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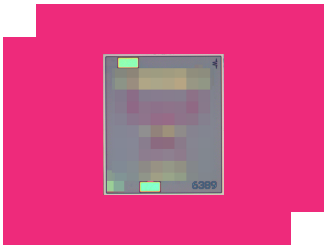
MMD-3580LCH

GaAs MMIC Millimeter Wave Doubler

DEVICE OVERVIEW

General Description

The MMD-3580L is a MMIC millimeter wave doubler fabricated with GaAs Schottky diodes. This operates over a guaranteed 17.5 to 40 GHz input frequency range or a doubled output frequency range of 35 to 80 GHz. The die version, MMD-3580LCH, is capable of operating beyond 80GHz. Both the wire bondable die and connectorized units are available. The MMD-3567L is a bandlimited version of this doubler.



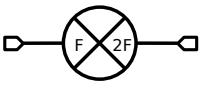
Features

- High fundamental rejection
- Millimeter wave output frequencies
- Low +7 dBm minimum input drive

Applications

- High frequency synthesis
- LO signal chain

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MMD-3580LU-KW	GaAs MMIC Millimeter Wave Doubler	U	Standard	REACH RoHS	Released	EAR99
MMD-3580LCH	GaAs MMIC Millimeter Wave Doubler	CH	-	REACH RoHS	Released	EAR99

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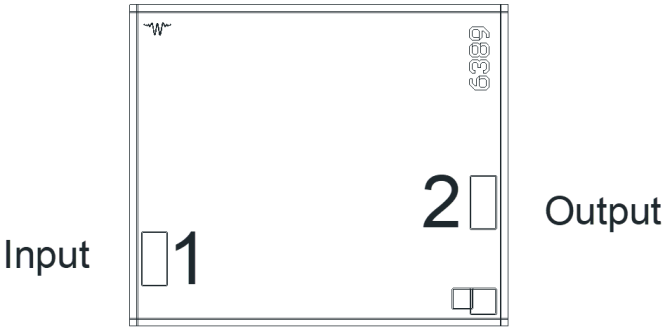
Revision History

Revision Code	Revision Date	Comment
-	2018-01-01	Datasheet Initial Release
A	2019-02-01	Updated output return loss

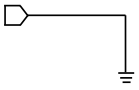
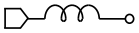
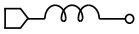
Port Configuration and Functions

Port Diagram

A top-down view of the MMD-3580L's CH package outline drawing is shown below.



Port Functions

Port	Function	Description	DC Equivalent Circuit
GND	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	Input	Input 1x Frequency Port. Port 1 is DC open for the CH and U package.	
Port 2	Output	2x Input Frequency output port. Port 2 is DC open for the CH and U package.	

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
Power Handling, at any Port	23	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	1.38 x 1.17 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
Input Power	7	-	11	dBm

Electrical Specifications

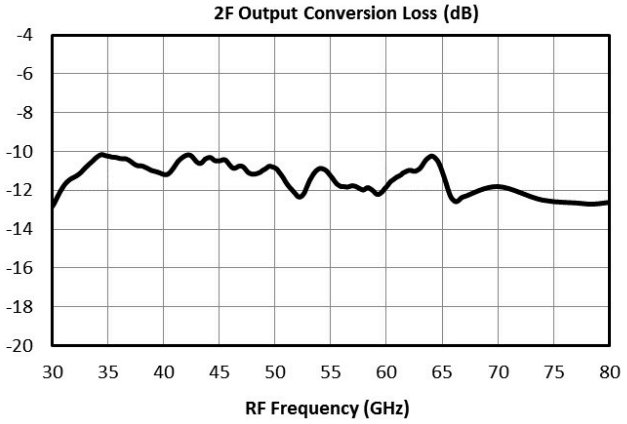
The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the connectorized U package doubler used in the forward direction with a +8 dBm sine wave input.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Conversion Loss	Second Harmonic Output	67	80	-	12	-	dB
Conversion Loss	Second Harmonic Output	35	67	-	11	15	dB
Input Frequency Range	-	-	-	17.5	-	40	GHz
Input Power	-	-	-	7	-	11	dBm
Isolation, 1F [1]	Input=17.5-40 GHz Output=17.5-40 GHz	17.5	40	-	47.7	-	dB
Isolation, 3F [2]	Input=17.5–22.3 GHz Output=52.5-67 GHz	52.5	67	-	54.4	-	dB
Isolation, 4F [3]	Input=15–16.8 GHz Output=60-67 GHz	60	67	-	31	-	dB
Output Frequency Range	-	-	-	35	-	80	GHz
Suppression, 1F [4]	Input=17.5-40 GHz Output=17.5-40 GHz	17.5	40	-	38	-	dBc
Suppression, 3F [5]	Input=17.5–22.3 GHz Output=52.5-67 GHz	52.5	67	-	44	-	dBc
Suppression, 4F [6]	Input=15–16.8 GHz Output=60-67 GHz	60	67	-	21	-	dBc

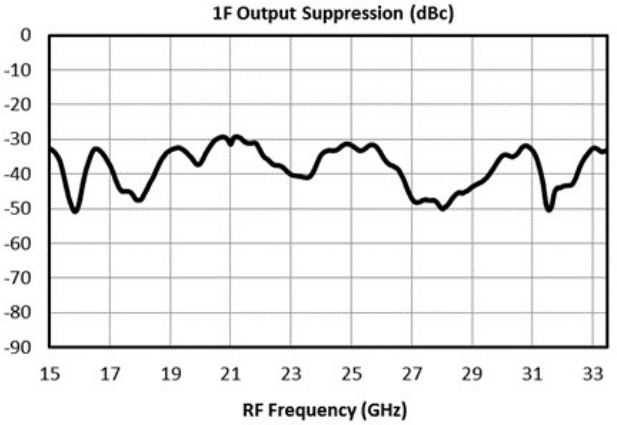
[1][2][3] Isolation is defined as the harmonic power relative to the 1F fundamental input power.
[4][5][6] Suppressions and isolations measured with an input source with >70dBc (relative to fundamental input) harmonic suppression. Suppression is defined as the harmonic power relative to the 2F doubled output power.

Typical Performance Plots

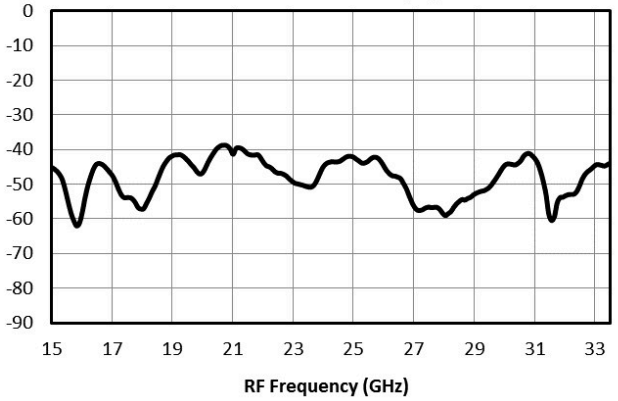
2F Output Conversion Loss (dB)



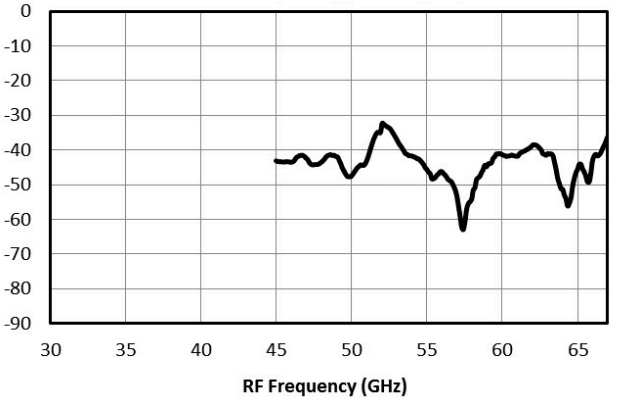
1F Output Suppression (dBc)



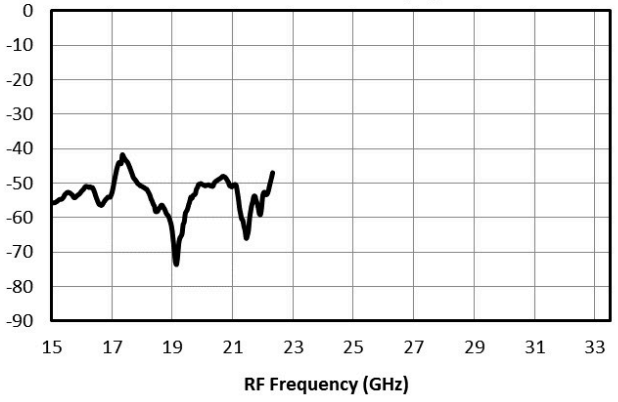
1F Harmonic Isolation (dB)



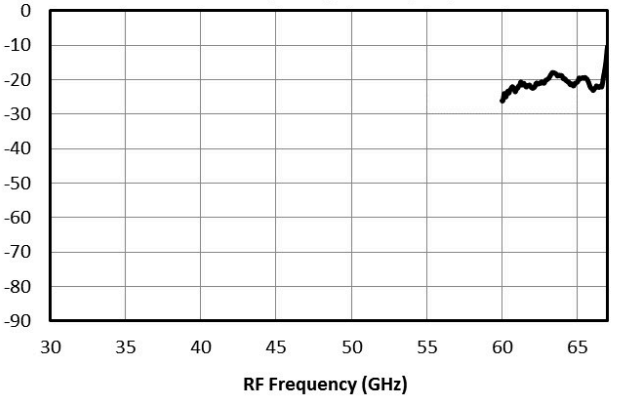
3F Output Suppression (dBc)



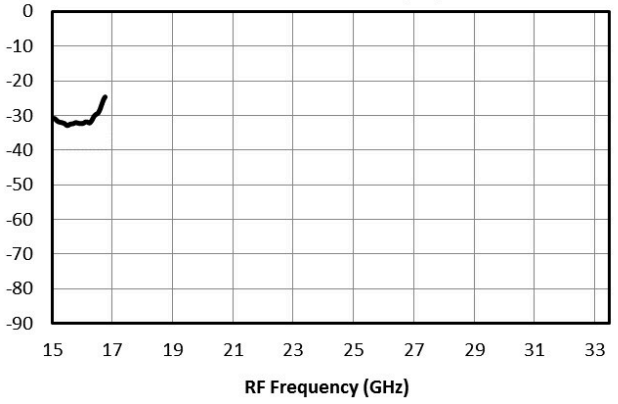
3F Harmonic Isolation (dB)



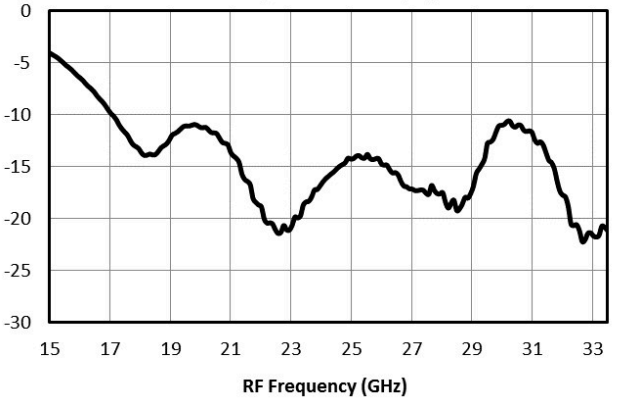
4F Output Suppression (dBc)

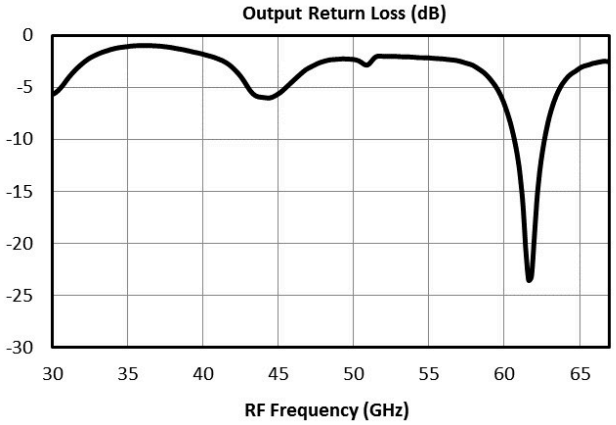


4F Harmonic Isolation (dB)



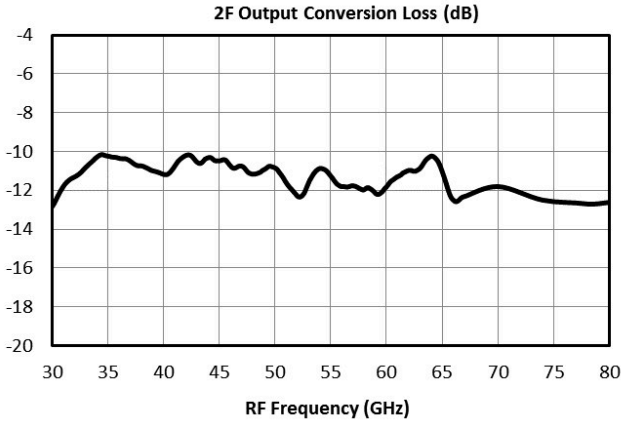
Input Return Loss (dB)

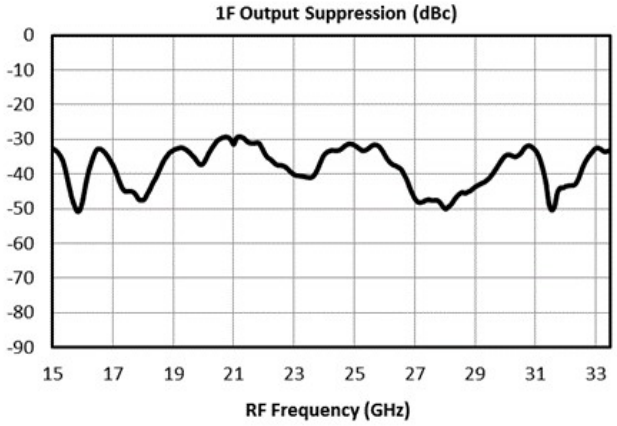


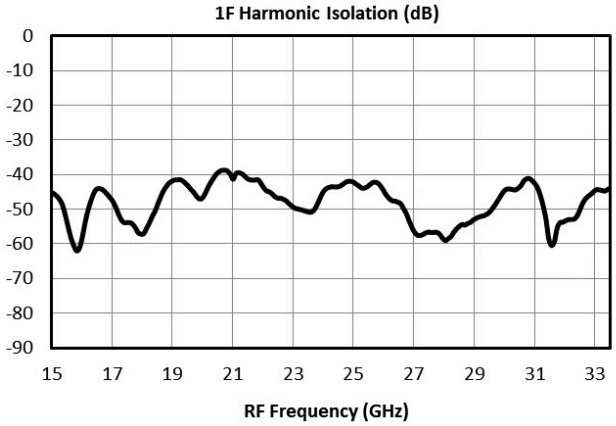


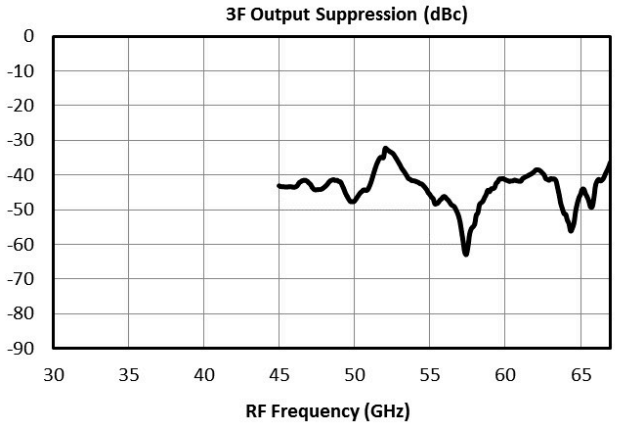
MMD-3580LU-KW - Typical Performance Plots

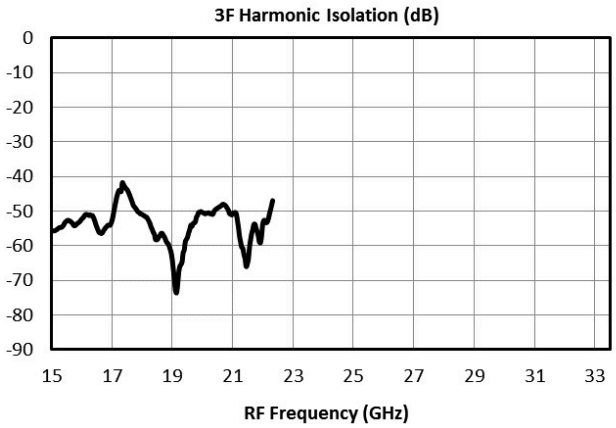
Performance plots for the connectorized module are shown for measurements where directly probed measurements of the die are unavailable. Note that the following measurements include losses from connectors and microstrip traces.

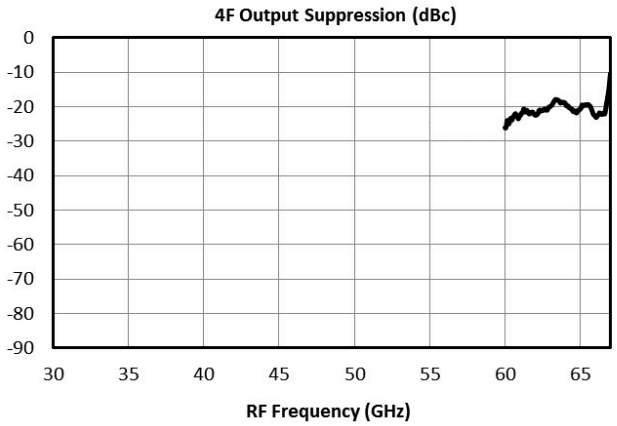


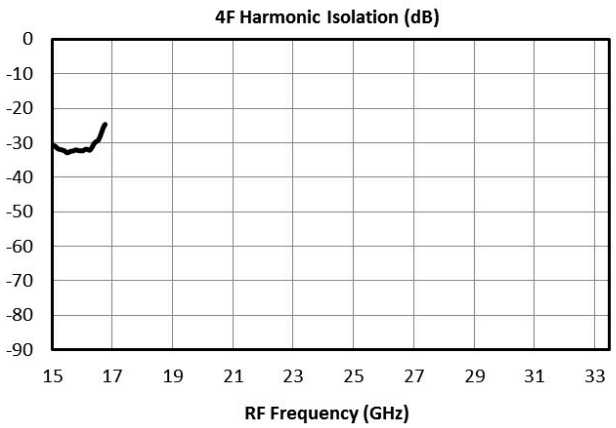


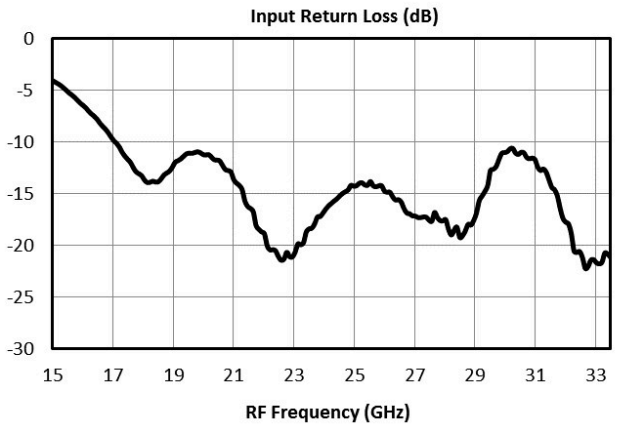


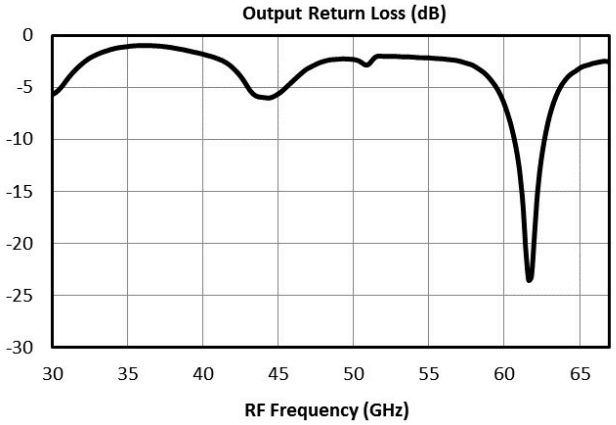












Die Mounting Recommendations

Mounting and Bonding Recommendations

Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment with a low electrical impedance ground.

Mounting - To epoxy the chip, apply a minimum amount of conductive epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip. Cure epoxy according to manufacturer instructions.

Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31 mm (12 mils).

Circuit Considerations – 50 Ω transmission lines should be used for all high frequency connections in and out of the chip. Wirebonds should be kept as short as possible, with multiple wirebonds recommended for higher frequency connections to reduce parasitic inductance. In circumstances where the chip more than .001” thinner than the substrate, a heat spreading spacer tab is optional to further reduce bondwire length and parasitic inductance.

Handling Precautions

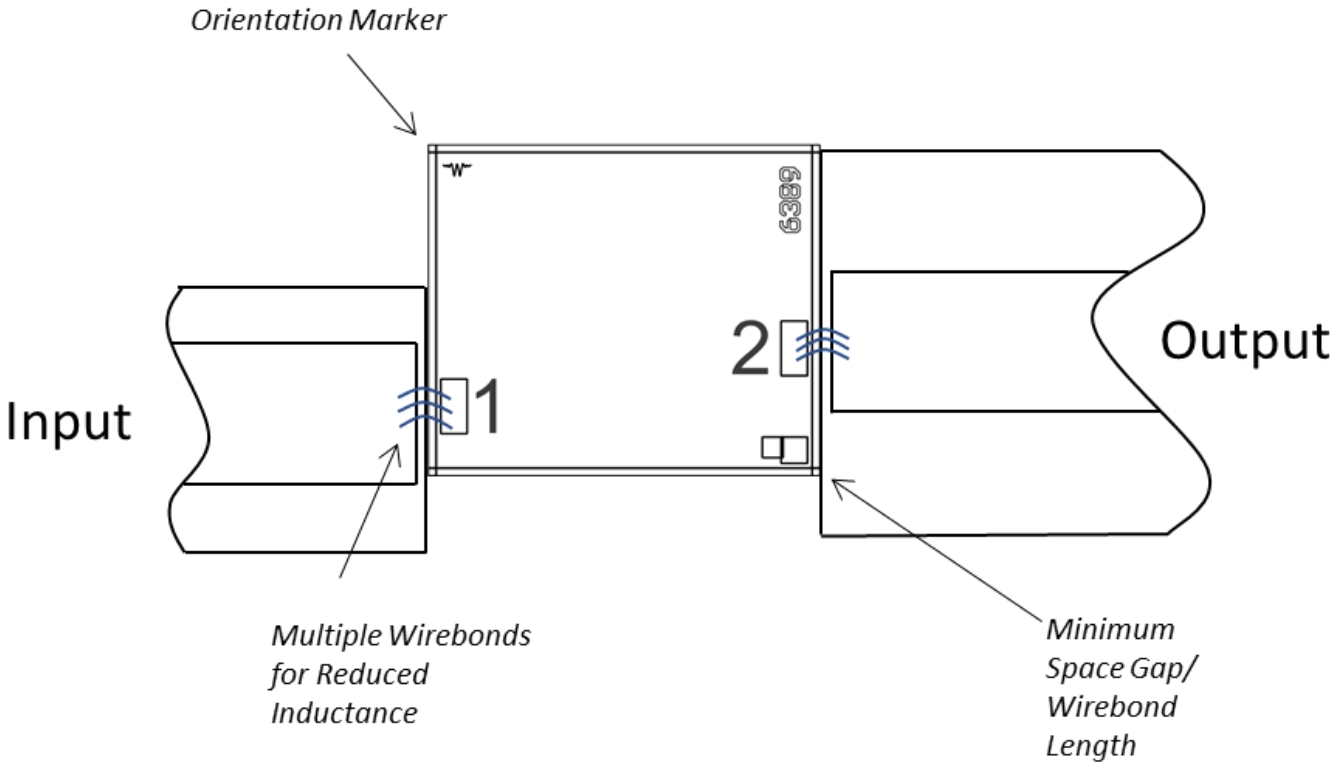
General Handling

Chips should be handled with care using tweezers or a vacuum collet. Users should take precautions to protect chips from direct human contact that can deposit contaminants, like perspiration and skin oils on any of the chip's surfaces.

Static Sensitivity

GaAs MMIC devices are sensitive to ESD and should be handled, assembled, tested, and transported only in static protected environments.

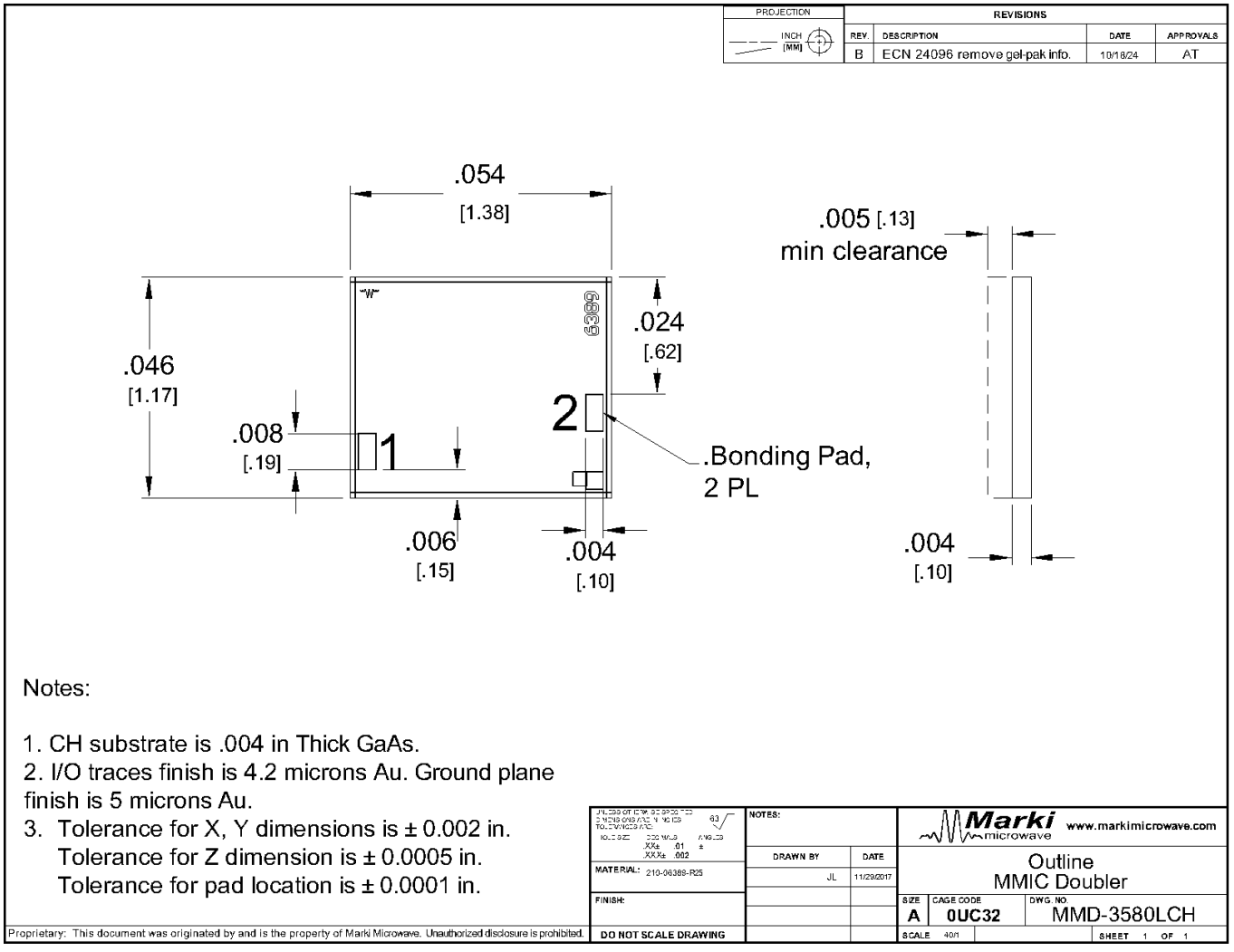
Cleaning and Storage: Do not attempt to clean the chip with a liquid cleaning system or expose the bare chips to liquid. Once the ESD sensitive bags the chips are stored in are opened, chips should be stored in a dry nitrogen atmosphere.



Mechanical Data

Outline Drawing

Download : Outline 2D Drawing



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