

### Features

- UNII, Hiperlan, and 802.11a+b/g Applications
- Broadband Performance: DC-6 GHz
- Low Insertion Loss: 0.9 dB at 6 GHz
- High Isolation: 28 dB Typical
- Fast Switching Speed: 0.5  $\mu$ m GaAs PHEMT
- High Power: 36 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

### Description

M/A-COM's MASWSS0093 is a broadband GaAs PHEMT MMIC SPDT switch in a low cost, lead-free 3 mm 12-lead PQFN package. The MASWSS0093 is ideally suited for applications where very small size and low cost are required.

The MASWSS0093, with its small size and low height, is ideal for 802.11a and 802.11b/g PC card and access point applications.

The MASWSS0093 delivers high isolation, low insertion loss and high linearity up to 6 GHz.

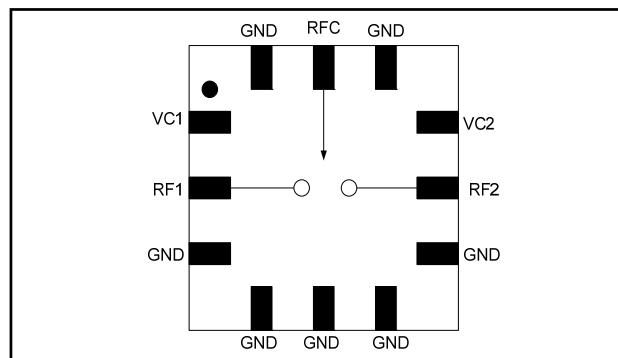
The MASWSS0093 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

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

| Part Number   | Package                                   |
|---------------|---|
| MASWSS0093    | Bulk Packaging                            |
| MASWSS0093TR  | 1000 piece reel                           |
| MASWSS0093SMB | 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       | VC1                 | Control 1        |
| 2       | RF1                 | RF Port 1        |
| 3       | GND                 | Ground           |
| 4       | GND                 | Ground           |
| 5       | GND                 | Ground           |
| 6       | GND                 | Ground           |
| 7       | GND                 | Ground           |
| 8       | RF2                 | RF Port 2        |
| 9       | VC2                 | Control 2        |
| 10      | GND                 | Ground           |
| 11      | RFC                 | RF Input         |
| 12      | GND                 | Ground           |
| 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.

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

| Parameter                 | Absolute Maximum |
|---------------------------|------------------|
| Input Power @ 3 V Control | +37 dBm          |
| Input Power @ 5 V Control | +39 dBm          |
| Operating Voltage         | +8.5 volts       |
| Operating Temperature     | -40°C to +85°C   |
| Storage Temperature       | -65°C to +150°C  |

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

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

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

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## GaAs Broadband SPDT Switch DC - 6.0 GHz

Rev. V2

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

| Parameter       | Test Conditions                                  | Units         | Min. | Typ. | Max. |
|-----------------|--|---------------|------|------|------|
| Insertion Loss  | 2.4 GHz  | dB            | —    | 0.70 | 1.05 |
|                 | 5.3 GHz  | dB            | —    | 0.85 | 1.20 |
|                 | 5.8 GHz  | dB            | —    | 0.85 | 1.20 |
| Isolation       | 2.4 GHz  | dB            | 24   | 29   | —    |
|                 | 5.3 GHz  | dB            | 23   | 28   | —    |
|                 | 5.8 GHz  | dB            | 21   | 26   | —    |
| Return Loss     | DC - 6.0 GHz                                     | dB            | —    | 20   | —    |
| IP2             | Two Tone, +15 dBm/Tone, 5 MHz Spacing, >50 MHz   |               |      |      |      |
|                 | 2.4 GHz, $V_C = 3.0 \text{ V}$                   | dBm           | —    | 98   | —    |
|                 | 5.8 GHz, $V_C = 3.0 \text{ V}$                   | dBm           | —    | 81   | —    |
|                 | 2.4 GHz, $V_C = 5.0 \text{ V}$                   | dBm           | —    | 107  | —    |
| IIP3            | Two Tone, +15 dBm/Tone, 5 MHz Spacing, >50 MHz   |               |      |      |      |
|                 | 2.4 GHz, $V_C = 3.0 \text{ V}$                   | dBm           | —    | 57   | —    |
|                 | 5.8 GHz, $V_C = 3.0 \text{ V}$                   | dBm           | —    | 53   | —    |
|                 | 2.4 GHz, $V_C = 5.0 \text{ V}$                   | dBm           | —    | 57   | —    |
| Input P-1dB     | 2.4 GHz  | dBm           | —    | 40   | —    |
|                 | 5.3 GHz  | dBm           | —    | 36   | —    |
|                 | 5.8 GHz  | dBm           | —    | 37   | —    |
| 2nd Harmonic    | 2.4 GHz, $P_{IN} = +20 \text{ dBm}$              | dBm           | —    | -72  | —    |
|                 | 5.8 GHz, $P_{IN} = +20 \text{ dBm}$              | dBm           | —    | -69  | —    |
| 3rd Harmonic    | 2.4 GHz, $P_{IN} = +20 \text{ dBm}$              | dBm           | —    | -85  | —    |
|                 | 5.8 GHz, $P_{IN} = +20 \text{ dBm}$              | dBm           | —    | -75  | —    |
| T-rise, T-fall  | 10% to 90% RF and 90% to 10% RF                  | nS            | —    | 55   | —    |
| Ton, Toff       | 50% control to 90% RF, and 50% control to 10% RF | nS            | —    | 80   | —    |
| Transients      | —  | mV            | —    | 14   | —    |
| Control Current | $ V_C  = 3 \text{ V}$                            | $\mu\text{A}$ | —    | 15   | 25   |

### Truth Table <sup>6,7,8</sup>

| Control V1 | Control V2 | RFC—RF1 | RFC—RF2 |
|------------|------------|---------|---------|
| 1          | 0          | On      | Off     |
| 0          | 1          | Off     | On      |

- For positive voltage control, external DC blocking capacitors are required on all RF ports.
- Differential voltage,  $V$  (state 1) -  $V$  (state 0), must be +2.7 V minimum and must not exceed +5 V.
- $0 = 0 \pm 0.2 \text{ V}$ ,  $1 = +2.9 \text{ V}$  to +5 V.

### Handling Procedures

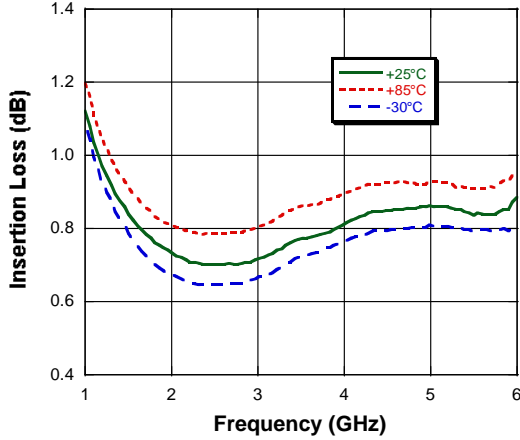
Please observe the following precautions to avoid damage:

### Static Sensitivity

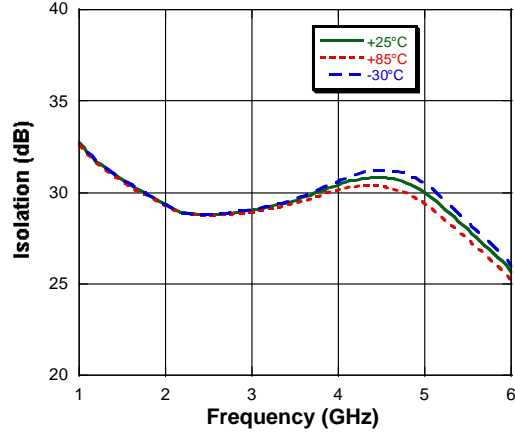
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## Typical Performance Curves

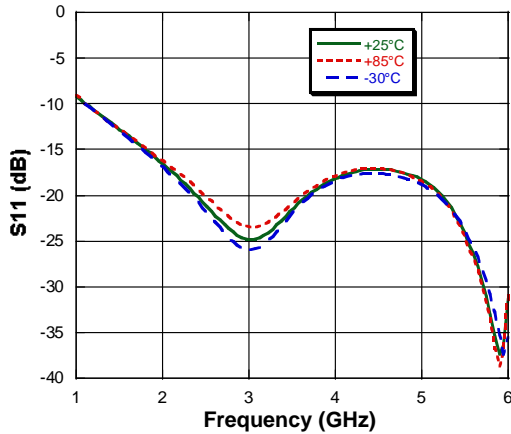
**Insertion Loss**



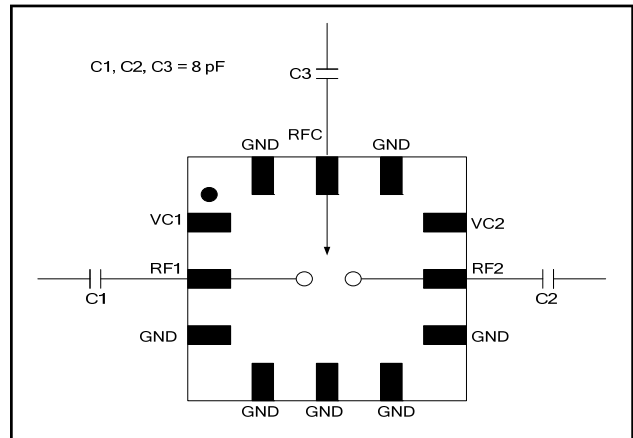
**Isolation**



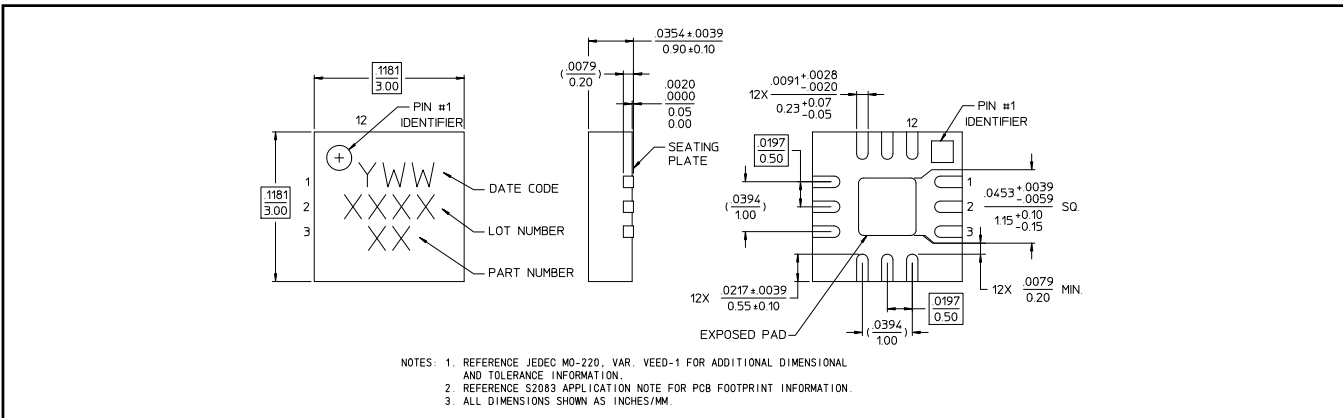
**Return Loss**



**Application Schematic**



## Lead-Free 3 mm 12-lead PQFN†



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

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