BLS7G2730L-200P; BLS7G2730LS-200P

LDMOS S-band radar power transistor

Rev. 3 — 12 July 2013 Product data sheet

1. Product profile

1.1 General description

200 W LDMOS power transistor for S-band radar applications in the frequency range from 2700 MHz to 3000 MHz.

Table 1. Typical performance

Typical RF performance at T_{case} = 25 °C.

Test signal	f (GHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)	t_r (ns)	t_f (ns)
Class-AB production test circuit							
pulsed RF [1]	2.7 to 3.0	32	200	12	48	8	5
Application circuit							
pulsed RF [2]	2.7 to 3.0	32	220	12.5	50	20	6
pulsed RF [3]	2.9 to 3.1	32	220	12.5	50	20	6

[1] t_p = 300 μs; δ = 10 %; I_{Dq} = 100 mA

[2] t_p = 3000 μs; δ = 20 %; I_{Dq} = 50 mA

[3] t_p = 500 μs; δ = 20 %; I_{Dq} = 50 mA

1.2 Features and benefits

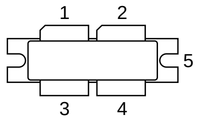
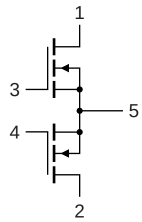
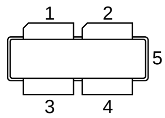
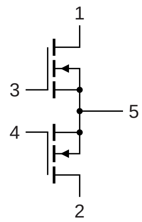
- High efficiency
- Excellent ruggedness
- Designed for broadband operation
- Excellent thermal stability
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- S-band radar applications in the frequency range 2700 MHz to 3000 MHz

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLS7G2730L-200P (SOT539A)			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source [1]		
BLS7G2730LS-200P (SOT539B)			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLS7G2730L-200P	-	flanged balanced ceramic package; 2 mounting holes; 4 leads	SOT539A
BLS7G2730LS-200P	-	earless flanged balanced ceramic package; 4 leads	SOT539B

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	-	65	V
V_{GS}	gate-source voltage	–0.5	+13	V
T_{stg}	storage temperature	–65	+150	°C
T_j	junction temperature [1]	-	225	°C

[1] Continuous use at maximum temperature will affect the reliability.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-c)}$	transient thermal impedance from junction to case	T_{case} = 85 °C; P_L = 200 W		
		t_p = 300 µs; δ = 10 %	0.13	K/W
		t_p = 3000 µs; δ = 20 %	0.19	K/W

6. Characteristics

Table 6. DC 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 = 1.2 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 120 mA	1.5	1.9	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	2.8	µA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	-	22.5	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	280	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 0.12 A	-	1	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 4.2 A	-	0.13	-	Ω

Table 7. RF characteristics

Test signal: 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 test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	P_L = 200 W	9.8	12	-	dB
RL_{in}	input return loss	P_L = 200 W	-	−10	−6	dB
η_D	drain efficiency	P_L = 200 W	43	48	-	%
$P_{droop(pulse)}$	pulse droop power	P_L = 200 W	-	0	0.25	dB
t_r	rise time	P_L = 200 W	-	8	50	ns
t_f	fall time	P_L = 200 W	-	5	50	ns

7. Test information

7.1 Ruggedness in class-AB operation

The BLS7G2730L-200P and BLS7G2730LS-200P are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under following conditions: V_{DS} = 32 V; I_{Dq} = 100 mA; P_L = 200 W; f = 2700 MHz; t_p = 300 µs; δ = 10 %

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data half device; V_{DS} = 32 V; I_{Dq} = 100 mA.

f (MHz)	Z_S [1] (Ω)	Z_L [1] (Ω)
2700	2.0 – j5.8	3.7 – j6.4
2800	1.6 – j5.9	3.8 – j6.9
2900	2.6 – j6.2	3.8 – j6.9
3000	3.4 – j6.0	3.7 – j6.4

[1] Z_S and Z_L defined in Figure 1.

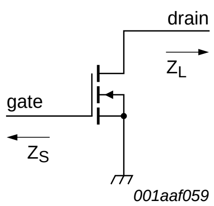
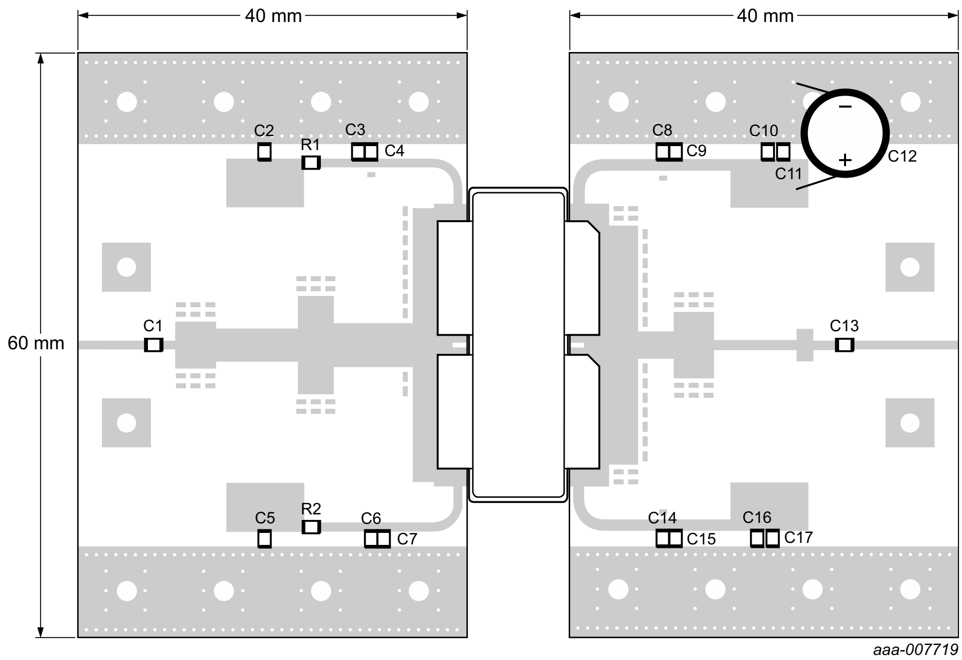


Fig 1. Definition of transistor impedance

7.3 Production test circuit



Printed-Circuit Board (PCB): Arlon TC600 with a thickness of 0.64 mm.

See Table 9 for a list of components.

Fig 2. Component layout for a class-AB production test circuit

Table 9. List of components test circuit
See Figure 2.

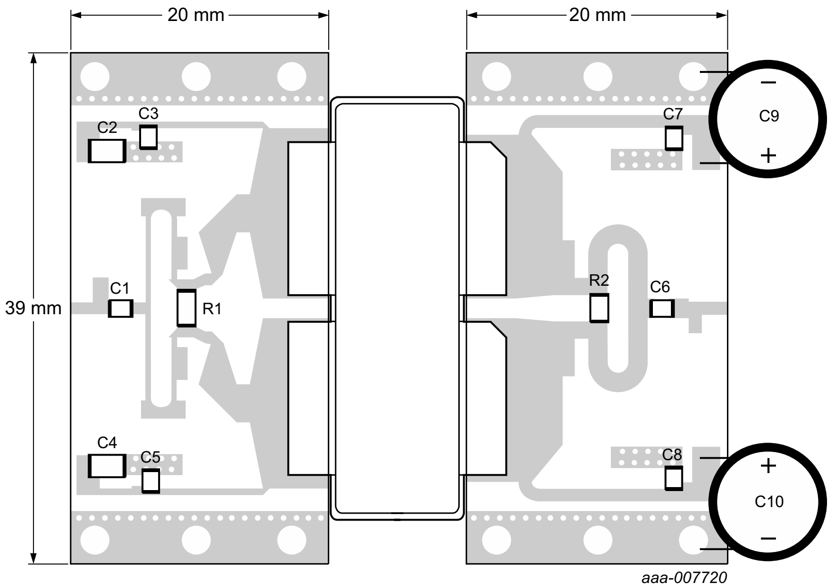
Component	Description	Value		Remarks
C1, C3, C6, C9, C13, C15	multilayer ceramic chip capacitor	18 pF	[1]	ATC600F
C2, C5, C10, C16	multilayer ceramic chip capacitor	1 μF	[2]	
C4, C7, C8, C14	multilayer ceramic chip capacitor	12 pF	[1]	ATC600F
C11, C17	multilayer ceramic chip capacitor	10 μF	[2]	
C12	electrolytic capacitor	2200 μF, 63 V		
R1, R2	chip resistor	9.1 Ω	[3]	

[1] American Technical Ceramics type 600F or capacitor of same quality.

[2] Murata or capacitor of same quality.

[3] Vishay Dale or capacitor of same quality.

7.4 Application circuit



Printed-Circuit Board (PCB): Arlon TC600 with a thickness of 0.64 mm.

See Table 10 for a list of components.

Fig 3. Component layout for a class-AB application circuit

Table 10. List of components application circuit
See Figure 2.

Component	Description	Value		Remarks
C1, C3, C5, C6, C7, C8	multilayer ceramic chip capacitor	12 pF	[1]	ATC600F
C2, C4	multilayer ceramic chip capacitor	1 μF	[2]	
C9, C10	electrolytic capacitor	2200 μF, 50 V		
R1, R2	chip resistor	50 Ω	[3]	

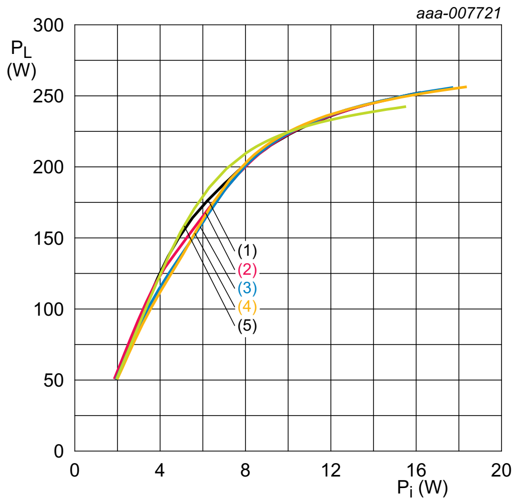
[1] American Technical Ceramics type 600F or capacitor of same quality.

[2] Murata or capacitor of same quality.

[3] Vishay Dale or capacitor of same quality.

7.5 Graphical data

7.5.1 Test circuit



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

(1) f = 2700 MHz

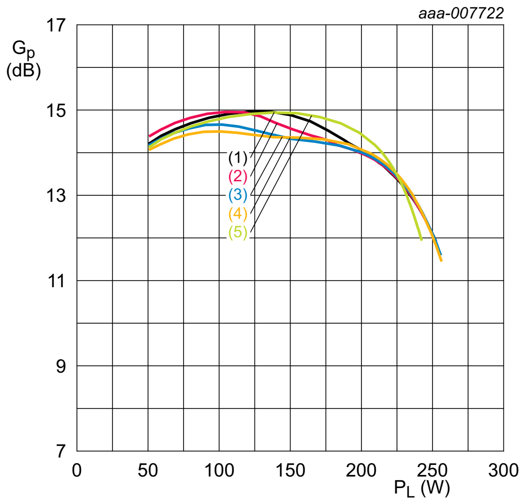
(2) f = 2800 MHz

(3) f = 2850 MHz

(4) f = 2900 MHz

(5) f = 3000 MHz

Fig 4. Output power as a function of input power; typical values



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

(1) f = 2700 MHz

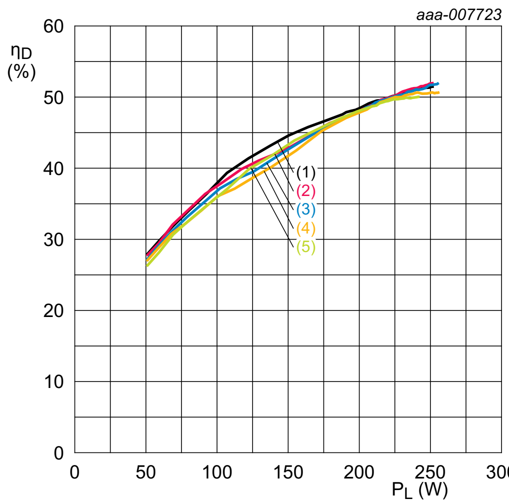
(2) f = 2800 MHz

(3) f = 2850 MHz

(4) f = 2900 MHz

(5) f = 3000 MHz

Fig 5. Power gain as a function of output power; typical values



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

(1) f = 2700 MHz

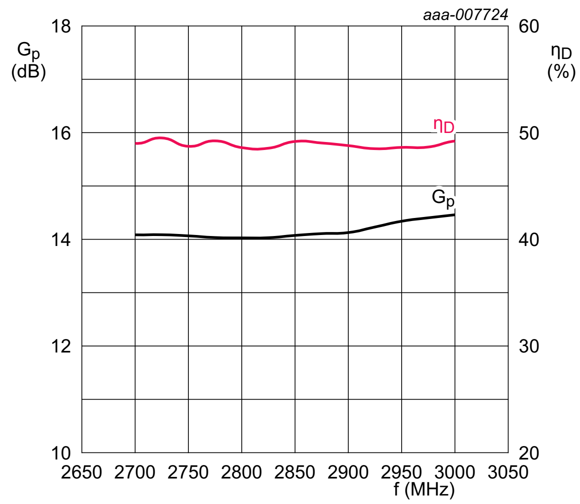
(2) f = 2800 MHz

(3) f = 2850 MHz

(4) f = 2900 MHz

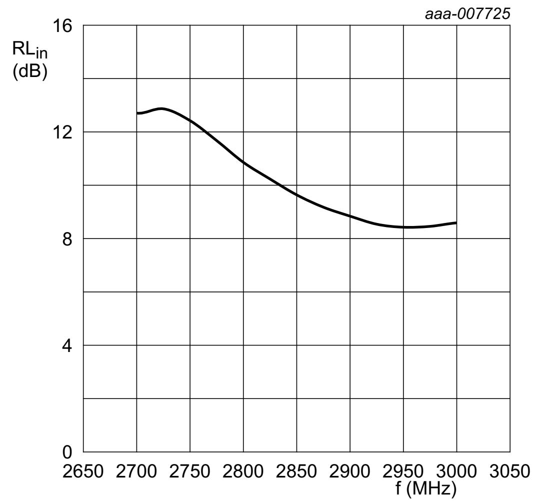
(5) f = 3000 MHz

Fig 6. Drain efficiency as a function of output power; typical values



V_{DS} = 32 V; P_L = 200 W; I_{Dq} = 100 mA; t_p = 300 μs; δ = 10 %.

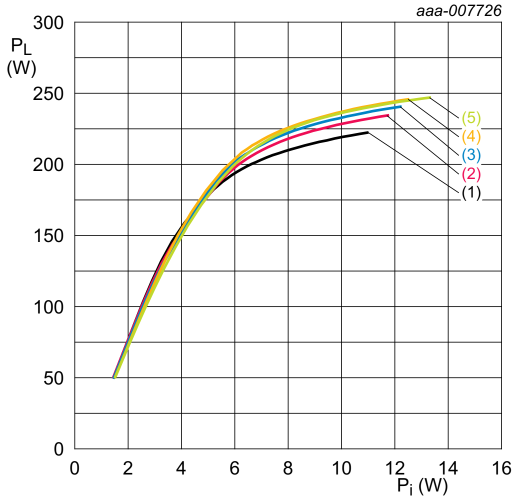
Fig 7. Power gain and drain efficiency as function of frequency; typical values



V_{DS} = 32 V; P_L = 200 W; I_{Dq} = 100 mA; t_p = 300 μs; δ = 10 %.

Fig 8. Input return loss as a function of frequency; typical values

7.5.2 Application circuit



V_{DS} = 32 V; I_{Dq} = 50 mA; t_p = 3000 μs; δ = 20 %.

(1) f = 2700 MHz

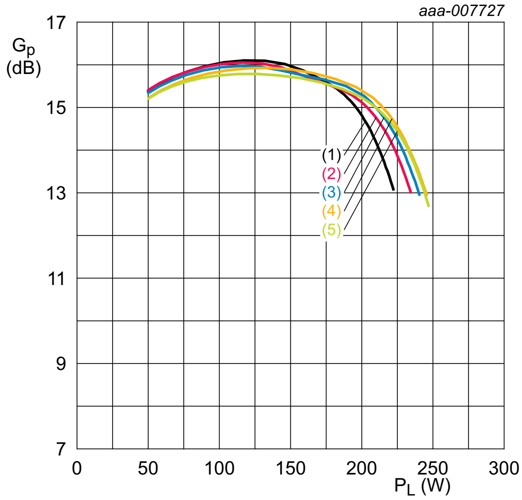
(2) f = 2800 MHz

(3) f = 2850 MHz

(4) f = 2900 MHz

(5) f = 3000 MHz

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



V_{DS} = 32 V; I_{Dq} = 50 mA; t_p = 3000 μs; δ = 20 %.

(1) f = 2700 MHz

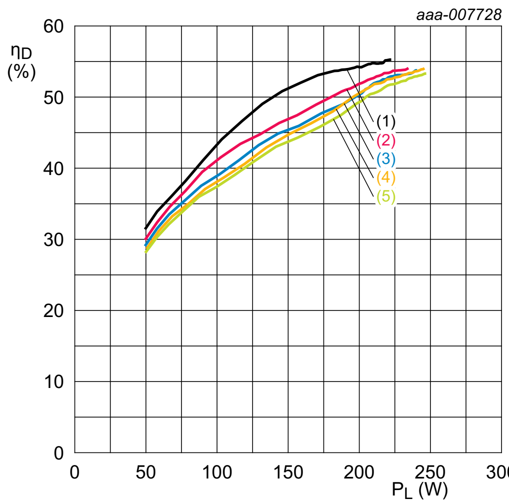
(2) f = 2800 MHz

(3) f = 2850 MHz

(4) f = 2900 MHz

(5) f = 3000 MHz

Fig 10. Power gain as a function of output power; typical values



V_{DS} = 32 V; I_{Dq} = 50 mA; t_p = 3000 μs; δ = 20 %.

(1) f = 2700 MHz

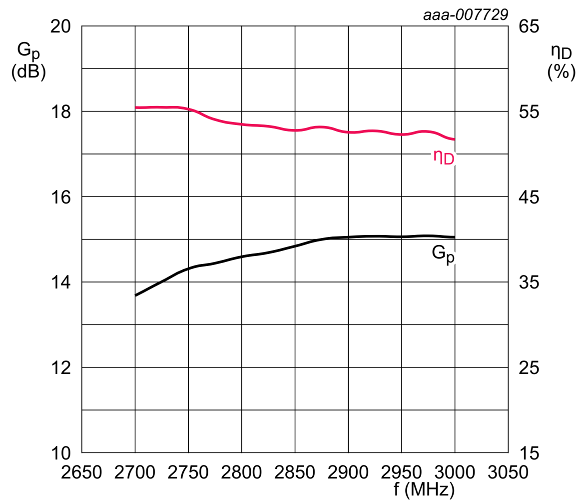
(2) f = 2800 MHz

(3) f = 2850 MHz

(4) f = 2900 MHz

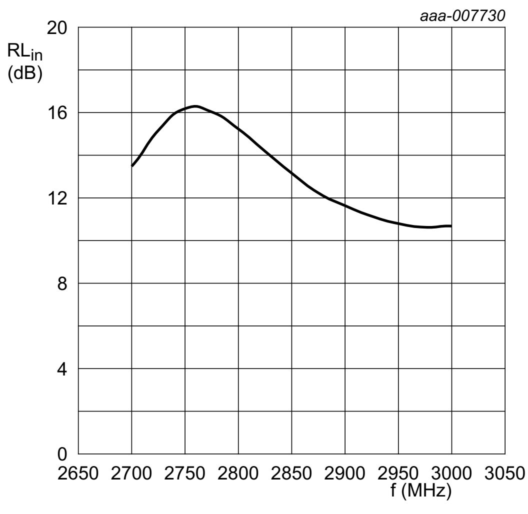
(5) f = 3000 MHz

Fig 11. Drain efficiency as a function of output power; typical values



V_{DS} = 32 V; P_L = 220 W; I_{Dq} = 50 mA; t_p = 3000 μs; δ = 20 %.

Fig 12. Power gain and drain efficiency as function of frequency; typical values

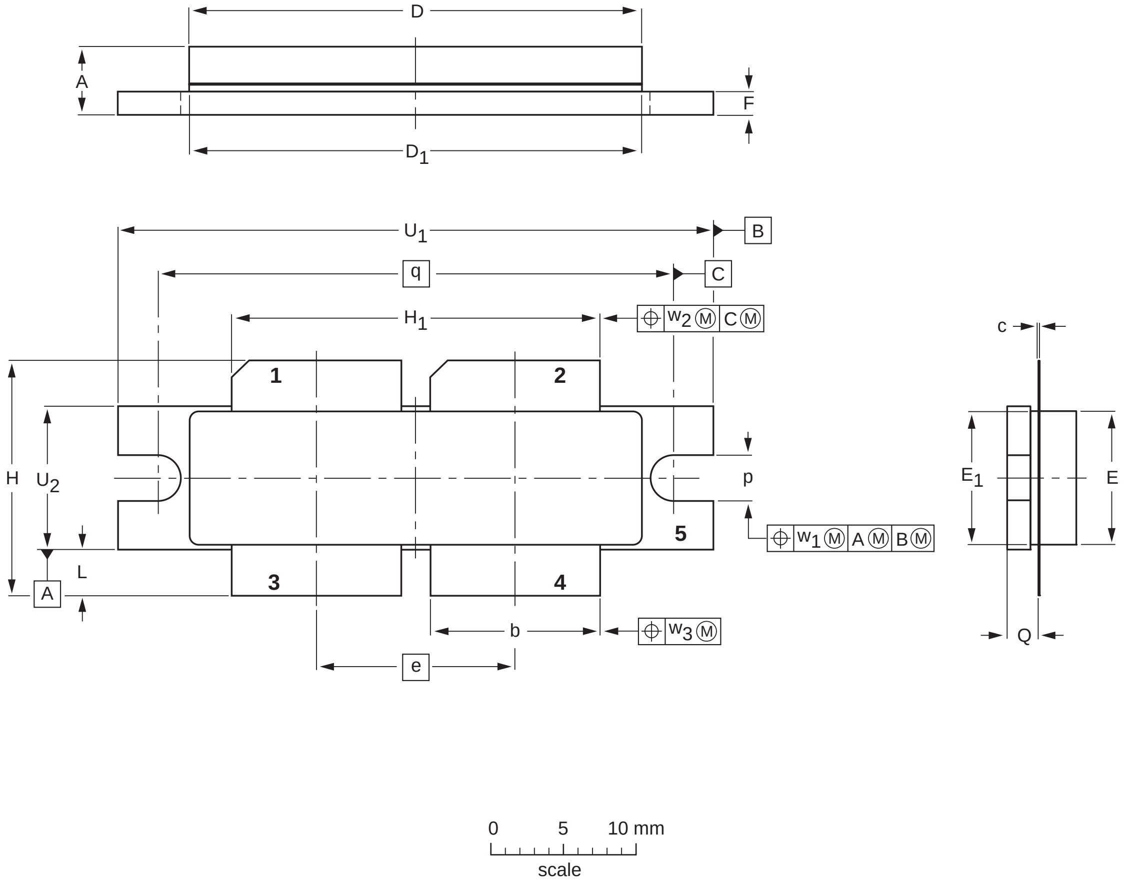


V_{DS} = 32 V; P_L = 220 W; I_{Dq} = 50 mA; t_p = 3000 μs; δ = 20 %.

Fig 13. Input return loss as a function of frequency; typical values

8. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads **SOT539A**



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

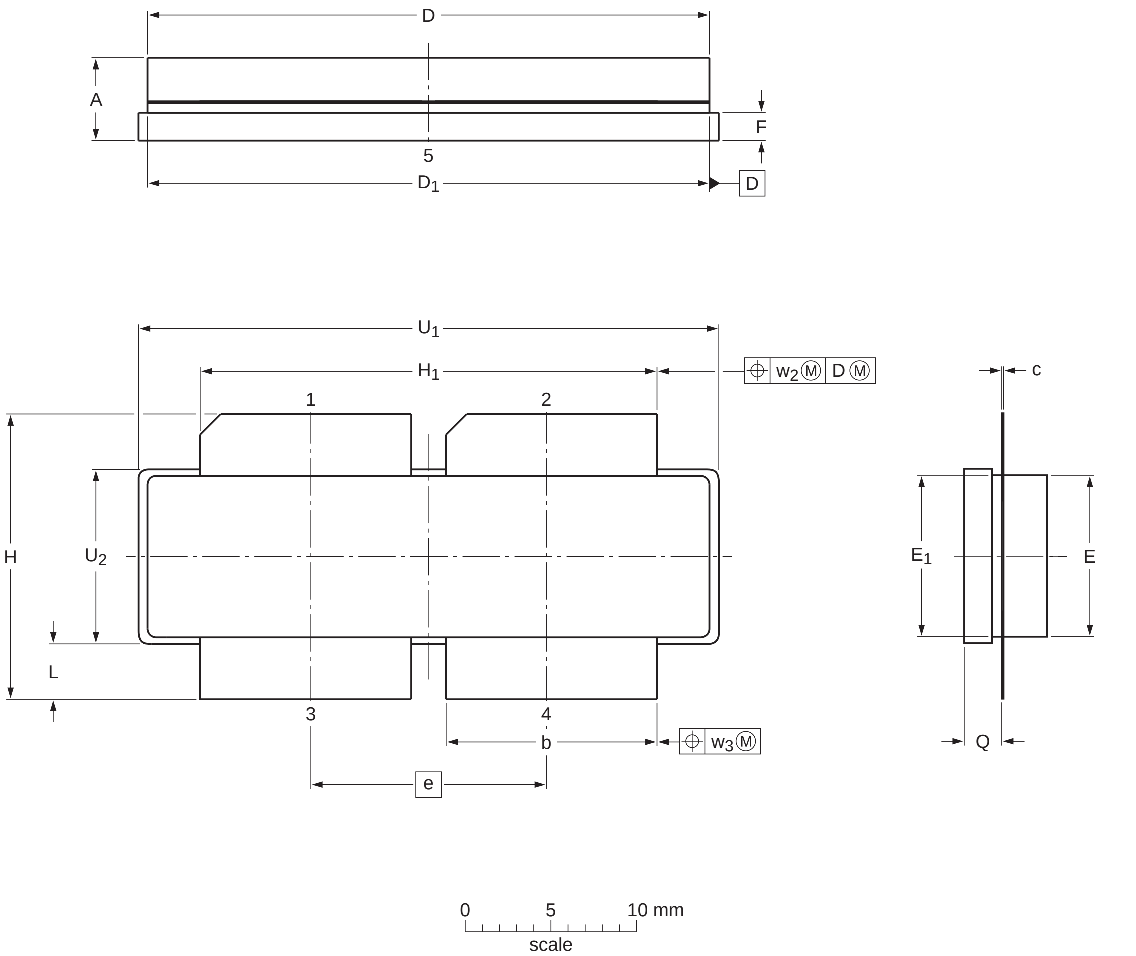
UNIT	A	b	c	D	D_1	e	E	E_1	F	H	H_1	L	p	Q	q	U_1	U_2	w_1	w_2	w_3
mm	4.7 4.2	11.81 11.56	0.18 0.10	31.55 30.94	31.52 30.96	13.72	9.50 9.30	9.53 9.27	1.75 1.50	17.12 16.10	25.53 25.27	3.48 2.97	3.30 3.05	2.26 2.01	35.56	41.28 41.02	10.29 10.03	0.25	0.51	0.25
inches	0.185 0.165	0.465 0.455	0.007 0.004	1.242 1.218	1.241 1.219	0.540	0.374 0.366	0.375 0.365	0.069 0.059	0.674 0.634	1.005 0.995	0.137 0.117	0.130 0.120	0.089 0.079	1.400	1.625 1.615	0.405 0.395	0.010	0.020	0.010

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. recommended screw pitch dimension of 1.52 inch (38.6 mm) based on M3 screw.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT539A						~~10-02-02~~ 12-05-02

Fig 14. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads **SOT539B**



Dimensions

Unit(1)		A	b	c	D	D_1	E	E_1	e	F	H	H_1	L	Q	U_1	U_2	w_2	w_3
mm	max	4.7	11.81	0.18	31.55	31.52	9.5	9.53		1.75	17.12	25.53	3.48	2.26	32.39	10.29		
	nom								13.72								0.25	0.25
	min	4.2	11.56	0.10	30.94	30.96	9.3	9.27		1.50	16.10	25.27	2.97	2.01	32.13	10.03		
inches	max	0.185	0.465	0.007	1.242	1.241	0.374	0.375		0.069	0.674	1.005	0.137	0.089	1.275	0.405		
	nom								0.54								0.01	0.01
	min	0.165	0.455	0.004	1.218	1.219	0.366	0.365		0.059	0.634	0.995	0.117	0.079	1.265	0.395		

Note
1. millimeter dimensions are derived from the original inch dimensions.

sot539b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT539B						~~12-05-02~~ 13-05-24

Fig 15. Package outline SOT539B

9. Handling information

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

10. Abbreviations

Table 11. Abbreviations

Acronym	Description
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
S-band	Short wave band
VSWR	Voltage Standing-Wave Ratio

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLS7G2730S-200P_LS-200P v.3	20130712	Product data sheet	-	BLS7G2730S-200P_LS-200P v.2
Modifications:	• The package outline Figure 15 is updated.			
BLS7G2730S-200P_LS-200P v.2	20130603	Product data sheet	-	BLS7G2730S-200P_LS-200P v.1
Modifications	• Table 1 on page 1: table has been updated • Section 1.2 on page 1: section has been updated • Table 4 on page 2: table has been updated • Table 5 on page 3: table has been updated • Table 6 on page 3: table has been updated • Table 7 on page 3: table has been updated • Section 7 on page 3: section has been added • Figure 15 on page 11: figure has been updated			
BLS7G2730S-200P_LS-200P v.1	20130129	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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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