

## GaAs SP2T 1.8 V Switch DC - 6.0 GHz

Rev. V1

### Features

- Voltage Operation as low as 1.6 V
- Insertion Loss: 0.20 dB @ 1 GHz
- Lead-Free 1 mm 6-Lead PDFN Package
- RoHS\* Compliant and 260°C Reflow Compatible

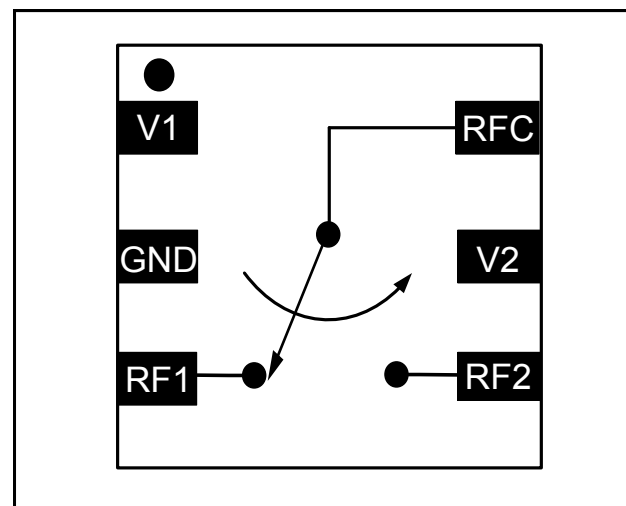
### Description

M/A-COM's MASW-009444 is a GaAs PHEMT MMIC single pole two throw (SP2T) switch in a miniature 1x1mm 6-lead PDFN package. The MASW-009444 is ideally suited for applications where low control voltage, low insertion loss, moderate isolation, and small size are required.

Typical applications are for filter and antenna switching in handset systems that connect separate receive functions to a common antenna, as well as other related handset and general purpose applications. This part can be used in all systems operating up to 6 GHz requiring high power at low control voltage.

The MASW-009444 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

### Functional Diagram



### Pin Configuration

| Pin No. | Function | Description |
|---------|----------|-------------|
| 1       | V1       | Control 1   |
| 2       | GND      | Ground      |
| 3       | RF1      | RF Port 1   |
| 4       | RF2      | RF Port 2   |
| 5       | V2       | Control 2   |
| 6       | RFC      | RF Common   |

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

| Part Number        | Package         |
|--------------------|-----------------|
| MASW-009444-TR3000 | 3000 piece reel |
| MASW-009444-001SMB | Sample Board    |

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

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

| Parameter                                      | Absolute Maximum |
|------------------------------------------------|------------------|
| Max Input Power<br>(0.5 - 3 GHz, 2.7V Control) | +27 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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Electrical Specifications:<sup>5</sup>  $T_A = 25^\circ\text{C}$ ,  $V_C = 1.8\text{ V}$ ,  $Z_0 = 50\ \Omega$ 

| Parameter       | Test Conditions                                                                            | Units         | Min.         | Typ.              | Max.          |
|-----------------|--------------------------------------------------------------------------------------------|---------------|--------------|-------------------|---------------|
| Insertion Loss  | DC - 1 GHz<br>1 - 2 GHz<br>2 - 3 GHz                                                       | dB            | —<br>—<br>—  | 0.2<br>0.3<br>0.4 | .45<br>—<br>— |
| Isolation       | DC - 1 GHz<br>1 - 2 GHz<br>2 - 3 GHz                                                       | dB            | 22<br>—<br>— | 28<br>23<br>19    | —<br>—<br>—   |
| VSWR            | DC - 2.5 GHz<br>2.5 - 3 GHz                                                                | dB            | —<br>—       | <1.3<br><1.3      | —<br>—        |
| IP3             | Two Tone +10 dBm, 5 MHz Spacing, >50 MHz<br>$P_{IN} = 0\text{ dBm}$ $V_C = 0/2.5\text{ V}$ | dBm           | —            | 47                | —             |
| P1dB            | $V_C = 1.8\text{ V}$<br>$V_C = 2.7\text{ V}$                                               | dBm           | —<br>—       | 15<br>24          | —<br>—        |
| Trise, Tfall    | 10% to 90% RF, 90% to 10% RF                                                               | ns            | —            | 10                | —             |
| Ton, Toff       | 50% control to 90% RF, and 50% control to 10% RF                                           | ns            | —            | 15                | —             |
| Transients      | In Band                                                                                    | mV            | —            | 30                | —             |
| Control Current | $ V_C  = 1.8\text{ V}$                                                                     | $\mu\text{A}$ | —            | 5                 | 10            |

5. Insertion Loss can be optimized by varying the DC Blocking Capacitor value, i.e. 1000 pF for 100 - 500 MHz, 39 pF for 0.5 - 3.0 GHz

Truth Table <sup>6</sup>

| V1          | V2          | RFC - RF1 | RFC - RF2 |
|-------------|-------------|-----------|-----------|
| 0 V         | +1.8 to 5 V | On        | Off       |
| +1.8 to 5 V | 0 V         | Off       | On        |

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

## Handling Procedures

Please observe the following precautions to avoid damage:

## Static Sensitivity

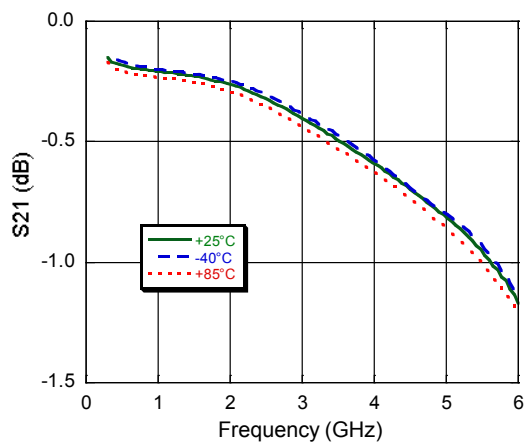
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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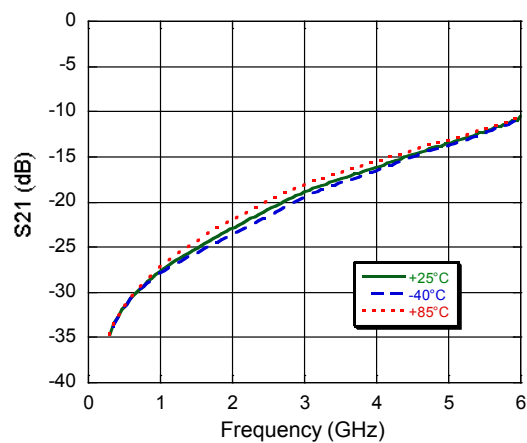
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### Typical Performance Curves

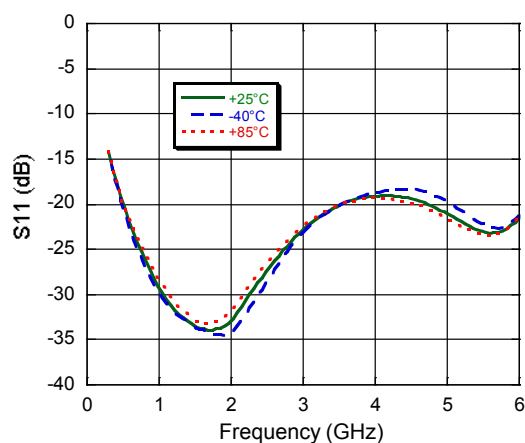
**Insertion Loss**



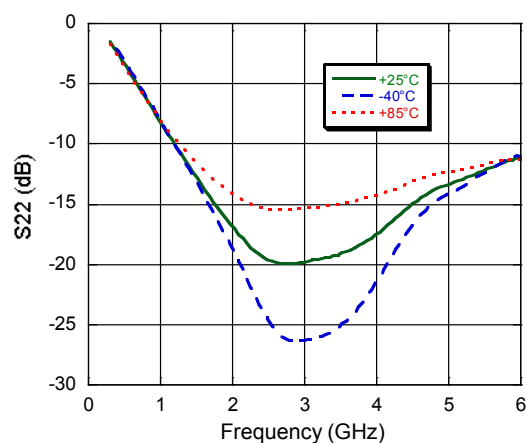
**Isolation**



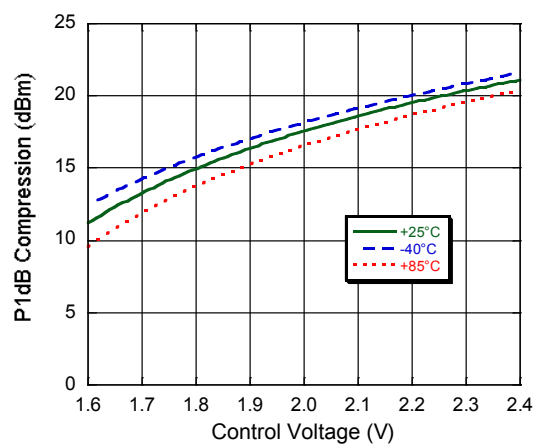
**Input Return Loss**



**Output Return Loss**



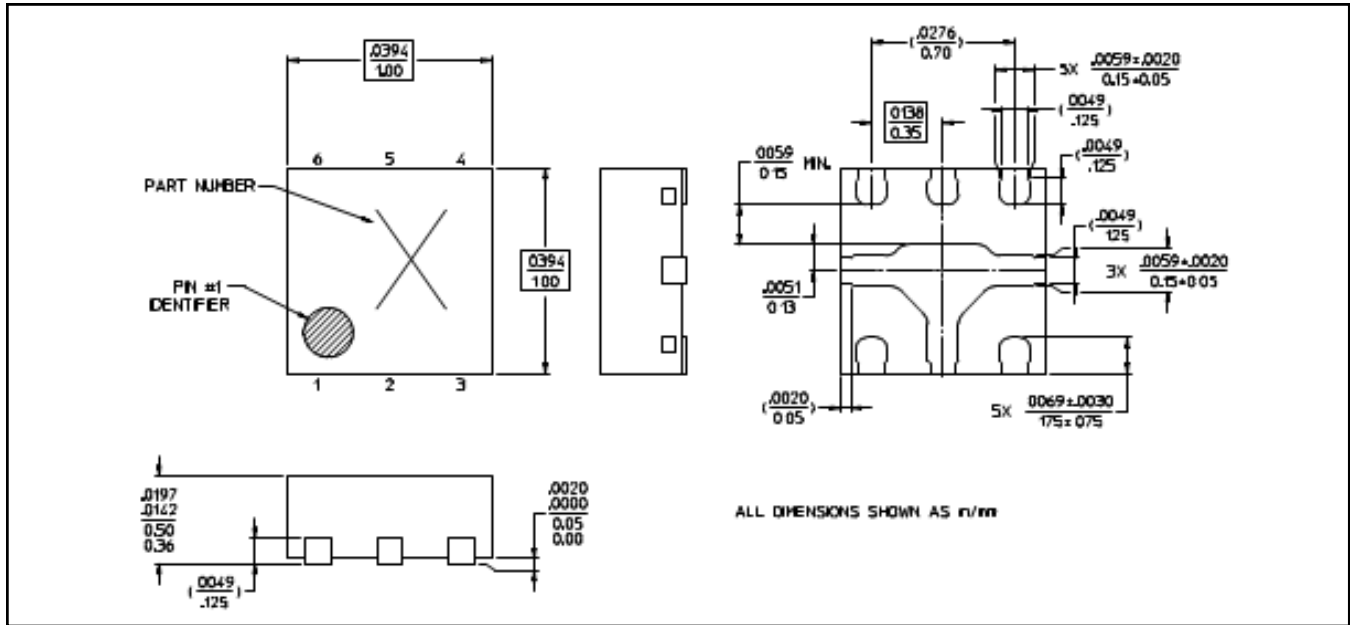
**Input P1dB vs. Control Voltage**



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### Lead-Free 1 mm 6-Lead PDFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.

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