

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)	η_D (%)	ACPR (dBc)
2-carrier W-CDMA	2110 to 2170	950	28	30	18.5	32	-32 ^[1]
1-carrier W-CDMA	2110 to 2170	950	28	33	18.5	33	-39 ^[2]

[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)

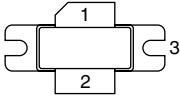
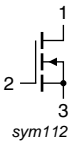
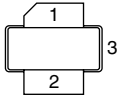
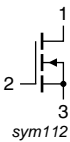
1.3 Applications

- 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
BLF7G22L-130 (SOT502A)			
1	drain		 sym112
2	gate		
3	source		
BLF7G22LS-130 (SOT502B)			
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	μA
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	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; 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
η_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](#).

f (MHz)	Z_S (Ω)	Z_L (Ω)
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

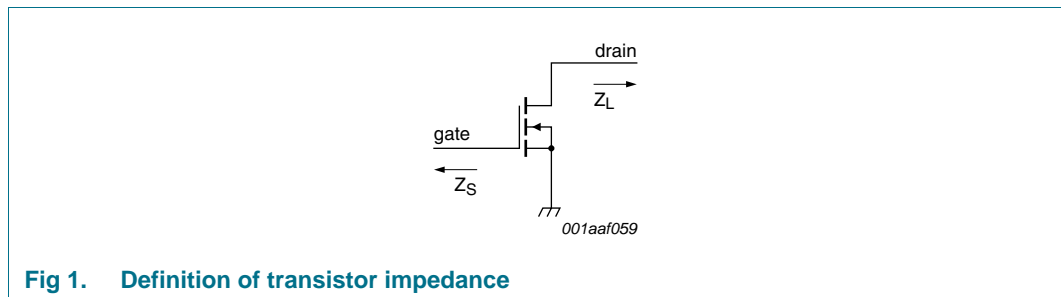
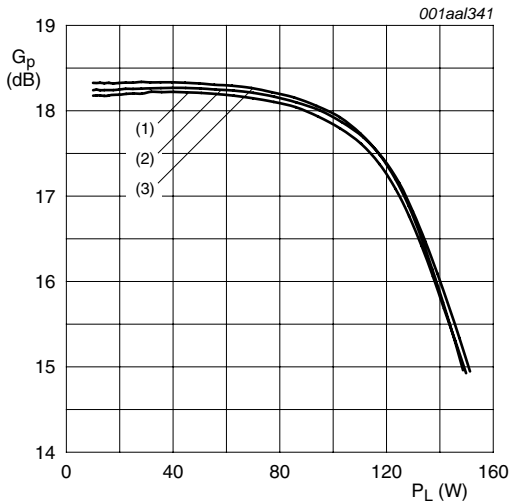


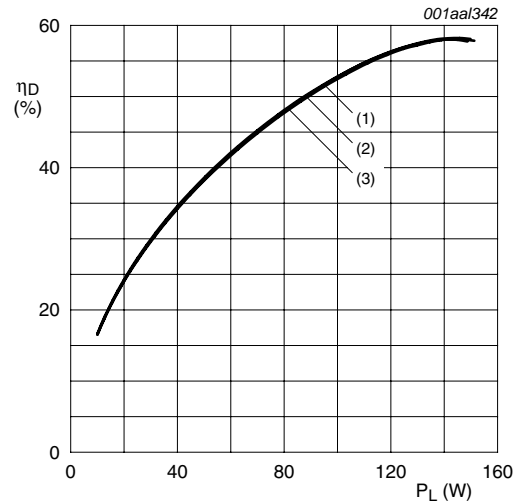
Fig 1. Definition of transistor impedance

7.3 1 Tone CW



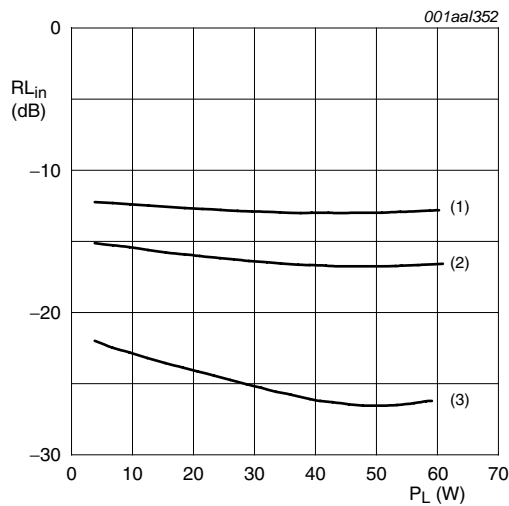
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$
 (1) $f = 2110\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2170\text{ MHz}$

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

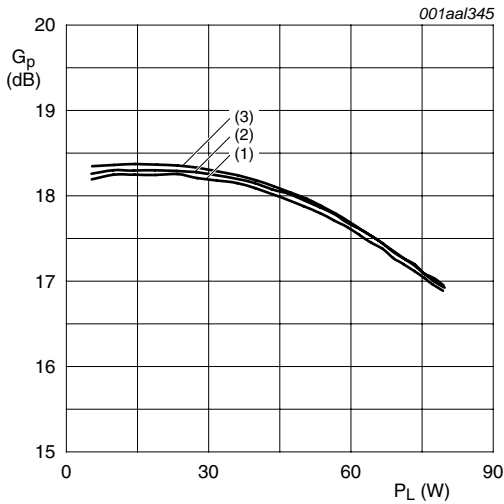


$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$
 (1) $f = 2110\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2170\text{ MHz}$

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

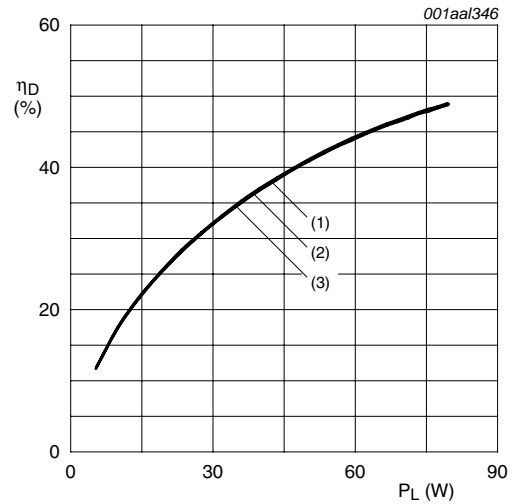
7.4 1-carrier W-CDMA

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



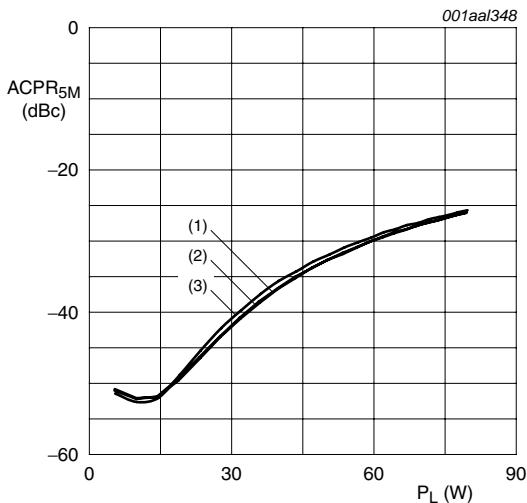
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$
 (1) $f = 2112.5\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2167.5\text{ MHz}$

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



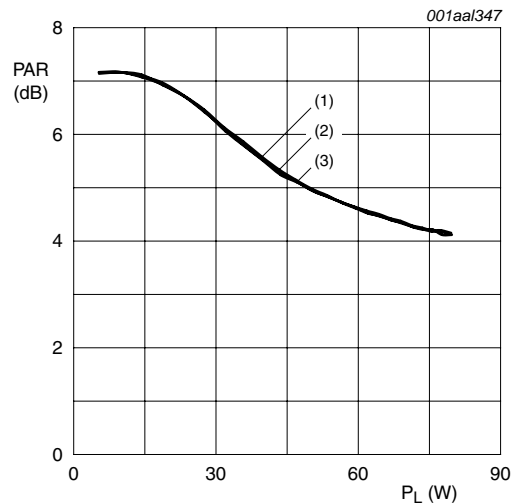
$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$
 (1) $f = 2112.5\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2167.5\text{ MHz}$

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

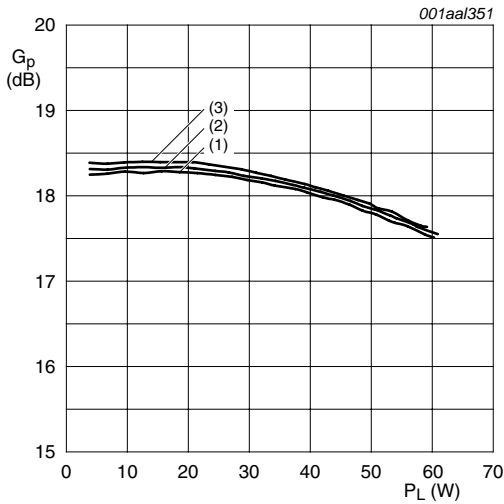


$V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}.$
 (1) $f = 2112.5\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2167.5\text{ MHz}$

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

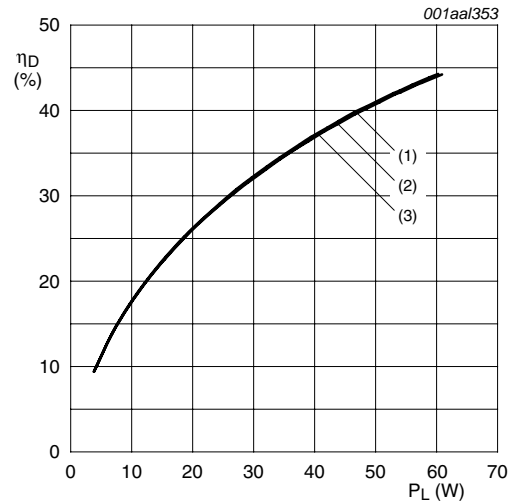
7.5 2-carrier W-CDMA (5 MHz carrier spacing)

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



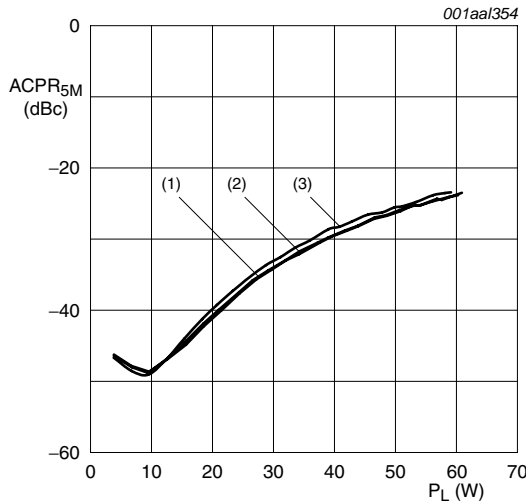
$V_{DS} = 28\text{ V}; I_{DQ} = 950\text{ mA};$ carrier spacing 5 MHz.
 (1) $f = 2115\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2165\text{ MHz}$

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

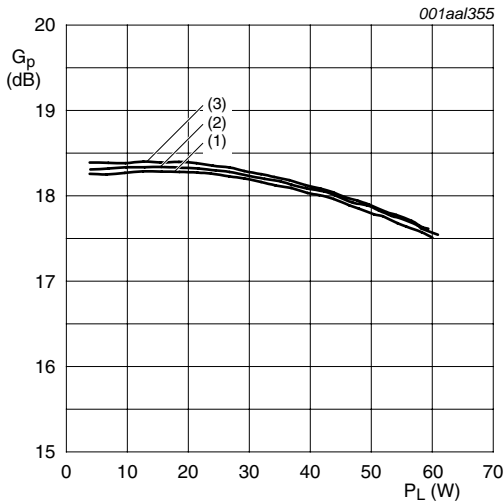


$V_{DS} = 28\text{ V}; I_{DQ} = 950\text{ mA};$ carrier spacing 5 MHz.
 (1) $f = 2115\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2165\text{ MHz}$

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

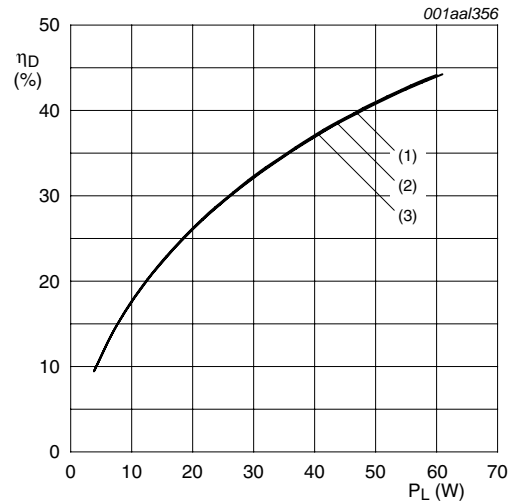
7.6 2-carrier W-CDMA (10 MHz carrier spacing)

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



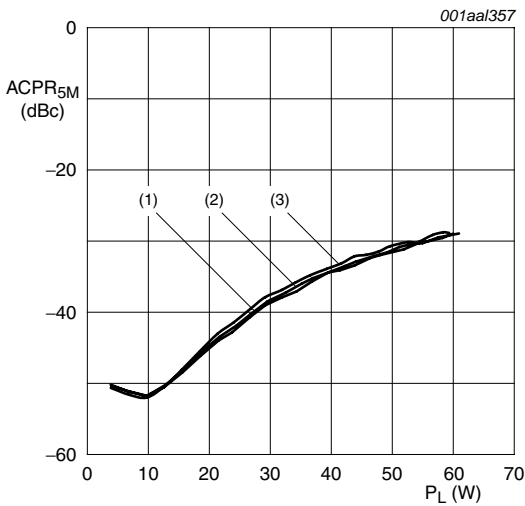
$V_{DS} = 28\text{ V}$; $I_{Dq} = 950\text{ mA}$; carrier spacing 10 MHz.
 (1) $f = 2117.5\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2162.5\text{ MHz}$

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



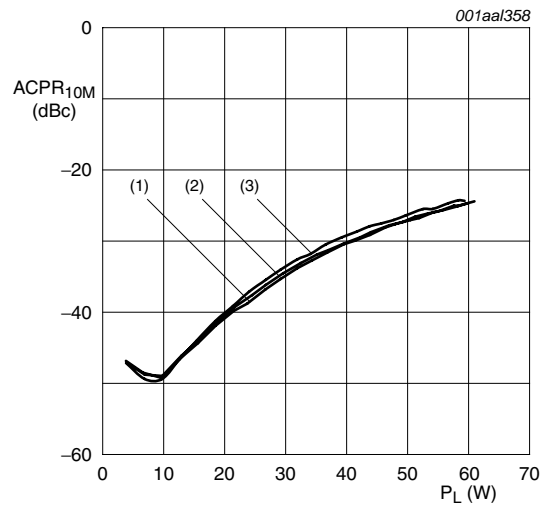
$V_{DS} = 28\text{ V}$; $I_{Dq} = 950\text{ mA}$; carrier spacing 10 MHz.
 (1) $f = 2117.5\text{ MHz}$
 (2) $f = 2140\text{ MHz}$
 (3) $f = 2162.5\text{ MHz}$

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

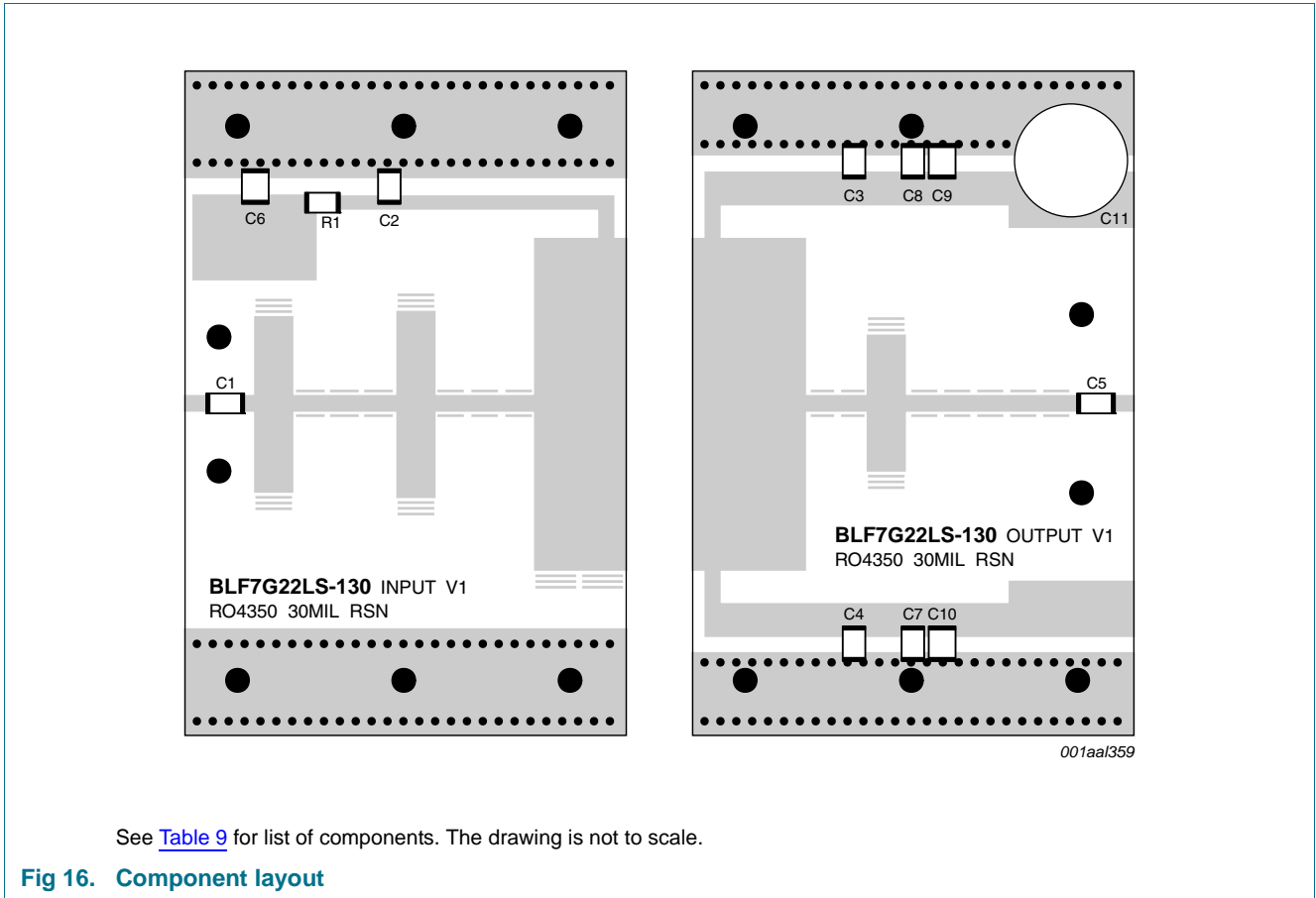


Table 9. List of components

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 μ F; 50 V	Kemet
C11	electrolytic capacitor	220 μ F; 63 V	BC
R1	SMD resistor	6.2 Ω	Philips 1206

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

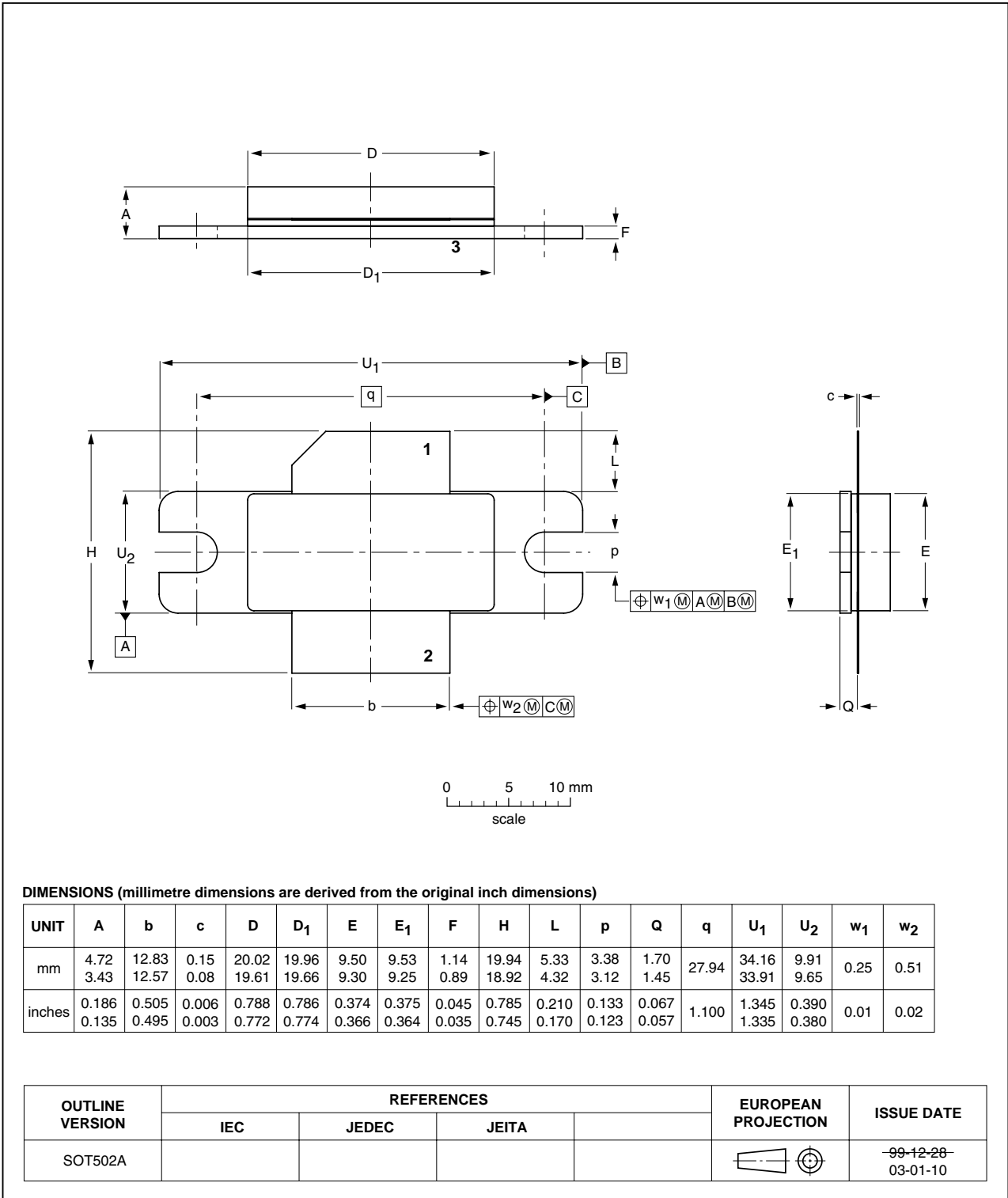


Fig 17. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

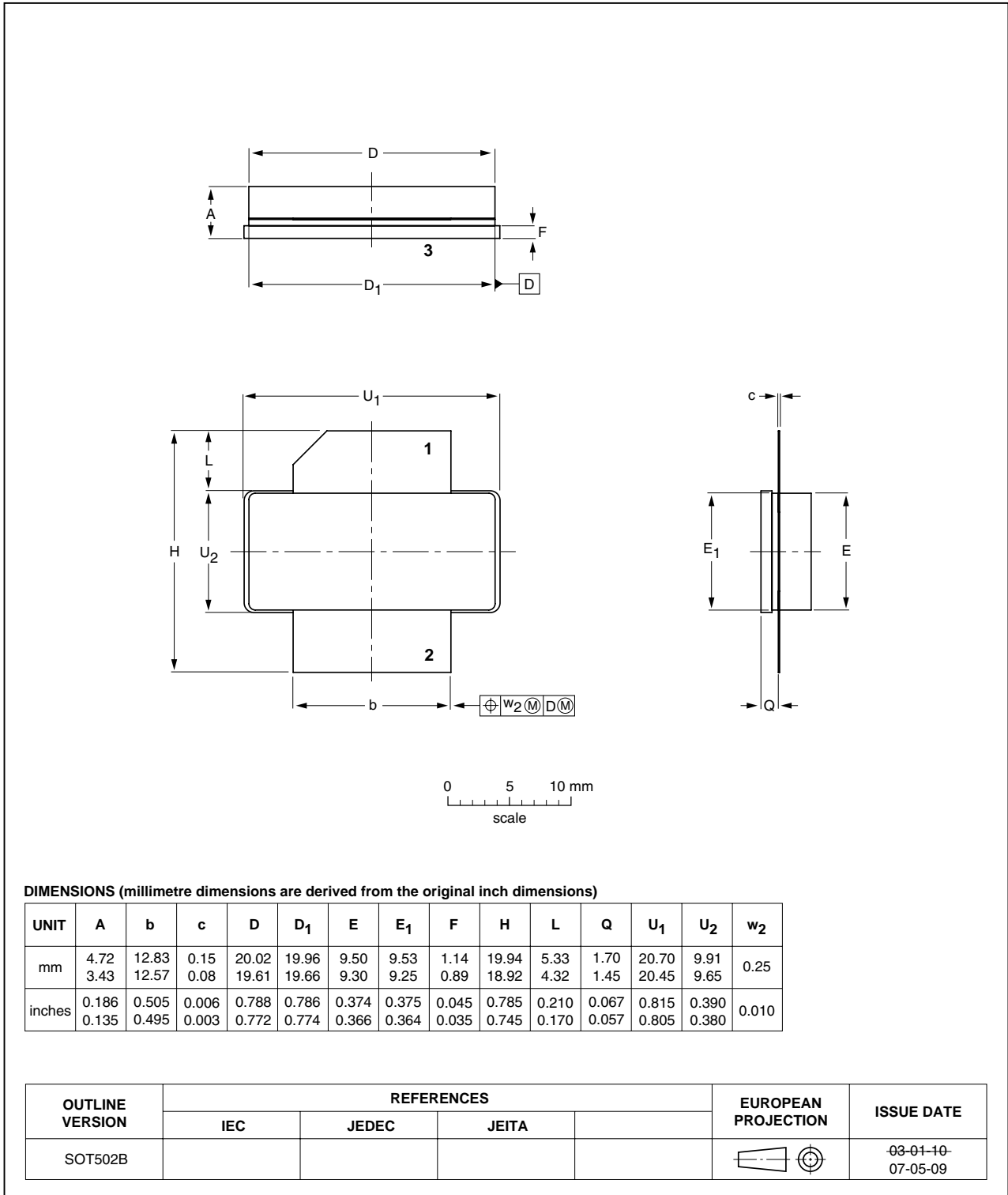


Fig 18. Package outline SOT502B

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"> • Table 7 on page 3: the maximum value of RL_{in} has been corrected to -9 dB. 			
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 ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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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".

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