BLC8G27LS-245AV

Power LDMOS transistor

Rev. 1 — 16 December 2014 — Product data sheet

1. Product profile

1.1 General description

240 W LDMOS packaged asymmetric Doherty power transistor for base station applications at frequencies from 2500 MHz to 2700 MHz.

Table 1. Typical performance

Typical RF performance at T_{case} = 25 °C in an asymmetrical Doherty demo board. V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V, unless otherwise specified.

Test signal	f	V_{DS}	$P_{L(AV)}$	G_p	η_D	ACPR
	(MHz)	(V)	(W)	(dB)	(%)	(dBc)
1-carrier W-CDMA	2500 to 2690	28	56	14.5	43	–35 [1]

[1] Test signal: 3GPP test model 1; 64 DPCH; PAR = 7.2 dB at 0.01% probability on CCDF per carrier.

1.2 Features and benefits

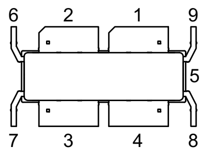
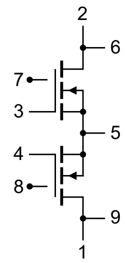
- Excellent ruggedness
- High-efficiency
- Low thermal resistance providing excellent thermal stability
- Designed for broadband operation (2500 MHz to 2700 MHz)
- Asymmetric design to achieve optimum efficiency across the band
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for base stations and multi carrier applications in the 2500 MHz to 2700 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain2 (peak)		 aaa-009150
2	drain1 (main)		
3	gate1 (main)		
4	gate2 (peak)		
5	source [1]		
6	video decoupling (main)		
7	n.c.		
8	n.c.		
9	video decoupling (peak)		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLC8G27LS-245AV	-	air cavity plastic earless flanged package; 8 leads	SOT1251-2

4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	65	V
$V_{GS(amp)main}$	main amplifier gate-source voltage		–0.5	+13	V
$V_{GS(amp)peak}$	peak amplifier 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, for details refer to the on-line MTF calculator.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 56 W; V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V	0.3	K/W

6. Characteristics

Table 6. DC characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Main device						
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.8 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	1.5	1.9	2.3	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 540 mA	1.6	2.1	2.4	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	-	30	-	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 = 180 mA	-	1.63	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 6.3 A	-	83	135	mΩ
Peak device						
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 2.2 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 220 mA	1.5	1.9	2.3	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 660 mA	1.6	2.1	2.4	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	-	40	-	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 = 220 mA	-	1.94	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.7 A	-	68	112	mΩ

Table 7. RF characteristics

Test signal: 1-carrier W-CDMA; PAR = 7.2 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1 to 64 DPCH; f_1 = 2500 MHz; f_2 = 2690 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V; T_{case} = 25 °C; unless otherwise specified; in an asymmetrical Doherty production test circuit in 2500 MHz to 2690 MHz.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 56 W	12.8	14	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 56 W	-	–10	–6	dB
η_D	drain efficiency	$P_{L(AV)}$ = 56 W	32	37	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 56 W	-	–25	–20	dBc

7. Test information

7.1 Ruggedness in class-AB operation

The BLC8G27LS-245AV is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V; P_L = 200 W; f = 2500 MHz.

7.2 Impedance information

Table 8. Typical impedance of main device

Measured load-pull data of main device; I_{Dq} = 1000 mA; V_{DS} = 28 V. Typical values unless otherwise specified.

f	Z_S [1]	Z_L [1]	P_L [2]	η_D [2]	G_p [2]
(MHz)	(Ω)	(Ω)	(W)	(%)	(dB)
Maximum power load					
2500	2.7 – j4.1	1.0 – j4.5	197	56.3	13.1
2600	2.7 – j5.2	1.0 – j4.5	196	56.3	14.1
2700	2.9 – j4.3	1.0 – j4.5	186	54.3	15.7
Maximum drain efficiency load					
2500	2.7 – j4.1	1.7 – j3.9	159	62.6	15.2
2600	2.7 – j5.2	1.5 – j3.7	144	61.2	16.5
2700	2.9 – j4.3	1.4 – j4.1	149	58.5	17.2

[1] Z_S and Z_L defined in Figure 1.

[2] at 3 dB gain compression.

Table 9. Typical impedance of peak device

Measured load-pull data of peak device; I_{Dq} = 1230 mA; V_{DS} = 28 V. Typical values unless otherwise specified.

f	Z_S [1]	Z_L [1]	P_L [2]	η_D [2]	G_p [2]
(MHz)	(Ω)	(Ω)	(W)	(%)	(dB)
Maximum power load					
2500	2.5 – j5.6	2.1 – j4.9	256	53.3	13.7
2600	3.9 – j5.1	2.1 – j4.9	254	53.8	14.4
2700	3.4 – j4.2	2.6 – j5.1	240	53.3	15.9
Maximum drain efficiency load					
2500	2.5 – j5.6	2.0 – j2.9	187	62.1	16.0
2600	3.9 – j5.1	1.8 – j3.1	177	60.4	16.9
2700	3.4 – j4.2	1.8 – j3.5	174	59.5	18.1

[1] Z_S and Z_L defined in Figure 1.

[2] at 3 dB gain compression.

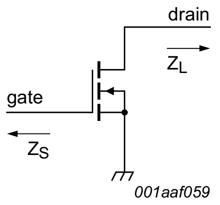
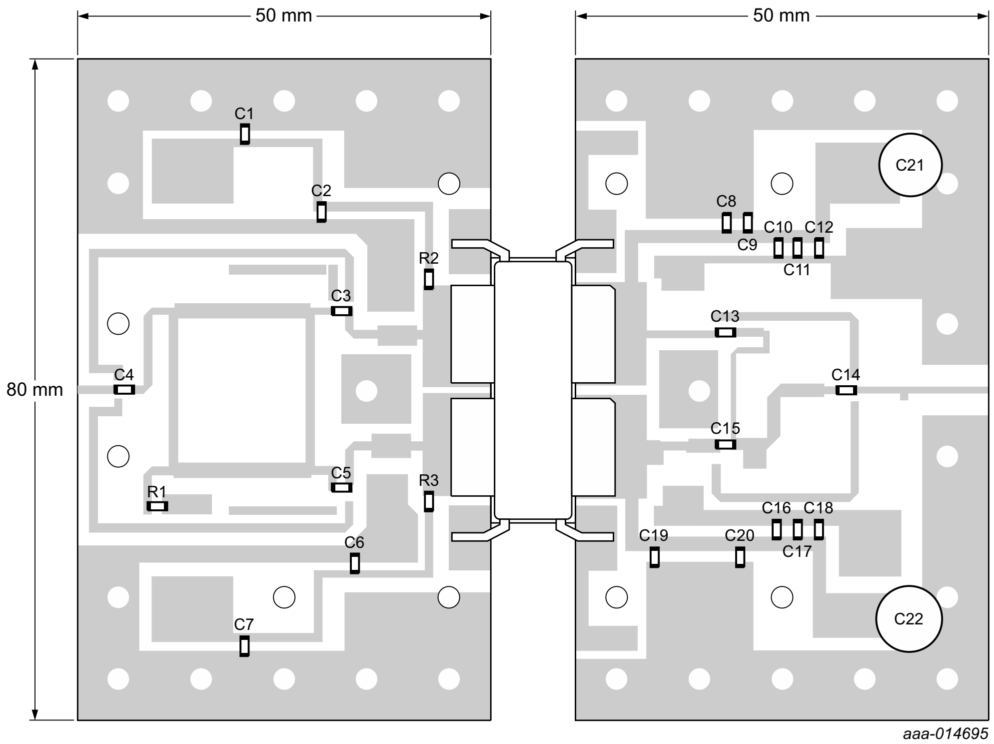


Fig 1. Definition of transistor impedance

7.3 VBW in Doherty operation

The BLC8G27LS-245AV shows 110 MHz (typical) video band-width in Doherty demo board in 2600 MHz at V_{DS} = 28 V; I_{Dq} = 500 mA and $V_{GS(amp)peak}$ = 0.5 V.

7.4 Test circuit



Printed-Circuit Board (PCB): Rogers RO4350B with a thickness of 0.508 mm.

See Table 10 for a list of components.

Fig 2. Component layout

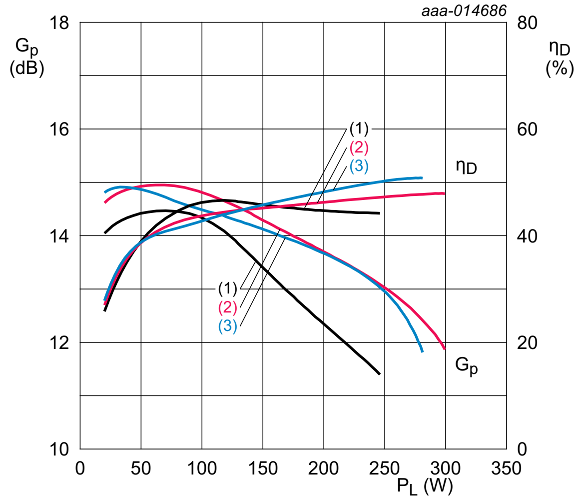
Table 10. List of components

For test circuit see Figure 2.

Component	Description	Value	Remarks
C1, C7	multilayer ceramic chip capacitor	0.1 μF, 50 V	Murata
C2, C3, C4, C5, C6, C8, C9, C13, C14, C15, C19, C20	multilayer ceramic chip capacitor	22 pF	ATC 600A
C10, C11, C12, C16, C17, C18	multilayer ceramic chip capacitor	4.7 μF, 50 V	Murata
C21, C22	electrolytic capacitor	2200 μF, 63 V	
R1	resistor	50 Ω	
R2, R3	chip resistor	9.1 Ω	SMD 0805

7.5 Graphical data

7.5.1 CW



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

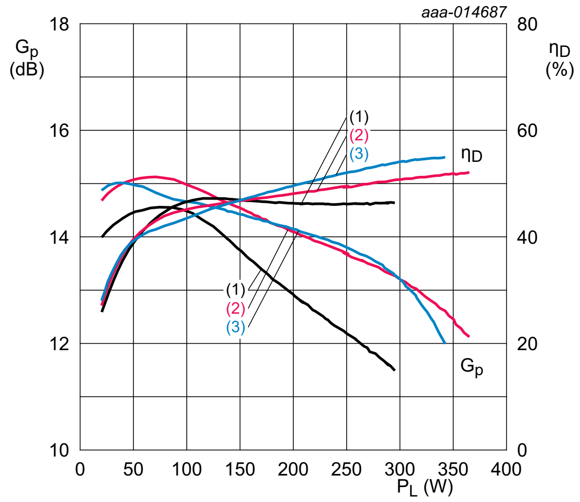
(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

Fig 3. Power gain and drain efficiency as function of output power; typical values

7.5.2 CW pulsed



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V; t_p = 100 μs; δ = 10 %

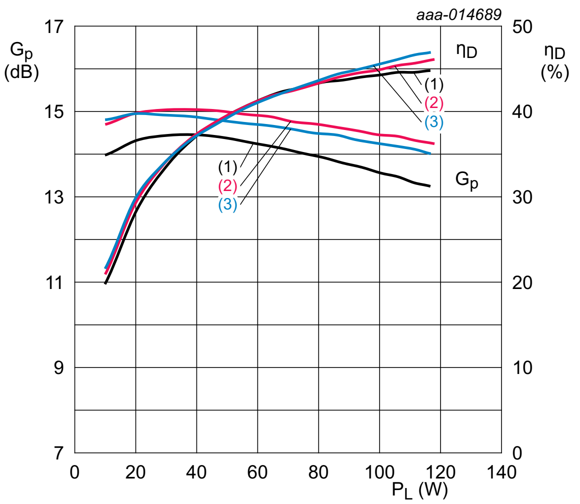
(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

Fig 4. Power gain and drain efficiency as function of output power; typical values

7.5.3 1-Carrier W-CDMA



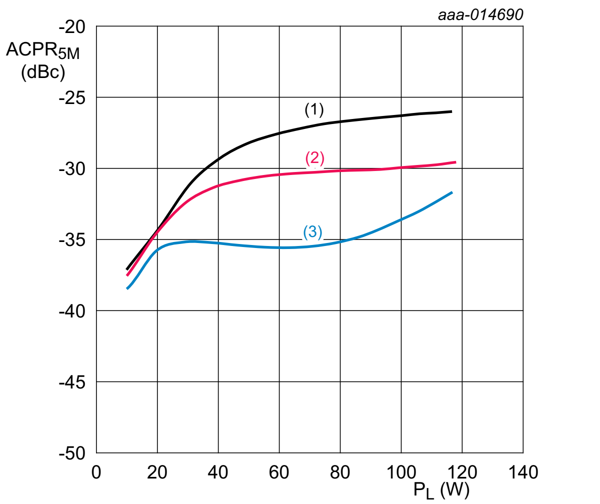
V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

Fig 5. Power gain and drain efficiency as function of output power; typical values



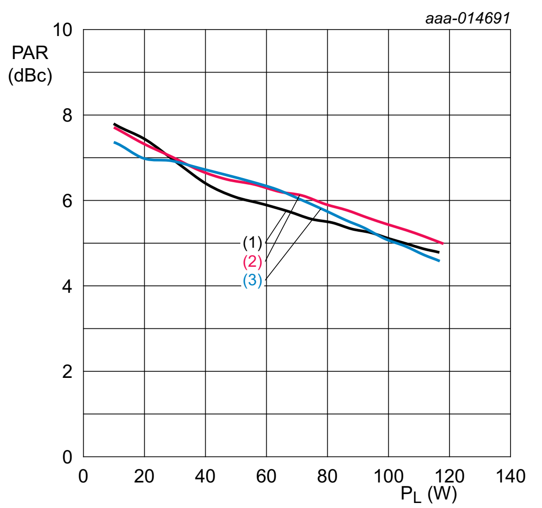
V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

Fig 6. Adjacent channel power ratio (5 MHz) as a function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

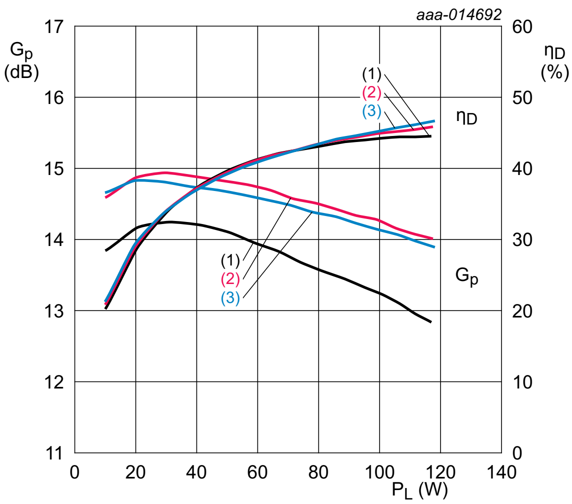
(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

Fig 7. Peak-to-average ratio as a function of output power; typical values

7.5.4 2-Carrier W-CDMA



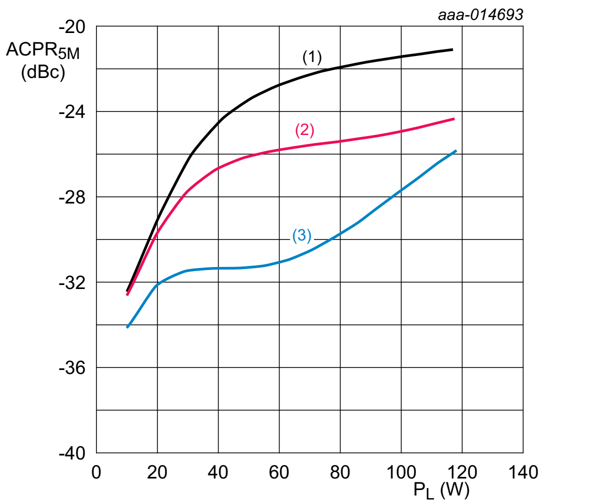
V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

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



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

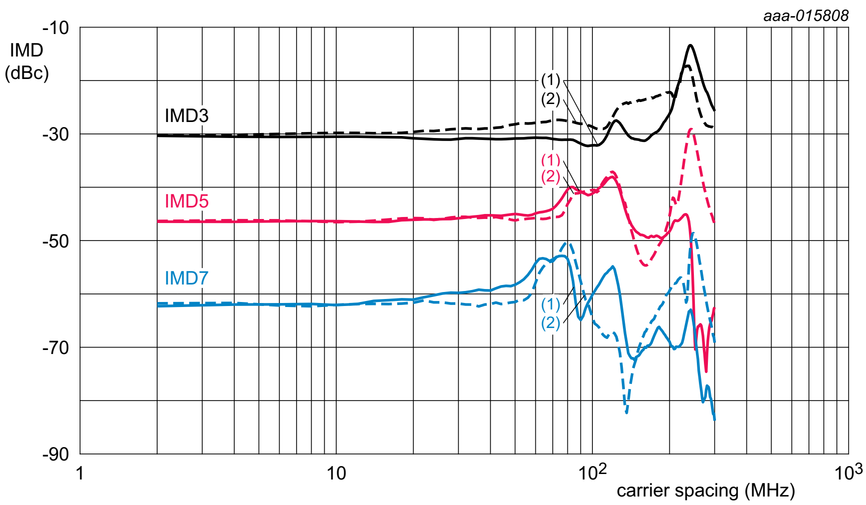
(1) f = 2500 MHz

(2) f = 2600 MHz

(3) f = 2690 MHz

Fig 9. Adjacent channel power ratio (5 MHz) as a function of output power; typical values

7.5.5 2-Tone VBW



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.5 V.

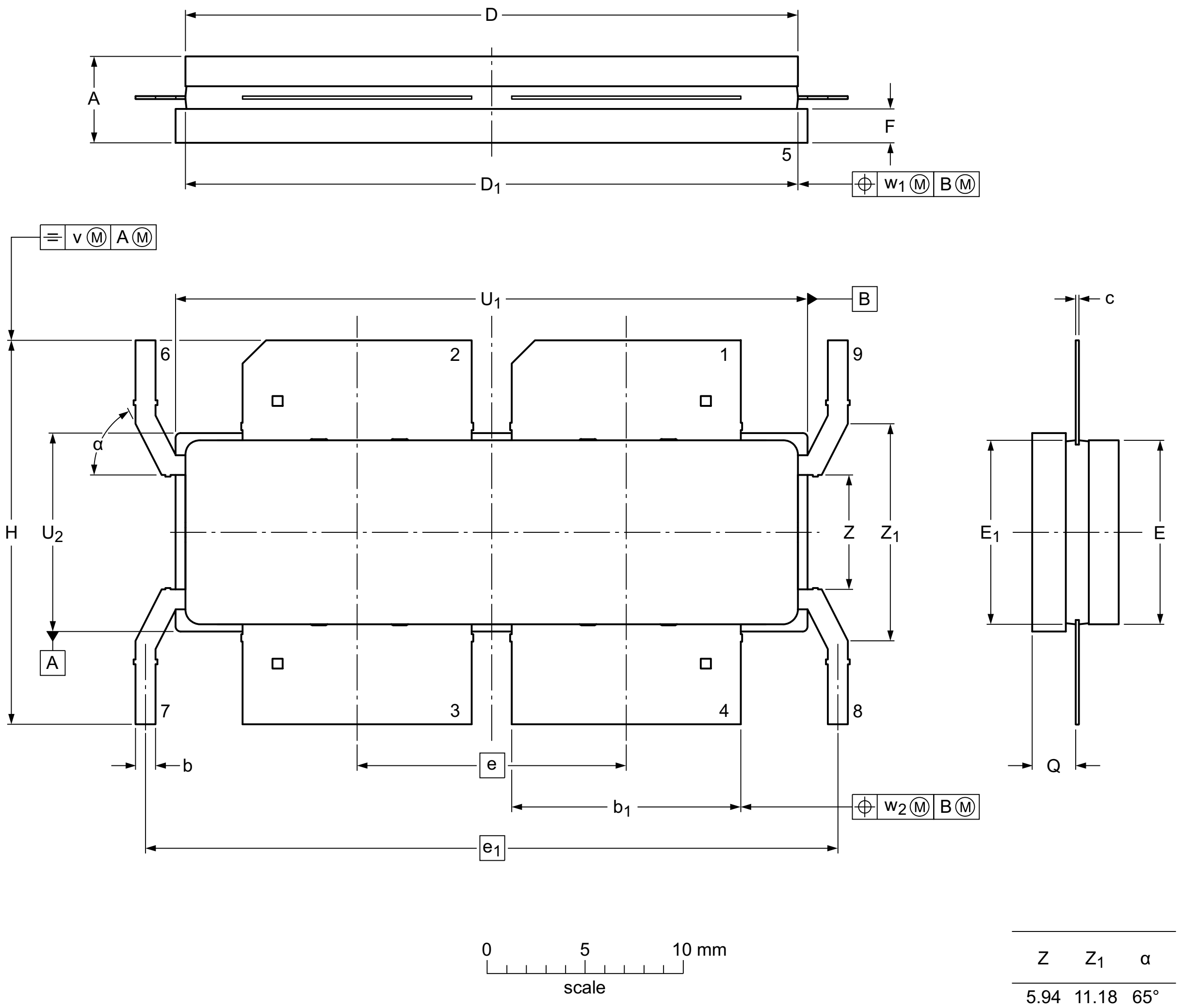
(1) IMD low

(2) IMD high

Fig 10. VBW capability in Doherty demo board

8. Package outline

Air cavity plastic earless flanged package; 8 leads **SOT1251-2**



Z	Z_1	α
5.94	11.18	65°
5.74	10.97	61°

Dimensions

Unit[1]		A	b	b_1	c	D	D_1	E	E_1	e	e_1	F	H	Q	U_1	U_2	v	w_1	w_2
	max	4.65	1.12	11.78	0.20	31.44	31.34	9.60	9.50			1.83	19.71	2.33	32.33	10.23			
mm	nom									13.72	35.31						0.50	0.50	0.50
	min	4.18	0.91	11.58	0.10	31.04	31.14	9.20	9.30			1.63	19.51	2.13	32.13	10.03			

sot1251-2_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1251-2						~~14-01-13~~ 14-01-31

Fig 11. Package outline SOT1251-2

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
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MTF	Median Time to Failure
PAR	Peak-to-Average Ratio
SMD	Surface Mounted Device
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLC8G27LS-245AV v.1	20141216	Product 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

Date of release: 16 December 2014
Document identifier: BLC8G27LS-245AV