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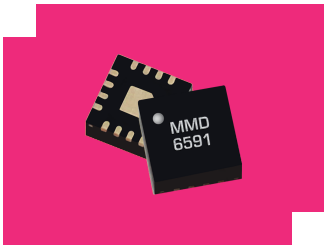
MMD-2050LSM

GaAs MMIC Millimeter Wave Doubler

DEVICE OVERVIEW

General Description

The MMD-2050LSM is a MMIC millimeter wave doubler fabricated with GaAs Schottky diodes. This operates over a guaranteed 10 to 25 GHz input frequency range or a doubled output frequency range of 20 to 50 GHz. It features excellent conversion loss, superior isolations, and high harmonic suppressions across a broad bandwidth. Both surface mount QFN and evaluation boards are available.



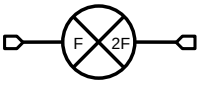
Features

- Low input drive
- High fundamental rejection
- Millimeter wave output frequencies
- RoHS Compliant

Applications

- High frequency synthesis
- LO signal chain

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Packing Size	Green Status	Product Lifecycle	Export Classification
EVAL-MMD-2050L	Evaluation Board, GaAs MMIC 20 - 50 GHz Millimeter Wave Doubler	-	-	RoHS	Released	EAR99
MMD-2050LSM	GaAs MMIC Millimeter Wave Doubler	QFN	-	RoHS	Released	EAR99

Table Of Contents

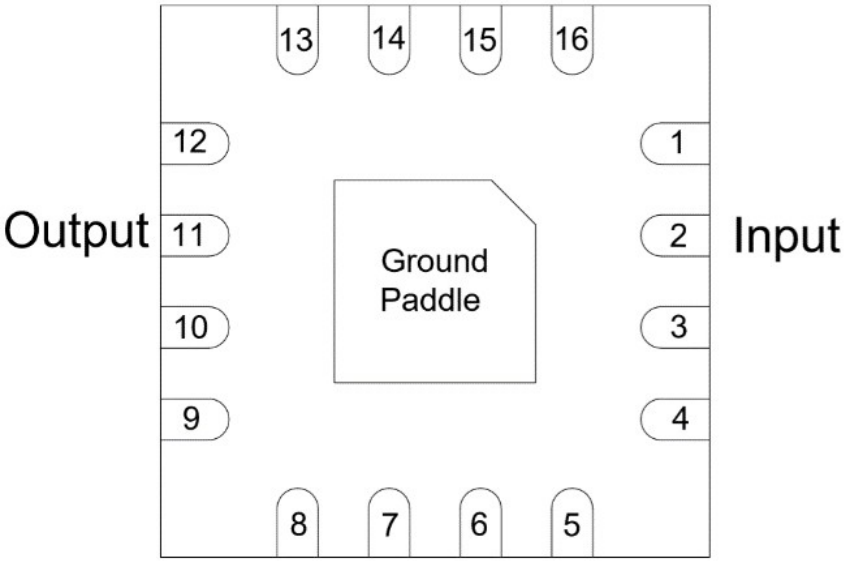
Revision History

Revision Code	Revision Date	Comment
-	2019-11-01	Datasheet Initial Release
A	2020-01-01	Updated Landing Pattern

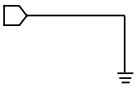
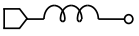
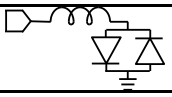
Port Configuration and Functions

Port Diagram

A bottom-up view of the MMD-2050LSM outline drawing is shown below. The MMD-2050L should only be used in the forward direction, with the input and output ports given in Port Functions.



Port Functions

Port	Function	Description	Equivalent Circuit for Package
GND	Ground	SM package ground path is provided through the ground paddle.	
Pin 11	2F Output	Pin 11 is DC open and AC matched to 50 Ohms from 20-50GHz.	
Pin 2	1F Input	Pin 2 is diode coupled and AC matched to 50 Ohms from 10-25GHz.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	3.00 x 3.00 mm

Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the electrical specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

Parameter	Min	Nominal	Max	Unit
Input Power	5	-	10	dBm
Ambient Temperature	-55	25	100	°C

Sequencing Requirements

There is no requirement to apply power to the ports in a specific order. However, it is recommended to provide a 50Ω termination to each port before applying power. This is a passive diode doubler that requires no DC bias.

Electrical Specifications

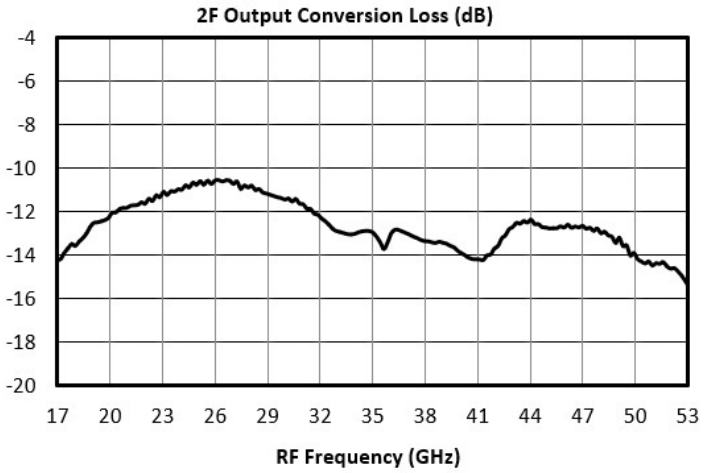
The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the EVAL package doubler used in the forward direction with a +7 dBm sine wave input.

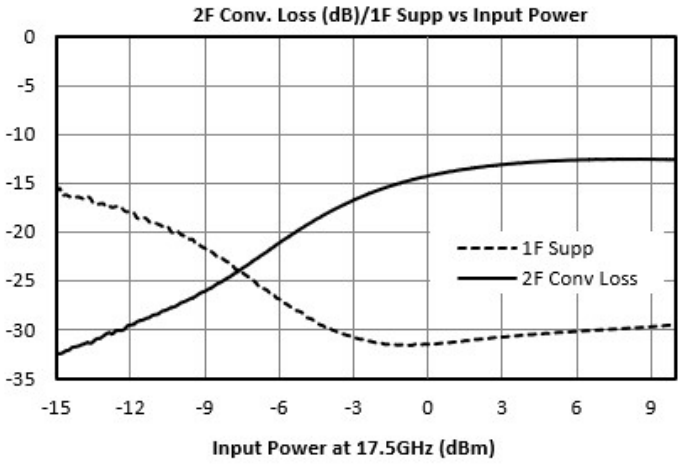
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Conversion Loss [1]	Second Harmonic Output	-	-	-	12.5	15	dB
Input Frequency Range	`	-	-	10	-	25	GHz
Input Power	-	-	-	5	-	10	dBm
Isolation, 1F [2]	Input = 10 - 25 GHz Output = 10 - 25 GHz	-	-	-	47	-	dB
Isolation, 3F [3]	Input = 10 – 17 GHz Output = 30 - 51 GHz	-	-	-	58	-	dB
Isolation, 4F [4]	Input = 10 – 12.5 GHz Output = 40 - 50 GHz	-	-	-	26	-	dB
Output Frequency Range	-	-	-	20	-	50	GHz
Suppression, 1F [5]	Input = 10 – 25 GHz Output = 10 - 25 GHz	-	-	-	34.5	-	dBc
Suppression, 3F [6]	Input = 10 – 17 GHz Output = 30 - 51 GHz	-	-	-	46	-	dBc
Suppression, 4F [7]	Input = 10 – 12.5 GHz Output = 40 - 50 GHz	-	-	-	14	-	dBc

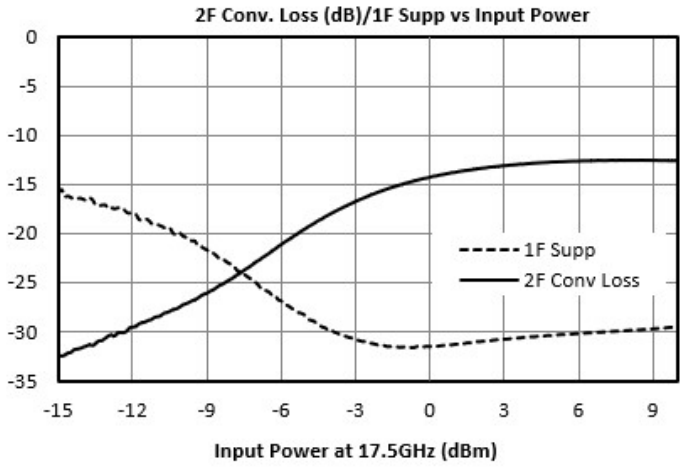
[1][5][6][7] Suppressions and isolations measured with an input source with >60dBc (relative to fundamental input) harmonic suppression. Suppression is defined as the harmonic power relative to the 2F doubled output power.
[2][3][4] Isolation is defined as the harmonic power relative to the 1F fundamental input power.

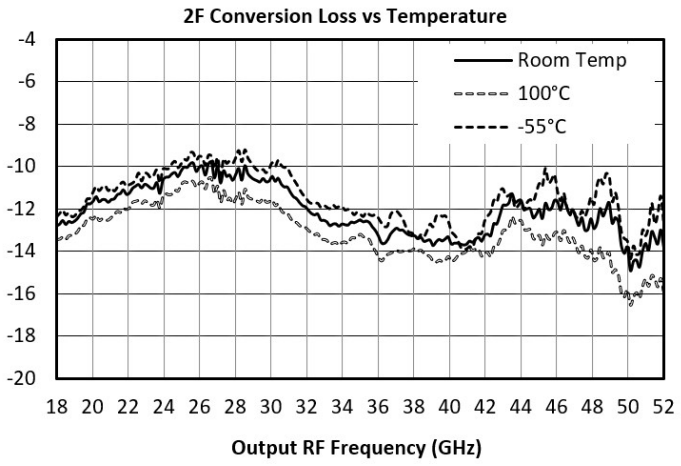
All typical performance data includes fixturing losses from the EVAL package. The actual DUT performs better than the displayed results, especially as the frequency increases.

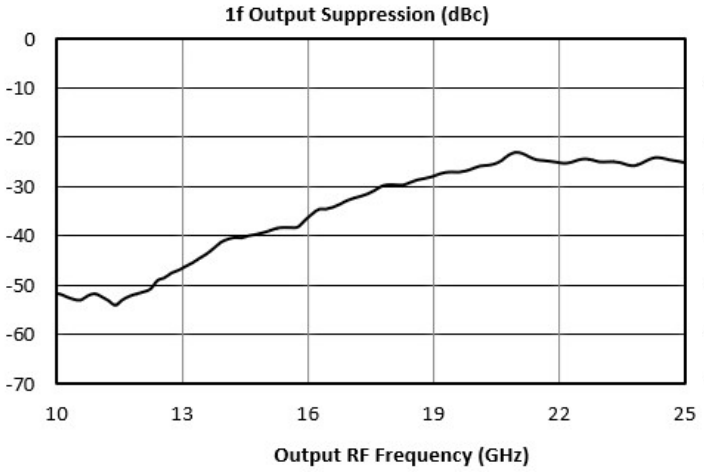
Typical Performance Plots

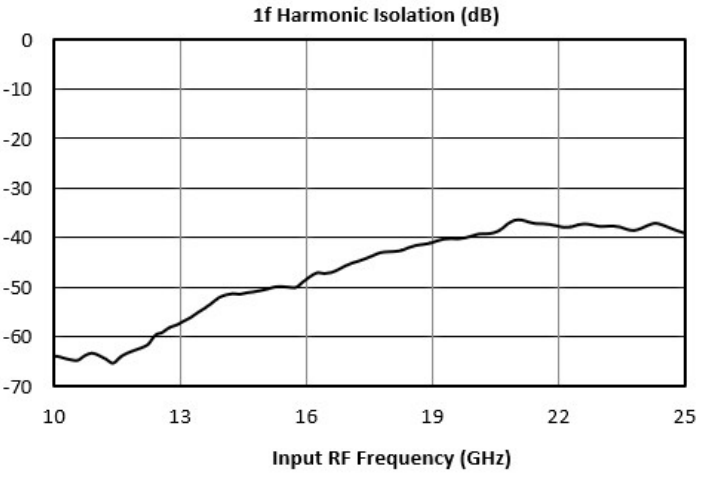


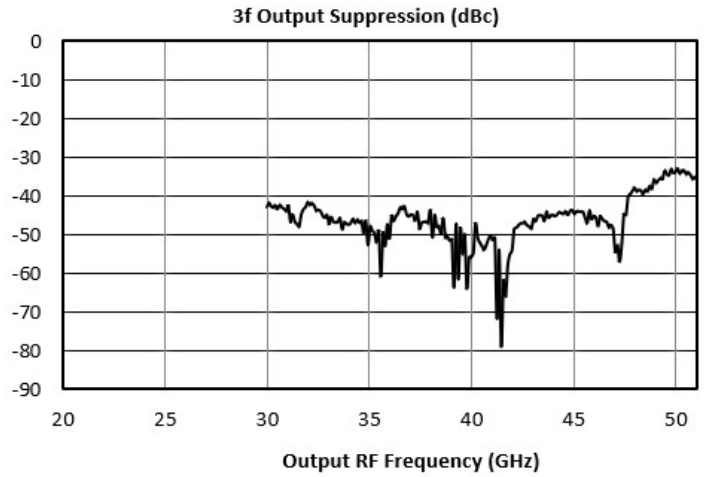


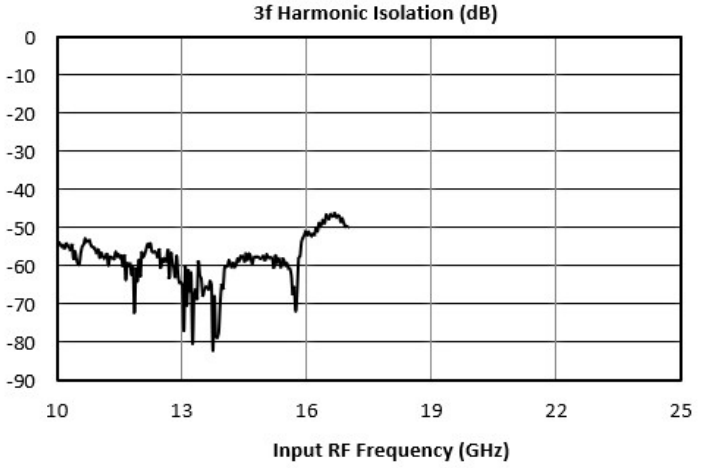


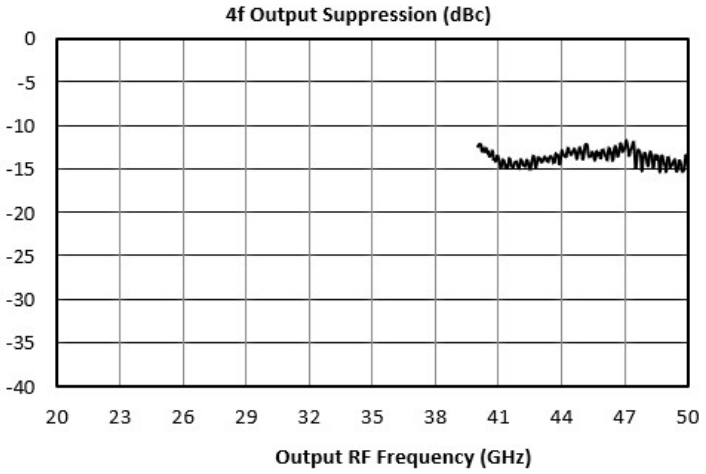


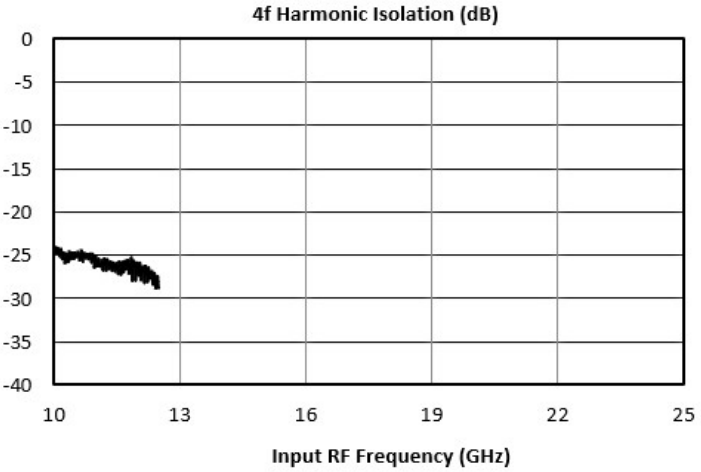


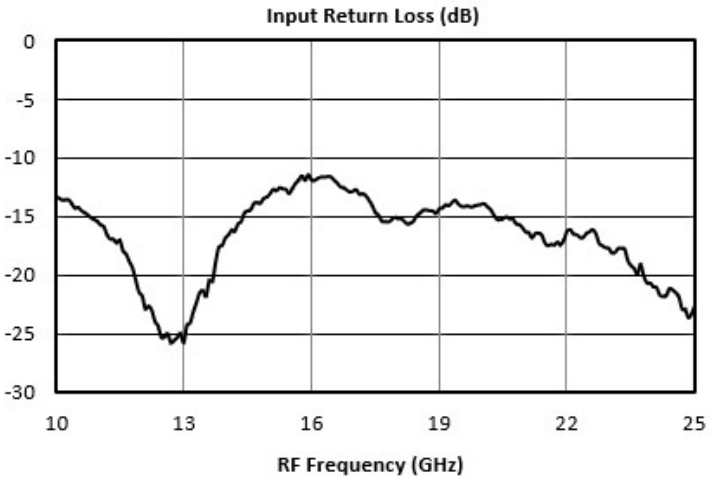


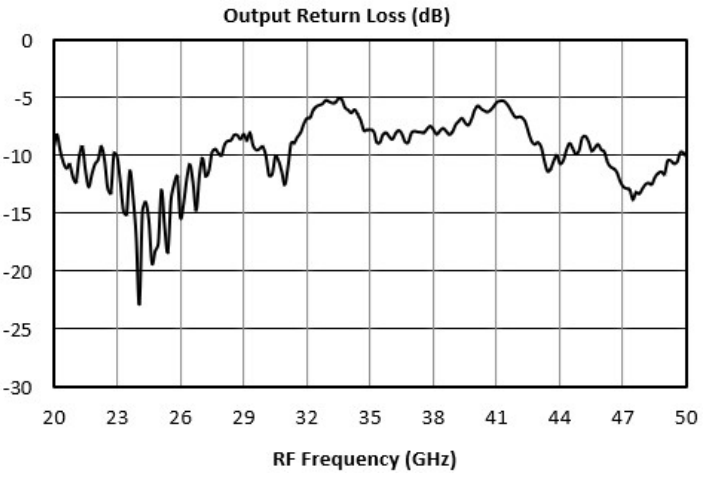








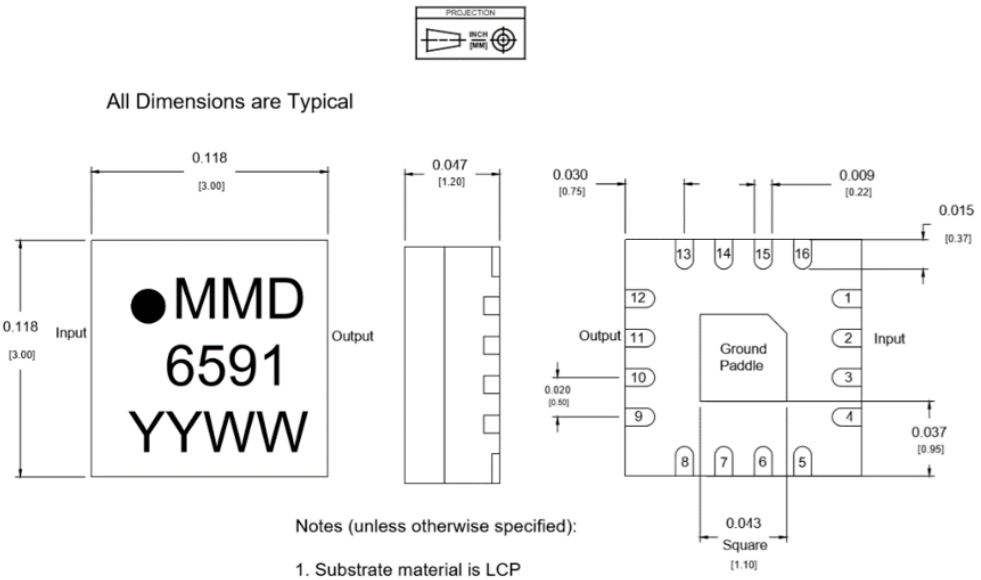




Mechanical Data

Outline Drawing

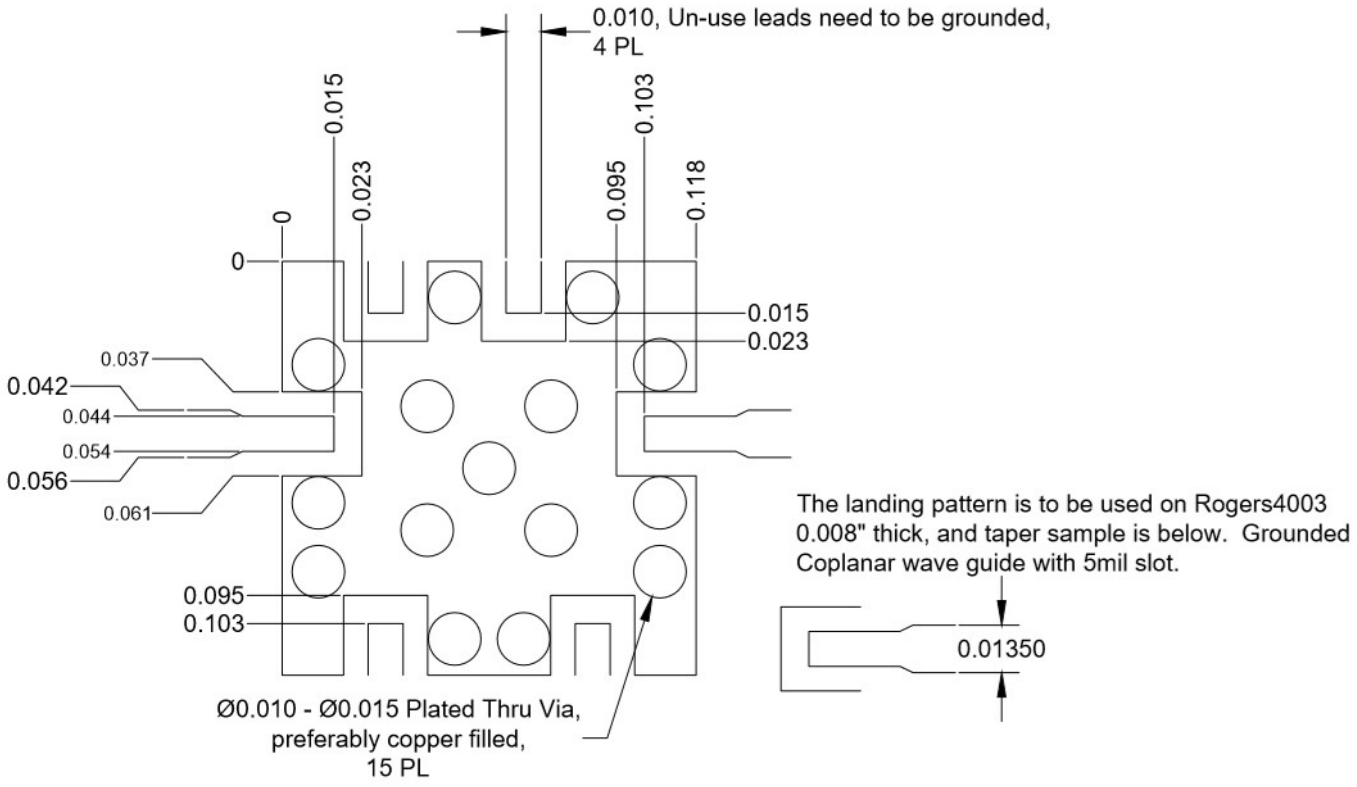
Pin #	Config A
1	N/C
2	Input
3	N/C
4	N/C
5	N/C
6	N/C
7	N/C
8	N/C
9	N/C
10	N/C
11	Output
12	N/C
13	N/C
14	N/C
15	N/C
16	N/C

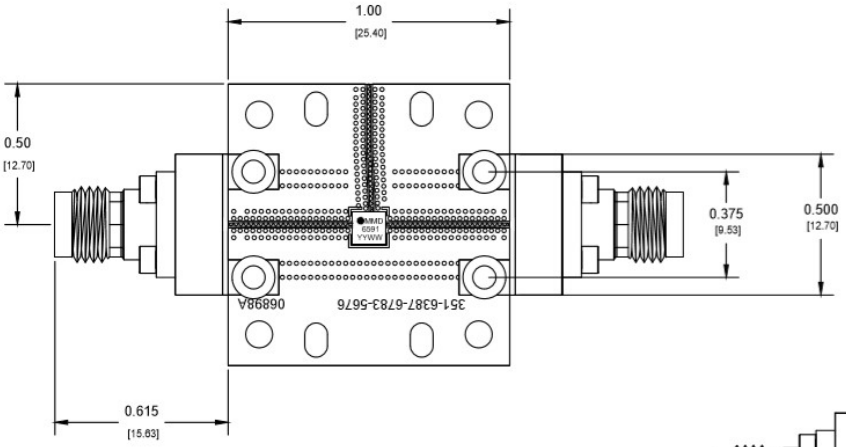


Notes (unless otherwise specified):

1. Substrate material is LCP
2. I/O Leads and Die Paddle is (from base to finish):
   Ni: 0.5um MIN
   Pd: 0.02um MIN
   Au: 0.05um MAX
3. All unconnected pins should be connected to PCB RF ground.

Footprint Image



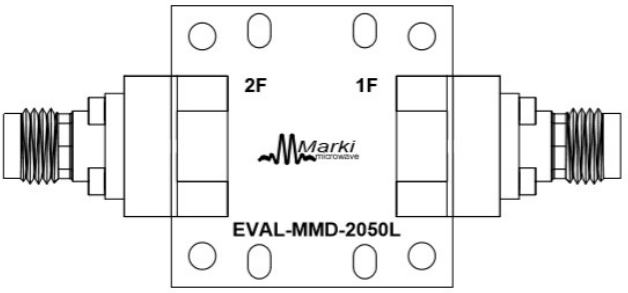


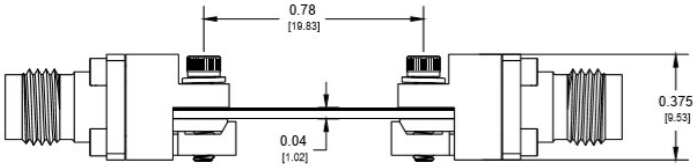
All measurements are typical

Port	Connector Type
F	2.40mm Female
2F	2.40mm Female
Note: Connectors are not removeable on EVAL board	

Port	DC Voltage
F	0.253 V
2F	DC Open

Backside Label





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