

BLF6G27-135; BLF6G27LS-135

WiMAX power LDMOS transistor

Rev. 02 — 26 May 2008

Product data sheet

1. Product profile

1.1 General description

135 W LDMOS power transistor for base station applications at frequencies from 2500 MHz to 2700 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) | $P_{L(p)}$ (W) | G_p (dB) | η_D (%) | $ACPR_{885k}$ (dBc) | $ACPR_{1980k}$ (dBc) |
|---------------------------------|--------------|-----------------|--------------------|-------------------|---------------|-----------------|------------------------|-------------------------|
| 1-carrier N-CDMA ^[1] | 2500 to 2700 | 32 | 20 | 200 | 16 | 22.5 | -52 ^[2] | -67 ^[2] |

[1] Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 to 13). PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz.

[2] Measured within 30 kHz bandwidth.

1.2 Features

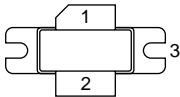
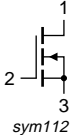
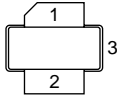
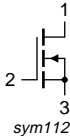
- Typical 1-carrier N-CDMA performance (Single carrier IS-95 with pilot, paging, sync and 6 traffic channels [Walsh codes 8 to 13]. PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz) at a frequency of 2500 MHz and 2700 MHz, a supply voltage of 32 V and an I_{Dq} of 1200 mA:
 - ◆ Average output power = 20 W
 - ◆ Power gain = 16 dB
 - ◆ Drain efficiency = 22.5 %
 - ◆ $ACPR_{885k} = -52.0$ dBc in 30 kHz bandwidth
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2500 MHz to 2700 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 base stations and multicarrier applications in the 2500 MHz to 2700 MHz frequency range

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|--------------------------------|-------------|---|---|
| BLF6G27-135 (SOT502A) | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source | | |
| BLF6G27LS-135 (SOT502B) | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---------------|---------|---|---------|
| | Name | Description | Version |
| BLF6G27-135 | - | flanged LDMOST ceramic package; 2 mounting holes; 2 leads | SOT502A |
| BLF6G27LS-135 | - | 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 | | - | 34 | A |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 200 | °C |

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Type | Typ | Unit |
|------------------|--|---|---------------|------|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C};$ $P_L = 135\text{ W (CW)}$ | BLF6G27-135 | 0.5 | K/W |
| | | | BLF6G27LS-135 | 0.45 | 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 = 0.5 mA | 65 | - | - | V |
| V _{GS(th)} | gate-source threshold voltage | V _{DS} = 10 V; I _D = 216 mA | 1.4 | 2 | 2.4 | V |
| I _{DSS} | drain leakage current | V _{GS} = 0 V; V _{DS} = 28 V | - | - | 4.2 | μA |
| I _{DSX} | drain cut-off current | V _{GS} = V _{GS(th)} + 3.75 V; V _{DS} = 10 V | 30.6 | 34 | - | A |
| I _{GSS} | gate leakage current | V _{GS} = +11 V; V _{DS} = 0 V | - | - | 420 | nA |
| g _{fs} | forward transconductance | V _{DS} = 10 V; I _D = 6.3 A | - | 12 | - | S |
| R _{DS(on)} | drain-source on-state resistance | V _{GS} = V _{GS(th)} + 3.75 V; I _D = 7.2 A | - | 0.085 | 0.135 | Ω |
| C _{rs} | feedback capacitance | V _{GS} = 0 V; V _{DS} = 28 V; f = 1 MHz | - | 3.15 | - | pF |

7. Application information

Table 7. Application information

Mode of operation: 1-carrier N-CDMA, single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 to 13). PAR = 9.7 dB at 0.01 % probability on the CCDF, channel bandwidth is 1.2288 MHz; f₁ = 2500 MHz; f₂ = 2600 MHz; f₃ = 2700 MHz; RF performance at V_{DS} = 32 V; I_{Dq} = 1200 mA; T_{case} = 25 °C; unless otherwise specified, in a class-AB production circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---|---------------------------|---------|------|-----|------|
| G _p | power gain | P _{L(AV)} = 20 W | 14 | 16 | - | dB |
| RL _{in} | input return loss | P _{L(AV)} = 20 W | - | -10 | - | dB |
| η _D | drain efficiency | P _{L(AV)} = 20 W | 19.0 | 22.5 | - | % |
| ACPR _{885k} | adjacent channel power ratio (885 kHz) | P _{L(AV)} = 20 W | [1] -48 | -52 | - | dBc |
| ACPR _{1980k} | adjacent channel power ratio (1980 kHz) | P _{L(AV)} = 20 W | [1] -65 | -67 | - | dBc |
| P _{L(M)} | peak output power | | [2] 185 | 200 | - | W |

[1] Measured within 30 kHz bandwidth.

[2] Measured at 2.7 GHz and 3 dB compression of the CCDF at 0.01 % probability.

7.1 Ruggedness in class-AB operation

The BLF6G27-135 and BLF6G27LS-135 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 1200 mA; P_L = P_{L(1dB)}; f = 2700 MHz.

7.2 NXP WiMAX signal

7.2.1 WiMAX signal description

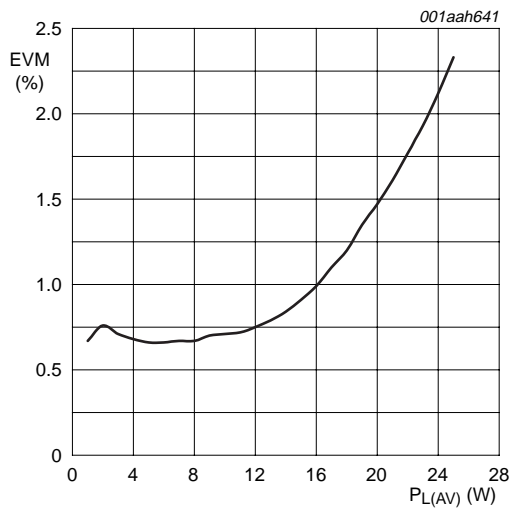
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;
 frequency band = WCS; sampling rate = 11.2 MHz; $n = 28 / 25$; $G = T_g / T_b = 1 / 8$;
 FFT = 1024; zone type = PUSC; $\delta = 97.7 \%$; number of symbols = 46;
 number of subchannels = 30; PAR = 9.5 dB.

Preamble: 1 symbol \times 30 subchannels; $P_L = P_{L(nom)} + 3.86$ dB.

Table 8. Frame structure

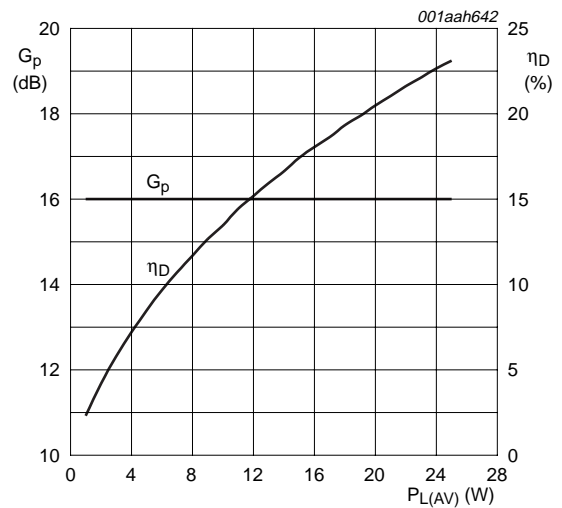
| Frame contents | Modulation technique | Data length |
|--|----------------------|-------------|
| Zone 0 FCH 2 symbols \times 4 subchannels | QPSK1/2 | 3 bit |
| Zone 0 data 2 symbols \times 26 subchannels | 64QAM3/4 | 692 bit |
| Zone 0 data 44 symbols \times 30 subchannels | 64QAM3/4 | 10000 bit |

7.2.2 Graphs



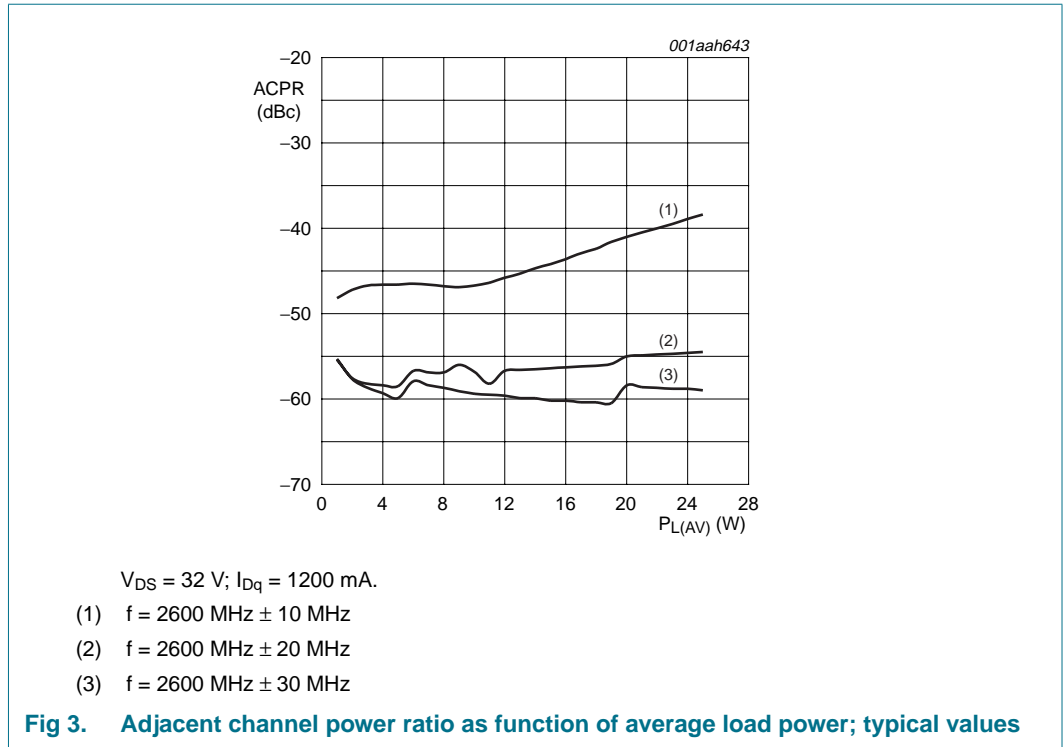
$V_{DS} = 32$ V; $I_{Dq} = 1200$ mA; $f = 2600$ MHz.

Fig 1. EVM as function of average load power; typical values



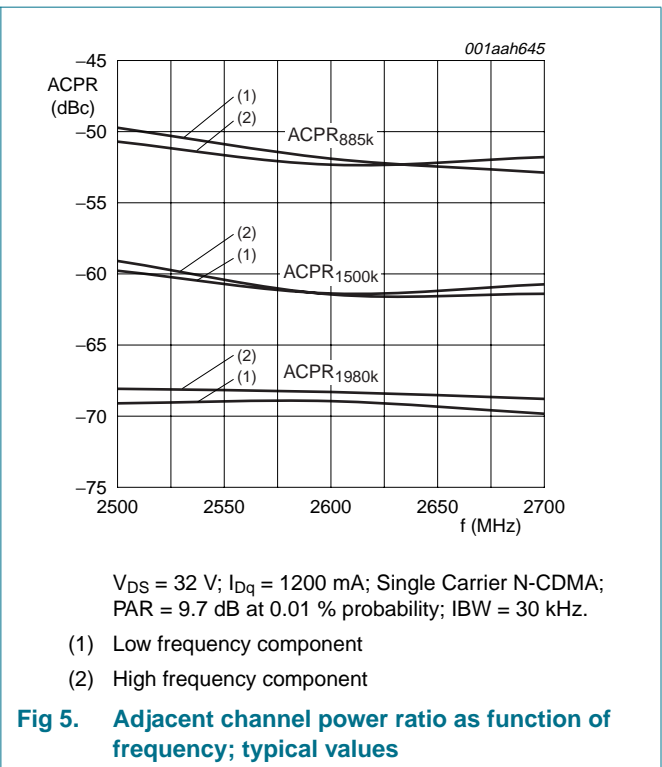
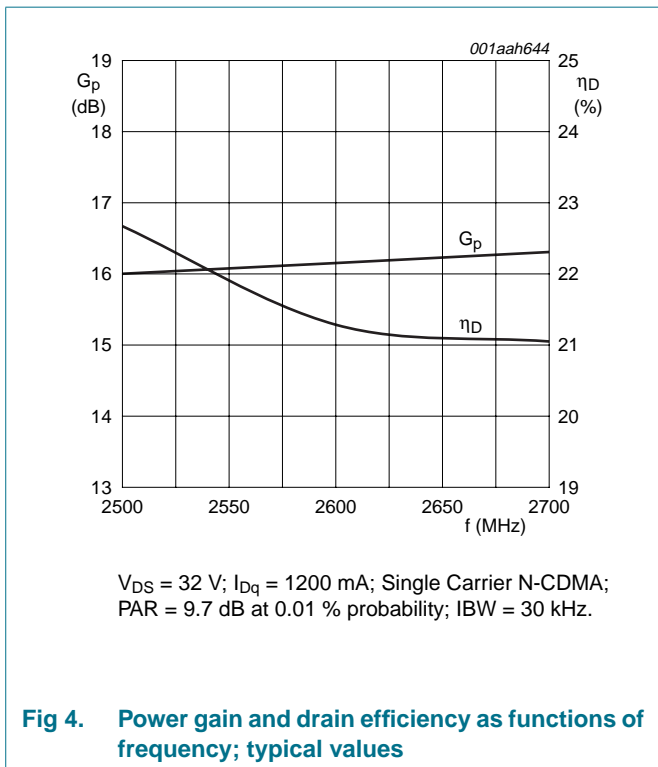
$V_{DS} = 32$ V; $I_{Dq} = 1200$ mA; $f = 2600$ MHz.

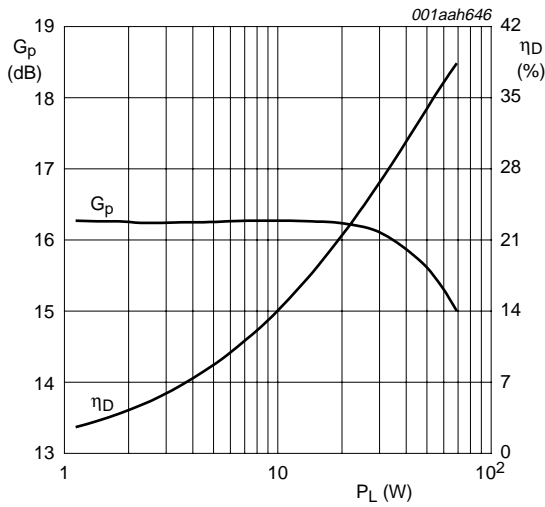
Fig 2. Power gain and drain efficiency as functions of average load power; typical values



7.3 Single carrier N-CDMA broadband performance at 9 W average

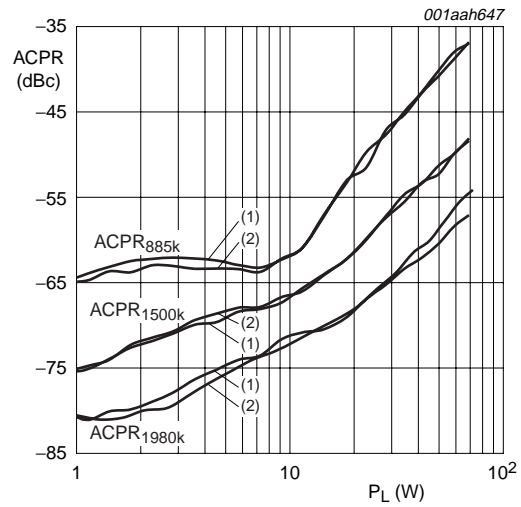
7.3.1 Graphs





$V_{DS} = 32$ V; $I_{DQ} = 1200$ mA; $f = 2600$ MHz; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

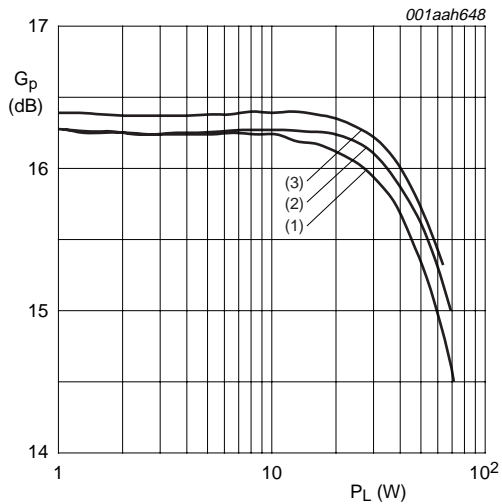
Fig 6. Power gain and drain efficiency as functions of load power; typical values



$V_{DS} = 32$ V; $I_{DQ} = 1200$ mA; $f = 2600$ MHz; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

- (1) Low frequency component
- (2) High frequency component

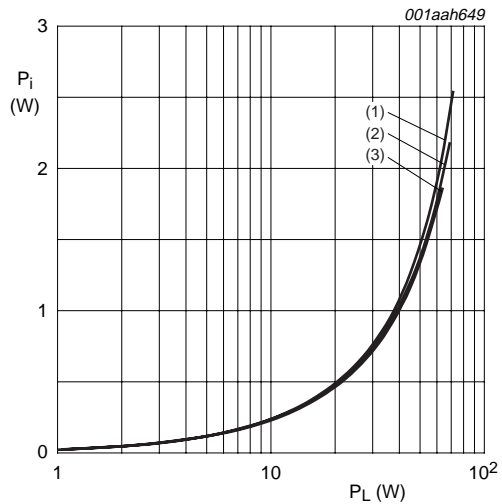
Fig 7. Adjacent channel power ratio as function of load power; typical values



$V_{DS} = 32$ V; $I_{DQ} = 1200$ mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

- (1) $f = 2500$ MHz
- (2) $f = 2600$ MHz
- (3) $f = 2700$ MHz

Fig 8. Power gain as function of load power; typical values



$V_{DS} = 32$ V; $I_{DQ} = 1200$ mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

- (1) $f = 2500$ MHz
- (2) $f = 2600$ MHz
- (3) $f = 2700$ MHz

Fig 9. Input power as function of load power; typical values

8. Test information

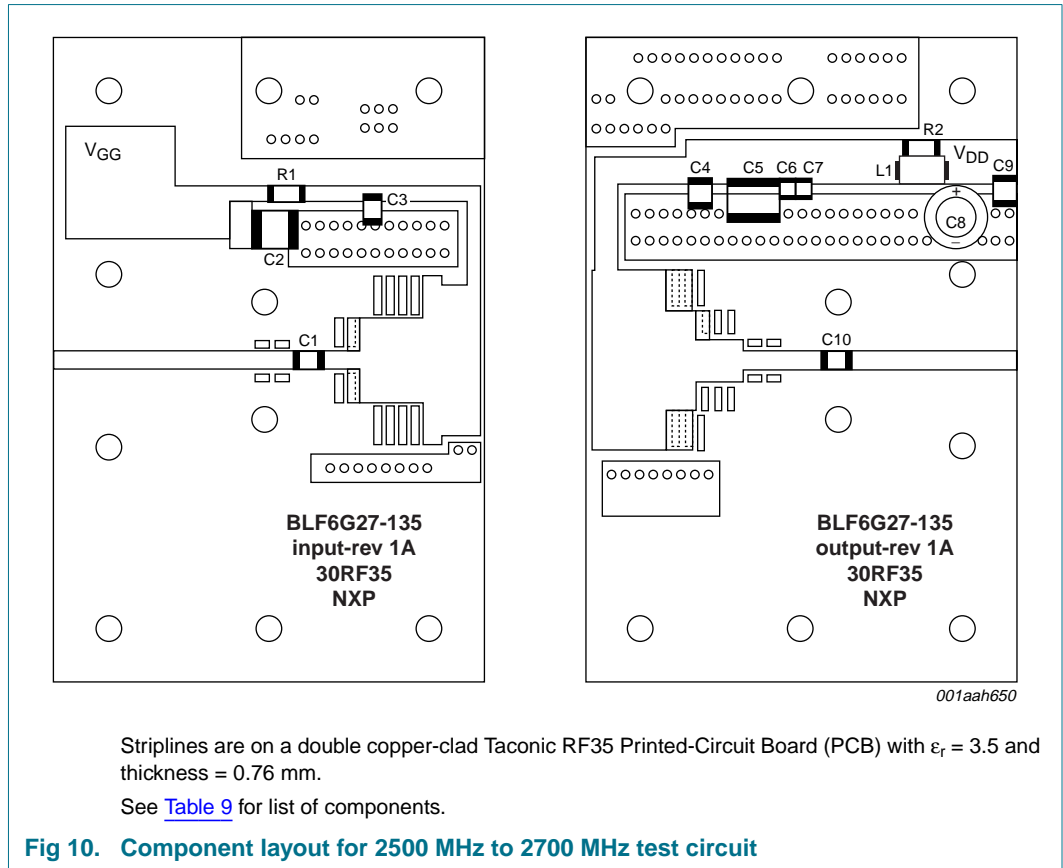


Table 9. List of components

For test circuit, see [Figure 10](#).

| Component | Description | Value | Remarks |
|-----------------|-----------------------------------|-------------------|--|
| C1, C3, C4, C10 | multilayer ceramic chip capacitor | 8.2 pF | ATC 100B or equivalent |
| C2 | multilayer ceramic chip capacitor | 4.7 μ F; 50 V | TDK C4532X7R1H475M or equivalent |
| C5 | multilayer ceramic chip capacitor | 10 μ F; 50 V | TDK C5750X7R1H106M or equivalent |
| C9 | multilayer ceramic chip capacitor | 1.5 μ F; 50 V | TDK C3225X7R1H155M or equivalent |
| C6, C7 | multilayer ceramic chip capacitor | 100 nF | Vishay VJ1206Y104KXB or equivalent |
| C8 | electrolytic capacitor | 470 μ F; 63 V | ATC 100B or equivalent |
| L1 | ferrite SMD bead | - | Ferroxcube BDS 3/3/4.6-4S2 or equivalent |
| R1 | SMD resistor | 5.1 Ω | SMD 1206 |
| R2 | SMD resistor | 9.1 Ω | SMD 1206 |

Table 10. Measured test circuit impedances

| f (GHz) | Z_i (Ω) | Z_o (Ω) |
|--------------------|------------------------------|------------------------------|
| 2.5 | 1.60 + j1.07 | 1.44 + j1.86 |
| 2.6 | 1.38 + j2.08 | 1.17 + j2.80 |
| 2.7 | 1.17 + j2.77 | 0.97 + j3.41 |

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

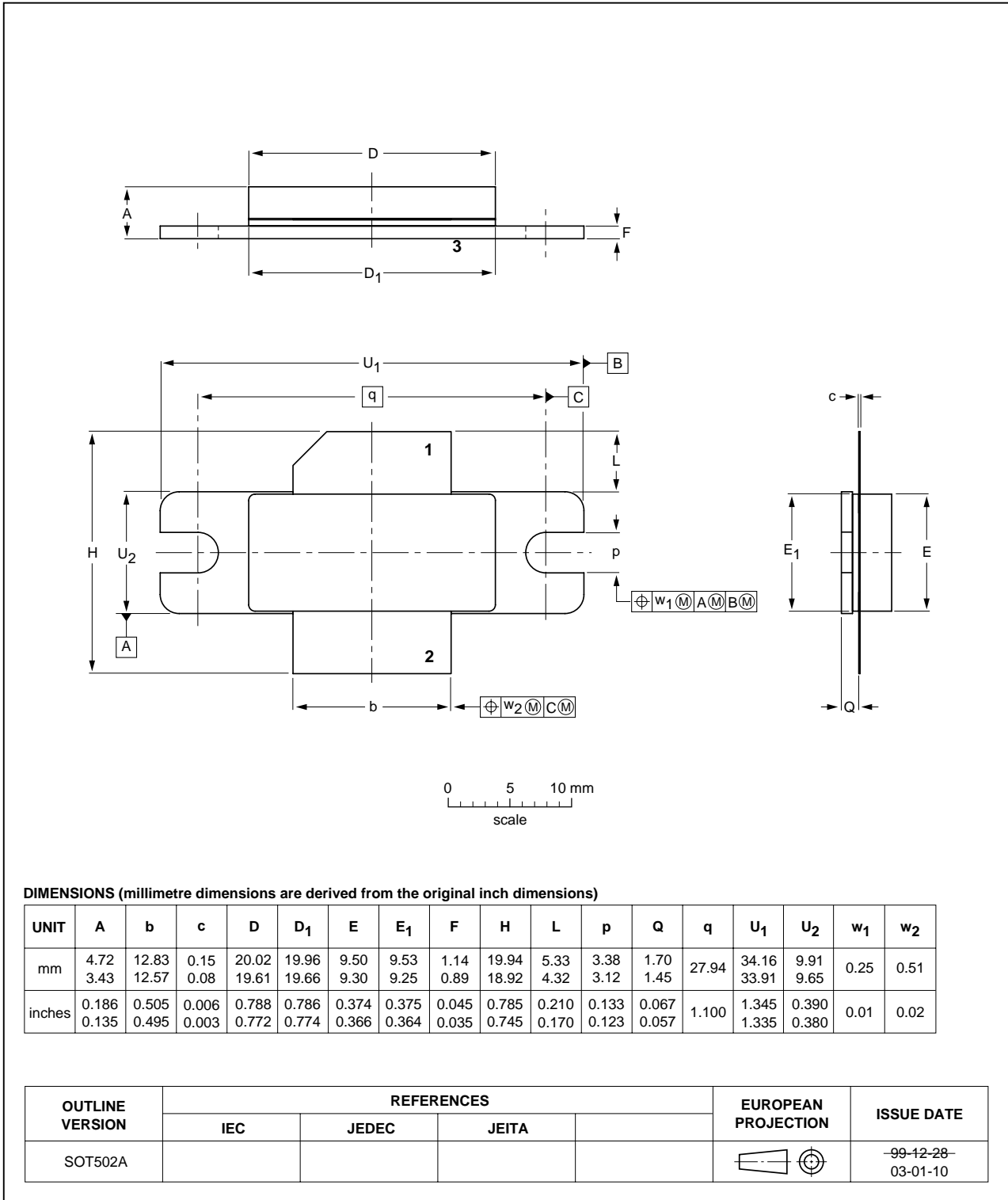


Fig 11. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

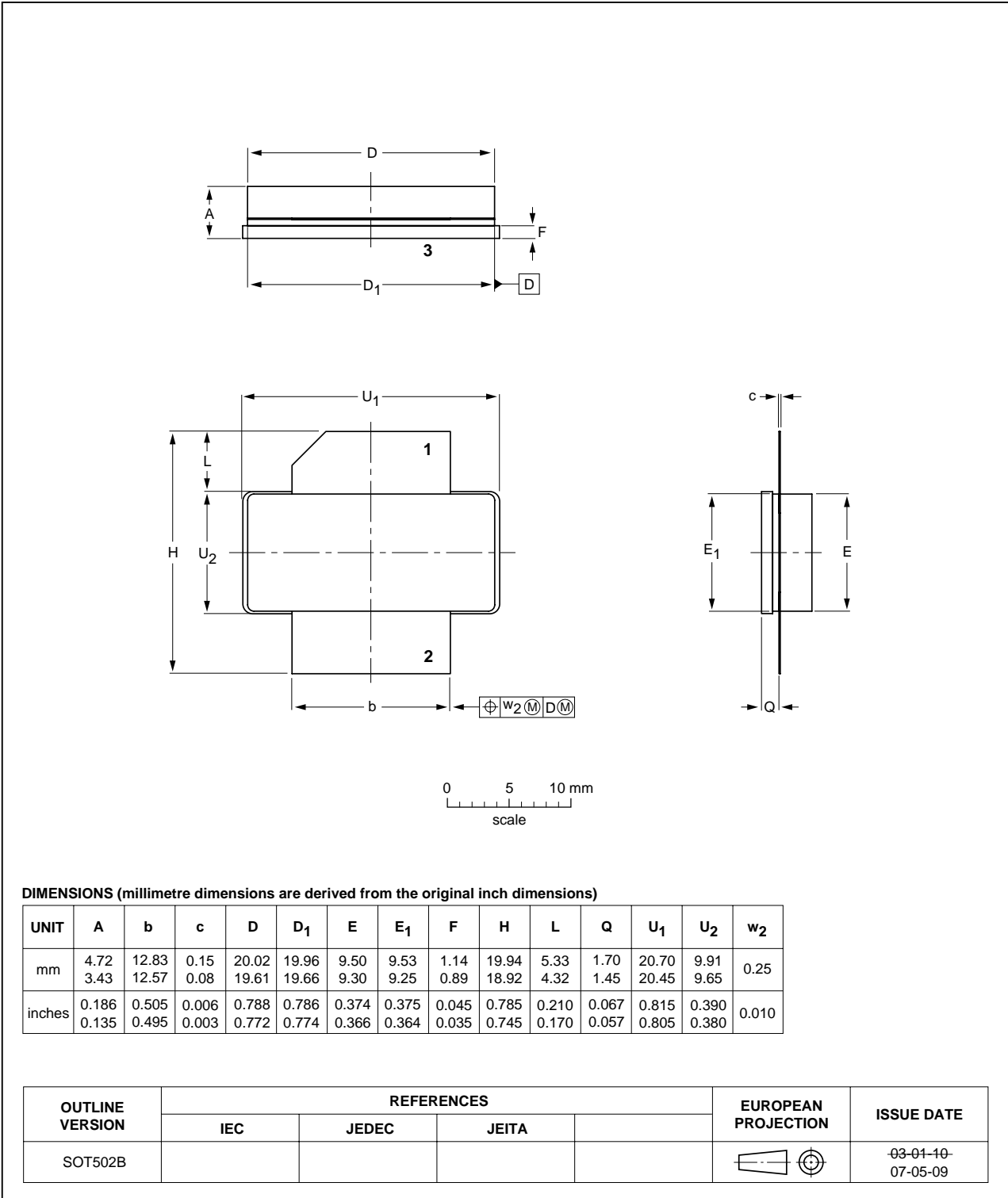


Fig 12. Package outline SOT502B

10. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|---|
| CCDF | Complementary Cumulative Distribution Function |
| CDMA | Code Division Multiple Access |
| CW | Continuous Wave |
| EVM | Error Vector Magnitude |
| FCH | Frame Control Header |
| FFT | Fast Fourier Transform |
| IBW | Instantaneous BandWidth |
| IS-95 | CDMA Interim Standard 95 |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| LDMOST | Laterally Diffused Metal-Oxide Semiconductor Transistor |
| N-CDMA | Narrowband Code Division Multiple Access |
| PAR | Peak-to-Average power Ratio |
| PUSC | Partial Usage of SubChannels |
| RF | Radio Frequency |
| SMD | Surface Mounted Device |
| VSWR | Voltage Standing-Wave Ratio |
| WCS | Wireless Communications Service |
| WiMAX | Worldwide Interoperability for Microwave Access |

11. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------------------|--------------|------------------------|---------------|---------------------------------|
| BLF6G27-135_BLF6G27LS-135_2 | 20080526 | Product data sheet | - | BLF6G27-135_ BLF6G27LS-135_1 |
| BLF6G27-135_BLF6G27LS-135_1 | 20080221 | Preliminary data sheet | - | - |

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12.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
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[2] The term 'short data sheet' is explained in section "Definitions".

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