

BLL1214-250R

LDMOS L-band radar power transistor

Rev. 01 — 4 February 2010

Product data sheet

1. Product profile

1.1 General description

Silicon N-channel enhancement model LDMOS power transistor encapsulated in a 2-lead flange package (SOT502A) with a ceramic cap. The common source is connected to the flange.

Table 1. Test information

Typical RF performance at $T_h = 25\text{ }^\circ\text{C}$; $t_p = 1\text{ ms}$; $\delta = 10\%$; in a common source class-AB test circuit.

Mode of operation	f (GHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	$P_{\text{droop(pulse)}}$ (dB)	t_r (ns)	t_f (ns)
pulsed RF	1.2 to 1.4	36	150	250	13	47	0.2	15	5

CAUTION



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

1.2 Features

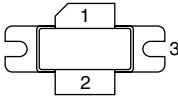
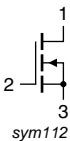
- Typical pulsed RF performance at a frequency of 1.2 GHz to 1.4 GHz, a supply voltage of 36 V, an I_{DQ} of 150 mA, a t_p of 1 ms with δ of 10 %:
 - ◆ Output power = 250 W
 - ◆ Power gain = 13 dB
 - ◆ Efficiency = 47 %
- High power gain
- Easy power control
- Excellent ruggedness
- Source on mounting base eliminates DC isolators, reducing common mode inductance.

1.3 Applications

- L-band 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
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLL1214-250R	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A

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		-	75	V
V_{GS}	gate-source voltage		-22	+22	V
P_{tot}	total power dissipation	$T_h \leq 70\text{ °C}$; $t_p = 1\text{ ms}$; $\delta = 10\%$	-	400	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
$Z_{th(j-h)}$	transient thermal impedance from junction to heatsink	$T_h = 25\text{ °C}$		
		$t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$	0.17	K/W
		$t_p = 1\text{ ms}$; $\delta = 10\%$	0.32	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	$V_{GS} = 0\text{ V}; I_D = 3\text{ mA}$	75	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 300\text{ mA}$	4	-	5	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 36\text{ V}$	-	-	1	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 9\text{ V}; V_{DS} = 10\text{ V}$	45	-	-	A
I_{GSS}	gate leakage current	$V_{GS} = \pm 20\text{ V}; V_{DS} = 0\text{ V}$	-	-	1	μA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 10\text{ A}$	-	9	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 9\text{ V}; I_D = 10\text{ A}$	-	60	-	$\text{m}\Omega$

Table 7. RF characteristics

Mode of operation: pulsed RF; $t_p = 1\text{ ms}$; $\delta = 10\%$; $f = 1.2\text{ GHz to }1.4\text{ GHz}$; RF performance at $V_{DS} = 36\text{ V}$; $I_{DQ} = 150\text{ mA}$; $T_h = 25\text{ °C}$; $Z_{th(mb-h)} = 0.25\text{ K/W}$; unless otherwise specified, in a common source class-AB circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P_L	output power		-	250	-	W
V_{DS}	drain-source voltage	$P_L = 250\text{ W}$	-	36	-	V
G_p	power gain	$P_L = 250\text{ W}$	-	13	-	dB
η_D	drain efficiency	$P_L = 250\text{ W}$	-	47	-	%
$P_{\text{droop(pulse)}}$	pulse droop power	$P_L = 250\text{ W}$	-	0.2	-	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 BLL1214-250R is capable of withstanding a load mismatch corresponding to $V_{SWR} = 3 : 1$ through all phases under the following conditions: $V_{DS} = 36\text{ V}$; $f = 1.2\text{ GHz to }1.4\text{ GHz}$ at rated load power.

7. Application information

7.1 Impedance information

Table 8. Typical impedance

Typical values unless otherwise specified.

f	Z_S	Z_L
GHz	Ω	Ω
1.20	$1.3 - j2.8$	$1.1 - j0.9$
1.25	$1.9 - j2.8$	$1.0 - j0.5$
1.30	$4.6 - j2.9$	$0.8 - j0.2$
1.35	$5.7 - j0.3$	$0.7 - j0.3$
1.40	$2.7 - j1.8$	$0.6 - j0.4$

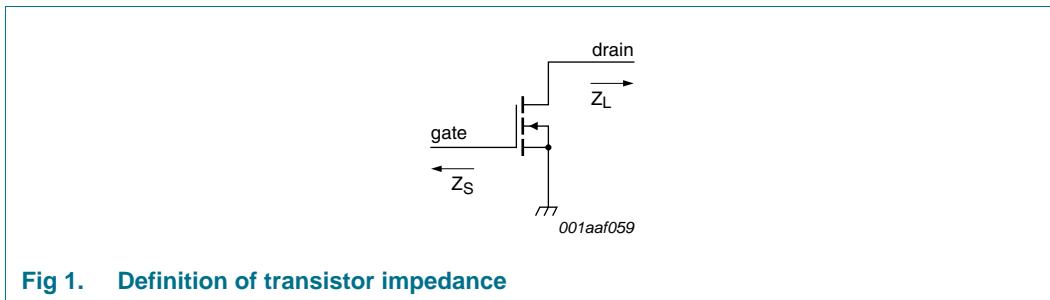


Fig 1. Definition of transistor impedance

7.2 Application circuit

Table 9. List of components

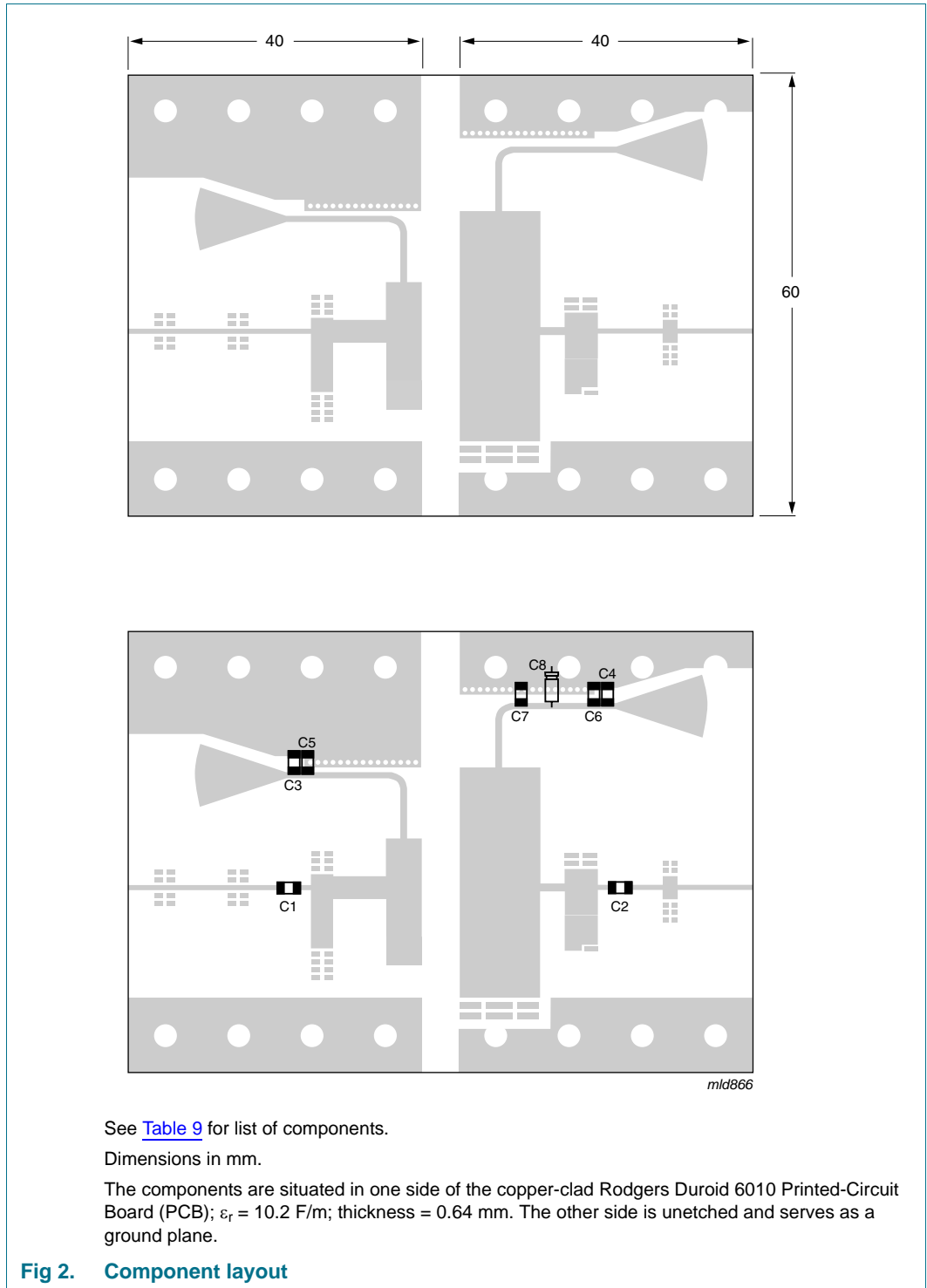
See [Figure 2](#).

The components are situated in one side of the copper-clad Rogers Duroid 6010 Printed-Circuit Board (PCB); $\epsilon_r = 10.2$ F/m; thickness = 0.64 mm. The other side is unetched and serves as a ground plane.

Component	Description	Value	Remarks
C1, C3	multilayer ceramic chip capacitor	39 pF	[1]
C2, C4	multilayer ceramic chip capacitor	47 pF	[1]
C5, C6	multilayer ceramic chip capacitor	20 nF	[2]
C7	multilayer ceramic chip capacitor	36 pF	[2]
C8	electrolytic capacitor	100 μ F; 100 V	

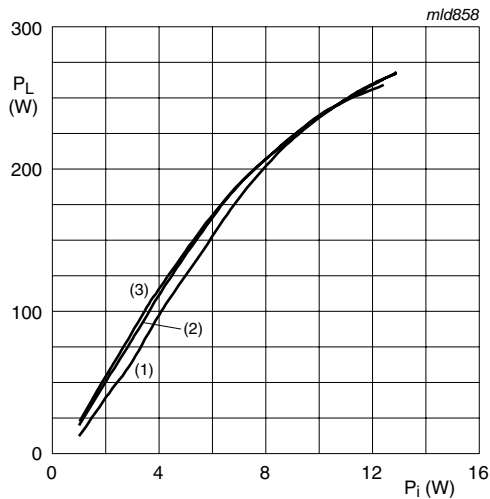
[1] American Technical Ceramics type 100A or capacitor of same quality.

[2] American Technical Ceramics type 200B or capacitor of same quality.



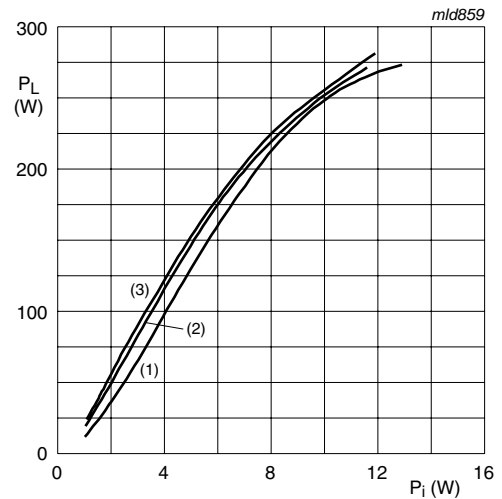
8. Test information

8.1 RF performance



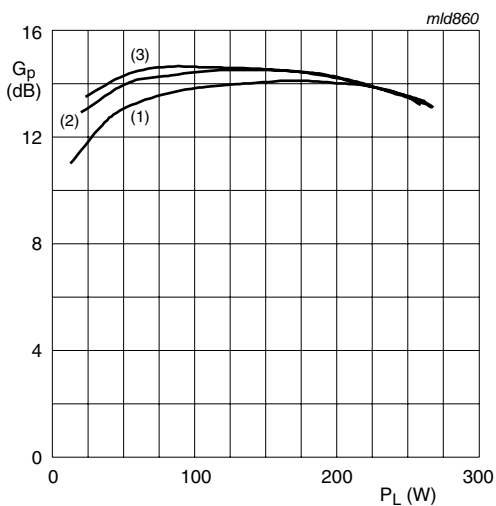
- $t_p = 1 \text{ ms}; \delta = 10 \%$.
- (1) $f = 1.2 \text{ GHz}$.
 - (2) $f = 1.3 \text{ GHz}$.
 - (3) $f = 1.4 \text{ GHz}$.

Fig 3. Output power as a function of input power; typical values



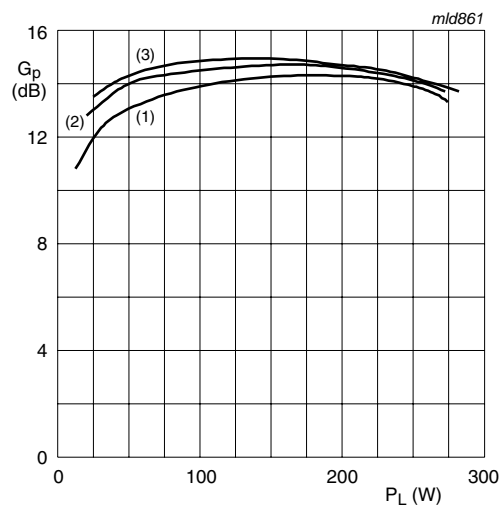
- $t_p = 100 \mu\text{s}; \delta = 10 \%$.
- (1) $f = 1.2 \text{ GHz}$.
 - (2) $f = 1.3 \text{ GHz}$.
 - (3) $f = 1.4 \text{ GHz}$.

Fig 4. Output power as a function of input power; typical values



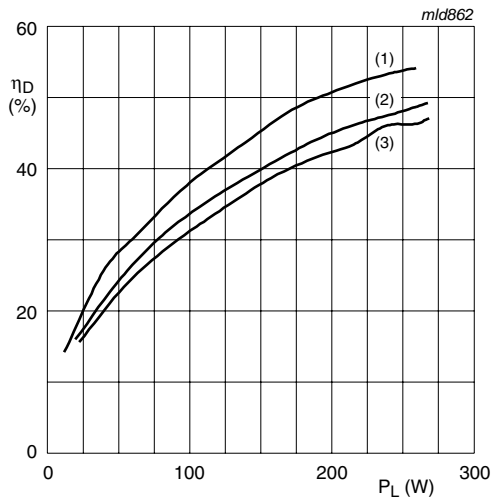
- $t_p = 1 \text{ ms}; \delta = 10 \%$.
- (1) $f = 1.2 \text{ GHz}$.
 - (2) $f = 1.3 \text{ GHz}$.
 - (3) $f = 1.4 \text{ GHz}$.

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



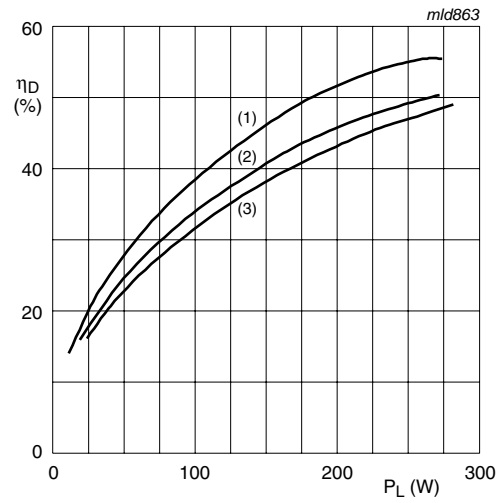
- $t_p = 100 \mu\text{s}; \delta = 10 \%$.
- (1) $f = 1.2 \text{ GHz}$.
 - (2) $f = 1.3 \text{ GHz}$.
 - (3) $f = 1.4 \text{ GHz}$.

Fig 6. Power gain as a function of load power; typical values



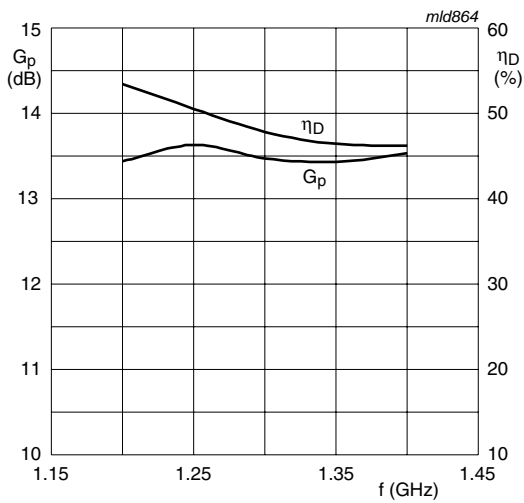
$t_p = 1 \text{ ms}; \delta = 10 \text{ \%}$.
 (1) $f = 1.2 \text{ GHz}$.
 (2) $f = 1.3 \text{ GHz}$.
 (3) $f = 1.4 \text{ GHz}$.

Fig 7. Drain efficiency as a function of load power; typical values



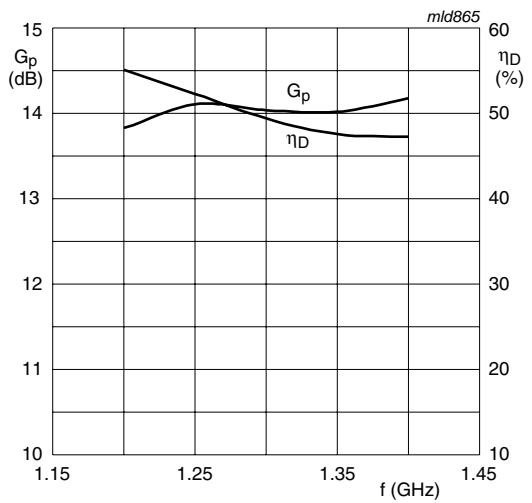
$t_p = 100 \text{ }\mu\text{s}; \delta = 10 \text{ \%}$.
 (1) $f = 1.2 \text{ GHz}$.
 (2) $f = 1.3 \text{ GHz}$.
 (3) $f = 1.4 \text{ GHz}$.

Fig 8. Drain efficiency as a function of load power; typical values



$t_p = 1 \text{ ms}; \delta = 10 \text{ \%}$.

Fig 9. Power gain and drain efficiency as function of frequency; typical values



$t_p = 100 \text{ }\mu\text{s}; \delta = 10 \text{ \%}$.

Fig 10. Power gain and drain efficiency as function of frequency; typical values

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

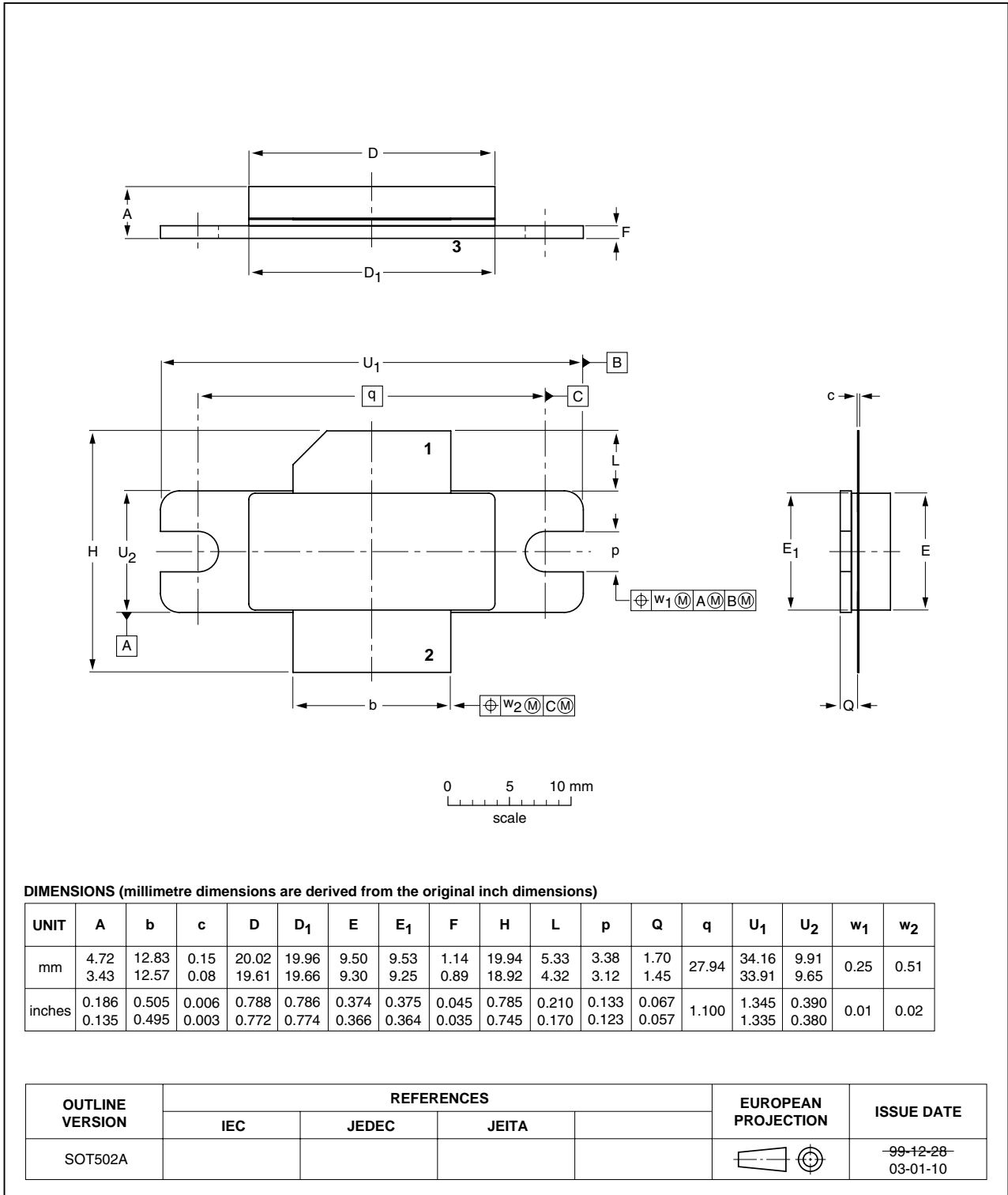


Fig 11. Package outline SOT502A

10. Abbreviations

Table 10. Abbreviations

Acronym	Description
DC	Direct Current
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
L-band	Long wave band
VSWR	Voltage Standing-Wave Ratio

11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLL1214-250R_1	20100204	Product 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.
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[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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