

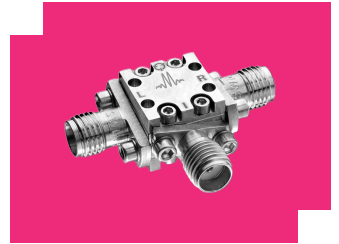
# M9-0942LNV-2

## Double-Balanced Mixers

### DEVICE OVERVIEW

#### General Description

M9 mixers double balanced mixers are hybrid assemblies that offer ultra-broadband RF, LO and IF bandwidths. M9 mixers have generally been replaced with MM1 mixers with superior performance, repeatability, and availability. M9 mixers are still used in legacy systems and where an MM1 mixer is not available.



#### Features

- LO/RF 9.0 to 42.0 GHz
- IF 1.0 to 22.0 GHz
- 10 dB Typical Conversion Loss
- Ultra-Broadband RF, LO, and IF
- 2.40 mm Connectors

#### Applications

N/A

#### Functional Block Diagram



#### Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
M9-0942LNV-2	Double-Balanced Mixers	NV	<u>Standard</u>	<u>Consult Factory.</u>	Not Recommended for New Design	EAR99	<u>MM1-1044LS</u>
<u>M9-0942INV</u>	Double-Balanced Mixers	NV	<u>Standard</u>	<u>Consult Factory.</u>	Not Recommended for New Design	EAR99	<u>MM1-1044HS</u>
<u>M9-0942LNV</u>	Double-Balanced Mixers	NV	<u>Standard</u>	Non-RoHS	Not Recommended for New Design	EAR99	<u>MM1-1044LS</u>

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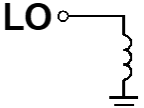
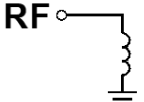
- Outline Drawing

- **Notes**

NOT RECOMMENDED FOR NEW DESIGN

**Port Configuration and Functions**

**Port Functions**

Port	Function	Connector Type	Description	Equivalent Circuit for Package
IF	IF	2.92F	The IF port is DC coupled to ground and AC matched to 50 Ohms from 1 to 22 GHz. Blocking capacitor is optional.	
LO	LO	2.4F	The LO port is DC coupled to ground and AC matched to 50 Ohms from 9 to 42 GHz. Blocking capacitor is optional.	
RF	RF	2.4F	The RF port is DC coupled to ground and AC matched to 50 Ohms from 9 to 42 GHz. Blocking capacitor is optional.	

NOT RECOMMENDED FOR NEW DESIGN

**Specifications**

**Absolute Maximum Ratings**

Parameter	Maximum Rating	Unit
IF DC Current	1	Amp
LO DC Current	1	Amp
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
RF DC Current	1	Amp
RF Power Handling (RF+LO), 100°C	20	dBm
RF Power Handling (RF+LO), 25°C	23	dBm

**Package Information**

Parameter	Details	Rating
ESD	< 250 Volts	HBM Class 0
Weight	Package name: NV	11g
Dimensions	-	11.94 x 11.94 mm

**Recommended Operating Conditions**

Parameter	Min	Nominal	Max	Unit
LO Input Power	9	-	14	-
LO Input Power	9	-	14	-

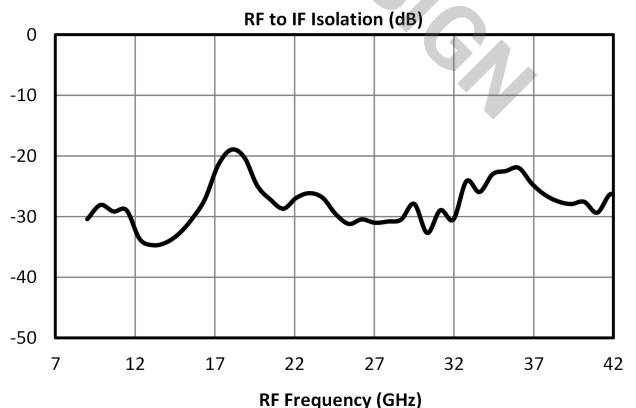
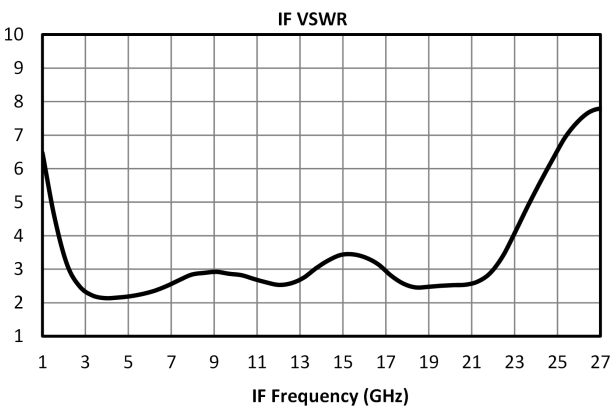
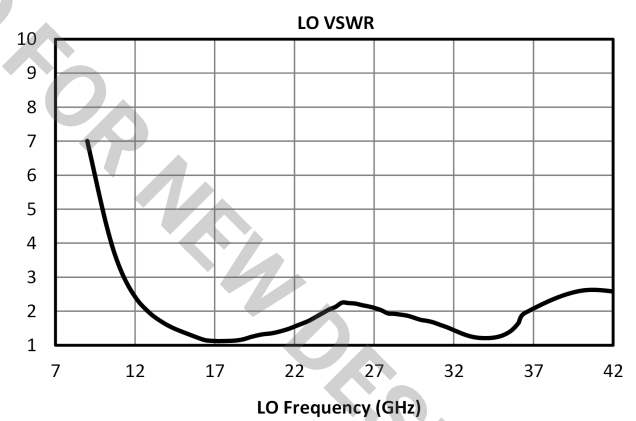
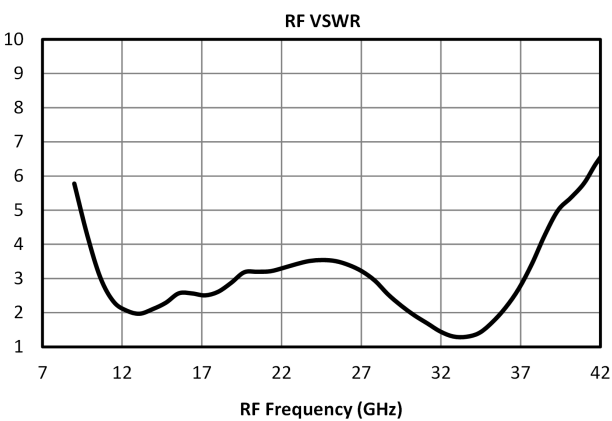
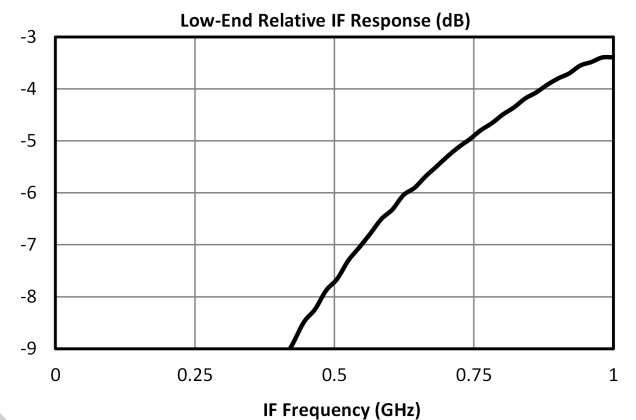
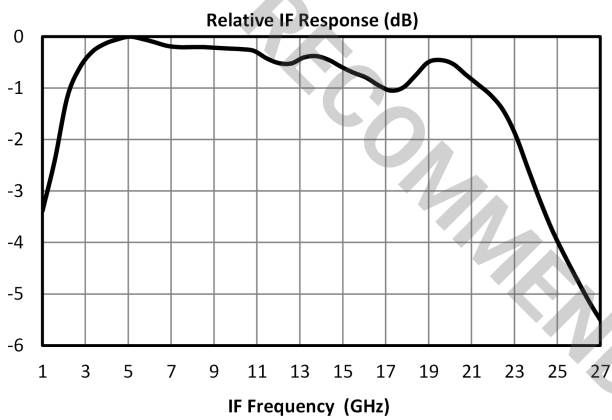
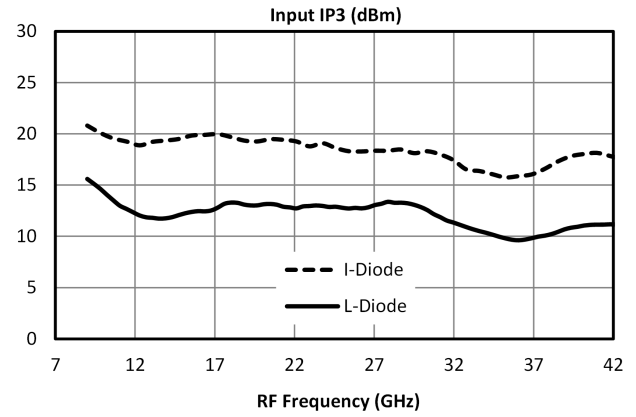
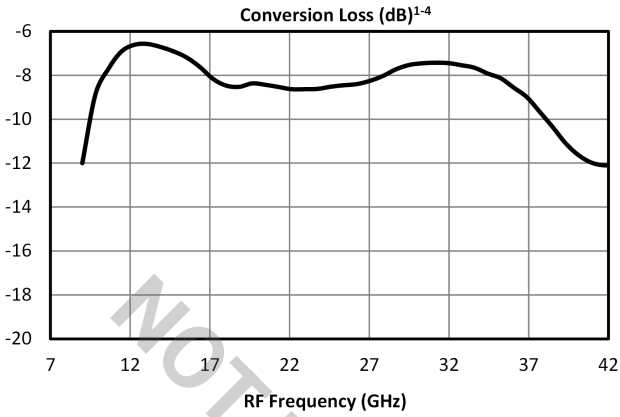
**Electrical Specifications**

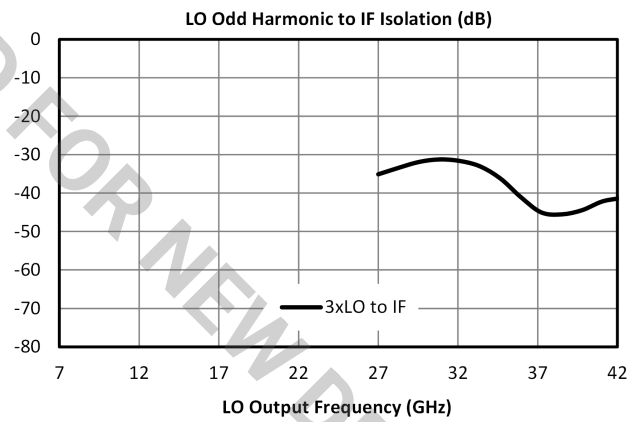
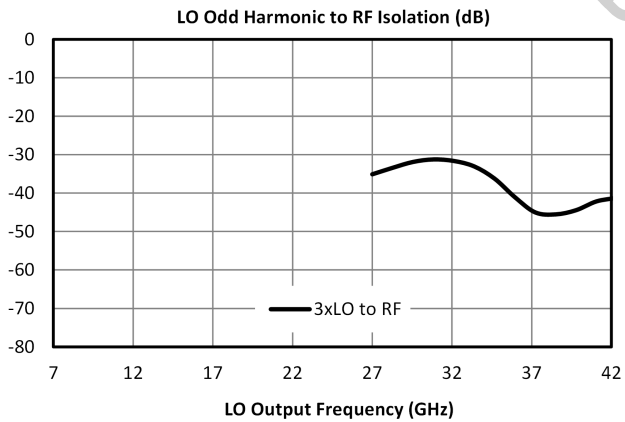
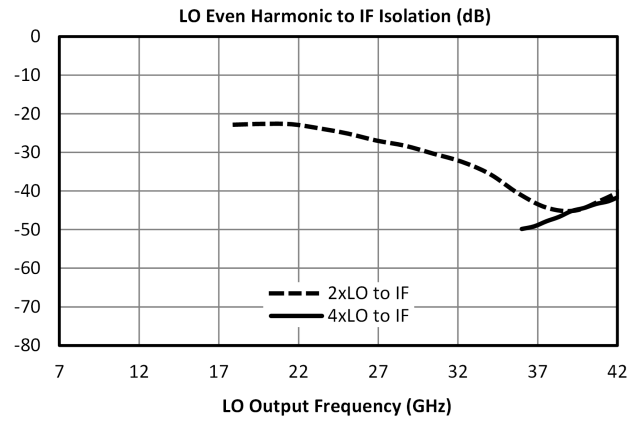
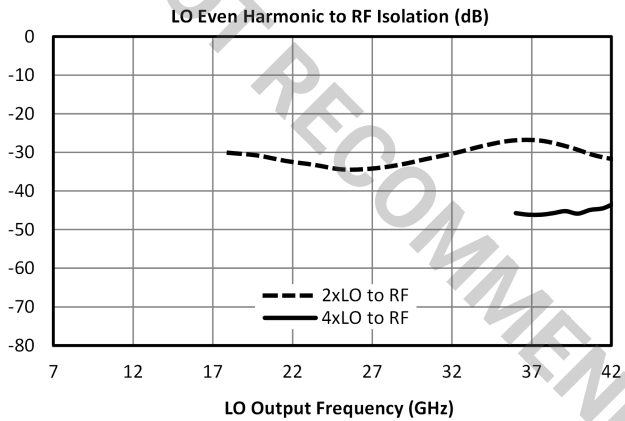
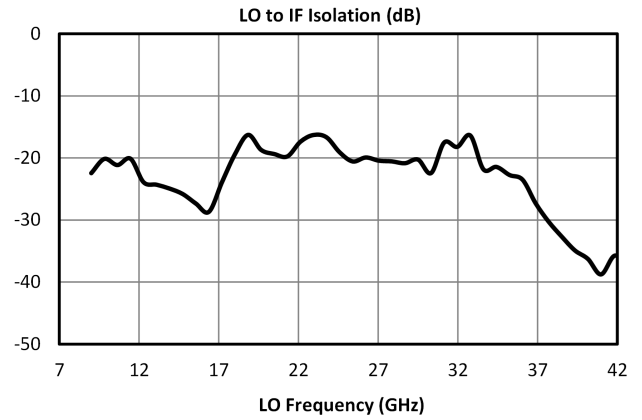
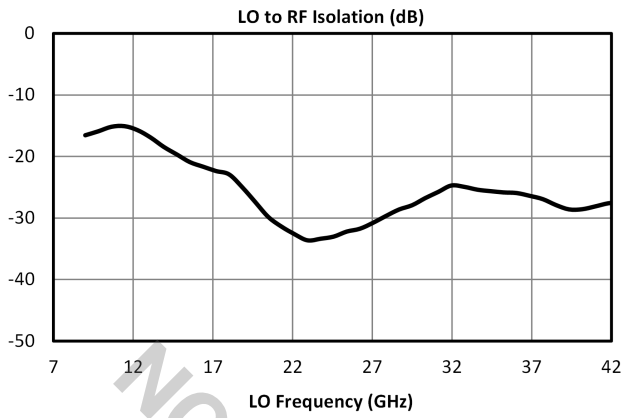
Specifications guaranteed from -55 to +100°C, measured in a 50-Ohm system.

Parameter	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	LO/RF=9-42 GHz IF=1-22 GHz	-	9	16	dB
Input 1 dB Compression	LO/RF=9-42 GHz LO drive level, L Diode Option=9-14 dBm	-	2	-	dBm
IF Frequency Range	-	1	-	22	GHz
Input IP3	-	-	19	-	dBm
Isolation, LO to RF	-	-	28	-	dB
RF Frequency Range	-	9	-	42	GHz

RECOMMENDED FOR NEW DESIGN

**Typical Performance Plots**





**Spur Table**

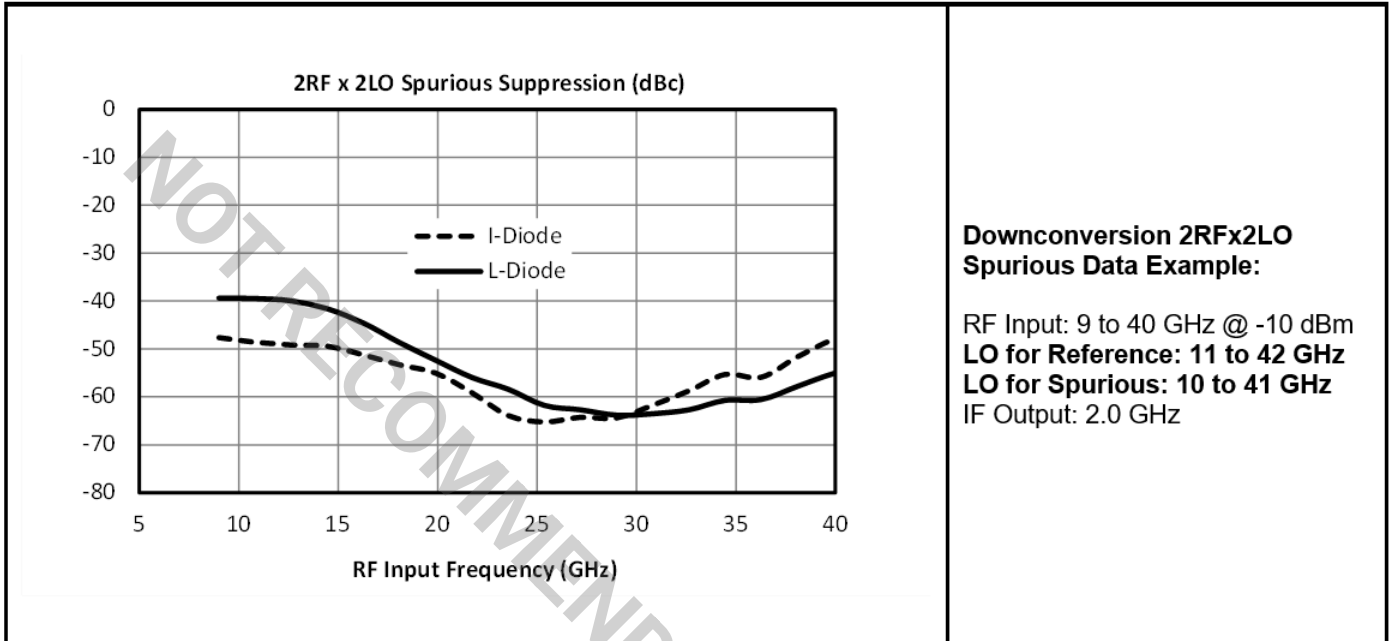
**Downconversion Spurious Suppression**

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 9 to 42 GHz RF/LO bands, which create a 2.0 GHz IF spurious output. The mixer is swept across the 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 55 dBc for a -10 dBm input (I-Diode), so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 65 dBc.

**Typical Downconversion Spurious Suppression (dBc): I-Diode (L-Diode) <sup>5</sup>**

<b>-10 dBm RF Input</b>	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
0xRF	-----	See LO to IF Isolation and LO Harmonic to IF Isolation Plots (Page 3)				
1xRF	18 (18)	Reference	30 (30)	14 (13)	32 (32)	22 (27)
2xRF	56 (52)	56 (55)	55 (52)	59 (49)	54 (42)	60 (53)
3xRF	79 (78)	53 (50)	77 (72)	66 (58)	84 (72)	66 (56)
4xRF	105 (105)	90 (92)	94 (84)	100 (89)	100 (87)	106 (91)
5xRF	117 (115)	104 (101)	114 (106)	106 (89)	118 (107)	111 (98)

A sample downconversion spurious sweep is shown below. An LO which is 2.0 GHz higher than the RF is used to create a 2.0 GHz reference IF. A second LO is used to create a 2x2 spurious IF, also at 2.0 GHz (1.0 GHz fundamental IF). The difference between these two output levels is the spurious suppression in dBc. The mean value across the 9 to 40 GHz RF input band is the number shown in the table above.



**Downconversion 2RFx2LO Spurious Data Example:**

RF Input: 9 to 40 GHz @ -10 dBm  
 LO for Reference: 11 to 42 GHz  
 LO for Spurious: 10 to 41 GHz  
 IF Output: 2.0 GHz

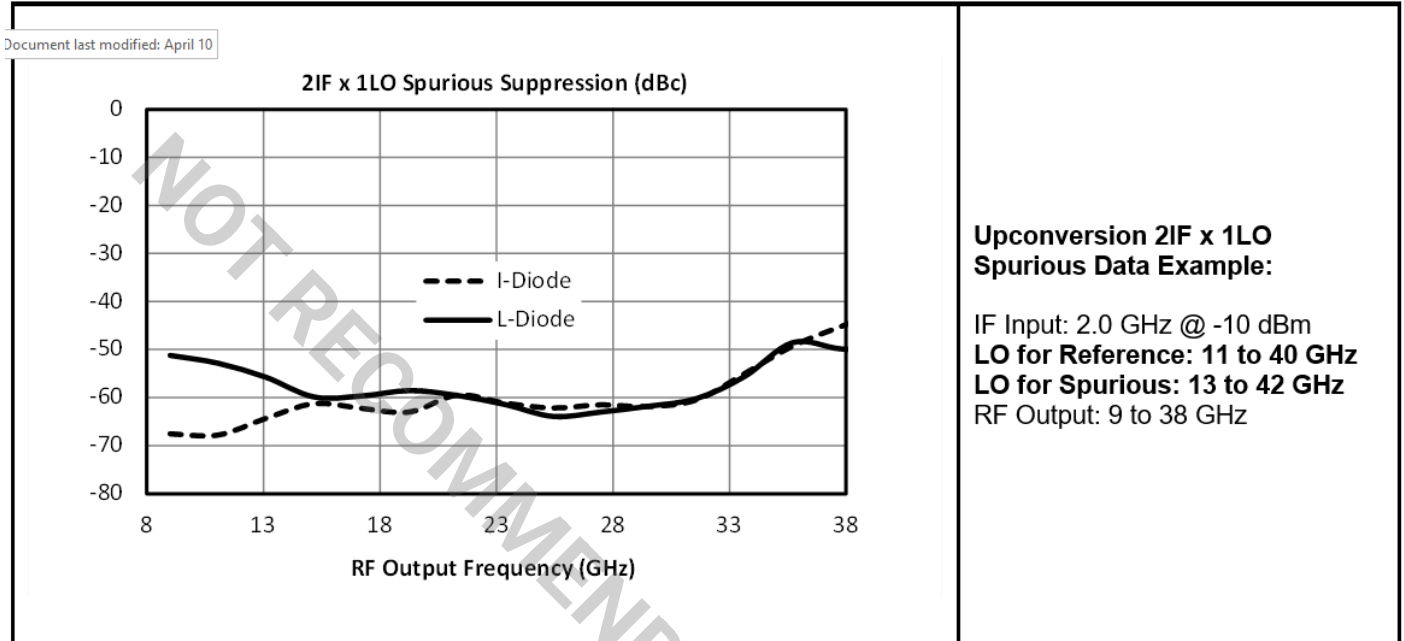
**Upconversion Spurious Suppression**

Spurious data is taken by mixing a 2.0 GHz IF with LO frequencies (+mLO+nIF) which create an RF within the 9 to 42 GHz RF band. The mixer is swept across the 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 57 dBc for a -10 dBm input (I-Diode), so a -20 dBm IF input creates a spur that is (2-1) x (-10 dB) dB lower, or 67 dBc.

**Typical Upconversion Spurious Suppression (dBc): I-Diode (L-Diode) <sup>5</sup>**

<b>-10 dBm IF Input</b>	<b>0xLO</b>	<b>1xLO</b>	<b>2xLO</b>	<b>3xLO</b>	<b>4xLO</b>	<b>5xLO</b>
0xIF	-----	See LO to RF Isolation and LO Harmonic to RF Isolation Plots (Page 3)				
1xIF	18 (20)	Reference	27 (26)	12 (11)	31 (33)	36 (30)
2xIF	57 (50)	57 (58)	56 (60)	54 (44)	50 (55)	52 (48)
3xIF	90 (81)	77 (68)	87 (76)	68 (61)	79 (72)	72 (69)
4xIF	116 (98)	109 (106)	110 (98)	100 (94)	101 (92)	95 (83)
5xIF	127 (126)	123 (119)	129 (122)	118 (109)	118 (108)	113 (102)

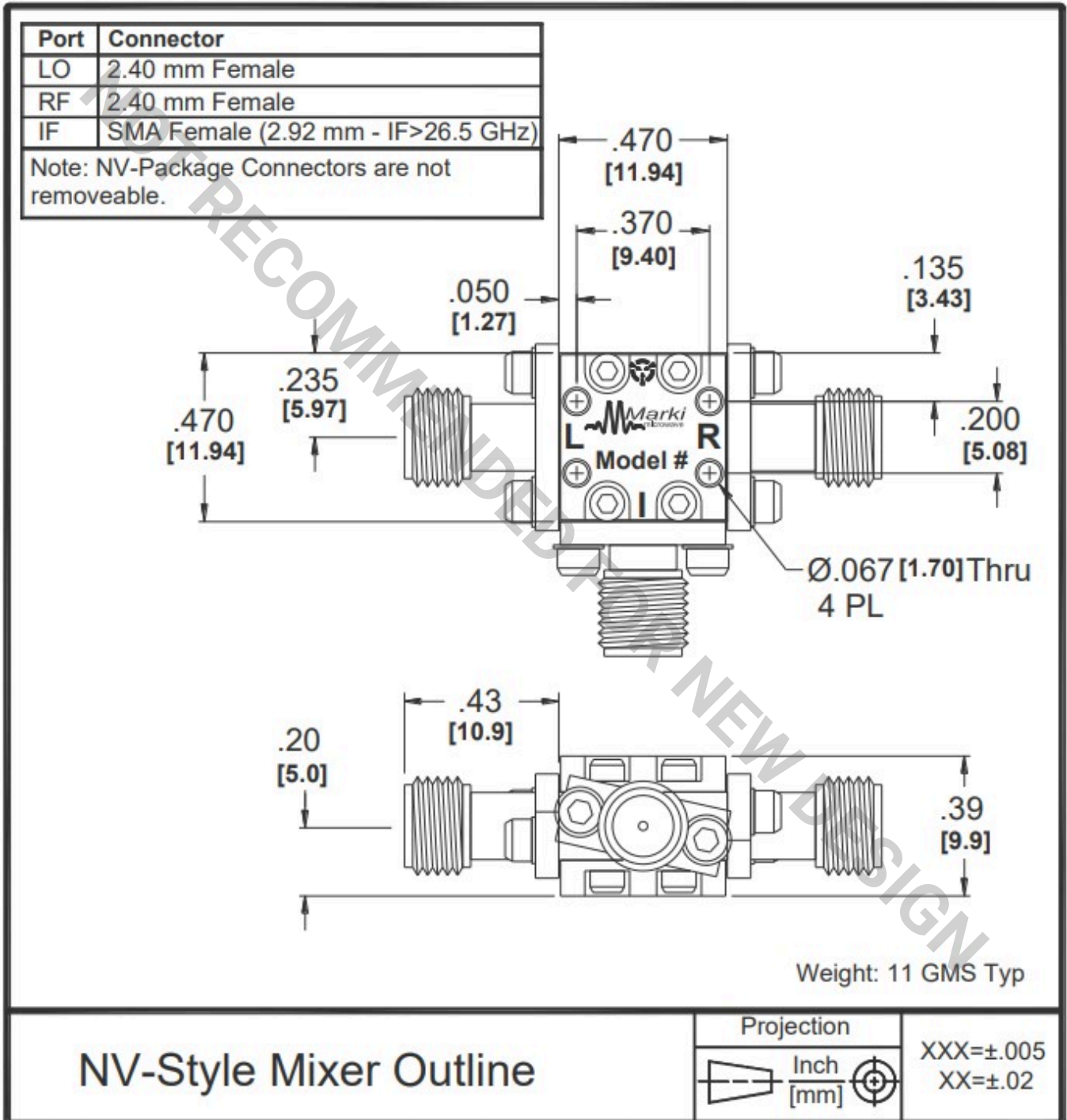
A sample upconversion spurious sweep is shown below. A 2.0 GHz reference IF input is used to create an RF output that is 2.0 GHz below the LO input ( $LO-IF=RF$ ). A second LO (2.0 GHz higher) is combined with the same 2.0 GHz IF input ( $LO-2xIF=RF$ ) to create the same 9 to 38 GHz RF output band. The difference between these two output levels is the spurious suppression in dBc. The mean value across the RF output band is the number shown in the table above.



**Mechanical Data**

**Outline Drawing**

Download : [Outline 3D Drawing](#) | [Outline 3D STP](#)



## Notes

### DATA SHEET NOTES:

1. Mixer Conversion Loss Plot IF frequency is 4.0 GHz.
2. Mixer Noise Figure typically measures within 0.5 dB of conversion loss.
3. Conversion Loss typically degrades less than 0.5 dB for LO drives 2 dB below the lowest and 3 dB above highest nominal LO drive levels.
4. Conversion Loss typically degrades less than 0.5 dB at +100°C and improves less than 0.5 dB at -55°C.
5. Unless otherwise specified, L-diode data is taken with +11 dBm LO drive, and I-diode data is taken with +16 dBm drive.
6. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
7. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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