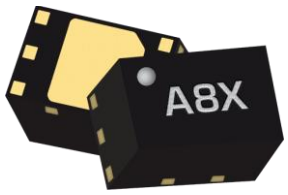
0.09 - 6 GHz High Dynamic Range Gain Block **ADM-8350PSM**

1. Device Overview

1.1 General Description

The ADM-8350PSM is a high-linearity, low noise amplifier capable of providing +22 dBm output power up to 6 GHz. The ADM-8350PSM 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, gain flatness, and high IP3. The ADM-8350PSM is similar to the ADM-8095. The main difference is that the IP3 is higher for the ADM-8350.



DFN Package

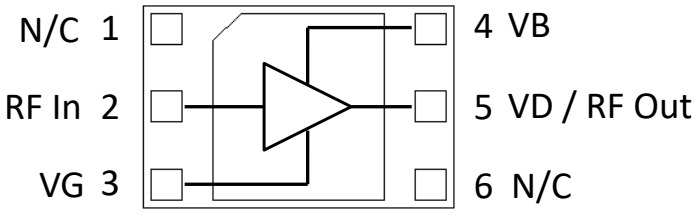
1.2 Features

- +22 dBm output power
- +23 dB gain
- +39.5dBm OIP3
- No negative bias required
- .s2p S-Parameters: EVB-ADM-8350P

1.3 Applications

- Mobile test and measurement equipment
- Radar and satellite communications
- Driver amplifier H & S – diode mixers

1.4 Functional Block Diagram



1.5 Part Ordering Options[1]

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
ADM-8350PSM	1.3 x 2 mm Surface Mount	DFN	**RoHS**	Active	EAR99
EVB-ADM-8350P	Connectorized Evaluation Fixture	EVAL	**RoHS**	Active	EAR99

[1] Refer to our website for a list of definitions for terminology presented in this table.

Table of Contents

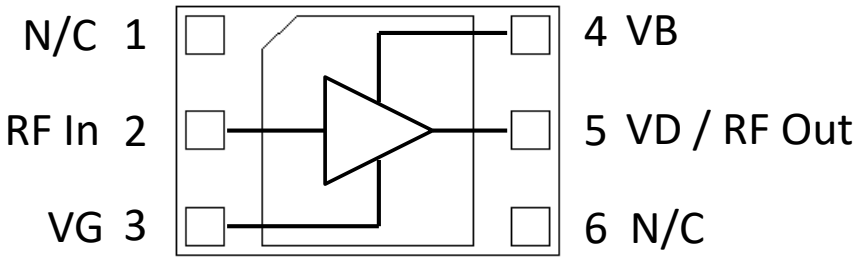
Revision History

Revision Code	Revision Date	Comment
-	February 2023	Initial Release

2. ADM-8350PSM Port Configurations and Functions

2.1 ADM-8350PSM Port Diagram

A port diagram of the ADM-8350PSM QFN package is shown below (X-ray view from the top). The pin functions are detailed in section 2.2 of this datasheet.



2.2 ADM-8350PSM Port Functions

Pin	Function	Description
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.
5	VD / RF Out	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.
3	VG	Pin 3 is an external bias resistor connection. The gate is internally biased by the Vd supply, therefore a supply voltage should not be applied to Vg. The default resistor is 1kΩ shunt to GND.
4	VB	Pin 4 is the current mirror DC voltage supply port that controls the drain current. The VB supply should be tied to the VD supply through an external supply. Increasing the current will increase OIP3 at the expense of efficiency. The default series resistor is 1.5kΩ to optimize gain, output power, and efficiency when VB and VD are both tied to 5V.
1, 6	N/C	Pin 1 and Pin 6 are internally no-connects and should be connected to DC/RF ground.
Paddle	GND	Package ground paddle must be connected to a DC/RF ground potential with high thermal and electrical conductivity.

3. Specifications

3.1 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	Units
Drain Supply Voltage (Vd)	+6.5	V
Drain Current (Id) (No RF Applied)[2]	120	mA
RF Input Power	+15	dBm
Operating Temperature for MTTF > 1E6 hours	-40 to +85	˚C
Storage Temperature	-65 to +125	˚C
θ_{Jc}, Junction to Case Thermal Resistance	85	ºC/W
Max Junction Temperature for MTTF of >1E6 hours	175	˚C
Max Power Dissipation for MTTF of >1E6 hours	1	W

3.2 Package Information

Parameter	Details	Rating
Weight	ADM-8350PSM	7 mg
Weight	EVB-ADM-8350P	29.5 g

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

3.3 Recommended Operating Condition

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.

Recommended Operating Conditions	Min	Nominal	Max	Units
T_A, Ambient Temperature	-40	+25	+85	°C
Power Supply DC Voltage (Vd)	+3	+5	+6	V
Power Supply DC Current (Id) (No RF Input)[3]	46	84	102	mA
Input Power for Saturation	+2	+4	+6	dBm

3.4 Supply 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.

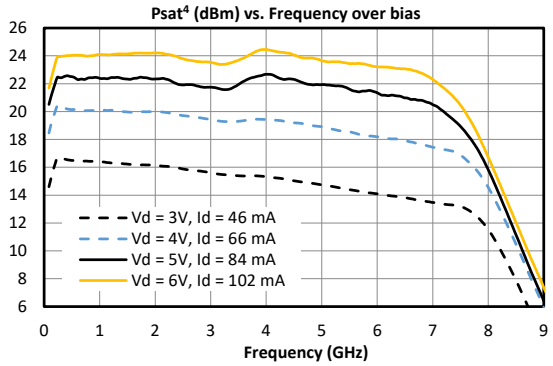
[3] Recommended operating current conditions without RF input applied.

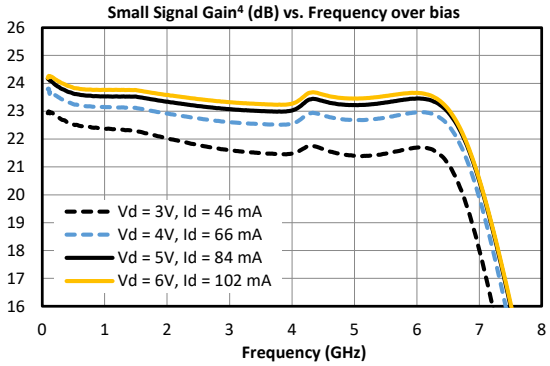
3.5 Electrical Specifications

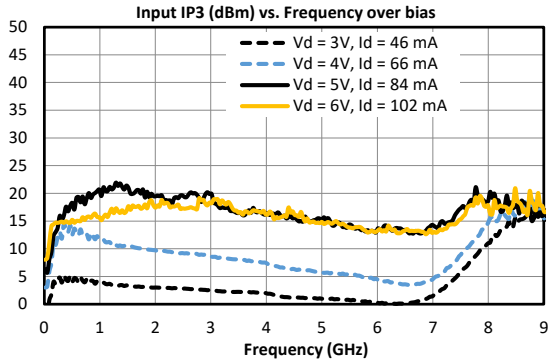
Unless otherwise specified, electrical specifications apply at T_A=+25°C, Vd = Vb = 5 V.

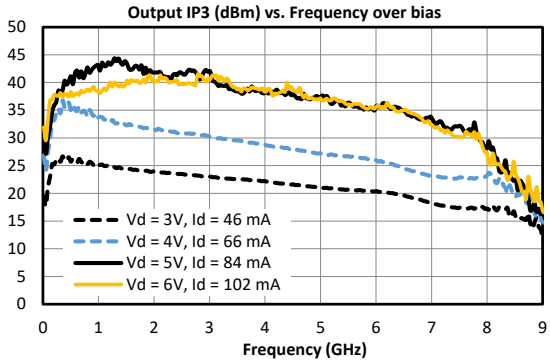
Parameter	Test Conditions	Frequency	Min	Typical	Units
Saturated Output Power	Vd = 5 V	0.09 - 6 GHz	+20	+22	dBm
Small Signal Gain	Vd = 5 V, Pin = -20 dBm		21	23	dB
Input Return Loss				15	
Output Return Loss				14	
Reverse Isolation				28	
Noise Figure		0.09 – 3 GHz		1.8	
		3 – 6 GHz		2.5	
Input IP3	Vd = 5 V, Pin = -15 dBm per tone, 10 MHz tone spacing	0.09 – 6GHz		+17	dBm
Output IP3				+39.5	
Output IP2				+37	
Output P1dB	Vd = 5V			+22	
Input Power for Saturation			+2	+4	
DC Supply Quiescent Current (Idq)	Vd = 5 V, no RF input	0.09 – 6GHz		84	mA

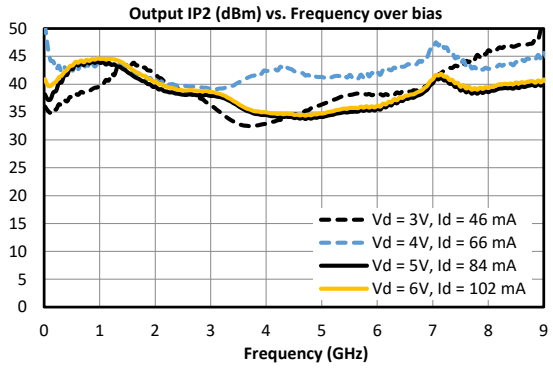
3.6 ADM-8350PSM Typical Performance Plots

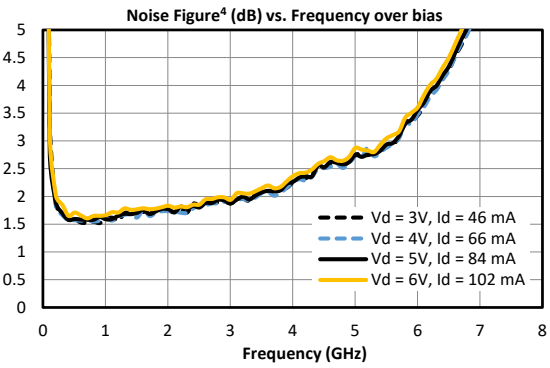


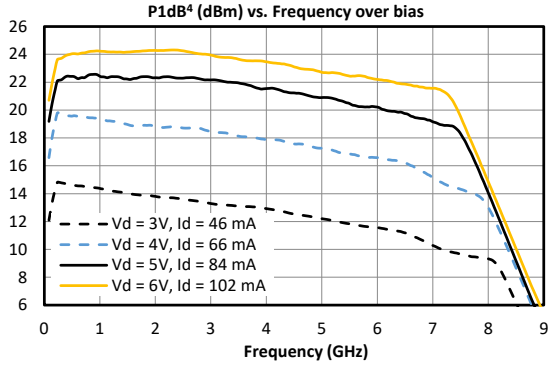


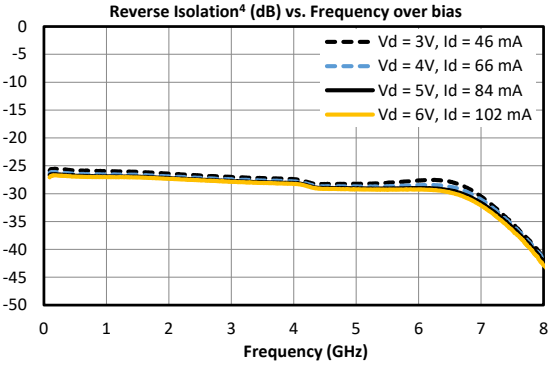




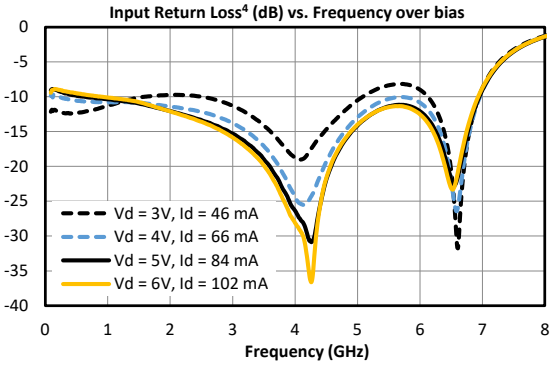


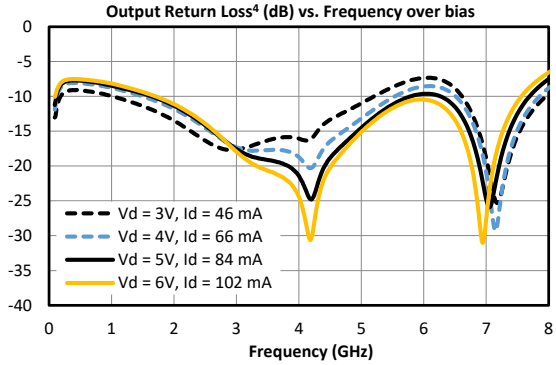


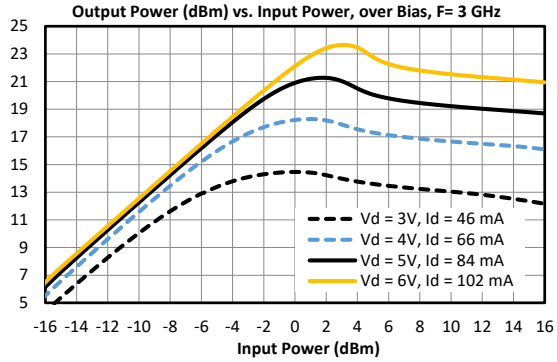


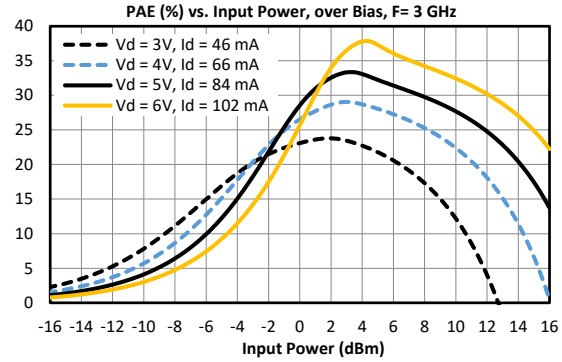


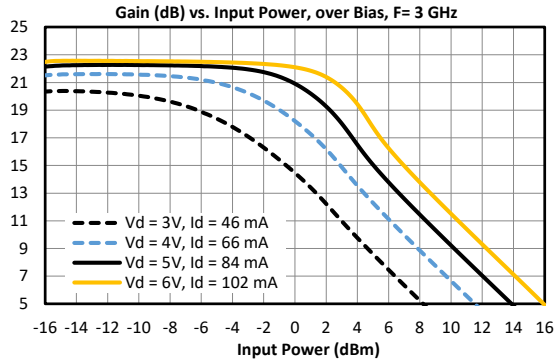
[4] Data is scalar de-embedded with thru-line fixture.

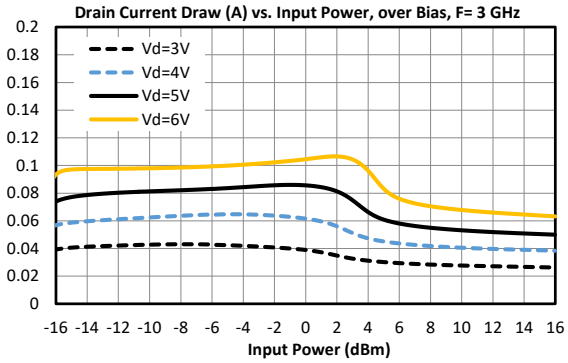










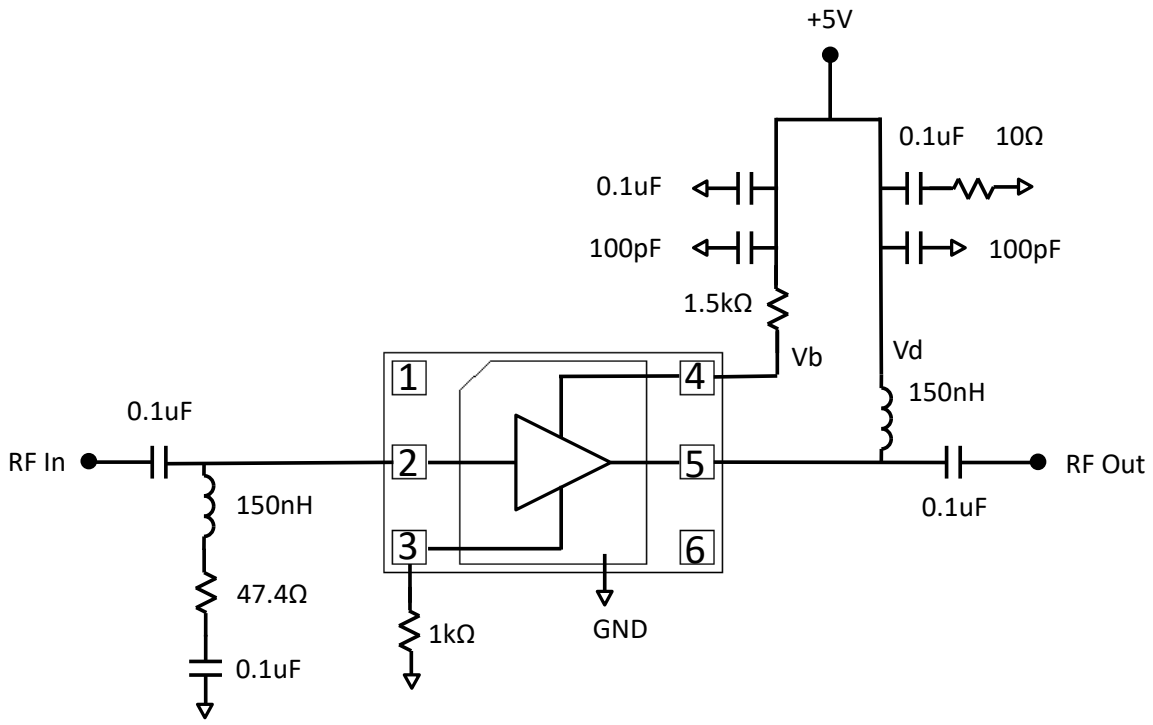


[4] Data is scalar de-embedded with thru-line fixture.

4. Application Information

4.1 Application Circuit

Below is the recommended application circuit for the ADM-8350PSM. DC power is supplied to RF Out/Vd pin 5 via a 150 nH choke inductor. Vb is also supplied through a 1.5kΩ resistor tied to the Vd power supply. Supply bypassing is provided by 100pf and 0.1uF capacitors. Drain current Id is controlled by applying voltage to Vb pin 4. Drain current Id is adjusted proportionally to the current flowing into pin 4 where the default 1.5kΩ is set to maximize linearity. Amplifier performance is optimized for improved IP3 performance using the external gate resistor on the Vg line. A supply voltage should not be applied to Vg. The ADM-8350PSM 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-8350P does not include DC blocking capacitors and must be externally blocked. See Section 5.4 for more details on the EVB circuit layout and component values. Contact support@markimicrowave.com if you would like help creating an alternative application circuit for your system's requirements.



5. Mechanical Data

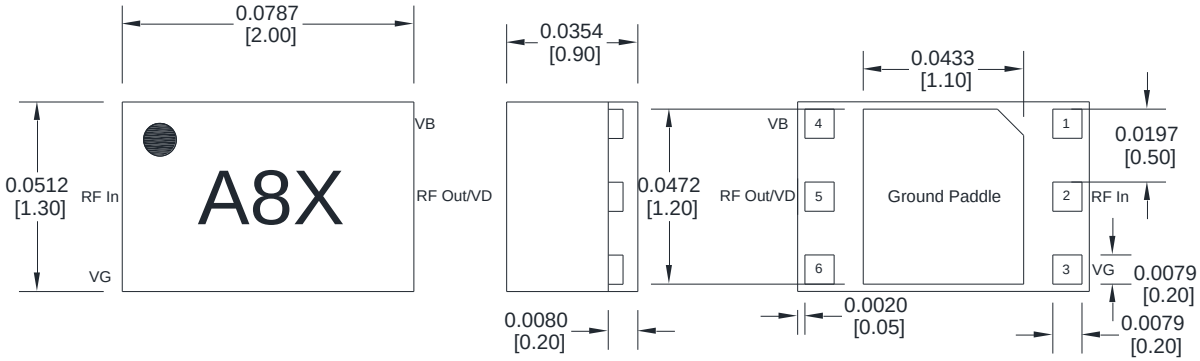
5.1 ADM-8350PSM Package Outline Drawing

PROJECTION

INCH (MM)

All dimensions are typical

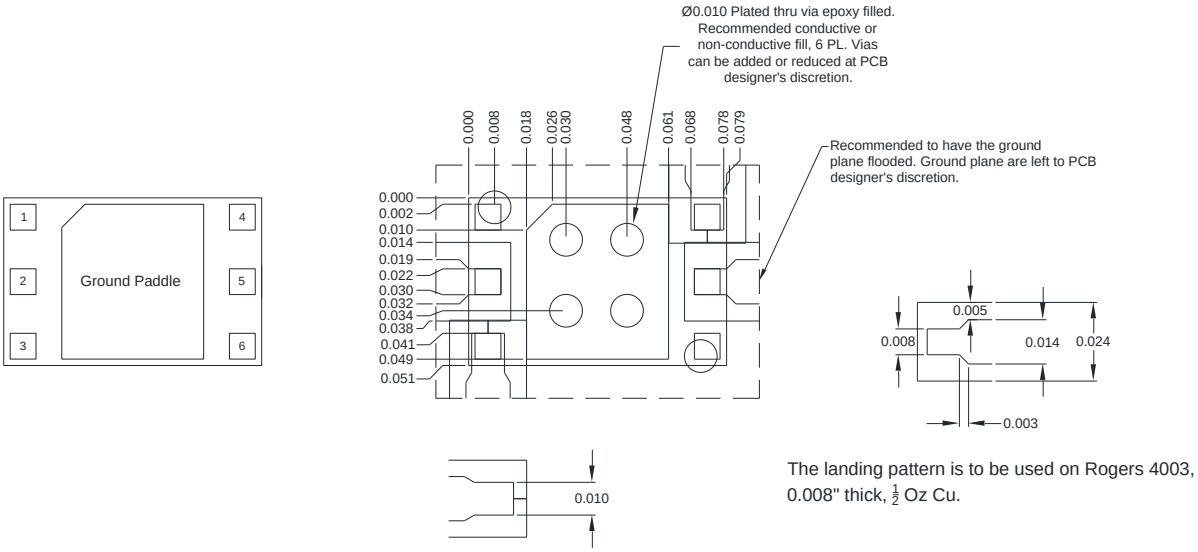
Pad #	Function
1	N/C
2	RF In
3	VG
4	VB
5	RF Out/VD
6	N/C



Notes (unless otherwise specified):

1. Substrate material is LCP.
2. I/O Leads and Die Paddle are 0.05 microns Au over 0.02 microns Pd over 0.5 micron Ni.
3. All unconnected pins should be connected to PCB RF ground.

5.2 ADM-8350PSM Recommended Landing Pattern

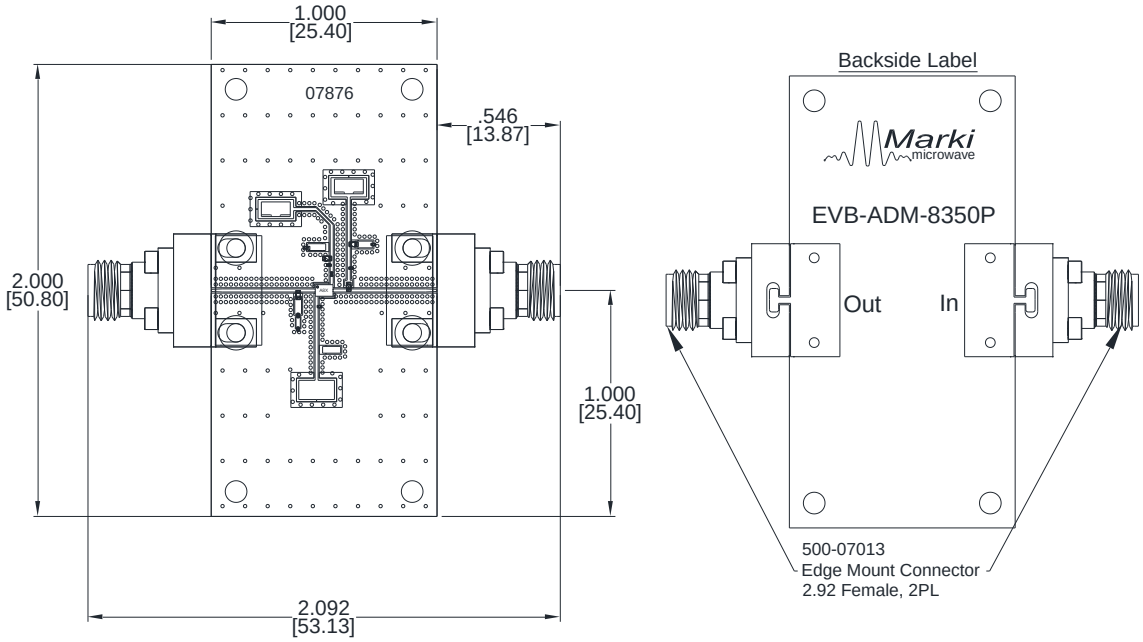


The landing pattern is to be used on Rogers 4003, 0.008" thick, $\frac{1}{2}$ Oz Cu.

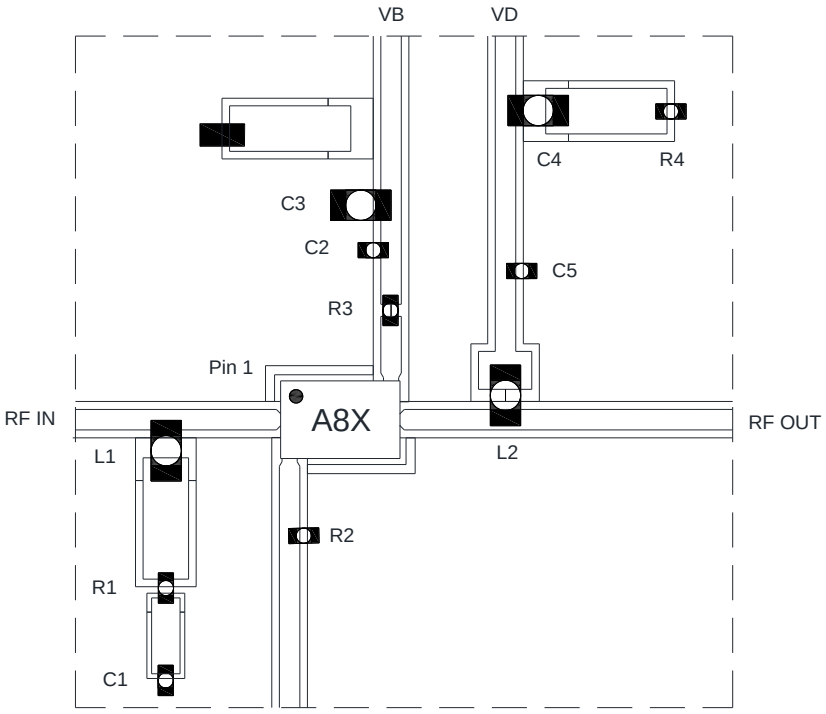
Click here for suggested layout shown above.
Click here for leaded solder reflow. Click here for lead-free solder reflow.

5.3 EVB-ADM-8350P Outline Drawing

All Dimensions are typical.



5.4 EVB-ADM-8350P Bill of Materials



Reference	Manufacturer	Description	Qty
In, Out	Southwest	Connector, Edge Mount, 2.9mm F	2
C1	Murata	0201 Cap Cer 0.1 µF 10V X5R	1
C3, C4	Murata	0402 Cap Cer 0.1uF	2
C2, C5	Murata	0201 Cap Cer 100pf	2
R1	Panasonic	0201 Res 47.5Ω 5% 1/20W	1
R2	Panasonic	0201 Res 1KΩ 5% 1/20W	1
R3	Panasonic	0201 Res 1.5KΩ 5% 1/20W	1
R4	Panasonic	0201 Res 10Ω 5% 1/20W	1
L1, L2	Coilcraft	0402 Ind 150nH (MFR PN: 0402HPH-R15X_R)	2
U1	Marki	0.09-6GHz, +24dBm Psat Amplifier (ADM-8350PSM)	1