

# BLF574XR; BLF574XRS

Power LDMOS transistor

Rev. 1 — 20 June 2013

Product data sheet

## 1. Product profile

### 1.1 General description

A 600 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 BLF574 using NXP's XR process to provide maximum ruggedness capability in the most severe applications without compromising the RF performance.

Table 1. Application information

| Test signal | f<br>(MHz) | V <sub>DS</sub><br>(V) | P <sub>L</sub><br>(W) | G <sub>p</sub><br>(dB) | η <sub>D</sub><br>(%) |
|-------------|------------|------------------------|-----------------------|------------------------|-----------------------|
| CW          | 225        | 50                     | 600                   | 23.5                   | 74.5                  |
| pulsed RF   | 225        | 50                     | 600                   | 24                     | 74.7                  |

### 1.2 Features and benefits

- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 500 MHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

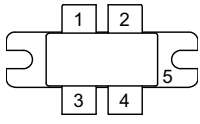
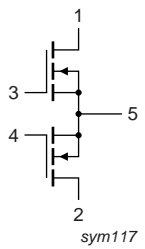
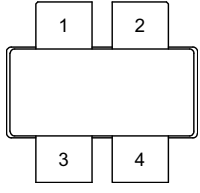
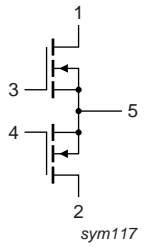
### 1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications



## 2. Pinning information

Table 2. Pinning

| Pin                         | Description | Simplified outline  | Graphic symbol   |
|-----------------------------|-------------|---|--|
| <b>BLF574XR (SOT1214A)</b>  |             |   |  |
| 1                           | drain1      |   | <br>sym117  |
| 2                           | drain2      |   |  |
| 3                           | gate1       |   |  |
| 4                           | gate2       |   |  |
| 5                           | source      |   |  |
| <b>BLF574XRS (SOT1214B)</b> |             |   |  |
| 1                           | drain1      |  | <br>sym117 |
| 2                           | drain2      |   |  |
| 3                           | gate1       |   |  |
| 4                           | gate2       |   |  |
| 5                           | source      |   |  |

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |  | Version  |
|-------------|---------|--|----------|
|             | Name    | Description  |          |
| BLF574XR    | -       | flanged ceramic package; 2 mounting holes; 4 leads | SOT1214A |
| BLF574XRS   | -       | earless flanged ceramic package; 4 leads           | SOT1214B |

## 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 |            | [1] | 225  | °C   |

[1] Continuous use at maximum temperature will affect the reliability. For details refer to the on-line MTF calculator.

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol        | Parameter                                | Conditions            | Typ         | Unit |
|---------------|--|-----------------------|-------------|------|
| $R_{th(j-c)}$ | thermal resistance from junction to case | $T_j = 150\text{ °C}$ | [1][2] 0.18 | K/W  |

[1]  $T_j$  is the junction temperature.

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

## 6. Characteristics

**Table 6. DC 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   | $V_{GS} = 0\text{ V}$ ; $I_D = 2.75\text{ mA}$                    | 110  | -    | -    | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}$ ; $I_D = 275\text{ mA}$                    | 1.25 | 1.7  | 2.25 | V             |
| $I_{DSS}$     | drain leakage current            | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$                    | -    | -    | 1.4  | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ;<br>$V_{DS} = 10\text{ V}$ | -    | 38   | -    | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$                    | -    | -    | 140  | nA            |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ;<br>$I_D = 9.625\text{ A}$ | -    | 0.15 | -    | $\Omega$      |

**Table 7. DC characteristics**

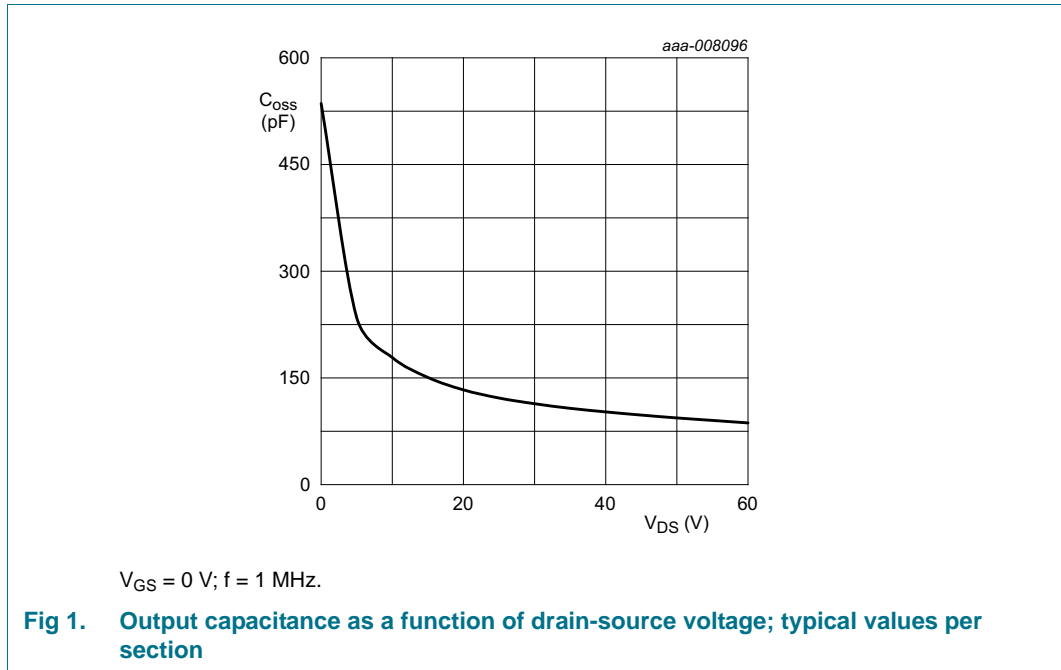
$T_j = 25\text{ °C}$ ; per section unless otherwise specified.

| Symbol    | Parameter            | Conditions  | Min | Typ | Max | Unit |
|-----------|----------------------|---|-----|-----|-----|------|
| $C_{rs}$  | feedback capacitance | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$ | -   | 2.4 | -   | pF   |
| $C_{iss}$ | input capacitance    | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$ | -   | 210 | -   | pF   |
| $C_{oss}$ | output capacitance   | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$ | -   | 94  | -   | pF   |

**Table 8. RF characteristics**

Test signal: CW;  $f = 225\text{ MHz}$ ; RF performance at  $V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 100\text{ mA}$ ;  $T_{case} = 25\text{ °C}$ ; unless otherwise specified; in a class-AB production test circuit.

| Symbol    | Parameter         | Conditions           | Min   | Typ  | Max | Unit |
|-----------|-------------------|----------------------|-------|------|-----|------|
| $G_p$     | power gain        | $P_L = 600\text{ W}$ | 21.65 | 23.5 | -   | dB   |
| $RL_{in}$ | input return loss | $P_L = 600\text{ W}$ | -     | -17  | -13 | dB   |
| $\eta_D$  | drain efficiency  | $P_L = 600\text{ W}$ | 70    | 74.5 | -   | %    |

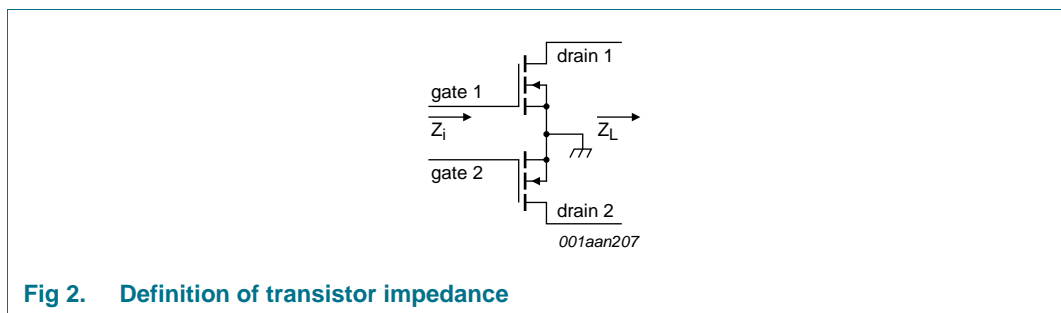


## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLF574XR and BLF574XRS are capable of withstanding a load mismatch corresponding to  $V_{SWR} > 65 : 1$  through all phases under the following conditions:  $V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 100\text{ mA}$ ;  $P_L = 600\text{ W}$  pulsed;  $f = 225\text{ MHz}$ .

### 7.2 Impedance information

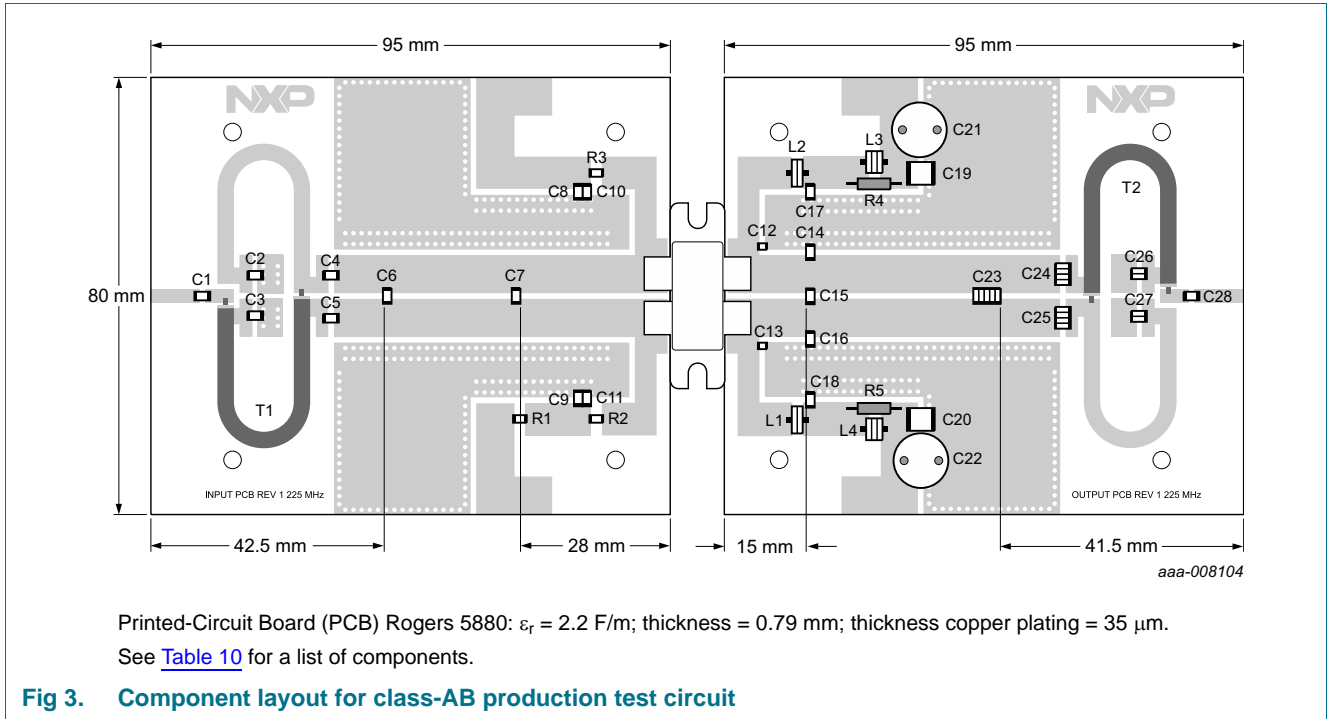


**Table 9. Typical push-pull impedance**

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 50\text{ V}$  and  $P_L = 600\text{ W}$ .

| f (MHz) | $Z_i$ ( $\Omega$ ) | $Z_L$ ( $\Omega$ ) |
|---------|--------------------|--------------------|
| 225     | $4.67 - j5.47$     | $5.66 + j2.05$     |

7.3 Test circuit



**Table 10. List of components**

For test circuit see [Figure 3](#).

| Component                      | Description                       | Value                      | Remarks                    |
|--------------------------------|-----------------------------------|----------------------------|----------------------------|
| C1, C2, C3, C10, C11, C17, C18 | multilayer ceramic chip capacitor | 1 nF                       | [1]                        |
| C4, C5                         | multilayer ceramic chip capacitor | 62 pF                      | [1]                        |
| C6, C7                         | multilayer ceramic chip capacitor | 51 pF                      | [1]                        |
| C8, C9                         | multilayer ceramic chip capacitor | 4.7 $\mu\text{F}$ , 50 V   | Kemet<br>C1210X475K5RAC-T4 |
| C12, C13                       | multilayer ceramic chip capacitor | 33 pF                      | [2]                        |
| C14, C16                       | multilayer ceramic chip capacitor | 43 pF                      | [1]                        |
| C15                            | multilayer ceramic chip capacitor | 20 pF                      | [1]                        |
| C19, C20                       | multilayer ceramic chip capacitor | 4.7 $\mu\text{F}$ ; 100 V  |                            |
| C21, C22                       | electrolytic capacitor            | 470 $\mu\text{F}$ ; 63 V   |                            |
| C23                            | multilayer ceramic chip capacitor | 5 $\times$ 12 pF           | [3]                        |
| C24, C25                       | multilayer ceramic chip capacitor | 4 $\times$ 16 pF           | [3]                        |
| C26, C27                       | multilayer ceramic chip capacitor | 2 $\times$ 510 pF          | [3]                        |
| C28                            | multilayer ceramic chip capacitor | 56 pF                      | [1]                        |
| L1, L2                         | 2 turn 1 mm copper wire           | D = 3 mm,<br>length = 3 mm |                            |
| L3, L4                         | 3 turn 1 mm copper wire           | D = 3 mm,<br>length = 3 mm |                            |
| R1                             | chip resistor                     | 0 $\Omega$                 |                            |

**Table 10. List of components ...continued**  
For test circuit see [Figure 3](#).

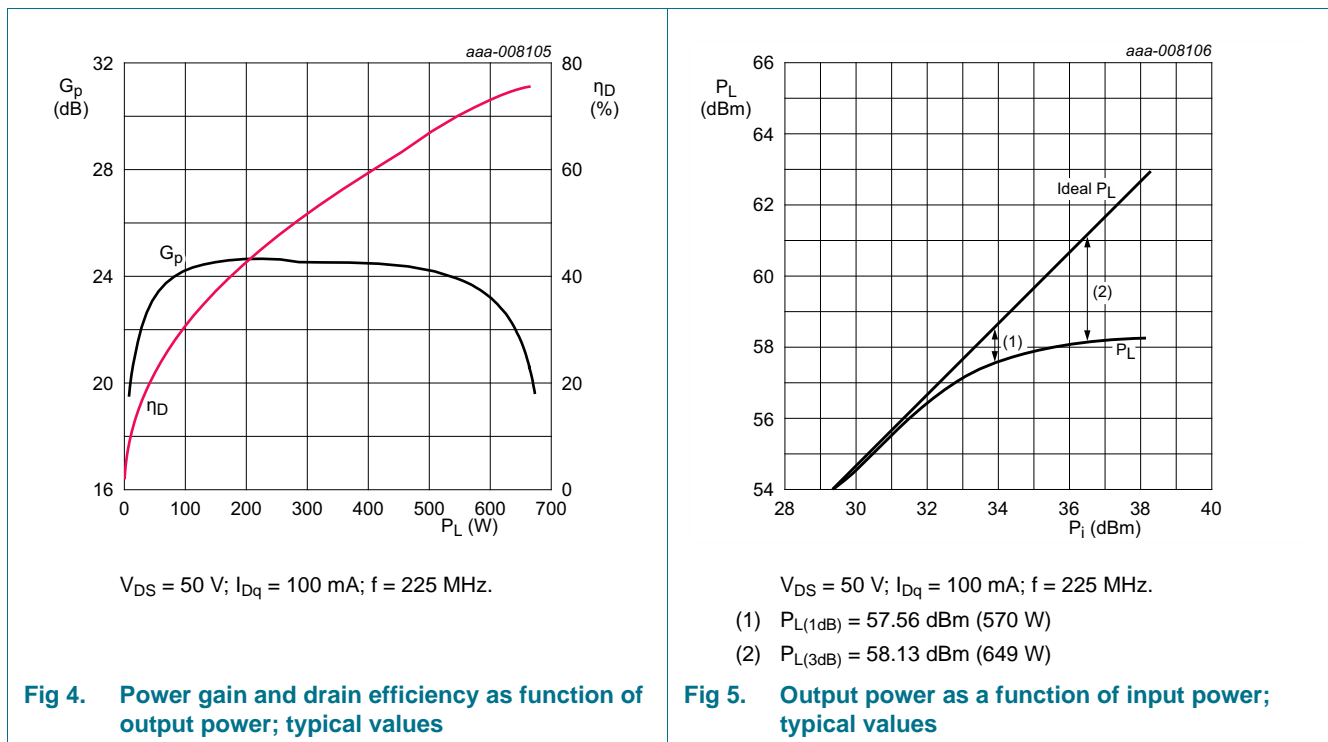
| Component | Description         | Value       | Remarks                          |
|-----------|---------------------|-------------|----------------------------------|
| R2, R3    | chip resistor       | 10 Ω        | SMD 1206                         |
| R4, R5    | metal film resistor | 2 Ω, 0.6 W  |                                  |
| T1, T2    | semi rigid coax     | 50 Ω, 58 mm | HUBER+SUHNER<br>EZ-141-AL-TP-M17 |

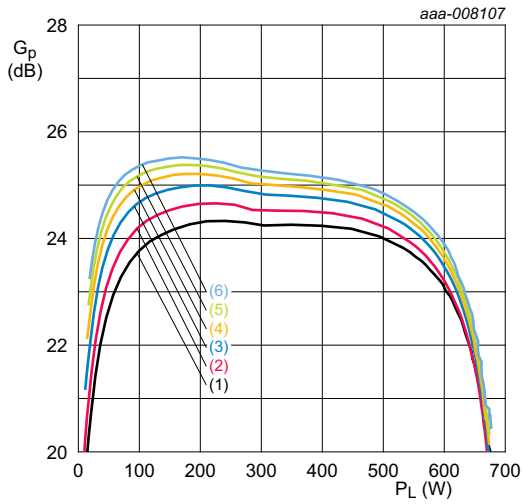
- [1] American Technical Ceramics type 100B or capacitor of same quality.
- [2] American Technical Ceramics type 100A or capacitor of same quality.
- [3] American Technical Ceramics type 800B or capacitor of same quality.

### 7.4 Graphical data

The following figures are measured in a class-AB production test circuit.

#### 7.4.1 1-Tone CW

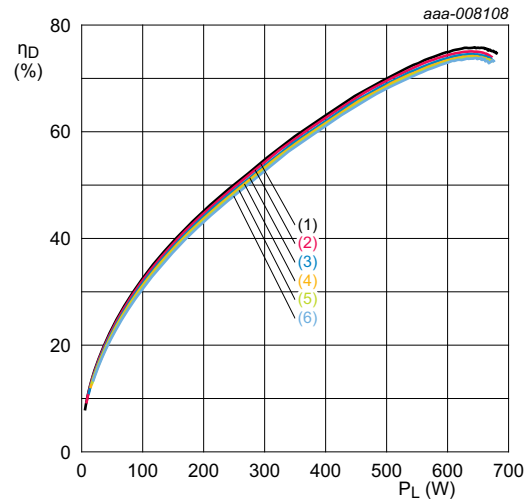




$V_{DS} = 50\text{ V}$ ;  $f = 225\text{ MHz}$ .

- (1)  $I_{Dq} = 50\text{ mA}$
- (2)  $I_{Dq} = 100\text{ mA}$
- (3)  $I_{Dq} = 200\text{ mA}$
- (4)  $I_{Dq} = 300\text{ mA}$
- (5)  $I_{Dq} = 400\text{ mA}$
- (6)  $I_{Dq} = 500\text{ mA}$

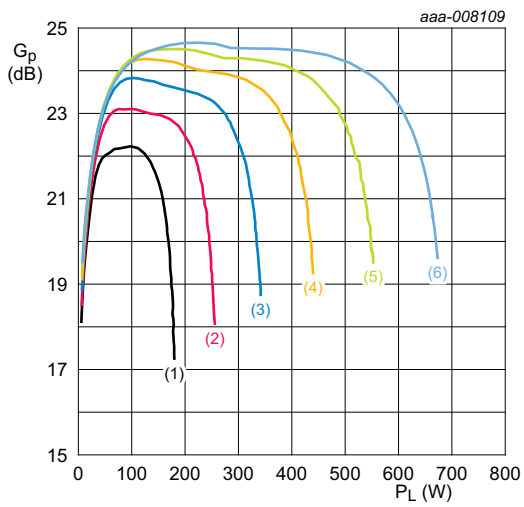
**Fig 6. Power gain as a function of output power; typical values**



$V_{DS} = 50\text{ V}$ ;  $f = 225\text{ MHz}$ .

- (1)  $I_{Dq} = 50\text{ mA}$
- (2)  $I_{Dq} = 100\text{ mA}$
- (3)  $I_{Dq} = 200\text{ mA}$
- (4)  $I_{Dq} = 300\text{ mA}$
- (5)  $I_{Dq} = 400\text{ mA}$
- (6)  $I_{Dq} = 500\text{ mA}$

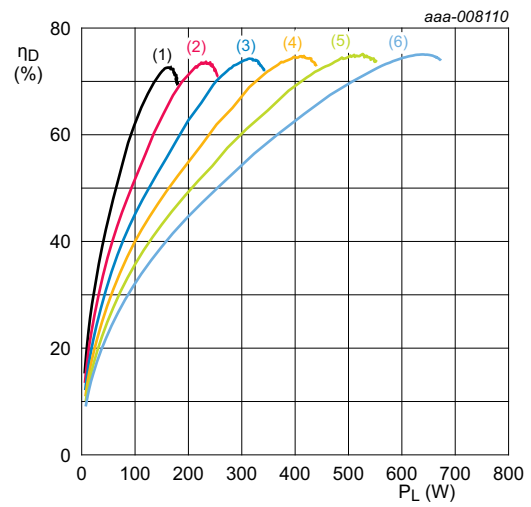
**Fig 7. Drain efficiency as a function of output power; typical values**



$I_{Dq} = 100 \text{ mA}; f = 225 \text{ MHz.}$

- (1)  $V_{DS} = 25 \text{ V}$
- (2)  $V_{DS} = 30 \text{ V}$
- (3)  $V_{DS} = 35 \text{ V}$
- (4)  $V_{DS} = 40 \text{ V}$
- (5)  $V_{DS} = 45 \text{ V}$
- (6)  $V_{DS} = 50 \text{ V}$

**Fig 8. Power gain as a function of output power; typical values**



$I_{Dq} = 100 \text{ mA}; f = 225 \text{ MHz.}$

- (1)  $V_{DS} = 25 \text{ V}$
- (2)  $V_{DS} = 30 \text{ V}$
- (3)  $V_{DS} = 35 \text{ V}$
- (4)  $V_{DS} = 40 \text{ V}$
- (5)  $V_{DS} = 45 \text{ V}$
- (6)  $V_{DS} = 50 \text{ V}$

**Fig 9. Drain efficiency as a function of output power; typical values**



8. Package outline

Flanged ceramic package; 2 mounting holes; 4 leads

SOT1214A

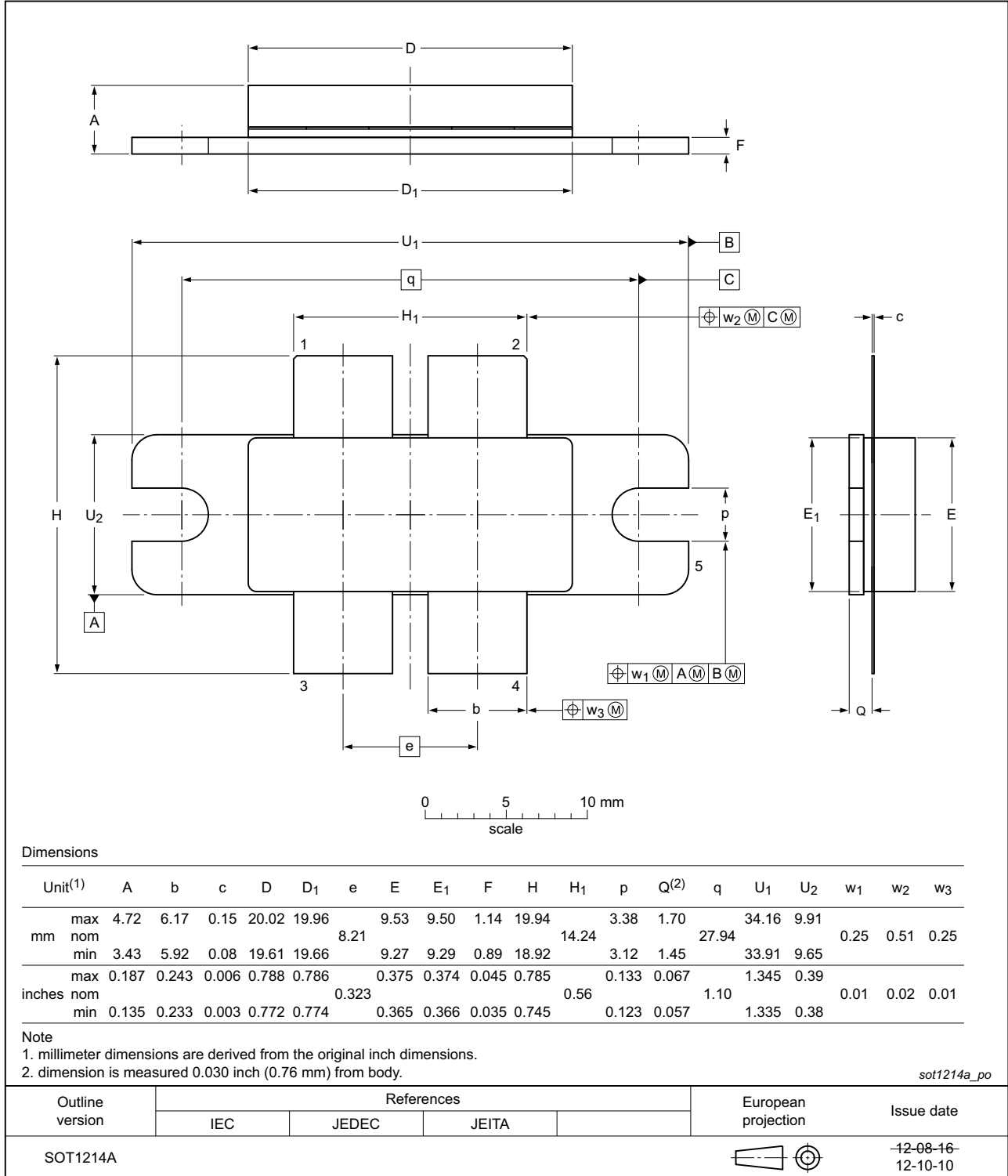


Fig 10. Package outline SOT1214A

Earless flanged ceramic package; 4 leads

SOT1214B

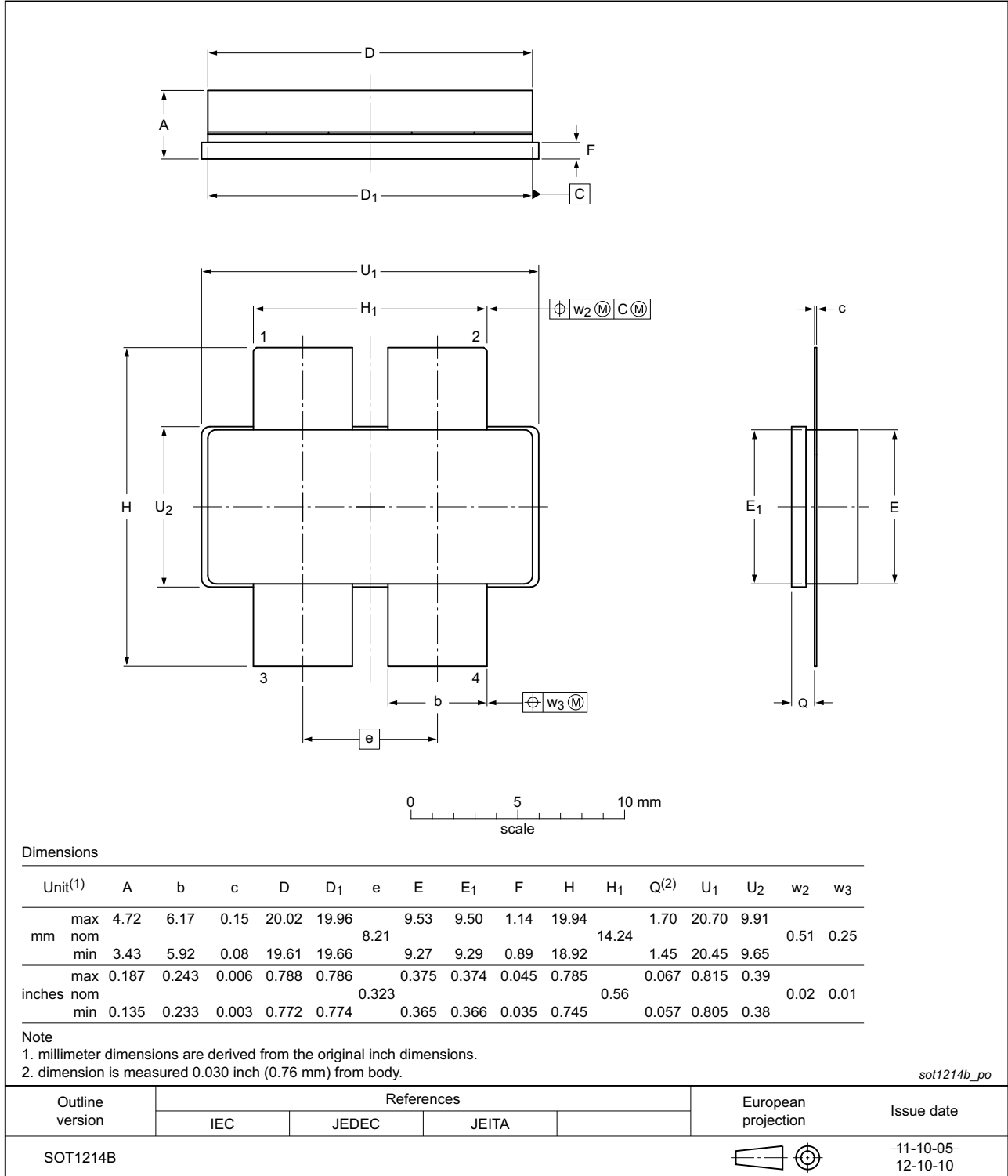


Fig 11. Package outline SOT1214B

## 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 11. Abbreviations

| Acronym | Description                                  |
|---------|--|
| CW      | Continuous Wave                              |
| ESD     | ElectroStatic Discharge                      |
| HF      | High Frequency                               |
| LDMOS   | Laterally Diffused Metal-Oxide Semiconductor |
| MTF     | Median Time to Failure                       |
| SMD     | Surface Mounted Device                       |
| VSWR    | Voltage Standing-Wave Ratio                  |
| XR      | eXtremely Rugged                             |

## 11. Revision history

Table 12. Revision history

| Document ID            | Release date | Data sheet status  | Change notice | Supersedes |
|------------------------|--------------|--------------------|---------------|------------|
| BLF574XR_BLF574XRS v.1 | 20130620     | Product data sheet | -             | -          |

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| 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.                                     |

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