

# BLF6G27-45; BLF6G27S-45

WiMAX power LDMOS transistor

Rev. 02 — 7 February 2008

Preliminary data sheet

## 1. Product profile

### 1.1 General description

45 W LDMOS power transistor for base station applications at frequencies from 2500 MHz to 2700 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>	2500 to 2700	28	7	18	24	-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

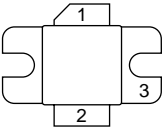
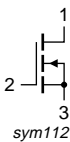
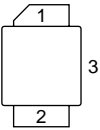
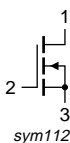
- Typical 1-carrier N-CDMA performance (single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an I<sub>Dq</sub> of 350 mA:
- Qualified up to a maximum V<sub>DS</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 2500 MHz to 2700 MHz frequency range

**2. Pinning information**

**Table 2. Pinning**

Pin	Description	Simplified outline	Symbol
<b>BLF6G27-45 (SOT608A)</b>			
1	drain		 sym112
2	gate		
3	source		
<b>BLF6G27S-45 (SOT608B)</b>			
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

**3. Ordering information**

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF6G27-45	-	flanged ceramic package; 2 mounting holes; 2 leads	SOT608A
BLF6G27S-45	-	ceramic earless flanged package; 2 leads	SOT608B

**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		-	20	A
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	225	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Type	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C};$	BLF6G27-45	1.7	K/W
		$P_L = 34\text{ W (CW)}$	BLF6G27S-45	1.7	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	$V_{GS} = 0\text{ V}; I_D = 0.5\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 60\text{ mA}$	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$	8.8	10.4	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 2.5\text{ A}$	-	4.3	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 2.1\text{ A}$	-	0.24	0.385	$\Omega$
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$	-	1.1	-	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 = 1.23 MHz;  $f = 2700\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 350\text{ mA}; T_{case} = 25\text{ °C}$ ; unless otherwise specified; in a class-AB production circuit.

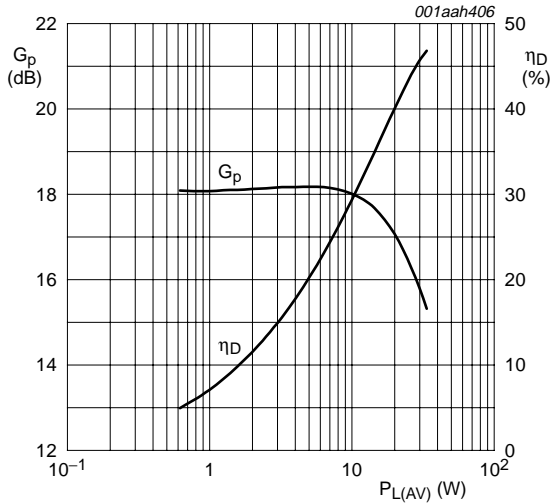
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	7	-	W
$G_p$	power gain	$P_{L(AV)} = 7\text{ W}$	16.5	18	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 7\text{ W}$	-	-10	-5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 7\text{ W}$	22	24	-	%
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)} = 7\text{ W}$ [1]	-	-49	-46	dBc
$ACPR_{1980k}$	adjacent channel power ratio (1980 kHz)	$P_{L(AV)} = 7\text{ W}$ [1]	-	-64	-61	dBc

[1] Measured within 30 kHz bandwidth.

### 7.1 Ruggedness in class-AB operation

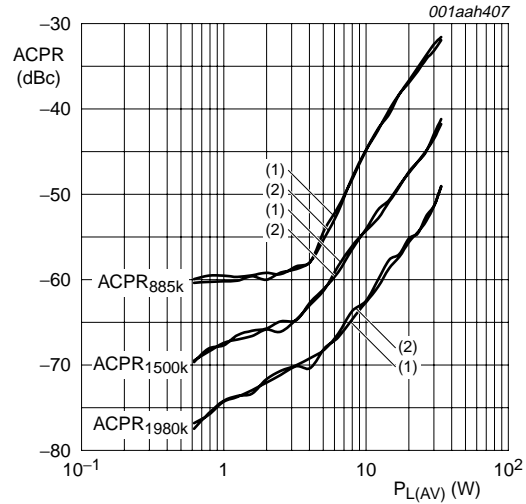
The BLF6G27-45 and BLF6G27S-45 are capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 350\text{ mA}; P_L = 45\text{ W (CW)}; f = 2600\text{ MHz}$ .

7.2 Single carrier N-CDMA performance



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 350\text{ mA}$ ;  $f = 2600\text{ MHz}$ ;  
 single carrier N-CDMA; PAR = 9.7 dB at 0.01 %  
 probability; channel bandwidth = 1.23 MHz;  
 instantaneous bandwidth = 30 kHz.

Fig 1. Power gain and drain efficiency as functions of average load power; typical values

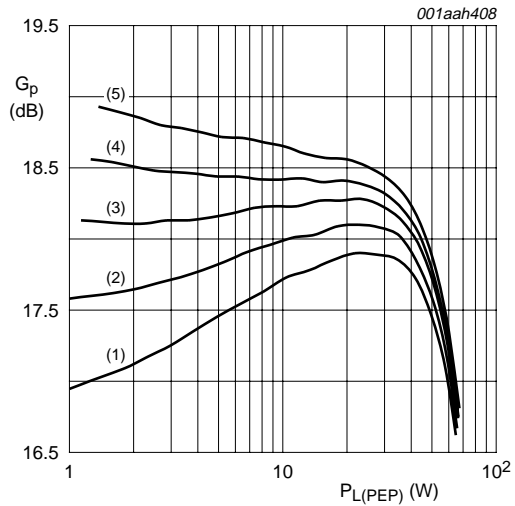


$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 350\text{ mA}$ ;  $f = 2600\text{ MHz}$ ;  
 single carrier N-CDMA; PAR = 9.7 dB at 0.01 %  
 probability; channel bandwidth = 1.23 MHz;  
 instantaneous bandwidth = 30 kHz.

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

Fig 2. Adjacent channel power ratio as function of average load power; typical values

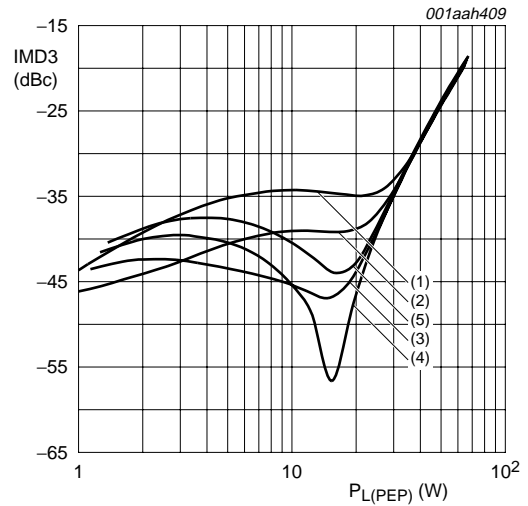
7.3 Two-tone



$V_{DS} = 28\text{ V}$ ;  $f_1 = 2598.75\text{ MHz}$ ;  $f_2 = 2601.25\text{ MHz}$ ;  
2.5 MHz tone spacing.

- (1)  $I_{Dq} = 250\text{ mA}$
- (2)  $I_{Dq} = 300\text{ mA}$
- (3)  $I_{Dq} = 350\text{ mA}$
- (4)  $I_{Dq} = 400\text{ mA}$
- (5)  $I_{Dq} = 500\text{ mA}$

Fig 3. Power gain as function of peak envelope load power; typical values

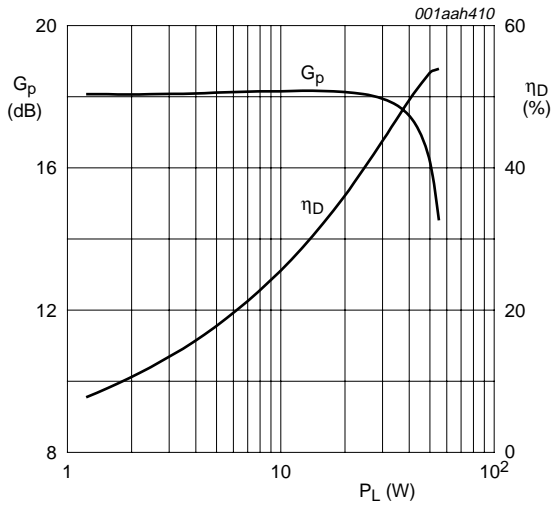


$V_{DS} = 28\text{ V}$ ;  $f_1 = 2598.75\text{ MHz}$ ;  $f_2 = 2601.25\text{ MHz}$ ;  
2.5 MHz tone spacing.

- (1)  $I_{Dq} = 250\text{ mA}$
- (2)  $I_{Dq} = 300\text{ mA}$
- (3)  $I_{Dq} = 350\text{ mA}$
- (4)  $I_{Dq} = 400\text{ mA}$
- (5)  $I_{Dq} = 500\text{ mA}$

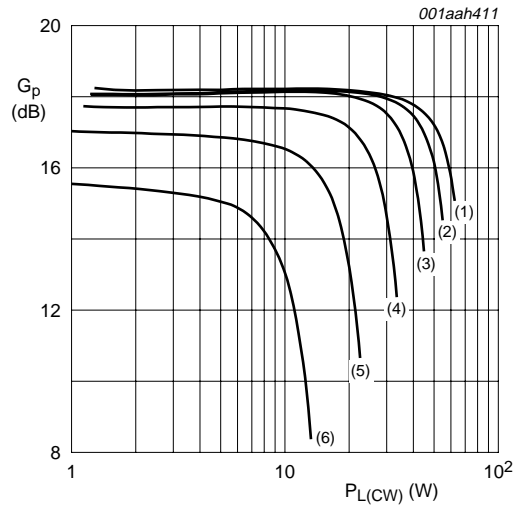
Fig 4. Third order intermodulation distortion as function of peak envelope load power; typical values

**7.4 Continuous wave**



$I_{Dq} = 350 \text{ mA}$ ;  $f = 2600 \text{ MHz}$ ;  $T_{case} = 25 \text{ }^\circ\text{C}$ ;  
 $V_{DS} = 28 \text{ V}$ .

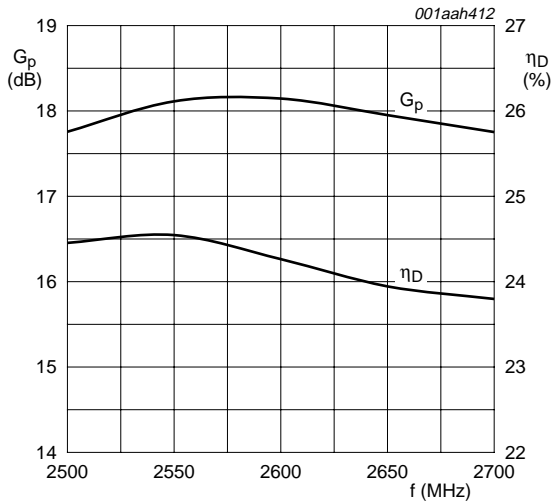
**Fig 5. Power gain and drain efficiency as functions of CW load power; typical values**



$I_{Dq} = 350 \text{ mA}$ ;  $f = 2600 \text{ MHz}$ ;  $T_{case} = 25 \text{ }^\circ\text{C}$ .

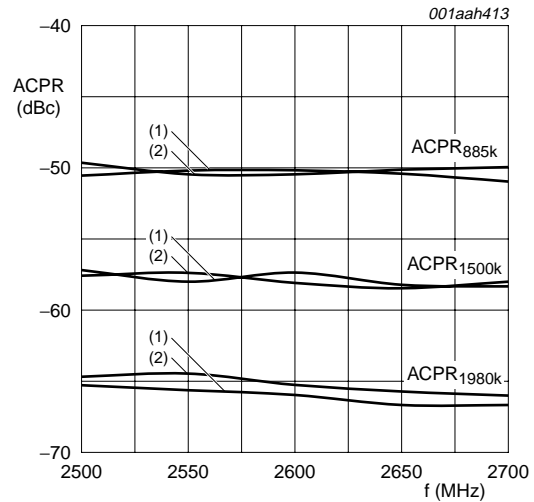
**Fig 6. Power gain as function of CW load power; typical values**

**7.5 Single carrier N-CDMA broadband performance at 7 W average**



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

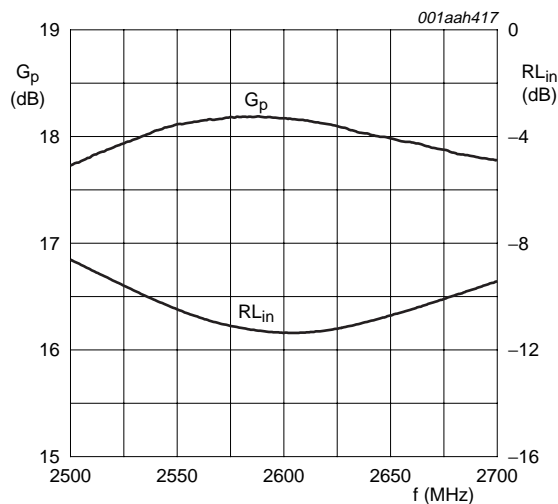
**Fig 7. Power gain and drain efficiency as functions of frequency; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

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

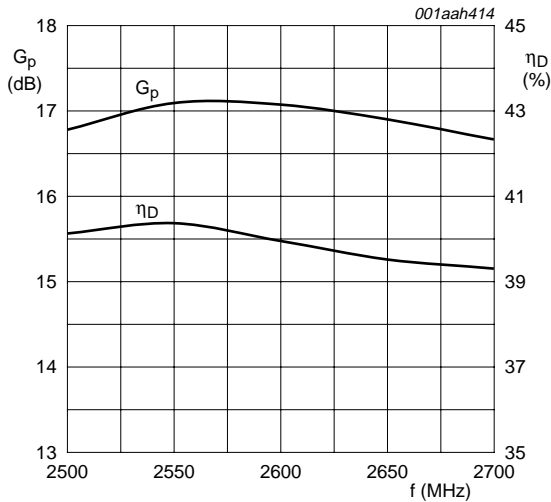
**Fig 8. Adjacent channel power ratio as function of frequency; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

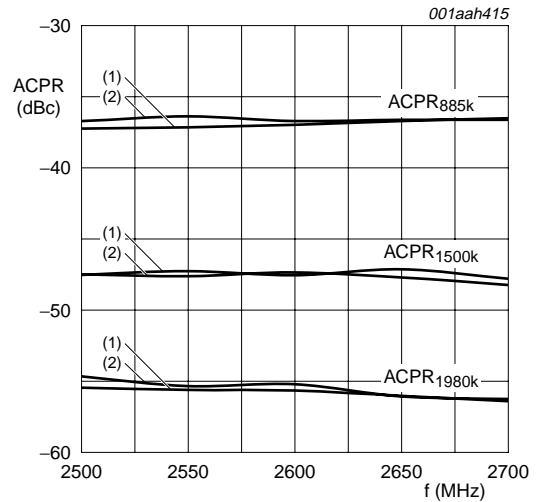
**Fig 9. Power gain and input return loss as functions of frequency**

7.6 Single carrier N-CDMA broadband performance at 20 W average



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 350\text{ mA}$ ; single carrier N-CDMA;  
 PAR = 9.7 dB at 0.01 % probability;  
 instantaneous bandwidth = 30 kHz.

Fig 10. Power gain and drain efficiency as functions of frequency; typical values



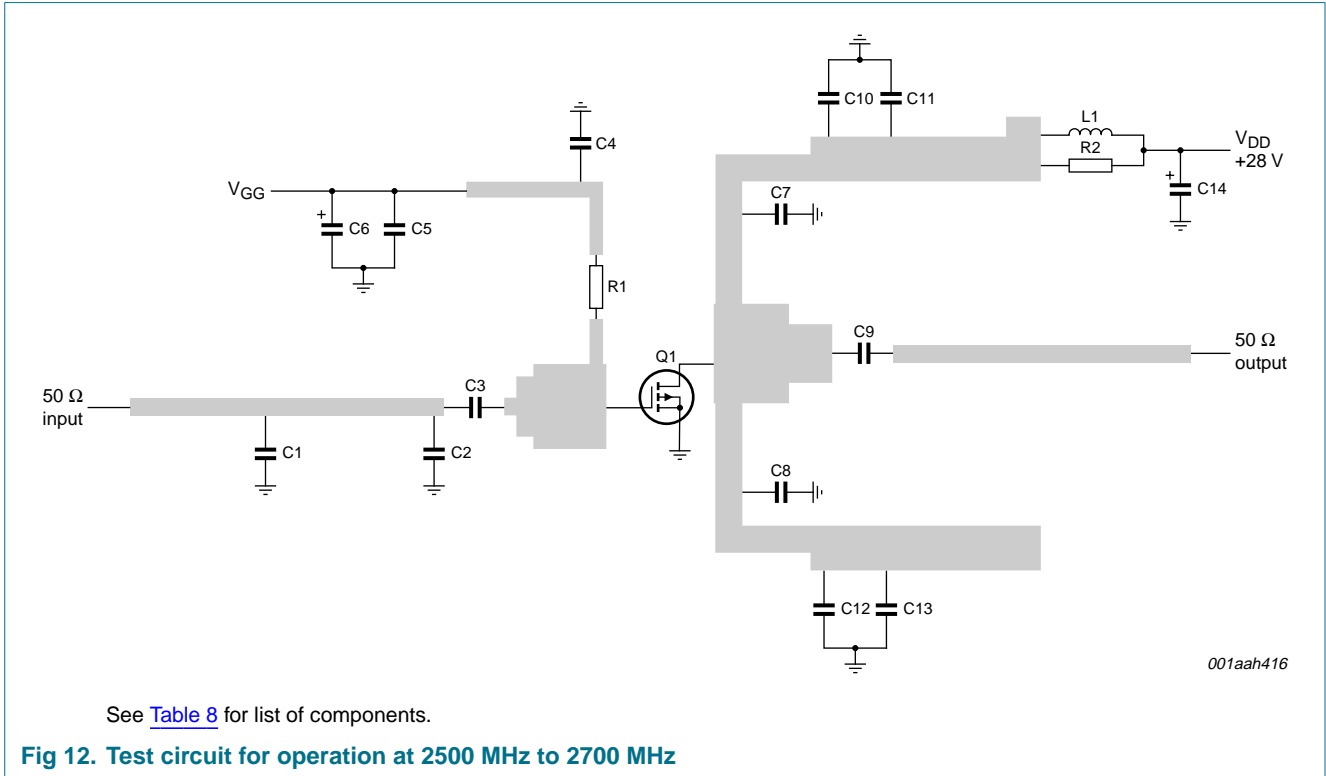
$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 350\text{ mA}$ ; single carrier N-CDMA;  
 PAR = 9.7 dB at 0.01 % probability;  
 instantaneous bandwidth = 30 kHz.

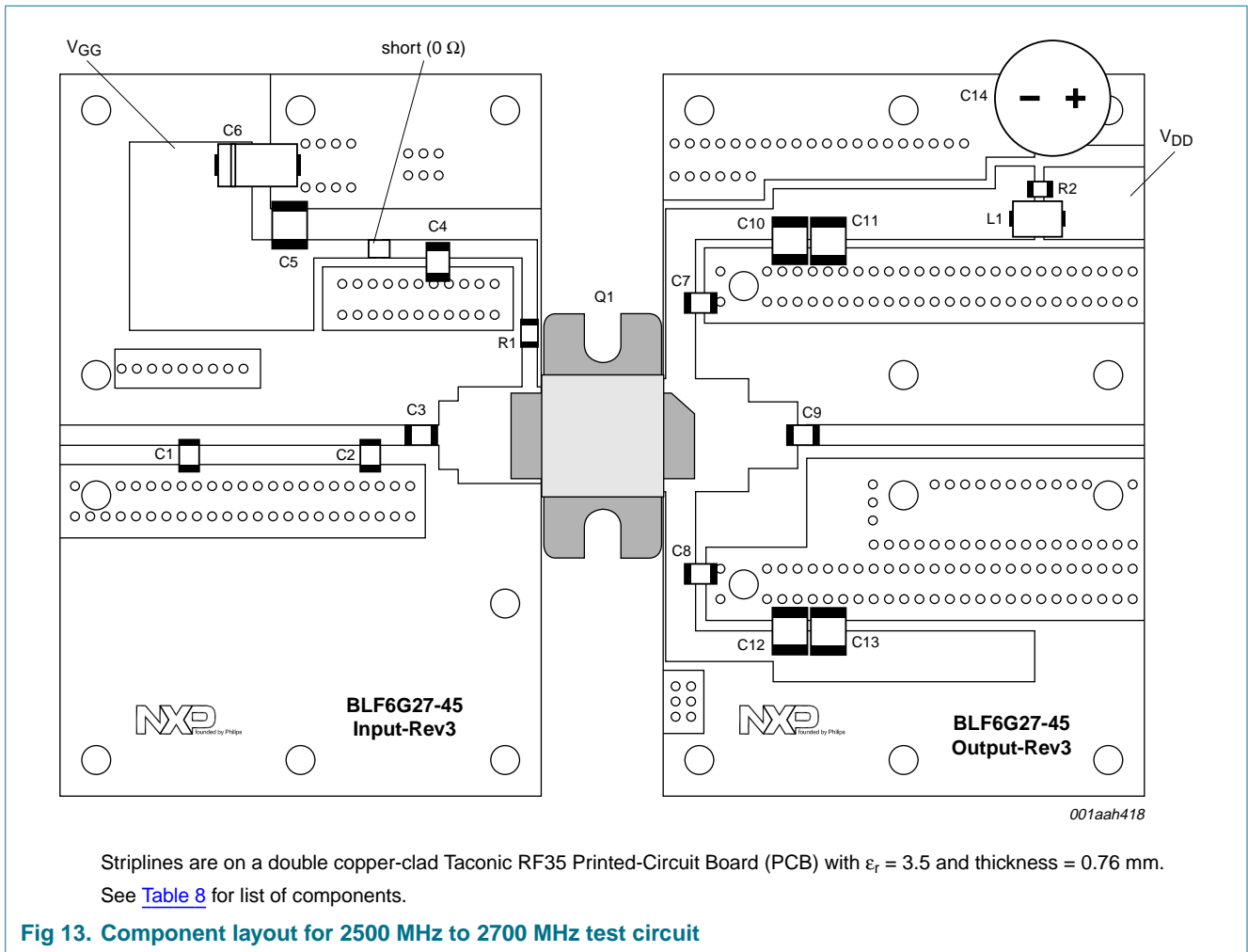
- (1) Low frequency component
- (2) High frequency component

Fig 11. Adjacent channel power ratio as function of frequency; typical values



**8. Test information**





**Table 8. List of components**

For test circuit, see [Figure 12](#) and [Figure 13](#).

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	0.3 pF	[1]
C2	multilayer ceramic chip capacitor	0.5 pF	[1]
C3, C4, C7, C8	multilayer ceramic chip capacitor	11 pF	[1]
C5, C10, C11, C12, C13	multilayer ceramic chip capacitor	4.7 $\mu$ F	C4532X7R1H475M
C6	tantalum capacitor	10 $\mu$ F; 35 V	Kemet (Farnell)
C9	multilayer ceramic chip capacitor	8.2 pF	
C14	electrolytic capacitor	470 $\mu$ F; 63 V	
L1	ferrite SMD bead	-	Ferroxcube BDS 3/3/4.6-4S2 or equivalent
R1	resistor	22 $\Omega$	package 0603
R2	resistor	12 $\Omega$	package 1206
Q1	BLF6G27-45 or BLF6G27S-45	-	

[1] American Technical Ceramics type 100B or capacitor of same quality.

9. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT608A

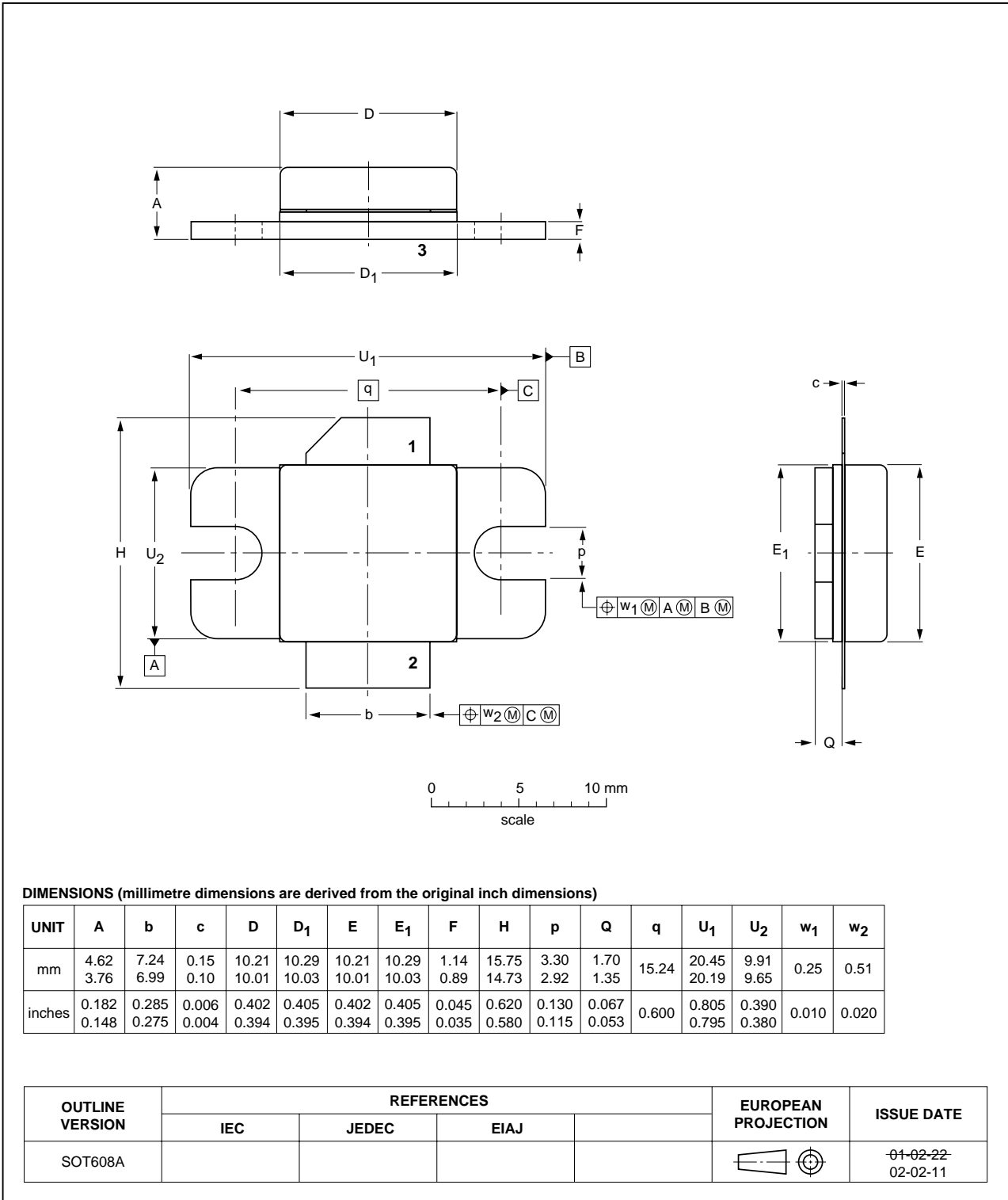
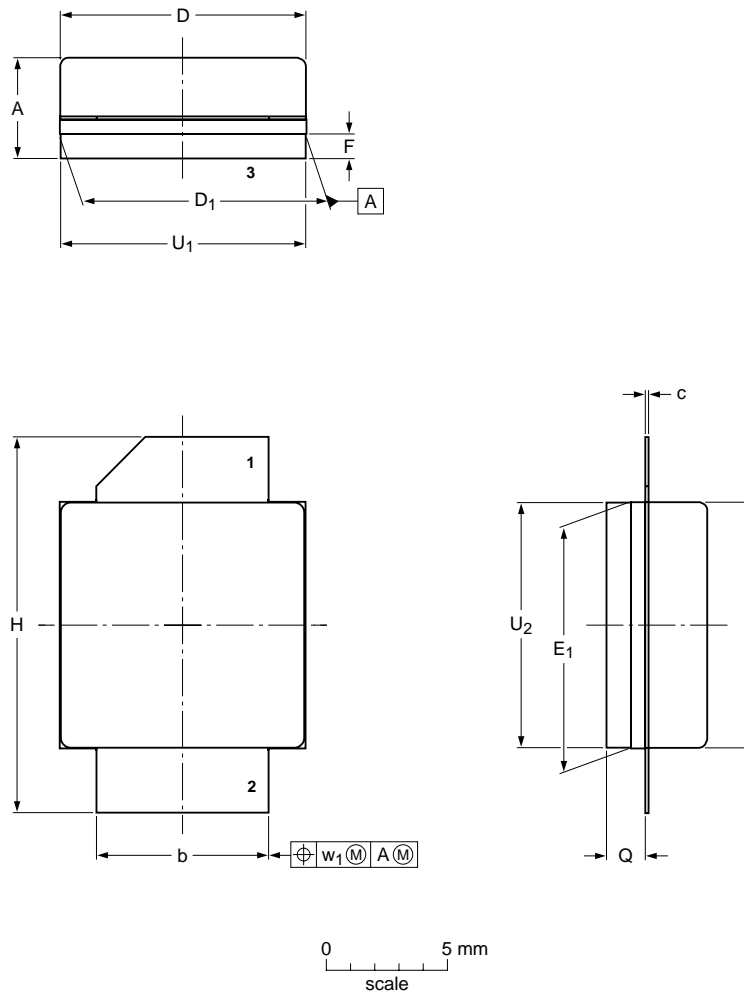


Fig 14. Package outline SOT608A

Ceramic earless flanged package; 2 leads

SOT608B



**DIMENSIONS** (mm dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D <sub>1</sub>	E	E <sub>1</sub>	F	H	Q	U <sub>1</sub>	U <sub>2</sub>	w <sub>1</sub>
mm	4.62 3.76	7.24 6.99	0.15 0.10	10.21 10.01	10.29 10.03	10.21 10.01	10.29 10.03	1.14 0.89	15.75 14.73	1.70 1.35	10.24 9.98	10.24 9.98	0.51
inch	0.182 0.148	0.285 0.275	0.006 0.004	0.402 0.394	0.405 0.395	0.402 0.394	0.405 0.395	0.045 0.035	0.620 0.580	0.067 0.053	0.403 0.393	0.403 0.393	0.020

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT608B					06-11-27 06-12-06

Fig 15. Package outline SOT608B

## 10. Abbreviations

**Table 9. Abbreviations**

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
N-CDMA	Narrowband Code Division Multiple Access
PAR	Peak-to-Average power Ratio
RF	Radio Frequency
VSWR	Voltage Standing-Wave Ratio
WiMAX	Worldwide Interoperability for Microwave Access

## 11. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G27-45_BLF6G27S-45_2	20080207	Preliminary data sheet	-	BLF6G27-45_BLF6G27S-45_1
Modifications:	•	Moved <a href="#">Figure 9 on page 7</a> from <a href="#">Section 8 on page 9</a> to <a href="#">Section 7.5 on page 7</a>		
BLF6G27-45_BLF6G27S-45_1	20080129	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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