

BLF881; BLF881S

UHF power LDMOS transistor

Rev. 01 — 10 December 2009

Preliminary 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)	η_D (%)	IMD3 (dBc)	IMD _{shldr} (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 ^[1]

[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

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- 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

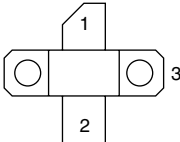
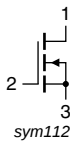
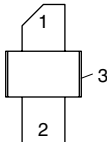
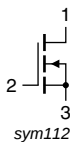
- High efficiency
- Excellent reliability
- Easy power control
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

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
BLF881 (SOT467C)			
1	drain		
2	gate		
3	source [1]		
BLF881S (SOT467B)			
1	drain		
2	gate		
3	source [1]		

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[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	$V_{DS} = 10\text{ V}$; $I_D = 1.35\text{ mA}$	[1]	1.4	-	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$	-	-	1.4	μA
I_{DSC}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 4.5\text{ A}$	[1]	-	210	mΩ
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

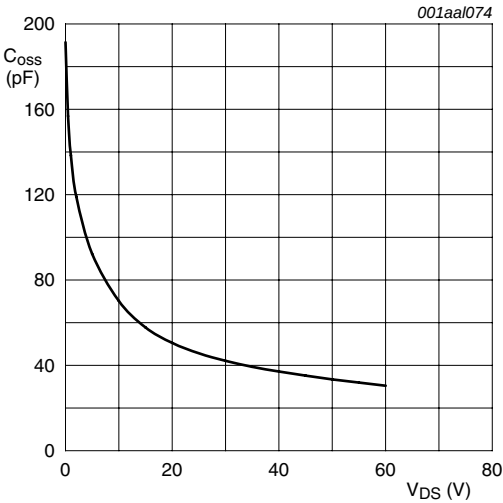
$T_h = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
2-Tone, class AB						
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
η_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
DVB-T (8k OFDM)						
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
η_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.



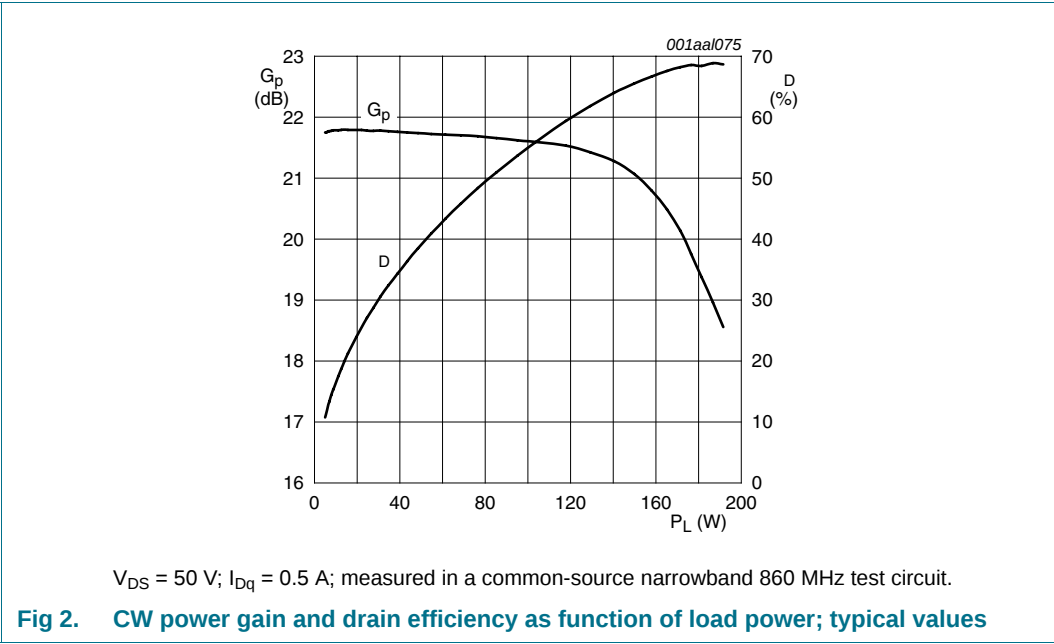
$V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$.

Fig 1. Output capacitance as a function of drain-source voltage; typical values

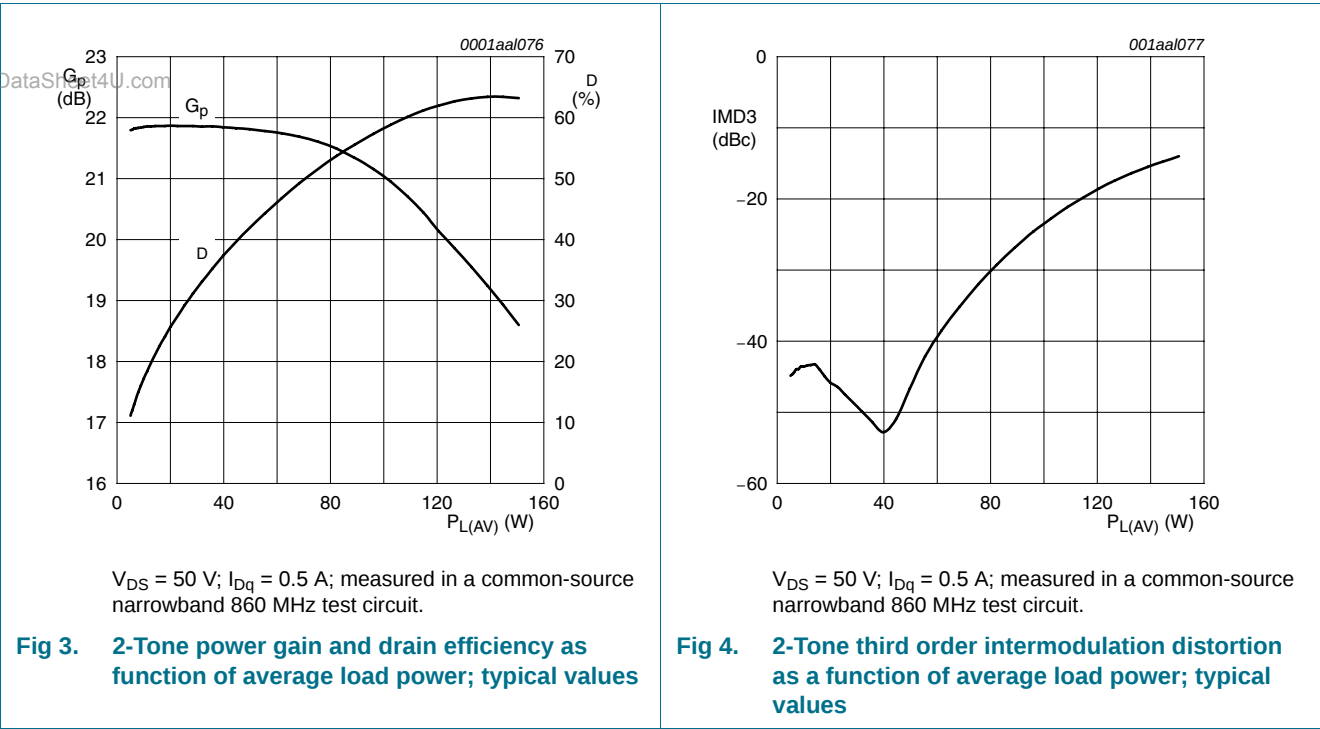
7. Application information

7.1 Narrowband RF figures

7.1.1 CW



7.1.2 2-Tone



7.1.3 DVB-T

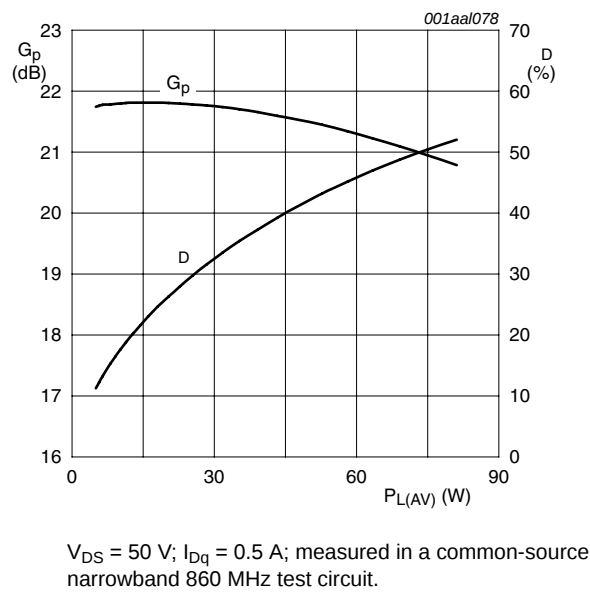


Fig 5. DVB-T power gain and drain efficiency as function of average load power; typical values

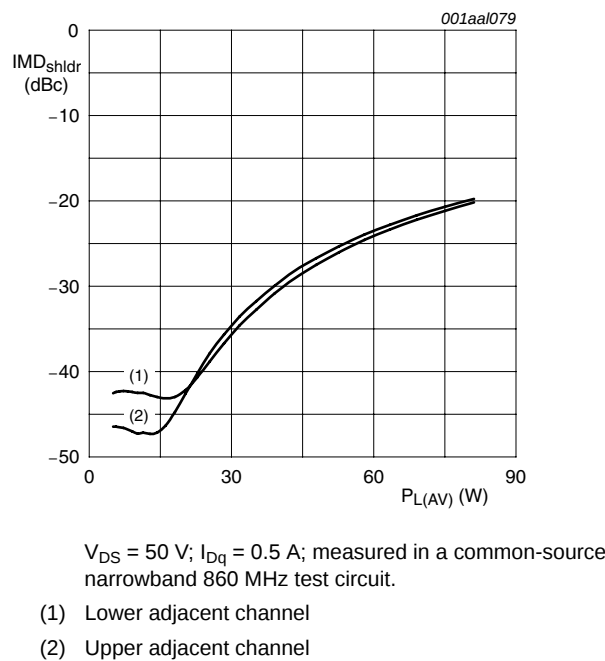
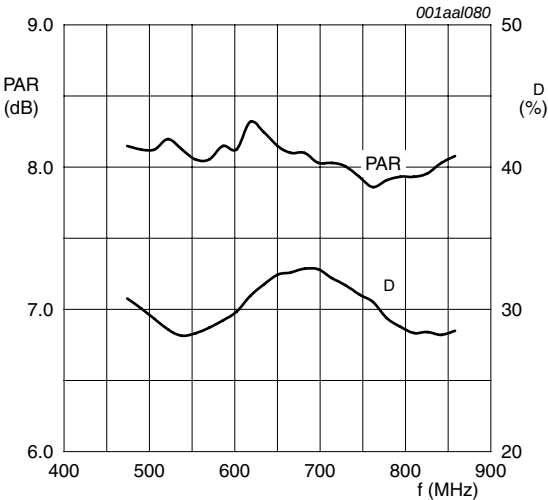


Fig 6. DVB-T shoulder distance as a function of average load power; typical values

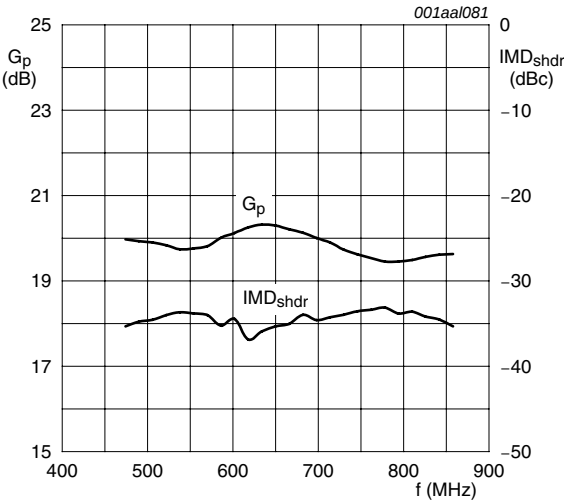
7.2 Broadband RF figures

7.2.1 DVB-T



$V_{DS} = 50\text{ V}$; $I_{DQ} = 0.35\text{ A}$; $P_{L(AV)} = 33\text{ W}$; measured in a common-source broadband test circuit as described in [Section 8](#).

Fig 7. DVB-T PAR at 0.01 % probability on the CCDF and drain efficiency as function of frequency; typical values



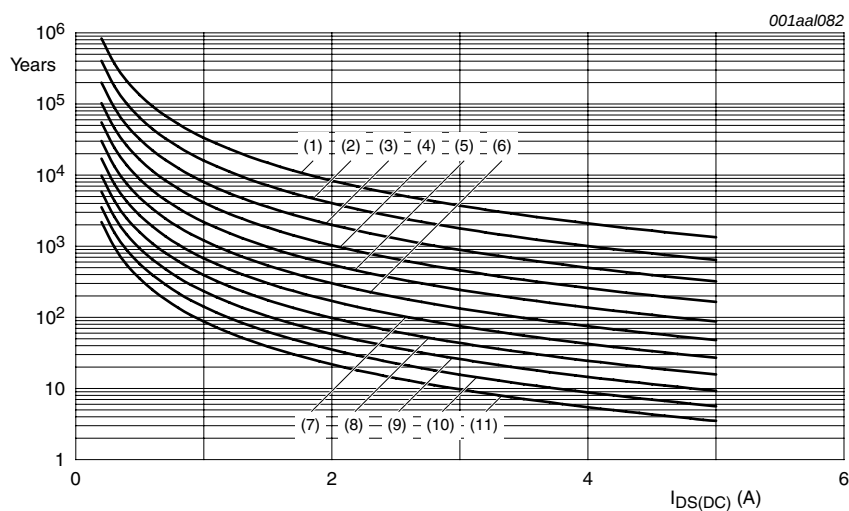
$V_{DS} = 50\text{ V}$; $I_{DQ} = 0.35\text{ A}$; $P_{L(AV)} = 33\text{ W}$; measured in a common-source broadband test circuit as described in [Section 8](#).

Fig 8. DVB-T power gain and shoulder distance as function of frequency; typical values

7.3 Ruggedness in class-AB operation

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

7.4 Reliability



TTF (0.1 % failure fraction).

The reliability at pulsed conditions can be calculated as follows: $TTF(0.1\%) \times 1/\delta$.

- (1) $T_j = 100\text{ }^{\circ}\text{C}$
- (2) $T_j = 110\text{ }^{\circ}\text{C}$
- (3) $T_j = 120\text{ }^{\circ}\text{C}$
- (4) $T_j = 130\text{ }^{\circ}\text{C}$
- (5) $T_j = 140\text{ }^{\circ}\text{C}$
- (6) $T_j = 150\text{ }^{\circ}\text{C}$
- (7) $T_j = 160\text{ }^{\circ}\text{C}$
- (8) $T_j = 170\text{ }^{\circ}\text{C}$
- (9) $T_j = 180\text{ }^{\circ}\text{C}$
- (10) $T_j = 190\text{ }^{\circ}\text{C}$
- (11) $T_j = 200\text{ }^{\circ}\text{C}$

Fig 9. BLF881 electromigration

8. Test information

Table 8. List of components

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

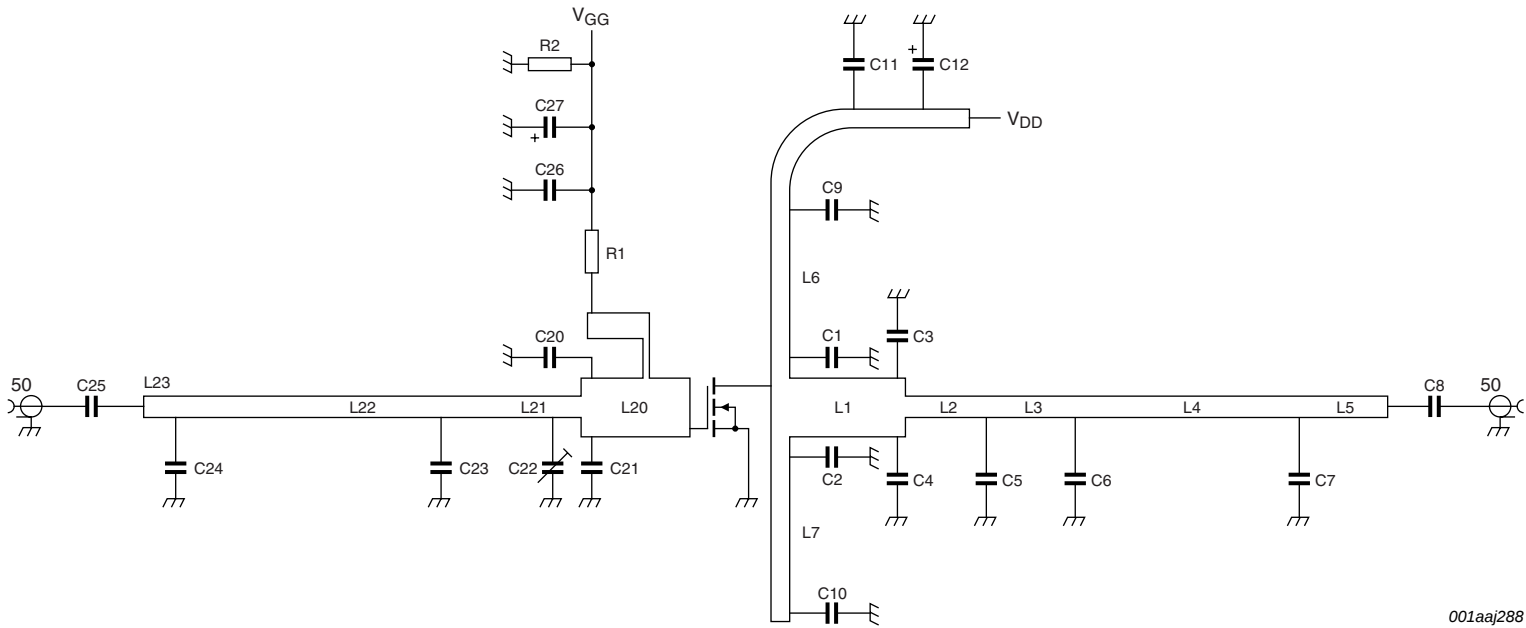
Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	5.1 pF	[1]
C3, C4	multilayer ceramic chip capacitor	10 pF	[2]
C5	multilayer ceramic chip capacitor	6.8 pF	[1]
C6	multilayer ceramic chip capacitor	4.7 pF	[1]
C7	multilayer ceramic chip capacitor	2.7 pF	[1]
C8, C9, C10, C25, C26	multilayer ceramic chip capacitor	100 pF	[1]
C11, C27	multilayer ceramic chip capacitor	10 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.

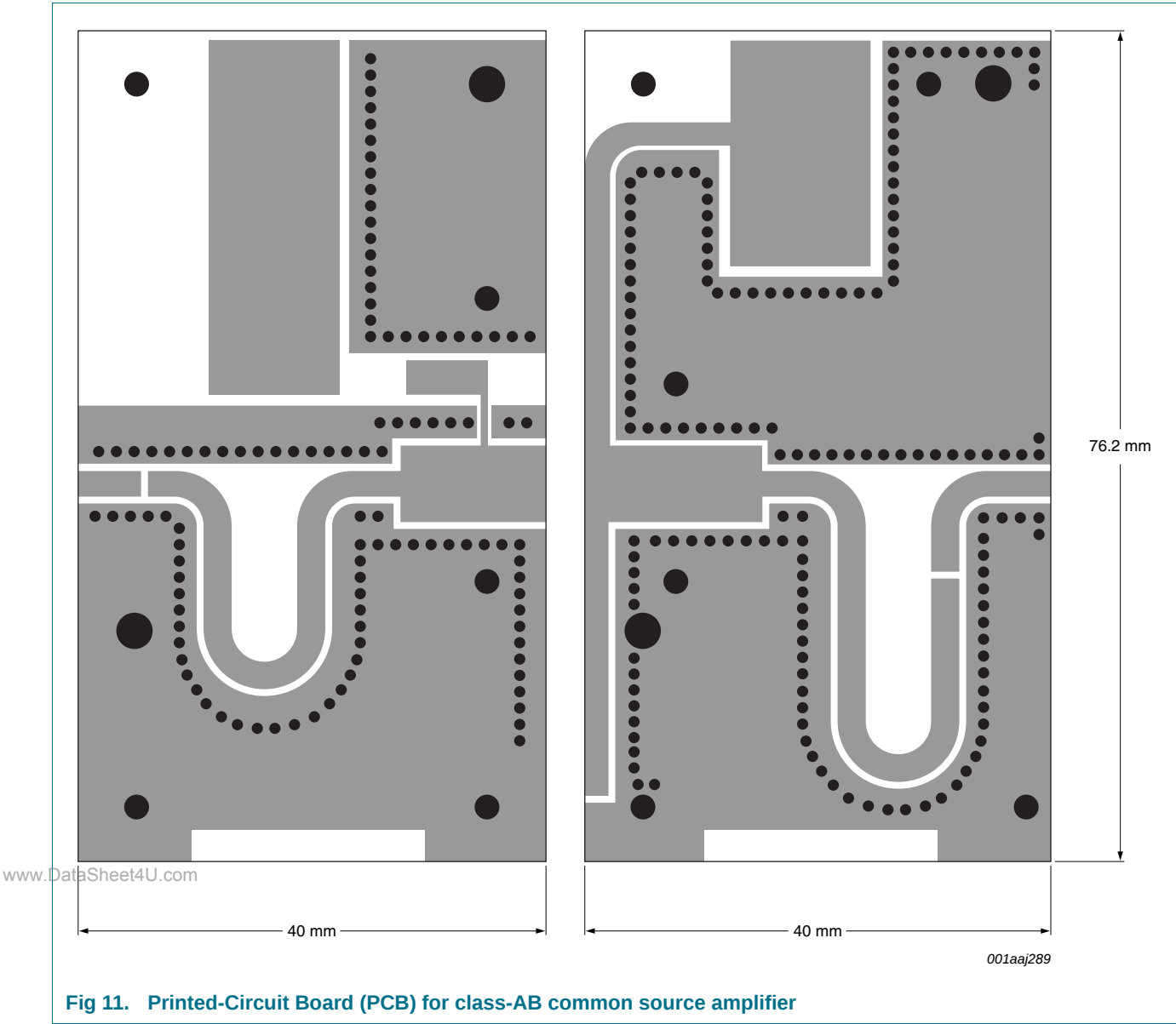
[4] Printed-Circuit Board (PCB): Rogers 5880; $\epsilon_r = 2.2$ F/m; height = 0.79 mm; Cu (top/bottom metallization); thickness copper plating = 35 μ m.

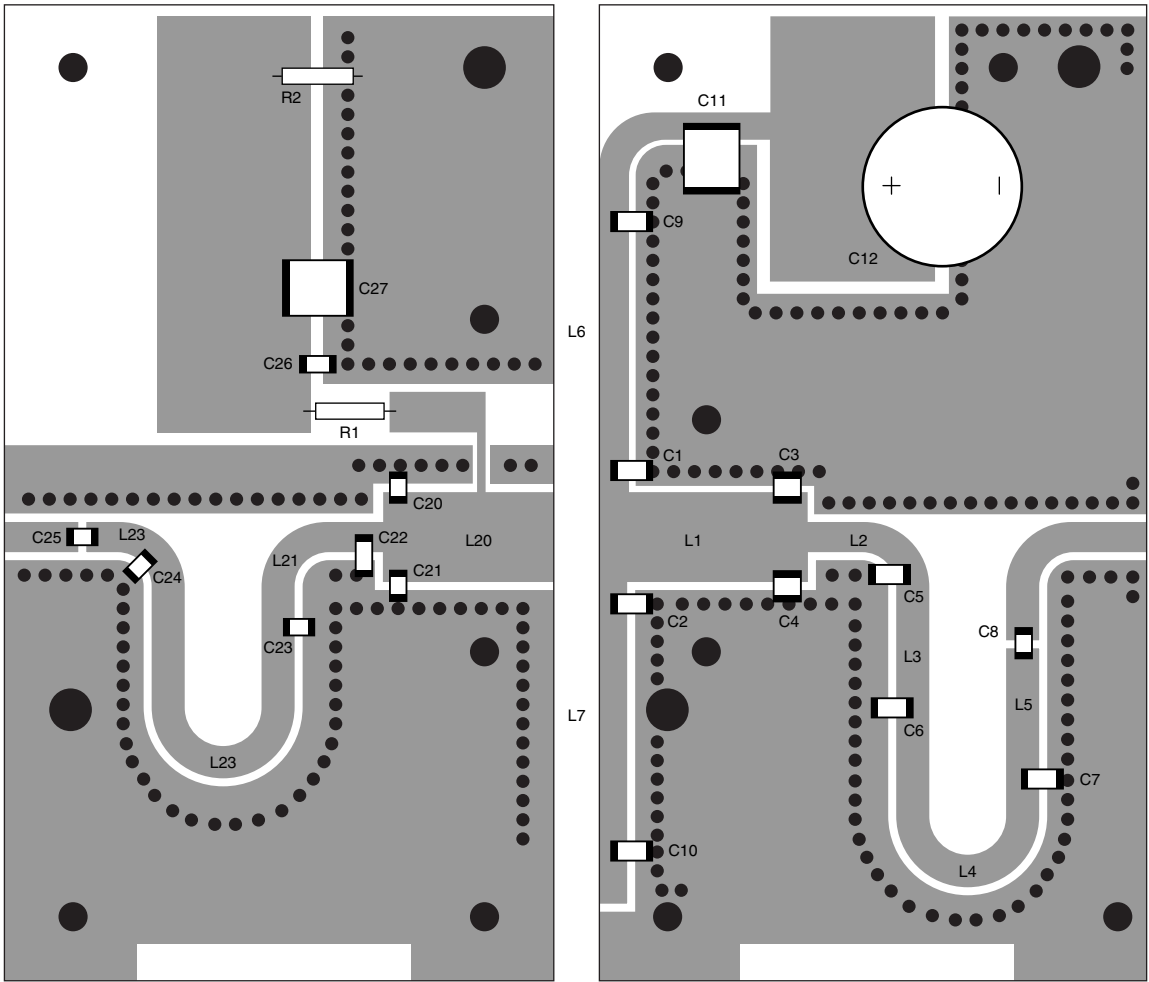


See [Table 8](#) for a list of components.

Fig 10. Class-AB common-source broadband amplifier

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

Fig 12. Component layout for class-AB common source amplifier

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT467C

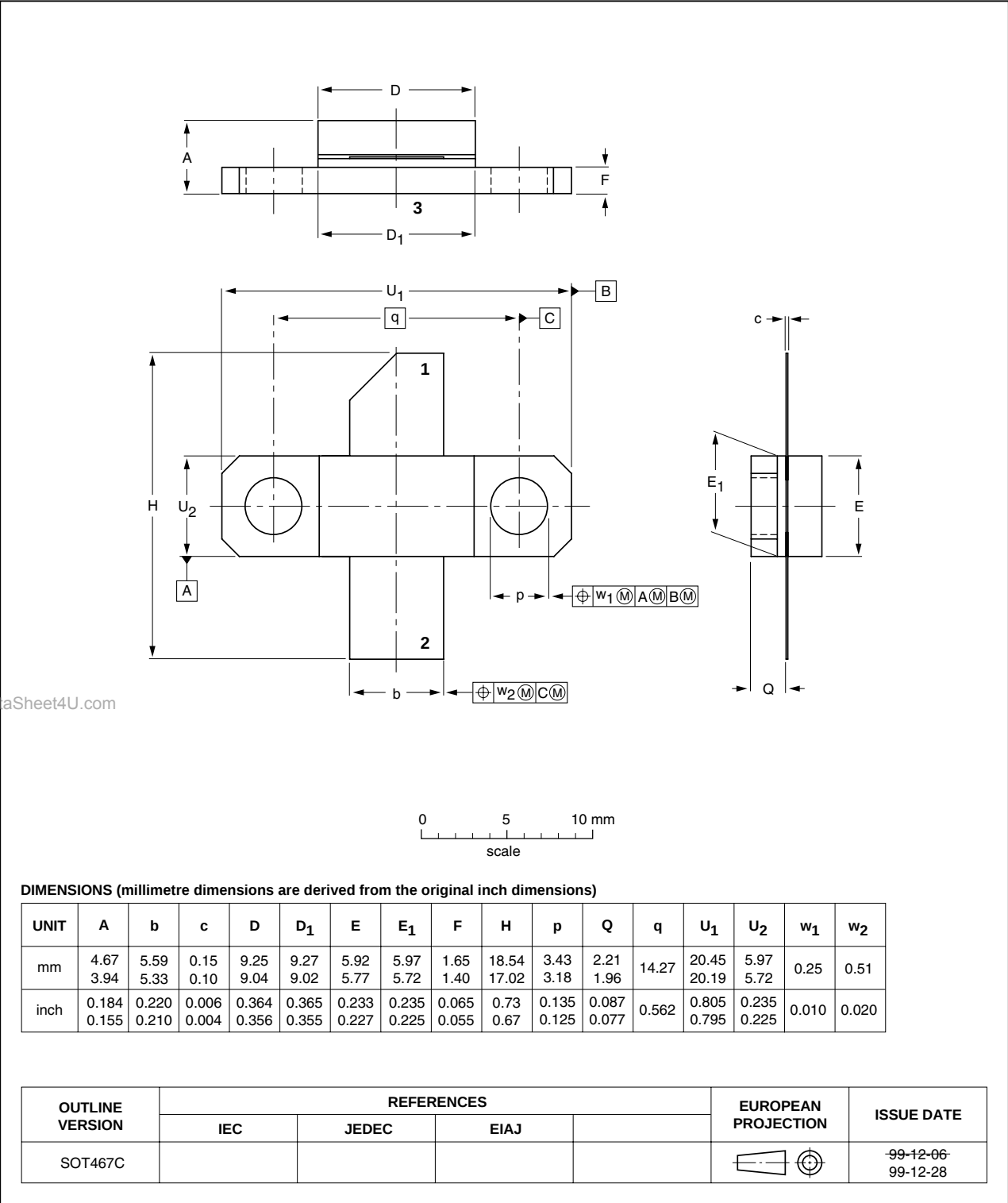


Fig 13. Package outline SOT467C

Earless LDMOST ceramic package; 2 leads

SOT467B

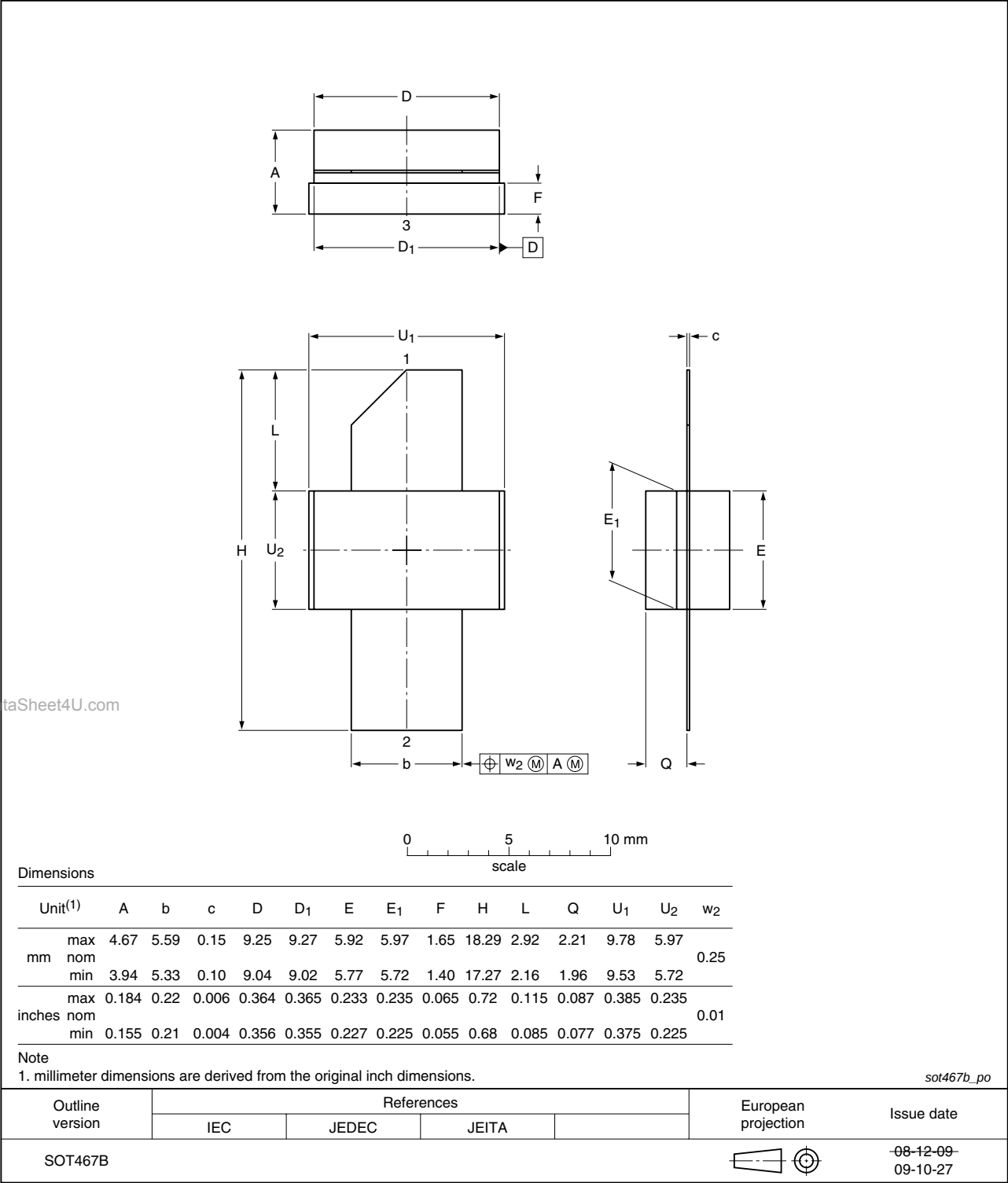


Fig 14. Package outline SOT467B

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_1	20091210	Preliminary 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.
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[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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