

## GaAs MMIC Doubler

## MMD-0415HPSM

### 1. Device Overview

#### 1.1 General Description

The MMD-0415HPSM is a MMIC doubler fabricated with GaAs Schottky diodes. This part operates over a 2 to 7.5 GHz input frequency range or a doubled output frequency range of 4 to 15 GHz. It features excellent conversion loss, superior isolations, and harmonic suppressions across a broad bandwidth. It is available as a 3x3mm QFN and connectorized evaluation board.



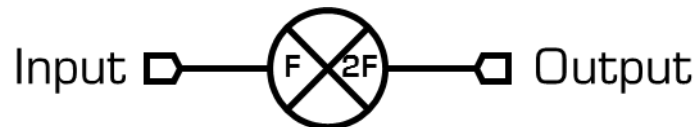
#### 1.2 Features

- High fundamental rejection
- Low 2F Conversion Loss

#### 1.3 Applications

- Test and Measurement
- High Frequency Synthesis
- LO Signal Chain

#### 1.4 Functional Block Diagram



#### 1.5 Part Ordering Options<sup>1</sup>

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
MMD-0415HPSM	3x3 mm QFN	PSM	RoHS	Active	EAR99
EVB-MMD-0415HP	Connectorized Evaluation Fixture	EVB		Active	EAR99

<sup>1</sup> Refer to our [website](#) for a list of definitions for terminology presented in this table.

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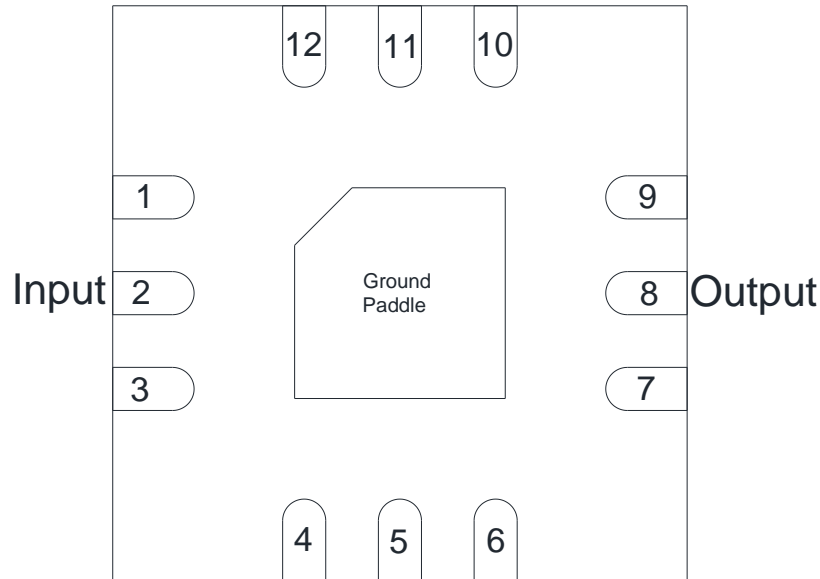
## Revision History

Revision Code	Revision Date	Comment
-	January 2023	Datasheet Initial Release
A	February 2023	Updated Minimum Input Power
B	March 2023	EVB Outline Updated

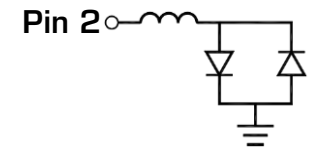
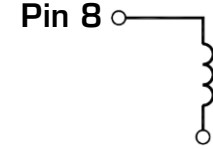
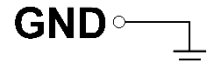
## 2. Port Configurations and Functions

### 2.1 Port Diagram

A top-down x-ray view of the MMD-0415HPSM's PSM package outline drawing is shown below. The MMD-0415HPSM should only be used in the forward direction, with the input and output ports given in Port Functions.



### 2.2 Port Functions

Port	Function	Description	Equivalent Circuit for Package
Pin 2	1F Input	Pin 2 is DC coupled to the diodes for the PSM package. Blocking capacitor is optional.	
Pin 8	2F Output	Pin 8 is DC open for the PSM package.	
GND	Ground	PSM package ground path is provided through the ground paddle.	

### 3. Specifications

#### 3.1 Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. All Absolute Maximum Ratings are individual and should not be met in parallel. If these limits are exceeded or multiple are met in parallel the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Units
Port 1 DC Current	25	mA
Port 2 DC Current	N/A	mA
Power Handling, at any Port	+29	dBm
Operating Temperature	-55 to +100	°C
Storage Temperature	-65 to +125	°C

#### 3.2 Package Information

Parameter	Details	Rating
ESD	Human Body Model (HBM), per MIL-STD-750, Method 1020	1A
Weight	EVB package	10 g

#### 3.3 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.

	Min	Nominal	Max	Units
T <sub>A</sub> , Ambient Temperature	-55	+25	+100	°C
Input Power	+7	+14	+20	dBm

#### 3.4 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.

### 3.5 Electrical Specifications

The electrical specifications apply at  $T_A=+25^{\circ}\text{C}$  in a  $50\Omega$  system. Typical data shown is for the connectorized EVB package doubler used in the forward direction with a +14 dBm sine wave input.

Min and Max limits apply only to our connectorized units and are guaranteed at  $T_A=+25^{\circ}\text{C}$ .

Parameter	Test Conditions	Min	Typical	Max	Units
Input (Port 1) Frequency Range		2		7.5	GHz
Output (Port 2) Frequency Range <sup>1</sup>		4		15	
Input Power		+7	+14	+20	dBm
2F Conversion Loss (CL)	Input = 2 – 7.5 GHz Output = 4 - 15 GHz		11	15	dB
Suppression <sup>2,3</sup>	1F Input = 2 – 7.5 GHz Output = 2 – 7.5 GHz		27		dBc
	3F Input = 2 – 5 GHz Output = 6 - 15 GHz		38		
	4F Input = 2 – 3.75 GHz Output = 8 - 15 GHz		16		
Isolations <sup>4</sup>	1F Input = 2 – 7.5 GHz Output = 2 – 7.5 GHz		39		dB
	3F Input = 2 – 5 GHz Output = 6 - 15 GHz		48		
	4F Input = 2 – 3.75 GHz Output = 8 - 15 GHz		26		

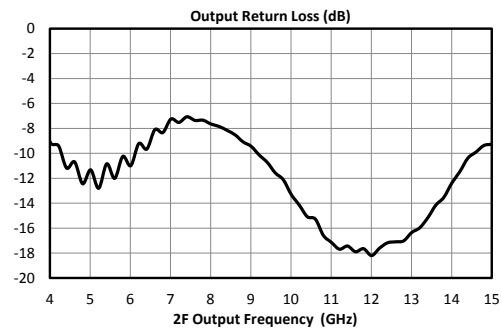
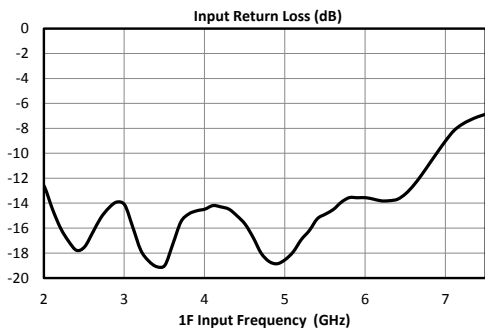
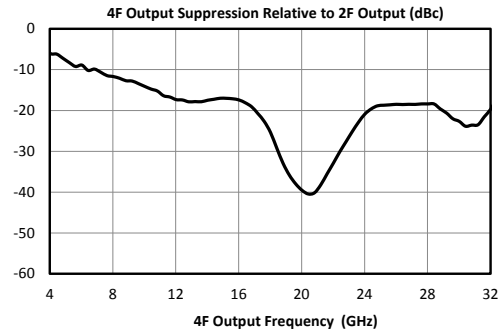
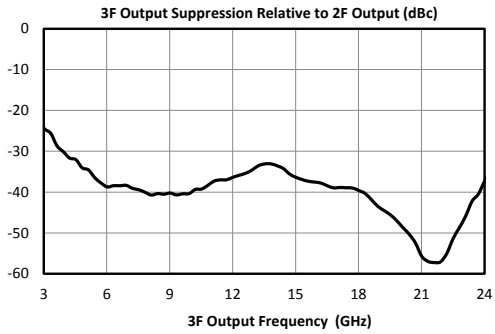
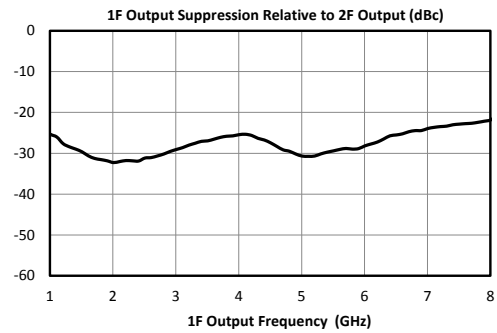
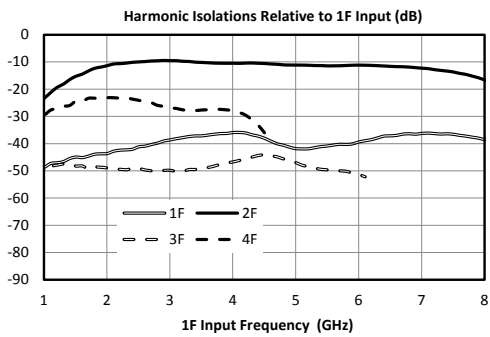
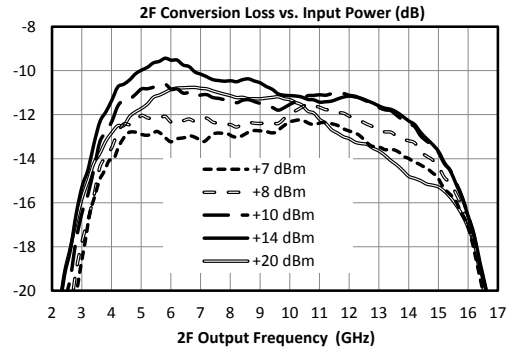
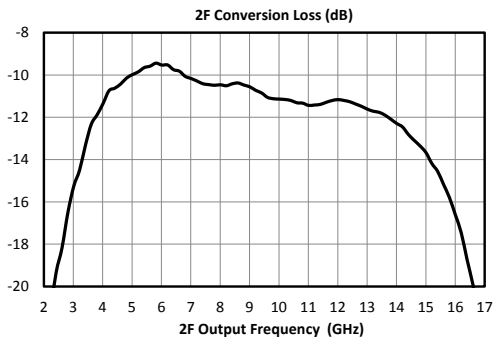
<sup>1</sup> Output return loss measured with a fixed frequency large signal 4.75 GHz input.

<sup>2</sup> Suppressions and isolations measured with an input source with >60dBc (relative to fundamental input) harmonic suppression.

<sup>3</sup> Suppression is defined as the harmonic power relative to the 2F doubled output power.

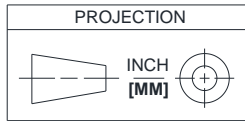
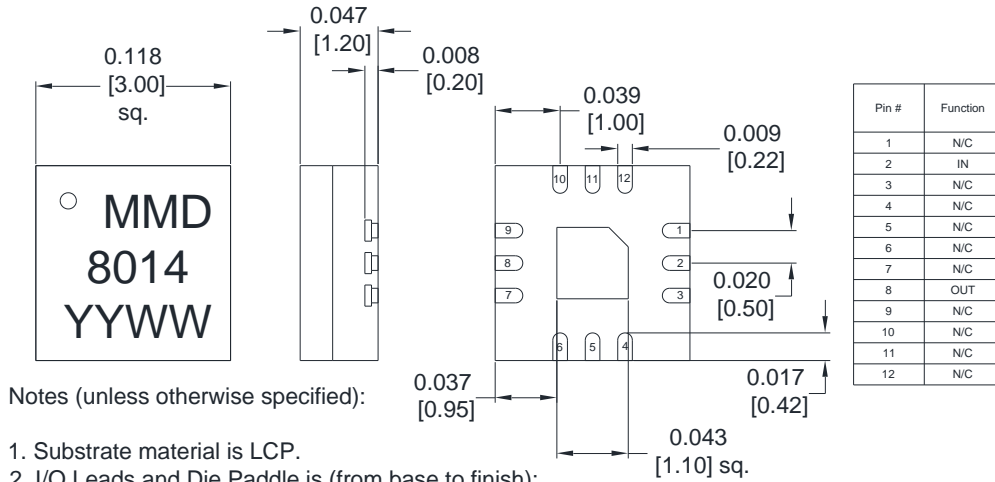
<sup>4</sup> Isolation is defined as the harmonic power relative to the 1F fundamental input power.

### 3.6 Typical Performance Plots



## 4. Mechanical Data

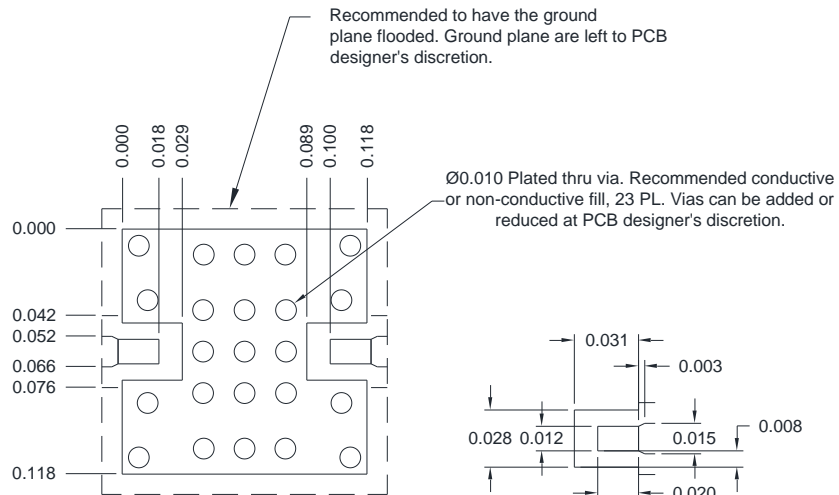
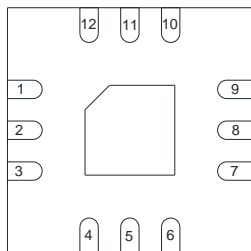
### 4.1 PSM Package Outline Drawing



All Dimensions are typical

### 4.2 PSM Package Footprint

QFN 3mm Sample Drawing X-Ray view



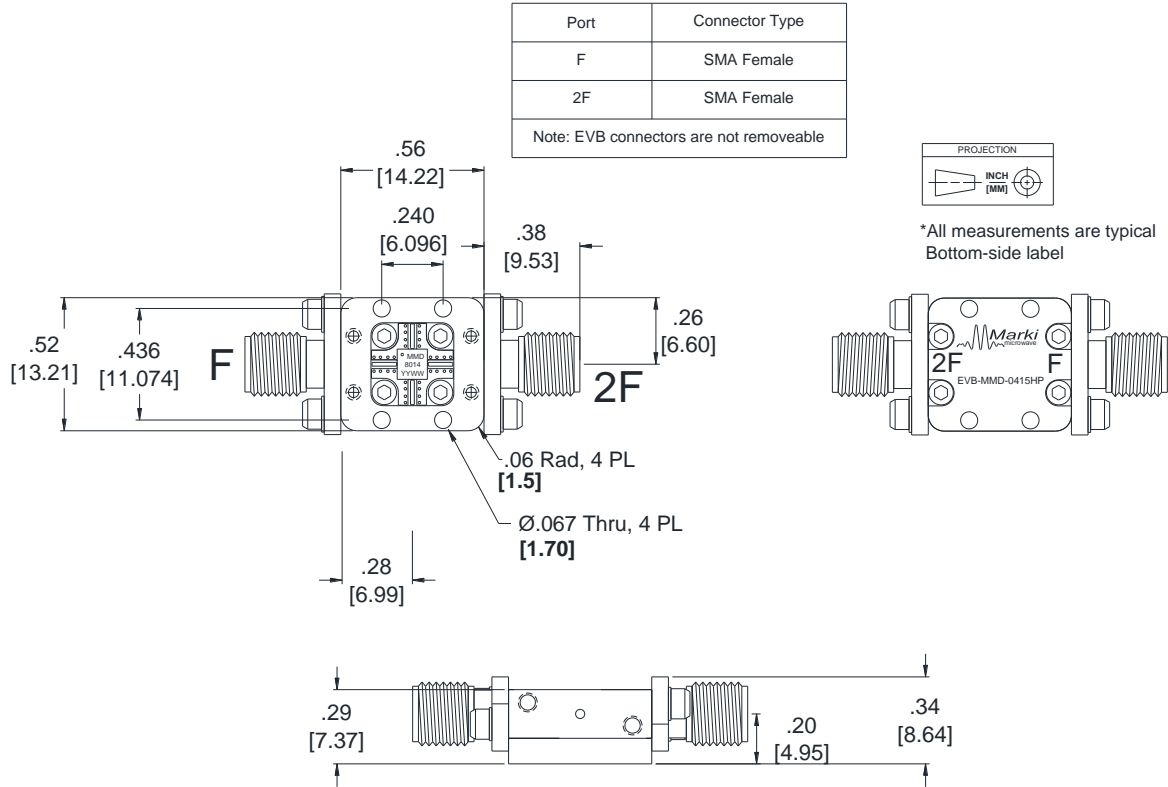
The landing pattern is to be used on 0.005" thick Taconic TLY-5 1/2 Oz Electro-Deposited CU Both Side.

QFN-Package Surface-Mount Landing Pattern

[Click Here for a DXF of the above layout.](#)

[Click here for leaded solder reflow.](#) [Click here for lead-free solder reflow.](#)

### 4.3 Evaluation Board Outline Drawing



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