

## GaAs DPDT Diversity Switch 4.5 - 6.0 GHz

Rev. V1

### Features

- Low Insertion Loss: 0.8 dB at 5.2 GHz
- Ideal for WLAN IEEE 802.11a
- 0.5 micron GaAs PHEMT Process
- Integrated DC Blocking Capacitors
- Lead-Free 3 mm 12-Lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of MASWSS0039

### Description

The MASWSS0175 is a GaAs pHEMT MMIC DPDT diversity switch in a lead-free 3 mm 12-lead PQFN package. It is designed for low insertion loss and allows for independent control and selection of each switch path. It integrates blocking capacitors on all RF ports and thus eliminates the need for additional off-chip DC blocking capacitors.

The MASWSS0175 is ideally suited for applications where very small size and low cost are required. Typical applications are for WLAN IEEE 802.11a systems that employ two antennas for transmit and receive diversity. This part can be used in all systems operating between 4.5 GHz and 6.0 GHz requiring moderate power and diversity switching.

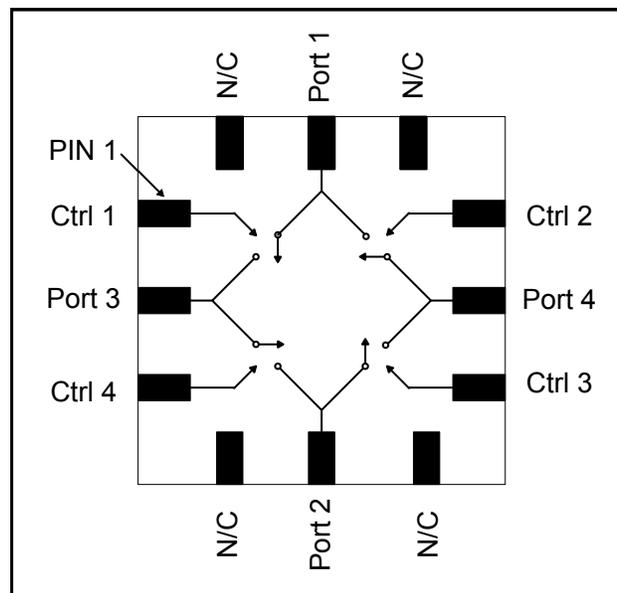
The MASWSS0175 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

### Ordering Information <sup>1</sup>

| Part Number       | Package           |
|-------------------|-------------------|
| MASWSS0175        | Bulk Packaging    |
| MASWSS0175TR-3000 | 3000 Piece Reel   |
| MASWSS0175SMB     | Sample Test Board |

1. Reference Application Note M513 for reel size information.

### Functional Schematic



### Pin Configuration <sup>2</sup>

| Pin No. | Pin Name            | Description      |
|---------|---------------------|------------------|
| 1       | Ctrl 1              | Control 1        |
| 2       | Port 3              | RF Port 3        |
| 3       | Ctrl 4              | Control 4        |
| 4       | N/C                 | No Connection    |
| 5       | Port 2              | RF Port 2        |
| 6       | N/C                 | No Connection    |
| 7       | Ctrl 3              | Control 3        |
| 8       | Port 4              | RF Port 4        |
| 9       | Ctrl 2              | Control 2        |
| 10      | N/C                 | No Connection    |
| 11      | Port 1              | RF Port 1        |
| 12      | N/C                 | No Connection    |
| 13      | Paddle <sup>2</sup> | RF and DC Ground |

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

\* Restrictions on Hazardous Substances, European Directive 2002/95/EC.

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**Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50 \Omega$ ,  $V_C = 0 \text{ V} / 3 \text{ V}$**

| Parameter                | Test Conditions   | Units         | Min. | Typ. | Max. |
|--------------------------|---|---------------|------|------|------|
| Insertion Loss           | 4.9 GHz   | dB            | —    | 0.9  | 1.3  |
|                          | 5.2 GHz   |               | —    | 0.8  | 1.2  |
|                          | 5.8 GHz   |               | —    | 0.8  | 1.2  |
| Isolation                | 4.9 GHz   | dB            | 15   | 20   | —    |
|                          | 5.2 GHz   |               | 20   | 25   | —    |
|                          | 5.8 GHz   |               | 20   | 29   | —    |
| Return Loss              | 4.5 - 6.0 GHz   | dB            | 15   | 25   | —    |
| P1dB                     | 5.2 GHz, $V_C = 2.7 \text{ V}$  | dBm           | —    | 31   | —    |
|                          | 5.2 GHz, $V_C = 3.0 \text{ V}$  |               | —    | 33   | —    |
|                          | 5.2 GHz, $V_C = 5.0 \text{ V}$  |               | —    | 39   | —    |
| IP2                      | Two Tone, +15 dBm / tone, 5 MHz Spacing<br>5.2 GHz                      | dBm           | —    | 98   | —    |
| IP3                      | Two Tone, +15 dBm / tone, 5 MHz Spacing<br>5.2 GHz, $V_C = 3 \text{ V}$ | dBm           | —    | 52   | —    |
|                          | 5.2 GHz, $V_C = 5 \text{ V}$  |               | —    | 55   | —    |
| 2 <sup>nd</sup> Harmonic | 5.2 GHz, $P_{IN} = 20 \text{ dBm}$                                      | dBc           | —    | -85  | —    |
| 3 <sup>rd</sup> Harmonic | 5.2 GHz, $P_{IN} = 20 \text{ dBm}$                                      | dBc           | —    | -83  | —    |
| Trise, Tfall             | 10% to 90% RF and 90% to 10% RF   | ns            | —    | 20   | —    |
| Ton, Toff                | 50% Control to 90% RF   | ns            | —    | 35   | —    |
|                          | 50% Control to 10% RF   |               | —    | 40   | —    |
| Control Current          | $ V_C  = 3 \text{ V}$   | $\mu\text{A}$ | —    | 5    | 25   |

### Absolute Maximum Ratings <sup>3,4</sup>

| Parameter                 | Absolute Maximum  |
|---------------------------|-------------------|
| Input Power @ 3 V Control | +32 dBm           |
| Input Power @ 5 V Control | +36 dBm           |
| Operating Voltage         | +8.5 volts        |
| Operating Temperature     | -40 °C to +85 °C  |
| Storage Temperature       | -65 °C to +150 °C |

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

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

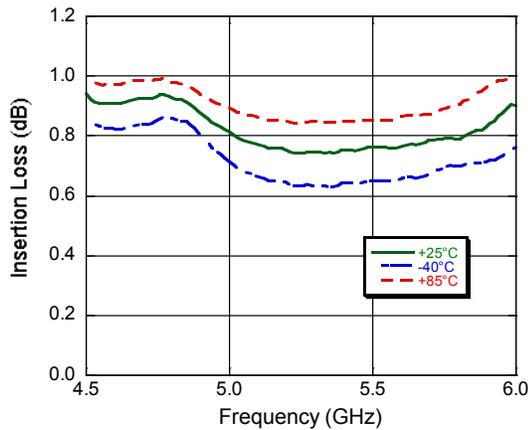
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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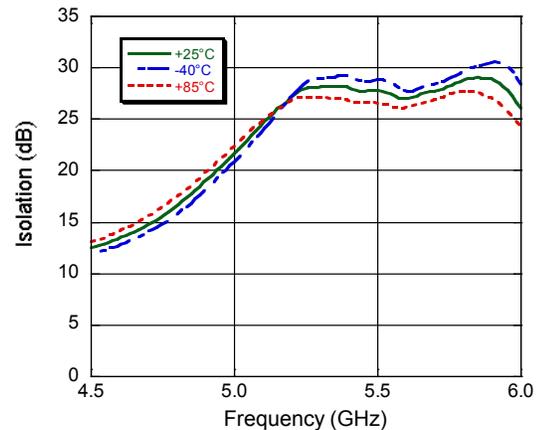
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### Typical Performance Curves

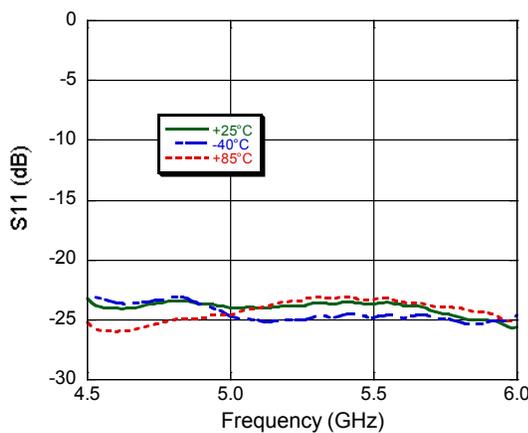
**Insertion Loss**



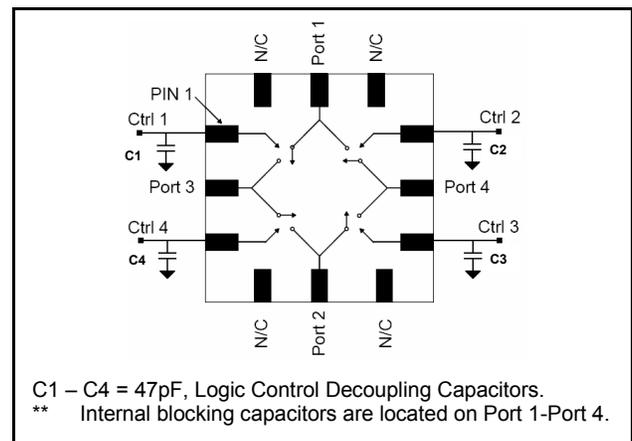
**Isolation**



**Return Loss**



**Circuit Block Diagram\*\***



**Truth Table<sup>4,5</sup>**

| Control V1 | Control V2 | Control V3 | Control V4 | Port 1 - Port 3 | Port 1 - Port 4 | Port 2 - Port 4 | Port 2 - Port 3 |
|------------|------------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| 1          | 0          | 0          | 0          | On              | Off             | Off             | Off             |
| 0          | 1          | 0          | 0          | Off             | On              | Off             | Off             |
| 0          | 0          | 1          | 0          | Off             | Off             | On              | Off             |
| 0          | 0          | 0          | 1          | Off             | Off             | Off             | On              |
| 1          | 0          | 1          | 0          | On              | Off             | On              | Off             |
| 0          | 1          | 0          | 1          | Off             | On              | Off             | On              |

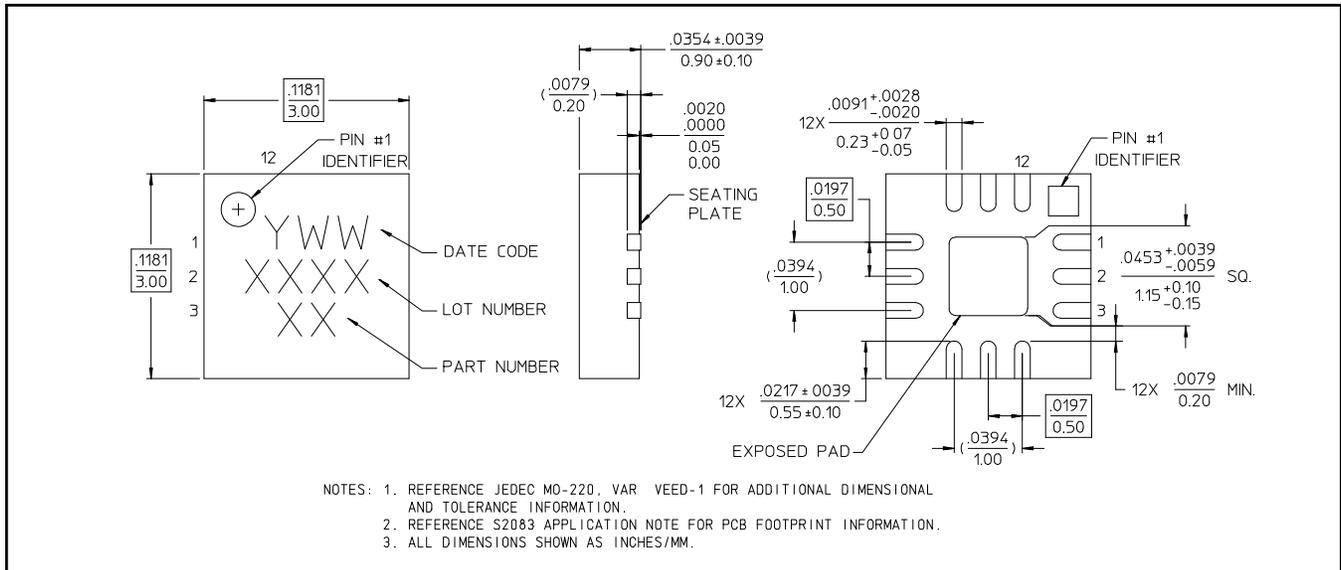
4. 1 = +2.5 V to +5 V, 0 = 0 V + 0.2 V.

5. Differential voltage, V (state 1) - V (state 0), must be 2.5 V minimum and must not exceed 8 V.

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### Lead-Free 3 mm 12-Lead PQFN†



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

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