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

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Thank you for your cooperation and understanding,

Ampleon

UHF push-pull power MOS transistor

BLF548

FEATURES

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

DESCRIPTION

Dual push-pull 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, SOT262A2 balanced flange package, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PIN CONFIGURATION

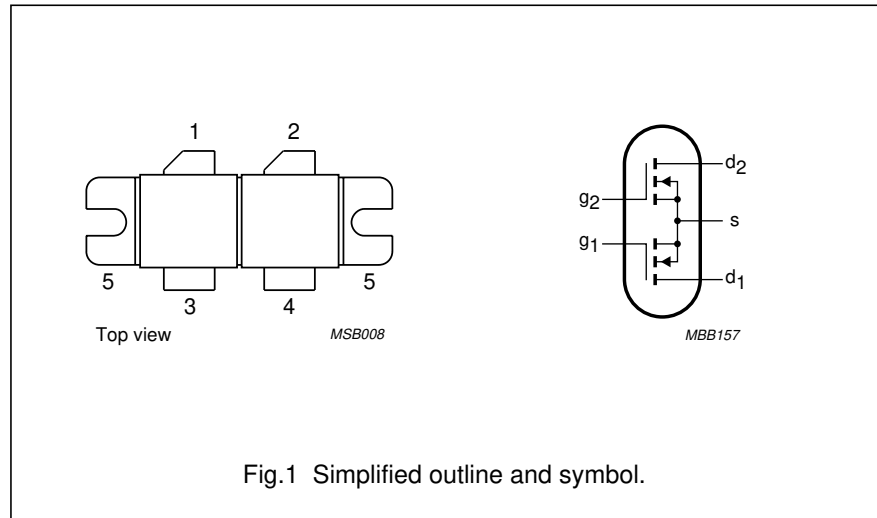


Fig.1 Simplified outline and symbol.

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 - SOT262A2

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | drain 1 |
| 2 | drain 2 |
| 3 | gate 1 |
| 4 | gate 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_{DS} (V) | P_L (W) | G_p (dB) | η_D (%) |
|-------------------|---------|--------------|-----------|------------|--------------|
| CW, class-B | 500 | 28 | 150 | >10 | >50 |

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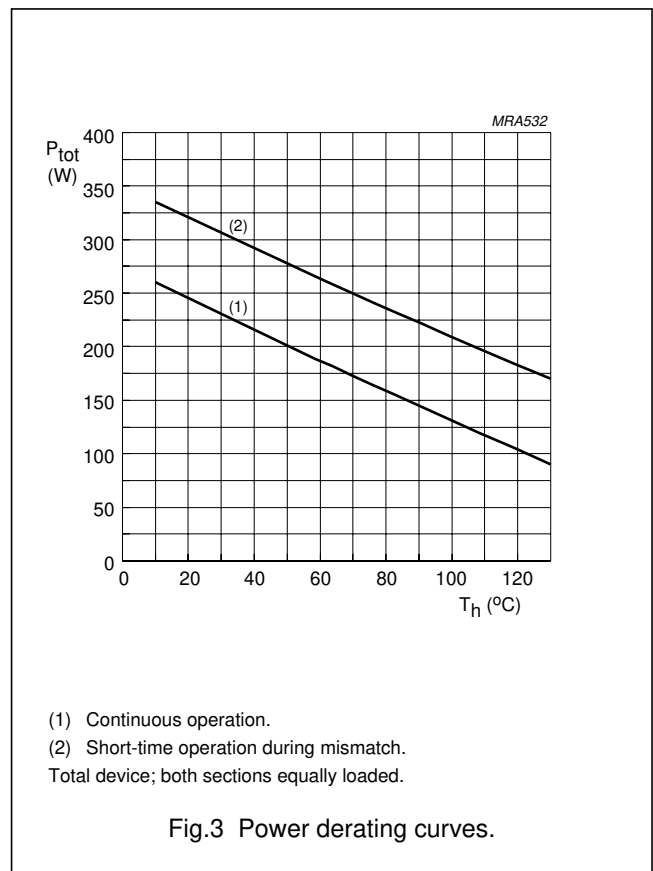
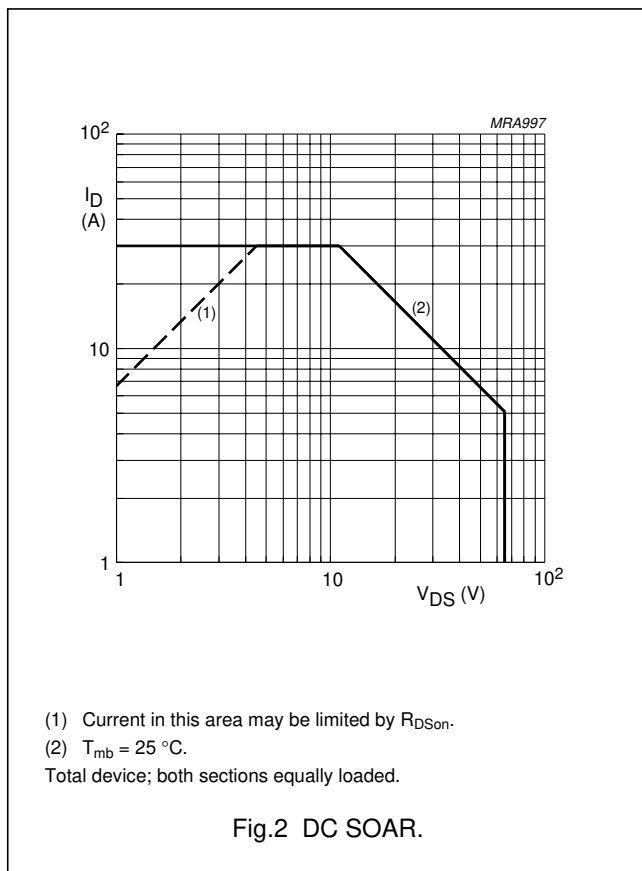
LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|--|-------------------------|---|------|------|------|
| Per transistor section unless otherwise specified | | | | | |
| V_{DS} | drain-source voltage | | – | 65 | V |
| V_{GS} | gate-source voltage | | – | ±20 | V |
| I_D | drain current (DC) | | – | 15 | A |
| P_{tot} | total power dissipation | $T_{mb} \leq 25\text{ °C}$; total device; both sections equally loaded | – | 330 | 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 | $T_{mb} = 25\text{ °C}$; $P_{tot} = 330\text{ W}$; total device; both sections equally loaded | 0.5 | K/W |
| $R_{th\ mb-h}$ | thermal resistance from mounting base to heatsink | total device; both sections equally loaded | 0.15 | K/W |



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CHARACTERISTICS

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

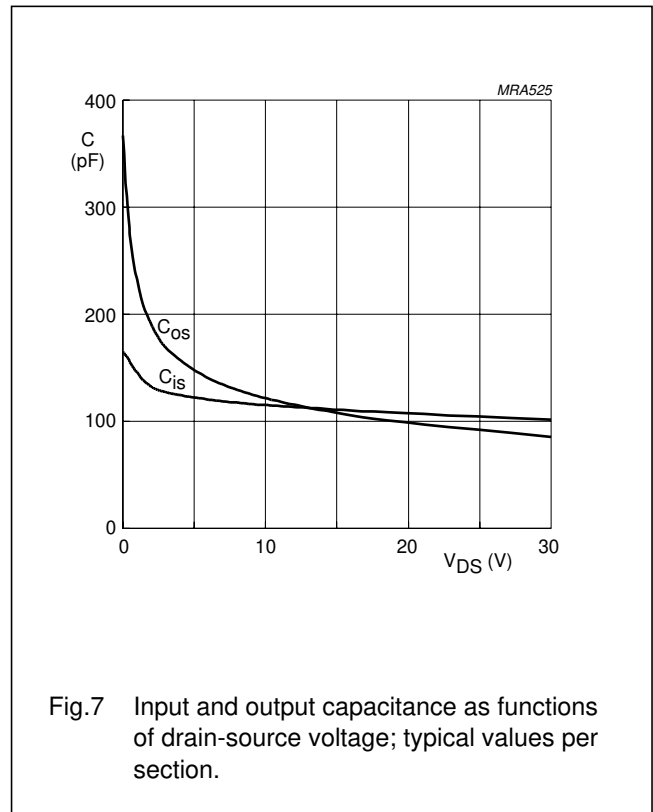
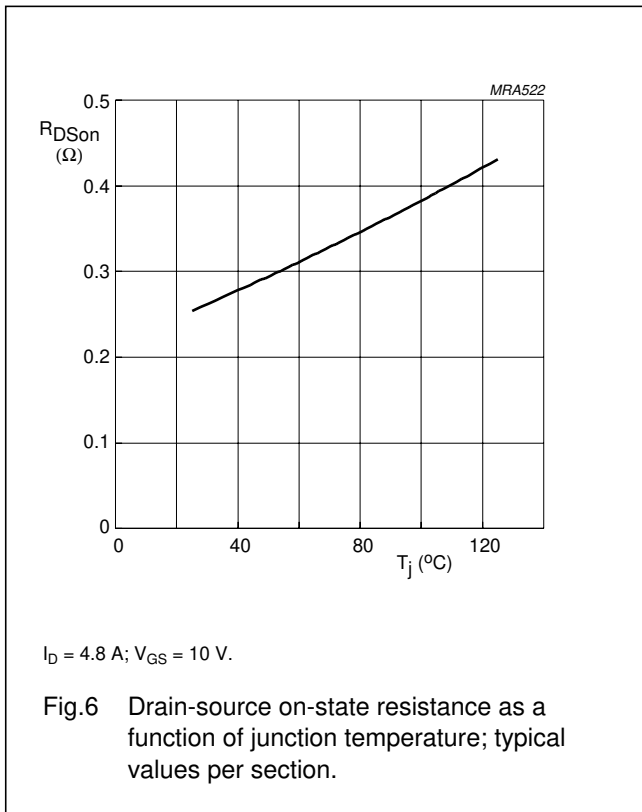
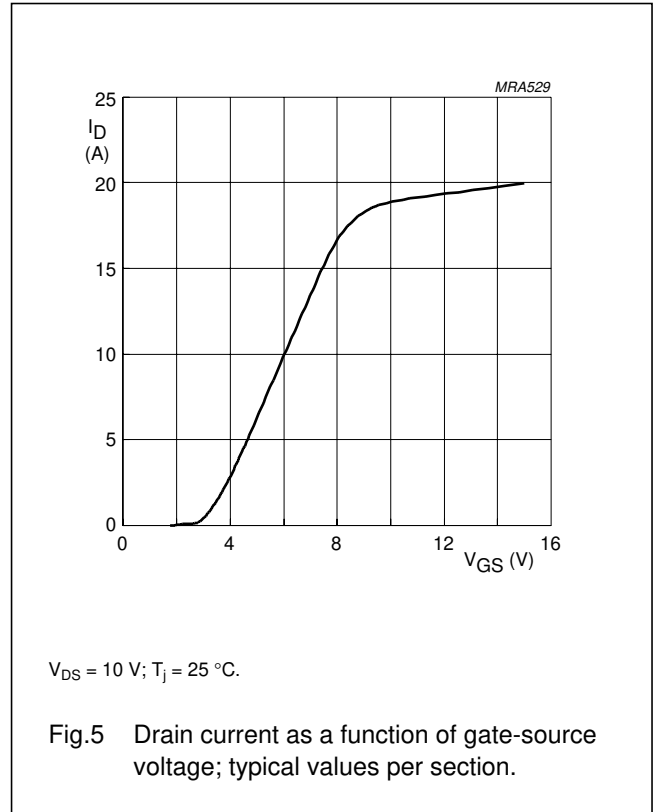
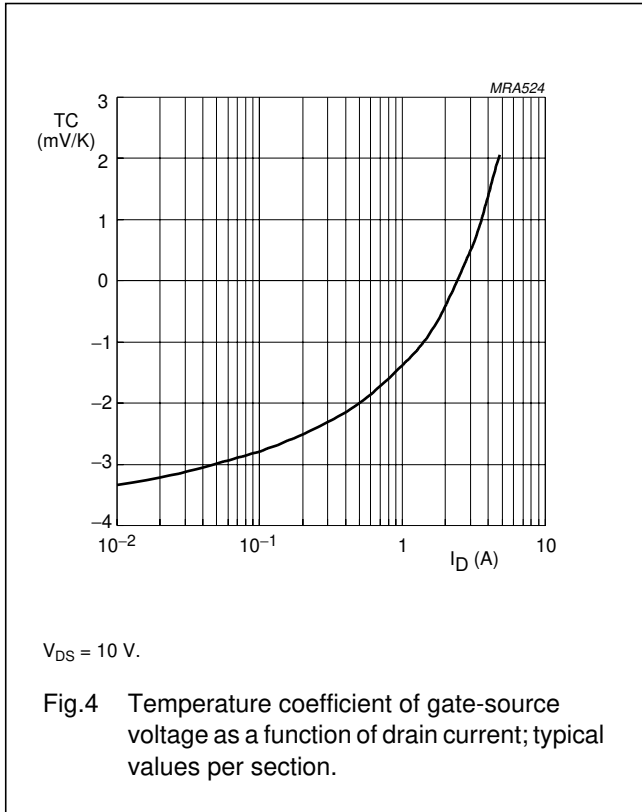
| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------------------------|----------------------------------|--|------|------|------|---------------|
| Per transistor section | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS} = 0; I_D = 40\text{ mA}$ | 65 | – | – | V |
| I_{DSS} | drain-source leakage current | $V_{GS} = 0; V_{DS} = 28\text{ V}$ | – | – | 0.5 | mA |
| I_{GSS} | gate-source leakage current | $V_{GS} = \pm 20\text{ V}; V_{DS} = 0$ | – | – | 1 | μA |
| V_{GSth} | gate-source threshold voltage | $I_D = 160\text{ mA}; V_{DS} = 10\text{ V}$ | 2 | – | 4 | V |
| g_{fs} | forward transconductance | $I_D = 4.8\text{ A}; V_{DS} = 10\text{ V}$ | 2.4 | 3.5 | – | S |
| R_{DSon} | drain-source on-state resistance | $I_D = 4.8\text{ A}; V_{GS} = 10\text{ V}$ | – | 0.25 | 0.3 | Ω |
| I_{DSX} | on-state drain current | $V_{GS} = 15\text{ V}; V_{DS} = 10\text{ V}$ | 16 | 20 | – | A |
| C_{is} | input capacitance | $V_{GS} = 0; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | – | 105 | – | pF |
| C_{os} | output capacitance | $V_{GS} = 0; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | – | 90 | – | pF |
| C_{rs} | feedback capacitance | $V_{GS} = 0; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | – | 25 | – | 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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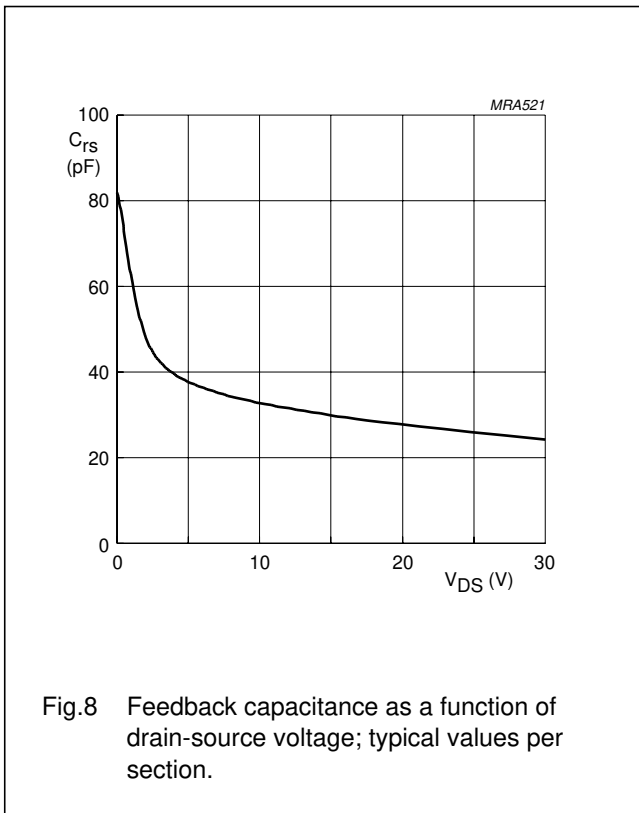


Fig.8 Feedback capacitance as a function of drain-source voltage; typical values per section.

APPLICATION INFORMATION FOR CLASS-B OPERATION

$T_h = 25\text{ }^\circ\text{C}$; $R_{th\text{ mb-h}} = 0.15\text{ K/W}$, unless otherwise specified.

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

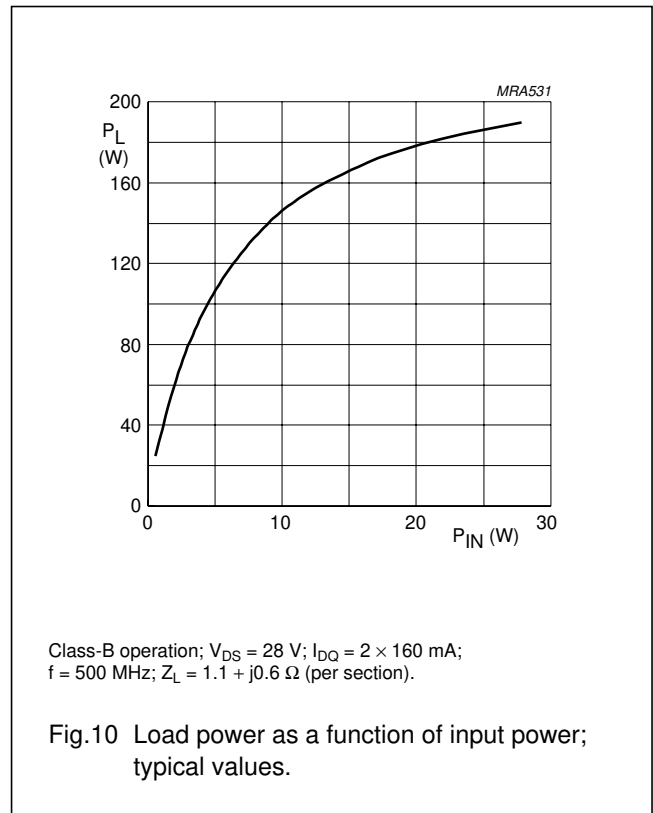
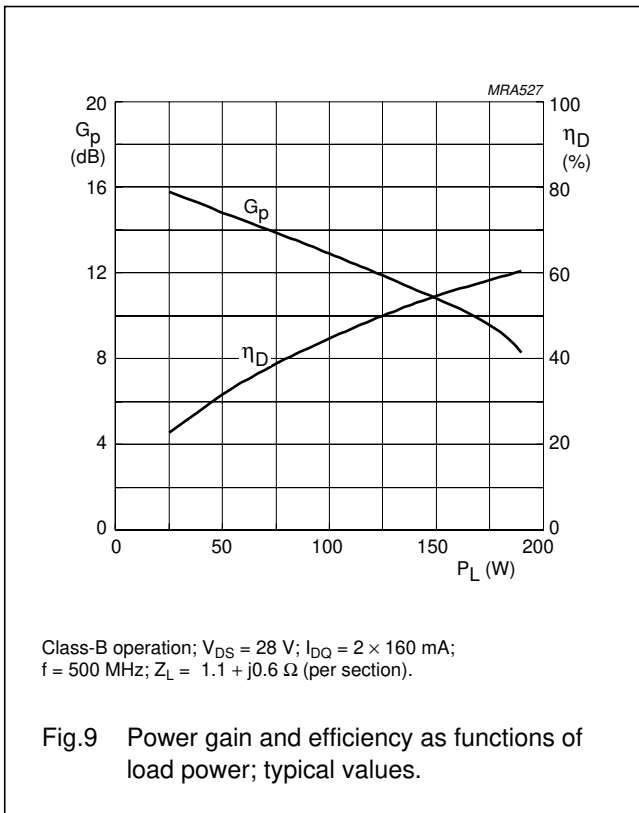
| MODE OF OPERATION | f (MHz) | V_{DS} (V) | I_{DQ} (mA) | P_L (W) | G_p (dB) | η_D (%) |
|-------------------|---------|--------------|---------------|-----------|----------------|----------------|
| CW, class-B | 500 | 28 | 2 x 160 | 150 | >10 typ. 11 | >50 typ. 55 |

Ruggedness in class-B operation

The BLF548 is capable of withstanding a load mismatch corresponding to $V_{SWR} = 10:1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $f = 500\text{ MHz}$ at rated output power.

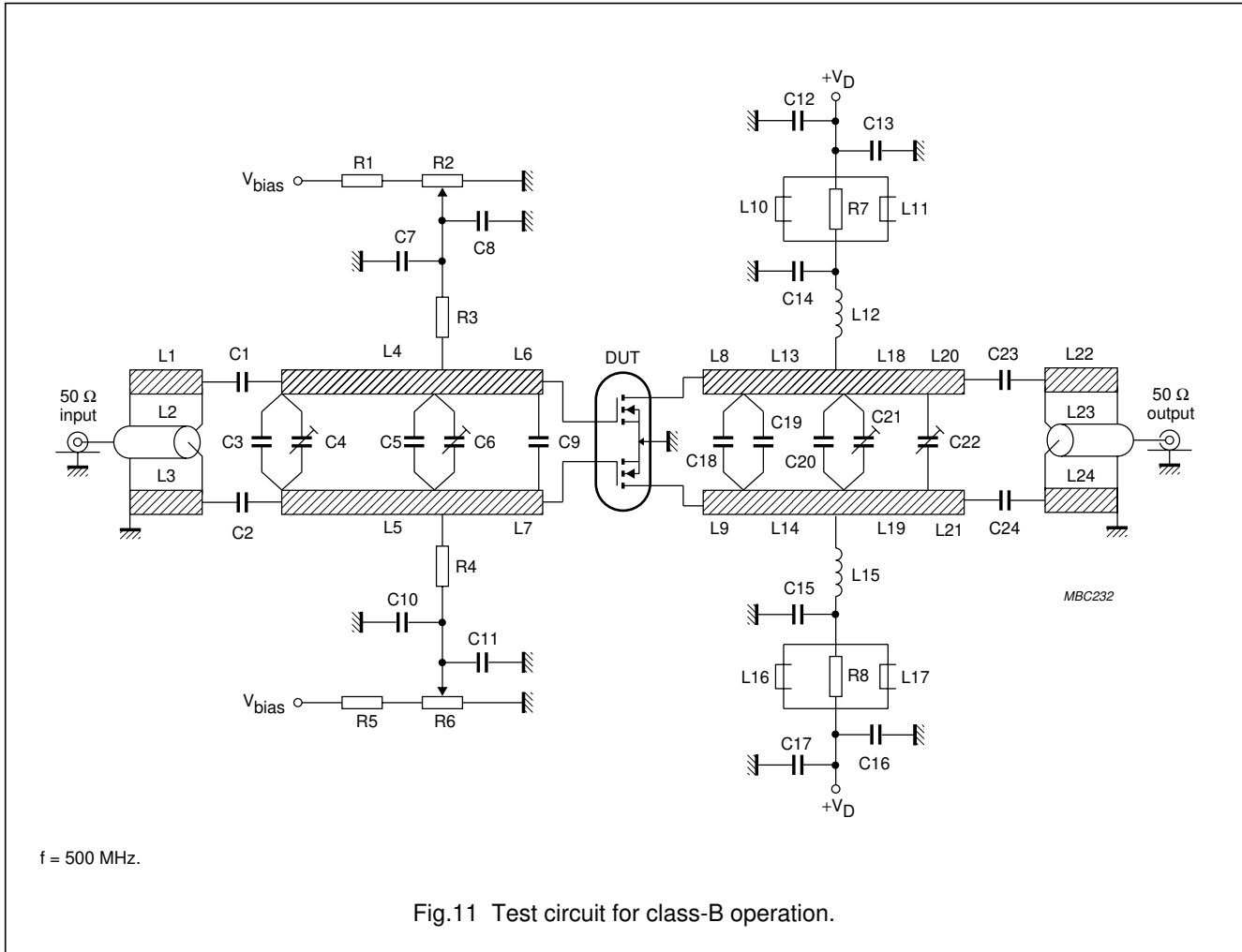
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List of components class-B test circuit (see Fig.11)

| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE NO. |
|-------------------|---|---------------------|------------|----------------|
| C1, C2 | multilayer ceramic chip capacitor; note 1 | 22 pF | | |
| C3 | multilayer ceramic chip capacitor; note 1 | 16 pF | | |
| C4 | film dielectric trimmer | 2 to 9 pF | | 2222 809 09005 |
| C5 | multilayer ceramic chip capacitor; note 2 | 27 pF | | |
| C6, C21, C22 | film dielectric trimmer | 2 to 18 pF | | 2222 809 09006 |
| C7, C10, C14, C15 | multilayer ceramic chip capacitor; note 1 | 390 pF | | |
| C8, C11, C12, C17 | multilayer ceramic chip capacitor | 100 nF | | 2222 852 47104 |
| C9 | multilayer ceramic chip capacitor; note 3 | 2 × 56 pF in series | | |

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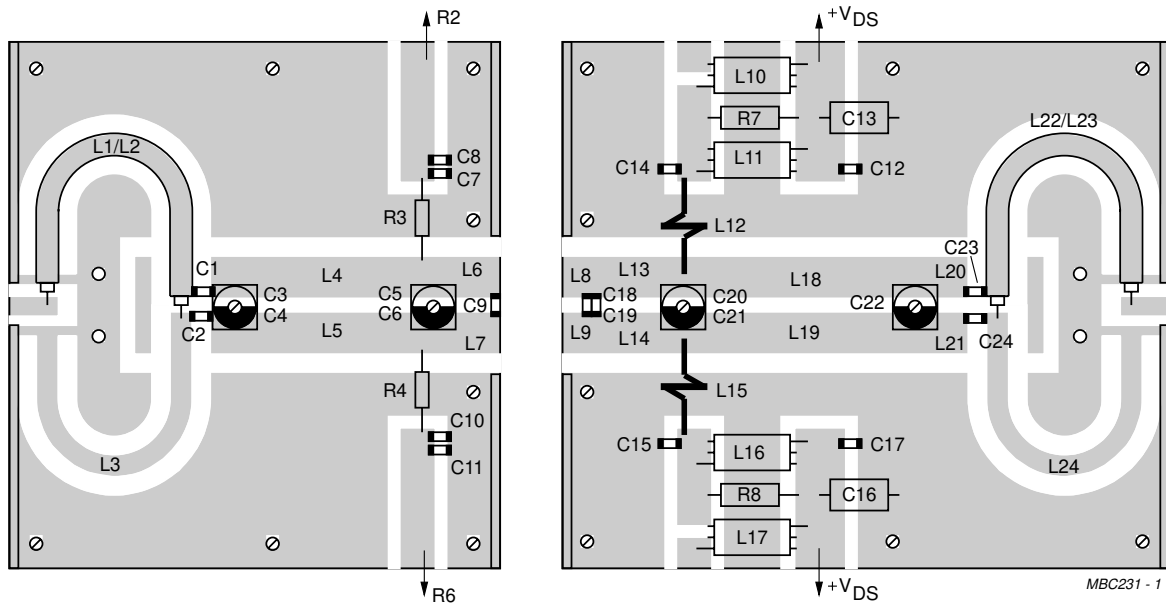
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE NO. |
|--------------------|--|------------------|--|----------------|
| C13, C16 | electrolytic capacitor | 10 μ F, 63 V | | 2222 030 38109 |
| C18 | multilayer ceramic chip capacitor; note 2 | 18 pF | | |
| C19 | multilayer ceramic chip capacitor; note 2 | 12 pF | | |
| C20 | multilayer ceramic chip capacitor; note 2 | 8.2 pF | | |
| C23, C24 | multilayer ceramic chip capacitor; note 1 | 30 pF | | |
| L1, L3, L22, L24 | stripline; note 4 | 34.5 Ω | length 66.5 mm width 4 mm | |
| L2, L23 | semi-rigid cable; note 5 | 50 Ω | length 66.5 mm width 3.6 mm | |
| L4, L5 | stripline; note 4 | 22.3 Ω | length 35 mm width 7 mm | |
| L6, L7 | stripline; note 4 | 22.3 Ω | length 10 mm width 7 mm | |
| L8, L9 | stripline; note 4 | 22.3 Ω | length 5.5 mm width 7 mm | |
| L10, L11, L16, L17 | grade 3B Ferroxcube wideband RF choke | | | 4312 020 36642 |
| L12, L15 | 1 turn enamelled 1.5 mm copper wire | 17 nH | length 5 mm int. dia. 9 mm leads 2 \times 5 mm | |
| L13, L14 | stripline; note 4 | 22.3 Ω | length 15 mm width 7 mm | |
| L18, L19 | stripline; note 4 | 22.3 Ω | length 36 mm width 7 mm | |
| L20, L21 | stripline; note 4 | 22.3 Ω | length 8.5 mm width 7 mm | |
| R1, R5 | 0.4 W metal film resistor | 24.7 k Ω | | 2322 151 72473 |
| R2, R6 | 10 turn potentiometer | 5 k Ω | | |
| R3, R4 | 0.4 W metal film resistor | 10.5 k Ω | | 2322 151 71053 |
| R7, R8 | 1 W metal film resistor | 10 Ω | | 2322 151 51009 |

Notes

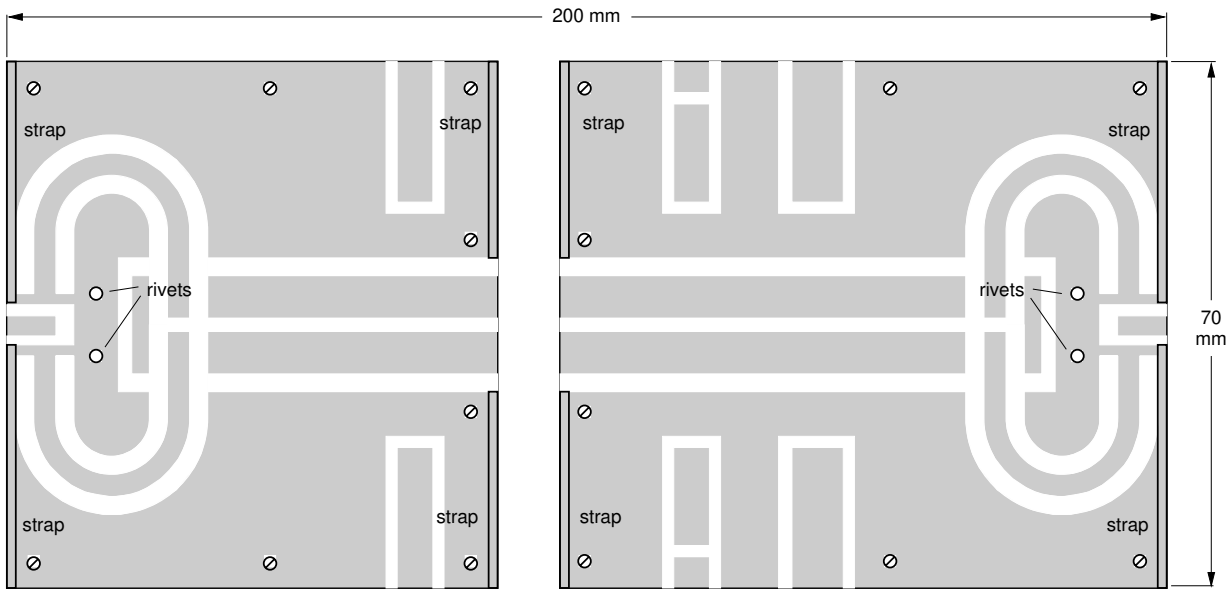
- American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
- American Technical Ceramics (ATC) capacitor, type 175B or other capacitor of the same quality.
- American Technical Ceramics (ATC) capacitor, type 100A or other capacitor of the same quality.
- The striplines are on a double copper-clad printed-circuit board, with PTFE fibre-glass dielectric ($\epsilon_r = 2.2$), thickness 0.79 mm.
- Cables L2 and L23 are soldered to striplines L1 and L22 respectively.

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BLF548



MBC231 - 1



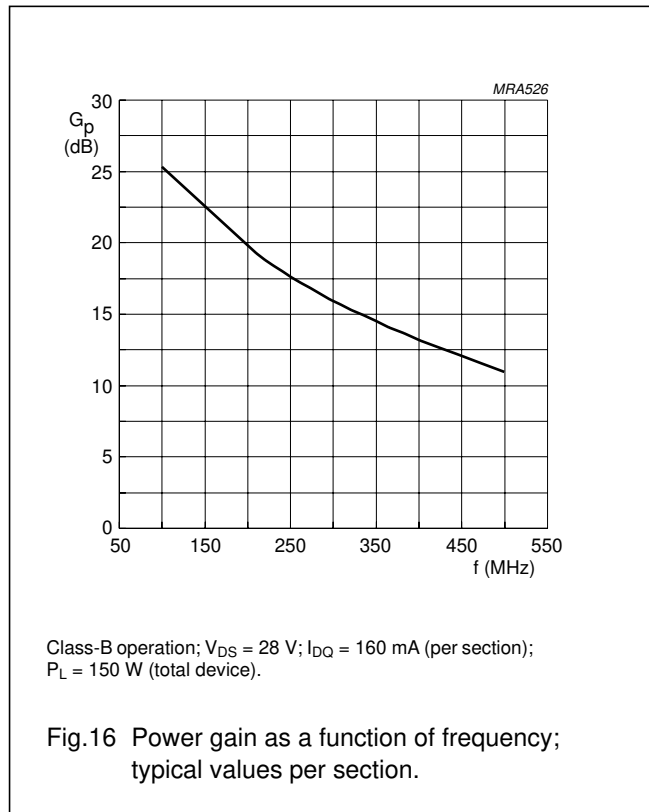
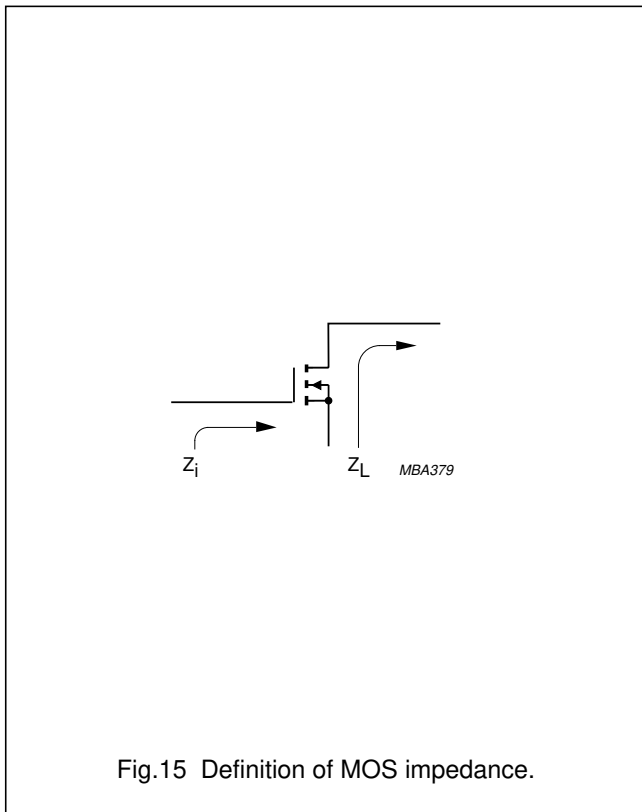
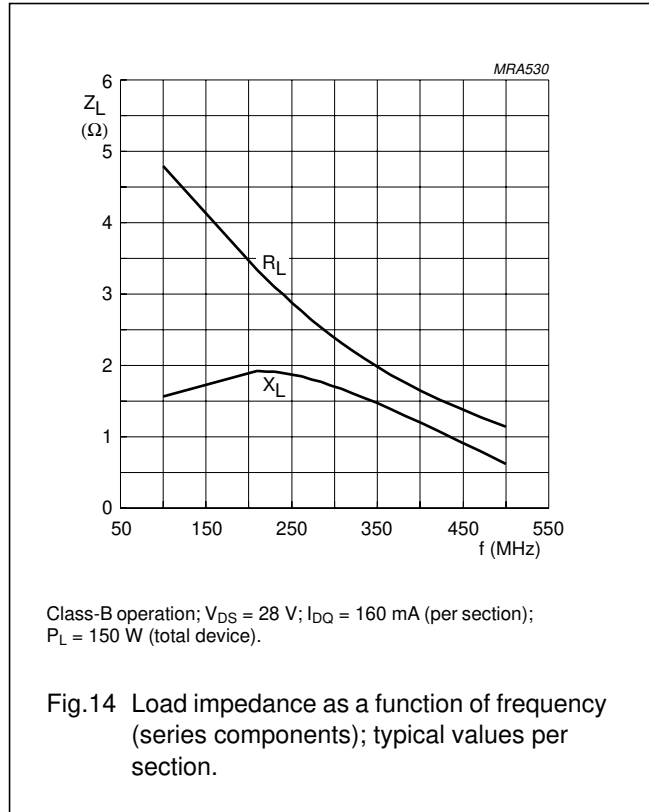
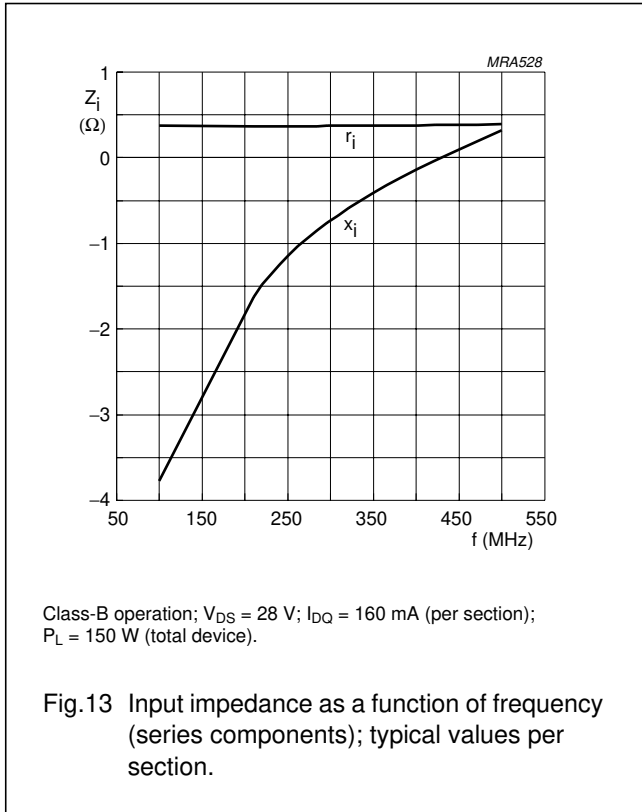
MBC230

The circuit and components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as a ground plane. 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 class-B test circuit.

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UHF push-pull power MOS transistor

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BLF548 scattering parameters $V_{DS} = 28\text{ V}$; $I_D = 40\text{ mA}$; note 1

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|---------|-----------------|--------|-----------------|-------|-----------------|-------|-----------------|--------|
| | S ₁₁ | ∠ Φ | S ₂₁ | ∠ Φ | S ₁₂ | ∠ Φ | S ₂₂ | ∠ Φ |
| 5 | 0.99 | -14.0 | 13.60 | 171.0 | 0.02 | 81.0 | 0.89 | -12.8 |
| 10 | 0.98 | -27.6 | 13.20 | 162.0 | 0.04 | 72.4 | 0.87 | -25.3 |
| 20 | 0.93 | -52.0 | 11.90 | 146.0 | 0.07 | 57.1 | 0.82 | -48.0 |
| 30 | 0.88 | -72.0 | 10.30 | 134.0 | 0.09 | 44.8 | 0.77 | -66.6 |
| 40 | 0.84 | -87.7 | 8.93 | 124.0 | 0.10 | 35.2 | 0.72 | -81.3 |
| 50 | 0.81 | -100.0 | 7.75 | 116.0 | 0.11 | 27.7 | 0.68 | -93.0 |
| 60 | 0.79 | -110.0 | 6.78 | 110.0 | 0.12 | 21.6 | 0.66 | -102.0 |
| 70 | 0.77 | -118.0 | 6.00 | 104.0 | 0.12 | 16.7 | 0.64 | -109.0 |
| 80 | 0.76 | -124.0 | 5.36 | 99.8 | 0.12 | 12.5 | 0.63 | -115.0 |
| 90 | 0.75 | -129.0 | 4.82 | 95.9 | 0.12 | 8.9 | 0.62 | -120.0 |
| 100 | 0.75 | -133.0 | 4.37 | 92.3 | 0.13 | 5.7 | 0.61 | -124.0 |
| 125 | 0.74 | -141.0 | 3.53 | 84.7 | 0.13 | -1.1 | 0.61 | -131.0 |
| 150 | 0.74 | -147.0 | 2.94 | 78.3 | 0.13 | -6.6 | 0.61 | -137.0 |
| 175 | 0.74 | -151.0 | 2.50 | 72.6 | 0.12 | -11.5 | 0.62 | -140.0 |
| 200 | 0.75 | -154.0 | 2.16 | 67.5 | 0.12 | -15.8 | 0.64 | -143.0 |
| 250 | 0.77 | -159.0 | 1.67 | 58.4 | 0.12 | -23.3 | 0.67 | -148.0 |
| 300 | 0.78 | -163.0 | 1.33 | 50.4 | 0.11 | -29.7 | 0.70 | -151.0 |
| 350 | 0.80 | -167.0 | 1.09 | 43.1 | 0.10 | -35.3 | 0.73 | -154.0 |
| 400 | 0.82 | -169.0 | 0.91 | 36.6 | 0.10 | -40.3 | 0.75 | -157.0 |
| 450 | 0.84 | -172.0 | 0.77 | 30.6 | 0.09 | -44.7 | 0.78 | -160.0 |
| 500 | 0.85 | -175.0 | 0.66 | 25.1 | 0.08 | -48.6 | 0.80 | -162.0 |
| 600 | 0.89 | -179.0 | 0.50 | 15.6 | 0.07 | -55.2 | 0.84 | -167.0 |
| 700 | 0.90 | 177.0 | 0.39 | 7.5 | 0.06 | -60.4 | 0.88 | -170.0 |
| 800 | 0.92 | 173.0 | 0.32 | 0.6 | 0.05 | -64.3 | 0.90 | -174.0 |
| 900 | 0.93 | 169.0 | 0.26 | -5.4 | 0.04 | -67.3 | 0.92 | -177.0 |
| 1000 | 0.94 | 166.0 | 0.22 | -10.8 | 0.04 | -69.2 | 0.93 | -179.0 |

Note

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

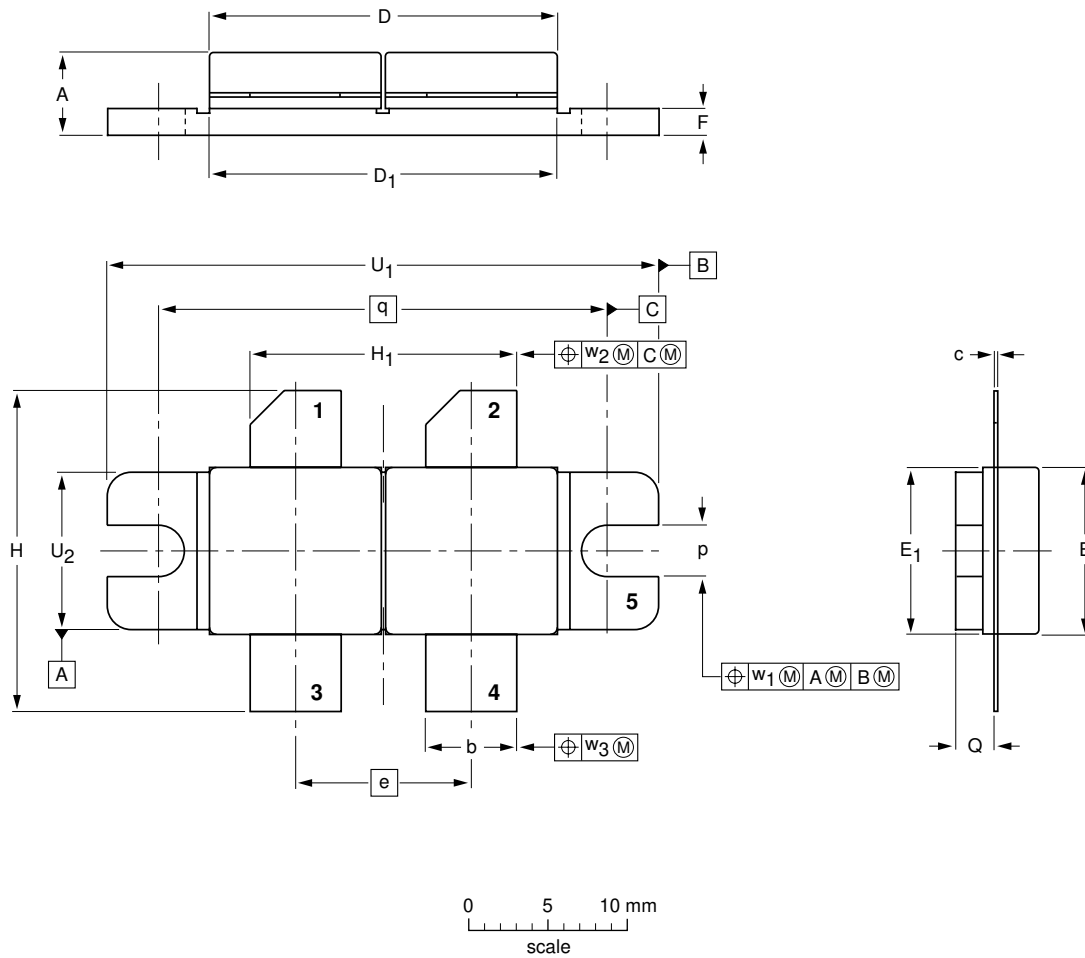
UHF push-pull power MOS transistor

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PACKAGE OUTLINE

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

SOT262A2



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

| UNIT | A | b | c | D | D ₁ | e | E | E ₁ | F | H | H ₁ | p | Q | q | U ₁ | U ₂ | w ₁ | w ₂ | w ₃ |
|--------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|----------------|
| mm | 5.39 4.62 | 5.85 5.58 | 0.16 0.10 | 22.17 21.46 | 21.98 21.71 | 11.05 | 10.27 10.05 | 10.29 10.03 | 1.78 1.52 | 21.08 19.56 | 17.02 16.51 | 3.28 3.02 | 2.47 2.20 | 27.94 | 34.17 33.90 | 9.91 9.65 | 0.25 | 0.51 | 0.25 |
| inches | 0.212 0.182 | 0.230 0.220 | 0.006 0.004 | 0.873 0.845 | 0.865 0.855 | 0.435 | 0.404 0.396 | 0.405 0.396 | 0.070 0.060 | 0.830 0.770 | 0.670 0.650 | 0.129 0.119 | 0.097 0.087 | 1.100 | 1.345 1.335 | 0.390 0.380 | 0.010 | 0.020 | 0.010 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT262A2 | | | | | | 99-03-29 |

UHF push-pull power MOS transistor

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| LEVEL | DATA SHEET STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾⁽³⁾ | 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. |
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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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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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