

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

Power LDMOS transistor

Rev. 6 — 1 September 2015

AMPLEON

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  $T_{case} = 25\text{ }^{\circ}\text{C}$ .

Test signal	f (MHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	$\eta_D$ (%)	t <sub>r</sub> (ns)	t <sub>f</sub> (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

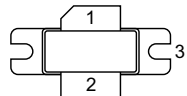
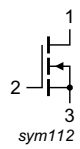
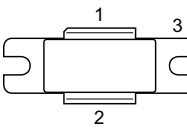
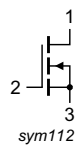
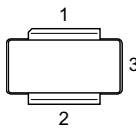
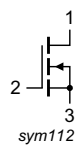
- Typical pulsed RF performance at frequencies from 1030 MHz to 1090 MHz, a supply voltage of 28 V and an  $I_{DQ}$  of 100 mA:
  - ◆ Output power = 200 W
  - ◆ Power gain = 20 dB
  - ◆ Efficiency = 65 %
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent 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
<b>BLA6G1011-200R (SOT502A)</b>			
1	drain		
2	gate		
3	source <sup>[1]</sup>		
<b>BLA6G1011L-200RG (SOT502D)</b>			
1	drain		
2	gate		
3	source <sup>[1]</sup>		
<b>BLA6G1011LS-200RG (SOT502C)</b>			
1	drain		
2	gate		
3	source <sup>[1]</sup>		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLA6G1011-200R	-	flanged ceramic package; 2 mounting holes; 2 leads	SOT502A
BLA6G1011L-200RG	-	eared flanged ceramic package; 2 mounting holes; 2 leads	SOT502D
BLA6G1011LS-200RG	-	earless flanged 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
$I_D$	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	0.085	K/W
			BLA6G1011L-200RG	0.065	K/W
			BLA6G1011LS-200RG	0.065	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	$\mu\text{A}$
$I_{DSX}$	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	$\Omega$
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$ ; $f = 1\text{ MHz}$	-	3	-	pF

Table 7. RF characteristics

Test 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
$\eta_D$	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

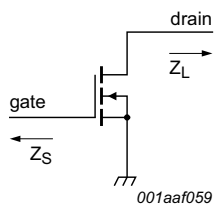
The BLA6G1011-200R, BLA6G1011L-200RG and BLA6G1011LS-200RG are enhanced rugged devices and are capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$ ;  $V_{DS} = 28\text{ V}$ ;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

## 7. Application information

### 7.1 Impedance information

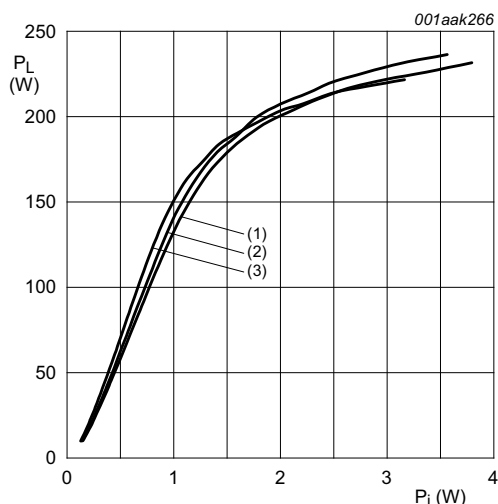
**Table 8. Typical impedance**  
Typical values unless otherwise specified.

<b>f</b>	<b>Z<sub>S</sub></b>	<b>Z<sub>L</sub></b>
<b>(MHz)</b>	<b>(Ω)</b>	<b>(Ω)</b>
<b>BLA6G1011-200R</b>		
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
<b>BLA6G1011L-200RG and BLA6G1011LS-200RG</b>		
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**

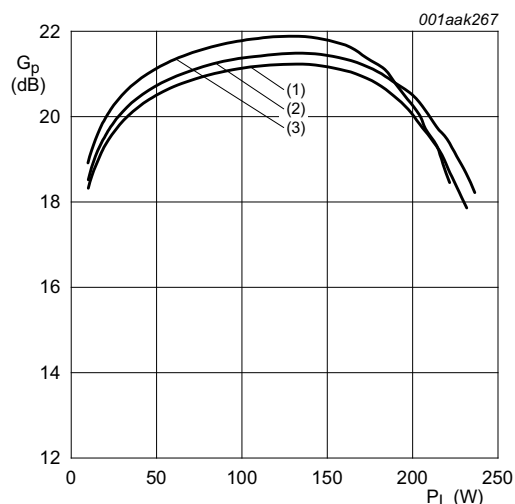
## 7.2 RF performance



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

- (1)  $f = 1030 \text{ MHz}$
- (2)  $f = 1060 \text{ MHz}$
- (3)  $f = 1090 \text{ MHz}$

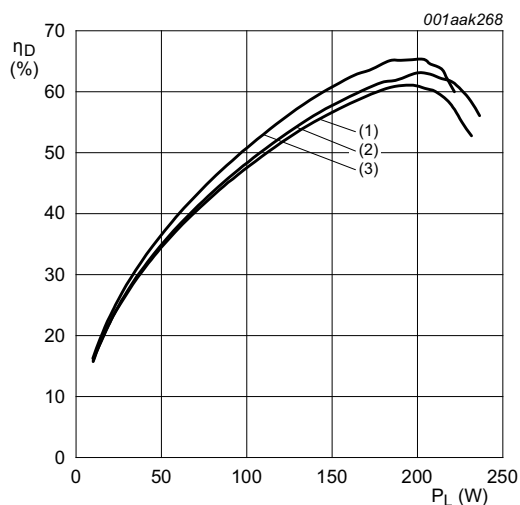
**Fig 2. Output power as a function of input power; typical values**



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

- (1)  $f = 1030 \text{ MHz}$
- (2)  $f = 1060 \text{ MHz}$
- (3)  $f = 1090 \text{ MHz}$

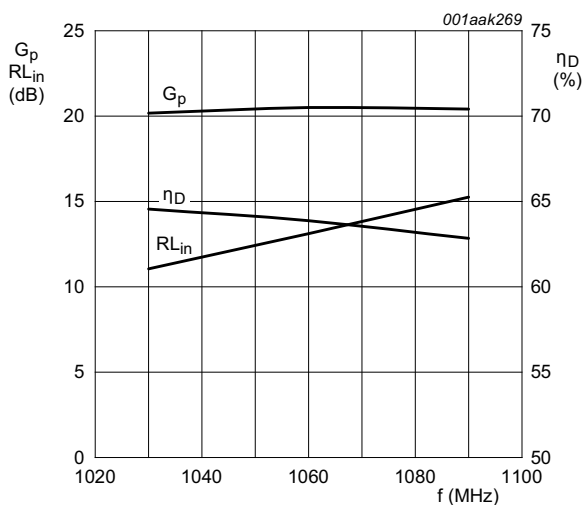
**Fig 3. Power gain as a function of output power; typical values**



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

- (1)  $f = 1030 \text{ MHz}$
- (2)  $f = 1060 \text{ MHz}$
- (3)  $f = 1090 \text{ MHz}$

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

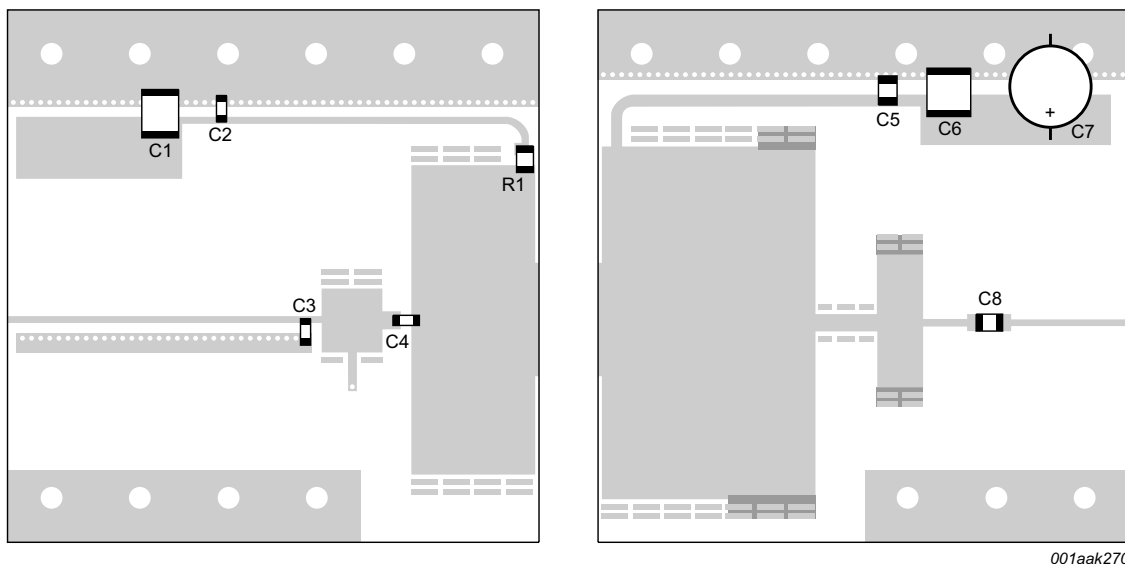


$P_L = 200 \text{ W}$ ;  $V_{DS} = 28 \text{ V}$ ;  $t_p = 50 \text{ } \mu\text{s}$ ;  $\delta = 2 \text{ } \%$ ;  $I_{Dq} = 100 \text{ mA}$ .

**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



See [Table 9](#) for list of components.

**Fig 6. Component layout for class-AB application circuit**

**Table 9. List of components**

See [Figure 6](#).

Striplines are on a Rogers Duroid 6006 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 $\mu$ F	TDK
C2	multilayer ceramic chip capacitor	68 pF <sup>[1]</sup>	
C3	multilayer ceramic chip capacitor	1.5 pF <sup>[1]</sup>	
C4	multilayer ceramic chip capacitor	3.9 pF <sup>[1]</sup>	
C5, C8	multilayer ceramic chip capacitor	30 pF <sup>[2]</sup>	
C7	electrolytic capacitor	470 $\mu$ F; 63 V	
R1	SMD resistor	12 $\Omega$	SMD 1206

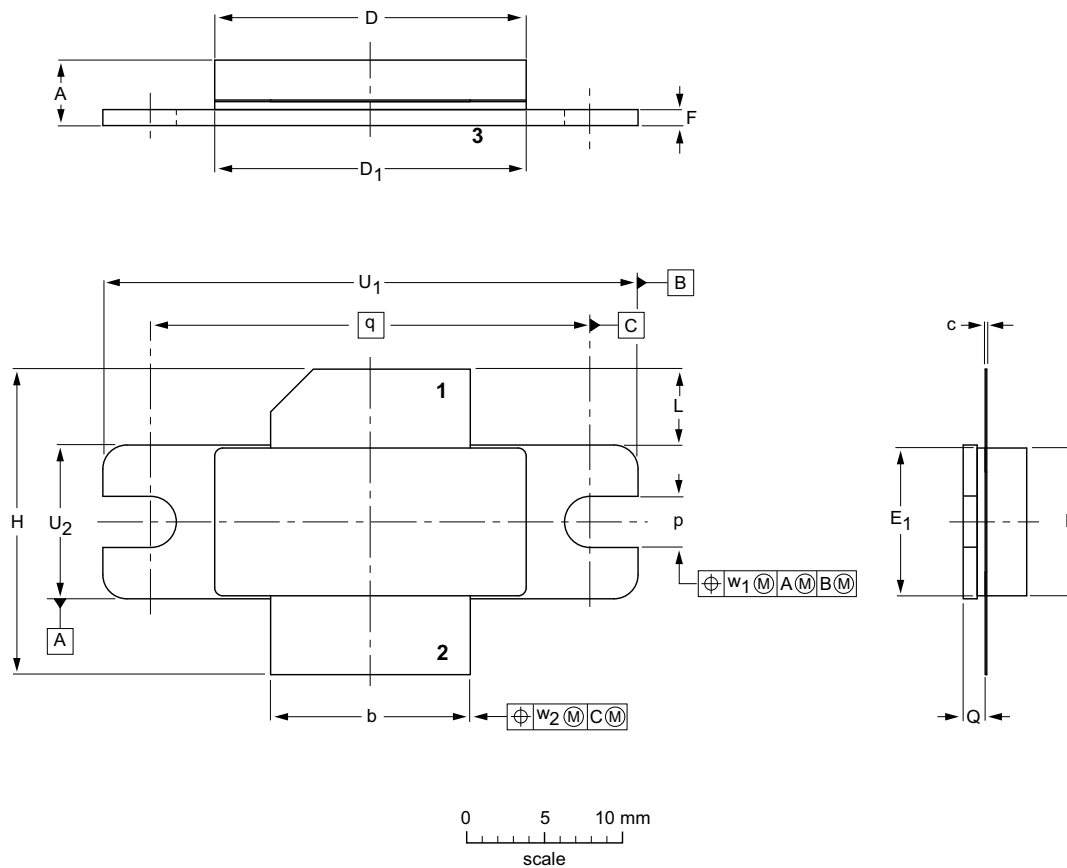
[1] American Technical Ceramics type 100A or capacitor of same quality.

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

## 8. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT502A



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D <sub>1</sub>	E	E <sub>1</sub>	F	H	L	p	Q	q	U <sub>1</sub>	U <sub>2</sub>	w <sub>1</sub>	w <sub>2</sub>
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02


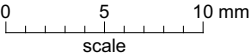
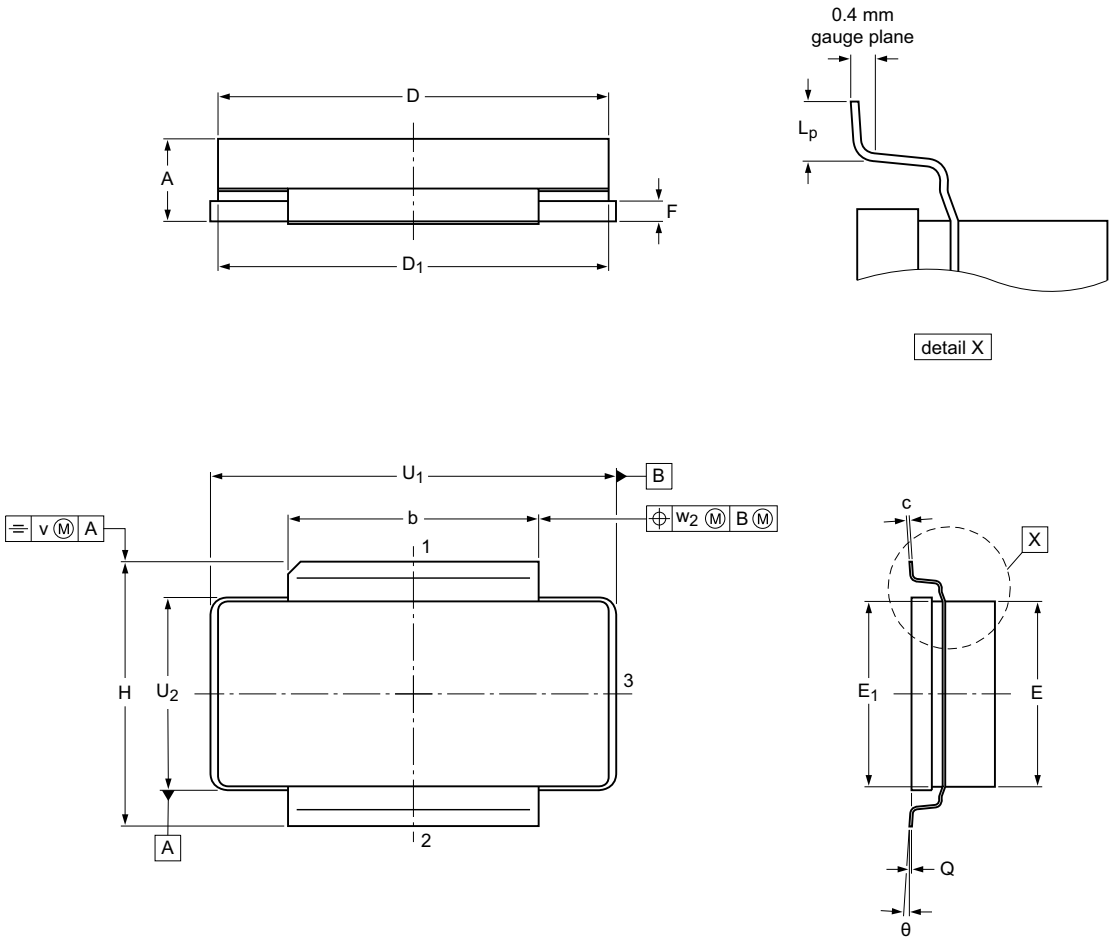
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						03-01-10 12-05-02

Fig 7. Package outline SOT502A

Earless flanged ceramic package; 2 leads

SOT502C



Dimensions

Unit <sup>(1)</sup>		A	b	c	D	D <sub>1</sub>	E	E <sub>1</sub>	F	H	L <sub>p</sub>	Q	U <sub>1</sub>	U <sub>2</sub>	v	w <sub>2</sub>	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°
	min	3.43	12.57	0.10	19.61	19.66	9.27	9.27	0.89	13.2	0.8	0.055	20.45	9.65			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°
	min	0.135	0.495	0.004	0.772	0.774	0.365	0.365	0.035	0.519	0.031	0.002	0.805	0.38			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						11-05-02 12-05-02

Fig 8. Package outline SOT502C



Eared flanged ceramic package; 2 leads; 2 mounting holes

SOT502D

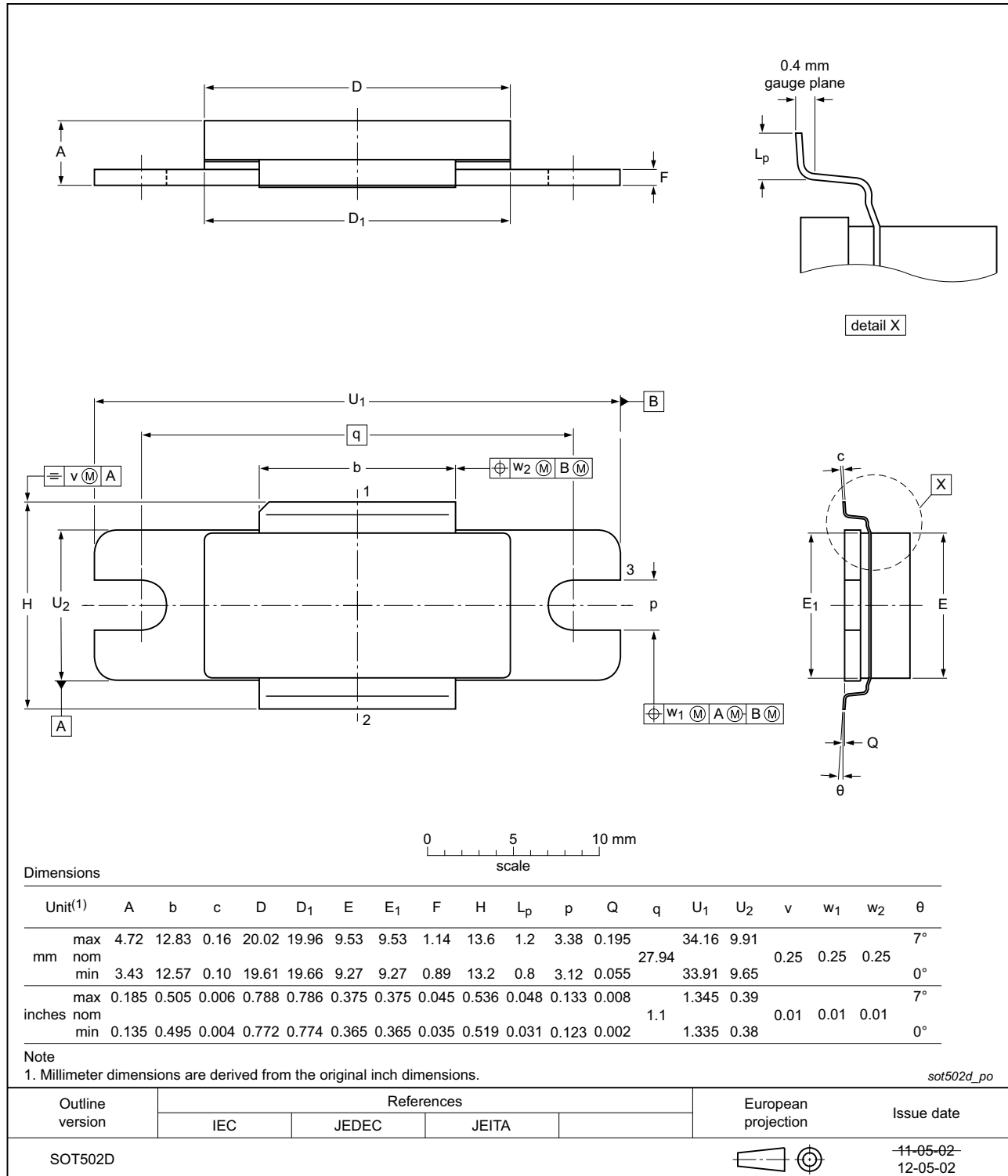


Fig 9. Package outline SOT502D

## 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
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
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#6	20150901	Product data sheet		BLA6G1011-200R v.5
Modifications:	<ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
BLA6G1011-200R_L-200RG_LS-200RG v.5	20150317	Product data sheet		BLA6G1011-200R v.4
BLA6G1011-200R_L-200RG_LS-200RG v.4	20111109	Product data sheet		BLA6G1011-200R v.3
BLA6G1011-200R v.3	20100714	Product data sheet	-	-

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Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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Date of release: 1 September 2015

Document identifier: BLA6G1011-200R\_L-200RG\_LS-200RG#6