

# BLF6G38-100; BLF6G38LS-100

WiMAX power LDMOS transistor

Rev. 01 — 11 November 2008

Product data sheet

## 1. Product profile

### 1.1 General description

100 W LDMOS power transistor for base station applications at frequencies from 3400 MHz to 3600 MHz.

**Table 1. Typical performance**

Typical RF performance at  $T_{case} = 25\text{ }^{\circ}\text{C}$  in a class-AB production test circuit.

Mode of operation	f (MHz)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$P_{L(p)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR <sub>885k</sub> (dBc)	ACPR <sub>1980k</sub> (dBc)
1-carrier N-CDMA <sup>[1]</sup>	3400 to 3600	28	18.5	130	13	21.5	-47.5 <sup>[2]</sup>	-65 <sup>[2]</sup>

[1] Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.23 MHz.

[2] Measured within 30 kHz bandwidth.

#### CAUTION



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

### 1.2 Features

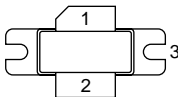
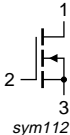
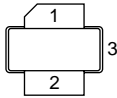
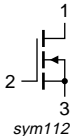
- Typical 1-carrier N-CDMA performance (Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.23 MHz) at a frequency of 3400 MHz, 3500 MHz and 3600 MHz, a supply voltage of 28 V and an  $I_{DQ}$  of 1050 mA:
- Qualified up to a maximum  $V_{DS}$  operation of 32 V
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation
- Internally matched for ease of use
- Low gold plating thickness on leads
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

## 1.3 Applications

- RF power amplifiers for base stations and multicarrier applications in the 3400 MHz to 3600 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
<b>BLF6G38-100 (SOT502A)</b>			
1	drain		 sym112
2	gate		
3	source		
<b>BLF6G38LS-100 (SOT502B)</b>			
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF6G38-100	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF6G38LS-100	-	earless flanged LDMOST ceramic package; 2 leads	SOT502B

## 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		-	65	V
$V_{GS}$	gate-source voltage		-0.5	+13	V
$I_D$	drain current		-	34	A
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Type	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_{L(AV)} = 18.5\text{ W}$	BLF6G38-100	0.58	K/W
			BLF6G38LS-100	0.43	K/W

## 6. Characteristics

**Table 6. 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	$V_{GS} = 0\text{ V}; I_D = 0.6\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.4	2	2.4	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	5	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	26.5	33	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = +11\text{ V}; V_{DS} = 0\text{ V}$	-	-	450	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 6.3\text{ A}$	-	12	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$	-	0.09	0.15	$\Omega$
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$	-	2.6	-	pF

## 7. Application information

**Table 7. Application information**

Mode of operation: 1-carrier N-CDMA; Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF; Channel bandwidth is 1.23 MHz;  $f_1 = 3400\text{ MHz}; f_2 = 3500\text{ MHz}; f_3 = 3600\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 1050\text{ mA}; T_{case} = 25\text{ °C}$ ; unless otherwise specified, in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$P_{L(AV)}$	average output power	$P_{L(AV)} = 18.5\text{ W}$	110	130	-	W	
$G_p$	power gain	$P_{L(AV)} = 18.5\text{ W}$	11.5	13	-	dB	
$RL_{in}$	input return loss	$P_{L(AV)} = 18.5\text{ W}$	-	-10	-	dB	
$\eta_D$	drain efficiency	$P_{L(AV)} = 18.5\text{ W}$	18.5	21.5	-	%	
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)} = 18.5\text{ W}$	[1]	-	-47.5	-45	dBc
$ACPR_{1980k}$	adjacent channel power ratio (1980 kHz)	$P_{L(AV)} = 18.5\text{ W}$	[1]	-	-65	-63	dBc

[1] Measured within 30 kHz bandwidth.

### 7.1 Ruggedness in class-AB operation

The BLF6G38-100 and BLF6G38LS-100 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 1050\text{ mA}; P_L = P_{L(1dB)}; f = 3600\text{ MHz}$ .

**7.2 NXP WiMAX signal**

**7.2.1 WiMAX signal description**

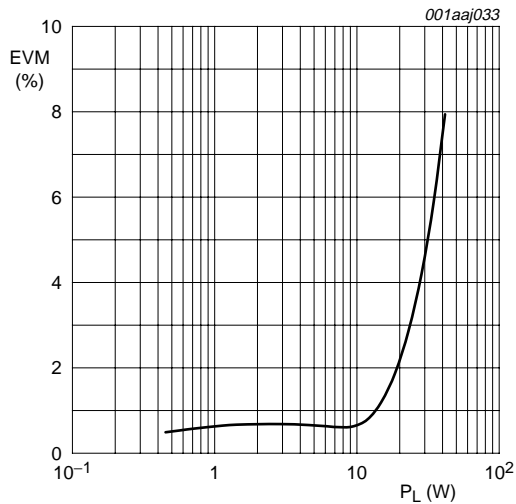
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;  
 frequency band = WCS; sampling rate = 11.2 MHz;  $n = 8 / 7$ ;  $G = T_g / T_b = 1 / 8$ ;  
 FFT = 1024; zone type = PUSC;  $\delta = 97.7 \%$ ; number of symbols = 46;  
 number of subchannels = 30; PAR = 9.5 dB.

Preamble: 1 symbol  $\times$  30 subchannels;  $P_L = P_{L(nom)} + 3.86 \text{ dB}$ .

**Table 8. Frame structure**

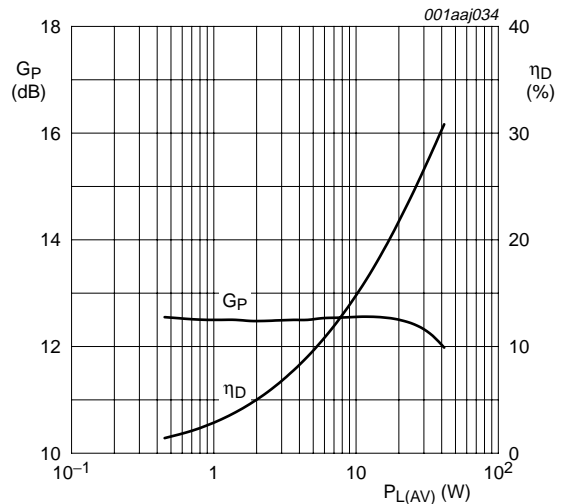
Frame contents	Modulation technique	Data length
Zone 0 FCH 2 symbols $\times$ 4 subchannels	QPSK1/2	3 bit
Zone 0 data 2 symbols $\times$ 26 subchannels	64QAM3/4	692 bit
Zone 0 data 44 symbols $\times$ 30 subchannels	64QAM3/4	10000 bit

**7.2.2 Graphs**



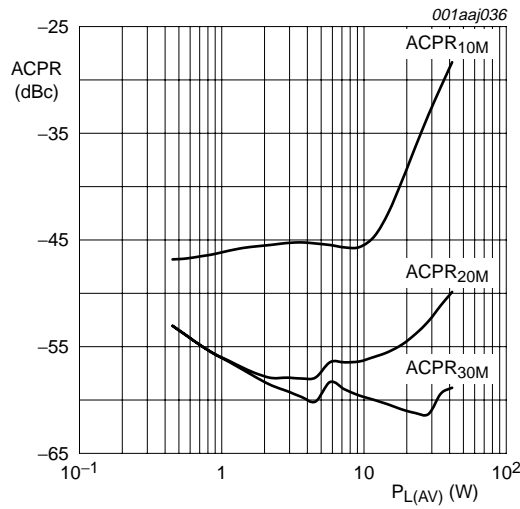
$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 1050 \text{ mA}$ ;  $f = 3500 \text{ MHz}$ .

**Fig 1. EVM as a function of load power; typical values**



$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 1050 \text{ mA}$ ;  $f = 3500 \text{ MHz}$ .

**Fig 2. Power gain and drain efficiency as function of average load power; typical values**

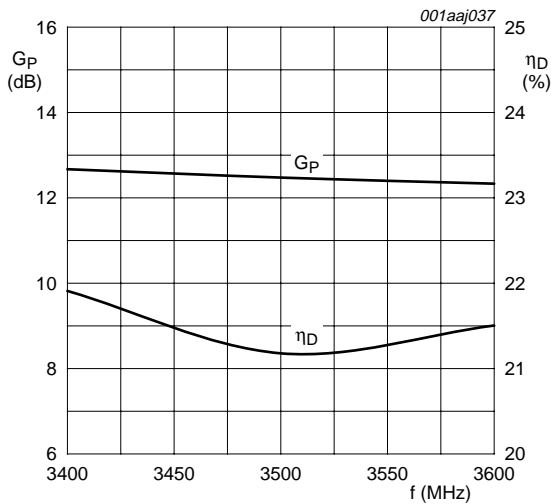


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ;  $f = 3500\text{ MHz}$ .

**Fig 3. Adjacent channel power ratio as a function of average load power; typical values**

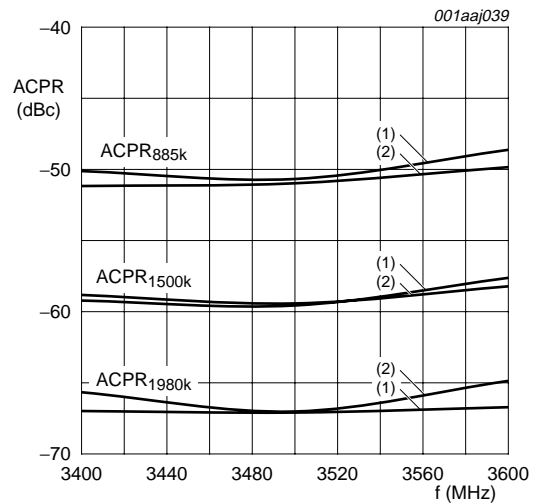
## 7.3 Single carrier NA IS-95 broadband performance at 2 W average

### 7.3.1 Graphs



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ; Single Carrier IS-95;  
PAR = 9.7 dB at 0.01 % probability.

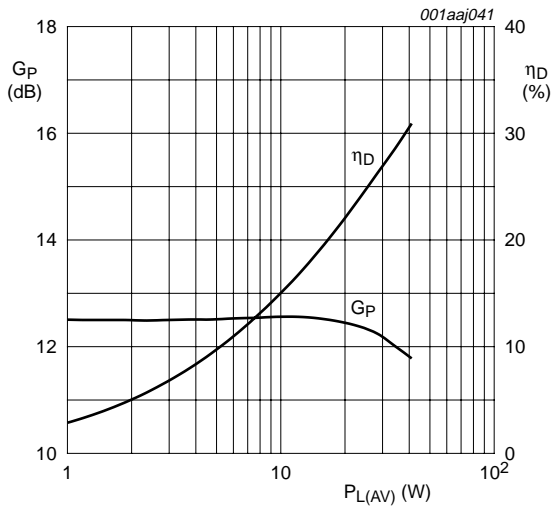
**Fig 4. Power gain and drain efficiency as function of frequency; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ; single carrier IS-95;  
PAR = 9.7 dB at 0.01 % probability.

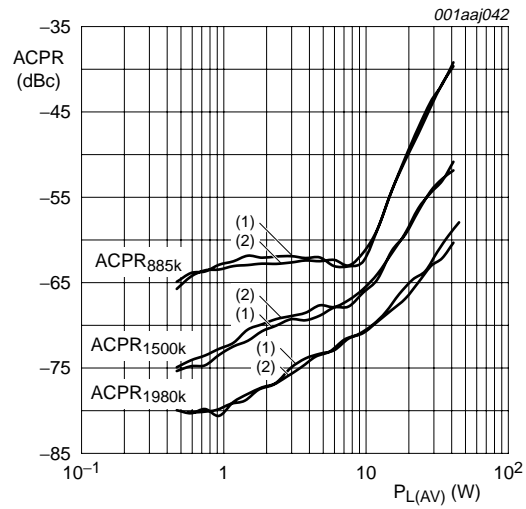
- (1) Low frequency component
- (2) High frequency component

**Fig 5. Adjacent channel power ratio as a function of frequency; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ;  $f = 3500\text{ MHz}$ ;  
single carrier IS-95; PAR = 9.7 dB at 0.01 % probability;  
channel bandwidth = 1.23 MHz.

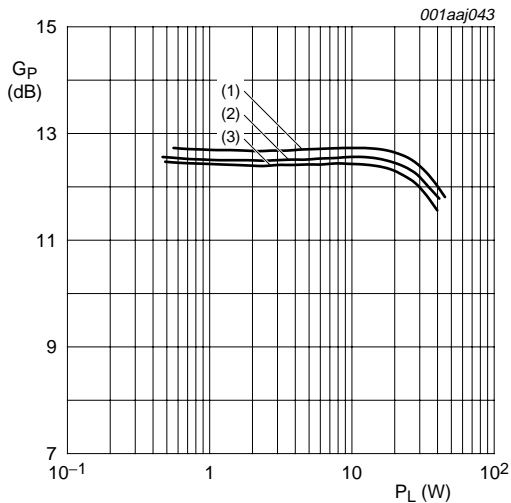
**Fig 6. Power gain and drain efficiency as function of load power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ;  $f = 3500\text{ MHz}$ ;  
single carrier IS-95; PAR = 9.7 dB at 0.01 % probability;  
channel bandwidth = 1.23 MHz; IBW = 30 kHz.

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

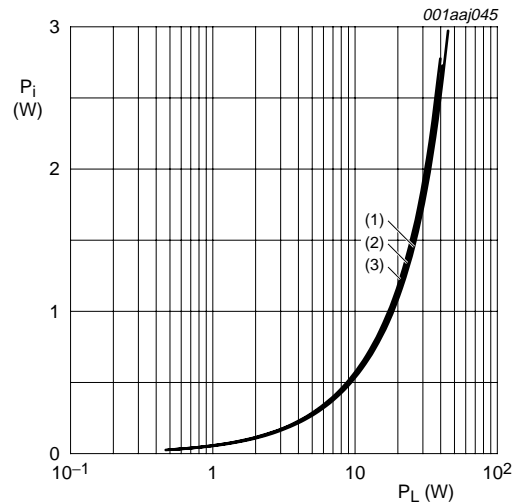
**Fig 7. Adjacent channel power ratio as a function of load power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ; single carrier IS-95;  
PAR = 9.7 dB at 0.01 % probability;  
channel bandwidth = 1.23 MHz.

- (1)  $f = 3400\text{ MHz}$
- (2)  $f = 3500\text{ MHz}$
- (3)  $f = 3600\text{ MHz}$

**Fig 8. Power gain as a function of load power; typical values**

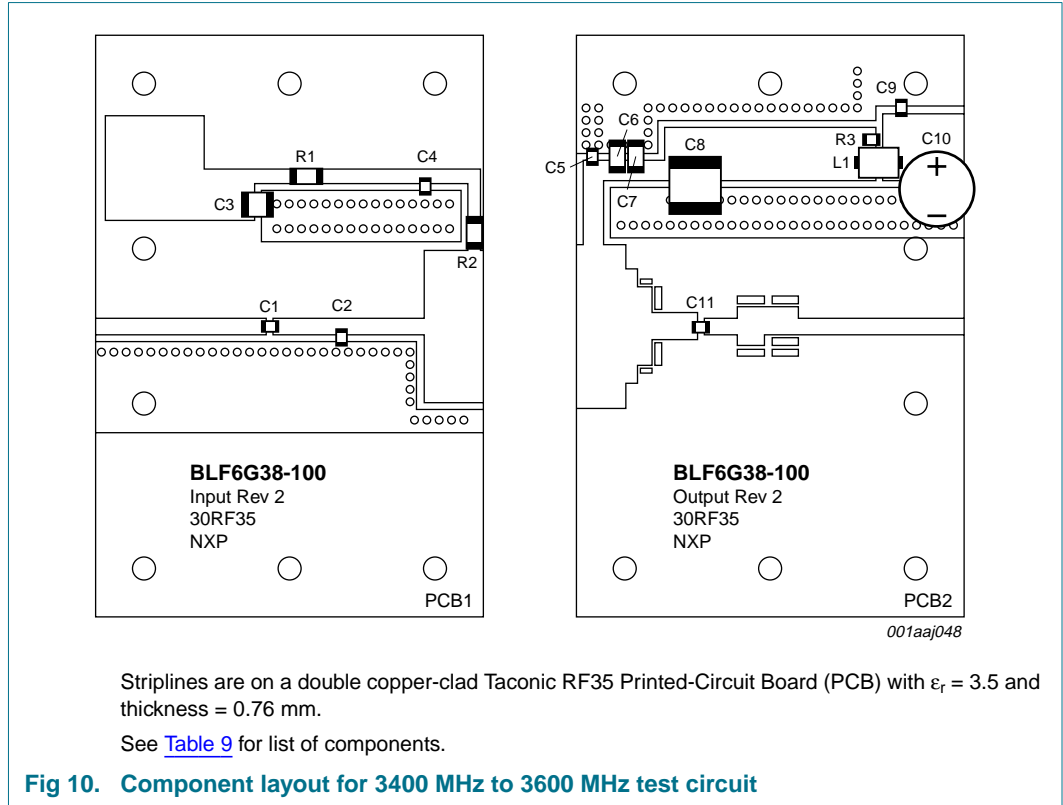


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1050\text{ mA}$ ; single carrier IS-95;  
PAR = 9.7 dB at 0.01 % probability;  
channel bandwidth = 1.23 MHz.

- (1)  $f = 3400\text{ MHz}$
- (2)  $f = 3500\text{ MHz}$
- (3)  $f = 3600\text{ MHz}$

**Fig 9. Input power as a function of load power; typical values**

## 8. Test information



**Table 9. List of components**

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

Component	Description	Value	Remarks
C1, C4, C5, C11	multilayer ceramic chip capacitor	10 pF	ATC 100A
C2	multilayer ceramic chip capacitor	0.2 pF	ATC 100A
C3	multilayer ceramic chip capacitor	4.7 $\mu$ F; 50 V	TDK C4532X7R1H475M
C6, C7	multilayer ceramic chip capacitor	100 nF	Vishay VJ1206Y104KXB
C8	multilayer ceramic chip capacitor	10 $\mu$ F; 50V	TDK C5750X7R1H106M
C9	multilayer ceramic chip capacitor	1.5 $\mu$ F; 50V	TDK C3225X7R1H155M
C10	electrolytic capacitor	470 $\mu$ F; 63 V	
L1	ferrite SMD bead	-	
R1, R2, R3	SMD resistor	9.1 $\Omega$	SMD 1206

**Table 10. Measured test circuit impedances**

f (GHz)	$Z_i$ ( $\Omega$ )	$Z_o$ ( $\Omega$ )
3.4	0.34 + j3.36	0.44 + j3.39
3.5	0.52 + j3.86	0.56 + j3.91
3.6	1.36 + j4.85	1.38 + j5.11

**9. Package outline**

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

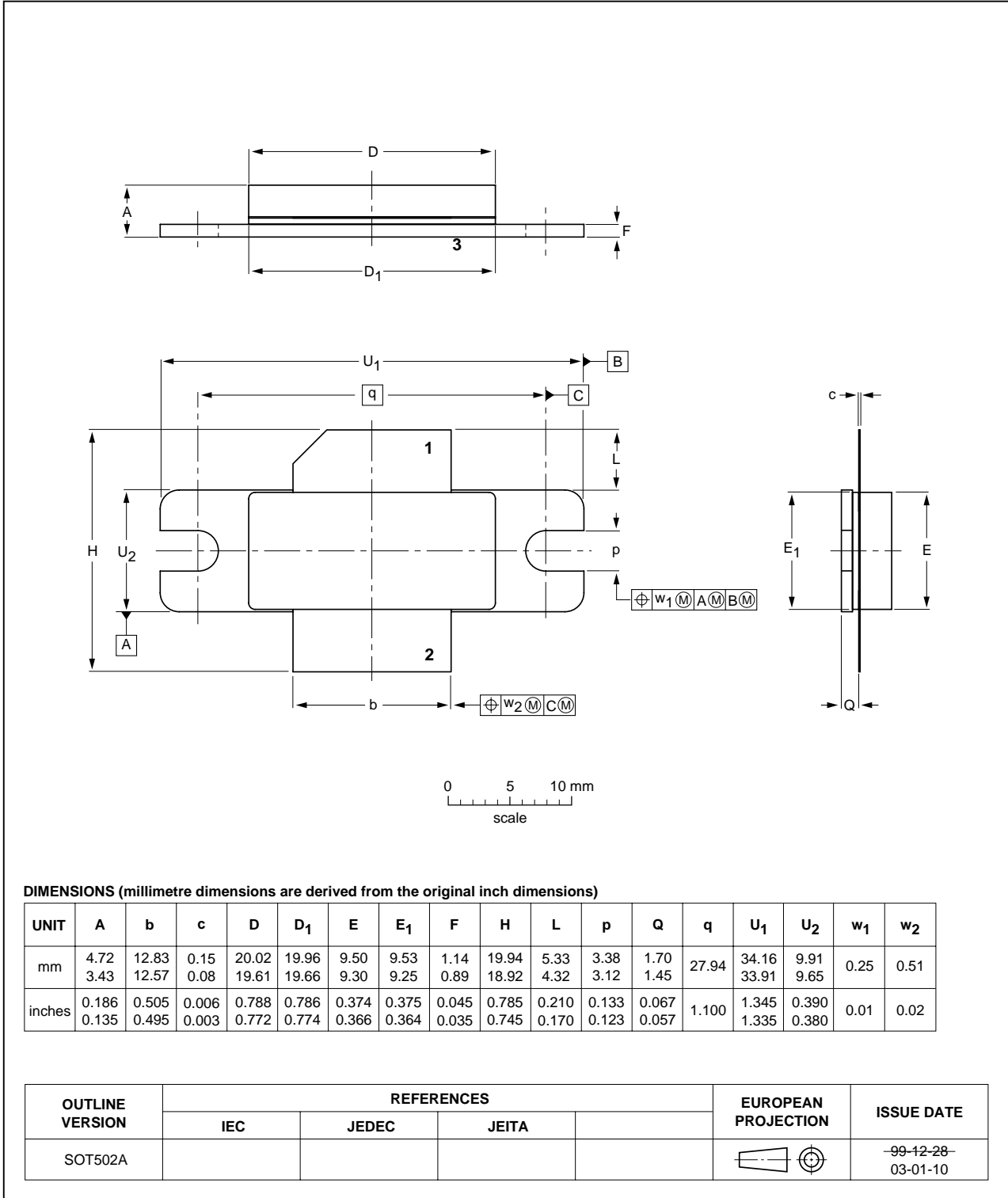


Fig 11. Package outline SOT502A



Earless flanged LDMOST ceramic package; 2 leads

SOT502B

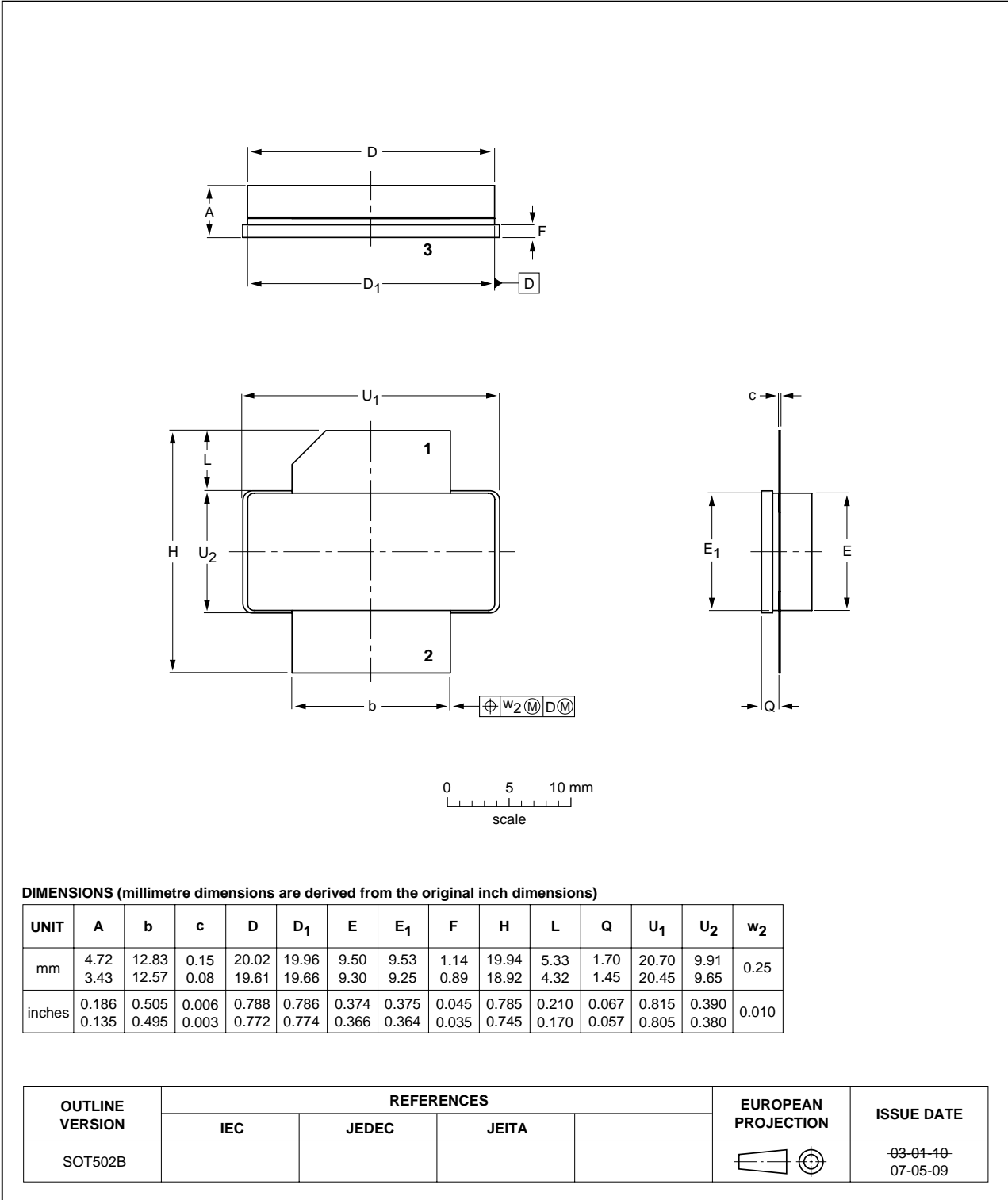


Fig 12. Package outline SOT502B

## 10. Abbreviations

**Table 11. Abbreviations**

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
EVM	Error Vector Magnitude
FCH	Frame Control Header
FFT	Fast Fourier Transform
IBW	Instantaneous BandWidth
IS-95	Interim Standard 95
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
NA	North American
N-CDMA	Narrowband Code Division Multiple Access
PAR	Peak-to-Average power Ratio
PUSC	Partial Usage SubChannels
RF	Radio Frequency
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio
WCS	Wireless Communications Service
WiMAX	Worldwide Interoperability for Microwave Access

## 11. Revision history

**Table 12. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G38-100_6G38LS-100_1	20081111	Product 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.
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Product [short] data sheet	Production	This document contains the product specification.

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