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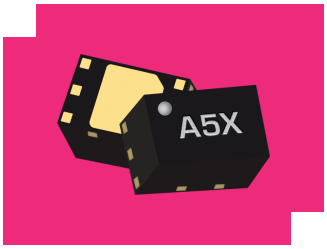
ADM-8095PSM

0.09 - 10 GHz High Dynamic Range Gain Block

DEVICE OVERVIEW

General Description

The ADM-8095PSM is a high-linearity low noise amplifier capable of providing +20 dBm output power up to 10 GHz. The ADM-8095PSM 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

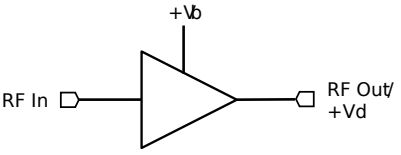
Features

- +21 dBm output power
- +18 dB gain
- 1.2 dB noise figure
- Excellent Gain flatness
- Excellent Return Losses
- No negative bias required

Applications

- SATCOM
- Radar
- Driver Amplifier for H and S - Diode Mixers
- Mobile test and measurement equipment
- 5G Transceivers

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
ADM-8095PSM	0.09 - 10 GHz High Dynamic Range Gain Block	DFN	REACH RoHS	Released	EAR99
EVB-ADM-8095P	Evaluation Board, 0.09 - 10 GHz High Dynamic Range Gain Block	EVB	REACH RoHS	Released	EAR99

Table Of Contents

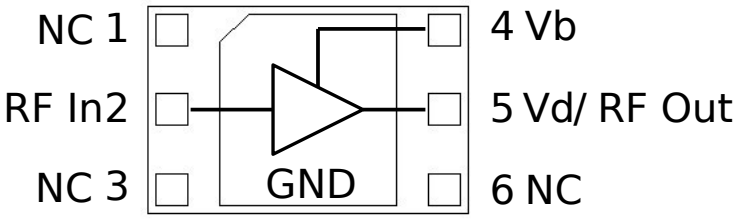
Revision History

Revision Code	Revision Date	Comment
-	2022-09-01	Initial Datasheet Release
A	2022-10-01	Package Drawing Updated
B	2024-02-27	Updated RF Input Power Handling
C	2024-10-11	Performance Plots Over Temp

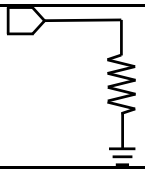
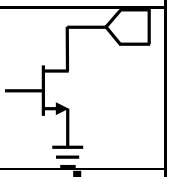
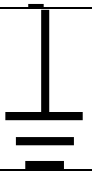
Port Configuration and Functions

Port Diagram

A port diagram of the ADM-8095PSM DFN package is shown below (X-ray view from the top). The pin functions are detailed in this datasheet.



Port Functions

Port	Function	Description	DC Equivalent Circuit
1,3,6	Gnd	These pins should be connected to ground.	-
2	RF Input	Pin 2 is the RF Input port of the amplifier. It is internally RF matched to 50 Ω and requires an external DC blocking cap.	
4	Vb	Pin 4 provides DC bias to the amplifier. Placement of an external series bias resistor allows this pin to be supplied by the same supply line providing 5V to Pin 5. 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.	-
5	RF Out / Vd	Pin 5 is the RF Output port and is also the Vd port providing the main power supply to the amplifier. This pin 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	Gnd	Package ground paddle must be connected to a DC/RF ground potential with high thermal and electrical conductivity.	

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 Voltage (Vb)	8	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
θ_Jc, Junction to Case Thermal Resistance	76	°C/W

Package Information

Parameter	Details	Rating
ESD	< 250 Volts	HBM Class 0
Weight	Package name: DFN	0.007g
Dimensions	-	1.3 x 2 mm
Moisture Sensitivity Level	-	MSL 1

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	-40	25	85	°C
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	dBm

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

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

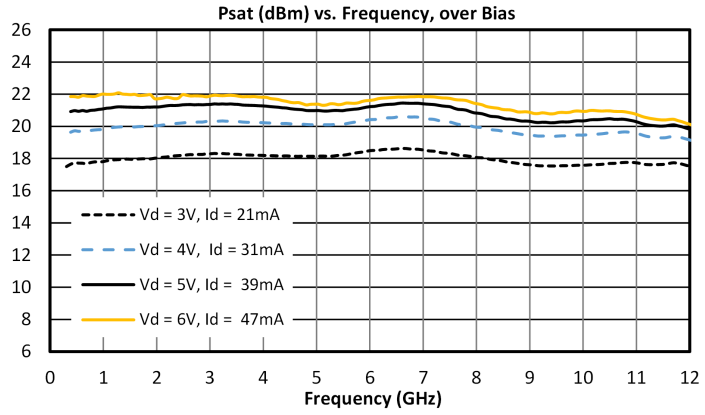
Unless otherwise specified, electrical specifications apply at TA=+25°C, Vd = 5 V, Vb = 5V.

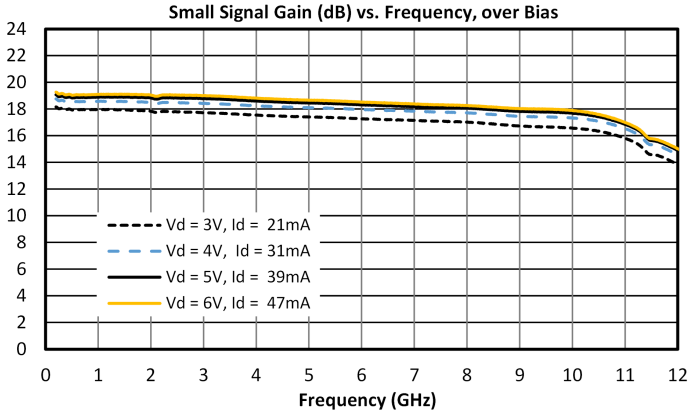
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Current Consumption	Vd, Vb = 5 V, no RF input	-	-	-	39	-	mA
Input IP3	Vd, Vb = 5 V, Pin = -15 dBm per tone, 10 MHz tone spacing	0.09	10	-	14	-	dBm
Input Power for Saturation	Vd, Vb = 5V	0.09	10	-	4	-	dBm
Input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

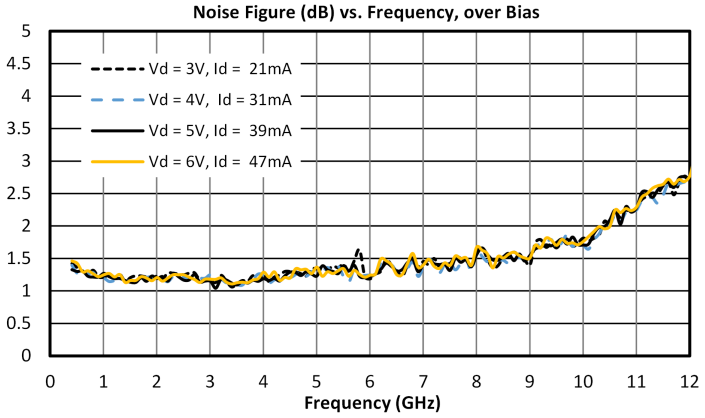
Typical Performance Plots (over bias)

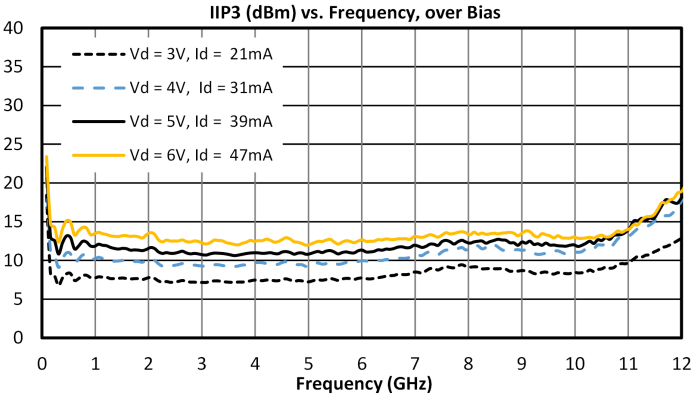
Performance measured on EVB-ADM-8095P with R2 = 3.3k Ohms.

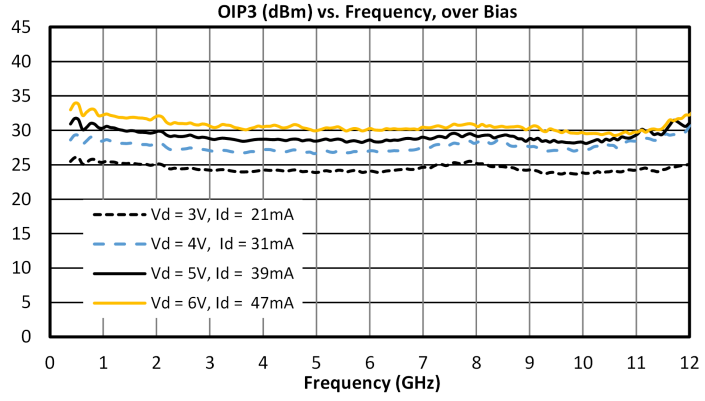
Psat, Small Signal Gain and Noise Figure plots have PCB trace loss de-embedded.

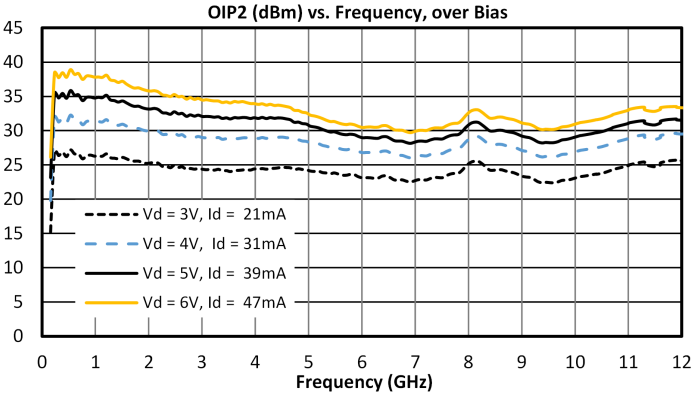




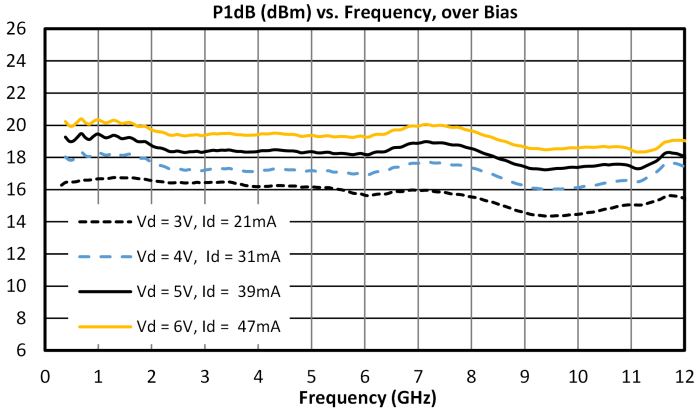




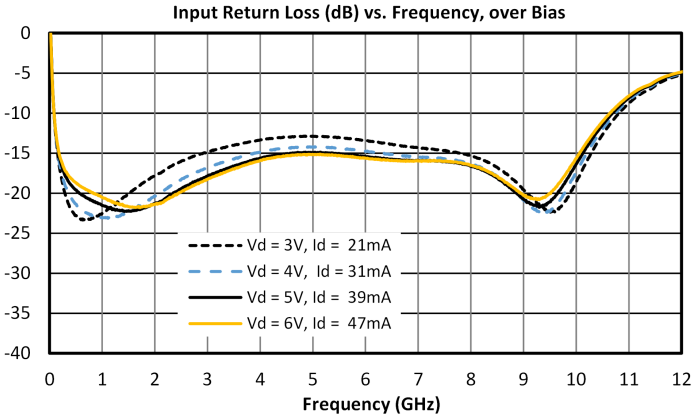




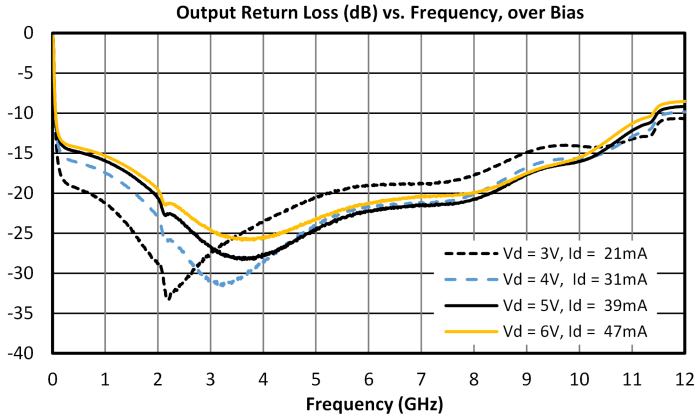
P1dB (dBm) vs. Frequency, over Bias



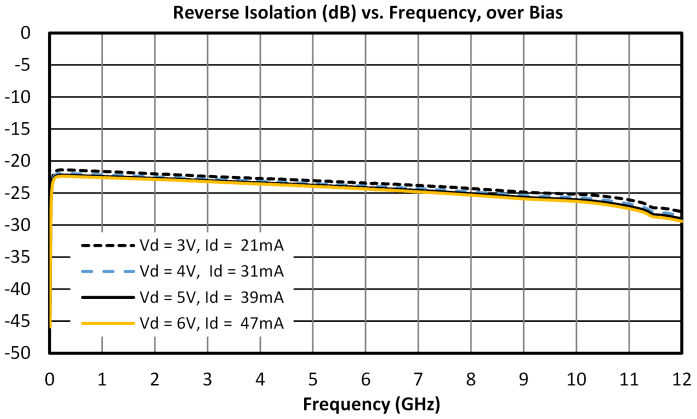
Input Return Loss (dB) vs. Frequency, over Bias



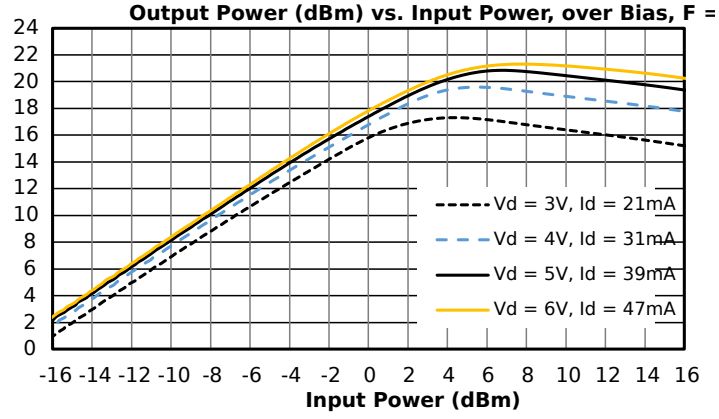
Output Return Loss (dB) vs. Frequency, over Bias



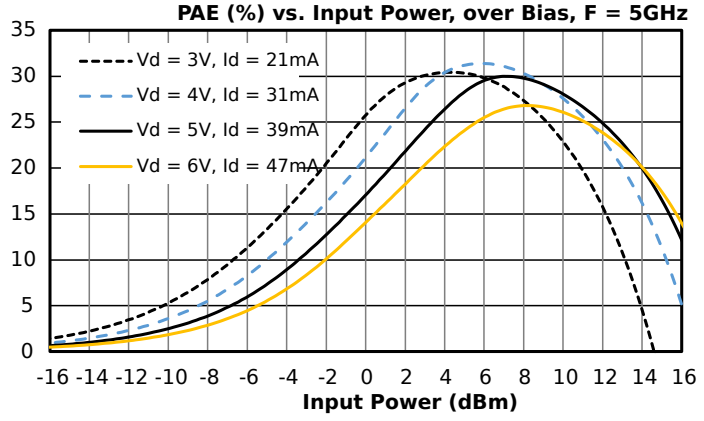
Reverse Isolation (dB) vs. Frequency, over Bias



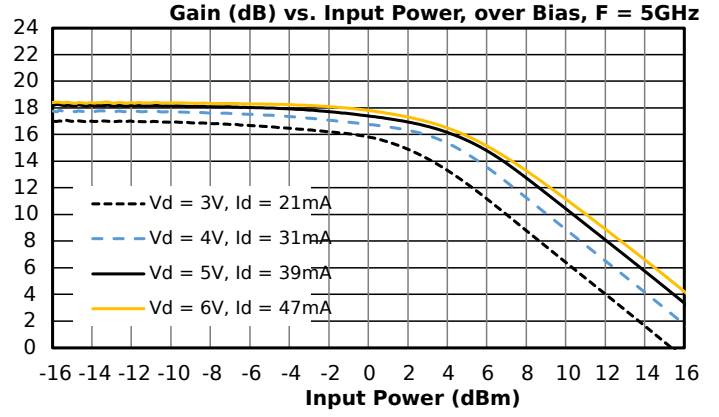
Output Power (dBm) vs. Input Power, over Bias, F =



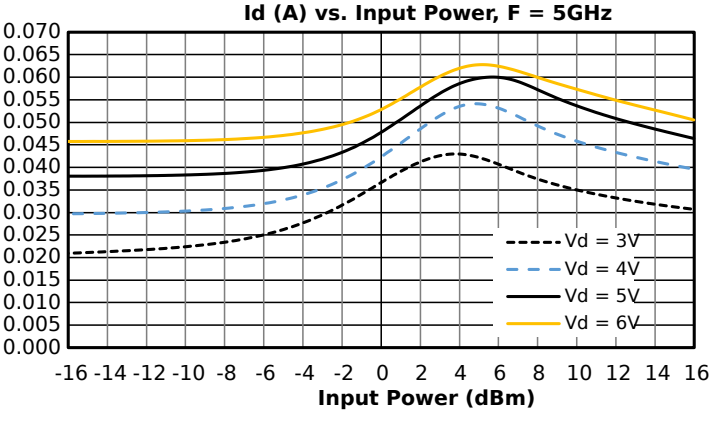
PAE (%) vs. Input Power, over Bias, F = 5GHz



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



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

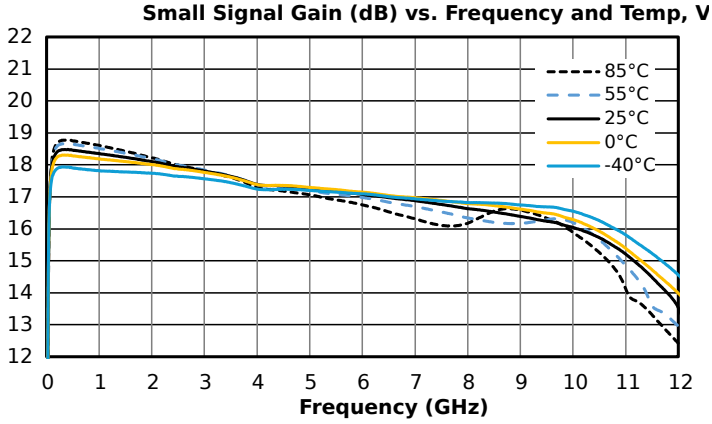


Typical Performance Plots (over temp)

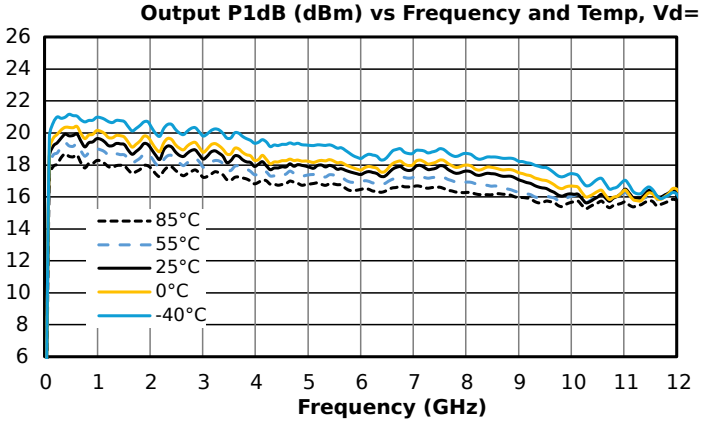
Performance measured on EVB-ADM-8095P with R2 = 3.3k Ohms.

Plots do not have PCB trace loss de-embedded.

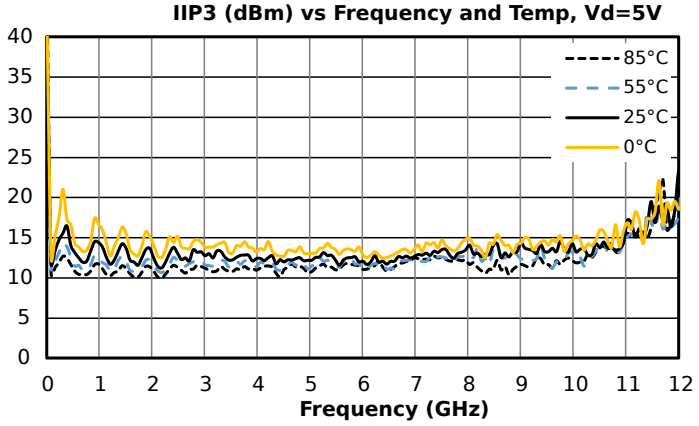
Small Signal Gain (dB) vs. Frequency and Temp, V



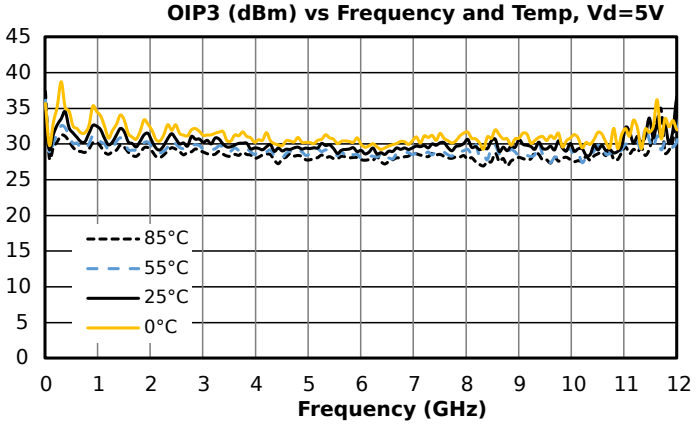
Output P1dB (dBm) vs Frequency and Temp, Vd=5



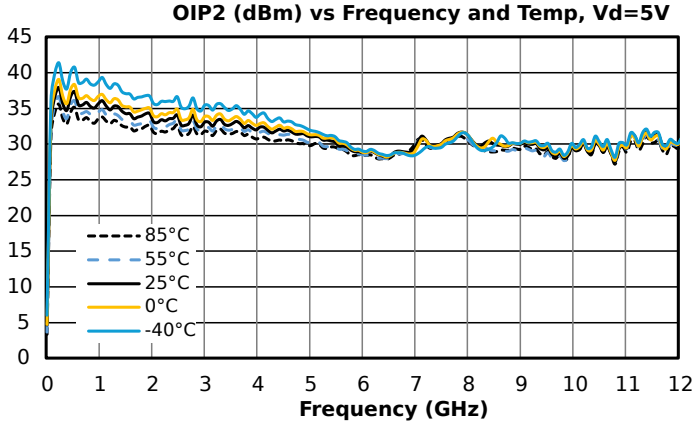
IIP3 (dBm) vs Frequency and Temp, Vd=5V



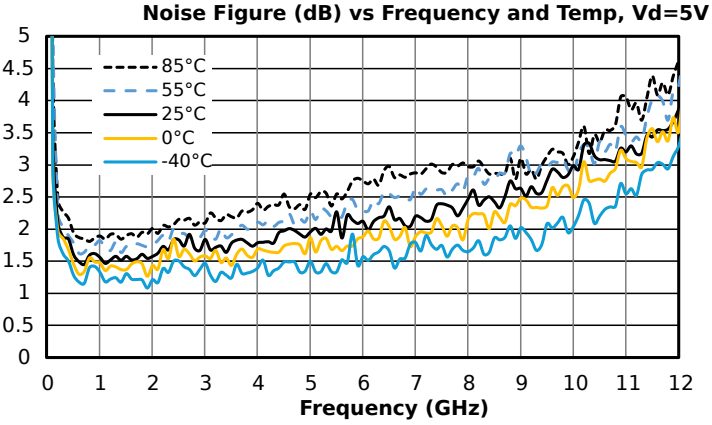
OIP3 (dBm) vs Frequency and Temp, Vd=5V



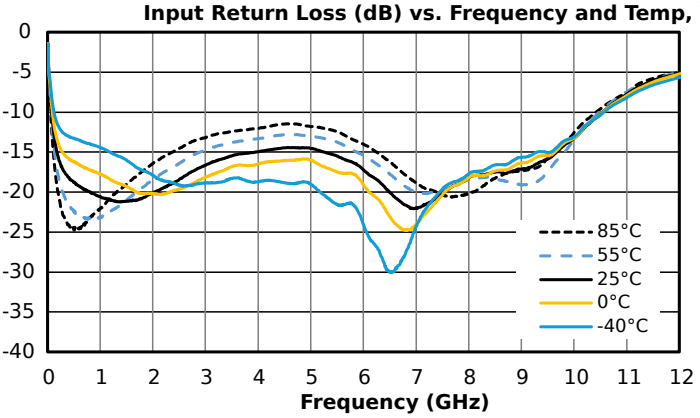
OIP2 (dBm) vs Frequency and Temp, Vd=5V



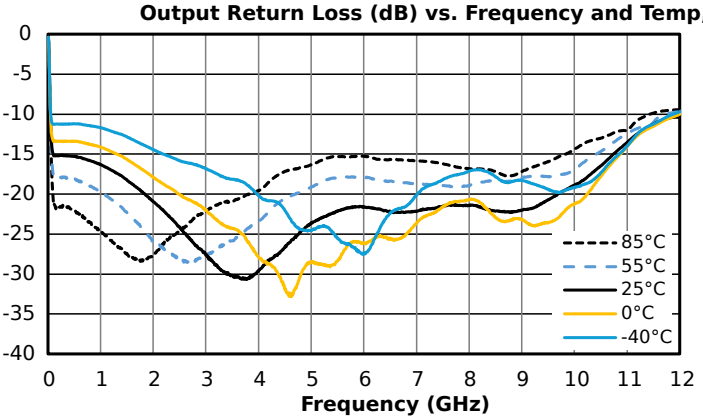
Noise Figure (dB) vs Frequency and Temp, Vd=5V

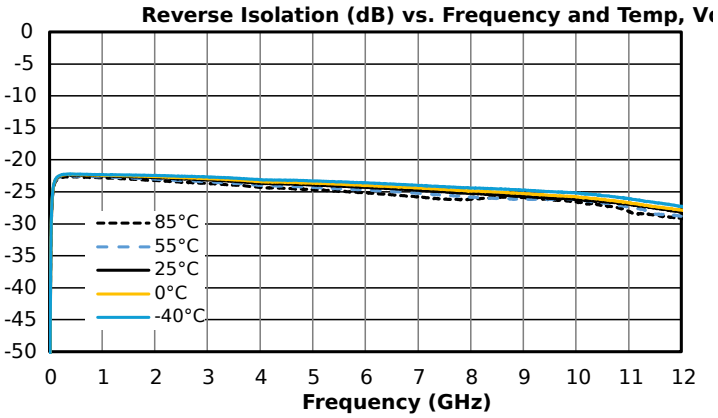


Input Return Loss (dB) vs. Frequency and Temp, V



Output Return Loss (dB) vs. Frequency and Temp,



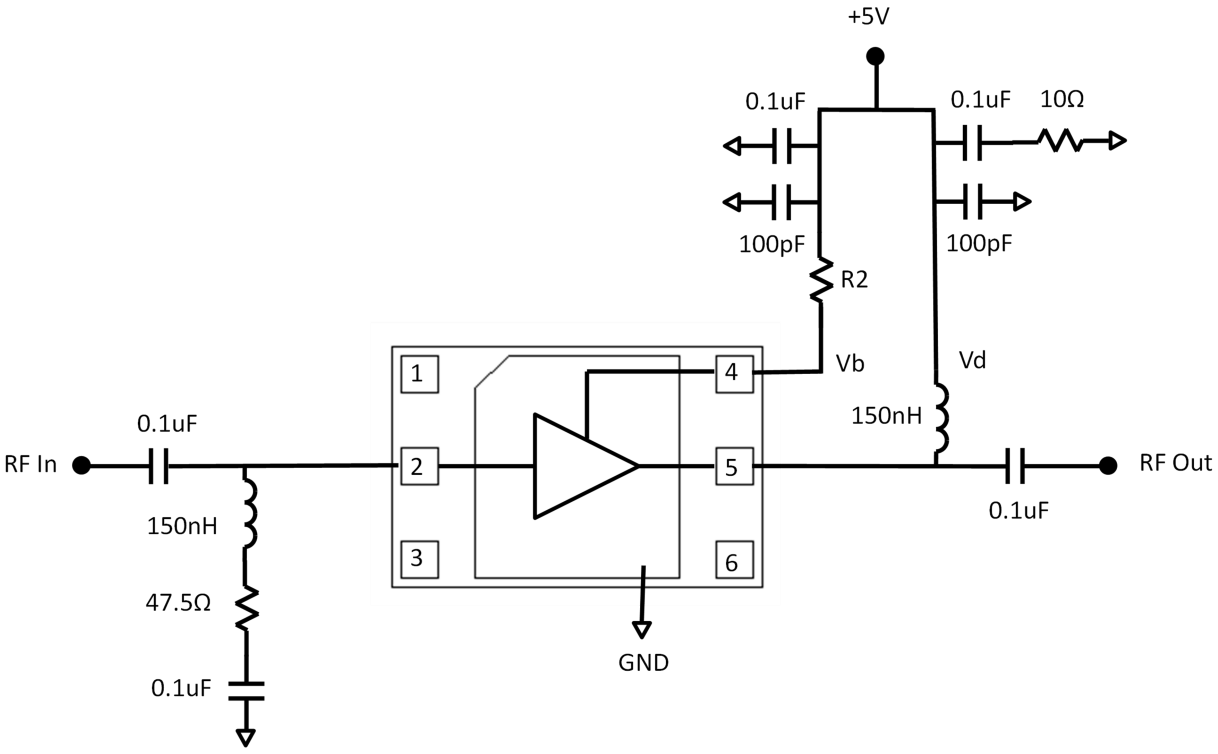


Application Information

Application Circuit

Below is the recommended application circuit for the ADM-8095PSM. DC power is supplied to RF Out/Vd pin 5 via a 150 nH choke inductor. Supply bypassing is provided by 100pf and 0.1uF capacitors. Drain current Id can be controlled by applying voltage to Vb pin 4. Drain current Id is adjusted proportionally to the current flowing into pin 4 with higher Vb and Ib resulting in increased current Id. Amplifier performance can therefore be optimized for specific applications by adjusting the value of series resistor R2 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 pin 4. The OIP3 can be improved by up to 4dB with the tradeoff being increased quiescent DC power consumption. EVB-ADM-8095P has provisions for an 0201 SMD resistor to be placed in series on the Vb line. The default value for R2 is 3.3k Ohms. For higher OIP3, R2 should be reduced to 453 Ohms. The ADM-8095PSM requires an RF input matching network at RF In pin 2 as shown. DC blocking capacitors are also required at RF input and output pins as shown. Note that EVB-ADM-8095P does not include DC blocking capacitors and must be externally blocked.

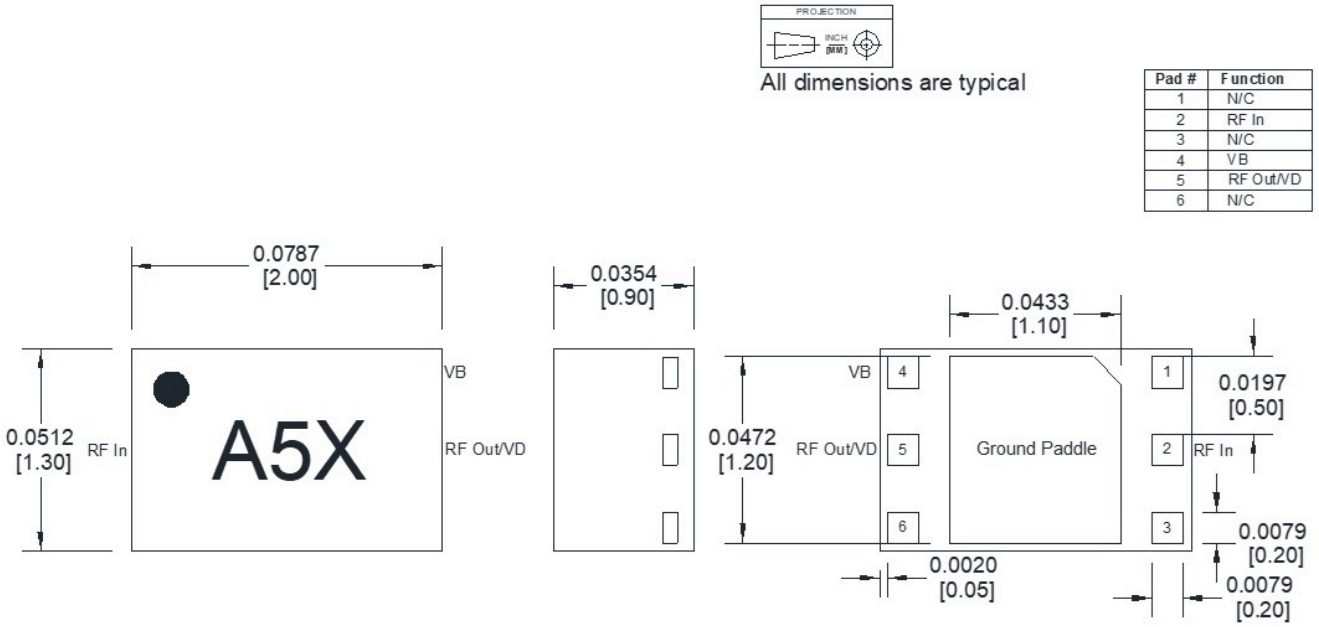
Application Circuit



Mechanical Data

Outline Drawing

Download : Outline 2D Drawing | Outline 3D Drawing | Outline 3D STP

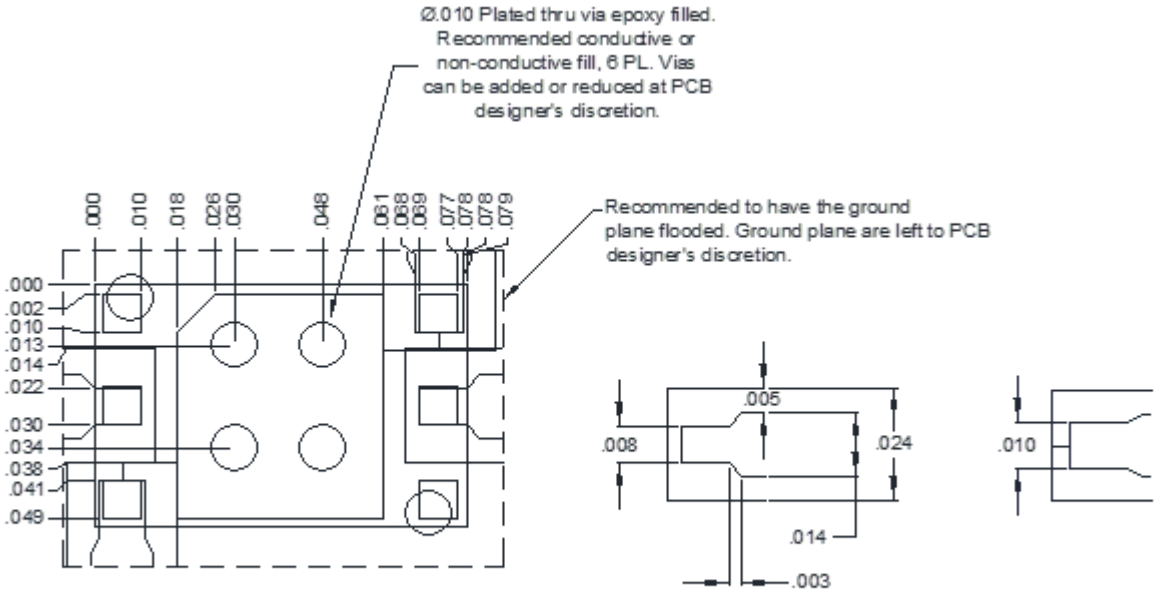


Pad #	Function
1	N/C
2	RF In
3	N/C
4	VB
5	RF Out/VD
6	N/C

1) Substrate material is LCP
2) I/O Leads and Die Paddle is (from base to finish):
   a. Ni: 0.5 um MIN
   b. Pd: 0.02 um MIN
   c. Au: 0.05 um MAX
3) All unconnected pins should be attached to PCB RF ground.

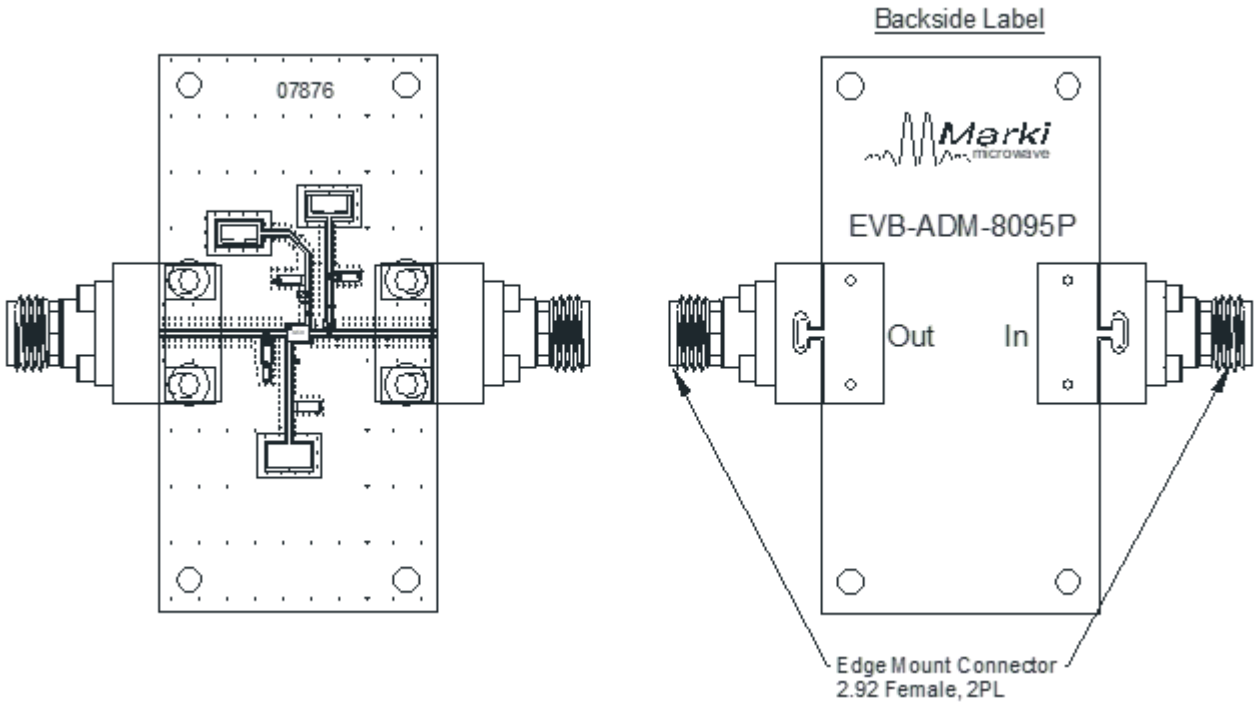
Footprint Image

Download : Footprint Drawing



The landing pattern is to be used on Rogers 4003, 0.008" thick, $\frac{1}{2}$ Oz Cu.

Evaluation Board - Outline Drawing



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