

MMIQ-0205HXA

MMIC Double-Balanced I/Q Mixer

DEVICE OVERVIEW

General Description

The MMIQ-0205HSM is a miniaturized, surface-mount multi-octave 1.75-5.0 GHz IQ mixer. It features matched double balanced mixers connected with an integrated LO hybrid and RF power divider. It can be used for either upconversion or downconversion. Applications include communications or radar systems with advanced digital modulation formats and phase modulated signals, test and measurement, or electronic warfare. Image reject or single sideband modulation with excellent suppression is possible with use of an external IF quadrature (90°) hybrid.



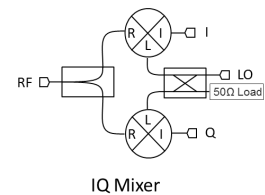
Features

- CAD Optimized for Superior Isolation, Spurious Response, and Image Rejection/Sideband Suppression
- Broadband Performance
- Excellent Unit-to-Unit Repeatability
- Fully nonlinear software models available with Marki Circuit Models for Microwave Office
- RoHS Compliant

Applications

N/A

Functional Block Diagram



Part Ordering Options

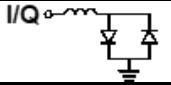
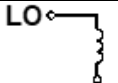
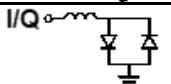
Part Number	Description	Package	Packing Size	Green Status	Product Lifecycle	Export Classification
MMIQ-0205HXA	MMIC Double-Balanced I/Q Mixer	-	-	RoHS	Released	EAR99

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Port Configuration and Functions

Port Functions

Port	Function	Description	Equivalent Circuit for Package
Pin 12	Q	The I/Q ports are DC coupled to the diodes. Blocking capacitor is optional.	
Pin 22	LO	The LO port is DC open and AC matched to 50 Ohms from 1.75 to 5 GHz. Blocking capacitor is optional.	
Pin 29	I	The I/Q ports are DC coupled to the diodes. Blocking capacitor is optional.	
Pin 4	RF	The RF port is DC short to ground and AC matched to 50 Ohms from 1.75 to 5 GHz. Blocking capacitor is optional.	

Specifications

Absolute Maximum Ratings

Parameter	Maximum Rating	Unit
DC Current	30	mA
DC Current	30	mA
DC Current	30	mA
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
RF Power Handling (RF+LO), 100°C	23	dBm
RF Power Handling (RF+LO), 25°C	26	dBm

Recommended Operating Conditions

Parameter	Min	Nominal	Max	Unit
LO Input Power	14	-	20	dBm

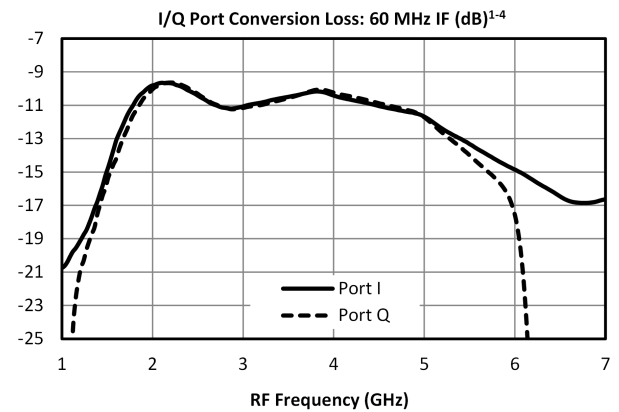
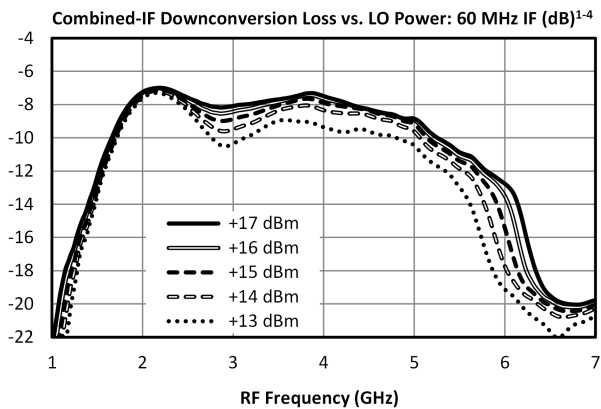
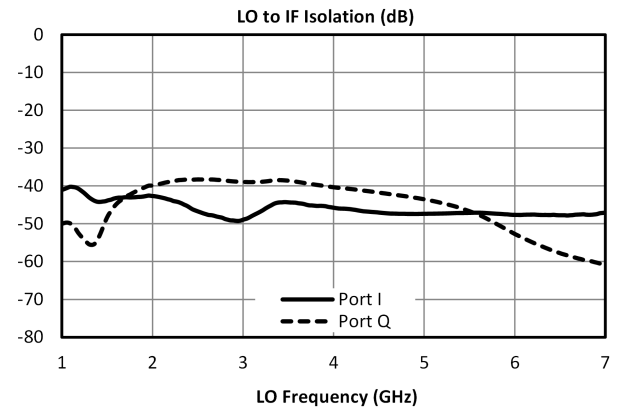
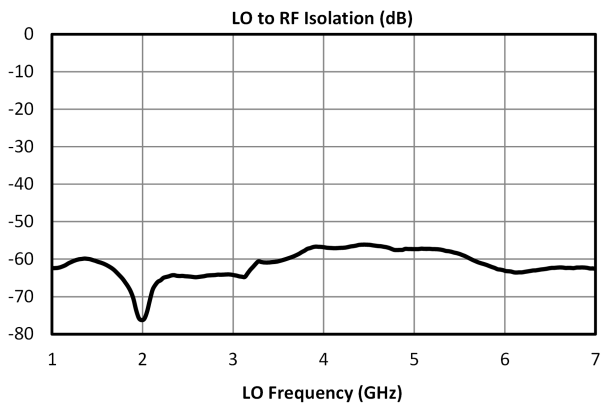
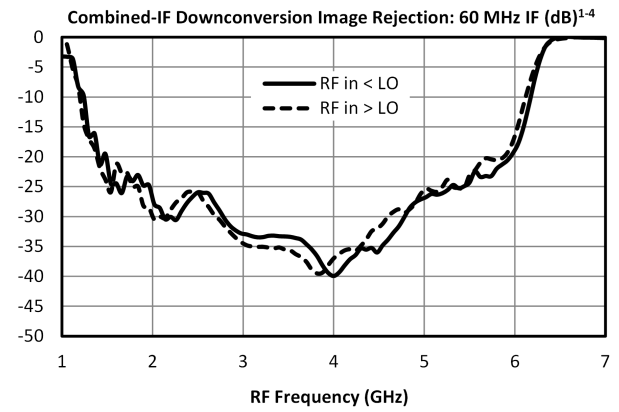
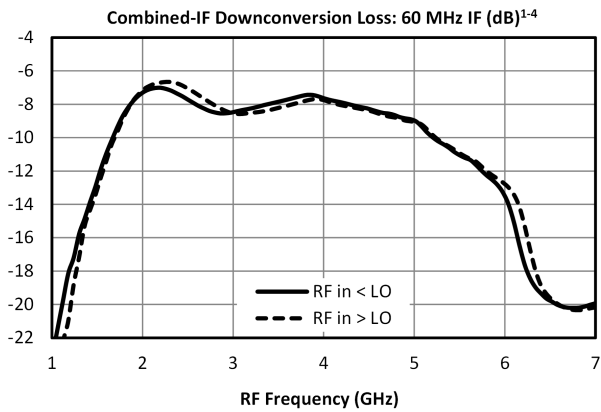
Electrical Specifications

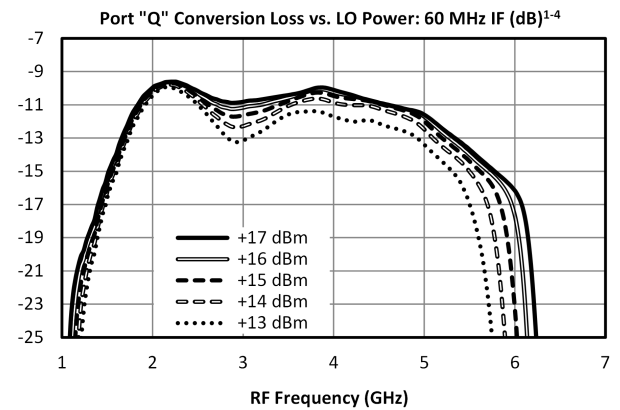
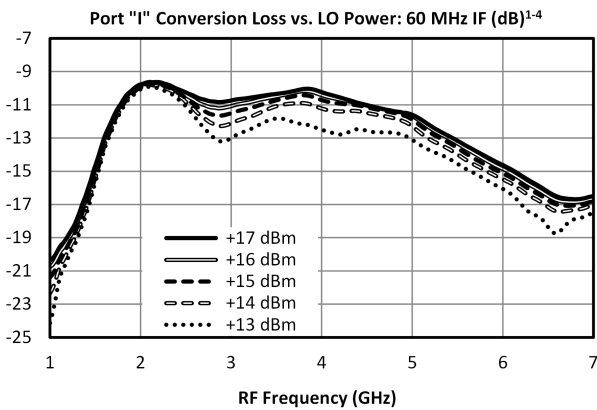
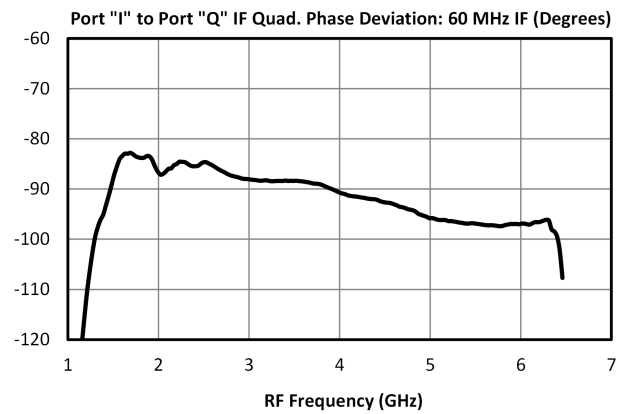
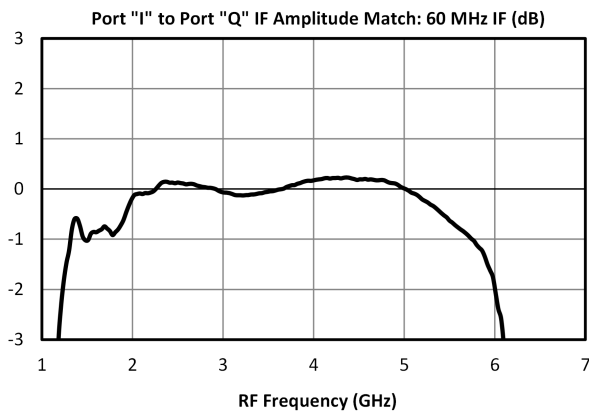
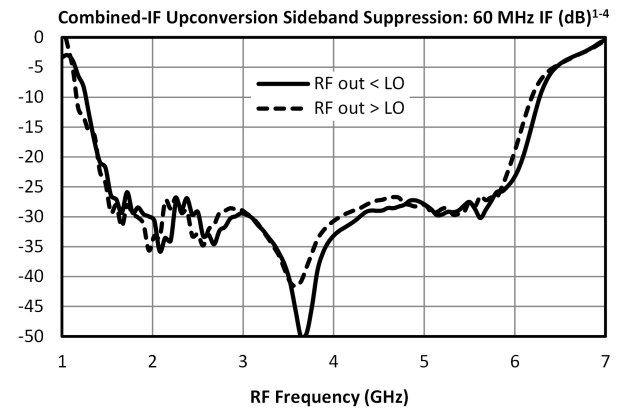
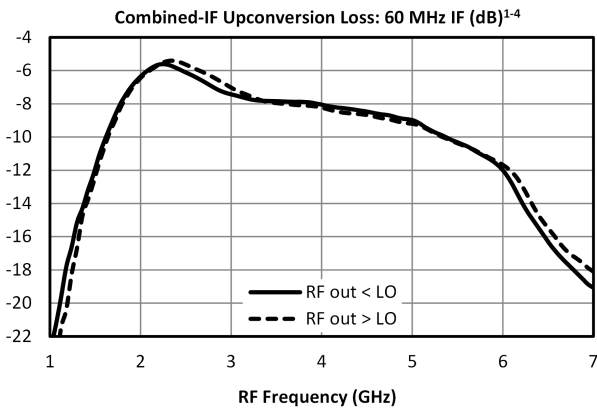
Specifications guaranteed from -55 to +100°C, measured in a 50Ω system.

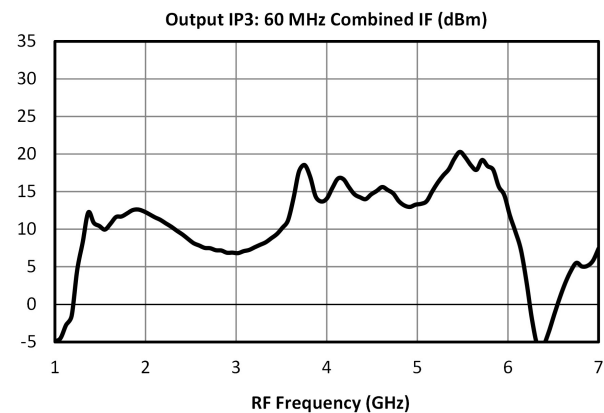
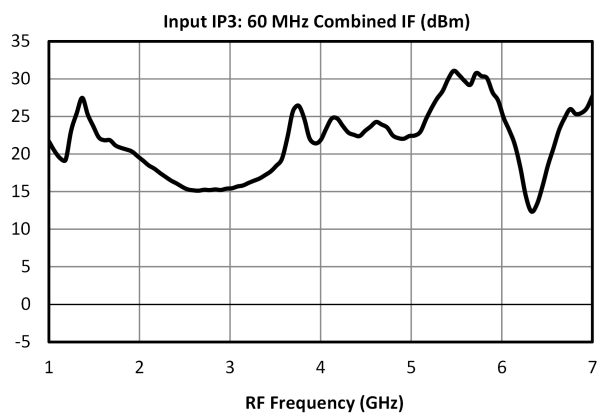
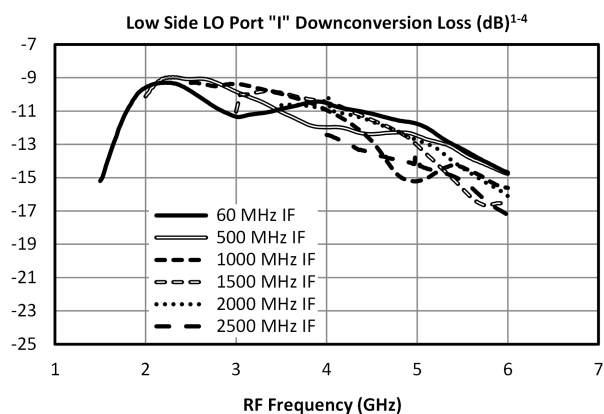
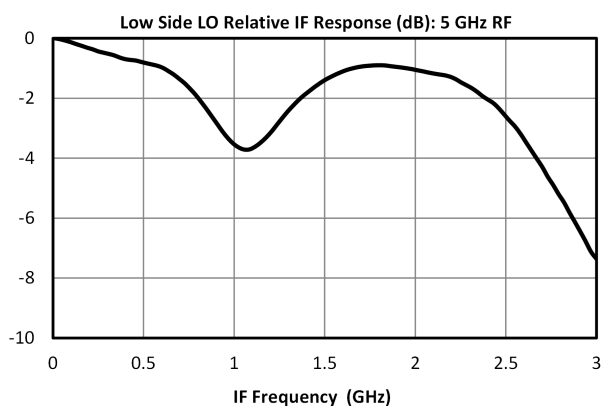
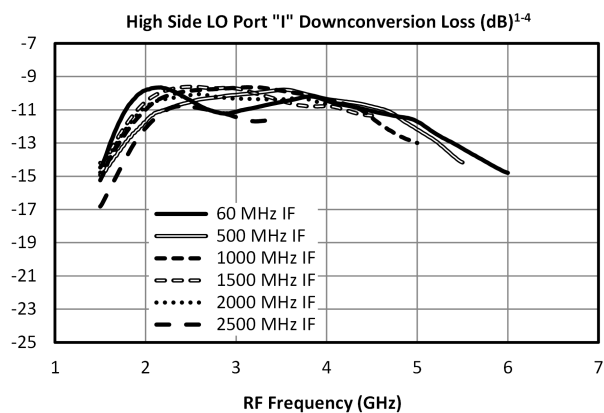
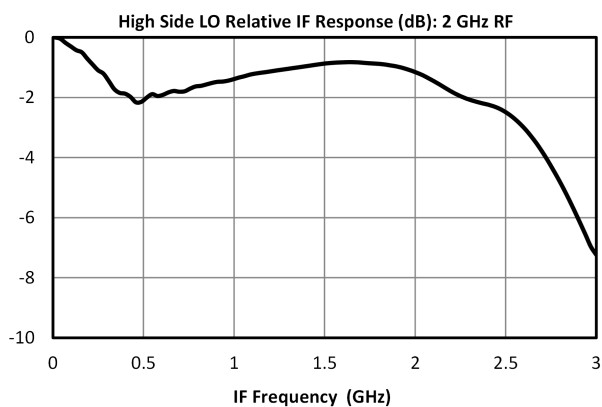
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
RF Frequency Range	-	-	-	1.75	-	5	GHz
LO Frequency Range	-	-	-	0	-	2	GHz
Conversion Loss ¹	LO=RF=1.75-5 GHz, IF=DC-2.0 GHz	1.75	5	-	8	10.5	dB
Image Rejection	-	-	-	-	33	-	dBc
Input IP3 ²	LO=RF=1.75-5 GHz, IF=DC-2.0 GHz	1.75	5	-	20	-	dBm
IF Frequency Range	-	-	-	0	-	2	GHz
Isolation, LO to RF	-	-	-	-	60	-	dB
Input 1 dB Compression ³	LO=RF=1.75-5 GHz, IF=DC-2.0 GHz	1.75	5	-	12	-	dBm
I/Q Amplitude Balance	LO=RF=1.75-5 GHz, IF=DC-2.0 GHz	1.75	5	-	0.16	-	dB
I/Q Quadrature Phase Balance	LO=RF=1.75-5 GHz, IF=DC-2.0 GHz	1.75	5	-	3	-	°
LO Drive Level, H Diode Option	LO = 1.75-5 GHz	1.75	5	14	-	20	dBm

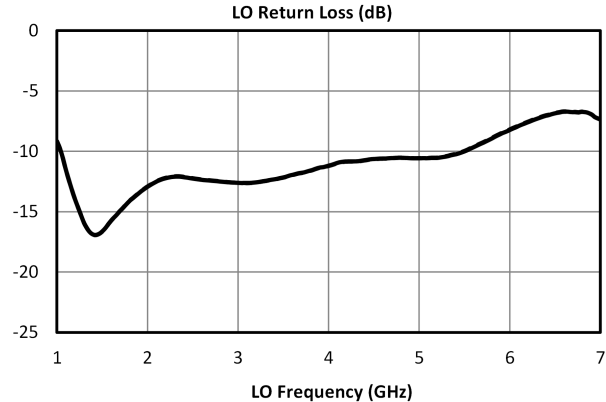
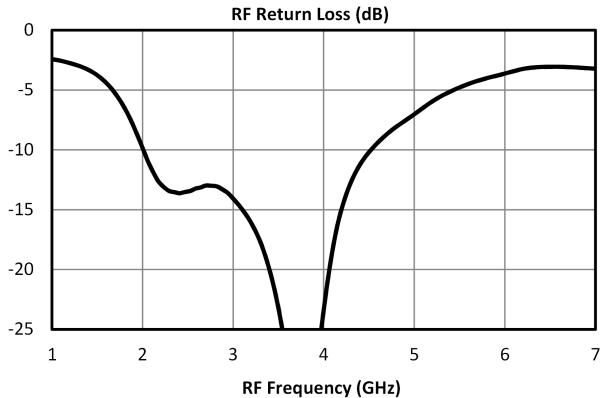
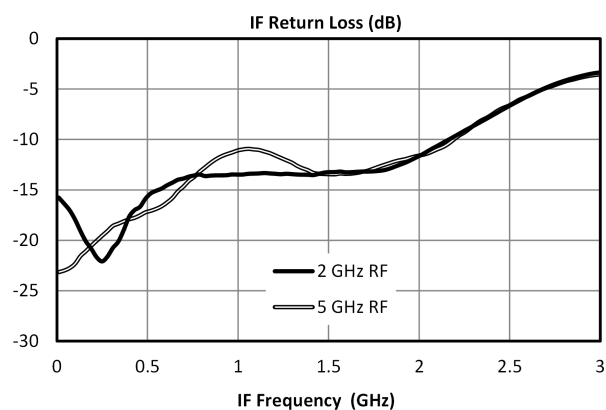
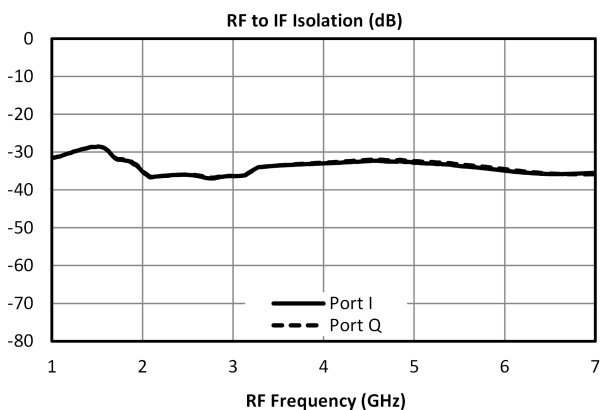
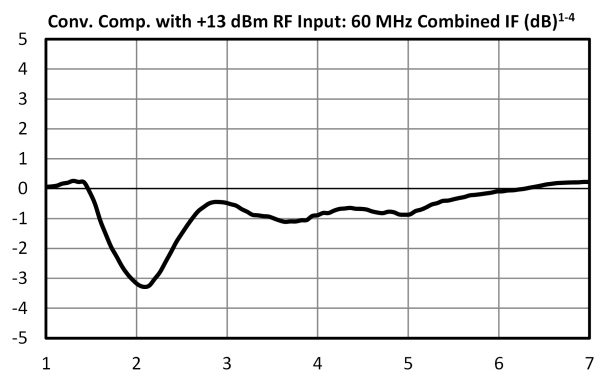
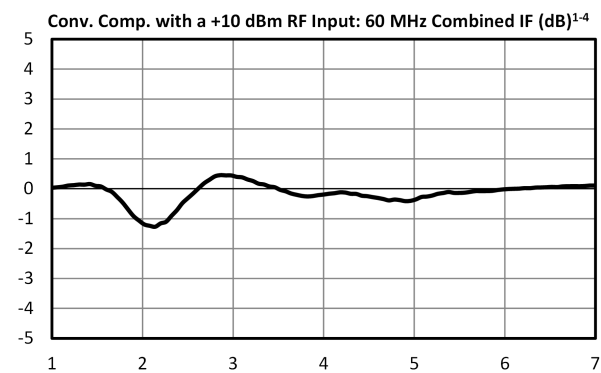
[1][2][3] Combined IF with Test Hybrid

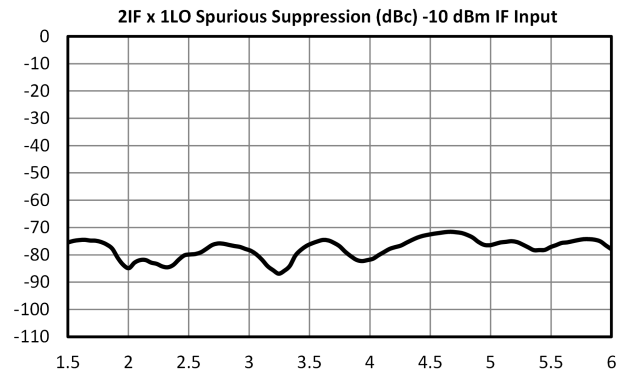
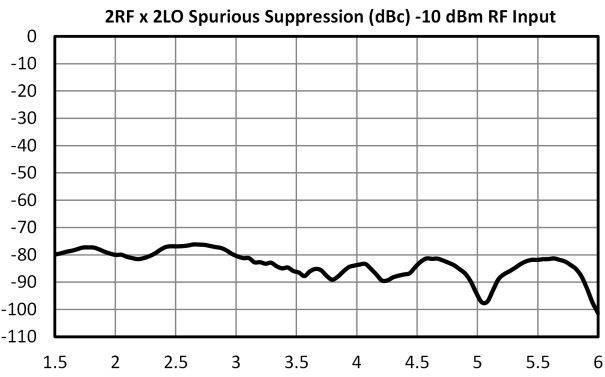
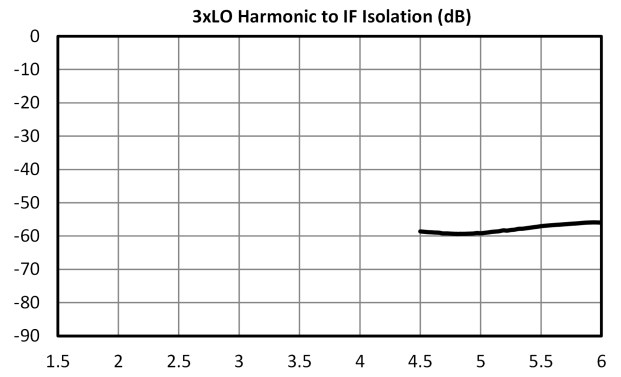
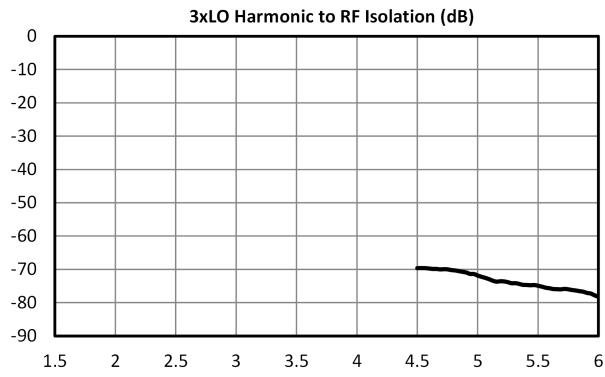
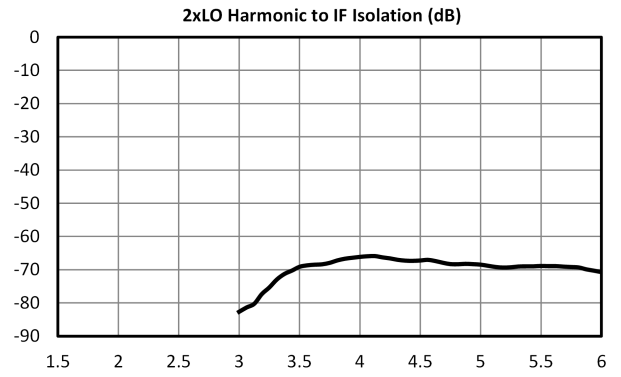
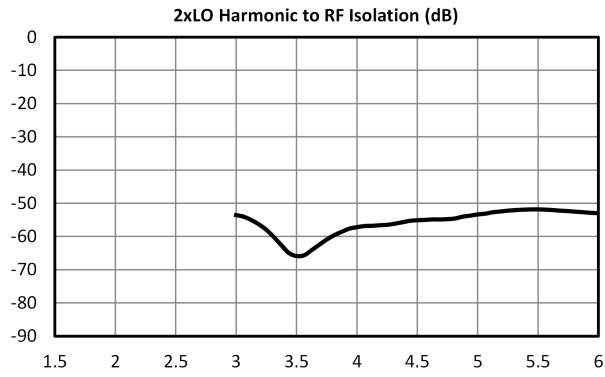
Typical Performance











Spur Table

Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the RF/LO bands, to create a spurious output within the IF band. 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 83 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 93 dBc.

Typical Downconversion Spurious Suppression (dBc) ⁴

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	23	Reference	42	15	55	18
2xRF	91	63	83	64	78	67
3xRF	92	76	88	68	94	68
4xRF	142	110	118	109	119	103
5xRF	155	126	134	121	129	115

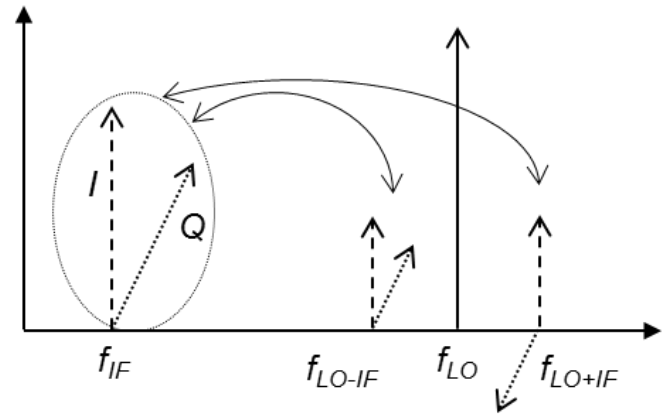
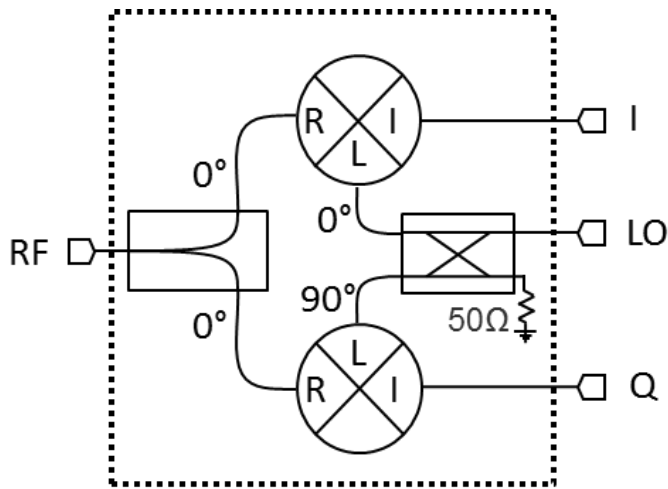
Upconversion Spurious Suppression

Spurious data is taken by mixing an input within the IF band, with LO frequencies (+mLO+nIF), to create a spurious output within the RF output 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 78 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 88 dBc.

Typical Upconversion Spurious Suppression (dBc) ⁴

-10 dBm IF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	23	Reference	39	9	51	33
2xIF	59	78	59	84	59	81
3xIF	92	58	84	54	84	60
4xIF	107	124	97	120	101	120
5xIF	135	103	127	106	123	103

Application Information



I/Q operation (as upconverter or downconverter)

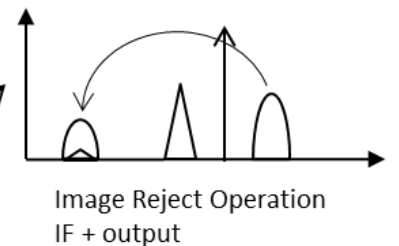
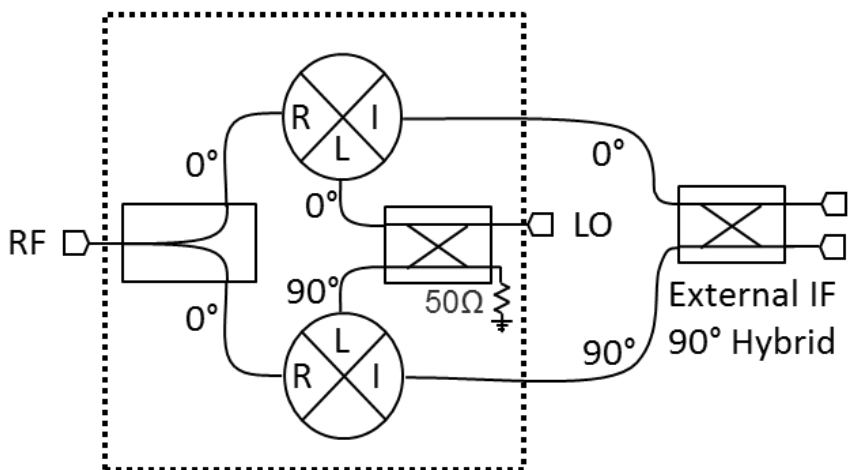


Image Reject Operation
IF + output

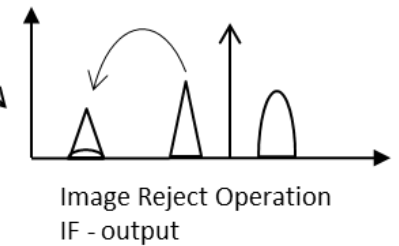
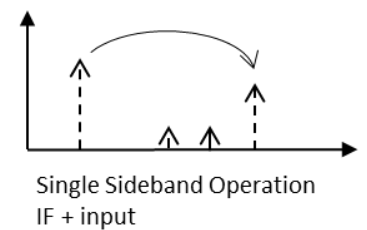
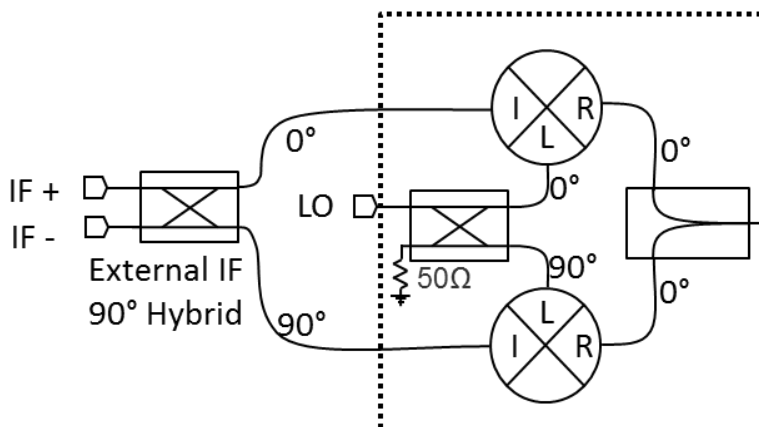
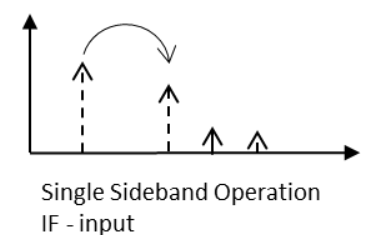


Image Reject Operation
IF - output



Single Sideband Operation
IF + input



Single Sideband Operation
IF - input

Evaluation Board - Performance Data

Parameter	Test Conditions	Frequency Range (GHz)	Min	Typ	Max	Unit
Isolation, LO to RF	-	-	-	60	-	dB
Image Rejection	-	-	-	33	-	dBc
RF Frequency Range	-	-	1.75	-	5	GHz
IF Frequency Range	-	-	0	-	2	GHz
LO Frequency Range	-	-	0	-	2	GHz

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