

BLF578XR; BLF578XRS

Power LDMOS transistor

Rev. 1 — 30 January 2012

Objective data sheet

1. Product profile

1.1 General description

A 1400 W extremely rugged LDMOS power transistor for broadcast and industrial applications in the HF to 500 MHz band. This product is an enhanced version of the BLF578 using NXP's XR process to provide maximum ruggedness capability in the most severe applications without compromising the RF performance.

Table 1. Application information

| Mode of operation | f (MHz) | V _{DS} (V) | P _L (W) | G _p (dB) | η _D (%) |
|-------------------|------------|------------------------|-----------------------|------------------------|-----------------------|
| CW | 108 | 50 | 1200 | 26 | 75 |
| pulsed RF | 225 | 50 | 1400 | 23 | 69 |

1.2 Features and benefits

- Typical pulsed performance at frequency of 225 MHz, a supply voltage of 50 V and an I_{DQ} of 40 mA, a t_p of 100 μs with δ of 20 %:
 - ◆ Output power = 1400 W
 - ◆ Power gain = 23 dB
 - ◆ Efficiency = 69 %
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (10 MHz to 500 MHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

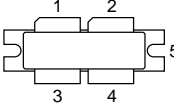
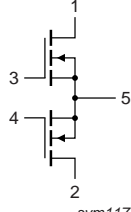
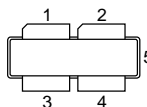
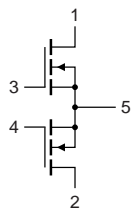
1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications



2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|---------------------|-------------|---|--|
| BLF578XR (SOT539A) | | | |
| 1 | drain1 |  |  |
| 2 | drain2 | | |
| 3 | gate1 | | |
| 4 | gate2 | | |
| 5 | source | | |
| BLF578XRS (SOT539B) | | | |
| 1 | drain1 |  |  |
| 2 | drain2 | | |
| 3 | gate1 | | |
| 4 | gate2 | | |
| 5 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BLF578XR | - | flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads | SOT539A |
| BLF578XRS | - | earless flanged balanced LDMOST ceramic package; 4 leads | SOT539B |

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 | | - | 110 | V |
| V_{GS} | gate-source voltage | | -6 | +11 | V |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 225 | °C |

5. Thermal characteristics

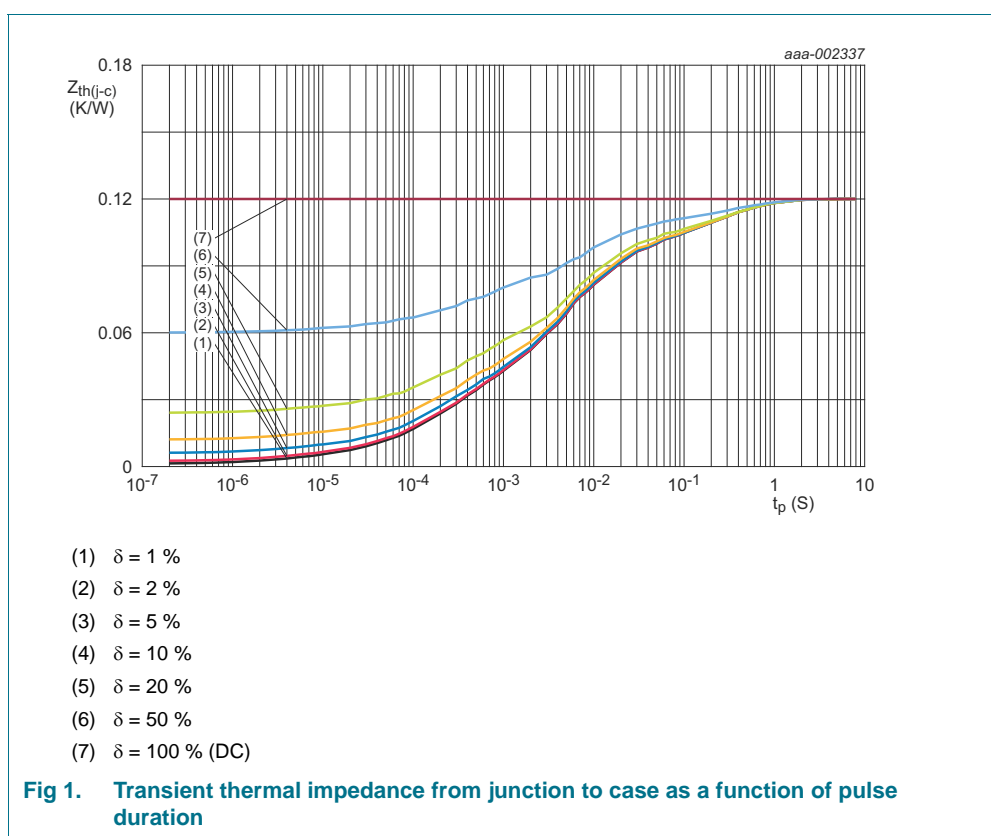
Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|---------------|---|---|-------------|------|
| $R_{th(j-c)}$ | thermal resistance from junction to case | $T_j = 150\text{ }^{\circ}\text{C}$ | [1][2] 0.12 | K/W |
| $Z_{th(j-c)}$ | transient thermal impedance from junction to case | $T_j = 150\text{ }^{\circ}\text{C}$; $t_p = 100\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$ | [3] 0.035 | K/W |

[1] T_j is the junction temperature.

[2] $R_{th(j-c)}$ is measured under RF conditions.

[3] See [Figure 1](#).



6. Characteristics

6.1 DC characteristics

Table 6. DC characteristics

$T_J = 25\text{ }^{\circ}\text{C}$; per section unless otherwise specified.

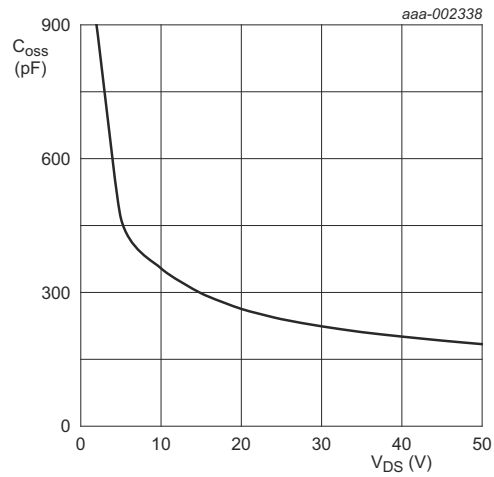
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|--|------|------|------|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS} = 0\text{ V}$; $I_D = 2.5\text{ mA}$ | 110 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS} = 10\text{ V}$; $I_D = 500\text{ mA}$ | 1.25 | 1.7 | 2.25 | V |
| V_{GSq} | gate-source quiescent voltage | $V_{DS} = 50\text{ V}$; $I_D = 20\text{ mA}$ | 0.8 | 1.3 | 1.8 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$ | - | - | 2.8 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$ | - | 77 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 11\text{ V}$; $V_{DS} = 0\text{ V}$ | - | - | 280 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 16.66\text{ A}$ | - | 0.07 | - | Ω |
| C_{rs} | feedback capacitance | $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $f = 1\text{ MHz}$ | - | 5.5 | - | pF |
| C_{iss} | input capacitance | $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $f = 1\text{ MHz}$ | - | 414 | - | pF |
| C_{oss} | output capacitance | $V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $f = 1\text{ MHz}$ | - | 184 | - | pF |

6.2 RF characteristics

Table 7. RF characteristics

Mode of operation: pulsed RF; $t_p = 100\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$; $f = 225\text{ MHz}$; RF performance at $V_{DS} = 50\text{ V}$; $I_{Dq} = 40\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified; in a class-AB production test circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-------------------|-----------------------|--------|-----|--------|------|
| G_p | power gain | $P_L = 1400\text{ W}$ | <tbid> | 23 | <tbid> | dB |
| RL_{in} | input return loss | $P_L = 1400\text{ W}$ | <tbid> | -17 | - | dB |
| η_D | drain efficiency | $P_L = 1400\text{ W}$ | <tbid> | 69 | - | % |



$V_{GS} = 0$ V; $f = 1$ MHz.

Fig 2. Output capacitance as a function of drain-source voltage; typical values per section

6.3 Ruggedness in class-AB operation

The BLF578XR and BLF578XRS are capable of withstanding a load mismatch corresponding to $V_{SWR} > 65 : 1$ through all phases under the following conditions: $V_{DS} = 50$ V; $I_{Dq} = 40$ mA; $P_L = 1400$ W pulsed; $f = 225$ MHz.

7. Package outline

Flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads

SOT539A

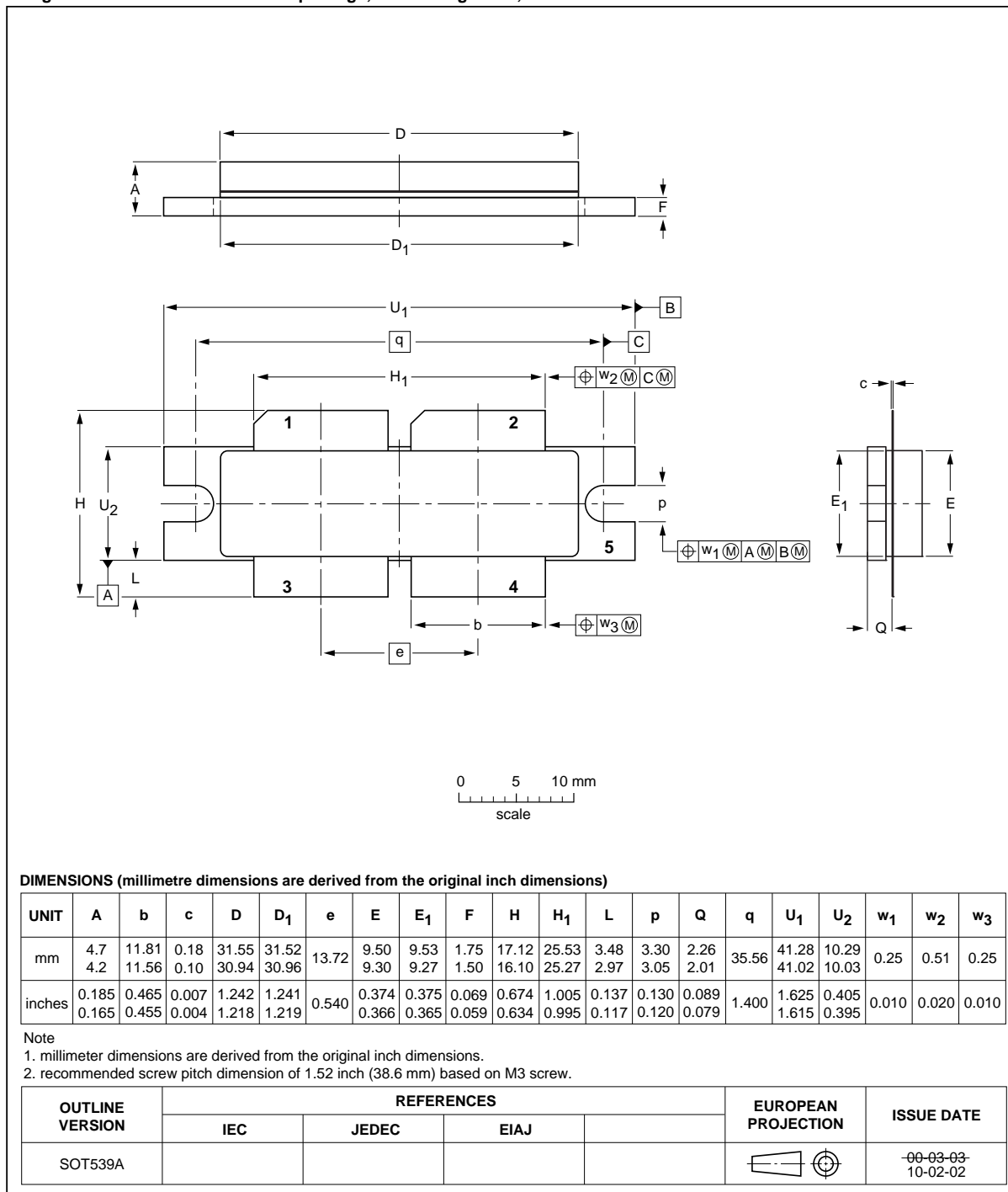


Fig 3. Package outline SOT539A

Earless flanged balanced LDMOST ceramic package; 4 leads

SOT539B

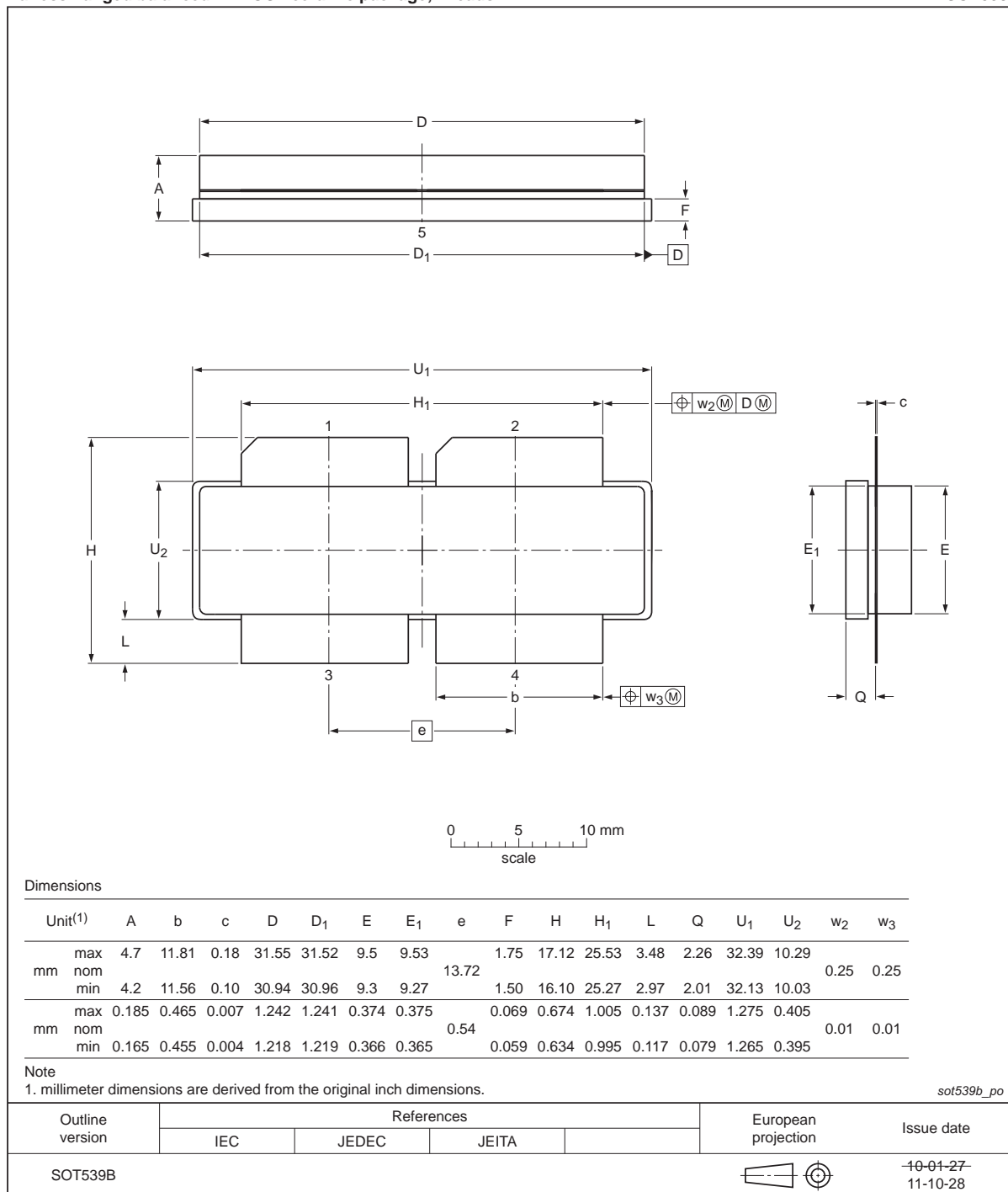


Fig 4. Package outline SOT539B

8. 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.

9. Abbreviations

Table 8. Abbreviations

| Acronym | Description |
|---------|---|
| CW | Continuous Wave |
| DC | Direct Current |
| ESD | ElectroStatic Discharge |
| HF | High Frequency |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| LDMOST | Laterally Diffused Metal-Oxide Semiconductor Transistor |
| RF | Radio Frequency |
| VSWR | Voltage Standing-Wave Ratio |
| XR | eXtremely Rugged |

10. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------|--------------|----------------------|---------------|------------|
| BLF578XR_BLF578XRS v.1 | 20120130 | Objective data sheet | - | - |

11. Legal information

11.1 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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