BLS6G2731S-130

LDMOS S-band radar power transistor

Rev. 3 — 1 September 2015

AMPLEON

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 °C; t_p = 300 μs; δ = 10 %; I_{Dq} = 100 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	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

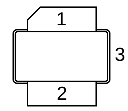
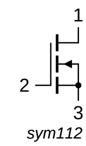
- Typical pulsed RF performance at a frequency of 2.7 GHz to 3.1 GHz, a supply voltage of 32 V, an I_{Dq} of 100 mA, a t_p of 300 μs with δ of 10 %:
  - Output power = 130 W
  - Power gain = 12 dB
  - Efficiency = 50 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to 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]		

[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 °C; P_L = 130 W		
		t_p = 100 μs; δ = 10 %	0.23	K/W
		t_p = 200 μs; δ = 10 %	0.28	K/W
		t_p = 300 μs; δ = 10 %	0.32	K/W
		t_p = 100 μs; δ = 20 %	0.33	K/W

6. Characteristics

Table 6. Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.6 mA	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	1.4	1.8	2.4	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	4.2	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	27	33	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	450	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 9 A	8.1	13	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 6.3 A	-	0.085	0.135	Ω

7. Application information

Table 7. Application information

Mode of operation: pulsed RF; t_p = 300 μs; δ = 10 %; RF performance at V_{DS} = 32 V; I_{Dq} = 100 mA; T_{case} = 25 °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 W	-	-	32	V
G_p	power gain	P_L = 130 W	10	12	-	dB
RL_{in}	input return loss	P_L = 130 W	5.5	8	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	140	-	W
η_D	drain efficiency	P_L = 130 W	45	50	-	%
$P_{droop(pulse)}$	pulse droop power	P_L = 130 W	-	0	0.25	dB
t_r	rise time	P_L = 130 W	-	20	50	ns
t_f	fall time	P_L = 130 W	-	6	50	ns

Table 8. Typical impedance

f (GHz)	Z_S (Ω)	Z_L (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

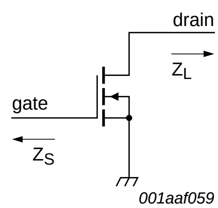
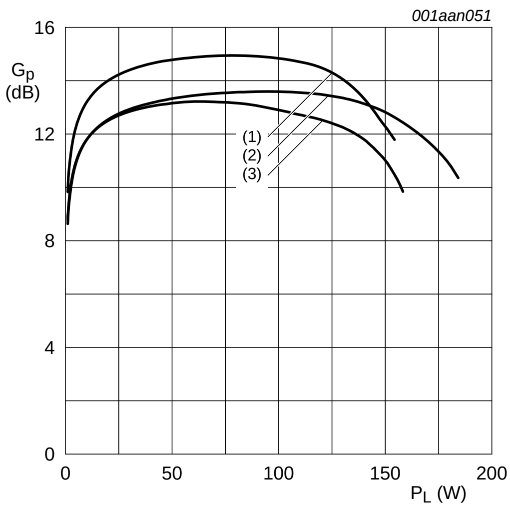


Fig 1. Definition of transistor impedance

7.1 Ruggedness in class-AB operation

The BLS6G2731S-130 is capable of withstanding a load mismatch corresponding to VSWR = 5 : 1 through all phases under the following conditions: V_{DS} = 32 V; I_{Dq} = 100 mA; P_L = 130 W; t_p = 300 μs; δ = 10 %.

7.2 Graphs



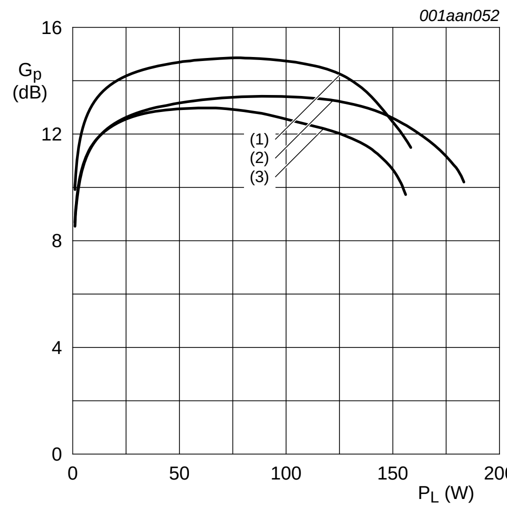
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 300 μs; δ = 10 %.

(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



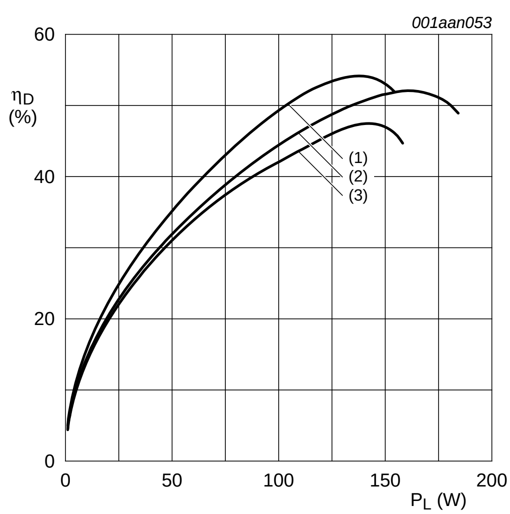
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 100 μs; δ = 20 %.

(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



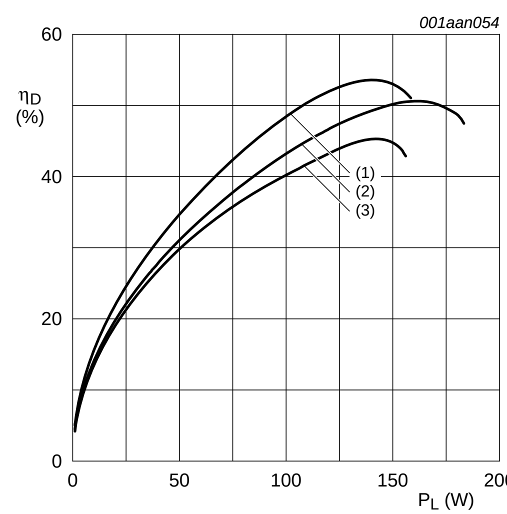
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 300 μs; δ = 10 %.

(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



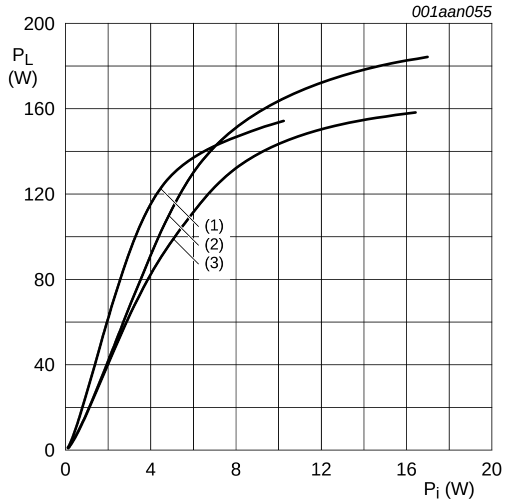
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 100 μs; δ = 20 %.

(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



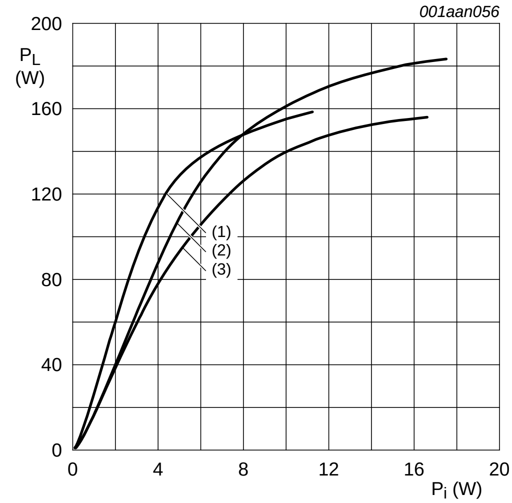
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 300 μs; δ = 10 %.

(1) f = 2.7 GHz

(2) f = 2.9 GHz

(3) f = 3.1 GHz

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



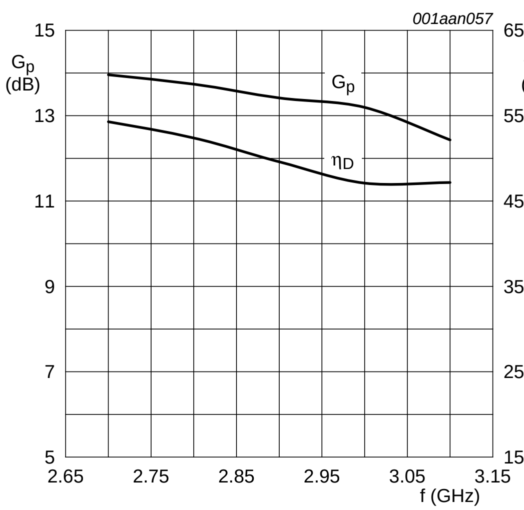
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 100 μs; δ = 20 %.

(1) f = 2.7 GHz

(2) f = 2.9 GHz

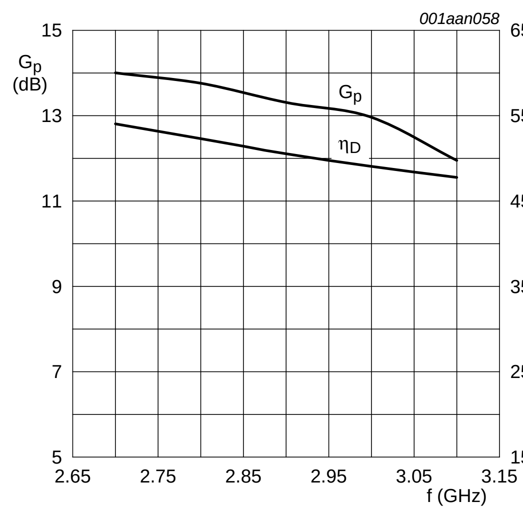
(3) f = 3.1 GHz

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



P_L = 130 W; V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 300 μs; δ = 10 %.

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



P_L = 130 W; V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 100 μs; δ = 20 %.

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

8. Test information

Table 9. List of components

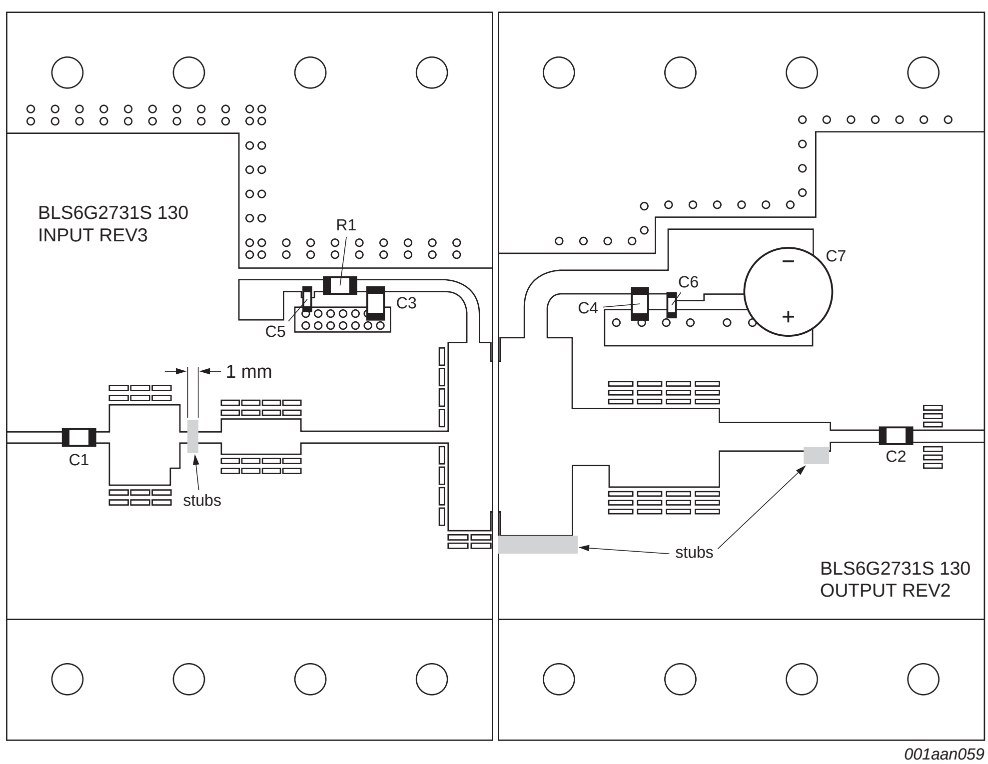
Printed-Circuit Board (PCB): Rogers Duroid 6006; thickness = 0.64 mm; ε_r = 6.15; thickness of copper plating = 0.035 mm.

For test circuit see Figure 10.

Component	Description	Value	Remarks
C1, C2, C3, C4	multilayer ceramic chip capacitor	20 pF	[1]
C5, C6	multilayer ceramic chip capacitor	1 nF	[2]
C7	electrolytic capacitor	470 μF; 63 V	
R1	SMD resistor	10 Ω	

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

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



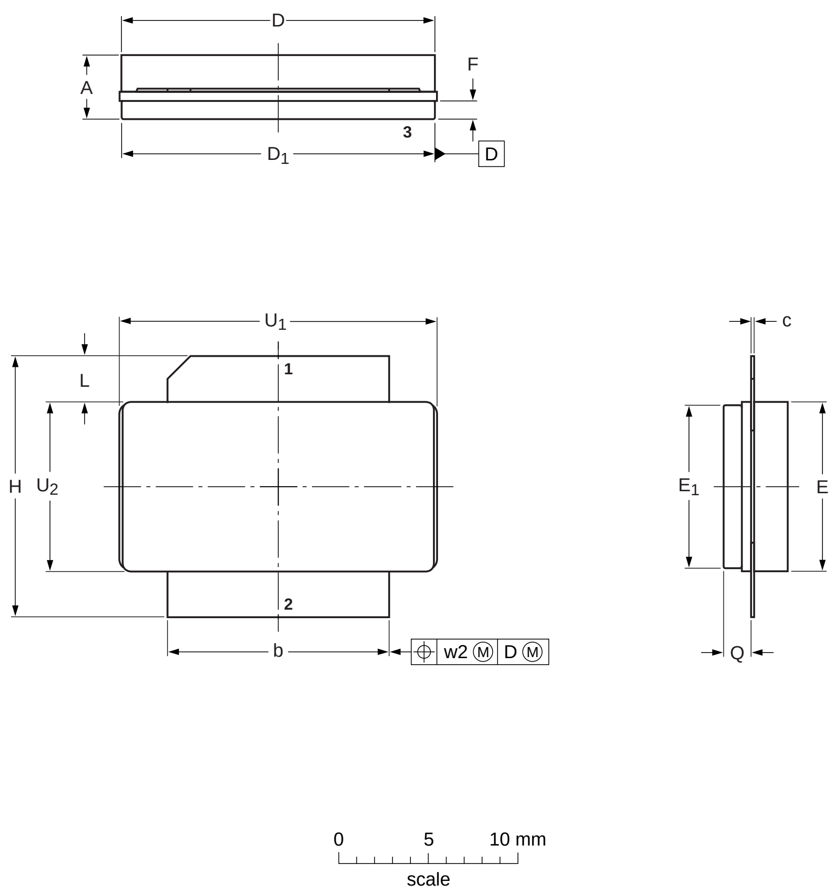
Printed-Circuit Board (PCB): Rogers Duroid 6006; thickness = 0.64 mm; ε_r = 6.15; thickness of copper plating = 0.035 mm.

See Table 9 for a list of components.

Fig 10. Component layout for test circuit

9. Package outline

Ceramic earless flanged cavity package; 2 leads **SOT922-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	w_2
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#3	20150901	Product data sheet		BLS6G2731S-130 v.2
Modifications:	• 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.			
BLS6G2731S-130 v.2	20101118	Product data sheet	-	BLS6G2731S-130 v.1
BLS6G2731S-130 v.1	20100726	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

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