

BLL6H1214L-250; BLL6H1214LS-250

LDMOS L-band radar power transistor

Rev. 3 — 14 July 2010

Product data sheet

1. Product profile

1.1 General description

250 W LDMOS power transistor intended for L-band radar applications in the 1.2 GHz to 1.4 GHz range.

Table 1. Test information

Typical RF performance at $T_{case} = 25\text{ }^{\circ}\text{C}$; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$; in a class-AB production test circuit.

Mode of operation	f (GHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η_D (%)	t _r (ns)	t _f (ns)
pulsed RF	1.2 to 1.4	50	250	17	55	15	5

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

- Typical pulsed RF performance at a frequency of 1.2 GHz to 1.4 GHz, a supply voltage of 50 V, an I_{Dq} of 100 mA, a t_p of 300 μs with δ of 10 %:
 - ◆ Output power = 250 W
 - ◆ Power gain = 17 dB
 - ◆ Efficiency = 55 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1.2 GHz to 1.4 GHz)
- Internally matched for ease of use
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

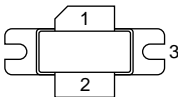
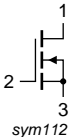
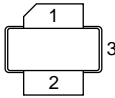
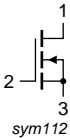


1.3 Applications

- L-band power amplifiers for radar applications in the 1.2 GHz to 1.4 GHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLL6H1214L-250 (SOT502A)			
1	drain		 sym112
2	gate		
3	source		
BLL6H1214LS-250 (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
BLL6H1214L-250	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLL6H1214LS-250	-	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		-	100	V
V_{GS}	gate-source voltage		-0.5	+13	V
I_D	drain current		-	42	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
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_{case} = 85\text{ °C}; P_L = 250\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\%$	0.10	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\%$	0.13	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\%$	0.15	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\%$	0.14	K/W
		$t_p = 500\text{ }\mu\text{s}; \delta = 20\%$	0.20	K/W

6. Characteristics

Table 6. DC characteristics

$T_j = 25\text{ °C}$.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 2.7\text{ mA}$	100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 270\text{ mA}$	1.3	1.8	2.25	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}$	-	-	1.4	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	32	42	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 270\text{ mA}$	1.6	2.3	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 9.5\text{ A}$	-	100	169	$\text{m}\Omega$

Table 7. RF characteristics

Mode of operation: pulsed RF; $t_p = 300\text{ }\mu\text{s}; \delta = 10\%$; RF performance at $V_{DS} = 50\text{ V}; I_{Dq} = 100\text{ mA}; T_{case} = 25\text{ °C}$; unless otherwise specified, in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P_L	output power		250	-	-	W
V_{DS}	drain-source voltage	$P_L = 250\text{ W}$	-	-	50	V
G_p	power gain	$P_L = 250\text{ W}$	15	17	-	dB
t_p	pulse duration	$P_L = 250\text{ W}$	-	300	500	μs
δ	duty cycle	$P_L = 250\text{ W}$	-	10	20	%
RL_{in}	input return loss	$P_L = 250\text{ W}$	-	10	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	300	-	W
η_D	drain efficiency	$P_L = 250\text{ W}$	49	55	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 250\text{ W}$	-	0	0.3	dB
t_r	rise time	$P_L = 250\text{ W}$	-	15	-	ns
t_f	fall time	$P_L = 250\text{ W}$	-	5	-	ns

6.1 Ruggedness in class-AB operation

The BLL6H1214L-250 and BLL6H1214LS-250 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 50\text{ V}$; $I_{DQ} = 100\text{ mA}$; $P_L = 250\text{ W}$; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\text{ }\%$.

7. Application information

7.1 Impedance information

Table 8. Typical impedance
Typical values unless otherwise specified.

f GHz	Z_S Ω	Z_L Ω
1.2	1.268 – j2.623	2.987 – j1.664
1.3	2.193 – j2.457	2.162 – j1.326
1.4	2.359 – j2.052	1.604 – j1.887

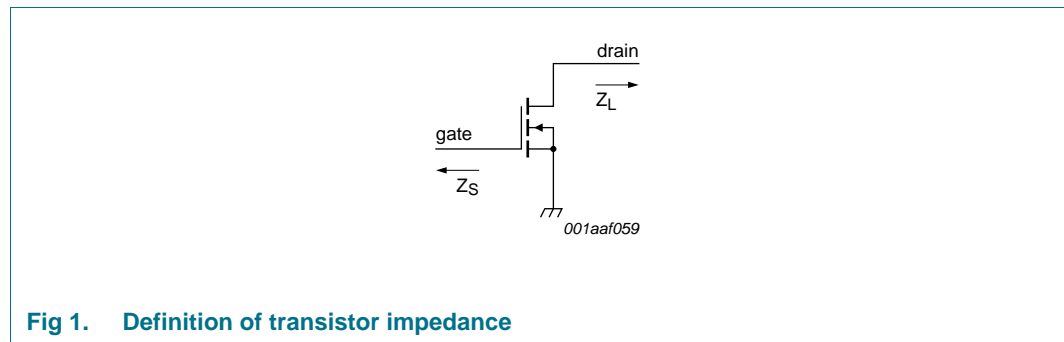
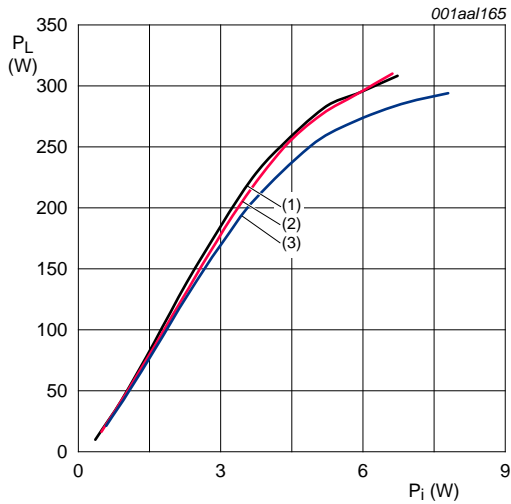


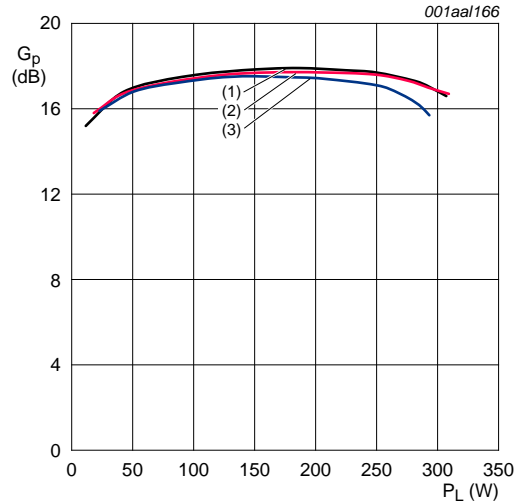
Fig 1. Definition of transistor impedance

7.2 RF performance



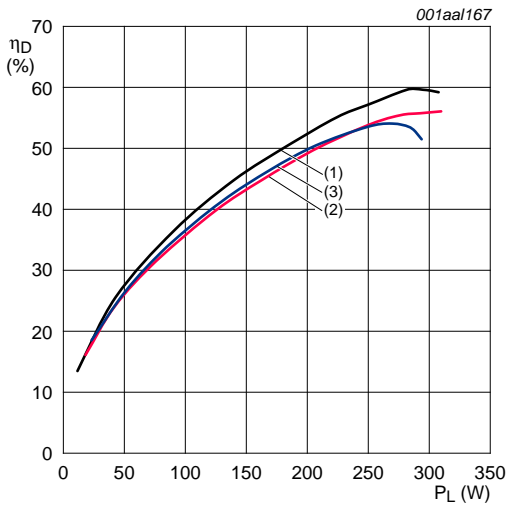
$V_{DS} = 50\text{ V}$; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$.
 (1) $f = 1200\text{ MHz}$
 (2) $f = 1300\text{ MHz}$
 (3) $f = 1400\text{ MHz}$

Fig 2. Output power as a function of input power; typical values



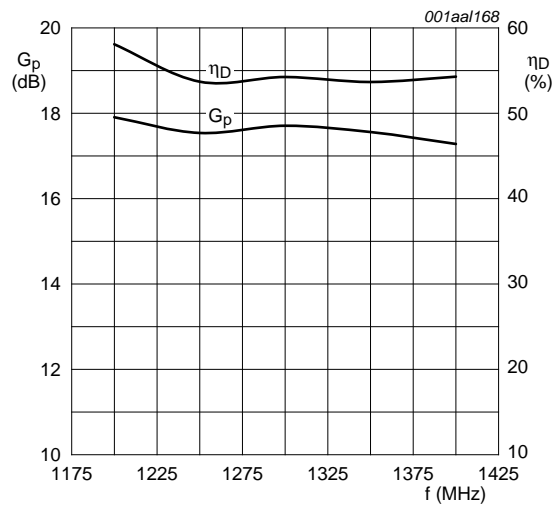
$V_{DS} = 50\text{ V}$; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$.
 (1) $f = 1200\text{ MHz}$
 (2) $f = 1300\text{ MHz}$
 (3) $f = 1400\text{ MHz}$

Fig 3. Power gain as a function of load power; typical values



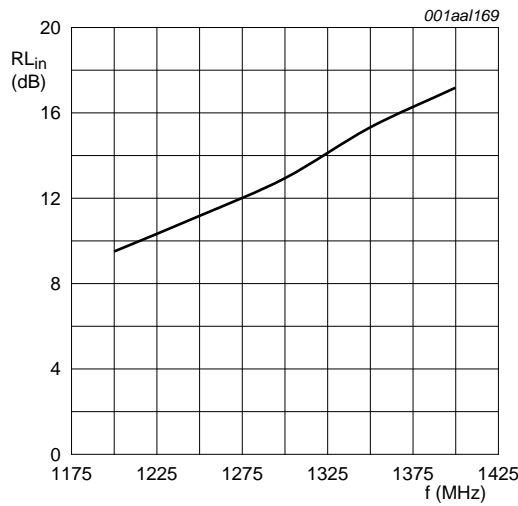
$V_{DS} = 50\text{ V}$; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$.
 (1) $f = 1200\text{ MHz}$
 (2) $f = 1300\text{ MHz}$
 (3) $f = 1400\text{ MHz}$

Fig 4. Drain efficiency as a function of load power; typical values



$P_L = 250\text{ W}$; $V_{DS} = 50\text{ V}$; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$.

Fig 5. Power gain and drain efficiency as function of frequency; typical values



$P_L = 250\text{ W}$; $V_{DS} = 50\text{ V}$; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$.

Fig 6. Input return loss as a function of frequency; typical value

7.3 Application circuit

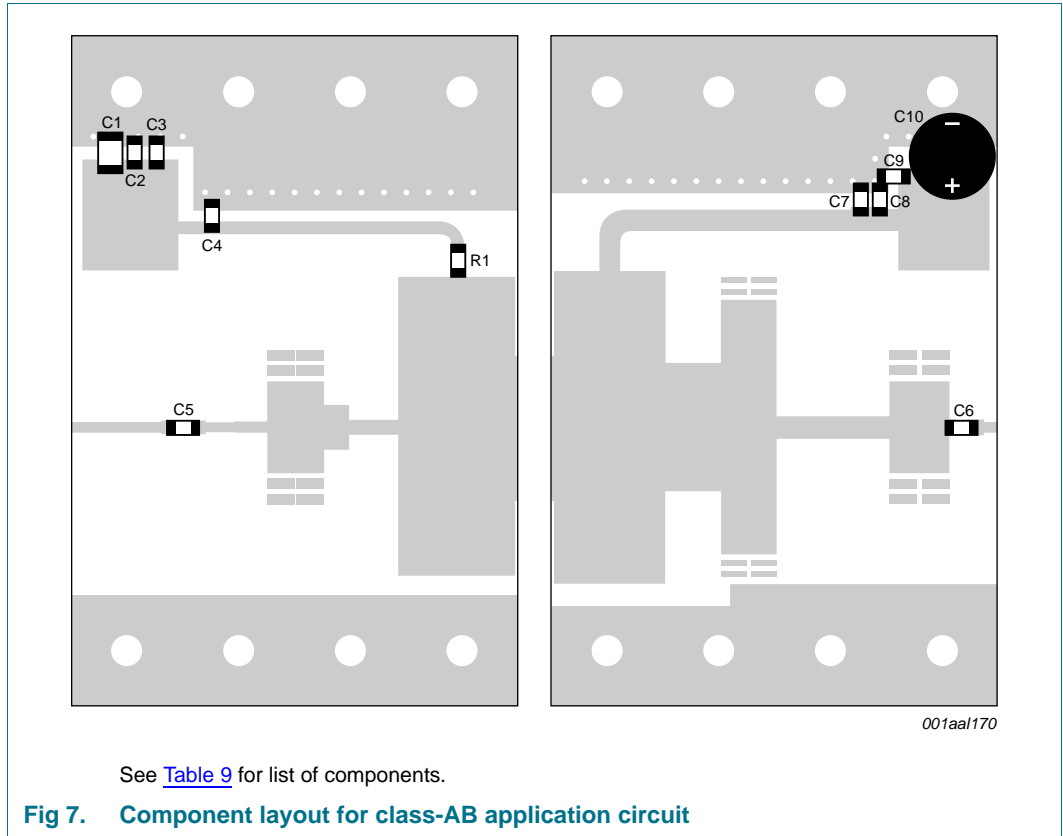


Table 9. List of components

See [Figure 7](#).

Striplines are on a *Rodgers Duroid 6006 Printed-Circuit Board (PCB)*; $\epsilon_r = 6.15 F/m$; thickness = 0.64 mm

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	10 μ F; 35 V	[1]
C2, C4	multilayer ceramic chip capacitor	51 pF	[2]
C3, C8	multilayer ceramic chip capacitor	1 nF	[2]
C5	multilayer ceramic chip capacitor	82 pF	[3]
C6, C7	multilayer ceramic chip capacitor	56 pF	[3]
C9	multilayer ceramic chip capacitor	100 pF	[3]
C10	electrolytic capacitor	47 μ F; 63 V	
R1	SMD resistor	10 Ω	0603

[1] American Technical Ceramics type 100A or capacitor of same quality.

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

[3] American Technical Ceramics type 800B or capacitor of same quality.

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

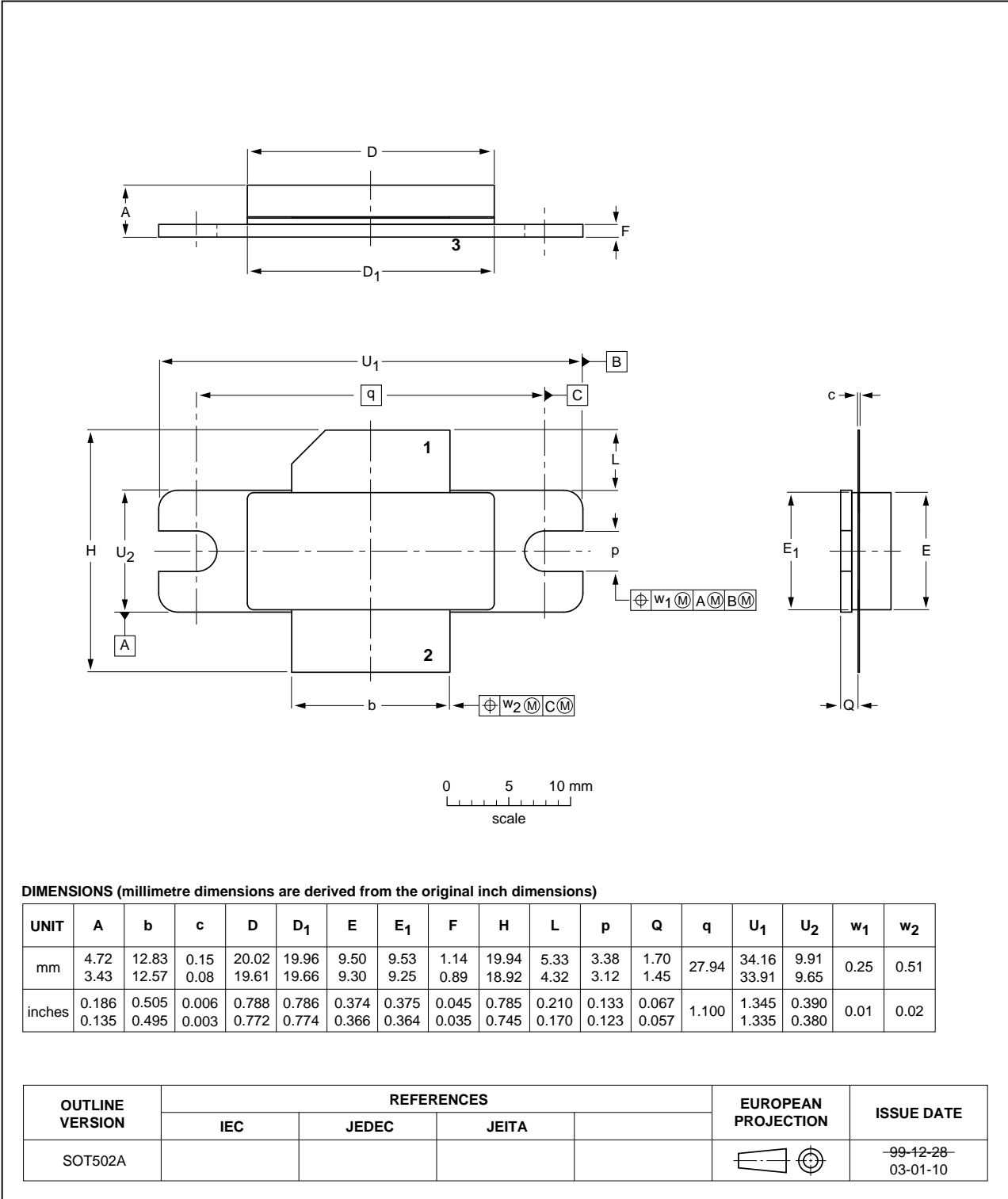


Fig 8. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

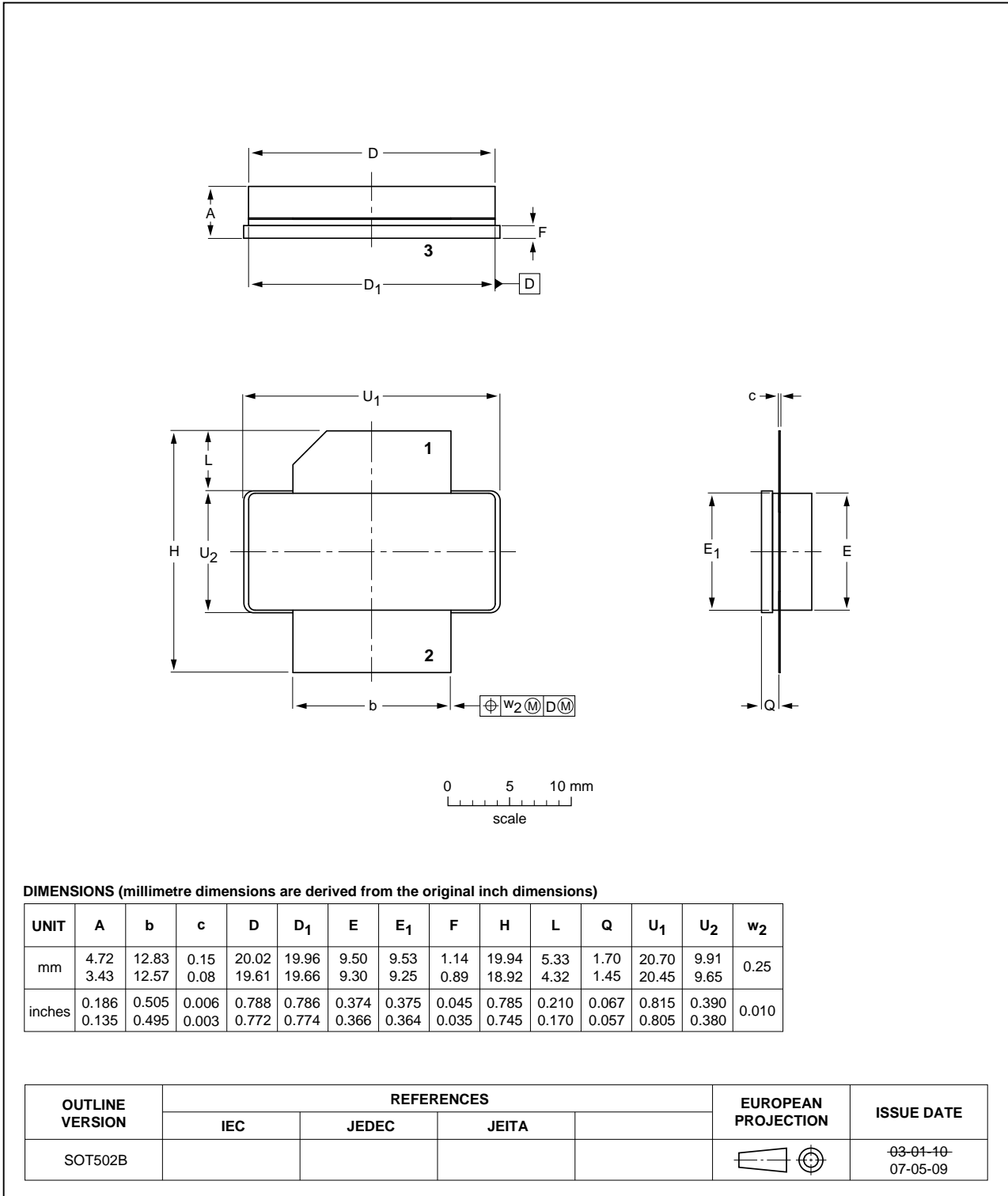


Fig 9. Package outline SOT502B

9. Abbreviations

Table 10. Abbreviations

Acronym	Description
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio

10. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLL6H1214L-250_1214LS-250 v.3	20100714	Product data sheet	-	BLL6H1214L-250_1214LS-250_2
Modifications:	<ul style="list-style-type: none"> • Table 7 on page 3: the minimum value of η_D has been changed. 			
BLL6H1214L-250_1214LS-250_2	20100302	Objective data sheet	-	BLL6H1214L-250_1214LS-250_1
BLL6H1214L-250_1214LS-250_1	20091211	Objective 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.
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".

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13. Contents

1 Product profile 1

1.1 General description 1

1.2 Features and benefits 1

1.3 Applications 2

2 Pinning information 2

3 Ordering information 2

4 Limiting values 2

5 Thermal characteristics 3

6 Characteristics 3

6.1 Ruggedness in class-AB operation 4

7 Application information 4

7.1 Impedance information 4

7.2 RF performance 5

7.3 Application circuit 7

8 Package outline 8

9 Abbreviations 10

10 Revision history 10

11 Legal information 11

11.1 Data sheet status 11

11.2 Definitions 11

11.3 Disclaimers 11

11.4 Trademarks 12

12 Contact information 12

13 Contents 13

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