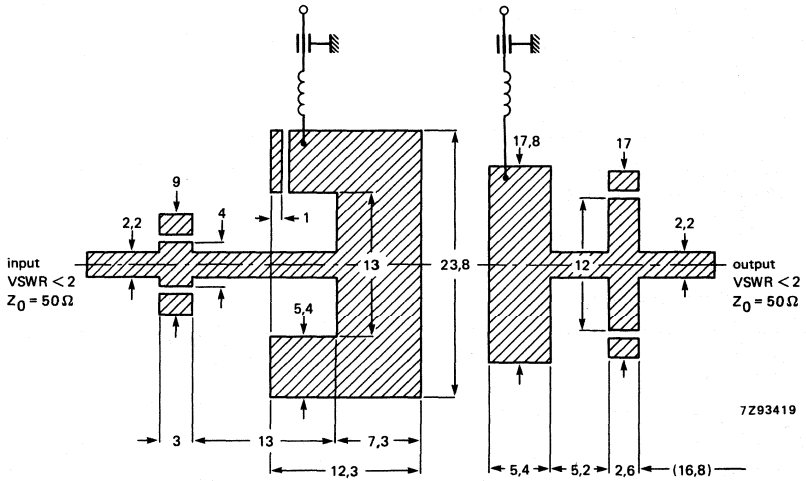


Fig. 4 Prematching test circuit board for 1,7 to 2,1 GHz, c.w., class-A application (Dimensions in mm).

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



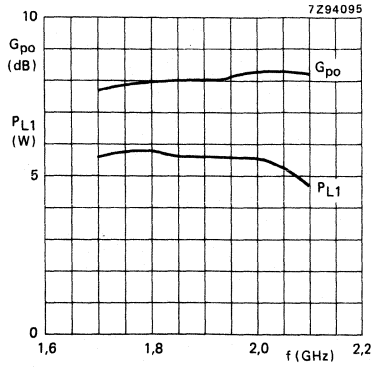


Fig. 5 Load power and power gain versus frequency;  $V_{CE} = 16 \text{ V}$ ;  $I_C = 1,1 \text{ A}$ ;  $V_{CE}$  and  $I_C$  regulated.

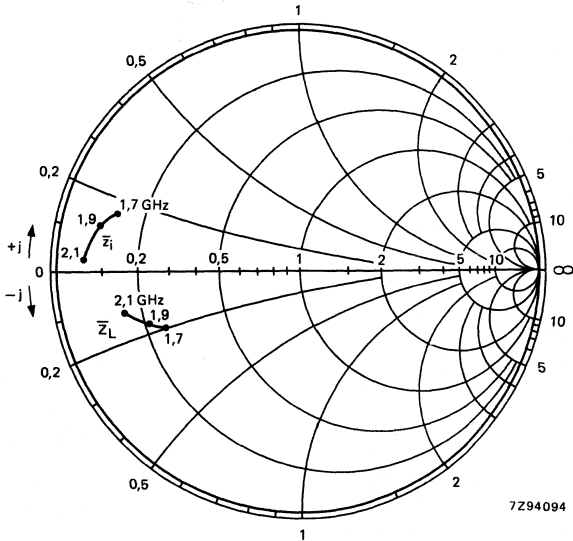


Fig. 6 Input and optimum load impedances versus frequency;  $P_{L1} = 5,5 \text{ W}$ ;  $Z_0 = 50 \Omega$ ; typical values.



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A wideband amplifier

mode of operation	f GHz	$V_{CE}$ V	$I_C$ A	$P_{L1}$ W	$G_{p0}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	2,0 to 2,4	16	1,1	typ. 5	typ. 7	see Fig. 6	

### MECHANICAL DATA

Dimensions in mm

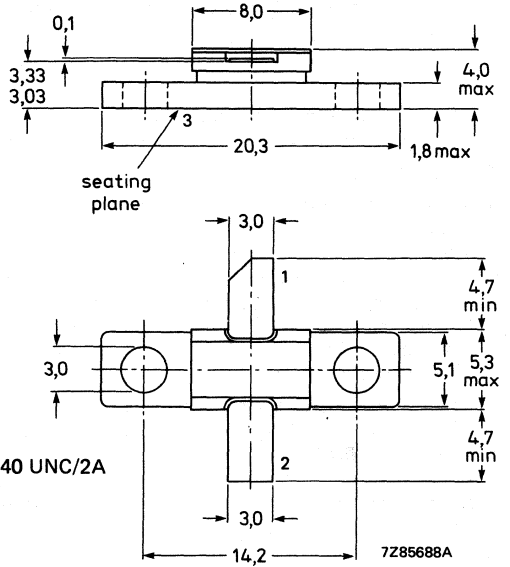
FO-83 (see Fig. 1).

**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**

Fig. 1 FO-83.

Dimensions in mm



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

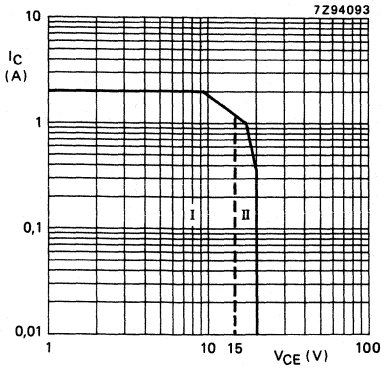


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75 \text{ }^\circ\text{C}$ .

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

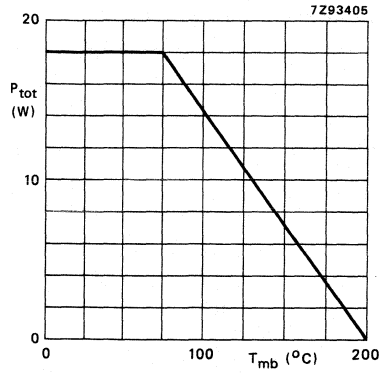


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

From mounting base to heatsink

$$R_{th \text{ j-mb}} = 4 \text{ K/W}$$

$$R_{th \text{ mb-h}} = 0,7 \text{ K/W}$$

**CHARACTERISTICS**

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

Collector cut-off currents

$$I_E = 0; V_{CB} = 20 \text{ V}$$

$$I_E = 0; V_{CB} = 40 \text{ V}$$

$$V_{CE} = 20 \text{ V}; R_{BE} = 47 \text{ } \Omega$$

$$V_{CE} = 15 \text{ V}; I_B = 0$$

$$I_{CBO} \leq 0,5 \text{ mA}$$

$$I_{CER} \leq 2,5 \text{ mA}$$

$$I_{CEO} \leq 2 \text{ mA}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5 \text{ V}$$

$$I_C = 0; V_{EB} = 3,5 \text{ V}$$

$$I_{EBO} \leq 100 \text{ } \mu\text{A}$$

$$\leq 500 \text{ } \mu\text{A}$$

D.C. current gain

$$I_C = 1 \text{ A}; V_{CE} = 3 \text{ V}$$

$$h_{FE} \quad 15 \text{ to } 100$$

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	$V_{CE}$ V	$I_C$ A	$P_{L1}$ W	$G_{p0}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	2,0 to 2,4	16	1,1	$\geq 4$	$\geq 6$	see Fig. 6	

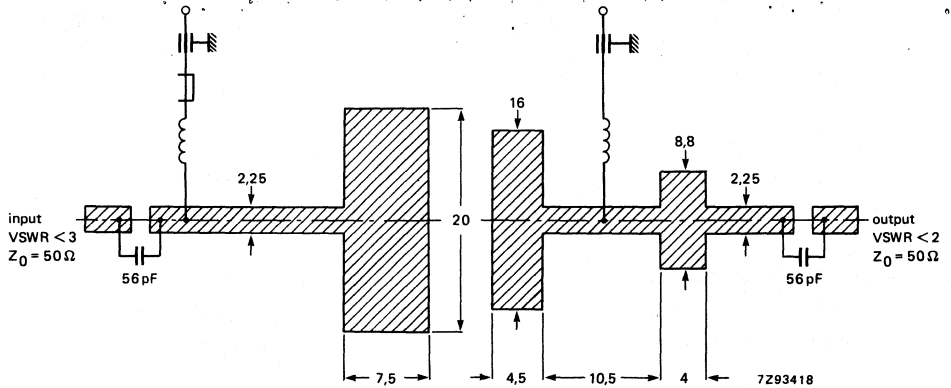


Fig. 4 Wideband test circuit board, class-A application. (Dimensions in mm).

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

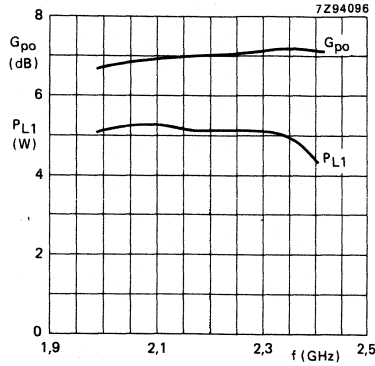


Fig. 5 Load power and power gain versus frequency;  $V_{CE} = 16 \text{ V}$ ;  $I_C = 1,1 \text{ A}$ ;  $V_{CE}$  and  $I_C$  regulated.

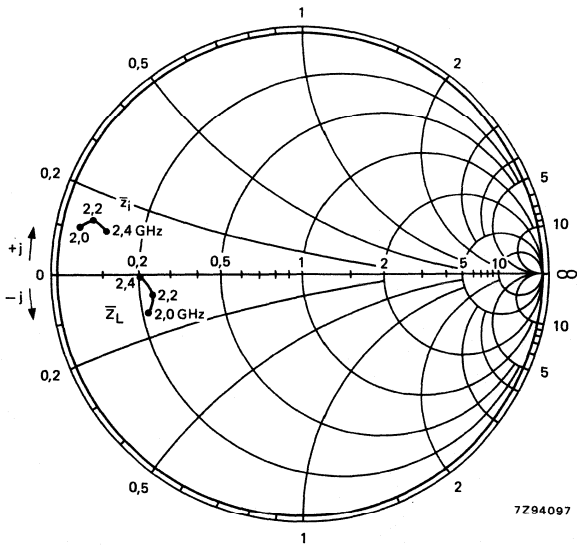


Fig. 6 Input and optimum load impedance versus frequency;  $Z_0 = 50 \Omega$ ; typical values.





## 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  $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$  in an unneutralized wideband common-emitter class-A circuit

mode of operation	f GHz	$V_{\text{CE}}$ V	$I_{\text{C}}$ A	$P_{\text{L1}}$ W	$G_{\text{po}}$ dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; linear amplifier	2,3 to 2,7	16	1	typ. 5	typ. 8	$11 + j3$	$7,5 - j9$

### MECHANICAL DATA

Fig. 1 FO-83.

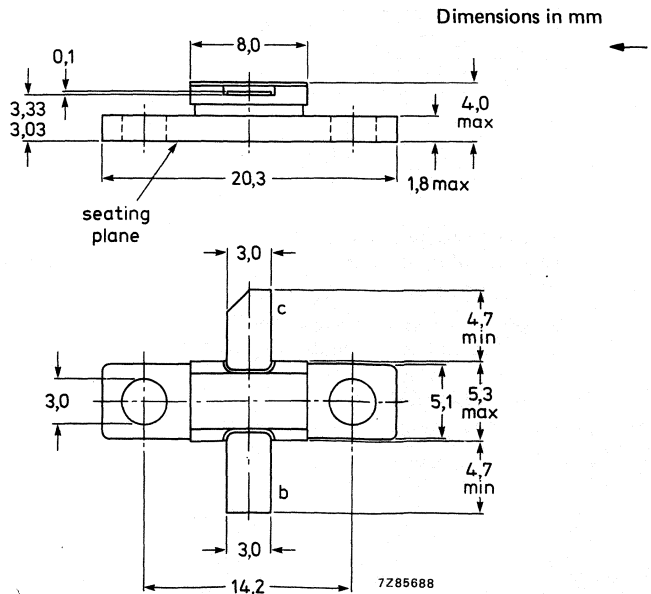
Metallic cap is connected to the flange

Torque on nut: max. 0,4 Nm

Recommended screw: M2,5

#### Marking code

RTC2327E40R = LV2327E40R

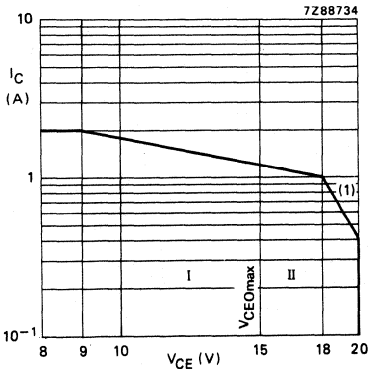


**PRODUCT SAFETY** This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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



(1) Second breakdown limit (independent of temperature)

Fig. 2 D.C. SOAR at  $T_{mb} \leq 75 \text{ }^\circ\text{C}$ .

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

**THERMAL RESISTANCE**

From junction to mounting base  
 From mounting base to heatsink

$R_{th\ j-mb}$	=	4 K/W
$R_{th\ mb-h}$	=	0,7 K/W

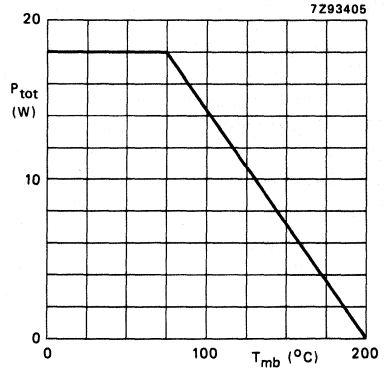


Fig. 3 Power derating curve versus mounting base temperature.

**CHARACTERISTICS**

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

Collector cut-off currents

$V_{CB} = 20\text{ V}; I_E = 0$

$V_{CB} = 40\text{ V}; I_E = 0$

$V_{CE} = 15\text{ V}; R_{BE} = 47\text{ }\Omega$

$V_{CE} = 15\text{ V}; I_B = 0$

$I_{CBO} \leq 0,5\text{ mA}$

$I_{CBO} \leq 2,5\text{ mA}$

$I_{CER} \leq 25\text{ mA}$

$I_{CEO} \leq 2\text{ mA}$

Emitter cut-off current

$V_{EB} = 1,5\text{ V}; I_C = 0$

$V_{EB} = 3,5\text{ V}; I_C = 0$

$I_{EBO} \leq 100\text{ }\mu\text{A}$

$I_{EBO} \leq 500\text{ }\mu\text{A}$

D.C. current gain

$V_{CE} = 3\text{ V}; I_C = 1\text{ A}$

$h_{FE} \geq 15$

$h_{FE} \leq 100$

**APPLICATION INFORMATION**

R.F. performance in c.w. operation up to  $T_{case} = 25\text{ }^{\circ}\text{C}$  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	$G_{ppo}(3)$ dB	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-A	2,3 to 2,7	16	1000	$\geq 4000$	$\geq 7$	typ. $11 + j3$	typ. $7,5 - j9$

**Notes**

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

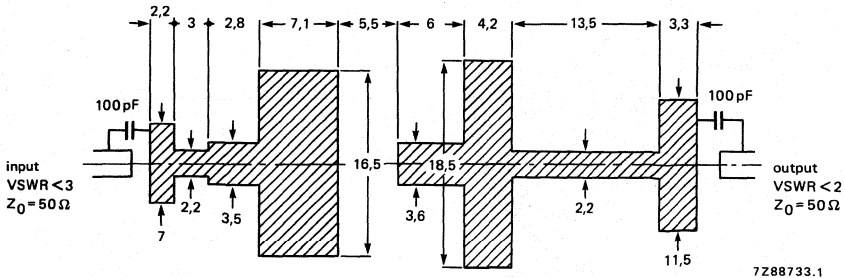


Fig. 4 Prematching test circuit board for 2,3 to 2,7 GHz. (Dimensions in mm).

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

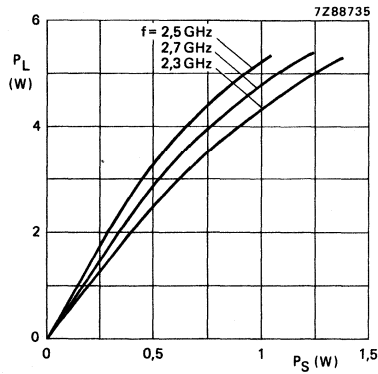


Fig. 5 Load power as a function of source power.

Conditions for Fig. 5:

$V_{CE} = 16 \text{ V}$   
 $I_C = 1 \text{ A}$

$\left. \begin{array}{l} V_{CE} = 16 \text{ V} \\ I_C = 1 \text{ A} \end{array} \right\} \text{ regulated; typical values; } T_{\text{case}} = 25 \text{ }^\circ\text{C.}$

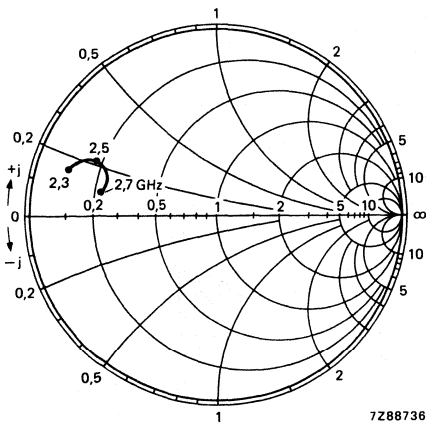


Fig. 6 Input impedance as a function of frequency for  $P_{L1}$ .

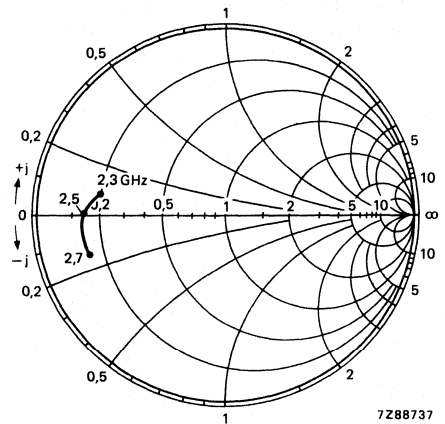


Fig. 7 Optimum load impedance as a function of frequency for  $P_{L1}$ .

Conditions for Figs 6 and 7:

$V_{CE} = 16 \text{ V}$   
 $I_C = 1 \text{ A}$

$\left. \begin{array}{l} V_{CE} = 16 \text{ V} \\ I_C = 1 \text{ A} \end{array} \right\} \text{ regulated; typical values; } Z_O = 50 \text{ } \Omega; T_{\text{case}} = 25 \text{ }^\circ\text{C.}$

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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

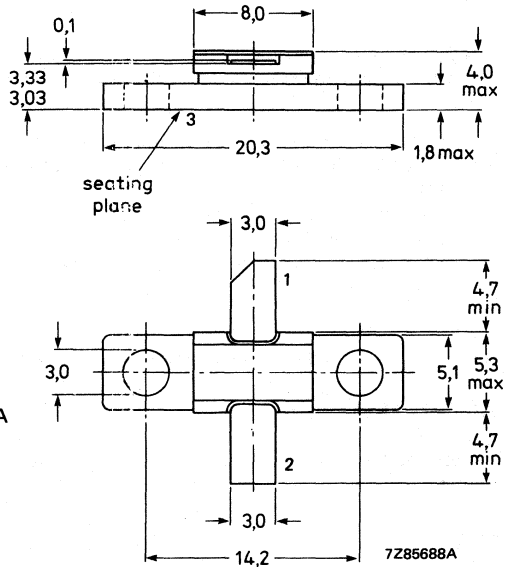
Fig. 1 FO-83.

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
$R_{BE} = 10 \Omega$	$V_{CER}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	235 °C

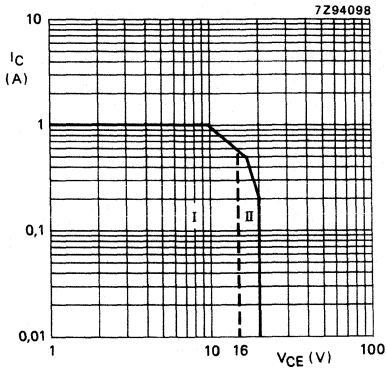


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75^\circ\text{C}$ .

- I Region of permissible D.C. operation.
- II Permissible extension provided  $R_{BE} \leq 10 \Omega$ .

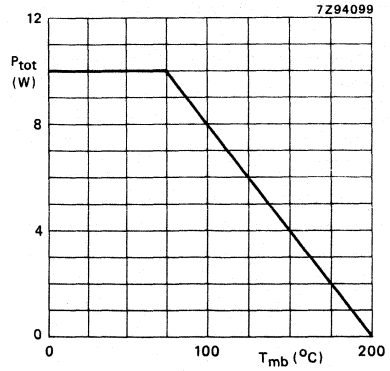


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base  
 From mounting base to heatsink

$R_{th\ j-mb} = 6,5\ \text{K/W}$   
 $R_{th\ mb-h} = 0,7\ \text{K/W}$

**CHARACTERISTICS**

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

Collector cut-off currents

- $I_E = 0; V_{CB} = 20\ \text{V}$
- $I_E = 0; V_{CB} = 40\ \text{V}$
- $V_{CE} = 28\ \text{V}; R_{BE} = 10\ \Omega$

$I_{CBO} \leq 300\ \mu\text{A}$   
 $I_{CBO} \leq 2\ \text{mA}$   
 $I_{CER} \leq 20\ \text{mA}$

Emitter cut-off current

- $I_C = 0; V_{EB} = 1,5\ \text{V}$
- $I_C = 0; V_{EB} = 3,5\ \text{V}$

$I_{EBO} \leq 0,8\ \mu\text{A}$   
 $I_{EBO} \leq 0,4\ \text{mA}$

D.C. current gain

$I_C = 0,5\ \text{A}; V_{CB} = 3\ \text{V}$

$h_{FE} = 15\ \text{to}\ 100$

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	3,7 to 4,2	16	500	$\leq 1,6$	$\leq 5,0$	see Fig. 6	

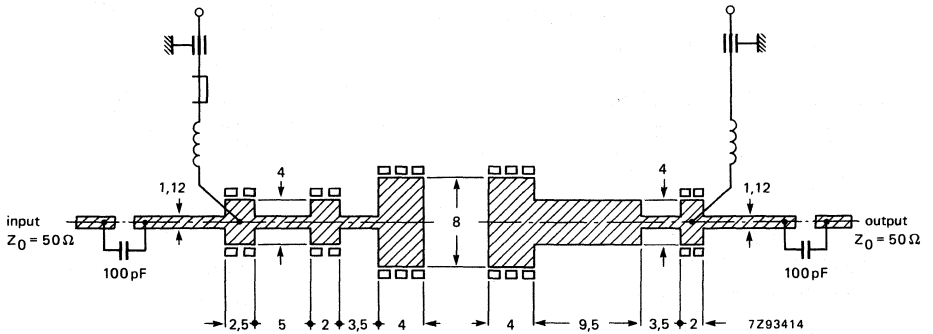


Fig. 4 Prematching test circuit board for 3,7 to 4,2 GHz; c.w., class-A application (Dimensions in mm).  
 Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass ( $\epsilon_r = 2,55$ ), thickness 0,4 mm.



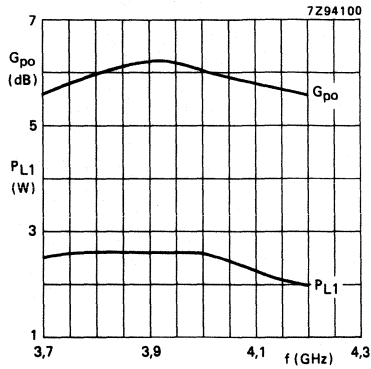


Fig. 5 Load power and power gain versus frequency;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; typical values.

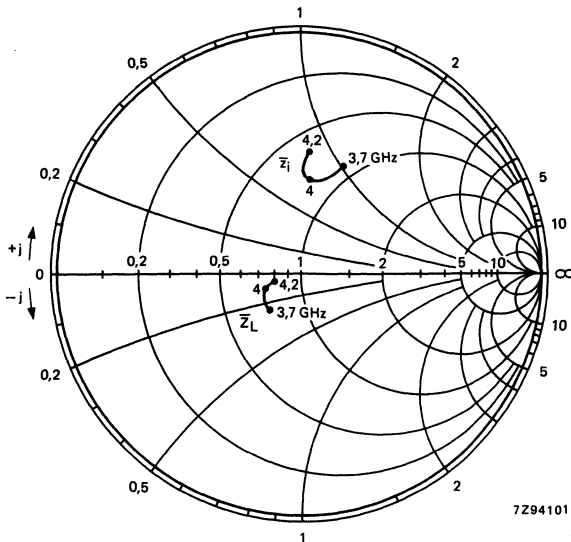


Fig. 6 Input and optimum load impedance versus frequency;  
 $V_{CE} = 16\text{ V}$  } regulated;  $Z_0 = 10\text{ }\Omega$ ; typical values.  
 $I_C = 0,5\text{ A}$  }



## 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  $T_{\text{case}}$  is 25 °C in an unneutralized common-emitter class-A circuit

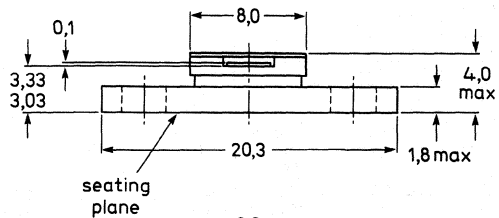
mode of operation	f GHz	$V_{\text{CE}}$ V	$I_{\text{C}}$ mA	$P_{\text{L1}}$ W	$G_{\text{po}}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; linear amplifier	3,7 to 4,2	16	800	typ. 2,4	typ. 6,5	$6 + j7,5$	$5,5 - j1$

### 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

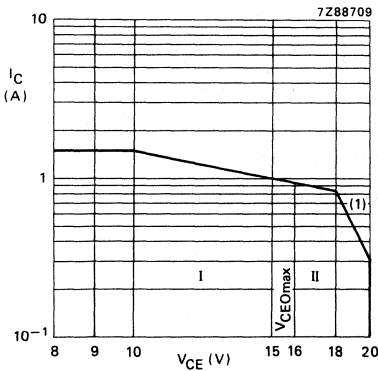
### PRODUCT SAFETY

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)	$V_{CB0}$	max.	40 V
Collector-emitter voltage $R_{BE} = 47 \Omega$ open base	$V_{CER}$	max.	20 V
Emitter-base voltage (open collector)	$V_{CEO}$	max.	16 V
Collector current (d.c.)	$V_{EBO}$	max.	3,5 V
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	$I_C$	max.	1,5 A
Storage temperature	$P_{tot}$	max.	15 W
Junction temperature	$T_{stg}$	-65 to +200	$^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_j$	max.	200 $^\circ\text{C}$
	$T_{sld}$	max.	235 $^\circ\text{C}$



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

Fig. 2 D.C. SOAR at  $T_{mb} \leq 75 \text{ }^\circ\text{C}$ .

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

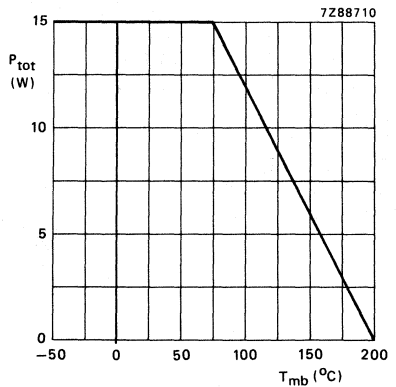


Fig. 3 Power derating curve vs. mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th \text{ j-mb}} = 5 \text{ K/W}$

From mounting base to heatsink

$R_{th \text{ mb-h}} = 0,7 \text{ K/W}$

## CHARACTERISTICS

$T_{\text{case}} = 25\text{ }^{\circ}\text{C}$

Collector cut-off current

$$I_E = 0; V_{CB} = 20\text{ V}$$

$$I_{CBO} < 0,4\text{ mA}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5\text{ V}$$

$$I_{EBO} < 1,2\text{ }\mu\text{A}$$

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

$$I_E = I_C = 0; V_{CB} = 16\text{ V}; V_{EB} = 1\text{ V}$$

$$C_{cb} \text{ typ. } 6\text{ pF}$$

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

$$I_E = I_C = 0; V_{CE} = 16\text{ V}; V_{EB} = 1\text{ V}$$

$$C_{ce} \text{ typ. } 66\text{ pF}$$

Emitter-base capacitance at  $f = 1\text{ MHz}$

$$I_E = I_C = 0; V_{CB} = 16\text{ V}; V_{EB} = 1\text{ V}$$

$$C_{eb} \text{ typ. } 66\text{ pF}$$

## APPLICATION INFORMATION

R.F. performance in c.w. operation up to  $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$  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	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
3,7 to 4,2	16	800	$\geq 2$ (33) typ. 2,4 (33,8)	$\geq 5$ typ. 6,5	$6 + j7,5$	$5,5 - j1$

## Notes

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

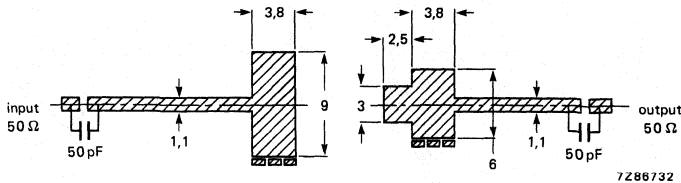


Fig. 4 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

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

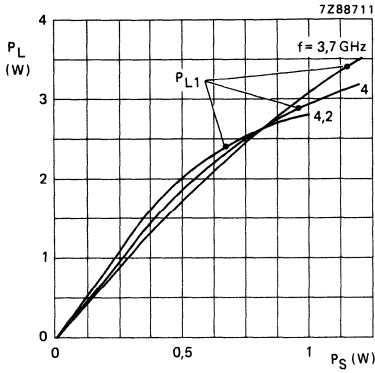


Fig. 5 Load power as a function of source power.

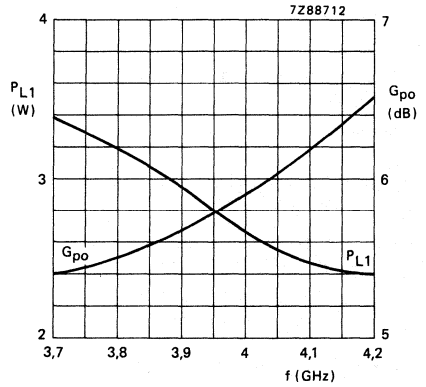


Fig. 6 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 5 and 6:

$V_{CE} = 16 \text{ V}$   
 $I_C = 800 \text{ mA}$  } regulated; typical values;  $T_{case} = 25 \text{ }^\circ\text{C}$ .

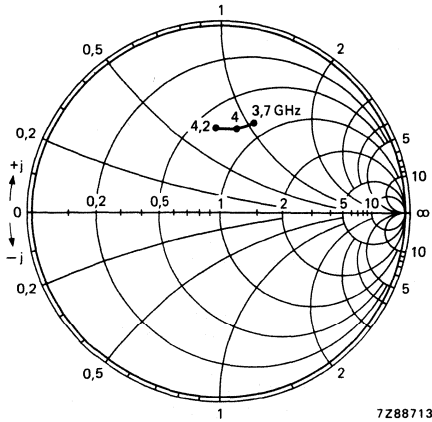


Fig. 7 Input impedance as a function of frequency for  $P_{L1}$ .

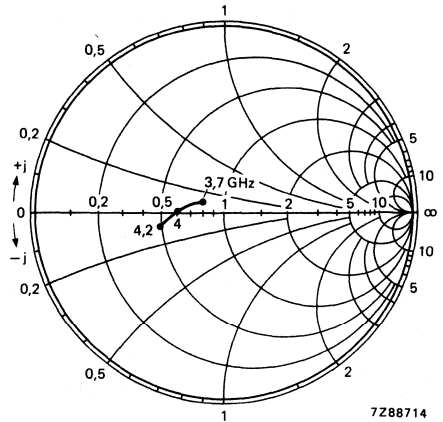


Fig.8 Optimum load impedance as a function of frequency for  $P_{L1}$ .

Conditions for Figs 7 and 8:

$V_{CE} = 16 \text{ V}$   
 $I_C = 800 \text{ mA}$  } regulated; typical values;  $Z_O = 10 \text{ } \Omega$ ;  $T_{case} = 25 \text{ }^\circ\text{C}$ .

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A selective amplifier

mode of operation	f GHz	$V_{CE}$ V	$I_C$ mA	$P_{L1}$ W	$G_{p0}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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

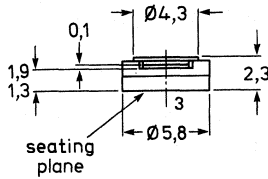
FO-93 (see Fig. 1).

**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**

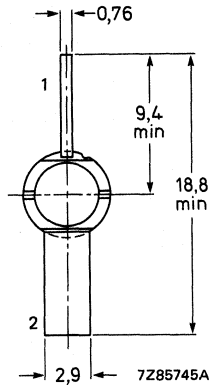
Dimensions in mm

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
$R_{BE} = 70 \Omega$	$V_{CER}$	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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	6 W
Storage temperature	$T_{stg}$		-65 to + 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$



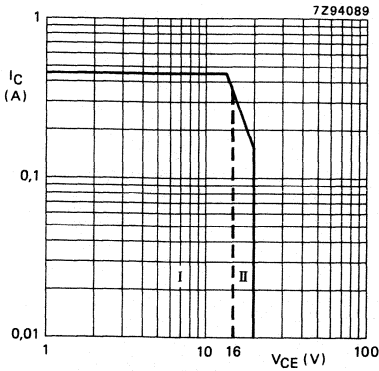


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75 \text{ }^\circ\text{C}$ .

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

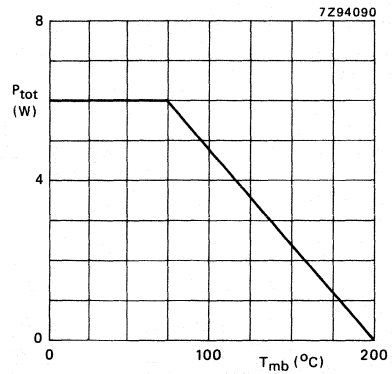


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

$$R_{th\ j-mb} = 12 \text{ K/W}$$

**CHARACTERISTICS**

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

Collector cut-off current

$$I_E = 0; V_{CB} = 25 \text{ V}$$

$$I_E = 0; V_{CB} = 35 \text{ V}$$

$$I_{CBO} \leq 10 \text{ } \mu\text{A}$$

$$\leq 500 \text{ } \mu\text{A}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5 \text{ V}$$

$$I_C = 0; V_{EB} = 3,5 \text{ V}$$

$$I_{EBO} \leq 10 \text{ } \mu\text{A}$$

$$\leq 100 \text{ } \mu\text{A}$$

D.C. current gain

$$I_C = 230 \text{ mA}; V_{CE} = 5 \text{ V}$$

$$h_{FE} \text{ typ. } 40$$

Collector-base capacitance

$$I_E = I_C = 0; V_{CB} = 16 \text{ V}; V_{EB} = 1,5 \text{ V}$$

$$C_{cb} \text{ typ. } 2 \text{ pF}$$

Collector-emitter capacitance

$$I_E = I_C = 0; V_{CE} = 16 \text{ V}; V_{EB} = 1,5 \text{ V}$$

$$C_{ce} \text{ typ. } 2 \text{ pF}$$

Emitter-base capacitance

$$I_E = I_C = 0; V_{CB} = 10 \text{ V}; V_{EB} = 1 \text{ V}$$

$$C_{eb} \text{ typ. } 15 \text{ pF}$$

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-emitter class-A selective amplifier\*.

mode of operation	f GHz	$V_{CE}$ V	$I_C$ mA	$PL_1$ W	$G_{po}$ dB	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	2,3	16	250	$\geq 1,2$	$\geq 7,5$	$3,5 + j11$	$6,4 + j2$

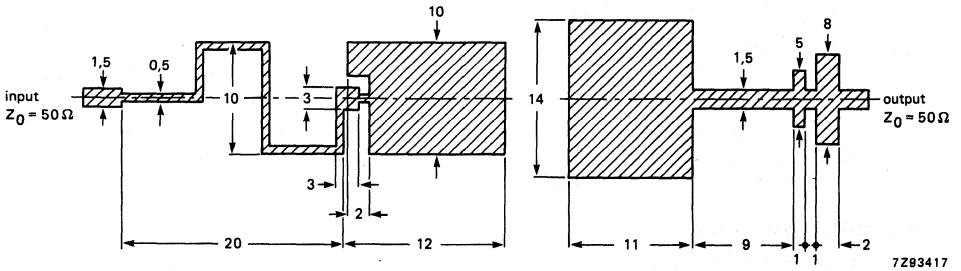


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,54$ ), thickness 0,8 mm.

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

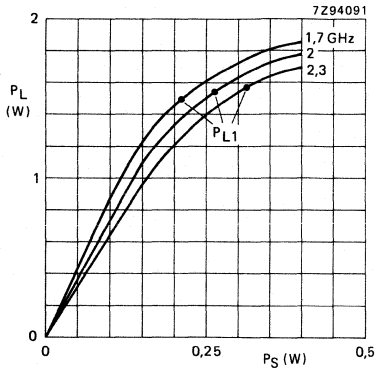


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

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

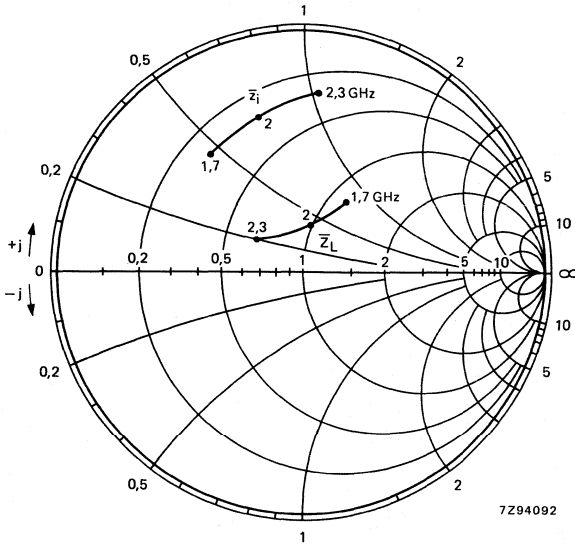


Fig. 6 Input and optimum load impedances versus frequency;  
 $Z_0 = 10 \Omega$ ;  $P_{L1} = 1,6 \text{ W}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	2,3	16	400	typ. 2,8	typ. 7,8	$2 + j8$	$5,5 - j1,8$

### MECHANICAL DATA

FO-93 (see Fig. 1).

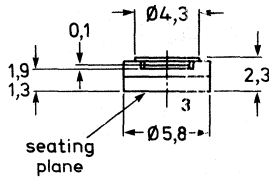
Dimensions in mm

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

**MECHANICAL DATA**

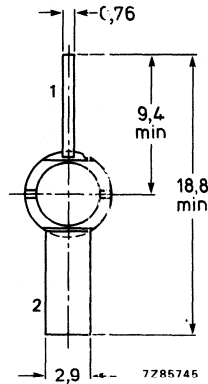
Fig. 1 FO-93.

Dimensions in mm



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 $T_{mb} = 75^\circ C$	$P_{tot}$	max.	8 W
Storage temperature	$T_{stg}$		$-65$ to $+200^\circ C$
Junction temperature	$T_j$	max.	$200^\circ C$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	$T_{sld}$	max.	$235^\circ C$

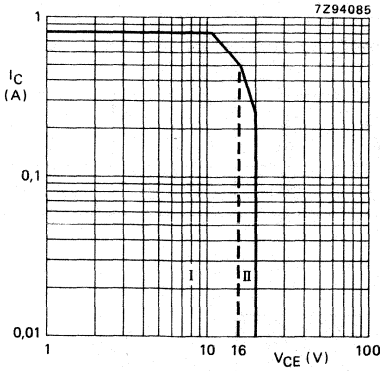


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75^\circ\text{C}$ .

- I Region of permissible d.c. operation
- II Permissible extension provided  $R_{BE} \leq 70 \Omega$ .

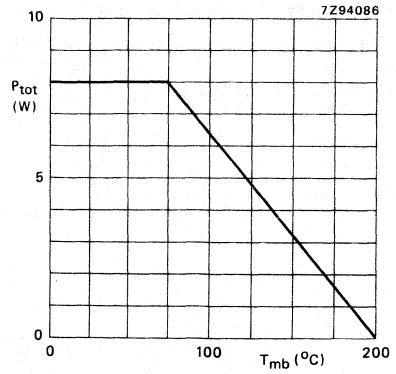


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

$$R_{th\ j-mb} = 8\ \text{K/W}$$

**CHARACTERISTICS**

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

Collector cut-off current

$$I_E = 0; V_{CB} = 25\ \text{V}$$

$$I_E = 0; V_{CB} = 35\ \text{V}$$

$$I_{CBO} \leq 15\ \mu\text{A}$$

$$\leq 700\ \mu\text{A}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5\ \text{V}$$

$$I_C = 0; V_{EB} = 3,5\ \text{V}$$

$$I_{EBO} \leq 15\ \mu\text{A}$$

$$\leq 150\ \mu\text{A}$$

D.C. current gain

$$I_C = 400\ \text{mA}; V_{CE} = 5\ \text{V}$$

$$h_{FE} \text{ typ. } 40$$

Collector-base capacitance

$$I_E = I_C = 0; V_{CB} = 16\ \text{V}; V_{EB} = 1,5\ \text{V}$$

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

Collector-emitter capacitance

$$I_E = I_C = 0; V_{CE} = 16\ \text{V}; V_{EB} = 1,5\ \text{V}$$

$$C_{ce} \text{ typ. } 2,2\ \text{pF}$$

Emitter-base capacitance

$$I_E = I_C = 0; V_{CB} = 10\ \text{V}; V_{EB} = 1\ \text{V}$$

$$C_{eb} \text{ typ. } 83\ \text{pF}$$

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w.; class-A	2,3	16	400	$\geq 2$	$\geq 7$	$2 + j8$	$5,5 - j1,8$

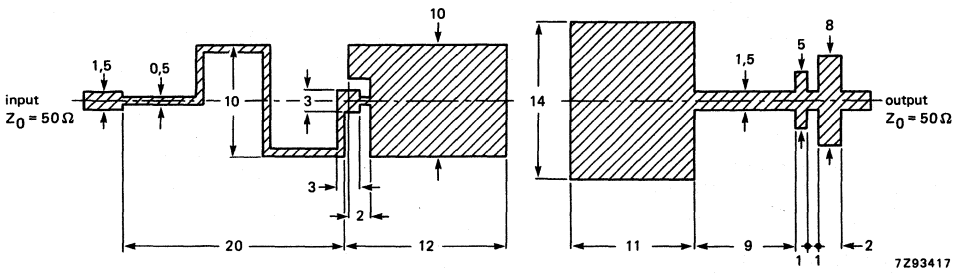


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,54$ ), thickness 0,8 mm.

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



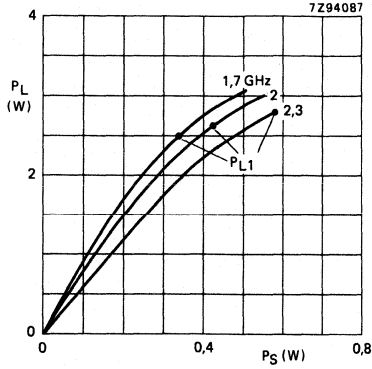


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

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

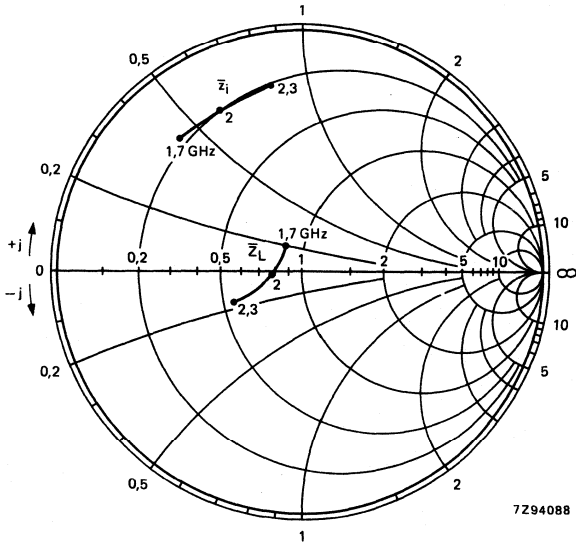


Fig. 6 Input and optimum load impedance versus frequency;  
 $Z_o = 10 \Omega$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-A wideband amplifier, typical values

mode of operation	f GHz	V <sub>CE</sub> V	PL <sub>1</sub> W	G <sub>po</sub> dB	I <sub>C</sub> A	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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.

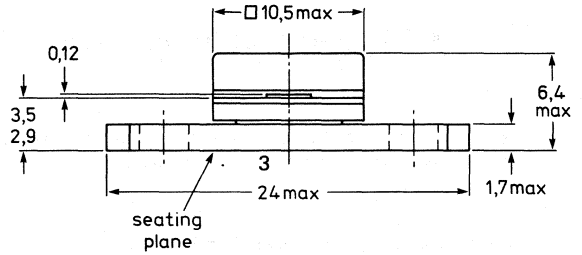
**MECHANICAL DATA**

Fig. 1 FO-57C.

Dimensions in mm

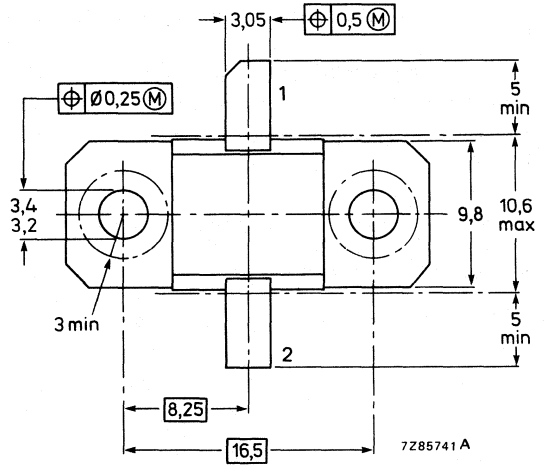
**Pinning:**

- 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 $T_{mb} = 75^\circ C$	$P_{tot}$	max.	36 W
Storage temperature	$T_{stg}$		-65 to +200 °C
Junction temperature	$T_j$	max.	200 °C
Soldering temperature at 0,1 mm from flange; $t_{sld} \leq 10$ s	$T_{sld}$	max.	235 °C

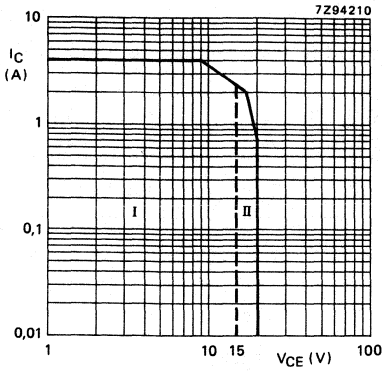


Fig. 2 D.C. SOAR;  $T_{mb} \leq 75^\circ\text{C}$ .  
 I Region of permissible D.C. operation  
 II Permissible extension provided  
 $R_{BE} \leq 47 \Omega$

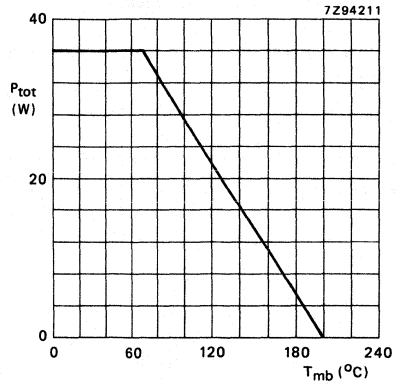


Fig. 3 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base  
 From mounting base to heatsink

$R_{th\ j-mb} = 2,2\ \text{K/W}$   
 $R_{th\ mb-h} = 0,5\ \text{K/W}$

**CHARACTERISTICS**

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

Collector cut-off current

$I_E = 0; V_{CB} = 20\ \text{V}$   
 $I_E = 0; V_{CB} = 30\ \text{V}$   
 $V_{CE} = 20\ \text{V}; R_{BE} = 47\ \Omega$   
 $V_{CE} = 15\ \text{V}; I_B = 0$

$I_{CBO} \leq 1\ \text{mA}$   
 $I_{CER} \leq 5\ \text{mA}$   
 $I_{CEO} \leq 4\ \text{mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\ \text{V}$   
 $I_C = 0; V_{EB} = 3\ \text{V}$

$I_{EBO} \leq 200\ \mu\text{A}$   
 $I_{EBO} \leq 1\ \text{mA}$

D.C. current gain

$I_C = 2\ \text{A}; V_{CE} = 3\ \text{V}$

$h_{FE} = 15\ \text{to}\ 100$

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-emitter class-A wideband amplifier \*

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L1</sub> W	G <sub>po</sub> dB	I <sub>C</sub> A	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.: class-A	1,4 to 1,8	16	$\geq 9$	$\geq 10$	2	see Fig. 7	

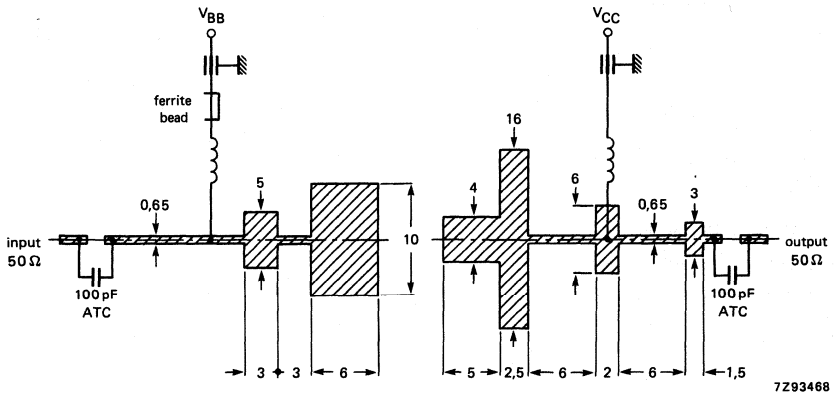


Fig. 4 Prematching test circuit board for 1,4 to 1,8 GHz, c.w, class-A application (dimensions in mm). Epsilam p.c. board, thickness 0,635 mm,  $\epsilon_r = 10$ .

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

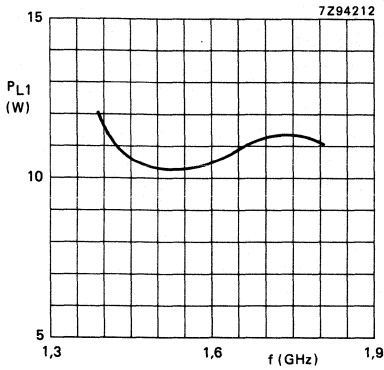


Fig. 5 Load power versus frequency.

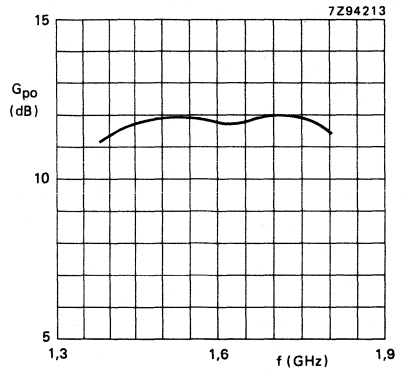


Fig. 6 Linear power gain versus frequency.

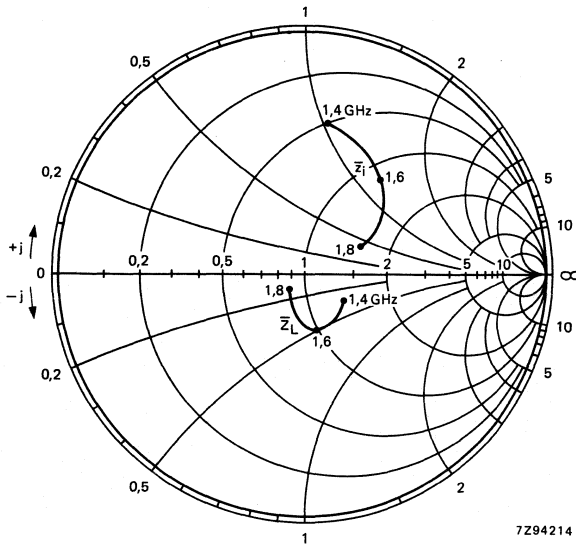


Fig. 7 Input and load impedances versus frequency;  
 $Z_0 = 5 \Omega$ ; typical values.

Conditions for Figs 5 to 7:

$V_{CE} = 16 \text{ V}$  } regulated;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ; typical values.  
 $I_C = 2 \text{ A}$  }





## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 1\%$	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.

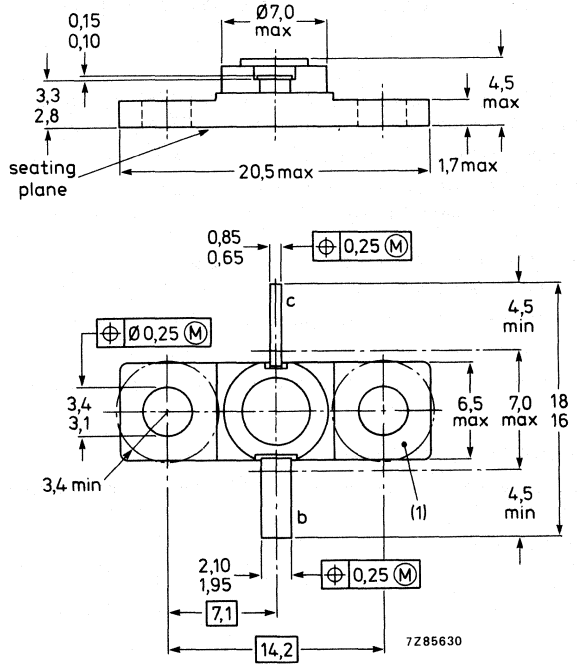
**MECHANICAL DATA**

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

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{ON} = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	8 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	$V_{CC}$ V	$P_L$ W	$G_D$ dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
pulsed $t_{on} = 10\ \mu s$ $\delta = 1\%$	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.

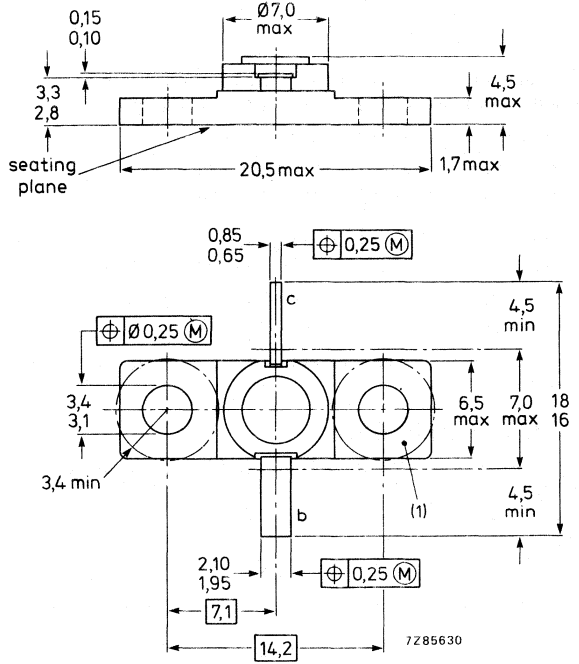
**MECHANICAL DATA**

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

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{on} = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	3,5 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 1\%$	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.

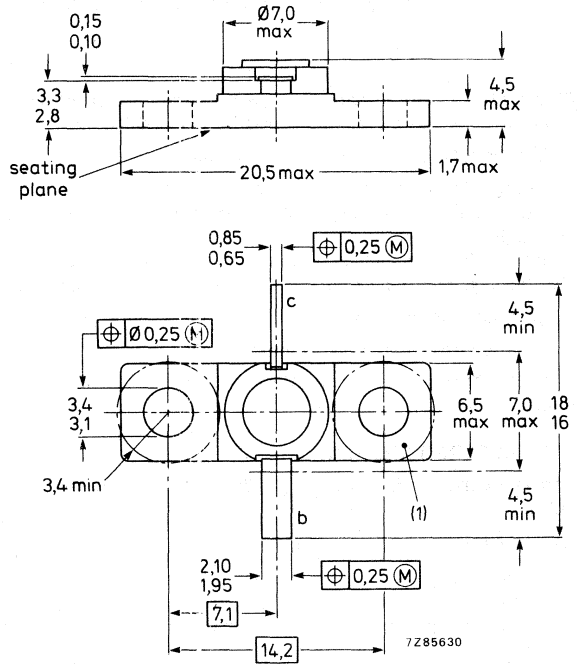
**MECHANICAL DATA**

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

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{on} = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	2,5 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	PL W	G <sub>p</sub> dB	$\eta_c$ %
pulsed $t_{on} = 10\text{ }\mu\text{s}$ $\delta = 1\%$	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.

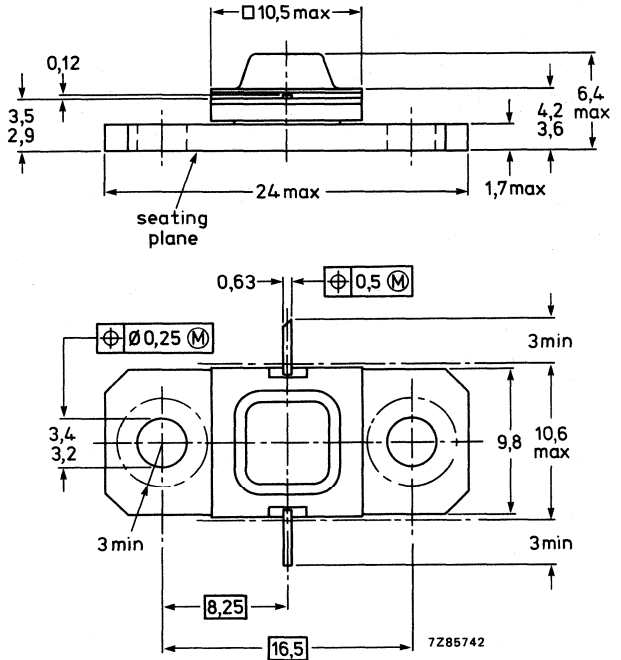
**MECHANICAL DATA**

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)	$V_{CB0}$	max.	65 V
Collector-emitter voltage ( $R_{BE} = 10 \Omega$ ) (open base)	$V_{CE0}$	max.	65 V
Emitter-base voltage (open collector)	$V_{EB0}$	max.	3.5 V
Collector current ( $t_{on} \leq 10 \mu s, \delta \leq 1\%$ )	$I_C$	max.	10 A
Total power dissipation ( $t_{on} \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75^\circ C$ )	$P_{tot}$	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; $t_{slid} \leq 10 s$	$T_{slid}$	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{on} = 10 \mu s, \delta = 1\%$	$R_{th j-mb}$	0,075 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	PL W	G <sub>p</sub> dB	$\eta_c$ %
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 1\%$	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.

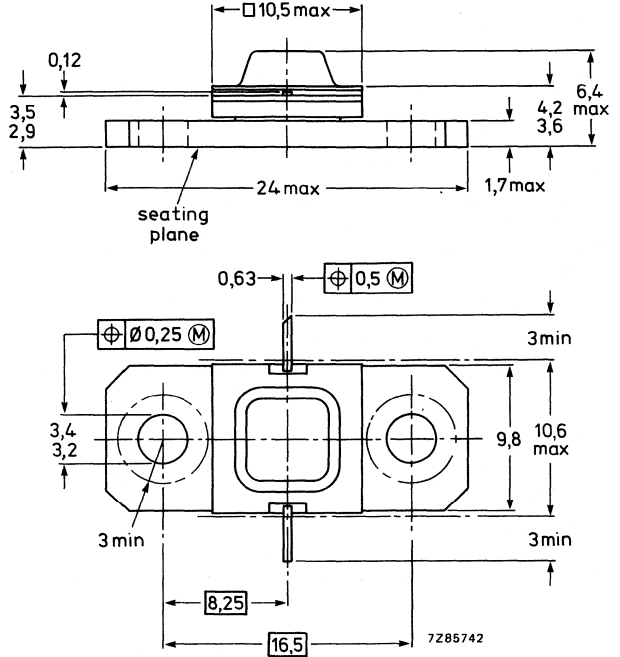
**MECHANICAL DATA**

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)	$V_{CB0}$	max.	65 V
Collector-emitter voltage ( $R_{BE} = 10 \Omega$ ) (open base)	$V_{CEr}$	max.	65 V
	$V_{CE0}$	max.	35 V
Emitter-base voltage (open collector)	$V_{EB0}$	max.	3,5 V
Collector current ( $t_{ON} \leq 10 \mu s, \delta \leq 1\%$ )	$I_C$	max.	32 A
Total power dissipation ( $t_{ON} \leq 10 \mu s, \delta \leq 1\%, T_{mb} = 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	1200 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{slid} \leq 10 \text{ s}$	$T_{slid}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{ON} = 10 \mu s, \delta = 1\%$	$R_{th j-mb}$	0,04 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f HGz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 1\%$	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<sub>e</sub>O disc is not damaged.

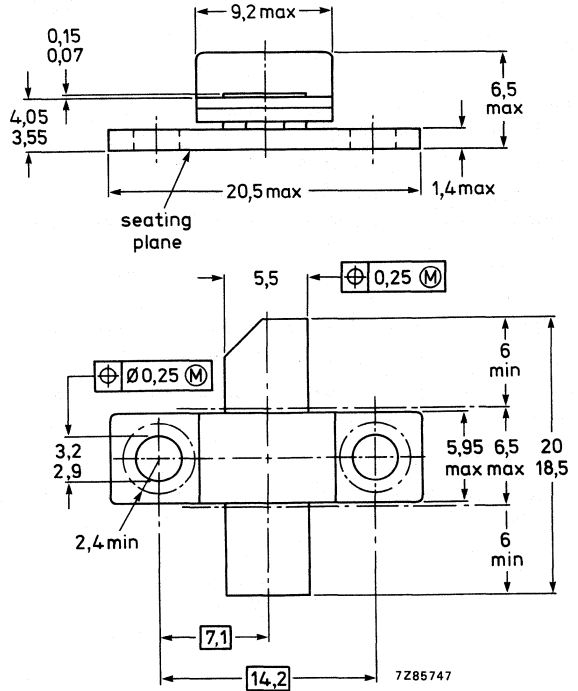
MECHANICAL DATA

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

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{ON} = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,08 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 1\%$	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.

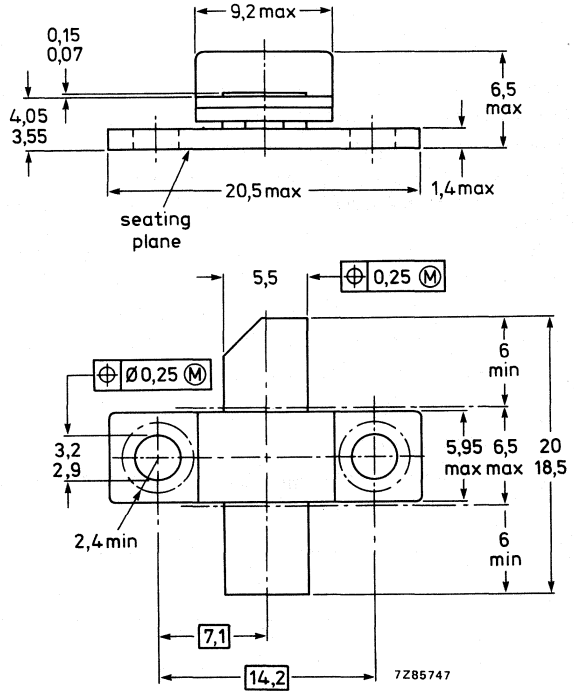
**MECHANICAL DATA**

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 ( $R_{BE} = 10 \Omega$ ) (open base)	$V_{CER}$	max.	65 V
	$V_{CEO}$	max.	35 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3.5 V
Collector current ( $t_{ON} \leq 10 \mu s, \delta \leq 1\%$ )	$I_C$	max.	25 A
Total power dissipation ( $t_{ON} \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	1000 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{ON} = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,04 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %
pulsed $t_{on} = 10\text{ }\mu\text{s}$ $\delta = 1\%$	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.

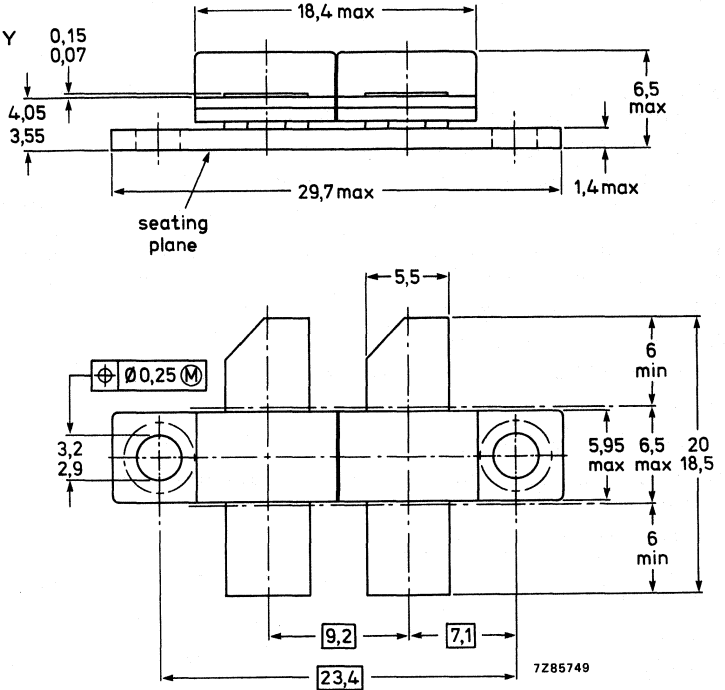
**MECHANICAL DATA**

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 <sub>CBO</sub>	max.	65 V
Collector-emitter voltage (R <sub>BE</sub> = 10 Ω) (open base)	V <sub>CER</sub> V <sub>CEO</sub>	max.	65 V 35 V
Emitter-base voltage (open collector)	V <sub>EBO</sub>	max.	3,5 V
Collector current (t <sub>ON</sub> ≤ 10 μs, δ ≤ 1%)	I <sub>C</sub>	max.	50 A
Total power dissipation (t <sub>ON</sub> ≤ 10 μs, δ ≤ 1%, T <sub>mb</sub> ≤ 75 °C)	P <sub>tot</sub>	max.	2000 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	200 °C
Soldering temperature at 0,1 mm from case; t <sub>slid</sub> ≤ 10 s	T <sub>slid</sub>	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; t <sub>ON</sub> = 10 μs, δ = 1%	R <sub>th j-mb</sub>	0,02 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %
pulsed $t_{on} = 10\text{ }\mu\text{s}$ $\delta = 1\%$	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.

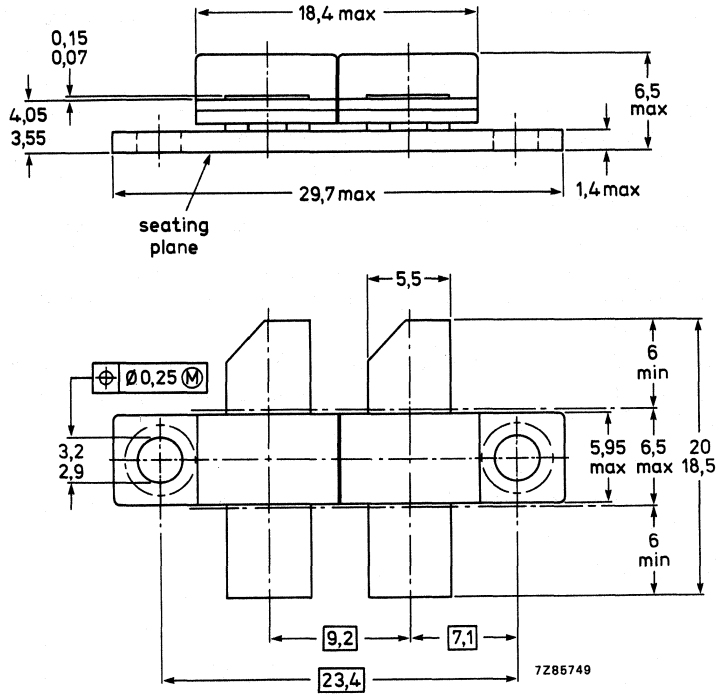
**MECHANICAL DATA**

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 <sub>CBO</sub>	max.	65 V
Collector-emitter voltage (R <sub>BE</sub> = 10 Ω) (open base)	V <sub>CER</sub>	max.	65 V
	V <sub>CEO</sub>	max.	35 V
Emitter-base voltage (open collector)	V <sub>EBO</sub>	max.	3,5 V
Collector current (t <sub>ON</sub> ≤ 10 μs, δ ≤ 1%)	I <sub>C</sub>	max.	50 A
Total power dissipation (t <sub>ON</sub> ≤ 10 μs, δ ≤ 1%, T <sub>mb</sub> ≤ 75 °C)	P <sub>tot</sub>	max.	1800 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	200 °C
Soldering temperature at 0,1 mm from case; t <sub>slid</sub> ≤ 10 s	T <sub>slid</sub>	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; t <sub>ON</sub> = 10 μs, δ = 1%	R <sub>th j-mb</sub>	0,02 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
pulsed $t_{on} = 10\text{ }\mu\text{s}$ $\delta = 1\%$	1,09	50	900	7,8	35	$2,5 + j4$	$10 - j11$

### MECHANICAL DATA

FO-96 (see Fig. 1)

### PRODUCT SAFETY

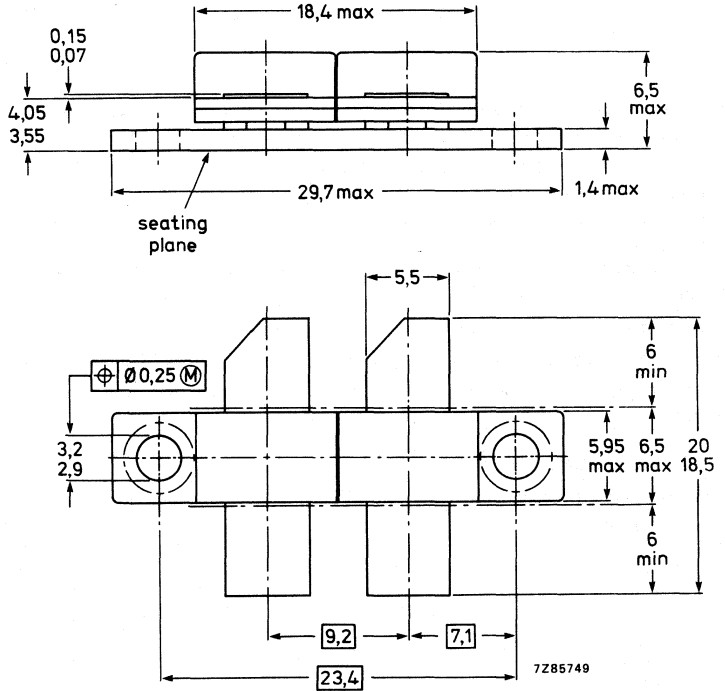
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

**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 ( $R_{BE} = 10 \Omega$ )	$V_{CER}$	max.	65 V
(open base)	$V_{CEO}$	max.	35 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3,5 V
Collector current ( $t_{ON} \leq 10 \mu s, \delta \leq 1\%$ )	$I_C$	max.	50 A
Total power dissipation ( $t_{ON} \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	2000 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case, $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; $t_{ON} = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,02 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 10\%$	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.

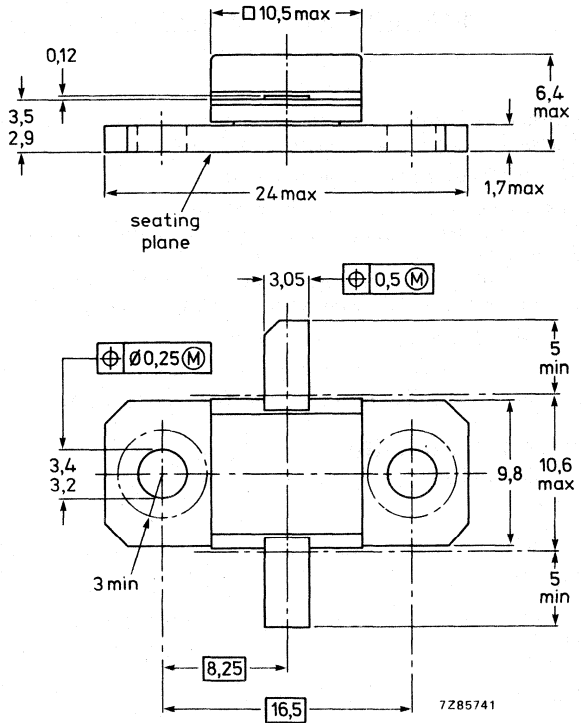
**MECHANICAL DATA**

Fig. 1 FO-57C.

**Marking code:**

RTC MZ 0912 B 75 Y

Dimensions in mm



**RATINGS**

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

Collector-base voltage (open emitter)	V <sub>CBO</sub>	max.	65 V
Collector-emitter voltage (R <sub>BE</sub> = 10 Ω) (open base)	V <sub>CER</sub>	max.	65 V
	V <sub>CEO</sub>	max.	35 V
Emitter-base voltage (open collector)	V <sub>EBO</sub>	max.	3.5 V
Collector current (t <sub>ON</sub> ≤ 10 μs, δ ≤ 10%)	I <sub>C</sub>	max.	7 A
Total power dissipation (t <sub>ON</sub> ≤ 10 μs, δ ≤ 10%, T <sub>mb</sub> ≤ 75 °C)	P <sub>tot</sub>	max.	300 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	200 °C
Soldering temperature at 0.1 mm from case; t <sub>slid</sub> ≤ 10 s	T <sub>slid</sub>	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base under pulsed conditions; t <sub>ON</sub> = 10 μs, δ = 10%	R <sub>th j-mb</sub>	0.2 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %
pulsed $t_{on} = 10\text{ }\mu\text{s}$ $\delta = 10\%$	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.

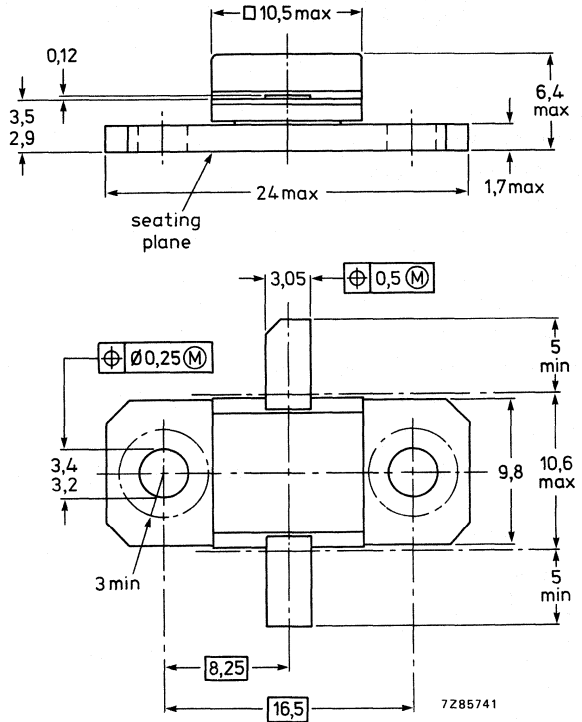
**MECHANICAL DATA**

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)	$V_{CB0}$	max.	65 V
Collector-emitter voltage ( $R_{BE} = 10 \Omega$ )	$V_{CER}$	max.	65 V
(open base)	$V_{CEO}$	max.	35 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3,5 V
Collector current ( $t_{on} \leq 10 \mu s, \delta \leq 10\%$ )	$I_C$	max.	14 A
Total power dissipation ( $t_{on} \leq 10 \mu s, \delta \leq 10\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	600 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature	$T_{slid}$	max.	235 $^\circ\text{C}$
at 0,1 mm from case, $t_{slid} \leq 10 \text{ s}$			

**THERMAL RESISTANCE**

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



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-emitter class-B circuit

type number	mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_D$ dB	$\eta$ %
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

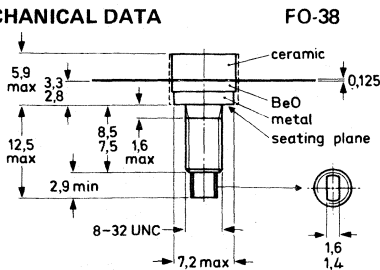
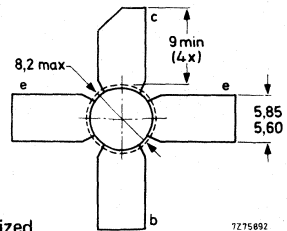
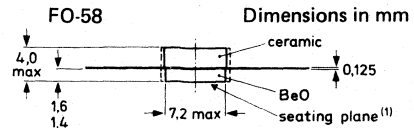


Fig. 1a For top view see Fig. 1b.

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.

**PEE1001U  
PDE1001U  
FAMILIES**

**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 $R_{BE} = 10 \Omega$	$V_{CER}$	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 $T_{mb} = 25^\circ\text{C}$	$P_{tot}$	max. 5	7	12,5	20	W
Storage temperature	$T_{stg}$	-65 to +150				$^\circ\text{C}$
Operating junction temperature	$T_j$	max. 200				$^\circ\text{C}$
Lead soldering temperature at 0,7 mm from ceramic; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max. 235				$^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base

		PEE/PDE1001U	1003U	1005U	1010U	
	$R_{th \text{ j-mb}}$	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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
c.w. class-B	3	28	1,2	10	33	50 + j30	2,5 + j5

### MECHANICAL DATA

FO-53 (see Fig. 1)

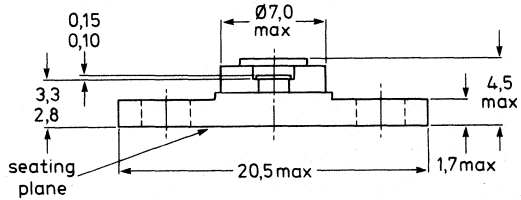
### PRODUCT SAFETY

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

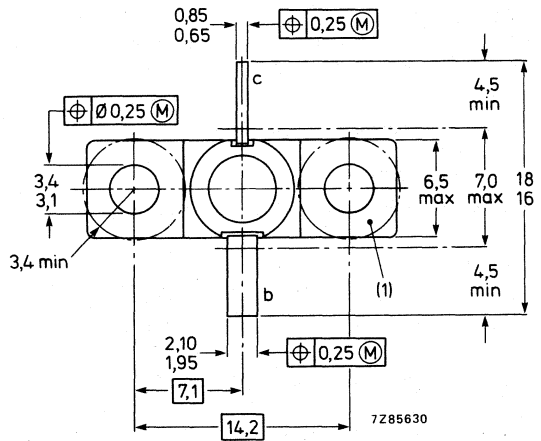
MECHANICAL DATA

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 $T_{mb} = 75\text{ °C}$	$P_{tot}$	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; $t_{sld} \leq 10\text{ s}$	$T_{sld}$	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	22 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-B	3	28	3,5	7	35	9 + j18	2 - j6

### MECHANICAL DATA

FO-53 (see Fig. 1)

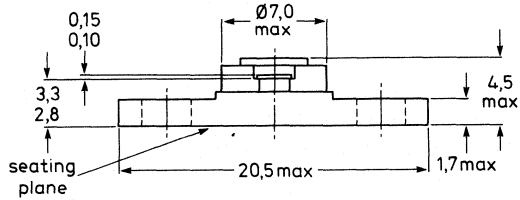
### PRODUCT SAFETY

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

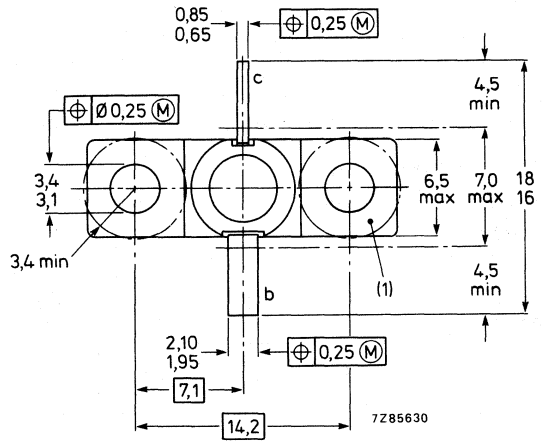
MECHANICAL DATA

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)	$V_{CB0}$	max.	45 V
Collector-emitter voltage (open base)	$V_{CE0}$	max.	20 V
Emitter-base voltage (open collector)	$V_{EB0}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	11 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w. class-B	3	28	5	5,2	29	5 + j25	1 + j14

### MECHANICAL DATA

FO-53 (see Fig. 1)

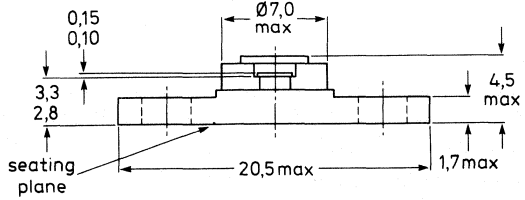
### PRODUCT SAFETY

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

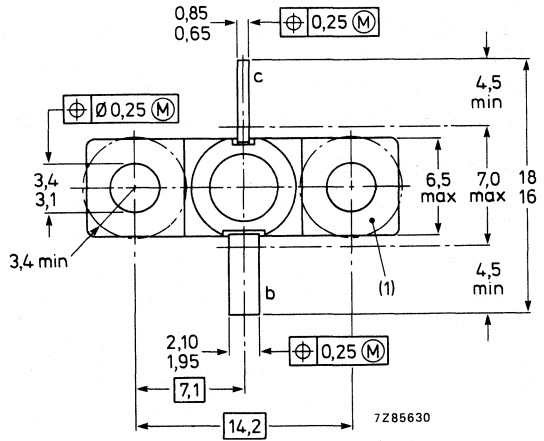
MECHANICAL DATA

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 ( $R_{BE} = 10 \Omega$ )	$V_{CER}$	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	$T_{sld}$	max.	235 °C
at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$			

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	7 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>D</sub> dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
pulsed $t_{on} = 10\ \mu\text{s}$ $\delta = 10\%$	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.

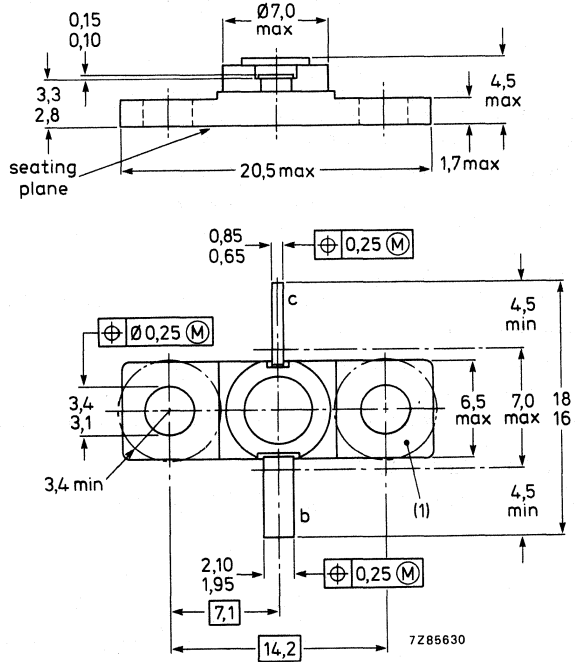
**MECHANICAL DATA**

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)	$V_{CB0}$	max.	40 V
Collector-emitter voltage ( $R_{BE} = 10 \Omega$ )	$V_{CEr}$	max.	40 V
Emitter-base voltage (open collector)	$V_{EB0}$	max.	3 V
Collector current ( $t_{on} \leq 10 \mu s, \delta \leq 10\%$ )	$I_C$	max.	1,2 A
Total power dissipation ( $t_{on} \leq 10 \mu s, \delta \leq 10\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	17,5 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0.1 mm from case; $t_{slid} \leq 10 \text{ s}$	$T_{slid}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	7,5 K/W
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## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C circuit

mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta_c$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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 ;**

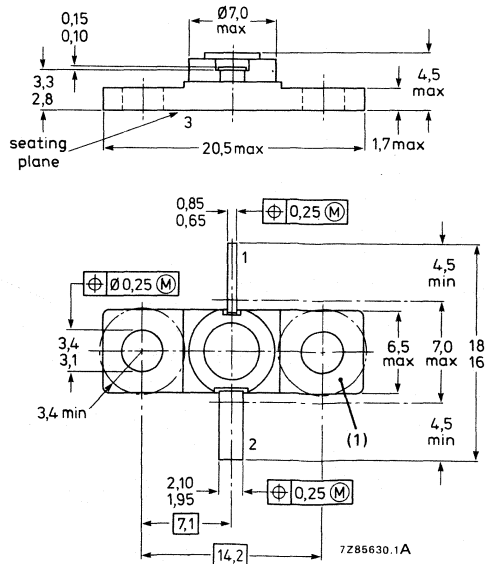
- 1 = collector
- 2 = emitter
- 3 = base

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 <sub>CBO</sub>	max.	40 V
Collector-emitter voltage	V <sub>CER</sub>	max.	40 V
R <sub>BE</sub> ≤ 10 Ω	V <sub>CEO</sub>	max.	22 V
open base	V <sub>EBO</sub>	max.	3 V
Emitter-base voltage (open collector)	I <sub>C</sub>	max.	2 A
Collector current (d.c.)	P <sub>tot</sub>	max.	25 W
Total power dissipation up to T <sub>mb</sub> = 75 °C	T <sub>stg</sub>	-65 to + 200 °C	
Storage temperature	T <sub>j</sub>	max.	200 °C
Junction temperature	T <sub>slid</sub>	max.	235 °C
Lead soldering temperature			
at 0,3 mm from the case; t <sub>slid</sub> ≤ 10 s			

**THERMAL RESISTANCE**

From junction to mounting base	R <sub>th j-mb</sub>	=	4 K/W
From mounting base to heatsink	R <sub>th mb-h</sub>	=	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 <sub>CC</sub> V	PL W	G <sub>p</sub> dB	η <sub>c</sub> %	$\bar{z}_i$ 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.

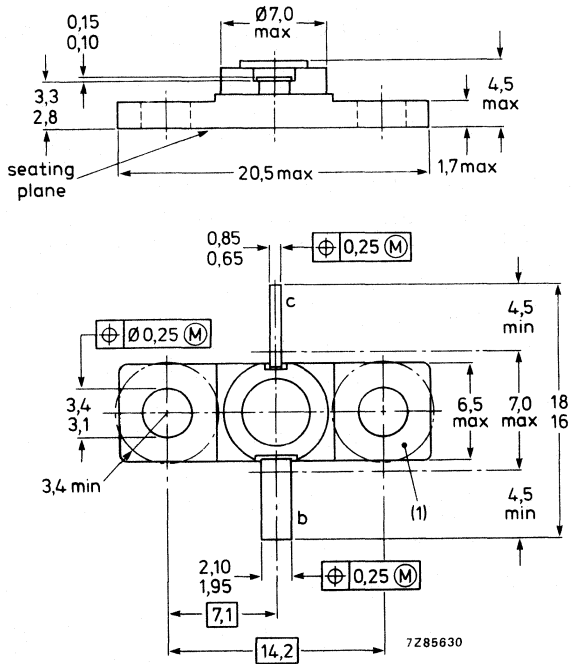
**MECHANICAL DATA**

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 ( $R_{BE} = 10 \Omega$ )	$V_{CER}$	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; $T_{mb} \leq 75^\circ C$	$P_{tot}$	max. 4	7,5	18	W
Junction temperature	$T_j$	max. 200	200	200	$^\circ C$
Storage temperature	$T_{stg}$	min. -65	-65	-65	$^\circ C$
		max. 200	200	200	$^\circ C$
Soldering temperature ( $d = 0,7$ mm; $t_{sld} = 10$ s)	$T_{sld}$	max. 235	235	235	$^\circ C$
<b>THERMAL RESISTANCE</b>					
Junction-mounting base	$R_{th j-mb}$	30	18	7	K/W
From mounting base to heatsink	$R_{th mb-h}$	0,7	0,7	0,7	K/W
(torque on nut: 0,5 Nm with M3 screw)					

## 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, interdigitated 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 <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>c</sub> %	$\bar{z}_i$ 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).

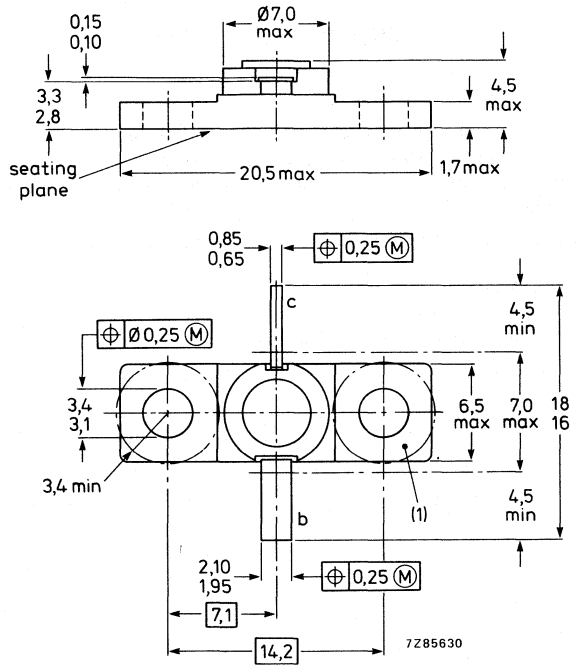
### PRODUCT SAFETY

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 ( $R_{BE} = 10 \Omega$ )	$V_{CER}$	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 ( $T_{mb} \leq 75 \text{ }^\circ\text{C}$ )	$P_{tot}$	max.	16.5 W
Storage temperature	$T_{stg}$	min.	-65 $^\circ\text{C}$
Operating junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0.7 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	230 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	6 K/W
From mounting base to heatsink (torque on nut: 0.5 Nm with M3 screw)	$R_{th mb-h}$	=	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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta$ %	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
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

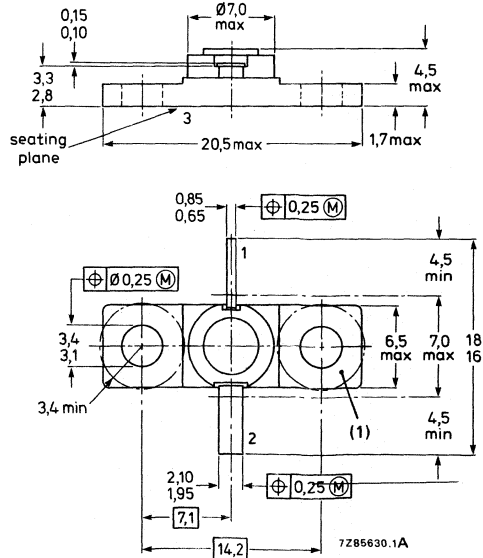
RTC3003M = PKB32003U

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 $T_{mb} = 75^\circ C$	$P_{rf}$	max. 4,5	9	15	W
Storage temperature	$T_{stg}$	max. -65 to +200			$^\circ C$
Junction temperature	$T_j$	max. 200			$^\circ C$
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leq 10$ s	$T_{sld}$	max. 235			$^\circ C$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th\ j-mb}$	max. 22	11	6,6	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max. 0,7	0,7	0,7	K/W

# DEVELOPMENT DATA

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

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  $T_{mb} = 25^{\circ}\text{C}$  in an oscillator circuit up to 5 GHz.

mode of operation	f GHz	VCE V	IC mA	PL mW
class-B; c.w.	5	• 20	200	450

### MECHANICAL DATA

Dimensions in mm

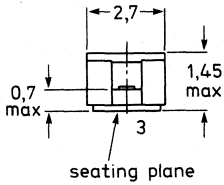
PPC5001T FO-102 (see Fig. 1a)

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.

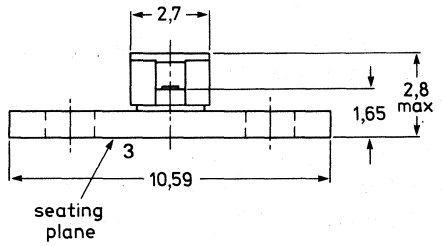
MECHANICAL DATA

Fig. 1a FO-102.  
PPC5001T



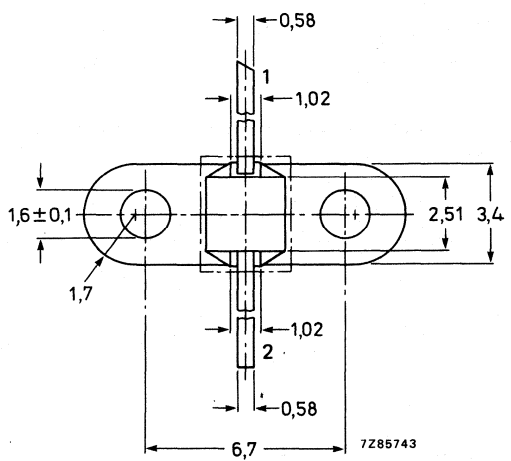
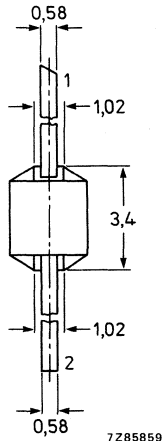
Dimensions in mm

Fig. 1b FO-85.  
PQC5001T



Pinning:

- 1 = base
- 2 = emitter
- 3 = collector



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, $R_{BE} = 70 \Omega$ open emitter	$V_{CER}$ $V_{CEO}$	max. max.	35 V 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 $T_{amb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	4 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from the case, $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

DEVELOPMENT DATA

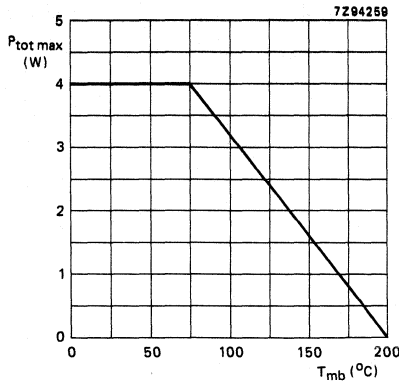


Fig. 2 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base  $R_{th \text{ j-mb}} = 24 \text{ K/W}$

**CHARACTERISTICS**

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

Breakdown voltages

$I_C = 500 \mu\text{A}; I_E = 0$

$I_C = 2,5 \text{ mA}; R_{BE} = 70 \Omega$

$I_C = 0; I_E = 100 \mu\text{A}$

$V_{(BR)CBO} \geq 40 \text{ V}$

$V_{(BR)CER} \geq 35 \text{ V}$

$V_{(BR)EBO} \geq 3,5 \text{ V}$

Collector cut-off current

$I_E = 0; V_{CB} = 24 \text{ V}$

$I_{CBO} \leq 100 \mu\text{A}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 0,2 \text{ mA}$

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

$I_E = I_C = 0; V_{CB} = 18 \text{ V}; V_{EB} = 1,5 \text{ V}$

$C_{cb} \text{ typ. } 1,4 \text{ pF}$

Emitter-base capacitance at  $f = 1 \text{ MHz}$   
 $I_E = I_C = 0; V_{EB} = 1 \text{ V}; V_{CB} = 10 \text{ V}$   
 Collector-emitter capacitance at  $f = 1 \text{ MHz}$   
 $I_E = I_C = 0; V_{CE} = 18 \text{ V}; V_{EB} = 1,5 \text{ V}$

$C_{eb}$	typ.	5,5 pF
$C_{ce}$	typ.	0,9 pF

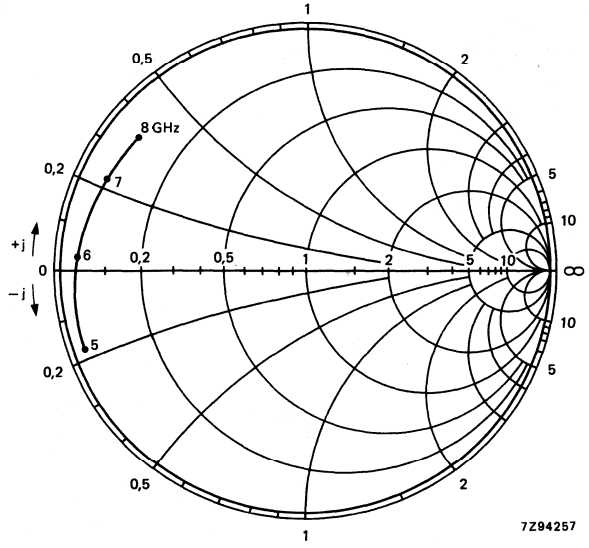


Fig. 3 Emitter reflection coefficient.

Conditions for Figs 3 and 4:  
 $V_{CE} = 20 \text{ V}; I_C = 200 \text{ mA};$   
 $Z_0 = 50 \Omega$

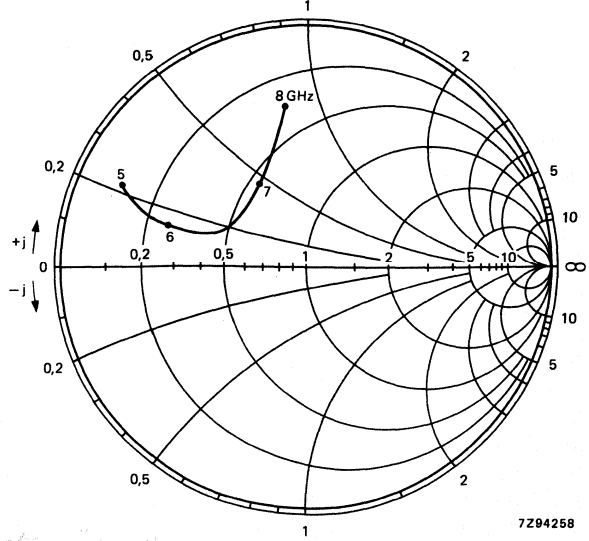


Fig. 4 Base reflection coefficient.

# DEVELOPMENT DATA

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

PTB23001X  
PTB23003X  
PTB23005X

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B circuit

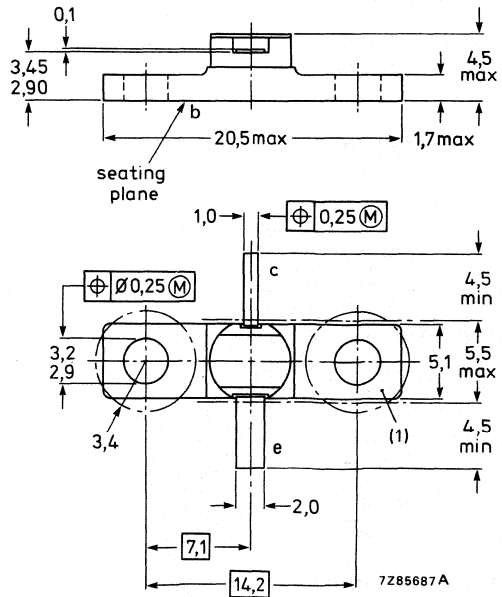
type number	mode of operation	f GHz	$V_{CE}$ V	PL W	$G_p$ dB	$\eta$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
PTB23001X	c.w.	2	24	typ. 1,8	typ. 9	typ. 50	$8 + j14$	$8 + j20$
PTB23003X	c.w.	2	24	typ. 4,0	typ. 10	typ. 50	$2,5 + j14$	$8 + j6$
PTB23005X	c.w.	2	24	typ. 7,0	typ. 11	typ. 50	$1,9 + j12$	$3 + j20$

### MECHANICAL DATA

Fig. 1 FO-41B.

Dimensions in mm

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 $R_{BE} = 10 \Omega$ open base	$V_{CER}$ max.	40	40	40 V
	$V_{CEO}$ 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; $t_{sld} \leq 10$ s	$T_{sld}$ max.	235 $^\circ C$		

**THERMAL RESISTANCE**

		PTB23001X	23003X	23005X
From junction to mounting base	$R_{th\ j-mb}$ max.	22	12	8,5 K/W
From mounting base to heatsink	$R_{th\ mb-h}$ max.	0,7	0,7	0,7 K/W

PTB23001X

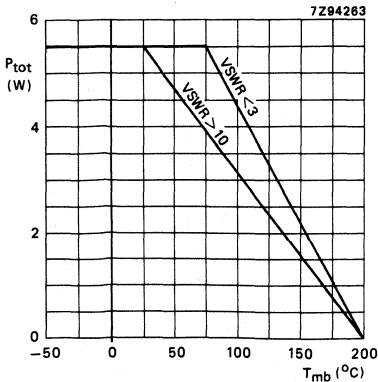


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.

PTB23003X

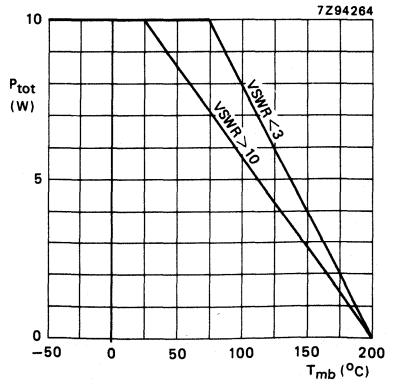
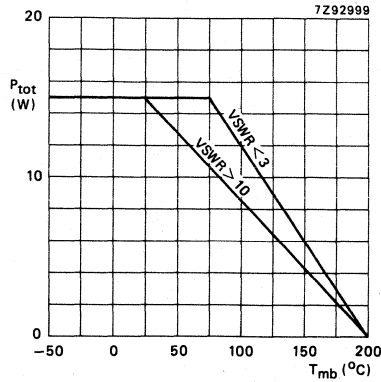


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.





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	$V_{(BR)CBO} \geq$	40	—	— V
open emitter; $I_C = 2$ mA	$\geq$	—	40	— V
open emitter; $I_C = 3$ mA	$\geq$	—	—	40 V
Collector-emitter breakdown voltage				
$R_{BE} = 10 \Omega$ ; $I_C = 10$ mA	$V_{(BR)CER} \geq$	40	40	40 V
Emitter-base breakdown voltage				
open collector; $I_E = 0,5$ mA	$V_{(BR)EBO} \geq$	3,5	—	— V
open collector; $I_E = 1,0$ mA	$\geq$	—	3,5	— V
open collector; $I_E = 1,5$ mA	$\geq$	—	—	3,5 V
Collector cut-off current				
$I_E = 0$ ; $V_{CB} = 24$ V	$I_{CBO} \leq$	10	20	30 $\mu$ A
Emitter cut-off current				
$I_C = 0$ ; $V_{EB} = 1,5$ V	$I_{EBO} \leq$	0,2	0,4	0,6 $\mu$ A
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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B circuit

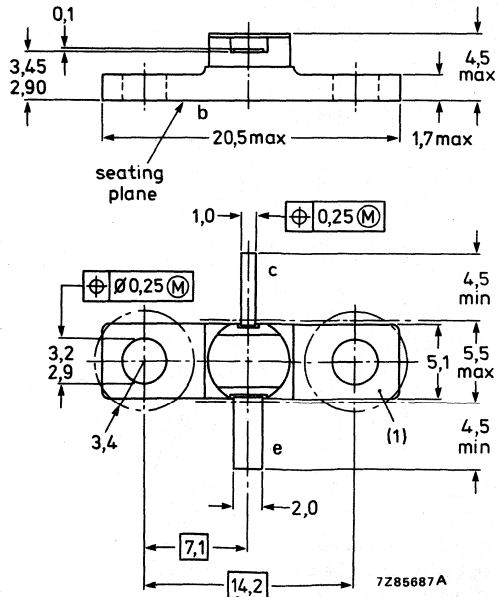
type number	mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	η %	$\bar{z}_i$ Ω	$\bar{z}_L$ Ω
PTB32001X	c.w.	3	24	typ. 1,8	typ. 9,5	typ. 45	15 + j31	5,5 + j10
PTB32003X	c.w.	3	24	typ. 3,0	typ. 9,5	typ. 40	5,5 + j29	5 - j2,2
PTB32005X	c.w.	3	24	typ. 5,5	typ. 9,5	typ. 40	8,5 + 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 BaO 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 $R_{BE} = 10 \Omega$ open base	$V_{CER}$ max.	40	40	40 V
	$V_{CEO}$ 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; $t_{sld} \leq 10$ s	$T_{sld}$ max.	235 $^\circ C$		

**THERMAL RESISTANCE**

		PTB32001X	32003X	32005X
From junction to mounting base	$R_{th\ j-mb}$ max.	22	12	8,5 K/W
From mounting base to heatsink	$R_{th\ mb-h}$ max.	0,7	0,7	0,7 K/W

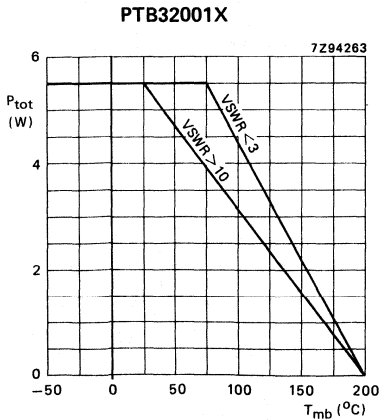


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.

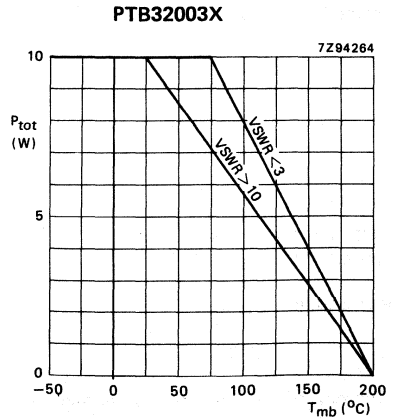
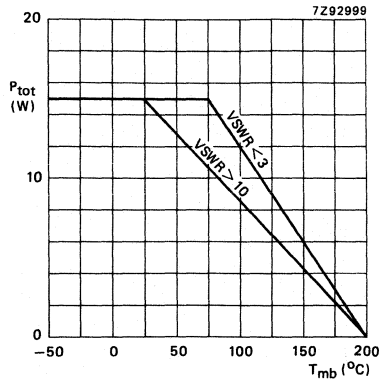


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.



PTB23005X

Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.

CHARACTERISTICS

SYMBOLS AND DATA

		PTB32001X	32003X	32005X
Collector-base breakdown voltage				
open emitter; $I_C = 1$ mA	$V_{(BR)CBO} \geq$	40	—	— V
open emitter; $I_C = 2$ mA	$V_{(BR)CBO} \geq$	—	40	— V
open emitter; $I_C = 3$ mA	$V_{(BR)CBO} \geq$	—	—	40 V
Collector-emitter breakdown voltage				
$R_{BE} = 10 \Omega$ ; $I_C = 10$ mA	$V_{(BR)CER} \geq$	40	40	40 V
Emitter-base breakdown voltage				
open collector; $I_E = 0,5$ mA	$V_{(BR)EBO} \geq$	3,5	—	— V
open collector; $I_E = 1,0$ mA	$V_{(BR)EBO} \geq$	—	3,5	— V
open collector; $I_E = 1,5$ mA	$V_{(BR)EBO} \geq$	—	—	3,5 V
Collector cut-off current				
$I_E = 0$ ; $V_{CB} = 24$ V	$I_{CBO} \leq$	10	20	30 $\mu$ A
Emitter cut-off current				
$I_C = 0$ ; $V_{EB} = 1,5$ V	$I_{EBO} \leq$	0,2	0,4	0,6 $\mu$ A
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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
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

Fig. 1 FO-41B.

Base and metallic cap connected to flange.

#### Pinning ;

- 1 = collector
- 2 = emitter
- 3 = base

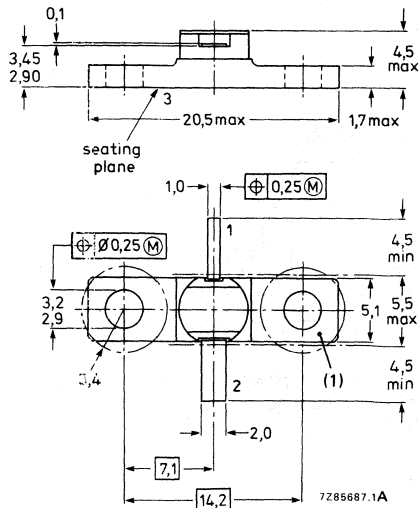
Torque on nut: max. 0,4 Nm

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.

# PTB42001X PTB42002X

## RATINGS

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

Collector-base voltage  
open emitter

Collector-emitter voltage  
 $R_{BE} = 10 \Omega$   
open base

Emitter-base voltage  
open collector

Collector current (d.c.)

→ R.F. power dissipation ( $f > 1$  MHz)  
up to  $T_{mb} = 75^\circ\text{C}$

Storage temperature

Junction temperature

Lead soldering temperature  
at 0,3 mm from ceramic;  $t_{sld} \leq 10$  s

		PTB42001X	42002X	
$V_{CBO}$	max.	40	40	V
$V_{CER}$	max.	40	40	V
$V_{CEO}$	max.	15	15	V
$V_{EBO}$	max.	3,5	3,5	V
$I_C$	max.	0,25	0,5	A
$P_{tot}$	max.	5,5	10	W
$T_{stg}$		-65 to +200		$^\circ\text{C}$
$T_j$	max.		200	$^\circ\text{C}$
$T_{sld}$	max.		235	$^\circ\text{C}$

PTB42001X

PTB42002X

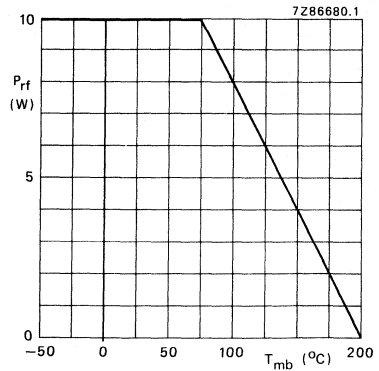
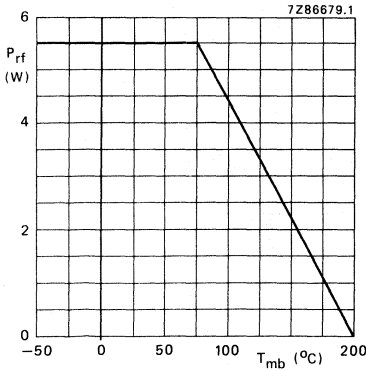


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.

Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature.  $f > 1$  MHz.

## THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

		PTB42001X	42002X	
$R_{th\ j-mb}$	max.	22	12	K/W
$R_{th\ mb-h}$	max.	0,7	0,7	K/W



**CHARACTERISTICS**

Collector-base breakdown voltage

open emitter;  $I_C = 1 \text{ mA}$

$V_{(BR)CBO} \geq$ 

PTB42001X	42002X
40	—

 V

open emitter;  $I_C = 2 \text{ mA}$

$V_{(BR)CBO} \geq$ 

PTB42001X	42002X
—	40

 V

Collector-emitter breakdown voltage

$R_{BE} = 10 \Omega$ ;  $I_C = 10 \text{ mA}$

$V_{(BR)CER} \geq$ 

PTB42001X	42002X
40	40

 V

Emitter-base breakdown voltage

open collector;  $I_E = 0,5 \text{ mA}$

$V_{(BR)EBO} \geq$ 

PTB42001X	42002X
3,5	—

 V

open collector;  $I_E = 1,0 \text{ mA}$

$V_{(BR)EBO} \geq$ 

PTB42001X	42002X
—	3,5

 V

Collector cut-off current

$I_E = 0$ ;  $V_{CB} = 24 \text{ V}$

$I_{CBO} \leq$ 

PTB42001X	42002X
10	20

 $\mu\text{A}$

Emitter cut-off current

$I_C = 0$ ;  $V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq$ 

PTB42001X	42002X
0,2	0,4

 $\mu\text{A}$

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

$I_E = I_C = 0$ ;  $V_{CB} = 24 \text{ V}$ ;  $V_{EB} = 1,5 \text{ V}$

$C_{cb}$  typ. 

PTB42001X	42002X
2,2	3

 pF

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

$I_E = I_C = 0$ ;  $V_{CB} = 24 \text{ V}$ ;  $V_{EB} = 1,5 \text{ V}$

$C_{ce}$  typ. 

PTB42001X	42002X
0,3	0,6

 pF

**APPLICATION INFORMATION** (see also next page)

**PTB42001X**

**PTB42002X**

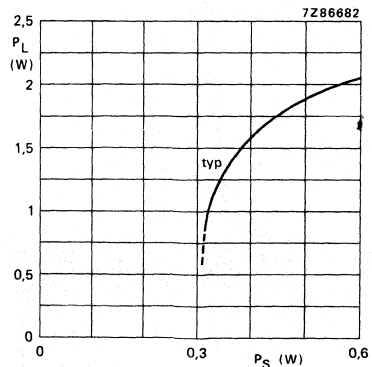
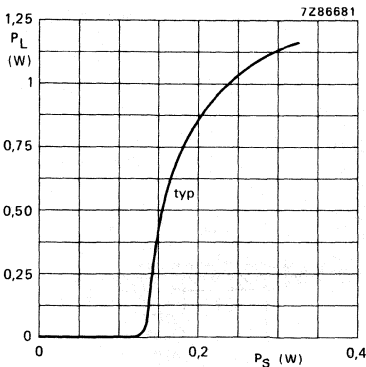


Fig. 4 Load power as a function of source power.

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

Conditions for Figs 4 and 5:

Class-B operation;  $V_{CE} = 24 \text{ V}$ ;  $f = 4,2 \text{ GHz}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ .

APPLICATION INFORMATION (see also previous page)

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

type number	mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta$ %	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
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

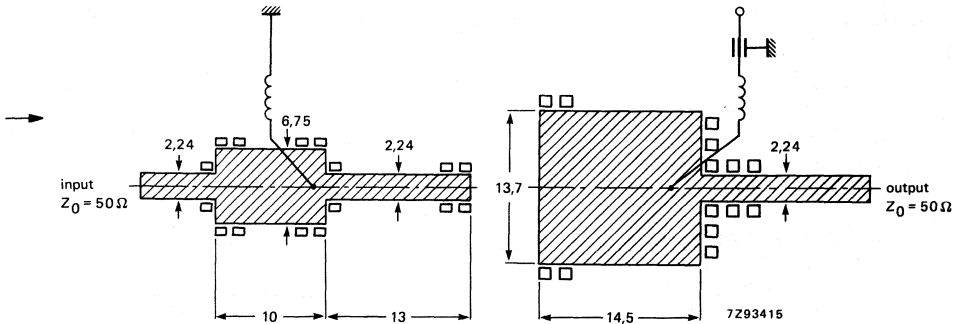


Fig. 6 Prematching test circuit boards for the PTB42001X at 4,2 GHz (Dimensions in mm.)

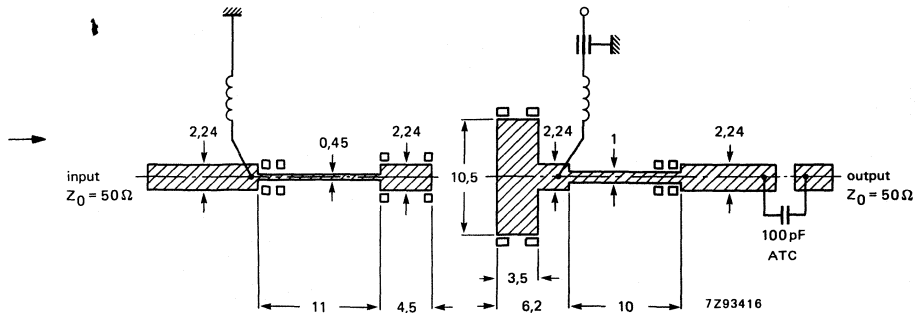


Fig. 7 Prematching test circuit boards for the PTB42002X at 4,2 GHz. (Dimensions in mm.)

→ Circuits on a double Cu-clad printed-circuit board PTFE fibre-glass dielectric ( $\epsilon_r = 2,5$ ); thickness 0,8 mm.

\* 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C selective amplifier.

mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
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**

Fig. 1 FO-41B.

Dimensions in mm

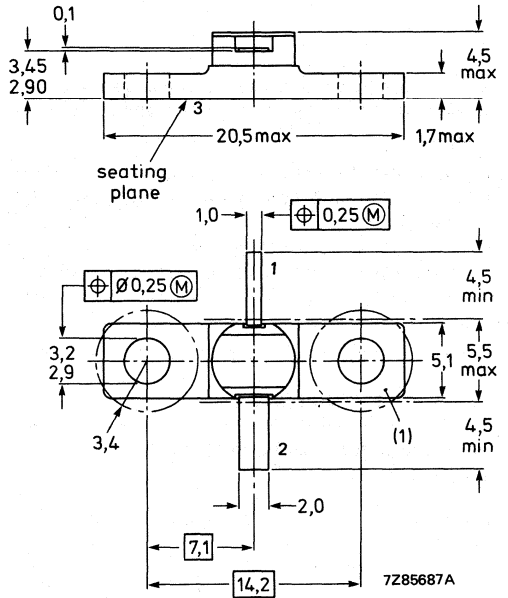
Base and metallic cap  
connected to flange

**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	$V_{CB0}$	max.	40 V
Collector-emitter voltage open base	$V_{CE0}$	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; $t_{sld} \leq 10$ s	$T_{sld}$	max.	235 °C

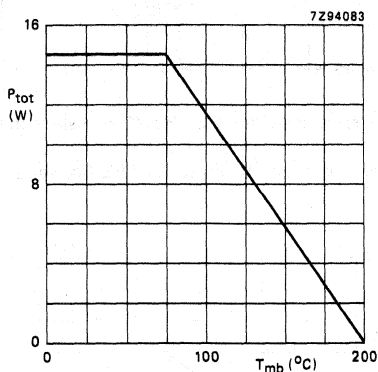


Fig. 2 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th j-mb}$	=	8,5 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,7 K/W

**CHARACTERISTICS**

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

Breakdown voltages

$I_C = 3$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geq$	40 V
$I_C = 10$ mA; $R_{BE} = 10 \Omega$	$V_{(BR)CER}$	$\geq$	40 V
$I_C = 0$ ; $I_E = 1$ mA	$V_{(BR)EBO}$	$\geq$	3,5 V

Collector cut-off current

$I_E = 0$ ; $V_{CB} = 24$ V	$I_{CBO}$	$\leq$	30 $\mu$ A
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Emitter cut-off current

$I_C = 0$ ; $V_{EB} = 1,5$ V	$I_{EBO}$	$\leq$	0,6 $\mu$ A
------------------------------	-----------	--------	-------------

Collector-base capacitance

$I_E = I_C = 0$ ; $V_{CB} = 24$ V	$C_{cb}$	typ.	3,8 pF
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**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C selective amplifier\*

mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.; class-C	4,2	24	$\geq 2,5$	$\geq 5$	$\geq 28$	$12 + j35$	$2,5 - j10$

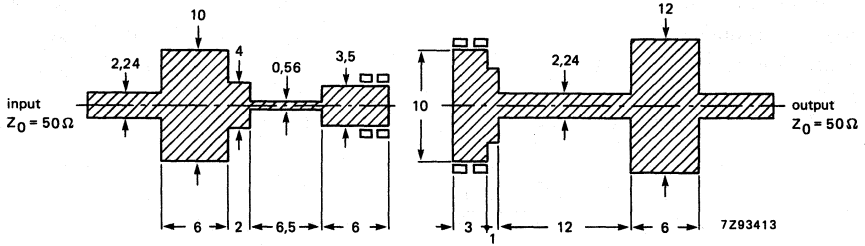


Fig. 3 Prematching test circuit board for 4,2 GHz. (Dimensions in mm).

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

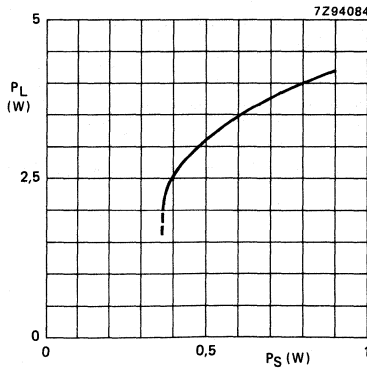


Fig. 4 Load power versus source power.

\* 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B circuit

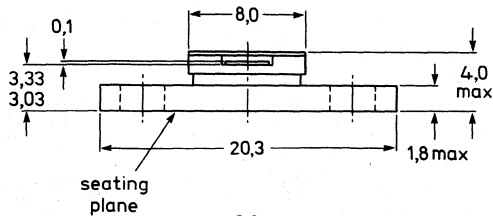
mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta$ %	$\bar{Z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
c.w.	3,7 to 4,2	24	typ. 4,5	typ. 7,4	typ. 32	$35 + j15$	$6 + j2$

### MECHANICAL DATA

Fig.1 FO-83.

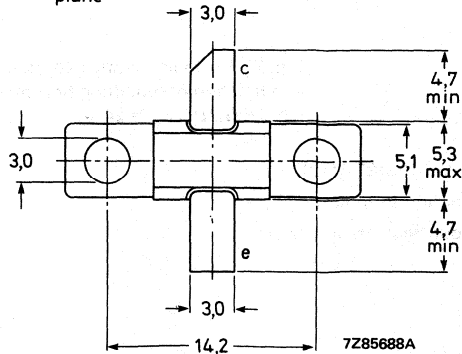
Base connected to flange

Dimensions in mm



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 ( $R_{BE} \leq 10 \Omega$ ) (open base)	$V_{CER}$	max.	40 V
	$V_{CEO}$	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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{rf}$	max.	18 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

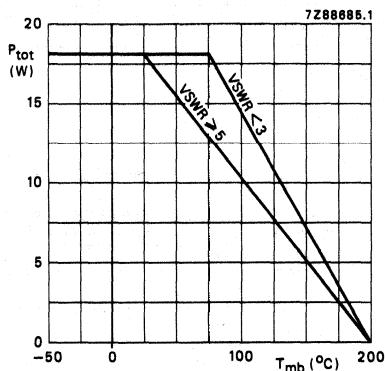


Fig. 2 Maximum permissible r.f. power dissipation as a function of mounting base temperature.  
 $f > 3,6 \text{ GHz}$ ;  $V_{CE} = 24 \text{ V}$ .

## → THERMAL RESISTANCE

From junction to mounting base  
From mounting base to heatsink

$R_{th \text{ j-mb}} = 6,5 \text{ K/W}$   
 $R_{th \text{ mb-h}} = 0,7 \text{ K/W}$



**CHARACTERISTICS**

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

Collector-emitter breakdown voltage

$R_{BE} = 10\ \Omega; I_C = 30\ \text{mA}$

$V_{(BR)CER} \geq 40\ \text{V}$

Emitter-base breakdown voltage

open collector;  $I_E = 0,5\ \text{mA}$

$V_{(BR)EBO} \geq 3,5\ \text{V}$

Collector cut-off current

$I_E = 0; V_{CB} = 24\ \text{V}$

$I_{CBO} < 50\ \mu\text{A}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\ \text{V}$

$I_{EBO} < 0,75\ \mu\text{A}$

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

$I_E = I_C = 0; V_{CB} = 24\ \text{V}; V_{EB} = 1,5\ \text{V}$

$C_{cb}$  typ.  $50\ \text{pF}$

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

$I_E = I_C = 0; V_{CE} = 24\ \text{V}; V_{EB} = 1,5\ \text{V}$

$C_{ce}$  typ.  $1,2\ \text{pF}$

Emitter-base capacitance at  $f = 1\ \text{MHz}$

$I_E = I_C = 0; V_{EB} = 1\ \text{V}; V_{CB} = 24\ \text{V}$

$C_{eb}$  typ.  $30\ \text{pF}$

**APPLICATION INFORMATION**

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

f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta$ %	$\overline{Z}_i$ $\Omega$	$\overline{Z}_L$ $\Omega$
3,7 to 4,2	24	> 4 typ. 4,5	> 6,0 typ. 7,4	> 25 typ. 32	$35 + j15$	$6 + j2$

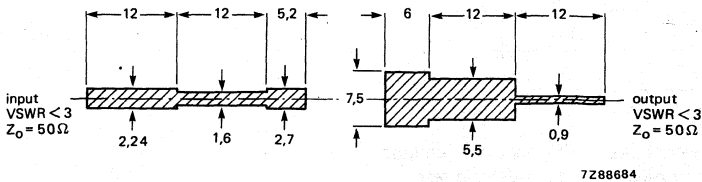


Fig. 3 Prematching test circuit boards for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,55$ ); thickness 0,8 mm.

Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ( $\epsilon_r = 2,4$ ); thickness 0,25 mm.

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

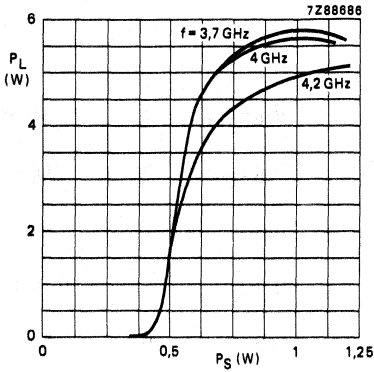


Fig. 4 Load power as a function of source power measured in a selective test circuit.

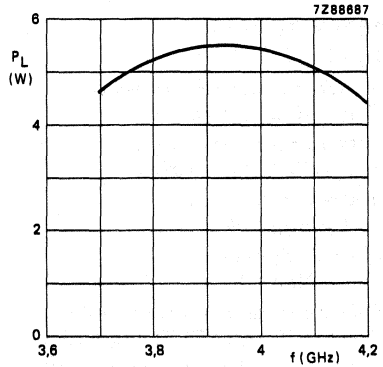


Fig. 5 Load power as a function of frequency measured in a wideband test circuit. VSWR at input  $\leq 3$ .

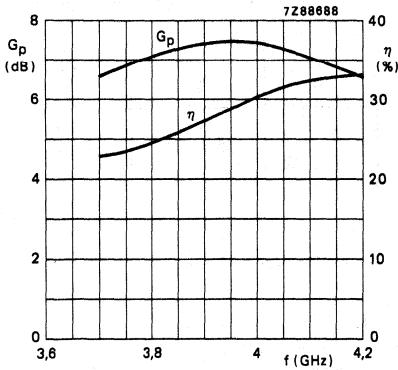


Fig. 6 Power gain and efficiency as a function of frequency measured in a wideband test circuit. VSWR at input  $\leq 3$ .

Conditions for Figs 4, 5 and 6:  
Typical values; class-B operation;  
 $V_{CE} = 24 \text{ V}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ .

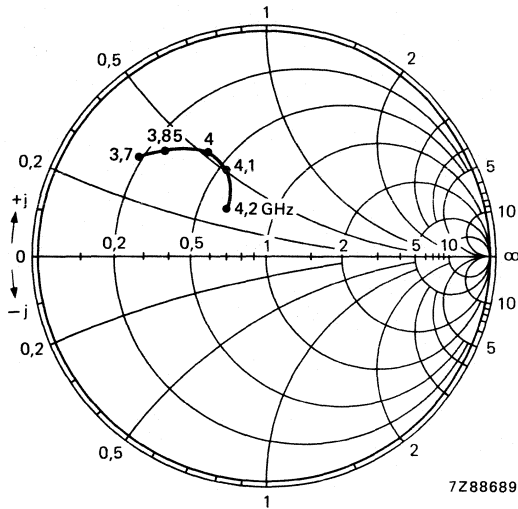


Fig. 7 Input impedance as a function of frequency.

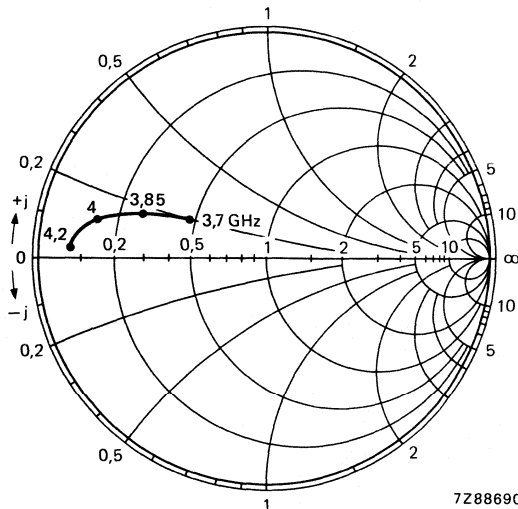


Fig. 8 Optimum load impedance as a function of frequency.

Conditions for Figs 7 and 8:

Typical values; class-B operation;  $V_{CE} = 24 \text{ V}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  $Z_o = 50 \text{ } \Omega$ .



## DEVELOPMENT DATA

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

PVB42004X

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B circuit.

mode of operation	f GHz	$V_{CE}$ V	PL W	$G_p$ dB	$\eta_C$ %
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

FO-83 (see Fig. 1).

Dimensions in mm

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

**MECHANICAL DATA**

Dimensions in mm

Fig. 1 FO-83.

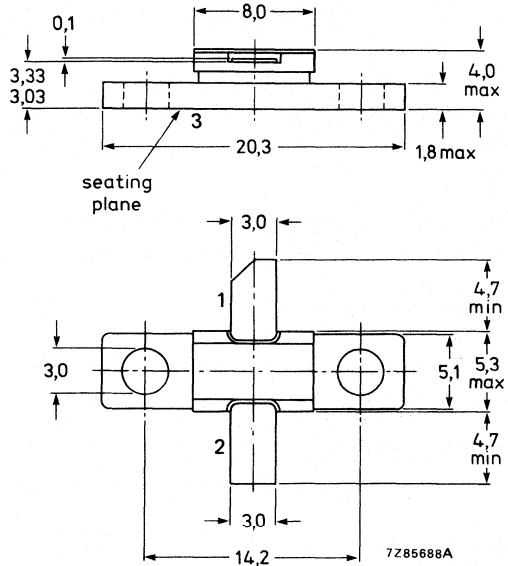
Base connected to flange.

**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	VCBO	max.	40 V
Collector-emitter voltage open base	VCEO	max.	15 V
R <sub>BE</sub> = 10 Ω	VCER	max.	40 V
Emitter-base voltage, open collector	VEBO	max.	3,5 V
Collector current (d.c.)	I <sub>C</sub>	max.	1 A
Total power dissipation up to T <sub>mb</sub> = 75 °C	P <sub>tot</sub>	max.	18 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	200 °C
Lead soldering temperature at 0,1 mm from the case; t <sub>slid</sub> ≤ 10 s	T <sub>slid</sub>	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base	R <sub>th j-mb</sub>	=	6,5 K/W
From mounting base to heatsink	R <sub>th mb-h</sub>	=	0,7 K/W

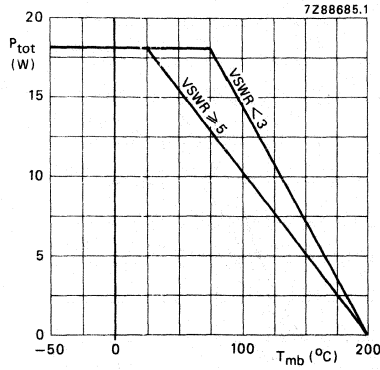


Fig. 2 Power derating curve versus mounting base temperature;  
 $V_{CE} = 24 \text{ V}$ ;  $f > 1 \text{ MHz}$ .

DEVELOPMENT DATA

**CHARACTERISTICS**

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

Collector-emitter breakdown voltage

$I_C = 30 \text{ mA}$ ;  $R_{BE} = 10 \text{ } \Omega$

$V_{(BR)CER} \geq 40 \text{ V}$

Emitter-base breakdown voltage

$I_C = 0$ ;  $I_E = 0,5 \text{ mA}$

$V_{(BR)EBO} \geq 3,5 \text{ V}$

Collector cut-off current

$I_E = 0$ ;  $V_{CB} = 24 \text{ V}$

$I_{CBO} \leq 50 \text{ mA}$

Emitter cut-off current

$I_C = 0$ ;  $V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 1,5 \text{ mA}$

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

$I_E = I_C = 0$ ;  $V_{CB} = 24 \text{ V}$ ;  $V_{EB} = 1,5 \text{ V}$

$C_{cb} \text{ typ. } 50 \text{ pF}$

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

$I_E = I_C = 0$ ;  $V_{CB} = 24 \text{ V}$ ;  $V_{EB} = 1,5 \text{ V}$

$C_{ce} \text{ typ. } 1,2 \text{ pF}$

Emitter-base capacitance at  $f = 1 \text{ MHz}$

$I_E = I_C = 0$ ;  $V_{CB} = 24 \text{ V}$ ;  $V_{EB} = 1 \text{ V}$

$C_{eb} \text{ typ. } 30 \text{ pF}$

**LARGE SIGNAL IMPEDANCES**

f MHz	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
2,5	$4,5 + j15,5$	$2,5 + j2,5$
2,7	$6 + j19$	$2,5 + j0$

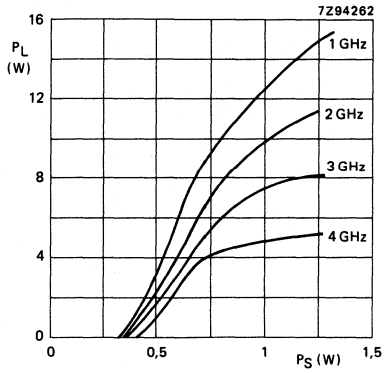


Fig. 3 Load power versus input power;  $V_{CE} = 24$  V.



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier (typical values).

type number	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	z <sub>i</sub> $\Omega$	Z <sub>L</sub> $\Omega$
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

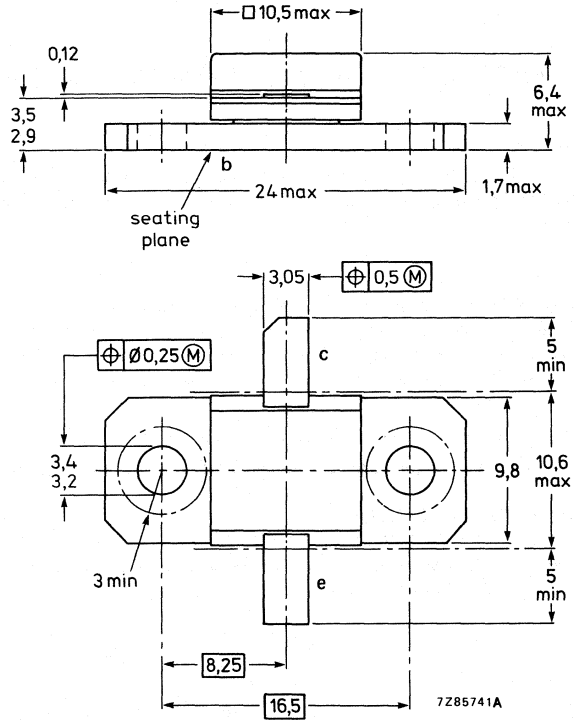
FO-57C (see Fig. 1)

**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.

PZ1418B15U  
 PZ1721B12U  
 PZ2024B10U

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 $R_{BE} = 10 \Omega$ open base	$V_{CER}$ $V_{CEO}$	max.	35 V 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 $T_{mb} = 75^\circ C$	$P_{tot}$	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  $R_{th j-mb} = 4 \text{ K/W}$

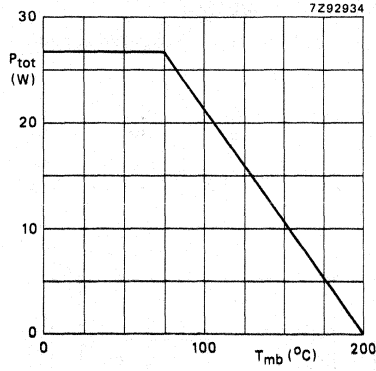


Fig. 2 Power derating curve versus mounting base temperature.

**CHARACTERISTICS**

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

Collector cut-off current

$I_E = 0; V_{CB} = 30\text{ V}$

$I_E = 0; V_{CB} = 40\text{ V}$

$R_{BE} = 10\ \Omega; V_{CE} = 35\text{ V}$

$I_{CBO} < 2,5\text{ mA}$

$I_{CBO} < 5\text{ mA}$

$I_{CER} < 25\text{ mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_C = 0; V_{EB} = 3\text{ V}$

$I_{EBO} < 100\ \mu\text{A}$

$I_{EBO} < 0,5\text{ mA}$

**APPLICATION INFORMATION** (type PZ1418B15U)

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	z <sub>i</sub> $\Omega$	Z <sub>L</sub> $\Omega$
PZ1418B15U	1,4 to 1,8	28	> 12,5	> 7	> 38	see Fig. 6	see Fig. 7

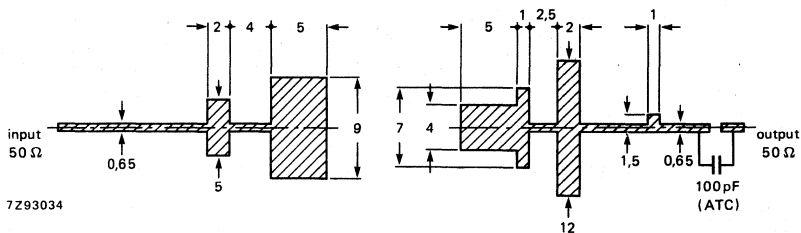


Fig. 3 Prematching test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm;  $\epsilon_r = 10$ .

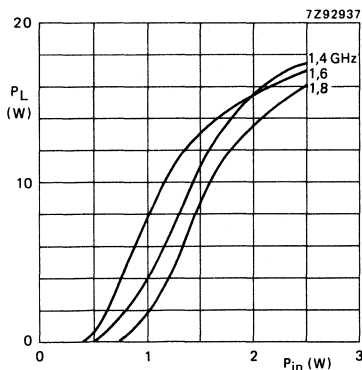


Fig. 4 Load power vs. input power; typical values.

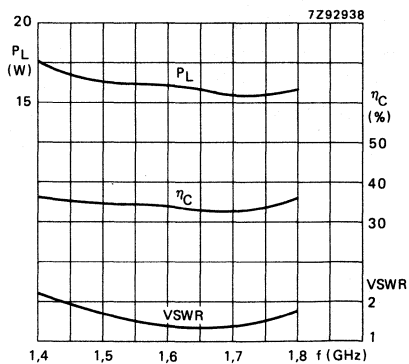


Fig. 5 Load power, efficiency and VSWR vs. frequency; typical values;  $P_{in} = 2,5\text{ W}$ .

Conditions for Figs 4 and 5:

V<sub>CC</sub> = 28 V; class-B operation;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

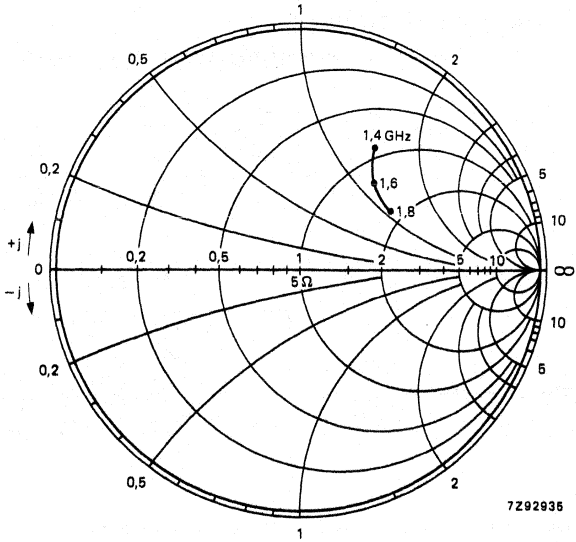


Fig. 6 Input impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

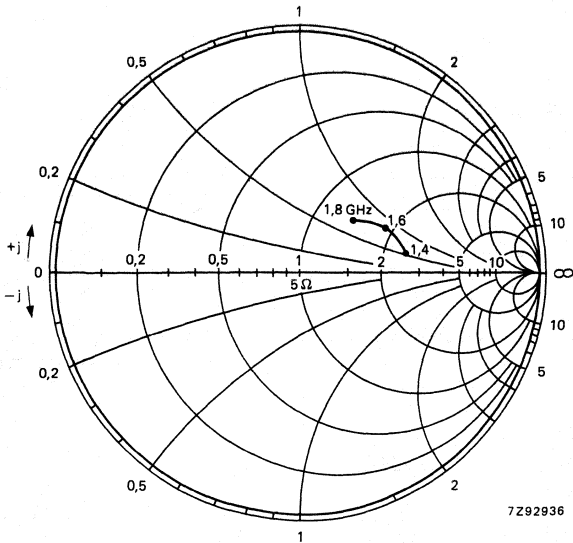


Fig. 7 Optimum load impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

**APPLICATION INFORMATION** (type PZ1721B12U)

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	Z <sub>i</sub> $\Omega$	Z <sub>L</sub> $\Omega$
PZ1721B10U	1,7 to 2,1	28	> 12	> 6,8	> 35	see Fig. 11	see Fig. 12

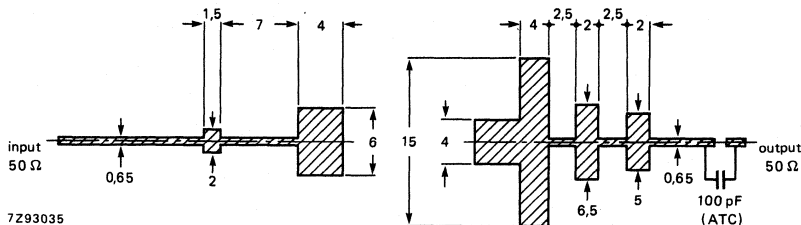


Fig. 8 Prematching test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm;  $\epsilon_r = 10$ .

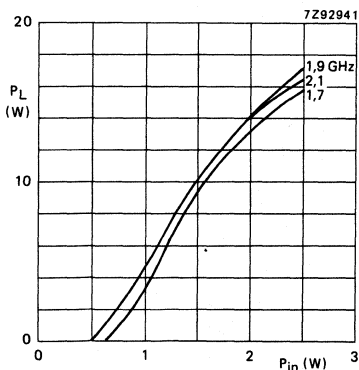


Fig. 9 Load power vs. input power; typical values.

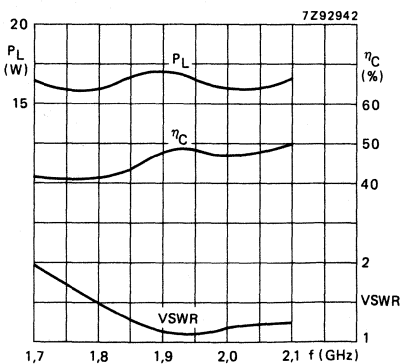


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values;  $P_{in} = 2,5\text{ W}$ .

Conditions for Figs 9 and 10:

V<sub>CC</sub> = 28 V; class-B operation;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

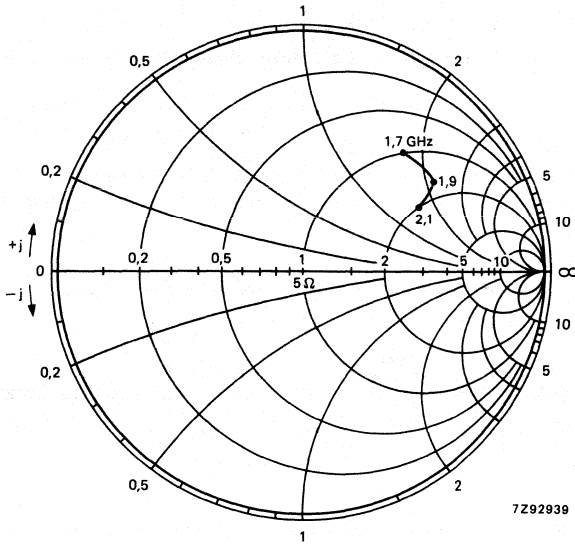


Fig. 11 Input impedance vs. frequency;  
typical values;  $Z_0 = 5 \Omega$ .

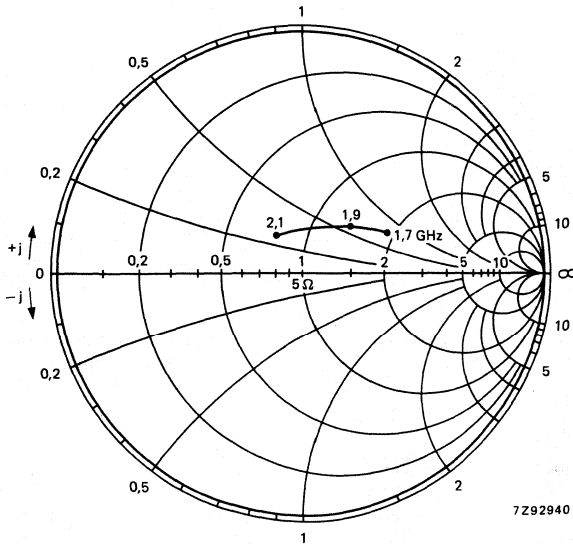


Fig. 12 Optimum load impedance vs. frequency;  
typical values;  $Z_0 = 5 \Omega$ .

**APPLICATION INFORMATION** (type PZ2024B10U)

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	$V_{CC}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$z_i$ $\Omega$	$Z_L$ $\Omega$
PZ2024B10U	2,0 to 2,4	28	> 9	> 5,6	> 30	see Fig. 16	see Fig. 17

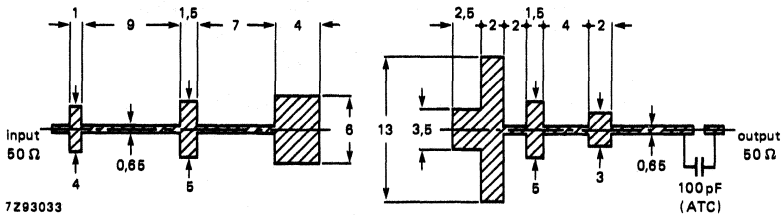


Fig. 13 Prematching test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm;  $\epsilon_r = 10$ .

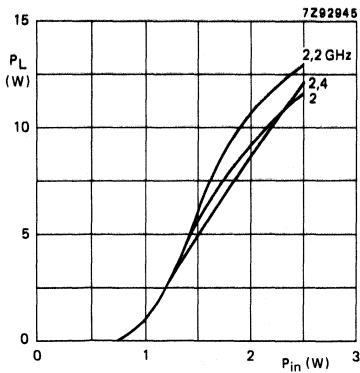


Fig. 14 Load power vs. input power. typical values.

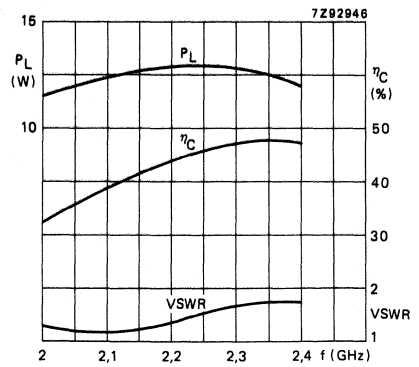


Fig. 15 Load power, efficiency and VSWR vs. frequency; typical values;  $P_{in} = 2,5\text{ W}$ .

Conditions for Figs 14 and 15:

$V_{CC} = 28\text{ V}$ ; class-B operation;  $T_{mb} = 25\text{ }^\circ\text{C}$ .



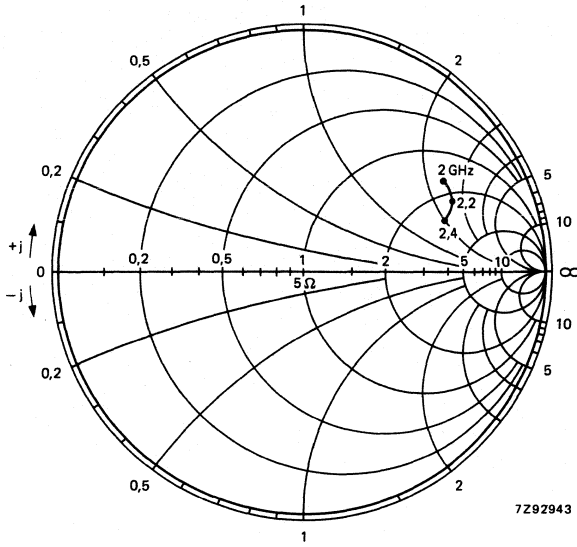


Fig. 16 Input impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

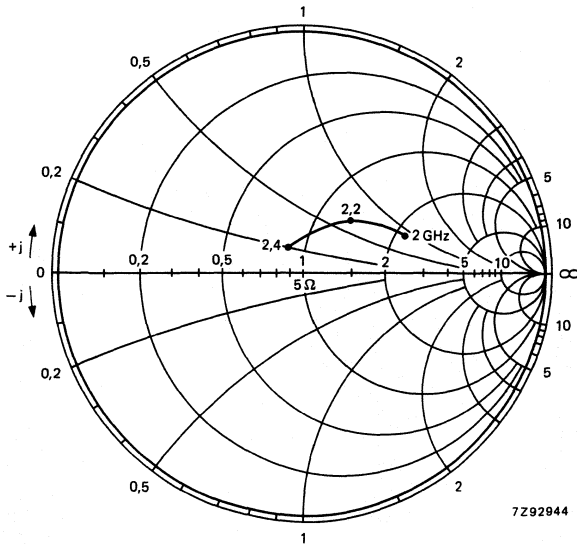


Fig. 17 Optimum load impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier (typical values).

type number	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	z <sub>i</sub> $\Omega$	Z <sub>L</sub> $\Omega$
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

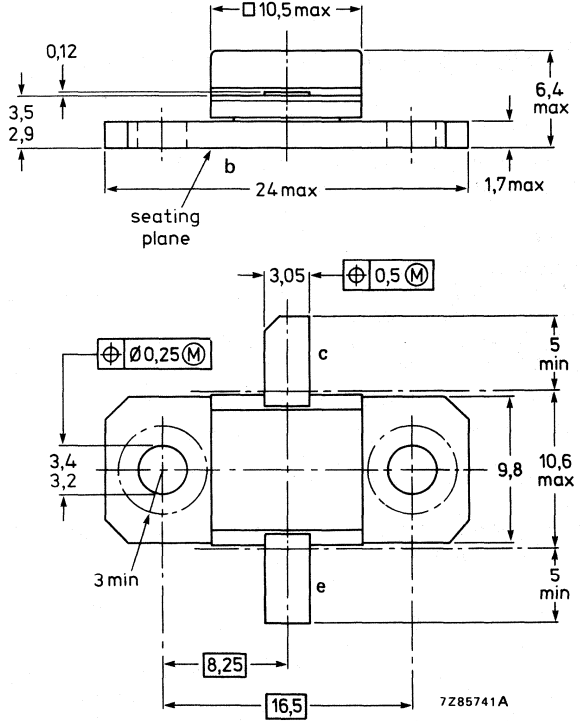
FO-57C (see Fig. 1)

**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.

PZ1418B30U  
 PZ1721B25U  
 PZ2024B20U

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	$V_{CB0}$	max.	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	$V_{CER}$ $V_{CEO}$	max.	35 V 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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	45 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	+200 $^\circ\text{C}$
Lead soldering temperature	$T_{slid}$	max.	+235 $^\circ\text{C}$

**THERMAL RESISTANCE**

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

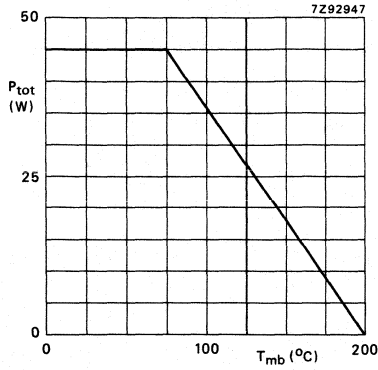


Fig. 2 Power derating curve versus mounting base temperature.

**CHARACTERISTICS**

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

Collector cut-off current

$I_E = 0; V_{CB} = 30\text{ V}$

$I_E = 0; V_{CB} = 40\text{ V}$

$R_{BE} = 10\ \Omega; V_{CE} = 35\text{ V}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_C = 0; V_{EB} = 3\text{ V}$

$I_{CBO} < 5\text{ mA}$

$I_{CBO} < 10\text{ mA}$

$I_{CER} < 50\text{ mA}$

$I_{EBO} < 200\ \mu\text{A}$

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

**APPLICATION INFORMATION** (type PZ1418B30U)

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	$V_{CC}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$z_i$ $\Omega$	$Z_L$ $\Omega$
PZ1418B30U	1,4 to 1,8	28	> 27	> 7,3	> 38	see Fig. 6	see Fig. 7

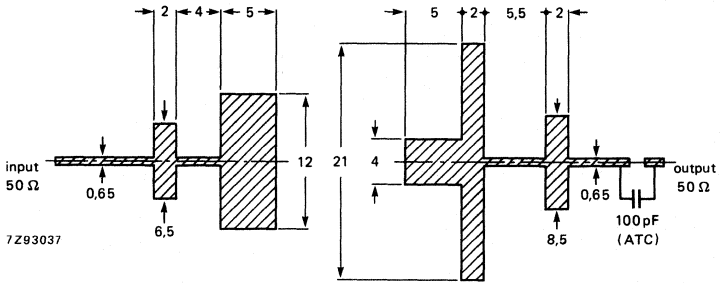


Fig. 3 Prematching test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm;  $\epsilon_r = 10$ .

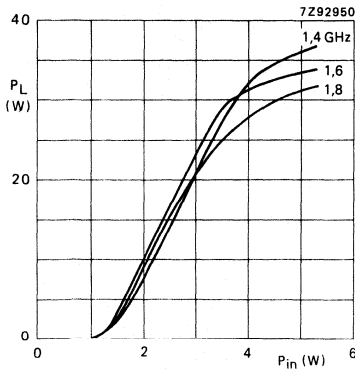


Fig. 4 Load power versus input power; typical values.

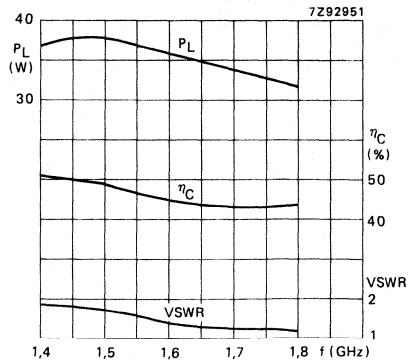


Fig. 5 Load power, efficiency and VSWR versus frequency; typical values;  $P_{in} = 5\text{ W}$ .

Conditions for Figs 4 and 5:

$V_{CC} = 28\text{ V}$ ; class-B operation;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

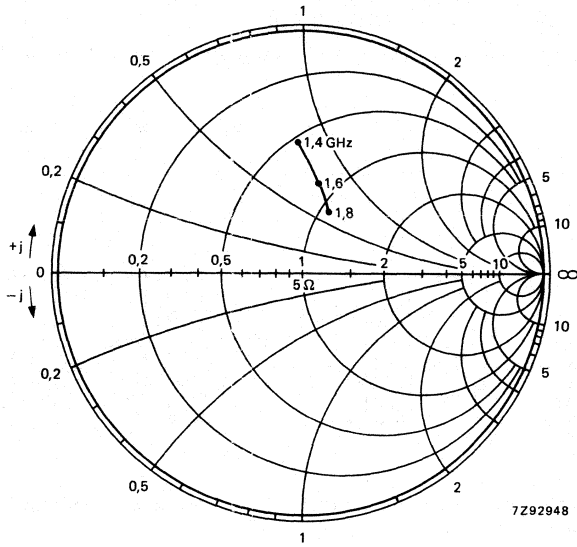


Fig. 6 Input impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

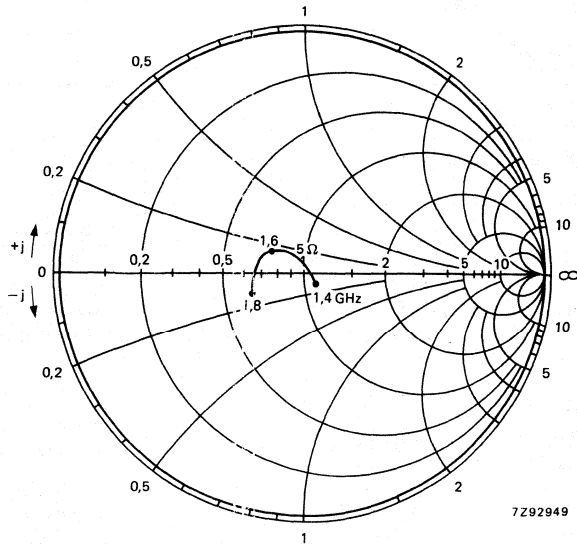


Fig. 7 Optimum load impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

**APPLICATION INFORMATION** (type PZ1721B25U)

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	z <sub>i</sub> $\Omega$	Z <sub>L</sub> $\Omega$
PZ1721B25U	1,7 to 2,1	28	> 25	> 7	> 35	see Fig. 11	see Fig. 12

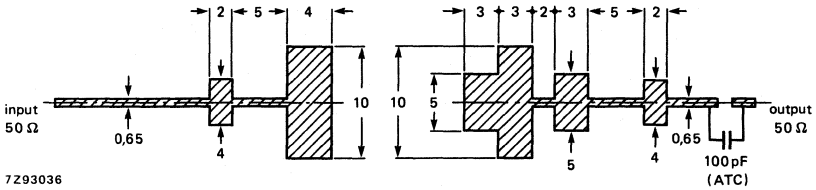


Fig. 8 Prematching test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm;  $\epsilon_r = 10$ .

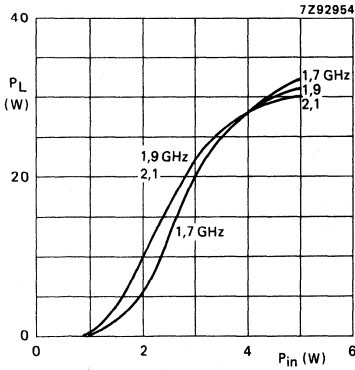


Fig. 9 Load power vs. input power; typical values.

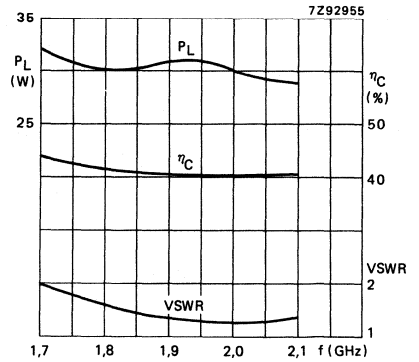


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values;  $P_{in} = 5\text{ W}$ .

Conditions for Figs 9 and 10:

$V_{CC} = 28\text{ V}$ ; class-B operation;  $T_{mb} = 25\text{ }^{\circ}\text{C}$ .



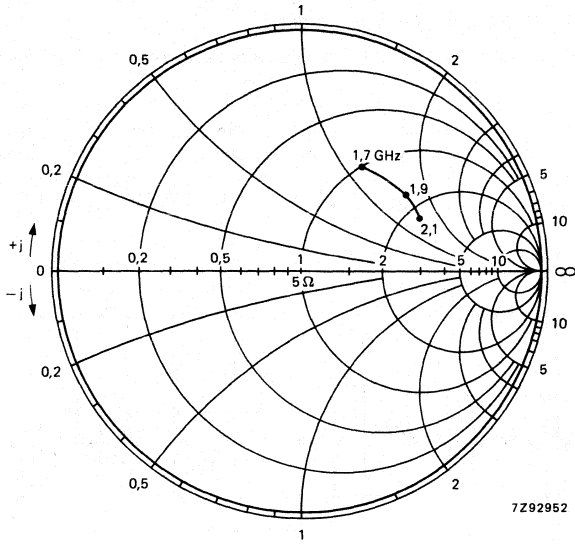


Fig. 11 Input impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

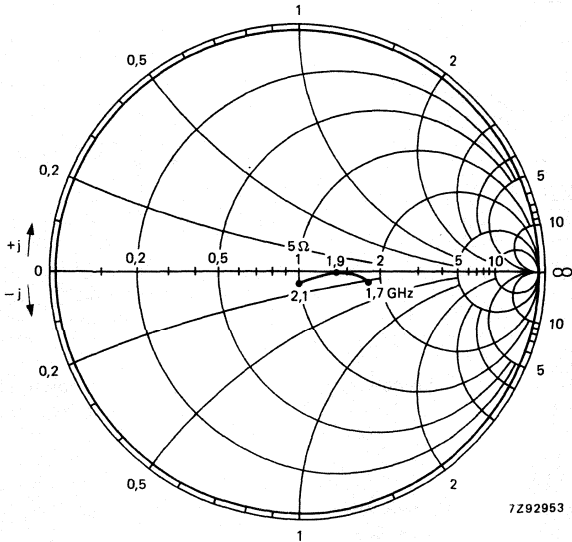


Fig. 12 Optimum load impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

**APPLICATION INFORMATION** (type PZ2024B20U)

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	$V_{CC}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$z_1$ $\Omega$	$Z_L$ $\Omega$
PZ2024B20U	2,0 to 2,4	28	> 20	> 6	> 35	see Fig. 16	see Fig. 17

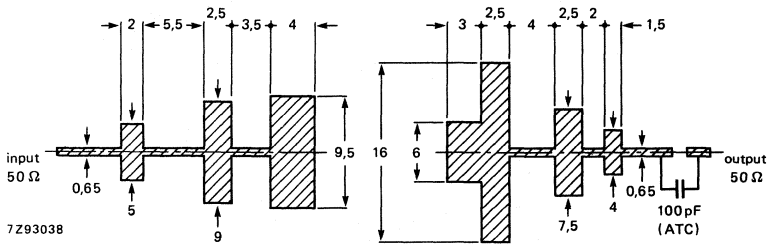


Fig. 13 Prematching test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilon p.c. board; thickness 0,635 mm;  $\epsilon_r = 10$ .

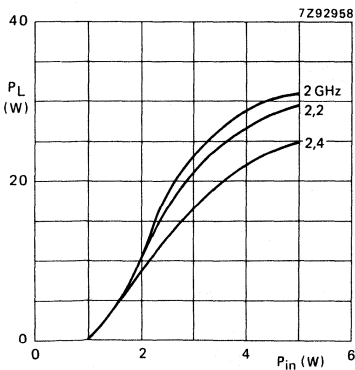


Fig. 14 Load power versus input power; typical values.

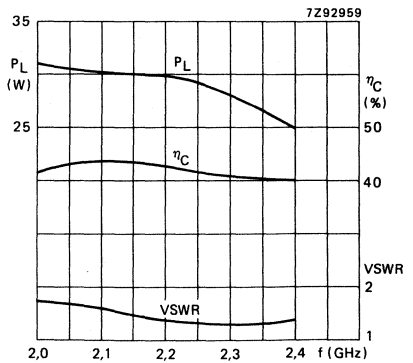


Fig. 15 Load power, efficiency and VSWR versus frequency; typical values;  $P_{in} = 5\text{ W}$ .

Conditions for Figs 14 and 15:

$V_{CC} = 28\text{ V}$ ; class-B operation;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

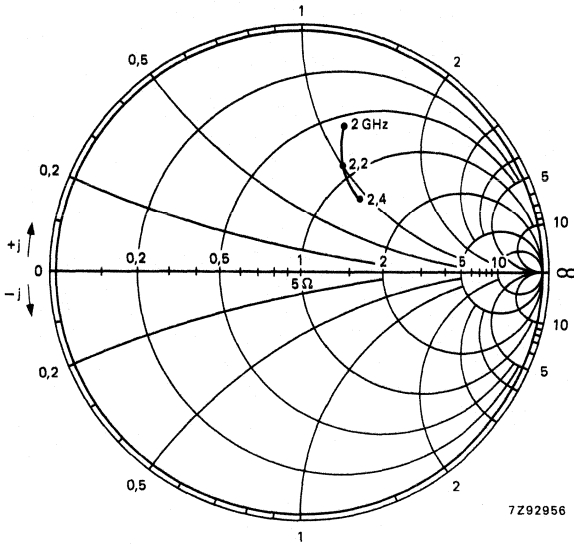


Fig. 16 Input impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .

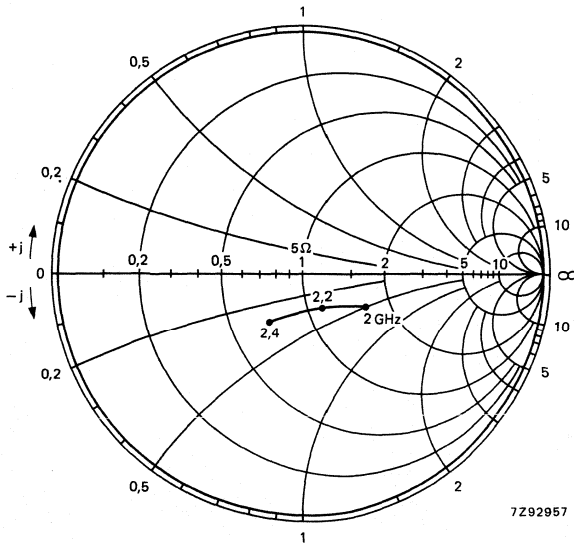


Fig. 17 Optimum load impedance vs. frequency; typical values;  $Z_0 = 5 \Omega$ .



## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  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	$\eta_C$	typ.	50 %
Input impedance	$Z_i$	typ.	$2 + j4,5\ \Omega$
Load impedance	$Z_L$	typ.	$1,5 + j0\ \Omega$

### MECHANICAL DATA

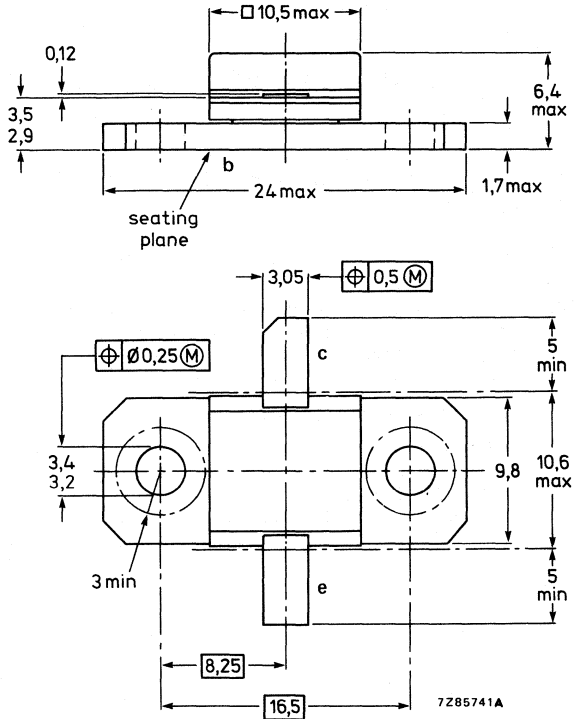
Dimensions in mm

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 $R_{BE} = 10 \Omega$ open base	$V_{CER}$ $V_{CEO}$	max.	35 V 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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	45 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	+200 $^\circ\text{C}$
Lead soldering temperature > 0,1 mm from flange; $t_{sld} < 10 \text{ s}$	$T_{sld}$	max.	+235 $^\circ\text{C}$

**THERMAL RESISTANCE**

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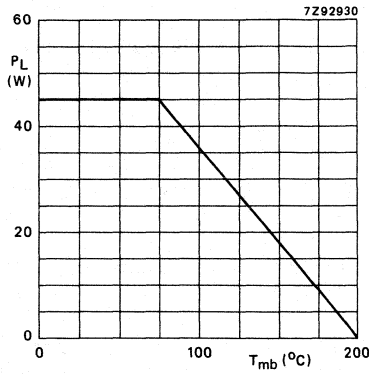


Fig. 2 Power derating curve versus mounting base temperature.

**CHARACTERISTICS**

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

Collector cut-off currents

$V_{CB} = 40\text{ V}; I_E = 0$

$V_{CB} = 30\text{ V}; I_E = 0$

$V_{CER} = 35\text{ V}; R_{BE} = 10\ \Omega$

$I_{CBO} \leq 10\text{ mA}$

$I_{CBO} \leq 5\text{ mA}$

$I_{CER} \leq 50\text{ mA}$

Emitter cut-off currents

$V_{EB} = 3\text{ V}; I_C = 0$

$V_{EB} = 1,5\text{ V}; I_C = 0$

$I_{EBO} \leq 1\text{ mA}$

$I_{EBO} \leq 200\ \mu\text{A}$

Collector-base capacitance

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

$C_{cb}$  typ. 17 pF

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in an unneutralized common-base class-B selective amplifier.\*

mode of operation	f GHz	V <sub>CC</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>C</sub> %	z <sub>i</sub> Ω	Z <sub>L</sub> 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.

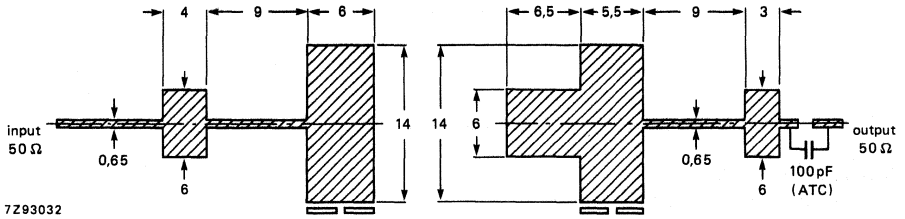


Fig. 3 Prematching test circuit boards, c.w., class-B at 1,55 GHz (dimensions in mm); Epsilon p.c. board; thickness 0,65 mm; ε<sub>r</sub> = 10.

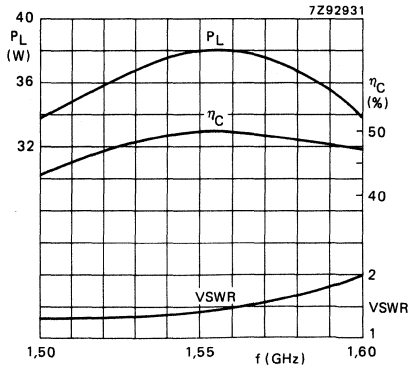


Fig. 4 Load power, efficiency and VSWR versus frequency; V<sub>CE</sub> = 28 V; T<sub>mb</sub> = 25 °C; class-B operation; typical values.



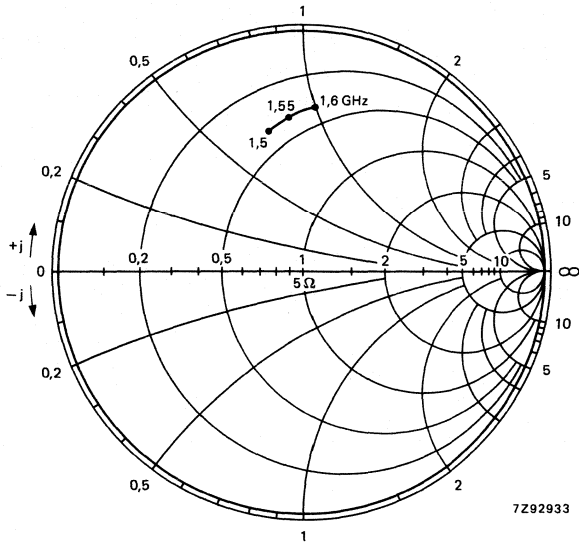


Fig. 5 Input impedance versus frequency;  
 $P_L = 38 \text{ W}$ ;  $Z_O = 5 \Omega$ ; typical values.

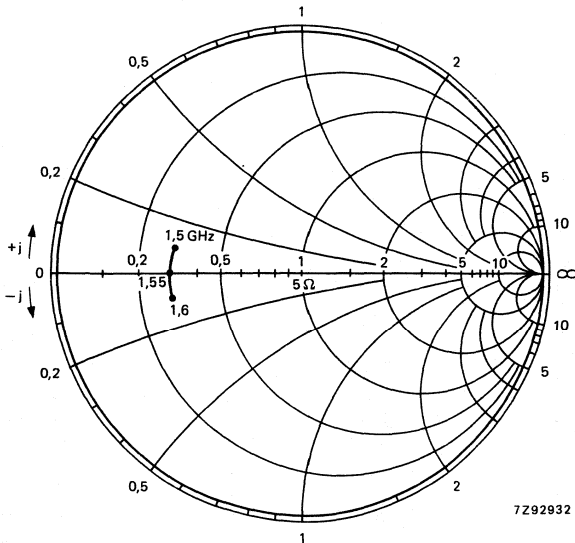


Fig. 6 Optimum load impedance versus frequency;  
 $P_L = 38 \text{ W}$ ;  $Z_O = 5 \Omega$ ; typical values.



# DEVELOPMENT DATA

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

PZB27020U

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B selective amplifier.

mode of operation	f GHz	V <sub>C</sub> E V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\bar{z}_L$ $\Omega$
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.

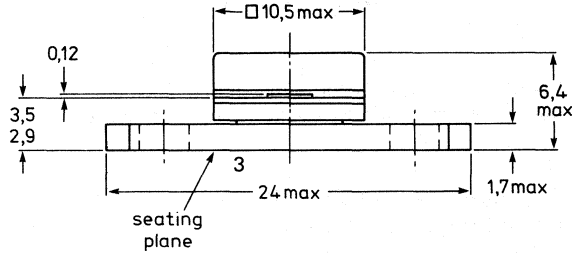
**MECHANICAL DATA**

Dimensions in mm

Fig. 1 FO-57C.

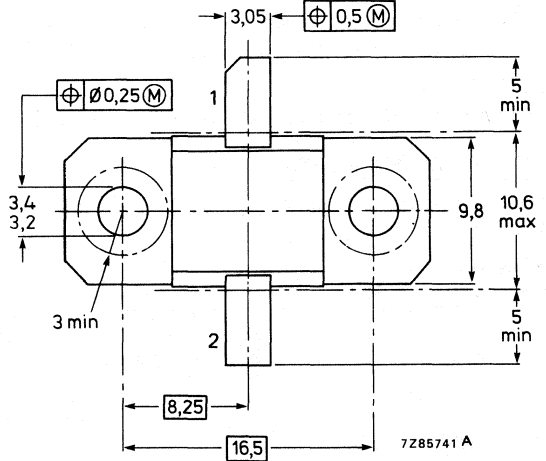
**Pinning:**

- 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 $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	67,5 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

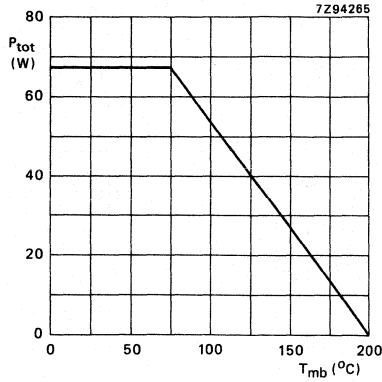


Fig. 2 Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th\ j-mb} = 1,8\ K/W$

**CHARACTERISTICS**

T<sub>mb</sub> = 25 °C unless otherwise specified

Collector cut-off currents

$V_{CB} = 40\ V; I_E = 0$

$V_{CB} = 30\ V; I_E = 0$

$V_{CER} = 35\ V; R_{BE} = 10\ \Omega$

$I_{CBO} \leq 20\ mA$

$I_{CER} \leq 10\ mA$

$I_{CER} \leq 100\ mA$

Emitter cut-off currents

$V_{EB} = 3\ V; I_C = 0$

$V_{EB} = 1,5\ V; I_C = 0$

$I_{EBO} \leq 2\ mA$

$I_{EBO} \leq 400\ \mu A$

Collector-base capacitance

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

$C_{cb} \text{ typ. } 23\ pF$

**APPLICATION INFORMATION**

Microwave performance at T<sub>mb</sub> = 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 <sub>CE</sub> V	PL W	G <sub>p</sub> dB	$\eta_C$ %
c.w. class-C	2,7	28	> 19	> 5	> 20

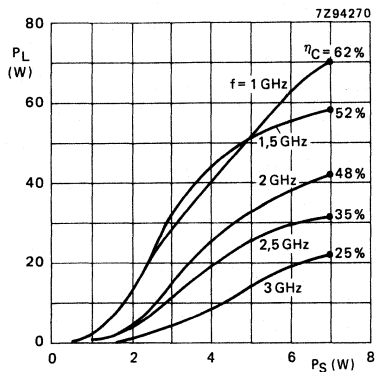


Fig. 3 Load power versus source power;  $V_{CE} = 28 \text{ V}$ ; c.w. conditions.

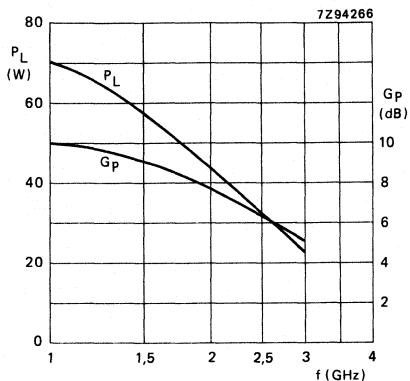


Fig. 4 Load power and gain versus frequency;  $V_{CE} = 28 \text{ V}$ ;  $P_L = 7 \text{ W}$ ; c.w. conditions.

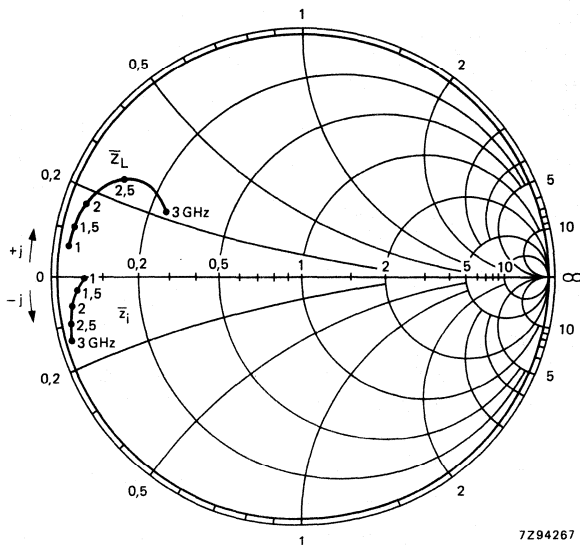


Fig. 5 Input and optimum load impedances versus frequency;  $Z_0 = 50 \Omega$ ; typical values.

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized wideband common-base class-B circuit under pulse conditions.

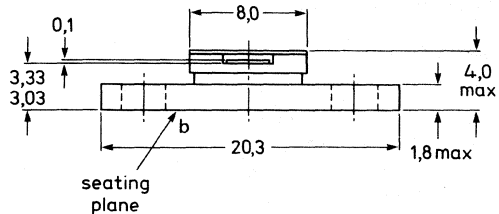
mode of operation	f GHz	V <sub>CC</sub> V	t <sub>on</sub> $\mu\text{s}$	$\delta$ %	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %
class-B	3,1 to 3,5	24	100	10	typ. 5,6	typ. 5,7	typ. 47

### MECHANICAL DATA

Dimensions in mm

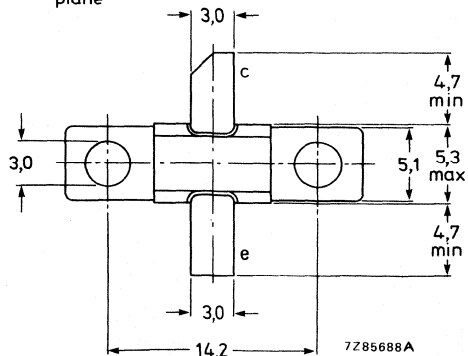
Fig. 1 FO-83.

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 ( $R_{BE} = 10 \Omega$ ) (open base)	$V_{CER}$ $V_{CEO}$	max. max.	35 V 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 $T_{mb} = 75 \text{ }^\circ\text{C}$ ( $t_{ON} = 100 \mu s$ ; $\delta = 10\%$ )	$P_{tot}$	max.	25 W
Storage temperature	$T_{stg}$		-65 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th j-mb}$	max.	6,5 K/W
From mounting base to heatsink	$R_{th mb-h}$	max.	0,6 K/W

**CHARACTERISTICS** $T_{mb} = 25 \text{ }^\circ\text{C}$ 

Collector-base breakdown voltage $I_C = 3 \text{ mA}$ ; open emitter	$V_{(BR)CBO}$	$\geq$	35 V
Collector-emitter breakdown voltage $R_{BE} = 10 \Omega$ ; $I_C = 3 \text{ mA}$	$V_{(BR)CER}$	$\geq$	35 V
Emitter-base breakdown voltage $I_E = 0,5 \text{ mA}$ ; open collector	$V_{(BR)EBO}$	$\geq$	3 V
Collector cut-off current $I_E = 0$ ; $V_{CB} = 24 \text{ V}$	$I_{CBO}$	$\leq$	0,1 mA
Emitter cut-off current $I_C = 0$ ; $V_{EB} = 1,5 \text{ V}$	$I_{EBO}$	$\leq$	10 $\mu\text{A}$



**APPLICATION INFORMATION**

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

type number	f GHz	V <sub>CC</sub> V	t <sub>on</sub> μs	δ %	P <sub>L</sub> W	G <sub>D</sub> dB	η <sub>C</sub> %
RV3135B5X	3,1 to 3,5	24	100	10	> 4 typ. 5,6	> 4,3 typ. 5,7	> 30 typ. 47

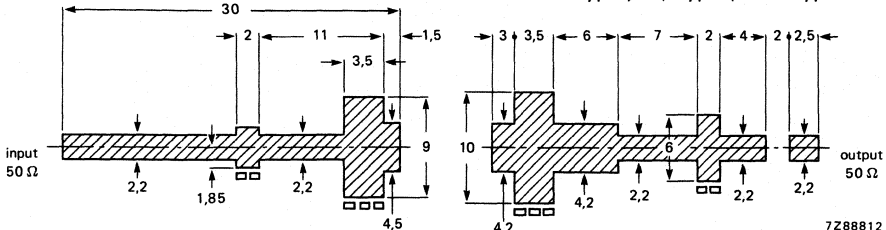


Fig. 2 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,54$ ); thickness 0,8 mm.

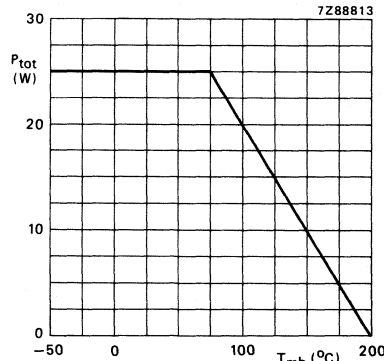


Fig. 3

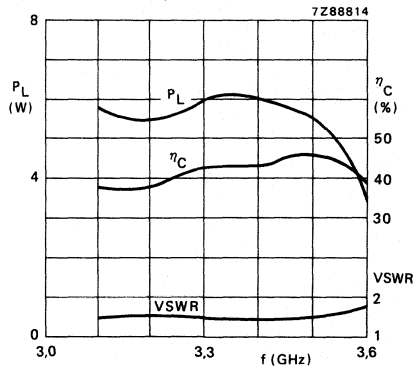


Fig. 4.

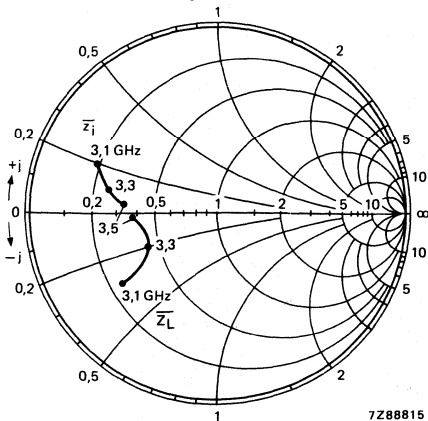


Fig. 5.

Fig. 3 Power derating curve vs. mounting base temperature;  $t_{on} = 100\text{ }\mu\text{s}$ ;  $\delta = 10\%$ .

Fig. 4 Load power, collector efficiency and VSWR vs. frequency;  $P_{in} = 1,5\text{ W}$ .

Fig. 5 Input and optimum load impedance vs. frequency; typical values;  $Z_O = 50\text{ }\Omega$ ;  $T_{mb} = 25\text{ }^{\circ}\text{C}$ .



# DEVELOPMENT DATA

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

RX1214B300Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %
class-B; $t_p = 150\text{ }\mu\text{s}$ ; $\delta = 4\%$	1,2 to 1,4	50	typ. 300	typ. 7	typ. 35
class-B; $t_p = 300\text{ }\mu\text{s}$ ; $\delta = 10\%$	1,2 to 1,4	50	typ. 300	typ. 7,5	typ. 30

### MECHANICAL DATA

Dimensions in mm

FO-91 (see Fig. 1).

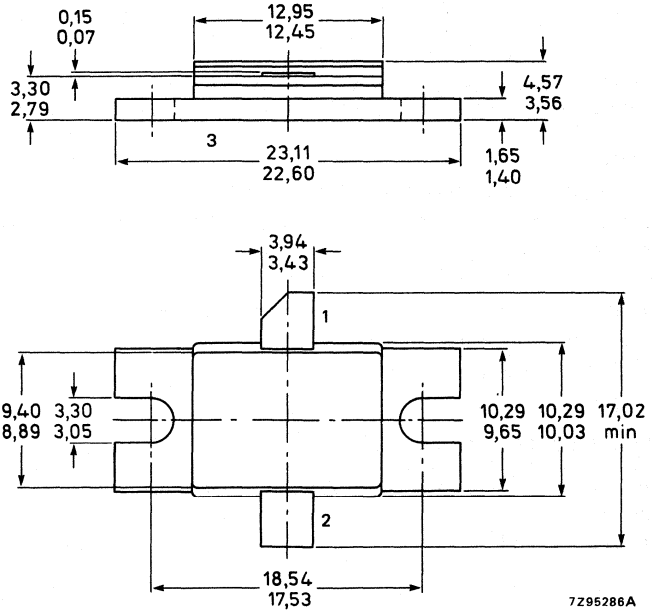
**MECHANICAL DATA**

Dimensions in mm

Fig. 1 FO-91.

Pinning :

- 1= collector
- 2= emitter
- 3= base



7295286A

**RATINGS**

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

Collector-base voltage, open emitter	$V_{CB0}$	max.	60 V
Collector-emitter voltage, $R_{BE} \leq 10 \Omega$	$V_{CER}$	max.	60 V
Emitter-base voltage, open collector	$V_{EBO}$	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s$ ; $\delta \leq 10 \%$	$I_C$	max.	21 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s$ ; $\delta \leq 10 \%$	$P_{tot}$	max.	630 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	0,7 K/W
Transient thermal impedance, $t_p = 50 \mu s$ , single pulse	$Z_{th}$	typ.	0,06 K/W

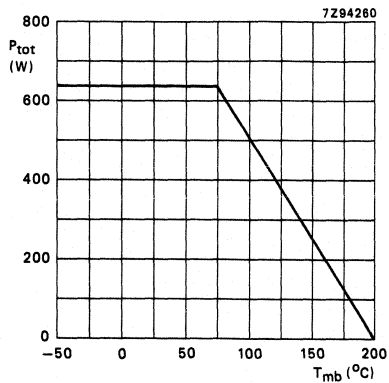


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions:  $t_p = 50 \mu s$ ,  $\delta = 10 \%$ .

**CHARACTERISTICS**

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

Collector-base breakdown voltage

$I_C = 14 \text{ mA}$ ;  $I_E = 0$

$V_{(BR)CBO} \geq 60 \text{ V}$

Collector-emitter breakdown voltage

$I_C = 14 \text{ mA}$ ;  $R_{BE} = 10 \Omega$

$V_{(BR)CER} \geq 60 \text{ V}$

Emitter-base breakdown voltage

$I_C = 0$ ;  $I_E = 1,4 \text{ mA}$

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

Collector cut-off current

$I_E = 0$ ;  $V_{CB} = 50 \text{ V}$

$I_{CBO} \leq 7 \text{ mA}$

Emitter cut-off current

$I_C = 0$ ;  $V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 0,5 \text{ mA}$

DEVELOPMENT DATA



# DEVELOPMENT DATA

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

RXB12350Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$
class-B						see table	
$t_p = 100\text{ }\mu\text{s}, \delta = 10\%$	1,09	50	typ. 350	typ. 7,8	typ. 38		
$t_p = 300\text{ }\mu\text{s}, \delta = 10\%$	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

FO-91 (see Fig. 1)

Dimensions in mm

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

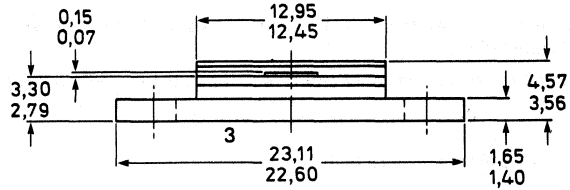
**MECHANICAL DATA**

Dimensions in mm

Fig. 1 FO-91.

**Pinning:**

- 1 = collector
- 2 = emitter
- 3 = base



Torque on screw: max. 0,5 Nm

Recommended screw: M3

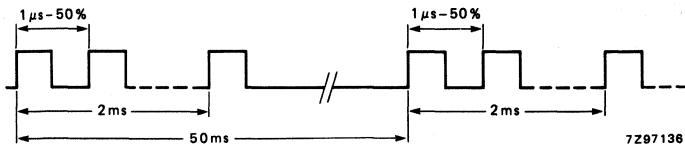
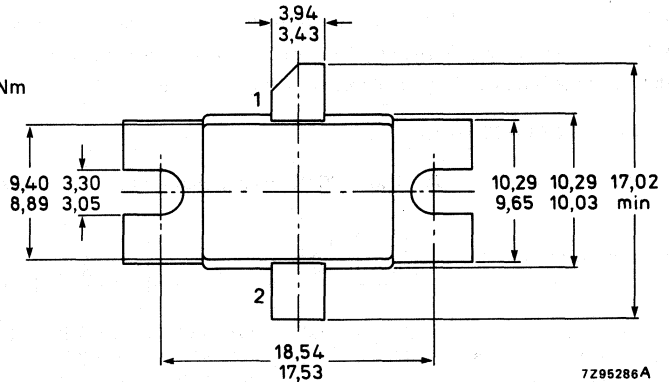


Fig. 2 DABS pulse definition.

**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, $R_{BE} = 10 \Omega$	$V_{CER}$	max.	60 V
Emitter-base voltage, open collector	$V_{EBO}$	max.	3 V



Collector current (d.c.)

$t_p = 50 \mu s, \delta \leq 10\%$

$I_C$  max. 21 A

Total power dissipation up to  $T_{mb} = 75^\circ C$

$t_p = 50 \mu s, \delta \leq 10\%$

$P_{tot}$  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,  $t_{sld} \leq 10 s$

$T_{sld}$  max. 235 °C

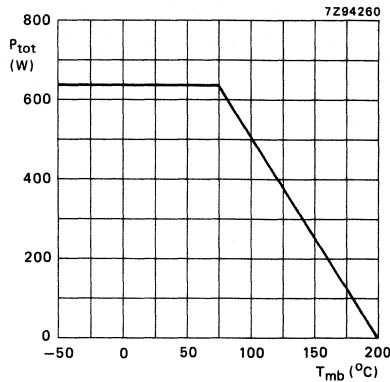


Fig. 3 Power derating curve versus mounting base temperature;  $t_p = 50 \mu s, \delta = 10\%$ .

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th j-mb}$  max. 0,7 K/W

Transient thermal impedance,  $t_p = 50 \mu s$

$Z_{th}$  typ. 0,06 K/W

**CHARACTERISTICS**

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

Breakdown voltages

$I_C = 14 mA; I_E = 0$

$V(BR)CBO \geq 60 V$

$I_C = 14 mA; R_{BE} = 10 \Omega$

$V(BR)CER \geq 60 V$

$I_C = 0; I_E = 1,4 mA$

$V(BR)EBO \geq 3 V$

Collector cut-off current

$I_E = 0; V_{CB} = 50 V$

$I_{CBO} \leq 7 mA$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 V$

$I_{EBO} \leq 0,5 mA$

**IMPEDANCES**

frequency GHz	input ( $\bar{z}_i$ ) $\Omega$	load ( $\bar{Z}_L$ ) $\Omega$
1,03	1,45 + j3,71	0,72 - j1,09
1,09	1,7 + j3,93	0,68 - j1,13



# DEVELOPMENT DATA

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

RZ1214B35Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
class-C; $t_p = 50\ \mu\text{s};$ $\delta = 10\%$	1,2 to 1,4	42	typ. 40	typ. 7,8	typ. 40	see Fig. 6	
class-C; $t_p = 300\ \mu\text{s};$ $\delta = 10\%$	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

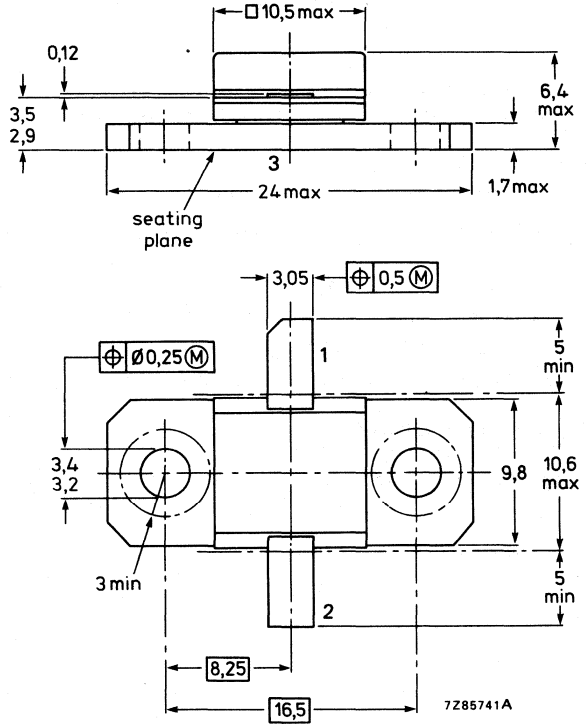
Dimensions in mm

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, $R_{BE} \leq 10 \Omega$	$V_{CER}$	max.	60 V
Emitter-base voltage, open collector	$V_{EBO}$	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s; \delta \leq 10 \%$	$I_C$	max.	3 A
Total power dissipation up to $T_{mb} = 75^\circ C$ $t_p \leq 50 \mu s; \delta \leq 10 \%$	$P_{tot}$	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; $t_{sld} \leq 10 s$	$T_{sld}$	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th j-mb}$	max.	5,0 K/W
Transient thermal impedance; $t_p = 50 \mu s$ , single pulse	$Z_{th}$	typ.	0,6 K/W

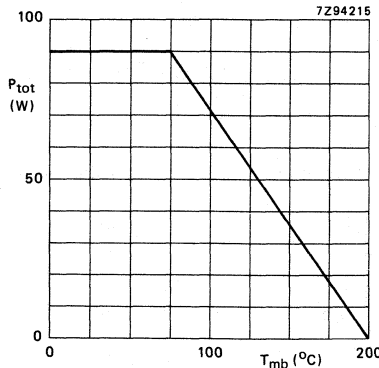


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions:  $t_p = 50 \mu s$ ,  $\delta = 10 \%$ ).

**CHARACTERISTICS**

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

Collector-base breakdown voltage $I_C = 2 mA; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 2 mA; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 0,2 mA$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 V$	$I_{CBO} \leq$	1 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 V$	$I_{EBO} \leq$	50 $\mu A$

PRODUCT TEST

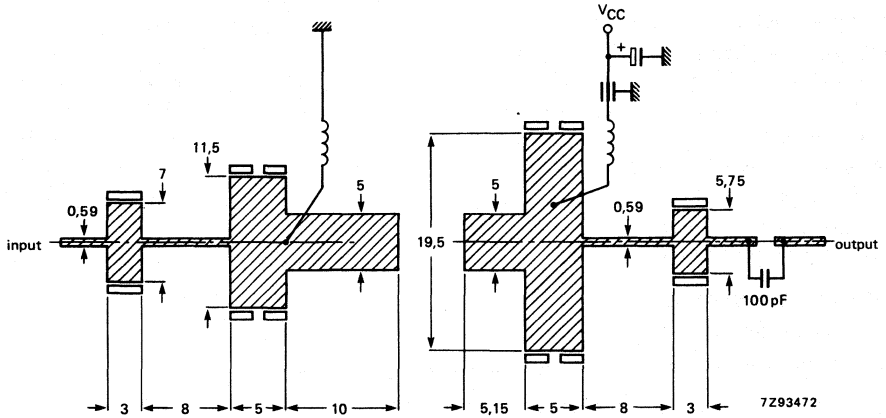


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).  
Epsilon p.c. board, thickness 0,635 mm,  $\epsilon_r = 10$ .

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
class-C; $t_p = 50 \mu s$ ; $\delta = 10 \%$	1,2 to 1,4	42	> 35	> 7	> 35	see Fig. 6	

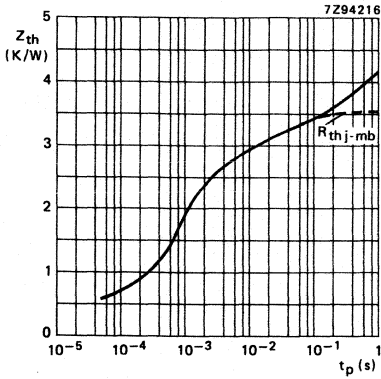


Fig. 4 Transient thermal impedance.

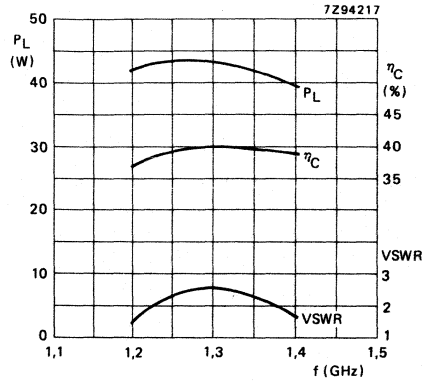


Fig. 5 Load power, collector efficiency and VSWR versus frequency;  $V_{CE} = 42\text{ V}$ ;  $P_S = 7\text{ W}$ .

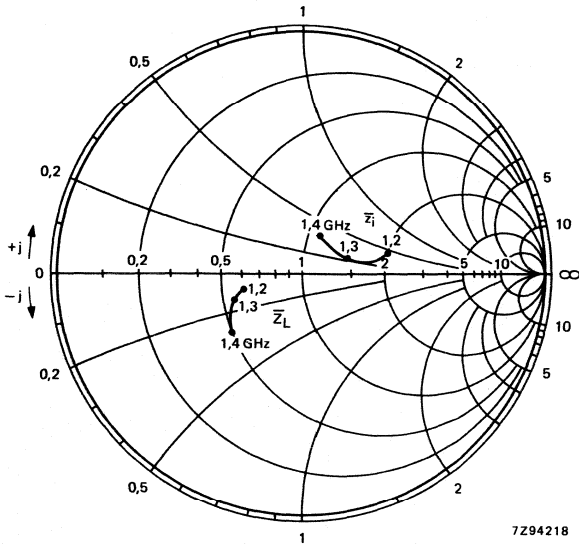


Fig. 6 Input and optimum load impedances versus frequency;  $Z_0 = 5\ \Omega$ .

Conditions for Fig. 6:

$V_{CE} = 42\text{ V}$ ;  $P_L = 35\text{ W}$ ;  $t_p = 50\ \mu\text{s}$ ;  $\delta = 10\%$ ; 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  $T_{mb} = 25^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier under pulse conditions of  $t_{on} = 100 \mu\text{s}$  and  $\delta = 10\%$ .

type number	f GHz	$V_{CC}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %
RZ1214B60W	1,2	42	60	7,8	31
RZ1214B125W	to 1,4		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.

RZ1214B60W  
RZ1214B125W

Base connected to flange.

Torque on nut: max. 0,5 Nm

Recommended screw: M3

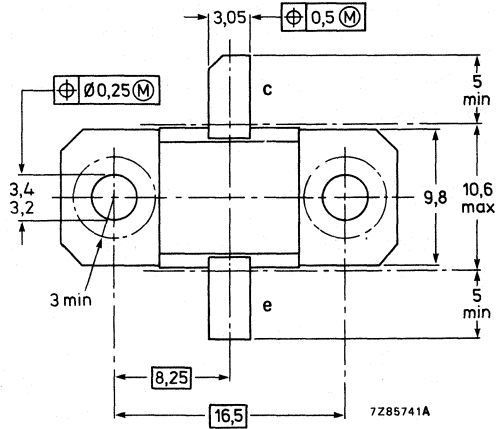
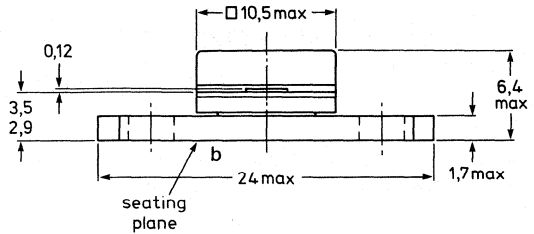


Fig. 1 FO-57C.

**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 $R_{BE} \leq 10 \Omega$ open base	$V_{CER}$ max. $V_{CEO}$ max.	50 35	50 35	V V
Emitter-base voltage open collector	$V_{EBO}$ max.	3	3	V
Collector current (d.c.) $t_{on} \leq 100 \mu s; \delta \leq 10\%$	$I_C$ max.	7,5	15	A
Total power dissipation up to $T_{mb} = 75^\circ C$ $t_{on} \leq 100 \mu s; \delta \leq 10\%$	$P_{tot}$ max.	275	550	W
Storage temperature	$T_{stg}$	-65 to 200		$^\circ C$
Junction temperature	$T_j$ max.	200		$^\circ C$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10$ s	$T_{sld}$ max.	235		$^\circ C$

# DEVELOPMENT DATA

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

RZ1214B65Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
class-B; $t_p = 50\ \mu\text{s}$ ; $\delta = 10\%$	1,2 to 1,4	42	typ. 80	typ. 7	typ. 38	see Fig. 6	
class-B; $t_p = 300\ \mu\text{s}$ ; $\delta = 10\%$	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.

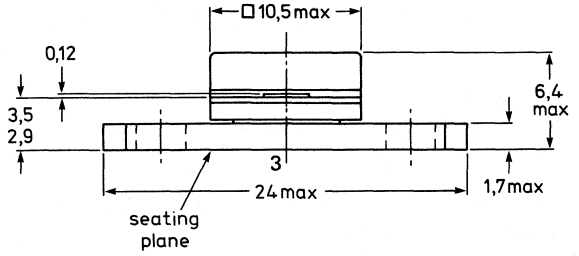
MECHANICAL DATA

Dimensions in mm

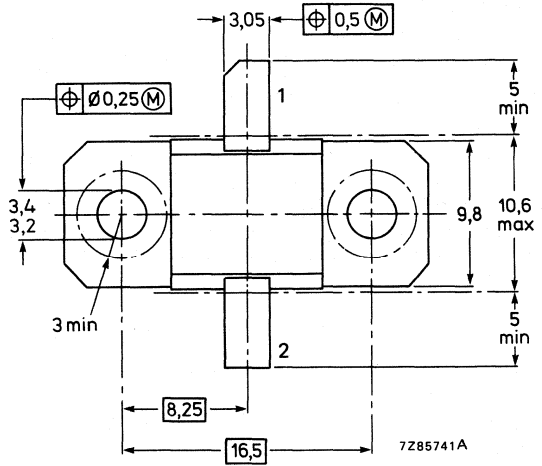
Fig. 1 FO-57C.

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, $R_{BE} \leq 10 \Omega$	$V_{CER}$	max.	60 V
Emitter-base voltage, open collector	$V_{EBO}$	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s; \delta \leq 10 \%$	$I_C$	max.	6 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s; \delta \leq 10 \%$	$P_{tot}$	max.	180 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{slid} \leq 10 \text{ s}$	$T_{slid}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	2,5 K/W
Transient thermal impedance, $t_p = 50 \mu s$ , (single pulse)	$Z_{th}$	typ.	0,3 K/W

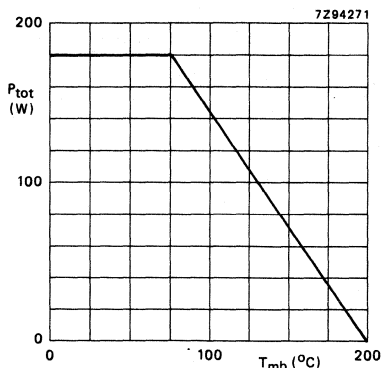


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions:  $t_p = 50 \mu s$ ,  $\delta = 10 \%$ ).

**CHARACTERISTICS**

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

Collector-base breakdown voltage $I_C = 4 \text{ mA}; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 4 \text{ mA}; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 0,4 \text{ mA}$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 \text{ V}$	$I_{CBO} \leq$	2 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 \text{ V}$	$I_{EBO} \leq$	100 $\mu\text{A}$

PRODUCT TEST

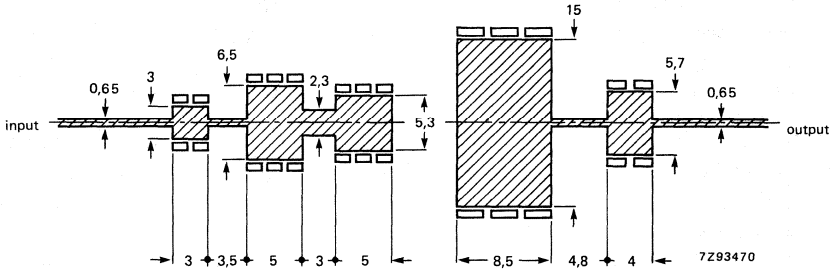


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).  
Epsilon p.c. board, thickness 0,635 mm,  $\epsilon_r = 10$ .

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
class-C; $t_p = 50 \mu s$ ; $\delta = 10 \%$	1,2 to 1,4	42	> 65	> 6	> 32	see Fig. 6	

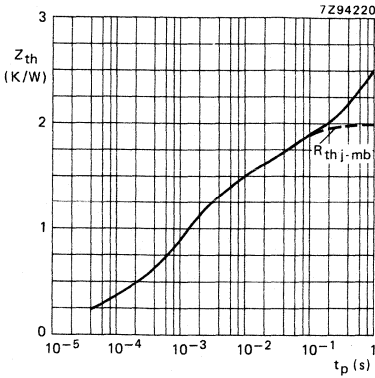


Fig. 4 Transient thermal impedance.

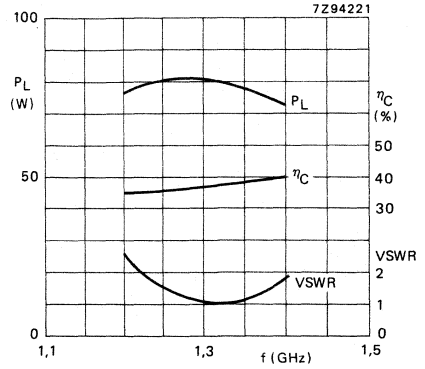


Fig. 5 Load power (at  $P_S = 16$  W), and collector efficiency and VSWR (at  $P_L = 65$  W) versus frequency;  $V_{CE} = 42$  V.

DEVELOPMENT DATA

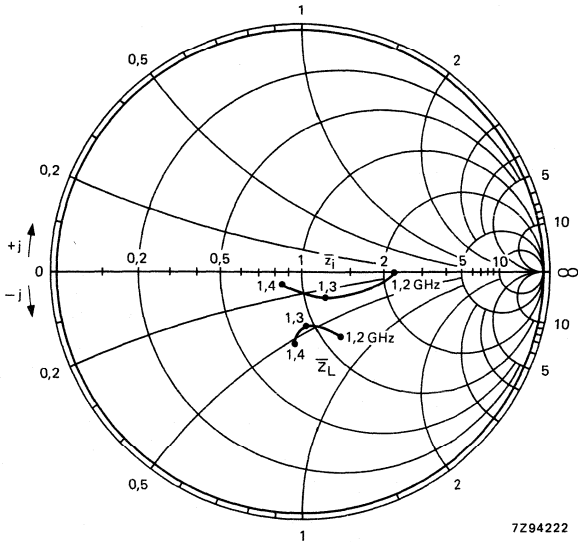


Fig. 6 Input and optimum load impedance versus frequency;  $Z_0 = 5 \Omega$ .

Conditions for Fig. 6:

$V_{CE} = 42$  V;  $P_L = 65$  W;  $t_p = 50 \mu s$ ;  $\delta = 10$  %; class-C operation.





# DEVELOPMENT DATA

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

RZ1214B125Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
class-C; $t_p = 50\ \mu\text{s}$ ; $\delta = 10\%$	1,2 to 1,4	42	typ. 150	typ. 7	typ. 38	see Fig. 7	
class-C; $t_p = 300\ \mu\text{s}$ ; $\delta = 10\%$	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.

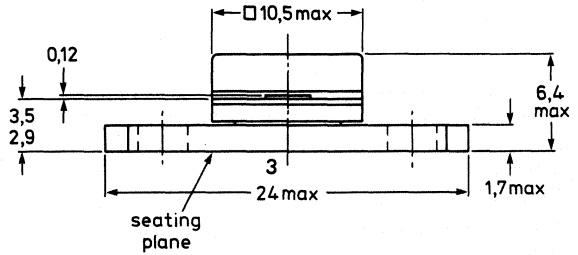
MECHANICAL DATA

Fig. 1 FO-57C.

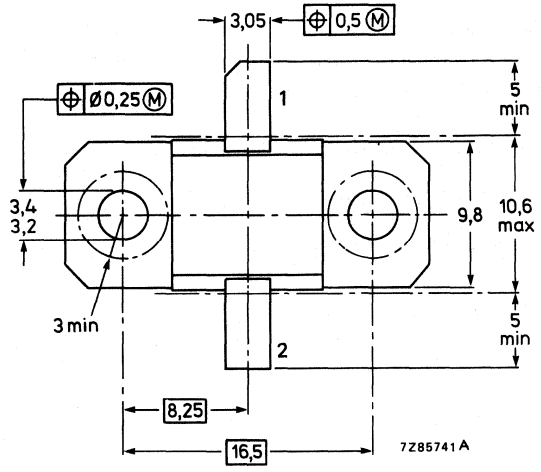
Dimensions in mm

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 <sub>CBO</sub>	max.	60 V
Collector-emitter voltage, R <sub>BE</sub> ≤ 10 Ω	V <sub>CER</sub>	max.	60 V
Emitter-base voltage, open collector	V <sub>EBO</sub>	max.	3 V
Collector current (d.c.) t <sub>p</sub> ≤ 50 μs; δ ≤ 10 %	I <sub>C</sub>	max.	12 A
Total power dissipation up to T <sub>mb</sub> = 75 °C t <sub>p</sub> ≤ 50 μs; δ ≤ 10 %	P <sub>tot</sub>	max.	360 W
Storage temperature	T <sub>stg</sub>		-65 to 200 °C
Junction temperature	T <sub>j</sub>	max.	200 °C
Lead soldering temperature at 0,1 mm from the case; t <sub>slid</sub> ≤ 10 s	T <sub>slid</sub>	max.	235 °C

**THERMAL RESISTANCE**

From junction to mounting base	R <sub>th j-mb</sub>	max.	1,25 K/W
Transient thermal impedance, t <sub>p</sub> = 50 μs single pulse	Z <sub>th</sub>	typ.	0,15 K/W

DEVELOPMENT DATA

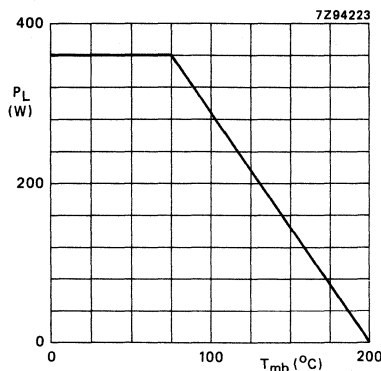


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions, t<sub>p</sub> = 50 μs, δ = 10 %.

**CHARACTERISTICS**

T<sub>mb</sub> = 25 °C unless otherwise specified

Collector-base breakdown voltage I <sub>C</sub> = 8 mA; I <sub>E</sub> = 0	V(BR)CBO	≥	60 V
Collector-emitter breakdown voltage I <sub>C</sub> = 8 mA; R <sub>BE</sub> = 10 Ω	V(BR)CER	≥	60 V
Emitter-base breakdown voltage I <sub>C</sub> = 0; I <sub>E</sub> = 0,8 mA	V(BR)EBO	≥	3 V
Collector cut-off current I <sub>E</sub> = 0; V <sub>CB</sub> = 50 V	I <sub>CBO</sub>	≤	4 mA
Emitter cut-off current I <sub>C</sub> = 0; V <sub>EB</sub> = 1,5 V	I <sub>EBO</sub>	≤	200 μA

PRODUCT TEST

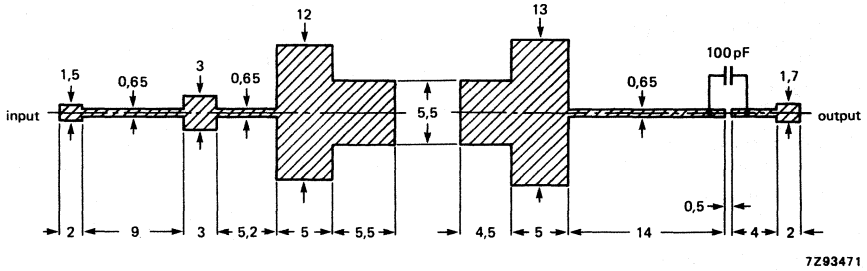


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).  
Epsilam p.c. board, thickness 0,635 mm,  $\epsilon_r = 10$ .

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	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
class-C; $t_p = 50 \mu s$ ; $\delta = 10 \%$	1,2 to 1,4	42	> 125	> 6	38	see Fig. 7	

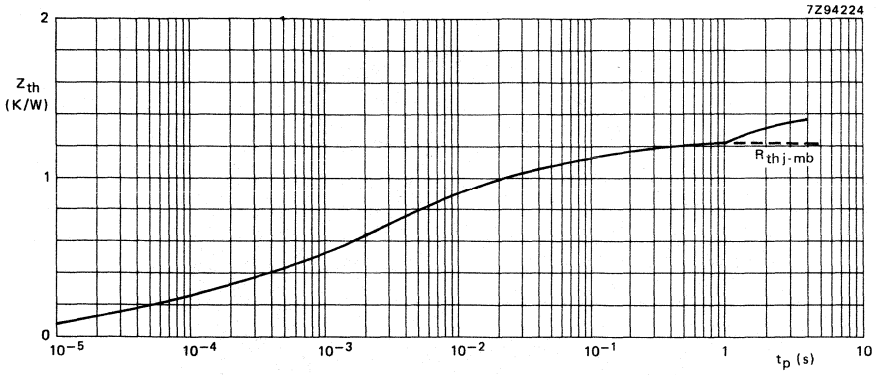


Fig. 4 Transient thermal impedance.

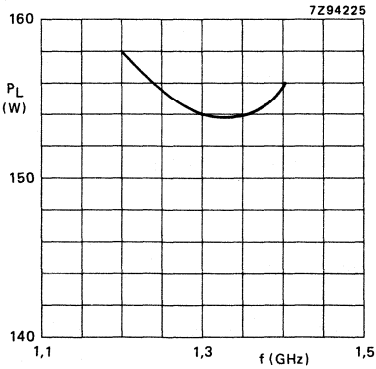


Fig. 5 Load power versus frequency;  $P_S = 30$  W.

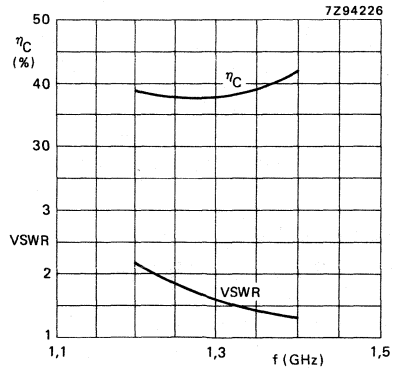


Fig. 6 Collector efficiency and VSWR versus frequency;  $P_L = 125$  W.

Conditions for Figs 5 and 6:

$V_{CE} = 42$  V;  $t_p = 50$   $\mu$ s;  $\delta = 10$  %.

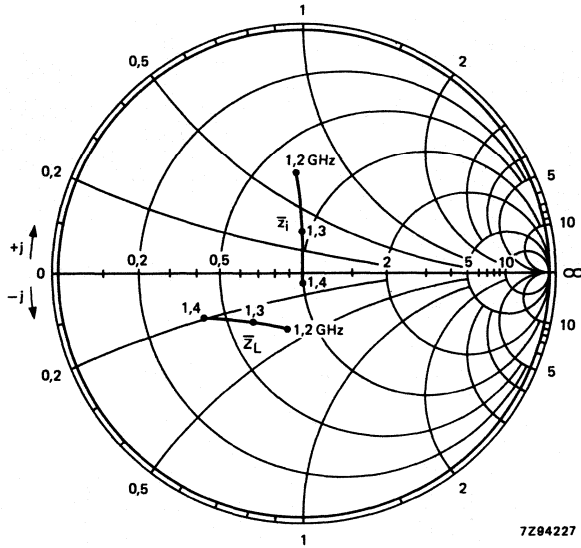


Fig. 7 Input and optimum load impedance versus frequency;  $Z_0 = 5 \Omega$ .

Conditions for Fig. 7:

$V_{CE} = 42 \text{ V}$ ;  $P_L = 125 \text{ W}$ ;  $t_p = 50 \mu\text{s}$ ,  $\delta = 10 \%$ ; class-C operation.

# DEVELOPMENT DATA

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

RZ1214B150Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
class-C; $t_p = 50\ \mu\text{s}$ ; $\delta = 10\ \%$	1,2 to 1,4	42	typ. 200	typ. 7	typ. 38	see Fig. 6	
class-C; $t_p = 300\ \mu\text{s}$ ; $\delta = 10\ \%$	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

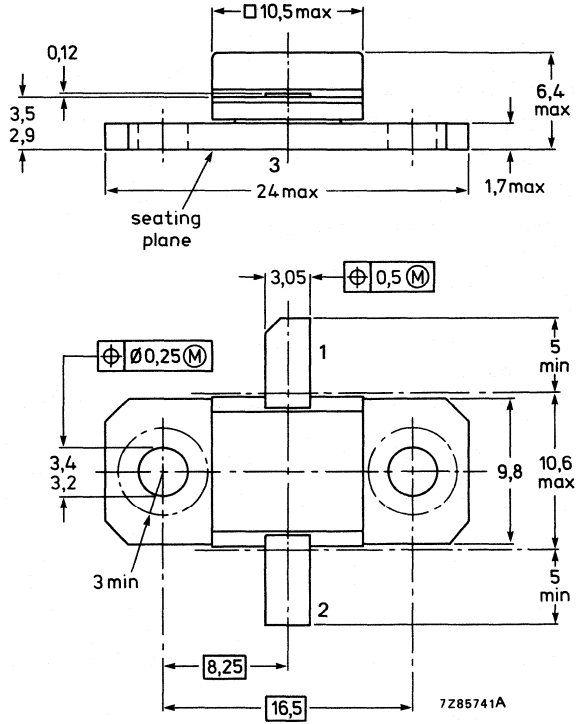
Dimensions in mm

Fig. 1 FO-57C.

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

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





**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, $R_{BE} \leq 10 \Omega$	$V_{CER}$	max.	60 V
Emitter-base voltage, open collector	$V_{EBO}$	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s; \delta \leq 10 \%$	$I_C$	max.	15 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s; \delta \leq 10 \%$	$P_{tot}$	max.	450 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	1,0 K/W
Transient thermal impedance, $t_p = 50 \mu s$ single pulse	$Z_{th}$	typ.	0,1 K/W

DEVELOPMENT DATA

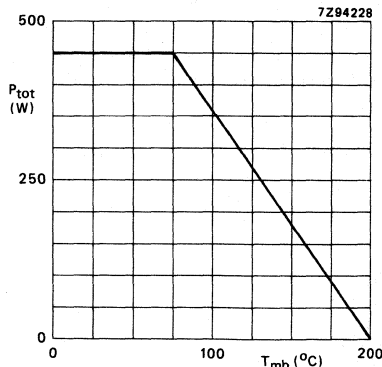


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions:  $t_p = 50 \mu s, \delta = 10 \%$ .

**CHARACTERISTICS**

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

Collector-base breakdown voltage $I_C = 10 \text{ mA}; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 10 \text{ mA}; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 1 \text{ mA}$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 \text{ V}$	$I_{CBO} \leq$	5 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 \text{ V}$	$I_{EBO} \leq$	0,25 mA

PRODUCT TEST

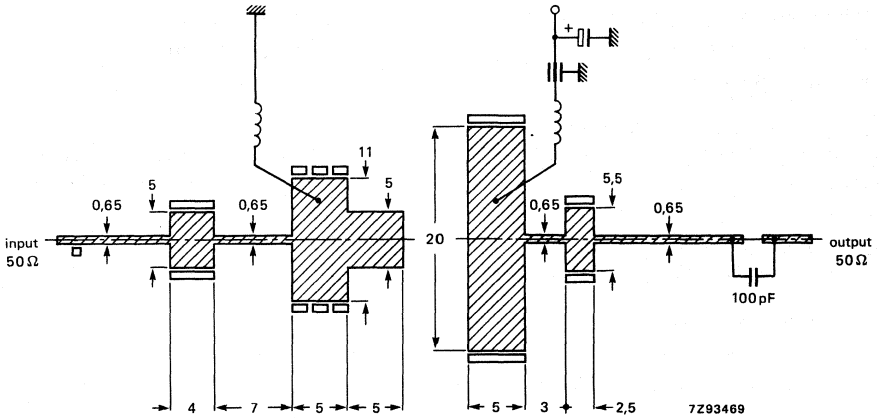


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).  
Epsilam p.c. board, thickness 0,635 mm,  $\epsilon_r = 10$ .

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
class-C; $t_p = 300 \mu s$ ; $\delta = 10 \%$	1,2 to 1,4	50	> 160	> 6	> 30	see Fig. 6	

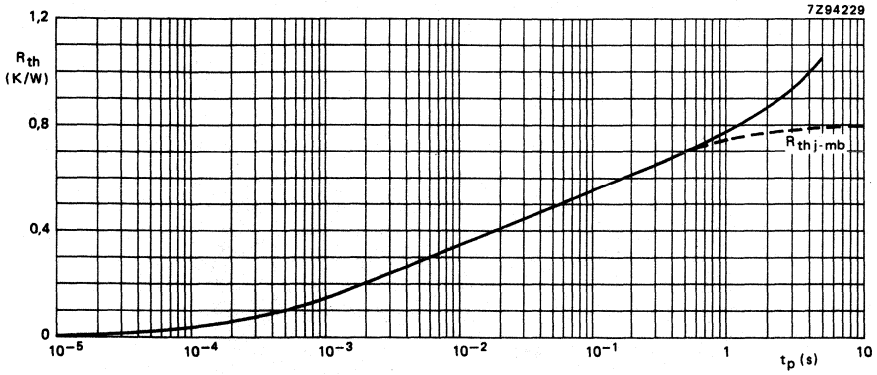


Fig. 4 Transient thermal impedance.

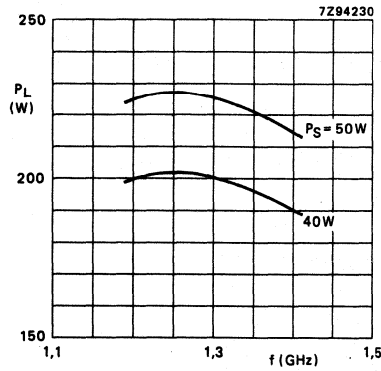


Fig. 5 Load power versus frequency.  
 $V_{CE} = 50 V$ ;  $t_{on} = 300 \mu s$ ,  $\delta = 10 \%$ .

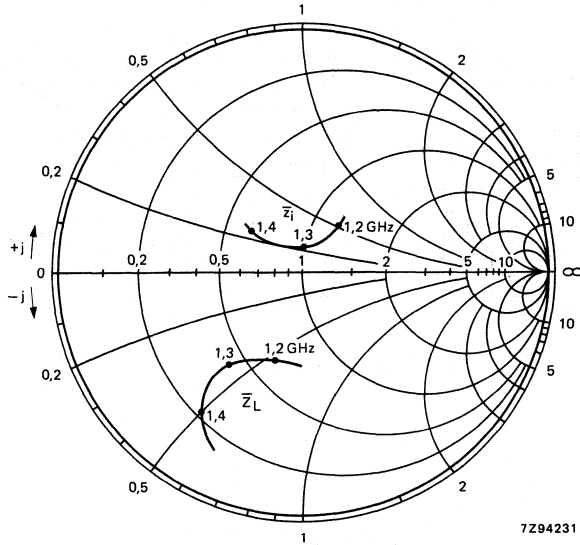


Fig. 6 Input and optimum load impedances versus frequency;  $Z_0 = 5 \Omega$ .

Conditions for Fig. 6:

$V_{CE} = 50 \text{ V}$ ;  $P_L = 150 \text{ W}$ ;  $t_p = 300 \mu\text{s}$ ;  $\delta = 10 \%$ .

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B test circuit.

mode of operation	f GHz	VCE V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\bar{z}_L$ Ω
class-B						see Fig. 5.
$t_p = 100\text{ }\mu\text{s}, \delta = 10\%$	2,8 – 3,3	40	typ. 45	typ. 5,5	typ. 25	
$t_p = 50\text{ }\mu\text{s}, \delta = 5\%$	2,7 – 3,1	40	typ. 55	typ. 6,5	typ. 30	
$t_p = 50\text{ }\mu\text{s}, \delta = 5\%$	2,9 – 3,1	42	typ. 65	typ. 7,0	typ. 30	

### MECHANICAL DATA

FO-57C (see Fig. 1)

Dimensions in mm

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

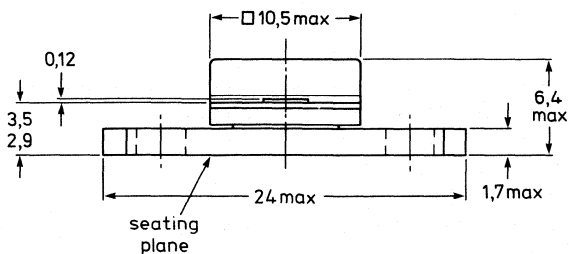
## MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

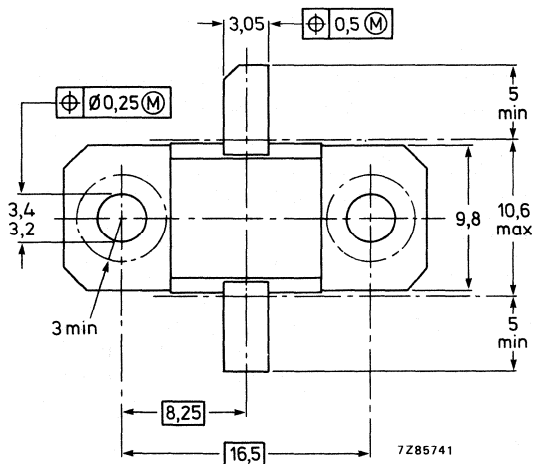
### Pinning:

- 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	$V_{CB0}$	max.	50 V
Collector-emitter voltage, open base	$V_{CE0}$	max.	20 V
$R_{BE} = 10 \Omega$	$V_{CER}$	max.	50 V
Emitter-base voltage, open collector	$V_{EB0}$	max.	3 V
Collector current; $t_p = 100 \mu s$ , $\delta = 10\%$	$I_C$	max.	6 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	$P_{tot}$	max.	175 W
Storage temperature	$T_{stg}$		-55 to +200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

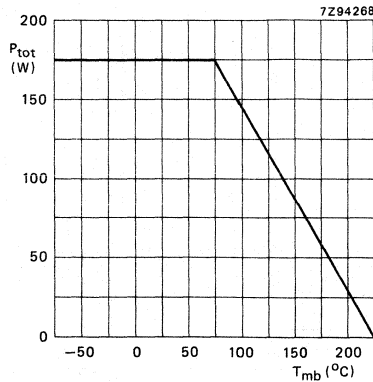


Fig. 2 Power derating curve versus mounting base temperature ( $t_p = 100 \mu s$ ,  $\delta = 10\%$ ).

**THERMAL RESISTANCE**

From junction to mounting base	$R_{th\ j-mb}$	max.	2 K/W
Transient thermal impedance; $t_p = 100 \mu s$	$Z_{th}$	typ.	0,3 K/W

**CHARACTERISTICS**

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

Collector-base breakdown voltages

$I_C = 5 \text{ mA}$ , open emitter	$V_{(BR)CBO}$	$\geq$	50 V
$I_C = 1 \text{ mA}$ , open emitter		$\geq$	3 V

Collector-emitter breakdown voltage

$I_C = 10 \text{ mA}$ , open base	$V_{(BR)CEO}$	$\geq$	20 V
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Emitter cut-off current

$V_{EB} = 3 \text{ V}$ ; $I_C = 0$	$I_{EBO}$	$\leq$	1 mA
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Collector cut-off current

$V_{CB} = 40 \text{ V}$ ; $I_C = 0$	$I_{CBO}$	$\leq$	1 mA
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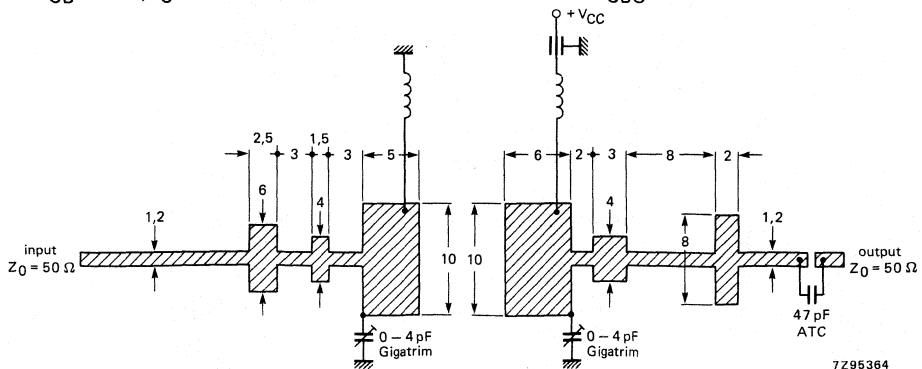


Fig. 3 Wideband test circuit board for 2,7 – 3,1 GHz and for 2,9 – 3,3 GHz. Teflon fibreglass p.c. board; thickness 0,4 mm (all dimensions in mm).

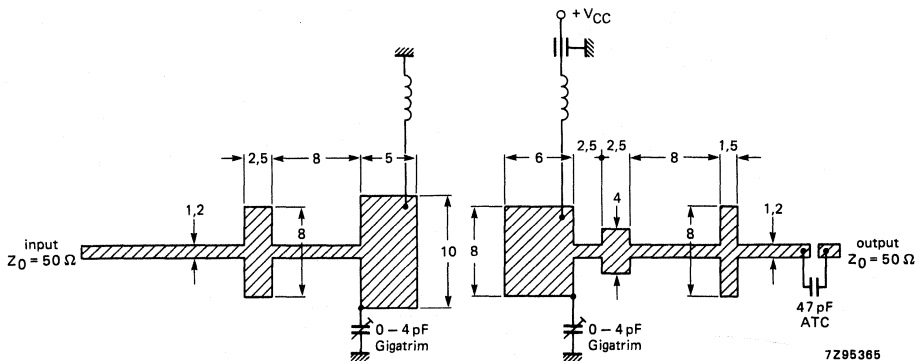


Fig. 4 Wideband test circuit board for 2,8 – 3,3 GHz. Teflon fibreglass p.c. board; thickness 0,4 mm (all dimensions in mm).

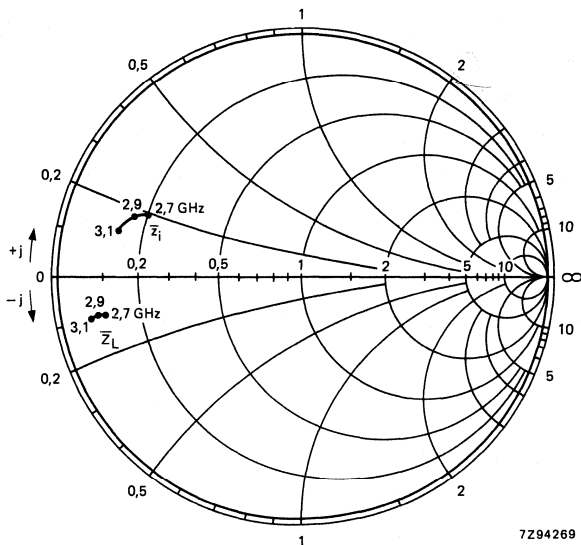


Fig. 5 Input and optimum load impedances versus frequency;  $Z_0 = 50 \Omega$ ; typical values.



## 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

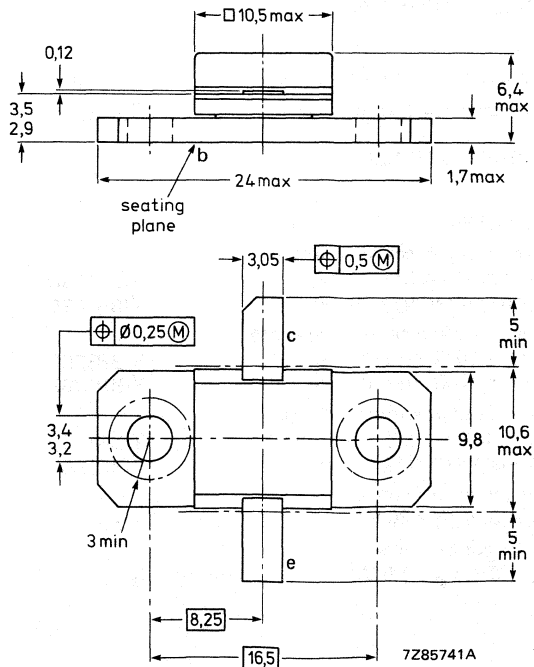
R.F. performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized wideband common-base class-B circuit under pulse conditions

type number	f GHz	V <sub>CC</sub> V	t <sub>on</sub> μs	δ %	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>C</sub> %
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

Fig. 1 FO-57C.

Dimensions in mm



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

# RZ3135B15U RZ3135B25U

## 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 $R_{BE} = 10 \Omega$ open base	$V_{CER}$ $V_{CEO}$	max. max.	40 25	40 V 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 $T_{mb} = 75^\circ C$ $t_{on} = 100 \mu s; \delta = 10\%$	$P_{tot}$	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 $t_{slid} \leq 10 s$	$T_{slid}$	max.	235 °C	

## THERMAL RESISTANCE

			RZ3135B15U	RZ3135B25U
From junction to mounting base	$R_{th j-mb}$	max.	3,5	1,75 K/W
From mounting base to heatsink	$R_{th mb-h}$	max.	0,3	0,3 K/W

## CHARACTERISTICS

			RZ3135B15U	RZ3135B25U
$T_{mb} = 25^\circ C$				
Collector-base breakdown voltage open emitter; $I_C = 5 mA$ open emitter; $I_C = 10 mA$	$V_{(BR)CBO}$ $V_{(BR)CBO}$	$\geq$ $\geq$	40	V 40 V
Collector-emitter breakdown voltage $R_{BE} = 10 \Omega; I_C = 5 mA$ $R_{BE} = 10 \Omega; I_C = 10 mA$	$V_{(BR)CER}$ $V_{(BR)CER}$	$\geq$ $\geq$	40	V 40 V
Emitter-base breakdown voltage open collector; $I_E = 0,5 mA$ open collector; $I_E = 1 mA$	$V_{(BR)EBO}$ $V_{(BR)EBO}$	$\geq$ $\geq$	2	V 2 V
Collector cut-off current $I_E = 0; V_{CB} = 30 V$	$I_{CBO}$	$\leq$	0,5	1 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 V$	$I_{EBO}$	$\leq$	100	200 $\mu A$

## 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.

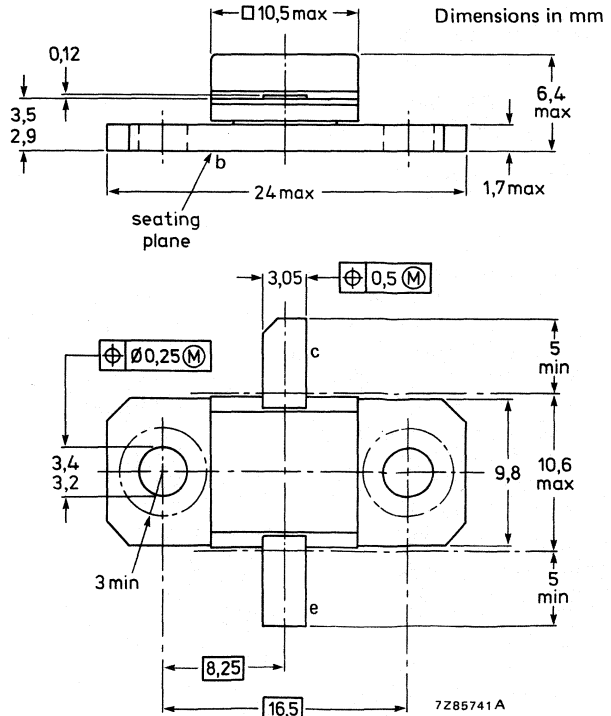
### QUICK REFERENCE DATA

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

type number	f GHz	V <sub>CC</sub> V	t <sub>on</sub> μs	δ %	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>C</sub> %
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.



# RZ3135B15W

# RZ3135B30W

## 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 $R_{BE} = 10 \Omega$ open base	$V_{CER}$	max.	50	50 V
	$V_{CEO}$	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 $T_{mb} = 75^\circ C$ $t_{on} = 100 \mu s; \delta = 10\%$	$P_{tot}$	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 $t_{sld} \leq 10 s$	$T_{sld}$	max.	235 °C	

## THERMAL RESISTANCE

			RZ3135B15W	RZ3135B30W
From junction to mounting base	$R_{th j-mb}$	max.	3,5	1,75 K/W
From mounting base to heatsink	$R_{th mb-h}$	max.	0,3	0,3 K/W

## CHARACTERISTICS

			RZ3135B15W	RZ3135B30W
$T_{mb} = 25^\circ C$				
Collector-base breakdown voltage open emitter; $I_C = 5 mA$ open emitter; $I_C = 10 mA$	$V_{(BR)CBO}$	$\geq$	50	V
	$V_{(BR)CBO}$	$\geq$		50 V
Collector-emitter breakdown voltage $R_{BE} = 10 \Omega; I_C = 5 mA$ $R_{BE} = 10 \Omega; I_C = 10 mA$	$V_{(BR)CER}$	$\geq$	50	V
	$V_{(BR)CER}$	$\geq$		50 V
Emitter-base breakdown voltage open collector; $I_E = 0,5 mA$ open collector; $I_E = 1 mA$	$V_{(BR)EBO}$	$\geq$	2	V
	$V_{(BR)EBO}$	$\geq$		2 V
Collector cut-off current $I_E = 0; V_{CB} = 30 V$	$I_{CBO}$	$\leq$	0,5	1 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 V$	$I_{EBO}$	$\leq$	100	200 $\mu A$

**APPLICATION INFORMATION** (type RZ3135B15W)

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

type number	f GHz	V <sub>CC</sub> V	t <sub>on</sub> μs	δ %	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>C</sub> %
RZ3135B15W	3,1 to 3,5	42	100	10	> 15 typ. 18	> 5 typ. 5,5	> 30 typ. 33

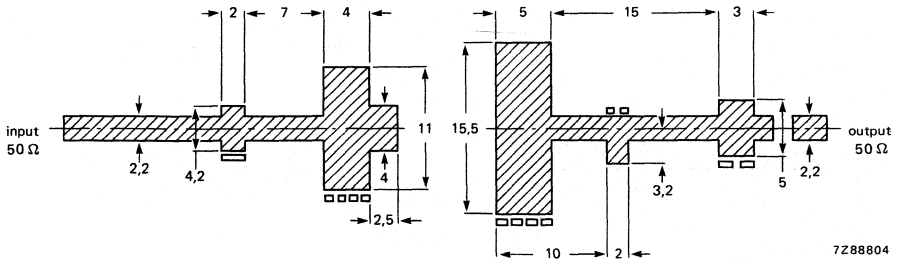


Fig. 2 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,54$ ); thickness 0,8 mm.

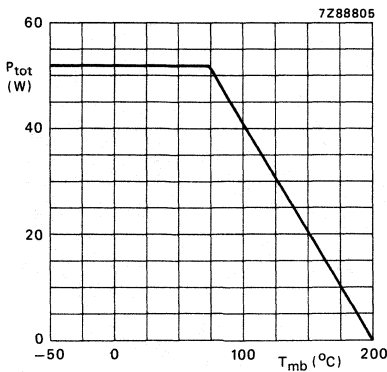


Fig. 3 Power derating curve vs. mounting base temperature;  $t_{on} = 100\text{ }\mu\text{s}$ ;  $\delta = 10\%$ .

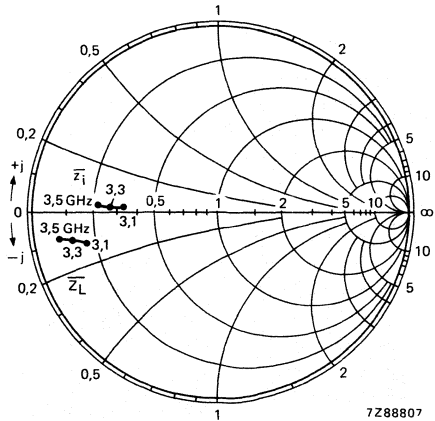
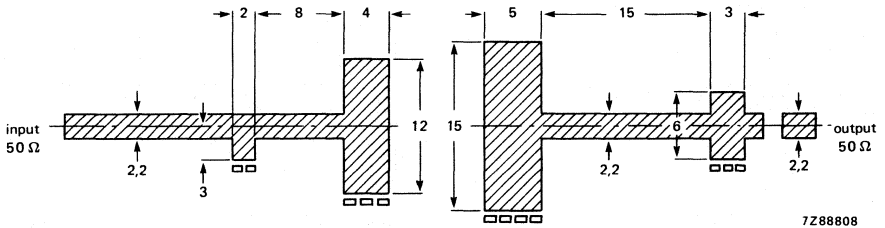


Fig. 4 Input and optimum load impedance vs. frequency; typical values;  $Z_0 = 50\text{ }\Omega$ ;  $T_{mb} = 25\text{ }^{\circ}\text{C}$ .

## APPLICATION INFORMATION (type RZ3135B30W)

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

type number	f GHz	V <sub>CC</sub> V	t <sub>on</sub> μs	δ %	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>C</sub> %
RZ3135B30W	3,1 to 3,5	42	100	10	> 30 typ. 34	> 5 typ. 5,5	> 30 typ. 33



7Z88808

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 ( $\epsilon_r = 2,54$ ); thickness 0,8 mm.

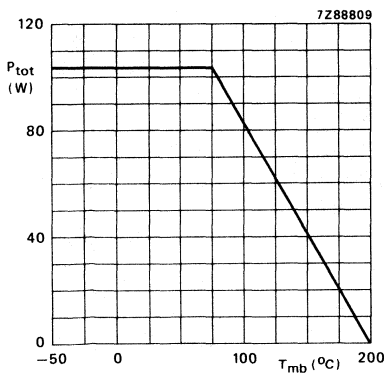


Fig. 6 Power derating curve vs. mounting base temperature;  $t_{on} = 100\text{ }\mu\text{s}$ ;  $\delta = 10\%$ .

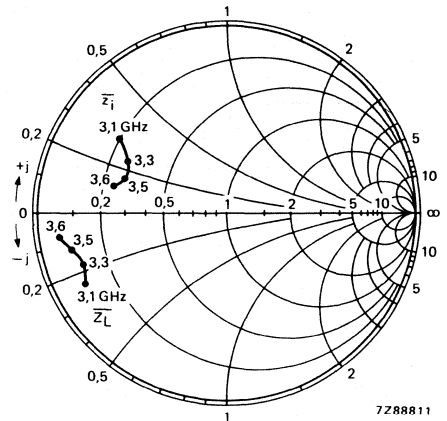


Fig. 7 Input and optimum load impedance vs. frequency; typical values;  $Z_0 = 50\text{ }\Omega$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

# DEVELOPMENT DATA

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

RZB12100Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\bar{Z}_L$ $\Omega$
class-B						see table
$t_p = 100\text{ }\mu\text{s}, \delta = 10\%$	1,09	50	typ. 100	typ. 10	typ. 45	
$t_p = 300\text{ }\mu\text{s}, \delta = 10\%$	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

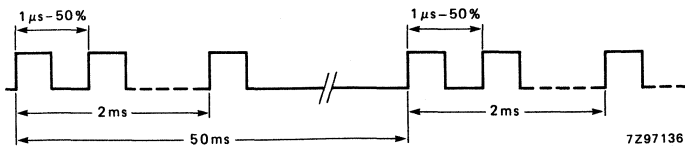
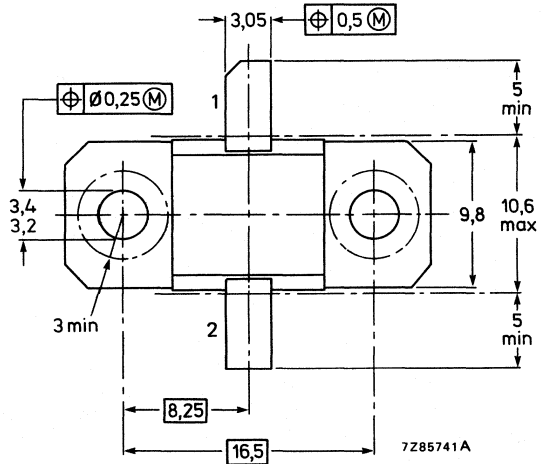
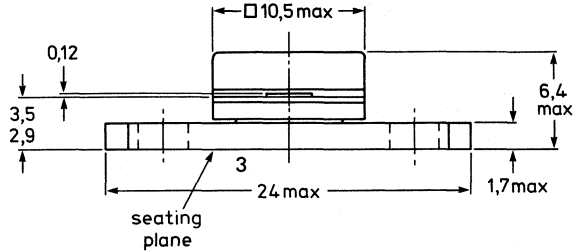


Fig. 2 DABS pulse definition.

**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.)

$t_p = 50 \mu s, \delta \leq 10\%$

$I_C$  max. 6 A

Total power dissipation up to  $T_{mb} = 75 \text{ }^\circ\text{C}$

$t_p = 50 \mu s, \delta \leq 10\%$

$P_{tot}$  max. 180 W

Storage temperature

$T_{stg}$  -65 to +200  $^\circ\text{C}$

Junction temperature

$T_j$  max. 200  $^\circ\text{C}$

Soldering temperature

at 0,1 mm from the case,  $t_{sld} \leq 10 \text{ s}$

$T_{sld}$  max. 235  $^\circ\text{C}$

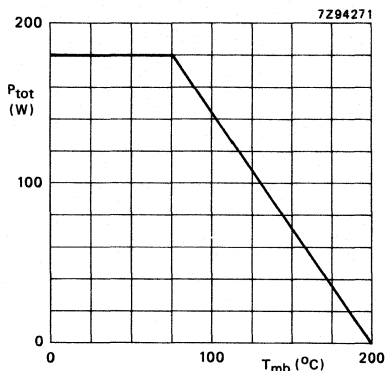


Fig. 3 Power derating curve versus mounting base temperature;  $t_p = 50 \mu s, \delta = 10\%$ .

DEVELOPMENT DATA

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th j-mb}$  max. 2,5 K/W

Transient thermal impedance,  $t_p = 50 \mu s$

$Z_{th}$  typ. 0,3 K/W

**CHARACTERISTICS**

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

Breakdown voltages

$I_C = 4 \text{ mA}; I_E = 0$

$V_{(BR)CBO} \geq 60 \text{ V}$

$I_C = 4 \text{ mA}; R_{BE} = 10 \Omega$

$V_{(BR)CER} \geq 60 \text{ V}$

$I_C = 0; I_E = 0,4 \text{ mA}$

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

Collector cut-off current

$I_E = 0; V_{CB} = 60 \text{ V}$

$I_{CBO} \leq 2 \text{ mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 100 \mu\text{A}$

**IMPEDANCES**

frequency GHz	input ( $\bar{Z}_i$ ) $\Omega$	load ( $\bar{Z}_L$ ) $\Omega$
1,03	3,5 + j4,5	2,6 + j1,75
1,09	4,2 + j4,5	1,9 - j0,9



# DEVELOPMENT DATA

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

RZB12250Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V <sub>CE</sub> V	P <sub>L</sub> W	G <sub>p</sub> dB	$\eta_C$ %	$\bar{z}_i$ $\bar{z}_L$
class-B						see table
$t_p = 100\text{ }\mu\text{s}, \delta = 10\%$	1,09	50	typ. 250	typ. 7,5	typ. 25	
$t_p = 300\text{ }\mu\text{s}, \delta = 10\%$	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

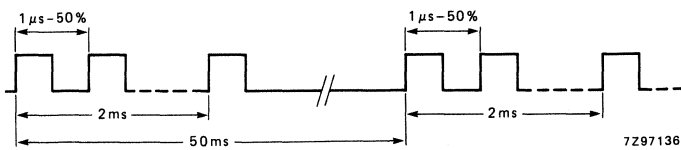
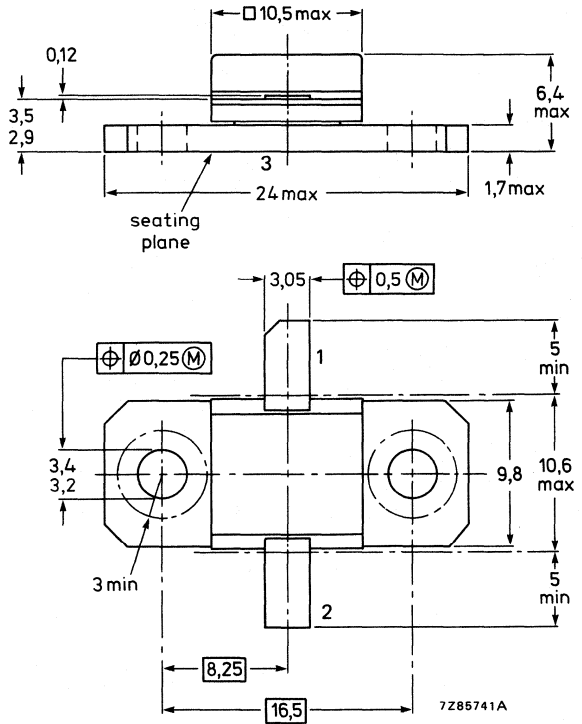


Fig. 2 DABS pulse definition.

**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.)

$t_p = 50 \mu s, \delta \leq 10\%$

$I_C$  max. 15 A

Total power dissipation up to  $T_{mb} = 75 \text{ }^\circ\text{C}$

$t_p = 50 \mu s, \delta \leq 10\%$

$P_{tot}$  max. 450 W

Storage temperature

$T_{stg}$  -65 to +200  $^\circ\text{C}$

Junction temperature

$T_j$  max. 200  $^\circ\text{C}$

Soldering temperature

at 0,1 mm from the case.  $t_{sld} \leq 10 \text{ s}$

$T_{sld}$  max. 235  $^\circ\text{C}$

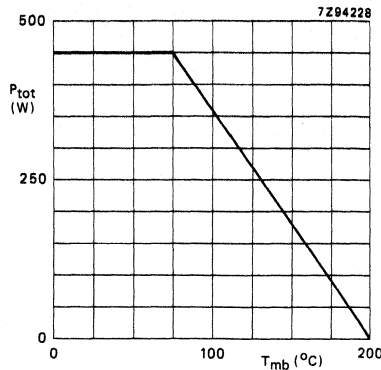


Fig. 3 Power derating curve versus mounting base temperature;  $t_p = 50 \mu s, \delta = 10\%$ .

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th \text{ j-mb}}$  max. 1 K/W

Transient thermal impedance,  $t_p = 50 \mu s$

$Z_{th}$  typ. 0,1 K/W

**CHARACTERISTICS**

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

Breakdown voltages

$I_C = 10 \text{ mA}; I_E = 0$

$V_{(BR)CBO} \geq 60 \text{ V}$

$I_C = 10 \text{ mA}; R_{BE} = 10 \Omega$

$V_{(BR)CER} \geq 60 \text{ V}$

$I_C = 0; I_E = 1 \text{ mA}$

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

Collector cut-off current

$I_E = 0; V_{CB} = 50 \text{ V}$

$I_{CBO} \leq 5 \text{ mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 0,25 \text{ mA}$

**IMPEDANCES**

frequency GHz	input ( $\bar{z}_i$ ) $\Omega$	load ( $\bar{Z}_L$ ) $\Omega$
1,03	$1,9 + j4$	$1,3 - j1$
1,09	$2,3 + j4,5$	$1,1 - j1,8$



# DEVELOPMENT DATA

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

RZZ1214B300Y

## 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  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{z}_L$ $\Omega$
class-C; $t_p = 50\text{ }\mu\text{s}$ ; $\delta = 10\%$	1,2 to 1,4	42	typ. 380	typ. 7	typ. 40	see Fig. 7	
class-C; $t_p = 300\text{ }\mu\text{s}$ ; $\delta = 10\%$	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**

Fig. 1 2FO-57C.

Base and metallic cap  
connected to flange;

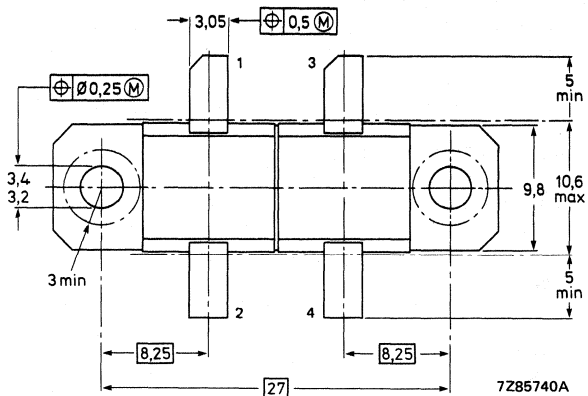
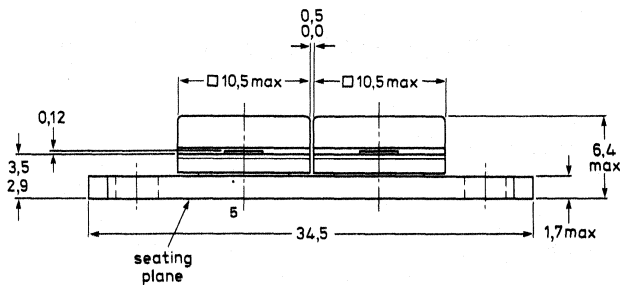
**Pinning:**

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

Torque on screw: max. 0,5 Nm

Recommended screw: M3

Dimensions in mm





**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, $R_{BE} \leq 10 \Omega$	$V_{CER}$	max.	60 V
Emitter-base voltage, open collector	$V_{EBO}$	max.	3 V
Collector current (d.c.), per transistor section $t_p \leq 50 \mu s; \delta \leq 10\%$	$I_C$	max.	15 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s; \delta \leq 10\%$	$P_{tot}$	max.	2 x 450 W
Storage temperature	$T_{stg}$		-65 to 200 $^\circ\text{C}$
Junction temperature	$T_j$	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	$T_{sld}$	max.	235 $^\circ\text{C}$

**THERMAL RESISTANCE \***

From junction to mounting base	$R_{th j-mb}$	max.	0,5 K/W
Transient thermal impedance, $t_p = 50 \mu s$ , single pulse	$Z_{th}$	max.	0,05 K/W

\* Dissipation of either transistor section shall not exceed half rated power.

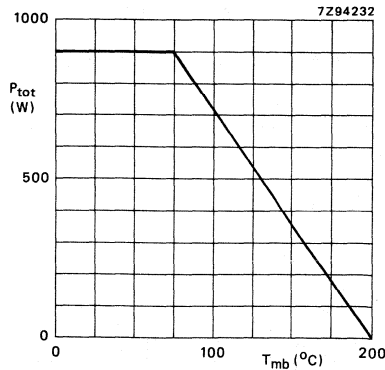


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions:  $t_p = 50 \mu s, \delta = 10\%$ .\*

**CHARACTERISTICS** (per transistor section)

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

Collector-base breakdown voltage $I_C = 10 \text{ mA}; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 10 \text{ mA}; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 1 \text{ mA}$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 \text{ V}$	$I_{CBO} \leq$	5 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 \text{ V}$	$I_{EBO} \leq$	250 $\mu\text{A}$

DEVELOPMENT DATA

PRODUCT TEST

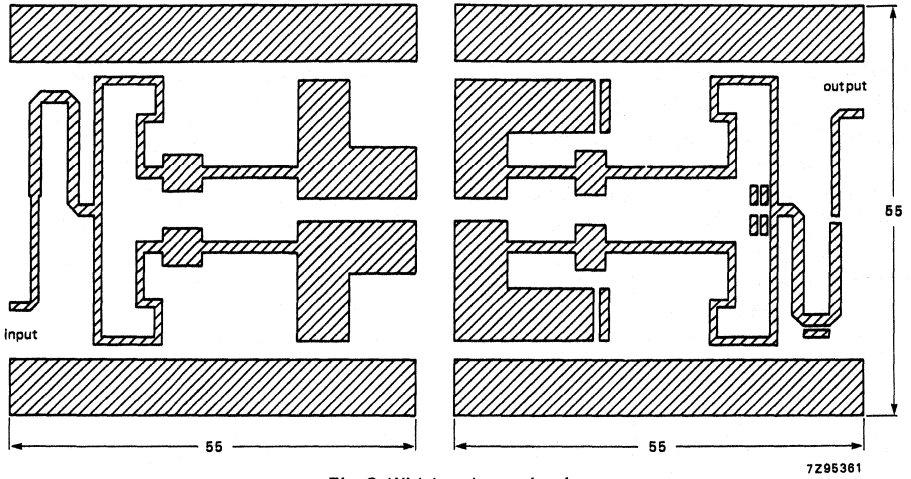


Fig. 3 Wideband test circuit.

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	$\eta_C$ %	$\bar{z}_i$ $\Omega$	$\bar{Z}_L$ $\Omega$
class-C; $t_p = 300 \mu s$ ; $\delta = 10\%$	1,2 to 1,4	50	$\geq 300$	$\geq 6,5$	$\geq 30$	see Fig. 7	

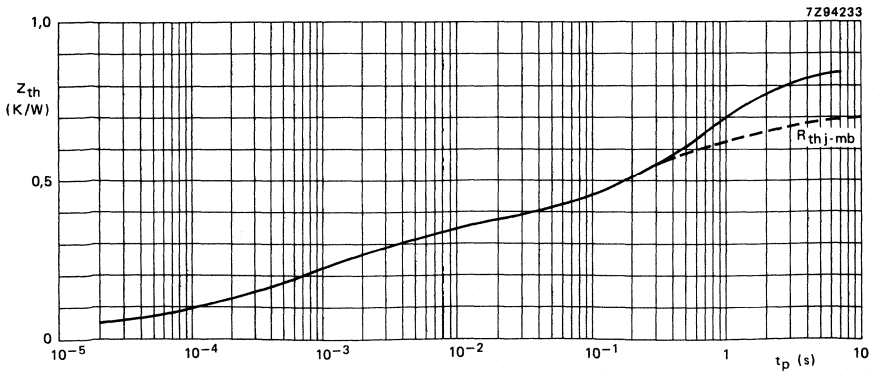


Fig. 4 Transient thermal impedance.  
(per transistor section)

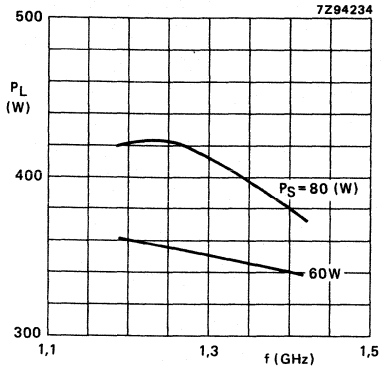


Fig. 5 Load power versus frequency.

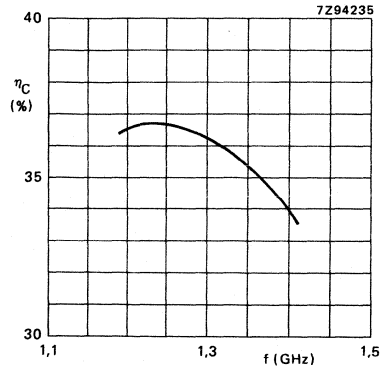


Fig. 6 Collector efficiency versus frequency.

DEVELOPMENT DATA

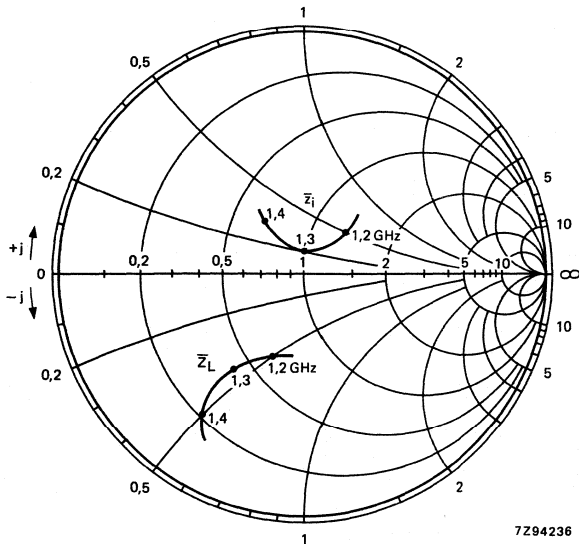


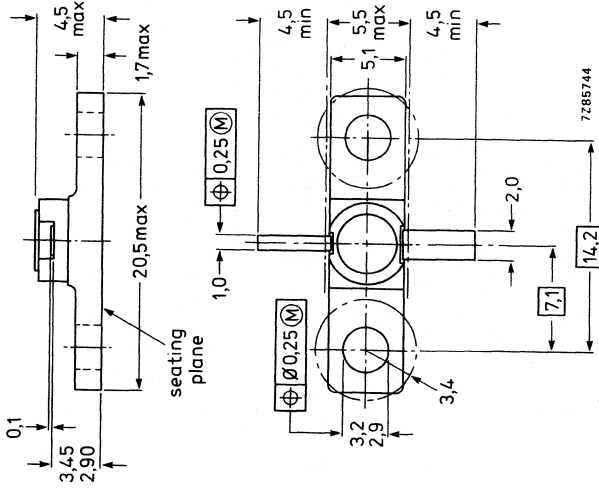
Fig. 7 Input and optimum load impedance versus frequency per transistor section.  $V_{CE} = 50 \text{ V}$ ;  $P_L = 300 \text{ W}$ ;  $t_p = 300 \mu\text{s}$ ,  $\delta = 10\%$ ; class-C operation;  $Z_0 = 5 \Omega$ .



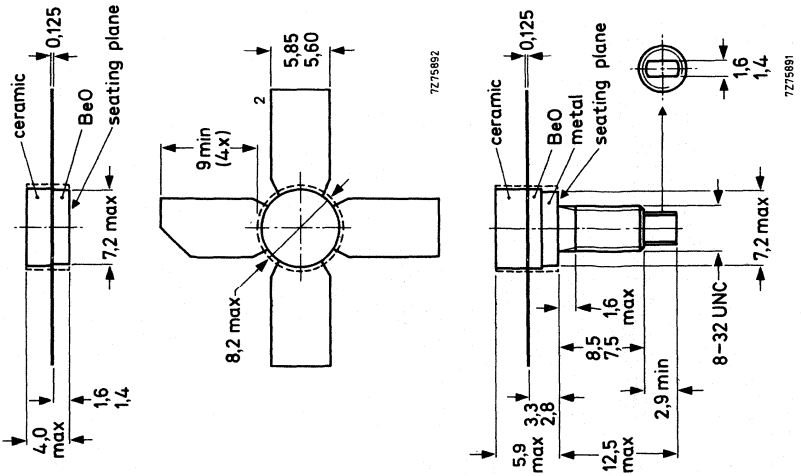
MECHANICAL DATA

Dimensions in mm

FO-41A.



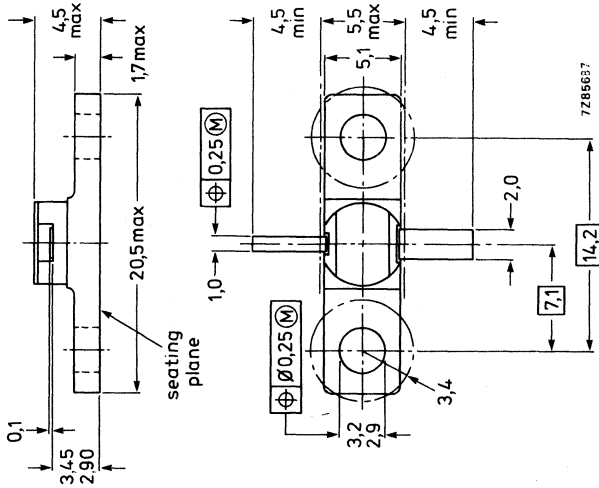
FO-38.



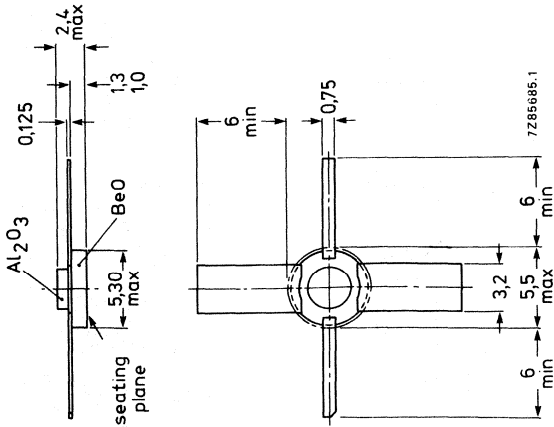
MECHANICAL DATA

Dimensions in mm

FO-45.



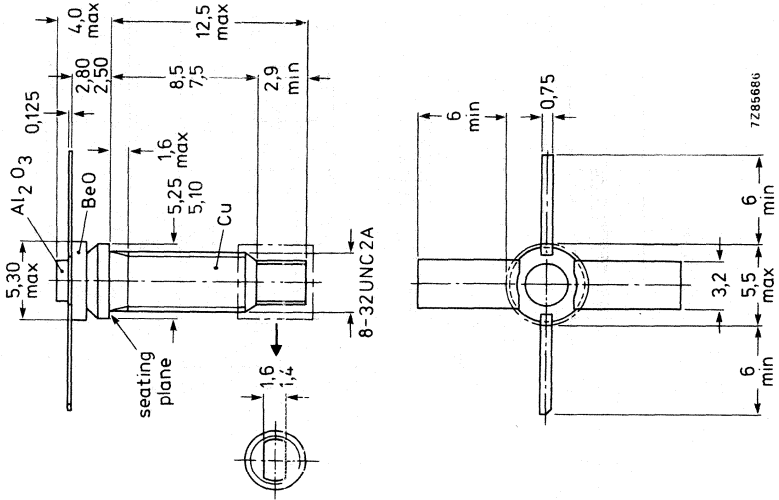
FO-41B.



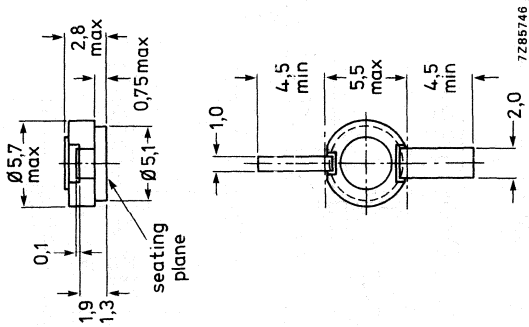
MECHANICAL DATA

Dimensions in mm

FO-49A.



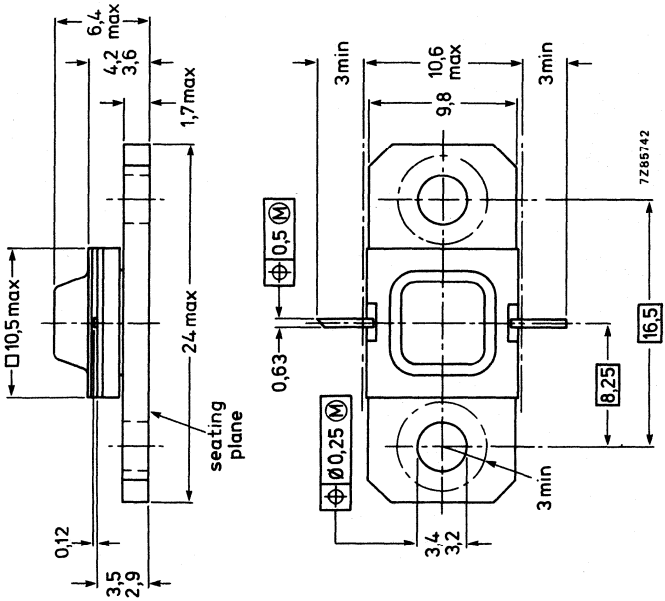
FO-46.



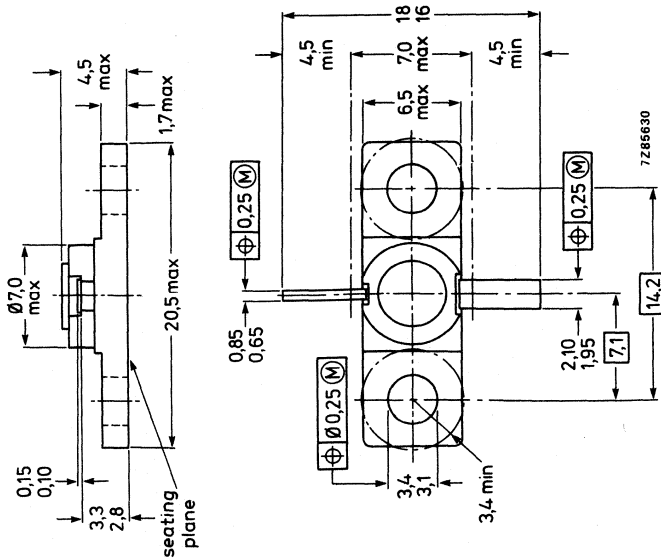
MECHANICAL DATA

Dimensions in mm

FO-57B.



FO-53.

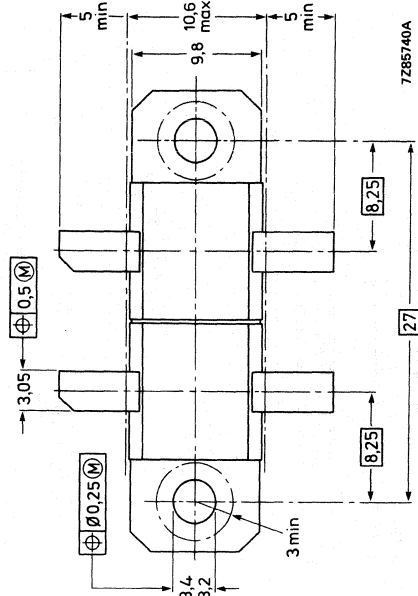
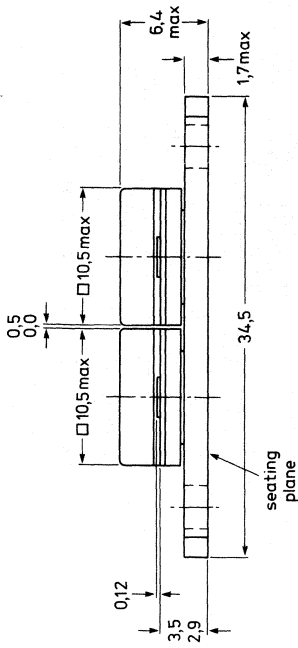




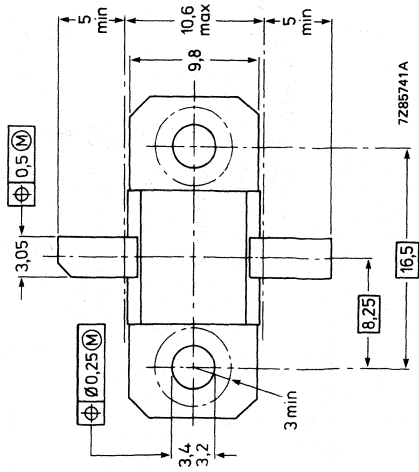
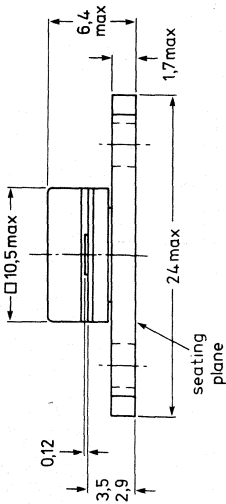
MECHANICAL DATA

Dimensions in mm

2FO-57C.



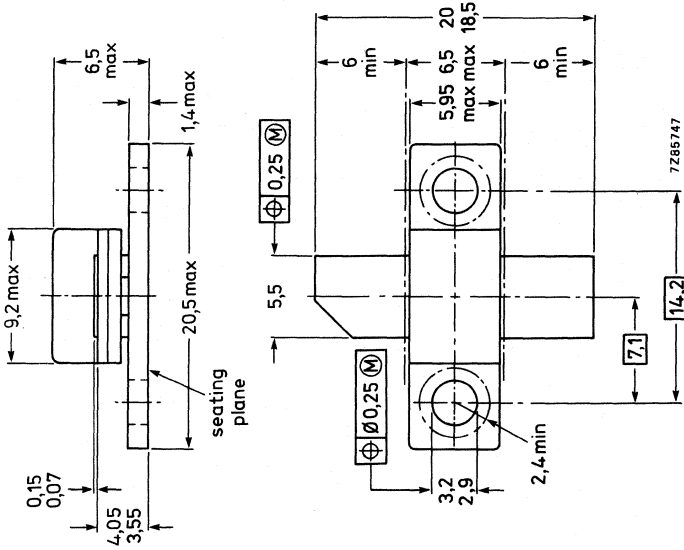
FO-57C.



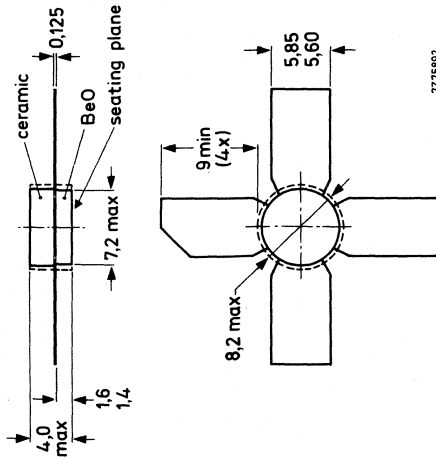
MECHANICAL DATA

Dimensions in mm

FO-67A.



FO-58.

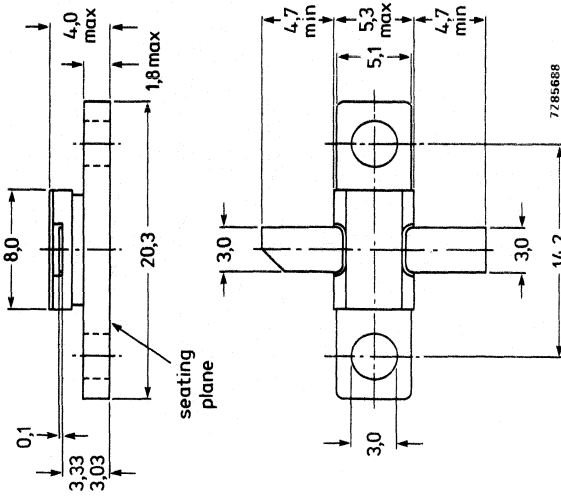


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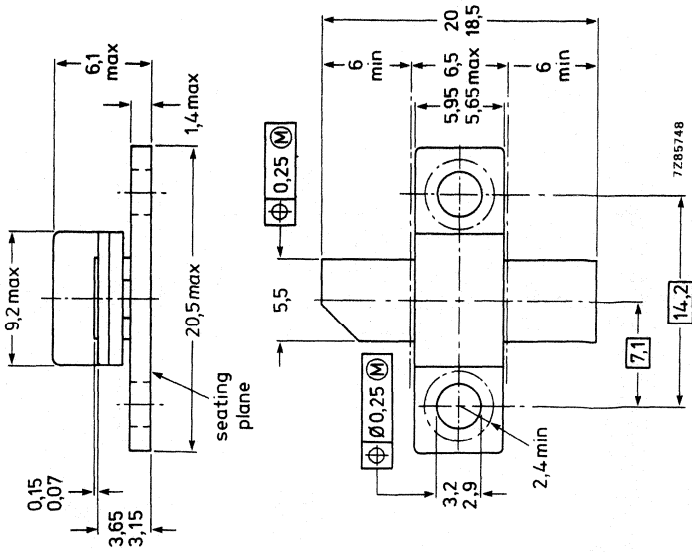
## MECHANICAL DATA

Dimensions in mm

FO-83.



FO-67B.

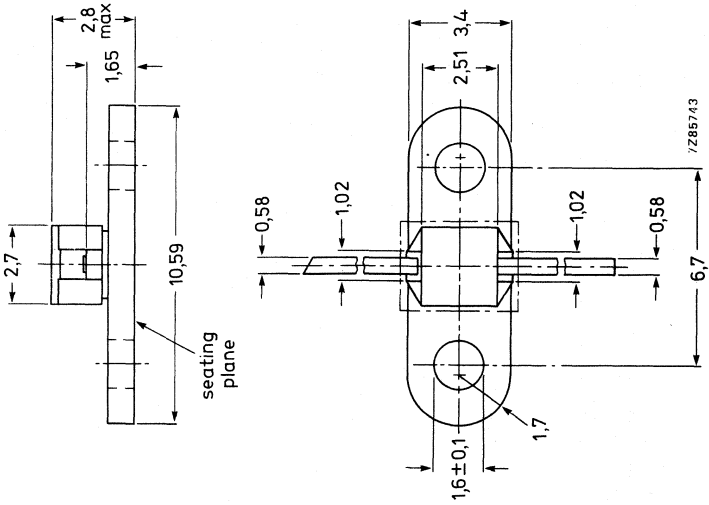


# ENVELOPES

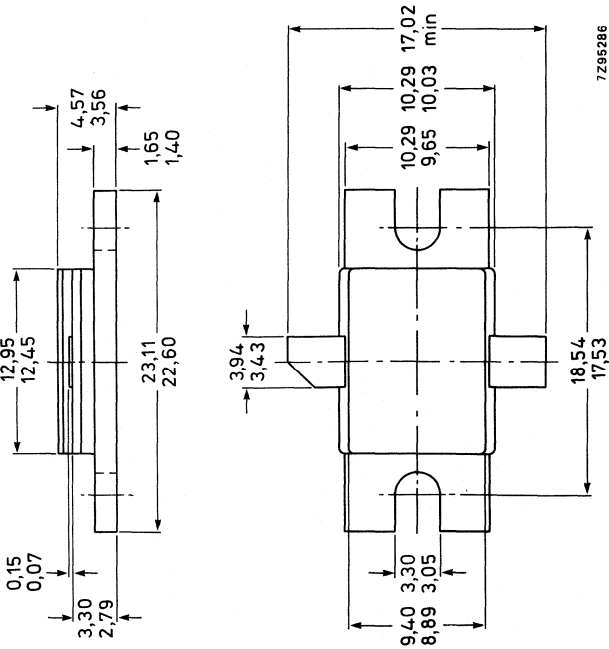
## MECHANICAL DATA

Dimensions in mm

FO-91.



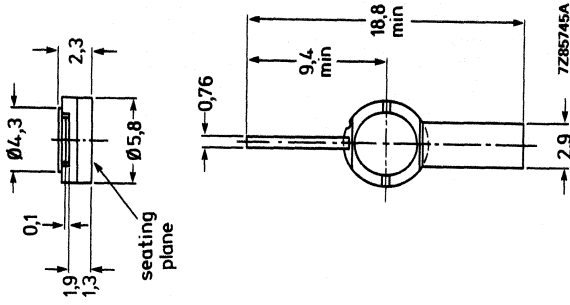
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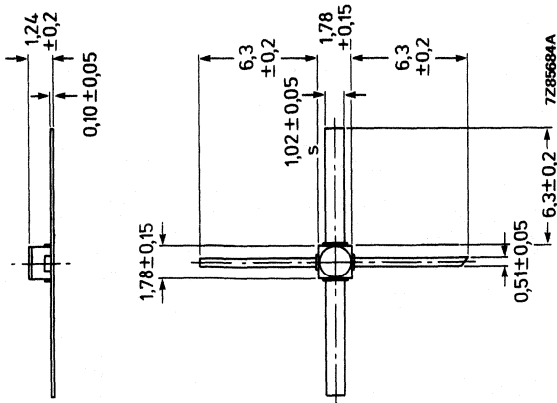
MECHANICAL DATA

Dimensions in mm

FO-93.



FO-92.

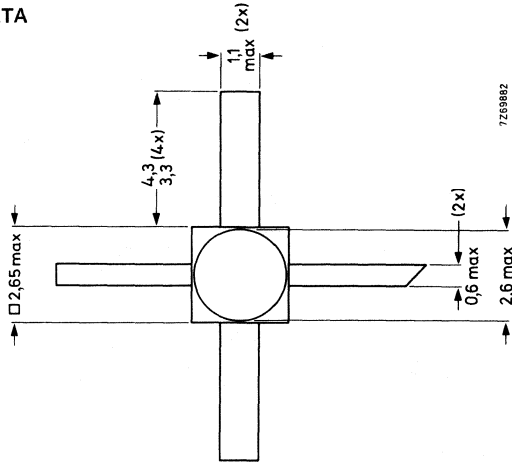


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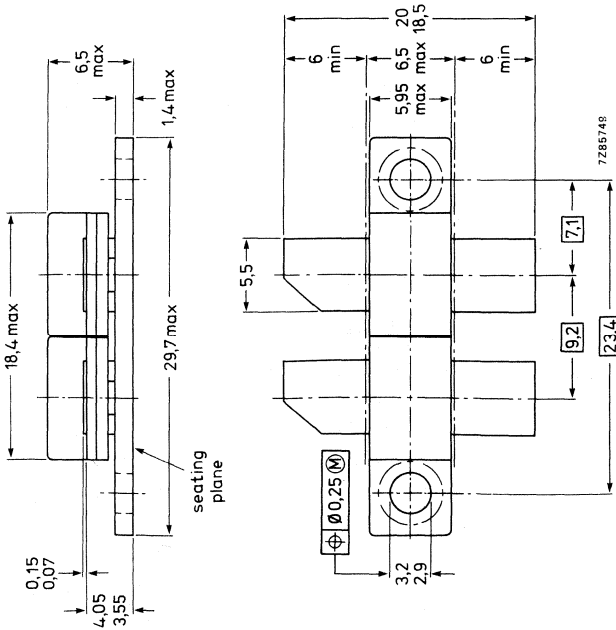
## MECHANICAL DATA

Dimensions in mm

SOT-100.



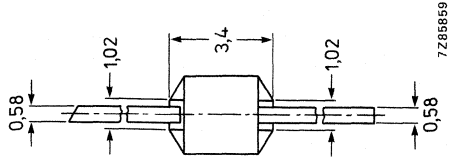
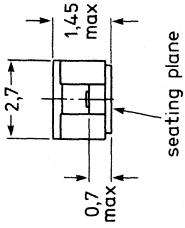
FO-96.



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	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV103	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAW56	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAW62	S1	SD
BA315	S1	Vrg	BAS56	S1	SD	BAX12	S1	SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAX14	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX18	S1	SD
BA318	S1	SD	BAT54	S1	SD	BAY80	S1	SD
BA423	S1	T	BAT74	S1	SD	BB112	S1	T
BA480	S1	T	BAT81	S1	T	BB119	S1	T
BA481	S1	T	BAT82	S1	T	BB130	S1	T
BA482	S1	T	BAT83	S1	T	BB204B	S1	T
BA483	S1	T	BAT85	S1	T	BB204G	S1	T
BA484	S1	T	BAT86	S1	T	BB212	S1	T
BA682	S1	T	BAV10	S1	SD	BB405B	S1	T
BA683	S1	T	BAV18	S1	SD	BB417	S1	T
BAS11	S1	SD	BAV19	S1	SD	BB809	S1	T
BAS15	S1	SD	BAV20	S1	SD	BB909A	S1	T
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB909B	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BBY31	S7/S1	Mm/T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BBY40	S7/S1	Mm/T
BAS20	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BC107	S3	Sm
BAS21	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD	BC108	S3	Sm
BAS28	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD	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	type no.	book	section	type no.	book	section
BC140	S3	Sm	BC818	S7	Mm	BCX51	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX52	S7	Mm
BC146	S3	Sm	BC847	S7	Mm	BCX53	S7	Mm
BC160	S3	Sm	BC848	S7	Mm	BCX54	S7	Mm
BC161	S3	Sm	BC849	S7	Mm	BCX55	S7	Mm
BC177	S3	Sm	BC850	S7	Mm	BCX56	S7	Mm
BC178	S3	Sm	BC856	S7	Mm	BCX68	S7	Mm
BC179	S3	Sm	BC857	S7	Mm	BCX69	S7	m
BC200	S3	Sm	BC858	S7	Mm	BCX70*	S7	Mm
BC264A	S5	FET	BC859	S7	Mm	BCX71*	S7	Mm
BC264B	S5	FET	BC860	S7	Mm	BCY56	S3	Sm
BC264C	S5	FET	BC868	S7	Mm	BCY57	S3	Sm
BC264D	S5	FET	BC869	S7	Mm	BCY58	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY59	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY70	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY71	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY72	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY78	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BCY79	S3	Sm
BC375	S3	Sm	BCV61	S7	Mm	BCY87	S3	Sm
BC376	S3	Sm	BCV62	S7	Mm	BCY88	S3	Sm
BC546	S3	Sm	BCV71;R	S7	Mm	BCY89	S3	Sm
BC547	S3	Sm	BCV72;R	S7	Mm	BD131	S4a	P
BC548	S3	Sm	BCW29;R	S7	Mm	BD132	S4a	P
BC549	S3	Sm	BCW30;R	S7	Mm	BD135	S4a	P
BC550	S3	Sm	BCW31;R	S7	Mm	BD136	S4a	P
BC556	S3	Sm	BCW32;R	S7	Mm	BD137	S4a	P
BC557	S3	Sm	BCW33;R	S7	Mm	BD138	S4a	P
BC558	S3	Sm	BCW60*	S7	Mm	BD139	S4a	P
BC559	S3	Sm	BCW61*	S7	Mm	BD140	S4a	P
BC560	S3	Sm	BCW69;R	S7	Mm	BD201	S4a	P
BC635	S3	Sm	BCW70;R	S7	Mm	BD202	S4a	P
BC636	S3	Sm	BCW71;R	S7	Mm	BD203	S4a	P
BC637	S3	Sm	BCW72;R	S7	Mm	BD204	S4a	P
BC638	S3	Sm	BCW81;R	S7	Mm	BD226	S4a	P
BC639	S3	Sm	BCW89;R	S7	Mm	BD227	S4a	P
BC640	S3	Sm	BCX17;R	S7	Mm	BD228	S4a	P
BC807	S7	Mm	BCX18;R	S7	Mm	BD229	S4a	P
BC808	S7	Mm	BCX19;R	S7	Mm	BD230	S4a	P
BC817	S7	Mm	BCX20;R	S7	Mm	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	type no.	book	section	type no.	book	section
BD233	S4a	P	BD433	S4a	P	BD843	S4a	P
BD234	S4a	P	BD434	S4a	P	BD844	S4a	P
BD235	S4a	P	BD435	S4a	P	BD845	S4a	P
BD236	S4a	P	BD436	S4a	P	BD846	S4a	P
BD237	S4a	P	BD437	S4a	P	BD847	S4a	P
BD238	S4a	P	BD438	S4a	P	BD848	S4a	P
BD239	S4a	P	BD645	S4a	P	BD849	S4a	P
BD239A	S4a	P	BD646	S4a	P	BD850	S4a	P
BD239B	S4a	P	BD647	S4a	P	BD933	S4a	P
BD239C	S4a	P	BD648	S4a	P	BD934	S4a	P
BD240	S4a	P	BD649	S4a	P	BD935	S4a	P
BD240A	S4a	P	BD650	S4a	P	BD936	S4a	P
BD240B	S4a	P	BD651	S4a	P	BD937	S4a	P
BD240C	S4a	P	BD652	S4a	P	BD938	S4a	P
BD241	S4a	P	BD675	S4a	P	BD939	S4a	P
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P
BD244A	S4a	P	BD816	S4a	P	BD952	S4a	P
BD244B	S4a	P	BD817	S4a	P	BD953	S4a	P
BD244C	S4a	P	BD818	S4a	P	BD954	S4a	P
BD329	S4a	P	BD825	S4a	P	BD955	S4a	P
BD330	S4a	P	BD826	S4a	P	BD956	S4a	P
BD331	S4a	P	BD827	S4a	P	BDT20	S4a	P
BD332	S4a	P	BD828	S4a	P	BDT21	S4a	P
BD333	S4a	P	BD829	S4a	P	BDT29	S4a	P
BD334	S4a	P	BD830	S4a	P	BDT29A	S4a	P
BD335	S4a	P	BD839	S4a	P	BDT29B	S4a	P
BD336	S4a	P	BD840	S4a	P	BDT29C	S4a	P
BD337	S4a	P	BD841	S4a	P	BDT30	S4a	P
BD338	S4a	P	BD842	S4a	P	BDT30A	S4a	P

P = Low-frequency power transistors

# INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BDT30B	S4a	P	BDT65B	S4a	P	BDX43	S4a	P
BDT30C	S4a	P	BDT65C	S4a	P	BDX44	S4a	P
BDT31	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT31A	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT31B	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT31C	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT32	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT32A	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT32B	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT32C	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT41	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P
BDT41A	S4a	P	BDV64C	S4a	P	BDX63B	S4a	P
BDT41B	S4a	P	BDV65	S4a	P	BDX63C	S4a	P
BDT41C	S4a	P	BDV65A	S4a	P	BDX64	S4a	P
BDT42	S4a	P	BDV65B	S4a	P	BDX64A	S4a	P
BDT42A	S4a	P	BDV65C	S4a	P	BDX64B	S4a	P
BDT42B	S4a	P	BDV66A	S4a	P	BDX64C	S4a	P
BDT42C	S4a	P	BDV66B	S4a	P	BDX65	S4a	P
BDT60	S4a	P	BDV66C	S4a	P	BDX65A	S4a	P
BDT60A	S4a	P	BDV66D	S4a	P	BDX65B	S4a	P
BDT60B	S4a	P	BDV67A	S4a	P	BDX65C	S4a	P
BDT60C	S4a	P	BDV67B	S4a	P	BDX66	S4a	P
BDT61	S4a	P	BDV67C	S4a	P	BDX66A	S4a	P
BDT61A	S4a	P	BDV67D	S4a	P	BDX66B	S4a	P
BDT61B	S4a	P	BDV91	S4a	P	BDX66C	S4a	P
BDT61C	S4a	P	BDV92	S4a	P	BDX67	S4a	P
BDT62	S4a	P	BDV93	S4a	P	BDX67A	S4a	P
BDT62A	S4a	P	BDV94	S4a	P	BDX67B	S4a	P
BDT62B	S4a	P	BDV95	S4a	P	BDX67C	S4a	P
BDT62C	S4a	P	BDV96	S4a	P	BDX68	S4a	P
BDT63	S4a	P	BDW55	S4a	P	BDX68A	S4a	P
BDT63A	S4a	P	BDW56	S4a	P	BDX68B	S4a	P
BDT63B	S4a	P	BDW57	S4a	P	BDX68C	S4a	P
BDT63C	S4a	P	BDW58	S4a	P	BDX69	S4a	P
BDT64	S4a	P	BDW59	S4a	P	BDX69A	S4a	P
BDT64A	S4a	P	BDW60	S4a	P	BDX69B	S4a	P
BDT64B	S4a	P	BDX35	S4a	P	BDX69C	S4a	P
BDT64C	S4a	P	BDX36	S4a	P	BDX77	S4a	P
BDT65	S4a	P	BDX37	S4a	P	BDX78	S4a	P
BDT65A	S4a	P	BDX42	S4a	P	BDX91	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX92	S4a	P	BF471	S4b	HVP	BF960	S5	FET
BDX93	S4a	P	BF472	S4b	HVP	BF964	S5	FET
BDX94	S4a	P	BF483	S3	Sm	BF966	S5	FET
BDX95	S4a	P	BF485	S3	Sm	BF967	S3	Sm
BDX96	S4a	P	BF487	S3	Sm	BF970	S3	Sm
BDY90	S4a	P	BF494	S3	Sm	BF979	S3	Sm
BDY90A	S4a	P	BF495	S3	Sm	BF980	S5	FET
BDY91	S4a	P	BF496	S3	Sm	BF981	S5	FET
BDY92	S4a	P	BF510	S7/S5	Mm/FET	BF982	S5	FET
BF198	S3	Sm	BF511	S7/S5	Mm/FET	BF989	S7/S5	Mm/FET
BF199	S3	Sm	BF512	S7/S5	Mm/FET	BF990	S7/S5	Mm/FET
BF240	S3	Sm	BF513	S7/S5	Mm/FET	BF991	S7/S5	Mm/FET
BF241	S3	Sm	BF536	S7	Mm	BF992	S7/S5	Mm/FET
BF245A	S5	FET	BF550;R	S7	Mm	BF994	S7/S5	Mm/FET
BF245B	S5	FET	BF569	S7	Mm	BF996	S7/S5	Mm/FET
BF245C	S5	FET	BF579	S7	Mm	BFG23	S10	WBT
BF247A	S5	FET	BF620	S7	Mm	BFG32	S10	WBT
BF247B	S5	FET	BF621	S7	Mm	BFG34	S10	WBT
BF247C	S5	FET	BF622	S7	Mm	BFG51	S10	WBT
BF256A	S5	FET	BF623	S7	Mm	BFG65	S10	WBT
BF256B	S5	FET	BF660;R	S7	Mm	BFG90A	S10	WBT
BF256C	S5	FET	BF689K	S10	WBT	BFG91A	S10	WBT
BF324	S3	Sm	BF763	S10	WBT	BFG96	S10	WBT
BF370	S3	Sm	BF767	S7	Mm	BFP90A	S10	WBT
BF410A	S5	FET	BF819	S4b	HVP	BFP91A	S10	WBT
BF410B	S5	FET	BF820	S7	Mm	BFP96	S10	WBT
BF410C	S5	FET	BF821	S7	Mm	BFQ10	S5	FET
BF410D	S5	FET	BF822	S7	Mm	BFQ11	S5	FET
BF419	S4b	HVP	BF823	S7	Mm	BFQ12	S5	FET
BF420	S3	Sm	BF824	S7	Mm	BFQ13	S5	FET
BF421	S3	Sm	BF857	S4b	HVP	BFQ14	S5	FET
BF422	S3	Sm	BF858	S4b	HVP	BFQ15	S5	FET
BF423	S3	Sm	BF859	S4b	HVP	BFQ16	S5	FET
BF450	S3	Sm	BF869	S4b	HVP	BFQ17	S7	Mm
BF451	S3	Sm	BF870	S4b	HVP	BFQ18A	S7	Mm
BF457	S4b	HVP	BF871	S4b	HVP	BFQ19	S7	Mm
BF458	S4b	HVP	BF872	S4b	HVP	BFQ22S	S10	WBT
BF459	S4b	HVP	BF926	S3	Sm	BFQ23	S10	WBT
BF469	S4b	HVP	BF936	S3	Sm	BFQ23C	S10	WBT
BF470	S4b	HVP	BF939	S3	Sm	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

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type no.	book	section	type no.	book	section	type no.	book	section
BFQ32	S10	WBT	BFS18;R	S7	Mm	BG2097	S1	RT
BFQ32C	S10	WBT	BFS19;R	S7	Mm	BGD102	S10	WBM
BFQ32S	S10	WBT	BFS20;R	S7	Mm	BGD102E	S10	WBM
BFQ33	S10	WBT	BFS21	S5	FET	BGD104	S10	WBM
BFQ34	S10	WBT	BFS21A	S5	FET	BGD104E	S10	WBM
BFQ34T	S10	WBT	BFS22A	S6	RFP	BGX11*	S2b	ThM
BFQ42	S6	RFP	BFS23A	S6	RFP	BGX12*	S2b	ThM
BFQ43	S6	RFP	BFT24	S10	WBT	BGX13*	S2b	ThM
BFQ51	S10	WBT	BFT25;R	S7	Mm	BGX14*	S2b	ThM
BFQ51C	S10	WBT	BFT44	S3	Sm	BGX15*	S2b	ThM
BFQ52	S10	WBT	BFT45	S3	Sm	BGX17*	S2b	ThM
BFQ53	S10	WBT	BFT46	S7/S5	Mm/FET	BGX25	S2a	ThM
BFQ63	S10	WBT	BFT92;R	S7	Mm	BGY22	S6	RFP
BFQ65	S10	WBT	BFT93;R	S7	Mm	BGY22A	S6	RFP
BFQ66	S10	WBT	BFW10	S5	FET	BGY23	S6	RFP
BFQ68	S10	WBT	BFW11	S5	FET	BGY23A	S6	RFP
BFQ136	S10	WBT	BFW12	S5	FET	BGY32	S6	RFP
BFR29	S5	FET	BFW13	S5	FET	BGY33	S6	RFP
BFR30	S7/S5	Mm/FET	BFW16A	S10	WBT	BGY35	S6	RFP
BFR31	S7/S5	Mm/FET	BFW17A	S10	WBT	BGY36	S6	RFP
BFR49	S10	WBT	BFW30	S10	WBT	BGY40A	S6	RFP
BFR53;R	S7	Mm	BFW61	S5	FET	BGY40B	S6	RFP
BFR54	S3	Sm	BFW92	S10	WBT	BGY41A	S6	RFP
BFR64	S10	WBT	BFW92A	S10	WBT	BGY41B	S6	RFP
BFR65	S10	WBT	BFW93	S10	WBT	BGY43	S6	RFP
BFR84	S5	FET	BFX29	S3	Sm	BGY45A	S6	RFP
BFR90	S10	WBT	BFX30	S3	Sm	BGY45B	S6	RFP
BFR90A	S10	WBT	BFX34	S3	Sm	BGY46A	S6	RFP
BFR91	S10	WBT	BFX84	S3	Sm	BGY46B	S6	RFP
BFR91A	S10	WBT	BFX85	S3	Sm	BGY47*	S6	RFP
BFR92;R	S7	Mm	BFX86	S3	Sm	BGY50	S10	WBM
BFR92A;R	S7	Mm	BFX87	S3	Sm	BGY51	S10	WBM
BFR93;R	S7	Mm	BFX88	S3	Sm	BGY52	S10	WBM
BFR93A;R	S7	Mm	BFX89	S10	WBT	BGY53	S10	WBM
BFR94	S10	WBT	BFY50	S3	Sm	BGY54	S10	WBM
BFR95	S10	WBT	BFY51	S3	Sm	BGY55	S10	WBM
BFR96	S10	WBT	BFY52	S3	Sm	BGY56	S10	WBM
BFR96S	S10	WBT	BFY55	S3	Sm	BGY57	S10	WBM
BFR101A;B	S7/S5	Mm/FET	BFY90	S10	WBT	BGY58	S10	WBM
BFS17;R	S7	Mm	BG2000	S1	RT	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	type no.	book	section	type no.	book	section
BGY59	S10	WBM	BLV37	S6	RFP	BLW96	S6	RFP
BGY60	S10	WBM	BLV45/12	S6	RFP	BLW97	S6	RFP
BGY61	S10	WBM	BLV57	S6	RFP	BLW98	S6	RFP
BGY65	S10	WBM	BLV59	S6	RFP	BLW99	S6	RFP
BGY67	S10	WBM	BLV75/12	S6	RFP	BLX13	S6	RFP
BGY67A	S10	WBM	BLV80/28	S6	RFP	BLX13C	S6	RFP
BGY70	S10	WBM	BLV90	S6	RFP	BLX14	S6	RFP
BGY71	S10	WBM	BLV91	S6	RFP	BLX15	S6	RFP
BGY74	S10	WBM	BLV92	S6	RFP	BLX39	S6	RFP
BGY75	S10	WBM	BLV93	S6	RFP	BLX65	S6	RFP
BGY84	S10	WBM	BLV94	S6	RFP	BLX65E	S6	RFP
BGY84A	S10	WBM	BLV95	S6	RFP	BLX67	S6	RFP
BGY85	S10	WBM	BLV96	S6	RFP	BLX68	S6	RFP
BGY85A	S10	WBM	BLV97	S6	RFP	BLX69A	S6	RFP
BGY93A	S6	RFP	BLV98	S6	RFP	BLX91A	S6	RFP
BGY93B	S6	RFP	BLV99	S6	RFP	BLX91CB	S6	RFP
BGY93C	S6	RFP	BLW29	S6	RFP	BLX92A	S6	RFP
BLU20/12	S6	RFP	BLW31	S6	RFP	BLX93A	S6	RFP
BLU30/12	S6	RFP	BLW32	S6	RFP	BLX94A	S6	RFP
BLU45/12	S6	RFP	BLW33	S6	RFP	BLX94C	S6	RFP
BLU50	S6	RFP	BLW34	S6	RFP	BLX95	S6	RFP
BLU51	S6	RFP	BLW50F	S6	RFP	BLX96	S6	RFP
BLU52	S6	RFP	BLW60	S6	RFP	BLX97	S6	RFP
BLU53	S6	RFP	BLW60C	S6	RFP	BLX98	S6	RFP
BLU60/12	S6	RFP	BLW76	S6	RFP	BLY85	S6	RFP
BLU97	S6	RFP	BLW77	S6	RFP	BLY87A	S6	RFP
BLU98	S6	RFP	BLW78	S6	RFP	BLY87C	S6	RFP
BLU99	S6	RFP	BLW79	S6	RFP	BLY88A	S6	RFP
BLV10	S6	RFP	BLW80	S6	RFP	BLY88C	S6	RFP
BLV11	S6	RFP	BLW81	S6	RFP	BLY89A	S6	RFP
BLV20	S6	RFP	BLW82	S6	RFP	BLY89C	S6	RFP
BLV21	S6	RFP	BLW83	S6	RFP	BLY90	S6	RFP
BLV25	S6	RFP	BLW84	S6	RFP	BLY91A	S6	RFP
BLV30	S6	RFP	BLW85	S6	RFP	BLY91C	S6	RFP
BLV30/12	S6	RFP	BLW86	S6	RFP	BLY92A	S6	RFP
BLV31	S6	RFP	BLW87	S6	RFP	BLY92C	S6	RFP
BLV32F	S6	RFP	BLW89	S6	RFP	BLY93A	S6	RFP
BLV33	S6	RFP	BLW90	S6	RFP	BLY93C	S6	RFP
BLV33F	S6	RFP	BLW91	S6	RFP	BLY94	S6	RFP
BLV36	S6	RFP	BLW95	S6	RFP	BLY97	S6	RFP

RFP = R.F. power transistors and modules

WBM = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
BPF10	S8	PDT	BSR33	S7	Mm	BST80	S5	FET
BPF24	S8	PDT	BSR40	S7	Mm	BST82	S5	FET
BPW22A	S8	PDT	BSR41	S7	Mm	BST84	S5	FET
BPW50	S8	PDT	BSR42	S7	Mm	BST86	S5	FET
BPX25	S8	PDT	BSR43	S7	Mm	BST90	S5	FET
BPX29	S8	PDT	BSR50	S3	Sm	BST97	S5	FET
BPX40	S8	PDT	BSR51	S3	Sm	BST100	S5	FET
BPX41	S8	PDT	BSR52	S3	Sm	BST110	S5	FET
BPX42	S8	PDT	BSR56	S7/S5	Mm/FET	BST120	S5	FET
BPX71	S8	PDT	BSR57	S7/S5	Mm/FET	BST122	S5	FET
BPX72	S8	PDT	BSR58	S7/S5	Mm/FET	BSV15	S3	Sm
BPX95C	S8	PDT	BSR60	S3	Sm	BSV16	S3	Sm
BR100/03	S2b	Th	BSR61	S3	Sm	BSV17	S3	Sm
BR101	S3	Sm	BSR62	S3	Sm	BSV52;R	S7	Mm
BRY39	S3	Sm	BSS38	S3	Sm	BSV64	S3	Sm
BRY56	S3	Sm	BSS50	S3	Sm	BSV78	S5	FET
BRY61	S7	Mm	BSS51	S3	Sm	BSV79	S5	FET
BRY62	S7	Mm	BSS52	S3	Sm	BSV80	S5	FET
BS107	S5	FET	BSS60	S3	Sm	BSV81	S5	FET
BS170	S5	FET	BSS61	S3	Sm	BSW66A	S3	Sm
BSD10	S5	FET	BSS62	S3	Sm	BSW67A	S3	Sm
BSD12	S5	FET	BSS63;R	S7	Mm	BSW68A	S3	Sm
BSD20	S5/7	FET	BSS64;R	S7	Mm	BSX19	S3	Sm
BSD22	S5/7	FET	BSS68	S3	Sm	BSX20	S3	Sm
BSD212	S5	FET	BSS83	S5/7	FET/Mm	BSX45	S3	Sm
BSD213	S5	FET	BST15	S7	Mm	BSX46	S3	Sm
BSD214	S5	FET	BST16	S7	Mm	BSX47	S3	Sm
BSD215	S5	FET	BST39	S7	Mm	BSX59	S3	Sm
BSR12;R	S7	Mm	BST40	S7	Mm	BSX60	S3	Sm
BSR13;R	S7	Mm	BST50	S7	Mm	BSX61	S3	Sm
BSR14;R	S7	Mm	BST51	S7	Mm	BSY95A	S3	Sm
BSR15;R	S7	Mm	BST52	S7	Mm	BT136*	S2b	Tri
BSR16;R	S7	Mm	BST60	S7	Mm	BT137*	S2b	Tri
BSR17;R	S7	Mm	BST61	S7	Mm	BT138*	S2b	Tri
BSR17A;R	S7	Mm	BST62	S7	Mm	BT139*	S2b	Tri
BSR18;R	S7	Mm	BST70A	S5	FET	BT149*	S2b	Th
BSR18A;R	S7	Mm	BST72A	S5	FET	BT151*	S2b	Th
BSR30	S7	Mm	BST74A	S5	FET	BT152*	S2b	Th
BSR31	S7	Mm	BST76A	S5	FET	BT153	S2b	Th
BSR32	S7	Mm	BST78	S5	FET	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	type no.	book	section	type no.	book	section
BT157*	S2b	Th	BUV83	S4b	SP	BUZ36	S9	PM
BTV24*	S2b	Th	BUV89	S4b	SP	BUZ40	S9	PM
BTV34*	S2b	Tri	BUW11;A	S4b	SP	BUZ41A	S9	PM
BTV58*	S2b	Th	BUW12;A	S4b	SP	BUZ42	S9	PM
BTV59*	S2b	Th	BUW13;A	S4b	SP	BUZ43	S9	PM
BTV60*	S2b	Th	BUW84	S4b	SP	BUZ44A	S9	PM
BTW23*	S2b	Th	BUW85	S4b	SP	BUZ45	S9	PM
BTW38*	S2b	Th	BUX46;A	S4b	SP	BUZ45A	S9	PM
BTW40*	S2b	Th	BUX47;A	S4b	SP	BUZ45B	S9	PM
BTW42*	S2b	Th	BUX48;A	S4b	SP	BUZ45C	S9	PM
BTW43*	S2b	Tri	BUX80	S4b	SP	BUZ46	S9	PM
BTW45*	S2b	Th	BUX81	S4b	SP	BUZ50A	S9	PM
BTW58*	S2b	Th	BUX82	S4b	SP	BUZ50B	S9	PM
BTW59*	S2b	Th	BUX83	S4b	SP	BUZ53A	S9	PM
BTW63*	S2b	Th	BUX84	S4b	SP	BUZ54	S9	PM
BTW92*	S2b	Th	BUX85	S4b	SP	BUZ54A	S9	PM
BTX18*	S2b	Th	BUX86	S4b	SP	BUZ60	S9	PM
BTX94*	S2b	Tri	BUX87	S4b	SP	BUZ60B	S9	PM
BTY79*	S2b	Th	BUX88	S4b	SP	BUZ63	S9	PM
BTY91*	S2b	Th	BUX90	S4b	SP	BUZ63B	S9	PM
BU208A	S4b	SP	BUX98	S4b	SP	BUZ64	S9	PM
BU208B	S4b	SP	BUX98A	S4b	SP	BUZ71	S9	PM
BU326	S4b	SP	BUY89	S4b	SP	BUZ71A	S9	PM
BU326A	S4b	SP	BUZ10	S9	PM	BUZ72	S9	PM
BU426	S4b	SP	BUZ10A	S9	PM	BUZ72A	S9	PM
BU426A	S4b	SP	BUZ11	S9	PM	BUZ73A	S9	PM
BU433	S4b	SP	BUZ11A	S9	PM	BUZ74	S9	PM
BU505	S4b	SP	BUZ14	S9	PM	BUZ74A	S9	PM
BU508A	S4b	SP	BUZ15	S9	PM	BUZ76	S9	PM
BU705	S4b	SP	BUZ20	S9	PM	BUZ76A	S9	PM
BU806	S4b	SP	BUZ21	S9	PM	BUZ80	S9	PM
BU807	S4b	SP	BUZ23	S9	PM	BUZ80A	S9	PM
BU824	S4b	SP	BUZ24	S9	PM	BUZ83	S9	PM
BU826	S4b	SP	BUZ25	S9	PM	BUZ83A	S9	PM
BUS11;A	S4b	SP	BUZ30	S9	PM	BUZ84	S9	PM
BUS12;A	S4b	SP	BUZ31	S9	PM	BUZ84A	S9	PM
BUS13;A	S4b	SP	BUZ32	S9	PM	BY228	S1	R
BUS14;A	S4b	SP	BUZ33	S9	PM	BY229*	S2a	R
BUT11;A	S4b	SP	BUZ34	S9	PM	BY249*	S2a	R
BUV82	S4b	SP	BUZ35	S9	PM	BY260*	S2a	R

\* = series

PM = Power MOS transistors

R = Rectifier diodes

SP = Low-frequency switching power transistors

Th = Thyristors

Tri = Triacs

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type no.	book	section	type no.	book	section	type no.	book	section
BY261*	S2a	R	BYV28*	S1/S2a	R	BYX46*	S2a	R
BY329*	S2a	R	BYV29*	S2a	R	BYX50*	S2a	R
BY359*	S2a	R	BYV30*	S2a	R	BYX52*	S2a	R
BY438	S1	R	BYV32*	S2a	R	BYX56*	S2a	R
BY448	S1	R	BYV33*	S2a	R	BYX90G	S1	R
BY458	S1	R	BYV34*	S2a	R	BYX94	S1	R
BY505	S1	R	BYV36*	S1	R	BYX96*	S2a	R
BY509	S1	R	BYV39*	S2a	R	BYX97*	S2a	R
BY527	S1	R	BYV42*	S2a	R	BYX98*	S2a	R
BY584	S1	R	BYV43*	S2a	R	BYX99*	S2a	R
BY588	S1	R	BYV72*	S2a	R	BZD23	S1	Vrg
BY609	S1	R	BYV73*	S2a	R	BZT03	S1	Vrg
BY610	S1	R	BYV79*	S2a	R	BZV10	S1	Vrf
BY614	S1	R	BYV92*	S2a	R	BZV11	S1	Vrf
BY619	S1	R	BYV95A	S1	R	BZV12	S1	Vrf
BY620	S1	R	BYV95B	S1	R	BZV13	S1	Vrf
BY707	S1	R	BYV95C	S1	R	BZV14	S1	Vrf
BY708	S1	R	BYV96D	S1	R	BZV37	S1	Vrf
BY709	S1	R	BYV96E	S1	R	BZV46	S1	Vrg
BY710	S1	R	BYW25*	S2a	R	BZV49*	S1/S7	Vrg/Mm
BY711	S1	R	BYW29*	S2a	R	BZV55*	S7	Mm
BY712	S1	R	BYW30*	S2a	R	BZV85*	S1	Vrg
BY713	S1	R	BYW31*	S2a	R	BZW03*	S1	Vrg
BY714	S1	R	BYW54	S1	R	BZW14	S1	Vrg
BYD13*	S1	R	BYW55	S1	R	BZW70*	S2a	TS
BYD33*	S1	R	BYW56	S1	R	BZW86*	S2a	TS
BYD73*	S1	R	BYW92*	S2a	R	BZW91*	S2a	TS
BYM56*	S1	R	BYW93*	S2a	R	BZX55*	S1	Vrg
BYQ28*	S2a	R	BYW94*	S2a	R	BZX70*	S2a	Vrg
BYR29*	S2a	R	BYW95A	S1	R	BZX75*	S1	Vrg
BYT79*	S2a	R	BYW95B	S1	R	BZX79*	S1	Vrg
BYV10	S1	R	BYW95C	S1	R	BZX84*	S7/S1	Mm/Vrg
BYV19*	S2a	R	BYW96D	S1	R	BZX90	S1	Vrf
BYV20*	S2a	R	BYW96E	S1	R	BZX91	S1	Vrf
BYV21*	S2a	R	BYX25*	S2a	R	BZX92	S1	Vrf
BYV22*	S2a	R	BYX30*	S2a	R	BZX93	S1	Vrf
BYV23*	S2a	R	BYX32*	S2a	R	BZX94	S1	Vrf
BYV24*	S2a	R	BYX38*	S2a	R	BZY91*	S2a	Vrg
BYV26*	S1	R	BYX39*	S2a	R	BZY93*	S2a	Vrg
BYV27*	S1/S2a	R	BYX42*	S2a	R	BZY95*	S2a	Vrg

\* = series

Mm = Microminiature semiconductors  
for hybrid circuits

R = Rectifier diodes

TS = Transient suppressor diodes

Vrf = Voltage reference diodes

Vrg = Voltage regulator diodes

type no.	book	section	type no.	book	section	type no.	book	section
BZY96*	S2a	Vrg	CQN11	S8	LED	CQY49B	S8	LED
CFX13	S11	M	CQT10	S8	LED	CQY49C	S8	LED
CFX21	S11	M	CQT11	S8	LED	CQY50	S8	LED
CFX30	S11	M	CQT12	S8	LED	CQY52	S8	LED
CFX31	S11	M	CQV60(L)	S8	LED	CQY54A	S8	LED
CFX32	S11	M	CQV60A(L)	S8	LED	CQY58A	S8	LED
CFX33	S11	M	CQV61A(L)	S8	LED	CQY89A	S8	LED
CNX21	S8	PhC	CQV62(L)	S8	LED	CQY94	S8	LED
CNX35	S8	PhC	CQV70(L)	S8	LED	CQY94B(L)	S8	LED
CNX36	S8	PhC	CQV70A(L)	S8	LED	CQY95B	S8	LED
CNX37	S8	PhC	CQV71A(L)	S8	LED	CQY96(L)	S8	LED
CNX38	S8	PhC	CQV72(L)	S8	LED	CQY97A	S8	LED
CNX44	S8	PhC	CQV80L	S8	LED	LAE2001R	S11	M
CNX48	S8	PhC	CQV80AL	S8	LED	LAE4001Q	S11	M
CNX62	S8	PhC	CQV81L	S8	LED	LAE4001R	S11	M
CNY50	S8	PhC	CQV82L	S8	LED	LAE4002S	S11	M
CNY52	S8	PhC	CQW10(L)	S8	LED	LAE6000Q	S11	M
CNY53	S8	PhC	CQW10A(L)	S8	LED	LBE1004R	S11	M
CNY57	S8	PhC	CQW10B(L)	S8	LED	LBE1010R	S11	M
CNY57A	S8	PhC	CQW11A(L)	S8	LED	LBE2003S	S11	M
CNY62	S8	PhC	CQW11B(L)	S8	LED	LBE2005Q	S11	M
CNY63	S8	PhC	CQW12(L)	S8	LED	LBE2008T	S11	M
CQ209S	S8	D	CQW12B(L)	S8	LED	LBE2009S	S11	M
CQ216X	S8	D	CQW20A	S8	LED	LCE1010R	S11	M
CQ216Y	S8	D	CQW21	S8	LED	LCE2003S	S11	M
CQ327;R	S8	D	CQW22	S8	LED	LCE2005Q	S11	M
CQ330;R	S8	D	CQW24(L)	S8	LED	LCE2008T	S11	M
CQ331;R	S8	D	CQW54	S8	LED	LCE2009S	S11	M
CQ332;R	S8	D	CQX10	S8	LED	LJE42002T	S11	M
CQ427;R	S8	D	CQX11	S8	LED	LKE1004R	S11	M
CQ430;R	S8	D	CQX12	S8	LED	LKE2002T	S11	M
CQ431;R	S8	D	CQX24(L)	S8	LED	LKE2004T	S11	M
CQ432;R	S8	D	CQX51	S8	LED	LKE2015T	S11	M
CQF24	S8	Ph	CQX54(L)	S8	LED	LKE21004R	S11	M
CQL10A	S8	Ph	CQX64(L)	S8	LED	LKE21015T	S11	M
CQL13	S8	Ph	CQX74(L)	S8	LED	LKE21050T	S11	M
CQL13A	S8	Ph	CQX74Y	S8	LED	LKE27010R	S11	M
CQL14A	S8	Ph	CQY11B	S8	LED	LKE27025R	S11	M
CQL14B	S8	Ph	CQY11C	S8	LED	LKE32002T	S11	M
CQN10	S8	LED	CQY24B(L)	S8	LED	LKE32004T	S11	M

\* = series

D = Displays

LED = Light-emitting diodes

M = Microwave transistors

Ph = Photoconductive devices

PhC = Photocouplers

Vrg = Voltage regulator diodes

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type no.	book	section	type no.	book	section	type no.	book	section
LTE42005S	S11	M	OM386	S13	SEN	PH2907A;R	S3	Sm
LTE42008R	S11	M	OM387	S13	SEN	PH2955T	S4a	P
LTE42012R	S11	M	OM931	S4a	P	PH3055T	S4a	P
LV1721E50R	S11	M	OM961	S4a	P	PH5415	S3	Sm
LV2024E45R	S11	M	OSB9110	S2a	St	PH5416	S3	Sm
LV2327E40R	S11	M	OSB9115	S2a	St	PHSD51	S2a	R
LV3742E16R	S11	M	OSB9210	S2a	St	PKB3001U	S11	M
LV3742E24R	S11	M	OSB9215	S2a	St	PKB3003U	S11	M
LWE2015R	S11	M	OSB9410	S2a	St	PKB3005U	S11	M
LWE2025R	S11	M	OSB9415	S2a	St	PKB12005U	S11	M
LZ1418E100RS11	M		OSM9110	S2a	St	PKB20010U	S11	M
MKB12040WS	S11	M	OSM9115	S2a	St	PKB23001U	S11	M
MKB12100WS	S11	M	OSM9210	S2a	St	PKB23003U	S11	M
MKB12140W	S11	M	OSM9215	S2a	St	PKB23005U	S11	M
MO6075B200ZS11	M		OSM9410	S2a	St	PKB25006T	S11	M
MO6075B400ZS11	M		OSM9415	S2a	St	PKB32001U	S11	M
MRB12175YR	S11	M	OSM9510	S2a	St	PKB32003U	S11	M
MRB12350YR	S11	M	OSM9511	S2a	St	PKB32005U	S11	M
MS1011B700YS11	M		OSM9512	S2a	St	PPC5001T	S11	M
MS6075B800ZS11	M		OSS9110	S2a	St	PQC5001T	S11	M
MSB12900Y	S11	M	OSS9115	S2a	St	PTB23001X	S11	M
MZ0912B75Y	S11	M	OSS9210	S2a	St	PTB23003X	S11	M
MZ0912B150YS11	M		OSS9215	S2a	St	PTB23005X	S11	M
OM286	S13	SEN	OSS9410	S2a	St	PTB32001X	S11	M
OM287	S13	SEN	OSS9415	S2a	St	PTB32003X	S11	M
OM320	S10	WBM	PBMF4391	S5	FET	PTB32005X	S11	M
OM321	S10	WBM	PBMF4392	S5	FET	PTB42001X	S11	M
OM322	S10	WBM	PBMF4393	S5	FET	PTB42002X	S11	M
OM323	S10	WBM	PDE1001U	S11	M	PTB42003X	S11	M
OM323A	S10	WBM	PDE1003U	S11	M	PV3742B4X	S11	M
OM335	S10	WBM	PDE1005U	S11	M	PVB42004X	S11	M
OM336	S10	WBM	PDE1010U	S11	M	PZ1418B15U	S11	M
OM337	S10	WBM	PEE1001U	S11	M	PZ1418B30U	S11	M
OM337A	S10	WBM	PEE1003U	S11	M	PZ1721B12U	S11	M
OM339	S10	WBM	PEE1005U	S11	M	PZ1721B25U	S11	M
OM345	S10	WBM	PEE1010U	S11	M	PZ2024B10U	S11	M
OM350	S10	WBM	PH2222;R	S3	Sm	PZ2024B20U	S11	M
OM360	S10	WBM	PH2222A;R	S3	Sm	PZB16035U	S11	M
OM361	S10	WBM	PH2369	S3	Sm	PZB27020U	S11	M
OM370	S10	WBM	PH2907;R	S3	Sm	RPY58A	S8	Ph

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	type no.	book	section	type no.	book	section
RPY76B	S8	Ph	1N3883	S2a	R	2N1893	S3	Sm
RPY86	S8	I	1N3889	S2a	R	2N2219	S3	Sm
RPY87	S8	I	1N3890	S2a	R	2N2219A	S3	Sm
RPY88	S8	I	1N3891	S2a	R	2N2222	S3	Sm
RPY89	S8	I	1N3892	S2a	R	2N2222A	S3	Sm
RPY90*	S8	I	1N3893	S2a	R	2N2297	S3	Sm
RPY91*	S8	I	1N3909	S2a	R	2N2368	S3	Sm
RPY93	S8	I	1N3910	S2a	R	2N2369	S3	Sm
RPY94	S8	I	1N3911	S2a	R	2N2369A	S3	Sm
RPY95	S8	I	1N3912	S2a	R	2N2483	S3	Sm
RPY96	S8	I	1N3913	S2a	R	2N2484	S3	Sm
RPY97	S8	I	1N4001G	S1	R	2N2904	S3	Sm
RV3135B5X	S11	M	1N4002G	S1	R	2N2904A	S3	Sm
RX1214B300Y	S11	M	1N4003G	S1	R	2N2905	S3	Sm
RXB12350Y	S11	M	1N4004G	S1	R	2N2905A	S3	Sm
RZ1214B35Y	S11	M	1N4005G	S1	R	2N2906	S3	Sm
RZ1214B60W	S11	M	1N4006G	S1	R	2N2906A	S3	Sm
RZ1214B65Y	S11	M	1N4007G	S1	R	2N2907	S3	Sm
RZ1214B125W	S11	M	1N4148	S1	SD	2N2907A	S3	Sm
RZ1214B125Y	S11	M	1N4150	S1	SD	2N3019	S3	Sm
RZ1214B150Y	S11	M	1N4151	S1	SD	2N3020	S3	Sm
RZ2833B45W	S11	M	1N4153	S1	SD	2N3053	S3	Sm
RZ3135B15U	S11	M	1N4446	S1	SD	2N3375	S6	RFP
RZ3135B15W	S11	M	1N4448	S1	SD	2N3553	S6	RFP
RZ3135B25U	S11	M	1N4531	S1	SD	2N3632	S6	RFP
RZ3135B30W	S11	M	1N4532	S1	SD	2N3822	S5	FET
RZB12100Y	S11	M	1N5059	S1	R	2N3823	S5	FET
RZB12350Y	S11	M	1N5060	S1	R	2N3866	S6	RFP
RZZ1214B300YS11	M		1N5061	S1	R	2N3903	S3	Sm
1N821;A	S1	Vrf	1N5062	S1	R	2N3904	S3	Sm
1N823;A	S1	Vrf	1N5832	S2a	R	2N3905	S3	Sm
1N825;A	S1	Vrf	1N5833	S2a	R	2N3906	S3	Sm
1N827;A	S1	Vrf	1N5834	S2a	R	2N3924	S6	RFP
1N829;A	S1	Vrf	1N6097	S2a	R	2N3926	S6	RFP
1N914	S1	SD	1N6098	S2a	R	2N3927	S6	RFP
1N916	S1	SD	2N918	S10	WBT	2N3966	S5	FET
1N3879	S2a	R	2N929	S3	Sm	2N4030	S3	Sm
1N3880	S2a	R	2N930	S3	Sm	2N4031	S3	Sm
1N3881	S2a	R	2N1613	S3	Sm	2N4032	S3	Sm
1N3882	S2a	R	2N1711	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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type no.	book	section	type no.	book	section	type no.	book	section
2N4091	S5	FET	2N5416	S3	Sm	56353	S4b	A
2N4092	S5	FET	2N5550	S3	Sm	56354	S4b	A
2N4093	S5	FET	2N5551	S3	Sm	56359b	S2,4b	A
2N4123	S3	Sm	2N6659	S5	FET	56359c	S2,4b	A
2N4124	S3	Sm	2N6660	S5	FET	56359d	S2,4b	A
2N4125	S3	Sm	2N6661	S5	FET	56360a	S2,4b	A
2N4126	S3	Sm	61SV	S8	I	56363	S2,4b	A
2N4391	S5	FET	375CQY/B	S8	Ph	56364	S2,4b	A
2N4392	S5	FET	497CQF/A	S8	Ph	56367	S2a/b	A
2N4393	S5	FET	498CQL	S8	Ph	56368a	S2,4b	A
2N4427	S6	RFP	56201d	S4b	A	56368b	S2,4b	A
2N4856	S5	FET	56201j	S4b	A	56369	S2,4b	A
2N4857	S5	FET	56245	S3,10	A	56378	S2,4b	A
2N4858	S5	FET	56246	S3,10	A	56379	S2,4b	A
2N4859	S5	FET	56261a	S4b	A	56387a,b	S4b	A
2N4860	S5	FET	56264a,b	S2a/b	A			
2N4861	S5	FET	56295	S2a/b	A			
2N5400	S3	Sm	56326	S4b	A			
2N5401	S3	Sm	56339	S4b	A			
2N5415	S3	Sm	56352	S4b	A			

A = Accessories  
 FET = Field-effect transistors  
 I = Infrared devices

Ph = Photoconductive devices  
 Sm = Small-signal transistors



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