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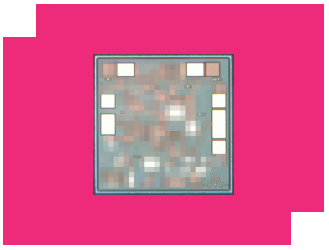
# ADM-8095CH

## 0.09 - 10 GHz High Dynamic Range Gain Block

## DEVICE OVERVIEW

### General Description

The ADM-8095CH is a high-linearity amplifier capable of providing +20 dBm output power up to 10 GHz. The ADM-8095CH can serve either as a linear signal amplifier, or as a saturated driver amplifier for H- or S-diode mixers. The amplifier has excellent return losses and gain flatness.



Download s-parameters here

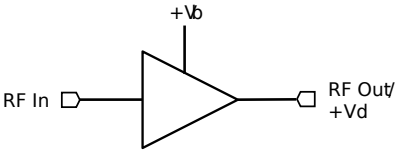
### Features

- +21 dBm output power
- +18 dB gain
- 1.2 dB noise figure
- Gain flatness
- Excellent Return Losses
- Single-supply, positive only bias

### Applications

- Mobile test and measurement equipment
- Driver Amplifier for H and S - Diode Mixers
- Radar
- SATCOM

### Functional Block Diagram




### Part Ordering Options

| Part Number | Description | Package | Green Status | Product Lifecycle | Export Classification |
|---|---|---|---|---|---|
| ADM-8095CH | 0.09 - 10 GHz High Dynamic Range Gain Block | CH | REACH RoHS | Released | EAR99 |

## Table Of Contents



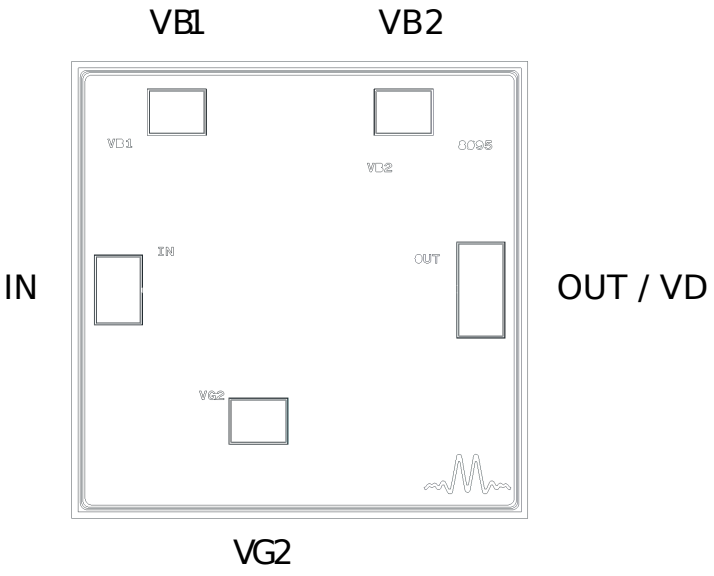
## Revision History

| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2023-12-13 | Initial Datasheet Release |
| A | 2024-02-27 | Updated RF Input Power Handling |

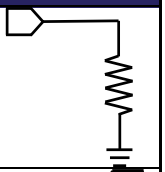
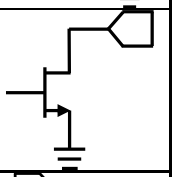
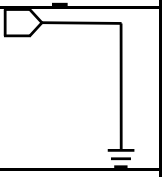
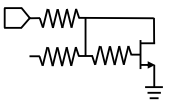
## Port Configuration and Functions

### Port Diagram

A port diagram of the ADM-8095CH is shown below.



## Port Functions

| Port | Function | Description | Equivalent Circuit for Package |
|---|---|---|---|
| IN | RF Input | The amplifier's RF Input pad, this pad requires and external blocking capacitor and external stability network as shown in the application schematic. |  |
| OUT / VD | Drain Supply / RF Output | This pad is the RF Output port and is also the Vd port providing the main power supply to the amplifier. This pad is DC coupled and requires an external bias-T or discrete choke and DC blocking capacitor. This port is RF matched to 50 Ω. DC voltage at this pin should be set to 5V for normal operation. |  |
| Paddle | Ground | GND is provided through the backside of the die. |  |
| VB1 | Non-connect (NC) | This pad should not be connected. | - |
| VB2 | Positive bias | This pad provides DC bias to the amplifier. Placement of an external series bias resistor allows this pad to be supplied by the same supply line providing 5V to the RF Out/Vd pad For normal operation at 5V Vd, the recommended series bias resistor value is 3.3kΩ. Device drain current will change proportional to the current flowing into this pin. RF performance can be balanced with DC power consumption by adjusting this current. |  |
| VG2 | Non-connect (NC) | This pad should not be connected. | - |

## 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 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 Voltage (Vb) | 4 | V |
| Drain Current (RF Applied) | 90 | mA |
| Drain Supply Voltage (Vd) | 8 | V |
| Maximum Operating Temperature for MTTF > 1E6 hours | 85 | °C |
| Maximum Storage Temperature | 125 | °C |
| Max Junction Temperature for MTTF of 1E6 hours | 175 | °C |
| Max Power Dissipation for MTTF of 1E6 hours | 0.26 | W |
| Minimum Operating Temperature for MTTF > 1E6 hours | -40 | °C |
| Minimum Storage Temperature | -65 | °C |
| RF Input Power | 20 | dBm |

### Package Information

| Parameter | Details | Rating |
|---|---|---|
| Dimensions | - | 1.05 x 1.05 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 |
|---|---|---|---|---|
| Power Supply DC Voltage (Vd) | 3 | 5 | 6 | V |
| Power Supply DC Current (Id) (No RF Input) [1] | 21 | 39 | 47 | mA |
| Input Power for Saturation | 2 | 4 | 6 | - |
| Ambient Temperature | -40 | 25 | 85 | °C |

[1] Recommended operating current conditions without RF input applied.

## Sequencing Requirements

There is no sequencing required to power up or power down the amplifier. An output load is recommended to be connected to the amplifier during operation.

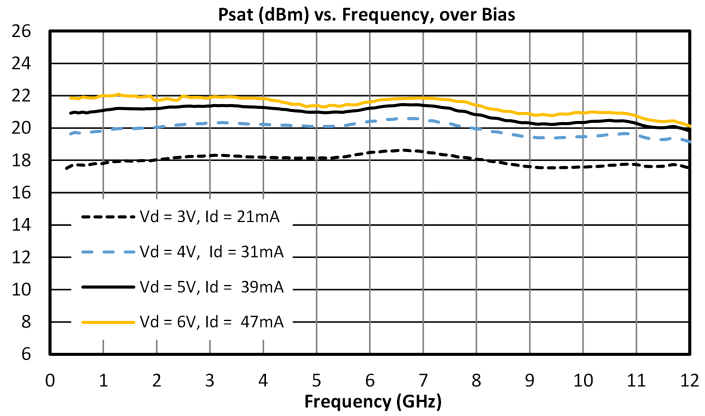
## Electrical Specifications

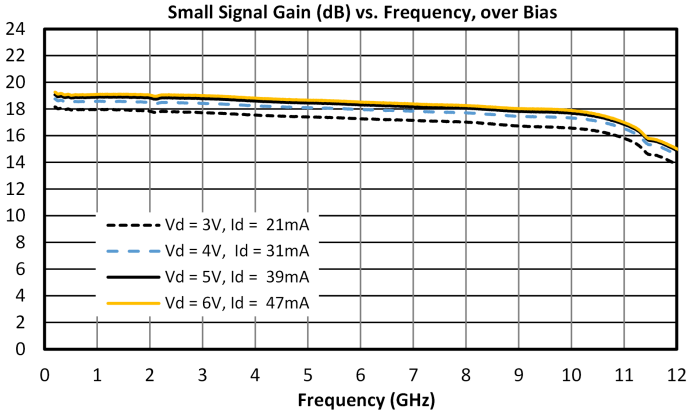
Unless otherwise specified, electrical specifications apply at TA=+25°C, Rb=3.3k, Vd = 5V, and Vb = 5 V.

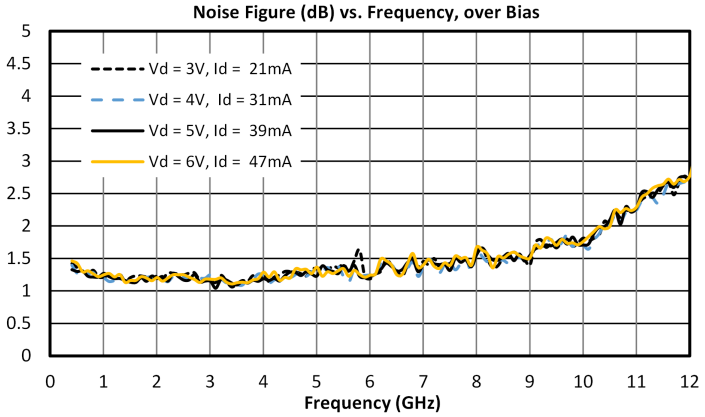
| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Output IP2 | Vd, Vb = 5V, Pin = -15 dBm per tone, 10 MHz tone spacing | 6 | 10 | - | 30 | - | dBm |
| Output IP2 | Vd,Vb = 5V, Pin = -15dBm per tone, 10 MHz tone spacing | 0.09 | 6 | - | 33 | - | dBm |
| DC Supply Quiescent Current (Idq) | Vd,Vb = 5 V, no RF input | - | - | - | 39 | - | mA |
| Input IP3 | Vd,Vb = 5 V, Pin = -15 dBm per tone, 10 MHz tone spacing | 0.09 | 10 | - | 14 | - | dBm |
| Input Power for Saturation | Vd,Vb = 5V | 0.09 | 10 | - | 4 | - | dBm |
| Input Return Loss | Vd,Vb = 5 V, Pin = -20 dBm | 0.09 | 10 | - | 17 | - | dB |
| Noise Figure | Vd,Vb = 5 V, Pin = -20 dBm | 0.2 | 5 | - | 1.2 | - | dB |
| Noise Figure | Vd,Vb = 5 V, Pin = -20 dBm | 5 | 10 | - | 1.5 | - | dB |
| Output IP3 | Vd,Vb = 5 V, Pin = -15 dBm per tone, 10 MHz tone spacing | 0.09 | 10 | - | 30 | - | dBm |
| Output P1dB | Vd,Vb = 5V | 0.09 | 10 | - | 18 | - | dBm |
| Output Power | Vd,Vb = 5 V | 0.09 | 10 | - | 21 | - | dBm |
| Output Return Loss | Vd,Vb = 5 V, Pin = -20 dBm | 0.09 | 10 | - | 21 | - | dB |
| Reverse Isolation | Vd,Vb = 5 V, Pin = -20 dBm | 0.09 | 10 | - | 23 | - | dB |
| Small Signal Gain | Vd,Vb = 5 V, Pin = -20 dBm | 0.09 | 10 | - | 18 | - | dB |

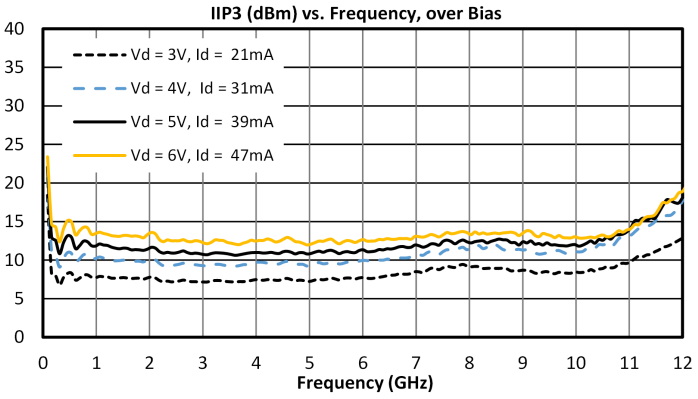
Performance plots measured with Vb resistor of 3.3k Ohms. Psat, Small Signal Gain and Noise Figure plots have fixture losses de-embedded.

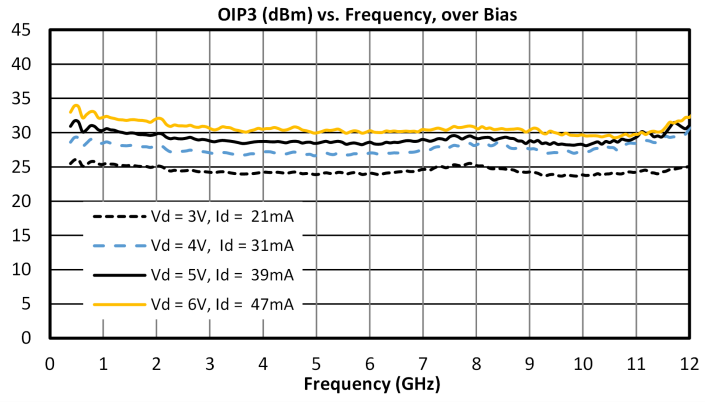
## ADM-8095CH Typical Performance Plots

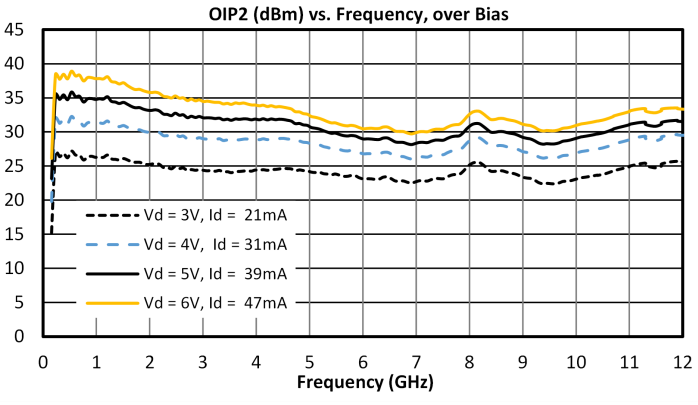


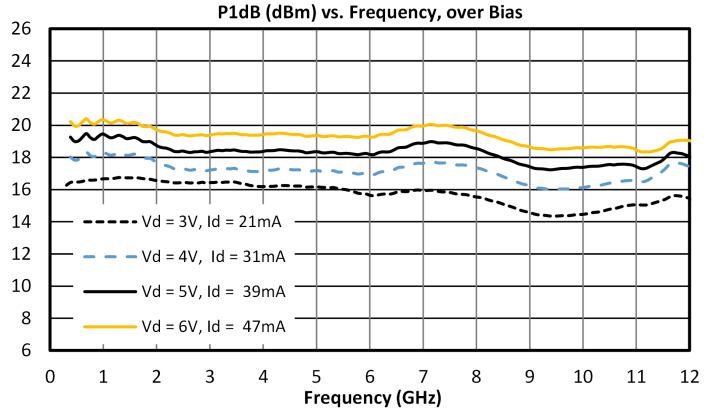



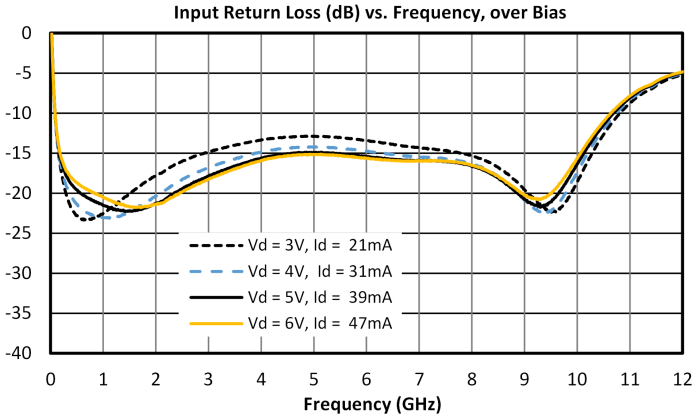



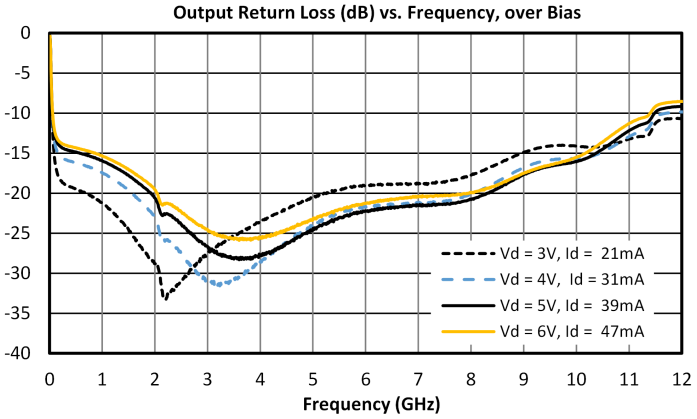



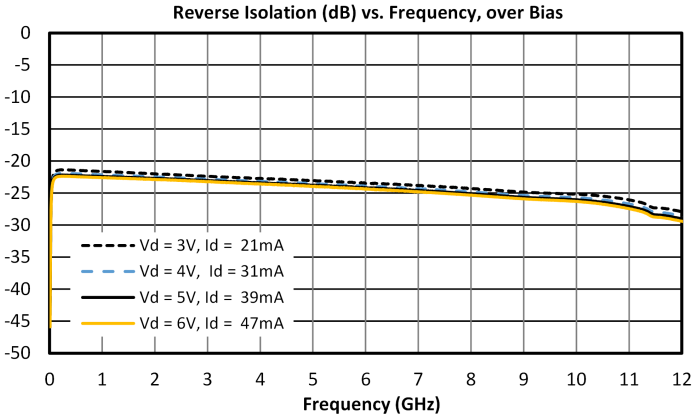
# ADM-8095CH

## 0.09 - 10 GHz High Dynamic Range Gain Block

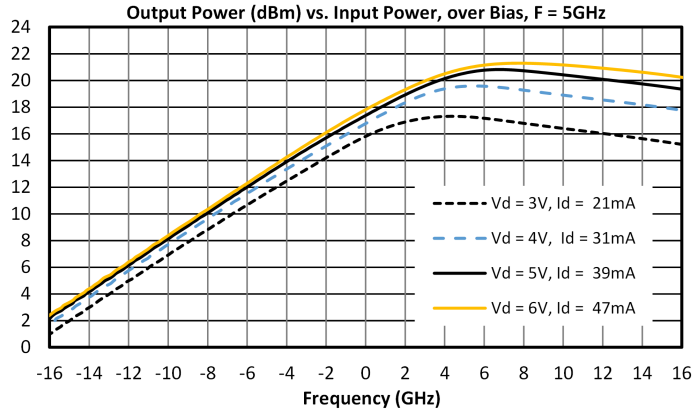
Output Return Loss (dB) vs. Frequency, over Bias



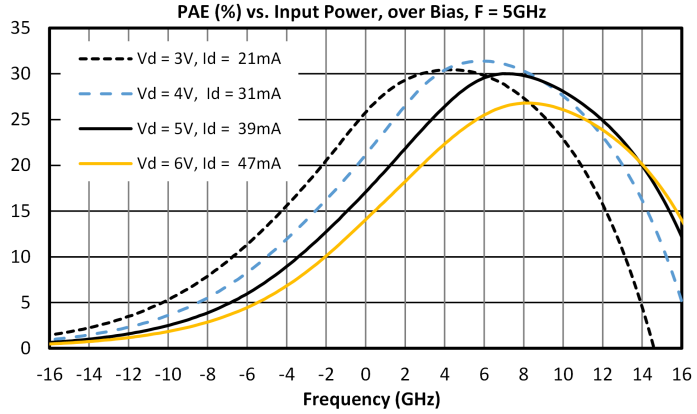

Reverse Isolation (dB) vs. Frequency, over Bias



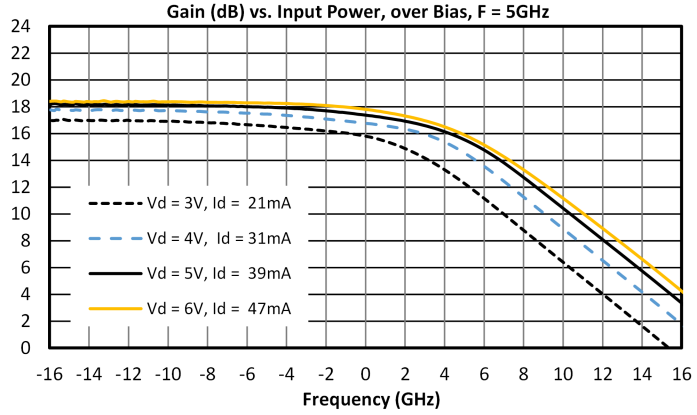

Output Power (dBm) vs. Input Power, over Bias, F = 5GHz



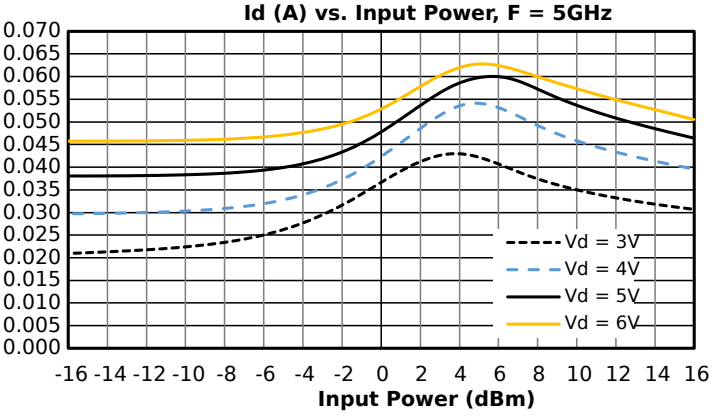

PAE (%) vs. Input Power, over Bias, F = 5GHz




Gain (dB) vs. Input Power, over Bias, F = 5GHz



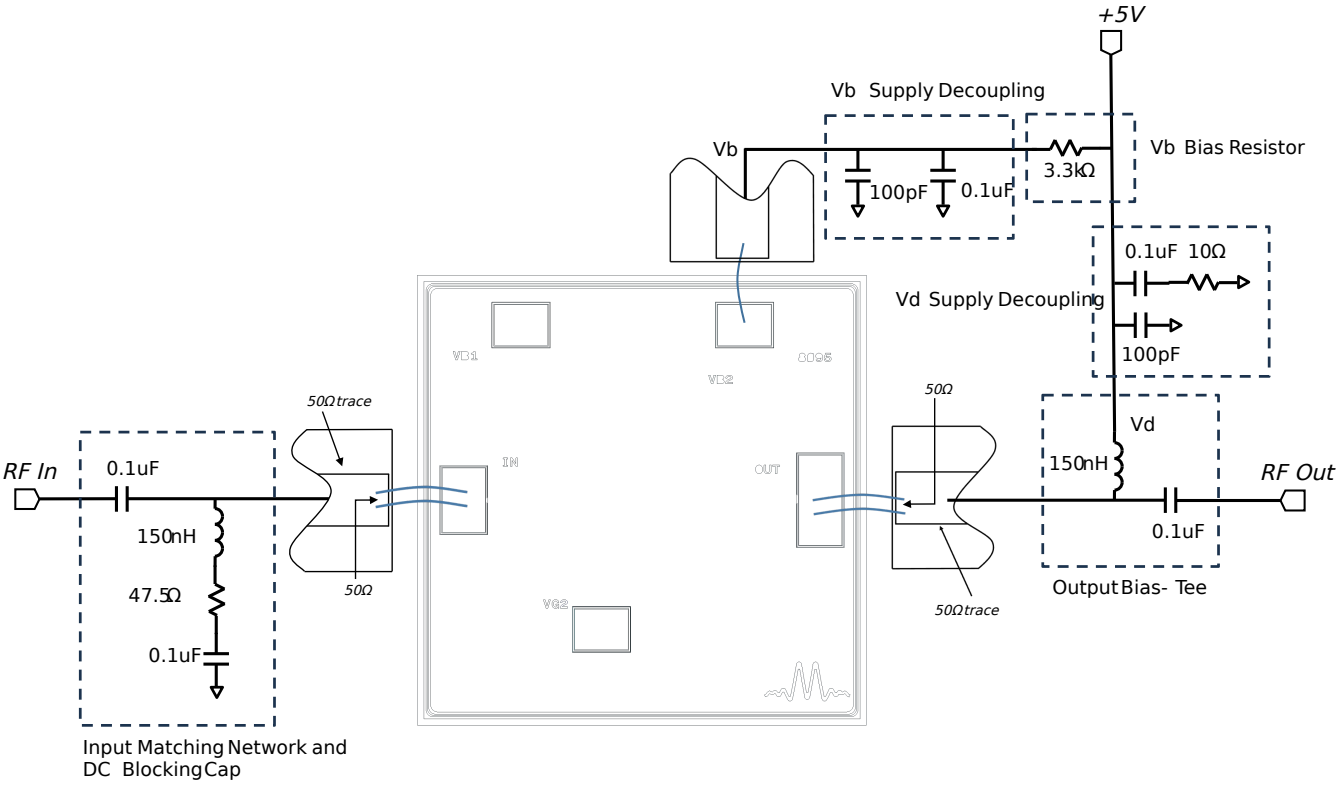

Id (A) vs. Input Power, F = 5GHz



## Application Information

Below is the recommended application circuit for the ADM-8095CH. DC power is supplied to RF Out/Vd pad via a 150 nH choke inductor. Supply bypassing is provided by 100pf and 0.1uF capacitors. Drain current Id is controlled by applying voltage to the VB2 pad. Drain current Id is adjusted proportionally to the current flowing into VB2 pad with higher Vb and Ib resulting in increased current Id. Amplifier performance can therefore be optimized for specific applications by adjusting the value of the series resistor on the Vb line. In particular, OIP3 across the band and especially at low voltage Vd can be improved from that shown in Typical Performance Plots by increasing current into VB2 pad. The OIP3 can be improved by up to 4dB with the tradeoff being increased quiescent DC power consumption (See ADM1-8095PC datasheet). The default value for the Vb resistor is 3.3k Ohms. For higher OIP3, it should be reduced to 453 Ohms. The ADM-8095CH requires an RF input matching network at RF IN pad as shown. DC blocking capacitors are also required at RF input and output pads as shown.

## 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 willprevent resonances and permit the best possible electrical performance. Datasheetperformance 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 themounting surface so that a thin epoxy fillet is observed around the perimeter of the chip.Cure epoxy according to manufacturer instructions.

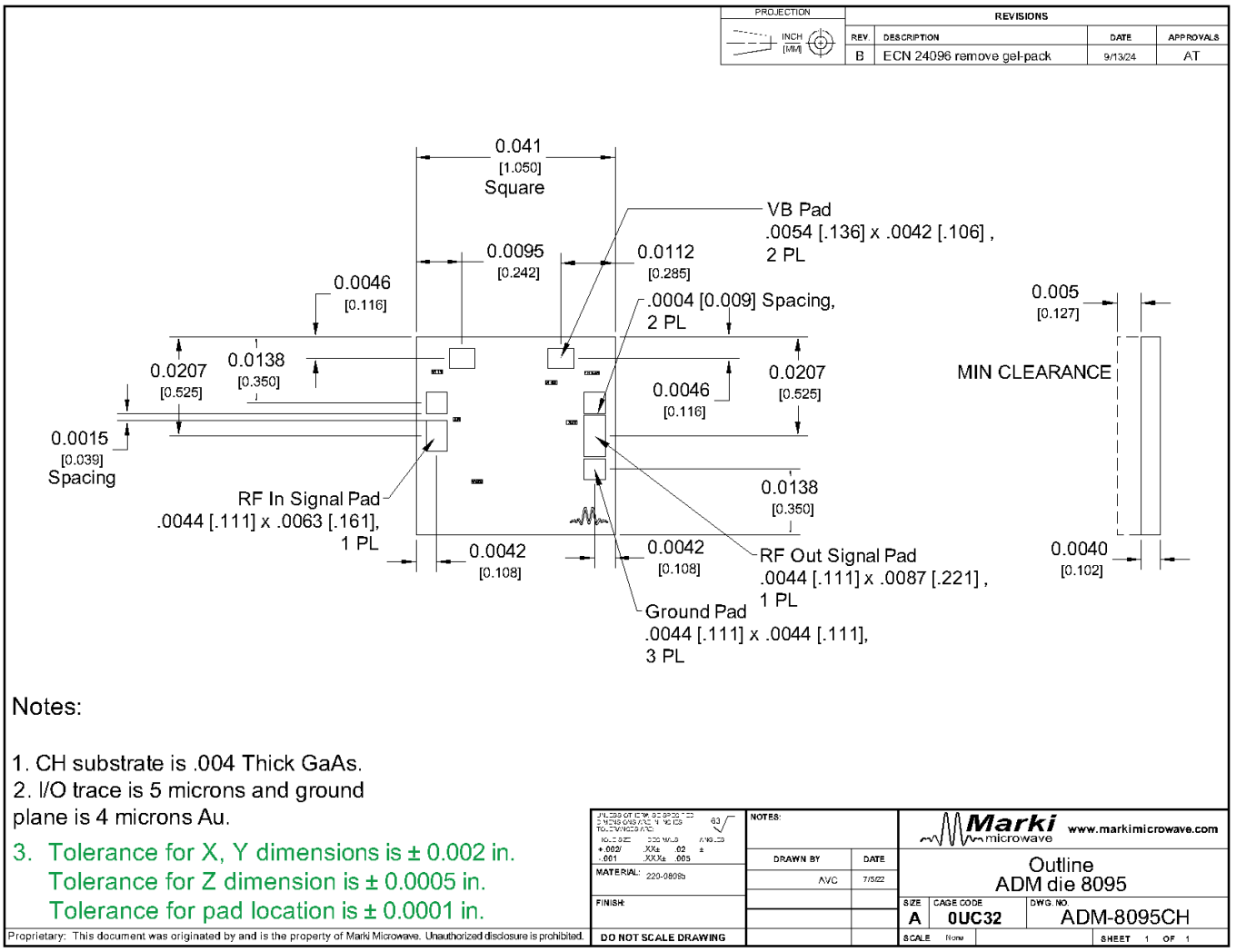
Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire.Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bondingforce of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Usethe minimum level of ultrasonic energy to achieve reliable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

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

## Mechanical Data

## Outline Drawing

Download : Outline 2D Drawing



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