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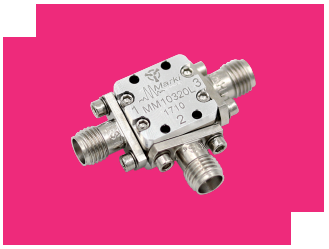
MM1-0320LS

GaAs MMIC Double Balanced Mixer

DEVICE OVERVIEW

General Description

The MM1-0320L is a passive double balanced MMIC mixer. It features excellent conversion loss, superior isolations and spurious performance across a broad bandwidth, in a highly miniaturized form factor. Low LO drive requirement allows operation at as low as +5dBm inputs. The MM1-0320L is available as a wire bondable chip or an SMA connectorized package. The MM1-0320L is a superior alternative to Marki Microwave carrier and packaged M1 and M3 mixers. The MM1-0320L is the low barrier version of the MM1-0320H. If higher LO power is available, the MM1-0320H is recommended for higher mixer linearity.



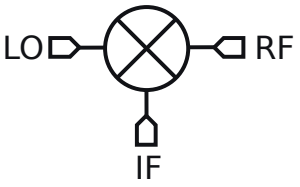
Features

- CAD Optimized for Superior Isolation and Spurious Response
- Broadband Performance
- Low LO Drive Requirement
- Excellent Unit-to-Unit Repeatability
- RoHS Compliant

Applications

- Test and Measurement Equipment
- SATCOM
- Radar

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MM1-0320LS	GaAs MMIC Double Balanced Mixer	S	Standard	REACH RoHS	Released	EAR99

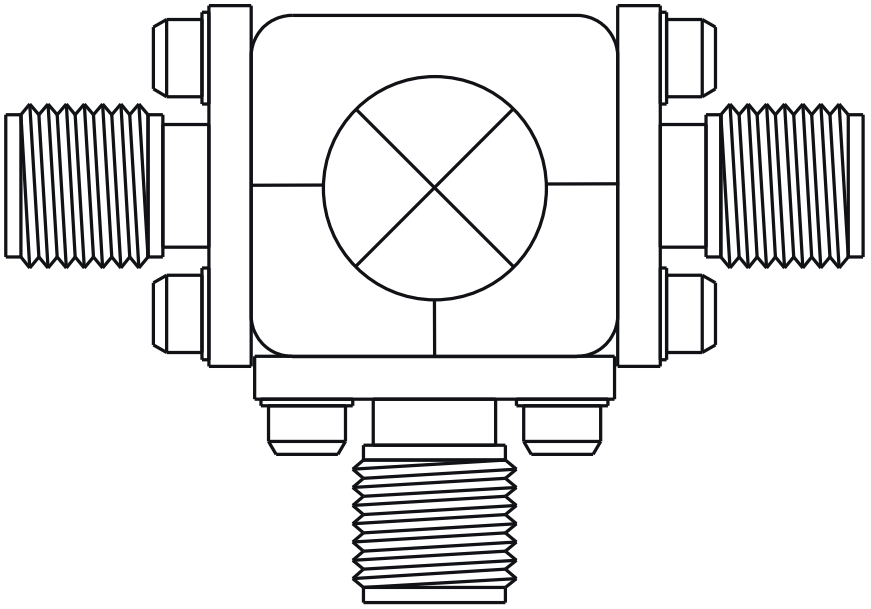
Table Of Contents

Revision History

Revision Code	Revision Date	Comment
A	2026-02-13	MTTF Table Added

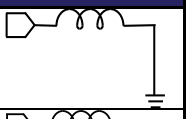
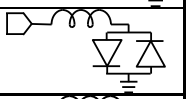
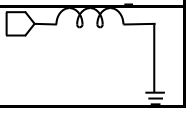
Port Configuration and Functions

Port Diagram

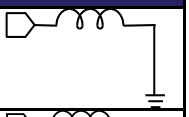
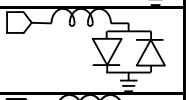
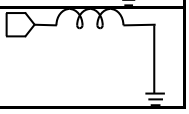


Port Functions

Configuration A

Port	Function	Connector Type	Description	DC Equivalent Circuit
Port 1	LO	SMAF	Port 1 is DC short and AC matched to 50 Ω from 3 to 20 GHz. Blocking capacitor is optional.	
Port 2	IF	SMAF	Port 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Port 3	RF	SMAF	Port 3 is DC short and AC matched to 50 Ω from 3 to 20 GHz. Blocking capacitor is optional.	

Configuration B

Port	Function	Connector Type	Description	DC Equivalent Circuit
Port 1	RF	SMAF	Port 1 is DC short and AC matched to 50 Ω from 3 to 20 GHz. Blocking capacitor is optional.	
Port 2	IF	SMAF	Port 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Port 3	LO	SMAF	Port 3 is DC short and AC matched to 50 Ω from 3 to 20 GHz. Blocking capacitor is optional.	

Specifications

Absolute Maximum Ratings

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	15	mA
Port 2 DC Current	15	mA
Port 3 DC Current	30	mA
RF Power Handling (RF+LO), 100°C	20	dBm
RF Power Handling (RF+LO), 25°C	25	dBm

FIT and MTTF Table

T (°C)	λ (TIF)	MTTF (hr)	MTTF (yr)
125	6,494.37	153,980	17.57757
85	644.3396	1,551,977	177.1663
55	78.70691	1.3E+07	1,450.384
40	23.6513	4.2E+07	4,826.595
25	6.297343	1.6E+08	18,127.53

Package Information

Parameter	Details	Rating
Dimensions	-	14.22 x 13.21mm

Recommended Operating Conditions

Parameter	Min	Nominal	Max	Unit
LO Input Power	5	-	9	-

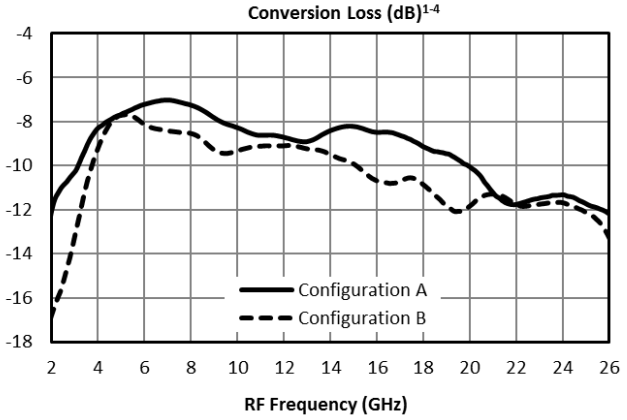
Electrical Specifications

Specifications guaranteed from -55 to +100°C, measured in a 50Ω system. All bare die are 100% DC tested and 100% visually inspected. RF testing is performed on a sample basis to verify conformance to datasheet guaranteed specifications.

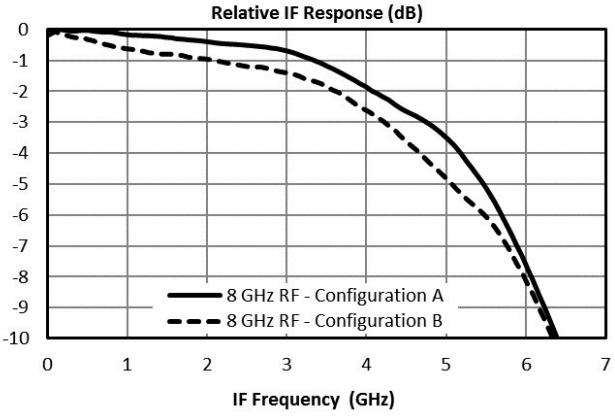
Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	A	LO/RF=3-20GHz IF=0.2-4 LO drive level=7dBm	-	10.5	-	dB
Conversion Loss	A	LO/RF=3-20GHz IF=DC-0.2 LO drive level=7dBm	-	8	11.5	dB
Input IP3	A	LO/RF=3-20GHZ IF=DC-4 LO drive level=5-9dBm	-	10	-	dBm
Input P1dB	A	LO/RF=3-20GHz IF=DC-4 LO drive level=5-9dBm	-	0	-	dBm
LO-RF Isolation	A	-	-	54	-	dB
Conversion Loss	B	LO/RF=3-20GHz IF=0.2-4 LO drive level=7dBm	-	12	-	dB
Conversion Loss	B	LO/RF=3-20GHz IF=DC-0.2 LO drive level=7dBm	-	9	13	dB
Input IP3	B	LO/RF=3-20GHZ IF=DC-4 LO drive level=5-9dBm	-	11	-	dBm
Input P1dB	B	LO/RF=3-20GHz IF=DC-4 LO drive level=5-9dBm	-	0	-	dBm
IF Frequency Range	-	-	0	-	4	GHz
LO Frequency Range	-	-	3	-	20	GHz
RF Frequency Range	-	-	3	-	20	GHz

Typical Performance Plots

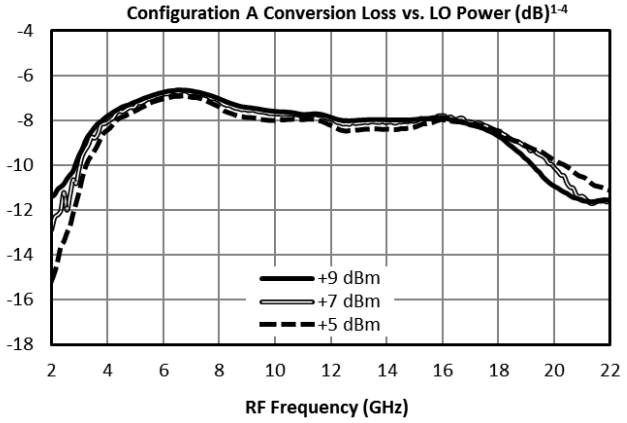
Conversion Loss (dB)[1-4]



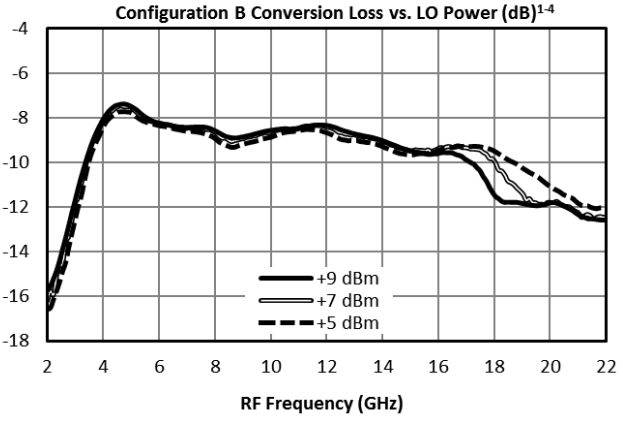
Relative IF Response (dB)



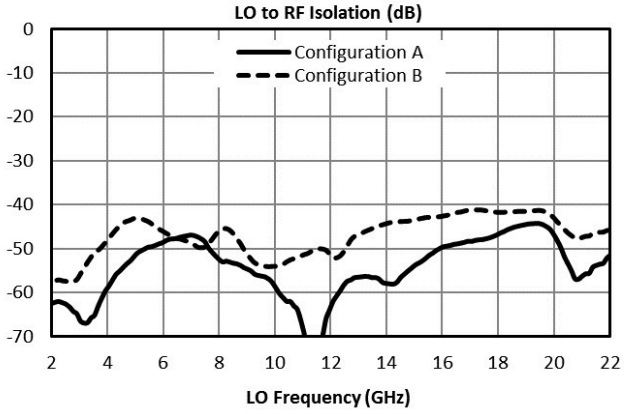
Configuration A Conversion Loss vs. LO Power (dB)[1-4]



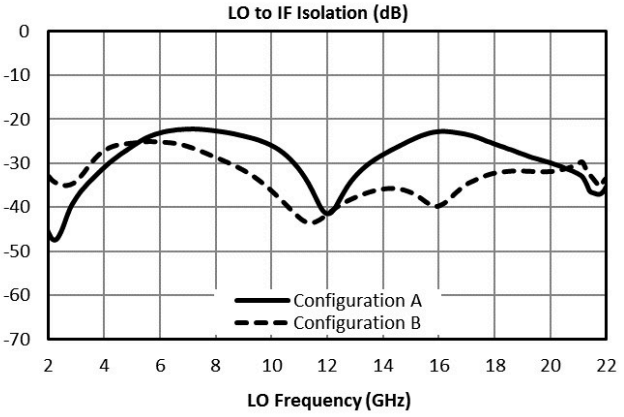
Configuration B Conversion Loss vs. LO Power (dB)[1-4]



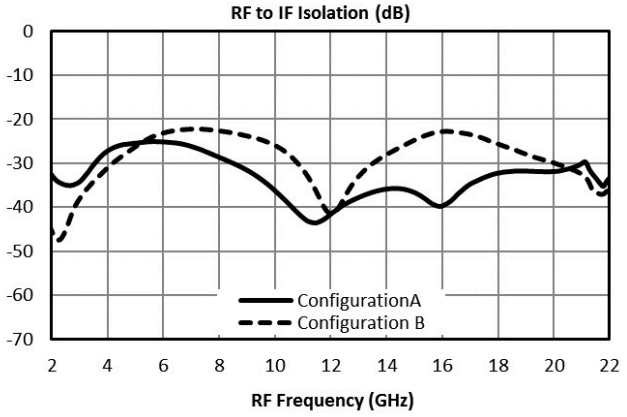
LO to RF Isolation (dB)



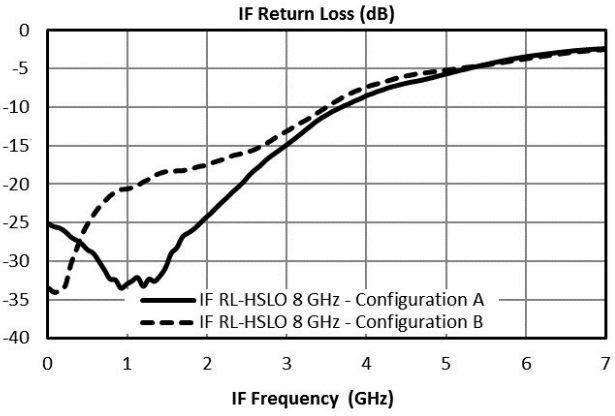
LO to IF Isolation (dB)



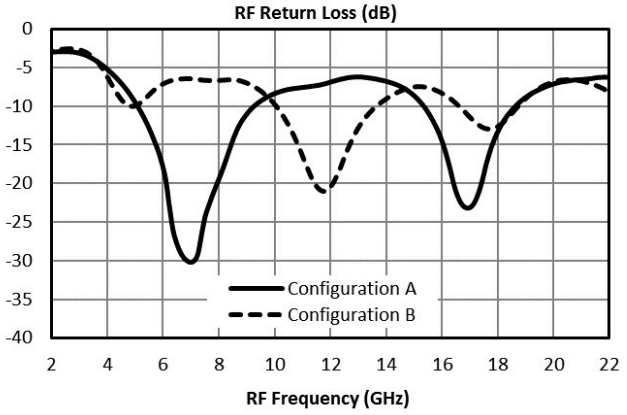
RF to IF Isolation (dB)



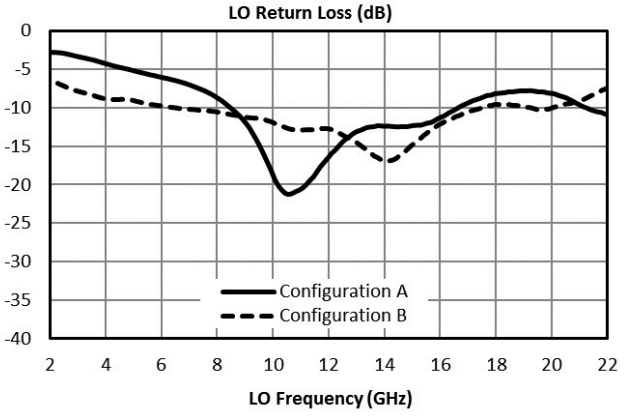
IF Return Loss (dB)



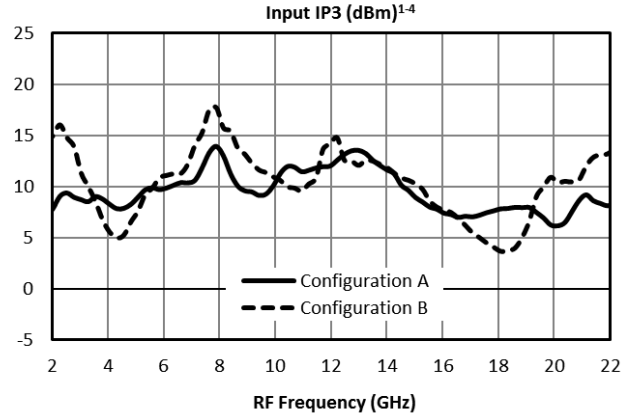
RF Return Loss (dB)



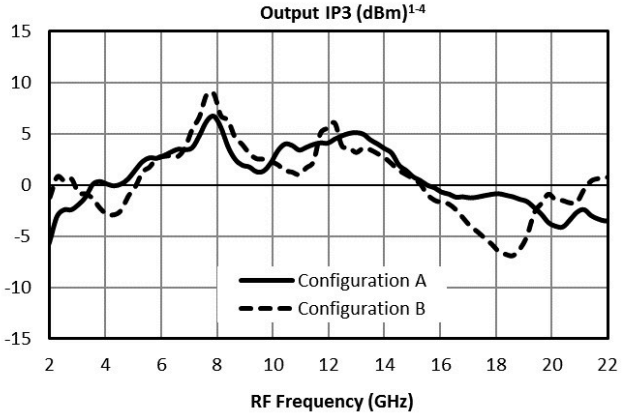
LO Return Loss (dB)



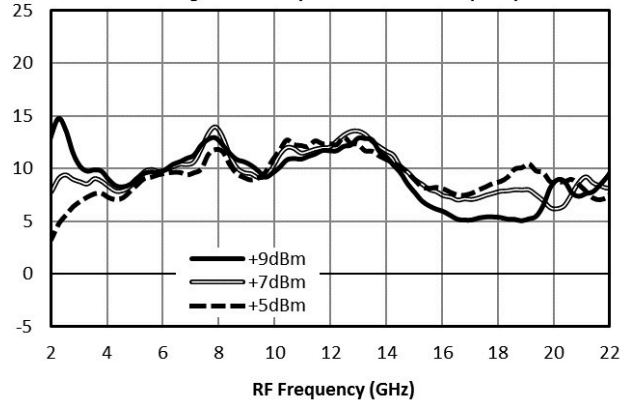
Input IP3 (dBm)[1-4]



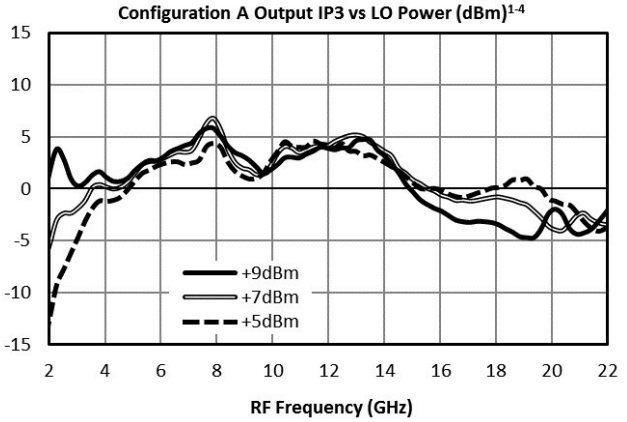
Output IP3 (dBm)[1-4]



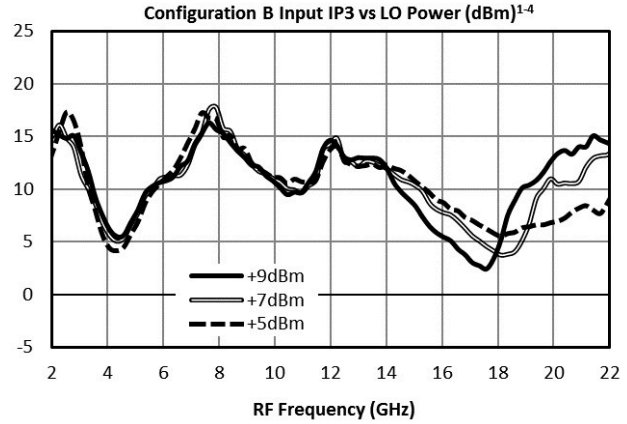
Configuration A Input IP3 vs LO Power (dBm)[1-4]



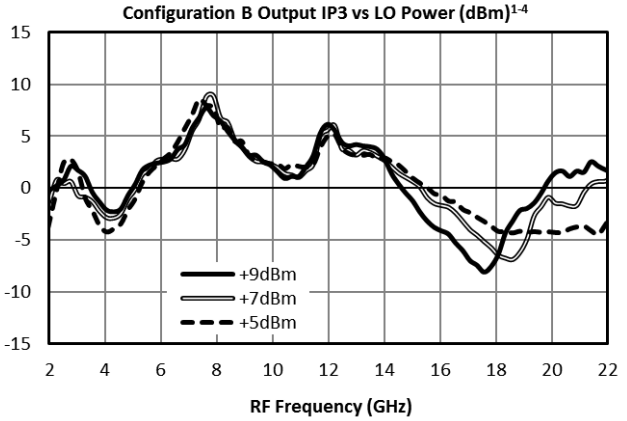
Configuration A Output IP3 vs LO Power (dBm)[1-4]



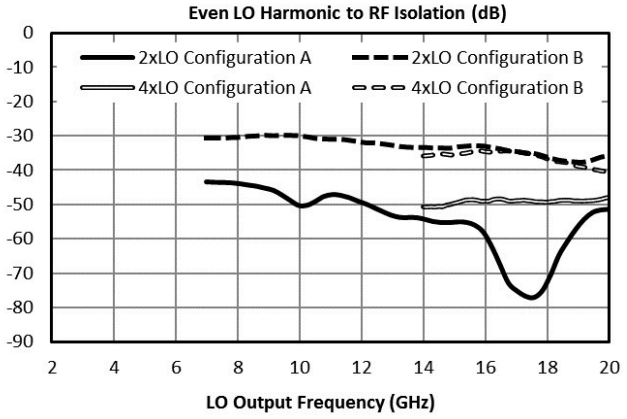
Configuration B Input IP3 vs LO Power (dBm)[1-4]



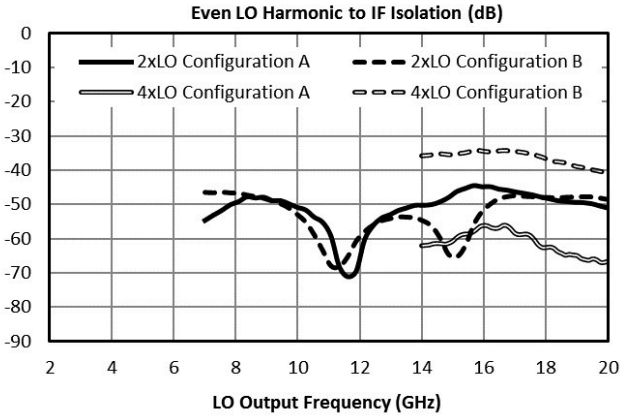
Configuration B Output IP3 vs LO Power (dBm)[1-4]



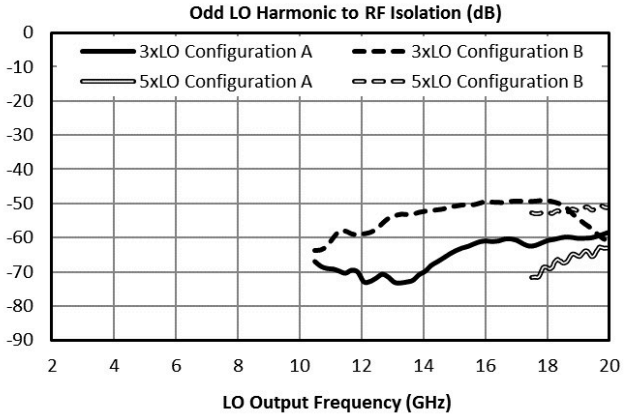
Even LO Harmonic to RF Isolation (dB)



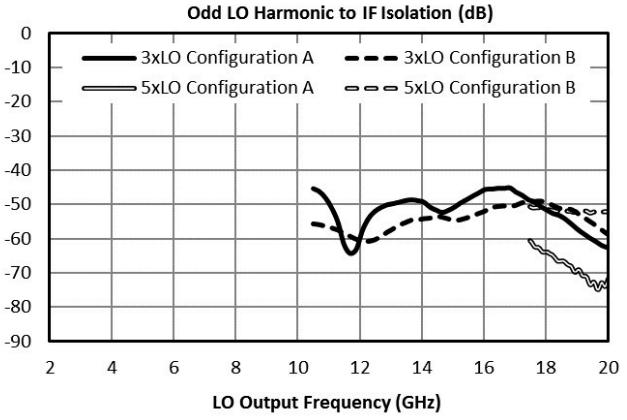
Even LO Harmonic to IF Isolation (dB)



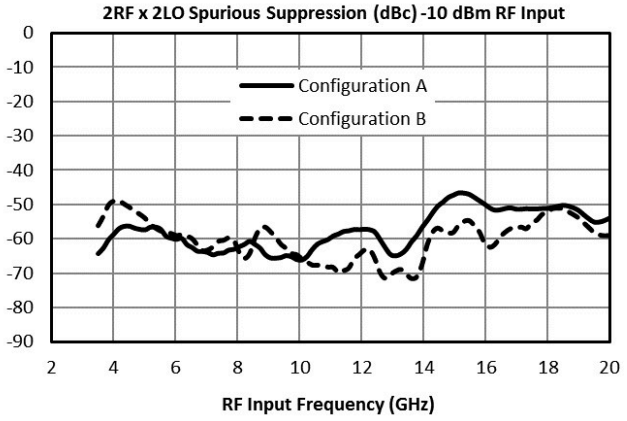
Odd LO Harmonic to RF Isolation (dB)



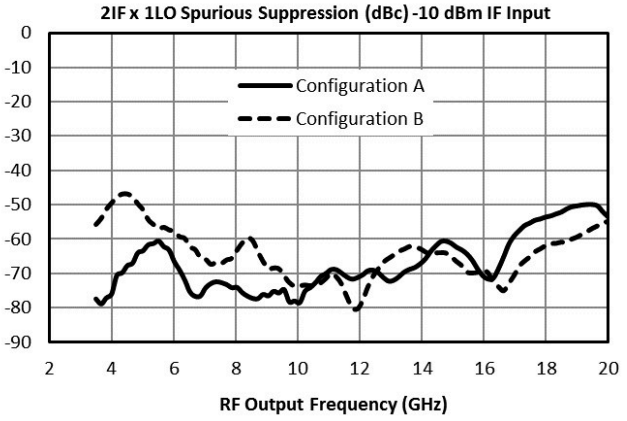
Odd LO Harmonic to IF Isolation (dB)



2RF x 2LO Spurious Suppression (dBc) -10 dBm RF Input



2IF x 1LO Spurious Suppression (dBc) -10 dBm IF Input



Spur Table

Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 5 to 30 GHz RF/LO bands, which create a 3 GHz IF spurious output. 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 2RFx2LO spur is 57 dBc for the A configuration for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 67 dBc.

Typical Downconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO [5]

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	22 (18)	Reference	20 (34)	12 (12)	37 (42)	30 (27)
2xRF	67 (66)	45 (41)	57 (60)	56 (42)	65 (58)	62 (44)
3xRF	81 (69)	40 (44)	57 (69)	49 (51)	60 (70)	51 (54)
4xRF	105 (98)	77 (80)	90 (91)	87 (82)	96 (94)	94 (78)
5xRF	128 (111)	83 (94)	86 (101)	83 (87)	95 (106)	89 (92)

Upconversion Spurious Suppression

Spurious data is taken by mixing a 3 GHz IF with LO frequencies (+mLO+nIF), which creates an RF within the 5 to 30 GHz RF 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 67 dBc for the A configuration for a -10 dBm input, so a -20 dBm IF input creates a spur that is (2-1) x (-10 dB) dB lower, or 77 dBc.

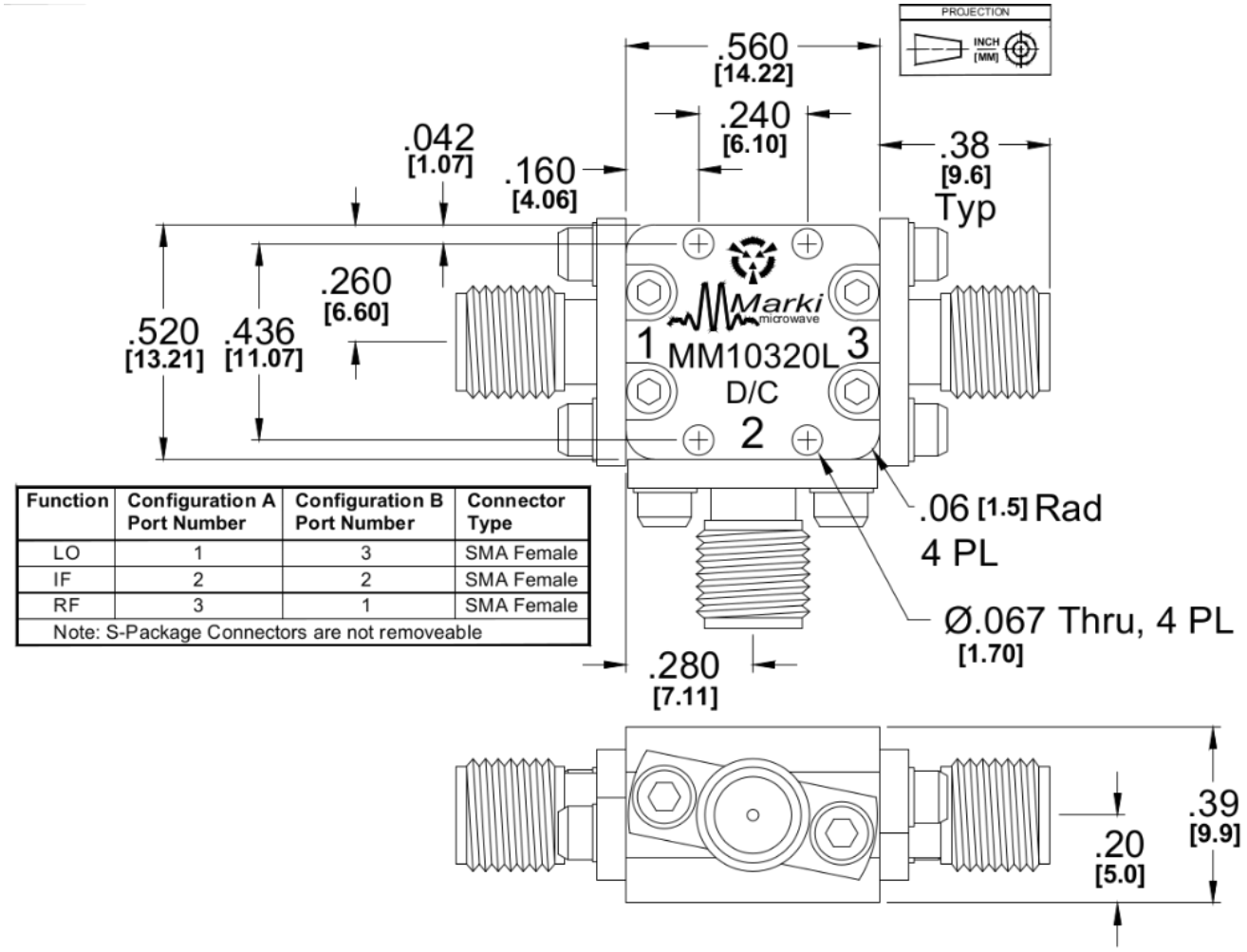
Typical Upconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO [5]

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	19 (24)	Reference	48 (69)	43 (61)	39 (66)	46 (64)
2xIF	48 (38)	67 (64)	56 (36)	66 (55)	56 (42)	63 (63)
3xIF	63 (74)	54 (54)	55 (67)	49 (48)	60 (68)	50 (50)
4xIF	94 (84)	96 (98)	94 (73)	100 (90)	93 (79)	96 (96)
5xIF	93 (101)	90 (92)	93 (105)	86 (81)	94 (106)	86 (93)

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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