

**MMP4400 Series Datasheet**

**RoHS-Compliant Control Devices-Surface Mount**

**PIN Diodes**



**Microsemi Corporate Headquarters**

One Enterprise, Aliso Viejo,  
CA 92656 USA

Within the USA: +1 (800) 713-4113

Outside the USA: +1 (949) 380-6100

Fax: +1 (949) 215-4996

Email: [sales.support@microsemi.com](mailto:sales.support@microsemi.com)

[www.microsemi.com](http://www.microsemi.com)

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# 1      **Revision History**

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The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

## 1.1      **Revision 1.0**

Revision 1.0 was the first publication of this document.

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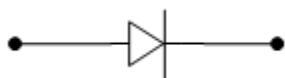
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## 2 Product Overview

The MMP4400 series are high-voltage, high-power (cathode base) PIN diodes. These high-resistivity silicon devices are glass passivated for high stability and reliability, and have been proven by thousands of device hours in high-reliability systems. Each device can withstand storage temperatures from  $-65^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  and will operate over the range from  $-55^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ .

The MMP4400 series will operate typically with 50 mA forward bias. Breakdown voltages are available up to 1000 V. Consult the factory for higher-voltage devices. This product meets RoHS requirements according to EU directives 2011/65/EC and 2002/95 EC.

**Figure 1 Functional Block Diagram**



### 2.1 Applications

The MMP4400 series can be used in RF circuits as an on/off element, as a switch, or as a current-controlled resistor in attenuators extending over the frequency range from UHF through X-band.

Switch applications include high-speed switches (ECM systems), TR or lobing switches, channel or antenna-selection switches (telecommunications), duplexers (radar), and digital phase shifters (phased arrays).

The MMP4400 series can be used in RF circuits as an on/off element at moderate RF power levels. Attenuator type applications include amplitude modulators, AGC attenuators, power levelers, and level set attenuators.

#### 2.1.1 Benefits

The MMP4400 series devices provide the following application benefits:

- TR switches
- Antenna selector switches
- Duplexers
- Digital phase shifters

### 2.2 Key Features

The following are key features of the MMP4400 series devices:

- Compact 0805 SMT package
- Suitable for application through X-band: 50 MHz–12 GHz
- High-power handling: >100 W peak
- Low thermal resistance:  $15^{\circ}\text{C/W}$ – $35^{\circ}\text{C/W}$
- High shunt isolation: >30 dB
- Low distortion
- RoHS compliant and  $260^{\circ}\text{C}$  reflow compatible

## 3 Electrical Specifications

### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings at 25 °C unless otherwise specified.

**Table 1 Absolute Maximum Ratings**

| Rating                                                   | Symbol    | Value      | Unit    |
|----------------------------------------------------------|-----------|------------|---------|
| Maximum leakage current (at 80% of minimum-rated $V_B$ ) | $I_R$     | 0.5        | $\mu A$ |
| Operating temperature                                    | $T_{OP}$  | –55 to 150 | °C      |
| Storage temperature                                      | $T_{STG}$ | –65 to 150 | °C      |
| ESD sensitivity (HBM)                                    |           | Class 1A   |         |
| Moisture sensitivity level                               |           | MSL 1      |         |

### 3.2 Device Electrical Parameters

The following table shows the device electrical parameters at 25 °C.

**Table 2 Device Electrical Parameters**

| Model Number | $V_b$<br>$I_R = 10 \mu A$<br>(Min) | $C_T$<br>$V_R = 50 V$<br>(Max) | $R_s$<br>$I_F = 100 mA$<br>$F = 100 MHz$<br>(Max) | $T_L$<br>$I_R = 6 mA$<br>$I_F = 10 mA$<br>(Typ) | $\theta_p$<br>Thermal Resistance<br>(Max) | Power Dissipation<br>(Max) |
|--------------|------------------------------------|--------------------------------|---------------------------------------------------|-------------------------------------------------|-------------------------------------------|----------------------------|
| MMP4401      | 500 V                              | 0.35 pF                        | 0.80 $\Omega$                                     | 1.5 $\mu s$                                     | 35 °C/W                                   | 3.5 W                      |
| MMP4402      | 500 V                              | 0.50 pF                        | 0.65 $\Omega$                                     | 2.0 $\mu s$                                     | 30 °C/W                                   | 4.0 W                      |
| MMP4403      | 500 V                              | 1.0 pF                         | 0.30 $\Omega$                                     | 3.0 $\mu s$                                     | 25 °C/W                                   | 5.0 W                      |
| MMP4404      | 750 V                              | 0.50 pF                        | 0.80 $\Omega$                                     | 3.5 $\mu s$                                     | 25 °C/W                                   | 5.0 W                      |
| MMP4405      | 1000 V                             | 0.60 pF                        | 0.75 $\Omega$                                     | 5.0 $\mu s$                                     | 15 °C/W                                   | 8.0 W                      |

The following table shows the bias specifications for the MMP4400 series devices.

**Table 3 Bias Table**

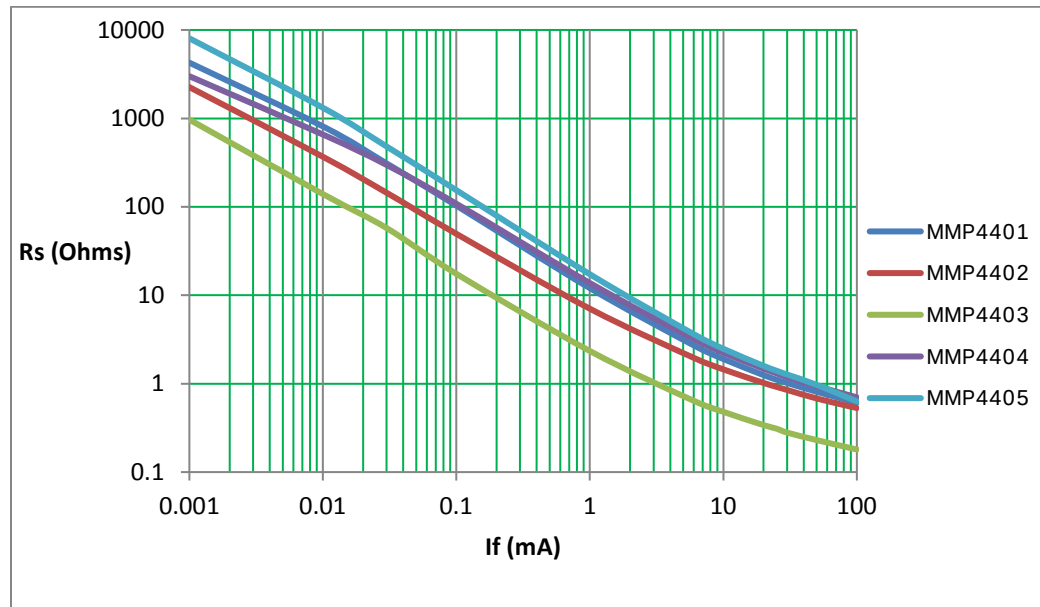
| RF State | Bias   |
|----------|--------|
| On       | 100 mA |
| Off      | 100 V  |



### 3.3 Typical $R_s$ Performance

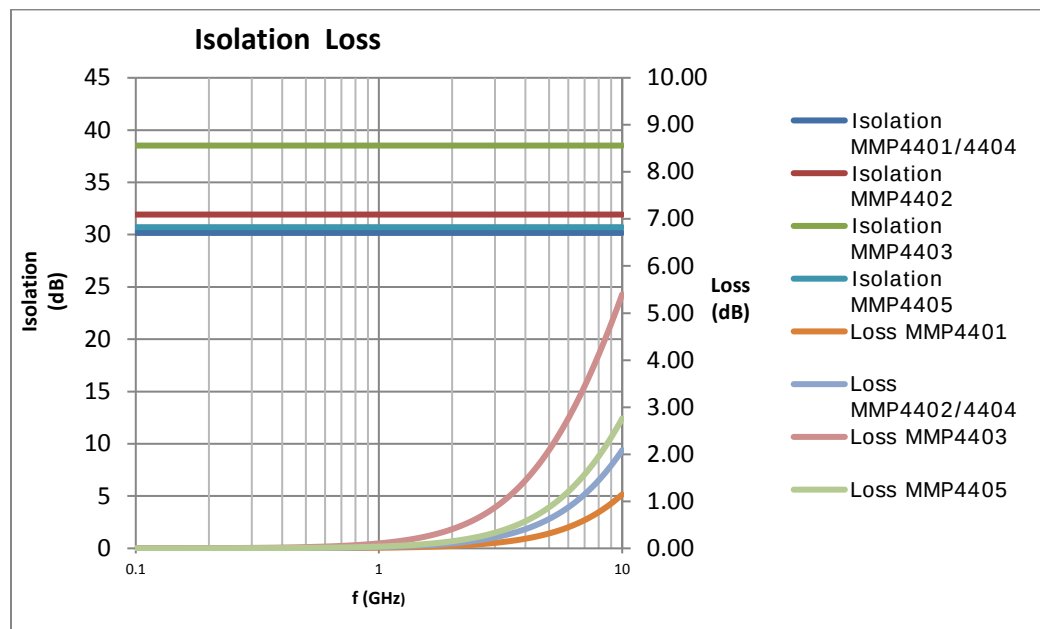
The following graph show the typical  $R_s$  performance of the MMP4400 series devices, where  $f = 100$  MHz.

**Figure 2 Typical  $R_s$  Performance**



### 3.4 Typical Isolation and Insertion Loss Performance

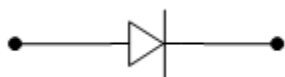
The following graph shows the typical Isolation and insertion loss performance of the MMP4400 series devices.



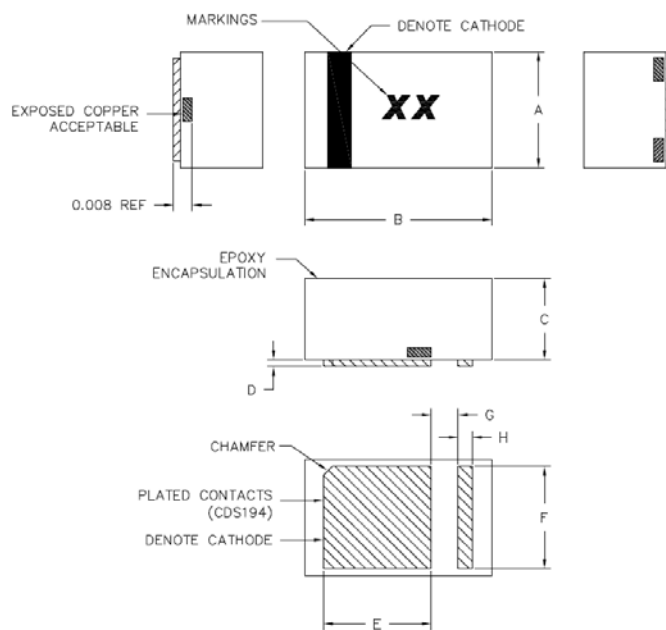
## 4 Package Outline

The following illustrations show the package outline of the MMP4400 series devices.

**Figure 3 Functional Block Diagram**



**Figure 4 Package Outline**



The following table shows the package dimensions of the MMP4400 series devices.

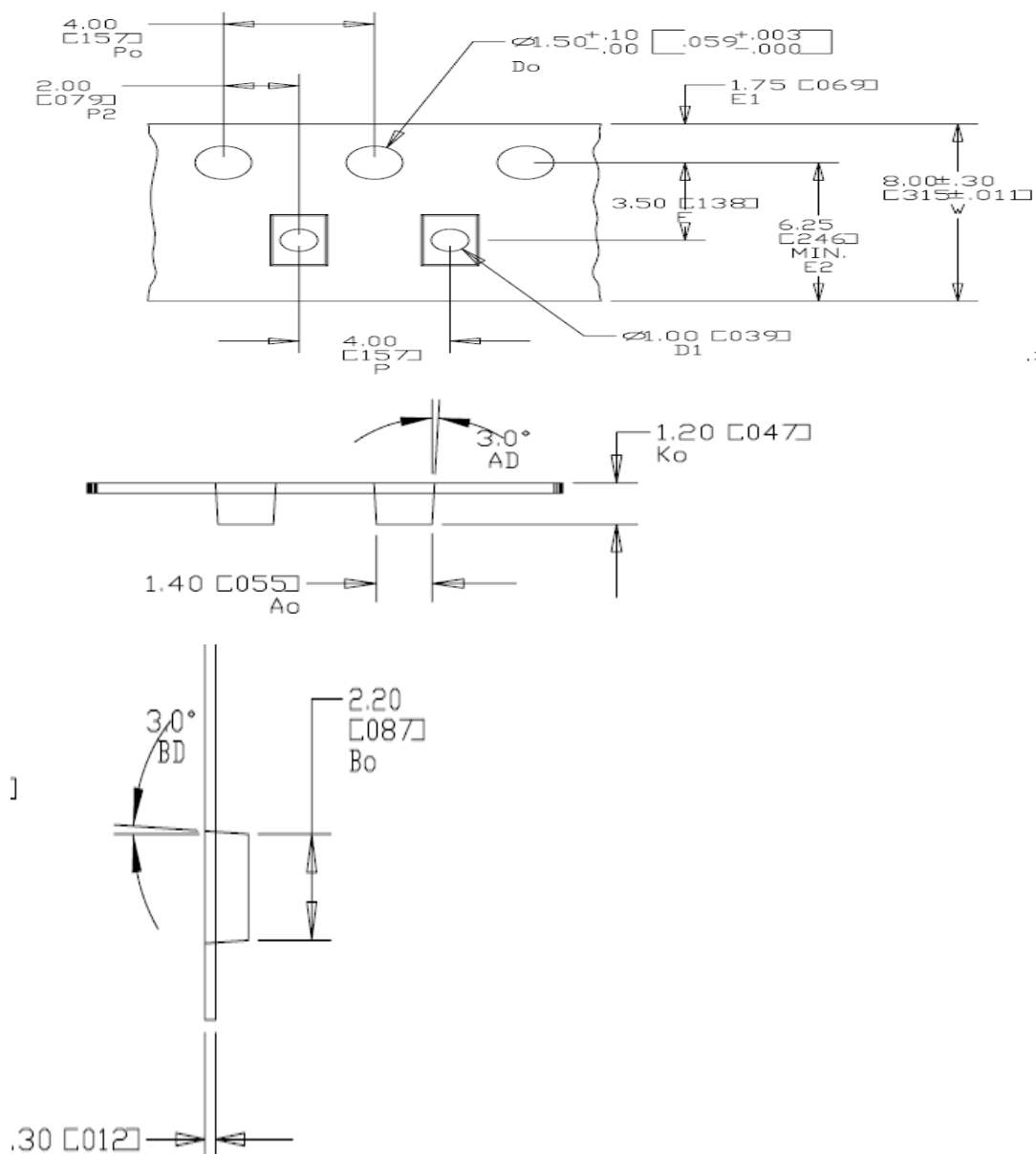
**Table 4 Package Dimensions**

| DIM | Inches |       |       | Millimeters |       |       |
|-----|--------|-------|-------|-------------|-------|-------|
|     | Min    | Typ   | Max   | Min         | Typ   | Max   |
| A   | 0.045  | 0.050 | 0.055 | 1.143       | 1.270 | 1.397 |
| B   | 0.075  | 0.080 | 0.085 | 1.905       | 2.032 | 2.159 |
| C   | 0.030  | 0.035 | 0.040 | 0.762       | 0.889 | 1.016 |
| D   |        |       | 0.003 |             |       | 0.076 |
| E   |        | 0.046 |       |             | 1.168 |       |
| F   |        | 0.044 |       |             | 1.118 |       |
| G   |        | 0.011 |       |             | 0.279 |       |
| H   |        | 0.006 |       |             | 0.152 |       |

## 5 Tape-and-Reel Format

The following illustration shows the tape-and-reel format of the MMP4400 series devices in inches and millimeters.

**Figure 5 Tape-and-Reel Format**



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## 6 Ordering Information

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The following table shows the ordering information for the MMP4400 series devices.

**Table 5 Ordering Information**

| Part Number | Package          |
|-------------|------------------|
| MMP4401-GM2 | 0805 SMT Package |
| MMP4402-GM2 | 0805 SMT Package |
| MMP4403-GM2 | 0805 SMT Package |
| MMP4404-GM2 | 0805 SMT Package |
| MMP4405-GM2 | 0805 SMT Package |