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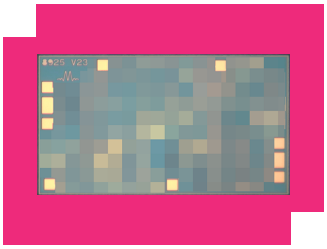
# IADA-2050CH

## Amplifier/Doubler/Amplifier

## DEVICE OVERVIEW

### General Description

The IADA-2050CH is an integrated MMIC active doubler fabricated with GaAs Schottky diodes. This operates over a guaranteed 10 to 25 GHz input frequency range or a doubled output frequency range of 20 to 50 GHz. It features excellent conversion loss, superior isolations and harmonic suppressions across a broad bandwidth. This device is offered as a wirebondable die.



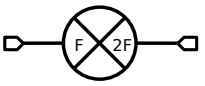
### Features

- Input Frequency Range 10 – 25 GHz
- Output Frequency Range 20 - 50 GHz
- Input Power +5 dBm
- Output Power +18 dBm
- 1F Harmonic suppression 24 dBc
- 3F Harmonic suppression 21 dBc

### Applications

- High frequency synthesis
- LO signal chain

### Functional Block Diagram




### Part Ordering Options

| Part Number | Description | Package | Green Status | Product Lifecycle | Export Classification |
|---|---|---|---|---|---|
| IADA-2050CH | Amplifier/Doubler/Amplifier | CH | REACH RoHS | Released | EAR99 |

## Table Of Contents



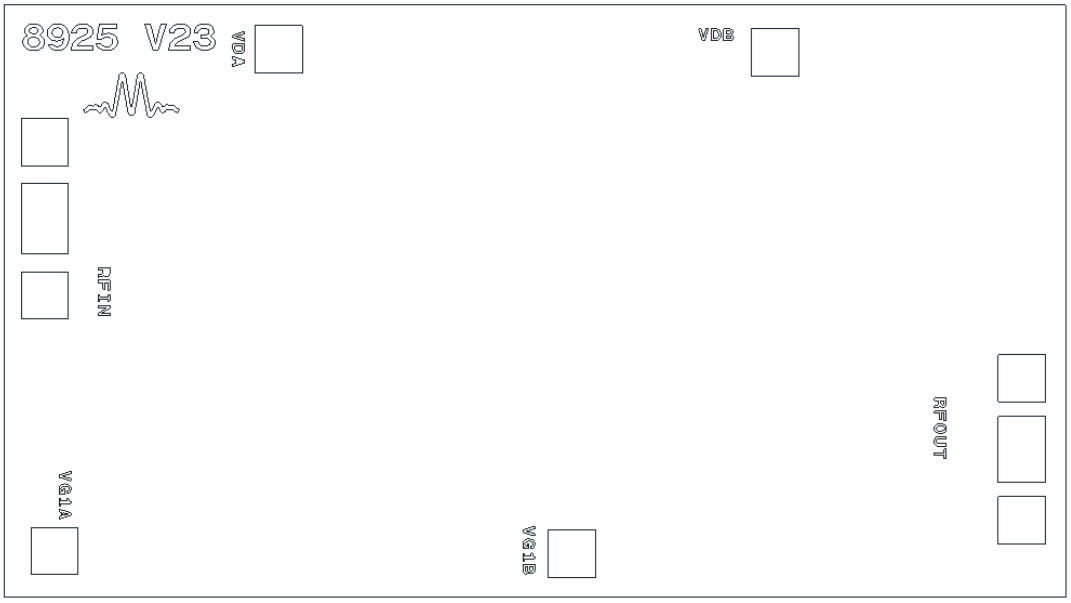
## Revision History

| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2024-07-11 | Initial Release |

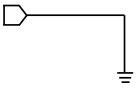
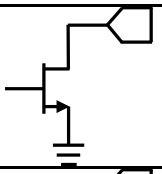
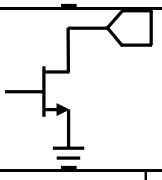
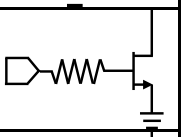
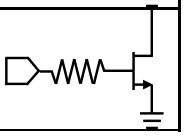
## Port Configuration and Functions

### Port Diagram

A top-down view of the IADA-2050 outline drawing is shown below.



## Port Functions

| Port | Function | Description | DC Equivalent Circuit |
|---|---|---|---|
| GND | Ground | Ground is provided through the backside of the die. The backside must be connected to a DC/RF ground with high thermal and electrical conductivity. |  |
| RF In | Input | This pad is the RF input of the device. This pad is DC open and matched to 50 Ω at frequency range 10 - 25 GHz. |  |
| RF Out | Output | This is the RF output of the device. This pad is DC open and matched to 50 Ω at frequency range 20 – 50 GHz. |  |
| VDA | Positive bias | Drain bias for the input amplifier. This pad must be connected to a positive power supply. Set this voltage to +5V for normal operation. |  |
| VDB | Positive bias | Drain bias for the output amplifier. This pad must be connected to a positive power supply. Set this voltage to +5V for normal operation. |  |
| VG1A | Negative bias | Gate control for the input amplifier. This pad must be connected to a negative power supply. Set this voltage to -0.15V for normal operation. |  |
| VG1B | Negative bias | Gate control for the output amplifier. This pad must be connected to a negative power supply. Set this voltage to -0.15V for normal operation. |  |

## 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 for MTTF > 1E6 hours | 85 | °C |
| Maximum Storage Temperature | 125 | °C |
| Minimum Operating Temperature for MTTF > 1E6 hours | -40 | °C |
| Minimum Storage Temperature | -65 | °C |
| Negative Bias Voltage | -1.5 | V |
| Positive Bias Voltage | 6 | V |
| RF Input Power | 10 | dBm |

### Package Information

| Parameter | Details | Rating |
|---|---|---|
| ESD | 250 to < 500 Volts | HBM Class 1A |
| Dimensions | - | 2.25 x 1.25 mm |

### Recommended Operating Conditions

| Parameter | Min | Nominal | Max | Unit |
|---|---|---|---|---|
| Positive DC Voltage (Vd) | - | 5 | - | V |
| Gate Bias DC Voltage (Vg) | - | -0.15 | - | V |

## Sequencing Requirements

Turn-on Procedure:
1) Apply -0.15V to VG1A and VG1B
2) Apply +5V to VDA and VDB
Turn-off Procedure:
1) Turn off VDA and VDB
2) Turn off VG1A and VG1B

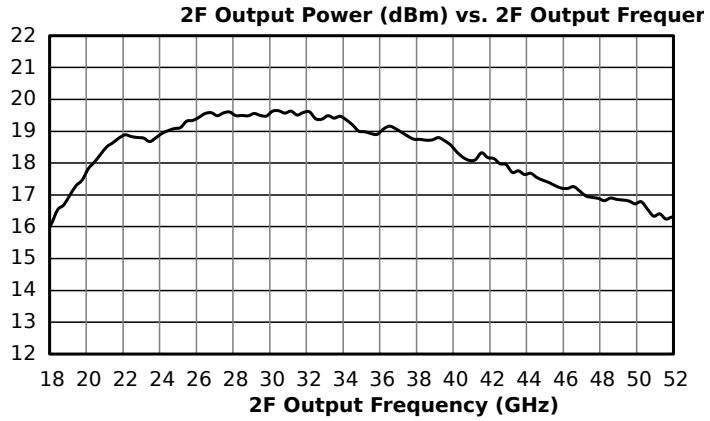
## Electrical Specifications

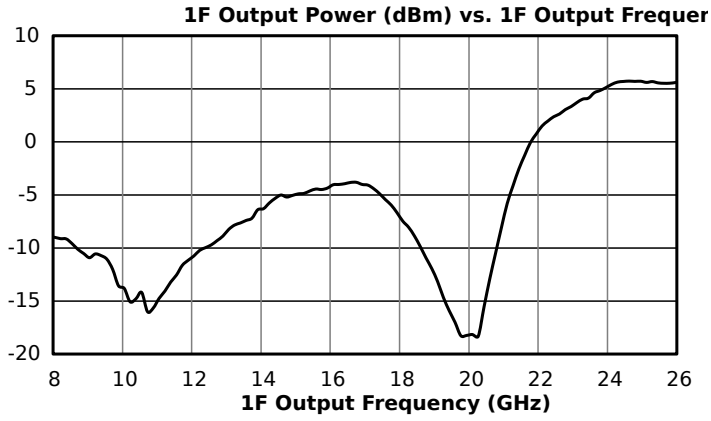
The electrical specifications apply at TA=+25°C in a 50Ω system. Suppression is specified relative to doubled output power.

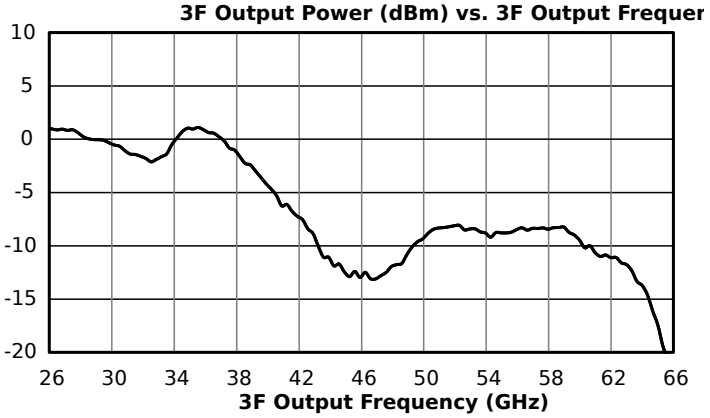
| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Current Consumption [1] | VDA,VDB = 5V | - | - | - | 130 | - | mA |
| Current Consumption [2] | VG1A,VG1B = -0.15V | - | - | - | 0 | - | mA |
| Input Frequency Range | - | - | - | 10 | - | 25 | GHz |
| Input Power | Input = 10.0 - 25.0 GHz | 10 | 25 | - | 5 | - | dBm |
| Input Return Loss | Input = 10.0 - 25.0 GHz | 10 | 25 | - | -14 | - | dB |
| Output Converted Power, 2F (out) | Output = 20.0 - 50.0 GHz | 20 | 50 | - | 18 | - | dBm |
| Output Frequency Range | - | - | - | 20 | - | 50 | GHz |
| Output Return Loss | Output = 20.0 - 50.0 GHz | 20 | 50 | - | -11 | - | dB |
| Suppression, 1F | Output = 20.0 - 50.0 GHz | - | - | - | 24 | - | dBc |
| Suppression, 3F | Output = 20.0 - 50.0 GHz | - | - | - | 21 | - | dBc |

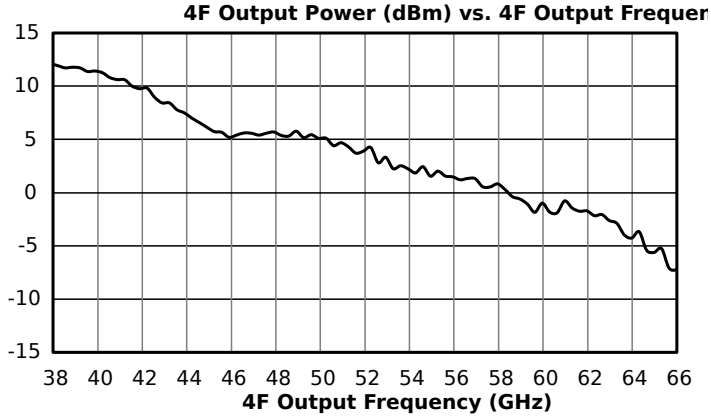
[1] It is required that the negative bias be applied before or concurrent with the positive bias.
[2] It is required that the negative bias be applied before or concurrent with the positive bias.

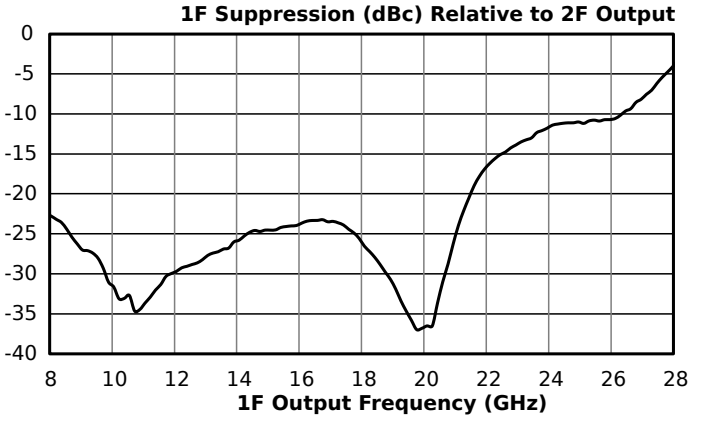
## Typical Performance Plots

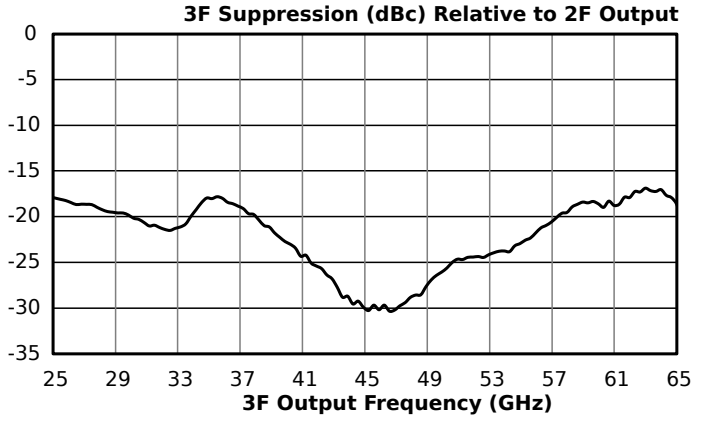


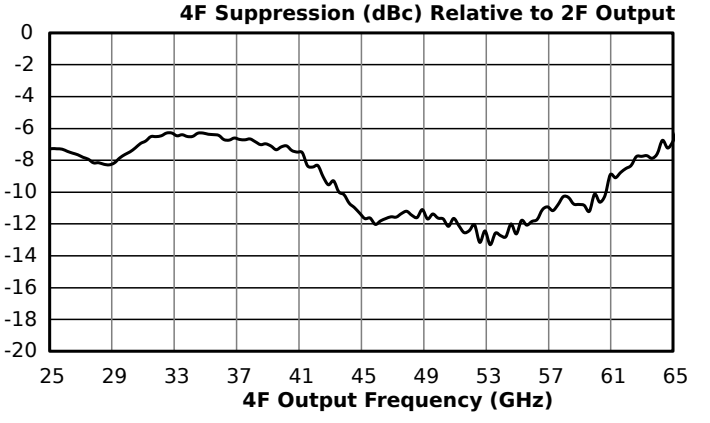



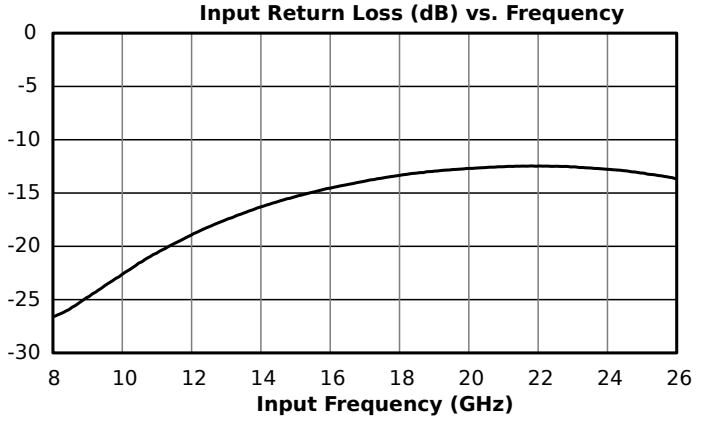



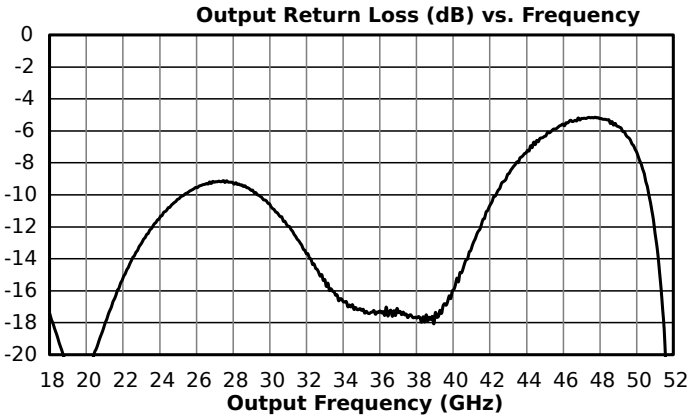



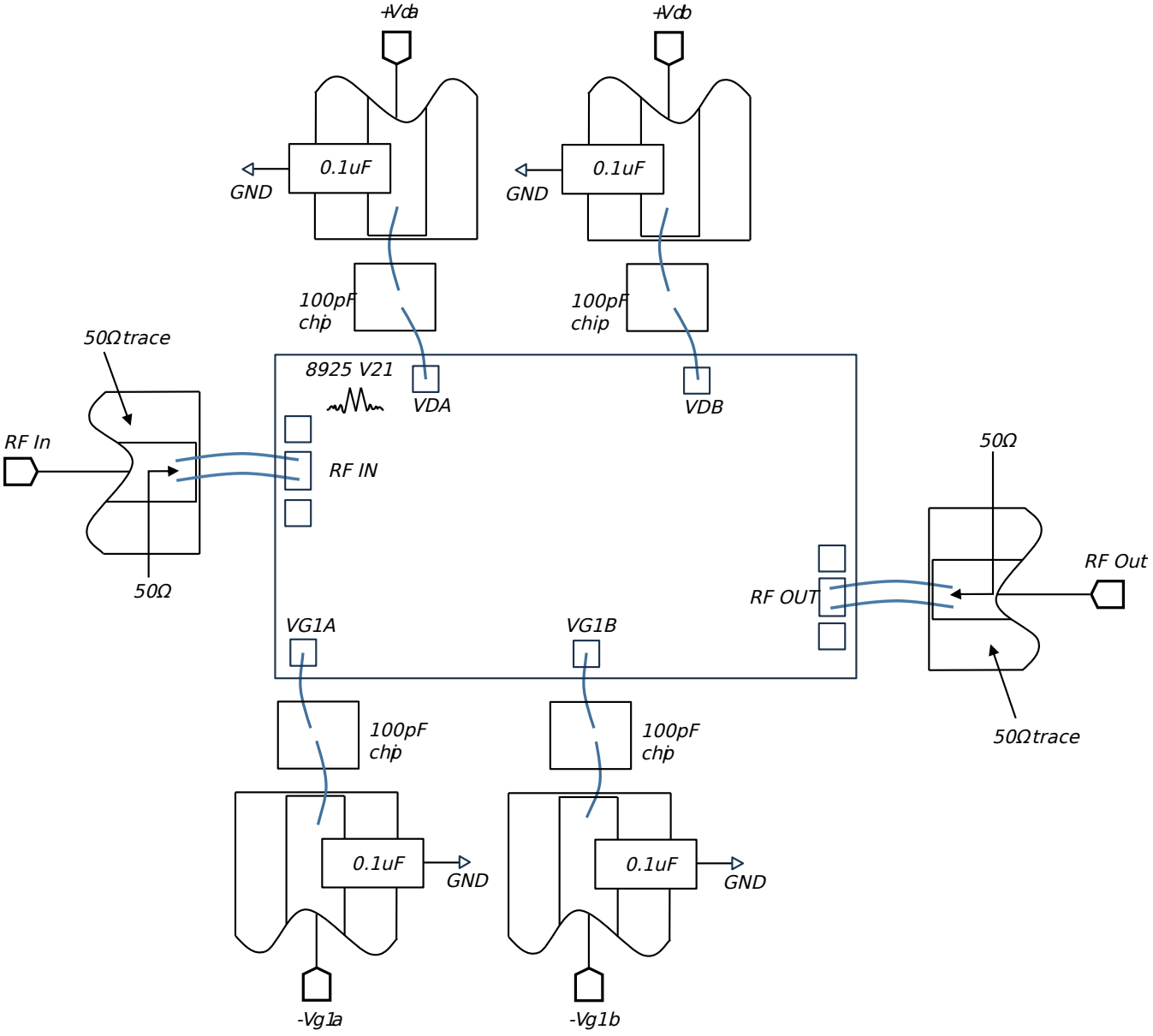





## Application Circuit



## 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.

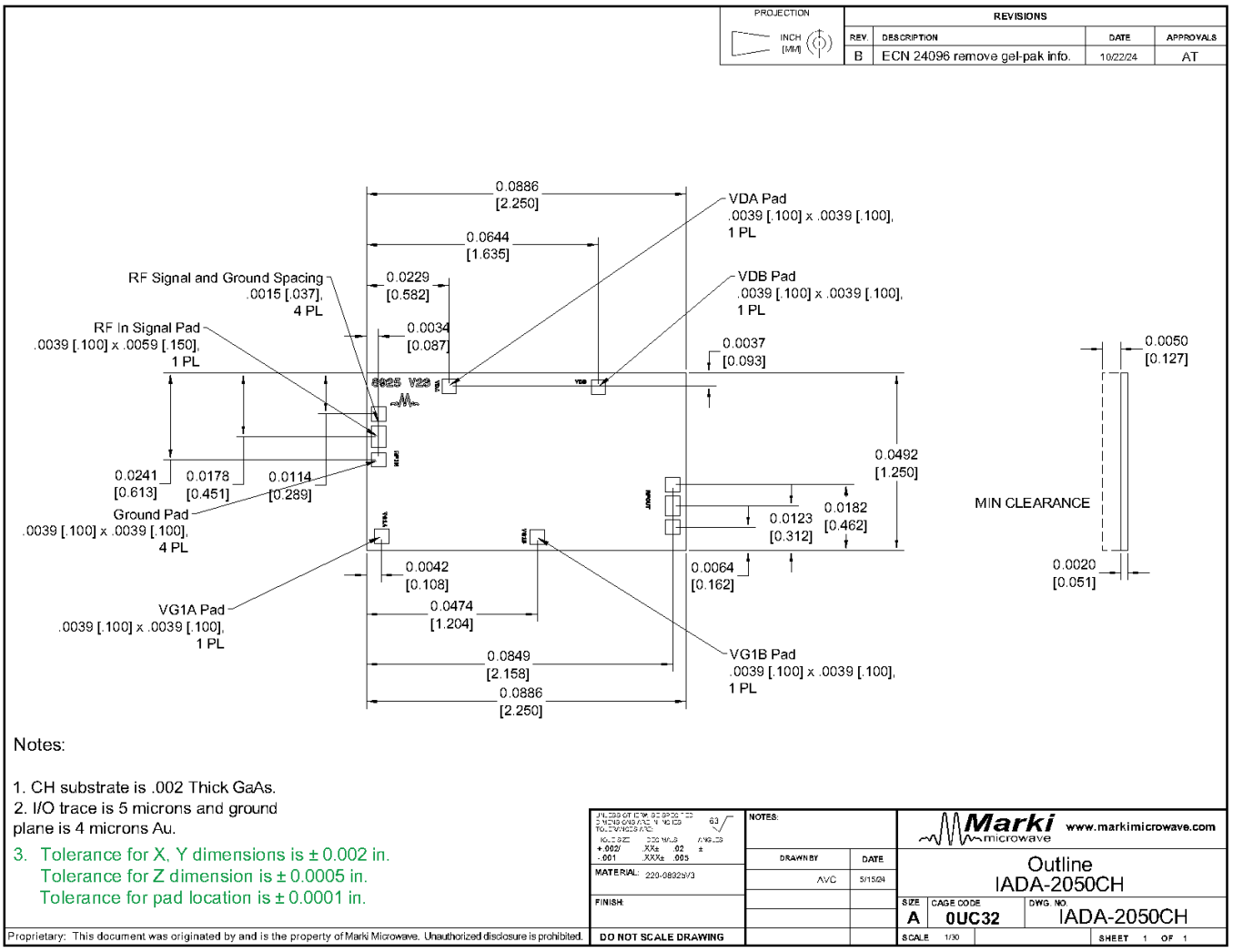
**Static Sensitivity**
GaAs MMIC devices are sensitive to ESD and should be handled, assembled, tested, and transported only in static protected environments.

**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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