**MASWSS0201**

**GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch**

**DC - 2.5 GHz**

**Features**
- Ideal for CATV, DTV, DVR, STB Applications
- Default-On in Unpowered State (RFC-RF1 Path)
- Broadband Performance: DC-2.5 GHz
- Low Insertion Loss: 1.1 dB at 1 GHz
- High Isolation: > 60dB @ 100MHz
- Single Control Operation
- Power Handling: > 20 dBm P1dB
- Lead-Free 3 mm 12-lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible
- Configurable for Non-terminated Operation

**Description**

M/A-COM’s MASWSS0201 is a broadband GaAs PHEMT MMIC SPDT terminated switch in a low cost, lead-free 3 mm 12-lead PQFN package. The MASWSS0201 is ideally suited for applications where an unpowered on state is critical in a single control line SPDT terminated switch. The unpowered condition is the same as the $V_C = 0$ condition. This part can also be configured as a reflective switch with minimal impact to the RF performance.

The MASWSS0201 delivers high isolation, low insertion loss and high linearity up to 2.5 GHz.

The MASWSS0201 is fabricated using a 0.5 micron gate length GaAs E/D 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>MASWSS0201TR-3000</td>
<td>3000 piece reel</td>
</tr>
<tr>
<td>MASWSS0201SMB</td>
<td>Sample Test Board (Includes 5 Samples)</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.

2. M/A-COM recommends that all unused (N/C) pins be connected to ground. All data on this datasheet was taken with N/C pins connected to ground.

3. Terminated grounds require DC blocking capacitors; see application schematic.

4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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**Functional Schematic**

![Functional Schematic Diagram]

**Pin Configuration**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>RF1</td>
<td>RF Port 1</td>
</tr>
<tr>
<td>3</td>
<td>Term 1 GND$^3$</td>
<td>Termination 1 Ground</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>Term 2 GND$^3$</td>
<td>Termination 2 Ground</td>
</tr>
<tr>
<td>8</td>
<td>RF2</td>
<td>RF Port 2</td>
</tr>
<tr>
<td>9</td>
<td>VC</td>
<td>Control</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>11</td>
<td>RFC</td>
<td>RF Input</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>13</td>
<td>Paddle$^4$</td>
<td>RF and DC Ground</td>
</tr>
</tbody>
</table>

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GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch
DC - 2.5 GHz

Electrical Specifications: \( T_A = 25^\circ\text{C}, Z_0 = 75 \Omega, V_C = 0 \text{V/3 V}, P_{IN} = 0 \text{dBm} \)

<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 RFC to RF1</td>
<td>100 MHz&lt;br&gt;1.0 GHz&lt;br&gt;2.0 GHz&lt;br&gt;(V_C = 0V)</td>
<td>dB</td>
<td>—</td>
<td>0.9</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Insertion Loss RFC to RF2</td>
<td>100 MHz&lt;br&gt;1.0 GHz&lt;br&gt;2.0 GHz&lt;br&gt;(V_C = 3V)</td>
<td>dB</td>
<td>—</td>
<td>1.0</td>
<td>1.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.2</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Isolation</td>
<td>100 MHz&lt;br&gt;1.0 GHz&lt;br&gt;2.0 GHz (RFC - RF1)&lt;br&gt;2.0 GHz (RFC - RF2)</td>
<td>dB</td>
<td>60</td>
<td>65</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40</td>
<td>45</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>43</td>
<td>—</td>
</tr>
<tr>
<td>Return Loss</td>
<td>DC - 2.0 GHz</td>
<td>dB</td>
<td>—</td>
<td>25</td>
<td>—</td>
</tr>
<tr>
<td>IIIP2</td>
<td>Two Tone, +5 dBm/Tone, 10 MHz Spacing</td>
<td>dBm</td>
<td>—</td>
<td>54 / 51 / 53</td>
<td>—</td>
</tr>
<tr>
<td>(V_C = 0V / 3V / 5V)</td>
<td></td>
<td></td>
<td></td>
<td>72 / 70 / 70</td>
<td>—</td>
</tr>
<tr>
<td>IIIP3</td>
<td>Two Tone, +5 dBm/Tone, 10 MHz Spacing</td>
<td>dBm</td>
<td>—</td>
<td>38 / 38 / 39</td>
<td>—</td>
</tr>
<tr>
<td>(V_C = 0V / 3V / 5V)</td>
<td></td>
<td></td>
<td></td>
<td>41 / 44 / 44</td>
<td>—</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>100 MHz&lt;br&gt;1.0 GHz&lt;br&gt;(V_C = 0V / 3V / 5V)</td>
<td>dBm</td>
<td>—</td>
<td>21 / 21 / 22</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29 / 28 / 29</td>
<td>—</td>
</tr>
<tr>
<td>T-rise</td>
<td>10% to 90% RF&lt;br&gt;90% to 10% RF</td>
<td>µS</td>
<td>—</td>
<td>1.4</td>
<td>—</td>
</tr>
<tr>
<td>T-fall</td>
<td></td>
<td>nS</td>
<td>—</td>
<td>12</td>
<td>—</td>
</tr>
<tr>
<td>Ton</td>
<td>50% control to 90% RF&lt;br&gt;50% control to 10% RF</td>
<td>µS</td>
<td>—</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Toff</td>
<td></td>
<td>nS</td>
<td>—</td>
<td>12</td>
<td>—</td>
</tr>
<tr>
<td>Transients</td>
<td></td>
<td>mV</td>
<td>—</td>
<td>550</td>
<td>—</td>
</tr>
<tr>
<td>Control Current</td>
<td></td>
<td>µA</td>
<td>—</td>
<td>250</td>
<td>500</td>
</tr>
</tbody>
</table>

5. Electrical specifications apply to terminated configuration only.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power @ 100 MHz</td>
<td>+22 dBm</td>
</tr>
<tr>
<td>Input Power @ 1 GHz</td>
<td>+29 dBm</td>
</tr>
<tr>
<td>Operating 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>

Truth Table

<table>
<thead>
<tr>
<th>Control V_C</th>
<th>RFC-RF1</th>
<th>RFC-RF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>1</td>
<td>Off</td>
<td>On</td>
</tr>
</tbody>
</table>

8. External DC blocking capacitors are required on all RF ports.
9. \( 0 = 0 \pm 0.1 \text{V}, 1 = +2.9 \text{V} \text{ to } +5 \text{V} \).
10. The unpowered on state is the same as \( V_C = 0 \).

6. Exceeding any one or combination of these limits may cause permanent damage to this device.
7. M/A-COM does not recommend sustained operation near these survivability limits.

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DC - 2.5 GHz

Typical Performance Curves: $T_A = 25^\circ C$, $Z_0 = 75 \Omega$, Components per Application Schematic

**Insertion Loss**

![Insertion Loss Graph](image1)

**RFC Return Loss**

![RFC Return Loss Graph](image2)

**Isolation (Below 200 MHz)**

![Isolation Below 200 MHz Graph](image3)

**RF1 Return Loss**

![RF1 Return Loss Graph](image4)

**Isolation (Above 200 MHz)**

![Isolation Above 200 MHz Graph](image5)

**RF2 Return Loss**

![RF2 Return Loss Graph](image6)

For further information and support please visit:
https://www.macom.com/support
GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch

DC - 2.5 GHz

Rev. V1

**Lead-Free 3 mm 12-lead PQFN**

† Reference Application Note M538 for lead-free solder reflow recommendations.

Meets JEDEC moisture sensitivity level 1 requirements.

**Application Schematic**

11. Non-connected pins (P1 and P5) are shown connected to ground as recommended. All data on this datasheet was taken with N/C pins connected to ground.

12. Application schematic shown is for terminated configuration. For non-terminated operation Term 1 and Term 2 ground pins are left open. See application section for data in unterminated configuration.

**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.

M/A-COM’s AN3007 Application Note outlines a method for ESD sensitivity mitigation. It can be found at the Tech/Apps section of the MACOM.COM website.

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.
Typical Performance Curves:

\( T_A = 25^\circ C, Z_0 = 75 \, \Omega \), Unterminated Configuration (Term 1\&2 GND pins open)

**Application Section**

**Insertion Loss**

\[
\begin{array}{c|c|c}
\text{Frequency (GHz)} & S_21 (\text{dB}) \\
\hline
0.0 & -3.0 \\
0.5 & -2.5 \\
1.0 & -2.0 \\
1.5 & -1.5 \\
2.0 & -1.0 \\
2.5 & -0.5 \\
3.0 & 0.0 \\
\end{array}
\]

**RFC Return Loss**

\[
\begin{array}{c|c|c}
\text{Frequency (GHz)} & S_11 (\text{dB}) \\
\hline
0.0 & -90 \\
0.5 & -80 \\
1.0 & -70 \\
1.5 & -60 \\
2.0 & -50 \\
2.5 & -40 \\
3.0 & -30 \\
\end{array}
\]

**Isolation (Below 200 MHz)**

\[
\begin{array}{c|c|c}
\text{Frequency (GHz)} & S_21 (\text{dB}) \\
\hline
25 & -70 \\
50 & -60 \\
75 & -50 \\
100 & -40 \\
125 & -30 \\
150 & -20 \\
175 & -10 \\
200 & 0.0 \\
225 & 0.0 \\
250 & 0.0 \\
\end{array}
\]

**RF1 Return Loss**

\[
\begin{array}{c|c|c}
\text{Frequency (GHz)} & S_22 (\text{dB}) \\
\hline
0.0 & -90 \\
0.5 & -80 \\
1.0 & -70 \\
1.5 & -60 \\
2.0 & -50 \\
2.5 & -40 \\
3.0 & -30 \\
\end{array}
\]

**Isolation (Above 200 MHz)**

\[
\begin{array}{c|c|c}
\text{Frequency (GHz)} & S_21 (\text{dB}) \\
\hline
0.0 & -70 \\
0.5 & -60 \\
1.0 & -50 \\
1.5 & -40 \\
2.0 & -30 \\
2.5 & -20 \\
3.0 & -10 \\
\end{array}
\]

**RF2 Return Loss**

\[
\begin{array}{c|c|c}
\text{Frequency (GHz)} & S_22 (\text{dB}) \\
\hline
0.0 & -90 \\
0.5 & -80 \\
1.0 & -70 \\
1.5 & -60 \\
2.0 & -50 \\
2.5 & -40 \\
3.0 & -30 \\
\end{array}
\]
Application Section

Application Schematic – Unterminated Configuration

C1-C3 = 10000 pf
C4 = 100 pf
GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch
DC - 2.5 GHz

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