Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com

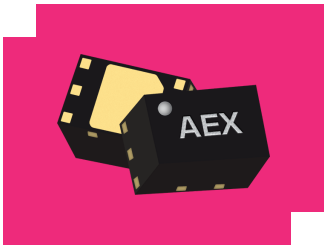
ADM-8475PSM

0.5 - 18 GHz High Dynamic Range Gain Block

DEVICE OVERVIEW

General Description

The ADM-8475PSM is a high-linearity, low noise amplifier capable of providing 13 dB gain, +26 dBm OIP3 and 2 dB noise figure across a broad 0.5-18 GHz bandwidth. The amplifier's low power consumption, high dynamic range and small size make it a suitable choice as a linear signal amplifier for RF front-end, low SWaP applications. Compared to the sister ADM-8624PSM, the ADM-8475PSM has higher gain and lower noise. The ADM-8624PSM has flatter gain and lower return loss. The ADM-8624PSM is available in a compact 1.3 x 2 mm DFN package.



Download s-parameters here

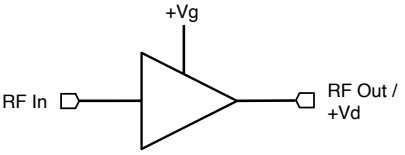
Features

13 dB flat gain response
+26 dBm output IP3
2 dB noise figure
No negative bias required

Applications

- Test and Measurement Equipment
- 5G transceivers
- SATCOM
- Radar

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
ADM-8475PSM	0.5 - 18 GHz High Dynamic Range Gain Block	DFN	REACH RoHS	Released	EAR99
EVB-ADM-8475P	Evaluation Board, 0.5 - 18 GHz High Dynamic Range Gain Block Amplifier	EVB	REACH RoHS	Released	EAR99

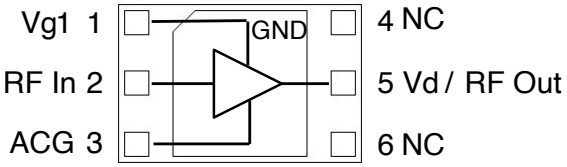
Table Of Contents

Revision History

Revision Code	Revision Date	Comment
-	2023-06-09	Initial Datasheet Release

Port Configuration and Functions

Port Diagram



Port Functions

Port	Function	Description	Equivalent Circuit for Package
Paddle	Gnd	Package ground paddle must be connected to a DC/RF ground potential with high thermal and electrical conductivity.	-
Pin 1	Vg1	Pin 1 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. Device drain current will change proportional to the current flowing into this pin. RF performance can be balanced with DC power consumption by adjusting the current into this pin.	-
Pin 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.	-
Pin 3	ACG	Pin 3 should be AC grounded using a series RC network. See application section for details. DO NOT DC GROUND THIS PIN.	-
Pin 4,6	NC	Pin 4 and Pin 6 are internally no-connects and should be connected to DC/RF ground.	-
Pin 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.	-

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
Drain Bias Current (Id)	75	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	0.41	W
Minimum Operating Temperature for MTTF > 1E6 hours	-40	°C
Minimum Storage Temperature	-65	°C
Reference Bias Current (Ig1)	10	mA
Reference Bias Voltage (Vg1)	6	V
RF Input Power	20	dBm
θ_Jc, Junction to Case Thermal Resistance	100	°C/W

Package Information

Parameter	Details	Rating
Dimensions	-	2.0 x 1.3 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.

Parameter	Min	Nominal	Max	Unit
Input Power for Saturation	-	6	-	dBm
Power Supply DC Current (Idq) (No RF Input)	21	40	48	mA
Ta Ambient Temperature	-40	25	85	°C
Power Supply DC Voltage (Vd) [1]	3	5	6	V

[1] It is recommended to set the bias resistor feeding Vg1 such that drain current Id=40mA. Data collected for this datasheet was measured with a single DC supply voltage as shown. Vd was connected to Vg1 through a series resistor Rbias=1kΩ. The 1kΩ value was chosen because it results in Id=40mA at Vd=5V.

Sequencing Requirements

There is no sequencing required to power up or power down the amplifier.

Electrical Specifications

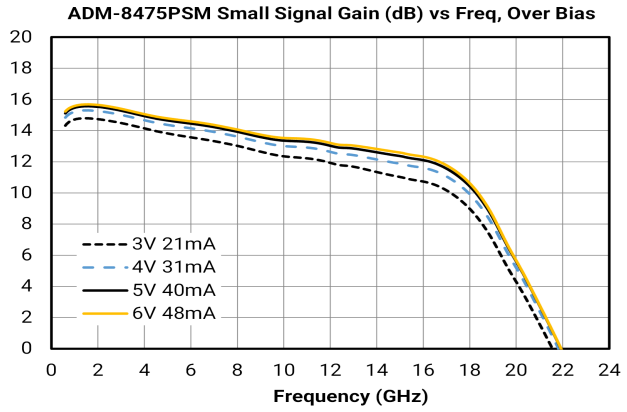
Unless otherwise specified, electrical specifications apply at TA=+25°C, Rbias = 1kΩ and Vd = 5 V.

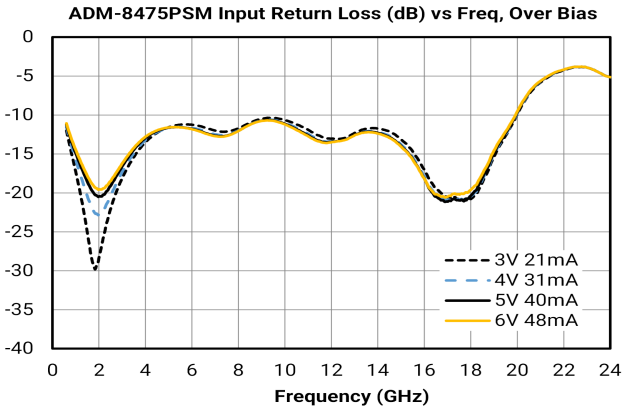
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
DC Supply Quiescent Current (Idq)	Vd = 5 V no RF input	-	-	-	40	-	mA
Input IP3	Vd = 5 V Idq = 40mA Pin = -18 dBm per tone, 1 MHz tone spacing	0.5	18	-	14	-	dBm
Input Power for Saturation	Vd = 5 V Idq = 40mA	0.5	18	-	6	-	dBm
Input Return Loss	Vd = 5 V Idq = 40mA Pin = -20 dBm	0.5	18	-	12	-	dB
Noise Figure	Vd = 5 V Idq = 40mA Pin = -20 dBm	0.5	18	-	2	-	dB
Output IP2	Vd = 5 V Idq = 40mA Pin = -18 dBm per tone, 1 MHz tone spacing	0.5	18	-	29	-	dBm
Output IP2	Vd = 5 V Idq = 40mA Pin = -18 dBm per tone, 1 MHz tone spacing	0.5	18	19	-	-	dBm
Output IP3	Vd = 5 V Idq = 40mA Pin = -18 dBm per tone, 1 MHz tone spacing	0.5	18	-	26	-	dBm
Output P1dB	Vd = 5 V Idq = 40mA	0.5	18	-	16	-	dBm
Output Power	Vd = 5 V Idq = 40mA	0.5	12	-	18	-	dBm
Output Power	Vd = 5 V Idq = 40mA	12	18	-	18	-	dBm
Output Return Loss	Vd = 5 V Idq = 40mA Pin = -20 dBm	0.5	18	-	13	-	dB
Reverse Isolation	Vd = 5 V Idq = 40mA Pin = -20 dBm	0.5	18	-	22	-	dB
Small Signal Gain	Vd = 5 V Idq = 40mA Pin = -20 dBm	0.5	18	10	13	-	dB

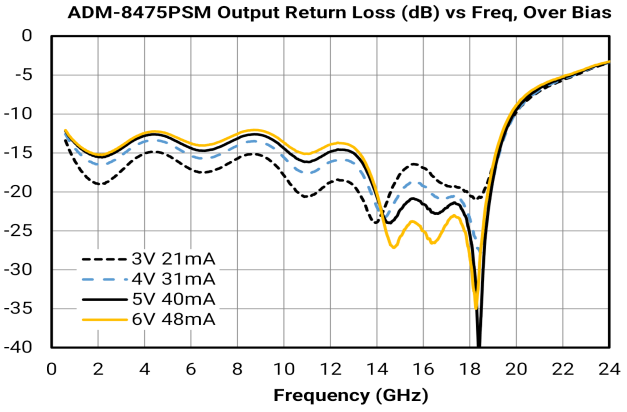
Typical Performance Plots

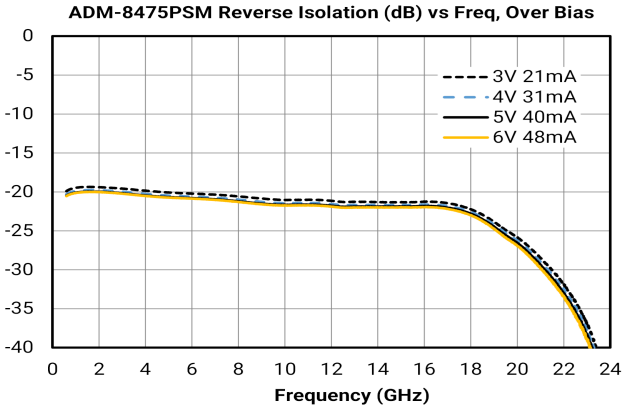
Performance measured on EVB-ADM-8475P. Results are de-embedded to the pin of the part.

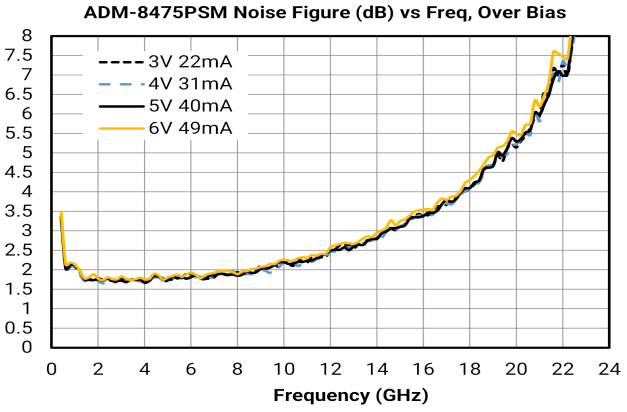
For plots vs bias, the Vd and Vg1 lines are supplied by a single DC supply with Rbias = 1kΩ between Vd and Vg1 pins.

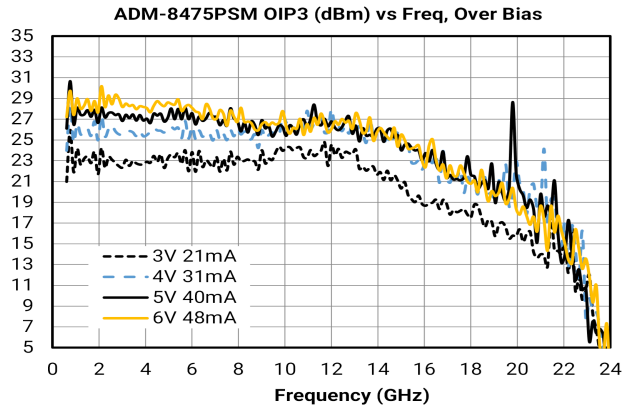








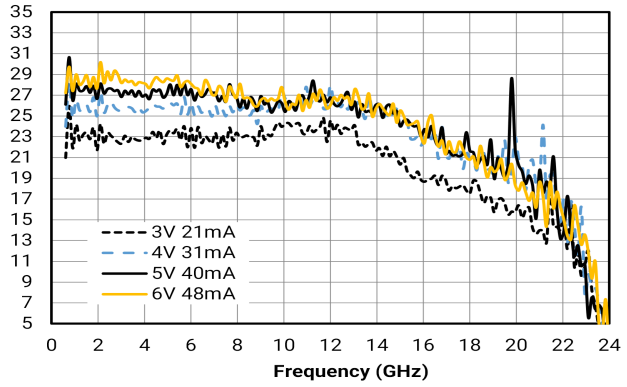




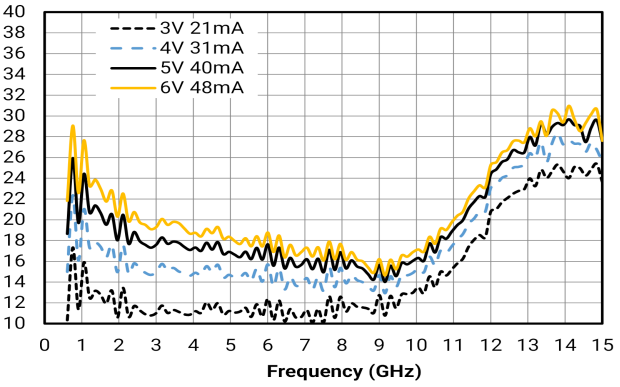
ADM-8475PSM

0.5 - 18 GHz High Dynamic Range Gain Block

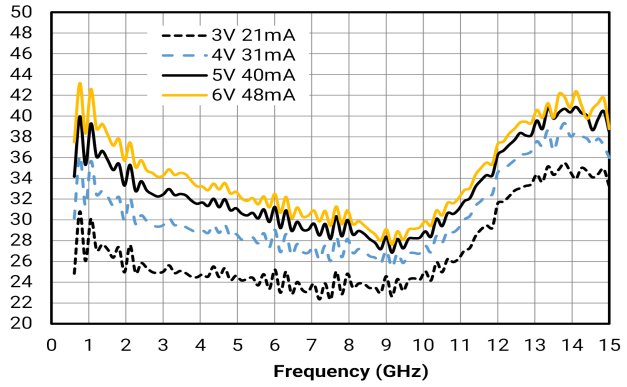
ADM-8475PSM OIP3 (dBm) vs Freq, Over Bias



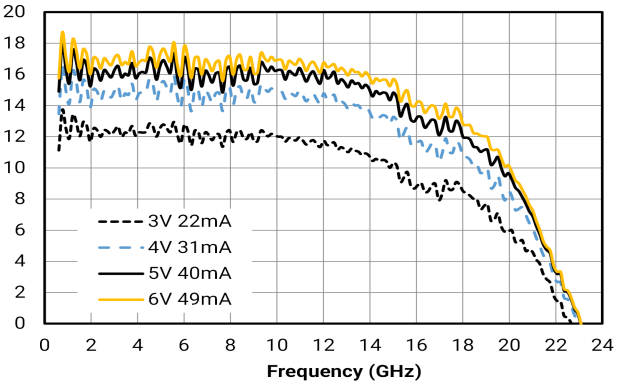
ADM-8475PSM IIP2 (dBm) vs Freq, Over Bias



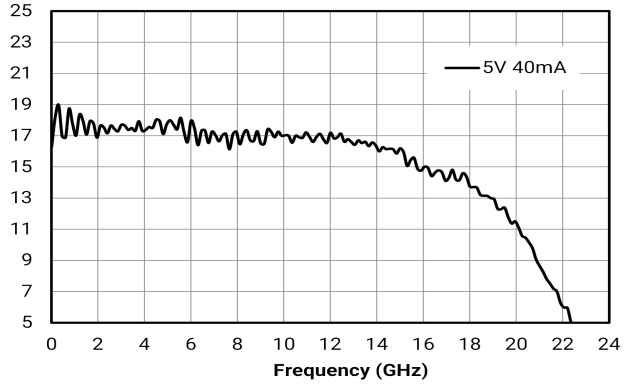
ADM-8475PSM OIP2 (dBm) vs Freq, Over Bias



ADM-8475PSM P1dB (dBm) vs Freq, Over Bias



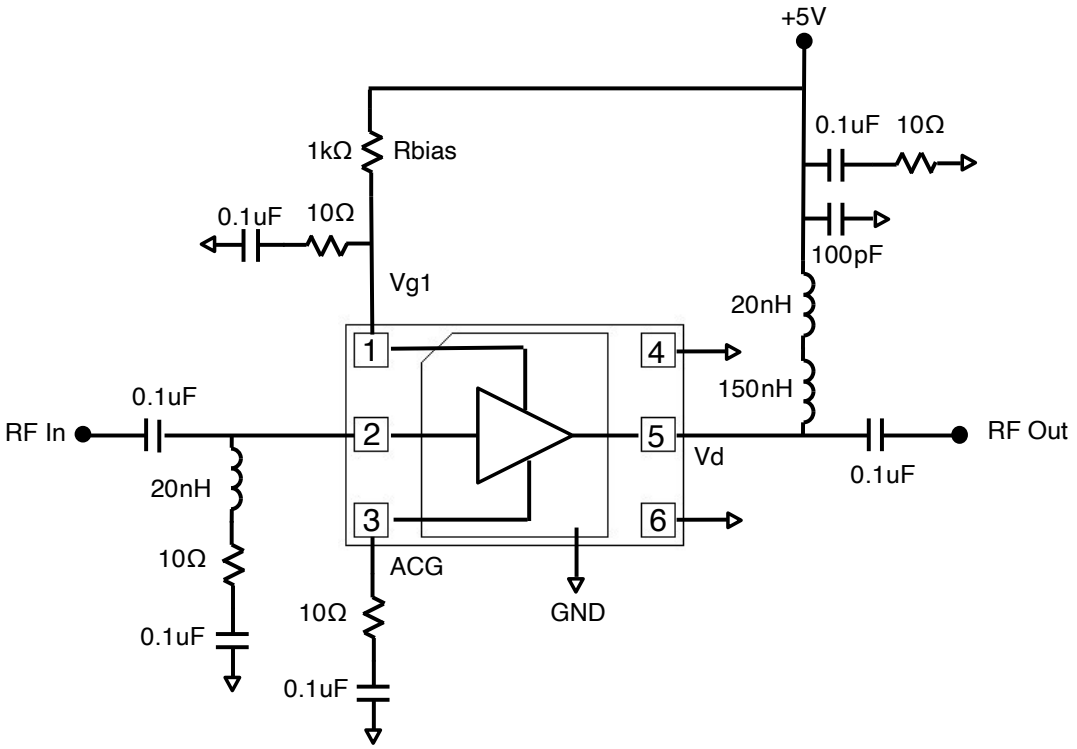
ADM-8475PSM PSat (dBm) vs Freq



Application Information

Below is the recommended application circuit for the ADM-8475PSM.

Application Circuit



Application Circuit Description

Drain current (Id) of the ADM-8475PSM can be adjusted by changing the value of the series resistor into Pin1 (Vg1). The resulting current at Pin5 (Vd/RF Out) will be proportional to the current flowing into Pin1. By carefully choosing the value of the bias resistor in series with Pin1, it's possible to power the ADM-8475PSM from a single supply. As shown above, the recommended resistor value for nominal operation with a 5V supply and Id=40mA is 1k Ohms.

The RF input pin requires a DC blocking capacitor and the external RF matching network as shown above. The matching network should be placed as close as possible to the part.

The RF Out pin doubles as a DC supply pin and requires an external choke inductor and DC blocking cap.

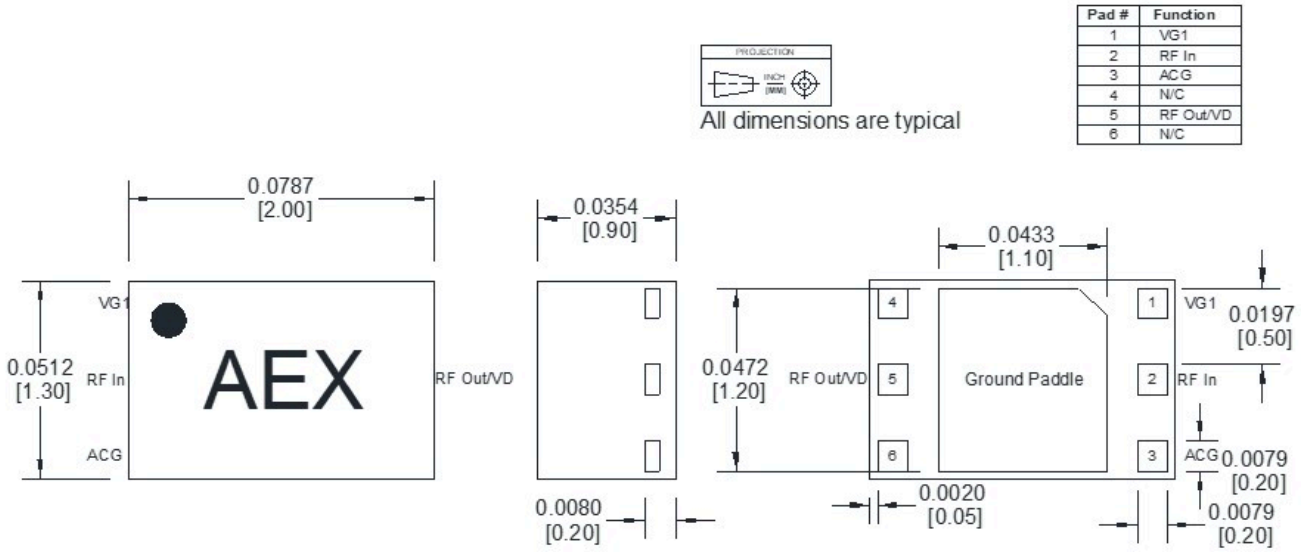
Supply bypassing components are recommended on all DC supply lines. Datasheet performance was measured with the values shown in the schematic above.

Package ground paddle and unused pins 3 and 4 must be connected to a DC/RF ground potential with high thermal and electrical conductivity. See the recommended landing pattern section for more details on recommended signal routing and grounding.

Mechanical Data

Outline Drawing

Download : Outline 3D Drawing | Outline 3D STP

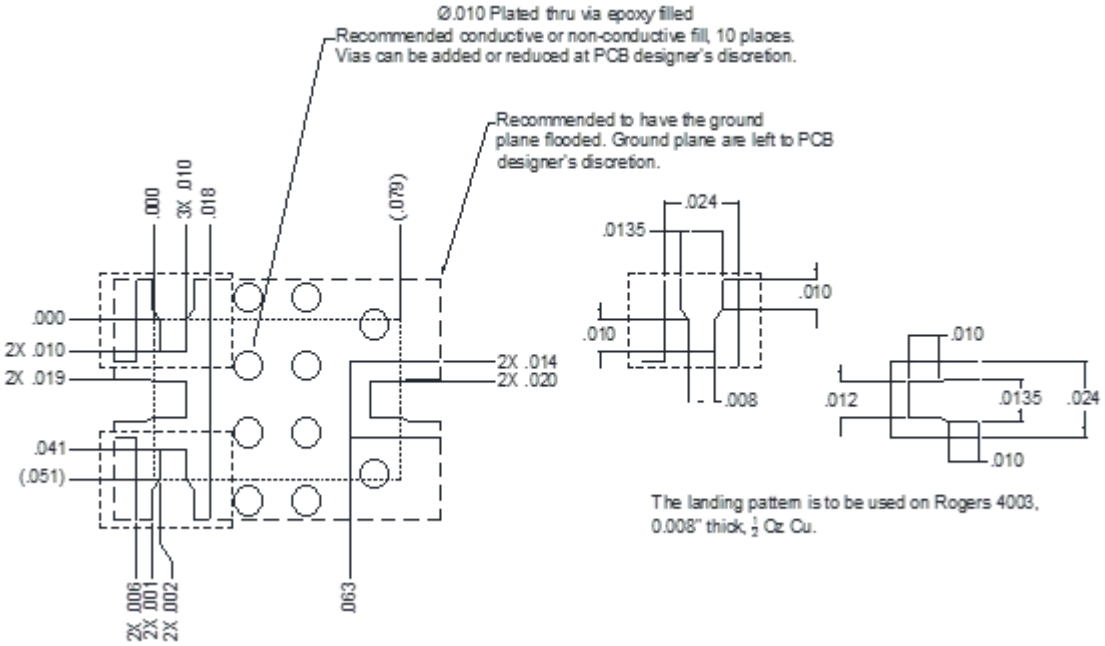


Pad #	Function
1	VG1
2	RF In
3	ACG
4	N/C
5	RF Out/VD
6	N/C

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.

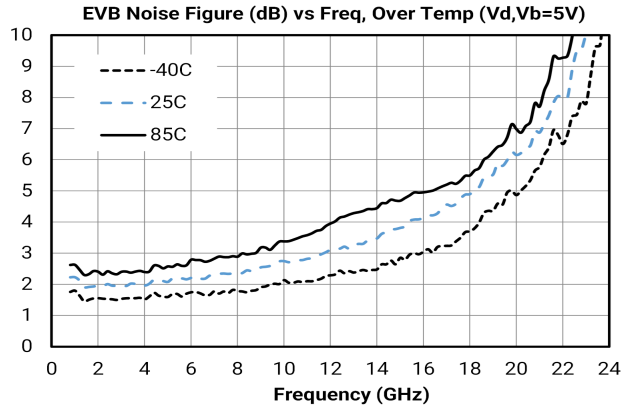
Footprint Image

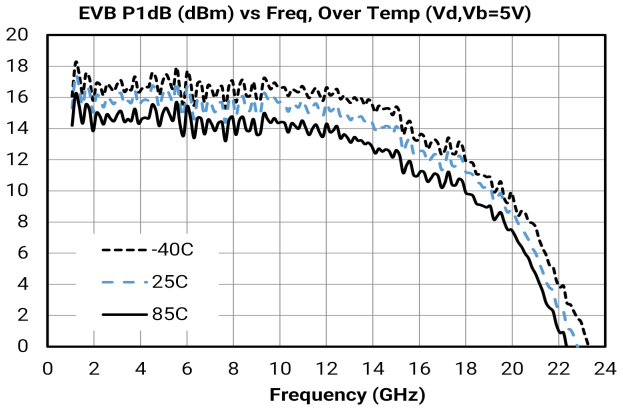
Download : Footprint Drawing

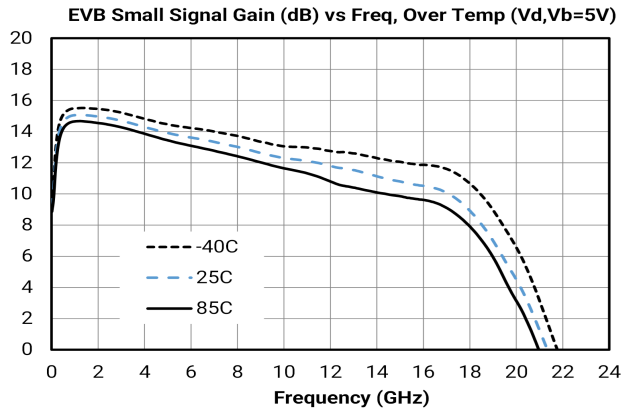


Evaluation Board - Typical Performance Plots

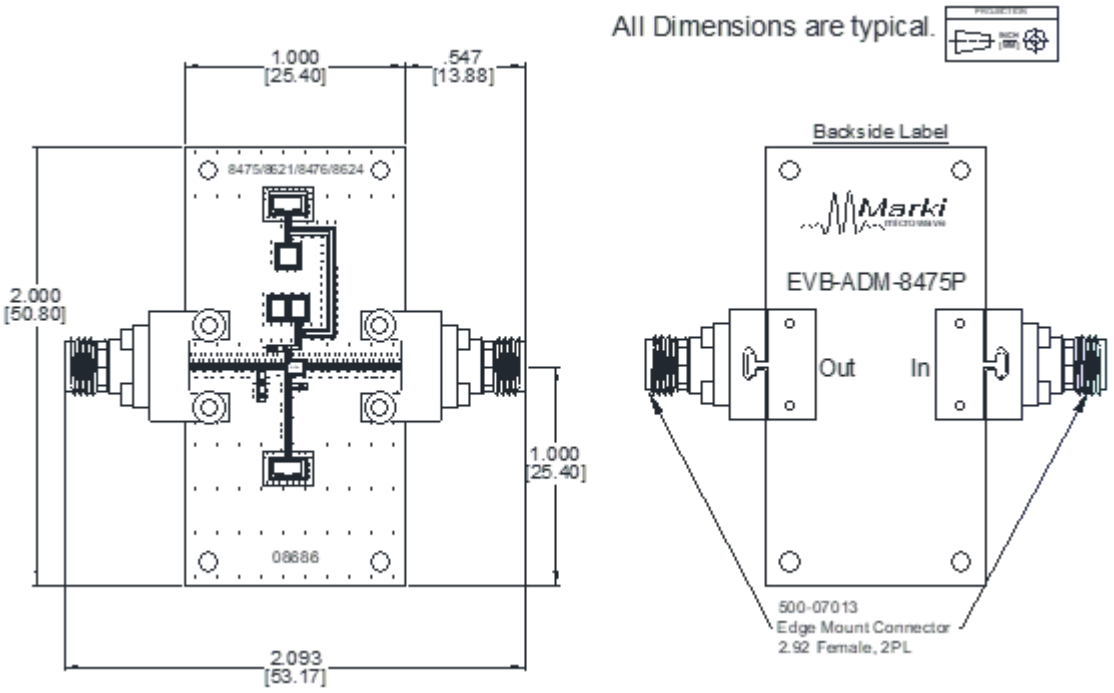
Measurements are taken at the evaluation board connectors.







Evaluation Board - Outline Drawing



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