

# BLS6G2731-120; BLS6G2731S-120

LDMOS S-band radar power transistor

Rev. 2 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

120 W LDMOS power transistor intended for radar applications in the 2.7 GHz to 3.1 GHz range.

**Table 1. Typical performance**

Typical RF performance at  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ ;  $I_{Dq} = 100\text{ mA}$ ; in a class-AB production test circuit.

Mode of operation	f (GHz)	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	2.7 to 3.1	32	120	13.5	48	20	6

#### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features

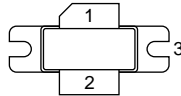
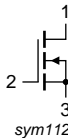
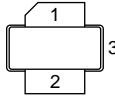
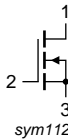
- Typical pulsed RF performance at a frequency of 2.7 GHz to 3.1 GHz, a supply voltage of 32 V, an  $I_{Dq}$  of 100 mA, a  $t_p$  of 100  $\mu\text{s}$  with  $\delta$  of 10 %:
  - ◆ Output power = 120 W
  - ◆ Power gain = 13.5 dB
  - ◆ Efficiency = 48 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2.7 GHz to 3.1 GHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding restriction of hazardous substances (RoHS)

### 1.3 Applications

- S-band power amplifiers for radar applications in the 2.7 GHz to 3.1 GHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLS6G2731-120 (SOT502A)</b>			
1	drain		
2	gate		
3	source		
<b>BLS6G2731S-120 (SOT502B)</b>			
1	drain		
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLS6G2731-120	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLS6G2731S-120	-	earless flanged LDMOST 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	-	60	V
$V_{GS}$	gate-source voltage	-0.5	+13	V
$I_D$	drain current	-	33	A
$T_{stg}$	storage temperature	-65	+150	°C
$T_j$	junction temperature	-	225	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-mb)}$	transient thermal impedance from junction to mounting base	$T_{case} = 85\text{ °C}; P_L = 120\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\%$	0.23	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\%$	0.28	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\%$	0.32	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\%$	0.33	K/W

## 6. Characteristics

**Table 6. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.6\text{ mA}$	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.4	1.8	2.4	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	27	33	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	450	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	8.1	13	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$	-	0.085	0.135	$\Omega$

## 7. Application information

**Table 7. Application information**

Mode of operation: pulsed RF;  $t_p = 100\text{ }\mu\text{s}; \delta = 10\%$ ; RF performance at  $V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; T_{case} = 25\text{ °C}$ ; unless otherwise specified, in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_L$	output power		-	120	-	W
$V_{CC}$	supply voltage	$P_L = 120\text{ W}$	-	-	32	V
$G_p$	power gain	$P_L = 120\text{ W}$	12	13.5	-	dB
$RL_{in}$	input return loss	$P_L = 120\text{ W}$	-	7	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	130	-	W
$\eta_D$	drain efficiency	$P_L = 120\text{ W}$	40	48	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 120\text{ W}$	-	0	0.5	dB
$t_r$	rise time	$P_L = 120\text{ W}$	-	20	50	ns
$t_f$	fall time	$P_L = 120\text{ W}$	-	6	50	ns

Table 8. Typical impedance

f GHz	$Z_S$ $\Omega$	$Z_L$ $\Omega$
2.7	$3.4 - j7.2$	$4.6 - j4.4$
2.8	$3.8 - j5.9$	$3.8 - j4.6$
2.9	$4.7 - j4.8$	$3.0 - j4.6$
3.0	$6.3 - j4.1$	$2.3 - j4.3$
3.1	$8.8 - j4.9$	$1.8 - j3.9$

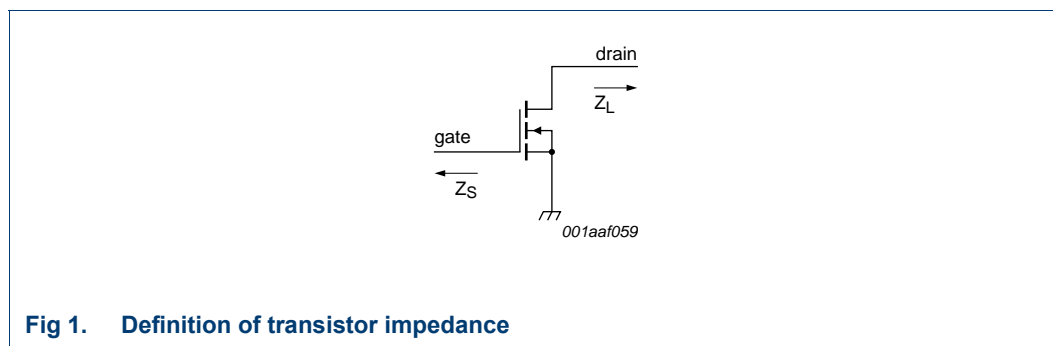
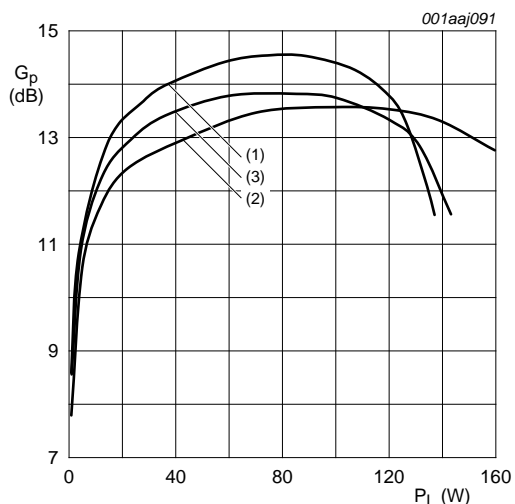


Fig 1. Definition of transistor impedance

## 7.1 Ruggedness in class-AB operation

The BLS6G2731-120 and BLS6G2731S-120 are capable of withstanding a load mismatch corresponding to VSWR = 5 : 1 through all phases under the following conditions:  
 $V_{DS} = 32$  V;  $I_{DQ} = 100$  mA;  $P_L = 120$  W;  $t_p = 100$   $\mu$ s;  $\delta = 10$  %.

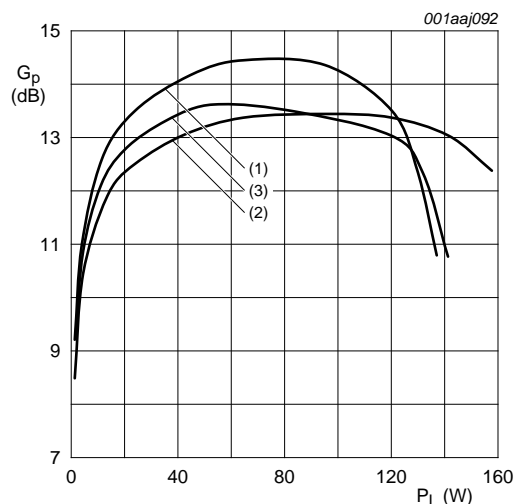
## 7.2 Graphs



$V_{DS} = 32$  V;  $I_{DQ} = 100$  mA;  $t_p = 300$   $\mu$ s;  $\delta = 10$  %.

- (1)  $f = 2.7$  GHz
- (2)  $f = 2.9$  GHz
- (3)  $f = 3.1$  GHz

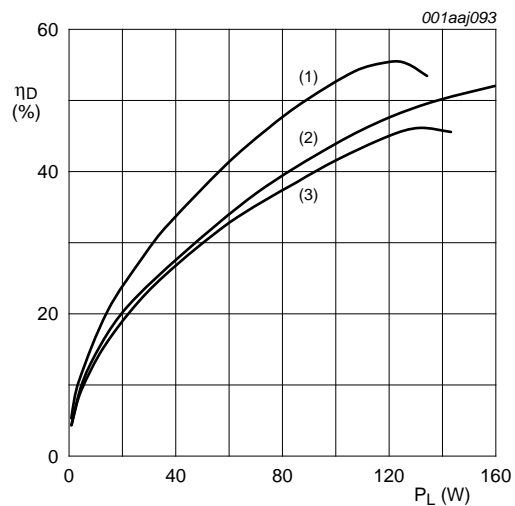
**Fig 2. Power gain as a function of load power; typical values**



$V_{DS} = 32$  V;  $I_{DQ} = 100$  mA;  $t_p = 100$   $\mu$ s;  $\delta = 20$  %.

- (1)  $f = 2.7$  GHz
- (2)  $f = 2.9$  GHz
- (3)  $f = 3.1$  GHz

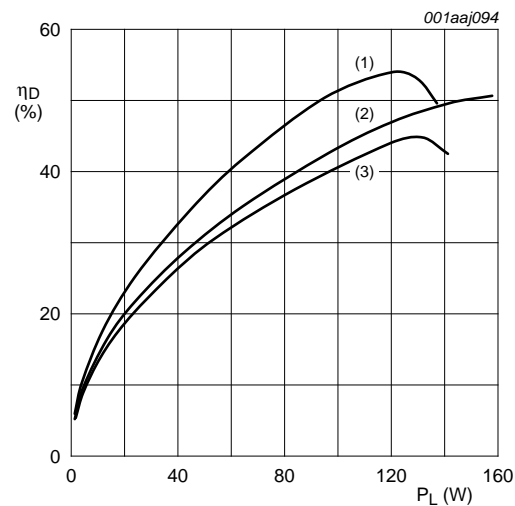
**Fig 3. Power gain as a function of load power; typical values**



$V_{DS} = 32$  V;  $I_{DQ} = 100$  mA;  $t_p = 300$   $\mu$ s;  $\delta = 10$  %.

- (1)  $f = 2.7$  GHz
- (2)  $f = 2.9$  GHz
- (3)  $f = 3.1$  GHz

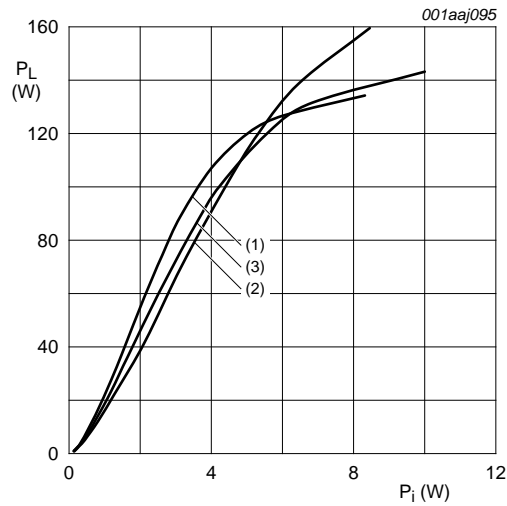
**Fig 4. Drain efficiency as a function of load power; typical values**



$V_{DS} = 32$  V;  $I_{DQ} = 100$  mA;  $t_p = 100$   $\mu$ s;  $\delta = 20$  %.

- (1)  $f = 2.7$  GHz
- (2)  $f = 2.9$  GHz
- (3)  $f = 3.1$  GHz

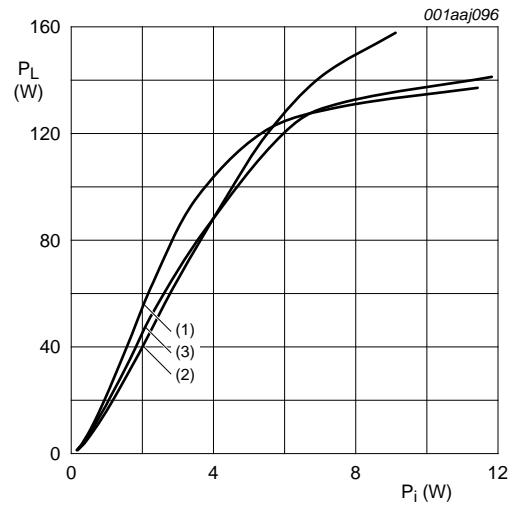
**Fig 5. Drain efficiency as a function of load power; typical values**



$V_{DS} = 32 \text{ V}$ ;  $I_{DQ} = 100 \text{ mA}$ ;  $t_p = 300 \text{ } \mu\text{s}$ ;  $\delta = 10 \text{ } \%$ .

- (1)  $f = 2.7 \text{ GHz}$
- (2)  $f = 2.9 \text{ GHz}$
- (3)  $f = 3.1 \text{ GHz}$

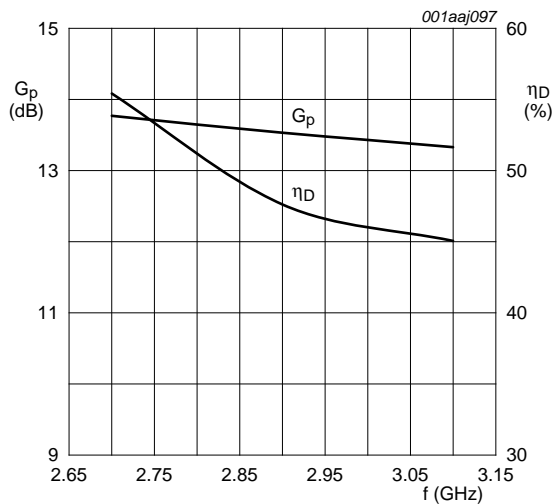
**Fig 6. Load power as a function of input power; typical values**



$V_{DS} = 32 \text{ V}$ ;  $I_{DQ} = 100 \text{ mA}$ ;  $t_p = 100 \text{ } \mu\text{s}$ ;  $\delta = 20 \text{ } \%$ .

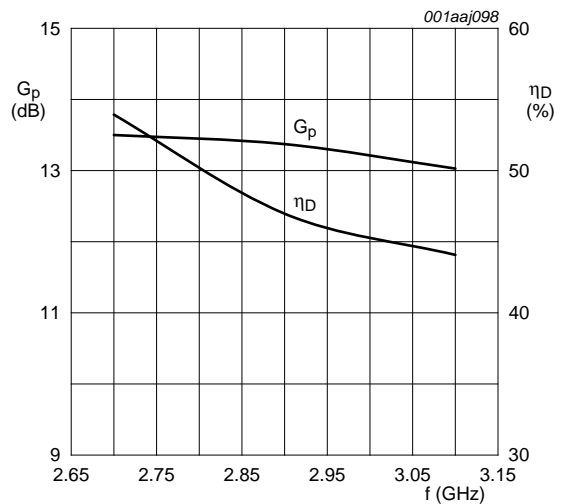
- (1)  $f = 2.7 \text{ GHz}$
- (2)  $f = 2.9 \text{ GHz}$
- (3)  $f = 3.1 \text{ GHz}$

**Fig 7. Load power as a function of input power; typical values**



$P_L = 120 \text{ W}$ ;  $V_{DS} = 32 \text{ V}$ ;  $I_{DQ} = 100 \text{ mA}$ ;  $t_p = 300 \text{ } \mu\text{s}$ ;  $\delta = 10 \text{ } \%$ .

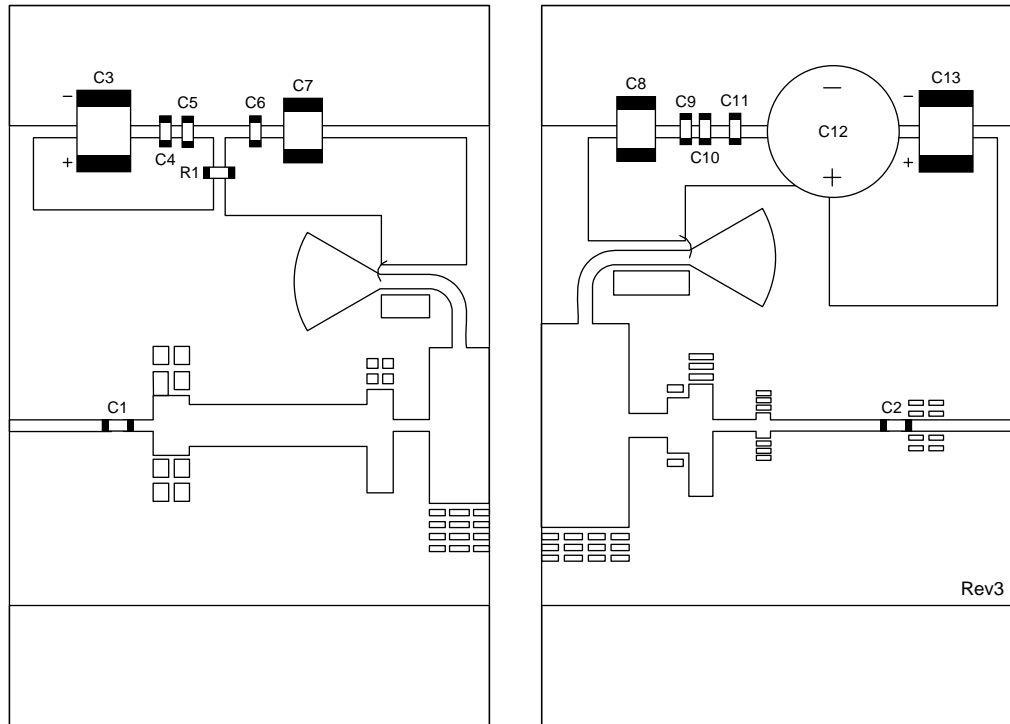
**Fig 8. Power gain and drain efficiency as function of frequency; typical values**



$P_L = 120 \text{ W}$ ;  $V_{DS} = 32 \text{ V}$ ;  $I_{DQ} = 100 \text{ mA}$ ;  $t_p = 100 \text{ } \mu\text{s}$ ;  $\delta = 20 \text{ } \%$ .

**Fig 9. Power gain and drain efficiency as function of frequency; typical values**

## 8. Test information



001aaj099

Striplines are on a double copper-clad Duroid 6006 Printed-Circuit Board (PCB) with  $\epsilon_r = 6.15$  and thickness = 0.64 mm.

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

**Fig 10. Component layout for 2700 MHz to 3100 MHz test circuit**

**Table 9. List of components**

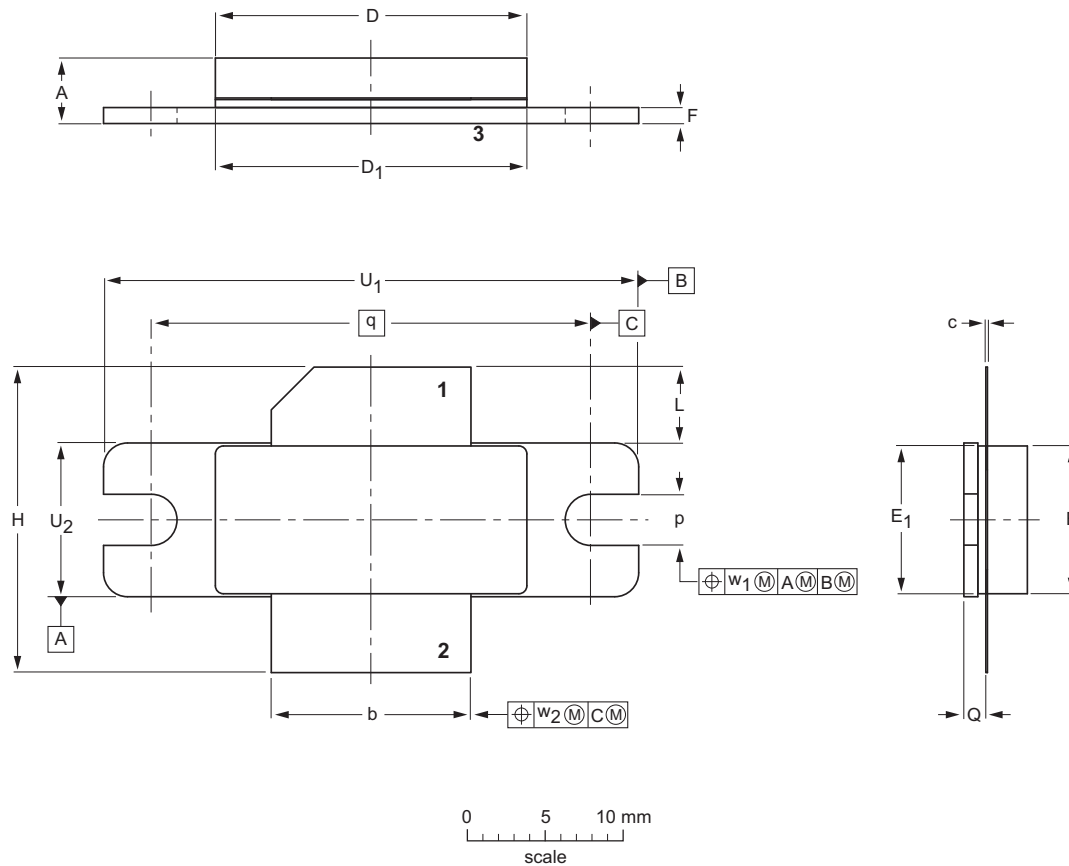
See [Figure 10](#).

Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	24 pF	ATC 100A or equivalent
C3	multilayer ceramic chip capacitor	47 $\mu$ F; 20 V	
C4, C6, C9, C10	multilayer ceramic chip capacitor	33 pF	ATC 100A or equivalent
C5, C11	multilayer ceramic chip capacitor	1 nF	ATC 100A or equivalent
C7, C8	multilayer ceramic chip capacitor	100 pF	ATC 100B or equivalent
C12	electrolytic capacitor	47 $\mu$ F; 63 V	
C13	multilayer ceramic chip capacitor	10 $\mu$ F; 35 V	
R1	SMD resistor	56 $\Omega$	SMD 0603

## 9. 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 11. Package outline SOT502A



Earless flanged ceramic package; 2 leads

SOT502B

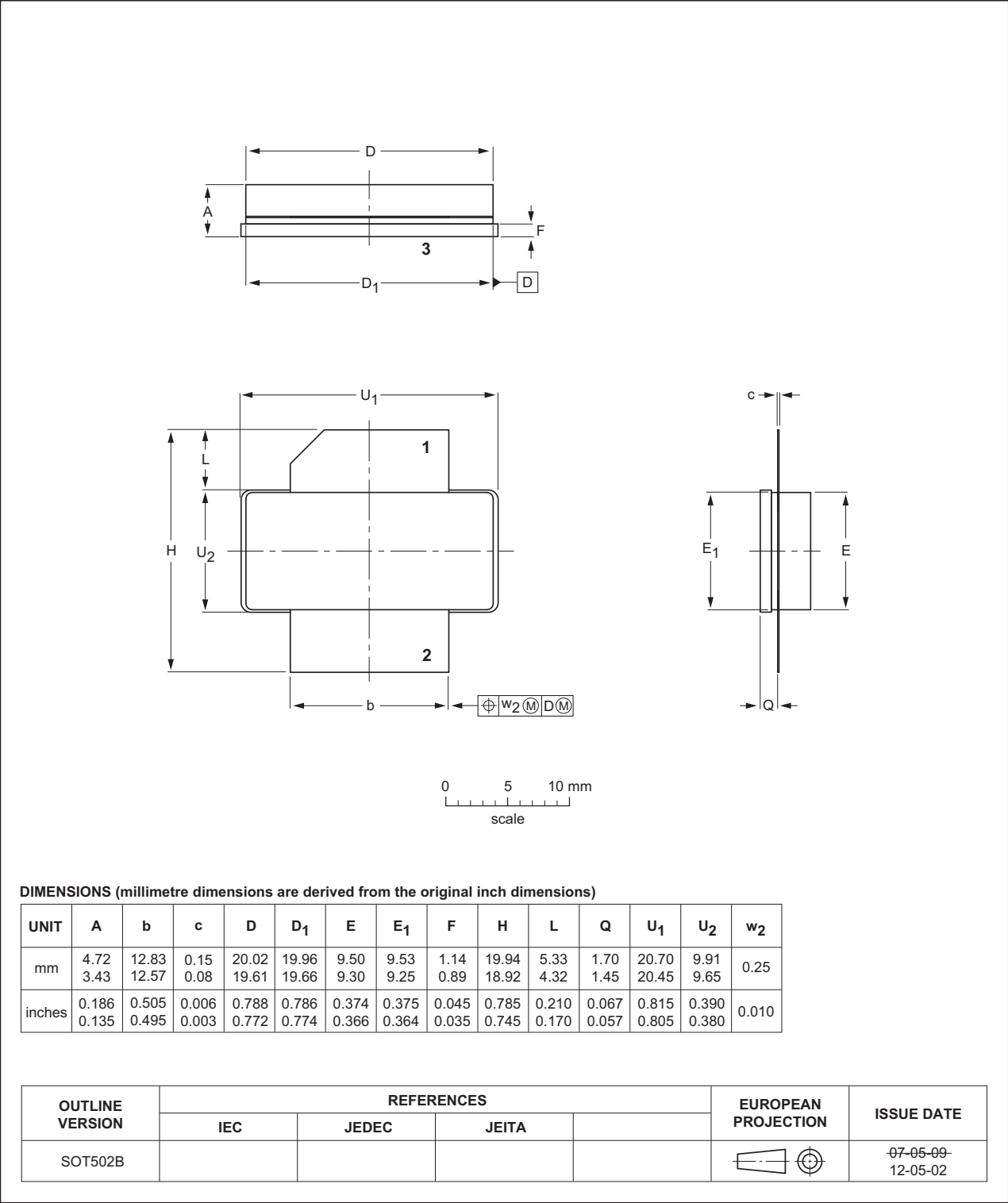


Fig 12. Package outline SOT502B

## 10. Abbreviations

Table 10. Abbreviations

Acronym	Description
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
S-band	Short wave Band
VSWR	Voltage Standing-Wave Ratio

## 11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLS6G2731-120_6G2731S-120#2	20150901	Product data sheet		BLS6G2731-120_6G2731S-120 #1
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>			
BLS6G2731-120_6G2731S-120#1	20081114	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.
Product [short] data sheet	Production	This document contains the product specification.

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## 14. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features . . . . .	1
1.3	Applications . . . . .	2
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Limiting values</b> . . . . .	<b>2</b>
<b>5</b>	<b>Thermal characteristics</b> . . . . .	<b>3</b>
<b>6</b>	<b>Characteristics</b> . . . . .	<b>3</b>
<b>7</b>	<b>Application information</b> . . . . .	<b>3</b>
7.1	Ruggedness in class-AB operation . . . . .	4
7.2	Graphs . . . . .	5
<b>8</b>	<b>Test information</b> . . . . .	<b>7</b>
<b>9</b>	<b>Package outline</b> . . . . .	<b>8</b>
<b>10</b>	<b>Abbreviations</b> . . . . .	<b>10</b>
<b>11</b>	<b>Revision history</b> . . . . .	<b>10</b>
<b>12</b>	<b>Legal information</b> . . . . .	<b>11</b>
12.1	Data sheet status . . . . .	11
12.2	Definitions . . . . .	11
12.3	Disclaimers . . . . .	11
12.4	Trademarks . . . . .	11
<b>13</b>	<b>Contact information</b> . . . . .	<b>11</b>
<b>14</b>	<b>Contents</b> . . . . .	<b>12</b>

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