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Tech Support: support@markimicrowave.com

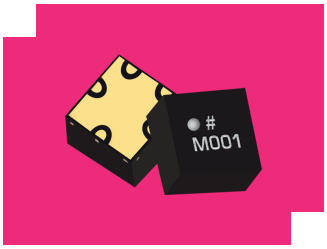
MM1-0626HCSP2

GaAs MMIC Chip Scale Package Double Balanced Mixer

DEVICE OVERVIEW

General Description

The MM1-0626HCSP2 is a highly linear passive GaAs double balanced MMIC mixer suitable for both up and down-conversion applications. As with all Marki Microwave mixers, it features excellent conversion loss, isolation and spurious performance across a broad bandwidth and in a small form factor. The MM1-0626HCSP2 is available in a lead-free, RoHS compliant 2.5x2.5 mm chip scale surface mount package (CSP2) and is compatible with standard leaded and lead-free PCB reflow soldering processes. The MM1-0626HCSP2 is a smaller alternative to the standard MM1-0626HSM.



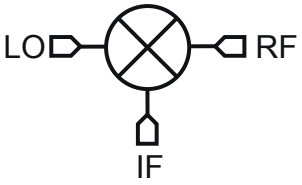
Features

- Compact 2.5x2.5 mm Chip Scale Package
- Broadband Performance
- Excellent Unit-to-Unit Repeatability
- RoHS Compliant

Applications

- Test and Measurement Equipment
- SATCOM
- Electronic Warfare
- 5G

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
MM1-0626HCSP2	GaAs MMIC Chip Scale Package Double Balanced Mixer	CSP2	REACH RoHS	Released	EAR99
EVB-MM1-0626H	CSP Double Balanced Mixer Evaluation Board	EVB	REACH RoHS	Released	EAR99

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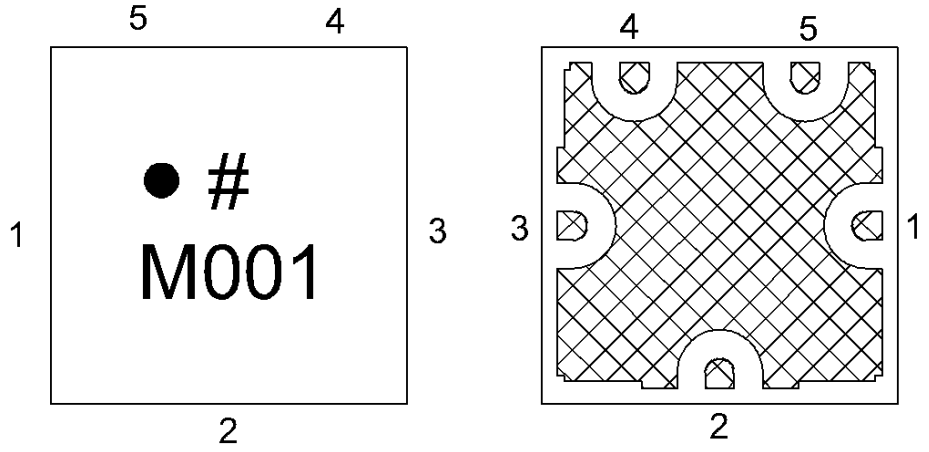
Revision History

Revision Code	Revision Date	Comment
-	2024-07-30	Initial Release
A	2025-04-28	Updated Moisture Sensitivity from MSL3 to MSL1

Port Configuration and Functions

Port Diagram

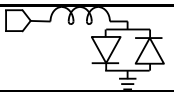
A bottom-up view of the MM1-0626HCSP2's CSP2 package outline drawing is shown below. The MM1-0626HCSP2 has the input and output ports given in Port Functions. The MM1-0626HCSP2 can be used in either an up or down conversion application. For configuration A, input the LO into pin 1, use pin 3 for the RF, and pin 2 for the IF. For configuration B, input the LO into pin 3, use pin 1 for the RF, and pin 2 for the IF.



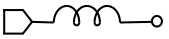
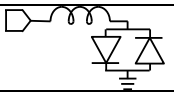
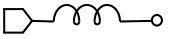
Pad #	Config A	Config B
1	LO	RF
2	IF	IF
3	RF	LO
4	N/C	N/C
5	N/C	N/C

Port Functions

Configuration A

Port	Function	Description	Equivalent Circuit for Package
Pin 1	LO	Pin 1 is DC open and AC matched to 50 Ohms from 6 to 26.5 GHz. Blocking capacitor is optional.	
Pin 2	IF	Pin 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Pin 3	RF	Pin 3 is DC open and AC matched to 50 Ohms from 6 to 26.5 GHz. Blocking capacitor is optional.	
Pin 4,5	N/C	Pins 4 and 5 are not internally connected to the circuit and should be connected to GND.	-

Configuration B

Port	Function	Description	Equivalent Circuit for Package
Pin 1	RF	Pin 1 is DC open and AC matched to 50 Ohms from 6 to 26.5 GHz. Blocking capacitor is optional.	
Pin 2	IF	Pin 2 is DC coupled to the diodes. Blocking capacitor is optional.	
Pin 3	LO	Pin 3 is DC open and AC matched to 50 Ohms from 6 to 26.5 GHz. Blocking capacitor is optional.	
Pin 4,5	N/C	Pins 4 and 5 are not internally connected to the circuit and should be connected to GND.	-

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 2 DC Current	15	mA
RF Power Handling (RF+LO), 100°C	21	dBm
RF Power Handling (RF+LO), 25°C	25	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	2.50 x 2.50 mm
Moisture Sensitivity Level	-	MSL 1

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
LO Input Power	11	15	20	-

Electrical Specifications

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

Parameter	Port Configuration	Test Conditions	Min	Typ	Max	Unit
Conversion Loss [1]	A	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	7	-	dB
Input 1 dB Compression	A	LO=6-26.5GHz RF=6-26GHz IF=DC-9GHz LO drive level=17-23dBm	-	14	-	dB
Input IP3	A	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	19.5	-	dBm
Isolation, LO to IF [2]	A	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	37	-	dB
Isolation, LO to RF [3]	A	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	45	-	dB
Isolation, RF to IF [4]	A	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	42	-	dB
Noise Figure [5]	A	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	7	-	dB
Conversion Loss [6]	B	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	8	-	dB
Input 1dB Compression	B	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	11	-	dBm
Input IP3	B	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	22.5	-	dBm
Isolation, LO to IF [7]	B	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	42	-	dB
Isolation, LO to RF [8]	B	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	45	-	dB
Isolation, RF to IF [9]	B	LO=6-26GHz RF=6-26.5GHz IF=DC-9GHz LO drive level=15dBm	-	37	-	dB

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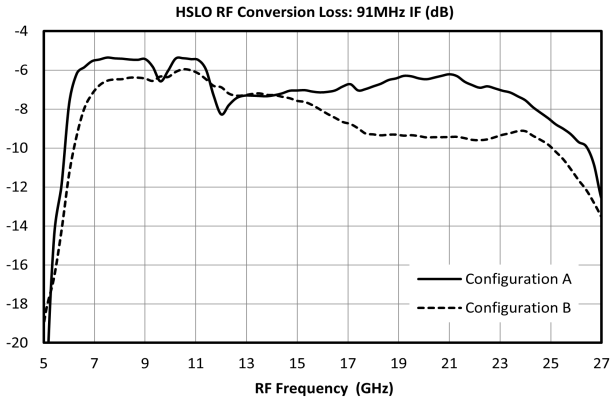
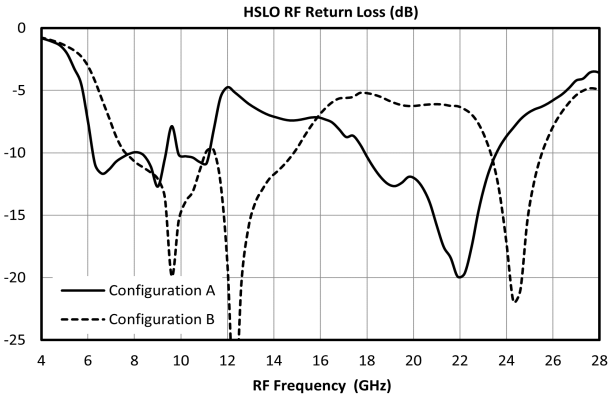
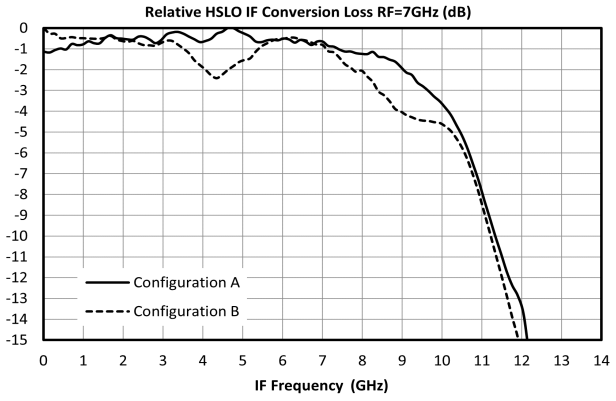
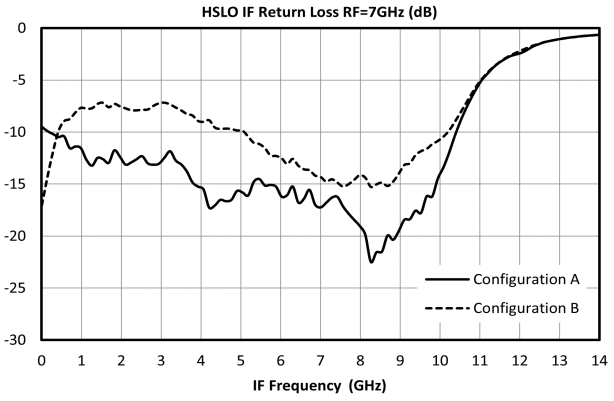
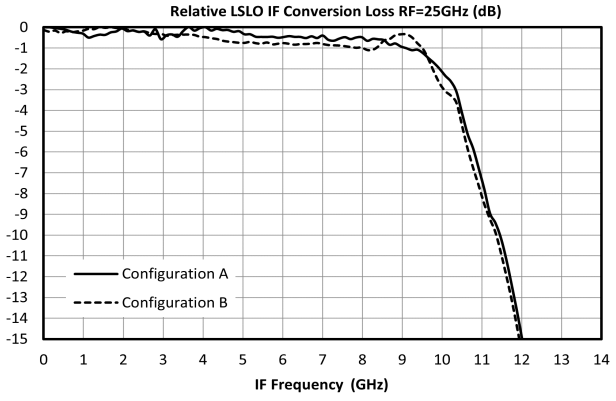
Typical Performance

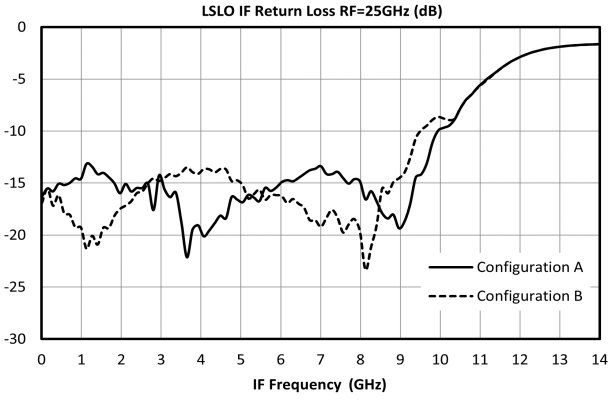


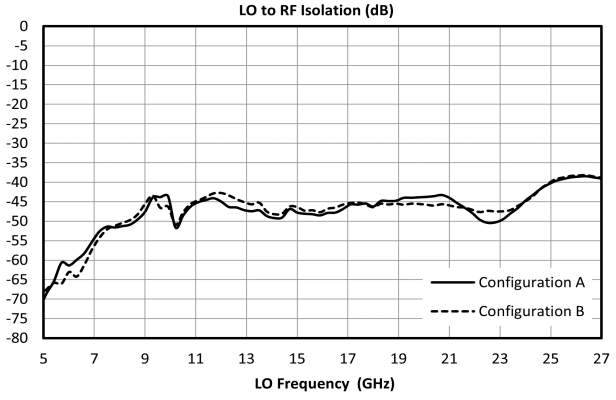


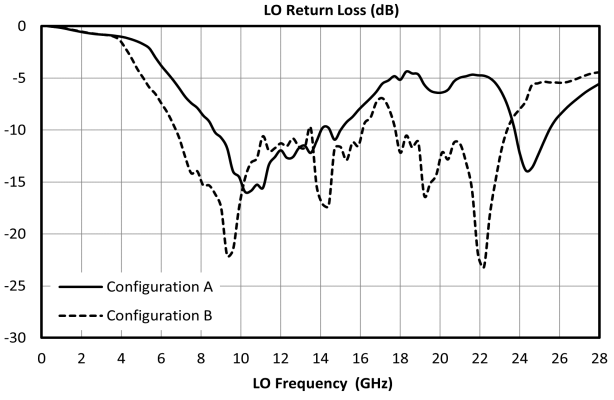












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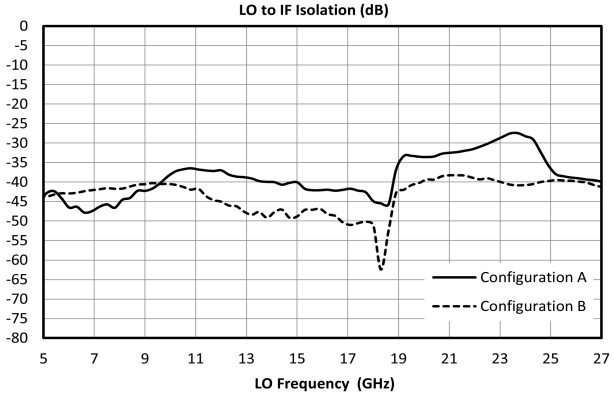
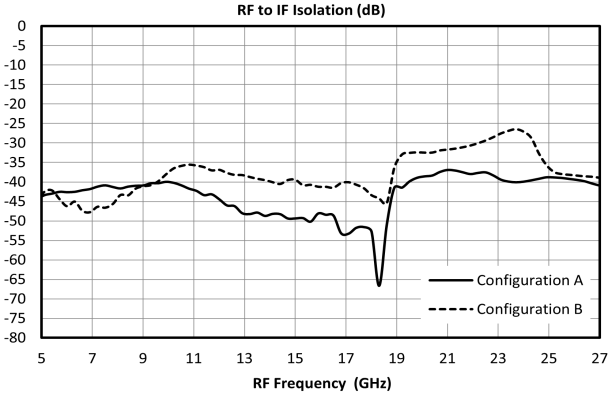
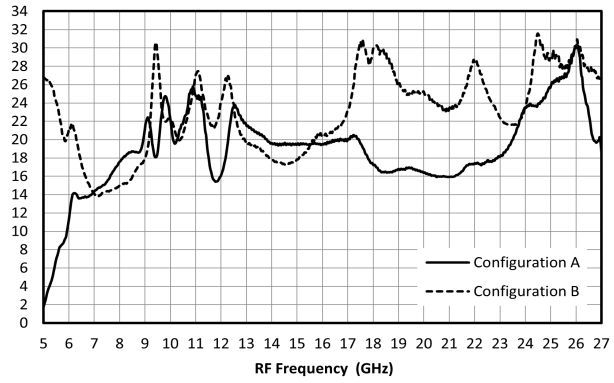
LO to IF Isolation (dB)



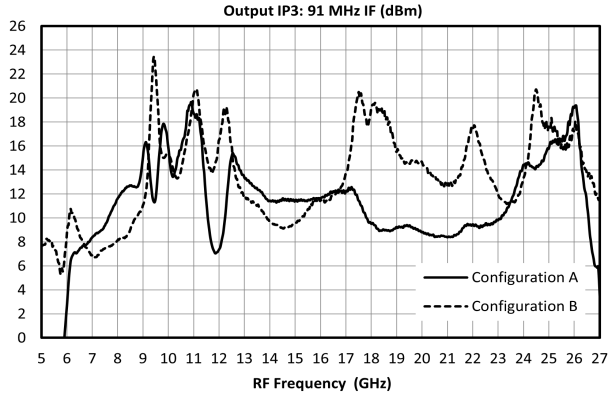
RF to IF Isolation (dB)



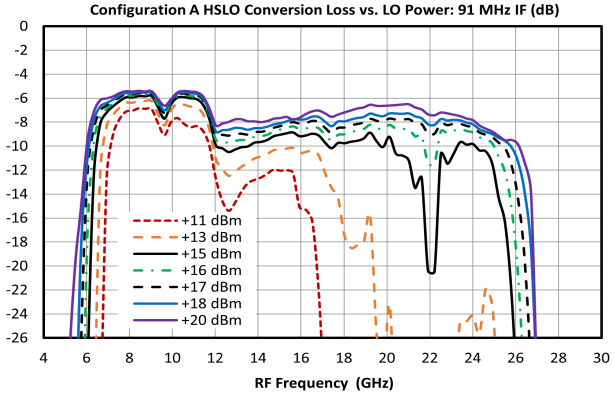
Input IP3: 91 MHz IF (dBm)



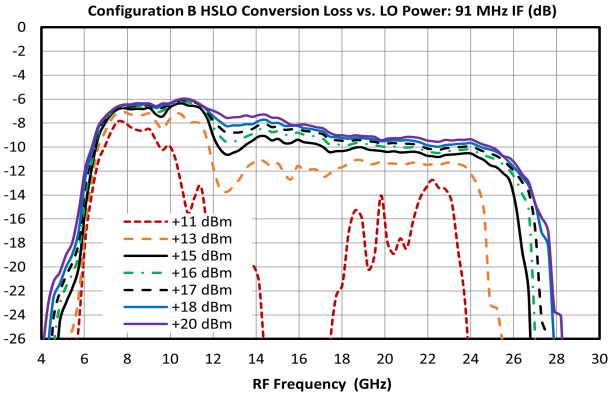
Output IP3: 91 MHz IF (dBm)



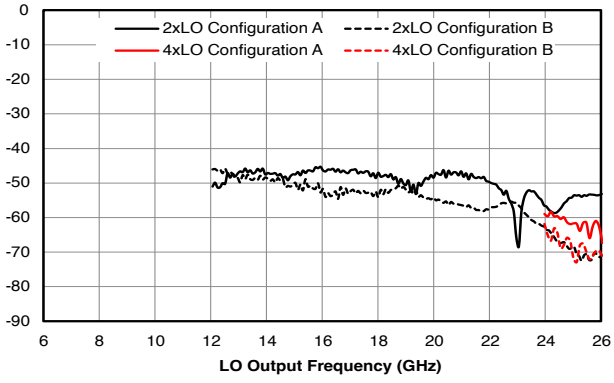
Configuration A HSLO Conversion Loss vs. LO Power: 91 MHz IF (dB)



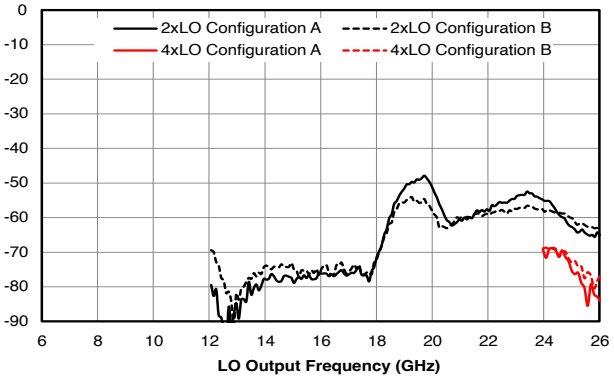
Configuration B HSLO Conversion Loss vs. LO Power: 91 MHz IF (dB)



Even LO Harmonic to RF Isolation (dB)



Even LO Harmonic to IF Isolation (dB)



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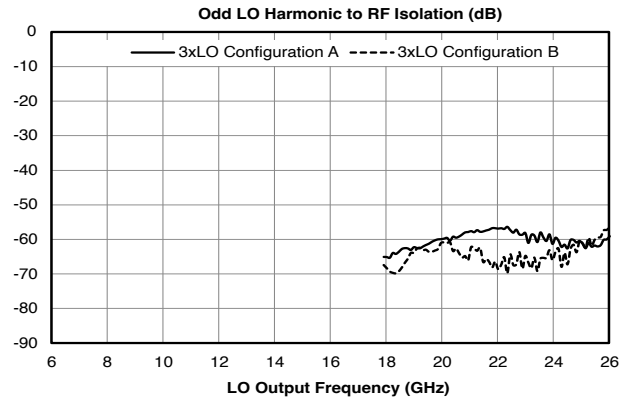
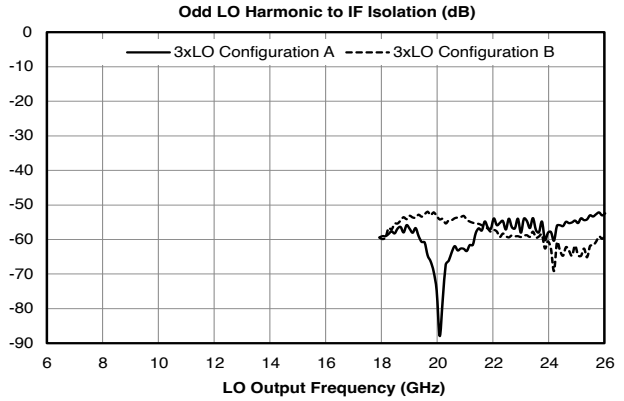
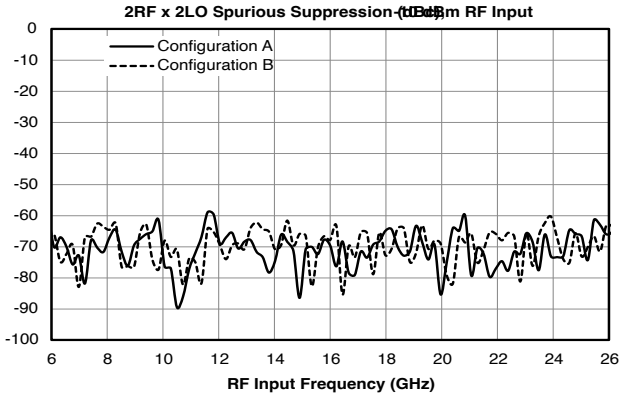
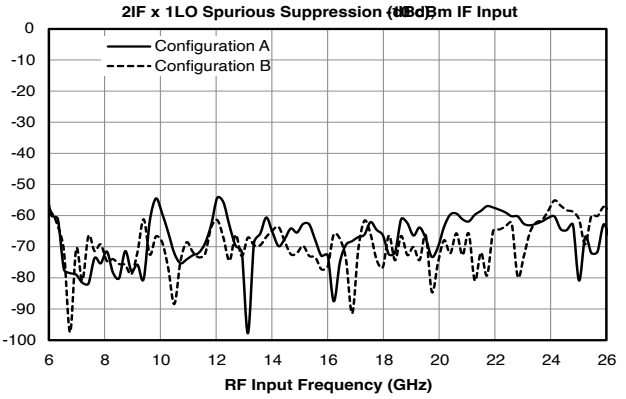
GaAs MMIC Chip Scale Package Double Balanced Mixer









Spur Table

Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 6 to 26 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 76 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 86 dBc.

Typical Downconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO						
-10 dBm RF Input	**0xLO**	**1xLO**	**2xLO**	**3xLO**	**4xLO**	**5xLO**
1×RF	33 (28)	Reference	41 (43)	14 (15)	47 (37)	15 (23)
2xRF	79 (82)	61 (72)	76 (80)	72 (77)	79 (76)	72 (74)
3xRF	91 (92)	75 (85)	89 (88)	86 (87)	88 (87)	85 (86)
4xRF	104 (100)	96 (99)	98 (99)	98 (98)	98 (98)	100 (100)
5xRF	111 (112)	108 (111)	109 (110)	112 (109)	110 (108)	109 (108)

Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.

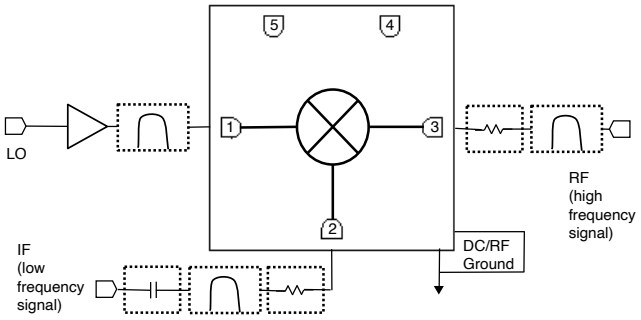
Upconversion Spurious Suppression

Spurious data is taken by mixing a 91 MHz IF with LO frequencies(+mLO+nIF), which creates an RF within the 6 to 26 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 82 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 92 dBc.

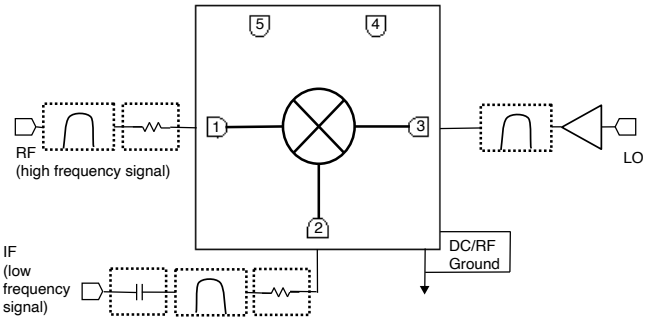
Typical Upconversion Spurious Suppression (dBc): A Configuration (B Configuration), Sine Wave LO						
-10 dBm IF Input	**0xLO**	**1xLO**	**2xLO**	**3xLO**	**4xLO**	**5xLO**
1×RF	34 (29)	Reference	42 (42)	14 (16)	45 (37	21 (22)
2xRF	87 (82)	82 (80)	82 (80)	80 (79)	82 (70)	81 (83)
3xRF	92 (91	92 (90)	92 (93)	95 (89)	93 (91)	92 (89
4xRF	106 (102)	103 (103)	101 (102)	102 (102)	101 (101)	104 (100)
5xRF	113 (111)	113 (111)	112 (111)	113 (109)	111 (112)	112 (110)

Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.

Application Circuit



Configuration A



Configuration B

Application Circuit Description

Ports Operation

IF Port – Used as input on an upconversion, output on downconversion, or LO port in a band shifting application. Signals should be connected by 50 ohm microstrip or coplanar traces to well matched broadband 50 ohm sources and loads. Blocking capacitor is recommended if DC voltage is present on the line.

RF Port – Used as input on a downconversion, output on upconversion, or output in a band shifting application. Signals should be connected by 50 ohm microstrip or coplanar traces to well matched broadband 50 ohm sources and loads.

Filtering and Matching- Filtering is generally desired for spurious and image removal on the output port of the mixer. Reflective filters can cause out of band signals to reflect back into the mixer and cause conversion loss ripple, erroneous spurs, and other undesired behaviors. To eliminate these problems it is recommend that the filters be placed as close to the output port as possible. If undesired behavior is still observed, a diplexer with one port terminated or a 1-3 dB attenuator may reduce this problem.

RF Ground – The ground paddle of the QFN should be connected to a low noise RF ground with very low electrical resistance for high frequency operation.

LO Port – The noise floor of the LO input signal should be less than the value of the noise floor plus isolation of the mixer, or a filter is recommended to prevent reduction in dynamic range. An LO amplifier is required if the LO power is below the recommended drive level. It is important to use an amplifier with a broadband 50 ohm match such that it does not reflect spurious signals back into the mixer or other system circuitry.

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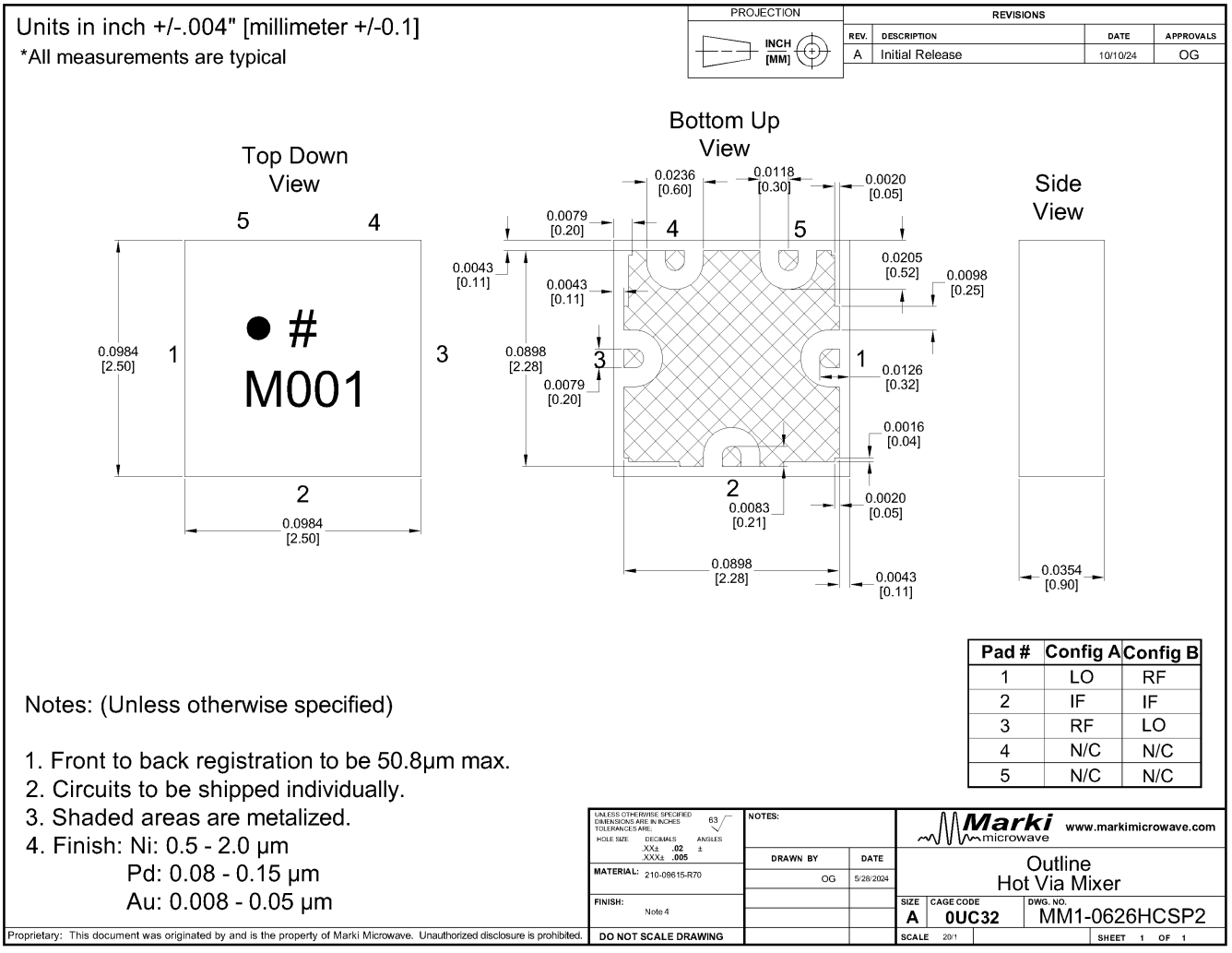
GaAs MMIC Chip Scale Package Double Balanced Mixer

Mechanical Data

Outline Drawing

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

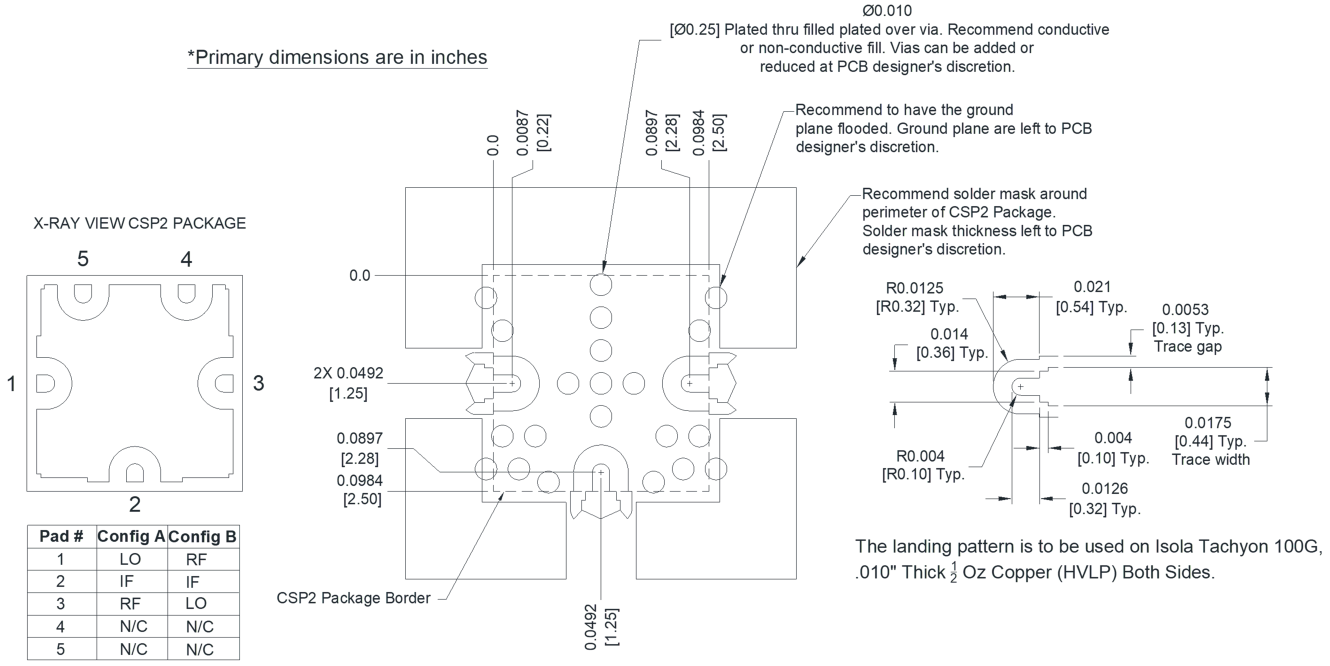


MM1-0626HCSP2

GaAs MMIC Chip Scale Package Double Balanced Mixer

Footprint Image

Download : Footprint Drawing



Pad #	Config A	Config B
1	LO	RF
2	IF	IF
3	RF	LO
4	N/C	N/C
5	N/C	N/C

DISCLAIMER

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