SURMOUNT ™ 5 μm PIN Diodes—MADP-042305-130600, MADP-042405-130600, MADP-042505-130600, MADP-042905-130600

MADP-042005 Series
V2

Features

- Surface Mount, 5 μm I-Region Length Device
- No Wirebonds Required
- Rugged Silicon-Glass Construction
- Silicon Nitride Passivation
- Polymer Scratch Protection
- Low Parasitic Capacitance and Inductance
- Higher Average and Peak Power Handling

Description and Applications

This device is a Silicon-Glass PIN diode chip fabricated with M/A-COM's patented HMIC™ process. This device features two silicon pedestals embedded in a low loss, low dispersion glass. The diode is formed on the top of one pedestal and connections to the backside of the device are facilitated by making the pedestal sidewalls electrically conductive. Selective backside metallization is applied producing a surface mount device. This Vertical Topology provides for Exceptional Heat Transfer. The topside is fully encapsulated with silicon nitride and has an additional polymer layer for scratch and impact protection. These protective coatings prevent damage to the junction and the anode air-bridge during handling and assembly.

These packageless devices are suitable for usage in Moderate Incident Power (10 W C.W.) and 50 W , 1 uS, 0.01 Duty Cycle, Peak Power, Series, Shunt, or Series-Shunt Switches. Smaller Parasitic Inductance, 0.4 nH, and Excellent RC Constant, make the devices ideal for Higher Frequency Switch Elements compared to their Plastic Device Counterparts.

Bottom Side Contacts are Circuit Side

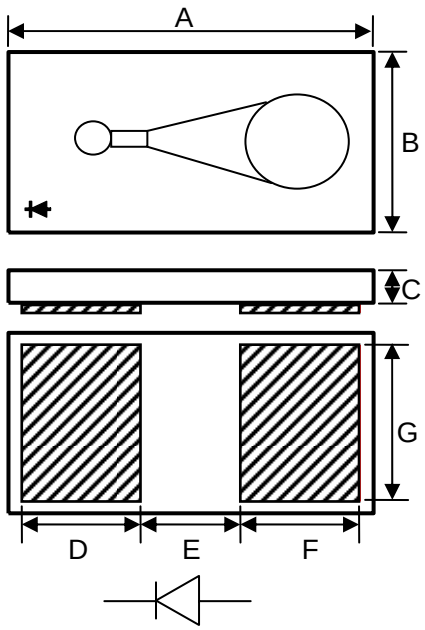
Dim	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.040	0.042	1.025	1.075
B	0.021	0.023	0.525	0.575
C	0.004	0.008	0.102	0.203
D	0.013	0.015	0.325	0.375
E	0.011	0.013	0.275	0.325
F	0.013	0.015	0.325	0.375
G	0.019	0.021	0.475	0.525

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

Parameter	Absolute Maximum			
Part	042 305	042 405	042 505	042 905
Forward Current	250 mA			
Reverse Voltage	I -80 V I			
Operating Temperature	-55 °C to +125 °C			
Storage Temperature	-55 °C to +150 °C			
Junction Temperature	+175 °C			
C.W. Incident Power (dBm)	40	44	43	35
Mounting Temperature	+300 °C for 10 seconds			

1. Operation of this device above any one of these parameters may cause permanent damage.

Case Style ODS-1306



1. Backside Metal: 0.1microns thick.
2. Shaded Areas Indicate Backside Ohmic Gold Contacts.
3. Both Devices have Same Outline Dimensions (A to G).

• **North America** Tel: 800.366.2266 / Fax: 978.366.2266
• **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
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Electrical Specifications @ + 25 °C

Parameter	Symbol	Conditions	Units	Min	Typ	Max	Min	Typ	Max
				MADP-042305			MADP-042505		
Capacitance	C_T	- 10 V, 1 MHz [1]	pF		0.14	0.22		0.28	0.40
Capacitance	C_T	- 10 V, 1 GHz [1,3]	pF		0.15			0.28	
Capacitance	C_T	- 40 V, 1 MHz [1]	pF		0.13	0.22		0.27	0.40
Capacitance	C_T	- 40 V, 1 GHz [1,3]	pF		0.14			0.27	
Resistance	R_S	+ 20 mA, 1 GHz [2,3]	Ω		1.32			0.83	
Resistance	R_S	+ 50 mA, 1 GHz [2,3]	Ω		1.18			0.76	
Forward Voltage	V_F	+ 10 mA	V		0.87	1.00		0.84	1.00
Reverse Leakage Current	I_R	| -80V |	uA			10			10
Input Third Order Intercept Point	IIP3	F 1= 1000MHz F2 = 1010MHz Input Power = +20dBm I bias = + 20 mA	dBm		72			76	
C.W. Thermal Resistance	$R_{\theta JL}$	I_H=0.5A, I_L=10 mA	° C / W		145			115	
Lifetime	T_L	+10 mA / -6 mA (50 % - 90 % V)	nS		180			210	

Parameter	Symbol	Conditions	Units	Min	Typ	Max	Min	Typ	Max
				MADP-042405			MADP-042905		
Capacitance	C_T	- 10 V, 1 MHz [1]	pF		0.61	0.75		0.06	0.18
Capacitance	C_T	- 10 V, 1 GHz [1,3]	pF		0.61			0.06	
Capacitance	C_T	- 40 V, 1 MHz [1]	pF		0.57	0.75		0.06	0.18
Capacitance	C_T	- 40 V, 1 GHz [1,3]	pF		0.58			0.06	
Resistance	R_S	+ 20 mA, 1 GHz [2,3]	Ω		0.62			3.14	
Resistance	R_S	+ 50 mA, 1 GHz [2,3]	Ω		0.58			2.60	
Forward Voltage	V_F	+ 10 mA	V		0.82	1.00		0.93	1.00
Reverse Leakage Current	I_R	| -80V |	uA			10			10
Input Third Order Intercept Point	IIP3	F 1= 1000MHz F2 = 1010MHz Input Power = +20dBm I bias = + 20 mA	dBm		80			65	
C.W. Thermal Resistance	$R_{\theta JL}$	I_H=0.5A, I_L=10 mA	° C / W		100			185	
Lifetime	T_L	+10 mA / -6 mA (50 % - 90 % V)	nS		255			140	

1. Total capacitance, C_T, is equivalent to the sum of Junction Capacitance ,Cj, and Parasitic Capacitance, Cpar.
2. Series resistance R_S is equivalent to the total diode resistance : Rs = Rj (Junction Resistance) + Rc (Ohmic Resistance)
3. Rs and C_T are measured on an HP4291A Impedance Analyzer with die mounted in an ODS-1134 package with Sn 60/Pb 40 Solder
4. Steady-state $R_{\theta JL}$ measured with die mounted in an ODS-1134 package with Sn 60/Pb 40 Solder.

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Handling Procedures

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

Bonding Techniques

Attachment to a circuit board is made simple through the use of surface mount technology. Mounting pads are conveniently located on the bottom surface of these devices and are removed from the active junction locations. These devices are well suited for solder attachment onto hard and soft substrates. The use of 80 Au / 20 Sn @ ~ + 280 °C or Sn 60 / Pb 40 ~ + 185 °C solder is recommended. Conductive silver epoxy for die attachment ~ + 150 °C may also be used for lower Incident power (< 1 W Average Power) applications.

When soldering these devices to a hard substrate, hot gas die bonding is preferred. We re-commend utilizing a vacuum tip and force of 60 to100 grams applied normal to the top surface of the device. When soldering to soft substrates, it is recommended to use a lead-tin interface at the circuit board mounting pads. Position the die so that its mounting pads are aligned with the circuit board mounting pads and reflow the solder by heating the circuit trace near the mounting pad while applying 60 to 100 grams of force perpendicular to the top surface of the die. The solder joint must Not be made one at a time, creating un-equal heat flow and thermal stress. Solder reflow should Not be performed by causing heat to flow through the top surface of the die. Since the HMIC glass is transparent, the edges of the mounting pads closest to each other can be visually inspected through the die after attach is completed.

A typical profile for a Sn 60/ Pb 40 Soldering process is provided in Application Note, " M538 " , " Surface Mounting Instructions " on the MA-COM website www.macom.com

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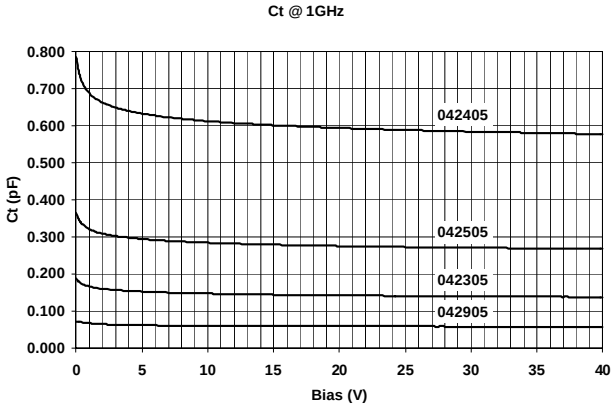
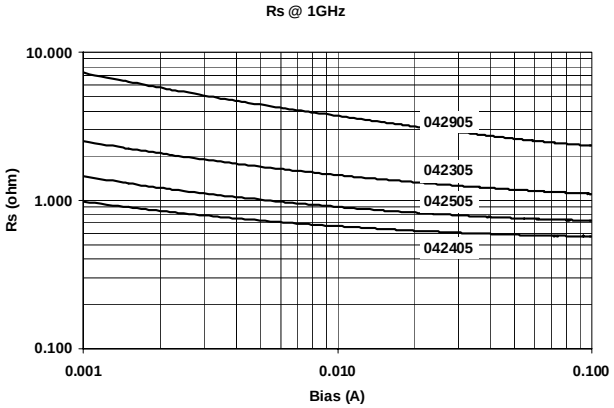
MADP-042005 Series Typical Performance Curves @ +25 °C

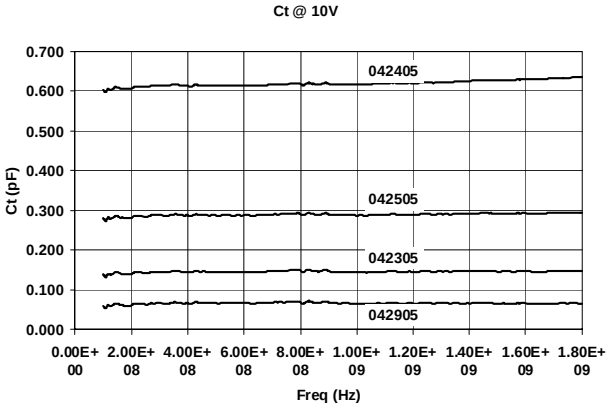
Ct vs V



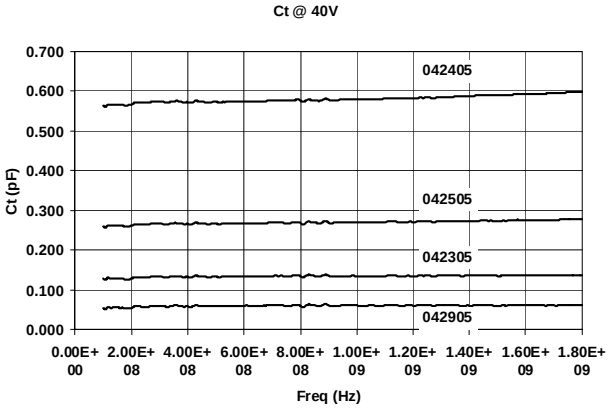
Rs vs I



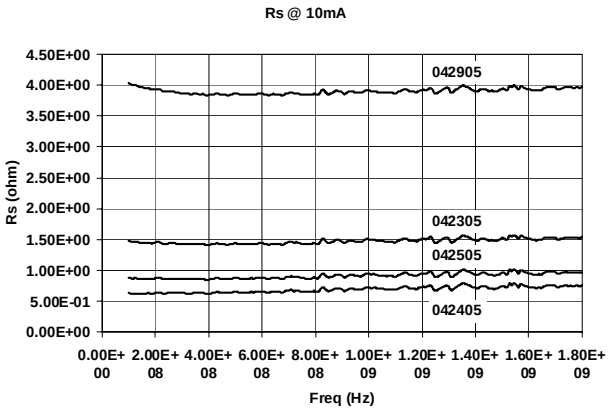
Ct vs F



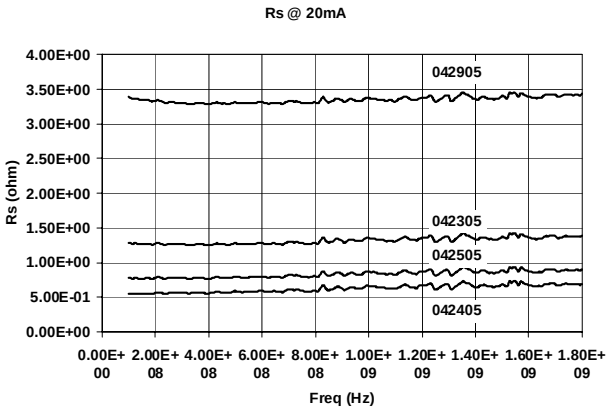
Ct vs F



Rs vs F



Rs vs F



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