

DATA SHEET

BLV90 UHF power transistor

Product specification

February 1996

UHF power transistor

BLV90

DESCRIPTION

NPN silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

FEATURES

- diffused emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at rated output power without an external heatsink when it is mounted on a printed-circuit board (see Fig.6).

The transistor has a 4-lead envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

RF performance at $T_a = 25\text{ }^\circ\text{C}$ in a common-emitter class-B circuit.⁽¹⁾

| MODE OF OPERATION | V_{CE} V | f MHz | P_L W | G_p dB | η_c % |
|-------------------|---------------|----------|------------|-------------|---------------|
| Narrow band; CW | 12.5 | 900 | 1 | > 7.5 | > 50 |
| | 9.6 | 900 | 1 | typ. 7.0 | typ. 57 |

Note

1. Device mounted on a printed-circuit board (see Fig.6).

PIN CONFIGURATION

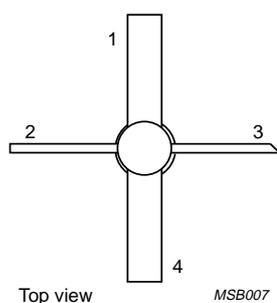


Fig.1 Simplified outline. SOT172D.

PINNING - SOT172D.

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | emitter |
| 2 | base |
| 3 | collector |
| 4 | emitter |

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.

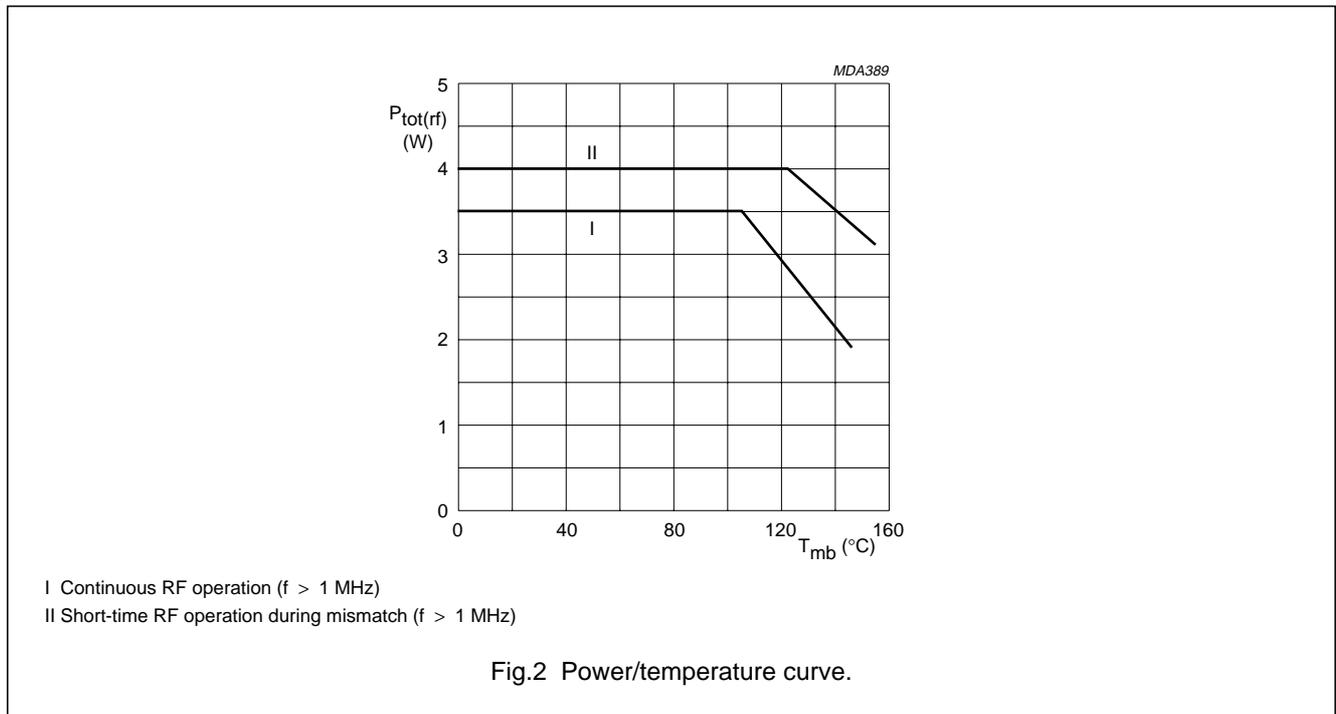
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RATINGS

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

| | | | |
|---------------------------------------|------------------|------|-----------------|
| Collector-base voltage (open emitter) | V_{CBO} | max. | 36 V |
| Collector-emitter voltage (open base) | V_{CEO} | max. | 16 V |
| Emitter-base voltage (open collector) | V_{EBO} | max. | 3 V |
| Collector current | | | |
| DC or average | $I_C; I_{C(AV)}$ | max. | 0.2 A |
| (peak value); $f > 1$ MHz | I_{CM} | max. | 0.6 A |
| Total power dissipation | | | |
| $f > 1$ MHz; $T_{mb} < 105$ °C | $P_{tot(rf)}$ | max. | 3.5 W |
| Storage temperature | T_{stg} | | -65 to + 150 °C |
| Operating junction temperature | T_j | max. | 200 °C |



THERMAL RESISTANCE

Dissipation = 2.25 W

From junction to ambient⁽¹⁾ ($f > 1$ MHz)

| | | | |
|---------------|--------------------|------|--------|
| $T_a = 25$ °C | $R_{th\ j-a}$ (RF) | max. | 60 K/W |
|---------------|--------------------|------|--------|

From junction to mounting base

| | | | |
|---------------------------------|---------------------|------|--------|
| $T_{mb} = 25$ °C ($f > 1$ MHz) | $R_{th\ j-mb}$ (RF) | max. | 19 K/W |
|---------------------------------|---------------------|------|--------|

Note

1. Device mounted on a printed-circuit board (see Fig.6).

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CHARACTERISTICS

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

Collector-base breakdown voltage

open emitter; $I_C = 2.5\text{ mA}$

$V_{(BR)CBO} > 36\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 10\text{ mA}$

$V_{(BR)CEO} > 16\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 0.5\text{ mA}$

$V_{(BR)EBO} > 3\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 16\text{ V}$

$I_{CES} < 1\text{ mA}$

Second breakdown energy

$L = 25\text{ mH}; f = 50\text{ Hz}; R_{BE} = 10\text{ }\Omega$

$E_{SBR} > 0.3\text{ mJ}$

D.C. current gain

$I_C = 0.15\text{ A}; V_{CE} = 10\text{ V}$

$h_{FE} > 25$

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

$I_E = i_e = 0; V_{CB} = 12.5\text{ V}$

C_c typ. 1.8 pF

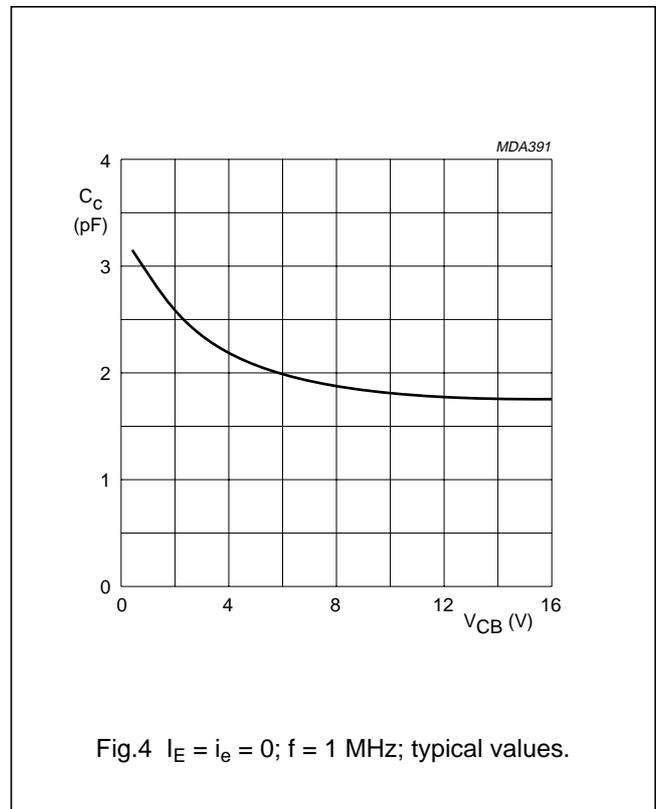
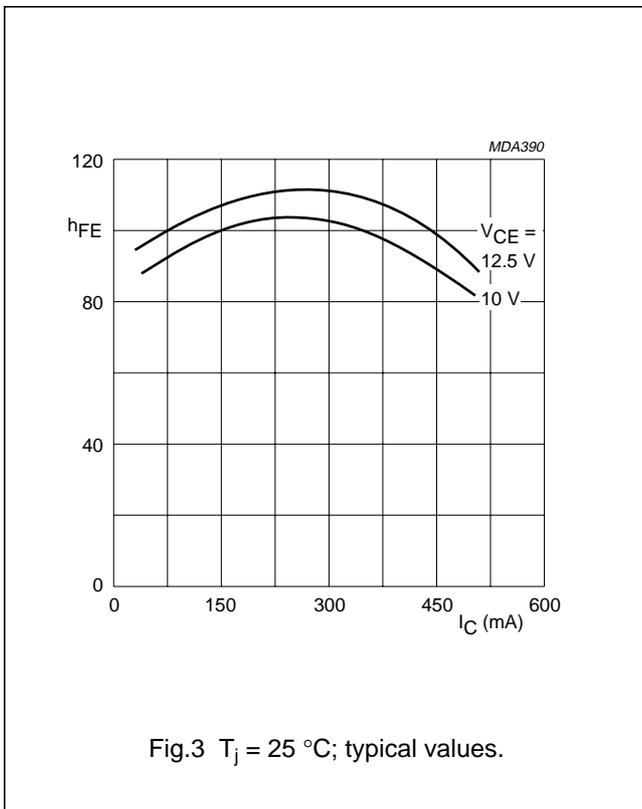
Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 12.5\text{ V}$

C_{re} typ. 1.0 pF

Collector-mounting base capacitance

C_{c-mb} typ. 0.5 pF



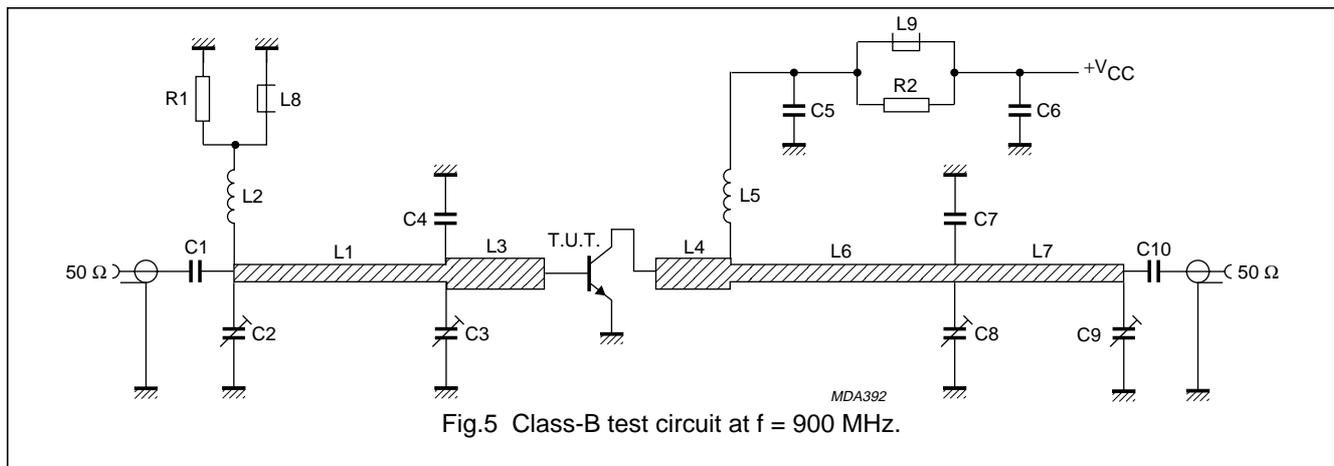
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APPLICATION INFORMATION

RF performance in CW operation (common-emitter circuit, class-B): $f = 900 \text{ MHz}$; $T_a = 25 \text{ }^\circ\text{C}$

| MODE OF OPERATION | V_{CE} V | P_L W | G_p dB | η_c % |
|-------------------|---------------|------------|-------------------|-----------------|
| narrow band; CW | 12.5 | 1 | > 7.5 typ. 9.0 | > 50 typ. 60 |
| | 9.6 | 1 | typ. 7.0 | typ. 57 |



List of components:

- C1 = C10 = 33 pF multilayer ceramic chip capacitor
- C2 = C9 = 1.4 to 5.5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
- C4 = 5.6 pF multilayer ceramic chip capacitor⁽¹⁾
- C5 = 10 pF multilayer ceramic chip capacitor
- C6 = 330 pF multilayer ceramic chip capacitor
- C7 = 3.9 pF multilayer ceramic chip capacitor⁽¹⁾
- C8 = 1.2 to 3.5 pF film dielectric trimmer (cat. no. 2222 809 05001)
- L1 = L7 = 50 Ω stripline (30.8 mm \times 2.4 mm)
- L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0.4 mm); int. dia. 3 mm; leads 2 \times 5 mm
- L3 = 38 Ω stripline (16.0 mm \times 3.5 mm)
- L4 = 38 Ω stripline (11.0 mm \times 3.5 mm)
- L5 = 280 nH; 15 turns closely wound enamelled Cu wire (0.4 mm); int. dia. 3 mm; leads 2 \times 5 mm
- L6 = 50 Ω stripline (41.2 mm \times 2.4 mm)
- L8 = L9 = Ferroxcube wideband HF choke, grade 3B (cat. no. 4312 020 36642)
- R1 = R2 = 10 $\Omega \pm 5\%$; 0.25 W metal film resistor

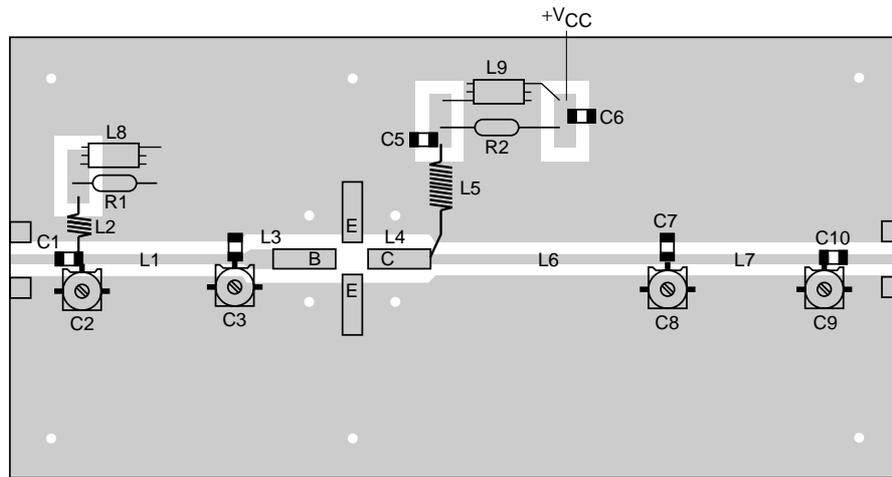
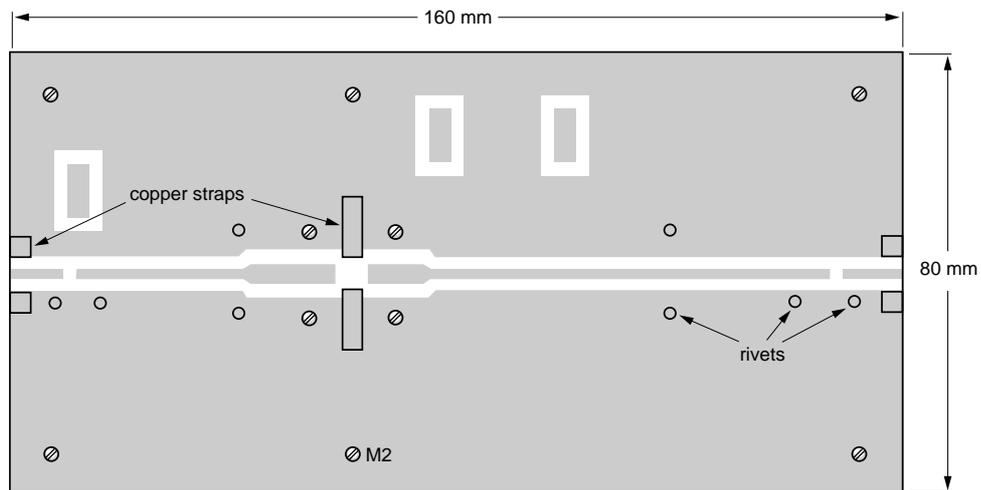
L1, L3, L4, L6 and L7 are striplines on a double Cu-clad printed-circuit board with P.T.F.E. fibre-glass dielectric ($\epsilon_r = 2.2$); thickness $\frac{1}{32}$ inch; thickness of copper-sheet 2 \times 35 μm .

Notes

1. American Technical Ceramics capacitor type 100A or capacitor of same quality.
2. Device mounted on a printed-circuit board (see Fig.6).

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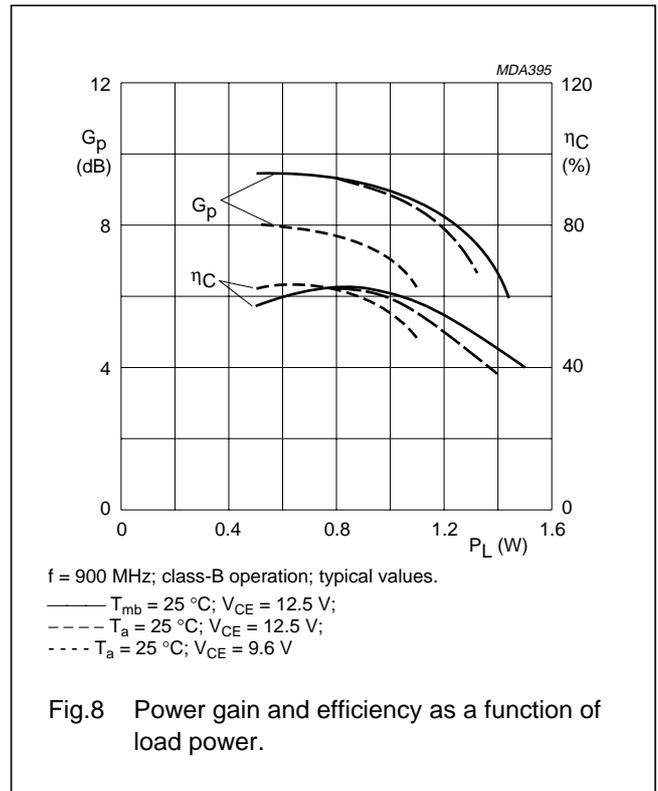
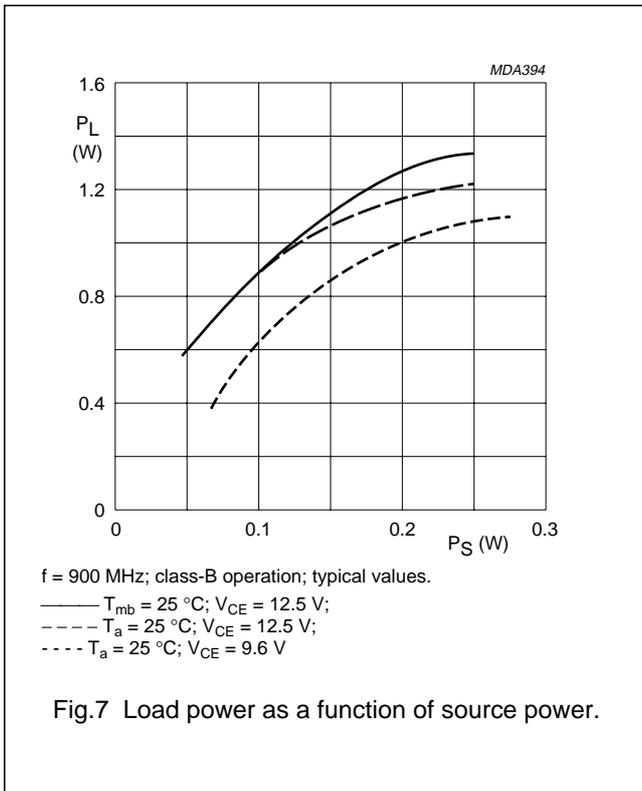
MDA393

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

Fig.6 Printed-circuit board and component lay-out for 900 MHz class-B test circuit.

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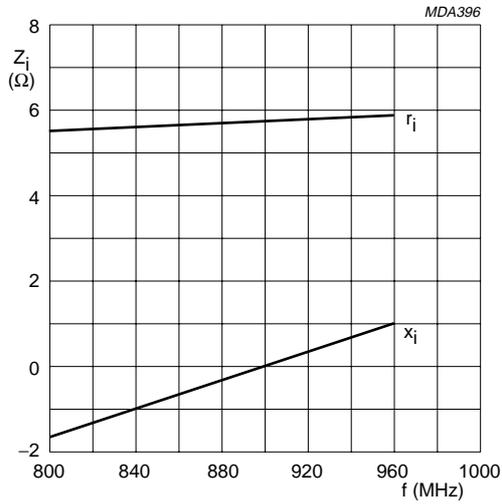


RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15.5 V at $T_a = 25$ °C. Device mounted on a printed-circuit board (see Fig.6).

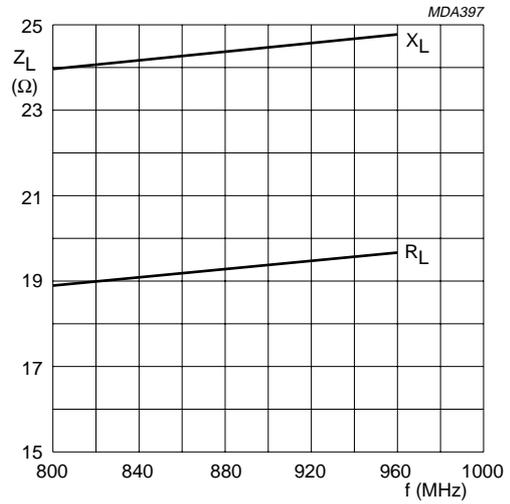
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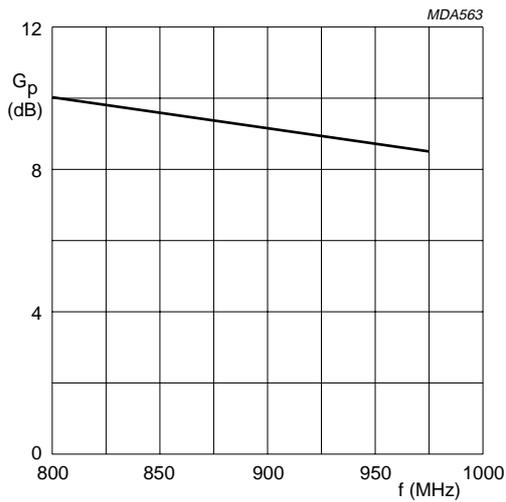
$V_{CE} = 12.5$ V; $P_L = 1$ W; $f = 800 - 960$ MHz;
 $T_{mb} = 25$ °C; class-B operation; typical values.

Fig.9 Input impedance (series components).



$V_{CE} = 12.5$ V; $P_L = 1$ W; $f = 800 - 960$ MHz;
 $T_{mb} = 25$ °C; class-B operation; typical values.

Fig.10 Load impedance (series components).



$V_{CE} = 12.5$ V; $P_L = 1$ W; $f = 800 - 960$ MHz;
 $T_{mb} = 25$ °C; class-B operation; typical values.

Fig.11 Power gain as a function of frequency.

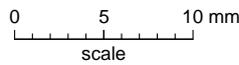
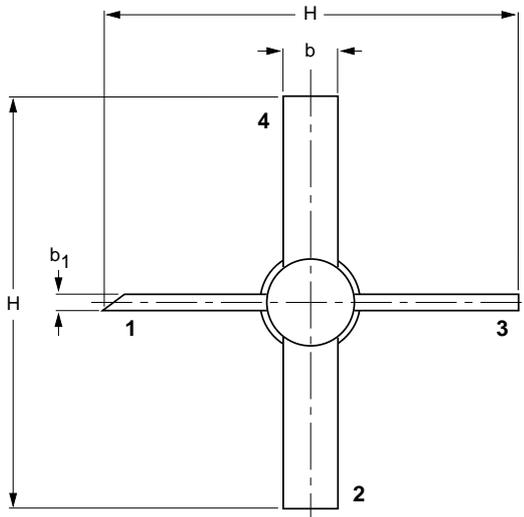
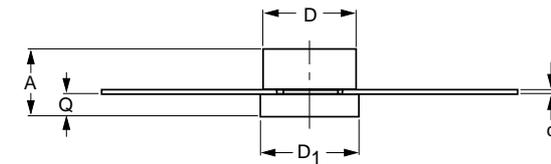
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PACKAGE OUTLINE

Studless ceramic package; 4 leads

SOT172D



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

| UNIT | A | b | b ₁ | c | D | D ₁ | H | Q |
|--------|----------------|--------------|----------------|----------------|----------------|----------------|----------------|----------------|
| mm | 3.71 2.89 | 3.31 3.04 | 0.89 0.63 | 0.16 0.10 | 5.20 4.95 | 5.33 5.08 | 26.17 24.63 | 1.15 0.88 |
| inches | 0.146 0.114 | 0.13 0.12 | 0.035 0.025 | 0.006 0.004 | 0.205 0.195 | 0.210 0.200 | 1.03 0.97 | 0.045 0.035 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT172D | | | | | | 97-06-28 |

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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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