

BLF6G38-10; BLF6G38-10G

WiMAX power LDMOS transistor

Rev. 2 — 6 January 2015

Product data sheet

1. Product profile

1.1 General description

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

Table 1. Typical performance

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)	G _p (dB)	η_D (%)	ACPR _{885k} (dBc)	ACPR _{1980k} (dBc)
1-carrier N-CDMA ^[1]	3400 to 3600	28	2	14	20	-49 ^[2]	-64 ^[2]

[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 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. You must use a ground strap or touch the PC case or other grounded source before unpacking or handling the hardware.

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 CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an I_{Dq} of 130 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)

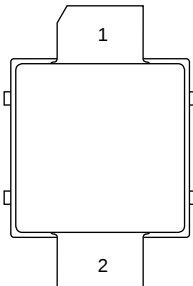
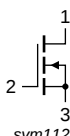
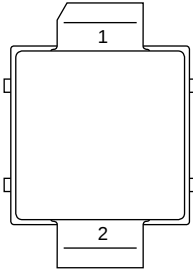
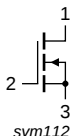


1.3 Applications

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

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLF6G38-10 (SOT975B)			
1	drain		
2	gate		
3	source [1]		
BLF6G38-10G (SOT975C)			
1	drain		
2	gate		
3	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G38-10	-	earless flanged ceramic package; 2 leads	SOT975B
BLF6G38-10G	-	earless flanged ceramic package; 2 leads	SOT975C

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		-	3.1	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	$T_{case} = 80\text{ °C}$; $P_L = 10\text{ W (CW)}$	BLF6G38-10	4.0	K/W
			BLF6G38-10G	4.0	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	$V_{GS} = 0\text{ V}$; $I_D = 0.18\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 18\text{ mA}$	1.4	1.9	2.4	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 28\text{ V}$	-	-	1.4	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	2.7	-	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	140	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}$; $I_D = 0.9\text{ A}$	0.8	-	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 0.6\text{ A}$	328	-	1256	mΩ
C_{rs}	feedback capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 28\text{ V}$; $f = 1\text{ MHz}$	-	3.6	-	pF

7. Application information

Table 7. Application information

Mode of operation: 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 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; $I_{Dq} = 130$ mA; $T_{case} = 25$ °C; unless otherwise specified; in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	2	-	W
G_p	power gain	$P_{L(AV)} = 2$ W	13	14	-	dB
RL_{in}	input return loss	$P_{L(AV)} = 2$ W	-	-10	-	dB
η_D	drain efficiency	$P_{L(AV)} = 2$ W	18	20	-	%
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)} = 2$ W [1]	-	-49	-46	dBc
$ACPR_{1980k}$	adjacent channel power ratio (1980 kHz)	$P_{L(AV)} = 2$ W [1]	-	-64	-61	dBc

[1] Measured within 30 kHz bandwidth.

7.1 Ruggedness in class-AB operation

The BLF6G38-10 and BLF6G38-10G are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 28$ V; $I_{Dq} = 130$ mA; $P_L = P_{L(1dB)}$; $f = 3600$ MHz.

7.2 NXP WiMAX signal

7.2.1 WiMAX signal description

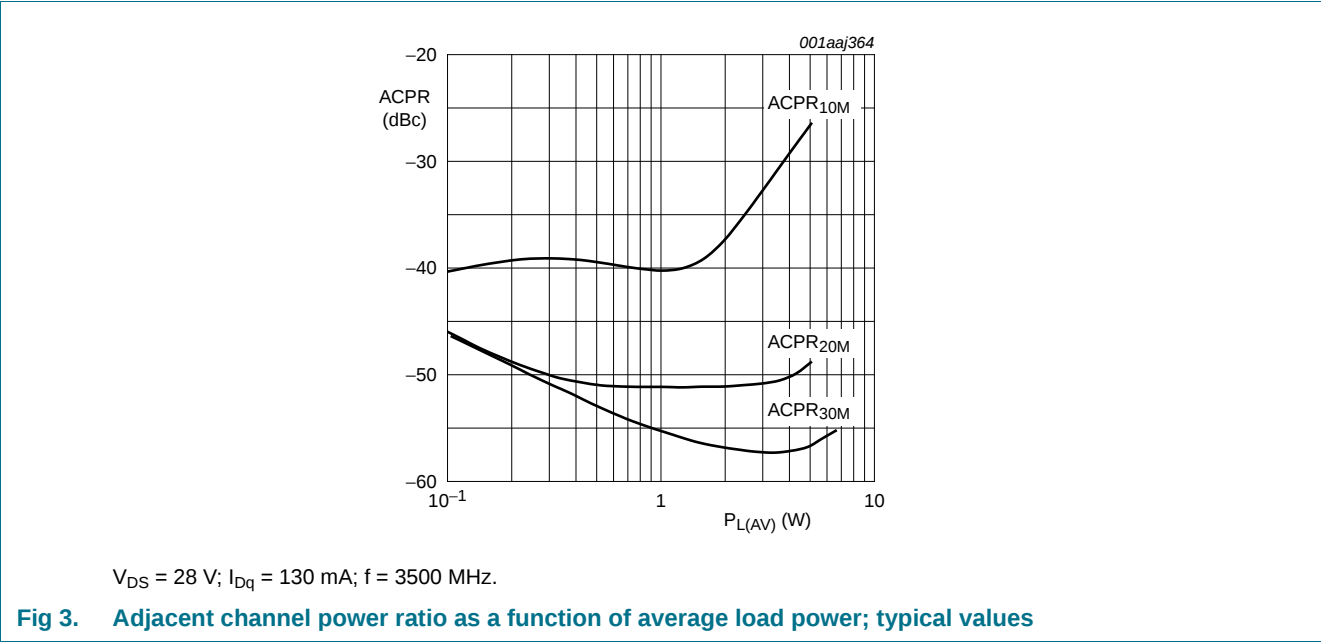
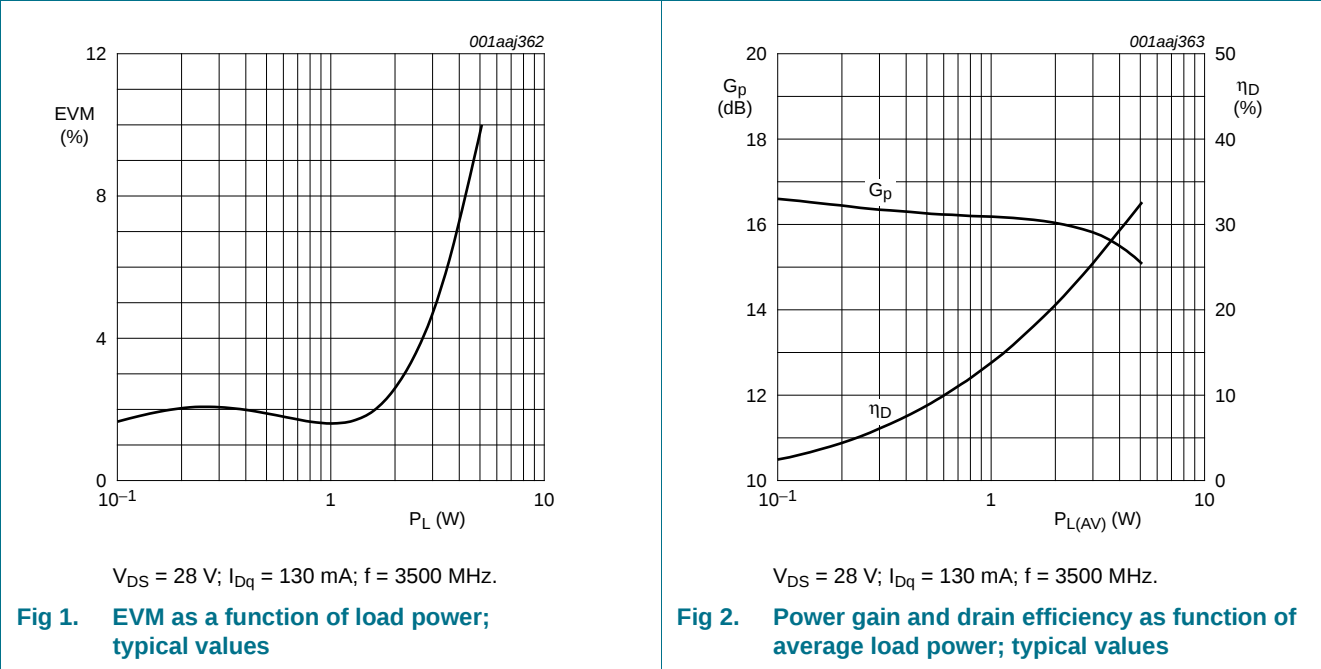
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;
frequency band = WCS; sampling rate = 11.2 MHz; $n = 8 / 7$; $G = T_g / T_b = 1 / 8$;
FFT = 1024; zone type = PUSC; $\delta = 97.7$ %; number of symbols = 46;
number of subchannels = 30; PAR = 9.5 dB.

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

Table 8. Frame structure

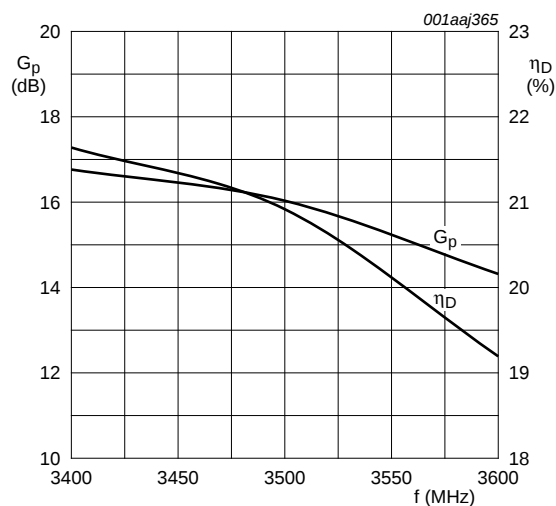
Frame contents			Modulation technique	Data length
Zone 0	FCH	2 symbols $\times$ 4 subchannels	QPSK1/2	3 bit
Zone 0	data	2 symbols $\times$ 26 subchannels	64QAM3/4	692 bit
Zone 0	data	44 symbols $\times$ 30 subchannels	64QAM3/4	10000 bit

7.2.2 Graphs



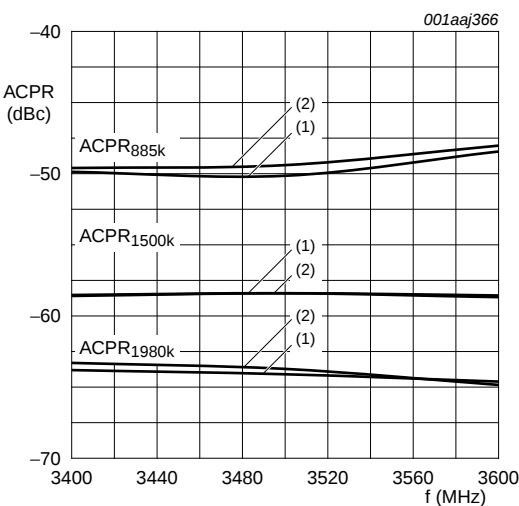
7.3 Single carrier NA IS-95 broadband performance at 2 W average

7.3.1 Graphs



$V_{DS} = 28\text{ V}$; $I_{DQ} = 130\text{ mA}$; Single Carrier IS-95;
PAR = 9.7 dB at 0.01 % probability.

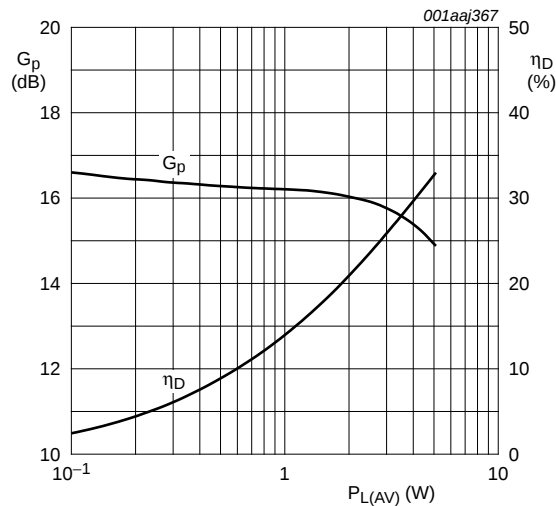
Fig 4. Power gain and drain efficiency as function of frequency; typical values



$V_{DS} = 28\text{ V}$; $I_{DQ} = 130\text{ mA}$; single carrier IS-95;
PAR = 9.7 dB at 0.01 % probability.

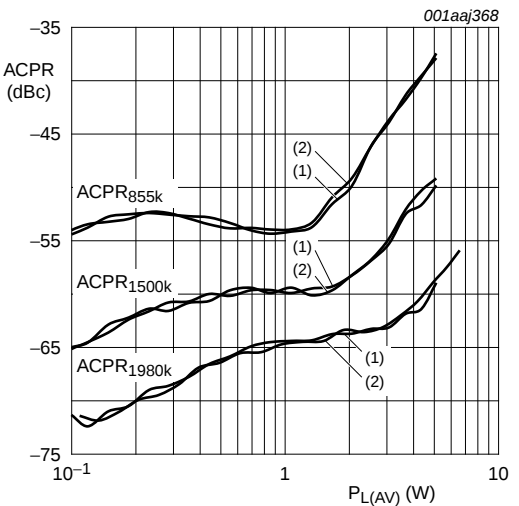
- (1) Low frequency component
- (2) High frequency component

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



$V_{DS} = 28\text{ V}$; $I_{DQ} = 130\text{ mA}$; $f = 3500\text{ MHz}$;
single carrier IS-95; PAR = 9.7 dB at 0.01 % probability;
channel bandwidth = 1.23 MHz.

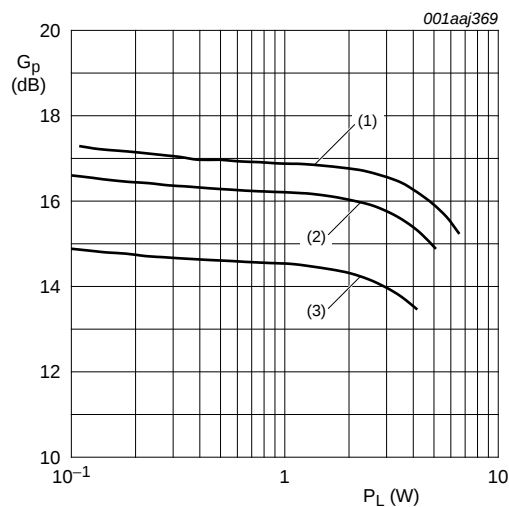
Fig 6. Power gain and drain efficiency as function of load power; typical values



$V_{DS} = 28\text{ V}$; $I_{DQ} = 130\text{ mA}$; $f = 3500\text{ MHz}$;
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

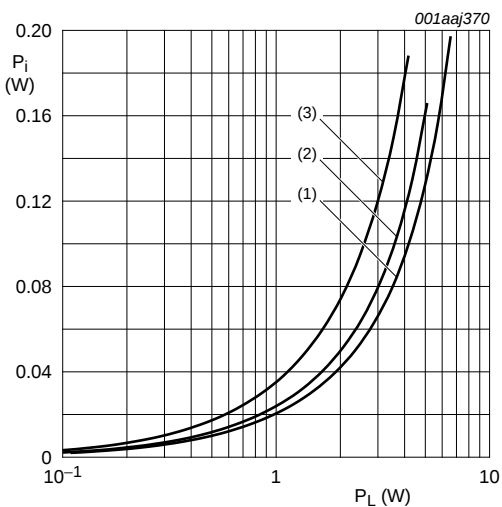
Fig 7. Adjacent channel power ratio as a function of load power; typical values



$V_{DS} = 28\text{ V}$; $I_{DQ} = 130\text{ mA}$; 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

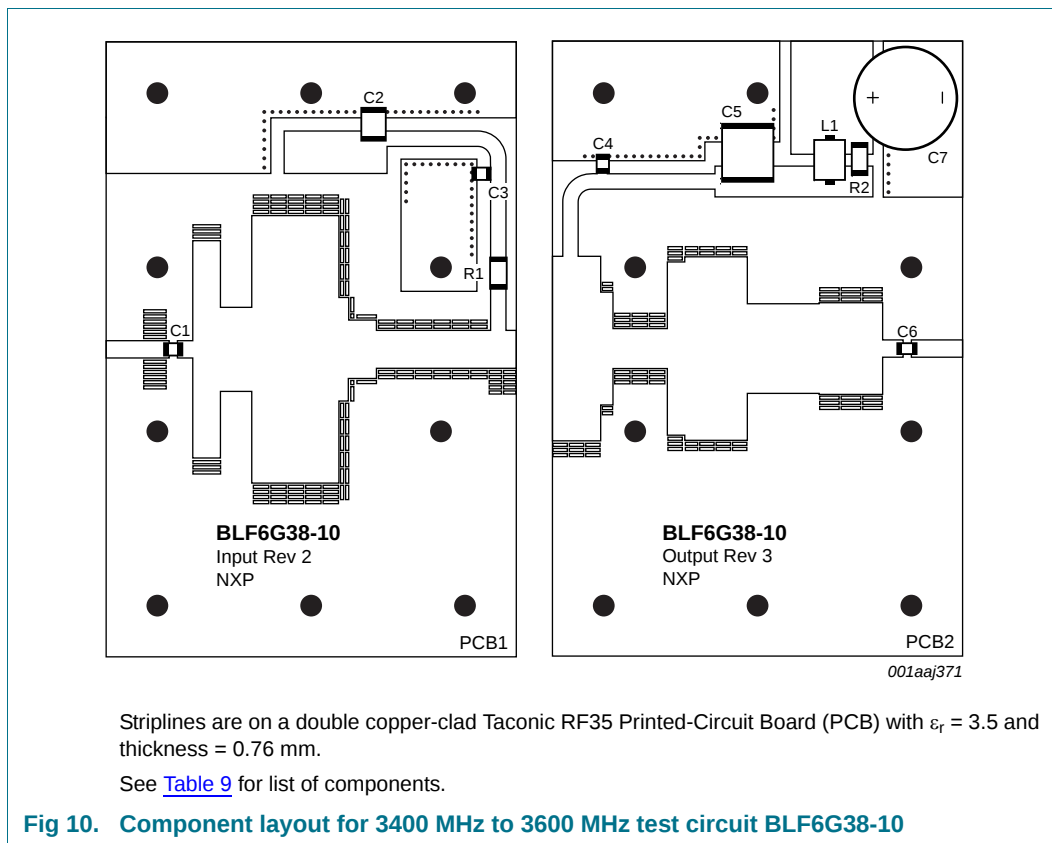


$V_{DS} = 28\text{ V}$; $I_{DQ} = 130\text{ mA}$; single carrier IS-95;
PAR = 9.7 dB at 0.01 % probability;
channel bandwidth = 1.23 MHz.

- (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



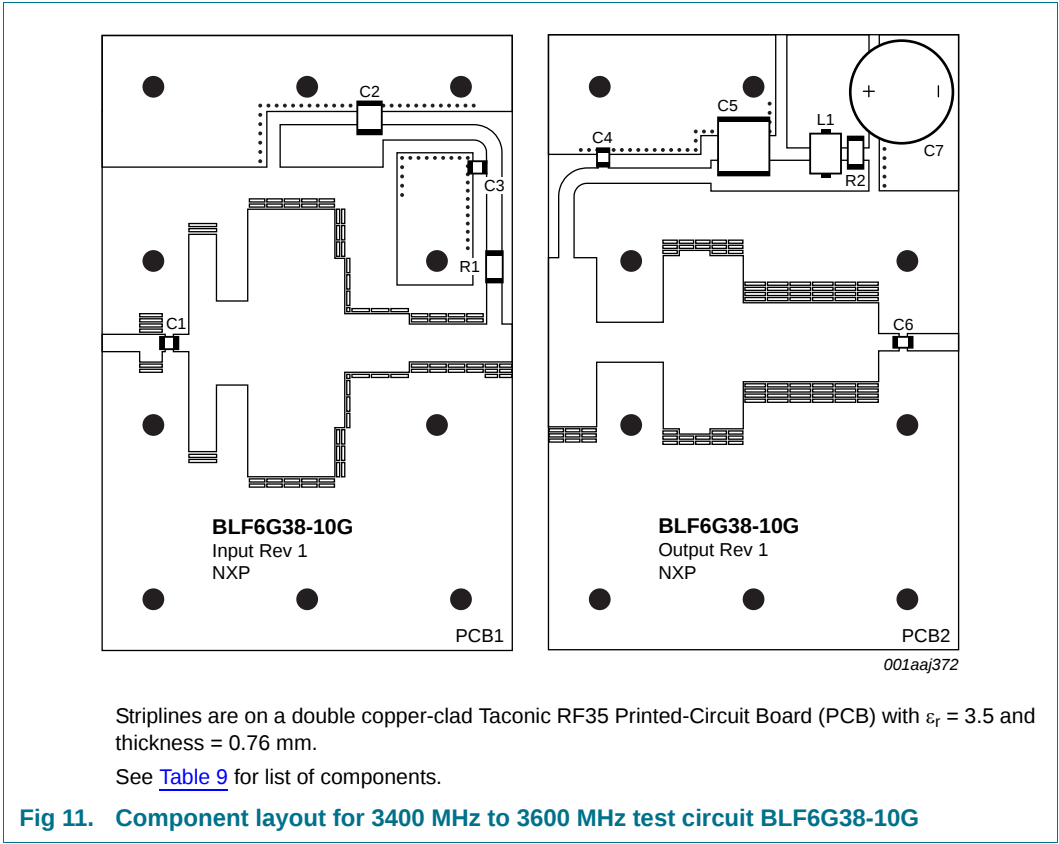


Table 9. List of components
For test circuit, see [Figure 10](#) and [Figure 11](#).

Component	Description	Value	Remarks
C1, C3, C6	multilayer ceramic chip capacitor	20 pF	ATC 100A
C2	multilayer ceramic chip capacitor	1.5 μ F	TDK
C4	multilayer ceramic chip capacitor	6.8 μ F	ATC 100A
C5	multilayer ceramic chip capacitor	10 μ F; 50 V	TDK
C7	electrolytic capacitor	220 μ F; 63 V	Elco
L1	ferrite SMD bead	-	Ferroxcube bead
R1, R2	SMD resistor	8.2 Ω	Thin film

Table 10. Measured test circuit impedances

f (GHz)	Z _i (Ω)	Z _o (Ω)
BLF6G38-10		
3.40	12.61 - j23.96	5.21 - j6.31
3.45	14.16 - j22.23	5.47 - j6.01
3.50	16.00 - j21.74	5.72 - j5.87
3.55	17.43 - j22.91	5.90 - j5.91
3.60	17.11 - j25.43	5.92 - j6.09
BLF6G38-10G		
3.40	19.33 - j22.54	4.71 - j7.09
3.45	21.20 - j21.65	4.75 - j6.82
3.50	23.02 - j22.41	4.72 - j6.65
3.55	23.70 - j24.95	4.60 - j6.55
3.60	21.98 - j28.26	4.36 - j6.47

9. Package outline

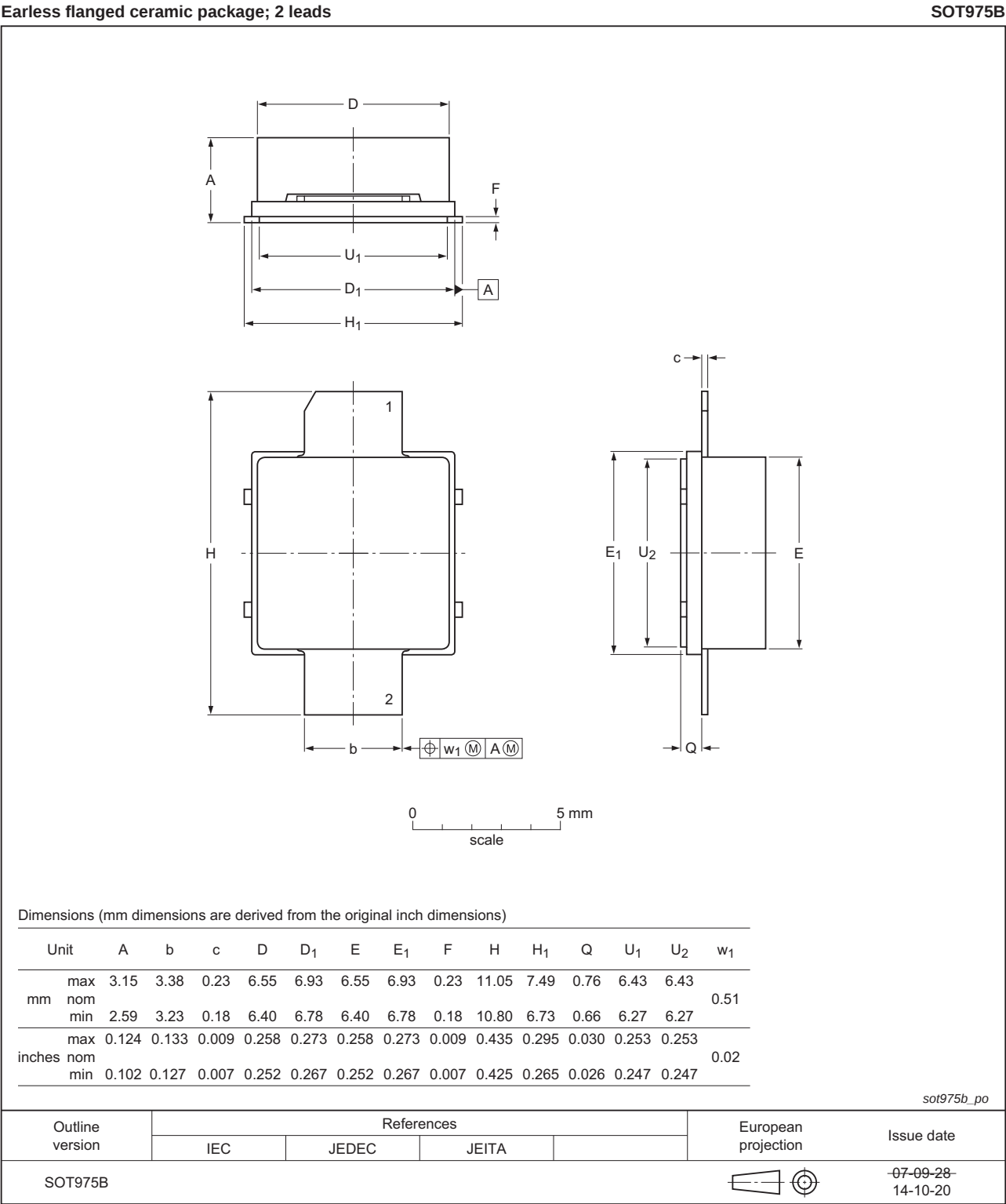


Fig 12. Package outline SOT975B

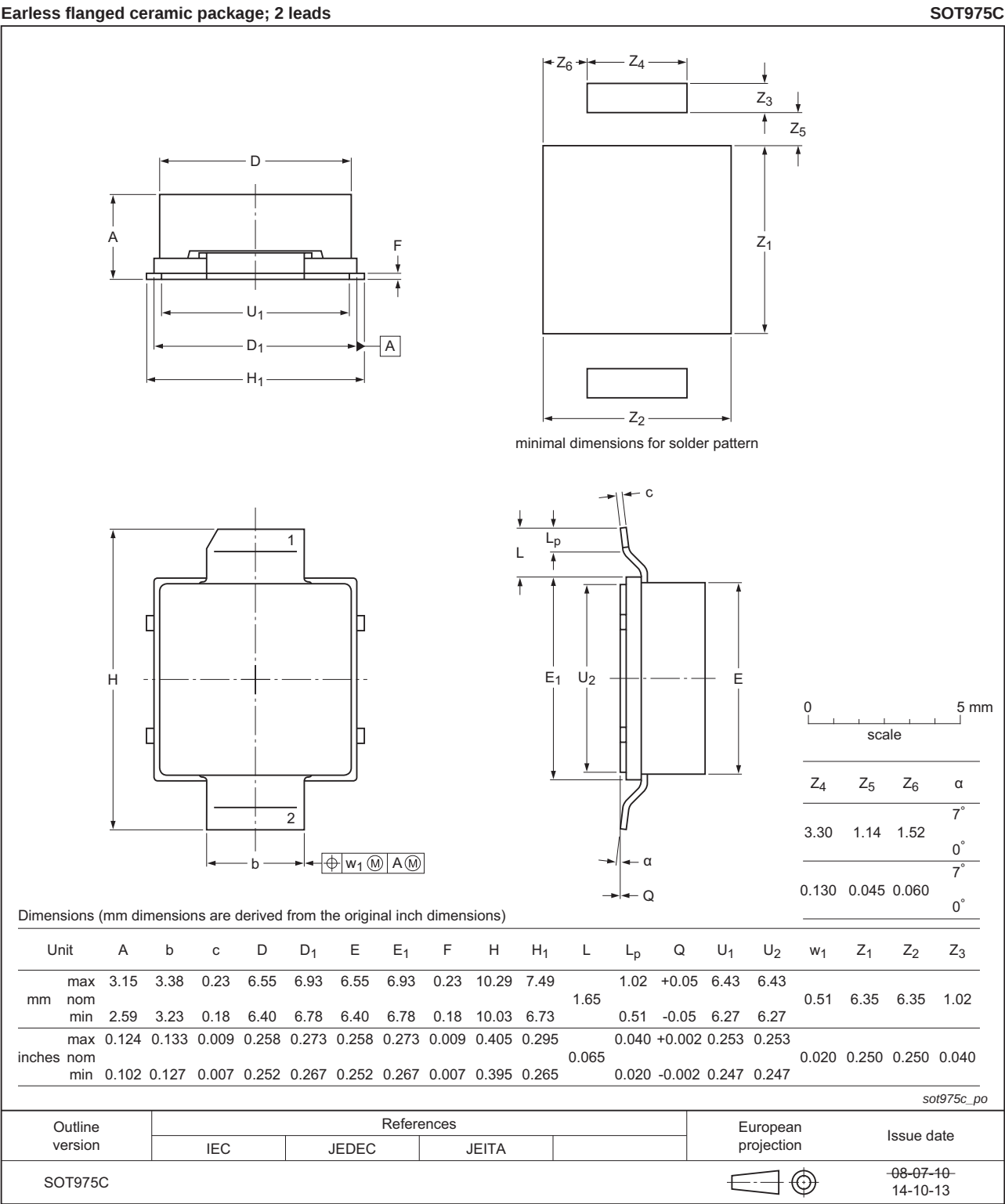


Fig 13. Package outline SOT975C

10. Abbreviations

Table 11. Abbreviations

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
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
NA	North American
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
BLF6G38-10_BLF6G38-10G v.2	20150106	Product data sheet	-	BLF6G38-10_BLF6G38-10G v.1
Modifications	• Package outline drawings updated.			
BLF6G38-10_BLF6G38-10G v.1	20090203	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.

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

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14. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	2
2	Pinning information	2
3	Ordering information	2
4	Limiting values	3
5	Thermal characteristics	3
6	Characteristics	3
7	Application information	4
7.1	Ruggedness in class-AB operation	4
7.2	NXP WiMAX signal	4
7.2.1	WiMAX signal description	4
7.2.2	Graphs	5
7.3	Single carrier NA IS-95 broadband performance at 2 W average	6
7.3.1	Graphs	6
8	Test information	8
9	Package outline	11
10	Abbreviations	13
11	Revision history	13
12	Legal information	14
12.1	Data sheet status	14
12.2	Definitions	14
12.3	Disclaimers	14
12.4	Trademarks	15
13	Contact information	15
14	Contents	16

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