BLF4G20-110B; BLF4G20S-110B

UHF power LDMOS transistor

Rev. 01 — 23 January 2006

Product data sheet

1. Product profile

1.1 General description

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

Table 1: Typical performance

f = 1930 MHz to 1990 MHz; T_{case} *= 25 °C; in a class-AB production test circuit.*

Mode of operation	V_{DS} (V)	P_L (W)	G_p (dB) (typ)	η_D (%) (typ)	$ACPR_{400}$ (dBc) (typ)	$ACPR_{600}$ (dBc) (typ)	EVM_{rms} (%) (typ)
CW	28	100	13.4	49	-	-	-
GSM EDGE	28	48 (AV)	13.8	38.5	–61 [1]	–74 [2]	2.1

[1] $ACPR_{400}$ at 30 kHz resolution bandwidth.

[2] $ACPR_{600}$ 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 a frequency of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I_{Dq} of 650 mA:
  - Load power = 48 W (AV)
  - Gain = 13.8 dB (typ)
  - Efficiency = 38.5 % (typ)
  - $ACPR_{400}$ = –61 dBc (typ)
  - $ACPR_{600}$ = –74 dBc (typ)
  - EVM_{rms} = 2.1 % (typ)
- Easy power control
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)

PHILIPS

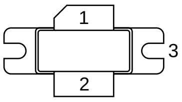
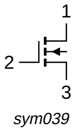
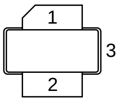
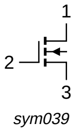
- Internally matched for ease of use

1.3 Applications

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

2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
BLF4G20-110B (SOT502A)			
1	drain		
2	gate		
3	source [1]		
BLF4G20S-110B (SOT502B)			
1	drain		
2	gate		
3	source [1]		

[1] Connected to flange

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BLF4G20-110B	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF4G20S-110B	-	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	Min	Max	Unit
V_{DS}	drain-source voltage	-	65	V
V_{GS}	gate-source voltage	–0.5	+15	V
I_D	drain current	-	12	A
T_{stg}	storage temperature	–65	+150	°C
T_j	junction temperature	-	200	°C

5. Thermal characteristics

Table 5: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j\text{-}case)}$	thermal resistance from junction to case	T_{case} = 80 °C				
		P_L = 40 W	-	0.76	0.85	K/W
		P_L = 100 W	-	0.65	0.74	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 = 0.9 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	2.5	3.1	3.5	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 900 mA	2.7	3.2	3.7	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	3	µA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 6 V; V_{DS} = 10 V	27	30	-	A
I_{GSS}	gate leakage current	V_{GS} = 15 V; V_{DS} = 0 V	-	-	300	nA
g_{fs}	transfer conductance	V_{DS} = 10 V; I_D = 10 A	-	9.0	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 6 V; I_D = 6 A	-	90	-	mΩ
C_{rs}	feedback capacitance	V_{GS} = 0 V; V_{DS} = 28 V; f = 1 MHz	-	2.5	-	pF

7. Application information

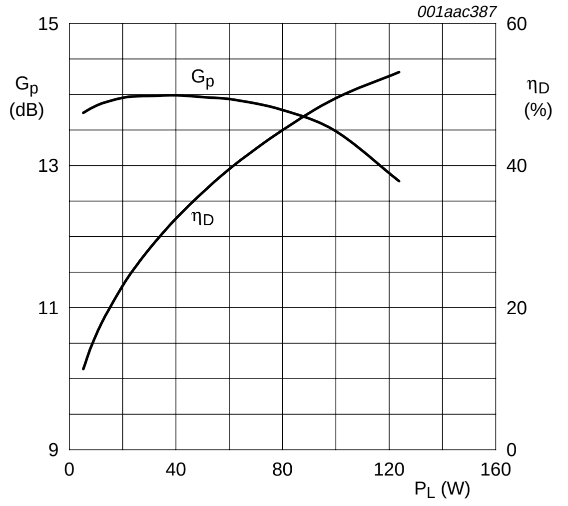
Table 7: Application information

Mode of operation: Two-tone (200 kHz tone spacing); f = 1930 MHz and 1990 MHz.
V_{DS} = 28 V; I_{Dq} = 700 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 100 W	12	13.5	-	dB
IRL	input return loss	$P_{L(AV)}$ = 100 W	-	–10	–6.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 100 W	36	38.5	-	%
IMD3	third order intermodulation distortion	$P_{L(AV)}$ = 100 W	-	–29	–26	dBc
IMD5	fifth order intermodulation distortion	$P_{L(AV)}$ = 100 W	-	–39.5	–36.5	dBc
IMD7	seventh order intermodulation distortion	$P_{L(AV)}$ = 100 W	-	–53.5	–50.5	dBc

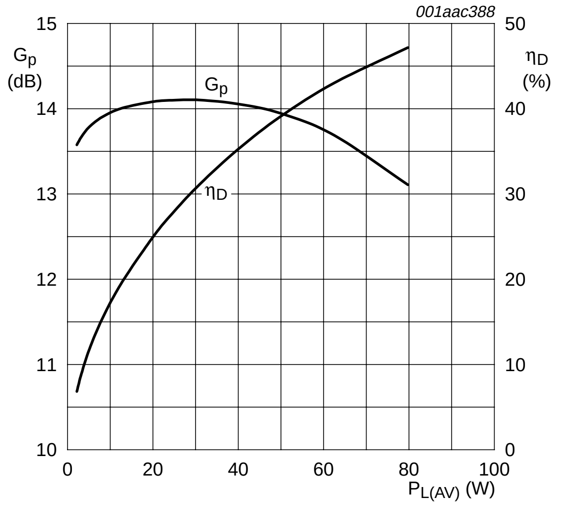
7.1 Ruggedness in class-AB operation

The BLF4G20(S)-110B 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} = 650 mA; P_L = 110 W (CW); f = 1990 MHz.



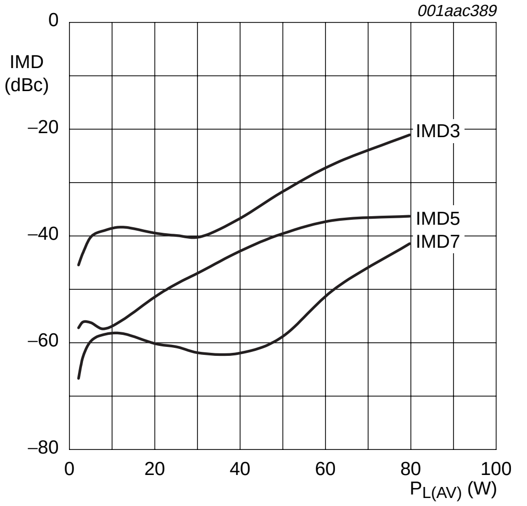
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

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



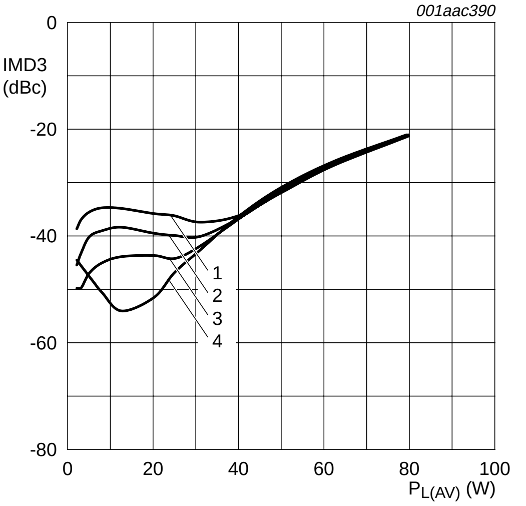
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

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



V_{DS} = 28 V; I_{Dq} = 650 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

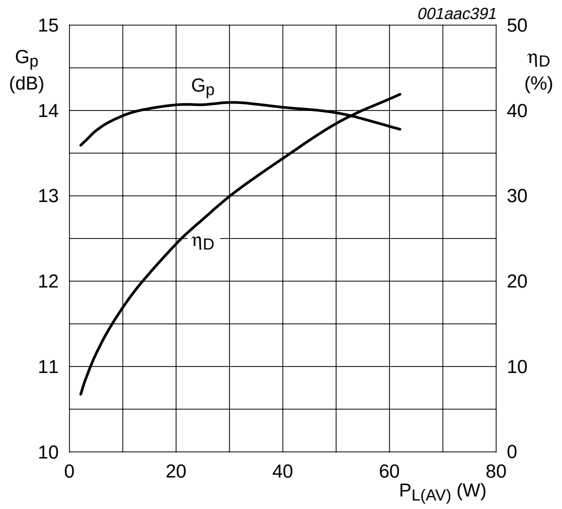
(1) I_{Dq} = 550 mA

(2) I_{Dq} = 650 mA

(3) I_{Dq} = 750 mA

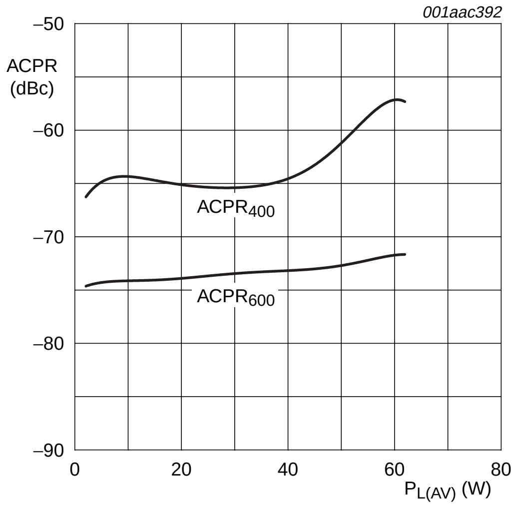
(4) I_{Dq} = 850 mA

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



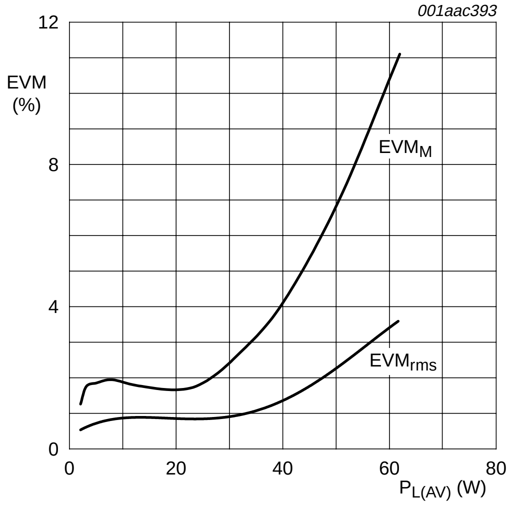
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

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



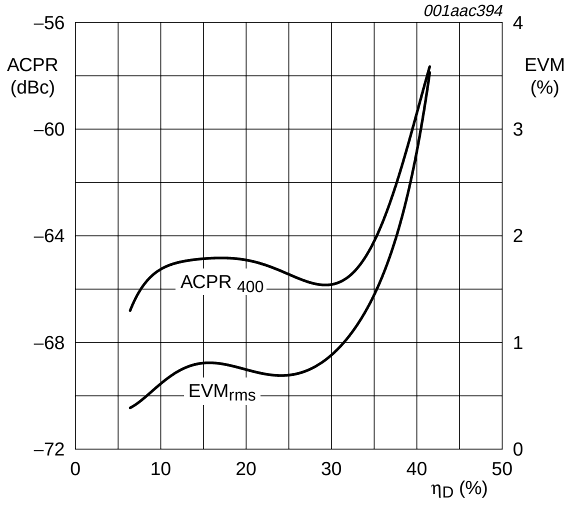
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

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



V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

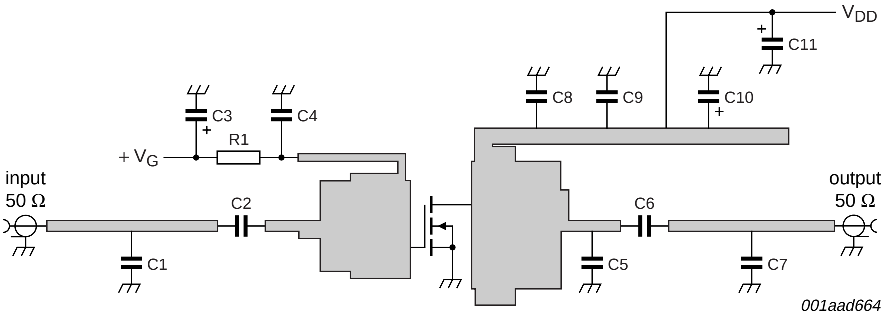
Fig 7. **GSM EDGE rms EVM and peak EVM as functions of average load power; typical values**



V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

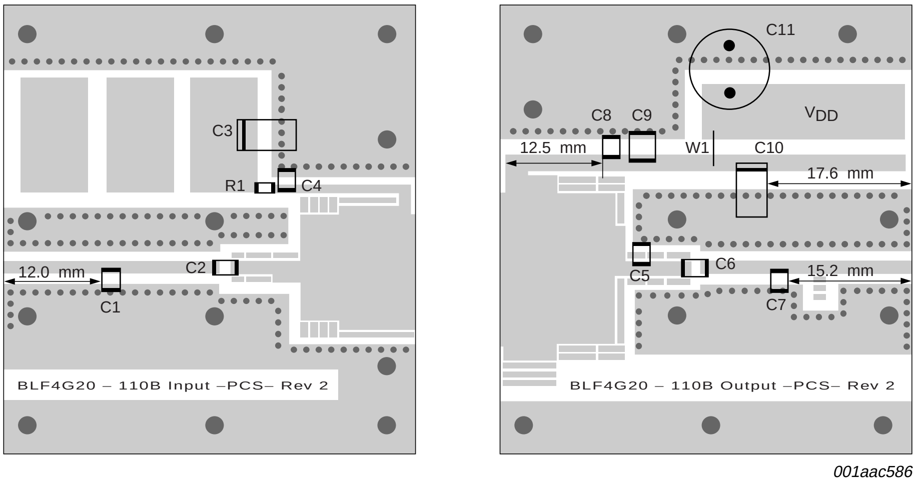
Fig 8. **GSM EDGE ACPR at 400 kHz and rms EVM as functions of drain efficiency; typical values**

8. Test information



See Table 8 for list of components.

Fig 9. Test circuit for operation at 1990 MHz



Striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) ($\varepsilon_r = 3.5$), thickness = 0.76 mm.

See Table 8 for list of components.

Fig 10. Component layout for 1990 MHz test circuit

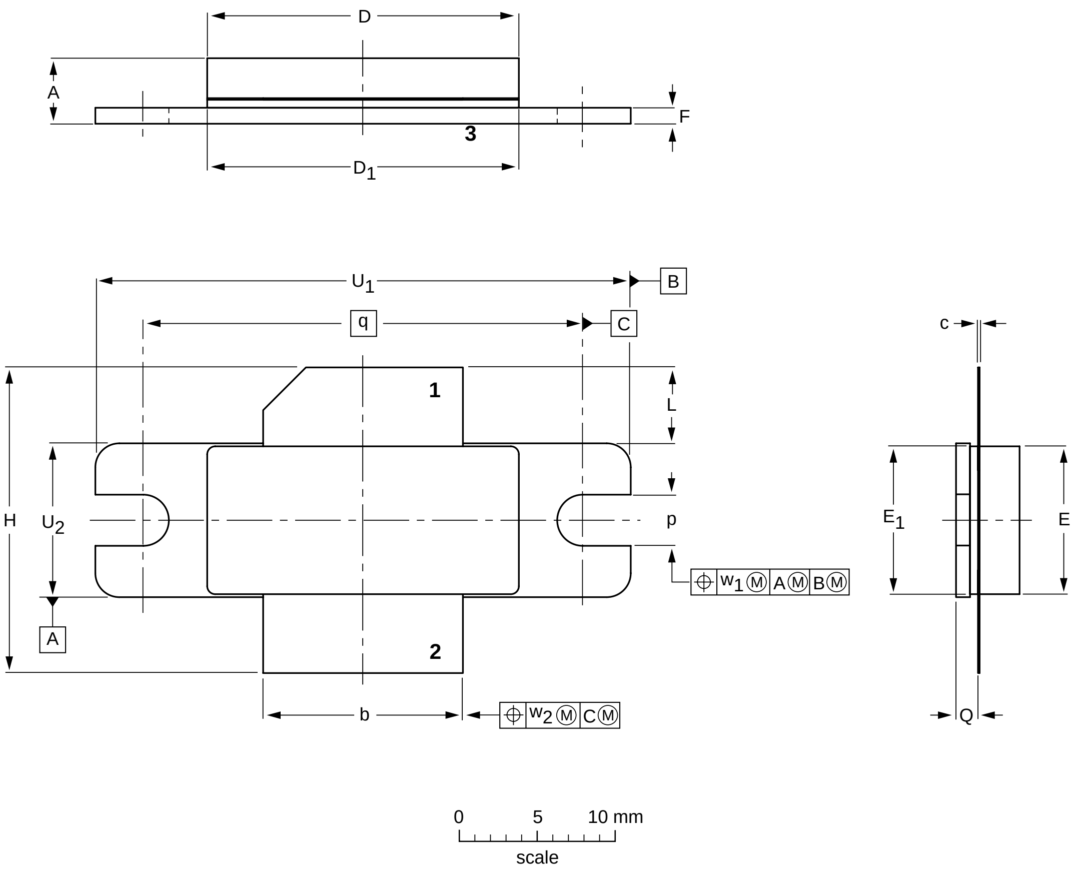
Table 8: List of components (see Figure 9 and 10).

Component	Description		Value	Dimensions	Catalogue number
C1	multilayer ceramic chip capacitor	[1]	0.1 pF		
C2, C4, C8	multilayer ceramic chip capacitor	[1]	11 pF		
C3, C10	multilayer ceramic chip capacitor		10 μF		
C5	multilayer ceramic chip capacitor	[1]	0.5 pF		
C6	multilayer ceramic chip capacitor	[1]	8.2 pF		
C7	multilayer ceramic chip capacitor	[1]	0.2 pF		
C9	multilayer ceramic chip capacitor	[1]	1 μF		1812X7R105KL2AB
C11	Philips electrolytic capacitor		220 μF; 35 V		
R1	Philips chip resistor		5.6 Ω	0603	
W1	hand made wire			5 mm	

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

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads **SOT502A**



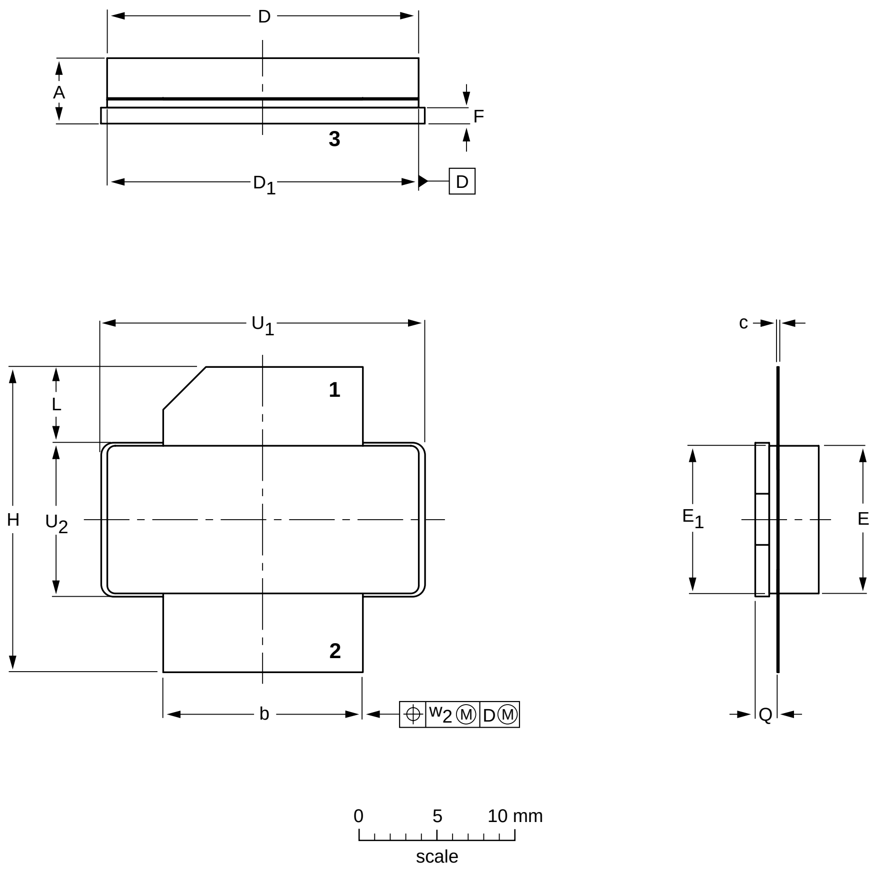
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	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	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
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	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						~~99-12-28~~ 03-01-10

Fig 11. Package outline SOT502A

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						~~99-12-28~~ 03-01-10

Fig 12. Package outline SOT502B

10. Abbreviations

Table 9: List of abbreviations

Abbreviation	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
I_{Dq}	quiescent drain current
LDMOS	Laterally Diffused Metal Oxide Semiconductor
PEP	Peak Envelope Power
RF	Radio Frequency
VSWR	Voltage Standing Wave Ratio

11. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BLF4G20-110B_4G20S-110B_1	20060123	Product data sheet	-	6397 750 14611	-

12. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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

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17. Contents

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