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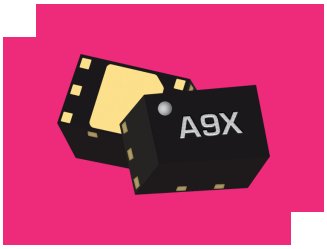
AKA-1300PSM

DC – 14 GHz Broadband InGaP SMT Amplifier

DEVICE OVERVIEW

General Description

The AKA-1300PSM is a low-cost, cascadable broadband InGaP HBT amplifier. This is a general-purpose gain block amplifier which provides high P1dB, high OIP3, and a very small form factor. The simple application circuit requires minimal external components, allowing it to be used in a variety of applications.



Download s-parameters here

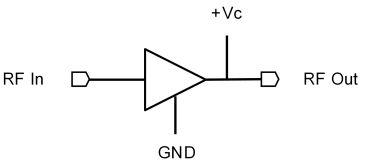
Features

- Small Form Factor: 1.3 x 2.0mm
- +28dBm OIP3 up to 6 GHz
- 13.5dB Gain at 2GHz
- Positive Only, Single Supply Operation
- Low-Cost

Applications

- Mobile test and measurement equipment
- Radar and satellite communications
- 5G transceivers
- Driver Amplifier L-Diode Mixers

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
AKA-1300PSM	DC – 14 GHz Broadband InGaP SMT Amplifier	DFN	REACH RoHS	Released	EAR99
EVB-AKA-1300P	Evaluation Board, DC – 14 GHz Broadband InGaP SMT Amplifier	EVB	REACH RoHS	Released	EAR99

Table Of Contents

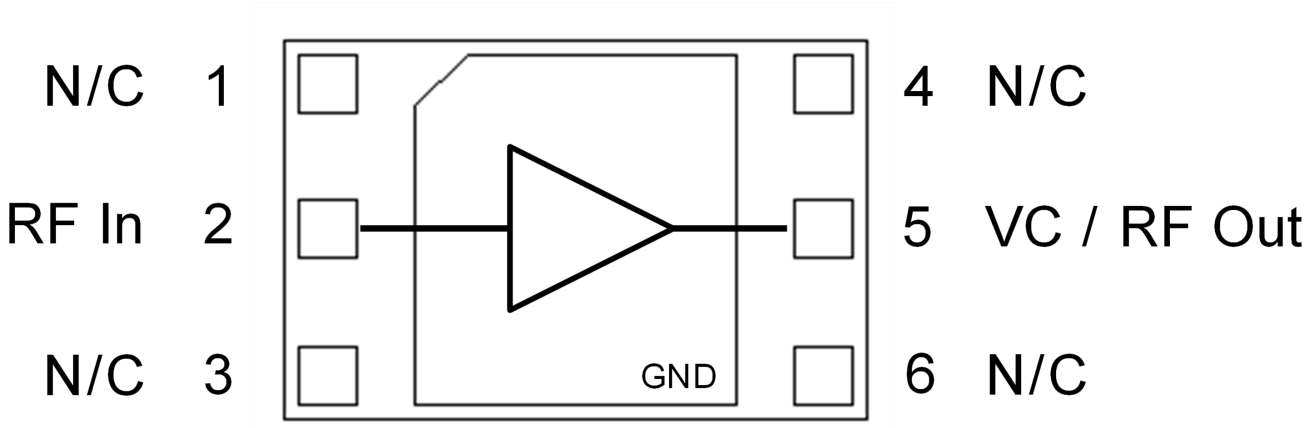
Revision History

Revision Code	Revision Date	Comment
-	2023-04-01	Datasheet Initial Release

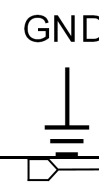
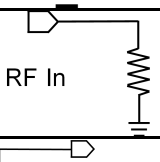
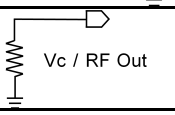
Port Configuration and Functions

Port Diagram

A port diagram of the AKA-1300PSM is shown below.



Port Functions

Port	Function	Description	Equivalent Circuit for Package
1, 3, 4, 6	N/C	These pins are internally no-connects and should be connected to DC/RF ground.	
2	RF Input	This is the RF Input port of the amplifier die. It is RF matched to 50 Ω and requires an external DC blocking capacitor.	
5	RF Output and Positive Collector Voltage Supply	This is the RF Output and positive supply voltage port Vc. It is RF matched to 50 Ω and is DC coupled. An external bias tee is required on this port.	
Paddle	Ground	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 these limits are exceeded, the device may become inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	85	°C
Maximum Storage Temperature	150	°C
Max Junction Temperature for MTTF > 1E6 hours	150	°C
Minimum Operating Temperature	-40	°C
Minimum Storage Temperature	-65	°C
Positive Bias Current (Icc)	82	mA
Power Dissipation	312	mW
RF Input Power	10	dBm
θJC, Junction to Case Thermal Resistance	210	°C/W

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
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
Positive DC Device Voltage (Vd)	3.7	3.8	3.9	V
Ambient Temperature	-40	25	85	°C
Positive DC Current (Icc)	35	50	60	mA

Sequencing Requirements

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

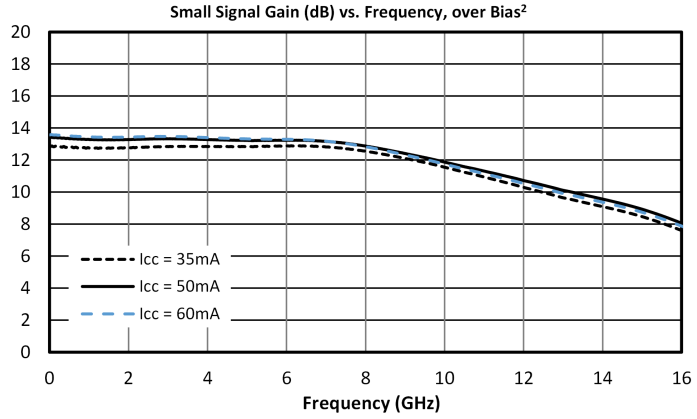
Electrical Specifications

Unless otherwise specified, electrical specifications apply at TA=+25°C, Vc = +3.8V in a 50Ω system. Typical performance data is measured from EVB unless otherwise stated. Min and Max limits are guaranteed at TA=+25°C.

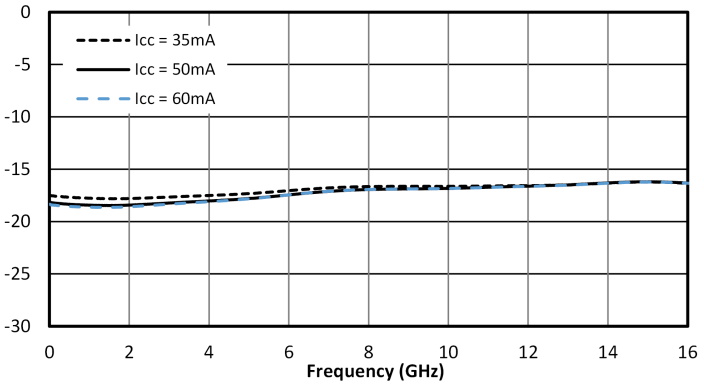
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
DC Supply Quiescent Current	Vc = +3.8V, No RF Input	-	-	-	50	-	mA
Input Return Loss	Vc = +3.8 V, Icc = 50 mA	0.1	14	-	14	-	dB
Noise Figure	Vc = +3.8 V, Icc = 50 mA	6	14	-	6	-	dB
Noise Figure	Vc = +3.8 V, Icc = 50 mA	0.1	6	-	5	-	dB
Output IP3	Vc = +3.8 V, Icc = 50 mA	6	14	-	24	-	dBm
Output IP3	Vc = +3.8 V, Icc = 50 mA	0.1	6	-	28	-	dBm
Output P1dB	Vc = +3.8 V, Icc = 50 mA	6	14	11	13	-	dBm
Output P1dB	Vc = +3.8 V, Icc = 50 mA	2	6	12	14	-	dBm
Output Return Loss	Vc = +3.8 V, Icc = 50 mA	0.1	14	-	10	-	dB
Reverse Isolation	Vc = +3.8 V, Icc = 50 mA	0.1	14	-	17	-	dB
Small Signal Gain	Vc = +3.8 V, Icc = 50 mA	0.1	6	11	13	-	dB
Small Signal Gain	Vc = +3.8 V, Icc = 50 mA	6	14	8	11	-	dB

Typical Performance Plots

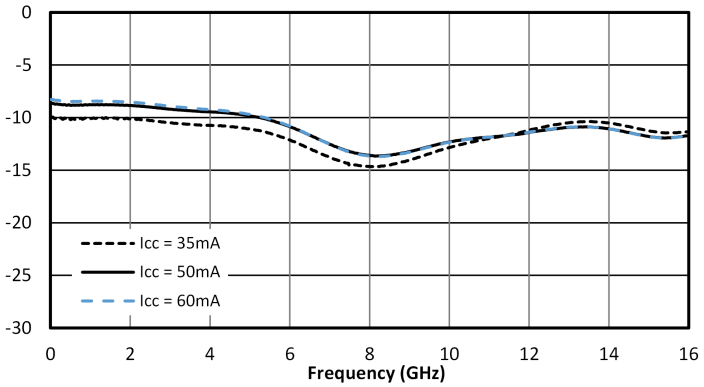
Small Signal Gain (dB) vs. Frequency, over Bias[2]



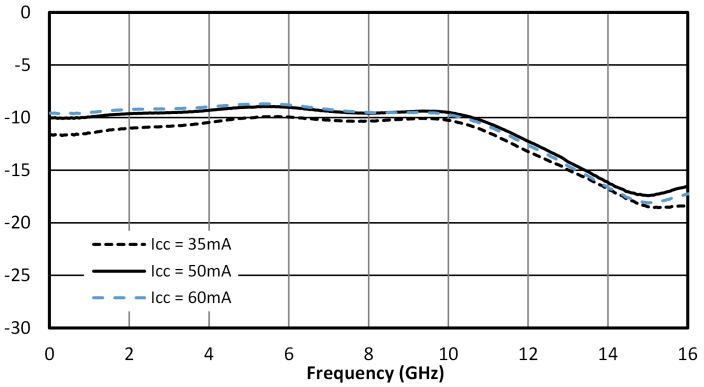
Reverse Isolation (dB) vs. Frequency, over Bias



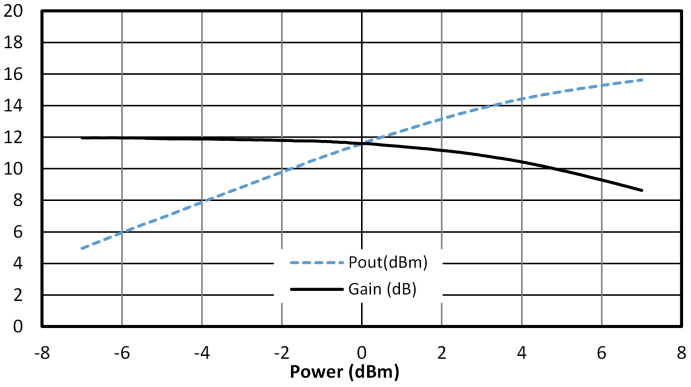
Input Return Loss (dB) vs. Frequency, over Bias



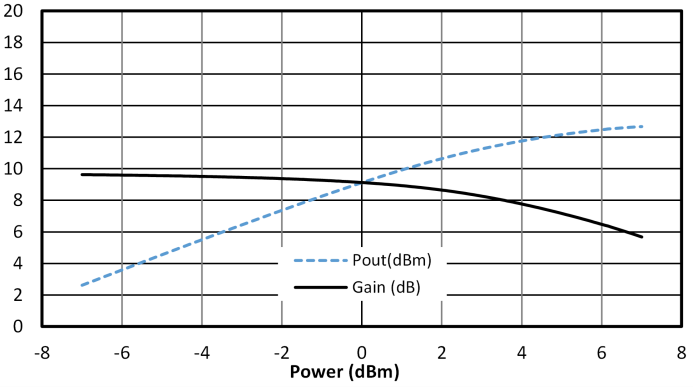
Output Return Loss (dB) vs. Frequency, over Bias



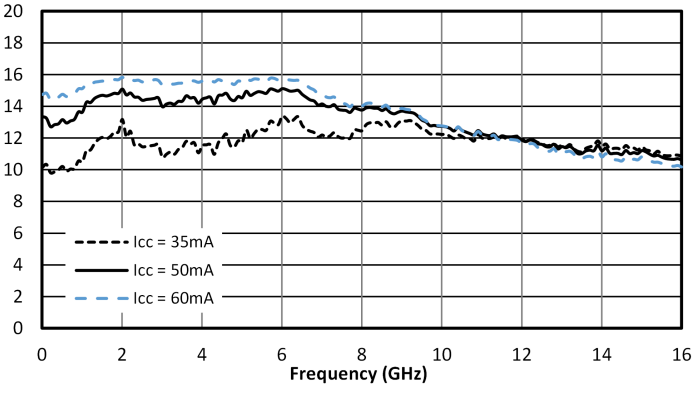
Output Power (dBm), Gain (dB) vs. Input Power, F = 2 GHz



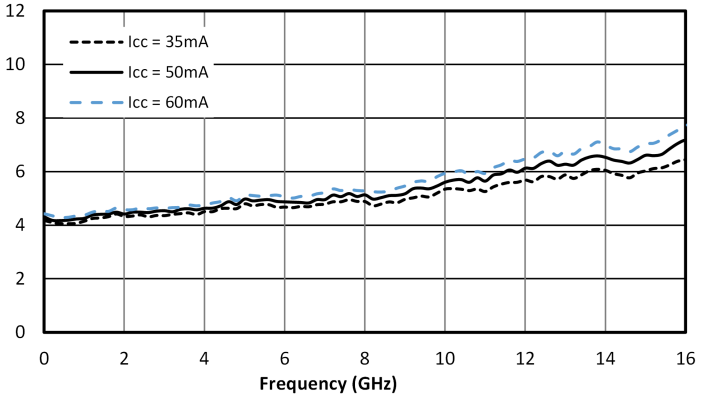
Output Power (dBm), Gain (dB) vs. Input Power, F = 12 GHz

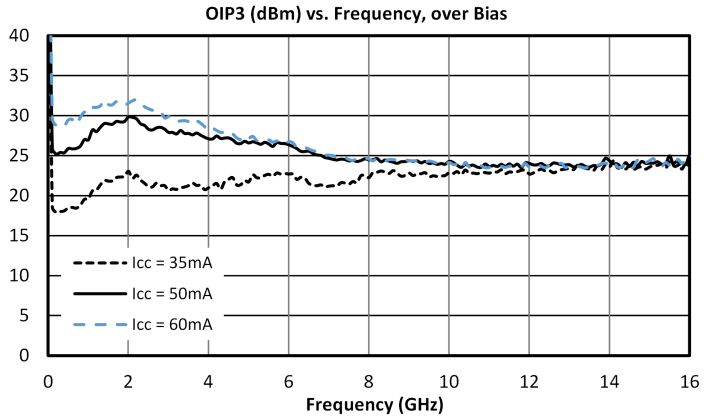


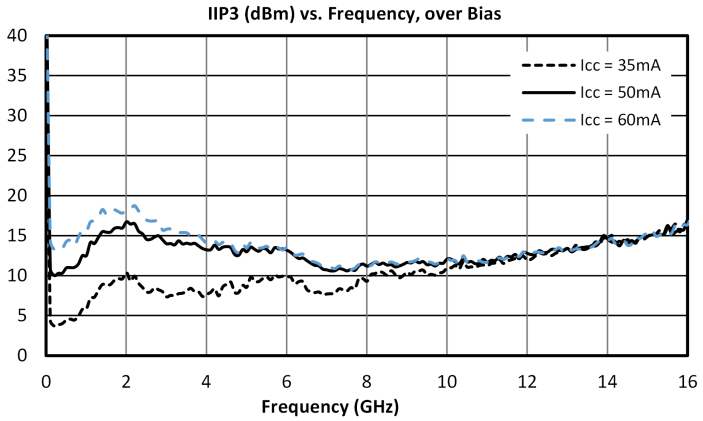
Output P1dB (dBm) vs. Frequency, over Bias[2]



Noise Figure vs. Frequency, over Bias[2]



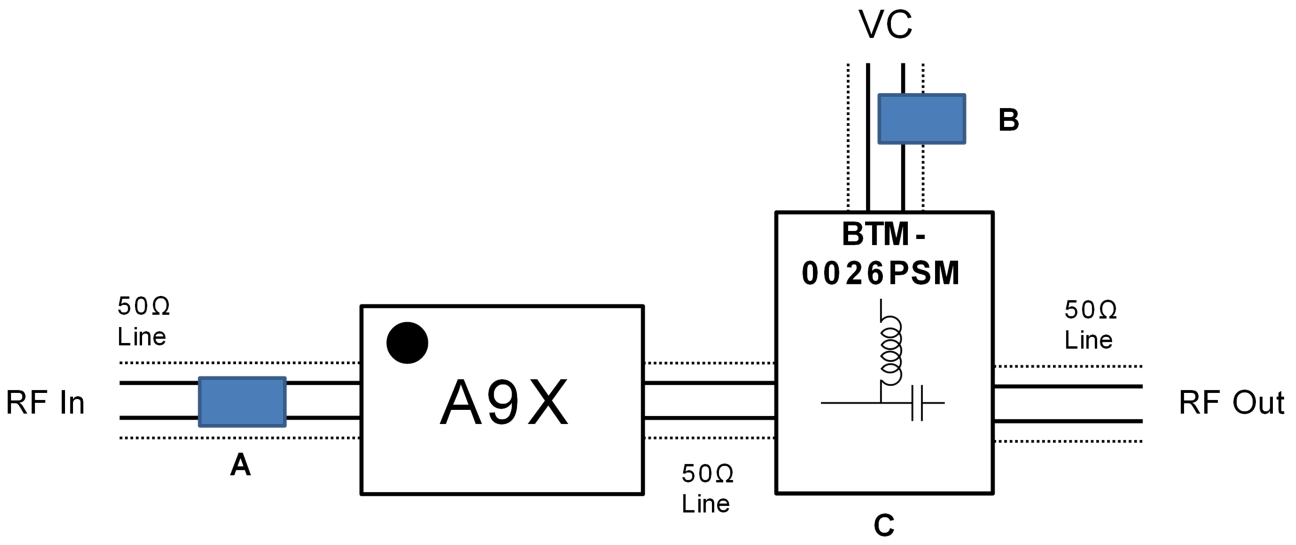




Application Information

Below is the recommended application circuit for the AKA-1300PSM.

Application Circuit



Application Circuit Description

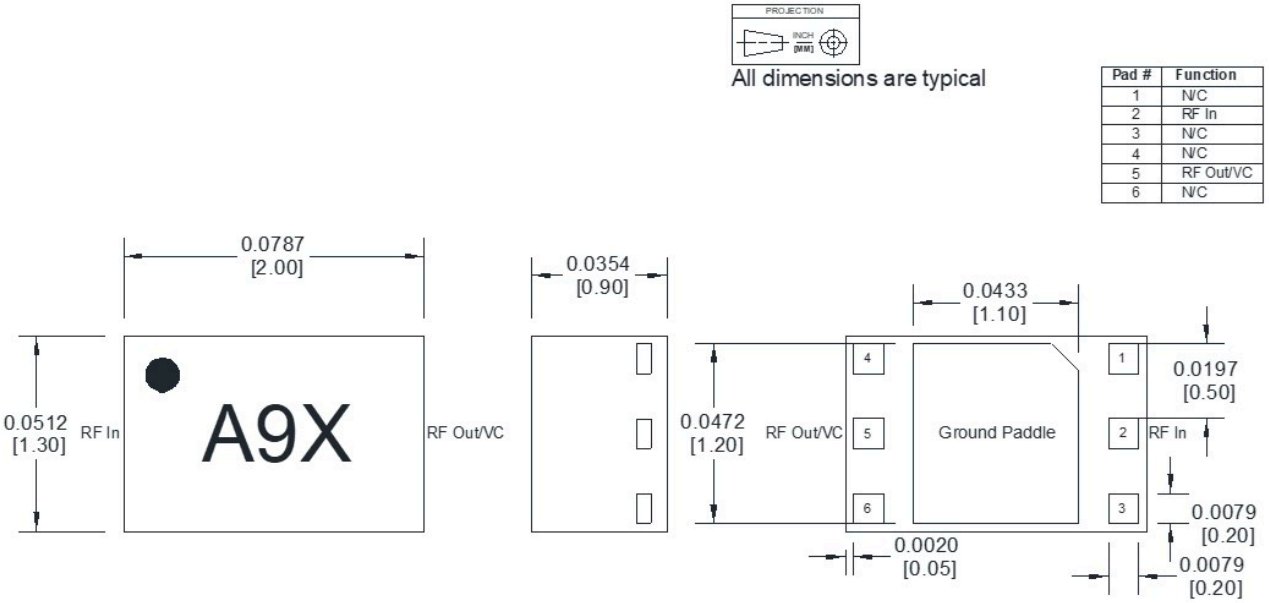
The RF input and output should be soldered to 50Ω traces. This amplifier requires external DC blocking on the input and output in addition to positive collector biasing on the output. The BTM-0026PSM is recommended to bias and DC the amplifier for its small 2.25 x 3.7mm footprint and excellent insertion loss performance.

Designator	Description	Sample Part Number
A	0201 0.1 µF SMT Capacitor	---
B	0201 0.1 µF SMT Capacitor	---
C	Marki Surface-Mount Mini Bias Tee; 10 MHz – 26 GHz	BTM-0026PSM

Mechanical Data

Outline Drawing

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



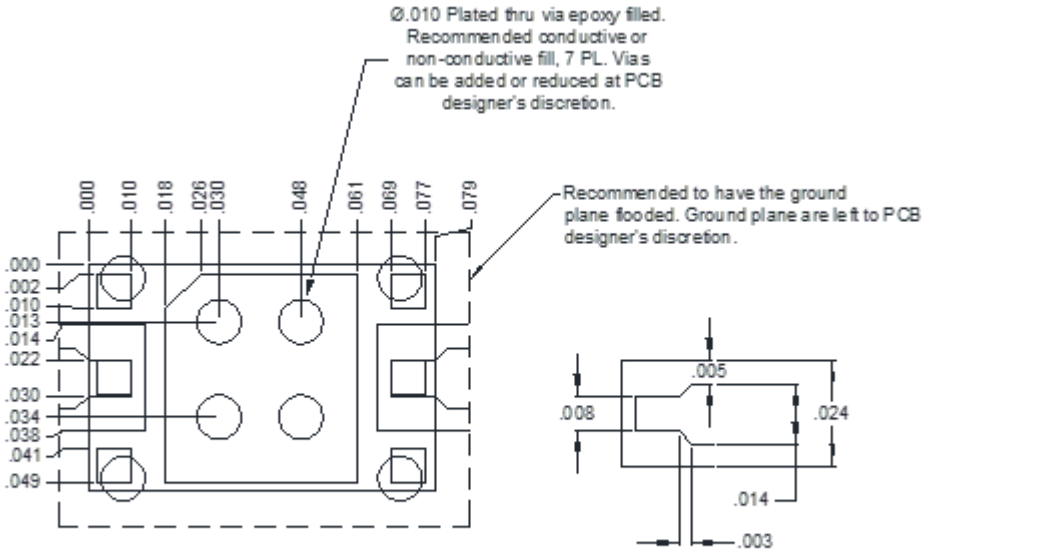
Pad #	Function
1	N/C
2	RF In
3	N/C
4	N/C
5	RF Out/VC
6	N/C

Notes (unless otherwise specified):

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

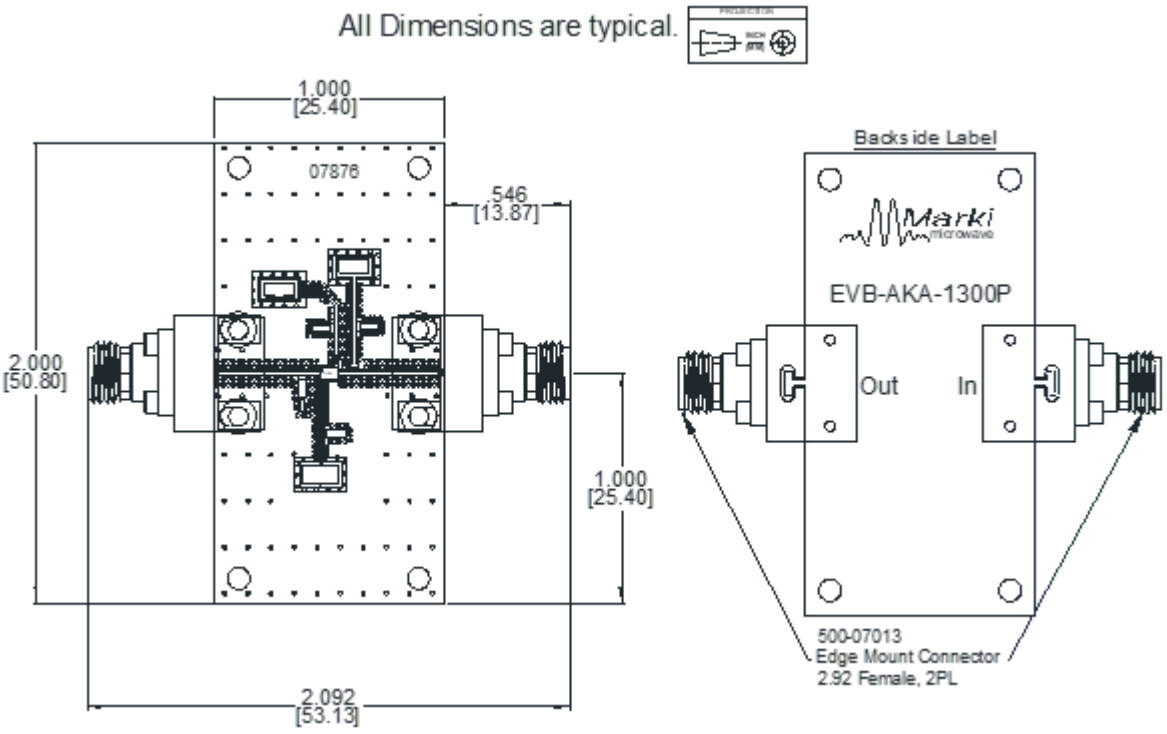
Footprint Image

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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