

DATA SHEET

BLT81 UHF power transistor

Product specification
Supersedes data of November 1992

1996 May 09

UHF power transistor

BLT81

FEATURES

- SMD encapsulation
- Gold metallization ensures excellent reliability.

APPLICATIONS

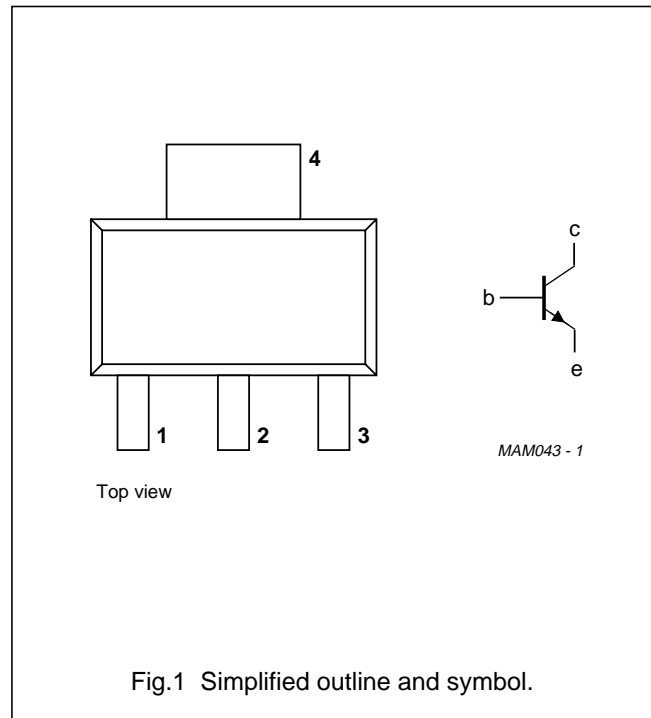
- Hand-held radio equipment in the 900 MHz communication band.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a plastic SOT223 SMD package.

PINNING - SOT223

| PIN | SYMBOL | DESCRIPTION |
|-----|--------|-------------|
| 1 | e | emitter |
| 2 | b | base |
| 3 | e | emitter |
| 4 | c | collector |



QUICK REFERENCE DATA

RF performance at $T_s \leq 60 \text{ }^\circ\text{C}$ in a common emitter test circuit (see Fig.7).

| MODE OF OPERATION | f (MHz) | V _{CE} (V) | P _L (W) | G _p (dB) | η_c (%) |
|-------------------------|---------|---------------------|--------------------|---------------------|--------------|
| CW, class-B narrow band | 900 | 7.5 | 1.2 | ≥ 6 | ≥ 60 |
| | | 6 | 1.2 | typ. 6.5 | typ. 77 |

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LIMITING VALUES

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

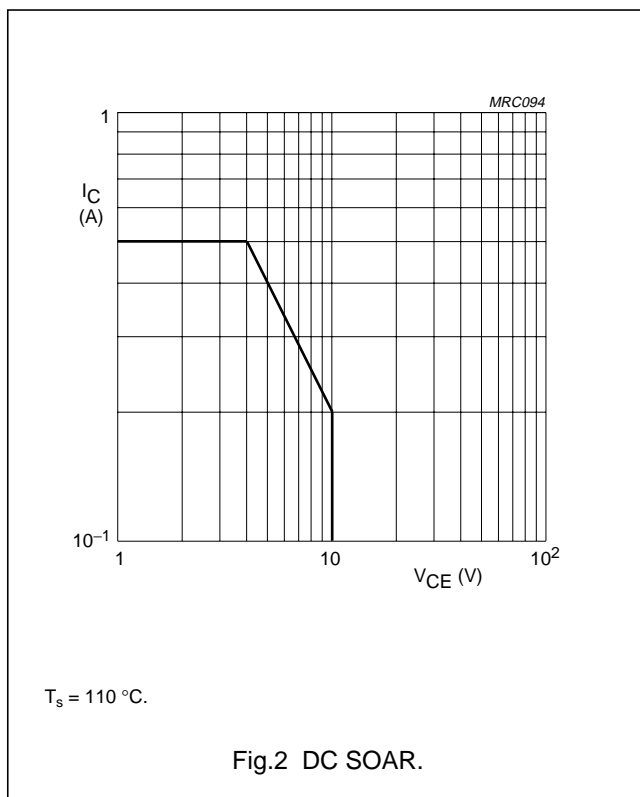
| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-------------|--------------------------------|--------------------------------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 20 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 9.5 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 2.5 | V |
| I_C | collector current (DC) | | – | 500 | mA |
| $I_{C(AV)}$ | average collector current | | – | 500 | mA |
| P_{tot} | total power dissipation | $T_s = 110\text{ °C}$; note 1 | – | 2 | W |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| T_j | operating junction temperature | | – | 175 | °C |

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|---|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | $P_{tot} = 2\text{ W}$; $T_s = 110\text{ °C}$; note 1 | 32 | K/W |

Note to the “Limiting values” and “Thermal characteristics”

- T_s is the temperature at the soldering point of the collector pin.



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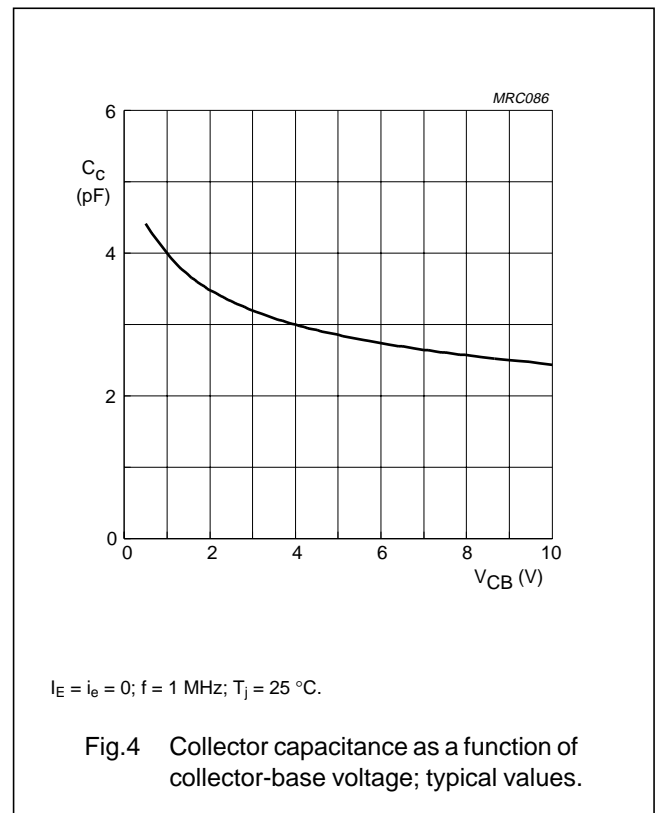
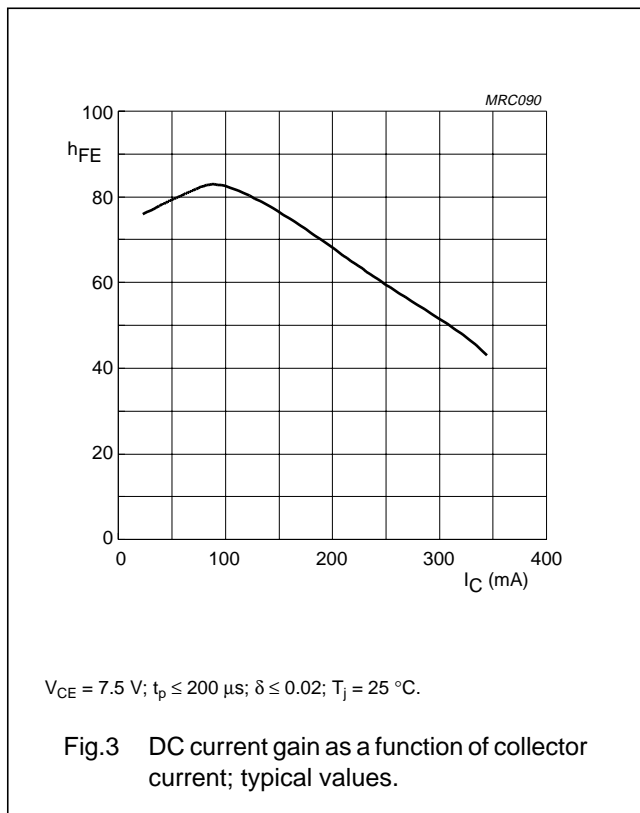
CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|-------------------------------------|---|------|------|------|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | open emitter; $I_C = 1\text{ mA}$ | 20 | – | – | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | open base; $I_C = 10\text{ mA}$ | 9.5 | – | – | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | open collector; $I_E = 0.1\text{ mA}$ | 2.5 | – | – | V |
| I_{CES} | collector leakage current | $V_{CE} = 10\text{ V}; V_{BE} = 0$ | – | – | 0.1 | mA |
| h_{FE} | DC current gain | $V_{CE} = 5\text{ V}; I_C = 300\text{ mA};$ note 1; | 25 | – | – | |
| C_c | collector capacitance | $V_{CB} = 7.5\text{ V}; I_E = i_e = 0; f = 1\text{ MHz};$ | – | 2.7 | 4 | pF |
| C_{re} | feedback capacitance | $V_{CE} = 7.5\text{ V}; I_C = 0; f = 1\text{ MHz}$ | – | 1.7 | 3 | pF |

Note

1. Measured under pulsed conditions: $t_p \leq 200\text{ }\mu\text{s}; \delta \leq 0.02$.



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APPLICATION INFORMATION

RF performance at $T_s \leq 60\text{ }^\circ\text{C}$ in a common emitter test circuit (see note 1 and Fig.7).

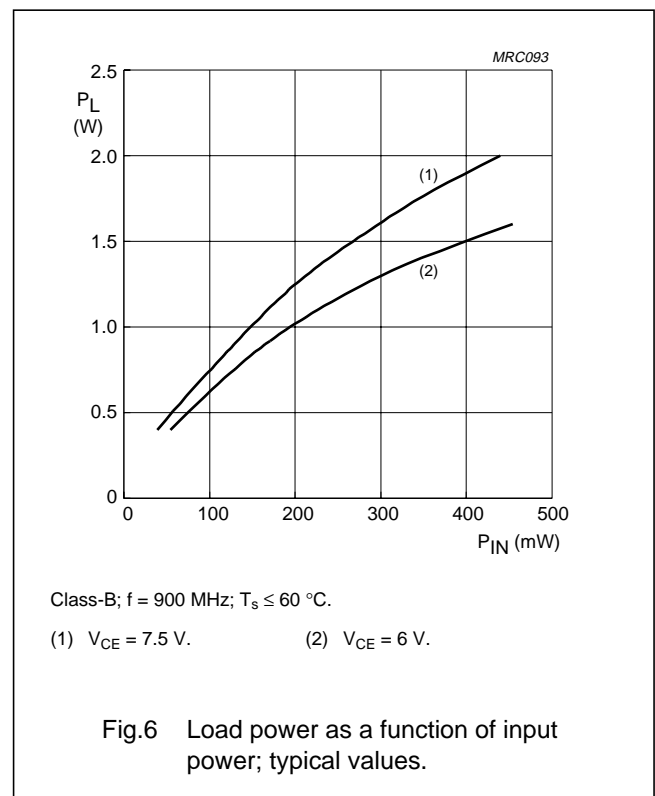
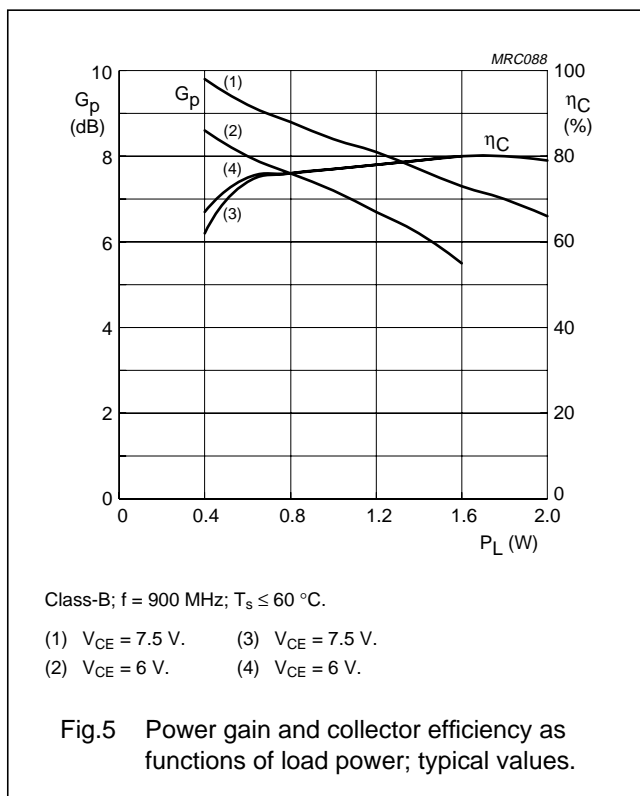
| MODE OF OPERATION | f (MHz) | V _{CE} (V) | P _L (W) | G _p (dB) | η_c (%) |
|-------------------------|---------|---------------------|--------------------|---------------------|----------------------|
| CW, class-B narrow band | 900 | 7.5 | 1.2 | ≥ 6 typ. 8 | ≥ 60 typ. 77 |
| | | 6 | 1.2 | typ. 6.5 | typ. 77 |

Note

- T_s is the temperature at the soldering point of the collector pin.

Ruggedness in class-AB operation

The BLT81 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the following conditions: f = 900 MHz; V_{CE} = 9 V; P_L = 1.2 W; T_s ≤ 60 °C.



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Test circuit information

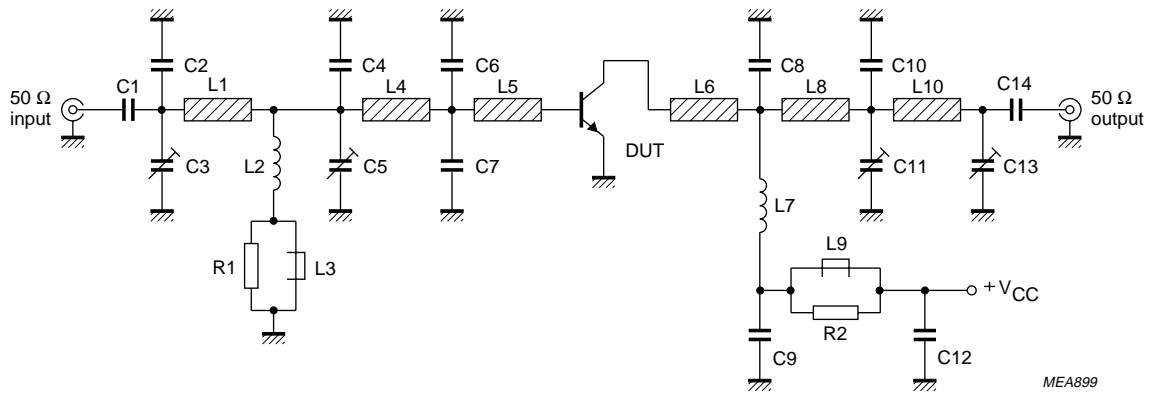


Fig.7 Common emitter test circuit for class-B operation at 900 MHz.

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List of components used in test circuit (see Figs 7 and 8)

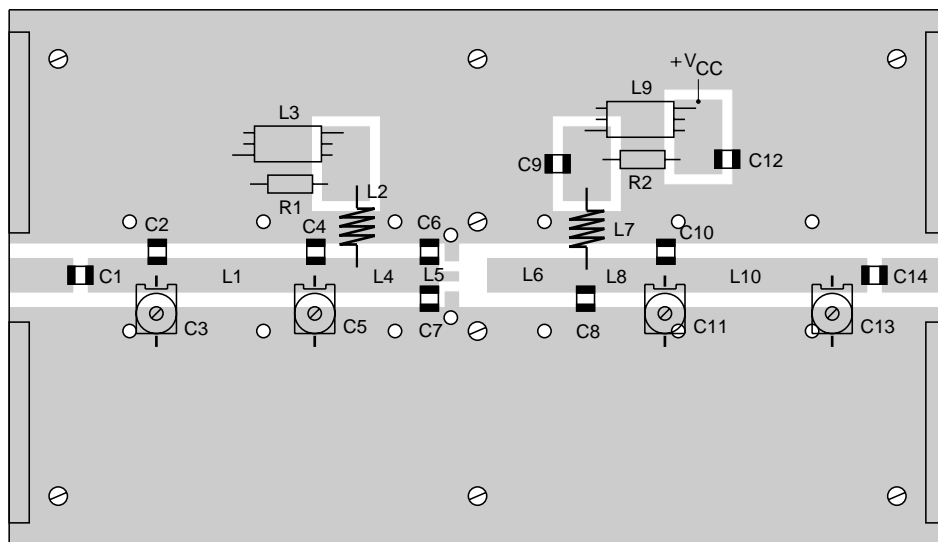
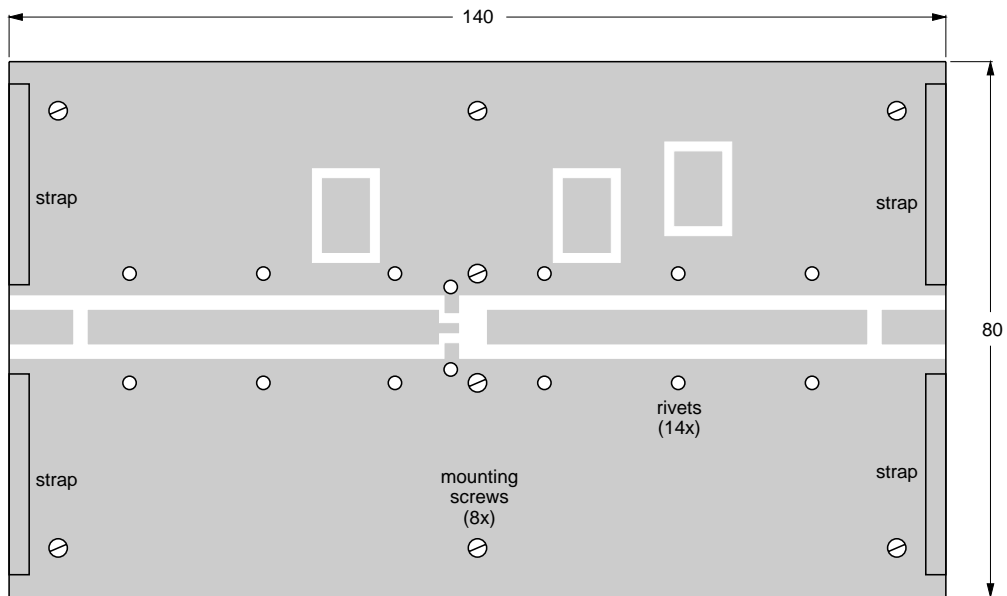
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE No. |
|------------------|---|----------------------|---|----------------|
| C1, C14 | multilayer ceramic chip capacitor; note 1 | 100 pF | | |
| C2 | multilayer ceramic chip capacitor; note 1 | 3 pF | | |
| C3, C5, C11, C13 | film dielectric trimmer | 1.4 to 5.5 pF | | 2222 809 09004 |
| C4 | multilayer ceramic chip capacitor; note 1 | 5.6 pF | | |
| C6, C7, C10 | multilayer ceramic chip capacitor; note 1 | 5.1 pF | | |
| C8 | multilayer ceramic chip capacitor; note 1 | 3.6 pF | | |
| C9 | multilayer ceramic chip capacitor; note 1 | 220 pF | | |
| C12 | multilayer ceramic chip capacitor; | 1 nF | | |
| L1 | stripline; note 2 | 50 Ω | length 26.6 mm width 4.85 mm | |
| L2 | 10 turns enamelled 0.6 mm copper wire | 250 nH | int. dia. 4.5 mm leads 2 \times 5 mm | |
| L3, L9 | grade 3B Ferroxcube wideband HF choke | | | 4312 020 36640 |
| L4 | stripline; note 2 | 50 Ω | length 18 mm width 4.85 mm | |
| L5 | stripline; note 2 | 75 Ω | length 3.5 mm width 2.5 mm | |
| L6 | stripline; note 2 | 50 Ω | length 10 mm width 4.85 mm | |
| L7 | 4 turns enamelled 0.6 mm copper wire | 65 nH | int. dia. 4.5 mm leads 2 \times 5 mm | |
| L8 | stripline; note 2 | 50 Ω | length 15 mm width 4.85 mm | |
| L10 | stripline; note 2 | 50 Ω | length 24.6 mm width 4.85 mm | |
| R1, R2 | metal film resistor | 10 Ω , 0.25 W | | |

Notes

- 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 ($\epsilon_r = 2.2$); thickness $\frac{1}{16}$ " ; thickness of the copper sheet 35 μm .

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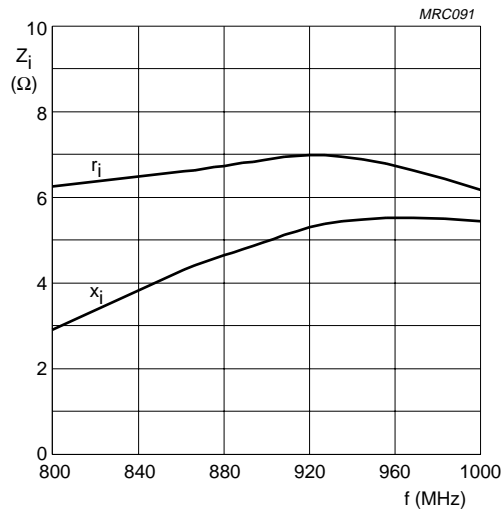
Dimensions in mm.

The components are situated on one side of the copper-clad PTFE fibre-glass board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by means of fixing screws and copper foil straps under the emitter leads.

Fig.8 Printed-circuit board and component lay-out for 900 MHz class-B test circuit in Fig.7.

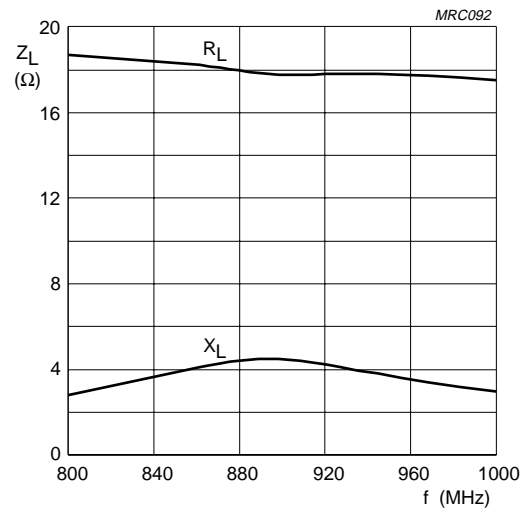
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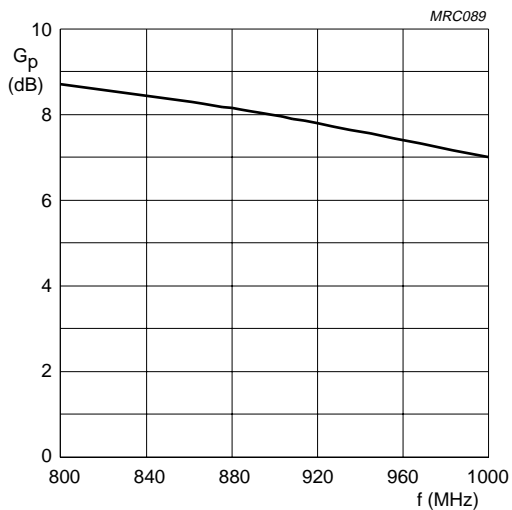
Class-B; $V_{CE} = 7.5$ V; $P_L = 1.2$ W; $T_s \leq 60$ °C.

Fig.9 Input impedance as a function of frequency (series components); typical values.



Class-B; $V_{CE} = 7.5$ V; $P_L = 1.2$ W; $T_s \leq 60$ °C.

Fig.10 Load impedance as a function of frequency (series components); typical values.



Class-B; $V_{CE} = 7.5$ V; $P_L = 1.2$ W; $T_s \leq 60$ °C.

Fig.11 Power gain as a function of frequency; typical values.

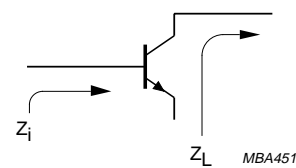
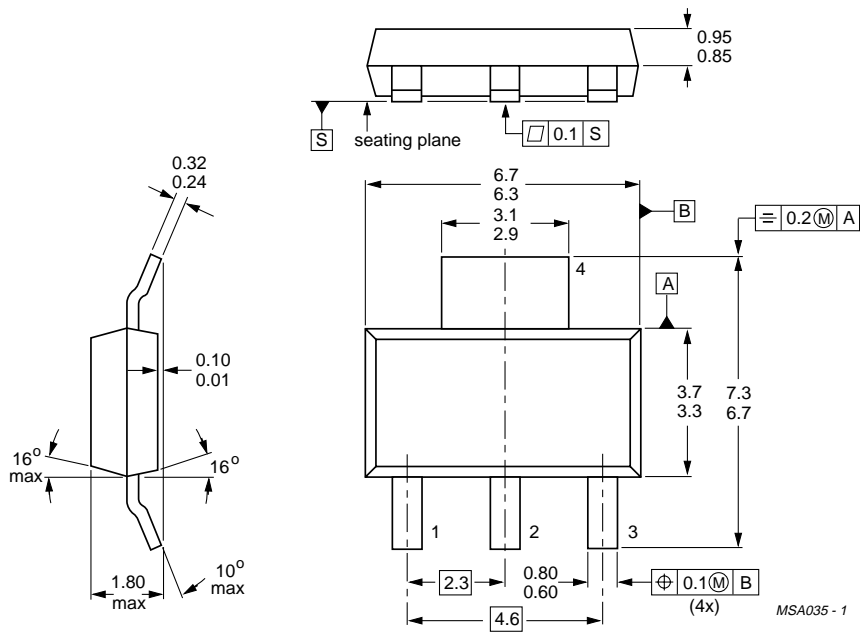


Fig.12 Definition of transistor impedance.

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PACKAGE OUTLINE



Dimensions in mm.

Fig.13 SOT223.

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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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