BLF6G38-100; BLF6G38LS-100

WiMAX power LDMOS transistor

Rev. 2 — 24 October 2011 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 °C in a class-AB production test circuit.

Mode of operation	f (MHz)	V_{DS} (V)	$P_{L(AV)}$ (W)	$P_{L(M)}$ [1] (W)	G_p (dB)	η_D (%)	$ACPR_{885k}$ (dBc)	$ACPR_{1980k}$ (dBc)
1-carrier N-CDMA[2]	3400 to 3600	28	18.5	130	13	21.5	–47.5[3]	–65[3]

[1] $P_{L(M)}$ stands for peak output power.

[2] 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.

[3] 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 and benefits

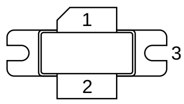
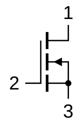
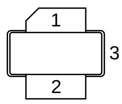
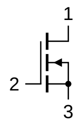
- Typical 1-carrier N-CDMA performance (Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.23 MHz) at a frequency of 3400 MHz, 3500 MHz and 3600 MHz, a supply voltage of 28 V and an I_{Dq} 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
BLF6G38-100 (SOT502A)			
1	drain		 sym112
2	gate		
3	source [1]		
BLF6G38LS-100 (SOT502B)			
1	drain		 sym112
2	gate		
3	source [1]		

[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 °C; $P_{L(AV)}$ = 18.5 W	BLF6G38-100	0.58	K/W
			BLF6G38LS-100	0.43	K/W

6. Characteristics

Table 6. Characteristics

T_j = 25 °C per section; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.6 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	1.4	2	2.4	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	5	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	26.5	33	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	450	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 = 6.3 A	-	0.09	0.15	Ω
C_{rs}	feedback capacitance	V_{GS} =0 V; V_{DS} = 28 V; f = 1 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 MHz; f_2 = 3500 MHz; f_3 = 3600 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 1050 mA; T_{case} = 25 °C; unless otherwise specified, in a class-AB production circuit.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$P_{L(M)}$	peak output power	$P_{L(AV)}$ = 18.5 W		110	130	-	W
G_p	power gain	$P_{L(AV)}$ = 18.5 W		11.5	13	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 18.5 W		-	–10	-	dB
η_D	drain efficiency	$P_{L(AV)}$ = 18.5 W		18.5	21.5	-	%
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)}$ = 18.5 W	[1]	-	–47.5	–45	dBc
$ACPR_{1980k}$	adjacent channel power ratio (1980 kHz)	$P_{L(AV)}$ = 18.5 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 V; I_{Dq} = 1050 mA; P_L = $P_{L(1dB)}$; f = 3600 MHz.

7.2 NXP WiMAX signal

7.2.1 WiMAX signal description

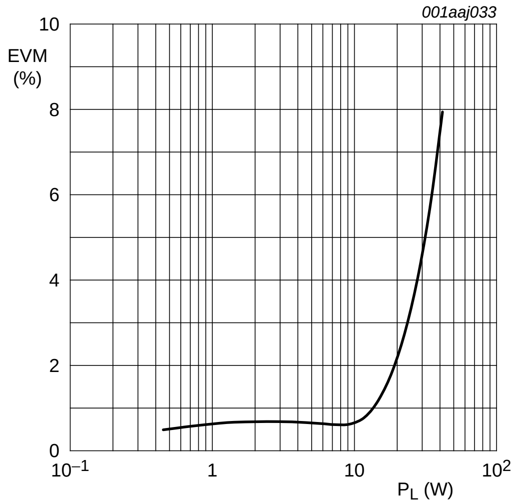
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;
frequency band = WCS; sampling rate = 11.2 MHz; n = 8 / 7; $G = T_g / T_b = 1 / 8$;
FFT = 1024; zone type = PUSC; δ = 97.7 %; number of symbols = 46;
number of subchannels = 30; PAR = 9.5 dB.

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

Table 8. Frame structure

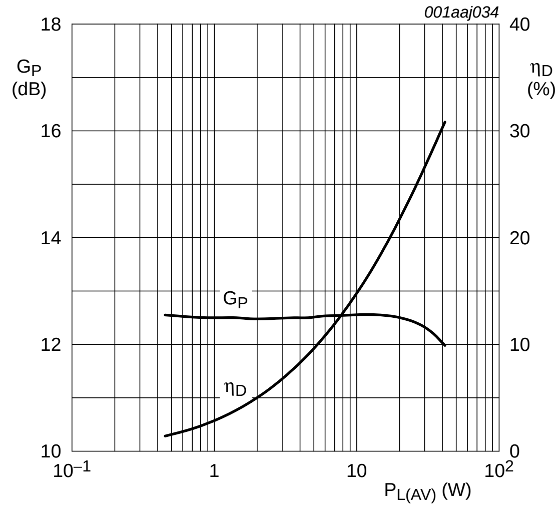
Frame contents			Modulation technique	Data length
Zone 0	FCH	2 symbols × 4 subchannels	QPSK 1/2	3 bit
Zone 0	data	2 symbols × 26 subchannels	64 QAM 3/4	692 bit
Zone 0	data	44 symbols × 30 subchannels	64 QAM 3/4	10000 bit

7.2.2 Graphs



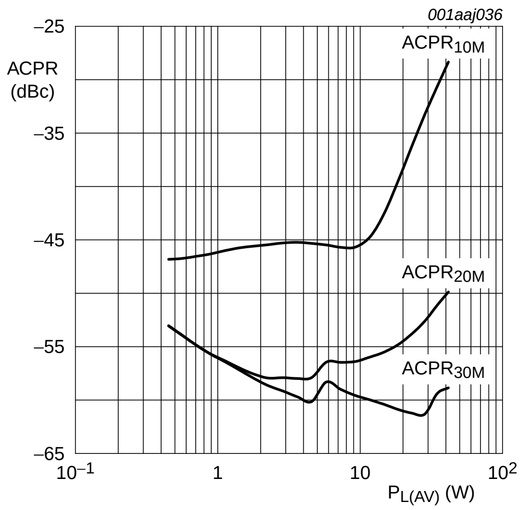
V_{DS} = 28 V; I_{Dq} = 1050 mA; f = 3500 MHz.

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



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

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

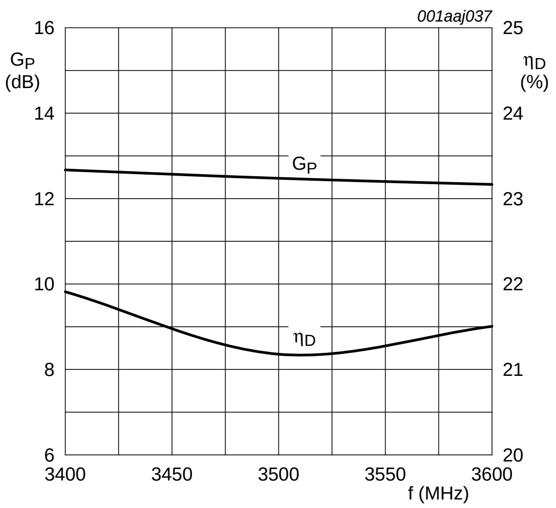


V_{DS} = 28 V; I_{Dq} = 1050 mA; f = 3500 MHz.

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

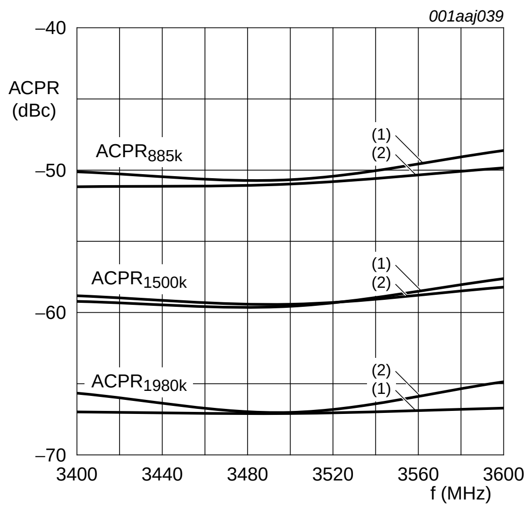
7.3 Single carrier NA IS-95 broadband performance at 2 W average

7.3.1 Graphs



V_{DS} = 28 V; I_{Dq} = 1050 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

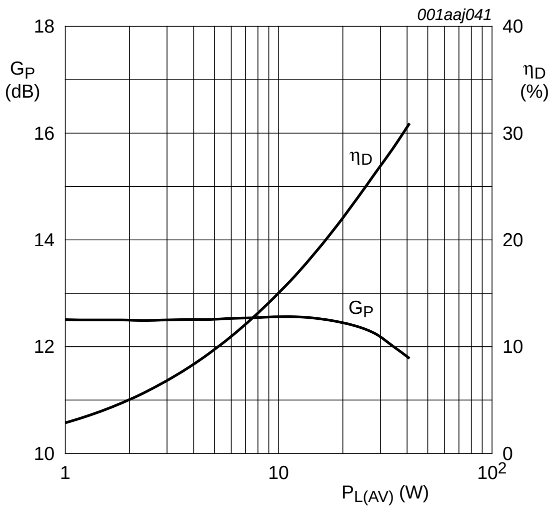


V_{DS} = 28 V; I_{Dq} = 1050 mA; single carrier IS-95; PAR = 9.7 dB at 0.01 % probability.

(1) Low frequency component

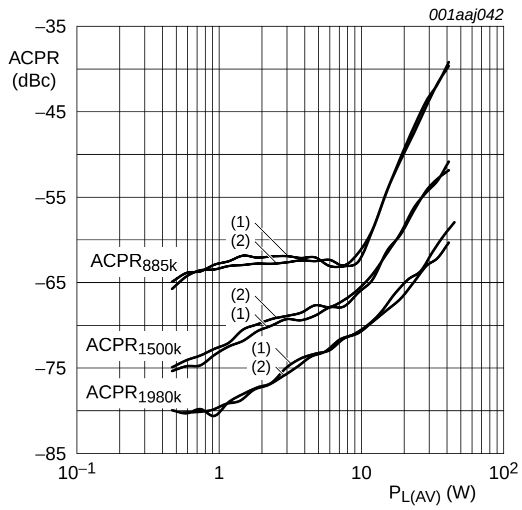
(2) High frequency component

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



V_{DS} = 28 V; I_{Dq} = 1050 mA; f = 3500 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

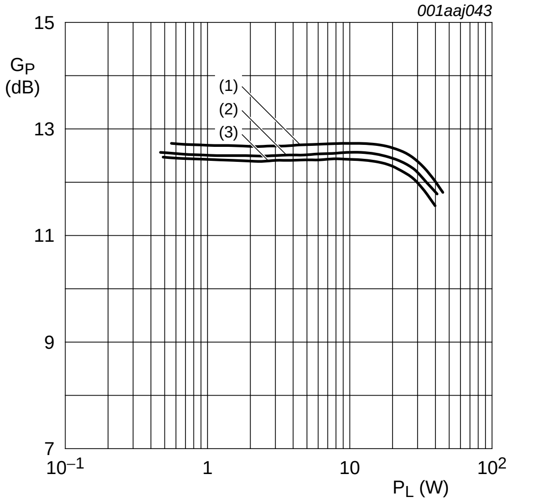


V_{DS} = 28 V; I_{Dq} = 1050 mA; f = 3500 MHz;
single carrier IS-95; PAR = 9.7 dB at 0.01 % probability;
channel bandwidth = 1.23 MHz; IBW = 30 kHz.

(1) Low frequency component

(2) High frequency component

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



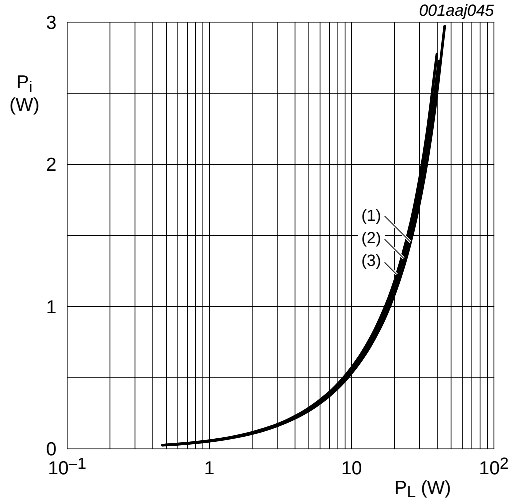
V_{DS} = 28 V; I_{Dq} = 1050 mA; single carrier IS-95;
PAR = 9.7 dB at 0.01 % probability;
channel bandwidth = 1.23 MHz.

(1) f = 3400 MHz

(2) f = 3500 MHz

(3) f = 3600 MHz

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



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

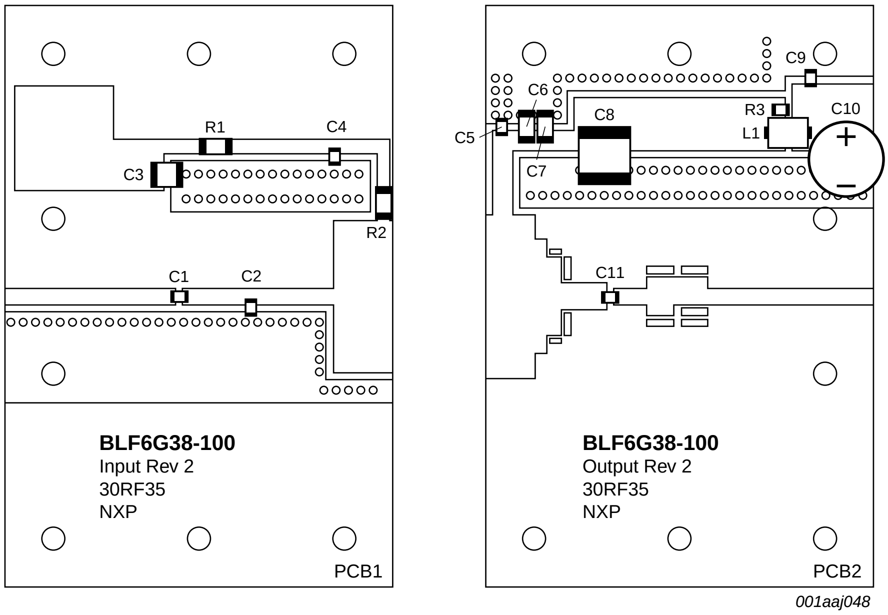
(1) f = 3400 MHz

(2) f = 3500 MHz

(3) f = 3600 MHz

Fig 9. Input power as a 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 3400 MHz to 3600 MHz test circuit

Table 9. List of components

For test circuit, see Figure 10.

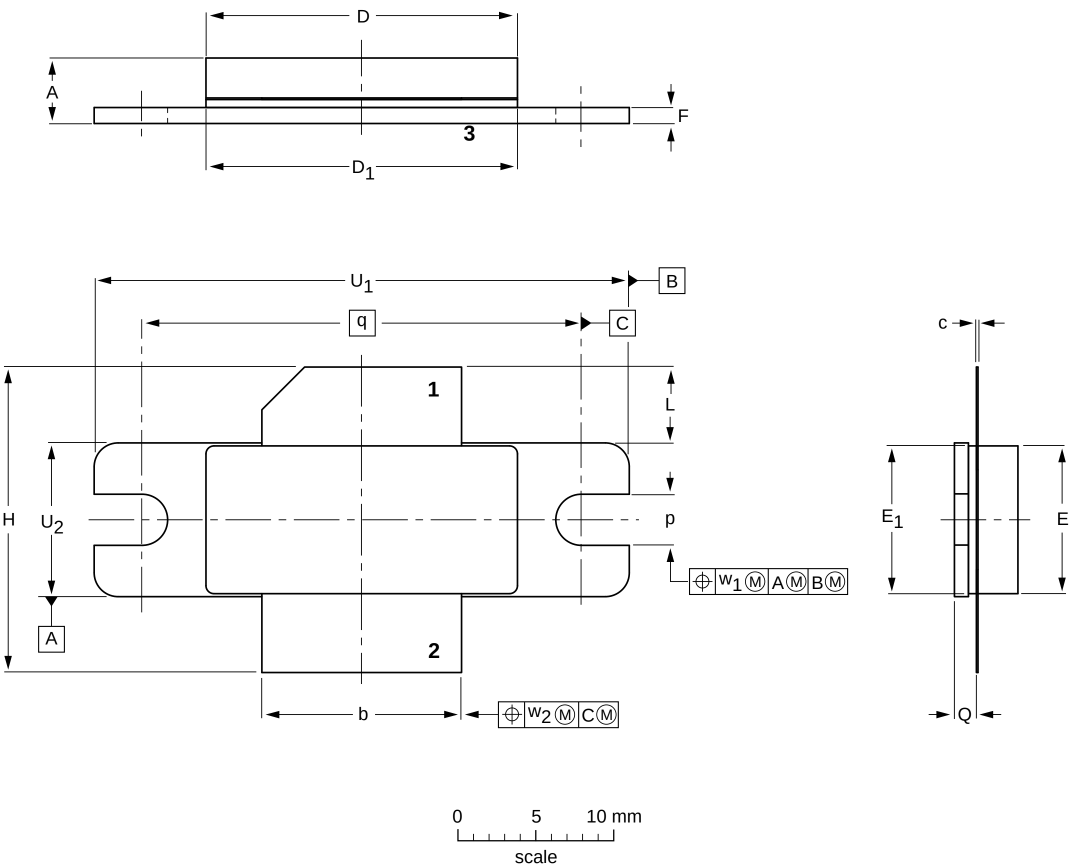
Component	Description	Value	Remarks
C1, C4, C5, C11	multilayer ceramic chip capacitor	10 pF	ATC 100A
C2	multilayer ceramic chip capacitor	0.2 pF	ATC 100A
C3	multilayer ceramic chip capacitor	4.7 μF; 50 V	TDK C4532X7R1H475M
C6, C7	multilayer ceramic chip capacitor	100 nF	Vishay VJ1206Y104KXB
C8	multilayer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

Table 10. Measured test circuit impedances

f (GHz)	Z_i (Ω)	Z_o (Ω)
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**



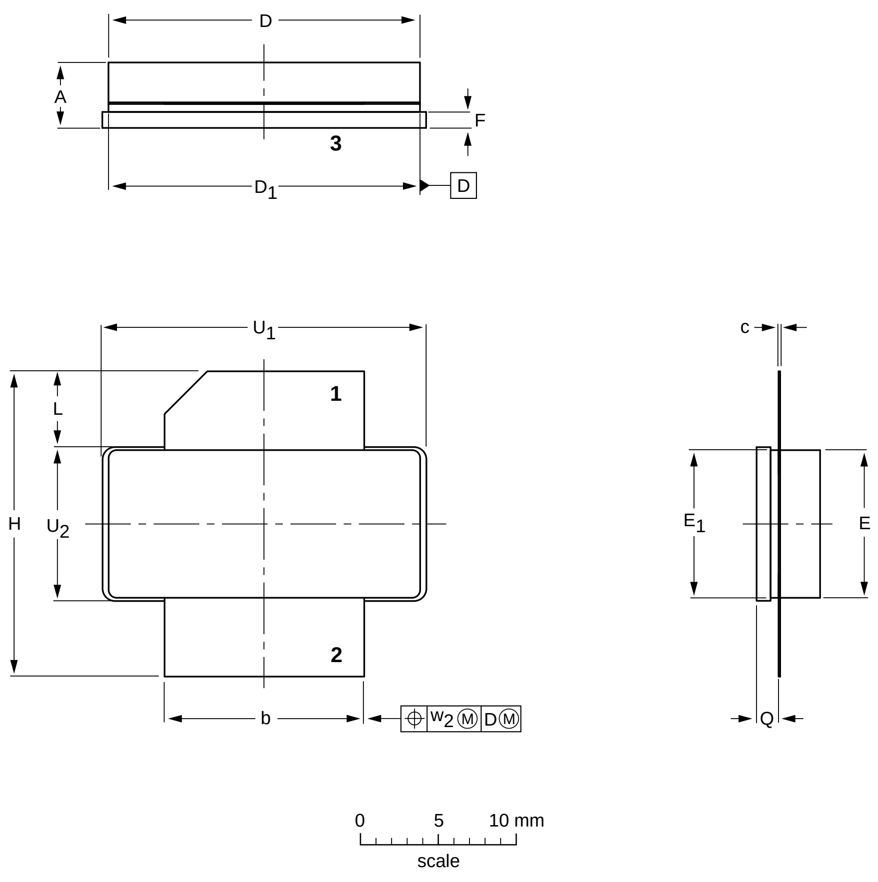
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

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
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 v.2	20111024	Product data sheet	-	BLF6G38-100_6G38LS-100_1
Modifications:	• Table 1 on page 1: $P_{L(p)}$ has been changed to $P_{L(M)}$. • Table 7 on page 3: $P_{L(AV)}$ has been changed to $P_{L(M)}$.			
BLF6G38-100_6G38LS-100_1	20081111	Product 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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