DATA SHEET

LTE42005S

NPN microwave power transistor

Product specification
Supersedes data of June 1992

1997 Feb 21

Philips
Semiconductors

PHILIPS

NPN microwave power transistor LTE42005S

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

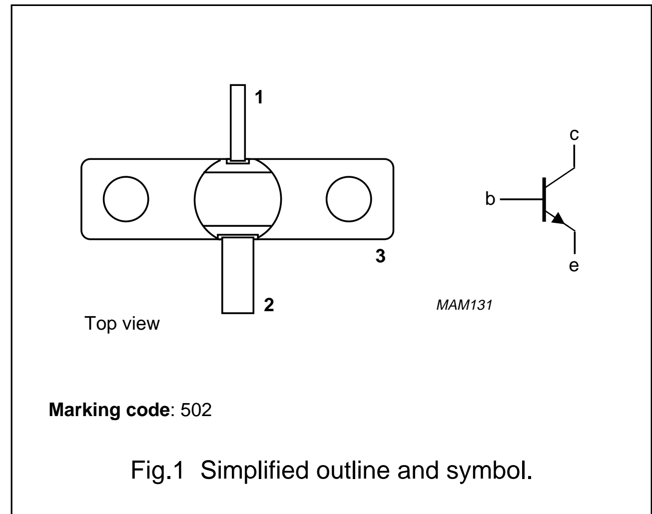


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

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

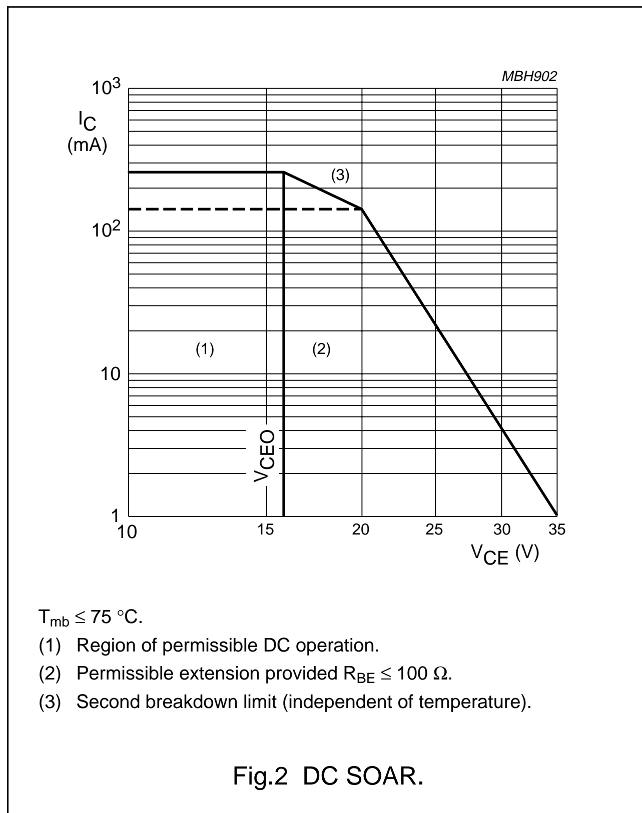
MODE OF OPERATION	f (GHz)	V_{CE} (V)	I_C (mA)	P_{L1} (mW)	G_{po} (dB)	Z_i (Ω)	Z_L (Ω)
Class-A (CW) linear	4.2	18	110	≥450	≥6.6	100 + j40	4 + j4

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.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CER}	collector-emitter voltage	R_{BE} = 100 Ω	–	35	V
V_{CEO}	collector-emitter voltage	open base	–	16	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	collector current (DC)		–	250	mA
P_{tot}	total power dissipation	T_{mb} ≤ 75 °C	–	4	W
T_{stg}	storage temperature		–65	+200	°C
T_j	operating junction temperature		–	200	°C
T_{sld}	soldering temperature	at 0.3 mm from case; t = 10 s	–	235	°C



T_{mb} ≤ 75 °C.

(1) Region of permissible DC operation.

(2) Permissible extension provided R_{BE} ≤ 100 Ω.

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

Fig.2 DC SOAR.

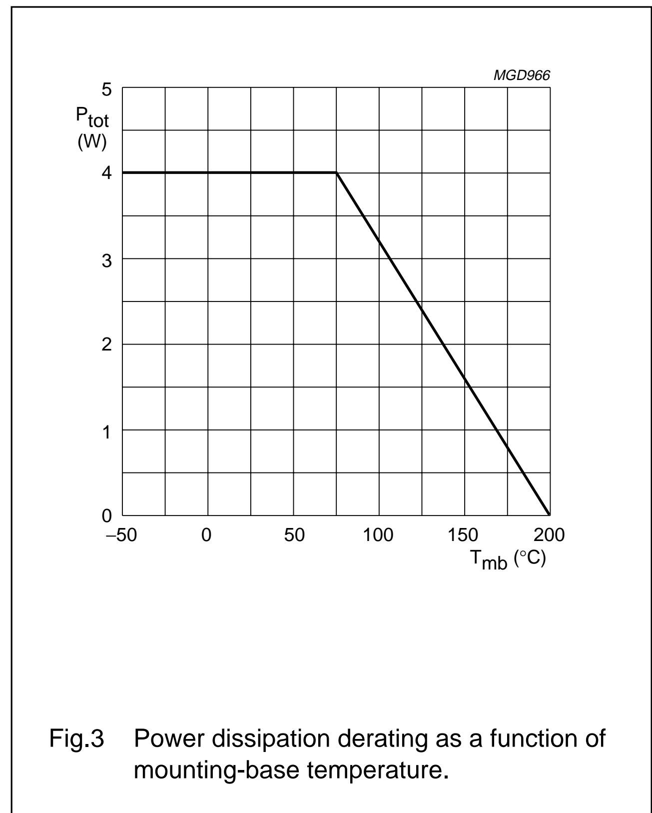


Fig.3 Power dissipation derating as a function of mounting-base temperature.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	T_j = 75 °C	36	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink	T_j = 75 °C; note 1	0.7	K/W

Note

1. See "*Mounting recommendations in the General part of handbook SC19a*".

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	V_{CB} = 20 V; I_E = 0	–	–	0.1	µA
		V_{CB} = 40 V; I_E = 0	–	–	0.25	mA
I_{CER}	emitter cut-off current	V_{CE} = 35 V; R_{BE} = 100 Ω	–	–	1	mA
I_{EBO}	emitter cut-off current	V_{EB} = 1.5 V; I_C = 0	–	–	0.2	µA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 110 mA	15	–	150	
C_{cb}	collector-base capacitance	V_{CB} = 20 V; V_{EB} = 1.5 V; I_E = I_C = 0; f = 1 MHz	–	0.5	–	pF
C_{ce}	collector-emitter capacitance	V_{CE} = 20 V; V_{EB} = 1.5 V; I_E = I_C = 0; f = 1 MHz	–	1.5	–	pF
C_{eb}	emitter-base capacitance	V_{CB} = 10 V; V_{EB} = 1 V; I_C = I_E = 0; f = 1 MHz	–	6.5	–	pF

Table 1 Scattering parameters: V_{CE} = 18 V; I_C = 110 mA (V_{CE} and I_C regulated); T_{mb} = 25 °C; Z_o = 50 Ω; typical values. (The figures given between brackets are values in dB).

f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
500	0.76	–176	0.022 (–33.2)	37	8.13 (18.2)	85	0.35	–62
600	0.75	180	0.023 (–32.8)	37	6.95 (16.8)	78	0.34	–66
700	0.76	177	0.023 (–32.8)	40	5.95 (15.5)	73	0.34	–71
800	0.76	174	0.024 (–32.5)	41	5.25 (14.4)	67	0.35	–75
900	0.76	171	0.024 (–32.3)	42	4.69 (13.4)	62	0.35	–79
1000	0.75	168	0.026 (–31.8)	43	4.23 (12.5)	57	0.36	–83
1100	0.75	165	0.028 (–31.0)	43	3.88 (11.8)	53	0.37	–87
1200	0.74	163	0.031 (–30.1)	43	3.61 (11.2)	49	0.39	–90
1300	0.75	160	0.035 (–29.2)	43	3.36 (10.5)	44	0.40	–95
1400	0.74	162	0.037 (–28.5)	44	3.12 (9.9)	41	0.43	–98
1500	0.73	157	0.041 (–27.8)	46	2.95 (9.4)	37	0.43	–101
1600	0.73	155	0.045 (–27.0)	46	2.83 (9.0)	32	0.45	–104
1700	0.71	154	0.047 (–26.5)	44	2.70 (8.6)	28	0.47	–107
1800	0.70	151	0.049 (–26.1)	43	2.56 (8.2)	23	0.48	–110
1900	0.69	148	0.050 (–25.9)	42	2.44 (7.7)	19	0.50	–114
2000	0.68	143	0.051 (–25.9)	39	2.34 (7.4)	14	0.51	–116
2200	0.67	138	0.058 (–24.7)	36	2.16 (6.7)	4	0.55	–124
2400	0.65	134	0.067 (–23.5	34	2.02(6.1)	–2	0.59	–129
2600	0.62	129	0.077 (–22.3)	31	1.95 (5.8)	–12	0.64	–134
2800	0.57	122	0.082 (–21.7)	25	1.84 (5.3)	–21	0.68	–138
3000	0.52	113	0.086 (–21.3)	21	1.78 (5.0)	–32	0.72	–143
3200	0.49	104	0.093 (–20.6)	16	1.67 (4.5)	–42	0.74	–150
3400	0.45	99	0.102 (–19.8)	13	1.62 (4.2)	–52	0.80	–157
3600	0.38	92	0.113 (–18.9)	8	1.52 (3.6)	–64	0.80	–163
3800	0.29	83	0.119 (–18.5)	6	1.43 (3.1)	–76	0.82	–170
4000	0.24	69	0.137 (–17.3)	2	1.27 (2.1)	–88	0.80	–179
4200	0.20	54	0.165 (–15.7)	–5	1.08 (0.7)	–98	0.68	171
4400	0.15	28	0.202 (–13.9)	–20	0.92 (0.8	–100	0.51	172
4600	0.12	–36	0.206 (–13.7)	–38	0.93 (0.6)	–102	0.52	–174
4800	0.17	–86	0.195 (–14.2)	–52	0.97 (–0.3)	–110	0.63	–171
5000	0.24	–114	0.177 (–15.0)	–65	0.97 (–0.3)	–122	0.73	–174
5200	0.31	–137	0.164 (–15.7	–73	0.93 (–0.6)	–133	0.79	–180
5400	0.41	–152	0.154 (–16.2)	–83	0.88 (–1.1)	–145	0.83	174
5600	0.48	–161	0.134 (–17.4)	–90	0.81 (–1.8)	–156	0.85	166
5800	0.53	–168	0.122 (–18.2)	–97	0.77 (–2.3)	–167	0.87	160
6000	0.56	–179	0.105 (–19.6)	–104	0.70 (–3.1)	–178	0.89	154

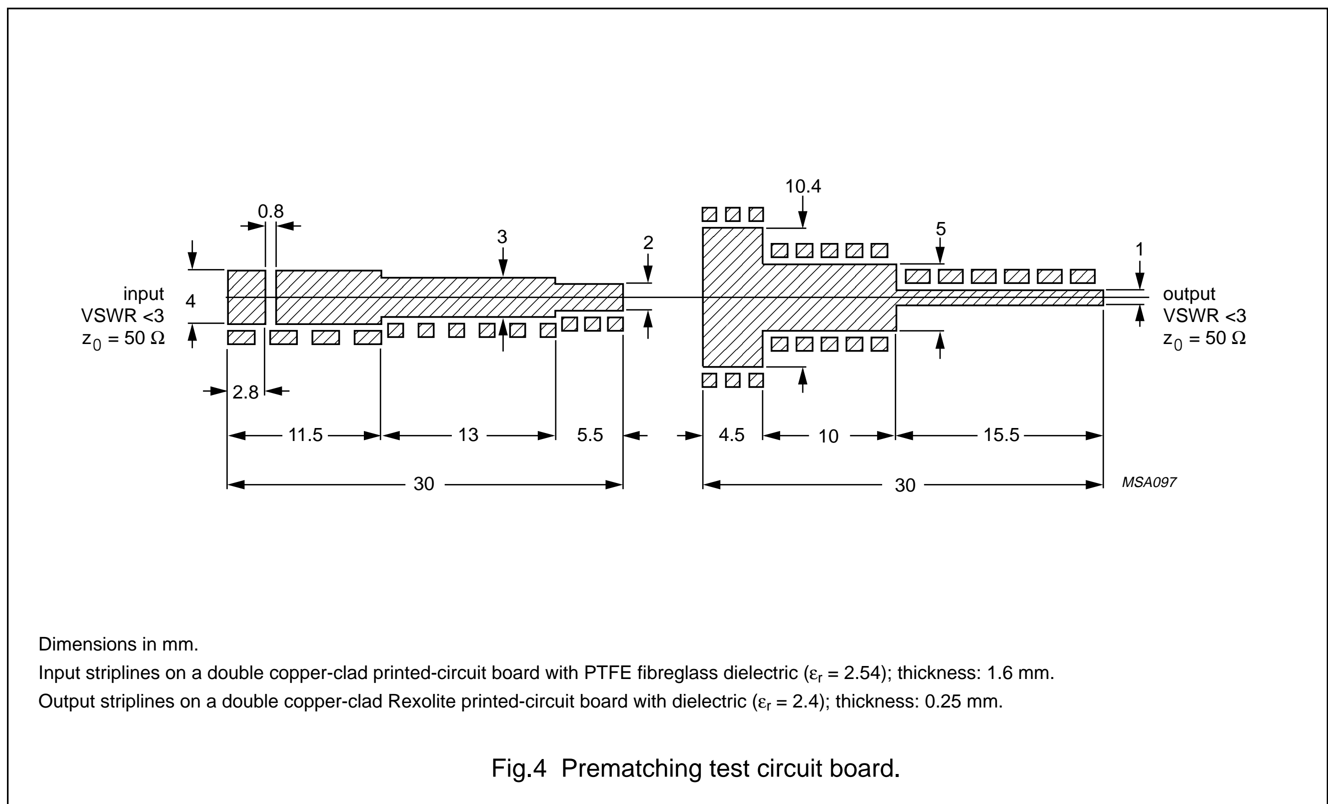
APPLICATION INFORMATION

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

MODE OF OPERATION	f (GHz)	V_{CE} (V) (2)	I_C (mA) (2)	P_{L1} (mW) (3)	G_{po} (dB) (4)	Z_i (Ω)	Z_L (Ω)
Class-A (CW)	4.2	18	110	≥450 (26.5) typ. 550 (27.4)	≥6.6 typ. 7.2	100 + j40	4 + j4

Notes

1. Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.
2. I_C and V_{CE} regulated.
3. Load power for 1 dB compressed power gain.
4. Low level power gain associated with P_{L1}.

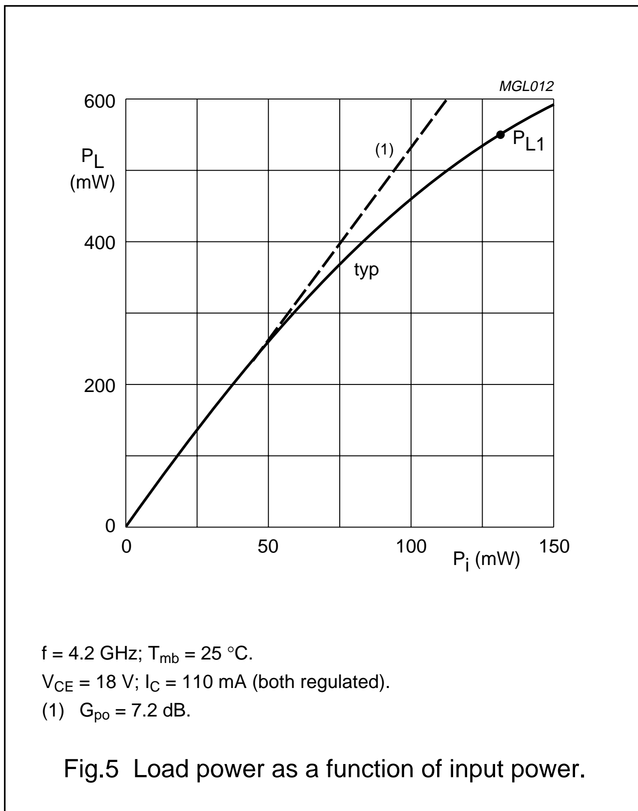


Dimensions in mm.

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

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

Fig.4 Prematching test circuit board.



f = 4.2 GHz; T_{mb} = 25 °C.
V_{CE} = 18 V; I_C = 110 mA (both regulated).
(1) G_{po} = 7.2 dB.

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

PACKAGE OUTLINE

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

Fig.6 SOT440A.

DEFINITIONS

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

LIFE SUPPORT APPLICATIONS

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