

## SURMOUNT™ 15µM PIN Diodes

### RoHS Compliant

Rev. V5

## Features

- ◆ 0603 Outline
- ◆ Surface Mount
- ◆ 15µm I-Region Length Devices
- ◆ No Wirebonds Required
- ◆ 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 surmount 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.

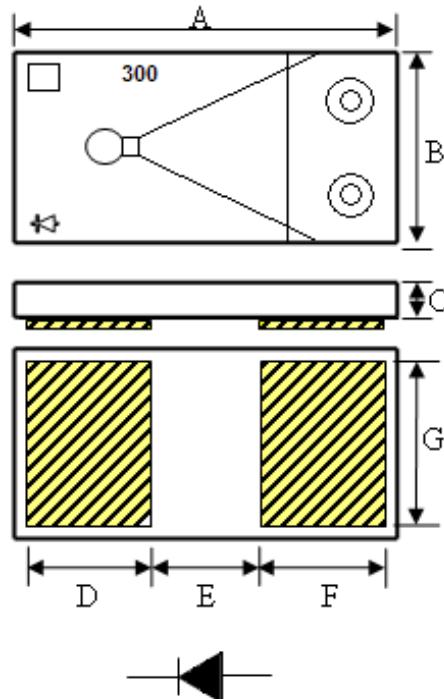
## Applications

These packageless devices are suitable for usage in moderate incident power,  $\leq 50\text{dBm/C.W.}$  or where the peak power is  $\leq 75\text{dBm}$ , pulse width is  $\leq 1\mu\text{s}$ , and duty cycle is  $\leq 0.01\%$ . Their low parasitic inductance, 0.4 nH, and excellent RC constant, make these devices a superior choice for higher frequency switch elements when compared to their plastic package counterparts.

### Absolute Maximum Ratings<sup>1</sup> @ $T_{AMB} = +25^\circ\text{C}$ (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	+280°C for 30 seconds

## Case Style ODS 1314



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

<sup>1</sup> Exceeding these limits may cause in permanent damage

**ADVANCED:** Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

**PRELIMINARY:** Data Sheets contain information regarding a product M/A-COM Technology Solutions 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  
Visit [www.macomtech.com](http://www.macomtech.com) for additional data sheets and product information.

*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*

SURMOUNT™ 15µM PIN Diodes  
RoHS Compliant

Rev. V5

**Electrical Specifications @  $T_A = 25^\circ\text{C}$  (unless otherwise noted)**

Parameter	Symbol	Conditions	Units	Min	Typ	Max	Min	Typ	Max
				<b>MADP-017015</b>			<b>MADP-030015</b>		
Capacitance	$C_T$	-40 V, 1 MHz <sup>1,3</sup>	pF		0.32	0.38		0.79	0.85
Capacitance	$C_T$	-40V, 1 GHz <sup>1,3</sup>	pF		0.31			0.78	
Capacitance, 85°C	$C_T$	-40 V, 1 GHz <sup>1,3</sup>	pF		0.29			0.76	
Resistance	$R_S$	+10 mA, 1 GHz <sup>2,3</sup>	$\Omega$		0.72			0.49	
Resistance	$R_S$	+70 mA, 1 GHz <sup>2,3</sup>	$\Omega$		0.51			0.38	
Resistance, 85°C	$R_S$	+10 mA, 1 GHz <sup>2,3</sup>	$\Omega$		1.08			0.82	
Resistance, 85°C	$R_S$	+70 mA, 1 GHz <sup>2,3</sup>	$\Omega$		0.84			0.69	
Forward Voltage	$V_F$	+10 mA	V		0.74	0.90		0.72	0.90
Reverse Leakage Current	$I_R$	-115 V	uA		-	10		-	10
Third Order Intercept Point	$IP^3$	F1= 1800 MHz F2 = 1810 MHz Input Power = 0 dBm I bias = +70 mA	dBc		-36.8			-	37.0
Thermal Resistance	$\theta$		°C/W		30			13	
Lifetime	$T_L$	+10 mA / -6 mA ( 50% - 90% V )	uS		1.3			1.6	

**Notes:**

- 1) Total capacitance,  $C_T$ , is equivalent to the sum of Junction Capacitance,  $C_j$ , and Parasitic Capacitance,  $C_{par}$ .
- 2) Series resistance  $R_S$  is equivalent to the total diode resistance :  $R_S = R_j$  ( Junction Resistance) +  $R_c$  ( Ohmic Resistance)
- 3)  $R_S$  and  $C_T$  are measured on an HP4291A Impedance Analyzer with the die mounted in an ODS-186 package .
- 4) Theta ( $\theta$ ) is measured with the die mounted in an ODS-186 package .

**Typical Spice Parameters @  $T_{AMB} = +25^\circ\text{C}$**

Spice Parameter	N	RS	IS	IK	BV	IBV	Ct	CJO	VJ	M	FC	Cpar_Cj
Units	-	$\Omega$	A	(mA)	(Volts)	( $\mu\text{A}$ )	(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

**ADVANCED:** Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

**PRELIMINARY:** Data Sheets contain information regarding a product M/A-COM Technology Solutions 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

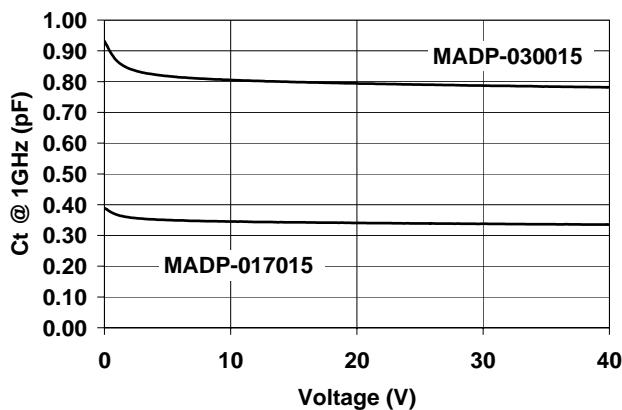
• **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit [www.macomtech.com](http://www.macomtech.com) for additional data sheets and product information.

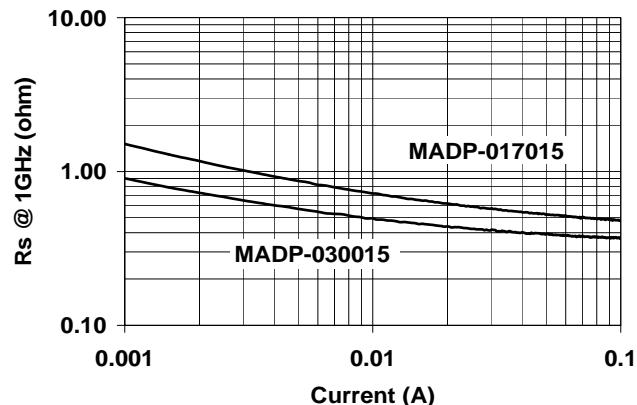
*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*

**Typical Performance @  $T_{AMB} = +25^{\circ}\text{C}$**

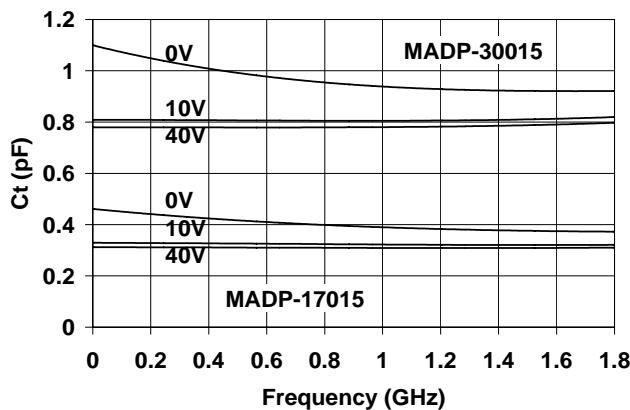
*C<sub>t</sub> vs. V*



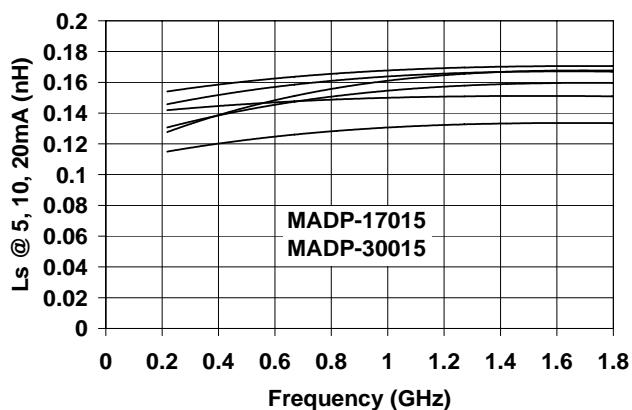
*R<sub>s</sub> vs. I*



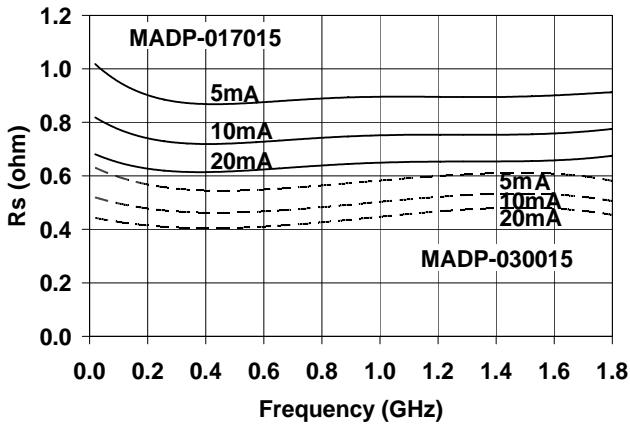
*C<sub>t</sub> vs. Freq.*



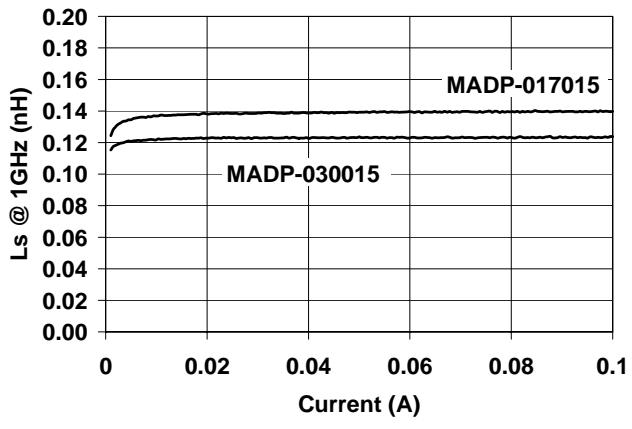
*L<sub>s</sub> vs. Freq.*



*R<sub>s</sub> vs. Freq.*



*L<sub>s</sub> vs. I*



**SURMOUNT™ 15µM PIN Diodes**  
**RoHS Compliant**

Rev. V5

## 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 80Au/20Sn, or RoHS compliant solders is recommended. For applications where the average power is ~1W, conductive silver epoxy may also be used. Cure per manufacturers recommended time and temperature. Typically 1 hour at 150°C.

When soldering these devices to a hard substrate, hot gas die bonding is preferred. A vacuum tip pick-up tool and a force of 60 to 100 grams applied to the top surface of the device is recommended. When soldering to soft substrates, such as Duroid, it is recommended to use a soft solder at the circuit board to mounting pad interface. Position the die so that its mounting pads are aligned with the circuit board mounting pads. While applying a downward force perpendicular to the top surface of the die, apply heat near the circuit trace and diode mounting pad. The solder connection to the two pads should not be made one at a time as this will create unequal heat flow and thermal stress to the part. Solder reflow should not be performed by causing heat to flow through the top surface of the die to the back. Since the HMIC glass is transparent, the edges of the mounting pads can be visually inspected through the die after attachment is completed.

Typical re-flow profiles for Sn60/Pb40 and RoHS compliant solders is provided in [Application Note M538](#) , "Surface Mounting Instructions" and can viewed on the MA-COM website @ [www.macomtech.com](http://www.macomtech.com)

## Ordering Information

Part Number	Package
MADP-017015-13140G	100 piece gel pack
MADP-017015-13140P	3000 piece reel
MADP-030015-13140G	100 piece gel pack
MADP-030015-13140P	3000 piece reel