

# Surface Mount RF PIN Diodes

## Technical Data

### HSMP-383x Series

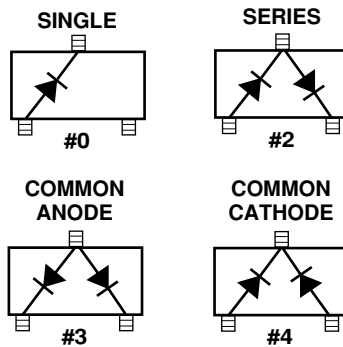
#### Features

- **Diodes Optimized for:**  
Low Capacitance Switching  
Low Current Attenuator
- **Surface Mount SOT-23 Package**  
Single and Dual Versions  
Tape and Reel Options  
Available
- **Low Failure in Time (FIT) Rate<sup>1</sup>**
- **Lead-free Option Available**

#### Note:

1. For more information see the Surface Mount PIN Reliability Data Sheet.

#### Package Lead Code Identification (Top View)



#### Description/Applications

The HSMP-383x series of general purpose PIN diodes are designed for two classes of applications. The first is attenuators where current consumption is the most important design consideration. The second application for this series of diodes is in switches where low capacitance is the driving issue for the designer.

The HSMP-386x series Total Capacitance ( $C_T$ ) and Total Resistance ( $R_T$ ) are typical specifications. For applications that require guaranteed performance, the general purpose HSMP-383x series is recommended.

A SPICE model is not available for PIN diodes as SPICE does not provide for a key PIN diode characteristic, carrier lifetime.

### Absolute Maximum Ratings<sup>[1]</sup> $T_C = 25^\circ\text{C}$

Symbol	Parameter	Units	Absolute Maximum
$I_F$	Forward Current (1 ms Pulse)	Amp	1
$P_t$	Total Device Dissipation	mW <sup>[2]</sup>	250
$P_{IV}$	Peak Inverse Voltage	—	Same as $V_{BR}$
$T_j$	Junction Temperature	$^\circ\text{C}$	150
$T_{STG}$	Storage Temperature	$^\circ\text{C}$	-65 to 150

#### Notes:

1. Operation in excess of any one of these conditions may result in permanent damage to this device.
2. CW Power Dissipation at  $T_{LEAD} = 25^\circ\text{C}$ . Derate to zero at maximum rated temperature.

### PIN General Purpose Diodes, Electrical Specifications $T_C = 25^\circ\text{C}$

Part Number HSMP-	Package Marking Code <sup>[1]</sup>	Lead Code	Configuration	Minimum Breakdown Voltage $V_{BR}$ (V)	Maximum Series Resistance $R_S$ ( $\Omega$ )	Maximum Total Capacitance $C_T$ (pF)
3830	K0	0	Single	200	1.5	0.3
3832	K2	2	Series			
3833	K3	3	Common Anode			
3834	K4	4	Common Cathode			
Test Conditions				$V_R = V_{BR}$ Measure $I_R \leq 10$ mA	$I_F = 100$ mA $f = 100$ MHz	$V_R = 50$ V $f = 1$ MHz

### Typical Parameters at $T_C = 25^\circ\text{C}$

Part Number HSMP-	Series Resistance $R_S$ ( $\Omega$ )	Carrier Lifetime $\tau$ (ns)	Reverse Recovery Time $T_{rr}$ (ns)	Total Capacitance $C_T$ (pF)
383x	20	500	80	0.20 @ 50 V
Test Conditions	$I_F = 1$ mA $f = 100$ MHz	$I_F = 50$ mA $I_R = 250$ mA	$V_R = 10$ V $I_F = 20$ mA 90% Recovery	

#### Note:

1. Package marking code is white.

## Typical Parameters at $T_C = 25^\circ\text{C}$ (unless otherwise noted), Single Diode

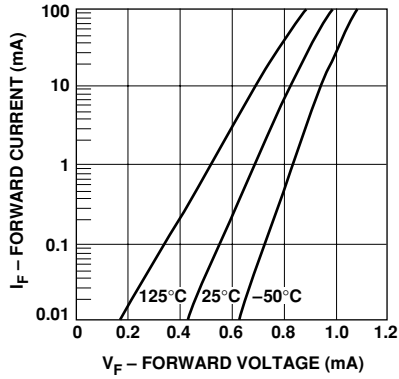


Figure 1. Forward Current vs. Forward Voltage.

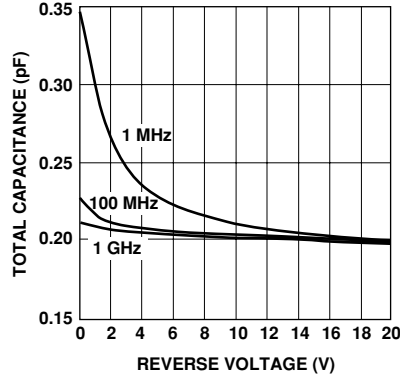


Figure 2. RF Capacitance vs. Reverse Bias.

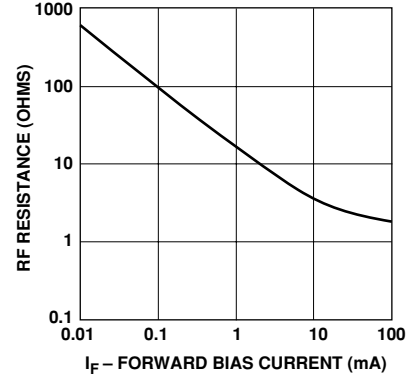


Figure 3. RF Resistance at  $25^\circ\text{C}$  vs. Forward Bias Current.

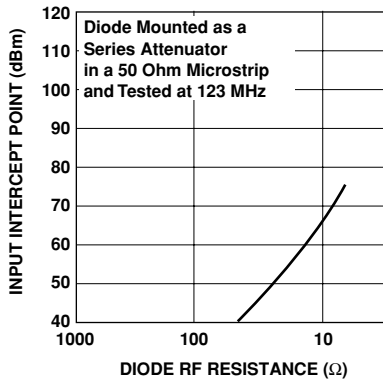


Figure 4. 2nd Harmonic Input Intercept Point vs. Diode RF Resistance for Attenuators.

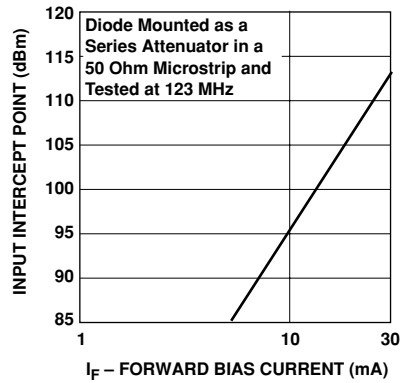


Figure 5. 2nd Harmonic Input Intercept Point vs. Forward Bias Current for Switches.

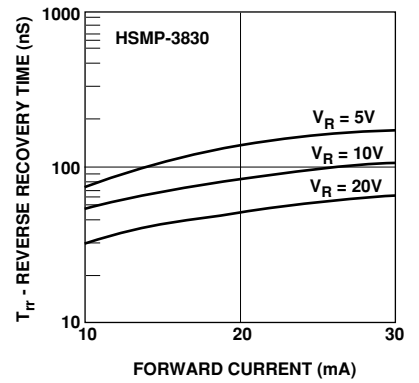


Figure 6. Reverse Recovery Time vs. Forward Current for Various Reverse Voltage.

## Typical Applications for Multiple Diode Products

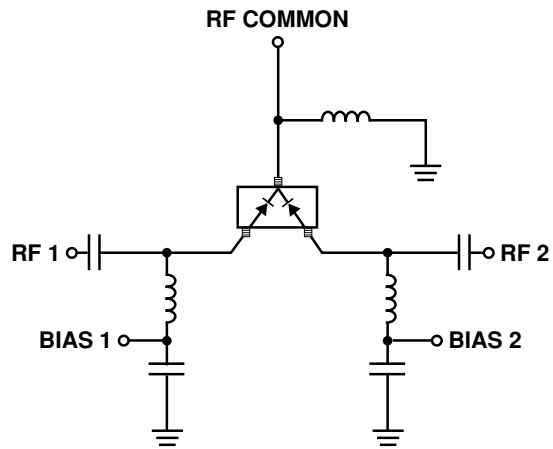


Figure 7. Simple SPDT Switch, Using Only Positive Current.

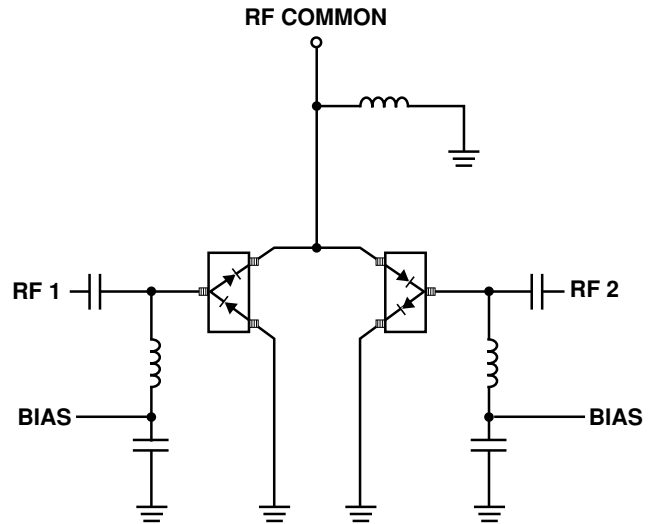


Figure 8. High Isolation SPDT Switch, Dual Bias.

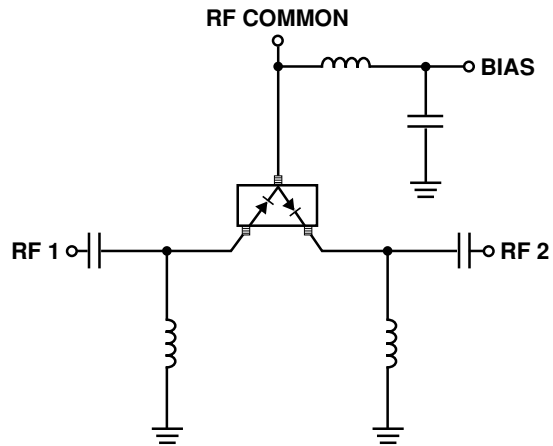


Figure 9. Switch Using Both Positive and Negative Current.

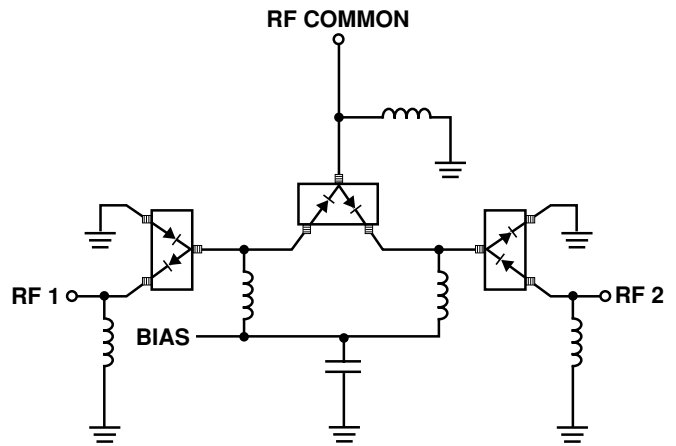


Figure 10. Very High Isolation SPDT Switch, Dual Bias.

## Typical Applications for Multiple Diode Products (continued)

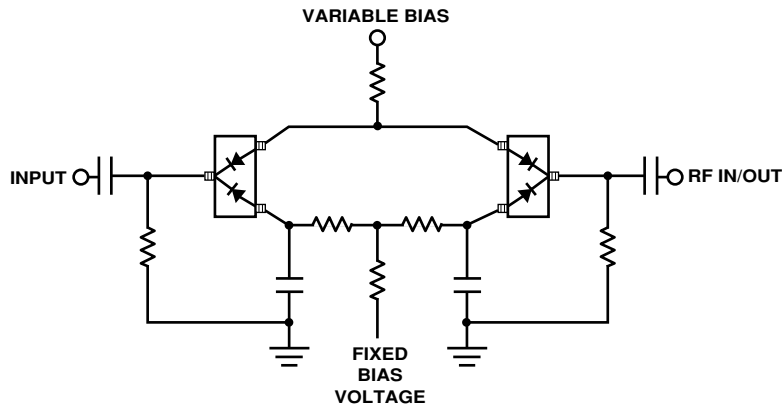


Figure 11. Four Diode  $\pi$  Attenuator. See AN1048 for details.

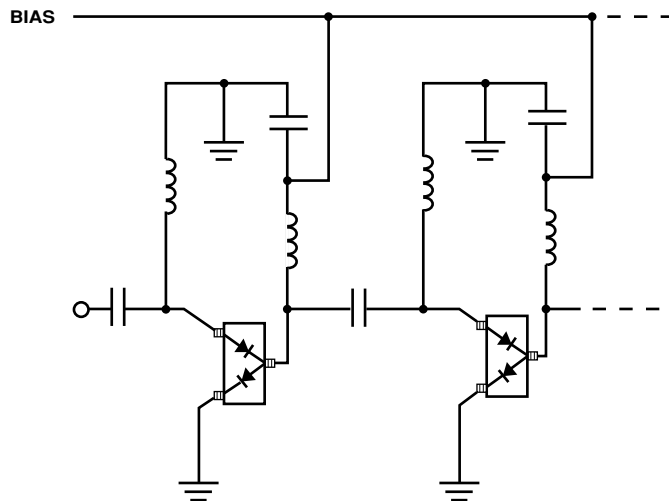
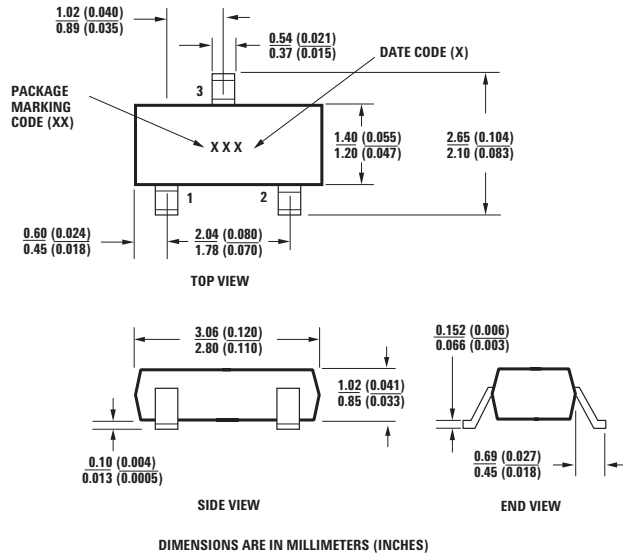


Figure 12. High Isolation SPST Switch  
(Repeat Cells as Required).

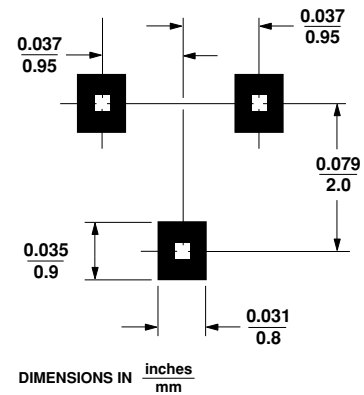
## Package Dimensions

### Outline 23 (SOT-23)



## PC Board Footprints

### SOT-23



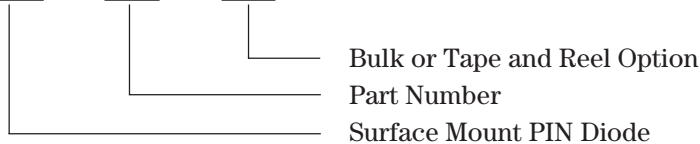
## Package Characteristics

Lead Material .....	Alloy 42
Lead Finish .....	Tin-Lead 85-15%
Maximum Soldering Temperature .....	260°C for 5 seconds
Minimum Lead Strength .....	2 pounds pull
Typical Package Inductance .....	2 nH
Typical Package Capacitance .....	0.08 pF (opposite leads)

## Ordering Information

Specify part number followed by option. For example:

HSMP - 383x - XXX



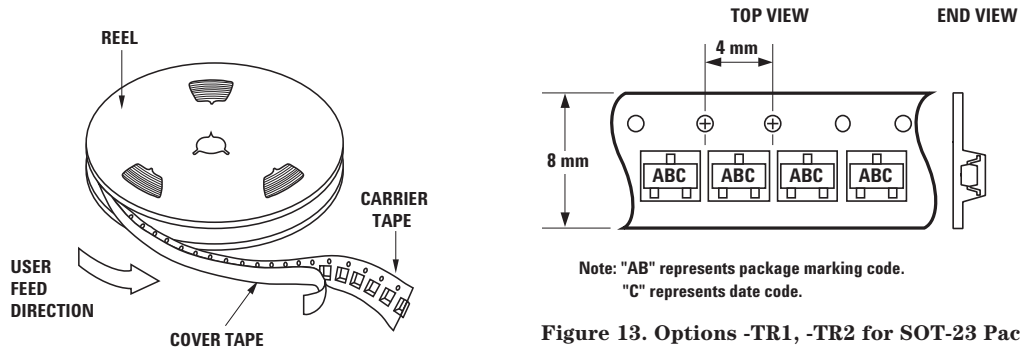
## Profile Option Descriptions

- BLK = Bulk
- TR1 = 3K pc. Tape and Reel, Device Orientation; See Figure 13
- TR2 = 10K pc. Tape and Reel, Device Orientation; See Figure 13

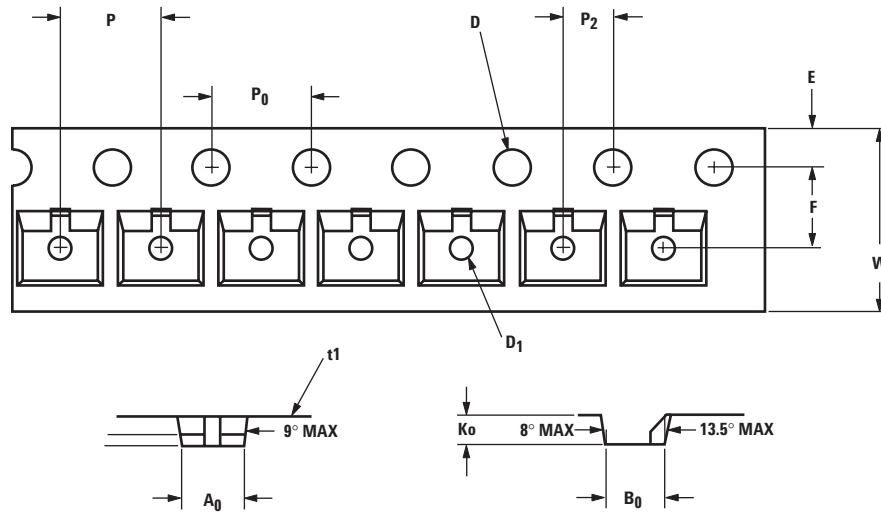
Tape and Reeling conforms to Electronic Industries RS-481, "Taping of Surface Mounted Components for Automated Placement."

For lead-free option, the part number will have the character "G" at the end, eg. -TR2G for a 10K pc lead-free reel.

## Device Orientation For Outlines SOT-23



## Tape Dimensions and Product Orientation For Outline SOT-23



	DESCRIPTION	SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	$A_0$	$3.15 \pm 0.10$	$0.124 \pm 0.004$
	WIDTH	$B_0$	$2.77 \pm 0.10$	$0.109 \pm 0.004$
	DEPTH	$K_0$	$1.22 \pm 0.10$	$0.048 \pm 0.004$
	PITCH	$P$	$4.00 \pm 0.10$	$0.157 \pm 0.004$
	BOTTOM HOLE DIAMETER	$D_1$	$1.00 + 0.05$	$0.039 \pm 0.002$
PERFORATION	DIAMETER	$D$	$1.50 + 0.10$	$0.059 + 0.004$
	PITCH	$P_0$	$4.00 \pm 0.10$	$0.157 \pm 0.004$
	POSITION	$E$	$1.75 \pm 0.10$	$0.069 \pm 0.004$
CARRIER TAPE	WIDTH	$W$	$8.00 + 0.30 - 0.10$	$0.315 + 0.012 - 0.004$
	THICKNESS	$t_1$	$0.229 \pm 0.013$	$0.009 \pm 0.0005$
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	$F$	$3.50 \pm 0.05$	$0.138 \pm 0.002$
	CAVITY TO PERFORATION (LENGTH DIRECTION)	$P_2$	$2.00 \pm 0.05$	$0.079 \pm 0.002$

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