

# 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)	$\eta_D$ (%)	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	$f_1 = 860; f_2 = 860.1$	200	-	21	47	-33	-	-
DVB-T (8k OFDM)	858	95	-	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	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
<b>BLF879P (SOT539A)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
<b>BLF879PS (SOT539B)</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	
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	$T_{case} = 80\text{ °C}; P_{L(AV)} = 95\text{ W}$	[1] 0.15	K/W

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

## 6. Characteristics

**Table 6. DC characteristics**

$T_j = 25\text{ °C}$ ; 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	$\mu\text{A}$
$I_{DSX}$	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	$V_{GS} = 10\text{ V}; V_{DS} = 0\text{ V}$	-	-	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;  $T_{case} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>2-Tone, class-AB</b>						
$V_{DS}$	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
$\eta_D$	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**

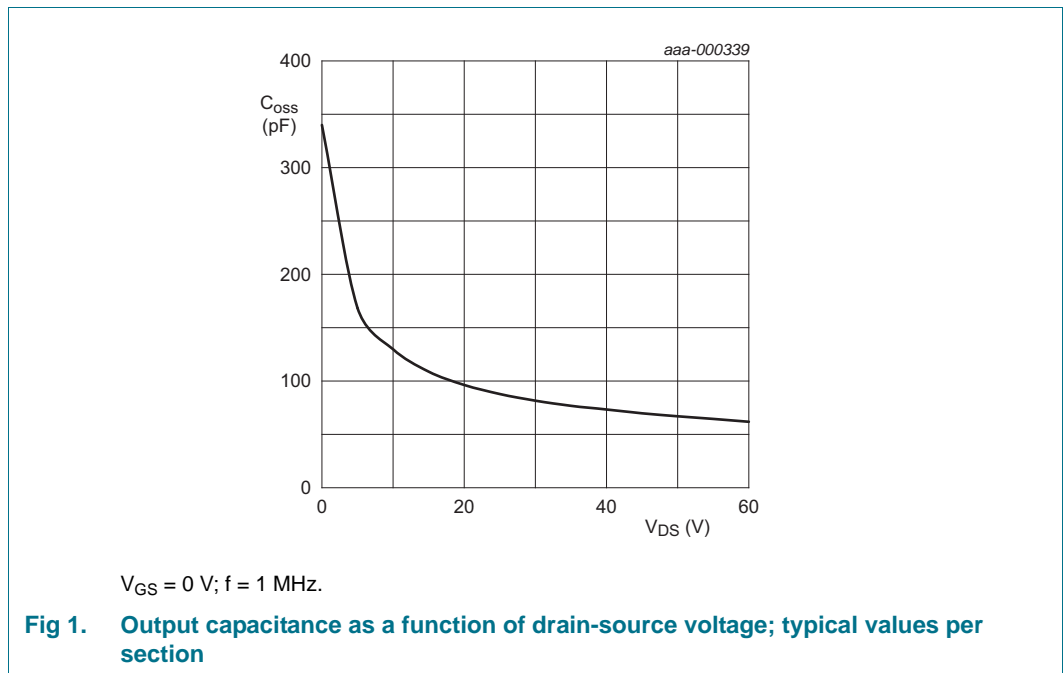
RF characteristics in NXP production narrowband test circuit;  $T_{case} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>DVB-T (8k OFDM), class-AB</b>							
$V_{DS}$	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	
$\eta_D$	drain efficiency	$f = 858\text{ MHz}$	30	33	-	%	
$IMD_{shldr}$	intermodulation distortion shoulder	$f = 858\text{ MHz}$	[2]	-	-31	-28	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.



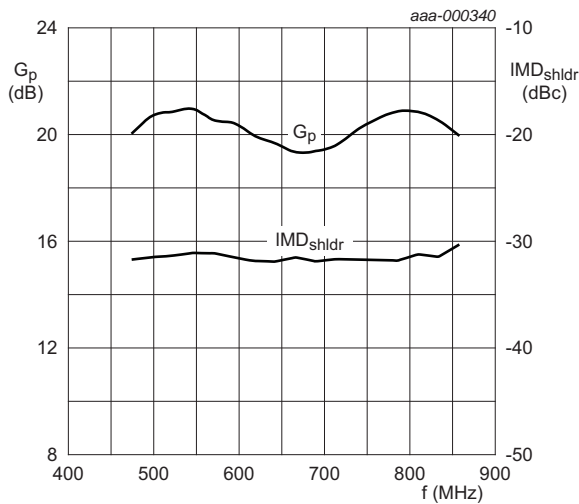
### 6.1 Ruggedness in class-AB operation

The 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

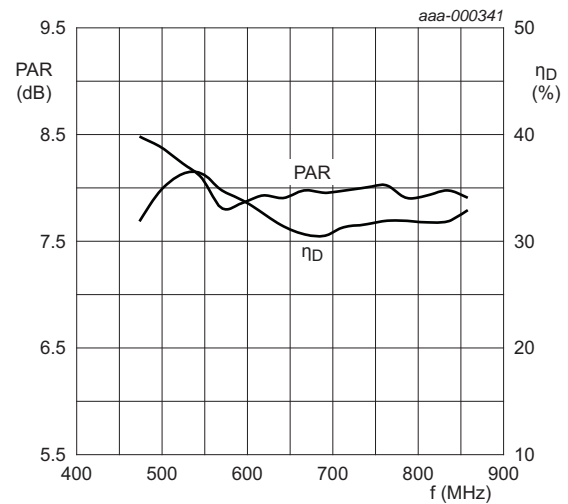
### 7.1 Broadband RF figures

#### 7.1.1 DVB-T



$P_{L(AV)} = 95\text{ W}$ ;  $V_{DS} = 42\text{ V}$ ;  $I_{Dq} = 1.3\text{ A}$ ; measured in a common source broadband test circuit as described in [Section 8](#).

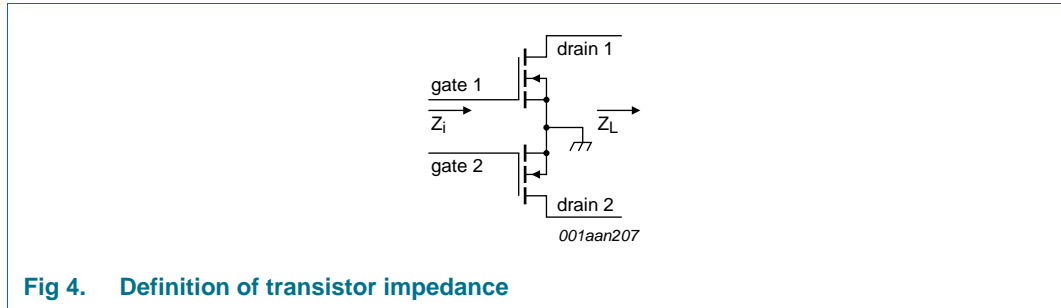
**Fig 2. DVB-T power gain and intermodulation distortion shoulder as function of frequency; typical values**



$P_{L(AV)} = 95\text{ W}$ ;  $V_{DS} = 42\text{ V}$ ;  $I_{Dq} = 1.3\text{ A}$ ; 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**



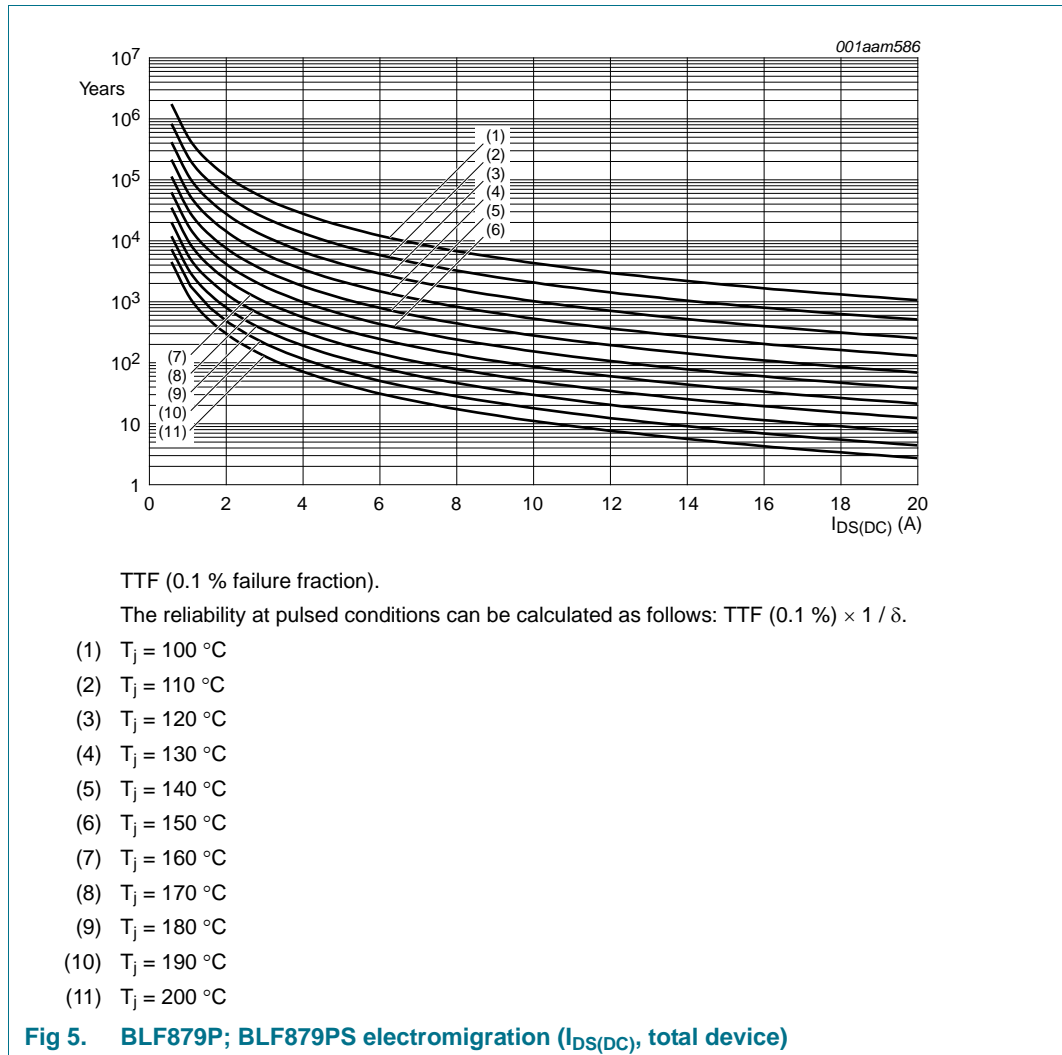
**Fig 4. Definition of transistor impedance**

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

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 42\text{ V}$  and  $P_{L(AV)} = 95\text{ W}$  (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	0.617 – 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**



## 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 μF, 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 μF, 50 V	TDK C570X7R1H106KT000N or capacitor of same quality.
C21, C22	electrolytic capacitor	470 μF, 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 μF, 50 V	TDK C4532X7R1E475MT020U or capacitor of same quality.
L1	microstrip	-	[5] (W × L) 15 mm × 13 mm
L2	microstrip	-	[5] (W × L) 5 mm × 26 mm
L3, L32	microstrip	-	[5] (W × L) 2 mm × 49.5 mm
L4	microstrip	-	[5] (W × L) 1.7 mm × 3.5 mm
L5	microstrip	-	[5] (W × L) 2 mm × 9.5 mm
L30	microstrip	-	[5] (W × L) 5 mm × 13 mm
L31	microstrip	-	[5] (W × L) 2 mm × 11 mm
L33	microstrip	-	[5] (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 800R or capacitor of same quality.

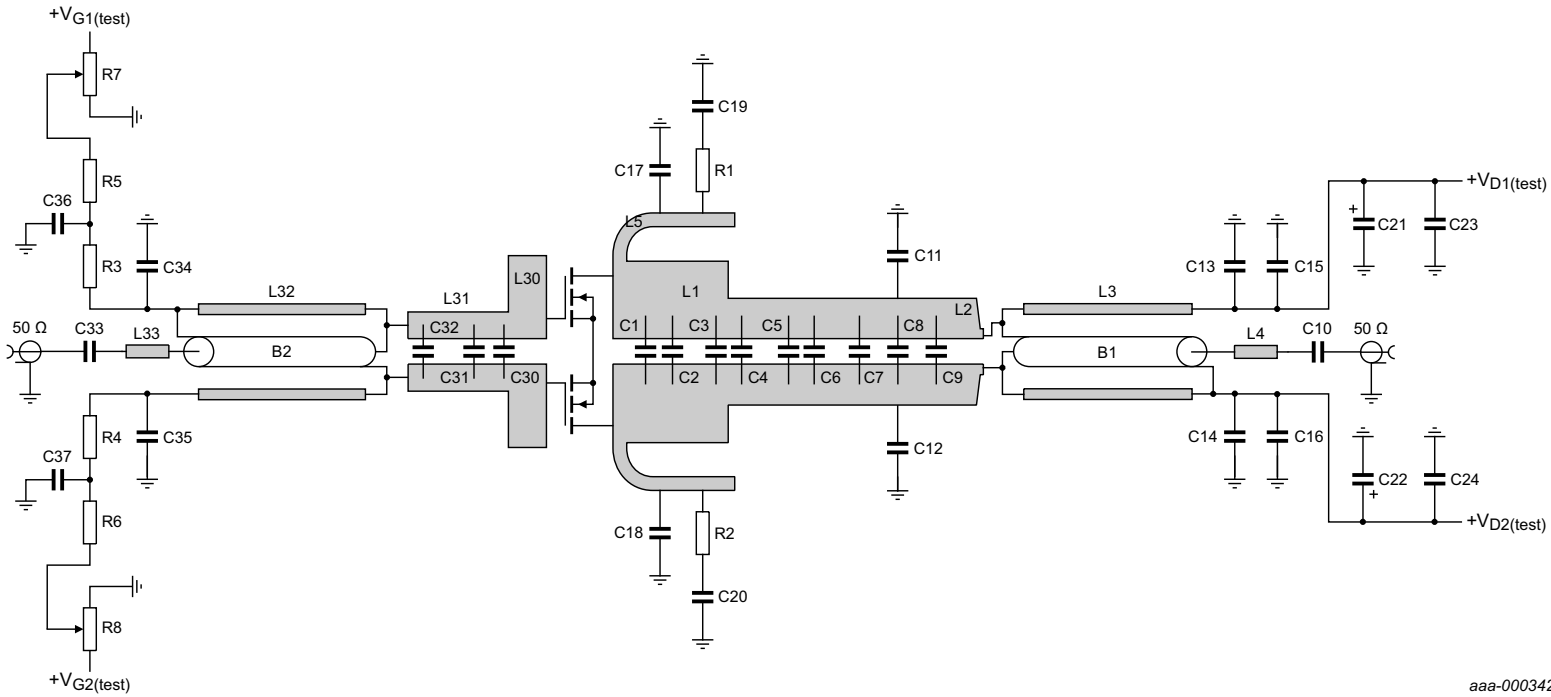
[2] American technical ceramics type 800B or capacitor of same quality.

[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; ε<sub>r</sub> = 3.5 F/m; height = 0.762 mm; Cu (top/bottom metallization); thickness copper plating = 35 μm.

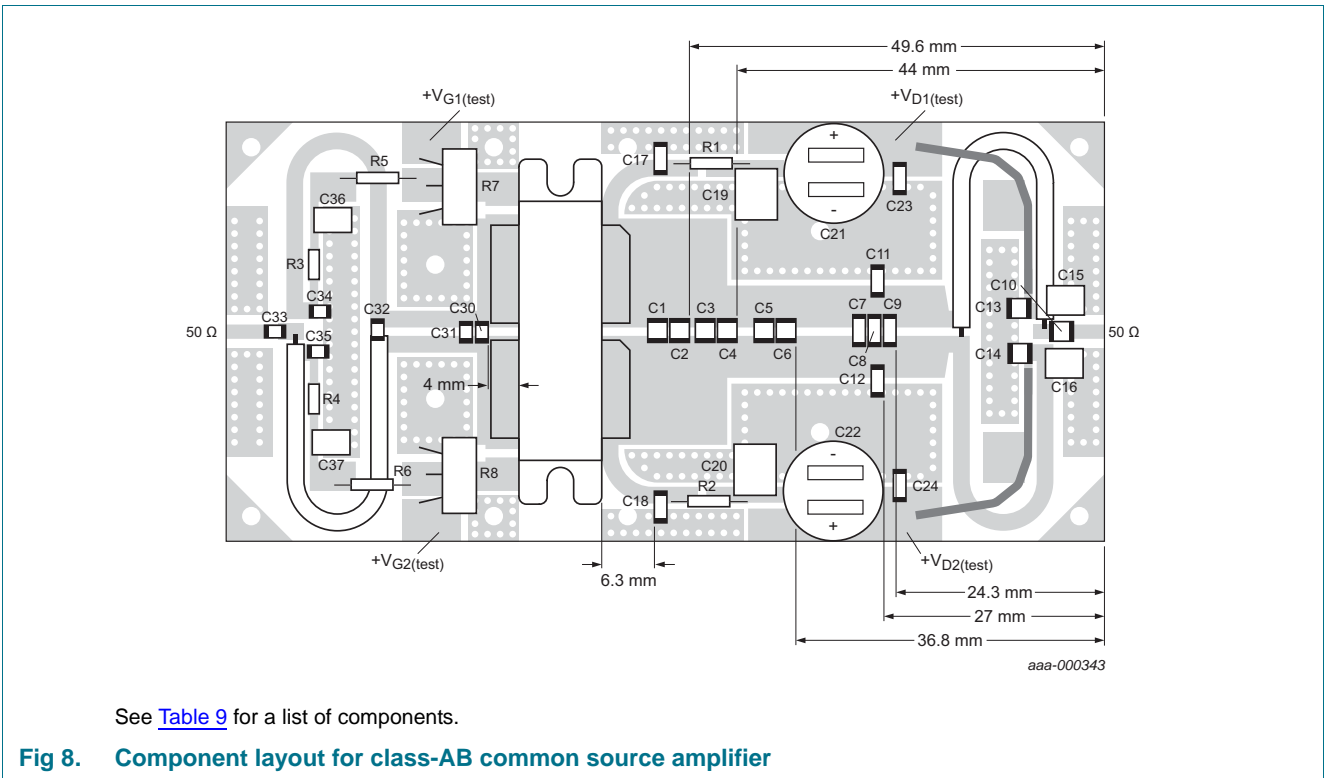
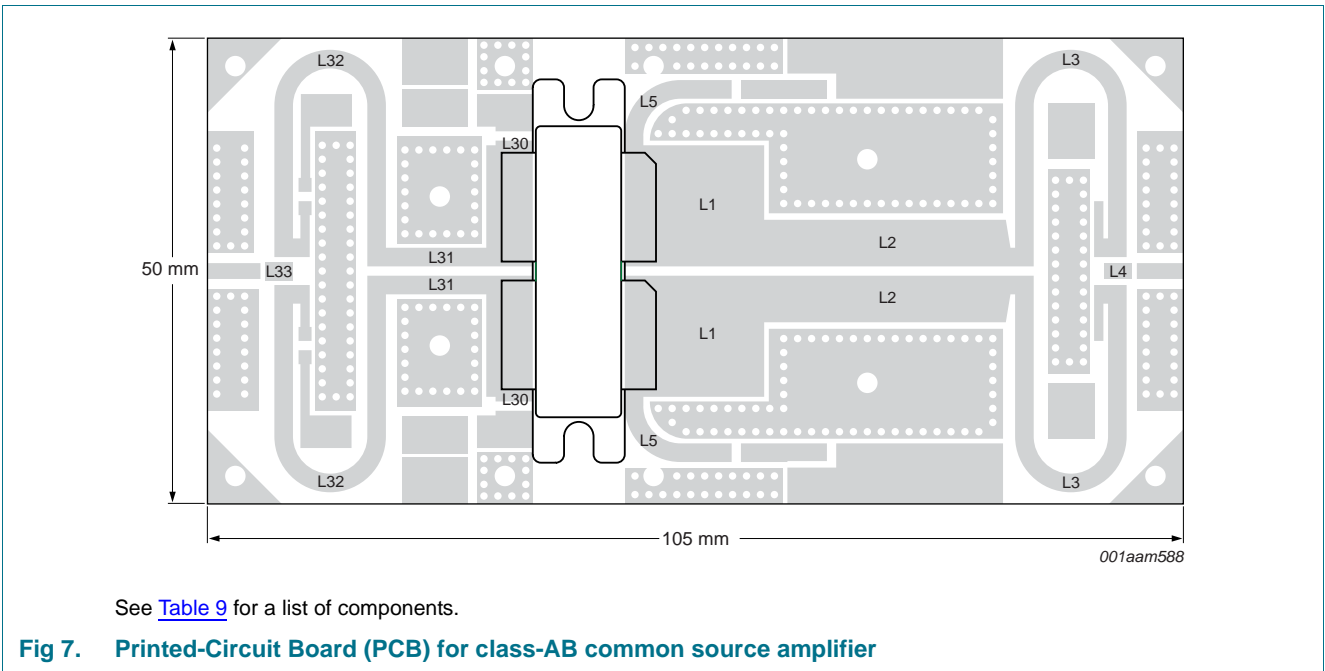




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See [Table 9](#) for a list of components.

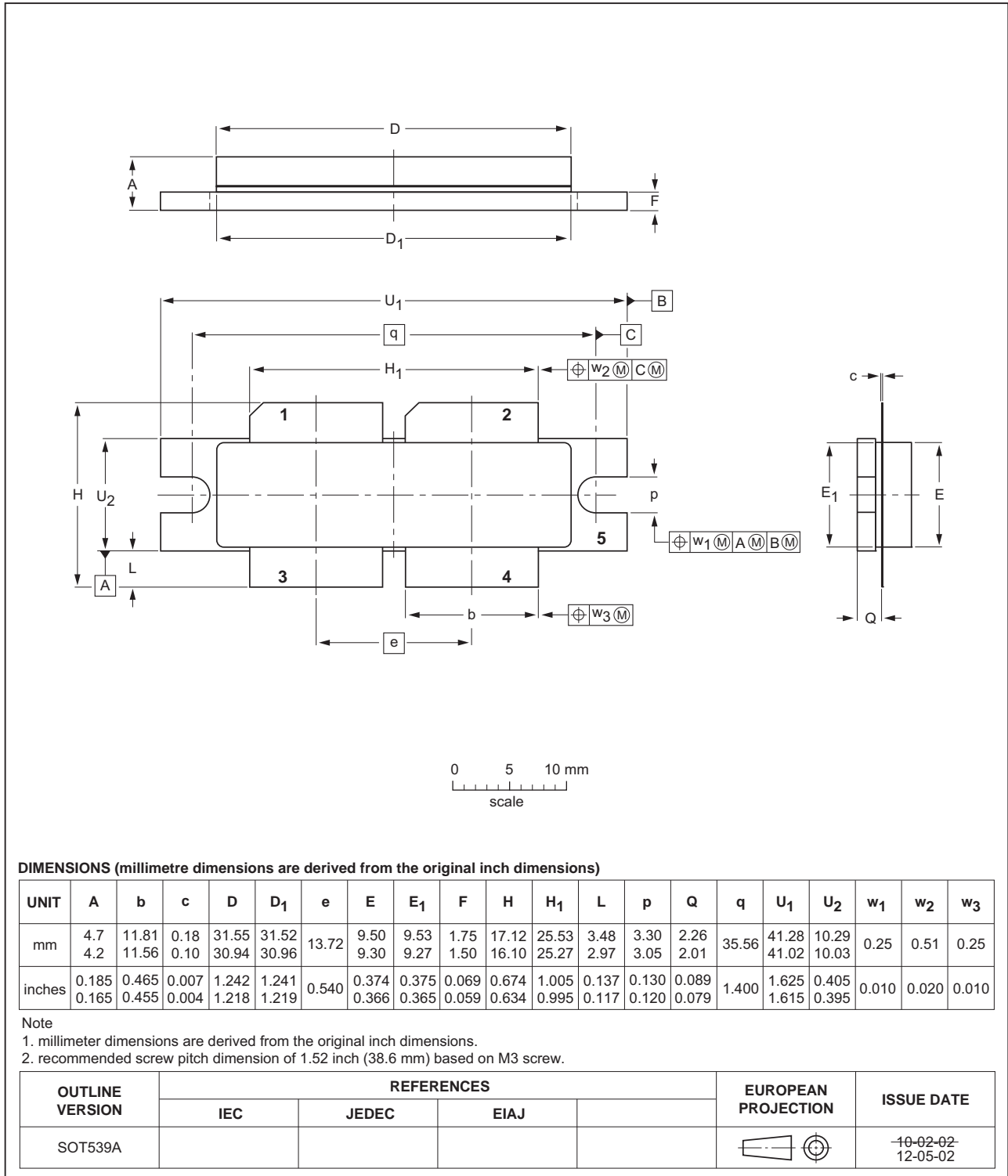
**Fig 6. Class-AB common source broadband amplifier;  $V_{D1(test)}$ ,  $V_{D2(test)}$ ,  $V_{G1(test)}$  and  $V_{G2(test)}$  are drain and gate test voltages**



**9. Package outline**

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A



**Fig 9. Package outline SOT539A**

Earless flanged balanced ceramic package; 4 leads

SOT539B

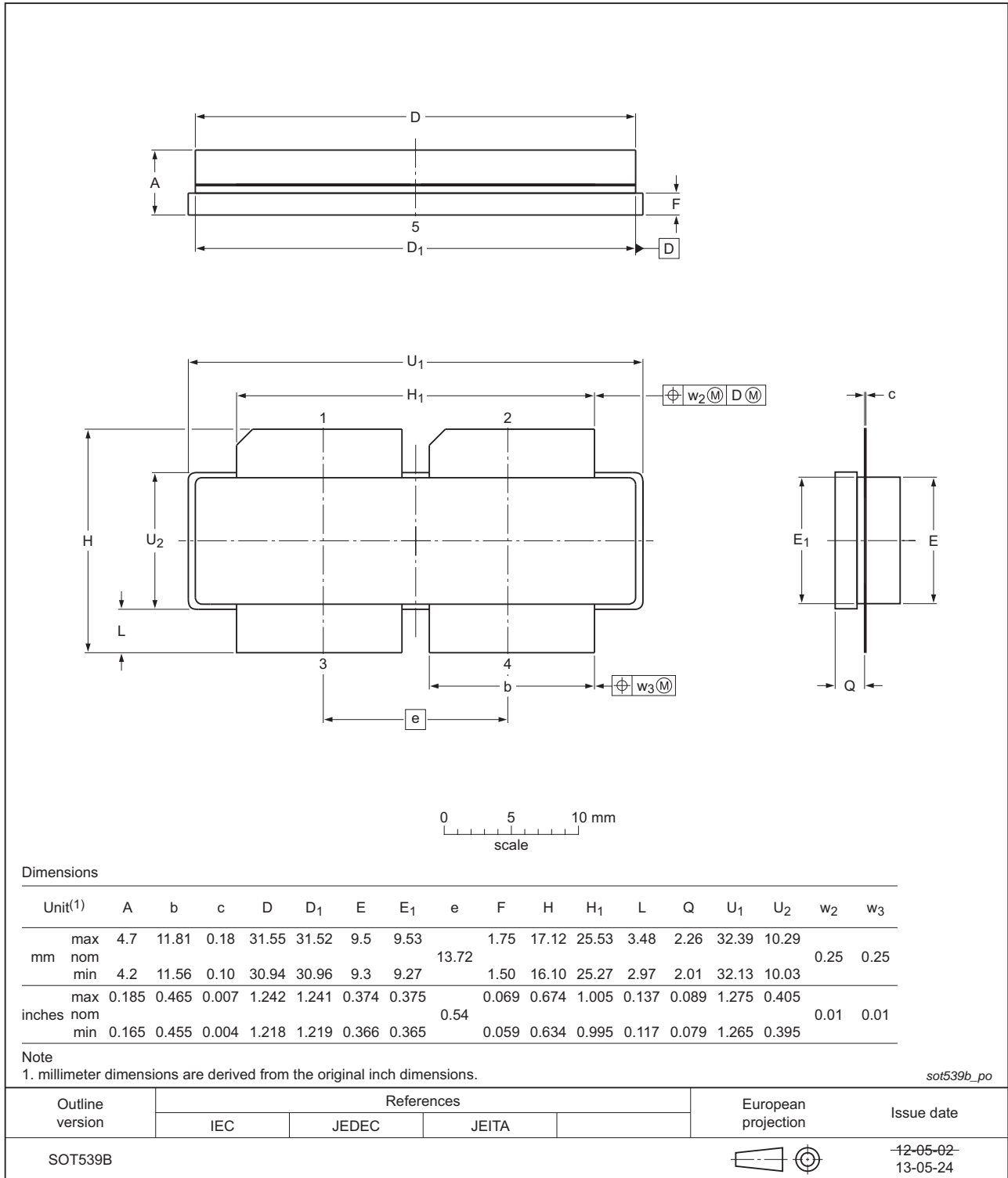


Fig 10. Package outline SOT539A

## 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:	<ul style="list-style-type: none"> <li>The package outline <a href="#">Figure 10</a> is updated.</li> </ul>			
BLF879P_BLF879PS v.2	20120725	Product data sheet	-	BLF879P v.1
Modifications:	<ul style="list-style-type: none"> <li>The document now describes both the eared and earless version of this product: BLF879P and BLF879PS respectively.</li> </ul>			
BLF879P v.1	20110823	Product 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.

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