

BLS6G2933S-130

LDMOS S-band radar power transistor

Rev. 02 — 18 June 2009

Preliminary data sheet

1. Product profile

1.1 General description

130 W LDMOS power transistor intended for radar applications in the 2.9 GHz to 3.3 GHz range.

Table 1. Typical performance

Typical RF performance at $T_{case} = 25\text{ }^{\circ}\text{C}$; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\text{ }\%$; $I_{DQ} = 100\text{ mA}$; in a class-AB production test circuit.

Mode of operation	f (GHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η_D (%)	t _r (ns)	t _f (ns)
pulsed RF	2.9 to 3.3	32	130	12.5	47	20	6

CAUTION



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

1.2 Features

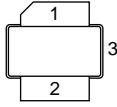
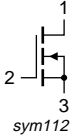
- Typical pulsed RF performance at a frequency of 2.9 GHz to 3.3 GHz, a supply voltage of 32 V, an I_{DQ} of 100 mA, a t_p of 300 μs with δ of 10 %:
 - ◆ Output power = 130 W
 - ◆ Power gain = 12.5 dB
 - ◆ Efficiency = 47 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2.9 GHz to 3.3 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 2.9 GHz to 3.3 GHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLS6G2933S-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	-	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	$T_{case} = 85\text{ °C}; P_L = 130\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ %}$	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	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; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\text{ }\%$; 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_{CC}	supply voltage	$P_L = 130\text{ W}$	-	-	32	V
G_p	power gain	$P_L = 130\text{ W}$	10	12.5	-	dB
RL_{in}	input return loss	$P_L = 130\text{ W}$	7.5	10	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	140	-	W
η_D	drain efficiency	$P_L = 130\text{ W}$	40	47	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 130\text{ W}$	-	0	0.5	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_S Ω	Z_L Ω
2.9	2.2 – j7.6	4.5 – j5.6
3.0	2.5 – j6.6	4.3 – j5.7
3.1	3.2 – j5.6	4.0 – j5.8
3.2	4.5 – j4.8	3.6 – j5.8
3.3	6.8 – j5.3	3.2 – j5.8

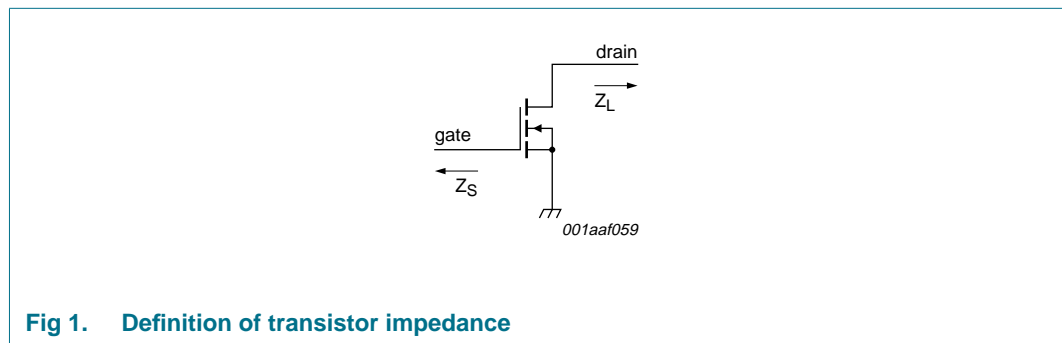
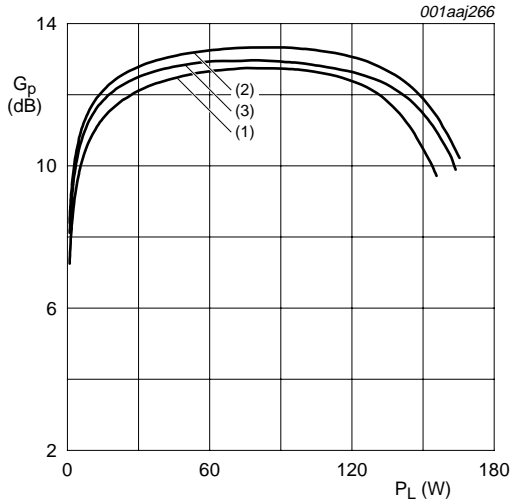


Fig 1. Definition of transistor impedance

7.1 Ruggedness in class-AB operation

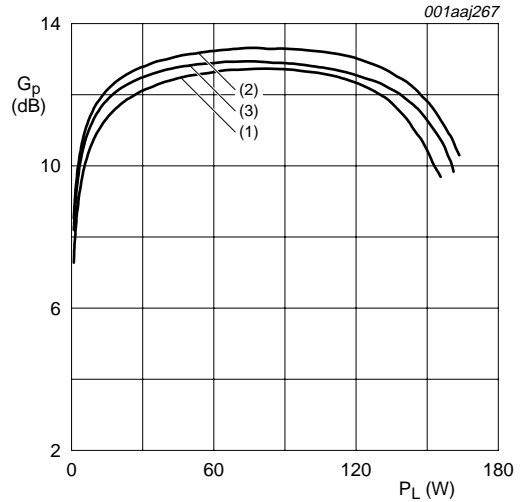
The BLS6G2933S-130 is capable of withstanding a load mismatch corresponding to $V_{SWR} = 5 : 1$ through all phases under the following conditions: $V_{DS} = 32 V$; $I_{DQ} = 100 mA$; $P_L = 130 W$; $t_p = 300 \mu s$; $\delta = 10 \%$.

7.2 Graphs



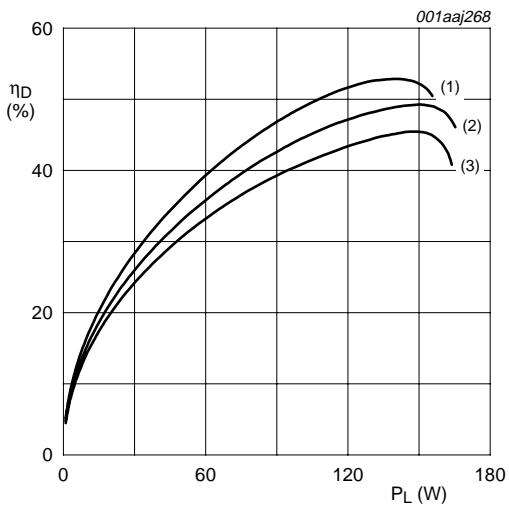
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.
 (1) $f = 2.9\text{ GHz}$
 (2) $f = 3.1\text{ GHz}$
 (3) $f = 3.3\text{ GHz}$

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



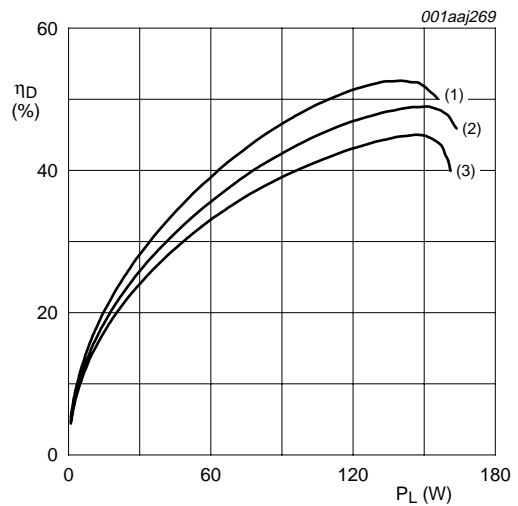
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$.
 (1) $f = 2.9\text{ GHz}$
 (2) $f = 3.1\text{ GHz}$
 (3) $f = 3.3\text{ GHz}$

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



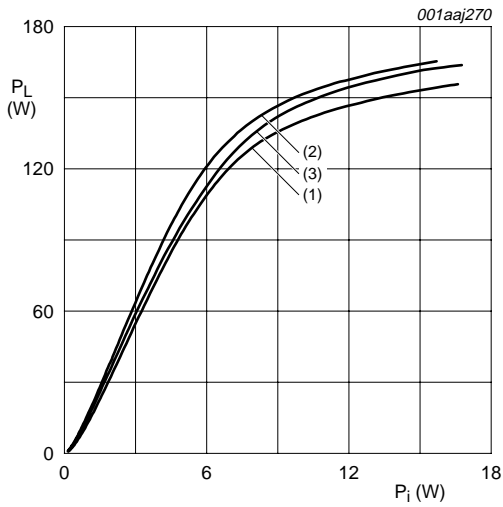
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.
 (1) $f = 2.9\text{ GHz}$
 (2) $f = 3.1\text{ GHz}$
 (3) $f = 3.3\text{ GHz}$

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



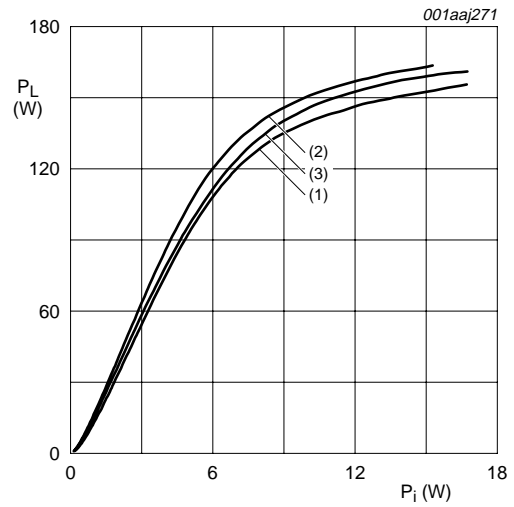
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$.
 (1) $f = 2.9\text{ GHz}$
 (2) $f = 3.1\text{ GHz}$
 (3) $f = 3.3\text{ GHz}$

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



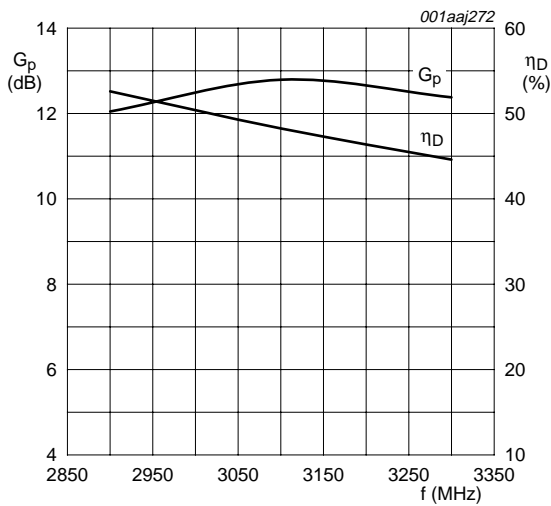
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.
 (1) $f = 2.9\text{ GHz}$
 (2) $f = 3.1\text{ GHz}$
 (3) $f = 3.3\text{ GHz}$

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



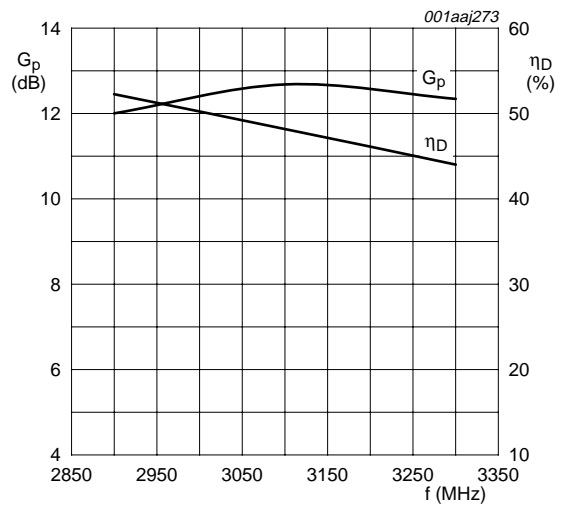
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$.
 (1) $f = 2.9\text{ GHz}$
 (2) $f = 3.1\text{ GHz}$
 (3) $f = 3.3\text{ GHz}$

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

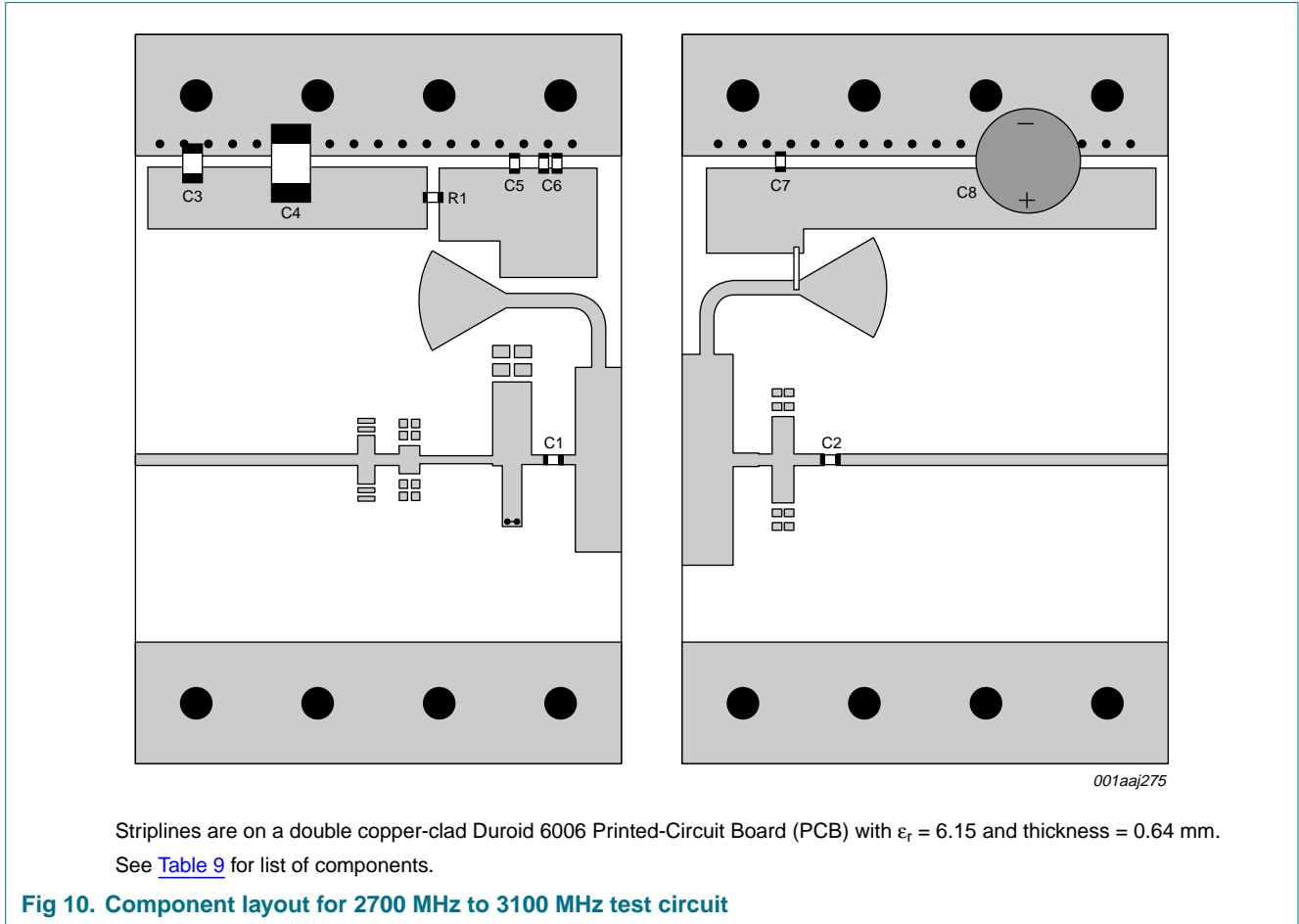


Table 9. List of components

See [Figure 10](#).

Component	Description	Value	Quantity	Remarks
C1, C2, C5, C7	multilayer ceramic chip capacitor	33 pF	1	ATC 100A or equivalent
C3	multilayer ceramic chip capacitor	1 μ F	1	ATC 900A or equivalent
C4	multilayer ceramic chip capacitor	47 μ F; 63 V	1	
C6	multilayer ceramic chip capacitor	1 nF	2	ATC 700A or equivalent
C8	electrolytic capacitor	68 μ F; 63 V	1	
R1	SMD resistor	47 Ω	1	SMD 0603

9. Package outline

Ceramic earless flanged cavity package; 2 leads

SOT922-1

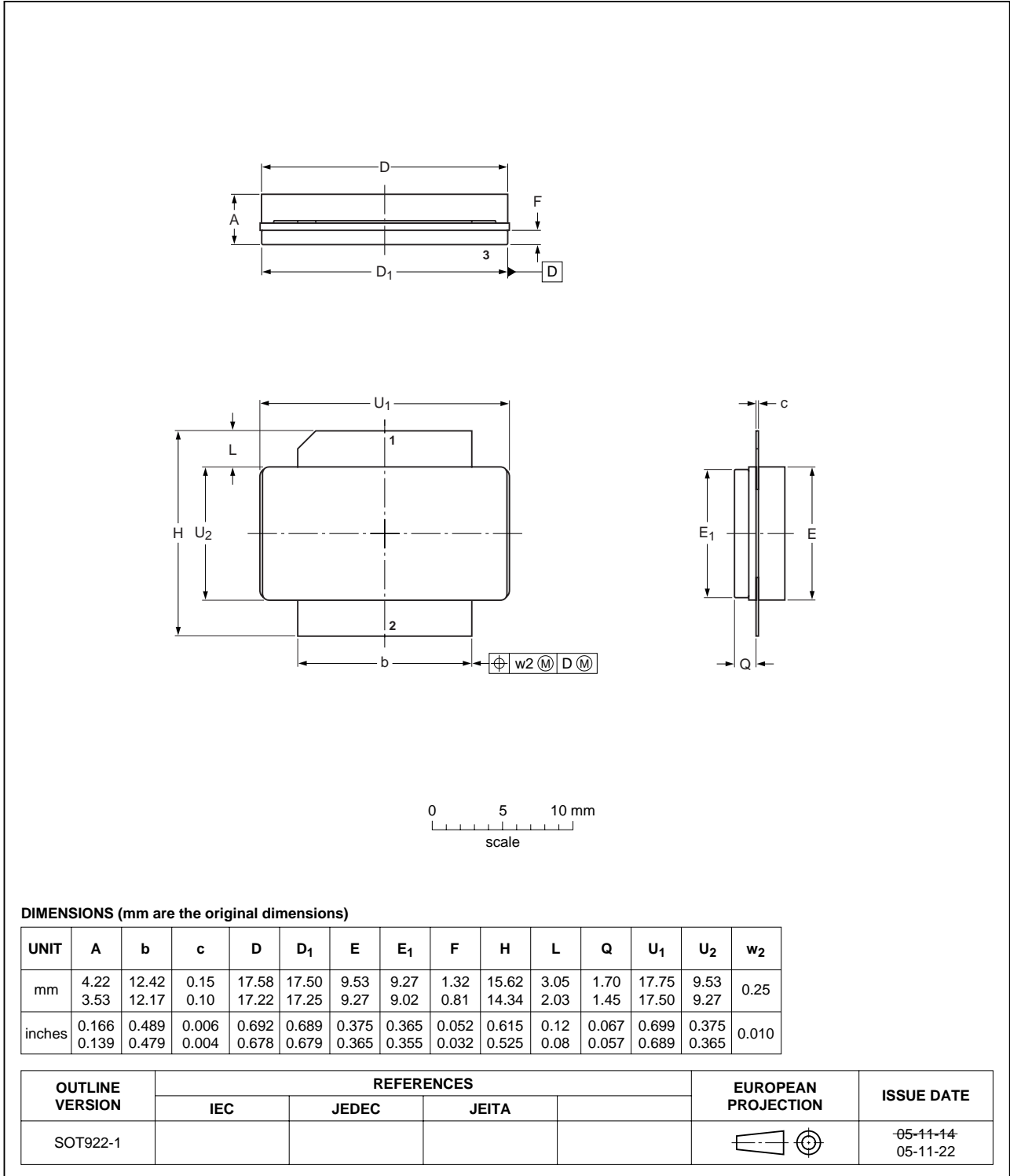


Fig 11. Package outline SOT922-1

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
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
BLS6G2933S-130_2	20090618	Preliminary data sheet	-	BLS6G2933S-130_1
Modifications:	Table 7 on page 3 : added minimum value for RL_{in}			
BLS6G2933S-130_1	20081211	Objective 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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14. Contents

1 Product profile 1

1.1 General description 1

1.2 Features 1

1.3 Applications 2

2 Pinning information 2

3 Ordering information 2

4 Limiting values 2

5 Thermal characteristics 2

6 Characteristics 3

7 Application information 3

7.1 Ruggedness in class-AB operation 4

7.2 Graphs 5

8 Test information 7

9 Package outline 8

10 Abbreviations 9

11 Revision history 9

12 Legal information 10

12.1 Data sheet status 10

12.2 Definitions 10

12.3 Disclaimers 10

12.4 Trademarks 10

13 Contact information 10

14 Contents 11

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