

BLF6G22-180RN; BLF6G22LS-180RN

Power LDMOS transistor

Rev. 01 — 20 November 2008

Product data sheet

1. Product profile

1.1 General description

180 W LDMOS power transistor for base station applications at frequencies from 2000 MHz to 2200 MHz.

Table 1. Typical performance

Typical RF performance at $T_{case} = 25\text{ }^{\circ}\text{C}$ in a class-AB production test circuit.

| Mode of operation | f (MHz) | V_{DS} (V) | $P_{L(AV)}$ (W) | G_p (dB) | η_D (%) | IMD3 (dBc) | ACPR (dBc) |
|-------------------|--------------|-----------------|--------------------|---------------|-----------------|--------------------|--------------------|
| 2-carrier W-CDMA | 2110 to 2170 | 30 | 40 | 16.0 | 25 | -38 ^[1] | -42 ^[1] |

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7 dB at 0.01 % probability on CCDF per carrier; carrier spacing 10 MHz.

CAUTION



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

1.2 Features

- Typical 2-carrier W-CDMA performance at frequencies of 2110 MHz and 2170 MHz, a supply voltage of 30 V and an I_{DQ} of 1400 mA:
 - ◆ Average output power = 40 W
 - ◆ Power gain = 16.0 dB
 - ◆ Efficiency = 25 %
 - ◆ IMD3 = -38 dBc
 - ◆ ACPR = -42 dBc
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2000 MHz to 2200 MHz)
- Internally matched for ease of use

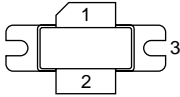
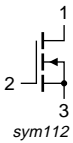
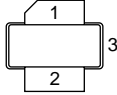
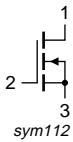
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for GSM, GSM EDGE, W-CDMA and CDMA base stations and multi carrier applications in the 2000 MHz to 2200 MHz frequency range

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|----------------------------------|-------------|--|--|
| BLF6G22-180RN (SOT502A) | | | |
| 1 | drain |  |  sym112 |
| 2 | gate | | |
| 3 | source | | |
| BLF6G22LS-180RN (SOT502B) | | | |
| 1 | drain |  |  sym112 |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-----------------|---------|---|---------|
| | Name | Description | Version |
| BLF6G22-180RN | - | flanged LDMOST ceramic package; 2 mounting holes; 2 leads | SOT502A |
| BLF6G22LS-180RN | - | 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 | +13 | V |
| I_D | drain current | | - | 49 | A |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 225 | °C |

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Type | Typ | Unit |
|-------------------------|--|---|-----------------|------|------|
| R _{th(j-case)} | thermal resistance from junction to case | T _{case} = 80 °C; P _L = 40 W | BLF6G22-180RN | 0.50 | K/W |
| | | | BLF6G22LS-180RN | 0.37 | K/W |

6. Characteristics

Table 6. Characteristics

T_j = 25 °C unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------------|----------------------------------|--|-----|------|-----|------|
| V _{(BR)DSS} | drain-source breakdown voltage | V _{GS} = 0 V; I _D = 0.9 mA | 65 | - | - | V |
| V _{GS(th)} | gate-source threshold voltage | V _{DS} = 10 V; I _D = 270 mA | 1.4 | 2.0 | 2.4 | V |
| V _{GSq} | gate-source quiescent voltage | V _{DS} = 28 V; I _D = 1.62 A | 1.5 | 2.0 | 2.5 | V |
| I _{DSS} | drain leakage current | V _{GS} = 0 V; V _{DS} = 28 V | - | - | 5 | μA |
| I _{DSX} | drain cut-off current | V _{GS} = V _{GS(th)} + 3.75 V; V _{DS} = 10 V | 40 | 45 | - | A |
| I _{GSS} | gate leakage current | V _{GS} = 13 V; V _{DS} = 0 V | - | - | 450 | nA |
| g _{fs} | forward transconductance | V _{DS} = 10 V; I _D = 13.5 A | - | 19.5 | - | S |
| R _{DS(on)} | drain-source on-state resistance | V _{GS} = V _{GS(th)} + 3.75 V; I _D = 9.45 A | - | 0.06 | - | Ω |
| C _{rs} | feedback capacitance | V _{GS} = 0 V; V _{DS} = 30 V; f = 1 MHz | - | 3.3 | - | pF |

7. Application information

Table 7. Application information

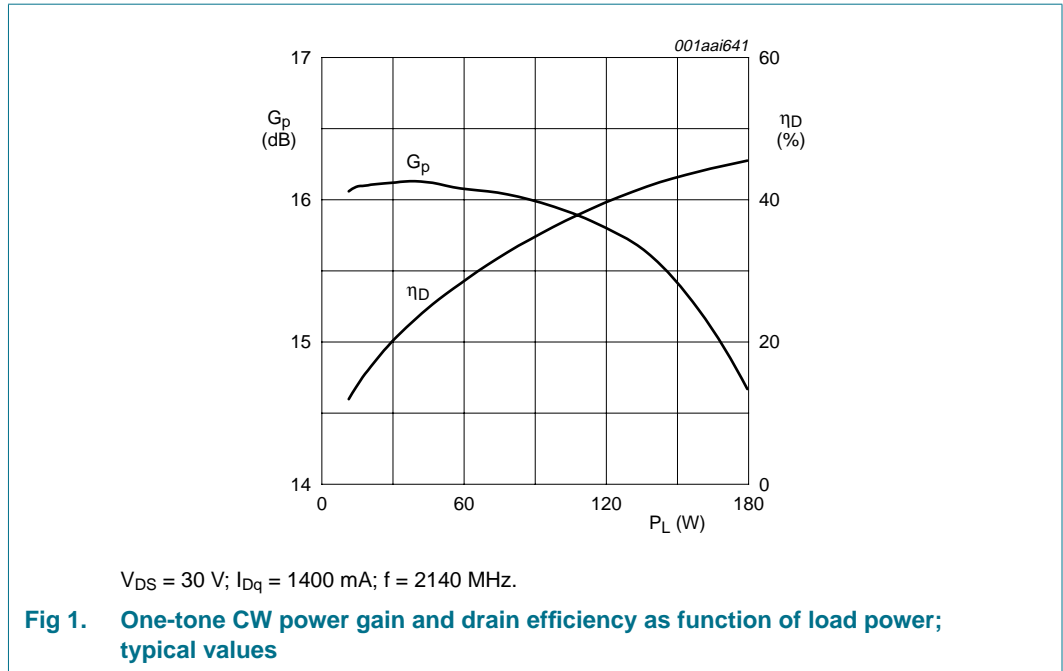
Mode of operation: 2-carrier W-CDMA; PAR = 7 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1-64 PDPCH; f₁ = 2112.5 MHz; f₂ = 2122.5 MHz; f₃ = 2157.5 MHz; f₄ = 2167.5 MHz; RF performance at V_{DS} = 30 V; I_{Dq} = 1400 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|--|---------------------------|------|------|-------|------|
| P _{L(AV)} | average output power | | - | 40 | - | W |
| G _p | power gain | P _{L(AV)} = 40 W | 15.0 | 16.0 | - | dB |
| RL _{in} | input return loss | P _{L(AV)} = 40 W | - | -11 | -8 | dB |
| η _D | drain efficiency | P _{L(AV)} = 40 W | 22 | 25 | - | % |
| IMD3 | third order intermodulation distortion | P _{L(AV)} = 40 W | - | -38 | -34.5 | dBc |
| ACPR | adjacent channel power ratio | P _{L(AV)} = 40 W | - | -42 | -39 | dBc |

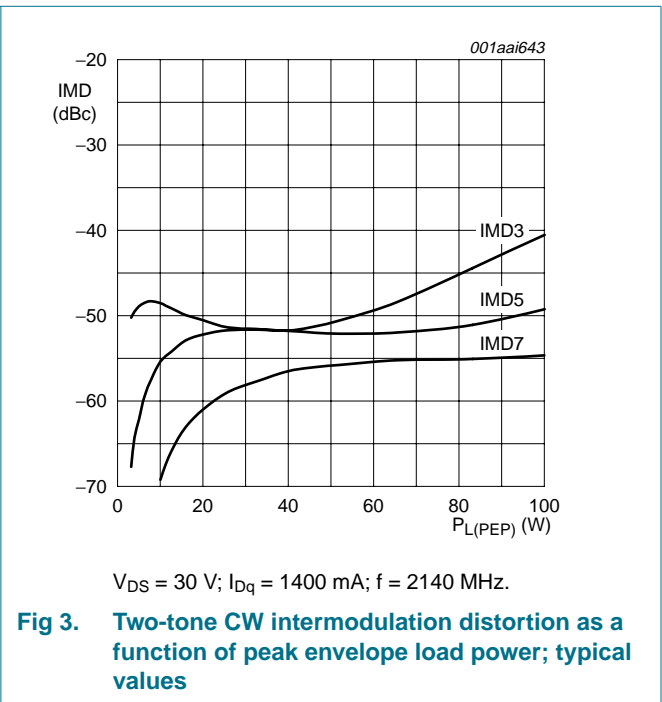
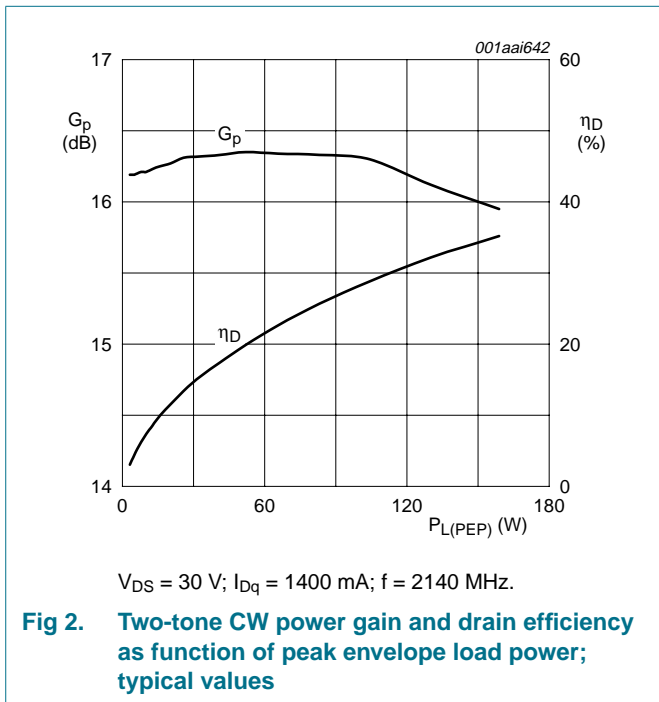
7.1 Ruggedness in class-AB operation

The BLF6G22-180RN and BLF6G22LS-180RN are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 30 V; I_{Dq} = 1400 mA; P_L = 180 W (CW); f = 2170 MHz.

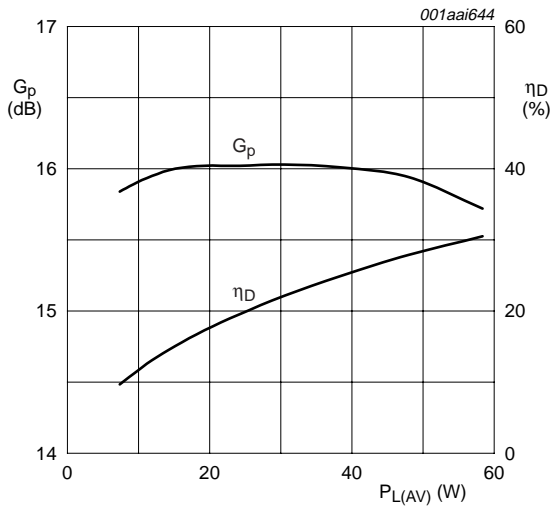
7.2 One-tone CW



7.3 Two-tone CW

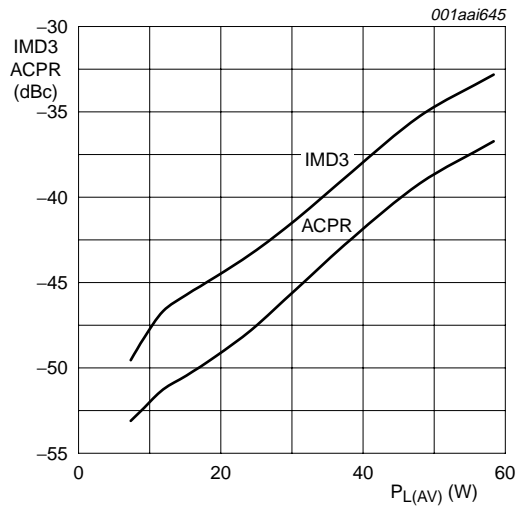


7.4 2-carrier W-CDMA



$V_{DS} = 30\text{ V}$; $I_{Dq} = 1400\text{ mA}$; $f = 2140\text{ MHz}$ ($\pm 5\text{ MHz}$);
carrier spacing 10 MHz.

Fig 4. 2-carrier W-CDMA power gain and drain efficiency as function of average load power; typical values



$V_{DS} = 30\text{ V}$; $I_{Dq} = 1400\text{ mA}$; $f = 2140\text{ MHz}$ ($\pm 5\text{ MHz}$);
carrier spacing 10 MHz.

Fig 5. 2-carrier W-CDMA adjacent channel power ratio and third order intermodulation distortion as function of average load power; typical values

8. Test information

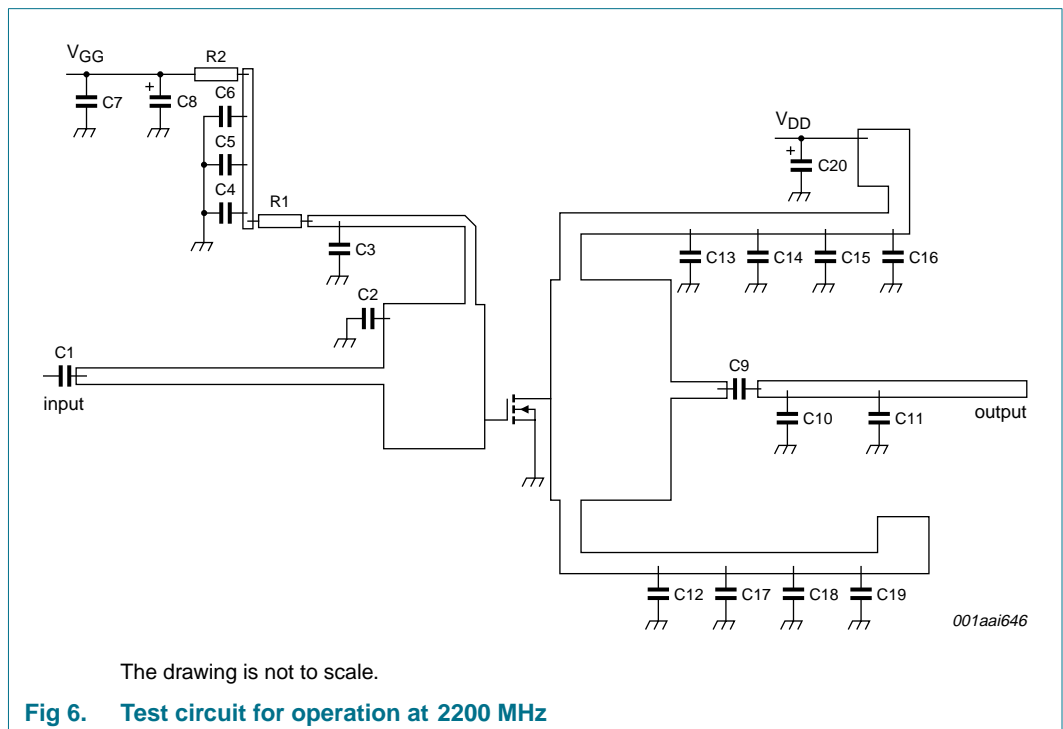


Fig 6. Test circuit for operation at 2200 MHz

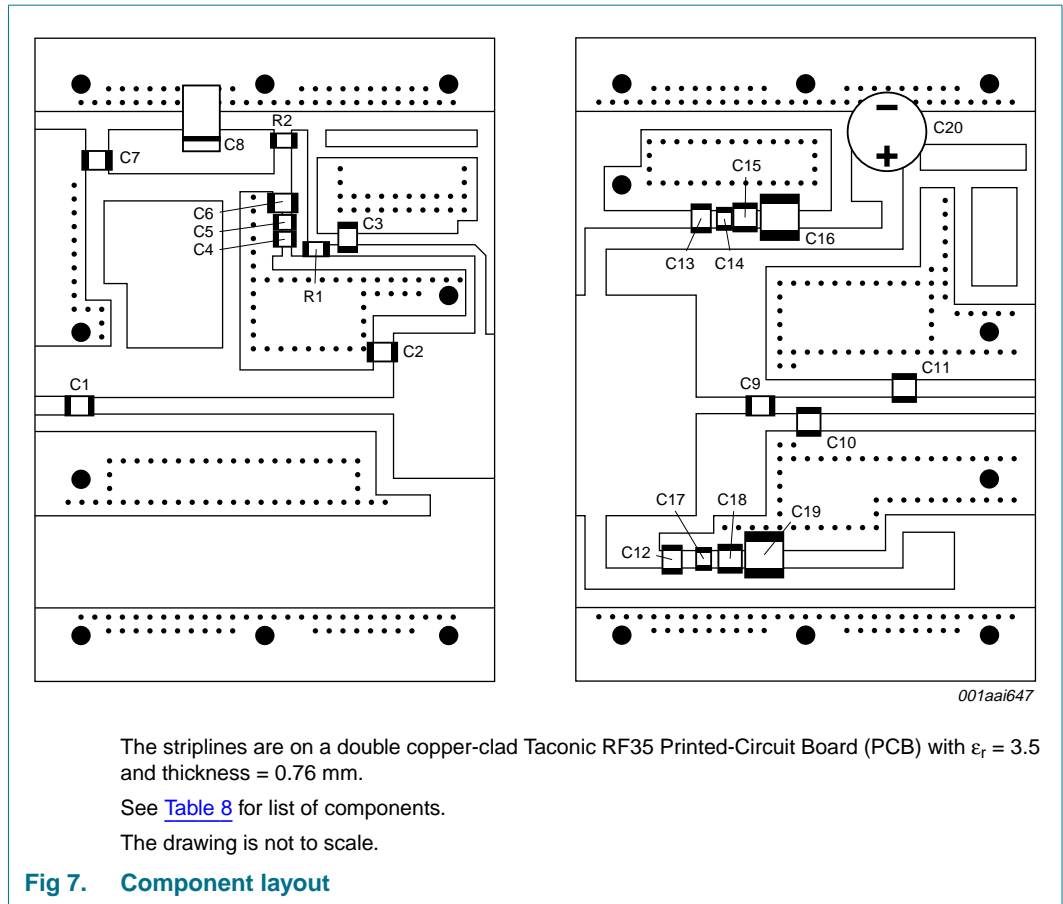


Table 8. List of components (see [Figure 6](#) and [Figure 7](#))

The Printed-Circuit Board (PCB) used is a double copper-clad Taconic RF35 with $\epsilon_r = 3.5$ and thickness = 0.76 mm.

| Component | Description | Value | Remarks |
|------------------|-----------------------------------|-------------------|---|
| C1, C3, C12, C13 | multilayer ceramic chip capacitor | 13 pF | [1] ATC 100B or capacitor of same quality |
| C2 | multilayer ceramic chip capacitor | 1.4 pF | [1] ATC 100B or capacitor of same quality |
| C4, C5, C14, C17 | multilayer ceramic chip capacitor | 220 nF | Vishay or capacitor of same quality |
| C6, C7 | multilayer ceramic chip capacitor | 100 nF | Vishay or capacitor of same quality |
| C8 | multilayer ceramic chip capacitor | 10 μ F | |
| C9 | multilayer ceramic chip capacitor | 12 pF | [1] ATC 100B or capacitor of same quality |
| C10 | multilayer ceramic chip capacitor | 1.1 pF | [1] ATC 100B or capacitor of same quality |
| C11 | multilayer ceramic chip capacitor | 0.7 pF | [1] ATC 100B or capacitor of same quality |
| C15, C18 | multilayer ceramic chip capacitor | 1.5 μ F | |
| C16, C19 | multilayer ceramic chip capacitor | 10 μ F; 50 V | TDK or capacitor of same quality |
| C20 | electrolytic capacitor | 220 μ F; 63 V | |
| L1 | ferrite SMD bead | - | Ferroxcube BDS 3/3/4.6-4S2 or equivalent |
| R1 | SMD resistor | 2.7 Ω | |
| R2, R3 | SMD resistor | 6.8 Ω | |

[1] Solder vertically.

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

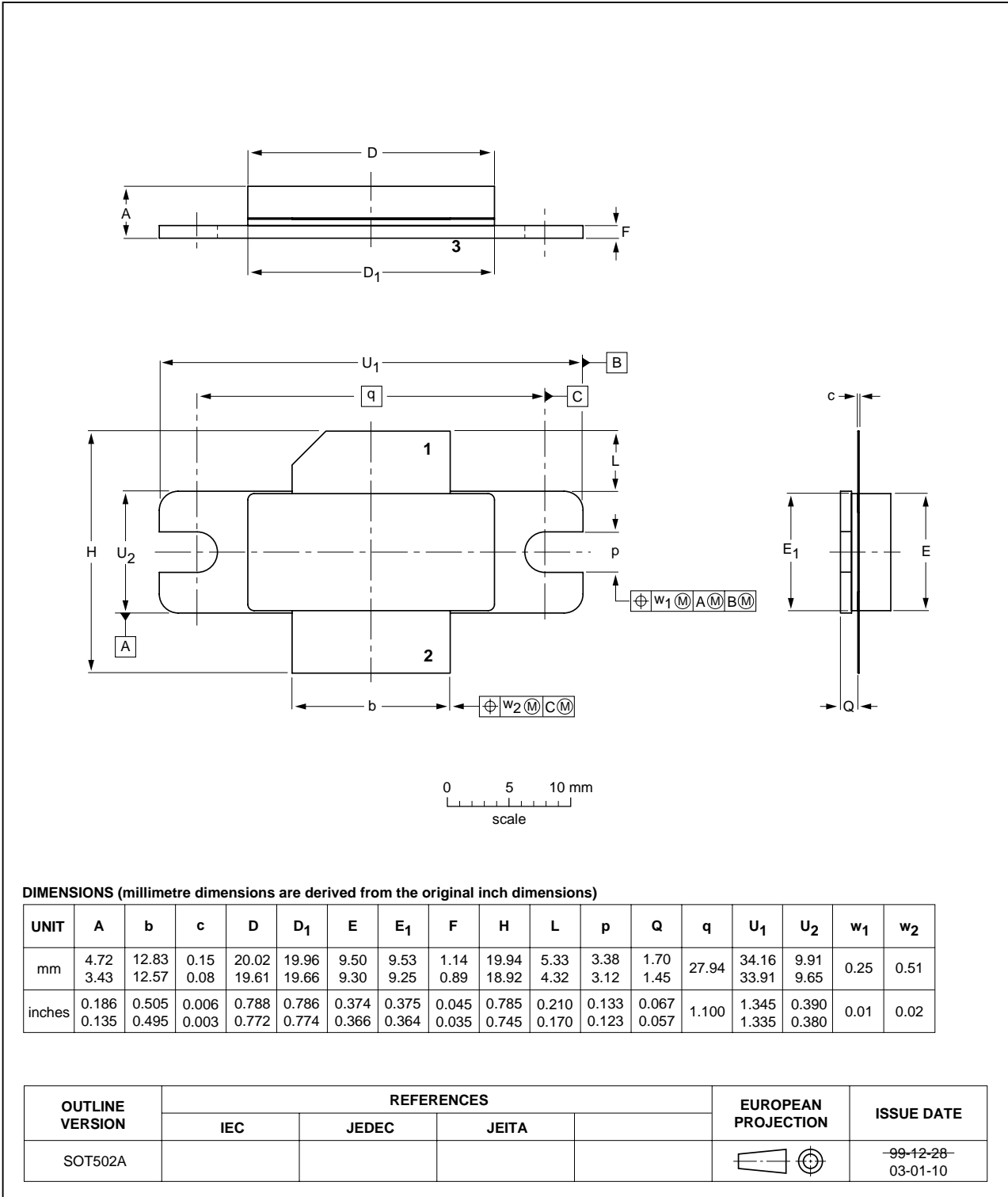


Fig 8. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

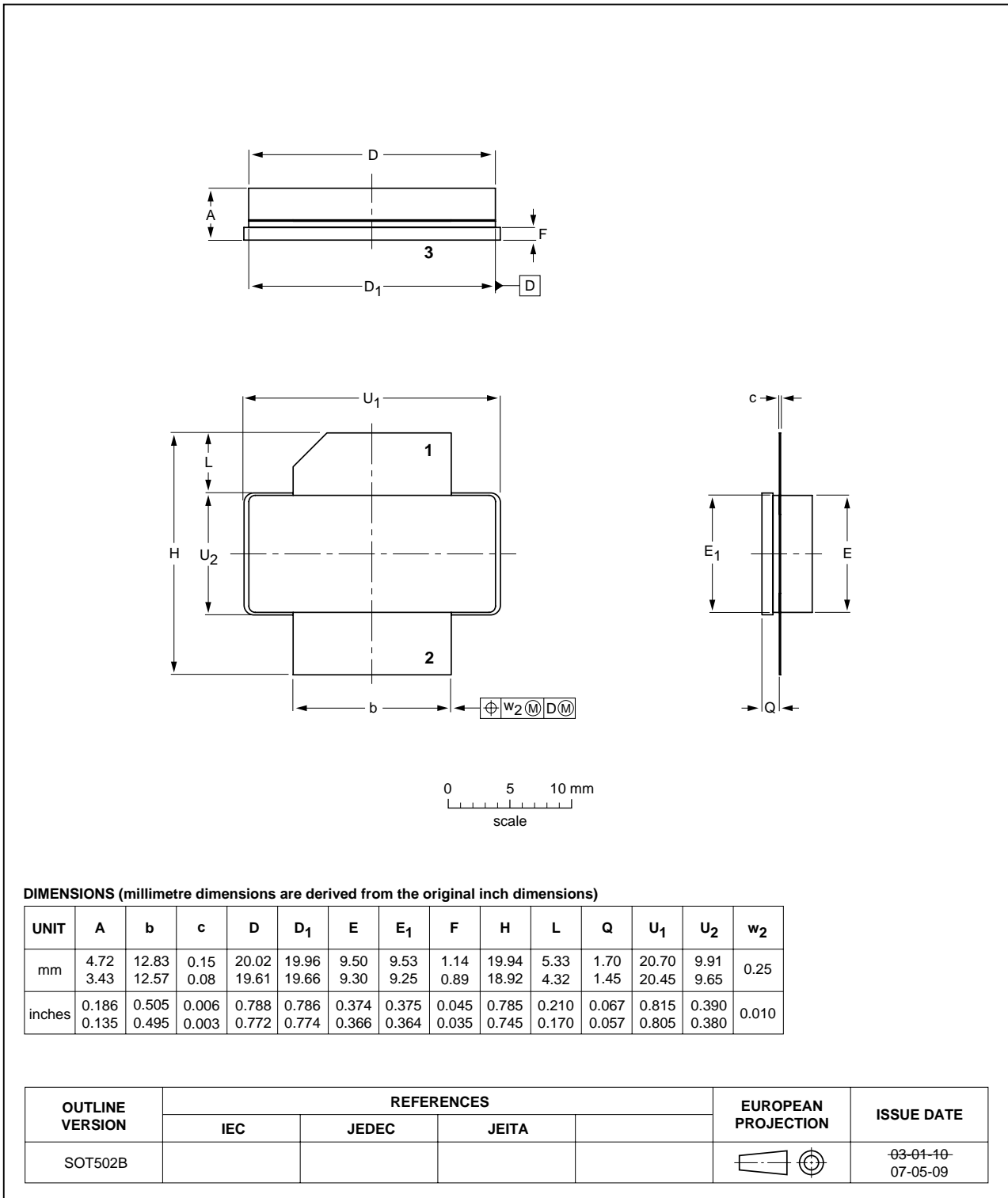


Fig 9. Package outline SOT502B

10. Abbreviations

Table 9. Abbreviations

| Acronym | Description |
|---------|---|
| 3GPP | Third Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CDMA | Code Division Multiple Access |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| EDGE | Enhanced Data rates for GSM Evolution |
| GSM | Global System for Mobile communications |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| LDMOST | Laterally Diffused Metal-Oxide Semiconductor Transistor |
| PAR | Peak-to-Average power Ratio |
| PDPCH | transmission Power of the Dedicated Physical CHannel |
| RF | Radio Frequency |
| VSWR | Voltage Standing-Wave Ratio |
| W-CDMA | Wideband Code Division Multiple Access |

11. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------------------|--------------|--------------------|---------------|------------|
| BLF6G22-180RN_22LS-180RN_1 | 20081120 | Product data sheet | - | - |

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12.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
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| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

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