

BLM10D2327-60ABG

LDMOS 2-stage integrated Doherty MMIC

Rev. 1 — 9 January 2020

AMPLEON

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 $T_{case} = 25\text{ }^{\circ}\text{C}$; $I_{DQ} = 70\text{ mA}$ (carrier and peaking); $V_{GSQ(peak)} = V_{GSQ(carrier)} - 0.47\text{ V}$. Test signal: 1-carrier W-CDMA 5 MHz; PAR = 9.9 dB; measured in an Ampleon $f = 2300\text{ MHz}$ 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

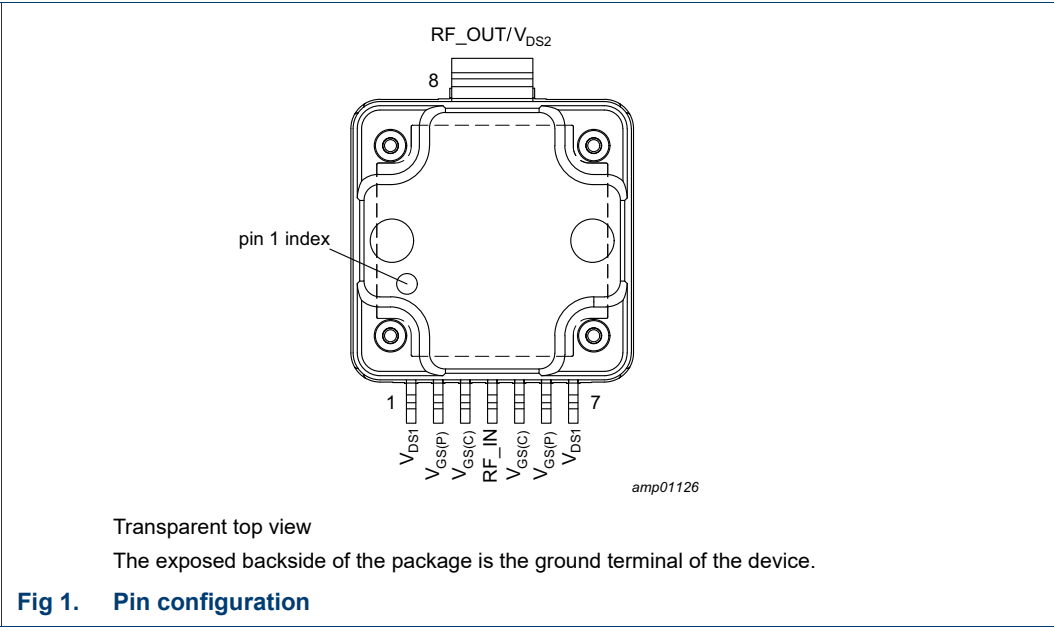
- Integrated input splitter
- Integrated output combiner
- High efficiency
- High output impedance thanks to integrated pre-match
- Designed for wideband operation (frequency 2300 MHz to 2700 MHz)
- Integrated temperature compensation bias
- Independent control of carrier and peaking bias
- Integrated 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



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

4. Block diagram

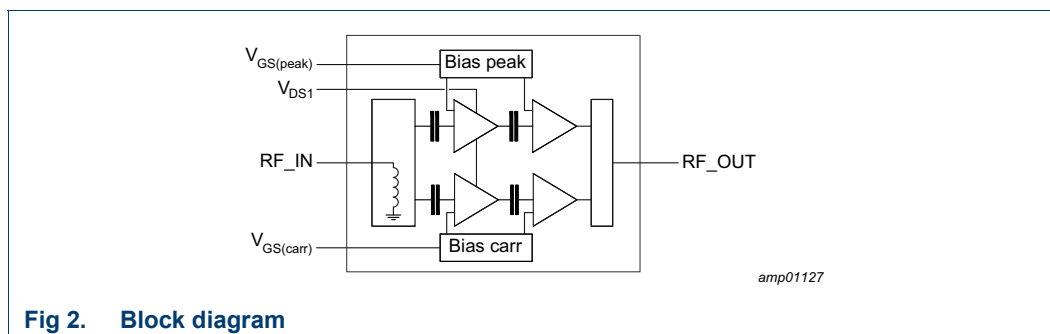


Fig 2. Block diagram

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	$T_{case} = 90\text{ °C}; P_L = 5\text{ W}$	[1]	2.19 K/W
		$T_{case} = 90\text{ °C}; P_L = 10\text{ W}$	[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

$T_{case} = 25\text{ °C}$.

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

Table 6. DC characteristics ...continued

$T_{case} = 25\text{ }^{\circ}\text{C}$.

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

Table 7. RF Characteristics

Typical RF performance at $T_{case} = 25\text{ }^{\circ}\text{C}$; $V_{DS} = 28\text{ V}$; $I_{DQ} = 80\text{ mA}$ (carrier);

$V_{GSQ(peak)} = V_{GSQ(carrier)} - 0.44\text{ V}$; $P_{L(AV)} = 10\text{ W}$; $f = 2500\text{ MHz}$ 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	$P_L = 10\text{ W}$ (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

$T_{case} = 25\text{ }^{\circ}\text{C}$; $V_{DS} = 28\text{ V}$; $I_{DQ} = 70\text{ mA}$ (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 $f = 2300\text{ MHz}$ 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	$f = 2500\text{ MHz}$ [1]	-	48.4	-	dBm
$P_{L(5dB)}$	output power at 5 dB compression point	$f = 2500\text{ MHz}$ [1]	-	48.7	-	dBm
$\phi_{s21}/\phi_{s21(norm)}$	normalized phase response	$f = 2500\text{ MHz}$; at 3 dB compression point [2]	-	-34	-	$^{\circ}$
η_D	drain efficiency	8 dB OBO ($P_{L(AV)} = 40\text{ dBm}$); $f = 2500\text{ MHz}$	-	42.6	-	%
G_p	power gain	$P_{L(AV)} = 40\text{ dBm}$; $f = 2500\text{ MHz}$	-	28.4	-	dB
B_{video}	video bandwidth	$P_{L(AV)} = 39\text{ dBm}$; set to obtain IMD3 = -30 dBc; 2-tone CW; $f = 2500\text{ MHz}$	-	400	-	MHz
G_{flat}	gain flatness	$P_{L(AV)} = 40\text{ dBm}$; from 2300 MHz to 2700 MHz	-	1	-	dB
$ACPR_{20M}$	adjacent channel power ratio (20 MHz)	$P_{L(AV)} = 40\text{ dBm}$; $f = 2500\text{ MHz}$	-	-33	-	dB
$\Delta G/\Delta T$	gain variation with temperature	$f = 2500\text{ MHz}$ [3]	-	0.05	-	dB/ $^{\circ}\text{C}$
K	Rollett stability factor	$T_{case} = -40\text{ }^{\circ}\text{C}$; $f = 0.1\text{ GHz}$ to 6.1 GHz [3]	-	>1	-	

[1] Pulsed CW power sweep measurement ($\delta = 10\%$; $t_p = 100\text{ }\mu\text{s}$).

[2] 25 ms CW power sweep measurement.

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

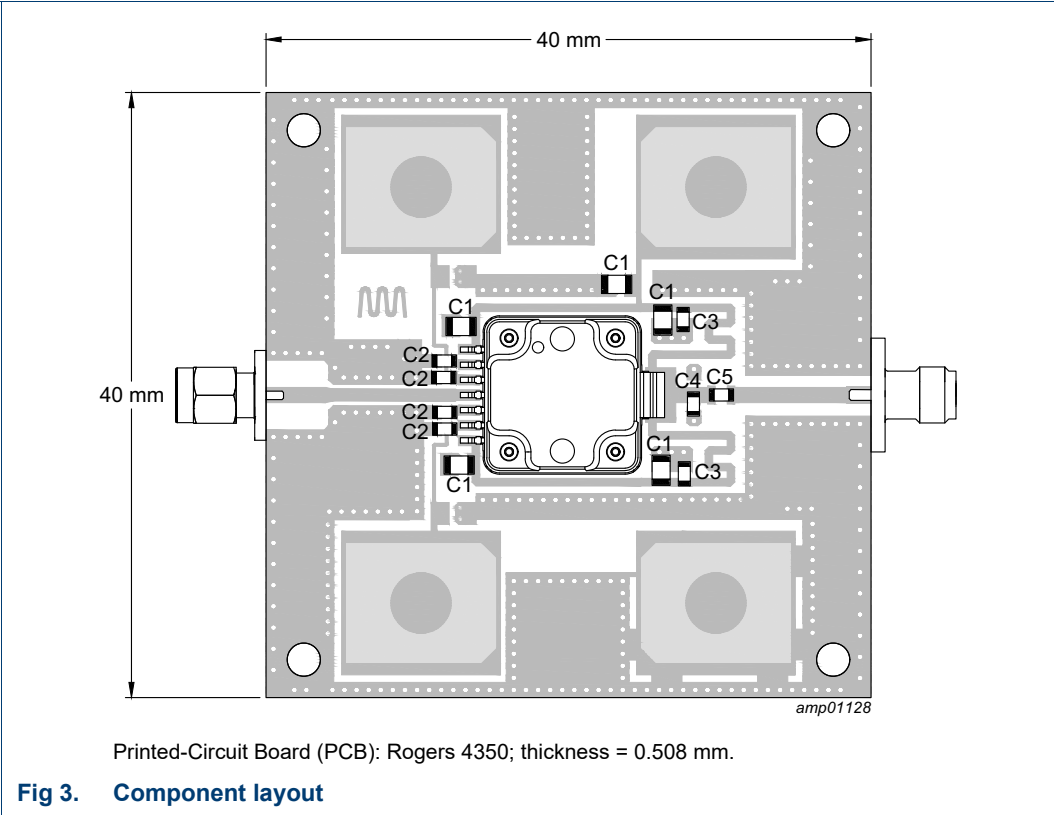


Table 9. Demo test circuit list of components
See [Figure 3](#) for component layout.

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	10 μ F, 50 V	SMD 0805
C2	multilayer ceramic chip capacitor	4.7 μ F, 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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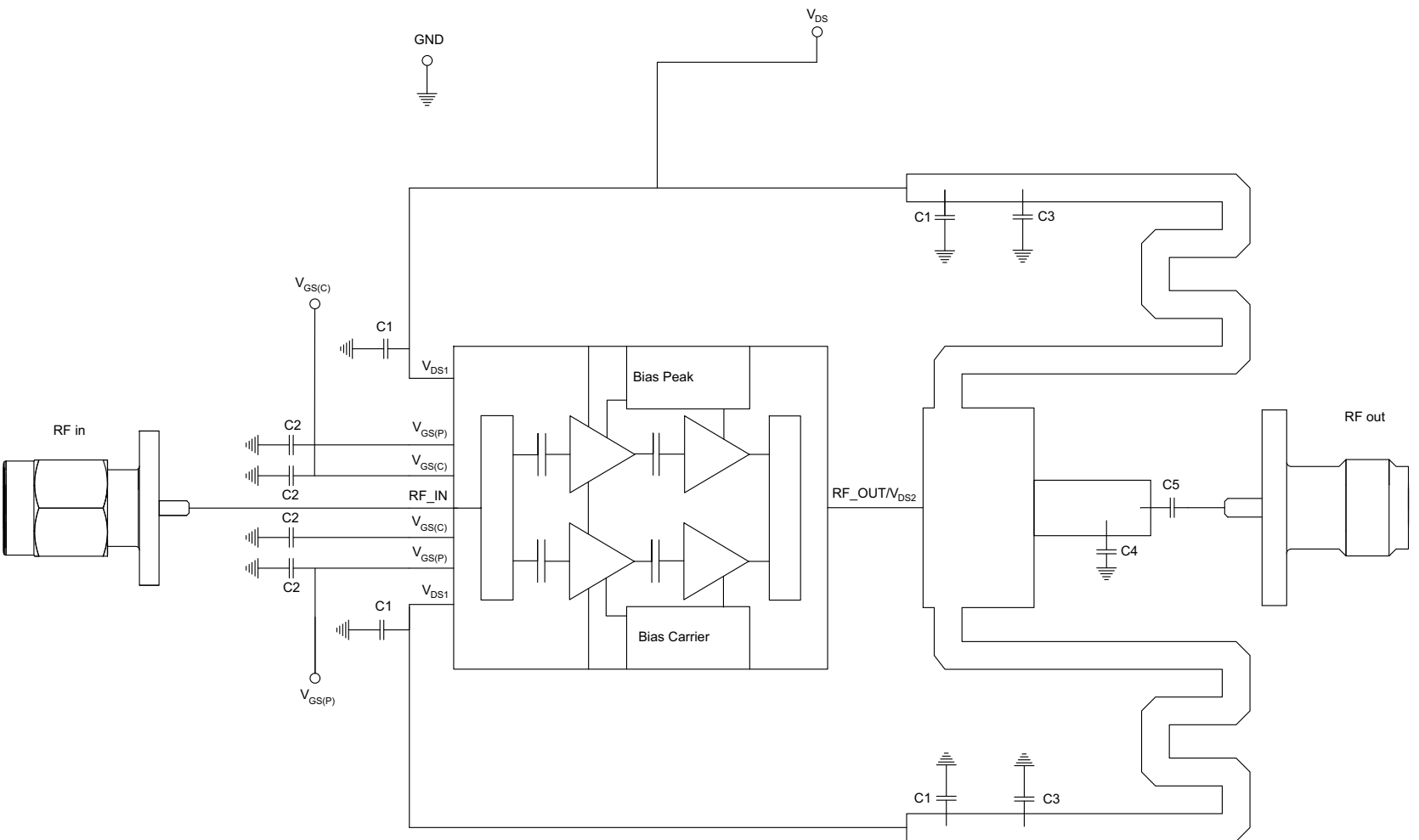


Fig 4. Electrical schematic

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); $V_{GSq(peak)} = V_{GSq(carrier)} - 0.48$ V; corresponding to $P_{L(3dB)} - 5$ dB under $Z_S = 50 \Omega$ 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); $V_{GSq(peak)} = V_{GSq(carrier)} - 0.44$ V; $t_p = 100$ μ s; $\delta = 10$ %. Typical values.

f (MHz)	tuned for optimum Doherty operation				
	Z_L (Ω)	$G_{p(max)}$ (dB)	P_L (dBm)	η_{add} [1] (%)	η_{add} [2] (%)
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.

9. Package outline

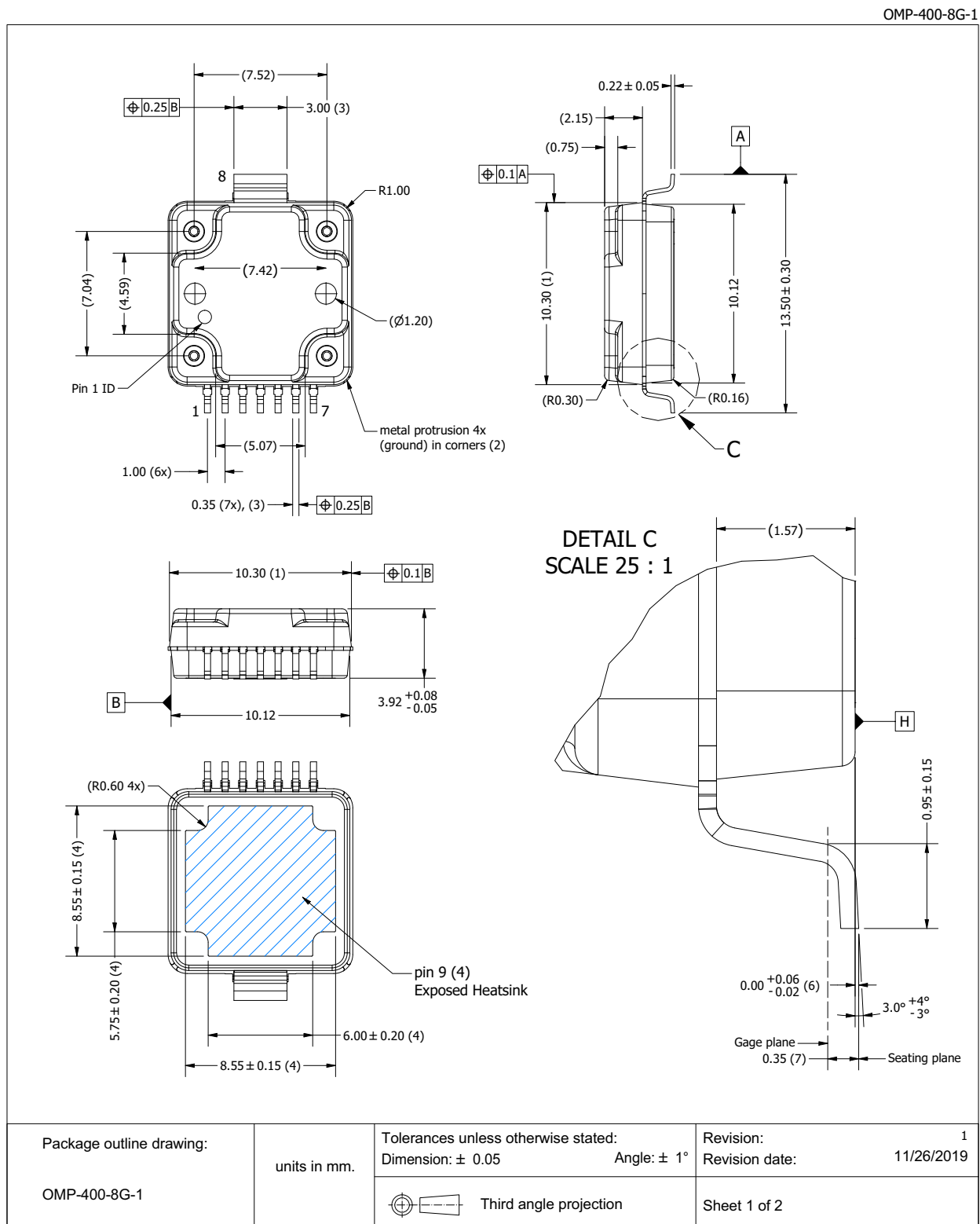
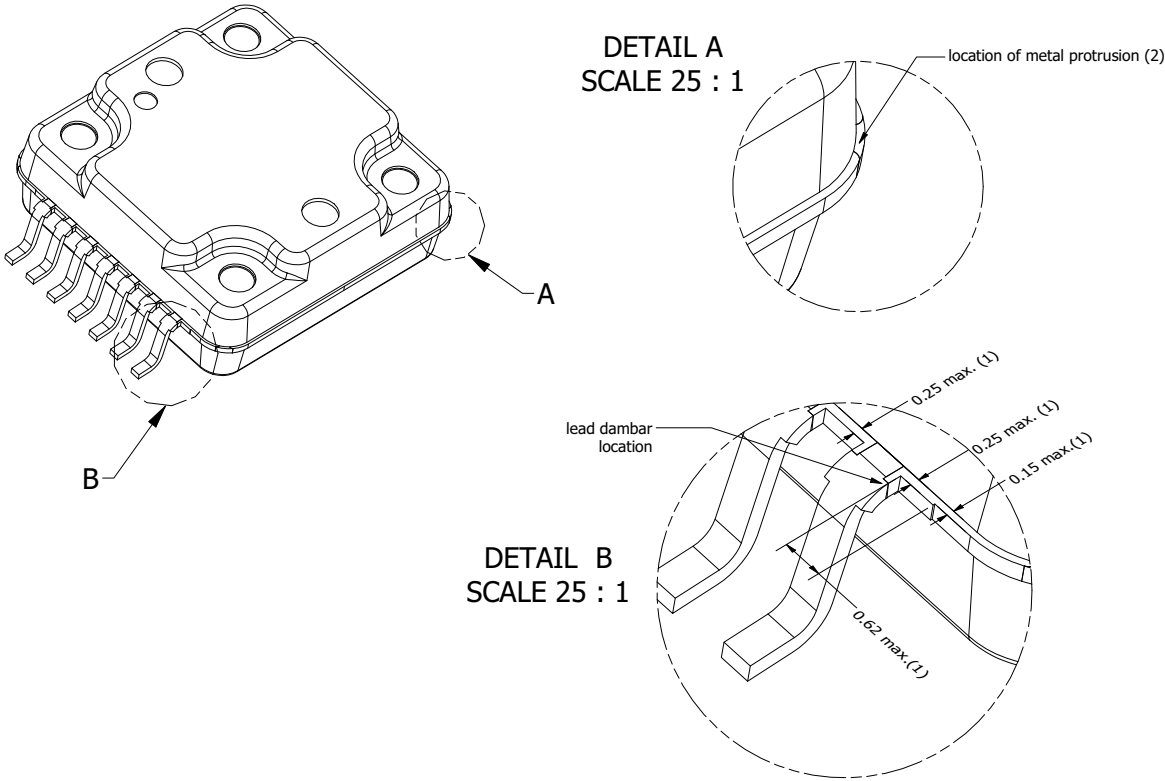


Fig 5. Package outline OMP-400-8G-1 (sheet 1 of 2)

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:	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: $\pm 1^\circ$	Revision: 1 Revision date: 11/26/2019
OMP-400-8G-1		 Third angle projection	Sheet 2 of 2

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

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	-	-

13. Legal information

13.1 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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15. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
2	Pinning information	2
2.1	Pinning	2
2.2	Pin description	2
3	Ordering information	2
4	Block diagram	3
5	Limiting values	3
6	Thermal characteristics	3
7	Characteristics	3
8	Application information	4
8.1	Ruggedness in a Doherty operation	7
8.2	Impedance information	7
9	Package outline	8
10	Handling information	10
11	Abbreviations	10
12	Revision history	10
13	Legal information	11
13.1	Data sheet status	11
13.2	Definitions	11
13.3	Disclaimers	11
13.4	Trademarks	12
14	Contact information	12
15	Contents	13

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