

DATA SHEET

BLV103 UHF power transistor

Product specification

March 1993

UHF power transistor

BLV103

FEATURES

- Internal matching for an optimum wideband capability and high gain
- Emitter-ballasting resistors for optimum temperature profile
- Gold metallization ensures excellent reliability.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a 6-lead SOT171 flange envelope with a ceramic cap. It is intended for common emitter, class-AB operation in cellular radio base stations in the 960 MHz frequency band. All leads are isolated from the mounting base.

PINNING - SOT171

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | emitter |
| 2 | emitter |
| 3 | base |
| 4 | collector |
| 5 | emitter |
| 6 | emitter |

QUICK REFERENCE DATA

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

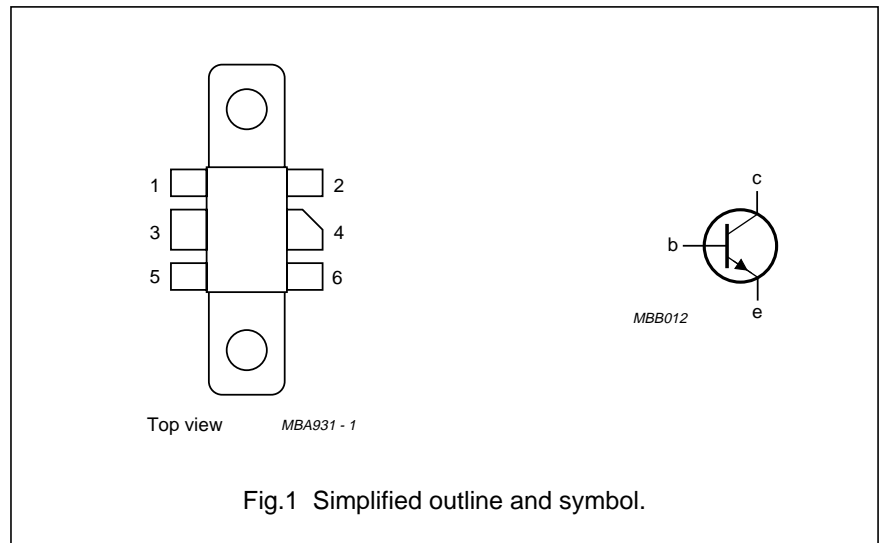
| MODE OF OPERATION | f (MHz) | V _{CE} (V) | P _L (W) | G _p (dB) | η_c (%) |
|-------------------|---------|---------------------|--------------------|---------------------|--------------|
| c.w. class-AB | 960 | 24 | 4 | > 11.5 | > 45 |

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc 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.

PIN CONFIGURATION



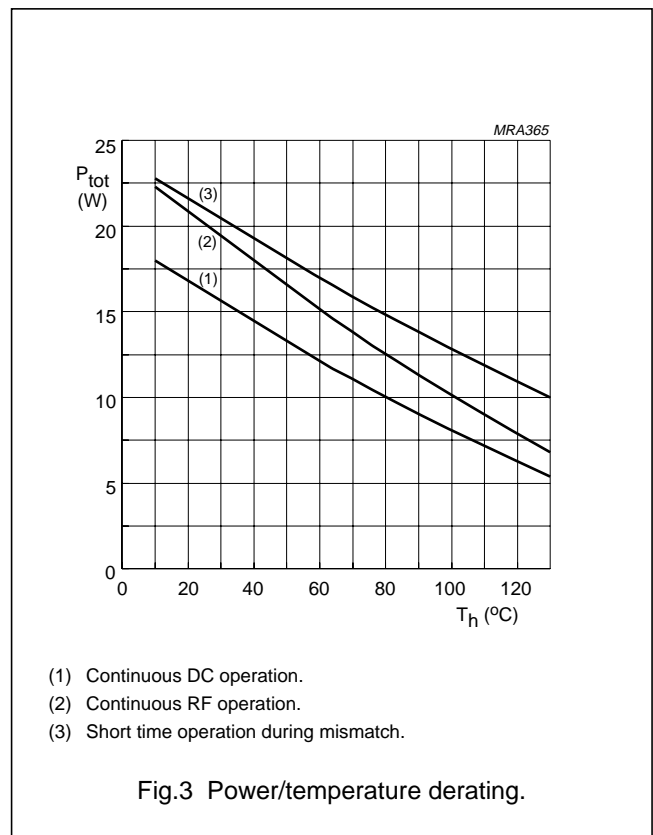
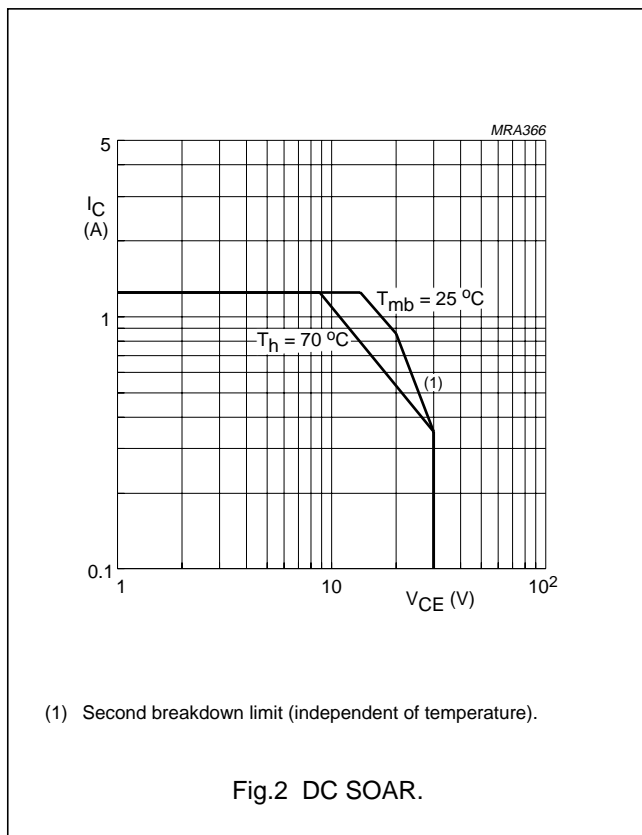
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LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|--------------------------------|-------------------------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 50 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 30 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 4 | V |
| I_C | collector current | DC or average value | – | 1.25 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$ | – | 17 | W |
| T_{stg} | storage temperature range | | –65 | 150 | °C |
| T_j | junction operating temperature | | – | 200 | °C |



THERMAL RESISTANCE

| SYMBOL | PARAMETER | CONDITIONS | MAX. | UNIT |
|----------------|--------------------------------|--|------|------|
| $R_{th\ j-mb}$ | from junction to mounting base | $T_{mb} = 25\text{ °C}$; $P_{dis} = 17\text{ W}$ | 10.3 | K/W |
| $R_{th\ mb-h}$ | from mounting base to heatsink | | 0.4 | K/W |

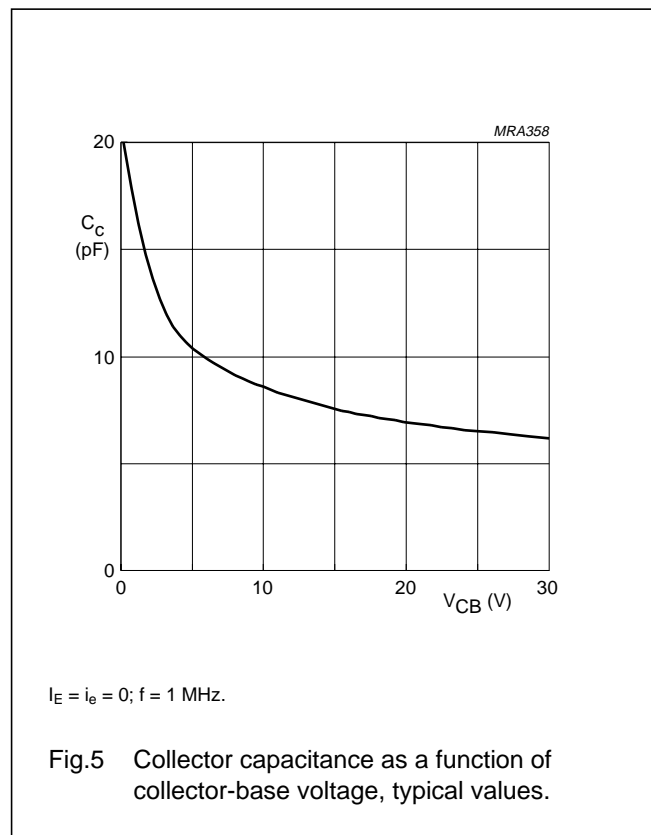
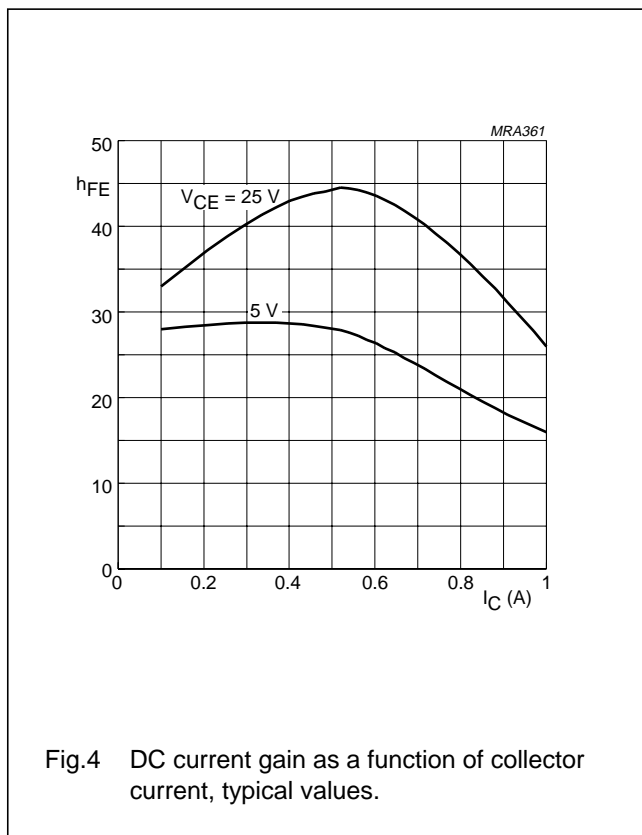
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|-------------------------------------|--|------|------|------|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | open emitter; $I_C = 4\text{ mA}$ | 50 | – | – | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | open base; $I_C = 30\text{ mA}$ | 30 | – | – | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | open collector; $I_E = 2\text{ mA}$ | 4 | – | – | V |
| I_{CES} | collector-emitter leakage current | $V_{BE} = 0$; $V_{CE} = 30\text{ V}$ | – | – | 1 | mA |
| h_{FE} | DC current gain | $V_{CE} = 25\text{ V}$; $I_C = 300\text{ mA}$ | 20 | 40 | – | |
| C_c | collector capacitance | $V_{CB} = 25\text{ V}$; $I_E = I_e = 0$; $f = 1\text{ MHz}$ | – | 6.6 | 8 | pF |
| C_{re} | feedback capacitance | $V_{CE} = 25\text{ V}$; $I_C = 20\text{ mA}$; $f = 1\text{ MHz}$ | – | 3.5 | 4.5 | pF |



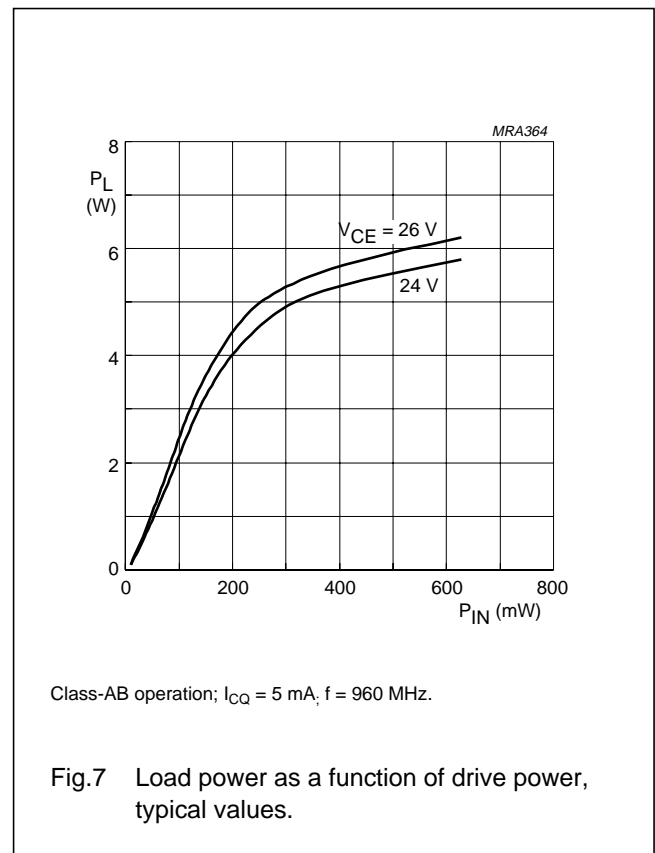
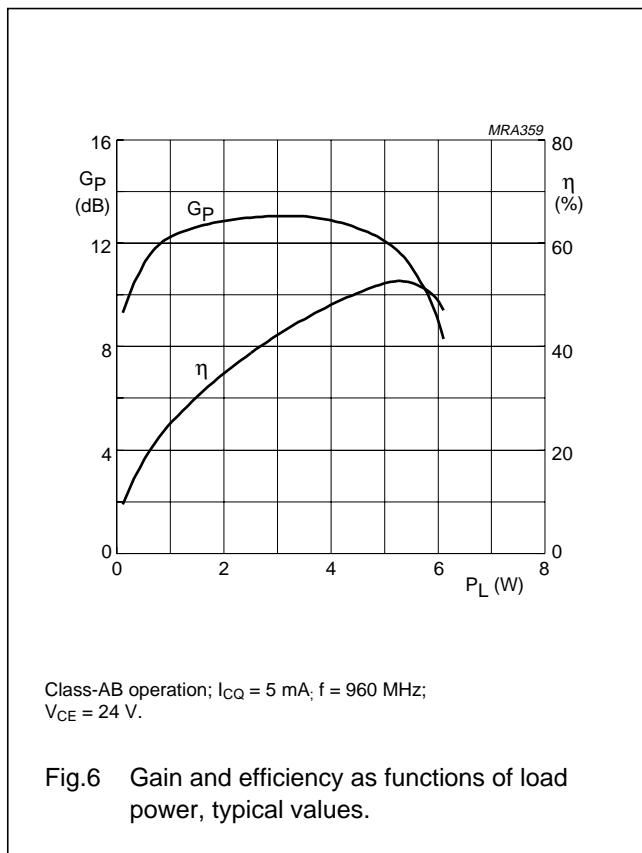
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APPLICATION INFORMATION

RF performance at $T_h = 25\text{ }^\circ\text{C}$ in a common emitter test circuit, $R_{th\text{ mb-h}} = 0.4\text{ K/W}$.

| MODE OF OPERATION | f (MHz) | V _{CE} (V) | I _{CQ} (mA) | P _L (W) | G _P (dB) | η _c (%) |
|-------------------|---------|---------------------|----------------------|--------------------|---------------------|--------------------|
| c.w. class-AB | 960 | 24 | 5 | 4 | > 11.5 typ. 13 | > 45 typ. 48 |
| | 960 | 26 | 5 | 4 | typ. 14 | typ. 50 |



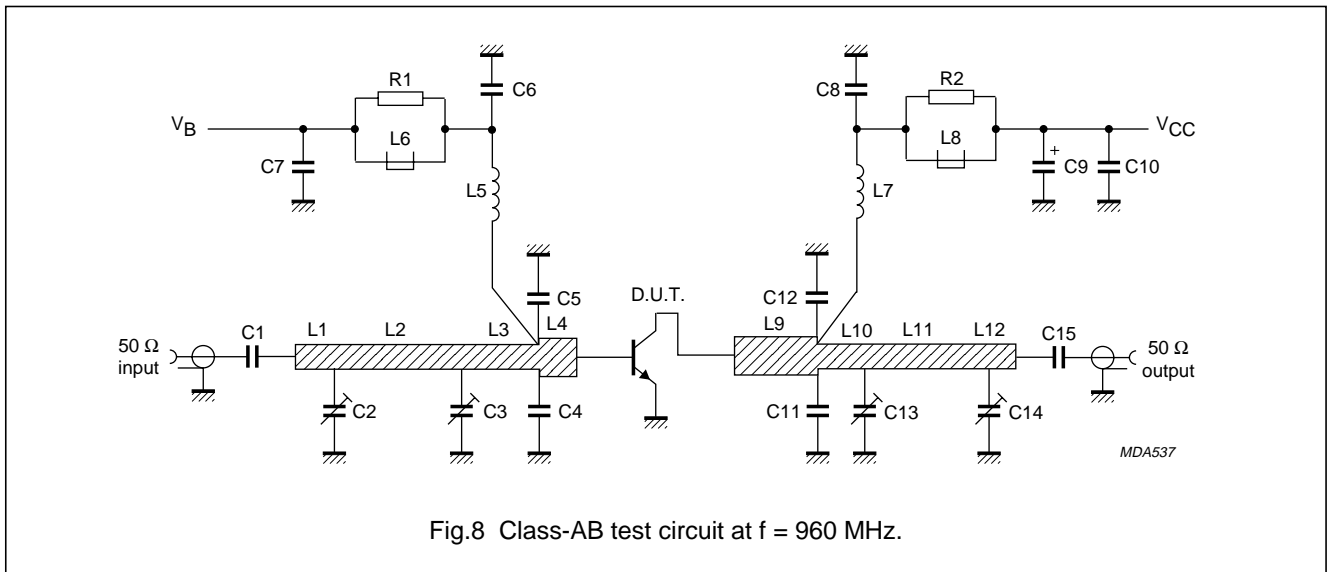
Ruggedness in class-AB operation

The BLV103 is capable of withstanding a full load mismatch corresponding to VSWR = 50:1 through all phases at rated output power under the following conditions:

V_{CE} = 24 V; f = 960 MHz; T_h = 25 °C;
R_{th mb-h} = 0.4 K/W.

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Fig.8 Class-AB test circuit at $f = 960$ MHz.

List of components (see test circuit)

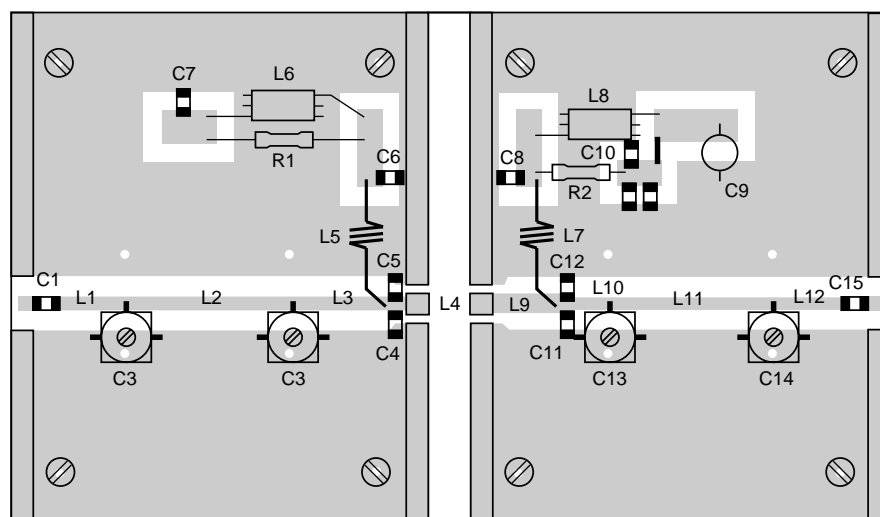
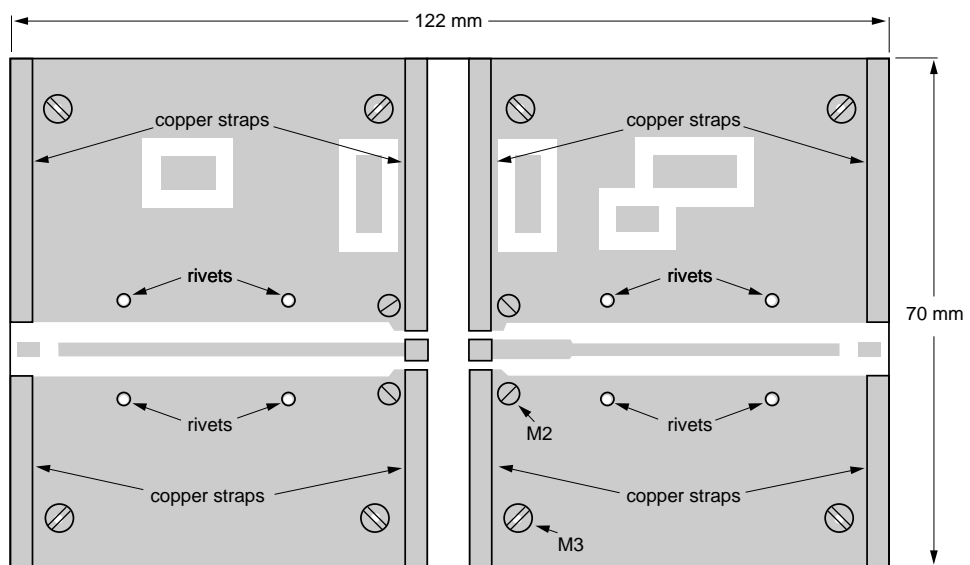
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE NO. |
|---------------------|---|-------------------------------|---|----------------|
| C1, C6, C7, C8, C15 | multilayer ceramic chip capacitor | 330 pF | | |
| C2, C3, C13, C14 | film dielectric trimmer | 1.4 to 5.5 pF | | 2222 809 09001 |
| C4, C5 | multilayer ceramic chip capacitor (note 1) | 5.1 pF | | |
| C9 | 35 V solid aluminum capacitor | 2.2 μ F | | 2222 128 50228 |
| C10 | multilayer ceramic chip capacitor | 3 \times 100 nF in parallel | | |
| C11, C12 | multiplayer ceramic chip capacitor (note 2) | 6.2 pF | | |
| L1, L12 | stripline (note 3) | 50 Ω | 9 mm \times 2.4 mm | |
| L2, L11 | stripline (note 3) | 50 Ω | 23 mm \times 2.4 mm | |
| L3 | stripline (note 3) | 50 Ω | 16 mm \times 2.4 mm | |
| L4 | stripline (note 3) | 43 Ω | 3 mm \times 3 mm | |
| L5 | 3 turns enamelled 0.8 mm copper wire | | int. dia. 3 mm; length 5 mm; leads 2 mm \times 5 mm | |
| L6, L8 | grade 3B Ferroxcube wideband HF choke | | | 4312 020 36642 |
| L7 | 4 turns enamelled 0.8 mm copper wire | | int. dia. 4 mm; length 5 mm; leads 2 mm \times 5 mm | |
| L9 | stripline (note 3) | 43 Ω | 14.5 mm \times 3 mm | |
| L10 | stripline (note 3) | 50 Ω | 4.5 mm \times 2.4 mm | |
| R1, R2 | 0.4 W metal film resistor | 10 Ω | | 2322 151 71009 |

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Notes

1. American Technical Ceramics (ATC) capacitor, type 100A or other capacitor of the same quality.
2. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
3. The striplines are on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric ($\epsilon_r = 2.2$); thickness $\frac{1}{32}$ inch.



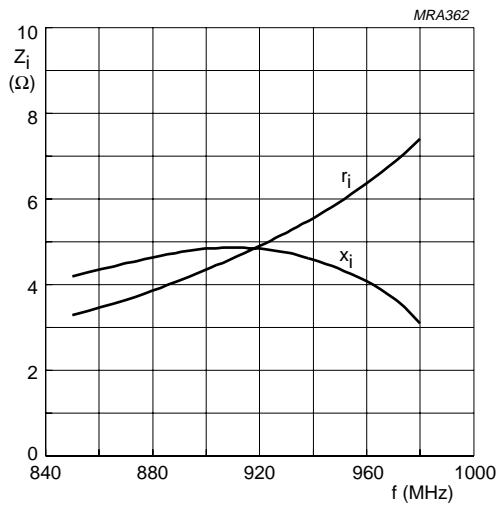
MDA536

The circuit and components are situated on one side of a copper-clad PTFE fibre-glass board; the other side is fully metallized and serves as a ground plane. Connections are made by means of fixing screws, hollow rivets and copper straps around the board and under the emitters, to provide a direct contact between the components side and the ground plane.

Fig.9 Component layout for 960 MHz class-AB test circuit.

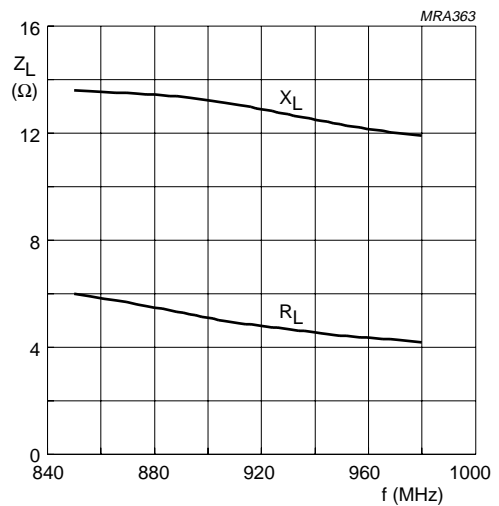
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Class-AB operation; $V_{CE} = 24$ V; $I_{CQ} = 5$ mA;
 $P_L = 4$ W; $T_h = 25$ °C.

Fig.10 Input impedance (series components) as a function of frequency, typical values.



Class-AB operation; $V_{CE} = 24$ V; $I_{CQ} = 5$ mA;
 $P_L = 4$ W; $T_h = 25$ °C.

Fig.11 Load impedance (series components) as a function of frequency, typical values.

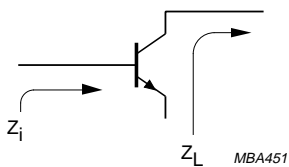
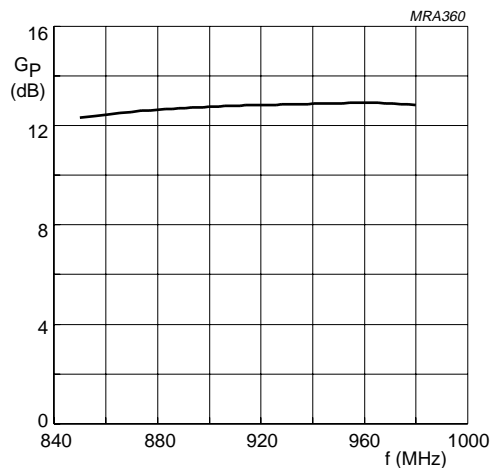


Fig.12 Definition of transistor impedance.



Class-AB operation; $V_{CE} = 24$ V; $I_{CQ} = 5$ mA;
 $P_L = 4$ W; $T_h = 25$ °C.

Fig.13 Power gain as a function of frequency, typical values.

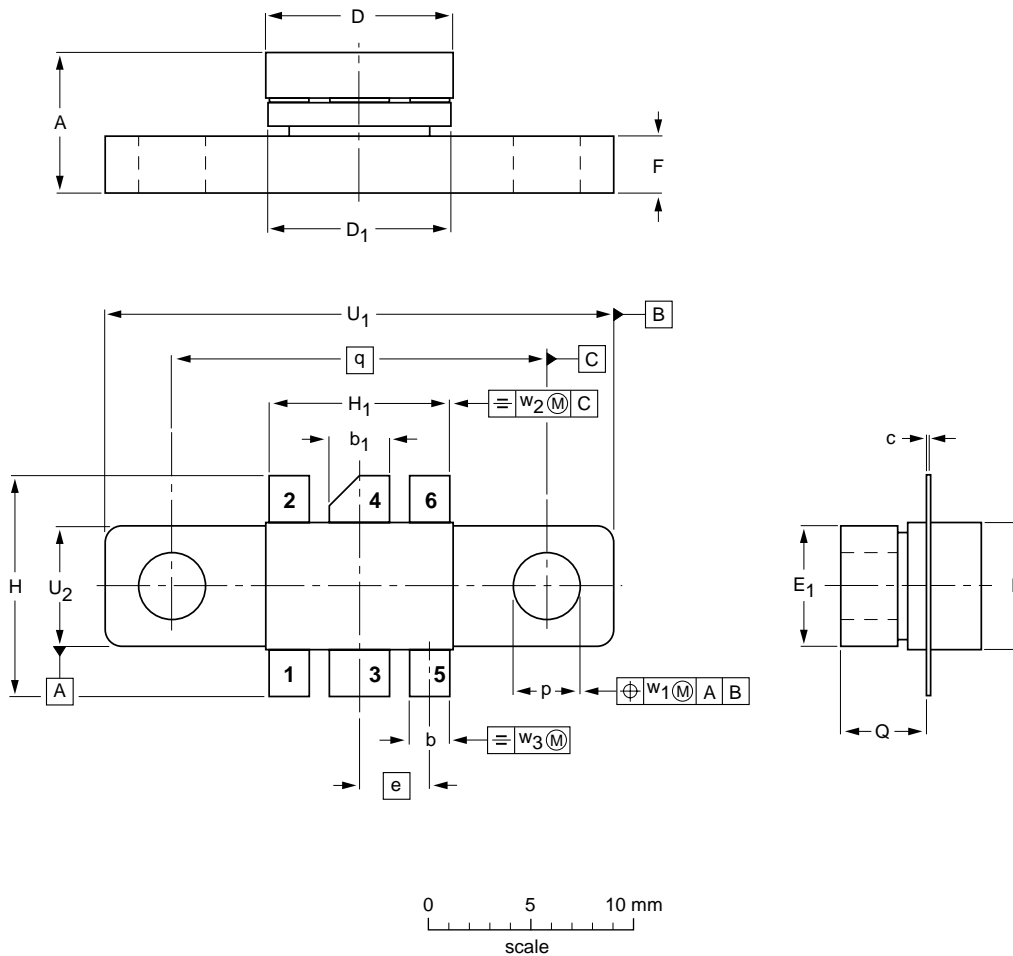
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PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 6 leads

SOT171A



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

| UNIT | A | b | b ₁ | c | D | D ₁ | E | E ₁ | e | F | H | H ₁ | p | Q | q | U ₁ | U ₂ | w ₁ | w ₂ | w ₃ |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|
| mm | 6.81 6.07 | 2.15 1.85 | 3.20 2.89 | 0.16 0.07 | 9.25 9.04 | 9.30 8.99 | 5.95 5.74 | 6.00 5.70 | 3.58 | 3.05 2.54 | 11.31 10.54 | 9.27 9.01 | 3.43 3.17 | 4.32 4.11 | 18.42 | 24.90 24.63 | 6.00 5.70 | 0.51 | 1.02 | 0.26 |
| inches | 0.268 0.239 | 0.085 0.073 | 0.126 0.114 | 0.006 0.003 | 0.364 0.356 | 0.366 0.354 | 0.234 0.226 | 0.236 0.224 | 0.140 | 0.120 0.100 | 0.445 0.415 | 0.365 0.355 | 0.135 0.125 | 0.170 0.162 | 0.725 | 0.980 0.970 | 0.236 0.224 | 0.02 | 0.04 | 0.01 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT171A | | | | | | 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. | |

LIFE SUPPORT APPLICATIONS

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