

BLF4G20LS-110B

UHF power LDMOS transistor

Rev. 01 — 10 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

$f = 1930\text{ MHz to }1990\text{ MHz}$; $T_{case} = 25\text{ }^{\circ}\text{C}$; $I_{Dq} = 650\text{ mA}$; unless otherwise specified; in a class-AB production test circuit; typical values

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

[1] ACPR₄₀₀ at 30 kHz resolution bandwidth.

[2] ACPR₆₀₀ 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

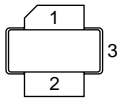
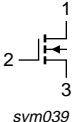
- Typical GSM EDGE performance at a frequency of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I_{Dq} of 650 mA:
 - ◆ Load power = 48 W (AV)
 - ◆ Gain = 13.8 dB (typ)
 - ◆ Efficiency = 38.5 % (typ)
 - ◆ ACPR₄₀₀ = -61 dBc (typ)
 - ◆ ACPR₆₀₀ = -74 dBc (typ)
 - ◆ EVM_{rms} = 2.1 % (typ)
- Easy power control
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- 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
1	drain		 sym039
2	gate		
3	source		

[1] Connected to flange

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BLF4G20LS-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	Conditions	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
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}$				
		$P_L = 40\text{ W}$	-	0.62	0.71	K/W
		$P_L = 100\text{ W}$	-	0.52	0.61	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	$V_{GS} = 0\text{ V}; I_D = 0.9\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	2.5	3.1	3.5	V
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 900\text{ mA}$	2.7	3.2	3.7	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	3	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 6\text{ V};$ $V_{DS} = 10\text{ V}$	27	30	-	A
I_{GSS}	gate leakage current	$V_{GS} = \pm 15\text{ V}; V_{DS} = 0\text{ V}$	-	-	300	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 10\text{ A}$	-	9.0	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 6\text{ V};$ $I_D = 6\text{ A}$	-	90	-	$\text{m}\Omega$
C_{rs}	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$	-	2.5	-	pF

7. Application information

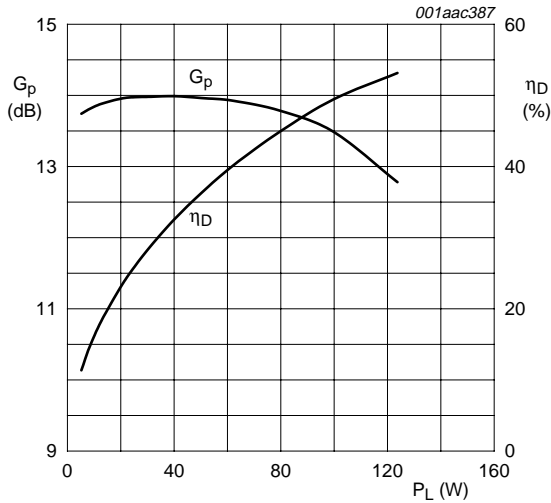
Table 7: Application information

Mode of operation: GSM EDGE; $f = 1930\text{ MHz}$ and 1990 MHz ; RF performance at $V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25^\circ\text{C}$; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)} = 48\text{ W}$	13	13.8	-	dB
IRL	input return loss	$P_{L(AV)} = 48\text{ W}$	-	-10	-6.5	dB
η_D	drain efficiency	$P_{L(AV)} = 48\text{ W}$	36	38.5	-	%
$ACPR_{400}$	adjacent channel power ratio (400 kHz)	$P_{L(AV)} = 48\text{ W}$	-	-61	-58	dBc
$ACPR_{600}$	adjacent channel power ratio (600 kHz)	$P_{L(AV)} = 48\text{ W}$	-	-74	-71	dBc
EVM_{rms}	rms EDGE signal distortion error	$P_{L(AV)} = 48\text{ W}$	-	2.1	3.3	%
EVM_M	peak EDGE signal distortion error	$P_{L(AV)} = 48\text{ W}$	-	7.0	10	%

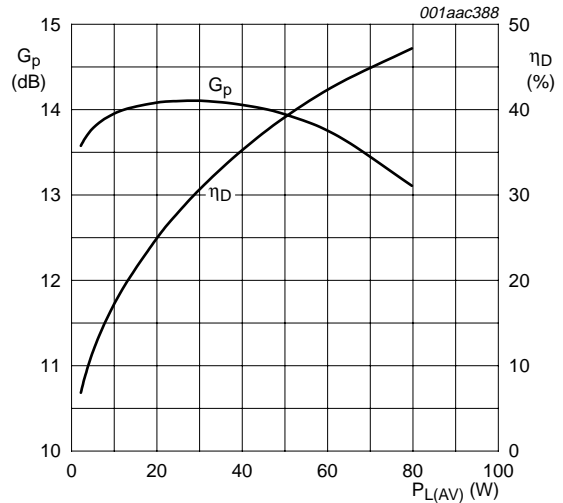
7.1 Ruggedness in class-AB operation

The BLF4G20LS-110B is capable of withstanding a load mismatch corresponding to $V_{SWR} = 10 : 1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $P_L = 110\text{ W}$ (CW); $f = 1990\text{ MHz}$.



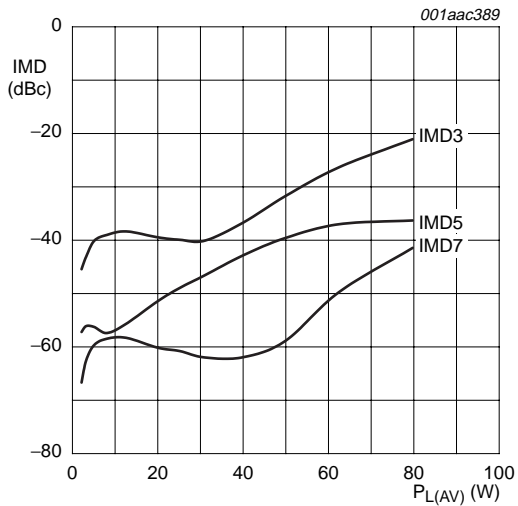
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

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



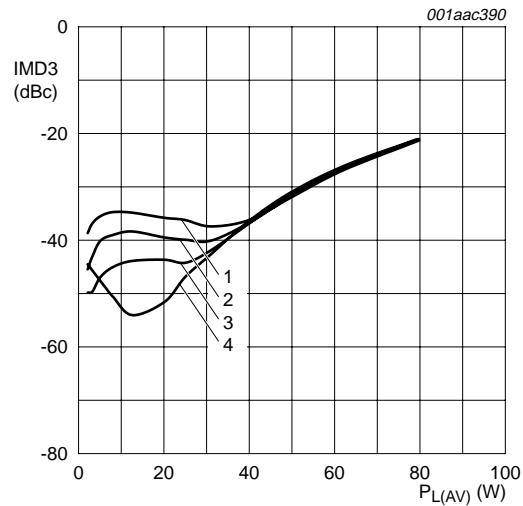
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

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



$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

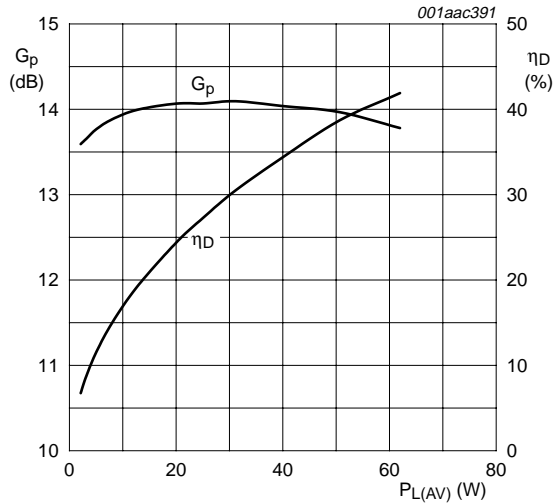
Fig 3. Intermodulation distortion as a function of average load power; typical values



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

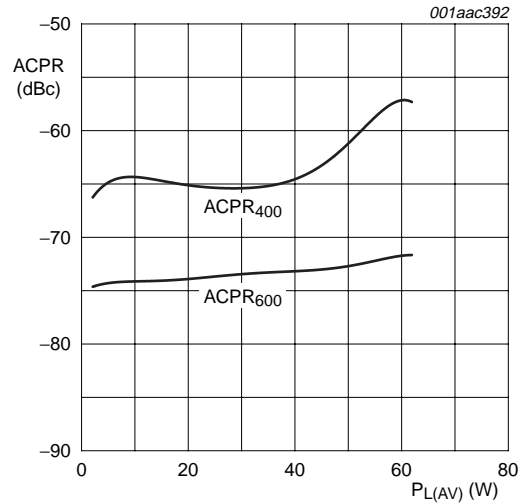
- (1) $I_{Dq} = 550\text{ mA}$
- (2) $I_{Dq} = 650\text{ mA}$
- (3) $I_{Dq} = 750\text{ mA}$
- (4) $I_{Dq} = 850\text{ mA}$

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



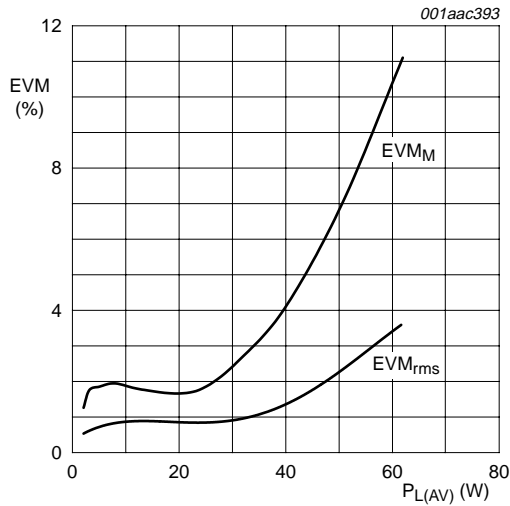
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

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



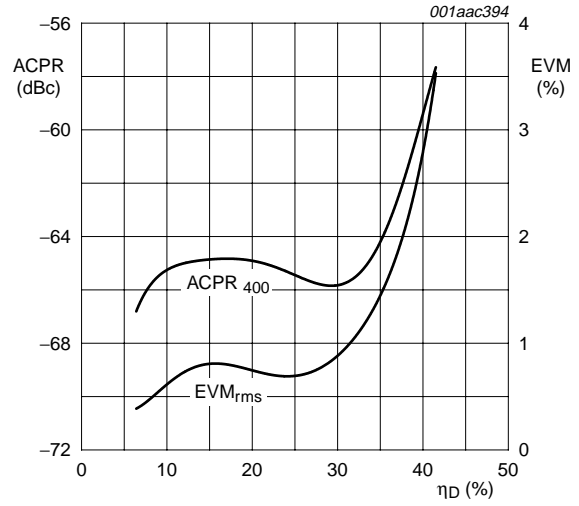
$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

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



$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

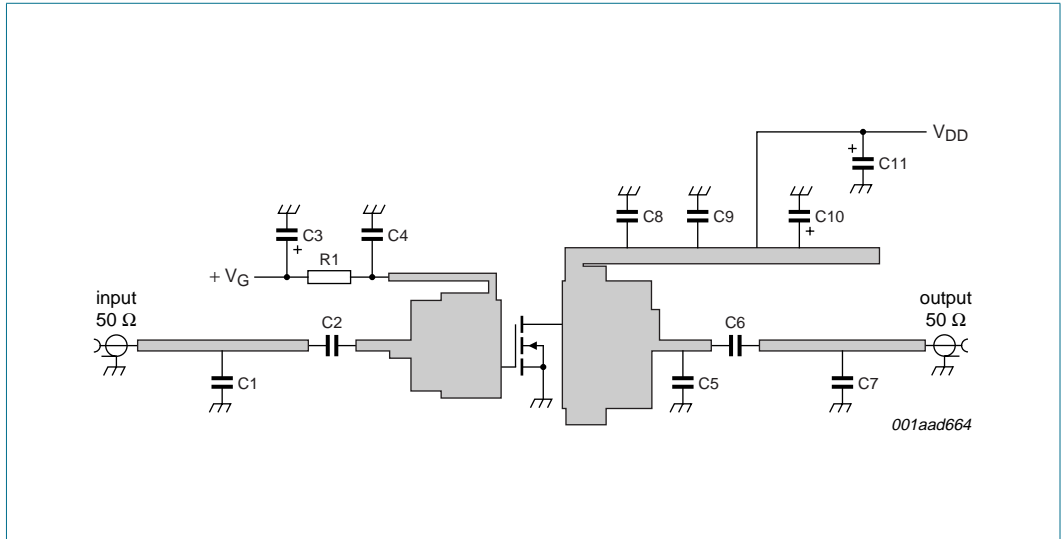
Fig 7. GSM EDGE rms EVM and peak EVM as functions of average load power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 650\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$;
 $f = 1990\text{ MHz}$

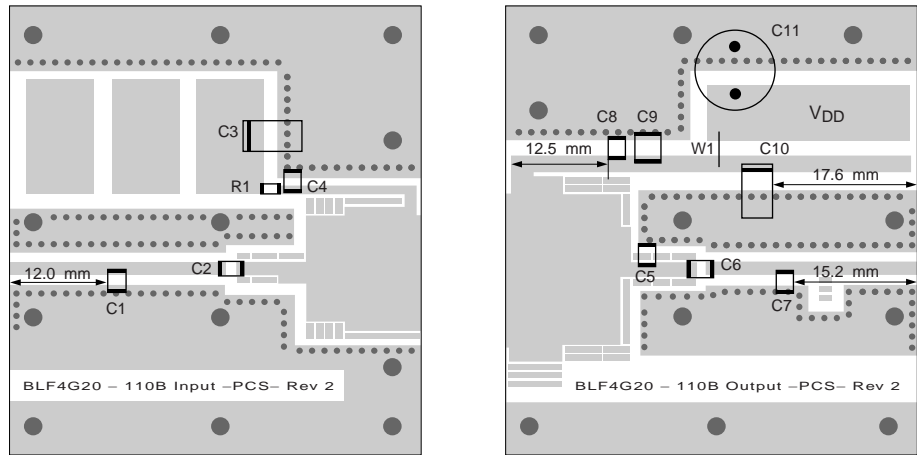
Fig 8. GSM EDGE ACPR at 400 kHz and rms EVM as functions of drain efficiency; typical values

8. Test information



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

Fig 9. Test circuit for operation at 1990 MHz



The striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with $\epsilon_r = 3.5$ and 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 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	tantalum capacitor	10 μ F		
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 μ F		1812X7R105KL2AB
C11	Philips electrolytic capacitor	220 μ F; 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

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

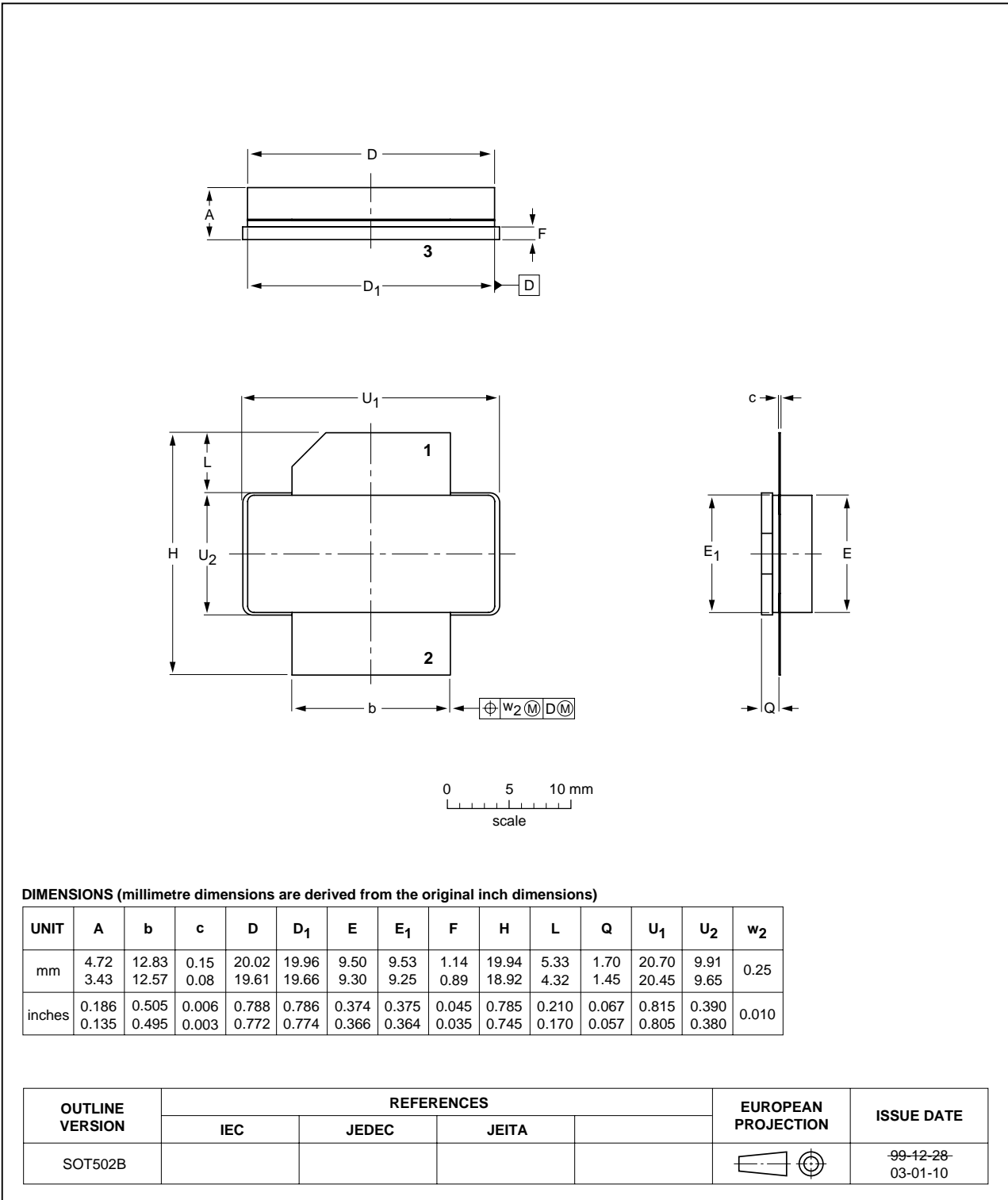


Fig 11. Package outline SOT502B

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
I_{Dq}	quiescent drain current
LDMOS	Laterally Diffused Metal Oxide Semiconductor
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
BLF4G20LS-110B_1	20060110	Product data sheet	-	9397 750 14548	-

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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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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