

## GaAs Broadband DPDT Diversity Switch 0.5 - 3.0 GHz

Rev. V5

### Features

- Ideal for 802.11 b/g Applications
- Broadband Performance: 0.5 - 3.0 GHz
- Low Insertion Loss: 0.6 dB @ 2.4 GHz
- High Isolation: 25 dB @ 2.4 GHz
- Fast Switching Speed: 0.5  $\mu$ m GaAs PHEMT Process
- High P1dB: 34 dBm @ 3 V
- 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

### Description

M/A-COM's MASWSS0130 is a broadband GaAs PHEMT MMIC DPDT diversity switch in a low cost, lead-free 3 mm 12-lead PQFN plastic package. The MASWSS0130 is ideally suited for applications where very small size and low cost are required.

Typical applications are for WLAN IEEE 802.11b/g systems that employ two antennas for transmit and receive diversity. Designed for high power, this DPDT switch is optimized for high linearity at 2.4 GHz.

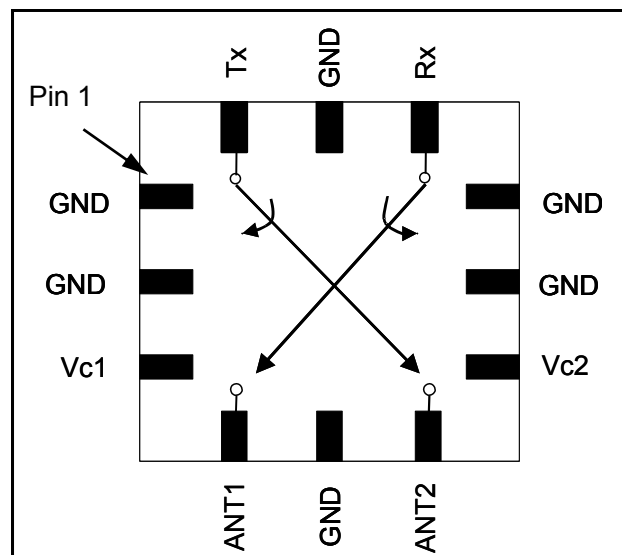
The MASWSS0130 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

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

| Part Number       | Package                                   |
|-------------------|-------------------------------------------|
| MASWSS0130        | Bulk Packaging                            |
| MASWSS0130TR      | 7 inch, 1000 piece reel                   |
| MASWSS0130TR-3000 | 13 inch, 3000 piece reel                  |
| MASWSS0130SMB     | 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  |

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

## GaAs Broadband DPDT Diversity Switch 0.5 - 3.0 GHz

Rev. V5

**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50\ \Omega$ ,  $V_C = 0\ \text{V}/3\ \text{V}$ , 8 pF Capacitor<sup>2,3</sup>

| Parameter                       | Test Conditions                                       | Units         | Min.   | Typ.     | Max.   |
|---------------------------------|-------------------------------------------------------|---------------|--------|----------|--------|
| Insertion Loss <sup>3</sup>     | 2.4 GHz                                               | dB            | —      | 0.6      | 0.9    |
| Isolation<br>(on/off or off/on) | 2.4 GHz                                               | dB            | 20     | 25       | —      |
| Return Loss                     | 2.4 GHz                                               | dB            |        | 23       | —      |
| IP2                             | Two Tone, +15 dBm per tone, 5 MHz Spacing,<br>2.4 GHz | dBm           | —      | 94       | —      |
| IIP3                            | Two Tone, +15 dBm per tone, 5 MHz Spacing,<br>2.4 GHz | dBm           | —      | 55       | —      |
| Input P1dB                      | 2.4 GHz                                               | dBm           | —      | 34       | —      |
| Input P0.1dB                    | 2.4 GHz                                               | dBm           | —      | 30       | —      |
| 2 <sup>nd</sup> Harmonic        | 2.4 GHz, $P_{IN} = 20\ \text{dBm}$                    | dBm           | —      | -80      | —      |
| 3 <sup>rd</sup> Harmonic        | 2.4 GHz, $P_{IN} = 20\ \text{dBm}$                    | dBm           | —      | -95      | —      |
| Trise, Tfall                    | 10% to 90% RF<br>90% to 10% RF                        | nS<br>nS      | —<br>— | 34<br>35 | —<br>— |
| Ton, Toff                       | 50% control to 90% RF<br>50% control to 10% RF        | nS            | —<br>— | 48<br>54 | —<br>— |
| Transients                      |                                                       | mV            | —      | 7        | —      |
| Control Current                 | $ V_C  = 3\ \text{V}$                                 | $\mu\text{A}$ | —      | 5        | 25     |

2. External DC blocking capacitors are required on all RF ports.

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

### Absolute Maximum Ratings<sup>4,5</sup>

| Parameter                 | Absolute Maximum |
|---------------------------|------------------|
| Input Power @ 3 V Control | +35 dBm          |
| Input Power @ 5 V Control | +35 dBm          |
| Operating Voltage         | +8.5 volts       |
| Operating Temperature     | -40°C to +85°C   |
| Storage Temperature       | -65°C to +150°C  |

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

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

### Qualification

Qualified to M/A-COM specification REL-201, Process Flow -2.

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

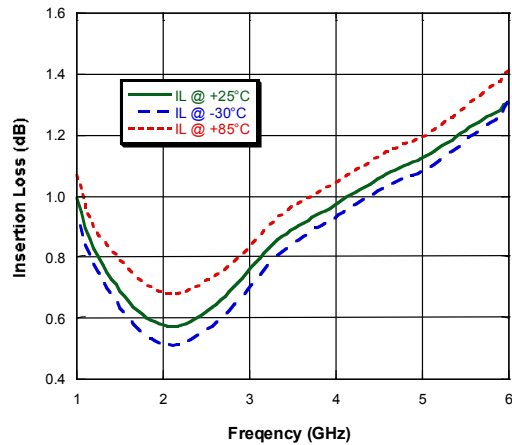
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## GaAs Broadband DPDT Diversity Switch 0.5 - 3.0 GHz

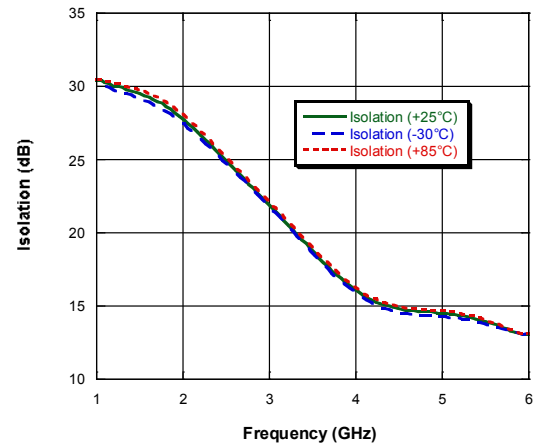
Rev. V5

### Typical Performance Curves

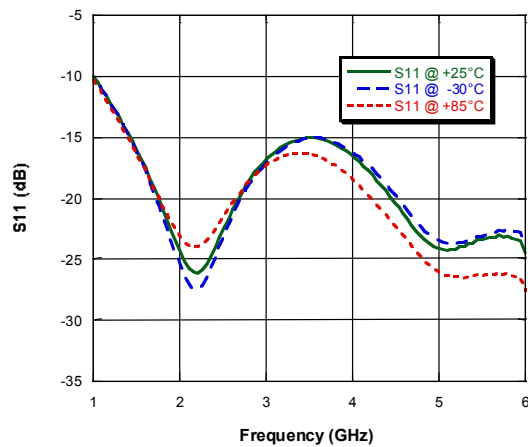
**Insertion Loss**



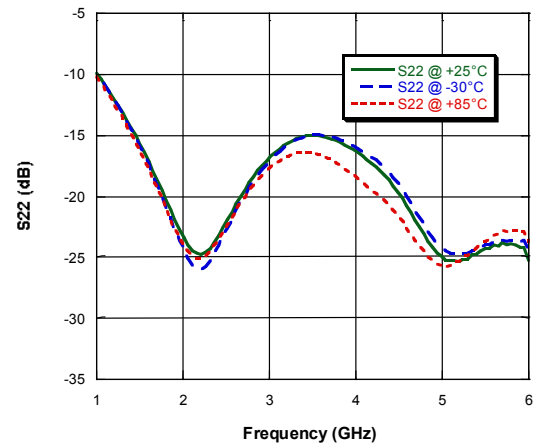
**Isolation**



**Input Return Loss**



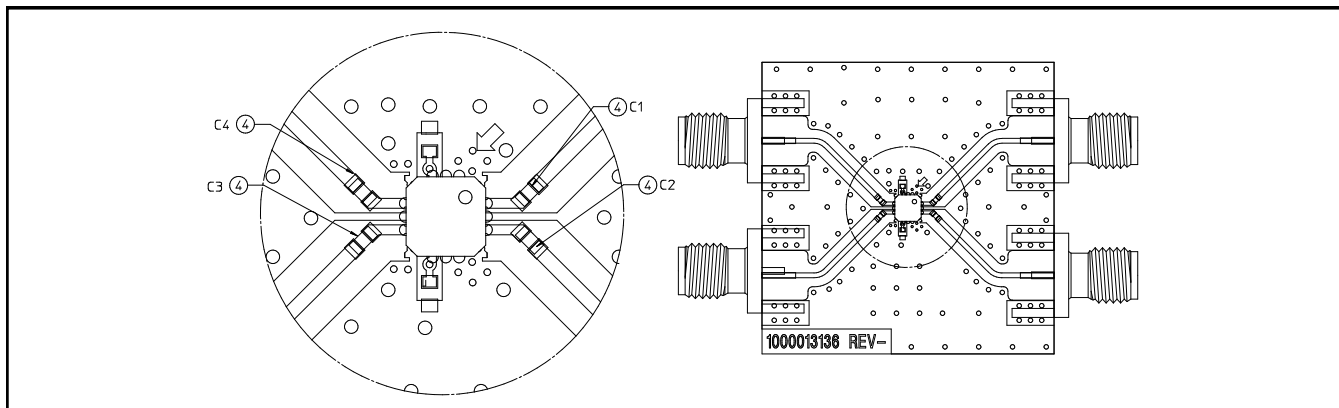
**Output Return Loss**



## GaAs Broadband DPDT Diversity Switch

Rev. V5

## Evaluation Board



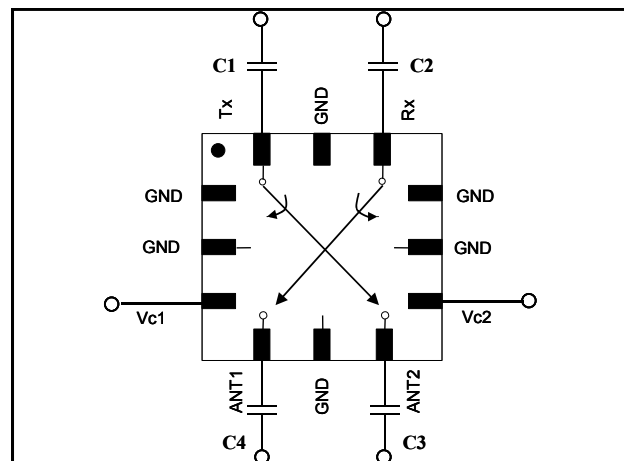
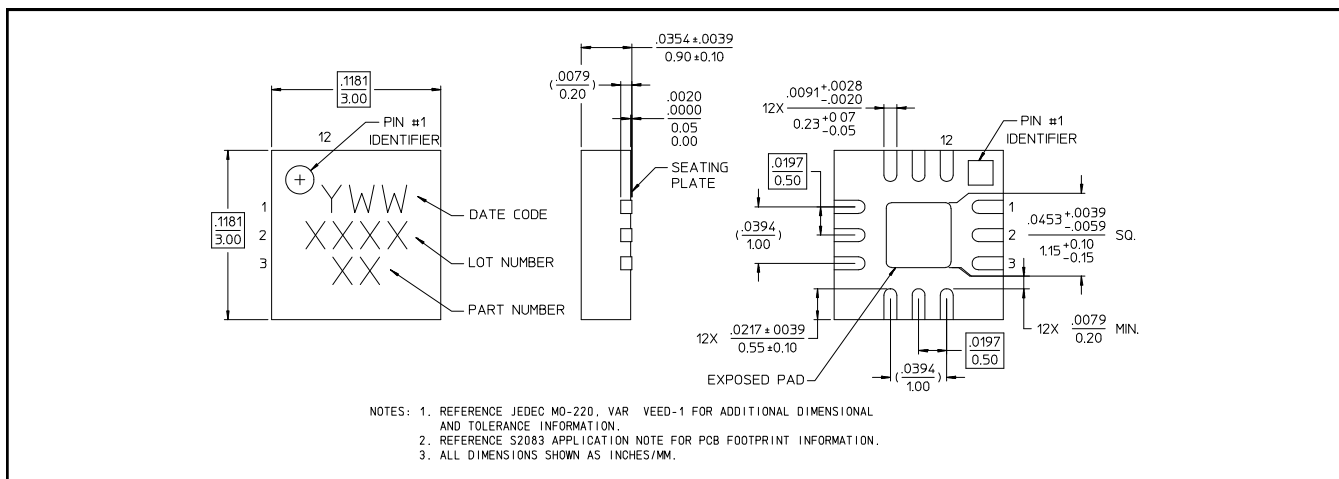
| Qty | Description                              |
|-----|------------------------------------------|
| 4   | Capacitor, 8 pF, 0402, SMT, 5% (C1 - C4) |

### Truth Table <sup>6</sup>

| Control<br>V <sub>C1</sub> | Control<br>V <sub>C2</sub> | ANT 1-<br>Rx | ANT 1-<br>Tx | ANT 2-<br>Tx | ANT 2-<br>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          |

6.  $1 = +2.9$  to  $+5V$ ,  $0 = 0 \pm 0.2V$

## Application Schematic

**Lead-Free 3 mm 12-Lead PQFN<sup>†</sup>**

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

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.