

DATA SHEET

LTE42005S

NPN microwave power transistor

Product specification
Supersedes data of June 1992

1997 Feb 21

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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

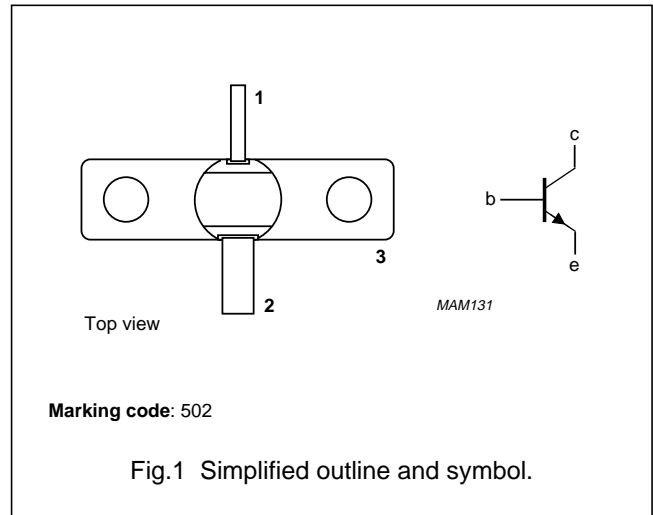
- Common emitter class-A linear power amplifiers up to 4.2 GHz.

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_{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.

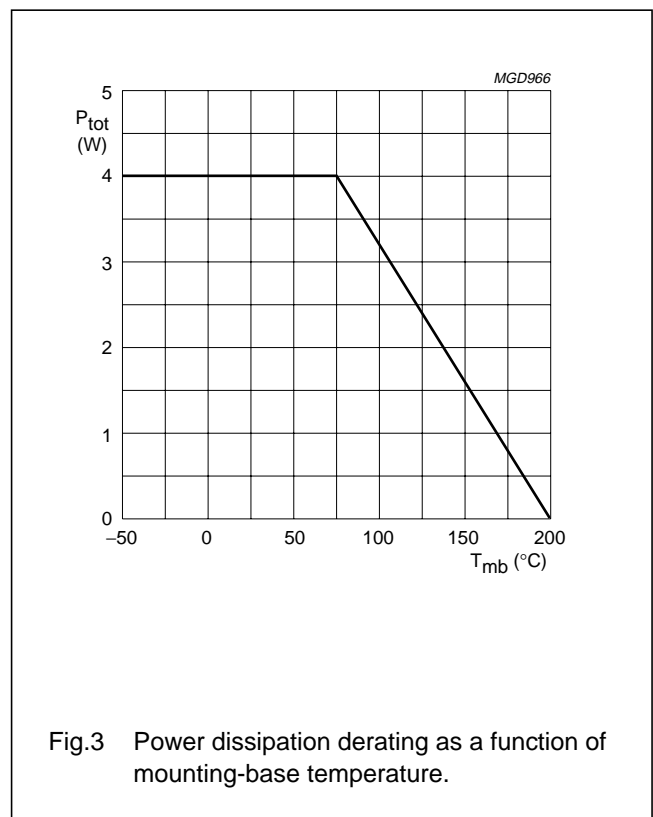
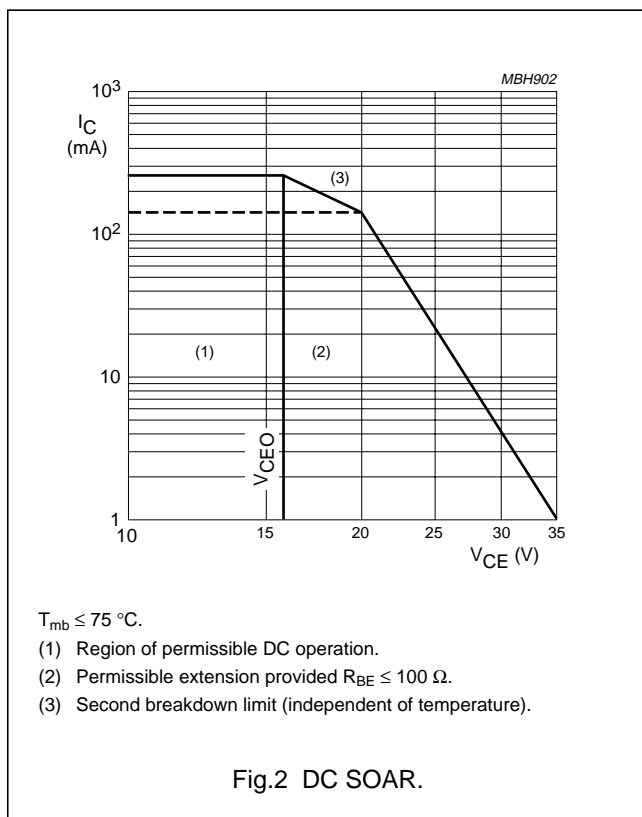
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LIMITING VALUES

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 | $R_{BE} = 100 \Omega$ | – | 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 | $T_{mb} \leq 75 \text{ }^\circ\text{C}$ | – | 4 | W |
| T_{stg} | storage temperature | | –65 | +200 | $^\circ\text{C}$ |
| T_j | operating junction temperature | | – | 200 | $^\circ\text{C}$ |
| T_{sld} | soldering temperature | at 0.3 mm from case; $t = 10 \text{ s}$ | – | 235 | $^\circ\text{C}$ |



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THERMAL CHARACTERISTICS

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

Note

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

CHARACTERISTICS

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

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

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Table 1 Scattering parameters: $V_{CE} = 18\text{ V}$; $I_C = 110\text{ mA}$ (V_{CE} and I_C regulated); $T_{mb} = 25\text{ °C}$; $Z_0 = 50\text{ }\Omega$; 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 |

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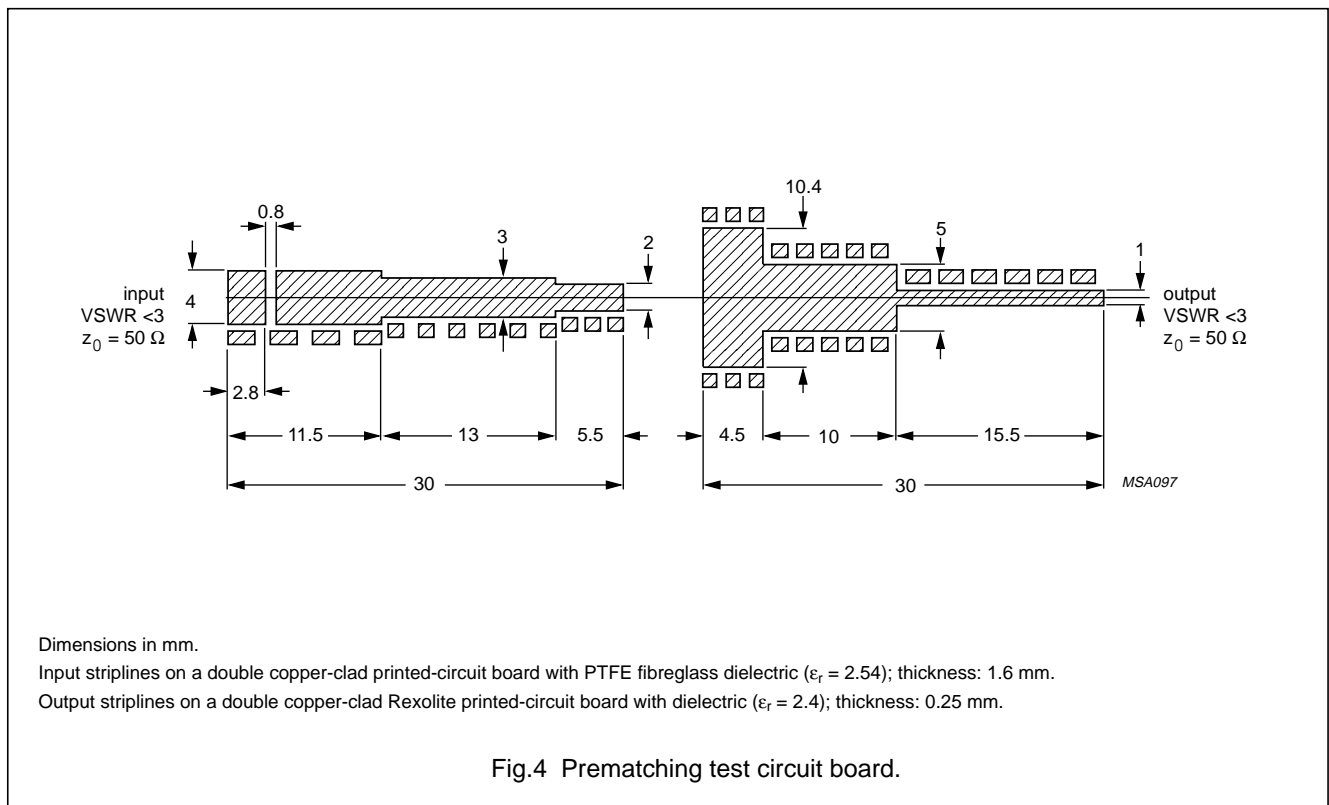
APPLICATION INFORMATION

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 _{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 |

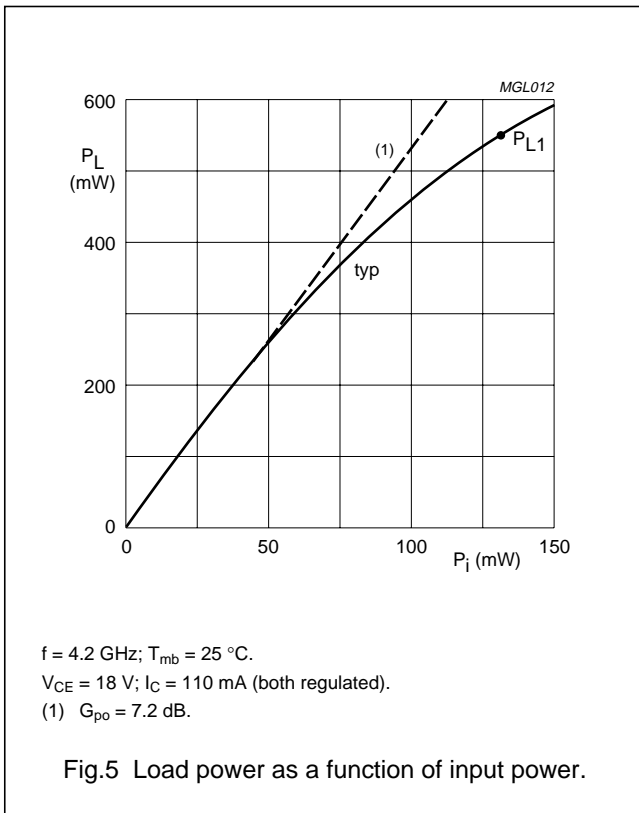
Notes

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}.



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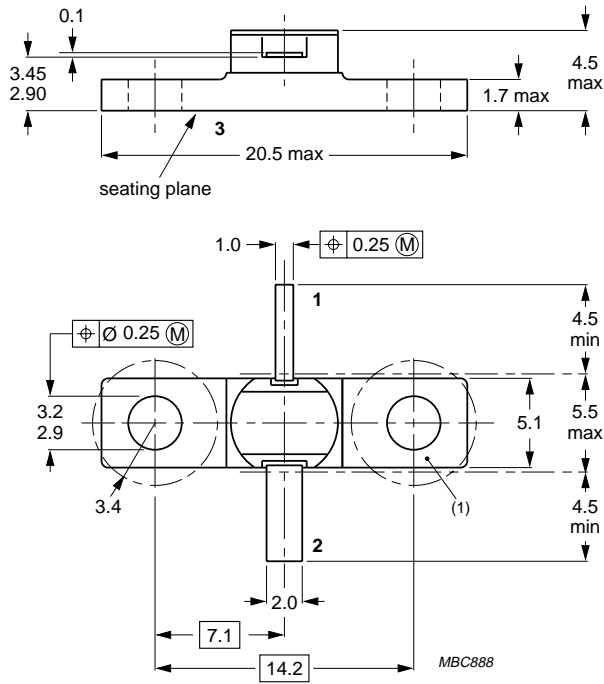
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PACKAGE OUTLINE



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

Fig.6 SOT440A.

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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. | |

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NOTES