

## SPDT High Isolation Terminated Switch 0.01- 4.0 GHz

Rev. V1

### Features

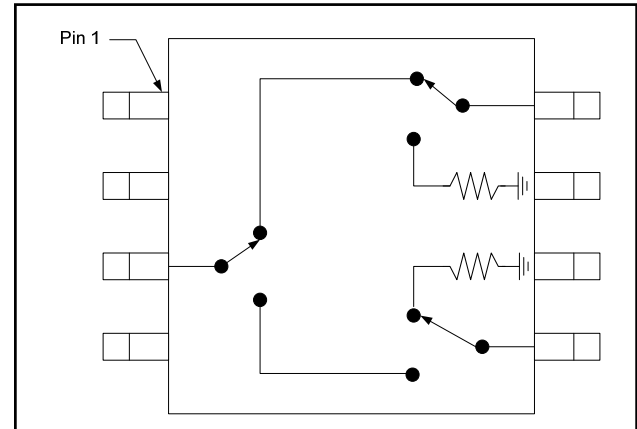
- Positive Voltage Control
- High Isolation: 62 dB @ 1 GHz  
65 dB @ 2 GHz
- 50  $\Omega$  Internal Terminations
- Low Insertion Loss: 0.65 dB @ 1 GHz  
0.70 dB @ 2 GHz
- Lead-Free MSOP-8-EP Package
- Halogen-Free "Green" Mold Compound
- RoHS\* Compliant and 260°C Reflow Compatible

### Description

The M/A-COM MASW-008543 GaAs monolithic switch provides high isolation in a lead-free, plastic surface mount package. The MASW-008543 is ideal for applications across a broad range of frequencies.

M/A-COM fabricates the MASW-008543 using a 0.5-micron gate length pHEMT process. The process features full chip passivation for performance and reliability.

### Functional Block Diagram



### Pin Configuration<sup>3</sup>

| Pin | Function  | Pin | Function  |
|-----|-----------|-----|-----------|
| 1   | V1        | 5   | RF Port 2 |
| 2   | V2        | 6   | Ground    |
| 3   | RF Common | 7   | Ground    |
| 4   | Ground    | 8   | RF Port 1 |

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

### Ordering Information<sup>1,2</sup>

| Part Number        | Package         |
|--------------------|-----------------|
| MASW-008543-000000 | Bulk Packaging  |
| MASW-008543-TR3000 | 3000 piece reel |
| MASW-008543-001SMB | Sample Board    |

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

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

| Parameter   | Absolute Maximum |
|---|------------------|
| Input Power (0.5 - 3.0 GHz)<br>$V_{HIGH} = 3.0 V$ | 33 dBm           |
| Operating Voltage                                 | 8 V              |
| 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.

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

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**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ ,  $V_{\text{HIGH}} = 3.0\text{ V}$ ,  $V_{\text{LOW}} = 0\text{ V}$ ,  $Z_0 = 50\ \Omega$ <sup>6</sup>

| Parameter             | Test Conditions                       | Units | Min. | Typ. | Max. |
|-----------------------|---------------------------------------|-------|------|------|------|
| Insertion Loss        | 1.0 GHz                               | dB    | —    | 0.65 | —    |
|                       | 2.0 GHz                               | dB    | —    | 0.70 | 0.95 |
|                       | 3.0 GHz                               | dB    | —    | 0.85 | —    |
|                       | 4.0 GHz                               | dB    | —    | 1.10 | —    |
| Isolation             | 1.0 GHz                               | dB    | —    | 62   | —    |
|                       | 2.0 GHz                               | dB    | 62   | 65   | —    |
|                       | 3.0 GHz                               | dB    | —    | 50   | —    |
|                       | 4.0 GHz                               | dB    | —    | 45   | —    |
| Return Loss           | 0.5 - 4.0 GHz                         | dB    | —    | 20   | —    |
| Input IP <sub>3</sub> | 2-Tone, 2.1 GHz, 10 MHz spacing       | dBm   | —    | 53   | —    |
| P1dB                  | 2.1 GHz                               | dBm   | —    | 25   | —    |
| P0.1dB                | 2.1 GHz                               | dBm   | —    | 20   | —    |
| Trise, Tfall          | 10% to 90% RF & 90% to 10% RF         | ns    | —    | 30   | —    |
| Ton, Toff             | 50% of V <sub>C</sub> to 10% / 90% RF | ns    | —    | 52   | —    |
| Transients            | In-band                               | mV    | —    | 12   | —    |
| Control Current       |                                       | μA    | —    | <1   | 5    |

6. External DC blocking capacitors are required on all RF ports (39 pF capacitors are recommended).

### Truth Table<sup>7,8,9</sup>

| V1                | V2                | RFC-RF1 | RFC-RF2 |
|-------------------|-------------------|---------|---------|
| V <sub>HIGH</sub> | V <sub>LOW</sub>  | On      | Off     |
| V <sub>LOW</sub>  | V <sub>HIGH</sub> | Off     | On      |

- V<sub>LOW</sub> = 0 V ± 0.2 V, V<sub>HIGH</sub> = 1.8 V to +5 V, minimum V<sub>HIGH</sub> - V<sub>LOW</sub> = 1.8 V, maximum V<sub>HIGH</sub> - V<sub>LOW</sub> = 8.0 V.
- For use at low voltage, M/A-COM recommends connecting a 20K pull up resistor on pin 3 to a voltage equal to the most positive control voltage.
- Negative control voltage may be used. The V<sub>HIGH</sub> in the table would be the most positive (0 V) and the V<sub>LOW</sub> would be the most negative (-3 V for example).

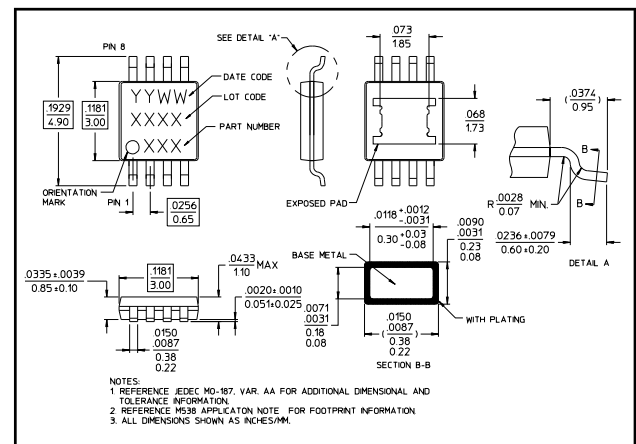
### Handling Procedures

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.

### Lead-Free MSOP-8-EP†



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

Meets JEDEC moisture sensitivity level 1 requirements. Plating is 100% matte tin over copper.

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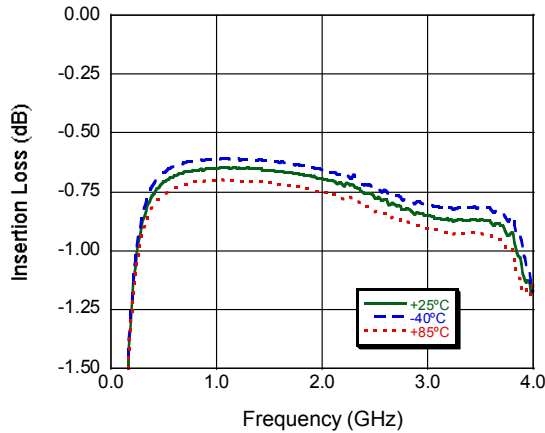
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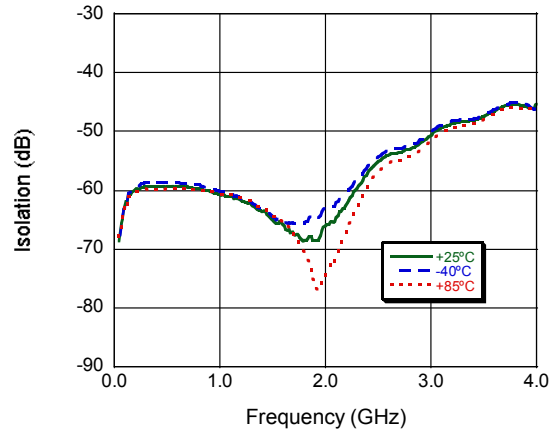
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### Typical Performance Curves

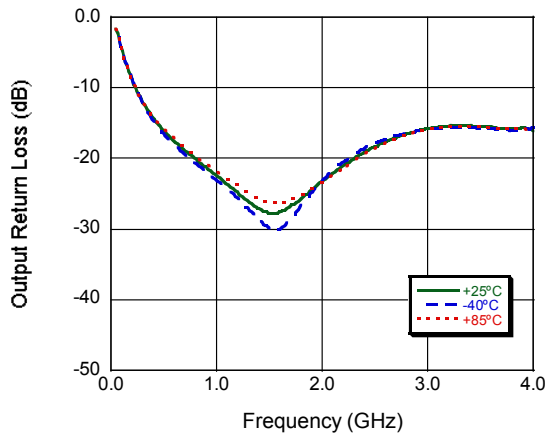
#### Insertion Loss



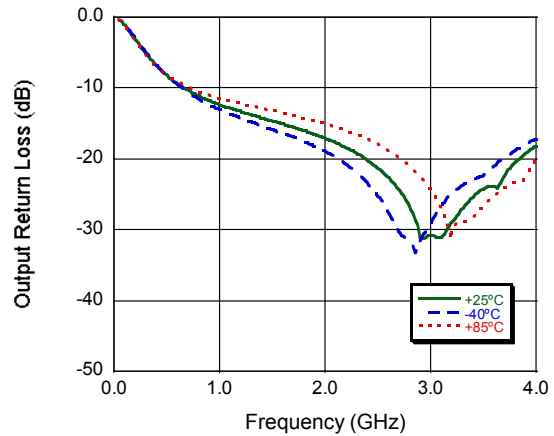
#### Isolation



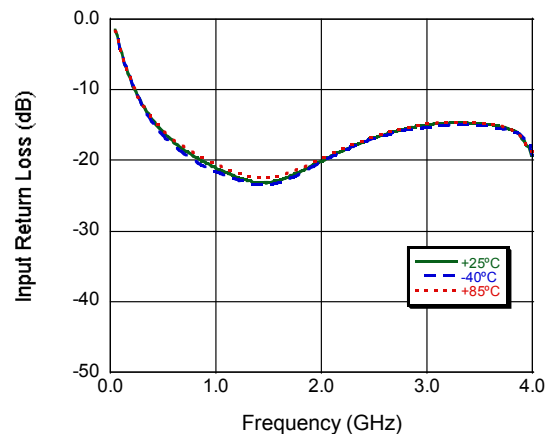
#### Output Return Loss (on state)



#### Output Return Loss (off state)

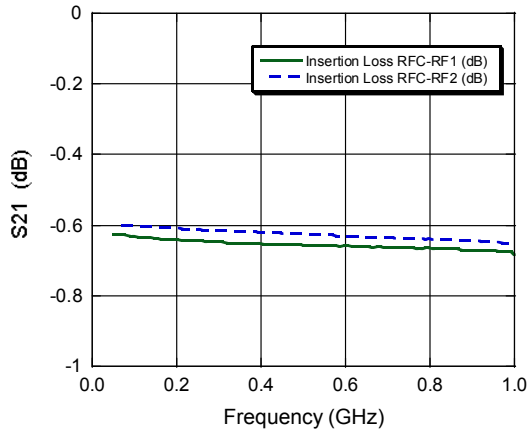


#### Input Return Loss (on state)

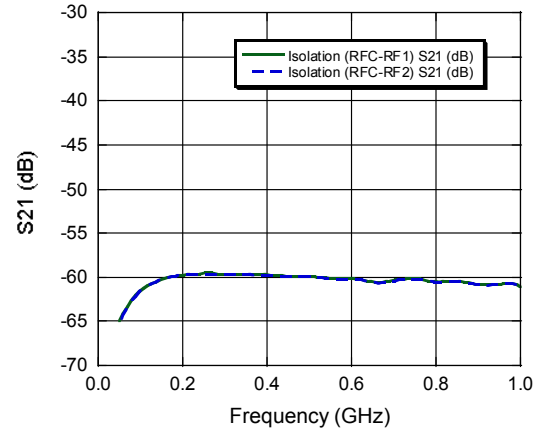


## Applications Section—Low Frequency Measurement

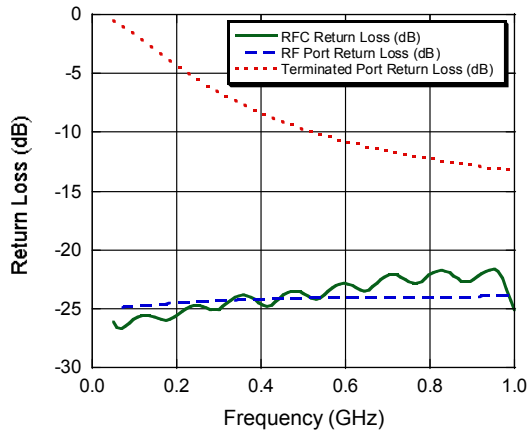
### Insertion Loss



### Isolation



### Return Loss



This data shows the MASW-008543 measured on an evaluation board with 0  $\Omega$  resistors. The board and connector loss have been removed.

0  $\Omega$  resistors can be used if negative control is available. To avoid changing the device bias points, the device should not be exposed to DC potentials on the RF ports.

With positive control M/A-COM recommends using DC-Blocking capacitors large enough that their  $X_c$  is insignificant at the frequency of use. At 50 MHz a capacitor value greater than 1000 pF is recommended.