BLA8H0910L-500; BLA8H0910LS-500

Power LDMOS transistor

Rev. 1 — 7 February 2017

AMPLEON

Product data sheet

1. Product profile

1.1 General description

A 500 W LDMOS power transistor for avionics applications at frequencies from 900 MHz to 930 MHz.

The BLA8H0910L-500 and BLA8H0910LS-500 are designed for high-power CW applications and are assembled in high performance ceramic packages.

Table 1. Typical performance

RF performance at V_{DS} = 50 V; I_{Dq} = 90 mA in a class-AB application circuit.

Test signal	f	V_{DS}	P_L	G_p	η_D
	(MHz)	(V)	(W)	(dB)	(%)
CW [1]	915	50	500	18	61
CW pulsed [2][3]	915	50	500	19.5	62.5

[1] T_{case} = 65 °C.

[2] T_{case} = 25 °C.

[3] t_p = 100 µs; δ = 10 %.

1.2 Features and benefits

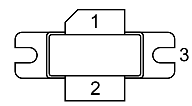
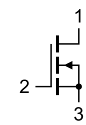
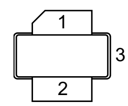
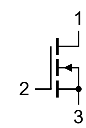
- High efficiency
- Easy power control
- Excellent ruggedness
- Integrated ESD protection
- Designed for broadband operation (900 MHz to 930 MHz)
- Internally input matched
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- Avionics applications in the 900 MHz to 930 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLA8H0910L-500 (SOT502A)			
1	drain	 	
2	gate		
3	source [1]		
BLA8H0910LS-500 (SOT502B)			
1	drain	 	
2	gate		
3	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLA8H0910L-500	-	flanged ceramic package; 2 mounting holes; 2 leads	SOT502A
BLA8H0910LS-500	-	earless flanged ceramic package; 2 leads	SOT502B

4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Min	Max	Unit
V_{DS}	drain-source voltage	-	114.5	V
V_{GS}	gate-source voltage	–6	+11	V
T_{stg}	storage temperature	–65	+150	°C
T_j	junction temperature [1]	-	225	°C

[1] Continuous use at maximum temperature will affect the reliability, for details refer to the online MTF calculator.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 500 W	0.2	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 = 4 mA	114.5	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 400 mA	1.25	1.9	2.35	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 50 V	-	-	2.8	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	-	60	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	280	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 20 A	-	29	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 14 A	-	0.078	-	Ω

Table 7. RF characteristics

Test signal: pulsed RF; t_p = 100 μs; δ = 10 %; f = 915 MHz; RF performance at V_{DS} = 50 V; I_{Dq} = 90 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	P_L = 500 W	15	19	-	dB
RL_{in}	input return loss	P_L = 500 W	-	−18	−7	dB
η_D	drain efficiency	P_L = 500 W	59	63.5	-	%

7. Test information

7.1 Ruggedness in class-AB operation

The BLA8H0910L-500 and BLA8H0910LS-500 are capable of withstanding a load mismatch corresponding to VSWR = 30 : 1 through all phases under the following conditions: V_{DS} = 50 V; I_{Dq} = 90 mA; P_L = 500 W (CW); f = 915 MHz.

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull Z_S and Z_L device impedances; I_{Dq} = 90 mA; V_{DS} = 50 V; typical values unless otherwise specified.

f	Z_S [1]	Z_L [1]
(GHz)	(Ω)	(Ω)
915	1.8 − 1.4j	0.6 + 0.35j

[1] Z_S and Z_L defined in Figure 1.

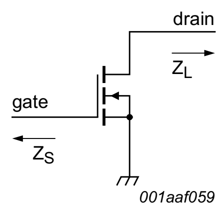
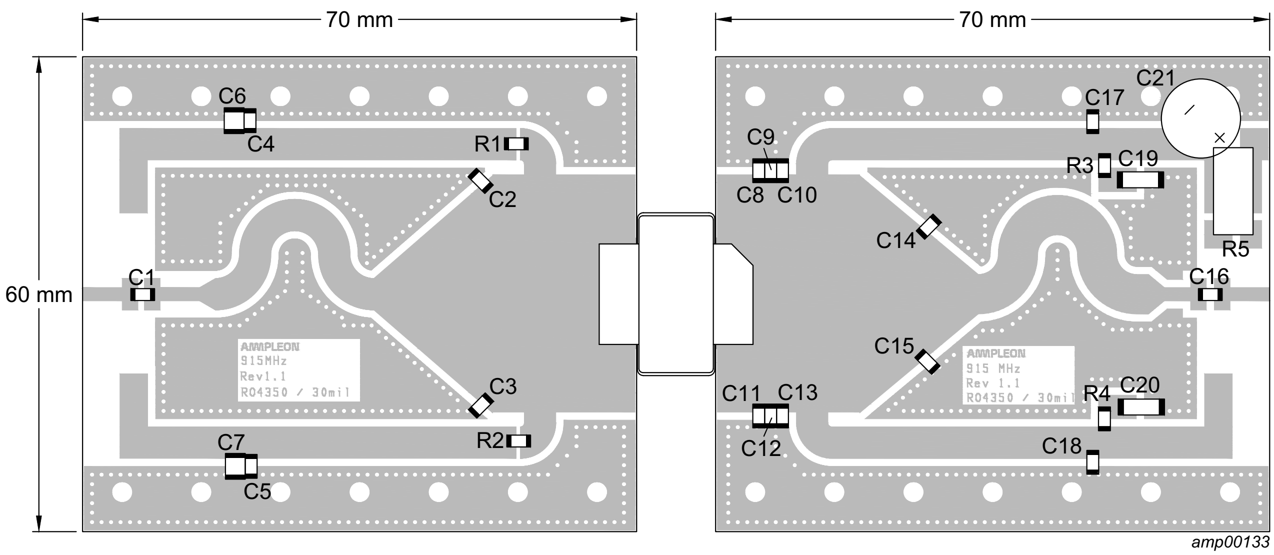


Fig 1. Definition of transistor impedance

7.3 Test circuit



Printed-Circuit Board (PCB): Rogers RO4350; ε_r = 3.48; height = 0.762 mm; thickness copper plating = 35 μm.

See Table 9 for a list of components.

Fig 2. Component layout for application circuit

Table 9. List of components

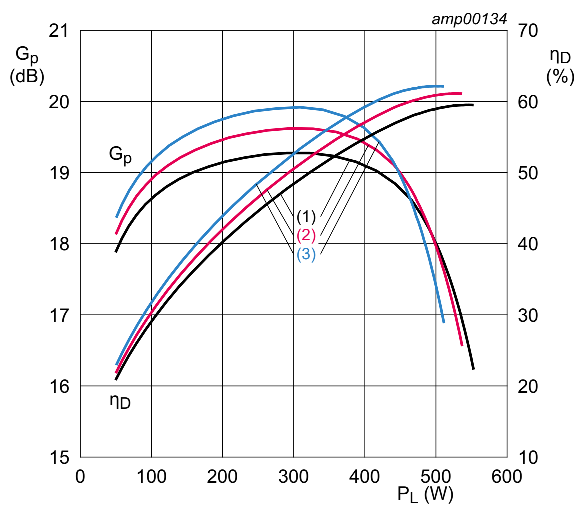
See Figure 2 for component layout.

Component	Description	Value	Remarks
C1, C16	multilayer ceramic chip capacitor	470 pF	ATC 800B
C2, C3	multilayer ceramic chip capacitor	2.4 pF	ATC 800B
C4, C5, C17, C18	multilayer ceramic chip capacitor	100 pF	ATC 800B
C6, C7	multilayer ceramic chip capacitor	4.7 μF, 50 V	Murata: GRM32ER71H475KA88L
C8, C11	multilayer ceramic chip capacitor	5.6 pF	ATC 800B
C9, C10, C12, C13	multilayer ceramic chip capacitor	4.7 pF	ATC 800B
C14, C15	multilayer ceramic chip capacitor	0.9 pF	ATC 800B
C19, C20	multilayer ceramic chip capacitor	4.7 μF, 100 V	TDK: C5750X7R2A475KT/A
C21	electrolytic capacitor	470 μF, 63 V	

Table 9. List of components *...continued*
See Figure 2 for component layout.

Component	Description	Value	Remarks
R1, R2	resistor	10 Ω	SMD1206
R3, R4	resistor	3 Ω	SMD1206
R5	shunt resistor	0.01 Ω	Ohmite: FC4L110R010FER

7.4 Graphical data



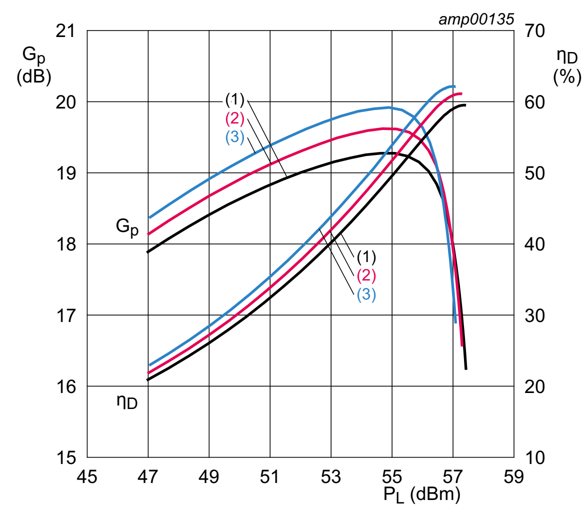
V_{DS} = 50 V; I_{Dq} = 90 mA.

(1) f = 902 MHz

(2) f = 915 MHz

(3) f = 928 MHz

Fig 3. Power gain and drain efficiency as function of output power; typical values



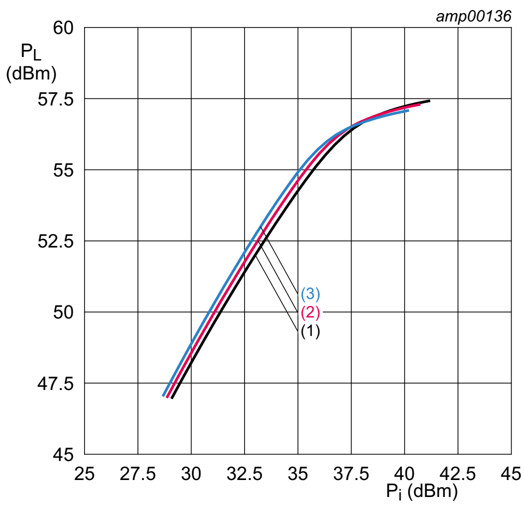
V_{DS} = 50 V; I_{Dq} = 90 mA.

(1) f = 902 MHz

(2) f = 915 MHz

(3) f = 928 MHz

Fig 4. Power gain and drain efficiency as function of output power; typical values



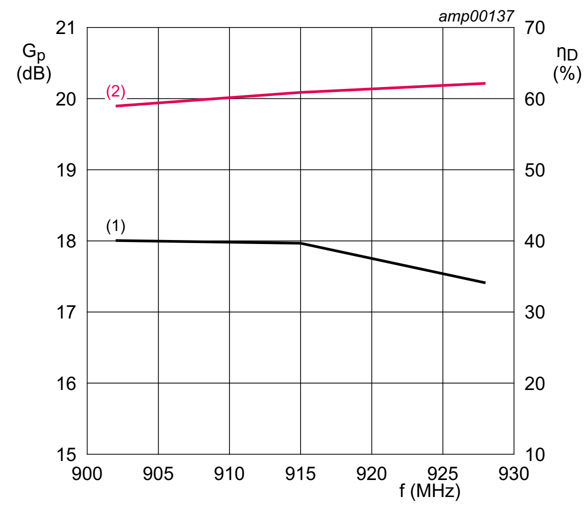
V_{DS} = 50 V; I_{Dq} = 90 mA.

(1) f = 902 MHz

(2) f = 915 MHz

(3) f = 928 MHz

Fig 5. Output power as a function of input power; typical values

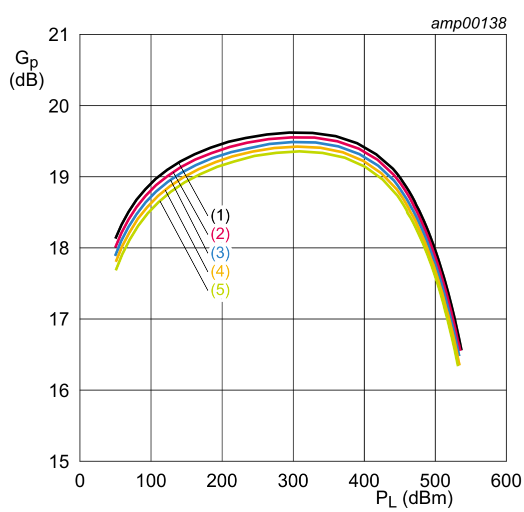


V_{DS} = 50 V; I_{Dq} = 90 mA; P_L = 500 W.

(1) G_p

(2) η_D

Fig 6. Power gain and drain efficiency as a function of frequency; typical values



V_{DS} = 50 V; f = 915 MHz.

(1) I_{Dq} = 90 mA

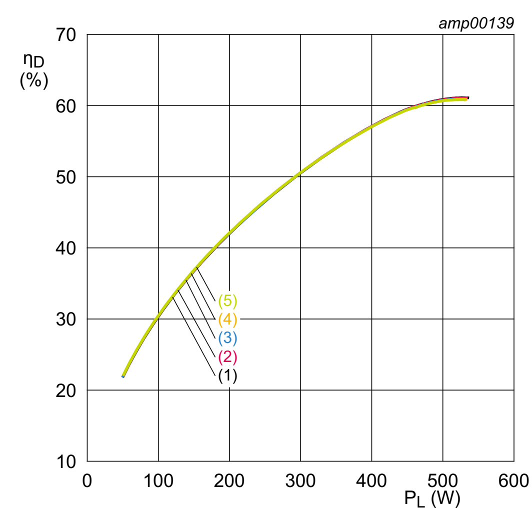
(2) I_{Dq} = 80 mA

(3) I_{Dq} = 70 mA

(4) I_{Dq} = 60 mA

(5) I_{Dq} = 50 mA

Fig 7. Power gain as a function of output power; typical values



V_{DS} = 50 V; f = 915 MHz.

(1) I_{Dq} = 90 mA

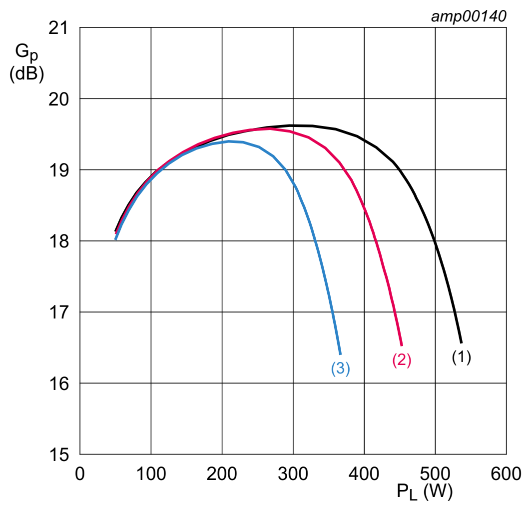
(2) I_{Dq} = 80 mA

(3) I_{Dq} = 70 mA

(4) I_{Dq} = 60 mA

(5) I_{Dq} = 50 mA

Fig 8. Drain efficiency as a function of output power; typical values



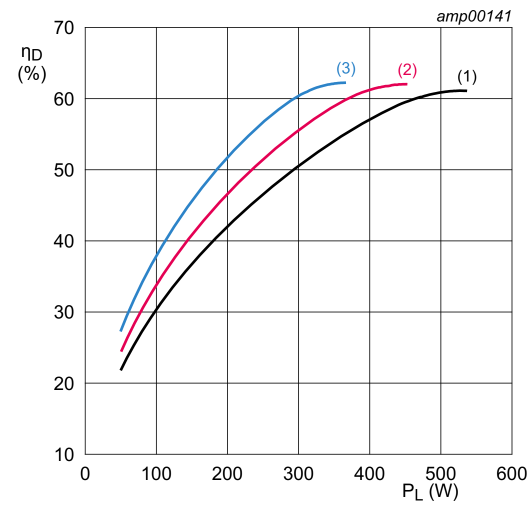
I_{Dq} = 90 mA; f = 915 MHz.

(1) V_{DS} = 50 V

(2) V_{DS} = 45 V

(3) V_{DS} = 40 V

Fig 9. Power gain as a function of output power; typical values



I_{Dq} = 90 mA; f = 915 MHz.

(1) V_{DS} = 50 V

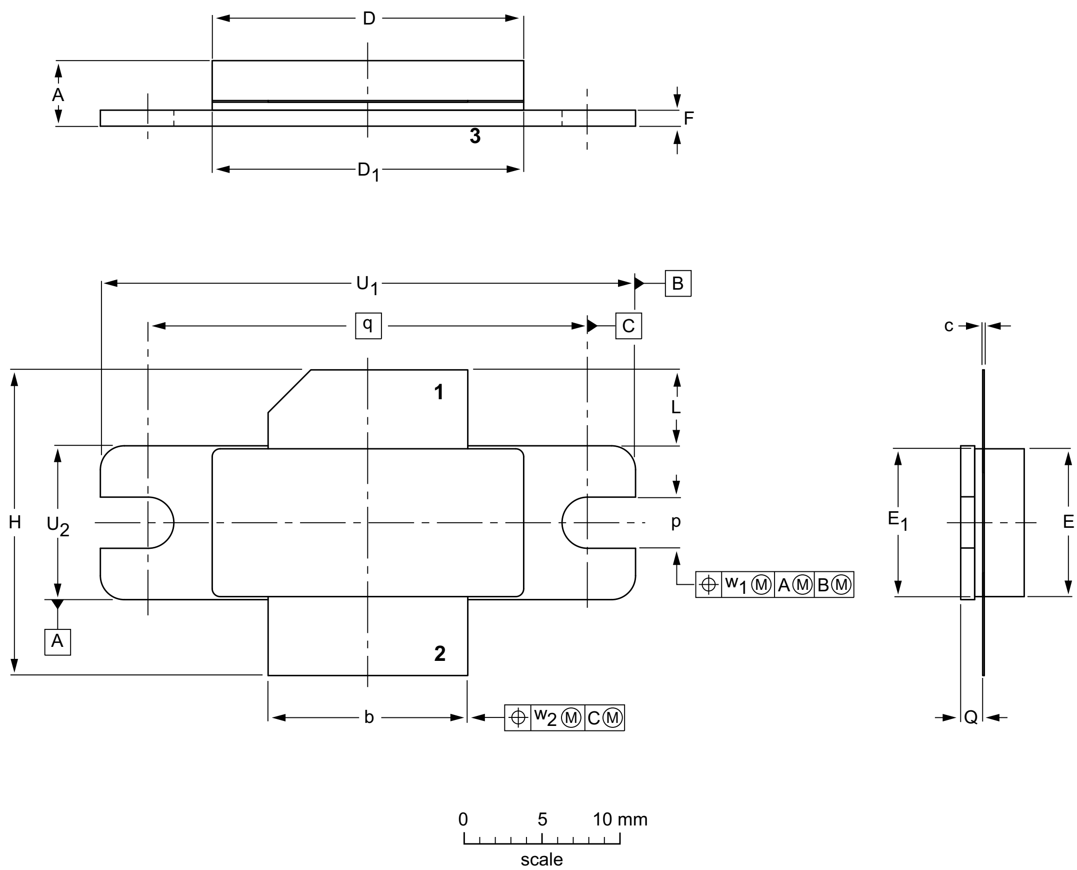
(2) V_{DS} = 45 V

(3) V_{DS} = 40 V

Fig 10. Drain efficiency as a function of output power; typical values

8. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads **SOT502A**



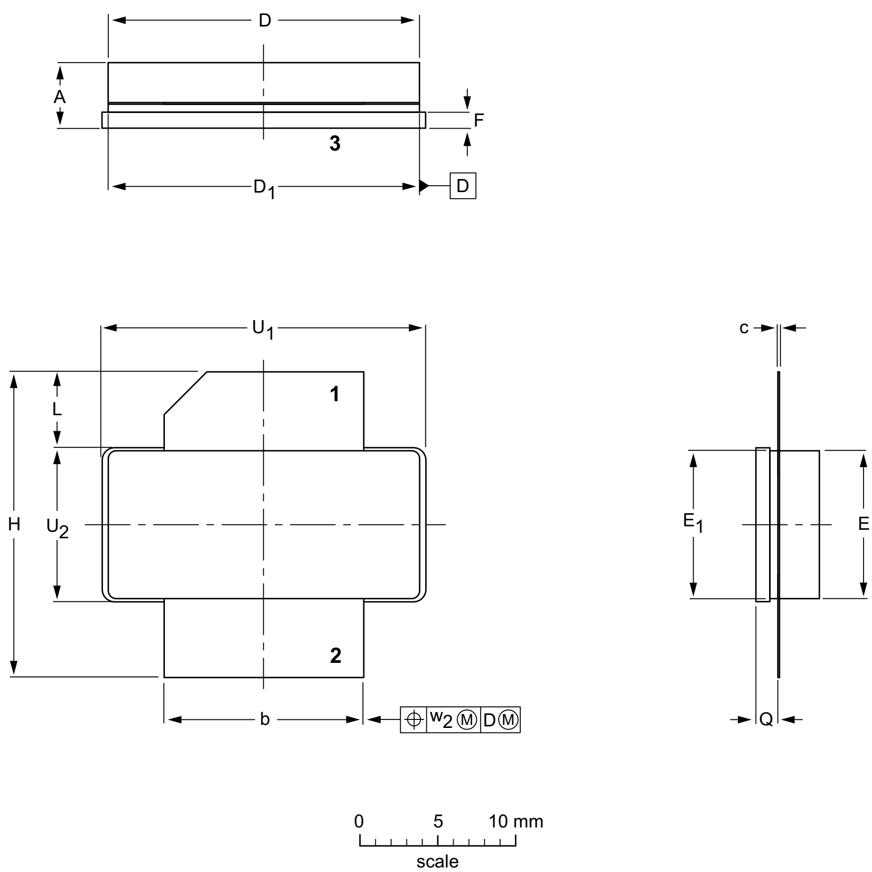
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

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 11. Package outline SOT502A

Earless flanged ceramic package; 2 leads **SOT502B**



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

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	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	1.70 1.45	20.70 20.45	9.91 9.65	0.25
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	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						~~07-05-09~~ 12-05-02

Fig 12. Package outline SOT502B

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.

Table 10. ESD sensitivity

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C1 [1]
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2 [2]

[1] CDM classification C1 is granted to any part that passes after exposure to an ESD pulse of 250 V, but fails after exposure to an ESD pulse of 500 V.

[2] HBM classification 2 is granted to any part that passes after exposure to an ESD pulse of 2000 V, but fails after exposure to an ESD pulse of 4000 V.

10. Abbreviations

Table 11. Abbreviations

Acronym	Description
CW	Continuous wave
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MTF	Median Time to Failure
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLA8H0910L-500_0910LS-500 v.1	20170207	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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