

BLA1011-200R; BLA1011S-200R

Avionics LDMOS transistors

Rev. 01 — 23 February 2010

Product data sheet

1. Product profile

1.1 General description

200 W LDMOS avionics power transistor for transmitter applications at frequencies from 1 030 MHz to 1 090 MHz.

Table 1. Typical performance

RF performance at $T_h = 25\text{ °C}$ in a common source class-AB test circuit; $I_{DQ} = 150\text{ mA}$; typical values.

Mode of operation	Conditions	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)	t_r (ns)	t_f (ns)
Pulsed class-AB: 1 030 MHz to 1 090 MHz	$t_p = 50\text{ }\mu\text{s}; \delta = 2\text{ }\%$	36	200	15	50	35	6
	$t_p = 128\text{ }\mu\text{s}; \delta = 2\text{ }\%$	36	250	14	50	35	6
	$t_p = 340\text{ }\mu\text{s}; \delta = 1\text{ }\%$	36	250	14	50	35	6

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 class-AB performance at a frequencies from 1 030 MHz to 1 090 MHz, a supply voltage of 36 V and an I_{DQ} of 150 mA:
 - ◆ Load power $\geq 200\text{ W}$
 - ◆ Gain $\geq 13\text{ dB}$
 - ◆ Efficiency $\geq 45\text{ }\%$
 - ◆ Rise time $\leq 50\text{ ns}$
 - ◆ Fall time $\leq 50\text{ ns}$
- High power gain
- Easy power control
- Excellent ruggedness
- Source on mounting flange eliminates DC isolators, reducing common mode inductance
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)



1.3 Applications

- Avionics transmitter applications in the 1030 MHz to 1090 MHz frequency range.

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLA1011-200R (SOT502A)			
1	drain		 sym039
2	gate		
3	source		
BLA1011S-200R (SOT502B)			
1	drain		 sym039
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLA1011-200R	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLA1011S-200R	-	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		-	75	V
V_{GS}	gate-source voltage		-	± 22	V
P_{tot}	total power dissipation	$T_h \leq 25\text{ }^\circ\text{C}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$	-	700	W
T_{stg}	storage temperature		-65	+150	$^\circ\text{C}$
T_j	junction temperature		-	200	$^\circ\text{C}$

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-h)}$	transient thermal impedance from junction to heatsink	$T_h = 25\text{ °C}$	[1] 0.15	K/W

[1] Thermal resistance is determined under RF operating conditions; $t_p = 50\text{ }\mu\text{s}$, $\delta = 10\text{ %}$.

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	$V_{GS} = 0\text{ V}$; $I_D = 3\text{ mA}$	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	-	$\text{m}\Omega$

7. Application information

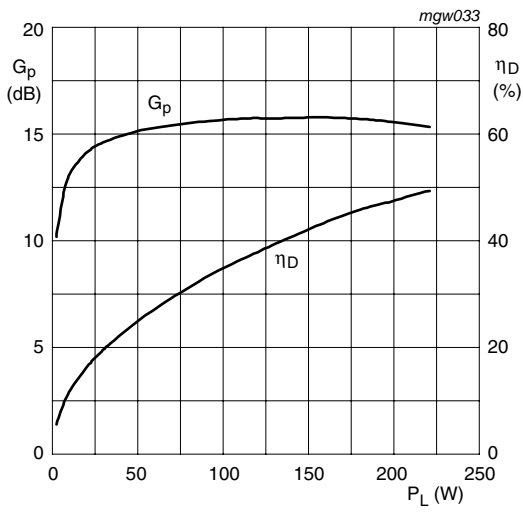
Table 7. Application information

RF performance in a common source pulsed class-AB circuit; ($t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ %}$); $f = 1030\text{ MHz}$ and 1090 MHz ; $T_h = 25\text{ °C}$; $Z_{th(mb-h)} = 0.15\text{ K/W}$; $I_{Dq} = 150\text{ mA}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage		-	36	-	V
P_L	output power	$t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ %}$	-	200		W
G_p	power gain	$P_L = 200\text{ W}$	13	-		dB
η_D	drain efficiency	$t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ %}$	45	-		%
t_r	rise time		-	-	50	ns
t_f	fall time		-	-	50	ns

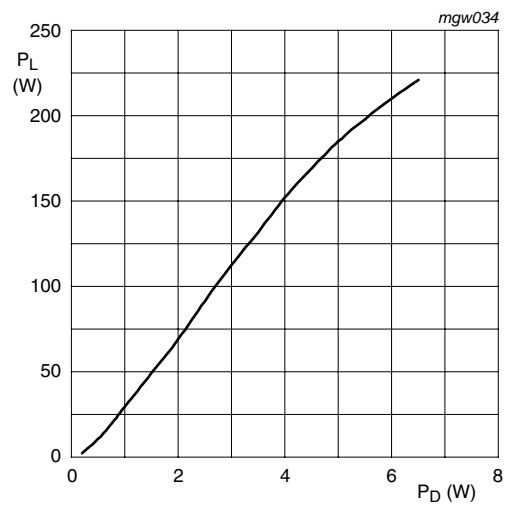
7.1 Ruggedness in class-AB operation

The BLA1011-200R and BLA1011S-200R are capable of withstanding a load mismatch corresponding to VSWR = 5 : 1 through all phases under the following conditions: $V_{DS} = 36\text{ V}$; $f = 1030\text{ MHz}$ to 1090 MHz at rated load power.



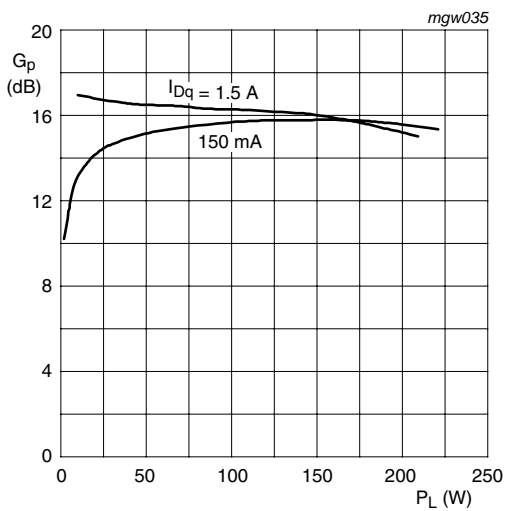
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

Fig 1. Power gain and drain efficiency as functions of load power; typical values



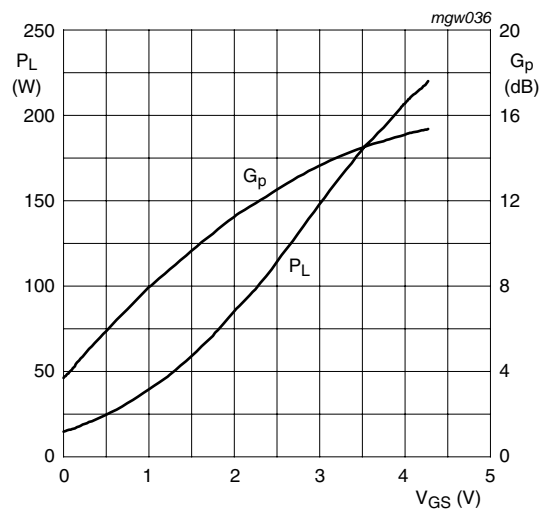
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

Fig 2. Load power as a function of drive power; typical values



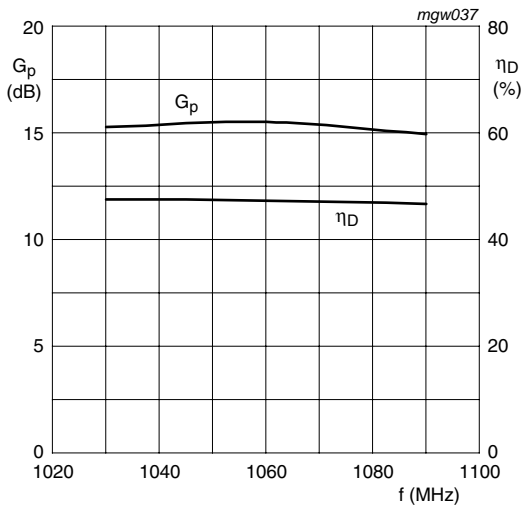
$V_{DS} = 36\text{ V}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

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



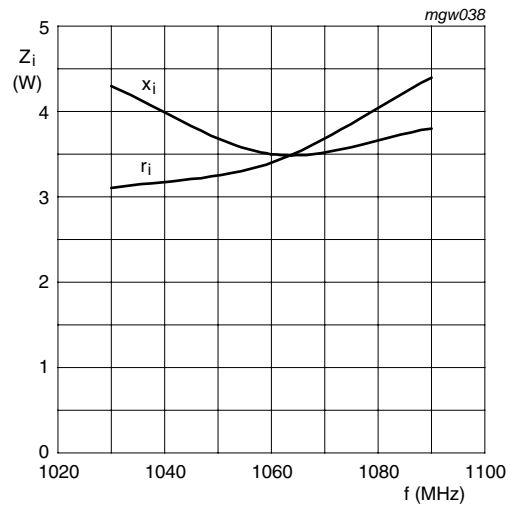
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $P_i = 5.5\text{ W}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

Fig 4. Load power and power gain as functions of gate-source voltage; typical values



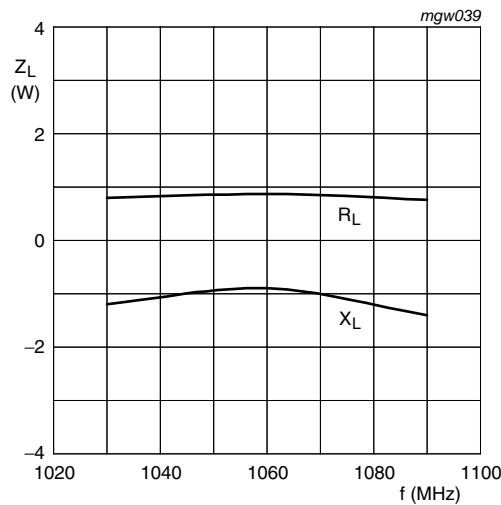
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $P_L = 200\text{ W}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$

Fig 5. Power gain and drain efficiency a functions of frequency; typical values



$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $P_L = 200\text{ W}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$

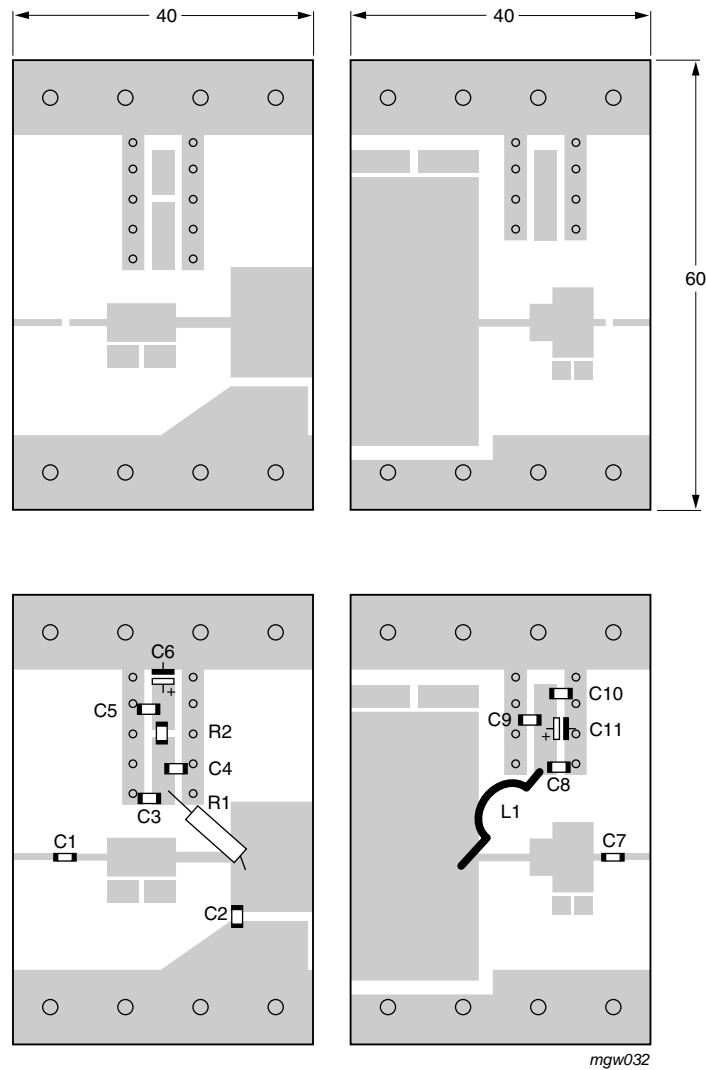
Fig 6. Input Impedance as a function of frequency (series components); typical values



$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $P_L = 200\text{ W}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$

Fig 7. Load impedance as a function of frequency (series components); typical values

8. Test information



Dimensions in mm.

The components are situated on one side of the copper-clad Duroid Printed-Circuit Board (PCB) with $\epsilon_r = 6.2$ and thickness 0.64 mm.

The other side is unetched and serves as a ground plane.

See [Table 8](#) for list of components.

Fig 8. Component layout for 1030 MHz to 1090 MHz test circuit

Table 8. List of components (see [Figure 8](#))

Component	Description	Value	Dimensions
C1	multilayer ceramic chip capacitor	[1] 39 pF	
C2	multilayer ceramic chip capacitor	[2] 4.3 pF	
C3	multilayer ceramic chip capacitor	[1] 11 pF	
C4, C7	multilayer ceramic chip capacitor	[1] 62 pF	
C5	multilayer ceramic chip capacitor	[1] 100 pF	
C6	electrolytic capacitor	47 μ F; 20 V	
C8	multilayer ceramic chip capacitor	[2] 20 pF	
C9	multilayer ceramic chip capacitor	[1] 47 pF	
C10	multilayer ceramic chip capacitor	[3] 1.2 nF	
C11	electrolytic capacitor	47 μ F; 63 V	
L1	Ω -shaped enamelled 1 mm copper wire		length = 38 mm
R1	metal film resistor	301 Ω	
R2	SMD 0508 resistor	18 Ω	

[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 700 or capacitor of same quality.

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

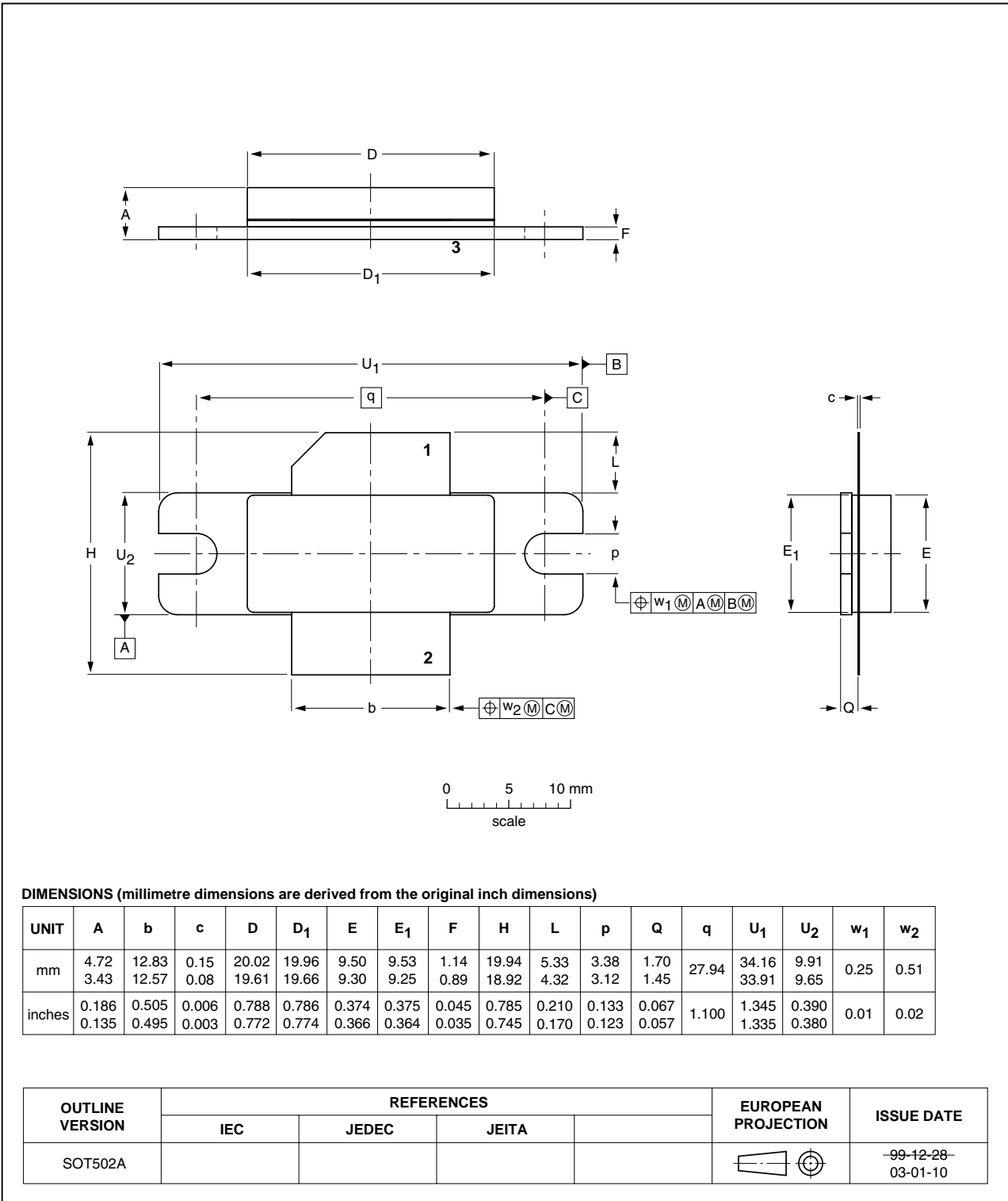


Fig 9. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

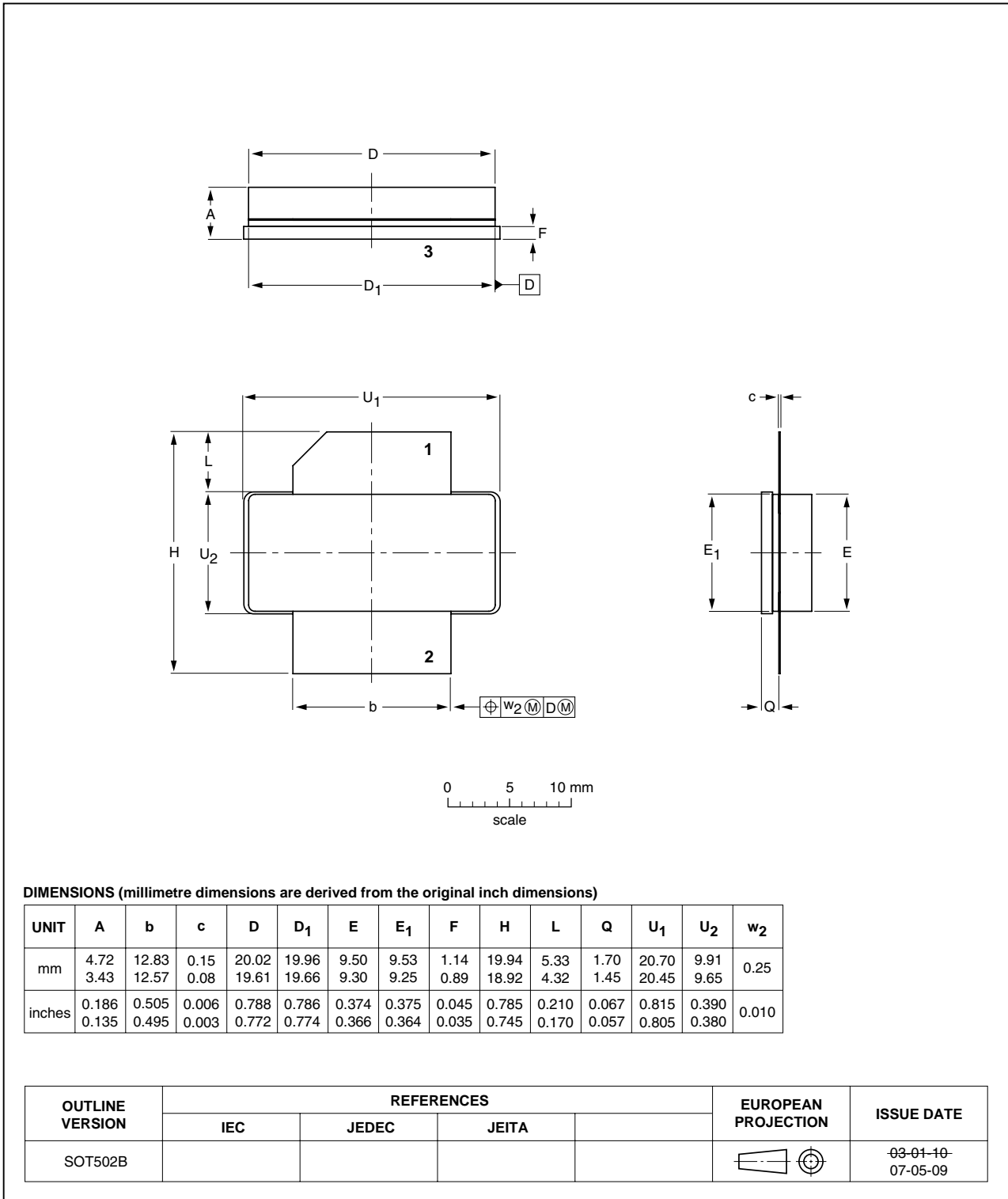


Fig 10. Package outline SOT502B

10. Abbreviations

Table 9. Abbreviations

Acronym	Description
I_{Dq}	quiescent drain current
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
SMD	Surface Mount Device
VSWR	Voltage Standing-Wave Ratio

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLA1011-200R_1011S-200R_1	20100223	Product data sheet	-	-

12. Legal information

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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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[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	2
2	Pinning information	2
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	3
6	Characteristics	3
7	Application information	3
7.1	Ruggedness in class-AB operation	3
8	Test information	6
9	Package outline	8
10	Abbreviations	10
11	Revision history	10
12	Legal information	11
12.1	Data sheet status	11
12.2	Definitions	11
12.3	Disclaimers	11
12.4	Trademarks	12
13	Contact information	12
14	Contents	13

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