

## IMPORTANT NOTICE

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In data sheets, where the previous Philips references is mentioned, please use the new links as shown below.

<http://www.philips.semiconductors.com> use <http://www.ampleon.com>

<http://www.semiconductors.philips.com> use <http://www.ampleon.com> (Internet)

[sales.addresses@www.semiconductors.philips.com](mailto:sales.addresses@www.semiconductors.philips.com) use  
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Thank you for your cooperation and understanding,

Ampleon

# UHF power MOS transistor

# BLF521

### FEATURES

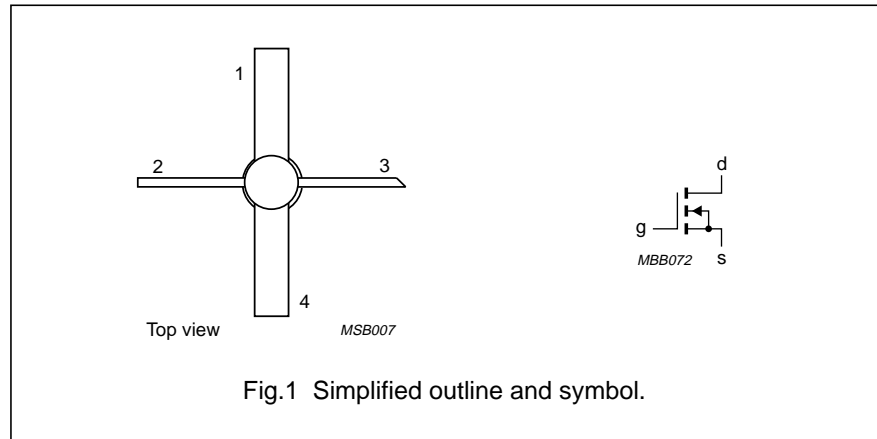
- High power gain
- Easy power control
- Gold metallization
- Good thermal stability
- Withstands full load mismatch
- Designed for broadband operation.

### DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor designed for communications transmitter applications in the UHF frequency range.

The transistor is encapsulated in a 4-lead, SOT172D studless package, with a ceramic cap. All leads are isolated from the mounting base.

### 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.

### PINNING - SOT172D

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

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

| MODE OF OPERATION | f (MHz) | $V_{DS}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta_D$ (%) |
|-------------------|---------|--------------|-----------|------------|--------------|
| CW, class-B       | 500     | 12.5         | 2         | >10        | >50          |

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## LIMITING VALUES

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

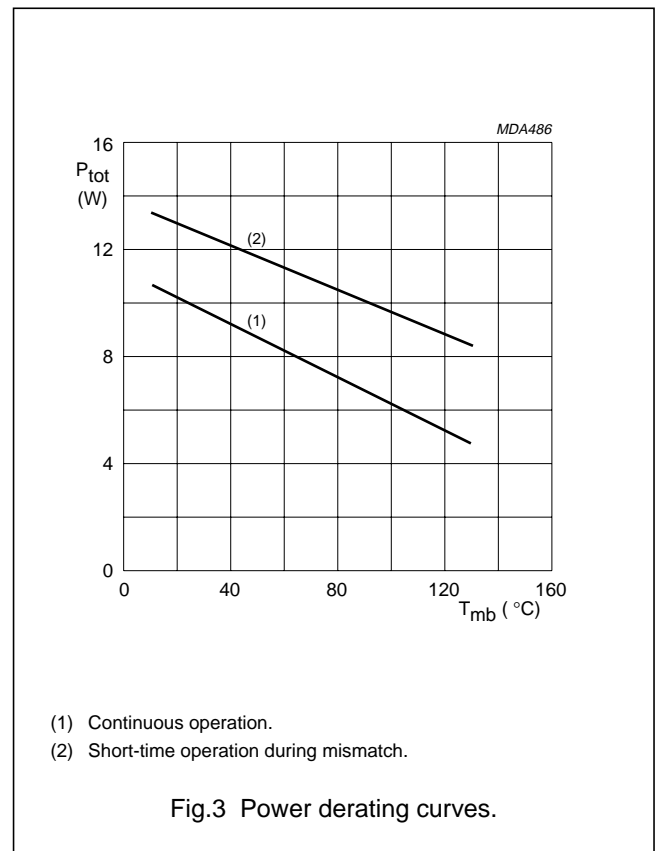
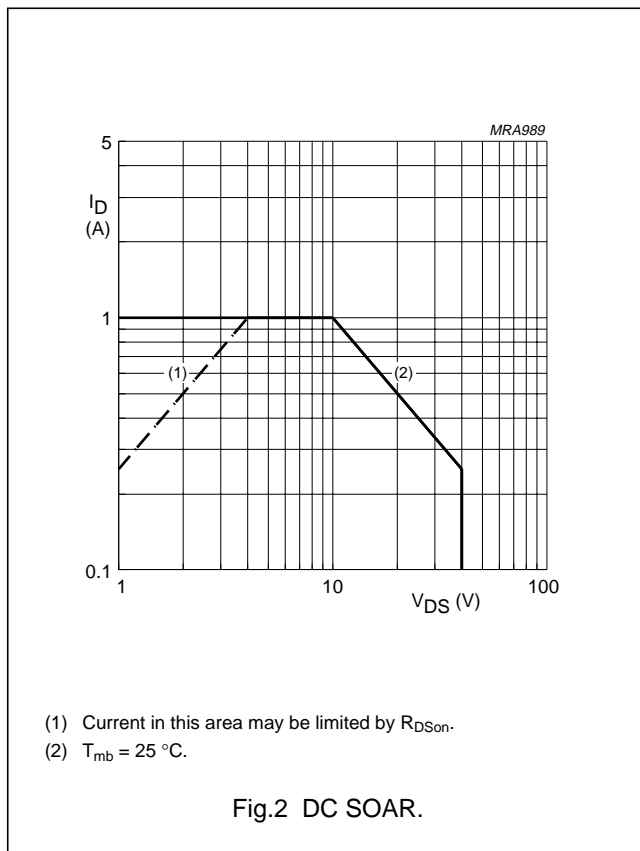
| SYMBOL    | PARAMETER               | CONDITIONS                             | MIN. | MAX.     | UNIT             |
|-----------|-------------------------|--|------|----------|------------------|
| $V_{DS}$  | drain-source voltage    |  | –    | 40       | V                |
| $V_{GS}$  | gate-source voltage     |  | –    | $\pm 20$ | V                |
| $I_D$     | drain current (DC)      |  | –    | 1        | A                |
| $P_{tot}$ | total power dissipation | $T_{mb} \leq 25\text{ }^\circ\text{C}$ | –    | 10       | W                |
| $T_{stg}$ | storage temperature     |  | –65  | 150      | $^\circ\text{C}$ |
| $T_j$     | junction temperature    |  | –    | 200      | $^\circ\text{C}$ |

## THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER  | VALUE | UNIT |
|----------------|--|-------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base  | 17.5  | K/W  |
| $R_{th\ j-a}$  | thermal resistance from junction to ambient; note1 | 75    | K/W  |

### Note

1. Mounted on printed-circuit board; see Fig.12.



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## CHARACTERISTICS

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

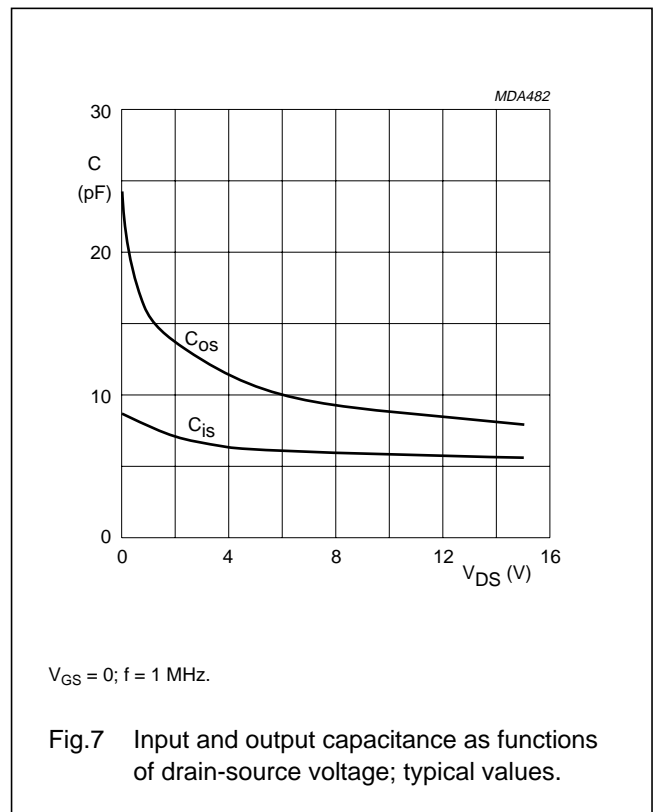
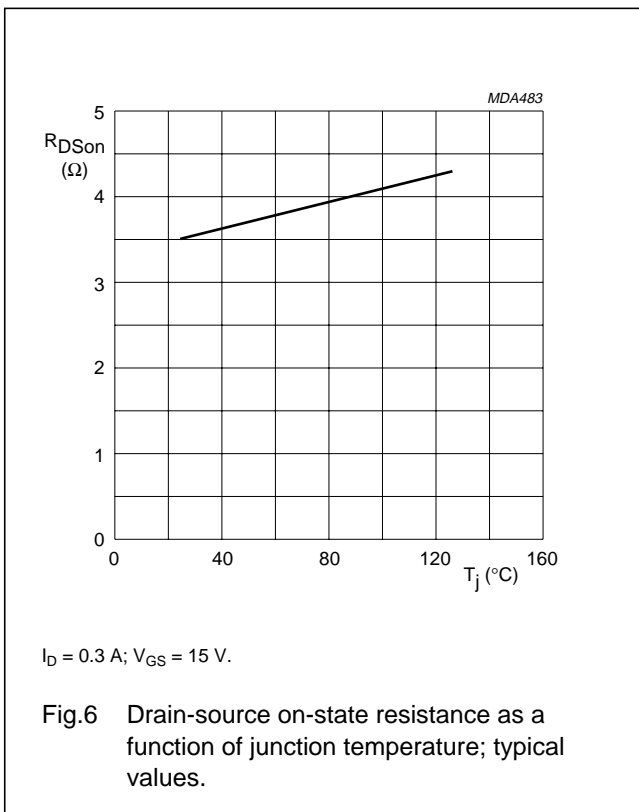
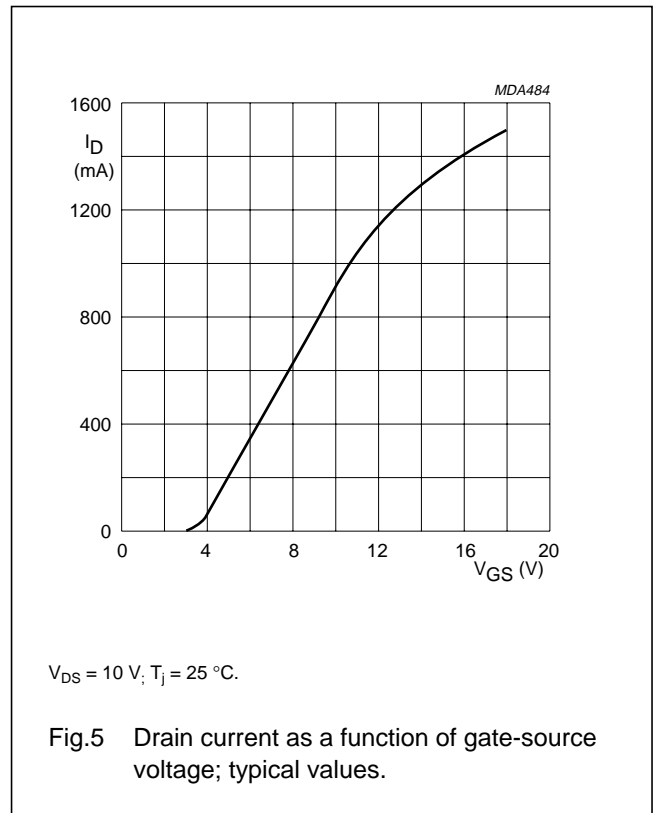
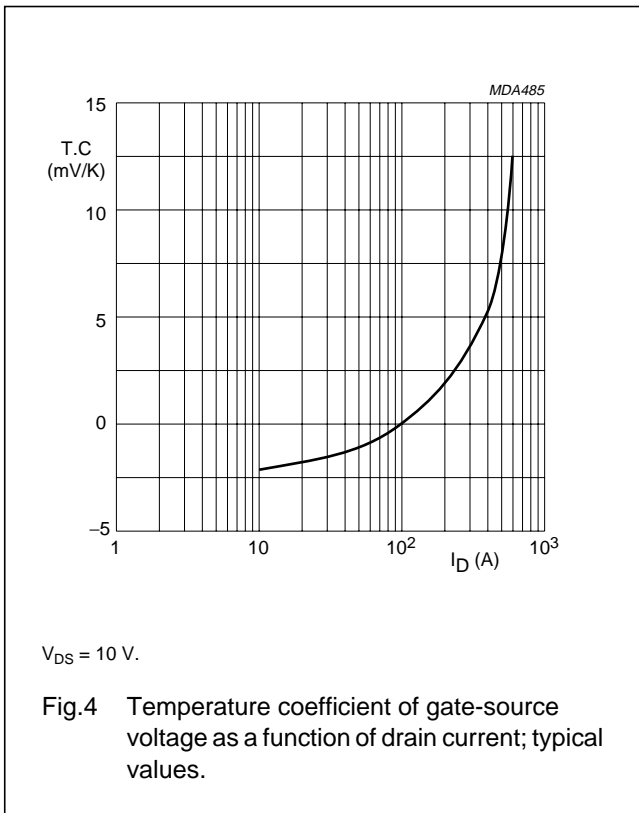
| SYMBOL        | PARAMETER                        | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|---------------|----------------------------------|--|------|------|------|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage   | $V_{GS} = 0$ ; $I_D = 3\text{ mA}$                           | 40   | –    | –    | V             |
| $I_{DSS}$     | drain-source leakage current     | $V_{GS} = 0$ ; $V_{DS} = 12.5\text{ V}$                      | –    | –    | 10   | $\mu\text{A}$ |
| $I_{GSS}$     | gate-source leakage current      | $V_{GS} = \pm 20\text{ V}$ ; $V_{DS} = 0$                    | –    | –    | 1    | $\mu\text{A}$ |
| $V_{GSth}$    | gate-source threshold voltage    | $I_D = 3\text{ mA}$ ; $V_{DS} = 10\text{ V}$                 | 2    | –    | 4.5  | V             |
| $g_{fs}$      | forward transconductance         | $I_D = 0.3\text{ A}$ ; $V_{DS} = 10\text{ V}$                | 80   | 135  | –    | mS            |
| $R_{DSon}$    | drain-source on-state resistance | $I_D = 0.3\text{ A}$ ; $V_{GS} = 15\text{ V}$                | –    | 3.5  | 4    | $\Omega$      |
| $I_{DSX}$     | on-state drain current           | $V_{GS} = 15\text{ V}$ ; $V_{DS} = 10\text{ V}$              | –    | 1.3  | –    | A             |
| $C_{is}$      | input capacitance                | $V_{GS} = 0$ ; $V_{DS} = 12.5\text{ V}$ ; $f = 1\text{ MHz}$ | –    | 5.3  | –    | pF            |
| $C_{os}$      | output capacitance               | $V_{GS} = 0$ ; $V_{DS} = 12.5\text{ V}$ ; $f = 1\text{ MHz}$ | –    | 7.8  | –    | pF            |
| $C_{rs}$      | feedback capacitance             | $V_{GS} = 0$ ; $V_{DS} = 12.5\text{ V}$ ; $f = 1\text{ MHz}$ | –    | 1.8  | –    | pF            |

 $V_{GS}$  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  |       |            |      |

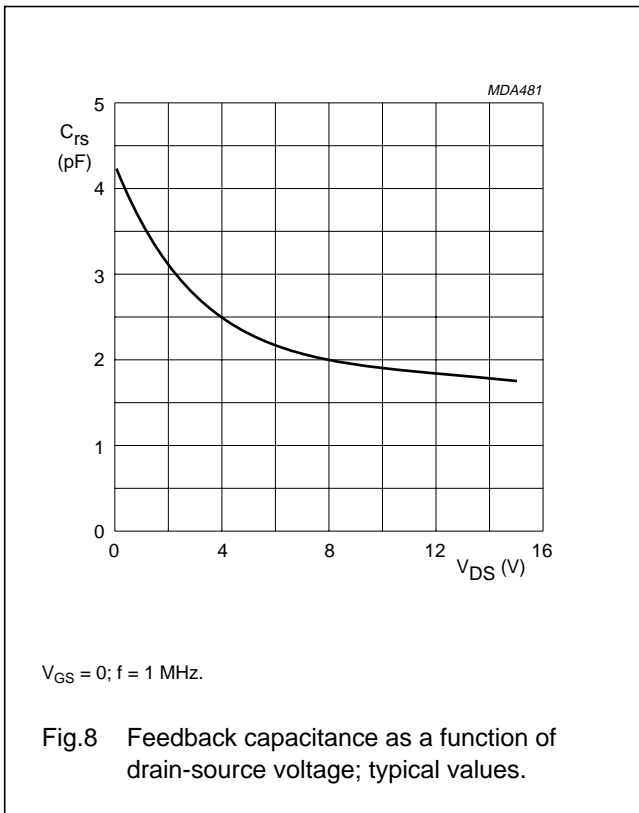
UHF power MOS transistor

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**APPLICATION INFORMATION FOR CLASS-B OPERATION**

$T_{amb} = 25$  °C;  $R_{GS} = 274$   $\Omega$ , unless otherwise specified.

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

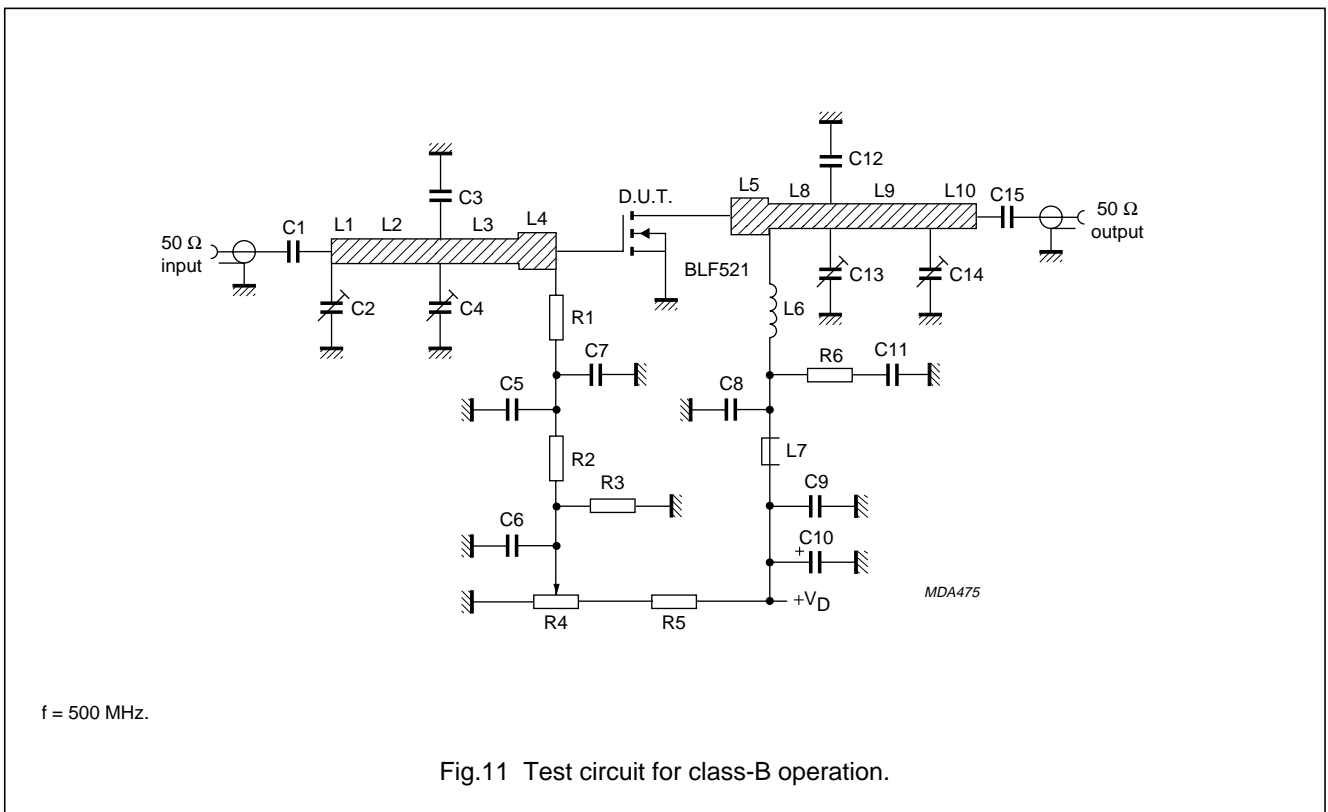
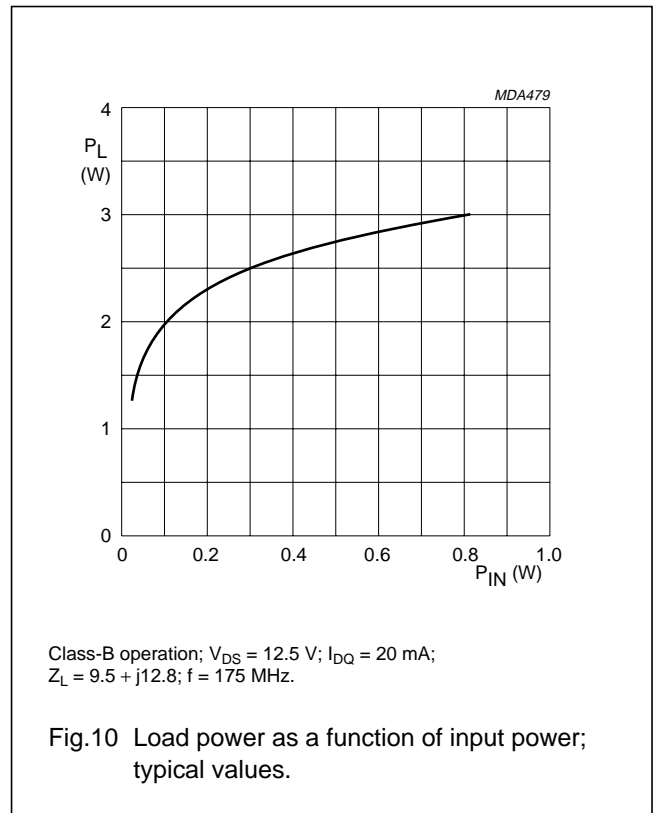
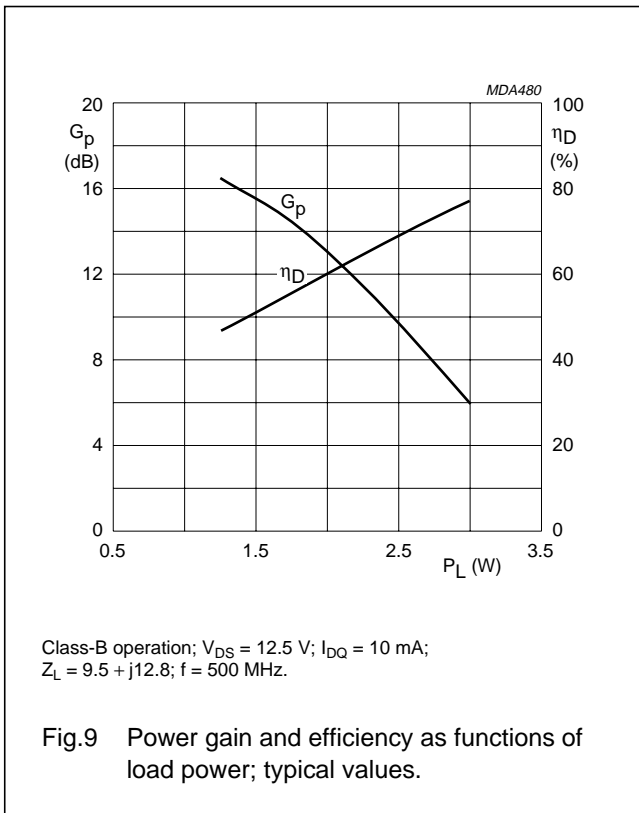
| MODE OF OPERATION | f (MHz) | $V_{DS}$ (V) | $I_{DQ}$ (mA) | $P_L$ (W) | $G_p$ (dB)      | $\eta_D$ (%)    |
|-------------------|---------|--------------|---------------|-----------|-----------------|-----------------|
| CW, class-B       | 500     | 12.5         | 10            | 2         | > 10<br>typ. 13 | > 50<br>typ. 60 |

**Ruggedness in class-B operation**

The BLF521 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 50:1$  through all phases under the following conditions:  $V_{DS} = 15.5$  V;  $f = 500$  MHz at rated output power.

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## List of components class-AB test circuit (see Fig.12)

| COMPONENT       | DESCRIPTION                               | VALUE                        | DIMENSIONS   | CATALOGUE NO.  |
|-----------------|---|------------------------------|--|----------------|
| C1, C5, C8, C15 | multilayer ceramic chip capacitor; note 1 | 390 pF, 500 V                |  |                |
| C2, C13         | film dielectric trimmer                   | 2 to 9 pF                    |  | 2222 809 09002 |
| C3              | multilayer ceramic chip capacitor; note 2 | 5.6 pF, 500 V                |  |                |
| C4              | film dielectric trimmer                   | 2 to 18 pF                   |  | 2222 809 09003 |
| C6, C11         | multilayer ceramic chip capacitor         | 2 × 100 nF in parallel, 50 V |  | 2222 852 47104 |
| C7, C9          | multilayer ceramic chip capacitor         | 100 nF, 50 V                 |  | 2222 852 47104 |
| C10             | electrolytic capacitor                    | 10 µF, 63 V                  |  | 2222 030 38109 |
| C12             | multilayer ceramic chip capacitor; note 2 | 9.1 pF, 50 V                 |  |                |
| C14             | film dielectric trimmer                   | 1.4 to 5.5 pF                |  | 2222 809 09001 |
| L1              | stripline; note 3                         | 83 Ω                         | 20 × 2 mm  |                |
| L2              | stripline; note 3                         | 83 Ω                         | 21 × 2 mm  |                |
| L3              | stripline; note 3                         | 83 Ω                         | 19 × 2 mm  |                |
| L4, L5          | stripline; note 3                         | 67 Ω                         | 12 × 3 mm  |                |
| L6              | 5 turns enamelled 0.5 mm copper wire      | 62 nH                        | length 3.75 mm<br>int. dia. 3 mm<br>leads 2 × 4 mm |                |
| L7              | grade 3B Ferroxcube RF choke              |                              |  | 4312 020 36642 |
| L8              | stripline; note 3                         | 83 Ω                         | 18.6 × 2 mm  |                |
| L9              | stripline; note 3                         | 83 Ω                         | 31.6 × 2 mm  |                |
| L10             | stripline; note 3                         | 83 Ω                         | 2 × 2 mm   |                |
| R1              | 0.4 W metal film resistor                 | 274 Ω                        |  | 2322 151 72741 |
| R2              | 0.4 W metal film resistor                 | 1.96 kΩ                      |  | 2322 151 71962 |
| R3              | 0.4 W metal film resistor                 | 1 MΩ                         |  | 2322 151 71005 |
| R4              | cermet potentiometer                      | 5 kΩ                         |  |                |
| R5              | 0.4 W metal film resistor                 | 7.5 kΩ                       |  | 2322 151 77502 |
| R6              | 1 W metal film resistor                   | 10 Ω                         |  | 2322 153 51009 |

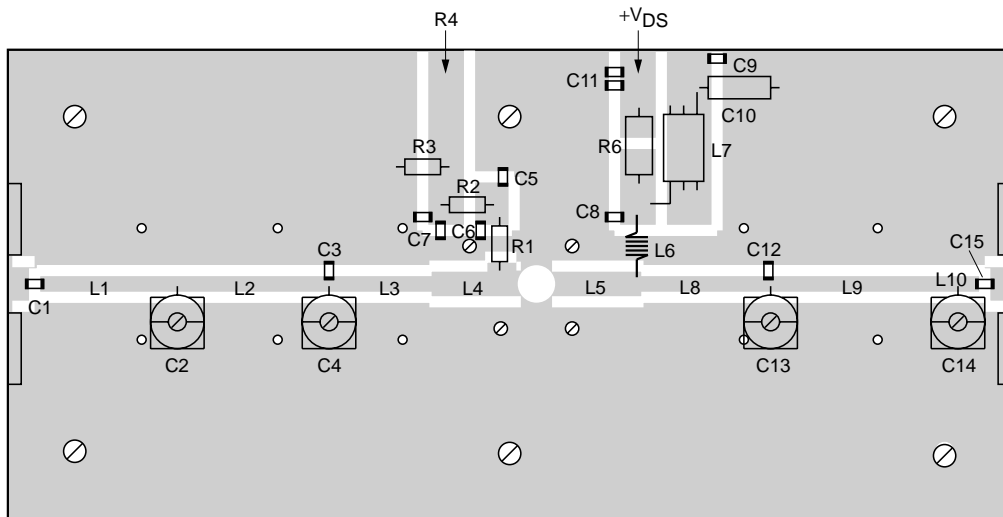
## Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. American Technical Ceramics (ATC) capacitor, type 100A 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 1.6 mm.

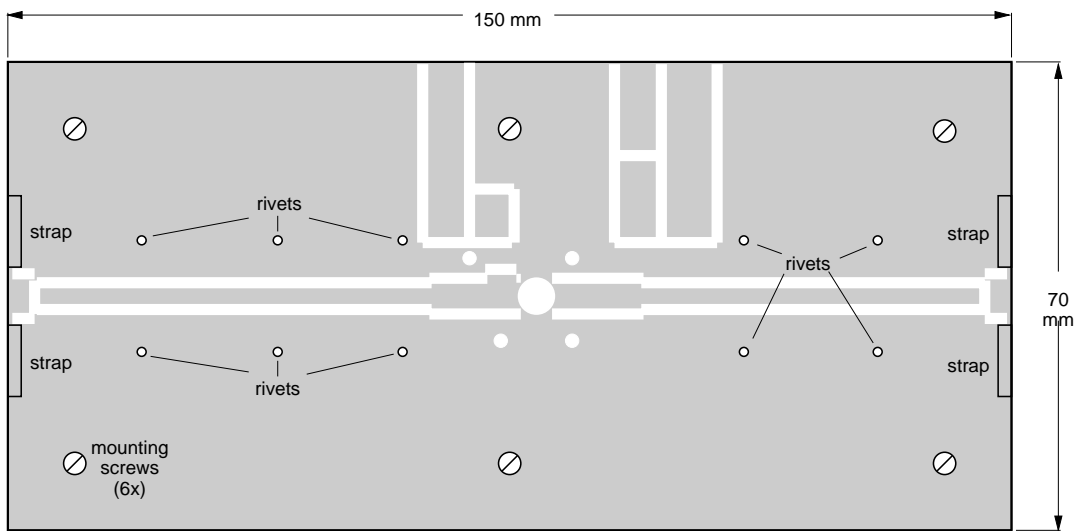


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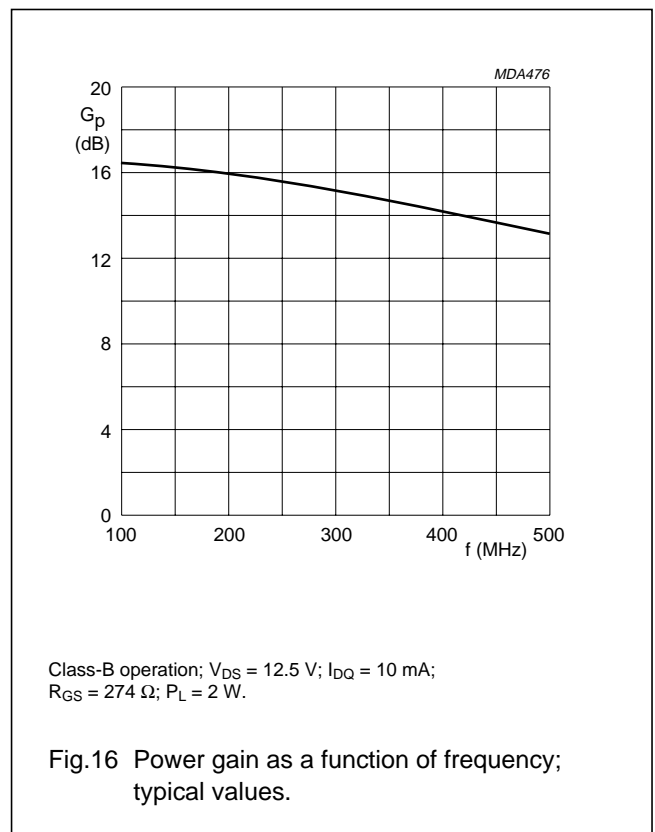
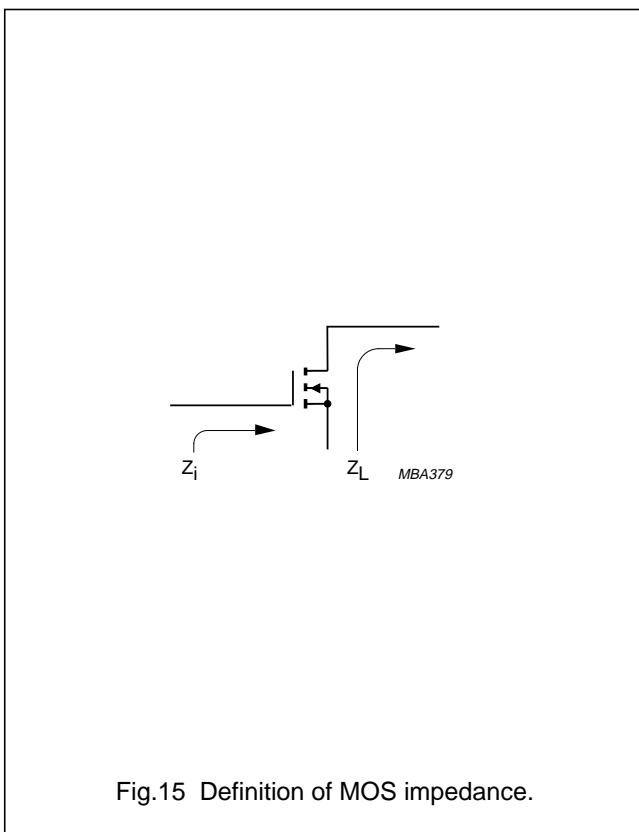
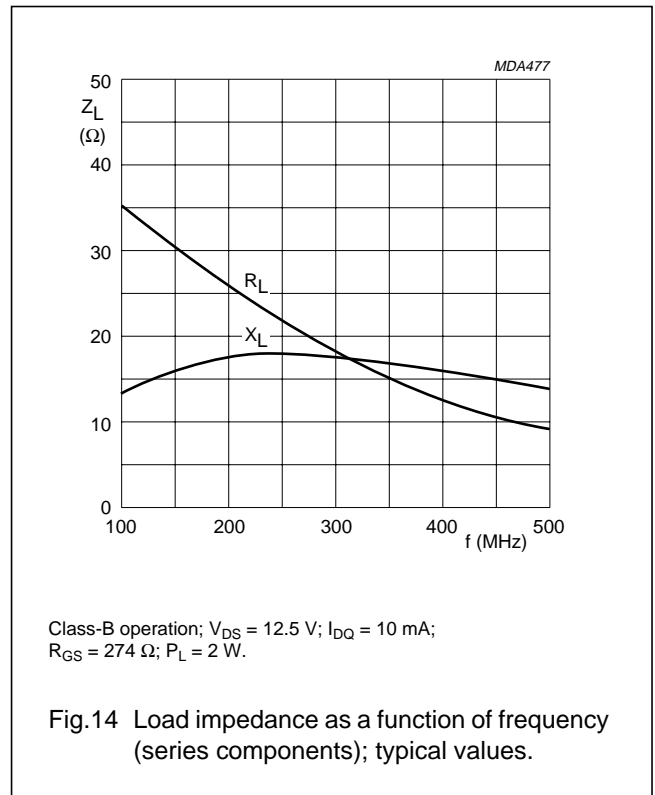
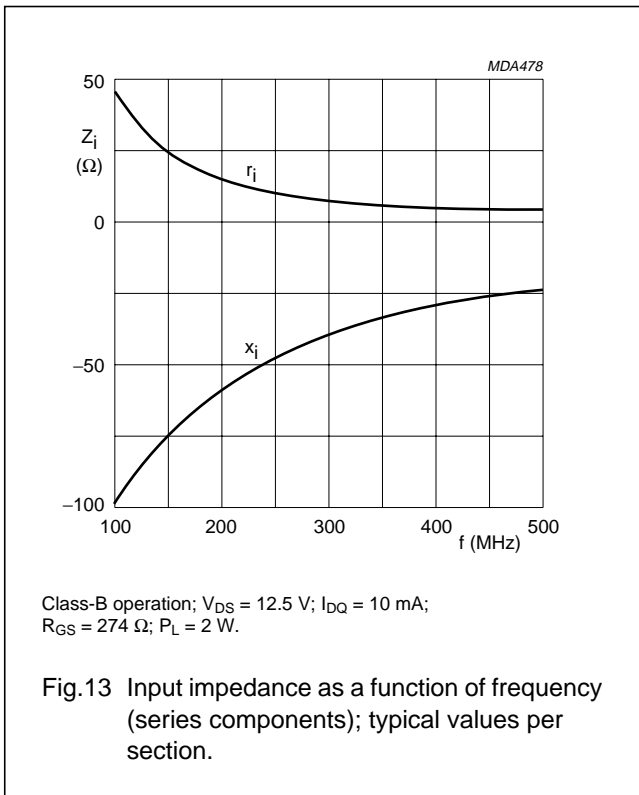
MBA380

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 for a direct contact between upper and lower sheets.

Fig.12 Component layout for 500 MHz test circuit.

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**BLF521 scattering parameters** $V_{DS} = 12.5\text{ V}$ ;  $I_D = 10\text{ mA}$ .; 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       | 1.00            | -1.6   | 4.51            | 178.5 | 0.01            | 88.5  | 0.98            | -2.0   |
| 10      | 1.00            | -3.2   | 4.51            | 177.0 | 0.01            | 87.2  | 0.98            | -4.0   |
| 20      | 1.00            | -6.4   | 4.50            | 173.9 | 0.02            | 84.5  | 0.98            | -8.0   |
| 30      | 1.00            | -9.6   | 4.48            | 170.9 | 0.03            | 81.7  | 0.98            | -12.0  |
| 40      | 0.99            | -12.8  | 4.45            | 167.9 | 0.04            | 79.0  | 0.97            | -16.0  |
| 50      | 0.99            | -16.0  | 4.43            | 164.9 | 0.05            | 76.2  | 0.97            | -19.9  |
| 60      | 0.98            | -19.1  | 4.39            | 161.9 | 0.06            | 73.5  | 0.97            | -23.8  |
| 70      | 0.97            | -22.1  | 4.34            | 158.9 | 0.07            | 70.9  | 0.96            | -27.6  |
| 80      | 0.97            | -25.1  | 4.28            | 156.1 | 0.08            | 68.3  | 0.96            | -31.3  |
| 90      | 0.96            | -28.0  | 4.22            | 153.3 | 0.08            | 65.8  | 0.95            | -34.9  |
| 100     | 0.95            | -30.9  | 4.16            | 150.5 | 0.09            | 63.3  | 0.94            | -38.5  |
| 125     | 0.92            | -37.9  | 4.00            | 144.0 | 0.11            | 57.5  | 0.93            | -47.1  |
| 150     | 0.90            | -44.3  | 3.83            | 137.6 | 0.13            | 51.8  | 0.91            | -55.2  |
| 175     | 0.87            | -50.4  | 3.64            | 131.8 | 0.14            | 46.7  | 0.89            | -62.7  |
| 200     | 0.85            | -56.0  | 3.46            | 126.5 | 0.15            | 42.2  | 0.88            | -69.6  |
| 250     | 0.80            | -66.2  | 3.12            | 116.4 | 0.17            | 33.4  | 0.85            | -81.9  |
| 300     | 0.77            | -75.1  | 2.81            | 108.0 | 0.18            | 26.4  | 0.82            | -92.3  |
| 350     | 0.74            | -82.9  | 2.54            | 100.1 | 0.19            | 19.8  | 0.81            | -101.3 |
| 400     | 0.72            | -89.7  | 2.31            | 93.5  | 0.19            | 14.4  | 0.79            | -108.9 |
| 450     | 0.70            | -95.9  | 2.10            | 87.1  | 0.19            | 9.5   | 0.79            | -115.5 |
| 500     | 0.69            | -101.5 | 1.93            | 81.4  | 0.19            | 4.9   | 0.78            | -121.2 |
| 600     | 0.69            | -111.3 | 1.64            | 71.2  | 0.19            | -2.6  | 0.78            | -130.7 |
| 700     | 0.69            | -119.9 | 1.41            | 62.2  | 0.18            | -8.7  | 0.77            | -138.5 |
| 800     | 0.69            | -127.9 | 1.23            | 54.3  | 0.17            | -13.6 | 0.78            | -145.2 |
| 900     | 0.70            | -135.1 | 1.08            | 47.3  | 0.15            | -17.7 | 0.78            | -151.4 |
| 1000    | 0.72            | -142.0 | 0.97            | 40.9  | 0.14            | -21.1 | 0.79            | -156.9 |

**Note**

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

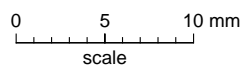
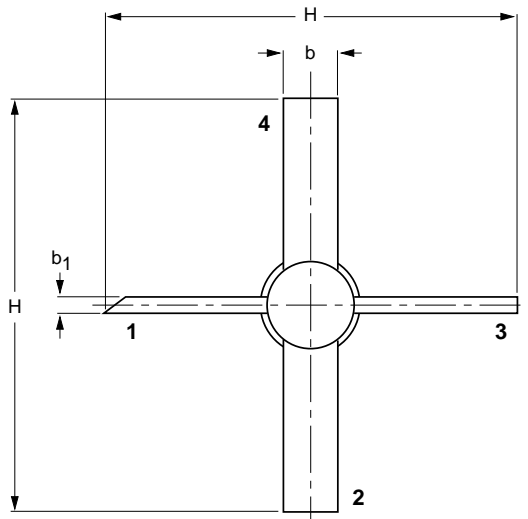
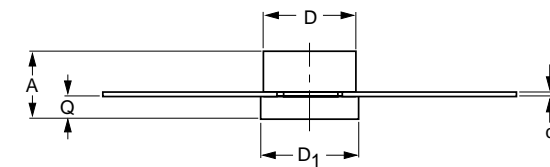
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PACKAGE OUTLINE

Studless ceramic package; 4 leads

SOT172D



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

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

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

## UHF power MOS transistor

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## 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>.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## DEFINITIONS

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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Printed in The Netherlands

613524/05/pp14

Date of release: 2003 Sep 02

Document order number: 9397 750 11587

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