Surface Mount Microwave Schottky Mixer Diodes

Technical Data

Features
- Optimized for use at 10-14 GHz
- Low Capacitance
- Low Conversion Loss
- Low RD
- Low Cost Surface Mount Plastic Package

Description/Applications
These low cost microwave Schottky diodes are specifically designed for use at X/Ku-bands and are ideal for DBS and VSAT downconverter applications. They are available in SOT-23 and SOT-143 standard package configurations.

Absolute Maximum Ratings[^1], \( T_A = +25^\circ C \)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_T )</td>
<td>Total Device Dissipation[^2]</td>
<td>mW</td>
<td>—</td>
<td>75</td>
</tr>
<tr>
<td>( P_{IV} )</td>
<td>Peak Inverse Voltage</td>
<td>V</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>( T_J )</td>
<td>Junction Temperature</td>
<td>(^\circ C)</td>
<td>—</td>
<td>+150</td>
</tr>
<tr>
<td>( T_{STG}, T_{op} )</td>
<td>Storage and Operating Temperature</td>
<td>(^\circ C)</td>
<td>-65</td>
<td>+150</td>
</tr>
</tbody>
</table>

Notes:
1. Operation in excess of any one of these conditions may result in permanent damage to the device.
2. Measured in an infinite heat sink at \( T_{CASE} = 25^\circ C \). Derate linearly to zero at 150\(^\circ C\) per diode.
### DC Electrical Specifications, $T_A = 25^\circ C$

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>$V_{BR}$</td>
<td>Breakdown Voltage</td>
<td>$I_R = 10 , \mu A$</td>
<td>V</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_T$</td>
<td>Total Capacitance</td>
<td>$V_R = 0 , V$, $f = 1 , MHz$</td>
<td>pF</td>
<td>0.26</td>
<td>0.26</td>
<td>0.26</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta C_T$</td>
<td>Capacitance Difference</td>
<td>$V_R = 0 , V$, $f = 1 , MHz$</td>
<td>pF</td>
<td>—</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_D$</td>
<td>Dynamic Resistance</td>
<td>$I_F = 5 , mA$</td>
<td>$\Omega$</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta R_D$</td>
<td>Dynamic Resistance Difference</td>
<td>$I_F = 5 , mA$</td>
<td>$\Omega$</td>
<td>—</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_F$</td>
<td>Forward Voltage</td>
<td>$I_F = 1 , mA$</td>
<td>mV</td>
<td>250</td>
<td>350</td>
<td>250</td>
<td>350</td>
<td>250</td>
<td>350</td>
<td>250</td>
</tr>
<tr>
<td>$\Delta V_F$</td>
<td>Forward Voltage Difference</td>
<td>$I_F = 1 , mA$</td>
<td>mV</td>
<td>—</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td></td>
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</tr>
</tbody>
</table>

**Lead Code**
- R1
- 2R
- R5
- R7

**Package Marking Code in White**
- HSMS-8101
- HSMS-8202
- HSMS-8205
- HSMS-8207

### RF Electrical Parameters, $T_A = 25^\circ C$

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Units</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_c$</td>
<td>Conversion Loss at 12 GHz</td>
<td>dB</td>
<td>6.3</td>
</tr>
<tr>
<td>$Z_{IF}$</td>
<td>IF Impedance</td>
<td>$\Omega$</td>
<td>150</td>
</tr>
<tr>
<td>SWR</td>
<td>SWR at 12 GHz</td>
<td>—</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**Note:**
DC Load Resistance = 0 $\Omega$; LO Power = 1 mW.

### SPICE Parameters

<table>
<thead>
<tr>
<th>$I_s = 4.6 \times 10^{-8}$</th>
<th>$E_o = 0.69$</th>
<th>$TT = 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_s = 6$</td>
<td>$C_{io} = 0.18 \times 10^{-12}$</td>
<td></td>
</tr>
<tr>
<td>$N = 1.09$</td>
<td>$P_b (V_J) = 0.5$</td>
<td></td>
</tr>
<tr>
<td>$B_v = 7.3$</td>
<td>$M = 0.5$</td>
<td></td>
</tr>
<tr>
<td>$I_{BV} = 10 \times 10^{-5}$</td>
<td>$FC = 0.5$</td>
<td></td>
</tr>
</tbody>
</table>

### Linear Equivalent Circuit

```
1.0 nH 1.3 nH 6 $\Omega$ 0.08 pF
```

### Self Bias

<table>
<thead>
<tr>
<th>$I_{Self}$</th>
<th>$R_j$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mA</td>
<td>263</td>
</tr>
<tr>
<td>2.5 mA</td>
<td>142</td>
</tr>
</tbody>
</table>
**Typical Performance, $T_c = 25°C$**

![Graphs showing typical forward current vs. forward voltage at three temperatures.](image)

**Ordering Information**
Specify part number followed by option. For example:

- **HSM - 8101 #L30** = Bulk
- **HSM - 8101 #L31** = 3K pc. Tape and Reel Option

**Profile Option Descriptions**

- **#L30** = Bulk
- **#L31** = 3K pc. Tape and Reel, Device Orientation Figures 4, 5

Tape and Reeling conforms to Electronic Industries RS-481, “Taping of Surface Mounted Components for Automated Placement.”

**Device Orientation**

![Diagram showing device orientation](image)

- **USER FEED DIRECTION**
- **CARRIER TAPE**
- **REEL**
- **COVER TAPE**

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![Graph showing typical conversion loss vs. local oscillator power.](image)

**Figure 3. Typical Conversion Loss vs. Local Oscillator Power.**

**Figure 1. Typical Forward Current vs. Forward Voltage at Three Temperatures.**

**Figure 2. Typical VF Match, HSMS-820X Pairs and Quads.**

**Figure 4. Option L31 for SOT-23 Packages.**

**Figure 5. Option L31 for SOT-143 Packages.**
Package Characteristics
Lead Material .............................................................. Alloy 42
Lead Finish .............................................................. Tin-Lead 85-15%
Maximum Soldering Temperature .................................... 260°C for 5 seconds
Minimum Lead Strength ............................................... 2 pounds pull
Typical Package Inductance .......................................... 2 nH
Typical Package Capacitance ...................................... 0.08 pF (opposite leads)

Package Dimensions
Outline 23 (SOT-23)

Outline 143 (SOT-143)

For technical assistance or the location of your nearest Hewlett-Packard sales office, distributor or representative call:

Americas/Canada: 1-800-235-0312 or 408-654-8675
Far East/Australasia: Call your local HP sales office.
Japan: (81 3) 3335-8152
Europe: Call your local HP sales office.

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