

# BLF884P; BLF884PS

UHF power LDMOS transistor

Rev. 2 — 16 December 2011

Product data sheet

## 1. Product profile

### 1.1 General description

A 350 W LDMOS RF power transistor for broadcast transmitter applications and industrial applications. The excellent ruggedness of this device makes it ideal for digital and analog transmitter applications.

**Table 1. Application information**

RF performance at  $V_{DS} = 50$  V unless otherwise specified.

Mode of operation	f (MHz)	$P_{L(AV)}$ (W)	$P_{L(M)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	IMD3 (dBc)	IMD <sub>shldr</sub> (dBc)	PAR (dB)
<b>RF performance in a common source 860 MHz narrowband test circuit</b>								
2-tone, class-AB	$f_1 = 860$ ; $f_2 = 860.1$	150	-	21	46	-32	-	-
DVB-T (8k OFDM)	858	70	-	21	33	-	-31 [1]	8.2 [2]
<b>RF performance in a common source 470 MHz to 860 MHz broadband test circuit</b>								
DVB-T (8k OFDM)	858	70	-	20	32	-	-32 [1]	8.0 [2]

[1] Measured [dBc] with delta marker at 4.3 MHz from center frequency.

[2] PAR (of output signal) at 0.01 % probability on CCDF; PAR of input signal = 9.5 dB at 0.01 % probability on CCDF.

### 1.2 Features and benefits

- Excellent ruggedness
- Optimum thermal behavior and reliability,  $R_{th(j-c)} = 0.22$  K/W
- High power gain
- High efficiency
- Designed for broadband operation (470 MHz to 860 MHz)
- Internal input matching for high gain and optimum broadband operation
- Excellent reliability
- Easy power control
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

### 1.3 Applications

- Communication transmitter applications in the UHF band
- Industrial applications in the UHF band



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLF884P (SOT1121A)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
<b>BLF884PS (SOT1121B)</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	
BLF884P	-	flanged LDMOST ceramic package; 2 mounting holes; 4 leads	SOT1121A
BLF884PS	-	earless flanged LDMOST 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		-	104	V
$V_{GS}$	gate-source voltage		-0.5	+11	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_{L(AV)} = 70\text{ W}$	[1] 0.22	K/W

[1]  $R_{th(j-c)}$  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	$V_{GS} = 0\text{ V}; I_D = 1.2\text{ mA}$	[1] 104	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 120\text{ mA}$	[1] 1.4	1.9	2.4	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	19	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 10\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 4.25\text{ A}$	[1] -	240	-	$\text{m}\Omega$
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$	[2] -	105	-	pF
$C_{oss}$	output capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$	-	34	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$	-	0.7	-	pF

[1]  $I_D$  is the drain current.

[2] Capacitance values without internal matching.

**Table 7. RF characteristics**

RF characteristics in NXP production narrowband test circuit;  $T_{case} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>2-Tone, class-AB</b>						
$V_{DS}$	drain-source voltage		-	50	-	V
$I_{Dq}$	quiescent drain current		[1] -	0.65	-	A
$P_{L(AV)}$	average output power	$f_1 = 860\text{ MHz}; f_2 = 860.1\text{ MHz}$	150	-	-	W
$G_p$	power gain	$f_1 = 860\text{ MHz}; f_2 = 860.1\text{ MHz}$	20	21	-	dB
$\eta_D$	drain efficiency	$f_1 = 860\text{ MHz}; f_2 = 860.1\text{ MHz}$	42	46	-	%
IMD3	third-order intermodulation distortion	$f_1 = 860\text{ MHz}; f_2 = 860.1\text{ MHz}$	-	-32	-28	dBc

**Table 7. RF characteristics ...continued**

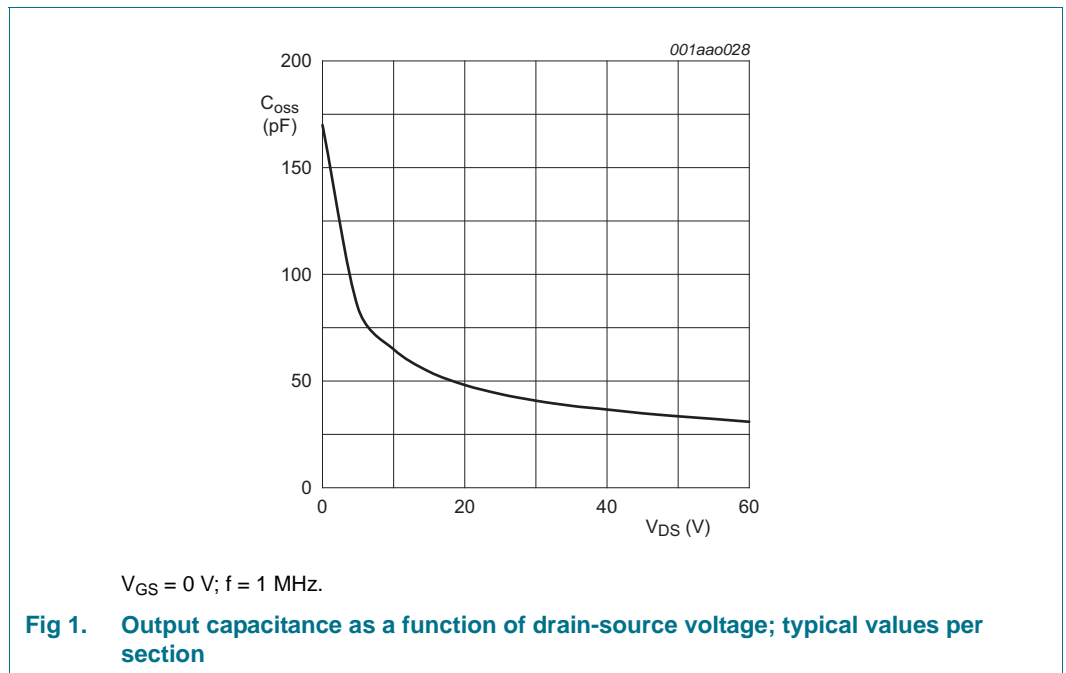
RF characteristics in NXP production narrowband test circuit;  $T_{case} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>DVB-T (8k OFDM), class-AB</b>							
$V_{DS}$	drain-source voltage		-	50	-	V	
$I_{Dq}$	quiescent drain current		[1]	-	0.65	A	
$P_{L(AV)}$	average output power	$f = 858\text{ MHz}$	70	-	-	W	
$G_p$	power gain	$f = 858\text{ MHz}$	20	21	-	dB	
$\eta_D$	drain efficiency	$f = 858\text{ MHz}$	30	33	-	%	
$IMD_{shldr}$	intermodulation distortion shoulder	$f = 858\text{ MHz}$	[2]	-	-31	-27	dBc
PAR	peak-to-average ratio	$f = 858\text{ MHz}$	[3]	-	8.2	-	dB

[1]  $I_{dq}$  for total device

[2] Measured [dBc] with delta marker at 4.3 MHz from center frequency.

[3] PAR (of output signal) at 0.01 % probability on CCDF; PAR of input signal = 9.5 dB at 0.01 % probability on CCDF.



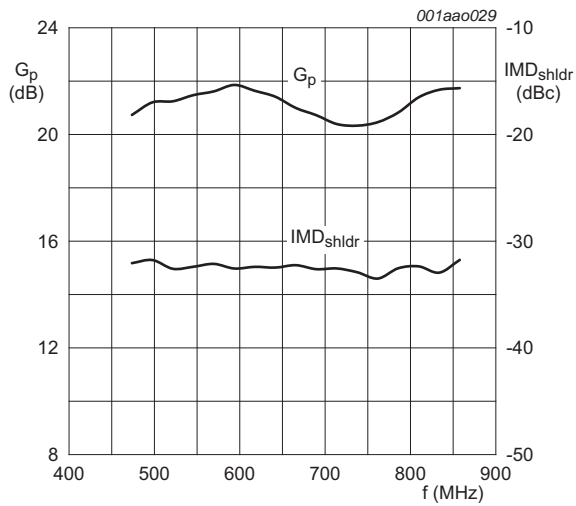
### 6.1 Ruggedness in class-AB operation

The BLF884P and BLF884PS are capable of withstanding a load mismatch corresponding to VSWR of  $\geq 40 : 1$  through all phases under the following conditions:  $V_{DS} = 50\text{ V}; f = 860\text{ MHz}$  at rated power.

## 7. Application information

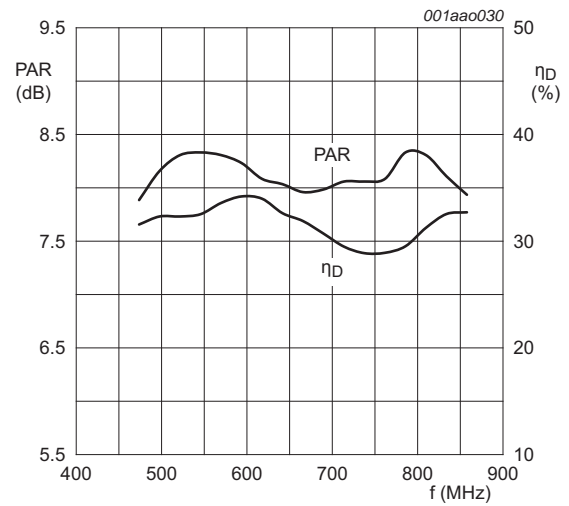
### 7.1 Broadband RF figures

#### 7.1.1 DVB-T



$P_{L(AV)} = 70\text{ W}$ ;  $V_{DS} = 50\text{ V}$ ;  $I_{DQ} = 0.65\text{ A}$ ; measured in a common source broadband test circuit as described in [Section 8](#).

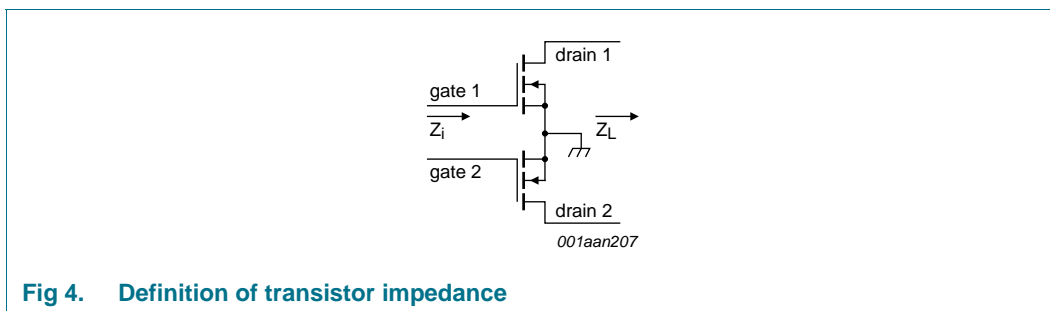
**Fig 2. DVB-T power gain and intermodulation distortion shoulder as function of frequency; typical values**



$P_{L(AV)} = 70\text{ W}$ ;  $V_{DS} = 50\text{ V}$ ;  $I_{DQ} = 0.65\text{ A}$ ; measured in a common source broadband test circuit as described in [Section 8](#).

**Fig 3. DVB-T peak-to-average ratio and drain efficiency as function of frequency; typical values**

**7.2 Impedance information**



**Fig 4. Definition of transistor impedance**

**Table 8. Typical push-pull impedance**

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 50\text{ V}$  and  $P_{L(AV)} = 70\text{ W}$  (DVB-T).

<b>f</b> <b>MHz</b>	<b><math>Z_i</math></b> <b><math>\Omega</math></b>	<b><math>Z_L</math></b> <b><math>\Omega</math></b>
300	0.984 – j3.485	8.315 + j1.246
325	1.009 – j2.805	8.236 + j1.328
350	1.038 – j2.185	8.153 + j1.406
375	1.071 – j1.614	8.066 + j1.479
400	1.107 – j1.080	7.975 + j1.547
425	1.147 – j0.574	7.880 + j1.610
450	1.193 – j0.092	7.782 + j1.667
475	1.243 + j0.373	7.682 + j1.720
500	1.300 + j0.826	7.579 + j1.767
525	1.364 + j1.270	7.474 + j1.809
550	1.436 + j1.708	7.367 + j1.846
575	1.517 + j2.144	7.258 + j1.877
600	1.609 + j2.581	7.149 + j1.903
625	1.714 + j3.022	7.038 + j1.925
650	1.834 + j3.469	6.927 + j1.941
675	1.971 + j3.925	6.815 + j1.952
700	2.129 + j4.394	6.703 + j1.958
725	2.313 + j4.879	6.591 + j1.960
750	2.528 + j5.382	6.480 + j1.956
775	2.781 + j5.907	6.368 + j1.949
800	3.081 + j6.458	6.258 + j1.937
825	3.441 + j7.038	6.148 + j1.921
850	3.875 + j7.648	6.040 + j1.901
875	4.404 + j8.291	5.932 + j1.877
900	5.057 + j8.964	5.825 + j1.849
925	5.870 + j9.659	5.720 + j1.818
950	6.892 + j10.358	5.616 + j1.783
975	8.186 + j11.019	5.514 + j1.745
1000	9.829 + j11.566	5.413 + j1.704

## 8. Test information

**Table 9. List of components**

For test circuit, see [Figure 5](#) and [Figure 6](#).

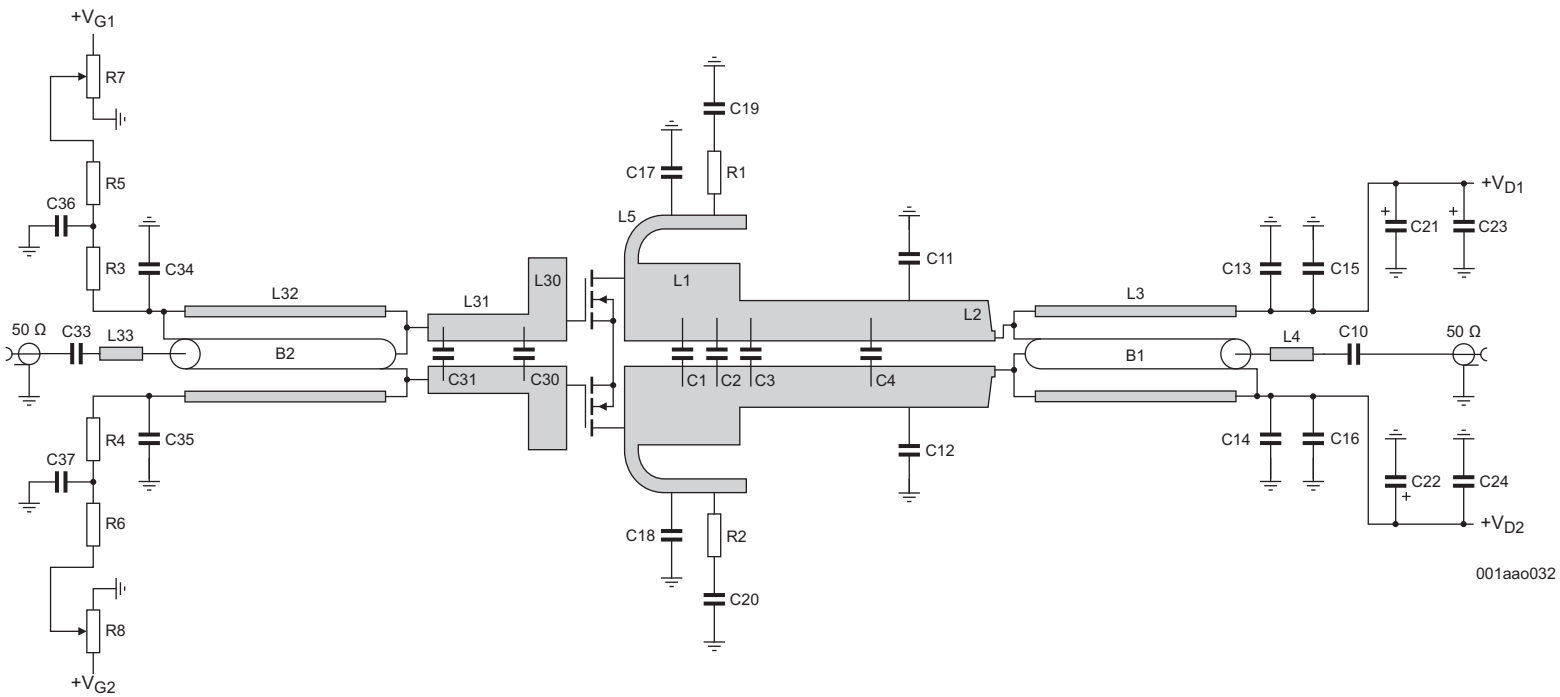
Component	Description	Value	Remarks
B1, B2	semi rigid coax	25 $\Omega$ ; 49.5 mm	UT-090C-25 (EZ 90-25)
C1, C2	multilayer ceramic chip capacitor	5.1 pF	[1]
C3	multilayer ceramic chip capacitor	6.8 pF	[1]
C4	multilayer ceramic chip capacitor	8.2 pF	[1]
C10, C13, C14	multilayer ceramic chip capacitor	100 pF	[2]
C11, C12	multilayer ceramic chip capacitor	10 pF	[1]
C15, C16	multilayer ceramic chip capacitor	4.7 $\mu$ F, 50 V	Kemet C1210X475K5RAC-TU or capacitor of same quality.
C17, C18, C23, C24	multilayer ceramic chip capacitor	100 pF	[1]
C19, C20	multilayer ceramic chip capacitor	10 $\mu$ F, 50 V	TDK C570X7R1H106KT000N or capacitor of same quality.
C21, C22	electrolytic capacitor	470 $\mu$ F; 63 V	
C30	multilayer ceramic chip capacitor	13 pF	[3]
C31	multilayer ceramic chip capacitor	2.2 pF	[3]
C33, C34, C35	multilayer ceramic chip capacitor	100 pF	[3]
C36, C37	multilayer ceramic chip capacitor	4.7 $\mu$ F, 50 V	TDK C4532X7R1E475MT020U or capacitor of same quality.
L1	microstrip	-	[4] (W $\times$ L) 15 mm $\times$ 13 mm
L2	microstrip	-	[4] (W $\times$ L) 5 mm $\times$ 26 mm
L3, L32	microstrip	-	[4] (W $\times$ L) 2 mm $\times$ 49.5 mm
L4	microstrip	-	[4] (W $\times$ L) 1.7 mm $\times$ 3.5 mm
L5	microstrip	-	[4] (W $\times$ L) 2 mm $\times$ 9.5 mm
L30	microstrip	-	[4] (W $\times$ L) 5 mm $\times$ 13 mm
L31	microstrip	-	[4] (W $\times$ L) 2 mm $\times$ 11 mm
L33	microstrip	-	[4] (W $\times$ L) 2 mm $\times$ 3 mm
R1, R2	wire resistor	10 $\Omega$	
R3, R4	SMD resistor	5.6 $\Omega$	0805
R5, R6	wire resistor	100 $\Omega$	
R7, R8	potentiometer	10 k $\Omega$	

[1] American technical ceramics type 800B or capacitor of same quality.

[2] American technical ceramics type 180R or capacitor of same quality.

[3] American technical ceramics type 100A or capacitor of same quality.

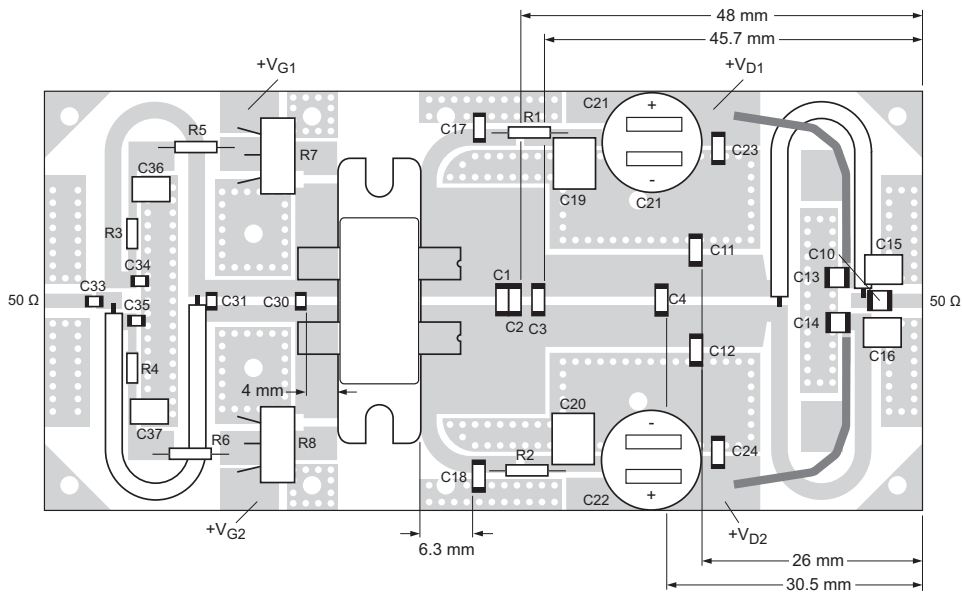
[4] Printed-Circuit Board (PCB): Taconic RF35;  $\epsilon_r = 3.5$  F/m; height = 0.762 mm; Cu (top/bottom metallization); thickness copper plating = 35  $\mu$ m.



See [Table 9](#) for a list of components.

**Fig 5. Class-AB common source broadband amplifier**





aaa-001709

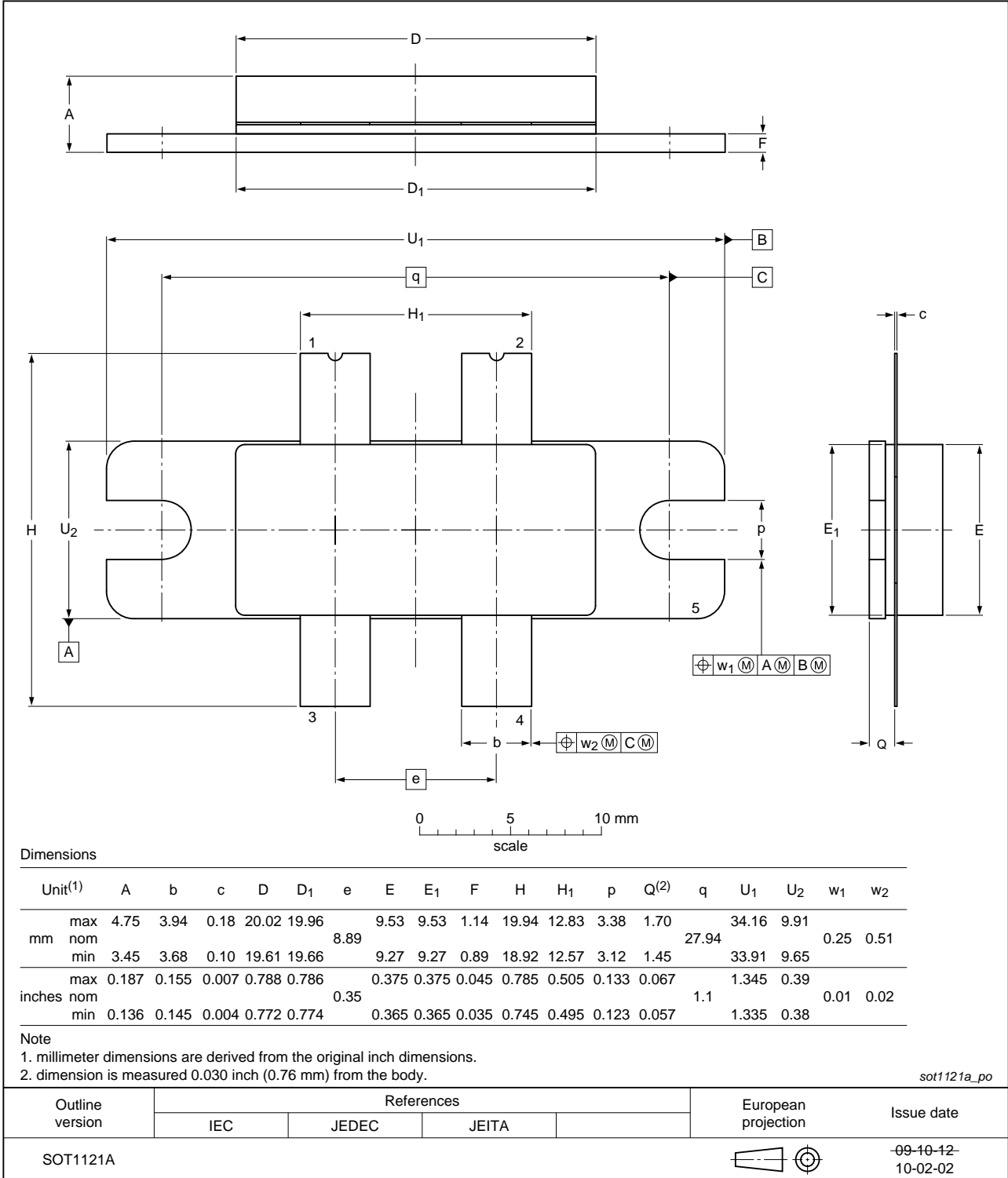
See [Table 9](#) for a list of components.

**Fig 6. Component layout for class-AB common source amplifier**

**9. Package outline**

Flanged LDMOST ceramic package; 2 mounting holes; 4 leads

SOT1121A



**Fig 7. Package outline SOT1121A**

Earless flanged LDMOST ceramic package; 4 leads

SOT1121B

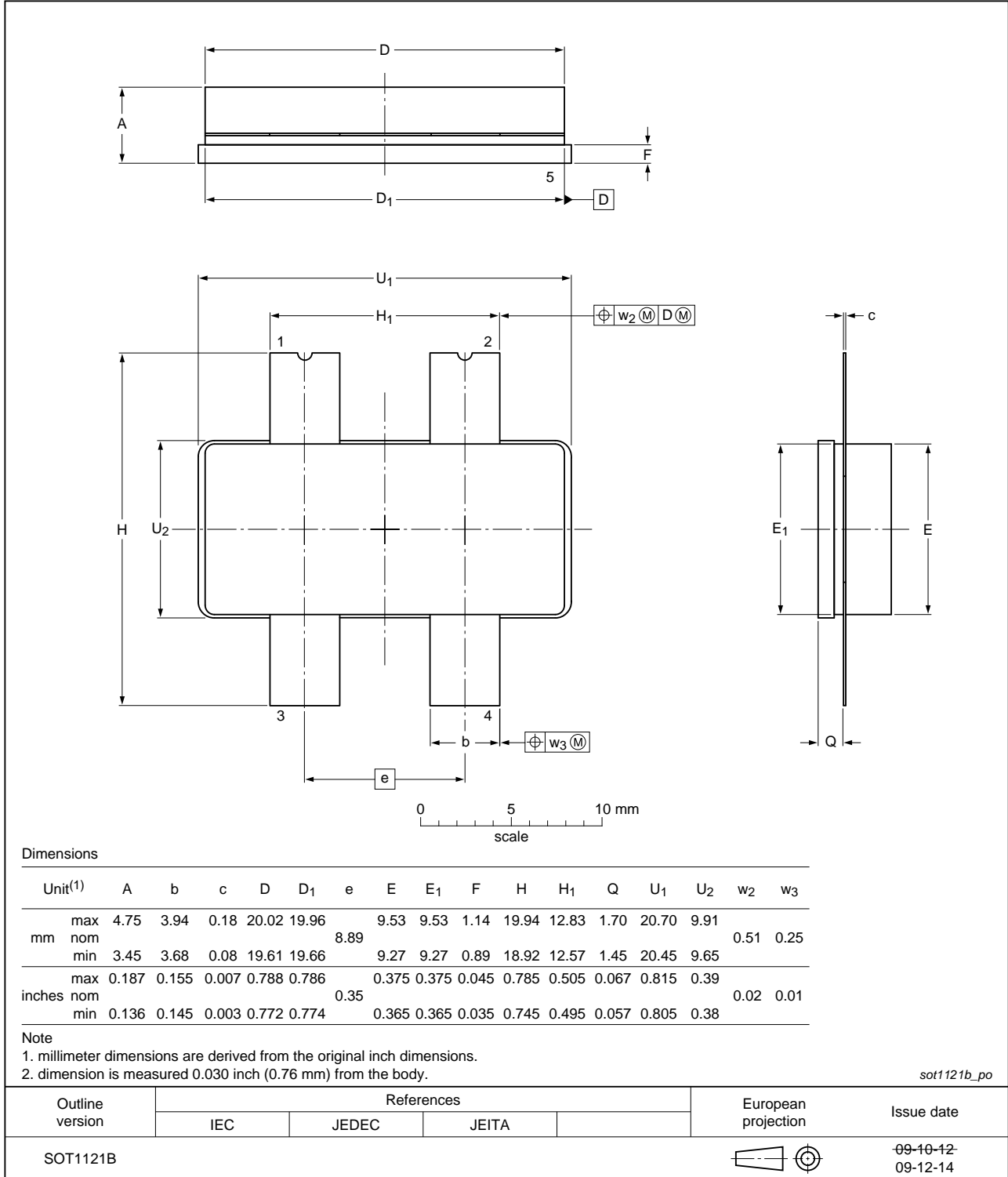


Fig 8. Package outline SOT1121B

## 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
CCDF	Complementary Cumulative Distribution Function
DVB	Digital Video Broadcast
DVB-T	Digital Video Broadcast - Terrestrial
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
OFDM	Orthogonal Frequency Division Multiplexing
PAR	Peak-to-Average power Ratio
RF	Radio Frequency
SMD	Surface Mounted Device
UHF	Ultra High Frequency
VSWR	Voltage Standing-Wave Ratio

## 12. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF884P_BLF884PS v.2	20111216	Product data sheet	-	BLF884P_BLF884PS v.1
Modifications:		<ul style="list-style-type: none"> <li>• <a href="#">Table Table 1. on page 1</a>: Has been updated</li> <li>• <a href="#">Table Table 7. on page 3</a>: Has been updated</li> <li>• Removed section "Reliability"</li> </ul>		
BLF884P_BLF884PS v.1	20111013	Objective data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

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.

[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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### ICs with DVB-T or DVB-T2 functionality

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