BLS6G3135-120; BLS6G3135S-120

LDMOS S-Band radar power transistor

Rev. 01 — 14 August 2007 Preliminary data sheet

1. Product profile

1.1 General description

120 W LDMOS power transistor intended for radar applications in the 3.1 GHz to 3.5 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	V_{DS}	P_L	G_p	η_D	t_r	t_f
	(GHz)	(V)	(W)	(dB)	(%)	(ns)	(ns)
pulsed RF	3.1 to 3.5	32	120	11	43	20	6

CAUTION

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

1.2 Features

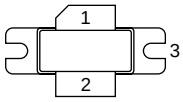
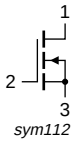
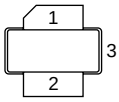
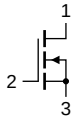
- Typical pulsed RF performance at a frequency of 3.1 GHz to 3.5 GHz, a supply voltage of 32 V, an I_{Dq} of 100 mA, a t_p of up to 300 µs with δ of 10 %:
  - Output power = 120 W
  - Gain = 11 dB
  - Efficiency = 43 %
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (3.1 GHz to 3.5 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 3.1 GHz to 3.5 GHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Symbol
BLS6G3135-120 (SOT502A)				
1	drain			
2	gate			
3	source	[1]		
BLS6G3135S-120 (SOT502B)				
1	drain			
2	gate			
3	source	[1]		

[1] Connected to flange

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLS6G3135-120	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLS6G3135S-120	-	earless flanged LDMOST ceramic package; 2 leads	SOT502B

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	-	7.2	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	Max	Unit
$Z_{th(j-mb)}$	transient thermal impedance from junction to mounting base	T_{case} = 85 °C; P_L = 120 W			
		t_p = 300 µs; δ = 10 %	0.29	0.40	K/W
		t_p = 100 µs; δ = 20 %	0.30	0.41	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 = 0.5 mA	60	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	1.4	1.8	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	5	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} = 8.3 V; V_{DS} = 0 V	-	-	450	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 9 A	-	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	0.160	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		-	120	-	W
V_{CC}	supply voltage	P_L = 120 W	-	-	32	V
G_p	power gain	P_L = 120 W	9.5	11	-	dB
IRL	input return loss	P_L = 120 W	6	10	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	P_L = 120 W	-	130	-	W
η_D	drain efficiency	P_L = 120 W	39	43	-	%
t_r	rise time	P_L = 120 W	-	20	50	ns
t_f	fall time	P_L = 120 W	-	6	50	ns

Table 8. Typical impedance

f	Z_S	Z_L
GHz	Ω	Ω
3.1	2.7 – j5.4	5.9 – j5.9
3.2	3.3 – j4.7	4.5 – j6.2
3.3	4.2 – j4.4	3.5 – j6.0
3.4	5.2 – j4.8	2.7 – j5.6
3.5	5.7 – j6.2	2.0 – j5.2

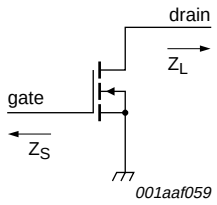
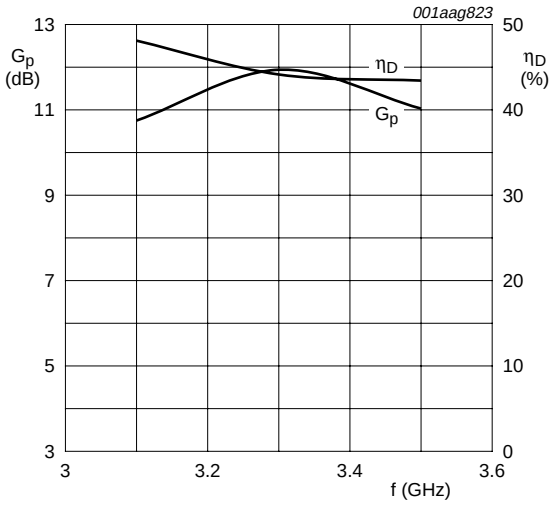


Fig 1. Definition of transistor impedance

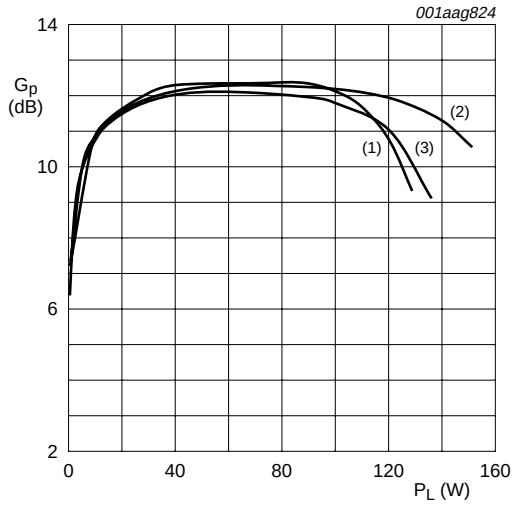
7.1 Ruggedness in class-AB operation

The BLS6G3135-120 and BLS6G3135S-120 are 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 = 120 W; t_p = 300 µs; δ = 10 %.



V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 300 µs; δ = 10 %; P_L = 120 W.

Fig 2. Power gain and drain efficiency as functions of frequency; typical values



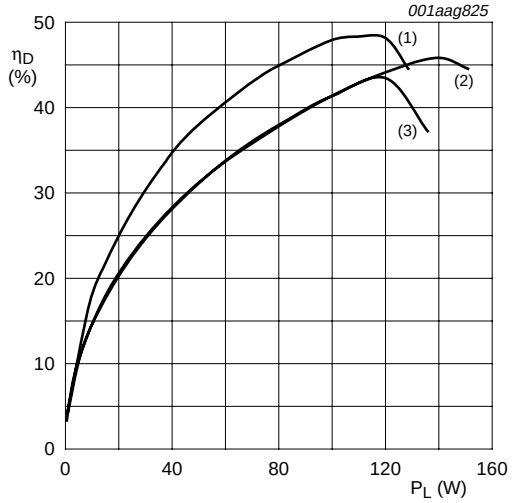
(1) f = 3.1 GHz.

(2) f = 3.3 GHz.

(3) f = 3.5 GHz.

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

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



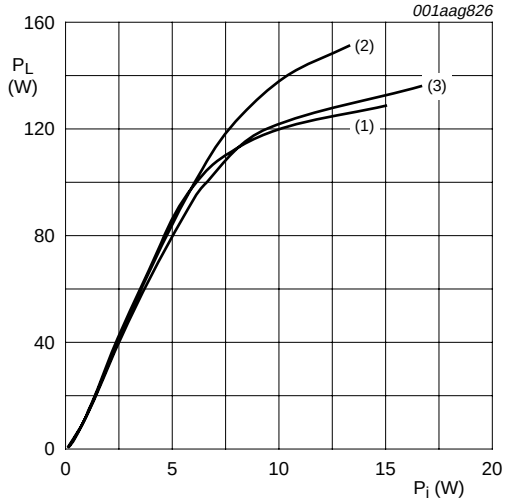
(1) f = 3.1 GHz.

(2) f = 3.3 GHz.

(3) f = 3.5 GHz.

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

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



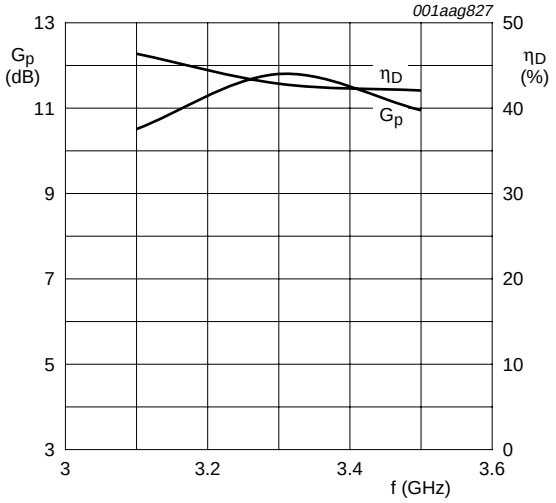
(1) f = 3.1 GHz.

(2) f = 3.3 GHz.

(3) f = 3.5 GHz.

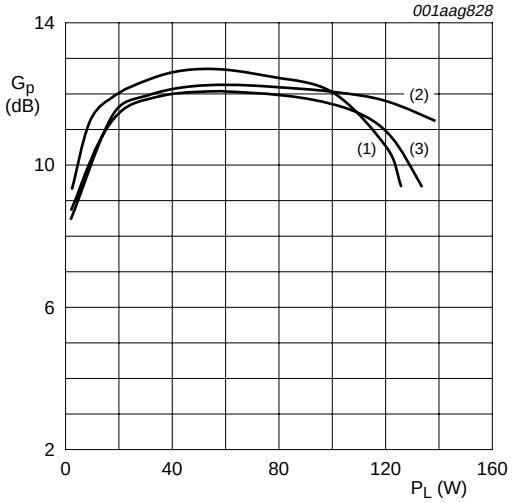
V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 300 µs; δ = 10 %.

Fig 5. Load power as a function of input power; typical values



V_{DS} = 32 V; I_{Dq} = 100 mA; t_p = 100 µs; δ = 20 %; P_L = 120 W.

Fig 6. Power gain and drain efficiency as functions of frequency; typical values



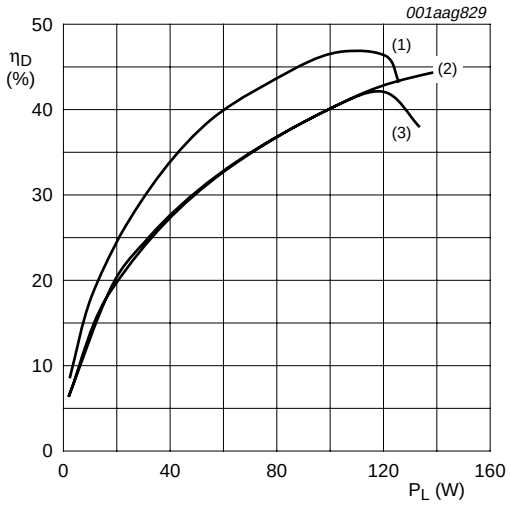
(1) f = 3.1 GHz.

(2) f = 3.3 GHz.

(3) f = 3.5 GHz.

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

Fig 7. Power gain as a function of load power; typical values



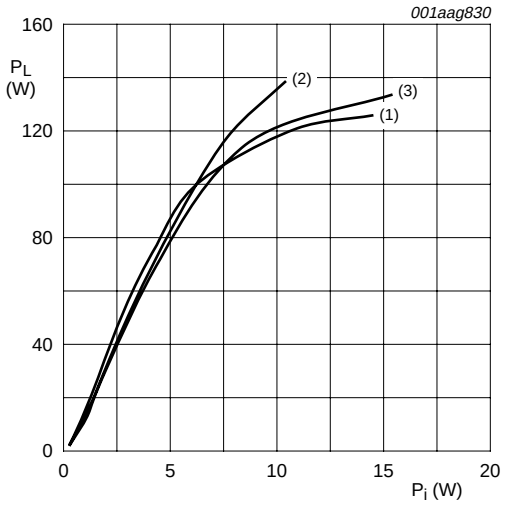
(1) f = 3.1 GHz.

(2) f = 3.3 GHz.

(3) f = 3.5 GHz.

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

Fig 8. Drain efficiency as a function of load power; typical values



(1) f = 3.1 GHz.

(2) f = 3.3 GHz.

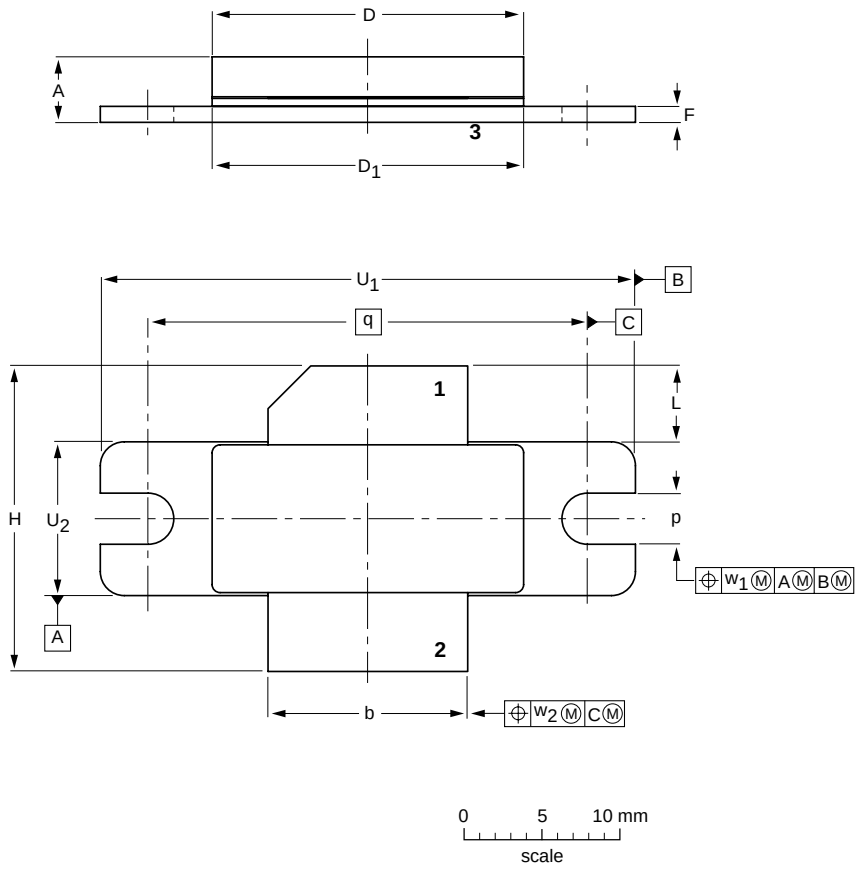
(3) f = 3.5 GHz.

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

Fig 9. Load power as a function of input power; typical values

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads **SOT502A**



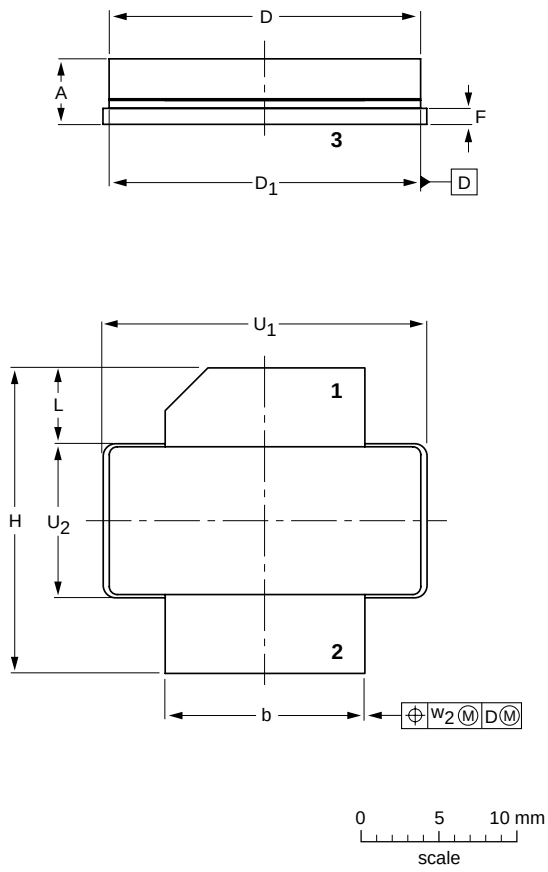
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						~~99-12-28~~ 03-01-10

Fig 10. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads **SOT502B**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	1.70 1.45	20.70 20.45	9.91 9.65	0.25
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						~~03-01-10~~ 07-05-09

Fig 11. Package outline SOT502B

9. Abbreviations

Table 9. Abbreviations

Acronym	Description
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Lateral Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
S-Band	Short wave Band
VSWR	Voltage Standing-Wave Ratio

10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLS6G3135-120_6G3135S-120_1	20070814	Preliminary data sheet	-	-

11. Legal information

11.1 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.

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

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