

## GaAs Broadband DPDT Diversity Switch DC - 6.0 GHz

Rev. V6

### Features

- 802.11a + b/g Dual Band Applications
- Broadband Performance: DC - 6.0 GHz
- Low Insertion Loss: 0.7 dB @ 2.4 GHz  
1.0 dB @ 4.9 to 6.0 GHz
- High Isolation: 43 dB @ 2.4 GHz  
30 dB @ 4.9 to 6.0 GHz
- Fast Switching Speed: 0.5  $\mu$ m GaAs PHEMT
- 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 MASWSS0094

### Description

M/A-COM's MASWSS0129 is a broadband GaAs PHEMT MMIC diversity switch available in a low cost, lead-free 3 mm 12-lead PQFN package. The MASWSS0129 is ideally suited for applications where very small size and low cost are required.

Typical applications are for WLAN IEEE 802.11a and 802.11b/g systems that employ two antennas for transmit and receive diversity. Other applications include cordless phones and base stations. Designed for high power, this DPDT switch maintains high linearity up to 6.0 GHz.

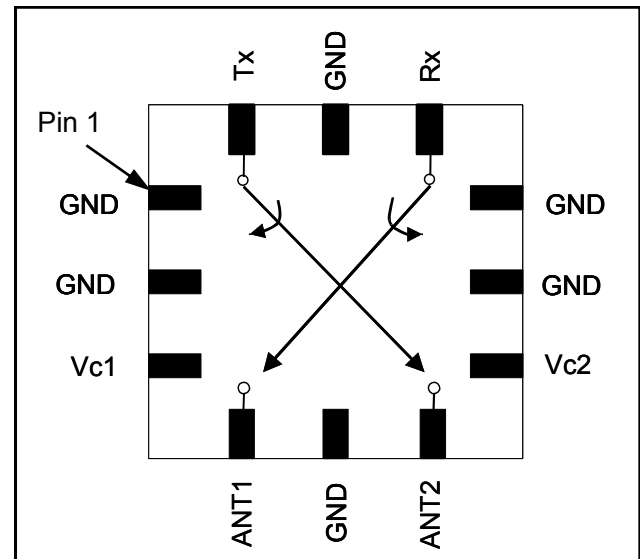
The MASWSS0129 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

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

| Part Number       | Package                                   |
|-------------------|---|
| MASWSS0129        | Bulk Packaging                            |
| MASWSS0129TR      | 7 inch, 1000 piece reel                   |
| MASWSS0129TR-3000 | 13 inch, 3000 piece reel                  |
| MASWSS0129SMB     | Sample Test Board<br>(Includes 5 Samples) |

1. Reference Application Note M513 for reel size information.

### Functional Schematic



### Pin Configuration

| Pin No. | Pin Name            | Description      |
|---------|---------------------|------------------|
| 1       | GND                 | Ground           |
| 2       | GND                 | Ground           |
| 3       | V <sub>C1</sub>     | Control 1        |
| 4       | ANT1                | Antenna Port 1   |
| 5       | GND                 | Ground           |
| 6       | ANT2                | Antenna Port 2   |
| 7       | V <sub>C2</sub>     | Control 2        |
| 8       | GND                 | Ground           |
| 9       | GND                 | Ground           |
| 10      | Rx                  | Receive Port     |
| 11      | GND                 | Ground           |
| 12      | Tx                  | Transmit Port    |
| 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 Union Directive 2002/95/EC.

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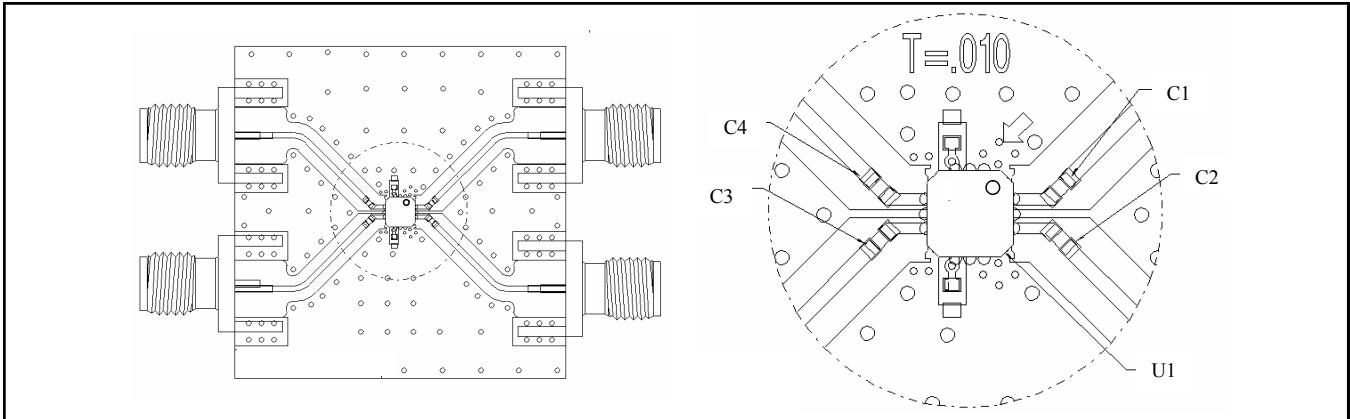
Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50\Omega$ ,  $V_c = 0\text{ V} / 3\text{ V}$ , 8 pF Capacitor<sup>3</sup>

| Parameter                       | Test Conditions                                  | Units         | Min. | Typ. | Max. |
|---------------------------------|--|---------------|------|------|------|
| Insertion Loss <sup>4</sup>     | 2.4 GHz  | dB            | —    | 0.70 | 1.30 |
|                                 | 2 - 4 GHz  | dB            | —    | 0.75 | —    |
|                                 | 4 - 5 GHz  | dB            | —    | 0.90 | —    |
|                                 | 4.9 - 6 GHz                                      | dB            | —    | 1.00 | 1.55 |
| Isolation<br>(on/off or off/on) | 2.4 GHz  | dB            | —    | 43   | —    |
|                                 | 4.9 - 6 GHz                                      | dB            | 25   | 30   | —    |
| Isolation<br>(on/on or off/off) | 2.4 GHz  | dB            | —    | 11   | —    |
|                                 | 4.9 - 6 GHz                                      | dB            | —    | 20   | —    |
| Return Loss                     | 2.4 GHz  | dB            | —    | 23   | —    |
|                                 | 4.9 - 6 GHz                                      | dB            | —    | 15   | —    |
| IP2                             | Two Tone, 15 dBm/Tone, 5 MHz Spacing             |               |      |      |      |
|                                 | 2.4 GHz  | dBm           | —    | 93   | —    |
|                                 | 5.3 GHz  | dBm           | —    | 86   | —    |
|                                 | 5.8 GHz  | dBm           | —    | 84   | —    |
| IP3                             | Two Tone, 15 dBm/Tone, 5 MHz Spacing             |               |      |      |      |
|                                 | 2.4 GHz  | dBm           | —    | 52   | —    |
|                                 | 5.3 GHz  | dBm           | —    | 50   | —    |
|                                 | 5.8 GHz  | dBm           | —    | 50   | —    |
| Input P-1dB                     | 2.4 GHz  | dBm           | —    | 33   | —    |
|                                 | 5.3 GHz  | dBm           | —    | 31   | —    |
|                                 | 5.8 GHz  | dBm           | —    | 31   | —    |
| 2 <sup>nd</sup> Harmonic        | $P_{IN} = 20\text{ dBm}$                         |               |      |      |      |
|                                 | 2.4 GHz  | dBc           | —    | -75  | —    |
|                                 | 5.8 GHz  | dBc           | —    | -77  | —    |
| 3 <sup>rd</sup> Harmonic        | $P_{IN} = 20\text{ dBm}$                         |               |      |      |      |
|                                 | 2.4 GHz  | dBc           | —    | -69  | —    |
|                                 | 5.8 GHz  | dBc           | —    | -86  | —    |
| Trise, Tfall                    | 10% to 90% RF                                    | nS            | —    | 35   | —    |
|                                 | 90% to 10% RF                                    | nS            | —    | 60   | —    |
| Ton, Toff                       | 50% control to 90% RF, and 50% control to 10% RF | nS            | —    | 90   | —    |
| Transients                      | —  | mV            | —    | 6    | —    |
| Control Current                 | $ V_c  = 3\text{ V}$                             | $\mu\text{A}$ | —    | 6    | 25   |

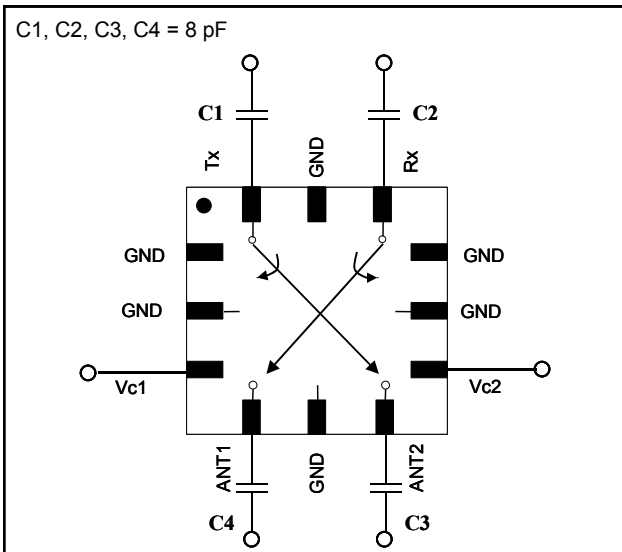
3. For positive voltage control, external DC blocking capacitors are required on all RF ports.

4. Insertion loss can be optimized by varying the DC blocking capacitor value.

## Evaluation Board for Lead-Free 3 mm 12-lead PQFN Package



### Application Schematic



### Truth Table <sup>7,8</sup>

| Control V <sub>c1</sub> | Control V <sub>c2</sub> | ANT 1 - Rx | ANT 1 - Tx | ANT 2 - Tx | ANT 2 - Rx |
|-------------------------|-------------------------|------------|------------|------------|------------|
| 1                       | 0                       | On         | Off        | On         | Off        |
| 0                       | 1                       | Off        | On         | Off        | On         |
| 1                       | 1                       | Off        | Off        | Off        | Off        |
| 0                       | 0                       | Off        | Off        | Off        | Off        |

7. 1 = +2.9 V to +5 V, 0 = 0 V ± 0.2 V.

8. Differential voltage, V(state 1) - V(state 0), must be 2.7 V minimum and must not exceed 8.5 V.

### 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.

### Absolute Maximum Ratings <sup>5,6</sup>

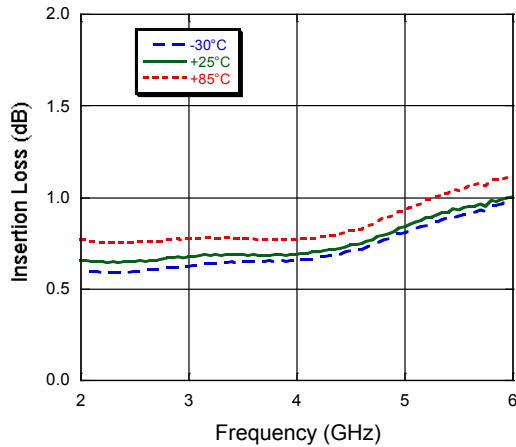
| Parameter                 | Absolute Maximum  |
|---------------------------|-------------------|
| Input Power @ 3 V Control | +31 dBm           |
| Input Power @ 5 V Control | +34 dBm           |
| Voltage                   | ± 8.5 volts       |
| Operating Temperature     | -40 °C to +85 °C  |
| Storage Temperature       | -65 °C to +150 °C |

5. Exceeding any one or combination of these limits may cause permanent damage to this device.

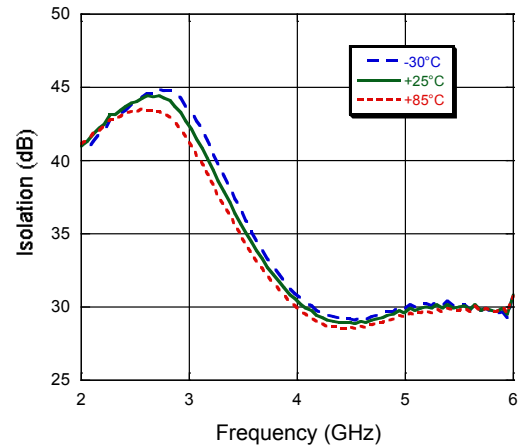
6. M/A-COM does not recommend sustained operation near these survivability limits.

## Typical Performance Curves, 8 pF Blocking Caps

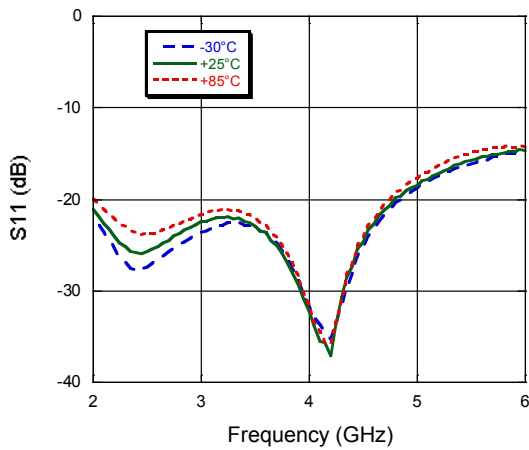
**Insertion Loss**



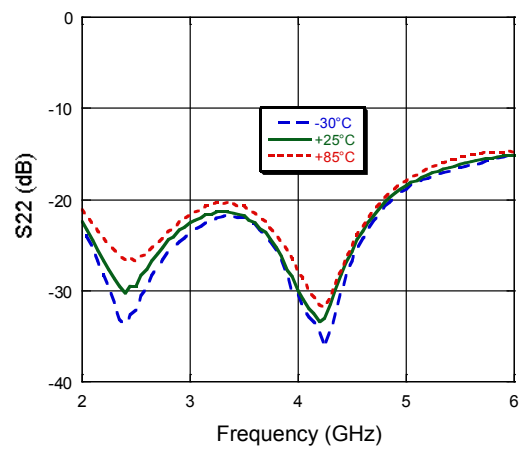
**Isolation**



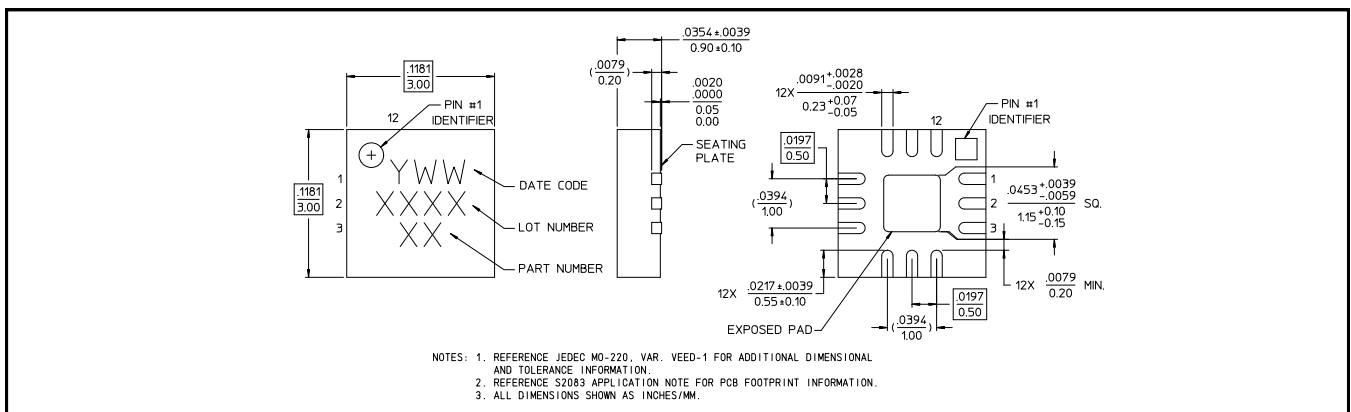
**Antenna Ports Return Loss**



**Tx/Rx Ports Return Loss**



## Lead-Free 3 mm 12-Lead PQFN†



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

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