

# BLF6G27-135; BLF6G27LS-135

WiMAX power LDMOS transistor

Rev. 02 — 26 May 2008

Product data sheet

## 1. Product profile

### 1.1 General description

135 W LDMOS power transistor for base station applications at frequencies from 2500 MHz to 2700 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)	$\eta_D$ (%)	$ACPR_{885k}$ (dBc)	$ACPR_{1980k}$ (dBc)
1-carrier N-CDMA <sup>[1]</sup>	2500 to 2700	32	20	200	16	22.5	-52 <sup>[2]</sup>	-67 <sup>[2]</sup>

[1] Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 to 13). PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz.

[2] Measured within 30 kHz bandwidth.

### 1.2 Features

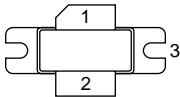
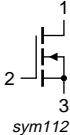
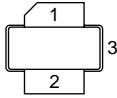
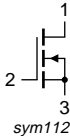
- Typical 1-carrier N-CDMA performance (Single carrier IS-95 with pilot, paging, sync and 6 traffic channels [Walsh codes 8 to 13]. PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz) at a frequency of 2500 MHz and 2700 MHz, a supply voltage of 32 V and an  $I_{Dq}$  of 1200 mA:
  - ◆ Average output power = 20 W
  - ◆ Power gain = 16 dB
  - ◆ Drain efficiency = 22.5 %
  - ◆  $ACPR_{885k} = -52.0$  dBc in 30 kHz bandwidth
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2500 MHz to 2700 MHz)
- Internally matched for ease of use
- 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 2500 MHz to 2700 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
<b>BLF6G27-135 (SOT502A)</b>			
1	drain		
2	gate		
3	source		
<b>BLF6G27LS-135 (SOT502B)</b>			
1	drain		
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF6G27-135	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF6G27LS-135	-	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	$T_{case} = 80\text{ °C};$ $P_L = 135\text{ W (CW)}$	BLF6G27-135	0.5	K/W
			BLF6G27LS-135	0.45	K/W

## 6. Characteristics

**Table 6. Characteristics**  
*T<sub>j</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	V <sub>GS</sub> = 0 V; I <sub>D</sub> = 0.5 mA	65	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 216 mA	1.4	2	2.4	V
I <sub>DSS</sub>	drain leakage current	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 28 V	-	-	4.2	μA
I <sub>DSX</sub>	drain cut-off current	V <sub>GS</sub> = V <sub>GS(th)</sub> + 3.75 V; V <sub>DS</sub> = 10 V	30.6	34	-	A
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = +11 V; V <sub>DS</sub> = 0 V	-	-	420	nA
g <sub>fs</sub>	forward transconductance	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 6.3 A	-	12	-	S
R <sub>DS(on)</sub>	drain-source on-state resistance	V <sub>GS</sub> = V <sub>GS(th)</sub> + 3.75 V; I <sub>D</sub> = 7.2 A	-	0.085	0.135	Ω
C <sub>rs</sub>	feedback capacitance	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 28 V; f = 1 MHz	-	3.15	-	pF

## 7. Application information

**Table 7. Application information**

*Mode of operation: 1-carrier N-CDMA, single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 to 13). PAR = 9.7 dB at 0.01 % probability on the CCDF, channel bandwidth is 1.2288 MHz; f<sub>1</sub> = 2500 MHz; f<sub>2</sub> = 2600 MHz; f<sub>3</sub> = 2700 MHz; RF performance at V<sub>DS</sub> = 32 V; I<sub>Dq</sub> = 1200 mA; T<sub>case</sub> = 25 °C; unless otherwise specified, in a class-AB production circuit.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G <sub>p</sub>	power gain	P <sub>L(AV)</sub> = 20 W	14	16	-	dB
RL <sub>in</sub>	input return loss	P <sub>L(AV)</sub> = 20 W	-	-10	-	dB
η <sub>D</sub>	drain efficiency	P <sub>L(AV)</sub> = 20 W	19.0	22.5	-	%
ACPR <sub>885k</sub>	adjacent channel power ratio (885 kHz)	P <sub>L(AV)</sub> = 20 W	[1] -48	-52	-	dBc
ACPR <sub>1980k</sub>	adjacent channel power ratio (1980 kHz)	P <sub>L(AV)</sub> = 20 W	[1] -65	-67	-	dBc
P <sub>L(M)</sub>	peak output power		[2] 185	200	-	W

[1] Measured within 30 kHz bandwidth.

[2] Measured at 2.7 GHz and 3 dB compression of the CCDF at 0.01 % probability.

### 7.1 Ruggedness in class-AB operation

The BLF6G27-135 and BLF6G27LS-135 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V<sub>DS</sub> = 28 V; I<sub>Dq</sub> = 1200 mA; P<sub>L</sub> = P<sub>L(1dB)</sub>; f = 2700 MHz.

## 7.2 NXP WiMAX signal

### 7.2.1 WiMAX signal description

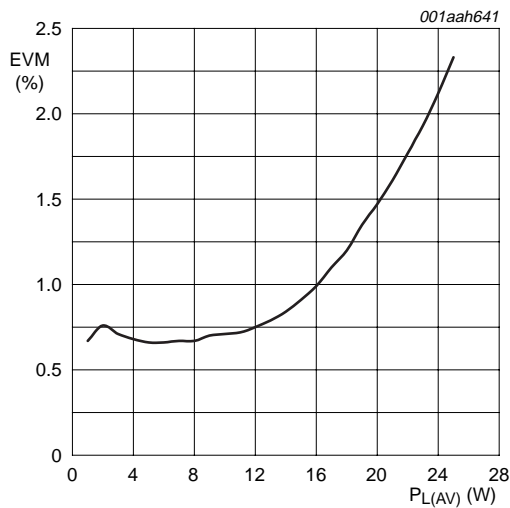
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;  
 frequency band = WCS; sampling rate = 11.2 MHz;  $n = 28 / 25$ ;  $G = T_g / T_b = 1 / 8$ ;  
 FFT = 1024; zone type = PUSC;  $\delta = 97.7 \%$ ; number of symbols = 46;  
 number of subchannels = 30; PAR = 9.5 dB.

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

**Table 8. Frame structure**

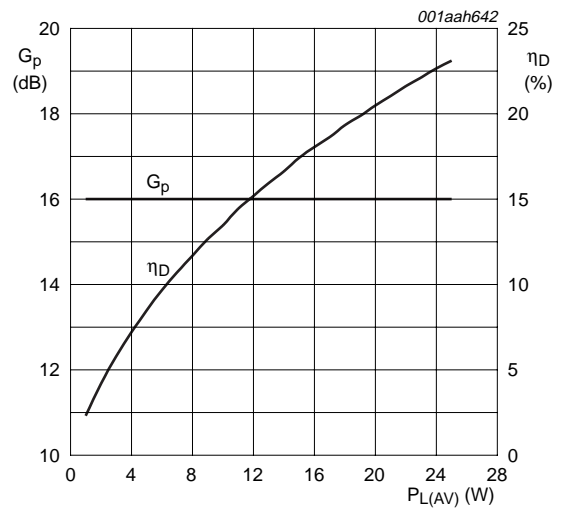
Frame contents	Modulation technique	Data length
Zone 0 FCH 2 symbols $\times$ 4 subchannels	QPSK1/2	3 bit
Zone 0 data 2 symbols $\times$ 26 subchannels	64QAM3/4	692 bit
Zone 0 data 44 symbols $\times$ 30 subchannels	64QAM3/4	10000 bit

### 7.2.2 Graphs



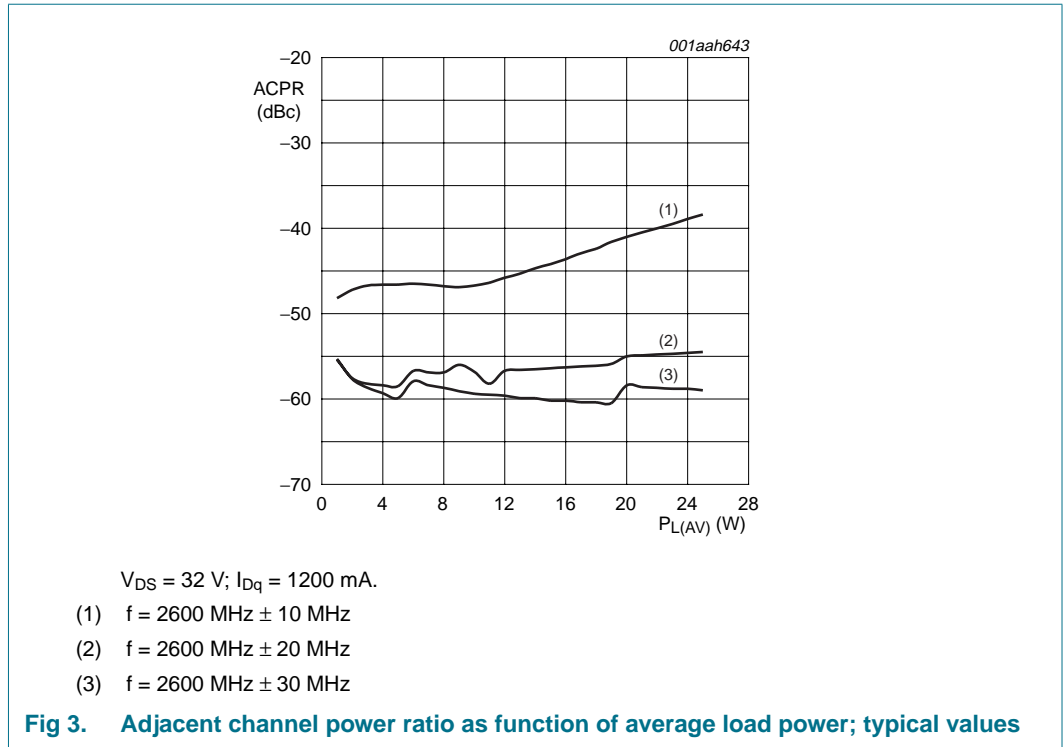
$V_{DS} = 32$  V;  $I_{Dq} = 1200$  mA;  $f = 2600$  MHz.

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



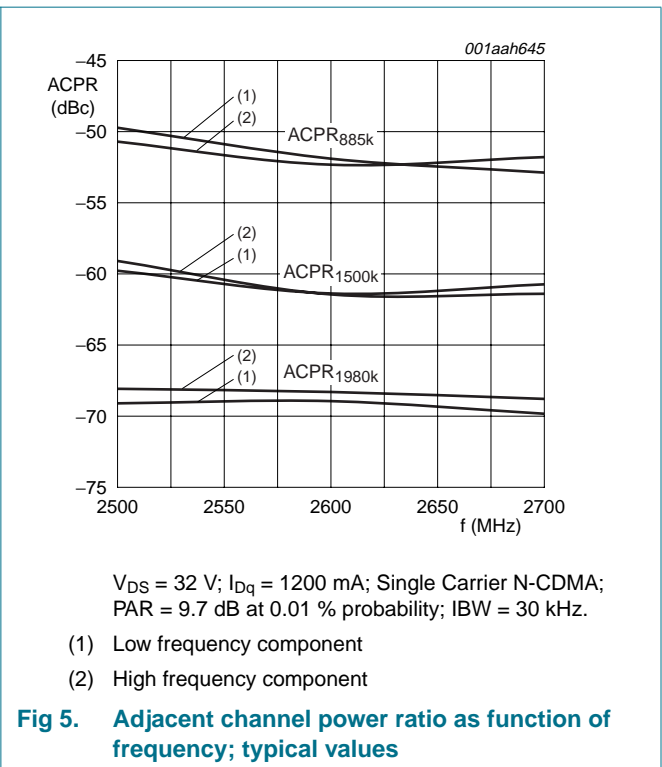
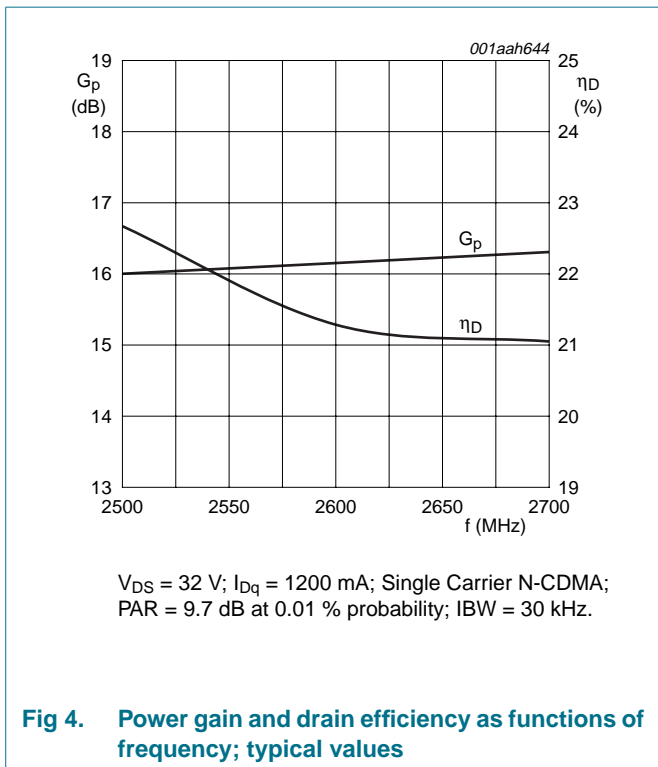
$V_{DS} = 32$  V;  $I_{Dq} = 1200$  mA;  $f = 2600$  MHz.

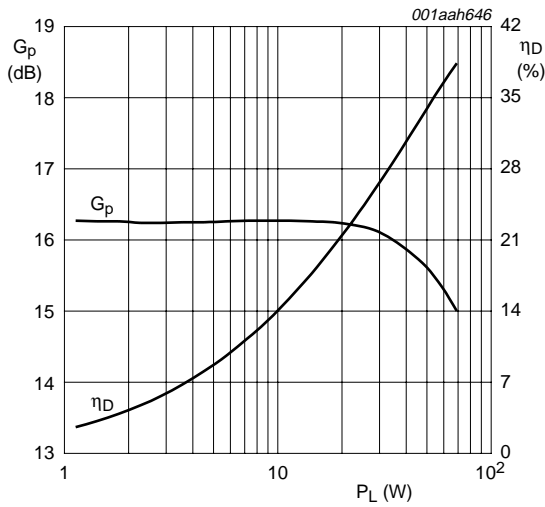
**Fig 2. Power gain and drain efficiency as functions of average load power; typical values**



## 7.3 Single carrier N-CDMA broadband performance at 9 W average

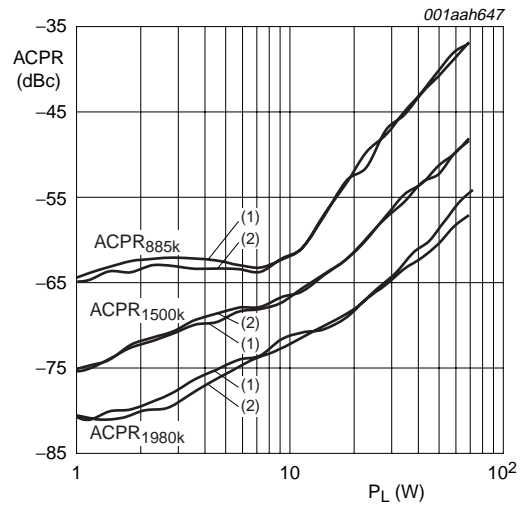
### 7.3.1 Graphs





$V_{DS} = 32$  V;  $I_{DQ} = 1200$  mA;  $f = 2600$  MHz; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

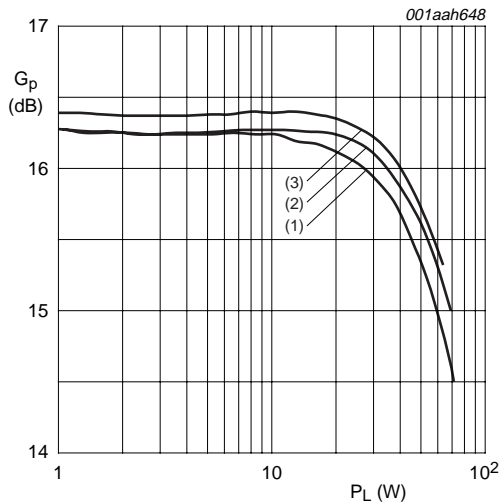
Fig 6. Power gain and drain efficiency as functions of load power; typical values



$V_{DS} = 32$  V;  $I_{DQ} = 1200$  mA;  $f = 2600$  MHz; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

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

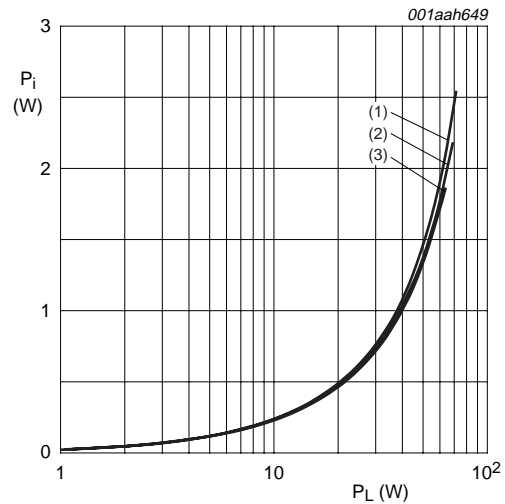
Fig 7. Adjacent channel power ratio as function of load power; typical values



$V_{DS} = 32$  V;  $I_{DQ} = 1200$  mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

- (1)  $f = 2500$  MHz
- (2)  $f = 2600$  MHz
- (3)  $f = 2700$  MHz

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

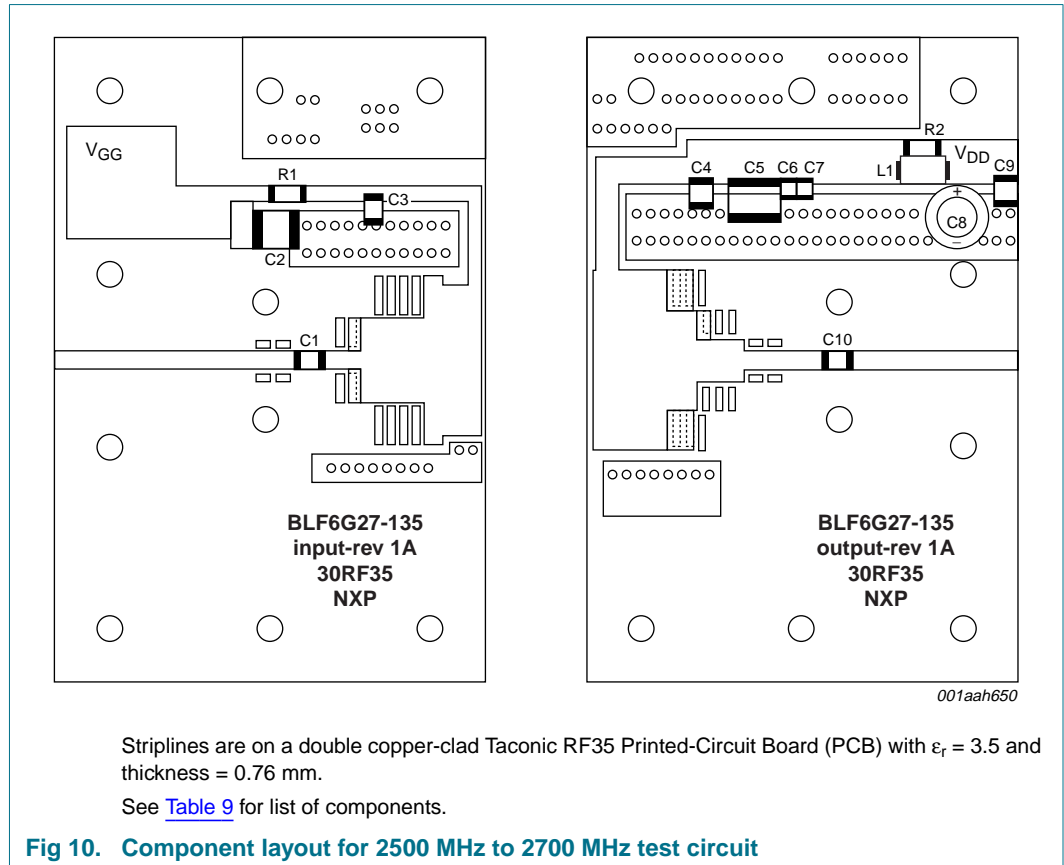


$V_{DS} = 32$  V;  $I_{DQ} = 1200$  mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

- (1)  $f = 2500$  MHz
- (2)  $f = 2600$  MHz
- (3)  $f = 2700$  MHz

Fig 9. Input power as 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, C3, C4, C10	multilayer ceramic chip capacitor	8.2 pF	ATC 100B or equivalent
C2	multilayer ceramic chip capacitor	4.7 $\mu$ F; 50 V	TDK C4532X7R1H475M or equivalent
C5	multilayer ceramic chip capacitor	10 $\mu$ F; 50 V	TDK C5750X7R1H106M or equivalent
C9	multilayer ceramic chip capacitor	1.5 $\mu$ F; 50 V	TDK C3225X7R1H155M or equivalent
C6, C7	multilayer ceramic chip capacitor	100 nF	Vishay VJ1206Y104KXB or equivalent
C8	electrolytic capacitor	470 $\mu$ F; 63 V	ATC 100B or equivalent
L1	ferrite SMD bead	-	Ferroxcube BDS 3/3/4.6-4S2 or equivalent
R1	SMD resistor	5.1 $\Omega$	SMD 1206
R2	SMD resistor	9.1 $\Omega$	SMD 1206

**Table 10. Measured test circuit impedances**

<b>f (GHz)</b>	<b>Z<sub>i</sub> (Ω)</b>	<b>Z<sub>o</sub> (Ω)</b>
2.5	1.60 + j1.07	1.44 + j1.86
2.6	1.38 + j2.08	1.17 + j2.80
2.7	1.17 + j2.77	0.97 + j3.41



9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

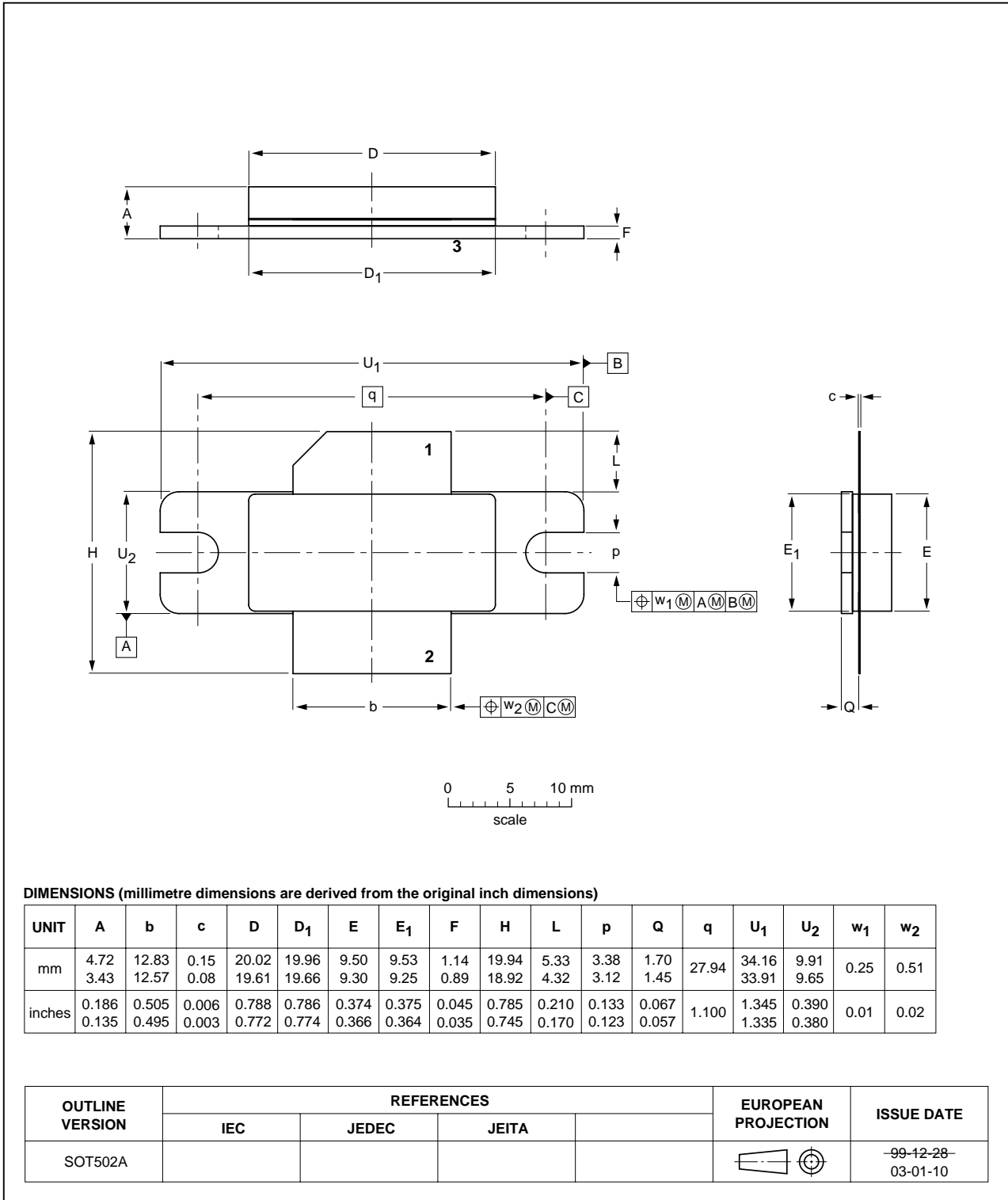


Fig 11. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

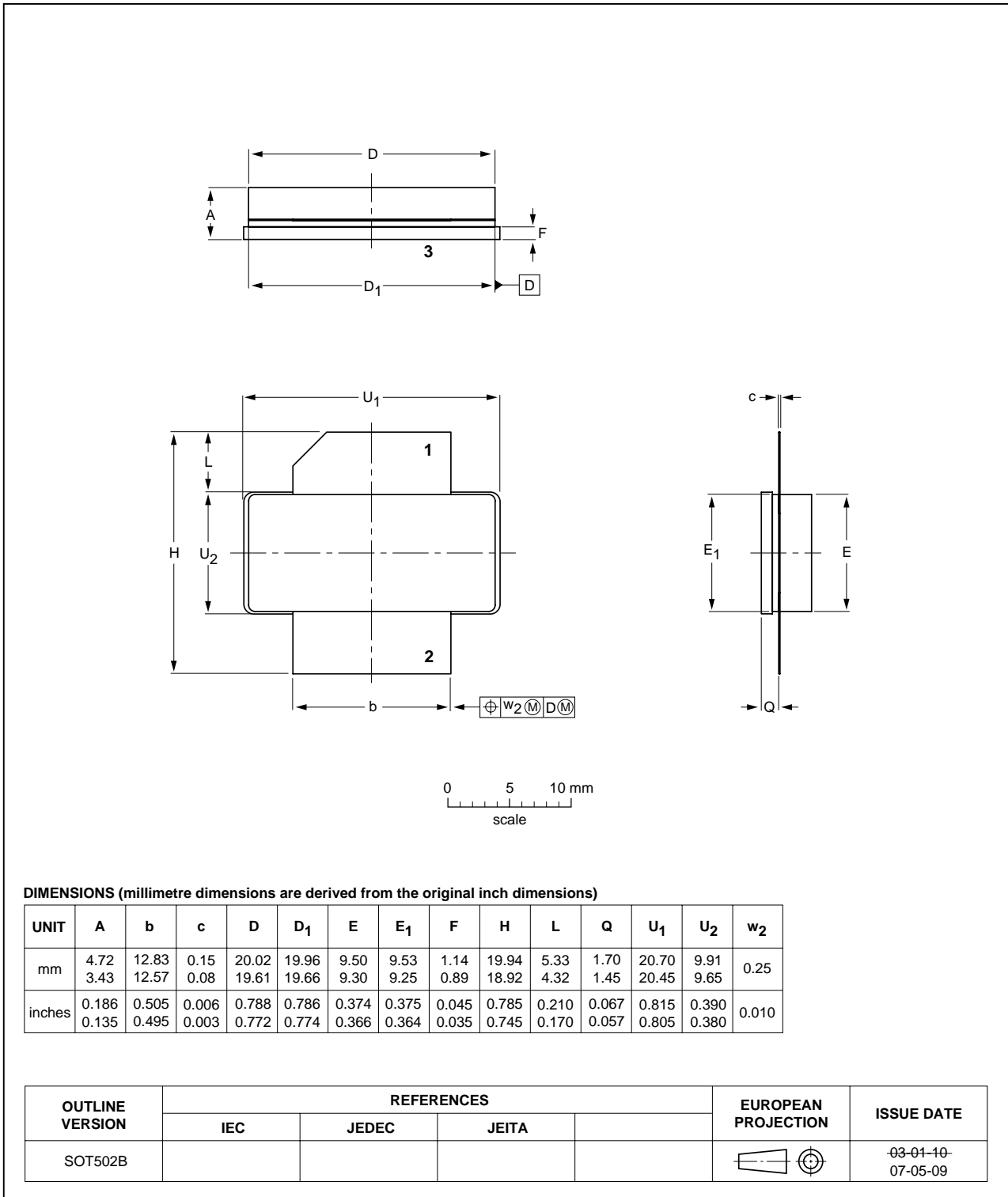


Fig 12. Package outline SOT502B

## 10. Abbreviations

**Table 11. Abbreviations**

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
CDMA	Code Division Multiple Access
CW	Continuous Wave
EVM	Error Vector Magnitude
FCH	Frame Control Header
FFT	Fast Fourier Transform
IBW	Instantaneous BandWidth
IS-95	CDMA Interim Standard 95
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
N-CDMA	Narrowband Code Division Multiple Access
PAR	Peak-to-Average power Ratio
PUSC	Partial Usage of SubChannels
RF	Radio Frequency
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
BLF6G27-135_BLF6G27LS-135_2	20080526	Product data sheet	-	BLF6G27-135_ BLF6G27LS-135_1
BLF6G27-135_BLF6G27LS-135_1	20080221	Preliminary data sheet	-	-

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### 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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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