

BLF10M6135; BLF10M6LS135

Power LDMOS transistor

Rev. 2 — 1 September 2015

AMMPLÉON

Product data sheet

1. Product profile

1.1 General description

135 W LDMOS power transistor for industrial applications at frequencies from 700 MHz to 1000 MHz.

Table 1. Typical performance

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

| Test signal | f | V _{DS} | P _{L(AV)} | G _p | η _D | ACPR |
|------------------|------------|-----------------|--------------------|----------------|----------------|--------------------|
| | (MHz) | (V) | (W) | (dB) | (%) | (dBc) |
| 2-carrier W-CDMA | 869 to 894 | 28 | 26.5 | 21.0 | 28.0 | -39 ^[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.

1.2 Features and benefits

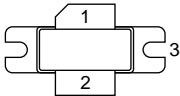
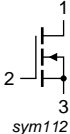
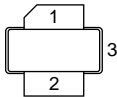
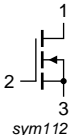
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (700 MHz to 1000 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding restriction of hazardous substances (RoHS)

1.3 Applications

- RF power amplifiers for ISM applications in the 700 MHz to 1000 MHz frequency range

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-------------------------------|-----------------------|---|---|
| BLF10M6135 (SOT502A) | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source ^[1] | | |
| BLF10M6LS135 (SOT502B) | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source ^[1] | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------|---------|--|---------|
| | Name | Description | Version |
| BLF10M6135 | - | flanged ceramic package; 2 mounting holes; 2 leads | SOT502A |
| BLF10M6LS135 | - | earless flanged 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 |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | ^[1] | - | 225 | °C |

[1] Continuous use at maximum temperature will affect reliability.

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Type | Typ | Unit |
|------------------|--|--|--------------|------|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}; P_L = 25\text{ W}$ | BLF10M6135 | 0.68 | K/W |
| | | | BLF10M6LS135 | 0.56 | K/W |

6. Characteristics

Table 6. DC characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|---|-----|-----|-----|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS} = 0\text{ V}; I_D = 0.8\text{ mA}$ | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$ | 1.4 | 1.9 | 2.4 | V |
| V_{GSq} | gate-source quiescent voltage | $V_{DS} = 28\text{ V}; I_D = 950\text{ mA}$ | 1.6 | 2.1 | 2.6 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 3 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$ | 24 | 32 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 300 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 9\text{ A}$ | 7 | 13 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$ | - | 0.1 | - | Ω |

Table 7. AC characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|----------------------|---|-----|-----|-----|------|
| C_{rs} | feedback capacitance | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | - | 2.0 | - | pF |

Table 8. RF characteristics

Test signal: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1-64 DPCH; $f_1 = 871.5\text{ MHz}; f_2 = 876.5\text{ MHz}; f_3 = 886.5\text{ MHz}; f_4 = 891.5\text{ MHz}$; RF performance at $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; T_{case} = 25\text{ °C}$; unless otherwise specified; in a class-AB production test circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|------------------------------|-----------------------------|------|-------|-------|------|
| G_p | power gain | $P_{L(AV)} = 26.5\text{ W}$ | 20.0 | 21.0 | - | dB |
| RL_{in} | input return loss | $P_{L(AV)} = 26.5\text{ W}$ | - | -10.0 | -6.5 | dB |
| η_D | drain efficiency | $P_{L(AV)} = 26.5\text{ W}$ | 26.0 | 28.0 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)} = 26.5\text{ W}$ | - | -39 | -36.5 | dBc |

7. Test information

7.1 Ruggedness in class-AB operation

The BLF10M6135 and BLF10M6LS135 are capable of withstanding a load mismatch corresponding to $VSWR = 10 : 1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; P_L = 135\text{ W}; f = 894\text{ MHz}$.

7.2 Test circuit information

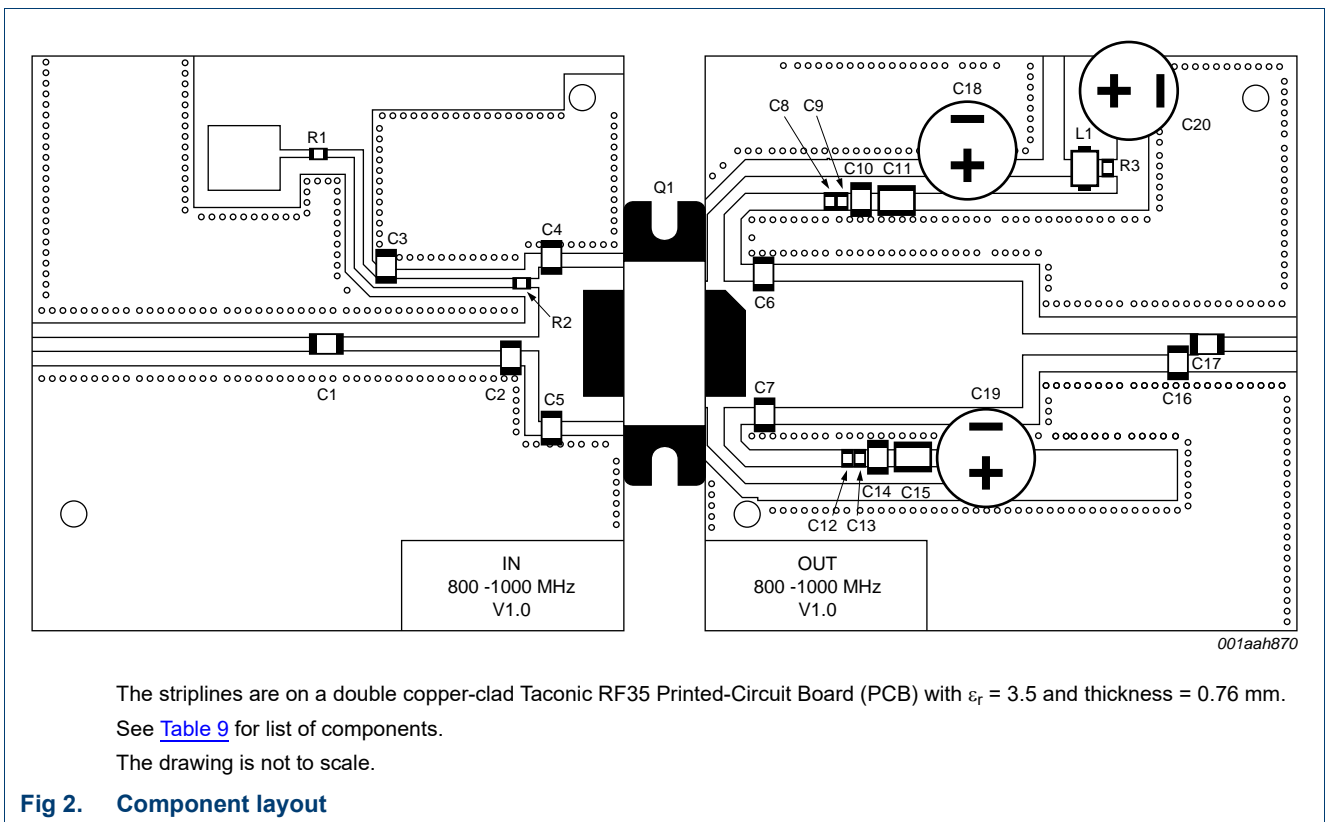
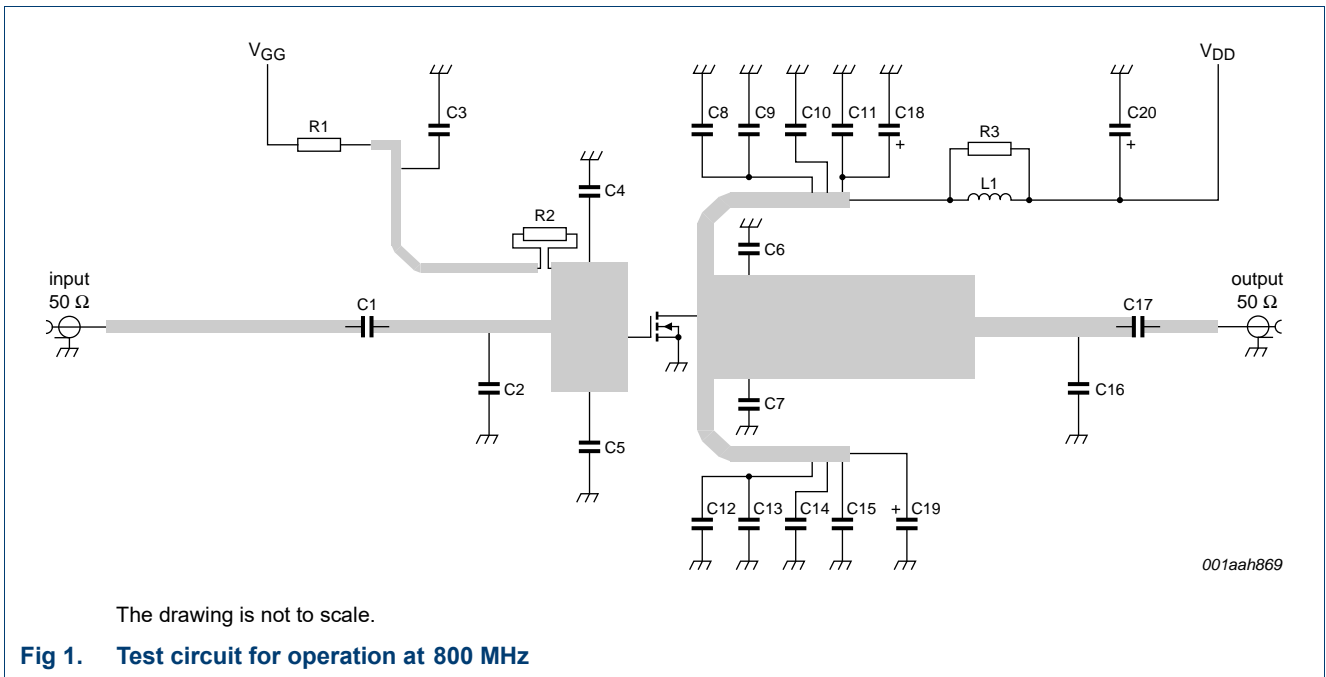


Table 9. List of components

See [Figure 1](#) and [Figure 2](#).

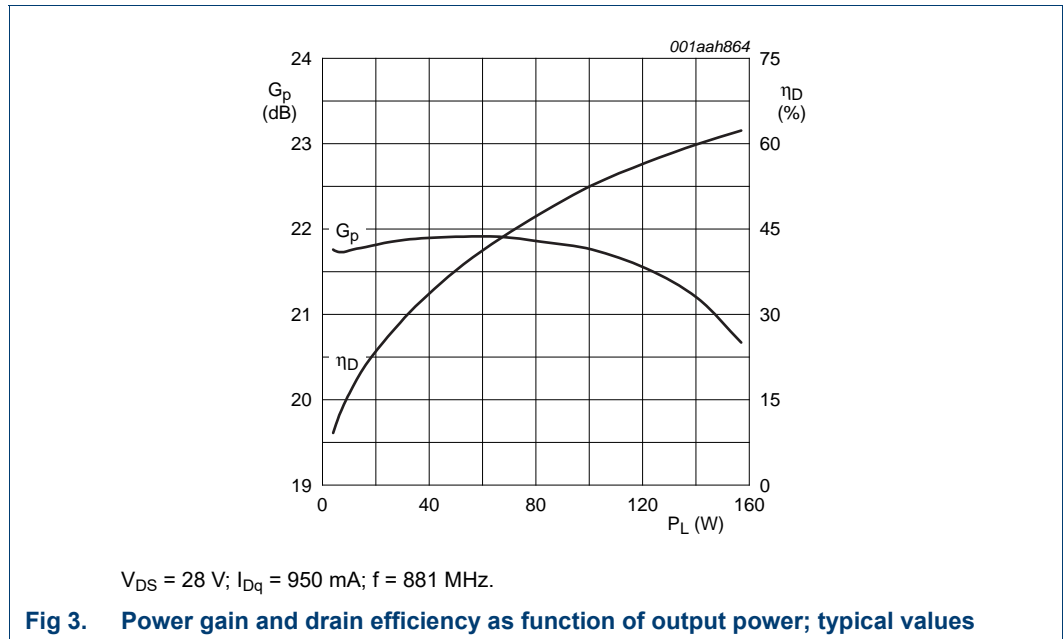
| Component | Description | Value | Remarks |
|-----------------------|-----------------------------------|--------------|--|
| C1, C3, C10, C14, C17 | multilayer ceramic chip capacitor | 68 pF | [1] solder vertically |
| C2, C4, C5 | multilayer ceramic chip capacitor | 8.2 pF | [1] solder vertically |
| C6, C7 | multilayer ceramic chip capacitor | 10 pF | [1] solder vertically |
| C8, C9, C12, C13 | electrolytic capacitor | 100 nF | Vishay or capacitor of same quality |
| C11, C15 | multilayer ceramic chip capacitor | 4.7 μF, 50 V | [2] |
| C16 | multilayer ceramic chip capacitor | 3.0 pF | [1] solder vertically |
| C18, C19, C20 | electrolytic capacitor | 220 μF, 63 V | |
| L1 | ferrite SMD bead | | Ferroxcube BDS 3/3/4.6-4S2 or equivalent |
| Q1 | BLF10M6135 | | |
| R1, R2, R3 | SMD resistor | 9.1 Ω, 0.1 W | |

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

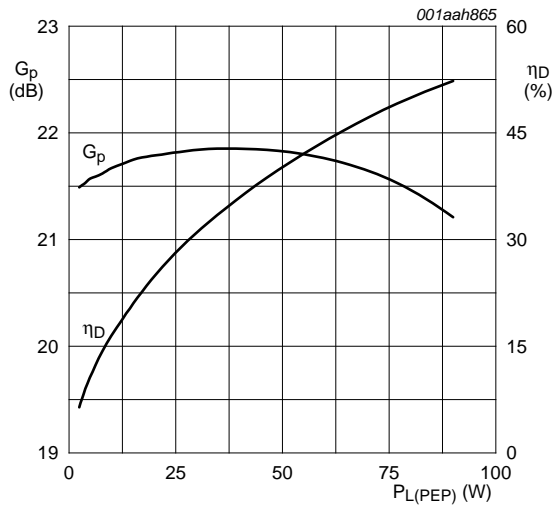
[2] TDK or capacitor of same quality.

7.3 Graphical data

7.3.1 1-Tone CW

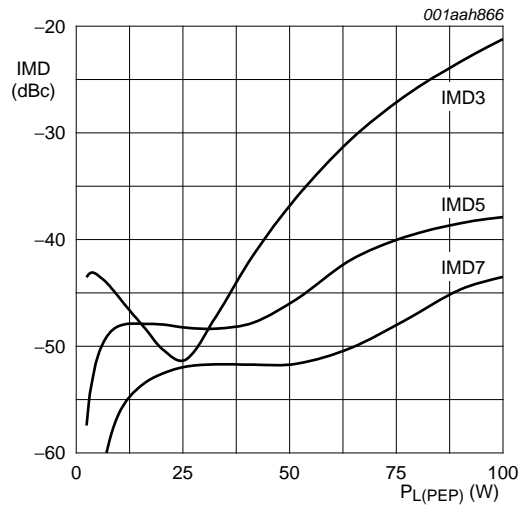


7.3.2 2-Tone CW



$V_{DS} = 28\text{ V}$; $I_{Dq} = 950\text{ mA}$; $f = 881\text{ MHz}$ ($\pm 100\text{ kHz}$).

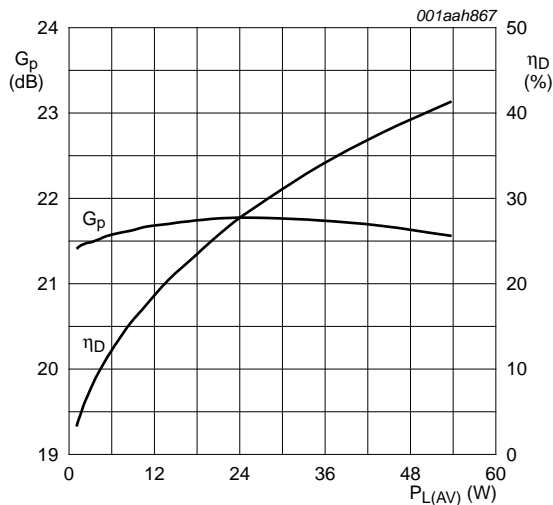
Fig 4. Power gain and drain efficiency as function of peak envelope power load power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 950\text{ mA}$; $f = 881\text{ MHz}$ ($\pm 100\text{ kHz}$).

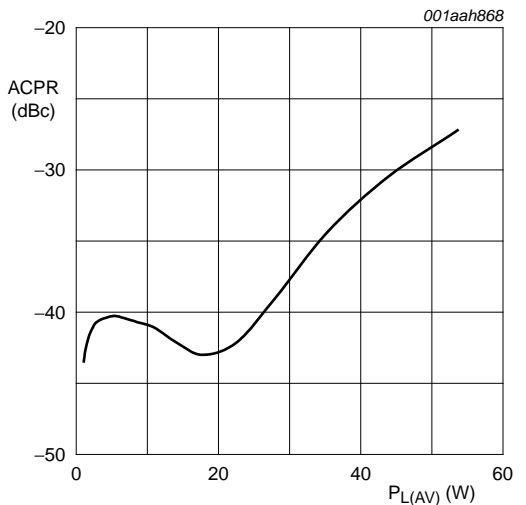
Fig 5. Intermodulation distortion as a function of peak envelope power load power; typical values

7.3.3 2-Carrier W-CDMA



$V_{DS} = 28\text{ V}$; $I_{Dq} = 950\text{ mA}$; $f_1 = 881\text{ MHz}$; $f_2 = 886\text{ MHz}$; carrier spacing 5 MHz.

Fig 6. Power gain and drain efficiency as function of average output power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 950\text{ mA}$; $f_1 = 881\text{ MHz}$; $f_2 = 886\text{ MHz}$; carrier spacing 5 MHz.

Fig 7. Adjacent power channel ratio as a function of average output power; typical values

8. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT502A

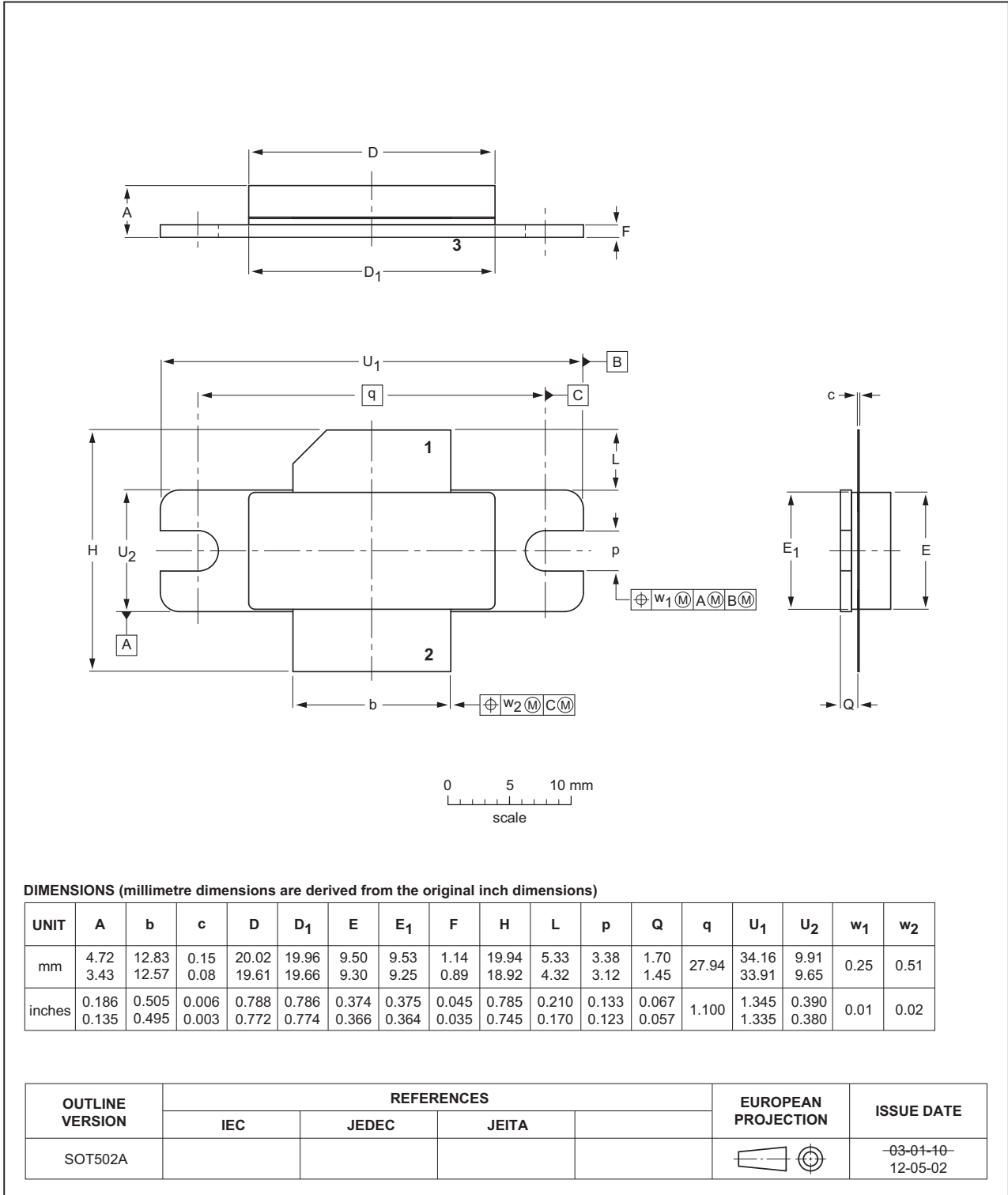


Fig 8. Package outline SOT502A

Earless flanged ceramic package; 2 leads

SOT502B

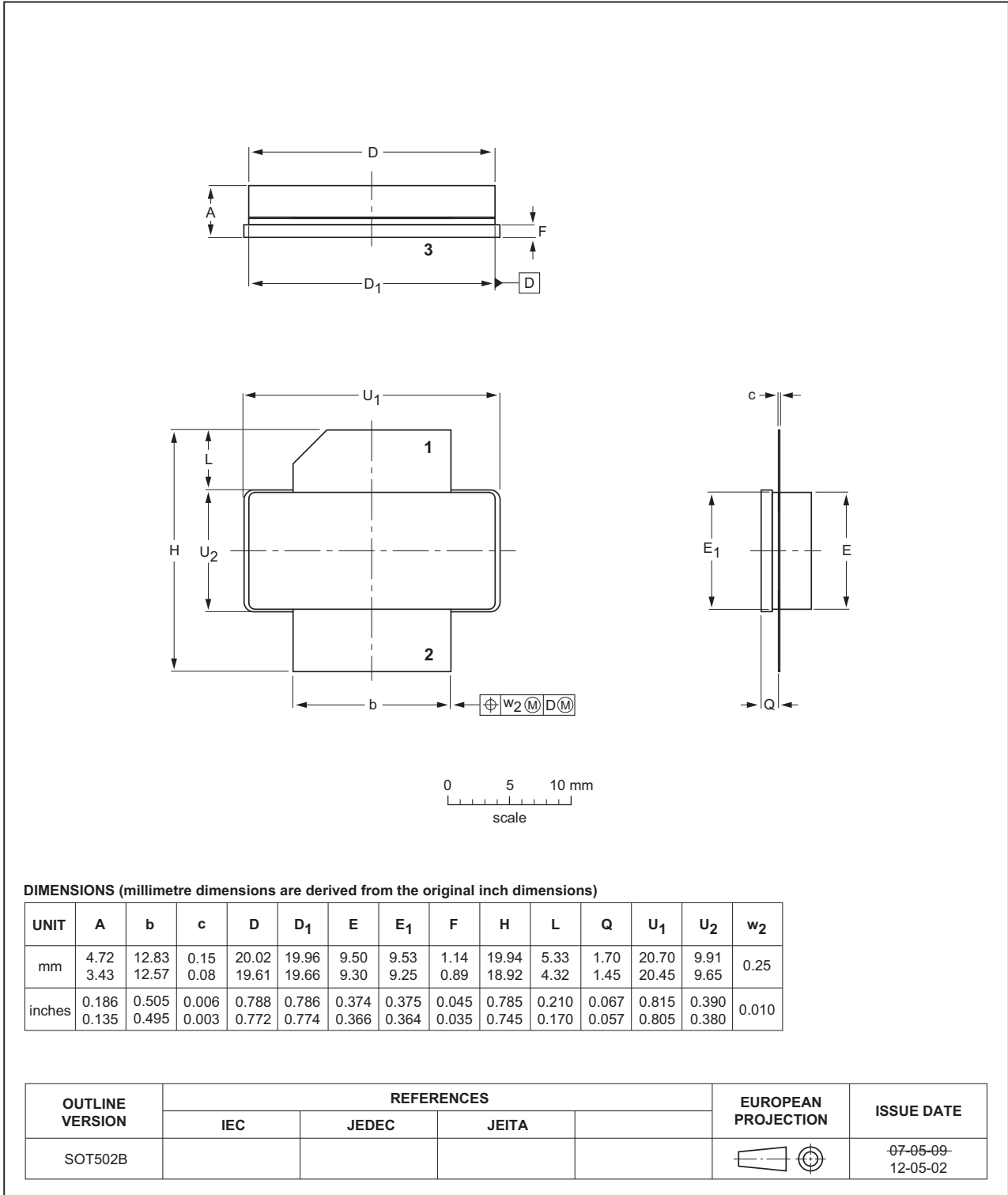


Fig 9. Package outline SOT502B

9. Handling information

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

10. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|--|
| 3GPP | 3rd Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| ESD | ElectroStatic Discharge |
| ISM | Industrial, Scientific and Medical |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| PAR | Peak-to-Average Ratio |
| SMD | Surface Mounted Device |
| VSWR | Voltage Standing-Wave Ratio |
| W-CDMA | Wideband Code Division Multiple Access |

11. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------------------|--|--------------------|---------------|-----------------------------|
| BLF10M6135_BLF10M6LS135#2 | 20150901 | Product data sheet | - | BLF10M6135_BLF10M6LS135 v.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. | | | |
| BLF10M6135_BLF10M6LS135 v.1 | 20140624 | Product data sheet | - | - |

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| 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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