

# BLF6G27-45; BLF6G27S-45

WiMAX power LDMOS transistor

Rev. 03 — 15 December 2008

Product 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

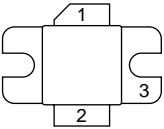
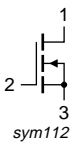
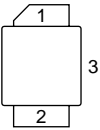
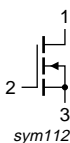
- Typical 1-carrier N-CDMA performance (single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an I<sub>Dq</sub> of 350 mA:
- Qualified up to a maximum V<sub>DS</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	Graphic 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		-	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	$T_{case} = 80\text{ °C};$ $P_L = 34\text{ W (CW)}$	BLF6G27-45	1.7	K/W
			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.

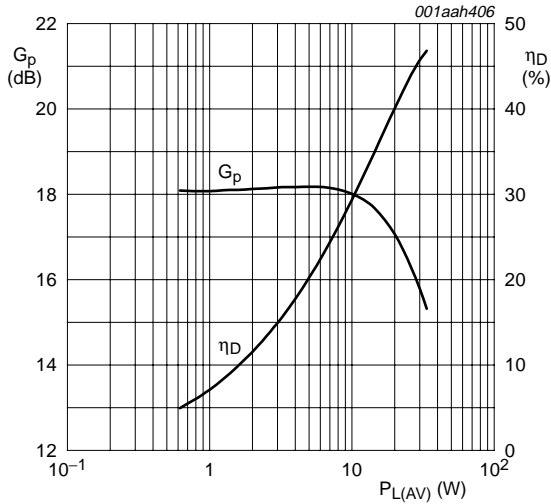
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	7	-	W
$G_p$	power gain	$P_{L(AV)} = 7\text{ W}$	16.5	18	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 7\text{ W}$	-	-10	-5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 7\text{ W}$	22	24	-	%
$ACPR_{885k}$	adjacent channel power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

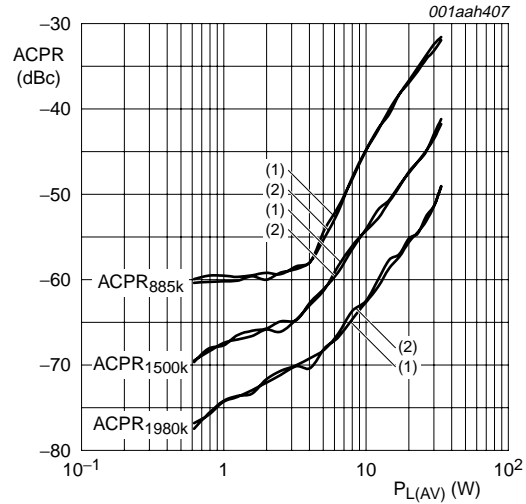
The BLF6G27-45 and BLF6G27S-45 are capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 350\text{ mA}; P_L = 45\text{ W (CW)}; f = 2600\text{ MHz}$ .

**7.2 Single carrier N-CDMA performance**



$V_{DS} = 28$  V;  $I_{DQ} = 350$  mA;  $f = 2600$  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**

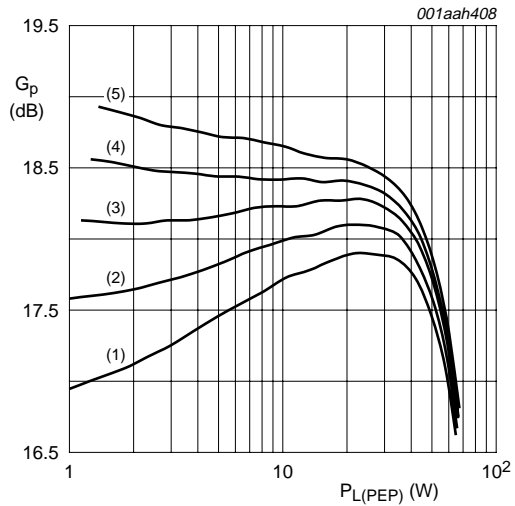


$V_{DS} = 28$  V;  $I_{DQ} = 350$  mA;  $f = 2600$  MHz; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; channel bandwidth = 1.23 MHz; instantaneous bandwidth = 30 kHz.

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

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

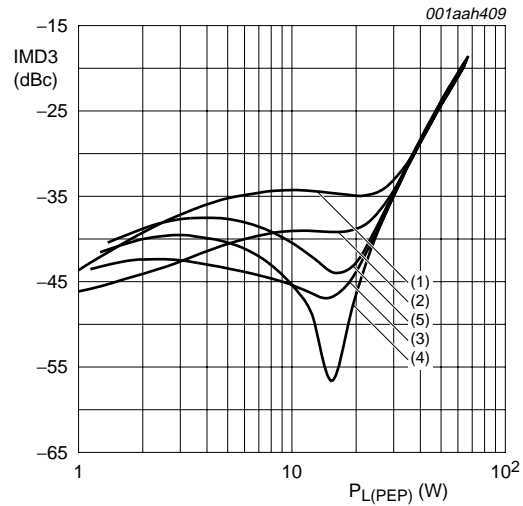
**7.3 Two-tone**



$V_{DS} = 28\text{ V}$ ;  $f_1 = 2598.75\text{ MHz}$ ;  $f_2 = 2601.25\text{ MHz}$ ;  
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**

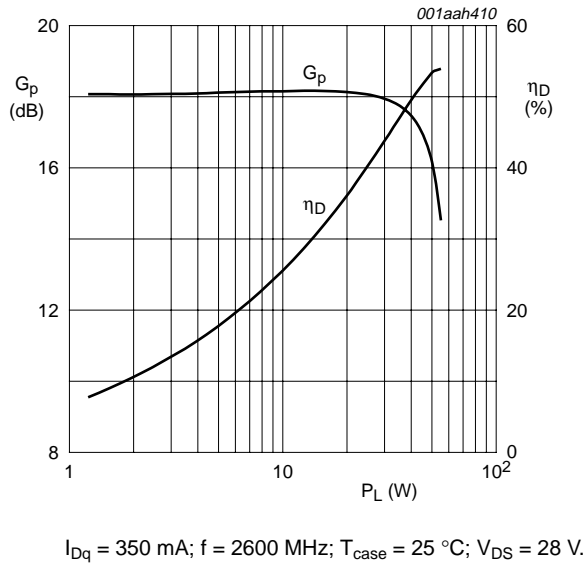


$V_{DS} = 28\text{ V}$ ;  $f_1 = 2598.75\text{ MHz}$ ;  $f_2 = 2601.25\text{ MHz}$ ;  
2.5 MHz tone spacing.

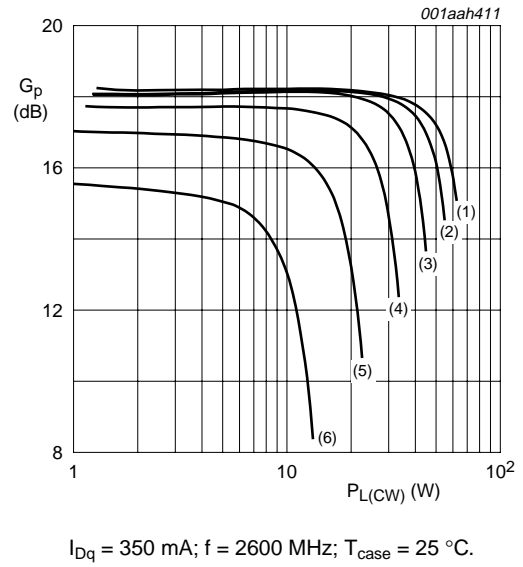
- (1)  $I_{Dq} = 250\text{ mA}$
- (2)  $I_{Dq} = 300\text{ mA}$
- (3)  $I_{Dq} = 350\text{ mA}$
- (4)  $I_{Dq} = 400\text{ mA}$
- (5)  $I_{Dq} = 500\text{ mA}$

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

**7.4 Continuous wave**



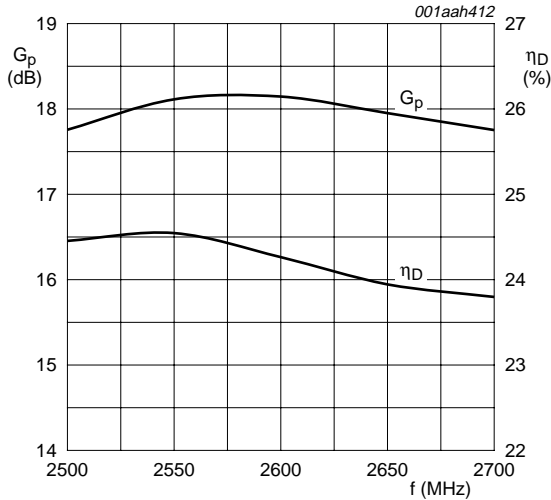
**Fig 5. Power gain and drain efficiency as functions of CW load power; typical values**



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

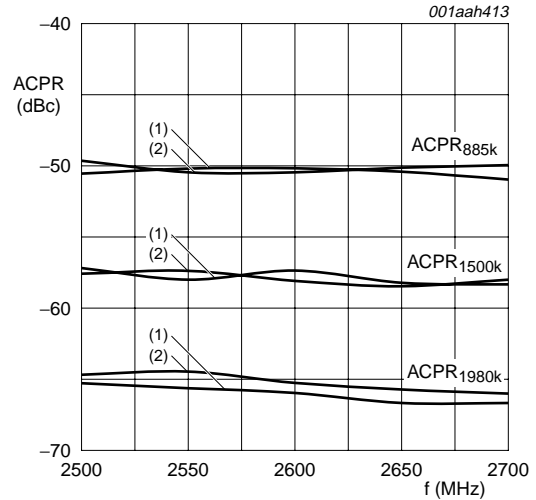
- (1)  $V_{DS} = 32 \text{ V}$
- (2)  $V_{DS} = 28 \text{ V}$
- (3)  $V_{DS} = 24 \text{ V}$
- (4)  $V_{DS} = 20 \text{ V}$
- (5)  $V_{DS} = 16 \text{ V}$
- (6)  $V_{DS} = 12 \text{ V}$

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.

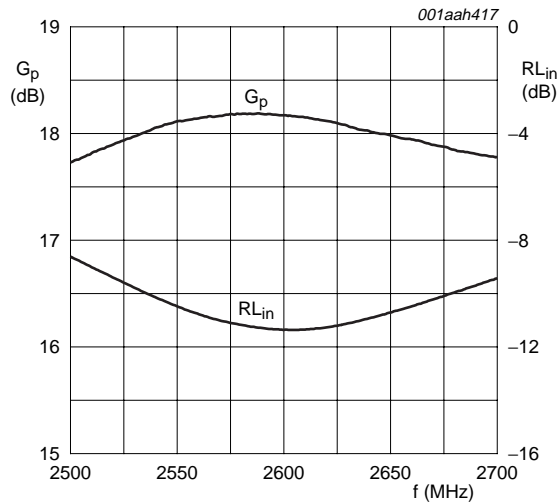
Fig 7. Power gain and drain efficiency as functions of frequency; typical values



$V_{DS} = 28$  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

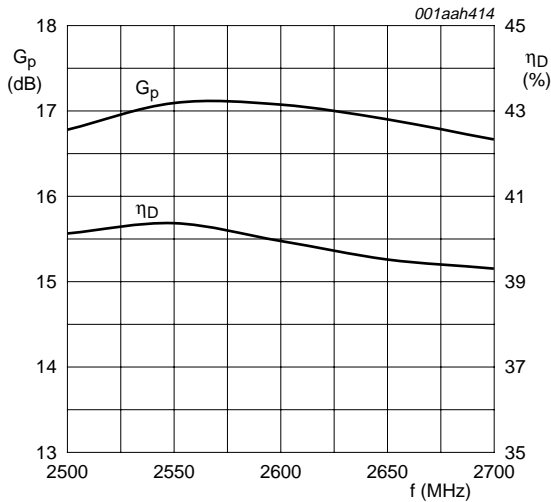
Fig 8. Adjacent channel power ratio as function of frequency; typical values



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

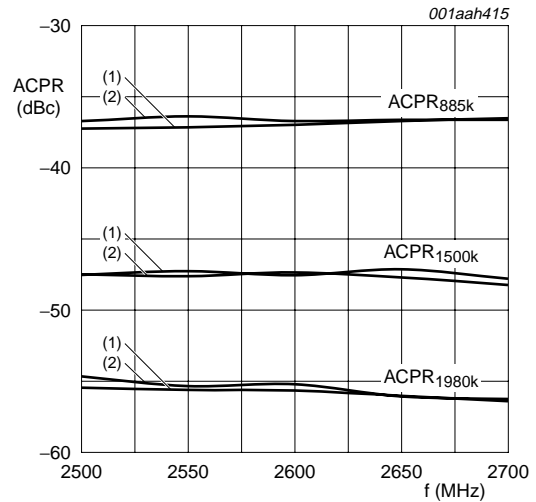
Fig 9. Power gain and input return loss as functions of frequency

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



V<sub>DS</sub> = 28 V; I<sub>Dq</sub> = 350 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**



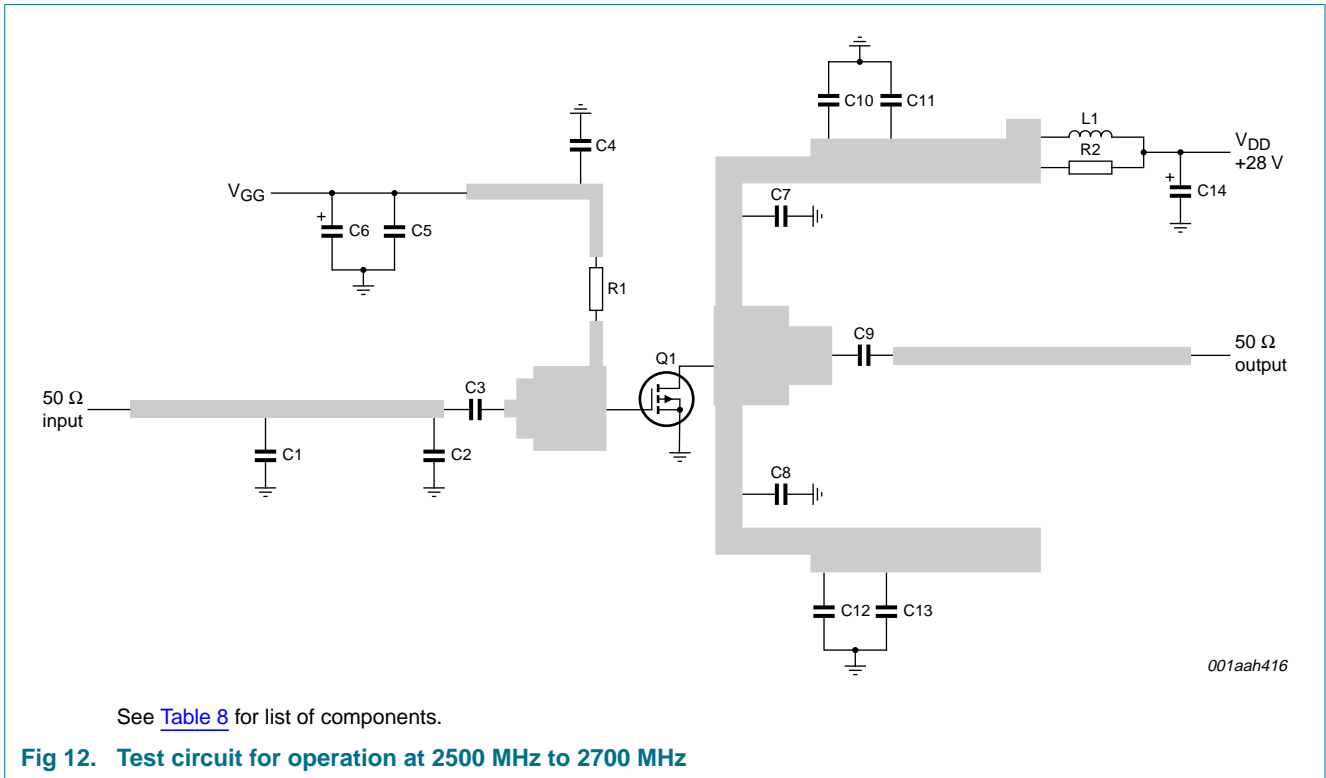
V<sub>DS</sub> = 28 V; I<sub>Dq</sub> = 350 mA; single carrier N-CDMA;  
 PAR = 9.7 dB at 0.01 % probability;  
 instantaneous bandwidth = 30 kHz.

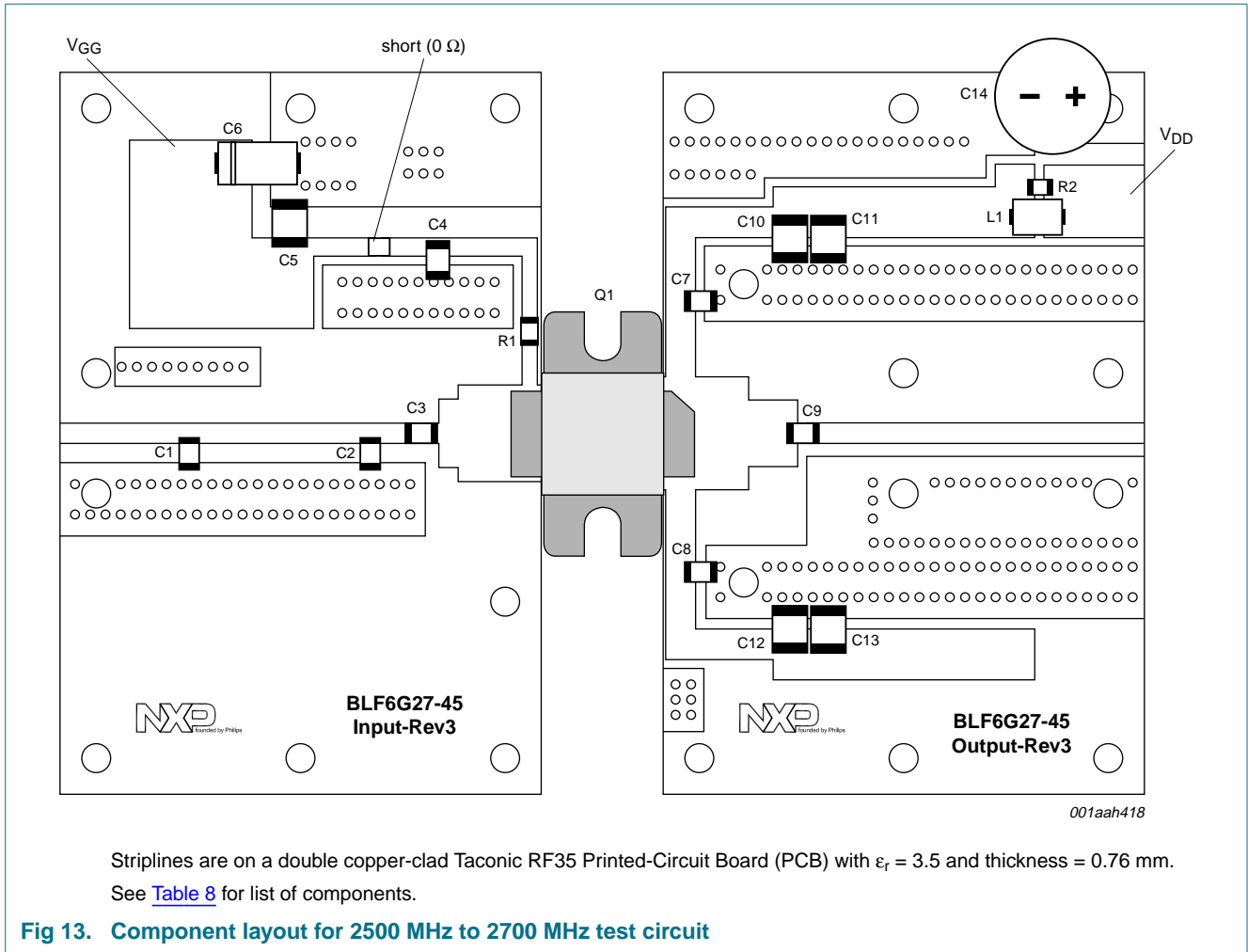
- (1) Low frequency component
- (2) High frequency component

**Fig 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.

**Table 9. Measured test circuit impedances**

<b>f (GHz)</b>	<b>Z<sub>i</sub> (Ω)</b>	<b>Z<sub>o</sub> (Ω)</b>
2.50	11.1 – j11.0	18.4 – j9.1
2.55	10.6 – j10.8	16.9 – j9.2
2.60	10.1 – j10.5	15.6 – j9.2
2.65	9.6 – j10.2	14.4 – j9.1
2.70	9.1 – j9.8	13.3 – j8.9

9. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT608A

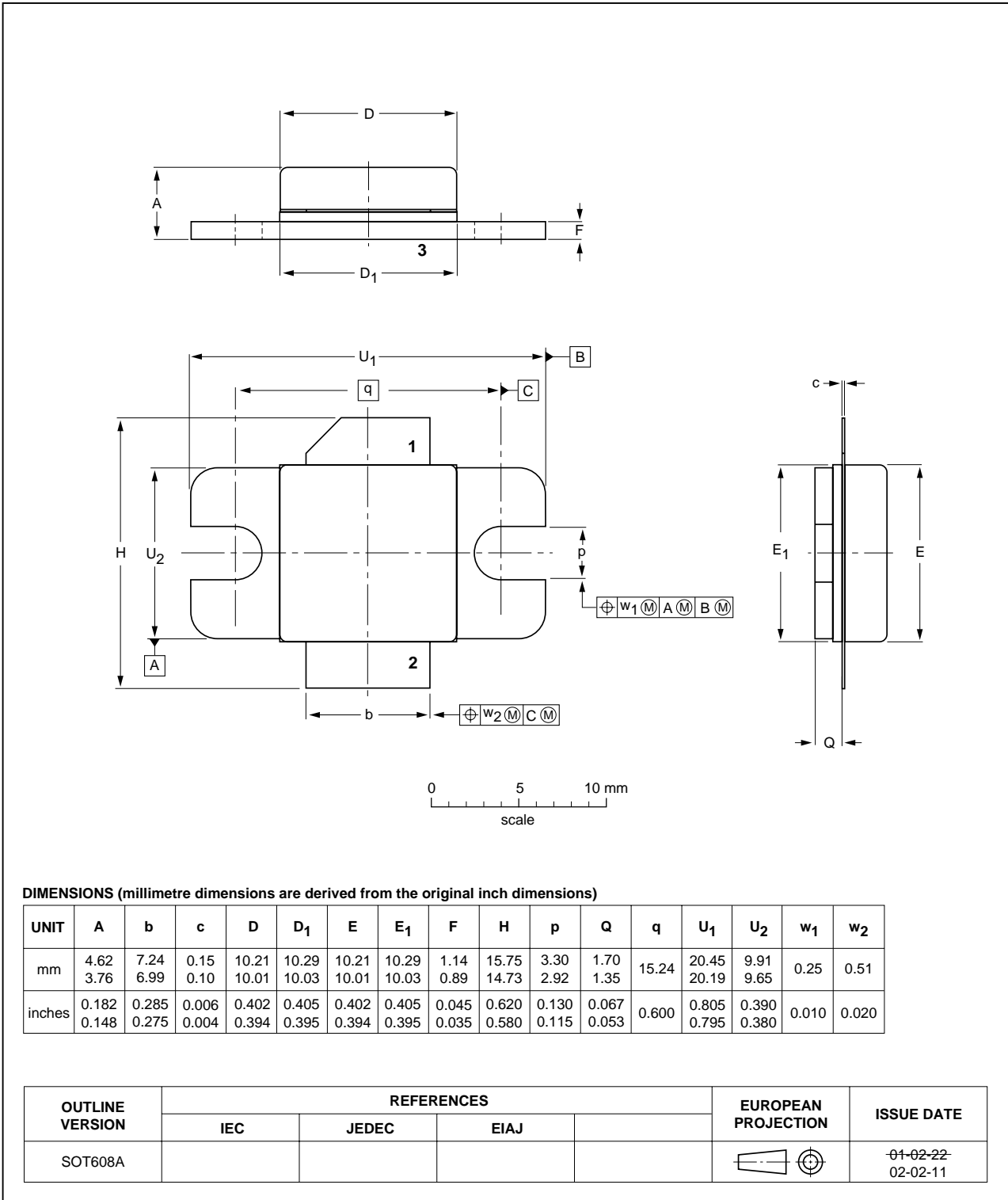


Fig 14. Package outline SOT608A

Ceramic earless flanged package; 2 leads

SOT608B

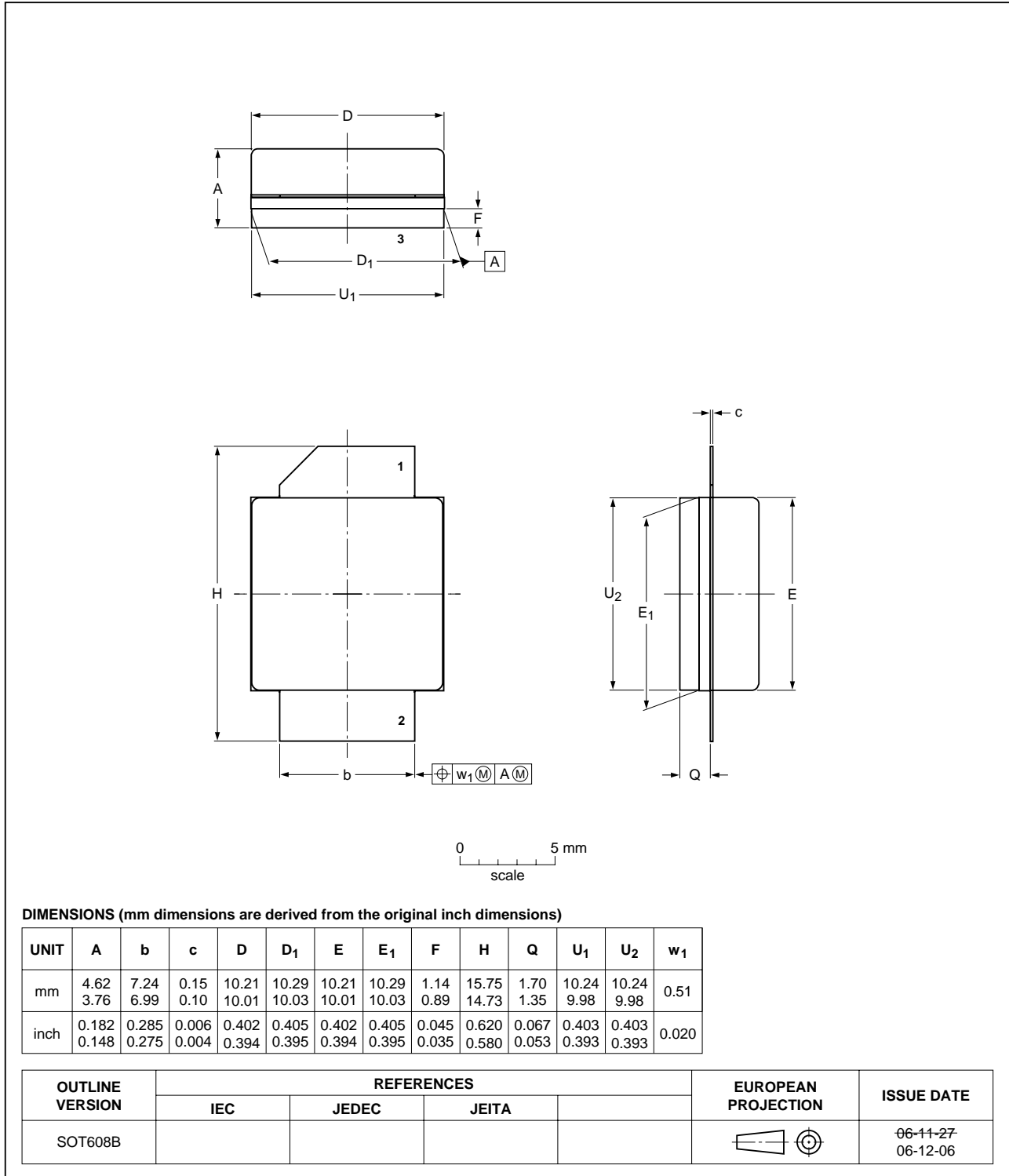


Fig 15. Package outline SOT608B

## 10. Abbreviations

**Table 10. 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
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio
WiMAX	Worldwide Interoperability for Microwave Access

## 11. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G27-45_BLF6G27S-45_3	20081215	Product data sheet	-	BLF6G27-45_BLF6G27S-45_2
Modifications:		• Changed the maximum junction temperature in <a href="#">Table 4 on page 2</a> .		
BLF6G27-45_BLF6G27S-45_2	20080207	Preliminary data sheet	-	BLF6G27-45_BLF6G27S-45_1
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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