

Features

- High Power Handling
- Low Loss / Low Distortion
- Voltage Ratings up to 1000 Volts
- Passivated Chip for Low Leakage Current
- Low Theta (θ) Due to Full Face Chip Bonding
- Fully RoHS Compliant
- Non-Magnetic Package
- Available in Both Tape & Reel and Bulk



Applications

- MRI

Description

The HIPAX series of PIN diodes are designed for usage in switch and attenuator applications requiring high power handling and low distortion. These diodes incorporate a fully passivated PIN diode chip resulting in an extremely low reverse bias leakage current. The semiconductor technology utilized in the HIPAX families draws on MACOM's substantial experience in PIN diode design and wafer fabrication. The result is a device which has a thick I-region and long carrier lifetime while maintaining low series resistance and capacitance values. The chips used in the HIPAX PIN diodes are enclosed in a rugged ceramic package and is full face bonded to metal pins on both the anode and cathode. The result is a low loss PIN diode with low thermal resistance due to symmetrical thermal paths.

The MADP-04002B-NM402 is a non-magnetic, HIPAX (axial leaded) packaged diode well suited for MRI applications. The package leads are tin plated and compatible with industry standard reflow and vapor phase soldering processes. See Application Note M538 for a typical solder reflow profile.

HIPAX PIN diodes are designed for use in a wide variety of switch and attenuator applications from HF through UHF frequencies and at power levels above 1 kW, CW. The internal chip as well as each diode assembly has been comprehensively tested and characterized to ensure predictable and repeatable performance.

Many of MACOM's HIPAX PIN diodes are also available as chips. Please consult the "Silicon PIN Chip Datasheet" for availability and specifications.

Ordering Information

Package Style	Quantity Per Reel	Bulk Devices Per Bag
402/402T	500 or 1000 (specify qty. when ordering)	100

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

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Reverse Voltage Rating	200 V	μA	—	—	1
Series Resistance	100 mA, 100 MHz	Ω	—	—	0.5
Total Capacitance	100 V, 1 MHz	pF	—	—	2.2
Parallel Resistance	100 V, 100 MHz	k Ω	20	—	—
Carrier Lifetime	$I_F = 10 \text{ mA}$, $I_R = 6 \text{ mA}$	μs	20	—	—
Forward Voltage	100 mA	V	—	—	1
Reverse Current	At max. rated voltage	μA	—	—	1
Nominal I-Region Width	—	μm	—	175	—

Condition	P_{DISS}	θ_{JC}
1/4" Lead Length	12 W	12.5°C/W
No Heatsink	2.5 W	—
Single 1 μs pulse	100 kW	—
Single 100 μs pulse	5 kW	0.03°C/W

Absolute Maximum Ratings
 $T_A = +25^\circ\text{C}$ (Unless Otherwise Noted)^{1,2}

Parameter	Absolute Maximum
DC Reverse Voltage	200 V
Operating Chip Junction Temperature	-55°C to +175°C
Storage Temperature	-55°C to +200°C
Installation Temperature	+280°C for 30 Seconds

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

Handling Procedures

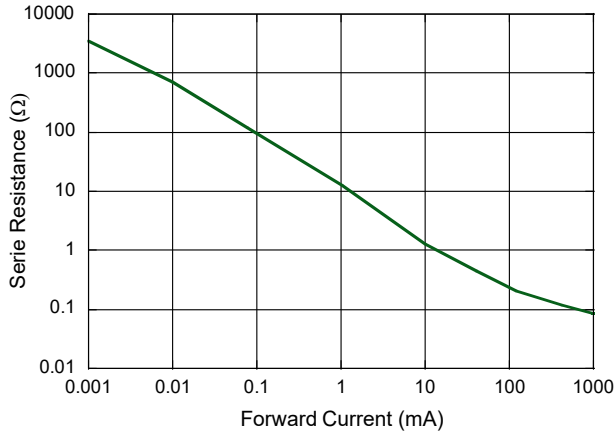
Please observe the following precautions to avoid damage:

Static Sensitivity

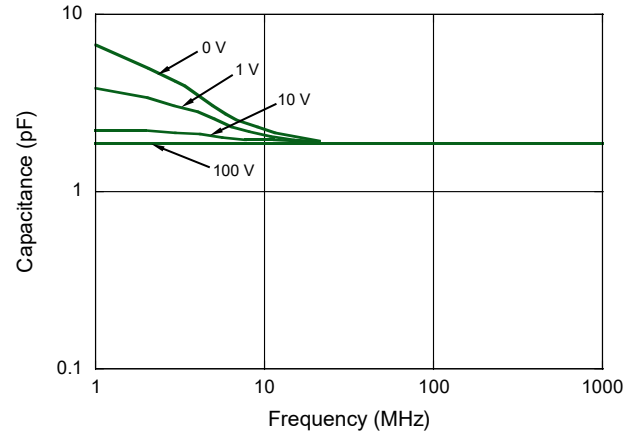
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1A devices.

Typical Performance Curves @ $T_A = +25^\circ\text{C}$

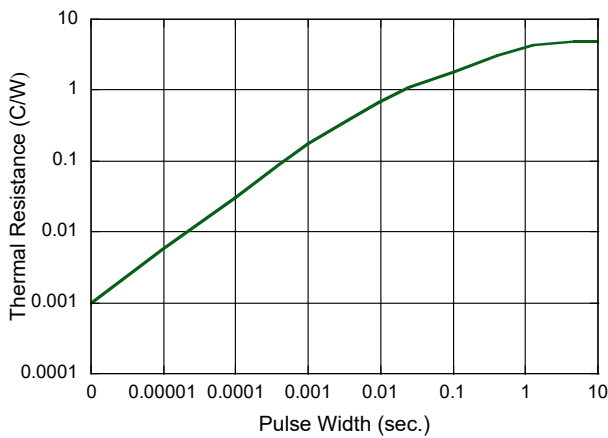
Series Resistance @ 100 MHz vs. Forward Bias Current



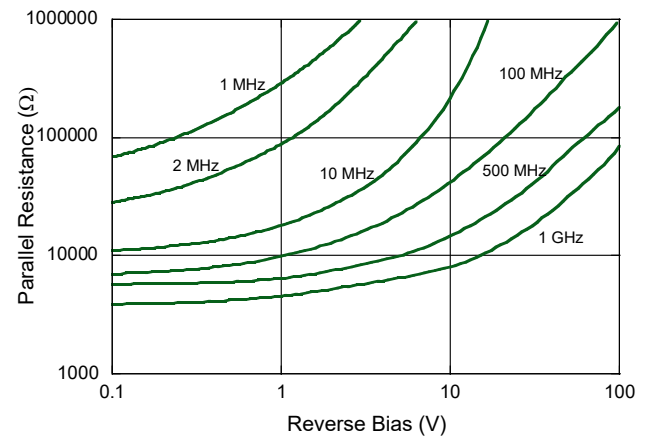
Capacitance vs. Frequency & Reverse Bias



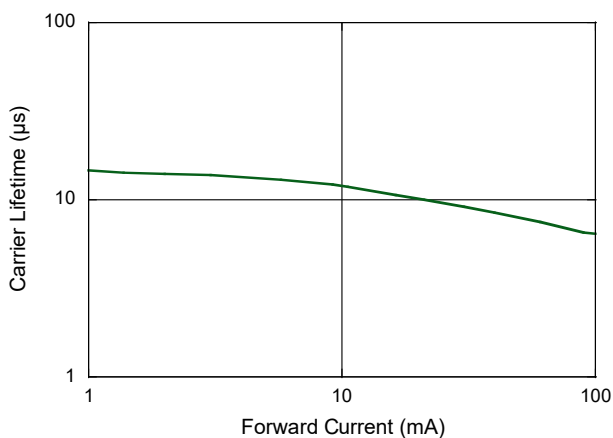
Thermal Resistance (C/W) vs. Pulse Width



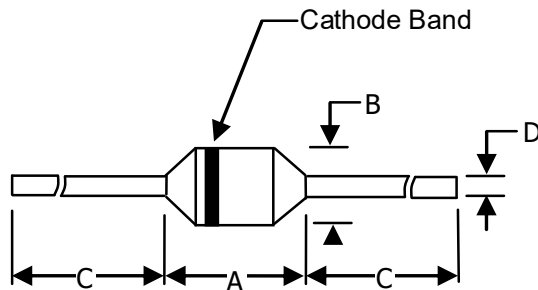
Parallel Resistance vs. Reverse Bias & Frequency



Carrier Lifetime vs. Forward Bias Current



Axial Leaded Package



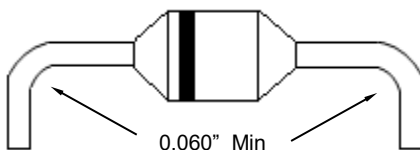
Dim.	Inches		mm	
	Min.	Max.	Min.	Max.
A	—	0.230	—	5.84
B	—	0.140	—	3.56
C	0.975	—	24.77	—
D	0.039	0.041	0.99	1.04

Axial Leaded HIPAX Assembly Recommendations

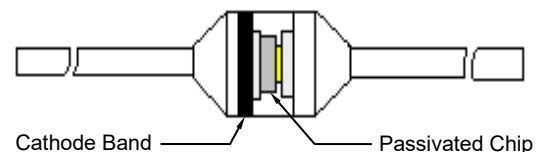
Bends on the ODS-402 axially leaded devices must be made while holding the lead firm and forming the bend no closer than 0.060 inches from the body of the part. Bending the lead <0.060 inches from the body of the part is not recommended and may cause internal damage to the chip. Appropriate fixturing should be used.

Devices may be soldered using standard 60Sn/40Pb or any RoHS compliant solders. Axial leads are tin plated 50 μm thick to ensure an optimum connection. For recommended Sn/Pb and RoHS soldering profiles see Application Note M538 on the MACOM website.

Minimum Bend Distance



Internal Construction



Environmental Ratings

HIPAX PIN diodes are designed to meet most environmental and electrical requirements and may be ordered screened to MIL-STD-750 specifications as described in the table below.

Test	Method	Description / Conditions
Moisture Resistance	1021	85°C, 85% Relative Humidity, 168 hrs
High Temperature Storage	1031	+175°C, 250 Hours
HTRB	1038	80% of rated V_R , 50°C, 96 Hours
Temperature Shock	1051	-65°C to +175°C, 20 Cycles
Fine Leak	1071 Cond. H	1×10^{-7} CC/Sec
Constant Acceleration	2006	20,000 G's
Solderability	2026	IPC/JDEC J-STD-02
Tension	2036.3 Cond. A	2 Lbs., 30 Seconds
Lead Fatigue	2036.3 Cond. E	3 Cycles, 8 oz., 90°,

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