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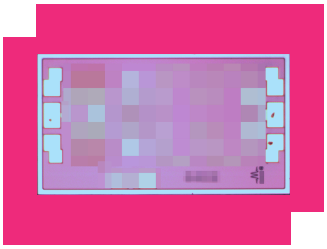
MMD-1030HCH

GaAs MMIC Doubler

DEVICE OVERVIEW

General Description

The MMD-1030H is a passive double balanced MMIC doubler covering 10 to 30 GHz on the output. It features excellent conversion loss, superior isolations and harmonic suppressions across a broad bandwidth, in a highly miniaturized form factor. Accurate, nonlinear simulation models are available for Microwave Office® and ADS through the Marki Microwave PDK. The MMD-1030H is available as a wire bondable chip or a connectorized package. The MMD-1030H is a superior alternative to Marki Microwave carrier and packaged doublers.



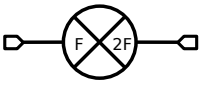
Features

- Compact Chip Style Package (0.054" x 0.046"x0.004")
- CAD Optimized for Superior Suppressions and Efficiency
- Broadband Performance
- Excellent Unit-to-Unit Repeatability
- Fully nonlinear software models available with Marki PDK for Microwave Office® and ADS
- RoHS Compliant

Applications

N/A

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MMD-1030HS	GaAs MMIC Doubler	S	Standard	REACH RoHS	Released	EAR99
MMD-1030HCH	GaAs MMIC Doubler	CH	-	REACH RoHS	Released	EAR99

Table Of Contents

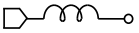
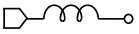
Revision History

Revision Code	Revision Date	Comment
A	2019-02-01	Die resized from 1.47 x 0.82 mm2 to 1.38 x 1.17 mm2. CH package tolerance added.

Port Configuration and Functions

Port Diagram

Port Functions

Port	Function	Description	DC Equivalent Circuit
2F	2F Output	The output port is DC open and AC matched to 50 Ohms from 10 to 30 GHz. Blocking capacitor is optional.	
F	F input	The input port is DC open and AC matched to 50 Ohms from 5 to 15 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
RF Power Handling, 100°C	20	dBm
RF Power Handling, 25°C	25	dBm

Package Information

Parameter	Details	Rating
Dimensions	-	1.38 x 1.17 mm

Electrical Specifications

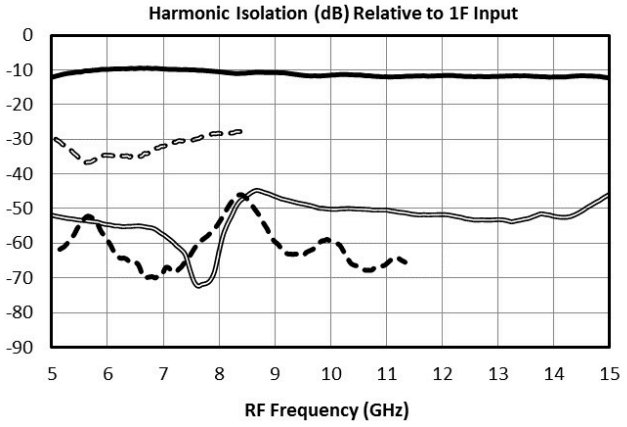
Specifications guaranteed from -55 to +100°C, measured in a 50Ω system. All bare die are 100% DC tested and 100% visual inspected. RF testing is performed on a sample basis to verify conformance to datasheet guaranteed specifications. Consult factory for more information.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Conversion Loss	Second Harmonic Output	10	30	-	11.5	17	dB
Input Frequency Range	-	-	-	5	-	15	GHz
Input Power	-	-	-	10	14	17	dBm
Isolation, 1F	-	-	-	-	53	-	dB
Isolation, 3F	-	-	-	-	58	-	dB
Isolation, 4F	-	-	-	-	29	-	dB
Output Frequency Range	-	-	-	10	-	30	GHz
Suppression, 1F	-	-	-	-	41	-	dBc
Suppression, 1F [1]	-	-	-	-	41	-	dBc
Suppression, 3F	-	-	-	-	47	-	dBc
Suppression, 4F	-	-	-	-	22	-	dBc

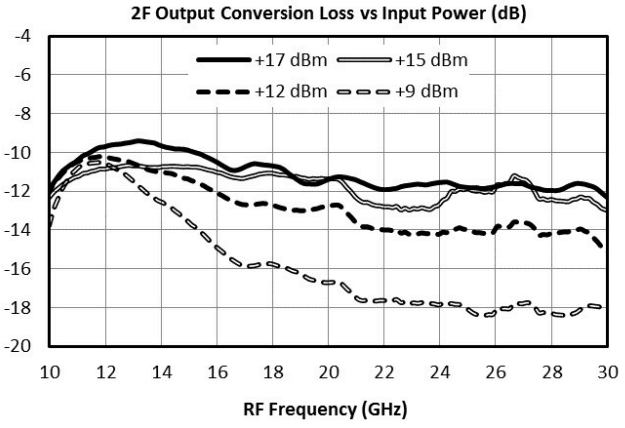
[1] Suppression is relative to doubled output power. Isolation is defined as relative to the fundamental input power.
Suppression is relative to doubled output power. Isolation is defined as relative to the fundamental input power.

Typical Performance

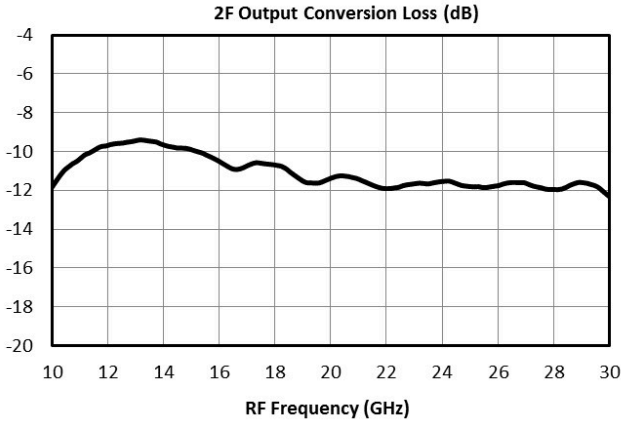
Harmonic Isolation (dB) Relative to 1F Input



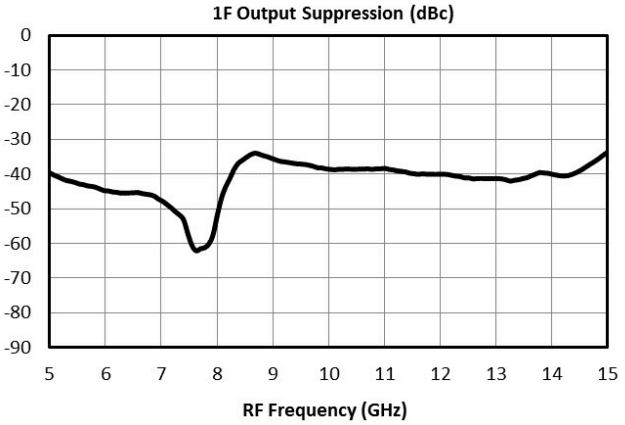
2F Output Conversion Loss vs Input Power (dB)



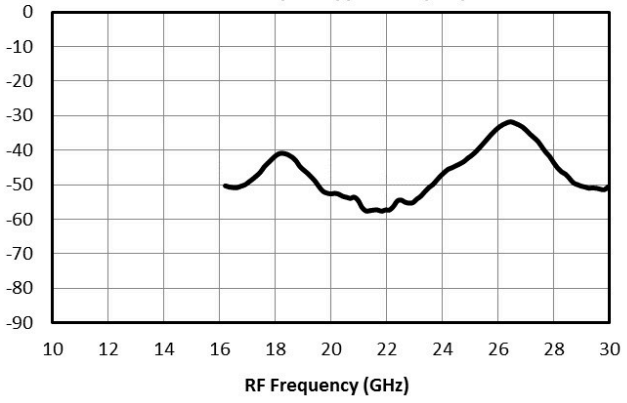
2F Output Conversion Loss (dB)



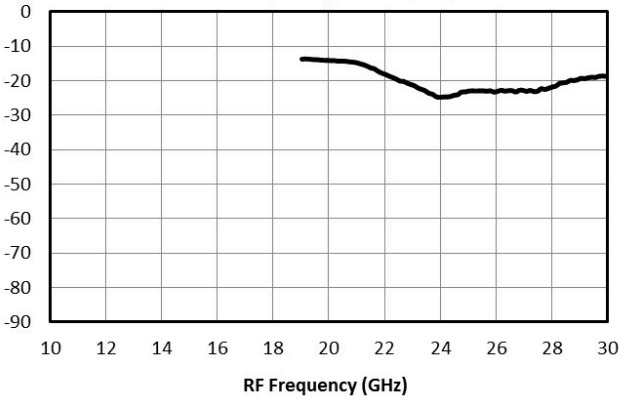
1F Output Suppression (dBc)



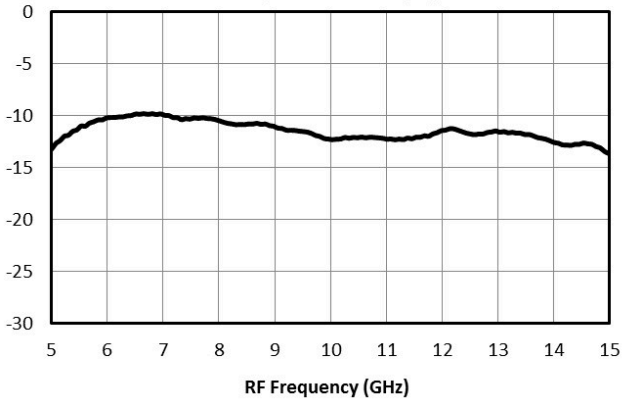
3F Output Suppression (dBc)



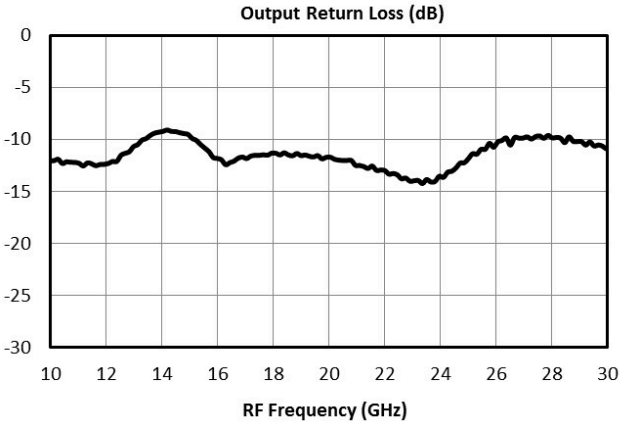
4F Output Suppression (dBc)



Input Return Loss (dB)



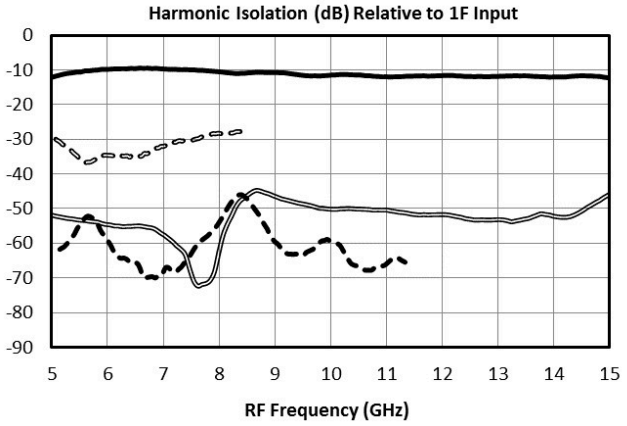
Output Return Loss (dB)



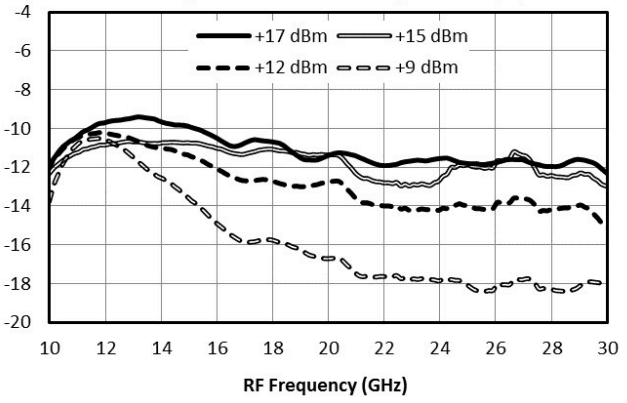
MMD-1030HS - Typical Performance Plots

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.

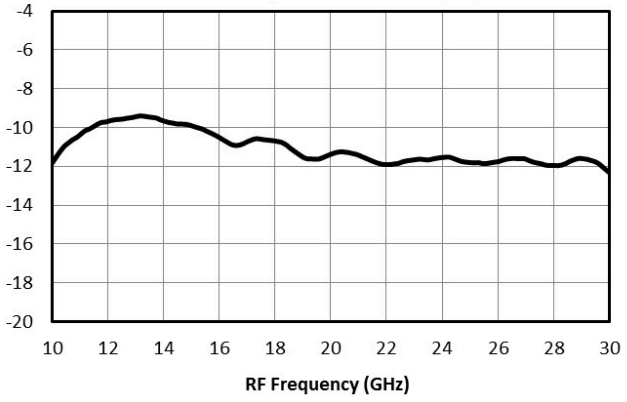
Harmonic Isolation (dB) Relative to 1F Input



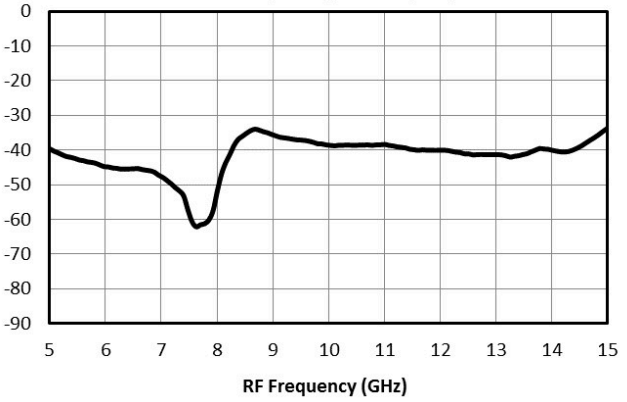
2F Output Conversion Loss vs Input Power (dB)



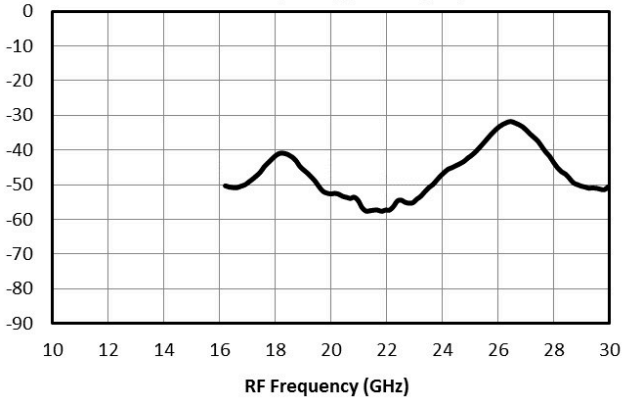
2F Output Conversion Loss (dB)



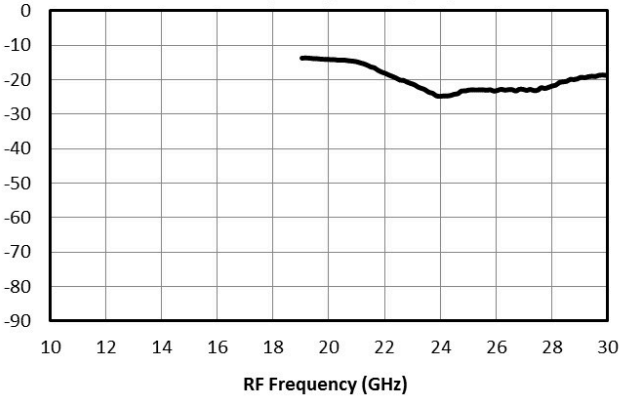
1F Output Suppression (dBc)



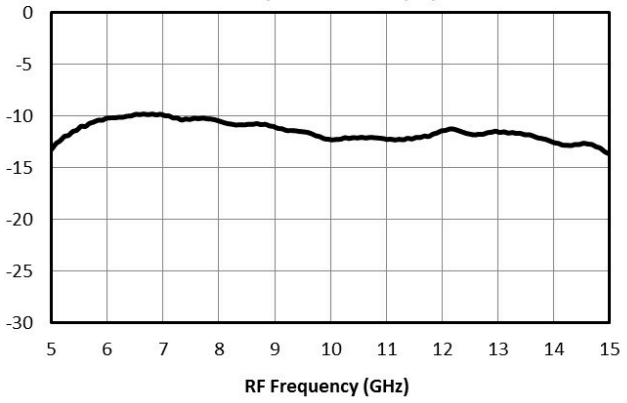
3F Output Suppression (dBc)



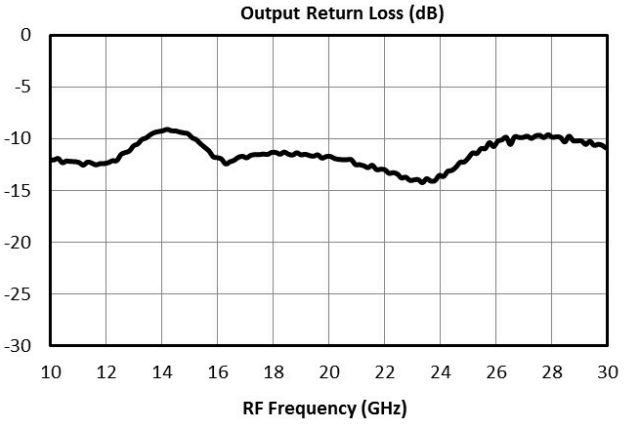
4F Output Suppression (dBc)



Input Return Loss (dB)



Output Return Loss (dB)



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 ohm 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.

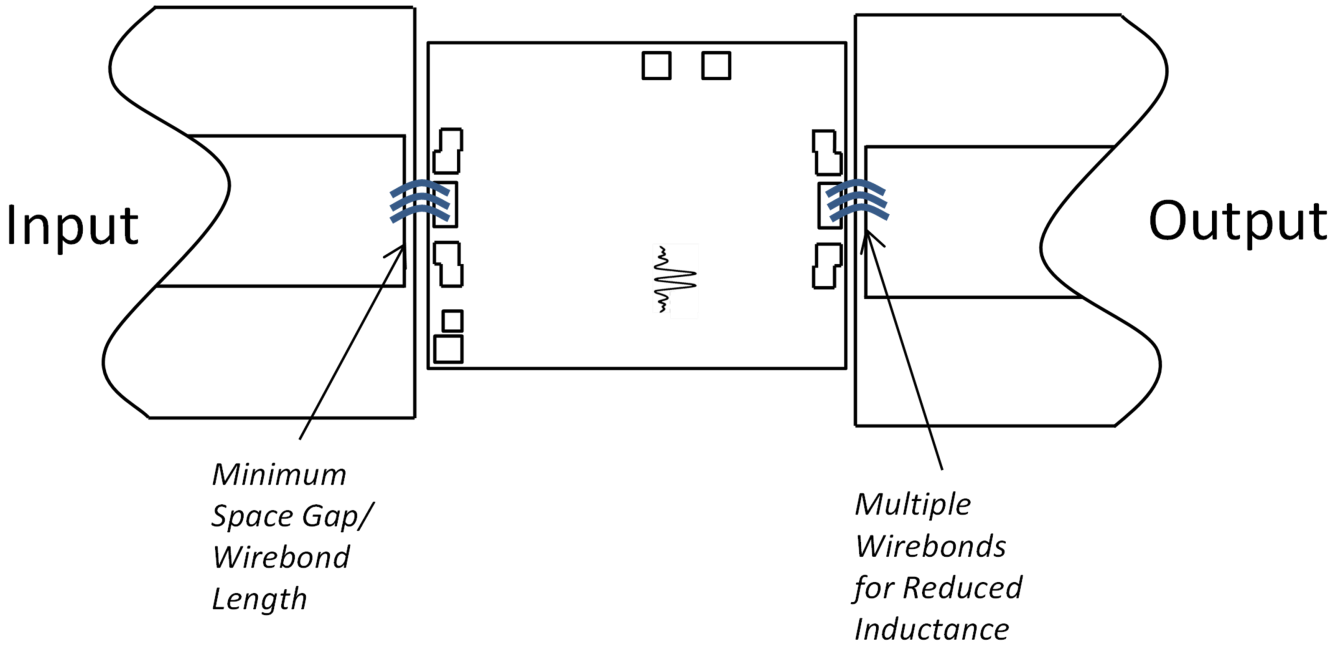
Handling Precautions

General Handling: Chips should be handled with a vacuum collet when possible, or with sharp tweezers using well trained personnel. The surface of the chip is fragile and should not be contacted if possible.

Static Sensitivity: GaAs MMIC devices are subject to static discharge, 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 a dry nitrogen atmosphere.

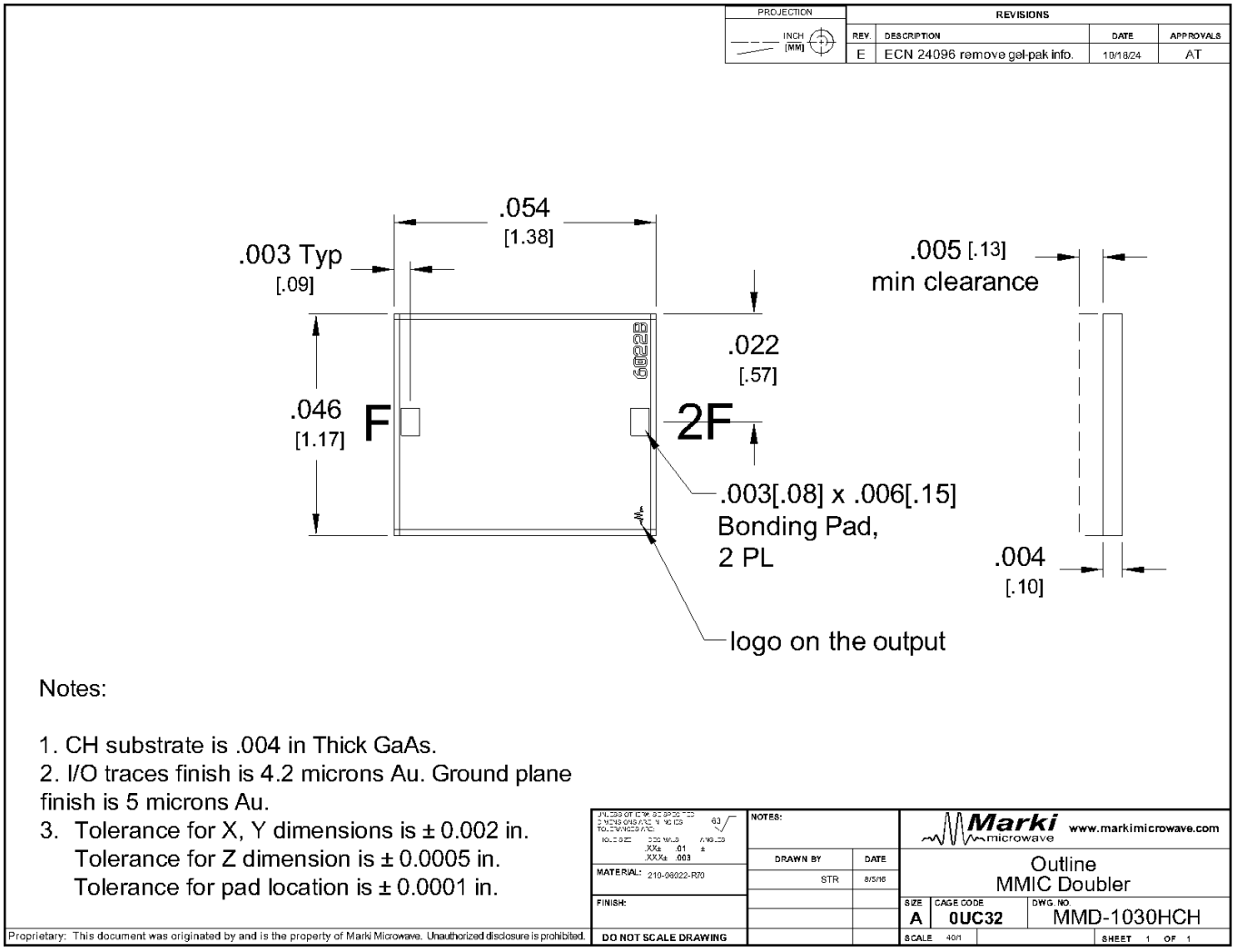
Bonding Diagram



Mechanical Data

Outline Drawing

Download : Outline 2D Drawing



Notes

1. Doubled Loss typically degrades less than 0.5 dB at +100°C and improves less than 0.5 dB at -55°C.
2. Unless otherwise specified, H-Diode data is taken with a +17 dBm input.
3. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
4. Catalog doubler circuits are continually improved. Configuration control requires custom model numbers and specifications.

DISCLAIMER