



**THE DATASHEET OF  
MASW-007813-TR3000**



## GaAs SP4T High Power Switch DC - 3 GHz

Rev. V2

### Features

- Low Voltage Operation: 2.5 V
- Low Harmonics: < -66 dBc at +34 dBm & 1 GHz
- Low Insertion Loss: 0.7 dB at 1 GHz
- High Isolation: 25 dB at 2 GHz
- 0.5 micron GaAs pHEMT Process
- Low Profile, Lead-Free 3 mm PQFN Package
- Halogen-Free "Green" Mold Compound
- RoHS\* Compliant and 260°C Re-flow Compatible

### Description

M/A-COM's MASW-007813 is a GaAs pHEMT MMIC single pole four throw (SP4T) high power switch in a low cost, low profile, lead-free 3 mm PQFN 16-lead package. The MASW-007813 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 CDMA handset and other related applications. The MASW-007813 can be used in all systems operating up to 3 GHz requiring high power at low control voltage.

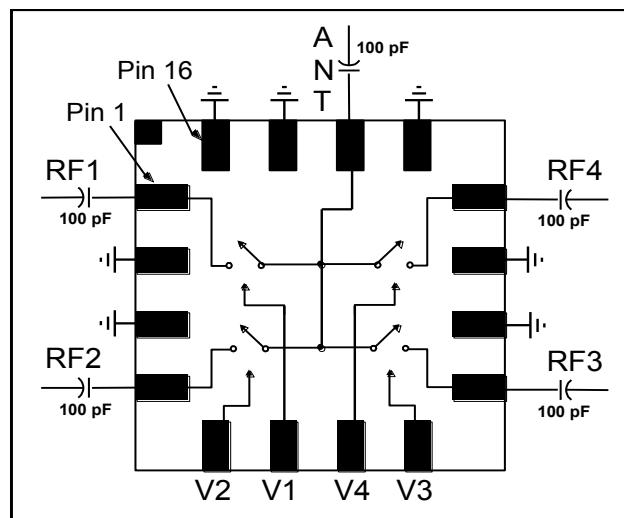
The MASW-007813 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

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

| Part Number        | Package         |
|--------------------|-----------------|
| MASW-007813-TR3000 | 3000 piece reel |
| MASW-007813-001SMB | 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       | RF1                       | RF Port 1    |
| 2       | GND                       | RF Ground    |
| 3       | GND                       | RF Ground    |
| 4       | RF2                       | RF Port 2    |
| 5       | V2                        | Control 2    |
| 6       | V1                        | Control 1    |
| 7       | V4                        | Control 4    |
| 8       | V3                        | Control 3    |
| 9       | RF3                       | RF Port 3    |
| 10      | GND                       | RF Ground    |
| 11      | GND                       | RF Ground    |
| 12      | RF4                       | RF Port 4    |
| 13      | GND                       | RF Ground    |
| 14      | ANT                       | Antenna Port |
| 15      | GND                       | RF Ground    |
| 16      | GND                       | RF Ground    |
| 17      | GND (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:  $T_A = 25^\circ\text{C}$ ,  $V_C = 0\text{ V} / 2.75\text{ V}$ ,  $P_{IN} = 34\text{ dBm}$ ,  $Z_0 = 50\ \Omega$  <sup>4</sup>

| Parameter                   | Test Conditions                                 | Units         | Min. | Typ. | Max. |
|-----------------------------|---|---------------|------|------|------|
| Insertion Loss <sup>5</sup> | DC - 1 GHz                                      | dB            | —    | 0.7  | 0.85 |
|                             | 1 - 2 GHz                                       |               | —    | 0.8  | —    |
|                             | 2 - 3 GHz                                       |               | —    | 1.0  | —    |
| Isolation                   | DC - 1 GHz                                      | dB            | 25   | 33   | —    |
|                             | 1 - 2 GHz                                       |               | —    | 27   | —    |
|                             | 2 - 3 GHz                                       |               | —    | 23   | —    |
| Return Loss                 | DC - 3 GHz                                      | dB            | —    | 20   | —    |
| P0.1dB                      | 1 GHz   | dBm           | —    | 38   | —    |
| IP2                         | Two Tone, +26 dBm/Tone, 5 MHz spacing, > 50 MHz | dBm           | —    | 96   | —    |
| IP3                         | Two Tone, +26 dBm/Tone, 5 MHz spacing, > 50 MHz | dBm           | —    | 58   | —    |
| 2nd Harmonic                | 1 GHz, Pin = +34 dBm                            | dBc           | —    | -76  | -68  |
| 3rd Harmonic                | 1 GHz, Pin = +34 dBm                            | dBc           | —    | -68  | -66  |
| Trise, Tfall                | 10% to 90% RF, 90% to 10% RF                    | ns            | —    | 40   | —    |
| Ton, Toff                   | 50% Control to 90% RF, 50% Control to 10% RF    | ns            | —    | 110  | —    |
| Transients                  |   | mV            | —    | 40   | —    |
| Control Current             | $V_C = 2.75\text{ V}$                           | $\mu\text{A}$ | —    | 20   | 80   |

4. For positive voltage control, 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 MHz - 1 GHz, 39 pF for 0.5 GHz - 3 GHz.

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

6. Differential voltage, V (state 1) - V (state 0), must be +2.5 V minimum and must not exceed 8.5 V.

7. 0 = -8.5 V to 0 V, 1 = -6 V to 8.5 V

### Absolute Maximum Ratings <sup>8</sup>

| Parameter                                     | Absolute Maximum |
|---|------------------|
| Max Input Power (0.5 - 3 GHz, 2.75 V Control) | +38 dBm          |
| Operating Voltage                             | +8.5 volts       |
| Operating Temperature                         | -40°C to +85°C   |
| Storage Temperature                           | -65°C to +150°C  |

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

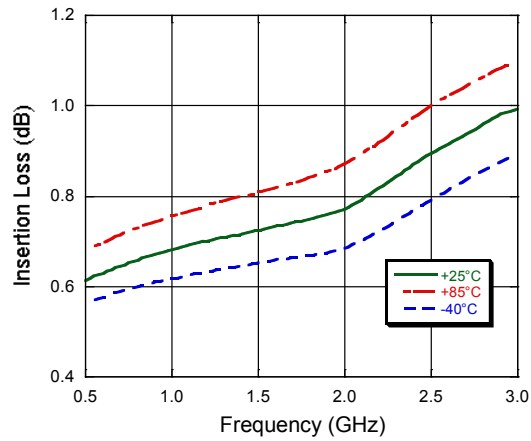
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GaAs SP4T High Power Switch  
DC - 3 GHz

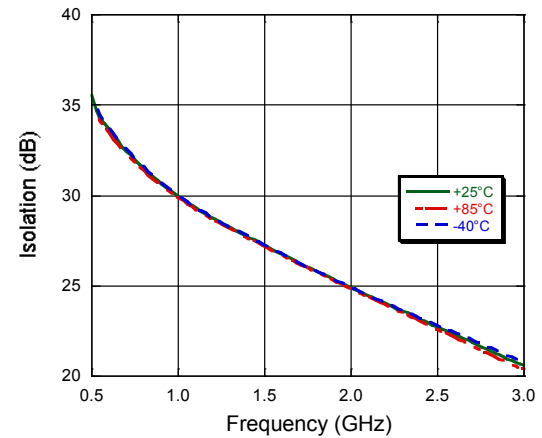
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## Typical Performance Curves

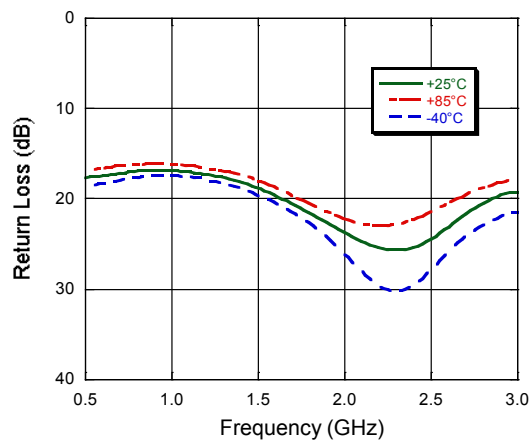
**Insertion Loss**



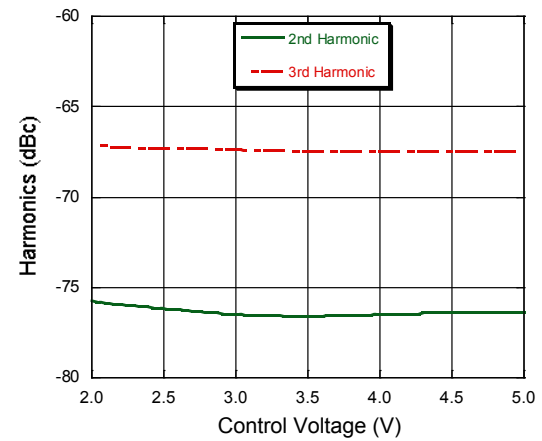
**Isolation**



**Return Loss**



**Harmonics vs. Control Voltage, 1 GHz**





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