

BLF871; BLF871S

UHF power LDMOS transistor

Rev. 04 — 19 November 2009

Product data sheet

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)	η_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	47	-35	-
DVB-T (8k OFDM)	858	-	-	24	22	33	-34 ^[1]	8.3 ^[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.

CAUTION



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

1.2 Features

- 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:
 - ◆ Peak envelope power load power = 100 W
 - ◆ Power gain = 21 dB
 - ◆ Drain efficiency = 47 %
 - ◆ Third order intermodulation distortion = -35 dBc
- DVB performance at 858 MHz, a drain-source voltage V_{DS} of 40 V and a quiescent drain current $I_{DQ} = 0.5$ A:
 - ◆ Average output power = 24 W
 - ◆ Power gain = 22 dB
 - ◆ Drain efficiency = 33 %
 - ◆ Third order intermodulation distortion = -34 dBc (4.3 MHz from center frequency)

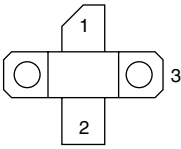
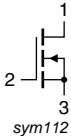
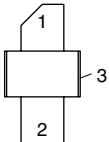
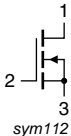
- Integrated ESD protection
- Excellent ruggedness
- High power gain
- High efficiency
- Excellent reliability
- Easy power control
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

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
BLF871 (SOT467C)			
1	drain		
2	gate		
3	source		
BLF871S (SOT467B)			
1	drain		
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BLF871	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT467C
BLF871S	-	earless LDMOST ceramic package; 2 leads	SOT467B

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	$T_{case} = 80\text{ °C}$; $P_{L(AV)} = 50\text{ W}$	0.95	K/W

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

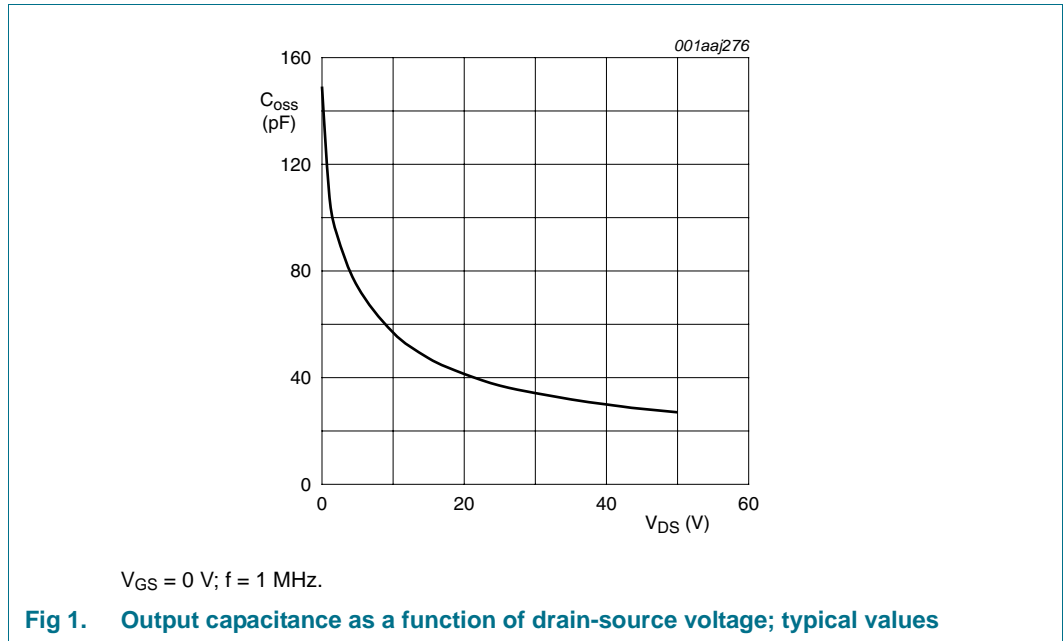
6. Characteristics

Table 6. Characteristics

$T_j = 25\text{ °C}$ 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	-	105.5	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 112\text{ mA}$	1.4	-	2.4	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 40\text{ V}$	-	-	1.4	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	16.7	20	-	A
I_{GSS}	gate leakage current	$V_{GS} = 10\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	140	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 3.7\text{ A}$	-	210	-	mΩ
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
 $T_h = 25 \text{ }^\circ\text{C}$ unless otherwise specified.

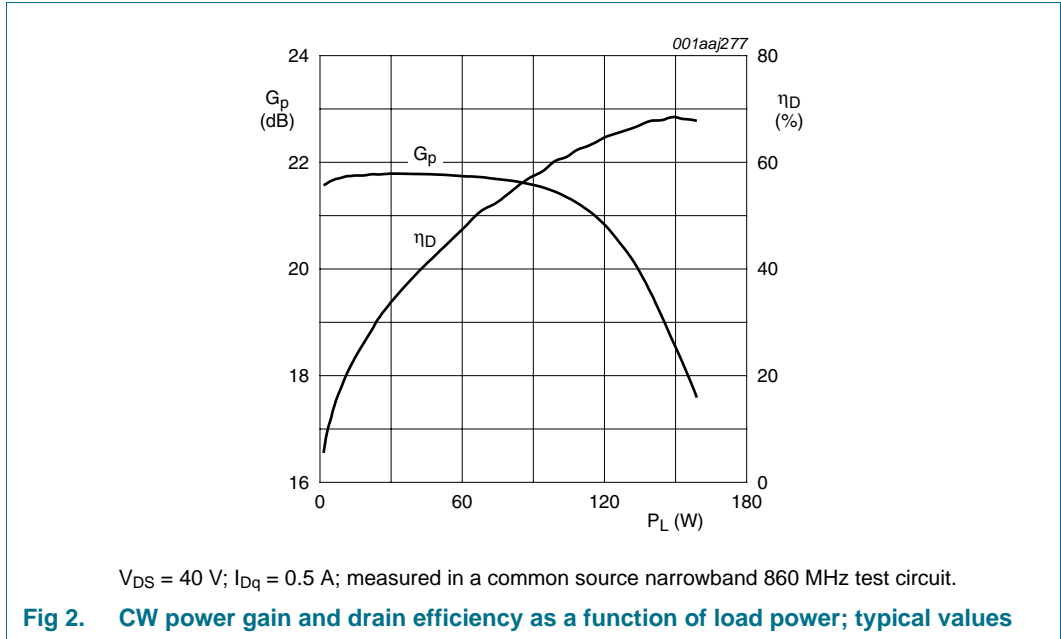
Mode of operation	f (MHz)	V_{DS} (V)	I_{Dq} (A)	$P_{L(PEP)}$ (W)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	IMD3 (dBc)	PAR (dB)
2-tone, class AB	$f_1 = 860;$ $f_2 = 860.1$	40	0.5	100	-	> 19	> 44	< -30	-
DVB-T (8k OFDM)	858	40	0.5	-	24	> 19	> 30	< -31 [1]	> 7.8 [2]

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

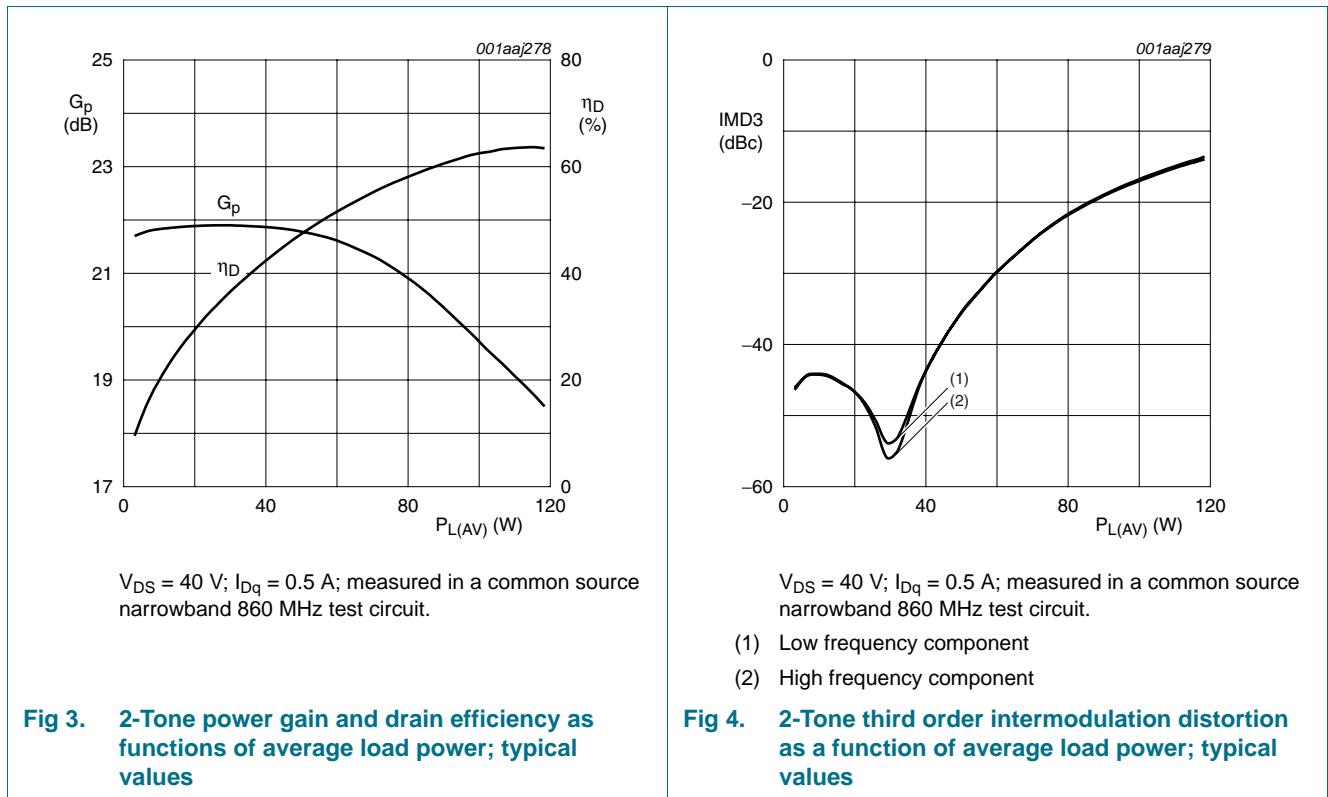
[2] PAR (of output signal) at 0.01 % probability on CCDF; PAR of input signal = 9.5 dB at 0.01 % probability on CCDF.

7.1 Narrowband RF figures

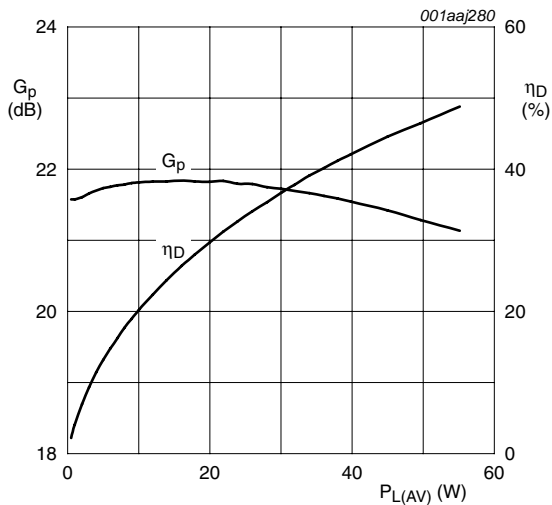
7.1.1 CW



7.1.2 2-Tone

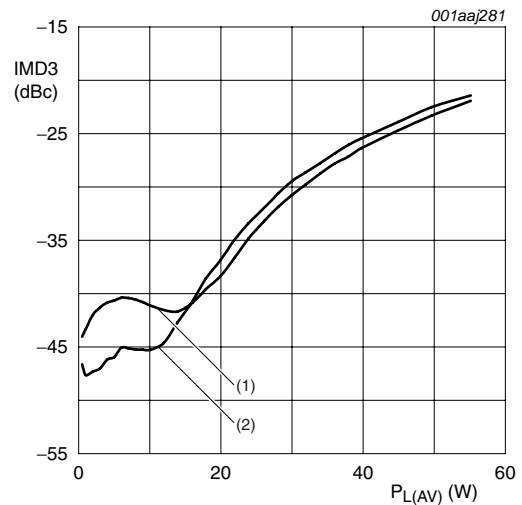


7.1.3 DVB-T



$V_{DS} = 40$ V; $I_{Dq} = 0.5$ 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



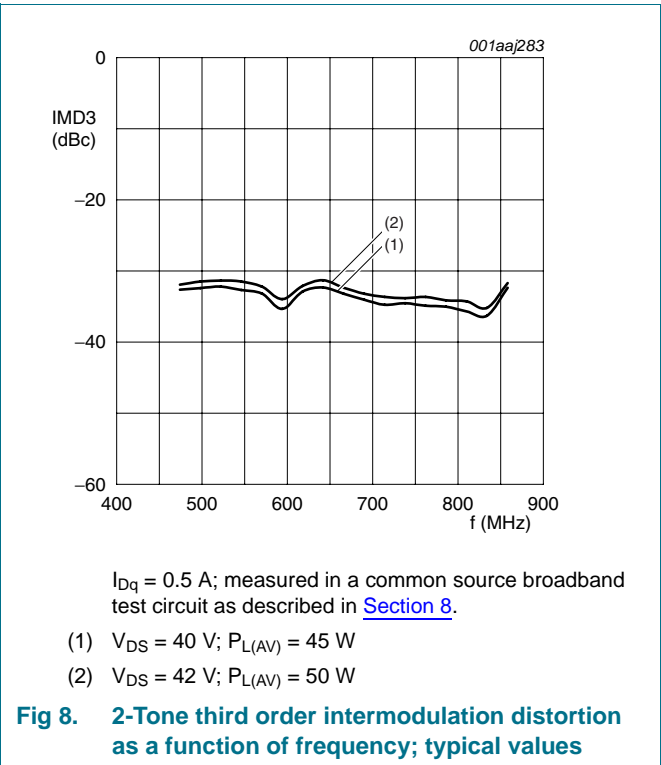
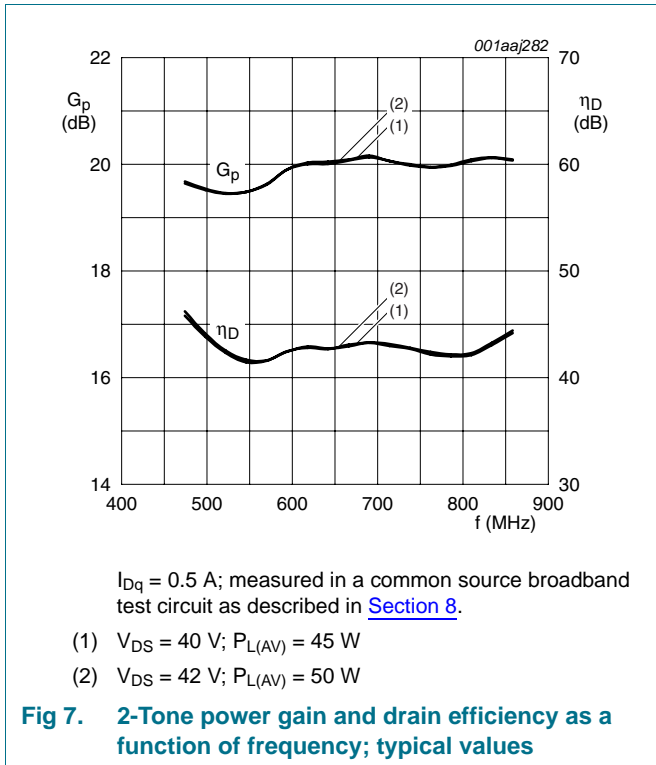
$V_{DS} = 40$ V; $I_{Dq} = 0.5$ A; measured in a common source narrowband 860 MHz test circuit.

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

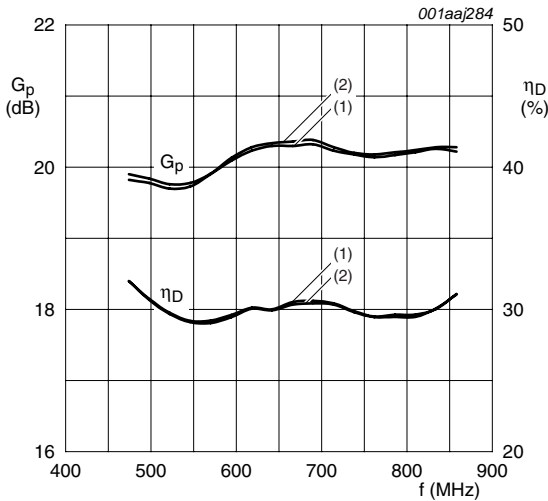
Fig 6. DVB-T third order intermodulation distortion as a function of average load power; typical values

7.2 Broadband RF figures

7.2.1 2-Tone



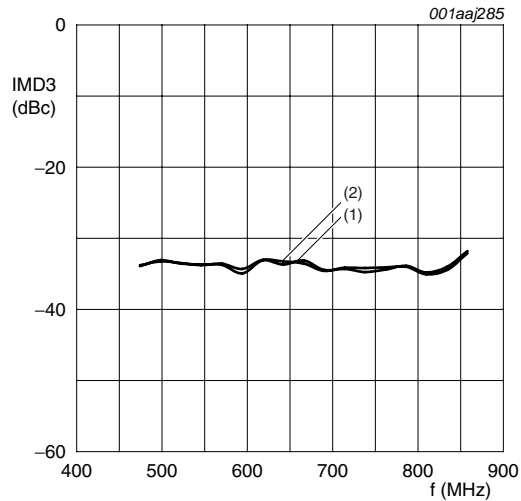
7.2.2 DVB-T



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

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

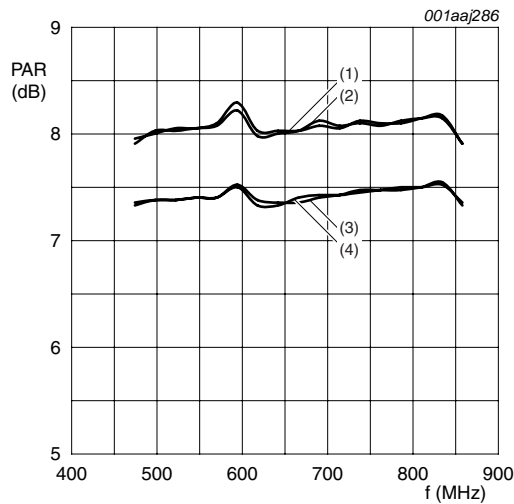
Fig 9. DVB-T power gain and drain efficiency as functions of frequency; typical values



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

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

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



$I_{Dq} = 0.5$ 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; $V_{DS} = 40$ V; $P_{L(AV)} = 22$ W
- (2) PAR at 0.01 % probability on the CCDF; $V_{DS} = 42$ V; $P_{L(AV)} = 24$ W
- (3) PAR at 0.1 % probability on the CCDF; $V_{DS} = 40$ V; $P_{L(AV)} = 22$ W
- (4) PAR at 0.1 % probability on the CCDF; $V_{DS} = 42$ V; $P_{L(AV)} = 24$ 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 and BLF871S are capable of withstanding a load mismatch corresponding to $V_{SWR} = 10 : 1$ through all phases under the following conditions: $V_{DS} = 42$ V; $f = 860$ MHz at rated power.

7.4 Impedance information

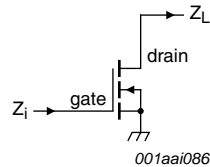


Fig 12. Definition of transistor impedance

Table 8. Typical impedance

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

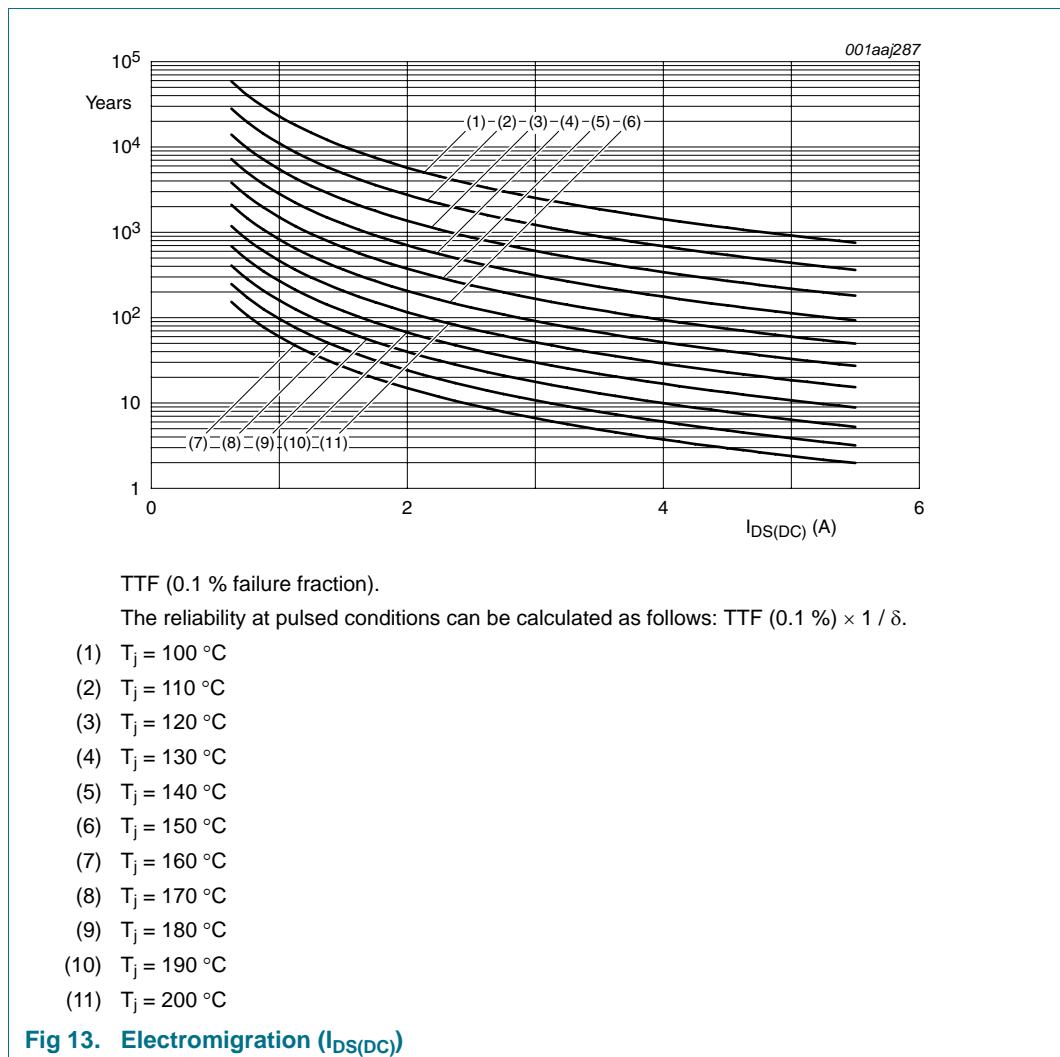
f (MHz)	Z_i (Ω)	Z_L (Ω)
300	$0.977 - j3.327$	$5.506 + j1.774$
325	$0.977 - j2.983$	$5.366 + j1.858$
350	$0.978 - j2.681$	$5.223 + j1.930$
375	$0.979 - j2.414$	$5.078 + j1.990$
400	$0.979 - j2.174$	$4.932 + j2.040$
425	$0.980 - j1.956$	$4.786 + j2.079$
450	$0.981 - j1.758$	$4.640 + j2.108$
475	$0.982 - j1.576$	$4.495 + j2.128$
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](#).

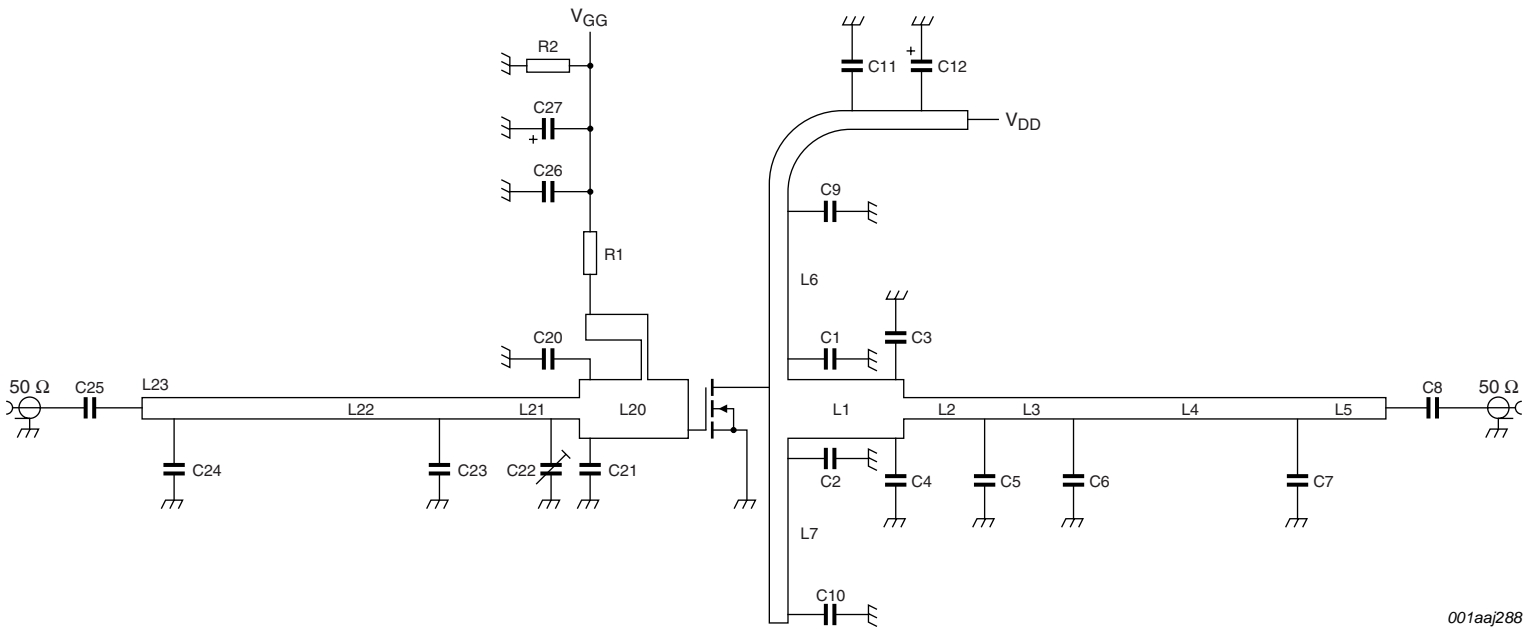
Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	5.1 pF	[1]
C3, C4	multilayer ceramic chip capacitor	10 pF	[2]
C5	multilayer ceramic chip capacitor	6.8 pF	[1]
C6	multilayer ceramic chip capacitor	4.7 pF	[1]
C7	multilayer ceramic chip capacitor	2.7 pF	[1]
C8, C9, C10, C25, C26	multilayer ceramic chip capacitor	100 pF	[1]
C11, C27	multilayer ceramic chip capacitor	10 μ F	TDK C570X7R1H106KT000N or capacitor of same quality.
C12	electrolytic capacitor	470 μ 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 \times L) 7 mm \times 15 mm
L2	stripline	-	[4] (W \times L) 2.4 mm \times 9 mm
L3	stripline	-	[4] (W \times L) 2.4 mm \times 10 mm
L4	stripline	-	[4] (W \times L) 2.4 mm \times 25 mm
L5	stripline	-	[4] (W \times L) 2.4 mm \times 10 mm
L6	stripline	-	[4] (W \times L) 2.0 mm \times 20 mm
L7	stripline	-	[4] (W \times L) 2.0 mm \times 21 mm
L20	stripline	-	[4] (W \times L) 7 mm \times 12 mm
L21	stripline	-	[4] (W \times L) 2.4 mm \times 13 mm
L22	stripline	-	[4] (W \times L) 2.4 mm \times 31 mm
L23	stripline	-	[4] (W \times L) 2.4 mm \times 5 mm
R1	resistor	100 Ω	
R2	resistor	10 k Ω	

[1] American technical ceramics type 100B or capacitor of same quality.

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

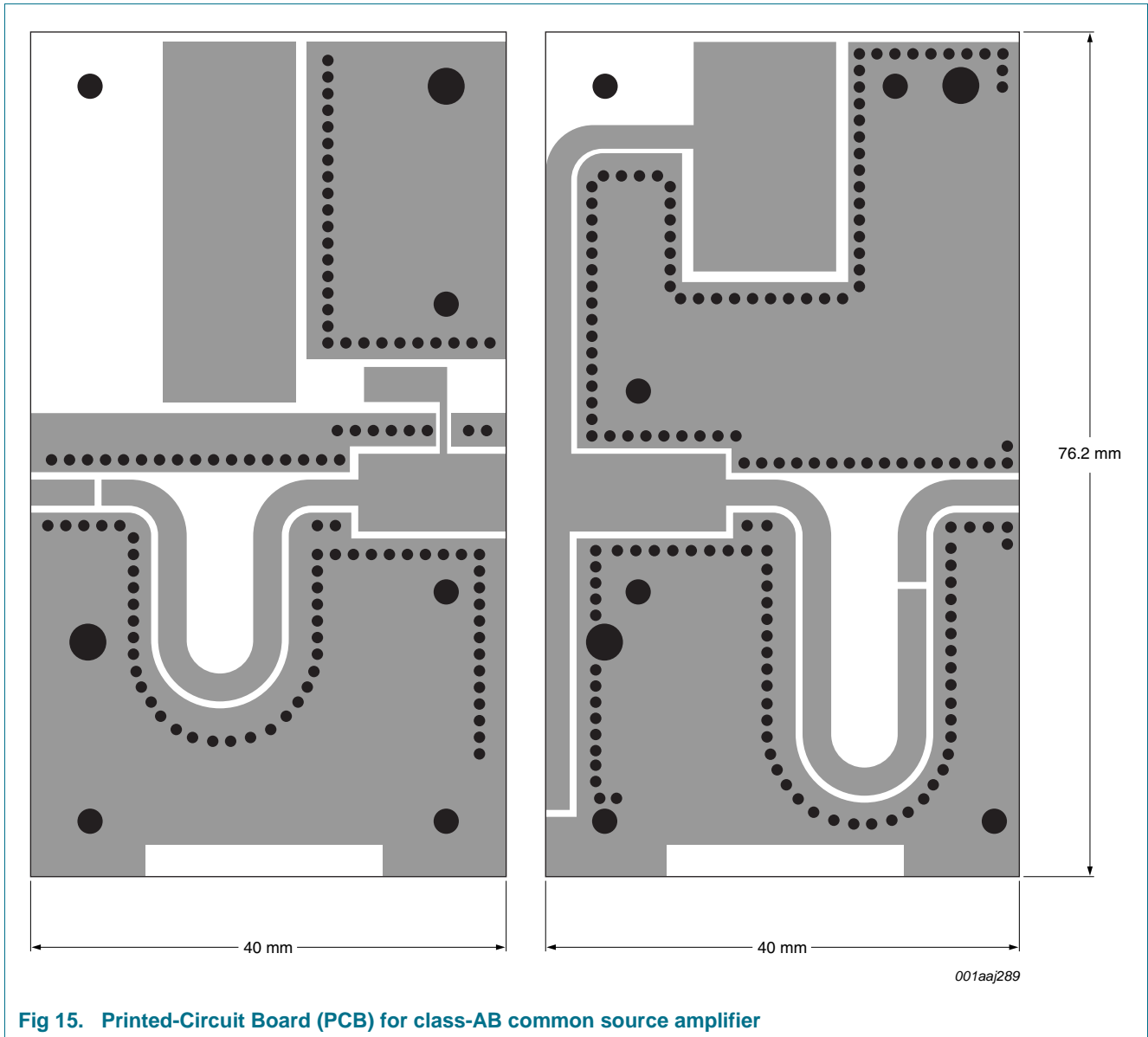
[3] American technical ceramics type 100A or capacitor of same quality.

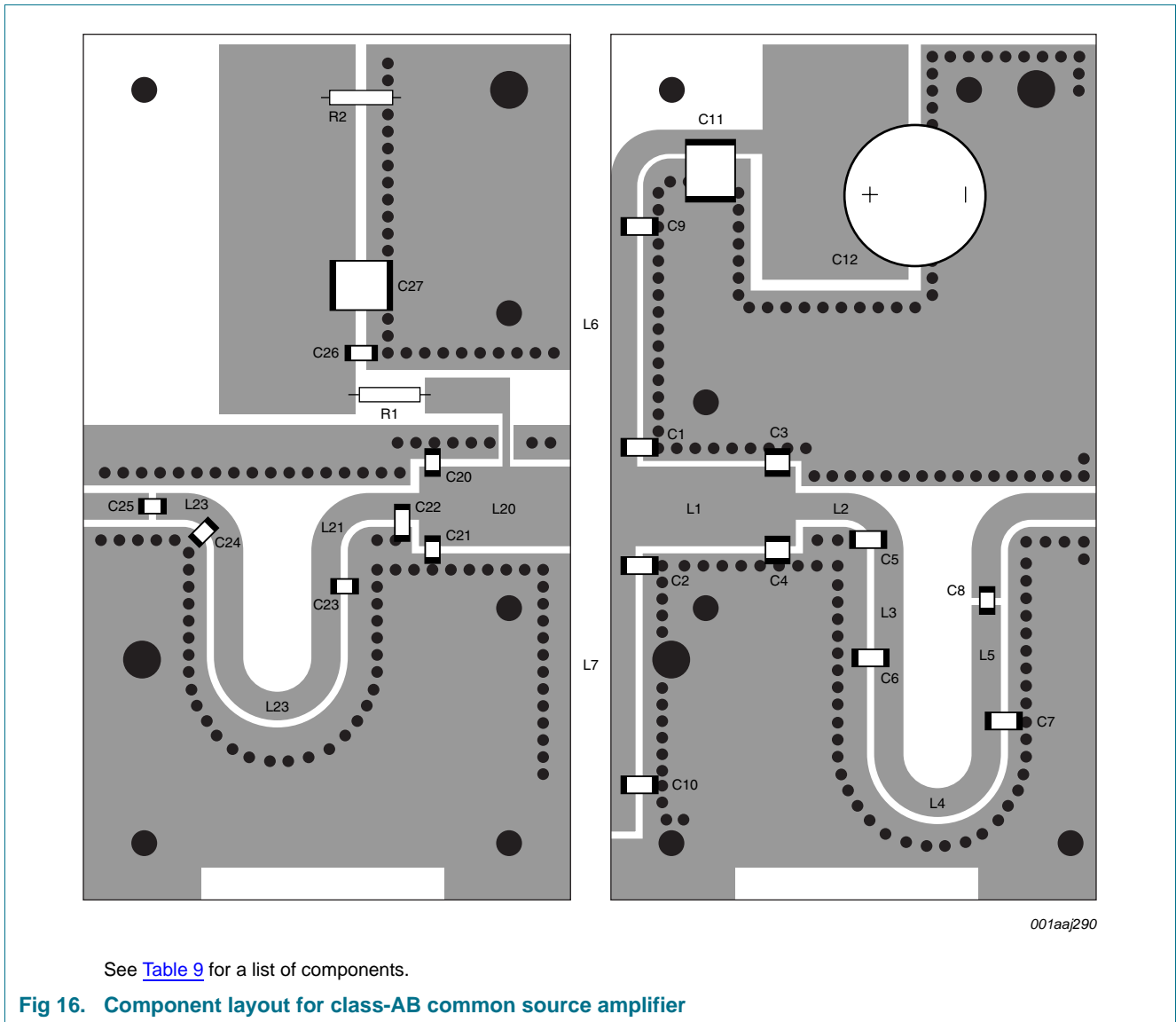
[4] Printed-Circuit Board (PCB): Rogers 5880; $\epsilon_r = 2.2$ F/m; height = 0.79 mm; Cu (top/bottom metallization); thickness copper plating = 35 μ m.



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

Fig 14. Class-AB common-source broadband amplifier





9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT467C

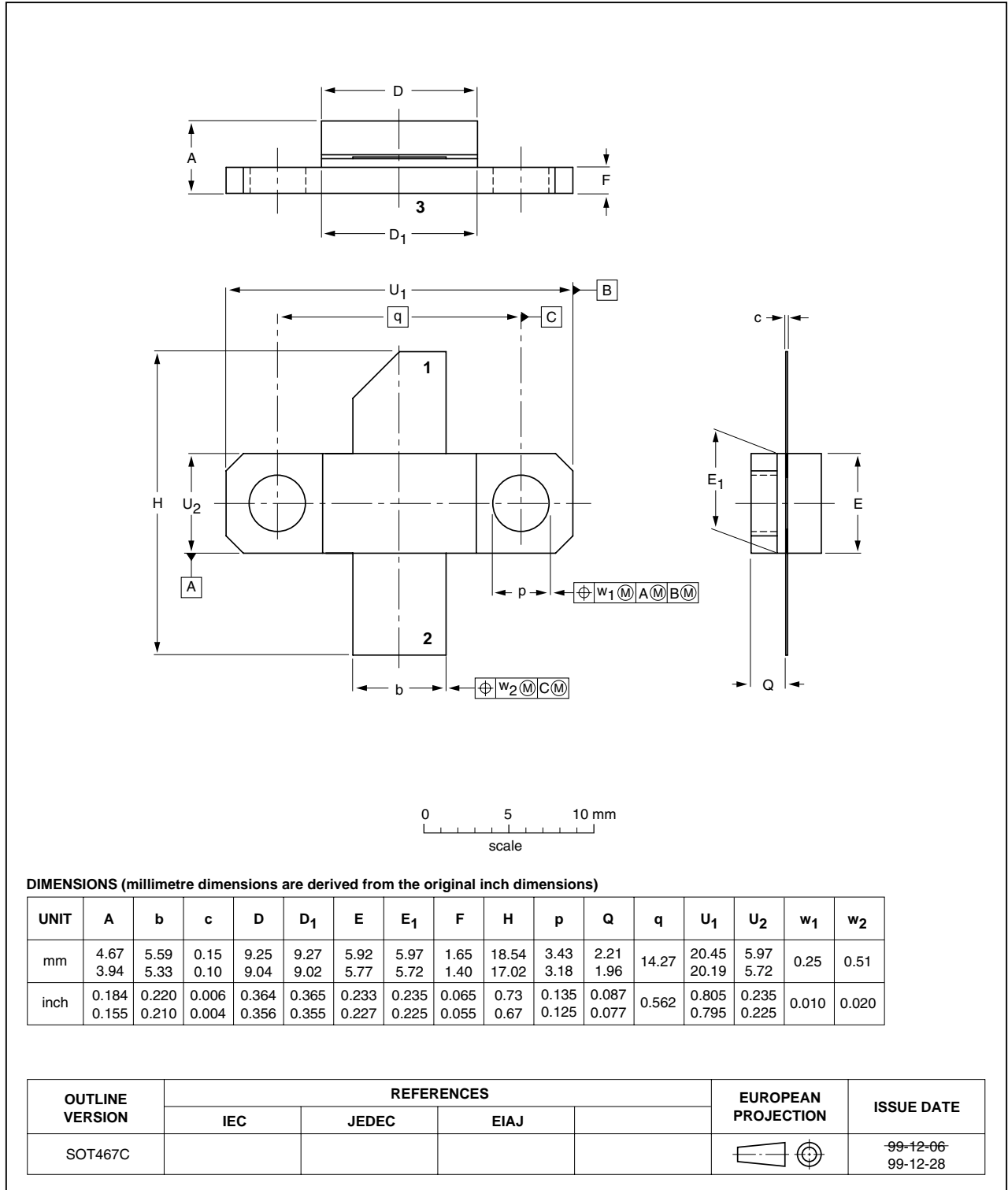


Fig 17. Package outline SOT467C

Earless LDMOST ceramic package; 2 leads

SOT467B

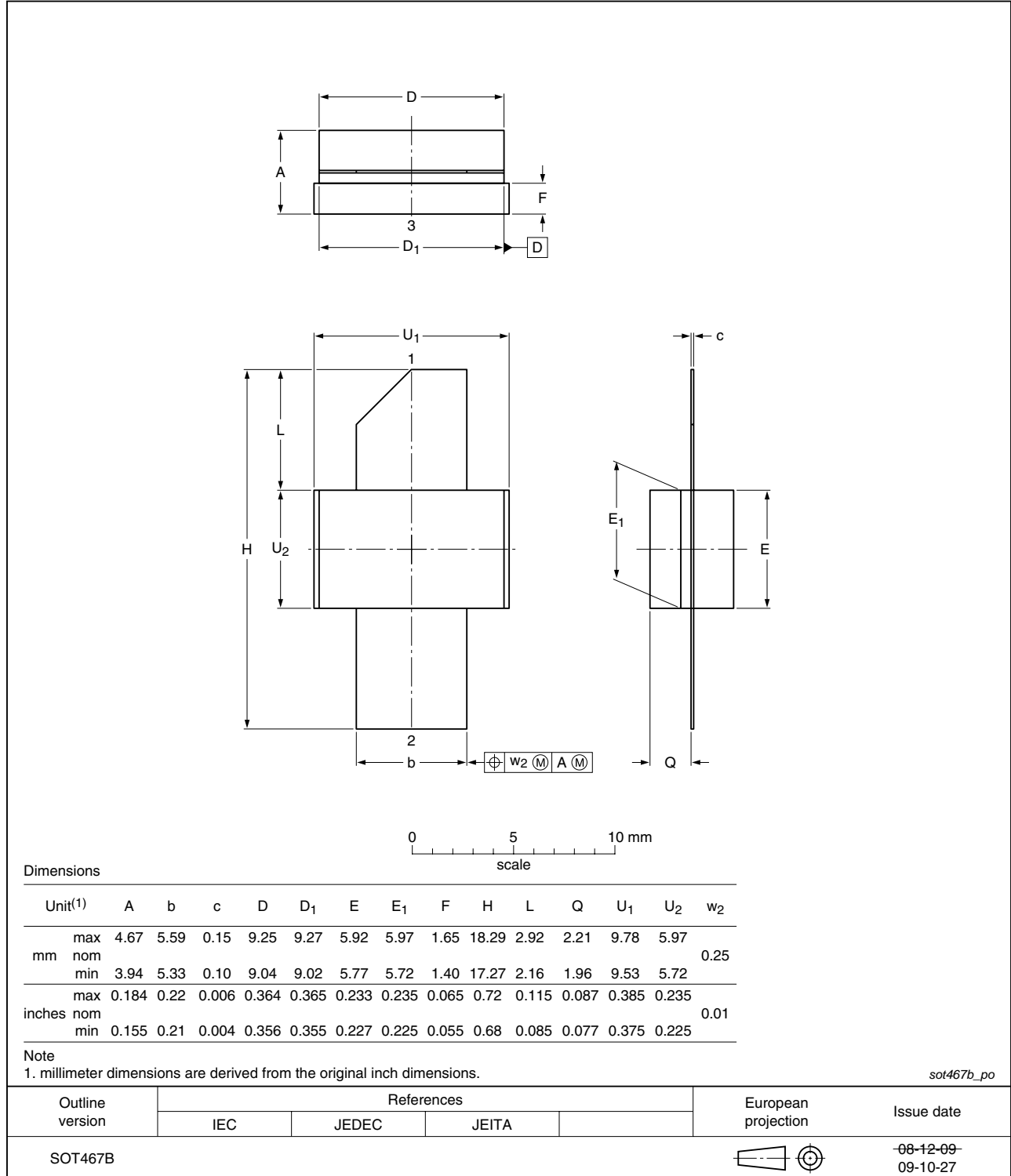


Fig 18. Package outline SOT467B

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_BLF871S_4	20091119	Product data sheet	-	BLF871_3
Modifications:	<ul style="list-style-type: none"> This document now describes both the BLF871 and the BLF871S. 			
BLF871_3	20090921	Product data sheet	-	BLF871_2
BLF871_2	20090305	Preliminary data sheet	-	BLF871_1
BLF871_1	20081218	Objective data sheet	-	-

12. Legal information

12.1 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".

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