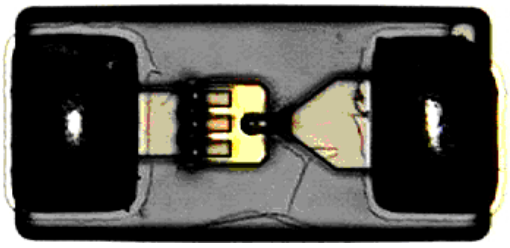
# AlGaAs Solder Bump Flip-Chip PIN Diode MA4AGSBP907 Rev 2.0

## Features

- Low Series Resistance, 4 Ω
- Ultra Low Capacitance, 25 fF
- High Switching Cutoff Frequency, 40 GHz
- 2 Nanosecond Switching Speed
- Can be Driven by Buffered TTL
- Silicon Nitride Passivation
- Polyimide Scratch Protection
- Solderable Bump Die Attach



Mounting Side with Solder Bumps

## Description

M/A-COM's MA4AGSBP907 is an Aluminum Gallium Arsenide Flip-Chip PIN diode with solder bumps.These devices are fabricated on OMCVD epitaxial wafers using a process designed for high device uniformity and extremely low parasitics. The diodes exhibit an extremely low RC Product, ( 0.1 ps ) and 2 nS switching characteristics. The useable frequency range is 100 MHz to 40 GHz. They are fully passivated with silicon nitride and have an additional layer of a polymer for scratch protection.The protective coatings prevent damage to the junction and the anode airbridge during handling and circuit attachment.

## Aplications



The 25 fF capacitance of the MA4AGSBP907 allows use through mmwave switch and switched phase shifter applications. This diode is designed for use in pulsed or CW applications, where single digit nS switching speed is required. For surface mount assembly, the low capacitance of the MA4AGSBP907 makes it ideal for use in microwave multithrow switch assemblies, where the series capacitance of each “off” port adversely loads the input and affects VSWR.

## Electrical Specifications and RF Data at $T_A$ = 25 °C

| Parameters and Test Conditions | Symbol | Units | 1 MHz & DC Specifications | | | 10 GHz Reference Data[1,2] | | |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ. | Max | Min | Typ. | Max. |
| Total Capacitance at –10 V | Ct | pF | | 0.025 | 0.030 | | 0.025 | |
| Forward Resistance at +10 mA | Rs | Ω | | 5.2 | 7.0 | | 4.2 | |
| Forward Voltage at +10 mA | Vf | Volts | | 1.33 | 1.45 | | | |
| Reverse Breakdown Voltage at -10 uA[3] | Vb | Volts | | -50 | -45 | | | |
| Switching Speed ( 10 to 90% RF Voltage )[4] & ( 90 to 10% RF Voltage )[4] | Trise Tfall | nS | | | | | 2 | |

**Notes:**

1. Capacitance is determined by measuring Single Series Diode Isolation in a 50 ohm line at 10 GHz.
2. Forward Series Resistance is determined by measuring Single Series Diode Insertion Loss in a 50 ohm line at 10 GHz.
3. Reverse current will not exceed 10 microamperes at the Maximum Voltage Rating.
4. Switching speed is measured between 10% and 90% or 90% to 10 % RFVoltage for a Single Series Mounted Diode. Driver Delay is Not included.



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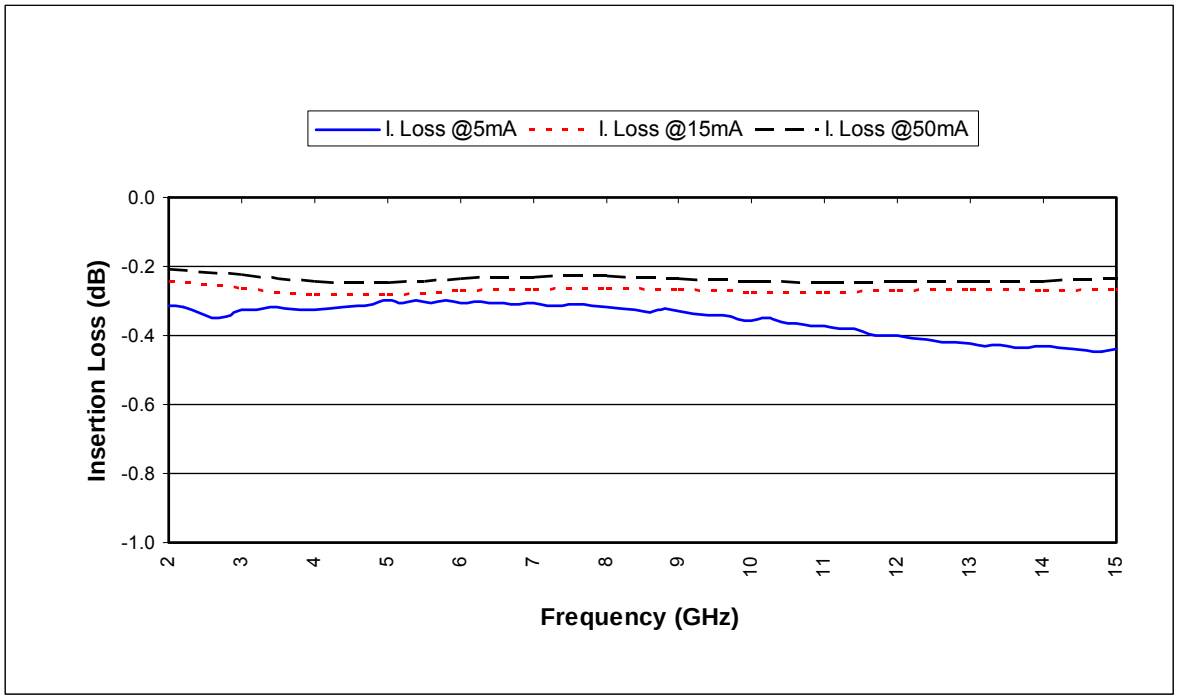
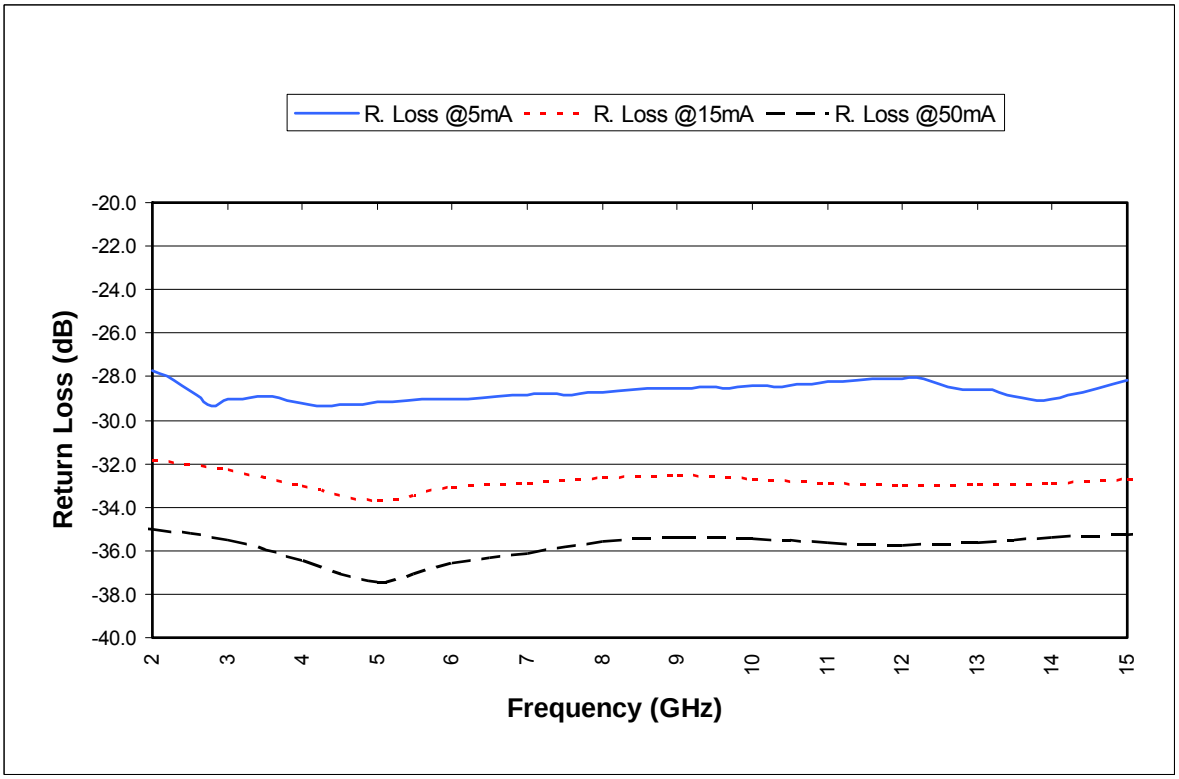
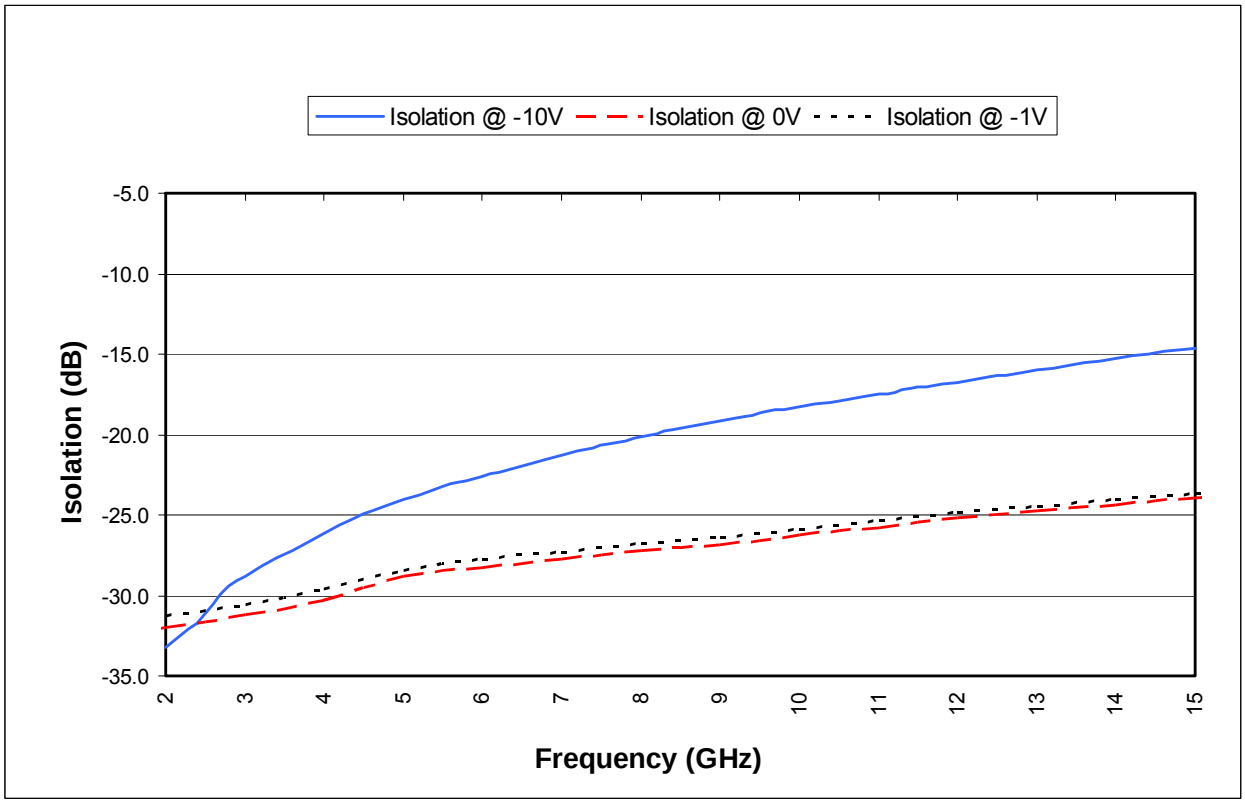
## Single Series Diode Insertion Loss vs Frequency

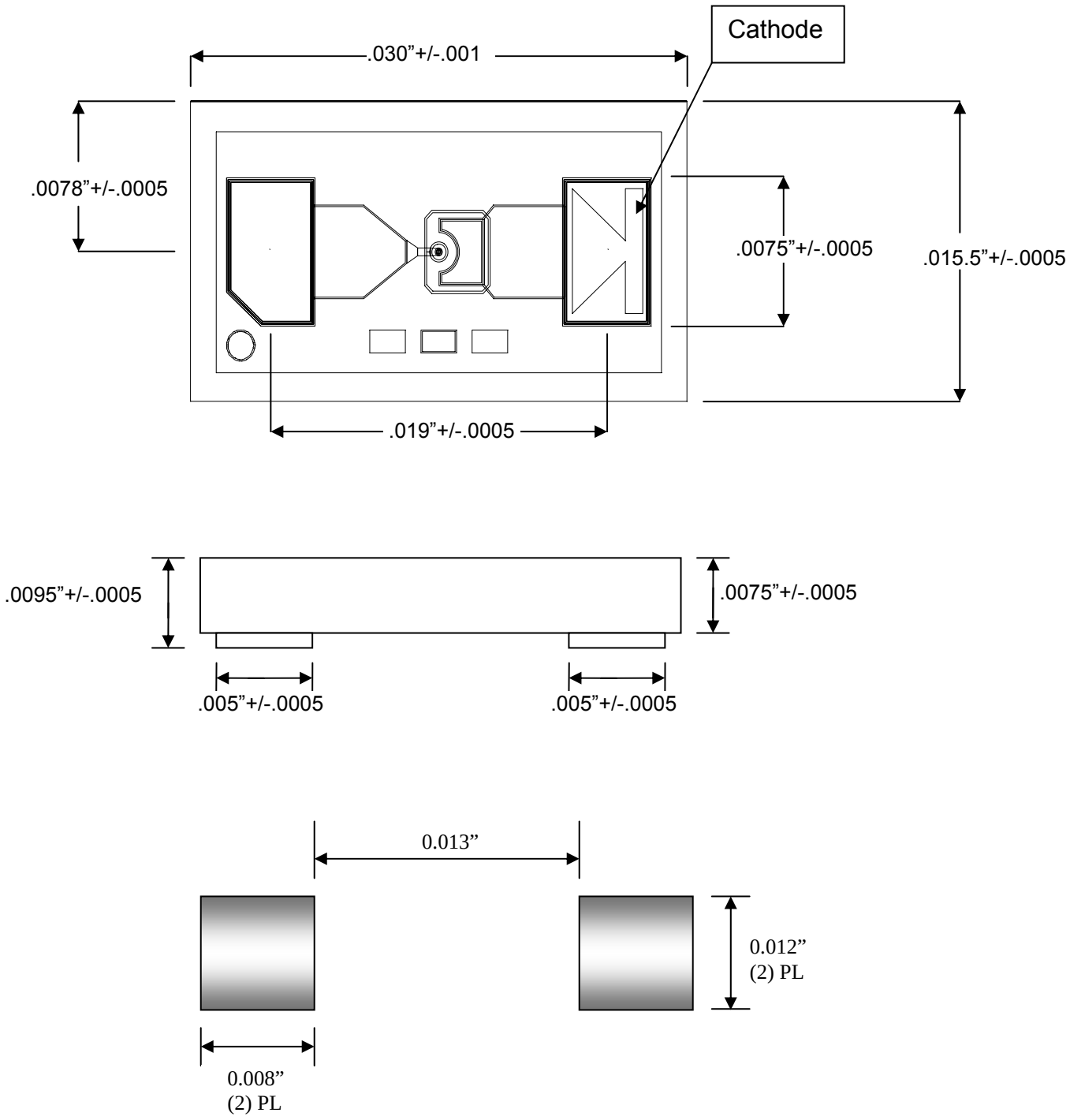



## Single Series Diode Return Loss vs Frequency



## Single Series Diode Isolation vs Frequency






**Circuit Mounting Dimensions ( Inches )**

## Device Installation Procedures

The following guidelines should be observed to avoid damaging GaAs Flip-Chips.

## Cleanliness

These devices should be handled in a clean environment. Do Not attempt to Clean Die After installation.

## Static Sensitivity

Gallium arsenide PIN diodes are ESD sensitive and can be damaged by static electricity. Proper ESD techniques should be used when handling these devices. These devices are rated Class 0, ( 0-199V ) per HBM MIL-STD-883, method 3015.7 [C = 100pF ±10%, R = 1.5kW ±1%]. Even though tested die pass 50V ESD, they must be handled in a static-free environment.

## General Handling

These devices have a polymer layer which provides scratch protection for the junction area and the anode air bridge. Die can be handled with plastic tweezers or picked and placed automatically with a #27 tip vacuum pencil.

## Assembly Requirements using Tin Lead Solder

The Flip Chip Diode employs a 6um thick, Sn 63 / Pb 37 Solderable interface as part of the 50µm high solder bump. These chips are designed to be soldered onto hard or soft substrates with the junction side down. They should be mounted onto silkscreened circuits using 60/40 Sn/Pb solder paste. A typical profile for a Sn 63/ Pb 37 Soldering process is provided in **Application Note, M538 Surface Mounting Instructions** on the M/A-COM website www.macom.com

## Absolute Maximum Ratings @ 25°C[1]

| Parameter | Maximum Ratings |
|---|---|
| Operating Temperature | -65 °C to +125 °C |
| Storage Temperature | -65 °C to +150 °C |
| Junction Temperature | +175 °C |
| Dissipated RF & DC Power | 50 mW |
| RF C.W. Incident Power | +23 dBm C.W. |
| Mounting Temperature | +300 °C for 10 seconds |

**Notes:**

1. Exceeding these limits may cause permanent damage.

## Ordering Information

| Part Number | Packaging |
|---|---|
| MA4AGSBP907 | Die in Carrier |
| MA4AGSBP907-T | Tape/Reel |
| MA4AGSBP907-W | Wafer on Frame |