

Solderable GaAs Flip Chip PIN

Rev. V1

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 Technology Solutions MADP-000907-14020 is a solderable, flip-chip Gallium Arsenide (GaAs) PIN diode. It is fabricated with MOCVD grown epitaxy using a process and design that optimizes device uniformity and produces extremely low parasitics. The diode exhibits an exceptionally low RC product (0.1ps) and a 2-3nS 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.

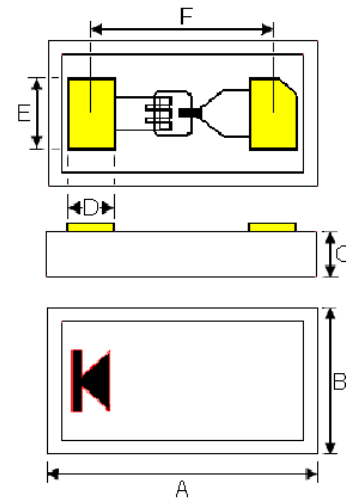
Applications

The ultra low capacitance of the MADP-000907-14020 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 the MADP-000907-14020 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.

Absolute Maximum Ratings $T_{AMB} = +25^{\circ}\text{C}$ (unless otherwise specified)

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

Chip Dimensions



Notes:

1. Gold Pads 14µM thick.
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

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PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

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Electrical Specifications @ $T_{AMB} = +25^{\circ}\text{C}$

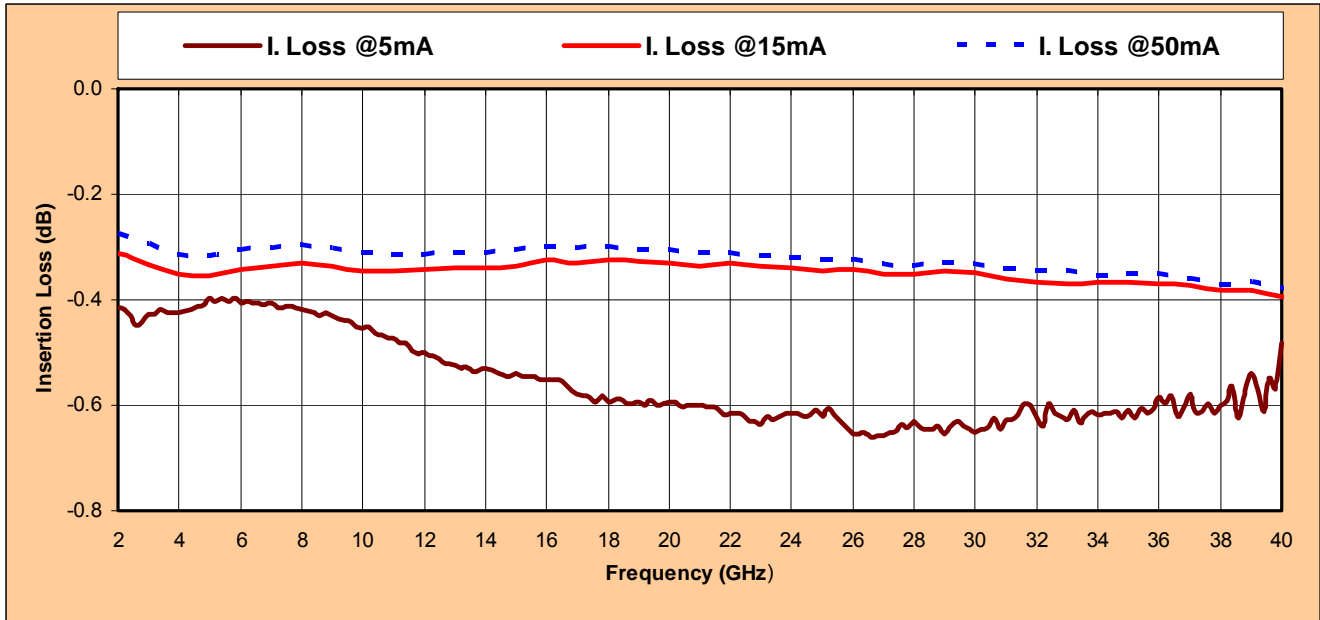
Parameter	Symbol	Conditions	Units	Typ.	Max.
Total Capacitance	C_T	-10V, 1MHz	pF	0.025	0.030
Series Resistance	R_S	+10mA, 1GHz	Ω	5.2	7.0
Forward Voltage	V_F	+10mA	V	1.33	1.45
Reverse Voltage Current ¹	I_R	$V_R = -50\text{V}$	μA	—	10
Switching Speed ²	T_{RISE} T_{FALL}	10GHz	nS	2	—

Notes:

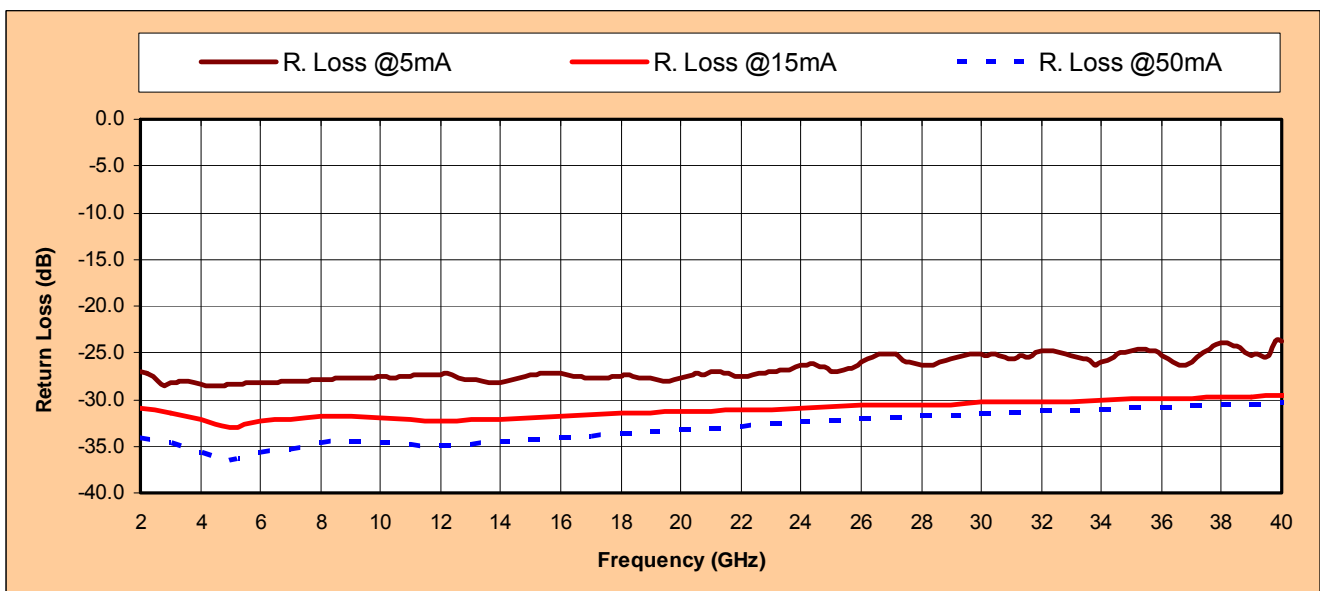
- 1) The max rated V_R (Reverse Voltage) is sourced and the resultant reverse leakage current, I_r , is measured to be $<10\mu\text{A}$
- 2) Switching speed is measured between 10% and 90% or 90% to 10% RF voltage for a single series mounted diode. Driver delay is not included.

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

Insertion Loss vs. Frequency



Return Loss vs. Frequency



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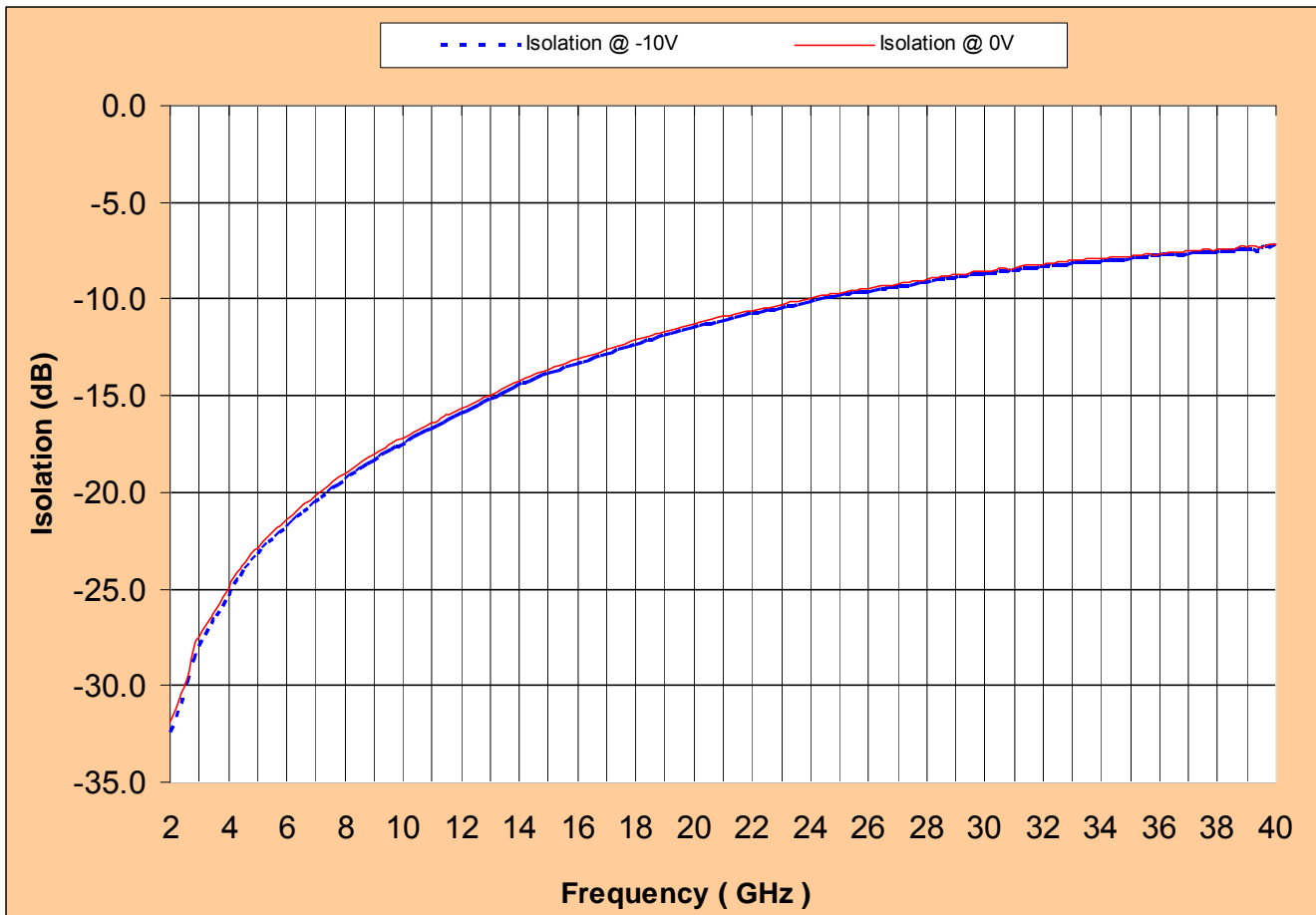
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Isolation vs. Frequency



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Device Installation Guidelines

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. These devices are rated Class 0, (0-199V) per HBM MIL-STD-883, method 3015.7 should be handled in a static-free environment.

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 using Electrically Conductive Silver Epoxy and Solder

The MADP-000907-14020 is designed to be inserted onto hard or soft substrates with the junction/pad side down. It may be mounted onto a silk-screened circuit 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 kept below 200°C.

Eutectic Die Attached

63/37 Sn/Pb or any RoHS compliant solder may be used for diode attachment. It is recommended that the attachment surface be preheated to 100°C prior to re-flow in order to minimize CTE mismatches. Gradual temperature ramp up and ramp down is also recommended with a maximum soldering temperature of 280°C for less than 10 seconds. See **Application Note [M538](#)** for recommended soldering profile.

Ordering Information

Part Number	Packaging
MADP-000907-14020W	Waffle Pack
MADP-000907-14020P	Tape and Reel

Circuit Pad Layout

