

BLF4G20LS-110B

UHF power LDMOS transistor

Rev. 01 — 10 January 2006

Product data sheet

1. Product profile

1.1 General description

110 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz.

Table 1: Typical performance

$f = 1930 \text{ MHz to } 1990 \text{ MHz}$; $T_{\text{case}} = 25 \text{ }^\circ\text{C}$; $I_{\text{Dq}} = 650 \text{ mA}$; unless otherwise specified; in a class-AB production test circuit; typical values

| Mode of operation | V _{DS} (V) | P _L (W) | G _p (dB) | η_{D} (%) | ACPR ₄₀₀ (dBc) | ACPR ₆₀₀ (dBc) | EVM _{rms} (%) |
|-------------------|------------------------|-----------------------|------------------------|--------------------------|------------------------------|------------------------------|---------------------------|
| CW | 28 | 100 | 13.4 | 49 | - | - | - |
| GSM EDGE | 28 | 48 (AV) | 13.8 | 38.5 | -61 [1] | -74 [2] | 2.1 |

[1] ACPR₄₀₀ at 30 kHz resolution bandwidth.

[2] ACPR₆₀₀ at 30 kHz resolution bandwidth.

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features

- Typical GSM EDGE performance at a frequency of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I_{Dq} of 650 mA:
 - ◆ Load power = 48 W (AV)
 - ◆ Gain = 13.8 dB (typ)
 - ◆ Efficiency = 38.5 % (typ)
 - ◆ ACPR₄₀₀ = -61 dBc (typ)
 - ◆ ACPR₆₀₀ = -74 dBc (typ)
 - ◆ EVM_{rms} = 2.1 % (typ)
- Easy power control
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use

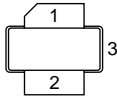
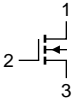
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1.3 Applications

- RF power amplifiers for GSM, GSM EDGE and CDMA base stations and multicarrier applications in the 1800 MHz to 2000 MHz frequency range.

2. Pinning information

Table 2: Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------|---|---|
| 1 | drain |  |  sym039 |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange

3. Ordering information

Table 3: Ordering information

| Type number | Package | | |
|----------------|---------|---|---------|
| | Name | Description | Version |
| BLF4G20LS-110B | - | earless flanged LDMOST ceramic package; 2 leads | SOT502B |

4. Limiting values

Table 4: 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 | | -0.5 | +15 | V |
| I_D | drain current | | - | 12 | A |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 200 | °C |

5. Thermal characteristics

Table 5: Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--|---------------------------|-----|------|------|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}$ | | | | |
| | | $P_L = 40\text{ W}$ | - | 0.62 | 0.71 | K/W |
| | | $P_L = 100\text{ W}$ | - | 0.52 | 0.61 | K/W |

6. Characteristics

Table 6: Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|--|-----|-----|-----|------------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS} = 0\text{ V}; I_D = 0.9\text{ mA}$ | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$ | 2.5 | 3.1 | 3.5 | V |
| V_{GSq} | gate-source quiescent voltage | $V_{DS} = 28\text{ V}; I_D = 900\text{ mA}$ | 2.7 | 3.2 | 3.7 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 3 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 6\text{ V};$ $V_{DS} = 10\text{ V}$ | 27 | 30 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = \pm 15\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 300 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 10\text{ A}$ | - | 9.0 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 6\text{ V};$ $I_D = 6\text{ A}$ | - | 90 | - | $\text{m}\Omega$ |
| C_{rs} | feedback capacitance | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$ | - | 2.5 | - | pF |

7. Application information

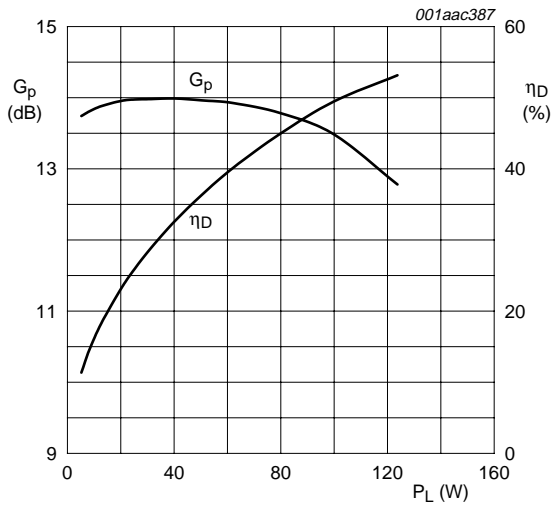
Table 7: Application information

Mode of operation: GSM EDGE; $f = 1930\text{ MHz}$ and 1990 MHz ; RF performance at $V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25^\circ\text{C}$; unless otherwise specified; in a class-AB production test circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--|---------------------------|-----|------|------|------|
| G_p | power gain | $P_{L(AV)} = 48\text{ W}$ | 13 | 13.8 | - | dB |
| IRL | input return loss | $P_{L(AV)} = 48\text{ W}$ | - | -10 | -6.5 | dB |
| η_D | drain efficiency | $P_{L(AV)} = 48\text{ W}$ | 36 | 38.5 | - | % |
| $ACPR_{400}$ | adjacent channel power ratio (400 kHz) | $P_{L(AV)} = 48\text{ W}$ | - | -61 | -58 | dBc |
| $ACPR_{600}$ | adjacent channel power ratio (600 kHz) | $P_{L(AV)} = 48\text{ W}$ | - | -74 | -71 | dBc |
| EVM_{rms} | rms EDGE signal distortion error | $P_{L(AV)} = 48\text{ W}$ | - | 2.1 | 3.3 | % |
| EVM_M | peak EDGE signal distortion error | $P_{L(AV)} = 48\text{ W}$ | - | 7.0 | 10 | % |

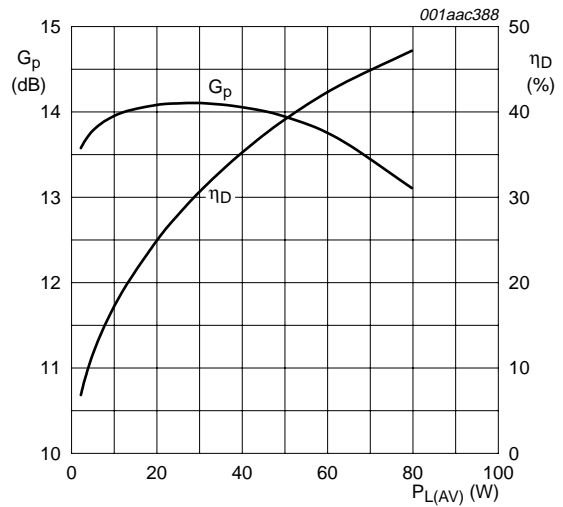
7.1 Ruggedness in class-AB operation

The BLF4G20LS-110B is capable of withstanding a load mismatch corresponding to $V_{SWR} = 10 : 1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $P_L = 110\text{ W}$ (CW); $f = 1990\text{ MHz}$.



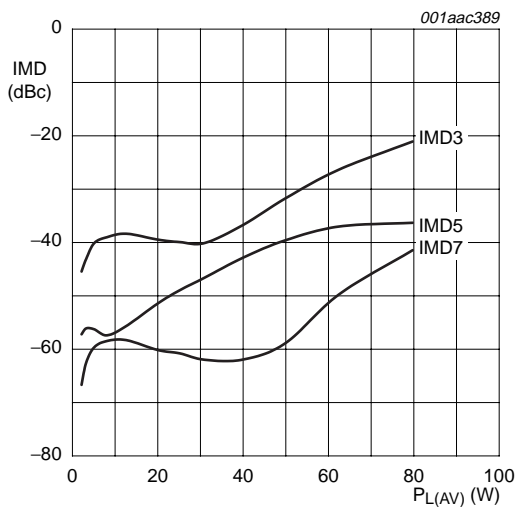
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$;
 $f = 1990\text{ MHz}$

Fig 1. One-tone CW power gain and drain efficiency as functions of load power; typical values



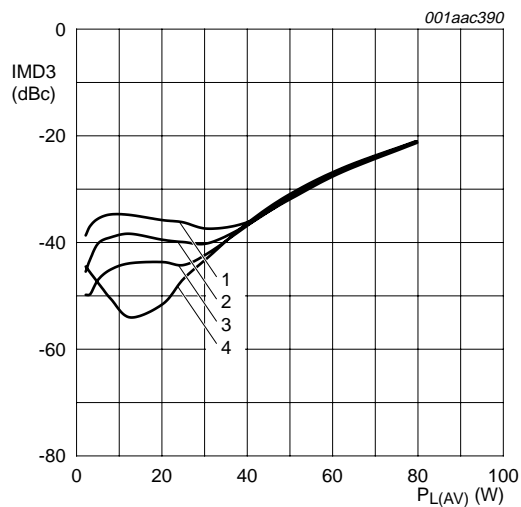
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$;
 $f = 1990\text{ MHz}$

Fig 2. Two-tone CW power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$;
 $f = 1990\text{ MHz}$

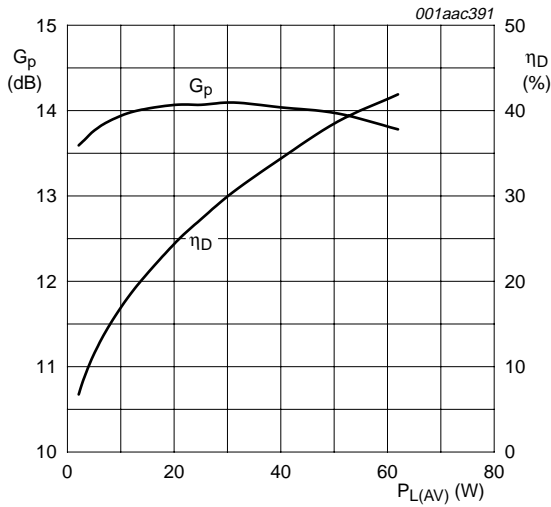
Fig 3. Intermodulation distortion as a function of average load power; typical values



$V_{DS} = 28\text{ V}$; $T_{case} = 25\text{ }^{\circ}\text{C}$; $f = 1990\text{ MHz}$

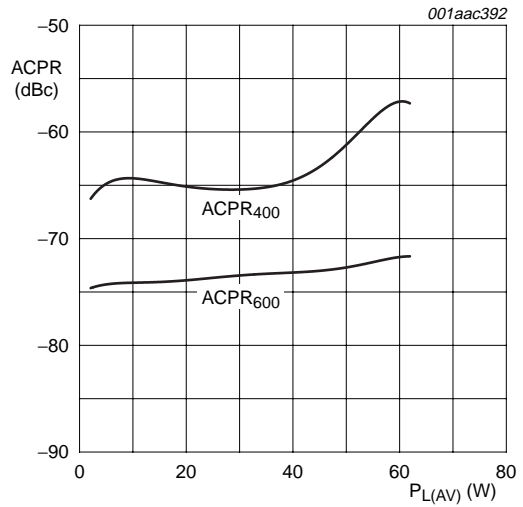
- (1) $I_{Dq} = 550\text{ mA}$
- (2) $I_{Dq} = 650\text{ mA}$
- (3) $I_{Dq} = 750\text{ mA}$
- (4) $I_{Dq} = 850\text{ mA}$

Fig 4. Third order intermodulation distortion as a function of average load power; typical values



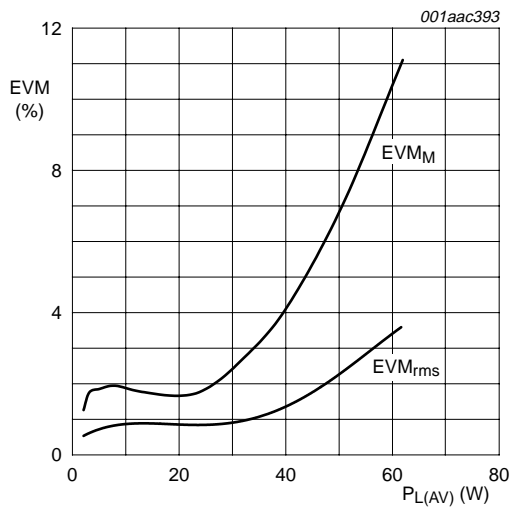
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

Fig 5. GSM EDGE power gain and drain efficiency as functions of average load power; typical values



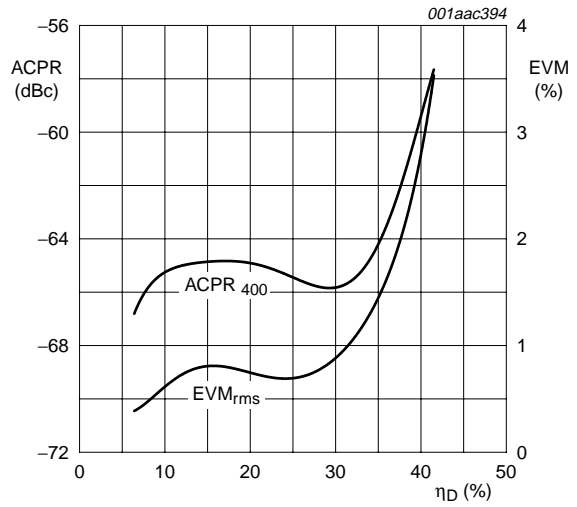
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

Fig 6. GSM EDGE ACPR at 400 kHz and at 600 kHz as a function of average load power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

Fig 7. GSM EDGE rms EVM and peak EVM as functions of average load power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

Fig 8. GSM EDGE ACPR at 400 kHz and rms EVM as functions of drain efficiency; typical values

8. Test information

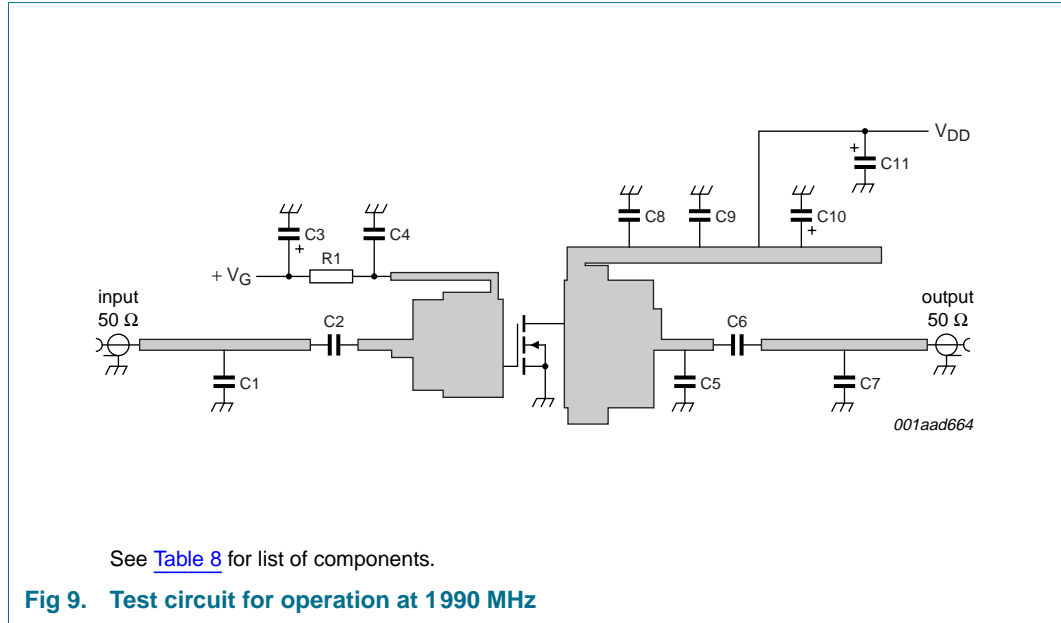


Fig 9. Test circuit for operation at 1990 MHz

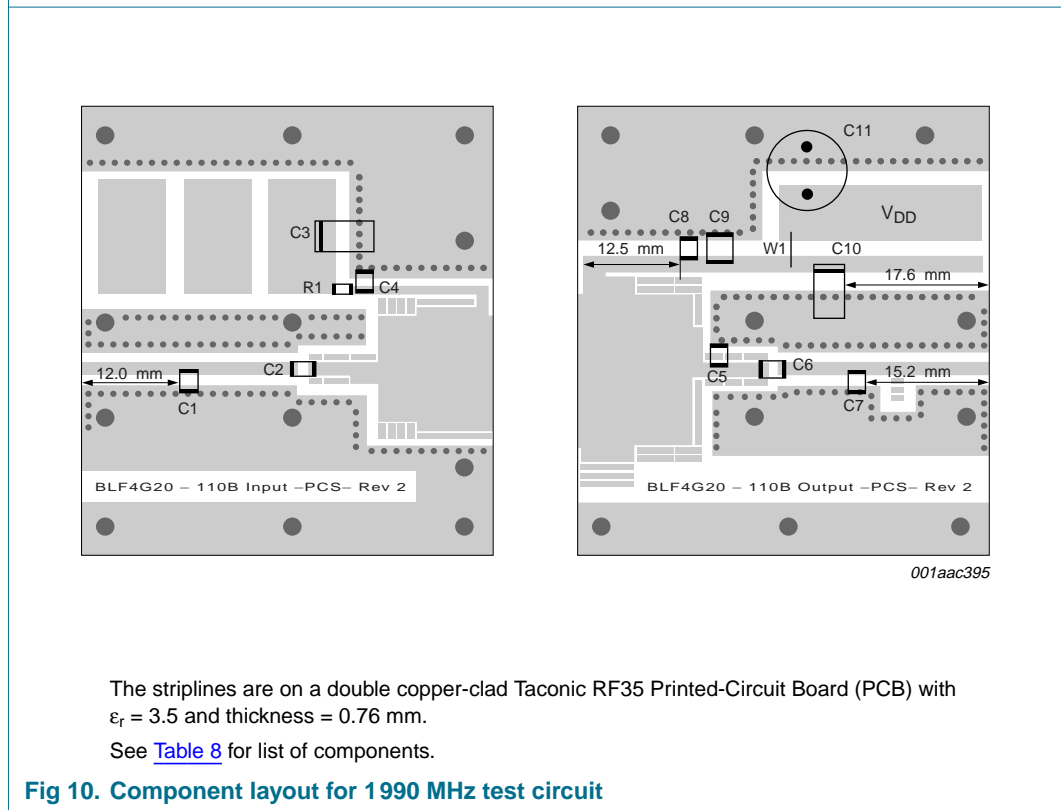


Fig 10. Component layout for 1990 MHz test circuit

Table 8: List of components (see [Figure 10](#)).

| Component | Description | Value | Dimensions | Catalogue number |
|------------|-----------------------------------|-------------------|------------|------------------|
| C1 | multilayer ceramic chip capacitor | [1] 0.1 pF | | |
| C2, C4, C8 | multilayer ceramic chip capacitor | [1] 11 pF | | |
| C3, C10 | tantalum capacitor | 10 μ F | | |
| C5 | multilayer ceramic chip capacitor | [1] 0.5 pF | | |
| C6 | multilayer ceramic chip capacitor | [1] 8.2 pF | | |
| C7 | multilayer ceramic chip capacitor | [1] 0.2 pF | | |
| C9 | multilayer ceramic chip capacitor | 1 μ F | | 1812X7R105KL2AB |
| C11 | Philips electrolytic capacitor | 220 μ F; 35 V | | |
| R1 | Philips chip resistor | 5.6 Ω | 0603 | |
| W1 | hand made wire | | 5 mm | |

[1] American Technical Ceramics type 100B or capacitor of same quality.

9. Package outline

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

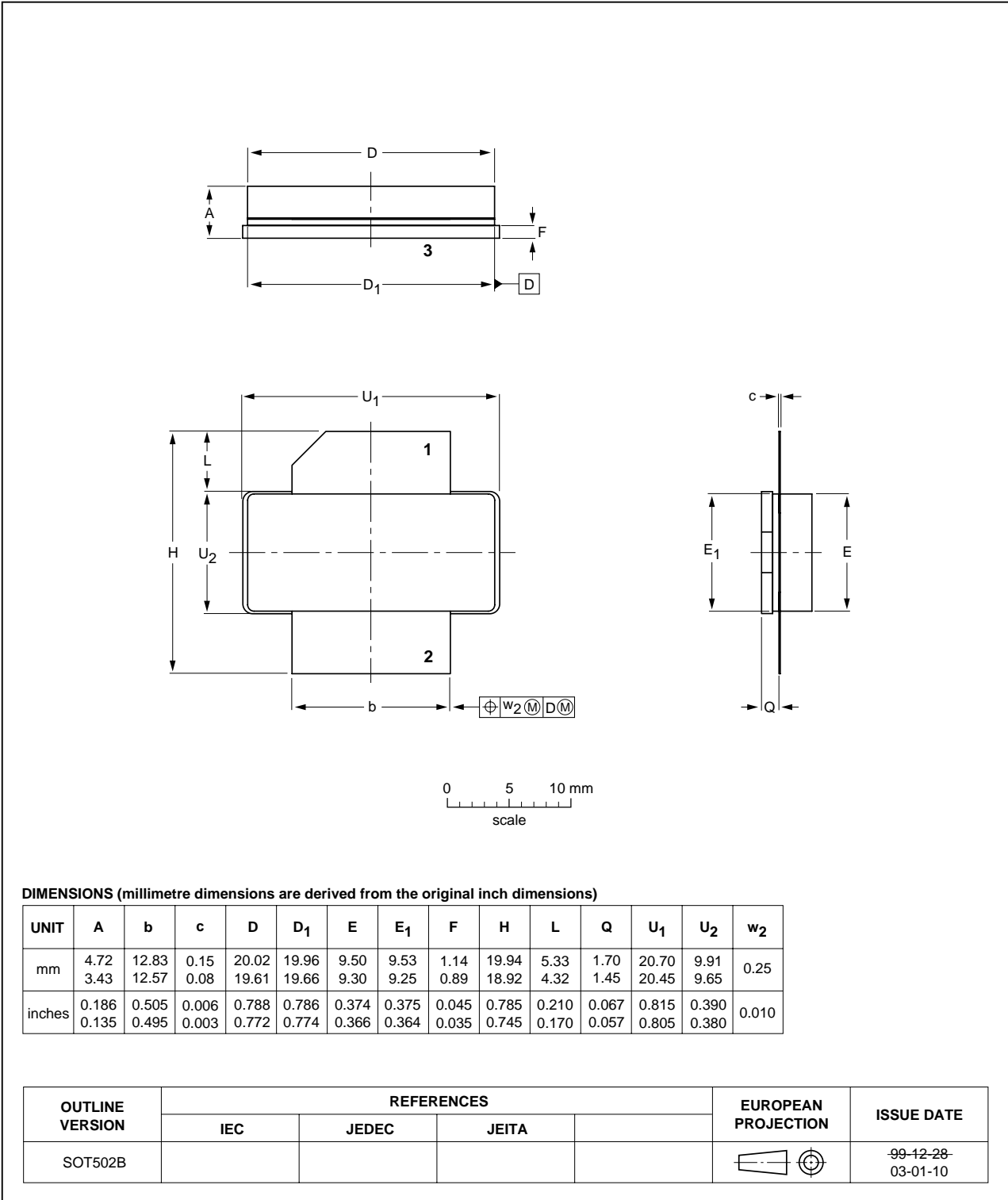


Fig 11. Package outline SOT502B

10. Abbreviations

Table 9: Abbreviations

| Acronym | Description |
|----------|--|
| ACPR | Adjacent Channel Power Ratio |
| CDMA | Code Division Multiple Access |
| CW | Continuous Wave |
| EDGE | Enhanced Data rates for GSM Evolution |
| EVM | Error Vector Magnitude |
| GSM | Global System for Mobile communications |
| I_{Dq} | quiescent drain current |
| LDMOS | Laterally Diffused Metal Oxide Semiconductor |
| RF | Radio Frequency |
| VSWR | Voltage Standing Wave Ratio |

11. Revision history

Table 10: Revision history

| Document ID | Release date | Data sheet status | Change notice | Doc. number | Supersedes |
|------------------|--------------|--------------------|---------------|----------------|------------|
| BLF4G20LS-110B_1 | 20060110 | Product data sheet | - | 9397 750 14548 | - |

12. Data sheet status

| 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. |
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