Passive GaAs MMIC IQ Mixer **MMIQ-4067L**

1. Device Overview

1.1 General Description

MMIC IQ mixer. This is an ultra-broadband mixer spanning 40 to 67 GHz on the RF and LO ports with an IF from DC to 20 GHz. Up to 25 dB of image rejection is available due to the excellent phase and amplitude balance of its on-chip LO quadrature hybrid. This product is available as a connectorized module. Contact factory for information regarding wire bondable die.

Module

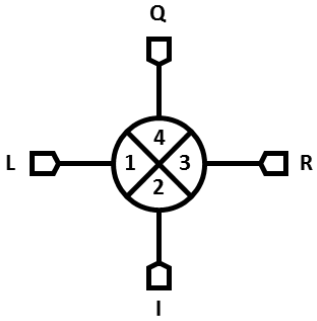
1.2 Electrical Summary

Parameter	Typical	Unit
RF/LO Frequency Range	40 - 67	GHz
IF Frequency Range	DC - 20	GHz
I+Q Conversion Loss	9	dB
Image Rejection	35	dB
LO-RF Isolation	33	dB

1.3 Applications

- Single Side Band & Image Rejection Mixing
- IQ Modulation/Demodulation
- Vector Amplitude Modulation
- Band Shifting

1.4 Functional Block Diagram



1.5 Part Ordering Options[1]

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
MMIQ-4067LU	Connectorized module	U	**RoHS**	Active	EAR99

[1] Refer to our website for a list of definitions for terminology presented in this table.

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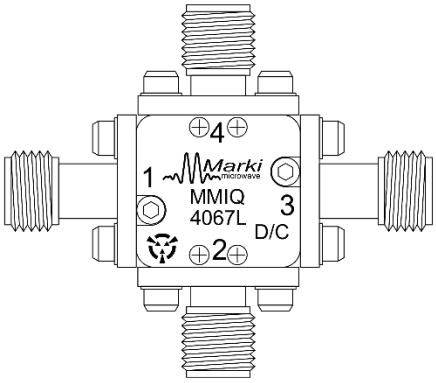
Revision History

Revision Code	Revision Date	Comment
-	April 2018	Datasheet Initial Release

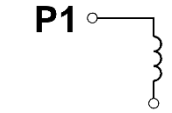
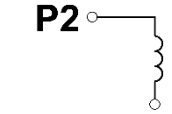
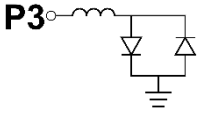
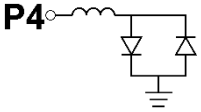
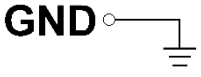
2. Port Configurations and Functions

2.1 Port Diagram

A top-down view of the MMIQ-4067L's U package outline drawing is shown below. The mixer may be operated as either a downconverter or an upconverter. Use of the RF or IF as the input or output port will depend on the application.



2.2 Port Functions

Port	Function	Description	Equivalent Circuit
Port 3	RF Input/Output	Port 1 is DC open and AC matched to 50Ω over the specified RF frequency range.	
Port 1	LO Input	Port 2 is DC open and AC matched to 50Ω over the specified LO frequency range.	
Port 2	I Input / Output	Port 3 is diode coupled and AC matched to 50Ω over the specified I port frequency range.	
Port 4	Q Input / Output	Port 4 is diode coupled and AC matched to 50Ω over the specified Q port frequency range.	
GND	Ground	U package ground path is provided through the metal housing and outer coax conductor.	

3. Specifications

3.1 Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Units
Port 2 DC Current	50	mA
Port 4 DC Current	50	mA
Power Handling, at any Port	+23	dBm
Operating Temperature	-55 to +100	°C
Storage Temperature	-65 to +125	°C

3.2 Package Information

Parameter	Details	Rating
ESD	Human Body Model (HBM), per MIL-STD-750, Method 1020	TBD
Weight	U package	14.5 g

3.3 Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications. Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the electrical specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

	Min	Nominal	Max	Units
T_A, Ambient Temperature	-55	+25	+100	°C
LO drive power	+11	+15	+20	dBm
RF/IF input power			+TBD	dBm

3.4 Sequencing Requirements

There is no requirement to apply power to the ports in a specific order. However, it is recommended to provide a 50Ω termination to each port before applying power. This is a passive diode mixer that requires no DC bias.

3.5 Electrical Specifications

The electrical specifications apply at T_A=+25°C in a 50Ω system. Typical data shown is for a down conversion application with a +15dBm sine wave LO input.

Min and Max limits apply only to our connectorized units and are guaranteed at T_A=+25°C. All bare die are 100% DC tested and visually inspected.

Parameter		Test Conditions	Min	Typical	Max	Units
RF (Port 3) Frequency Range			40		67	GHz
LO (Port 1) Frequency Range			40		67	
I (Port 2) Frequency Range			0		20	
Q (Port 4) Frequency Range			0		20	
Conversion Loss (CL)[2]		RF/LO = 40 - 67 GHz I = DC – 0.2 GHz		12		dB
		RF/LO = 40 - 67 GHz I = 0.2 - 20 GHz		14		
		RF/LO = 40 - 67 GHz Q = DC -0.2 GHz		12		
		RF/LO = 40 - 67 GHz Q = 0.2 - 20 GHz		14		
Noise Figure (NF)[3]		RF/LO = 40 - 67 GHz I = DC – 0.2 GHz		12		dB
		RF/LO = 40 - 67 GHz Q = DC – 0.2 GHz		12		
Image Rejection (IR)[4]		RF/LO = 40 - 67 GHz I+Q = DC – 0.2 GHz		35		dBc
Isolation	LO to RF	RF/LO = 40-67 GHz		33		dB
	LO to IF	IF/LO = 40-67 GHz		40		
	RF to IF	RF/IF = 40-67 GHz		37		
Input IP3 (IIP3)[5]	I+Q	RF/LO = 40 - 67 GHz I = DC – 0.2 GHz		19		dBm

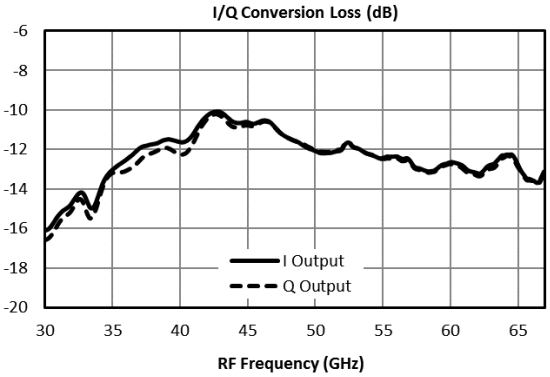
[2] Measured as an I/Q down converter. (i.e., I and Q powers are not combined)

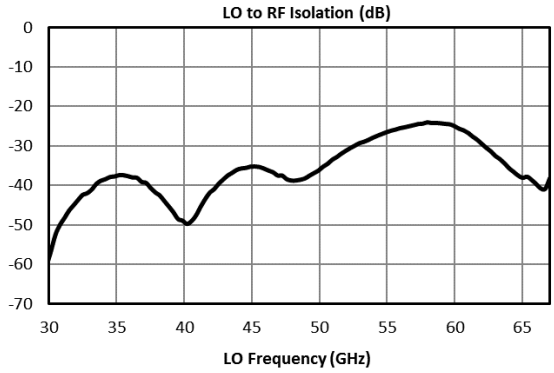
[3] Mixer Noise Figure typically measures within 0.5 dB of conversion loss for IF frequencies greater than 5 MHz.

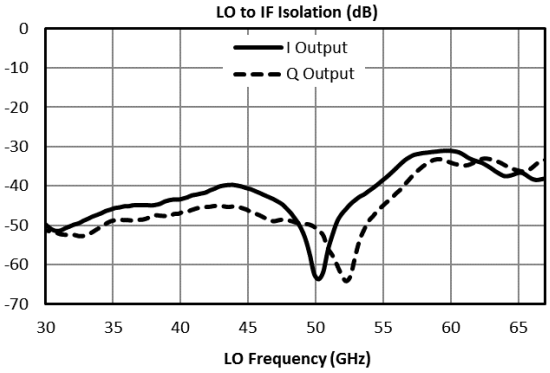
[4] Image Rejection and Single sideband performance plots are defined by the upper sideband (USB) or lower sideband (LSB) with respect to the LO signal. Plots are defined by which sideband is selected by the external IF quadrature hybrid.

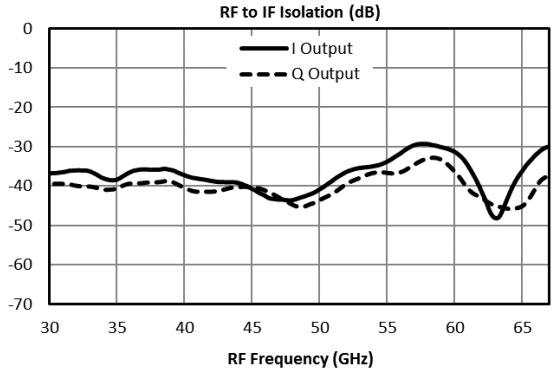
[5] Typical IIP3 measured with I and Q ports combined with an external quadrature hybrid coupler.

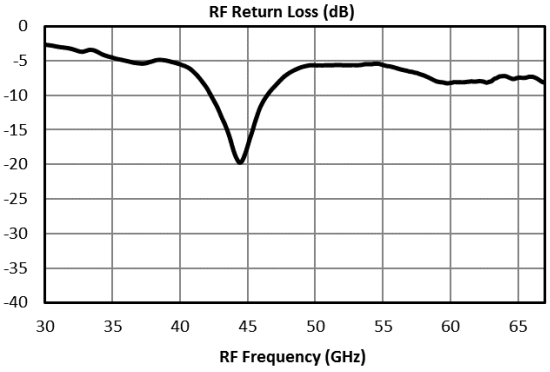
3.6 Typical Performance Plots

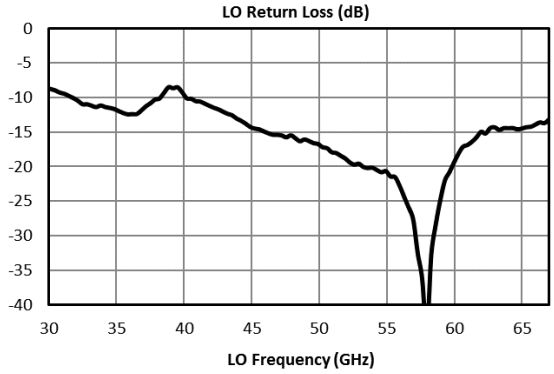


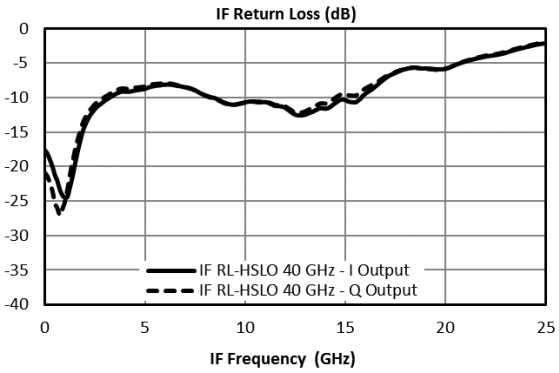


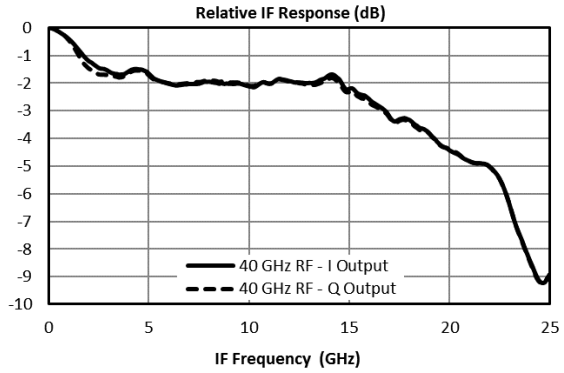




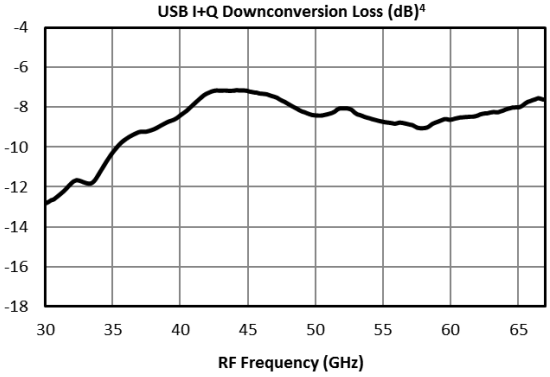




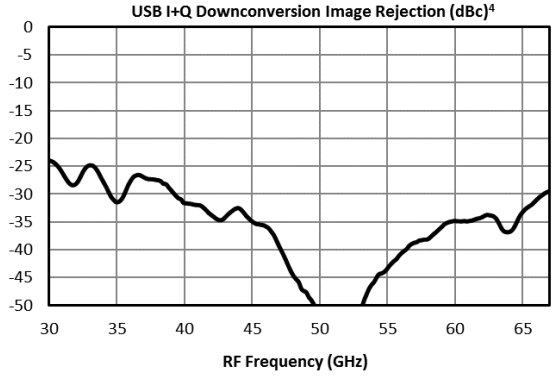




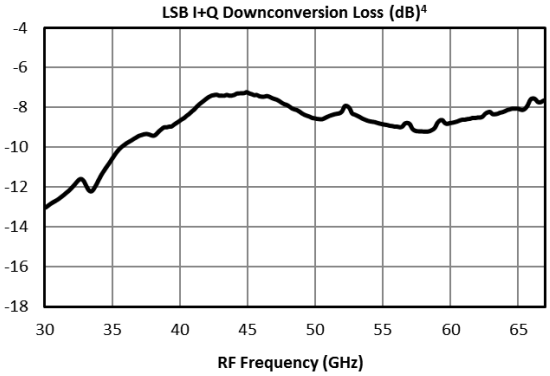
USB I+Q Downconversion Loss (dB)[4]



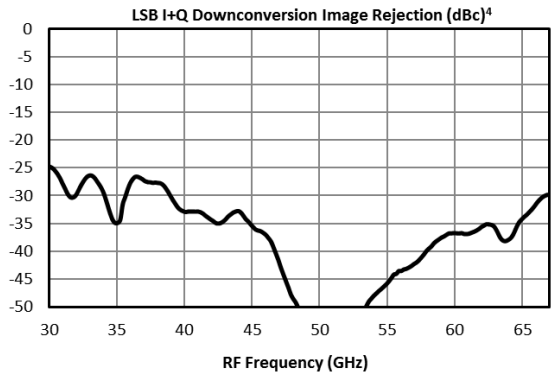
USB I+Q Downconversion Image Rejection (dBc)[4]



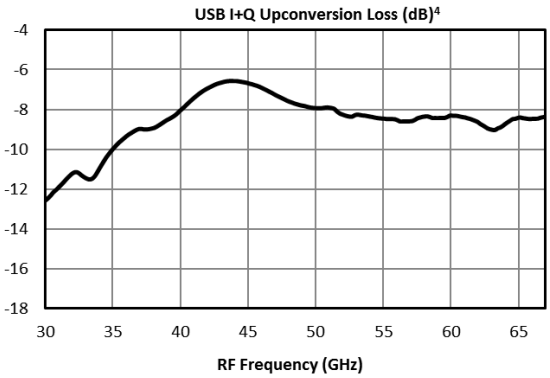
LSB I+Q Downconversion Loss (dB)[4]



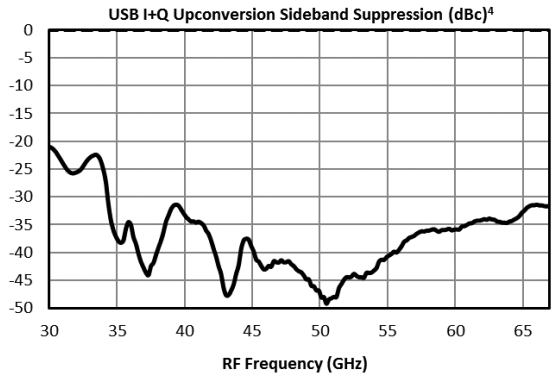
LSB I+Q Downconversion Image Rejection (dBc)[4]



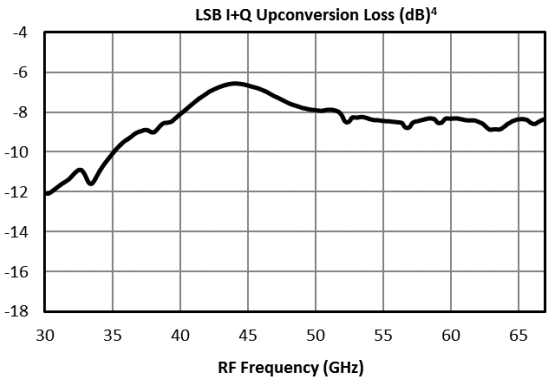
USB I+Q Upconversion Loss (dB)[4]



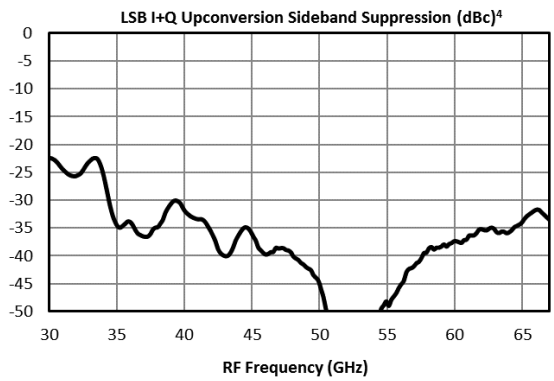
USB I+Q Upconversion Sideband Suppression (dBc)[4]

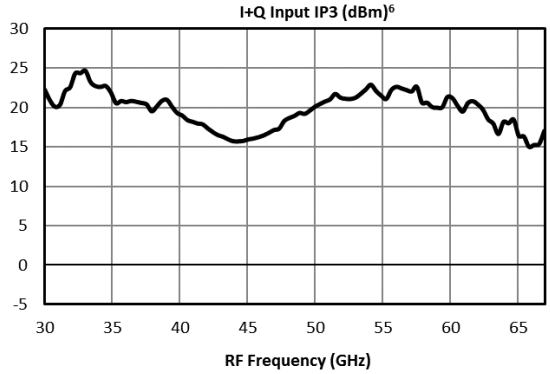


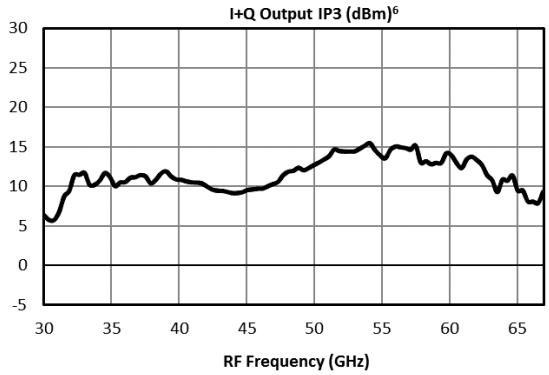
LSB I+Q Upconversion Loss (dB)[4]



LSB I+Q Upconversion Sideband Suppression (dBc)[4]

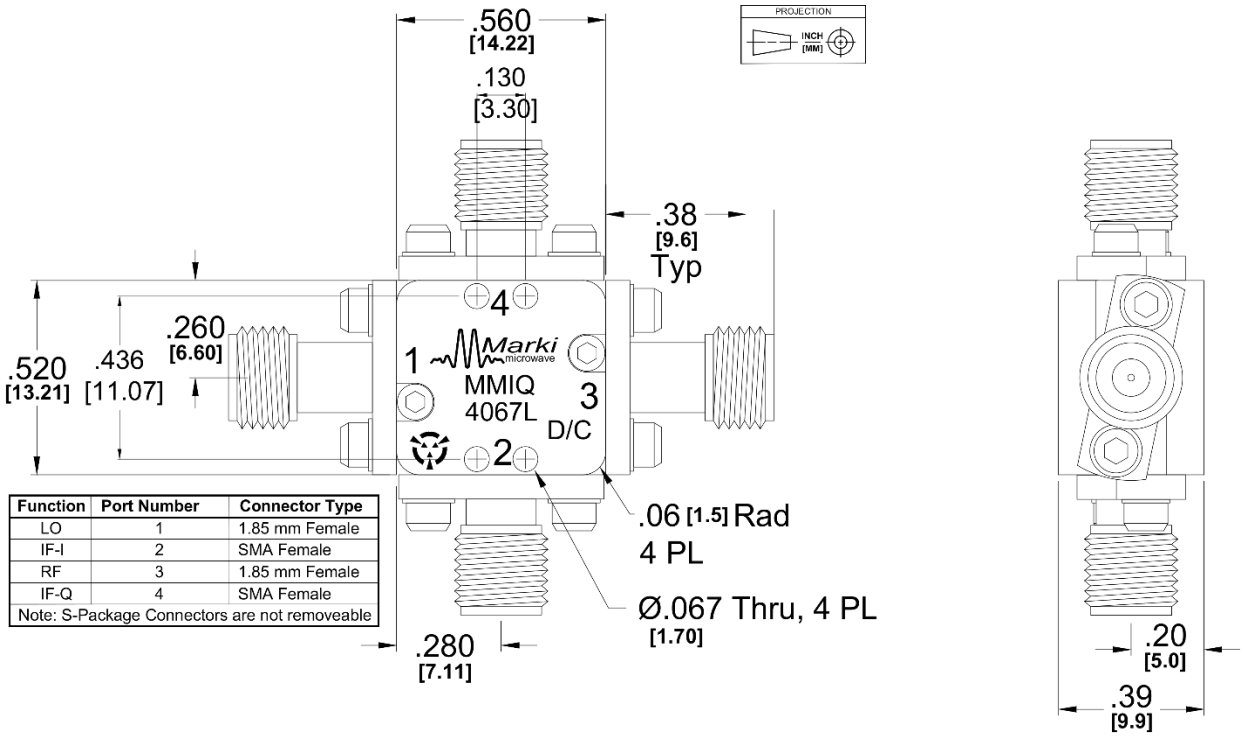






4. Mechanical Data

4.1 U Package Outline Drawing



Function	Port Number	Connector Type
LO	1	1.85 mm Female
IF-I	2	SMA Female
RF	3	1.85 mm Female
IF-Q	4	SMA Female
Note: S-Package Connectors are not removeable		