

# BLF7G22L-130; BLF7G22LS-130

Power LDMOS transistor

Rev. 4 — 20 January 2011

Product data sheet

## 1. Product profile

### 1.1 General description

130 W LDMOS power transistor for base station applications at frequencies from 2000 MHz to 2200 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	950	28	30	18.5	32	-32 <sup>[1]</sup>
1-carrier W-CDMA	2110 to 2170	950	28	33	18.5	33	-39 <sup>[2]</sup>

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

[2] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF.

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for broadband operation (2000 MHz to 2200 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

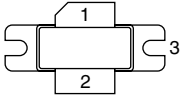
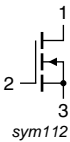
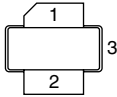
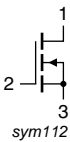
### 1.3 Applications

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



## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
<b>BLF7G22L-130 (SOT502A)</b>			
1	drain		 sym112
2	gate		
3	source		
<b>BLF7G22LS-130 (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-130	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF7G22LS-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	+13	V
$I_D$	drain current		-	28	A
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	225	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 30\text{ W}$	0.35	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	$V_{GS} = 0\text{ V}; I_D = 1.5\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 150\text{ mA}$	1.3	1.8	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	5	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	25	29.5	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	450	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 7.5\text{ A}$	-	10	11	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 5.25\text{ A}$	-	0.1	0.16	$\Omega$

## 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; 64 DPCH;  $f_1 = 2112.5\text{ MHz}; f_2 = 2117.5\text{ MHz}; f_3 = 2162.5\text{ MHz}; f_4 = 2167.5\text{ MHz};$  RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	30	-	W
$G_p$	power gain	$P_{L(AV)} = 30\text{ W}$	17	18.5	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 30\text{ W}$	-	-15	-9	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 30\text{ W}$	29	32	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)} = 30\text{ W}$	-	-31	-28	dBc

### 7.1 Ruggedness in class-AB operation

The BLF7G22L-130 and BLF7G22LS-130 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; P_L = 130\text{ W (CW)}; f = 2110\text{ MHz}.$

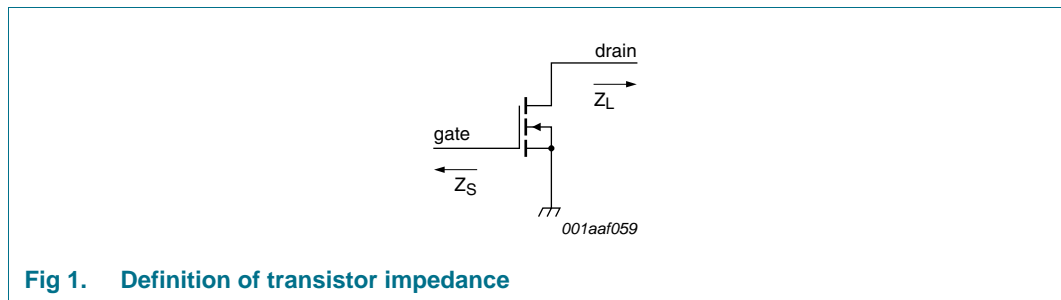
**7.2 Impedance information**

**Table 8. Typical impedance information**

$I_{Dq} = 950\text{ mA}$ ; main transistor  $V_{DS} = 28\text{ V}$ .

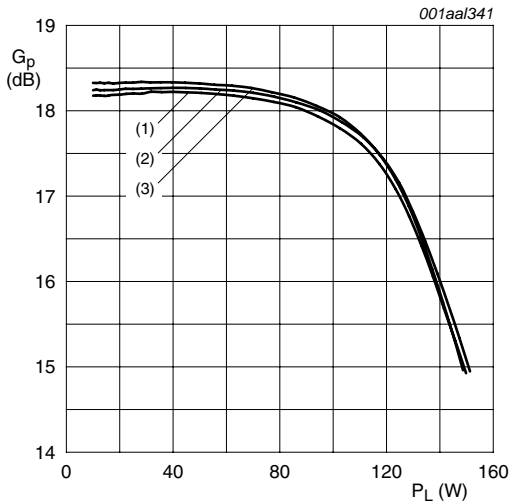
$Z_S$  and  $Z_L$  defined in [Figure 1](#).

<b>f (MHz)</b>	<b><math>Z_S</math> (<math>\Omega</math>)</b>	<b><math>Z_L</math> (<math>\Omega</math>)</b>
2050	1.3 – j3.6	2.2 – j2.6
2140	1.9 – j4.2	2.0 – j2.6
2230	3.1 – j4.7	1.9 – j2.8



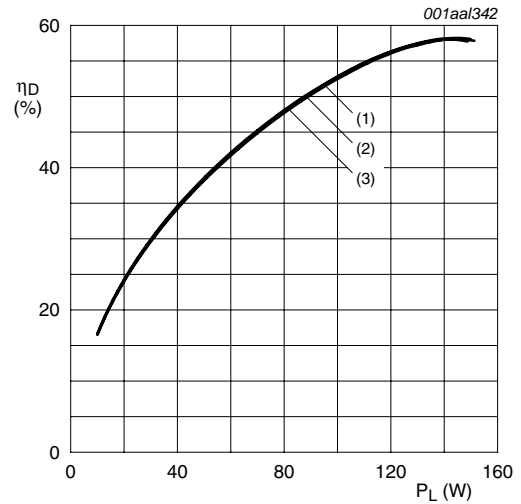
**Fig 1. Definition of transistor impedance**

7.3 1 Tone CW



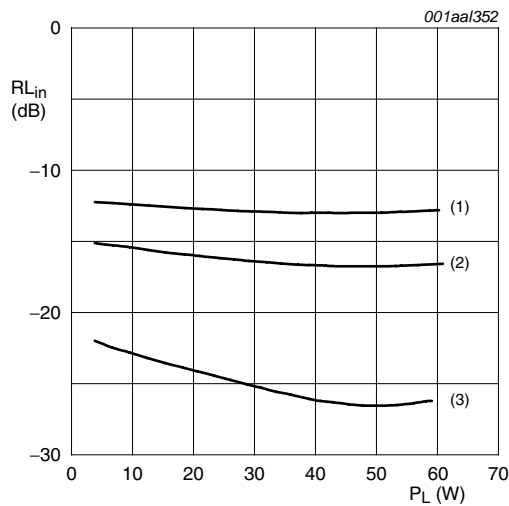
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2170\text{ MHz}$

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



$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2170\text{ MHz}$

**Fig 3. Drain efficiency as a function of load power; typical values**

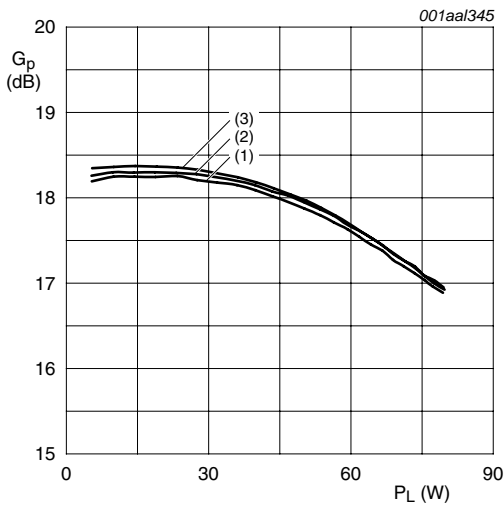


$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2170\text{ MHz}$

**Fig 4. Input return loss as a function of load power; typical values**

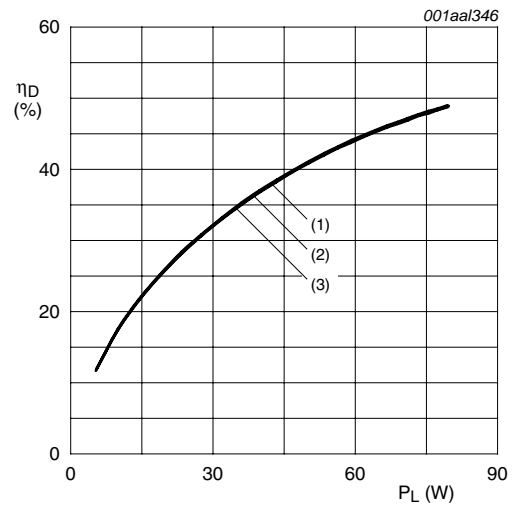
7.4 1-carrier W-CDMA

Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF.



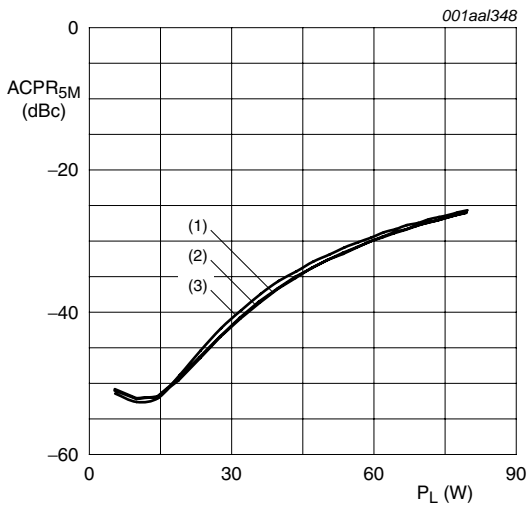
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2112.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2167.5\text{ MHz}$

Fig 5. Power gain as a function of load power; typical values



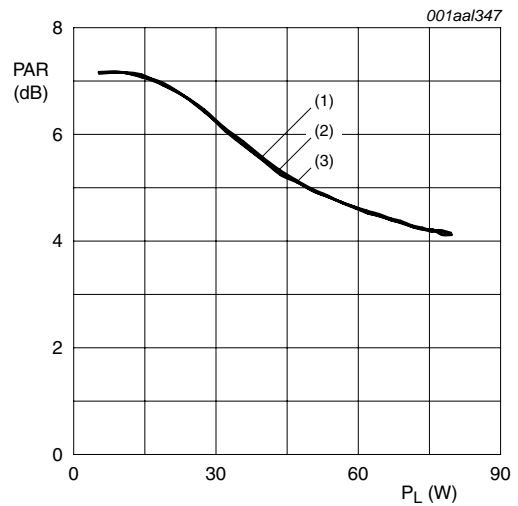
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2112.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2167.5\text{ MHz}$

Fig 6. Drain efficiency as a function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2112.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2167.5\text{ MHz}$

Fig 7. Adjacent channel power ratio (5MHz) as a function of load power; typical values

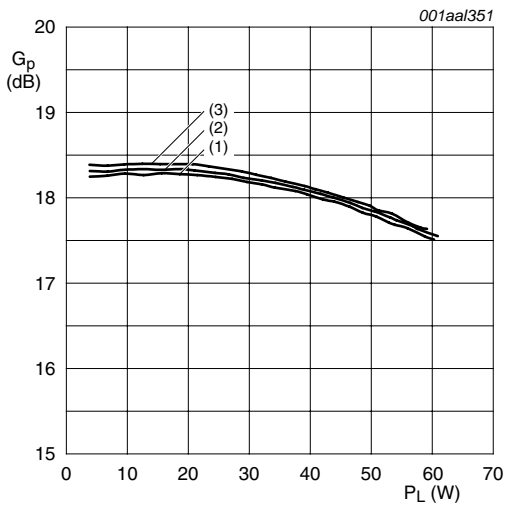


$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$   
 (1)  $f = 2112.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2167.5\text{ MHz}$

Fig 8. Peak-to-average power ratio as a function of load power; typical values

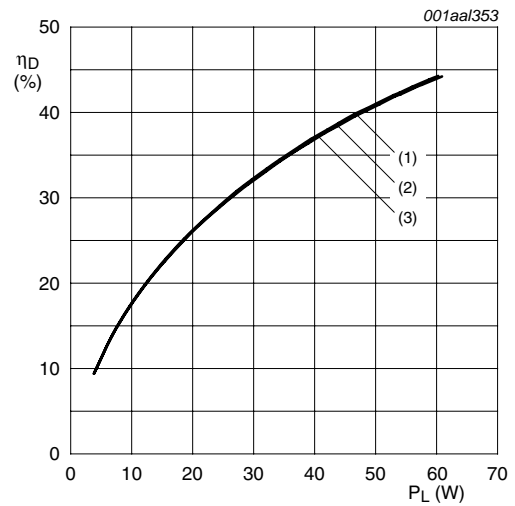
## 7.5 2-carrier W-CDMA (5 MHz carrier spacing)

Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF.



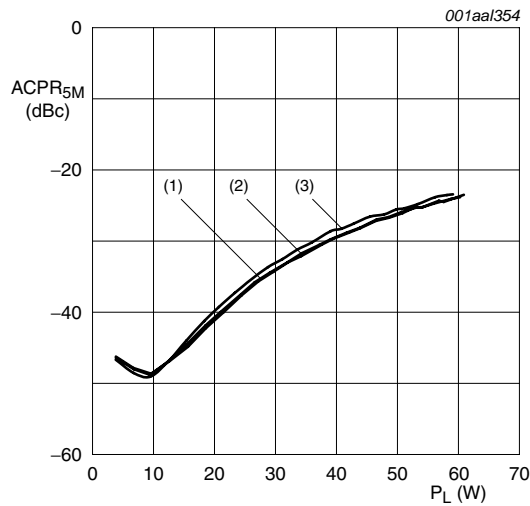
$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 950\text{ mA}$ ; carrier spacing 5 MHz.  
 (1)  $f = 2115\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2165\text{ MHz}$

**Fig 9. Power gain as a function of load power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 950\text{ mA}$ ; carrier spacing 5 MHz.  
 (1)  $f = 2115\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2165\text{ MHz}$

**Fig 10. Drain efficiency as a function of load power; typical values**

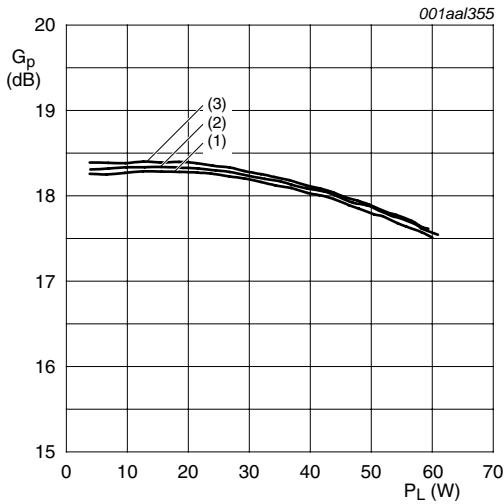


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 950\text{ mA}$ ; carrier spacing 5 MHz.  
 (1)  $f = 2115\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2165\text{ MHz}$

**Fig 11. Adjacent channel power ratio (5 MHz) as a function of load power; typical values**

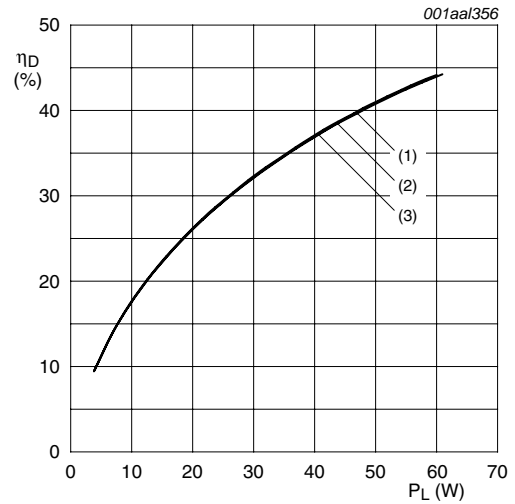
**7.6 2-carrier W-CDMA (10 MHz carrier spacing)**

Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF.



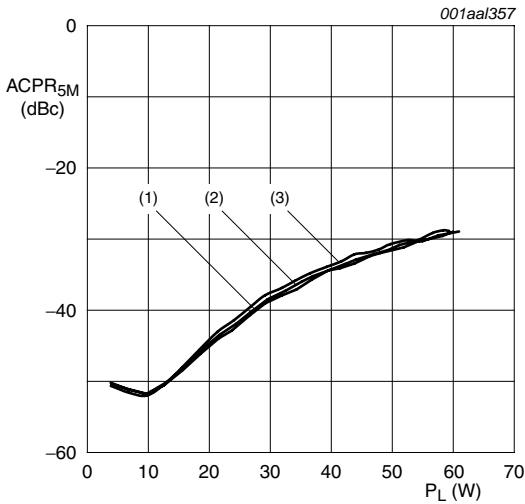
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA};$  carrier spacing 10 MHz.  
 (1)  $f = 2117.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2162.5\text{ MHz}$

**Fig 12. Power gain as a function of load power; typical values**



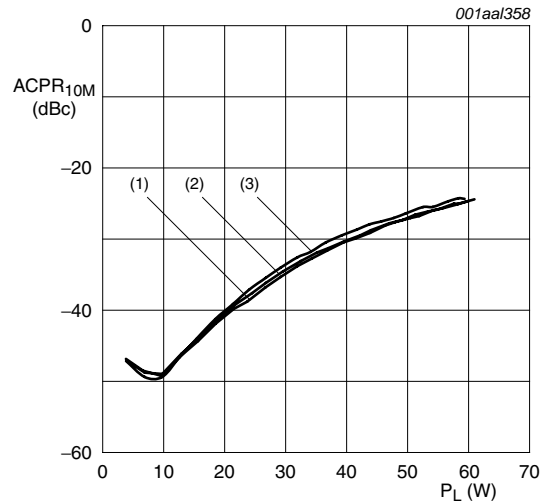
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA};$  carrier spacing 10 MHz.  
 (1)  $f = 2117.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2162.5\text{ MHz}$

**Fig 13. Drain efficiency as a function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA};$  carrier spacing 10 MHz.  
 (1)  $f = 2117.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2162.5\text{ MHz}$

**Fig 14. Adjacent channel power ratio (5 MHz) as a function of load power; typical values**

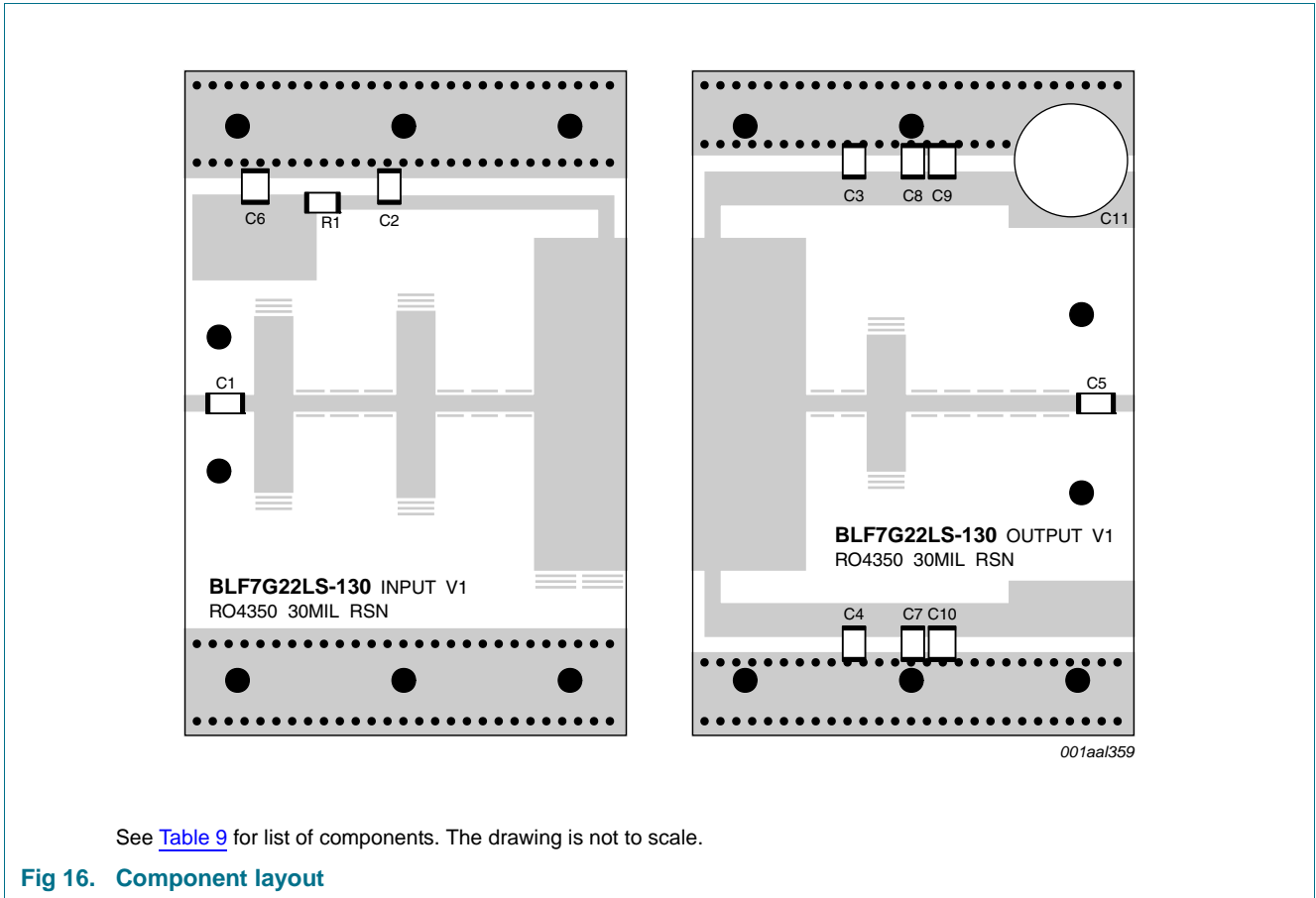


$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA};$  carrier spacing 10 MHz.  
 (1)  $f = 2117.5\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2162.5\text{ MHz}$

**Fig 15. Adjacent channel power ratio (10 MHz) as a function of load power; typical values**



## 7.7 Test circuit



**Table 9. List of components**

See [Figure 16](#) for component layout.

Component	Description	Value	Remarks
C1, C2, C3, C4, C5	multilayer ceramic chip capacitor	9.1 pF	ATC100B
C6, C7	multilayer ceramic chip capacitor	220 nF	AVX1206
C8, C9, C10	multilayer ceramic chip capacitor	4.7 $\mu$ F; 50 V	Kemet
C11	electrolytic capacitor	220 $\mu$ F; 63 V	BC
R1	SMD resistor	6.2 $\Omega$	Philips 1206

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

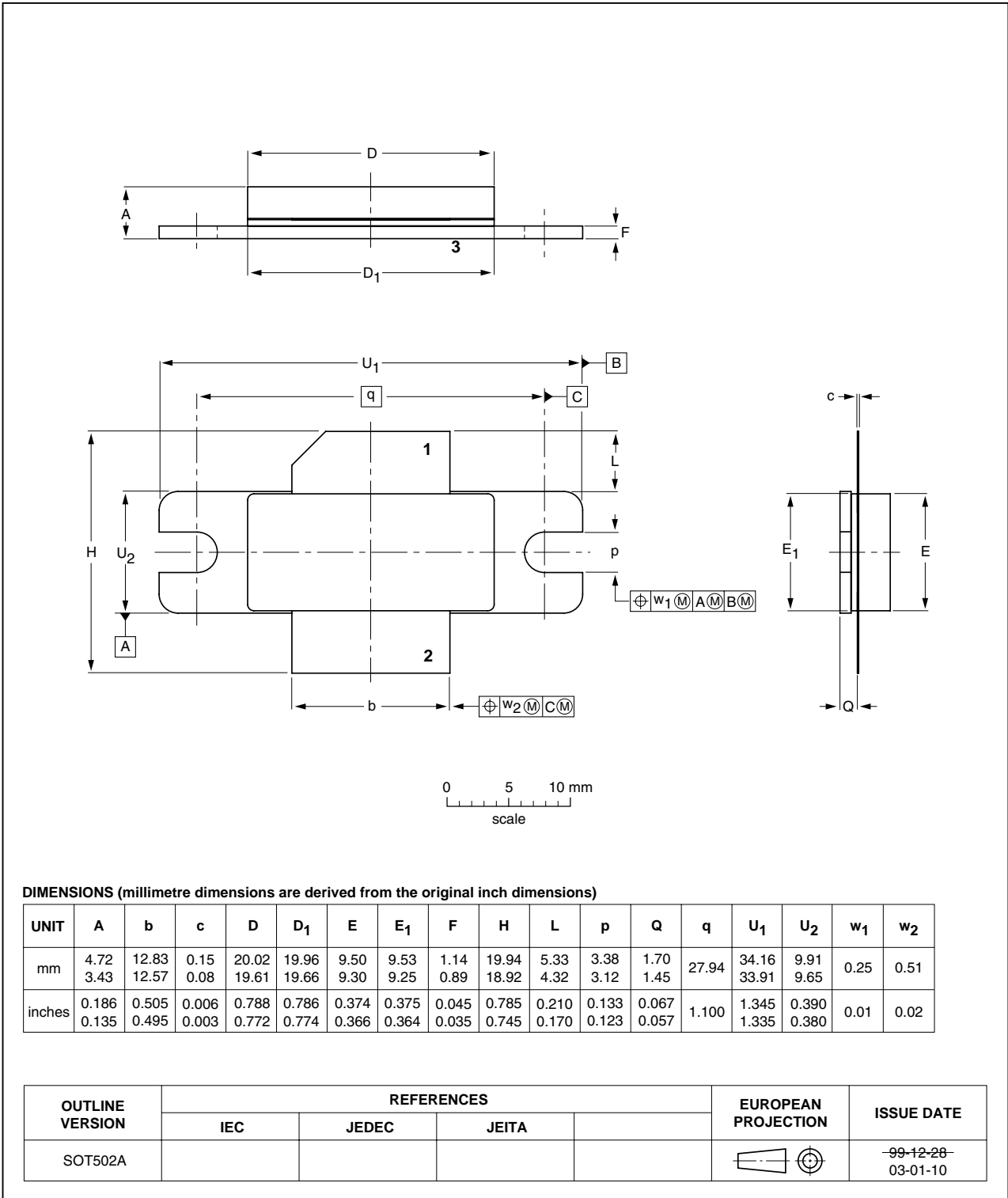


Fig 17. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

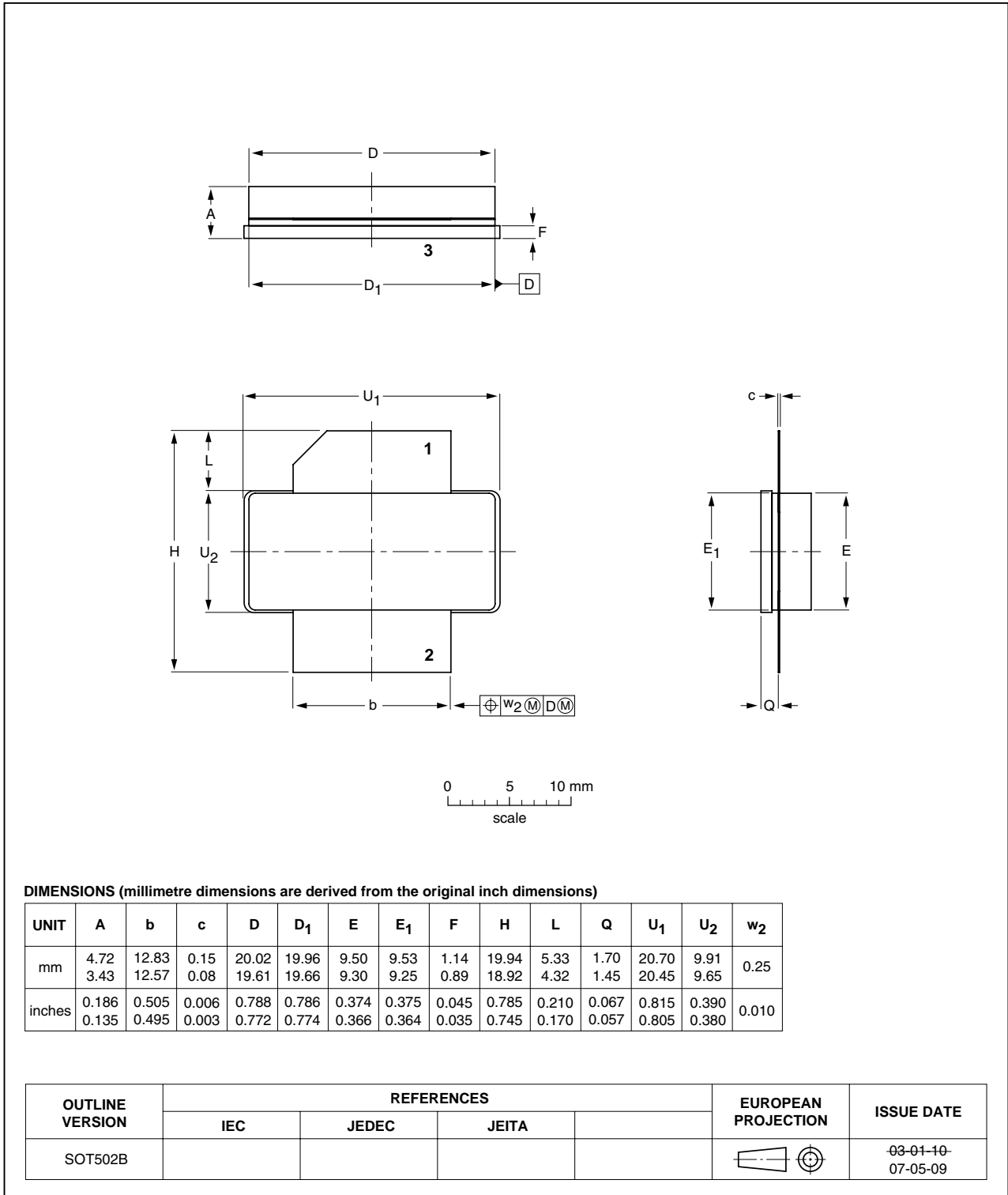


Fig 18. Package outline SOT502B

## 9. Abbreviations

**Table 10. Abbreviations**

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

## 10. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G22L-130_7G22LS-130 v.4	20110120	Product data sheet	-	BLF7G22LS-130 v.3
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Table 7 on page 3</a>: the maximum value of <math>RL_{in}</math> has been corrected to -9 dB.</li> </ul>			
BLF7G22L-130_7G22LS-130 v.3	20101118	Product data sheet	-	BLF7G22LS-130 v.2
BLF7G22L-130_7G22LS-130 v.2	20101004	Product data sheet	-	BLF7G22LS-130 v.1
BLF7G22LS-130 v.1	20100202	Product data sheet	-	-

## 11. Legal information

### 11.1 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.

[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>.

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