

# BLA6H0912L-1000; BLA6H0912LS-1000

LDMOS avionics power transistor

Rev. 5 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

1000W LDMOS pulsed power transistor intended for avionics transmitter applications in the 960 MHz to 1215 MHz frequency range such as Mode-S, TCAS, JTIDS, DME and TACAN.

**Table 1. Application information**

Typical RF performance at  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\text{ }\%$ ;  $I_{Dq} = 200\text{ mA}$ ; in a class-AB application circuit.

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)
pulsed RF	1030	50	1000	16	52	11	5

### 1.2 Features and benefits

- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (960 MHz to 1215 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- 1000 W LDMOS pulsed power transistor intended for Mode-S, TCAS, JTIDS, DME and TACAN applications in the 960 MHz to 1215 MHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLA6H0912L-1000 (SOT539A)</b>			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source <a href="#">[1]</a>		
<b>BLA6H0912LS-1000 (SOT539B)</b>			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source <a href="#">[1]</a>		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLA6H0912L-1000	-	flanged balanced ceramic package; 2 mounting holes; 4 leads	SOT539A
BLA6H0912LS-1000	-	earless flanged balanced ceramic package; 4 leads	SOT539B

## 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		-	100	V
$V_{GS}$	gate-source voltage		-0.5	+13	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature	<a href="#">[1]</a>	-	225	°C

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

## 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_{case} = 80\text{ °C}; P_L = 1000\text{ W}$		
		$t_p = 50\text{ }\mu\text{s}; \delta = 2\%$	0.011	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\%$	0.021	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\%$	0.025	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\%$	0.027	K/W
		$t_p = 2.4\text{ ms}; \delta = 6.4\%$	0.041	K/W

## 6. Characteristics

Table 6. DC characteristics

$T_j = 25\text{ °C}$ ; per section unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 4\text{ mA}$	104	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 400\text{ mA}$	1.25	1.8	2.25	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}$	-	-	2.8	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	62	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	280	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 20\text{ A}$	-	34	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 14\text{ A}$	-	75	-	$\text{m}\Omega$

Table 7. RF characteristics

Test signal: pulsed RF;  $t_p = 50\text{ }\mu\text{s}; \delta = 2\%$ ; RF performance at  $V_{DS} = 50\text{ V}; I_{Dq} = 200\text{ mA}$ ;  $f = 1030\text{ MHz}; T_{case} = 25\text{ °C}$ ; unless otherwise specified, in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$P_L = 1000\text{ W}$	-	-	50	V
$G_p$	power gain	$P_L = 1000\text{ W}$	14	15.5	-	dB
$RL_{in}$	input return loss	$P_L = 1000\text{ W}$	-	-19	-11	dB
$\eta_D$	drain efficiency	$P_L = 1000\text{ W}$	47	51	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 1000\text{ W}$	-	0	0.3	dB
$t_r$	rise time	$P_L = 1000\text{ W}$	-	11	30	ns
$t_f$	fall time	$P_L = 1000\text{ W}$	-	5	30	ns

## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLA6H0912L-1000 and the BLA6H0912LS-1000 are capable of withstanding a load mismatch corresponding to  $V_{SWR} = 3 : 1$  through all phases under the following conditions:  $V_{DS} = 50\text{ V}; I_{Dq} = 200\text{ mA}; P_L = 1000\text{ W}; t_p = 50\text{ }\mu\text{s}; \delta = 2\%; f = 1030\text{ MHz}$ .

7.2 Impedance information

Table 8. Typical impedance

Typical values per section unless otherwise specified.

f (MHz)	Z <sub>s</sub> (Ω)	Z <sub>L</sub> [1] (Ω)	Z <sub>L</sub> [2] (Ω)
950	1.12 – j2.27	0.60 + j0.21	0.62 – j0.02
1000	1.39 – j2.69	0.54 + j0.08	0.66 – j0.06
1050	1.79 – j2.79	0.40 + j0.03	0.52 – j0.28
1100	2.44 – j2.72	0.41 – j0.12	0.67 – j0.29
1150	1.68 – j2.52	0.49 – j0.21	0.53 – j0.35
1200	4.68 – j2.97	0.36 – j0.30	0.57 – j0.40

[1] Optimized for drain efficiency.

[2] Optimized for power gain.

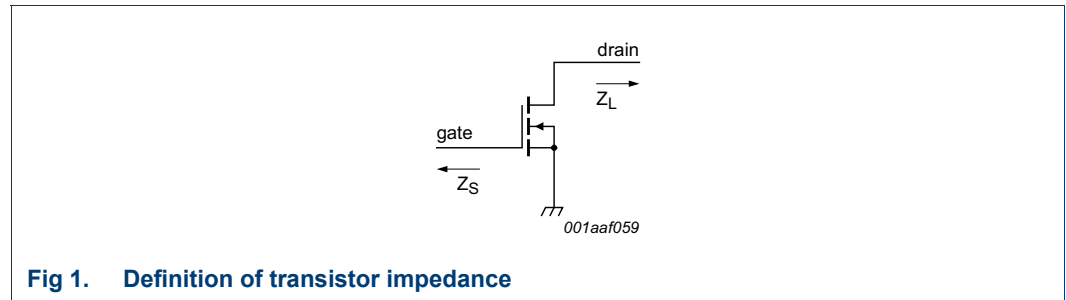
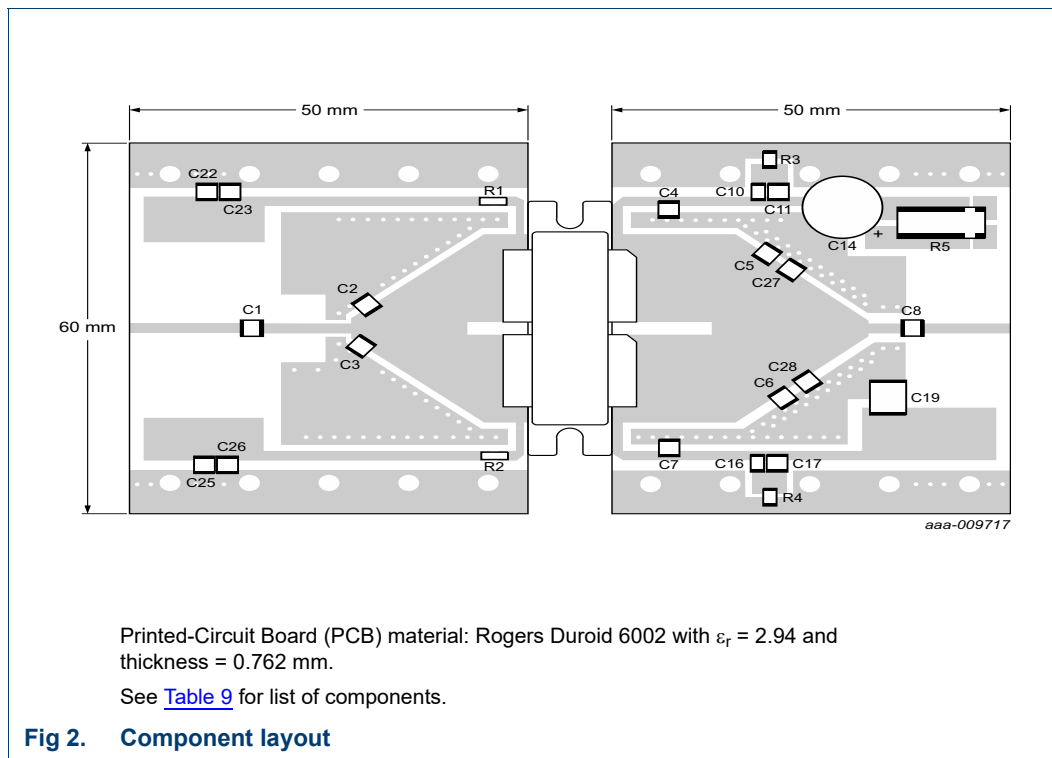


Fig 1. Definition of transistor impedance

7.3 Circuit information



**Table 9. List of components**

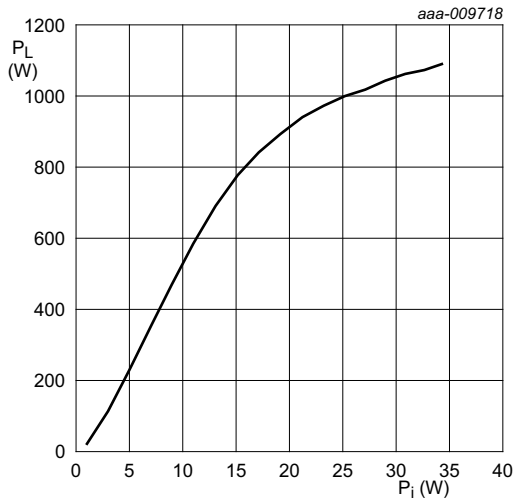
See [Figure 2](#) for component layout.

Component	Description	Value	Remarks
C1, C4, C7, C8, C22, C25	multilayer ceramic chip capacitor	33 pF	[1]
C2, C3, C27, C28	multilayer ceramic chip capacitor	6.2 pF	[1]
C5, C6	multilayer ceramic chip capacitor	3.9 pF	[1]
C23, C26	multilayer ceramic chip capacitor	1 nF	[1]
C10, C16	multilayer ceramic chip capacitor	10 nF	Murata
C11, C17	multilayer ceramic chip capacitor	100 nF	TDK
C14	electrolytic capacitor	220 $\mu$ F, 63 V	
C19	multilayer ceramic chip capacitor	10 $\mu$ F, 100 V	
R1	SMD resistor	1 k $\Omega$	SMD 0603
R2	SMD resistor	20 $\Omega$	SMD 0603
R3, R4	SMD resistor	2.4 $\Omega$	SMD 0603
R5	current sense resistor	0.005 $\Omega$	

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

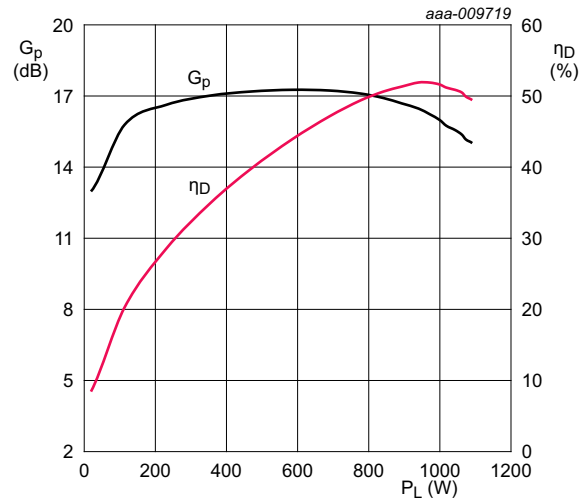
7.4 Graphical data

7.4.1 Pulsed CW



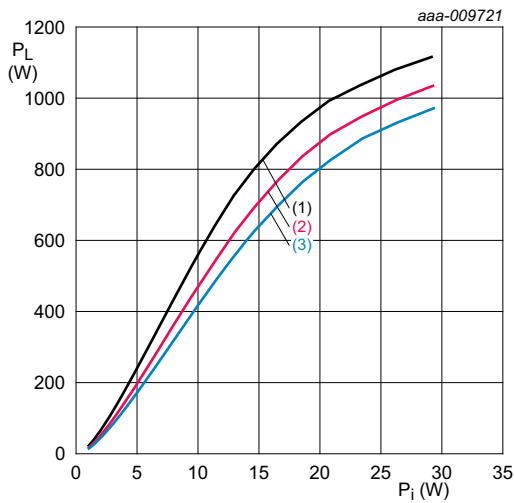
$V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 200\text{ mA}$ ;  $f = 1030\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$ .

Fig 3. Output power as a function of input power; typical values



$V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 200\text{ mA}$ ;  $f = 1030\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$ .

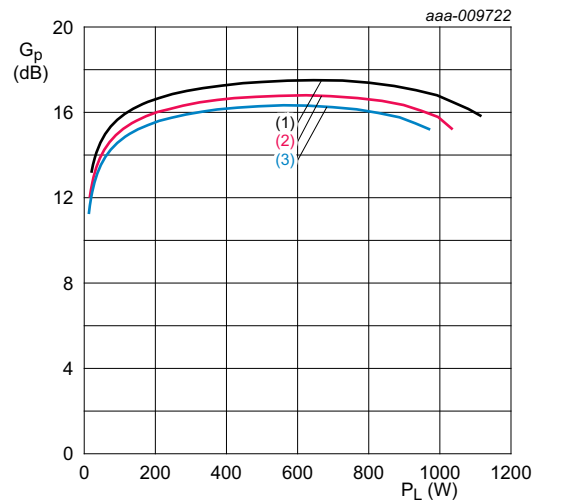
Fig 4. Power gain and drain efficiency as function of output power; typical values



$V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 200\text{ mA}$ ;  $f = 1030\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$ .

- (1)  $T_{case} = 20\text{ }^\circ\text{C}$
- (2)  $T_{case} = 50\text{ }^\circ\text{C}$
- (3)  $T_{case} = 70\text{ }^\circ\text{C}$

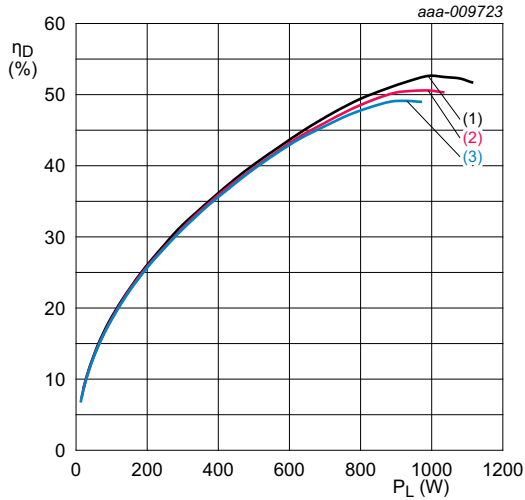
Fig 5. Output power as a function of input power; typical values



$V_{DS} = 50\text{ V}$ ;  $I_{Dq} = 200\text{ mA}$ ;  $f = 1030\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$ .

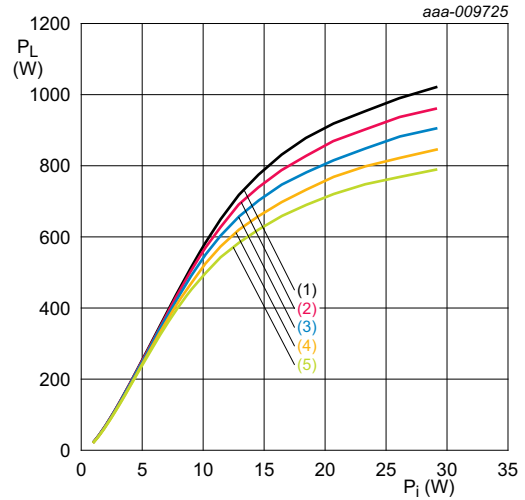
- (1)  $T_{case} = 20\text{ }^\circ\text{C}$
- (2)  $T_{case} = 50\text{ }^\circ\text{C}$
- (3)  $T_{case} = 70\text{ }^\circ\text{C}$

Fig 6. Power gain as a function of output power; typical values



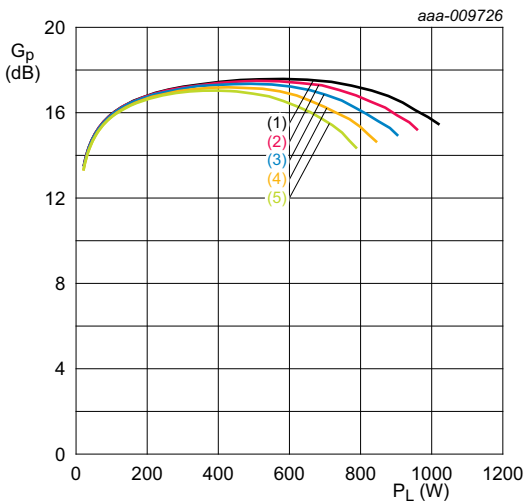
$V_{DS} = 50 \text{ V}; I_{Dq} = 200 \text{ mA}; f = 1030 \text{ MHz}; t_p = 50 \text{ }\mu\text{s}; \delta = 2 \text{ \%}$   
 (1)  $T_{case} = 20 \text{ }^\circ\text{C}$   
 (2)  $T_{case} = 50 \text{ }^\circ\text{C}$   
 (3)  $T_{case} = 70 \text{ }^\circ\text{C}$

**Fig 7. Drain efficiency as a function of output power; typical values**



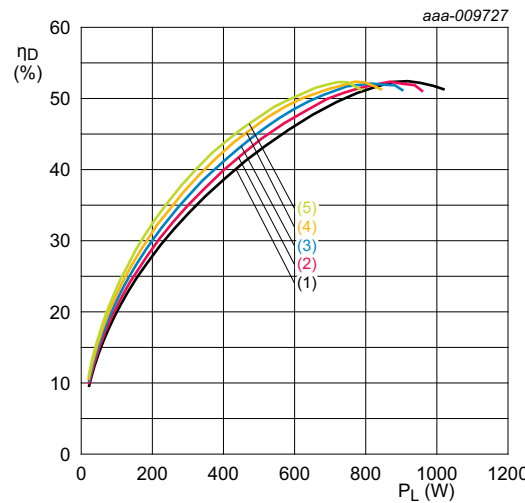
$I_{Dq} = 200 \text{ mA}; t_p = 50 \text{ }\mu\text{s}; \delta = 2 \text{ \%}$   
 (1)  $V_{DS} = 50 \text{ V}$   
 (2)  $V_{DS} = 48 \text{ V}$   
 (3)  $V_{DS} = 46 \text{ V}$   
 (4)  $V_{DS} = 44 \text{ V}$   
 (5)  $V_{DS} = 42 \text{ V}$

**Fig 8. Output power as a function of input power; typical values**



$I_{Dq} = 200 \text{ mA}; t_p = 50 \text{ }\mu\text{s}; \delta = 2 \text{ \%}$   
 (1)  $V_{DS} = 50 \text{ V}$   
 (2)  $V_{DS} = 48 \text{ V}$   
 (3)  $V_{DS} = 46 \text{ V}$   
 (4)  $V_{DS} = 44 \text{ V}$   
 (5)  $V_{DS} = 42 \text{ V}$

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



$I_{Dq} = 200 \text{ mA}; t_p = 50 \text{ }\mu\text{s}; \delta = 2 \text{ \%}$   
 (1)  $V_{DS} = 50 \text{ V}$   
 (2)  $V_{DS} = 48 \text{ V}$   
 (3)  $V_{DS} = 46 \text{ V}$   
 (4)  $V_{DS} = 44 \text{ V}$   
 (5)  $V_{DS} = 42 \text{ V}$

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

8. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A

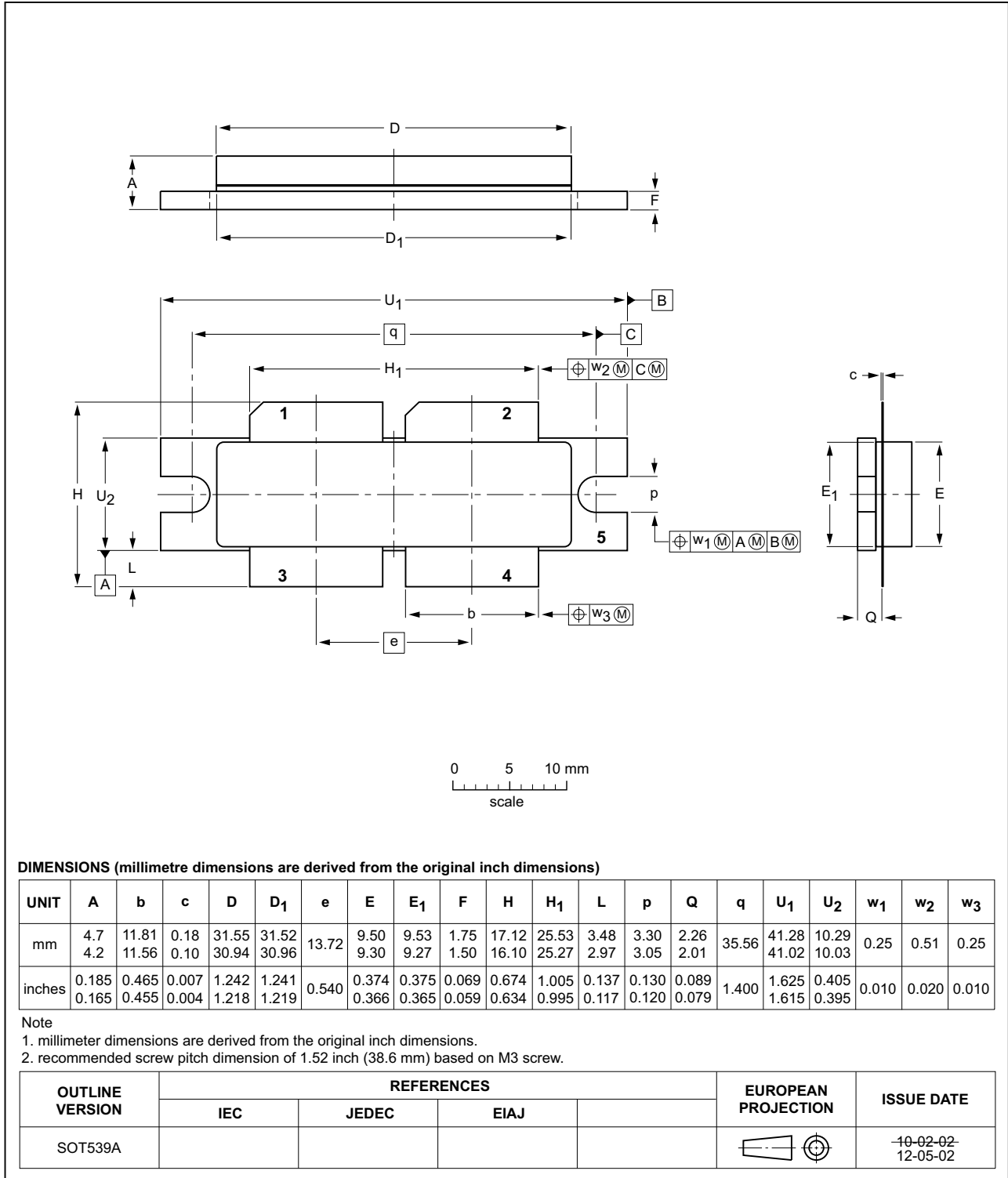


Fig 11. Package outline SOT539A



Earless flanged balanced ceramic package; 4 leads

SOT539B

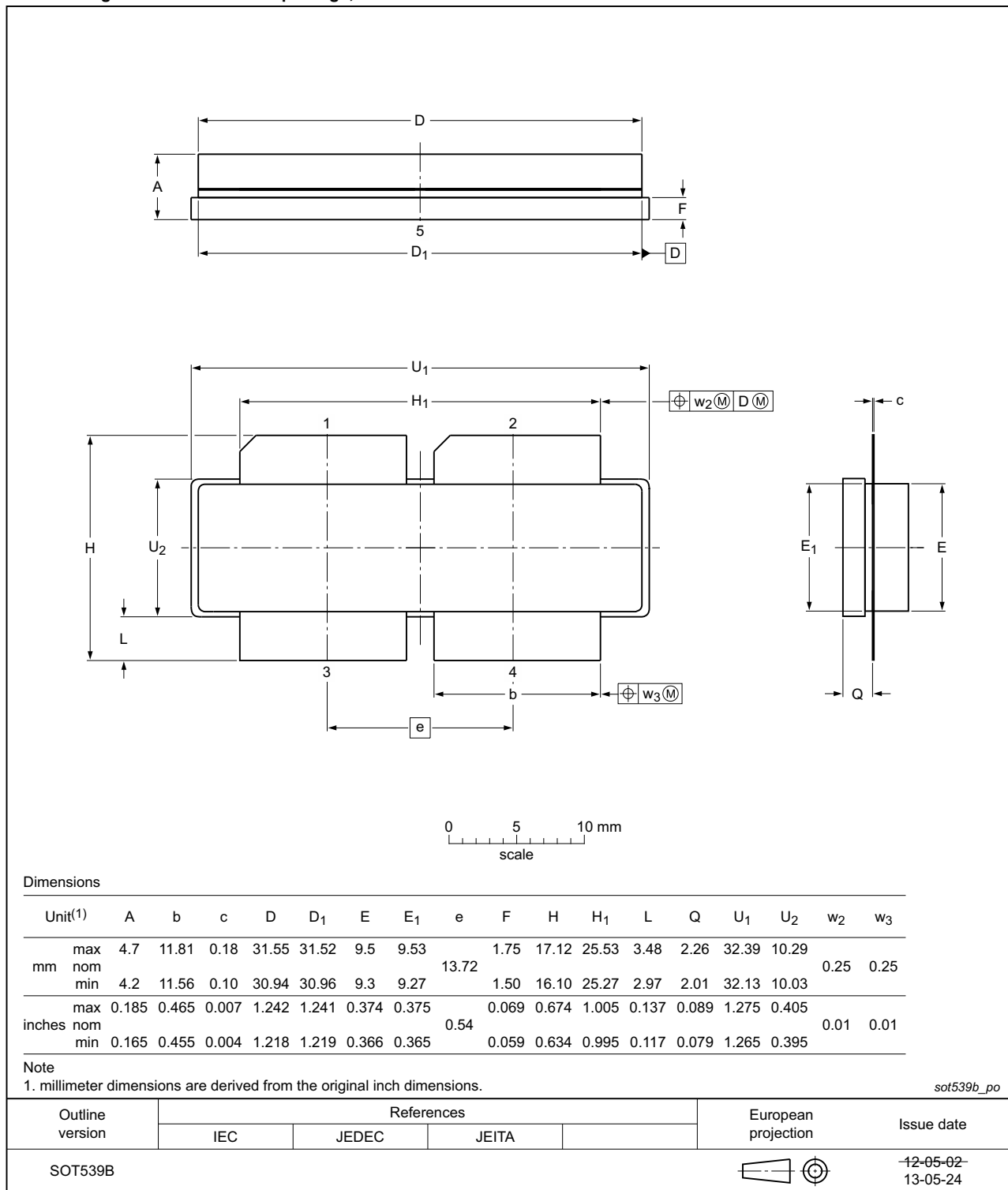


Fig 12. Package outline SOT539B

## 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
CW	Continuous Wave
DME	Distance Measuring Equipment
ESD	ElectroStatic Discharge
JTIDS	Joint Tactical Information Distribution System
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
Mode-S	Mode Select
MTF	Median Time to Failure
SMD	Surface Mounted Device
TACAN	TACTical Air Navigation
TCAS	Traffic Collision Avoidance System
VSWR	Voltage Standing-Wave Ratio

## 11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLA6H0912L-1000_0912LS-1000#5	20150901	Product data sheet	-	BLA6H0912L-1000_0912LS-1000 v.4
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>		
BLA6H0912L-1000_0912LS-1000 v.4	20150702	Product data sheet	-	BLA6H0912L-1000_0912LS-1000 v.3
BLA6H0912L-1000_0912LS-1000 v.3	20150615	Product data sheet	-	BLA6H0912L-1000_0912LS-1000 v.2
BLA6H0912L-1000_0912LS-1000 v.2	20140210	Objective data sheet	-	BLA6H0912L-1000_0912LS-1000 v.1
BLA6H0912L-1000_0912LS-1000 v.1	20131104	Objective data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

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

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