

BLF4G22-100; BLF4G22S-100

UHF power LDMOS transistor

Rev. 01 — 10 January 2006

Product data sheet

1. Product profile

1.1 General description

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

Table 1: Typical performance

$T_{case} = 25\text{ }^{\circ}\text{C}$; in a common source class-AB test circuit; $I_{Dq} = 900\text{ mA}$; typical values

Mode of operation	f (MHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η_D (%)	IMD3 (dBc)	ACPR (dBc)
2-carrier W-CDMA [1]	$f_1 = 2135$; $f_2 = 2145$	28	25 (AV)	13.5	26	-37	-41

[1] 10 MHz carrier spacing PAR 7 dB at 0.01 % probability on CCDF, 3GPP test model 1, 1 to 64 DPCH.

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 a supply voltage of 28 V and an I_{Dq} of 900 mA:
 - ◆ Load power = 25 W (AV)
 - ◆ Gain = 13.5 dB (typ)
 - ◆ Efficiency = 26 % (typ)
 - ◆ ACPR = -41 dBc (typ)
 - ◆ IMD3 = -37 dBc (typ)
- Easy power control
- Integrated ESD protection
- Excellent ruggedness > 10 : 1 VSWR at 100 W CW
- High efficiency
- High peak power capability (> 150 W)
- Excellent thermal stability
- Designed for broadband operation (2000 MHz to 2200 MHz)
- Internally matched for ease of use

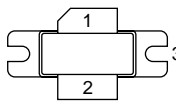
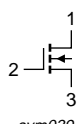
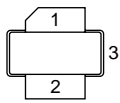
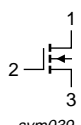
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1.3 Applications

- RF power amplifiers for W-CDMA base stations and multicarrier applications in the 2000 MHz to 2200 MHz frequency range.

2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
BLF4G22-100 (SOT502A)			
1	drain		 sym039
2	gate		
3	source		
BLF4G22S-100 (SOT502B)			
1	drain		 sym039
2	gate		
3	source		

[1] Connected to flange

3. Ordering information

Table 3: Ordering information

Type number	Package		Version
	Name	Description	
BLF4G22-100	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF4G22S-100	-	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	$T_{case} = 80\text{ °C}$; $P_L = 25\text{ W}$; 2-carrier W-CDMA	-	0.76	0.85	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	$V_{GS} = 0\text{ V}$; $I_D = 0.9\text{ mA}$	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	$V_{GS} = 15\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	300	nA
g_{fs}	transfer conductance	$V_{DS} = 10\text{ V}$; $I_D = 10\text{ A}$	-	9.0	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 6\text{ V}$; $I_D = 6\text{ A}$	-	0.09	-	Ω
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: 2-Carrier W-CDMA, PAR 7 dB at 0.01 % probability on CCDF, 3GPP test model 1, 1-64 DPCH, $f_1 = 2112.5\text{ MHz}$, $f_2 = 2122.5\text{ MHz}$, $f_3 = 2157.5\text{ MHz}$, $f_4 = 2167.5\text{ MHz}$.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)} = 25\text{ W}$	12.5	13.5	-	dB
IRL	input return loss	$P_{L(AV)} = 25\text{ W}$	9	15	-	dB
η_D	drain efficiency	$P_{L(AV)} = 25\text{ W}$	24	26	-	%
IMD3	third order intermodulation distortion	$P_{L(AV)} = 25\text{ W}$	-	-37	-35	dBc
ACPR	adjacent channel power ratio	$P_{L(AV)} = 25\text{ W}$	-	-41	-39	dBc

7.1 Ruggedness in class-AB operation

The BLF4G22-100/BLF4G22S-100 are capable of withstanding a load mismatch corresponding to VSWR > 10 : 1 through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{Dq} = 900\text{ mA}$; $P_L = 100\text{ W}$ (CW).

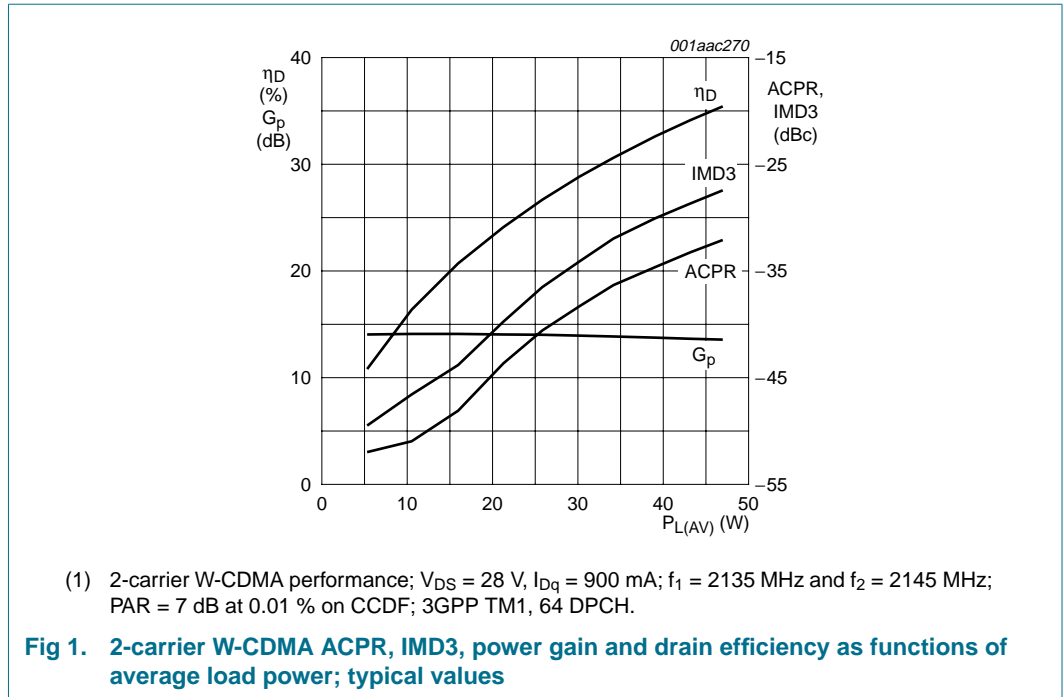


Table 8: Typical impedance values

$V_{DS} = 28\text{ V}$; $I_{Dq} = 900\text{ mA}$; $P_L = 25\text{ W (AV)}$; $T_{case} = 25\text{ °C}$.

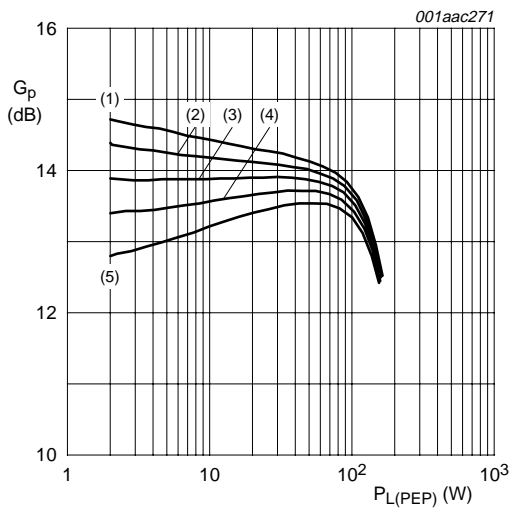
Frequency (MHz)	Z_S (Ω)	Z_L (Ω)
2110	$2.2 + j4.8$	$1.5 - j2.6$
2140	$2.2 + j4.6$	$1.5 - j2.4$
2170	$2.2 + j4.5$	$1.4 - j2.2$

Table 9: RF gain grouping

Code [1]	Gain (dB) [2]	
	Min	Max
A	12.5	13.0
B	13.0	13.5
C	13.5	14.0
D	14.0	14.5
E	14.5	-

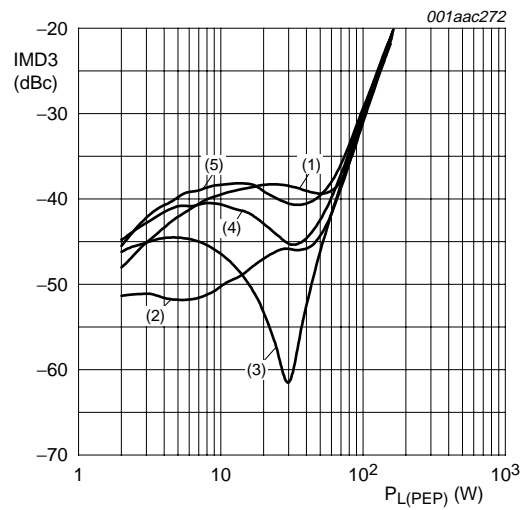
[1] 0.2 dB overlap is allowed for measurement reproducibility.

[2] For 2-carrier W-CDMA at $f_1 = 2157\text{ MHz}$, $f_2 = 2167.5\text{ MHz}$.



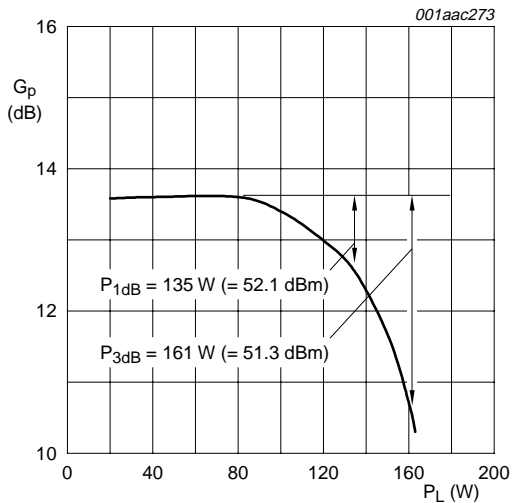
(1) $I_{Dq} = 600 \text{ mA}$
 (2) $I_{Dq} = 750 \text{ mA}$
 (3) $I_{Dq} = 900 \text{ mA}$
 (4) $I_{Dq} = 1050 \text{ mA}$
 (5) $I_{Dq} = 1200 \text{ mA}$
 Two-tone measurement;
 $V_{DS} = 28 \text{ V}$; $f_1 = 2140.0 \text{ MHz}$; $f_2 = 2140.1 \text{ MHz}$

Fig 2. Power gain as a function of peak envelope load power; typical values



(1) $I_{Dq} = 600 \text{ mA}$
 (2) $I_{Dq} = 750 \text{ mA}$
 (3) $I_{Dq} = 900 \text{ mA}$
 (4) $I_{Dq} = 1050 \text{ mA}$
 (5) $I_{Dq} = 1200 \text{ mA}$
 Two-tone measurement;
 $V_{DS} = 28 \text{ V}$; $f_1 = 2140.0 \text{ MHz}$; $f_2 = 2140.1 \text{ MHz}$

Fig 3. Third order intermodulation distortion as a function of peak envelope power; typical values



$t_{on} = 8 \mu\text{s}$
 $t_{off} = 1 \text{ ms}$

Fig 4. Pulsed peak power capability; typical values

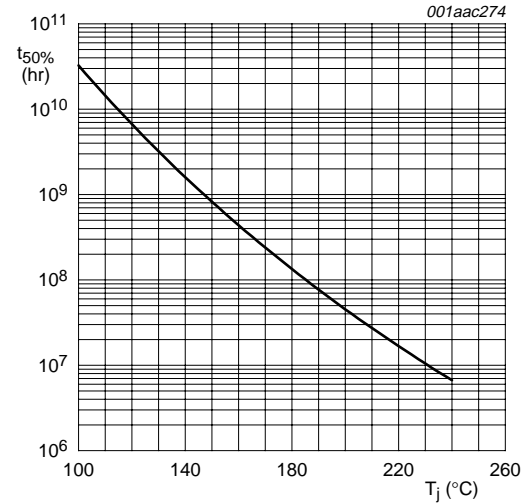
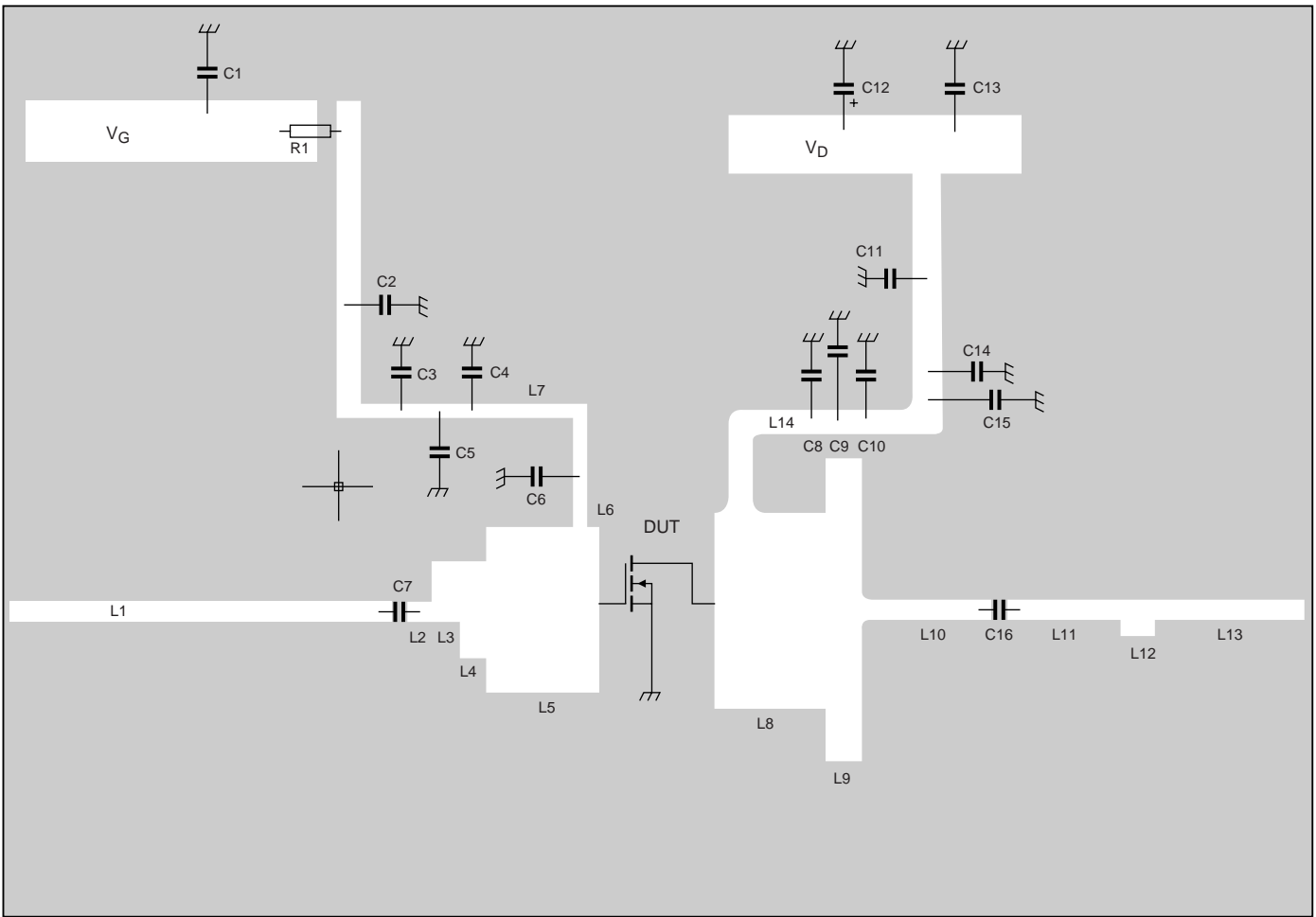


Fig 5. $t_{50\%}$ failures due to electromigration as a function of junction temperature

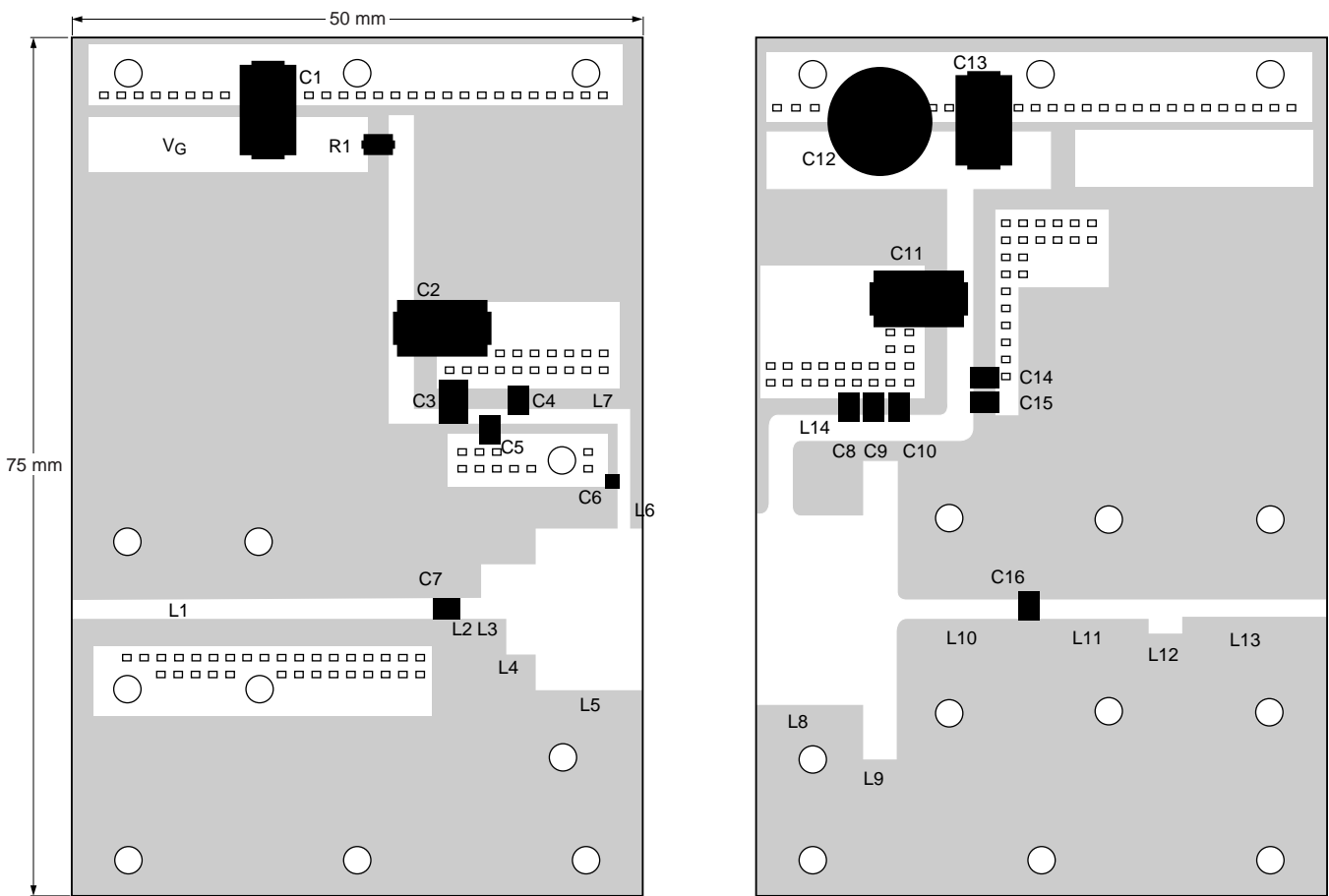
8. Test information



001aac275

See [Table 10](#) for list of components

Fig 6. Test circuit for operation at 2.14 GHz



001aac276

The components are situated on double copper-clad Taconic RF35 Printed-Circuit Board (PCB) ($\epsilon_r = 3.5$); thickness = 0.76 mm.

The other side is unetched and serves as a ground plane.

See [Table 10](#) for list of components.

Fig 7. Component layout for 2.14 GHz test circuit

Table 10: List of components (see Figure 6 and Figure 7)

Component	Description	Value	Dimensions
C1, C2, C11	tantalum capacitor	10 μ F; 35 V	
C3	multilayer ceramic chip capacitor	4.7 μ F; 25 V	
C4, C10	multilayer ceramic chip capacitor	[1] 8.2 pF	
C5, C8, C14, C15	multilayer ceramic chip capacitor	1.5 μ F; 50 V	
C6	multilayer ceramic chip capacitor	[2] 0.6 pF	
C7	multilayer ceramic chip capacitor	[1] 4.7 pF	
C9	multilayer ceramic chip capacitor	220 nF; 50 V	
C12	electrolytic capacitor	220 μ F; 63 V	
C13	tantalum capacitor	4.7 μ F; 50 V	
C16	multilayer ceramic chip capacitor	[3] 7.5 pF	
L1	stripline	[4] $Z_0 = 50 \Omega$	(W \times L) 32.3 mm \times 1.7 mm
L2	stripline	[4] $Z_0 = 50 \Omega$	(W \times L) 2.2 mm \times 1.7 mm
L3	stripline	[4] $Z_0 = 24 \Omega$	(W \times L) 2.3 mm \times 4.8 mm
L4	stripline	[4] $Z_0 = 15 \Omega$	(W \times L) 2.4 mm \times 8 mm
L5	stripline	[4] $Z_0 = 9.5 \Omega$	(W \times L) 9.3 mm \times 14 mm
L6	stripline	[4] $Z_0 = 60 \Omega$	(W \times L) 4 mm \times 1.2 mm
L7	stripline	[4] $Z_0 = 60 \Omega$	(W \times L) 14.5 mm \times 1.2 mm
L8	stripline	[4] $Z_0 = 8.2 \Omega$	(W \times L) 9.3 mm \times 16.8 mm
L9	stripline	[4] $Z_0 = 5.5 \Omega$	(W \times L) 3 mm \times 25.8 mm
L10	stripline	[4] $Z_0 = 50 \Omega$	(W \times L) 11 mm \times 1.7 mm
L11	stripline	[4] $Z_0 = 50 \Omega$	(W \times L) 9.5 mm \times 1.7 mm
L12	stripline	[4] $Z_0 = 34 \Omega$	(W \times L) 3 mm \times 3 mm
L13	stripline	[4] $Z_0 = 50 \Omega$	(W \times L) 12.7 mm \times 1.7 mm
L14	stripline	[4] $Z_0 = 43 \Omega$	(W \times L) 13.5 mm \times 2.1 mm
R1	SMD resistor	4.7 Ω ; 0.1 W	

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

[2] American Technical Ceramics type 100A or capacitor of same quality.

[3] American Technical Ceramics type 180R or capacitor of same quality.

[4] Striplines are on a double copper-clad Taconic RF35 PCB ($\epsilon_r = 3.5$); thickness = 0.76 mm.

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

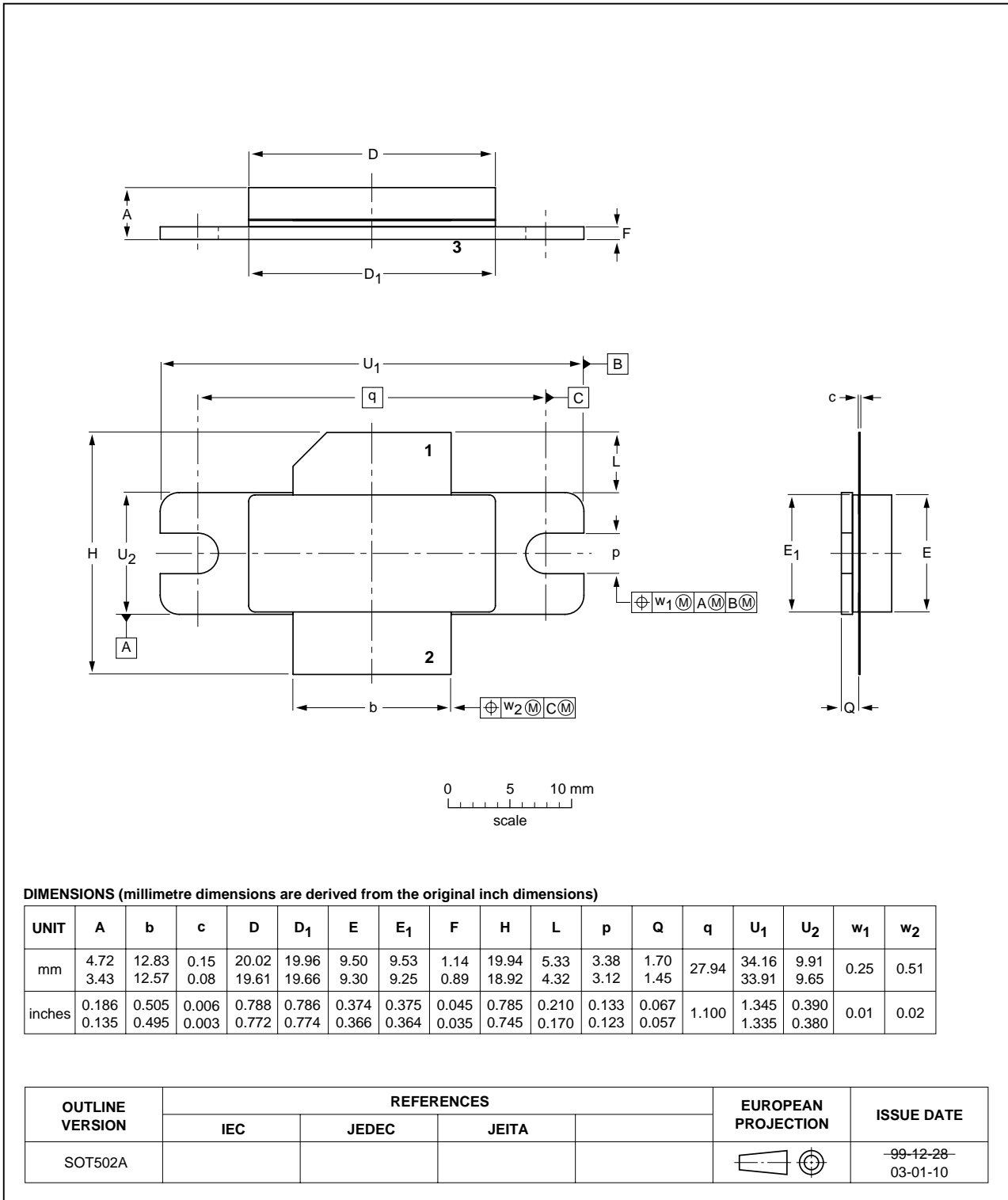


Fig 8. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

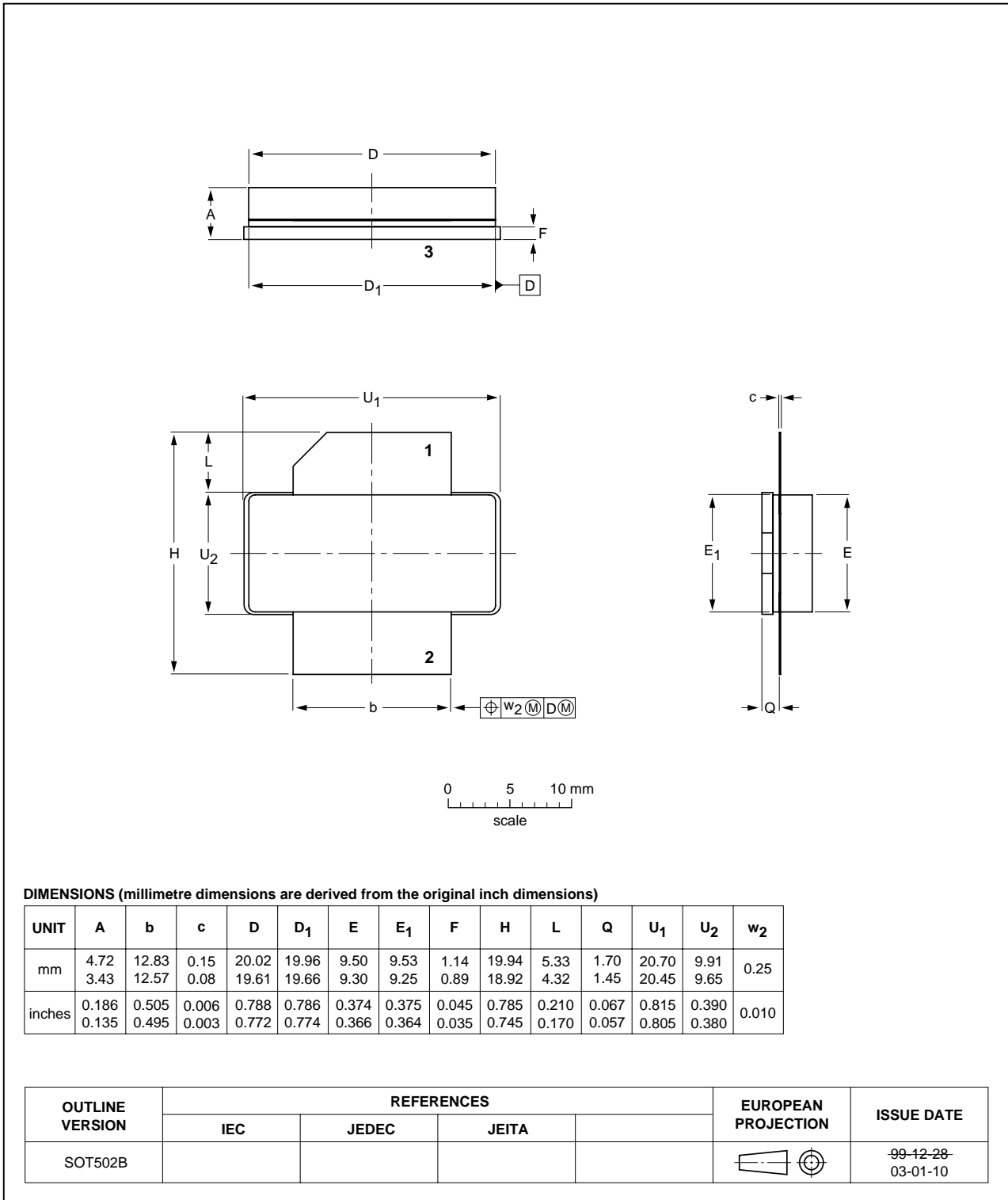


Fig 9. Package outline SOT502B

10. Abbreviations

Table 11: Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CW	Continuous Wave
CCDF	Complementary Cumulative Distribution Function
DPCH	Dedicated Physical Channels
I_{Dq}	quiescent drain current
LDMOS	Laterally Diffused Metal Oxide Semiconductor
PAR	Peak-to-Average Ratio
PEP	Peak Envelope Power
RF	Radio Frequency
TM1	Test Model 1
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 12: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BLF4G22-100_4G22 S-100_1	20060110	Product data sheet	-	9397 750 14338	-

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.
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