MADP-017015-1314
MADP-030015-1314

Tyco Electronics

SURMOUNT™ 15µM PIN Diodes
RoHS Compliant

M/A-COM Products
Rev 3

Features

- 0603 Surface Mount 15µm I-Region Length Devices
- No Wirebonds Required
- Rugged Silicon-Glass Construction
- Silicon Nitride Passivation
- Polymer Scratch Protection
- Low Parasitic Capacitance and Inductance
- High Average and Peak Power Handling

Description

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.

Applications

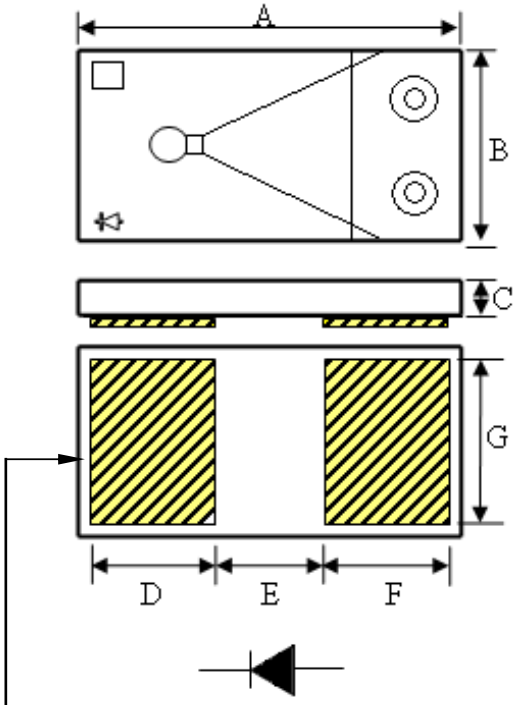
These packageless devices are suitable for usage in high incident power, 50dBm C.W., and 75dBm,1µS, 0.01% duty cycle, peak power applications, when used as series, shunt, or series-shunt switches. Smaller parasitic inductance, <0.2nH, and excellent RC constant, make these devices ideally suited for higher frequency switch elements compared to their plastic device counterparts.

Absolute Maximum Ratings[1] @T_{AMB} = +25°C (unless otherwise specified)

Parameter	Absolute Maximum
Forward Current	500 mA
Reverse Voltage	| - 115 V |
Operating Temperature	-55°C to +125°C
Storage Temperature	-55 °C to +150°C
Junction Temperature	+175°C
C.W. Incident Power	50dBm
Mounting Temperature	+260°C for 30 seconds

1) Exceeding these limits may cause in permanent damage

Case Style ODS 1314



Backside Contacts are Circuit Side

Chip Dimensions

DIM	INCHES		MM	
	Min	Max	Min	Max
A	0.060	0.062	1.525	1.575
B	0.031	0.032	0.775	0.825
C	0.004	0.008	0.102	0.203
D	0.019	0.021	0.475	0.525
E	0.019	0.021	0.475	0.525
F	0.019	0.021	0.475	0.525
G	0.029	0.031	0.725	0.775

Notes:
1) Backside metal: 0.1microns thick.
2) Yellow area with hatch lines indicate backside ohmic gold contacts.
3) Both devices have same outline dimensions (A to G).

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- **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

Visit www.macom.com for additional data sheets and product information.

Electrical Specifications @ T_A = 25°C (unless otherwise noted)

Parameter	Symbol	Conditions	Units	Min	Typ	Max	Min	Typ	Max
				MADP-017015			MADP-030015		
Capacitance	C_T	-40V, 1MHz [1]	pF		0.32	0.38		0.79	0.85
Capacitance	C_T	-40V, 1GHz [1,3]	pF		0.31			0.78	
Capacitance, 85°C	C_T	-40V, 1GHz [1,3]	pF		0.29			0.76	
Resistance	R_S	+10mA, 1GHz [2,3]	Ω		0.72			0.49	
Resistance	R_S	+70mA, 1GHz [2,3]	Ω		0.51			0.38	
Resistance, 85°C	R_S	+10mA, 1GHz [2,3]	Ω		1.08			0.82	
Resistance, 85°C	R_S	+70mA, 1GHz [2,3]	Ω		0.84			0.69	
Forward Voltage	V_F	+10mA	V		0.74	0.90		0.72	0.90
Reverse Leakage Current	I_R	| -115V |	uA		-	10		-	10
Third Order Intercept Point	IP3	F1= 1800MHz F2 = 1810MHz Input Power = 0dBm I bias = +70mA	dBc		-36.8			-37.0	
C.W. Thermal Resistance	R_{qJL}	I_H=0.5A, I_L=10mA	°C/W		30			13	
Lifetime	T_L	+10mA / -6mA (50 % - 90 % V)	mS		1.3			1.6	

Notes:
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-186 package with 60/40, Sn/Pb solder.

MADP-0XX015 Series *Typical Spice Parameters @ +25°C*

Spice Parameter	N	RS	IS	IK	BV	IBV	Ct	CJO	VJ	M	FC	Cpar_Cj
Units	-	Ω	A	(mA)	(Volts)	(µA)	(pF)	(pF)	(Volts)	-	-	(F)
MADP-017015-1314	1.1	1.2	9.8E-15	14.7	145	10	0.46	0.10	0.29	0.50	0.34	3.5E-13
MADP-030015-1314	1.1	1.1	8.5E-15	13.9	145	10	1.12	0.29	0.18	0.50	0.19	8.2E-13

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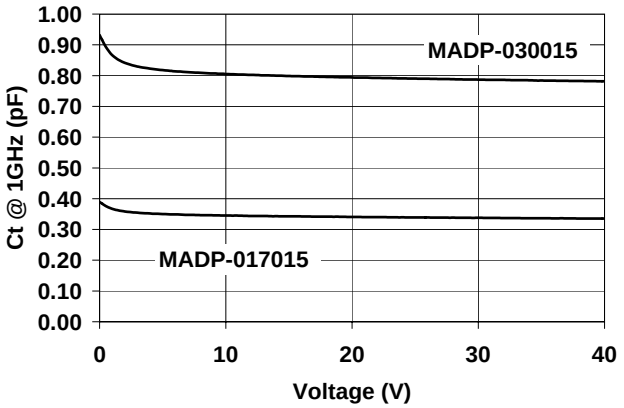
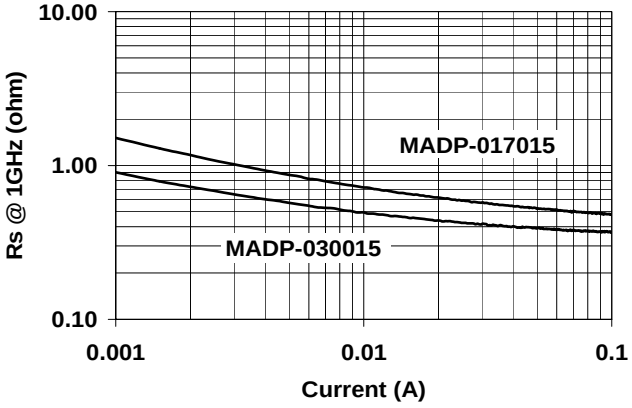
MADP-0XXX15 Series Typical Performance Curves @ +25°C

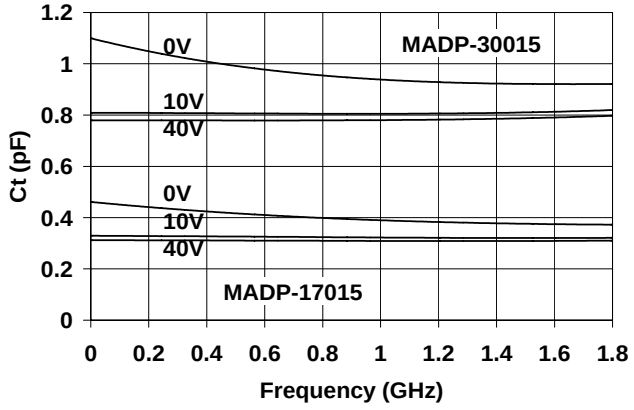
Ct vs. V



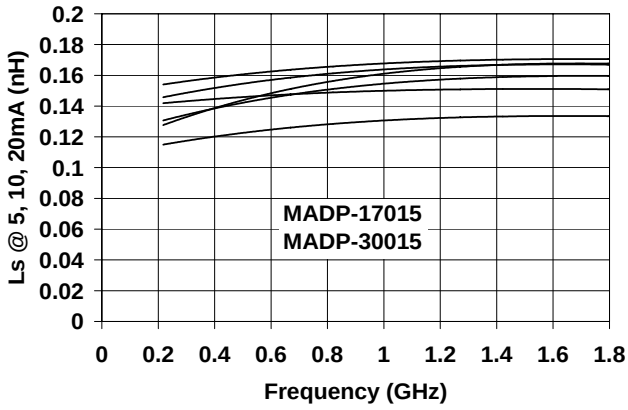
Rs vs. I



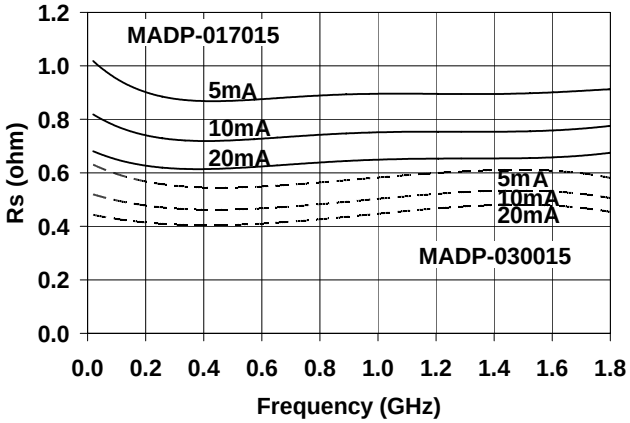
Ct vs. Freq.



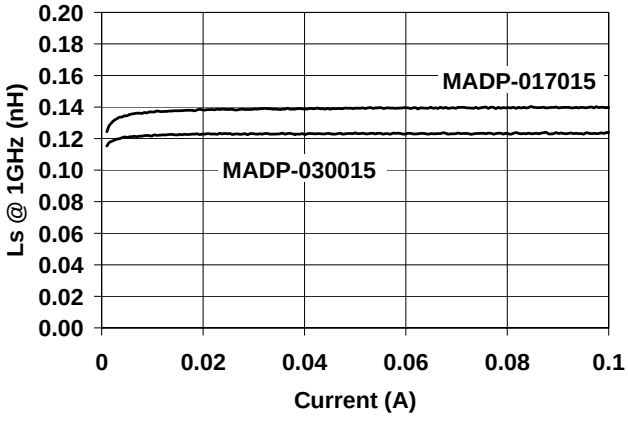
Ls vs. Freq.



Rs vs. Freq.



Ls vs. I



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Assembly Guidelines

Handling

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

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 or conductive epoxy attachment onto hard and soft substrates. The use of 60/40, Pb/Sn, 80/20, Au/Sn or any other lead-free solder is recommended to achieve the lowest series resistance and optimum heat sink.

When soldering these devices to a hard substrate, hot gas die bonding is preferred. We recommend utilizing a vacuum tip and applying a force of 40 - 60 grams to the top surface of the device. When soldering, 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 pads while applying 40 to 60 grams of force perpendicular to the top surface of the die. Both mounting pads should be heated simultaneously so that the solder under both pads flows at the same time. The solder joint should not be made one at a time. By doing so, would create an un-equal heat flow and potentially create thermal stress to the chip.

Solder reflow should not be performed by causing heat to flow through the top surface of the die. Die should be uniformly heated in a re-flow oven. Proper flow is easily determined looking down from the top since the HMIC glass is transparent and the edges of the mounting pads can be visually inspected through the die after attachment is complete. A typical soldering process profile and handling instructions are provided in Application Notes, **M538 Surface Mounting Instructions** and **M541 Bonding and Handling Procedures** on the MA-COM website at www.macom.com/Application%20Notes/default.asp.

Conductive silver epoxy may also be used for die attachment, in lower Incident power applications where the average power is < 1 W. Apply a thin controlled amount approximately 1- 2 mils thick to minimize ohmic and thermal stresses. Take care not to bridge the gap between the chip pads with epoxy. A thin epoxy fillet should be visible around the perimeter of the pads after placement to ensure full coverage. Cure per epoxy per manufacturer's recommended schedule.

Ordering Information

Gel Pack
MADP-017015-13140G
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