MHV507-19-1

Silicon Hyperabrupt Varactor Diode

Features
- High Capacitance Ratio: 3 Minimum
- High Quality Factor: 1500 Typical
- Compact Surface Mount Package
- Ultra-thin Termination Plating to Combat Embrittlement
- RoHS* Compliant

Description
The MHV507-19-1 silicon hyperabrupt tuning varactor offers a large change in junction capacitance over a small tuning voltage range. It is a mesa device with an epitaxial-deposited cathode layer for low series resistance and high quality factor. The die is passivated with a high-reliability glass passivation for very fast settling time. This varactor diode is packaged in an epoxy-encapsulated surface mount package.

The MHV507-19-1 is ideally suited for voltage controlled filters, analog voltage controlled phase shifters and voltage controlled oscillators.

Electrical Specifications: $T_A = +25^\circ$C

<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>Breakdown Voltage ($V_B$)</td>
<td>$I_R = 10 \mu A$</td>
<td>V</td>
<td>22</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Reverse Leakage Current ($I_R$)</td>
<td>$V_R = 20 V$</td>
<td>nA</td>
<td>—</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>Total Capacitance ($C_T$)</td>
<td>$V_R = 0 V, 1 MHz$</td>
<td>pF</td>
<td>9.20</td>
<td>3.20</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td>$V_R = 4 V, 1 MHz$</td>
<td></td>
<td>3.0</td>
<td>0.75</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>$V_R = 20 V, 1 MHz$</td>
<td></td>
<td>0.75</td>
<td>0.75</td>
<td>3.8</td>
</tr>
<tr>
<td>Capacitance Ratio</td>
<td>$V_R = 4 V$ to $V_R = 20 V, 1 MHz$</td>
<td>Ratio</td>
<td>3.0</td>
<td>—</td>
<td>5.5</td>
</tr>
<tr>
<td>Quality Factor ($Q_4$)</td>
<td>$V_R = 4 V, 50 MHz$</td>
<td></td>
<td>—</td>
<td>—</td>
<td>1500</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHV507-19-1-W</td>
<td>100 piece waffle pack</td>
</tr>
<tr>
<td>MHV507-19-R</td>
<td>3000 piece reel</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse DC Voltage</td>
<td>22 V</td>
</tr>
<tr>
<td>Forward DC Current</td>
<td>50 mA</td>
</tr>
<tr>
<td>Assembly Temperature</td>
<td>+260°C, 10 seconds</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°C to +100°C</td>
</tr>
</tbody>
</table>

Environmental Capabilities
The MHV507-19-1 silicon hyperabrupt junction varactor diode is durable and capable of reliably operating in military, commercial, and industrial environments. The device is compatible with pick-and-place assembly and is available in tape and reel. The MHV507-19-1 silicon hyperabrupt junction varactor diode is capable of meeting the environmental requirements of MIL-STD-750.

ESD & Moisture Sensitivity Level Rating
As are all semiconductors, silicon hyperabrupt tuning varactor diode are susceptible to damage from ESD events. Proper ESD prevention procedures should be followed. The ESD rating for this device is Class 0 (HBM). The moisture sensitivity level (MSL) rating for this part is MSL 1.

Assembly Instructions
Diodes may be placed onto circuit boards with pick and place manufacturing equipment from tape-reel. The devices are attached to the circuit using conventional solder re-flow or wave soldering procedures with RoHS type or Sn 60 / Pb 40 type solders.

Table 1. Time-Temperature Profile for Sn60/Pb40 or RoHS Type Solders

<table>
<thead>
<tr>
<th>Profile Feature</th>
<th>SnPb Solder Assembly</th>
<th>Pb-Free Solder Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Ramp-Up Rate (T_L to T_P)</td>
<td>3°C /second maximum</td>
<td>3°C /second maximum</td>
</tr>
<tr>
<td>Preheat:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Temperature Min (T_SMIN)</td>
<td>100°C</td>
<td>150°C</td>
</tr>
<tr>
<td>- Temperature Max (T_SMAX)</td>
<td>150°C</td>
<td>200°C</td>
</tr>
<tr>
<td>- Time (min to max)(t_S)</td>
<td>60 - 120 s</td>
<td>60 - 180 s</td>
</tr>
<tr>
<td>T_SMAX to T_L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ramp-Up Rate</td>
<td>3°C /s maximum</td>
<td></td>
</tr>
<tr>
<td>Time Maintained Above:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Temperature (T_L)</td>
<td>183°C</td>
<td>217°C</td>
</tr>
<tr>
<td>- Time (t_L)</td>
<td>60 - 150 s</td>
<td>60 - 150 s</td>
</tr>
<tr>
<td>Peak temperature (T_P)</td>
<td>225 +0/-5°C</td>
<td>260 +0/-5°C</td>
</tr>
<tr>
<td>Time Within 5°C of Actual Peak Temperature (t_P)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Time 25°C to Peak Temperature</td>
<td>10 – 30 s</td>
<td>20 – 40 s</td>
</tr>
<tr>
<td>Ramp-Down Rate</td>
<td>6°C /s maximum</td>
<td>6°C /s maximum</td>
</tr>
<tr>
<td>Time 25°C to Peak Temperature</td>
<td>6 minutes maximum</td>
<td>8 minutes maximum</td>
</tr>
</tbody>
</table>

Figure 1. Solder Re-Flow Time-Temperature Profile
Notes:

1. All dimensions in inches [mm].
2. Ceramic carrier is alumina (Al₂O₃).
3. Metal terminals composed of electrolytic Au over electrolytic Ni.
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.