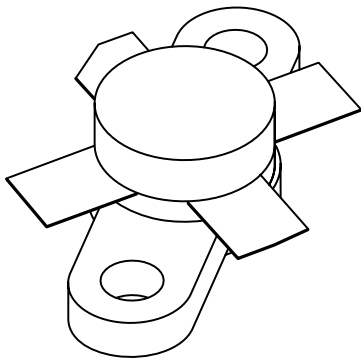


# DATA SHEET



## **BLF244** VHF power MOS transistor

Product specification  
Supersedes data of 1997 Dec 17

2003 Oct 13

# VHF power MOS transistor

# BLF244

## FEATURES

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

## DESCRIPTION

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

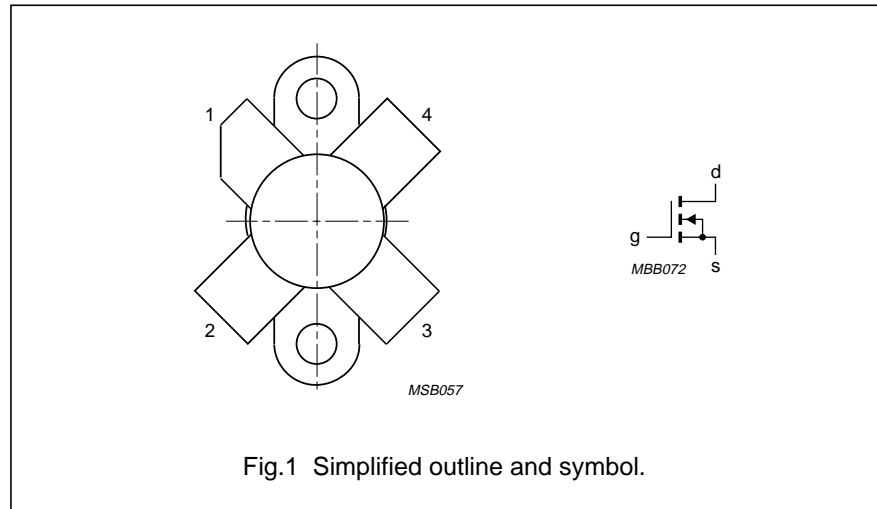
The transistor is encapsulated in a 4-lead SOT123A flange package, with a ceramic cap. All leads are isolated from the flange.

Matched gate-source voltage ( $V_{GS}$ ) groups are available on request.

## PINNING - SOT123A

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

## PIN CONFIGURATION



**CAUTION**

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A, and SNW-FQ-302B.

**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  $T_h = 25\text{ }^\circ\text{C}$  in a common source test circuit.

| MODE OF OPERATION | f (MHz) | $V_{DS}$ (V) | PL (W) | $G_p$ (dB) | $\eta_D$ (%) |
|-------------------|---------|--------------|--------|------------|--------------|
| CW, class-B       | 175     | 28           | 15     | >13        | >50          |

VHF power MOS transistor

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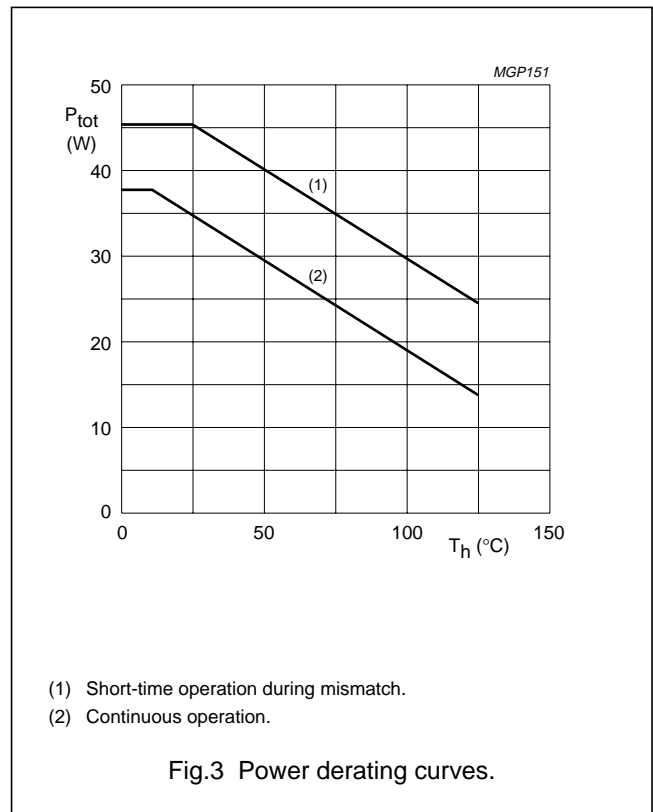
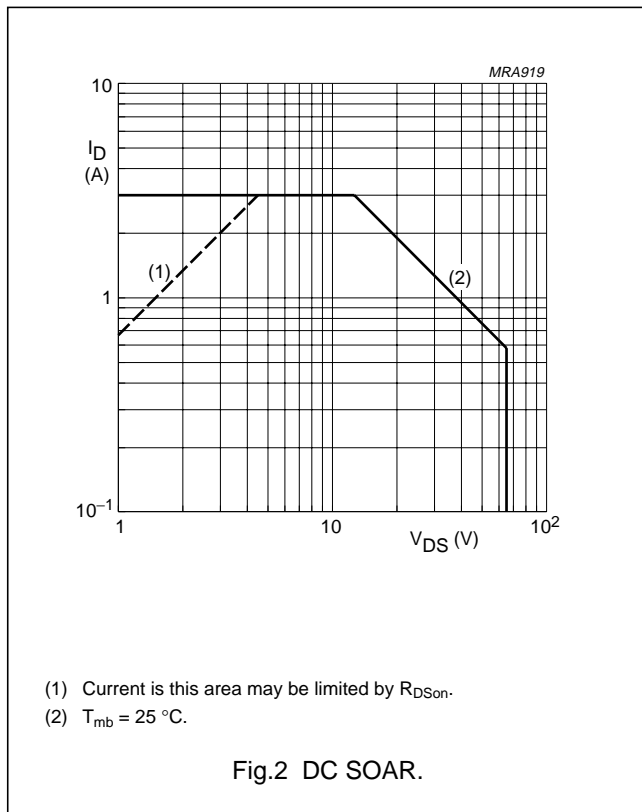
**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| SYMBOL    | PARAMETER               | CONDITIONS                             | MIN. | MAX.     | UNIT             |
|-----------|-------------------------|--|------|----------|------------------|
| $V_{DS}$  | drain-source voltage    |  | –    | 65       | V                |
| $V_{GS}$  | gate-source voltage     |  | –    | $\pm 20$ | V                |
| $I_D$     | drain current (DC)      |  | –    | 3        | A                |
| $P_{tot}$ | total power dissipation | $T_{mb} \leq 25\text{ }^\circ\text{C}$ | –    | 38       | W                |
| $T_{stg}$ | storage temperature     |  | –65  | 150      | $^\circ\text{C}$ |
| $T_j$     | junction temperature    |  | –    | 200      | $^\circ\text{C}$ |

**THERMAL CHARACTERISTICS**

| SYMBOL         | PARAMETER   | CONDITIONS   | VALUE | UNIT |
|----------------|---|--|-------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | $T_{mb} = 25\text{ }^\circ\text{C}; P_{tot} = 38\text{ W}$ | 4.6   | K/W  |
| $R_{th\ mb-h}$ | thermal resistance from mounting base to heatsink | $T_{mb} = 25\text{ }^\circ\text{C}; P_{tot} = 38\text{ W}$ | 0.3   | K/W  |



## VHF power MOS transistor

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## CHARACTERISTICS

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

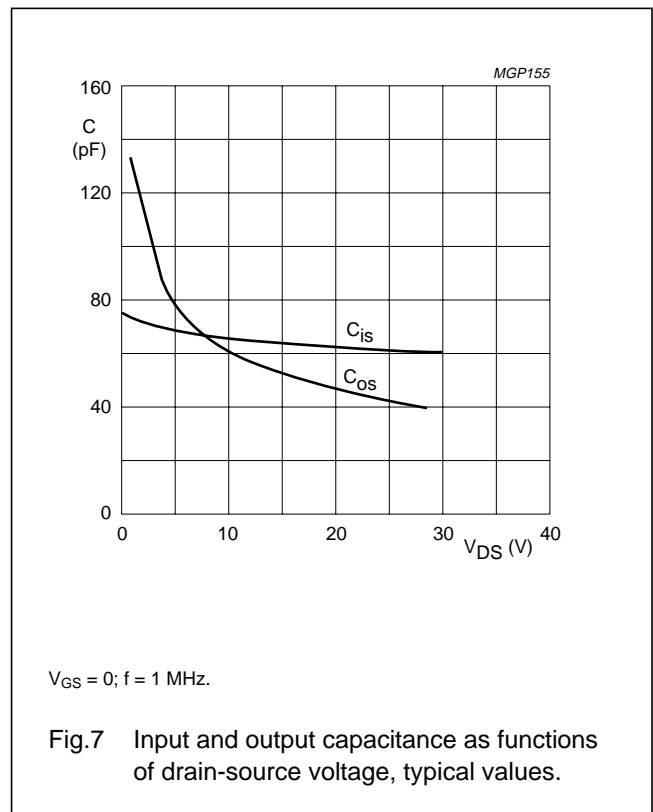
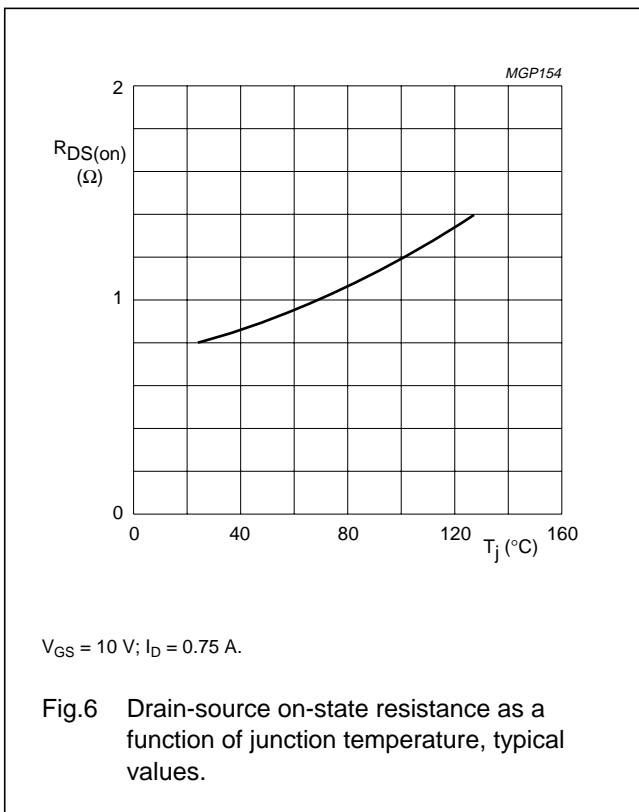
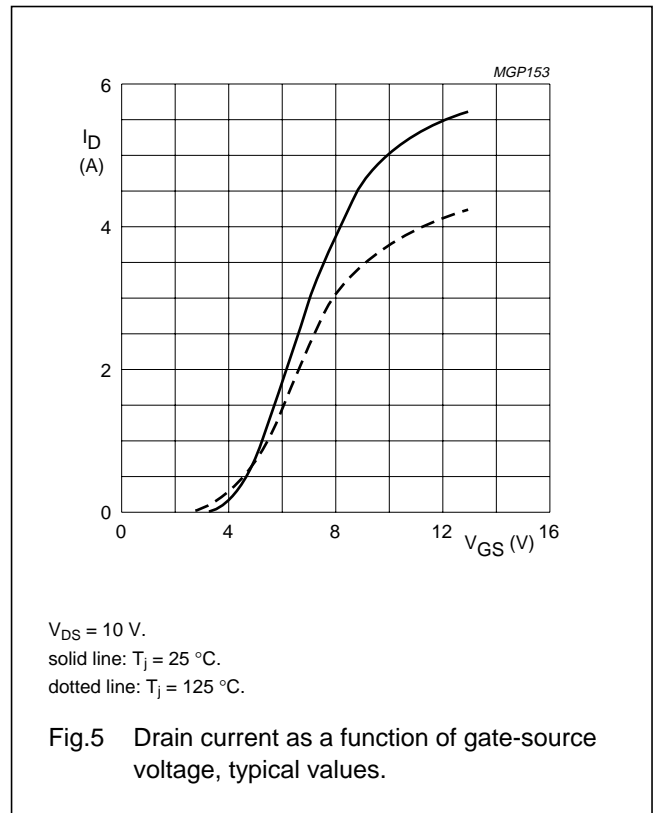
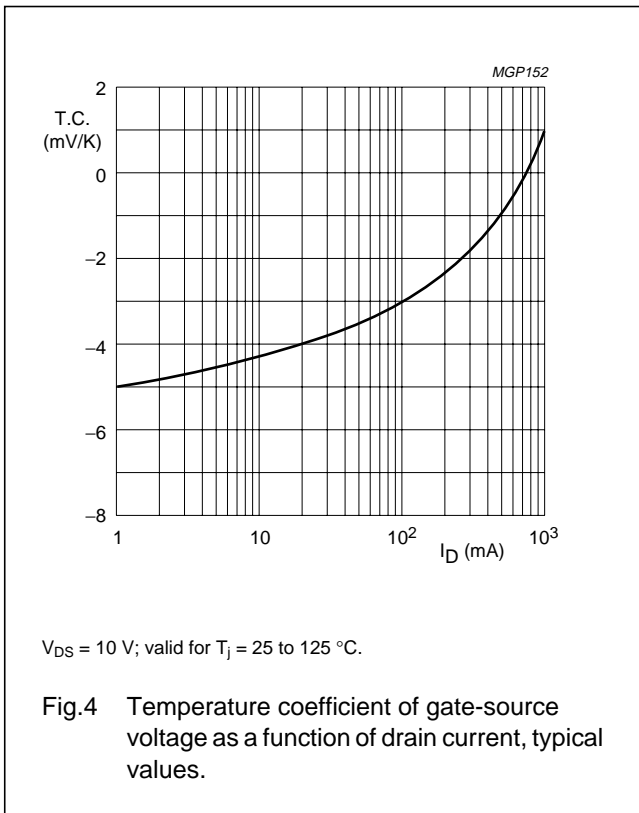
| SYMBOL          | PARAMETER   | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|-----------------|---|--|------|------|------|---------------|
| $V_{(BR)DSS}$   | drain-source breakdown voltage                    | $V_{GS} = 0$ ; $I_D = 5\text{ mA}$   | 65   | –    | –    | V             |
| $I_{DSS}$       | drain-source leakage current                      | $V_{GS} = 0$ ; $V_{DS} = 28\text{ V}$  | –    | –    | 1    | mA            |
| $I_{GSS}$       | gate-source leakage current                       | $V_{GS} = \pm 20\text{ V}$ ; $V_{DS} = 0$  | –    | –    | 1    | $\mu\text{A}$ |
| $V_{GSth}$      | gate-source threshold voltage                     | $I_D = 5\text{ mA}$ ; $V_{DS} = 10\text{ V}$   | 2    | –    | 4.5  | V             |
| $\Delta V_{GS}$ | gate-source voltage difference of matched devices | $I_D = 5\text{ mA}$ ; $V_{DS} = 10\text{ V}$   | –    | –    | 100  | mV            |
| $g_{fs}$        | forward transconductance                          | $I_D = 0.75\text{ A}$ ; $V_{DS} = 10\text{ V}$   | 0.6  | –    | –    | S             |
| $R_{DSon}$      | drain-source on-state resistance                  | $I_D = 0.75\text{ A}$ ; $V_{GS} = 10\text{ V}$   | –    | 0.8  | 1.5  | $\Omega$      |
| $I_{DSX}$       | on-state drain current                            | $V_{GS} = 10\text{ V}$ ; $V_{DS} = 10\text{ V}$  | –    | 5    | –    | A             |
| $C_{is}$        | input capacitance                                 | $V_{GS} = 0$ ; $V_{DS} = 28\text{ V}$ ; $f = 1\text{ MHz}$   | –    | 60   | –    | pF            |
| $C_{os}$        | output capacitance                                | $V_{GS} = 0$ ; $V_{DS} = 28\text{ V}$ ; $f = 1\text{ MHz}$   | –    | 40   | –    | pF            |
| $C_{rs}$        | feedback capacitance                              | $V_{GS} = 0$ ; $V_{DS} = 28\text{ V}$ ; $f = 1\text{ MHz}$   | –    | 4.5  | –    | pF            |
| F               | noise figure; see Fig.13                          | $I_D = 0.5\text{ A}$ ; $V_{DS} = 28\text{ V}$ ; $R_1 = 23\text{ }\Omega$ ;<br>$T_h = 25\text{ }^\circ\text{C}$ ; $f = 175\text{ MHz}$ ;<br>$R_{th\text{ mb-h}} = 0.3\text{ K/W}$ | –    | 4.3  | –    | dB            |

 $V_{GS}$  group indicator

| GROUP | LIMITS (V) |      | GROUP | LIMITS (V) |      |
|-------|------------|------|-------|------------|------|
|       | MIN.       | MAX. |       | MIN.       | MAX. |
| A     | 2.0        | 2.1  | O     | 3.3        | 3.4  |
| B     | 2.1        | 2.2  | P     | 3.4        | 3.5  |
| C     | 2.2        | 2.3  | Q     | 3.5        | 3.6  |
| D     | 2.3        | 2.4  | R     | 3.6        | 3.7  |
| E     | 2.4        | 2.5  | S     | 3.7        | 3.8  |
| F     | 2.5        | 2.6  | T     | 3.8        | 3.9  |
| G     | 2.6        | 2.7  | U     | 3.9        | 4.0  |
| H     | 2.7        | 2.8  | V     | 4.0        | 4.1  |
| J     | 2.8        | 2.9  | W     | 4.1        | 4.2  |
| K     | 2.9        | 3.0  | X     | 4.2        | 4.3  |
| L     | 3.0        | 3.1  | Y     | 4.3        | 4.4  |
| M     | 3.1        | 3.2  | Z     | 4.4        | 4.5  |
| N     | 3.2        | 3.3  |       |            |      |

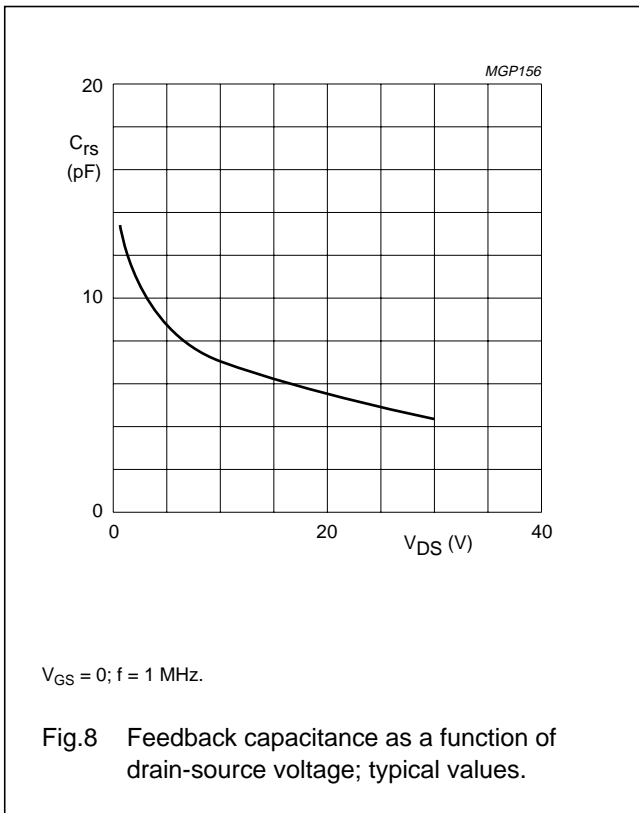
VHF power MOS transistor

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**APPLICATION INFORMATION FOR CLASS-B OPERATION**

$T_h = 25 \text{ }^\circ\text{C}; R_{th\ mb-h} = 3 \text{ K/W};$  unless otherwise specified.

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

| MODE OF OPERATION | f (MHz) | $V_{DS}$ (V) | $I_{DQ}$ (mA) | $P_L$ (W) | $G_P$ (dB)     | $\eta_D$ (%)   | $Z_i$ ( $\Omega$ ) <sup>(1)</sup> | $Z_L$ ( $\Omega$ ) | R1 ( $\Omega$ ) |
|-------------------|---------|--------------|---------------|-----------|----------------|----------------|-----------------------------------|--------------------|-----------------|
| CW, class-B       | 175     | 28           | 25            | 15        | >13<br>typ. 17 | >50<br>typ. 65 | 3.0 – j4.0                        | 6.3 + j9.8         | 46.4//46.4      |
|                   | 175     | 12.5         | 25            | 6         | typ. 15        | typ. 60        | 3.0 – j4.0                        | 4.5 + j3.3         | 100             |

**Note**

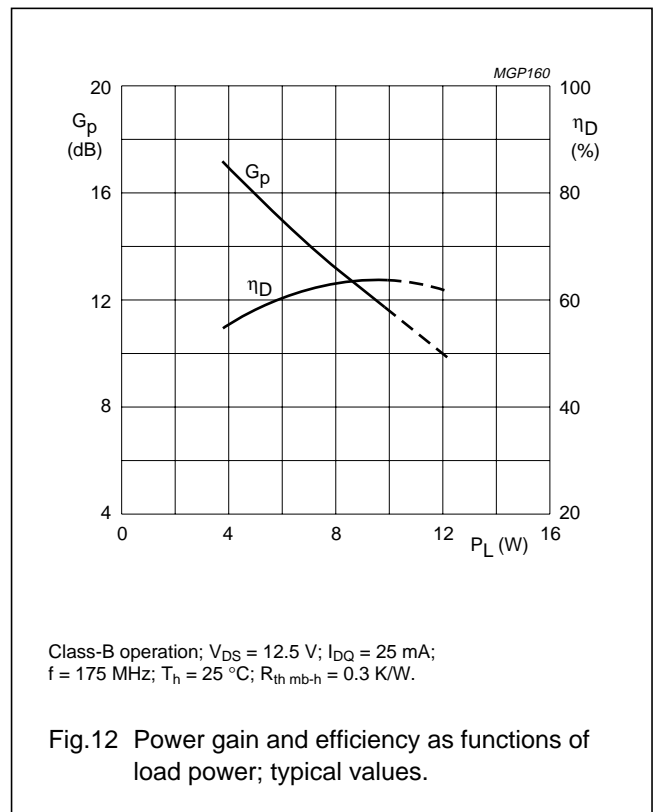
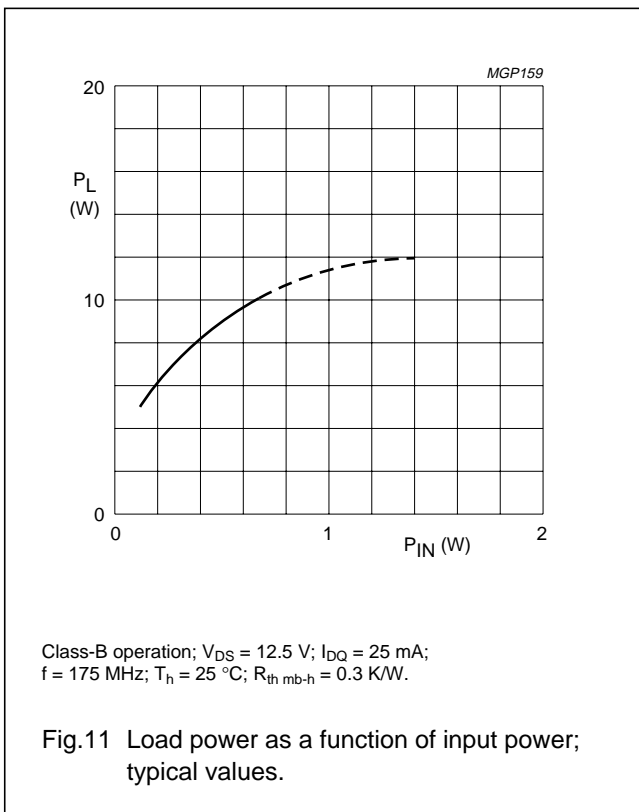
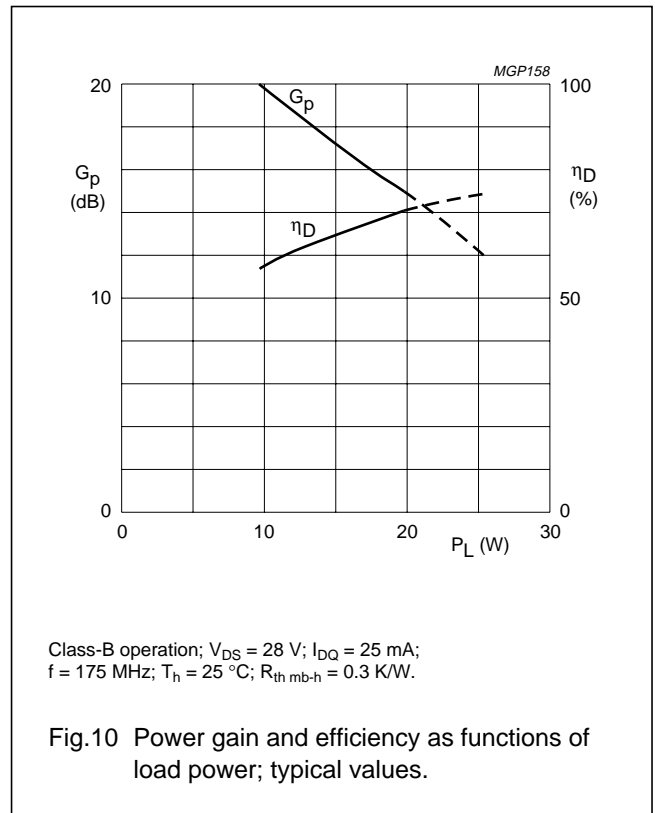
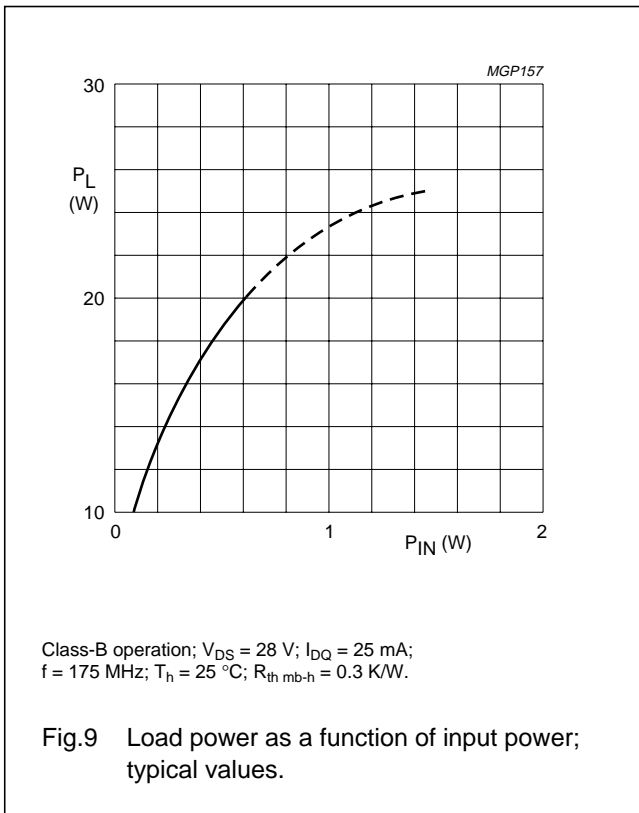
1. R1 included.

**Ruggedness in class-B operation**

The BLF244 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 50$  through all phases under the following conditions:  $T_h = 25 \text{ }^\circ\text{C}; R_{th\ mb-h} = 0.3 \text{ K/W};$  at rated load power.

VHF power MOS transistor

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VHF power MOS transistor

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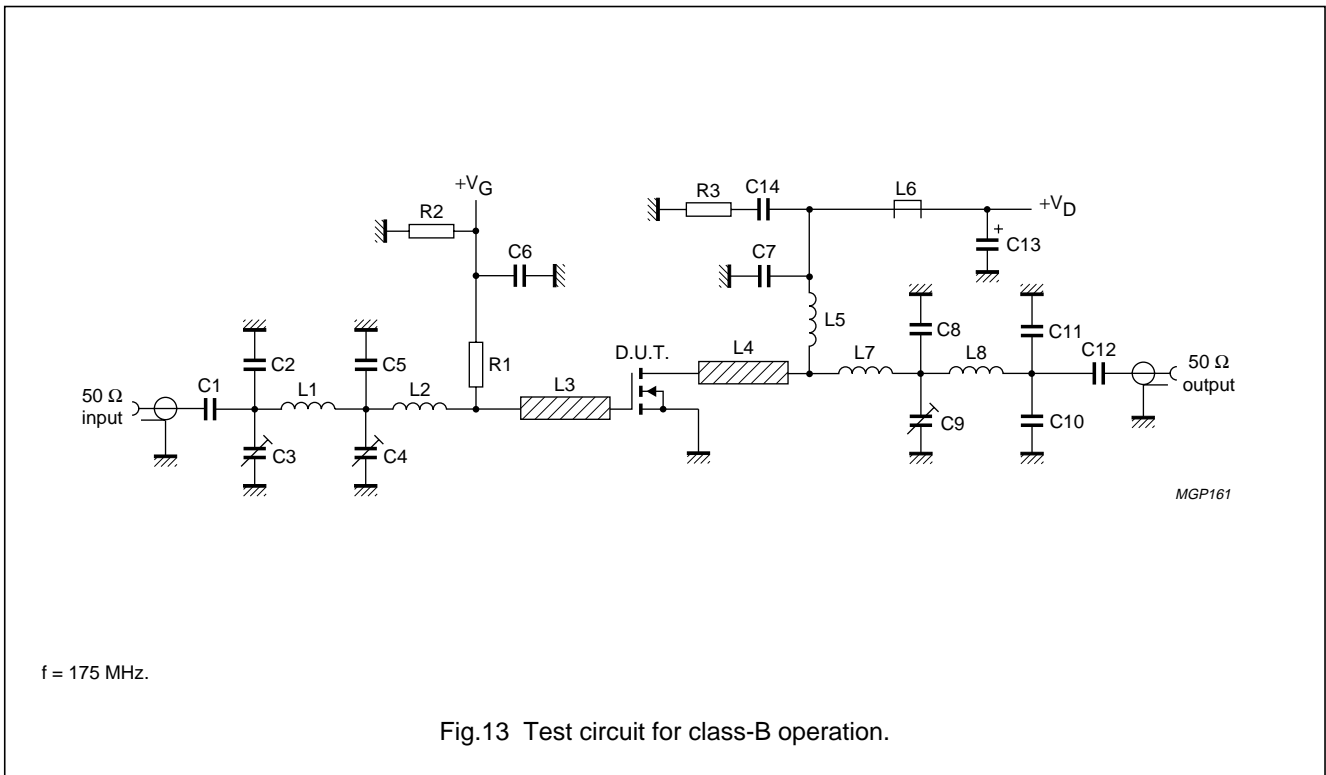


Fig.13 Test circuit for class-B operation.

## VHF power MOS transistor

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## List of components (see Fig.13)

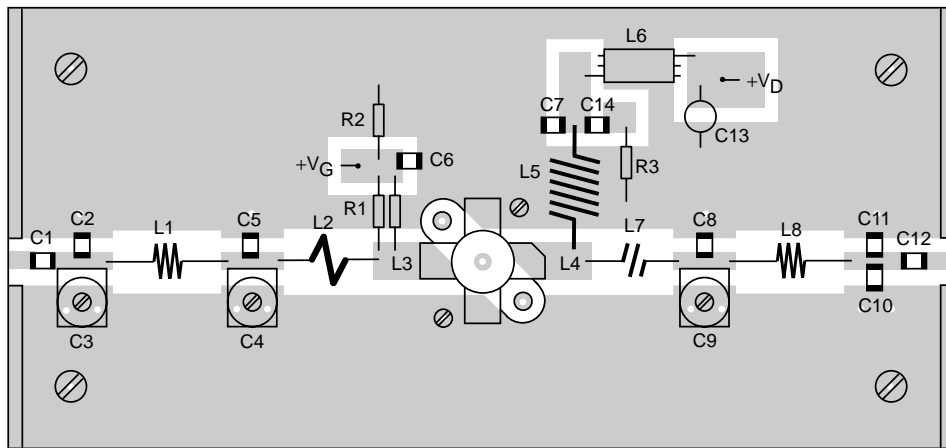
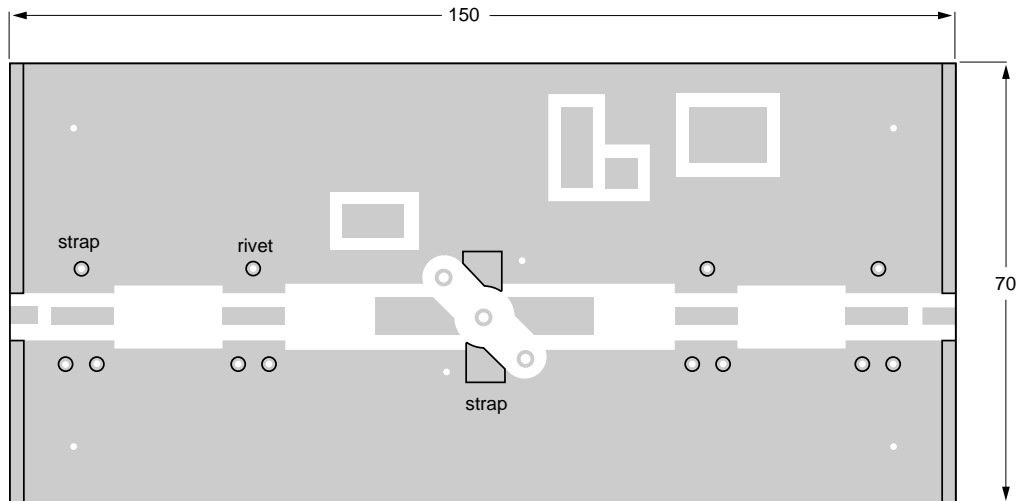
| COMPONENT  | DESCRIPTION                               | VALUE        | DIMENSIONS  | CATALOGUE NO.  |
|------------|---|--------------|---|----------------|
| C1, C12    | multilayer ceramic chip capacitor; note 1 | 680 nF       |   |                |
| C2         | multilayer ceramic chip capacitor; note 1 | 20 pF        |   |                |
| C3, C4, C9 | film dielectric trimmer                   | 5 to 60 pF   |   | 2222 809 08003 |
| C5         | multilayer ceramic chip capacitor; note 1 | 75 pF        |   |                |
| C6         | multilayer ceramic chip capacitor         | 10 nF        |   | 2222 852 47103 |
| C7         | multilayer ceramic chip capacitor; note 1 | 100 pF       |   |                |
| C8         | multilayer ceramic chip capacitor; note 1 | 47 pF        |   |                |
| C10, C11   | multilayer ceramic chip capacitor; note 1 | 11 pF        |   |                |
| C13        | solid tantalum capacitor                  | 2.2 $\mu$ F  |   |                |
| C14        | multilayer ceramic chip capacitor         | 100 nF       |   | 2222 852 47104 |
| L1         | 4 turns enamelled 1 mm copper wire        | 32 nH        | length 6.3 mm<br>int. dia. 3 mm<br>leads 2 $\times$ 5 mm  |                |
| L2         | 1 turn enamelled 1 mm copper wire         | 12.2 nH      | int. dia. 5.6 mm<br>leads 2 $\times$ 5 mm                 |                |
| L3, L4     | stripline; note 2                         | 30 $\Omega$  | 15 $\times$ 6 mm  |                |
| L5         | 6 turns enamelled 1 mm copper wire        | 119 nH       | length 10.4 mm<br>int. dia. 6 mm<br>leads 2 $\times$ 5 mm |                |
| L6         | grade 3B Ferroxcube RF choke              |              |   | 4312 020 36640 |
| L7         | 2 turns enamelled 1 mm copper wire        | 19 nH        | length 2.4 mm<br>int. dia. 3 mm<br>leads 2 $\times$ 5 mm  |                |
| L8         | 4 turns enamelled 1 mm copper wire        | 28.5 nH      | length 8.5 mm<br>int. dia. 3 mm<br>leads 2 $\times$ 5 mm  |                |
| R1         | metal film resistor; note 3               |              |   |                |
| R2         | 0.4 W metal film resistor                 | 1 M $\Omega$ |   |                |
| R3         | 0.4 W metal film resistor                 | 10 $\Omega$  |   |                |

## Notes

- American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
- The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric ( $\epsilon_r = 4.5$ ), thickness  $\frac{1}{16}$  inch.
- Refer to Application Information for value.

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MGP162

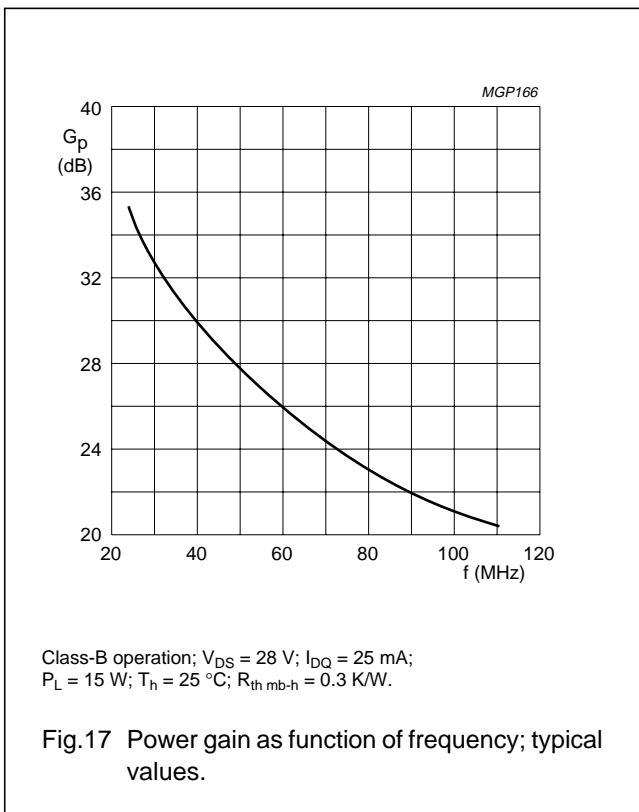
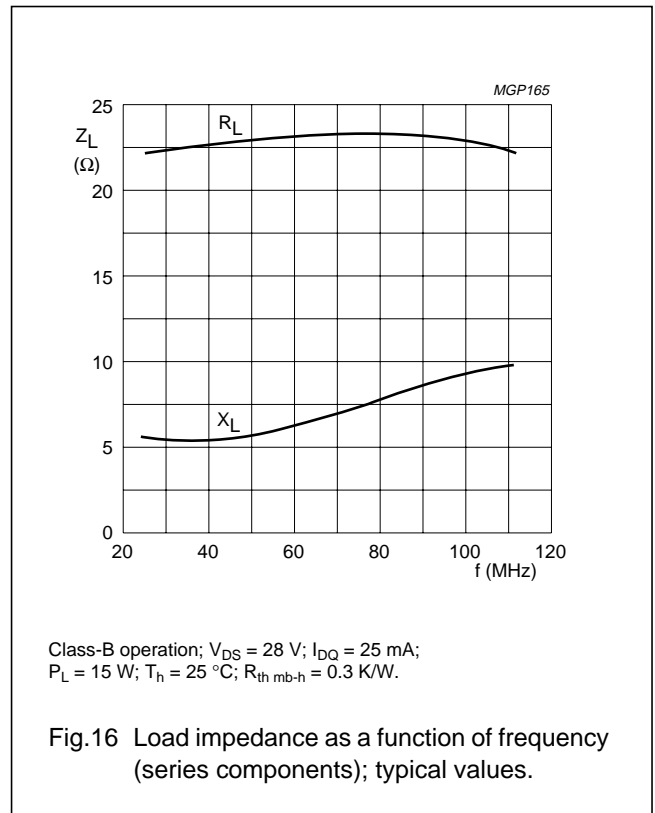
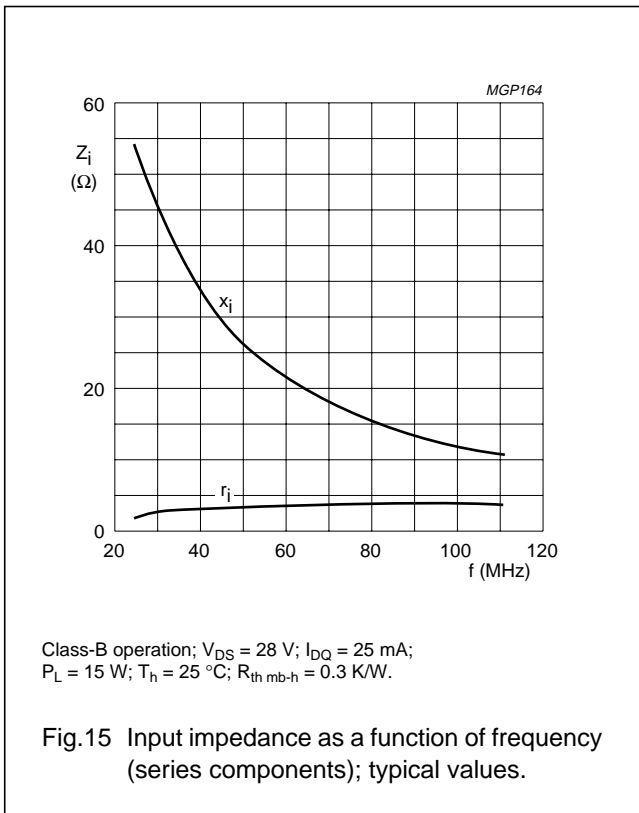
Dimensions in mm.

The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being unetched copper to serve as ground plane. Earth connections are made by fixing screws, copper straps and hollow rivets under the sources and around the edges to provide a direct contact between the copper on the component side and the ground plane.

Fig.14 Component layout for 175 MHz class-B test circuit.

VHF power MOS transistor

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## VHF power MOS transistor

## BLF244

**BLF244 scattering parameters** $V_{DS} = 12.5\text{ V}$ ;  $I_D = 25\text{ mA}$ ; note 1

| f (MHz) | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |       | S <sub>22</sub> |        |
|---------|-----------------|--------|-----------------|-------|-----------------|-------|-----------------|--------|
|         | S <sub>11</sub> | ∠ Φ    | S <sub>21</sub> | ∠ Φ   | S <sub>12</sub> | ∠ Φ   | S <sub>22</sub> | ∠ Φ    |
| 5       | 0.98            | -18.6  | 15.11           | 165.1 | 0.02            | 75.8  | 0.98            | -18.9  |
| 10      | 0.93            | -35.0  | 14.06           | 152.3 | 0.04            | 63.1  | 0.95            | -36.5  |
| 20      | 0.84            | -63.4  | 11.55           | 130.0 | 0.06            | 42.1  | 0.86            | -65.1  |
| 30      | 0.77            | -83.3  | 9.20            | 114.5 | 0.07            | 27.3  | 0.80            | -85.7  |
| 40      | 0.73            | -97.6  | 7.41            | 102.8 | 0.07            | 16.5  | 0.76            | -99.8  |
| 50      | 0.72            | -107.9 | 6.09            | 93.7  | 0.07            | 8.5   | 0.74            | -109.8 |
| 60      | 0.71            | -115.7 | 5.09            | 86.2  | 0.07            | 2.0   | 0.74            | -117.3 |
| 70      | 0.72            | -121.4 | 4.32            | 80.1  | 0.07            | -3.1  | 0.74            | -123.1 |
| 80      | 0.72            | -126.0 | 3.72            | 74.8  | 0.07            | -7.2  | 0.75            | -127.8 |
| 90      | 0.74            | -130.0 | 3.26            | 70.1  | 0.006           | -10.9 | 0.76            | -131.9 |
| 100     | 0.75            | -133.8 | 2.88            | 65.6  | 0.06            | -14.3 | 0.78            | -135.4 |
| 125     | 0.78            | -142.0 | 2.16            | 55.5  | 0.05            | -20.6 | 0.81            | -142.4 |
| 150     | 0.81            | -147.9 | 1.66            | 48.1  | 0.04            | -22.9 | 0.84            | -147.8 |
| 175     | 0.85            | -152.7 | 1.33            | 42.2  | 0.03            | -21.0 | 0.86            | -152.4 |
| 200     | 0.87            | -157.6 | 1.09            | 36.7  | 0.02            | -12.8 | 0.88            | -156.4 |
| 250     | 0.90            | -165.1 | 0.75            | 28.8  | 0.01            | 46.1  | 0.92            | -162.9 |
| 300     | 0.92            | -171.5 | 0.56            | 23.8  | 0.03            | 80.9  | 0.94            | -168.1 |
| 350     | 0.94            | -176.8 | 0.42            | 21.4  | 0.04            | 88.3  | 0.95            | -172.4 |
| 400     | 0.94            | 178.3  | 0.34            | 20.8  | 0.06            | 89.0  | 0.96            | -176.2 |
| 450     | 0.95            | 174.0  | 0.28            | 21.9  | 0.07            | 88.8  | 0.96            | -179.6 |
| 500     | 0.95            | 169.9  | 0.24            | 24.8  | 0.09            | 86.9  | 0.96            | 177.3  |
| 600     | 0.95            | 162.4  | 0.19            | 33.8  | 0.12            | 83.5  | 0.97            | 171.8  |
| 700     | 0.94            | 155.4  | 0.18            | 42.8  | 0.14            | 79.9  | 0.96            | 166.8  |
| 800     | 0.94            | 148.6  | 0.19            | 50.1  | 0.17            | 77.1  | 0.96            | 162.1  |
| 900     | 0.93            | 142.0  | 0.21            | 54.4  | 0.19            | 71.6  | 0.94            | 157.9  |
| 1000    | 0.92            | 135.5  | 0.23            | 59.6  | 0.22            | 73.5  | 0.93            | 162.9  |

**Note**

1. For more extensive s-parameters see internet:  
<http://www.semiconductors.philips.com/markets/communications/wirelesscommunication/broadcast>.

## VHF power MOS transistor

## BLF244

**BLF244 scattering parameters** $V_{DS} = 28\text{ V}$ ;  $I_D = 25\text{ mA}$ ; note 1

| f (MHz) | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |       | S <sub>22</sub> |        |
|---------|-----------------|--------|-----------------|-------|-----------------|-------|-----------------|--------|
|         | S <sub>11</sub> | ∠ Φ    | S <sub>21</sub> | ∠ Φ   | S <sub>12</sub> | ∠ Φ   | S <sub>22</sub> | ∠ Φ    |
| 5       | 0.99            | -15.9  | 15.62           | 167.8 | 0.01            | 78.5  | 0.98            | -13.8  |
| 10      | 0.96            | -30.1  | 14.85           | 157.2 | 0.03            | 68.0  | 0.96            | -27.1  |
| 20      | 0.89            | -56.5  | 12.92           | 137.3 | 0.04            | 49.3  | 0.88            | -50.1  |
| 30      | 0.83            | -76.5  | 10.79           | 122.3 | 0.06            | 35.1  | 0.81            | -68.2  |
| 40      | 0.79            | -91.7  | 8.98            | 110.5 | 0.06            | 24.1  | 0.76            | -81.7  |
| 50      | 0.77            | -103.1 | 7.55            | 101.1 | 0.06            | 15.8  | 0.73            | -91.9  |
| 60      | 0.76            | -111.8 | 6.40            | 93.4  | 0.06            | 9.1   | 0.72            | -99.9  |
| 70      | 0.75            | -118.3 | 5.50            | 87.1  | 0.06            | 3.8   | 0.72            | -106.4 |
| 80      | 0.76            | -123.5 | 4.79            | 81.7  | 0.06            | -0.5  | 0.72            | -111.8 |
| 90      | 0.76            | -127.9 | 4.24            | 76.8  | 0.06            | -4.3  | 0.73            | -116.6 |
| 100     | 0.77            | -132.0 | 3.77            | 72.2  | 0.06            | -7.7  | 0.74            | -120.8 |
| 125     | 0.79            | -140.7 | 2.88            | 61.9  | 0.05            | -14.3 | 0.77            | -129.3 |
| 150     | 0.82            | -146.7 | 2.24            | 54.2  | 0.04            | -16.8 | 0.80            | -135.8 |
| 175     | 0.85            | -151.6 | 1.82            | 47.9  | 0.03            | -15.2 | 0.83            | -141.4 |
| 200     | 0.87            | -156.5 | 1.50            | 42.0  | 0.02            | -7.5  | 0.85            | -146.3 |
| 250     | 0.89            | -164.0 | 1.04            | 33.2  | 0.01            | 48.5  | 0.89            | -154.2 |
| 300     | 0.92            | -170.5 | 0.78            | 27.0  | 0.03            | 83.8  | 0.92            | -160.5 |
| 350     | 0.93            | -175.8 | 0.59            | 23.1  | 0.04            | 91.3  | 0.93            | -165.7 |
| 400     | 0.94            | 179.1  | 0.47            | 20.9  | 0.06            | 91.9  | 0.95            | -170.1 |
| 450     | 0.95            | 174.8  | 0.38            | 20.0  | 0.07            | 91.5  | 0.95            | -174.1 |
| 500     | 0.94            | 170.7  | 0.32            | 20.8  | 0.09            | 89.4  | 0.96            | -177.6 |
| 600     | 0.94            | 163.1  | 0.25            | 26.1  | 0.12            | 85.7  | 0.96            | 176.1  |
| 700     | 0.94            | 156.0  | 0.22            | 33.7  | 0.14            | 81.9  | 0.96            | 170.6  |
| 800     | 0.93            | 149.2  | 0.21            | 41.9  | 0.17            | 78.9  | 0.96            | 165.5  |
| 900     | 0.93            | 142.5  | 0.22            | 47.9  | 0.19            | 73.1  | 0.94            | 160.9  |
| 1000    | 0.92            | 136.1  | 0.23            | 57.3  | 0.17            | 75.3  | 0.93            | 165.9  |

**Note**

- For more extensive s-parameters see internet:  
<http://www.semiconductors.philips.com/markets/communications/wirelesscommunication/broadcast>.

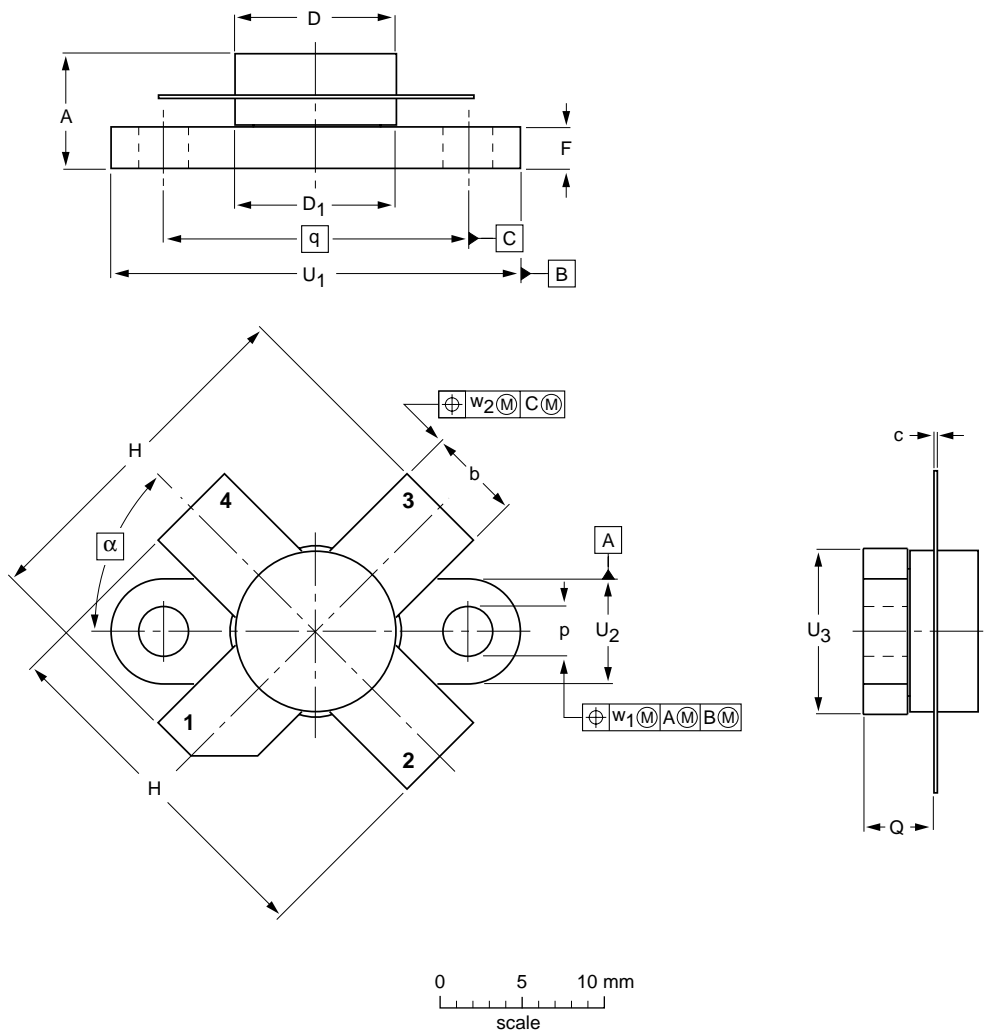
VHF power MOS transistor

BLF244

PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 4 leads

SOT123A



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

| UNIT   | A              | b              | c              | D              | D <sub>1</sub> | F              | H              | p              | Q              | q     | U <sub>1</sub> | U <sub>2</sub> | U <sub>3</sub> | w <sub>1</sub> | w <sub>2</sub> | α   |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|-----|
| mm     | 7.47<br>6.37   | 5.82<br>5.56   | 0.18<br>0.10   | 9.73<br>9.47   | 9.78<br>9.42   | 2.72<br>2.31   | 20.71<br>19.93 | 3.33<br>3.04   | 4.63<br>4.11   | 18.42 | 24.87<br>24.64 | 6.48<br>6.22   | 9.78<br>9.39   | 0.25           | 0.51           | 45° |
| inches | 0.294<br>0.251 | 0.229<br>0.219 | 0.007<br>0.004 | 0.383<br>0.373 | 0.385<br>0.371 | 0.107<br>0.091 | 0.815<br>0.785 | 0.131<br>0.120 | 0.182<br>0.162 | 0.725 | 0.980<br>0.970 | 0.255<br>0.245 | 0.385<br>0.370 | 0.010          | 0.020          |     |

| OUTLINE VERSION | REFERENCES |       |      |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ |  |                     |            |
| SOT123A         |            |       |      |  |                     | 99-03-29   |

## VHF power MOS transistor

BLF244

## DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)(3)</sup> | DEFINITION   |
|-------|----------------------------------|----------------------------------|--|
| I     | Objective data                   | Development                      | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.  |
| II    | Preliminary data                 | Qualification                    | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                       | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.
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