

BLS6G2731-6G

LDMOS S-Band radar power transistor

Rev. 3 — 1 September 2015

AMMPELON

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

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling. You must use a ground strap or touch the PC case or other grounded source before unpacking or handling the hardware.

1.2 Features and benefits

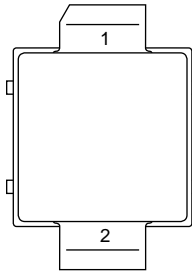
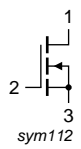
- Typical pulsed RF performance at a frequency of 2.7 GHz to 3.1 GHz, a supply voltage of 32 V, an I_{Dq} of 25 mA, a t_p of 100 μs and a δ of 10 %:
 - ◆ Output power = 6 W
 - ◆ Power gain = 15 dB
 - ◆ Efficiency = 33 %
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent 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]		

[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	$T_{case} = 80\text{ °C}; P_L = 6\text{ W}$		
		$t_p = 100\ \mu\text{s}; \delta = 10\ \%$	1.56	K/W
		$t_p = 200\ \mu\text{s}; \delta = 10\ \%$	1.95	K/W
		$t_p = 300\ \mu\text{s}; \delta = 10\ \%$	2.20	K/W
		$t_p = 100\ \mu\text{s}; \delta = 20\ \%$	2.00	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	$V_{GS} = 0\text{ V}; I_D = 0.18\text{ mA}$	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	μA
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; $t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$; RF performance at $V_{DS} = 32\text{ V}$; $I_{Dq} = 25\text{ mA}$; $T_{case} = 25\text{ °C}$; 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
η_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

f	Z _S	Z _L
GHz	Ω	Ω
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

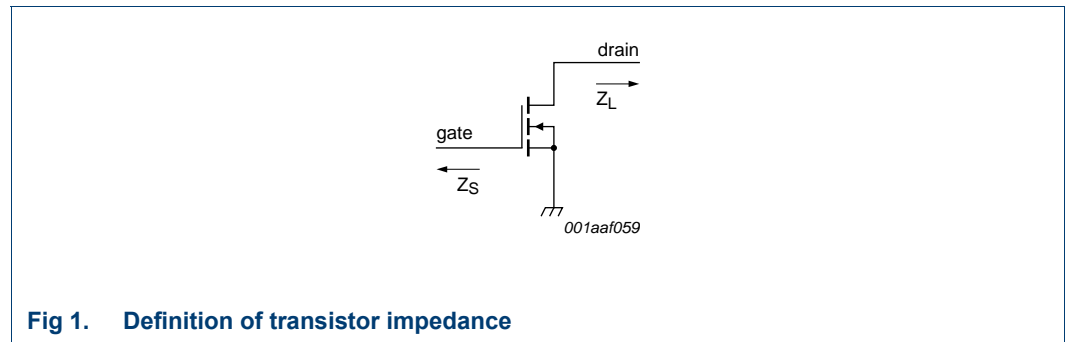
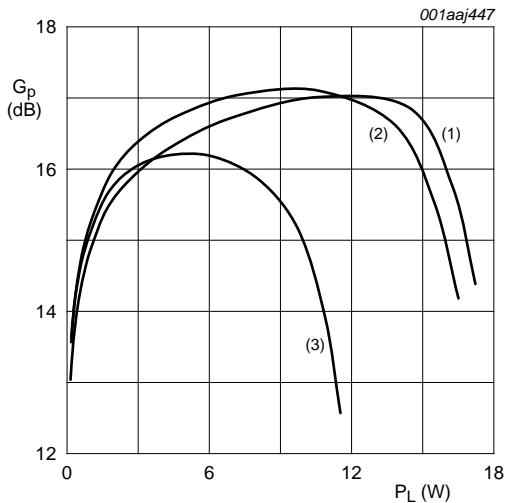


Fig 1. Definition of transistor impedance

7.1 Ruggedness in class-AB operation

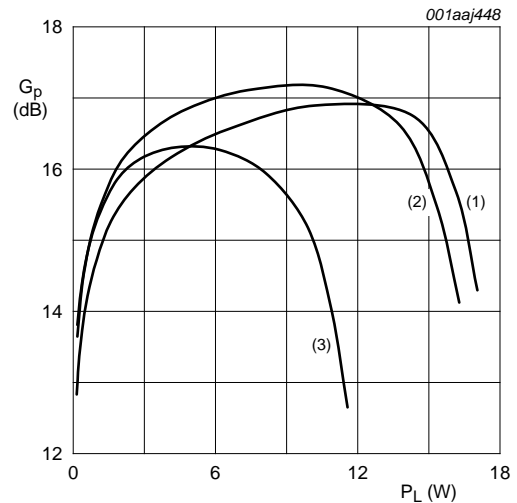
The BLS6G2731-6G is capable of withstanding a load mismatch corresponding to $V_{SWR} = 5 : 1$ through all phases under the following conditions: $V_{DS} = 32 \text{ V}$; $I_{Dq} = 25 \text{ mA}$; $P_L = 6 \text{ W}$; $t_p = 100 \text{ } \mu\text{s}$; $\delta = 10 \%$.

7.2 Graphs



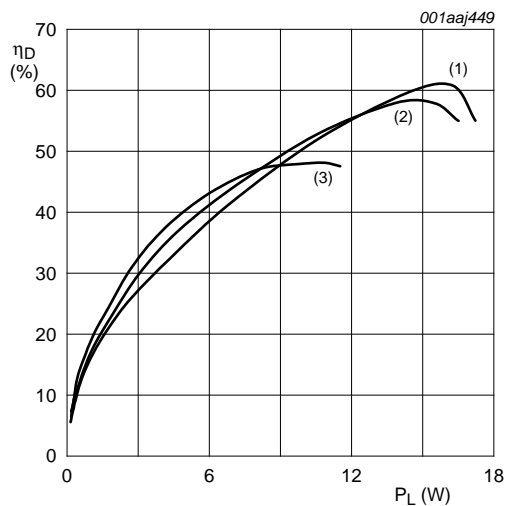
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



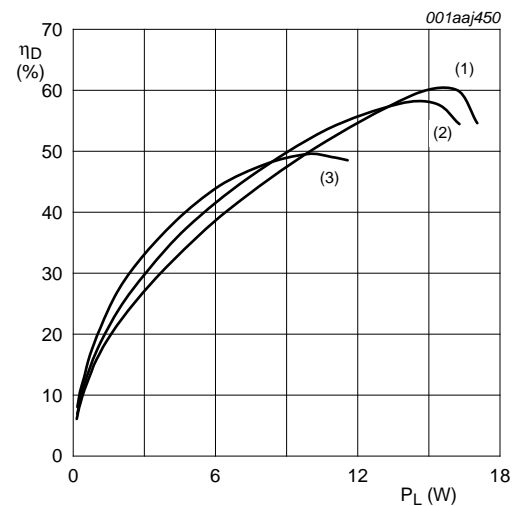
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



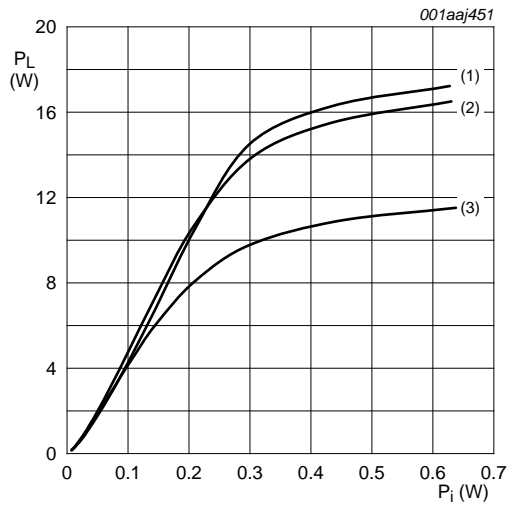
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



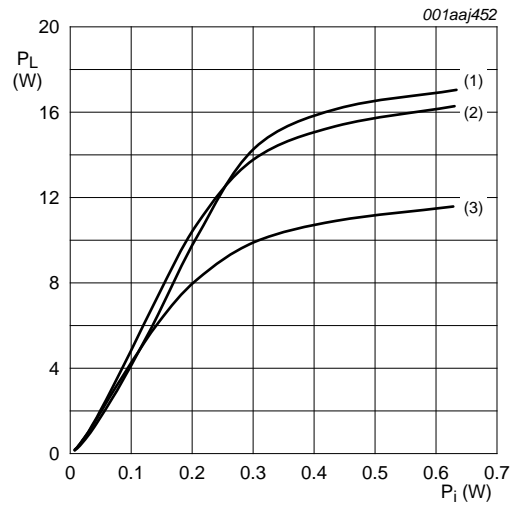
$V_{DS} = 32\text{ V}; I_{Dq} = 25\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



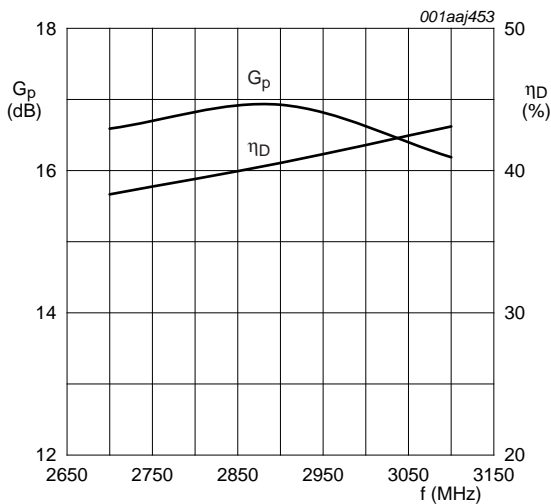
$V_{DS} = 32\text{ V}; I_{DQ} = 25\text{ mA}; t_p = 300\ \mu\text{s}; \delta = 10\ \%$
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



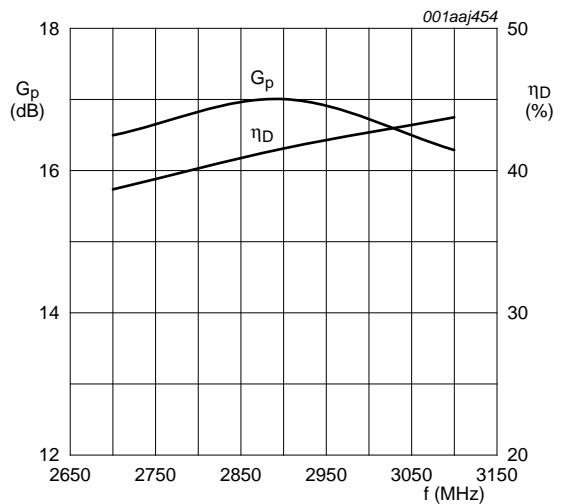
$V_{DS} = 32\text{ V}; I_{DQ} = 25\text{ mA}; t_p = 100\ \mu\text{s}; \delta = 20\ \%$
 (1) $f = 2.7\text{ GHz}$
 (2) $f = 2.9\text{ GHz}$
 (3) $f = 3.1\text{ GHz}$

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



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

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



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

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

8. Test information

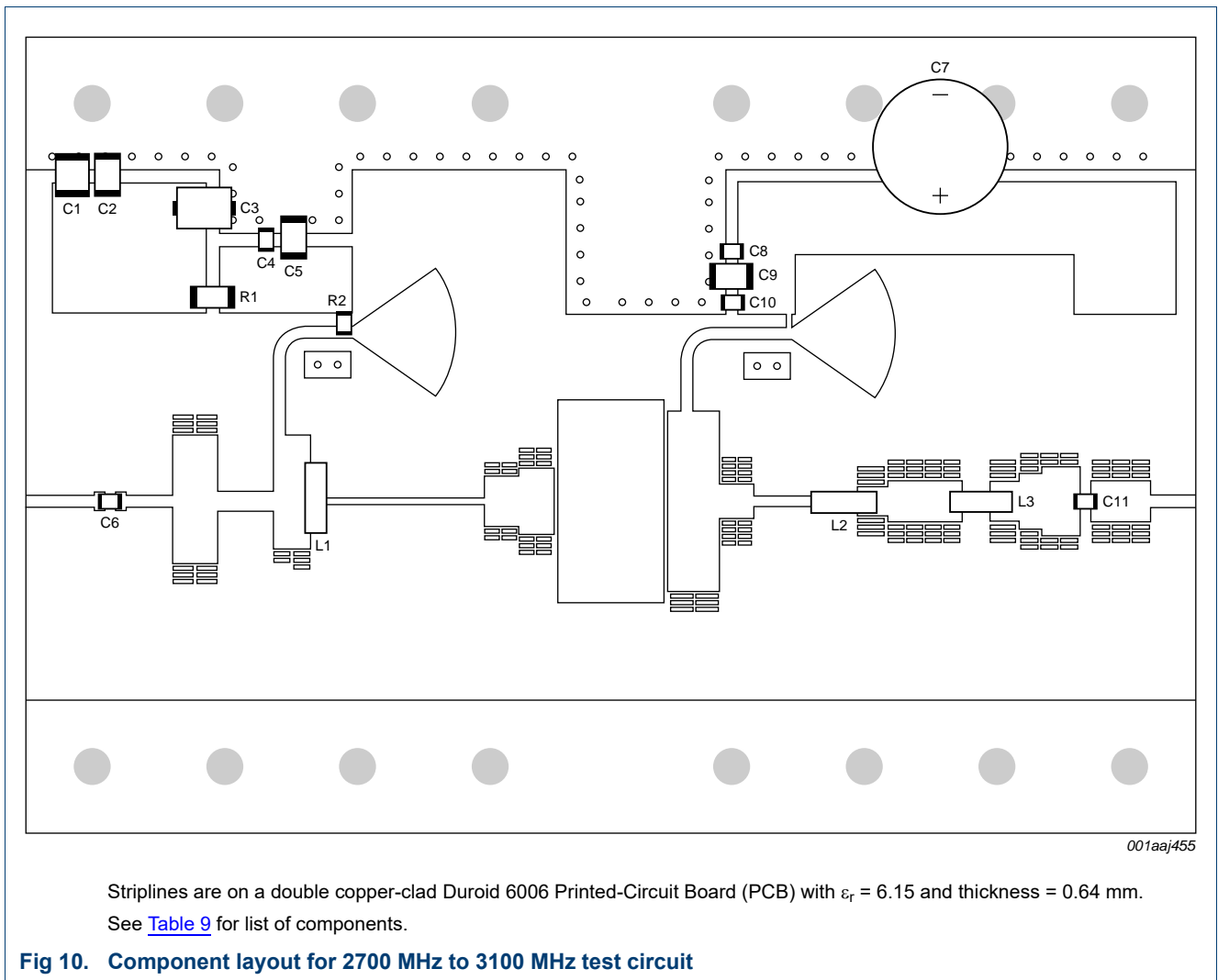


Table 9. List of components (see Figure 10)

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 μ 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 μ F; 63 V	
R1	SMD resistor	56 Ω	
R2	SMD resistor	3.9 Ω	
L1, L2, L3	copper (Cu) strips	-	

9. Package outline

Earless flanged ceramic package; 2 leads

SOT975C

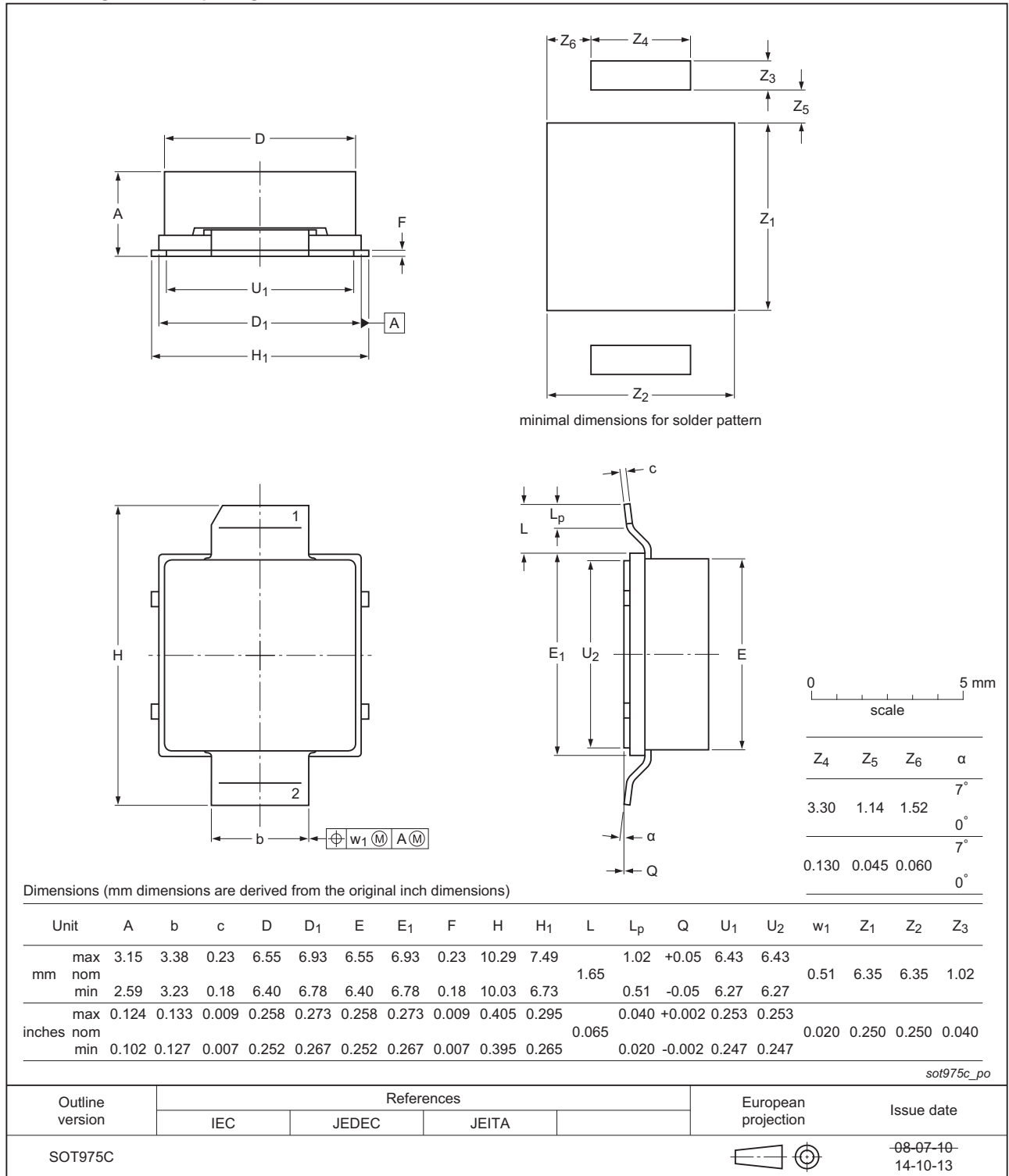


Fig 11. Package outline SOT975C

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#3	20150901	Product data sheet		BLS6G2731-6G v.2
Modifications:	<ul style="list-style-type: none"> The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. Legal texts have been adapted to the new company name where appropriate. 			
BLS6G2731-6G v.2	20141216	Product data sheet	-	BLS6G2731-6G v.1
BLS6G2731-6G v.1	20090219	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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