

# BLF174XR; BLF174XRS

Power LDMOS transistor

Rev. 2 — 1 September 2015

AMMPLION

Product data sheet

## 1. Product profile

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### 1.1 General description

A 600 W extremely rugged LDMOS power transistor for broadcast and industrial applications in the HF to 128 MHz band.

Table 1. Application information

Test signal	f (MHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)
CW	108	50	600	28.5	74
pulsed RF	108	50	600	29	73

### 1.2 Features and benefits

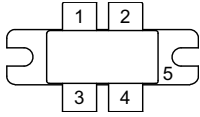
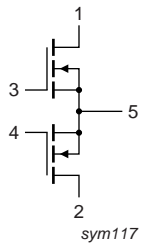
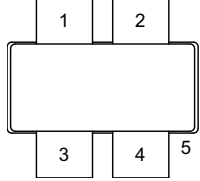
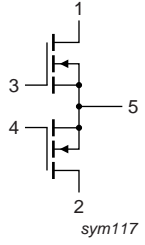
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 128 MHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLF174XR (SOT1214A)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
<b>BLF174XRS (SOT1214B)</b>			
1	drain1		
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	
BLF174XR	-	flanged ceramic package; 2 mounting holes; 4 leads	SOT1214A
BLF174XRS	-	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $V_{DS} = 10\text{ V}$	-	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 9.625\text{ A}$	-	0.15	-	$\Omega$

**Table 7. AC characteristics**

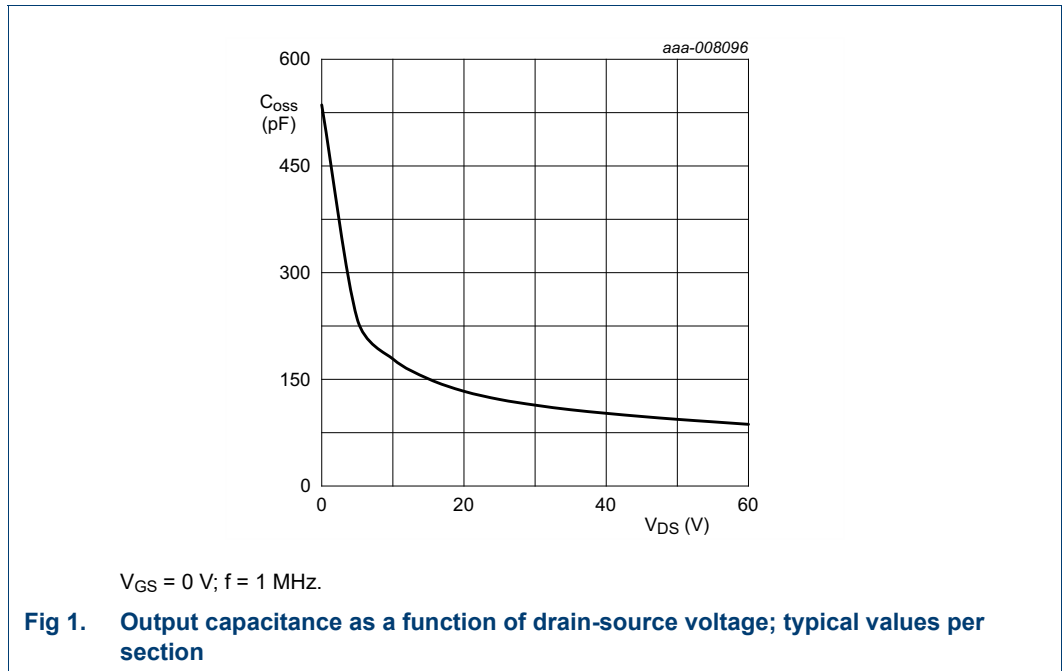
$T_j = 25\text{ °C}$ ; per section unless otherwise specified.

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;  $f = 108\text{ MHz}$ ; 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	$P_L = 600\text{ W}$	27.0	28.5	-	dB
$RL_{in}$	input return loss	$P_L = 600\text{ W}$	-	-21	-13	dB
$\eta_D$	drain efficiency	$P_L = 600\text{ W}$	70	74	-	%

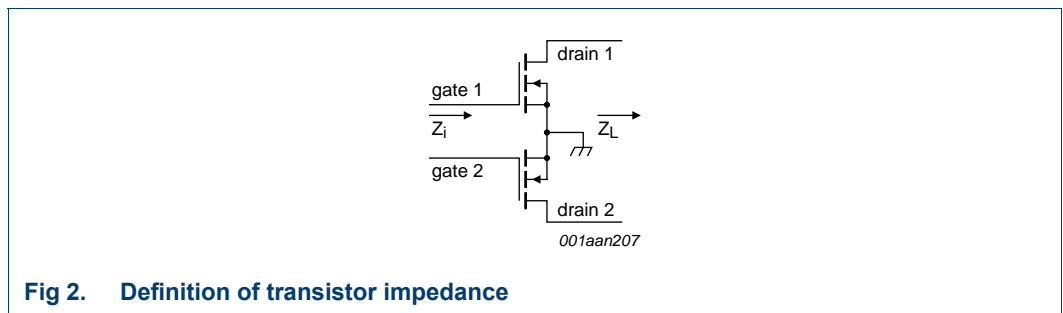


## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLF174XR and BLF174XRS are capable of withstanding a load mismatch corresponding to VSWR > 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;  $f = 108 \text{ MHz}$ .

### 7.2 Impedance information

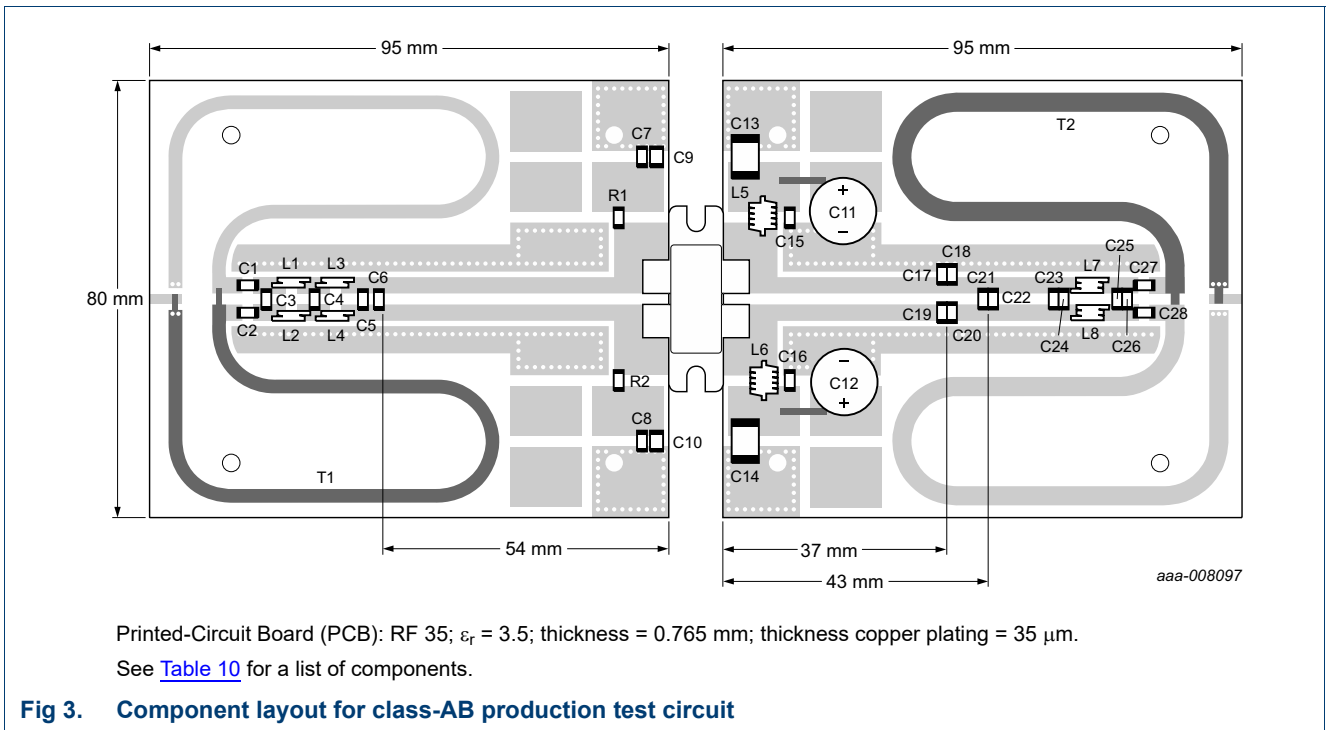


**Table 9. Typical push-pull impedance**

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

f (MHz)	$Z_i$ ( $\Omega$ )	$Z_L$ ( $\Omega$ )
108	4.66 - j12.04	6.47 + j1.16

7.3 Test circuit



**Table 10. List of components**

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

Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	910 pF	[1]
C3	multilayer ceramic chip capacitor	51 pF	[2]
C4	multilayer ceramic chip capacitor	43 pF	[1]
C5	multilayer ceramic chip capacitor	100 pF	[1]
C6	multilayer ceramic chip capacitor	75 pF	[1]
C7, C8, C15, C16	multilayer ceramic chip capacitor	820 pF	[1]
C9, C10	multilayer ceramic chip capacitor	4.7 $\mu\text{F}$ , 100 V	TDK C5750X7R2A475KT
C11, C12	electrolytic capacitor	470 $\mu\text{F}$ , 63 V	
C13, C14	multilayer ceramic chip capacitor	4.7 $\mu\text{F}$ , 100 V	
C17, C18, C19, C20	multilayer ceramic chip capacitor	39 pF	[1]
C21, C23	multilayer ceramic chip capacitor	22 pF	[1]
C22	multilayer ceramic chip capacitor	15 pF	[1]
C24	multilayer ceramic chip capacitor	20 pF	[1]
C25, C26	multilayer ceramic chip capacitor	27 pF	[1]
C27, C28	multilayer ceramic chip capacitor	1 nF	[2]
L1, L2, L3, L4	1.5 turn 0.8 mm copper wire	D = 3.6 mm, length = 1.8 mm	

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

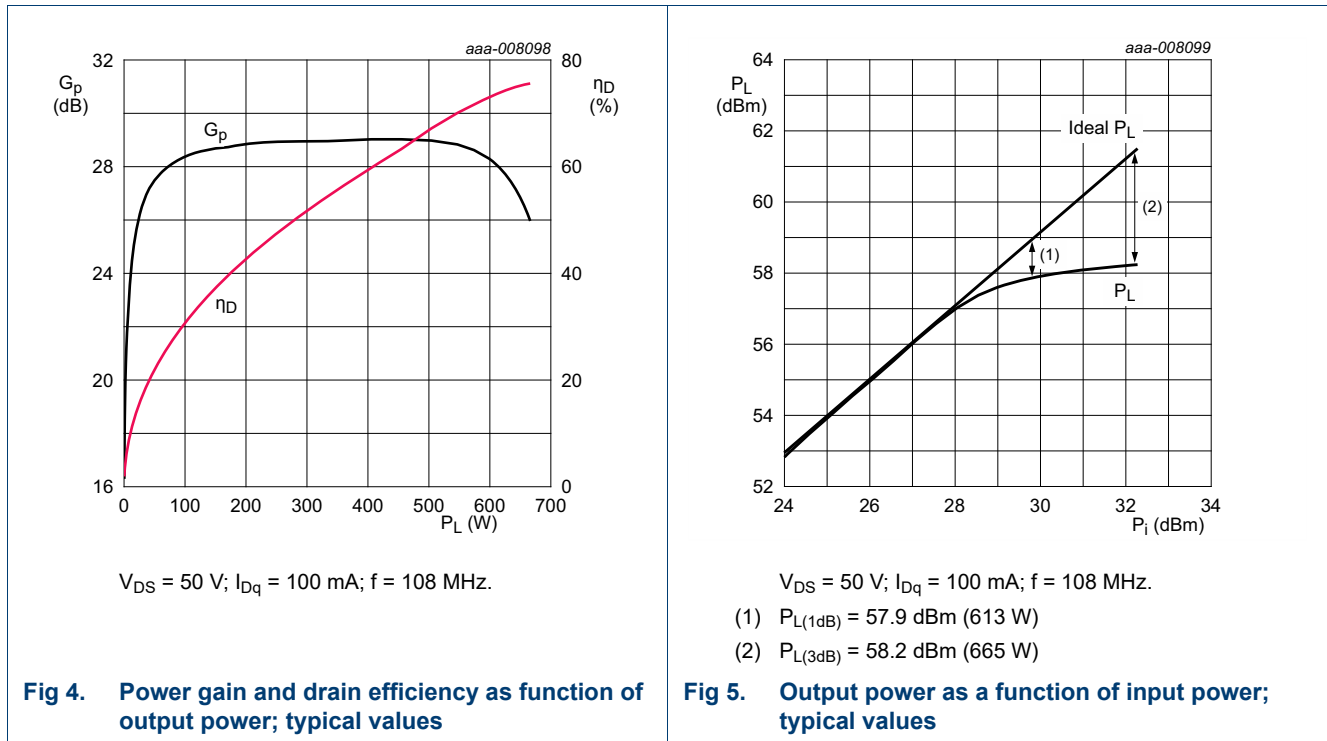
Component	Description	Value	Remarks
L5, L6	5.5 turn 0.8 mm copper wire	D = 4.4 mm, length = 5.2 mm	
L7, L8	1.5 turn 1.5 mm copper wire	D = 6.5 mm, length = 3.2 mm	
R1, R2	resistor	10.0 Ω	SMD 1206
T1	semi rigid coax	25 Ω, 160 mm	Micro-Coax UT-090C-25
T2	semi rigid coax	25 Ω, 160 mm	Micro-Coax UT-141C-25

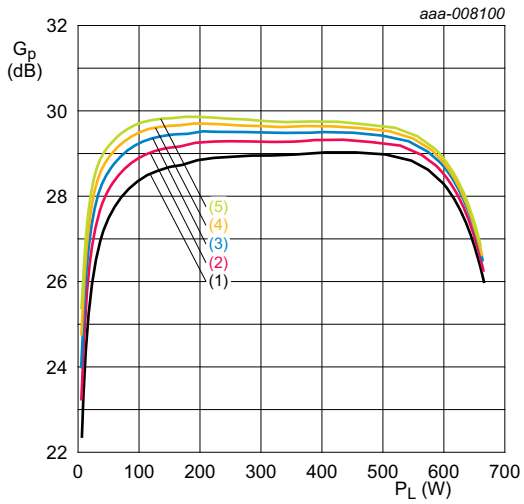
- [1] American Technical Ceramics type 800B or capacitor of same quality.
- [2] American Technical Ceramics type 100B or capacitor of same quality.

### 7.4 Graphical data

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

#### 7.4.1 1-Tone CW

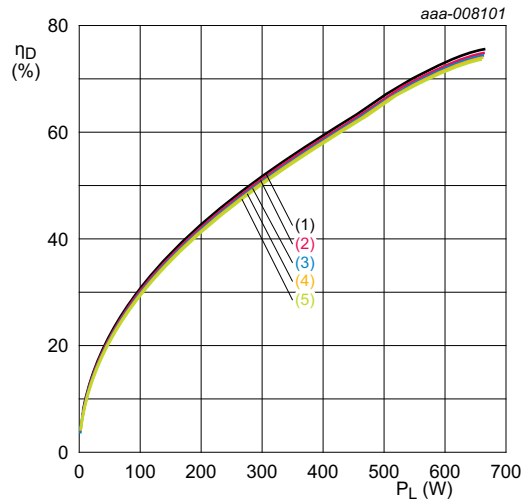




$V_{DS} = 50 \text{ V}; f = 108 \text{ MHz.}$

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

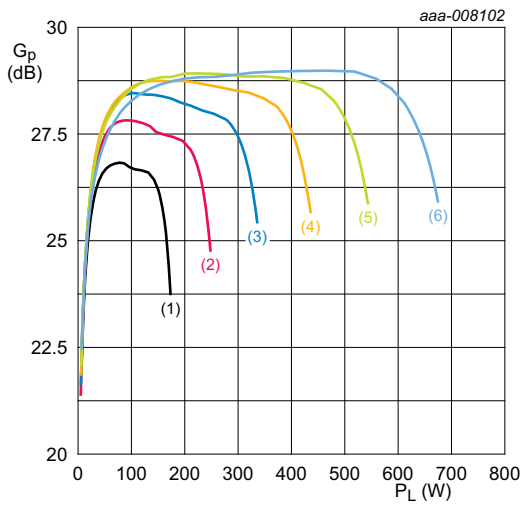
**Fig 6. Power gain as a function of output power; typical values**



$V_{DS} = 50 \text{ V}; f = 108 \text{ MHz.}$

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

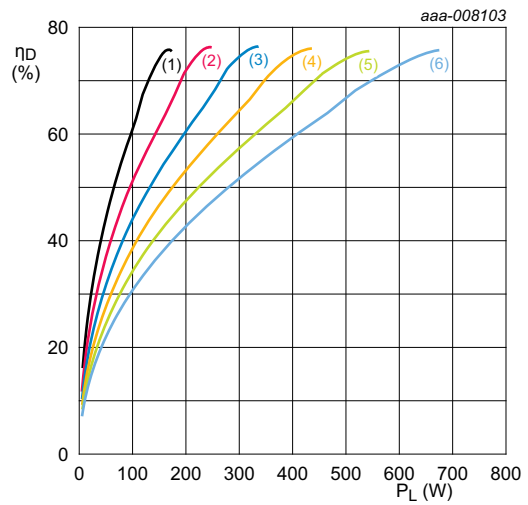
**Fig 7. Drain efficiency as a function of output power; typical values**



$I_{Dq} = 100 \text{ mA}; f = 108 \text{ MHz.}$

- (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**



$I_{Dq} = 100 \text{ mA}; f = 108 \text{ MHz.}$

- (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

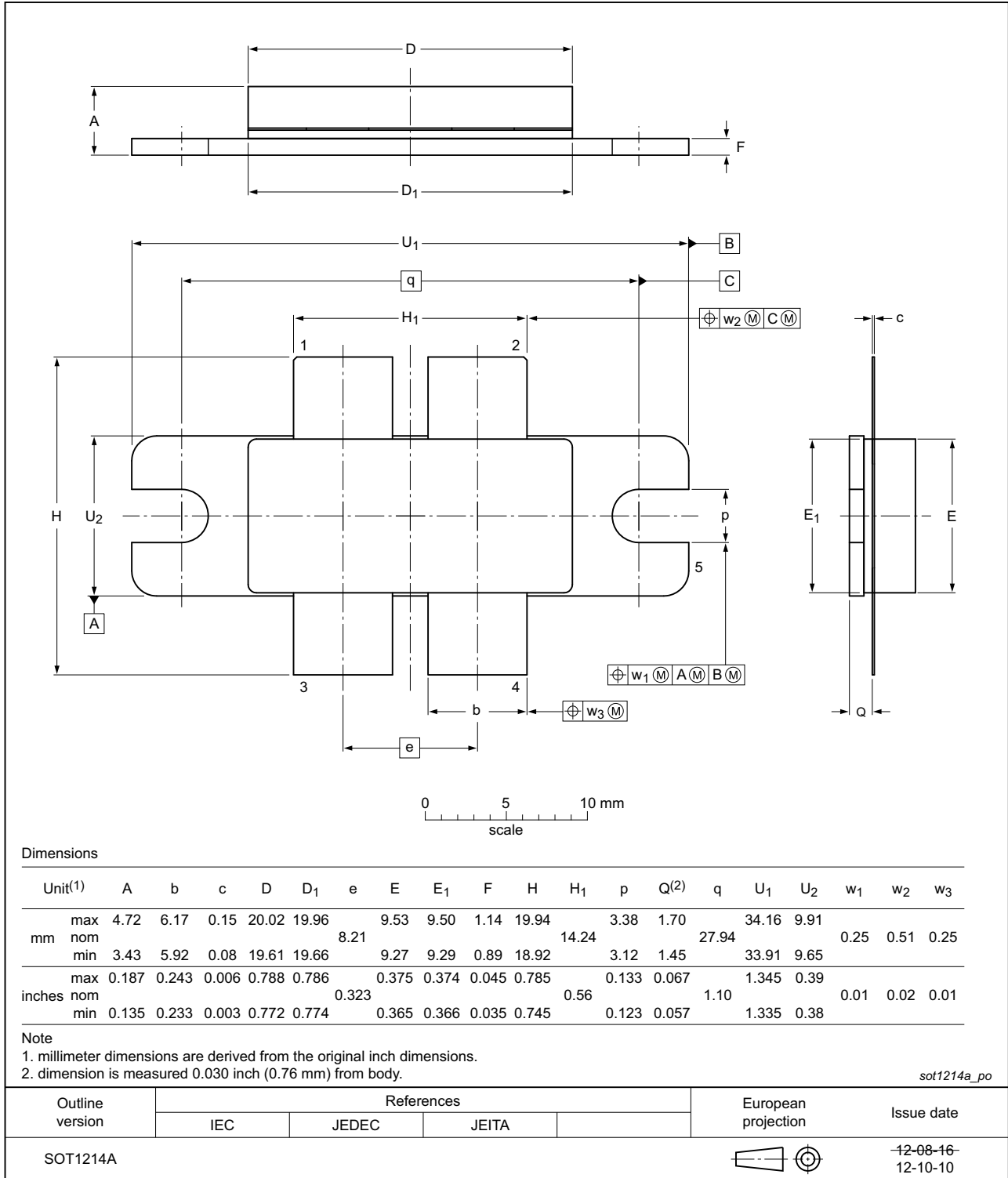


Fig 10. Package outline SOT1214A



Earless flanged ceramic package; 4 leads

SOT1214B

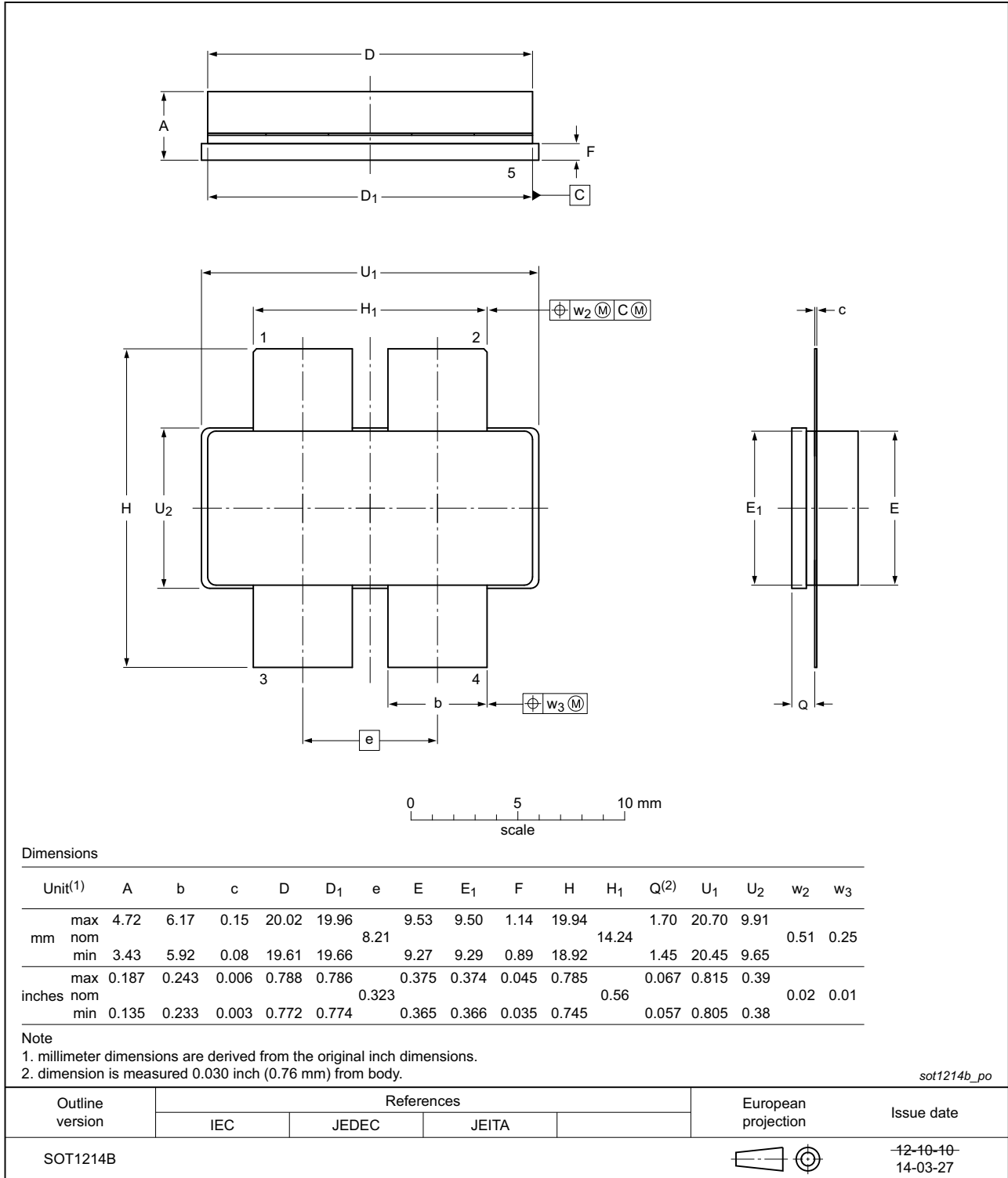


Fig 11. Package outline SOT1214B

## 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
BLF174XR_BLF174XRS#2	20150901	Product data sheet	-	BLF174XR_BLF174XRS 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>			
BLF174XR_BLF174XRS v.1	20130625	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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[2] The term 'short data sheet' is explained in section "Definitions".

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