**MADP-011084**

Anti-Parallel Pair Non-Magnetic PIN

5 - 400 MHz  

**Features**

- Designed for MRI applications
- Non-Magnetic Surface Mount Package
- Anti-Parallel Self Bias Configuration
- \( R_p = 20 \, k \Omega, \, C_T = 2 \, pF, \, V_B = 50 \, V \)
- >50 W CW Incident Power Handling @ 400 MHz
- Lead-Free 4 mm 8-lead HQFN Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant

**Description**

The MADP-011084 acts as a passive switch using silicon PIN diodes in a non-magnetic surface mount package. There is one pair of diodes constructed in an electrically isolated anti-parallel configuration that operate from 5 to 400 MHz.

The MADP-011084 is well suited for MRI passive switching applications. The PIN diodes become a high Q R-C network under small signal and behave as an effective passive rectifier or short circuit under high RF signal to tune and de-tune the resonant MRI tank circuit.

**Ordering Information**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MADP-011084-TR0500</td>
<td>500 piece reel</td>
</tr>
<tr>
<td>MADP-011084-TR3000</td>
<td>3000 piece reel</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.

2. MACOM recommends connecting unused package pins to ground.

3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

**Functional Schematic**

**Pin Configuration**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D1 Anode</td>
</tr>
<tr>
<td>2</td>
<td>D2 Cathode</td>
</tr>
<tr>
<td>3, 4</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>D2 Anode</td>
</tr>
<tr>
<td>6</td>
<td>D1 Cathode</td>
</tr>
<tr>
<td>7, 8</td>
<td>No Connection</td>
</tr>
<tr>
<td>Paddle</td>
<td>Ground</td>
</tr>
</tbody>
</table>

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.
## Electrical Specifications

For the device under test (DUT), the parameters are defined as follows:

### Total Capacitance ($C_T$)
- Test Condition: 100 MHz, 0 V
- Units: pF
- Min.: 2
- Typ.: 3

### Series Resistance ($R_S$)
- Test Condition: 100 MHz, +10 mA
- Units: Ω
- Min.: 1

### Parallel Resistance ($R_P$)
- Test Condition: 100 MHz, 0 V
- Units: kΩ
- Min.: 20

### Reverse Breakdown Voltage
- Test Condition: -10 μA
- Units: V
- Min.: 50

### Forward Voltage
- Test Condition: +10 mA
- Units: V
- Min.: 0.8

### Carrier Lifetime
- Test Condition: 1 kHz, +10 mA, -6 mA
- (50% Control Voltage, 90% Output Voltage)
- Units: ns
- Min.: 55

### CW Thermal Resistance ($\Theta_{JC}$)
- (Infinite heat sink at thermal ground plane)
- Units: °C/W
- Min.: 22

### Insertion Loss
- Test Condition: 100 MHz, +10 mA
- Units: dB
- Min.: 0.1

### Return Loss
- Test Condition: 100 MHz, +10 mA
- Units: dB
- Min.: 25

### Isolation
- Test Condition: 100 MHz, 0 V
- Units: dB
- Min.: 18

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW Incident Power</td>
<td>+50 dBm</td>
</tr>
<tr>
<td>+50 mA, 400 MHz @ 85°C</td>
<td></td>
</tr>
<tr>
<td>DC Reverse Voltage</td>
<td>-50 V</td>
</tr>
<tr>
<td>$AC_{RMS}$ + DC Forward Current (per diode D1 or D2)</td>
<td>1.8 A</td>
</tr>
<tr>
<td>Power Dissipation @ 85°C (per diode D1 or D2)</td>
<td>4 W</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>+175°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°C to +125°C</td>
</tr>
</tbody>
</table>

### Handling Procedures

Please observe the following precautions to avoid damage:

#### Static Sensitivity

These devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1C devices.

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4. Per diode D1 or D2.

5. Exceeding any one or combination of these limits may cause permanent damage to this device.

6. MACOM does not recommend sustained operation near these survivability limits.

7. Operating at nominal conditions with $T_J \leq +175°C$ will ensure $MTTF > 1 \times 10^6$ hours.
Typical Performance Curves: Freq. = 100 MHz

Series Resistance vs. Forward Current

Capacitance vs. Reverse Voltage

Parallel Resistance vs. Reverse Voltage
Typical Performance Curves:

- **Insertion Loss @ 10 mA Forward Bias**
- **Return Loss @ 10 mA Forward Bias**
- **Isolation @ 10 V Reverse Bias**
- **Isolation @ 20 V Reverse Bias**
- **Isolation @ 40 V Reverse Bias**
- **Output Power vs. Input Power @ 50 mA, 400 MHz CW**
Lead-Free 4 mm 8-Lead HQFN†

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.
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