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 °C in a class-AB production test circuit.

Mode of operation	f	V_{DS}	$P_{L(AV)}$	$P_{L(p)}$	G_p	η_D	$ACPR_{885k}$	$ACPR_{1980k}$
	(MHz)	(V)	(W)	(W)	(dB)	(%)	(dBc)	(dBc)
1-carrier N-CDMA[1]	2500 to 2700	32	20	200	16	22.5	–52[2]	–67[2]

[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

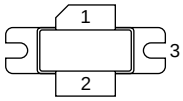
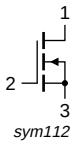
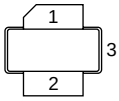
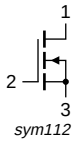
- Typical 1-carrier N-CDMA performance (Single carrier IS-95 with pilot, paging, sync and 6 traffic channels [Walsh codes 8 to 13]. PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz) at a frequency of 2500 MHz and 2700 MHz, a supply voltage of 32 V and an I_{Dq} of 1200 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
BLF6G27-135 (SOT502A)				
1	drain			
2	gate			
3	source	[1]		
BLF6G27LS-135 (SOT502B)				
1	drain			
2	gate			
3	source	[1]		

[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 °C; P_L = 135 W (CW)	BLF6G27-135	0.5	K/W
			BLF6G27LS-135	0.45	K/W

6. Characteristics

Table 6. Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.5 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 216 mA	1.4	2	2.4	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	4.2	µA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	30.6	34	-	A
I_{GSS}	gate leakage current	V_{GS} = +11 V; V_{DS} = 0 V	-	-	420	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 6.3 A	-	12	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.2 A	-	0.085	0.135	Ω
C_{rs}	feedback capacitance	V_{GS} =0 V; V_{DS} = 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_1 = 2500 MHz; f_2 = 2600 MHz; f_3 = 2700 MHz; RF performance at V_{DS} = 32 V; I_{Dq} = 1200 mA; T_{case} = 25 °C; unless otherwise specified, in a class-AB production circuit.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 20 W		14	16	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 20 W		-	–10	-	dB
η_D	drain efficiency	$P_{L(AV)}$ = 20 W		19.0	22.5	-	%
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)}$ = 20 W	[1]	–48	–52	-	dBc
$ACPR_{1980k}$	adjacent channel power ratio (1980 kHz)	$P_{L(AV)}$ = 20 W	[1]	–65	–67	-	dBc
$P_{L(M)}$	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_{DS} = 28 V; I_{Dq} = 1200 mA; P_L = $P_{L(1dB)}$; f = 2700 MHz.

7.2 NXP WiMAX signal

7.2.1 WiMAX signal description

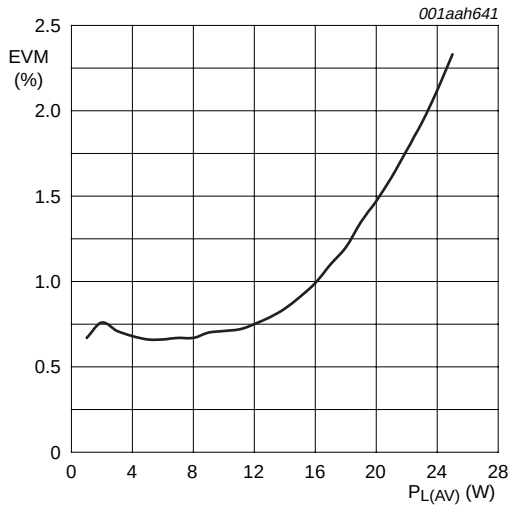
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;
frequency band = WCS; sampling rate = 11.2 MHz; n = 28 / 25; G = T_g / T_b = 1 / 8;
FFT = 1024; zone type = PUSC; δ = 97.7 %; number of symbols = 46;
number of subchannels = 30; PAR = 9.5 dB.

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

Table 8. Frame structure

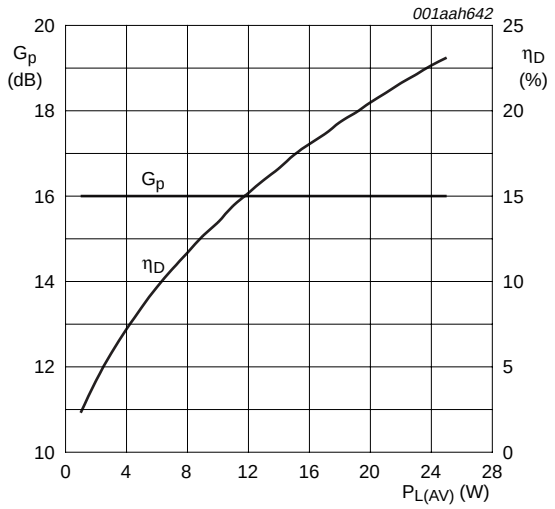
Frame contents			Modulation technique	Data length
Zone 0	FCH	2 symbols × 4 subchannels	QPSK1/2	3 bit
Zone 0	data	2 symbols × 26 subchannels	64QAM3/4	692 bit
Zone 0	data	44 symbols × 30 subchannels	64QAM3/4	10000 bit

7.2.2 Graphs



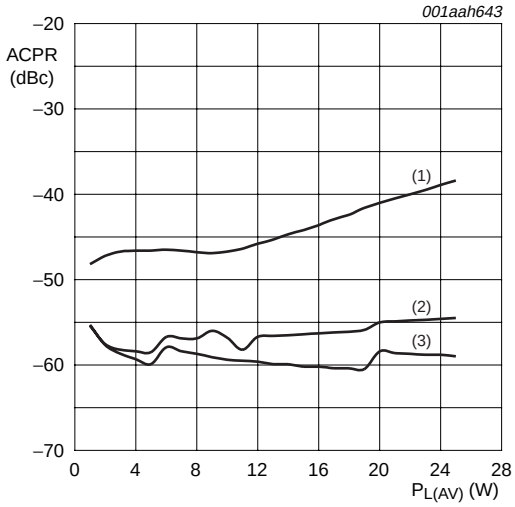
V_{DS} = 32 V; I_{Dq} = 1200 mA; f = 2600 MHz.

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



V_{DS} = 32 V; I_{Dq} = 1200 mA.

(1) f = 2600 MHz ± 10 MHz

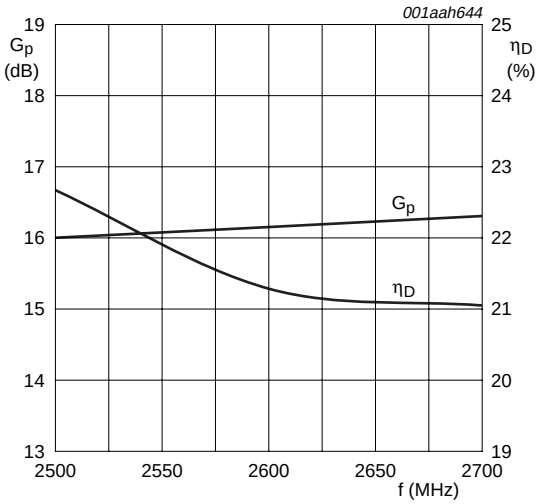
(2) f = 2600 MHz ± 20 MHz

(3) f = 2600 MHz ± 30 MHz

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

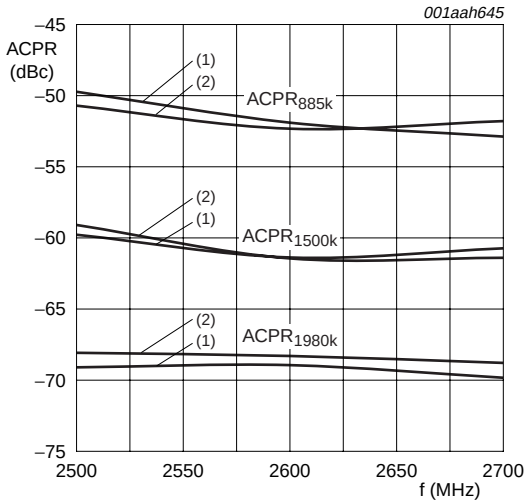
7.3 Single carrier N-CDMA broadband performance at 9 W average

7.3.1 Graphs



V_{DS} = 32 V; I_{Dq} = 1200 mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; IBW = 30 kHz.

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

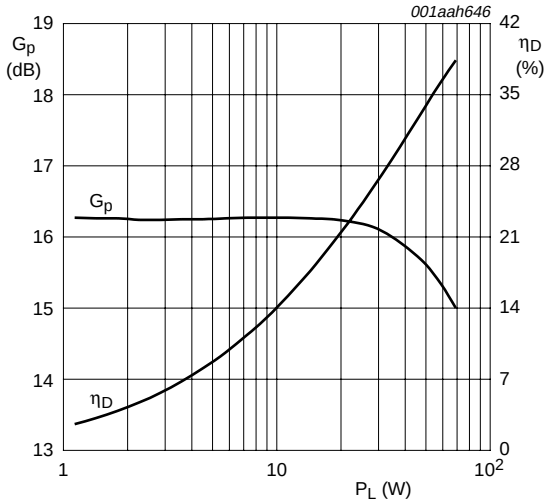


V_{DS} = 32 V; I_{Dq} = 1200 mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; IBW = 30 kHz.

(1) Low frequency component

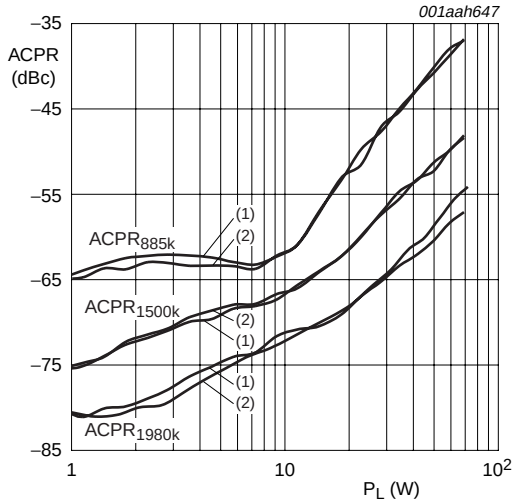
(2) High frequency component

Fig 5. Adjacent channel power ratio as function of frequency; 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.

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

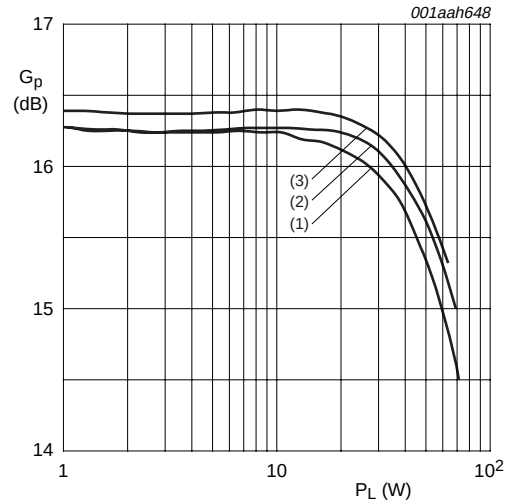


V_{DS} = 32 V; I_{Dq} = 1200 mA; f = 2600 MHz; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

(1) Low frequency component

(2) High frequency component

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



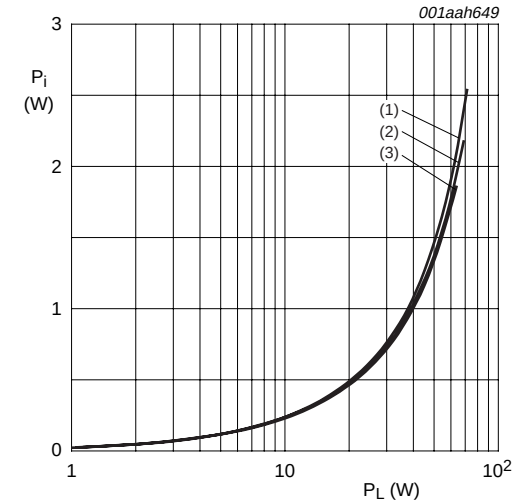
V_{DS} = 32 V; I_{Dq} = 1200 mA; Single Carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; Channel Bandwidth = 1.23 MHz; IBW = 30 kHz.

(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.

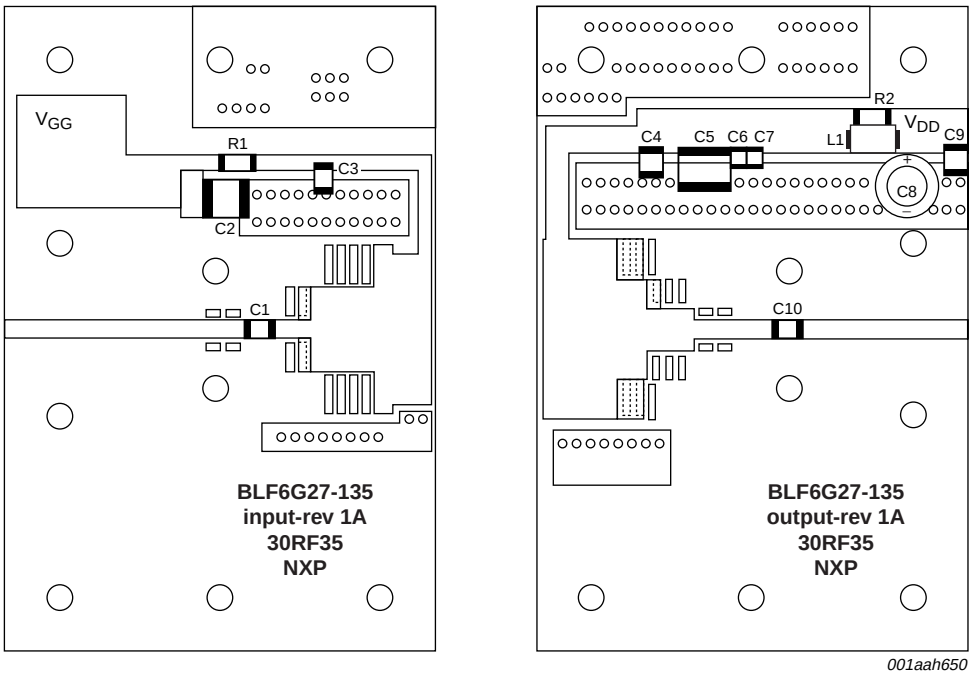
(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2700 MHz

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

8. Test information



Striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm.

See Table 9 for list of components.

Fig 10. Component layout for 2500 MHz to 2700 MHz test circuit

Table 9. List of components

For test circuit, see Figure 10.

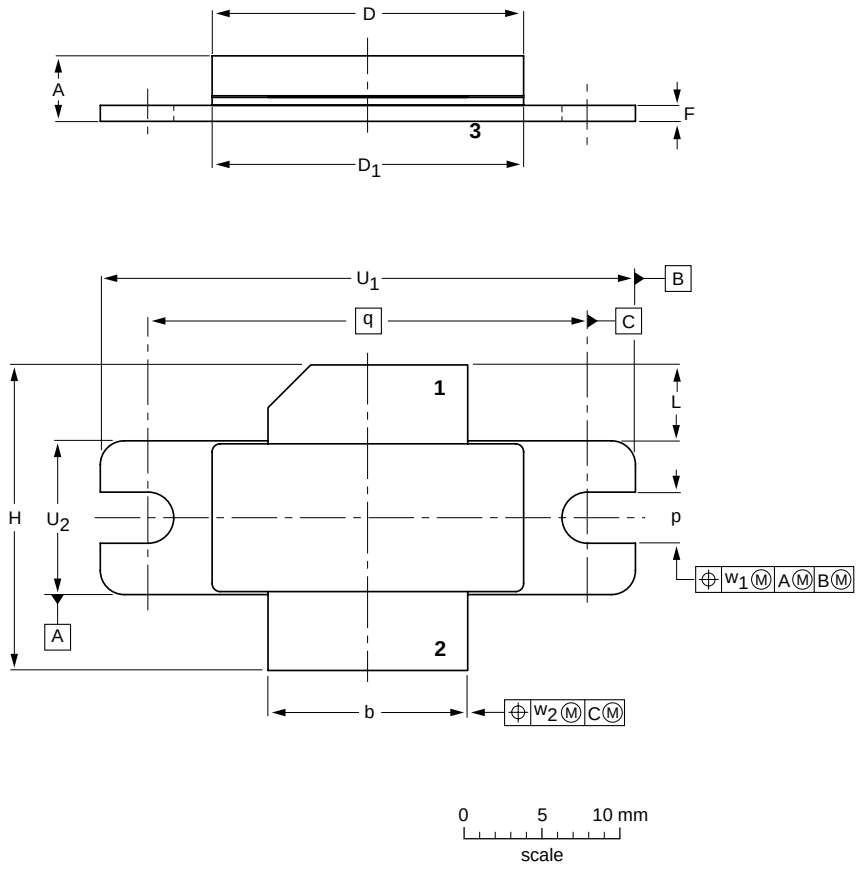
Component	Description	Value	Remarks
C1, C3, C4, C10	multilayer ceramic chip capacitor	8.2 pF	ATC 100B or equivalent
C2	multilayer ceramic chip capacitor	4.7 µF; 50 V	TDK C4532X7R1H475M or equivalent
C5	multilayer ceramic chip capacitor	10 µF; 50 V	TDK C5750X7R1H106M or equivalent
C9	multilayer ceramic chip capacitor	1.5 µF; 50 V	TDK C3225X7R1H155M or equivalent
C6, C7	multilayer ceramic chip capacitor	100 nF	Vishay VJ1206Y104KXB or equivalent
C8	electrolytic capacitor	470 µF; 63 V	ATC 100B or equivalent
L1	ferrite SMD bead	-	Ferroxcube BDS 3/3/4.6-4S2 or equivalent
R1	SMD resistor	5.1 Ω	SMD 1206
R2	SMD resistor	9.1 Ω	SMD 1206

Table 10. Measured test circuit impedances

f	Z_i	Z_o
(GHz)	(Ω)	(Ω)
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**



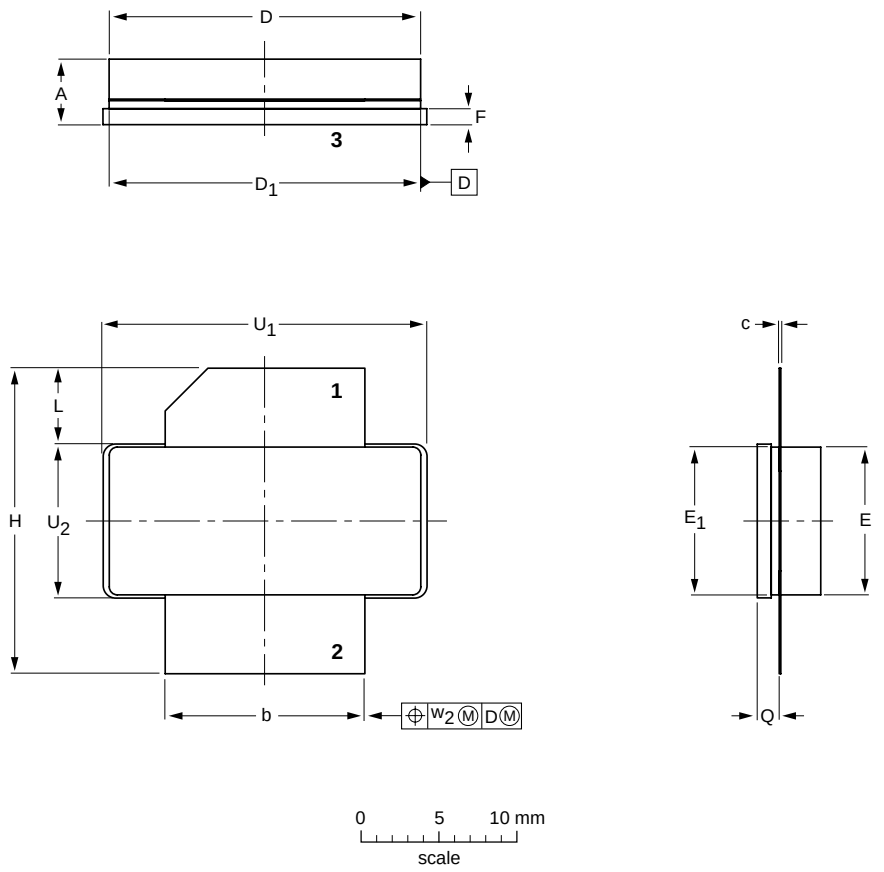
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						~~99-12-28~~ 03-01-10

Fig 11. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads **SOT502B**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	1.70 1.45	20.70 20.45	9.91 9.65	0.25
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						~~03-01-10~~ 07-05-09

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	-	-

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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14. Contents

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