

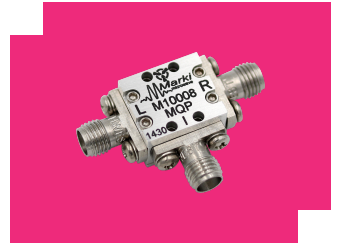
M1-0008LQP

Double-Balanced Mixers

DEVICE OVERVIEW

General Description

M1 double balanced mixers are hybrid assemblies that have been hand-tuned to feature low conversion loss and high isolations and a DC IF response. M1 mixers have generally been replaced with MM1 mixers with superior performance, repeatability, and availability. M1 mixers are still used in legacy systems and are suitable for laboratory use.



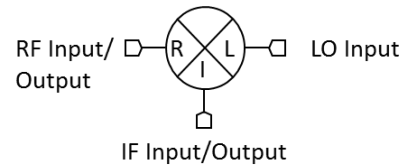
Features

- LO/RF .01 to 8.0 GHz
- IF DC to 2.0 GHz
- 7.5 dB Typical Conversion Loss
- Ultra-Broadband RF, LO, and IF

Applications

N/A

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
M1-0008LQP	Double-Balanced Mixers	QP	<u>Standard</u>	Non-RoHS	End of Life	EAR99	<u>T3-12LQP</u>

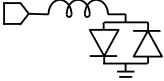
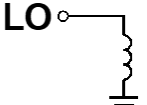
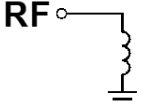
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Port Configuration and Functions

Port Functions

Port	Function	Connector Type	Description	Equivalent Circuit for Package
IF	IF	SMAF	The IF port is DC coupled to the diodes. Blocking capacitor is optional.	
LO	LO	SMAF	The LO port is DC coupled to ground and AC matched to 50 Ohms from 10 MHz to 8 GHz. Blocking capacitor is optional.	
RF	RF	SMAF	The RF port is DC coupled to ground and AC matched to 50 Ohms from 10 MHz to 8 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: QP	15g
Dimensions	-	15.24 x 13.20 mm

Recommended Operating Conditions

Parameter	Min	Nominal	Max	Unit
LO Input Power	10	-	13	-

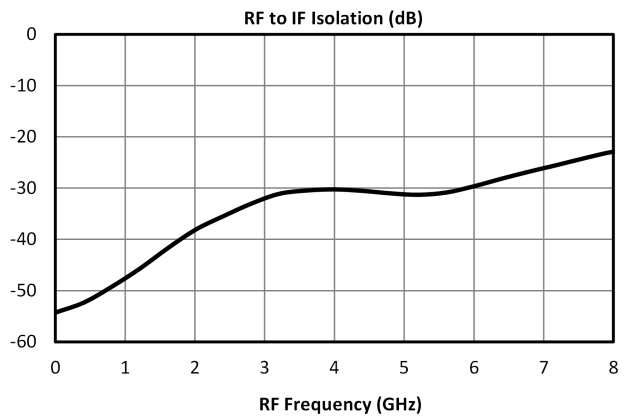
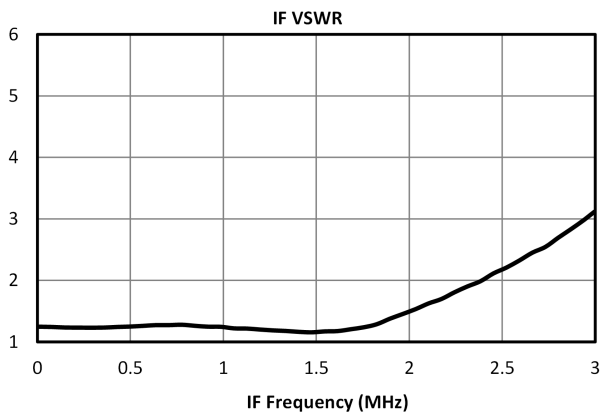
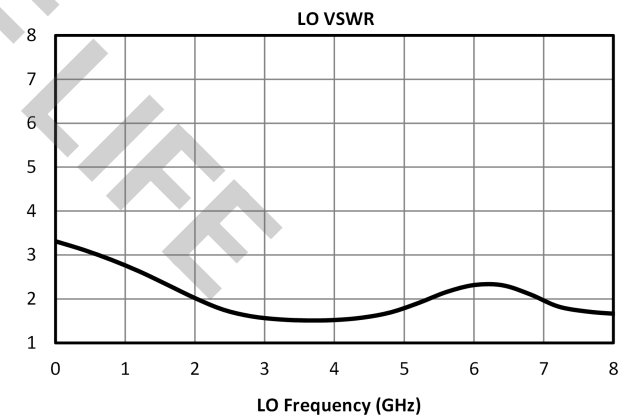
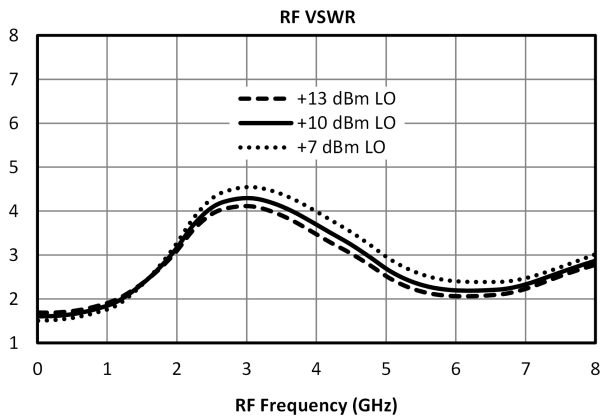
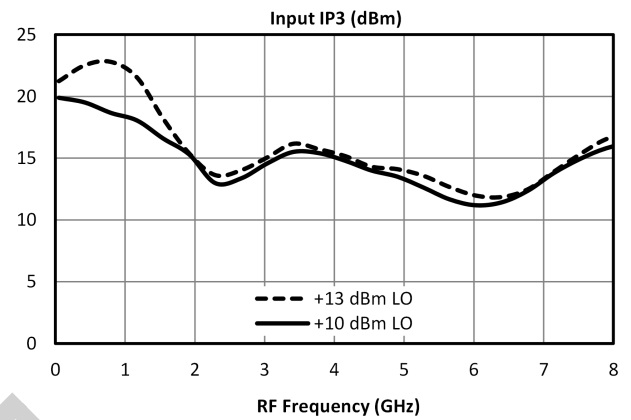
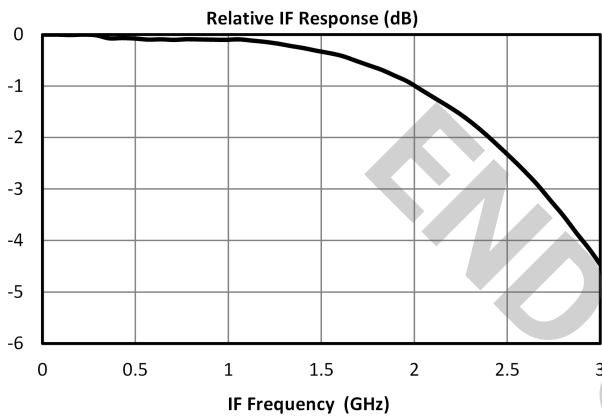
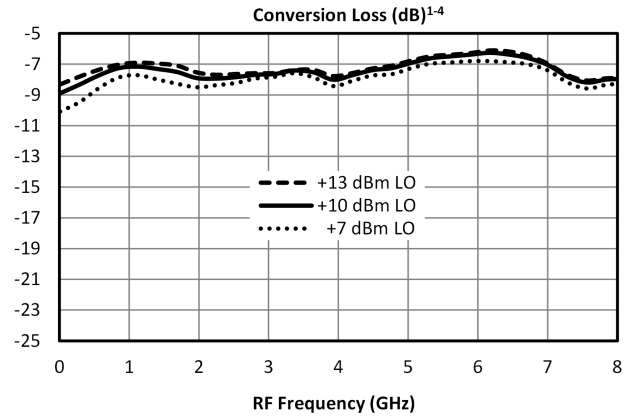
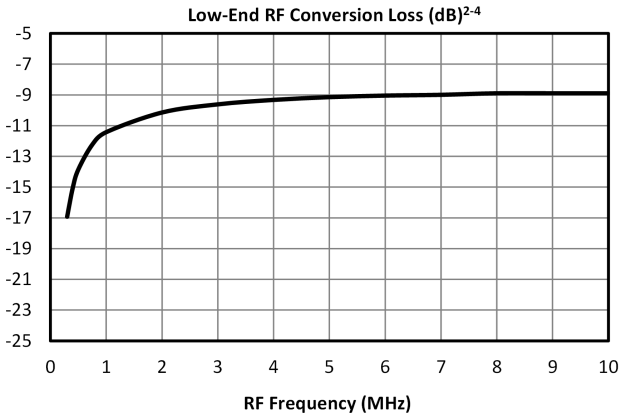
Electrical Specifications

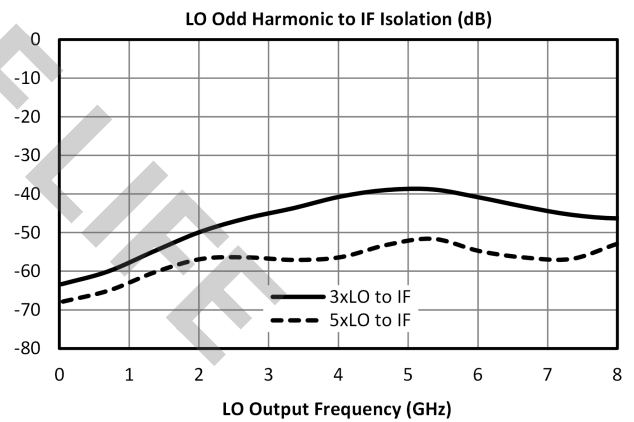
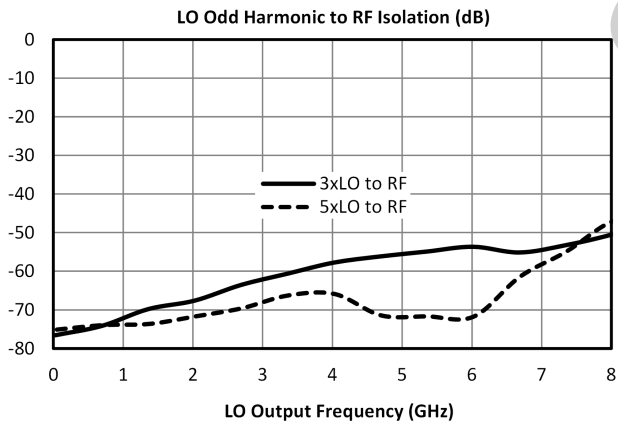
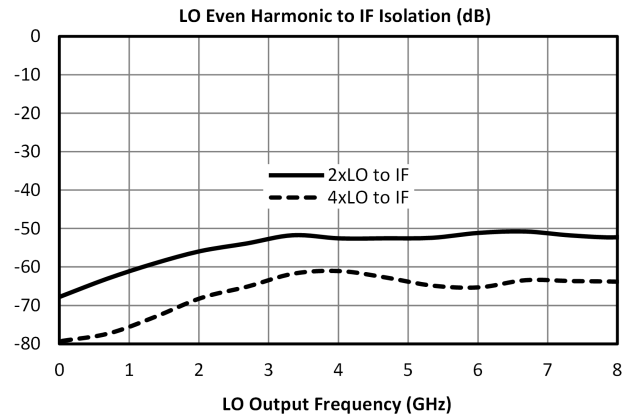
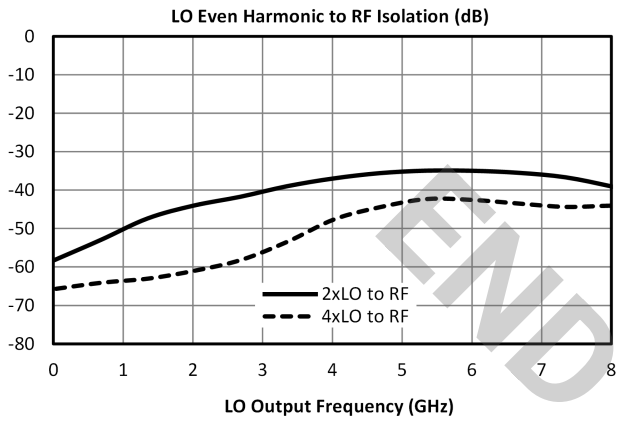
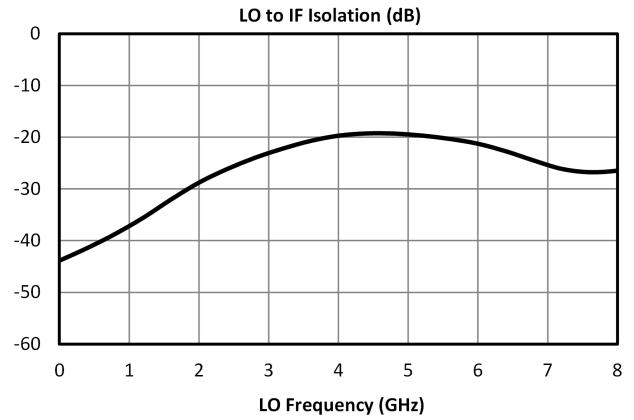
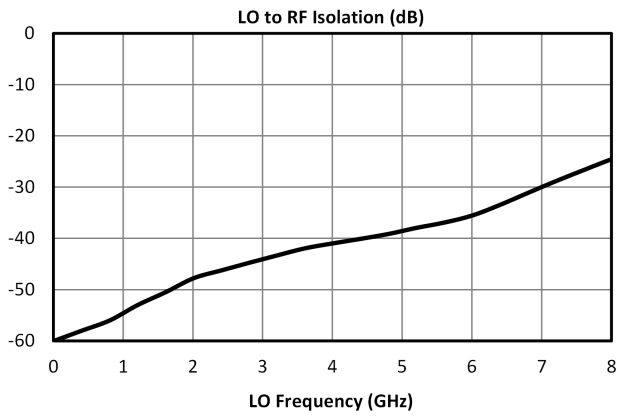
Specifications guaranteed from -55 to +100°C, measured in a 50-Ohm system.

Parameter	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	LO/RF=.01-8 GHz IF=DC-2 GHz	-	7.5	11	dB
Input 1 dB Compression	LO/RF=.01-8 GHz LO drive level, L Diode Option=10-13 dBm	-	4	-	dBm
IF Frequency Range	-	0	-	2	GHz
Input IP3	-	-	15	-	dBm
Isolation, LO to RF	-	-	40	-	dB
RF Frequency Range	-	0.01	-	8	GHz

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Typical Performance Plots





Spur Table

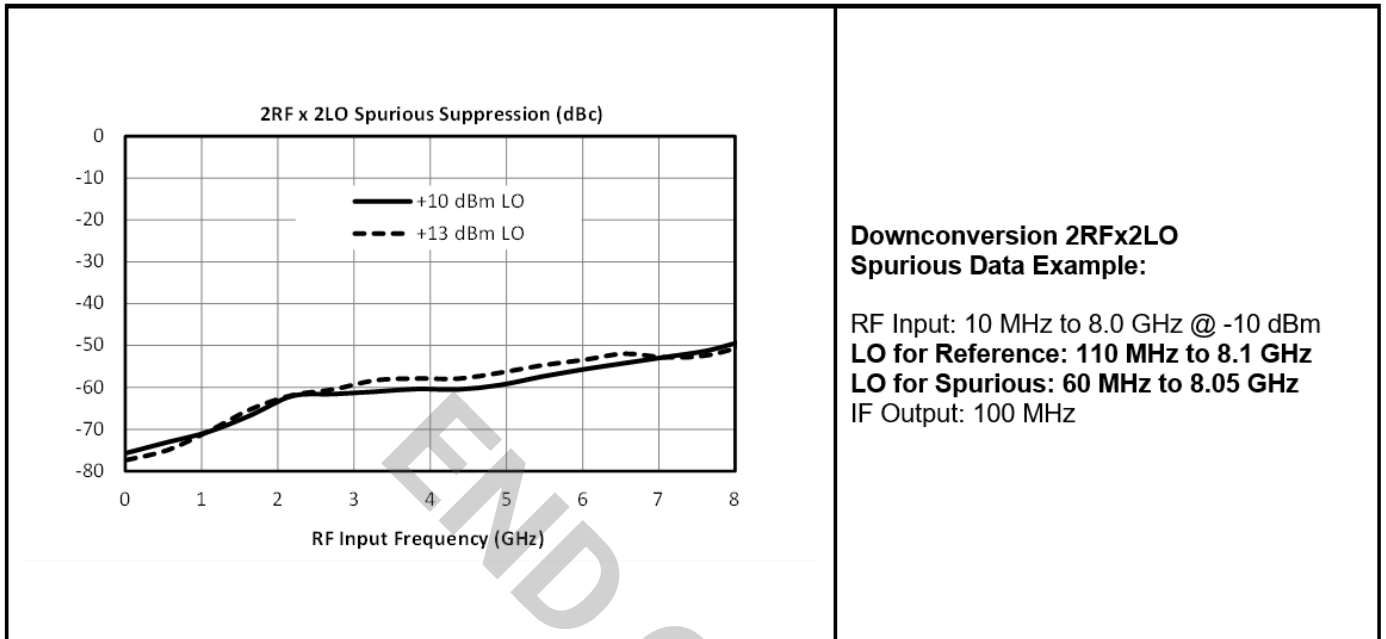
Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 10 MHz to 8 GHz RF/LO bands, which create a 100 MHz 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 61 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 71 dBc.

Typical Downconversion Spurious Suppression (dBc): +10 dBm LO

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
0xRF	-----	See LO to IF Isolation and LO Harmonic to IF Isolation Plots (Page 3)				
1xRF	25	Reference	30	13	40	25
2xRF	57	54	61	52	68	52
3xRF	70	57	73	59	72	61
4xRF	102	90	93	88	92	88
5xRF	115	96	103	95	107	96

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 full 10 MHz to 8 GHz RF input band is the number shown in the table above.



Downconversion 2RFx2LO Spurious Data Example:

RF Input: 10 MHz to 8.0 GHz @ -10 dBm
 LO for Reference: 110 MHz to 8.1 GHz
 LO for Spurious: 60 MHz to 8.05 GHz
 IF Output: 100 MHz

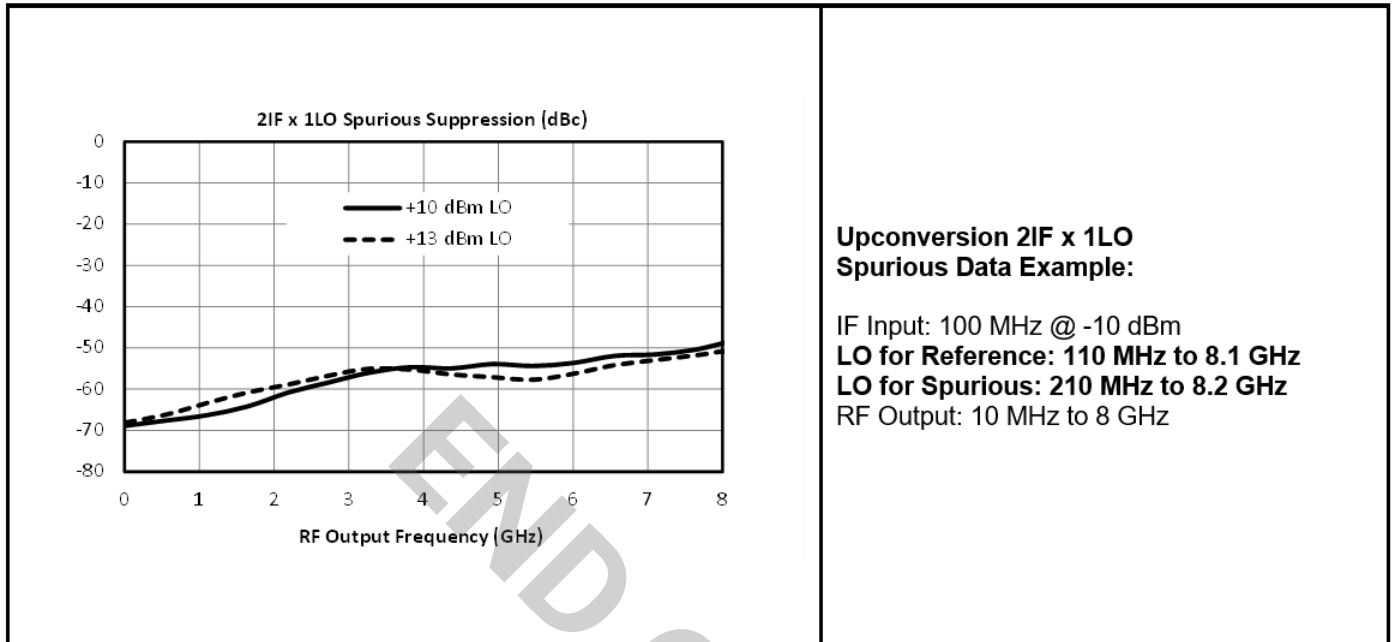
Upconversion Spurious Suppression

Spurious data is taken by mixing a 100 MHz IF with LO frequencies (+mLO+nIF) which create an RF within the 10 MHz to 8 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, 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): +10 dBm LO

-10 dBm IF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
0xIF	-----	See LO to RF Isolation and LO Harmonic to RF Isolation Plots (Page 3)				
1xIF	23	Reference	29	13	38	28
2xIF	63	57	49	62	53	67
3xIF	98	62	64	51	68	55
4xIF	113	95	85	94	84	93
5xIF	123	92	103	87	97	87

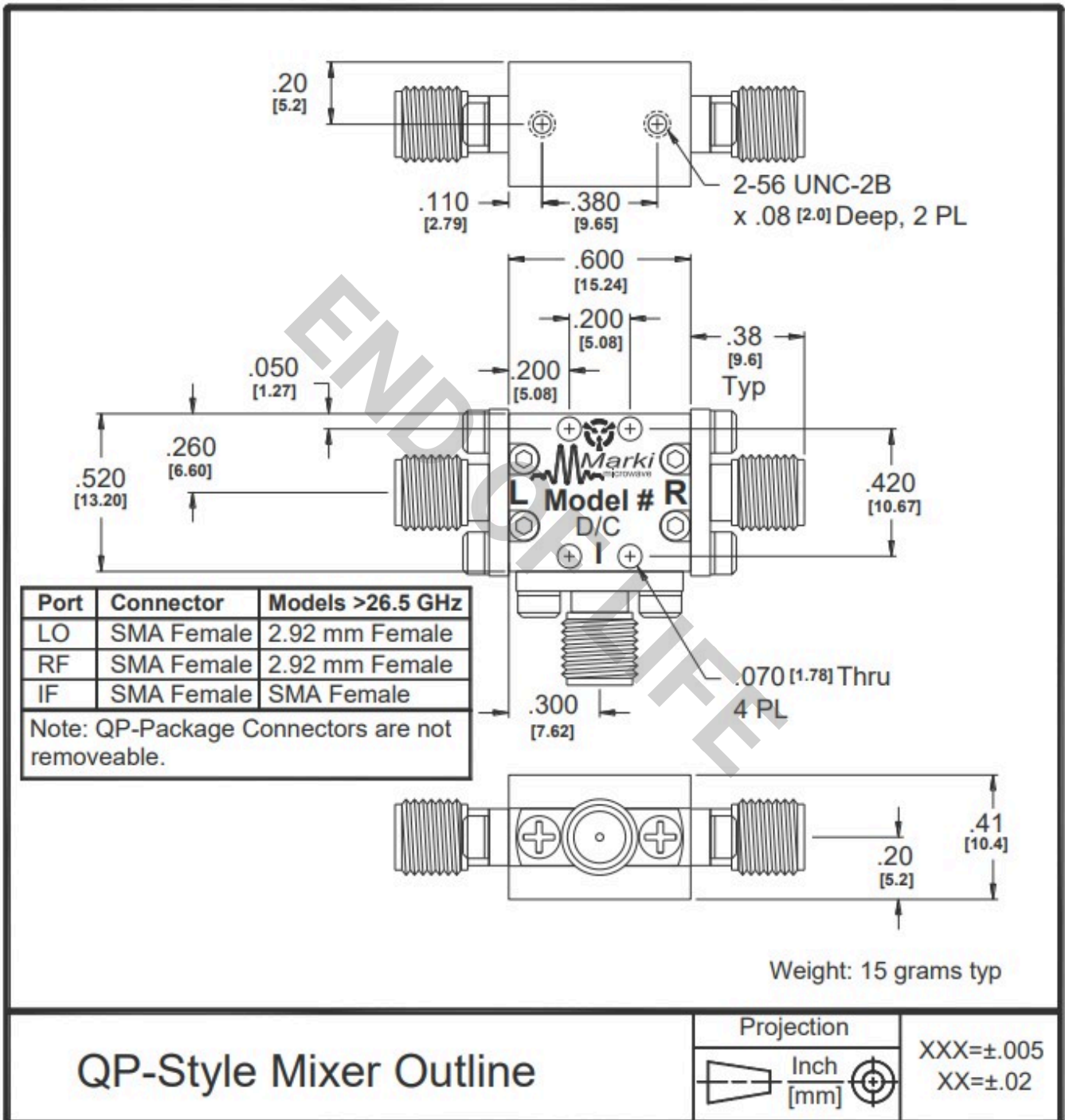
A sample upconversion spurious sweep is shown below. A 100 MHz reference IF input is used to create an RF output that is 100 MHz below the LO input (LO-IF=RF). A second LO (100 MHz higher) is combined with the same 100 MHz IF input (LO-2xIF=RF) to create the same 10 MHz to 8 GHz RF output band. The difference between these two output levels is the spurious suppression in dBc. The mean value across the full 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 100 MHz.
2. Mixer Noise Figure typically measures within 0.5 dB of conversion loss for IF frequencies greater than 5 MHz.
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. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
6. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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