MA4GP907

GaAs Flip Chip PIN

Rev. V10

Features

- Low Series Resistance
- Ultra Low Capacitance
- Millimeter Wave Switching & Cutoff Frequency
- 2 ns Switching Speed
- Can be Driven by a Buffered TTL
- Silicon Nitride Passivation
- Polyimide Scratch Protection
- RoHS* Compliant

Description

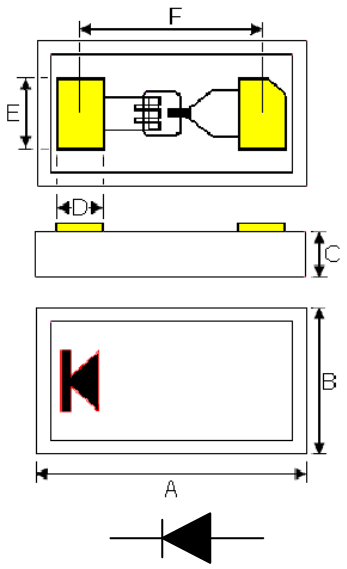
The MA4GP907 is a Gallium Arsenide (GaAs) flip-chip PIN diode. It is fabricated with MOCVD grown epitaxy using a process and design that optimizes device-to-device uniformity and produces extremely low parasitics. The diode exhibits an exceptionally low RC product (0.1 ps) and a 2 - 3 ns switching speed. The chips are fully passivated with silicon nitride and have an added BCB polymer layer for scratch protection. The BCB protective coating prevents damage to the diode junction and anode air-bridge during handling and assembly.

The ultra low capacitance of the MA4GP907 allows for operation at millimeter wave frequencies for RF switches and phase shifter applications. The diode is designed to be used in pulsed or CW applications, where single digit ns switching speed is required. The low capacitance of this device makes it ideal for use in many microwave multi-throw switch assemblies, where the series capacitance of each "off" port adversely loads the input and affects VSWR.

Ordering Information

Part Number	Packaging
MA4GP907	Waffle Pack
MADP-000907-13050P	Pocket Tape

Chip Dimensions[1,2]



1. Gold Pads 14 µm thick (nominal).
2. Yellow areas indicate ohmic gold mounting pads.

Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.0260	0.0270	0.6604	0.6858
B	0.0135	0.0145	0.3429	0.3683
C	0.0065	0.0075	0.1651	0.1905
D	0.0043	0.0053	0.1092	0.1346
E	0.0068	0.0073	0.1727	0.1854
F	0.0182	0.0192	0.4623	0.4877

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Electrical Specifications @ T_A = +25°C

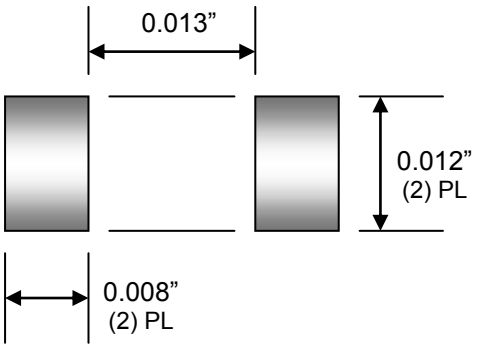
Parameter	Conditions	Units	Min.	Typ.	Max.
Total Capacitance (C_T)	-10 V,1 MHz	pF	—	0.025	0.030
Series Resistance (R_S)	+10 mA, 1 GHz	Ω	—	5.2	7.0
Forward Voltage (V_F)	+10 mA	V	—	1.33	1.45
Reverse Voltage Current[3] (I_R)	V_R = -50 V	µA	—	—	10
Switching Speed[4] (T_{RISE}/T_{FALL})	10 GHz	ns	—	2	—

3. The max rated reverse voltage (V_R) is sourced and the resultant reverse leakage current (I_R), is measured to be <10 µA.
4. Switching speed is measured between 10% and 90% or 90% to 10% RF voltage for a single series mounted diode, driver delay is not included.

Absolute Maximum Ratings

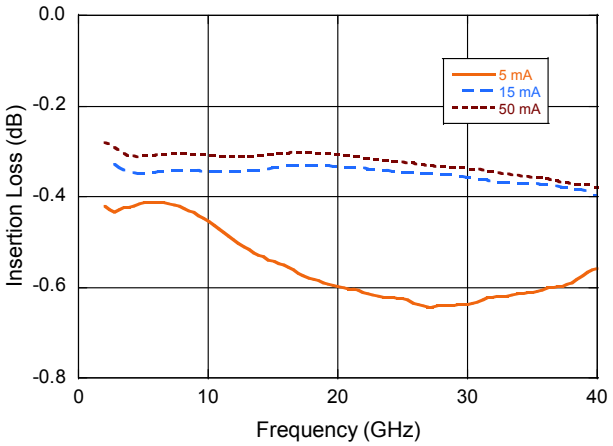
Parameter	Absolute Maximum
Reverse Voltage	50 V
CW Incident Power	23 dBm
RF & DC Dissipated Power	250 mW
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +150°C
Junction Temperature	+175°C
Mounting Temperature	+280°C for 10 seconds

Circuit Pad Layout

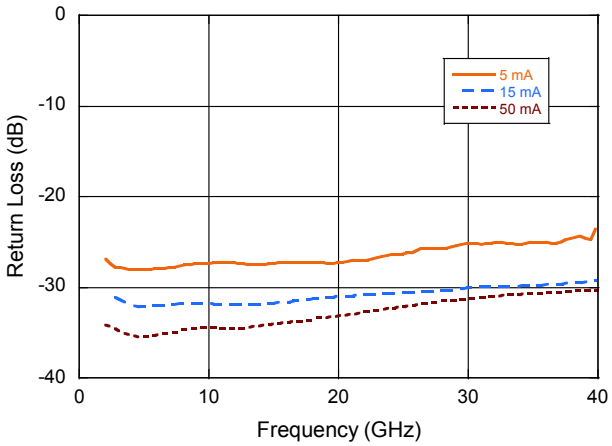


Typical Performance Curves

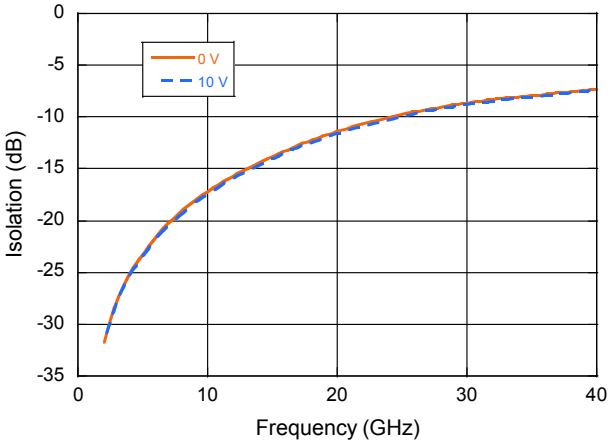
Insertion Loss



Return Loss



Isolation



Cleanliness

This device should be handled in a clean environment. The chip is resistant to solvents and may be cleaned using approved industry standard practices and chemicals.

Static Sensitivity

Gallium Arsenide PIN diodes are ESD sensitive and can be damaged by static electricity. Proper ESD handling techniques should be used in a static-free environment. These devices are rated Class 0 HBM per MIL-STD-883, method 3015.7.

General Handling

The die has 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 with a #27 tip vacuum pencil.

Assembly Requirements

Electrically Conductive Silver Epoxy:

The MA4GP907 is designed to be inserted onto hard or soft substrates with the junction/pad side down. It can be mounted onto a silk-screened circuit using electrically conductive silver epoxy which is approximately 1 - 2 mils thick and cured at approximately 90°C to 150°C per manufacturer's schedule. For extended cure times, >30 minutes, temperatures must be kept below 200°C.

Solder Die Attached:

The MA4GP907 and the MA4AGP907 (AlGaAs) PIN diode, which both employ the same contact pad metalization scheme (T-W-Au), must use a solder that contains <30% Sn by weight for a reliable die attach to a circuit. An example is a eutectic 80Au/20Sn.

Tin rich solders (>30% Sn by weight) are not recommended as they will scavenge the gold on the contact pads, exposing the tungsten metalization beneath and creating a poor solder connection.

Note:
For an AlGaAs solderable PIN diode version (with Cu-Ni-Au contact pads) where both 60Sn/40Pb (non RoHS) and 96Sn/4Ag (RoHS) type solders can be used, please refer to MACOM's MADP-000907-14020.