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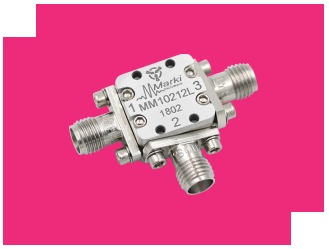
MM1-0212LS

Connectorized Module

DEVICE OVERVIEW

General Description

MM1-0212L is a low power GaAs MMIC double balanced mixer that operates at LO powers as a low as +1 dBm. MM1-0212L is a low frequency, low power S band mixer that works well as both an up and down converter to through X band. This mixer offers low conversion loss and high LO to RF isolations at extremely low LO drives. The sister MM1-0212H and MM1-0212S are recommended for high linearity applications. The MM1-0212L is available as both wire bondable die and as connectorized modules.



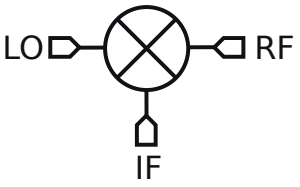
Features

- Low +1 dBm minimum LO drive
- Low cost X band mixer

Applications

- Mobile test and measurement equipment
- Power efficient modules

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MM1-0212LS	Connectorized Module	S	Standard	REACH RoHS	Released	EAR99

Table Of Contents

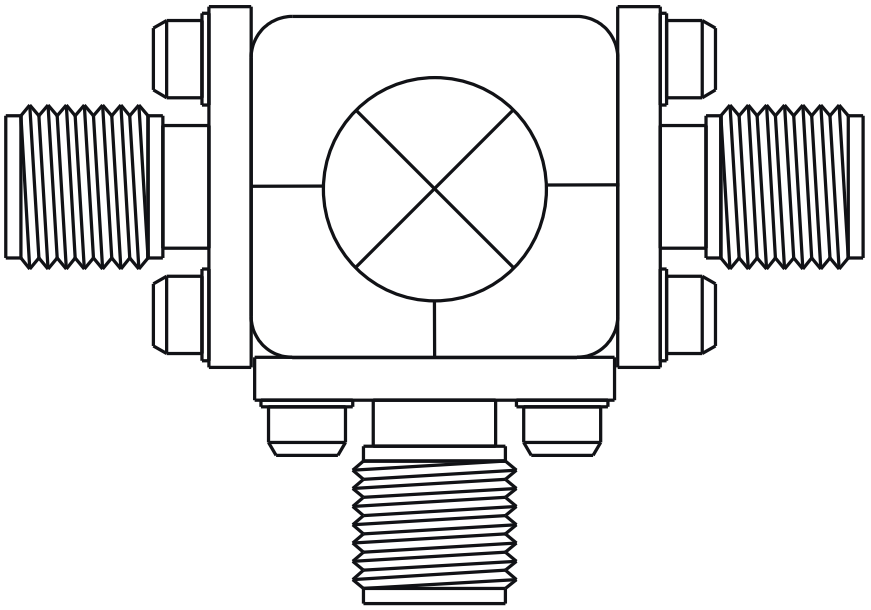
Revision History

Revision Code	Revision Date	Comment
-	2018-01-01	Datasheet Initial Release
A	2019-01-01	Added max power/current spec, ESD rating

Port Configuration and Functions

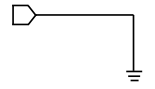
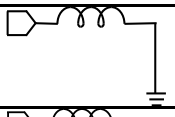
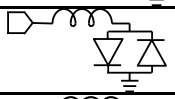
Port Diagram

The MM1-0212L has the input and output ports given in Port Functions. The MM1-0212L can be used in either an up or down conversion. For configuration A, input the LO into port 1, use port 3 for the RF, and port 2 for the IF. For configuration B, input the LO into port 3, use port 1 for the RF, and port 2 for the IF.

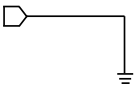
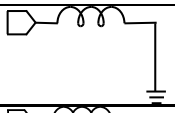
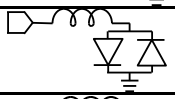
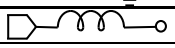


Port Functions

Configuration A

Port	Function	Connector Type	Description	DC Equivalent Circuit
GND	Ground	-	S package ground provided through metal housing and outer coax conductor.	
Port 1	LO	SMAF	Port 1 is DC short for the CH and S packages.	
Port 2	IF	SMAF	Port 2 is diode connected for the CH and S package.	
Port 3	RF	SMAF	Port 3 is DC open for the CH and S packages.	

Configuration B

Port	Function	Connector Type	Description	DC Equivalent Circuit
GND	Ground	-	S package ground provided through metal housing and outer coax conductor.	
Port 1	RF	SMAF	Port 1 is DC short for the CH and S packages.	
Port 2	IF	SMAF	Port 2 is diode connected for the CH and S package.	
Port 3	LO	SMAF	Port 3 is DC open for the CH and S packages.	

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
Port 1 DC Current	30	mA
Port 2 DC Current	30	mA
Power Handling, at any Port	30	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Weight	Package name: S	10g
Dimensions	-	14.22 x 13.21 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
Ambient Temperature	-55	25	100	°C
LO Input Power	1	-	15	dBm

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 mixer that requires no DC bias.

Electrical Specifications

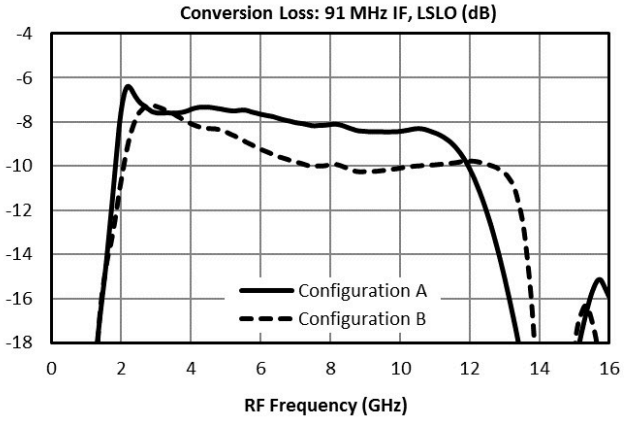
The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the connectorized S package mixer used in the forward direction with a +9 dBm sine wave input. Min and Max limits apply only to our connectorized units and are guaranteed at TA=+25°C. All bare die are 100% DC tested and visually inspected.

Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
Conversion Loss [1]	A	RF/LO = 2 - 12 GHz I = 0.2 - 3 GHz	-	9.5	-	dB
Conversion Loss [2]	A	RF/LO = 2 - 12 GHz I = DC - 0.2 GHz	-	8	11	dB
Input IP3	A	RF/LO = 2 - 12 GHz I = DC - 0.2 GHz	-	12.5	-	dBm
Input P1dB	A	-	-	2	-	dBm
Conversion Loss [3]	B	RF/LO = 2 - 12 GHz I = 0.2 - 3 GHz	-	11	-	dB
Conversion Loss [4]	B	RF/LO = 2 - 12 GHz I = DC - 0.2 GHz	-	9.5	12.5	dB
Input IP3	B	RF/LO = 2 - 12 GHz I = DC - 0.2 GHz	-	14	-	dBm
Input P1dB	B	-	-	4	-	dBm
IF Frequency Range	-	-	0	-	3	GHz
LO Frequency Range	-	-	2	-	12	GHz
LO-IF Isolation	-	IF/LO = 2 - 12 GHz	-	49	-	dB
LO-RF Isolation	-	RF/LO = 2 - 12 GHz	-	47	-	dB
Noise Figure [5]	-	RF/LO = 2 - 12 GHz I = DC - 0.2 GHz	-	8.5	-	dB
RF Frequency Range	-	-	2	-	12	GHz
RF-IF Isolation	-	RF/IF = 2 - 12 GHz	-	39	-	dB

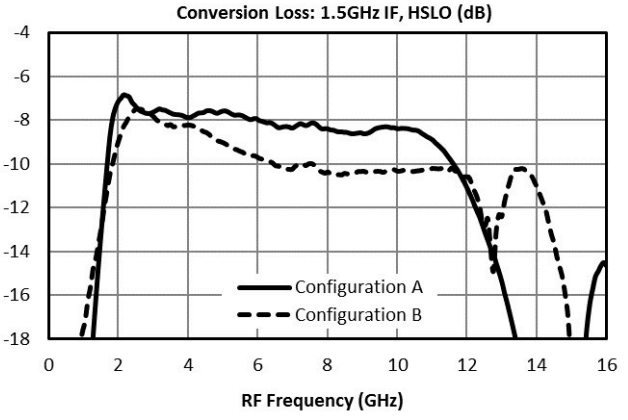
[1][2][3][4] Measured as a down converter to a fixed 91MHz IF.
[5] Mixer Noise Figure typically measures within 0.5 dB of conversion loss for IF frequencies greater than 5 MHz.

Typical Performance Plots

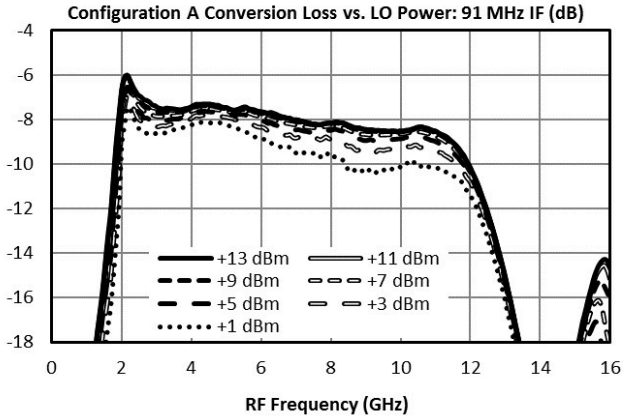
Conversion Loss: 91 MHz IF, LSLO (dB)



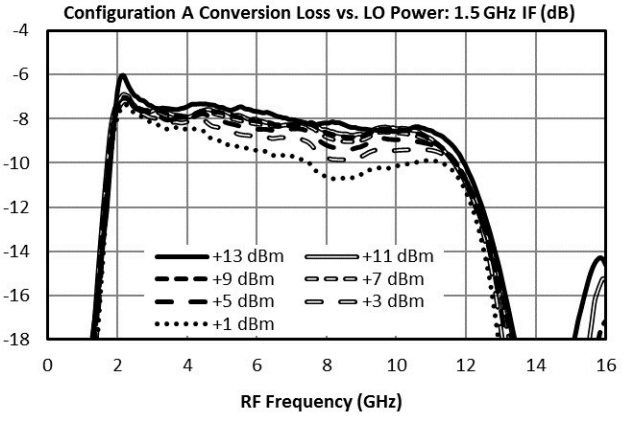
Conversion Loss: 1.5GHz IF, HSLO (dB)



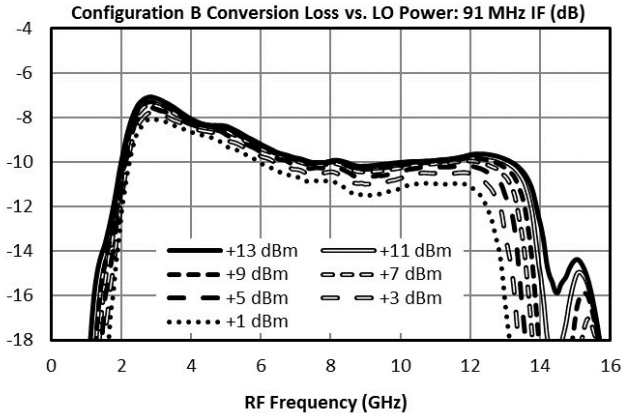
Configuration A Conversion Loss vs. LO Power: 91 MHz IF (dB)



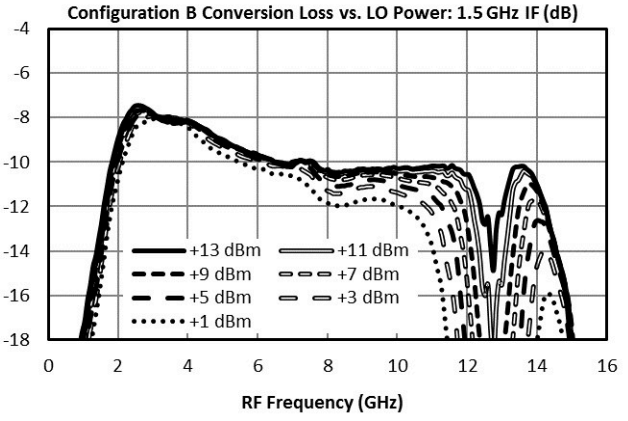
Configuration A Conversion Loss vs. LO Power: 1.5 GHz IF (dB)



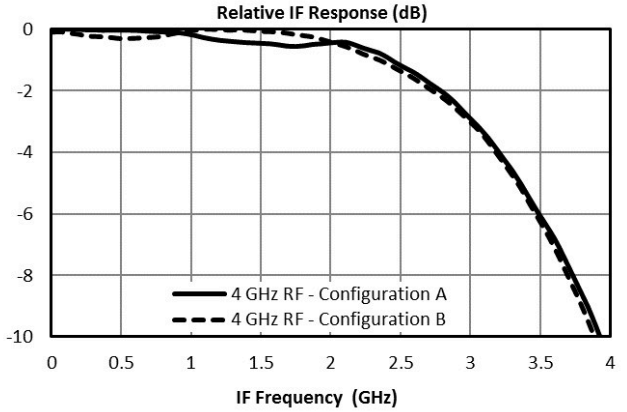
Configuration B Conversion Loss vs. LO Power: 91 MHz IF (dB)



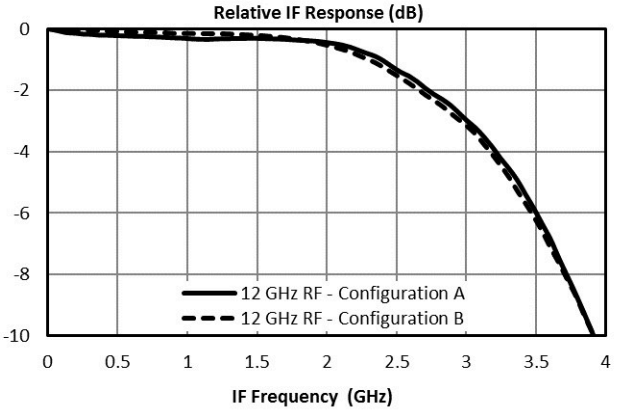
Configuration B Conversion Loss vs. LO Power: 1.5 GHz IF (dB)

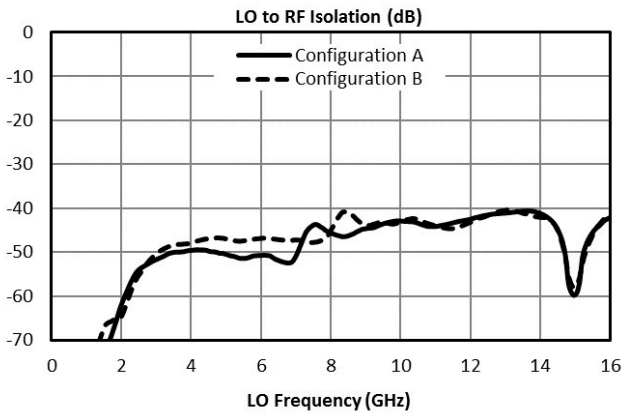


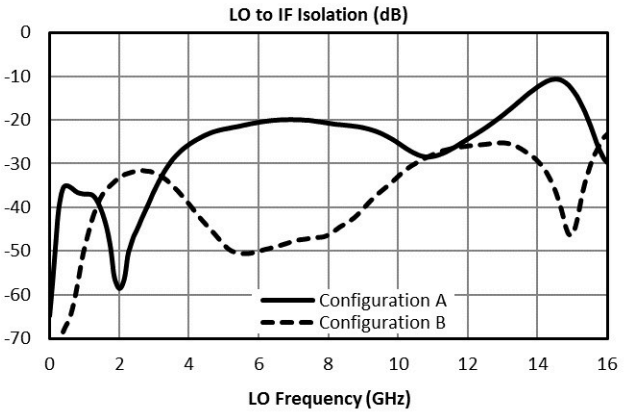
Relative IF Response (dB)

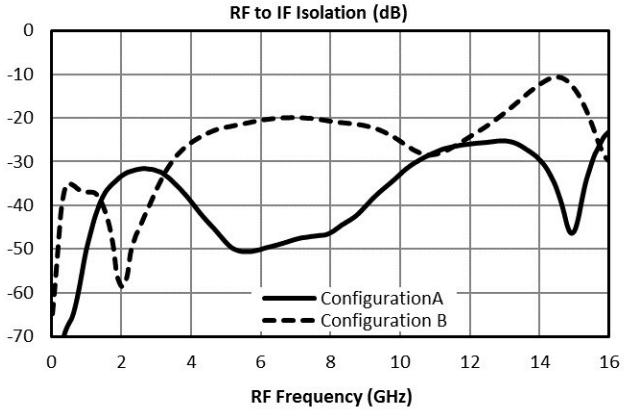


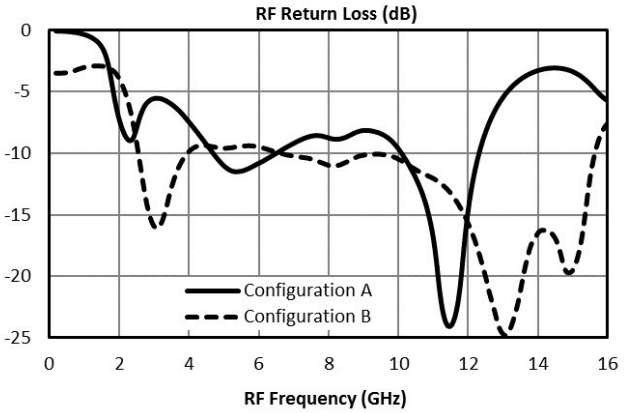
Relative IF Response (dB)

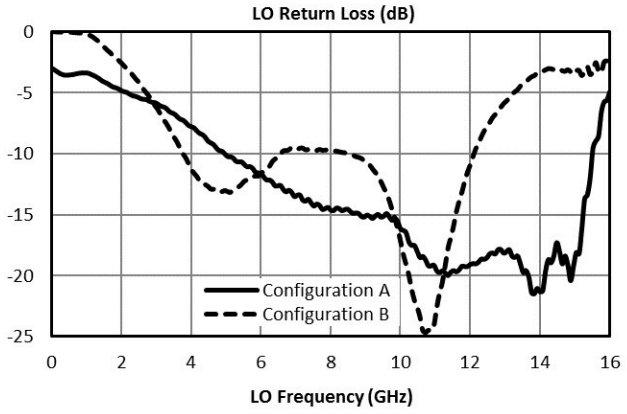


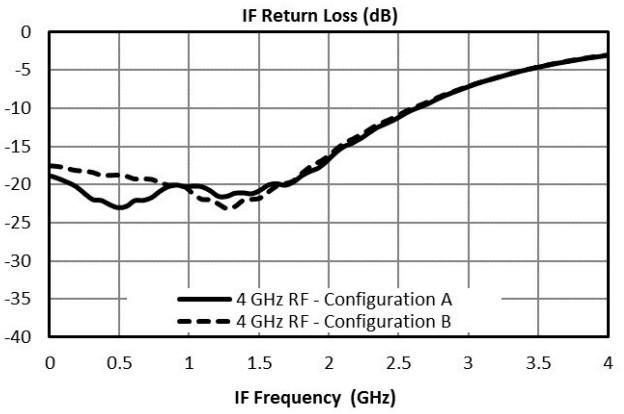


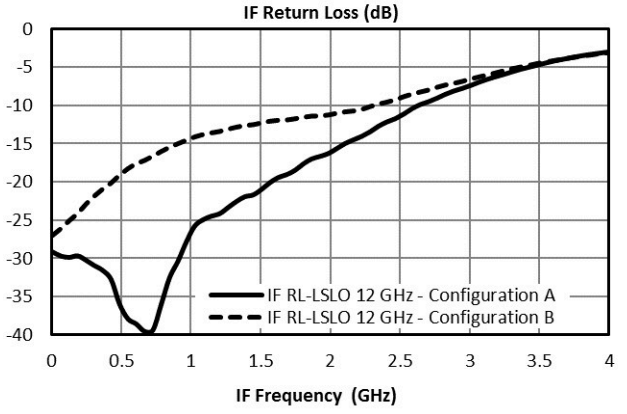




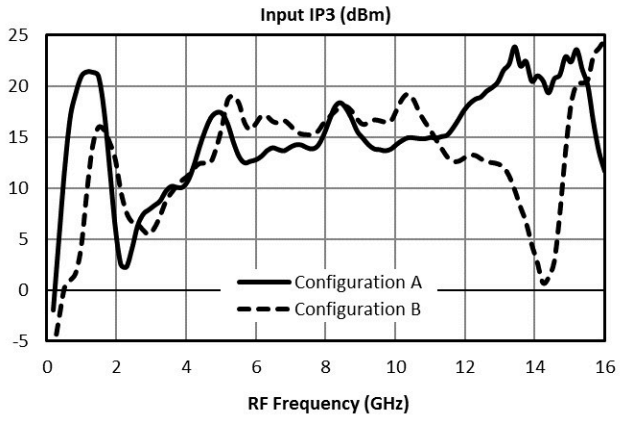


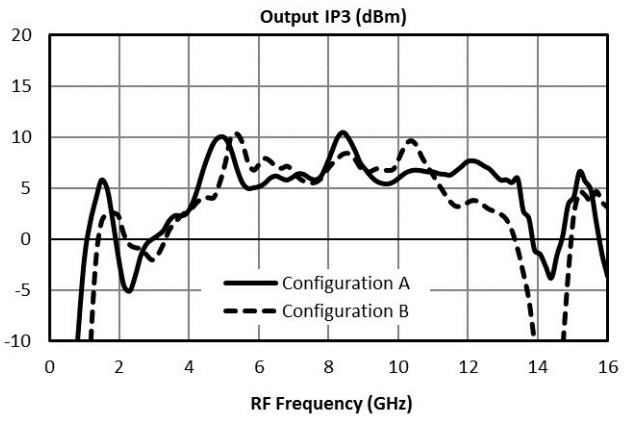


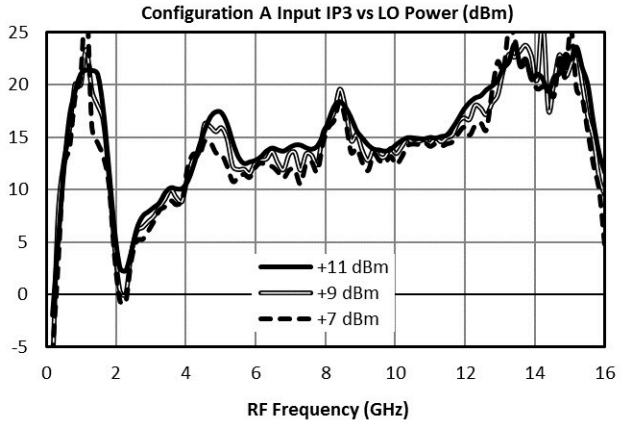


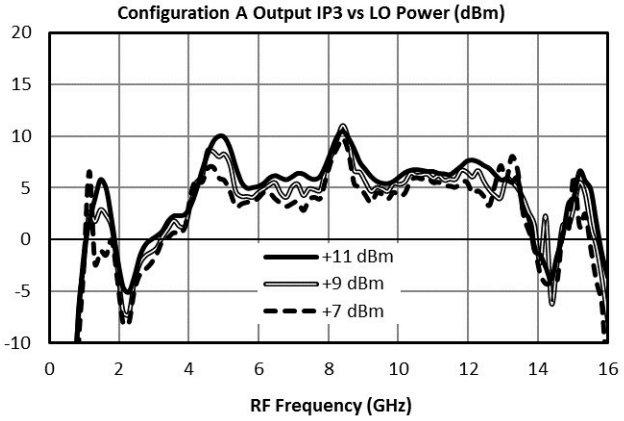


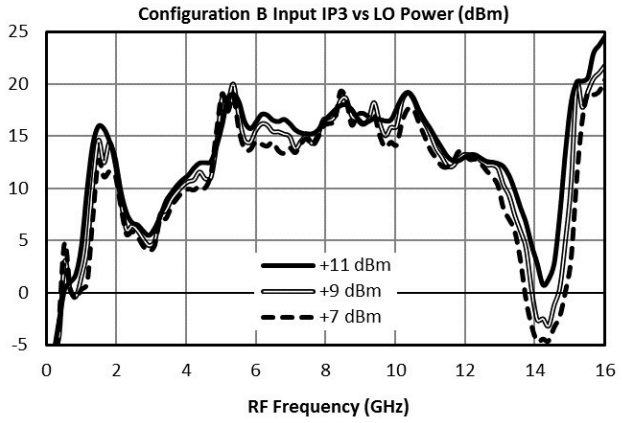
Typical Performance Plots: IP3

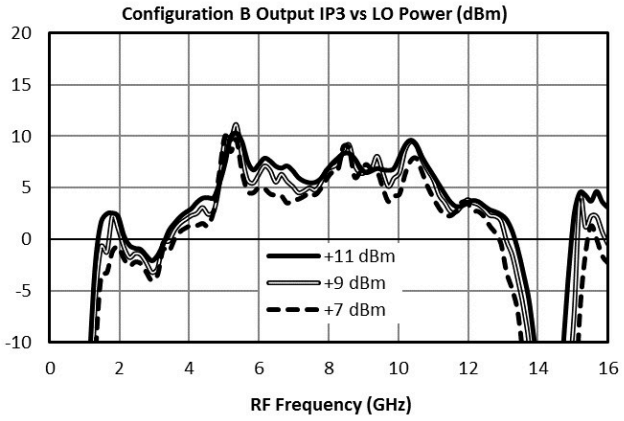




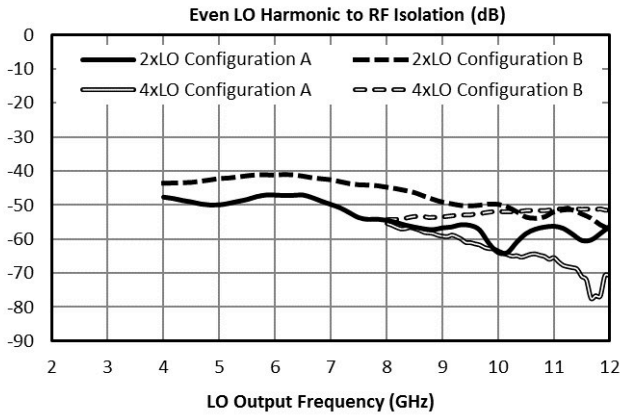


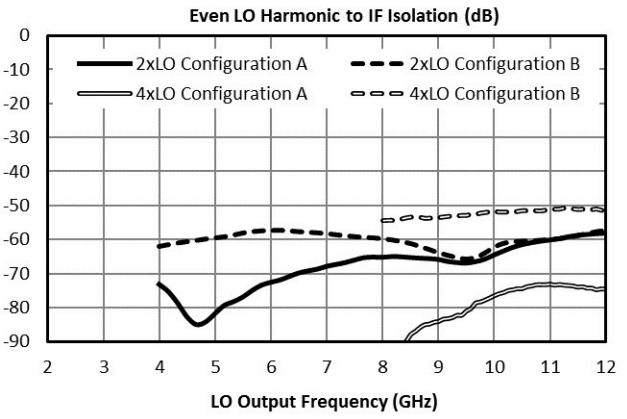


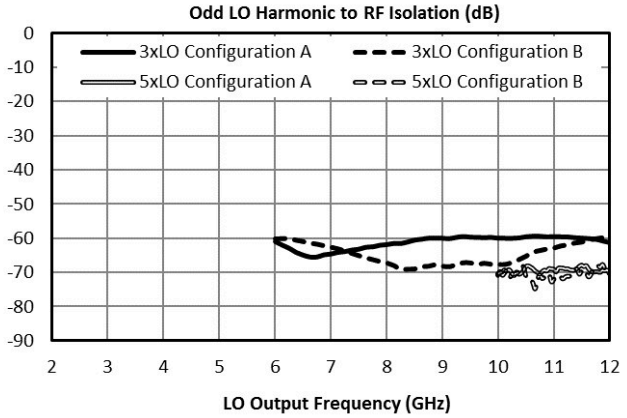


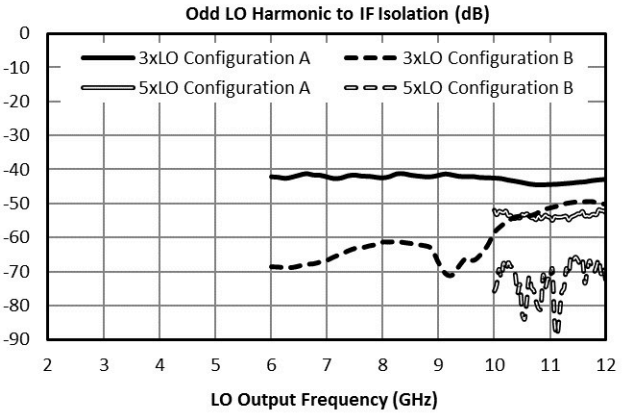


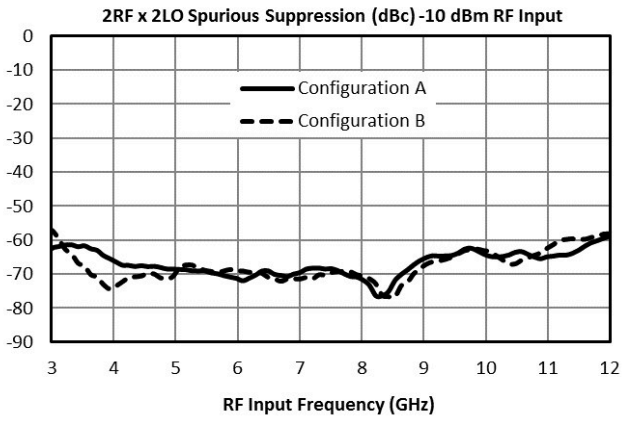
Typical Performance Plots: LO Harmonic Isolation

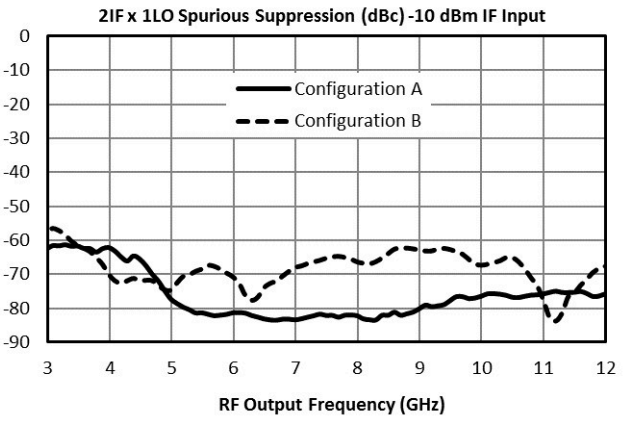












Spur Table

Typical Spurious Performance: Down-Conversion

Typical spurious data is provided by selecting RF and LO frequencies (± m*LO ± n*RF) within the RF/LO bands, to create a spurious output within the IF band. The mixer is swept across the full spurious band and the mean is calculated. The numbers shown in the table below are for a -10 dBm RF input. Spurious suppression is scaled for different RF power levels by (n-1), where "n" is the RF spur order. For example, the 2RF x 2LO spur is 67 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) lower, or 77 dBc. Data is shown for the frequency plan in 3.6 Typical Performance.

Typical Down-conversion spurious suppression (dBc): Config A (B)

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	30 (15)	Reference	37 (36)	11 (11)	42 (38)	26 (26)
2xRF	69 (70)	51 (50)	67 (67)	62 (61)	63 (66)	66 (58)
3xRF	78 (66)	41 (44)	72 (76)	54 (56)	76 (72)	53 (53)
4xRF	100 (105)	82 (88)	89 (91)	76 (80)	100 (98)	89 (93)
5xRF	98 (105)	95 (99)	93 (91)	80 (85)	104 (104)	90 (96)

Typical Spurious Performance: Up-Conversion

Typical spurious data is taken by mixing an input within the IF band, with LO frequencies (± m*LO ± n*IF), to create a spurious output within the RF output band. The mixer is swept across the full spurious output band and the mean is calculated. The numbers shown in the table below are for a -10 dBm IF input. Spurious suppression is scaled for different IF input power levels by (n-1), where "n" is the IF spur order. For example, the 2IFx1LO spur is typically 75 dBc for a -10 dBm input with a sine-wave LO, so a -20 dBm IF input creates a spur that is (2-1) x (-10 dB) lower, or 85 dBc. Data is shown for the frequency plan in 3.6 Typical Performance.

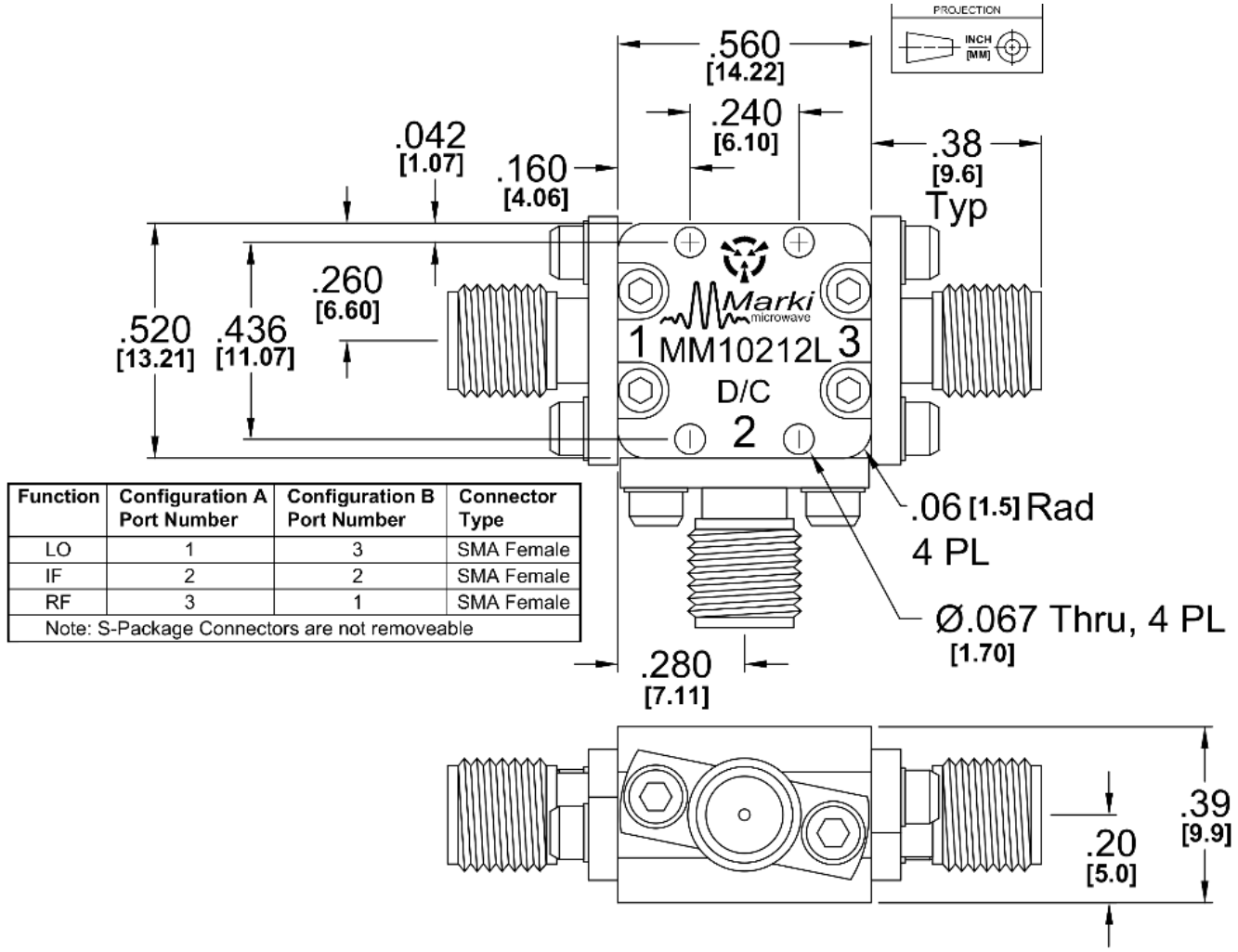
Typical Up-conversion spurious suppression (dBc): Config A (B)

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	28 (21)	Reference	39 (37)	11 (12)	46 (40)	23 (24)
2xIF	52 (66)	75 (67)	53 (56)	66 (66)	57 (54)	65 (74)
3xIF	89 (75)	54 (55)	66 (67)	42 (49)	66 (68)	56 (48)
4xIF	104 (113)	110 (113)	100 (98)	102 (105)	97 (91)	109 (108)
5xIF	122 (122)	102 (105)	115 (117)	85 (90)	110 (111)	96 (87)

Mechanical Data

Outline Drawing

Download : Outline 2D Drawing | Outline 3D Drawing | Outline 3D STP



Function	Configuration A Port Number	Configuration B Port Number	Connector Type
LO	1	3	SMA Female
IF	2	2	SMA Female
RF	3	1	SMA Female
Note: S-Package Connectors are not removeable			

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