BLF6G10L-40BRN

Power LDMOS transistor

Rev. 01 — 9 August 2010 Preliminary data sheet

1. Product profile

1.1 General description

40 W LDMOS power transistor for base station applications at frequencies from 700 MHz to 1 GHz.

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[1]	791 to 821	28	2.5	23.0	15.0	−42.5

[1] Test signal: 3GPP test model 1; 1 to 64 DPCH; PAR = 7.5 dB at 0.01 % probability on CCDF per 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

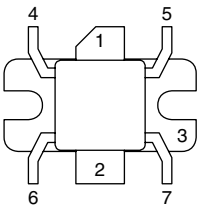
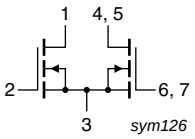
- Typical 2-carrier W-CDMA performance at frequencies of 791 MHz and 821 MHz, a supply voltage of 28 V and an I_{Dq} of 360 mA:
  - Average output power ($P_{L(AV)}$) = 2.5 W
  - Power gain (G_p) = 23.0 dB
  - Drain efficiency (η_D) = 15.0 %
  - ACPR = −42.5 dBc
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (728 MHz to 960 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)
- Integrated current sense

1.3 Applications

RF power amplifiers for W-CDMA base stations and multi-carrier GSM and LTE applications in the 728 MHz to 960 MHz frequency range.

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLF6G10L-40BRN (SOT1112A)			
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
BLF6G10L-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)	1.7	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 = 59 mA	1.4	1.9	2.4	V
I_{Dq}	quiescent drain current	sense transistor: I_{DS} = 8.2 mA, V_{DS} = 26.5 V; main transistor: V_{DS} = 28 V	280	360	420	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 = 2.1 A	0.09	0.25	0.39	Ω

7. Application information

Table 7. Application information

Mode of operation: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1 to 64 DPCH; f_1 = 788.5 MHz; f_2 = 793.5 MHz; f_3 = 818.5 MHz; f_4 = 823.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 360 mA; T_{case} = 25 °C; unless otherwise specified in a class AB production test circuit.

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	22.2	23.0	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 2.5 W	11	15	-	dB
η_D	drain efficiency	$P_{L(AV)}$ = 2.5 W	14	15	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 2.5 W	-	–42.5	–41	dBc

Table 8. Application information

Mode of operation; 1 carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1 to 64 DPCH; f_1 = 821 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 360 mA; T_{case} = 25 °C; unless otherwise specified in a class AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
PAR	peak-to-average ratio	$P_{L(AV)}$ = 10 W at 0.01 % probability on CCDF	5.5	5.9	-	dB

7.1 Ruggedness in class-AB operation

The BLF6G10L-40BRN is capable of withstanding a load mismatch corresponding to VSWR = 1 : 10 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 360 mA; P_L = 40 W; f = 791 MHz and 821 MHz.

7.2 Impedance information

Table 9. Typical impedance per section

I_{Dq} = 360 mA; main transistor V_{DS} = 28 V.

f (MHz)	Z_S[1] (Ω)	Z_L[1] (Ω)
800	2.0 – j5.0	5.3 + j2.9
810	2.0 – j5.5	5.6 + j2.3

[1] Z_S and Z_L are defined in Figure 1.

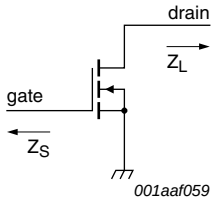
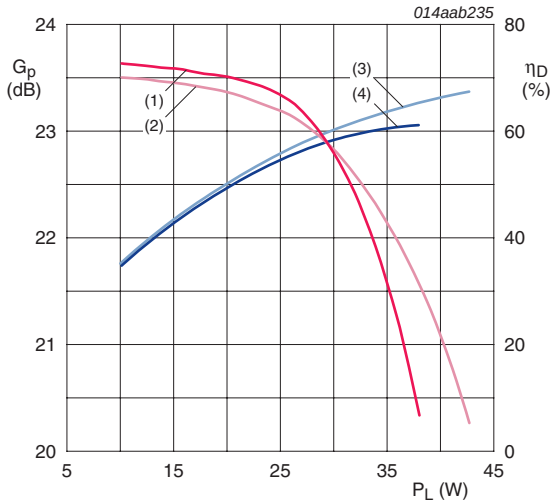


Fig 1. Definition of transistor impedance

7.3 Typical power sweep

7.3.1 CW



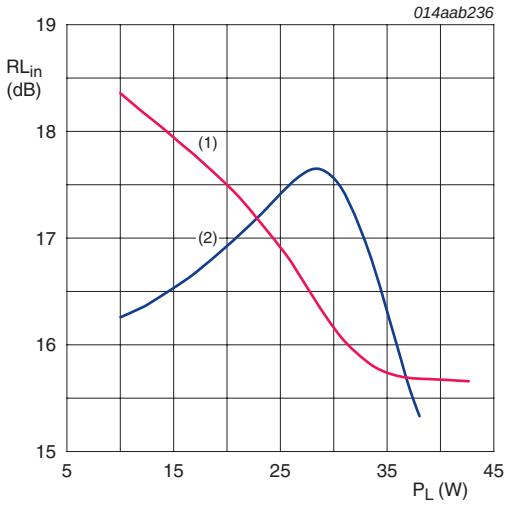
(1) dB power gain at 791 MHz.

(2) dB power gain at 821 MHz.

(3) % drain efficiency at 821 MHz.

(4) % drain efficiency at 791 MHz.

Fig 2. Typical continuous wave: power gain and drain efficiency as a function of output power

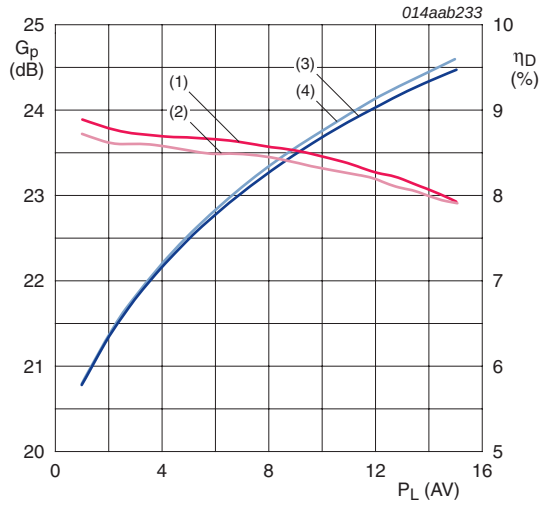


(1) dB return loss at 821 MHz.

(2) dB return loss at 791 MHz.

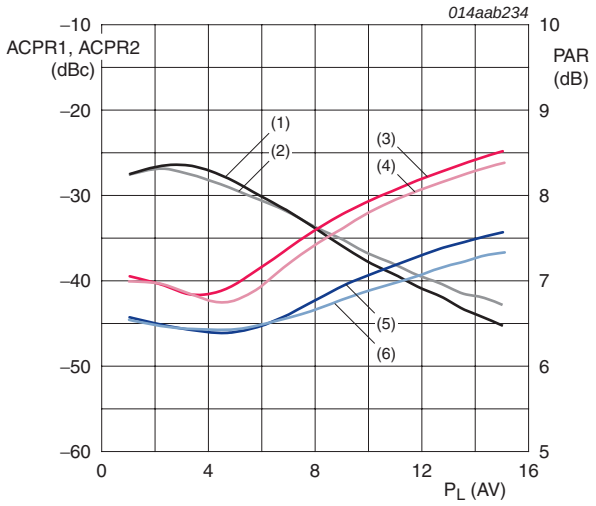
Fig 3. Typical continuous wave: input return loss as a function of output power

7.3.2 2-carrier W-CDMA (5 MHz spacing)



(1) dB power gain at 791 MHz.
(2) dB power gain at 821 MHz.
(3) % drain efficiency at 791 MHz.
(4) % drain efficiency at 821 MHz.

a. Power gain and drain efficiency as a function of average output power



(1) dB PAR at 791 MHz.
(2) dB PAR at 821 MHz.
(3) 5 MHz ACPR, dBc at 791 MHz.
(4) 5 MHz ACPR, dBc at 821 MHz.
(5) 10 MHz ACPR, dBc at 791 MHz.
(6) 10 MHz ACPR, dBc at 821 MHz.

b. ACPR, and PAR as a function of average output power

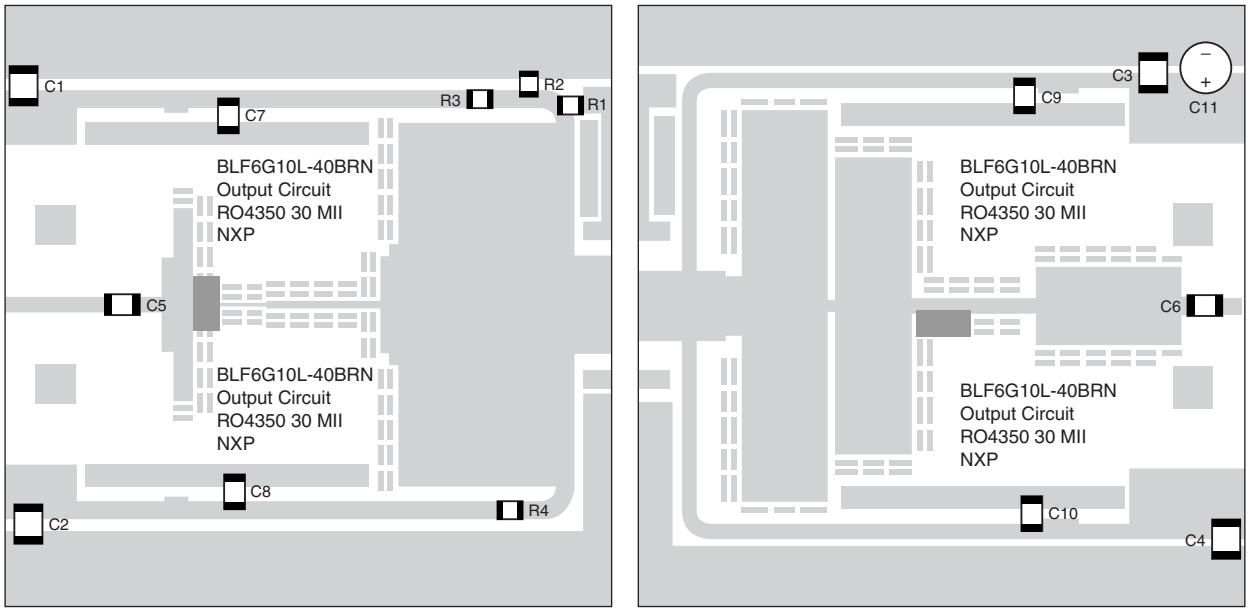
3GPP test model 1; 1 to 64 DPCH; PAR = 7.5 dB at 0.01% probability per carrier; 5 MHz carrier spacing.

Fig 4. Typical 2-carrier W-CDMA: power gain, drain efficiency and ACPR as a function of average output power

8. Test information

8.1 Test circuit

The PCB test circuit layout is shown in Figure 5.



When placing components, it is possible to use the vias as a reference.

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 obtained from the RF Power and Base station group.

Fig 5. Input and output test circuit PCBs

8.2 Bill of materials (BOM)

A list of all the components needed to build the RF test circuit is shown in Table 10.

Table 10. Bill of materials

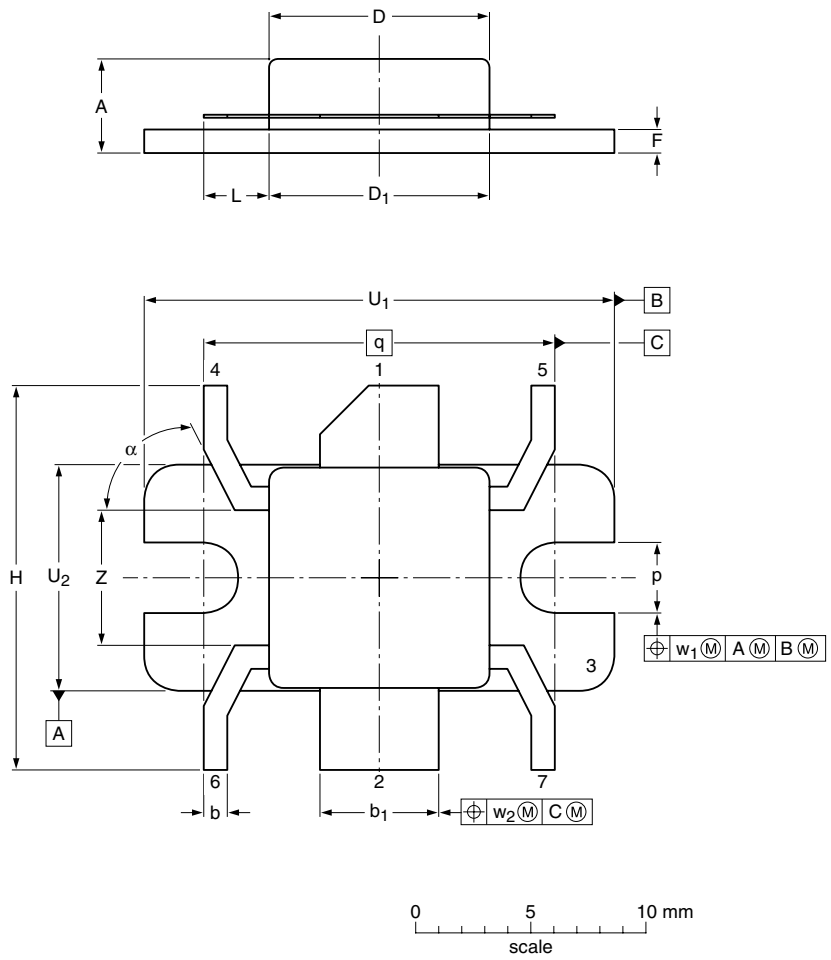
Component	Description	Type	Value	Code number	Remarks
C1, C2, C3, C4	multi-layer ceramic chip capacitor	MURATA	10 μF	-	-
C5, C6	multi-layer ceramic chip capacitor	ATC100B	47 pF	-	-
C7, C8	multi-layer ceramic chip capacitor	ATC100B	100 pF	-	-
C9, C10	multi-layer ceramic chip capacitor	ATC100B	30 pF	-	-
C11	electrolytic capacitor	-	470 μF; 63 V	-	-
R1	chip resistor	Philips 1206	820 Ω	-	-
R2	chip resistor	Philips 1206	2.2 kΩ	-	-
R3, R4	chip resistor	Philips 1206	15 Ω	-	-
-	N-connector female	23N-50-057/1	-	-	Suhner
-	N-connector male	13N-50-057/1	-	-	Suhner
-	2 × contact block	-	6 × 5 mm	-	brass (milled)
-	2 × contact block	-	2.5 × 2.5 mm	-	brass (milled)
-	DC-connector 8 pin male	8140-115	-	-	Souriau (Farnell)
-	2 × DC-connector 2 pin male	8140-12	-	-	Souriau (Farnell)
-	solid copper wire (1 mm diameter)	-	30 mm	-	-
-	flexible copper wire	SIMX-F	0.75 mm^2	-	silicon isolated
-	input PCB	-	-	-	see PCB information
-	output PCB	-	-	-	see PCB information
-	8 × washer M2	-	-	-	brass (nickel plated)
-	14 × bolt M2	-	5 mm	-	brass (nickel plated)
-	4 × bolt M3	-	12 mm	-	chrome nickel steel
-	2 × bolt M3	-	30 mm	-	chrome nickel steel
-	2 × washer M3	-	-	-	chrome nickel steel
-	4 × spring washer M3	-	-	-	chrome nickel steel
-	10 × isolated paper washer M2	-	-	-	paper
-	auto bias[1]	28 V/I_{DS} = 8.2 mA	-	-	-
-	base plate[2]	-	-	-	-

[1] Auto bias documentation available on request from RF Power and Base station group, NXP Semiconductors.

[2] Base plate mechanical drawing available on request from RF Power and Base station group, NXP Semiconductors.

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

10. Abbreviations

Table 11. Abbreviations

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LTE	Long Term Evolution
PAR	Peak-to-Average power Ratio
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
BLF6G10L-40BRN v.1	20100809	Preliminary data sheet	-	-

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".

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14. Contents

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