GaAs SPDT Switch
17.7 - 31.0 GHz

MASW-011105
Rev. V2

Features
- Broadband Performance
- Low Insertion Loss: 1.6 dB
- High Isolation: 30 dB
- Fast Switching Speed: 12 ns
- Reflective Configuration
- Ultra Low DC Power Consumption
- Lead-Free 3 mm 14-Lead PQFN Package
- RoHS* Compliant

Applications
- Test & Measurement

Description
The MASW-011105 is a versatile, broadband, high isolation SPDT switch offered in a lead-free 3 mm 14-lead PQFN surface mount plastic package. The combination of broadband performance along with fast switching and excellent settling time make this device ideal for many applications, including test & measurement, EW and broadband communication systems.

The MASW-011105 is fabricated using MACOM’s robust process with full surface passivation for a high performance and high reliability.

Ordering Information¹,²

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASW-011105-TR0500</td>
<td>500 piece reel</td>
</tr>
<tr>
<td>MASW-011105-TR1000</td>
<td>1000 piece reel</td>
</tr>
<tr>
<td>MASW-011105-SMB</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.
2. All sample boards include 2 loose parts.

Functional Schematic

Pin Configuration³

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Pin Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 3-5, 7-9, 11</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>RF1</td>
<td>RF Port 1</td>
</tr>
<tr>
<td>6</td>
<td>RFC</td>
<td>RF Common</td>
</tr>
<tr>
<td>10</td>
<td>RF2</td>
<td>RF Port 2</td>
</tr>
<tr>
<td>12</td>
<td>V2</td>
<td>Control Voltage</td>
</tr>
<tr>
<td>13</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>14</td>
<td>V1</td>
<td>Control Voltage</td>
</tr>
<tr>
<td>15</td>
<td>Paddle⁴</td>
<td>Ground</td>
</tr>
</tbody>
</table>

3. MACOM recommends connecting unused package pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

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Electrical Specifications: Freq. = 17.7 - 31.0 GHz, \( T_A = +25^\circ C \), \( V_{1,2} = 0/+5 \, V \), \( Z_0 = 50 \, \Omega \)

<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></td>
<td>dB</td>
<td>1.6</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td></td>
<td>dB</td>
<td>25</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Port Amplitude Imbalance</td>
<td></td>
<td>dB</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Phase Imbalance</td>
<td>RFC RF1, RF2</td>
<td>°</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return Loss</td>
<td>RFC RF1, RF2</td>
<td>dB</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input P0.1dB</td>
<td>@ 24 GHz</td>
<td>dBm</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input IP3</td>
<td>Two Tone, +7 dBm/Tone, 5 MHz Spacing, 24 GHz</td>
<td>dBm</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{R\text{RISE}}, T_{F\text{FALL}} )</td>
<td>10% to 90% RF and 90% to 10% RF</td>
<td>ns</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{\text{ON}}, T_{\text{OFF}} )</td>
<td>50% control to 90% RF and 50% control to 10% RF</td>
<td>ns</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Settling Time</td>
<td>50% Vctl to 0.1 dB of final value</td>
<td>ns</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Current (Complementary Logic)</td>
<td>V Low (0 V), V High (5 V)</td>
<td>( \mu A )</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Voltage</td>
<td>8.5 V</td>
</tr>
<tr>
<td>Input Power</td>
<td>25 dBm</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>

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.

**Truth Table**

<table>
<thead>
<tr>
<th>Control Input</th>
<th>Condition of Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_1 )</td>
<td>( V_2 )</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

7. Logic “0” = 0 to 0.2 V, Logic “1” = 5 to 5.2 V.

**Handling Procedures**

Please observe the following precautions to avoid damage:

**Static Sensitivity**

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.
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PCB Layout Recommendation

Ground of transmission lines should connect to package paddle in shortest possible way.
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Typical Performance Curves

**Insertion Loss**

- **Frequency (GHz)**
  - 15
  - 20
  - 25
  - 30
  - 35

- **S21 (dB)**
  - -2
  - -3
  - -4
  - -5

- **Temperature**
  - +25°C
  - -40°C
  - +85°C

**Isolation**

- **Frequency (GHz)**
  - 15
  - 20
  - 25
  - 30
  - 35

- **S21 (dB)**
  - -10
  - -20
  - -30
  - -40

- **Temperature**
  - +25°C
  - -40°C
  - +85°C

**Input Return Loss (RF Common)**

- **Frequency (GHz)**
  - 15
  - 20
  - 25
  - 30
  - 35

- **S11 (dB)**
  - -20
  - -30
  - -40
  - -50

- **Temperature**
  - +25°C
  - -40°C
  - +85°C

**Output Return Loss (On state RF1, RF2)**

- **Frequency (GHz)**
  - 15
  - 20
  - 25
  - 30
  - 35

- **S22 (dB)**
  - -20
  - -30
  - -40
  - -50

- **Temperature**
  - +25°C
  - -40°C
  - +85°C

**Gain Compression @ 24 GHz**

- **Insertion Loss (dB)**
  - 0.0
  - 0.1
  - 0.2

- **Input Power (dBm)**
  - 0
  - 5
  - 10
  - 15
  - 20
  - 25

- **Temperature**
  - +25°C
  - -40°C
  - +85°C

**Input IP3**

- **IP3 (dBm)**
  - 25
  - 30
  - 35
  - 40
  - 45
  - 50

- **Frequency (GHz)**
  - 20
  - 22
  - 24
  - 26
  - 28
  - 30
  - 32

- **Temperature**
  - +25°C
  - -40°C
  - +85°C

For further information and support please visit: [www.macom.com/support](https://www.macom.com/support)
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Lead-Free 3 mm 14-Lead PQFN†

![Diagram of the Lead-Free 3 mm 14-Lead PQFN](image)

All dimensions shown as Inches [mm].

† Reference Application Note S2083 for lead-free solder reflow recommendations. Meets JEDEC moisture sensitivity level 1 requirements. Plating is NiPdAuAg.
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