

# BLF7G22L-200; BLF7G22LS-200

Power LDMOS transistor

Rev. 3 — 1 April 2011

Preliminary data sheet

## 1. Product profile

### 1.1 General description

200 W LDMOS power transistor for base station applications at frequencies from 2110 MHz to 2170 MHz.

**Table 1. Typical performance**

Typical RF performance at  $T_{case} = 25\text{ °C}$  in a common source class-AB production test circuit.

Mode of operation	f (MHz)	$I_{DQ}$ (mA)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR (dBc)
2-carrier W-CDMA	2110 to 2170	1620	28	55	18.5	31	-31 <sup>[1]</sup>

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF; carrier spacing 5 MHz.

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

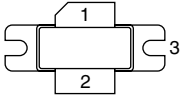
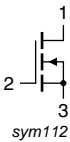
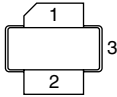
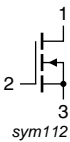
### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2110 MHz to 2170 MHz frequency range



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLF7G22L-200 (SOT502A)</b>			
1	drain		 sym112
2	gate		
3	source		
<b>BLF7G22LS-200 (SOT502B)</b>			
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF7G22L-200	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF7G22LS-200	-	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	+13	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}$ ; $P_L = 80\text{ W (CW)}$ ; $V_{DS} = 28\text{ V}$ ; $I_{Dq} = 1620\text{ mA}$	0.26	K/W

**6. Characteristics**

**Table 6. Characteristics**

*T<sub>j</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	V <sub>GS</sub> = 0 V; I <sub>D</sub> = 1.5 mA	65	-	-	V
V <sub>GS(th)</sub>	gate-source threshold voltage	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 150 mA	1.5	1.9	2.3	V
I <sub>DSS</sub>	drain leakage current	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 28 V	-	-	4.2	μA
I <sub>DSX</sub>	drain cut-off current	V <sub>GS</sub> = V <sub>GS(th)</sub> + 3.75 V; V <sub>DS</sub> = 10 V	42	50.8	-	A
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = 11 V; V <sub>DS</sub> = 0 V	-	-	420	nA
g <sub>fs</sub>	forward transconductance	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 5.25 A	-	18.9	-	S
R <sub>DS(on)</sub>	drain-source on-state resistance	V <sub>GS</sub> = V <sub>GS(th)</sub> + 3.75 V; I <sub>D</sub> = 5.25 A	-	0.054	-	Ω

**7. Test information**

**Table 7. Functional test information**

*Mode of operation: 2-carrier W-CDMA; PAR = 8.4 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1-64 DPCH; f<sub>1</sub> = 2112.5 MHz; f<sub>2</sub> = 2117.5 MHz; f<sub>3</sub> = 2162.5 MHz; f<sub>4</sub> = 2167.5 MHz; RF performance at V<sub>DS</sub> = 28 V; I<sub>Dq</sub> = 1620 mA; T<sub>case</sub> = 25 °C; unless otherwise specified; in a class-AB production test circuit.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P <sub>L(AV)</sub>	average output power		-	55	-	W
G <sub>p</sub>	power gain	P <sub>L(AV)</sub> = 55 W	16.8	18.5	-	dB
RL <sub>in</sub>	input return loss	P <sub>L(AV)</sub> = 55 W	-	-15	-6	dB
η <sub>D</sub>	drain efficiency	P <sub>L(AV)</sub> = 55 W	27	31	-	%
ACPR	adjacent channel power ratio	P <sub>L(AV)</sub> = 55 W	-	-31	-25.5	dBc

**7.1 Ruggedness in class-AB operation**

The BLF7G22L-200 and BLF7G22LS-200 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V<sub>DS</sub> = 28 V; I<sub>Dq</sub> = 1620 mA; P<sub>L</sub> = 200 W (CW); f = 2110 MHz to 2170 MHz.

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data;  $I_{Dq} = 1620 \text{ mA}$ ;  $V_{DS} = 28 \text{ V}$ .

f (MHz)	$Z_S$ [1] ( $\Omega$ )	$Z_L$ [1] ( $\Omega$ )
2050	$1.05 - j4.04$	$2.04 - j1.28$
2110	$1.18 - j4.17$	$1.67 - j1.52$
2140	$1.32 - j4.68$	$1.67 - j1.52$
2170	$1.58 - j4.37$	$1.62 - j1.63$
2230	$2.55 - j5.14$	$1.51 - j1.83$

[1]  $Z_S$  and  $Z_L$  defined in Figure 1.

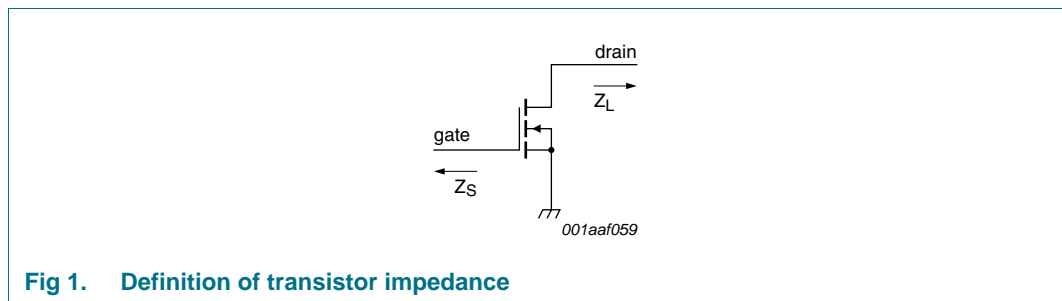
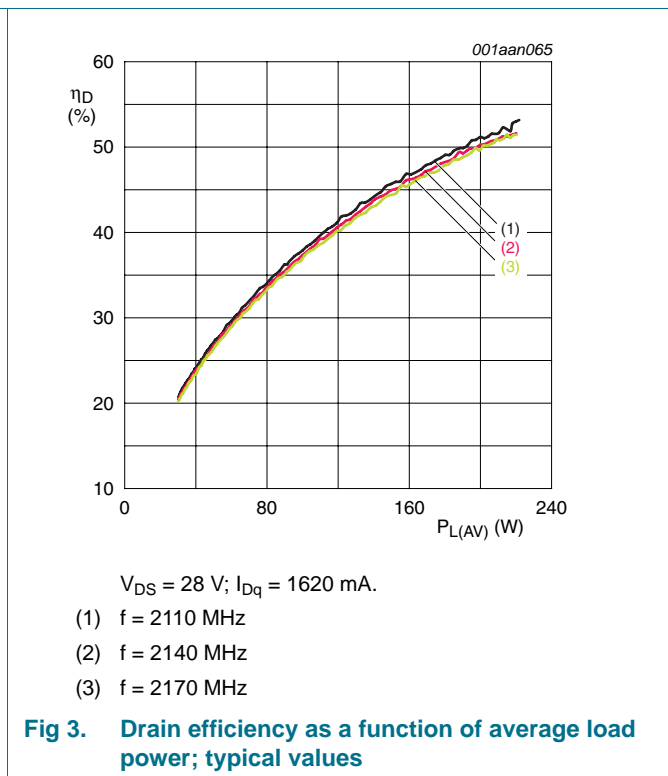
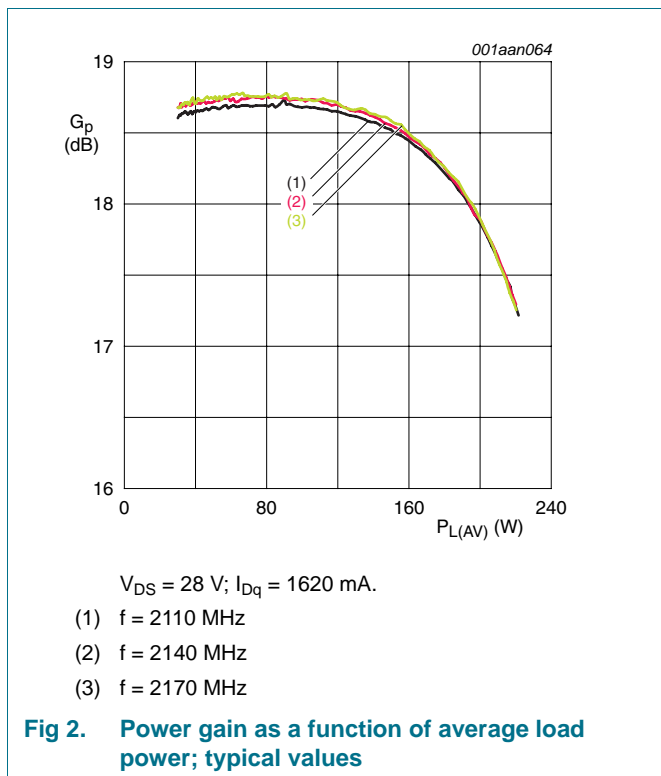
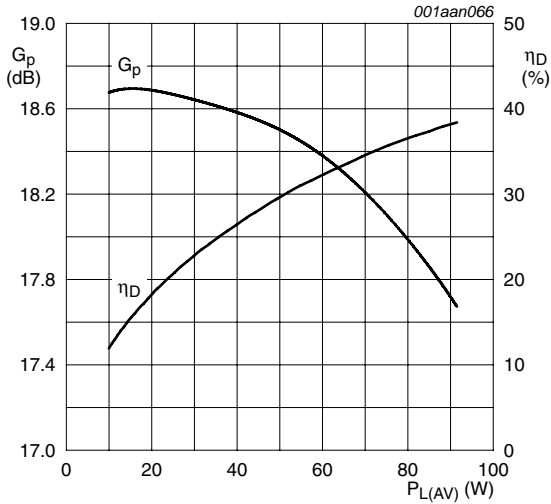


Fig 1. Definition of transistor impedance

7.3 1 Tone CW

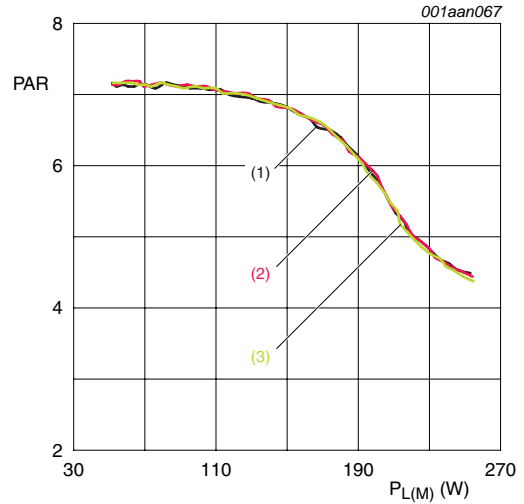


7.4 1-carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ;  $f = 2140\text{ MHz}$ ;  $PAR = 7.2\text{ dB}$  at 0.01 % probability on the CCDF.

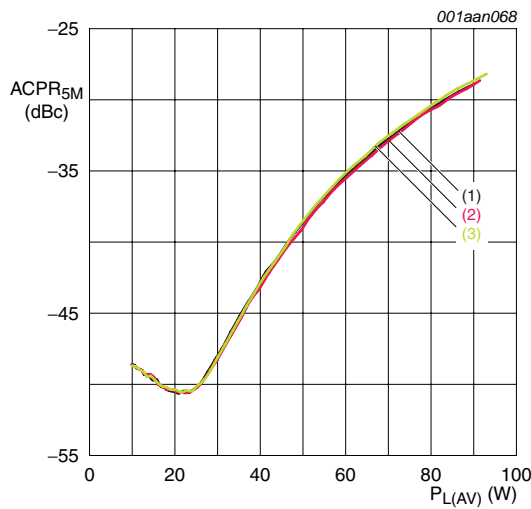
Fig 4. Power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ;  $PAR = 7.2\text{ dB}$  at 0.01 % probability on the CCDF.

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

Fig 5. Peak-to-average power ratio as function of peak power; typical values

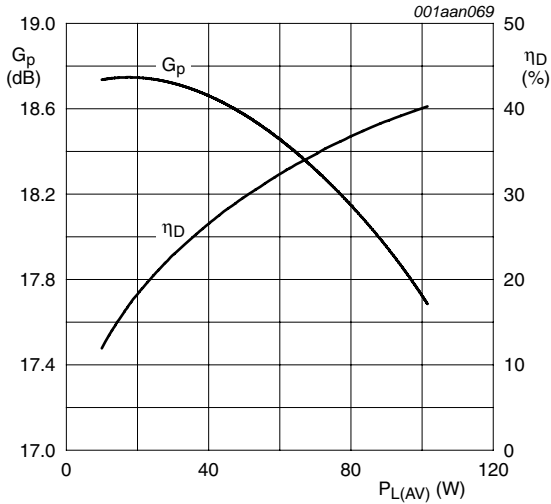


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ;  $PAR = 7.2\text{ dB}$  at 0.01 % probability on the CCDF.

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

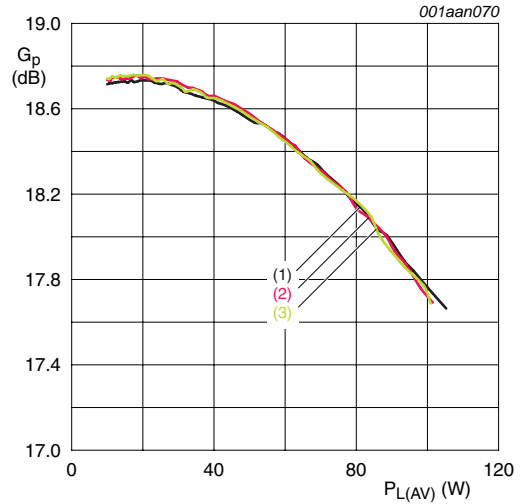
Fig 6. Adjacent power channel ratio (5 MHz) as function of average load power; typical values

7.5 2-carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ;  $f = 2140\text{ MHz}$ ; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

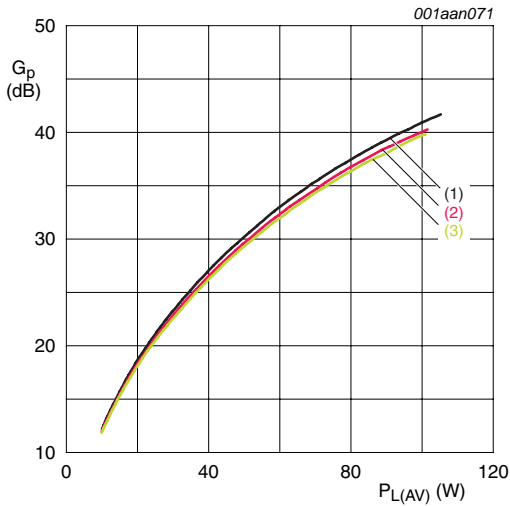
Fig 7. Power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

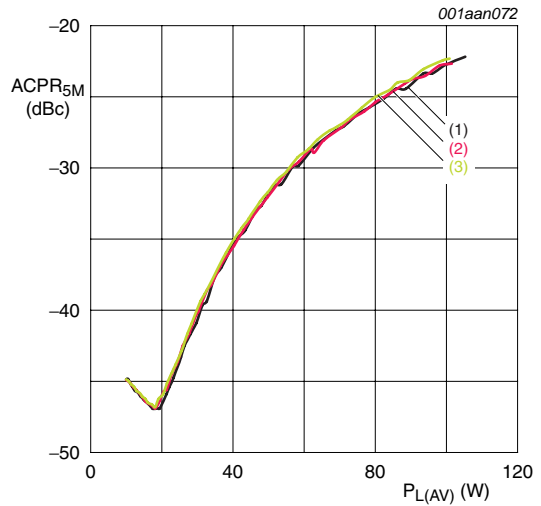
Fig 8. Power gain as a function of average load power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

Fig 9. Drain efficiency as function of average load power; typical values

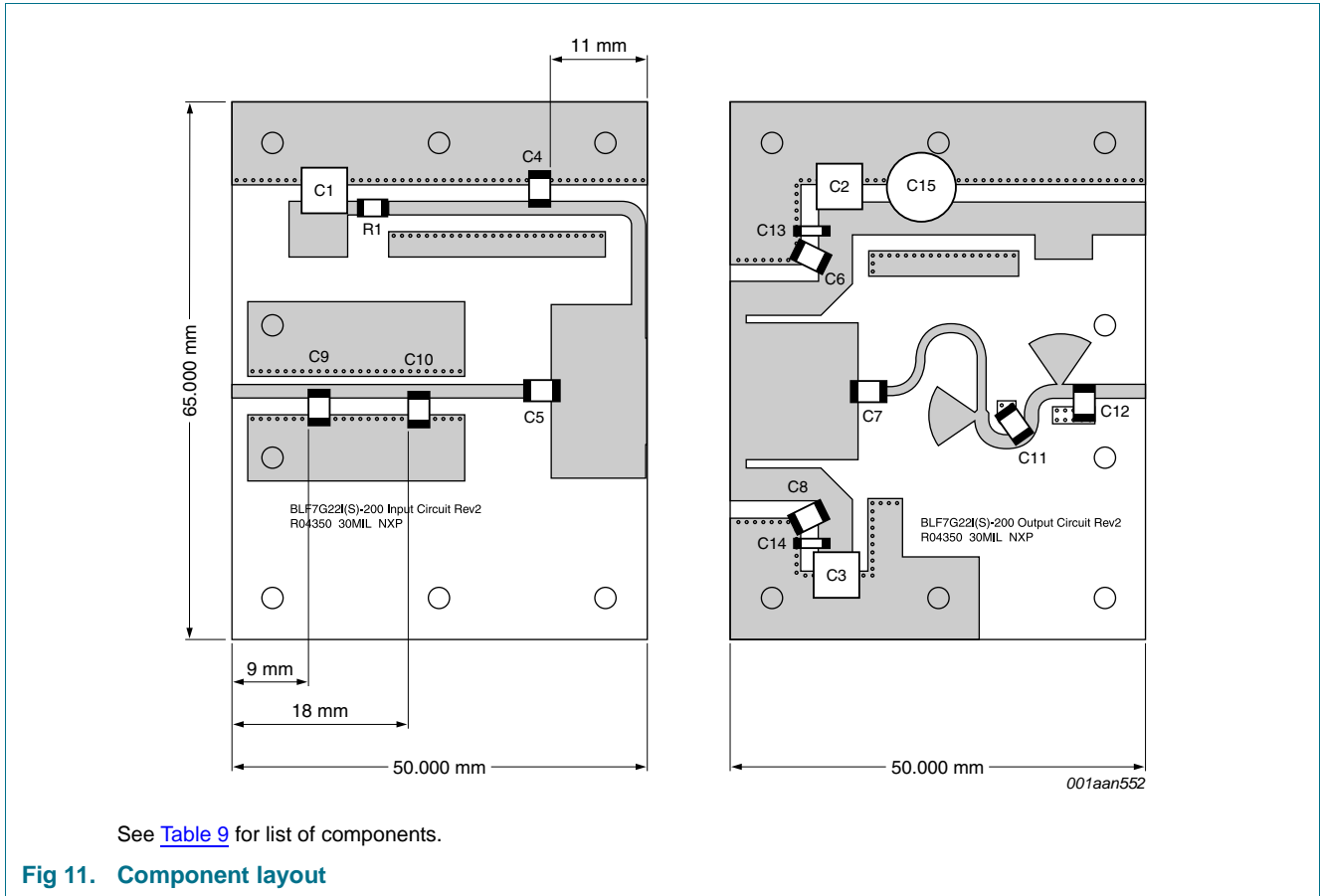


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1620\text{ mA}$ ; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

Fig 10. Adjacent power channel ratio (5 MHz) as function of average load power; typical values

**7.6 Test circuit**



**Table 9. List of components**

See [Figure 11](#) for component layout.

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	10 $\mu$ F	[1] TDK
C2, C3	multilayer ceramic chip capacitor	4.7 $\mu$ F	[1] TDK
C4, C5, C6, C7, C8	multilayer ceramic chip capacitor	22 pF	[2] ATC100B
C9	multilayer ceramic chip capacitor	2.0 pF	[2] ATC100B
C10	multilayer ceramic chip capacitor	2.1 pF	[2] ATC100B
C11	multilayer ceramic chip capacitor	0.5 pF	[2] ATC100B
C12	multilayer ceramic chip capacitor	0.9 pF	[2] ATC100B
C13, C14	multilayer ceramic chip capacitor	330 nF	[1] TDK
C15	electrolytic capacitor	470 $\mu$ F; 63 V	
R1	chip resistor	10 $\Omega$	Philips 1206

[1] TDK or capacitor of same quality.

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

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

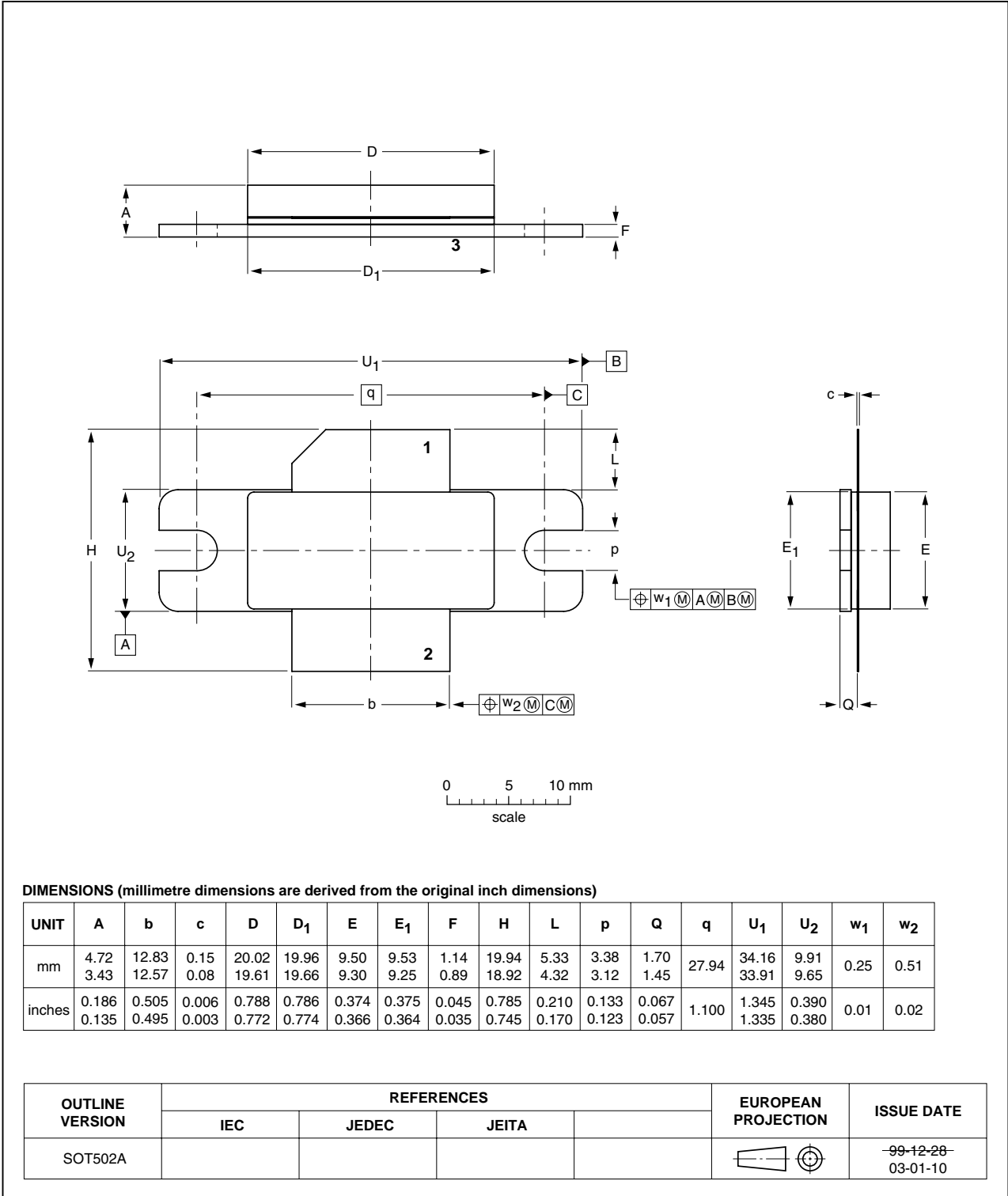


Fig 12. Package outline SOT502A



Earless flanged LDMOST ceramic package; 2 leads

SOT502B

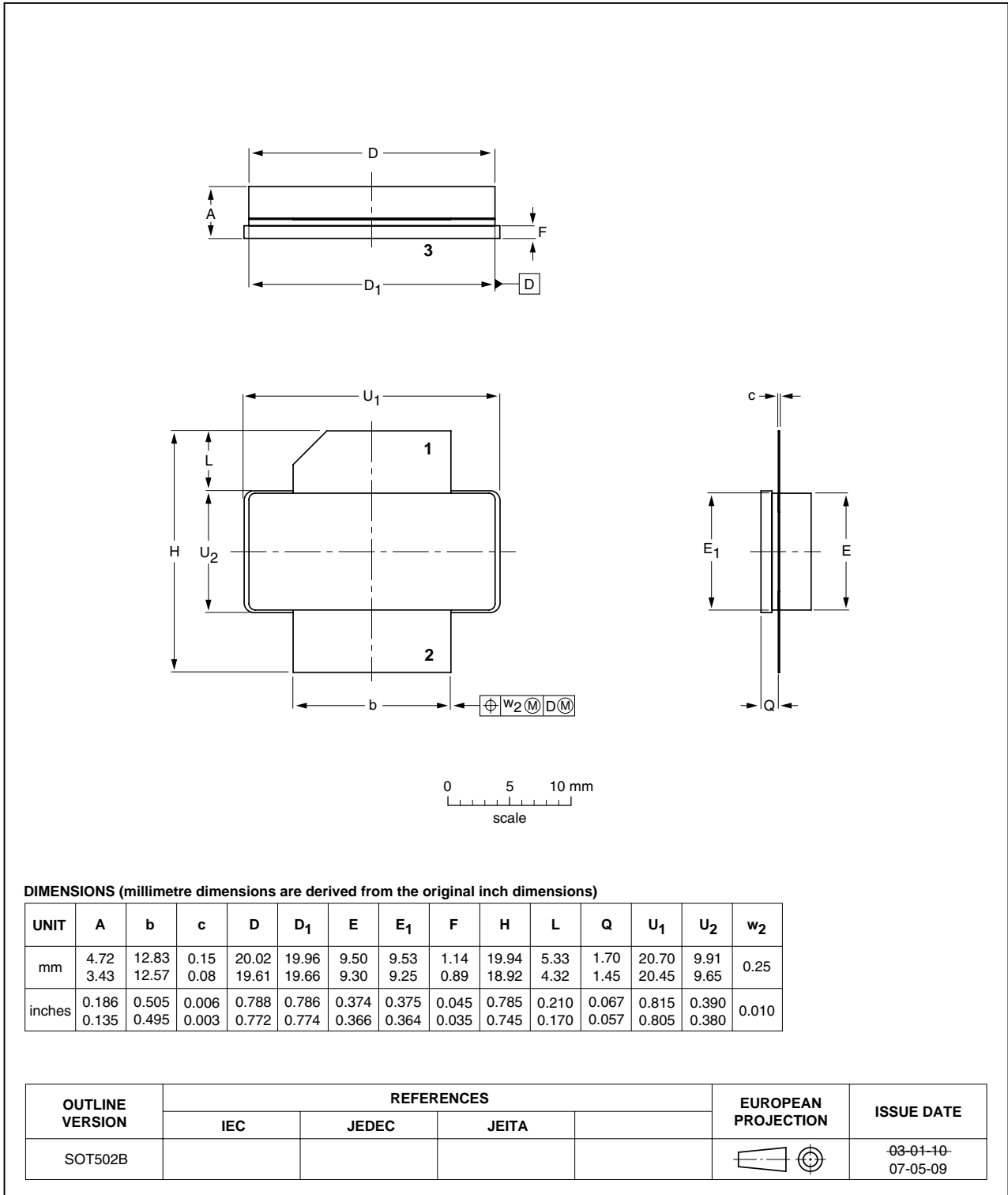


Fig 13. Package outline SOT502B

## 9. Handling information

### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

## 10. Abbreviations

Table 10. Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
PAR	Peak-to-Average power Ratio
PDPCH	transmission Power of the Dedicated Physical CHannel
RF	Radio Frequency
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

## 11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G22L-200_7G22LS-200 v.3	20110401	Preliminary data sheet	-	BLF7G22L-200_7G22LS-200 v.2
Modifications:				
				<ul style="list-style-type: none"> <li>• <a href="#">Table 1 on page 1</a>: the term PDPCH has been changed to DPCH</li> <li>• <a href="#">Table 7 on page 3</a>: the term PDPCH has been changed to DPCH</li> <li>• <a href="#">Table 7 on page 3</a>: several values have been changed</li> <li>• <a href="#">Figure 3 on page 4</a>: the value of the frequency has been changed in the conditions</li> <li>• <a href="#">Figure 6 on page 5</a>: the frequency has been added as a condition</li> <li>• <a href="#">Section 7.2 on page 4</a>: section has been added</li> <li>• <a href="#">Section 7.6 on page 7</a>: section has been added</li> <li>• <a href="#">Section 9 on page 10</a>: this section replaces the caution that was previously on the front page</li> </ul>
BLF7G22L-200_7G22LS-200 v.2	20101228	Preliminary data sheet	-	BLF7G22L-200_7G22LS-200 v.1
BLF7G22L-200_7G22LS-200 v.1	20100419	Objective data sheet	-	-

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### 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.

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