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# BLF7G22L-250P; BLF7G22LS-250P

Power LDMOS transistor

Rev. 4 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

250 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	1900	28	70	18.5	31	-30 <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-250P (SOT539A)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
<b>BLF7G22LS-250P (SOT539B)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF7G22L-250P	-	Flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads	SOT539A
BLF7G22LS-250P	-	Earless flanged LDMOST ceramic package; 4 leads	SOT539B

## 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		-	65	A
$T_{stg}$	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	$T_{case} = 80\text{ °C}; P_L = 70\text{ W}; V_{DS} = 28\text{ V}; I_{Dq} = 1900\text{ mA}$	0.20	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	$V_{GS} = 0\text{ V}; I_D = 1.8\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.5	1.9	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	2.8	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	28	34.2	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	280	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	-	13.7	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$	-	0.081	-	$\Omega$

## 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; 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  $V_{DS} = 28\text{ V}; I_{Dq} = 1900\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	70	-	W
$G_p$	power gain	$P_{L(AV)} = 70\text{ W}$	17	18.5	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 70\text{ W}$	-	-15	-5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 70\text{ W}$	27	31	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)} = 70\text{ W}$	-	-30	-25	dBc

### 7.1 Ruggedness in class-AB operation

The BLF7G22L-250P and BLF7G22LS-250P are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 30\text{ V}; I_{Dq} = 1900\text{ mA}; P_L = 250\text{ W (CW)}; f = 2110\text{ MHz to } 2170\text{ MHz}.$



7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data half device;  $I_{Dq} = 1900 \text{ mA}$ ;  $V_{DS} = 28 \text{ V}$ .

f (MHz)	$Z_S$ <sup>[1]</sup> ( $\Omega$ )	$Z_L$ <sup>[1]</sup> ( $\Omega$ )
2050	1.50 – j5.20	3.03 – j2.92
2110	2.08 – j5.64	2.76 – j2.70
2140	2.16 – j5.89	2.31 – j2.74
2170	2.43 – j5.97	2.31 – j2.74
2230	3.94 – j7.60	2.10 – j2.96

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

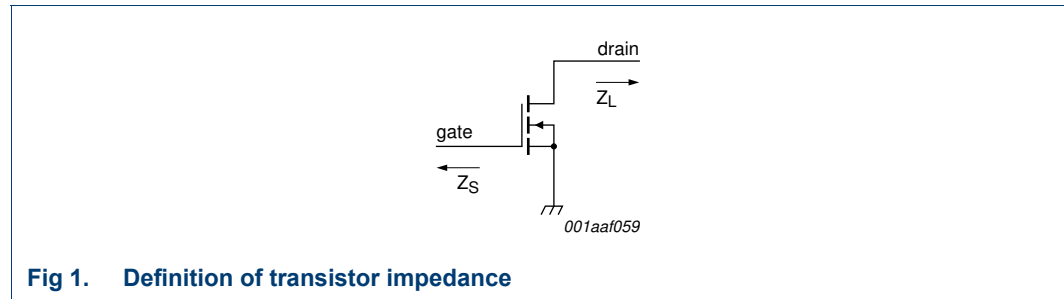
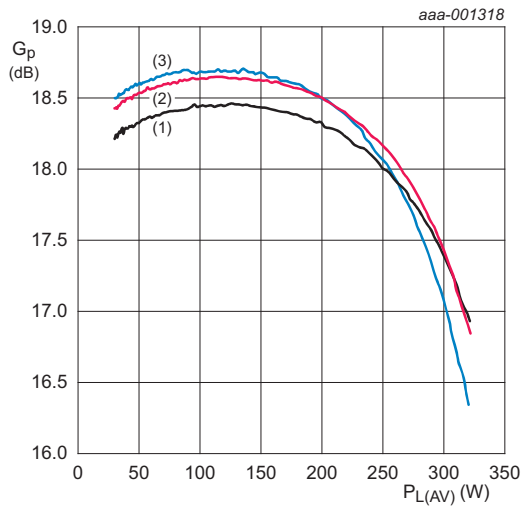


Fig 1. Definition of transistor impedance

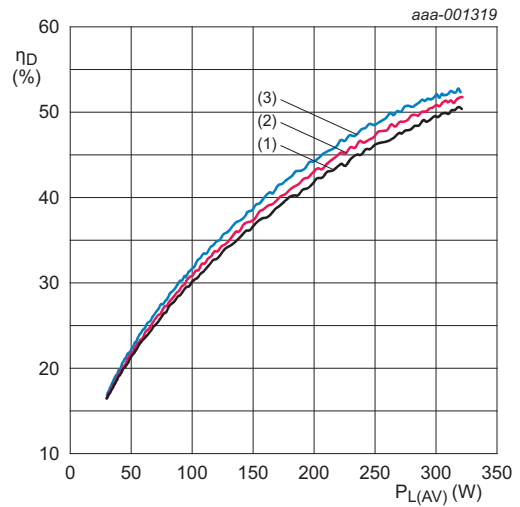
7.3 1 Tone CW



$V_{DS} = 28\text{ V}; I_{Dq} = 1900\text{ mA.}$

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

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

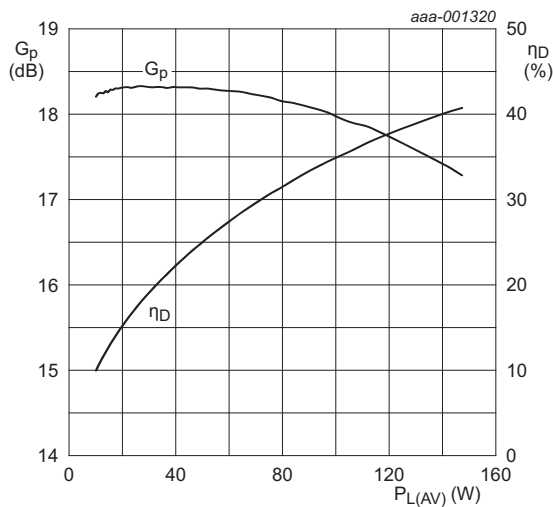


$V_{DS} = 28\text{ V}; I_{Dq} = 1900\text{ mA.}$

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

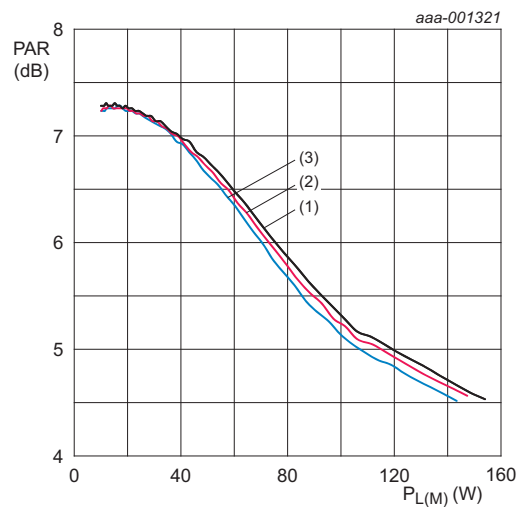
**Fig 3. Drain efficiency as a function of average load power; typical values**

7.4 1-carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ ;  $f = 2140\text{ MHz}$ ;  $PAR = 7.2\text{ dB}$  at 0.01 % probability on the CCDF.

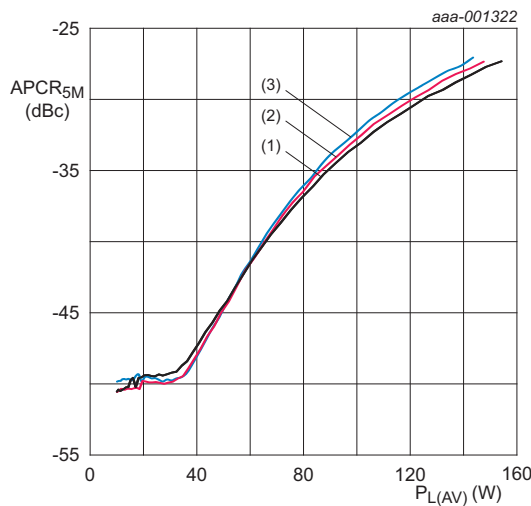
Fig 4. Power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ ;  $PAR = 7.2\text{ dB}$  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

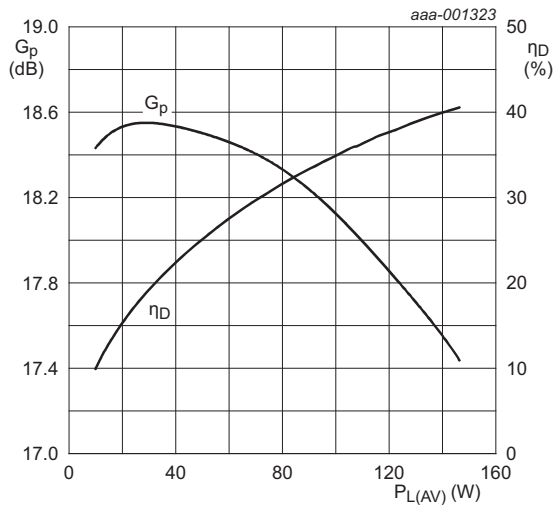


$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ ;  $PAR = 7.2\text{ dB}$  at 0.01 % probability on the CCDF.

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

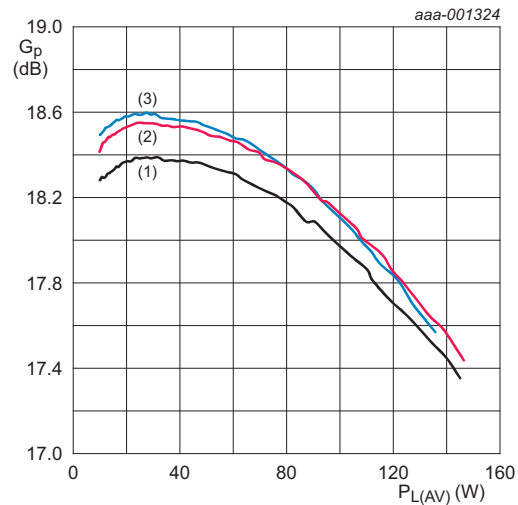
Fig 6. Adjacent power channel ratio (5 MHz) as function of average load power; typical values

7.5 2-carrier W-CDMA



$V_{DS} = 28$  V;  $I_{Dq} = 1900$  mA;  $f = 2140$  MHz; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

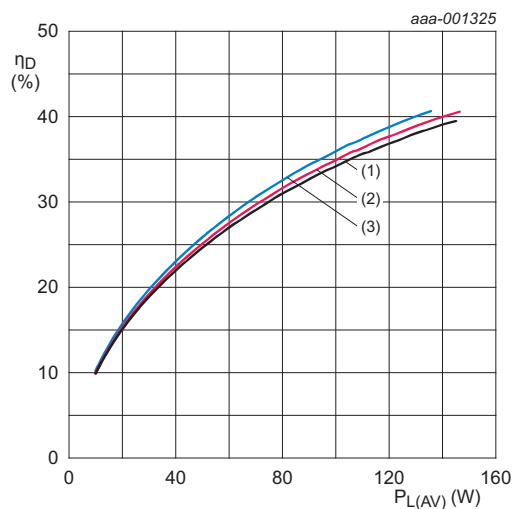
Fig 7. Power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28$  V;  $I_{Dq} = 1900$  mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 2110$  MHz
- (2)  $f = 2140$  MHz
- (3)  $f = 2170$  MHz

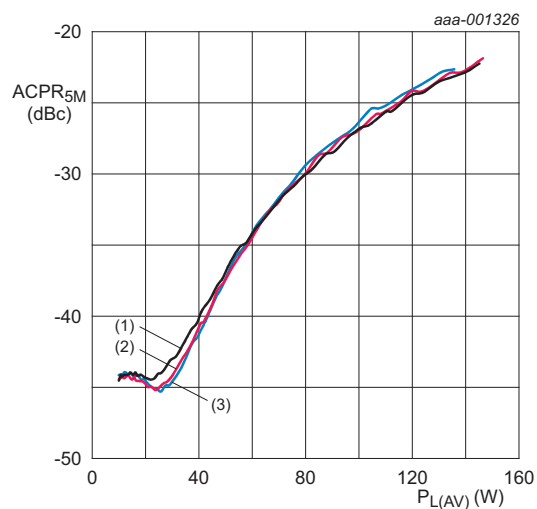
Fig 8. Power gain as a function of average load power; typical values



$V_{DS} = 28$  V;  $I_{Dq} = 1900$  mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 2110$  MHz
- (2)  $f = 2140$  MHz
- (3)  $f = 2170$  MHz

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



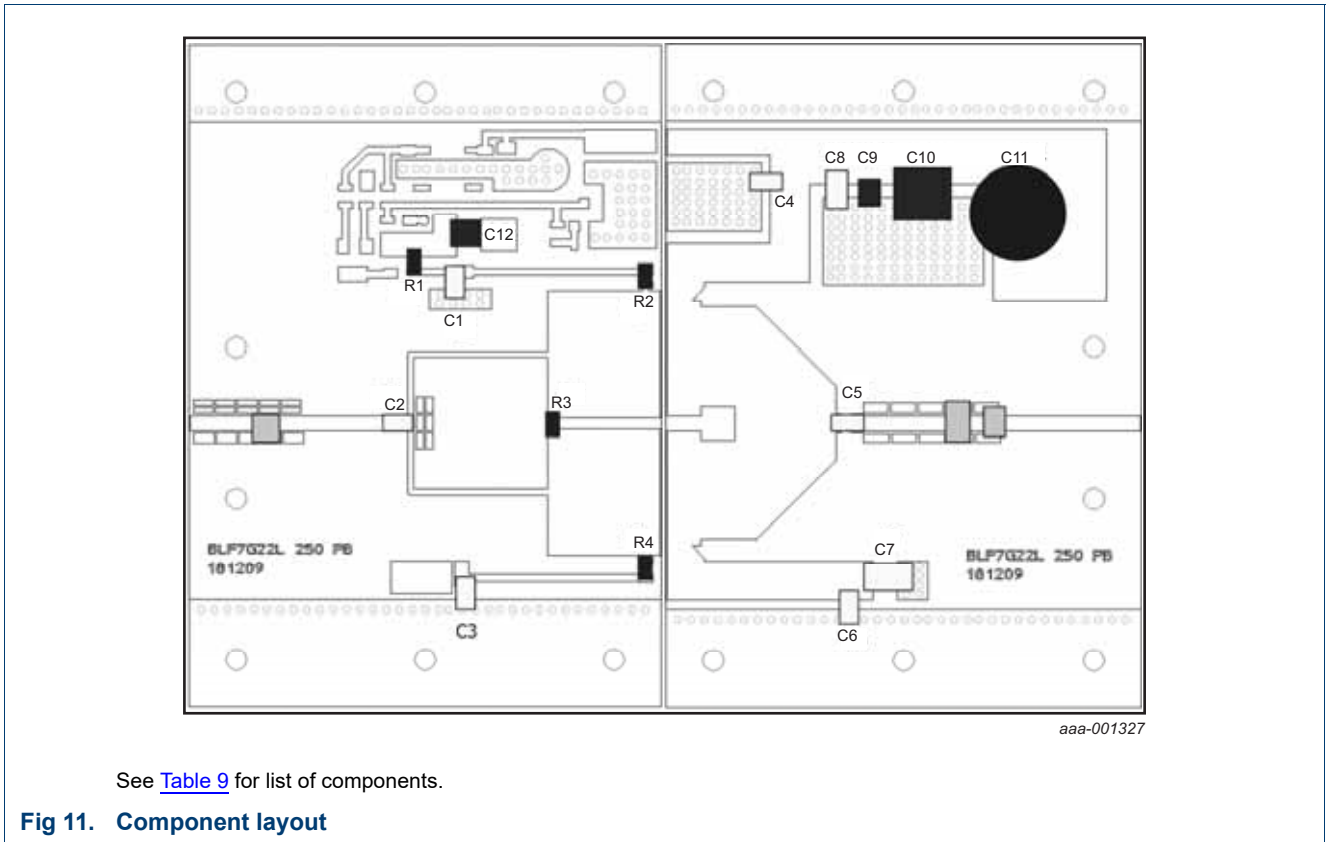
$V_{DS} = 28$  V;  $I_{Dq} = 1900$  mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 2110$  MHz
- (2)  $f = 2140$  MHz
- (3)  $f = 2170$  MHz

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



7.6 Test circuit



See [Table 9](#) for list of components.

Fig 11. Component layout

**Table 9. List of components**  
See [Figure 11](#) for component layout.

Component	Description	Value	Remarks
C2	multilayer ceramic chip capacitor	8.2 pF	[1] ATC100A
C1, C3, C4, C5, C6	multilayer ceramic chip capacitor	8.2 pF	[2] ATC100B
C7, C8	multilayer ceramic chip capacitor	470 nF	[3] TDK
C9, C12	multilayer ceramic chip capacitor	4.7 μF	[3] TDK
C10	multilayer ceramic chip capacitor	10 μF	[3] TDK
C11	electrolytic capacitor	470 μF	
R1	chip resistor	4.7 Ω	Philips 0603
R2, R4	chip resistor	10 Ω	Philips 0603
R3	chip resistor	33 Ω	Philips 0603

- [1] American Technical Ceramics type 100A or capacitor of same quality.
- [2] American Technical Ceramics type 100B or capacitor of same quality.
- [3] TDK or capacitor of same quality.

### 8. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A

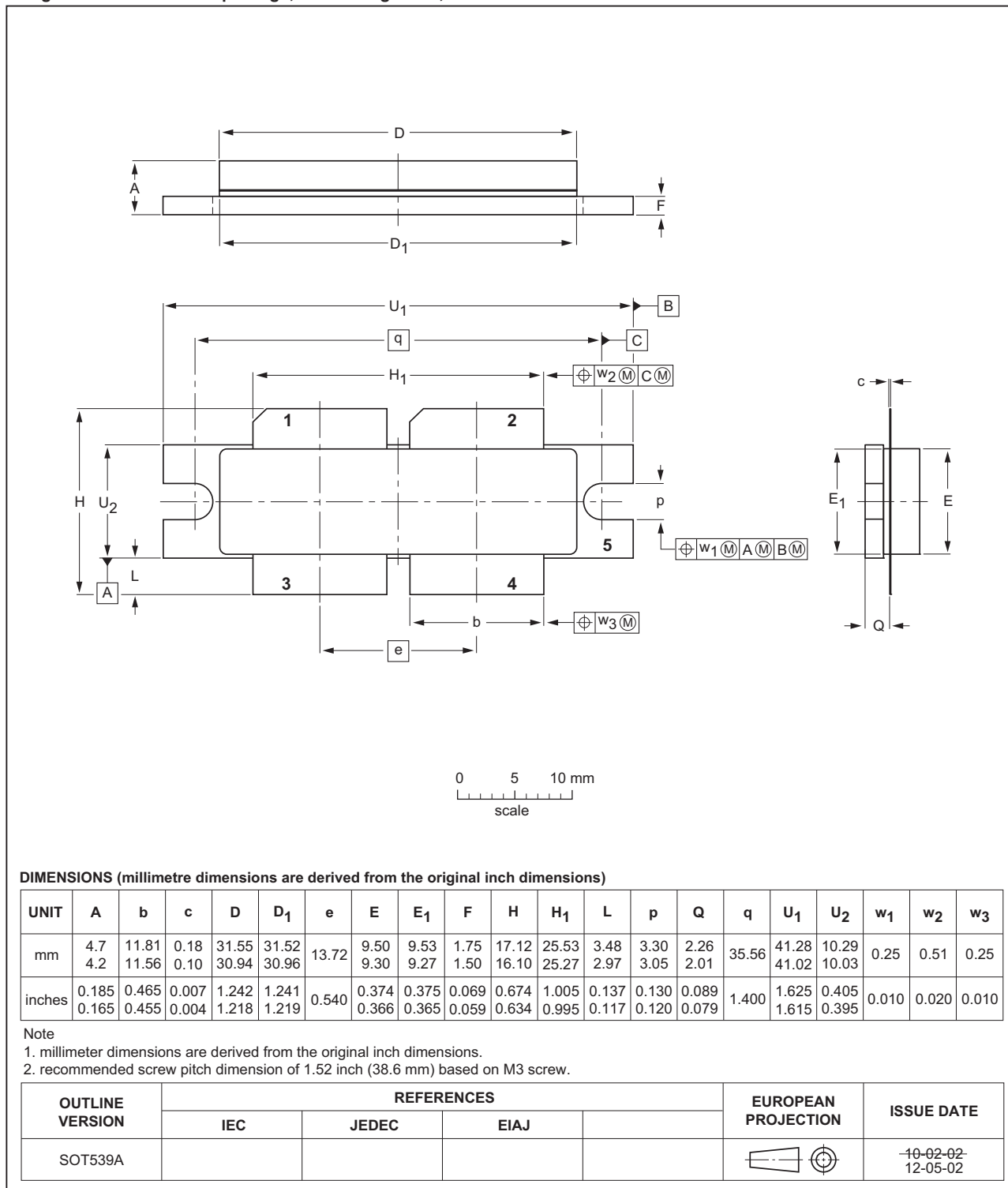


Fig 12. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B

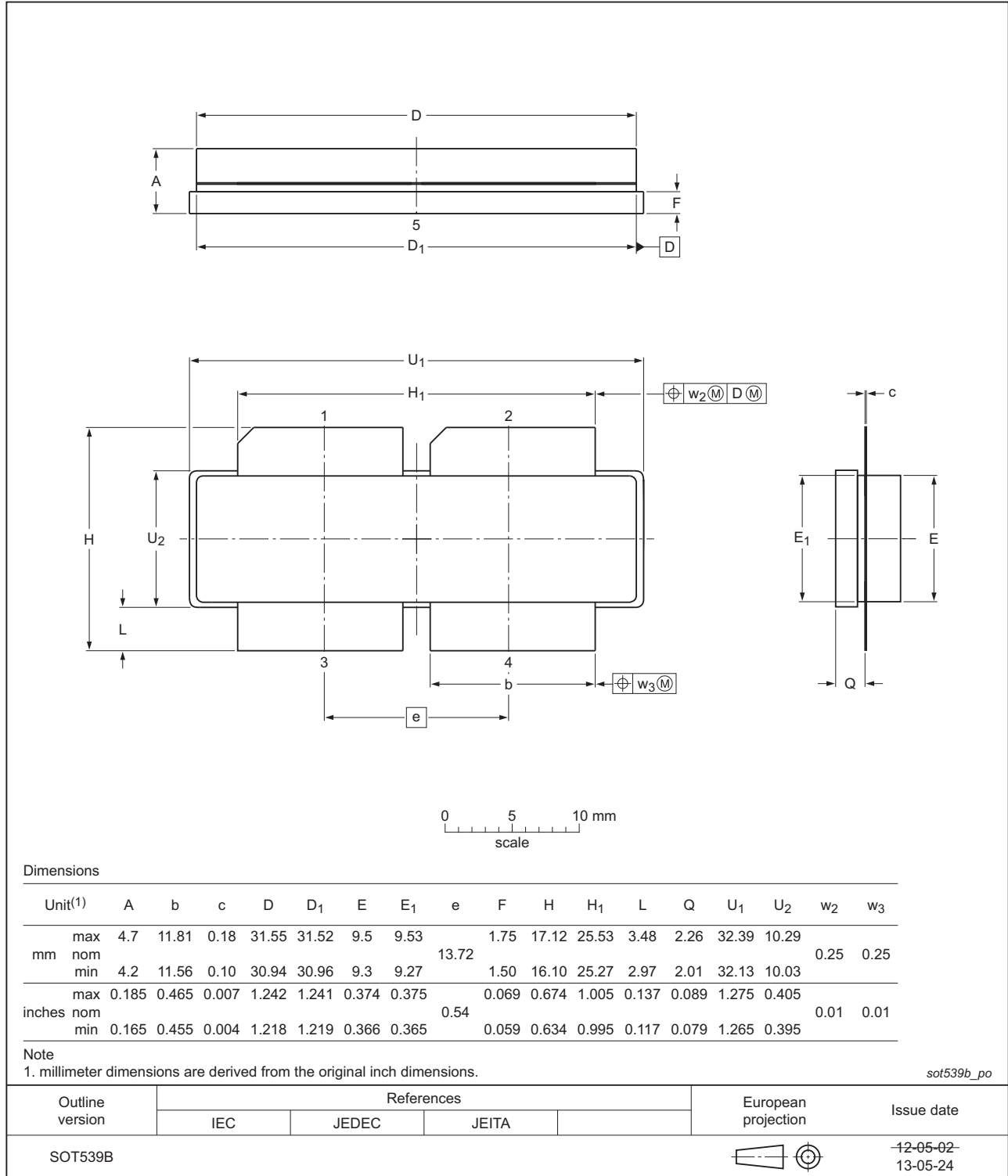


Fig 13. Package outline SOT539B

## 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
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-250P_22LS-250P#4	20150901	Product data sheet	-	BLF7G22L-250P_22LS-250P v.3
Modifications:	<ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
BLF7G22L-250P_22LS-250P v.3	20130712	Product data sheet	-	BLF7G22L-250P_22LS-250P v.2
BLF7G22L-250P_22LS-250P v.2	20111028	Product data sheet	-	BLF7G22L-250P_22LS-250P v.1
BLF7G22L-250P_22LS-250P v.1	20100506	Objective data sheet	-	-

## 12. Legal information

### 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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