

BLA6G1011-200R; BLA6G1011L(S)-200RG

Power LDMOS transistor

Rev. 4 — 9 November 2011

Product data sheet

1. Product profile

1.1 General description

200 W LDMOS power transistor for avionics applications at frequencies from 1030 MHz to 1090 MHz.

Table 1. Test information

Typical RF performance at $T_{case} = 25\text{ °C}$.

Test signal	f (MHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η _D (%)	t _r (ns)	t _f (ns)
Typical RF performance in a class-AB production test circuit for SOT502A							
pulsed RF	1030 to 1090	28	200	20	65	10	6
Typical RF performance in a Gullwing application for SOT502C and SOT502D							
pulsed RF	1030 to 1090	28	200	20	65	15	6

1.2 Features and benefits

- Typical pulsed RF performance at frequencies from 1030 MHz to 1090 MHz, a supply voltage of 28 V and an I_{DQ} of 100 mA:
 - ◆ Output power = 200 W
 - ◆ Power gain = 20 dB
 - ◆ Efficiency = 65 %
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1030 MHz to 1090 MHz)
- Internally matched for ease of use
- 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
BLA6G1011-200R (SOT502A)			
1	drain		
2	gate		
3	source		
BLA6G1011L-200RG (SOT502D)			
1	drain		
2	gate		
3	source		
BLA6G1011LS-200RG (SOT502C)			
1	drain		
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLA6G1011-200R	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLA6G1011L-200RG	-	eared flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502D
BLA6G1011LS-200RG	-	earless flanged LDMOST ceramic package; 2 leads	SOT502C

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

Table 4. Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
I_D	drain current		-	49	A
T_{stg}	storage temperature		-65	+150	°C
T_j	junction temperature		-	225	°C

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Type	Typ	Unit
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_{case} = 25\text{ °C}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$	BLA6G1011-200R BLA6G1011L-200RG BLA6G1011LS-200RG	0.085 0.065 0.065	K/W K/W K/W

6. Characteristics

Table 6. DC characteristics $T_j = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$; $I_D = 0.9\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 270\text{ mA}$	1.4	2.0	2.4	V
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 28\text{ V}$; $I_D = 1620\text{ mA}$	1.7	2.2	2.7	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 28\text{ V}$	-	-	4.2	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	40	48	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	420	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}$; $I_D = 9.45\text{ A}$	11	18	26	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 9.45\text{ A}$	0.012	0.07	0.093	Ω
C_{rs}	feedback capacitance	$V_{GS} = 0\text{ V}$; $V_{DS} = 28\text{ V}$; $f = 1\text{ MHz}$	-	3	-	pF

Table 7. RF characteristicsTest signal: Pulsed RF; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$; $V_{DS} = 28\text{ V}$; $I_{Dq} = 100\text{ mA}$; $T_{case} = 25\text{ °C}$; unless otherwise specified; in a class-AB production test circuit for straight leads.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P_L	output power		200	-	-	W
G_p	power gain	$P_L = 200\text{ W}$	18	20	-	dB
RL_{in}	input return loss	$P_L = 200\text{ W}$	-	-10	-8	dB
η_D	drain efficiency	$P_L = 200\text{ W}$	58	65	-	%
t_r	rise time	$P_L = 200\text{ W}$	-	10	20	ns
t_f	fall time	$P_L = 200\text{ W}$	-	6	20	ns

6.1 Ruggedness in class-AB operation

The BLA6G1011-200R, BLA6G1011L-200RG and BLA6G1011LS-200RG are enhanced rugged devices and are capable of withstanding a load mismatch corresponding to $V_{SWR} = 10 : 1$ through all phases under the following conditions: $t_p = 50 \mu s$; $\delta = 2 \%$; $V_{DS} = 28 V$; $I_{DQ} = 100 mA$; $P_L = 200 W$; $f = 1030 MHz$ to $1090 MHz$.

7. Application information

7.1 Impedance information

Table 8. Typical impedance
Typical values unless otherwise specified.

f MHz	Z_S Ω	Z_L Ω
BLA6G1011-200R		
1030	0.57 – j0.94	0.80 – j0.68
1060	0.70 – j1.13	0.84 – j0.52
1090	0.80 – j1.53	0.86 – j0.35
BLA6G1011L-200RG and BLA6G1011LS-200RG		
1030	0.69 – j2.18	0.84 – j0.59
1060	0.86 – j2.36	0.85 – j0.73
1090	1.12 – j2.54	0.86 – j0.87

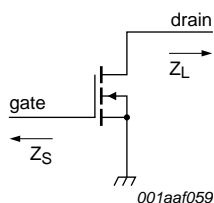
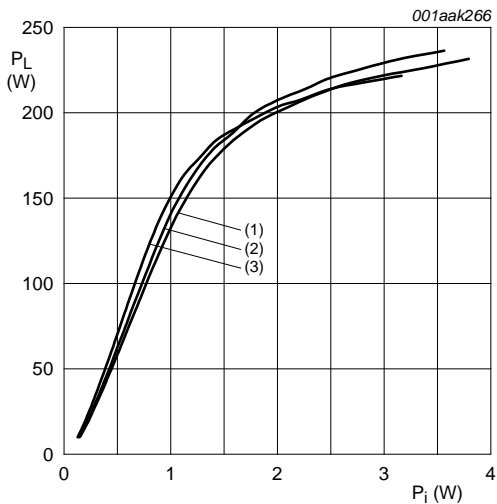


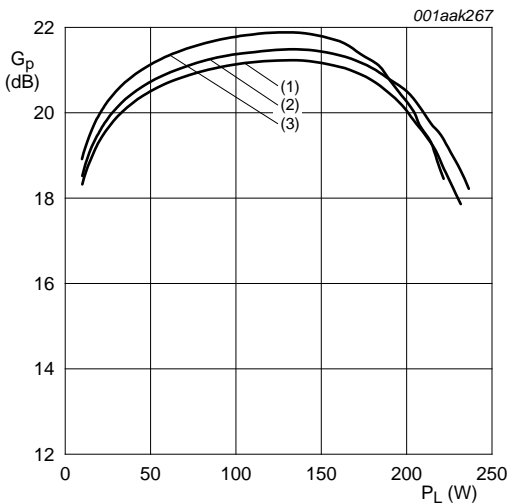
Fig 1. Definition of transistor impedance

7.2 RF performance



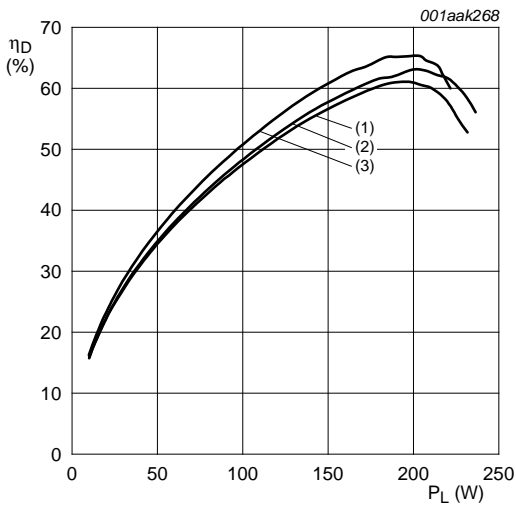
$V_{DS} = 28\text{ V}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$; $I_{Dq} = 100\text{ mA}$.
(1) $f = 1030\text{ MHz}$
(2) $f = 1060\text{ MHz}$
(3) $f = 1090\text{ MHz}$

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



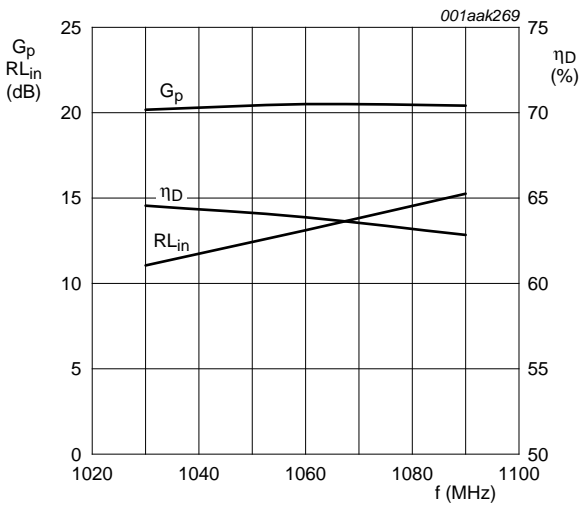
$V_{DS} = 28\text{ V}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$; $I_{Dq} = 100\text{ mA}$.
(1) $f = 1030\text{ MHz}$
(2) $f = 1060\text{ MHz}$
(3) $f = 1090\text{ MHz}$

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



$V_{DS} = 28\text{ V}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$; $I_{Dq} = 100\text{ mA}$.
(1) $f = 1030\text{ MHz}$
(2) $f = 1060\text{ MHz}$
(3) $f = 1090\text{ MHz}$

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



$P_L = 200\text{ W}$; $V_{DS} = 28\text{ V}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$; $I_{Dq} = 100\text{ mA}$.

Fig 5. Power gain, input return loss and drain efficiency as function of frequency; typical values

7.3 Application circuit

Remark: For BLA6G1011-200R with straight leads

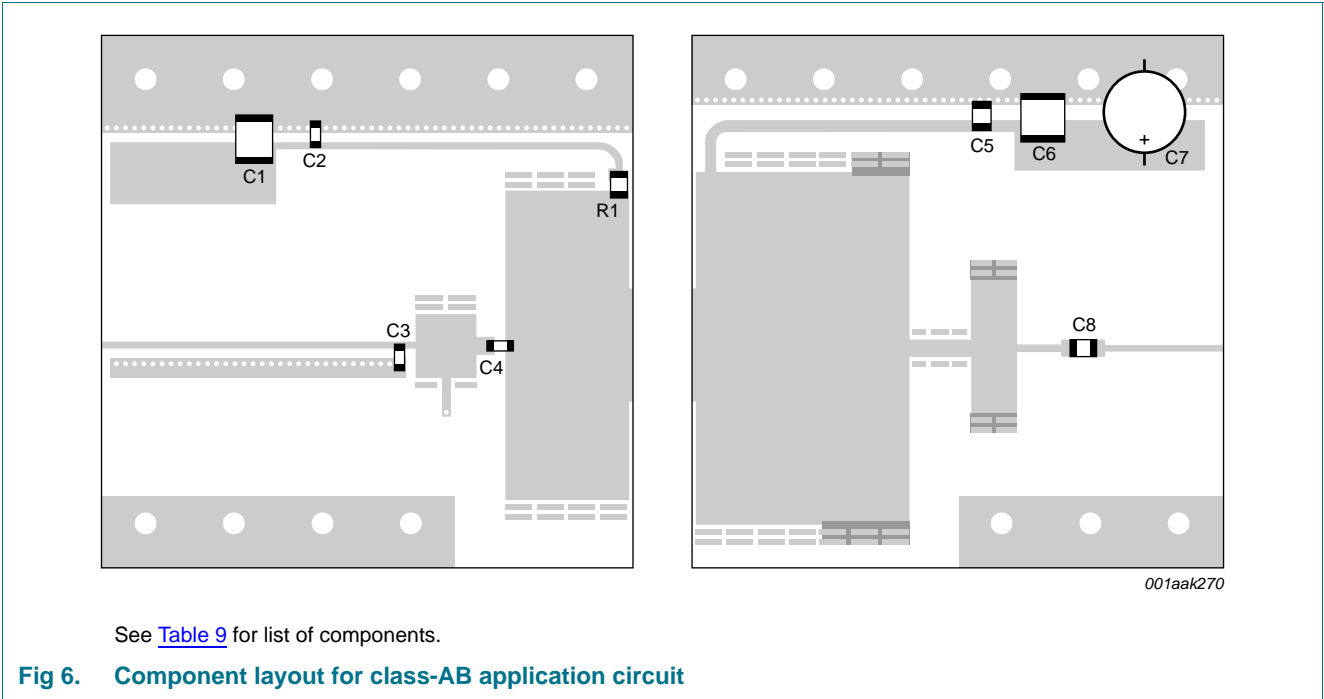


Table 9. List of components
See [Figure 6](#).
Striplines are on a Rogers Duroid 6010 Printed-Circuit Board (PCB); $\epsilon_r = 6.15$ F/m;
thickness = 0.64 mm

Component	Description	Value	Remarks
C1, C6	multilayer ceramic chip capacitor	10 μ F	TDK
C2	multilayer ceramic chip capacitor	68 pF	[1]
C3	multilayer ceramic chip capacitor	1.5 pF	[1]
C4	multilayer ceramic chip capacitor	3.9 pF	[1]
C5, C8	multilayer ceramic chip capacitor	30 pF	[2]
C7	electrolytic capacitor	470 μ F; 63 V	
R1	SMD resistor	12 Ω	1206

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

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

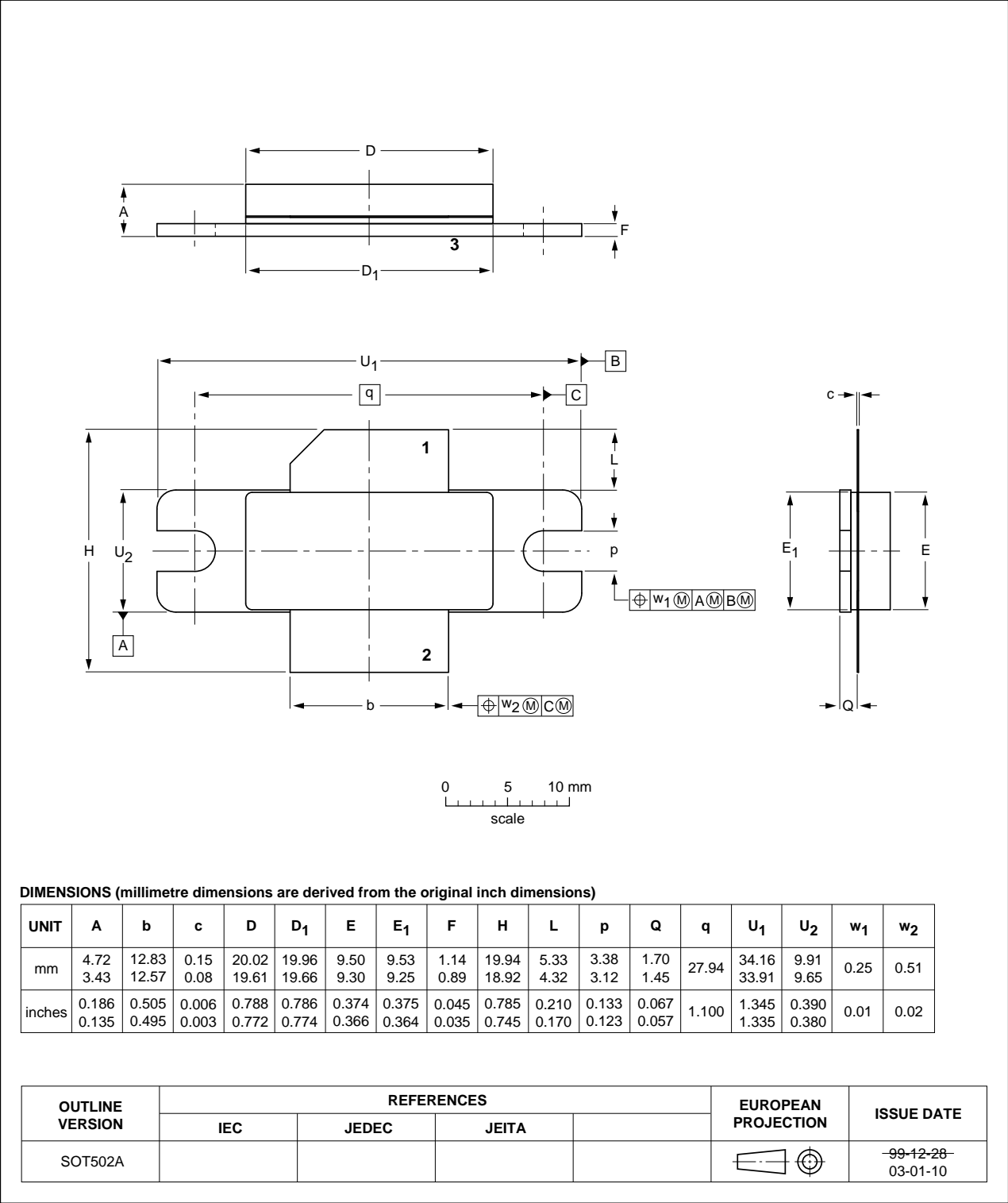
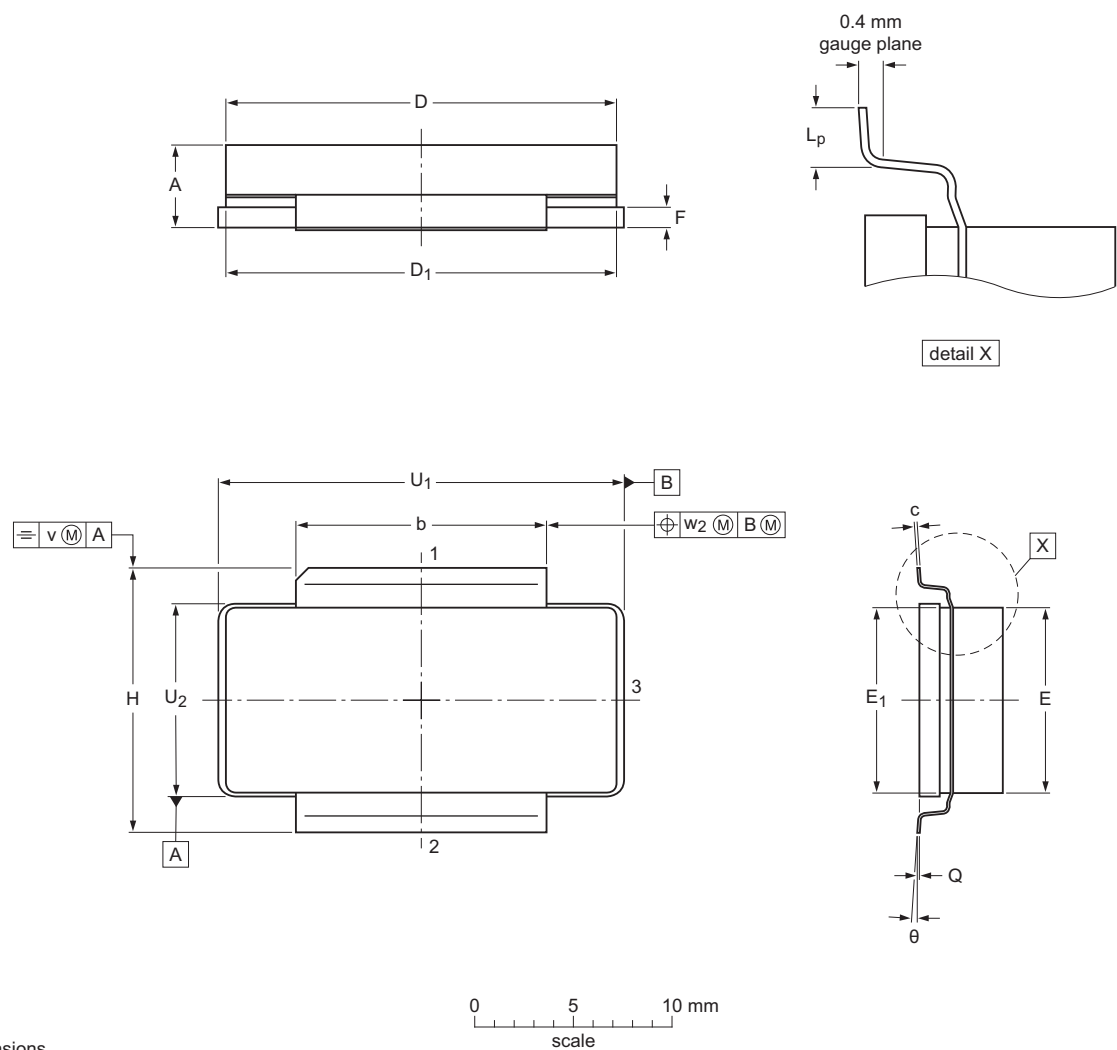


Fig 7. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502C



Dimensions																	
Unit ⁽¹⁾	A	b	c	D	D ₁	E	E ₁	F	H	L _p	Q	U ₁	U ₂	v	w ₂	θ	
mm	max	4.72	12.83	0.16	20.02	19.96	9.53	9.53	1.14	13.6	1.2	0.195	20.70	9.91	0.25	0.25	7°
	nom																0°
inches	max	0.185	0.505	0.006	0.788	0.786	0.375	0.375	0.045	0.536	0.048	0.008	0.815	0.39	0.01	0.01	7°
	nom																0°

Note
1. Millimeter dimensions are derived from the original inch dimensions.

sot502c_po

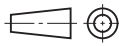
Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT502C						11-03-23 11-05-02

Fig 8. Package outline SOT502C

Eared flanged LDMOST ceramic package; 2 leads; 2 mounting holes

SOT502D

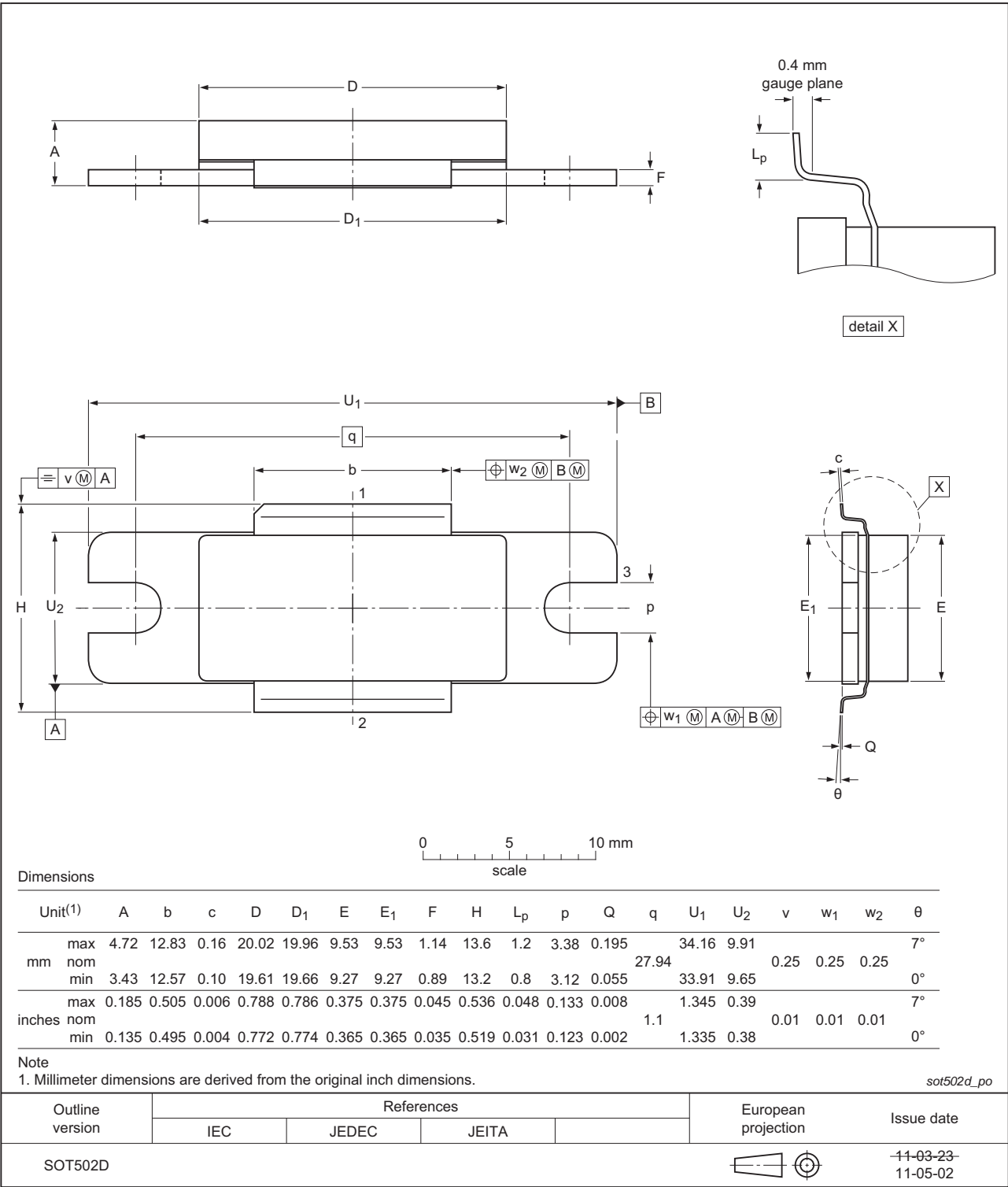


Fig 9. Package outline SOT502D

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
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

11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLA6G1011-200R_L-200RG_LS-200RG V.4	20111109	Product data sheet		BLA6G1011-200R v.3
Modifications:	<ul style="list-style-type: none">This document now also describes the products BLA6G1011L-200RG and BLA6G1011LS-200RG.			
BLA6G1011-200R v.3	20100714	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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