

Low Noise Amplifier with Bypass Mode for LTE Mid-High Band

Features

- Operating frequency:1805~2690MHz
- low noise figure
 - 0.7dB noise figure at 1805~2200MHz
 - 0.9dB noise figure at 2300~2690MHz
- High power gain
 - 14.5dB power gain at 1805~2200MHz
 - 13.0dB power gain at 2300~2690MHz
- Insertion loss in bypass mode: 3.5dB
- Supply voltage: 1.6V to 3.0V
- Gain mode current: 6.5mA
- Bypass mode current: <math><1\mu\text{A}</math>
- Requires only one input matching inductor
- Input and output DC decoupled
- DFN 1.1X0.7-6L
- RoHS Compliant, Pb-free, Halogen Free
- Moisture Sensitivity Level : MSL1

Applications

- LTE middle band and high band receiver applications

General Description

The AW15208HG is a Low Noise Amplifier with bypass mode for LTE middle band and high band receiver applications. The AW15208HG requires only one external input matching inductor, reduces assembly complexity and the PCB area, enabling a cost-effective solution.

The AW15208HG achieves low noise figure, high linearity, high gain, over a wide range of supply voltages from 1.6V up to 3.0V. All these features make AW15208HG an excellent choice for LTE LNA as it improves sensitivity with low noise figure and high gain, provides better immunity against jammer signals with high linearity, reduces filtering requirement of preceding stage and hence reduces the overall cost.

The AW15208HG is available in a small, lead-free, RoHS-Compliant, DFN 1.1X0.7-6L package.

Typical Application Circuit

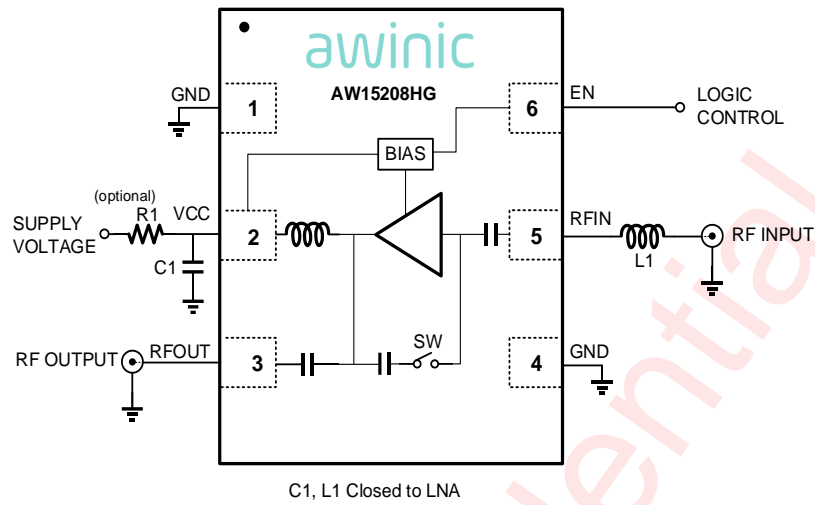


Figure 1 Typical Application Circuit of AW15208HG

Recommended Components List

Table1: list of components

Component	Matching Band	Part Number	Inductance (nH)	Supplier	Size
L1	1805~2200MHz	LQW15AN	5.8	Murata	0402
	2300~2690MHz		3.6		
Component	Part Number	Capacitance (pF)	Rated Voltage (V)	Supplier	Size
C1	GRM155	1000	50	Murata	0402

Pin Configuration And Top Mark

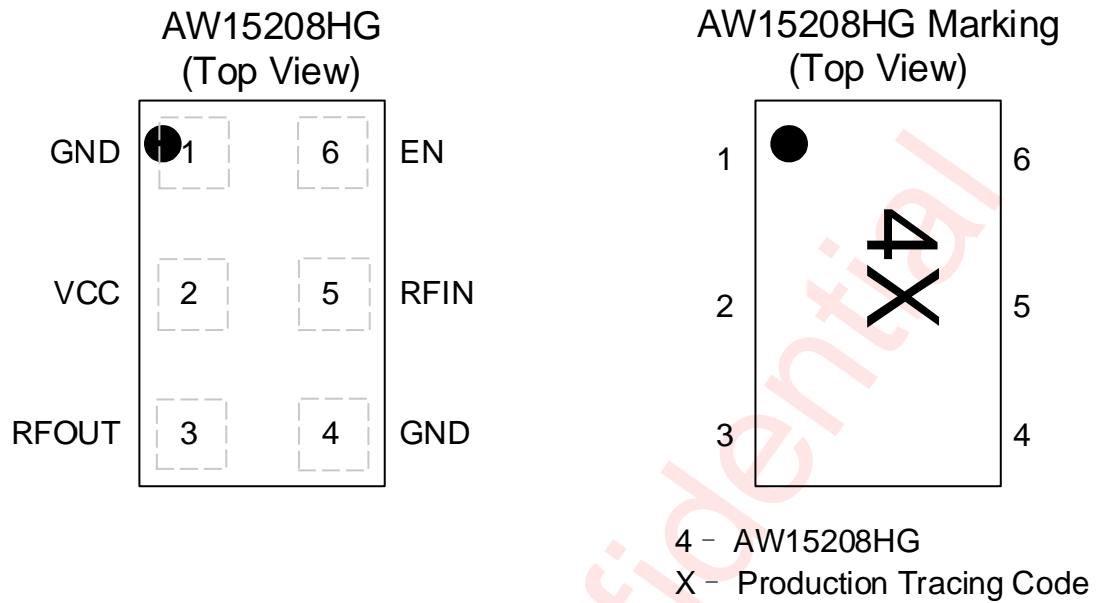


Figure 2 Pin Configuration and Top Mark

Pin Definition

No.	NAME	DESCRIPTION
1	GND	Ground
2	VCC	DC Supply
3	RFOUT	LNA output
4	GND	Ground
5	RFIN	LNA input
6	EN	Logic control

Functional Block Diagram

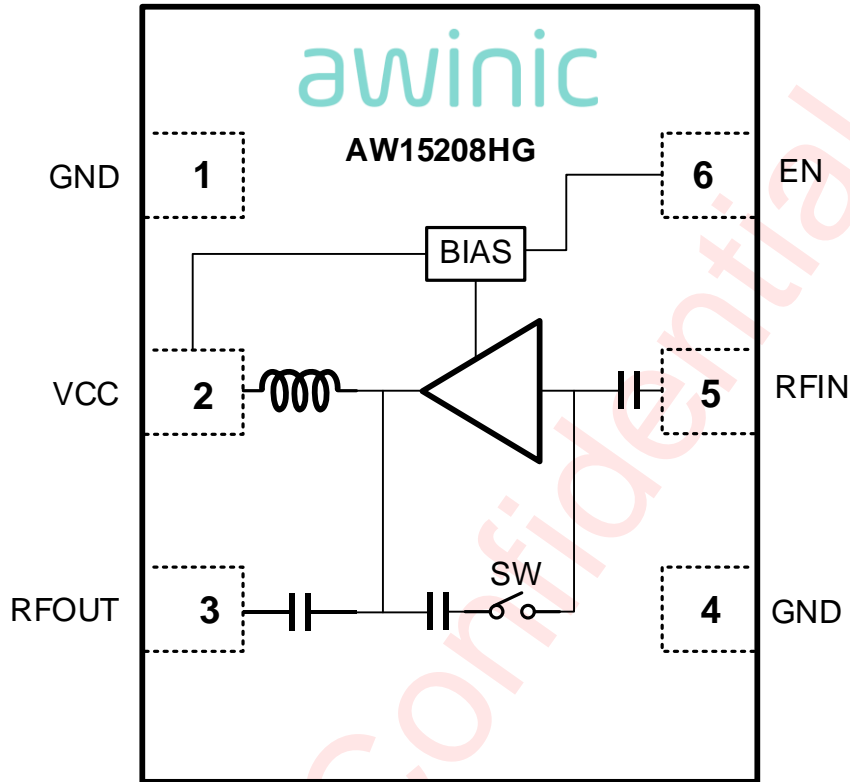


Figure 3 Functional Block Diagram

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW15208HGDNR	-40°C~85°C	DFN 1.1X0.7-6L	4	MSL1	ROHS+HF	9000 units/ Tape and Reel
AW15208HGDNRA	-40°C~85°C	DFN 1.1X0.7-6L	4	MSL1	ROHS+HF	9000 units/ Tape and Reel

Absolute Maximum Ratings^[1]

Parameters	Symbol	Values			Unit
		Min	Typ	Max	
Supply Voltage at pin VCC	V _{CC}	-0.3	-	3.3	V
Voltage at pin EN	V _{EN}	-0.3	-	V _{CC}	V
Current into pin VCC	I _{CC}	-	-	30	mA
RF input power	P _{IN}	-	-	23	dBm
Package thermal resistance	θ _{JA}	-	260	-	°C/W
Junction temperature	T _J	-	-	150	°C
Storage temperature range	T _{STG}	-65	-	150	°C
Ambient temperature range	T _{amb}	-40	-	85	°C
Solder temperature(10s)		-	260	-	°C
ESD range					
HBM ^[2]		±2000			V
CDM ^[2]		±1000			V
Latch-up					
Standard: JEDEC78E		+IT: +200 -IT: -200			mA mA

Note1: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device.

These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

Note2: HBM standard: ESDA/JEDEC JS-001-2017. CDM standard: ESDA/JEDEC JS-002-2018.

Recommended Operating Conditions

Symbol	Parameters	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	1.6	-	3.0	V
V _{EN}	Digital Input-Logic High	1.0	-	V _{CC}	V
	Digital Input-Logic Low	-	-	0.4	V
T _A	Operating Free-Air Temperature Range	-40	25	85	°C

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Electrical Characteristics

$T_A=+25^{\circ}\text{C}$, $V_{CC}=2.8\text{V}$, $V_{EN}=2.8\text{V}/0\text{V}$, $P_{IN}=-30\text{dBm}$, $f=1805\text{-}2200\text{MHz}$ (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
DC ELECTRICAL CHARACTERISTICS						
V_{CC}	Supply Voltage		1.6	-	3.0	V
I_{CC}	Supply Current	Gain Mode		6.8	10.5	mA
		Bypass Mode			1	μA
I_{EN}	Control Current				5	μA
GAIN MODE ($V_{EN}=2.8\text{V}$)						
G_p	Power Gain	$P_{in}=-30\text{dBm}$	12.5	14.5	17.0	dB
RL_{in}	Input Return Loss		5.5	8.0		dB
RL_{out}	Output Return Loss		7.5	10.5		dB
ISL	Reverse Isolation		20	30		dB
NF	Noise Figure	$Z_s=50\text{ ohm}$; No jammer;		0.7	1.3	dB
K_f	Stability Factor	$f=10\text{MHz}\dots 10\text{GHz}$	1			
IP1dB	Input 1dB-Compression Point	$f=2000\text{MHz}$	-7.5	-3.8		dBm
IIP3 _{ib}	In-Band Input 3 rd -Order Intercept Point	$f_1=2140\text{MHz}$; $f_2=2141\text{MHz}$; $P_{in}=-25\text{dBm}$;	-3.0	1.6		dBm
t_{on}	turn-on time	time from V_{EN} ON to 90% of the final gain		2	4	μs
t_{off}	turn-off time	time from V_{EN} OFF to 10% of the gain		0.1	1	μs
BYPASS MODE ($V_{EN}=0\text{V}$)						
IL	Insertion Loss	$P_{in}=-30\text{dBm}$		4.0	6.5	dB
RL_{in}	Input Return Loss		6.0	10.0		dB
RL_{out}	Output Return Loss		8.0	16.4		dB
IP1dB	Input 1dB-Compression Point		5.5	10.0		dBm

Note: PCB losses are subtracted.

$T_A=+25^{\circ}\text{C}$, $V_{CC}=1.8\text{V}$, $V_{EN}=1.8\text{V}/0\text{V}$, $P_{IN}=-30\text{dBm}$, $f=1805\text{-}2200\text{MHz}$ (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
DC ELECTRICAL CHARACTERISTICS						
V_{CC}	Supply Voltage		1.6	-	3.0	V
I_{CC}	Supply Current	Gain Mode		6.5	10.0	mA
		Bypass Mode			1	μA
I_{EN}	Control Current				5	μA
GAIN MODE ($V_{EN}=1.8\text{V}$)						
G_p	Power Gain		12.0	14.0	16.5	dB
RL_{in}	Input Return Loss	Pin=-30dBm	5.5	7.5		dB
RL_{out}	Output Return Loss		7.5	11.0		dB
ISL	Reverse Isolation		20	30		dB
NF	Noise Figure	Zs=50 ohm; No jammer;		0.7	1.3	dB
Kf	Stability Factor	f=10MHz...10GHz	1			
IP1dB	Input 1dB-Compression Point	f=2000MHz	-10.0	-6.3		dBm
IIP3 _{ib}	In-Band Input 3 rd -Order Intercept Point	f1=2140MHz; f2=2141MHz; Pin=-25dBm;	-4.0	1.1		dBm
t _{on}	turn-on time	time from V_{EN} ON to 90% of the final gain		2	4	μs
t _{off}	turn-off time	time from V_{EN} OFF to 10% of the gain		0.1	1	μs
BYPASS MODE ($V_{EN}=0\text{V}$)						
IL	Insertion Loss	Pin=-30dBm		4.5	7.0	dB
RL_{in}	Input Return Loss		6.0	10.0		dB
RL_{out}	Output Return Loss		8.0	16.4		dB
IP1dB	Input 1dB-Compression Point		4.5	8.5		dBm

Note: PCB losses are subtracted.

$T_A=+25^{\circ}\text{C}$, $V_{CC}=2.8\text{V}$, $V_{EN}=2.8\text{V}/0\text{V}$, $P_{IN}=-30\text{dBm}$, $f=2300\text{-}2690\text{MHz}$ (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
DC ELECTRICAL CHARACTERISTICS						
V_{CC}	Supply Voltage		1.6	-	3.0	V
I_{CC}	Supply Current	Gain Mode		6.8	10.5	mA
		Bypass Mode			1	μA
I_{EN}	Control Current				5	μA
GAIN MODE ($V_{EN}=2.8\text{V}$)						
G_p	Power Gain		11.5	13.0	15.0	dB
RL_{in}	Input Return Loss	Pin=-30dBm	5.5	8.0		dB
RL_{out}	Output Return Loss		6.5	9.0		dB
ISL	Reverse Isolation		20	30		dB
NF	Noise Figure	Zs=50 ohm; No jammer;		0.9	1.5	dB
Kf	Stability Factor	f=10MHz...10GHz	1			
IP1dB	Input 1dB-Compression Point	f=2500MHz	-6.0	-2.0		dBm
IIP3 _{ib}	In-Band Input 3 rd -Order Intercept Point	f1=2655MHz; f2=2656MHz; Pin=-25dBm;	-1.0	4.0		dBm
t _{on}	turn-on time	time from V_{EN} ON to 90% of the final gain		2	4	μs
t _{off}	turn-off time	time from V_{EN} OFF to 10% of the gain		0.1	1	μs
BYPASS MODE ($V_{EN}=0\text{V}$)						
IL	Insertion Loss	Pin=-30dBm		3.5	6.0	dB
RL_{in}	Input Return Loss		5.5	8.8		dB
RL_{out}	Output Return Loss		10.0	22.0		dB
IP1dB	Input 1dB-Compression Point		5.5	10.0		dBm

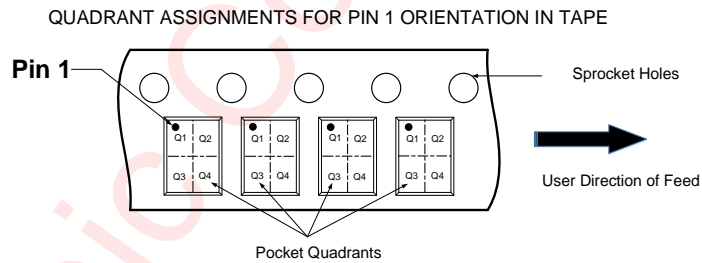
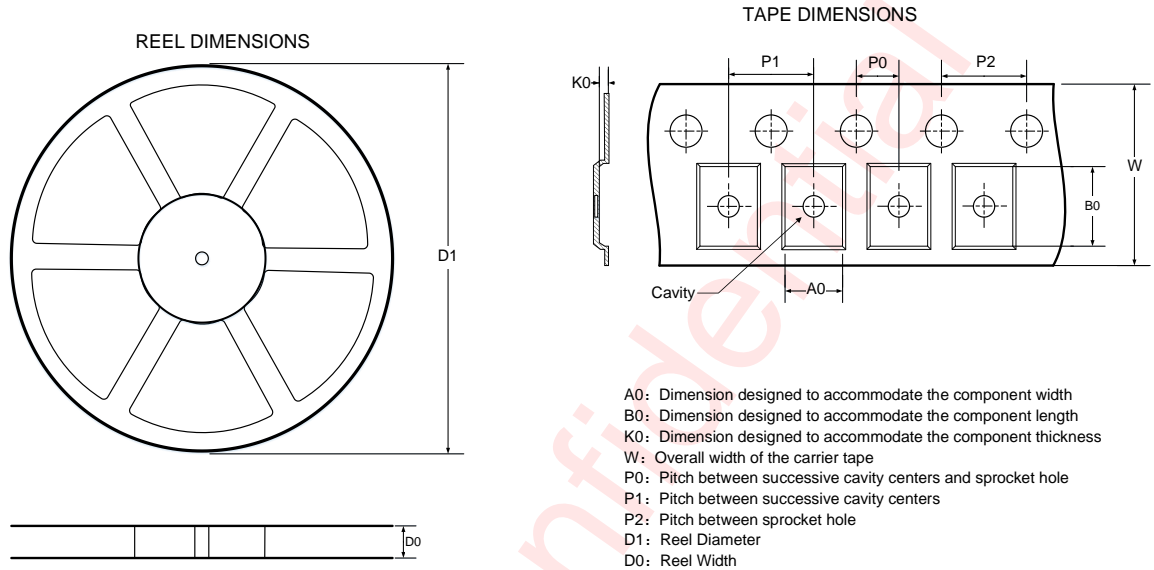
Note: PCB losses are subtracted.

$T_A=+25^{\circ}\text{C}$, $V_{CC}=1.8\text{V}$, $V_{EN}=1.8\text{V}/0\text{V}$, $P_{IN}=-30\text{dBm}$, $f=2300\text{-}2690\text{MHz}$ (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
DC ELECTRICAL CHARACTERISTICS						
V_{CC}	Supply Voltage		1.6	-	3.0	V
I_{CC}	Supply Current	Gain Mode		6.5	10.0	mA
		Bypass Mode			1	μA
I_{EN}	Control Current				5	μA
GAIN MODE ($V_{EN}=1.8\text{V}$)						
G_p	Power Gain		11.0	12.8	15.0	dB
RL_{in}	Input Return Loss	Pin=-30dBm	5.5	8.0		dB
RL_{out}	Output Return Loss		6.5	9.0		dB
ISL	Reverse Isolation		20	30		dB
NF	Noise Figure	Zs=50 ohm; No jammer;		0.9	1.5	dB
Kf	Stability Factor	f=10MHz...10GHz	1			
IP1dB	Input 1dB-Compression Point	f=2500MHz	-7.0	-4.0		dBm
IIP3 _{ib}	In-Band Input 3 rd -Order Intercept Point	f1=2655MHz; f2=2656MHz; Pin=-25dBm;	-1.5	4.0		dBm
t _{on}	turn-on time	time from V_{EN} ON to 90% of the final gain		2	4	μs
t _{off}	turn-off time	time from V_{EN} OFF to 10% of the gain		0.1	1	μs
BYPASS MODE ($V_{EN}=0\text{V}$)						
IL	Insertion Loss	Pin=-30dBm		4.0	6.5	dB
RL_{in}	Input Return Loss		5.5	9.0		dB
RL_{out}	Output Return Loss		10.0	22.5		dB
IP1dB	Input 1dB-Compression Point		5.0	9.0		dBm

Note: PCB losses are subtracted.

Tape And Reel Information



Note: The above picture is for reference only. Please refer to the value in the table below for the actual size.

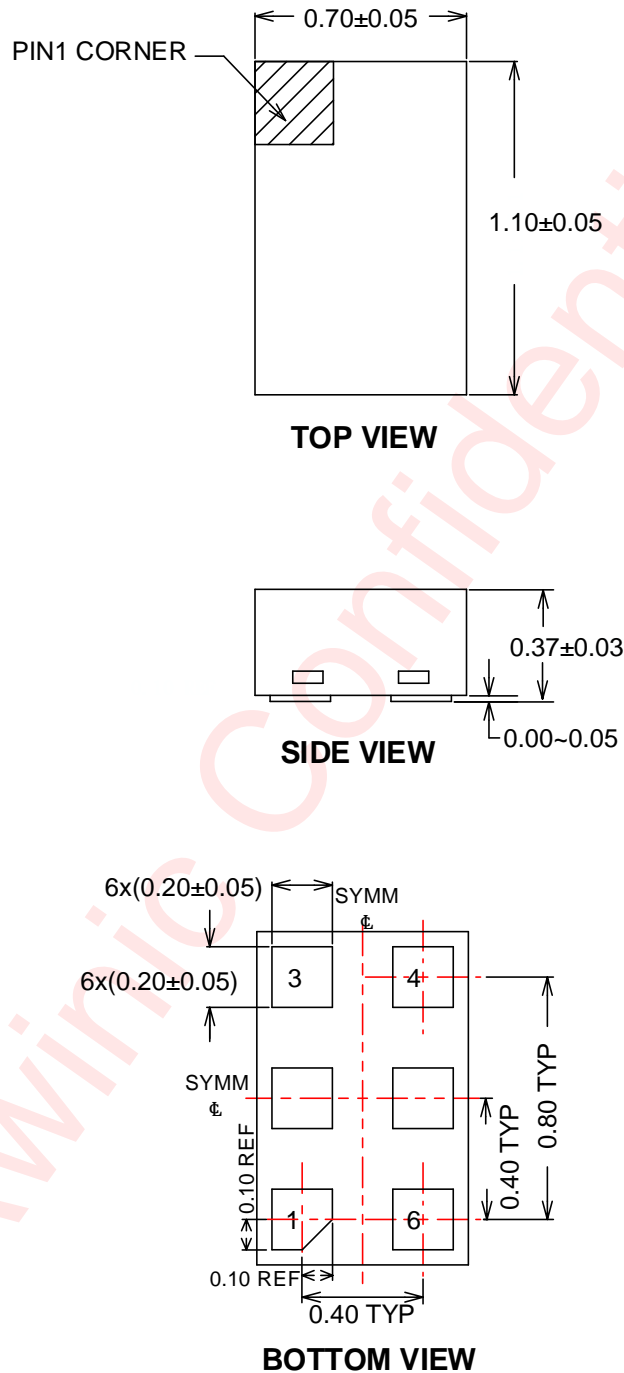
DIMENSIONS AND PIN1 ORIENTATION

D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
178	8.4	0.82	1.22	0.46	2	2	4	8	Q1

All dimensions are nominal

Figure 4 Tape And Reel Information

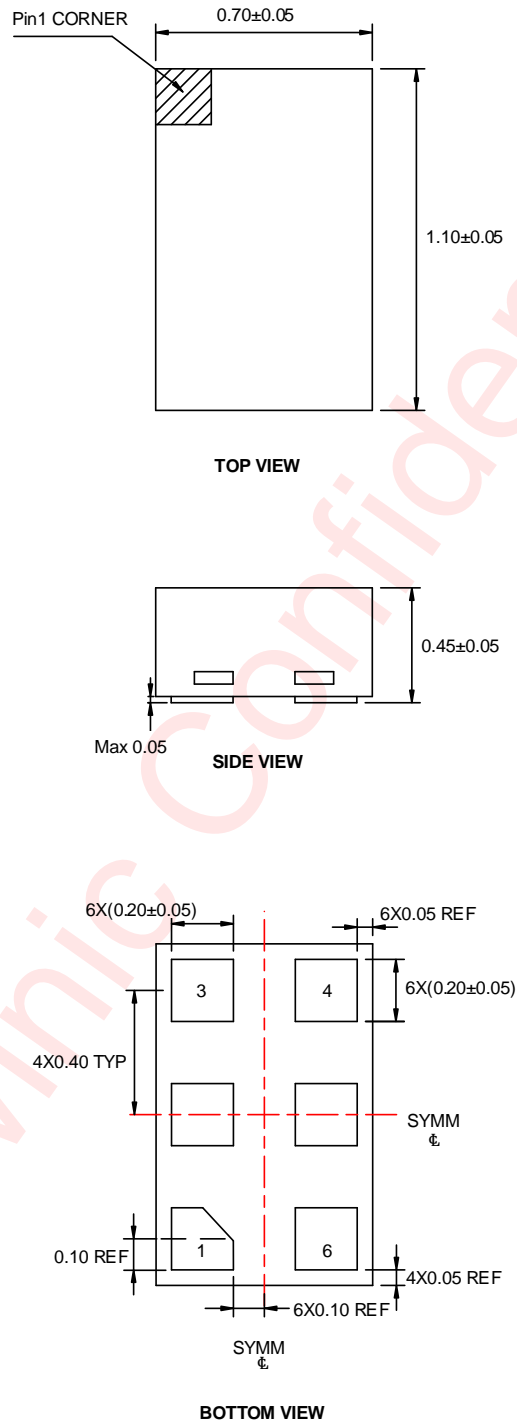
AW15208HGDNR Package Description



Unit: mm

Figure 5 AW15208HGDNR Package Outline

AW15208HGDNRA Package Description



Unit: mm

Figure 6 AW15208HGDNRA Package Outline

Land Pattern Data

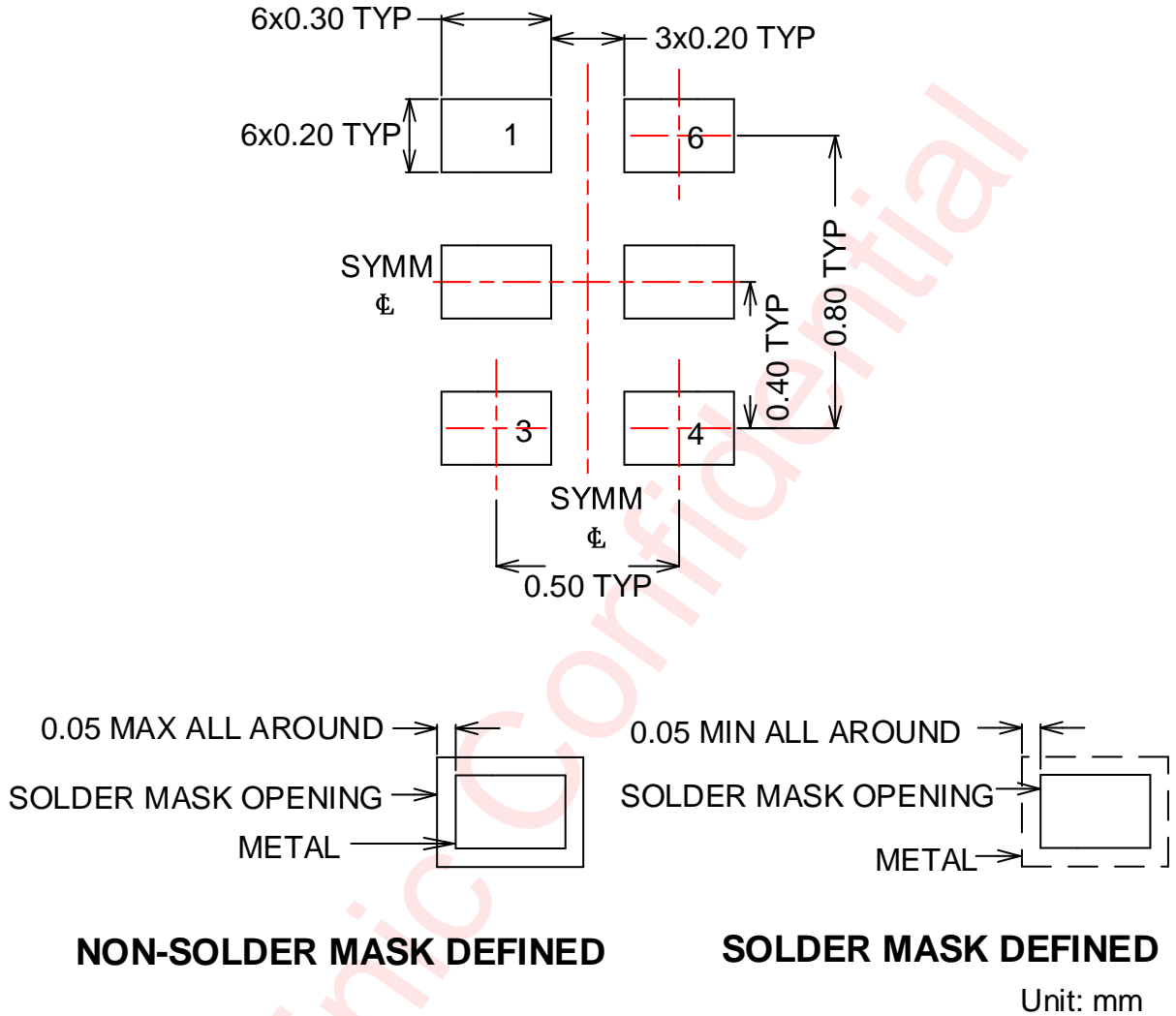


Figure 7 Land Pattern Data

Revision History

Version	Date	Change Record
V1.0	Jan. 2023	Officially Released
V1.1	Dec. 2025	Added AW15208HGDNRA Description

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