Surface Mount Limiter PIN Diode

Features
- Low Junction Capacitance for Low Insertion Loss and High Isolation: \( C_T < 0.3 \text{ pF} \)
- Low Series Resistance for High Isolation: \( R_S < 1 \Omega \)
- Nominal I Layer Width: \( W = 10 \mu\text{m} \)
- Compact Surface Mount Plastic Package
- RoHS* Compliant

Description
The MLP7120-2012 limiter PIN diode is a low series resistance, low capacitance limiter PIN diode packaged in a surface mount, low-parasitic plastic package. It is manufactured using a proprietary diode process for excellent performance and high reliability.

The 10 \( \mu\text{m} \) nominal I layer width of this diode produces a threshold level of 20 dBm nominal, for demanding receiver protection applications. The low series resistance (<1 \( \Omega \)), and low total capacitance (<0.3 pF) of MLP7120-2012 produce excellent isolation and insertion loss in shunt, receiver protection applications.

The MLP7120-2012 limiter PIN diode is designed to be used in receiver protection applications.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLP7120-2012-R</td>
<td>3000 piece reel</td>
</tr>
<tr>
<td>MLP7120-2012-B</td>
<td>100 per bag bulk</td>
</tr>
<tr>
<td>MLP7120-2012-W</td>
<td>400 piece waffle pack</td>
</tr>
</tbody>
</table>

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.
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Electrical Specifications: $T_A = +25^\circ C$ (measured on evaluation board)

<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>120</td>
<td>—</td>
<td>180</td>
</tr>
<tr>
<td>Forward Voltage ($V_F$)</td>
<td>$I_F = 100 mA$</td>
<td>V</td>
<td>—</td>
<td>0.95</td>
<td>1.2</td>
</tr>
<tr>
<td>Total Capacitance $^1$ ($C_T$)</td>
<td>$V_R = 6 V, 1 MHz$</td>
<td>pF</td>
<td>—</td>
<td>—</td>
<td>0.3</td>
</tr>
<tr>
<td>Series Resistance $^2$ ($R_S$)</td>
<td>$I_F = 1 mA, 1 GHz$; $I_F = 10 mA, 1 GHz$</td>
<td>Ω</td>
<td>—</td>
<td>3.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Recovery Time ($T_R$)</td>
<td>End of the RF input to 1 dB excess insertion loss</td>
<td>ns</td>
<td>—</td>
<td>50</td>
<td>—</td>
</tr>
<tr>
<td>Minority Carrier Lifetime ($T_L$)</td>
<td>50% control to 90% output voltage, $I_F = 10 mA, I_R = 6 mA, 1 KHz</td>
<td>ns</td>
<td>—</td>
<td>50</td>
<td>—</td>
</tr>
<tr>
<td>Thermal Resistance ($\theta_{JC}$)</td>
<td>—</td>
<td>°C/W</td>
<td>—</td>
<td>—</td>
<td>45</td>
</tr>
<tr>
<td>I layer Thickness ($W$)</td>
<td>—</td>
<td>μm</td>
<td>—</td>
<td>10</td>
<td>—</td>
</tr>
</tbody>
</table>

1. Total capacitance ($C_T$) is the sum of the diode junction capacitance ($C_J$) and the package capacitance ($C_{PKG}$).
2. Series resistance ($R_S$) is measured on the HP 4291 Impedance Analyzer.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward DC Current</td>
<td>—</td>
<td>150 mA</td>
</tr>
<tr>
<td>Reverse DC Voltage</td>
<td>—</td>
<td>180 V</td>
</tr>
<tr>
<td>Forward DC Voltage</td>
<td>$I_F = 150 mA$</td>
<td>1.3 V</td>
</tr>
<tr>
<td>Peak RF Input Power</td>
<td>Pulse Width = 1 μs, Duty Cycle = 1%</td>
<td>60 dBm</td>
</tr>
<tr>
<td>CW Input Power</td>
<td>—</td>
<td>37 dBm</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>—</td>
<td>+175°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>—</td>
<td>-55°C to +150°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>—</td>
<td>-65°C to +100°C</td>
</tr>
<tr>
<td>Assembly Temperature</td>
<td>$t = 10 s$</td>
<td>+260°C</td>
</tr>
</tbody>
</table>
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_MIN)</td>
<td>100°C</td>
<td>150°C</td>
</tr>
<tr>
<td>- Temperature Max (T_MAX)</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_MAX 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>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
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Package Outline

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https://www.macom.com/support
3. Unless otherwise specified: Tolerance ±0.10 mm.
4. If possible, use copper filled vias underneath pin 3 for better thermals; otherwise, use vias that are plated through, filled and plated over.
5. Solder mask should provide a 60 µm clearance between copper pad and soldermask. Rounded package pads should have matching rounded solder mask openings.
6. Use circles or squares for thermal land stencil such that there is only 50% to 80% solder paste coverage.
7. 20 mils Rogers RO4350B with 1 oz. copper clad and 10 mil diameter plated thru vias on 20 mil centers underneath package.