

BLF7G22L-250P; BLF7G22LS-250P

Power LDMOS transistor

Rev. 3 — 12 July 2013

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 $T_{case} = 25^\circ\text{C}$ 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	1900	28	70	18.5	31	-30 ^[1]

[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
BLF7G22L-250P (SOT539A)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source	[1]	
BLF7G22LS-250P (SOT539B)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source	[1]	

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package			Version
	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	$T_{case} = 80^\circ\text{C}$; $P_L = 70\text{ W}$; $V_{DS} = 28\text{ V}$; $I_{Dq} = 1900\text{ mA}$	0.20	K/W

6. Characteristics

Table 6. Characteristics

$T_j = 25^\circ\text{C}$ 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	μA
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	-	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; $f_1 = 2112.5\text{ MHz}$; $f_2 = 2117.5\text{ MHz}$; $f_3 = 2162.5\text{ MHz}$; $f_4 = 2167.5\text{ MHz}$; RF performance at $V_{DS} = 28\text{ V}$; $I_{Dq} = 1900\text{ mA}$; $T_{case} = 25^\circ\text{C}$; 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
η_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 MHz .

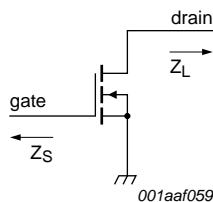
7.2 Impedance information

Table 8. Typical impedance

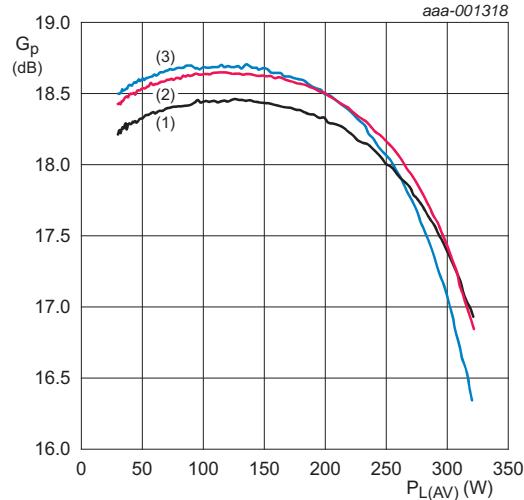
Measured load-pull data half device; $I_{Dq} = 1900 \text{ mA}$; $V_{DS} = 28 \text{ V}$.

f (MHz)	Z_S ^[1] (Ω)	Z_L ^[1] (Ω)
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**

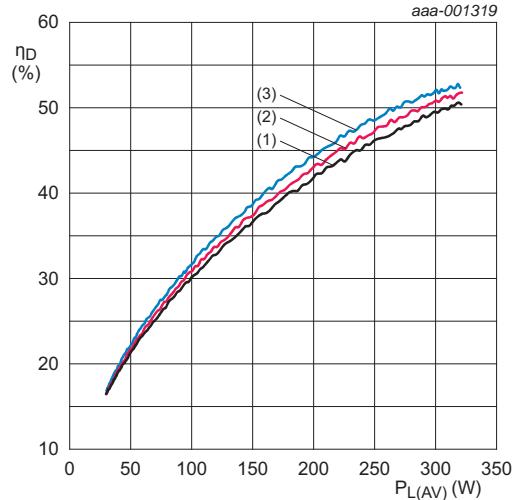
7.3 1 Tone CW



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

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

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

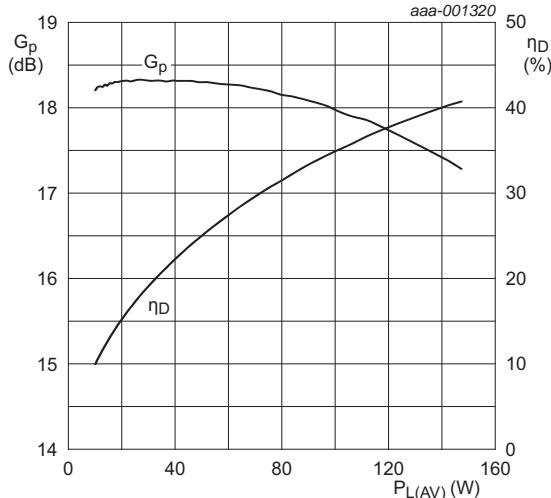


$V_{DS} = 28$ V; $I_{Dq} = 1900$ mA.

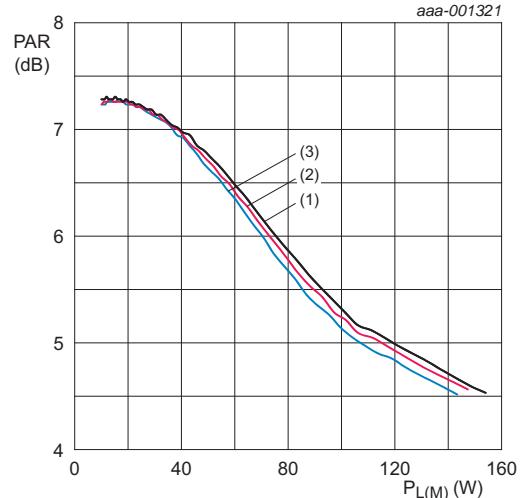
- (1) $f = 2110$ MHz
- (2) $f = 2140$ MHz
- (3) $f = 2170$ MHz

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

7.4 1-carrier W-CDMA



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

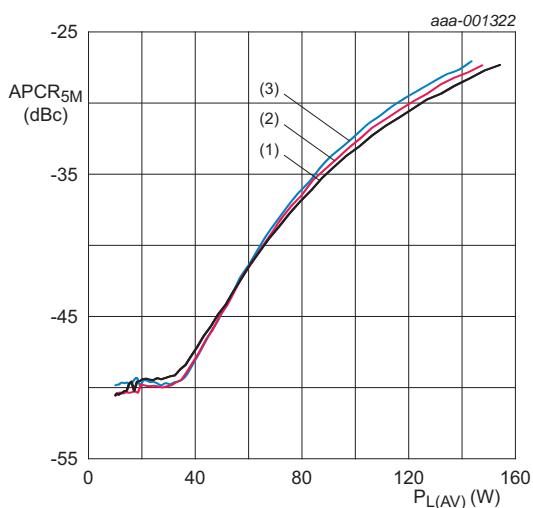


$V_{DS} = 28$ V; $I_{Dq} = 1900$ mA; PAR = 7.2 dB at 0.01 % probability on the CCDF.

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

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

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

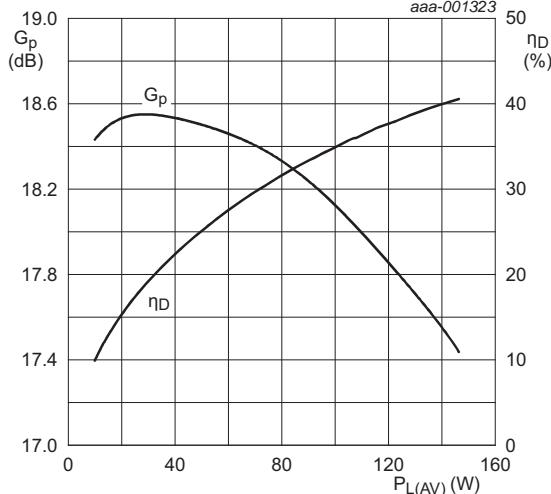


$V_{DS} = 28$ V; $I_{Dq} = 1900$ mA; PAR = 7.2 dB at 0.01 % probability on the CCDF.

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

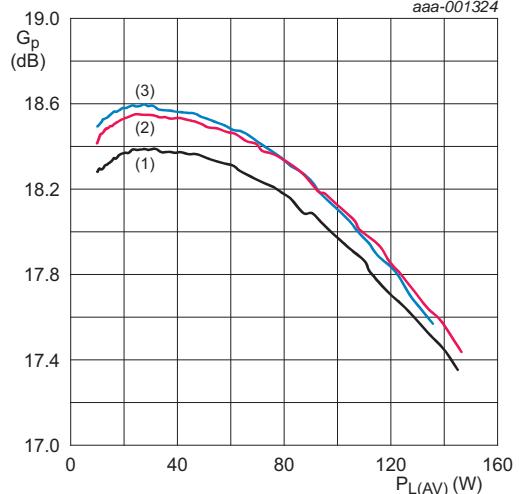
Fig 6. Adjacent power channel ratio (5 MHz) as function of average load power; typical values

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.

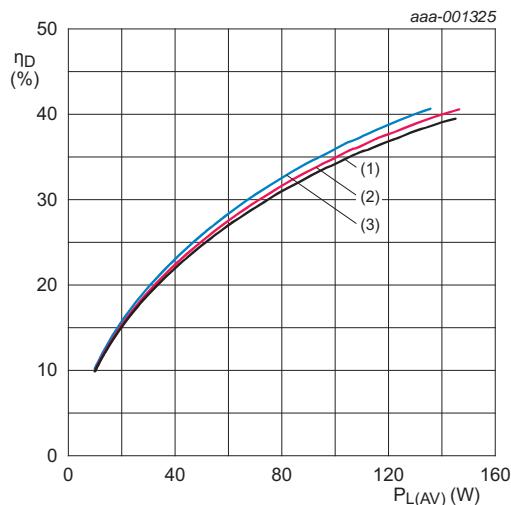
Fig 7. Power gain and drain efficiency as functions of average load power; typical values



$V_{DS} = 28$ 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

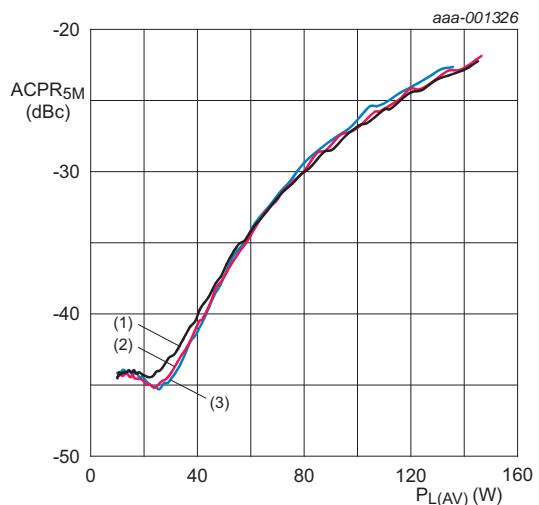
Fig 8. Power gain as a function of average load power; typical values



$V_{DS} = 28$ 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

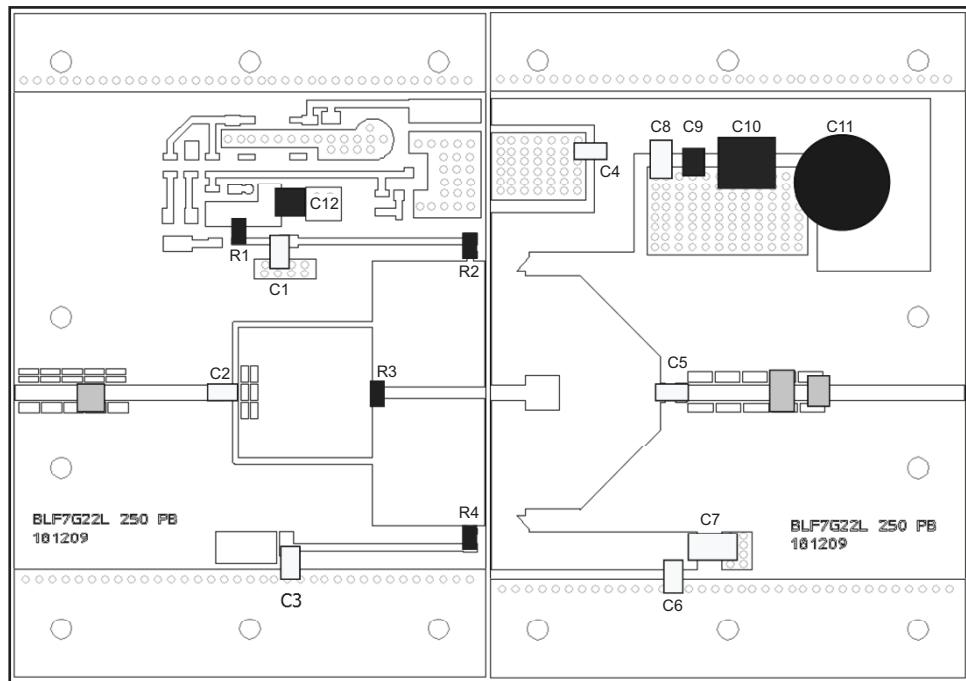


$V_{DS} = 28$ V; $I_{Dq} = 1900$ mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (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 μ F	[3] TDK
C10	multilayer ceramic chip capacitor	10 μ F	[3] TDK
C11	electrolytic capacitor	470 μ F	
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.

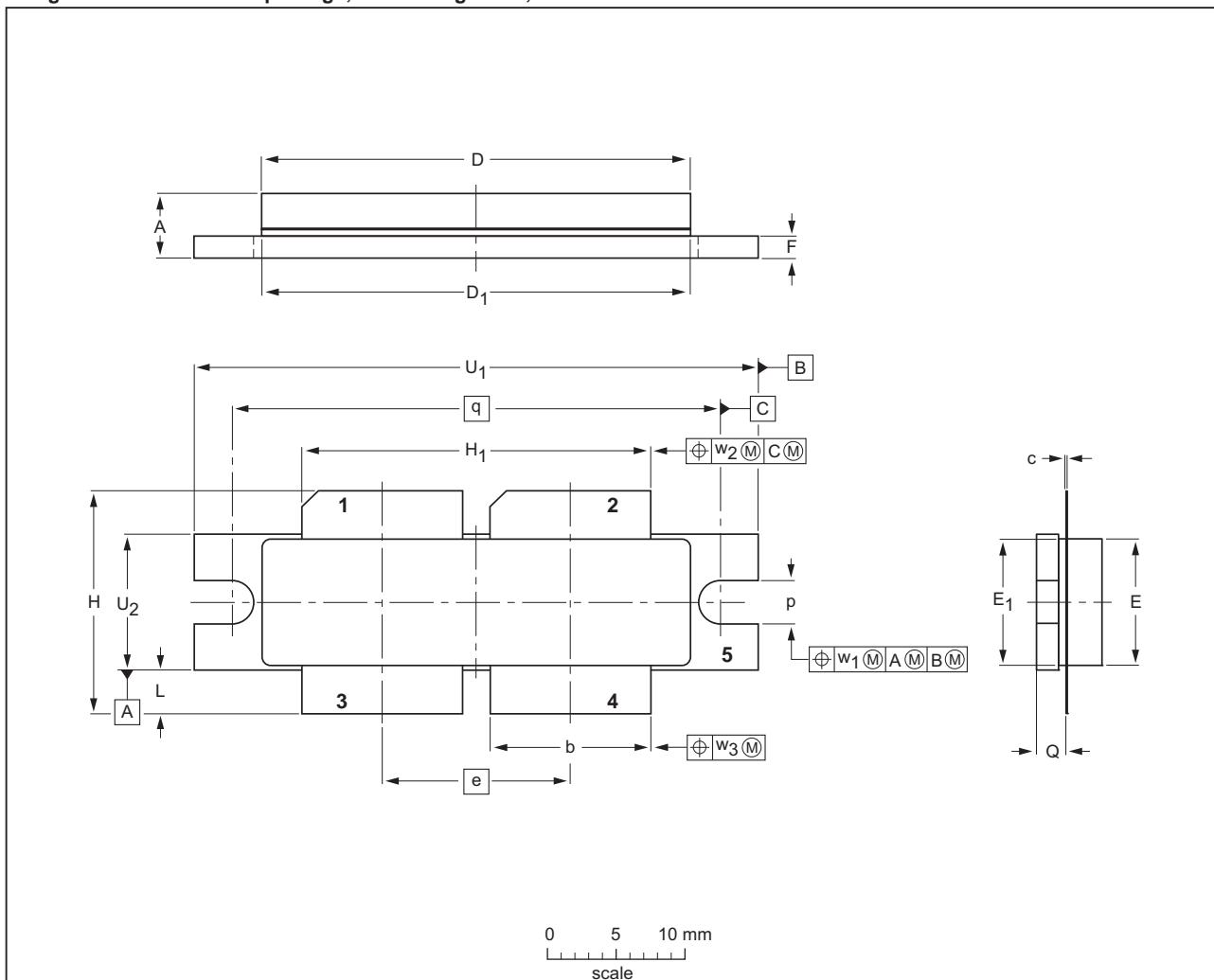
[2] American Technical Ceramics type 100B or capacitor of same quality.

[3] TDK or capacitor of same quality.

8. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D ₁	e	E	E ₁	F	H	H ₁	L	p	Q	q	U ₁	U ₂	w ₁	w ₂	w ₃
mm	4.7	11.81	0.18	31.55	31.52	13.72	9.50	9.53	1.75	17.12	25.53	3.48	3.30	2.26	35.56	41.28	10.29	0.25	0.51	0.25
	4.2	11.56	0.10	30.94	30.96		9.30	9.27	1.50	16.10	25.27	2.97	3.05	2.01	41.02	10.03				
inches	0.185	0.465	0.007	1.242	1.241	0.540	0.374	0.375	0.069	0.674	1.005	0.137	0.130	0.089	1.400	1.625	0.405	0.010	0.020	0.010
	0.165	0.455	0.004	1.218	1.219		0.366	0.365	0.059	0.634	0.995	0.117	0.120	0.079						

Note

1. millimeter dimensions are derived from the original inch dimensions.

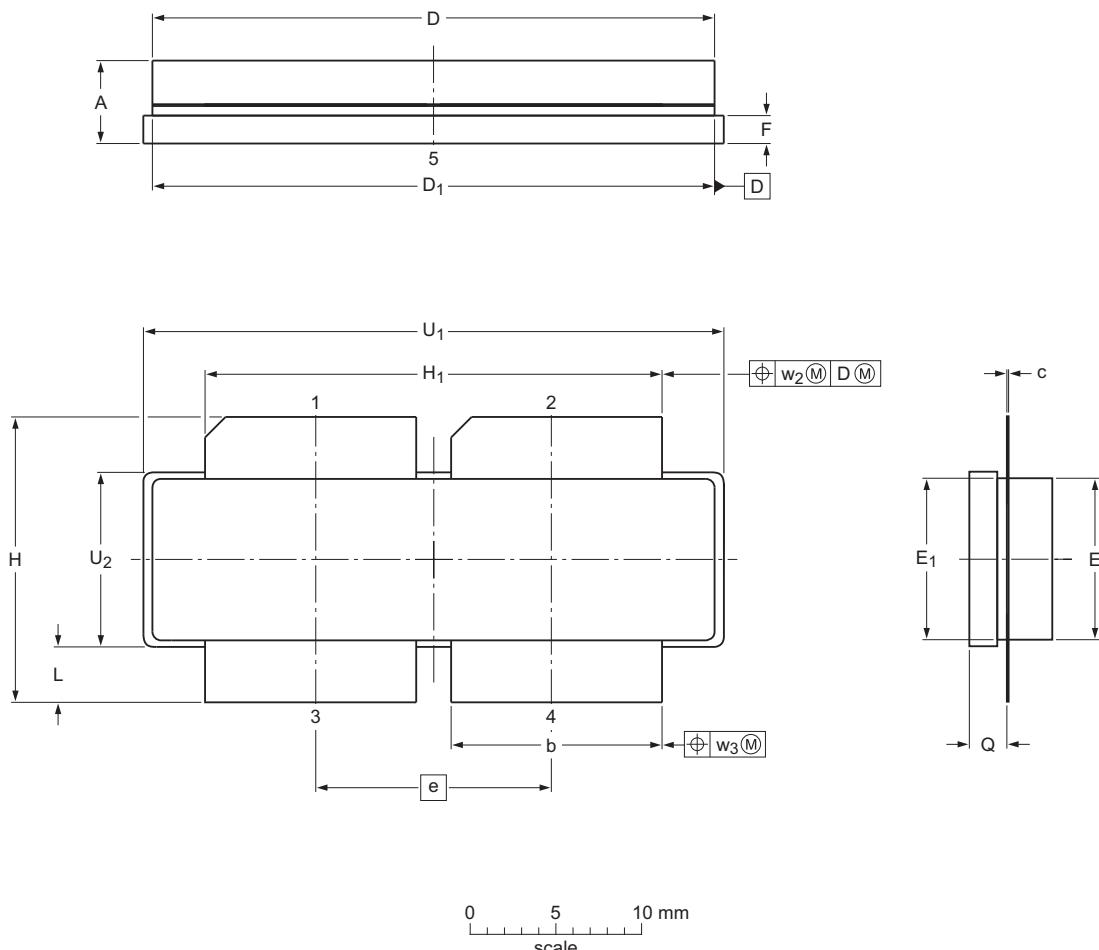
2. recommended screw pitch dimension of 1.52 inch (38.6 mm) based on M3 screw.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT539A						10-02-02 12-05-02

Fig 12. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B



Dimensions

Unit ⁽¹⁾	A	b	c	D	D ₁	E	E ₁	e	F	H	H ₁	L	Q	U ₁	U ₂	w ₂	w ₃
mm	max 4.7	11.81	0.18	31.55	31.52	9.5	9.53		1.75	17.12	25.53	3.48	2.26	32.39	10.29		
mm	nom	11.56	0.10	30.94	30.96	9.3	9.27		1.50	16.10	25.27	2.97	2.01	32.13	10.03	0.25	0.25
mm	min 4.2	11.56	0.10	30.94	30.96	9.3	9.27	13.72	1.50	16.10	25.27	2.97	2.01	32.13	10.03		
inches	max 0.185	0.465	0.007	1.242	1.241	0.374	0.375		0.069	0.674	1.005	0.137	0.089	1.275	0.405		
inches	nom	0.465	0.007	1.242	1.241	0.374	0.375	0.54	0.069	0.674	1.005	0.137	0.089	1.275	0.405	0.01	0.01
inches	min 0.165	0.455	0.004	1.218	1.219	0.366	0.365		0.059	0.634	0.995	0.117	0.079	1.265	0.395		

Note

1. millimeter dimensions are derived from the original inch dimensions.

sot539b_po

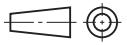
Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT539B					-12-05-02- 13-05-24

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 v.3	20130712	Product data sheet	-	BLF7G22L-250P_22LS-250P v.2
Modifications:			<ul style="list-style-type: none"> The package outline Figure 13 is updated. Translation disclaimer added to the legal text. 	
BLF7G22L-250P_22LS-250P v.2	20111028	Product data sheet	-	BLF7G22L-250P_22LS-250P v.1
Modifications:			<ul style="list-style-type: none"> The status of this document has been changed to Product data sheet Table 1 on page 1: the term PDPCH has been changed to DPCH; several values have been changed Table 7 on page 3: the term PDPCH has been changed to DPCH; several values have been changed Section 7.2 on page 4: section has been added Section 7.6 on page 8: section has been added Section 9 on page 11: section has been added 	
BLF7G22L-250P_22LS-250P v.1	20100506	Objective data sheet	-	-

12. Legal information

12.1 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.
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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[2] The term 'short data sheet' is explained in section "Definitions".

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14. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
2	Pinning information	2
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	3
6	Characteristics	3
7	Test information	3
7.1	Ruggedness in class-AB operation	3
7.2	Impedance information	4
7.3	1 Tone CW	5
7.4	1-carrier W-CDMA	6
7.5	2-carrier W-CDMA	7
7.6	Test circuit	8
8	Package outline	9
9	Handling information	11
10	Abbreviations	11
11	Revision history	11
12	Legal information	12
12.1	Data sheet status	12
12.2	Definitions	12
12.3	Disclaimers	12
12.4	Trademarks	13
13	Contact information	13
14	Contents	14

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Date of release: 12 July 2013

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