BLM10D2327-60ABG

LDMOS 2-stage integrated Doherty MMIC

AMPLEON

Rev. 1 — 9 January 2020

Product data sheet

1. Product profile

1.1 General description

The BLM10D2327-60ABG is a 2-stage fully integrated Doherty MMIC solution using Ampleon's state of the art GEN10 LDMOS MMIC technology. The carrier and peaking device, input splitter and output combiner are integrated in a single package. This device is perfectly suited as general purpose driver or mMIMO final in the frequency range from 2300 MHz to 2700 MHz. Available in gull wing.

Table 1. Application performance

Typical RF performance at T_{case} = 25 °C; I_{Dq} = 70 mA (carrier and peaking); $V_{GSq(peaking)} = V_{GSq(carrier)} - 0.47$ V. Test signal: 1-carrier W-CDMA 5 MHz; PAR = 9.9 dB; measured in an Ampleon f = 2300 MHz to 2700 MHz frequency band application circuit.

Test signal	f	V_{DS}	$P_{L(AV)}$	G_p	η_D	$P_{L(M)}$
	(MHz)	(V)	(dBm)	(dB)	(%)	(dBm)
1-carrier W-CDMA 5 MHz PAR 9.9 dB	2500	28	40	28.2	40.8	48.9

1.2 Features and benefits

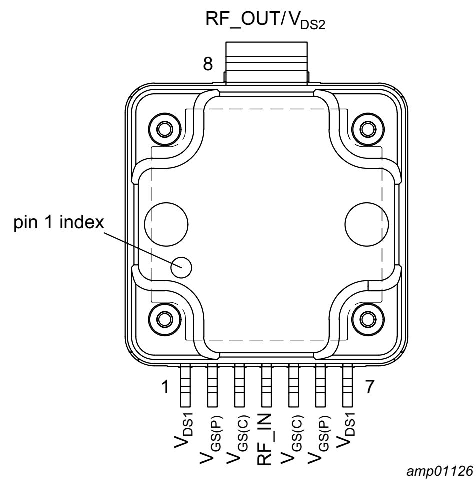
- Integrated input splitter
- Integrated output combiner
- High efficiency
- High output impedance thanks to integrated pre-match
- Designed for wideband operation (frequency 2300 MHz to 2700 MHz)
- Integrated temperature compensation bias
- Independent control of carrier and peaking bias
- Integrated ESD protection
- Source impedance 50 Ω; high power gain
- For RoHS compliance see the product details on the Ampleon website

1.3 Applications

- RF power MMIC for multi-carrier and multi-standard GSM, W-CDMA and LTE base stations in the 2300 MHz to 2700 MHz frequency range

2. Pinning information

2.1 Pinning



Transparent top view

The exposed backside of the package is the ground terminal of the device.

Fig 1. Pin configuration

2.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
V_{DS1}	1	drain-source voltage of driver stages
$V_{GS(P)}$	2	gate-source voltage of peaking P
$V_{GS(C)}$	3	gate-source voltage of carrier C
RF_IN	4	RF input
$V_{GS(C)}$	5	gate-source voltage of carrier C
$V_{GS(P)}$	6	gate-source voltage of peaking P
V_{DS1}	7	drain-source voltage of driver stages
RF_OUT/V_{DS2}	8	RF output / drain-source voltage of final stages
GND	flange	RF ground

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLM10D2327-60ABG		plastic, heatsink small outline package; 8 leads	OMP-400-8G-1

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4. Block diagram

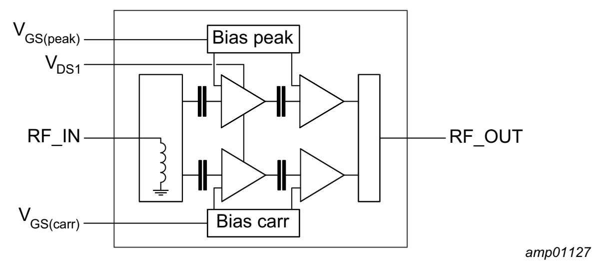

Fig 2. Block diagram

5. 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		–0.5	+65	V
V_{GS}	gate-source voltage		–6	+9	V
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature	[1]	-	200	°C
T_{case}	case temperature	[1]	-	150	°C

[1] Continuous use at maximum temperature will affect the reliability. For details refer to the online MTF calculator.

6. Thermal characteristics

Table 5. Thermal characteristics

Measured for total device.

Symbol	Parameter	Conditions	Value	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	T_{case} = 90 °C; P_L = 5 W [1]	2.19	K/W
		T_{case} = 90 °C; P_L = 10 W [1]	1.63	K/W

[1] When operated with a 1-carrier W-CDMA with PAR = 9.9 dB.

7. Characteristics

Table 6. DC characteristics

T_{case} = 25 °C.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Carrier						
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 80 mA	1.7	2.25	2.55	V
I_{GSS}	gate leakage current	V_{GS} = 1 V; V_{DS} = 0 V	-	-	140	nA
Peaking						
I_{GSS}	gate leakage current	V_{GS} = 1 V; V_{DS} = 0 V	-	-	140	nA

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Table 6. DC characteristics *...continued*

T_{case} = 25 °C.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Final stages						
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	1.4	μA
Driver stages						
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	1.4	μA

Table 7. RF Characteristics

Typical RF performance at T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq} = 80 mA (carrier); $V_{GSq(peaking)}$ = $V_{GSq(carrier)}$ − 0.44 V; $P_{L(AV)}$ = 10 W; f = 2500 MHz measured in an Ampleon production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain		26.3	28.3	30.3	dB
η_D	drain efficiency	P_L = 10 W (40 dBm)	40	42.8	-	%
		P_L = $P_{L(5dB)}$	39.5	42.3	-	%
RL_{in}	input return loss		-	-	−10	dB
$P_{L(M)}$	peak output power	at 5 dB compression	47.8	48.5	-	dBm

8. Application information

Table 8. Typical performance

T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq} = 70 mA (driver and final stages). Test signal: 1-carrier LTE 20 MHz; PAR = 7.6 dB at 0.01 % probability CCDF; typical performance in an Ampleon f = 2300 MHz to 2700 MHz frequency band asymmetrical integrated Doherty application circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(3dB)}$	output power at 3 dB compression point	f = 2500 MHz [1]	-	48.4	-	dBm
$P_{L(5dB)}$	output power at 5 dB compression point	f = 2500 MHz [1]	-	48.7	-	dBm
$\varphi_{s21}/\varphi_{s21(norm)}$	normalized phase response	f = 2500 MHz; at 3 dB compression point [2]	-	−34	-	°
η_D	drain efficiency	8 dB OBO ($P_{L(AV)}$ = 40 dBm); f = 2500 MHz	-	42.6	-	%
G_p	power gain	$P_{L(AV)}$ = 40 dBm; f = 2500 MHz	-	28.4	-	dB
B_{video}	video bandwidth	$P_{L(AV)}$ = 39 dBm; set to obtain IMD3 = −30 dBc; 2-tone CW; f = 2500 MHz	-	400	-	MHz
G_{flat}	gain flatness	$P_{L(AV)}$ = 40 dBm; from 2300 MHz to 2700 MHz	-	1	-	dB
$ACPR_{20M}$	adjacent channel power ratio (20 MHz)	$P_{L(AV)}$ = 40 dBm; f = 2500 MHz	-	−33	-	dB
$\Delta G/\Delta T$	gain variation with temperature	f = 2500 MHz [3]	-	0.05	-	dB/°C
K	Rollett stability factor	T_{case} = −40 °C; f = 0.1 GHz to 6.1 GHz [3]	-	>1	-	

[1] Pulsed CW power sweep measurement (δ = 10 %; t_p = 100 μs).

[2] 25 ms CW power sweep measurement.

[3] S-parameters measured with broadband demo board.

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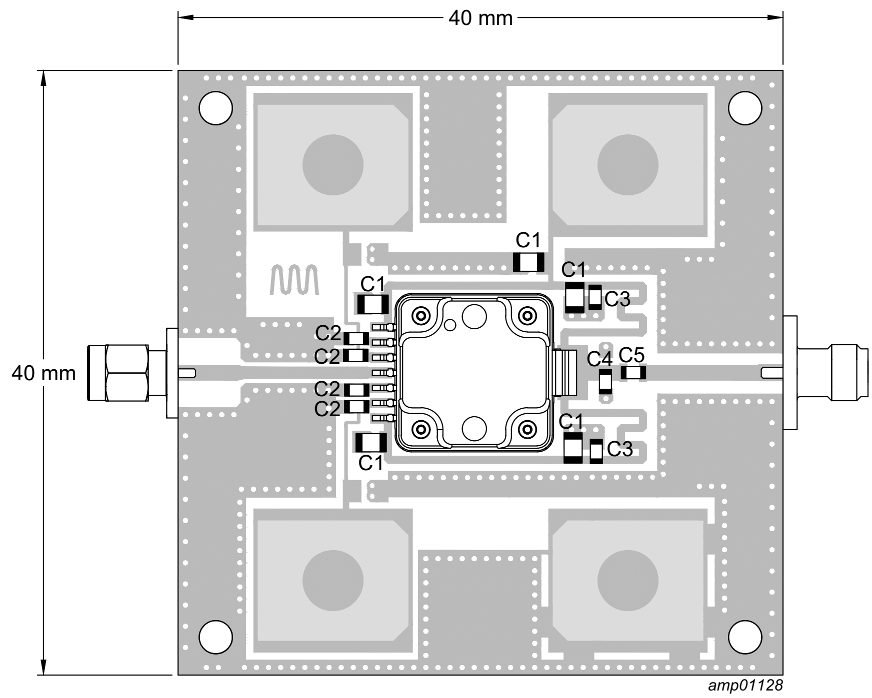

Printed-Circuit Board (PCB): Rogers 4350; thickness = 0.508 mm.

Fig 3. Component layout

Table 9. Demo test circuit list of components

See Figure 3 for component layout.

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	10 µF, 50 V	SMD 0805
C2	multilayer ceramic chip capacitor	4.7 µF, 6.3 V	SMD 0603
C3	multilayer ceramic chip capacitor	5.6 pF	SMD 0603
C4	multilayer ceramic chip capacitor	1.6 pF	SMD 0603
C5	multilayer ceramic chip capacitor	3.9 pF	SMD 0603

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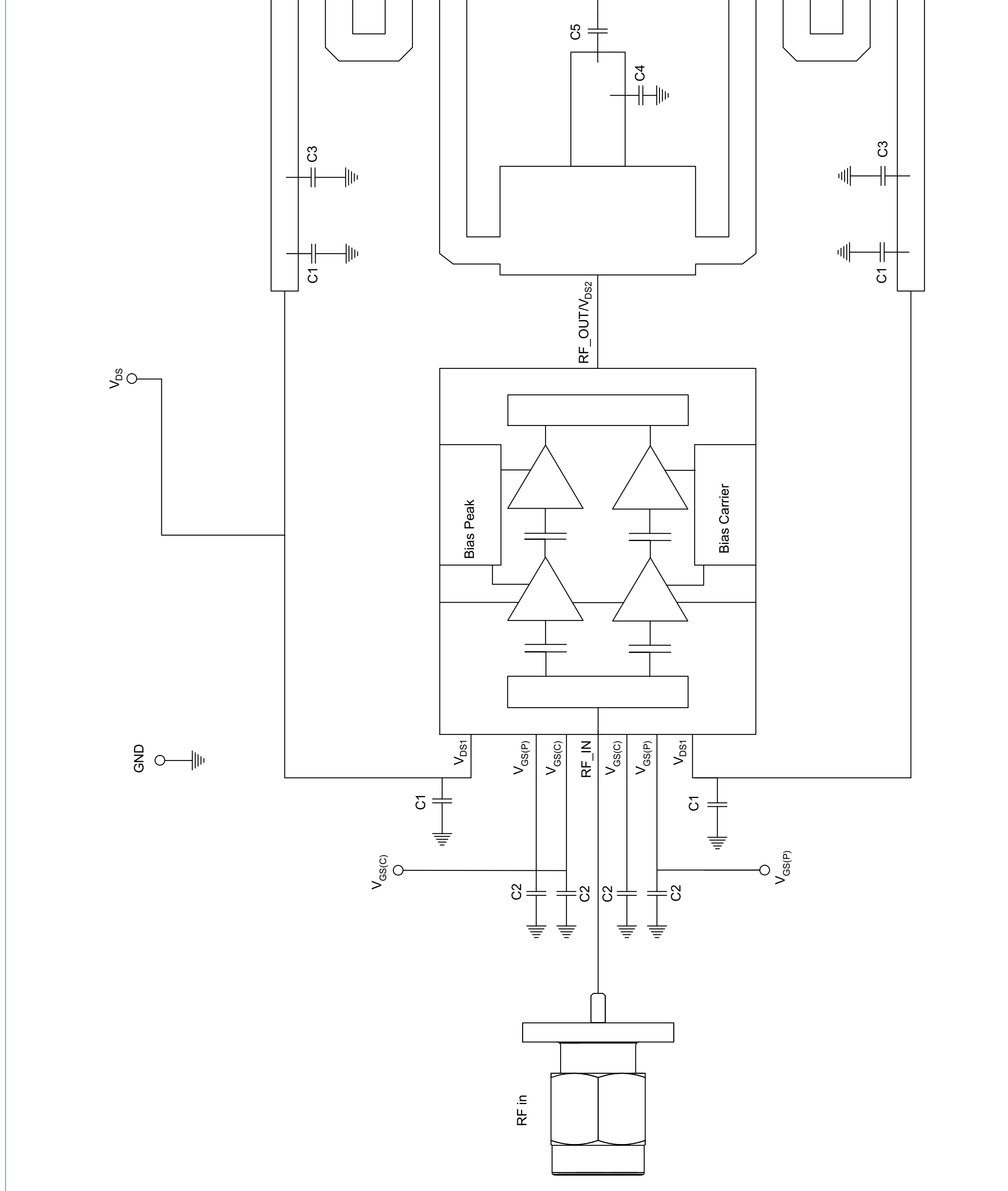

Fig 4. Electrical schematic

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8.1 Ruggedness in a Doherty operation

The BLM10D2327-60ABG is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 32 V; I_{Dq} = 80 mA (carrier); $V_{GSq(peaking)}$ = $V_{GSq(carrier)}$ – 0.48 V; corresponding to $P_{L(3dB)}$ – 5 dB under Z_S = 50 Ω load; f = 2700 MHz (1-carrier W-CDMA signal); T_{case} = 25 °C.

8.2 Impedance information

Table 10. Typical impedance for optimum Doherty operation

Measured load-pull data per section; test signal: pulsed CW; T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq} = 90 mA (carrier); $V_{GSq(peaking)}$ = $V_{GSq(carrier)}$ – 0.44 V; t_p = 100 μs; δ = 10 %. Typical values.

	tuned for optimum Doherty operation				
f	Z_L	$G_{p(max)}$	P_L	η_{add} [1]	η_{add} [2]
(MHz)	(Ω)	(dB)	(dBm)	(%)	(%)
2300	12.5 – j13.0	28.2	48.3	46.3	49.2
2400	14.4 – j12.2	28.2	48.2	47.5	47.5
2500	12.6 – j10.9	28.0	48.3	48.7	46.8
2600	10.5 – j10.3	28.0	48.6	50.8	47.3
2700	10.6 – j10.3	27.7	48.7	50.5	46.0

[1] At 3 dB gain compression point.

[2] At P_L = 40 dBm.

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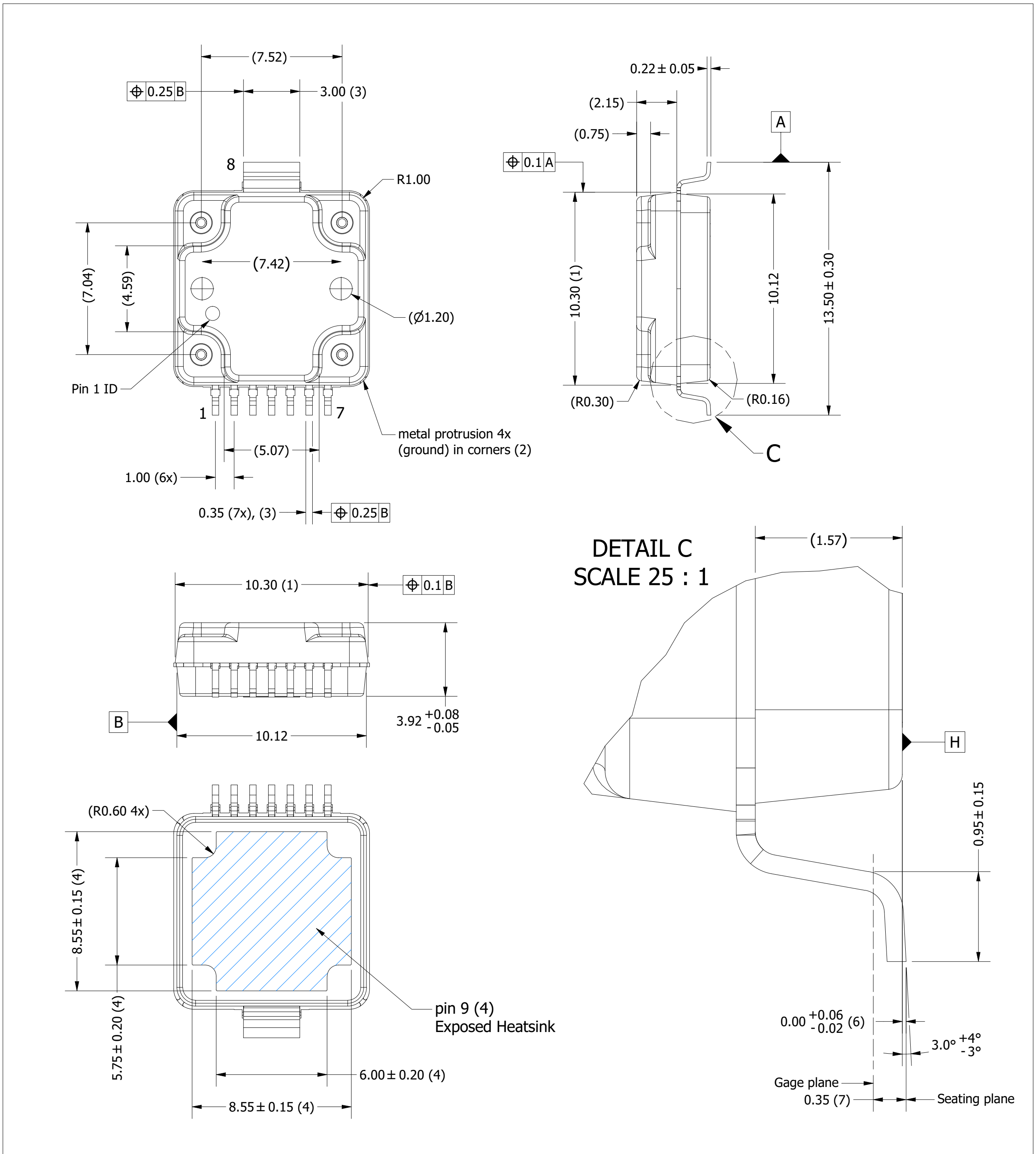
9. Package outline

OMP-400-8G-1



Package outline drawing:	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: ± 1°	Revision: 1 Revision date: 11/26/2019
OMP-400-8G-1		Third angle projection	Sheet 1 of 2

Fig 5. Package outline OMP-400-8G-1 (sheet 1 of 2)

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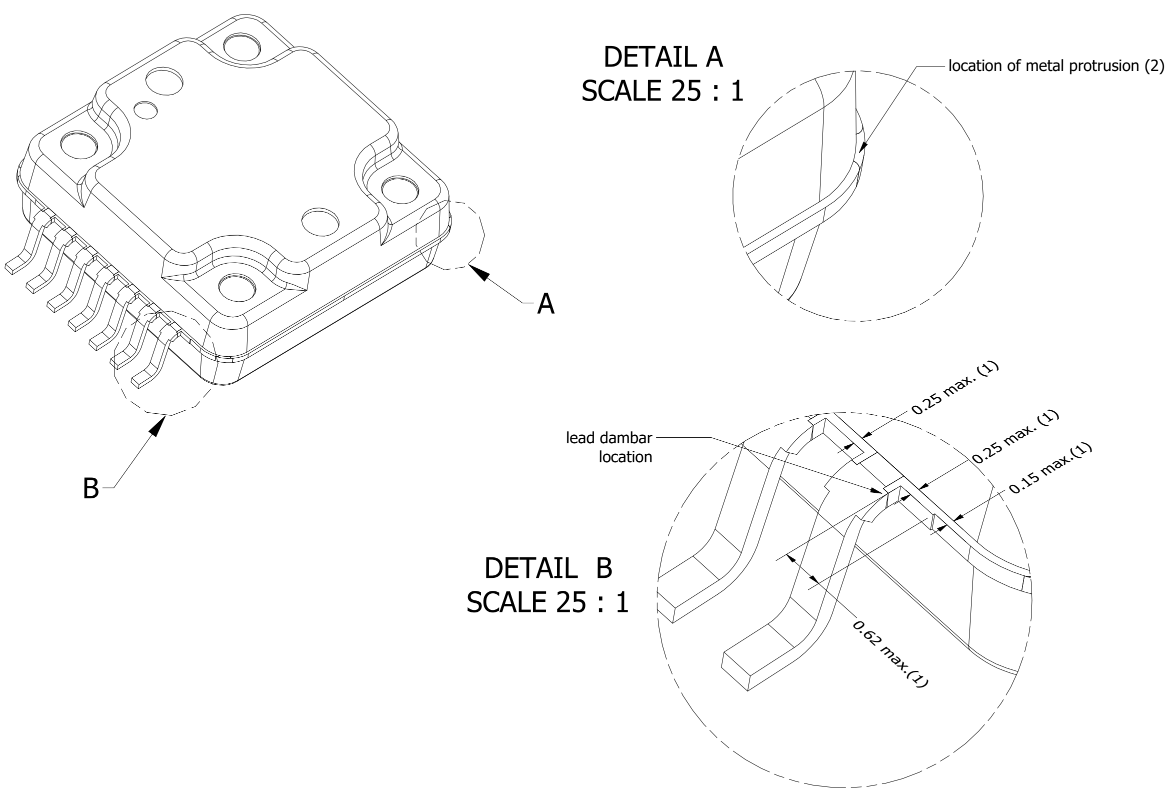
OMP-400-8G-1

Drawing Notes

Items	Description
(1)	Dimensions are excluding mold protrusion. Areas located adjacent to the leads have a maximum mold protrusion of 0.25 mm (per side) and 0.62 mm max. in length. In between the 7 leads the protrusion is 0.25 mm max. At all other areas the mold protrusion is maximum 0.15 mm per side. See also detail B.
(2)	The metal protrusion (tie bars) in the corner will not stick out of the molding compound protrusions (detail A).
(3)	The lead dambar (metal) protrusions are not included. Add 0.14 mm max to the total lead dimension at the dambar location.
(4)	The hatched area indicates the exposed heatsink. The dimensions represent the values between two opposite points along the original heatsink perimeter.
(5)	The leads and exposed heatsink are plated with matte Tin (Sn).
(6)	Dimension is measured with respect to the bottom of the heatsink Datum H. Positive value means that the bottom of the heatsink is higher than the bottom of the lead.
(7)	Gage plane (foot length) to be measured from the seating plane.



Package outline drawing: OMP-400-8G-1	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: ± 1°	Revision: 1 Revision date: 11/26/2019
		Third angle projection	Sheet 2 of 2

Fig 6. Package outline OMP-400-8G-1 (sheet 2 of 2)

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10. 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.

Table 11. ESD sensitivity

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C3 [1]
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	1C [2]

[1] CDM classification C3 is granted to any part that passes after exposure to an ESD pulse of 1000 V.

[2] HBM classification 1C is granted to any part that passes after exposure to an ESD pulse of 1000 V.

11. Abbreviations

Table 12. Abbreviations

Acronym	Description
CW	Continuous Wave
ESD	ElectroStatic Discharge
GEN10	Tenth Generation
GSM	Global System for Mobile Communications
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LTE	Long Term Evolution
mMIMO	Massive Multiple Input-Multiple Output
MMIC	Monolithic Microwave Integrated Circuit
MTF	Median Time to Failure
OBO	Output Back Off
PAR	Peak-to-Average Ratio
RoHS	Restriction of Hazardous Substances
SMD	Surface Mounted Device
W-CDMA	Wideband Code Division Multiple Access

12. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLM10D2327-60ABG v.1	20200109	Product data sheet	-	-

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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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Date of release: 9 January 2020
Document identifier: BLM10D2327-60ABG

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