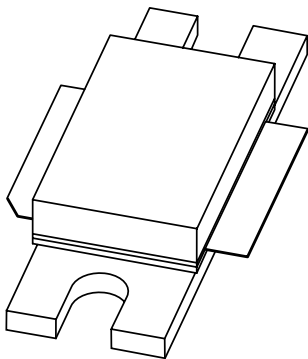


DATA SHEET



BLV2047 UHF power transistor

Product specification
Supersedes data of 1999 Jan 28

1999 Jun 09

UHF power transistor

BLV2047

FEATURES

- Emitter ballasting resistors for optimum temperature profile
- Gold metallization ensures excellent reliability
- Internal input and output matching for easy design of wideband circuits
- AlN substrate package for environmental safety.

APPLICATIONS

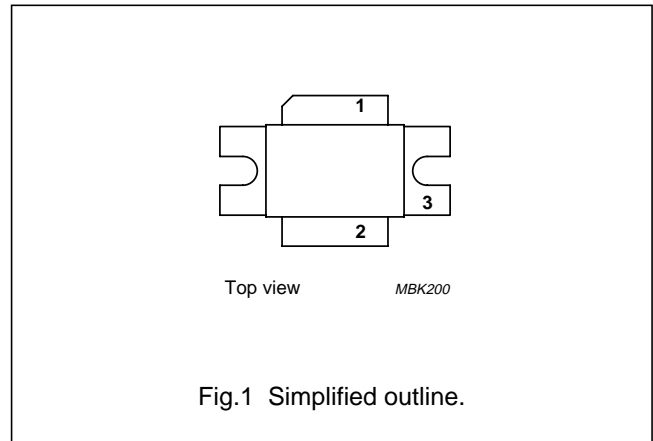
- Common emitter class-AB operation for PCN (Personal Communication Networks) and PCS (Personal Communication Services) base station applications in the 1800 to 2000 MHz frequency range.

DESCRIPTION

NPN silicon planar power transistor in a 2-lead SOT468A flange package with ceramic cap. The emitter is connected to the flange.

PINNING - SOT468A

| PIN | DESCRIPTION |
|-----|------------------------------|
| 1 | collector |
| 2 | base |
| 3 | emitter; connected to flange |



QUICK REFERENCE DATA

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

| MODE OF OPERATION | f (MHz) | V_{CE} (V) | P_L (W) | G_p (dB) | η_c (%) | d_{im} (dBc) |
|-------------------|------------------------------|--------------|-----------|------------|--------------|----------------|
| CW, class-AB | 2000 | 26 | 60 | ≥ 8.5 | ≥ 40 | – |
| 2-tone, class-AB | $f_1 = 2000.0; f_2 = 2000.1$ | 26 | 60 (PEP) | ≥ 9 | ≥ 33 | ≤ -30 |

LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|--------------------------------|-------------------------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 65 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 27 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 3 | V |
| I_C | collector current (DC) | | – | 10 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$ | – | 270 | W |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| T_j | operating junction temperature | | – | 200 | °C |

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THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|----------------|---|--|-------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | $P_{tot} = 270\ W; T_{mb} = 25\ ^\circ C; \text{note 1}$ | 0.65 | K/W |
| $R_{th\ mb-h}$ | thermal resistance from mounting base to heatsink | | 0.25 | K/W |

Note

1. Thermal resistance is determined under specified RF operating conditions.

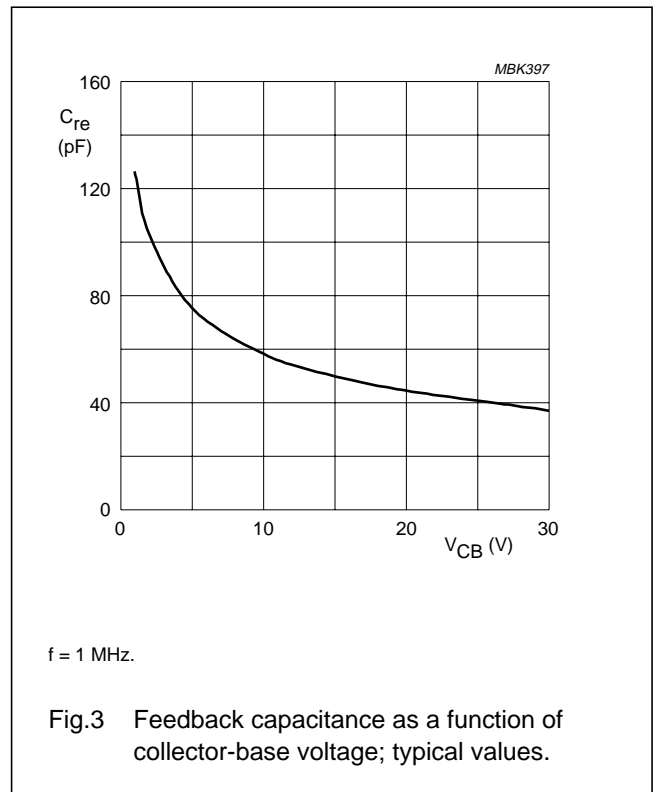
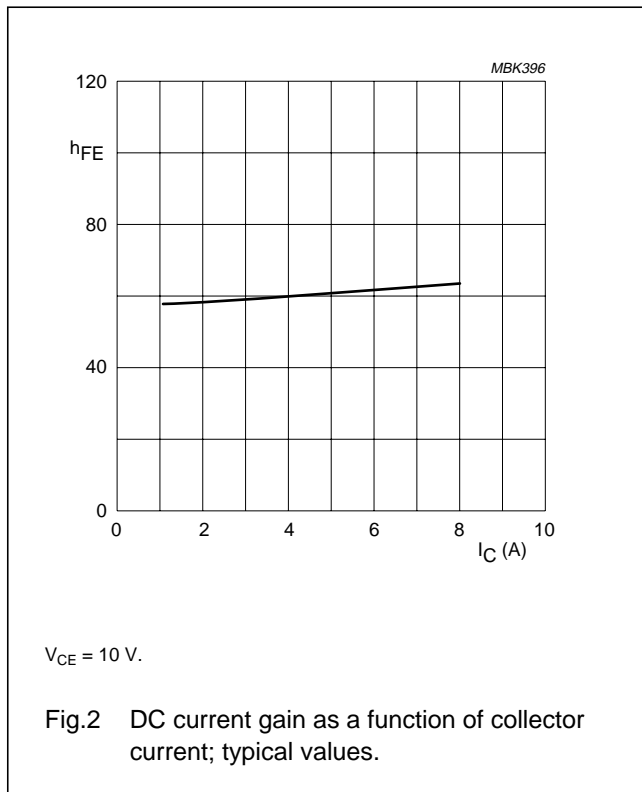
CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|-------------------------------------|--|------|------|------|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | open emitter; $I_C = 40\ mA$ | 65 | – | – | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | open base; $I_C = 120\ mA$ | 27 | – | – | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | open collector; $I_E = 40\ mA$ | 3 | – | – | V |
| I_{CES} | collector leakage current | $V_{CE} = 26\ V; V_{BE} = 0$ | – | – | 8 | mA |
| h_{FE} | DC current gain | $V_{CE} = 10\ V; I_C = 4\ A$ | 45 | – | 100 | |
| C_c | collector capacitance | $V_{CB} = 26\ V; I_E = i_e = 0; f = 1\ MHz; \text{note 1}$ | – | 72 | – | pF |
| C_{re} | feedback capacitance | $V_{CE} = 26\ V; I_C = 0; f = 1\ MHz$ | – | 41 | – | pF |

Note

1. Capacitance of die only.



UHF power transistor

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APPLICATION INFORMATION

RF performance at $T_h = 25\text{ }^\circ\text{C}$ in a common emitter test circuit.

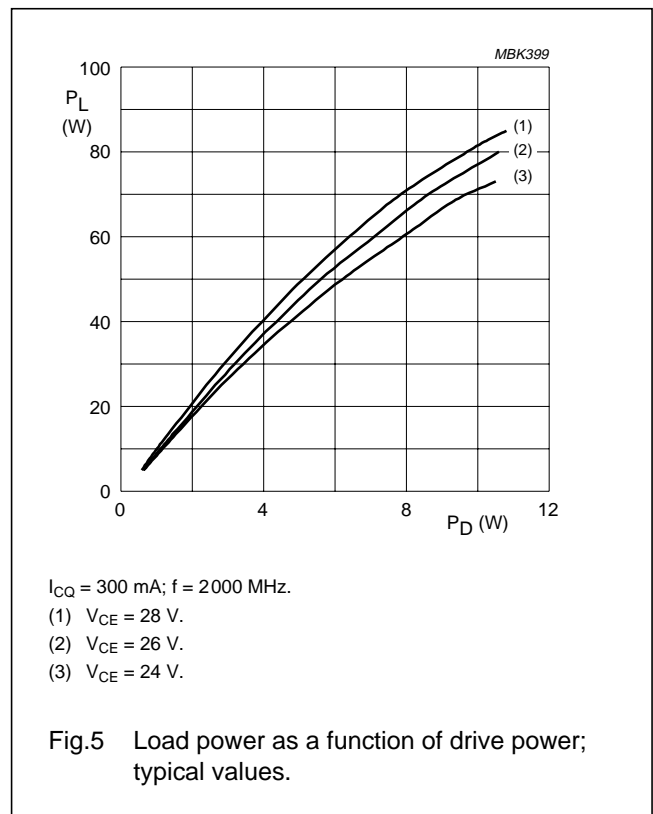
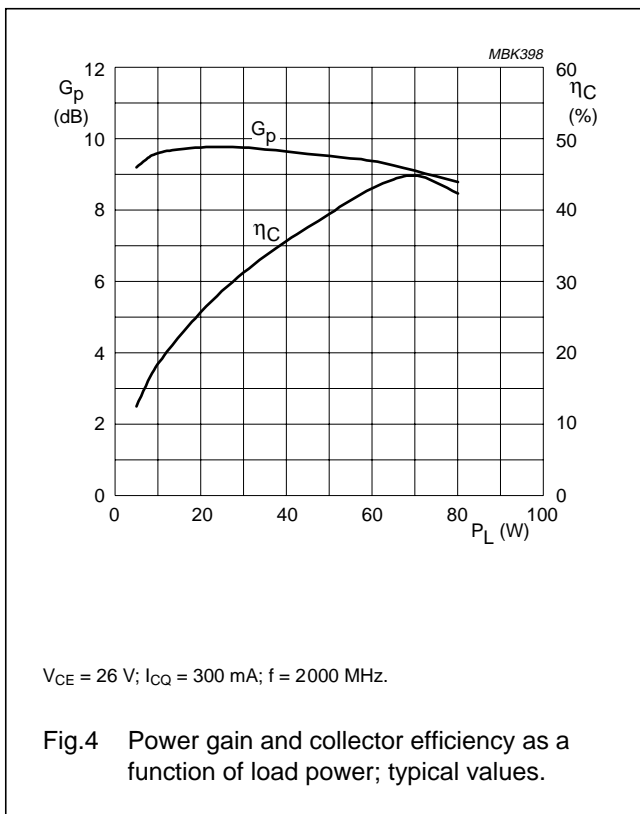
| MODE OF OPERATION | f (MHz) | V _{CE} (V) | I _{CQ} (mA) | P _L (W) | G _p (dB) | η _c (%) | d _{im} (dBc) |
|-------------------|--|---------------------|----------------------|--------------------|---------------------|--------------------|-----------------------|
| CW, class-AB | 2000 | 26 | 300 | 60 | ≥8.5 | ≥40 | – |
| 2-tone, class-AB | f ₁ = 2000.0 f ₂ = 2000.1 | 26 | 300 | 60 (PEP) | ≥9 | ≥33 | ≤–30 |
| CDMA, class-AB | 2000 | 26 | 500 | 12.5 | typ. 9 | typ. 22 | ≤–46 ⁽¹⁾ |

Note

1. CDMA test signal with peak to average ratio of 11.9 dB. Adjacent Channel Power (ACP) is measured at ±885 kHz offset from the centre of the channel (2000 MHz) using a spectrum analyzer with the resolution set to 30 kHz.

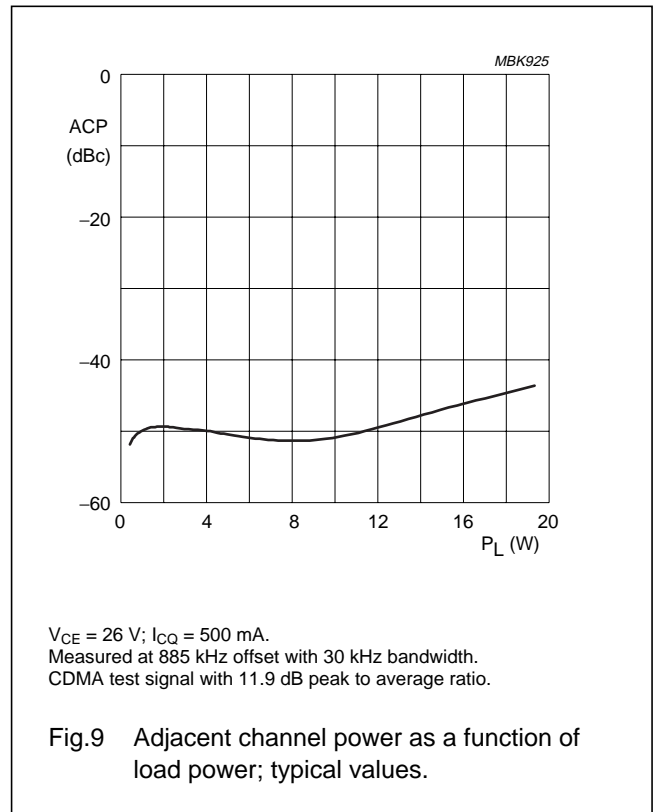
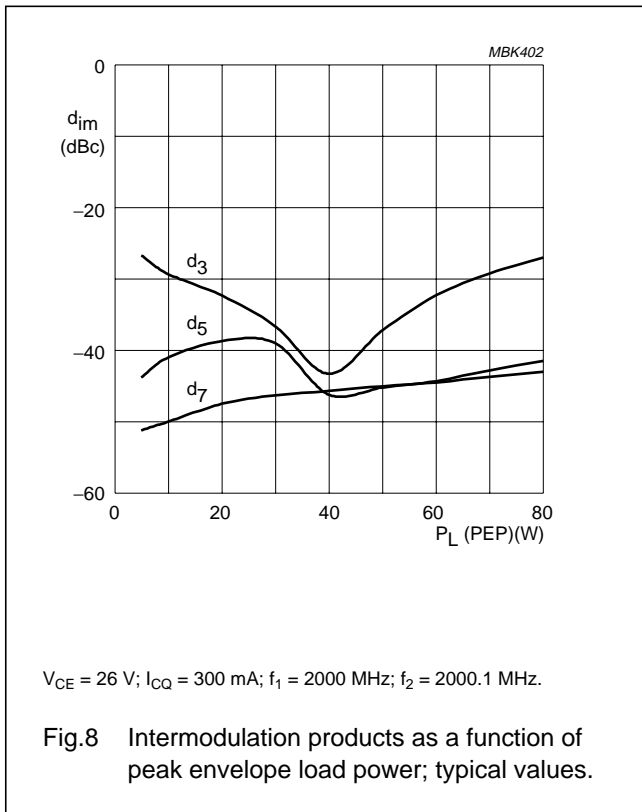
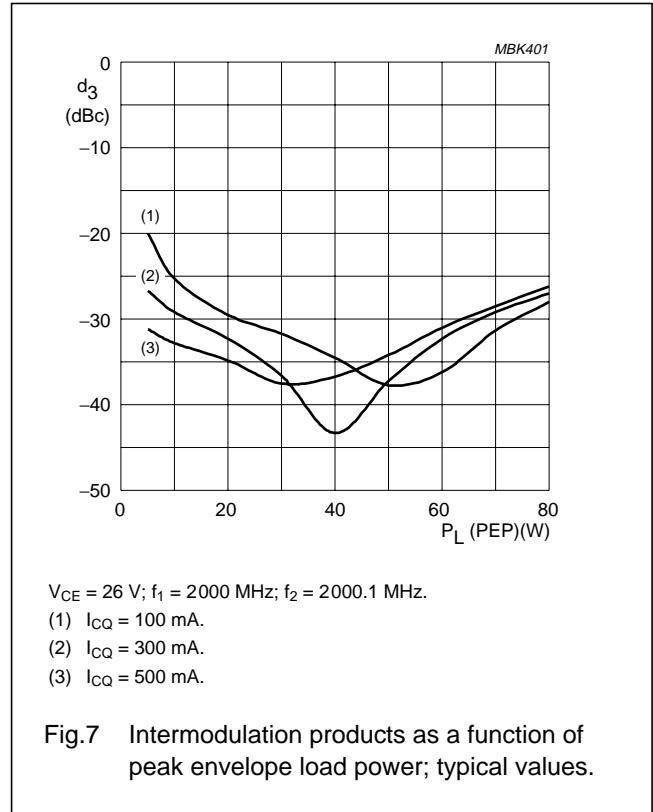
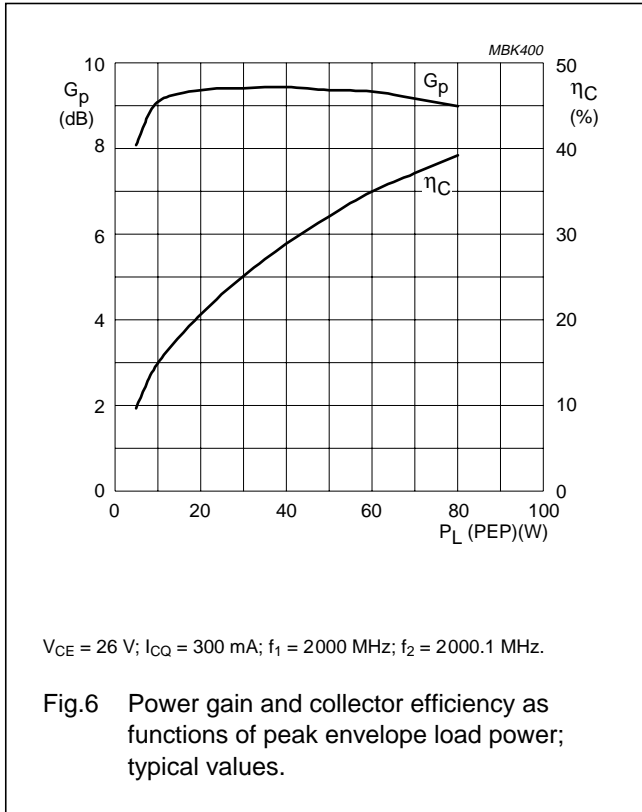
Ruggedness in class-AB operation

The BLV2047 is capable of withstanding a load mismatch corresponding to VSWR = 3 : 1 through all phases under the following conditions: f₁ = 2000.0 MHz; f₂ = 2000.1 MHz; V_{CE} = 26 V; I_{CQ} = 300 mA; P_L = 60 W (PEP); T_{mb} = 25 °C.



UHF power transistor

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UHF power transistor

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List of components (see Figs 10 and 11)

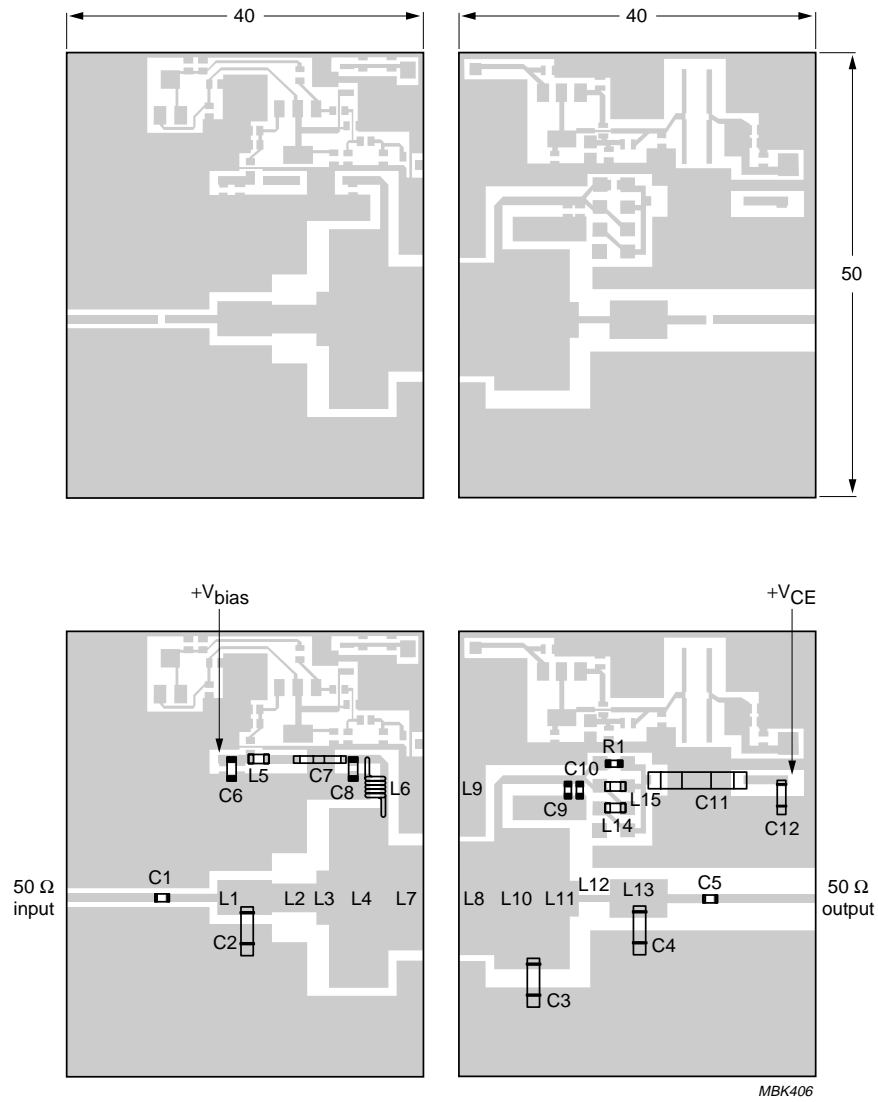
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE NO. |
|--------------|---|------------------|---------------------------------|----------------|
| C1, C8 | multilayer ceramic chip capacitor; note 1 | 22 pF | | |
| C2 | Tekelec variable capacitor; type 37291 | 0.8 to 8 pF | | |
| C3, C4 | Tekelec variable capacitor; type 37271 | 0.6 to 4.5 pF | | |
| C5 | multilayer ceramic chip capacitor, note 2 | 22 pF | | |
| C6, C12 | tantalum SMD capacitor | 10 μ F, 35 V | | |
| C7 | feedthrough capacitor | 1.5 nF | | |
| C9 | multilayer ceramic chip capacitor, note 3 | 13 pF | | |
| C10 | multilayer ceramic chip capacitor, note 3 | 10 nF | | |
| C11 | feedthrough capacitor | 3.3 nF | | |
| L1 | stripline; note 4 | 18.8 Ω | length 6.1 mm; width 3.9 mm | |
| L2 | stripline; note 4 | 21.9 Ω | length 5 mm; width 3.2 mm | |
| L3 | stripline; note 4 | 13 Ω | length 1.4 mm; width 6.1 mm | |
| L4 | stripline; note 4 | 4.5 Ω | length 6.6 mm; width 20.2 mm | |
| L5, L14, L15 | grade 4B1 ferroxcube chip-bead | | | 4322 020 34420 |
| L6 | 4 turns enamelled 1 mm copper wire | 30 nH | int.dia. 3 mm; length 7 mm | |
| L7 | stripline; note 4 | 7.3 Ω | length 4 mm; width 11.8 mm | |
| L8 | stripline; note 4 | 6.8 Ω | length 4 mm; width 12.8 mm | |
| L9 | stripline; note 4 | 43.7 Ω | length 12.5 mm; width 1 mm | |
| L10 | stripline; note 4 | 5.6 Ω | length 8.5 mm; width 15.9 mm | |
| L11 | stripline; note 4 | 18.8 Ω | length 1 mm; width 3.9 mm | |
| L12 | stripline; note 4 | 53.3 Ω | length 3.4 mm; width 0.8 mm | |
| L13 | stripline; note 4 | 17.4 Ω | length 6.5 mm; width 4.3 mm | |
| R1 | standard chip resistor | 10 Ω | type 0603 | |

Notes

- American Technical Ceramics type 100A or capacitor of same quality.
- American Technical Ceramics type 175B or capacitor of same quality.
- American Technical Ceramics type 100B or capacitor of same quality.
- The striplines are on a double copper-clad printed-circuit board with Teflon dielectric ($\epsilon_r = 6.15$); thickness 0.64 mm.

UHF power transistor

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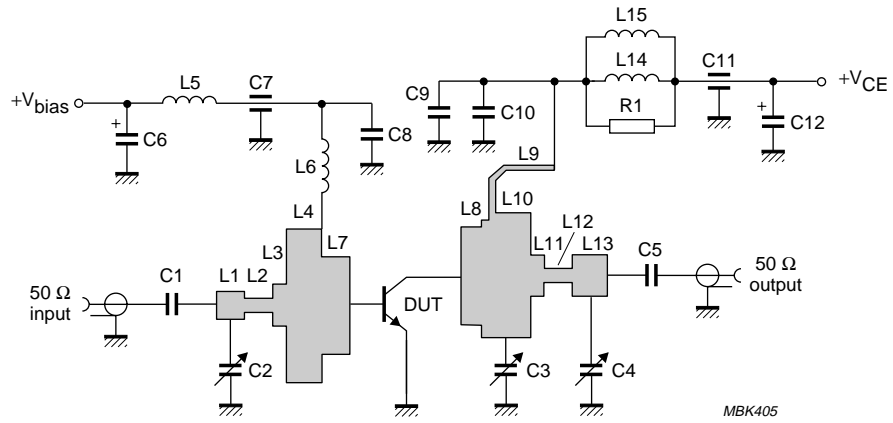
Dimensions in mm.

The components are situated on one side of the copper-clad Teflon board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.10 Component layout for 2000 MHz class-AB test circuit.

UHF power transistor

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MBK405

For CDMA measurements:
 Replace L5, C7 and C11 by a bridging wire.
 Change L6 from 6 turns to 2 turns (same diameter).
 Add 4.7 μF, 50 V tantalum capacitor to C12.
 Add 100 pF ATC type 100A capacitor to C8.

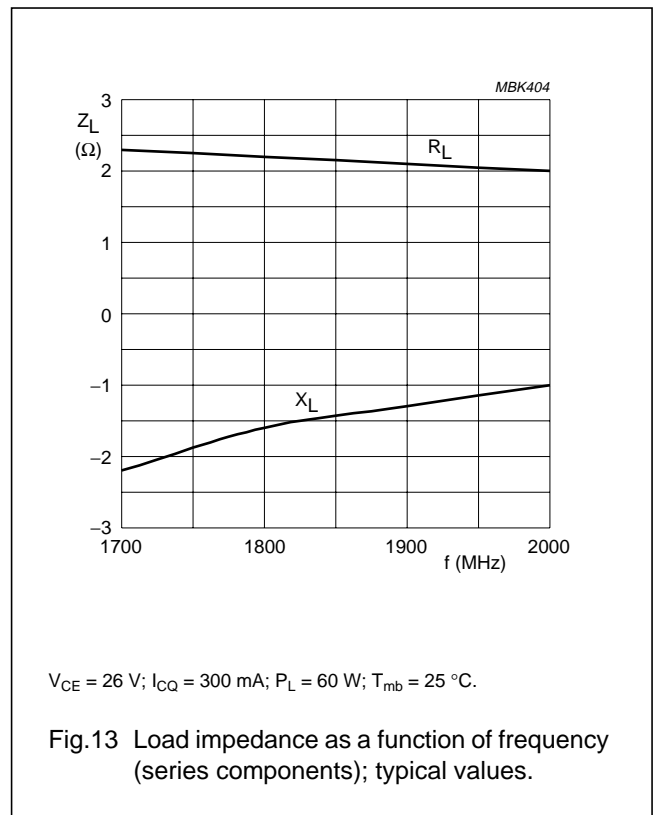
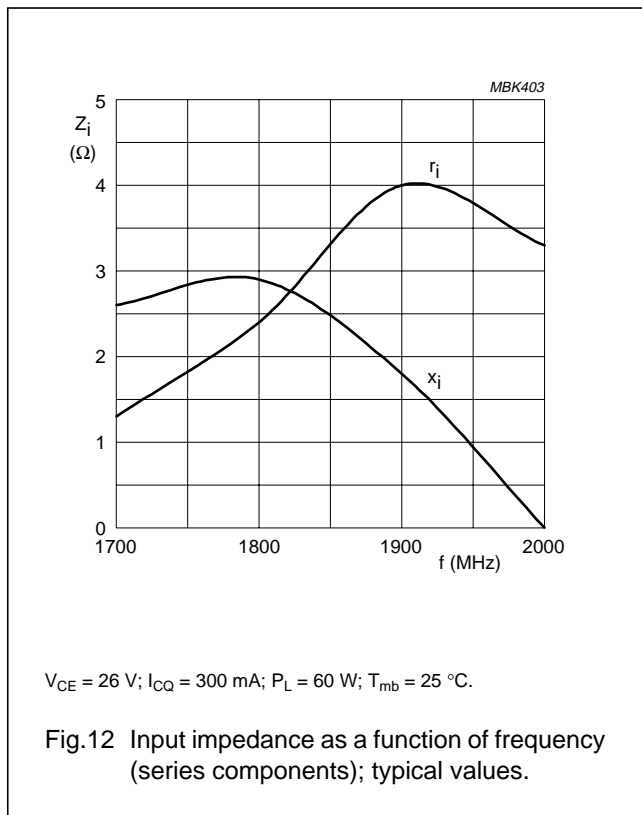
Fig.11 Class-AB test circuit for 2000 MHz.

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Scattering parameters: $V_{CE} = 26\text{ V}$; $I_C = 1\text{ A}$

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|---------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) |
| 1500 | 0.982 | 173.3 | 0.169 | 131.8 | 0.031 | 106.4 | 0.967 | 174.6 |
| 1600 | 0.970 | 172.0 | 0.227 | 126.1 | 0.035 | 96.0 | 0.953 | 174.0 |
| 1700 | 0.947 | 170.4 | 0.349 | 114.3 | 0.037 | 93.3 | 0.929 | 173.8 |
| 1800 | 0.870 | 167.5 | 0.633 | 85.8 | 0.036 | 74.7 | 0.879 | 174.2 |
| 1850 | 0.779 | 169.9 | 0.838 | 59.5 | 0.034 | 60.4 | 0.845 | 178.0 |
| 1900 | 0.775 | 179.3 | 0.833 | 22.7 | 0.018 | 47.4 | 0.902 | -177.4 |
| 1950 | 0.863 | -178.0 | 0.644 | -6.9 | 0.011 | 103.7 | 0.967 | -178.7 |
| 2000 | 0.913 | -179.4 | 0.456 | -24.5 | 0.018 | 121.2 | 0.990 | 179.3 |
| 2100 | 0.950 | 178.0 | 0.285 | -40.8 | 0.028 | 114.7 | 0.995 | 176.9 |
| 2200 | 0.955 | 176.4 | 0.190 | -54.0 | 0.031 | 115.2 | 0.987 | 175.5 |
| 2300 | 0.955 | 175.0 | 0.145 | -53.6 | 0.034 | 114.7 | 0.983 | 175.0 |
| 2400 | 0.948 | 173.7 | 0.162 | -60.4 | 0.036 | 116.7 | 0.975 | 174.4 |
| 2500 | 0.937 | 172.4 | 0.143 | -84.2 | 0.038 | 116.8 | 0.973 | 173.9 |



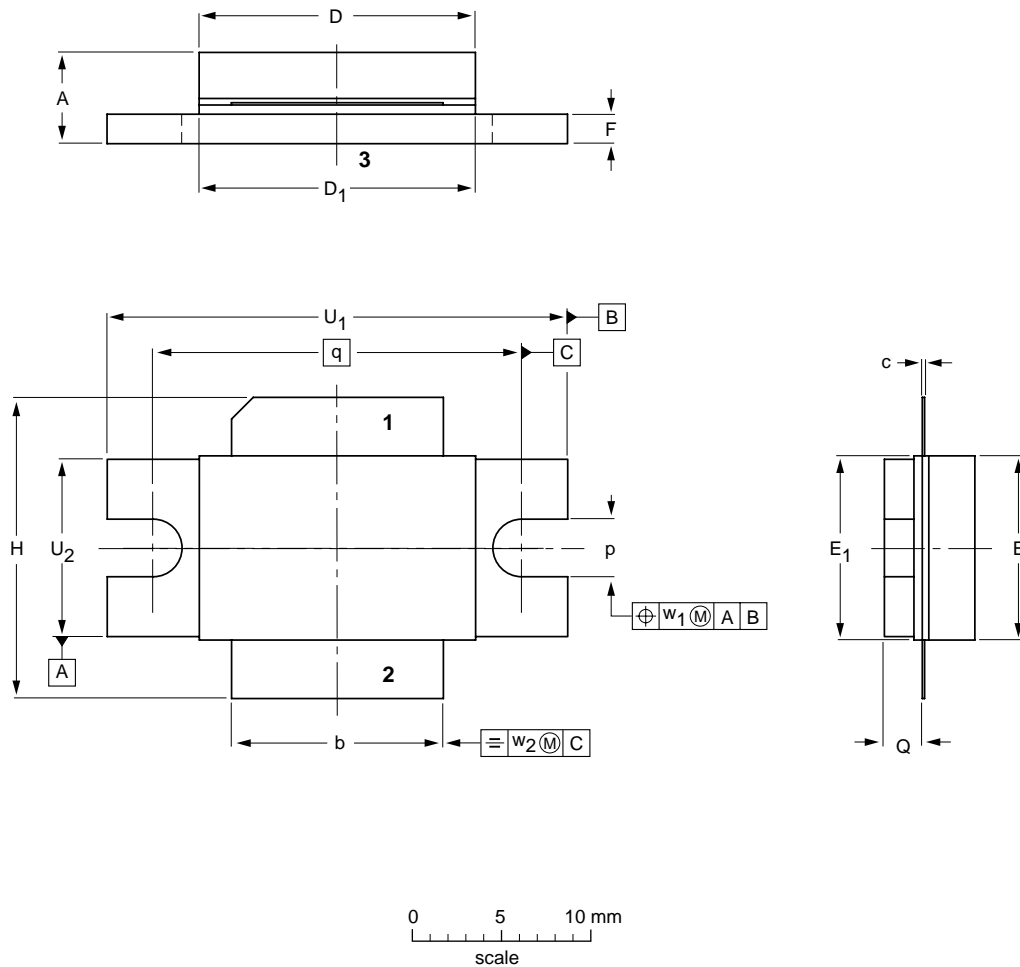
UHF power transistor

BLV2047

PACKAGE OUTLINE

Flanged ceramic (AlN) package; 2 mounting holes; 2 leads

SOT468A



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

| UNIT | A | b | c | D | D ₁ | E | E ₁ | F | H | p | Q | q | U ₁ | U ₂ | w ₁ | w ₂ |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|
| mm | 5.23 4.62 | 11.81 11.58 | 0.15 0.10 | 15.39 15,09 | 15.37 15,11 | 10.26 10.06 | 10.29 10.03 | 1.65 1.60 | 16.74 16.48 | 3.30 3.05 | 2.21 2.06 | 20.32 | 25.53 25.27 | 9.91 9.65 | 0.254 | 0.508 |
| inches | 0.206 0.182 | 0.465 0.455 | 0.006 0.004 | 0.606 0.594 | 0.605 0.595 | 0.404 0.396 | 0.405 0.395 | 0.065 0.063 | 0.659 0.649 | 0.130 0.120 | 0.087 0.081 | 0.800 | 1.005 0.995 | 0.390 0.380 | 0.01 | 0.02 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT468A | | | | | | 97-12-24 |

UHF power transistor

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DEFINITIONS

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

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