AlGaAs PIN Diode Voltage-Variable Attenuator Wideband, 80 - 100 GHz

MAAV-011014-DIE

Rev. V1

Features

- Insertion Loss: <3 dB
- Return Loss (at all conditions): >10 dB
- Wide Attenuation range: >25 dB
- P1dB: 25 dBm
- Control Voltage: -5.0 V to +1.4 V
- Die Size: 1.33 x 0.93 x 0.10 mm

Applications

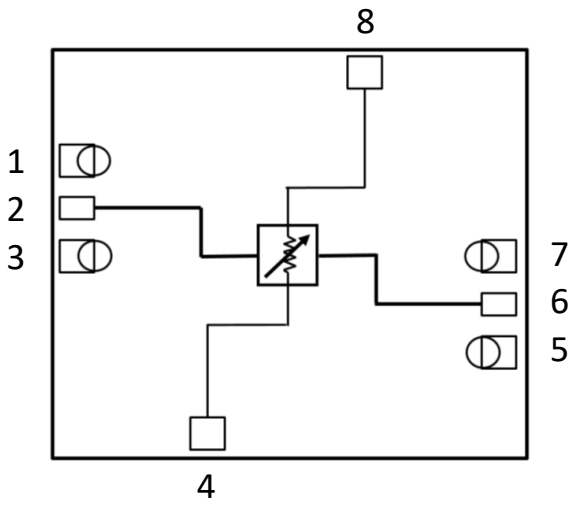
- MMW Radios
- Automotive Radar
- Radiometry
- Passive Imaging
- SATCOM
- MMW Test Equipment.

Description

The MAAV-011014-DIE is a wide band PIN Diode Voltage-Variable Attenuator (VVA). This device is designed and manufactured utilizing MACOM's AlGaAs PIN diode technology which is ideally suited for high frequency, high linearity, and high power applications.

This MAAV-011014 VVA exhibits the lowest insertion loss, and the highest P1dB available for this frequency band.

Functional Schematic



Pin Configuration[1,2]

Pin #	Function	Description
1, 3, 5, 7	GND	Ground[1]
2	RF_IN	RF Input
4, 8	V_Control	Bias Control[2]
6	RF_OUT	RF Output

1. Connects to back side GND thru a substrate via
2. Pin 4 and pin 8 are DC connected. Do not use both at the same time.

Ordering Information

Part Number	Package
MAAV-011014-DIE	Waffle Pack

*Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications:

Freq. = 80 - 100 GHz, T_A = 25°C, Z_0 = 50 Ω, $V_{CONTROL}$[3] = -5 V to +1.4 V, P_{IN} = 0 dBm

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Reference Insertion Loss	—	dB	—	-3.5	—
Attenuation Range[3]	—	dB	—	35	—
Return Loss (In/Out)	All attenuation conditions	dB	—	10	—
Input P1dB	Insertion loss state	dBm	—	25	—
IIP_3	2-Tone, +10 dBm/tone, 1 MHz Spacing	dBm	—	40	—

3. Refer to the transfer curve on page 3 for attenuation vs current (or voltage) settings.

Absolute Maximum Ratings[4,5]

Parameter	Absolute Maximum
Input power	29 dBm
Control voltage	-5.5 V ≤ $V_{Control}$ ≤ 1.5 V
Control current	20 mA
Junction Temperature	+150°C
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to +150°C

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HMB Class 1A devices.

Solder Die Attach

All die attach and bonding methods should be compatible with gold. Solder which does not scavenge gold, such as 80 Au/20 Sn or Indalloy #2, is recommended. Do not expose die to a temperature greater than 300°C for more than 10 seconds.

Electrically Conductive Epoxy Die Attach

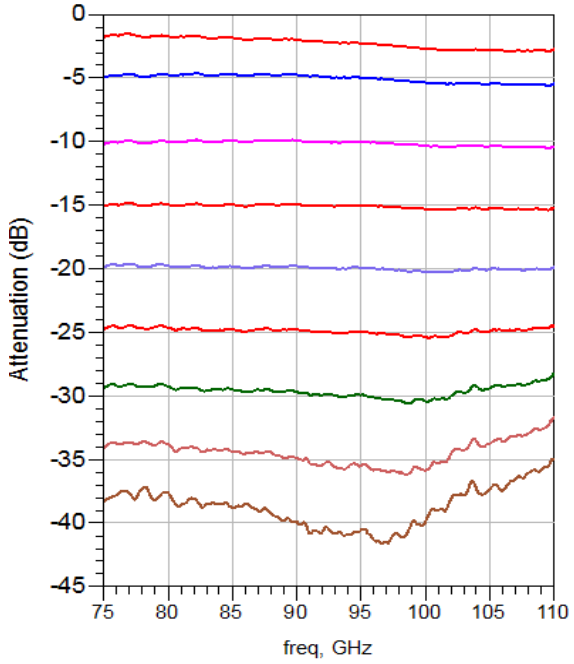
Assembly can be preheated to approximately 125°C. Use a controlled thickness of approximately 1 mils for best electrical conductivity and lower thermal resistance. A thin epoxy fillet should be visible around the perimeter of the chip after placement. Cure epoxy per manufacturer's schedule. For extended cure times, temperatures should be kept below 150°C.

Wire / Ribbon Bonding

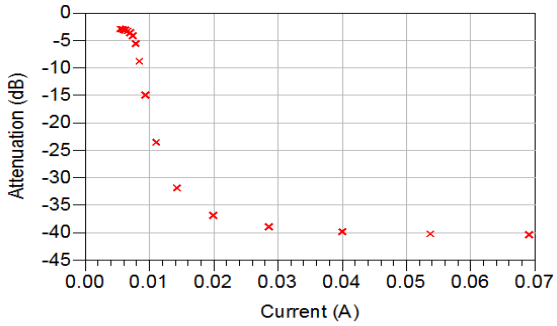
Wedge thermo compression bonding may be used to attach ribbons to the RF bonding pads. Gold ribbons should be at least 1/4 by 2 mil for lowest inductance. The same gold ribbon or 1 mil dia. gold wire is recommended for all DC pads.

Typical Performance Curves

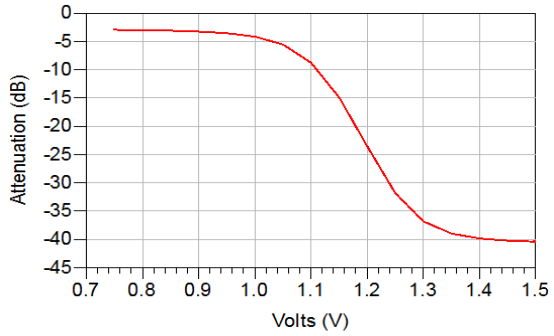
Typical Attenuation Dynamic Range (raw)



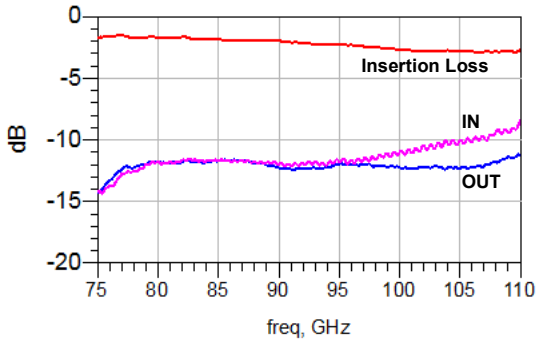
Typical Attenuation VS Control Current



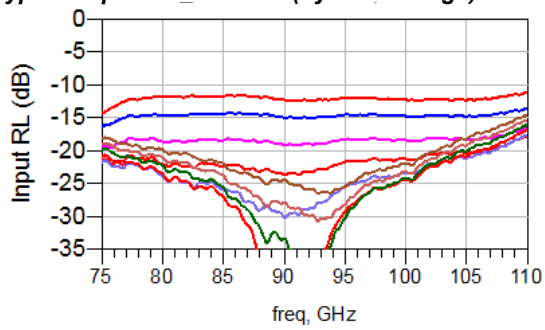
Typical Attenuation VS Control Voltage



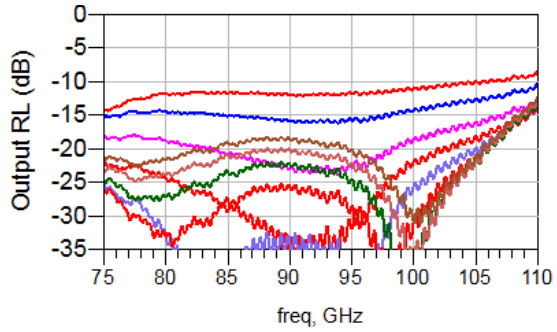
Typical reference I. Loss, & Return Loss (IN/OUT)



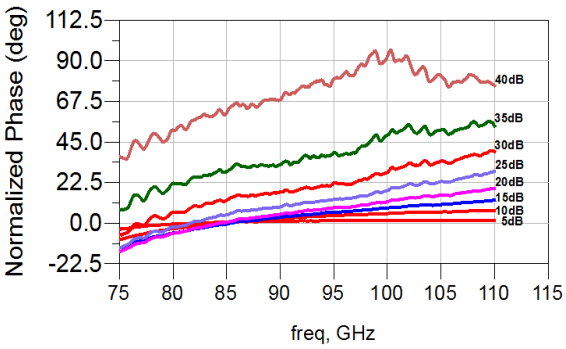
Typical Input Return Loss (dynamic range)



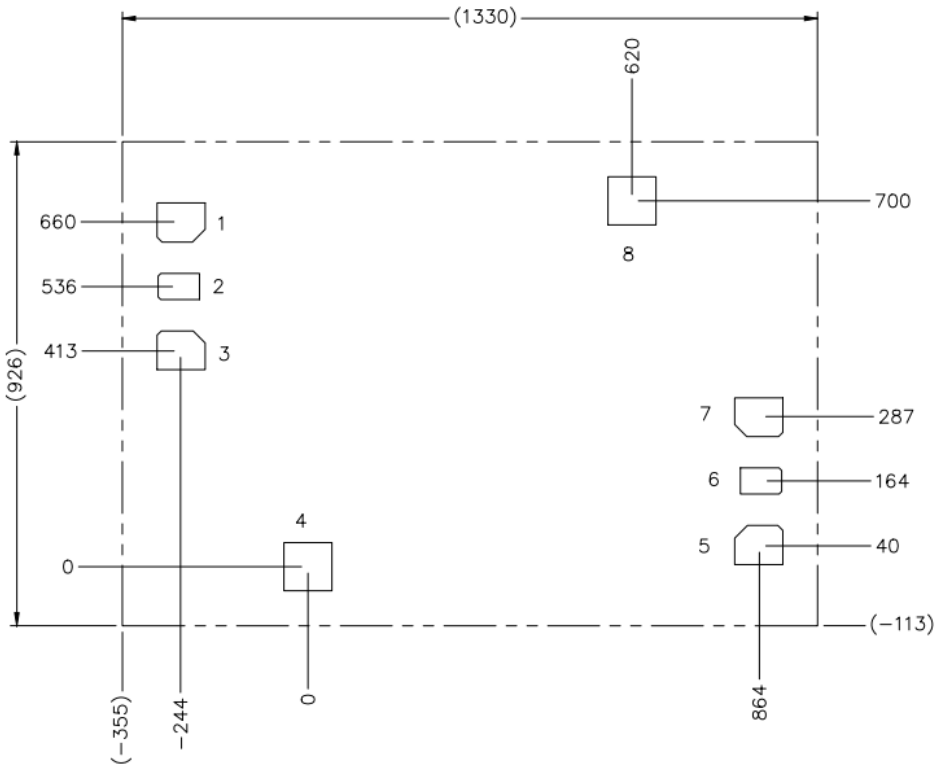
Typical Output Return Loss (dynamic range)



Normalized Phase response (dynamic range)



Outline Drawing



BOND PAD DIM (μm)		
PAD	X	Y
1,3,5,7	92	81
2,6	79	50
4,8	92	92

NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHOWN ARE μm WITH A TOLERANCE OF ±5μm.
2. DIE THICKNESS IS 100 ±10μm
3. BOND PAD/BACKSIDE METALLIZATION: GOLD.
4. DIE SIZE REFLECTS UN-CUT DIMENSIONS. SAW OR LASER KERF REDUCES DIE SIZE BY ~25μm EACH DIMENSION.