

# BLF881; BLF881S

UHF power LDMOS transistor

Rev. 3 — 7 December 2010

Product data sheet

## 1. Product profile

### 1.1 General description

A 140 W LDMOS RF power transistor for broadcast transmitter applications and industrial applications. The transistor can deliver 140 W 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  $V_{DS} = 50$  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)	IMD <sub>shldr</sub> (dBc)
2-tone, class AB	$f_1 = 860$ ; $f_2 = 860.1$	-	140	-	21	49	-34	-
DVB-T (8k OFDM)	858	-	-	33	21	34	-	-33 <sup>[1]</sup>

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

#### CAUTION



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

### 1.2 Features and benefits

- 2-Tone performance at 860 MHz, a drain-source voltage  $V_{DS}$  of 50 V and a quiescent drain current  $I_{Dq} = 0.5$  A:
  - ◆ Peak envelope power load power = 140 W
  - ◆ Power gain = 21 dB
  - ◆ Drain efficiency = 49 %
  - ◆ Third order intermodulation distortion = -34 dBc
- DVB performance at 858 MHz, a drain-source voltage  $V_{DS}$  of 50 V and a quiescent drain current  $I_{Dq} = 0.5$  A:
  - ◆ Average output power = 33 W
  - ◆ Power gain = 21 dB
  - ◆ Drain efficiency = 34 %
  - ◆ Shoulder distance = -33 dBc (4.3 MHz from center frequency)
- Integrated ESD protection
- Excellent ruggedness
- High power gain



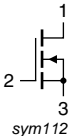
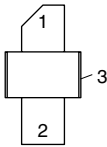
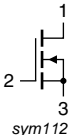
- High efficiency
- Excellent reliability
- Easy power control
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 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
<b>BLF881 (SOT467C)</b>			
1	drain		 sym112
2	gate		
3	source <a href="#">[1]</a>		
<b>BLF881S (SOT467B)</b>			
1	drain		 sym112
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
BLF881	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT467C
BLF881S	-	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		-	104	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	$T_{case} = 80\text{ °C}$ ; $P_{L(AV)} = 70\text{ W}$	[1]	0.95 K/W

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

## 6. Characteristics

**Table 6. DC characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 1.35\text{ mA}$	[1]	104	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 135\text{ mA}$	[1]	1.4	2.4	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$	-	-	1.4	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GSth} + 3.75\text{ V}$ ; $V_{DS} = 10\text{ V}$	19	21	-	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	$V_{GS} = V_{GSth} + 3.75\text{ V}$ ; $I_D = 4.5\text{ A}$	[1]	-	210	$\text{m}\Omega$
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$	-	100	-	pF
$C_{oss}$	output capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$	-	33.5	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$	-	1	-	pF

[1]  $I_D$  is the drain current.

**Table 7. RF characteristics**

$T_h = 25\text{ °C}$  unless otherwise specified.

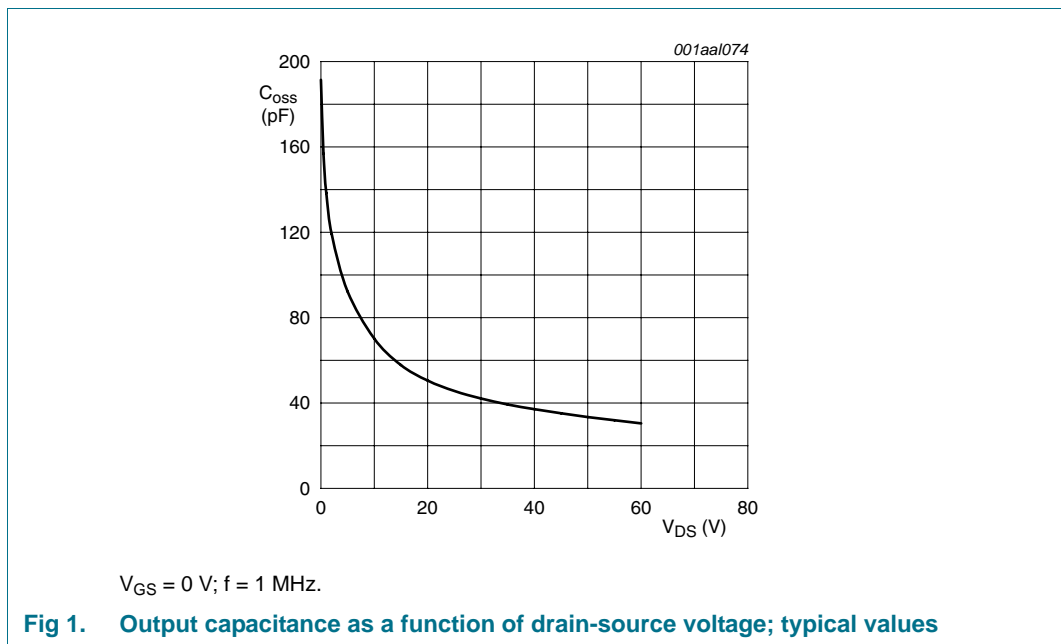
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>2-Tone, class AB</b>						
$V_{DS}$	drain-source voltage		-	50	-	V
$I_{Dq}$	quiescent drain current		-	0.5	-	A
$P_{L(PEP)}$	peak envelope power load power		-	140	-	W
$G_p$	power gain		20	21	-	dB
$\eta_D$	drain efficiency		45	49	-	%
IMD3	third-order intermodulation distortion		-	-34	-30	dBc

**Table 7. RF characteristics ...continued**  
 $T_h = 25\text{ }^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>DVB-T (8k OFDM)</b>						
$V_{DS}$	drain-source voltage		-	50	-	V
$I_{Dq}$	quiescent drain current		-	0.5	-	A
$P_{L(AV)}$	average output power		-	33	-	W
$G_p$	power gain		20	21	-	dB
$\eta_D$	drain efficiency		30	34	-	%
$IMD_{shldr}$	intermodulation distortion shoulder		[1]	-33	-30	dBc
PAR	peak-to-average ratio		[2]	8.3	-	dB

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

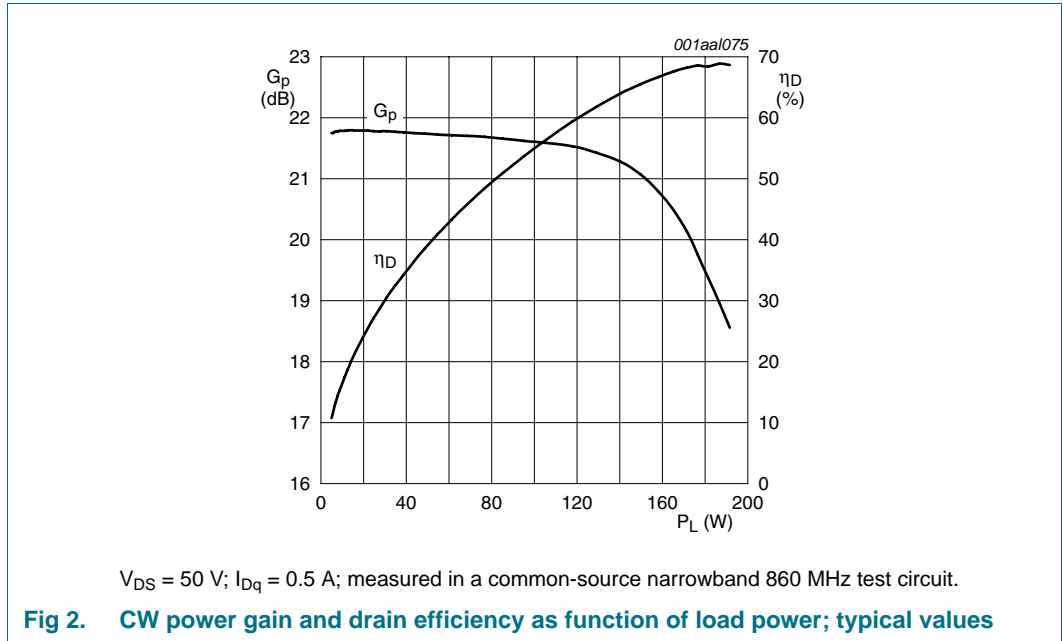
[2] PAR (of output signal) at 0.01 % probability on CCDF; PAR of input signal = 9.5 dB at 0.01 % probability on CCDF.



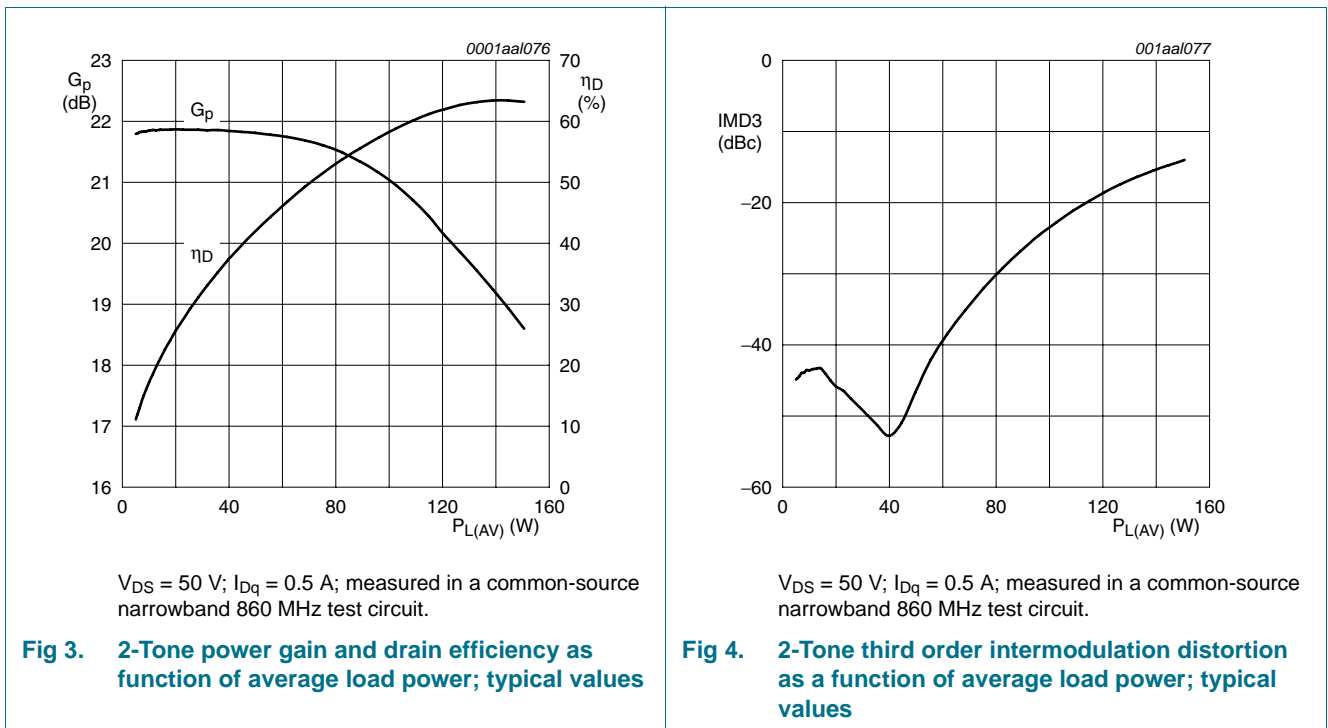
**7. Application information**

**7.1 Narrowband RF figures**

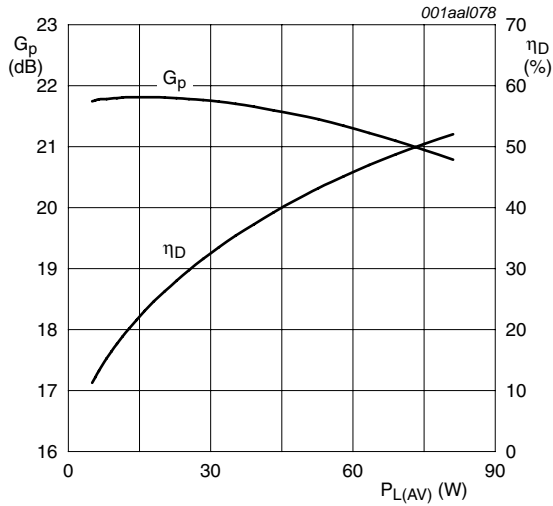
**7.1.1 CW**



**7.1.2 2-Tone**

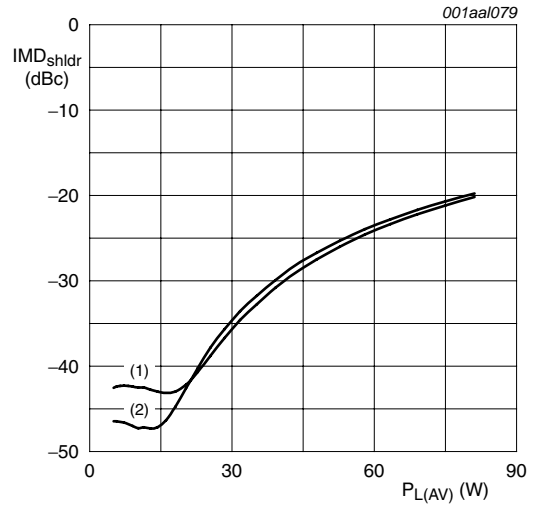


**7.1.3 DVB-T**



$V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 0.5\text{ A}$ ; measured in a common-source narrowband 860 MHz test circuit.

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



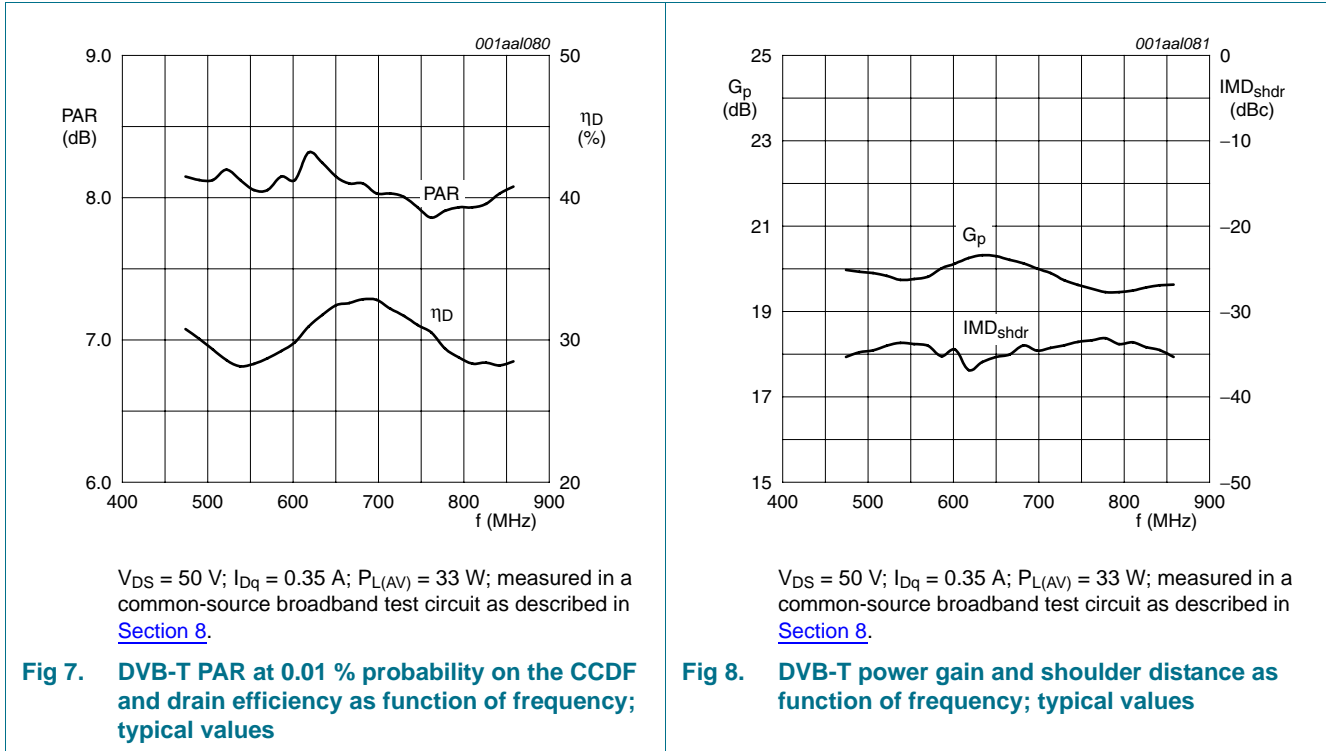
$V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 0.5\text{ A}$ ; measured in a common-source narrowband 860 MHz test circuit.

- (1) Lower adjacent channel
- (2) Upper adjacent channel

**Fig 6. DVB-T shoulder distance as a function of average load power; typical values**

**7.2 Broadband RF figures**

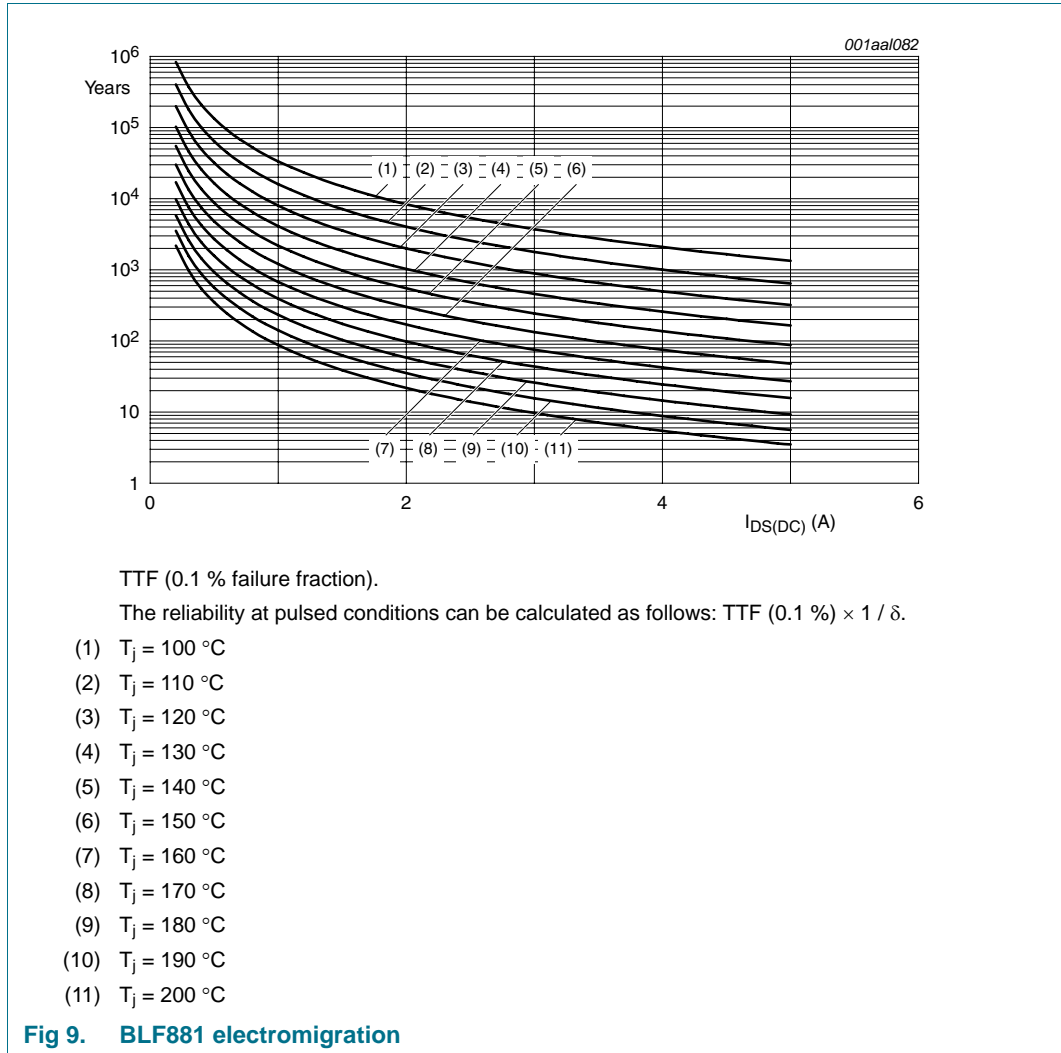
**7.2.1 DVB-T**



**7.3 Ruggedness in class-AB operation**

The BLF881 and BLF881S are capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 50 V$ ;  $f = 860 MHz$  at rated power. Ruggedness is measured in the application circuit as described in [Section 8](#).

**7.4 Reliability**



## 8. Test information

**Table 8. List of components**

For test circuit, see [Figure 10](#), [Figure 11](#) and [Figure 12](#).

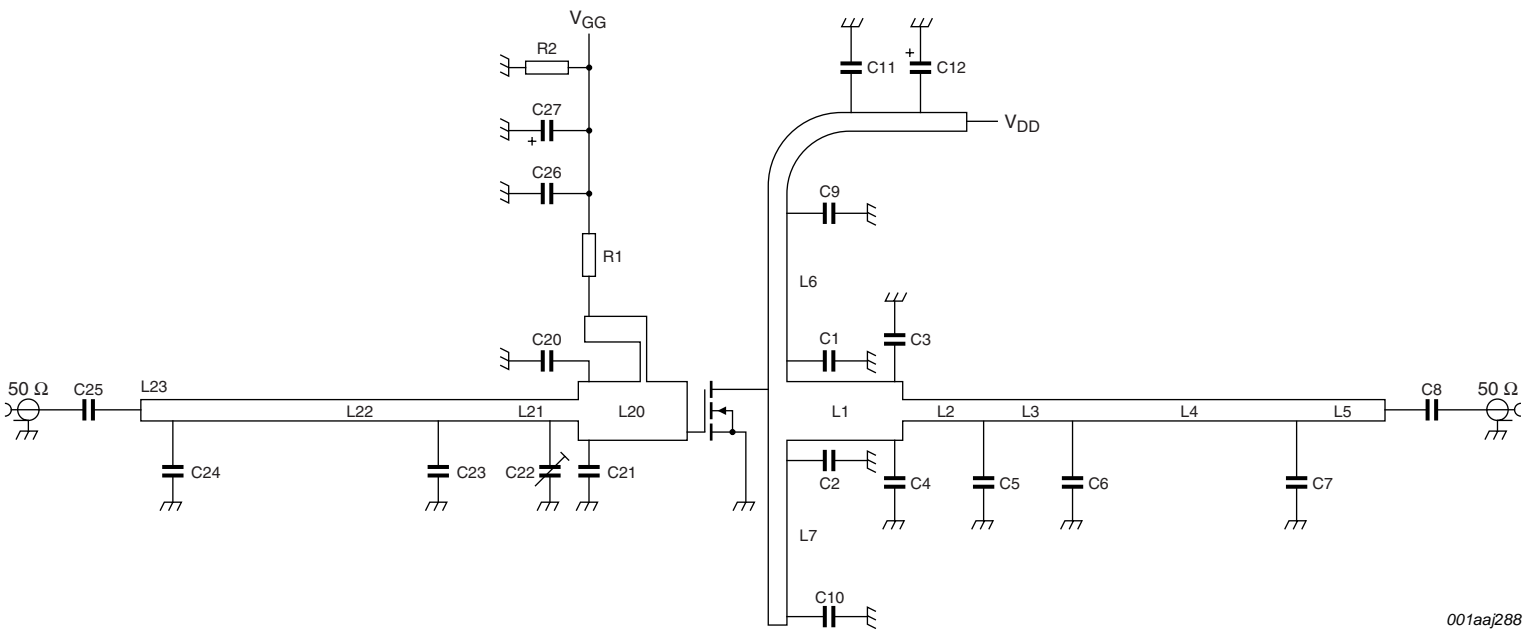
Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	5.1 pF	[1]
C3, C4	multilayer ceramic chip capacitor	10 pF	[2]
C5	multilayer ceramic chip capacitor	6.8 pF	[1]
C6	multilayer ceramic chip capacitor	4.7 pF	[1]
C7	multilayer ceramic chip capacitor	2.7 pF	[1]
C8, C9, C10, C25, 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 $\times$ 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 $\Omega$	
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.

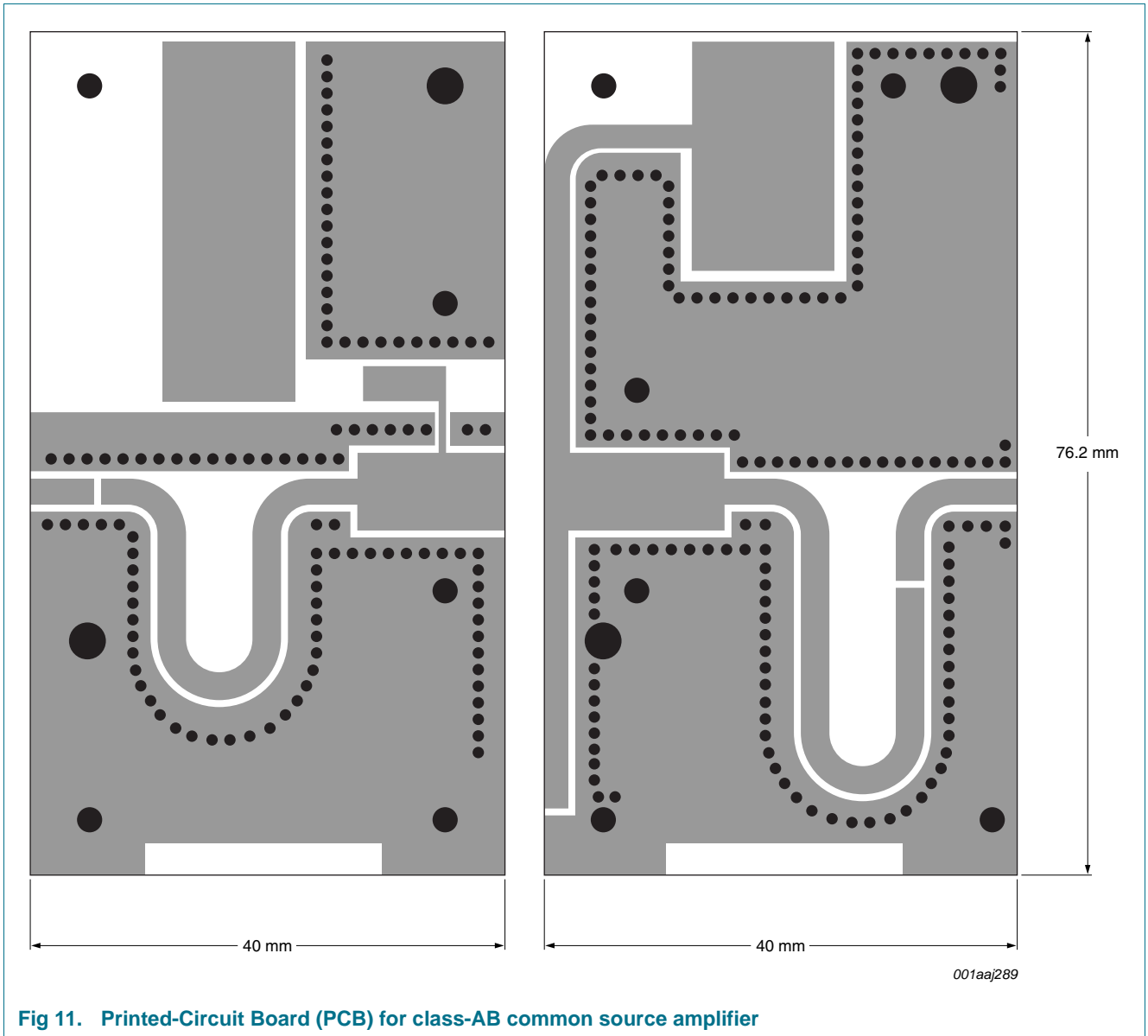
[4] Printed-Circuit Board (PCB): Rogers 5880;  $\epsilon_r = 2.2$  F/m; height = 0.79 mm; Cu (top/bottom metallization); thickness copper plating = 35  $\mu$ m.

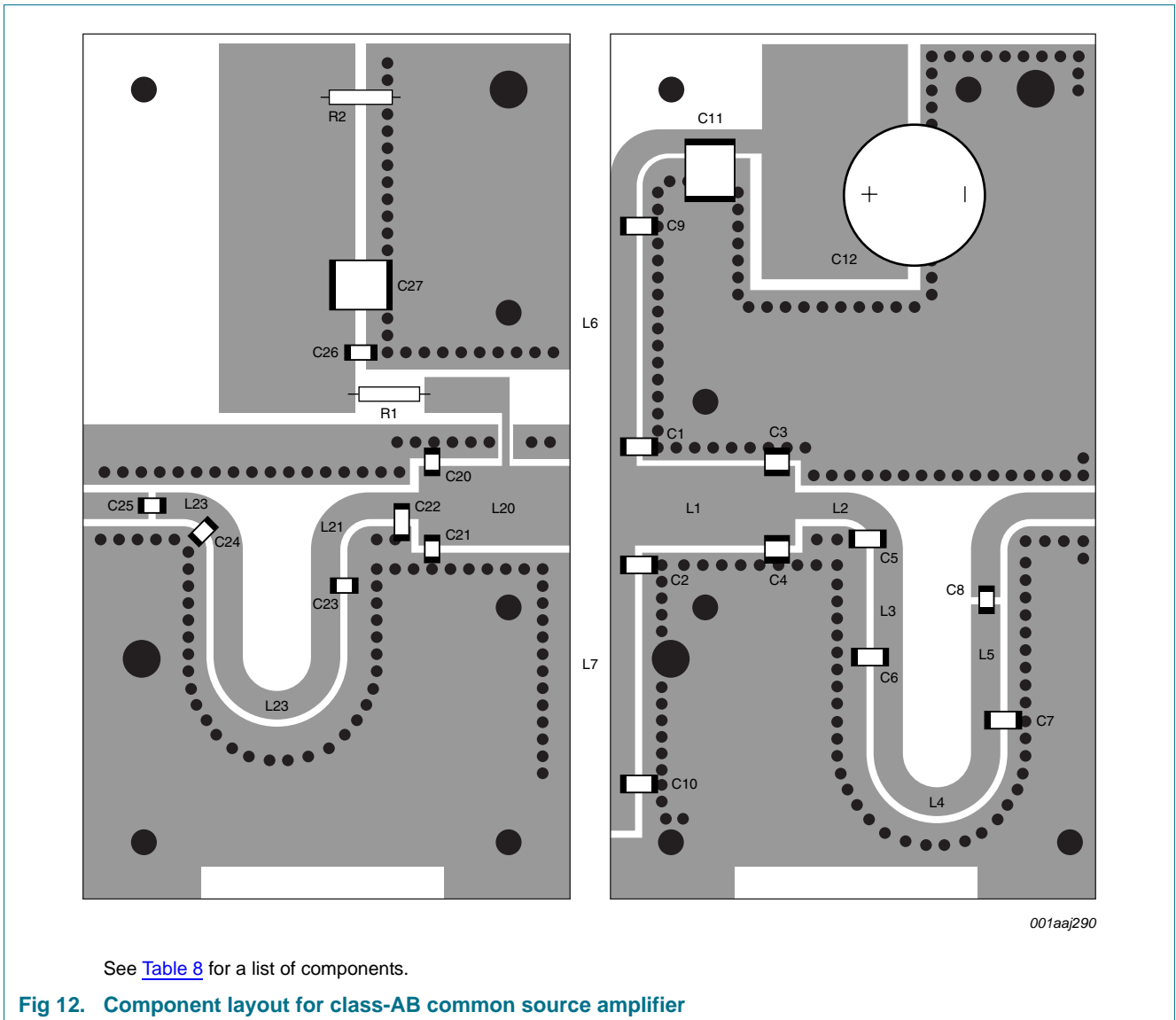


001aa|288

See [Table 8](#) for a list of components.

**Fig 10. Class-AB common-source broadband amplifier**





**9. Package outline**

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT467C

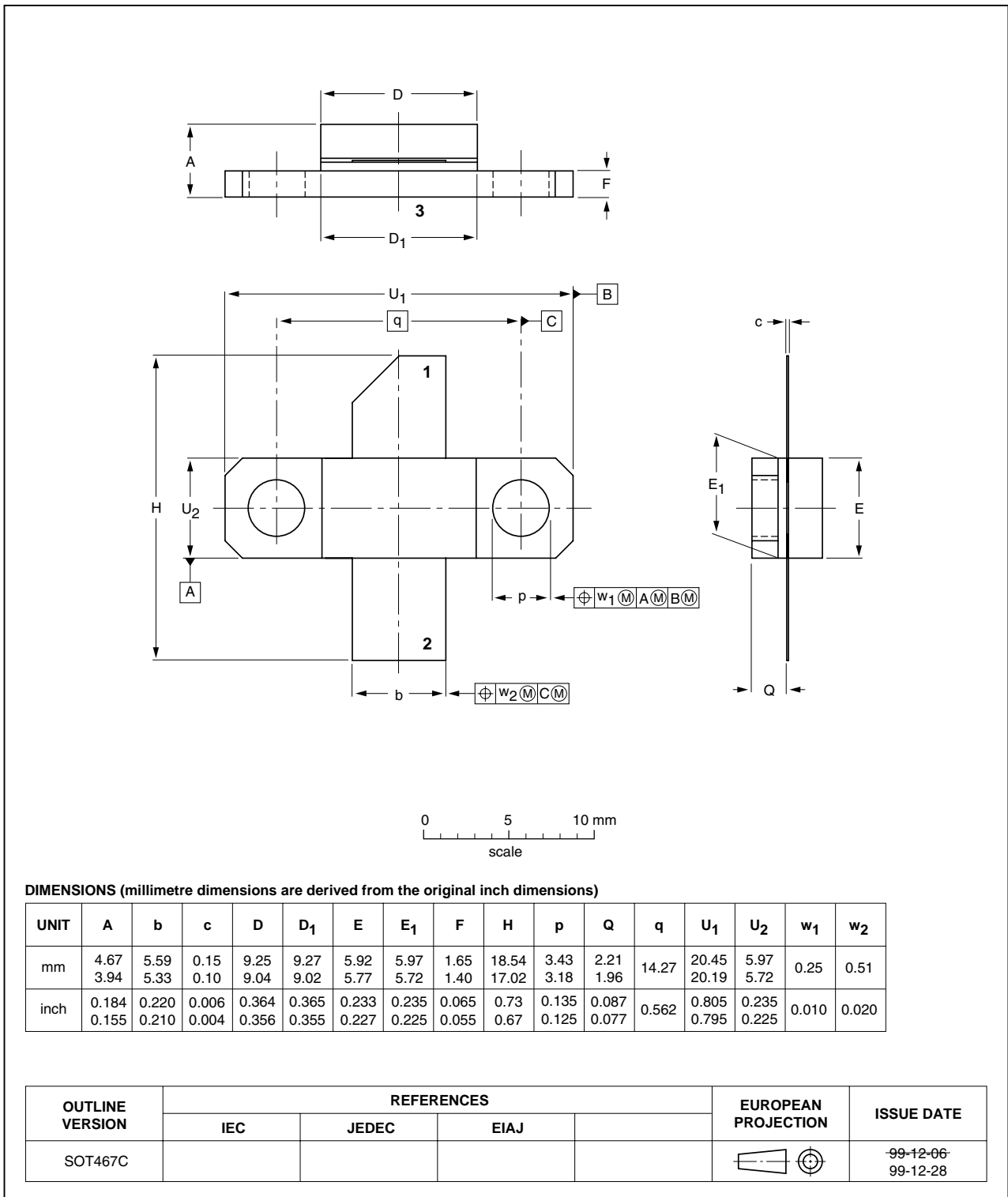


Fig 13. Package outline SOT467C

Earless LDMOST ceramic package; 2 leads

SOT467B

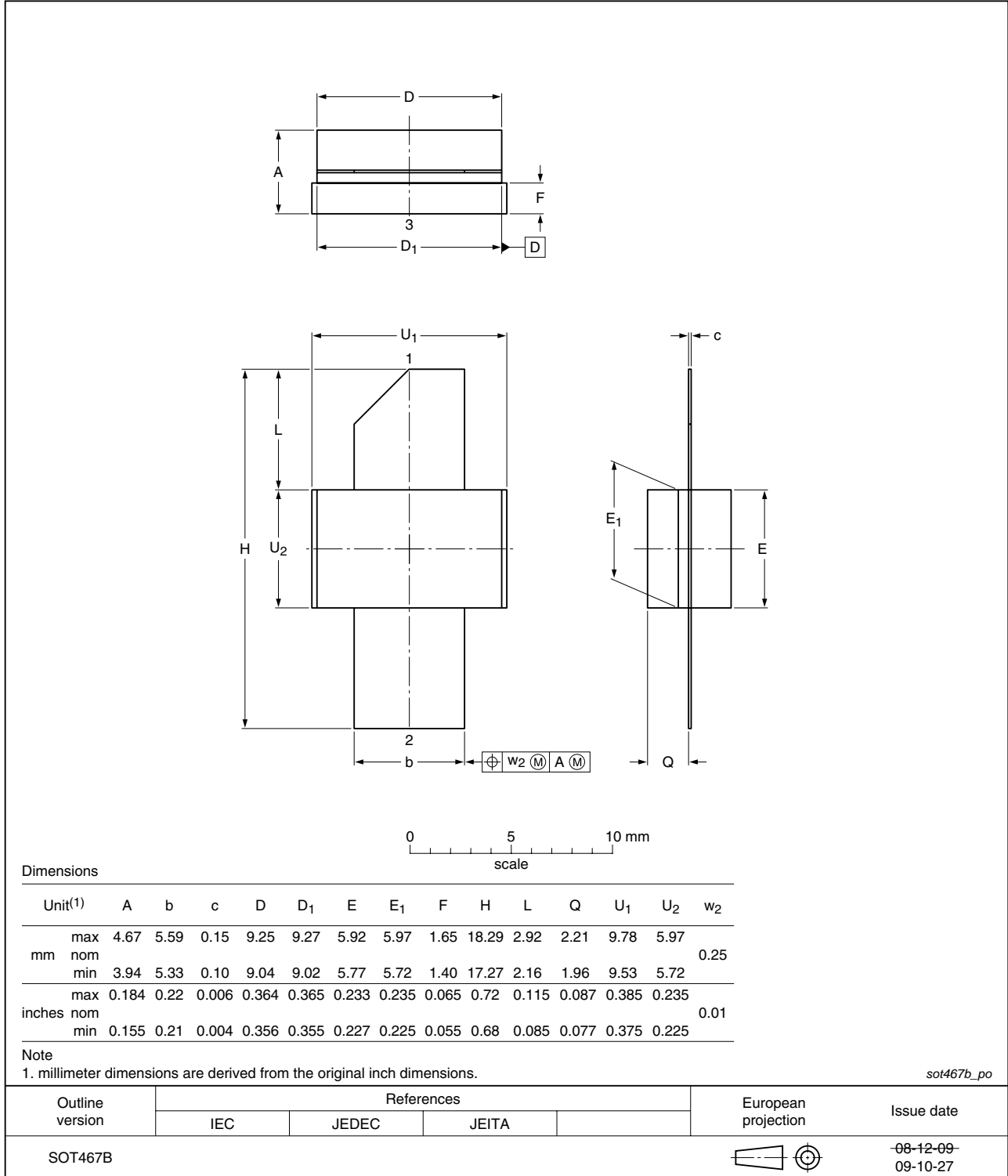


Fig 14. Package outline SOT467B

## 10. Abbreviations

Table 9. 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 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF881_BLF881S v.3	20101207	Product data sheet	-	BLF881_BLF881S v.2
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Table 6 on page 3</a>: In the conditions column of <math>V_{GS(th)}</math> the value of <math>I_D</math> has been changed</li> </ul>			
BLF881_BLF881S v.2	20100210	Product data sheet	-	BLF881_BLF881S v.1
BLF881_BLF881S v.1	20091210	Preliminary 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".

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