

# BLF879P; BLF879PS

UHF power LDMOS transistor

Rev. 4 — 1 September 2015

AMMPLÉON

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

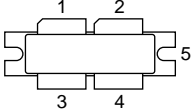
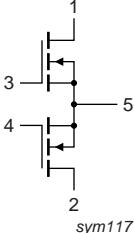
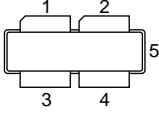
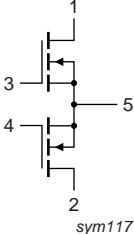
- Excellent ruggedness
- Optimum thermal behavior and reliability,  $R_{th(j-c)} = 0.15$  K/W
- High power gain
- High efficiency
- Designed for broadband operation (470 MHz to 860 MHz)
- Internal input matching for high gain and optimum broadband operation
- Excellent reliability
- Easy power control
- 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		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source		
<b>BLF879PS (SOT539B)</b>			
1	drain1		 sym117
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 Ampleon 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**

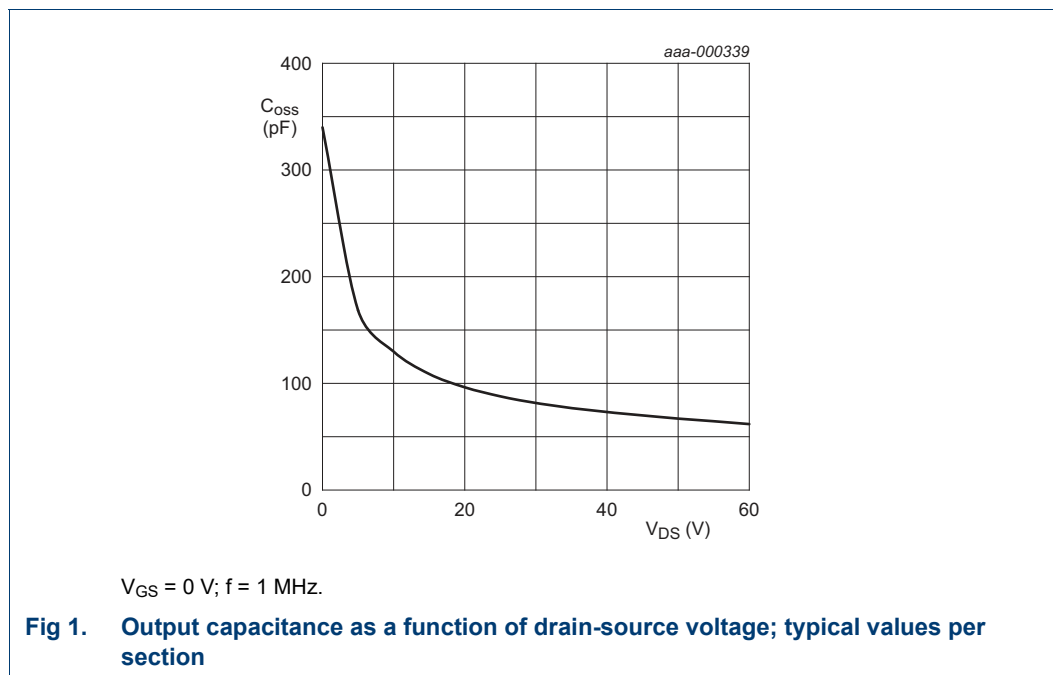
RF characteristics in Ampleon production narrowband test circuit;  $T_{case} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

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.



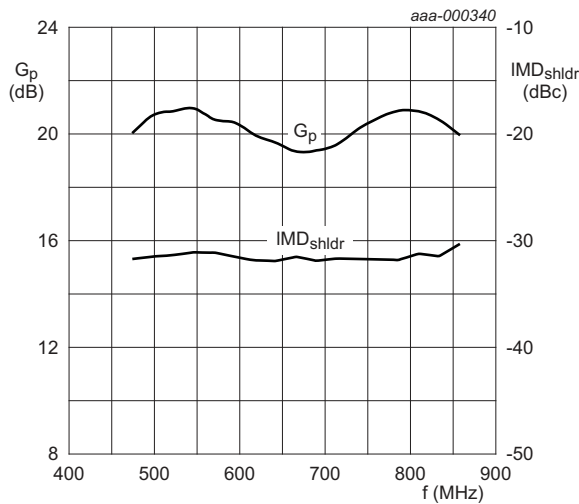
### 6.1 Ruggedness in class-AB operation

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

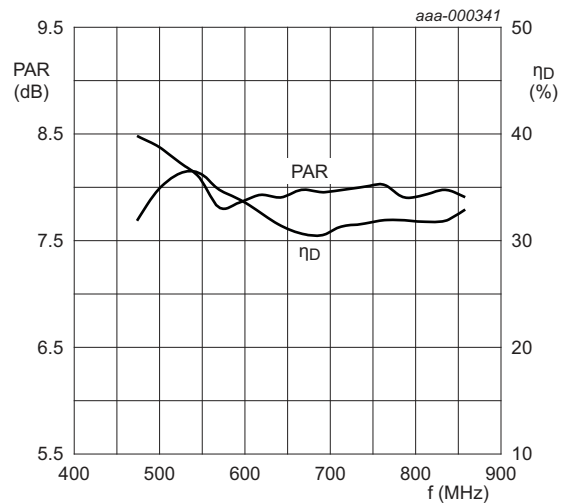
### 7.1 Broadband RF figures

#### 7.1.1 DVB-T



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



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

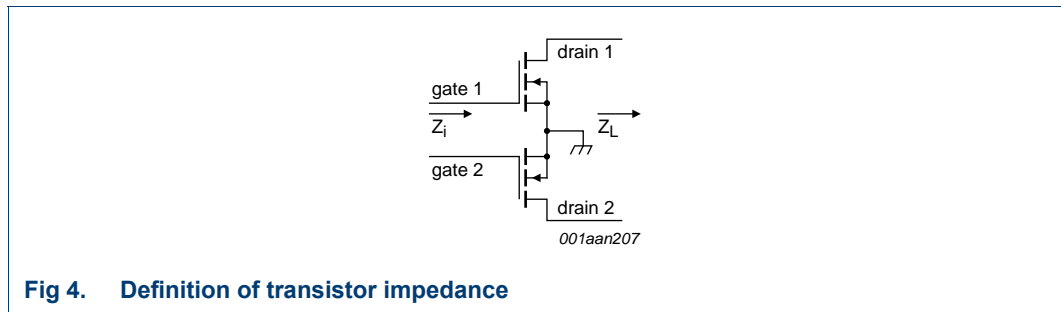


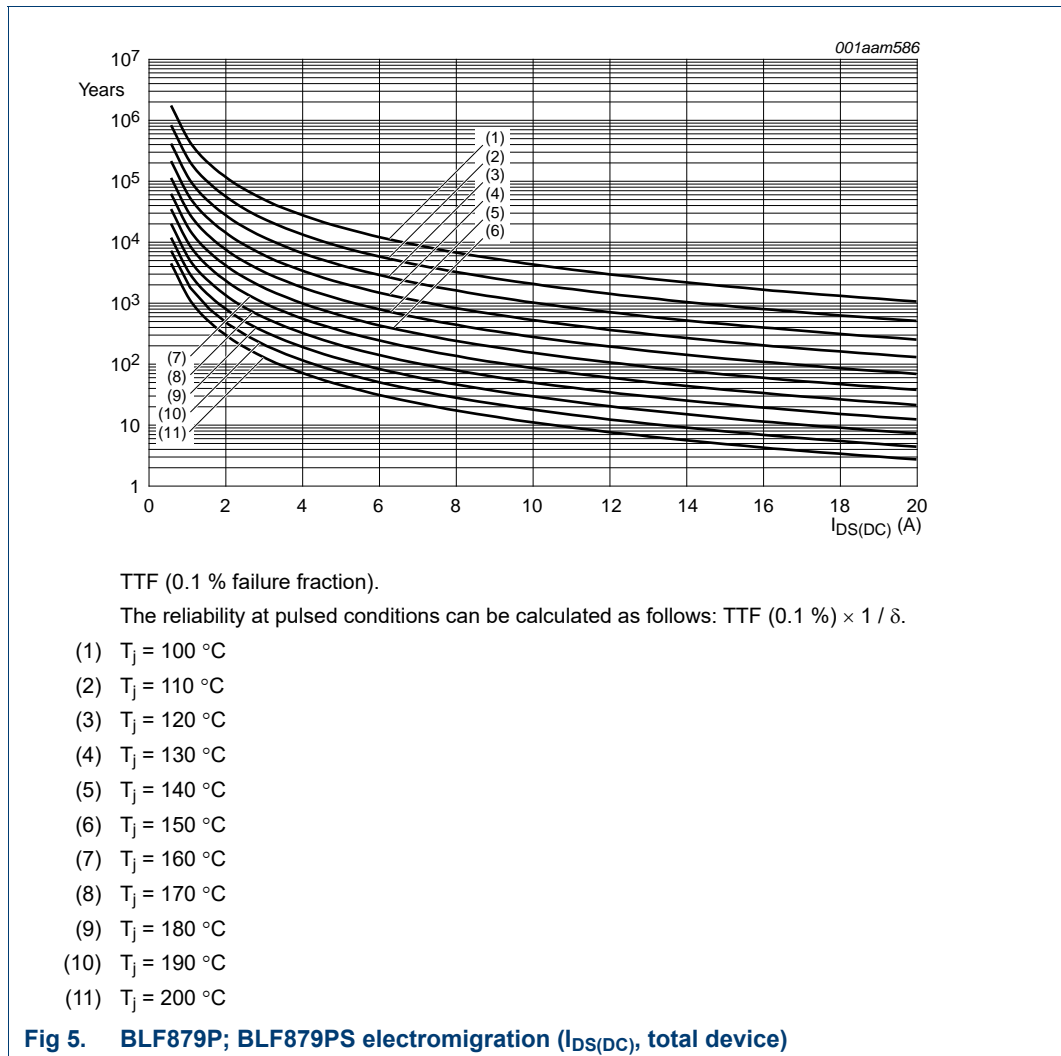
Fig 4. Definition of transistor impedance

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).

f MHz	$Z_i$ $\Omega$	$Z_L$ $\Omega$
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.

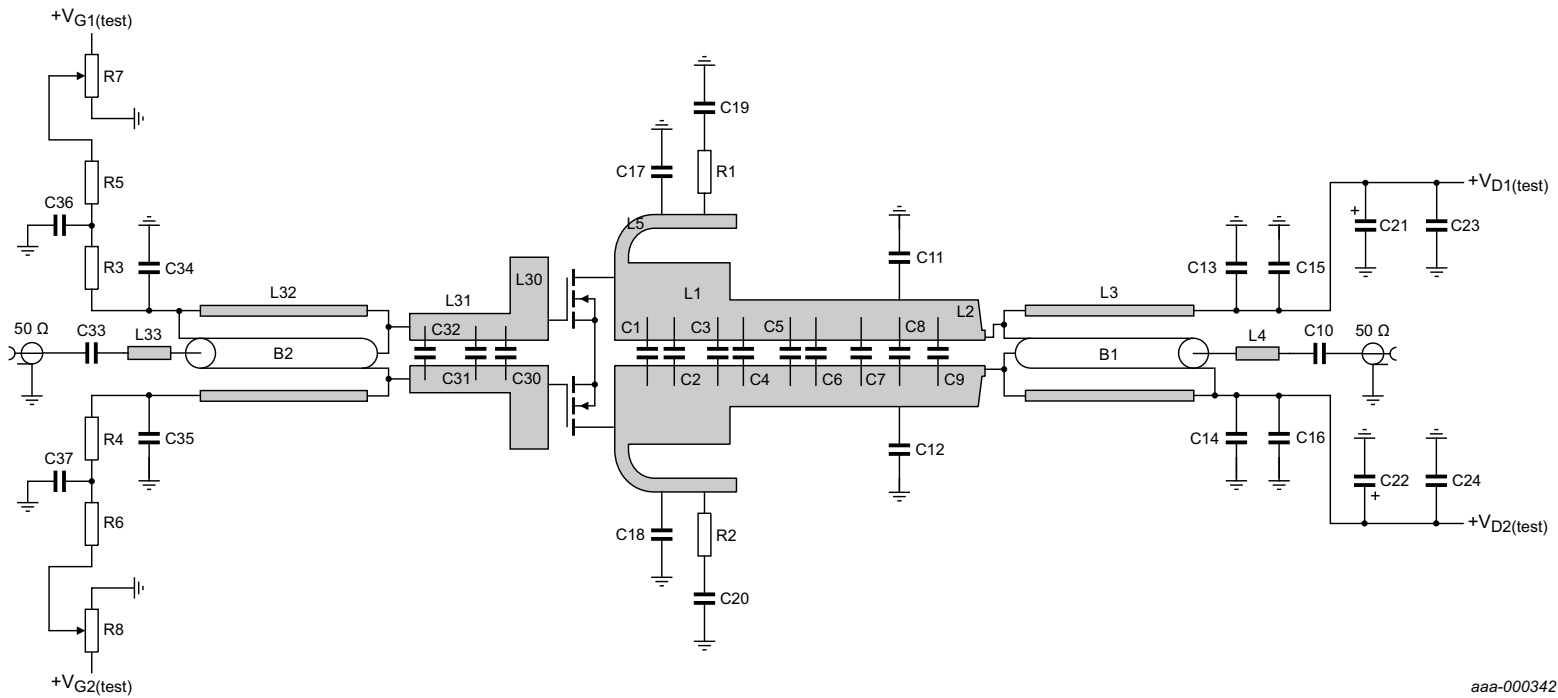
[2] American technical ceramics type 800B or capacitor of same quality.

[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.

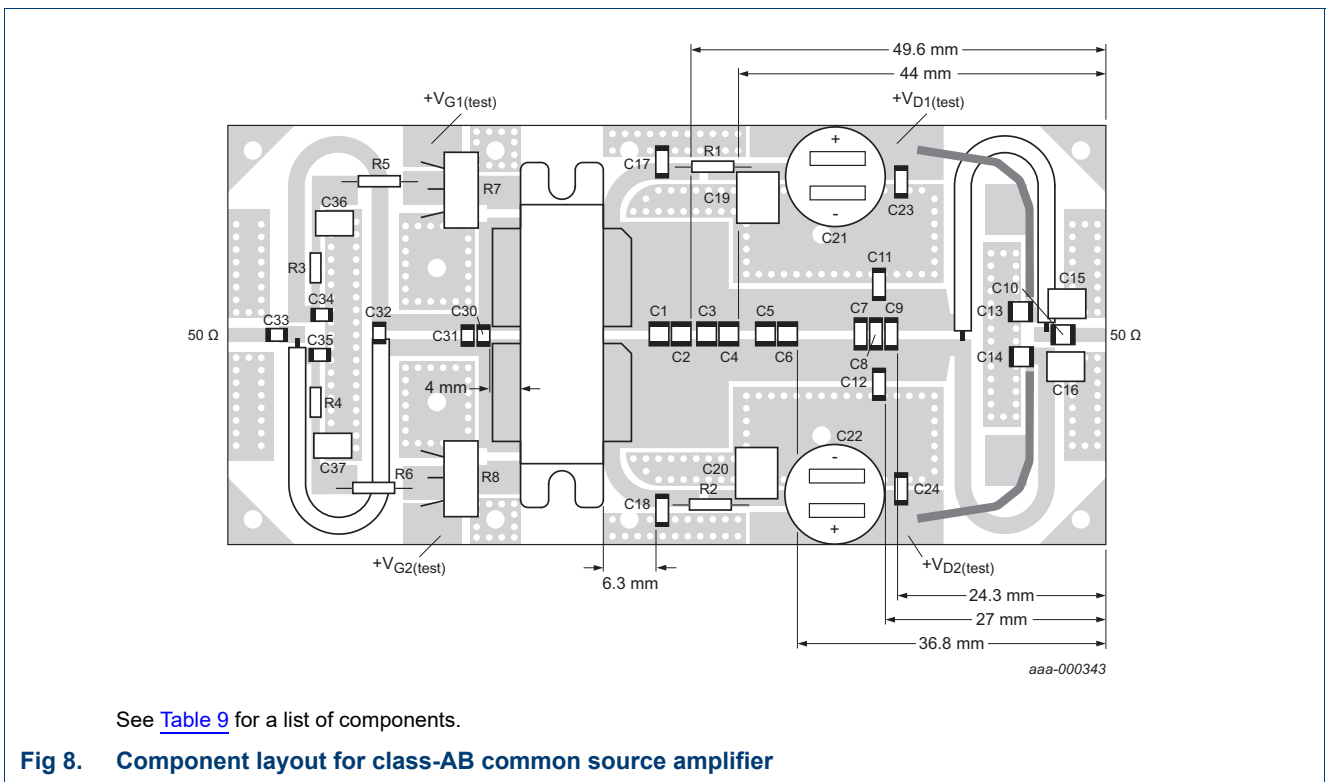
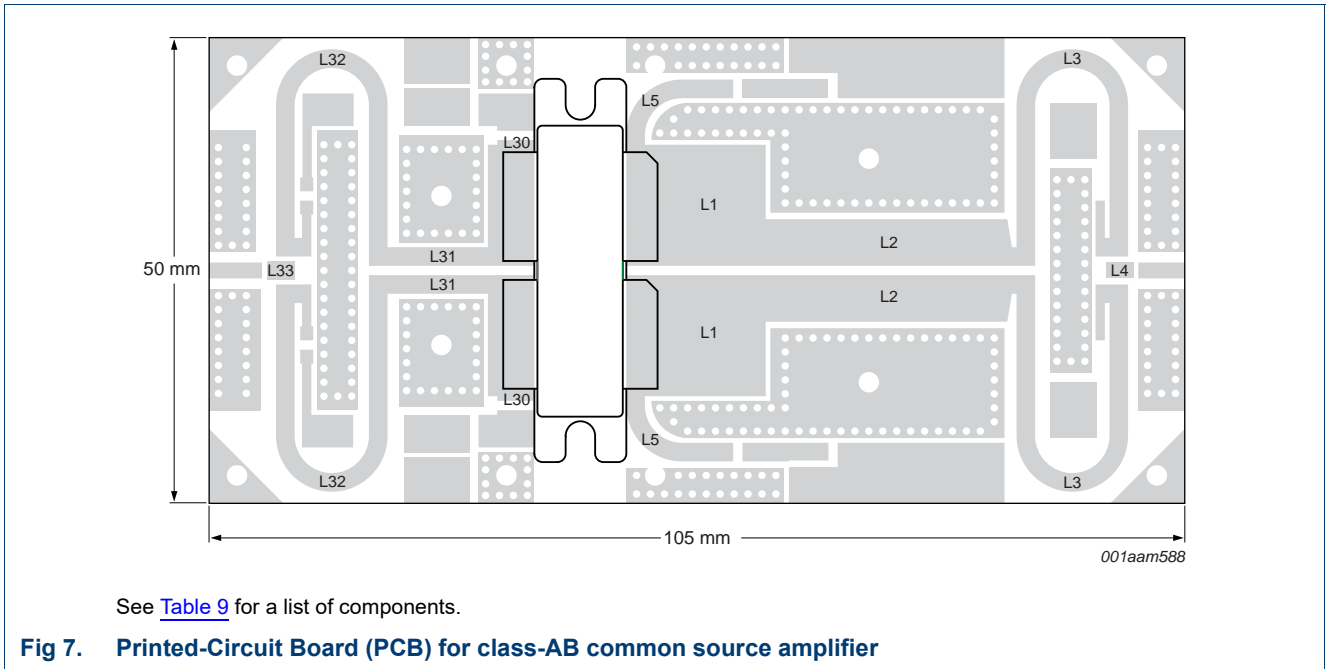




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See [Table 9](#) for a list of components.

**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

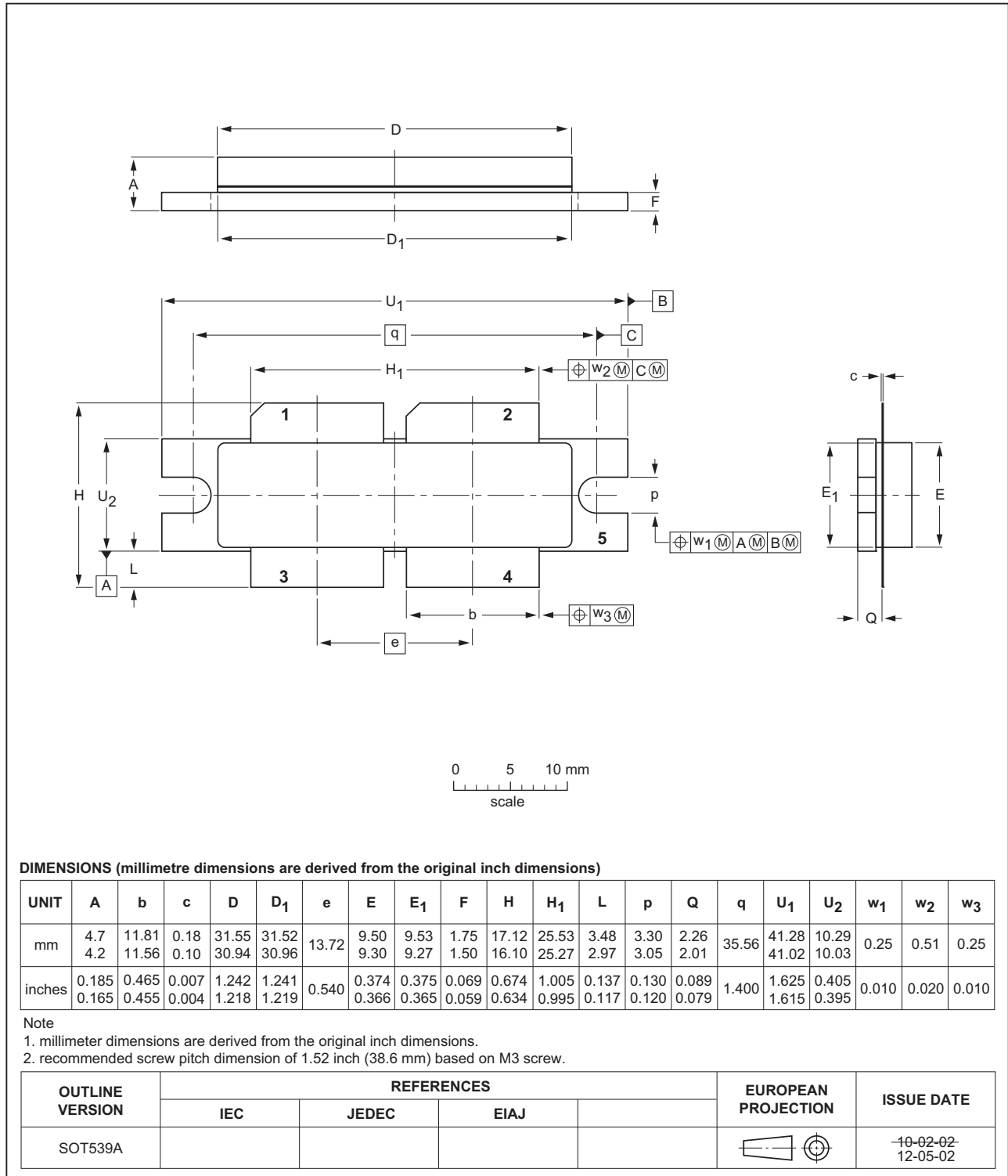


Fig 9. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B

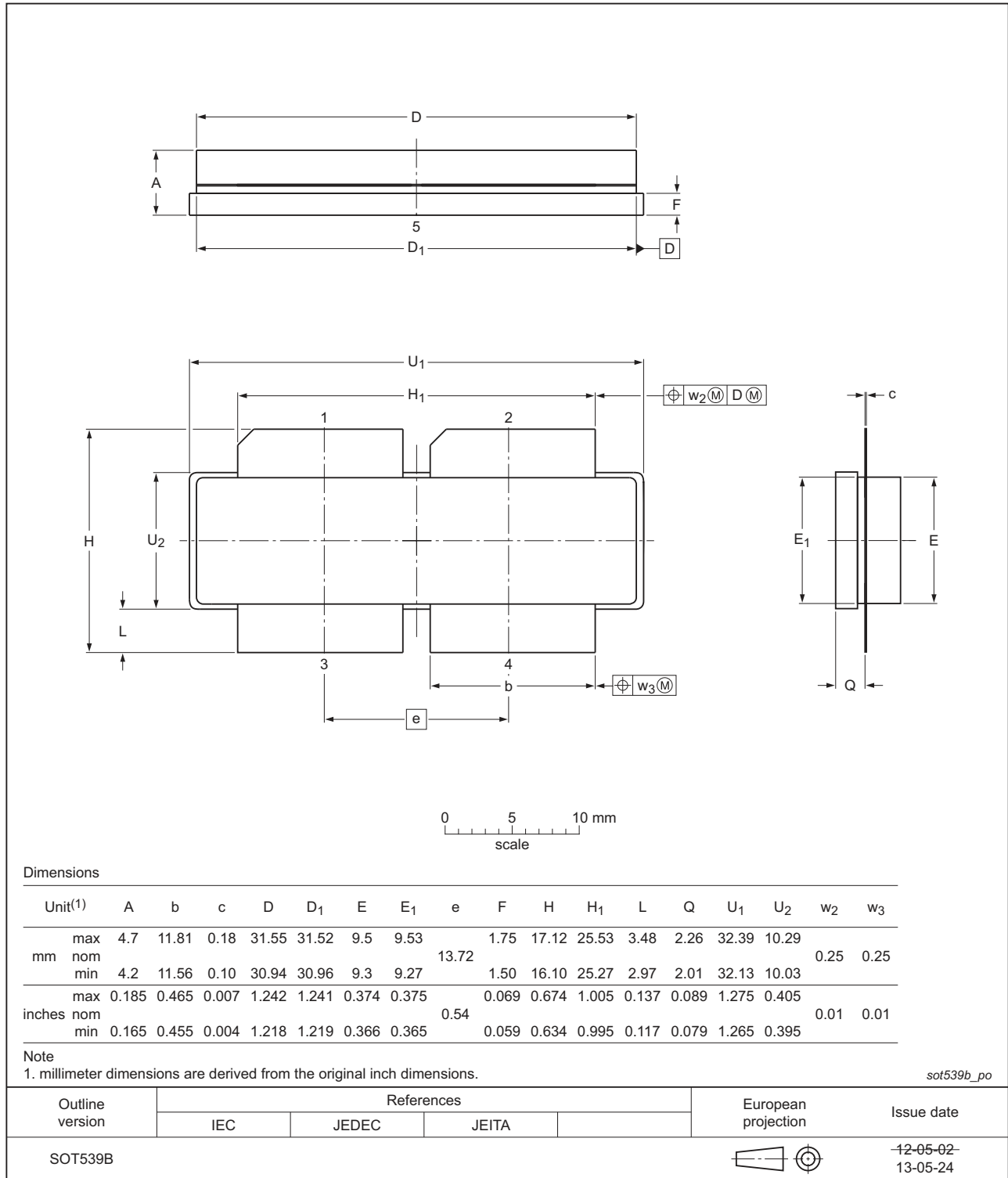


Fig 10. Package outline SOT539A

## 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#4	20150901	Product data sheet	-	BLF879P_BLF879PS v.3
Modifications:	<ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
BLF879P_BLF879PS v.3	20130712	Product data sheet	-	BLF879P_BLF879PS v.2
BLF879P_BLF879PS v.2	20120725	Product data sheet	-	BLF879P v.1
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.

[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.ampleon.com>.

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