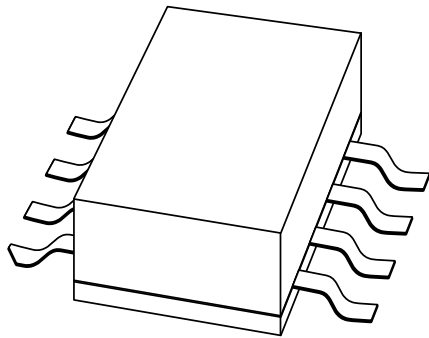


DATA SHEET



BLV909 UHF power transistor

Product specification
Supersedes data of 1996 Nov 04

1999 Jun 25

UHF power transistor

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FEATURES

- Emitter ballasting resistors for optimum temperature profile
- Gold metallization ensures excellent reliability
- Internal input matching to achieve high power gain and easy design of wideband circuits.

APPLICATIONS

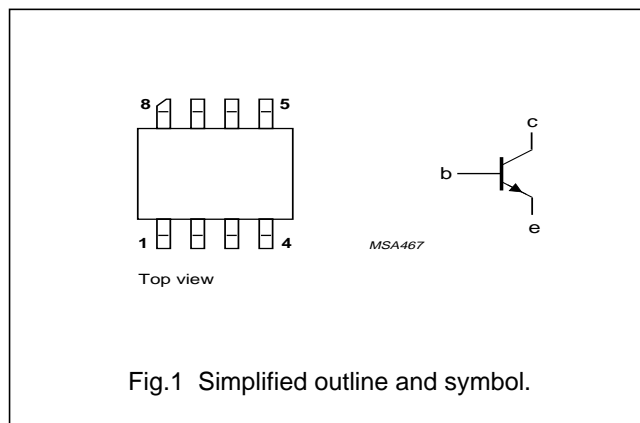
- Common emitter class-AB operation in base stations in the 820 to 960 MHz frequency range.

DESCRIPTION

NPN silicon planar epitaxial transistor in an 8-lead SOT409B SMD package with a ceramic cap. All leads are isolated from the mounting base.

PINNING - SOT409B

| PIN | SYMBOL | DESCRIPTION |
|------------|--------|-------------|
| 1, 4, 5, 8 | e | emitter |
| 2, 3 | b | base |
| 6, 7 | c | collector |



QUICK REFERENCE DATA

RF performance at $T_{mb} = 25\text{ }^\circ\text{C}$ in a common emitter test circuit.

| MODE OF OPERATION | f (MHz) | V_{CE} (V) | P_L (W) | G_p (dB) | η_c (%) | d_{im} (dBc) |
|-------------------|--------------------------|--------------|-----------|------------|--------------|----------------|
| CW, class-AB | 960 | 26 | 9 | ≥ 9.5 | ≥ 50 | - |
| 2-tone, class-AB | $f_1 = 960; f_2 = 960.1$ | 26 | 9 (PEP) | ≥ 9.5 | ≥ 35 | typ. -30 |

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LIMITING VALUES

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

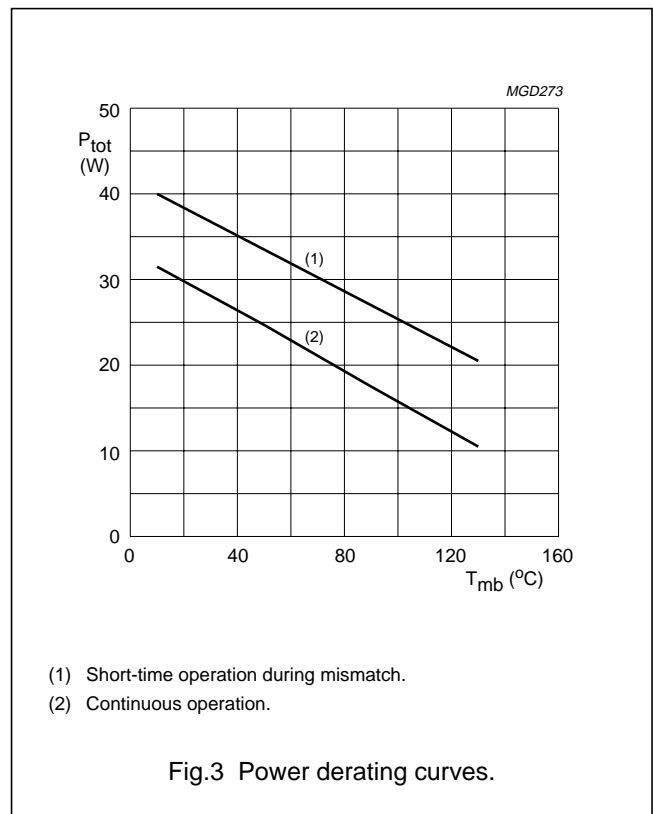
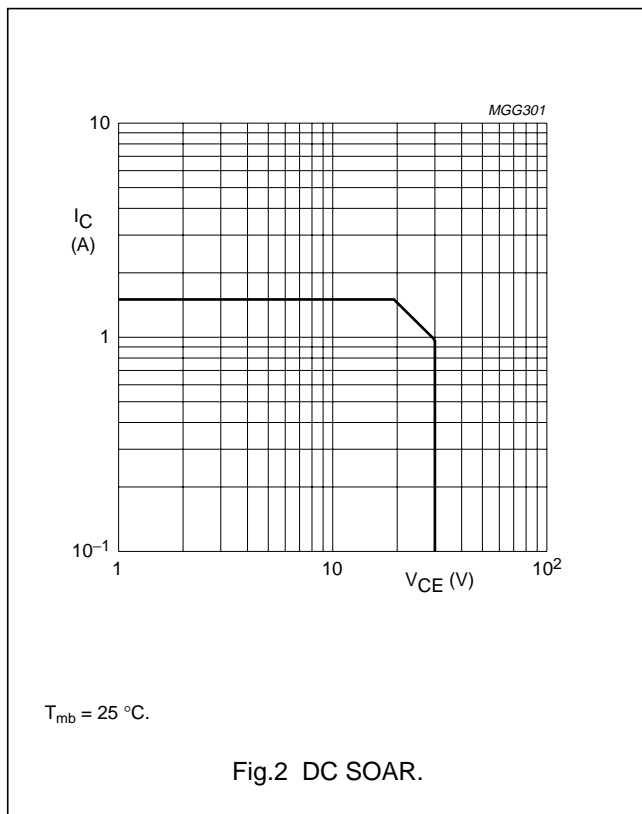
| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-------------|--------------------------------|----------------------------------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 70 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 30 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 3 | V |
| I_C | collector current (DC) | | – | 1.5 | A |
| $I_{C(AV)}$ | average collector current | | – | 1.5 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; note 1 | – | 29 | W |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| T_j | operating junction temperature | | – | 200 | °C |

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|----------------|---|--|-------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | $P_{tot} = 29\text{ W}$; $T_{mb} = 25\text{ °C}$; note 1 | 6 | K/W |

Note to the Limiting values and Thermal characteristics

1. Transistor with metallized ground plane mounted on a printed-circuit board, see "Mounting and soldering section, Handbook SC19a."



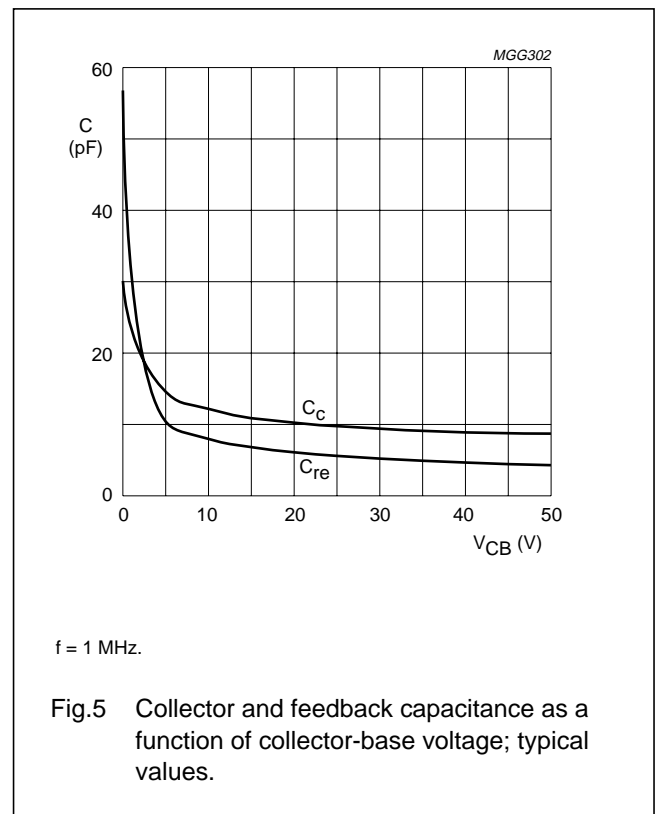
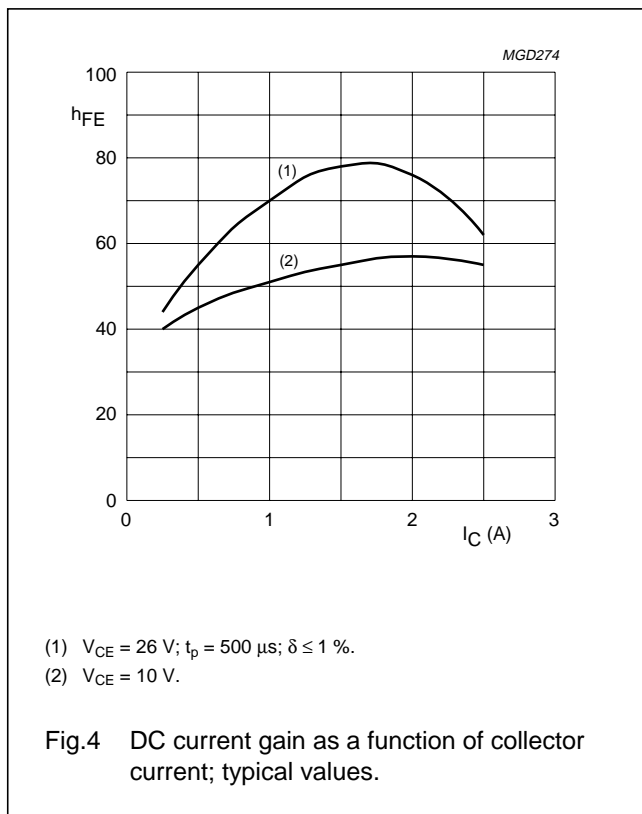
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CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|----------------------|-------------------------------------|--|------|------|------|------|
| V _{(BR)CBO} | collector-base breakdown voltage | open emitter; I _C = 5 mA | 70 | – | – | V |
| V _{(BR)CEO} | collector-emitter breakdown voltage | open base; I _C = 15 mA | 30 | – | – | V |
| V _{(BR)EBO} | emitter-base breakdown voltage | open collector; I _E = 0.3 mA | 3 | – | – | V |
| I _{CES} | collector leakage current | V _{CE} = 28 V; V _{BE} = 0 | – | – | 0.75 | mA |
| h _{FE} | DC current gain | V _{CE} = 10 V; I _C = 500 mA | 30 | – | 120 | |
| C _c | collector capacitance | V _{CB} = 26 V; I _E = i _e = 0; f = 1 MHz | – | 10 | – | pF |
| C _{re} | feedback capacitance | V _{CE} = 26 V; I _C = 0; f = 1 MHz | – | 6 | – | pF |



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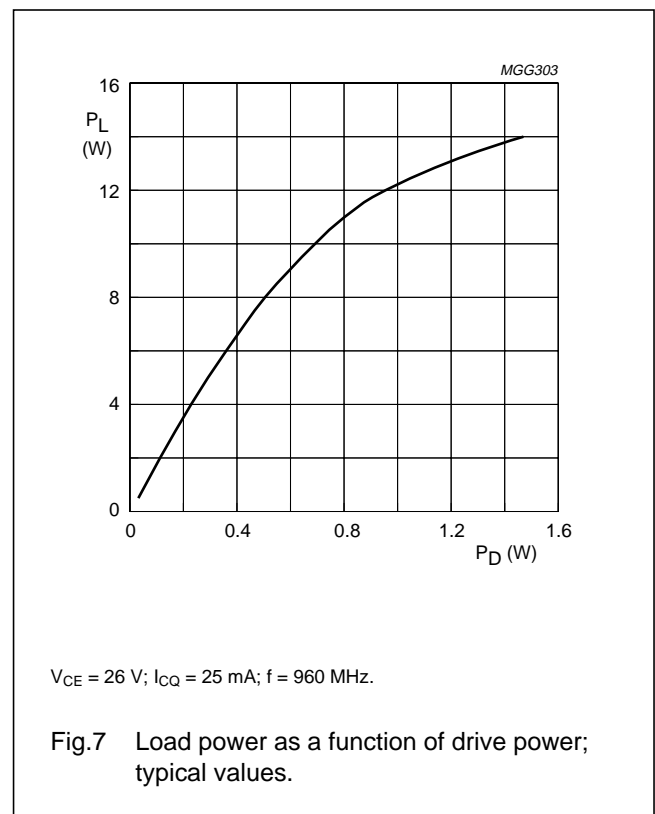
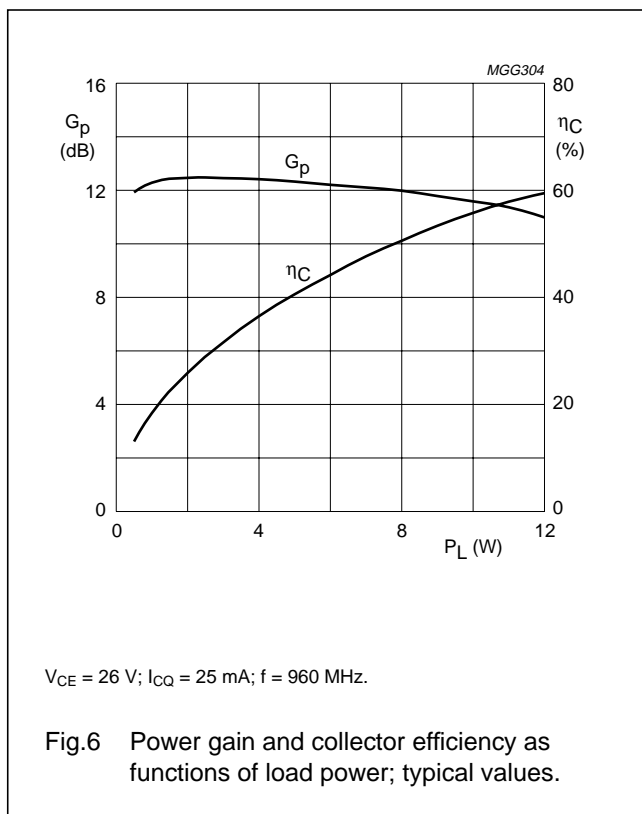
APPLICATION INFORMATION

RF performance at $T_{mb} = 25\text{ }^{\circ}\text{C}$ in a common emitter test circuit (see Figs 12 and 13).

| MODE OF OPERATION | f (MHz) | V _{CE} (V) | I _{CQ} (mA) | P _L (W) | G _p (dB) | η _c (%) | d _{im} (dBc) |
|-------------------|--|---------------------|----------------------|--------------------|---------------------|--------------------|-----------------------|
| CW, class-AB | 960 | 26 | 25 | 9 | ≥9.5, typ. 11.5 | ≥50, typ. 55 | – |
| 2-tone, class-AB | f ₁ = 960; f ₂ = 960.1 | 26 | 25 | 9 (PEP) | ≥9.5, typ. 11.5 | ≥35, typ. 40 | typ. –30 |

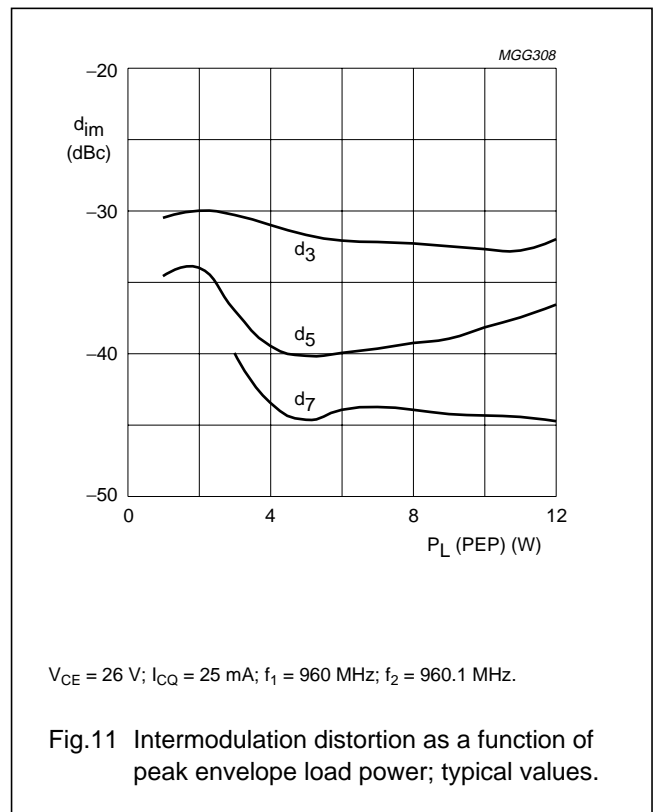
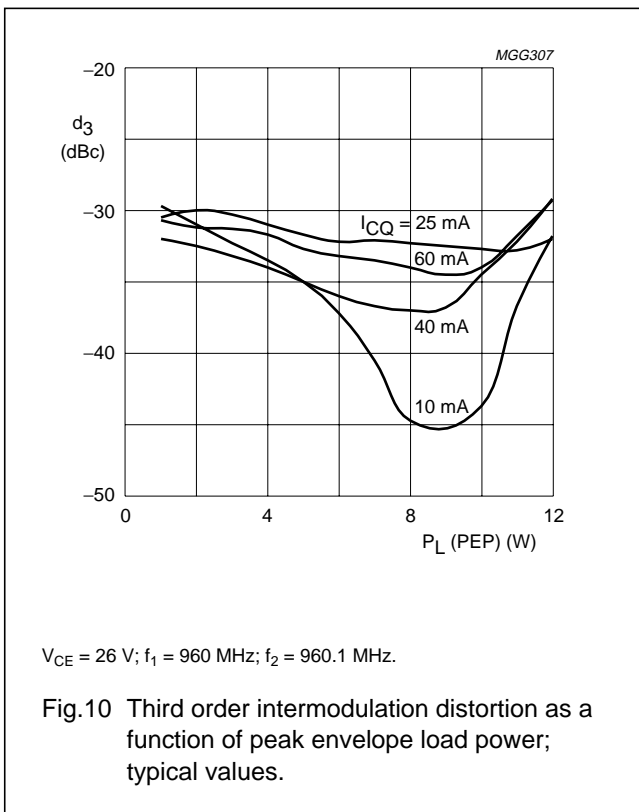
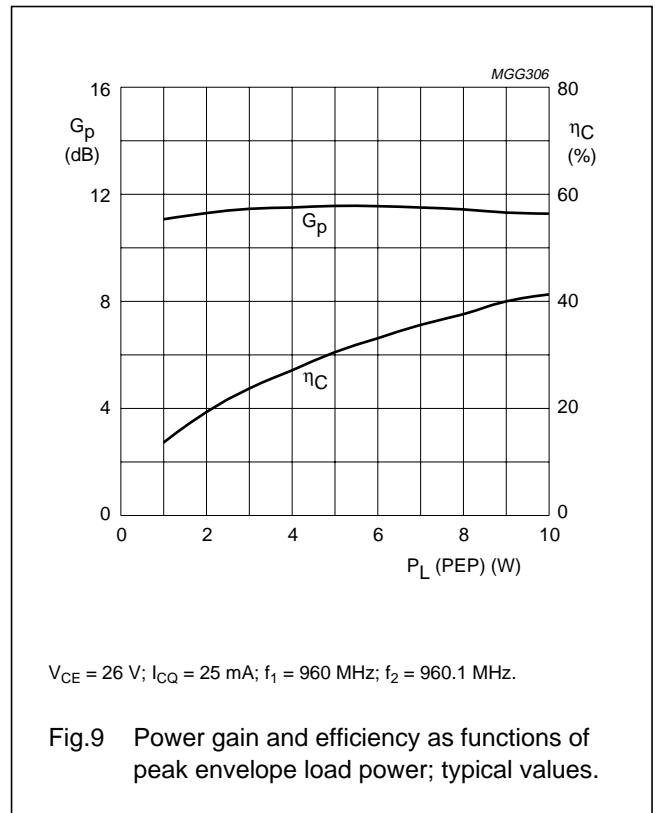
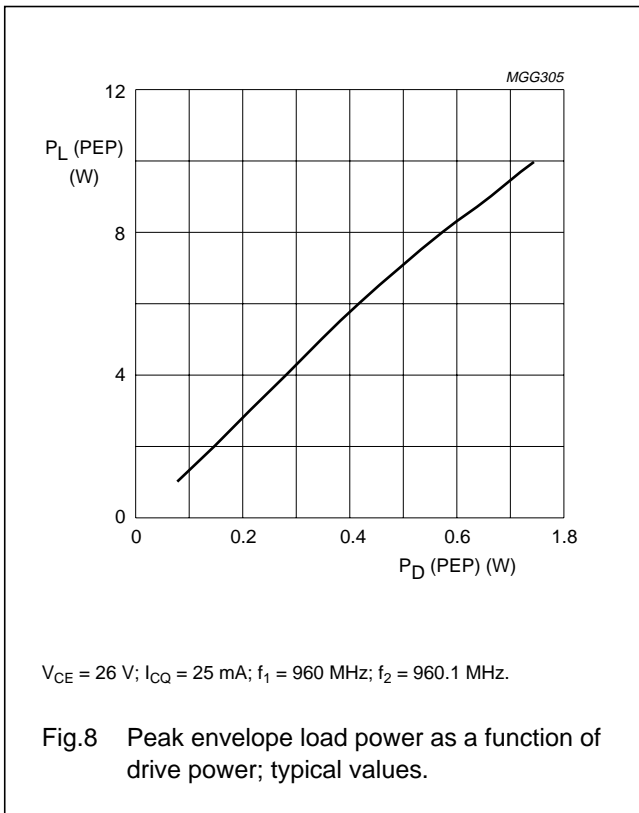
Ruggedness in class-AB operation

The BLV909 is capable of withstanding a load mismatch corresponding to VSWR = 20 : 1 through all phases under the following conditions: f = 960 MHz; V_{CE} = 26 V; I_{CQ} = 25 mA; T_{mb} = 25 °C.



UHF power transistor

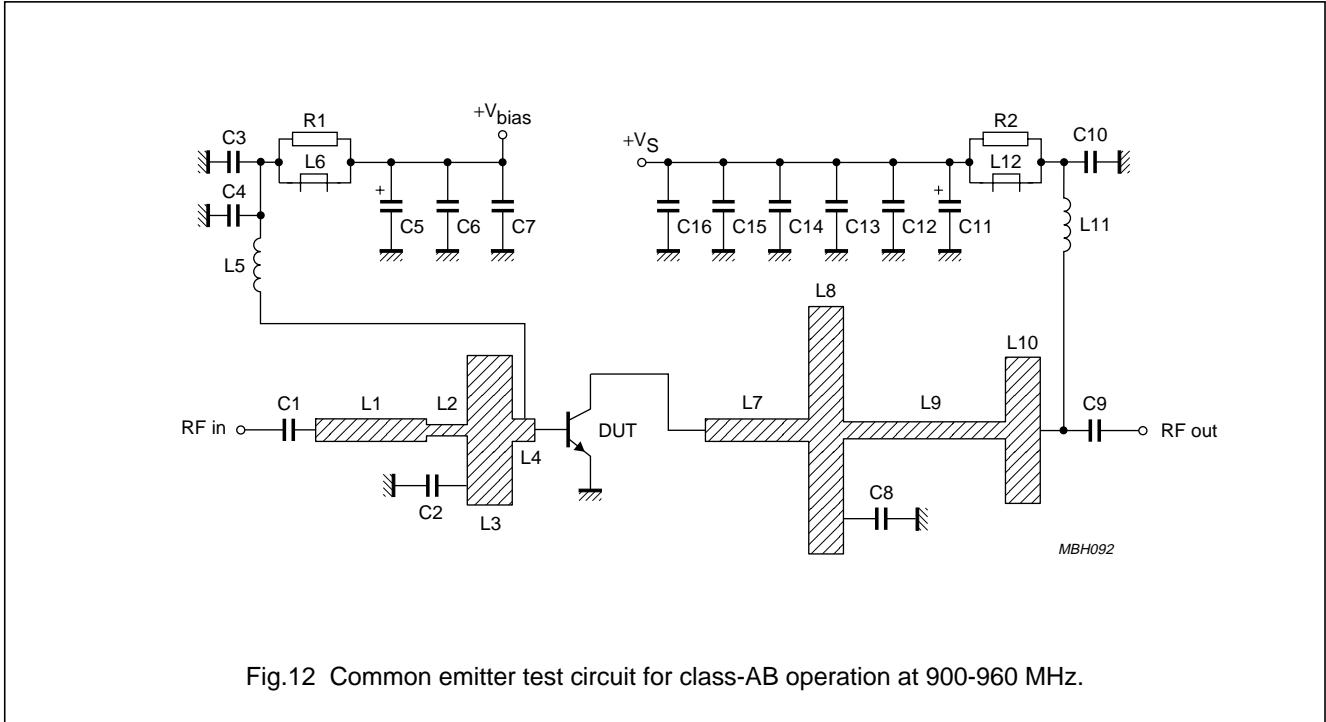
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UHF power transistor

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Test circuit information



Mounting recommendations

Both the metallized rear side and the leads of the device contribute to the heat flow. For the best results, it is recommended to mount the transistor on a grounded metallized area on the printed-circuit board, which is equipped with a large number of through metallized holes filled with solder.

When the heatsink is mounted to the rear side of the printed-circuit board by means of heatsink compound, a thermal resistance between the mounting base and the heatsink of 0.9 K/W can be achieved.

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List of components used in test circuit (see Figs 12 and 13)

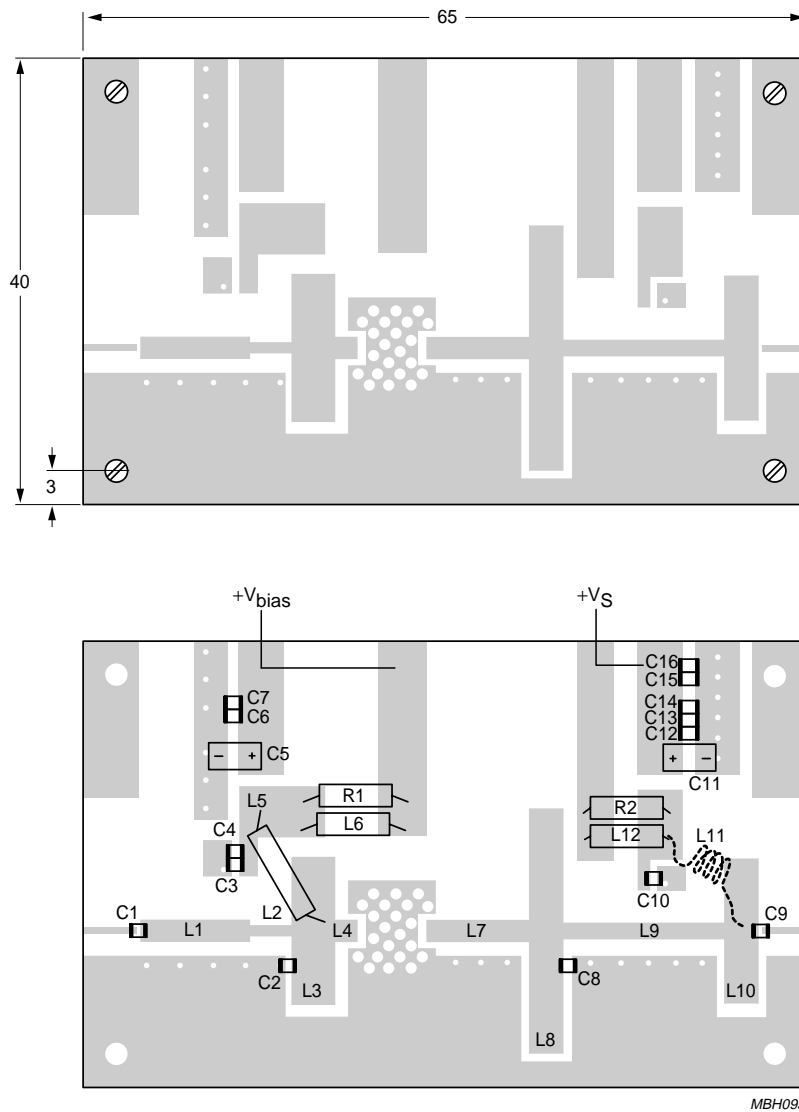
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE No. |
|-------------------|---|----------------------|-----------------------------------|----------------|
| C1, C9 | multilayer ceramic chip capacitor; note 1 | 24 pF | | |
| C2 | multilayer ceramic chip capacitor; notes 1 and 2 | 5.6 pF | | |
| C3, C7, C10, C16 | multilayer ceramic chip capacitor; note 3 | 110 pF | | |
| C4, C15 | multilayer ceramic chip capacitor; note 3 | 200 pF | | |
| C5, C11 | tantalum SMD capacitor | 10 μ F, 35 V | | |
| C6, C12, C13, C14 | ceramic chip capacitor | 100 nF | | 2222 852 47104 |
| C8 | multilayer ceramic chip capacitor; note 1 | 8.2 pF | | |
| L1 | stripline; note 4 | 24.3 Ω | length 9.85 mm width 2 mm | |
| L2 | stripline; note 4 | 37.5 Ω | length 3.63 mm width 1 mm | |
| L3 | stripline; note 4 | 5.11 Ω | length 4.1 mm width 13.3 mm | |
| L4 | stripline; note 4 | 24.3 Ω | length 2 mm width 2 mm | |
| L5 | RF choke | 0.22 μ H | | |
| L6, L12 | grade 4S2 ferroxcube chip-bead | | | |
| L7 | stripline; note 4 | 24.3 Ω | length 9.2 mm width 2 mm | |
| L8 | stripline; note 4 | 3.2 Ω | length 3.1 mm width 22 mm | |
| L9 | stripline; note 4 | 29.4 Ω | length 14.4 mm width 1.5 mm | |
| L10 | stripline; note 4 | 5.22 Ω | length 3.2 mm width 13 mm | |
| L11 | 5 turns enamelled 1 mm copper wire | 35 nH | pitch 1.23 mm int. dia. 3.2 mm | |
| R1, R2 | metal film resistor | 100 Ω , 0.4 W | | |

Notes

- American Technical Ceramics type 100A or capacitor of same quality.
- For operation at 820 to 900 MHz: C2 = 6.2 pF.
- American Technical Ceramics type 100B or capacitor of same quality.
- The striplines are on a double copper-clad printed-circuit board, with PTFE fibre-glass dielectric ($\epsilon_r = 10.2$); thickness 0.64 mm.

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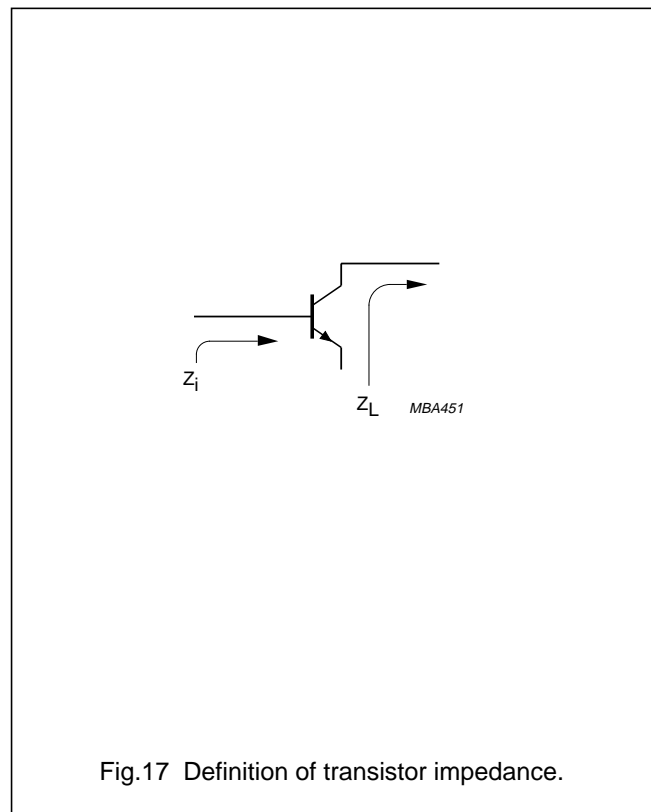
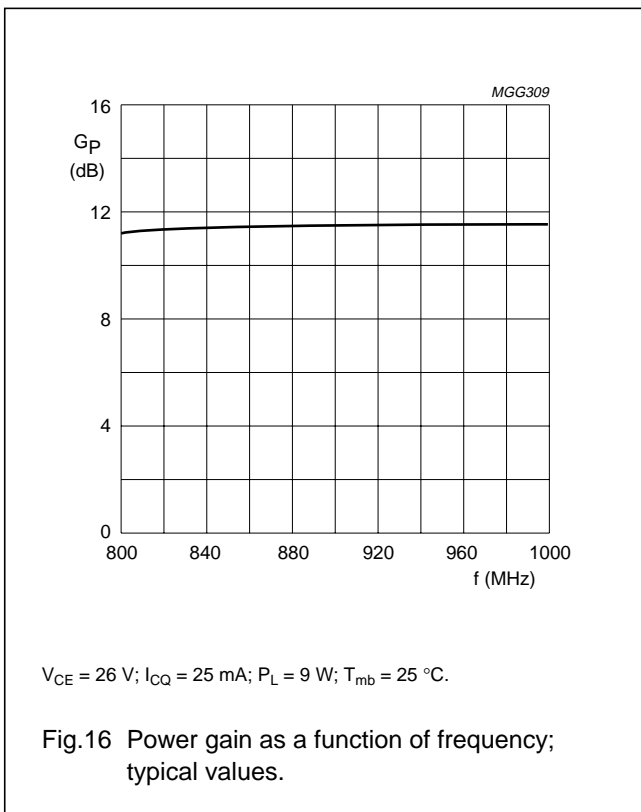
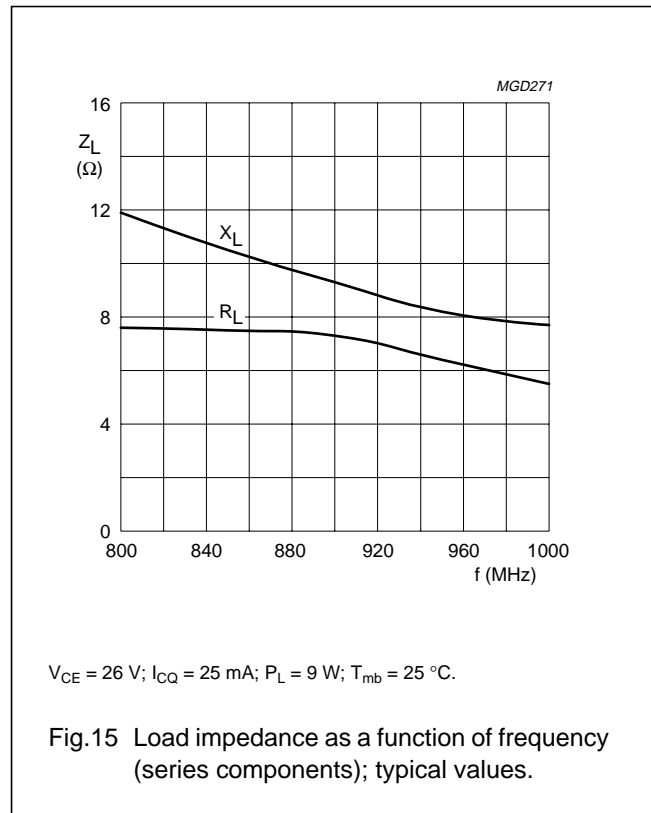
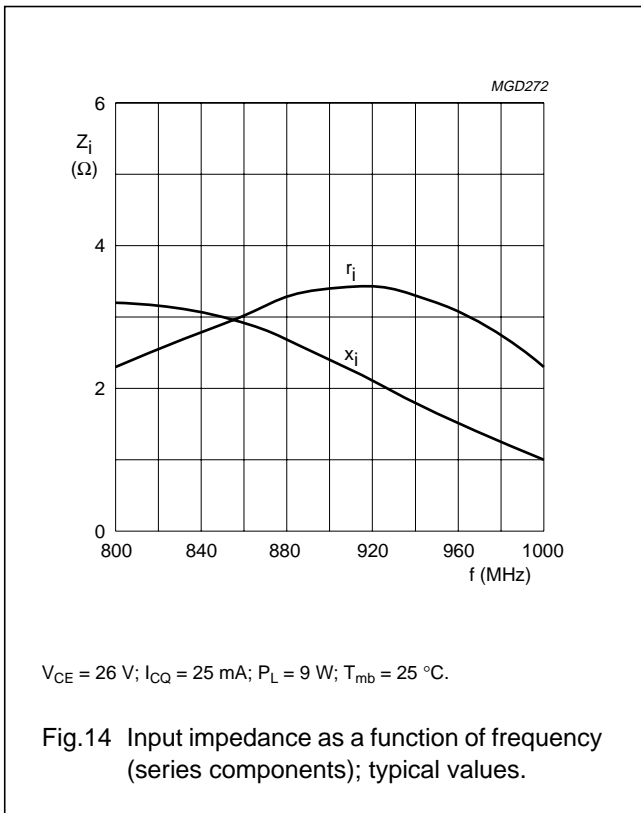
Dimensions in mm.

The components are situated on one side of the copper-clad PCB, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.13 Component layout and printed-circuit board and component lay-out for 900 to 960 MHz class-AB test circuit.

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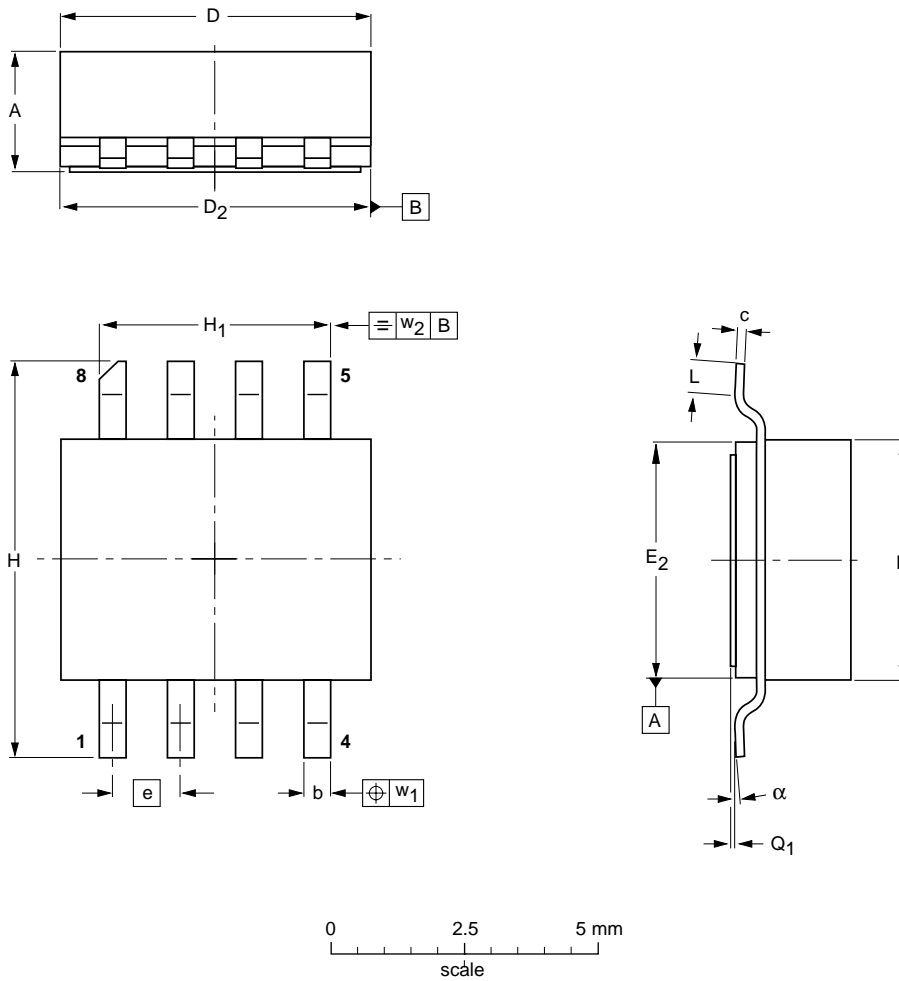
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PACKAGE OUTLINE

Ceramic surface mounted package; 8 leads

SOT409B



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

| UNIT | A | b | c | D | D ₂ | E | E ₂ | e | H | H ₁ | L | Q ₁ | w ₁ | w ₂ | α |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| mm | 2.36 2.06 | 0.58 0.43 | 0.15 0.10 | 5.94 5.03 | 5.16 5.00 | 4.93 4.01 | 4.14 3.99 | 1.27 | 7.47 7.26 | 4.39 4.24 | 0.84 0.69 | 0.10 0.00 | 0.25 | 0.25 | 2° 0° |
| inches | 0.093 0.081 | 0.023 0.017 | 0.006 0.004 | 0.234 0.198 | 0.203 0.197 | 0.194 0.158 | 0.163 0.157 | 0.050 | 0.294 0.286 | 0.173 0.167 | 0.033 0.027 | 0.004 0.000 | 0.010 | 0.010 | 2° 0° |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT409B | | | | | | 98-01-27 |

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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. | |

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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