

## GaAs SP4T 2.5 V High Power Switch DC - 3.0 GHz

Rev. V1

### Features

- Low Voltage Operation: 2.5 V
- Low Harmonics: < -65 dBc at +34 dBm & 1 GHz
- Low Insertion Loss: 0.65 dB @ 1 GHz
- High Isolation: 23 dB @ 2 GHz
- 0.5 micron GaAs PHEMT Process
- Lead-Free 4mm 16-lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of MASWSS0118

### Description

M/A-COM's MASW-008566 is a GaAs PHEMT MMIC single pole four throw (SP4T) high power switch in a low cost 4 mm 16-lead PQFN package. The MASW-008566 is ideally suited for applications where high power, low control voltage, low insertion loss, high isolation, small size, and low cost are required.

Typical applications are for GSM and DCS handset systems that connect separate transmit and receive functions to a common antenna, as well as other handset and related applications. This part can be used in all systems operating up to 3.0 GHz requiring high power at low control voltage.

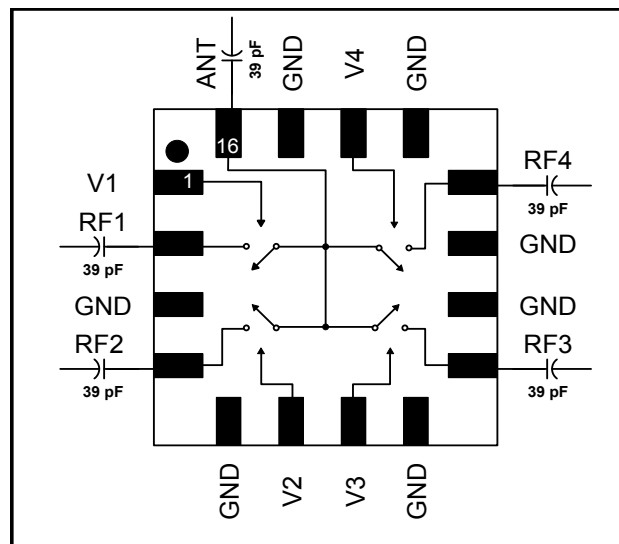
The MASW-008566 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

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

| Part Number        | Package         |
|--------------------|-----------------|
| MASW-008566-TR3000 | 3000 piece reel |
| MASW-008566-001SMB | Sample Board    |

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

### Functional Schematic



### Pin Configuration

| Pin No. | Pin Name            | Description  |
|---------|---------------------|--------------|
| 1       | V1                  | Control 1    |
| 2       | RF1                 | RF Port 1    |
| 3       | GND                 | RF Ground    |
| 4       | RF2                 | RF Port 2    |
| 5       | GND                 | RF Ground    |
| 6       | V2                  | Control 2    |
| 7       | V3                  | Control 3    |
| 8       | GND                 | RF Ground    |
| 9       | RF3                 | RF Port 3    |
| 10      | GND                 | RF Ground    |
| 11      | GND                 | RF Ground    |
| 12      | RF4                 | RF Port 4    |
| 13      | GND                 | RF Ground    |
| 14      | V4                  | Control 4    |
| 15      | GND                 | RF Ground    |
| 16      | ANT                 | Antenna Port |
| 17      | Paddle <sup>3</sup> | RF Ground    |

3. 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: $T_A = 25^\circ\text{C}$ , $Z_0 = 50 \Omega$ <sup>4</sup>

| Parameter                   | Test Conditions   | Units         | Min. | Typ. | Max. |
|-----------------------------|---|---------------|------|------|------|
| Insertion Loss <sup>5</sup> | DC – 1 GHz  | dB            | —    | 0.65 | 0.85 |
|                             | 1 – 2 GHz   | dB            | —    | 0.80 | 1.00 |
|                             | 2 - 3 GHz   | dB            | —    | 1.00 | —    |
| Isolation                   | DC – 1 GHz  | dB            | 27   | 29.0 | —    |
|                             | 1 – 2 GHz   | dB            | 21   | 23.0 | —    |
|                             | 2 - 3 GHz   | dB            | —    | 18.5 | —    |
| Return Loss                 | DC – 3 GHz  | dB            | —    | 20   | —    |
| IP3                         | Two Tone +26 dBm, 5 MHz Spacing, > 50 MHz<br>$V_C = 0 \text{ V} / 2.5 \text{ V}$  | dBm           | —    | 57   | —    |
| IP2                         | Two Tone +26 dBm, 5 MHz Spacing, > 50 MHz<br>$V_C = 0 \text{ V} / 2.5 \text{ V}$  | dBm           | —    | 81   | —    |
| P.1dB                       | $V_C = 0 \text{ V} / 2.5 \text{ V}$   | dBm           | —    | 38   | —    |
| 2 <sup>nd</sup> Harmonic    | 1 GHz, $P_{IN} = +34 \text{ dBm}$ , $V_C = 0 \text{ V} / 2.5 \text{ V}$           | dBc           | —    | -80  | -71  |
| 3 <sup>rd</sup> Harmonic    | 1 GHz, $P_{IN} = +34 \text{ dBm}$ , $V_C = 0 \text{ V} / 2.5 \text{ V}$           | dBc           | —    | -68  | -65  |
| Trise, Tfall                | 10% RF to 90% RF, 90% to 10% RF, $V_C = 0 \text{ V} / 2.5 \text{ V}$              | $\mu\text{S}$ | —    | 0.2  | —    |
| Ton, Toff                   | 50% control to 90% RF, 50% control to 10% RF, $V_C = 0 \text{ V} / 2.5 \text{ V}$ | $\mu\text{S}$ | —    | 0.2  | —    |
| Transients                  |   | mV            | —    | 35   | —    |
| Control Current             | $V_C = 0 \text{ V} / 2.5 \text{ V}$ , 34 dBm                                      | $\mu\text{A}$ | —    | 10   | 50   |

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

5. Insertion Loss can be optimized by varying the DC blocking capacitor value, e.g. 1000 pF for 100 - 500 MHz, 39 pF for 0.5 - 3 GHz.

### Absolute Maximum Ratings<sup>6,7</sup>

| Parameter                                     | Absolute Maximum                            |
|---|---|
| Input Power<br>(0.5 - 3.0 GHz, 2.5 V Control) | +38 dBm                                     |
| Voltage                                       | $\pm 8.5$ volts                             |
| Operating Temperature                         | $-40^\circ\text{C}$ to $+85^\circ\text{C}$  |
| Storage Temperature                           | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |

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

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

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

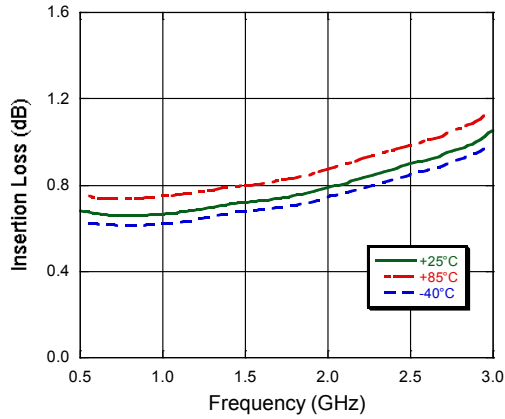
| V1 | V2 | V3 | V4 | ANT-RF1 | ANT-RF2 | ANT-RF3 | ANT-RF4 |
|----|----|----|----|---------|---------|---------|---------|
| 1  | 0  | 0  | 0  | On      | Off     | Off     | Off     |
| 0  | 1  | 0  | 0  | Off     | On      | Off     | Off     |
| 0  | 0  | 1  | 0  | Off     | Off     | On      | Off     |
| 0  | 0  | 0  | 1  | Off     | Off     | Off     | On      |

8. Differential voltage, V (state 1) - V (state 2), must be 2.5 V minimum.

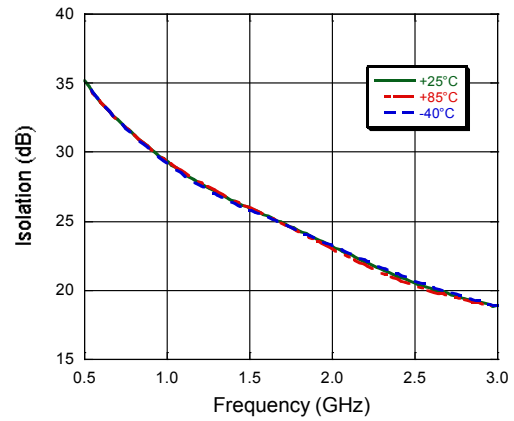
9. 0 = -5 V to +2.5 V, 1 = -2.5 V to +5 V

## Typical Performance Curves

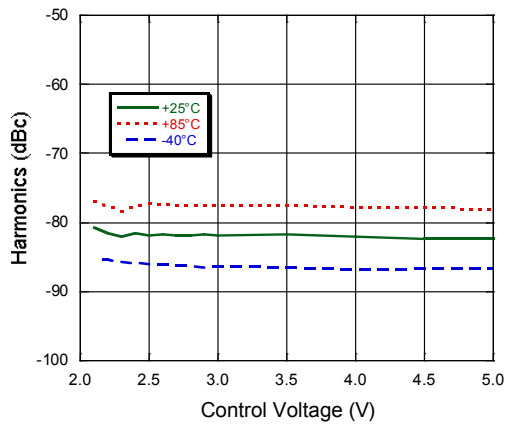
**Insertion Loss vs. Temperature**



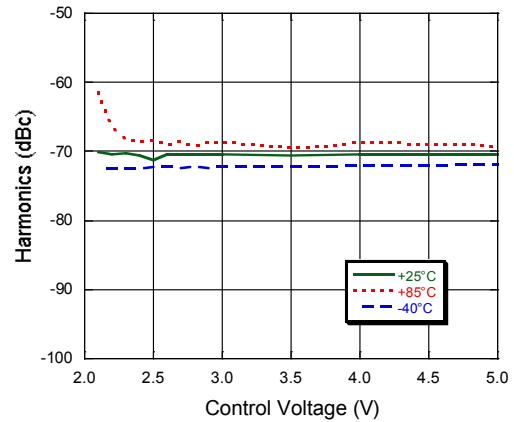
**Isolation vs. Temperature**



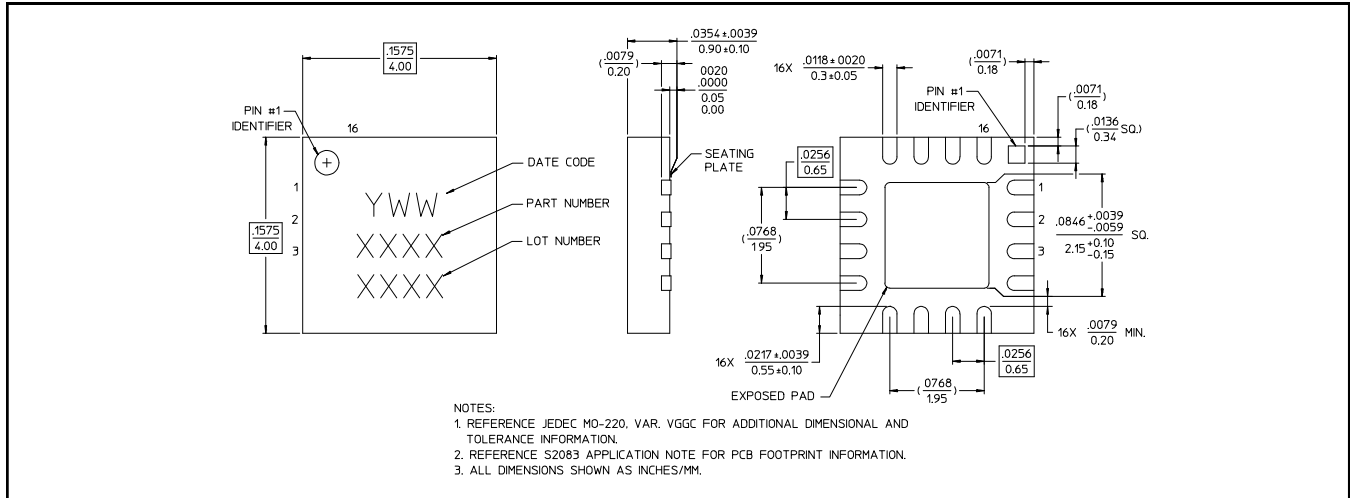
**1 GHz 2nd Harmonic Rejection**



**1 GHz 3rd Harmonic Rejection**



**Lead-Free 4 mm 16-Lead PQFN†**



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

## 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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5

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