

# BLF871

## UHF power LDMOS transistor

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Objective data sheet

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## 1. Product profile

### 1.1 General description

A 100 W LDMOS RF power transistor for broadcast transmitter applications and industrial applications. The transistor can deliver 100 W broadband from HF to 1 GHz. The excellent ruggedness and broadband performance of this device makes it ideal for digital transmitter applications.

**Table 1. Typical performance**

RF performance at  $V_{DS} = 40$  V in a common-source 860 MHz test circuit.

Mode of operation	f (MHz)	$P_L$ (W)	$P_{L(PEP)}$ (W)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	IMD3 (dBc)	PAR (dB)
CW, class AB	860	100	-	-	21	60	-	-
2-tone, class AB	$f_1 = 860; f_2 = 860.1$	-	100	-	21	48	≧33	-
DVB-T (8k OFDM)	858	-	-	24	22	33	≧34 <sup>[1]</sup>	8.35 <sup>[2]</sup>

[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.

### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features

- n 2-tone performance at 860 MHz, a drain-source voltage  $V_{DS}$  of 40 V and a quiescent drain current  $I_{Dq} = 0.5$  A:
  - u Peak envelope power load power = 100 W
  - u Power gain = 21 dB
  - u Drain efficiency = 48 %
  - u Third order intermodulation distortion = ≧33 dBc
- n DVB performance at 858 MHz, a drain-source voltage  $V_{DS}$  of 40 V and a quiescent drain current  $I_{Dq} = 0.5$  A:
  - u Average output power = 24 W
  - u Power gain = 22 dB
  - u Drain efficiency = 33 %
  - u Third order intermodulation distortion = ≧34 dBc (4.3 MHz from center frequency)

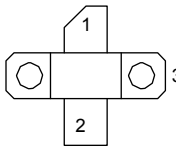
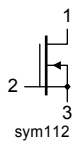
- n Integrated ESD protection
- n Excellent ruggedness
- n High power gain
- n High efficiency
- n Excellent reliability
- n Easy power control
- n Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

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

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source <a href="#">[1]</a>		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF871	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT467C

## 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		-	89	V
$V_{GS}$	gate-source voltage		≧0.5	+13	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	$T_{case} = 80 \text{ }^\circ\text{C}$ ; $P_{L(AV)} = 50 \text{ W}$	[1]	0.95	K/W

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

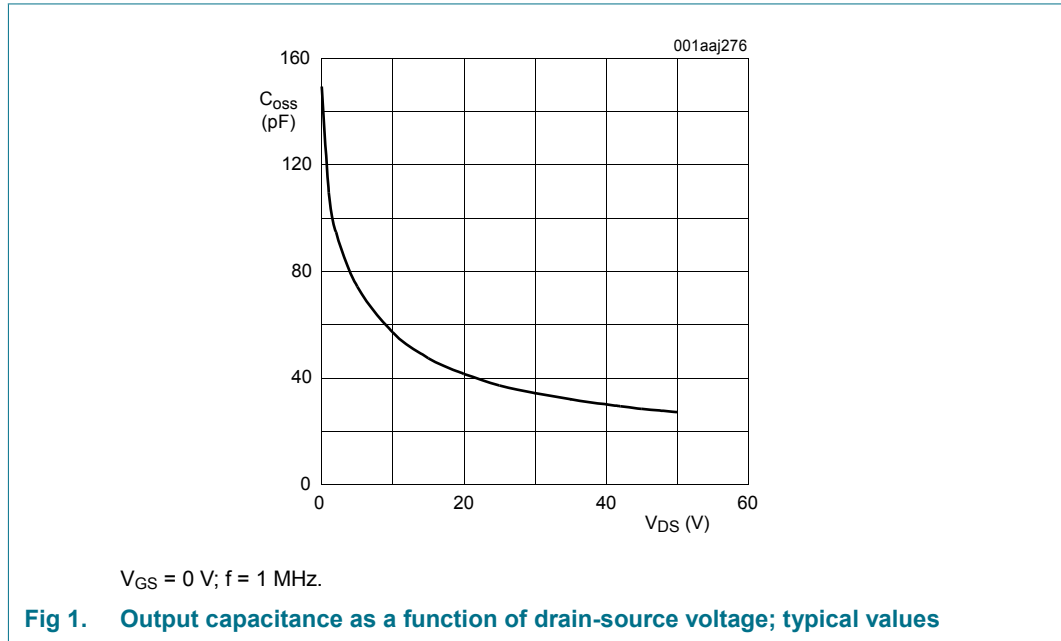
## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25 \text{ }^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0 \text{ V}$ ; $I_D = 1.12 \text{ mA}$	89	-	105	V	
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10 \text{ V}$ ; $I_D = 112 \text{ mA}$	[1]	1.3	-	2.2	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = 40 \text{ V}$	-	-	1.2	$\mu\text{A}$	
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GSth} + 3.75 \text{ V}$ ; $V_{DS} = 10 \text{ V}$	-	20	-	A	
$I_{GSS}$	gate leakage current	$V_{GS} = 10 \text{ V}$ ; $V_{DS} = 0 \text{ V}$	-	-	100	nA	
$g_{fs}$	forward transconductance	$V_{GS} = 10 \text{ V}$ ; $I_D = <tbid>$	[1]	-	<tbid>	S	
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GSth} + 3.75 \text{ V}$ ; $I_D = 8 \text{ A}$	[1]	-	<tbid>	$\text{m}\Omega$	
$C_{iss}$	input capacitance	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = 40 \text{ V}$ ; $f = 1 \text{ MHz}$	-	95	-	pF	
$C_{oss}$	output capacitance	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = 40 \text{ V}$ ; $f = 1 \text{ MHz}$	-	30	-	pF	
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0 \text{ V}$ ; $V_{DS} = 40 \text{ V}$ ; $f = 1 \text{ MHz}$	-	1	-	pF	

[1]  $I_D$  is the drain current.



## 7. Application information

**Table 7. RF performance in a common-source narrowband 860 MHz test circuit**  
 T<sub>h</sub> = 25 °C unless otherwise specified.

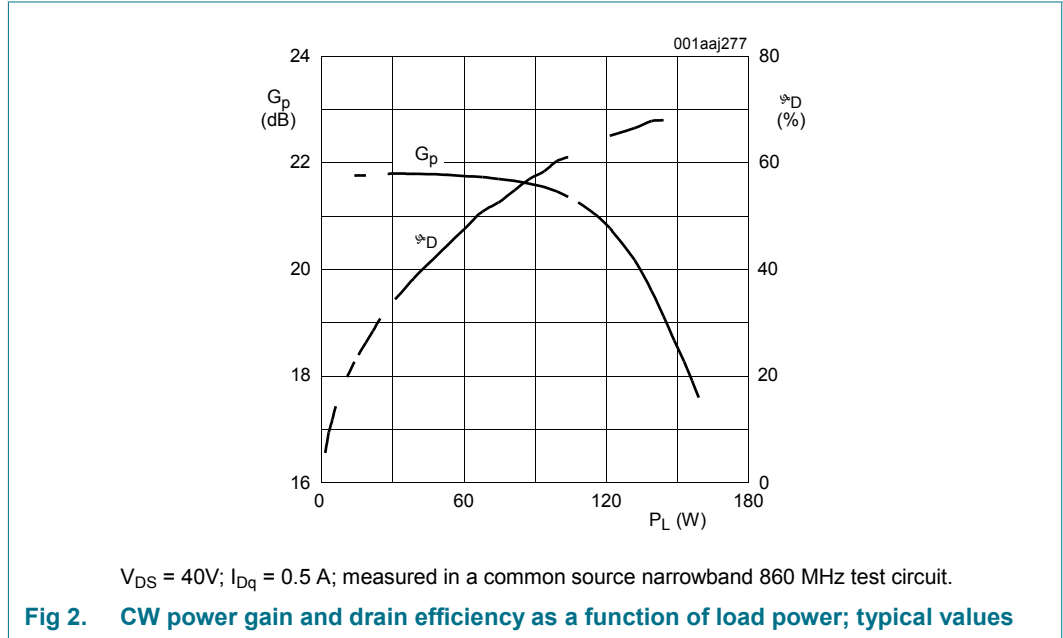
Mode of operation	f (MHz)	V <sub>DS</sub> (V)	I <sub>Dq</sub> (A)	P <sub>L(PEP)</sub> (W)	P <sub>L(AV)</sub> (W)	G <sub>p</sub> (dB)	G <sub>p</sub> (dB)	IMD3 (dBc)	PAR (dB)
2-tone, class AB	f <sub>1</sub> = 860; f <sub>2</sub> = 860.1	40	0.5	50	-	> 19	> 45	< 30	-
DVB-T (8k OFDM)	858	40	0.5	-	24	> 19	> 30	<	> 8 [2]

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

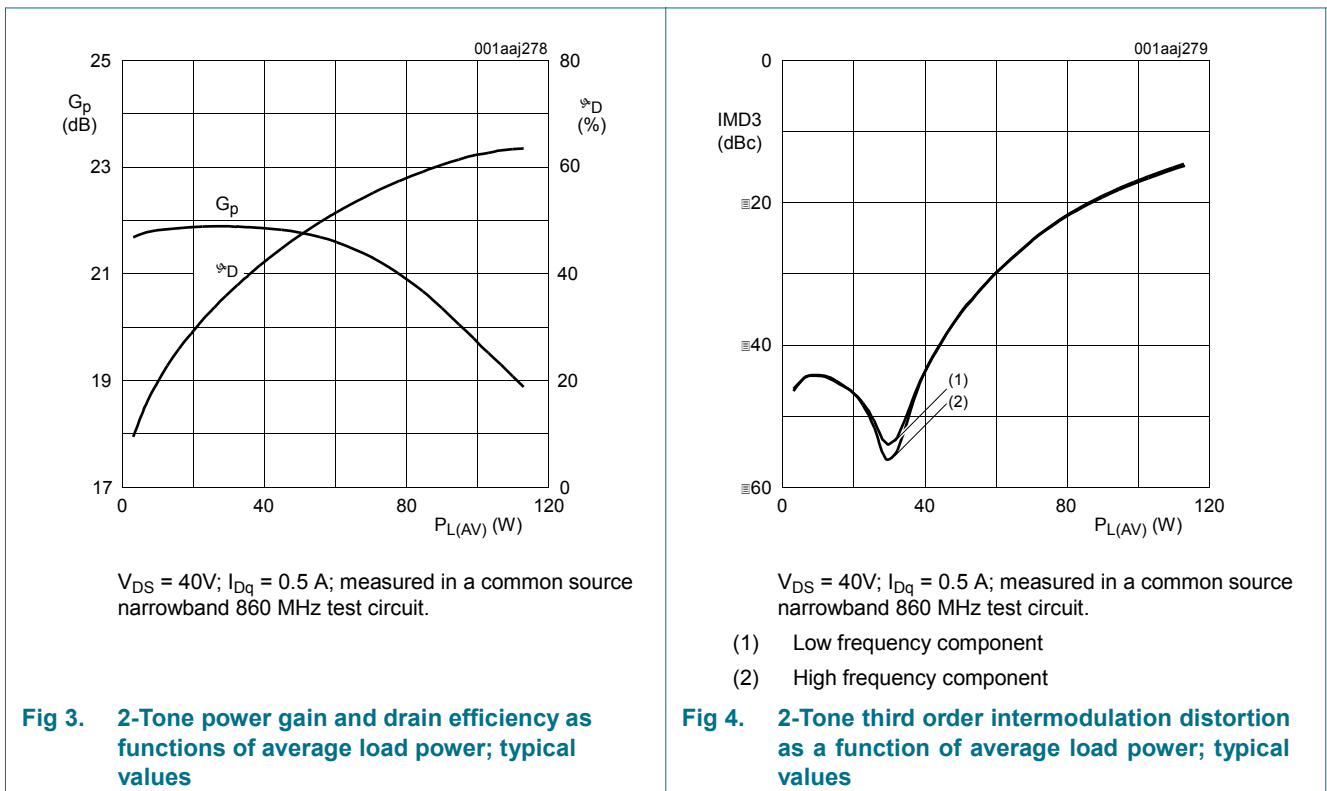
[2] PAR (of output signal) at 0.01 % probability on CCDF; PAR of input signal = 9.5 dB at 0.01 % probability on CCDF.

7.1 Narrowband RF figures

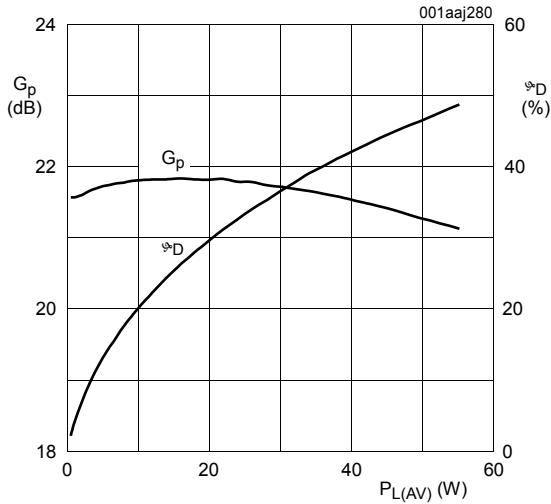
7.1.1 CW



7.1.2 2-Tone

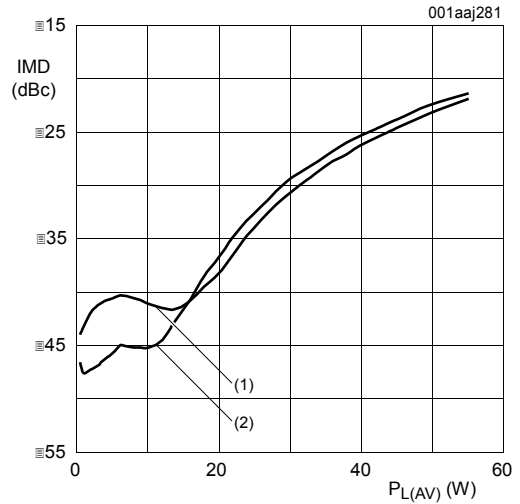


7.1.3 DVB-T



$V_{DS} = 40V$ ;  $I_{Dq} = 0.5 A$ ; measured in a common source narrowband 860 MHz test circuit.

Fig 5. DVB-T power gain and drain efficiency as functions of average load power; typical values



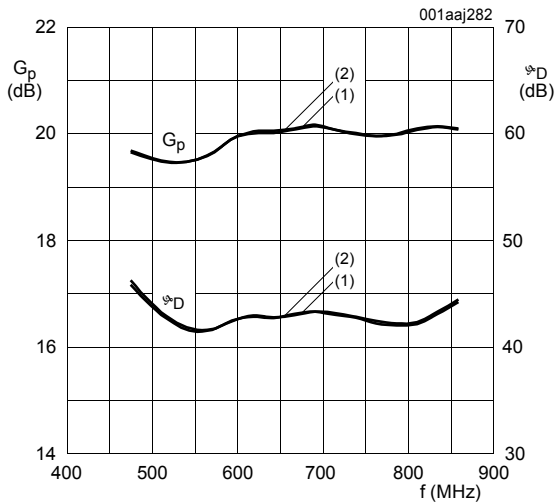
$V_{DS} = 40V$ ;  $I_{Dq} = 0.5 A$ ; measured in a common source narrowband 860 MHz test circuit.

- (1) Low frequency component
- (2) High frequency component

Fig 6. DVB-T third order intermodulation distortion as a function of average load power; typical values

7.2 Broadband RF figures

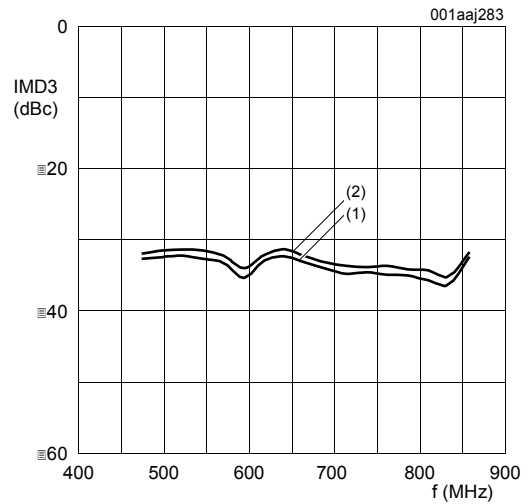
7.2.1 2-Tone



I<sub>Dq</sub> = 0.5 A; measured in a common source broadband test circuit as described in [Section 8](#).

- (1) V<sub>DS</sub> = 40 V; P<sub>L(AV)</sub> = 45 W
- (2) V<sub>DS</sub> = 42 V; P<sub>L(AV)</sub> = 50 W

Fig 7. 2-Tone power gain and drain efficiency as a function of frequency; typical values

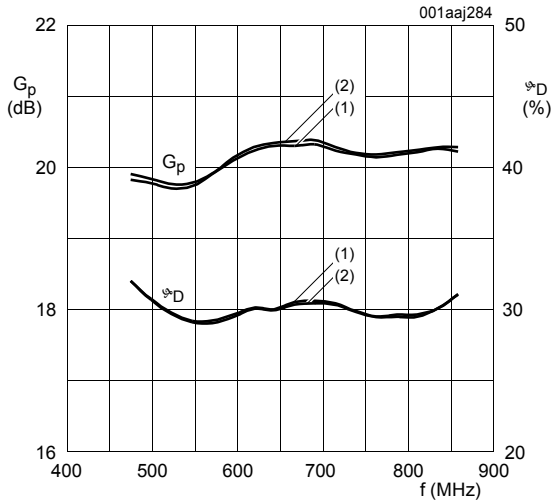


I<sub>Dq</sub> = 0.5 A; measured in a common source broadband test circuit as described in [Section 8](#).

- (1) V<sub>DS</sub> = 40 V; P<sub>L(AV)</sub> = 45 W
- (2) V<sub>DS</sub> = 42 V; P<sub>L(AV)</sub> = 50 W

Fig 8. 2-Tone third order intermodulation distortion as a function of frequency; typical values

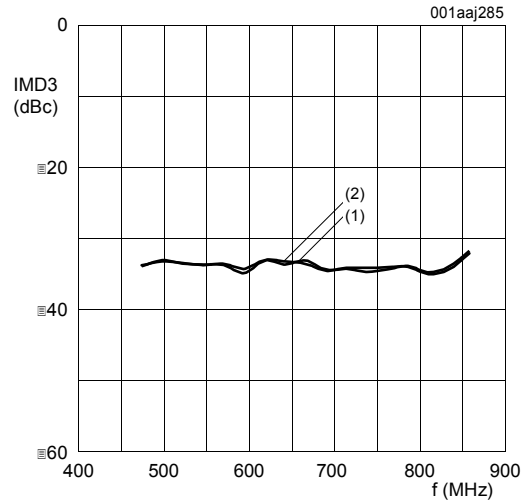
7.2.2 DVB-T



$I_{Dq} = 0.5 \text{ A}$ ; measured in a common source broadband test circuit as described in [Section 8](#).

- (1)  $V_{DS} = 40 \text{ V}$ ;  $P_{L(AV)} = 22 \text{ W}$
- (2)  $V_{DS} = 42 \text{ V}$ ;  $P_{L(AV)} = 24 \text{ W}$

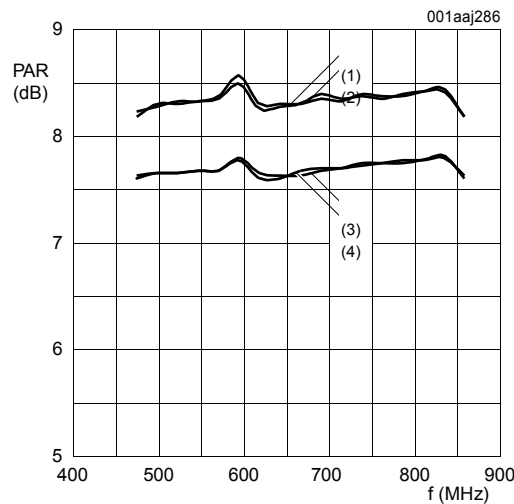
**Fig 9. DVB-T power gain and drain efficiency as functions of frequency; typical values**



$I_{Dq} = 0.5 \text{ A}$ ; measured in a common source broadband test circuit as described in [Section 8](#).

- (1)  $V_{DS} = 40 \text{ V}$ ;  $P_{L(AV)} = 22 \text{ W}$
- (2)  $V_{DS} = 42 \text{ V}$ ;  $P_{L(AV)} = 24 \text{ W}$

**Fig 10. DVB-T third order intermodulation distortion as a function of frequency; typical values**



$I_{Dq} = 0.5 \text{ A}$ ; measured in a common source broadband test circuit as described in [Section 8](#).

PAR of input signal = 9.5 dB at 0.01 % probability on CCDF.

- (1) PAR at 0.01 % probability on the CCDF;  $V_{DS} = 40 \text{ V}$ ;  $P_{L(AV)} = 22 \text{ W}$
- (2) PAR at 0.01 % probability on the CCDF;  $V_{DS} = 42 \text{ V}$ ;  $P_{L(AV)} = 24 \text{ W}$
- (3) PAR at 0.1 % probability on the CCDF;  $V_{DS} = 40 \text{ V}$ ;  $P_{L(AV)} = 22 \text{ W}$
- (4) PAR at 0.1 % probability on the CCDF;  $V_{DS} = 42 \text{ V}$ ;  $P_{L(AV)} = 24 \text{ W}$

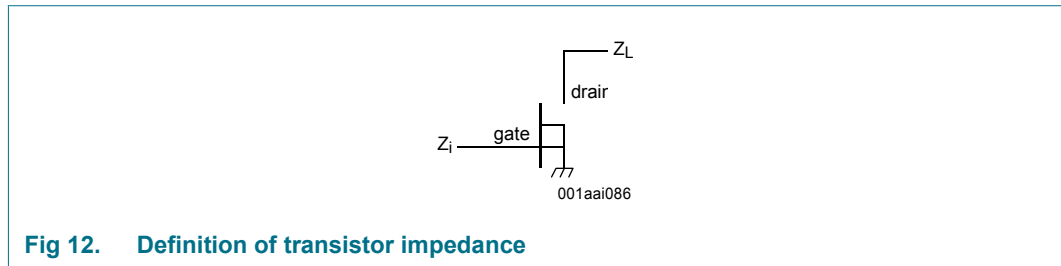
**Fig 11. DVB-T PAR at 0.1 % and at 0.01 % probability on the CCDF as function of frequency; typical values**



### 7.3 Ruggedness in class-AB operation

The BLF871 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 42$  V;  $f = 860$  MHz at rated power.

### 7.4 Impedance information



**Fig 12. Definition of transistor impedance**

**Table 8. Typical impedance**

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 42$  V.

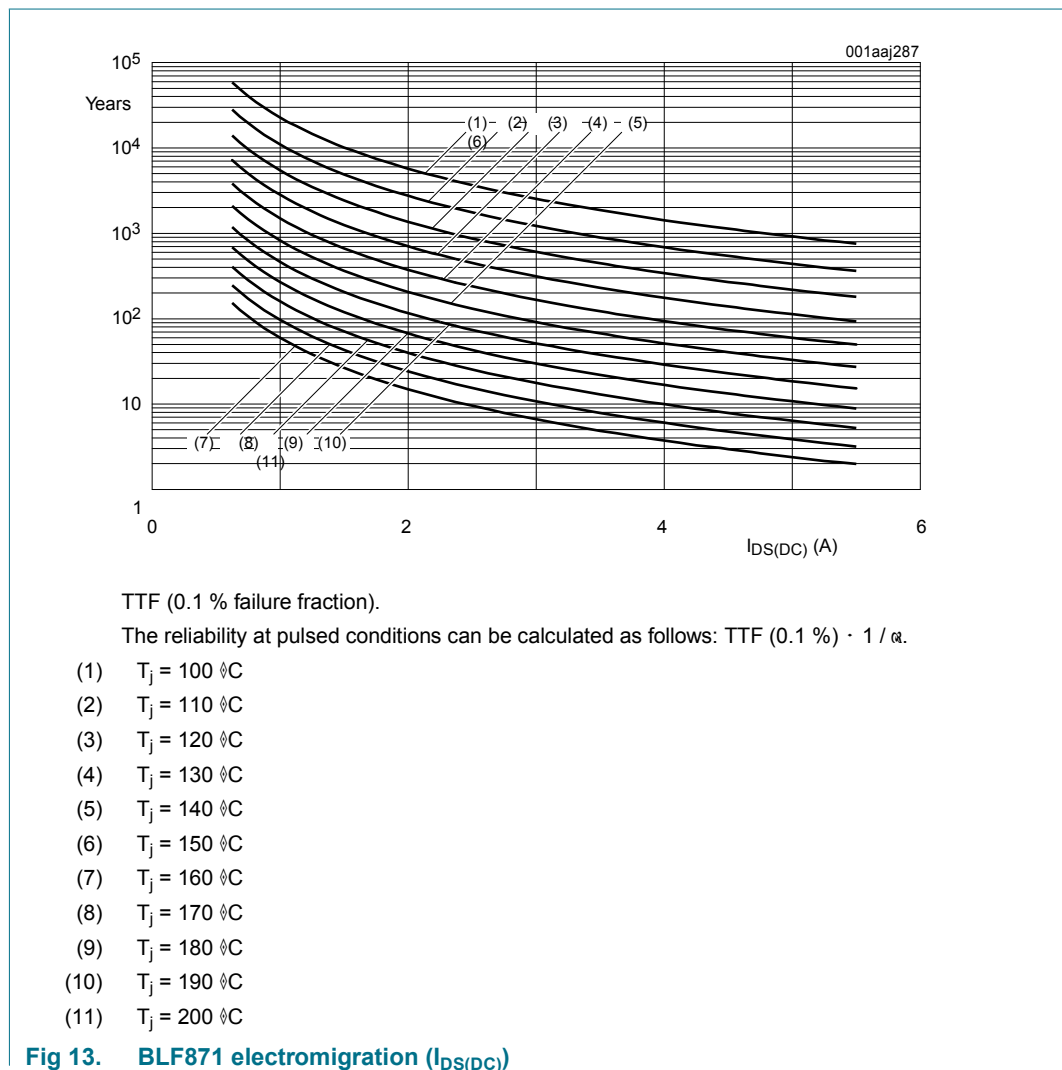
f MHz	$Z_i$ ⊙	$Z_L$ ⊙
300	0.977 ∟ j3.327	5.506 + j1.774
325	0.977 ∟ j2.983	5.366 + j1.858
350	0.978 ∟ j2.681	5.223 + j1.930
375	0.979 ∟ j2.414	5.078 + j1.990
400	0.979 ∟ j2.174	4.932 + j2.040
425	0.980 ∟ j1.956	4.786 + j2.079
450	0.981 ∟ j1.758	4.640 + j2.108
475	0.982 ∟ j1.576	4.495 + j2.128
500	0.982 ∟ j1.407	4.352 + j2.138
525	0.983 ∟ j1.250	4.212 + j2.140
550	0.984 ∟ j1.103	4.074 + j2.135
575	0.985 ∟ j0.964	3.940 + j2.122
600	0.986 ∟ j0.834	3.809 + j2.102
625	0.987 ∟ j0.709	3.682 + j2.077
650	0.988 ∟ j0.591	3.558 + j2.045
675	0.990 ∟ j0.478	3.438 + j2.009
700	0.991 ∟ j0.370	3.323 + j1.968
725	0.992 ∟ j0.266	3.211 + j1.923
750	0.993 ∟ j0.165	3.103 + j1.874
775	0.995 ∟ j0.068	3.000 + j1.822
800	0.996 + j0.026	2.900 + j1.766
825	0.997 + j0.117	2.804 + j1.708
850	0.999 + j0.206	2.711 + j1.648
875	1.000 + j0.292	2.623 + j1.586
900	1.002 + j0.376	2.538 + j1.521

**Table 8. Typical impedance ...continued**

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 42$  V.

f MHz	$Z_i$ Ω	$Z_L$ Ω
925	1.004 + j0.459	2.456 + j2.455
950	1.005 + j0.540	2.378 + j2.388
975	1.007 + j0.619	2.303 + j2.320
1000	1.009 + j0.696	2.230 + j2.250

### 7.5 Reliability



## 8. Test information

**Table 9. List of components**

For test circuit, see [Figure 14](#), [Figure 15](#) and [Figure 16](#).

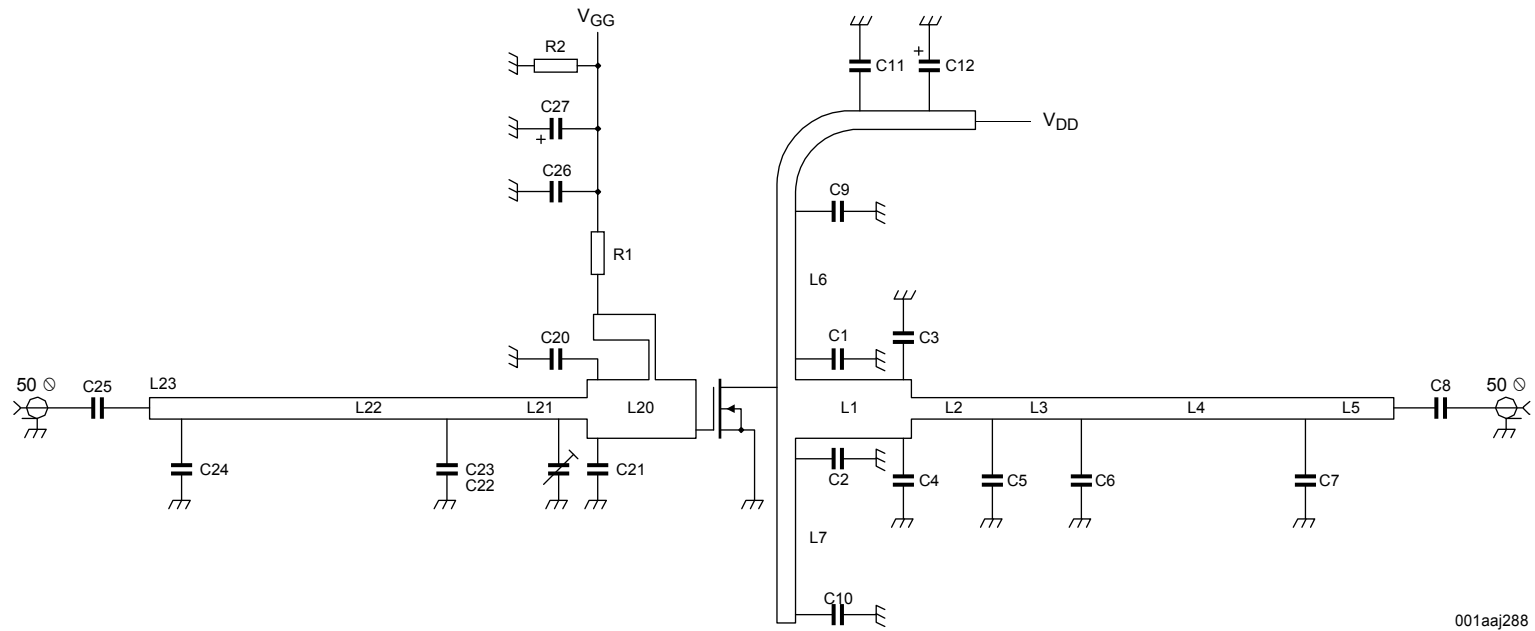
Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	5.1 pF	[1]
C3, C4	multilayer ceramic chip capacitor	10 pF	[2]
C5	multilayer ceramic chip capacitor	6.8 pF	[1]
C6	multilayer ceramic chip capacitor	4.7 pF	[1]
C7	multilayer ceramic chip capacitor	2.7 pF	[1]
C8, C9, C10, C25, C26	multilayer ceramic chip capacitor	100 pF	[1]
C11, C27	multilayer ceramic chip capacitor	10 $\mu$ F	TDK C570X7R1H106KT000N or capacitor of same quality.
C12	electrolytic capacitor	470 $\mu$ F; 63 V	
C20	multilayer ceramic chip capacitor	10 pF	[3]
C21	multilayer ceramic chip capacitor	8.2 pF	[3]
C22	trimmer	0.6 pF to 4.5 pF	Tekelec
C23	multilayer ceramic chip capacitor	6.8 pF	[3]
C24	multilayer ceramic chip capacitor	3.9 pF	[3]
L1	stripline	-	[4] (W · L) 7 mm · 15 mm
L2	stripline	-	[4] (W · L) 2.4 mm · 9 mm
L3	stripline	-	[4] (W · L) 2.4 mm · 10 mm
L4	stripline	-	[4] (W · L) 2.4 mm · 25 mm
L5	stripline	-	[4] (W · L) 2.4 mm · 10 mm
L6	stripline	-	[4] (W · L) 2.0 mm · 20 mm
L7	stripline	-	[4] (W · L) 2.0 mm · 21 mm
L20	stripline	-	[4] (W · L) 7 mm · 12 mm
L21	stripline	-	[4] (W · L) 2.4 mm · 13
mm L22	stripline	-	[4] (W · L) 2.4 mm · 31
mm L23	stripline	-	[4] (W · L) 2.4 mm · 5
mm			
R1	resistor	100 $\Omega$	
R2	resistor	10 k $\Omega$	

[1] American technical ceramics type 100B 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.

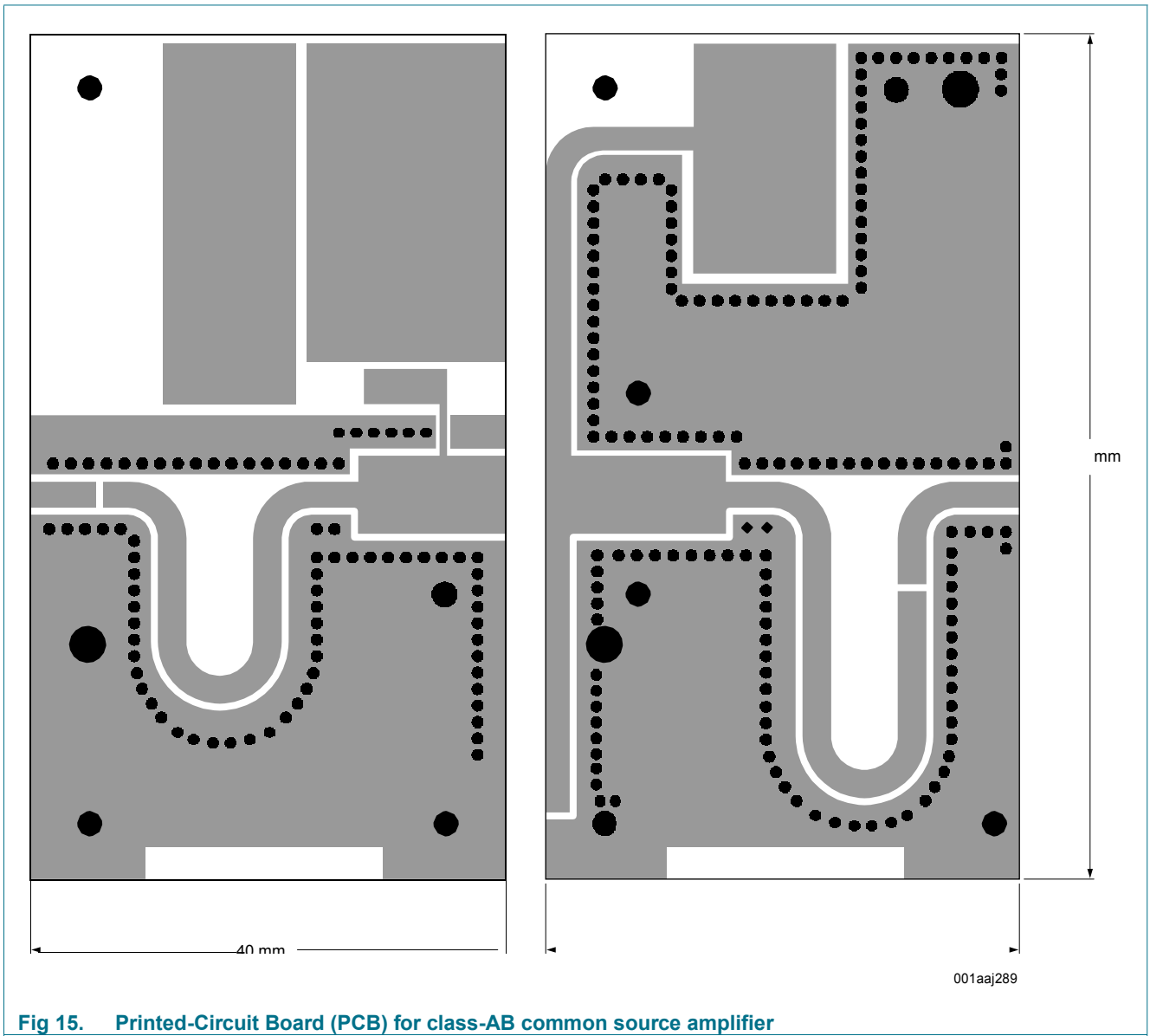
[4] Printed-Circuit Board (PCB): Rogers 5880;  $\epsilon_r = 2.2$  F/m; height = 0.79 mm; Cu (top/bottom metallization); thickness copper plating = 35  $\mu$ m.

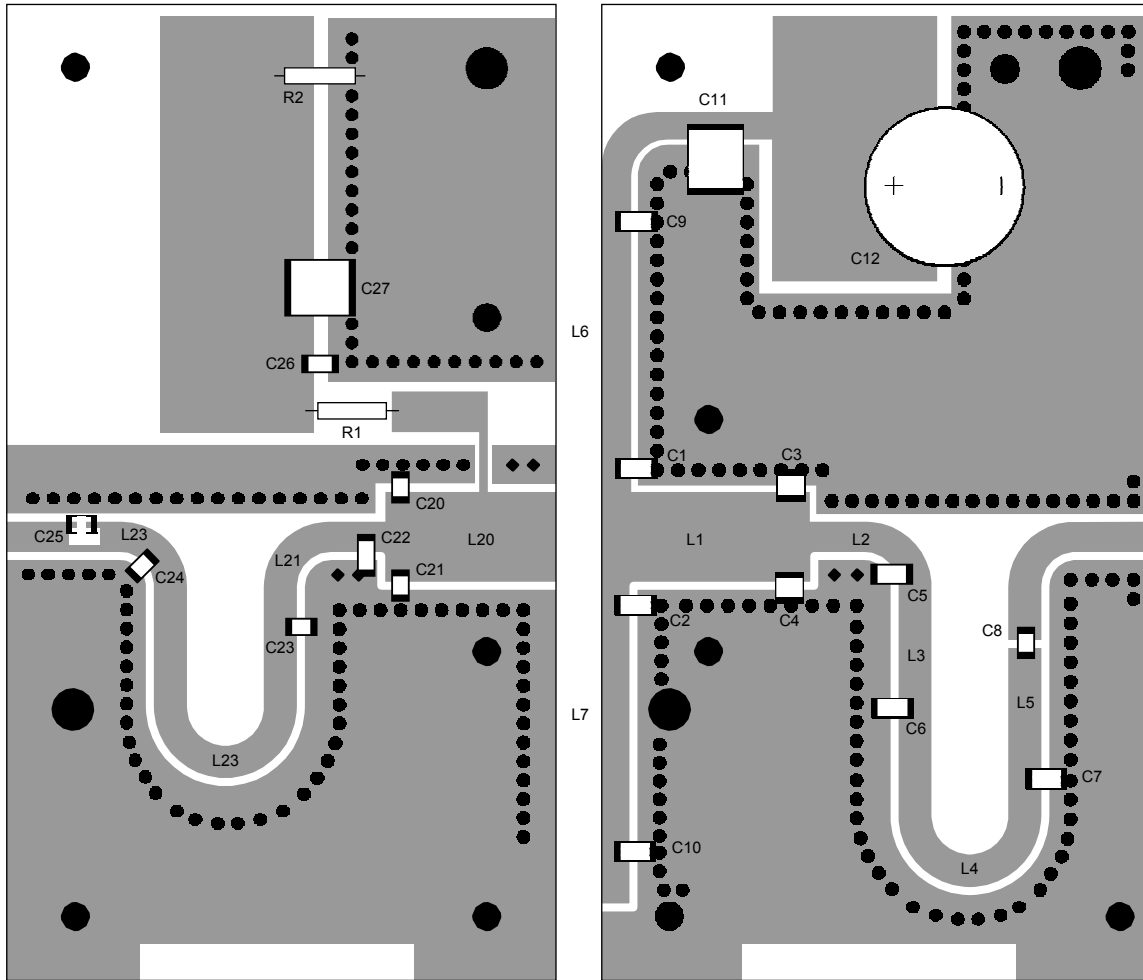


001aaaj288

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

**Fig 14. Class-AB common-source broadband amplifier**





001aa290

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

**Fig 16. Component layout for class-AB common source amplifier**

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT467C

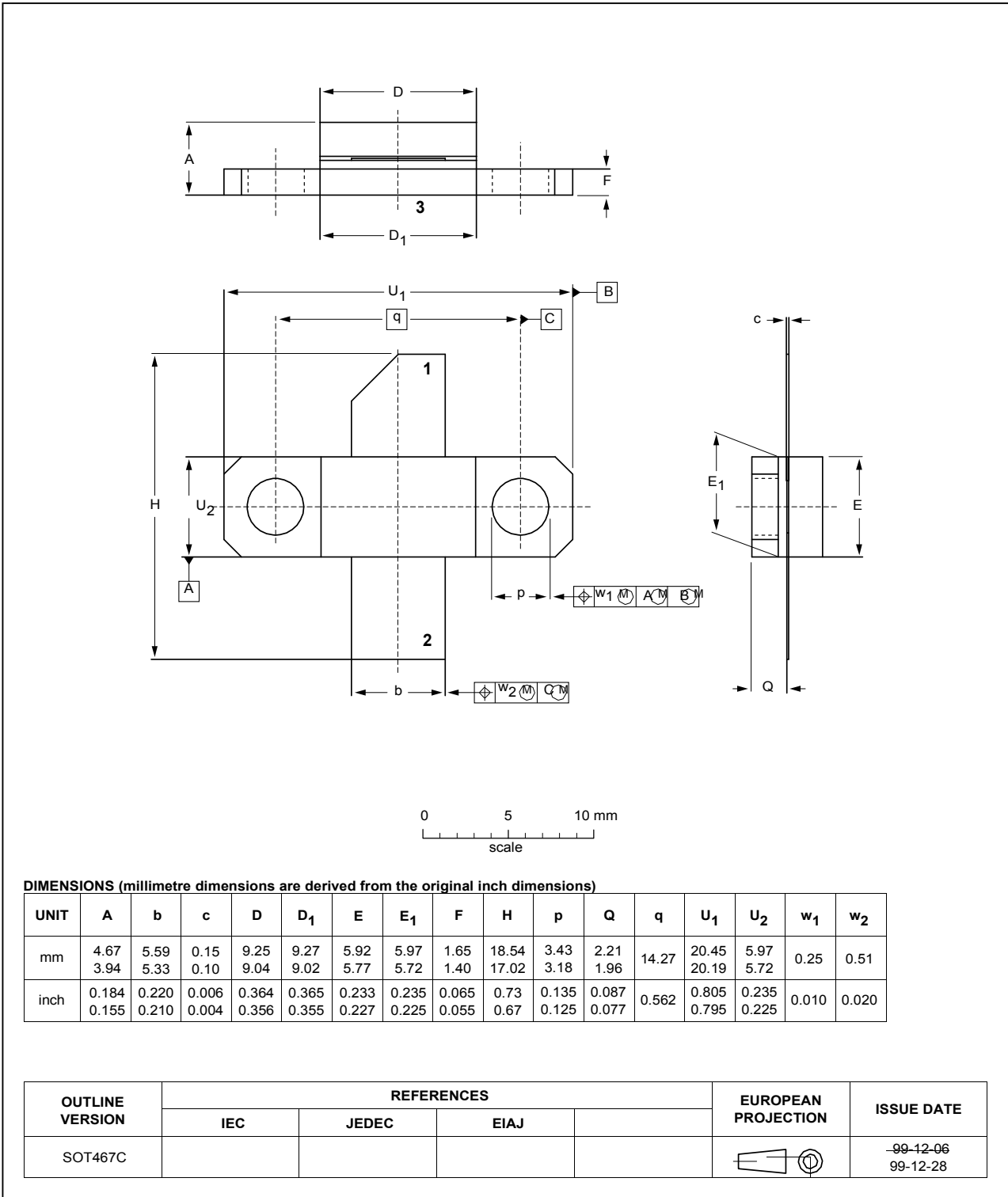


Fig 17. Package outline SOT467C

## 10. Abbreviations

**Table 10. Abbreviations**

Acronym	Description
CW	Continuous Wave
CCDF	Complementary Cumulative Distribution Function
DVB	Digital Video Broadcast
DVB-T	Digital Video Broadcast - Terrestrial
ESD	ElectroStatic Discharge
HF	High Frequency
IMD3	Third order InterModulation Distortion
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
OFDM	Orthogonal Frequency Division Multiplexing
PAR	Peak-to-Average power Ratio
PEP	Peak Envelope Power
RF	Radio Frequency
TTF	Time To Failure
UHF	Ultra High Frequency
VSWR	Voltage Standing-Wave Ratio

## 11. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF871_1	20081218	Objective data sheet	-	-



## 12. Legal information

### 12.1 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.nxp.com>.

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