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)	η_D (%)	IMD3 (dBc)	IMD_{shldr} (dBc)	PAR (dB)
RF performance in a common source 860 MHz narrowband test circuit								
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]
RF performance in a common source 470 MHz to 860 MHz broadband test circuit								
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

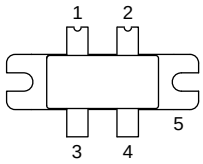
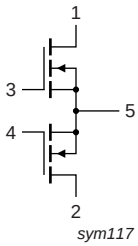
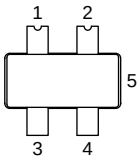
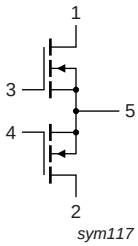
- Excellent ruggedness
- Optimum thermal behavior and reliability, $R_{th(j-c)}$ = 0.22 K/W
- High power gain
- High efficiency
- Designed for broadband operation (470 MHz to 860 MHz)
- Internal input matching for high gain and optimum broadband operation
- Excellent reliability
- Easy power control
- 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
BLF884P (SOT1121A)				
1	drain1			
2	drain2			
3	gate1			
4	gate2			
5	source	[1]		
BLF884PS (SOT1121B)				
1	drain1			
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
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 °C; $P_{L(AV)}$ = 70 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 °C; per section unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.2 mA	[1]	104	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 120 mA	[1]	1.4	1.9	2.4	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 50 V		-	-	1.4	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V		-	19	-	A
I_{GSS}	gate leakage current	V_{GS} = 10 V; V_{DS} = 0 V		-	-	140	nA
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 4.25 A	[1]	-	240	-	mΩ
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 MHz	[2]	-	105	-	pF
C_{oss}	output capacitance	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 MHz		-	34	-	pF
C_{rss}	reverse transfer capacitance	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 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 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
2-Tone, class-AB							
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 MHz; f_2 = 860.1 MHz		150	-	-	W
G_p	power gain	f_1 = 860 MHz; f_2 = 860.1 MHz		20	21	-	dB
η_D	drain efficiency	f_1 = 860 MHz; f_2 = 860.1 MHz		42	46	-	%
IMD3	third-order intermodulation distortion	f_1 = 860 MHz; f_2 = 860.1 MHz		-	−32	−28	dBc

Table 7. RF characteristics *...continued*

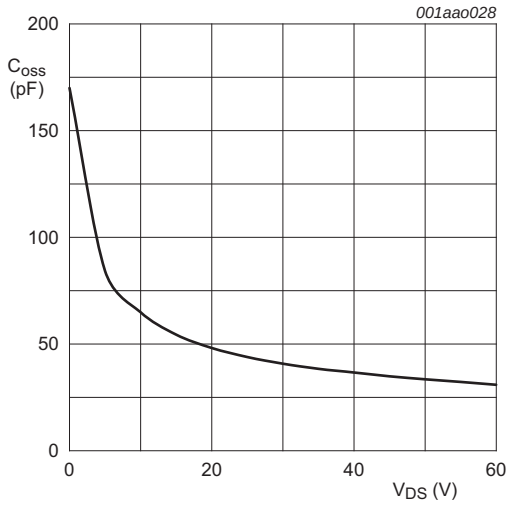
RF characteristics in NXP production narrowband test circuit; T_{case} = 25 °C unless otherwise specified.

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



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

Fig 1. Output capacitance as a function of drain-source voltage; typical values per section

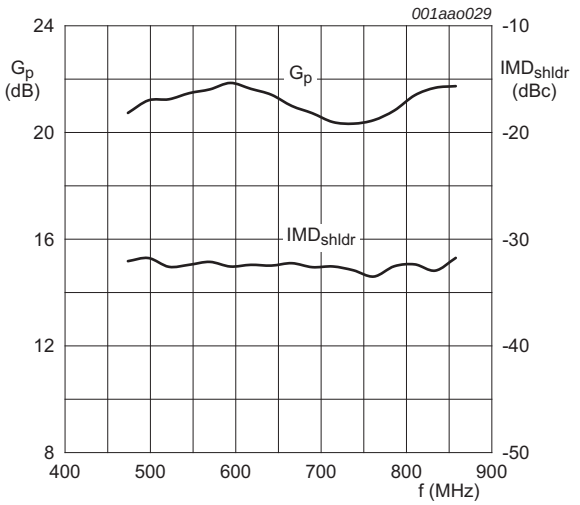
6.1 Ruggedness in class-AB operation

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

7. Application information

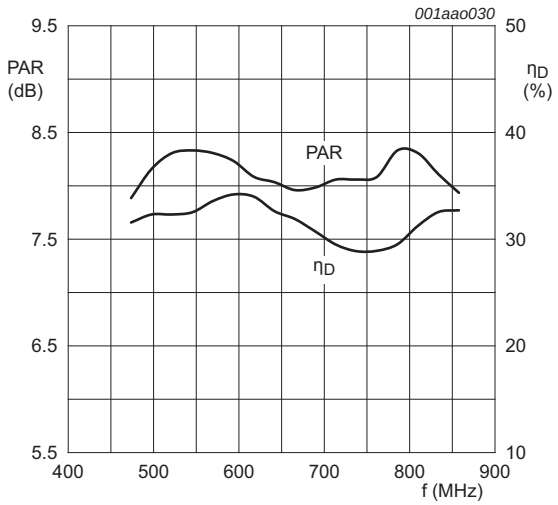
7.1 Broadband RF figures

7.1.1 DVB-T



$P_{L(AV)}$ = 70 W; V_{DS} = 50 V; I_{Dq} = 0.65 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 W; V_{DS} = 50 V; I_{Dq} = 0.65 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

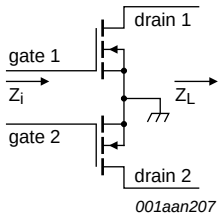


Fig 4. Definition of transistor impedance

Table 8. Typical push-pull impedance

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

f	Z_i	Z_L
MHz	Ω	Ω
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.

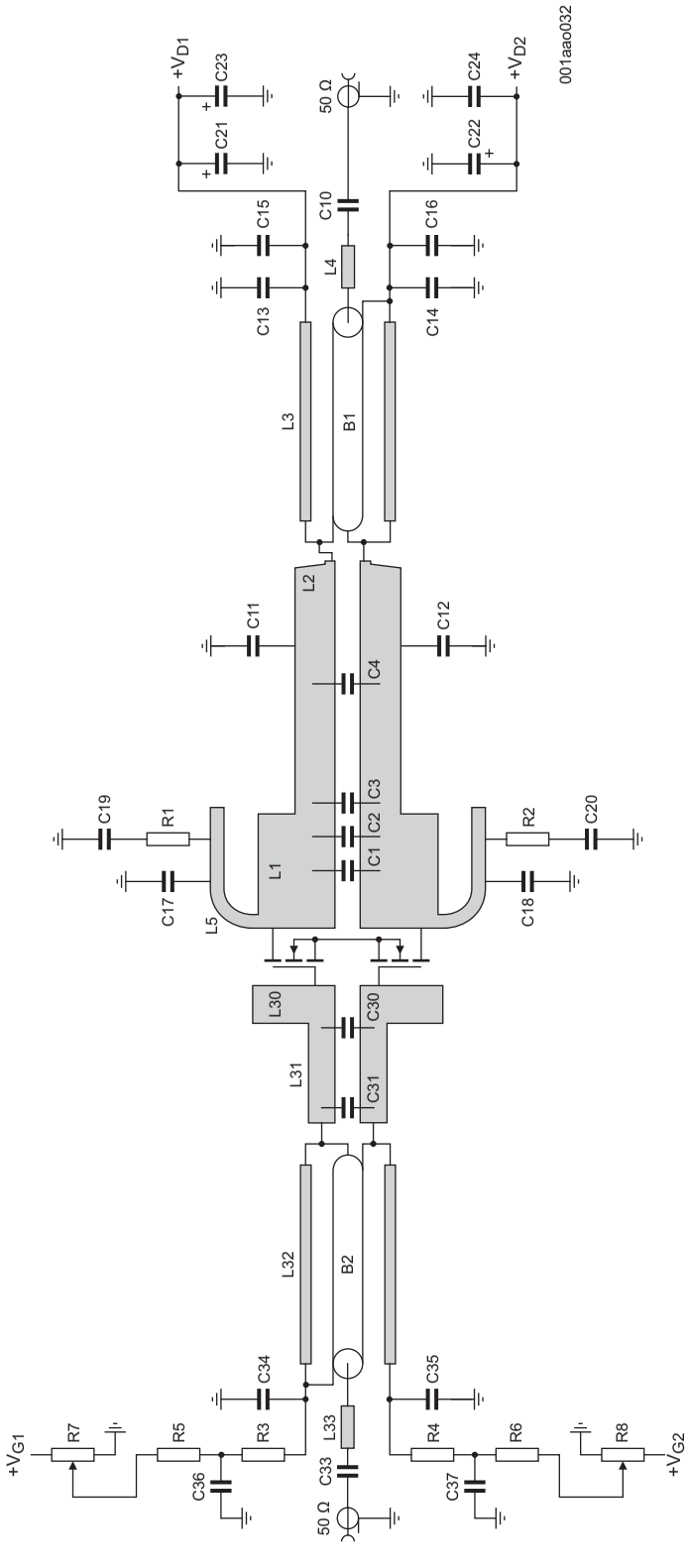
Component	Description	Value		Remarks
B1, B2	semi rigid coax	25 Ω; 49.5 mm		UT-090C-25 (EZ 90-25)
C1, C2	multilayer ceramic chip capacitor	5.1 pF	[1]	
C3	multilayer ceramic chip capacitor	6.8 pF	[1]	
C4	multilayer ceramic chip capacitor	8.2 pF	[1]	
C10, C13, C14	multilayer ceramic chip capacitor	100 pF	[2]	
C11, C12	multilayer ceramic chip capacitor	10 pF	[1]	
C15, C16	multilayer ceramic chip capacitor	4.7 μF, 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 μF, 50 V		TDK C570X7R1H106KT000N or capacitor of same quality.
C21, C22	electrolytic capacitor	470 μF; 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 μF, 50 V		TDK C4532X7R1E475MT020U or capacitor of same quality.
L1	microstrip	-	[4]	(W × L) 15 mm × 13 mm
L2	microstrip	-	[4]	(W × L) 5 mm × 26 mm
L3, L32	microstrip	-	[4]	(W × L) 2 mm × 49.5 mm
L4	microstrip	-	[4]	(W × L) 1.7 mm × 3.5 mm
L5	microstrip	-	[4]	(W × L) 2 mm × 9.5 mm
L30	microstrip	-	[4]	(W × L) 5 mm × 13 mm
L31	microstrip	-	[4]	(W × L) 2 mm × 11 mm
L33	microstrip	-	[4]	(W × L) 2 mm × 3 mm
R1, R2	wire resistor	10 Ω		
R3, R4	SMD resistor	5.6 Ω		0805
R5, R6	wire resistor	100 Ω		
R7, R8	potentiometer	10 kΩ		

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

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

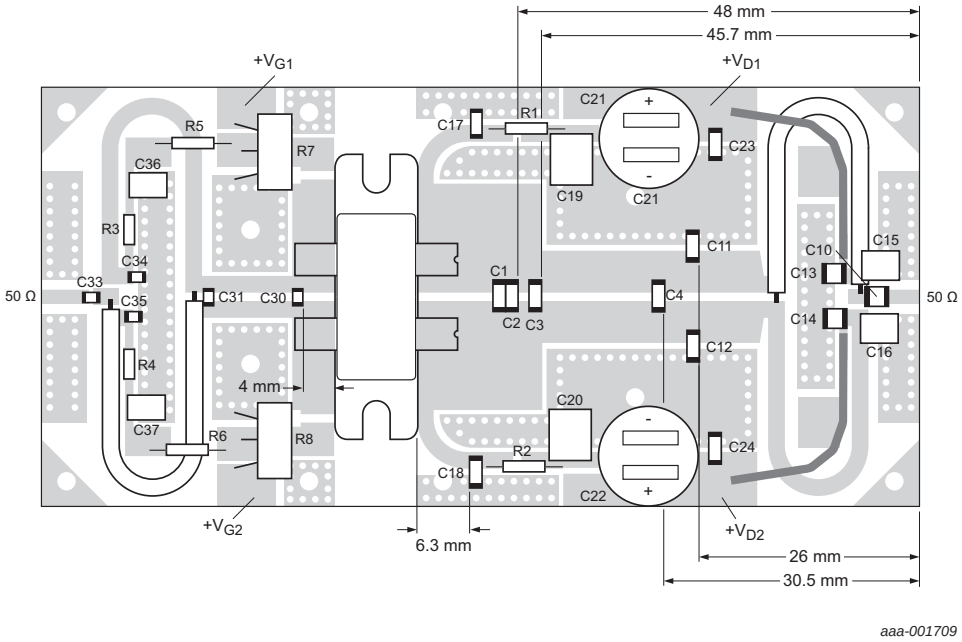
[3] American technical ceramics type 100A or capacitor of same quality.

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



See Table 9 for a list of components.

Fig 5. Class-AB common source broadband amplifier

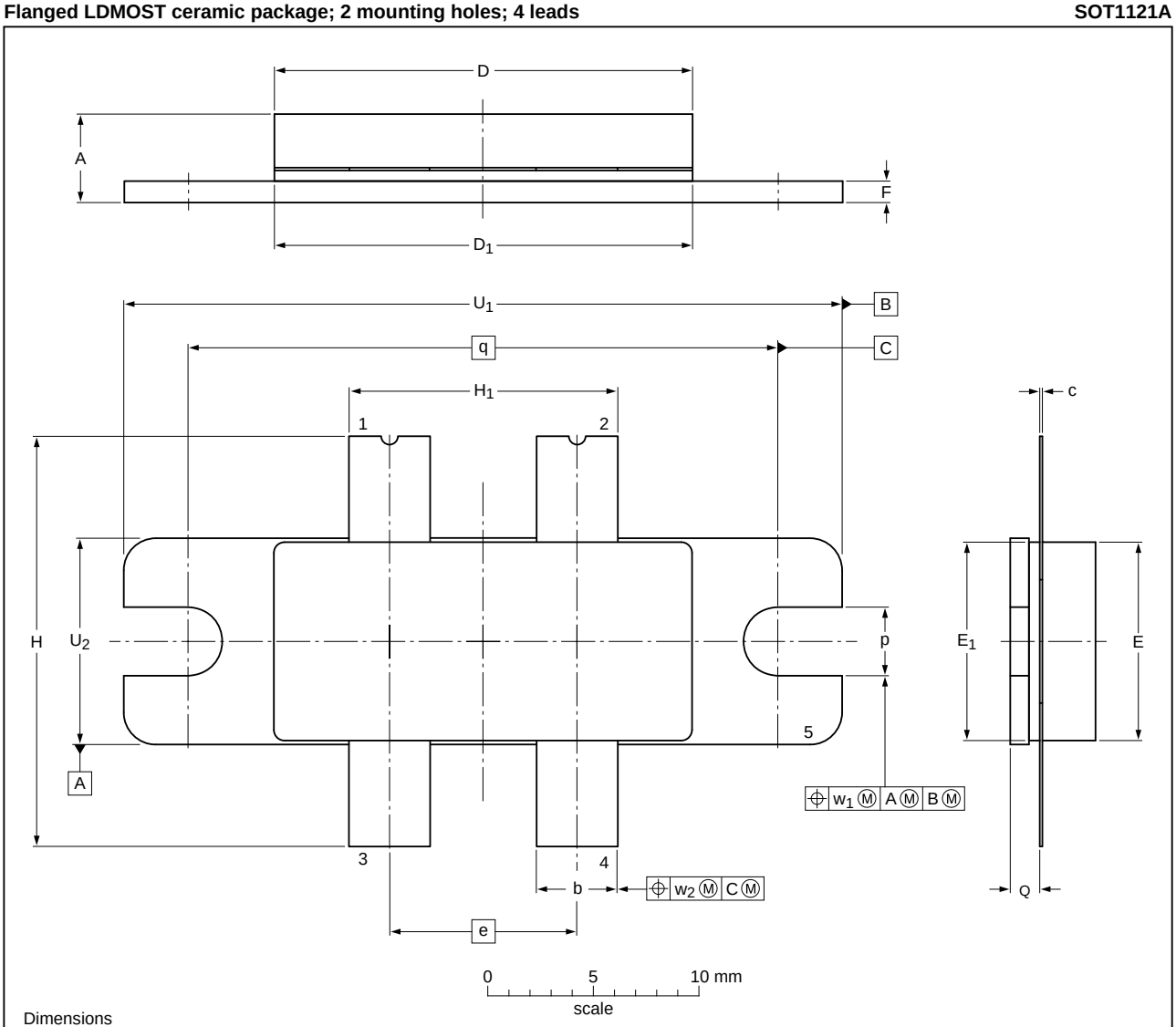


See Table 9 for a list of components.

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

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 4 leads **SOT1121A**



Dimensions

Unit[1]		A	b	c	D	D1	e	E	E1	F	H	H1	p	Q[2]	q	U1	U2	w1	w2
mm	max	4.75	3.94	0.18	20.02	19.96		9.53	9.53	1.14	19.94	12.83	3.38	1.70		34.16	9.91		
	nom						8.89								27.94			0.25	0.51
	min	3.45	3.68	0.10	19.61	19.66		9.27	9.27	0.89	18.92	12.57	3.12	1.45		33.91	9.65		
inches	max	0.187	0.155	0.007	0.788	0.786		0.375	0.375	0.045	0.785	0.505	0.133	0.067		1.345	0.39		
	nom						0.35								1.1			0.01	0.02
	min	0.136	0.145	0.004	0.772	0.774		0.365	0.365	0.035	0.745	0.495	0.123	0.057		1.335	0.38		

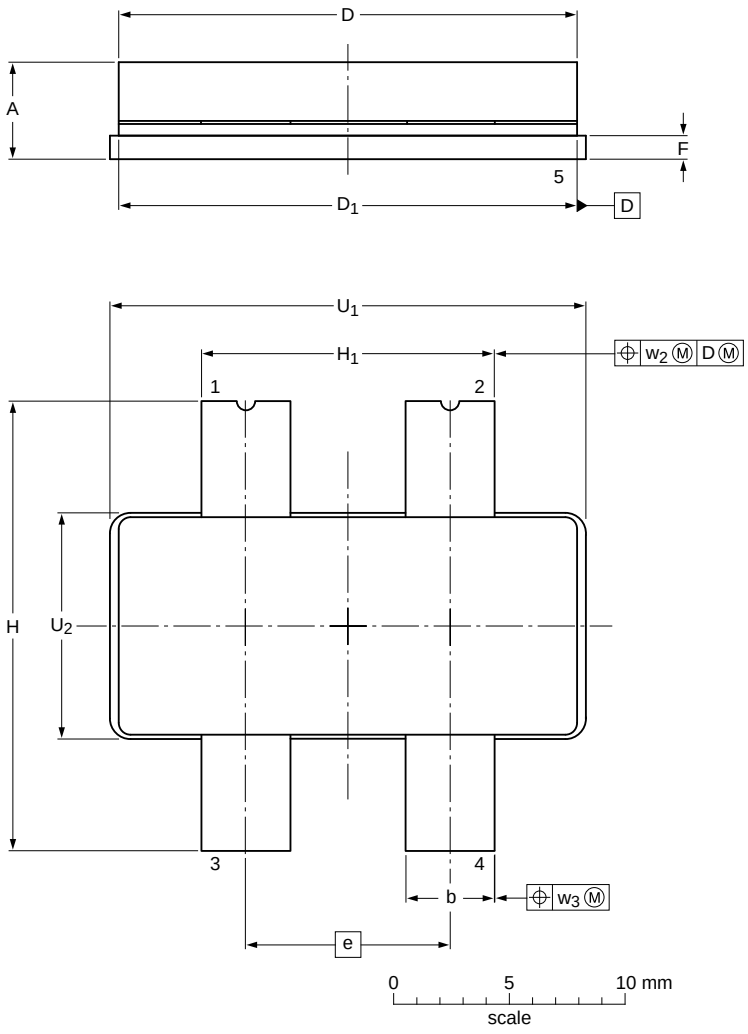
Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

sot1121a_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1121A						~~09-10-12~~ 10-02-02

Fig 7. Package outline SOT1121A

Earless flanged LDMOST ceramic package; 4 leads **SOT1121B**



Dimensions

Unit[1]		A	b	c	D	D_1	e	E	E_1	F	H	H_1	Q	U_1	U_2	w_2	w_3
mm	max	4.75	3.94	0.18	20.02	19.96		9.53	9.53	1.14	19.94	12.83	1.70	20.70	9.91		
	nom						8.89									0.51	0.25
	min	3.45	3.68	0.08	19.61	19.66		9.27	9.27	0.89	18.92	12.57	1.45	20.45	9.65		
inches	max	0.187	0.155	0.007	0.788	0.786		0.375	0.375	0.045	0.785	0.505	0.067	0.815	0.39		
	nom						0.35									0.02	0.01
	min	0.136	0.145	0.003	0.772	0.774		0.365	0.365	0.035	0.745	0.495	0.057	0.805	0.38		

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

sot1121b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1121B						~~09-10-12~~ 09-12-14

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:	• Table Table 1. on page 1: Has been updated • Table Table 7. on page 3: Has been updated • Removed section “Reliability”			
BLF884P_BLF884PS v.1	20111013	Objective data sheet	-	-

13. Legal information

13.1 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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Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

13.4 Licenses

ICs with DVB-T or DVB-T2 functionality
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14. Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

15. Contents

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