

# BLS6G2731S-130

## LDMOS S-band radar power transistor

Rev. 2 — 18 November 2010

Product data sheet

## 1. Product profile

### 1.1 General description

130 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  $T_{case} = 25\text{ °C}$ ;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ ;  $I_{Dq} = 100\text{ mA}$ ; 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	130	12	50	20	6

#### CAUTION



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

### 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 100 mA, a  $t_p$  of 300  $\mu\text{s}$  with  $\delta$  of 10 %:
  - ◆ Output power = 130 W
  - ◆ Power gain = 12 dB
  - ◆ Efficiency = 50 %
- 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 Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

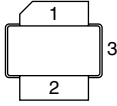
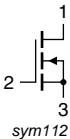
### 1.3 Applications

- 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
BLS6G2731S-130	-	ceramic earless flanged cavity package; 2 leads	SOT922-1

## 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	-	200	°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	$T_{case} = 85\text{ °C}; P_L = 130\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$	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**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.6\text{ mA}$	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;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ ; RF performance at  $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 100\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified, in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_L$	output power		-	130	-	W
$V_{DD}$	supply voltage	$P_L = 130\text{ W}$	-	-	32	V
$G_p$	power gain	$P_L = 130\text{ W}$	10	12	-	dB
$RL_{in}$	input return loss	$P_L = 130\text{ W}$	5.5	8	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	140	-	W
$\eta_D$	drain efficiency	$P_L = 130\text{ W}$	45	50	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 130\text{ W}$	-	0	0.25	dB
$t_r$	rise time	$P_L = 130\text{ W}$	-	20	50	ns
$t_f$	fall time	$P_L = 130\text{ W}$	-	6	50	ns

Table 8. Typical impedance

f (GHz)	Z <sub>S</sub> (Ω)	Z <sub>L</sub> (Ω)
2.7	3.2 – j6.5	4.5 – j3.6
2.8	4.4 – j6.2	3.5 – j3.8
2.9	5.6 – j7.3	3.7 – j3.1
3.0	4.9 – j9.2	3.0 – j3.3
3.1	3 – j9.5	2.8 – j3.6

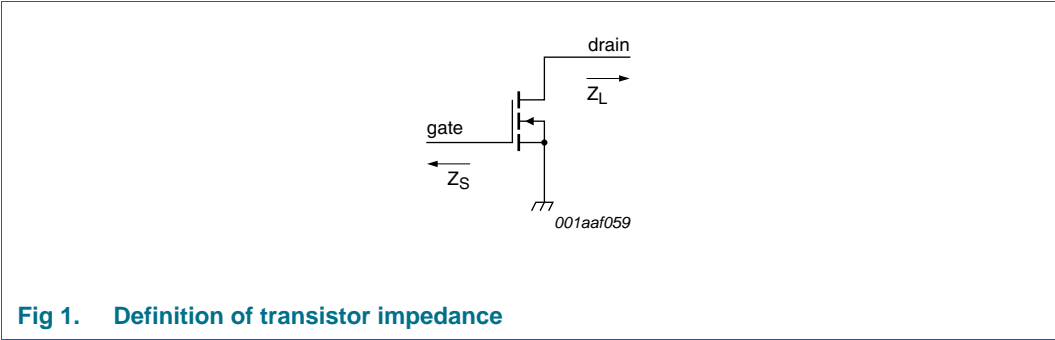
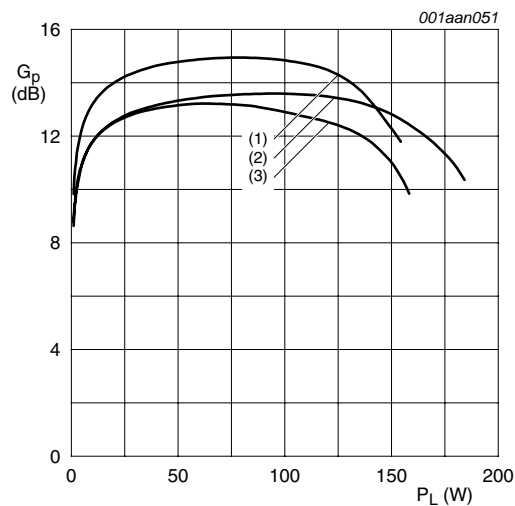


Fig 1. Definition of transistor impedance

7.1 Ruggedness in class-AB operation

The BLS6G2731S-130 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 5 : 1$  through all phases under the following conditions:  $V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 100\text{ mA}$ ;  $P_L = 130\text{ W}$ ;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

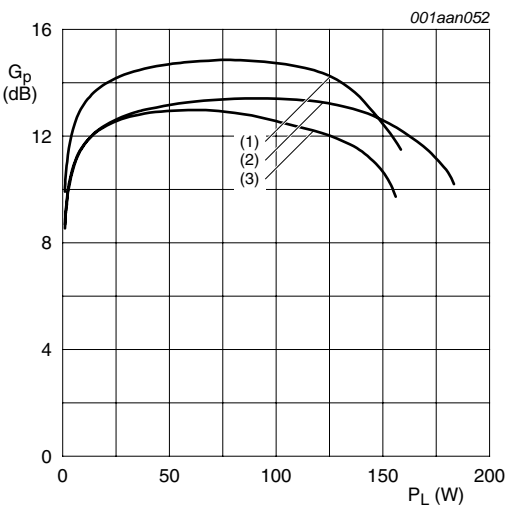
7.2 Graphs



$V_{DS} = 32$  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

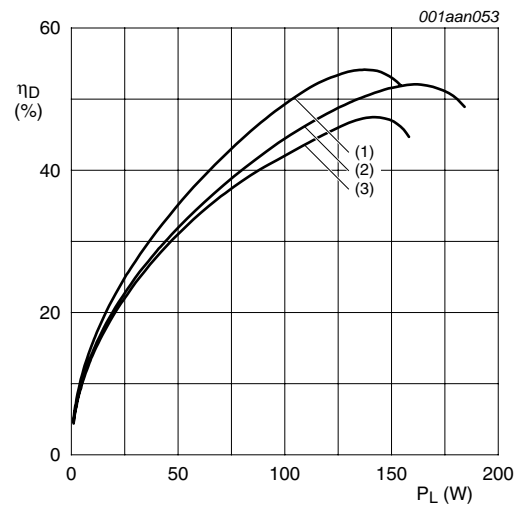
Fig 2. Power gain as a function of load power; typical values



$V_{DS} = 32$  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

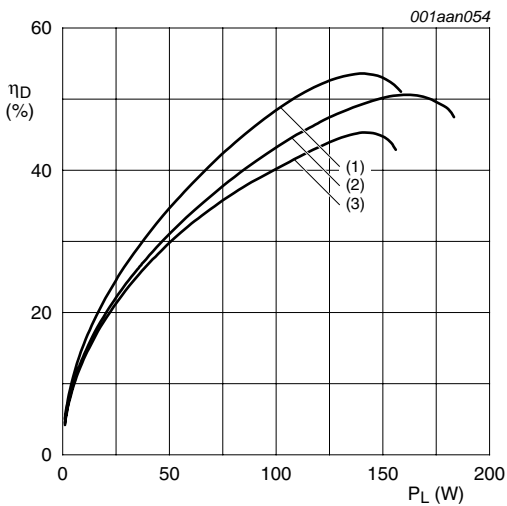
Fig 3. Power gain as a function of load power; typical values



$V_{DS} = 32$  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

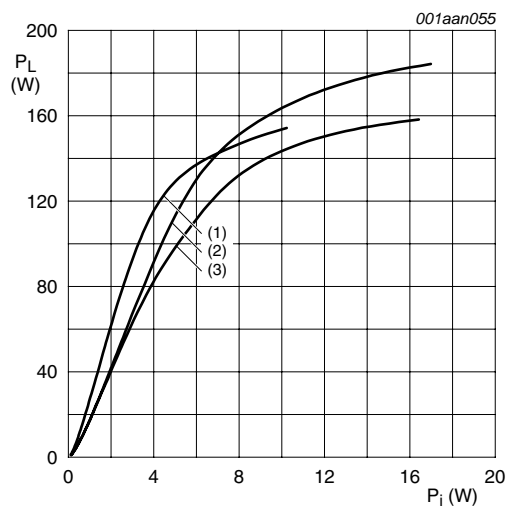
Fig 4. Drain efficiency as a function of load power; typical values



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

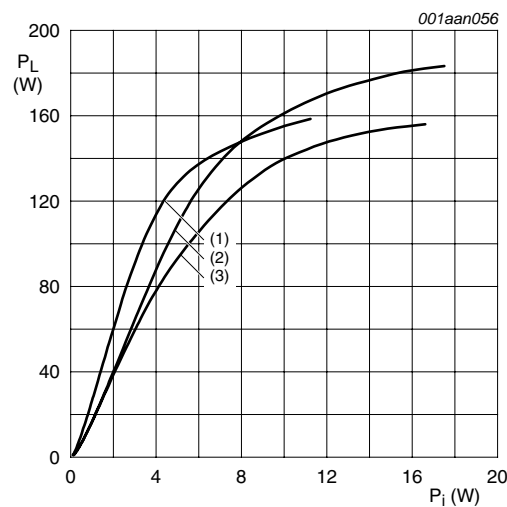
- (1)  $f = 2.7$  GHz
- (2)  $f = 2.9$  GHz
- (3)  $f = 3.1$  GHz

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



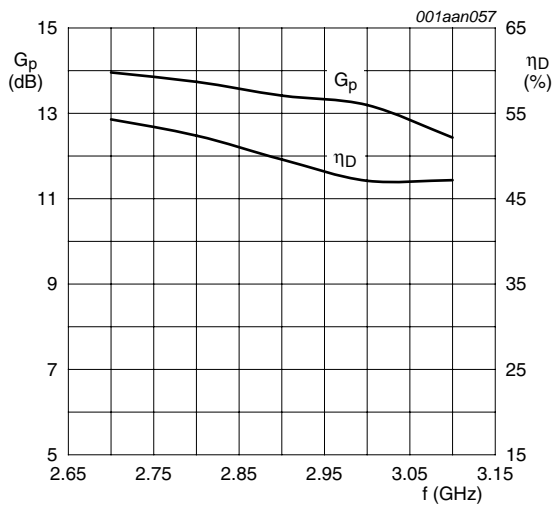
$V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 100\text{ mA}$ ;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .  
(1)  $f = 2.7\text{ GHz}$   
(2)  $f = 2.9\text{ GHz}$   
(3)  $f = 3.1\text{ GHz}$

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



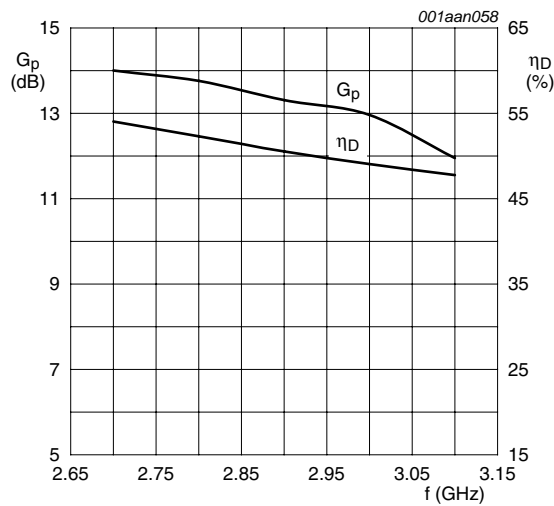
$V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 100\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 20\text{ }\%$ .  
(1)  $f = 2.7\text{ GHz}$   
(2)  $f = 2.9\text{ GHz}$   
(3)  $f = 3.1\text{ GHz}$

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



$P_L = 130\text{ W}$ ;  $V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 100\text{ mA}$ ;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

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



$P_L = 130\text{ W}$ ;  $V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 100\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 20\text{ }\%$ .

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

8. Test information

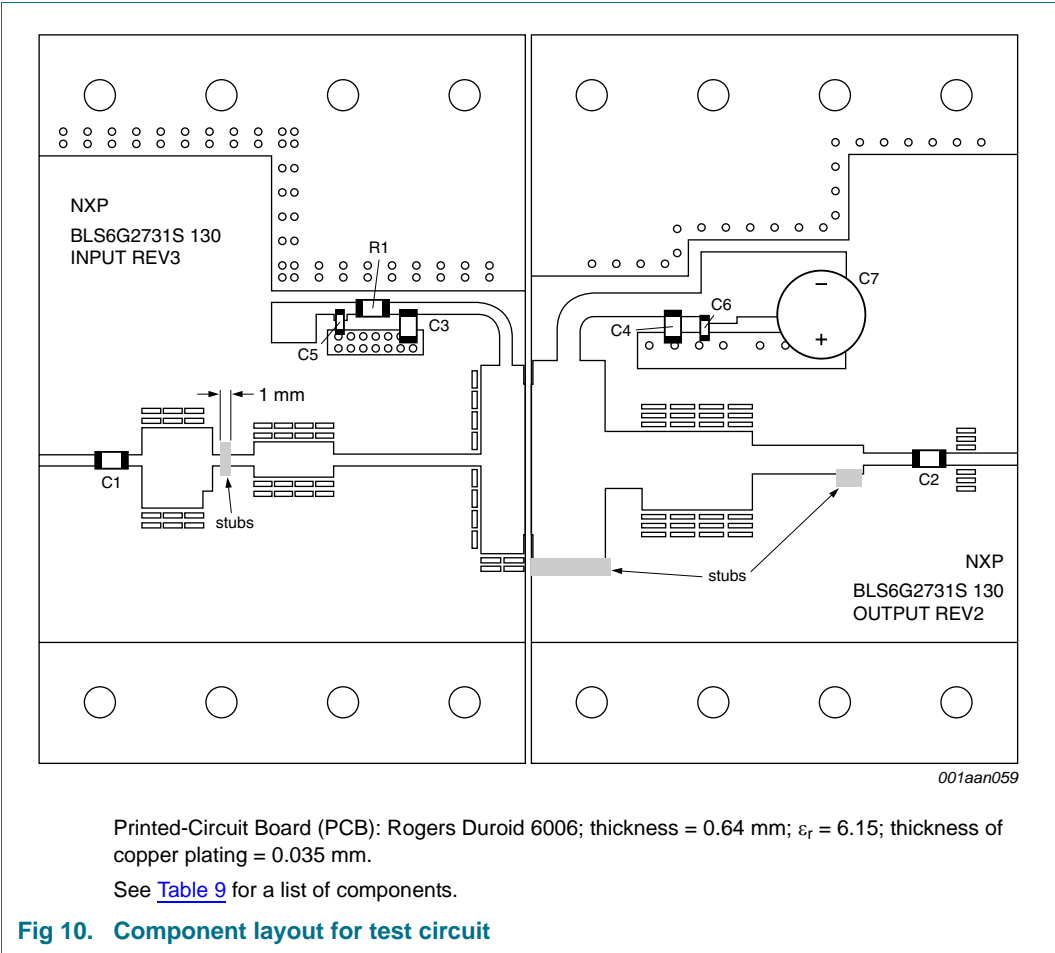
Table 9. List of components

Printed-Circuit Board (PCB): Rogers Duroid 6006; thickness = 0.64 mm;  $\epsilon_r = 6.15$ ; thickness of copper plating = 0.035 mm.  
For test circuit see [Figure 10](#).

Component	Description	Value	Remarks
C1, C2, C3, C4	multilayer ceramic chip capacitor	20 pF	<a href="#">[1]</a>
C5, C6	multilayer ceramic chip capacitor	1 nF	<a href="#">[2]</a>
C7	electrolytic capacitor	470 $\mu$ F; 63 V	
R1	SMD resistor	10 $\Omega$	

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

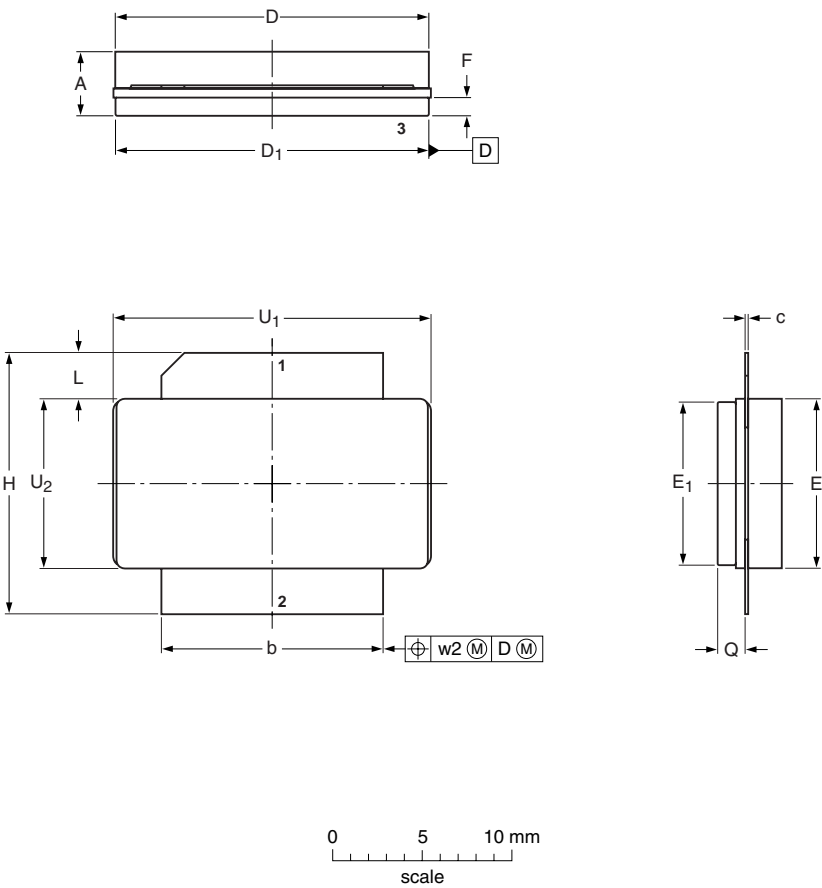
[2] American Technical Ceramics type 700A or capacitor of same quality.



9. Package outline

Ceramic earless flanged cavity package; 2 leads

SOT922-1



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	c	D	D <sub>1</sub>	E	E <sub>1</sub>	F	H	L	Q	U <sub>1</sub>	U <sub>2</sub>	w <sub>2</sub>
mm	4.22 3.53	12.42 12.17	0.15 0.10	17.58 17.22	17.50 17.25	9.53 9.27	9.27 9.02	1.32 0.81	15.62 14.34	3.05 2.03	1.70 1.45	17.75 17.50	9.53 9.27	0.25
inches	0.166 0.139	0.489 0.479	0.006 0.004	0.692 0.678	0.689 0.679	0.375 0.365	0.365 0.355	0.052 0.032	0.615 0.525	0.12 0.08	0.067 0.057	0.699 0.689	0.375 0.365	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT922-1						05-11-14 05-11-22

Fig 11. Package outline SOT922-1



## 10. Abbreviations

Table 10. Abbreviations

Acronym	Description
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
RF	Radio Frequency
VSWR	Voltage Standing-Wave Ratio

## 11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLS6G2731S-130 v.2	20101118	Product data sheet	-	BLS6G2731S-130 v.1
Modifications:	<ul style="list-style-type: none"><li>• <a href="#">Table 1 on page 1</a>: Some values have been changed.</li><li>• <a href="#">Section 1.2 on page 1</a>: The value of <math>G_p</math> has been changed.</li><li>• <a href="#">Table 7 on page 3</a>: Some values have been changed.</li><li>• <a href="#">Table 8 on page 4</a>: Values have been entered.</li><li>• <a href="#">Section 7.2 on page 5</a>: Section with graphs has been added.</li><li>• <a href="#">Section 8 on page 7</a>: Test information has been added.</li></ul>			
BLS6G2731S-130 v.1	20100726	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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[2] The term 'short data sheet' is explained in section "Definitions".

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