

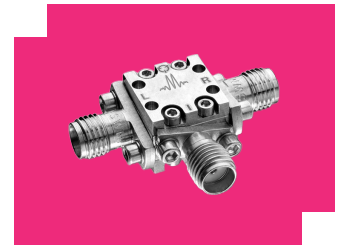
# M9-0444LNV

## 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 4.0 to 44.0 GHz
- IF DC to 3.0 GHz
- 7.5 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
M9-0444LNV	Double-Balanced Mixers	NV	<u>Standard</u>	Non-RoHS	End of Life	EAR99	<u>MM1-1044LS</u>
<u>M9-0444INV</u>	Double-Balanced Mixers	NV	<u>Standard</u>	Non-RoHS	Not Recommended for New Design	EAR99	-

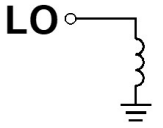
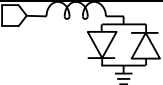
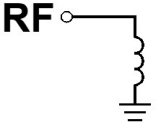
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**Port Configuration and Functions**

**Port Functions**

Port	Function	Connector Type	Description	Equivalent Circuit for Package
Port 1	LO	2.4M	The LO port is DC coupled to ground and AC matched to 50 Ohms from 4 to 44 GHz. Blocking capacitor is optional.	
Port 2	IF	SMAF	The IF port is DC coupled to the diodes. Blocking capacitor is optional.	
Port 3	RF	2.4M	The RF port is DC coupled to ground and AC matched to 50 Ohms from 4 to 44 GHz. Blocking capacitor is optional.	

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**Specifications**

**Absolute Maximum Ratings**

Parameter	Maximum Rating	Unit
IF DC Current	50	mA
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	-

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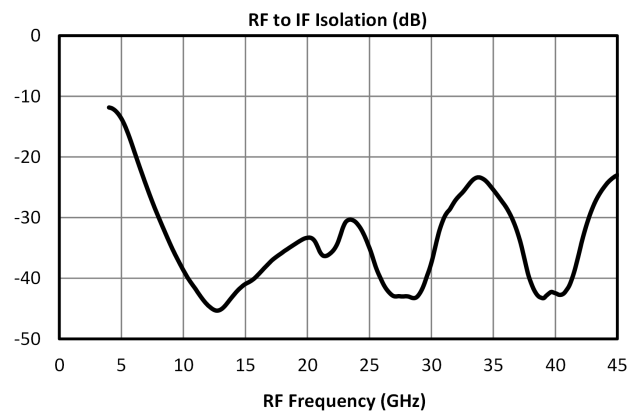
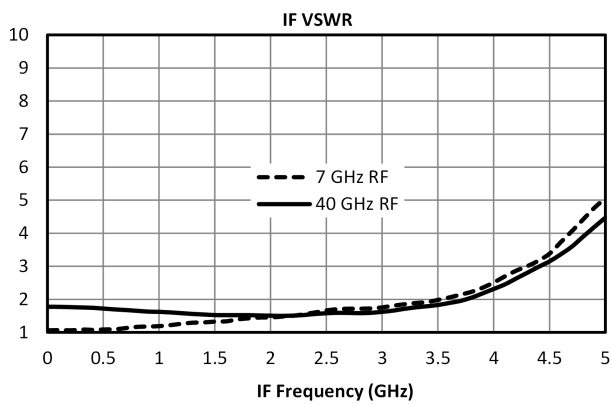
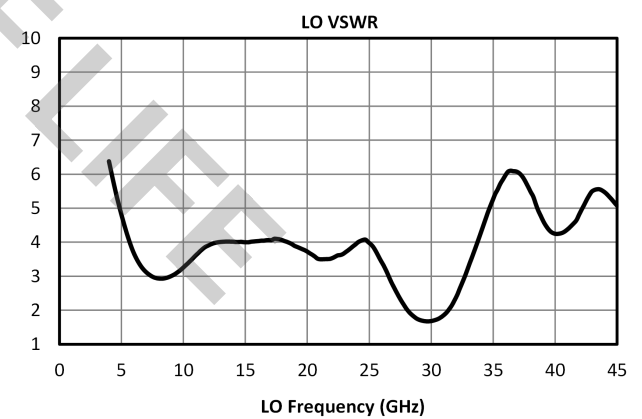
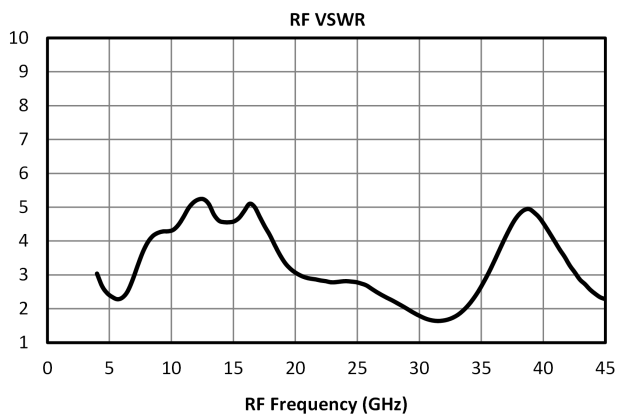
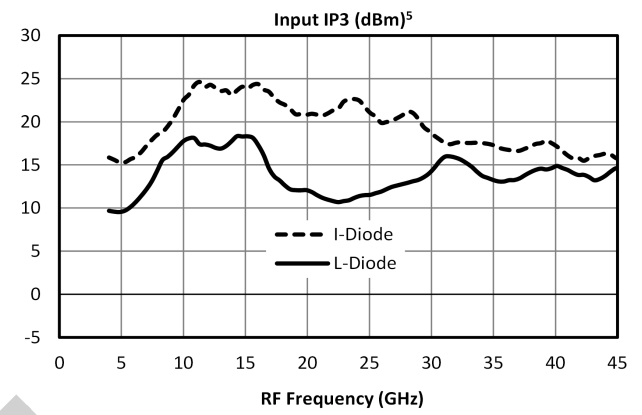
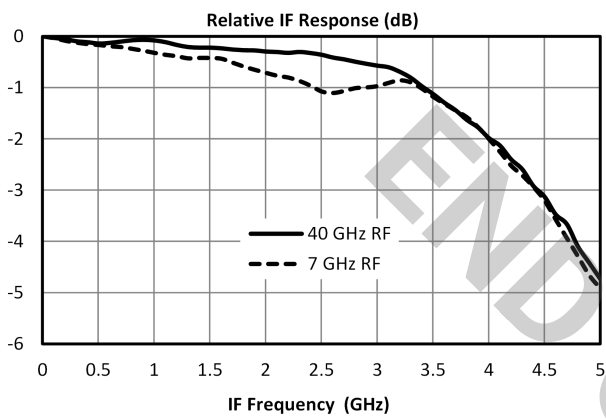
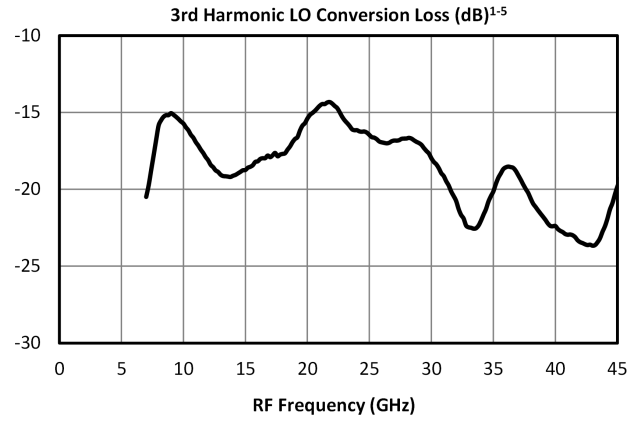
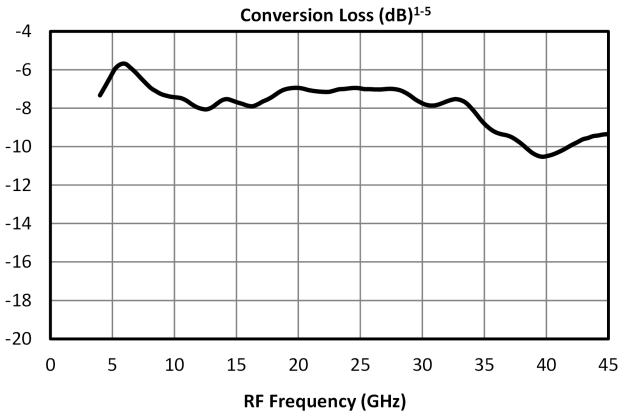
**Electrical Specifications**

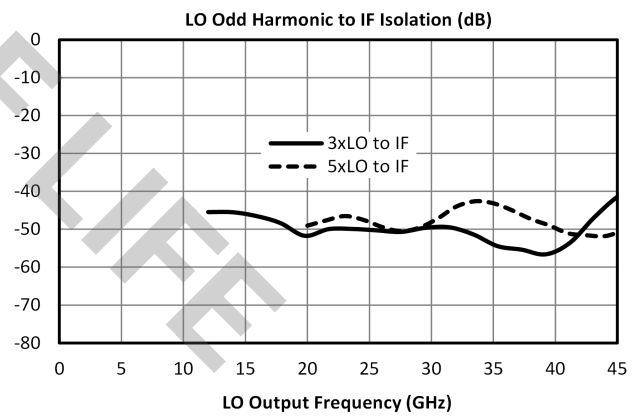
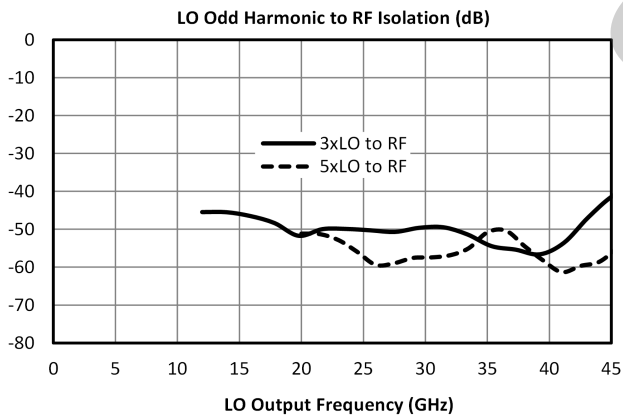
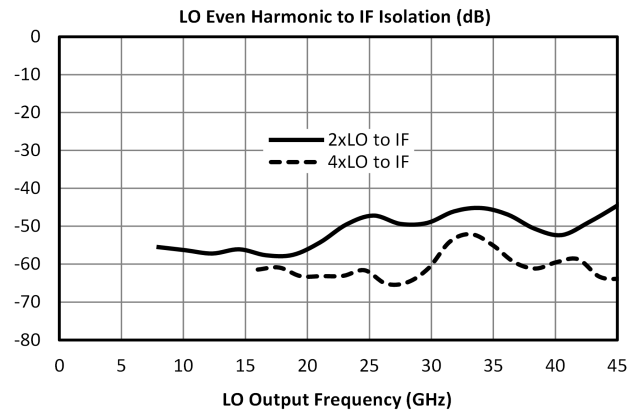
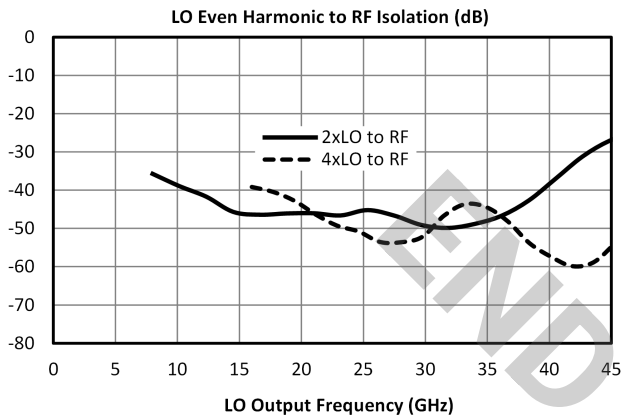
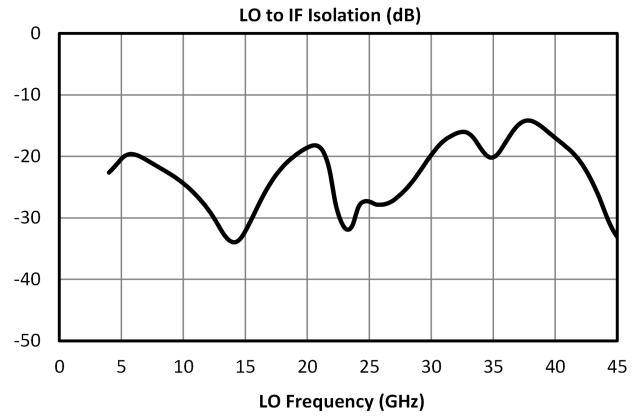
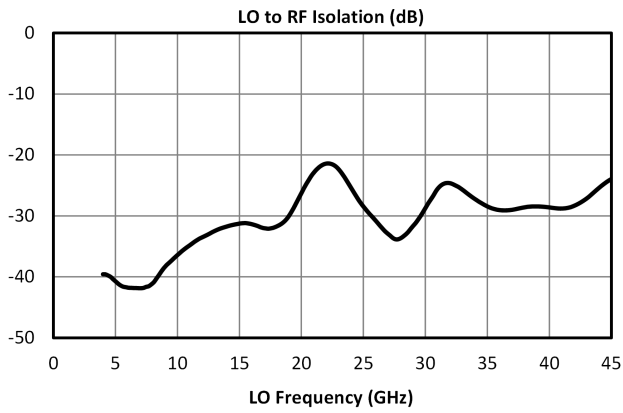
Specifications guaranteed from -55 to +100°C, measured in a 50-Ohm system.

Parameter	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	LO/RF=4-44 GHz IF=1.5-3 GHz	-	8.5	12.5	dB
Conversion Loss	LO/RF=4-44 GHz IF=DC-1.5 GHz	-	7.5	11.5	dB
Input 1 dB Compression	LO/RF=4-44 GHz LO drive level, L Diode Option=9-14 dBm	-	2	-	dBm
Third Harmonic LO Conversion Loss	LO=2.67-14.67 GHz RF=8-44 GHz IF=DC-3 GHz LO drive level, L Diode Option=13-18 dBm	-	18	-	dB
IF Frequency Range	-	0	-	3	GHz
Input IP3	-	-	15	-	dB
Isolation, LO to RF	-	-	30	-	dB
RF Frequency Range	-	4	-	44	GHz

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**Typical Performance Plots**





**Spur Table**

**Downconversion Spurious Suppression**

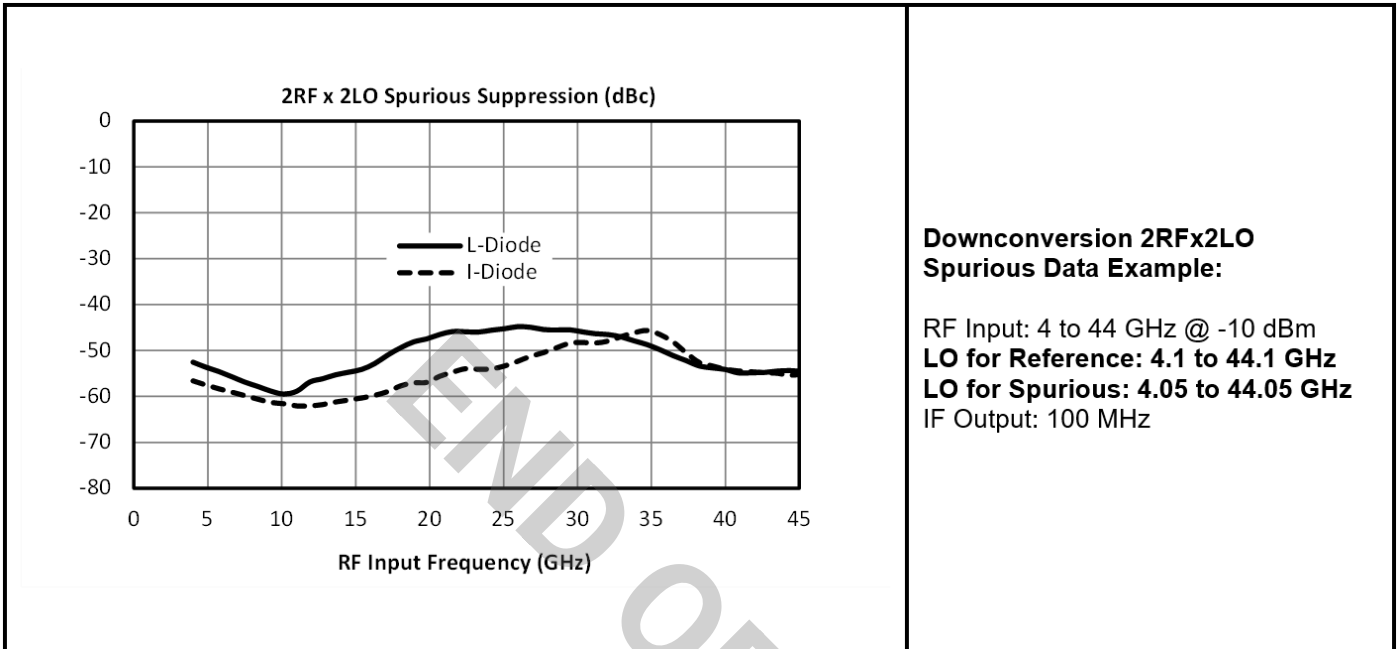
Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) over the 4 to 44 GHz RF/LO bands, which create a 100 MHz IF spurious output. The mixer is swept across the spurious band and the mean is calculated. The numbers shown in the table below are for a -10 dBm RF input. Spurious suppression 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)**

<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				
1xRF	24 (25)	Reference	23 (25)	14 (13)	26 (32)	21 (24)
2xRF	59 (56)	53 (46)	55 (52)	58 (53)	59 (54)	61 (58)
3xRF	85 (76)	64 (53)	73 (63)	68 (58)	78 (67)	73 (61)
4xRF	109 (99)	98 (84)	99 (91)	105 (86)	100 (88)	105 (87)
5xRF	124 (119)	113 (100)	118 (101)	116 (94)	119 (103)	114 (97)

Unless otherwise specified, L-diode data is taken with +11 dBm LO drive, and I-Diode data is taken with +16 dBm LO drive.

A sample downconversion spurious sweep is shown below. An LO which is 100 MHz higher than the RF is used to create a 100 MHz reference IF. A second LO is used to create a 2x2 spurious IF, also at 100 MHz (50 MHz fundamental IF). The difference between these two output levels is the spurious suppression in dBc. The mean value across the 4 to 44 GHz RF input band is the number shown in the table above.



**Upconversion Spurious Suppression**

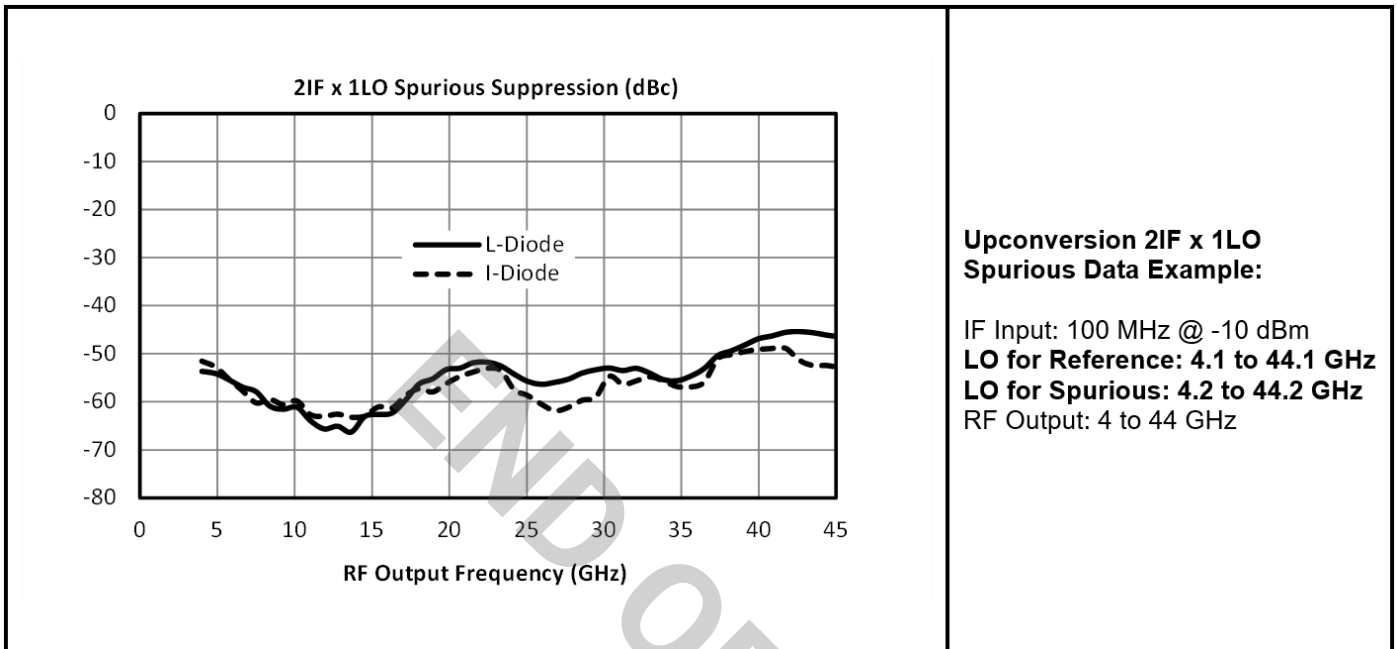
Spurious data is taken by mixing a 100 MHz IF with LO frequencies (+mLO+nIF) which create an RF over the 4 to 44 GHz RF band. The mixer is swept across the full spurious output band and the mean is calculated. The numbers shown in the table below are for a -10 dBm IF input. Spurious suppression is scaled for different IF input power levels by (n-1), where “n” is the IF spur order. For example, the 2IFx1LO spur is typically 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)**

<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				
1xIF	13 (12)	Reference	21 (26)	11 (11)	24 (30)	23 (22)
2xIF	60 (46)	57 (57)	58 (57)	57 (61)	56 (56)	58 (59)
3xIF	91 (75)	70 (69)	78 (74)	72 (65)	72 (69)	67 (63)
4xIF	104 (97)	106 (101)	102 (98)	102 (101)	99 (97)	97 (95)
5xIF	140 (124)	117 (111)	122 (113)	112 (107)	114 (108)	105 (97)

Unless otherwise specified, L-diode data is taken with +11 dBm LO drive, and I-Diode data is taken with +16 dBm LO drive.

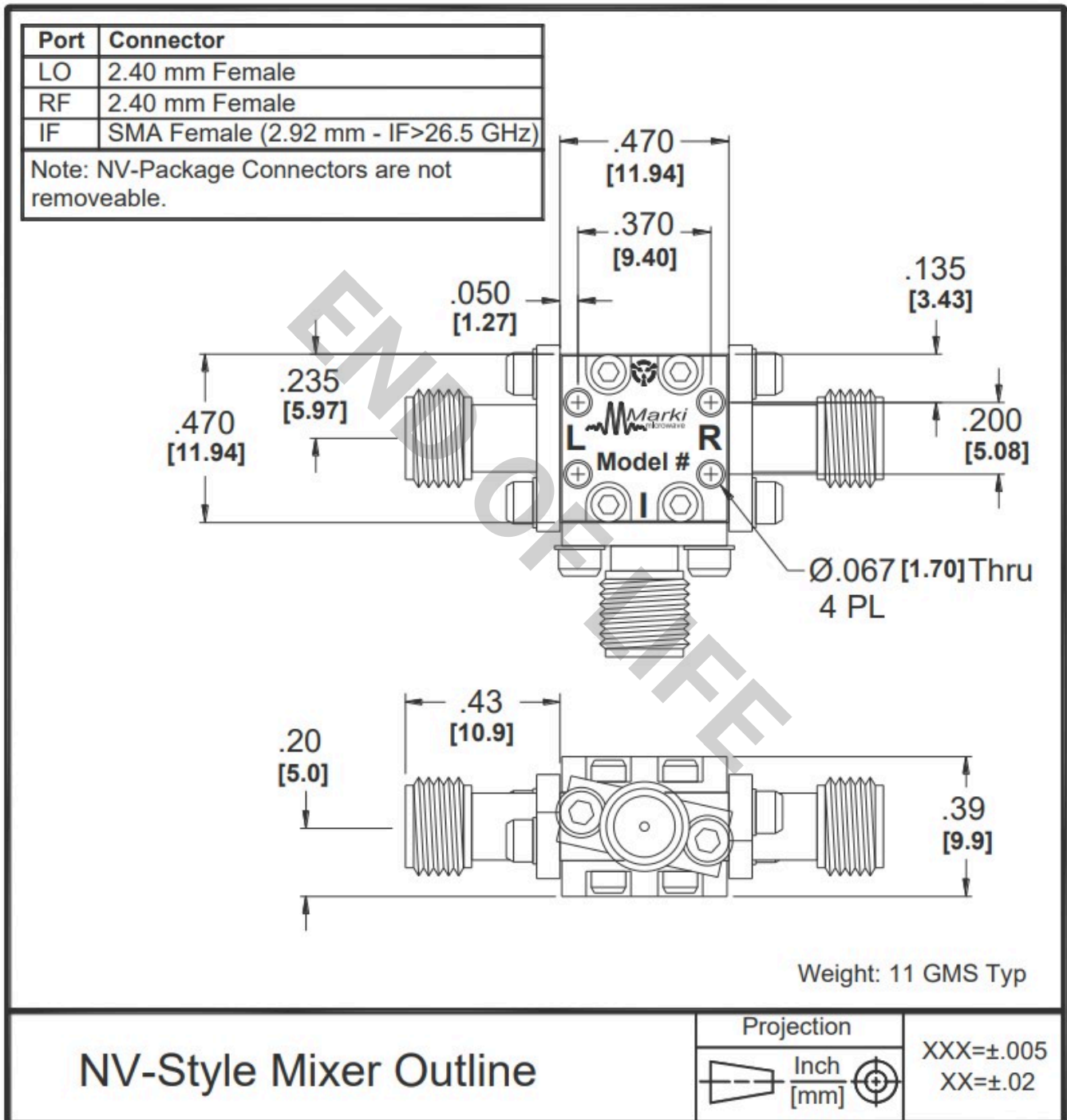
A sample upconversion spurious sweep is shown below. A 100 MHz reference IF input is used to create an RF output that is 100 MHz below the LO input (LO-IF=RF). A second LO (100 MHz higher) is combined with the same 100 MHz IF input (LO-2xIF=RF) to create the same 4 to 44 GHz RF output band. The difference 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

1. Mixer Conversion Loss Plot IF frequency is 100 MHz.
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 LO 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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