

# SMPP Series

## Surface Mount Plastic PIN Diodes

Rev. V19

### Features

- Industry Standard Surface Mount Packages
- Lead-Free (RoHS Compliant) Equivalents Available with 260 °C Reflow Compatibility
- Low Loss, High Isolation Switching Diodes
- Low Distortion Attenuator Diodes
- Single and Dual Diode Configurations
- Tape and Reel Packaging

### Description and Applications

M/A-COM Technology Solutions offers silicon PIN diodes in five standard, low cost, surface mount plastic packages for use as switches and attenuators. The diodes are offered with standard Sn/Pb plating, as well as with 100% matte Sn plating on our RoHS compliant devices. These PIN diodes feature a variety of I-region lengths resulting in lower resistance, and lower capacitance devices for various microwave control circuit applications.

The MA4P275 / MA4P7436 / MADP-007436 series offer the lowest series resistance for best performance as low loss series switches and high isolation shunt switches.

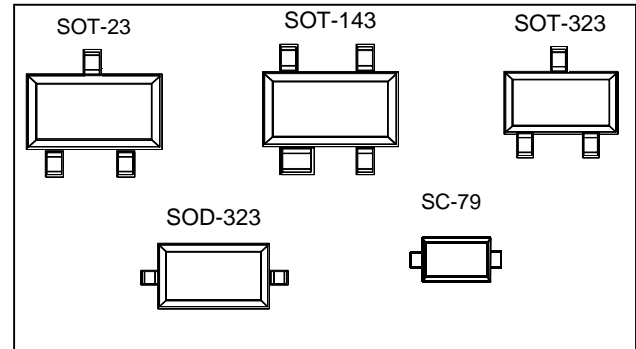
The MA4P789 / MA4P7433 / MADP-007433 series have the lowest capacitance and offers the highest isolation in series and series-shunt switches through 3GHz.

The MA4P282 / MA4P7447 / MADP-007155 series, the MA4P274 / MA4P7455 / MADP-007455 series and the MADP-007448 series are general purpose PIN diodes useful as either switches or attenuators.

The MA4P277 / MA4P7437 / MADP-007437 series and MA4P278 / MA4P7438 / MADP-007438 series device have thicker intrinsic regions to provide lower distortion in attenuator circuits.

The MA4P290/MADP-007167 series devices have the thickest I-Region, offering the lowest distortion and highest IP3 for current controlled attenuator circuits. These devices are ideal for AGC functions for infrastructure and

### Package Outlines



The diodes are come in various chip configurations and are available as single diodes, series tees (ST), series tee reverse (STR), common cathode pairs (CK), common anode pairs (CA), and unconnected pairs in the respective featured packages.

M/A-COM's PIN diodes are available in the SOT-23 (case style 287), the SOT-143 (case style 1068), the SOT-323/SC-70 (3L) (case style 1146), the SOD-323 (case style 1141), and the SC-79 (case style 1279) packages. These packages are supplied on tape and reel for automatic pick and place assembly. The tape and reel suffix designation is a "T" at the end of the part number.

### Absolute Maximum Power Ratings @ 25 °C<sup>1</sup>

Parameter	Absolute Maximum
Operating Temperature	-65°C to +150 °C
Storage Temperature	-65°C to +125 °C
Junction Temperature	+ 175 °C
Reverse Voltage	Voltage Rating (See Table)
Forward Current	150 mA DC

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

### Absolute Maximum Power Ratings @ 25 °C<sup>1</sup> (Unless Otherwise Noted)

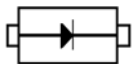
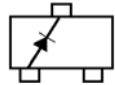
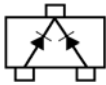
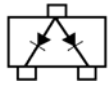
MA4P282 / MA4P7447/MADP-007155 Series	( $\theta$ die = 15°C/W), RF & DC Incident De-rating Coefficient = - 21.3 mW / °C	+ 32 dBm
MA4P275 / MA4P7436/MADP-007436 Series	( $\theta$ die = 25°C/W), RF & DC Incident De-rating Coefficient = - 16.8 mW / °C	+ 31 dBm
MA4P278 / MA4P7438/MADP-007438 Series	( $\theta$ die = 30°C/W), RF & DC Incident De-rating Coefficient = - 13.3 mW / °C	+ 30 dBm
MA4P274 / MA4P7455/MADP-007455 Series	( $\theta$ die = 35°C/W), RF & DC Incident De-rating Coefficient = - 13.3 mW / °C	+ 30 dBm
MA4P277 / MA4P7437/MADP-007437 Series	( $\theta$ die = 45°C/W), RF & DC Incident De-rating Coefficient = - 13.3 mW / °C	+ 30 dBm
MA4P290 / MADP-007167 Series	( $\theta$ die = 55°C/W), RF & DC Incident De-rating Coefficient = - 13.3 mW / °C	+ 30 dBm
MA4P789 / MA4P7433 / MADP-007433 Series	( $\theta$ die = 80°C/W), RF & DC Incident De-rating Coefficient = - 10.7 mW / °C	+ 29 dBm
MADP-007448 Series	( $\theta$ die = 80°C/W), RF & DC Incident De-rating Coefficient = - 10.7 mW / °C	+ 32 dBm
Total ( RF + DC ) Power Dissipation @ 25 °C		
( SOT-23, SOT-143 ) : RF & DC Dissipated De-rating Coefficient = - 33.3 mW / °C		250 mW
( SOT-323, SOD-323, SC-79 ) : RF & DC Dissipated De-rating Coefficient = - 26.7 mW / °C		200 mW

### Electrical Specifications @ 25°C

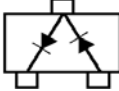
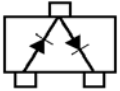
Standard Part Number	RoHS Compliant Part Number	Reverse Voltage <sup>2</sup> (V)	Total Capacitance <sup>3</sup> Max. (pF)	R <sub>S</sub> @ 10 mA <sup>4</sup> Max. (Ohms)	Nominal Characteristics	
					Carrier Lifetime <sup>5</sup> (μs)	I-Region Thickness (mils)
MA4P275	MA4P7436 MADP-007436 Series	75	1.00 @ 20V	0.5	0.2	0.4
MA4P789	MA4P7433 MADP-007433 Series	75	0.35 @ 20V	1.5	0.2	0.4
MA4P282	MA4P7447 MADP-007155 Series	100	1.20 @ 20V	0.6	1.0	0.8
	MADP-007448 Series	100	0.25 @ 50V	2.0	0.4	0.6
MA4P274	MA4P7455 MADP-007455 Series	100	0.35 @ 50V	3.0	1.0	2.0
MA4P277	MA4P7437 MADP-007437 Series	200	0.35 @ 50V	6.0	2.0	4.0
MA4P278	MA4P7438 MADP-007438 Series	200	0.35 @ 50V	10.0	3.0	5.0
MA4P290	MADP-007167	200	0.30 @ 50V	16.0	3.0	7.0

- The reverse current will not exceed 10 μA at the reverse voltage rating.
- Total capacitance is measured at 1 MHz at the indicated voltage.
- Series resistance is measured at the specified current and a frequency of 100 MHz.
- Nominal minority carrier lifetime is measured at I<sub>F</sub> = 10 mA, I<sub>R</sub> = 6 mA, 90% recovery.

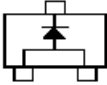
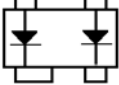
### Packaging and Configurations

							
Single				Single			
SC-79		SOD-323		SOT-23			
Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number		
	MADP-007436-12790T	MA4P275-1141T	MA4P7436-1141T	MA4P275-287T	MA4P7436-287T		
	MADP-007433-12790T	MA4P789-1141T	MA4P7433-1141T	MA4P789-287T	MA4P7433-287T		
	MADP-007155-12790T	MA4P282-1141T	MA4P7447-1141T	MA4P282-287T	MA4P7447-287T		
	MADP-007448-12790T		MADP-007448-11410T		MADP-007448-0287AT		
	MADP-007455-12790T	MA4P274-1141T	MA4P7455-1141T	MA4P274-287T	MA4P7455-287T		
		MA4P277-1141T	MA4P7437-1141T	MA4P277-287T	MA4P7437-287T		
		MA4P278-1141T	MA4P7438-1141T	MA4P278-287T	MA4P7438-287T		
		MA4P290-1141T	MADP-007167-11410T	MA4P290-287T	MADP-007167-0287AT		
$L_S = 0.6 \text{ nH}$		$L_S = 1.3 \text{ nH}$		$L_S = 1.4 \text{ nH}$			
$C_P = 0.10 \text{ pF}$		$C_P = 0.11 \text{ pF}$		$C_P = 0.12 \text{ pF}$			
							
Common Cathode				Common Anode			
SOT-23		SOT323/SC70 (3L)		SOT-23		SOT323/SC70 (3L)	
Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number
MA4P275CK-287T	MA4P7436CK-287T	MA4P275CK-1146T	MA4P7436CK-1146T	MA4P275CA-287T	MA4P7436CA-287T	MA4P275CA-1146T	MA4P7436CA-1146T
MA4P789CK-287T	MA4P7433CK-287T	MA4P789CK-1146T	MA4P7433CK-1146T	MA4P789CA-287T	MA4P7433CA-287T	MA4P789CA-1146T	MA4P7433CA-1146T
MA4P282CK-287T	MA4P7447CK-287T			MA4P282CA-287T	MA4P7447CA-287T		
	MADP-007448-0287FT				MADP-007448-0287GT		MADP-007448-1146GT
MA4P274CK-287T	MA4P7455CK-287T	MA4P274CK-1146T	MA4P7455CK-1146T	MA4P274CA-287T	MA4P7455CA-287T	MA4P274CA-1146T	MA4P7455CA-1146T
MA4P277CK-287T	MADP-007437-0287FT			MA4P277CA-287T	MA4P7437CA-287T		
MA4P278CK-287T	MADP-007438-0287FT			MA4P278CA-287T	MA4P7438CA-287T		
MA4P290CK-287T	MADP-007167-0287FT				MADP-007167-0287GT		
$L_S = 1.4 \text{ nH}$		$L_S = 1.3 \text{ nH}$		$L_S = 1.4 \text{ nH}$		$L_S = 1.3 \text{ nH}$	
$C_P = 0.12 \text{ pF}$		$C_P = 0.12 \text{ pF}$		$C_P = 0.12 \text{ pF}$		$C_P = 0.12 \text{ pF}$	

### Packaging and Configurations

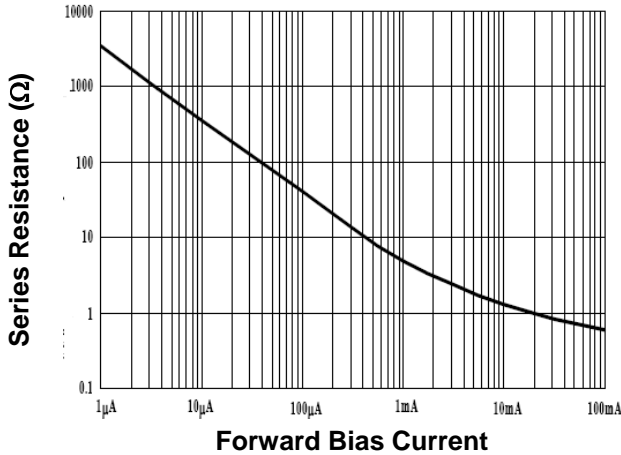
							
Series Tee				Series Tee Reverse			
SOT-23		SOT323/SC70 (3L)		SOT-23		SOT323/SC70 (3L)	
Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number
MA4P275ST-287T	MA4P7436ST-287T	MA4P275ST-1146T	MA4P7436ST-1146T	MA4P275STR-287T	MADP-007436-0287DT	MA4P275STR-1146T	MADP-007436-1146DT
MA4P789ST-287T	MA4P7433ST-287T	MA4P789ST-1146T	MA4P7433ST-1146T	MA4P789STR-287T	MADP-007433-0287DT	MA4P789STR-1146T	MADP-007433-1146DT
MA4P282ST-287T	MA4P7447ST-287T			MA4P282STR-287T	MADP-007155-0287DT		
	MADP-007448-0287BT		MADP-007448-1146BT		MADP-007448-0287DT		MADP-007448-1146DT
MA4P274ST-287T	MA4P7455ST-287T	MA4P274ST-1146T	MA4P7455ST-1146T	MA4P274STR-287T	MADP-007455-0287DT	MA4P274STR-1146T	MADP-007455-1146DT
MA4P277ST-287T	MADP-007437-0287BT			MA4P277STR-287T	MADP-007437-0287DT		
MA4P278ST-287T	MADP-007438-0287BT			MA4P278STR-287T	MADP-007438-0287DT		
	MADP-007167-0287BT			MA4P290STR-287T	MADP-007167-0287DT		
L <sub>S</sub> = 1.4 nH		L <sub>S</sub> = 1.3 nH		L <sub>S</sub> = 1.4 nH		L <sub>S</sub> = 1.3 nH	
C <sub>P</sub> = 0.12 pF		C <sub>P</sub> = 0.12 pF		C <sub>P</sub> = 0.12 pF		C <sub>P</sub> = 0.12 pF	

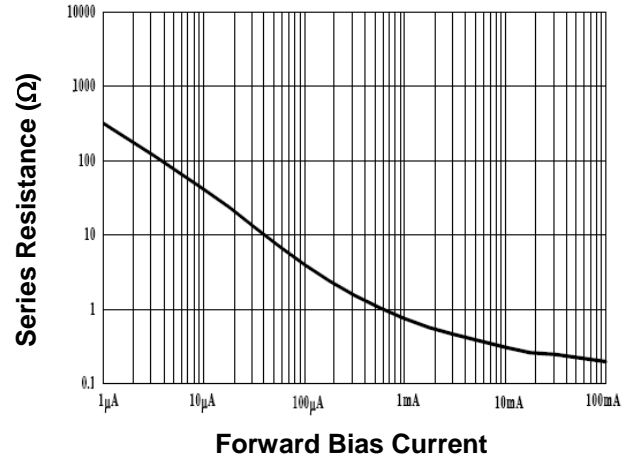
			
Low Inductance		Unconnected Pair	
SOT-23		SOT-143	
Standard Part Number	RoHS Compliant Part Number	Standard Part Number	RoHS Compliant Part Number
MA4P290-LI-287T	MADP-007167-0287HT	MA4P275-1068T	MA4P7436-1068T
	MADP-007433-0287HT	MA4P789-1068T	MA4P7433-1068T
			MADP-007448-1068ET
		MA4P274-1068T	MA4P7455-1068T
L <sub>S</sub> = 0.4 nH		L <sub>S</sub> = 1.3 nH	
C <sub>P</sub> = 0.12 pF		C <sub>P</sub> = 0.12 pF	

## Typical Forward Resistance vs. DC Bias Current @ 100 MHz

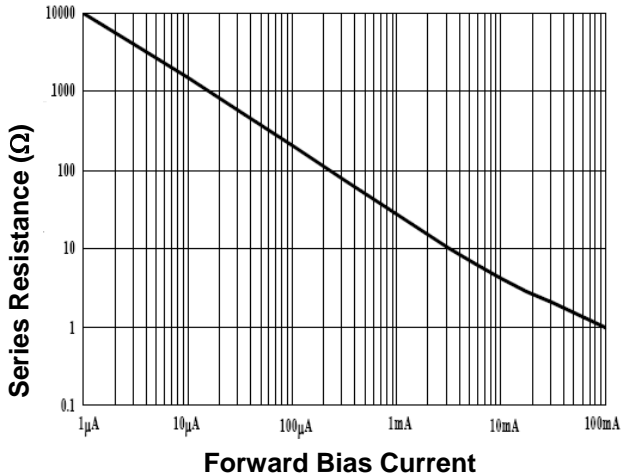
**Resistance vs. Forward Current**  
(MA4P274 / MA4P7455 / MADP-007155 Series)



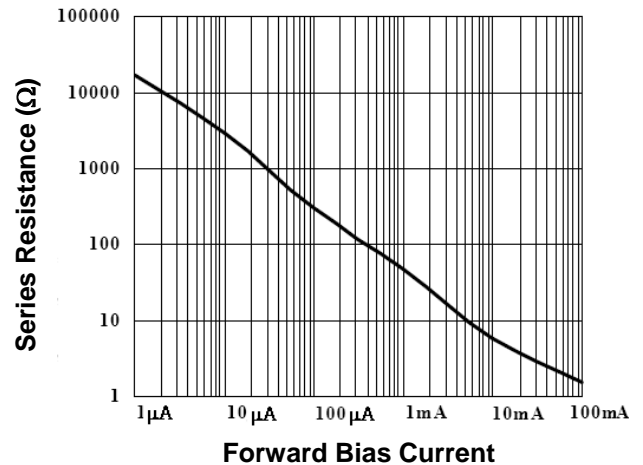
**Resistance vs. Forward Current**  
(MA4P275 / MA4P7436 / MADP-007436 Series)



**Resistance vs. Forward Current**  
(MA4P277 / MA4P7437 / MADP-007437 Series)

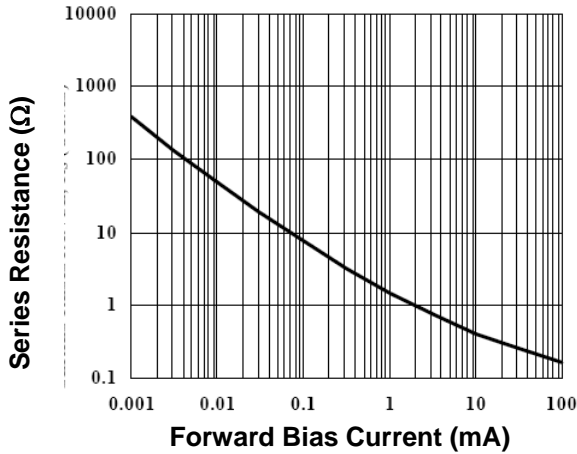


**Resistance vs. Forward Current**  
(MA4P278 / MA4P7438 / MADP-007438 Series)

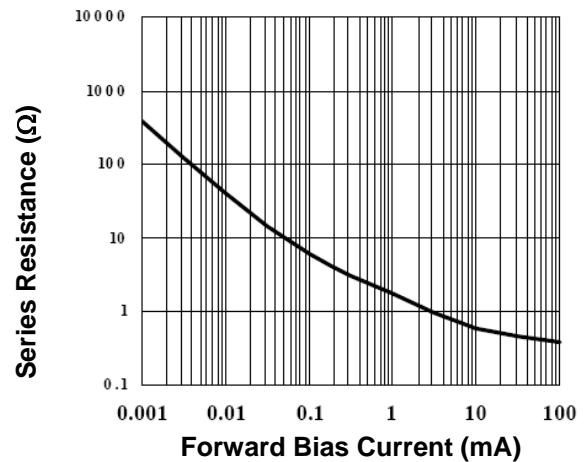


## Typical Forward Resistance vs. DC Bias Current @ 100 MHz

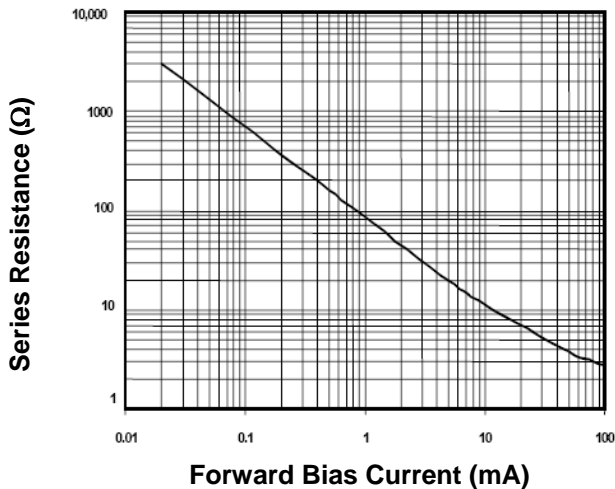
**Resistance vs. Forward Current**  
(MA4P282 / MA4P7447 / MADP-007155 Series)



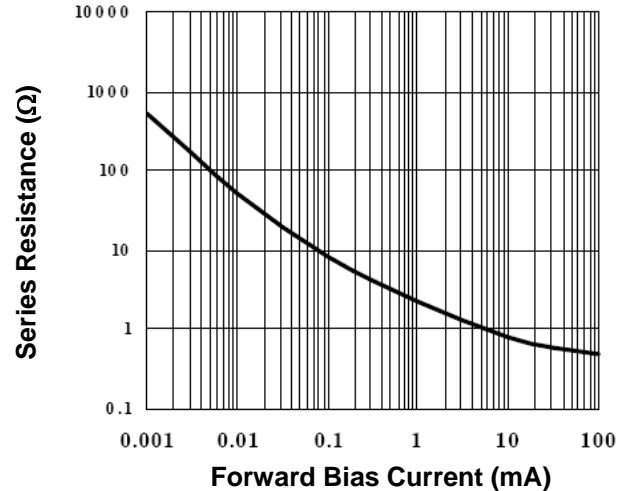
**Resistance vs. Forward Current**  
(MA4P789 / MA4P7433/ MADP-007433 Series)



**Resistance vs. Forward Current**  
(MA4P290 / MADP-007167 Series)

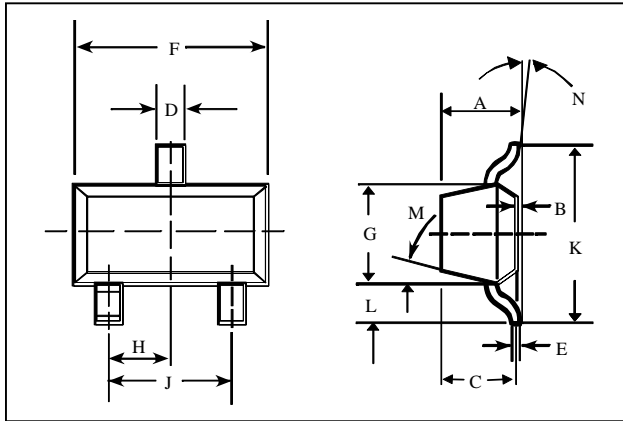


**Resistance vs. Forward Current**  
(MADP-007448 Series)



### Case Styles

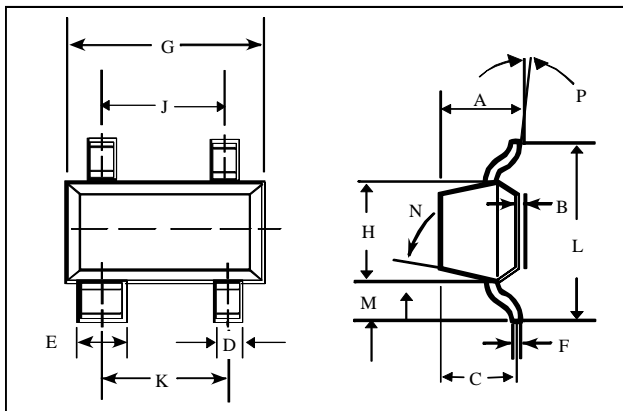
#### SOT-23 (Case Style 287)



#### SOT-23 (Case Style 287)

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	—	0.048	—	1.22
B	—	0.008	—	0.20
C	—	0.040	—	1.00
D	0.013	0.020	0.35	0.50
E	0.003	0.006	0.08	0.15
F	0.110	0.119	2.80	3.00
G	0.047	0.056	1.20	1.40
H	0.037 typical		0.95 typical	
J	0.075 typical		1.90 typical	
K	—	0.103	—	2.60
L	—	0.024	—	0.60
<b>DIM.</b>	<b>GRADIENT</b>			
M	10° max. <sup>6</sup>			
N	2° ... 30°			

#### SOT-143 (Case Style 1068)

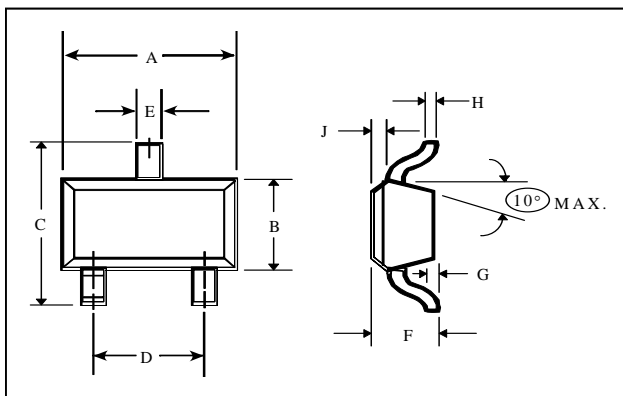


#### SOT-143 (Case Style 1068)

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	—	0.044	—	1.10
B	—	0.004	—	0.10
C	—	0.040	—	1.00
D	0.013	0.020	0.35	0.50
E	0.030	0.035	0.75	0.90
F	0.003	0.006	0.08	0.15
G	0.110	0.119	2.80	3.00
H	0.047	0.056	1.20	1.40
J	0.075 typical		1.90 typical	
K	0.075 typical		1.90 typical	
L	—	0.103	—	2.6
M	—	0.024	—	0.6
<b>DIM.</b>	<b>GRADIENT</b>			
M	10° max. <sup>7</sup>			
N	2° ... 30°			

7. Applicable on all sides

#### SOT-323/SC70 (Case Style 1146)



#### SOT-323/SC70 (Case Style 1146)

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.063	0.087	1.6	2.2
B	0.045	0.053	1.15	1.35
C	0.079	0.087	2.0	2.2
D	0.047	0.055	1.2	1.4
E	0.008	0.016	0.2	0.4
F	0.031	0.039	0.8	1.0
G	—	0.004	—	0.1
H	0.003 typical	0.006	0.08 typical	0.15
J	0.004 typical	0.010	0.1	0.25

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**ADVANCED:** Data Sheets contain information regarding a product MA-COM Technical 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 MA-COM Technical 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.

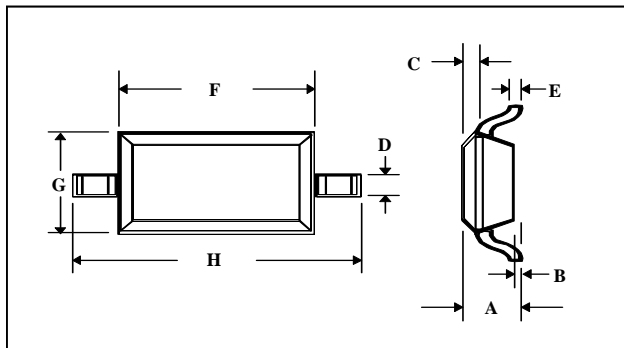
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
  - **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
  - **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
- Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

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### Case Styles (Cont'd)

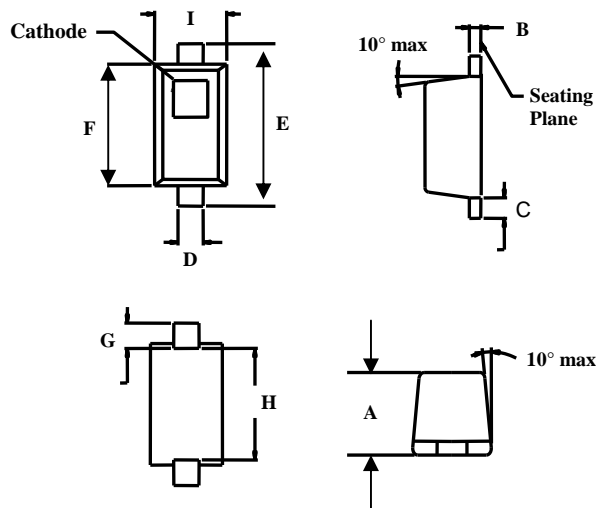
#### SOD-323 (Case Style 1141)



#### SOD-323 (Case Style 1141)

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	—	0.043	—	1.1
B	—	0.004	—	0.1
C	—	0.008	—	0.2
D	0.010	0.016	0.25	0.4
E	0.003	0.006	0.08	0.15
F	0.063	0.075	1.6	1.9
G	0.045	0.057	1.15	1.45
H	0.091 typical	0.106	2.3	2.7

#### SC-79 (Case Style 1279)



#### SC-79 (Case Style 1279)

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.020	0.028	0.51	0.71
B	0.003	0.008	0.08	0.20
C	0.006	0.010	0.15	0.25
D	0.010	0.014	0.25	0.36
E	0.059	0.067	1.50	1.70
F	0.043	0.051	1.09	1.30
G	0.011	0.012	0.28	0.30
H	0.037 typical	0.043	0.94	1.09
I	0.027	0.035	0.69	0.89



# SMPP Series

## Surface Mount Plastic PIN Diodes

Rev. V19

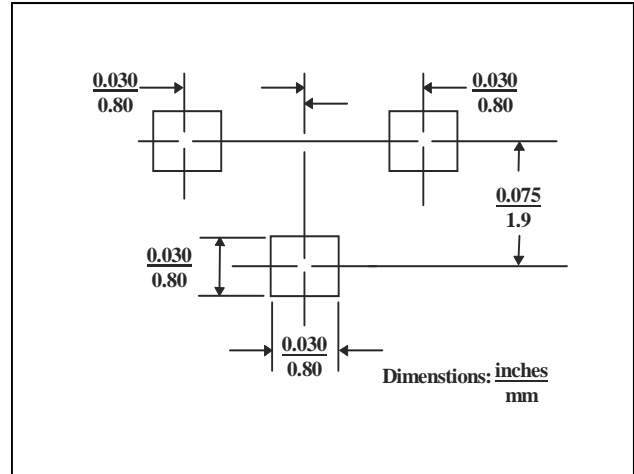
### Mounting Information

The illustration indicates the recommended mounting pad configuration for the SOT-23, SOT-323, SOD-323, SOT-143, and SC-79 packages. Solder paste containing flux should be screened onto the pads to a thickness of 0.005-0.007 inches. The plastic package is placed in position, firmly adhering to the solder paste.

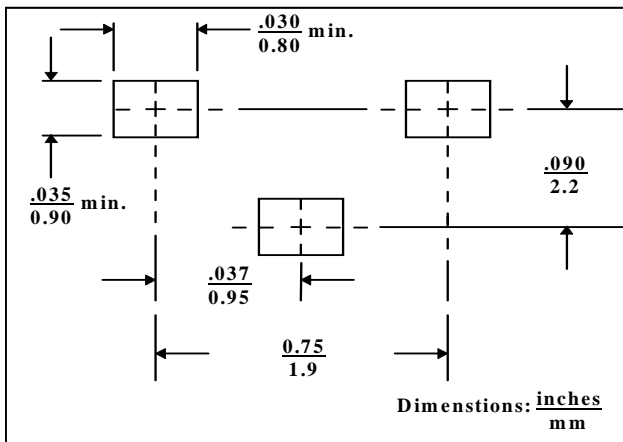
Permanent attachment is performed by a reflow soldering procedure during which the tab temperature does not exceed +275 °C and the body temperature does not exceed +250 °C, for standard models and +260 °C for the RoHS compliant devices.

Please refer to [Application Note M538](#) for surface mounting instructions.

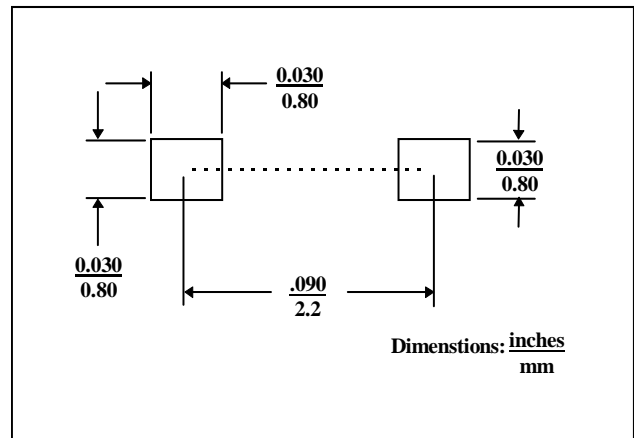
### SOT-323



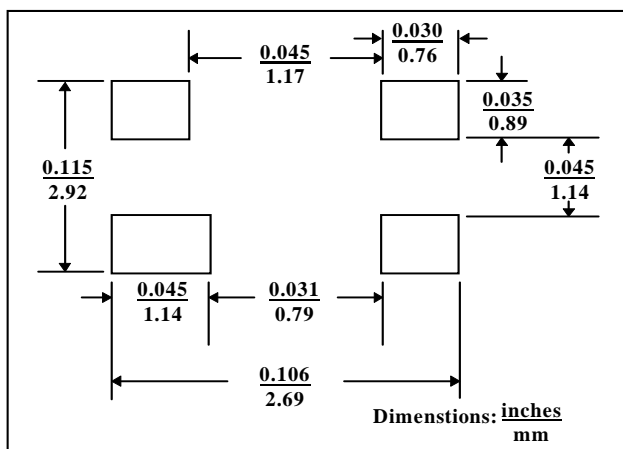
### SOT-23



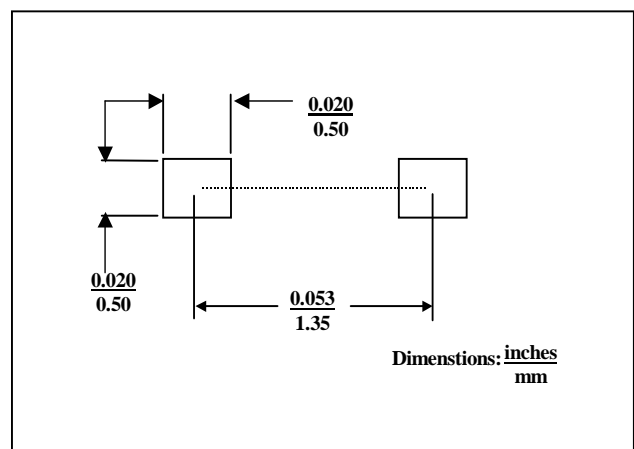
### SOD-323/SC70



### SOT-143



### SC-79



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

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### Наши контакты:

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331