MA4AGP907
MA4AGFCP910

AlGaAs
Flip Chip PIN Diodes

RoHS Compliant

Rev. V4

Features

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

Description

M/A-COM's MA4AGP907 and MA4AGFCP910 are Aluminum Gallium Arsenide (AlGaAs) flip-chip PIN diodes. 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, (0.1ps) and 2-3nS switching characteristics. They are fully passivated with silicon nitride and have an added polymer layer for scratch protection. The protective coating prevents damage to the junction and the anode air-bridge during handling and assembly.

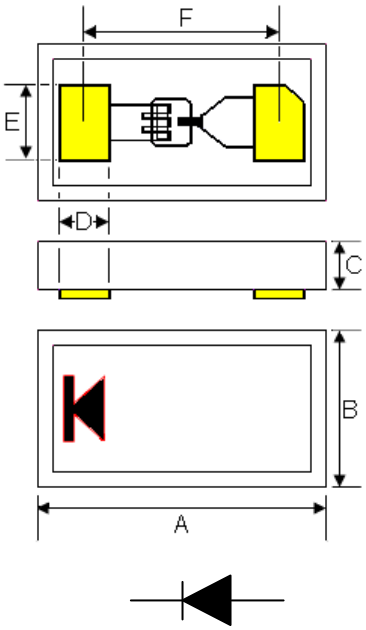
Applications

The ultra low capacitance of the MA4AGP907 and MA4AGFCP910 allows their use through millimeter frequencies for RF switches and switched phase shifter applications. The diodes are designed for use in pulsed or CW applications, where single digit nS switching speed is required. For surface mount assembly, the low capacitance of these switches make them ideal for use in microwave multi-throw switch assemblies, where the series capacitance of each “off” port adversely loads the input and affects VSWR.

Absolute Maximum Ratings T_{AMB} = +25°C
(unless otherwise specified)

Parameter	Absolute Maximum
Reverse Voltage	MA4AGP907 -50V
	MA4AGFCP910 -75V
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +150°C
Junction Temperature	+175°C
Dissipated Power (RF & DC)	50mW
C.W. Incident Power	+23 dBm
Mounting Temperature	+280°C for 10 seconds

Chip Dimensions
MA4AGP907 and MA4AGFCP910



Notes:

1. Gold Pads 14µM thick.
2. Yellow areas indicate ohmic gold mounting pads.
3. Dimensions A thru F are identical for both devices

DIM	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.026	0.027	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

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- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
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Electrical Specifications @ T_{AMB} = +25°C

Parameter	Symbol	Conditions	Units	MA4AGP907		MA4AGFCP910	
				Typ.	Max.	Typ.	Max.
Total Capacitance	C_T	MA4AGP907 -5V,1MHz	pF	0.025	0.030	0.018	0.021
		MA4AGFCP910 -10V,1MHz					
Total Capacitance [1]	C_T	-5V, 10GHz	pF	0.020	——	0.018	0.021
Series Resistance	R_S	+10mA, 1MHz	Ω	5.2	7.0	——	——
Series Resistance [2]	R_S	+10mA, 10GHz	Ω	4.2	——	5.2	6.0
Forward Voltage	V_F	+10mA	V	1.33	1.45	1.33	1.45
Reverse Leakage Current [3]	I_R	MA4AGP907 V_R = -50V	µA	——	10	——	10
		MA4AGFCP910 V_R = -75V					
Switching Speed [4]	T_{RISE} T_{FALL}	10GHz	nS	2	——	2	——
Carrier Lifetime	T_L	I_F = 10mA / I_{REV} = 6mA	nS	——	——	4	——

Notes:

1) Capacitance is determined by measuring the isolation of a single series diode in a 50Ω transmission line at 10GHz.
2) Series resistance is determined by measuring the insertion loss of a single series diode in a 50Ω transmission line at 10GHz.
3) The max rated V_R(Reverse Voltage) is sourced and the resultant reverse leakage current, Ir, is measured to be <10µA
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.

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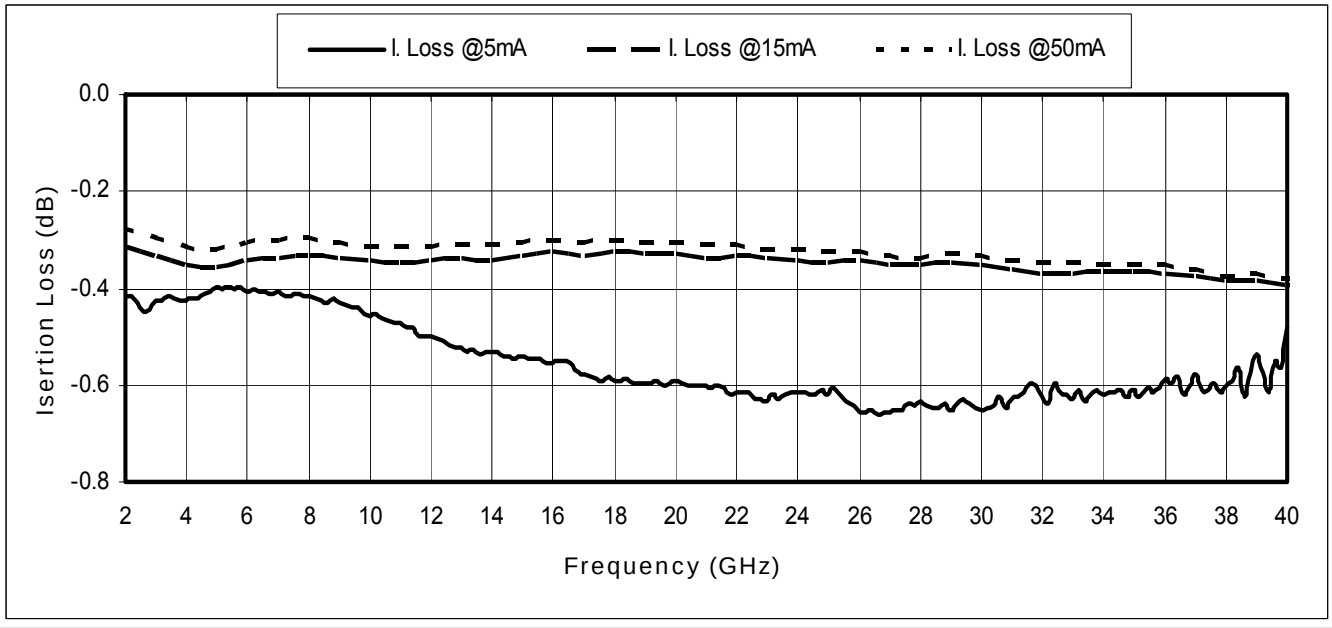
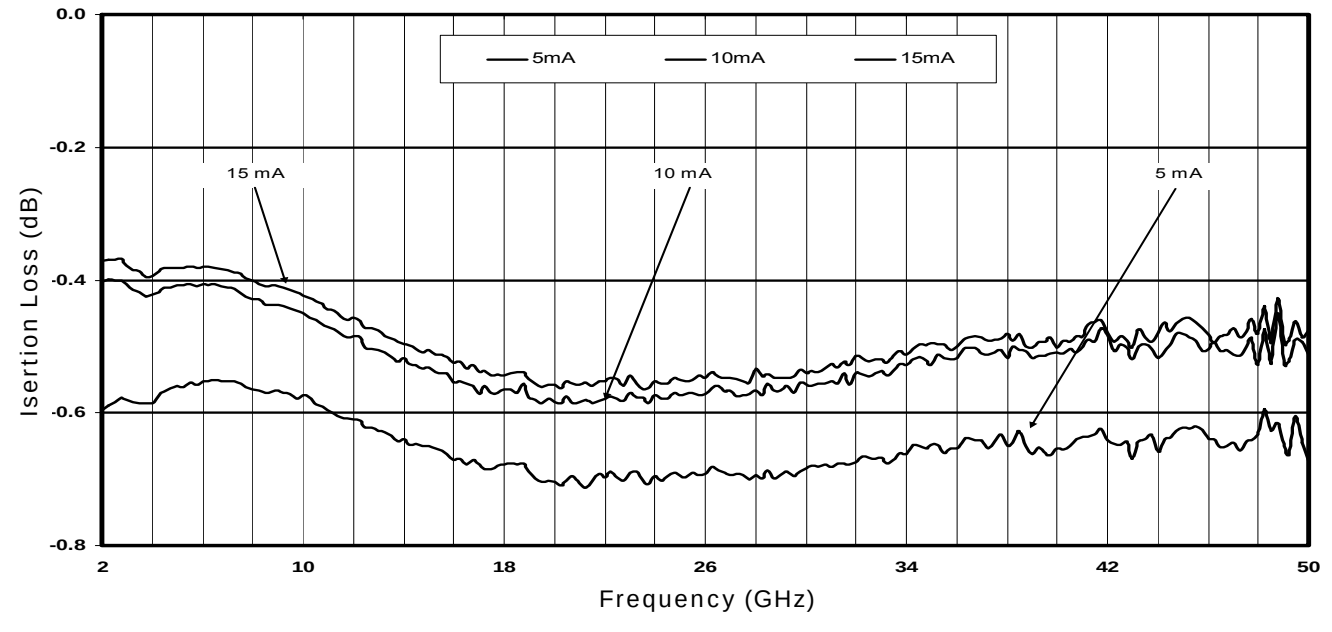
Typical RF Performance @ T_{AMB} = +25°C

MA4AGP907
Typical Insertion Loss vs. Frequency



MA4AGFCP910
Typical Insertion Loss vs. Frequency



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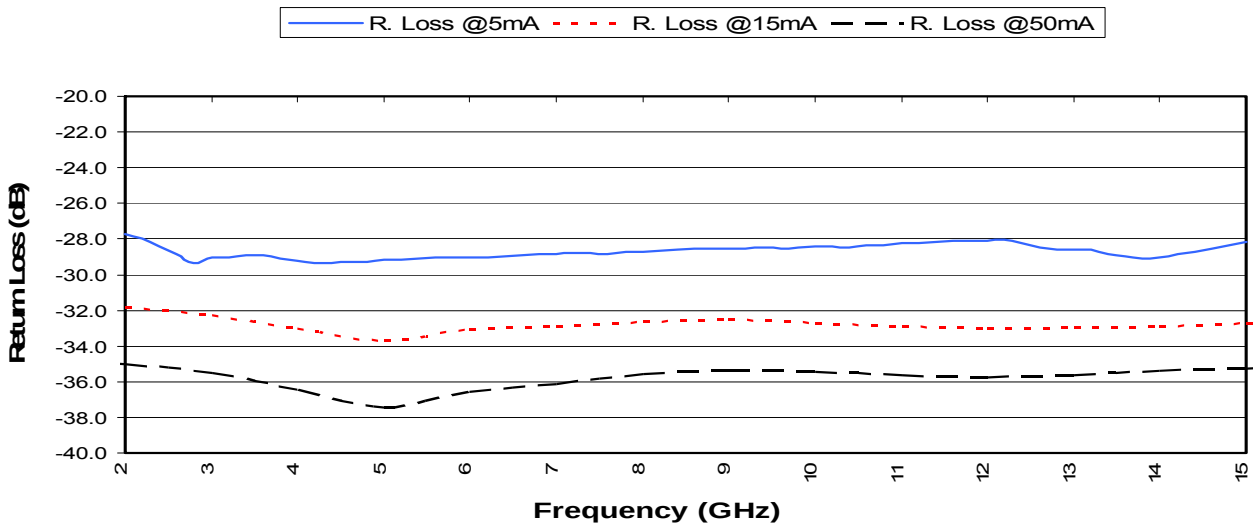
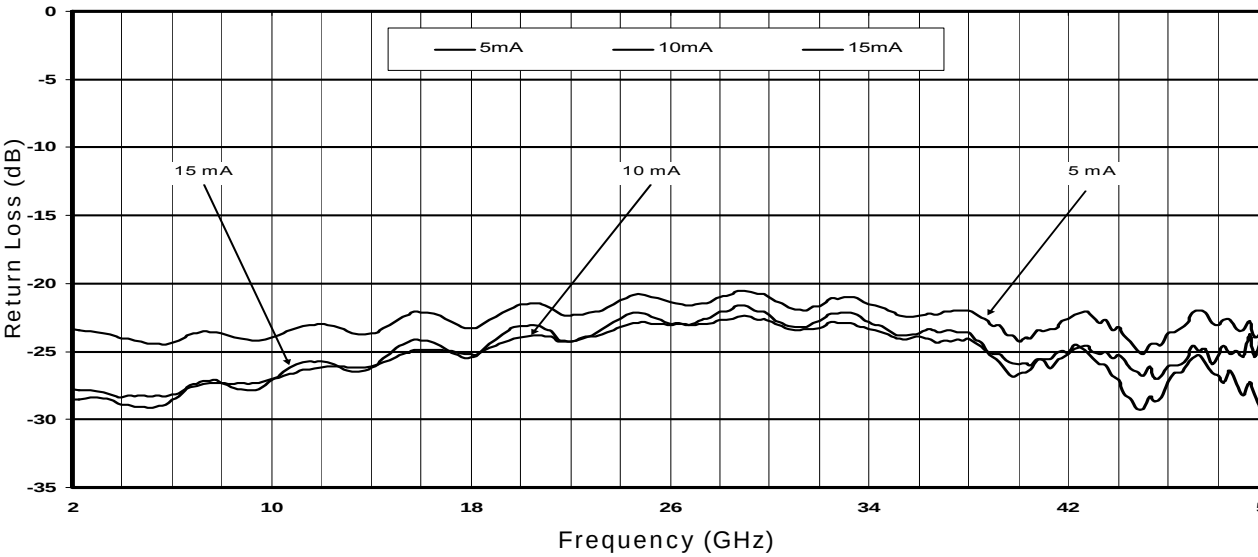
Typical RF Performance @ T_{AMB} = +25°C

MA4AGP907
Typical return Loss vs. Frequency (Either Port)



MA4AGFCP910
Typical Return Loss vs. Frequency (Either Port Direction)



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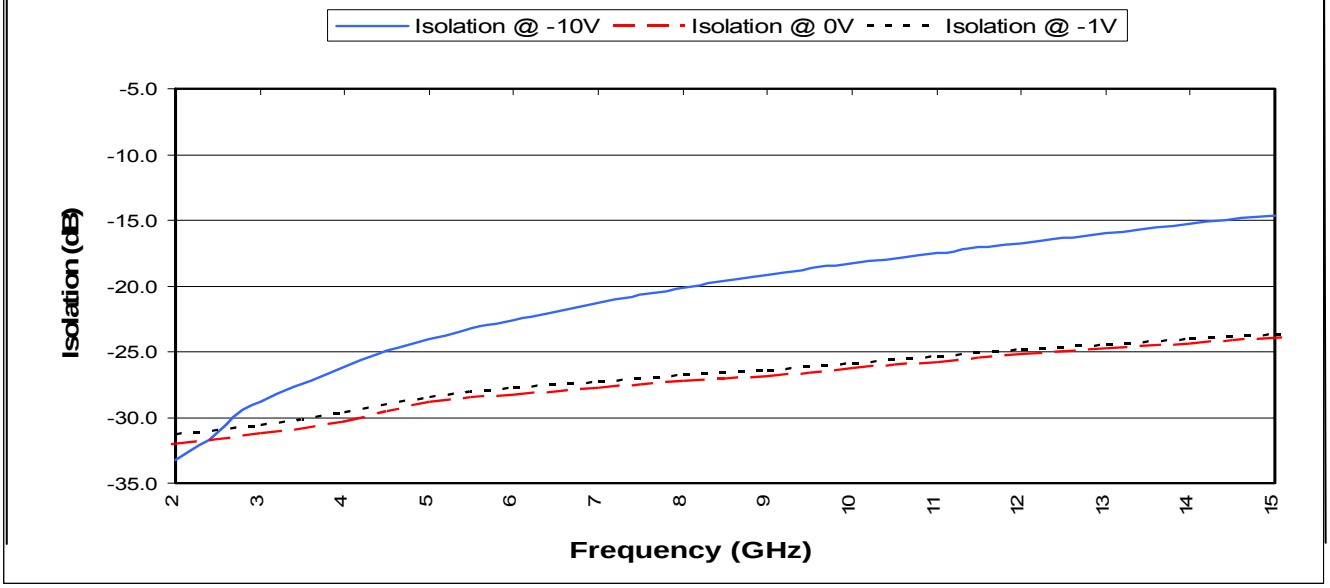
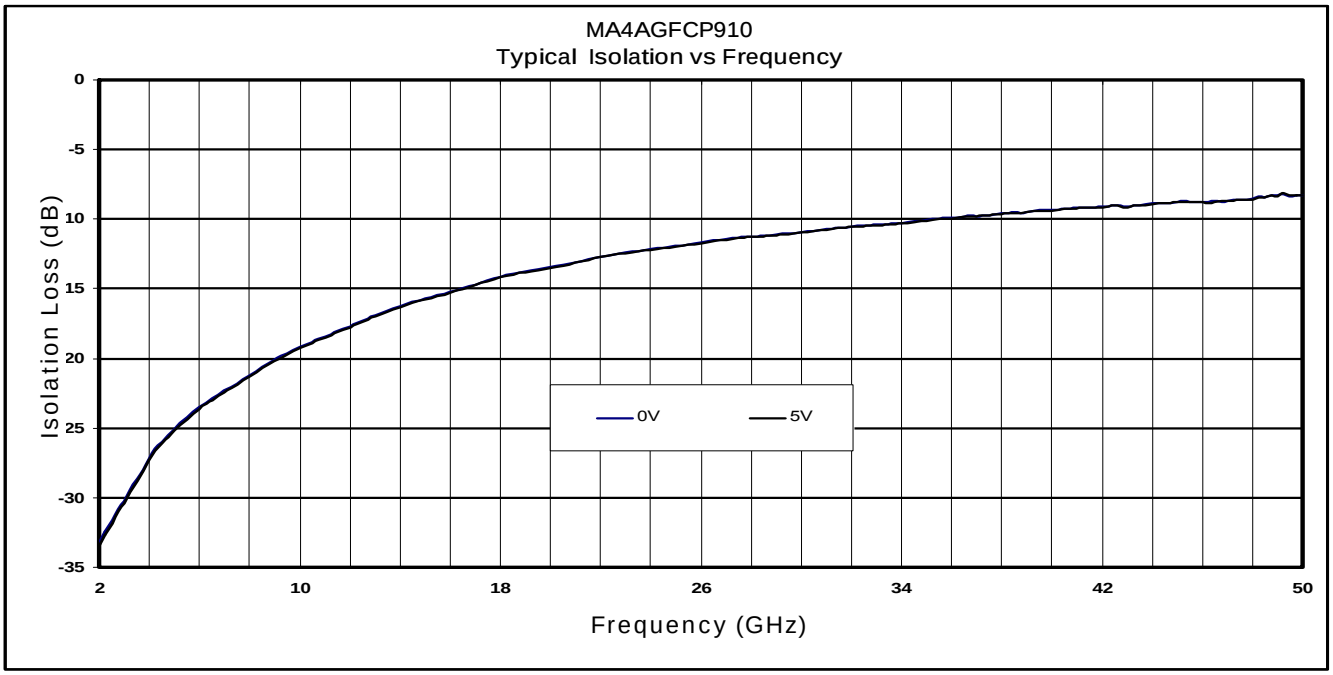
Typical RF Performance @ T_{AMB} = +25°C

MA4AGP907
Typical Isolation vs. Frequency



MA4AGFCP910
Typical Isolation vs Frequency



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Device Installation Guidelines

Cleanliness

These devices should be handled in a clean environment. The chips are resistant to solvents and may cleaned using approved industry standard practices.

Static Sensitivity

Aluminum 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

The 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 with a #27 tip vacuum pencil.

Assembly Requirements using Electrically Conductive Silver Epoxy and Solder

These chips are designed to be inserted onto hard or soft substrates with the junction side down. They should be mounted onto silk-screened circuits using electrically conductive silver epoxy, approximately 1-2 mils in thickness and cured at approximately 90°C to 150°C per manufacturer's schedule. For extended cure times, > 30 minutes, temperatures must be below 200°C.

Eutectic Die Attached

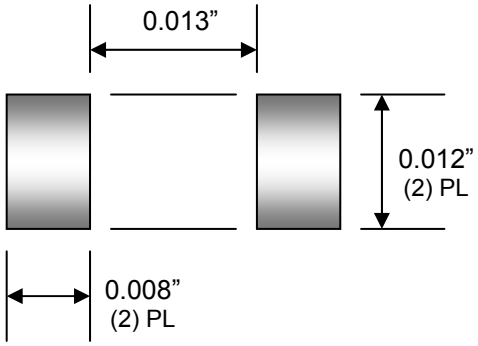
Tin rich solders (>30% Sn by weight) are not recommended as they will scavenge the gold on the contact Pads exposing the tungsten metallization beneath and creating a poor solder connection. Indalloy or 80/20, Au/Sn type solders are acceptable. Maximum soldering temperature must be kept below 280°C for less than 10 seconds.

Note:
The MA4AGSBP907 which is a solder bumped version of the MA4AGP907, is also available. The datasheet can be viewed on the M/A-COM website at: http://www.macom.com/DataSheets/MA4AGSBP907.pdf

Ordering Information

Part Number	Packaging
MA4AGP907	Gel Pack
MADP-001907-13050P	Pocket Tape
Part Number	**Packaging**
MA4AGFCP910	Gel Pack
MADP-000910-13050P	Pocket Tape

Circuit Pad Layout



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