DOUBLE-BALANCED MIXERS M1-0012

Features

- LO/RF .01 to 12.0 GHz
- IF DC to 2.0 GHz
- 7.5 dB Typical Conversion Loss
- Ultra-Broadband RF, LO, and IF
- For a list of recommended LO driver amps for all mixers and IQ mixers, see here.

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

Parameter	LO (GHz)	RF (GHz)	IF (GHz)	Min	Typ	Max	Diode Option LO drive level (dBm)
Conversion Loss (dB)	.01-12.0	.01-12.0	DC-2.0		7.5	11.5	
Isolation (dB) LO-RF LO-IF RF-IF	 .01-12.0 .01-12.0 .01-12.0	 .01-12.0 .01-12.0 .01-12.0			 See Plots		
Input 1 dB Compression (dBm)	.01-12.0	.01-12.0			+4		L (+10 to +13)
Input Two-Tone Third Order Intercept Point (dBm)	.01-12.0	.01-12.0			See Plot		L (+10 to +13)

Part Number Options

Please specify diode level and package style by adding to model number.

Package Styles		Examples			
		M1-0012LQP			
Connectorized	QP	M1-0012 (Model)	L (Diode Option)	QP (Package)	-2 (I-Port Configuration)

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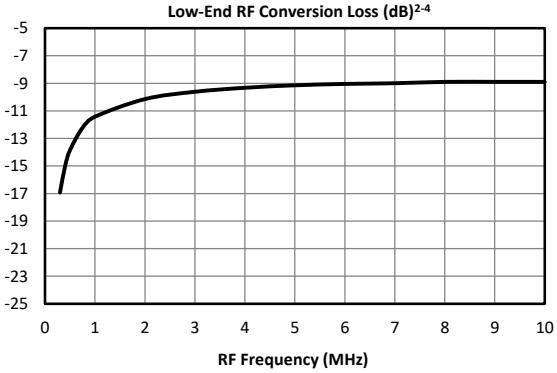
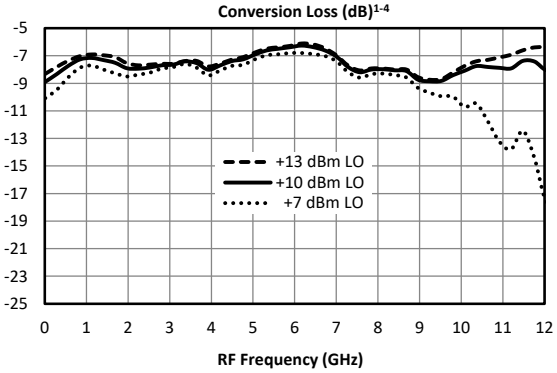
IF DC to 2.0 GHz

Typical Performance

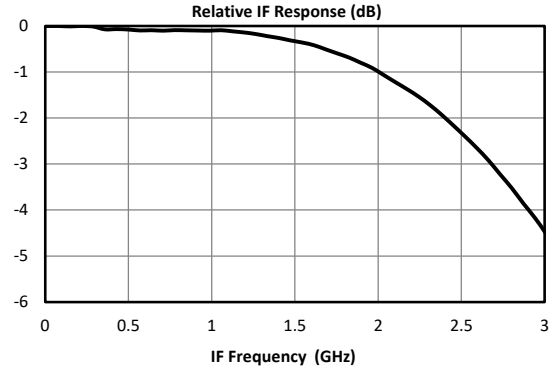
Low-End RF Conversion Loss (dB)[2-4]



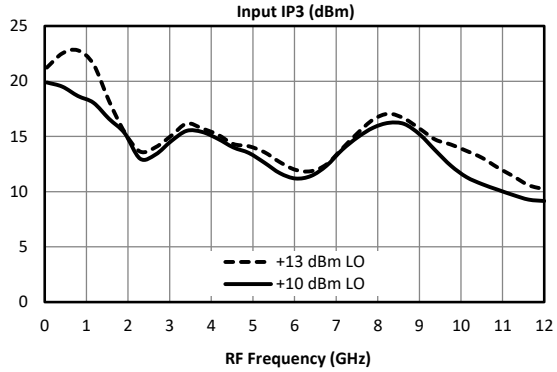
Conversion Loss (dB)[1-4]



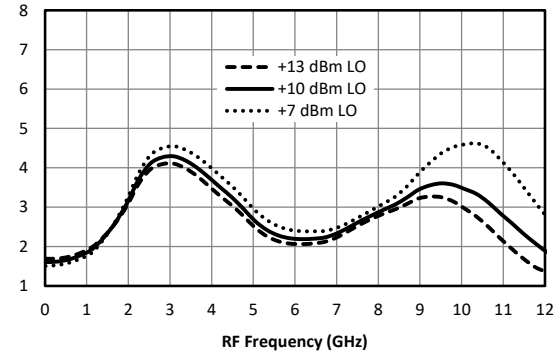
Relative IF Response (dB)



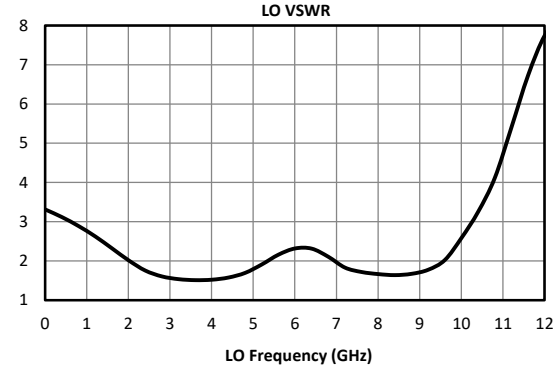
Input IP3 (dBm)



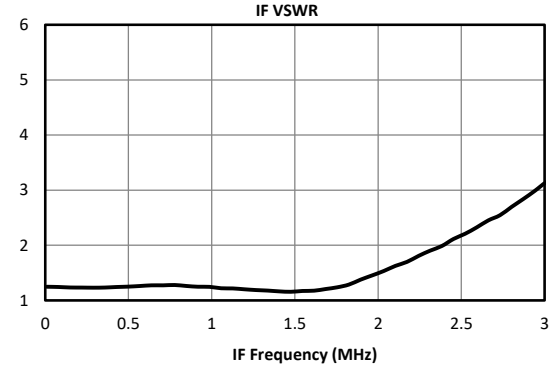
RF VSWR



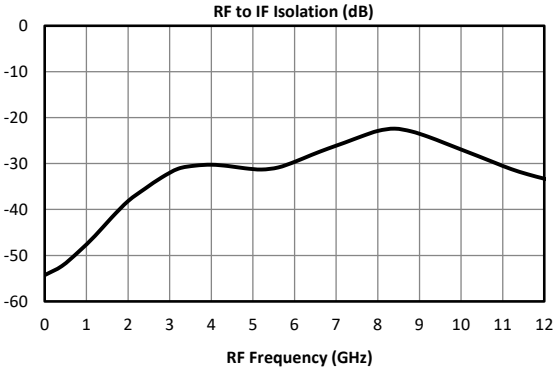
LO VSWR



IF VSWR

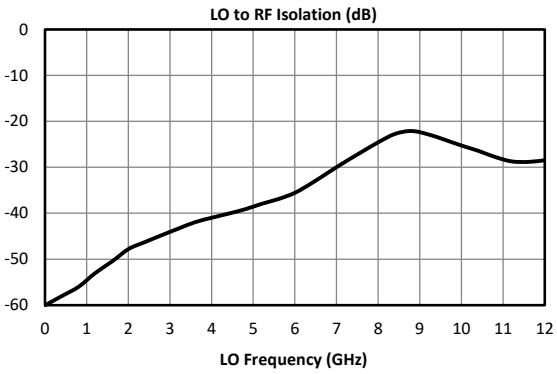


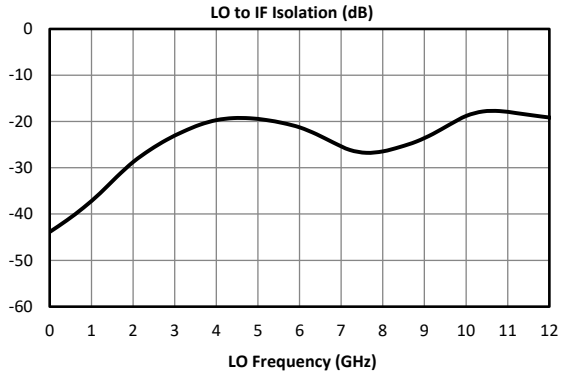
RF to IF Isolation (dB)

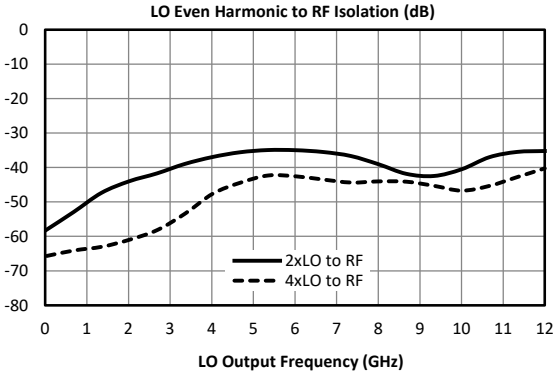


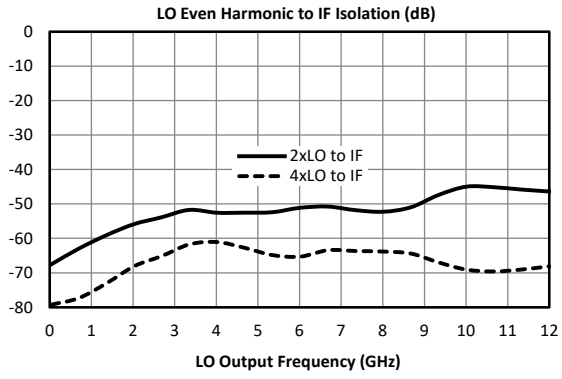
LO/RF .01 to 12.0 GHz
IF DC to 2.0 GHz

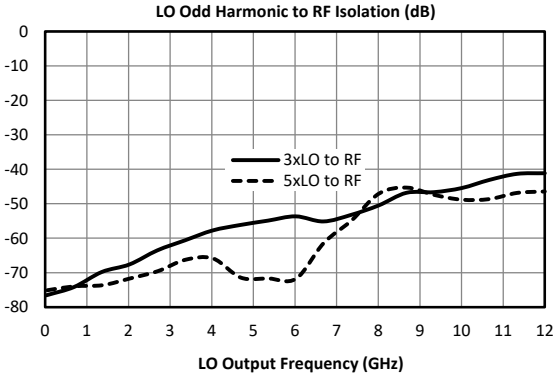
Typical Performance

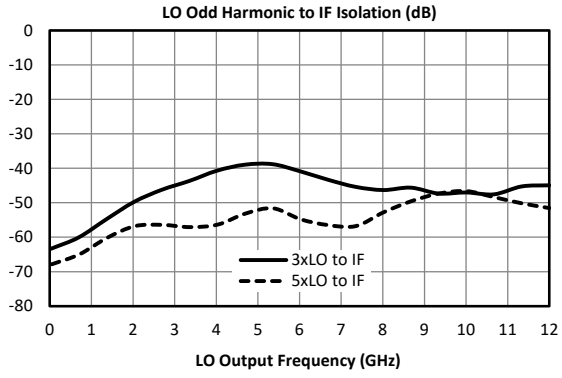












DOUBLE-BALANCED MIXERS M1-0012

LO/RF .01 to 12.0 GHz
IF DC to 2.0 GHz

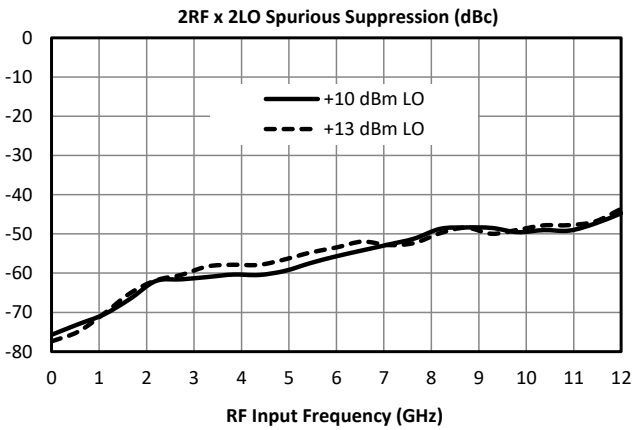
Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (±mLO±nRF) within the 10 MHz to 12 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 57 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 67 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	22	Reference	27	12	35	22
2xRF	63	49	57	51	62	52
3xRF	71	53	69	58	70	59
4xRF	105	87	87	87	91	87
5xRF	115	96	103	93	105	97

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 12 GHz RF input band is the number shown in the table above.



Downconversion 2RFx2LO Spurious Data Example:

RF Input: 10 MHz to 12.0 GHz @ -10 dBm
LO for Reference: 110 MHz to 12.1 GHz
LO for Spurious: 60 MHz to 12.05 GHz
IF Output: 100 MHz

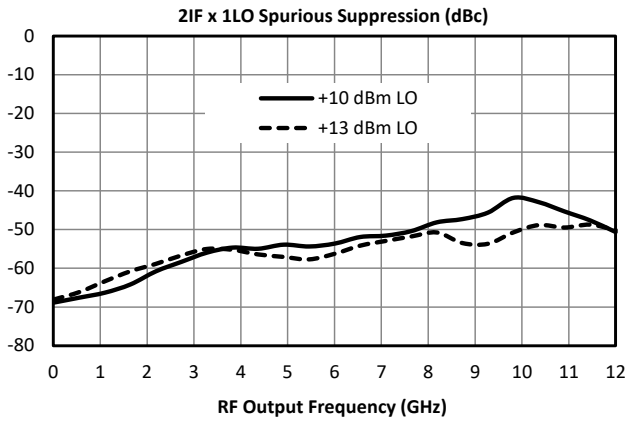
Upconversion Spurious Suppression

Spurious data is taken by mixing a 100 MHz IF with LO frequencies (±mLO±nIF) which create an RF within the 10 MHz to 12 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 54 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 64 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	21	Reference	27	12	33	27
2xIF	61	54	47	56	48	62
3xIF	97	58	63	52	64	53
4xIF	110	88	84	92	82	88
5xIF	120	89	102	87	98	87

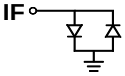
A sample upconversion spurious sweep is shown below. A 100 MHz reference IF input is used to create an RF output that is 100 MHz below the LO input (LO-IF=RF). A second LO (100 MHz higher) is combined with the same 100 MHz IF input (LO-2xIF=RF) to create the same 10 MHz to 12 GHz RF output band. The 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.



Upconversion 2IF x 1LO Spurious Data Example:

IF Input: 100 MHz @ -10 dBm
LO for Reference: 110 MHz to 12.1 GHz
LO for Spurious: 210 MHz to 12.2 GHz
RF Output: 10 MHz to 12 GHz

LO/RF .01 to 12.0 GHz
IF DC to 2.0 GHz

Port	Description	DC Interface Schematic
LO	The LO port is DC coupled to ground and AC matched to 50 Ohms from 10 MHz to 12 GHz. Blocking capacitor is optional.	
RF	The RF port is DC coupled to ground and AC matched to 50 Ohms from 10 MHz to 12 GHz. Blocking capacitor is optional.	
IF	The IF port is DC coupled to the diodes. Blocking capacitor is optional.	

Absolute Maximum Ratings	
Parameter	**Maximum Rating**
RF DC Current	1 Amp
LO DC Current	1 Amp
IF DC Current	50 mA
RF Power Handling (RF+LO)	+23 dBm at +25°C, derated linearly to +20 dBm at +100°C
Operating Temperature	-55ºC to +100ºC
Storage Temperature	-65ºC to +125ºC
ESD Sensitivity (HBM)	Class 0

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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