

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 1030 MHz to 1090 MHz.

Table 1. Typical performance

RF performance at $T_h = 25\text{ }^\circ\text{C}$ 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: 1030 MHz to 1090 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 1030 MHz to 1090 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)

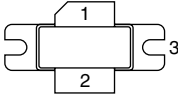
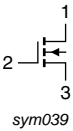
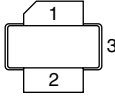
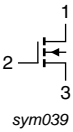


1.3 Applications

- 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		 <p>sym039</p>
2	gate		
3	source		
BLA1011S-200R (SOT502B)			
1	drain		 <p>sym039</p>
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	$T_h \leq 25\text{ °C}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ %}$	-	700	W
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	$T_h = 25\text{ °C}$	[1] 0.15	K/W

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

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

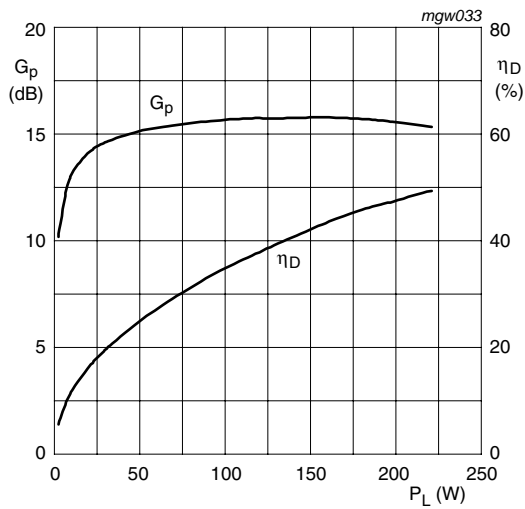
Table 7. Application information

RF performance in a common source pulsed class-AB circuit; ($t_p = 50\ \mu\text{s}$; $\delta = 2\ \%$); $f = 1030\text{ MHz}$ 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	$t_p = 50\ \mu\text{s}; \delta = 2\ \%$	-	200		W
G_p	power gain	$P_L = 200\text{ W}$	13	-		dB
η_D	drain efficiency	$t_p = 50\ \mu\text{s}; \delta = 2\ \%$	45	-		%
t_r	rise time		-	-	50	ns
t_f	fall time		-	-	50	ns

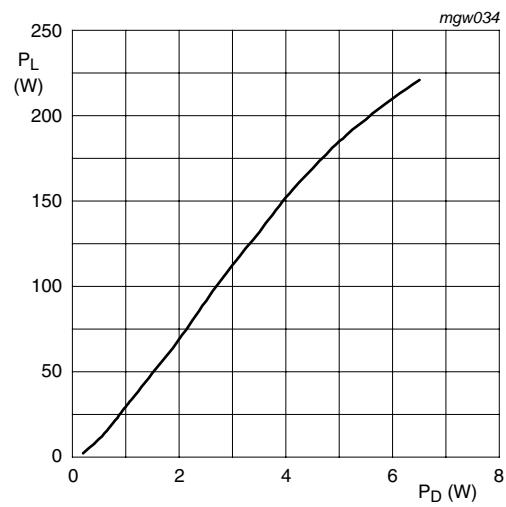
7.1 Ruggedness in class-AB operation

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



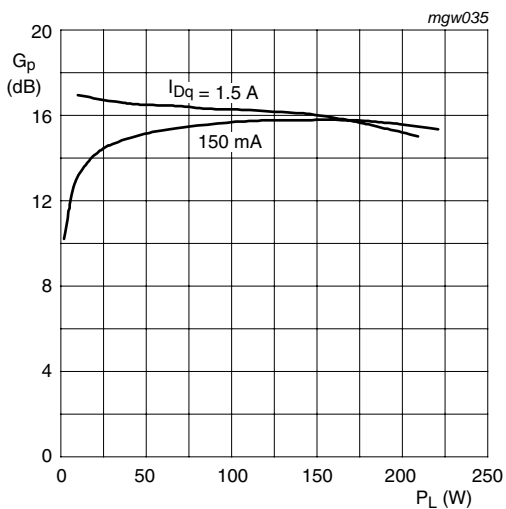
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

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



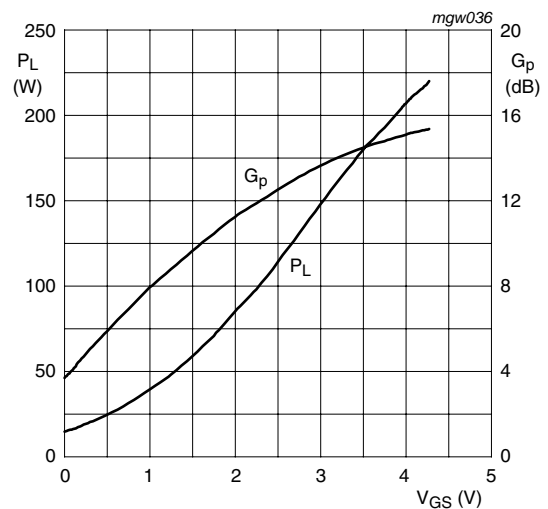
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

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



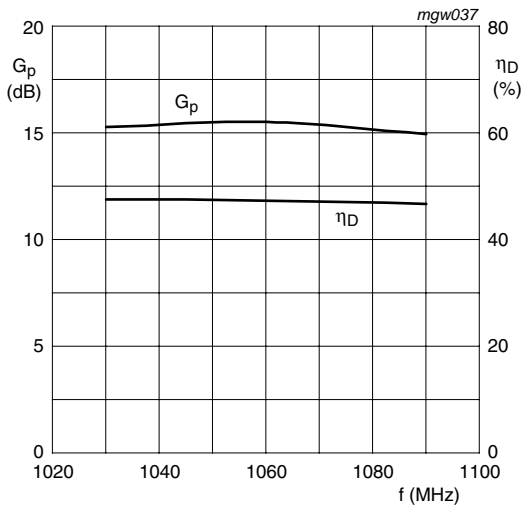
$V_{DS} = 36\text{ V}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

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



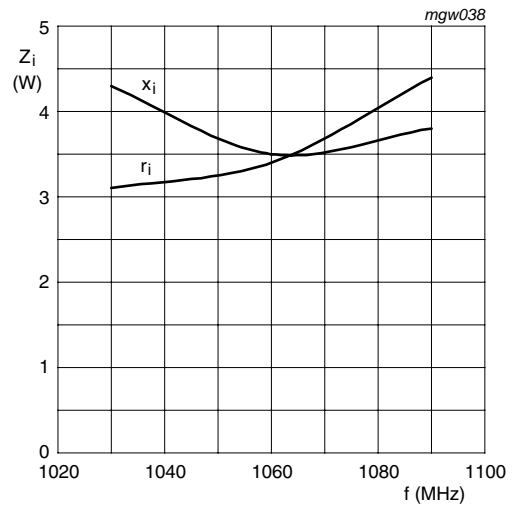
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $P_i = 5.5\text{ W}$; $f = 1060\text{ MHz}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$

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



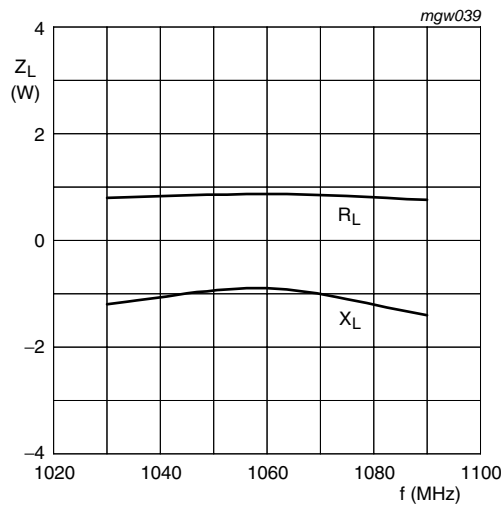
$V_{DS} = 36\text{ V}$; $I_{Dq} = 150\text{ mA}$; $P_L = 200\text{ W}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$

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



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

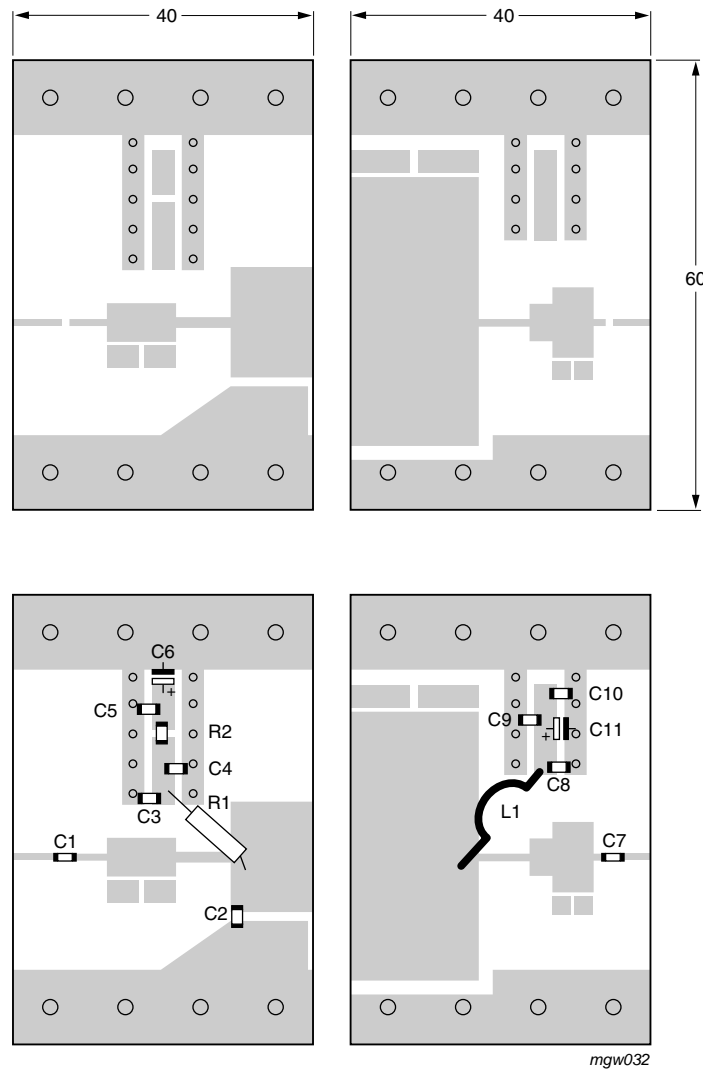
Fig 6. Input Impedance as a function of frequency (series components); typical values



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

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

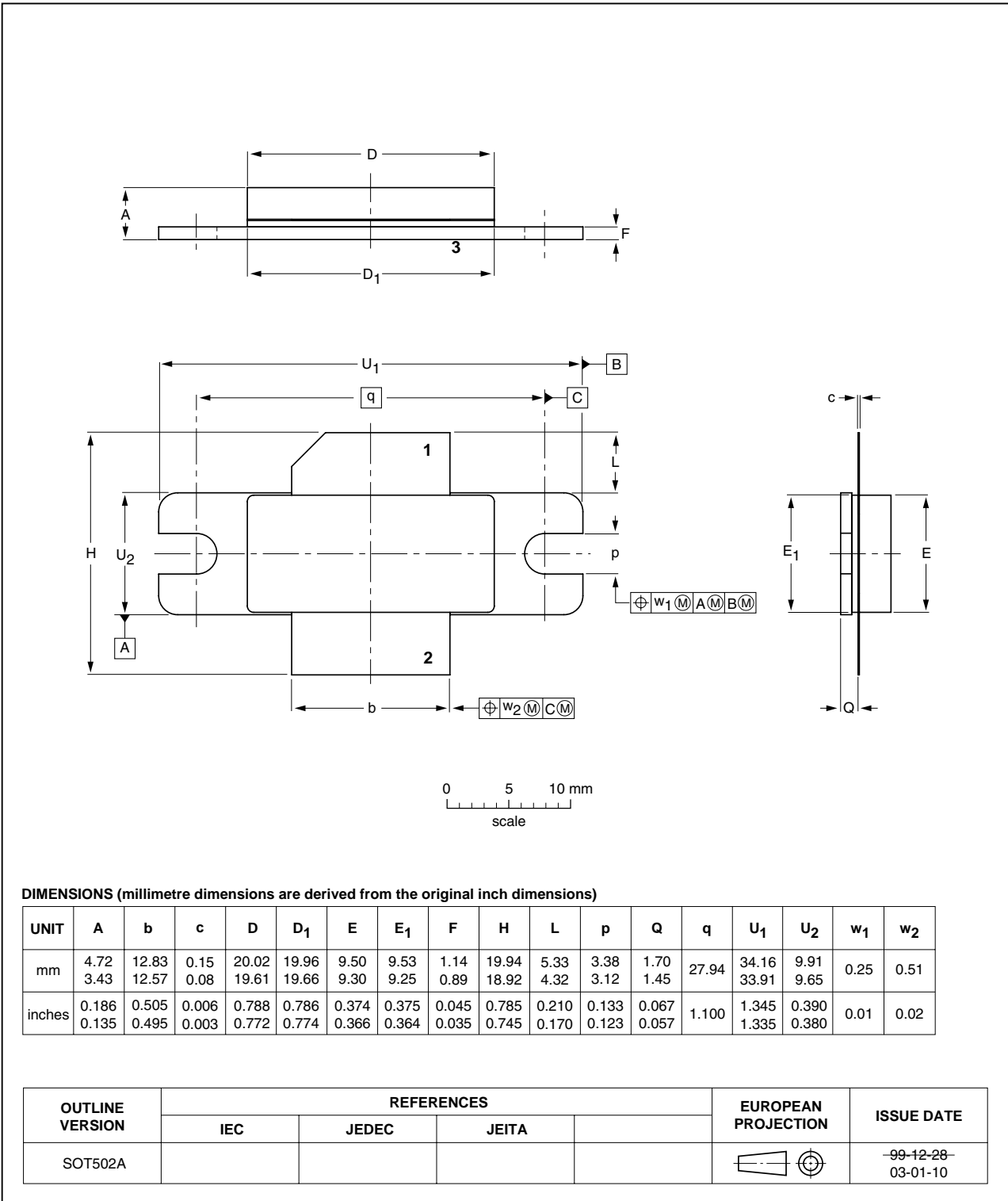


Fig 9. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

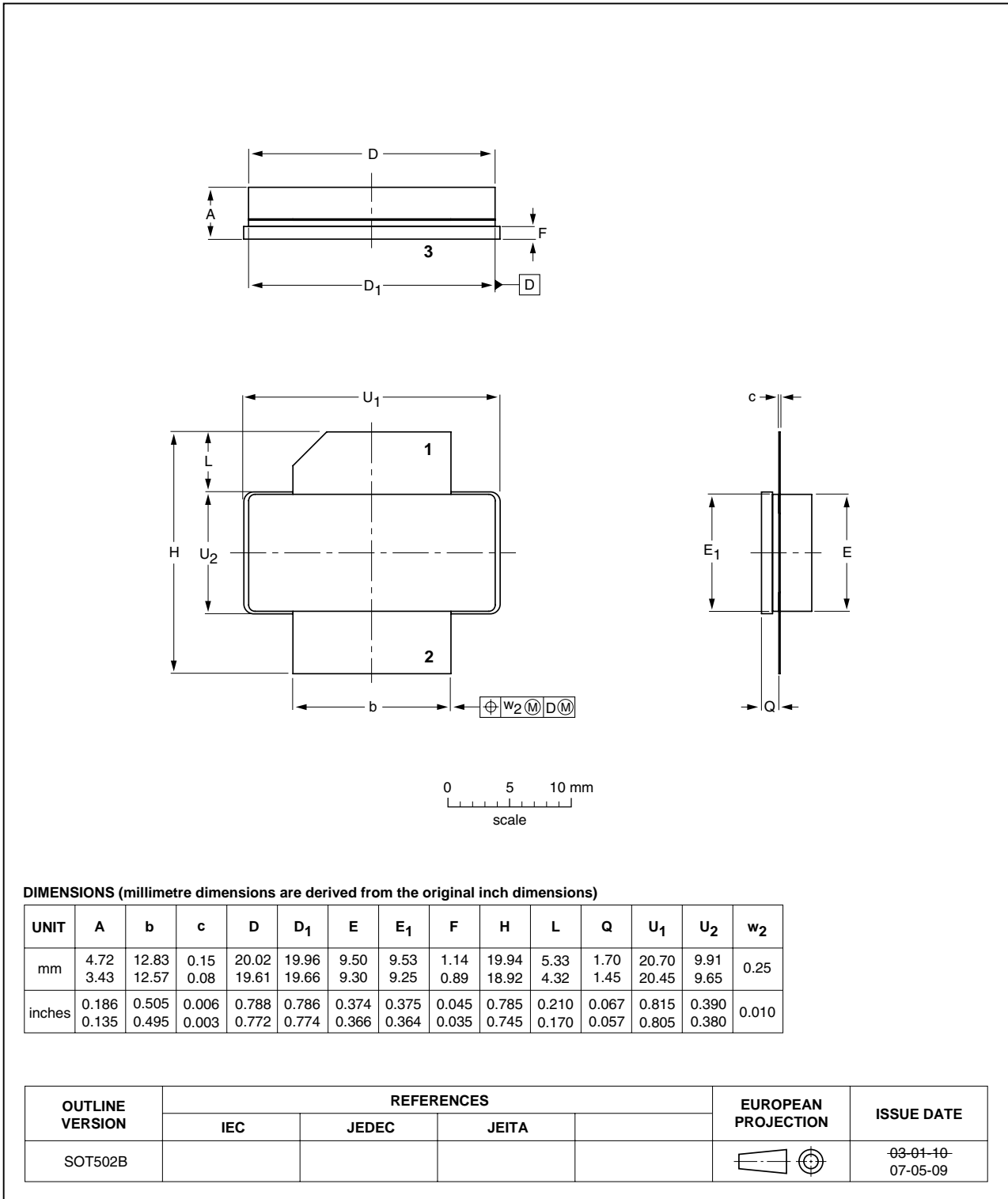


Fig 10. Package outline SOT502B

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

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.
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