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BLF6G27-45; BLF6G27S-45

WiMAX power LDMOS transistor

Rev. 4 — 7 March 2013 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 °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]	2500 to 2700	28	7	18	24	–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.

1.2 Features and benefits

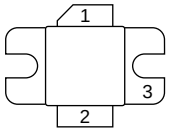
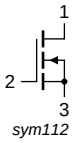
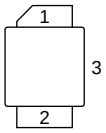
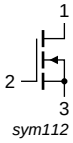
- Typical 1-carrier N-CDMA performance (single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an I_{Dq} of 350 mA:
- Qualified up to a maximum V_{DS} operation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

2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
BLF6G27-45 (SOT608A)				
1	drain			 sym112
2	gate			
3	source	[1]		
BLF6G27S-45 (SOT608B)				
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
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

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5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Type	Typ	Unit
$R_{th(j\text{-}case)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 34 W (CW)	BLF6G27-45	1.7	K/W
			BLF6G27S-45	1.7	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 = 0.5 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 60 mA	1.4	1.9	2.4	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	1.4	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	8.8	10.4	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	140	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 2.5 A	-	4.3	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 2.1 A	-	0.24	0.385	Ω
C_{rs}	feedback capacitance	V_{GS} = 0 V; V_{DS} = 28 V; f = 1 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 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 350 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			-	7	-	W
G_p	power gain	$P_{L(AV)}$ = 7 W		16.5	18	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 7 W		-	–10	–5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 7 W		22	24	-	%
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)}$ = 7 W	[1]	-	–49	–46	dBc
$ACPR_{1980k}$	adjacent channel power ratio (1980 kHz)	$P_{L(AV)}$ = 7 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 V; I_{Dq} = 350 mA; P_L = 45 W (CW); f = 2600 MHz.

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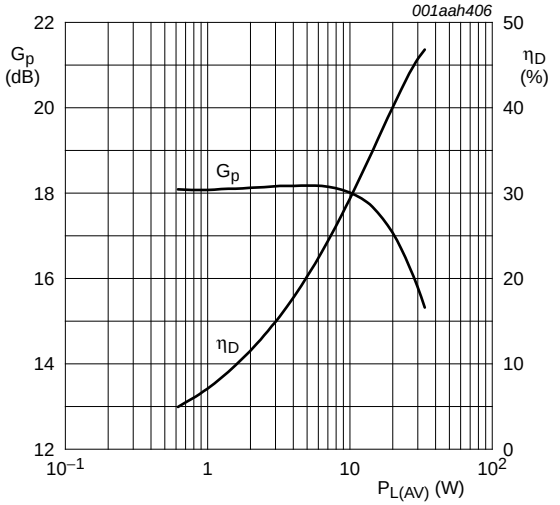
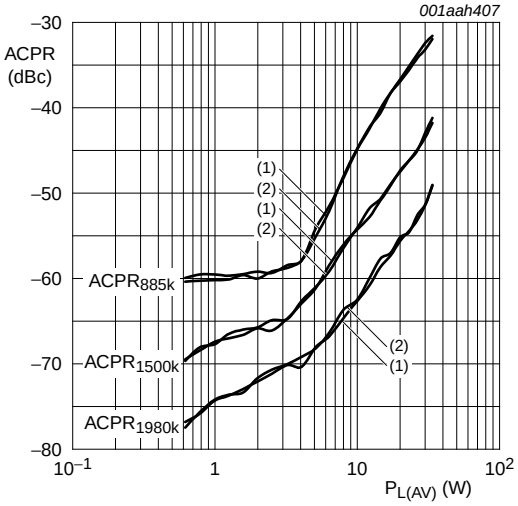
7.2 Single carrier N-CDMA performance



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

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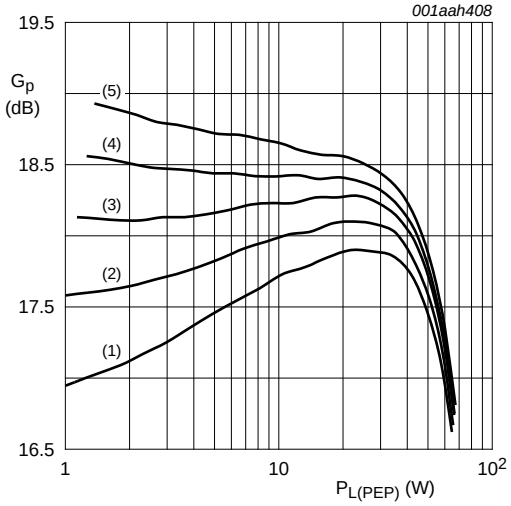
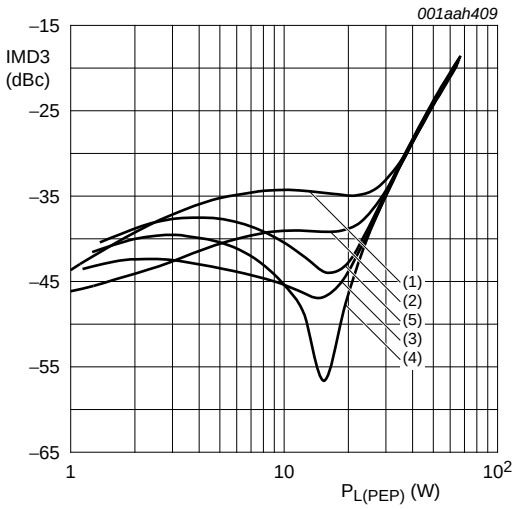
7.3 Two-tone



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

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

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



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

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

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

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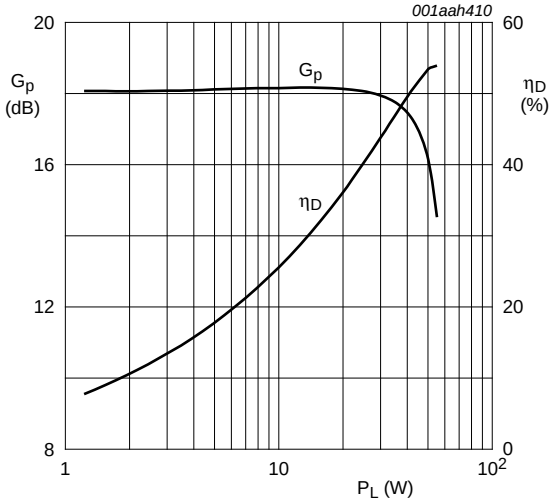
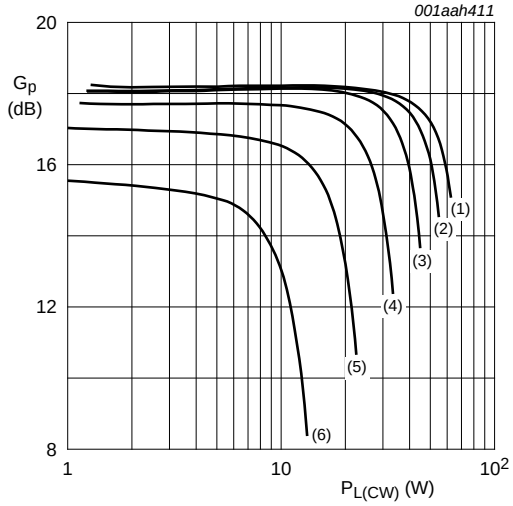
7.4 Continuous wave



I_{Dq} = 350 mA; f = 2600 MHz; T_{case} = 25 °C; V_{DS} = 28 V.

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



I_{Dq} = 350 mA; f = 2600 MHz; T_{case} = 25 °C.

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

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

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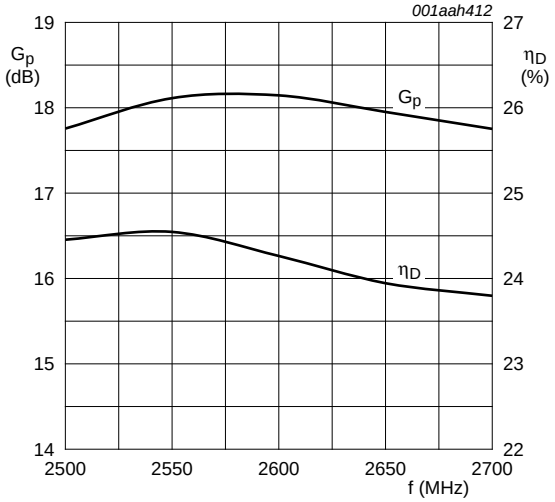
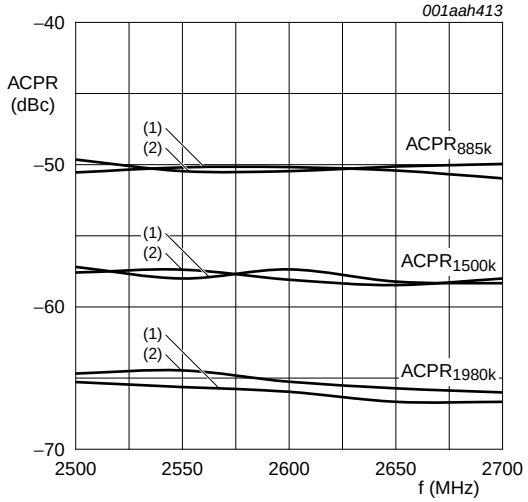
7.5 Single carrier N-CDMA broadband performance at 7 W average



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

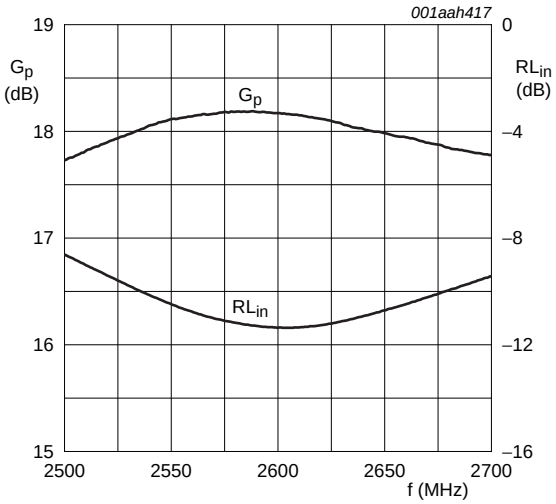


V_{DS} = 28 V; I_{Dq} = 350 mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

(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

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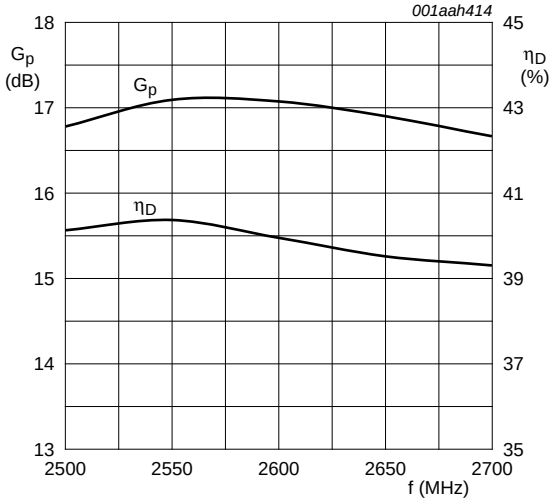
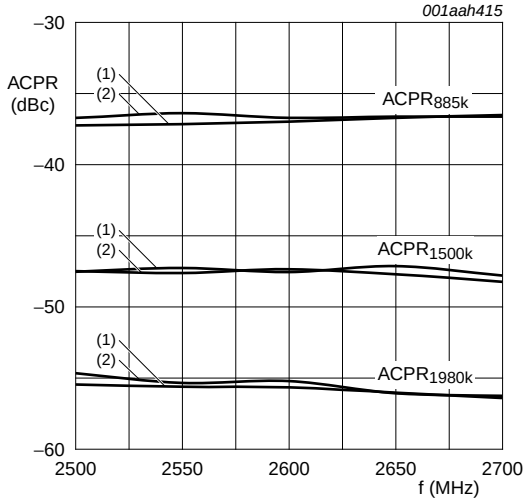
7.6 Single carrier N-CDMA broadband performance at 20 W average



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

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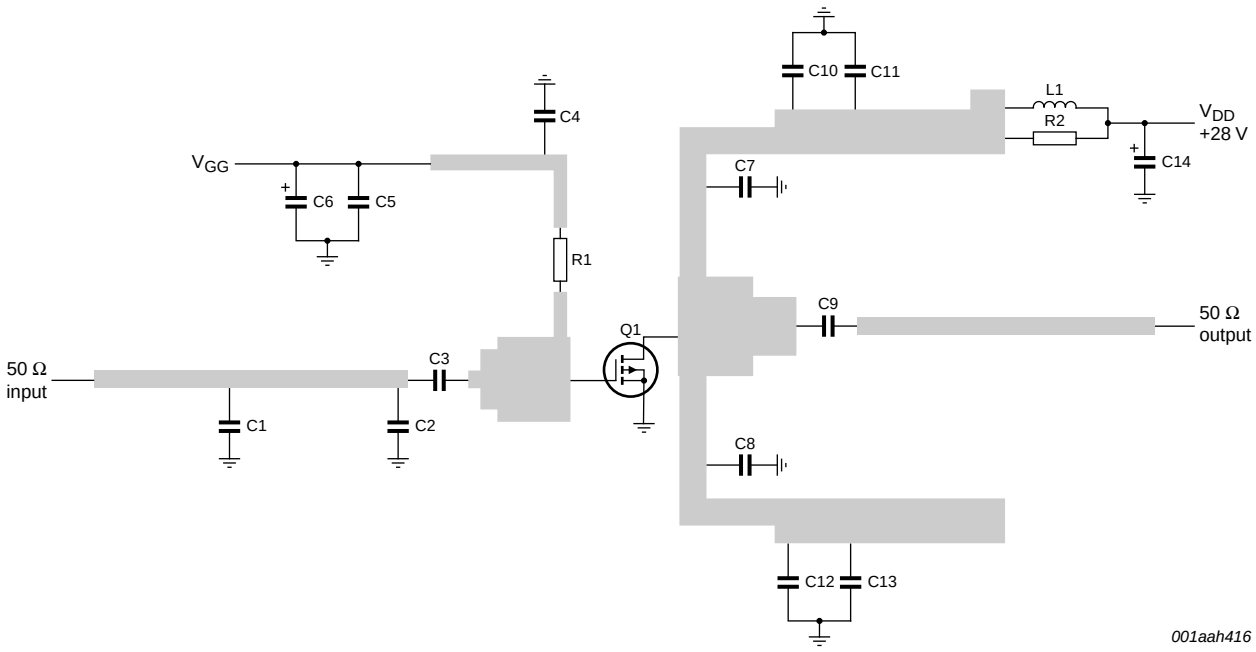
8. Test information



See Table 8 for list of components.

Fig 12. Test circuit for operation at 2500 MHz to 2700 MHz

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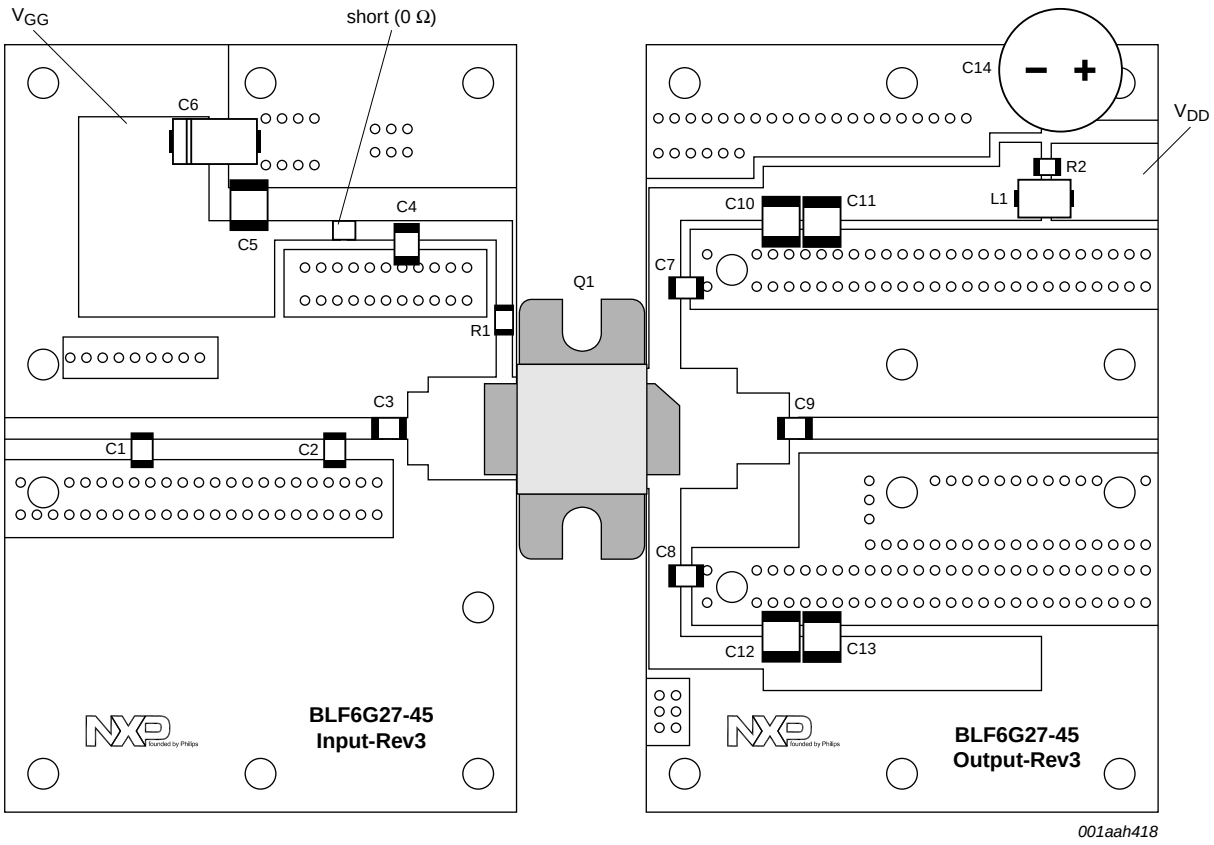

Striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm.

See Table 8 for list of components.

Fig 13. Component layout for 2500 MHz to 2700 MHz test circuit

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 μF		C4532X7R1H475M
C6	tantalum capacitor	10 μF; 35 V		Kemet (Farnell)
C9	multilayer ceramic chip capacitor	8.2 pF		
C14	electrolytic capacitor	470 μF; 63 V		
L1	ferrite SMD bead	-		Ferroxcube BDS 3/3/4.6-4S2 or equivalent
R1	resistor	22 Ω		package 0603
R2	resistor	12 Ω		package 1206
Q1	BLF6G27-45 or BLF6G27S-45	-		

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

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Table 9. Measured test circuit impedances

f	Z_i	Z_o
(GHz)	(Ω)	(Ω)
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

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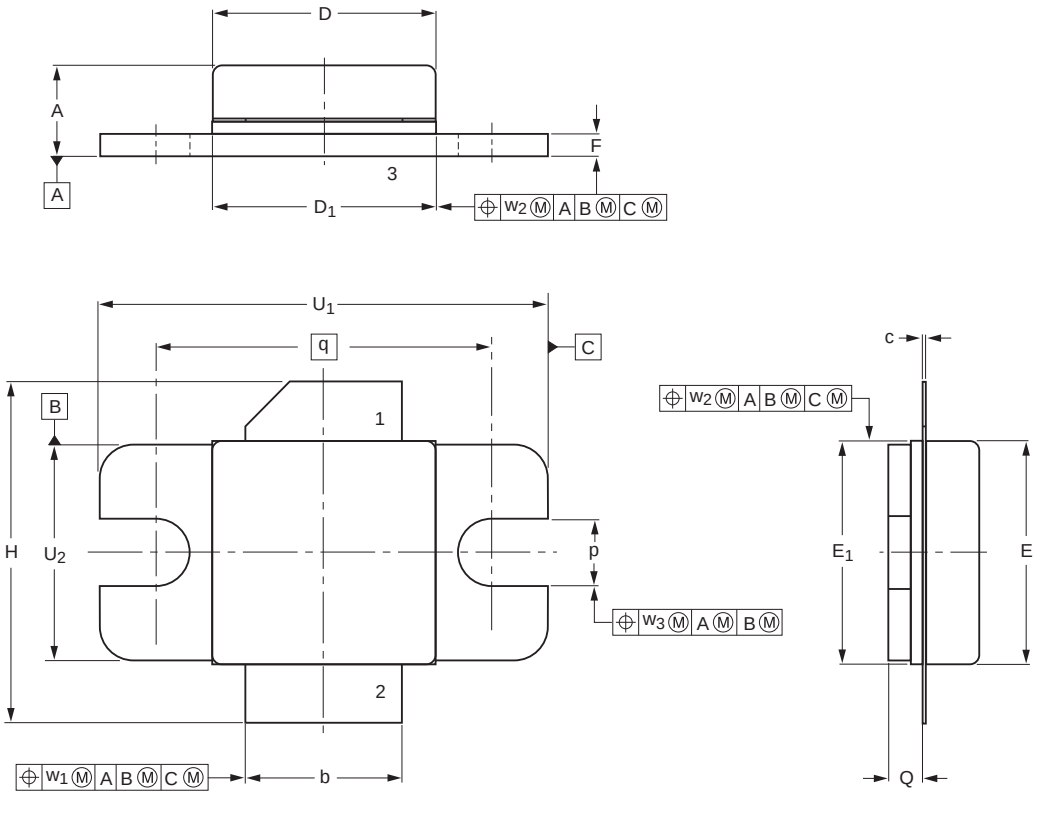
9. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads **SOT608A**



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

Unit		A	b	c	D	D_1	E	E_1	F	H	p	Q	q	U_1	U_2	w_1	w_2	w_3
mm	max	4.62	7.24	0.15	10.21	10.29	10.21	10.29	1.14	15.37	3.30	1.70		20.45	9.91			
	nom												15.24			0.25	0.25	0.25
	min	3.76	6.99	0.10	10.01	10.03	10.01	10.03	0.89	15.11	2.92	1.45		20.19	9.65			

sot608a_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT608A						~~09-08-26~~ 13-01-29

Fig 14. Package outline SOT608A

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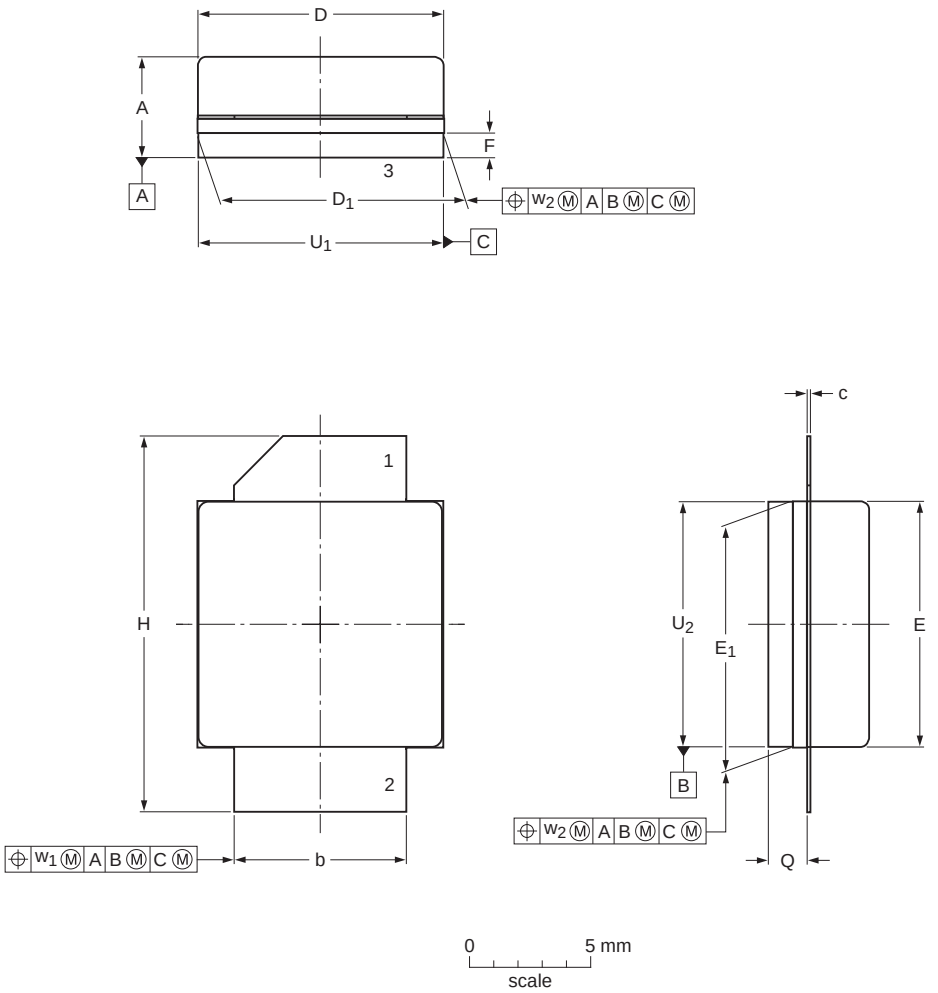
Ceramic earless flanged package; 2 leads **SOT608B**



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

Unit		A	b	c	D	D_1	E	E_1	F	H	Q	U_1	U_2	w_1	w_2
mm	max	4.62	7.24	0.15	10.21	10.29	10.21	10.29	1.14	15.37	1.70	10.24	10.24		
	nom													0.25	0.25
	min	3.76	6.99	0.10	10.01	10.03	10.01	10.03	0.89	15.11	1.45	9.98	9.98		

sot608b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT608B						~~09-08-26~~ 13-01-29

Fig 15. Package outline SOT608B

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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 v.4	20130307	Product data sheet	-	BLF6G27-45_BLF6G27S-45_3
Modifications:	• Update of Package Outline drawing.			
BLF6G27-45_BLF6G27S-45_3	20081215	Product data sheet	-	BLF6G27-45_BLF6G27S-45_2
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. 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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