MASW-007921

High Power GaAs SPDT Switch
DC - 7.0 GHz

Rev. V1

Features
- Ideal for high power SPDT switch applications including WiMAX, WLAN, Mesh Networks, and Fixed Wireless Access
- Broadband Performance: DC - 7.0 GHz
- Low Insertion Loss:
  - 0.65 dB @ 3.5 GHz, RFC to TX
  - 0.70 dB @ 3.5 GHz, RCF to RX
- High P0.1dB Compression:
  - 40 dBm @ 3V, 3.5 GHz, RFC to TX
- Fast Settling for Low Gate Lag requirements
- Lead-Free 2 mm 8-Lead PDFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible
- Asymmetrical Design for optimized performance

Description
M/A-COM’s MASW-007921 is a broadband GaAs pHEMT MMIC SPDT switch available in a lead-free 2 mm 8-lead PDFN package. The MASW-007921 is ideally suited for applications where very small size and high linearity are required.

Typical applications include WiMAX, WLAN, Mesh networks, fixed wireless access, and other higher power systems. This switch has a very high initial compression point, ideal for complex modulations such as OFDM, with large peak average power levels.

The MASW-007921 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASW-007921-TR3000</td>
<td>3000 piece reel</td>
</tr>
<tr>
<td>MASW-007921-001SMB</td>
<td>Sample Board 2.0 - 6.0 GHz Tuning</td>
</tr>
<tr>
<td>MASW-007921-002SMB</td>
<td>Sample Board 0.05 - 2.0 GHz Tuning</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

Functional Schematic

Pin Configuration

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX</td>
<td>RF Output 1</td>
</tr>
<tr>
<td>2</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>4</td>
<td>RX</td>
<td>RF Output 2</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>RF and DC Ground</td>
</tr>
<tr>
<td>6</td>
<td>Vc2</td>
<td>Voltage Control 2</td>
</tr>
<tr>
<td>7</td>
<td>RFC</td>
<td>RF Common</td>
</tr>
<tr>
<td>8</td>
<td>Vc1</td>
<td>Voltage Control 1</td>
</tr>
<tr>
<td>9</td>
<td>Paddle</td>
<td>RF and DC Ground</td>
</tr>
</tbody>
</table>

3. M/A-COM recommends connecting unused pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power @ 5 V Control (RFC to RX Path)</td>
<td>+38 dBm</td>
</tr>
<tr>
<td>Input Power @ 5 V Control (RFC to TX Path)</td>
<td>+40 dBm</td>
</tr>
<tr>
<td>Voltage</td>
<td>≤ 8.5 volts</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. M/A-COM does not recommend sustained operation near these survivability limits.
7. Maximum Input Power applies for 0.5 to 7.0 GHz range.


For further information and support please visit:
https://www.macom.com/support
High Power GaAs SPDT Switch  
DC - 7.0 GHz

Electrical Specifications:  \( T_A = 25^\circ C, Z_0 = 50 \, \Omega, V_C = 0 \, V / 3 \, V, 4.7 \, pF \) Capacitor

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
</table>
| Insertion Loss RFC to \( R_X \) | 0.05 - 2 GHz\(^{10}\)  
2.4 GHz  
3.5 GHz  
5.8 GHz | dB | — | 0.5 | 0.85 | — |
| Insertion Loss RFC to \( T_X \) | 0.05 - 2 GHz\(^{10}\)  
2.4 GHz  
3.5 GHz  
5.8 GHz | dB | — | 0.5 | 0.85 | — |
| Isolation          | 0.05 - 2 GHz\(^{10}\)  
2.4 GHz  
3.5 GHz  
5.8 GHz | dB | — | 27 | — | — |
| Return Loss        | DC - 6.0 GHz           | dB | — | 15 | — |
| Input IP2 \( R_X \) | 10 MHz Spacing, +20 dBm  
2.4 GHz  
3.5 GHz  
5.8 GHz | dBm | — | 102 | — | — |
| Input IP2 \( T_X \) | 10 MHz Spacing, +20 dBm  
2.4 GHz  
3.5 GHz  
5.8 GHz | dBm | — | 104 | — | — |
| Input IP3 \( R_X \) | 10 MHz Spacing, +20 dBm  
2.4 GHz  
3.5 GHz  
5.8 GHz | dBm | — | 59 | — | — |
| Input IP3 \( T_X \) | 10 MHz Spacing, +20 dBm  
2.4 GHz  
3.5 GHz  
5.8 GHz | dBm | — | 62 | — | — |
| Input P0.1dB \( R_X \) | 2.4 GHz  
3.5 GHz  
5.8 GHz | dBm | — | 38 | — | — |
| Input P0.1dB \( T_X \) | 2.4 GHz  
3.5 GHz  
5.8 GHz | dBm | — | 38 | — | — |
| Trise, Tfall       | 10% to 90% RF          | nS | — | 21 | — |
| Ton, Toff          | 50% control to 90% and  
50% control to 10% RF | nS | — | 40 | — |
| Transients         | mV | — | 100 | — | — |
| Control Current    | µA | — | 2.0 | 10.0 | — |

8. For positive voltage control, external DC blocking capacitors are required on all RF ports.
9. Performance can be optimized by varying the DC blocking capacitor value. See application schematic for details.
10. 0.05 - 2.0 GHz specifications apply with 1000 pF blocking capacitors. See applications section for typical data.
Typical Performance Curves Over Temp.: $Z_0 = 50 \ \Omega$, 4.7 pF Blocking Caps on all RF Ports

**RFC to Rx Insertion Loss**

![Graph of RFC to Rx Insertion Loss](image1)

**RFC to Tx Insertion Loss**

![Graph of RFC to Tx Insertion Loss](image2)

**RFC to Rx Isolation**

![Graph of RFC to Rx Isolation](image3)

**RFC to Tx Isolation**

![Graph of RFC to Tx Isolation](image4)

**Rx Return Loss**

![Graph of Rx Return Loss](image5)

**Tx Return Loss**

![Graph of Tx Return Loss](image6)
High Power GaAs SPDT Switch
DC - 7.0 GHz

Application Schematic

Truth Table

<table>
<thead>
<tr>
<th>Control Vc1</th>
<th>Control Vc2</th>
<th>RFC - TX</th>
<th>RFC - RX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>Off</td>
<td>On</td>
</tr>
</tbody>
</table>

12. Differential voltage, V (state 1) - V (state 0), must be +2.7 V minimum and must not exceed 8.0 V.
13. Positive Control: 1 = +2.9 V to +8 V, 0 = 0 V ± 0.2 V.
    Negative Control: 1 = 0 V ± 0.2 V, 0 = -2.9 V to -8.0 V.

Qualification

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 devices.
High Power GaAs SPDT Switch
DC - 7.0 GHz

Lead Free 2 mm 8-lead PDFN †

† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Applications Section

Typical Low Frequency Performance Curves: \( T_A = 25^\circ\text{C}, \ Z_0 = 50\ \Omega, \ 1000\ \text{pF Blocking Caps on all RF Ports} \)

**Insertion Loss**

![Insertion Loss Graph]

**RFC Return Loss**

![RFC Return Loss Graph]

**Isolation**

![Isolation Graph]

**Tx and Rx Return Loss**

![Tx and Rx Return Loss Graph]
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