

BLF6G22LS-130

Power LDMOS transistor

Rev. 01 — 23 May 2008

Product data sheet

1. Product profile

1.1 General description

130 W LDMOS power transistor for base station applications at frequencies from 2000 MHz to 2200 MHz.

Table 1. Typical performance

RF performance at $T_{case} = 25^{\circ}\text{C}$ in a common source class-AB production test circuit.

Mode of operation	f (MHz)	V_{DS} (V)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	IMD3 (dBc)	ACPR (dBc)
2-carrier W-CDMA	2110 to 2170	28	30	17	28.5	-37 ^[1]	-40 ^[1]

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7 dB at 0.01 % probability on CCDF per carrier; carrier spacing 10 MHz.

CAUTION



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

1.2 Features

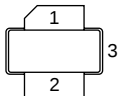
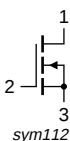
- Typical 2-carrier W-CDMA performance at frequencies of 2110 MHz and 2170 MHz, a supply voltage of 28 V and an I_{DQ} of 1100 mA:
 - ◆ Average output power = 30 W
 - ◆ Power gain = 17 dB (typ)
 - ◆ Efficiency = 28.5 %
 - ◆ IMD3 = -37 dBc
 - ◆ ACPR = -40 dBc
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2000 MHz to 2200 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers W-CDMA base stations and multi carrier applications in the 2000 MHz to 2200 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G22LS-130	-	earless flanged LDMOST ceramic package; 2 leads	SOT502B

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		-	34	A
T_{stg}	storage temperature		-65	+150	°C
T_j	junction temperature		-	225	°C

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}$; $P_L = 30\text{ W}$	0.43	K/W

6. Characteristics

Table 6. Characteristics

$T_j = 25^\circ\text{C}$ 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	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.4	1.9	2.4	V
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 28\text{ V};$ $I_D = 1100\text{ mA}$	1.6	2.1	2.6	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	5	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$	26.5	34	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	450	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	-	12	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 6.3\text{ A}$	-	0.085	0.135	Ω
C_{rs}	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$	-	3.15	-	pF

7. Application information

Table 7. Application information

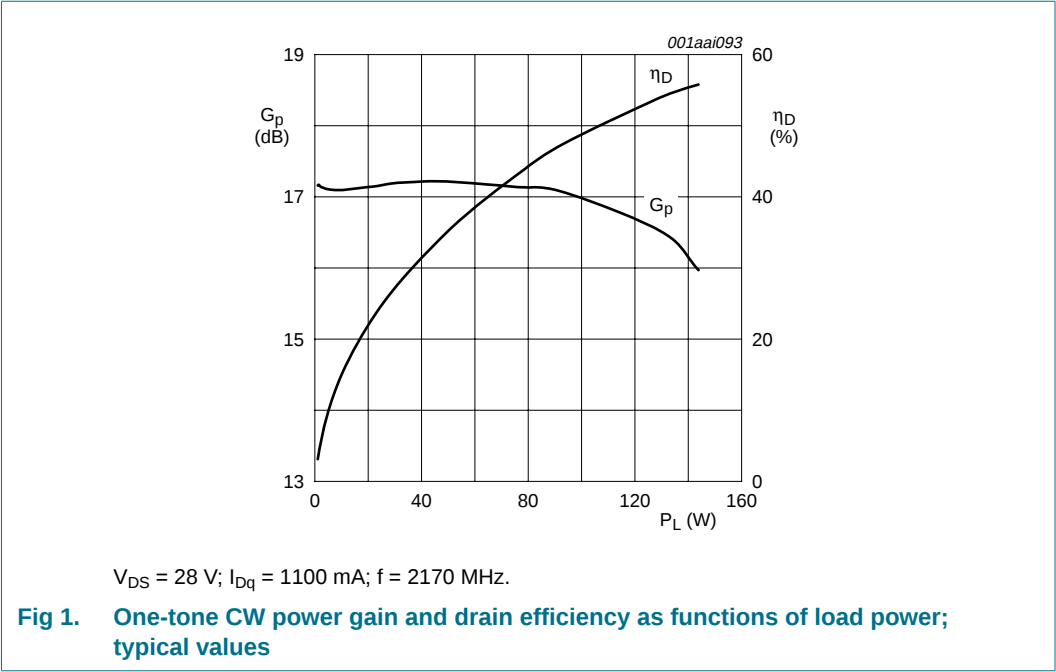
Mode of operation: 2-carrier W-CDMA; PAR 7 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1-64 PDPCH; $f_1 = 2112.5\text{ MHz}$; $f_2 = 2122.5\text{ MHz}$; $f_3 = 2157.5\text{ MHz}$; $f_4 = 2167.5\text{ MHz}$; RF performance at $V_{DS} = 28\text{ V}$; $I_{Dq} = 1100\text{ mA}$; $T_{case} = 25^\circ\text{C}$; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	30	-	W
G_p	power gain	$P_{L(AV)} = 30\text{ W}$	16	17	-	dB
RL_{in}	input return loss	$P_{L(AV)} = 30\text{ W}$	-	-9	-6	dB
η_D	drain efficiency	$P_{L(AV)} = 30\text{ W}$	25.5	28.5	-	%
IMD3	third order intermodulation distortion	$P_{L(AV)} = 30\text{ W}$	-	-37	-34.5	dBc
ACPR	adjacent channel power ratio	$P_{L(AV)} = 30\text{ W}$	-	-40	-38	dBc

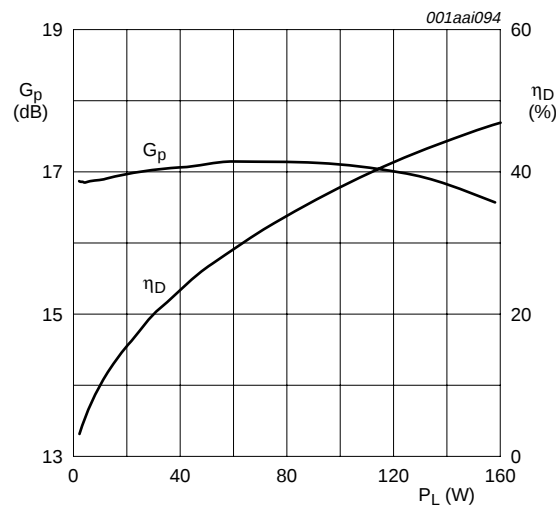
7.1 Ruggedness in class-AB operation

The BLF6G22LS-130 is capable of withstanding a load mismatch corresponding to $VSWR = 10 : 1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{Dq} = 1100\text{ mA}$; $P_L = 130\text{ W (CW)}$; $f = 2170\text{ MHz}$.

7.2 One-tone CW

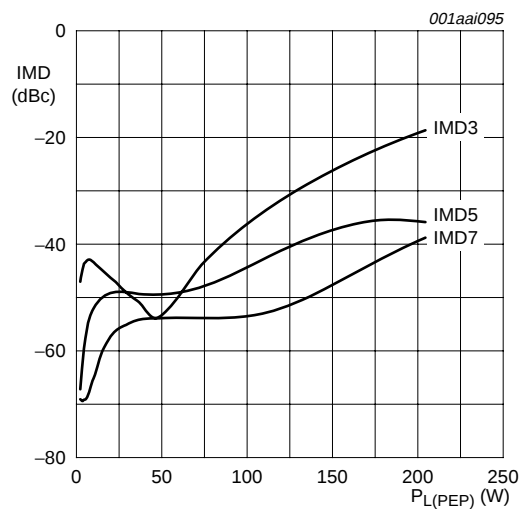


7.3 Two-tone CW



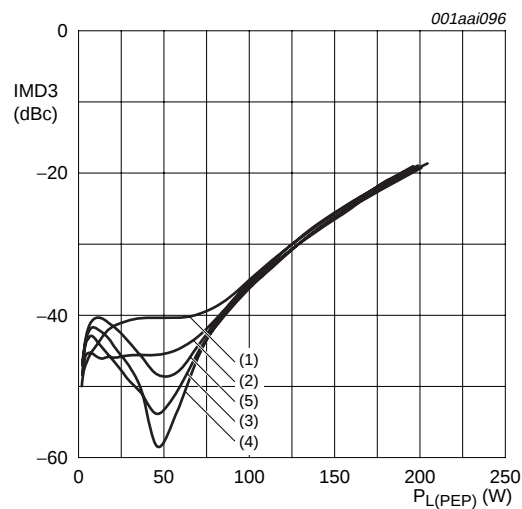
$V_{DS} = 28\text{ V}$; $I_{Dq} = 1100\text{ mA}$; $f_1 = 2169.95\text{ MHz}$; $f_2 = 2170.05\text{ MHz}$.

Fig 2. Two-tone CW power gain and drain efficiency as functions of peak envelope load power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 1100\text{ mA}$; $f_1 = 2169.95\text{ MHz}$; $f_2 = 2170.05\text{ MHz}$.

Fig 3. Intermodulation distortion as a function of peak envelope load power; typical values

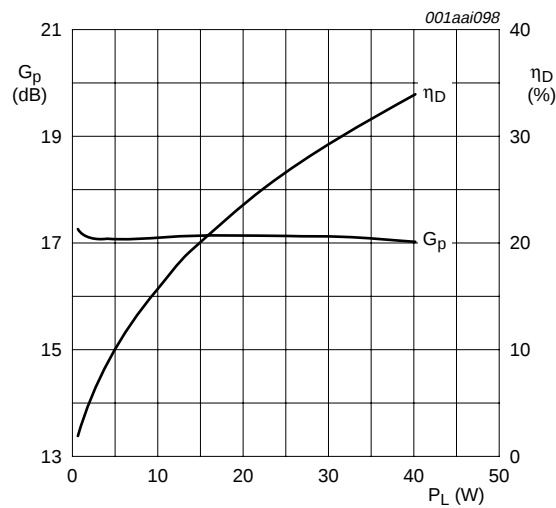


$V_{DS} = 28\text{ V}$; $f_1 = 2169.95\text{ MHz}$; $f_2 = 2170.05\text{ MHz}$.

- (1) $I_{Dq} = 900\text{ mA}$
- (2) $I_{Dq} = 1000\text{ mA}$
- (3) $I_{Dq} = 1100\text{ mA}$
- (4) $I_{Dq} = 1200\text{ mA}$
- (5) $I_{Dq} = 1300\text{ mA}$

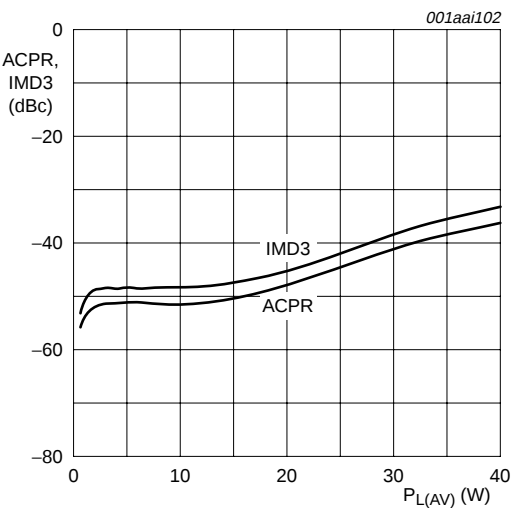
Fig 4. Third order intermodulation distortion as a function of peak envelope load power; typical values

7.4 2-carrier W-CDMA



$V_{DS} = 28\text{ V}$; $I_{DQ} = 1100\text{ mA}$; $f_1 = 2157.5\text{ MHz}$; $f_2 = 2167.5\text{ MHz}$; carrier spacing 10 MHz.

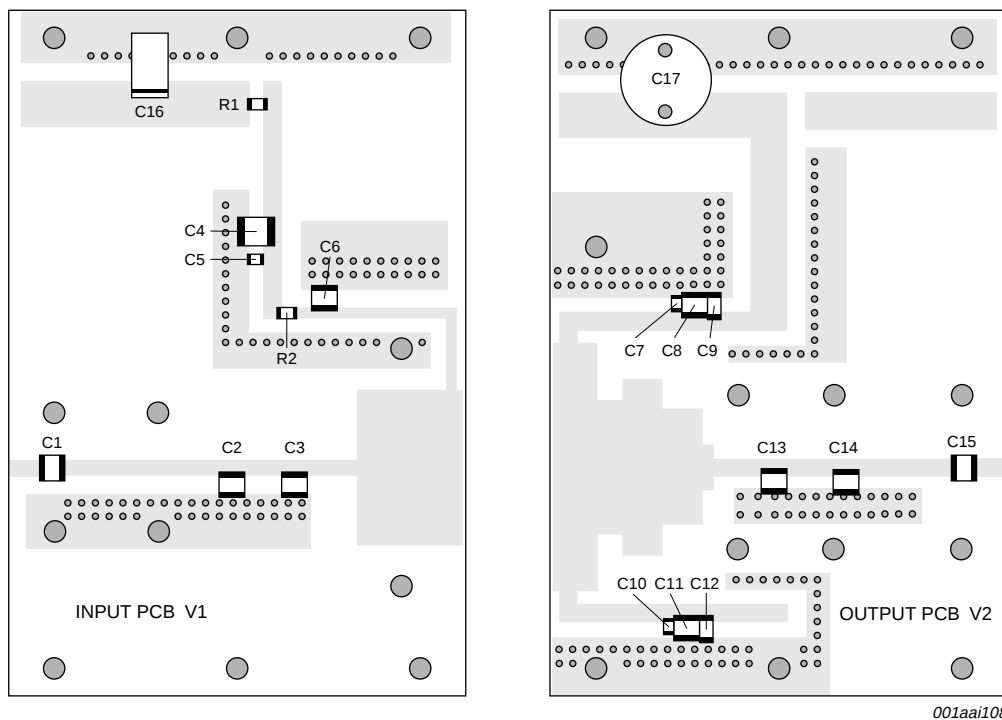
Fig 5. 2-carrier W-CDMA power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28\text{ V}$; $I_{DQ} = 1100\text{ mA}$; $f_1 = 2169.95\text{ MHz}$; $f_2 = 2170.05\text{ MHz}$.

Fig 6. 2-carrier W-CDMA adjacent channel leakage ratio and IMD3 as functions of average load power; typical values

8. Test information



The striplines are on a Rogers RO4350B Printed-Circuit Board (PCB) with $\epsilon_r = 3.48$ and thickness = 0.762 mm.

See [Table 8](#) for list of components.

Fig 7. Component layout for 2110 MHz to 2170 MHz test circuit for 2-carrier W-CDMA

Table 8. List of components (see [Figure 7](#))

All capacitors should be soldered vertically.

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	3.6 pF	[1]
C2	multilayer ceramic chip capacitor	0.3 pF	[1]
C3	multilayer ceramic chip capacitor	1.2 pF	[1]
C4	multilayer ceramic chip capacitor	4.7 pF	TDK C4532X7R1E475M t020U or equivalent
C5, C7, C10	multilayer ceramic chip capacitor	100 nF	Murata GRM217BR71H104KA11L or equivalent
C6, C8, C11	multilayer ceramic chip capacitor	15 pF	[1]
C9, C12	multilayer ceramic chip capacitor	220 nF	AVX12065C224K
C13	multilayer ceramic chip capacitor	1.3 pF	[1]
C14	multilayer ceramic chip capacitor	1.4 pF	[1]
C15	multilayer ceramic chip capacitor	24 pF	[1]
C16	tantalum capacitor	10 μ F	
C17	electrolytic capacitor	220 μ F; 35 V	
R1	chip resistor	4.7 Ω	SMD 0603
R2	chip resistor	2.7 Ω	SMD 0603

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

9. Package outline

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

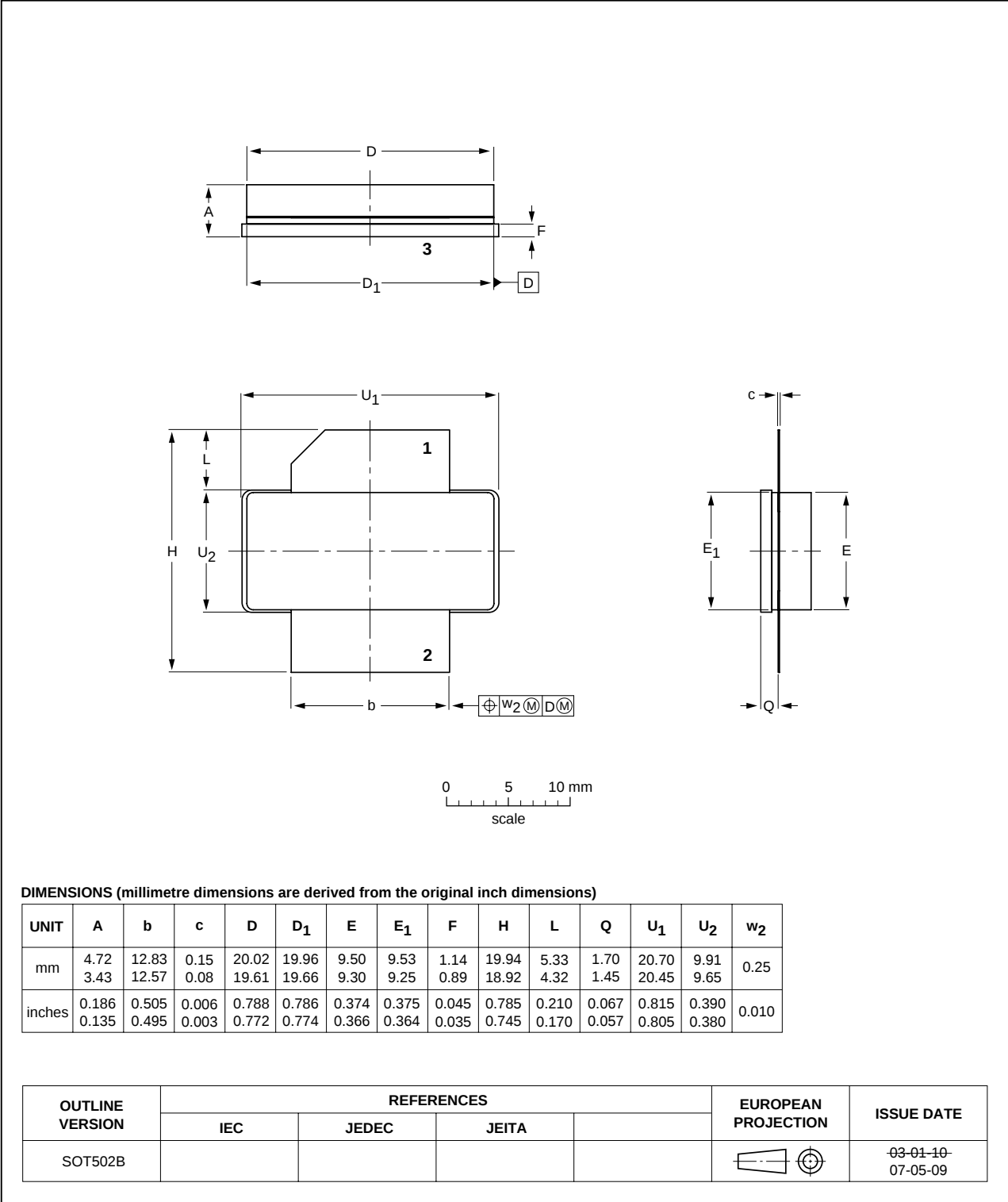


Fig 8. Package outline SOT502B

10. Abbreviations

Table 9. Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
PAR	Peak-to-Average power Ratio
PDPCH	transmission Power of the Dedicated Physical CHannel
RF	Radio Frequency
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G22LS-130_1	20080523	Product 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".

[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.

12.3 Disclaimers

General — 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.

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 medical, military, aircraft, space or life support 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.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

Terms and conditions of 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>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

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.

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

14. Contents

1	Product profile	1
1.1	General description	1
1.2	Features	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	One-tone CW	4
7.3	Two-tone CW	5
7.4	2-carrier W-CDMA	6
8	Test information	7
9	Package outline	8
10	Abbreviations	9
11	Revision history	9
12	Legal information	10
12.1	Data sheet status	10
12.2	Definitions	10
12.3	Disclaimers	10
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'.

founded by

PHILIPS

© NXP B.V. 2008.

All rights reserved.

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

For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 23 May 2008

Document identifier: BLF6G22LS-130_1