

BLS7G2933S-150

LDMOS S-band radar power transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

150 W LDMOS power transistor intended for radar applications in the 2.9 GHz to 3.3 GHz range.

Table 1. Typical performance

Typical RF performance at $T_{case} = 25\text{ }^{\circ}\text{C}$; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\text{ }\%$; $I_{Dq} = 100\text{ mA}$; in a class-AB production test circuit.

| Mode of operation | f (GHz) | V _{DS} (V) | P _L (W) | G _p (dB) | η_D (%) | t _r (ns) | t _f (ns) |
|-------------------|------------|------------------------|-----------------------|------------------------|-----------------|------------------------|------------------------|
| pulsed RF | 2.9 to 3.3 | 32 | 150 | 13.5 | 47 | 20 | 6 |

1.2 Features and benefits

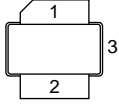
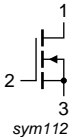
- Typical pulsed RF performance at a frequency of 2.9 GHz to 3.3 GHz, a supply voltage of 32 V, an I_{Dq} of 100 mA, a t_p of 300 μs with δ of 10 %:
 - ◆ Output power = 150 W
 - ◆ Power gain = 13.5 dB
 - ◆ Efficiency = 47 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2.9 GHz to 3.3 GHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- S-band power amplifiers for radar applications in the 2.9 GHz to 3.3 GHz frequency range

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|---|---|
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|----------------|---------|---|----------|
| | Name | Description | Version |
| BLS7G2933S-150 | - | ceramic earless flanged cavity package; 2 leads | SOT922-1 |

4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Min | Max | Unit |
|-----------|----------------------|------|------|------|
| V_{DS} | drain-source voltage | - | 60 | V |
| V_{GS} | gate-source voltage | -0.5 | +13 | V |
| I_D | drain current | - | 33 | A |
| T_{stg} | storage temperature | -65 | +150 | °C |
| T_j | junction temperature | - | 200 | °C |

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|----------------|--|---|------|------|
| $Z_{th(j-mb)}$ | transient thermal impedance from junction to mounting base | $T_{case} = 85\text{ °C}; P_L = 150\text{ W}$ | | |
| | | $t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$ | 0.12 | K/W |
| | | $t_p = 200\text{ }\mu\text{s}; \delta = 10\text{ }\%$ | 0.14 | K/W |
| | | $t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$ | 0.16 | K/W |
| | | $t_p = 500\text{ }\mu\text{s}; \delta = 10\text{ }\%$ | 0.18 | K/W |
| | | $t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$ | 0.15 | K/W |

6. Characteristics

Table 6. 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 | $V_{GS} = 0\text{ V}; I_D = 0.6\text{ mA}$ | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$ | 1.5 | 1.8 | 2.3 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 4.2 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$ | 29 | 35 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 420 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 9\text{ A}$ | - | 12.7 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$ | - | 0.085 | 0.135 | Ω |

7. Application information

Table 7. Application information

Mode of operation: pulsed RF; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\text{ }\%$; RF performance at $V_{DS} = 32\text{ V}$; $I_{DQ} = 100\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified, in a class-AB production circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|---------------------------------------|----------------------|-----|------|------|------|
| P_L | output power | | - | 150 | - | W |
| V_{CC} | supply voltage | $P_L = 150\text{ W}$ | - | - | 32 | V |
| G_p | power gain | $P_L = 150\text{ W}$ | 11 | 13.5 | - | dB |
| RL_{in} | input return loss | $P_L = 150\text{ W}$ | | -10 | -5.5 | dB |
| $P_{L(1dB)}$ | output power at 1 dB gain compression | | - | 170 | - | W |
| η_D | drain efficiency | $P_L = 150\text{ W}$ | 44 | 47 | - | % |
| $P_{droop(pulse)}$ | pulse droop power | $P_L = 150\text{ W}$ | - | 0 | 0.3 | dB |
| t_r | rise time | $P_L = 150\text{ W}$ | - | 20 | 50 | ns |
| t_f | fall time | $P_L = 150\text{ W}$ | - | 6 | 50 | ns |

Table 8. Typical impedance

| f GHz | Z_S Ω | Z_L Ω |
|----------|-------------------|-------------------|
| 2.9 | $2.2 - j7.4$ | $4.2 - j6.3$ |
| 3.0 | $2.9 - j6.5$ | $3.8 - j6.4$ |
| 3.1 | $4.2 - j5.9$ | $3.4 - j6.3$ |
| 3.2 | $6.0 - j6.5$ | $2.9 - j6.2$ |
| 3.3 | $6.5 - j8.9$ | $2.5 - j5.9$ |

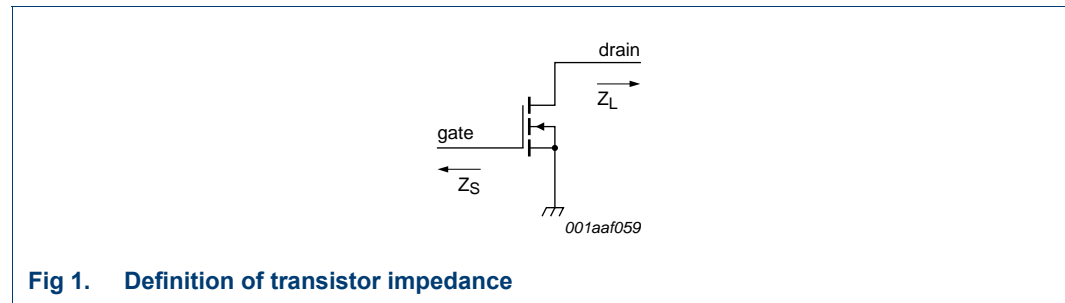
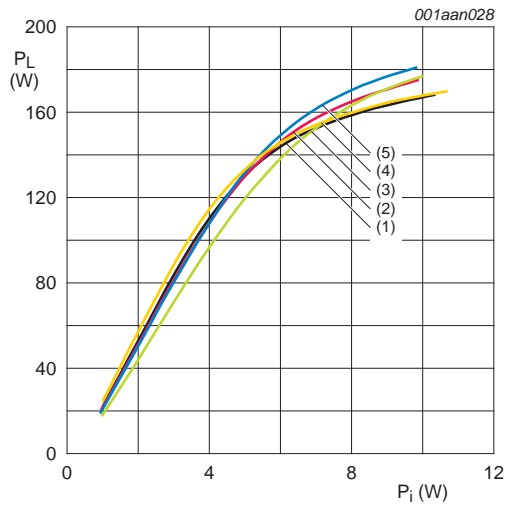


Fig 1. Definition of transistor impedance

7.1 Ruggedness in class-AB operation

The BLS7G2933S-150 is capable of withstanding a load mismatch corresponding to $V_{SWR} = 10 : 1$ through all phases under the following conditions: $V_{DS} = 32 \text{ V}$; $I_{DQ} = 100 \text{ mA}$; $P_L = 150 \text{ W}$; $t_p = 300 \text{ }\mu\text{s}$; $\delta = 10 \text{ \%}$.

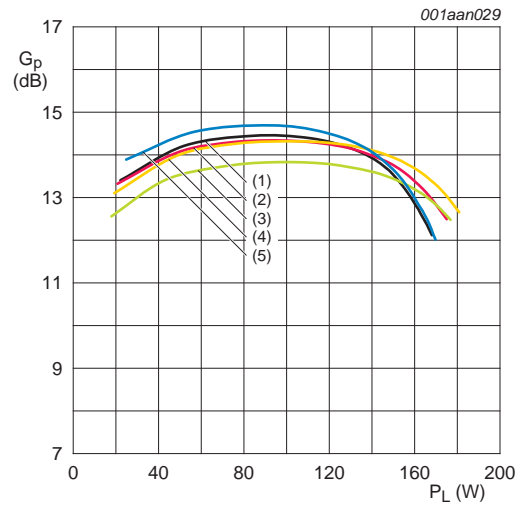
7.2 Graphs



$V_{DS} = 32 \text{ V}$; $I_{Dq} = 100 \text{ mA}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 10 \text{ \%}$.

- (1) $f = 2900 \text{ MHz}$
- (2) $f = 3000 \text{ MHz}$
- (3) $f = 3100 \text{ MHz}$
- (4) $f = 3200 \text{ MHz}$
- (5) $f = 3300 \text{ MHz}$

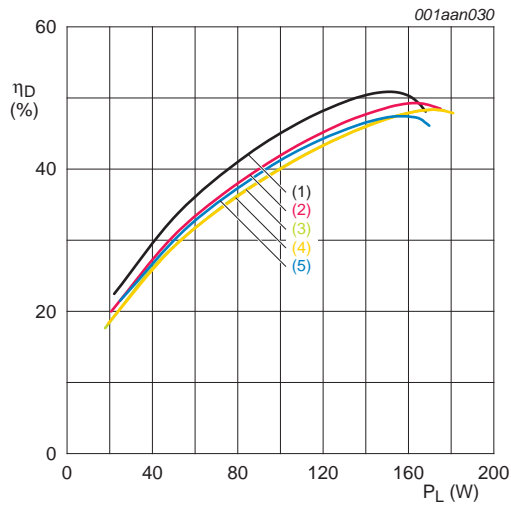
Fig 2. Load power as a function of input power; typical values



$V_{DS} = 32 \text{ V}$; $I_{Dq} = 100 \text{ mA}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 10 \text{ \%}$.

- (1) $f = 2900 \text{ MHz}$
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- (3) $f = 3100 \text{ MHz}$
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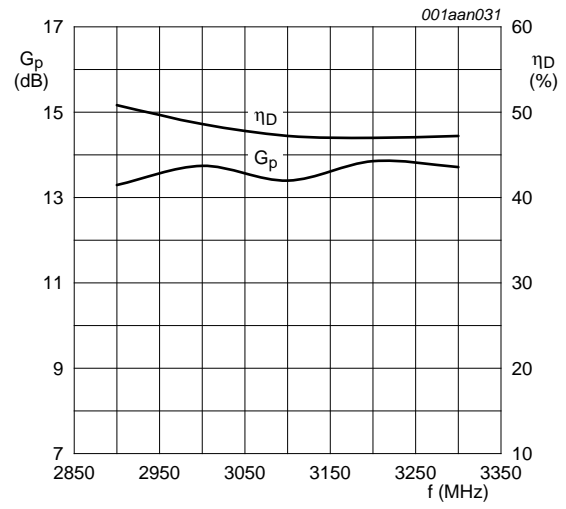
Fig 3. Power gain as a function of load power; typical values



$V_{DS} = 32 \text{ V}$; $I_{Dq} = 100 \text{ mA}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 10 \text{ } \%$.

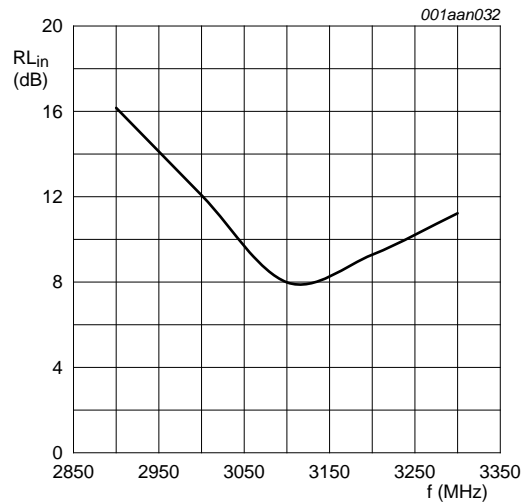
- (1) $f = 2900 \text{ MHz}$
- (2) $f = 3000 \text{ MHz}$
- (3) $f = 3100 \text{ MHz}$
- (4) $f = 3200 \text{ MHz}$
- (5) $f = 3300 \text{ MHz}$

Fig 4. Drain efficiency as a function of load power; typical values



$V_{DS} = 32 \text{ V}$; $P_L = 150 \text{ W}$; $I_{Dq} = 100 \text{ mA}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 10 \text{ } \%$.

Fig 5. Power gain and drain efficiency as function of frequency; typical values



$V_{DS} = 32 \text{ V}$; $P_L = 150 \text{ W}$; $I_{Dq} = 100 \text{ mA}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 10 \text{ } \%$.

Fig 6. Input return loss as a function of frequency; typical values

8. Test information

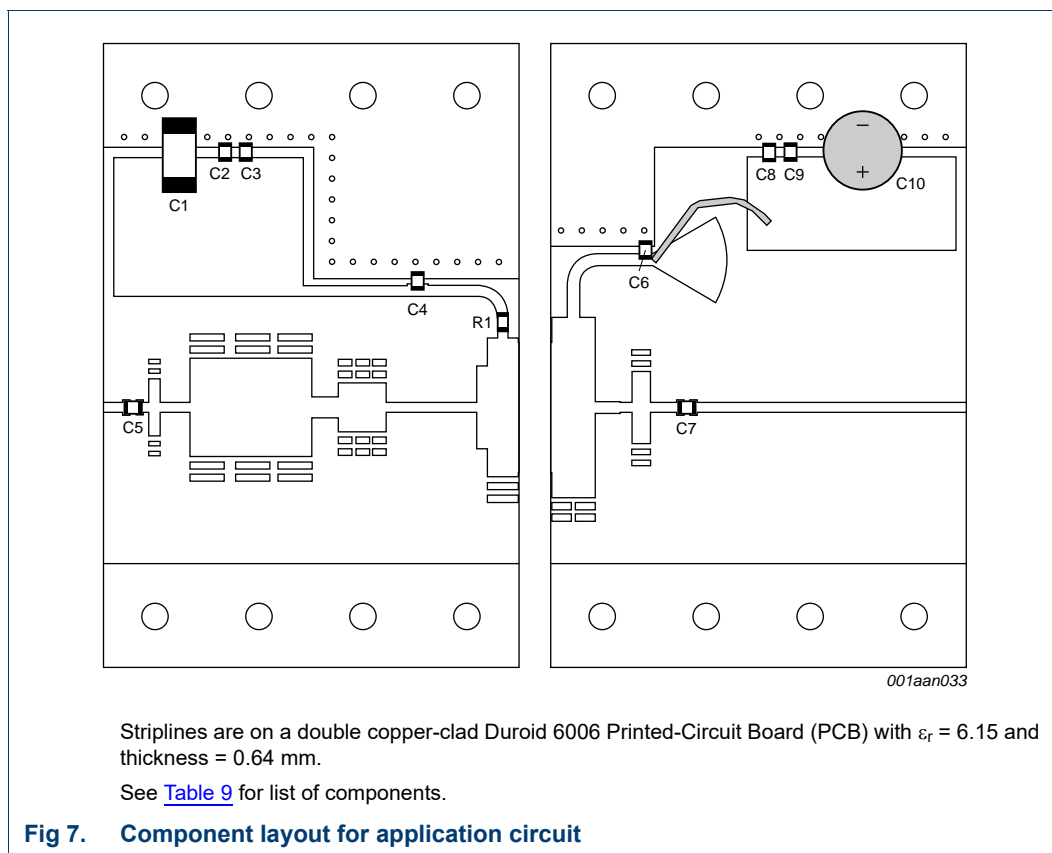


Table 9. List of components

See [Figure 7](#).

| Component | Description | Value | Remarks |
|----------------|-----------------------------------|------------------|------------------------|
| C1 | multilayer ceramic chip capacitor | 10 μ F; 20 V | |
| C2, C8 | multilayer ceramic chip capacitor | 1 nF | ATC 700A or equivalent |
| C3, C9 | multilayer ceramic chip capacitor | 100 pF | ATC 100A or equivalent |
| C4, C5, C6, C7 | multilayer ceramic chip capacitor | 10 pF | ATC 100A or equivalent |
| C10 | electrolytic capacitor | 68 μ F; 63 V | |
| R1 | SMD resistor | 10 Ω | SMD 0603 |

9. Package outline

Ceramic earless flanged cavity package; 2 leads

SOT922-1

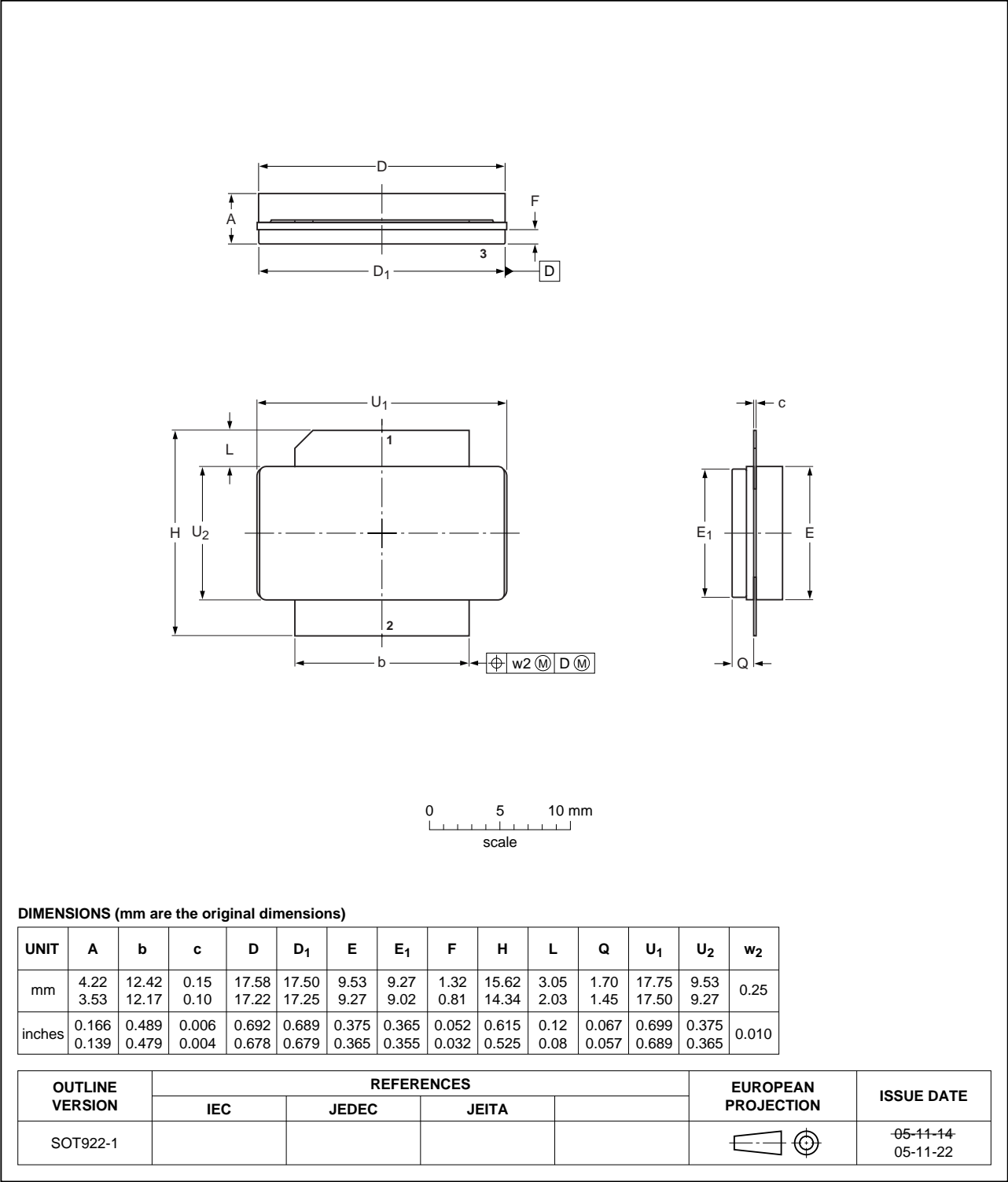


Fig 8. Package outline SOT922-1

10. 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.

11. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|--|
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| RF | Radio Frequency |
| S-band | Short wave Band |
| SMD | Surface Mounted Device |
| VSWR | Voltage Standing-Wave Ratio |

12. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------|---|----------------------|---------------|--------------------|
| BLS7G2933S-150#3 | 20150901 | Product data sheet | | BLS7G2933S-150 v.2 |
| 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. | | | |
| BLS7G2933S-150 v.2 | 20110223 | Product data sheet | - | BLS7G2933S-150 v.1 |
| BLS7G2933S-150 v.1 | 20101112 | Objective data sheet | - | - |

13. Legal information

13.1 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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