

# BLF4G20LS-130

## UHF power LDMOS transistor

Rev. 01 — 1 June 2007

Product data sheet

## 1. Product profile

### 1.1 General description

130 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz.

**Table 1. Typical performance**

$T_{case} = 25\text{ }^{\circ}\text{C}$ ;  $I_{Dq} = 900\text{ mA}$ ; unless otherwise specified; in a class-AB production test circuit.

Mode of operation	f (MHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	P <sub>L(AV)</sub> (W)	G <sub>p</sub> (dB)	$\eta_D$ (%)	ACPR <sub>400</sub> (dBc)	ACPR <sub>600</sub> (dBc)	EVM <sub>rms</sub> (%)	IMD3 (dBc)
CW	1930 to 1990	28	130	-	14.5	50	-	-	-	-
GSM EDGE	1930 to 1990	28	-	60	14.8	36	-62 <sup>[1]</sup>	-73 <sup>[1]</sup>	2.1	-
2-tone	1930 to 1990	28	-	65	14.6	38.5	-	-	-	-30

[1] ACPR<sub>400</sub> and ACPR<sub>600</sub> at 30 kHz resolution bandwidth.

### CAUTION



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

### 1.2 Features

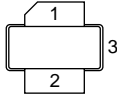
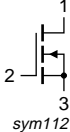
- Typical GSM EDGE performance at frequencies of 1990 MHz, a supply voltage of 28 V and an  $I_{Dq}$  of 900 mA:
  - ◆ Average output power = 60 W
  - ◆ Power gain = 14.8 dB
  - ◆ Efficiency = 36 %
  - ◆ ACPR<sub>400</sub> = -62 dBc
  - ◆ ACPR<sub>600</sub> = -73 dBc
  - ◆ EVM<sub>rms</sub> = 2.1 %
- Easy power control
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use

### 1.3 Applications

- RF power amplifiers for GSM, GSM EDGE and CDMA base stations and multi carrier applications in the 1800 MHz to 2000 MHz frequency range.

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Symbol
1	drain		
2	gate		
3	source		

[1] Connected to flange

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF4G20LS-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	+15	V
$I_D$	drain current		-	15	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	Max	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C};$ $P_L = 50\text{ W}$	0.49	0.58	K/W

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 2.1\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 230\text{ mA}$	2.5	2.9	3.5	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 900\text{ mA}$	2.65	3.15	3.65	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	5	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 6\text{ V};$ $V_{DS} = 10\text{ V}$	35	42	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 15\text{ V}; V_{DS} = 0\text{ V}$	-	-	420	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 7.5\text{ A}$	-	11	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 6\text{ V};$ $I_D = 7.5\text{ A}$	-	0.065	-	$\Omega$
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$	-	3	-	pF

## 7. Application information

**Table 7. Application information**

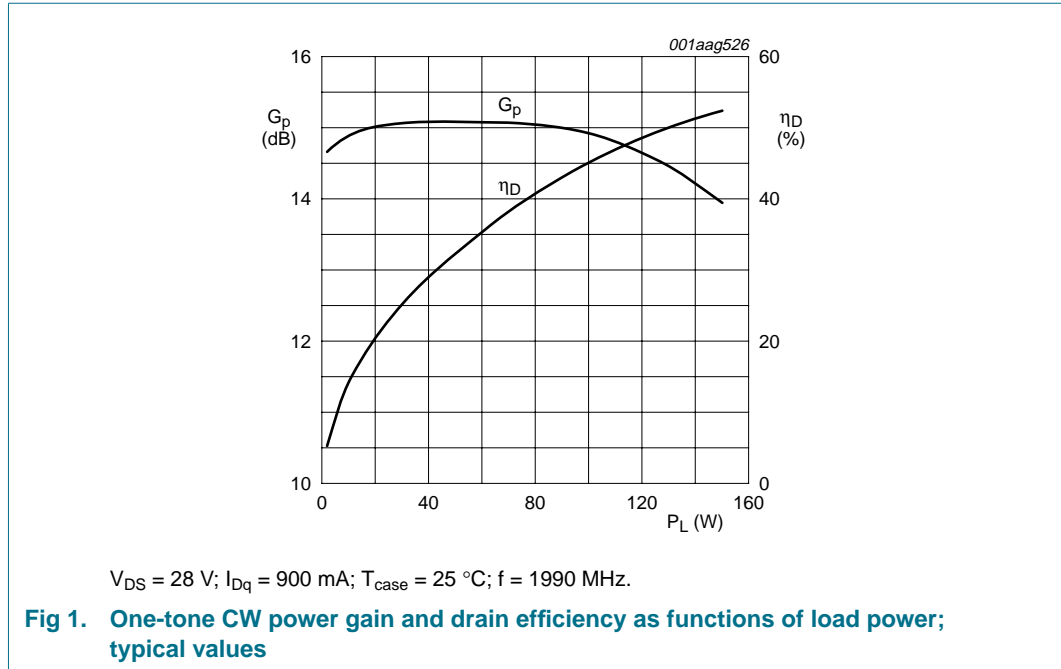
Mode of operation: 2-tone (200 kHz tone spacing);  $f_1 = 1930\text{ MHz}; f_2 = 1990\text{ MHz}; V_{DS} = 28\text{ V};$   
 $I_{Dq} = 900\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(PEP)} = 130\text{ W}$	13	14.6	-	dB
$RL_{in}$	input return loss	$P_{L(PEP)} = 130\text{ W}$	-	-10	-7	dB
$\eta_D$	drain efficiency	$P_{L(PEP)} = 130\text{ W}$	34.5	38.5	-	%
IMD3	third order intermodulation distortion	$P_{L(PEP)} = 130\text{ W}$	-	-30	-27	dBc
IMD5	fifth order intermodulation distortion	$P_{L(PEP)} = 130\text{ W}$	-	-39.5	-35.5	dBc
IMD7	seventh order intermodulation distortion	$P_{L(PEP)} = 130\text{ W}$	-	-58.5	-54	dBc

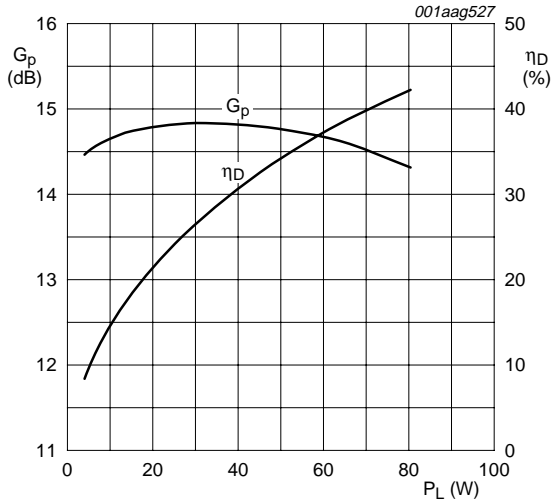
### 7.1 Ruggedness in class-AB operation

The BLF4G20LS-130 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V};$   
 $I_{Dq} = 900\text{ mA}; P_L = 130\text{ W (CW)}; f = 1990\text{ MHz}.$

**7.2 One-tone CW**

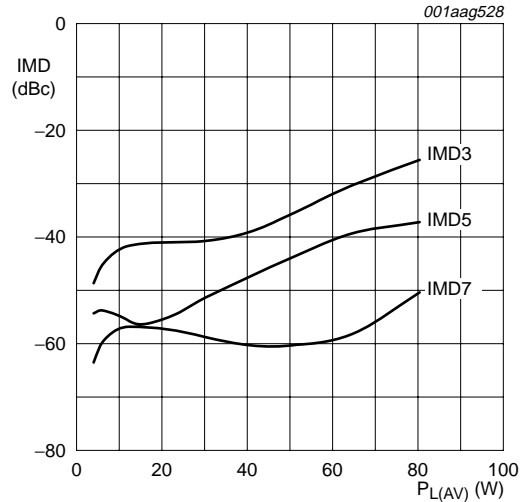


**7.3 Two-tone CW**



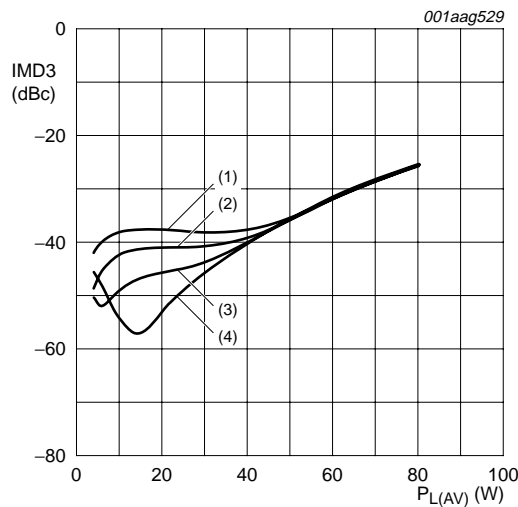
$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 900\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  
 $f = 1990\text{ MHz}$ .

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



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 900\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  
 $f = 1990\text{ MHz}$ .

**Fig 3. Intermodulation distortion as a function of average load power; typical values**

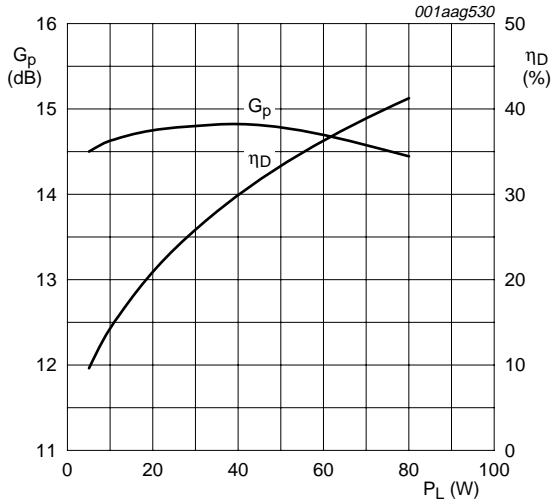


$V_{DS} = 28\text{ V}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  $f = 1990\text{ MHz}$ .

- (1)  $I_{Dq} = 800\text{ mA}$ .
- (2)  $I_{Dq} = 900\text{ mA}$ .
- (3)  $I_{Dq} = 1000\text{ mA}$ .
- (4)  $I_{Dq} = 1100\text{ mA}$ .

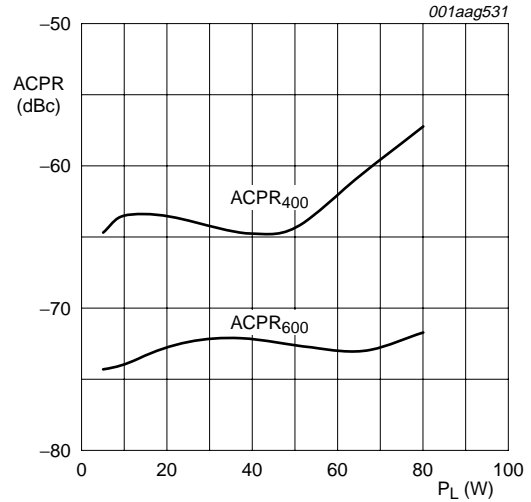
**Fig 4. Third order intermodulation distortion as function of average load power; typical values**

**7.4 GSM EDGE**



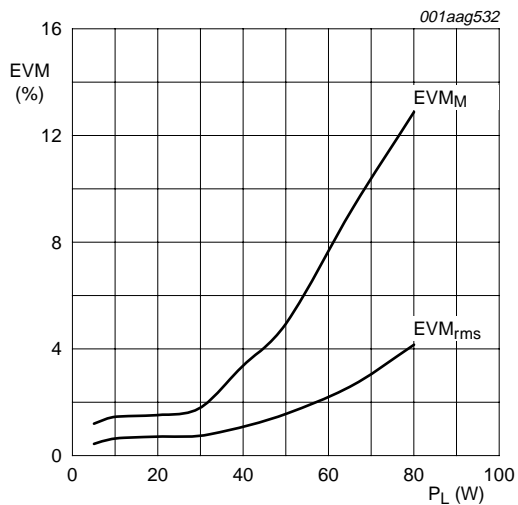
$V_{DS} = 28$  V;  $I_{Dq} = 900$  mA;  $T_{case} = 25$  °C;  
 $f = 1990$  MHz.

**Fig 5. GSM EDGE power gain and drain efficiency as functions of load power; typical values**



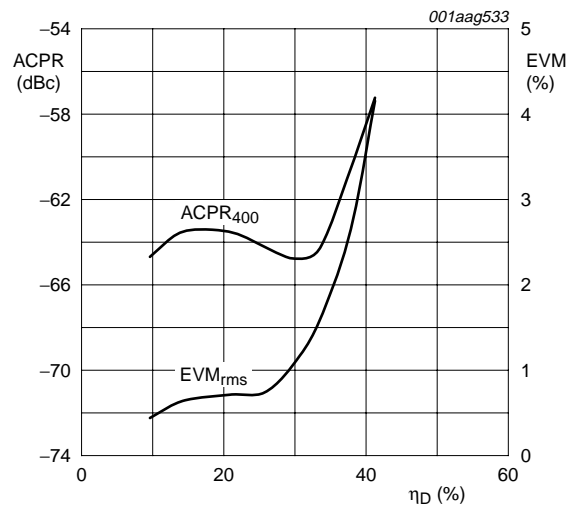
$V_{DS} = 28$  V;  $I_{Dq} = 900$  mA;  $T_{case} = 25$  °C;  
 $f = 1990$  MHz.

**Fig 6. GSM EDGE ACPR at 400 kHz and at 600 kHz as functions of load power; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 850$  mA;  $T_{case} = 25$  °C;  
 $f = 960$  MHz.

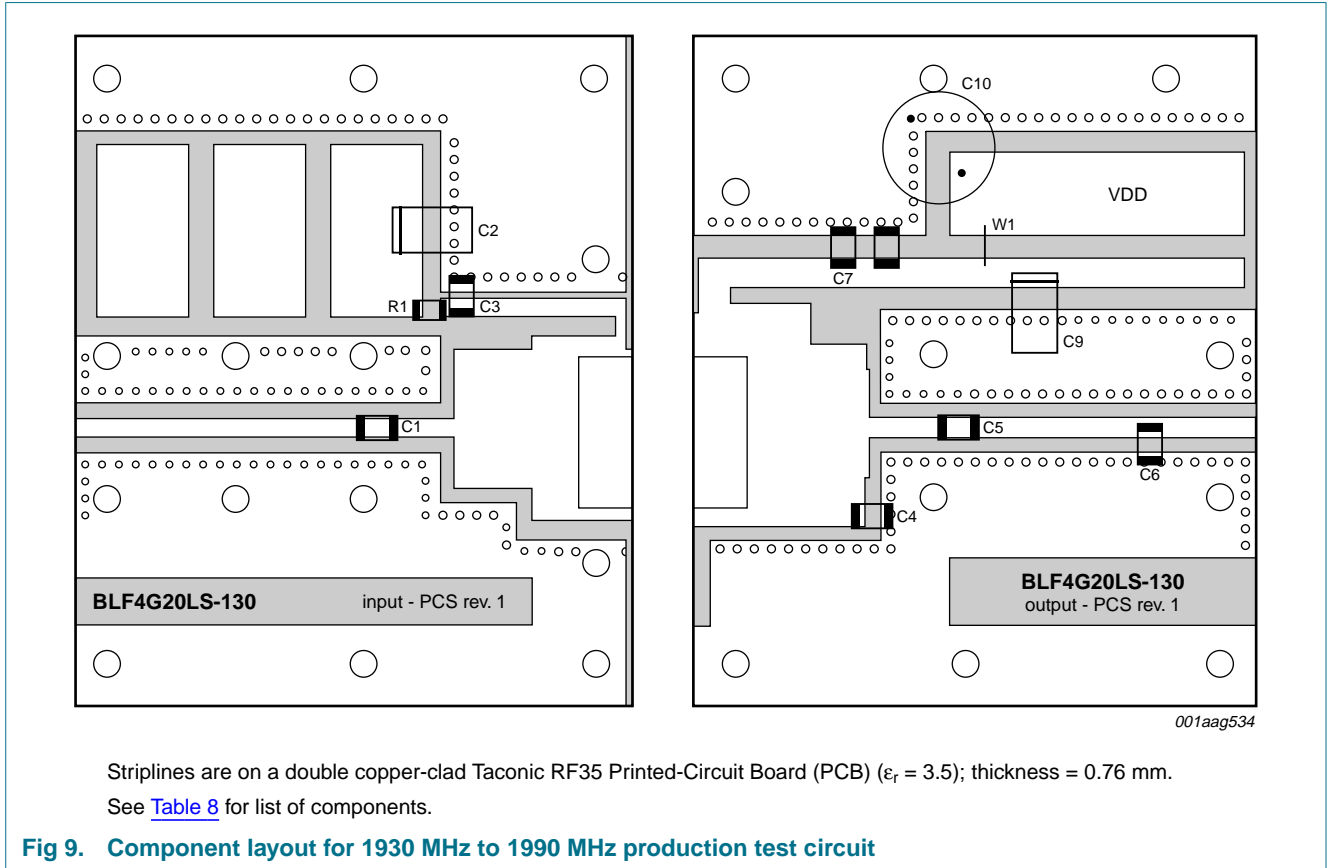
**Fig 7. GSM EDGE rms EVM and peak EVM as functions of load power; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 850$  mA;  $T_{case} = 25$  °C;  
 $f = 960$  MHz.

**Fig 8. GSM EDGE ACPR and rms EVM as functions of drain efficiency; typical values**

**8. Test information**



**Table 8. List of components (see [Figure 9](#))**

Component	Description	Value	Dimensions	Remarks
C1, C3, C5, C7	chip capacitor	11 pF	[1]	
C2, C9	tantalum capacitor	10 $\mu$ F		
C4	chip capacitor	0.8 pF	[1]	
C6	chip capacitor	0.1 pF	[1]	
C8	American Technical Ceramics (ATC) chip capacitor	1 $\mu$ F		1812X7R105KL2AB
C10	Philips electrolytic capacitor	220 $\mu$ F; 35 V		
R1	Philips chip resistor	5.1 $\Omega$	0603	
W1	hand made wire		5 mm	

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

**9. Package outline**

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

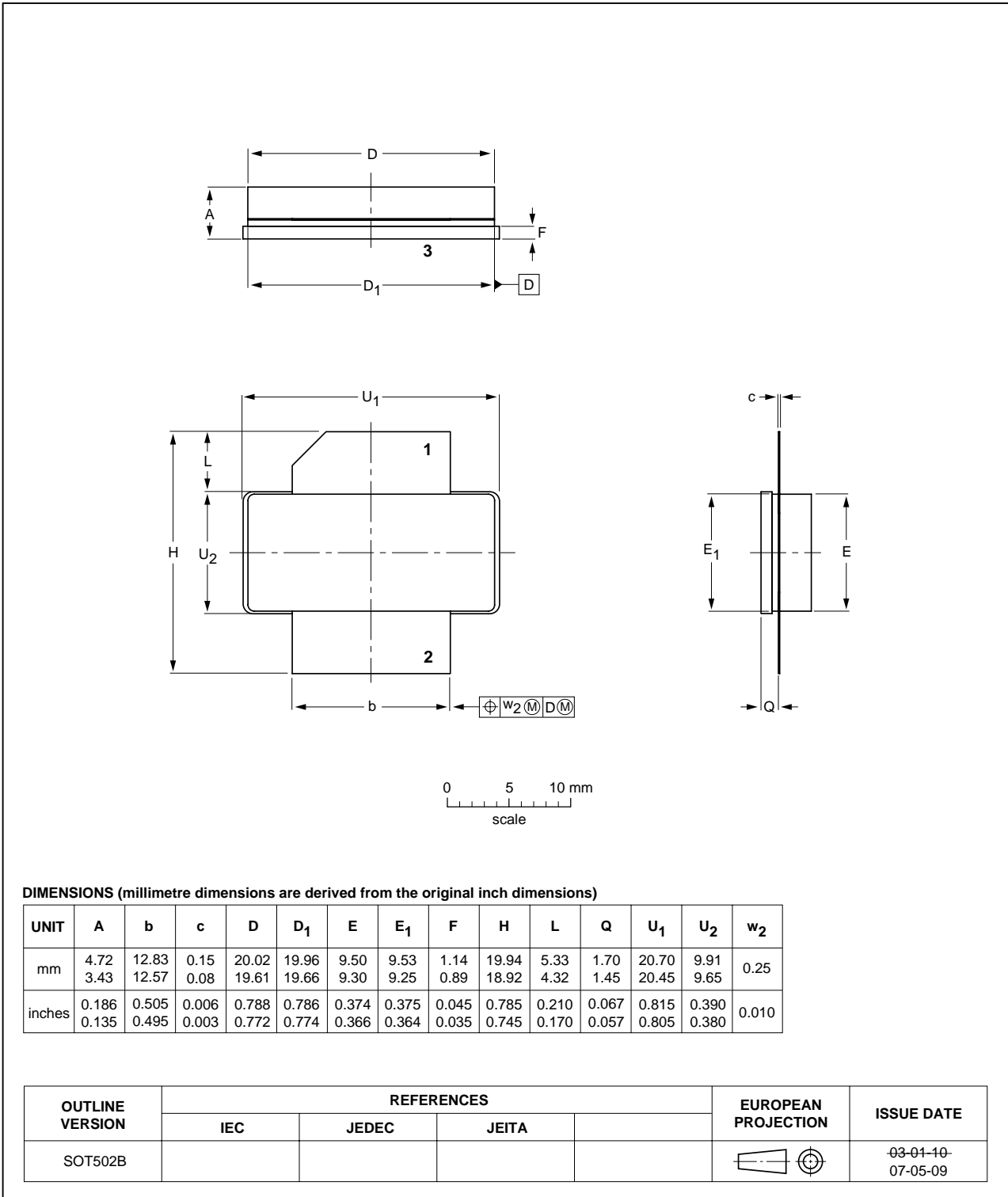


Fig 10. Package outline SOT502B



## 10. Abbreviations

**Table 9. Abbreviations**

Acronym	Description
ACPR	Adjacent Channel Power Ratio
CDMA	Code Division Multiple Access
CW	Continuous Wave
EDGE	Enhanced Data rates for GSM Evolution
EVM	Error Vector Magnitude
GSM	Global System for Mobile communications
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
RMS	Root Mean Square
VSWR	Voltage Standing Wave Ratio

## 11. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF4G20LS-130_1	20070601	Product 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.

### 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 a 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 additional information, please visit: <http://www.nxp.com>

For sales office addresses, 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 . . . . . 1

1.3 Applications . . . . . 2

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

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

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

**5 Thermal characteristics . . . . . 3**

**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 GSM EDGE . . . . . 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'.



© NXP B.V. 2007.

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: 1 June 2007

Document identifier: BLF4G20LS-130\_1