

# 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  $T_{case} = 25\text{ °C}$  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)	η <sub>D</sub> (%)	ACPR (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<sub>DQ</sub> 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

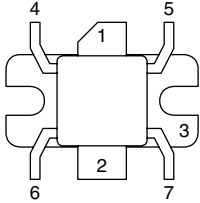
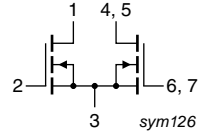


## 1.3 Applications

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

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ }^\circ\text{C}$  per section; unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.59\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 59\text{ mA}$	1.4	1.9	2.4	V
$I_{Dq}$	quiescent drain current	sense transistor: $I_{DS} = 5.1\text{ mA}; V_{DS} = 12\text{ V}$ main transistor: $V_{DS} = 28\text{ V}$	280	330	380	mA
$I_{DSS}$	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	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 2.9\text{ A}$	2.7	4.3	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 2.06\text{ A}$	0.09	0.25	0.39	$\Omega$

## 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;  $f_1 = 1473.4\text{ MHz}; f_2 = 1478.4\text{ MHz}; f_3 = 1508.4\text{ MHz}; f_4 = 1513.4\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 330\text{ mA}; T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	2.5	-	W
$G_p$	power gain	$P_{L(AV)} = 2.5\text{ W}$	19.8	22.0	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 2.5\text{ W}$	10	15	-	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 2.5\text{ W}$	11	13	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)} = 2.5\text{ W}$	-	-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;  $f_1 = 1510.9\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 330\text{ mA}; T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$PAR_O$	output peak-to-average ratio	$P_{L(AV)} = 10\text{ W}$ 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  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 330\text{ mA}; P_L = 30\text{ W}; f = 1475\text{ MHz}$  (CW).

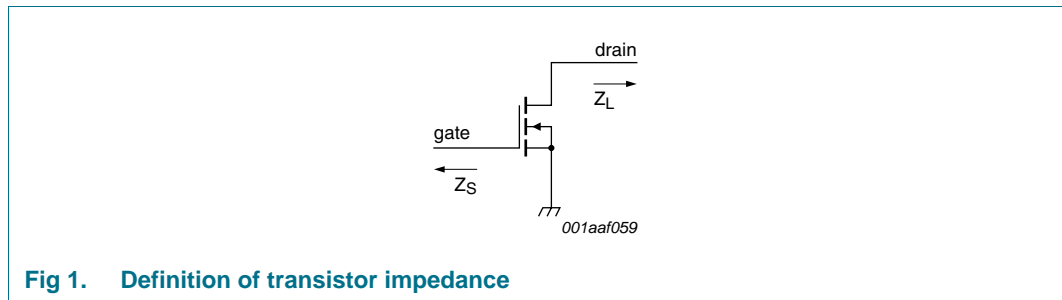
**7.2 Impedance information**

**Table 9. Typical impedance per section**

$I_{DQ} = 330 \text{ mA}$ ; main transistor  $V_{DS} = 28 \text{ V}$

f (MHz)	$Z_S$ <sup>[1]</sup> ( $\Omega$ )	$Z_L$ <sup>[1]</sup> ( $\Omega$ )
1480	3.2 – j6.3	4.6 – j4.5
1510	4.4 – j6.5	4.6 – j4.5

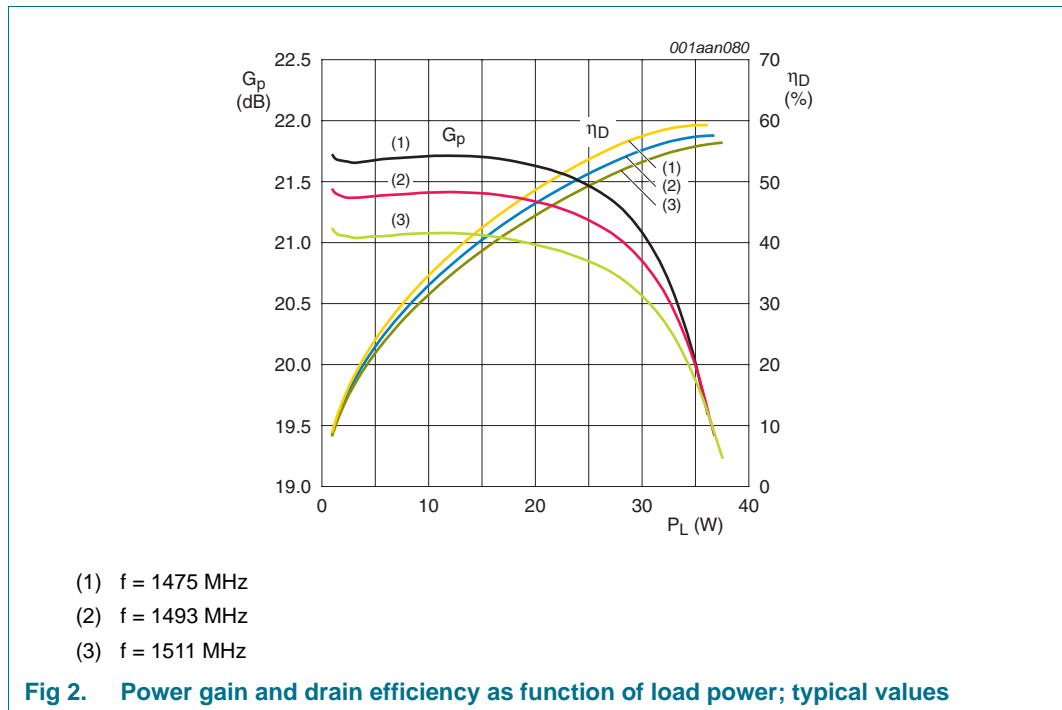
[1]  $Z_S$  and  $Z_L$  defined in [Figure 1](#).



**Fig 1. Definition of transistor impedance**

**7.3 Graphs**

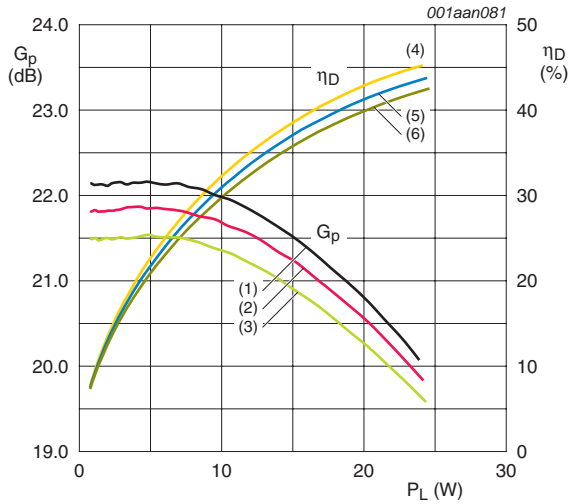
**7.3.1 CW**



- (1)  $f = 1475 \text{ MHz}$
- (2)  $f = 1493 \text{ MHz}$
- (3)  $f = 1511 \text{ MHz}$

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

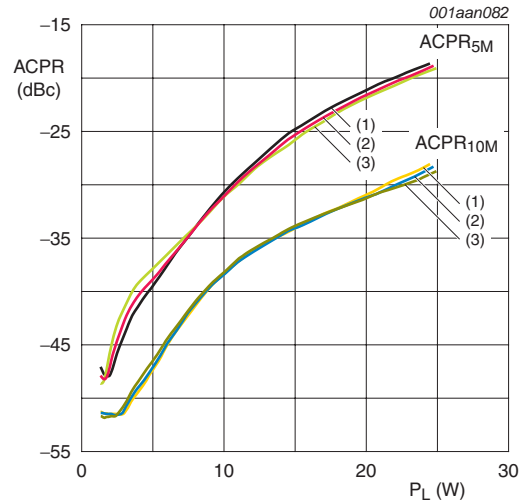
7.3.2 2C-WCDMA (5 MHz spacing)



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

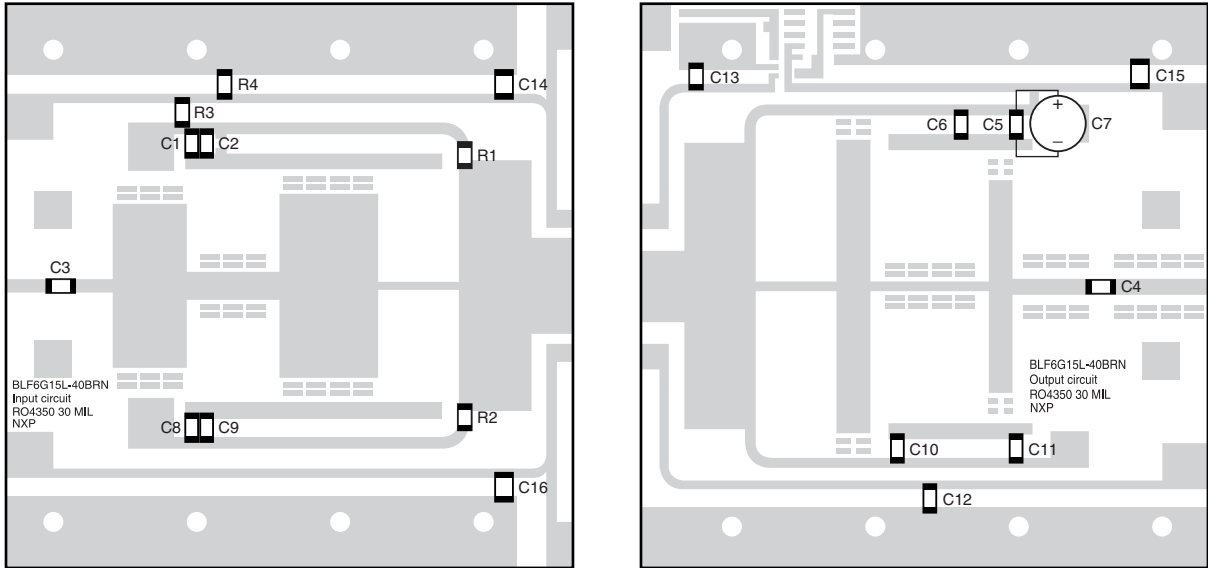


3GPP, test model 1; 64 DPCH, PAR = 7.5 dB at 0.01 % probability per carrier. 5 MHz carrier spacing.

- (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

**8. Test information**



014aab103

Printed-Circuit Board (PCB): Rogers RO4350;  $\epsilon_r = 3.5$  F/m; thickness = 0.762 mm; thickness copper plating = 35  $\mu\text{m}$ .  
 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 $\mu\text{F}$ ; 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 $\mu\text{F}$	Murata 0603
C16	multilayer ceramic chip capacitor	100 pF	
R1, R2	chip resistor	15 $\Omega$	Philips 0603
R3	chip resistor	820 $\Omega$	Philips 0603
R4	chip resistor	1.8 k $\Omega$	Philips 0603

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

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

9. Package outline

Flanged ceramic package; 2 mounting holes; 6 leads

SOT1112A

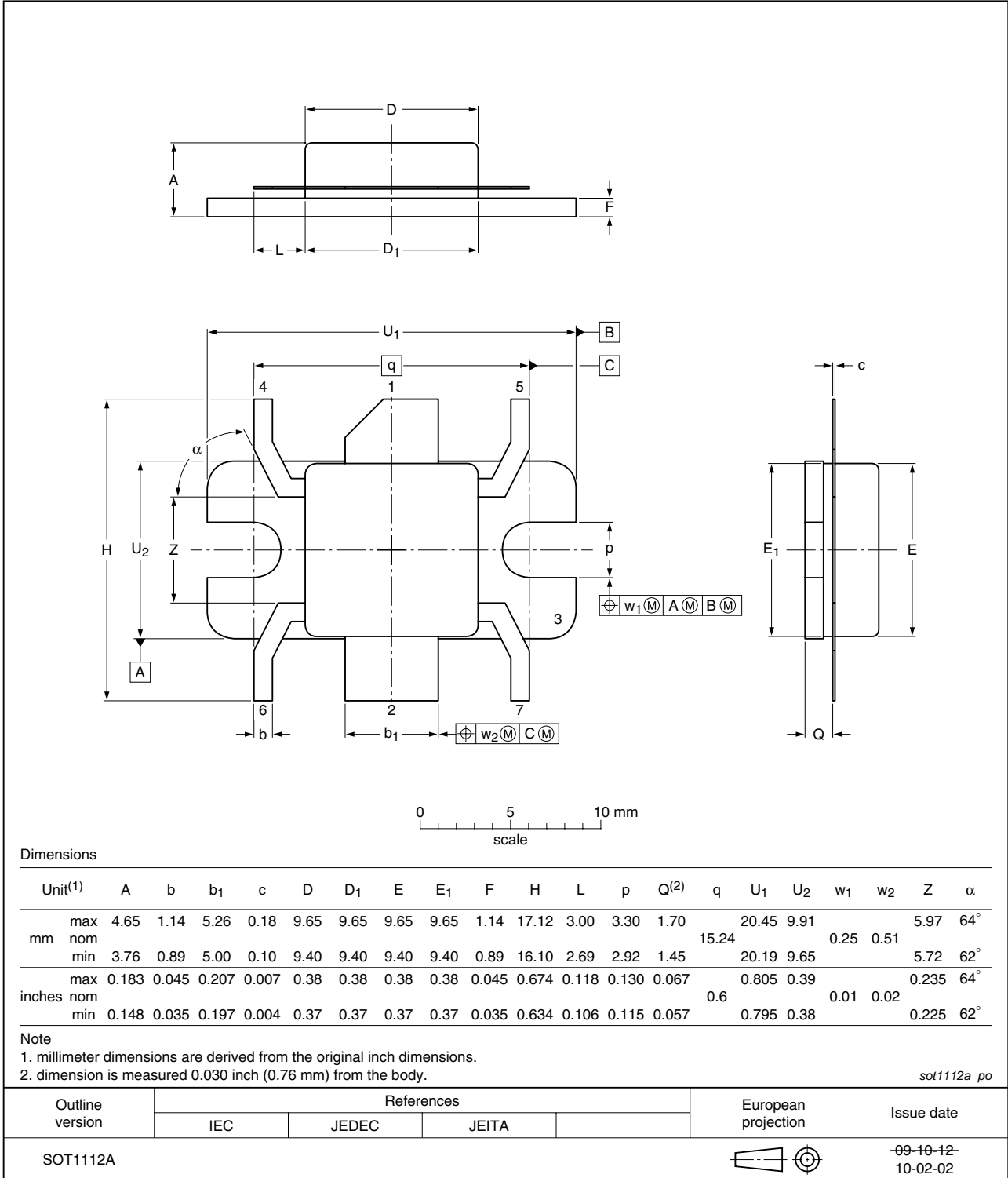


Fig 6. Package outline SOT1112A

## 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:	<ul style="list-style-type: none"> <li>Data sheet status changed from Preliminary sheet to Product data</li> </ul>			
BLF6G15L-40BRN v.1	20100914	Preliminary data sheet	-	-



## 12. Legal information

### 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.

[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>.

### 12.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 12.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or

malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

## 12.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 13. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

**14. Contents**

**1 Product profile . . . . . 1**

1.1 General description . . . . . 1

1.2 Features and benefits . . . . . 1

1.3 Applications . . . . . 2

**2 Pinning information . . . . . 2**

**3 Ordering information . . . . . 2**

**4 Limiting values . . . . . 2**

**5 Thermal characteristics . . . . . 2**

**6 Characteristics . . . . . 3**

**7 Application information . . . . . 3**

7.1 Ruggedness in class-AB operation . . . . . 3

7.2 Impedance information . . . . . 4

7.3 Graphs . . . . . 4

7.3.1 CW . . . . . 4

7.3.2 2C-WCDMA (5 MHz spacing) . . . . . 5

**8 Test information . . . . . 6**

**9 Package outline . . . . . 7**

**10 Abbreviations . . . . . 8**

**11 Revision history . . . . . 8**

**12 Legal information . . . . . 9**

12.1 Data sheet status . . . . . 9

12.2 Definitions . . . . . 9

12.3 Disclaimers . . . . . 9

12.4 Trademarks . . . . . 10

**13 Contact information . . . . . 10**

**14 Contents . . . . . 11**

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2010. All rights reserved.

For more information, please visit: <http://www.nxp.com>  
 For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 12 November 2010  
 Document identifier: BLF6G15L-40BRN