

MM2-0530LS

GaAs MMIC Triple Balanced Mixer

DEVICE OVERVIEW

General Description

The MM2-0530L is a passive MMIC triple balanced mixer. It features a broadband IF port that spans from 2 to 20 GHz, and has excellent spurious suppression. GaAs MMIC technology improves upon the previous generation of hand assembled, hybrid M2 triple balanced mixers with improved isolations, unit-to-unit repeatability and reliability. The MM2-0530L is available as a wire bondable chip or connectorized SMA package.



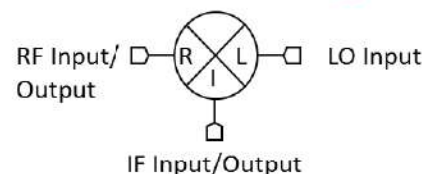
Features

- Broadband IF Port
- Typical Input 1 dB Compression of +8 dBm
- High Input IP3 of +19 dBm
- Excellent LO to IF Isolation
- Unit-to-Unit Repeatability
- RoHS Compliant

Applications

N/A

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Packing Size	Green Status	Product Lifecycle	Export Classification
MM2-0530LS	GaAs MMIC Triple Balanced Mixer	S	-	RoHS	Released	EAR99

Table Of Contents

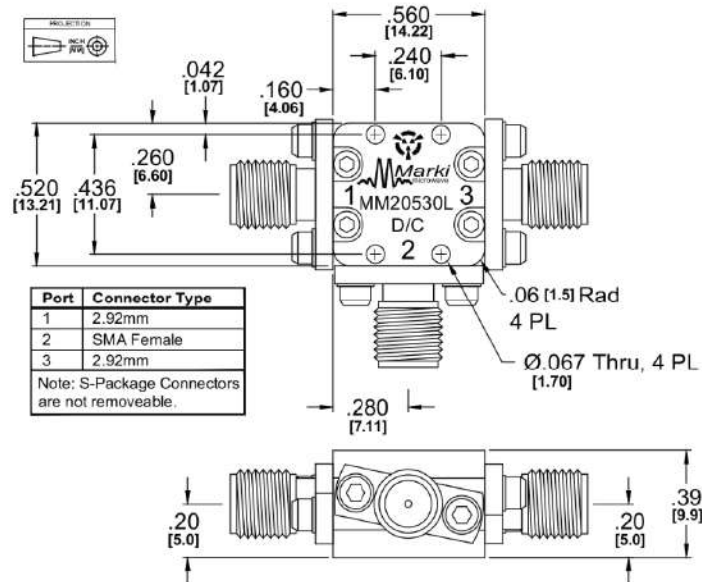
- **Device Overview**
 - General Description
 - Features
 - Applications
 - Functional Block Diagram
- **Port Configuration and Functions**
 - Port Diagram
 - Port Functions
- **Revision History**
- **Specifications**
 - Absolute Maximum Ratings
 - Package Information
 - Recommended Operating Conditions
 - Electrical Specifications
 - Typical Performance
 - Spur Tables
- **Mechanical Data**
 - Outline Drawing
- **Operation**
 - Application Circuit
 - Application Circuit Description

Revision History

Revision Code	Revision Date	Comment
-	2016-01-01	Initial Release

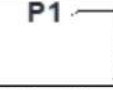
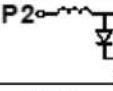
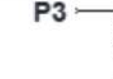
Port Configuration and Functions

Port Diagram





Port Functions

Configuration A

Port	Function	Description	Equivalent Circuit for Package
Port 1	LO	Port 1 is DC short and AC matched to 50 Ω from 5 to 30 GHz. Blocking capacitor is optional.	
Port 2	IF	Port 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Port 3	RF	Port 3 is DC short and AC matched to 50 Ω from 5 to 30 GHz. Blocking capacitor is optional.	

Configuration B

Port	Function	Description	Equivalent Circuit for Package
Port 1	RF	Port 1 is DC short and AC matched to 50 Ω from 5 to 30 GHz. Blocking capacitor is optional.	P1 
Port 2	IF	Port 2 is DC coupled to the diodes. Blocking capacitor is optional.	-
Port 3	LO	Port 3 is DC short and AC matched to 50 Ω from 5 to 30 GHz. Blocking capacitor is optional.	P3 

Specifications

Absolute Maximum Ratings

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
Port 1 DC Current	21	mA
Port 2 DC Current	15	mA
Port 3 DC Current	24	mA
RF Power Handling (RF+LO), 100°C	20	dBm
RF Power Handling (RF+LO), 25°C	25	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	14.22x13.21mm

Recommended Operating Conditions

Parameter	Min	Nominal	Max	Unit
LO Input Power	9	-	17	dBm

Electrical Specifications

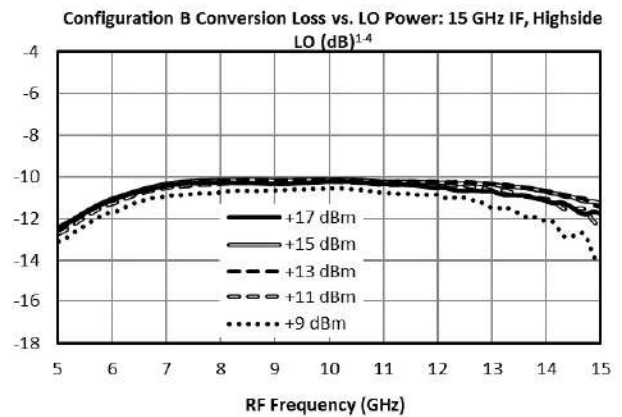
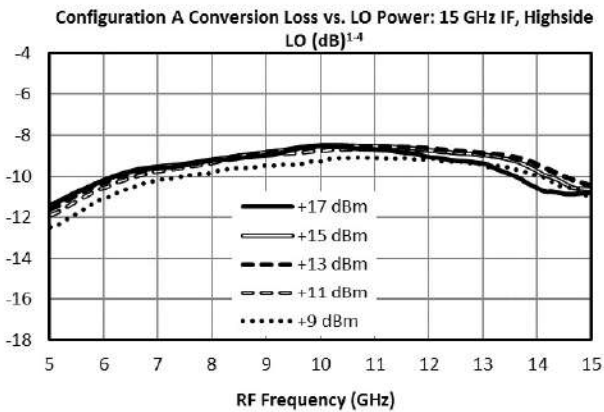
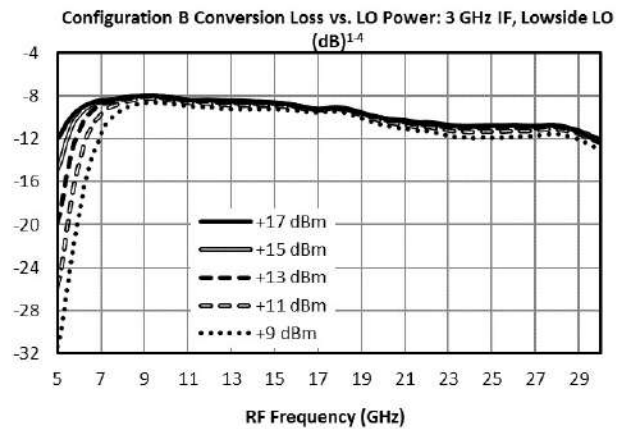
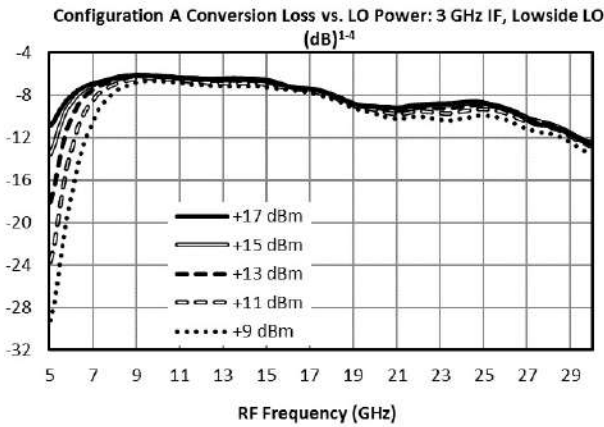
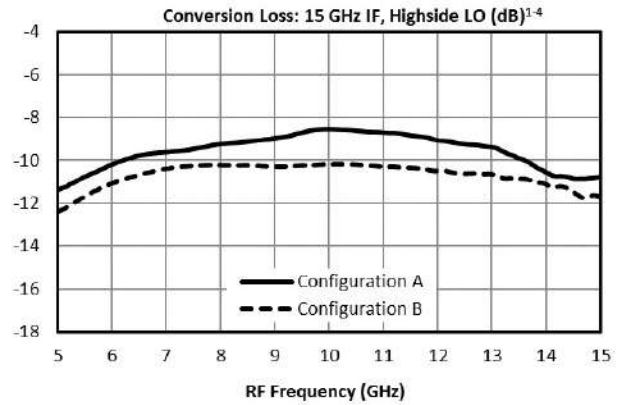
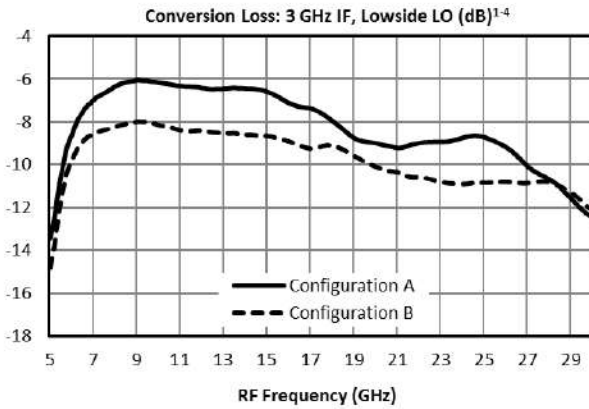
Specifications guaranteed from -55 to +100°C, measured in a 50Ω system. Specifications are shown for Configurations A (B). RF testing is performed on a sample basis to verify conformance to datasheet guaranteed specifications. Consult factory for more information.

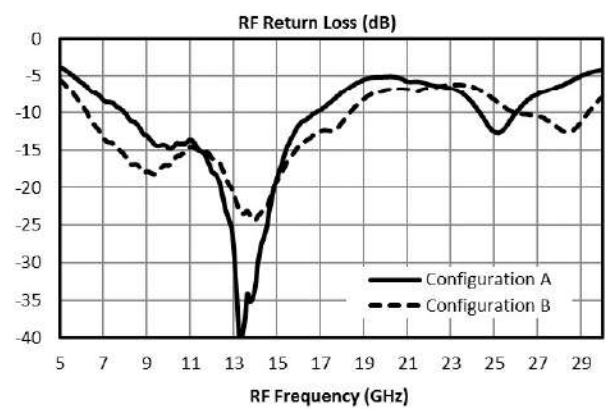
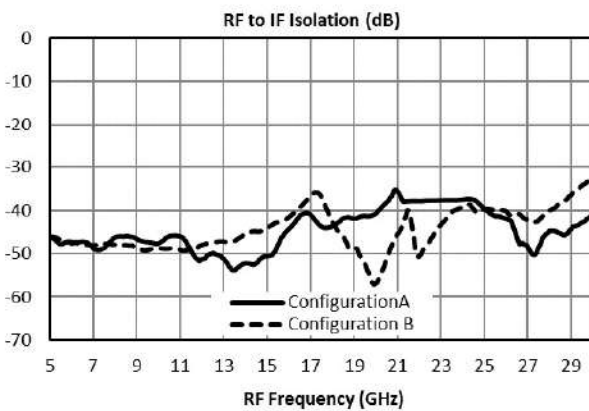
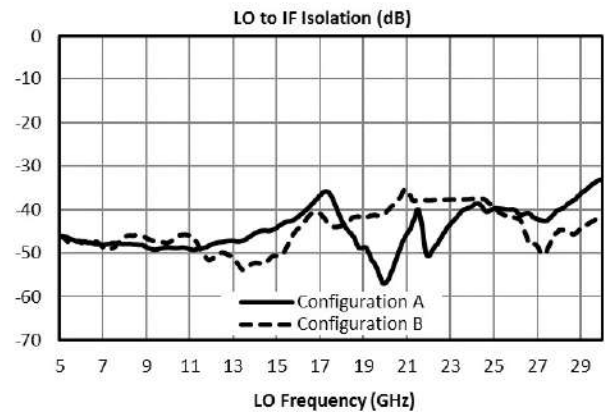
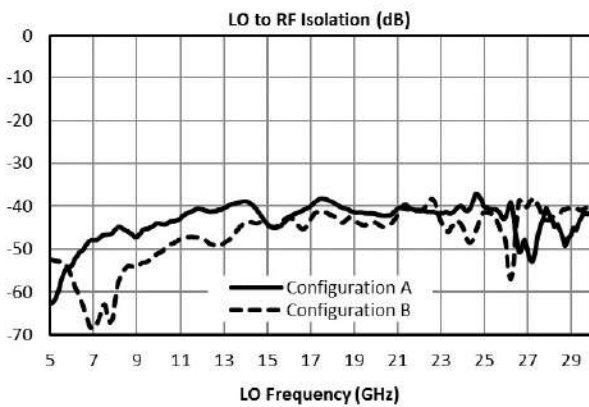
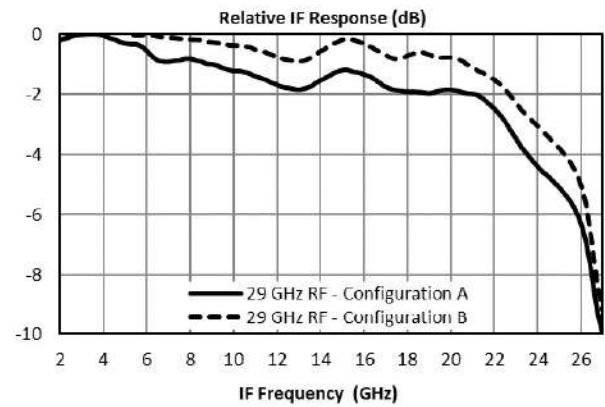
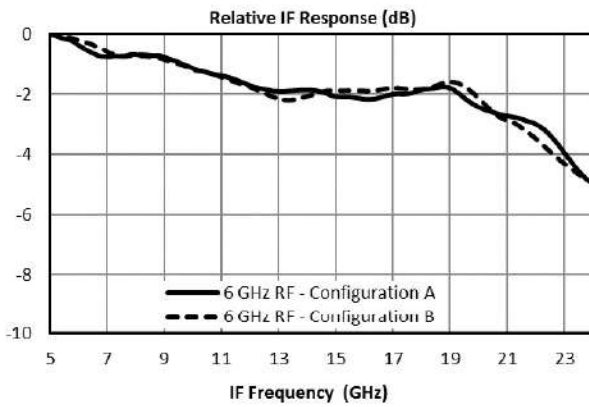
Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
RF Frequency Range	-	-	5	-	30	GHz
LO Frequency Range	-	-	5	-	30	GHz
Conversion Loss ¹	A	LO/RF=5-30 GHz IF=2-20 GHz LO Drive Level=15	-	9	-	dB
Conversion Loss ²	B	LO/RF=5-30 GHz IF=2-20 GHz LO Drive Level=15	-	10	-	dB
Isolation, LO to RF	A	-	-	44	-	dB
Input IP3 ³	A	LO/RF=5-30 GHz IF=2-20 GHz LO Drive Level= 9-17	-	15	-	dBm
Input IP3 ⁴	B	LO/RF=5-30 GHz IF=2-20 GHz LO Drive Level= 9-17	-	19	-	dBm
IF Frequency Range	-	-	2	-	20	GHz
Input 1 dB Compression	A	LO/RF=5-30 GHz IF=2-20 GHz LO Drive Level= 9-17	-	8	-	dBm
Input 1 dB Compression	B	LO/RF=5-30 GHz IF=2-20 GHz LO Drive Level= 9-17	-	10	-	dBm

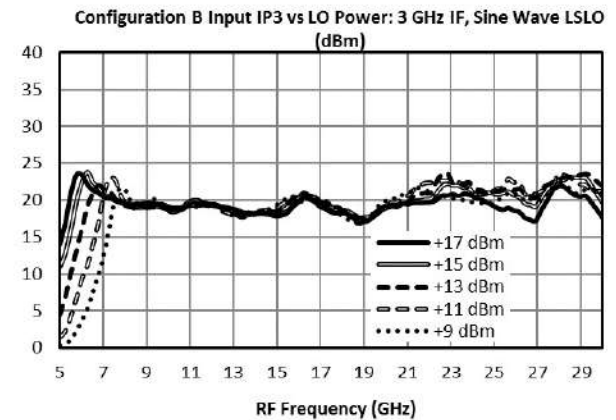
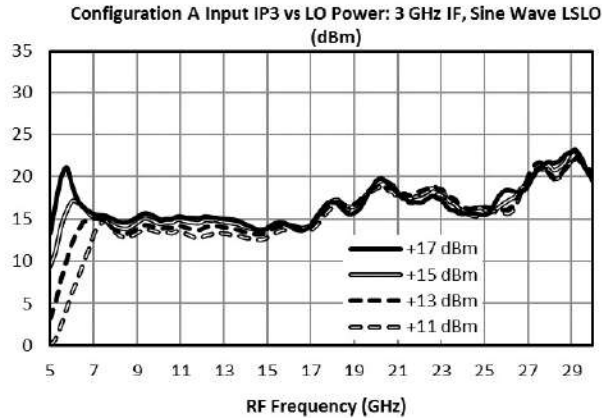
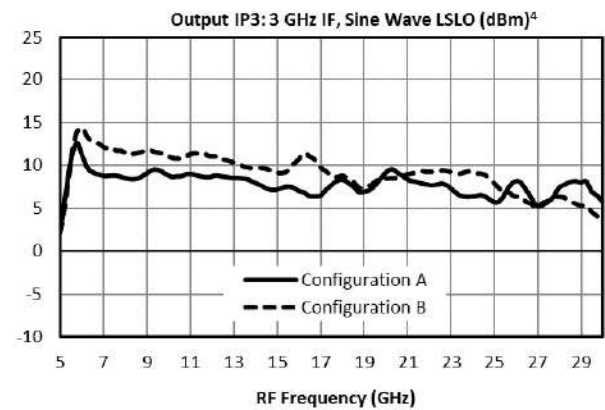
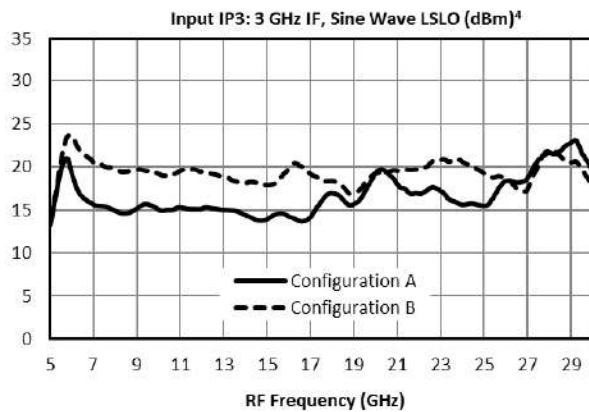
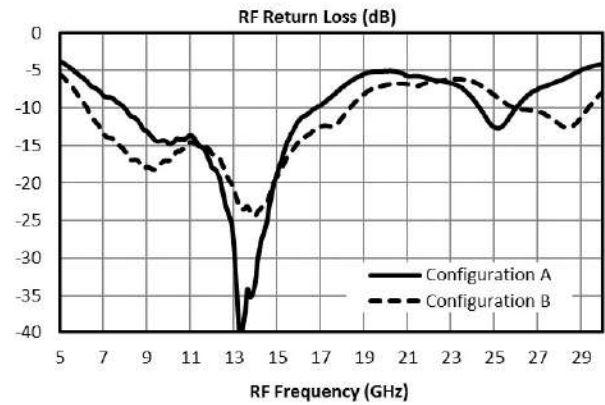
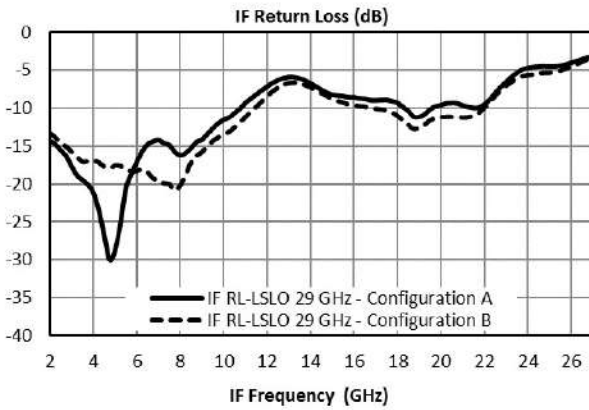
[1][2] Measured Conversion Loss measured at 3 GHz fixed IF

[3][4] IP3 depends on LO drive conditions, see plots for more details

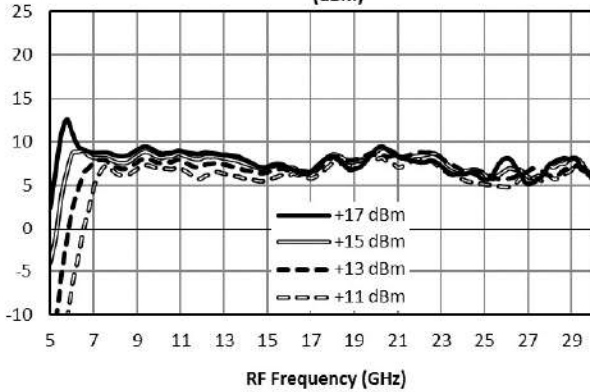
Typical Performance



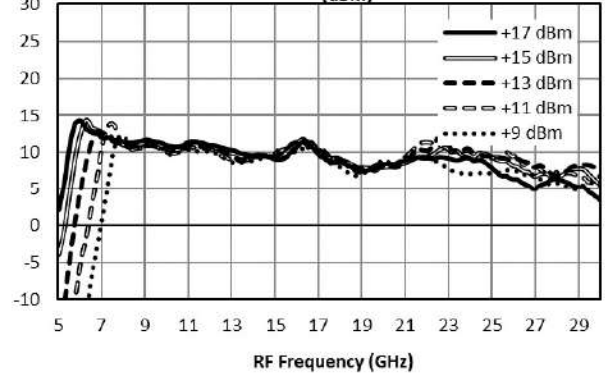




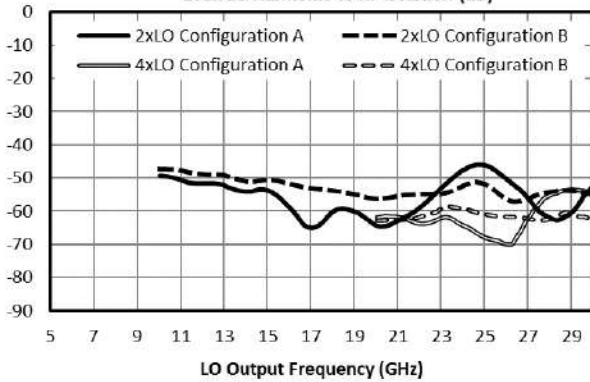
Configuration A Output IP3 vs LO Power: 3 GHz IF, Sine Wave LSLO (dBm)



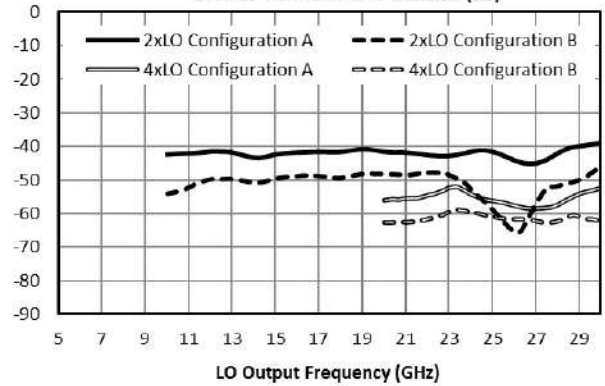
Configuration B Output IP3 vs LO Power: 3 GHz IF, Sine Wave LSLO (dBm)



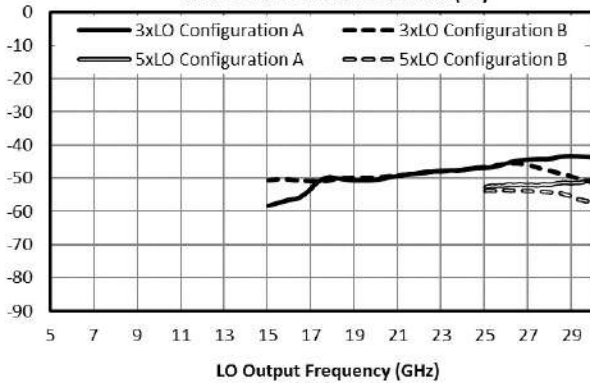
Even LO Harmonic to RF Isolation (dB)



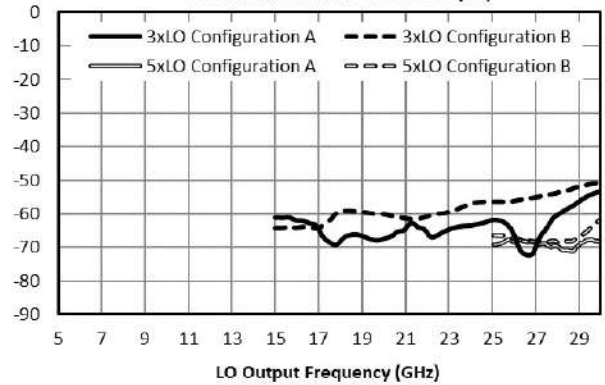
Even LO Harmonic to IF Isolation (dB)

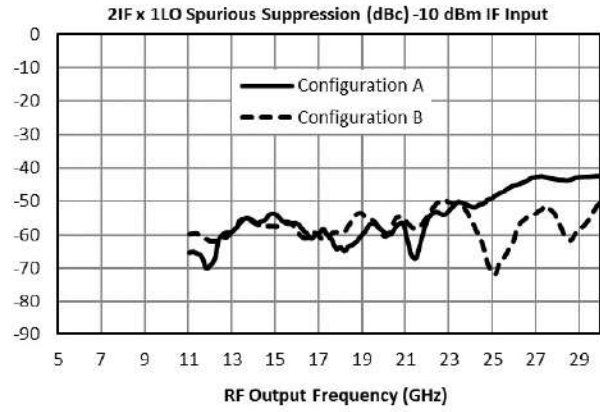
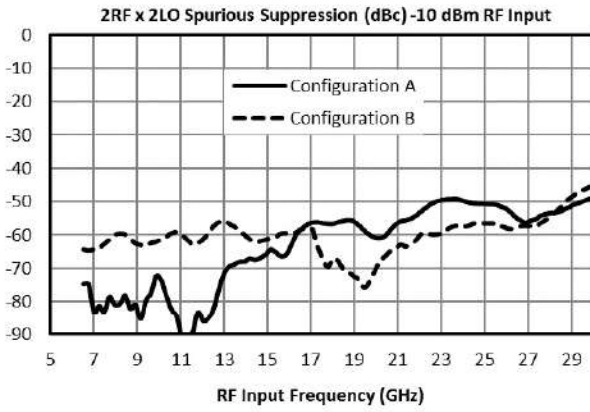


Odd LO Harmonic to RF Isolation (dB)



Odd LO Harmonic to IF Isolation (dB)





Spur Table

Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 5 to 30 GHz RF/LO bands, which create a 3 GHz 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 59 dBc for the A configuration for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 69 dBc.

Typical Downconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO ⁵

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	36 (37)	Reference	36 (44)	14 (12)	38 (43)	29 (21)
2xRF	65 (61)	57 (58)	63 (60)	59 (64)	64 (67)	70 (70)
3xRF	85 (87)	61 (62)	84 (85)	71 (70)	83 (85)	72 (69)
4xRF	152 (153)	82 (110)	113 (114)	116 (117)	115 (110)	116 (119)
5xRF	177 (173)	123 (122)	140 (139)	122 (123)	139 (140)	132 (129)

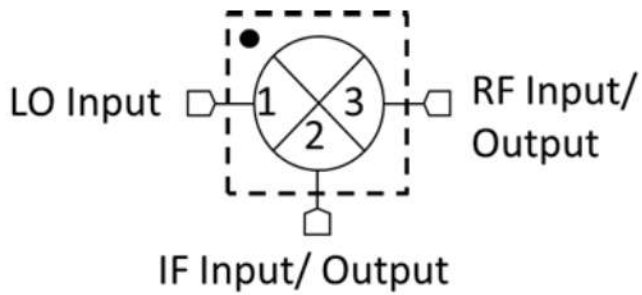
Upconversion Spurious Suppression

Spurious data is taken by mixing a 3 GHz IF with LO frequencies (+mLO+nIF), which creates an RF within the 5 to 30 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 60 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 70 dBc.

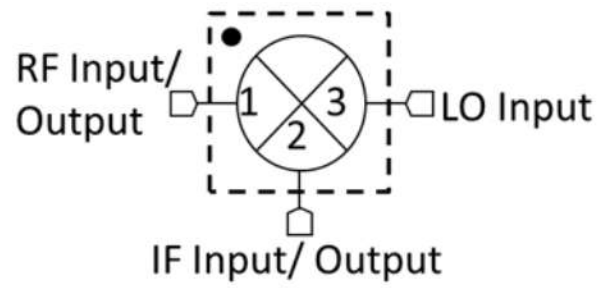
Typical Upconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO ⁵

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	38 (40)	Reference	41 (40)	12 (11)	43 (42)	22 (19)
2xIF	71 (66)	54 (58)	60 (62)	67 (66)	70 (66)	68 (63)
3xIF	90 (96)	69 (77)	89 (99)	71 (77)	88 (93)	68 (74)
4xIF	114 (111)	107 (111)	113 (118)	115 (117)	121 (117)	116 (124)
5xIF	134 (140)	125 (127)	138 (139)	119 (123)	141 (141)	123 (121)

Application Circuit



Configuration A



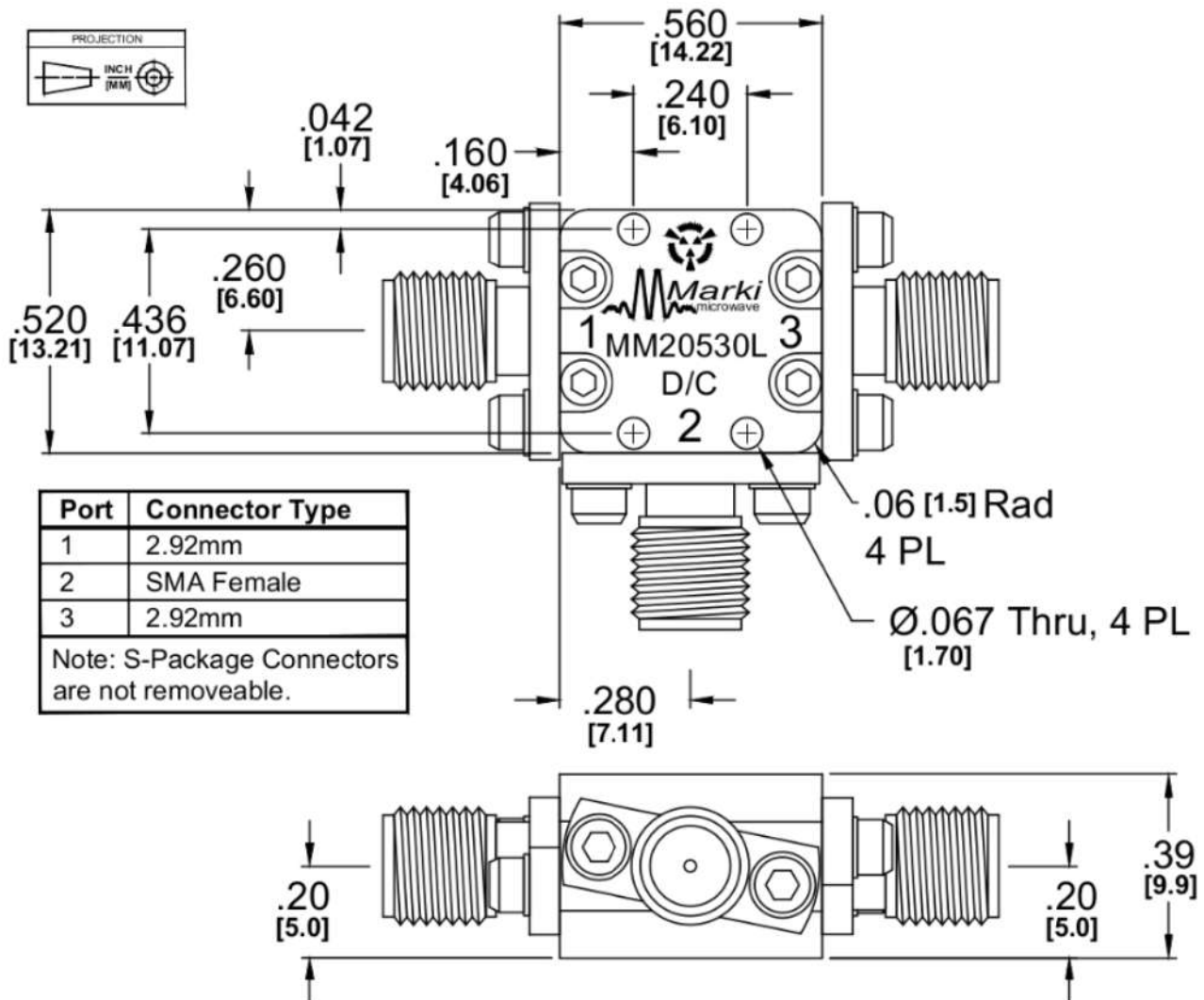
Configuration B

Application Circuit Description

Configuration A/B refer to the same part number (MM2-0530L) used in one of two different ways for optimal spurious performance. For the lowest conversion loss, use the mixer in Configuration A (port 1 as the LO input, port 3 as the RF input or output). If you need to use a lower LO drive, use the mixer in Configuration B (port 1 as the RF input or output, port 3 as the LO input). For optimal spurious suppression, experimentation or simulation is required to choose between Configuration A and B.

Mechanical Data

Outline Drawing



DISCLAIMER

MARKI MICROWAVE, INC., ("MARKI") PROVIDES TECHNICAL SPECIFICATIONS AND DATA (INCLUDING DATASHEETS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, AND OTHER INFORMATION AND RESOURCES "AS IS" AND WITH ALL FAULTS. MARKI DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT.

These resources are intended for developers skilled in the art designing with Marki products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards and other requirements. Marki makes no guarantee regarding the suitability of its products for any particular purpose, nor does Marki assume any liability whatsoever arising out of your use or application of any Marki product.

Marki grants you permission to use these resources only for development of an application that uses Marki products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Marki intellectual property or to any third-party intellectual property. Marki reserves the right to make changes to the product(s) or information contained herein without notice.

MARKI MICROWAVE and T3 MIXER are trademarks or registered trademarks of Marki Microwave, Inc. All other trademarks used are the property of their respective owners.

© 2016, Marki Microwave, Inc