

AAT2074B2 Preliminary Data Sheet

75Ω Digital Attenuator 2-Bit 12 dB DC~2700 MHz

1. Product Overview

1.1 General Description

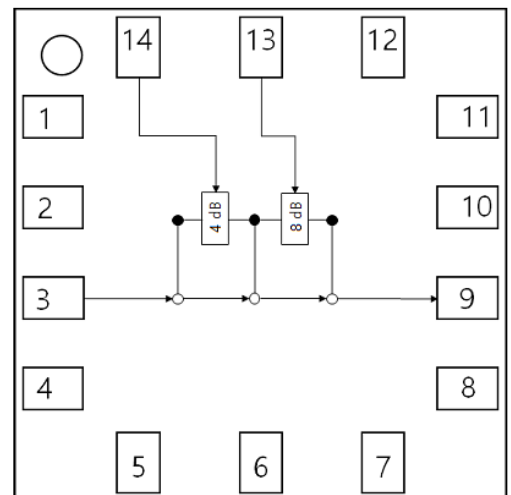
The AAT2074B2 is a GaAs MMIC two bit positive control digital attenuator. The device operates from DC to 2700 MHz with a control and supply voltage of +3 V or +5 V. The AAT2074B2 has LSB of 4 dB and a total attenuation of 12dB. The AAT2074B2 is composed of two cascade fixed attenuators. The states of attenuator are controlled by the logic level voltage. The attenuator bit values are 4 dB (LSB), 8 dB for a total attenuation of 12 dB. Attenuation accuracy is $\pm(0.15 \text{ dB} + 3 \% \text{ of attenuation setting}) @ \text{DC} \sim 1200 \text{ MHz}$.

1.2 Features

- 75 Ω Impedance
- Attenuation: 12 dB with 4 dB LSB
- Attenuation Accuracy:
 $\pm (0.15 \text{ dB} + 3 \% \text{ of Atten. setting}) @ \text{DC} \sim 1200 \text{ MHz}$

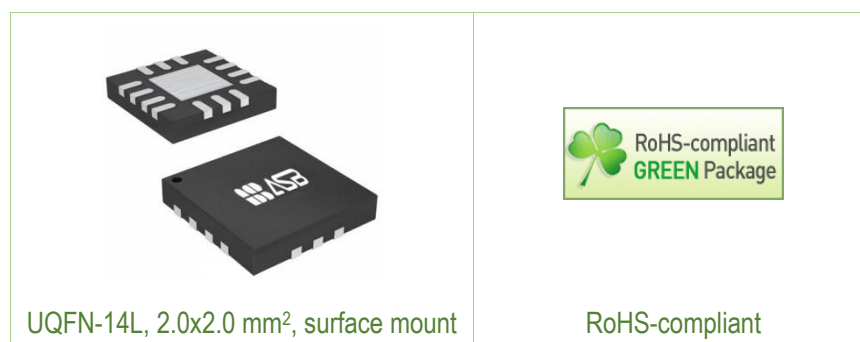
1.3 Applications

- Telecommunication System
- CATV and FTTH



AAT2074B2 Block Diagram (X-ray view)

1.4 Package Profile & RoHS Compliance



2. Summary on Product Performances

2.1 Electrical Specifications

Parameter	Test Condition	Min	Typ	Max	Unit
Reference Insertion Loss (IL)	50		0.4		dB
	1200		0.7		
	2000	-	1.0	-	
	2700		2.1		
Attenuation Accuracy ¹⁾	DC – 1200 MHz	±(0.15 dB + 3% of attenuation setting)			
	DC – 2700 MHz	±(0.7 dB + 10% of attenuation setting)			
Return Loss	DC – 1200 MHz	15	16	-	dB
	DC – 2700 MHz	14	15		
Switching Characteristics: Rise/fall Time	(10% to 90% RF) (50% Vctrl to RF)		300		ns
On/off Time			320		
Input P1dB	50 MHz		26		dBm
	1200 MHz		21		
	2000 MHz	-	20	-	
	2700 MHz		15		
IIP3 ²⁾	50 MHz		37		dBm
	1200 MHz		37		
	2000 MHz	-	40	-	
	2700 MHz		34		
IIP2 ²⁾	50 MHz		60		dBm
	860 MHz		70		
Supply Voltage (Vs)		+3	+5	-	V
Control Voltage	High	Vs-0.5	Vs		V
	Low	0	-	+0.5	
Current			600		uA

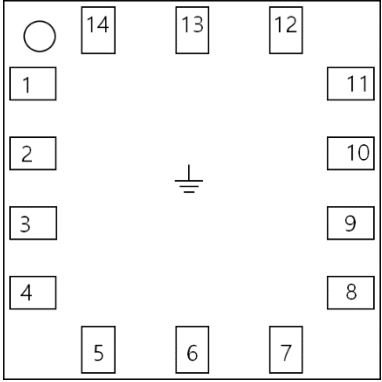
1) Attenuation accuracy are calculated at any bit or combination

2) IIP3 and IIP2 are measured with two tones at an input power of +0 dBm/tone separated by 6 MHz.

2.2 Truth Table

State	V1	V2
Insertion loss	Low	Low
4 dB	High	Low
8 dB	Low	High
12 dB	High	High

2.3 Pin Configuration

Pin	Description	Simplified Outline
1, 2, 4, 6, 8, 10, 11	No connection	
3	RF1, RF port	
9	RF2, RF port	
5, 7	RF GND	
12	Vs, DC power supply voltage.	
13	V2, DC control voltage. Controls 8 dB attenuation state.	
14	V1, DC control voltage. Controls 4 dB attenuation state.	

Note: Backside metal paddle is DC ground.

2.4 Absolute Maximum Ratings

Parameters	Max. Ratings
Operation Case Temperature	-40 to +85 °C
Storage Temperature	-65 to +150 °C
Device Voltage	+7 V
Input RF Power	+27 dBm @ 50 MHz +22 dBm @ 1200 MHz +15 dBm @ 2700 MHz

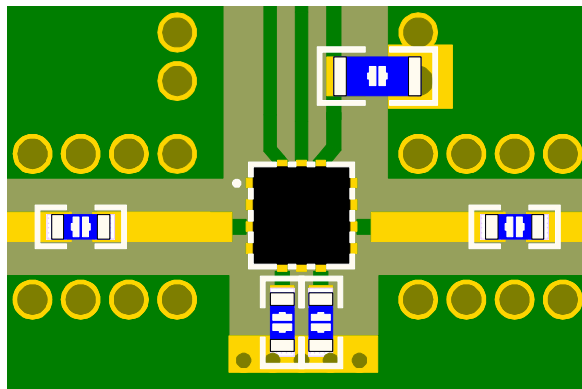
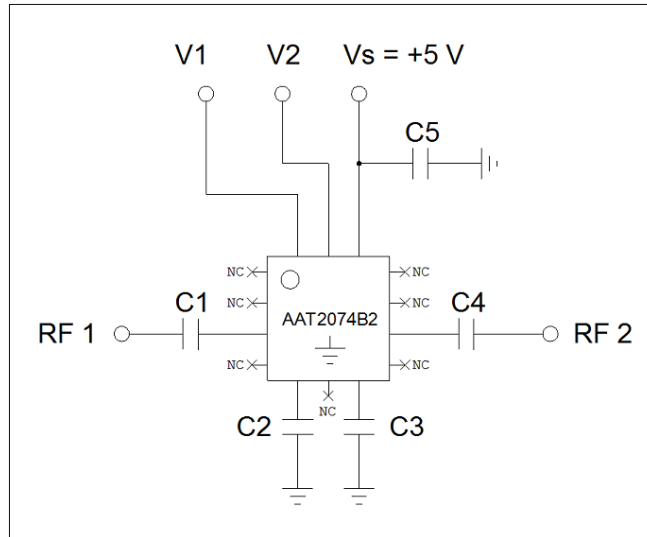
2.5 Moisture Sensitivity Level

Level 3 at 260 °C reflow

(Intentionally Blanked)

3. Application: DC ~ 1200 MHz ($V_s = +5\text{ V}$, $75\ \Omega$)

3.1 Application Circuit & Evaluation Board



PCB Information	
Material	FR4
Thickness (mm)	0.8
Size (mm)	25x50
EB No.	EB-2x2-QFN14_ATT01

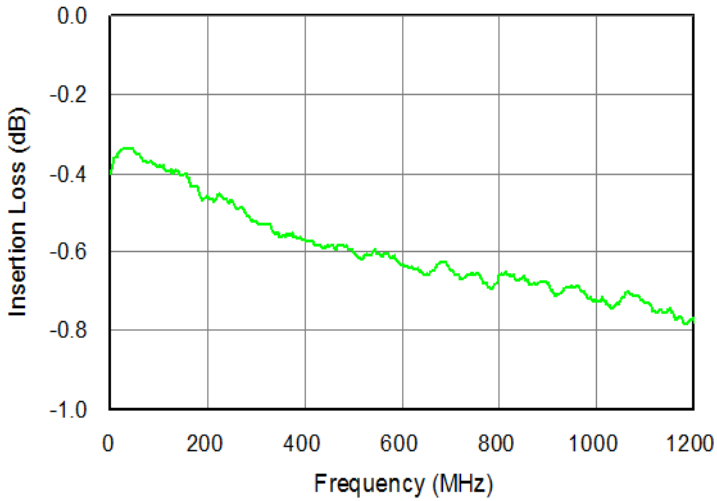
Bill of Material

Symbol	Value	Size	Description	Manufacturer
AAT2074B2	-	-	2-Bit digital attenuator	ASB
C1, C4	1 μF	0402	DC blocking capacitor	Murata
C2, C3	1 μF	0402	Bypass capacitor	Murata
C5	10 μF	0805	Decoupling capacitor	Murata

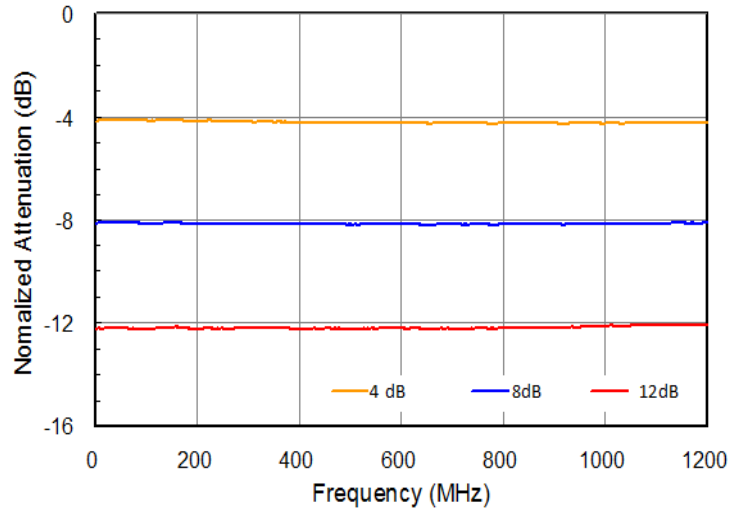
Note: Bypass capacitors (C2 and C3) should be close to the RF GND(pin 5 and pin 7).

3.2 Plot of Performances

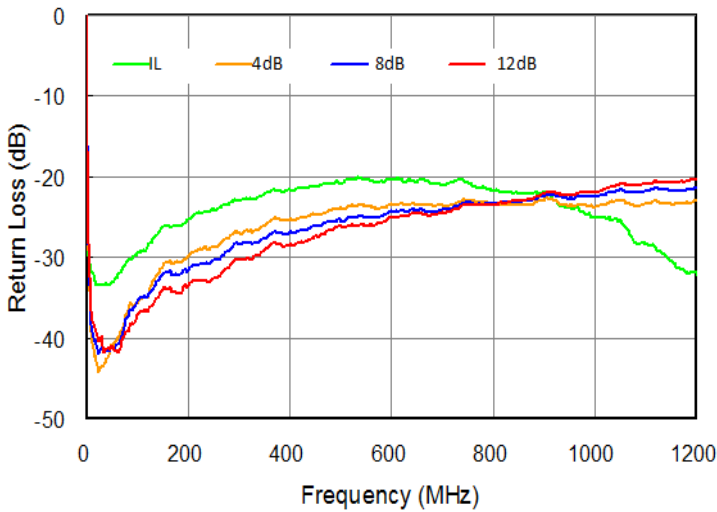
Insertion loss



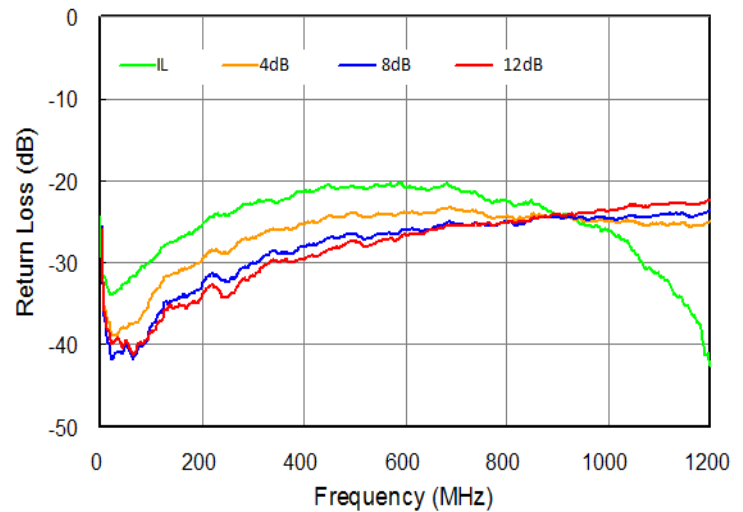
Normalized attenuation all states



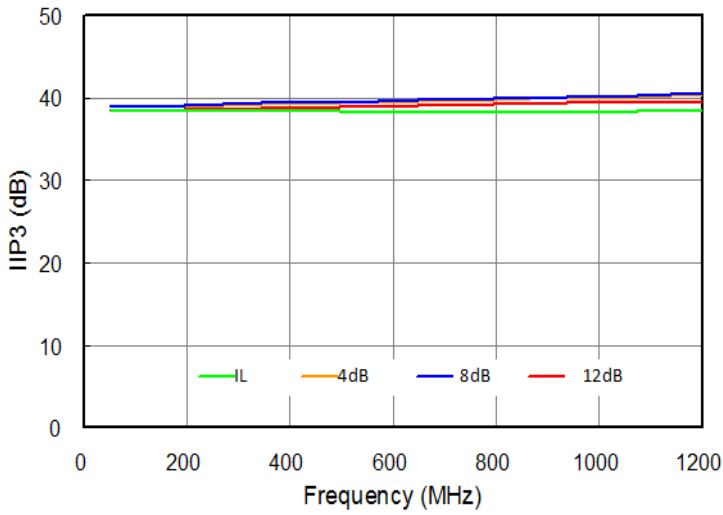
Input return loss over all states



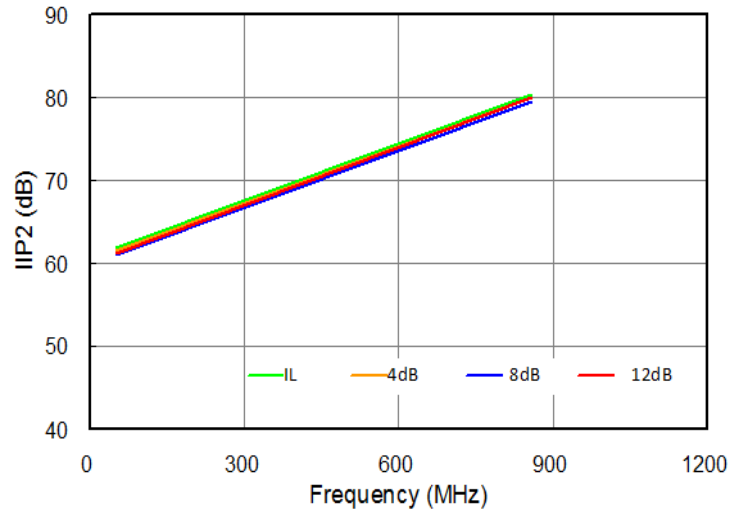
Output return loss over all states



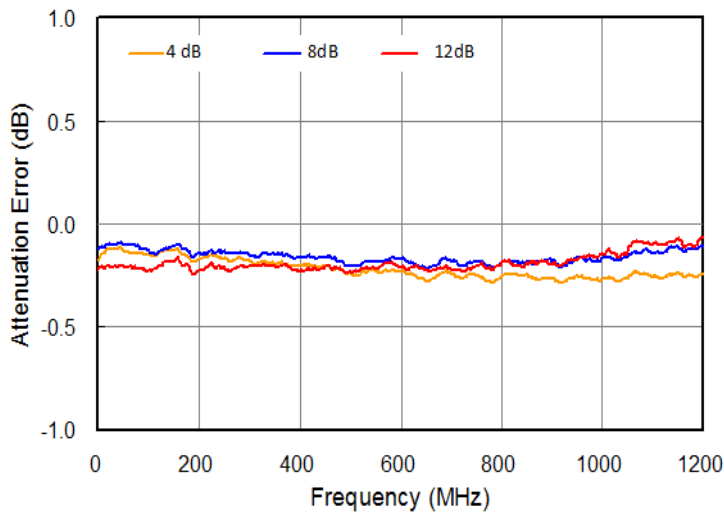
IIP3 vs. Frequency over all states



IIP2 vs. Frequency over all states

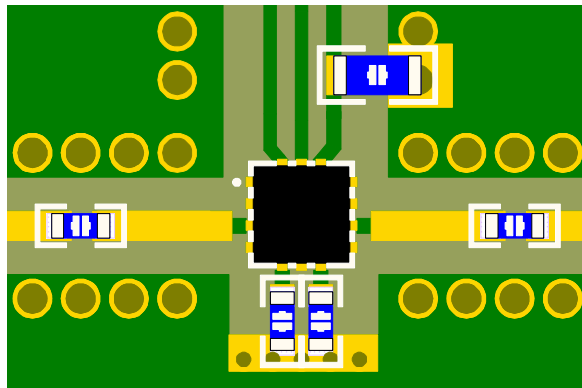
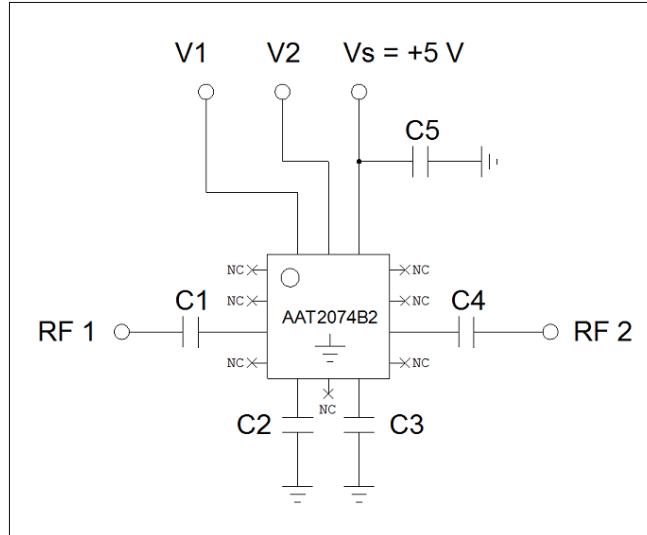


Step error vs. frequency over all states



4. Application: DC ~ 2700 MHz ($V_s = +5\text{ V}$, $75\ \Omega$)

4.1 Application Circuit & Evaluation Board



PCB Information	
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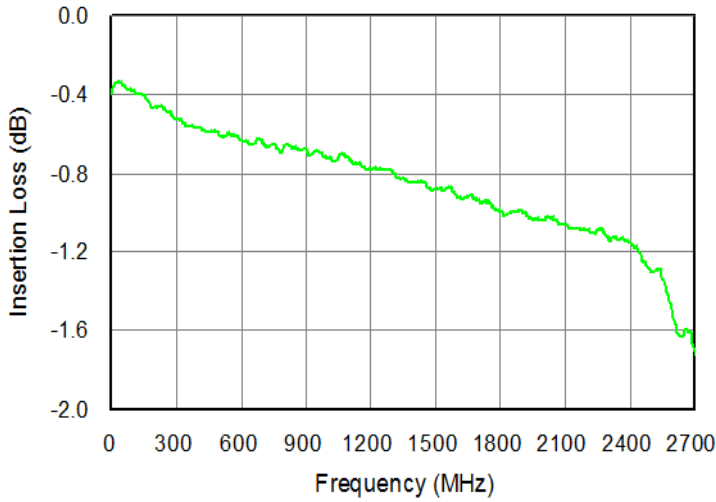
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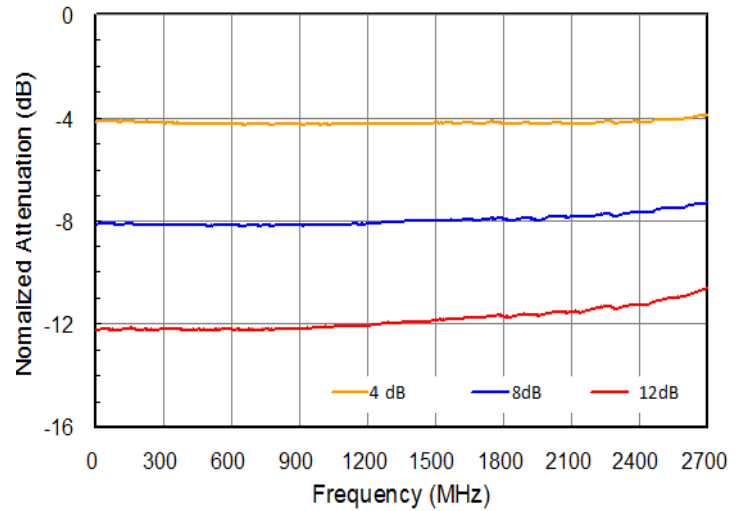
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4.2 Plot of Performances

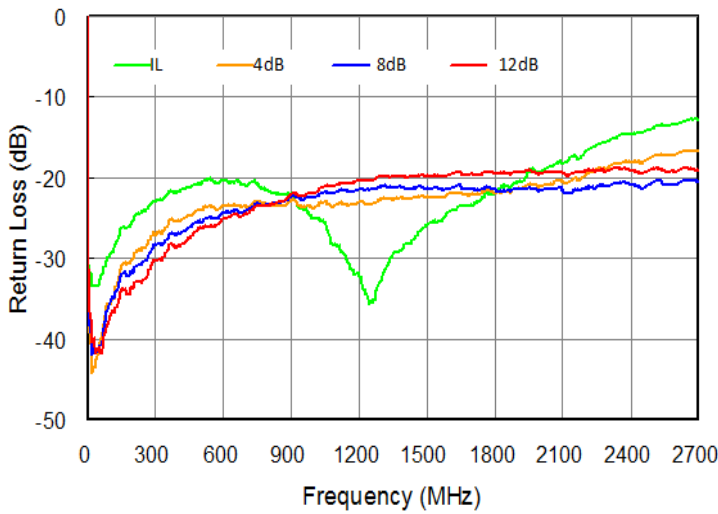
Insertion loss



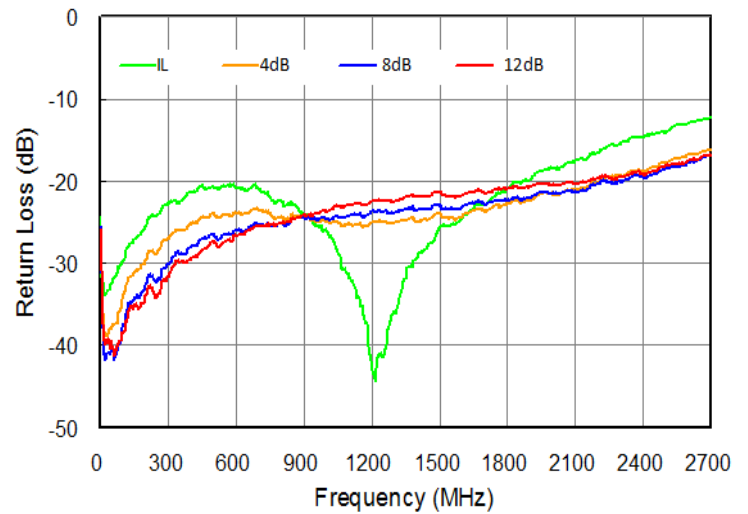
Normalized attenuation all states



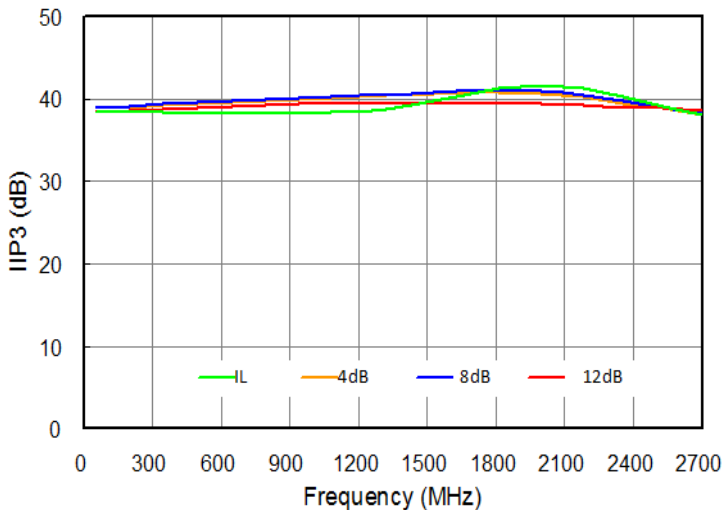
Input return loss over all states



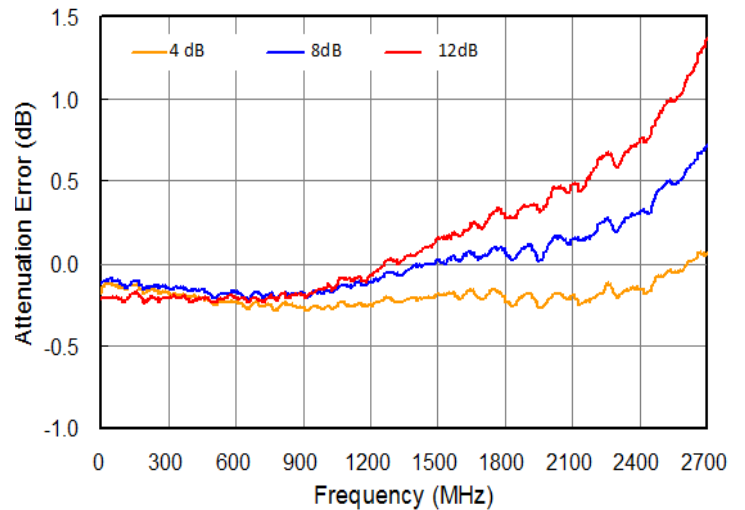
Output return loss over all states



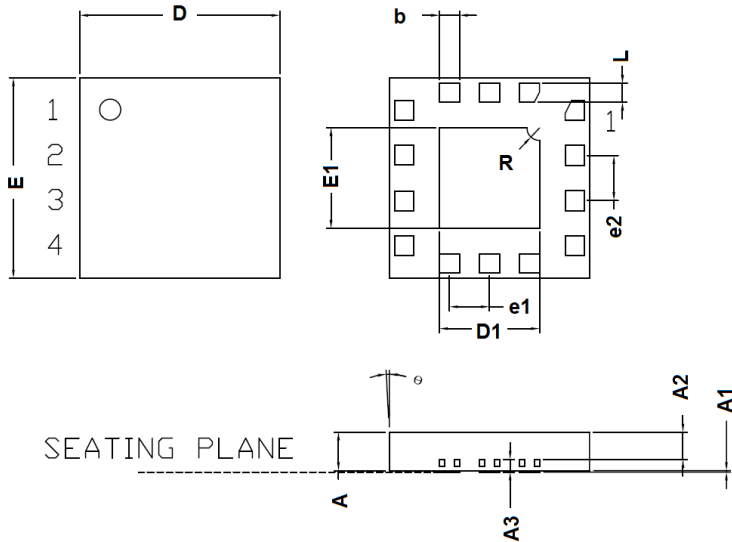
IIP3 vs. Frequency over all states



Step error vs. frequency over all states

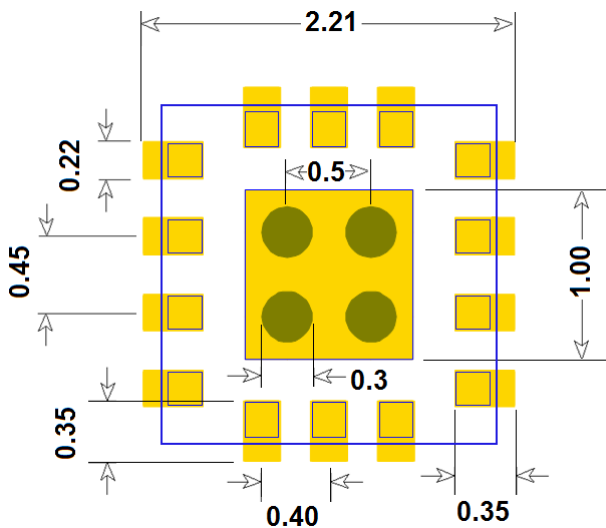


5. Package Outline (UQFN-14L, 2.0x2.0x0.4 mm³)



Symbols	Dimensions (In mm)		
	MIN	NOM	MAX
A	0.35	-	0.40
A1	0.00	-	0.05
A2	0.223	-	0.273
A3	-	0.127REF	-
b	0.15	0.20	0.25
D	1.95	2.00	2.03
E	1.95	2.00	2.03
D1	-	1.00BSC	-
E1	-	1.00BSC	-
e1	-	0.40BSC	-
e2	-	0.45BSC	-
L	0.13	0.18	0.23
R	-	0.125BSC	-
θ	-12	-	0
Burr	0.00	0.03	0.06

6. Surface Mount Recommendation (In mm)

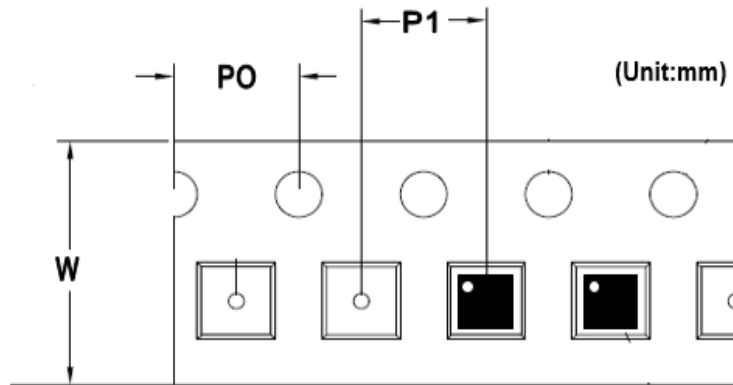


NOTE

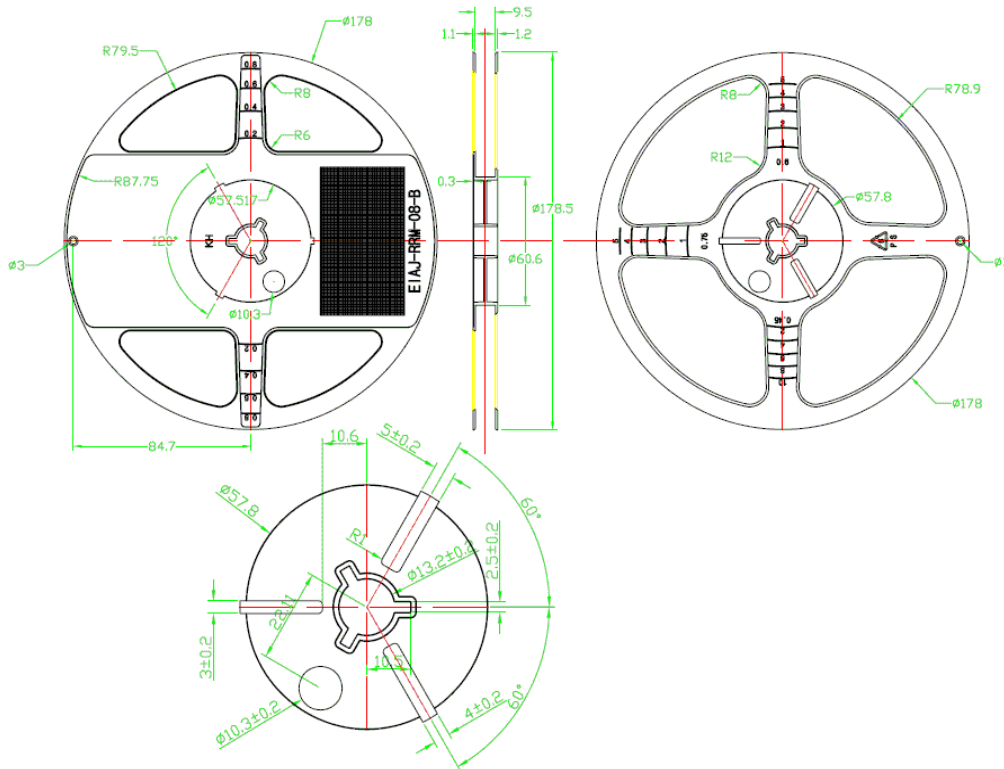
1. Recommended is that the ground via holes be placed on the bottom of the exposed pad of the device for better RF and thermal performance, as shown in the drawing at the left side

7. Tape and Reel Information

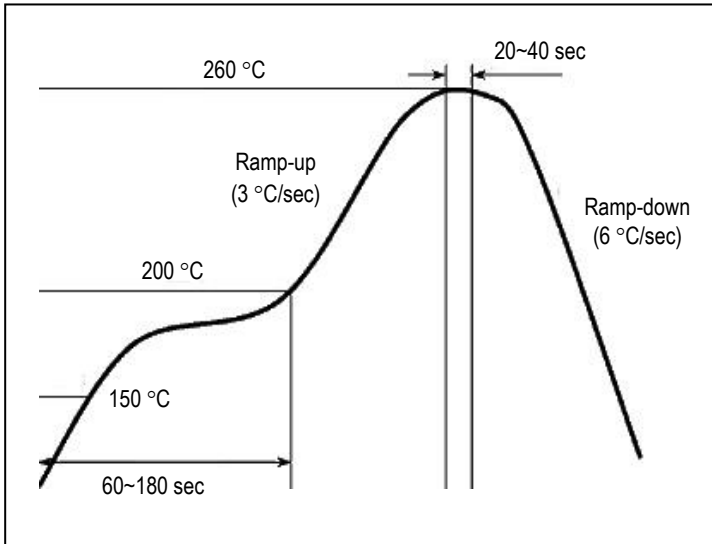
7.1 UQFN-14L Package



Package	Carrier Width (W)	Pitch (P0)	Pitch (P1)	Part Per Full Reel	Reel Size
UQFN-14L	8 mm	4 mm	4 mm	3,000 pcs	180 mm



8. Recommended Soldering Reflow Profile



(End of Datasheet)

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