

BLF6G20-45; BLF6G20S-45

Power LDMOS transistor

Rev. 4 — 1 September 2015

AMMPLION

Product data sheet

1. Product profile

1.1 General description

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

Table 1. Typical performance

RF performance at $T_{case} = 25\text{ °C}$ in a common source class-AB production test circuit.

| Mode of operation | f (MHz) | V _{DS} (V) | P _{L(AV)} (W) | G _p (dB) | η _D (%) | ACPR (dBc) |
|-------------------|--------------|------------------------|---------------------------|------------------------|-----------------------|--------------------|
| 2-carrier W-CDMA | 1805 to 1880 | 28 | 2.5 | 19.2 | 14 | -50 ^[1] |

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.5 dB at 0.01 % probability on CCDF per carrier; carrier spacing 5 MHz.

CAUTION



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

1.2 Features and benefits

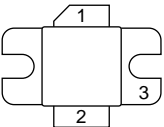
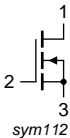
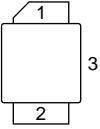
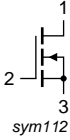
- Typical 2-carrier W-CDMA performance at frequencies of 1805 MHz and 1880 MHz, a supply voltage of 28 V and an I_{Dq} of 360 mA:
 - ◆ Average output power = 2.5 W
 - ◆ Power gain = 19.2 dB (typ)
 - ◆ Efficiency = 14 %
 - ◆ ACPR = -50 dBc
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- 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 W-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 |
|------------------------------|-------------|--|--|
| BLF6G20-45 (SOT608A) | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source | | |
| BLF6G20S-45 (SOT608B) | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|---------|
| | Name | Description | |
| BLF6G20-45 | - | flanged ceramic package; 2 mounting holes; 2 leads | SOT608A |
| BLF6G20S-45 | - | ceramic earless flanged package; 2 leads | SOT608B |

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 | | - | 13 | A |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 225 | °C |

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|------------------|--|--|-----|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}; P_{L(AV)} = 12.5\text{ W}$ | 1.7 | K/W |

6. Characteristics

Table 6. Characteristics

$T_j = 25\text{ °C}$ per section; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|---|------|------|------|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS} = 0\text{ V}; I_D = 0.5\text{ mA}$ | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS} = 10\text{ V}; I_D = 72\text{ mA}$ | 1.4 | 1.9 | 2.4 | V |
| V_{GSq} | gate-source quiescent voltage | $V_{DS} = 28\text{ V}; I_D = 300\text{ mA}$ | 1.70 | 2.30 | 2.79 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 1.5 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$ | - | 12.5 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 150 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 3.6\text{ A}$ | - | 5 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 2.5\text{ A}$ | - | 0.2 | - | Ω |

7. Application information

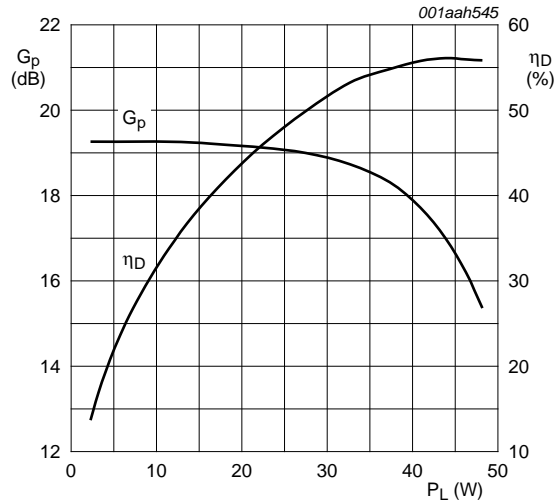
Table 7. Application information

Mode of operation: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1 to 64 PDPCH; $f_1 = 1802.5\text{ MHz}; f_2 = 1807.5\text{ MHz}; f_3 = 1872.5\text{ MHz}; f_4 = 1877.5\text{ MHz};$ RF performance at $V_{DS} = 28\text{ V}; I_{Dq} = 360\text{ mA}; T_{case} = 25\text{ °C};$ unless otherwise specified; in a class-AB production test circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|------------------------------|----------------------------|------|------|------|------|
| G_p | power gain | $P_{L(AV)} = 2.5\text{ W}$ | 18.3 | 19.2 | 20.8 | dB |
| RL_{in} | input return loss | $P_{L(AV)} = 2.5\text{ W}$ | - | -10 | -6.5 | dB |
| η_D | drain efficiency | $P_{L(AV)} = 2.5\text{ W}$ | 12 | 14 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)} = 2.5\text{ W}$ | - | -50 | -46 | dBc |

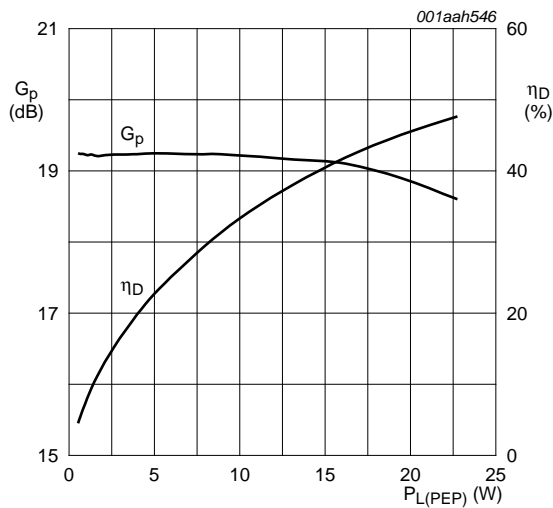
7.1 Ruggedness in class-AB operation

The BLF6G20-45 and BLF6G20S-45 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 28\text{ V}; I_{Dq} = 360\text{ mA}; P_L = 45\text{ W (CW)}; f = 1880\text{ MHz}.$



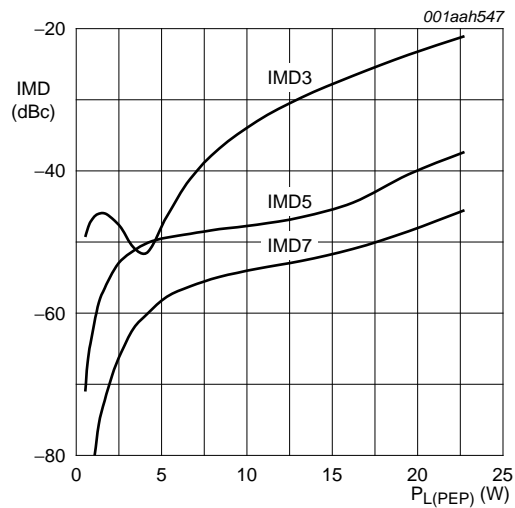
$V_{DS} = 28$ V; $I_{Dq} = 360$ mA; $f = 1842$ MHz.

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



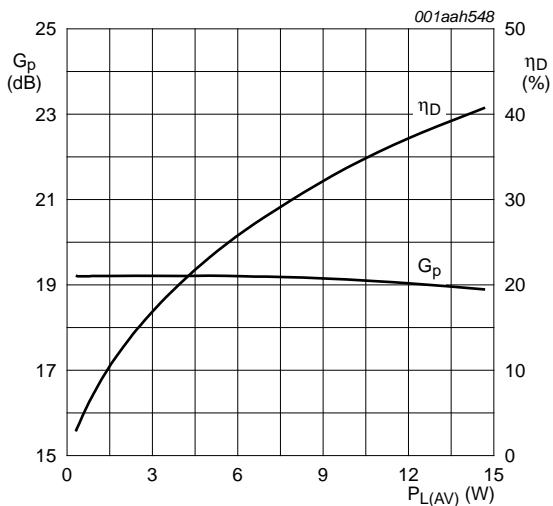
$V_{DS} = 28$ V; $I_{Dq} = 360$ mA; $f_1 = 1843$ MHz; $f_2 = 1843.1$ MHz.

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



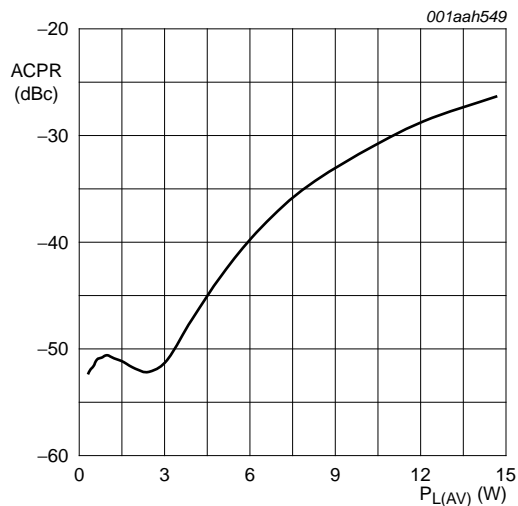
$V_{DS} = 28$ V; $I_{Dq} = 360$ mA; $f_1 = 1843$ MHz; $f_2 = 1843.1$ MHz.

Fig 3. Two-tone CW intermodulation distortion as a function of peak envelope load power; typical values



$V_{DS} = 28\text{ V}$; $I_{DQ} = 360\text{ mA}$; $f_1 = 1840.5\text{ MHz}$; $f_2 = 1845.5\text{ MHz}$; carrier spacing 5 MHz.

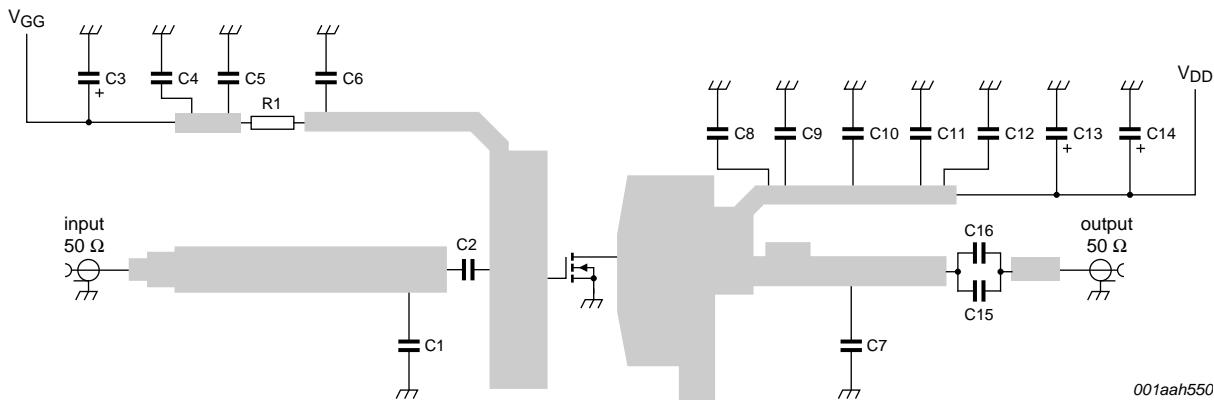
Fig 4. 2-carrier W-CDMA power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28\text{ V}$; $I_{DQ} = 360\text{ mA}$; $f_1 = 1840.5\text{ MHz}$; $f_2 = 1845.5\text{ MHz}$; carrier spacing 5 MHz.

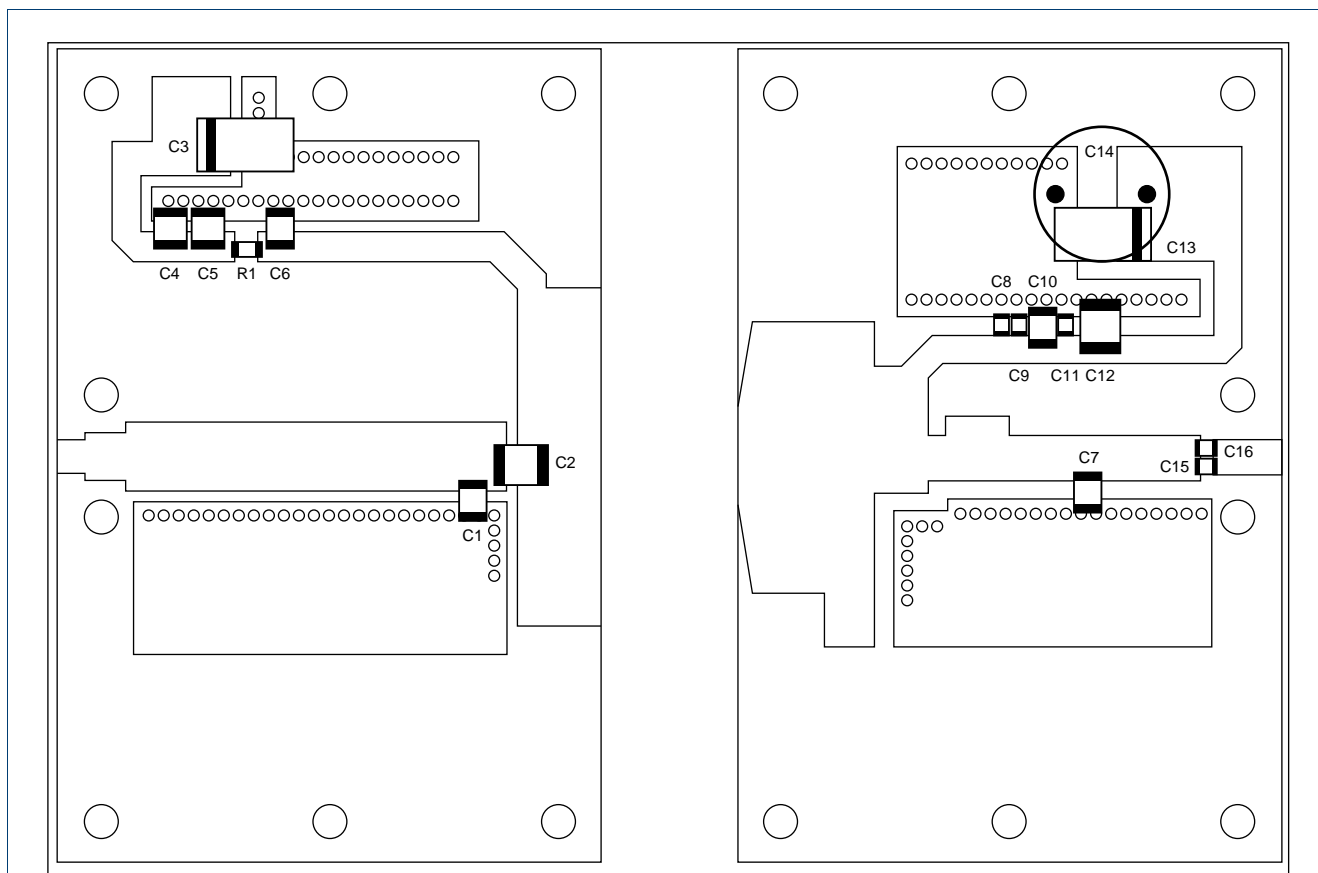
Fig 5. 2-carrier W-CDMA adjacent power channel ratio as function of average load power; typical values

8. Test information



See [Table 8](#) for list of components.

Fig 6. Test circuit for operation at 1805 MHz and 1880 MHz



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Striplines are on a double copper-clad Rogers Duroid 5880 Printed-Circuit Board (PCB) ($\epsilon_r = 2.2$), thickness = 0.79 mm.
 See [Table 8](#) for list of components.

Fig 7. Component layout for 1805 MHz and 1880 MHz test circuit

Table 8. List of components

For test circuit, see [Figure 6](#) and [Figure 7](#).

| Component | Description | Value | Remarks |
|-----------|-----------------------------------|-------------------|---------|
| C1 | multilayer ceramic chip capacitor | 0.7 pF | [1] |
| C2 | multilayer ceramic chip capacitor | 3.9 pF | [1] |
| C3, C13 | tantalum capacitor | 10 μ F | |
| C4, C5 | multilayer ceramic chip capacitor | 1.5 μ F | |
| C6, C10 | multilayer ceramic chip capacitor | 10 pF | [1] |
| C7 | multilayer ceramic chip capacitor | 1.2 pF | [1] |
| C8, C9 | multilayer ceramic chip capacitor | 100 nF | |
| C11 | multilayer ceramic chip capacitor | 220 nF | |
| C12 | multilayer ceramic chip capacitor | 4.7 μ F | |
| C14 | Philips electrolytic capacitor | 220 μ F, 63 V | |
| C15, C16 | multilayer ceramic chip capacitor | 6.8 pF | [2] |
| R1 | Philips chip resistor | 5.6 Ω | |

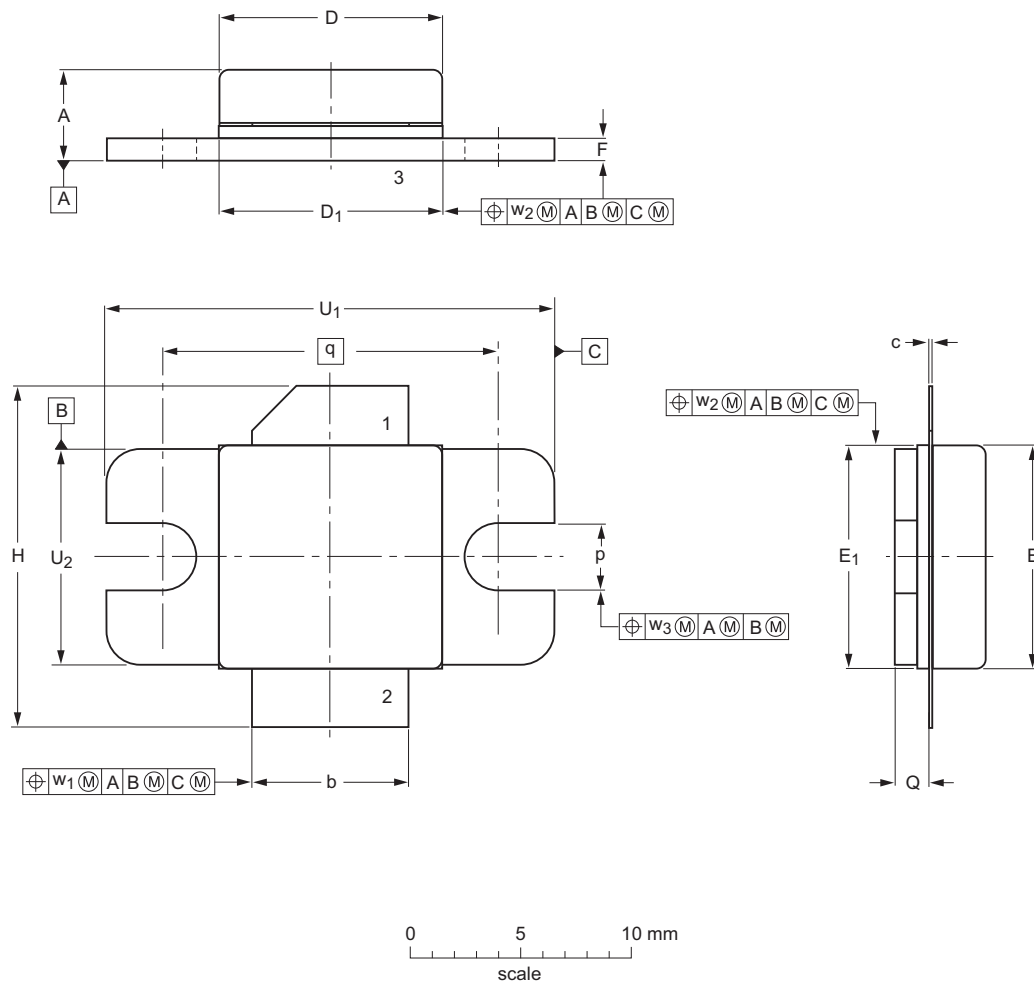
[1] American technical ceramics type 100B or capacitor of same quality.

[2] American technical ceramics type 100A or capacitor of same quality.

9. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT608A



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 | w ₃ |
|------|------|------|------|-------|----------------|-------|----------------|------|-------|------|------|-------|----------------|----------------|----------------|----------------|----------------|
| max | 4.62 | 7.24 | 0.15 | 10.21 | 10.29 | 10.21 | 10.29 | 1.14 | 15.37 | 3.30 | 1.70 | | 20.45 | 9.91 | | | |
| nom | | | | | | | | | | | | 15.24 | | | 0.25 | 0.25 | 0.25 |
| min | 3.76 | 6.99 | 0.10 | 10.01 | 10.03 | 10.01 | 10.03 | 0.89 | 15.11 | 2.92 | 1.45 | | 20.19 | 9.65 | | | |

sot608a_po

| | | | | | |
|-----------------|------------|-------|-------|---------------------|----------------------|
| Outline version | References | | | European projection | Issue date |
| | IEC | JEDEC | JEITA | | |
| SOT608A | | | | | 09-08-26 13-01-29 |

Fig 8. Package outline SOT608A

Ceramic earless flanged package; 2 leads

SOT608B

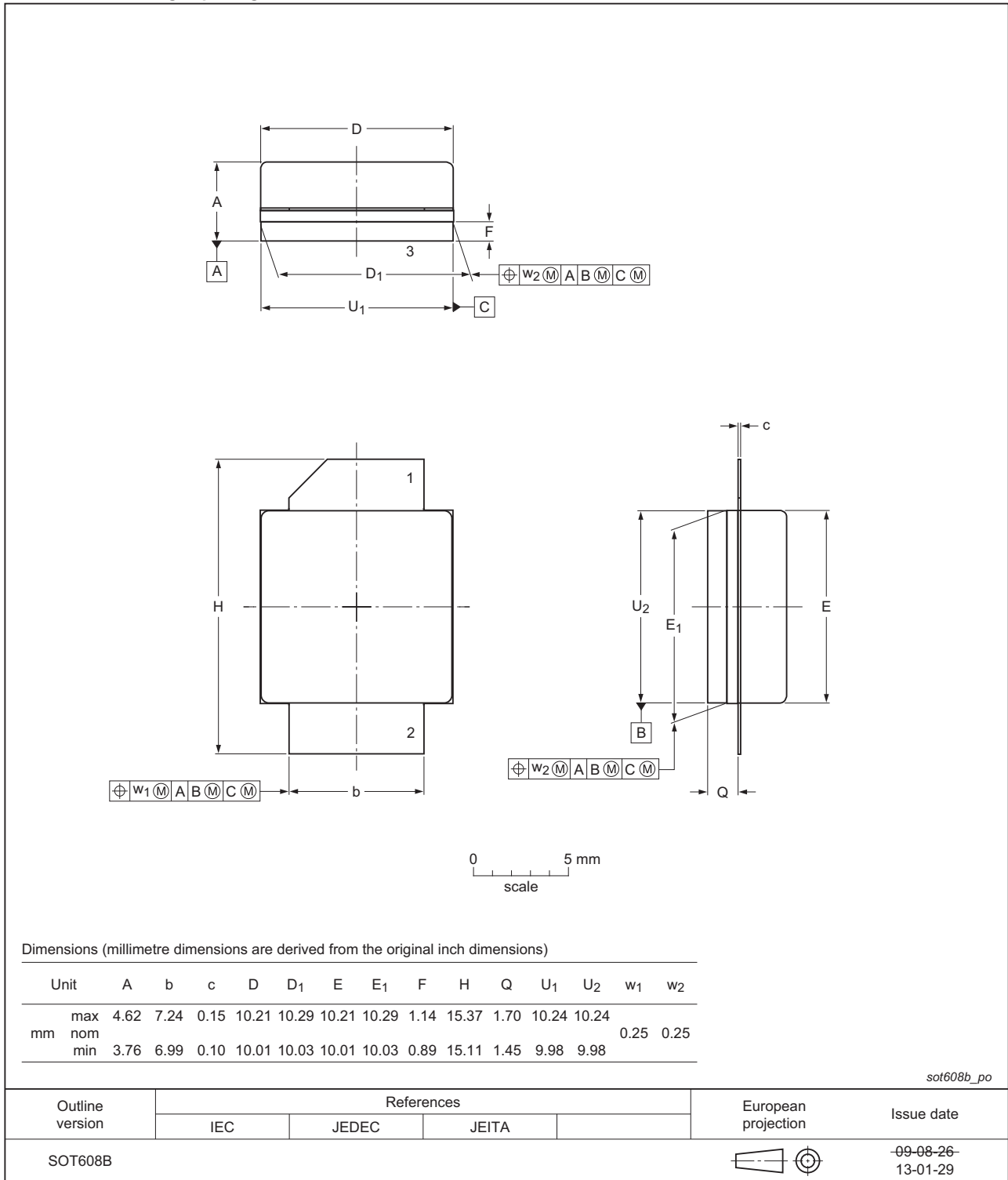


Fig 9. Package outline SOT608B

10. Abbreviations

Table 9. Abbreviations

| Acronym | Description |
|---------|--|
| 3GPP | Third Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| IMD | InterModulation Distortion |
| LDMOS | Laterally Diffused Metal Oxide Semiconductor |
| 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 |
|----------------------------|--|----------------------|---------------|--------------------------|
| BLF6G20-45_BLF6G20S-45#4 | 20150901 | Product data sheet | | BLF6G20-45_BLF6G20S-45_3 |
| 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. | | | |
| BLF6G20-45_BLF6G20S-45 v.3 | 20130311 | Product data sheet | | BLF6G20-45_BLF6G20S-45_2 |
| BLF6G20-45_BLF6G20S-45_2 | 20080825 | Product data sheet | - | BLF6G20-45_1 |
| BLF6G20-45_1 | 20060220 | Objective 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. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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