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

Power LDMOS transistor

AMPLEON

Rev. 6 — 1 September 2015

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 °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

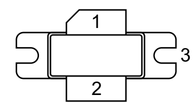
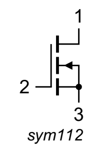
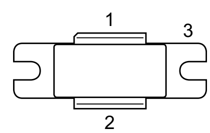
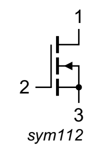
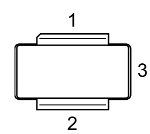
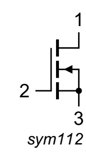
- Typical pulsed RF performance at frequencies from 1030 MHz to 1090 MHz, a supply voltage of 28 V and an I_{Dq} of 100 mA:
  - Output power = 200 W
  - Power gain = 20 dB
  - Efficiency = 65 %
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal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

[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 °C; t_p = 50 μs; δ = 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 °C unless otherwise specified.

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

Table 7. RF characteristics

Test signal: Pulsed RF; t_p = 50 μs; δ = 2 %; V_{DS} = 28 V; I_{Dq} = 100 mA; T_{case} = 25 °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 W	18	20	-	dB
RL_{in}	input return loss	P_L = 200 W	-	−10	−8	dB
η_D	drain efficiency	P_L = 200 W	58	65	-	%
t_r	rise time	P_L = 200 W	-	10	20	ns
t_f	fall time	P_L = 200 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 VSWR = 10 : 1 through all phases under the following conditions: t_p = 50 μs; δ = 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

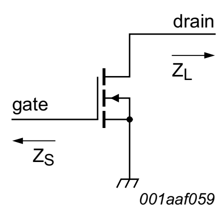
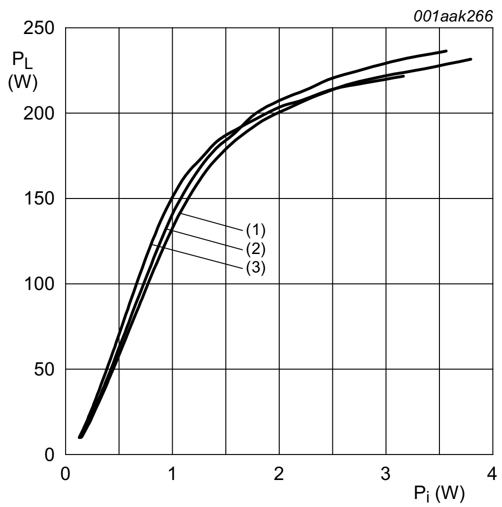


Fig 1. Definition of transistor impedance

7.2 RF performance



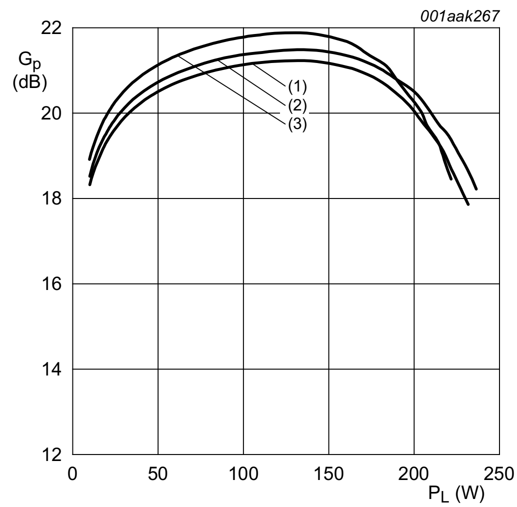
V_{DS} = 28 V; t_p = 50 μs; δ = 2 %; I_{Dq} = 100 mA.

(1) f = 1030 MHz

(2) f = 1060 MHz

(3) f = 1090 MHz

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



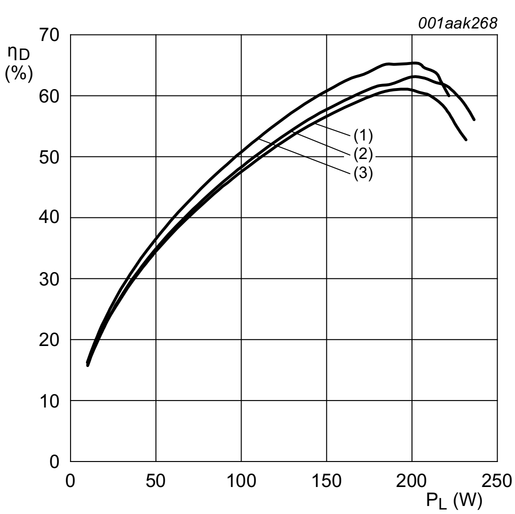
V_{DS} = 28 V; t_p = 50 μs; δ = 2 %; I_{Dq} = 100 mA.

(1) f = 1030 MHz

(2) f = 1060 MHz

(3) f = 1090 MHz

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



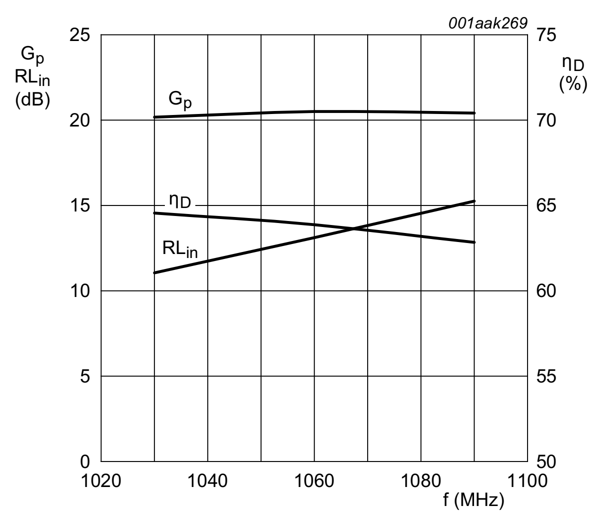
V_{DS} = 28 V; t_p = 50 μs; δ = 2 %; I_{Dq} = 100 mA.

(1) f = 1030 MHz

(2) f = 1060 MHz

(3) f = 1090 MHz

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

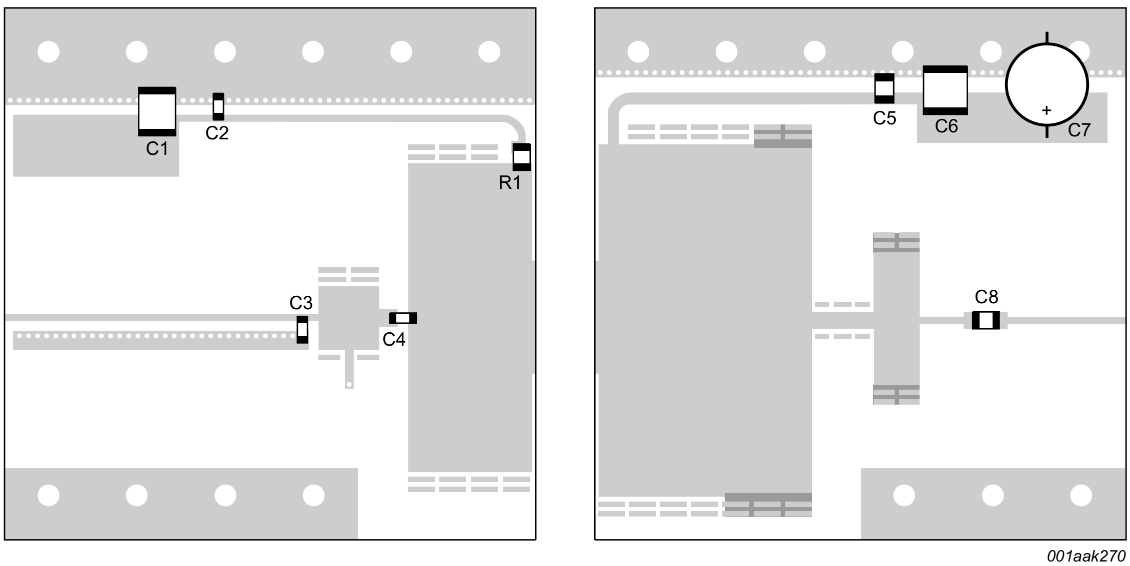


P_L = 200 W; V_{DS} = 28 V; t_p = 50 μs; δ = 2 %; I_{Dq} = 100 mA.

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); ε_r = 6.15 F/m; thickness = 0.64 mm

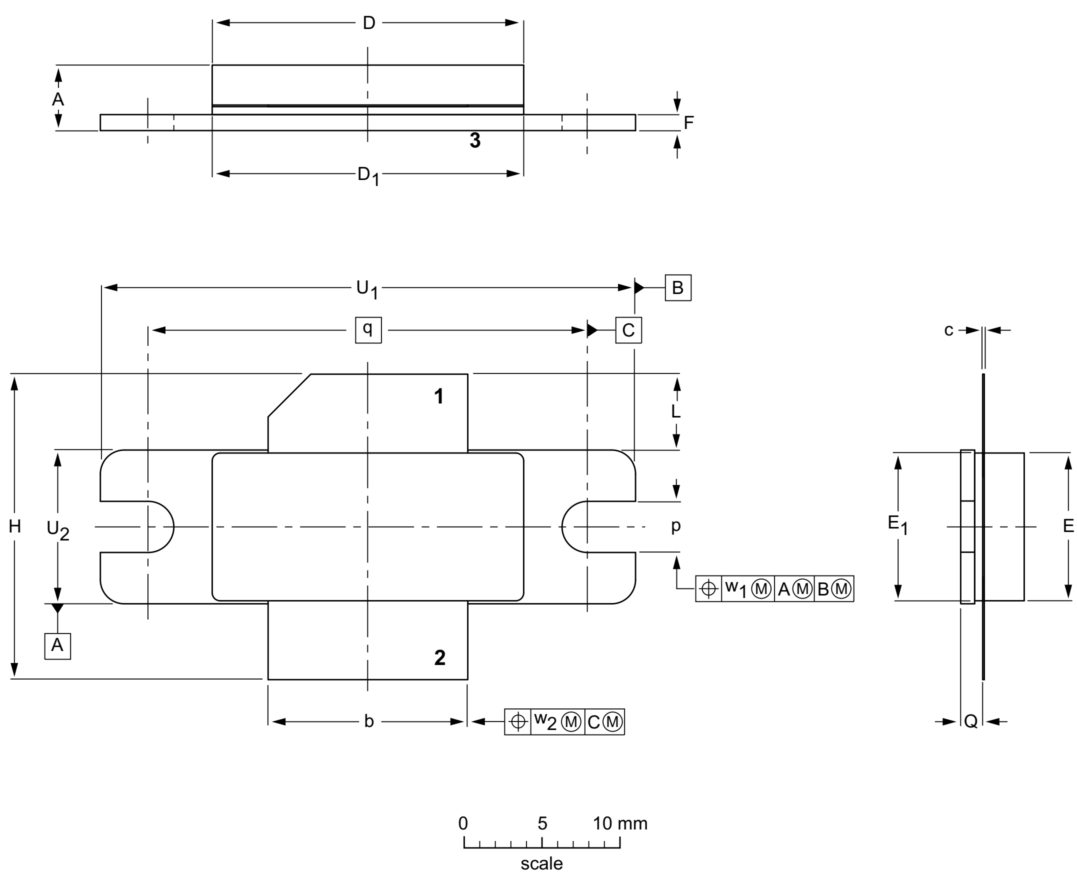
Component	Description	Value		Remarks
C1, C6	multilayer ceramic chip capacitor	10 μF		TDK
C2	multilayer ceramic chip capacitor	68 pF	[1]	
C3	multilayer ceramic chip capacitor	1.5 pF	[1]	
C4	multilayer ceramic chip capacitor	3.9 pF	[1]	
C5, C8	multilayer ceramic chip capacitor	30 pF	[2]	
C7	electrolytic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



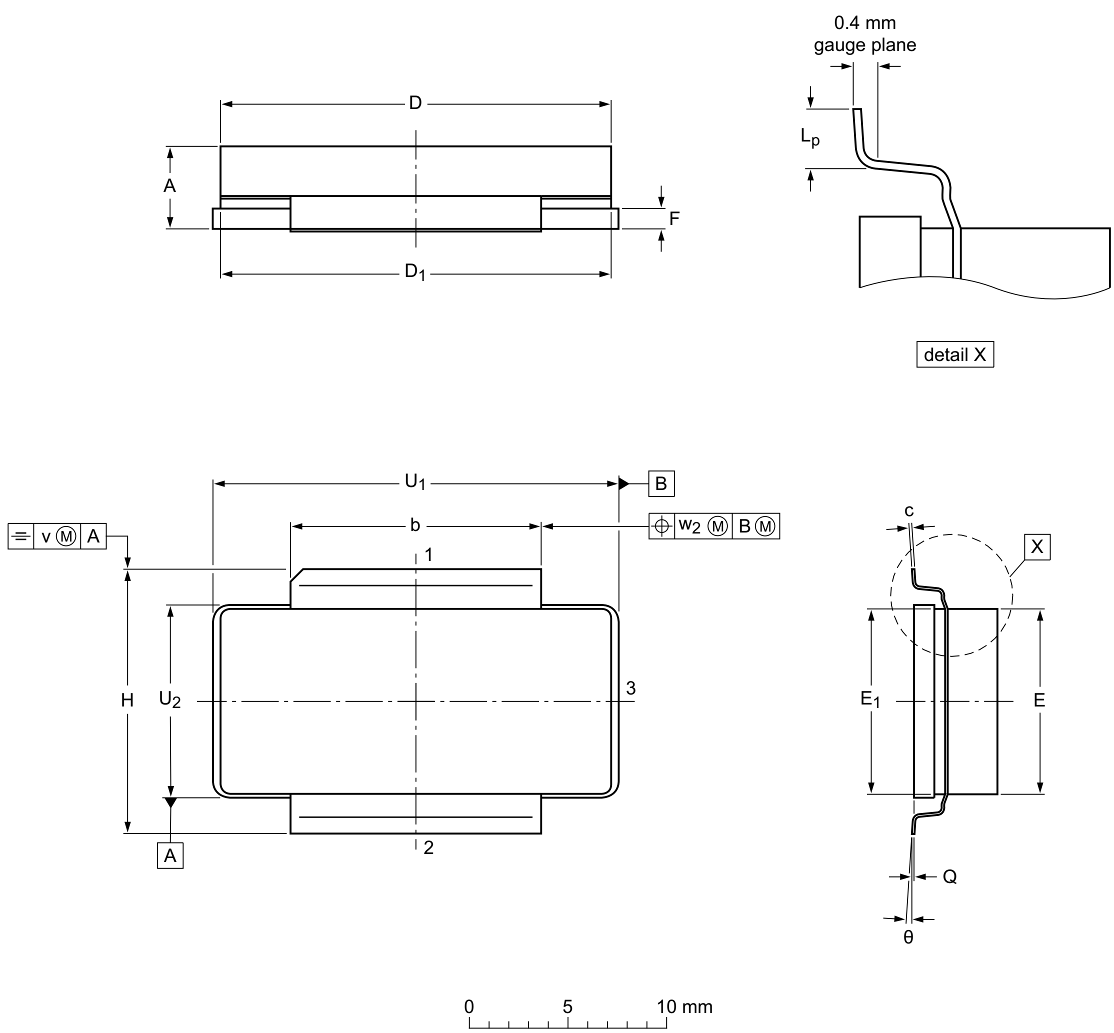
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	w_2
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(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			7°
	nom														0.25	0.25	
	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			7°
	nom														0.01	0.01	
	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°

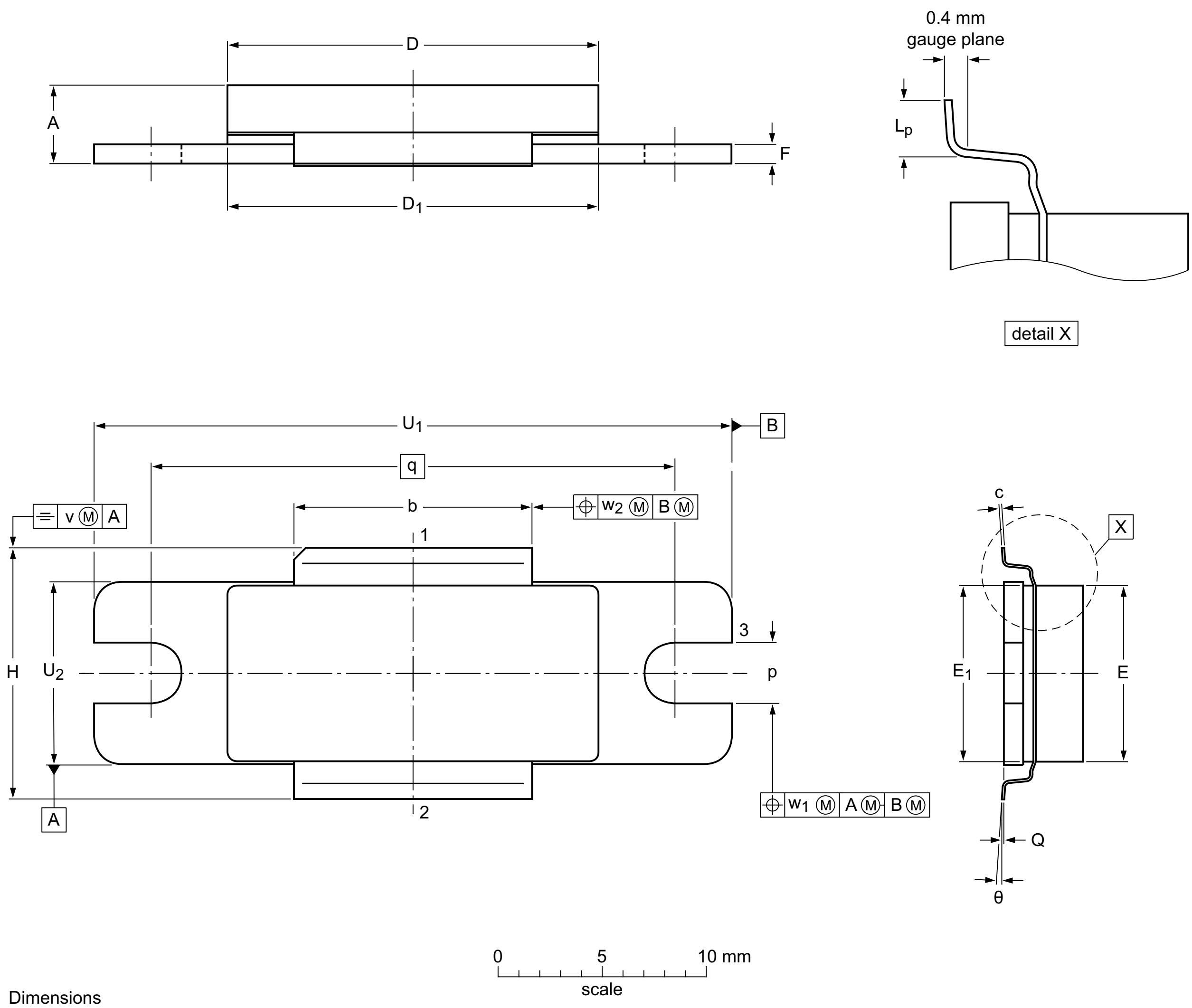
Note
1. Millimeter dimensions are derived from the original inch dimensions.

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**



Dimensions

Unit(1)		A	b	c	D	D_1	E	E_1	F	H	L_p	p	Q	q	U_1	U_2	v	w_1	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	3.38	0.195		34.16	9.91				7°
	nom													27.94			0.25	0.25	0.25	
	min	3.43	12.57	0.10	19.61	19.66	9.27	9.27	0.89	13.2	0.8	3.12	0.055		33.91	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	0.133	0.008		1.345	0.39				7°
	nom													1.1			0.01	0.01	0.01	
	min	0.135	0.495	0.004	0.772	0.774	0.365	0.365	0.035	0.519	0.031	0.123	0.002		1.335	0.38				0°

Note

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

sot502d_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT502D						~~11-05-02~~ 12-05-02

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:	• The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. • Legal texts have been adapted to the new company name where appropriate.			
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	-	-

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.
Product [short] data sheet	Production	This document contains the product specification.

[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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14. Contents

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Document identifier: BLA6G1011-200R_L-200RG_LS-200RG#6