

# BLF546

UHF push-pull power MOS transistor

Rev. 4 — 1 September 2015

AMPLEON

Product data sheet

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Ampleon

# UHF push-pull power MOS transistor

**BLF546**

## FEATURES

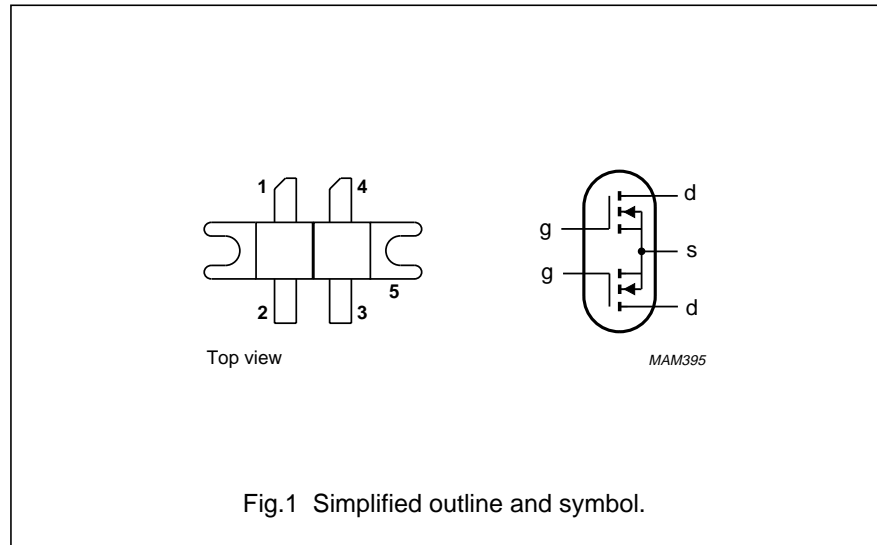
- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability
- Designed for broadband operation.

## DESCRIPTION

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

The transistor is encapsulated in a 4-lead, SOT268A balanced flange package, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

## 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 - SOT268A

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

**WARNING**

**Product and environmental safety - toxic materials**

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are 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 push-pull common source test circuit.

| MODE OF OPERATION | f (MHz) | V <sub>DS</sub> (V) | P <sub>L</sub> (W) | G <sub>p</sub> (dB) | η <sub>D</sub> (%) |
|-------------------|---------|---------------------|--------------------|---------------------|--------------------|
| CW, class-B       | 500     | 28                  | 80                 | >11                 | >50                |

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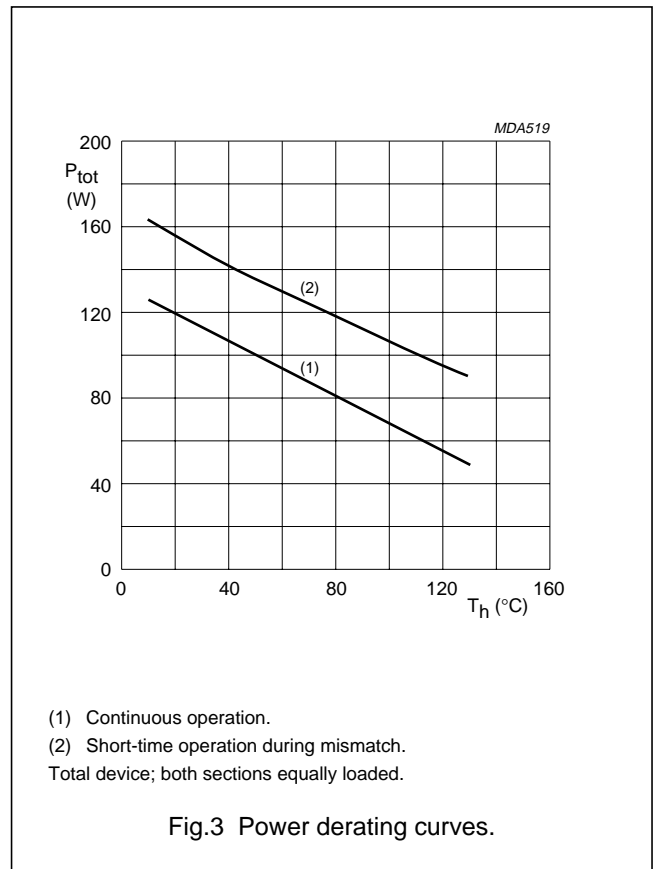
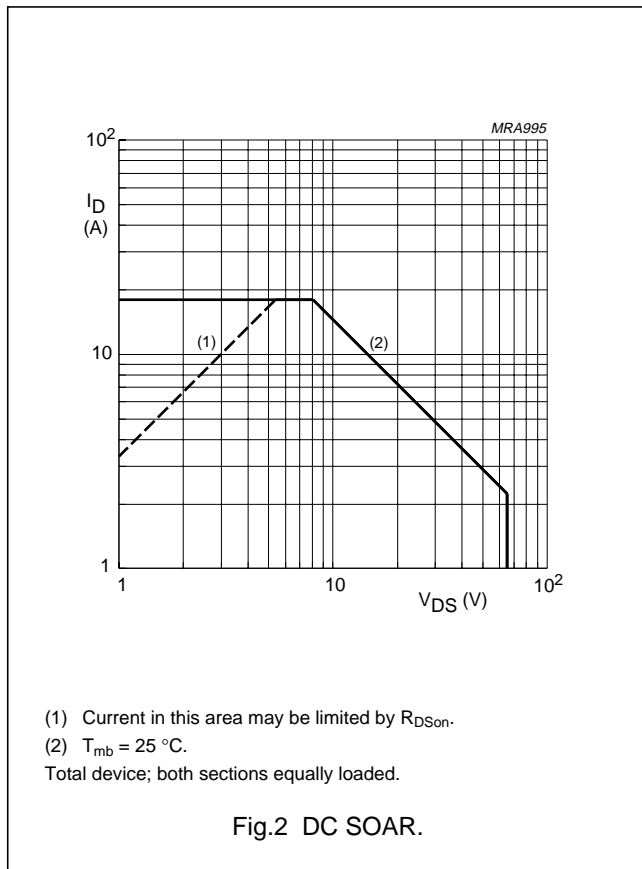
## LIMITING VALUES

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

| SYMBOL   | PARAMETER               | CONDITIONS  | MIN. | MAX.     | UNIT |
|--|-------------------------|---|------|----------|------|
| <b>Per transistor section (unless otherwise specified)</b> |                         |   |      |          |      |
| $V_{DS}$   | drain-source voltage    |   | –    | 65       | V    |
| $V_{GS}$   | gate-source voltage     |   | –    | $\pm 20$ | V    |
| $I_D$  | drain current (DC)      |   | –    | 9        | A    |
| $P_{tot}$  | total power dissipation | $T_{mb} \leq 25\text{ °C}$ ; total device; both sections equally loaded | –    | 145      | W    |
| $T_{stg}$  | storage temperature     |   | –65  | 150      | °C   |
| $T_j$  | junction temperature    |   | –    | 200      | °C   |

## THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER   | CONDITIONS                                 | VALUE | UNIT |
|----------------|---|--|-------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | total device; both sections equally loaded | 1.2   | K/W  |
| $R_{th\ mb-h}$ | thermal resistance from mounting base to heatsink | total device; both sections equally loaded | 0.25  | K/W  |



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## CHARACTERISTICS

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

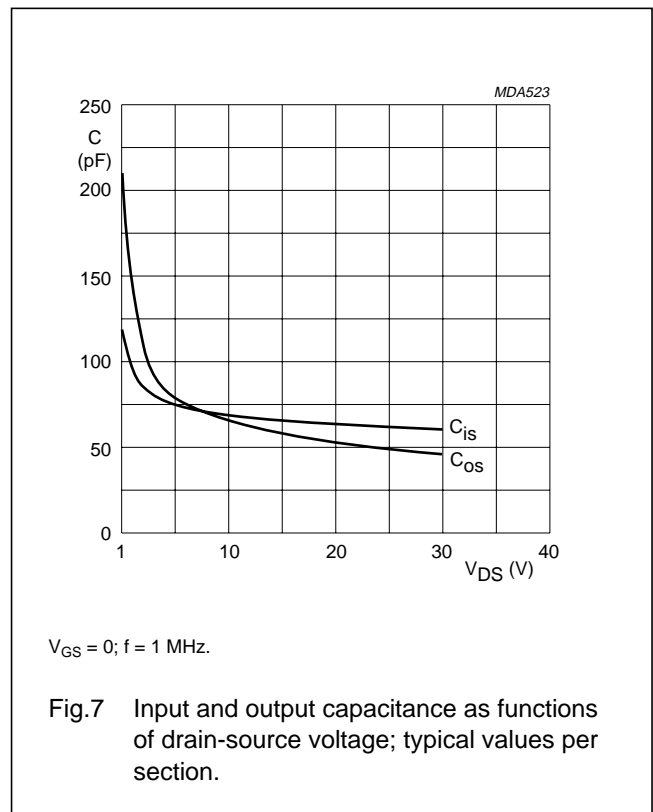
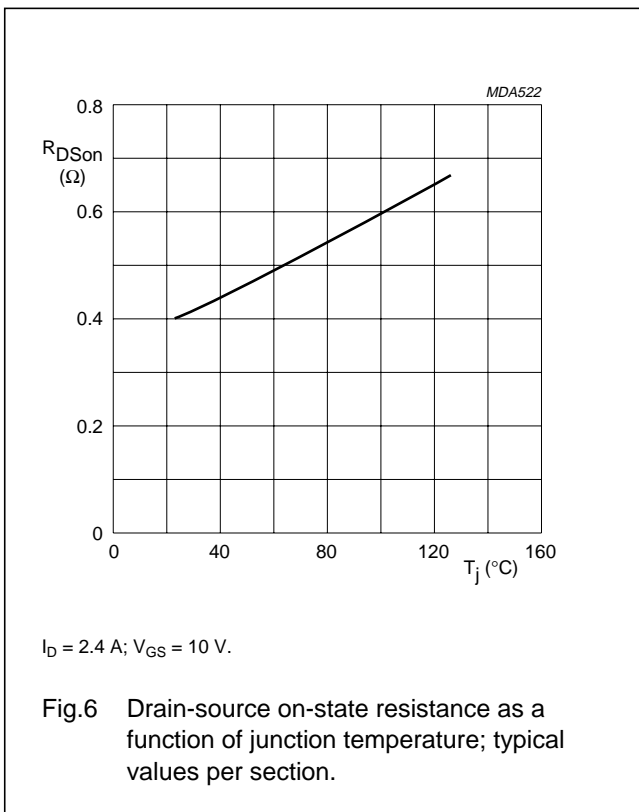
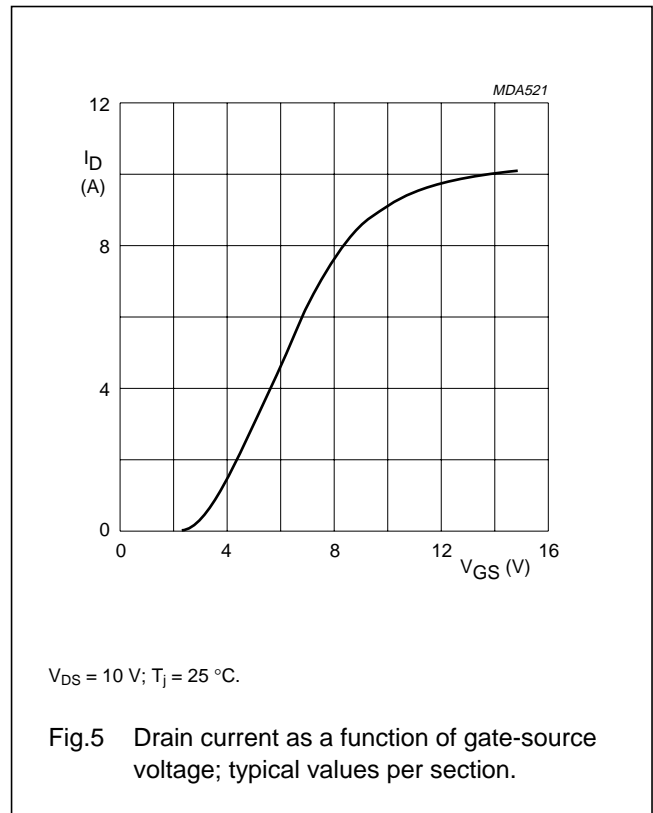
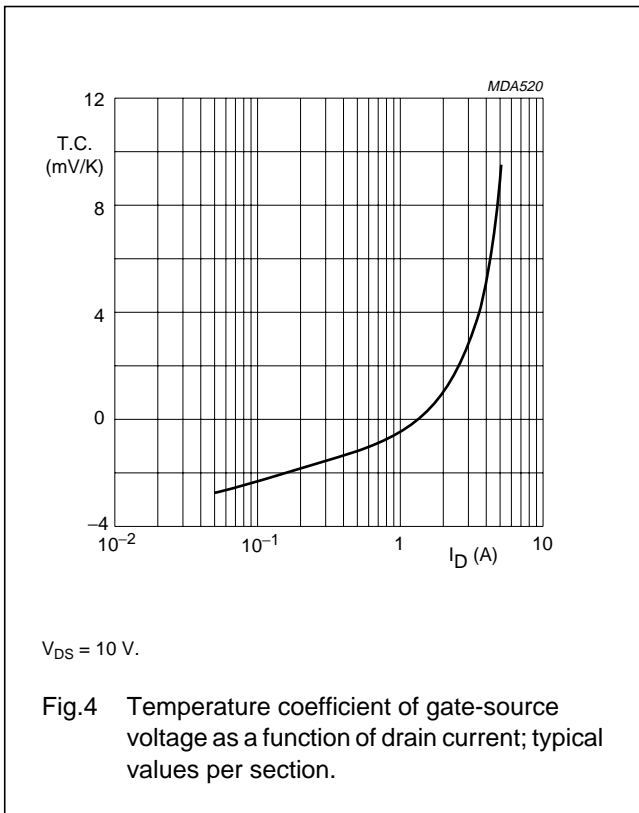
| SYMBOL             | PARAMETER                        | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|--------------------|----------------------------------|--|------|------|------|---------------|
| <b>Per section</b> |                                  |  |      |      |      |               |
| $V_{(BR)DSS}$      | drain-source breakdown voltage   | $V_{GS} = 0; I_D = 20\text{ mA}$                     | 65   | –    | –    | V             |
| $I_{DSS}$          | drain-source leakage current     | $V_{GS} = 0; V_{DS} = 28\text{ V}$                   | –    | –    | 2    | 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    | $I_D = 80\text{ mA}; V_{DS} = 10\text{ V}$           | 1    | –    | 4    | V             |
| $g_{fs}$           | forward transconductance         | $I_D = 2.4\text{ A}; V_{DS} = 10\text{ V}$           | 1.2  | 1.7  | –    | S             |
| $R_{DSon}$         | drain-source on-state resistance | $I_D = 2.4\text{ A}; V_{GS} = 10\text{ V}$           | –    | 0.4  | 0.6  | $\Omega$      |
| $I_{DSX}$          | on-state drain current           | $V_{GS} = 15\text{ V}; V_{DS} = 10\text{ V}$         | –    | 10   | –    | A             |
| $C_{is}$           | input capacitance                | $V_{GS} = 0; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | –    | 60   | –    | pF            |
| $C_{os}$           | output capacitance               | $V_{GS} = 0; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | –    | 46   | –    | pF            |
| $C_{rs}$           | feedback capacitance             | $V_{GS} = 0; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | –    | 15   | –    | 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  |       |            |      |

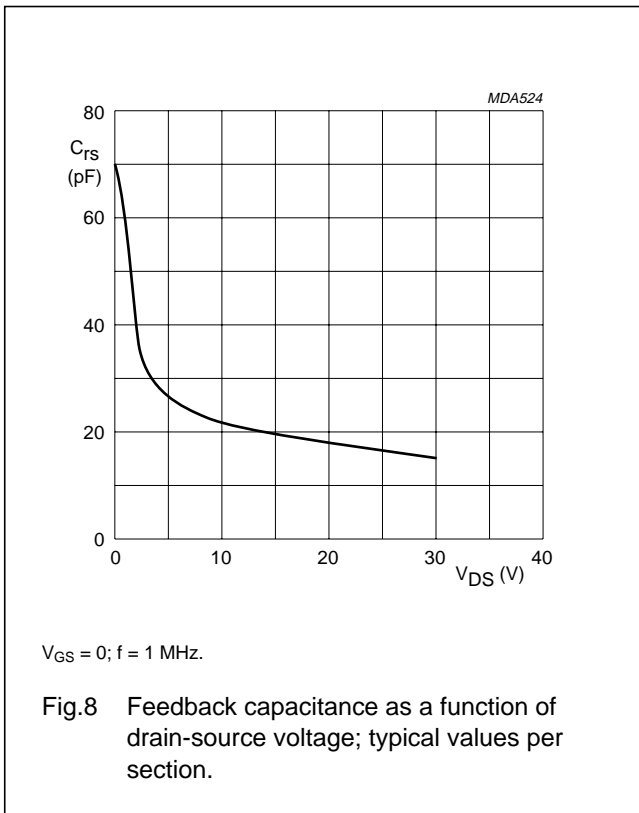
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**APPLICATION INFORMATION FOR CLASS-B OPERATION**

$T_h = 25$  °C;  $R_{th\ mb-h} = 0.25$  K/W, unless otherwise specified.

RF performance in a common source, class-B, push-pull circuit.

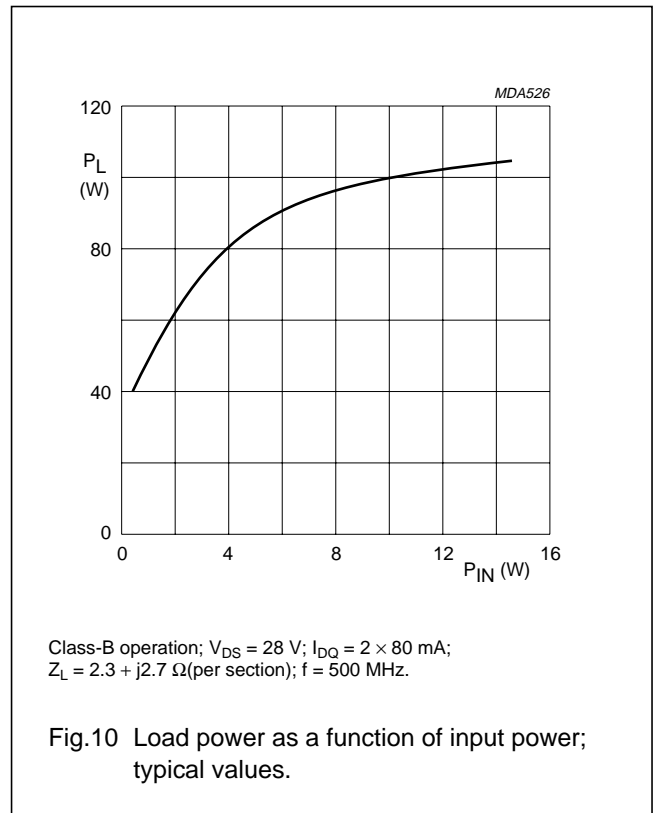
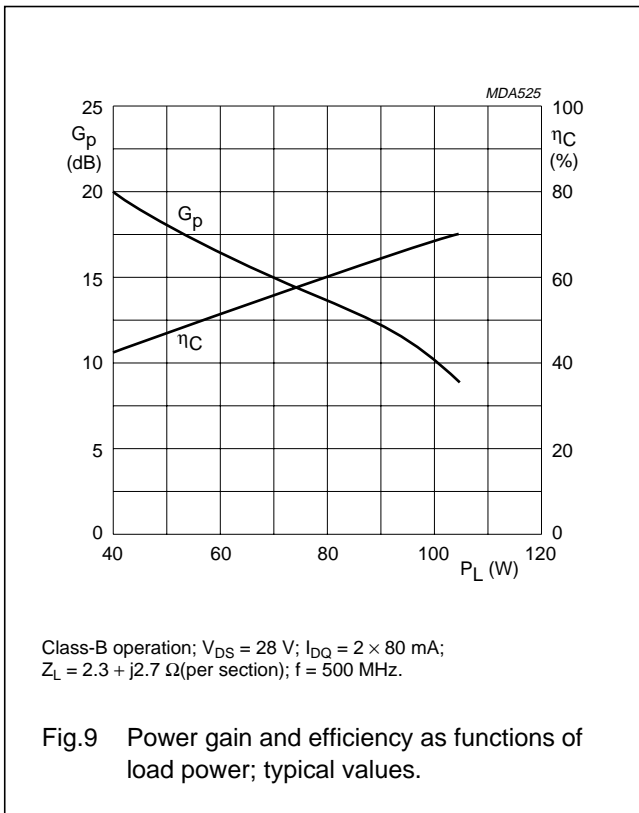
| MODE OF OPERATION | f (MHz) | $V_{DS}$ (V) | $I_{DQ}$ (mA) | $P_L$ (W) | $G_p$ (dB)     | $\eta_D$ (%)   |
|-------------------|---------|--------------|---------------|-----------|----------------|----------------|
| CW, class-B       | 500     | 28           | $2 \times 80$ | 80        | >11<br>typ. 13 | >50<br>typ. 60 |

**Ruggedness in class-B operation**

The BLF546 is capable of withstanding a full load mismatch corresponding to  $V_{SWR} = 10$  through all phases under the following conditions:  $V_{DS} = 28$  V;  $f = 500$  MHz at rated output power.

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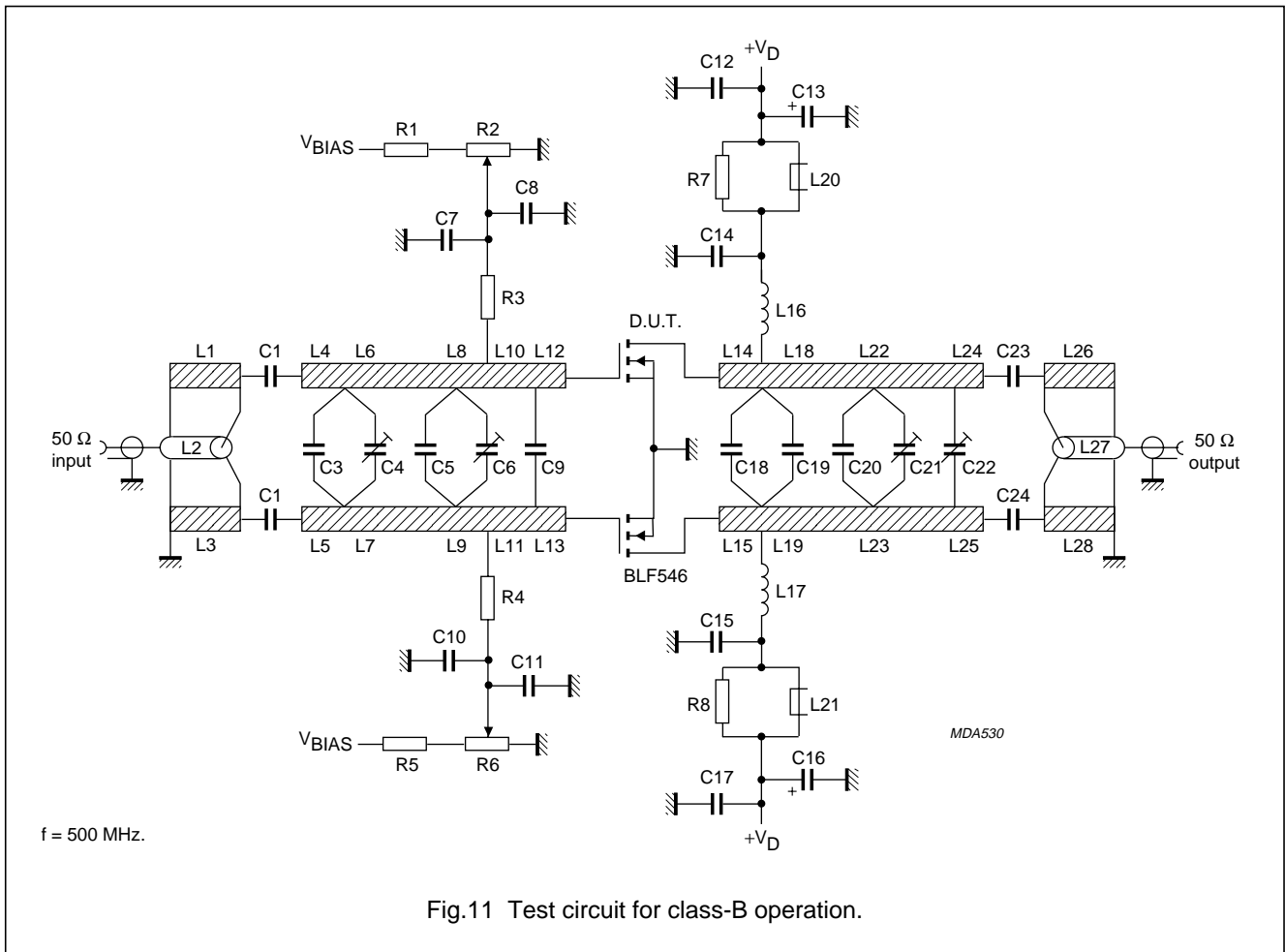


Fig.11 Test circuit for class-B operation.

List of components (see Fig.11)

| COMPONENT         | DESCRIPTION                                  | VALUE         | DIMENSIONS | CATALOGUE NO.  |
|-------------------|--|---------------|------------|----------------|
| C1, C2            | multilayer ceramic chip capacitor;<br>note 1 | 33 pF, 500 V  |            |                |
| C3                | multilayer ceramic chip capacitor;<br>note 1 | 11 pF, 500 V  |            |                |
| C4, C6, C21, C22  | film dielectric trimmer                      | 2 to 9 pF     |            | 2222 809 09005 |
| C5                | multilayer ceramic chip capacitor;<br>note 2 | 12 pF, 500 V  |            |                |
| C7, C10, C14, C15 | multilayer ceramic chip capacitor;<br>note 1 | 390 pF, 500 V |            |                |
| C8, C11, C12, C17 | multilayer ceramic chip capacitor            | 100 nF, 50 V  |            | 2222 852 47104 |
| C9                | multilayer ceramic chip capacitor;<br>note 2 | 39 pF, 500 V  |            |                |
| C13, C16          | electrolytic capacitor                       | 4.7 μF, 63 V  |            | 2222 030 38478 |



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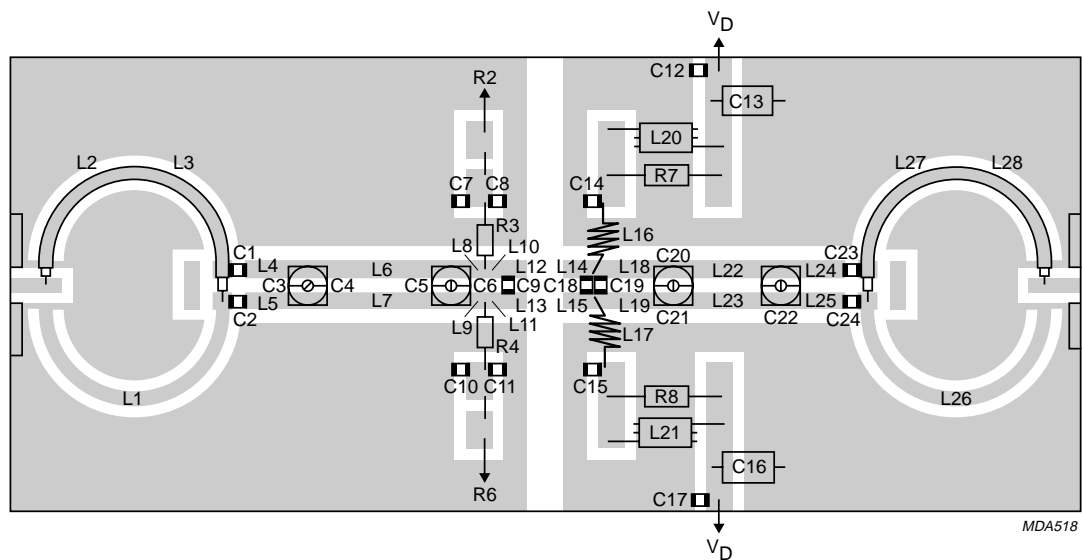
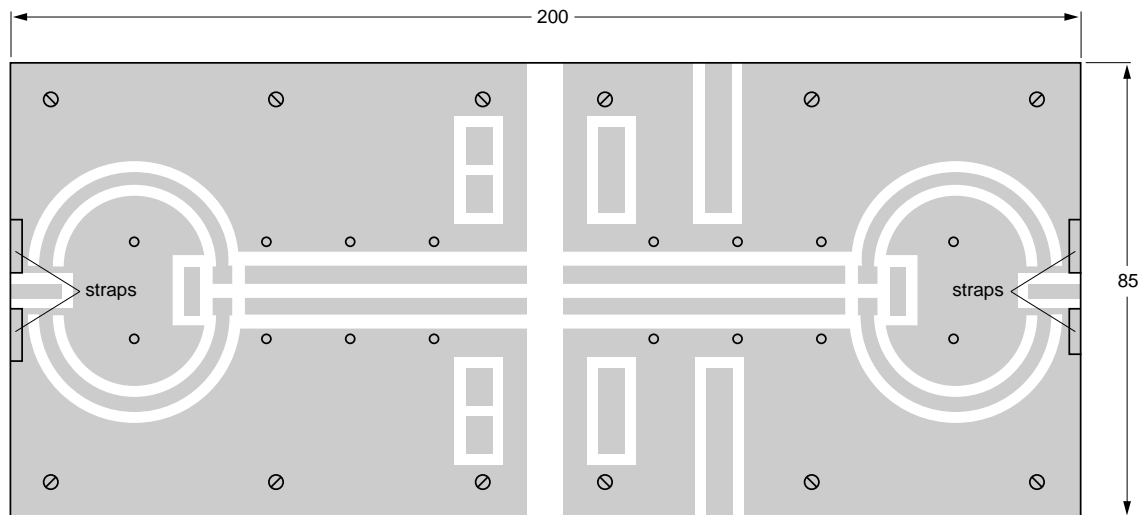
| COMPONENT        | DESCRIPTION                                  | VALUE           | DIMENSIONS   | CATALOGUE NO.  |
|------------------|--|-----------------|--|----------------|
| C18, C19         | multilayer ceramic chip capacitor;<br>note 2 | 18 pF, 500 V    |  |                |
| C20              | multilayer ceramic chip capacitor;<br>note 2 | 15 pF, 500 V    |  |                |
| C23, C24         | multilayer ceramic chip capacitor;<br>note 1 | 15 pF, 500 V    |  |                |
| L1, L3, L26, L28 | stripline; note 3                            | 50 $\Omega$     | 55.6 $\times$ 2.4 mm                                       |                |
| L2               | semi-rigid cable; note 4                     | 50 $\Omega$     | ext. dia. 2 mm<br>ext. conductor<br>length 55.6 mm         |                |
| L4, L5           | stripline; note 3                            | 42 $\Omega$     | 12 $\times$ 3 mm   |                |
| L6, L7           | stripline; note 3                            | 42 $\Omega$     | 26.5 $\times$ 3 mm   |                |
| L8, L9           | stripline; note 3                            | 42 $\Omega$     | 5.5 $\times$ 3 mm  |                |
| L10, L11         | stripline; note 3                            | 42 $\Omega$     | 6 $\times$ 3 mm  |                |
| L12, L13         | stripline; note 3                            | 42 $\Omega$     | 3 $\times$ 3 mm  |                |
| L14, L15         | stripline; note 3                            | 42 $\Omega$     | 7 $\times$ 3 mm  |                |
| L16, L17         | 3 turns enamelled 1 mm copper wire           | 15.6 nH         | length 8.5 mm<br>int. dia. 5.4 mm<br>leads 2 $\times$ 5 mm |                |
| L18, L19         | stripline; note 3                            | 42 $\Omega$     | 12 $\times$ 3 mm   |                |
| L20, L21         | grade 3B Ferroxcube RF choke                 |                 |  | 4312 020 36642 |
| L22, L23         | stripline; note 3                            | 42 $\Omega$     | 20 $\times$ 3 mm   |                |
| L24, L25         | stripline; note 3                            | 42 $\Omega$     | 14 $\times$ 3 mm   |                |
| L27              | semi-rigid cable; note 5                     | 50 $\Omega$     | ext. dia. 2 mm<br>ext. conductor<br>length 55.6 mm         |                |
| R1, R5           | 0.4 W metal film resistor                    | 11.5 k $\Omega$ |  | 2322 151 71153 |
| R2, R6           | 10 turns cermet potentiometer                | 50 k $\Omega$   |  |                |
| R3, R4           | 0.4 W metal film resistor                    | 10 k $\Omega$   |  | 2322 151 71003 |
| R7, R8           | 1 W metal film resistor                      | 10 $\Omega$     |  | 2322 153 51009 |

**Notes**

- American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
- American Technical Ceramics (ATC) capacitor, type 175B or other capacitor of the same quality.
- The striplines are on a double copper-clad printed circuit board, with glass microfibre reinforced PTFE ( $\epsilon_r = 2.2$ ); thickness  $\frac{1}{32}$  inch.
- Semi-rigid cable L2 is soldered on to stripline L3.
- Semi-rigid cable L27 is soldered on to stripline L28.

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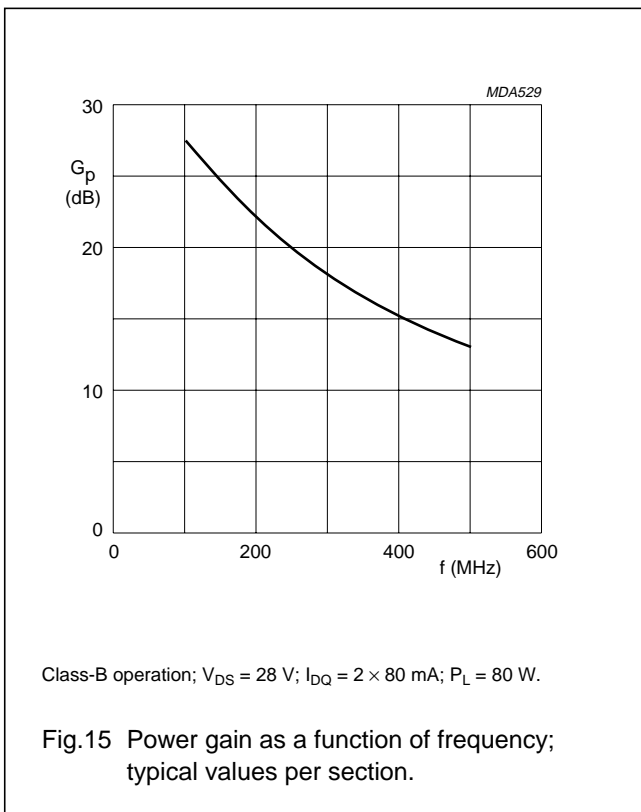
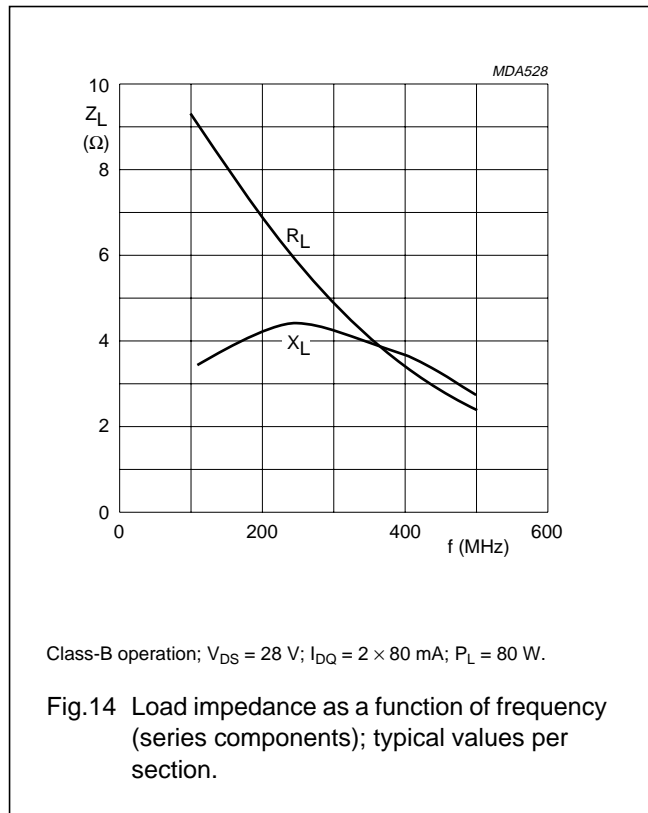
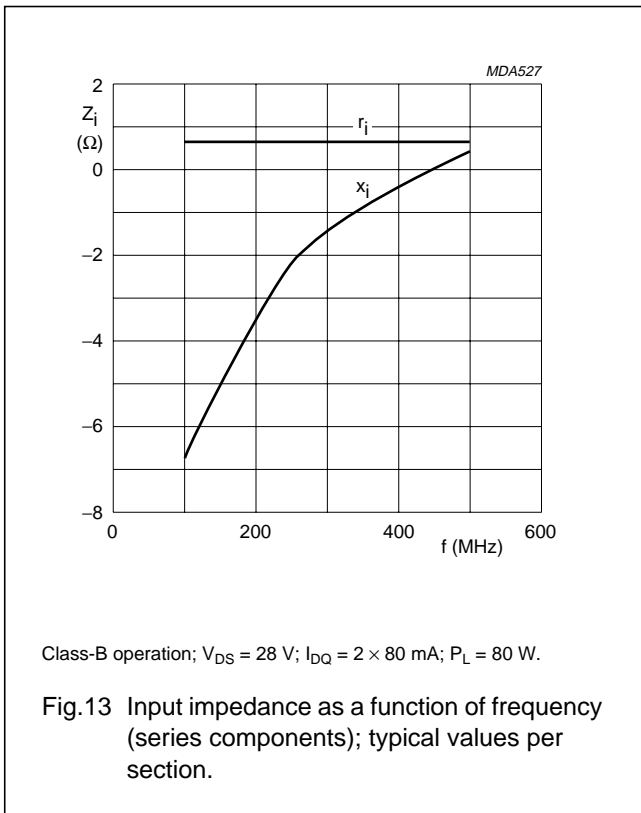
Dimensions in mm.

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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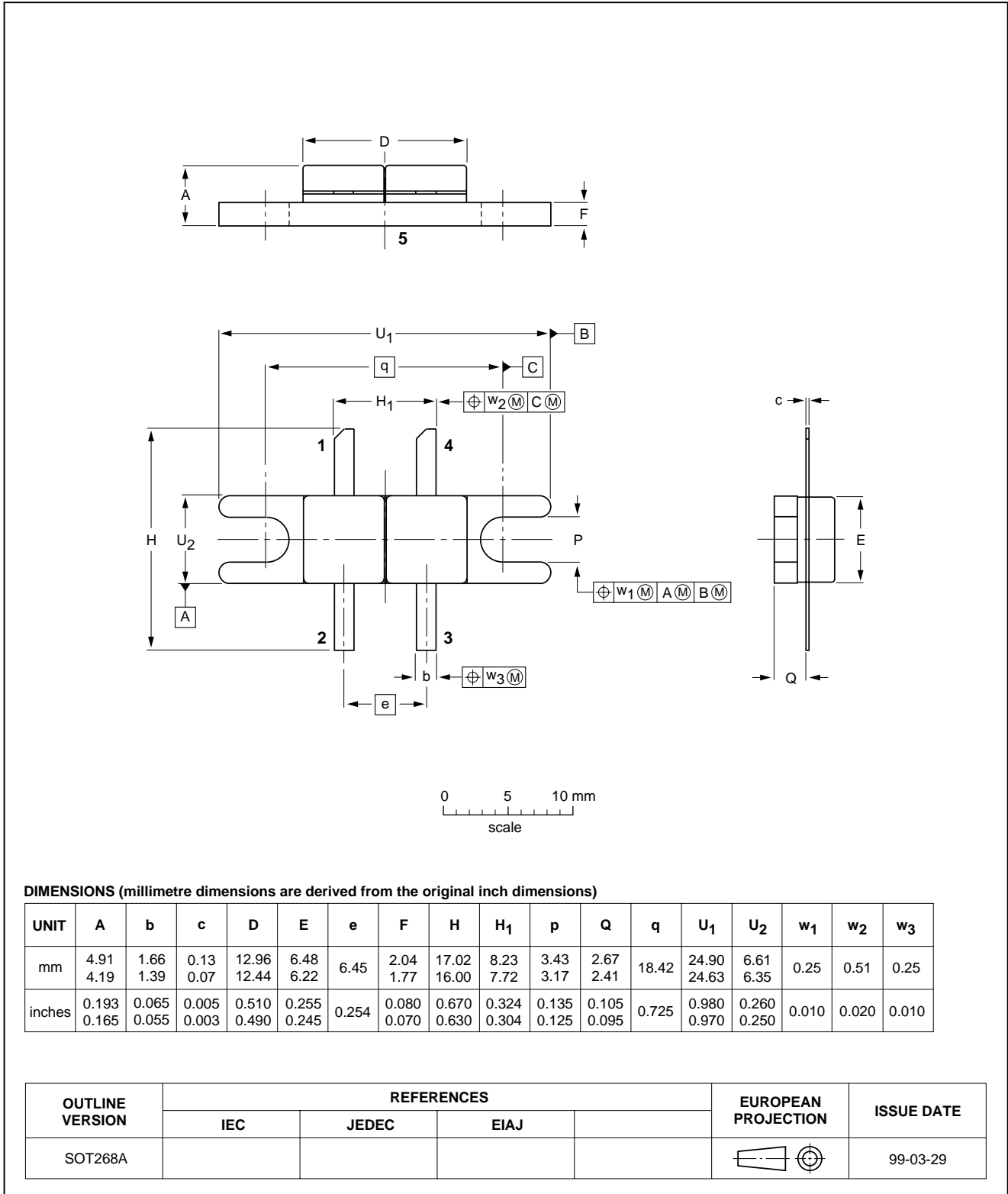
# UHF push-pull power MOS transistor

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## PACKAGE OUTLINE

Flanged double-ended ceramic package; 2 mounting holes; 4 leads

SOT268A



## UHF push-pull 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.  |
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