

BLF879P; BLF879PS

UHF power LDMOS transistor

Rev. 3 — 12 July 2013

Product data sheet

1. Product profile

1.1 General description

A 500 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 $V_{DS} = 42$ 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	$f_1 = 860$; $f_2 = 860.1$	200	-	21	47	-33	-	-
DVB-T (8k OFDM)	858	95	-	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	95	-	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, $R_{th(j-c)} = 0.15$ 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

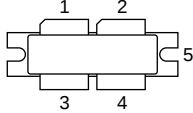
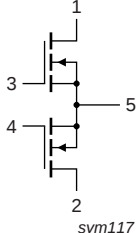
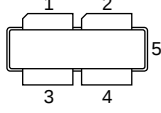
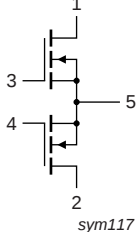
1.3 Applications

- 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
BLF879P (SOT539A)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
BLF879PS (SOT539B)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF879P	-	flanged balanced ceramic package; 2 mounting holes; 4 leads	SOT539A
BLF879PS	-	earless flanged balanced ceramic package; 4 leads	SOT539B

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	$T_{case} = 80\text{ }^{\circ}\text{C}$; $P_{L(AV)} = 95\text{ W}$	[1] 0.15	K/W

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

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	$V_{GS} = 0\text{ V}$; $I_D = 2.4\text{ mA}$	[1] 104	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 240\text{ mA}$	[1] 1.4	1.9	2.4	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 42\text{ V}$	-	-	2.8	μA
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	$V_{GS} = 10\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	280	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 8.5\text{ A}$	[1] -	120	-	$\text{m}\Omega$
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 42\text{ V}$; $f = 1\text{ MHz}$	[2] -	210	-	pF
C_{oss}	output capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 42\text{ V}$; $f = 1\text{ MHz}$	-	72	-	pF
C_{rss}	reverse transfer capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 42\text{ V}$; $f = 1\text{ MHz}$	-	1.5	-	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; $T_{case} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
2-Tone, class-AB						
V_{DS}	drain-source voltage		-	42	-	V
I_{Dq}	quiescent drain current		[1] -	1.3	-	A
$P_{L(AV)}$	average output power	$f_1 = 860\text{ MHz}$; $f_2 = 860.1\text{ MHz}$	200	-	-	W
G_p	power gain	$f_1 = 860\text{ MHz}$; $f_2 = 860.1\text{ MHz}$	20	21	-	dB
η_D	drain efficiency	$f_1 = 860\text{ MHz}$; $f_2 = 860.1\text{ MHz}$	43	47	-	%
IMD3	third-order intermodulation distortion	$f_1 = 860\text{ MHz}$; $f_2 = 860.1\text{ MHz}$	-	-33	-29	dBc

Table 7. RF characteristics ...continued

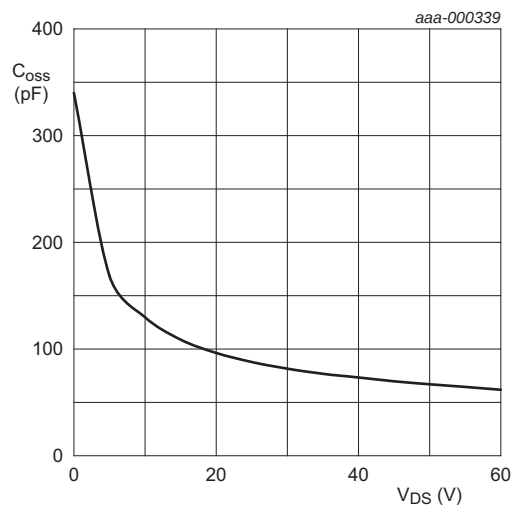
RF characteristics in NXP production narrowband test circuit; $T_{case} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DVB-T (8k OFDM), class-AB						
V_{DS}	drain-source voltage		-	42	-	V
I_{DQ}	quiescent drain current		[1]	-	1.3	A
$P_{L(AV)}$	average output power	$f = 858\text{ MHz}$	95	-	-	W
G_p	power gain	$f = 858\text{ MHz}$	20	21	-	dB
η_D	drain efficiency	$f = 858\text{ MHz}$	30	33	-	%
IMD_{shldr}	intermodulation distortion shoulder	$f = 858\text{ MHz}$	[2]	-	-31	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.



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

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

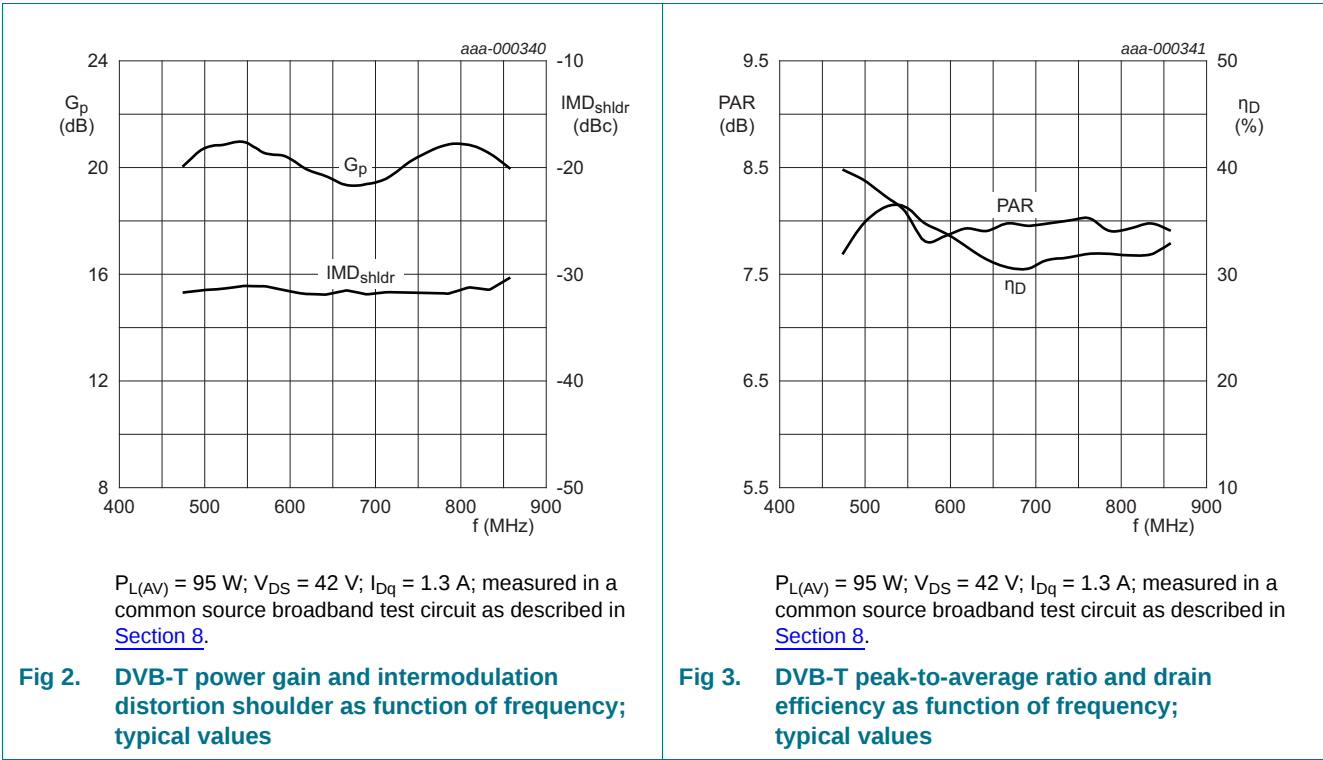
6.1 Ruggedness in class-AB operation

The BLF879P and BLF879PS are capable of withstanding a load mismatch corresponding to $VSWR = 40 : 1$ through all phases under the following conditions: $V_{DS} = 42\text{ V}$; $f = 860\text{ MHz}$ at rated power.

7. Application information

7.1 Broadband RF figures

7.1.1 DVB-T



7.2 Impedance information

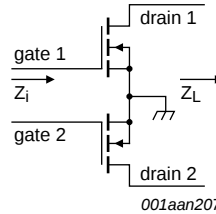


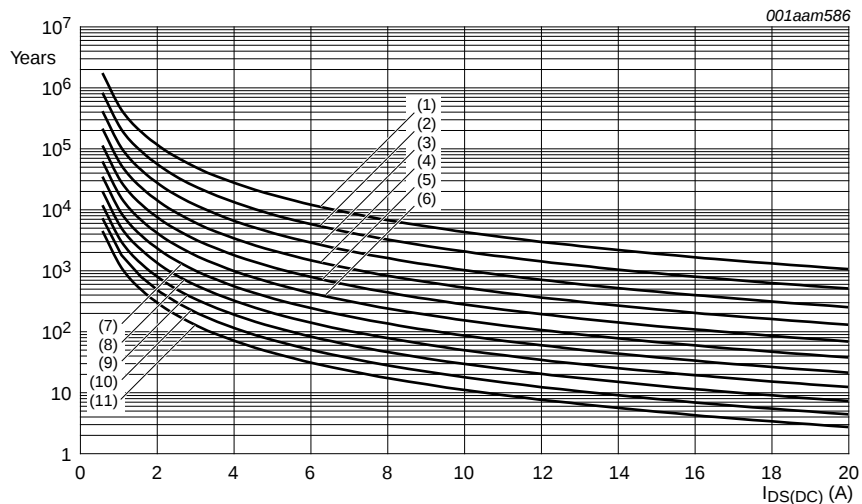
Fig 4. Definition of transistor impedance

Table 8. Typical push-pull impedance

Simulated Z_i and Z_L device impedance; impedance info at $V_{DS} = 42\text{ V}$ and $P_{L(AV)} = 95\text{ W}$ (DVB-T).

f MHz	Z_i Ω	Z_L Ω
300	0.617 – j1.715	4.164 + j0.608
325	0.635 – j1.355	4.101 + j0.636
350	0.655 – j1.026	4.036 + j0.661
375	0.677 – j0.721	3.968 + j0.681
400	0.702 – j0.435	3.898 + j0.696
425	0.731 – j0.164	3.826 + j0.707
450	0.762 + j0.096	3.753 + j0.713
475	0.798 + j0.347	3.679 + j0.715
500	0.839 + j0.592	3.604 + j0.713
525	0.884 + j0.833	3.528 + j0.706
550	0.936 + j1.072	3.453 + j0.695
575	0.995 + j1.310	3.377 + j0.680
600	1.063 + j1.549	3.302 + j0.661
625	1.141 + j1.791	3.227 + j0.638
650	1.230 + j2.037	3.153 + j0.612
675	1.334 + j2.289	3.079 + j0.582
700	1.456 + j2.548	3.007 + j0.549
725	1.599 + j2.814	2.936 + j0.513
750	1.768 + j3.090	2.866 + j0.474
775	1.971 + j3.376	2.797 + j0.432
800	2.214 + j3.671	2.729 + j0.387
825	2.510 + j3.975	2.663 + j0.340
850	2.873 + j4.282	2.599 + j0.291
875	3.320 + j4.584	2.535 + j0.240
900	3.875 + j4.865	2.474 + j0.186
925	4.562 + j5.095	2.414 + j0.131
950	5.409 + j5.223	2.355 + j0.074
975	6.426 + j5.166	2.298 + j0.015
1000	7.587 + j4.807	2.243 – j0.045

7.3 Reliability



TTF (0.1 % failure fraction).

The reliability at pulsed conditions can be calculated as follows: $TTF (0.1 \%) \times 1 / \delta$.

- (1) $T_j = 100 \text{ }^{\circ}\text{C}$
- (2) $T_j = 110 \text{ }^{\circ}\text{C}$
- (3) $T_j = 120 \text{ }^{\circ}\text{C}$
- (4) $T_j = 130 \text{ }^{\circ}\text{C}$
- (5) $T_j = 140 \text{ }^{\circ}\text{C}$
- (6) $T_j = 150 \text{ }^{\circ}\text{C}$
- (7) $T_j = 160 \text{ }^{\circ}\text{C}$
- (8) $T_j = 170 \text{ }^{\circ}\text{C}$
- (9) $T_j = 180 \text{ }^{\circ}\text{C}$
- (10) $T_j = 190 \text{ }^{\circ}\text{C}$
- (11) $T_j = 200 \text{ }^{\circ}\text{C}$

Fig 5. BLF879P; BLF879PS electromigration ($I_{DS(DC)}$, total device)

8. Test information

Table 9. List of components

For test circuit, see [Figure 6](#), [Figure 7](#) and [Figure 8](#).

Component	Description	Value	Remarks
B1, B2	semi rigid coax	25 Ω ; 49.5 mm	UT-090C-25 (EZ 90-25)
C1	multilayer ceramic chip capacitor	12 pF	[1]
C2, C3, C4, C5, C6	multilayer ceramic chip capacitor	8.2 pF	[1]
C7	multilayer ceramic chip capacitor	6.8 pF	[2]
C8	multilayer ceramic chip capacitor	2.7 pF	[2]
C9	multilayer ceramic chip capacitor	2.2 pF	[2]
C10, C13, C14	multilayer ceramic chip capacitor	100 pF	[3]
C11, C12	multilayer ceramic chip capacitor	10 pF	[2]
C15, C16	multilayer ceramic chip capacitor	4.7 μ F, 50 V	Kemet C1210X475K5RAC-TU or capacitor of same quality.
C17, C18, C23, C24	multilayer ceramic chip capacitor	100 pF	[2]
C19, C20	multilayer ceramic chip capacitor	10 μ F, 50 V	TDK C570X7R1H106KT000N or capacitor of same quality.
C21, C22	electrolytic capacitor	470 μ F, 63 V	
C30	multilayer ceramic chip capacitor	10 pF	[4]
C31	multilayer ceramic chip capacitor	9.1 pF	[4]
C32	multilayer ceramic chip capacitor	3.9 pF	[4]
C33, C34, C35	multilayer ceramic chip capacitor	100 pF	[4]
C36, C37	multilayer ceramic chip capacitor	4.7 μ F, 50 V	TDK C4532X7R1E475MT020U or capacitor of same quality.
L1	microstrip	-	[5] (W $\times$ L) 15 mm $\times$ 13 mm
L2	microstrip	-	[5] (W $\times$ L) 5 mm $\times$ 26 mm
L3, L32	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 49.5 mm
L4	microstrip	-	[5] (W $\times$ L) 1.7 mm $\times$ 3.5 mm
L5	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 9.5 mm
L30	microstrip	-	[5] (W $\times$ L) 5 mm $\times$ 13 mm
L31	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 11 mm
L33	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 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 k Ω	

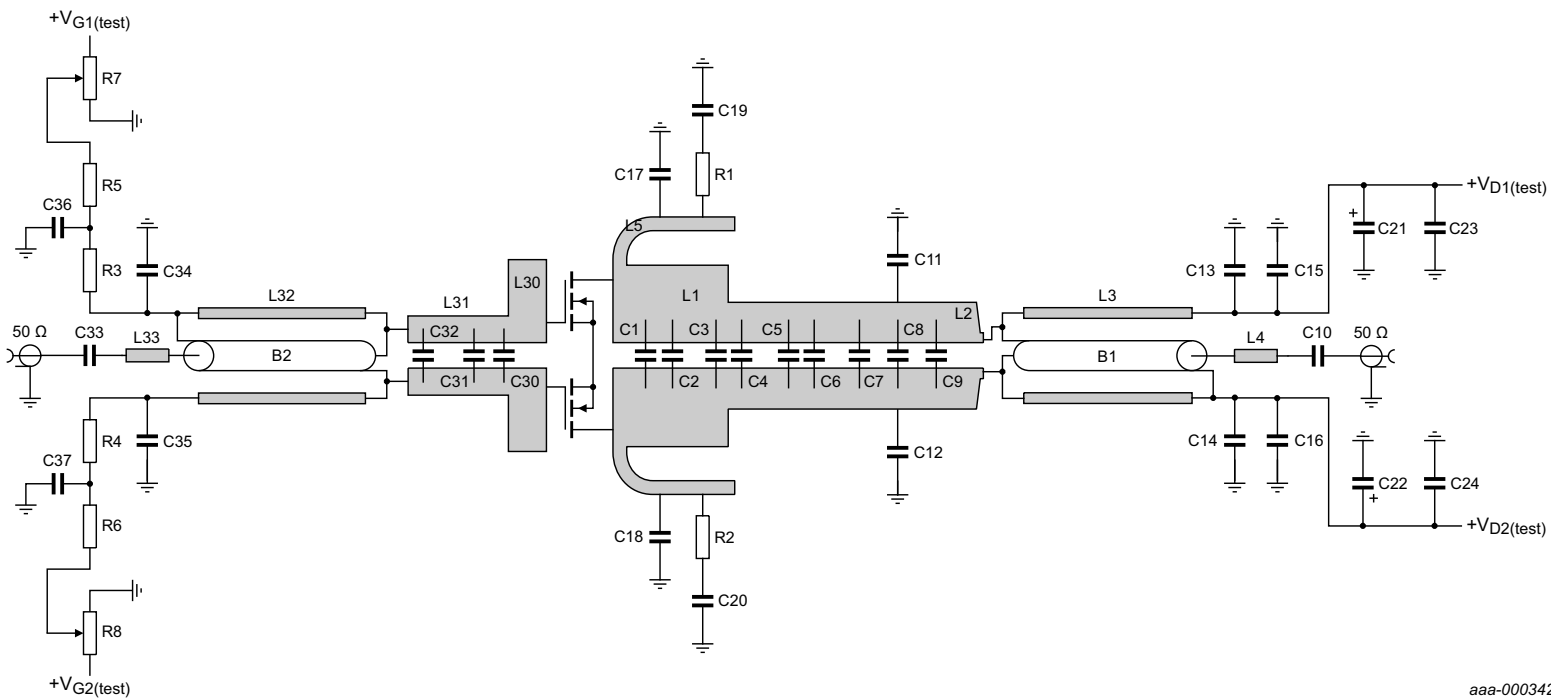
[1] American technical ceramics type 800R or capacitor of same quality.

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

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

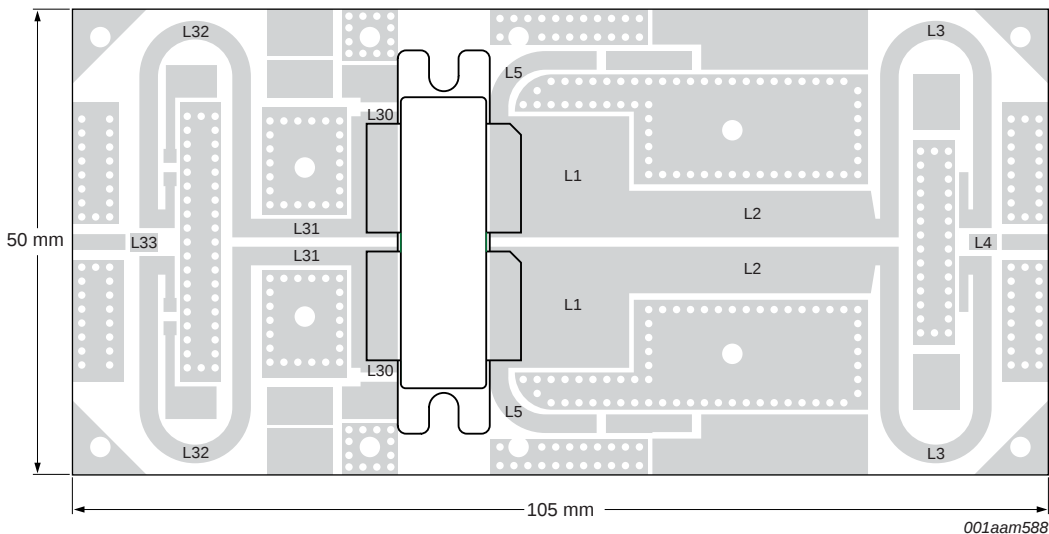
[4] American technical ceramics type 100A or capacitor of same quality.

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



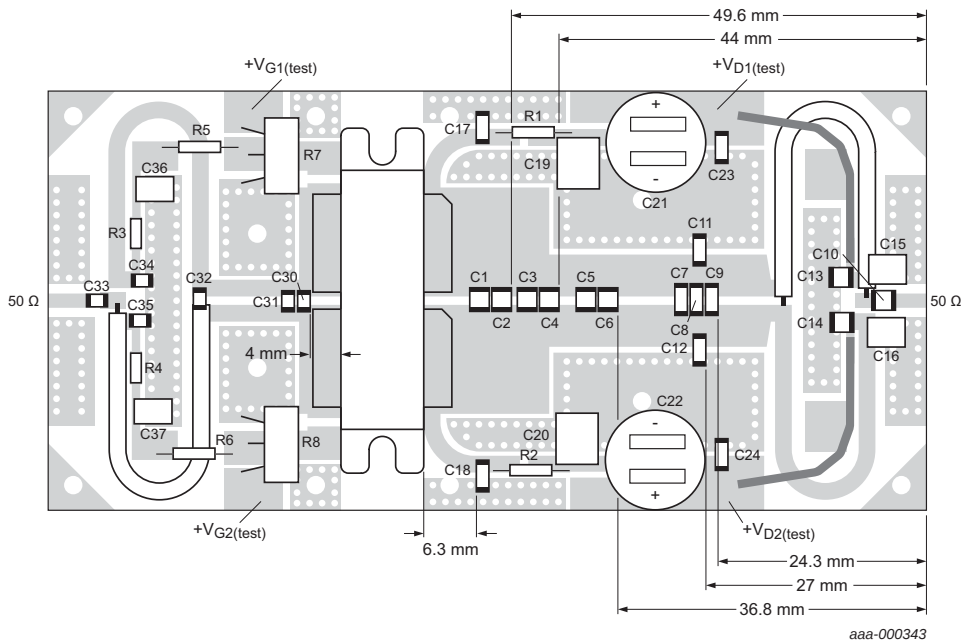
See [Table 9](#) for a list of components.

Fig 6. Class-AB common source broadband amplifier; $V_{D1(test)}$, $V_{D2(test)}$, $V_{G1(test)}$ and $V_{G2(test)}$ are drain and gate test voltages



See Table 9 for a list of components.

Fig 7. Printed-Circuit Board (PCB) for class-AB common source amplifier



See Table 9 for a list of components.

Fig 8. Component layout for class-AB common source amplifier

9. Package outline

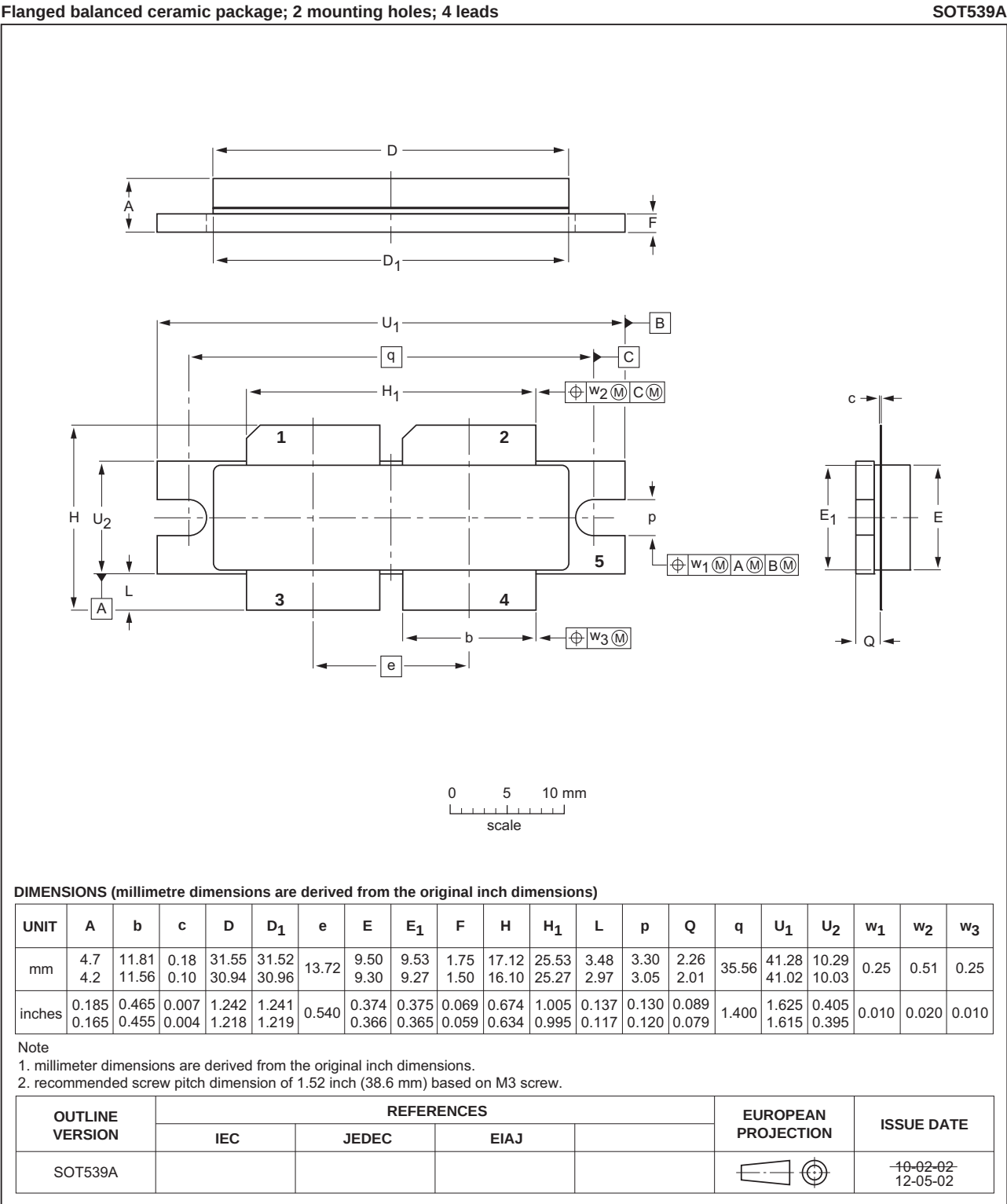
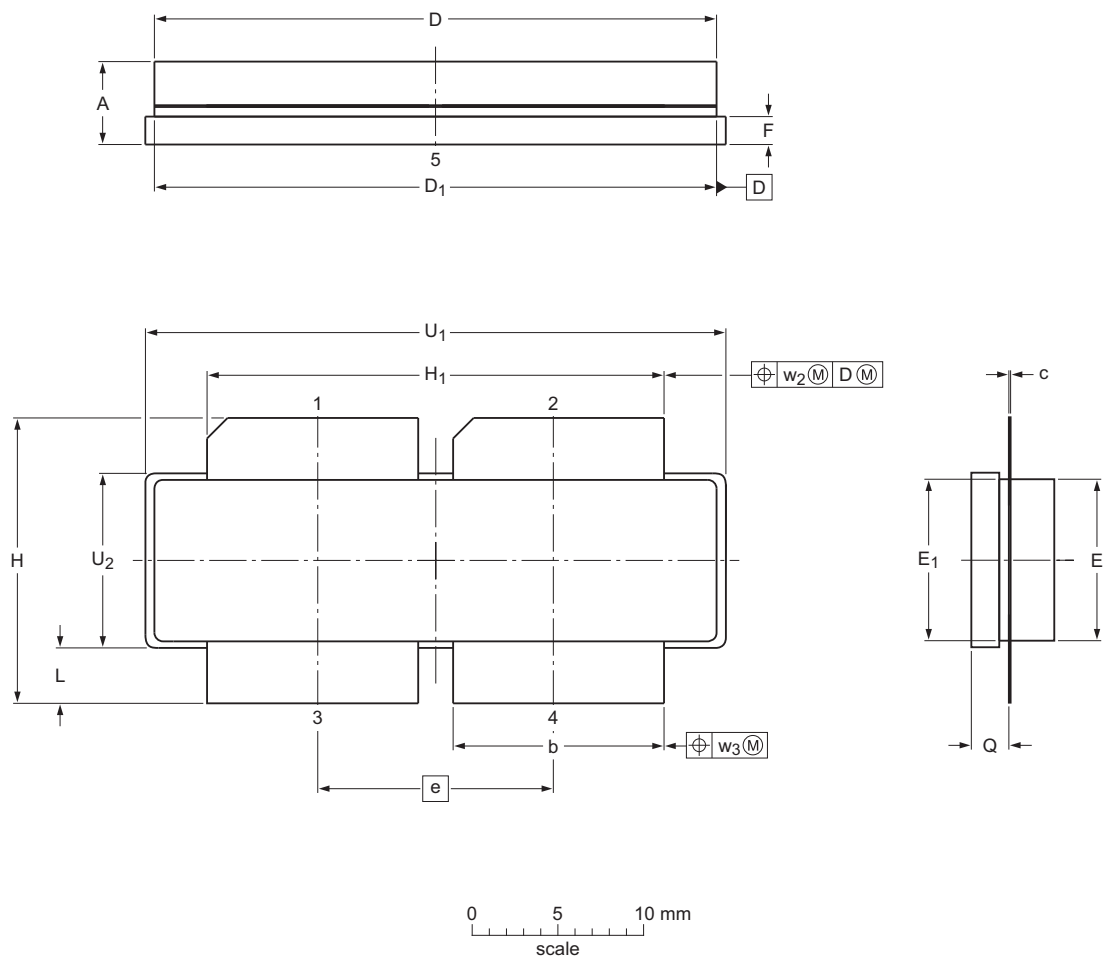


Fig 9. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B



Dimensions																	
Unit ⁽¹⁾	A	b	c	D	D ₁	E	E ₁	e	F	H	H ₁	L	Q	U ₁	U ₂	w ₂	w ₃
mm	max	4.7	11.81	0.18	31.55	31.52	9.5	9.53	1.75	17.12	25.53	3.48	2.26	32.39	10.29	0.25	0.25
	nom	4.2	11.56	0.10	30.94	30.96	9.3	9.27	1.50	16.10	25.27	2.97	2.01	32.13	10.03		
inches	max	0.185	0.465	0.007	1.242	1.241	0.374	0.375	0.069	0.674	1.005	0.137	0.089	1.275	0.405	0.01	0.01
	nom	0.165	0.455	0.004	1.218	1.219	0.366	0.365	0.059	0.634	0.995	0.117	0.079	1.265	0.395		

Note
1. millimeter dimensions are derived from the original inch dimensions.

sot539b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT539B						12-05-02 13-05-24

Fig 10. Package outline SOT539A

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-T	Digital Video Broadcast - Terrestrial
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
OFDM	Orthogonal Frequency Division Multiplexing
PAR	Peak-to-Average Ratio
SMD	Surface Mounted Device
TTF	Time-To-Failure
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
BLF879P_BLF879PS v.3	20130712	Product data sheet	-	BLF879P_BLF879PS v.2
Modifications:	• The package outline Figure 10 is updated.			
BLF879P_BLF879PS v.2	20120725	Product data sheet	-	BLF879P v.1
Modifications:	• The document now describes both the eared and earless version of this product: BLF879P and BLF879PS respectively.			
BLF879P v.1	20110823	Product 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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Use of this product in any manner that complies with the DVB-T or the DVB-T2 standard may require licenses under applicable patents of the DVB-T respectively the DVB-T2 patent portfolio, which license is available from Sisvel S.p.A., Via Sestriere 100, 10060 None (TO), Italy, and under applicable patents of other parties.

13.5 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

14. Contact information

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

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