Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com

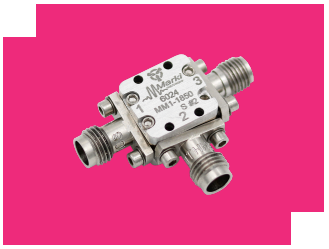
MM1-1850SS

GaAs DOUBLE-BALANCED MIXER

DEVICE OVERVIEW

General Description

The MM1-1850S is a high linearity passive double balanced MMIC mixer. The S diode offers superior 1 dB compression, two tone intermodulation performance, and spurious suppression to other GaAs MMIC mixers. It features excellent conversion loss, superior isolations and spurious performance across a broad bandwidth, in a miniature form factor. Accurate, nonlinear simulation models are available for Microwave Office® through the Marki Microwave PDK. The MM1-1850S is available as a wire bondable chip or an SMA connectorized package. The MM1-1850S is a superior alternative to Marki Microwave carrier and packaged M9 mixers.



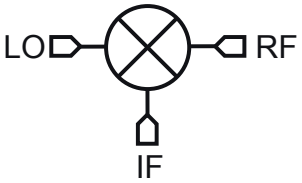
Features

- CAD Optimized for Superior Isolation and Spurious Response
- Broadband Performance
- Excellent Unit-to-Unit Repeatability
- Fully nonlinear software models available with Marki PDK for Microwave Office®
- RoHS Compliant

Applications

- Test and Measurement Equipment
- Fixed RF up converters
- Electronic warfare equipment

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MM1-1850SS	GaAs DOUBLE-BALANCED MIXER	S	Standard	REACH RoHS	Released	EAR99

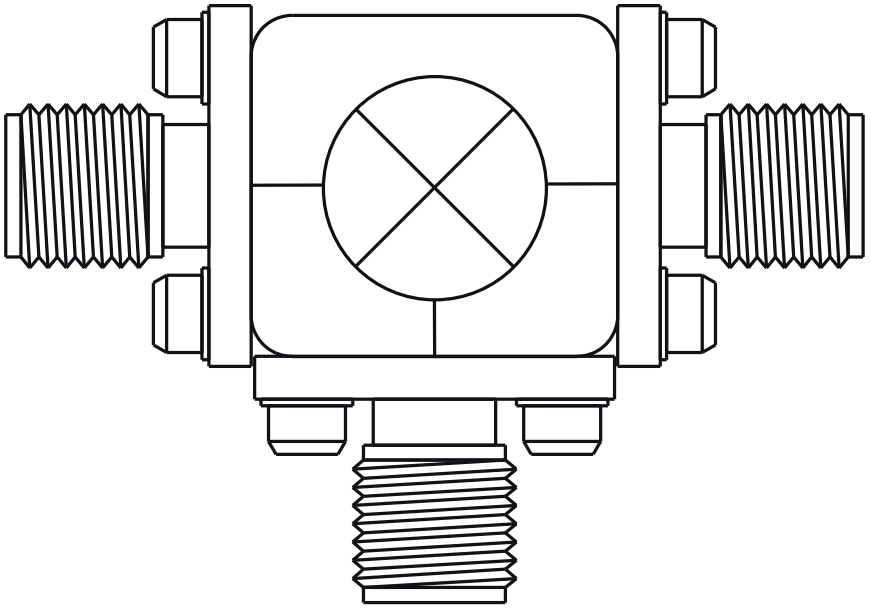
Table Of Contents

Revision History

Revision Code	Revision Date	Comment
-	2016-01-01	Datasheet Initial Release
A	2022-12-01	Updated Port Definitions

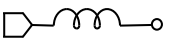
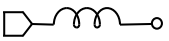
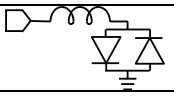
Port Configuration and Functions

Port Diagram

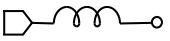
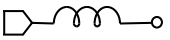
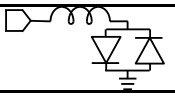


Port Functions

Configuration A

Port	Function	Connector Type	Description	Equivalent Circuit for Package
Port 1	RF	1.85F	Port 1 is DC open and AC matched to 50 Ohms from 18 to 50 GHz. Blocking capacitor is optional.	
Port 2	LO	1.85F	Port 2 is DC open and AC matched to 50 Ohms from 18 to 50 GHz. Blocking capacitor is optional.	
Port 3	IF	SMAF	Port 3 is DC coupled to the diodes. Blocking capacitor is optional.	

Configuration B

Port	Function	Connector Type	Description	Equivalent Circuit for Package
Port 1	LO	1.85F	Port 1 is DC open and AC matched to 50 Ohms from 18 to 50 GHz. Blocking capacitor is optional.	
Port 2	RF	1.85F	Port 2 is DC open and AC matched to 50 Ohms from 18 to 50 GHz. Blocking capacitor is optional.	
Port 3	IF	SMAF	Port 3 is DC coupled to the diodes. Blocking capacitor is optional.	

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 3 DC Current	22.8	mA
RF Power Handling (RF+LO), 100°C	24	dBm
RF Power Handling (RF+LO), 25°C	28	dBm

Package Information

Parameter	Details	Rating
Dimensions	-	14.22 x 13.21mm

Recommended Operating Conditions

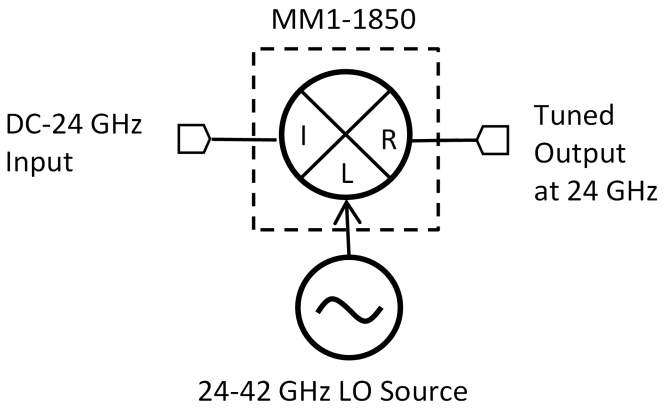
Parameter	Min	Nominal	Max	Unit
LO Input Power	17	-	23	-

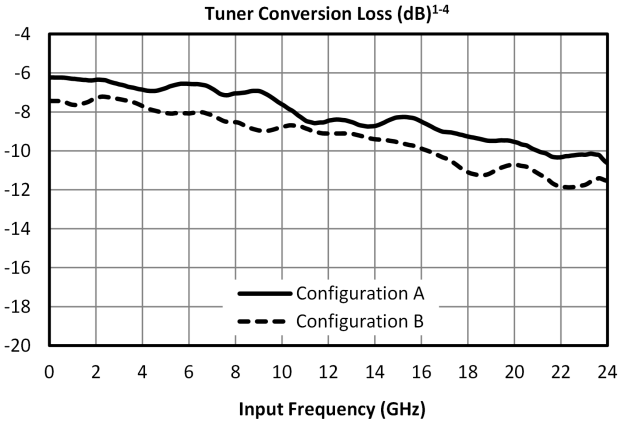
Electrical Specifications

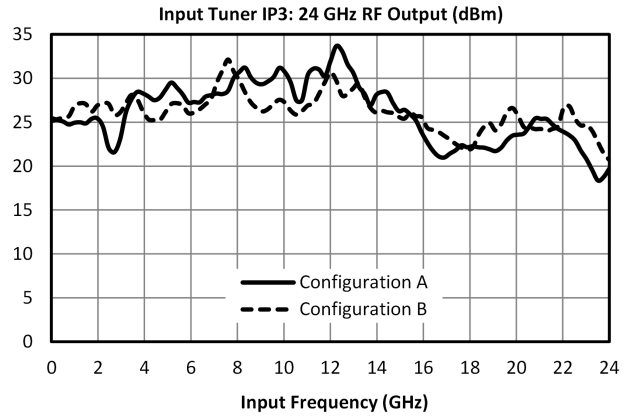
Specifications guaranteed from -55 to +100°C, measured in a 50Ω system. All bare die are 100% DC tested and 100% visual inspected. RF testing is performed on a sample basis to verify conformance to datasheet guaranteed specifications.

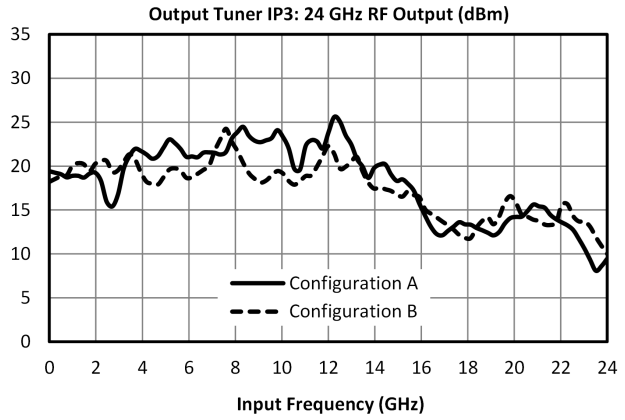
Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	A	LO/RF=18-50GHz IF=DC-20GHz	-	8.5	-	dB
Input 1 dB Compression	A	LO/RF=18-50GHz IF=DC-20GHz LO drive level=18-23dBm	-	14	-	dBm
Input IP3	A	LO/RF=18-50GHz IF=DC-20GHz LO drive level=18-23dBm	-	25	-	dBm
Isolation, LO to RF	A	-	-	43	-	dB
Conversion Loss	B	LO/RF=18-50GHz IF=DC-20GHz	-	8.5	-	dB
Input 1 dB Compression	B	LO/RF=18-50GHz IF=DC-20GHz LO drive level=17-23dBm	-	14	-	dBm
Input IP3	B	LO/RF=18-50GHz IF=DC-20GHz LO drive level=17-23dBm	-	25	-	dBm
IF Frequency Range	-	-	0	-	20	GHz
LO Frequency Range	-	-	18	-	50	GHz
RF Frequency Range	-	-	18	-	50	GHz

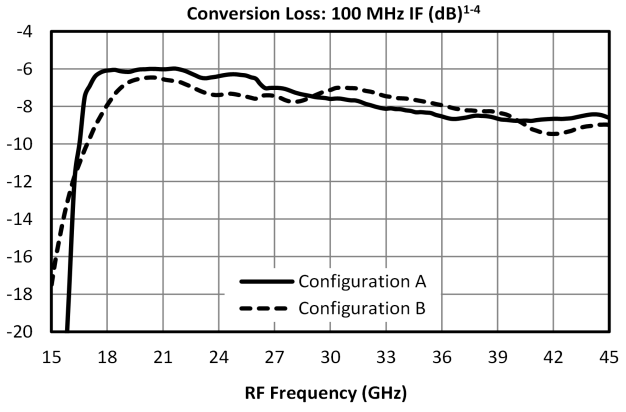
Typical Performance Plots

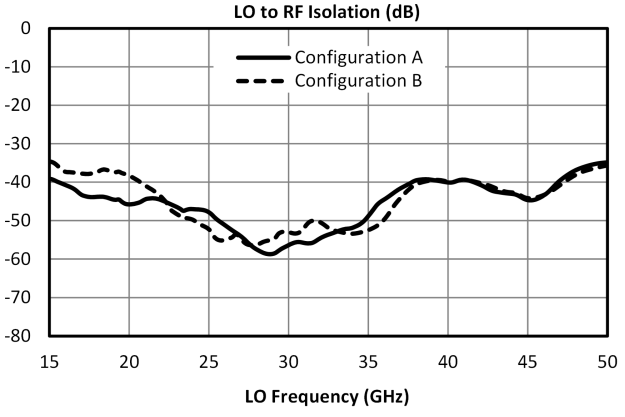


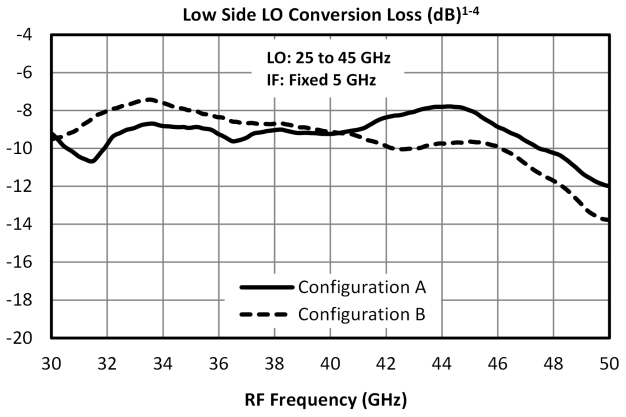


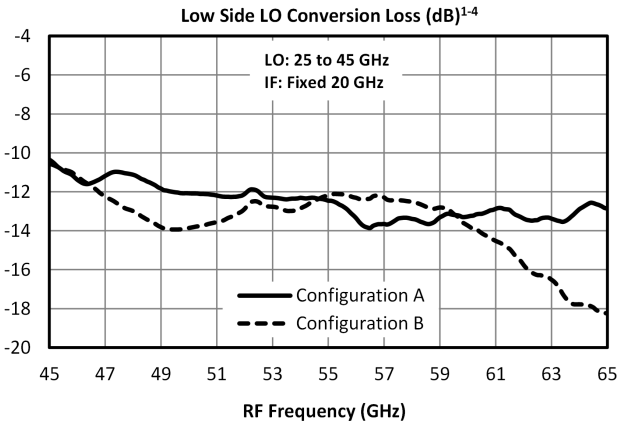




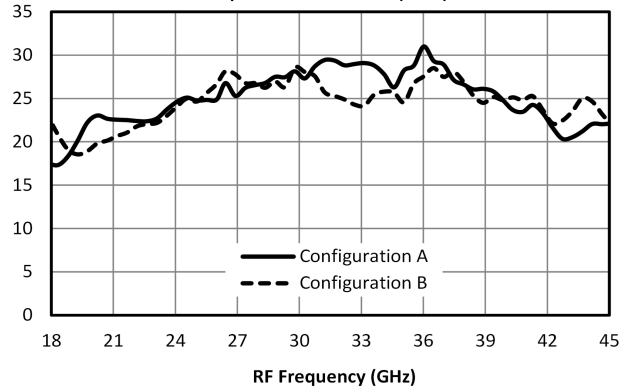




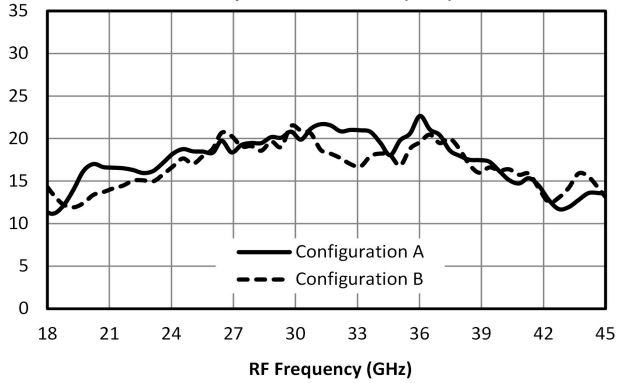




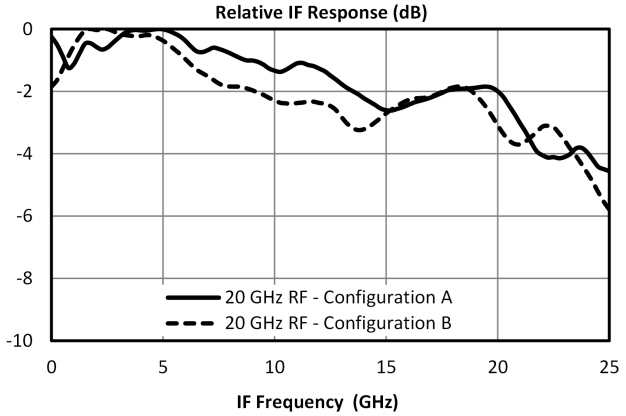
Input IP3: 100 MHz IF (dBm)



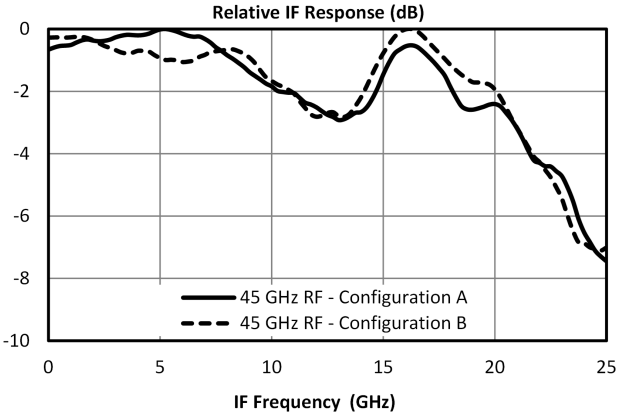
Output IP3: 100 MHz IF (dBm)



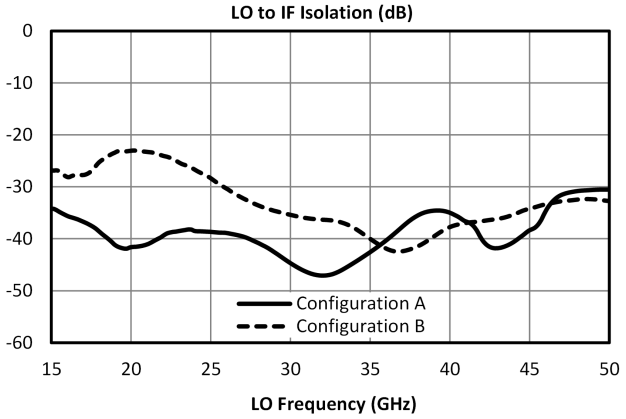
Relative IF Response (dB)



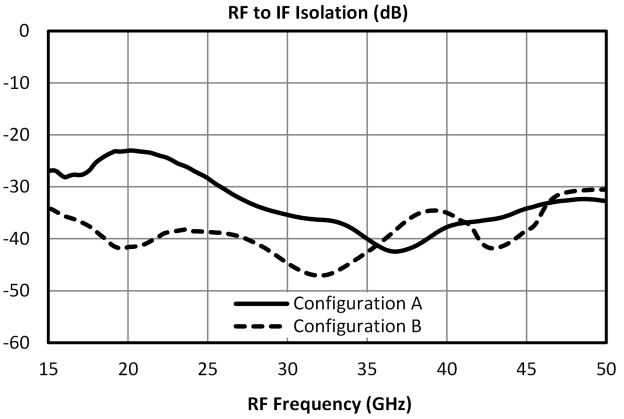
Relative IF Response (dB)



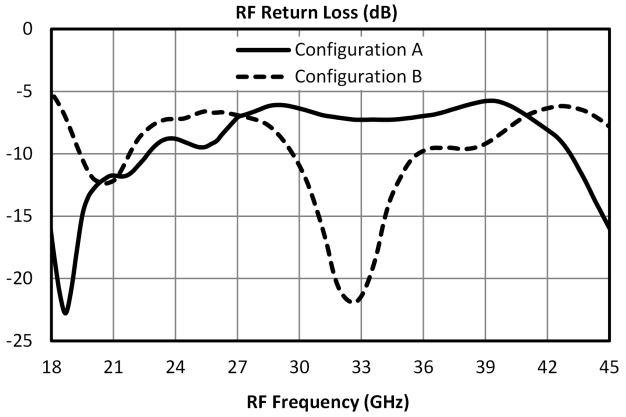
LO to IF Isolation (dB)



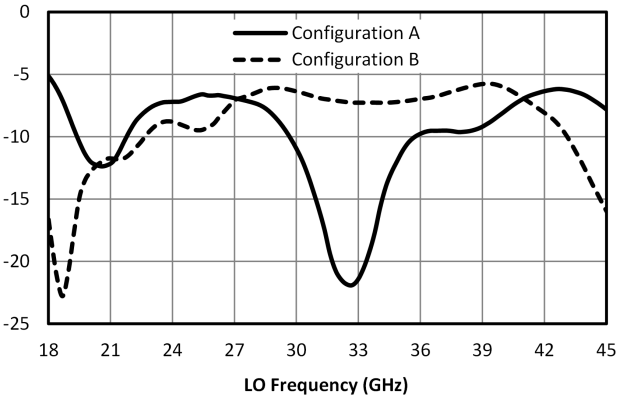
RF to IF Isolation (dB)



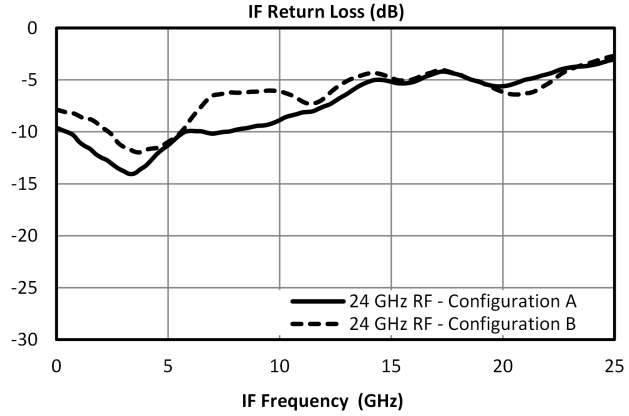
RF Return Loss (dB)



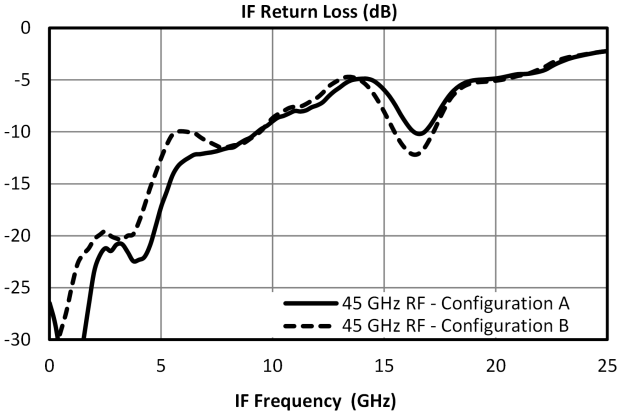
Low Level LO Return Loss (dB)



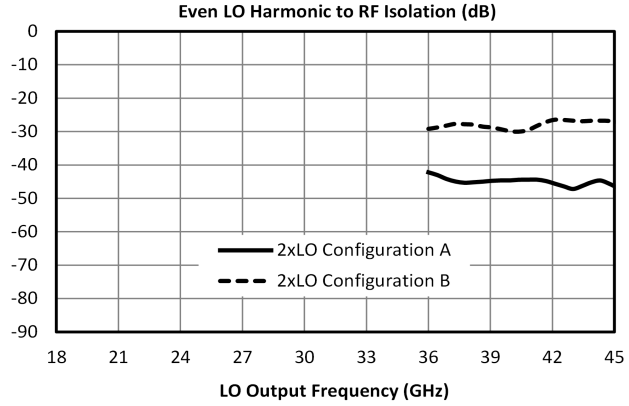
IF Return Loss (dB)



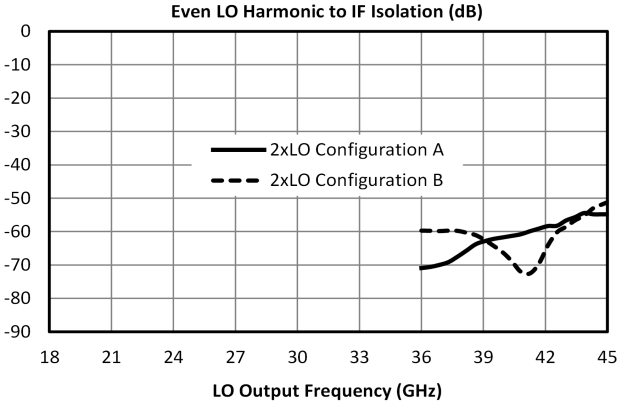
IF Return Loss (dB)



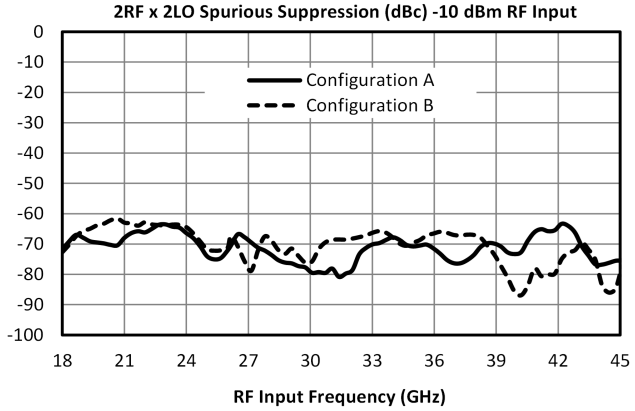
Even LO Harmonic to RF Isolation (dB)



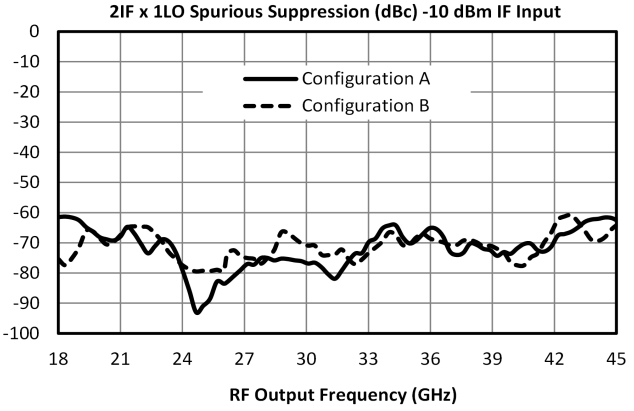
Even LO Harmonic to IF Isolation (dB)



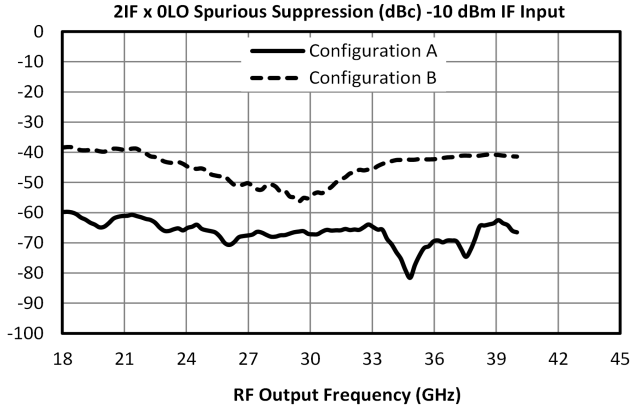
2RF x 2LO Spurious Suppression (dBc) -10 dBm RF Input



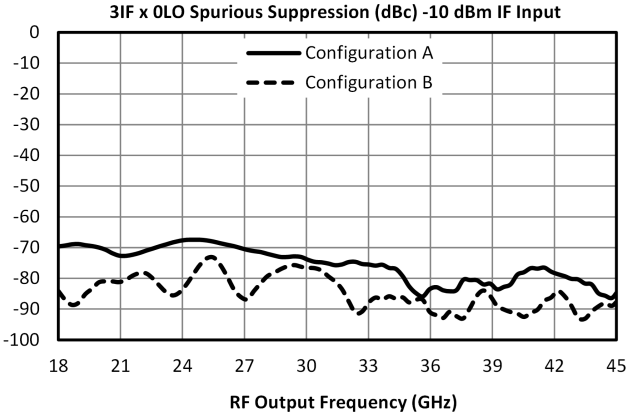
2IF x 1LO Spurious Suppression (dBc) -10 dBm IF Input



2IF x 0LO Spurious Suppression (dBc) -10 dBm IF Input



3IF x 0LO Spurious Suppression (dBc) -10 dBm IF Input



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 output 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 70 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 80 dBc.

Typical Downconversion Spurious Suppression (dBc): A Configuration (B Configuration)[4]

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	30 (34)	Reference	23 (35)	10 (17)	20 (24)	N/A
2xRF	83 (81)	64 (56)	70 (71)	77 (52)	71 (72)	78 (64)
3xRF	93 (93)	72 (83)	84 (98)	85 (82)	89 (98)	84 (92)
4xRF	N/A	127 (127)	121 (121)	120 (112)	124 (121)	126 (118)
5xRF	N/A	137 (138)	131 (139)	132 (134)	135 (136)	131 (132)

Unless otherwise specified, data is taken with +20 dBm LO drive.

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 71 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 81 dBc.

Typical Upconversion Spurious Suppression (dBc): A Configuration (B Configuration) [4]

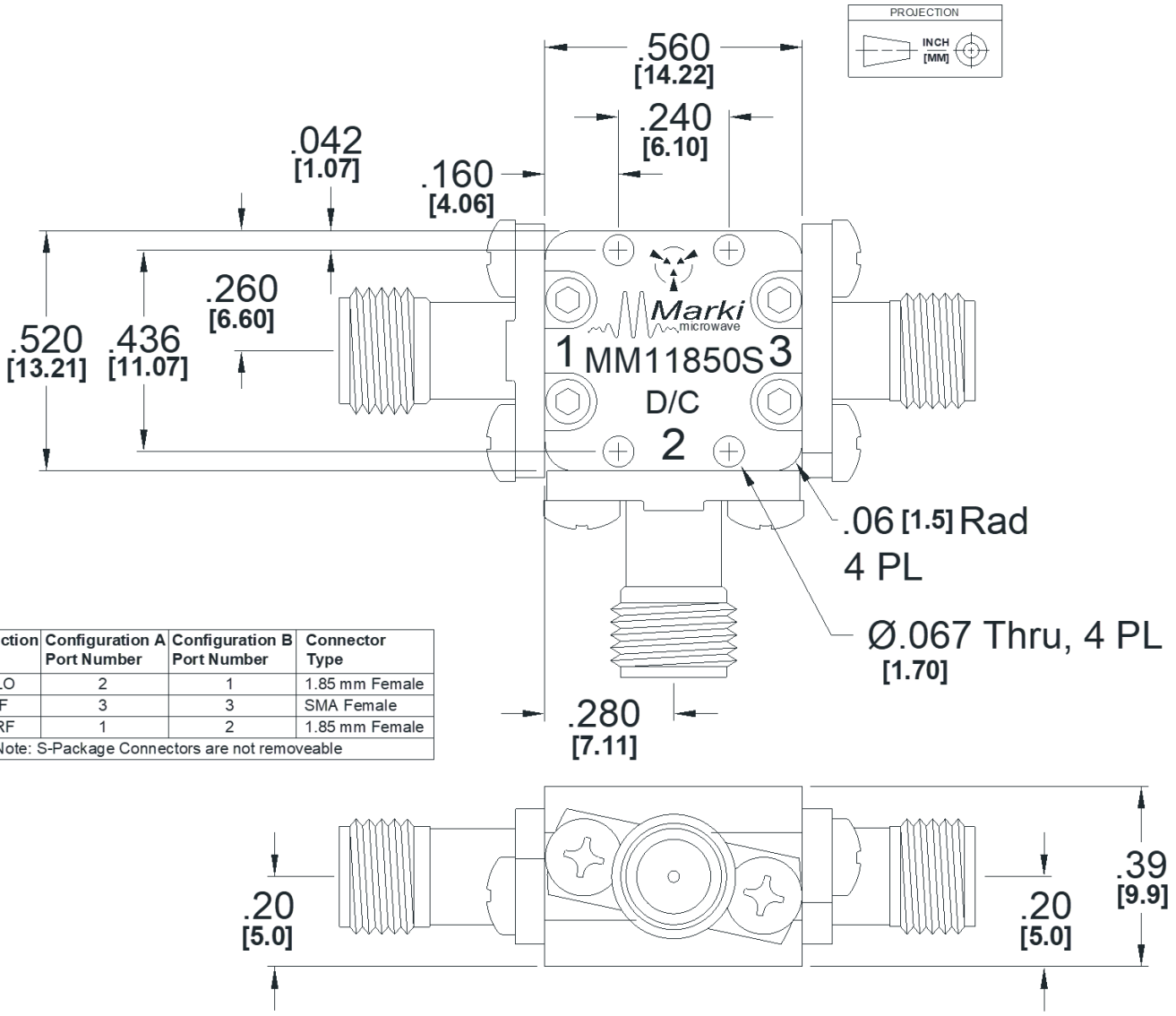
-10 dBm IF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	21 (28)	Reference	18 (34)	8 (9)	24 (25)	N/A
2xIF	71 (50)	71 (70)	68 (61)	71 (67)	64 (51)	69 (57)
3xIF	87 (96)	82 (86)	79 (87)	77 (75)	86 (89)	68 (72)
4xIF	129 (114)	115 (113)	111 (110)	114 (113)	115 (114)	111 (116)
5xIF	140 (146)	124 (126)	131 (133)	124 (127)	127 (128)	125 (124)

Unless otherwise specified, data is taken with +20 dBm LO drive.

Mechanical Data

Outline Drawing

Download : Outline 2D Drawing | Outline 3D Drawing | Outline 3D STP



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

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 at +100°C and improves less than 0.5 dB at -55°C.
4. Unless otherwise specified, data is taken with +20 dBm LO drive.
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.

DISCLAIMER