Features

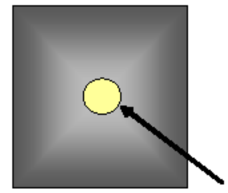
- Switch & Attenuator Die
- Extensive Selection of I-Region Lengths
- Hermetic
- Glass Passivated Cermachip
- Oxide Passivated Planar Chips
- Voltage Ratings to 3000 V
- Fast Switching Speed
- Low Loss
- High Isolation
- RoHS* Compliant

Description

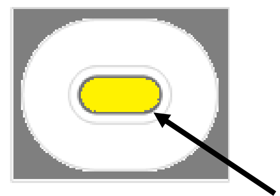
MACOM offers a comprehensive line of low capacitance, planar and mesa, silicon PIN/NIP diode chips which use ceramic glass and silicon nitride passivation technology. The silicon PIN/NIP chip series of devices cover a broad spectrum of performance requirements for control circuit applications. They are available in several choices of I-region lengths and have been optimally designed to minimize parametric trade offs when considering low capacitance, low series resistance, and high breakdown voltages. Their small size and low parasitics, make them an ideal choice for broadband, high frequency, micro-strip hybrid assemblies.

The attenuator line of PIN diode chips are a planar or mesa construction and because of their thicker I-regions and predictable R_S vs. I characteristics, they are well suited for low distortion attenuator and switch circuits. Incorporated in the chip's construction is MACOM's, time proven, hard glass, Cermachip process. The hard glass passivation completely encapsulates the entire PIN junction area resulting in a hermetically sealed chip which has been qualified in many military applications. These Cermachip diodes are available in a wide range of voltages, up to 3,000 volts, which are capable of controlling kilowatts of RF power.

PIN Chip



NIP Chip



Absolute Maximum Ratings[1]
T_A = +25°C (Unless otherwise specified)

Parameter	Absolute Maximum
Forward Current (I_F)	Per P/N R_s vs. I Graph
Reverse Voltage (V_R)	Per Specification Table
Power Dissipation (W)	175°C – $T_{ambient}$°C Theta
Operating Temperature	-55°C to +175°C
Storage Temperature	-55°C to +200°C
Junction Temperature	+175°C
Mounting Temperature	+320°C for 10 seconds

1. Exceeding these limits may cause permanent damage to the chip.

Many of MACOM 's silicon PIN diode chips are also available in several different package styles. Please refer to the "Packaged PIN Diode Datasheet" for case style availability and electrical specifications located on the MACOM website. Also for high voltage, high power devices refer to MA4PK2000.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support

Electrical Specifications: T_A = +25°C

Low Capacitance PIN

Part Number	Maximum Characteristics			Nominal Characteristics			
	Reverse Voltage[2] V_R <10 µA	Capacitance 1 MHz C_J @ -10 V	Series Res. 500 MHz R_S @ 10 mA	Carrier Lifetime[3] T_L	Reverse Recovery Time[4] T_{RR}	I Region Length	Theta
	VDC	pF	Ω	ηs	ηs	µm	°C/W
MA4P161-134	100	0.10	1.50	150	15	13	65
MA4P203-134	100	0.15	1.50	150	25	13	75
MA4P7493-134	150	0.05	1.80	80	8	19	60
MADP-000165-01340W	200	0.06	2.50	200	20	19	30
MADP-000135-01340W	200	0.15	1.20	440	44	19	30

Attenuator PIN

Part Number	Maximum Characteristics			Nominal Characteristics				
	Reverse Voltage[2] V_R <10 µA	Capacitance 1 MHz C_J @ -100 V	Series Res. 100 MHz R_S @ 10 mA	Carrier Lifetime[3] T_L	Series Res. 100 MHz R_S @ 10 µA	Series Res. 100 MHz R_S @ 1 mA	I Region Length	Theta
	V_{DC}	pF	Ω	µs	Ω	Ω	mils	°C/W
MA47416-132	200	0.15	6	2	2000	30	4	30
MA47418-134	200	0.15	3	1	500	15	2	25

2. Reverse Voltage (V_R) is sourced and the resultant reverse leakage current (I_R) is measured to be <10 µA.
3. Nominal carrier life time (T_L) specified at I_F = +10 mA, I_{REV} = -6 mA.
4. Nominal reverse recovery time specified at I_F = +20 mA, I_{REV} = -200 mA.

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support

Electrical Specifications: T_A = +25°C (cont.)

Cermachip PIN

Part Number	Maximum Characteristics			Nominal Characteristics		
	Reverse Voltage[5] V_R <10 µA	Capacitance 1 MHz C_J @ -100 V	Series Res. 100 MHz R_S @ 100 mA	Carrier Lifetime[6]	I Region Length	Theta
	V_{DC}	pF	Ω	µs	µm	°C/W
MA4P303-134	200	0.15 @ 10 V	1.5 @ 10 mA[8]	0.3	20	30
MA4P404-132	250	0.20 @ 50 V	0.70 @ 50 mA[8]	0.6	30	20
MADP-011199	400	0.15 @ 50 V	2.4	3	200	8.5
MA4P504-132	500	0.20	0.60	1	50	20
MA4P505-131	500	0.35	0.45	2	50	14
MA4P506-131	500	0.70	0.30	3	50	11
MADP-000488-13740W	900	0.19 @ 50 V	1.6 @ 50 mA	4	140	45
MA4P604-131	1000	0.30	1.00	3	90	10
MA4P606-131	1000	0.60	0.70	4	90	8
MA4P607-212	1000	1.30	0.40	12	127	4
MADP-011141-13160W	1100	0.40	0.70	7	140	10
MADP-011204	1100	0.25 @ 50 V	1.00	3.3	96	10
MADP-011169	1500	0.15	1.2 @ 200 mA	3.5	175	6.5
MADP-04P709-0DIEW0	1500	3.17 @ 50 V	0.20	24	200	2
MA4PK3000-1252[7]	3000	2.90	0.25 @ 500 mA[9]	60	350	1.5

5. Reverse Voltage (V_R) is sourced and the resultant reverse leakage current (I_R) is measured to be <10 µA.
6. Nominal carrier life time (T_L) specified at I_F = +10 mA, I_{REV} = -6 mA.
7. Upon completion of circuit installation, the chip must be covered with a dielectric conformal coating such as SYLGARD 539® to prevent voltage arcing.
8. Test Frequency = 500 MHz.
9. Test Frequency = 4 MHz.

Cermachip NIP

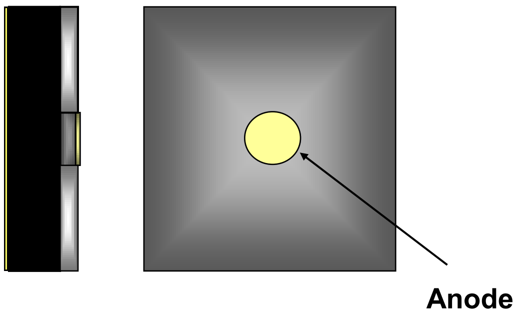
Part Number	Maximum Characteristics			Nominal Characteristics		
	Reverse Voltage[10] V_R <10 µA	Capacitance 1 MHz C_J @ -50 V	Series Res. 100 MHz R_S @ 10 mA	Carrier Lifetime[11] T_L	I Region Length	Theta
	V_{DC}	pF	Ω	ns	µm	°C/W
MADN-011147-0DIEW0	400	0.1	2.5	950	45	20

10. Reverse Voltage (V_R) is sourced and the resultant reverse leakage current (I_R) is measured to be <10 µA.
11. Nominal carrier life time (T_L) specified at I_F = +10 mA, I_{REV} = -6 mA., 90%.

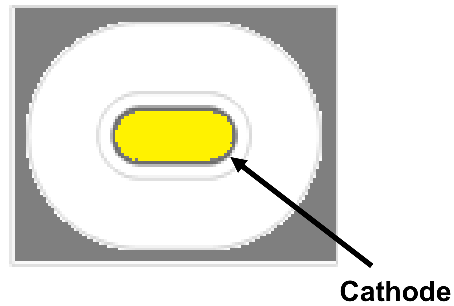
MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support

PIN Chip Outline



NIP Chip Outline



Low Capacitance PIN Chip

Part Number	Nominal Characteristics (mils.)		
	Anode Diameter ± 0.5	Chip Size ± 0.5	Chip Thickness ± 0.5
MA4P161-134	3.5	13 x 13	6.0
MA4P203-134	3.1	13 x 13	6.0
MA4P7493-134	3.8	13 x 13	6.5
MADP-000165-01340W	2.3	13 x 13	10.0
MADP-000135-01340W	3.1	13 x 13	10.0

Attenuator PIN Chip

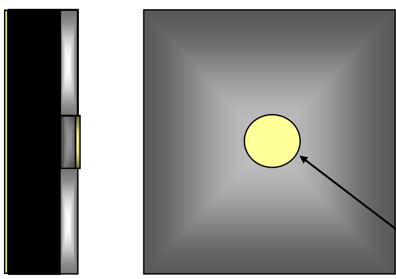
Part Number	Nominal Characteristics (mils.)		
	Anode Diameter ± 0.5	Chip Size ± 2.0	Chip Thickness ± 1.0
MA47416-132	7.5 x 7.5[10]	19 x 19	7.0
MA47418-134	7.5	13 x 13	7.0

10. Anode top contact is square.

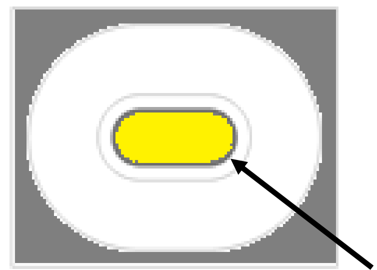
MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support

PIN Chip Outline



NIP Chip Outline



Cermachip PIN Chip

Part Number	Nominal Characteristics (mils.)		
	Anode Diameter ± 0.5	Chip Size ± 2.0	Chip Thickness ± 1.0
MA4P303-134	3.0	13 x 13	10.0
MA4P404-132	6.8	20 x 20	10.0
MADP-011199	7.1 x 13.0 (Oval)	26 x 34	14.0
MA4P504-132	6.8	20 x 20	10.0
MA4P505-131	13.0	27 x 27	11.0
MA4P506-131	15.8	27 x 27	12.0
MADP-000488-13740W	12.2	23 x 23	13.5
MA4P604-131	17.0	27 x 27	13.5
MA4P606-131	21.0	32 x 32	14.0
MA4P607-212	37.0	62 x 62	18.5
MADP-011141-13160W	17.5	32 x 32	16.0
MADP-011204	13.4	30 x 30	12.0
MADP-011169	12.5	42 x 42	15.0
MADP-04P709-0DIEW0	71.6	115 x 115	21.0
MA4PK3000-1252	85.0	172 x 172	28.0

Cermachip NIP Chip

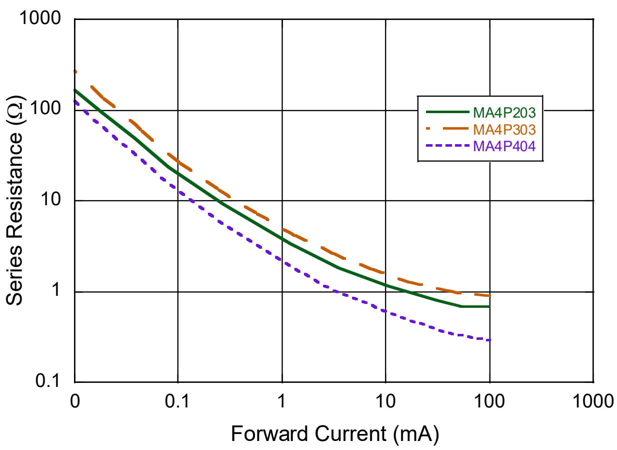
Part Number	Nominal Characteristics (mils.)		
	Cathode (Oval) ± 0.2	Chip Size ± 1.0	Chip Thickness ± 0.5
MADN-011147-0DIE0W	7.3 x 3.5	17.5 x 13.5	7.0

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

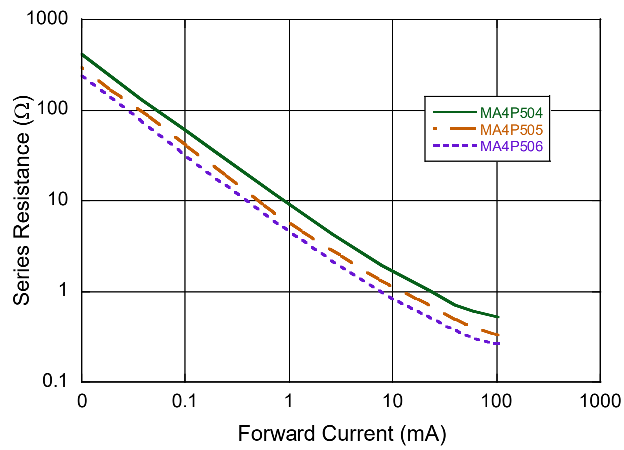
For further information and support please visit:
https://www.macom.com/support

Typical Series Resistance vs. Forward Current Performance

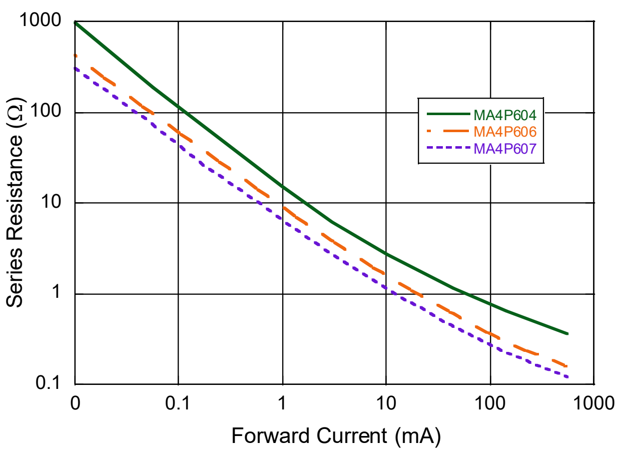
MA4P203, MA4P303, MA4P404



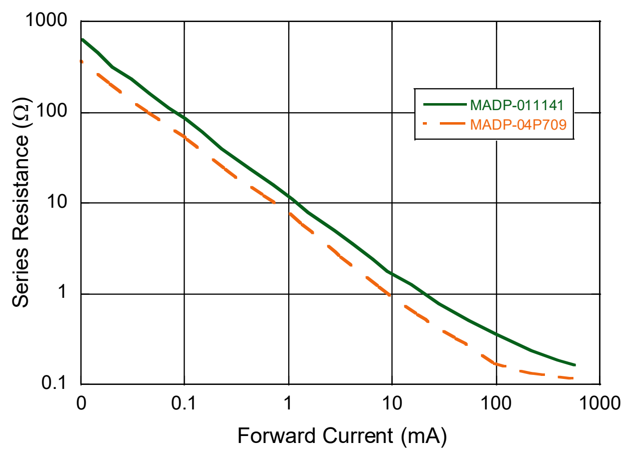
MA4P504, MA4P505, MA4P506



MA4P604, MA4P606, MA4P607



MADP-011141, MAPD-04P709

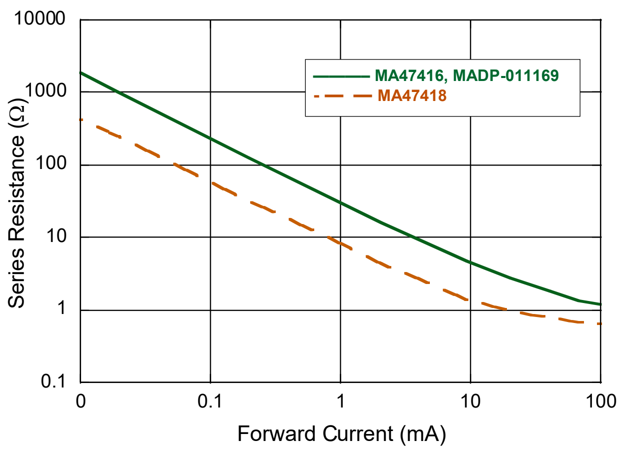


MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

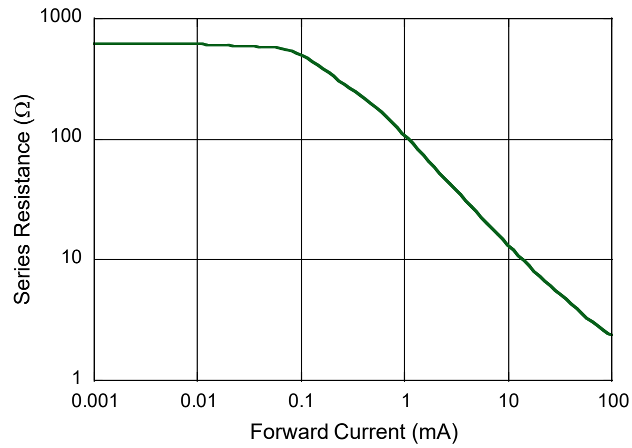
For further information and support please visit:
https://www.macom.com/support

Typical Series Resistance vs. Forward Current Performance

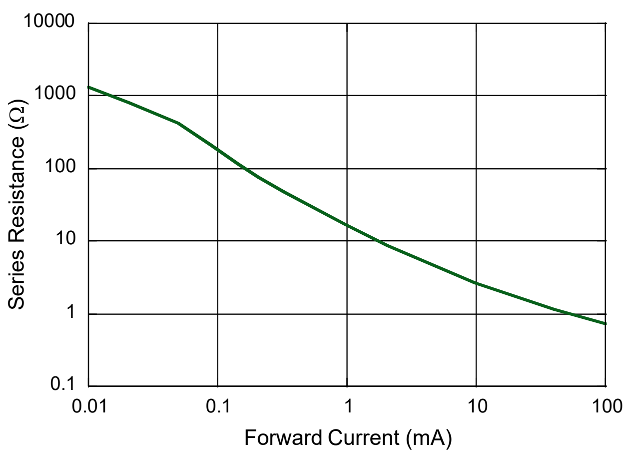
MA47416, MA47418, MADP-011169



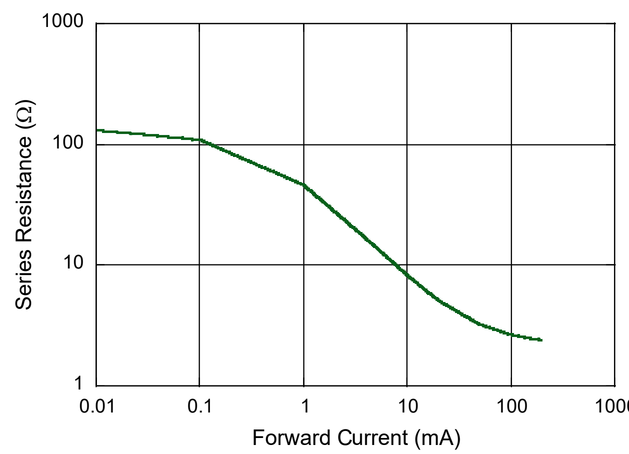
MA4P203, MA4P303, MA4P404



MADP-011204[11]



MADP-011199[11]



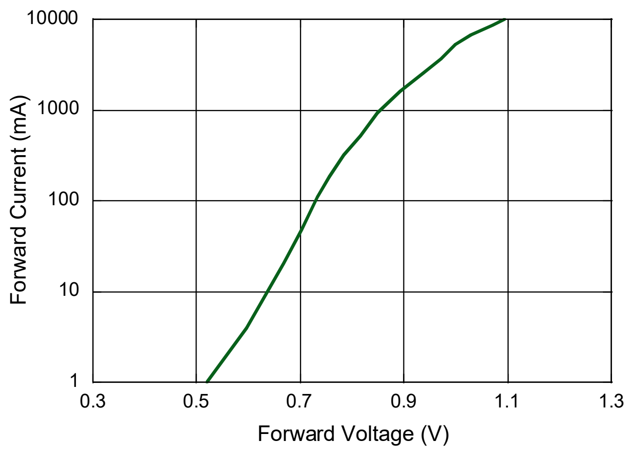
11. Diode can be biased above 100 mA.

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

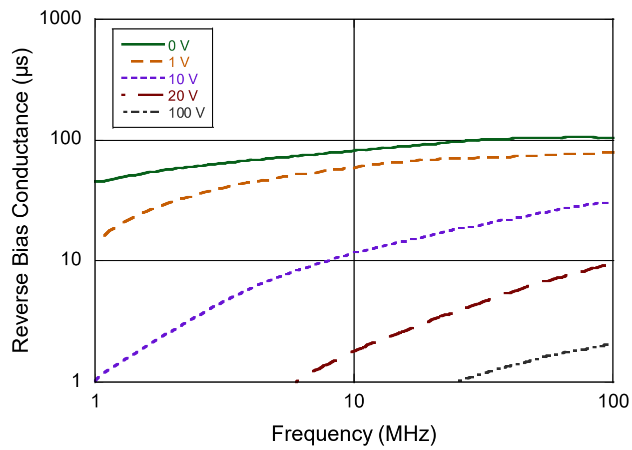
For further information and support please visit:
https://www.macom.com/support

MA4PK3000 (3kV) Chip

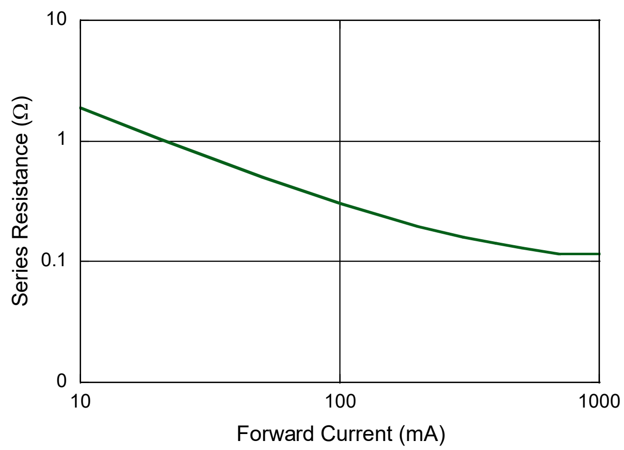
Forward Current vs. DC Forward Voltage @ 100 MHz



Reverse Bias Conductance vs. Frequency



Series Resistance vs. Forward Current @ 100 MHz



MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support

Die Handling and Bonding Information

Handling:
All semiconductor chips should be handled with care to avoid damage or contamination from perspiration, salts, and skin oils. The use of plastic tipped tweezers or vacuum pickup is strongly recommended for the handling and placing of individual components. Bulk handling should ensure that abrasion and mechanical shock are minimized.

Die Attach Surface:
Die can be mounted with an 80Au/Sn20, eutectic solder preform, RoHS compliant solders or electrically conductive silver epoxy. The metal RF and DC ground plane mounting surface must be free of contamination and should have a surface flatness of < ±0.002”.

Eutectic Die Attachment Using Hot Gas Die Bonder:
A work surface temperature of +255°C is recommended. When hot forming gas (95%N/5%H) is applied, the work area temperature should be approximately +290°C. The chip should not be exposed to temperatures greater than +320°C for more than 10 seconds.

Eutectic Die Attachment Using Reflow Oven:
For recommended reflow profile refer to Application Note 538 “Surface Mounting Instructions”.

Electrically Conductive Epoxy Die Attachment:
A controlled amount of electrically conductive, silver epoxy, approximately 1 - 2 mils in thickness, should be used to minimize ohmic and thermal resistance. A thin epoxy fillet should be visible around the perimeter of the chip after placement to ensure full area coverage. Cure conductive epoxy per manufacturer’s schedule. Typically +150°C for 1 hour.

Wire and Ribbon Bonding:
The die anode bond pads have a Ti-Pt-Au metallization scheme, with a final gold thickness of 1.0 micron. Thermo-compression or thermo-sonic wedge bonding of either gold wire or ribbon is recommended. A bonder heat stage temperature setting of +200°C, tool tip temperature of +150°C and a force of 18 to 50 grams is suggested. Ultrasonic energy may also be used but should be adjusted to the minimum amplitude required to achieve an acceptable bond. Excessive energy may cause the anode metallization to separate from the chip. Automatic ball or wedge bonding may also be used.

For more detailed handling and assembly instructions, see Application Note M541, “Bonding and Handling Procedures for Chip Diode Devices”.

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support

DC-0008899

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.
These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.