

BLF183XR; BLF183XRS

Power LDMOS transistor

Rev. 2 — 22 May 2015

Product data sheet

1. Product profile

1.1 General description

A 350 W extremely rugged LDMOS power transistor for broadcast and industrial applications in the HF to 600 MHz band.

Table 1. Application information

Test signal	f (MHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η _D (%)
pulsed RF	108	50	350	28	75
CW	88 to 108	50	388	26	80
pulsed RF	30 to 512	50	400	15	48
CW	30 to 512	35	193	14	47

1.2 Features and benefits

- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 600 MHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

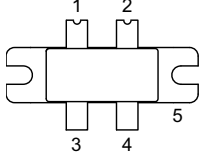
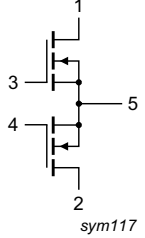
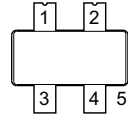
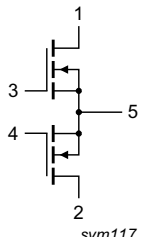
1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications



2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLF183XR (SOT1121A)			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source [1]		
BLF183XRS (SOT1121B)			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF183XR	-	flanged LDMOST ceramic package; 2 mounting holes; 4 leads	SOT1121A
BLF183XRS	-	earless flanged ceramic package; 4 leads	SOT1121B

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		-	135	V
V_{GS}	gate-source voltage		-6	+11	V
T_{stg}	storage temperature		-65	+150	°C
T_j	junction temperature	[1]	-	225	°C

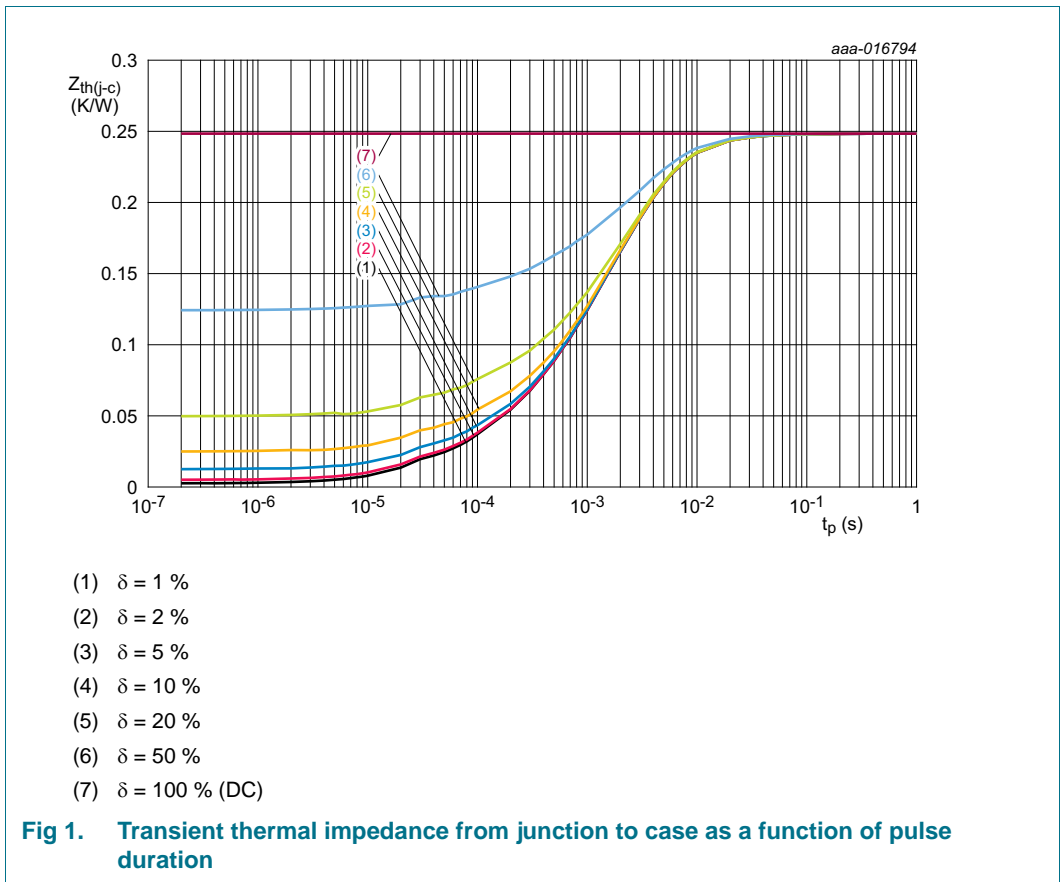
[1] Continuous use at maximum temperature will affect the reliability, for details refer to the on-line MTF calculator.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_j = 115\text{ °C}$ [1][2]	0.25	K/W
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_j = 150\text{ °C}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ %}$ [3]	0.076	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

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	$V_{GS} = 0\text{ V}$; $I_D = 1.5\text{ mA}$	135	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 150\text{ mA}$	1.33	2.0	2.33	V
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 50\text{ V}$; $I_D = 50\text{ mA}$	-	1.9	-	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$	-	-	1.4	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	-	21	-	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 5.25\text{ A}$	-	0.29	-	Ω

Table 7. AC characteristics

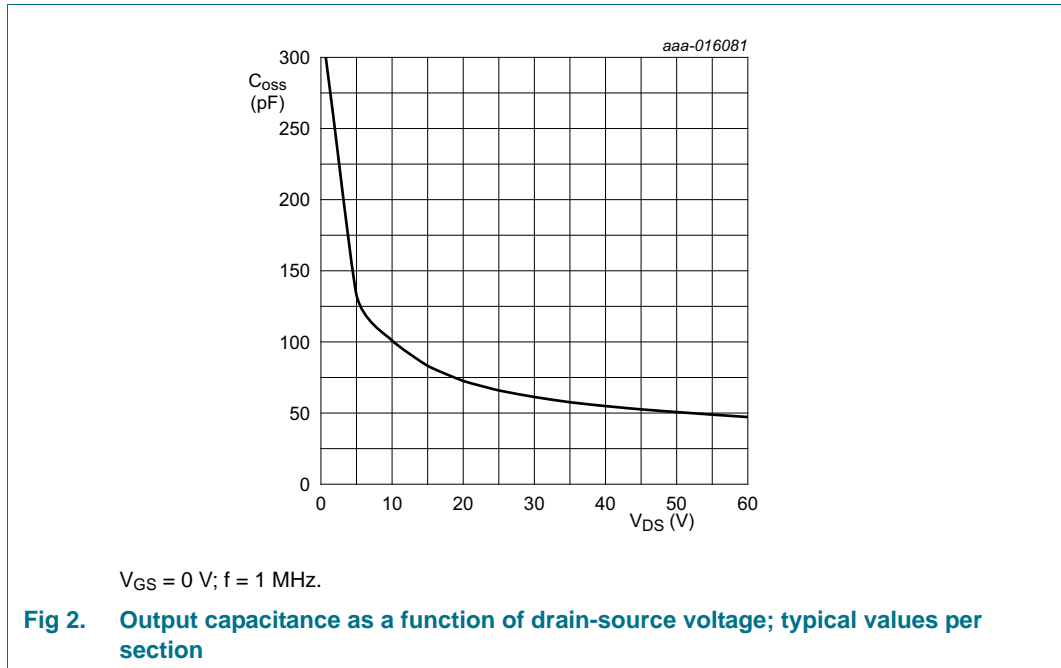
$T_j = 25\text{ }^\circ\text{C}$; per section unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_{rs}	feedback capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $f = 1\text{ MHz}$	-	1.1	-	pF
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $f = 1\text{ MHz}$	-	156	-	pF
C_{oss}	output capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$; $f = 1\text{ MHz}$	-	51	-	pF

Table 8. RF characteristics

Test signal: pulsed RF; $t_p = 100\text{ }\mu\text{s}$; $\delta = 20\%$; $f = 108\text{ MHz}$; RF performance at $V_{DS} = 50\text{ V}$;
 $I_{Dq} = 100\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_L = 350\text{ W}$	26.5	28	-	dB
RL_{in}	input return loss	$P_L = 350\text{ W}$	-	-10	-7	dB
η_D	drain efficiency	$P_L = 350\text{ W}$	71	75	-	%



7. Test information

7.1 Ruggedness in class-AB operation

The BLF183XR and BLF183XRS are capable of withstanding a load mismatch corresponding to $V_{SWR} > 65 : 1$ through all phases under the following conditions: $V_{DS} = 50\text{ V}$; $I_{Dq} = 100\text{ mA}$; $P_L = 350\text{ W}$ pulsed; $f = 108\text{ MHz}$.

7.2 Impedance information

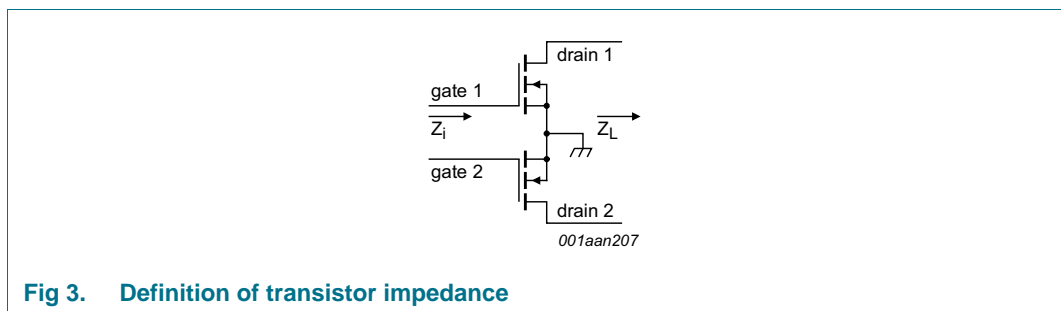


Table 9. Typical push-pull impedance

Simulated Z_i and Z_L device impedance; impedance info at $V_{DS} = 50\text{ V}$ and $P_L = 350\text{ W}$.

f (MHz)	Z_i (Ω)	Z_L (Ω)
108	$10.3 - j35.6$	$10.9 + j2.5$

7.3 UIS avalanche energy

Table 10. Typical avalanche data per section

$T_{amb} = 25\text{ }^{\circ}\text{C}$; typical test data; test jig without water cooling.

I_{AS} (A)	E_{AS} (J)
10	2.6
12.5	1.5
15	1.0

For information see application note AN10273.

7.4 Test circuit

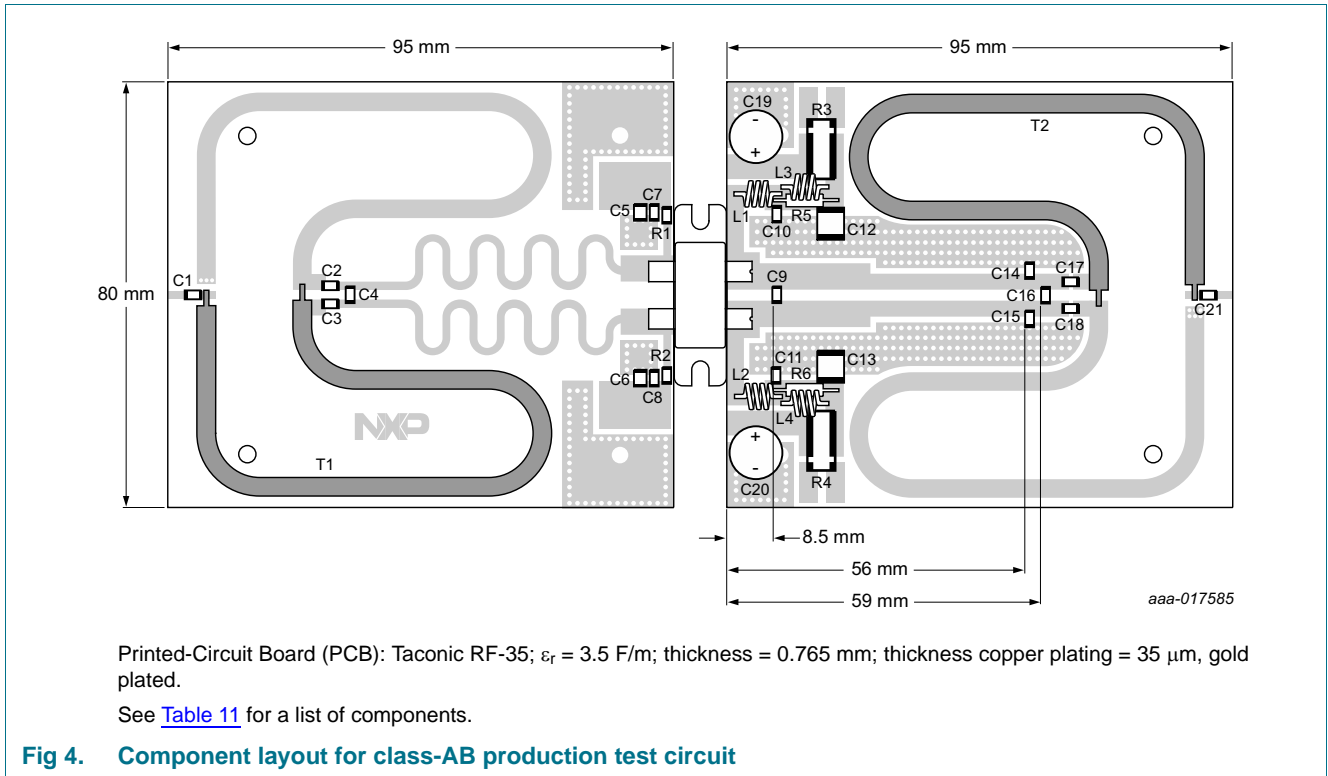


Table 11. List of components

For test circuit see Figure 4.

Component	Description	Value	Remarks
C1, C4	multilayer ceramic chip capacitor	51 pF	[1]
C2, C3	multilayer ceramic chip capacitor	150 pF	[1]
C5, C6	multilayer ceramic chip capacitor	4.7 μF , 50 V	
C7, C8	multilayer ceramic chip capacitor	820 pF	[1]
C9	multilayer ceramic chip capacitor	11 pF	[1]
C10, C11	multilayer ceramic chip capacitor	820 pF	[1]
C12, C13	multilayer ceramic chip capacitor	4.7 μF , 100 V	
C14, C15, C21	electrolytic capacitor	51 pF	[1]

Table 11. List of components ...continued
For test circuit see [Figure 4](#).

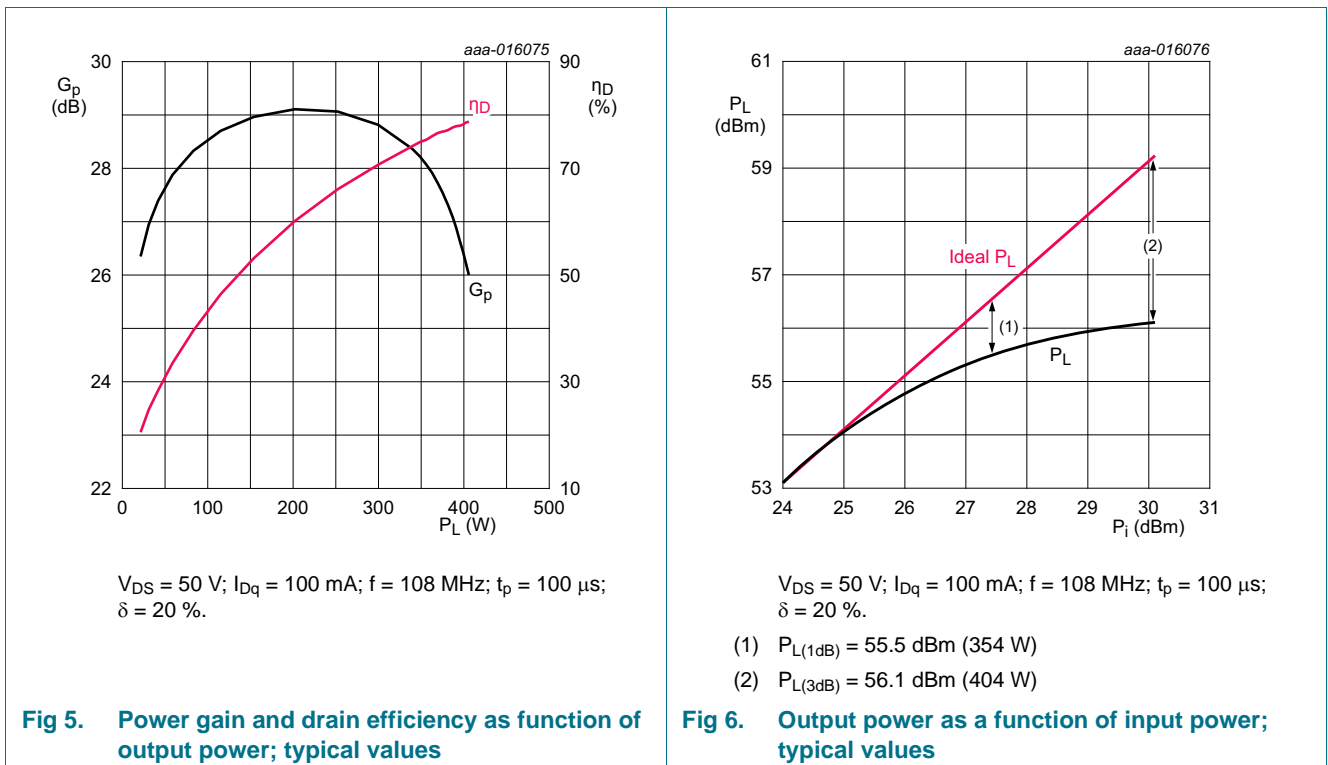
Component	Description	Value	Remarks
C16	multilayer ceramic chip capacitor	7.5 pF [1]	
C17,C18	multilayer ceramic chip capacitor	120 pF [1]	
C19, C20	electrolytic capacitor	2200 μ F, 64 V	
L1, L2, L3, L4	3.0 turn 1.0 mm copper wire	D = 3.0 mm	
R1, R2	resistor	510 Ω	SMD 1206
R3, R4	shunt resistor	0.01 Ω	Ohmite: FC4L110R010FER
R5, R6	metal film resistor	10 Ω , 0.6 W	SMD 1206
T1, T2	semi rigid coax	50 Ω , length = 160 mm	EZ Form: EZ-141-AL-TP-M17

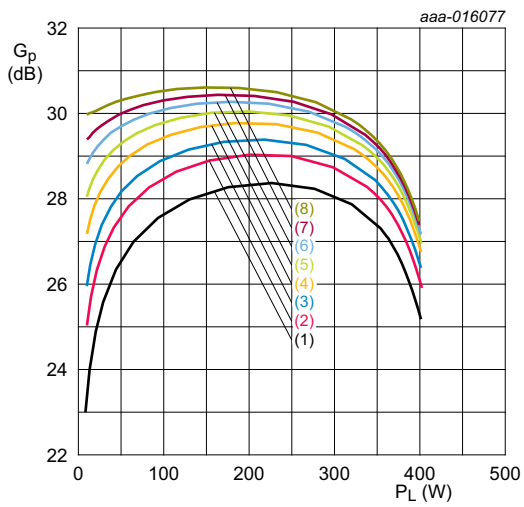
[1] American Technical Ceramics type 100B or capacitor of same quality.

7.5 Graphical data

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

7.5.1 1-Tone CW pulsed

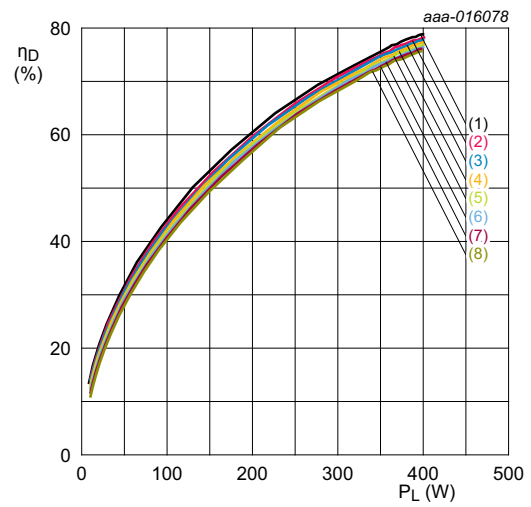




$V_{DS} = 50\text{ V}$; $f = 108\text{ MHz}$; $t_p = 100\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$.

- (1) $I_{Dq} = 20\text{ mA}$
- (2) $I_{Dq} = 100\text{ mA}$
- (3) $I_{Dq} = 200\text{ mA}$
- (4) $I_{Dq} = 400\text{ mA}$
- (5) $I_{Dq} = 600\text{ mA}$
- (6) $I_{Dq} = 800\text{ mA}$
- (7) $I_{Dq} = 1000\text{ mA}$
- (8) $I_{Dq} = 1200\text{ mA}$

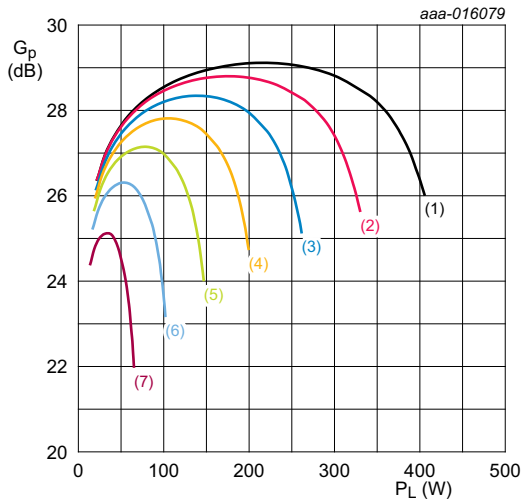
Fig 7. Power gain as a function of output power; typical values



$V_{DS} = 50\text{ V}$; $f = 108\text{ MHz}$; $t_p = 100\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$.

- (1) $I_{Dq} = 20\text{ mA}$
- (2) $I_{Dq} = 100\text{ mA}$
- (3) $I_{Dq} = 200\text{ mA}$
- (4) $I_{Dq} = 400\text{ mA}$
- (5) $I_{Dq} = 600\text{ mA}$
- (6) $I_{Dq} = 800\text{ mA}$
- (7) $I_{Dq} = 1000\text{ mA}$
- (8) $I_{Dq} = 1200\text{ mA}$

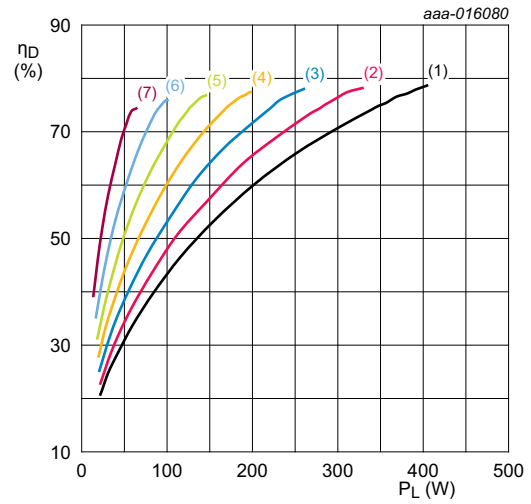
Fig 8. Drain efficiency as a function of output power; typical values



$I_{Dq} = 100 \text{ mA}$; $f = 108 \text{ MHz}$; $t_p = 100 \text{ }\mu\text{s}$; $\delta = 20 \text{ }\%$.

- (1) $V_{DS} = 50 \text{ V}$
- (2) $V_{DS} = 45 \text{ V}$
- (3) $V_{DS} = 40 \text{ V}$
- (4) $V_{DS} = 35 \text{ V}$
- (5) $V_{DS} = 30 \text{ V}$
- (6) $V_{DS} = 25 \text{ V}$
- (7) $V_{DS} = 20 \text{ V}$

Fig 9. Power gain as a function of output power; typical values



$I_{Dq} = 100 \text{ mA}$; $f = 108 \text{ MHz}$; $t_p = 100 \text{ }\mu\text{s}$; $\delta = 20 \text{ }\%$.

- (1) $V_{DS} = 50 \text{ V}$
- (2) $V_{DS} = 45 \text{ V}$
- (3) $V_{DS} = 40 \text{ V}$
- (4) $V_{DS} = 35 \text{ V}$
- (5) $V_{DS} = 30 \text{ V}$
- (6) $V_{DS} = 25 \text{ V}$
- (7) $V_{DS} = 20 \text{ V}$

Fig 10. Drain efficiency as a function of output power; typical values

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 4 leads

SOT1121A

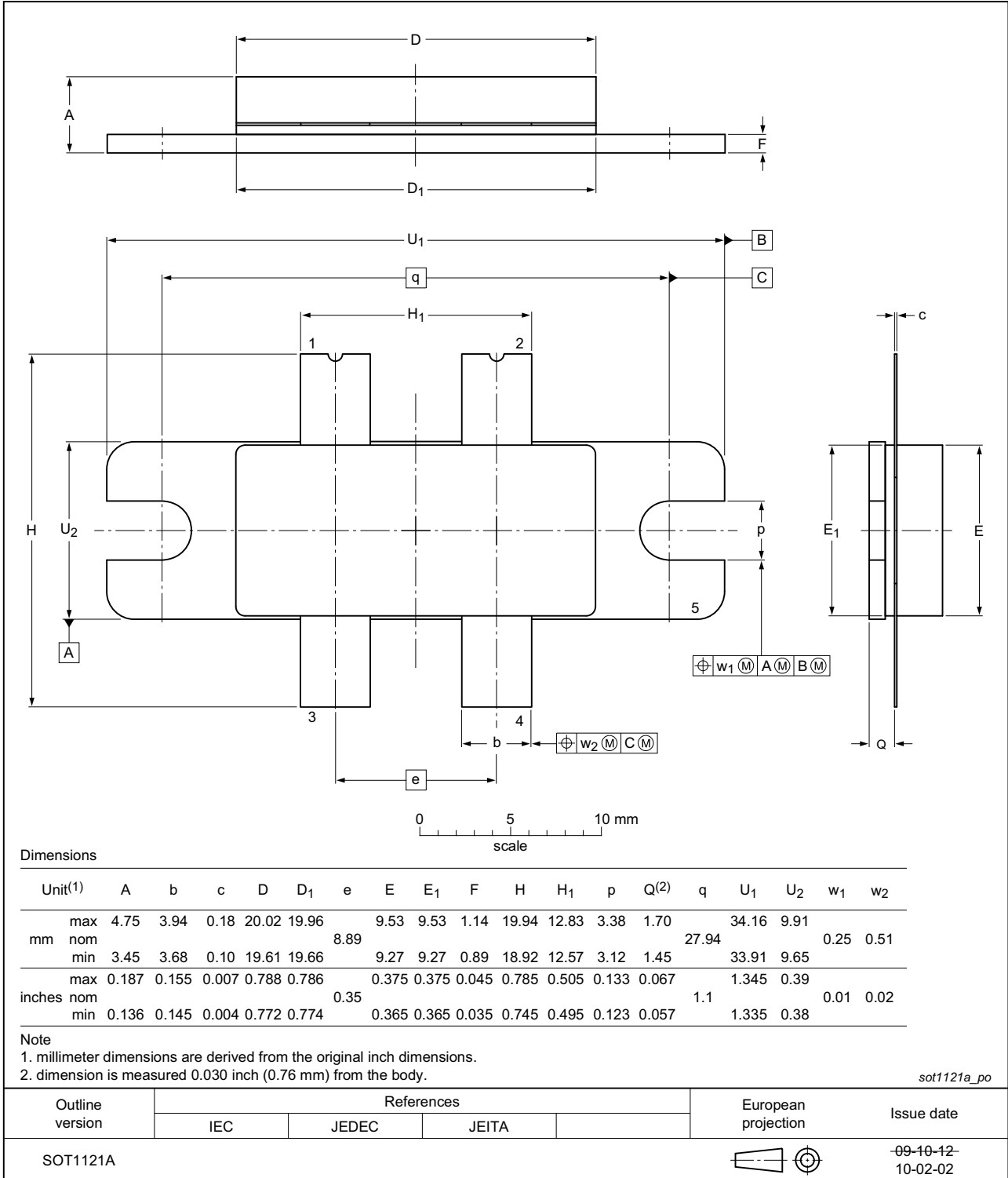


Fig 11. Package outline SOT1121A

Earless flanged ceramic package; 4 leads

SOT1121B

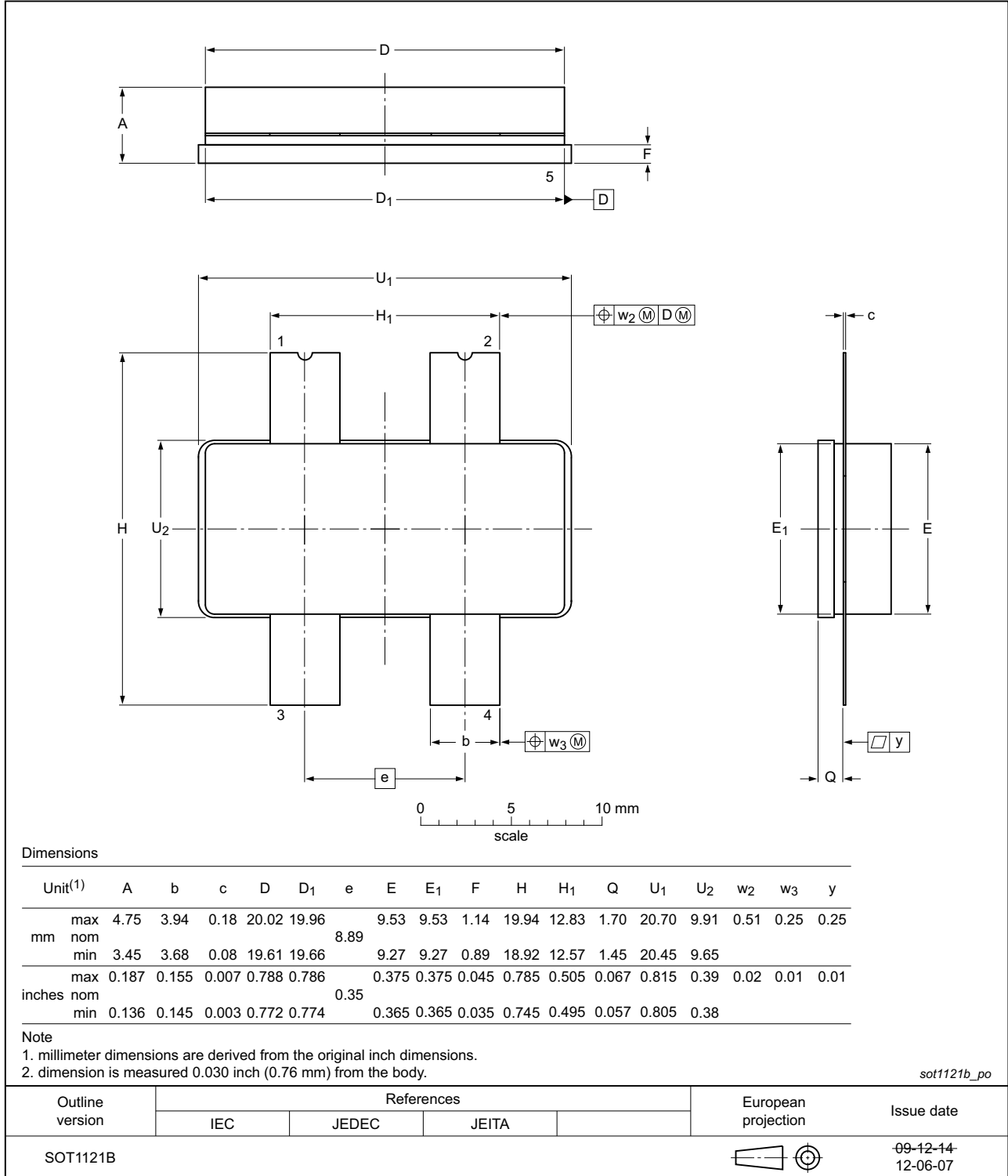


Fig 12. Package outline SOT1121B

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 12. Abbreviations

Acronym	Description
CW	Continuous Wave
ESD	ElectroStatic Discharge
HF	High Frequency
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
MTF	Median Time to Failure
SMD	Surface Mounted Device
UIS	Unclamped Inductive Switching
VSWR	Voltage Standing-Wave Ratio

11. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF183XR_BLF183XRS v.2	20150522	Product data sheet	-	BLF183XR_BLF183XRS v.1
Modifications:	<ul style="list-style-type: none"> • Table 1 on page 1; table updated • Table 5 on page 3; table updated • Table 6 on page 4; table updated • Figure 1 on page 3; figure added • Table 7 on page 4; table updated • Table 8 on page 4; table updated • Figure 2 on page 5; figure added • Table 10 on page 6; table updated • Section 7.4 on page 6; section added • Section 7.5 on page 7; section added 			
BLF183XR_BLF183XRS v.1	20140819	Objective data sheet	-	-

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12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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