

BLS6G2731-120; BLS6G2731S-120

LDMOS S-band radar power transistor

Rev. 01 — 14 November 2008

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

Mode of operation	f (GHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η_D (%)	t _r (ns)	t _f (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

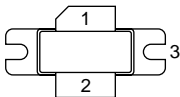
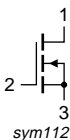
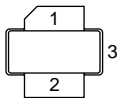
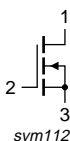
- Typical pulsed RF performance at a frequency of 2.7 GHz to 3.1 GHz, a supply voltage of 32 V, an I_{Dq} of 100 mA, a t_p of 100 μs with δ of 10 %:
 - ◆ Output power = 120 W
 - ◆ Power gain = 13.5 dB
 - ◆ Efficiency = 48 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect 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
BLS6G2731-120 (SOT502A)			
1	drain		 sym112
2	gate		
3	source		
BLS6G2731S-120 (SOT502B)			
1	drain		 sym112
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	$T_{case} = 85\text{ °C}; P_L = 120\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.23	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.28	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.32	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$	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	μA
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	Ω

7. Application information

Table 7. Application information

Mode of operation: pulsed RF; $t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$; 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
η_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 Ω	Z_L Ω
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

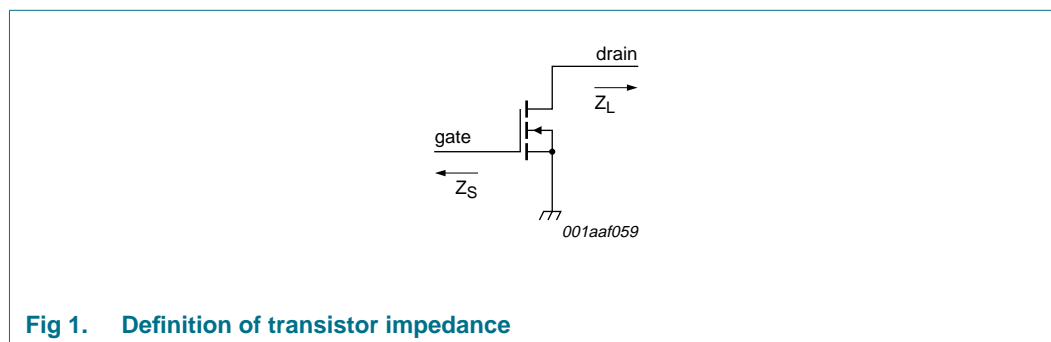
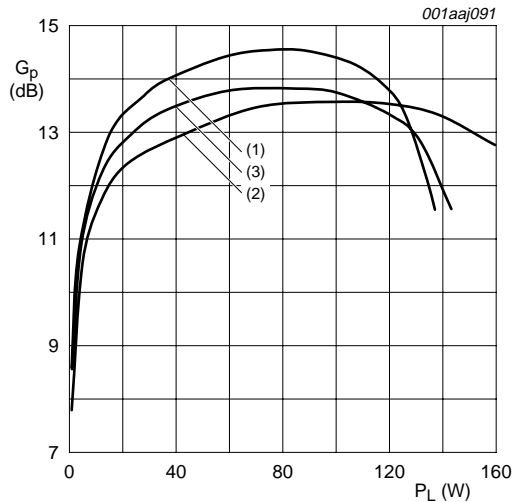


Fig 1. Definition of transistor impedance

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; $t_p = 100$ μ s; $\delta = 10$ %.

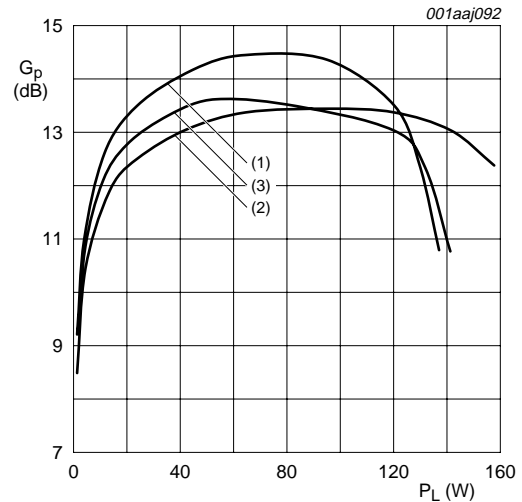
7.2 Graphs



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

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

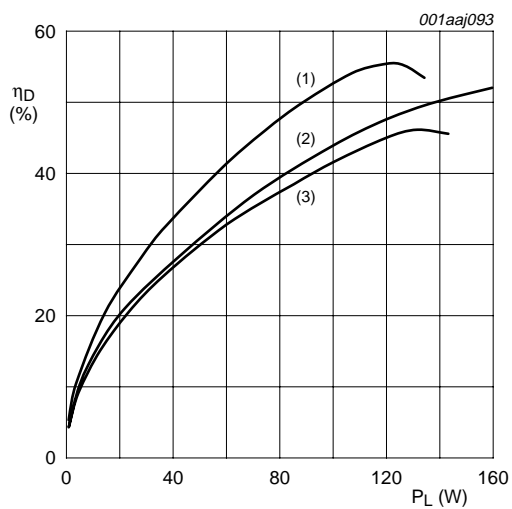
Fig 2. Power gain as a function of load power; typical values



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

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

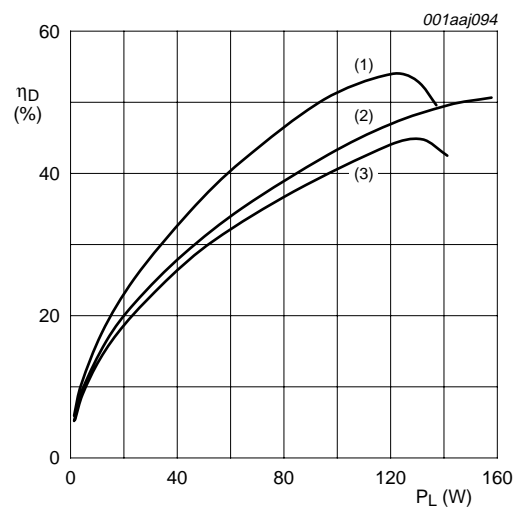
Fig 3. Power gain as a function of load power; typical values



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

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

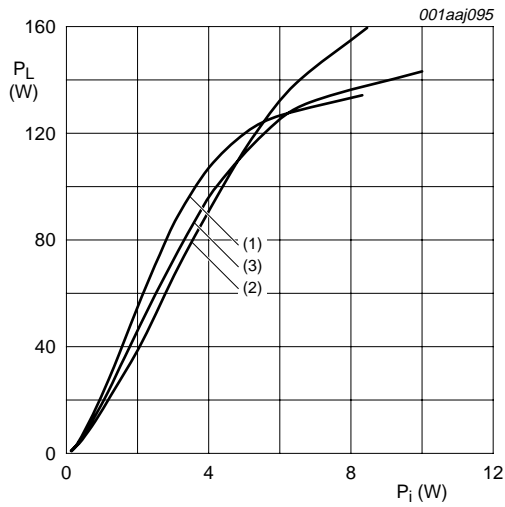
Fig 4. Drain efficiency as a function of load power; typical values



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

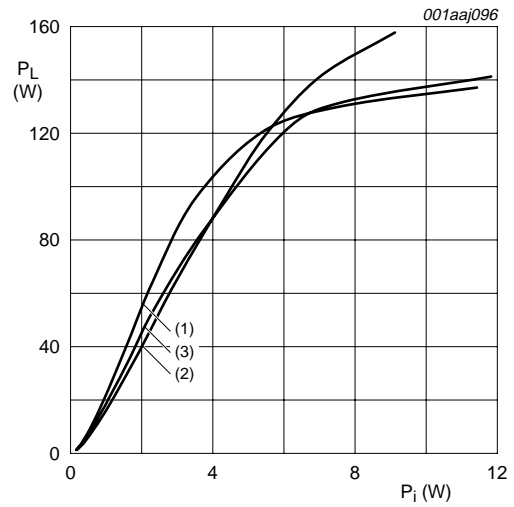
- (1) $f = 2.7\text{ GHz}$
- (2) $f = 2.9\text{ GHz}$
- (3) $f = 3.1\text{ GHz}$

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



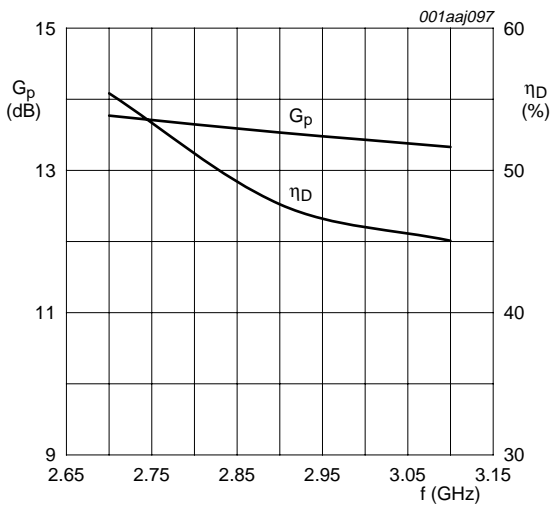
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



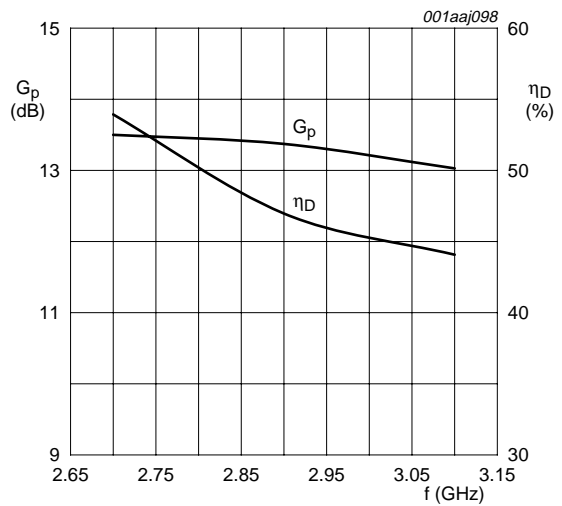
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$.
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



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

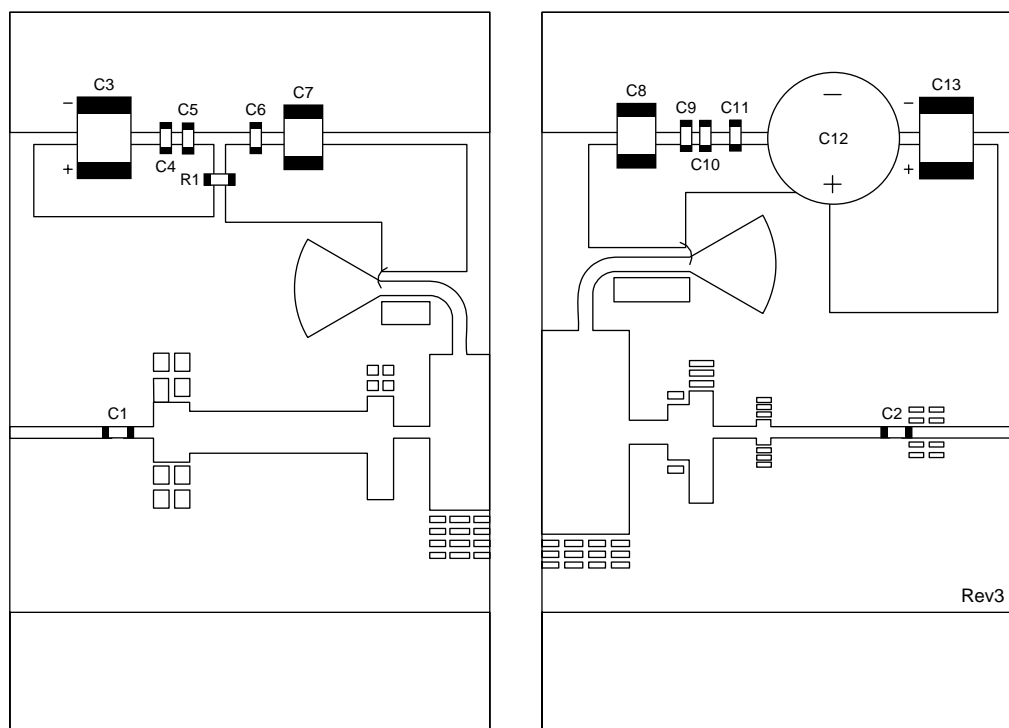
Fig 8. Power gain and drain efficiency as function of frequency; typical values



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

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 μ 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 μ F; 63 V	
C13	multilayer ceramic chip capacitor	10 μ F; 35 V	
R1	SMD resistor	56 Ω	SMD 0603

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

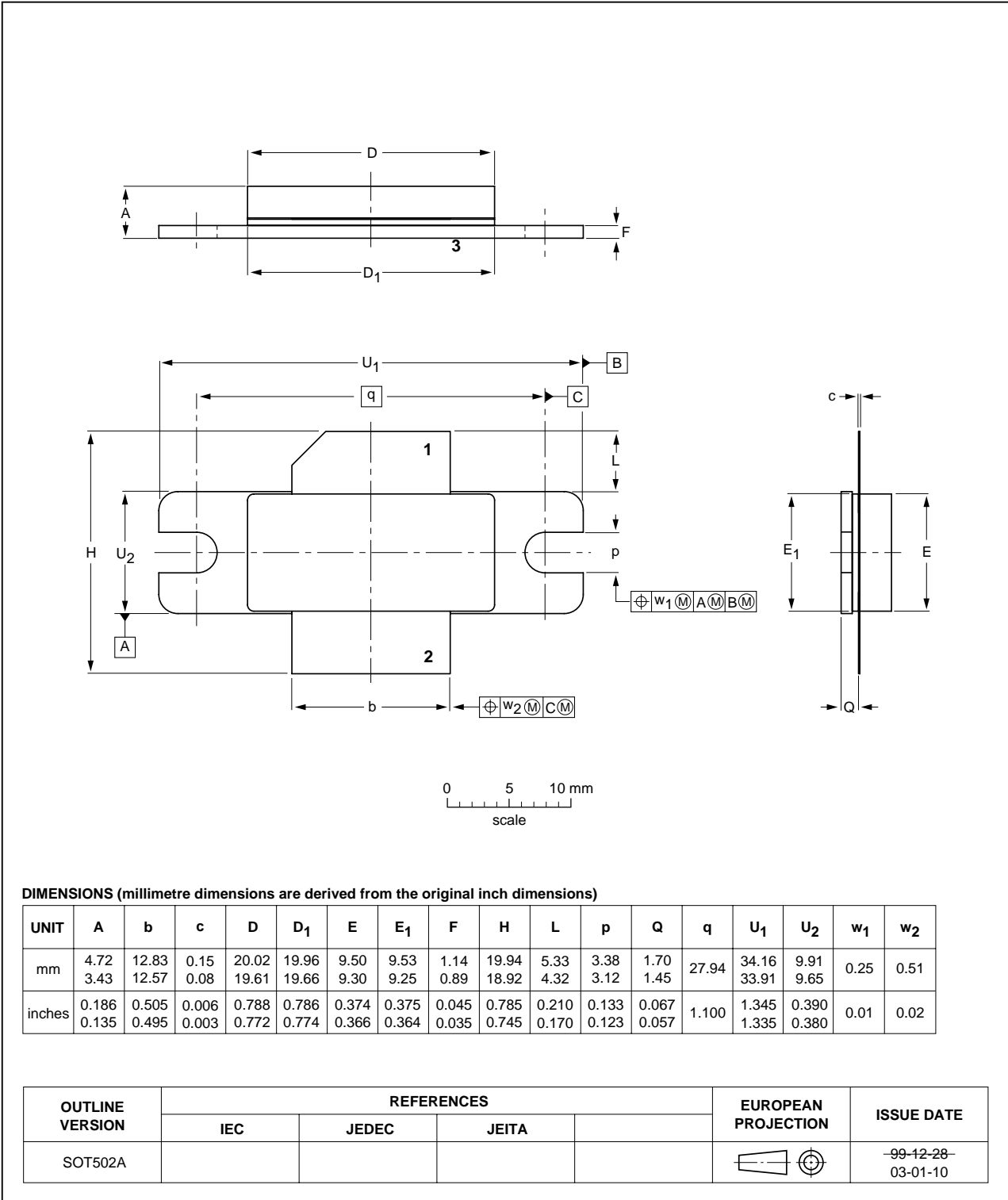


Fig 11. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

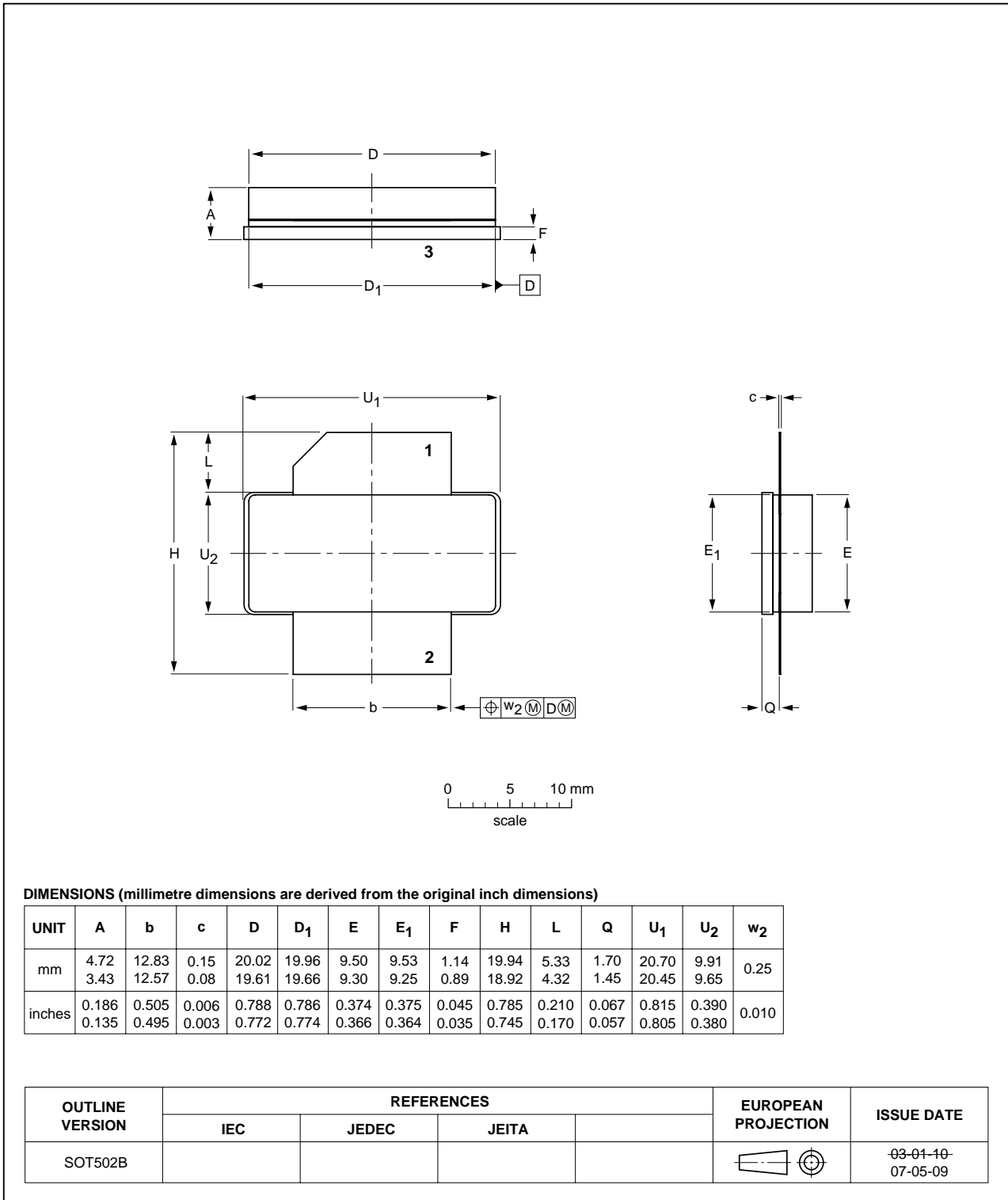


Fig 12. Package outline SOT502B

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_1	20081114	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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