

BLS7G2730L-200P; BLS7G2730LS-200P

LDMOS S-band radar power transistor

Rev. 4 — 1 September 2015

AMPLEON

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 $T_{case} = 25\text{ °C}$.

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] $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\%$; $I_{Dq} = 100\text{ mA}$

[2] $t_p = 3000\text{ }\mu\text{s}$; $\delta = 20\%$; $I_{Dq} = 50\text{ mA}$

[3] $t_p = 500\text{ }\mu\text{s}$; $\delta = 20\%$; $I_{Dq} = 50\text{ mA}$

1.2 Features and benefits

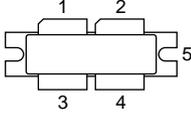
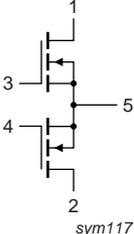
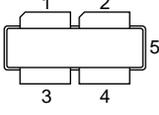
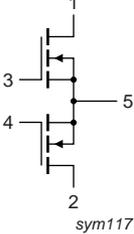
- High efficiency
- Excellent ruggedness
- Designed for broadband operation
- Excellent thermal stability
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of 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		
BLS7G2730LS-200P (SOT539B)			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source		

[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	$T_{case} = 85\text{ °C}; P_L = 200\text{ W}$		
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.13	K/W
		$t_p = 3000\text{ }\mu\text{s}; \delta = 20\text{ }\%$	0.19	K/W

6. Characteristics

Table 6. DC characteristics

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

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

Table 7. RF characteristics

Test signal: pulsed RF; $t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$; RF performance at $V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; T_{case} = 25\text{ °C};$ unless otherwise specified, in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_L = 200\text{ W}$	9.8	12	-	dB
RL_{in}	input return loss	$P_L = 200\text{ W}$	-	-10	-6	dB
η_D	drain efficiency	$P_L = 200\text{ W}$	43	48	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 200\text{ W}$	-	0	0.25	dB
t_r	rise time	$P_L = 200\text{ W}$	-	8	50	ns
t_f	fall time	$P_L = 200\text{ W}$	-	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 $V_{SWR} = 10 : 1$ through all phases under following conditions: $V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; P_L = 200\text{ W}; f = 2700\text{ MHz}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$

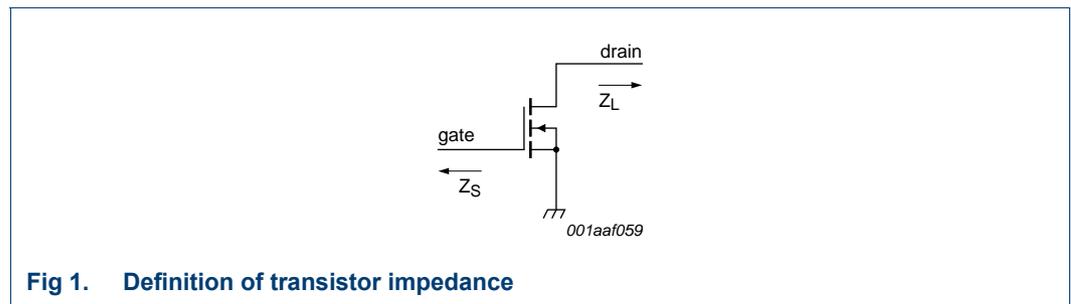
7.2 Impedance information

Table 8. Typical impedance

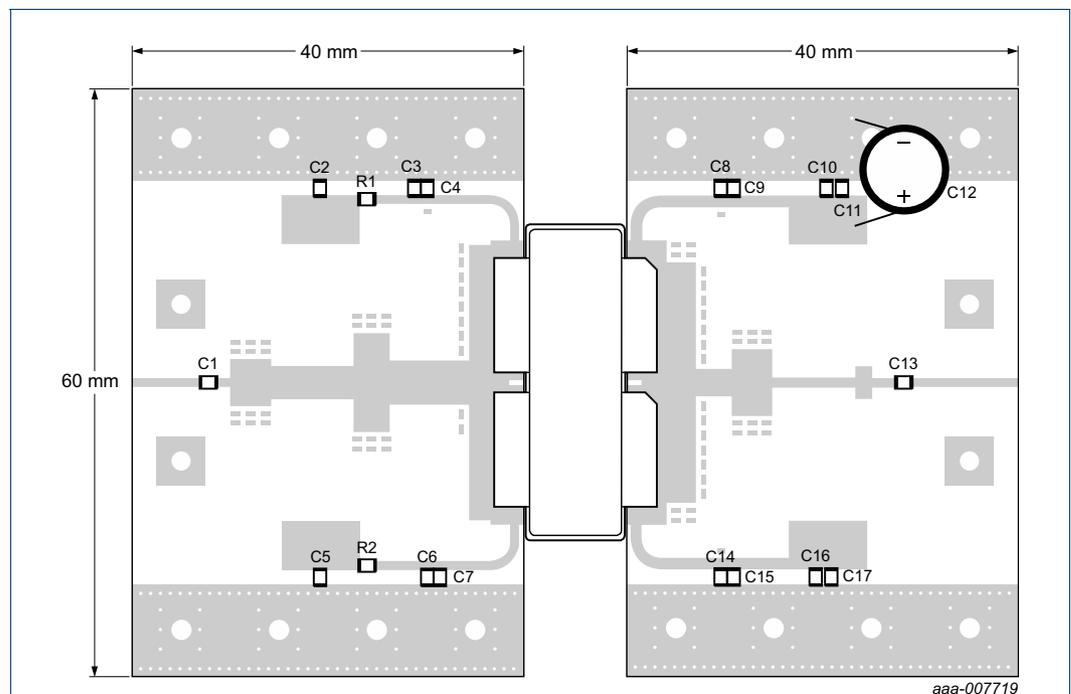
Measured load-pull data half device; $V_{DS} = 32\text{ V}$; $I_{Dq} = 100\text{ mA}$.

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.



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

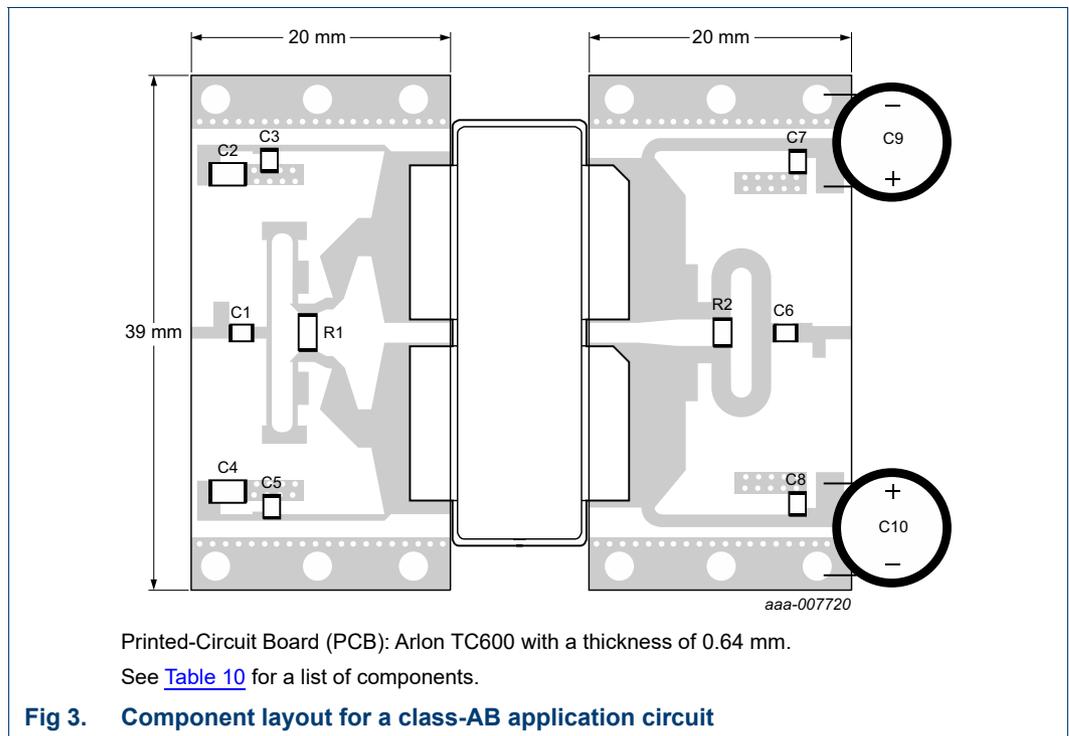


Table 10. List of components application circuit

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]

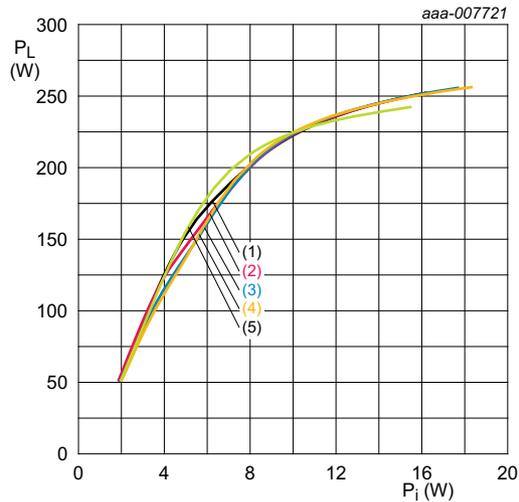
[1] American Technical Ceramics type 600F or capacitor of same quality.

[2] Murata or capacitor of same quality.

[3] Vishay Dale or capacitor of same quality.

7.5 Graphical data

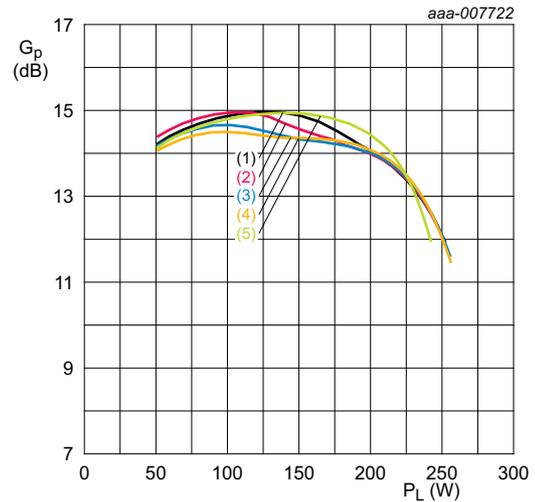
7.5.1 Test circuit



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

- (1) $f = 2700\text{ MHz}$
- (2) $f = 2800\text{ MHz}$
- (3) $f = 2850\text{ MHz}$
- (4) $f = 2900\text{ MHz}$
- (5) $f = 3000\text{ MHz}$

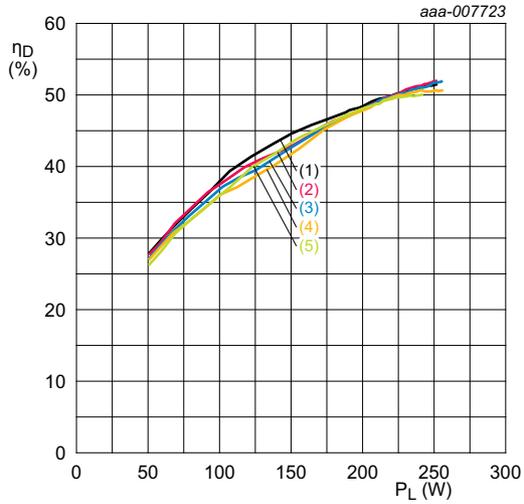
Fig 4. Output power as a function of input power; typical values



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

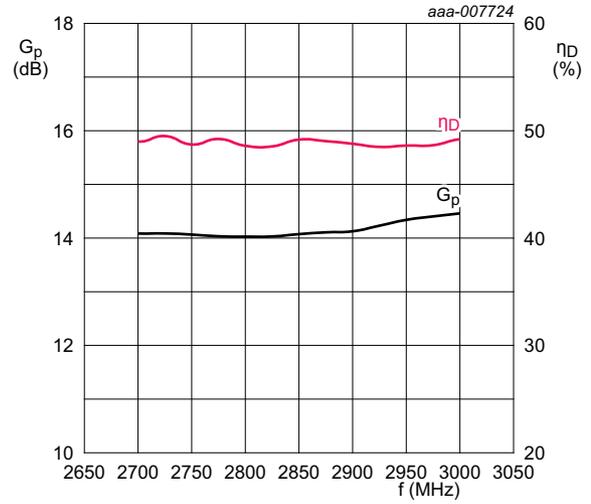
- (1) $f = 2700\text{ MHz}$
- (2) $f = 2800\text{ MHz}$
- (3) $f = 2850\text{ MHz}$
- (4) $f = 2900\text{ MHz}$
- (5) $f = 3000\text{ MHz}$

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



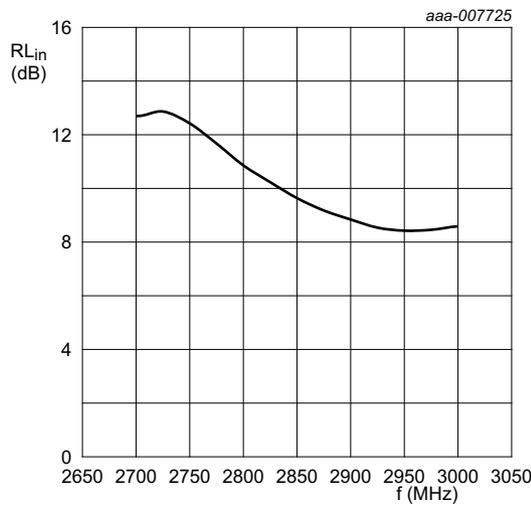
$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.
 (1) $f = 2700\text{ MHz}$
 (2) $f = 2800\text{ MHz}$
 (3) $f = 2850\text{ MHz}$
 (4) $f = 2900\text{ MHz}$
 (5) $f = 3000\text{ MHz}$

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



$V_{DS} = 32\text{ V}; P_L = 200\text{ W}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.

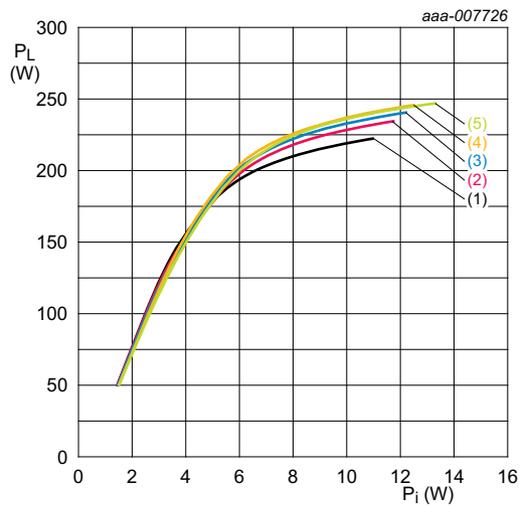
Fig 7. Power gain and drain efficiency as function of frequency; typical values



$V_{DS} = 32\text{ V}; P_L = 200\text{ W}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$.

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

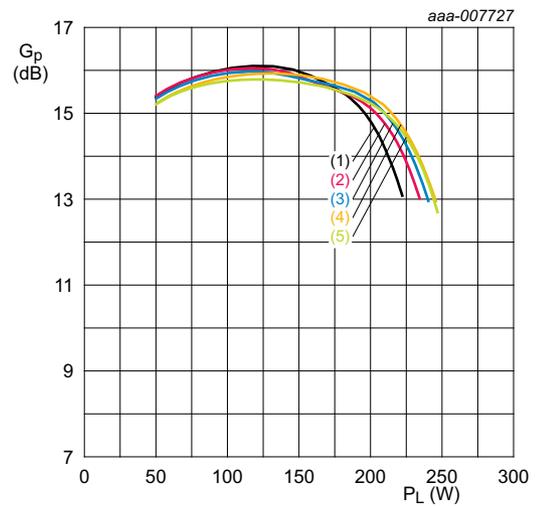
7.5.2 Application circuit



$V_{DS} = 32\text{ V}; I_{Dq} = 50\text{ mA}; t_p = 3000\ \mu\text{s}; \delta = 20\ \%$.

- (1) $f = 2700\text{ MHz}$
- (2) $f = 2800\text{ MHz}$
- (3) $f = 2850\text{ MHz}$
- (4) $f = 2900\text{ MHz}$
- (5) $f = 3000\text{ MHz}$

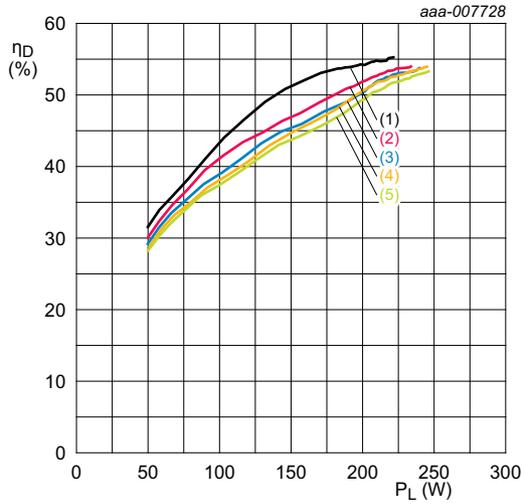
Fig 9. Output power as a function of input power; typical values



$V_{DS} = 32\text{ V}; I_{Dq} = 50\text{ mA}; t_p = 3000\ \mu\text{s}; \delta = 20\ \%$.

- (1) $f = 2700\text{ MHz}$
- (2) $f = 2800\text{ MHz}$
- (3) $f = 2850\text{ MHz}$
- (4) $f = 2900\text{ MHz}$
- (5) $f = 3000\text{ MHz}$

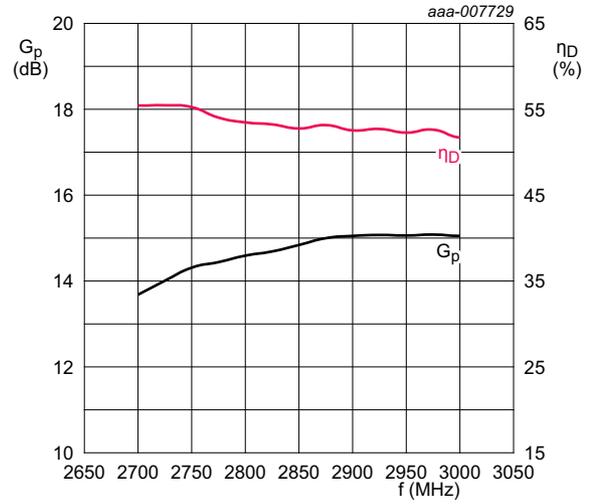
Fig 10. Power gain as a function of output power; typical values



$V_{DS} = 32\text{ V}$; $I_{Dq} = 50\text{ mA}$; $t_p = 3000\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$.

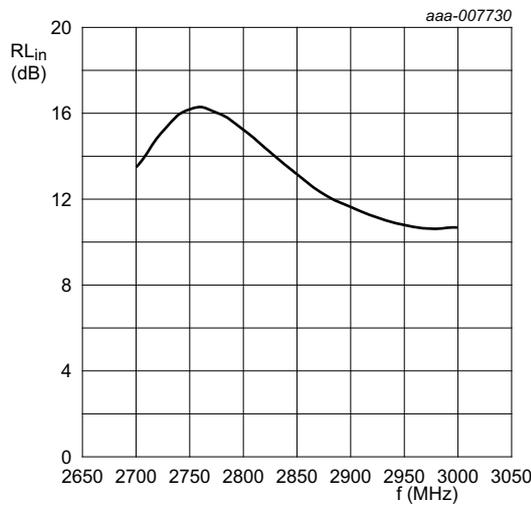
- (1) $f = 2700\text{ MHz}$
- (2) $f = 2800\text{ MHz}$
- (3) $f = 2850\text{ MHz}$
- (4) $f = 2900\text{ MHz}$
- (5) $f = 3000\text{ MHz}$

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



$V_{DS} = 32\text{ V}$; $P_L = 220\text{ W}$; $I_{Dq} = 50\text{ mA}$; $t_p = 3000\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$.

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



$V_{DS} = 32\text{ V}$; $P_L = 220\text{ W}$; $I_{Dq} = 50\text{ mA}$; $t_p = 3000\text{ }\mu\text{s}$; $\delta = 20\text{ }\%$.

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

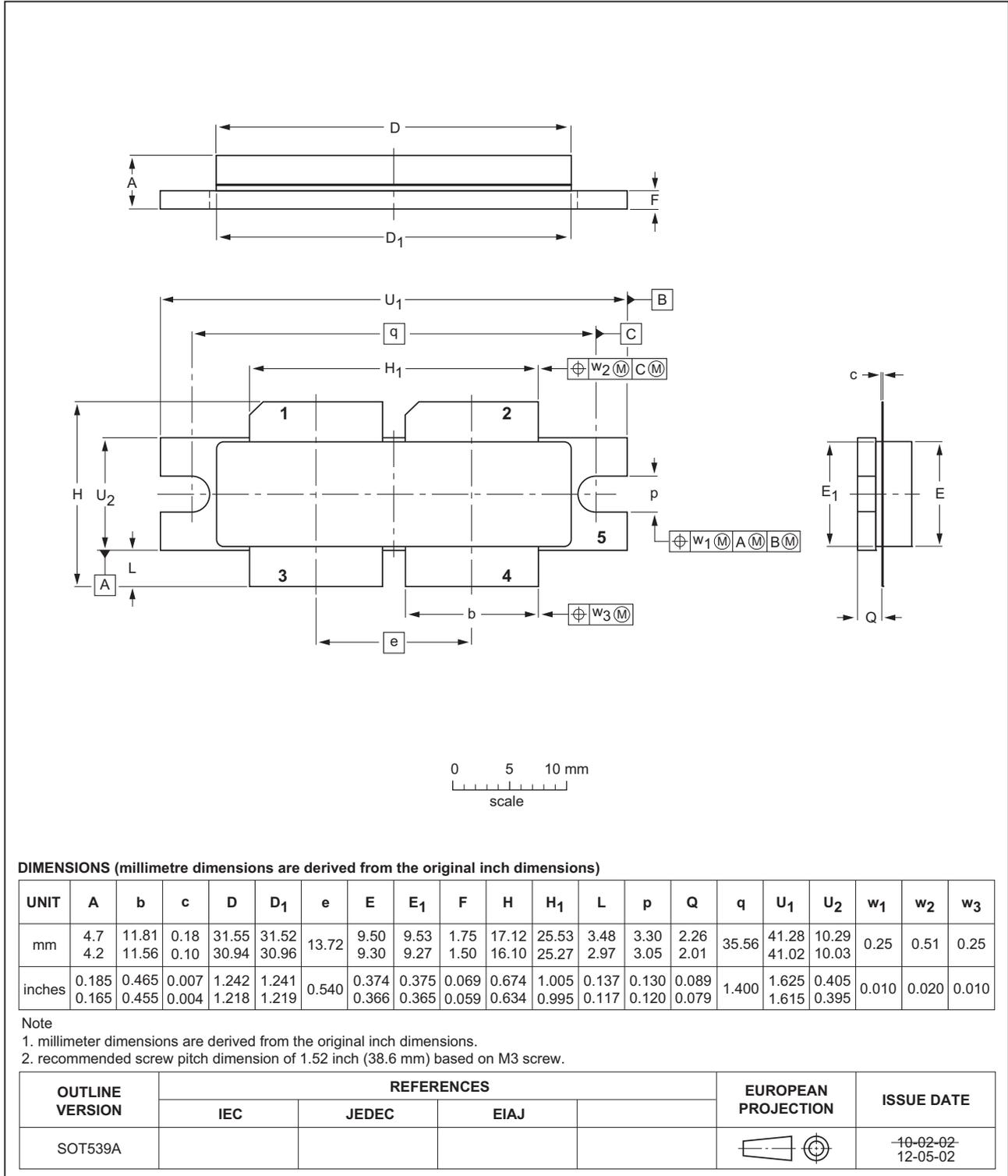


Fig 14. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B

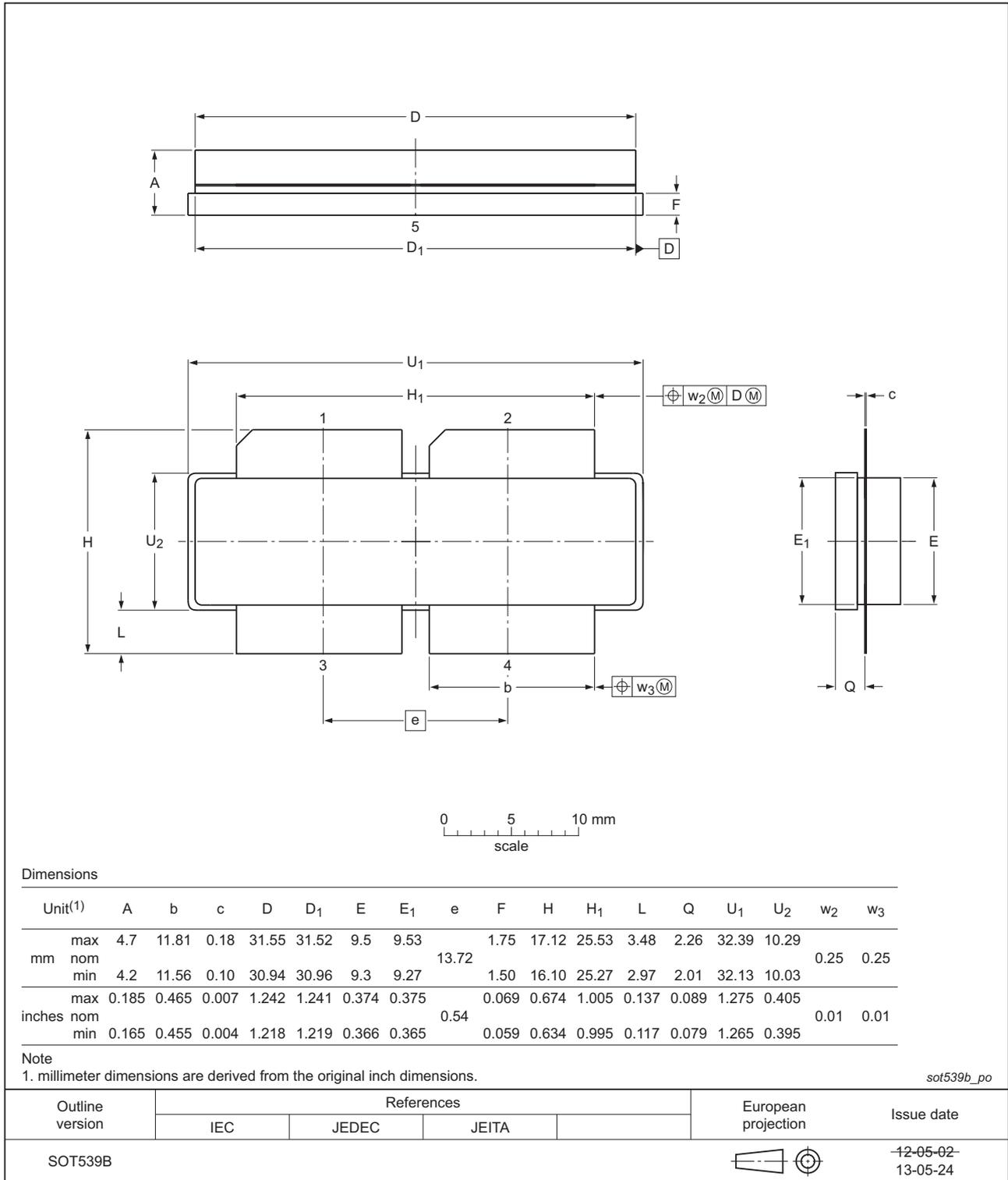


Fig 15. Package outline SOT539B

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#4	20150901	Product data sheet		BLS7G2730S-200P_LS-200P v.3
Modifications:	<ul style="list-style-type: none"> 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. 			
BLS7G2730S-200P_LS-200P v.3	20130712	Product data sheet	-	BLS7G2730S-200P_LS-200P v.2
BLS7G2730S-200P_LS-200P v.2	20130603	Product data sheet	-	BLS7G2730S-200P_LS-200P v.1
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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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Date of release: 1 September 2015

Document identifier: BLS7G2730L-200P_LS-200P#4