

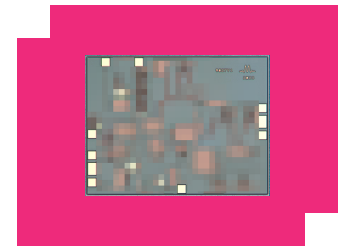
ADM-9027CH

2-24 GHz Distributed Amplifier

DEVICE OVERVIEW

General Description

The ADM-9027CH is a wideband distributed low noise amplifier capable of providing 16 dB gain and +25 dBm OIP3 from 2 to 20 GHz and a low 2.5 dB typical noise figure from 7 to 18 GHz. The ADM-9027CH is an ideal linear signal amplifier for applications requiring low power consumption and small form-factors. The amplifier has excellent return losses and gain flatness and includes integrated DC blocking capacitors and RF choke.



[Download s-parameters here](#)

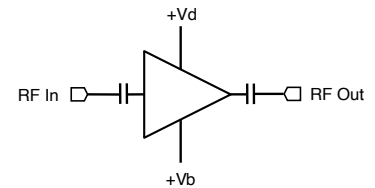
Features

- Broadband 2-24GHz Operation
- Low Noise Figure
- Integrated DC Blocks and RF Choke
- Single Positive Supply Capable
- Excellent Return Losses

Applications

- Communication Systems
- Test and Measurement Equipment
- Satellite Communications
- Electronic Warfare

Functional Block Diagram



Part Ordering Options

| Part Number | Description | Package | Green Status | Product Lifecycle | Export Classification |
|-------------|--------------------------------|---------|--------------|-------------------|-----------------------|
| ADM-9027CH | 2-24 GHz Distributed Amplifier | CH | RoHS | Released | EAR99 |

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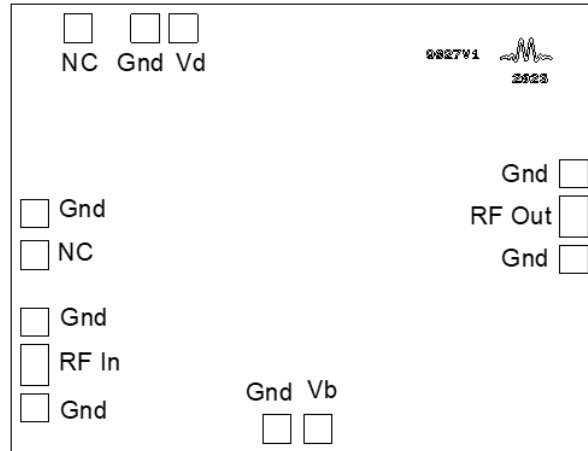
Revision History

| Revision Code | Revision Date | Comment |
|---------------|---------------|---------------------------|
| - | 2024-04-08 | Datasheet Initial Release |

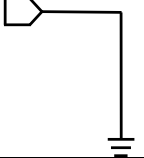
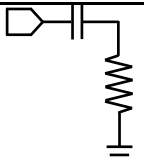
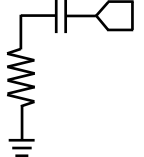
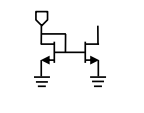
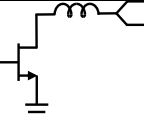
Port Configuration and Functions

Port Diagram

A port diagram of the ADM-9027CH is shown below.



Port Functions

| Port | Function | Description | Equivalent Circuit for Package |
|--------|----------------------------|--|---|
| GND | Ground | DC and RF Ground is provided through the backside of the die. |  |
| NC | Non-connect (NC) | Do not connect to or ground these pads. Leave them floating for normal operation. | - |
| RF In | RF Input | This is the amplifiers RF input port. It is internally matched to 50 Ohms and is internally DC blocked. |  |
| RF Out | RF Output | This is the amplifiers RF output port. This port is internally matched to 50 Ohms and is internally DC blocked. |  |
| Vb | Positive Bias Pin | This is the positive DC bias voltage for the amplifier IC. The voltage at this pin controls the current draw I_d of the part. Higher voltage results in higher current. For normal operation, the voltage at this pin is adjusted to produce an I_d of 60mA when $V_d=6V$. Alternatively, it is possible to use a single positive voltage supply and a 751Ohm resistor between V_d and V_b pins. This part requires off-chip bypass capacitors of 100pF and 0.1uF installed at this pin as close to the IC as possible. See applications circuit. |  |
| Vd | Positive DC Supply Voltage | This is the positive DC supply voltage for the amplifier IC. This pin is nominally set to +6V. This part requires off-chip bypass capacitors of 100pF and 0.1uF installed at this pin as close to the IC as possible. See applications circuit. |  |

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If any one of these limits are exceeded, the device may become inoperable or have a reduced lifetime. Reliability limits are individual, instantaneous catastrophic limits only. Functional operation limits are indicated below. Operation of the device at multiple absolute maximum limits or for extended periods at a single limit can cause degradation and damage to the device.

| Parameter | Maximum Rating | Unit |
|--|----------------|------|
| Bias Supply Voltage (Vb) | 6.5 | V |
| Drain Current (Id) (No RF Applied) | 85 | mA |
| 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 |
| Positive Drain Supply Voltage (Vd) | 8 | V |
| RF Input Power | 15 | dBm |

Package Information

| Parameter | Details | Rating |
|------------|---------|--------------|
| Dimensions | - | 2.3 x 1.75mm |

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 |
|--|-----|---------|-----|------|
| Positive DC Current (Id) (No RF Input) | 50 | 60 | 77 | mA |
| Positive DC Bias Voltage (Vb) | 2 | 2.3 | 3 | V |
| Ambient Temperature | -40 | 25 | 85 | °C |
| Positive DC Voltage (Vd) | 5 | 6 | 7 | V |

Sequencing Requirements

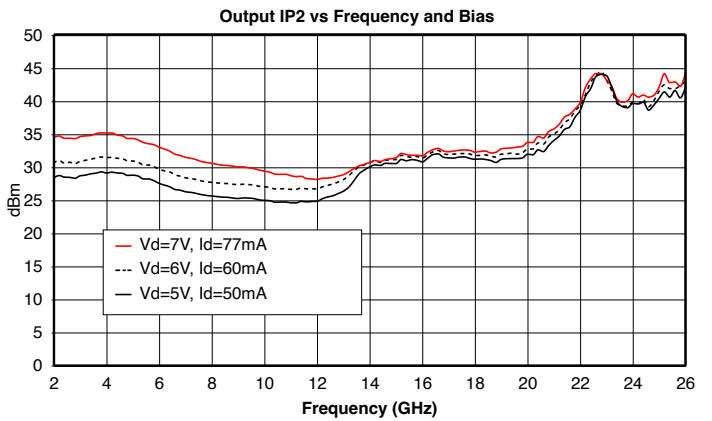
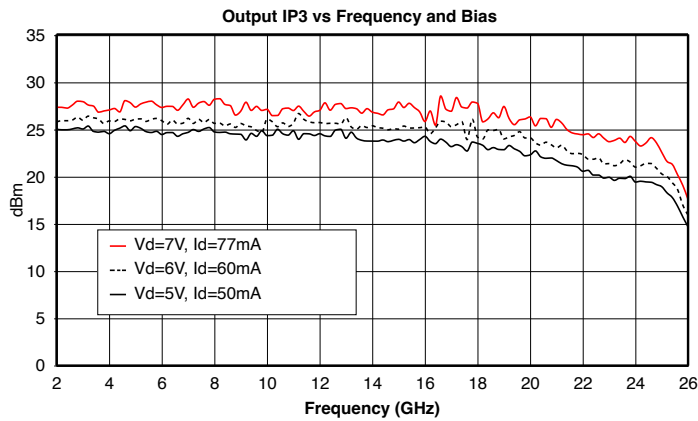
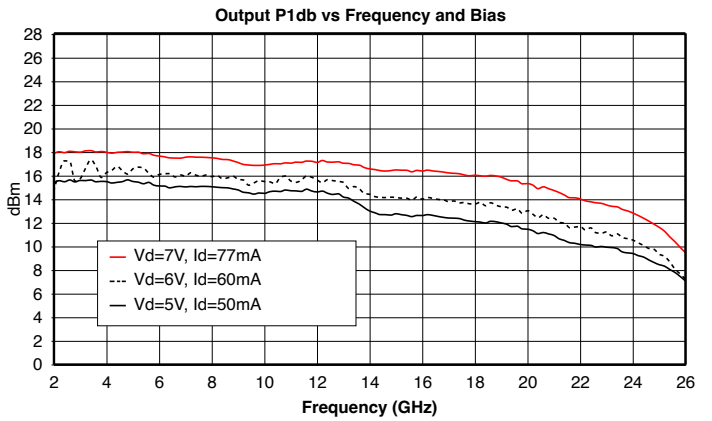
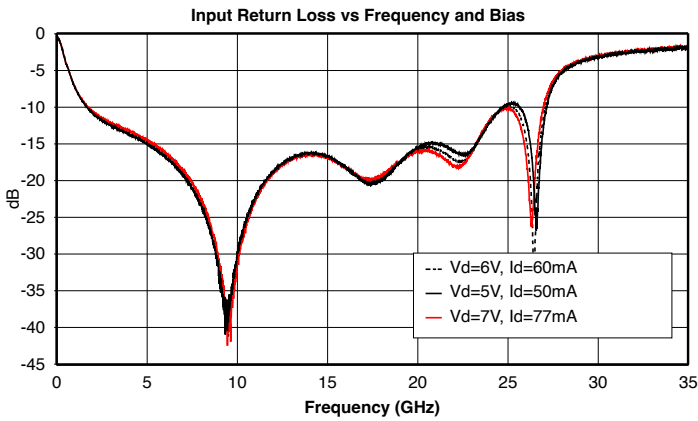
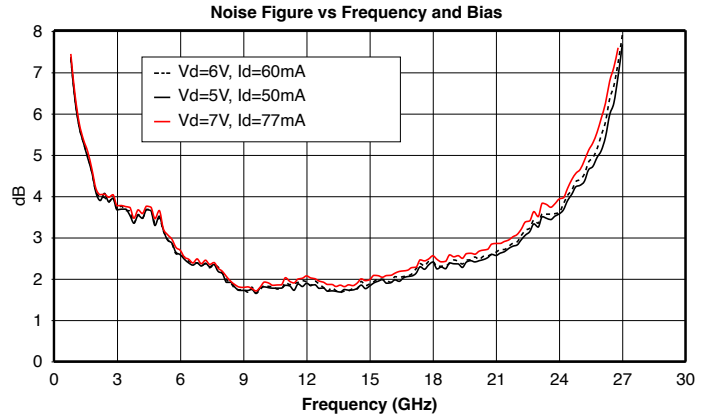
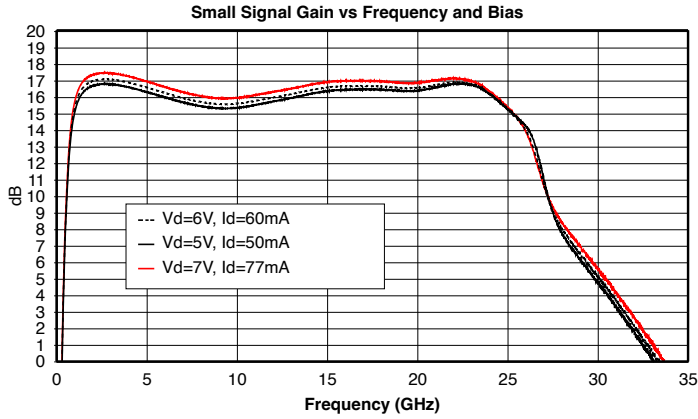
There is no sequencing required to power up or power down the amplifier. The amplifier must have an output load connected during operation.

Electrical Specifications

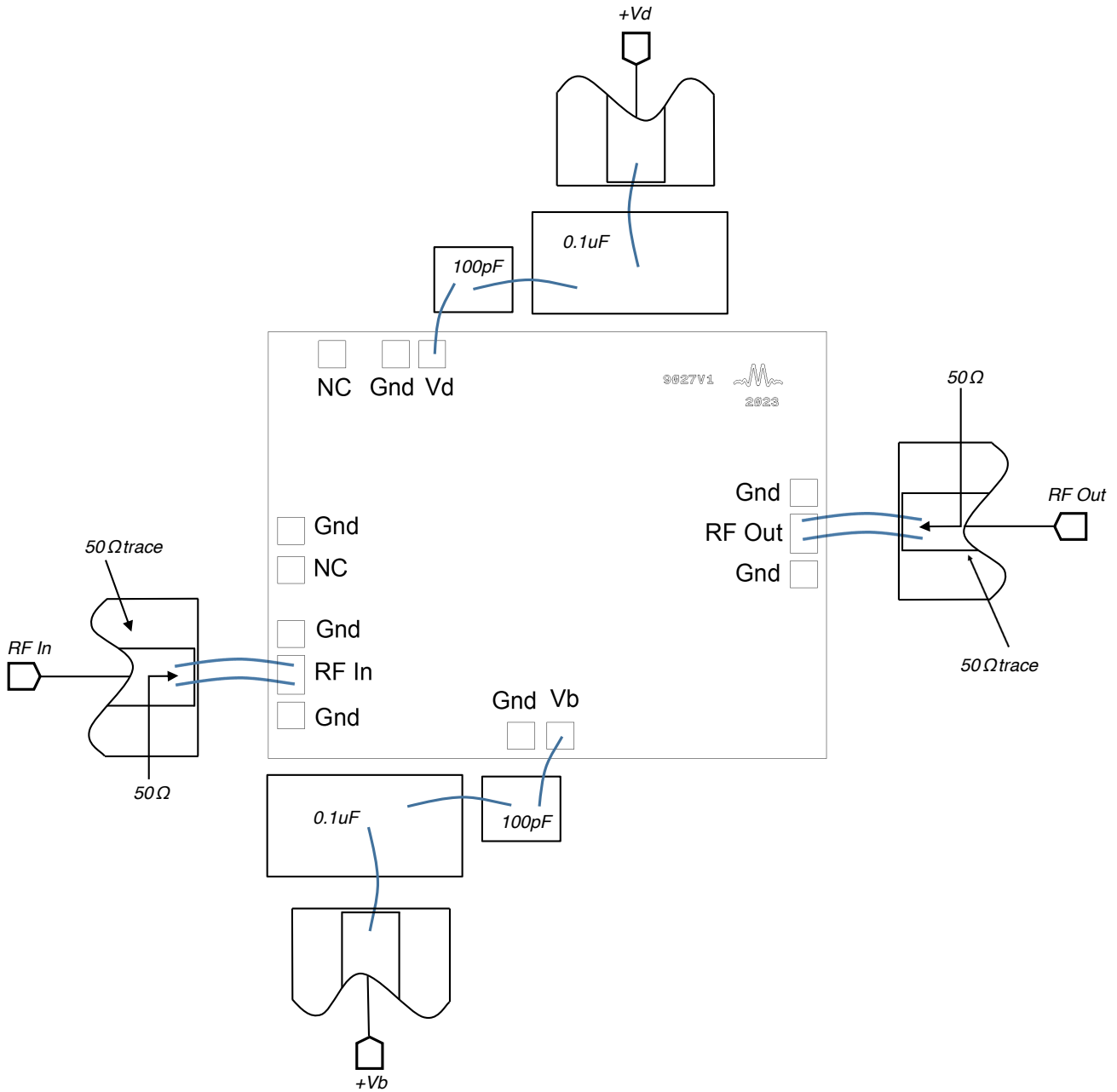
Unless otherwise specified, electrical specifications apply at TA=+25°C, Vd = 6V and Vb set such that Id=60mA.

| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|--------------------|-----------------|-------------------------|-------------------------|-----|-----|-----|------|
| Input Return Loss | Vd=6V, Id=60mA | 2 | 24 | - | 15 | - | dB |
| Noise Figure | Vd=6V, Id=60mA | 7 | 18 | - | 2.5 | - | dB |
| Noise Figure | Vd=6V, Id=60mA | 18 | 24 | - | 3.5 | - | dB |
| Noise Figure | Vd=6V, Id=60mA | 2 | 7 | - | 3.5 | - | dB |
| Output IP3 | Vd=6V, Id=60mA | 2 | 20 | - | 25 | - | dBm |
| Output IP3 | Vd=6V, Id=60mA | 20 | 24 | - | 22 | - | dBm |
| Output P1dB | Vd=6V, Id=60mA | 2 | 12 | - | 16 | - | dBm |
| Output P1dB | Vd=6V, Id=60mA | 12 | 24 | - | 13 | - | dBm |
| Output Return Loss | Vd=6V, Id=60mA | 2 | 24 | - | 15 | - | dB |
| Reverse Isolation | Vd=6V, Id=60mA | 2 | 24 | - | 40 | - | dB |
| Small Signal Gain | Vd=6V, Id=60mA | 2 | 24 | 14 | 16 | - | dB |

Typical Performance Plots



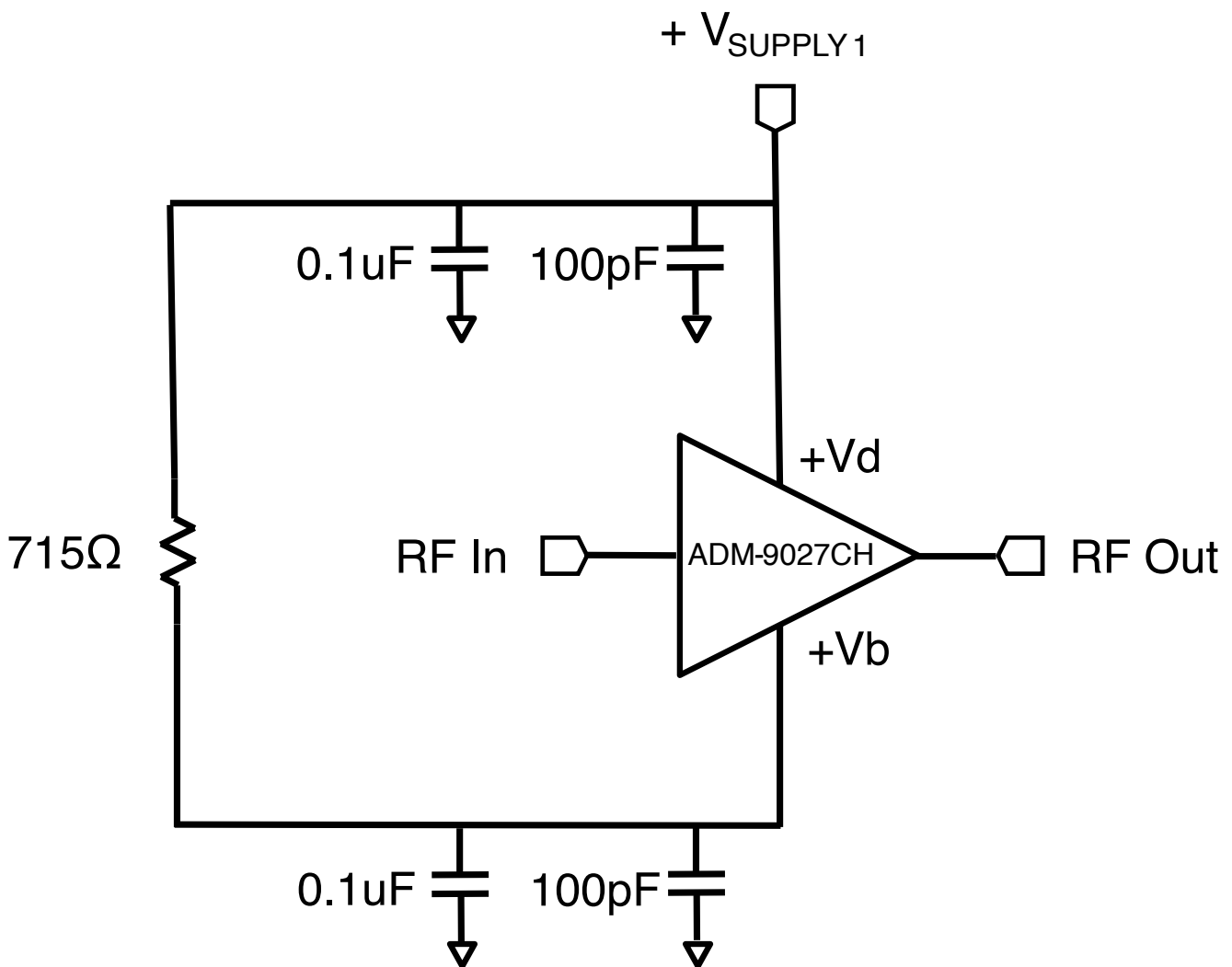
Application Circuit



Application Circuit Description

Above is the recommended application circuit for the ADM-9027CH. Multiple DC power supply bypassing capacitors are shown around the die. These capacitors are of the vertical wire-bondable type. DC drain voltage is supplied to the amplifier across a 0.1uF+100pF bypass capacitor combination to the Vd pad. DC bias voltage is supplied to the Vb pad across a 0.1uF+100pF bypass capacitor combination. 50 Ohm RF input and output traces should be bonded to the ADM-9027CH using 2 bondwires as shown in the diagram above.

An alternate application circuit allows for the use of a single positive DC supply to provide voltage to both Vd and Vb pins simultaneously. Decoupling capacitors are kept in the same arrangement as the dual supply circuit but a 715 Ohm resistor is added in series between the Vd and Vb pads. The supply is connected directly to Vd and daisy-chained to Vb via the series 715 Ohm resistor. The alternate circuit is illustrated below.



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.

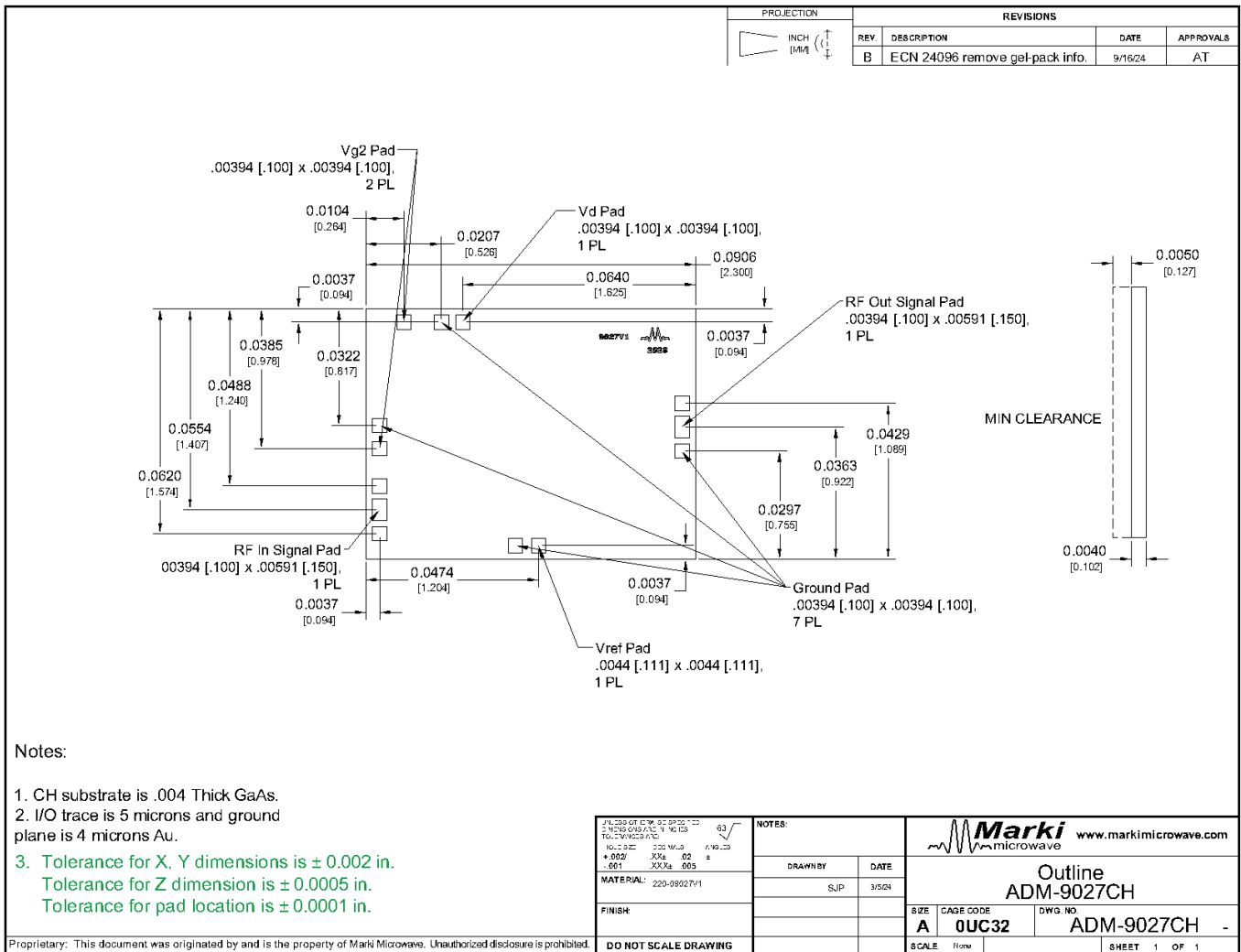
Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wire bonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. Bond wire inductance will improve return loss. Bondwire inductance in the range of 30pH to 200pH will improve performance.

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.

Mechanical Data

Outline Drawing

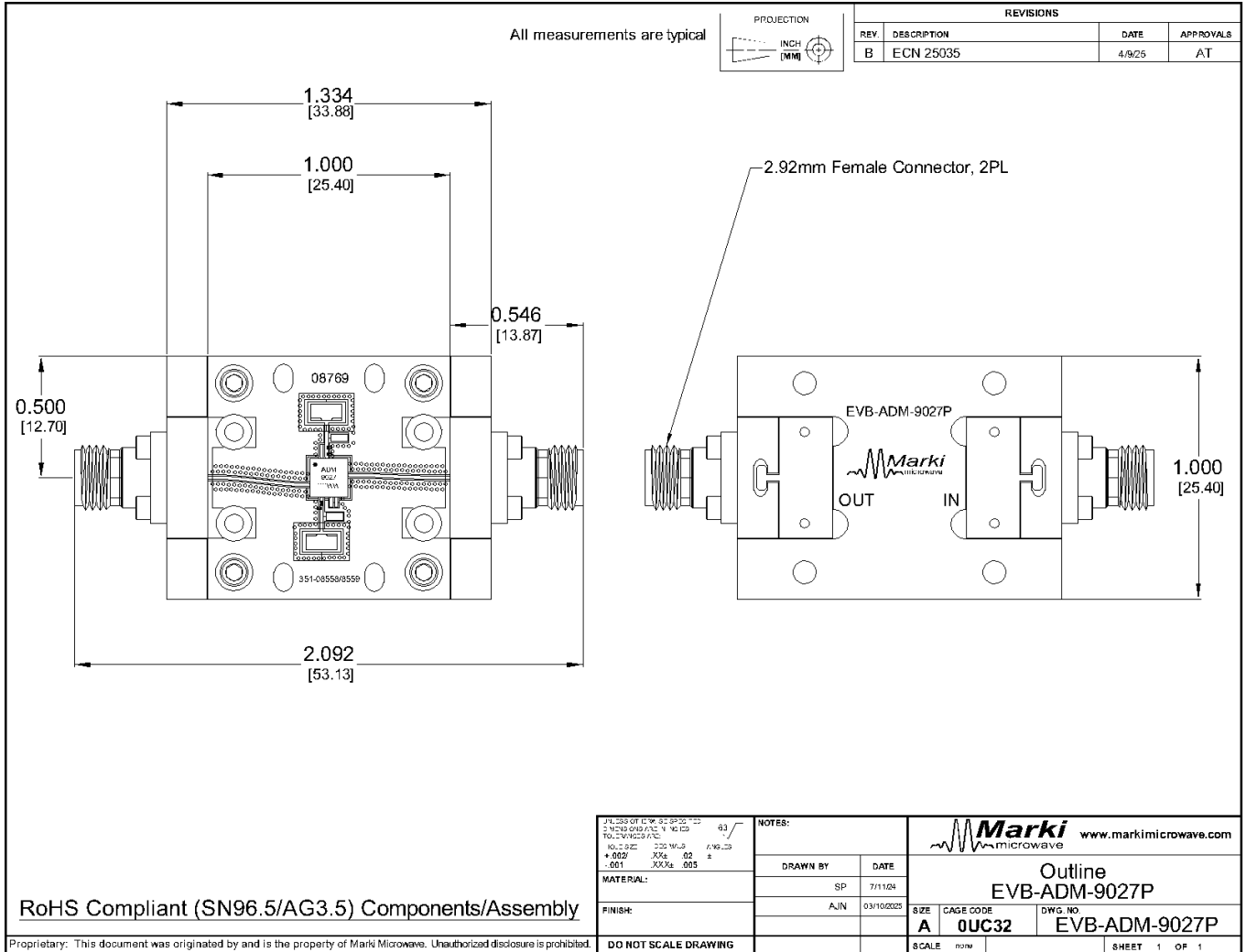
Download : [Outline 2D Drawing](#)



Notes:

- CH substrate is 0.004 thick GaAs
- I/O trace is 5 microns and ground plane is 4 microns Au.
- Tolerance for X,Y dimensions is ±0.002in.
- Tolerance for Z dimension is ±0.0005in.
- Tolerance for pad location is ±0.0001in.

Evaluation Board - Outline Drawing



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