

# BLF6G38-10; BLF6G38-10G

WiMAX power LDMOS transistor

Rev. 01 — 3 February 2009

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 <sub>DS</sub> (V)	P <sub>L(AV)</sub> (W)	G <sub>p</sub> (dB)	$\eta_D$ (%)	ACPR <sub>885k</sub> (dBc)	ACPR <sub>1980k</sub> (dBc)
1-carrier N-CDMA <sup>[1]</sup>	3400 to 3600	28	2	14	20	-49 <sup>[2]</sup>	-64 <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 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

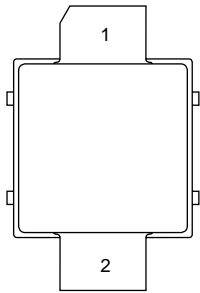
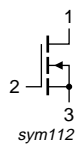
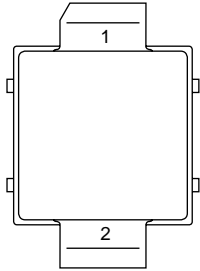
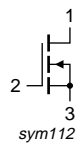
- Typical 1-carrier N-CDMA performance (Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an I<sub>Dq</sub> of 130 mA:
- Qualified up to a maximum V<sub>DS</sub> 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
<b>BLF6G38-10 (SOT975B)</b>			
1	drain		
2	gate		
3	source		
<b>BLF6G38-10G (SOT975C)</b>			
1	drain		
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
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	$\mu\text{A}$
$I_{DSX}$	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	m $\Omega$
$C_{rs}$	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
$\eta_D$	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

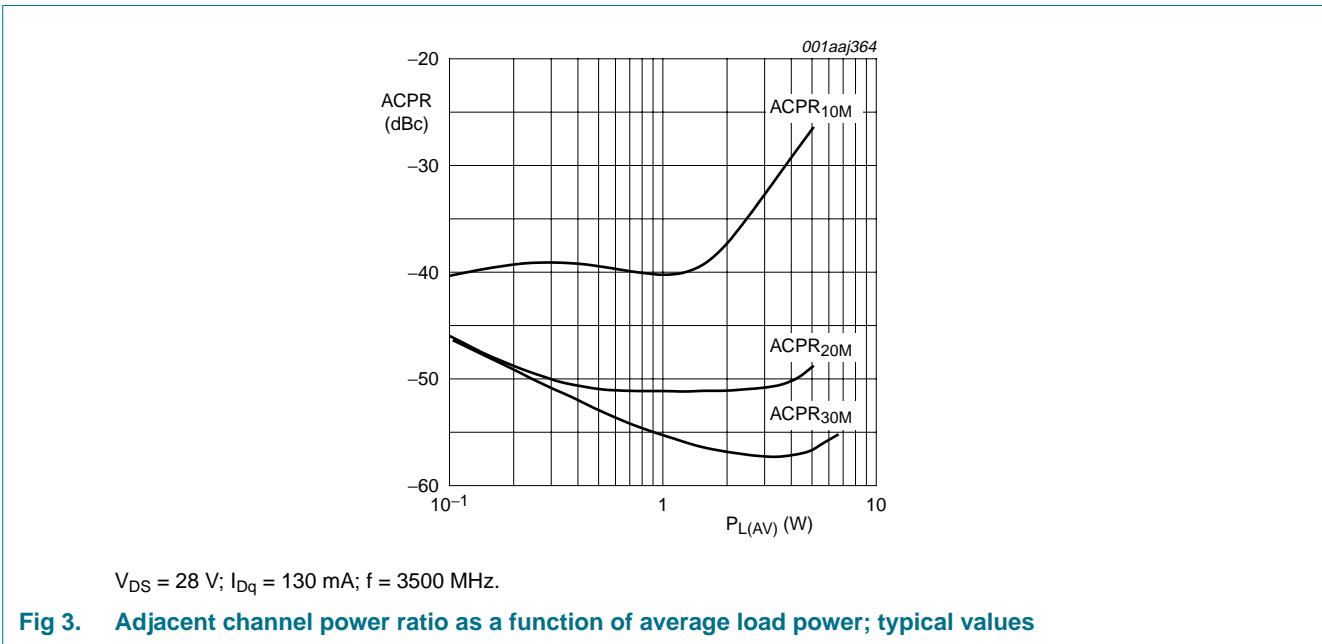
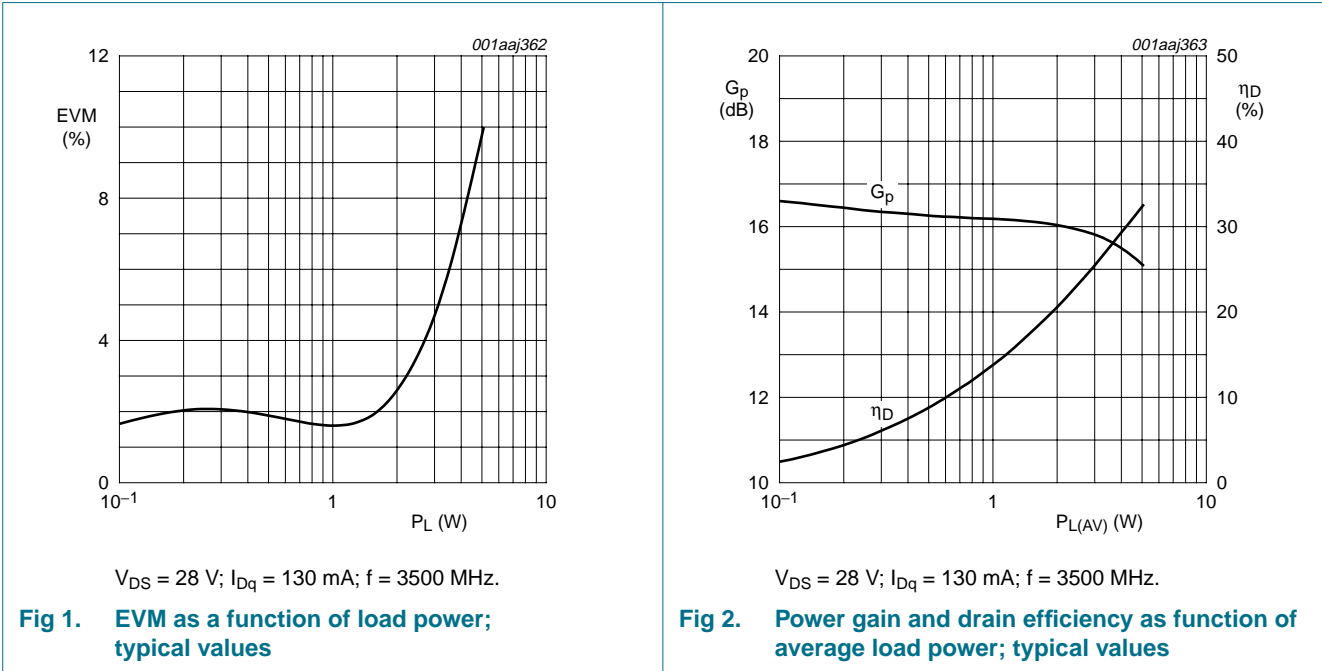
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;  
 frequency band = WCS; sampling rate = 11.2 MHz;  $n = 8 / 7$ ;  $G = T_g / T_b = 1 / 8$ ;  
 FFT = 1024; zone type = PUSC;  $\delta = 97.7$  %; number of symbols = 46;  
 number of subchannels = 30; PAR = 9.5 dB.

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

**Table 8. Frame structure**

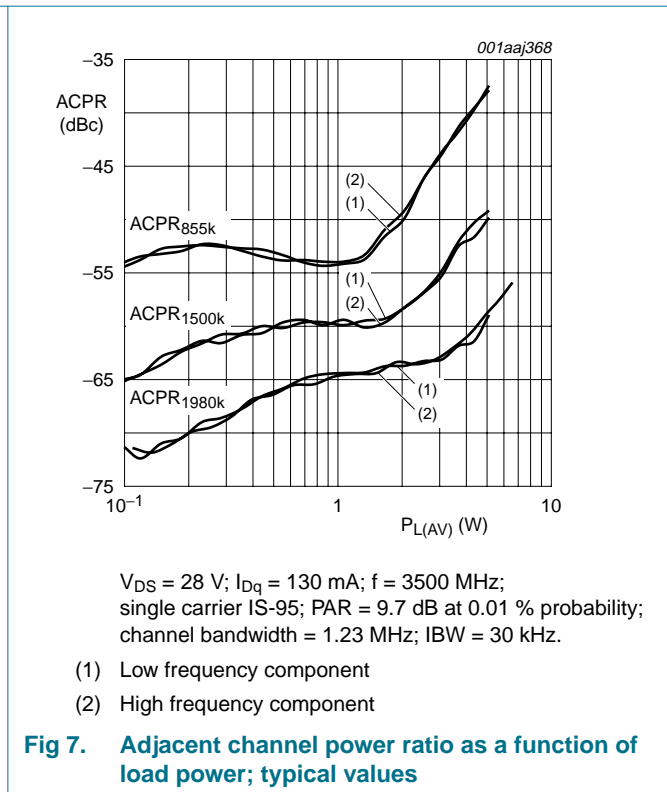
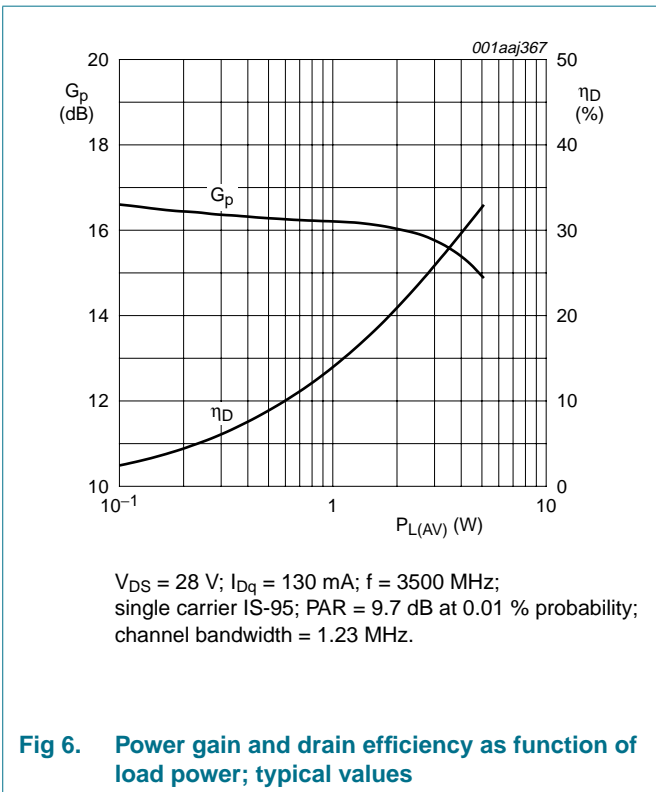
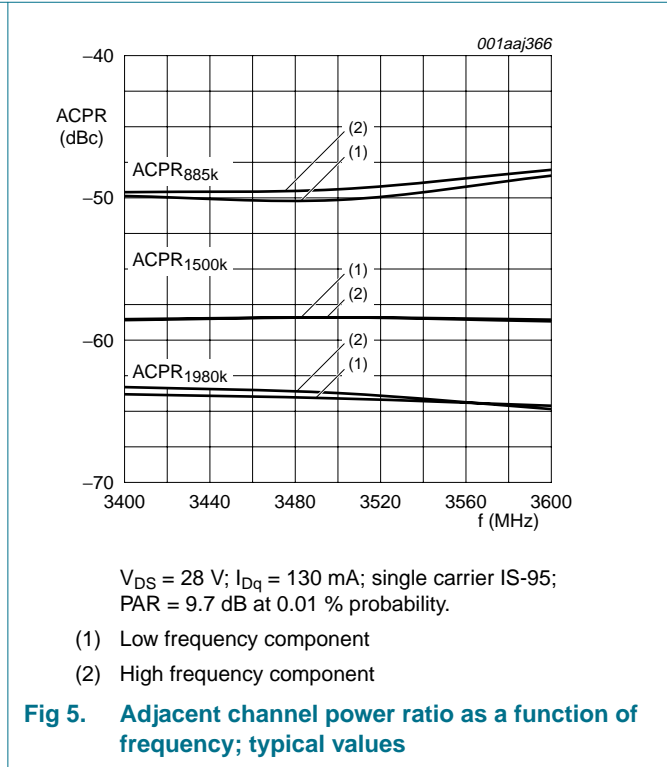
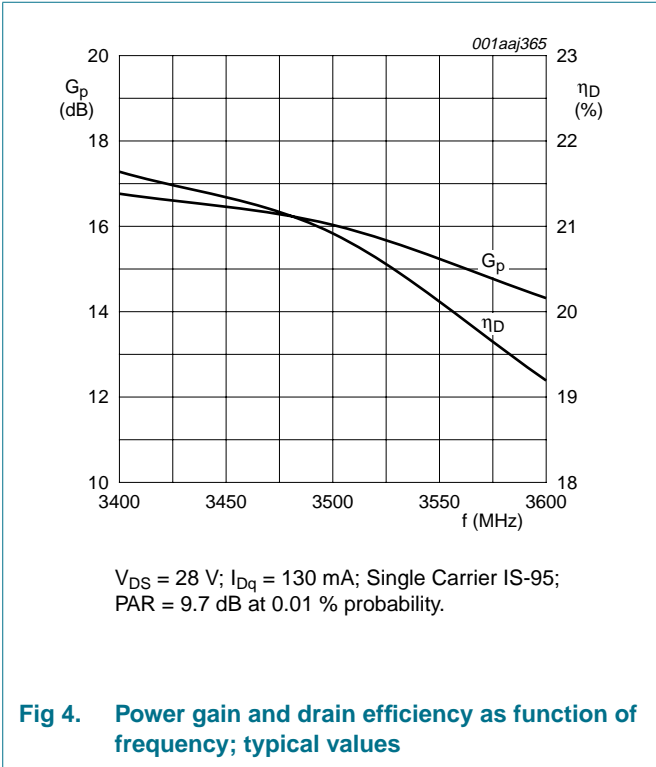
Frame contents	Modulation technique	Data length
Zone 0 FCH 2 symbols $\times$ 4 subchannels	QPSK1/2	3 bit
Zone 0 data 2 symbols $\times$ 26 subchannels	64QAM3/4	692 bit
Zone 0 data 44 symbols $\times$ 30 subchannels	64QAM3/4	10000 bit

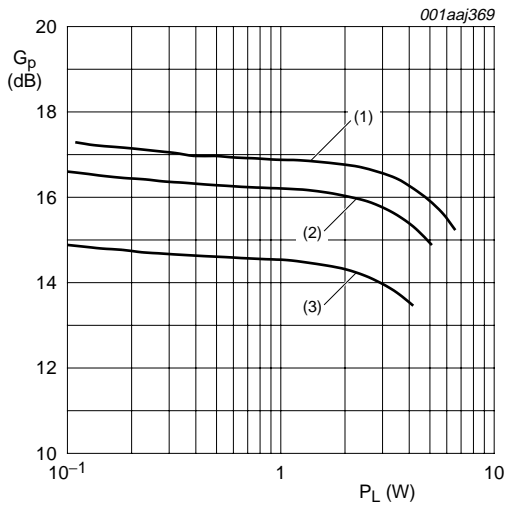
7.2.2 Graphs



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

7.3.1 Graphs

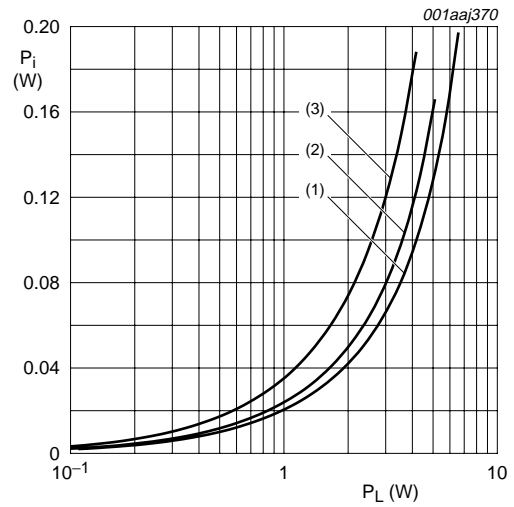




$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 130\text{ mA}$ ; single carrier IS-95;  
 PAR = 9.7 dB at 0.01 % probability;  
 channel bandwidth = 1.23 MHz.

- (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**

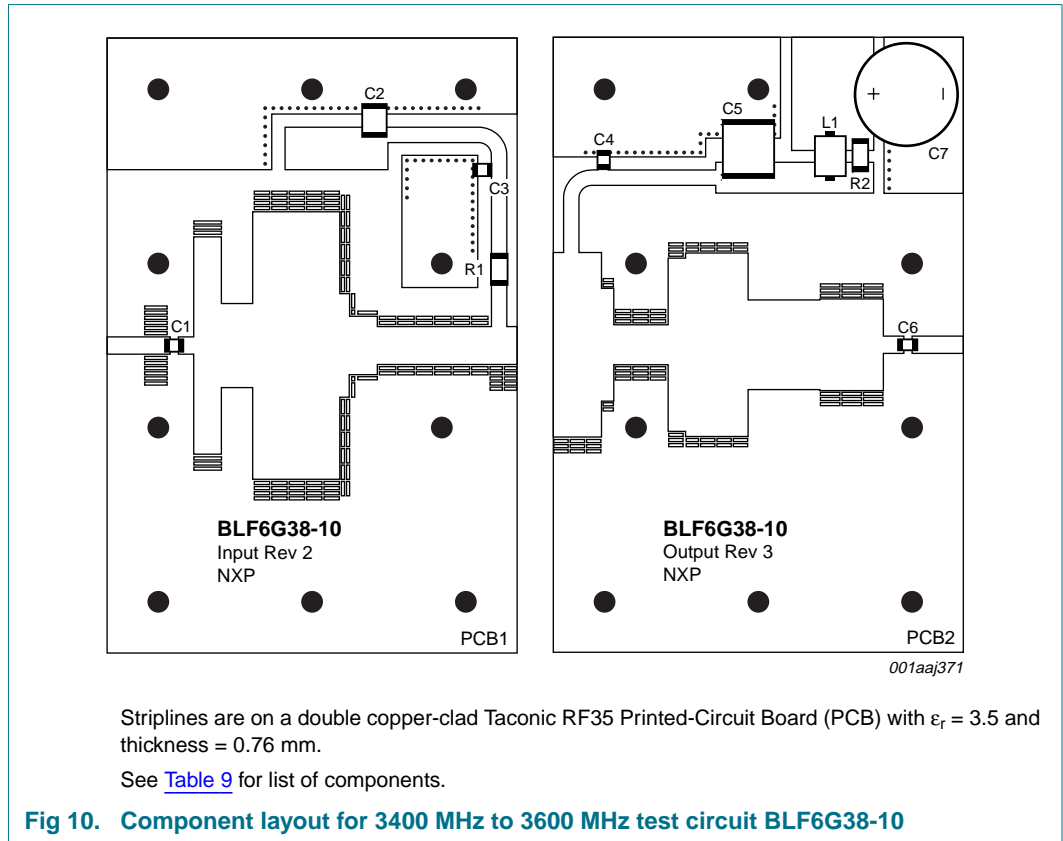


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 130\text{ mA}$ ; single carrier IS-95;  
 PAR = 9.7 dB at 0.01 % probability;  
 channel bandwidth = 1.23 MHz.

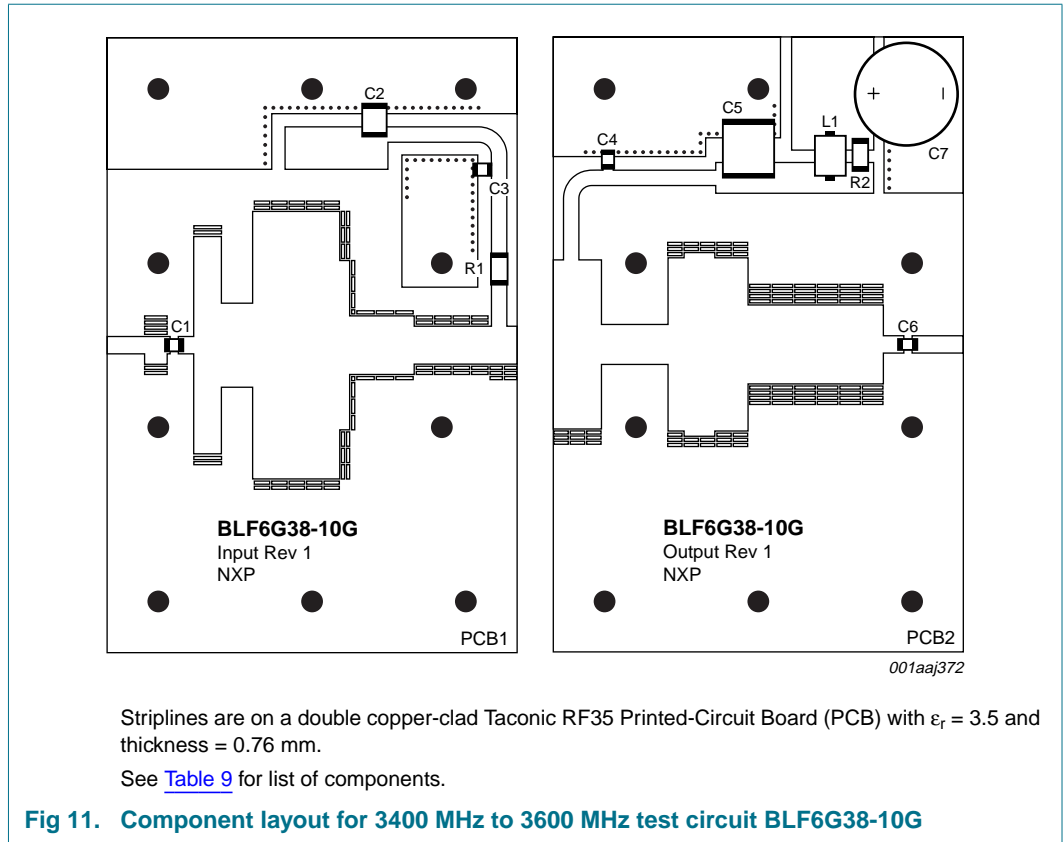
- (1)  $f = 3400\text{ MHz}$
- (2)  $f = 3500\text{ MHz}$
- (3)  $f = 3600\text{ MHz}$

**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 $\mu$ F	TDK
C4	multilayer ceramic chip capacitor	6.8 $\mu$ F	ATC 100A
C5	multilayer ceramic chip capacitor	10 $\mu$ F; 50 V	TDK
C7	electrolytic capacitor	220 $\mu$ F; 63 V	Elco
L1	ferrite SMD bead	-	Ferroxcube bead
R1, R2	SMD resistor	8.2 $\Omega$	Thin film

Table 10. Measured test circuit impedances

f (GHz)	Z <sub>i</sub> (Ω)	Z <sub>o</sub> (Ω)
<b>BLF6G38-10</b>		
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
<b>BLF6G38-10G</b>		
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

Earless flanged ceramic package; 2 leads

SOT975B

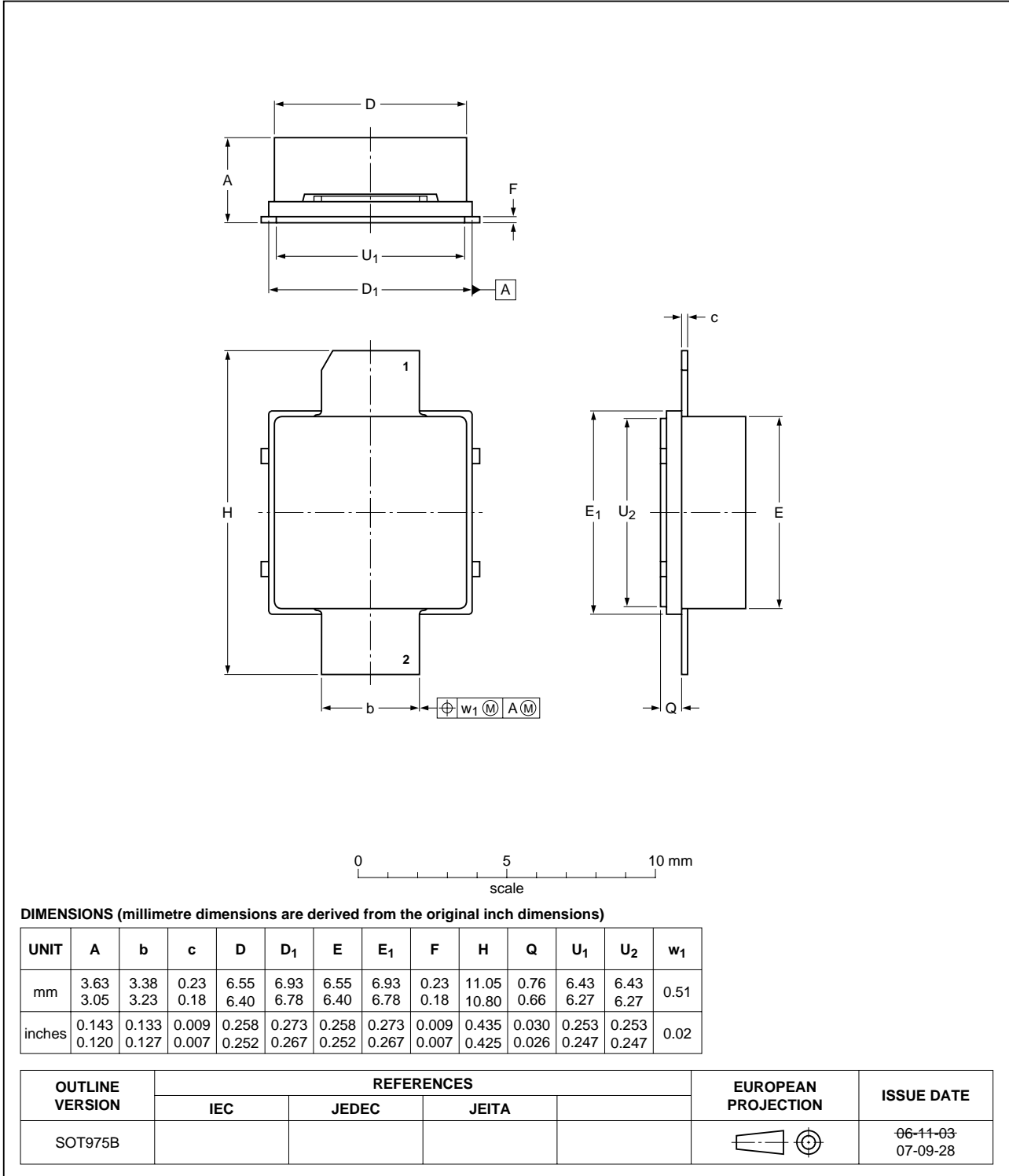


Fig 12. Package outline SOT975B

Earless flanged ceramic package; 2 leads

SOT975C

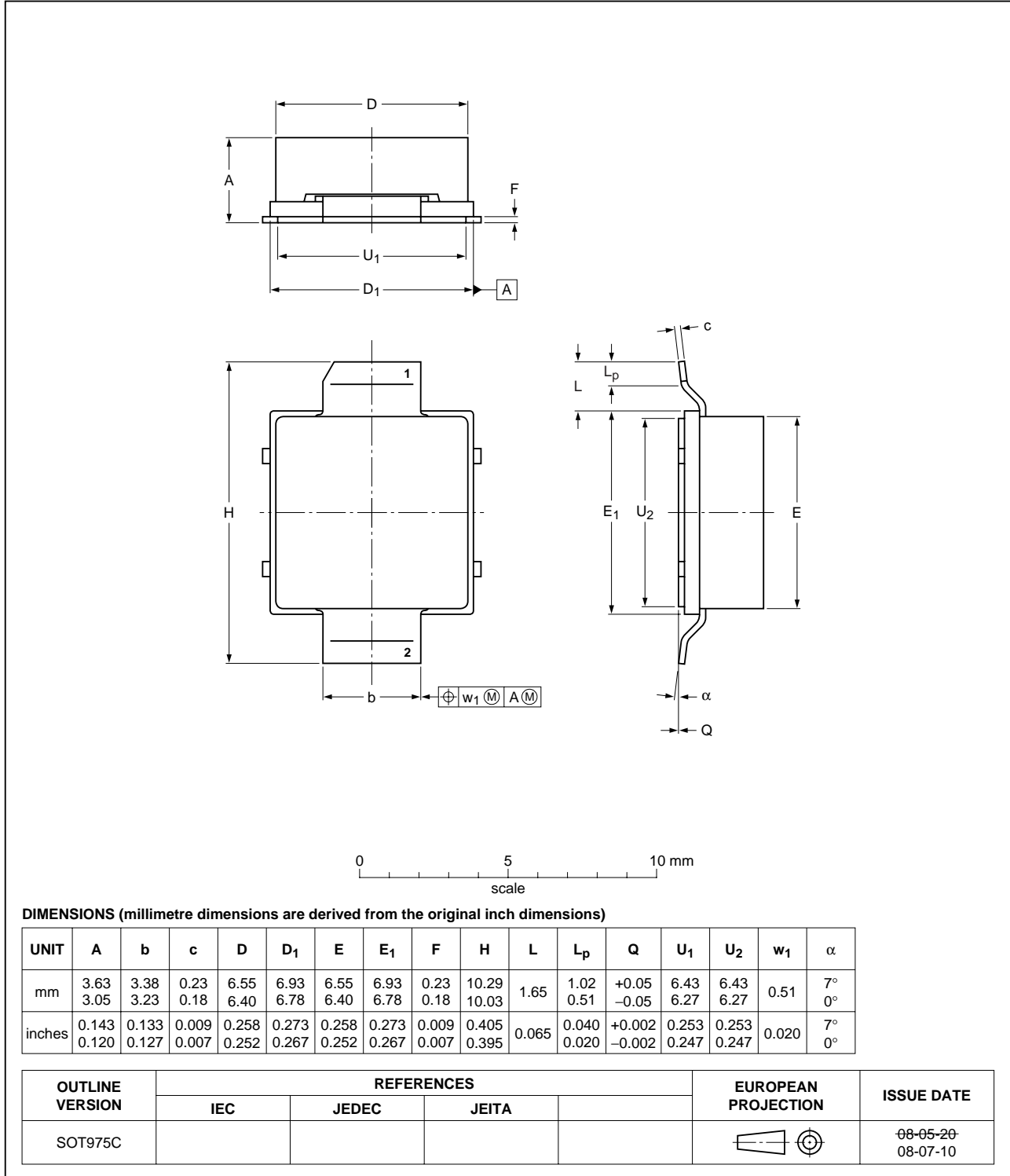


Fig 13. Package outline SOT975C

## 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_1	20090203	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.
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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