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 °C; I_{Dq} = 900 mA; unless otherwise specified; in a class-AB production test circuit.

Mode of operation	f (MHz)	V_{DS} (V)	P_L (W)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	$ACPR_{400}$ (dBc)	$ACPR_{600}$ (dBc)	EVM_{rms} (%)	IMD3 (dBc)
CW	1930 to 1990	28	130	-	14.5	50	-	-	-	-
GSM EDGE	1930 to 1990	28	-	60	14.8	36	–62[1]	–73[1]	2.1	-
2-tone	1930 to 1990	28	-	65	14.6	38.5	-	-	-	–30

[1] $ACPR_{400}$ and $ACPR_{600}$ 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 %
  - $ACPR_{400}$ = –62 dBc
  - $ACPR_{600}$ = –73 dBc
  - EVM_{rms} = 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

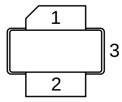
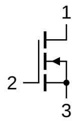
founded by Philips

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		 sym112
2	gate		
3	source [1]		

[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
$R_{th(j\text{-}case)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 50 W	0.49	0.58	K/W

6. Characteristics

Table 6. Characteristics

T_j = 25 °C unless otherwise specified.

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

7. Application information

Table 7. Application information

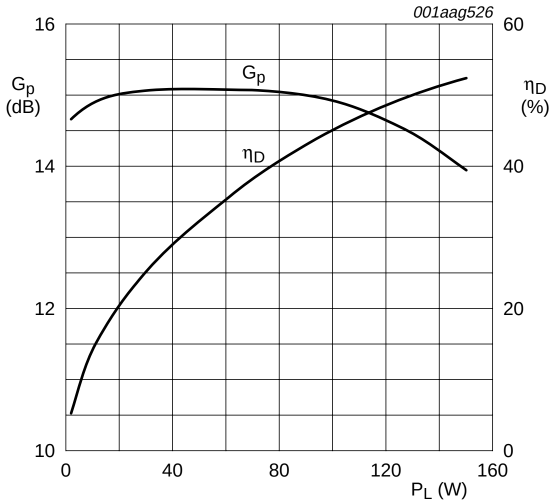
Mode of operation: 2-tone (200 kHz tone spacing); f_1 = 1930 MHz; f_2 = 1990 MHz; V_{DS} = 28 V; I_{Dq} = 900 mA; T_{case} = 25 °C; unless otherwise specified.

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

7.1 Ruggedness in class-AB operation

The BLF4G20LS-130 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} = 900 mA; P_L = 130 W (CW); f = 1990 MHz.

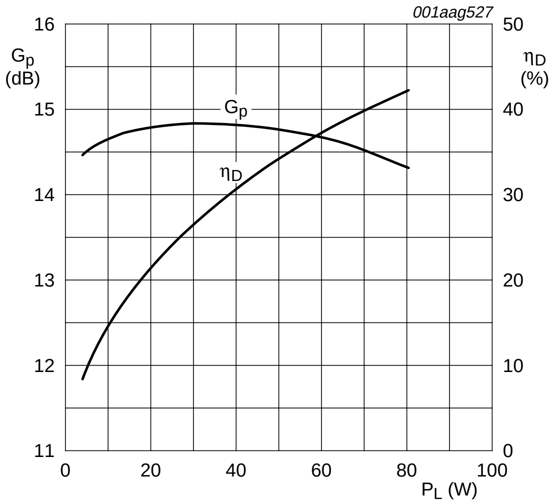
7.2 One-tone CW



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

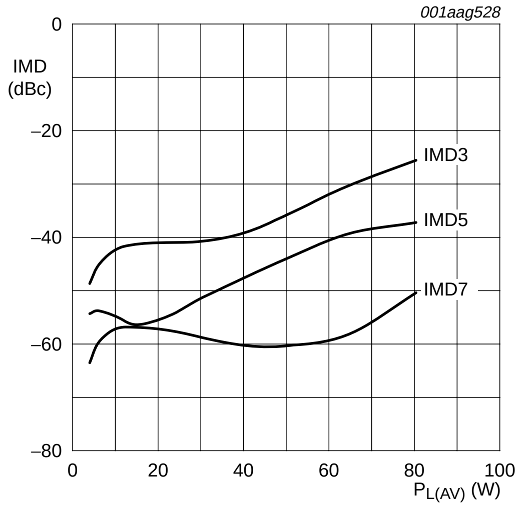
Fig 1. One-tone CW power gain and drain efficiency as functions of load power; typical values

7.3 Two-tone CW



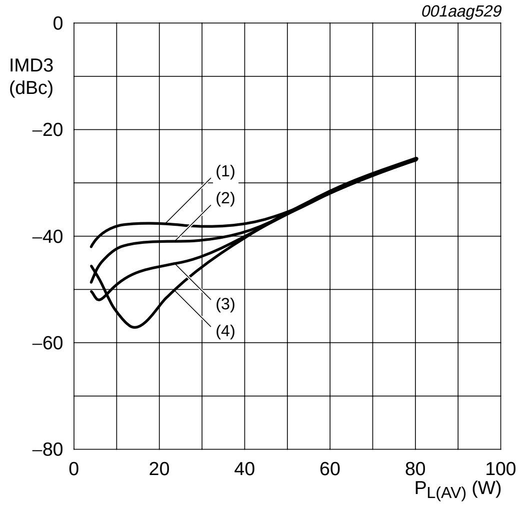
V_{DS} = 28 V; I_{Dq} = 900 mA; T_{case} = 25 °C;
f = 1990 MHz.

Fig 2. Two-tone CW 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 3. Intermodulation distortion as a function of average load power; typical values



V_{DS} = 28 V; T_{case} = 25 °C; f = 1990 MHz.

(1) I_{Dq} = 800 mA.

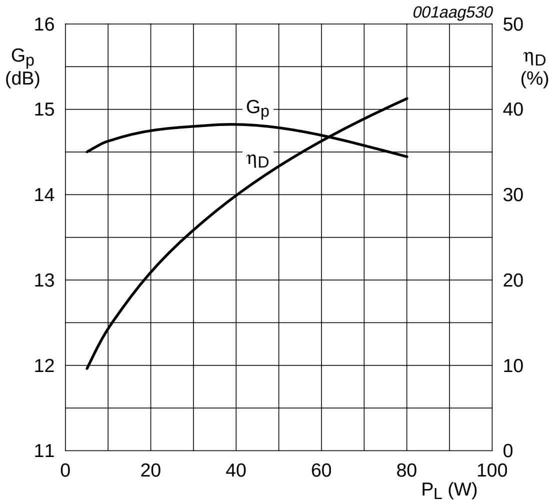
(2) I_{Dq} = 900 mA.

(3) I_{Dq} = 1000 mA.

(4) I_{Dq} = 1100 mA.

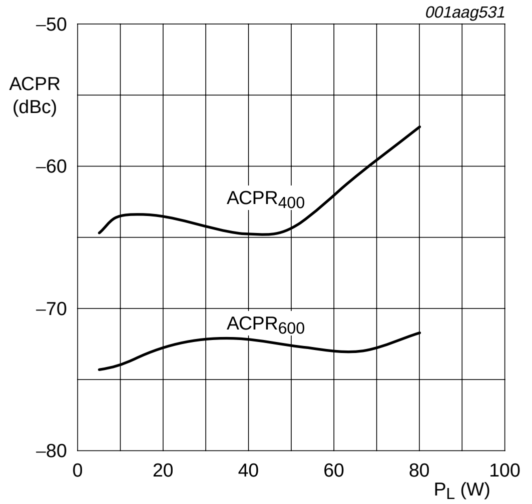
Fig 4. Third order intermodulation distortion as function of average load power; typical values

7.4 GSM EDGE



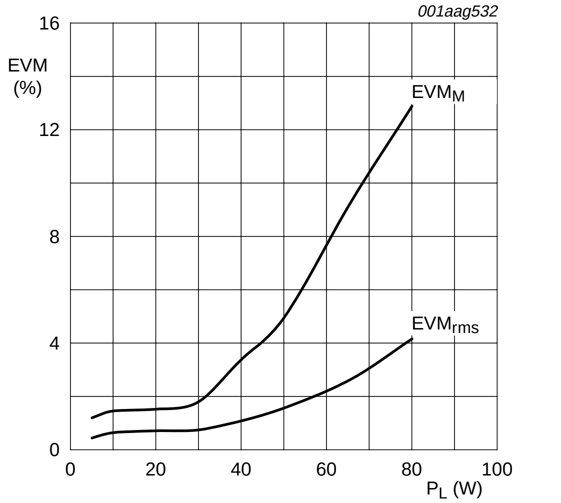
V_{DS} = 28 V; I_{Dq} = 900 mA; T_{case} = 25 °C;
f = 1990 MHz.

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



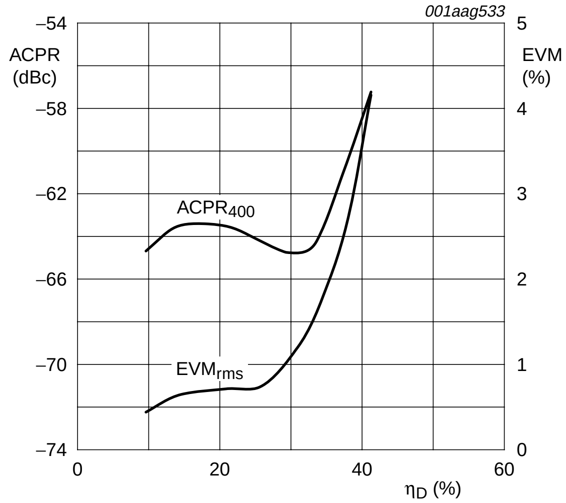
V_{DS} = 28 V; I_{Dq} = 900 mA; T_{case} = 25 °C;
f = 1990 MHz.

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.

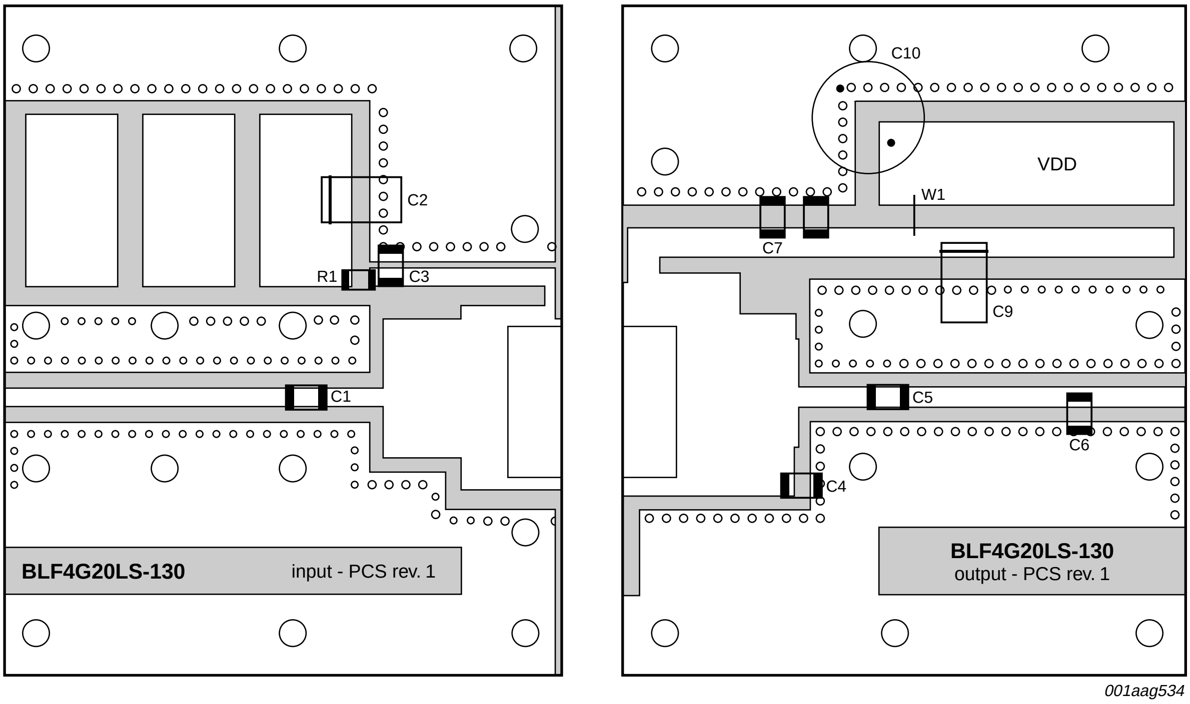
Fig 7. GSM EDGE rms EVM and peak EVM as functions of load power; typical values



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



Striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) (ε_r = 3.5); thickness = 0.76 mm.

See Table 8 for list of components.

Fig 9. Component layout for 1930 MHz to 1990 MHz production test circuit

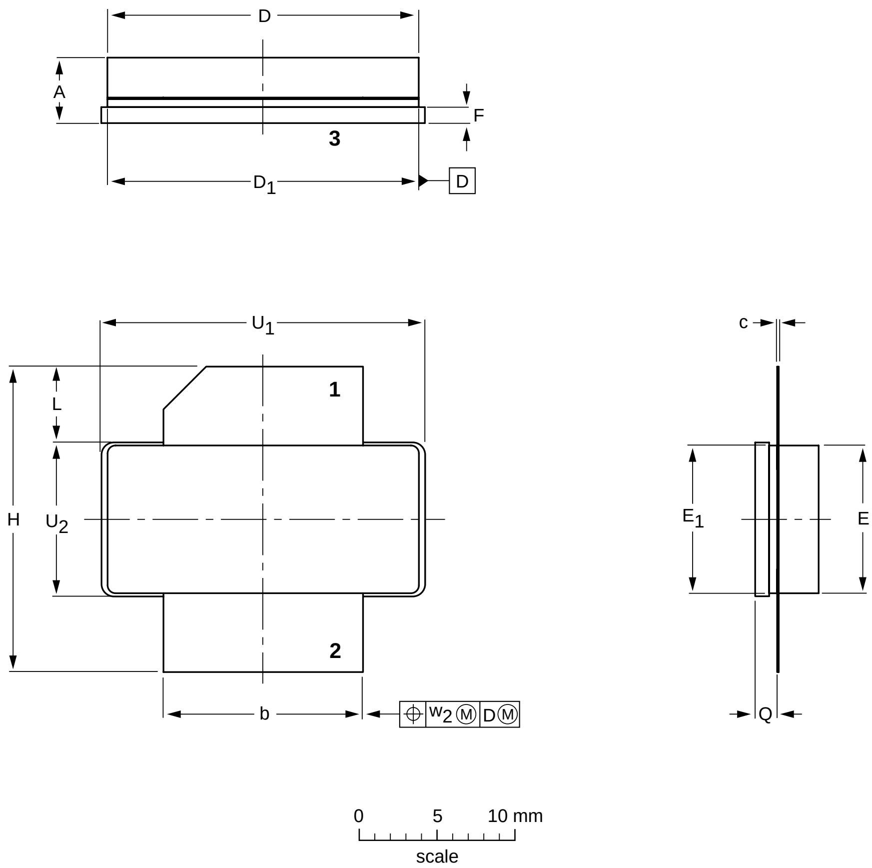
Table 8. List of components (see Figure 9)

Component	Description	Value		Dimensions	Remarks
C1, C3, C5, C7	chip capacitor	11 pF	[1]		
C2, C9	tantalum capacitor	10 µF			
C4	chip capacitor	0.8 pF	[1]		
C6	chip capacitor	0.1 pF	[1]		
C8	American Technical Ceramics (ATC) chip capacitor	1 µF			1812X7R105KL2AB
C10	Philips electrolytic capacitor	220 µF; 35 V			
R1	Philips chip resistor	5.1 Ω		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**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	1.70 1.45	20.70 20.45	9.91 9.65	0.25
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						~~03-01-10~~ 07-05-09

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[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 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**

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

founded by PHILIPS

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 1 June 2007

Document identifier: BLF4G20LS-130_1