

# DATA SHEET

## **BLF277** VHF power MOS transistor

Product specification

September 1992

# VHF power MOS transistor

# BLF277

## FEATURES

- High power gain
- Easy power control
- Gold metallization ensures excellent reliability
- Good thermal stability
- Withstands full load mismatch.

## DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for large signal amplifier applications in the VHF frequency range.

The transistor is encapsulated in a 6-lead, SOT119 flange envelope, with a ceramic cap. All leads are isolated from the flange.

A marking code, showing gate-source voltage ( $V_{GS}$ ) information is provided for matched pair applications. Refer to the 'General' section for further information.

## PINNING - SOT119

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | source      |
| 2   | source      |
| 3   | gate        |
| 4   | drain       |
| 5   | source      |
| 6   | source      |

## PIN CONFIGURATION

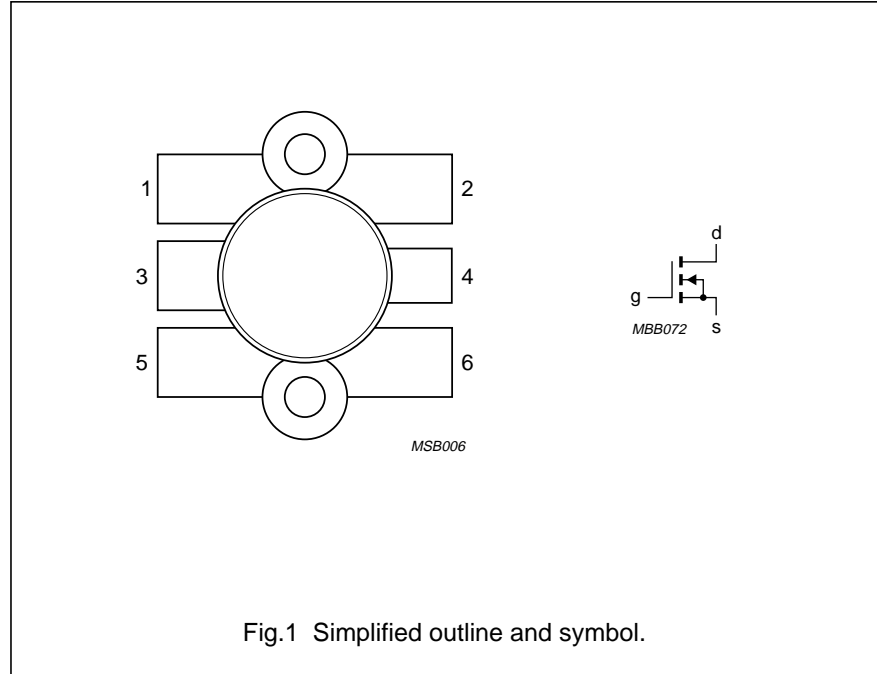


Fig.1 Simplified outline and symbol.

## CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

## 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.

## QUICK REFERENCE DATA

RF performance at  $T_h = 25\text{ °C}$  in a common source circuit.

| MODE OF OPERATION | f (MHz) | $V_{DS}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta_D$ (%) |
|-------------------|---------|--------------|-----------|------------|--------------|
| CW, class-B       | 175     | 50           | 150       | > 14       | > 50         |

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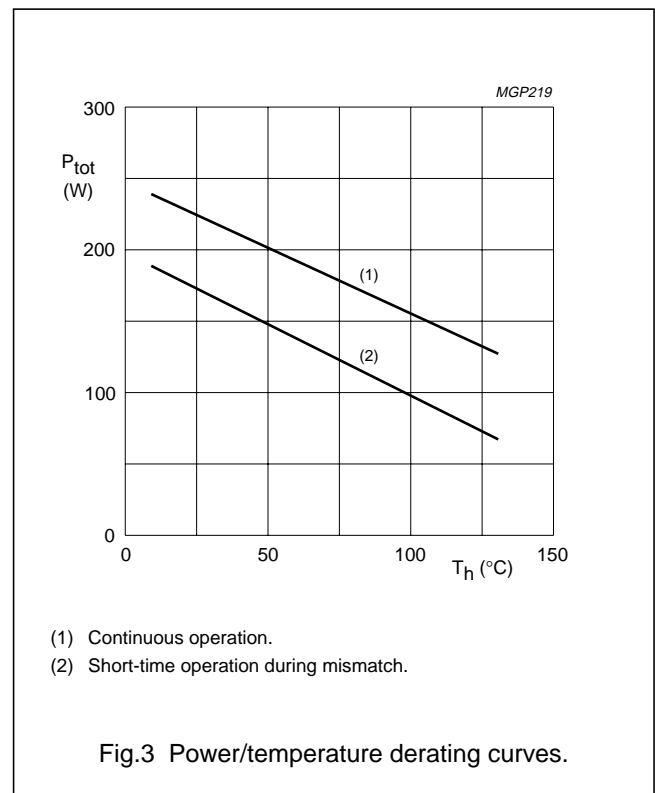
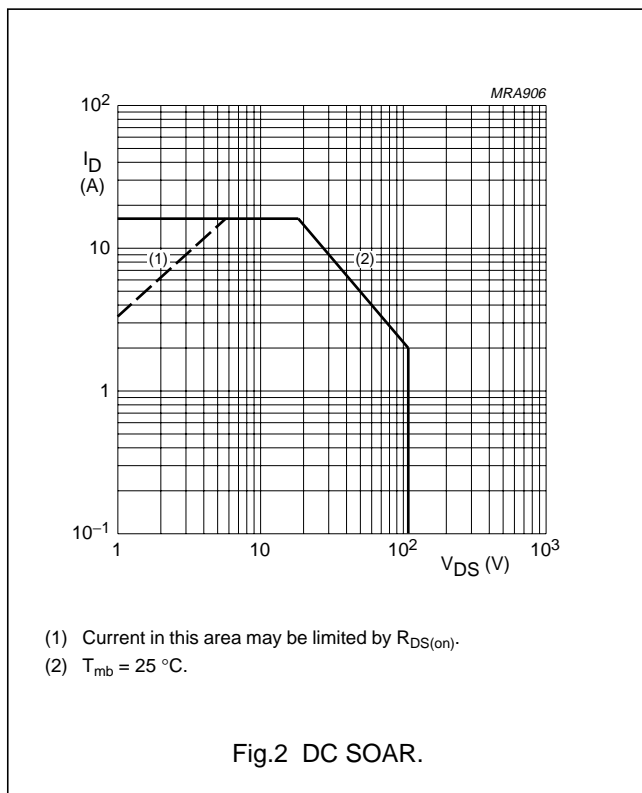
**LIMITING VALUES**

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

| SYMBOL       | PARAMETER               | CONDITIONS                                | MIN. | MAX. | UNIT             |
|--------------|-------------------------|---|------|------|------------------|
| $V_{DS}$     | drain-source voltage    |   | –    | 110  | V                |
| $\pm V_{GS}$ | gate-source voltage     |   | –    | 20   | V                |
| $I_D$        | DC drain current        |   | –    | 16   | A                |
| $P_{tot}$    | total power dissipation | up to $T_{mb} = 25\text{ }^\circ\text{C}$ | –    | 220  | W                |
| $T_{stg}$    | storage temperature     |   | –65  | 150  | $^\circ\text{C}$ |
| $T_j$        | junction temperature    |   | –    | 200  | $^\circ\text{C}$ |

**THERMAL RESISTANCE**

| SYMBOL         | PARAMETER   | CONDITIONS  | THERMAL RESISTANCE |
|----------------|---|---|--------------------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | $T_{mb} = 25\text{ }^\circ\text{C}; P_{tot} = 220\text{ W}$ | 0.8 K/W            |
| $R_{th\ mb-h}$ | thermal resistance from mounting base to heatsink | $T_{mb} = 25\text{ }^\circ\text{C}; P_{tot} = 220\text{ W}$ | 0.2 K/W            |



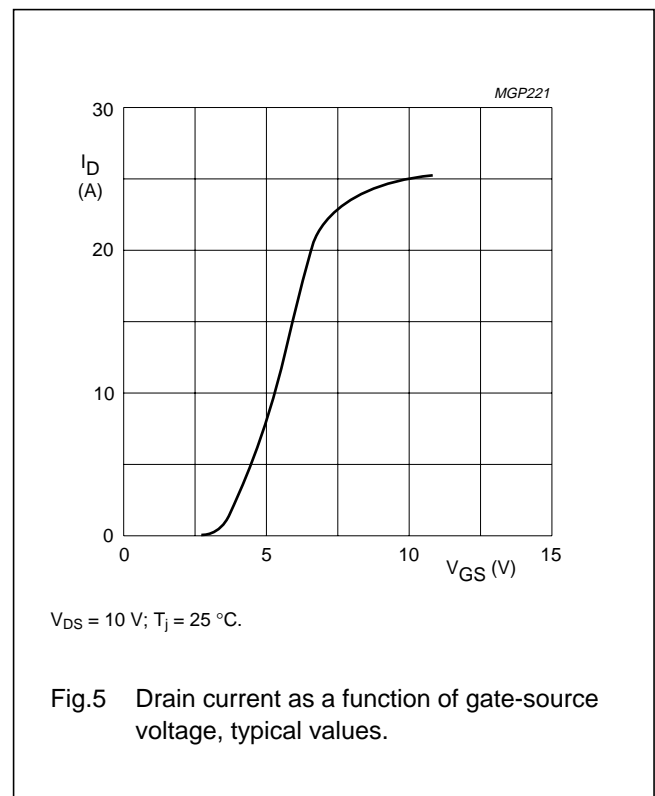
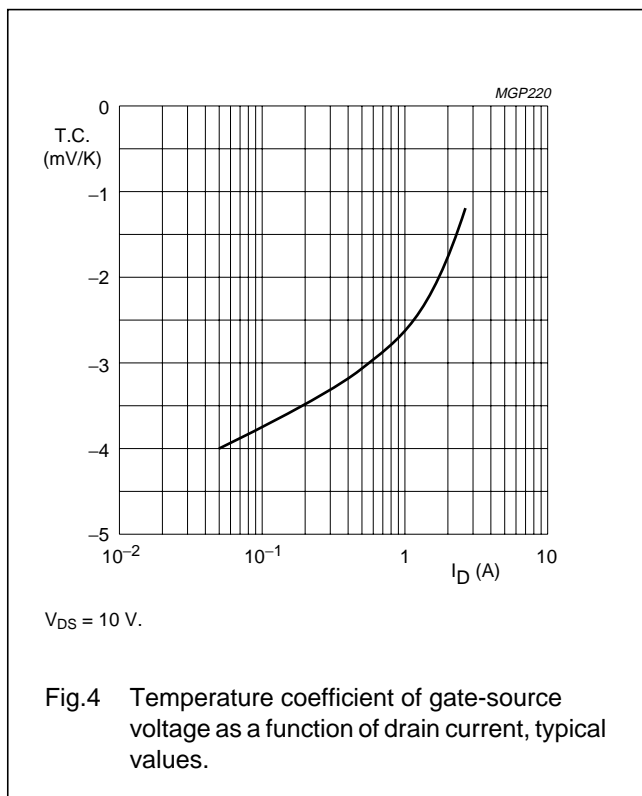
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**CHARACTERISTICS**

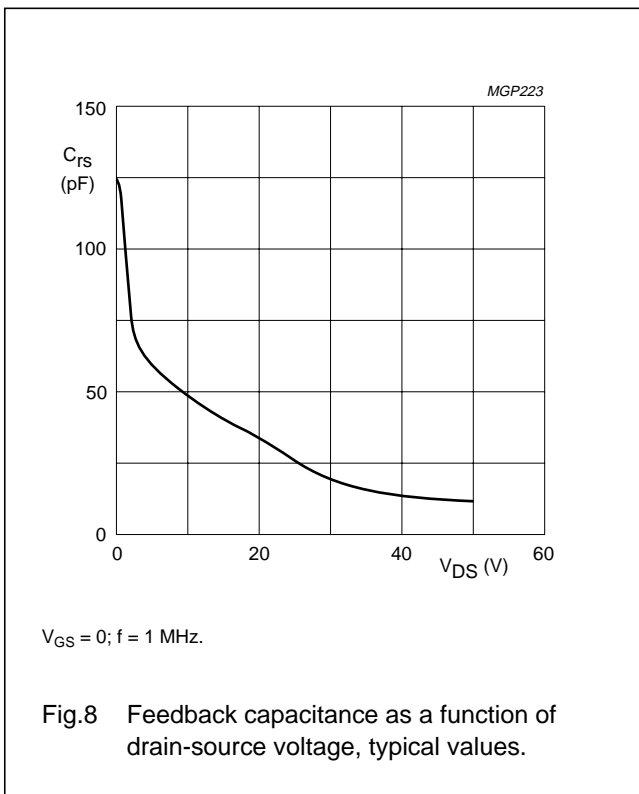
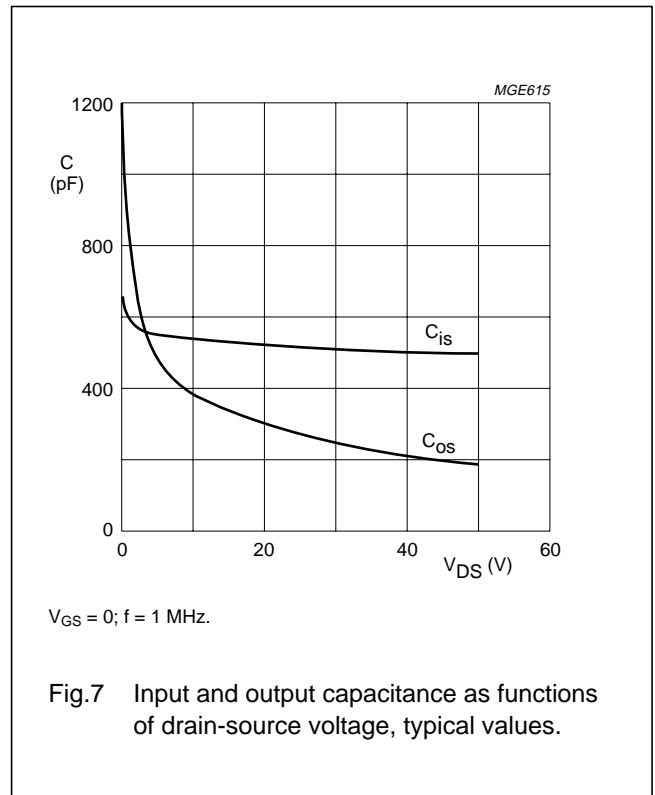
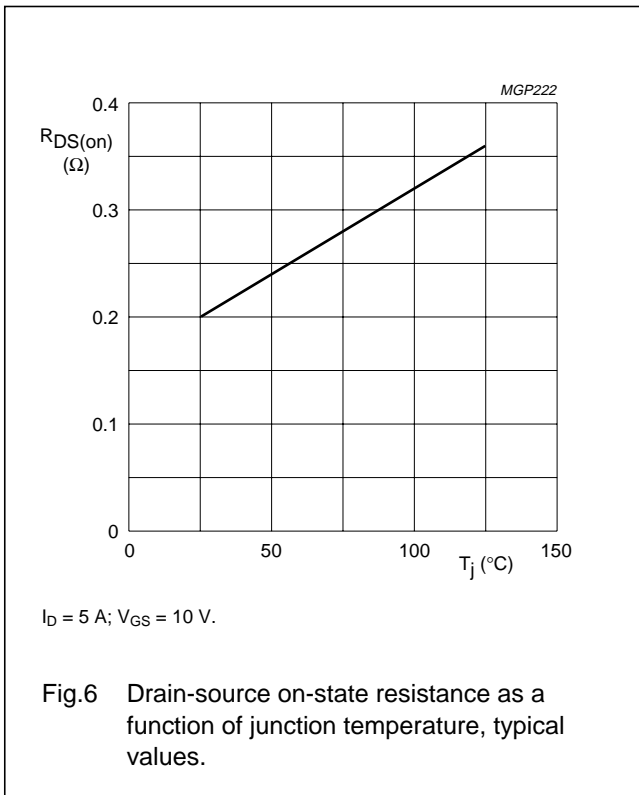
$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

| SYMBOL          | PARAMETER                                       | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|-----------------|---|--|------|------|------|---------------|
| $V_{(BR)DSS}$   | drain-source breakdown voltage                  | $V_{GS} = 0; I_D = 50\text{ mA}$                     | 110  | –    | –    | V             |
| $I_{DSS}$       | drain-source leakage current                    | $V_{GS} = 0; V_{DS} = 50\text{ V}$                   | –    | –    | 2.5  | mA            |
| $I_{GSS}$       | gate-source leakage current                     | $\pm V_{GS} = 20\text{ V}; V_{DS} = 0$               | –    | –    | 1    | $\mu\text{A}$ |
| $V_{GS(th)}$    | gate-source threshold voltage                   | $I_D = 50\text{ mA}; V_{DS} = 10\text{ V}$           | 2    | –    | 4.5  | V             |
| $\Delta V_{GS}$ | gate-source voltage difference of matched pairs | $I_D = 50\text{ mA}; V_{DS} = 10\text{ V}$           | –    | –    | 100  | mV            |
| $g_{fs}$        | forward transconductance                        | $I_D = 5\text{ A}; V_{DS} = 10\text{ V}$             | 4.5  | 6.2  | –    | S             |
| $R_{DS(on)}$    | drain-source on-state resistance                | $I_D = 5\text{ A}; V_{GS} = 10\text{ V}$             | –    | 0.2  | 0.3  | $\Omega$      |
| $I_{DSX}$       | on-state drain current                          | $V_{GS} = 10\text{ V}; V_{DS} = 10\text{ V}$         | –    | 25   | –    | A             |
| $C_{is}$        | input capacitance                               | $V_{GS} = 0; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$ | –    | 480  | –    | pF            |
| $C_{os}$        | output capacitance                              | $V_{GS} = 0; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$ | –    | 190  | –    | pF            |
| $C_{rs}$        | feedback capacitance                            | $V_{GS} = 0; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$ | –    | 14   | –    | pF            |



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**APPLICATION INFORMATION FOR CLASS-B OPERATION**

$T_h = 25\text{ }^\circ\text{C}$ ;  $R_{th\text{ mb-h}} = 0.2\text{ K/W}$ ;  $R_{GS} = 16\text{ }\Omega$ ; unless otherwise specified.

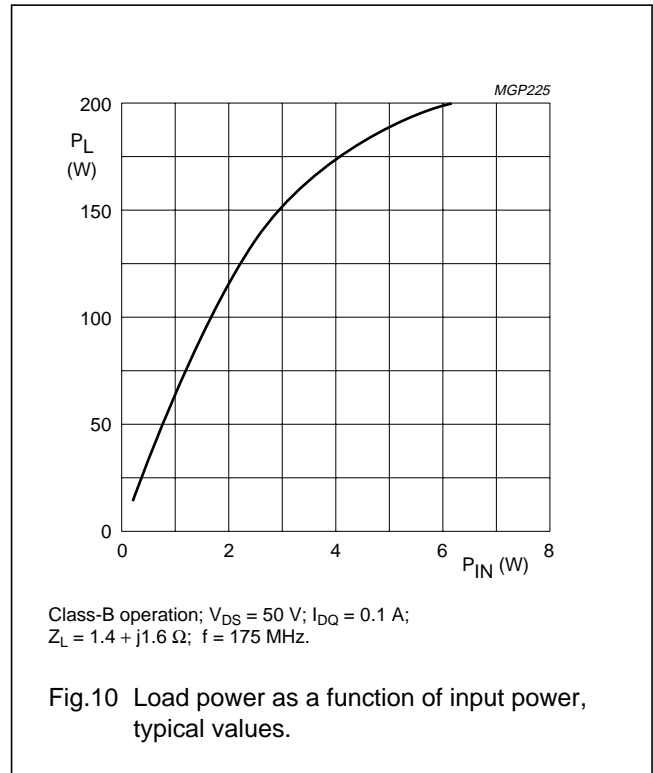
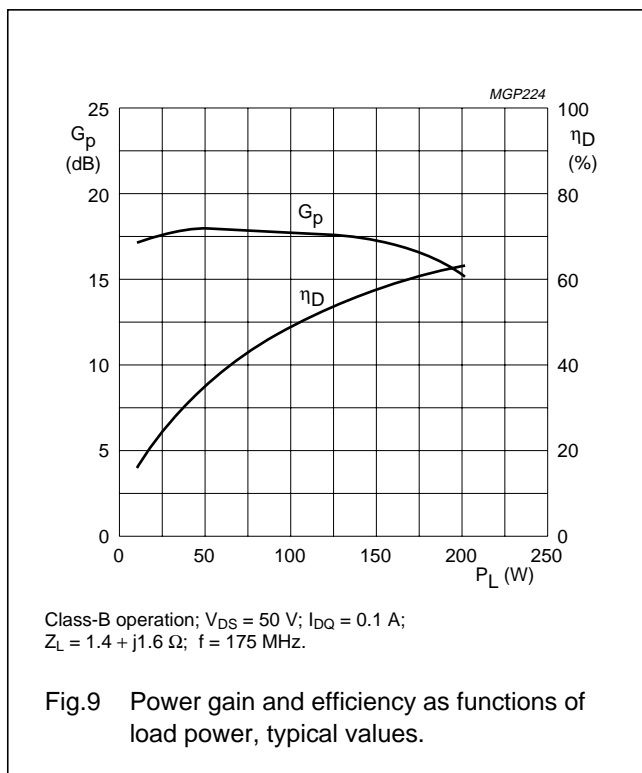
RF performance in CW operation in a common source class-B test circuit.

| MODE OF OPERATION | f (MHz) | V <sub>DS</sub> (V) | I <sub>DQ</sub> (A) | P <sub>L</sub> (W) | G <sub>p</sub> (dB) | $\eta_D$ (%)    |
|-------------------|---------|---------------------|---------------------|--------------------|---------------------|-----------------|
| CW, class-B       | 175     | 50                  | 0.1                 | 150                | > 14<br>typ. 17     | > 50<br>typ. 58 |

**Ruggedness in class-B operation**

The BLF277 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V<sub>DS</sub> = 50 V; f = 175 MHz at rated load power.



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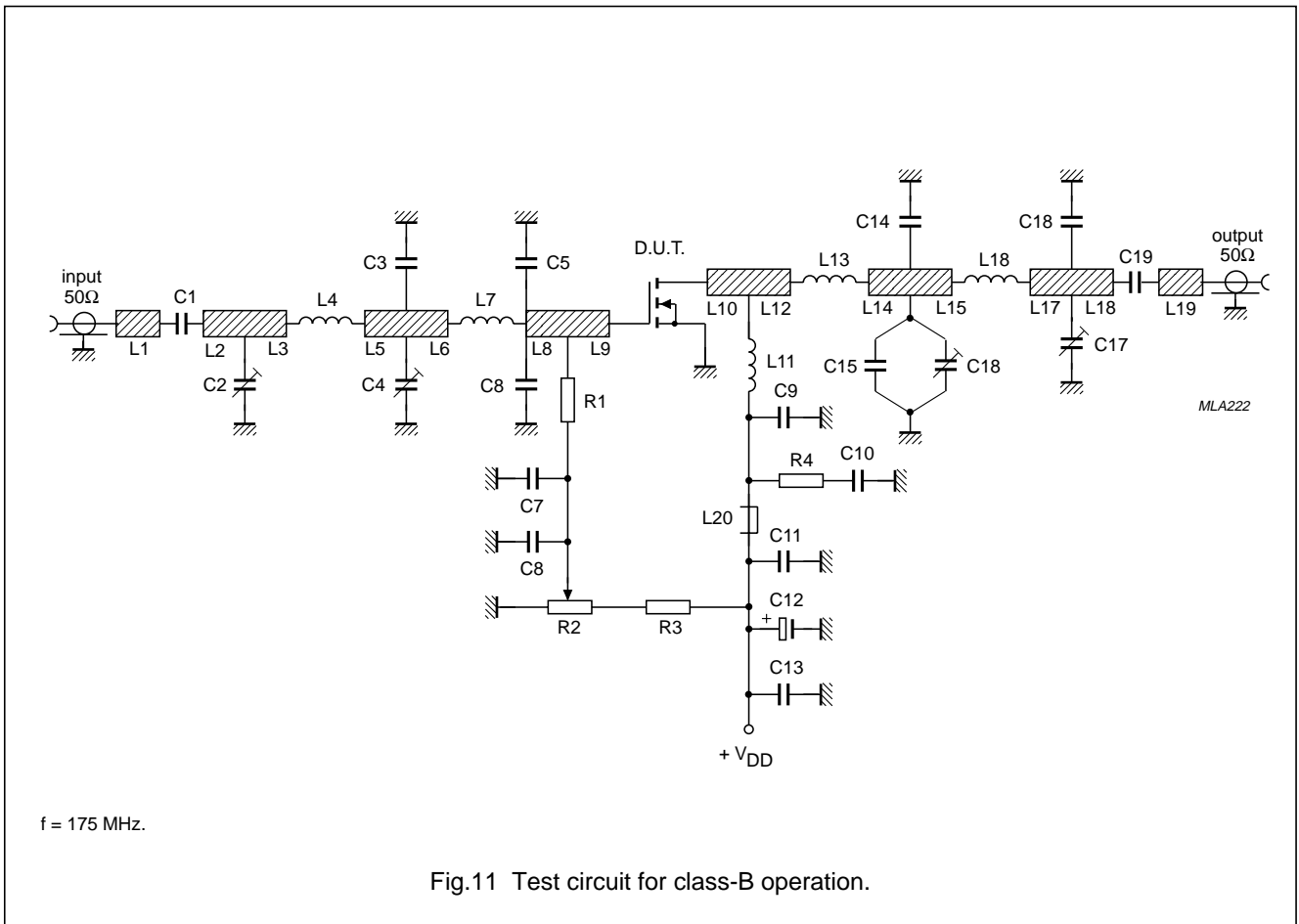


Fig.11 Test circuit for class-B operation.

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## List of components (class-B test circuit)

| COMPONENT    | DESCRIPTION                                   | VALUE                           | DIMENSIONS   | CATALOGUE NO.  |
|--------------|---|---------------------------------|--|----------------|
| C1, C8, C19  | multilayer ceramic chip capacitor<br>(note 1) | 680 pF                          |  |                |
| C2, C4, C17  | film dielectric trimmer                       | 5 to 60 pF                      |  | 2222 809 08003 |
| C3           | multilayer ceramic chip capacitor<br>(note 1) | 33 pF                           |  |                |
| C5, C6, C9   | multilayer ceramic chip capacitor<br>(note 1) | 100 pF                          |  |                |
| C7, C10, C13 | multilayer ceramic chip capacitor             | 100 nF                          |  | 2222 852 47104 |
| C11          | multilayer ceramic chip capacitor             | 10 nF                           |  | 2222 852 47103 |
| C12          | electrolytic capacitor                        | 10 $\mu$ F, 63 V                |  |                |
| C14, C15     | multilayer ceramic chip capacitor<br>(note 2) | 3 $\times$ 22 pF<br>in parallel |  |                |
| C16          | film dielectric trimmer                       | 4 to 40 pF                      |  | 2222 809 08002 |
| C18          | multilayer ceramic chip capacitor<br>(note 1) | 18 pF                           |  |                |
| L1           | stripline (note 3)                            | 49 $\Omega$                     | length 8 mm<br>width 4 mm                                |                |
| L2           | stripline (note 3)                            | 49 $\Omega$                     | length 12 mm<br>width 4 mm                               |                |
| L3           | stripline (note 3)                            | 49 $\Omega$                     | length 7.5 mm<br>width 4 mm                              |                |
| L4           | 2 turns enamelled 1.5 mm copper<br>wire       | 25 nH                           | length 3.7 mm<br>int. dia. 5 mm<br>leads 2 $\times$ 1 mm |                |
| L5           | stripline (note 3)                            | 49 $\Omega$                     | length 15.5 mm<br>width 4 mm                             |                |
| L6           | stripline (note 3)                            | 49 $\Omega$                     | length 5 mm<br>width 4 mm                                |                |
| L7           | 2 turns enamelled 1.5 mm copper<br>wire       | 25 nH                           | length 4.2 mm<br>int. dia. 5 mm<br>leads 2 $\times$ 4 mm |                |
| L8           | stripline (note 3)                            | 31 $\Omega$                     | length 18 mm<br>width 6 mm                               |                |
| L9           | stripline (note 3)                            | 31 $\Omega$                     | length 6 mm<br>width 6 mm                                |                |
| L10, L12     | stripline (note 3)                            | 31 $\Omega$                     | length 7 mm<br>width 6 mm                                |                |
| L11          | 3 turns enamelled 1.5 mm copper<br>wire       | 40 nH                           | length 6.8 mm<br>int. dia. 5 mm<br>leads 2 $\times$ 3 mm |                |
| L13          | 1 turn enamelled 1.5 mm copper<br>wire        | 3 nH                            | int. dia. 2.8 mm<br>leads 2 $\times$ 1 mm                |                |
| L14          | stripline (note 3)                            | 36 $\Omega$                     | length 15.5 mm<br>width 5 mm                             |                |



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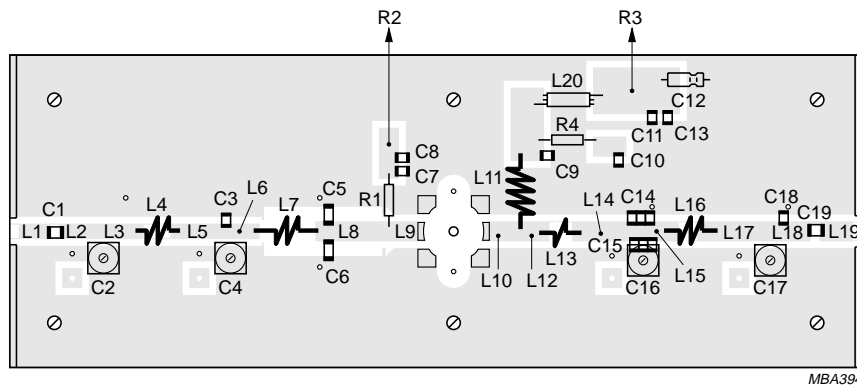
| COMPONENT | DESCRIPTION                          | VALUE          | DIMENSIONS   | CATALOGUE NO.  |
|-----------|--------------------------------------|----------------|--|----------------|
| L15       | stripline (note 3)                   | 36 $\Omega$    | length 8 mm<br>width 5 mm                                |                |
| L16       | 2 turns enamelled 2.5 mm copper wire | 28 nH          | length 5.5 mm<br>int. dia. 5 mm<br>leads 2 $\times$ 3 mm |                |
| L17       | stripline (note 3)                   | 36 $\Omega$    | length 12 mm<br>width 5 mm                               |                |
| L18, L19  | stripline (note 3)                   | 36 $\Omega$    | length 8.5 mm<br>width 5 mm                              |                |
| L20       | grade 3B Ferroxcube RF choke         |                |  | 4312 020 36642 |
| R1        | 0.4 W metal film resistor            | 16 $\Omega$    |  |                |
| R2        | 10 turn potentiometer                | 50 k $\Omega$  |  |                |
| R3        | 0.4 W metal film resistor            | 400 k $\Omega$ |  |                |
| R4        | 0.4 W metal film resistor            | 100 k $\Omega$ |  |                |

**Notes**

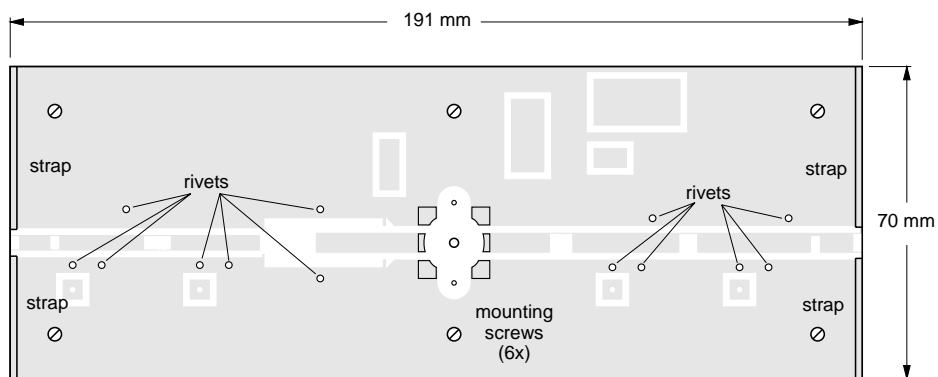
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. American Technical Ceramics (ATC) capacitor, type 175B or other capacitor of the same quality.
3. The striplines are mounted double copper-clad printed circuit board, with epoxy glass dielectric ( $\epsilon_r = 4.5$ ); thickness 1.6 mm.

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MBA394



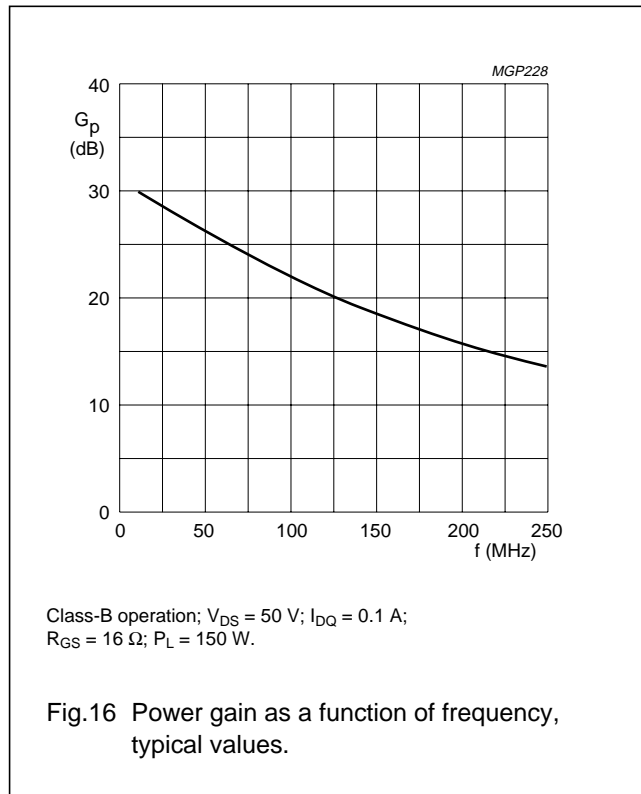
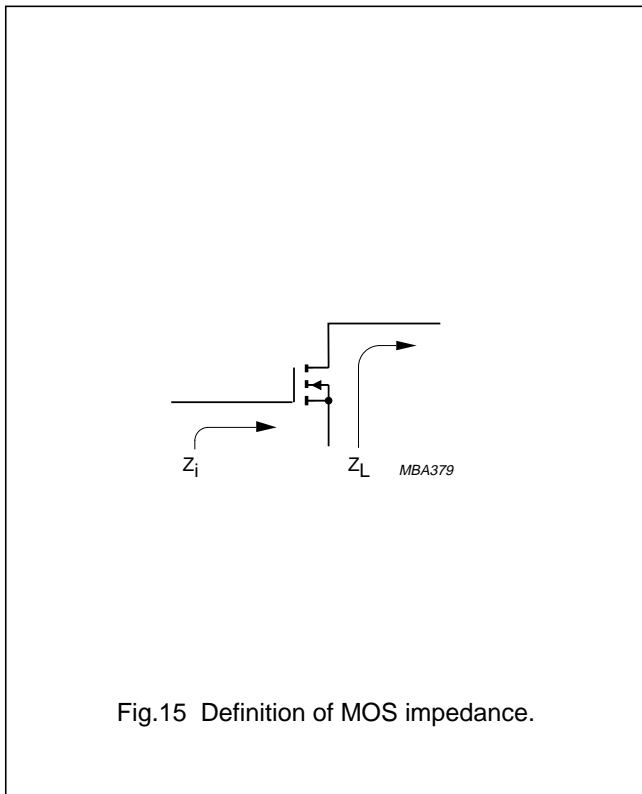
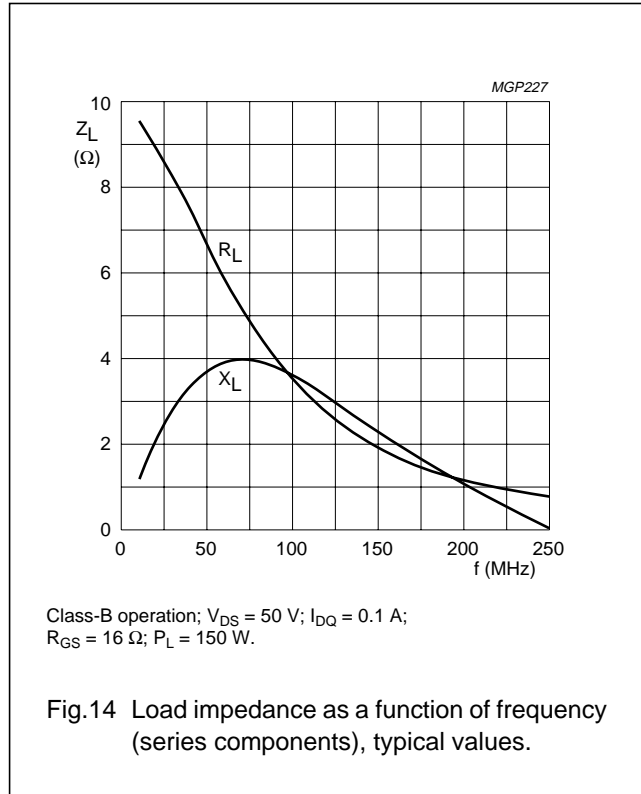
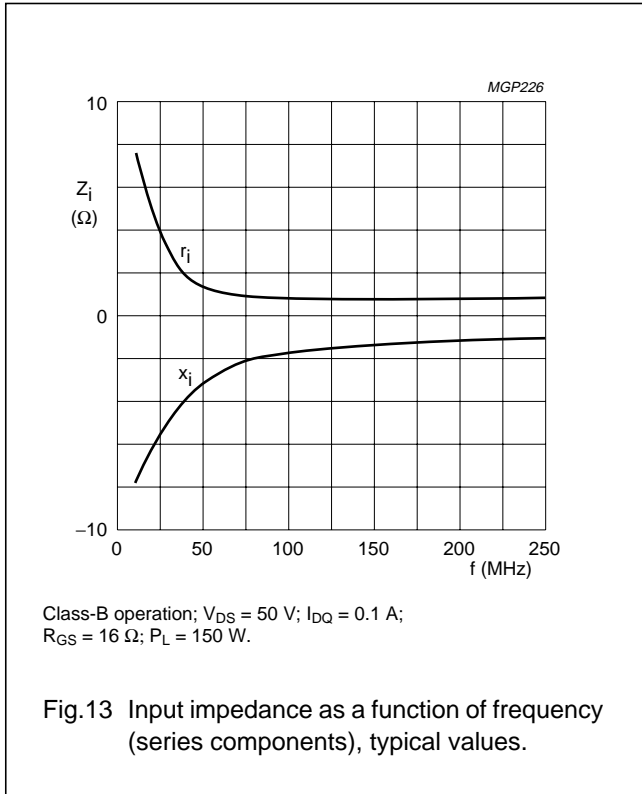
MBA393

The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets.

Fig.12 Component layout for 175 MHz class-B test circuit.

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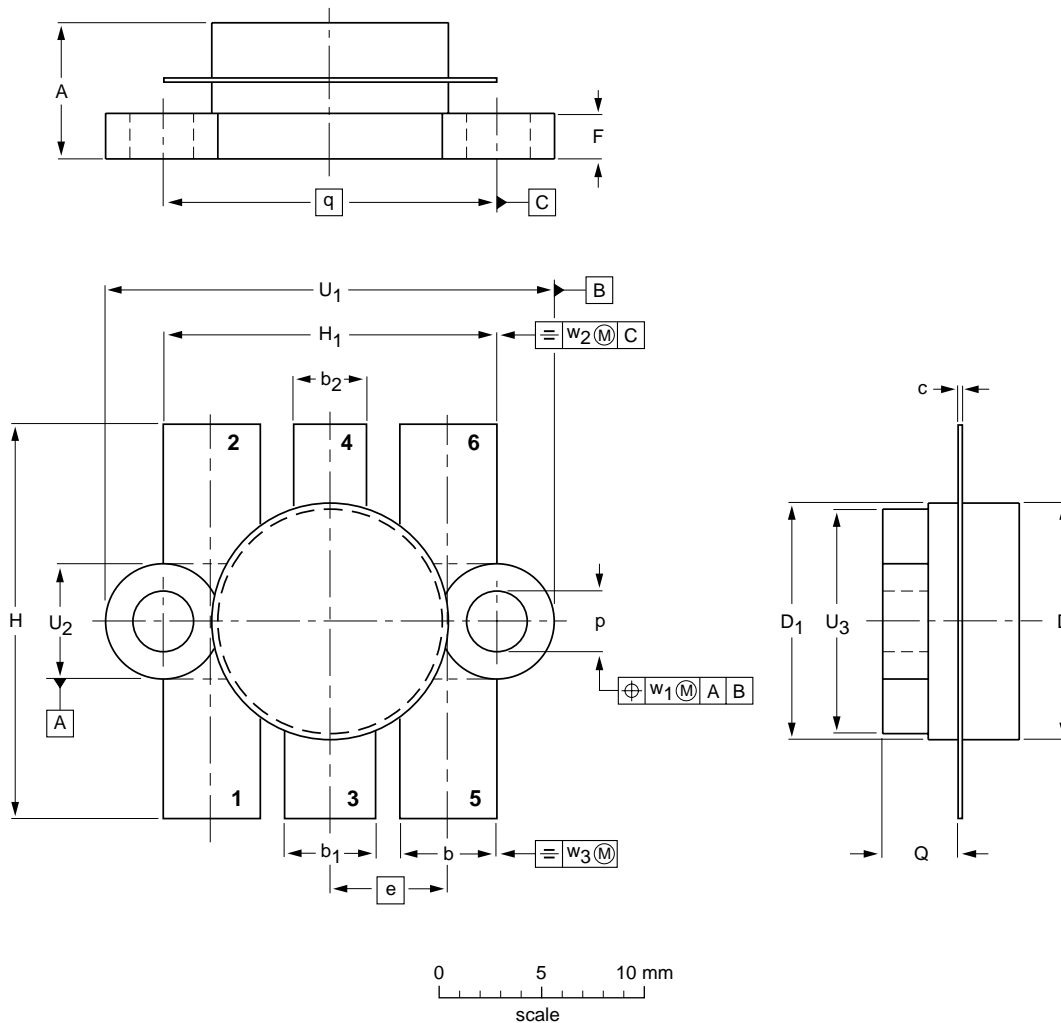
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PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 6 leads

SOT119A



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

| UNIT   | A              | b              | b <sub>1</sub> | b <sub>2</sub> | c              | D              | D <sub>1</sub> | e     | F              | H              | H <sub>1</sub> | p              | Q              | q     | U <sub>1</sub> | U <sub>2</sub> | U <sub>3</sub> | w <sub>1</sub> | w <sub>2</sub> | w <sub>3</sub> |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|----------------|
| mm     | 7.39<br>6.32   | 5.59<br>5.33   | 5.34<br>5.08   | 4.07<br>3.81   | 0.18<br>0.07   | 12.86<br>12.59 | 12.83<br>12.57 | 6.48  | 2.54<br>2.28   | 22.10<br>21.08 | 18.55<br>18.28 | 3.31<br>2.97   | 4.58<br>3.98   | 18.42 | 25.23<br>23.95 | 6.48<br>6.07   | 12.76<br>12.06 | 0.51           | 1.02           | 0.26           |
| inches | 0.291<br>0.249 | 0.220<br>0.210 | 0.210<br>0.200 | 0.160<br>0.150 | 0.007<br>0.003 | 0.505<br>0.496 | 0.505<br>0.495 | 0.255 | 0.100<br>0.090 | 0.870<br>0.830 | 0.730<br>0.720 | 0.130<br>0.117 | 0.180<br>0.157 | 0.725 | 0.993<br>0.943 | 0.255<br>0.239 | 0.502<br>0.475 | 0.02           | 0.04           | 0.01           |

| OUTLINE VERSION | REFERENCES |       |      |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ |  |                     |            |
| SOT119A         |            |       |      |  |                     | 97-06-28   |

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**DEFINITIONS**

| <b>Data Sheet Status</b>  |   |
|---|---|
| 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.                                |
| <b>Limiting values</b>  |   |
| 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. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

**LIFE SUPPORT APPLICATIONS**

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