

# 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 <sub>DS</sub> | P <sub>L(AV)</sub> | G <sub>p</sub> | η <sub>D</sub> | ACPR               |
|------------------|------------|-----------------|--------------------|----------------|----------------|--------------------|
|                  | (MHz)      | (V)             | (W)                | (dB)           | (%)            | (dBc)              |
| 2-carrier W-CDMA | 869 to 894 | 28              | 26.5               | 21.0           | 28.0           | -39 <sup>[1]</sup> |

[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

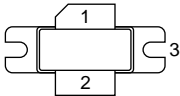
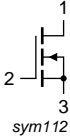
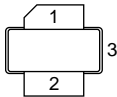
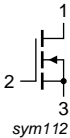
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (700 MHz to 1000 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding restriction of hazardous substances (RoHS)

### 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  |
|-------------------------------|-----------------------|---|---|
| <b>BLF10M6135 (SOT502A)</b>   |                       |   |   |
| 1                             | drain                 |  |  |
| 2                             | gate                  |   |   |
| 3                             | source <sup>[1]</sup> |   |   |
| <b>BLF10M6LS135 (SOT502B)</b> |                       |   |   |
| 1                             | drain                 |  |  |
| 2                             | gate                  |   |   |
| 3                             | source <sup>[1]</sup> |   |   |

[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 | <sup>[1]</sup> | -    | 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**

$T_j = 25\text{ }^\circ\text{C}$  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   | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$<br>$V_{DS} = 10\text{ V}$ | 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 | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$<br>$I_D = 6.3\text{ A}$   | -   | 0.1 | -   | $\Omega$      |

**Table 7. AC characteristics**

$T_j = 25\text{ }^\circ\text{C}$  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  $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

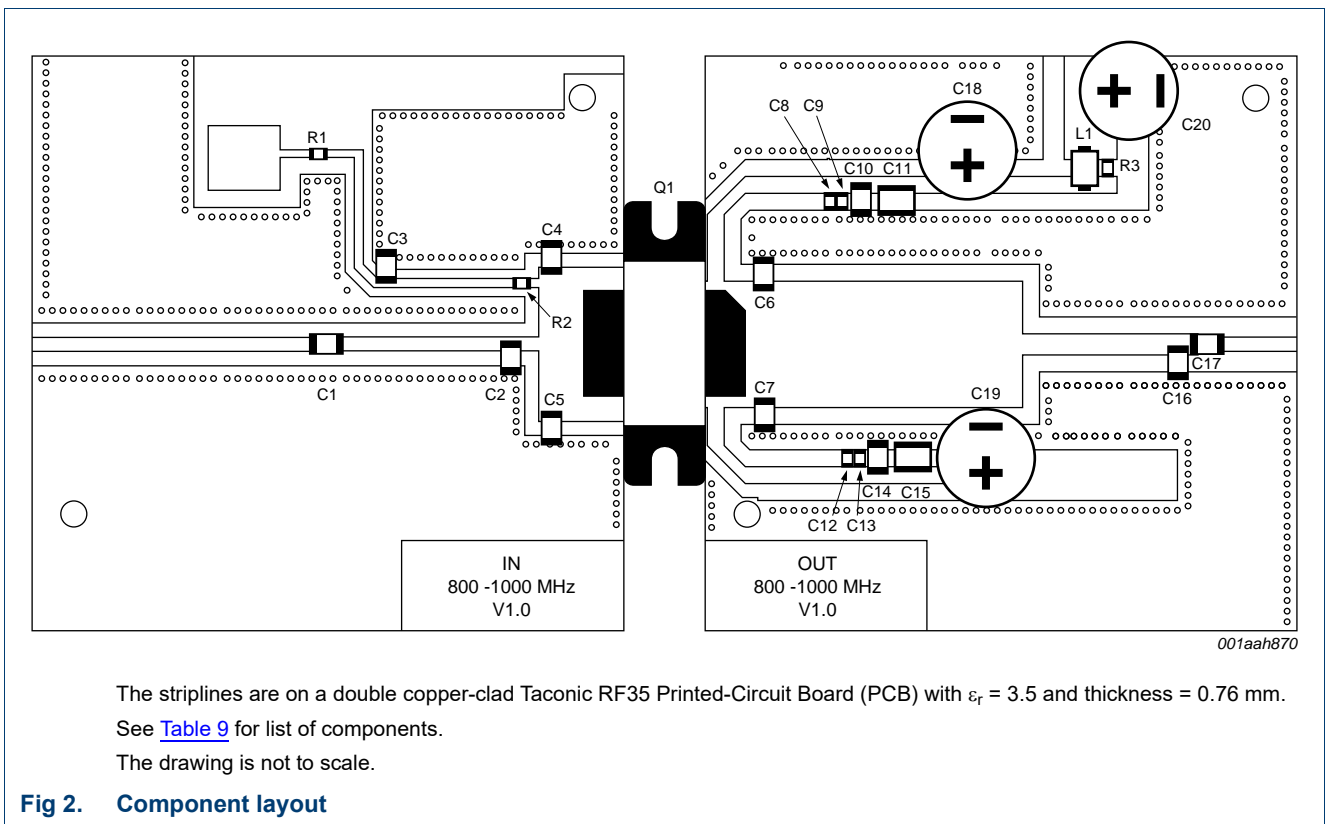
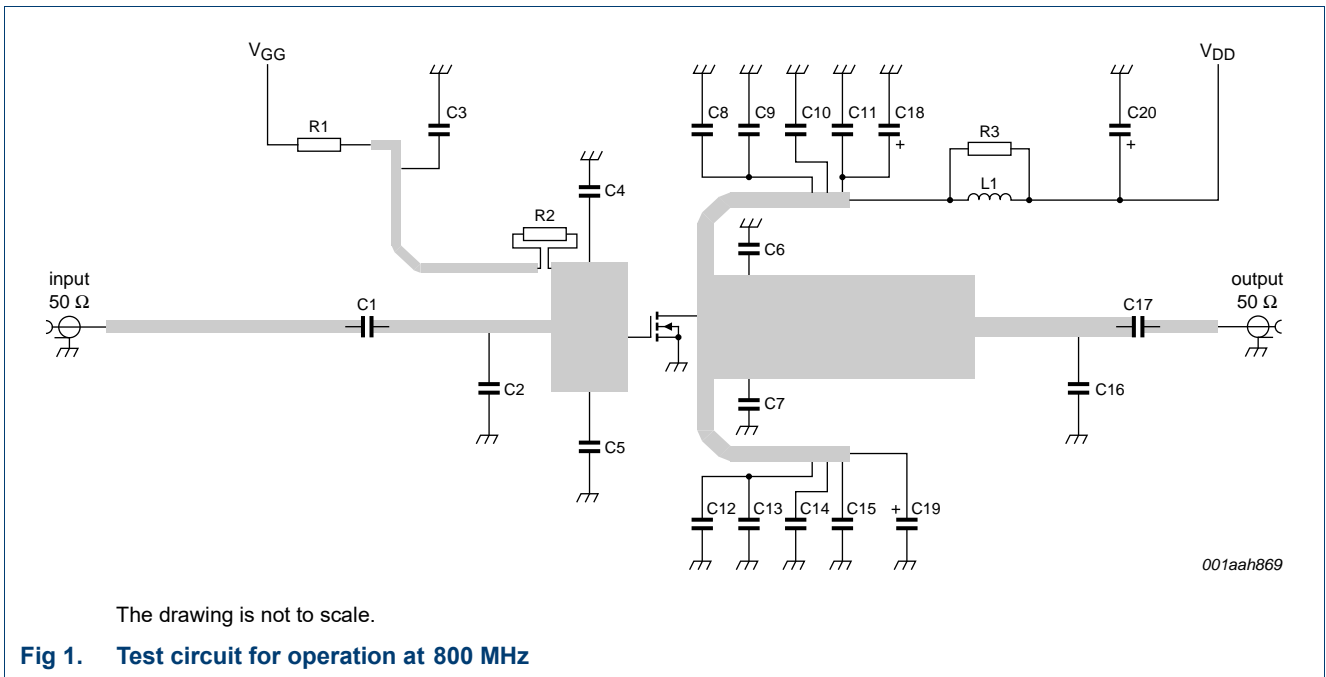
| Symbol    | Parameter                    | Conditions                  | Min  | Typ   | Max   | Unit |
|-----------|------------------------------|-----------------------------|------|-------|-------|------|
| $G_p$     | power gain                   | $P_{L(AV)} = 26.5\text{ W}$ | 20.0 | 21.0  | -     | dB   |
| $RL_{in}$ | input return loss            | $P_{L(AV)} = 26.5\text{ W}$ | -    | -10.0 | -6.5  | dB   |
| $\eta_D$  | 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](#).

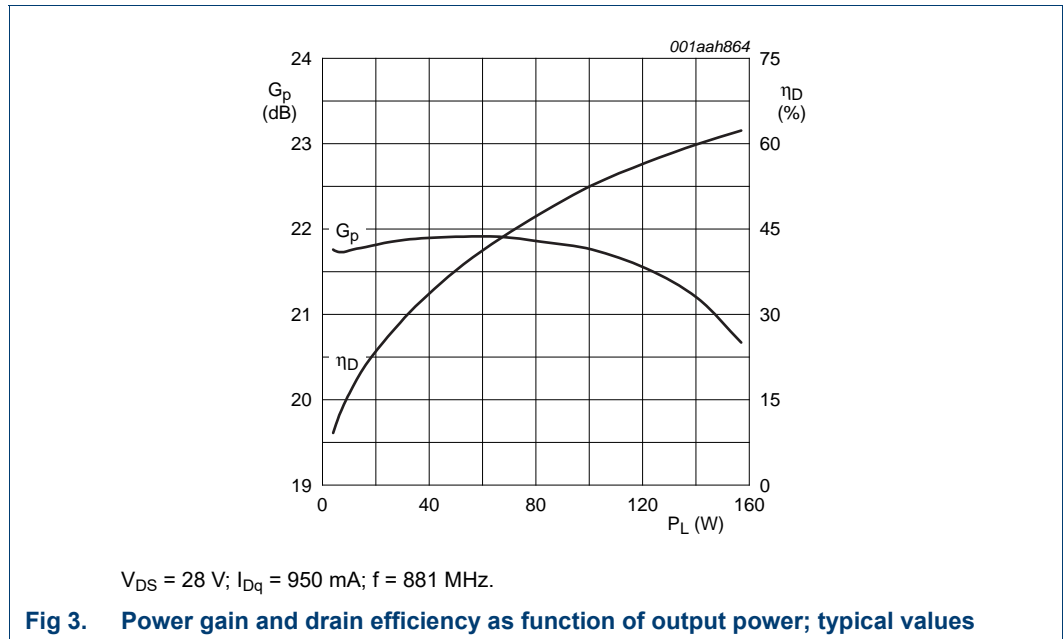
| Component             | Description                       | Value                | Remarks                                  |
|-----------------------|-----------------------------------|----------------------|--|
| C1, C3, C10, C14, C17 | multilayer ceramic chip capacitor | 68 pF                | [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 $\mu$ F, 50 V    | [2]                                      |
| C16                   | multilayer ceramic chip capacitor | 3.0 pF               | [1] solder vertically                    |
| C18, C19, C20         | electrolytic capacitor            | 220 $\mu$ F, 63 V    |  |
| L1                    | ferrite SMD bead                  |                      | Ferroxcube BDS 3/3/4.6-4S2 or equivalent |
| Q1                    | BLF10M6135                        |                      |  |
| R1, R2, R3            | SMD resistor                      | 9.1 $\Omega$ , 0.1 W |  |

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

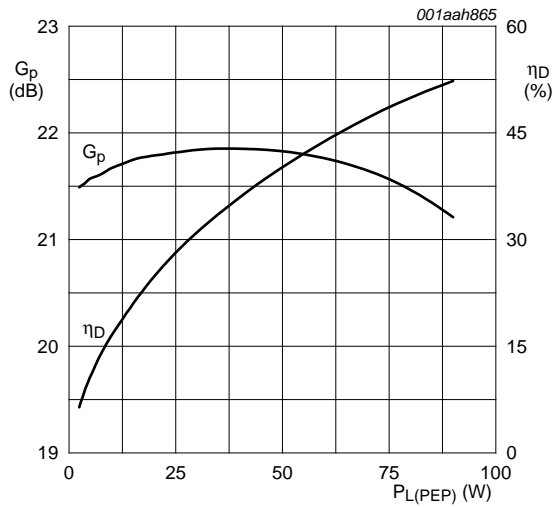
[2] TDK or capacitor of same quality.

### 7.3 Graphical data

#### 7.3.1 1-Tone CW

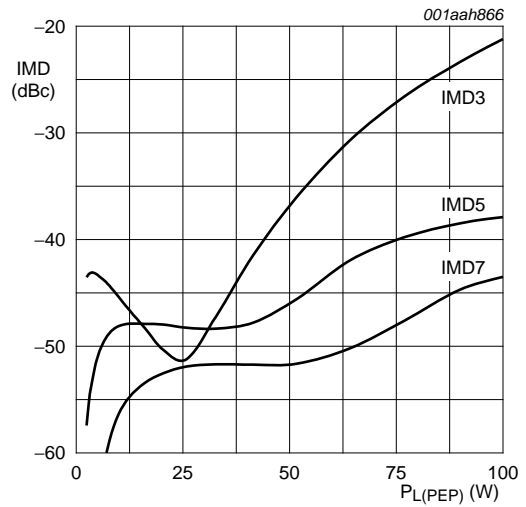


7.3.2 2-Tone CW



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

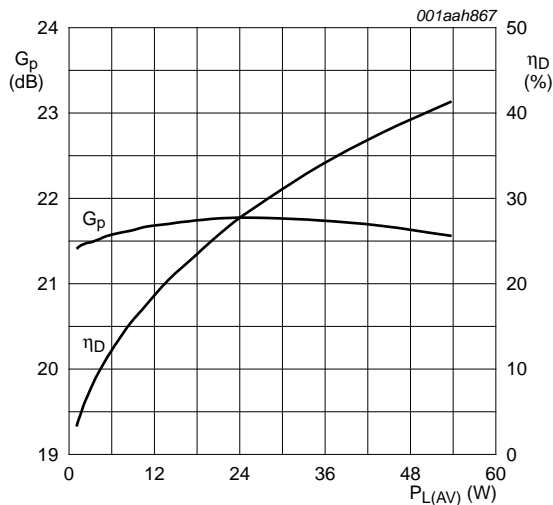
Fig 4. Power gain and drain efficiency as function of peak envelope power load power; typical values



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

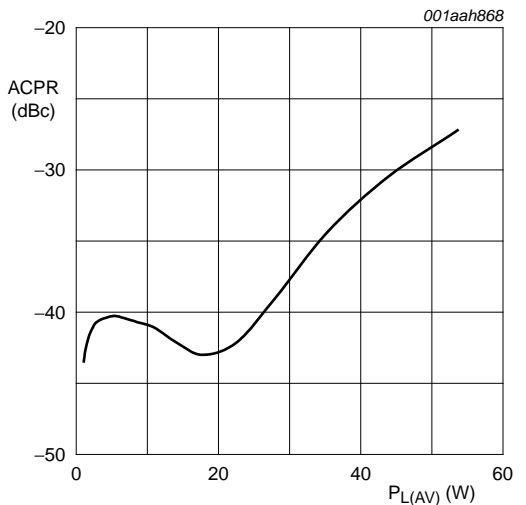
Fig 5. Intermodulation distortion as a function of peak envelope power load power; typical values

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

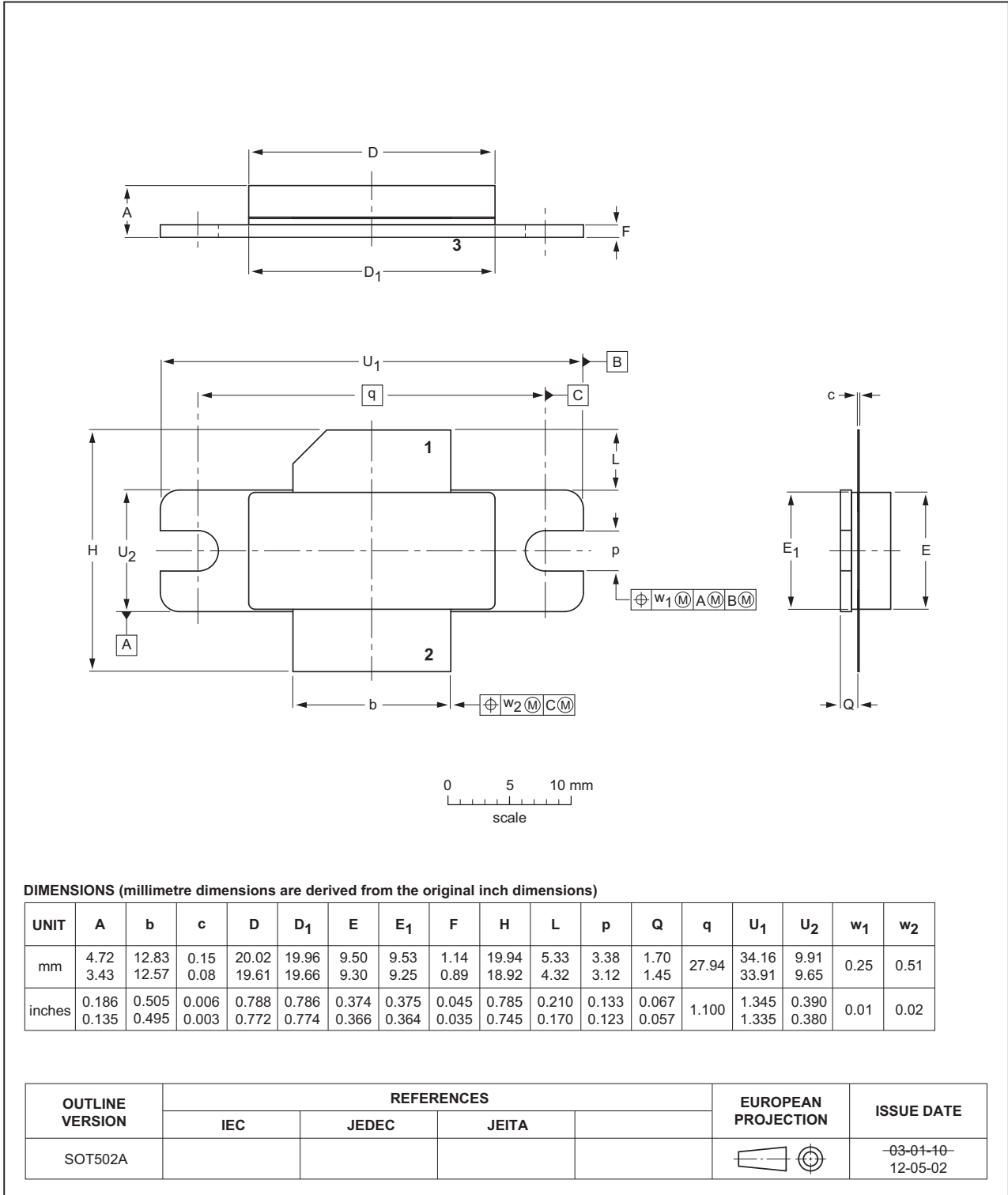


Fig 8. Package outline SOT502A

Earless flanged ceramic package; 2 leads

SOT502B

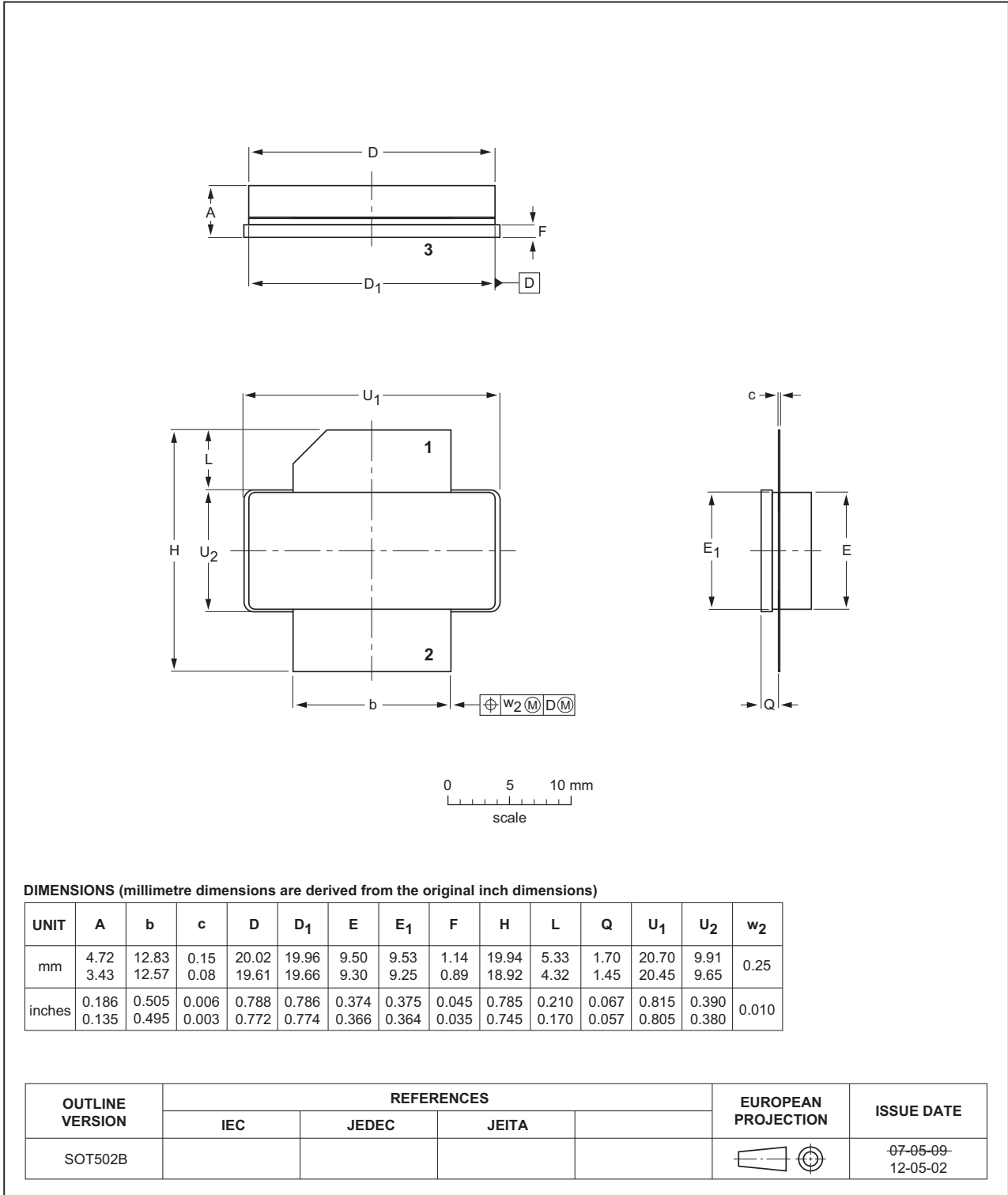


Fig 9. Package outline SOT502B



## 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"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul> |                    |               |                             |
| BLF10M6135_BLF10M6LS135 v.1 | 20140624   | Product data sheet | -             | -                           |

## 12. Legal information

### 12.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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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