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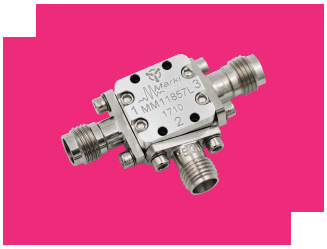
MM1-1857LS

GaAs MMIC Double Balanced Mixer

DEVICE OVERVIEW

General Description

The MM1-1857L is a passive double balanced MMIC mixer. It features excellent conversion loss, superior isolations and spurious performance across a broad bandwidth, in a highly miniaturized form factor. Low LO drive requirement allows operation at as low as +7dBm inputs. The MM1-1857L is available as a wire bondable chip or an SMA connectorized package. The MM1-1857H is a superior alternative to Marki Microwave carrier and packaged M9 mixers.



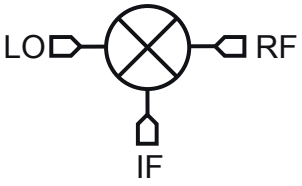
Features

- CAD Optimized for Superior Isolation and Spurious Response
- Broadband Performance
- Low LO Drive Requirement
- Excellent Unit-to-Unit Repeatability
- 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
MM1-1857LS	GaAs MMIC Double Balanced Mixer	S	Standard	REACH RoHS	Released	EAR99

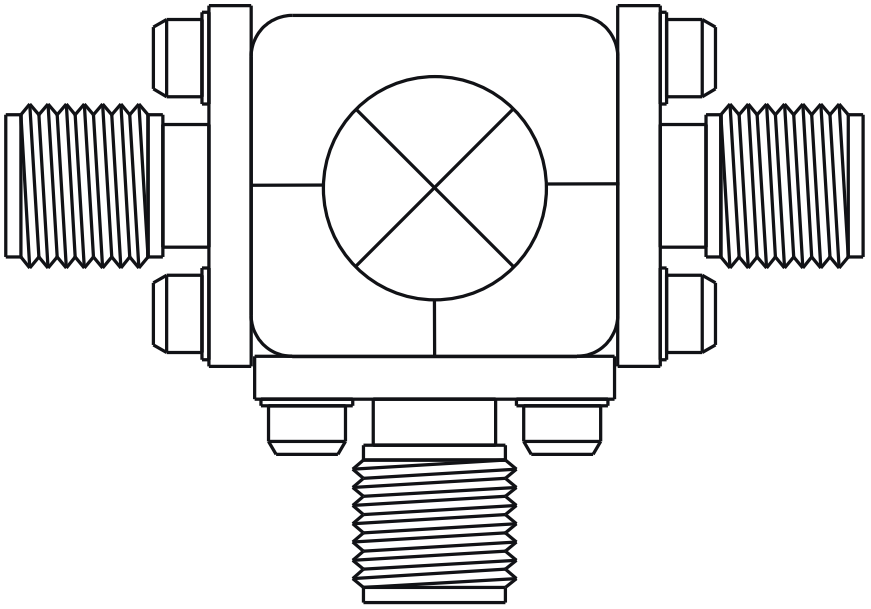
Table Of Contents

Revision History

Revision Code	Revision Date	Comment
A	2017-11-01	Die shrunk from 1.48 x 1.18 mm² to 1.37 x 1.17 mm². CH package tolerance added.
B	2018-10-01	Power Handling rating changed from +25dBm to +28dBm

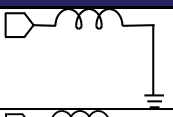
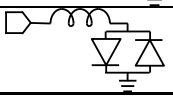
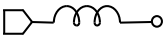
Port Configuration and Functions

Port Diagram

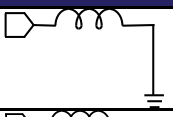
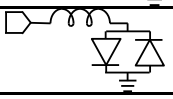
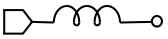


Port Functions

Configuration A

Port	Function	Connector Type	Description	Equivalent Circuit for Package
Port 1	LO	1.85F	Port 1 is DC short to ground and AC matched to 50 Ohms from 18 to 57 GHz. Blocking capacitor is optional.	
Port 2	IF	SMAF	Port 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Port 3	RF	1.85F	Port 3 is DC open and AC matched to 50 Ohms from 18 to 57 GHz. Blocking capacitor is optional.	

Configuration B

Port	Function	Connector Type	Description	Equivalent Circuit for Package
Port 1	RF	1.85F	Port 1 is DC short to ground and AC matched to 50 Ohms from 18 to 57 GHz. Blocking capacitor is optional.	
Port 2	IF	SMAF	Port 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Port 3	LO	1.85F	Port 3 is DC open and AC matched to 50 Ohms from 18 to 57 GHz. 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 1 DC Current	30	mA
Port 2 DC Current	22.5	mA
RF Power Handling (RF+LO), 100°C	23	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	7	-	15	-

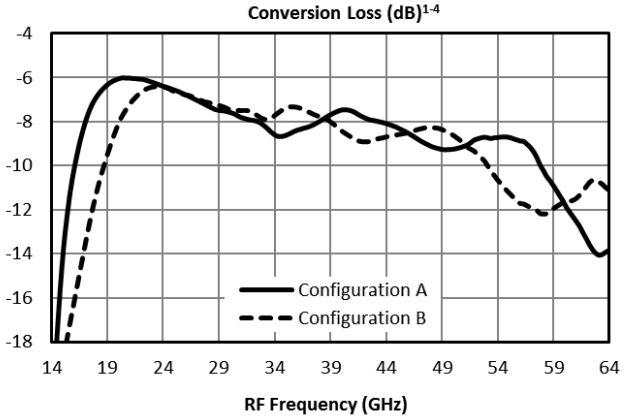
Electrical Specifications

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

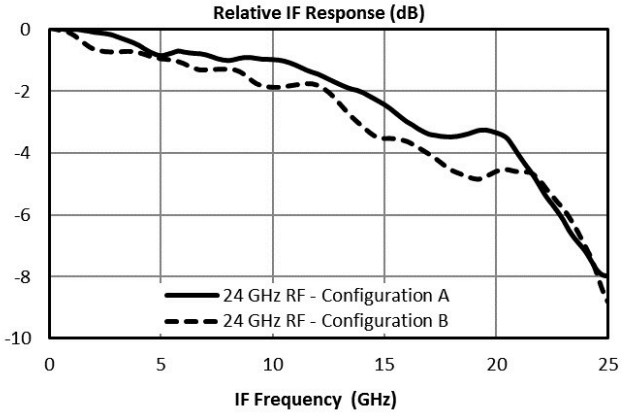
Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	A	LO/RF=18-57 GHz IF=0.2-21 GHz LO drive level=13 dBm	-	12	-	dB
Conversion Loss	A	LO/RF=18-57 GHz IF=DC-0.2 GHz LO drive level=13 dBm	-	8	11	dB
Input 1 dB Compression	A	LO/RF=18-57 GHz IF=DC-21 GHz LO drive level=7-15 dBm	-	4	-	dBm
Input IP3	A	LO/RF=18-57 GHz IF=DC-21 GHz LO drive level=7-15 dBm	-	13	-	dBm
Isolation, LO to RF	A	-	-	35	-	dB
Conversion Loss	B	LO/RF=18-57 GHz IF=0.2-21 GHz LO drive level=13 dBm	-	13	-	dB
Conversion Loss	B	LO/RF=18-57 GHz IF=DC-0.2 GHz LO drive level=13 dBm	-	9	12.5	dB
Input 1 dB Compression	B	LO/RF=18-57 GHz IF=DC-21 GHz LO drive level=7-15 dBm	-	4	-	dBm
Input IP3	B	LO/RF=18-57 GHz IF=DC-21 GHz LO drive level=7-15 dBm	-	14	-	dBm
IF Frequency Range	-	-	0	-	21	GHz
LO Frequency Range	-	-	18	-	57	GHz
RF Frequency Range	-	-	18	-	57	GHz

Typical Performance Plots

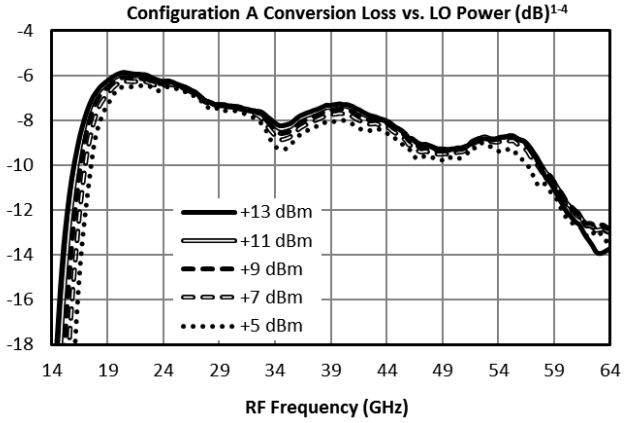
Conversion Loss (dB)[1-4]



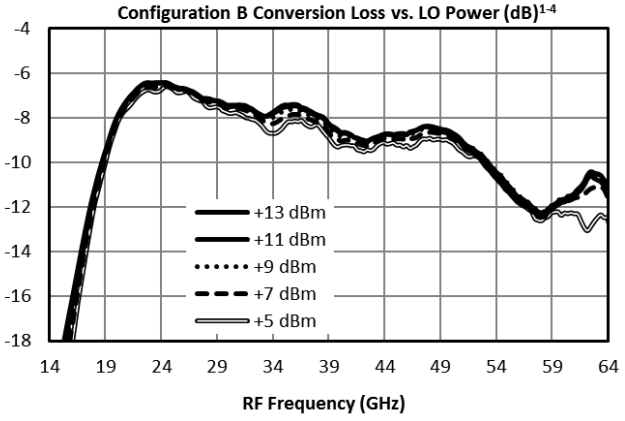
Relative IF Response (dB)



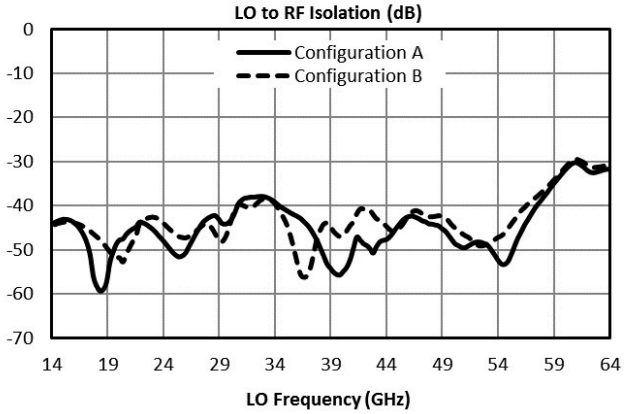
Configuration A Conversion Loss vs. LO Power (dB)[1-4]



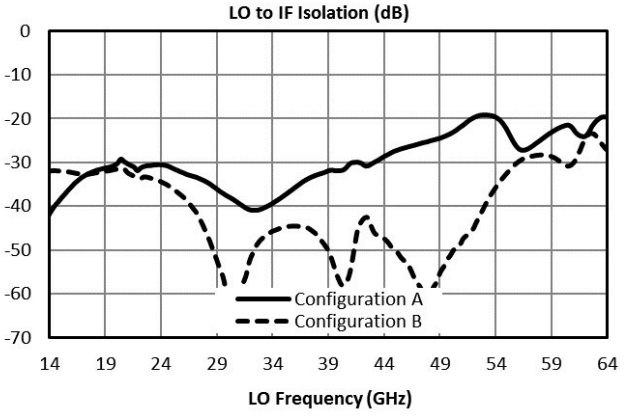
Configuration B Conversion Loss vs. LO Power (dB)[1-4]



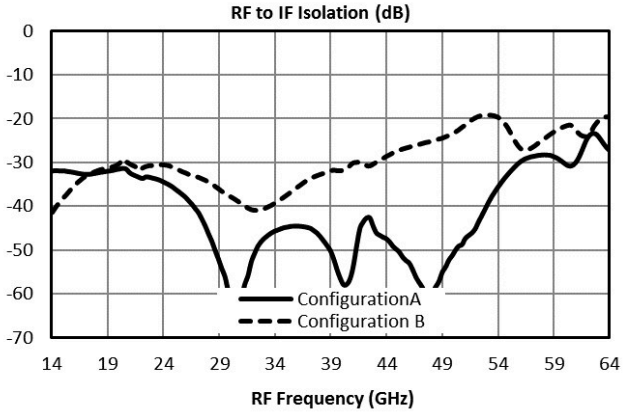
LO to RF Isolation (dB)



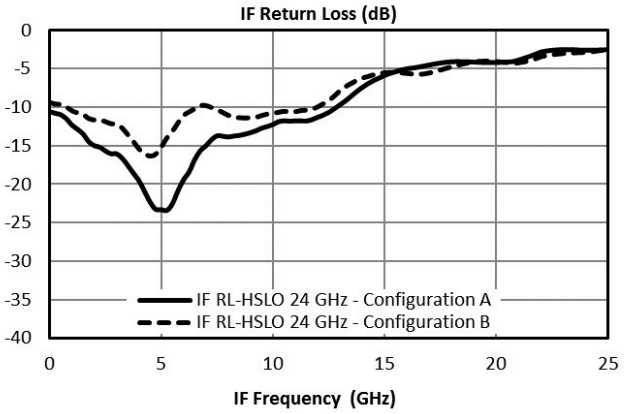
LO to IF Isolation (dB)



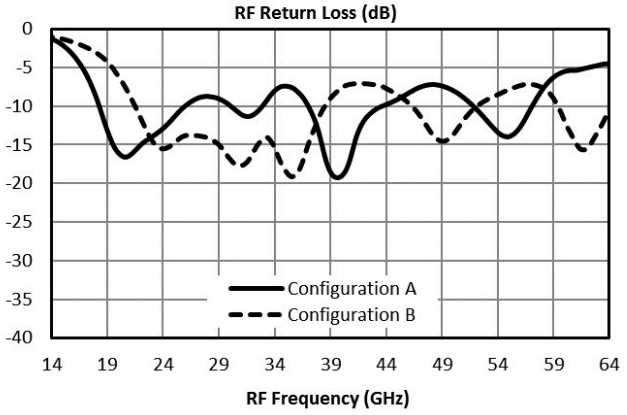
RF to IF Isolation (dB)



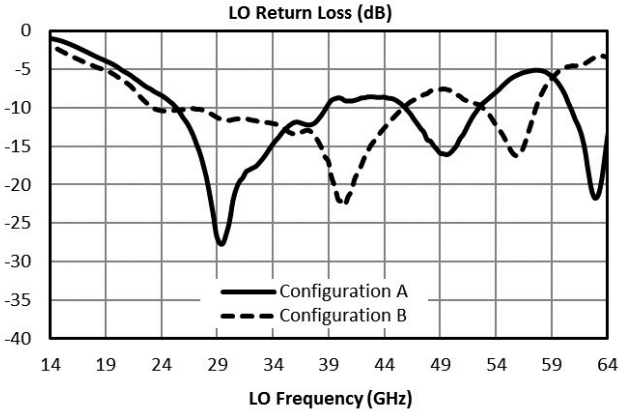
IF Return Loss (dB)



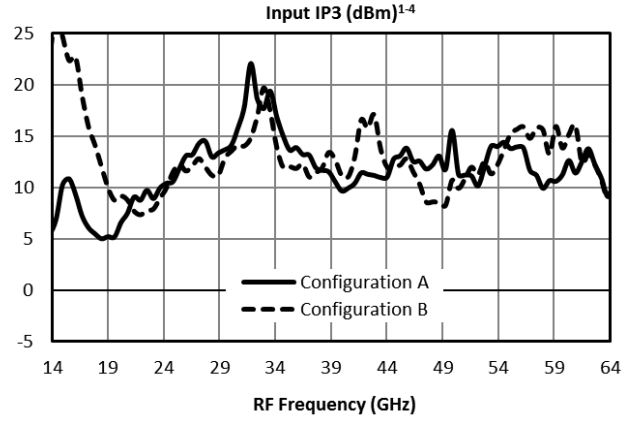
RF Return Loss (dB)



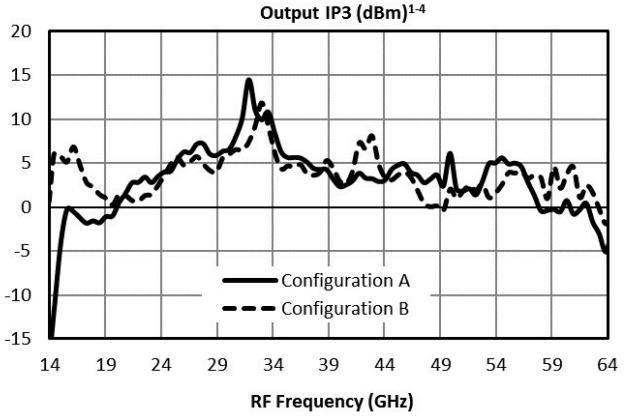
LO Return Loss (dB)



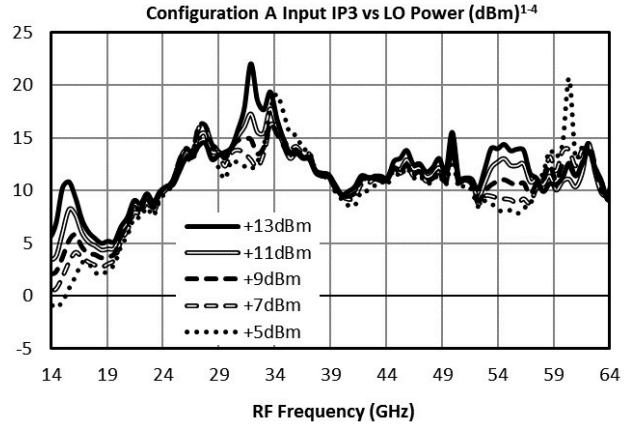
Input IP3 (dBm)[1-4]



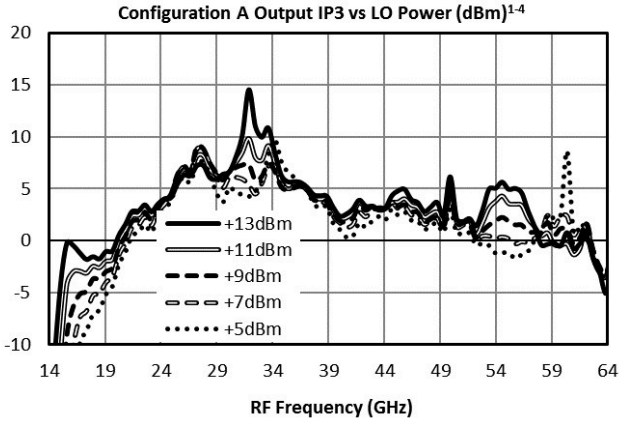
Output IP3 (dBm)[1-4]



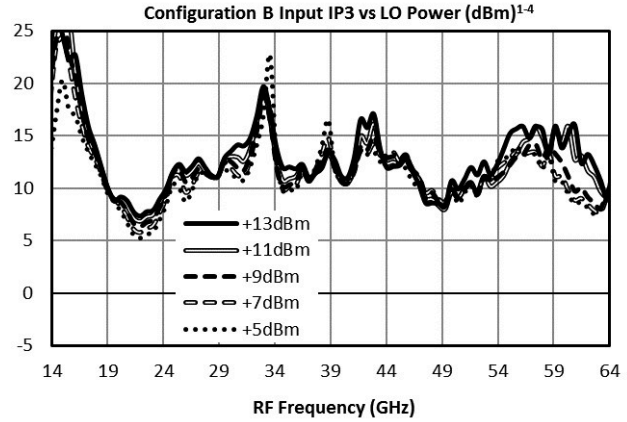
Configuration A Input IP3 vs LO Power (dBm)[1-4]



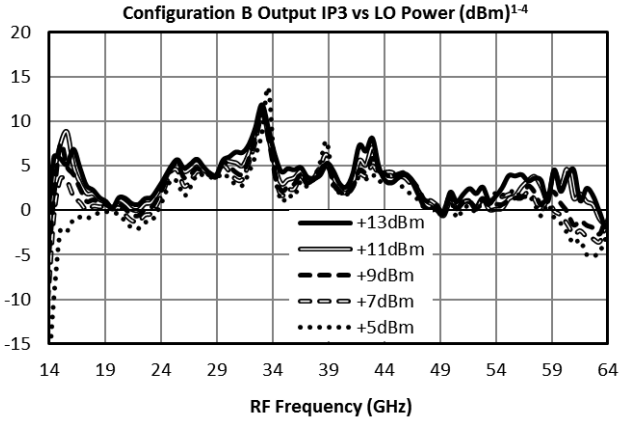
Configuration A Output IP3 vs LO Power (dBm)[1-4]

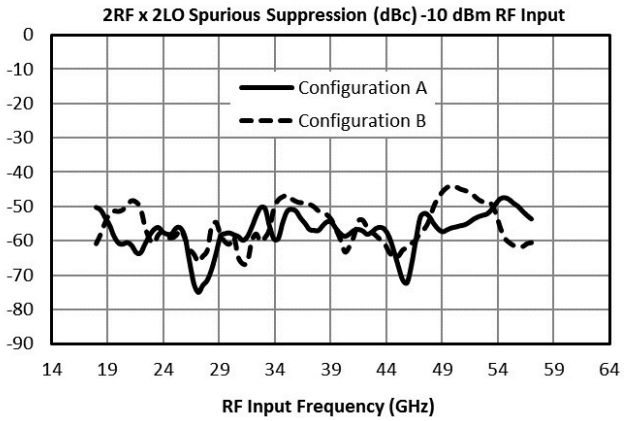


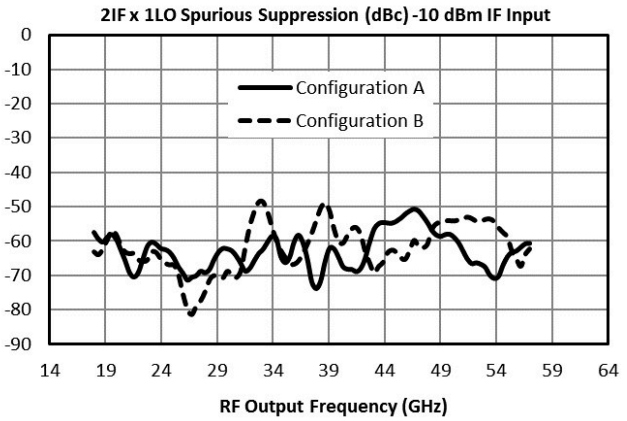
Configuration B Input IP3 vs LO Power (dBm)[1-4]



Configuration B Output IP3 vs LO Power (dBm)[1-4]







Spur Table

Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 18 to 57 GHz RF/LO bands, which create a 91 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 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 67 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	35 (23)	Reference	26 (35)	11 (9)	35 (41)	N/A
2xRF	64 (68)	46 (46)	57 (56)	52 (42)	60 (59)	50 (50)
3xRF	80 (82)	51 (58)	69 (71)	55 (56)	68 (72)	56 (57)
4xRF	N/A	84 (90)	89 (88)	88 (82)	91 (92)	91 (78)
5xRF	N/A	N/A	92 (101)	98 (99)	98 (105)	92 (93)

Upconversion Spurious Suppression

Spurious data is taken by mixing a 91 MHz IF with LO frequencies (+mLO+nIF), which creates an RF within the 18 to 57 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 63 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 73 dBc.

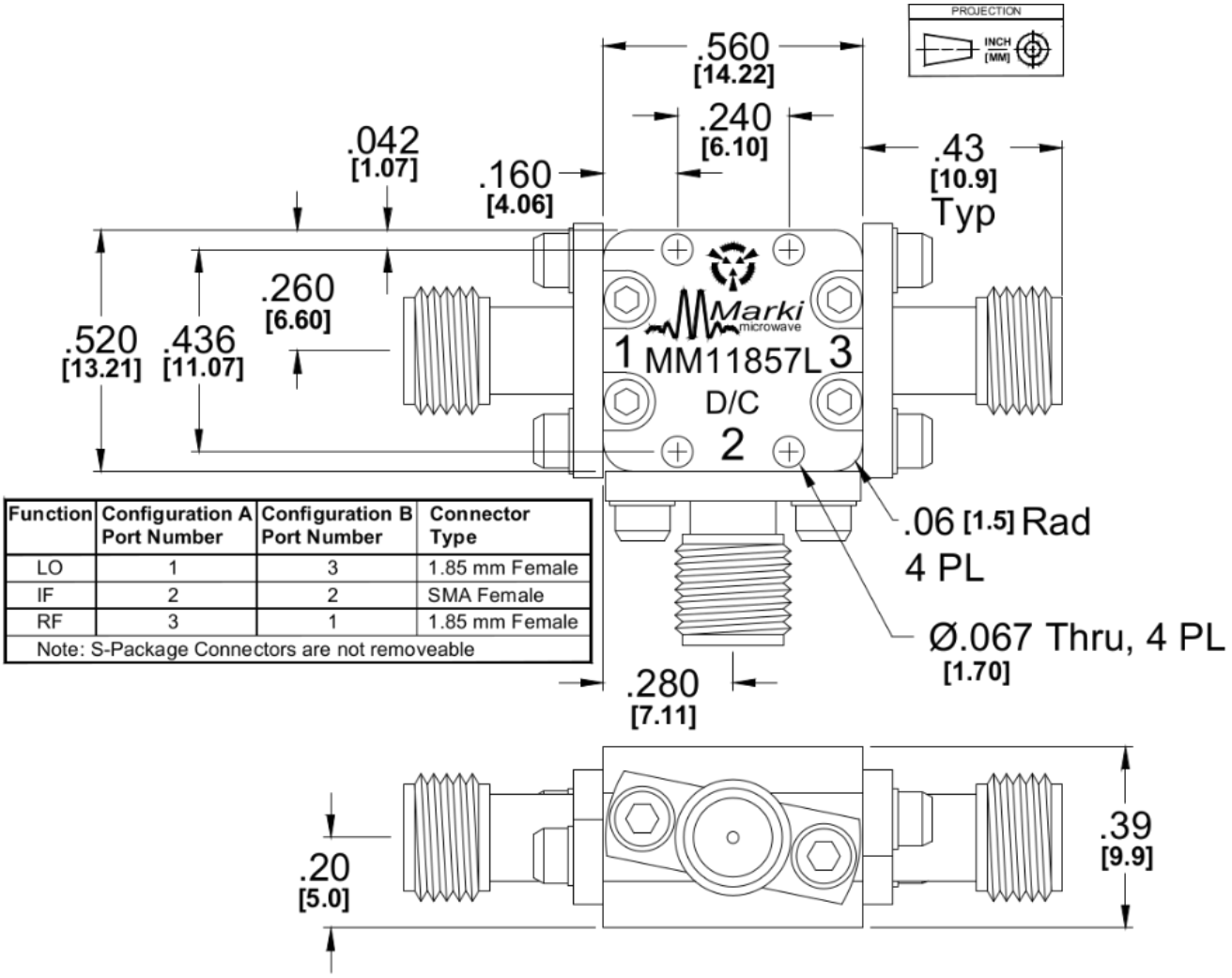
Typical Upconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO [5]

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	28 (25)	Reference	31 (31)	9 (8)	34 (43)	N/A
2xIF	59 (60)	63 (62)	59 (48)	67 (66)	60 (58)	74 (72)
3xIF	69 (79)	57 (56)	61 (64)	60 (57)	74 (77)	71 (70)
4xIF	88 (95)	95 (90)	85 (77)	100 (98)	94 (86)	104 (103)
5xIF	100 (113)	100 (96)	99 (99)	99 (100)	110 (108)	95 (102)

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	1	3	1.85 mm Female
IF	2	2	SMA Female
RF	3	1	1.85 mm Female
Note: S-Package Connectors are not removeable			

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