Features

- Surface Mount Device
- 8 µm I-Region Length Devices
- Two PIN diodes in Flexible Configuration
- No Wire bonds Required
- Rugged Silicon-Glass Construction
- Silicon Nitride Passivation
- Polymer Scratch Protection
- Low Parasitic Capacitance and Inductance

Description

The MADP-000208-13180W is a pair of silicon glass PIN diodes incorporated onto one chip and is fabricated using M/A-COM Technology Solutions patented HMIC™ process. The device features three silicon pedestals embedded in low loss, low dispersion glass (k=4.1, Tanδ=0.002). The diodes are formed on the top of pedestals and connections to the backside of the device are made via electrically conductive sidewalls. Selective backside metallization is applied to produce a surface mount device. This vertical topology provides for exceptional heat transfer and also allows the topside to be fully encapsulated with silicon nitride. An additional polymer layer is also added to provide scratch and impact protection. These protective coatings prevent damage to the junction and the anode air-bridge during handling and assembly.

Applications

The MADP-000208-13180W packageless devices are suitable for usage in high incident power, 44.8 dBm C.W at 2 GHz., series, shunt, or series-shunt switches. The low parasitic inductance, < 0.12 nH, and excellent RC constant, make these devices an attractive alternative for high frequency switch elements when compared to their plastic device counterparts.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MADP-000208-13180W</td>
<td>200 pieces per tray</td>
</tr>
</tbody>
</table>
**Electrical Specifications**: \[ T_A = +25^\circ C \]

**D1 - J1 to J3 & D2 - J3 to J4**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacitance ((C_T)^4)</td>
<td>-10 V, 1 MHz</td>
<td>pF</td>
<td>—</td>
<td>0.81</td>
<td>0.90</td>
</tr>
<tr>
<td>Resistance ((R_S))</td>
<td>+10 mA, 1 GHz</td>
<td>Ω</td>
<td>—</td>
<td>0.40</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>+100 mA, 1 GHz</td>
<td></td>
<td>0.30</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Forward Voltage ((V_F)^4)</td>
<td>+5 mA</td>
<td>V</td>
<td>—</td>
<td>0.78</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>+100 mA</td>
<td></td>
<td>1.00</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Reverse Leakage Current ((I_R)^4)</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>C.W. Thermal Resistance (R_{\theta JL})</td>
<td></td>
<td>°C/W</td>
<td>—</td>
<td>58</td>
<td>—</td>
</tr>
<tr>
<td>Lifetime ((T_L))</td>
<td>+10 mA / -6 mA (50% - 90% V)</td>
<td>μS</td>
<td>—</td>
<td>0.5</td>
<td>—</td>
</tr>
</tbody>
</table>

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. \(R_S\) is measured on an HP4291A Impedance Analyzer with die mounted in an ODS-186 package using Sn60/Pb40 solder.
4. On wafer measurement.

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Current</td>
<td>500 mA</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>-90 V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55 °C to +125°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55 °C to +150°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>+175°C</td>
</tr>
<tr>
<td>C.W. Incident Power</td>
<td>44.8 dBm @ 2 GHz</td>
</tr>
<tr>
<td>Mounting Temperature</td>
<td>+260 °C for 10 seconds</td>
</tr>
</tbody>
</table>

**Application Schematic**

---

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

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.
Typical Performance Curves @ 25°C

**Resistance vs. Frequency @ 5, 10 & 20 mA**

- **Resistance vs. Frequency @ 5, 10 & 20 mA**
  - Frequency (GHz) vs. $R_v$ (Ohms)
  - 5 mA, 10 mA, 20 mA

**Resistance vs. Forward Current @ 30, 500, 1000 MHz**

- **Resistance vs. Forward Current @ 30, 500, 1000 MHz**
  - Current (mA) vs. $R_v$ (Ohms)
  - 30 MHz, 500 MHz, 1000 MHz

**Capacitance vs. Frequency @ 10 & 40 V**

- **Capacitance vs. Frequency @ 10 & 40 V**
  - Frequency (GHz) vs. $C_T$ (pF)
  - 10 Volts, 40 Volts

**Capacitance vs. Voltage @ 30, 500, 1000 MHz**

- **Capacitance vs. Voltage @ 30, 500, 1000 MHz**
  - Voltage (V) vs. $C_T$ (pF)
  - 30 MHz, 500 MHz, 1000 MHz

**Series Inductance vs. Frequency @ 5, 10 & 20 mA**

- **Series Inductance vs. Frequency @ 5, 10 & 20 mA**
  - Frequency (GHz) vs. $L_s$ (mH)
  - 5 mA, 10 mA, 20 mA

**Series Inductance vs. Forward Current @ 500 & 1000 MHz**

- **Series Inductance vs. Forward Current @ 500 & 1000 MHz**
  - Current (mA) vs. $L_s$ (mH)
  - 500 MHz, 1000 MHz
Die Handling and Mounting Information

**Handling:** All semiconductor chips should be handled with care to avoid damage or contamination from perspiration, salts, and skin oils. The use of plastic tipped tweezers or vacuum pickups is strongly recommended for individual components. Bulk handling should ensure that abrasion and mechanical shock are minimized.

**Electro-Static Sensitivity:** The MADP-000208-13108W Diode Pair are ESD, Class 1A sensitive (HBM). Proper ESD precautions should be taken.

**Die Attach Surface:** Die can be mounted with an 80Au/Sn20, eutectic solder preform, RoHS compliant solders or electrically conductive silver epoxy. The metal RF and D.C. ground plane mounting surface must be free of contamination and should have a surface flatness of < ±0.002”.

**Eutectic Die Attachment Using Hot Gas Die Bonder:** A work surface temperature of 255°C is recommended. When hot forming gas is applied, the temperature should be approximately 290°C. The chip should not be exposed to temperatures greater than 320°C for more than 10 seconds.

**Eutectic Die Attachment Using Reflow Oven:** Please visit the [www.macomtech.com](http://www.macomtech.com) and see Application Note M538, “Surface Mounting Instructions” for the recommended time-temperature profile.

**Electrically Conductive Epoxy Die Attachment:** A controlled amount of electrically conductive, silver epoxy, approximately 1–2 mils in thickness, should be used to minimize ohmic and thermal resistance. A thin epoxy fillet should be visible around the perimeter of the bond pad after placement to ensure full area coverage. Cure conductive epoxy per manufacturer's schedule. Typically 150°C for 1 hour.
MADP-000208-13180W

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

For further information and support please visit:
https://www.macom.com/support