

# BLS6G2731-6G

LDMOS S-Band radar power transistor

Rev. 01 — 19 February 2009

Product data sheet

## 1. Product profile

### 1.1 General description

6 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  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ ;  $I_{Dq} = 25\text{ mA}$ ; 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	6	15	33	20	10

#### CAUTION



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

### 1.2 Features

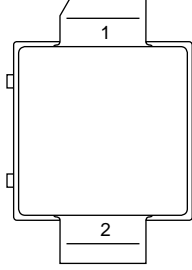
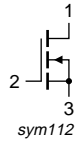
- Typical pulsed RF performance at a frequency of 2.7 GHz to 3.1 GHz, a supply voltage of 32 V, an  $I_{Dq}$  of 25 mA, a  $t_p$  of 100  $\mu\text{s}$  and a  $\delta$  of 10 %:
  - ◆ Output power = 6 W
  - ◆ Power gain = 15 dB
  - ◆ Efficiency = 33 %
- Integrated ESD protection
- High flexibility with 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
1	drain		
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLS6G2731-6G	-	eared flanged ceramic package; 2 mounting holes; 2 leads	SOT975C

## 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	-	3.5	A
$T_{stg}$	storage temperature	-65	+150	°C
$T_j$	junction temperature	-	200	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 6\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ %}$	1.56	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\text{ %}$	1.95	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ %}$	2.20	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ %}$	2.00	K/W

## 6. Characteristics

**Table 6. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.18\text{ mA}$	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 18\text{ mA}$	1.4	1.8	2.4	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	1.4	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	2.7	-	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 0.9\text{ A}$	0.81	-	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 0.63\text{ A}$	328	-	1260	$\text{m}\Omega$

## 7. Application information

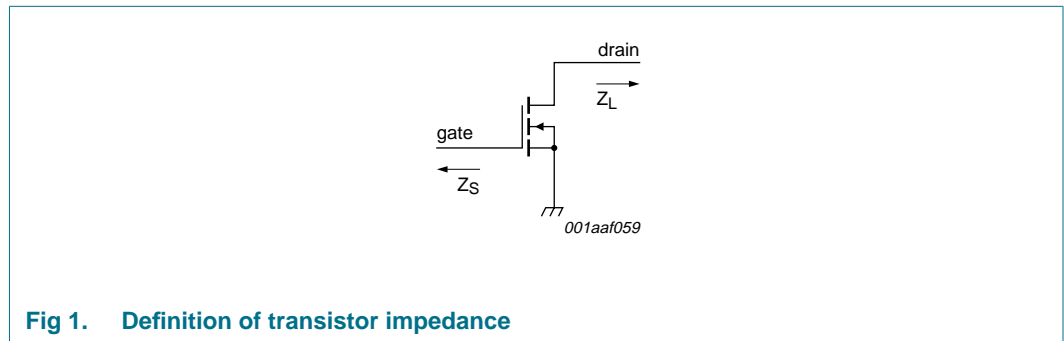
**Table 7. Application information**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	$P_L = 6\text{ W}$	-	-	32	V
$G_p$	power gain	$P_L = 6\text{ W}$	14	15	-	dB
$\eta_D$	drain efficiency	$P_L = 6\text{ W}$	30	33	-	%
$t_r$	rise time	$P_L = 6\text{ W}$	-	20	50	ns
$t_f$	fall time	$P_L = 6\text{ W}$	-	10	50	ns

**Table 8. Typical impedance**

<b>f</b> <b>GHz</b>	<b>Z<sub>S</sub></b> <b>Ω</b>	<b>Z<sub>L</sub></b> <b>Ω</b>
2.7	2.44 – j17.78	3.30 – j4.14
2.8	2.99 – j16.04	4.52 – j3.72
2.9	3.94 – j14.56	5.67 – j4.67
3.0	5.44 – j13.75	4.94 – j6.39
3.1	6.89 – j14.58	3.00 – j6.56

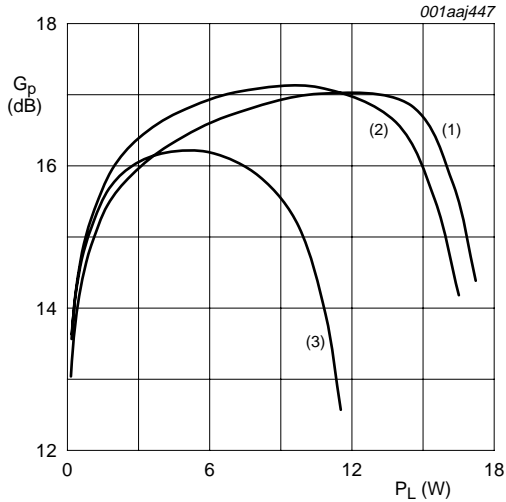


**Fig 1. Definition of transistor impedance**

**7.1 Ruggedness in class-AB operation**

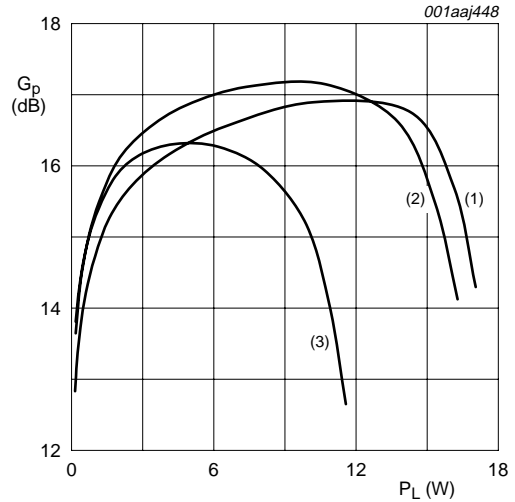
The BLS6G2731-6G is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 5 : 1$  through all phases under the following conditions:  $V_{DS} = 32 \text{ V}$ ;  $I_{Dq} = 25 \text{ mA}$ ;  $P_L = 6 \text{ W}$ ;  $t_p = 100 \text{ μs}$ ;  $\delta = 10 \%$ .

**7.2 Graphs**



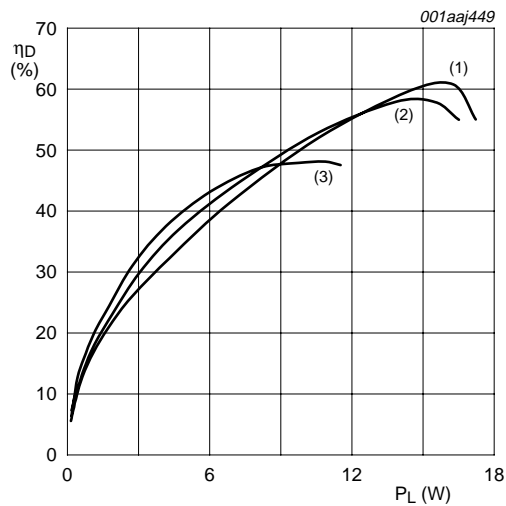
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 300\ \mu\text{s}; \delta = 10\%$   
 (1)  $f = 2.7\text{ GHz}$   
 (2)  $f = 2.9\text{ GHz}$   
 (3)  $f = 3.1\text{ GHz}$

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



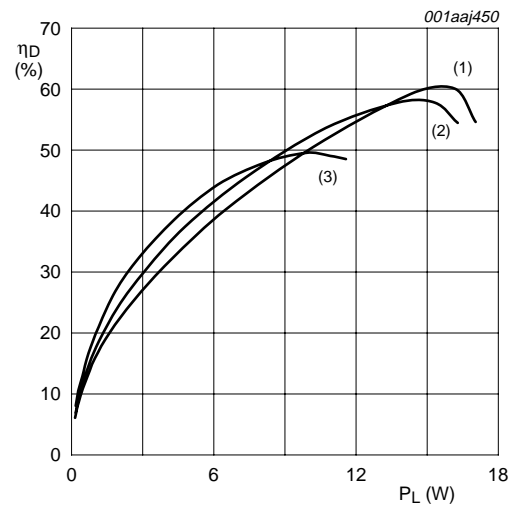
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 100\ \mu\text{s}; \delta = 20\%$   
 (1)  $f = 2.7\text{ GHz}$   
 (2)  $f = 2.9\text{ GHz}$   
 (3)  $f = 3.1\text{ GHz}$

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



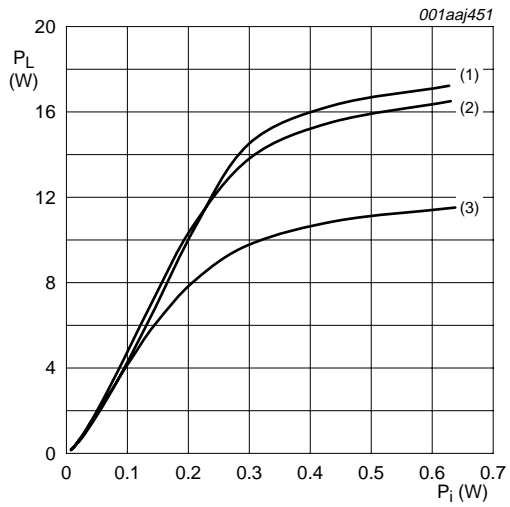
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 300\ \mu\text{s}; \delta = 10\%$   
 (1)  $f = 2.7\text{ GHz}$   
 (2)  $f = 2.9\text{ GHz}$   
 (3)  $f = 3.1\text{ GHz}$

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



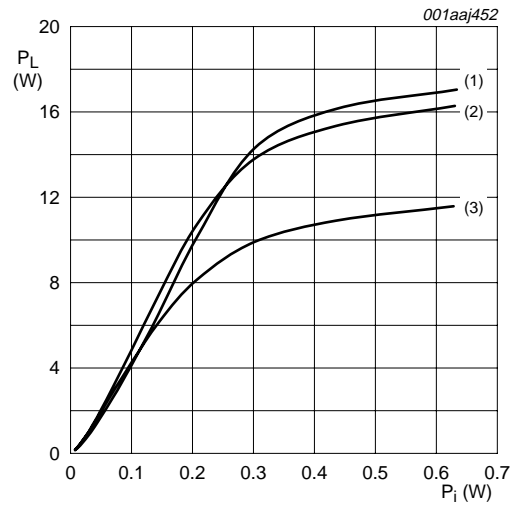
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 100\ \mu\text{s}; \delta = 20\%$   
 (1)  $f = 2.7\text{ GHz}$   
 (2)  $f = 2.9\text{ GHz}$   
 (3)  $f = 3.1\text{ GHz}$

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



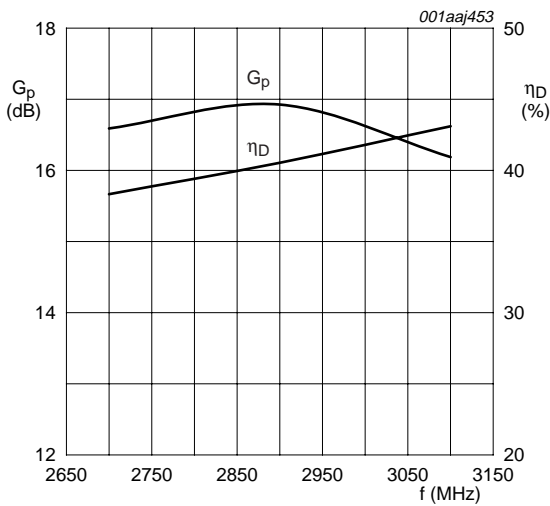
$V_{DS} = 32\text{ V}; I_{DQ} = 25\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .  
 (1)  $f = 2.7\text{ GHz}$   
 (2)  $f = 2.9\text{ GHz}$   
 (3)  $f = 3.1\text{ GHz}$

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



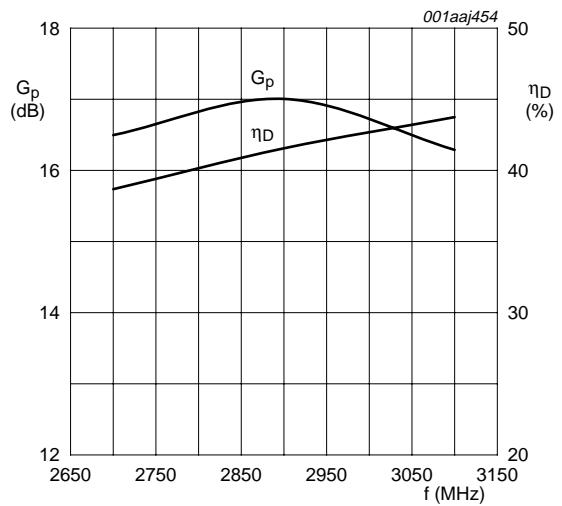
$V_{DS} = 32\text{ V}; I_{DQ} = 25\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$ .  
 (1)  $f = 2.7\text{ GHz}$   
 (2)  $f = 2.9\text{ GHz}$   
 (3)  $f = 3.1\text{ GHz}$

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



$V_{DS} = 32\text{ V}; I_{DQ} = 25\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .

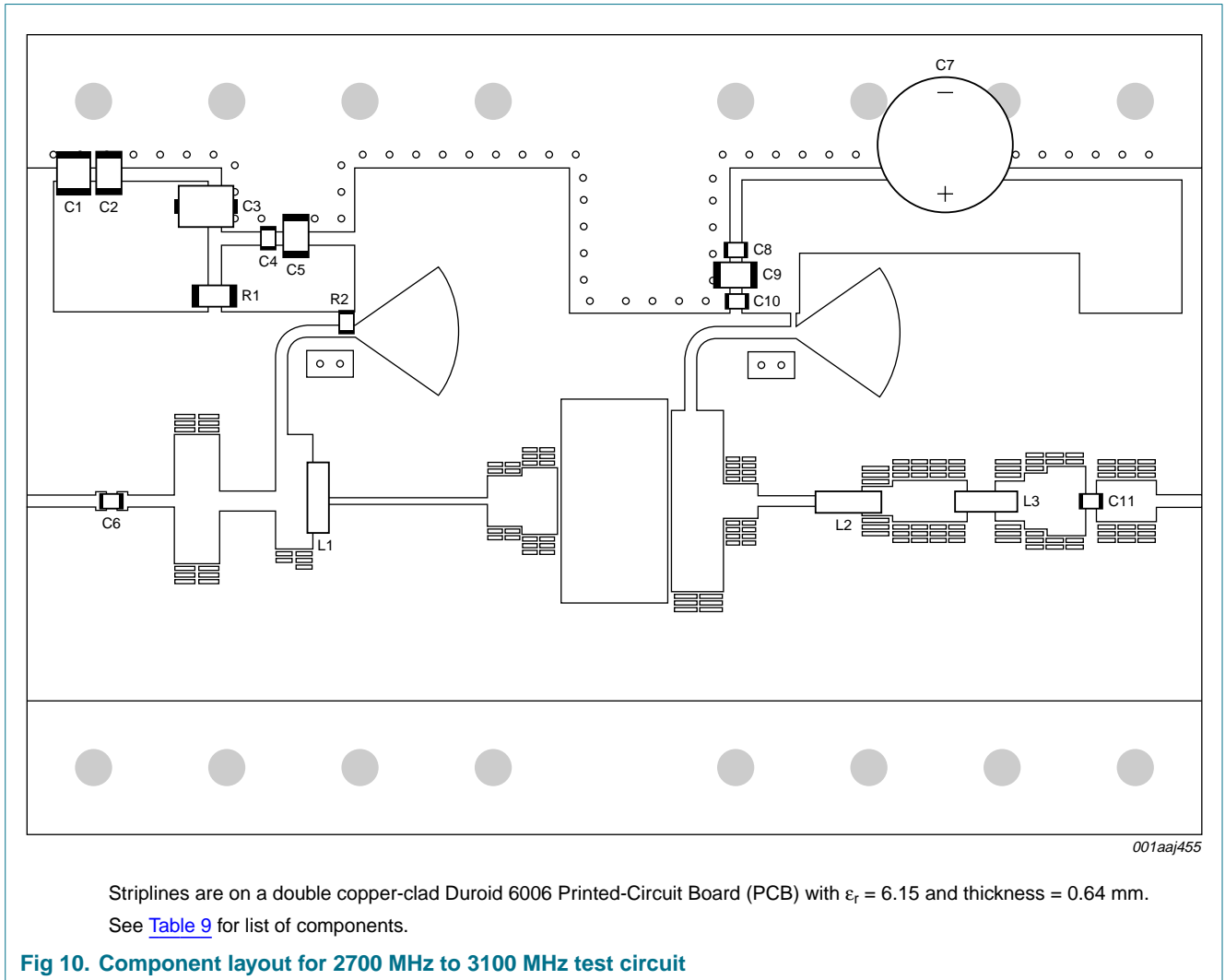
**Fig 8. Power gain and drain efficiency as function of frequency; typical values**



$V_{DS} = 32\text{ V}; I_{DQ} = 25\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$ .

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

**8. Test information**



**Table 9. List of components (see Figure 10)**

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

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	20 nF	ATC 200B or equivalent
C2, C9	multilayer ceramic chip capacitor	100 pF	ATC 100B or equivalent
C3	multilayer ceramic chip capacitor	10 $\mu$ F; 35 V	AVX TAJD106K035R or equivalent
C4, C8	multilayer ceramic chip capacitor	1 nF	ATC 700A or equivalent
C5, C10, C11	multilayer ceramic chip capacitor	20 pF	ATC 100A or equivalent
C6	multilayer ceramic chip capacitor	2.7 pF	ATC 100A or equivalent
C7	electrolytic capacitor	47 $\mu$ F; 63 V	
R1	SMD resistor	56 $\Omega$	
R2	SMD resistor	3.9 $\Omega$	
L1, L2, L3	copper (Cu) strips	-	

**9. Package outline**

Earless flanged ceramic package; 2 leads

SOT975C

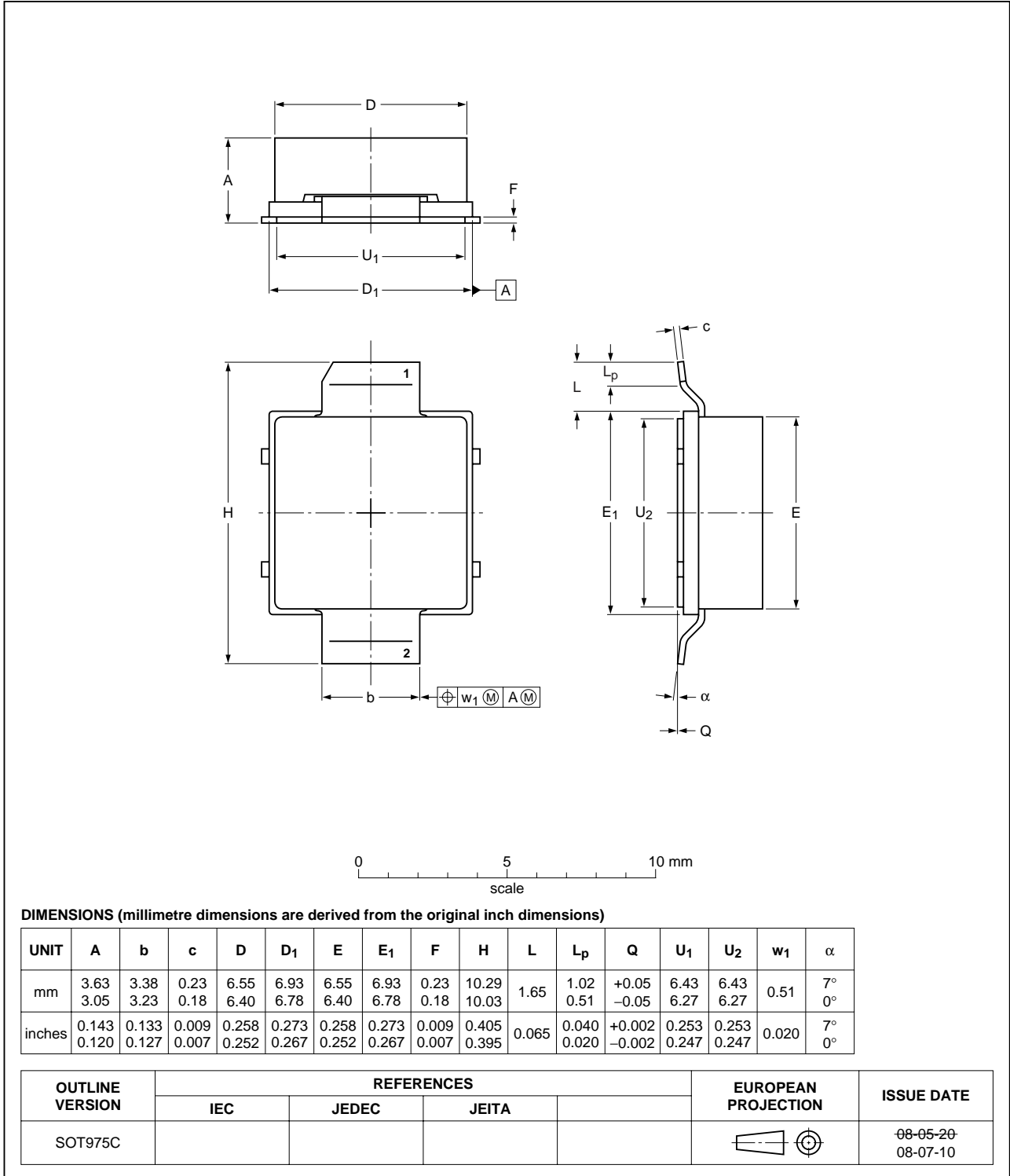


Fig 11. Package outline SOT975C



## 10. Abbreviations

**Table 10. Abbreviations**

Acronym	Description
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
RF	Radio Frequency
S-Band	Short wave Band
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
BLS6G2731-6G_1	20090219	Product 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.
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Product [short] data sheet	Production	This document contains the product specification.

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[2] The term 'short data sheet' is explained in section "Definitions".

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