Features
- Broadband Performance, 26 to 40 GHz
- Low Loss: 0.6 dB
- High Isolation: 32 dB
- Up to 13 W CW Power, +85°C
- Die with G-S-G RF Pads and DC Bias Pads
- Includes DC Blocks and RF Bias Networks

Description and Applications
The MASW-010646 is a high power, broadband, reflective, high linearity, SPDT switch. This switch was developed for Ka-Band applications that require up to 13 W of power handling while maintaining low insertion loss and high isolation.

The SPDT MMIC utilizes MACOM’s proven AlGaAs PIN diode technology. The switch is fully passivated with silicon nitride and has an added polymer layer for scratch protection. The protective coating prevents damage to the junction and the anode air-bridge during handling and assembly. The die has backside metallization to facilitate an epoxy die attach process.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASW-010646-13940G</td>
<td>Die in Gel Pack</td>
</tr>
<tr>
<td>MASW-010646-13940W</td>
<td>Die in Waffle Pack</td>
</tr>
</tbody>
</table>

1. Die quantity varies.

Ka-Band High Power Reflective SPDT PIN Switch
26 - 40 GHz

Electrical Specifications:
Freq. = 28 - 38 GHz, \( T_A = +25^\circ C \), \( I_F^2 = +25 \, mA \), \( V_R^3 = -15 \, V \), \( Z_0 = 50 \, \Omega \)

<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>Insertion Loss</td>
<td>26 GHz</td>
<td>dB</td>
<td>0.60</td>
<td>0.60</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>28 GHz</td>
<td></td>
<td>0.60</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 GHz</td>
<td></td>
<td>0.60</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38 GHz</td>
<td></td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 GHz</td>
<td></td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td>26 GHz</td>
<td>dB</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RF_COMMON to RFx OFF state)</td>
<td>28 GHz</td>
<td></td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 GHz</td>
<td></td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>38 GHz</td>
<td></td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 GHz</td>
<td></td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return Loss</td>
<td>26 GHz</td>
<td>dB</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RF_COMMON)</td>
<td>28 GHz</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 GHz</td>
<td></td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36 GHz</td>
<td></td>
<td>16</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>40 GHz</td>
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<td>Return Loss</td>
<td>26 GHz</td>
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<td></td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( CW \) Power Handling (ON state):
-25 V, +85°C dBm — 41.2 —

Switching Speed
- \( T_{ON} / T_{OFF} \)
- \( T_{RISE} / T_{FALL} \)
50% DC to 90% RF / 50% DC to 10% RF
10% to 90% RF / 90% to 10% RF
ns — 25 / 23
9 / 9 —

Reverse Bias Voltage
- V
-32
-15
-5

Reverse Bias Current
- nA
- 25 —

2. Forward bias current \( (I_F) \) is set using external bias resistors \( (R_{BIAS}) \) placed at pins Bias1 and Bias2, where \( R_{BIAS} = (V_{CC} - 1.32 \, V) / I_F \).
3. Reverse bias voltage should be determined based on working conditions. For example, -25 V @ 41.2 dBm input power. For lower power applications, a less negative voltage can be used. R. Caverly and G. Hiller, “Establishing the Minimum Reverse Bias for a PIN Diode in a High Power Switch,” IEEE Transactions on Microwave Theory and Techniques, Vol.38, No.12, December 1990.

4. Isolation defined with 1 port in low loss state.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
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</thead>
<tbody>
<tr>
<td>Reverse Bias Voltage</td>
<td>-50 V</td>
</tr>
<tr>
<td>Forward Bias Current</td>
<td>40 mA</td>
</tr>
<tr>
<td>CW Incident Power</td>
<td>43 dBm @ 85°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +150°C</td>
</tr>
</tbody>
</table>

Truth Table

<table>
<thead>
<tr>
<th>RF_COMMON Path</th>
<th>Bias 1</th>
<th>Bias 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF1 Insertion Loss</td>
<td>-15 V</td>
<td>25 mA</td>
</tr>
<tr>
<td>RF2 Isolation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
Ka-Band High Power Reflective SPDT PIN Switch
26 - 40 GHz

Typical Performance: $T_A = +25^\circ C$, +25 mA, -15 V, $Z_0 = 50 \, \Omega$

**Insertion Loss (On State)**

![Insertion Loss Graph]

**Isolation (Off State)**

![Isolation Graph]

**RF\_COMMON Return Loss (On State)**

![RF\_COMMON Return Loss Graph]

**RF1, 2 Return Loss (On State)**

![RF1, 2 Return Loss Graph]
Handling Procedures
Please observe the following precautions to avoid damage:

Static Sensitivity
Gallium Arsenide Integrated Circuits 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 1A devices.

Die Outline†

Dimensions indicated in μm.
Die Thickness : 100 μm
RF Pads (1, 3 & 4) are 100 x 150 μm.
DC Bias Pads (2 & 5) are 100 x 100 μm.
Meets JEDEC moisture sensitivity level 1 requirements.
Ka-Band High Power Reflective SPDT PIN Switch
26 - 40 GHz

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