

# DATA SHEET

**LTE42008R**

**NPN microwave power transistor**

Product specification  
Supersedes data of June 1992  
File under Discrete Semiconductors, SC15

1997 Feb 24

# NPN microwave power transistor

# LTE42008R

### FEATURES

- Diffused emitter ballasting resistors provide excellent current sharing and withstanding a high VSWR
- Gold metallization realizes very stable characteristics and excellent lifetime
- Input matching cell improves input impedance and allows an easier design of circuits.

### APPLICATION

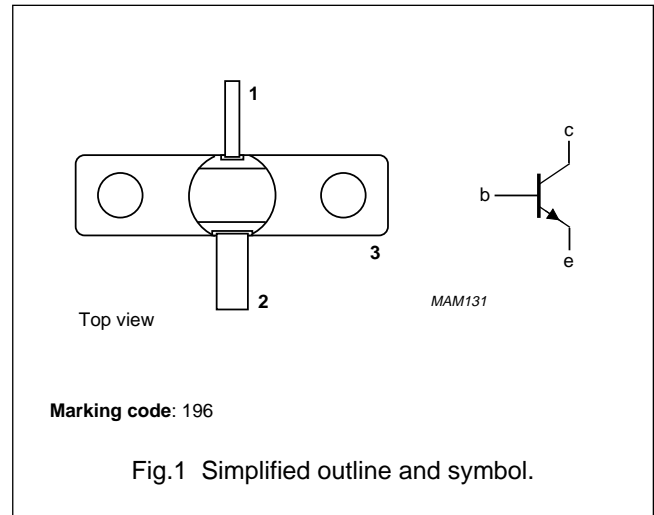
- Common emitter class-A linear power amplifiers up to 4.2 GHz.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT440A metal ceramic flange package with the emitter connected to the flange.

### PINNING - SOT440A

PIN	DESCRIPTION
1	collector
2	base
3	emitter connected to flange



### QUICK REFERENCE DATA

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

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)	Z <sub>i</sub> (Ω)	Z <sub>L</sub> (Ω)
Class-A (CW) linear	4.2	16	250	≥800	>7	7.5 + j23.5	2.5 – j9

### WARNING

Product and environmental safety - toxic materials

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

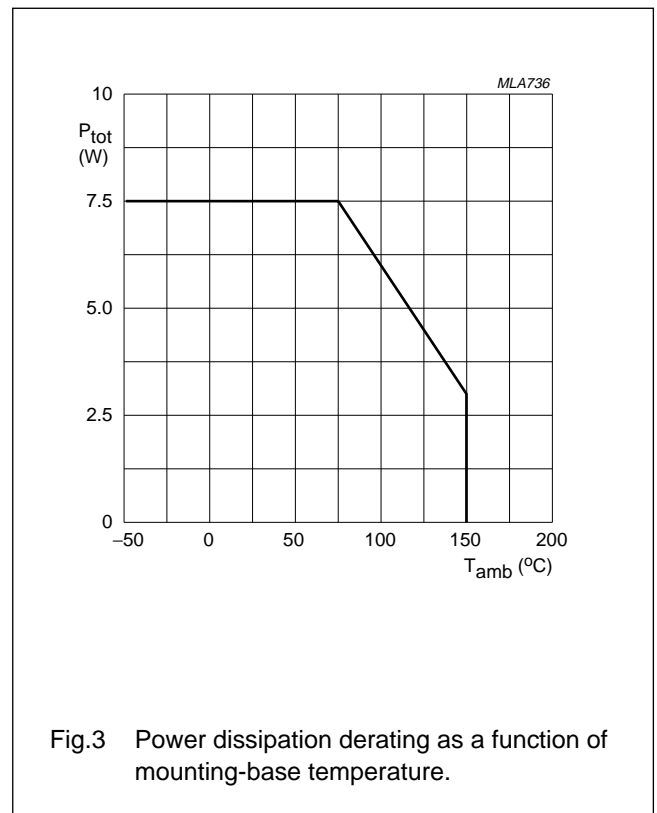
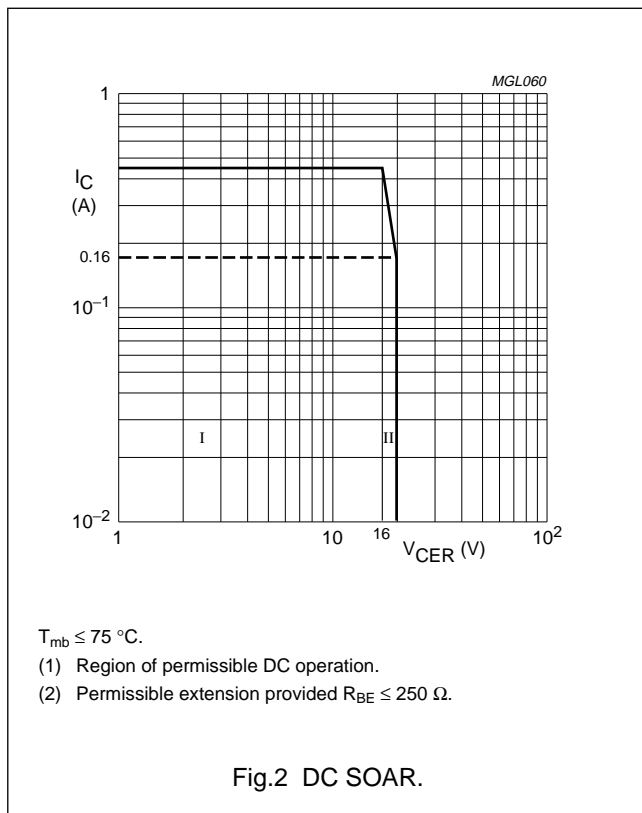
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**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	40	V
V <sub>CER</sub>	collector-emitter voltage	R <sub>BE</sub> = 250 Ω	–	20	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	16	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current (DC)		–	450	mA
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> ≤ 75 °C	–	7.5	W
T <sub>stg</sub>	storage temperature		–65	+200	°C
T <sub>j</sub>	operating junction temperature		–	200	°C
T <sub>slid</sub>	soldering temperature	at 0.3 mm from case; t = 10 s	–	235	°C



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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting-base	$T_j = 70\text{ °C}$	12	K/W
$R_{th\ mb-h}$	thermal resistance from mounting-base to heatsink	$T_j = 70\text{ °C}$ ; note 1	0.7	K/W

## Note

1. See "Mounting recommendations in the General part of handbook SC15".

## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 20\text{ V}$ ; $I_E = 0$	–	–	150	$\mu\text{A}$
		$V_{CB} = 40\text{ V}$ ; $I_E = 0$	–	–	1	mA
$I_{CER}$	emitter cut-off current	$V_{CE} = 20\text{ V}$ ; $R_{BE} = 250\ \Omega$	–	–	0.5	mA
$I_{EBO}$	emitter cut-off current	$V_{EB} = 1.5\text{ V}$ ; $I_C = 0$	–	–	0.4	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 250\text{ mA}$	15	–	150	
$C_{cb}$	collector-base capacitance	$V_{CB} = 16\text{ V}$ ; $V_{EB} = 1.5\text{ V}$ ; $I_E = I_C = 0$ ; $f = 1\text{ MHz}$	–	2	–	pF
$C_{ce}$	collector-emitter capacitance	$V_{CE} = 16\text{ V}$ ; $V_{EB} = 1.5\text{ V}$ ; $I_E = I_C = 0$ ; $f = 1\text{ MHz}$	–	1.5	–	pF
$C_{eb}$	emitter-base capacitance	$V_{CB} = 10\text{ V}$ ; $V_{EB} = 1\text{ V}$ ; $I_C = I_E = 0$ ; $f = 1\text{ MHz}$	–	20	–	pF

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**Table 1** Common-emitter scattering parameters:  $V_{CE} = 16\text{ V}$ ;  $I_C = 250\text{ mA}$ ;  $T_{mb} = 25\text{ °C}$ ;  $Z_o = 50\text{ }\Omega$ ; typical values

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
2000	0.80	160	0.061	61.5	1.40	42.4	0.45	-172.7
2100	0.79	157	0.065	59.4	1.37	38.0	0.44	-173.7
2200	0.79	155	0.068	56.5	1.36	34.0	0.44	-175.5
2300	0.80	153	0.071	54.3	1.35	29.9	0.45	-176.5
2400	0.79	151	0.074	52.2	1.35	25.3	0.45	-176.9
2500	0.79	150	0.079	50.1	1.35	21.1	0.45	-177.6
2600	0.78	148	0.085	48.4	1.34	16.2	0.46	-178.0
2700	0.77	147	0.090	45.1	1.34	11.8	0.47	-178.3
2800	0.75	146	0.095	41.7	1.35	7.6	0.48	-178.6
2900	0.73	144	0.099	38.3	1.38	2.9	0.50	-178.9
3000	0.71	143	0.104	35.4	1.40	-2.6	0.52	-178.8
3100	0.67	143	0.111	31.8	1.42	-8.3	0.55	-179.2
3200	0.64	141	0.116	27.4	1.43	-14.1	0.58	-179.9
3300	0.60	141	0.121	21.7	1.44	-20.4	0.62	178.8
3400	0.56	142	0.124	15.7	1.48	-28.1	0.66	176.9
3500	0.52	143	0.124	11.2	1.49	-36.4	0.70	174.4
3600	0.49	146	0.124	5.2	1.48	-45.1	0.74	171.3
3700	0.47	149	0.122	-2.2	1.47	-53.9	0.79	166.8
3800	0.46	154	0.118	-9.7	1.45	-63.1	0.84	161.9
3900	0.48	159	0.112	-15.7	1.41	-72.9	0.87	156.7
4000	0.51	161	0.106	-22.8	1.34	-82.5	0.91	150.7
4100	0.56	162	0.096	-29.4	1.26	-91.7	0.94	144.8
4200	0.61	161	0.083	-34.5	1.18	-100.1	0.96	138.6
4300	0.67	158	0.068	-37.4	1.08	-108.8	0.97	132.5
4400	0.71	155	0.054	-38.7	0.99	-117.8	0.98	127.3
4500	0.76	152	0.042	-35.4	0.90	-126.5	0.99	122.2
4600	0.79	147	0.031	-26.6	0.81	-134.7	0.99	117.2
4700	0.81	143	0.025	-5.6	0.73	-143.0	0.99	113.7
4800	0.82	140	0.026	28.8	0.66	-151.2	0.99	110.0
4900	0.82	136	0.034	40.1	0.59	-158.8	0.99	106.5
5000	0.82	132	0.043	52.4	0.53	-167.3	0.98	103.2

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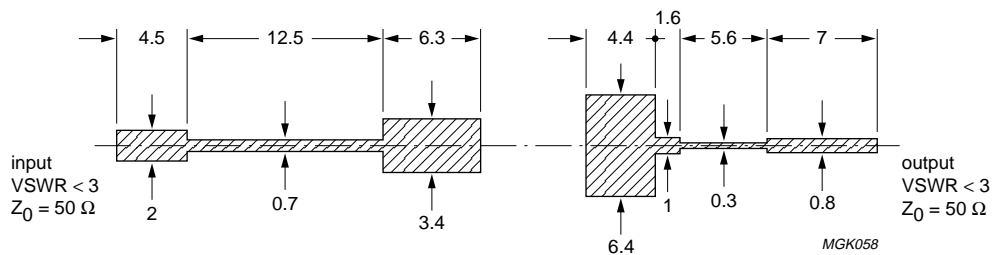
APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a common emitter class-A test circuit; note 1.

MODE OF OPERATION	f (GHz)	V <sub>CE</sub> (V) <sup>(2)</sup>	I <sub>C</sub> (mA) <sup>(2)</sup>	P <sub>L1</sub> (mW) <sup>(3)</sup>	G <sub>po</sub> (dB) <sup>(4)</sup>	Z <sub>i</sub> (Ω)	Z <sub>L</sub> (Ω)
Class-A (CW)	4.2	16	250	≥800 (29) typ. 940 (29.7)	≥7 typ. 7.5	7.5 + j40	4 + j4

Notes

1. Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.
2. I<sub>C</sub> and V<sub>CE</sub> regulated.
3. Load power for 1 dB compressed power gain.
4. Low level power gain associated with P<sub>L1</sub>.



Dimensions in mm.

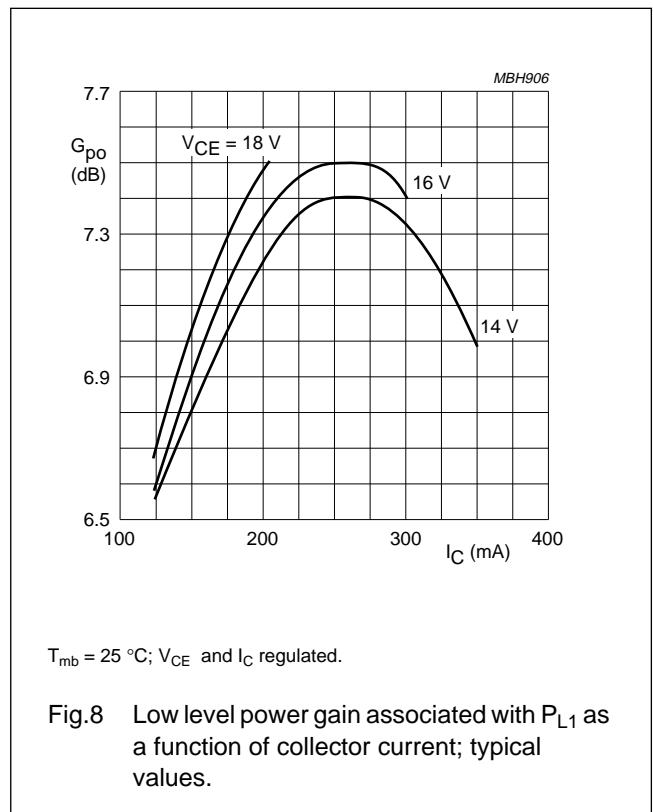
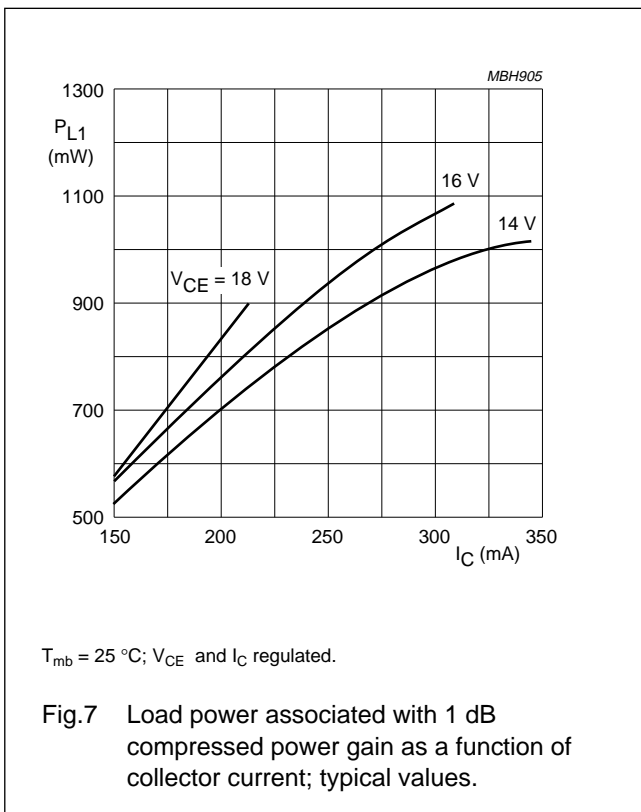
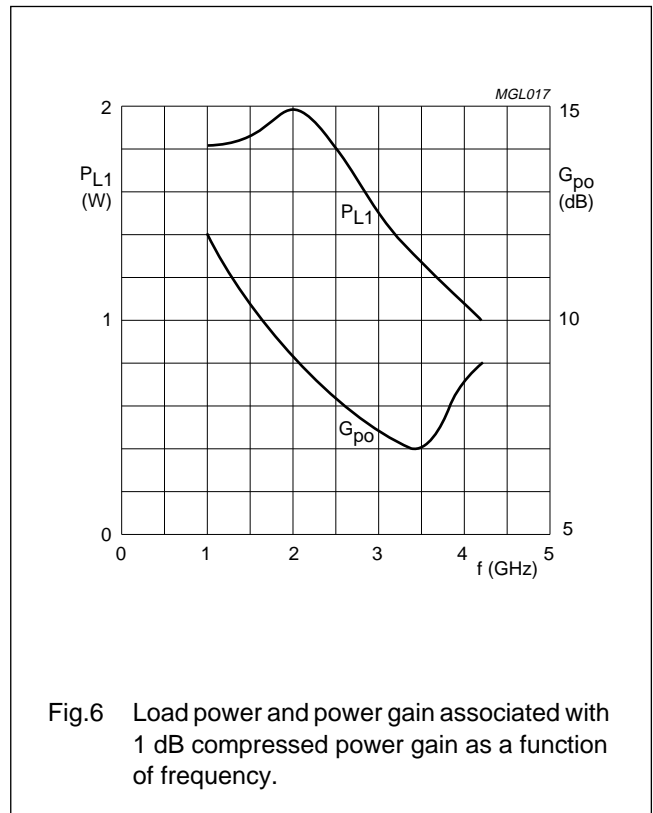
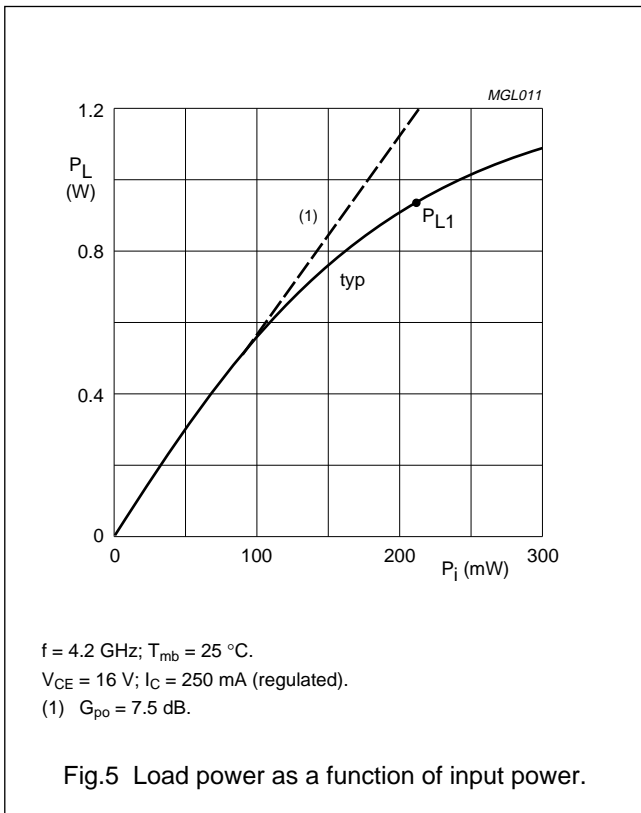
Input striplines on a double copper-clad printed-circuit board with PTFE fibreglass dielectric ( $\epsilon_r = 2.54$ ); thickness: 1.6 mm.

Output striplines on a double copper-clad Rexolite printed-circuit board with dielectric ( $\epsilon_r = 2.4$ ); thickness: 0.25 mm.

Fig.4 Prematching test circuit board.

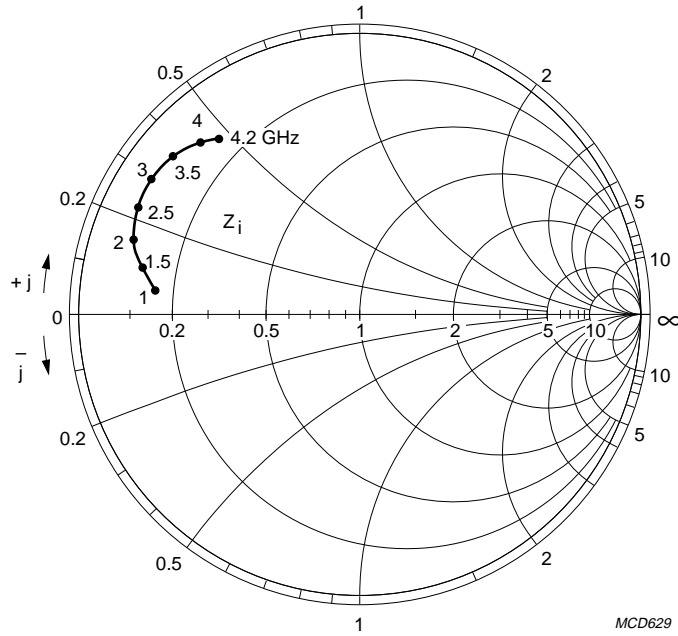
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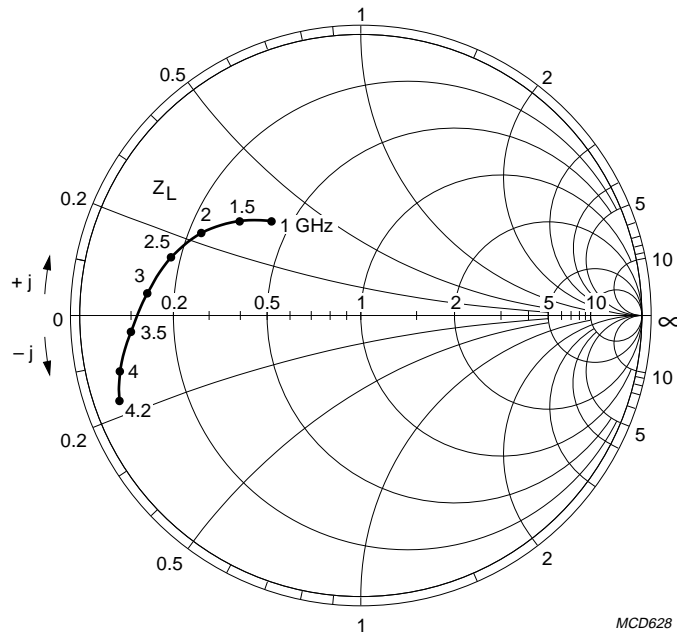
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$V_{CE} = 16\text{ V}$ ;  $I_C = 250\text{ mA}$  (regulated).  
 $Z_o = 50\ \Omega$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

Fig.9 Input impedance as a function of frequency for  $P_{L1}$ ; typical values.



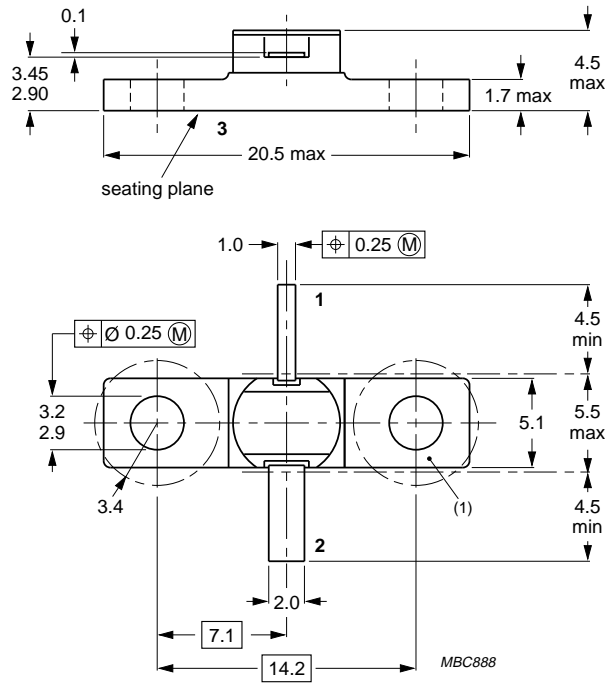
$V_{CE} = 16\text{ V}$ ;  $I_C = 250\text{ mA}$  (regulated).  
 $Z_o = 50\ \Omega$ ;  $T_{mb} = 25\text{ }^\circ\text{C}$ .

Fig.10 Optimum load impedance as a function of frequency for  $P_{L1}$ ; typical values.

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PACKAGE OUTLINE



Dimensions in mm.  
 Torque on screw: Max. 0.4 Nm.  
 Recommended screw: M2.5.

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

Fig.11 SOT440A.

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**DEFINITIONS**

<b>Data Sheet Status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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