BLF6G15L-40BRN

Power LDMOS transistor

Rev. 2 — 12 November 2010 Product data sheet

1. Product profile

1.1 General description

40 W LDMOS power transistor for base station applications at frequencies from 1450 MHz to 1550 MHz.

Table 1. Typical performance

Typical RF performance at T_{case} = 25 °C in a class-AB production test circuit.

Mode of operation	f	V_{DS}	$P_{L(AV)}$	G_p	η_D	ACPR
	(MHz)	(V)	(W)	(dB)	(%)	(dBc)
2-carrier W-CDMA	1476 to 1511	28	2.5	22.0	13.0	−45 [1]

[1] Test signal: 3GPP test model 1, 64 DPCH; PAR = 7.5 dB at probability of 0.01% on CCDF carrier; carrier spacing 5 MHz.

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

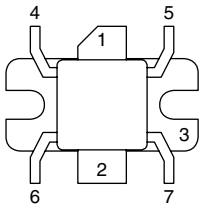
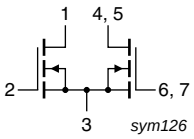
- Typical 2-carrier W-CDMA performance at frequencies of 1476 MHz and 1511 MHz, a supply voltage of 28 V and an I_{Dq} of 330 mA:
  - Average output power = 2.5 W
  - Power gain = 22.0 dB
  - Efficiency = 13.0 %
  - ACPR = −45 dBc
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1450 MHz to 1550 MHz)
- Internally matched for ease of use
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.
- Integrated current sense

1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 1450 MHz to 1550 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source [1]		
4, 5	sense drain		
6, 7	sense gate		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G15L-40BRN	-	flanged ceramic package; 2 mounting holes; 6 leads	SOT1112A

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	+11	V
$V_{GS(sense)}$	sense gate-source voltage		−0.5	+9	V
I_D	drain current		-	11	A
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		-	200	°C

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j\text{-}case)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 2.5 W (CW)	1.6	K/W

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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 = 0.59 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 59 mA	1.4	1.9	2.4	V
I_{Dq}	quiescent drain current	sense transistor: I_{DS}= 5.1 mA; V_{DS} = 12 V main transistor: V_{DS} = 28 V	280	330	380	mA
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	-	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 = 2.9 A	2.7	4.3	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 2.06 A	0.09	0.25	0.39	Ω

7. Application information

Table 7. 2-carrier W-CDMA RF performance

Class-AB production test circuit; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH; f_1 = 1473.4 MHz; f_2 = 1478.4 MHz; f_3 = 1508.4 MHz; f_4 = 1513.4 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 330 mA; T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	2.5	-	W
G_p	power gain	$P_{L(AV)}$ = 2.5 W	19.8	22.0	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 2.5 W	10	15	-	dB
η_D	drain efficiency	$P_{L(AV)}$ = 2.5 W	11	13	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 2.5 W	-	–45	–40	dBc

Table 8. 1 carrier W-CDMA PAR performance

Class-AB production test circuit; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH; f_1 = 1510.9 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 330 mA; T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
PAR_O	output peak-to-average ratio	$P_{L(AV)}$ = 10 W at 0.01 % probability on CCDF	5.3	6.0	-	dB

7.1 Ruggedness in class-AB operation

The BLF6G15L-40BRN is capable of withstanding a load mismatch corresponding to VSWR = 10 :1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 330 mA; P_L = 30 W; f = 1475 MHz (CW).

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7.2 Impedance information

Table 9. Typical impedance per section

I_{Dq} = 330 mA; main transistor V_{DS} = 28 V

f	Z_S[1]	Z_L[1]
(MHz)	(Ω)	(Ω)
1480	3.2 – j6.3	4.6 – j4.5
1510	4.4 – j6.5	4.6 – j4.5

[1] Z_S and Z_L defined in Figure 1.

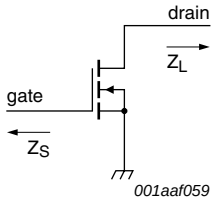
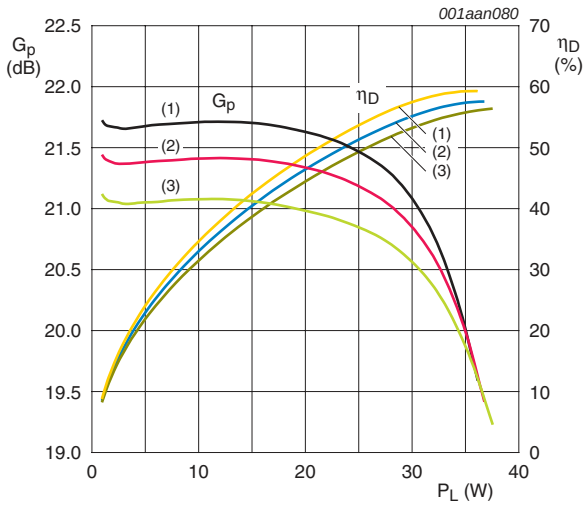


Fig 1. Definition of transistor impedance

7.3 Graphs

7.3.1 CW



(1) f = 1475 MHz

(2) f = 1493 MHz

(3) f = 1511 MHz

Fig 2. Power gain and drain efficiency as function of load power; typical values

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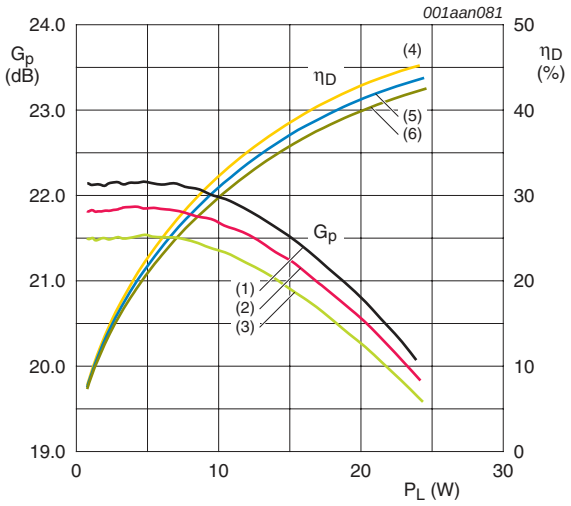
7.3.2 2C-WCDMA (5 MHz spacing)



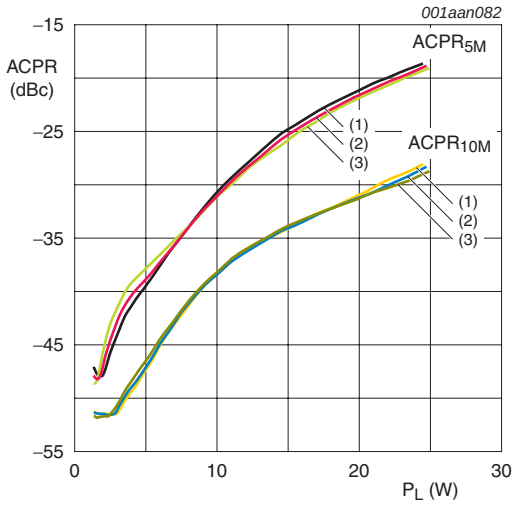
3GPP, test model 1; 64 DPCH, PAR = 7.5 dB at 0.01 % probability per carrier. 5 MHz carrier spacing.

(1) f = 1475 MHz

(2) f = 1493 MHz

(3) f = 1511 MHz

Fig 3. Power gain and drain efficiency as function of load power; typical values



3GPP, test model 1; 64 DPCH, PAR = 7.5 dB at 0.01 % probability per carrier. 5 MHz carrier spacing.

(1) f = 1475 MHz

(2) f = 1493 MHz

(3) f = 1511 MHz

Fig 4. Adjacent channel power ratio as a function of load power; typical values

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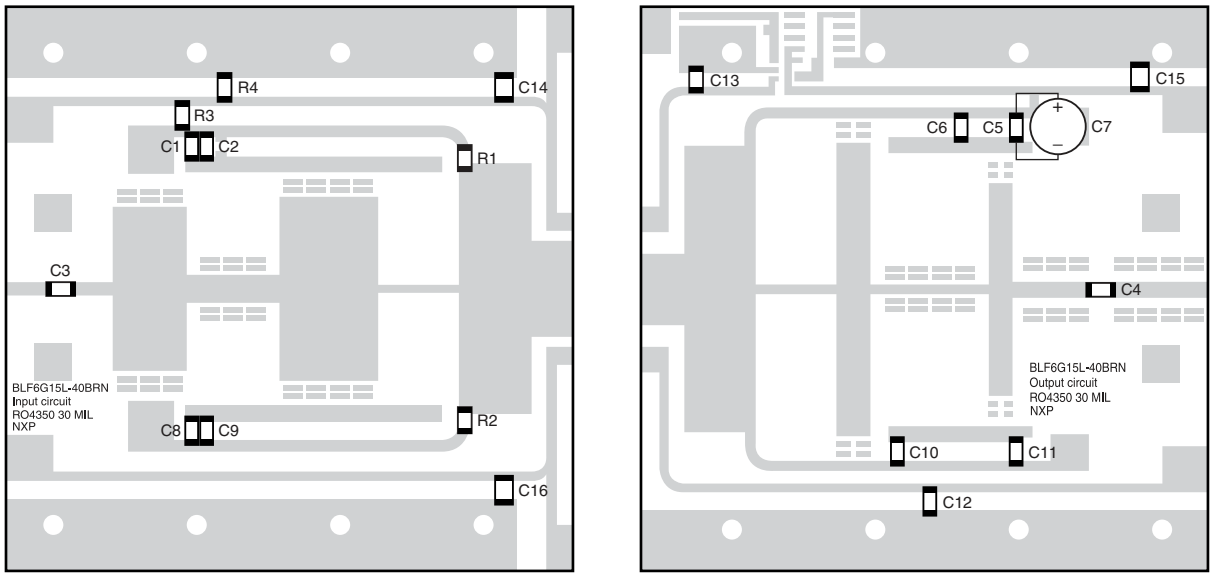
8. Test information



Printed-Circuit Board (PCB): Rogers RO4350; ε_r = 3.5 F/m; thickness = 0.762 mm; thickness copper plating = 35 μm.

The vias can be as a reference to place components.

The above layout shows the test circuit used to measure the devices in production. A more appropriate application demonstration for specific customer needs can be provided.

See Table 10 for list of components.

Fig 5. Component layout

Table 10. List of components

See Figure 5 for component layout.

Component	Description	Value		Remarks
C1, C8	multilayer ceramic chip capacitor	68 pF	[1]	
C2, C6, C9	multilayer ceramic chip capacitor	160 pF	[1]	
C3, C4	multilayer ceramic chip capacitor	24 pF	[2]	
C5, C11	multilayer ceramic chip capacitor	47 pF	[1]	
C7	electrolytic capacitor	470 μF; 63 V		
C10	multilayer ceramic chip capacitor	15 pF	[1]	
C12	multilayer ceramic chip capacitor	43 pF	[1]	
C13	multilayer ceramic chip capacitor	20 pF	[1]	
C14, C15	multilayer ceramic chip capacitor	1 μF		Murata 0603
C16	multilayer ceramic chip capacitor	100 pF		
R1, R2	chip resistor	15 Ω		Philips 0603
R3	chip resistor	820 Ω		Philips 0603
R4	chip resistor	1.8 kΩ		Philips 0603

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

[2] American Technical Ceramics type 800B or capacitor of same quality.

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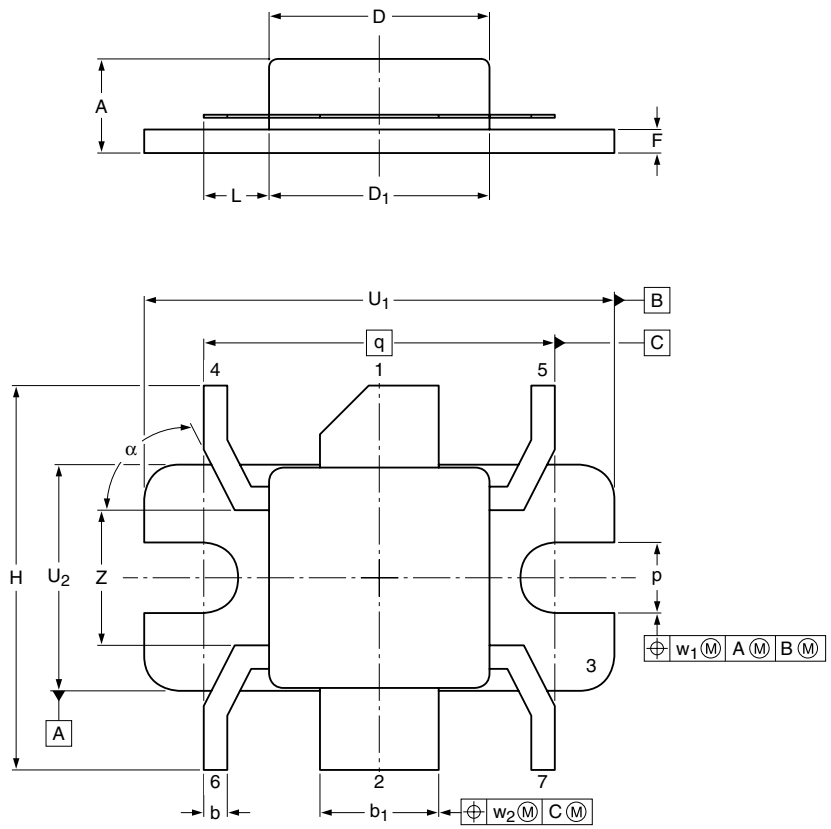
9. Package outline

Flanged ceramic package; 2 mounting holes; 6 leads **SOT1112A**



Dimensions

Unit[1]		A	b	b_1	c	D	D_1	E	E_1	F	H	L	p	Q[2]	q	U_1	U_2	w_1	w_2	Z	α
mm	max	4.65	1.14	5.26	0.18	9.65	9.65	9.65	9.65	1.14	17.12	3.00	3.30	1.70		20.45	9.91			5.97	64°
	nom														15.24			0.25	0.51		
	min	3.76	0.89	5.00	0.10	9.40	9.40	9.40	9.40	0.89	16.10	2.69	2.92	1.45		20.19	9.65			5.72	62°
inches	max	0.183	0.045	0.207	0.007	0.38	0.38	0.38	0.38	0.045	0.674	0.118	0.130	0.067		0.805	0.39			0.235	64°
	nom														0.6			0.01	0.02		
	min	0.148	0.035	0.197	0.004	0.37	0.37	0.37	0.37	0.035	0.634	0.106	0.115	0.057		0.795	0.38			0.225	62°

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

sot1112a_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1112A						~~09-10-12~~ 10-02-02

Fig 6. Package outline SOT1112A

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10. Abbreviations

Table 11. Abbreviations

Acronym	Description
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
PAR	Peak-to-Average power Ratio
DPCH	Dedicated Physical Channel
RF	Radio Frequency
VSWR	Voltage Standing-Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G15L-40BRN v.2	20101112	Product data sheet	-	BLF6G15L-40BRN v.1
Modifications:	• Data sheet status changed from Preliminary sheet to Product data			
BLF6G15L-40BRN v.1	20100914	Preliminary data sheet	-	-

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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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