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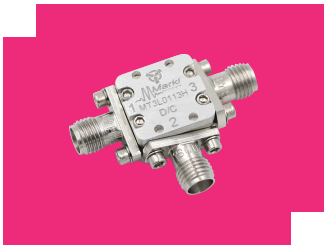
MT3L-0113HS

GaAs MMIC High Dynamic Range Mixer

DEVICE OVERVIEW

General Description

MT3L-0113H is a GaAs MMIC triple balanced mixer with high dynamic range and low conversion loss. This mixer belongs to the T3 family which offers high IP3, P1dB, and broad operating bandwidths for applications in the S, C and X bands. MT3L-0113H is the monolithic cousin of the MT3-0113HCQG and sister of the MT3H-0113HCH targeted towards lower IF applications in a small footprint. The MT3L-0113H is available as both wire bondable die and a connectorized module.



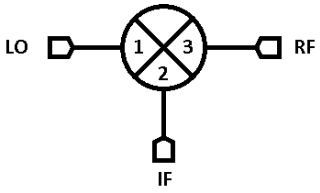
Features

- Low IF band
- Broad, overlapping RF/LO & IF bands
- High >+30 dBm IP3

Applications

- Test and Measurement Equipment
- S/C/X band radar

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MT3L-0113HS	GaAs MMIC High Dynamic Range Mixer	S	Standard	REACH RoHS	Released	EAR99

Table Of Contents

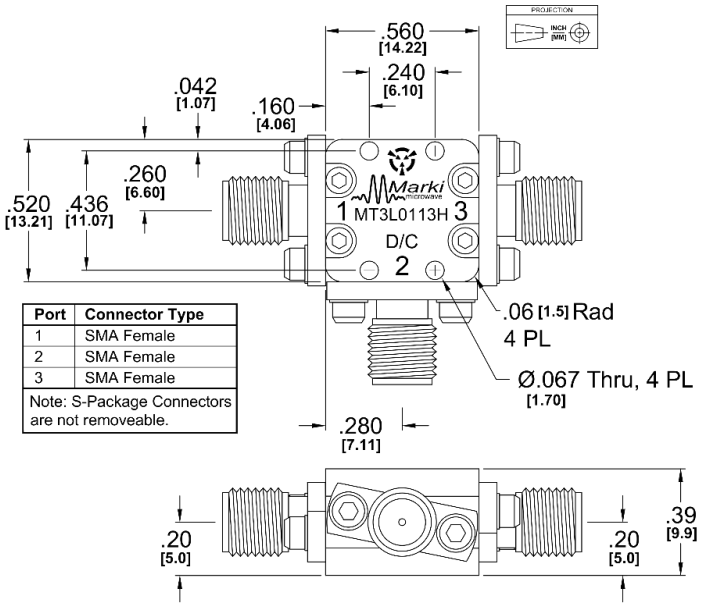
Revision History

Revision Code	Revision Date	Comment
-	2019-01-01	Datasheet Initial Release

Port Configuration and Functions

Port Diagram

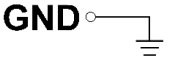
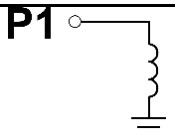
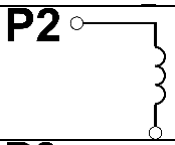
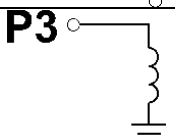
The MT3L-0113H has the input and output ports given in Port Functions. The MT3L-0113H can be used in either an up or down conversion. For configuration A, input the LO into port 1, use port 3 for the RF, and port 2 for the IF. For configuration B, input the LO into port 3, use port 1 for the RF, and port 2 for the IF.



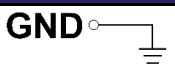
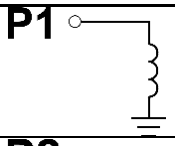
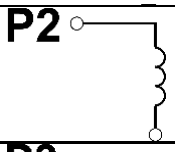
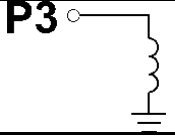
Port	Connector Type
1	SMA Female
2	SMA Female
3	SMA Female
Note: S-Package Connectors are not removeable.	

Port Functions

Configuration A

Port	Function	Connector Type	Description	Equivalent Circuit for Package
GND	Ground	-	S package ground provided through metal housing and outer coax conductor.	
Port 1	LO	SMAF	Port 1 is DC short for the CH and S packages.	
Port 2	IF	SMAF	Port 2 is DC open for the CH and S package.	
Port 3	RF	SMAF	Port 3 is DC short for the CH and S packages.	

Configuration B

Port	Function	Connector Type	Description	Equivalent Circuit for Package
GND	Ground	-	S package ground provided through metal housing and outer coax conductor.	
Port 1	RF	SMAF	Port 1 is DC short for the CH and S packages.	
Port 2	IF	SMAF	Port 2 is DC open for the CH and S package.	
Port 3	LO	SMAF	Port 3 is DC short for the CH and S packages.	

Specifications

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	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	150	mA
Port 2 DC Current	150	mA
Power Handling, at any Port	33	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Weight	Package name: S	10g
Dimensions	-	14.22 x 13.21 mm

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.

Parameter	Min	Nominal	Max	Unit
Ambient Temperature	-55	25	100	°C
LO Input Power	15	-	25	dBm

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.

Electrical Specifications

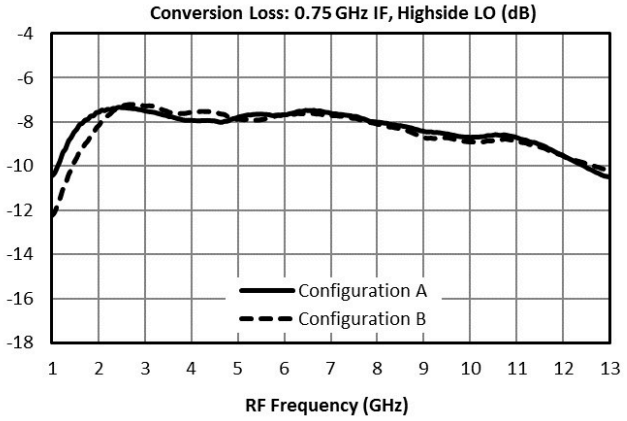
The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the connectorized S package mixer used with a +20 dBm sine wave LO. Min and Max limits apply only to our connectorized units and are guaranteed at TA=+25°C.

Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
Conversion Loss [1]	A	RF/LO = 1.5 - 13 GHz I = 0.25- 0.75 GHz	-	10.5	-	dB
Conversion Loss [2]	A	RF/LO = 1.5 - 13 GHz I = 0.75- 5 GHz	-	9.5	-	dB
Conversion Loss [3]	A	RF/LO = 1.5 - 13 GHz I = 0.75 GHz	-	8.5	11.5	dB
Input 1 dB Gain Compression Point (P1dB) [4]	A	-	-	20	-	dBm
Input IP3	A	RF/LO = 1.5 - 13 GHz I = 0.75 GHz	-	31	-	dBm
Conversion Loss [5]	B	RF/LO = 1.5 - 13 GHz I = 0.25- 0.75 GHz	-	11	-	dB
Conversion Loss [6]	B	RF/LO = 1.5 - 13 GHz I = 0.75- 5 GHz	-	11	-	dB
Conversion Loss [7]	B	RF/LO = 1.5 - 13 GHz I = 0.75 GHz	-	10	13	dB
Input 1 dB Gain Compression Point (P1dB) [8]	B	-	-	20	-	dBm
Input IP3	B	RF/LO = 1.5 - 13 GHz I = 0.75 GHz	-	31	-	dBm
IF Frequency Range	-	-	0.25	-	5	GHz
Isolation, LO to IF	-	IF/LO = 1.5 - 13 GHz	-	41	-	dB
Isolation, LO to RF	-	RF/LO = 1.5 - 13 GHz	-	43	-	dB
Isolation, RF to IF	-	RF/IF = 1.5 - 13 GHz	-	39	-	dB
LO Frequency Range	-	-	1.5	-	13	GHz
Noise Figure [9]	-	RF/LO = 1.5 - 13 GHz I = 0.75 GHz	-	8.5	-	dB
RF Frequency Range	-	-	1.5	-	13	GHz

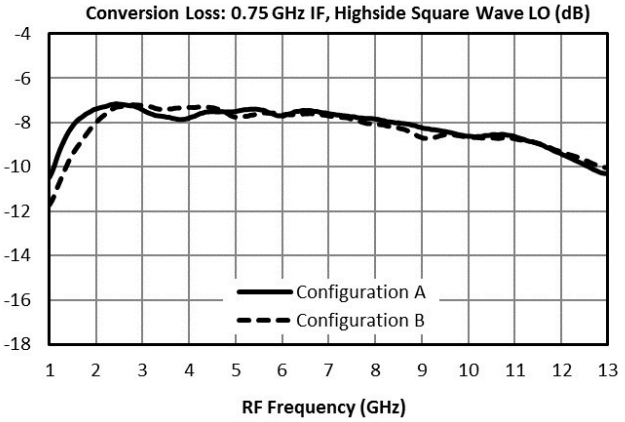
[1][2][3][5][6][7] Measured as a down converter to a fixed 750 MHz IF. Unless otherwise stated, frequency conversion done using a highside LO.
[4][8] P1dB is measured using a +23 dBm square wave LO.
[9] Mixer Noise Figure typically measures within 0.5 dB of conversion loss for IF frequencies greater than 5 MHz.

Typical Performance Plots

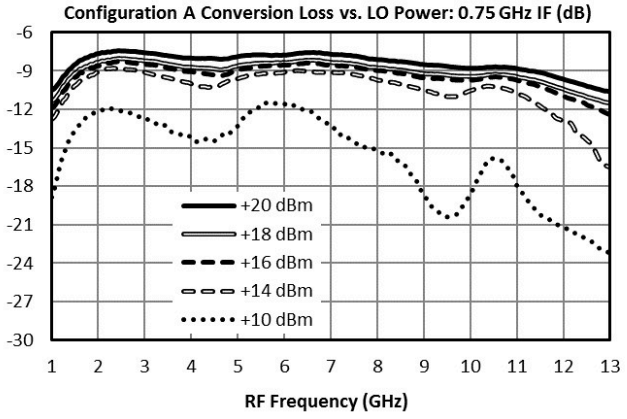
Conversion Loss: 0.75 GHz IF, Highside LO (dB)



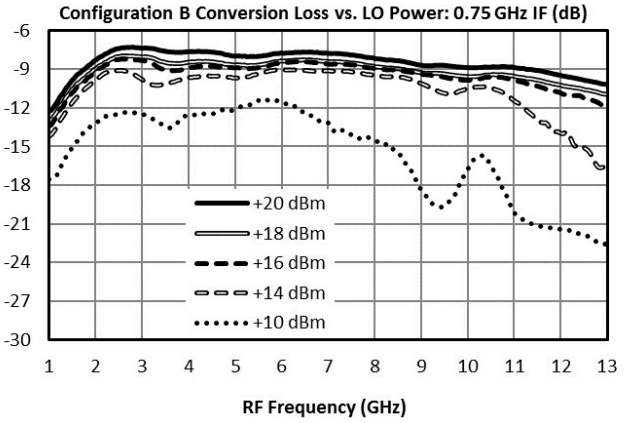
Conversion Loss: 0.75 GHz IF, Highside Square Wave LO (dB)



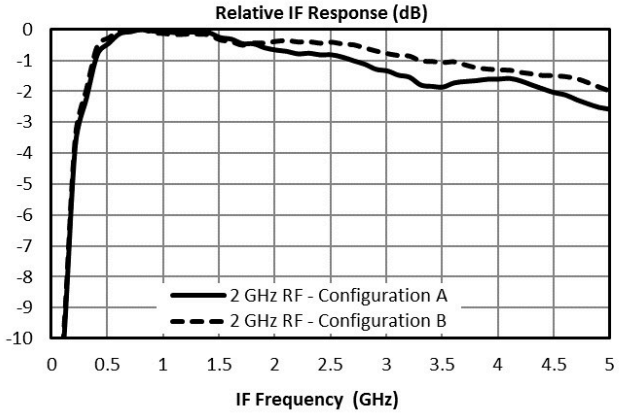
Configuration A Conversion Loss vs. LO Power: 0.75 GHz IF (dB)



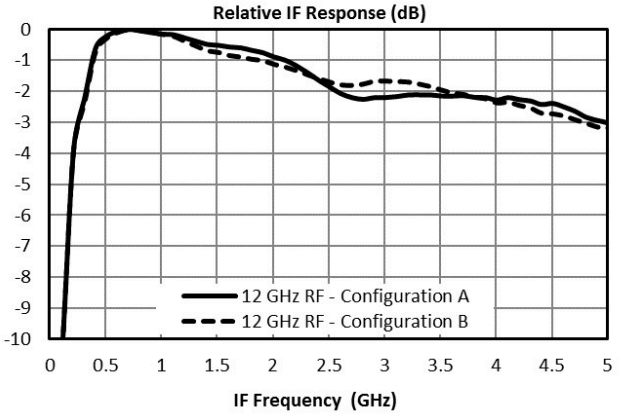
Configuration B Conversion Loss vs. LO Power: 0.75 GHz IF (dB)



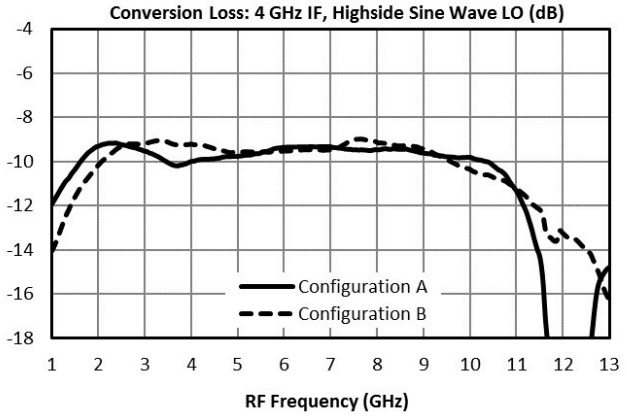
Relative IF Response (dB)



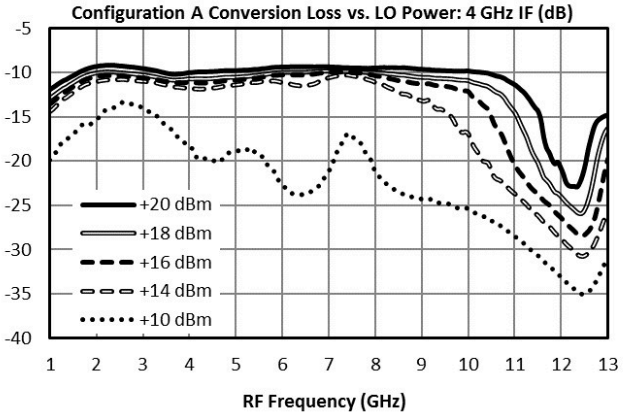
Relative IF Response (dB)



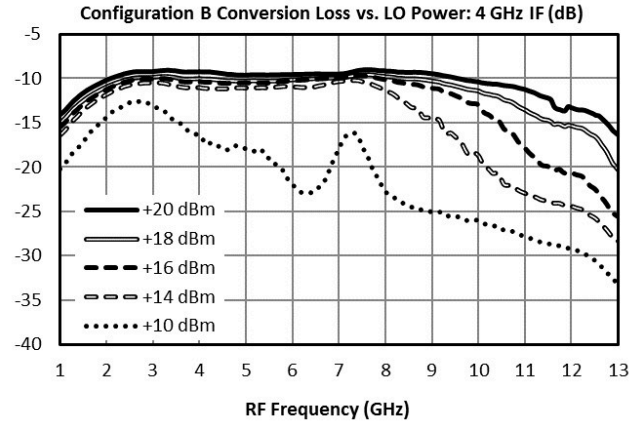
Conversion Loss: 4 GHz IF, Highside Sine Wave LO (dB)



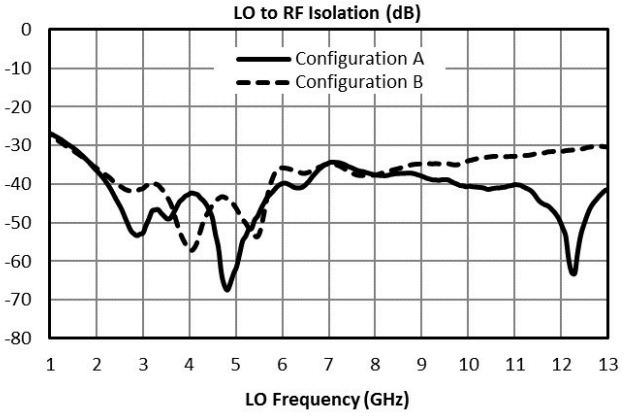
Configuration A Conversion Loss vs. LO Power: 4 GHz IF (dB)



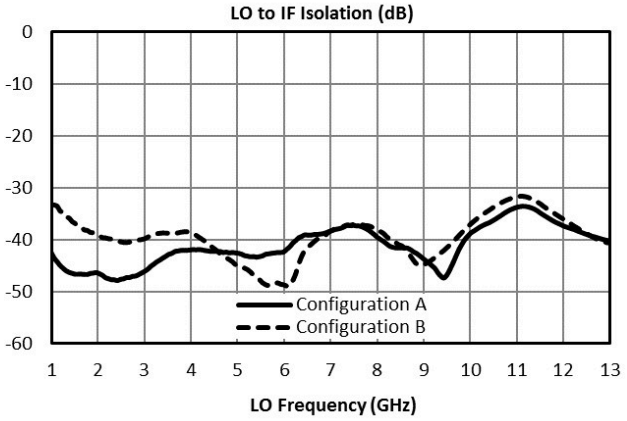
Configuration B Conversion Loss vs. LO Power: 4 GHz IF (dB)



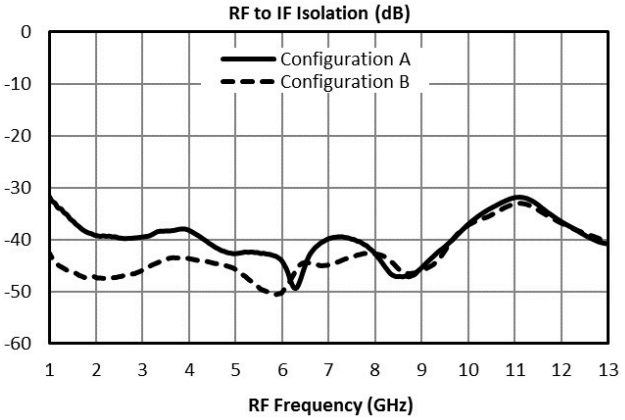
LO to RF Isolation (dB)



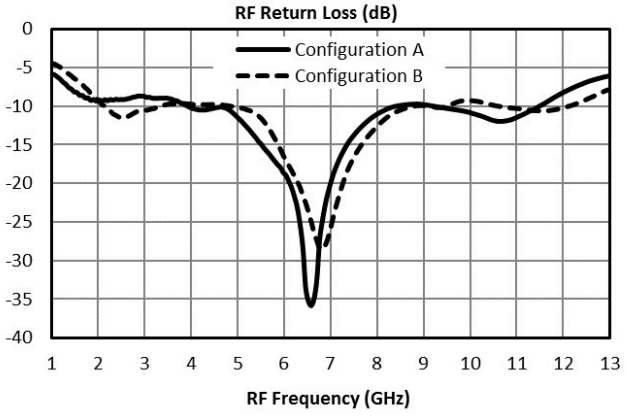
LO to IF Isolation (dB)



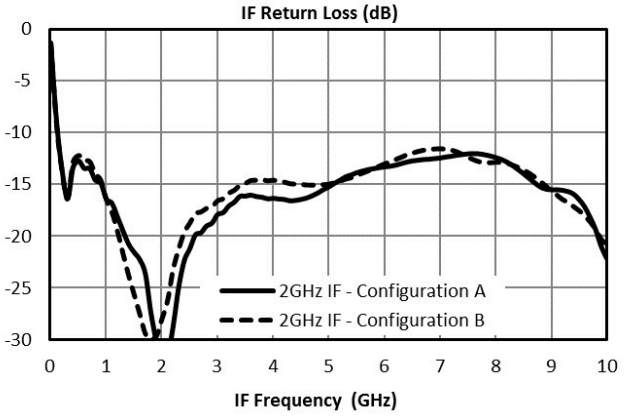
RF to IF Isolation (dB)



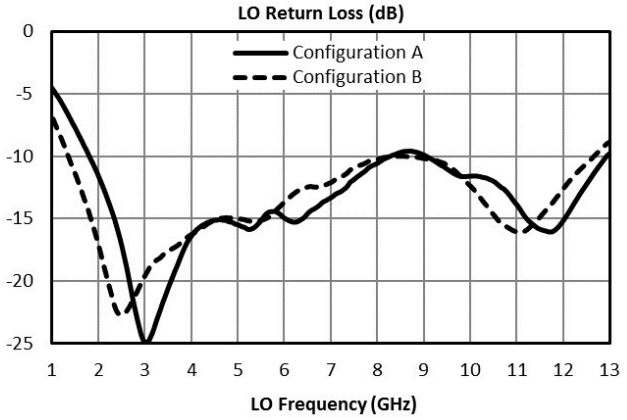
RF Return Loss (dB)



IF Return Loss (dB)

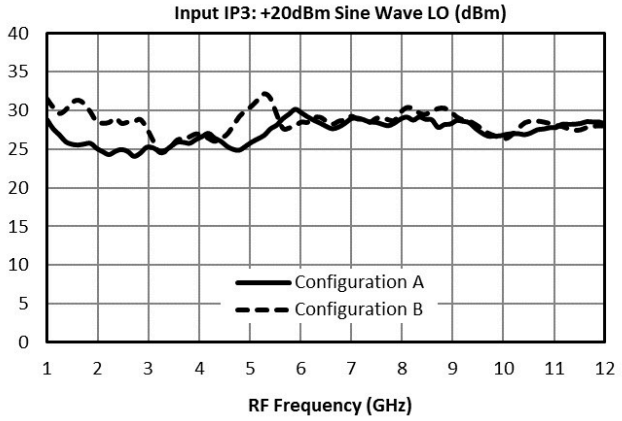


LO Return Loss (dB)

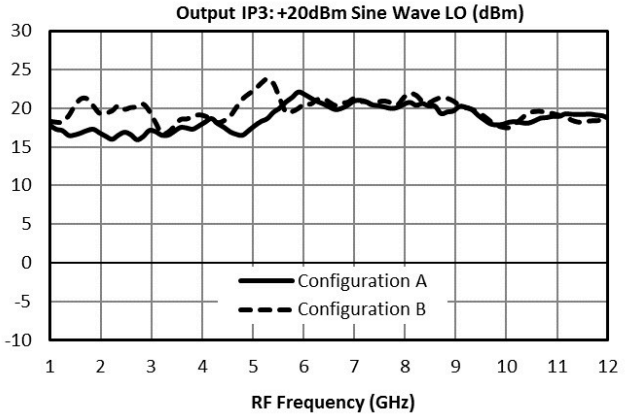


Typical Performance Plots: IP3, Sine Wave LO

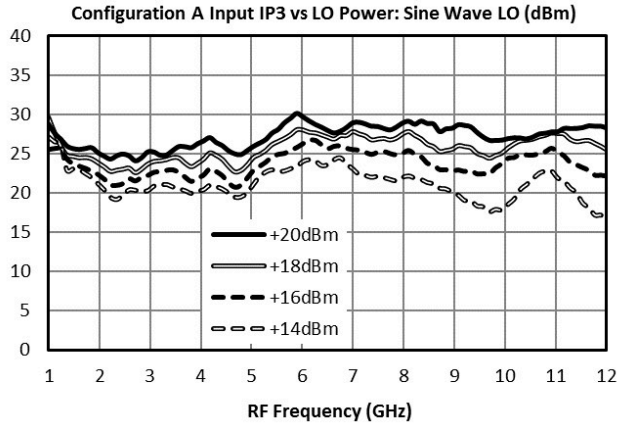
Input IP3: +20dBm Sine Wave LO (dBm)



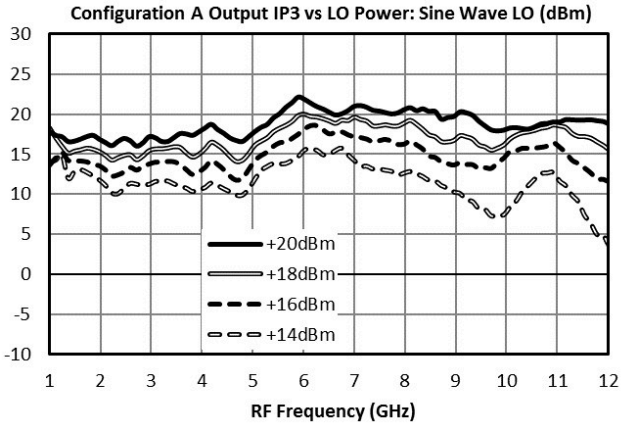
Output IP3: +20dBm Sine Wave LO (dBm)



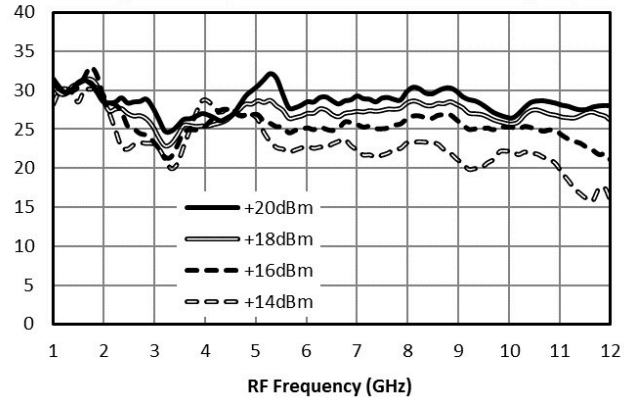
Configuration A Input IP3 vs LO Power: Sine Wave LO (dBm)



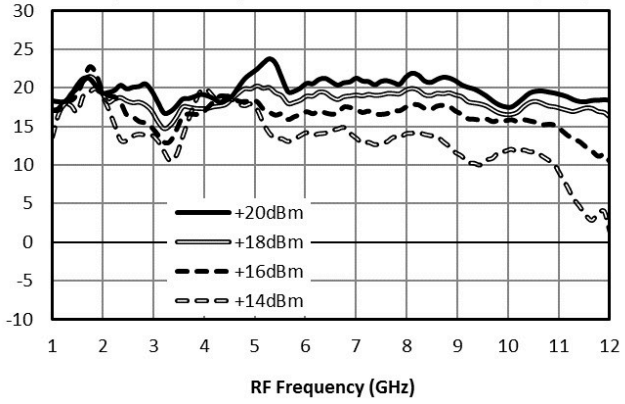
Configuration A Output IP3 vs LO Power: Sine Wave LO (dBm)



Configuration B Input IP3 vs LO Power: Sine Wave LO (dBm)

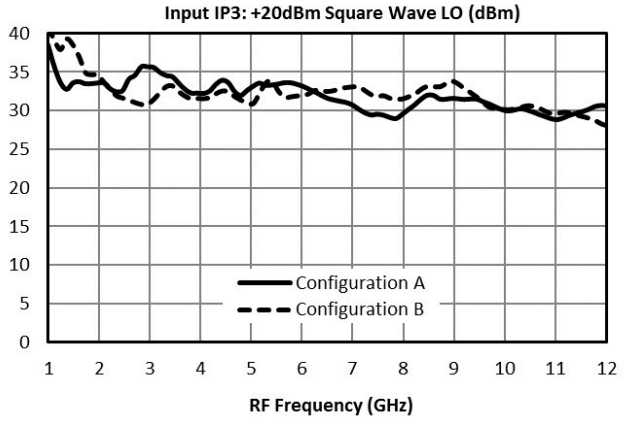


Configuration B Output IP3 vs LO Power: Sine Wave LO (dBm)

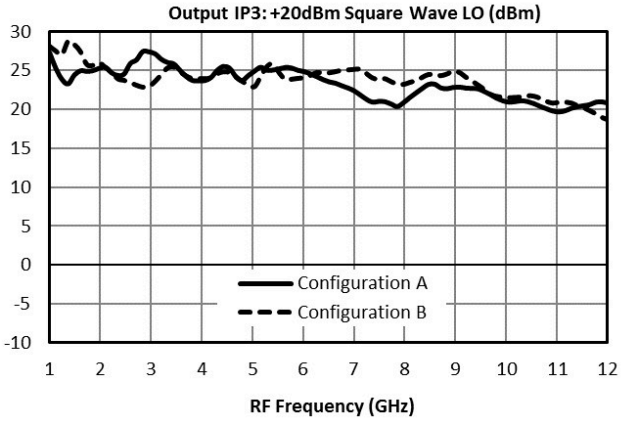


Typical Performance Plots: IP3, Square Wave LO

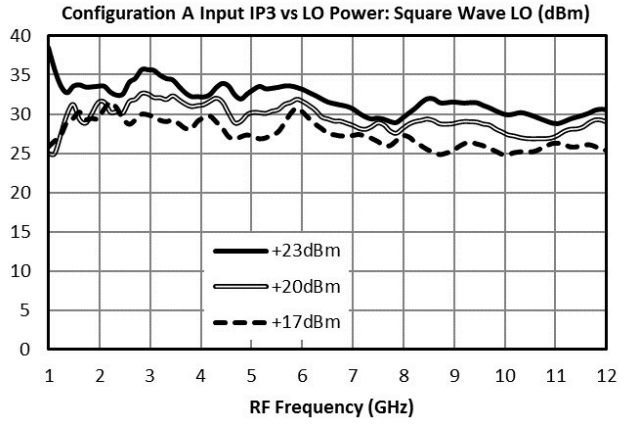
Input IP3: +20dBm Square Wave LO (dBm)



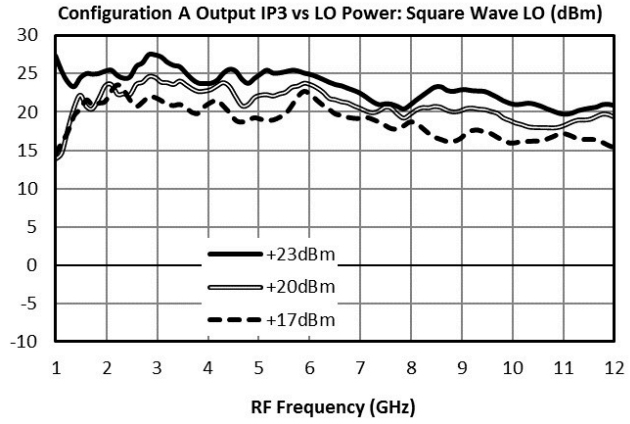
Output IP3: +20dBm Square Wave LO (dBm)



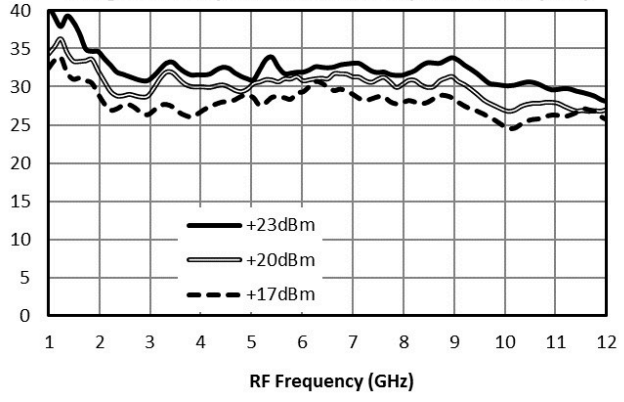
Configuration A Input IP3 vs LO Power: Square Wave LO (dBm)



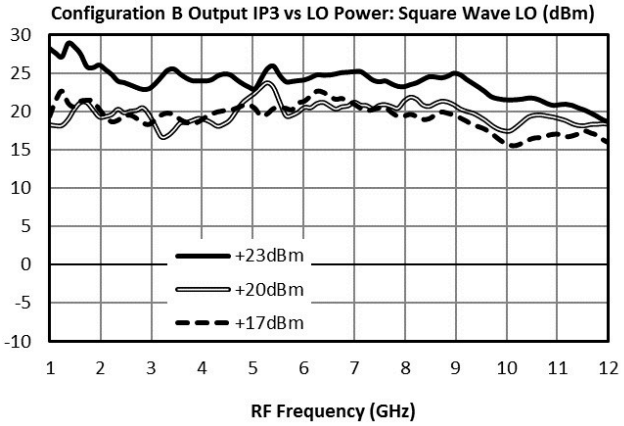
Configuration A Output IP3 vs LO Power: Square Wave LO (dBm)



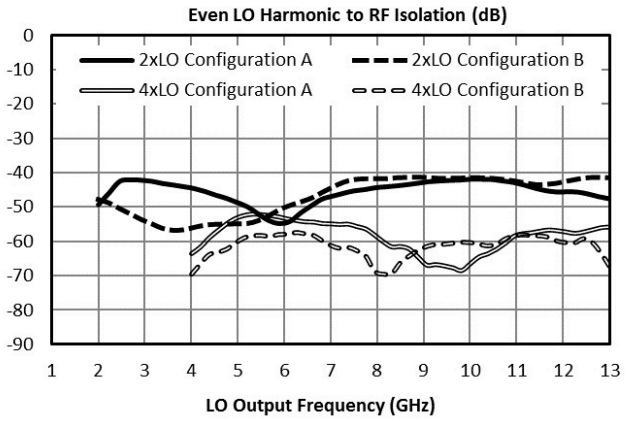
Configuration B Input IP3 vs LO Power: Square Wave LO (dBm)

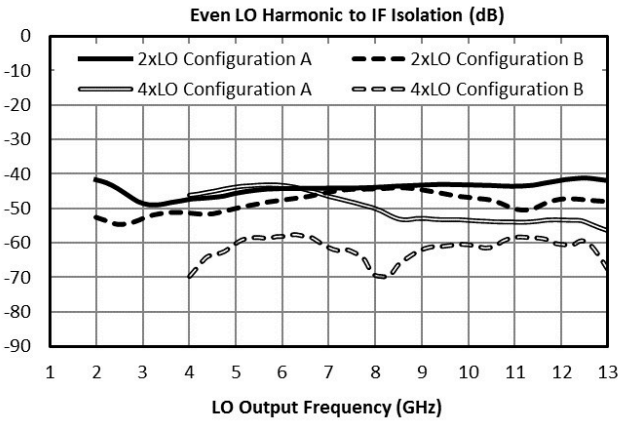


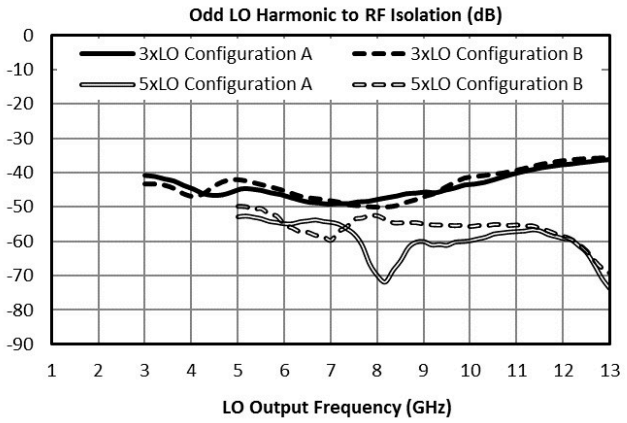
Configuration B Output IP3 vs LO Power: Square Wave LO (dBm)

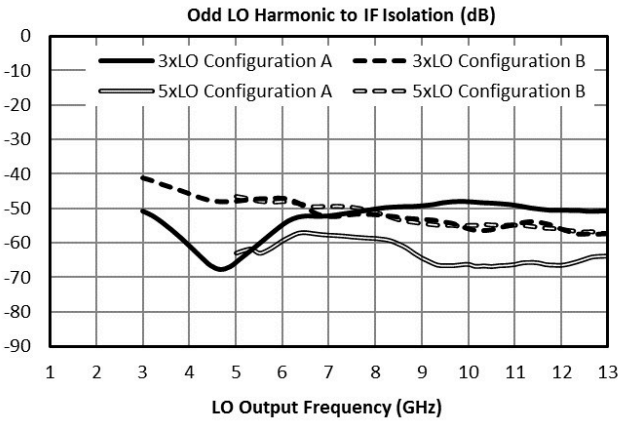


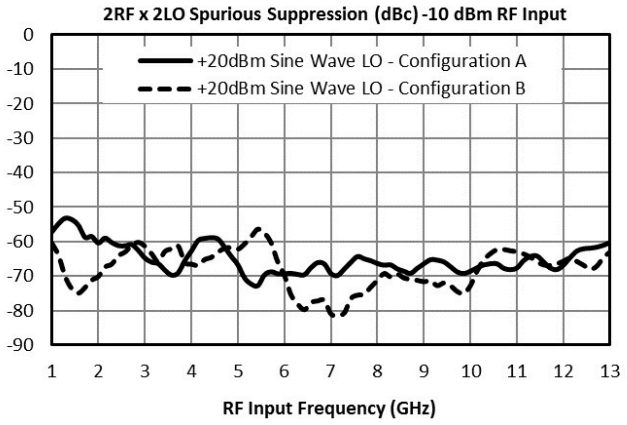
Typical Performance Plots: LO Harmonic Isolation

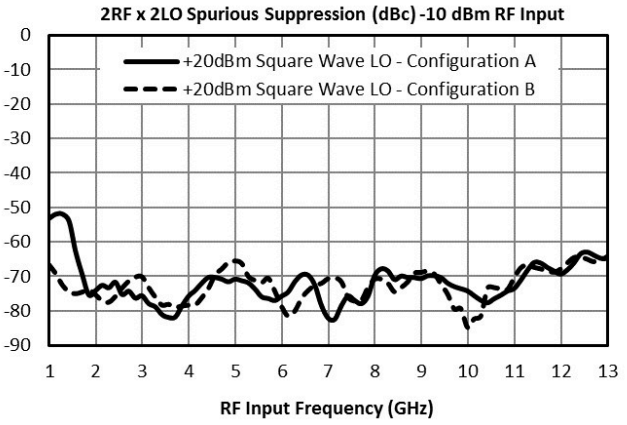


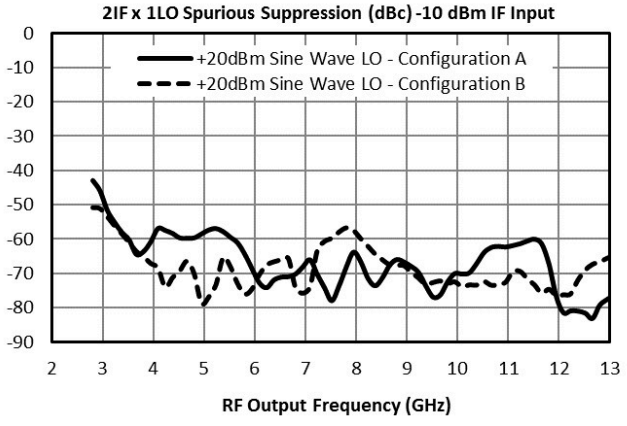


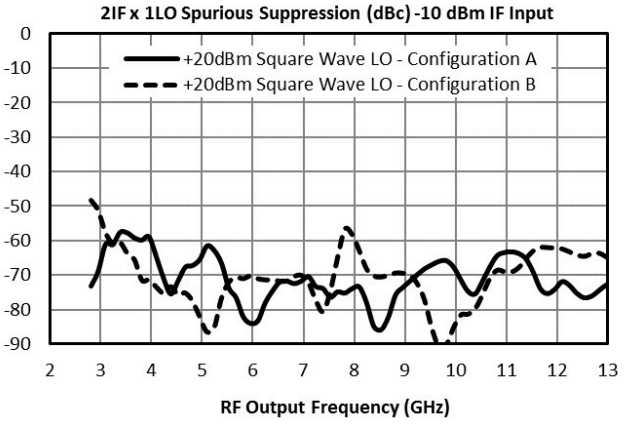












Spur Table

Typical Spurious Performance: Down-Conversion

Typical spurious data is provided by selecting RF and LO frequencies (± m*LO ± n*RF) 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 2RF x 2LO spur is 63 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) lower, or 73 dBc.

Typical Down-conversion spurious suppression (dBc): Config A (B), Sine Wave LO

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	30 (35)	Reference	42 (41)	18 (18)	35 (41)	21 (23)
2xRF	62 (62)	67 (66)	63 (66)	68 (63)	56 (58)	69 (64)
3xRF	111 (110)	82 (87)	98 (102)	80 (81)	101 (100)	138 (138)
4xRF	129 (128)	145 (145)	124 (127)	128 (129)	123 (123)	131 (129)
5xRF	165 (172)	147 (154)	159 (161)	148 (149)	159 (161)	145 (145)

Typical Down-conversion spurious suppression (dBc): Config A (B), Square Wave LO

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	29 (35)	Reference	37 (39)	13 (13)	37 (37)	18 (19)
2xRF	69 (62)	68 (69)	69 (70)	73 (71)	61 (64)	70 (73)
3xRF	109 (114)	94 (94)	106 (110)	91 (91)	107 (110)	137 (138)
4xRF	137 (141)	145 (145)	133 (137)	140 (140)	133 (137)	138 (137)
5xRF	173 (174)	158 (163)	167 (170)	162 (163)	171 (167)	161 (162)

Typical Up-conversion spurious suppression (dBc): Config A (B), Sine Wave LO

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	23 (30)	Reference	42 (41)	19 (17)	39 (43)	22 (21)
2xIF	71 (63)	64 (67)	60 (57)	57 (59)	63 (59)	52 (57)
3xIF	102 (101)	85 (85)	100 (99)	85 (81)	94 (100)	81 (79)
4xIF	135 (131)	127 (128)	127 (123)	122 (120)	124 (121)	115 (117)
5xIF	163 (153)	150 (156)	161 (157)	151 (149)	155 (154)	144 (146)

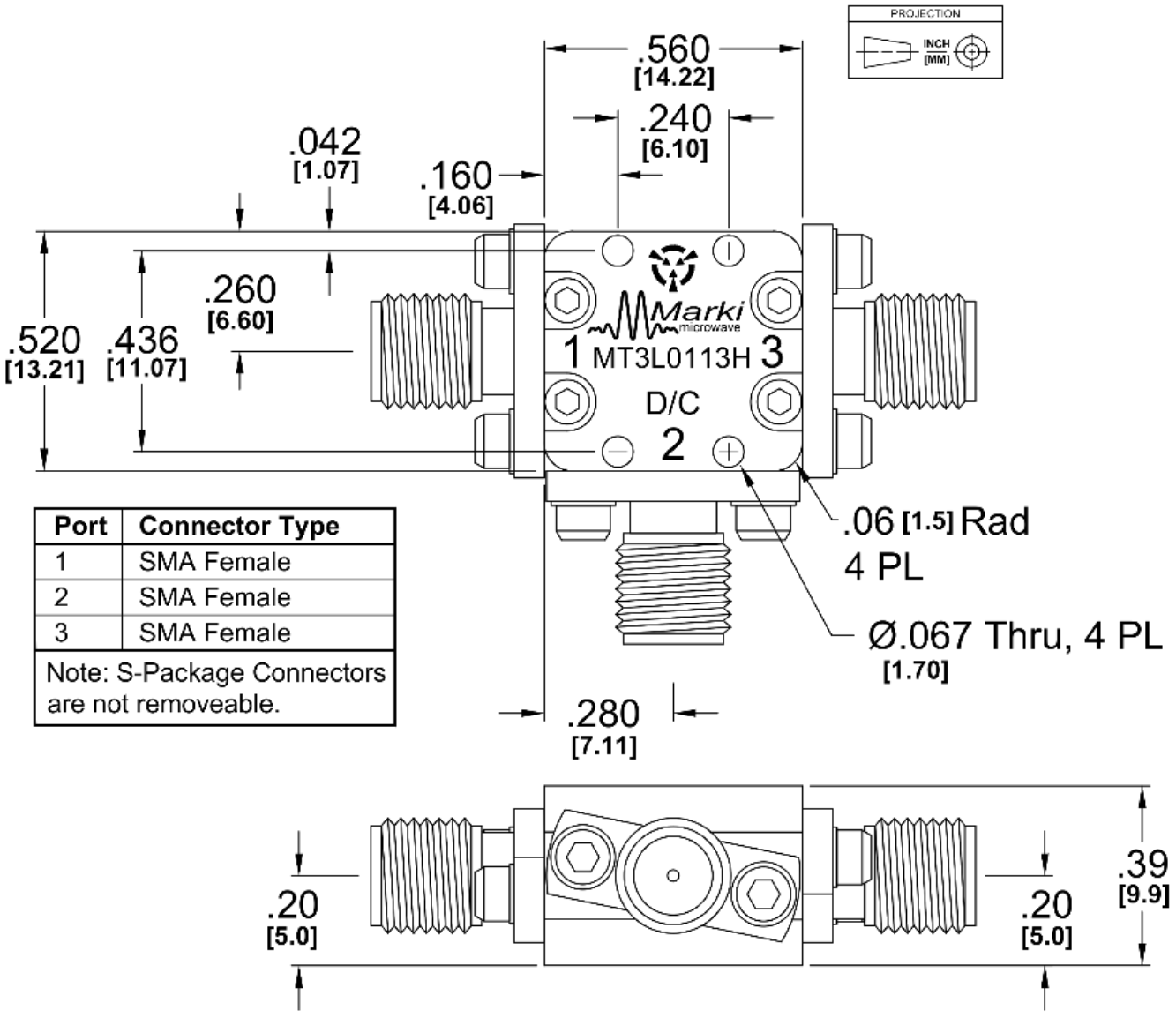
Typical Up-conversion spurious suppression (dBc): Config A (B), Square Wave LO

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	23 (30)	Reference	37 (36)	13 (13)	37 (37)	18 (19)
2xIF	71 (63)	64 (67)	58 (59)	73 (71)	61 (64)	70 (73)
3xIF	102 (101)	89 (90)	105 (110)	91 (91)	107 (110)	137 (138)
4xIF	135 (131)	127 (128)	130 (133)	140 (140)	133 (137)	138 (137)
5xIF	163 (153)	150 (156)	172 (174)	162 (163)	171 (167)	161 (162)

Mechanical Data

Outline Drawing

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



Port	Connector Type
1	SMA Female
2	SMA Female
3	SMA Female
Note: S-Package Connectors are not removeable.	

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