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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



BLF6G20-180RN; BLF6G20LS-180RN

Power LDMOS transistor

Rev. 2 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

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

Table 1. Typical performance

Typical RF performance at $T_{case} = 25\text{ °C}$ 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 WCDMA | 1930 to 1990 | 30 | 40 | 17.2 | 27 | -38 ^[1] | -41 ^[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 WCDMA performance at frequencies of 1930 MHz and 1990 MHz, a supply voltage of 30 V and an I_{Dq} of 1400 mA:
 - ◆ Average output power = 40 W
 - ◆ Power gain = 17.2 dB
 - ◆ Efficiency = 27 %
 - ◆ IMD3 = -41 dBc
 - ◆ ACPR = -38 dBc
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use

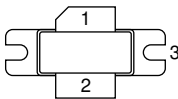
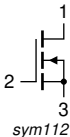
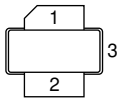
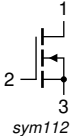
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

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

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|----------------------------------|-------------|--|--|
| BLF6G20-180RN (SOT502A) | | | |
| 1 | drain |  |  sym112 |
| 2 | gate | | |
| 3 | source | | |
| BLF6G20LS-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 |
| BLF6G20-180RN | - | flanged LDMOST ceramic package; 2 mounting holes; 2 leads | SOT502A |
| BLF6G20LS-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 | $T_{case} = 80\text{ °C};$ $P_L = 40\text{ W}$ | BLF6G20-180RN | 0.50 | K/W |
| | | | BLF6G20LS-180RN | 0.37 | K/W |

6. Characteristics

Table 6. Characteristics

$T_j = 25\text{ °C}$ 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 | $V_{DS} = 10\text{ V}; I_D = 270\text{ mA}$ | 1.4 | 2.0 | 2.4 | V |
| V_{GSq} | gate-source quiescent voltage | $V_{DS} = 28\text{ V}; I_D = 1.62\text{ A}$ | 1.5 | 2.0 | 2.5 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 5 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$ | 40 | 45 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 13\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 450 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 13.5\text{ A}$ | - | 19.5 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 9.45\text{ A}$ | - | 0.06 | - | Ω |
| C_{rs} | feedback capacitance | $V_{GS} = 0\text{ V}; V_{DS} = 30\text{ V};$ $f = 1\text{ MHz}$ | - | 3.3 | - | pF |

7. Application information

Table 7. Application information

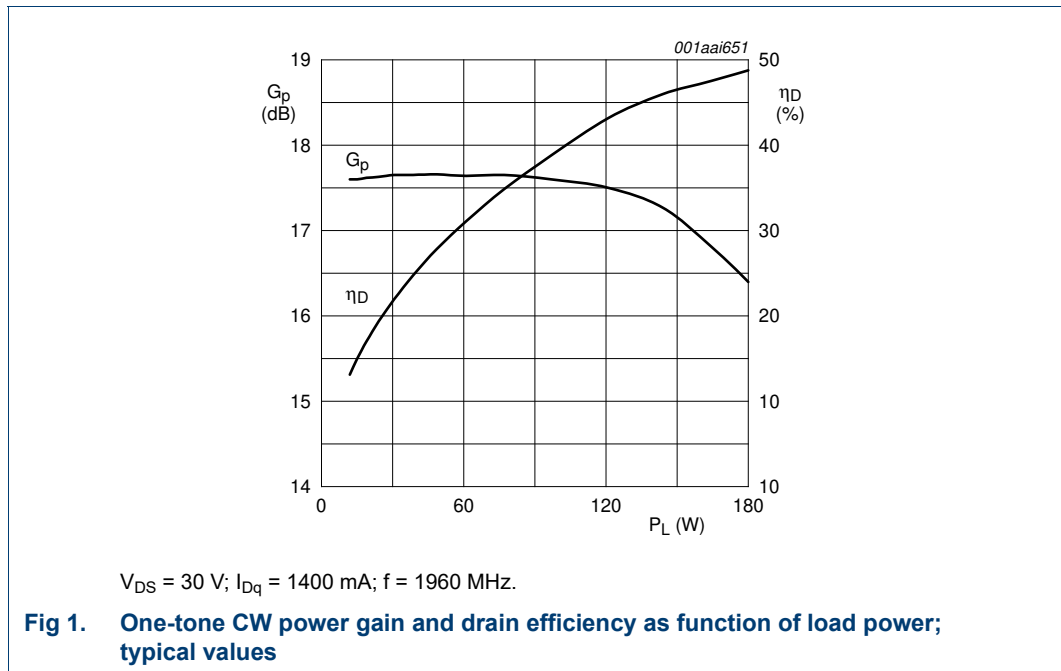
Mode of operation: 2-carrier WCDMA; PAR = 7 dB at 0.01 % probability on the CCDF; $f_1 = 1932.5\text{ MHz}; f_2 = 1942.5\text{ MHz}; f_3 = 1977.5\text{ MHz}; f_4 = 1987.5\text{ MHz}$; RF performance at $V_{DS} = 30\text{ V}; I_{Dq} = 1400\text{ mA}; T_{case} = 25\text{ °C}$; unless otherwise specified; 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 | $P_{L(AV)} = 40\text{ W}$ | 16.3 | 17.2 | - | dB |
| RL_{in} | input return loss | $P_{L(AV)} = 40\text{ W}$ | - | -15 | -10 | dB |
| η_D | drain efficiency | $P_{L(AV)} = 40\text{ W}$ | 24 | 27 | - | % |
| IMD3 | third order intermodulation distortion | $P_{L(AV)} = 40\text{ W}$ | - | -38 | -35 | dBc |
| ACPR | adjacent channel power ratio | $P_{L(AV)} = 40\text{ W}$ | - | -41 | -39 | dBc |

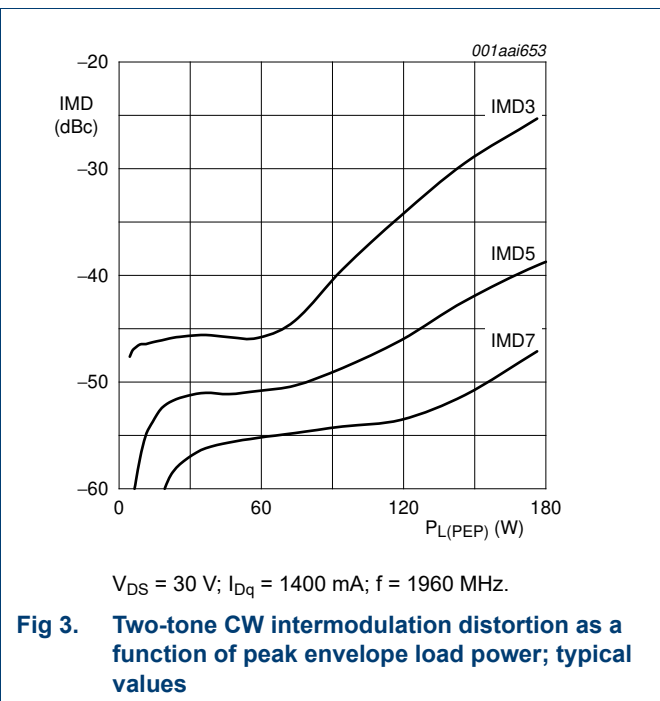
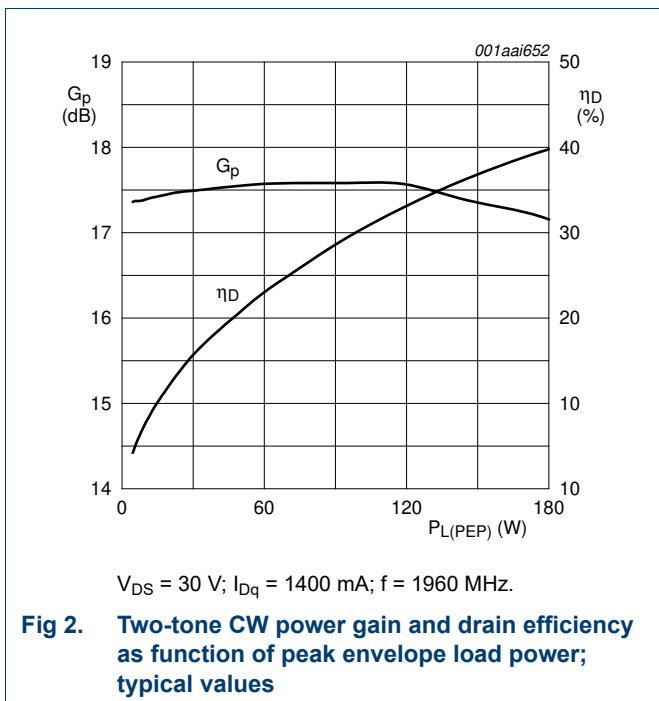
7.1 Ruggedness in class-AB operation

The BLF6G20-180RN and BLF6G20LS-180RN are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 30\text{ V}; I_{Dq} = 1400\text{ mA}; P_L = 180\text{ W (CW)}; f = 1990\text{ MHz}$.

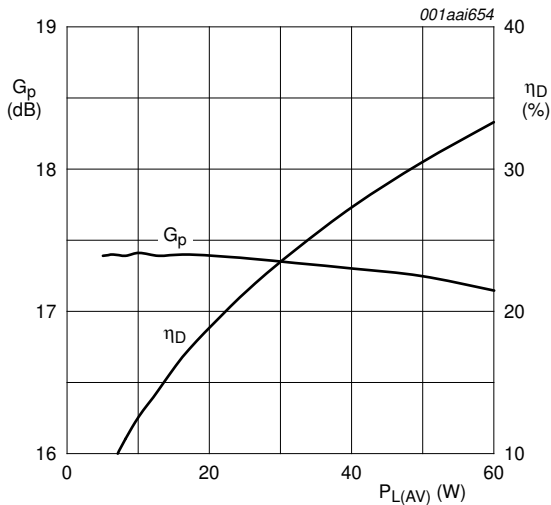
7.2 One-tone CW



7.3 Two-tone CW

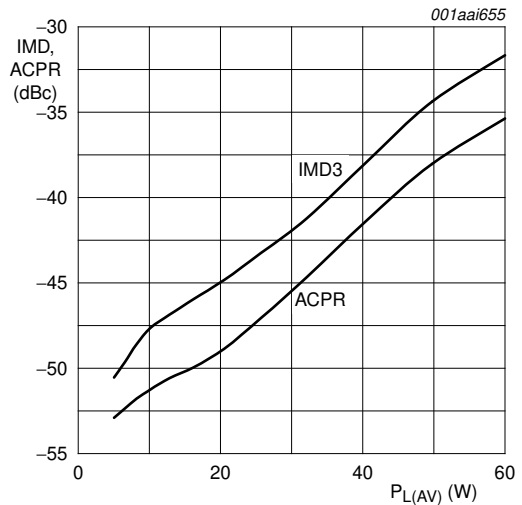


7.4 2-carrier W-CDMA



$V_{DS} = 30\text{ V}$; $I_{Dq} = 1400\text{ mA}$; $f = 1960\text{ MHz}$ ($\pm 5\text{ MHz}$);
carrier spacing 10 MHz.

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



$V_{DS} = 30\text{ V}$; $I_{Dq} = 1400\text{ mA}$; $f = 1960\text{ MHz}$ ($\pm 5\text{ MHz}$);
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

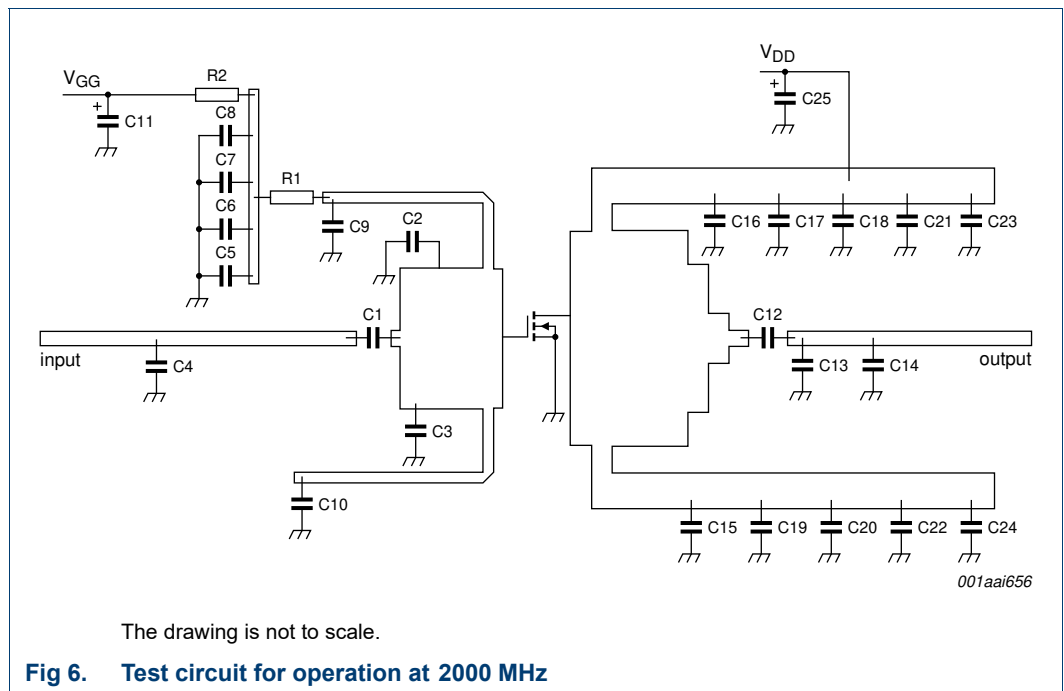


Fig 6. Test circuit for operation at 2000 MHz

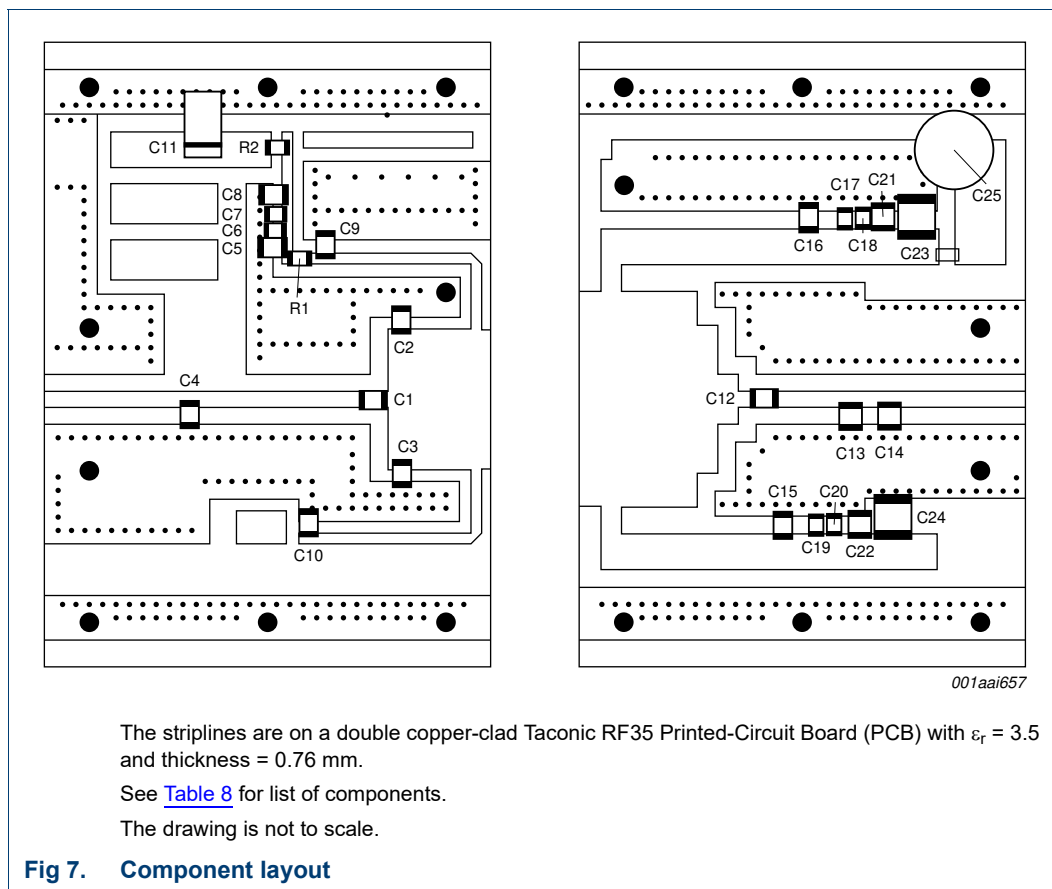


Table 8. List of components (see Figure 6 and Figure 7)

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 | multilayer ceramic chip capacitor | 1.9 pF | [1] ATC 100B or capacitor of same quality |
| C2 | multilayer ceramic chip capacitor | 2.0 pF | [1] ATC 100B or capacitor of same quality |
| C3 | multilayer ceramic chip capacitor | 0.6 pF | [1] ATC 100B or capacitor of same quality |
| C4 | multilayer ceramic chip capacitor | 1.8 pF | [1] ATC 100B or capacitor of same quality |
| C5, C12, C15, C16 | multilayer ceramic chip capacitor | 11 pF | [1] ATC 100B or capacitor of same quality |
| C6, C7, C17, C18, C19, C20 | multilayer ceramic chip capacitor | 220 nF | Vishay or capacitor of same quality |
| C8 | multilayer ceramic chip capacitor | 100 nF | Vishay or capacitor of same quality |
| C9, C10 | multilayer ceramic chip capacitor | 12 pF | [1] ATC 100B or capacitor of same quality |
| C11 | multilayer ceramic chip capacitor | 10 μ F | |
| C13 | multilayer ceramic chip capacitor | 1.0 pF | [1] ATC 100B or capacitor of same quality |
| C14 | multilayer ceramic chip capacitor | 0.3 pF | [1] ATC 100B or capacitor of same quality |
| C21, C22 | multilayer ceramic chip capacitor | 1.5 μ F | |
| C23, C24 | multilayer ceramic chip capacitor | 10 μ F; 50 V | TDK or capacitor of same quality |
| C25 | electrolytic capacitor | 220 μ F; 63 V | |

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

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

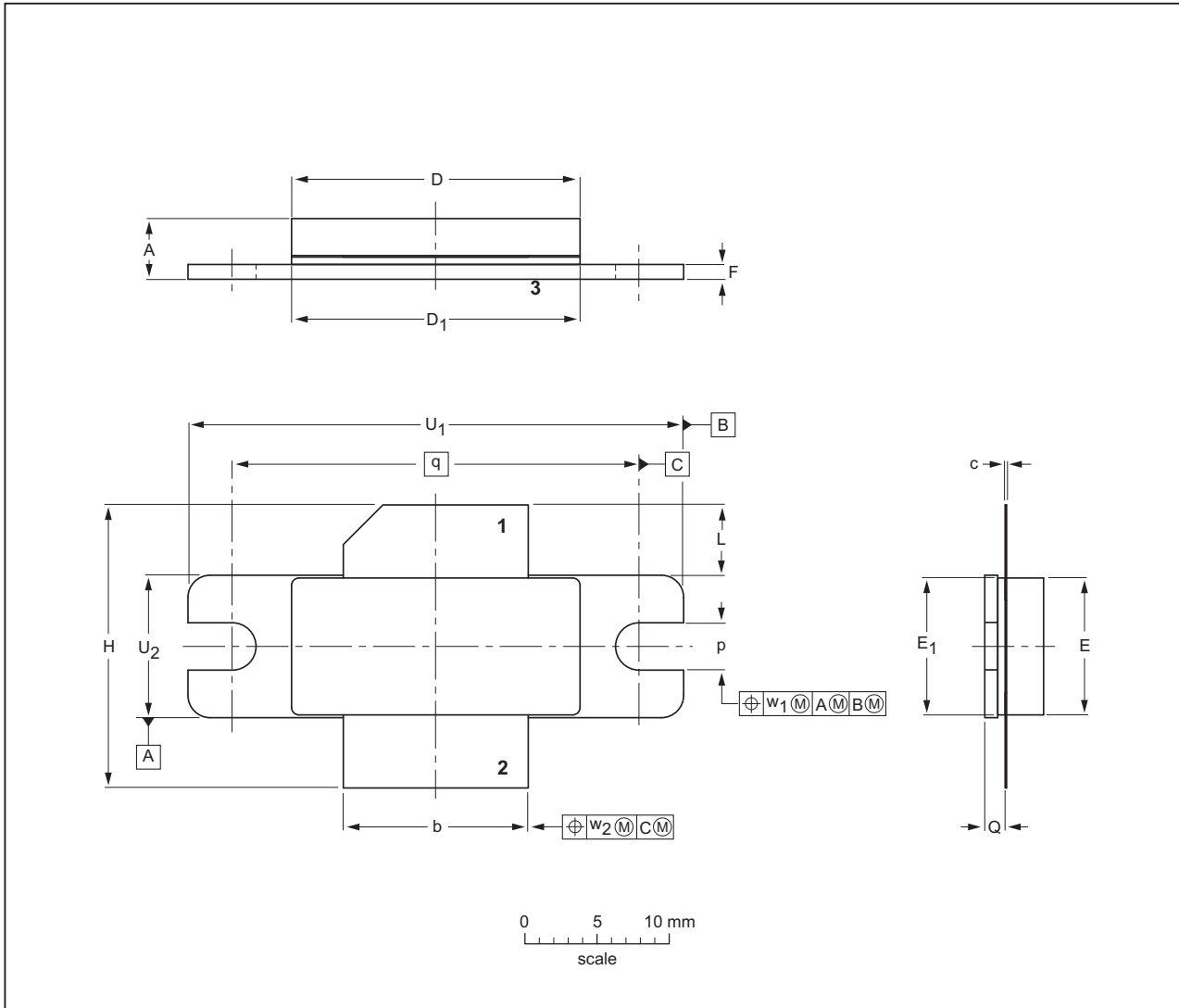
| Component | Description | Value | Remarks |
|-----------|------------------|--------------|--|
| L1 | ferrite SMD bead | - | Ferroxcube BDS 3/3/4.6-4S2 or equivalent |
| R1 | SMD resistor | 2.7 Ω | |
| R2 | SMD resistor | 6.8 Ω | |

[1] Solder vertically.

9. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT502A



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

| UNIT | A | b | c | D | D ₁ | E | E ₁ | F | H | L | p | Q | q | U ₁ | U ₂ | w ₁ | w ₂ |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|
| mm | 4.72 3.43 | 12.83 12.57 | 0.15 0.08 | 20.02 19.61 | 19.96 19.66 | 9.50 9.30 | 9.53 9.25 | 1.14 0.89 | 19.94 18.92 | 5.33 4.32 | 3.38 3.12 | 1.70 1.45 | 27.94 | 34.16 33.91 | 9.91 9.65 | 0.25 | 0.51 |
| inches | 0.186 0.135 | 0.505 0.495 | 0.006 0.003 | 0.788 0.772 | 0.786 0.774 | 0.374 0.366 | 0.375 0.364 | 0.045 0.035 | 0.785 0.745 | 0.210 0.170 | 0.133 0.123 | 0.067 0.057 | 1.100 | 1.345 1.335 | 0.390 0.380 | 0.01 | 0.02 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|--|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT502A | | | | | | -03-01-10- 12-05-02 |

Fig 8. Package outline SOT502A

Earless flanged ceramic package; 2 leads

SOT502B

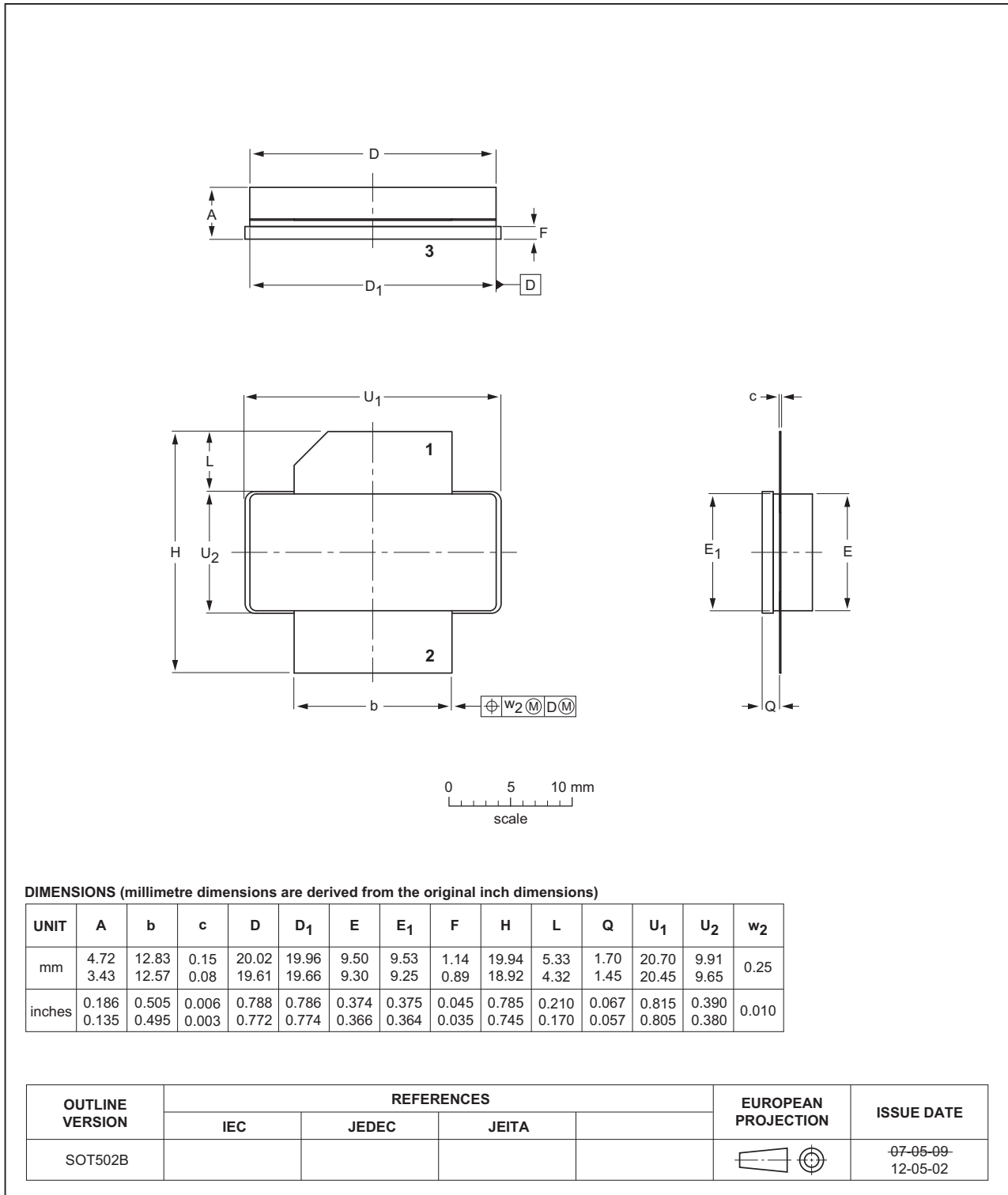


Fig 9. Package outline SOT502B

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 |
|----------------------------|--|--------------------|---------------|----------------------------|
| BLF6G20-180RN_20LS-180RN#2 | 20150901 | Product data sheet | - | BLF6G20-180RN_20LS-180RN_1 |
| Modifications: | <ul style="list-style-type: none"> The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. Legal texts have been adapted to the new company name where appropriate. | | | |
| BLF6G20-180RN_20LS-180RN_1 | 20081117 | Product data sheet | - | - |

12. Legal information

12.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| 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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[2] The term 'short data sheet' is explained in section "Definitions".

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