

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

Rev. V3

### Features

- Low Voltage Operation: 2.5 V
- Harmonics: <-67 dBc @ +34 dBm & 1 GHz
- Low Insertion Loss: 0.40 dB @ 1 GHz
- High Isolation: 20 dB @ 2 GHz
- 0.5 micron GaAs pHEMT Process
- Lead-Free SOT-26 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of MASWSS0006

### Description

The MASWSS0181 is a GaAs PHEMT MMIC single pole two throw (SPDT) high power switch in a lead-free SOT-26 package. The MASWSS0181 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 related handset and general purpose applications. This part can be used in all systems operating up to 3 GHz requiring high power at low control voltage.

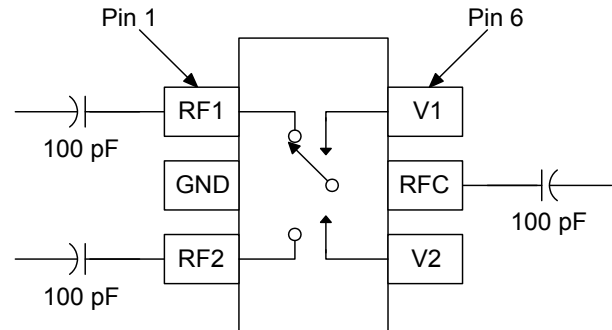
The MASWSS0181 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

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

| Part Number       | Package           |
|-------------------|-------------------|
| MASWSS0181        | Bulk Packaging    |
| MASWSS0181TR-3000 | 3000 piece reel   |
| MASWSS0181SMB     | Sample Test Board |

1. Reference Application Note M513 for reel size information.

### Functional Schematic



### Pin Configuration

| Pin # | Pin Name | Description    |
|-------|----------|----------------|
| 1     | RF1      | RF Port 1      |
| 2     | GND      | RF Ground      |
| 3     | RF2      | RF Port 2      |
| 4     | V2       | Control 2      |
| 5     | RFC      | RF Common Port |
| 6     | V1       | Control 1      |

### Absolute Maximum Ratings<sup>2,3</sup>

| Parameter                                   | Absolute Maximum |
|---|------------------|
| Input Power<br>(0.5 - 3 GHz, 2.5 V Control) | 38 dBm           |
| Voltage                                     | ±8.5 V           |
| Operating Temperature                       | -40°C to +85°C   |
| Storage Temperature                         | -65°C to +150°C  |

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. MACOM does not recommend sustained operation near these survivability limits.

\* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ ,  $V_C = 0\text{ V} / 2.5\text{ V}$ ,  $Z_0 = 50\ \Omega^4$

| Parameter                             | Test Conditions                                     | Units | Min.           | Typ.                 | Max.           |
|---------------------------------------|---|-------|----------------|----------------------|----------------|
| Insertion Loss <sup>5</sup>           | DC - 1 GHz<br>1 - 2 GHz<br>2 - 3 GHz                | dB    | —              | 0.40<br>0.50<br>0.75 | 0.65<br>—<br>— |
| Isolation                             | DC - 1 GHz<br>1 - 2 GHz<br>2 - 3 GHz                | dB    | 23.0<br>—<br>— | 26<br>20<br>16       | —              |
| Return Loss                           | DC - 2 GHz<br>2 - 3 GHz                             | dB    | —              | 20<br>16             | —              |
| IP3                                   | Two Tone, +26 dBm / tone,<br>5 MHz Spacing, >50 MHz | dBm   | —              | 57                   | —              |
| P0.1dB                                | —   | dBm   | —              | 39                   | —              |
| 2 <sup>nd</sup> Harmonic              | 1 GHz, P <sub>IN</sub> = 34 dBm                     | dBc   | —              | -75                  | —              |
| 3 <sup>rd</sup> Harmonic              | 1 GHz, P <sub>IN</sub> = 34 dBm                     | dBc   | —              | -75                  | -67            |
| T <sub>RISE</sub> , T <sub>FALL</sub> | 10% to 90% RF, 90% to 10% RF                        | μs    | —              | 0.04                 | —              |
| T <sub>ON</sub> , T <sub>OFF</sub>    | 50% control to 90% RF, and<br>50% control to 10% RF | μs    | —              | 0.06                 | —              |
| Transients                            | In Band   | mV    | —              | 50                   | —              |
| Control Current                       | —   | μA    | —              | —                    | 50             |

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 - 500 MHz, 100 pF for 0.5 - 3 GHz.

### Qualification

Qualified to MACOM specification REL-201, Process Flow -2.

### 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.

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

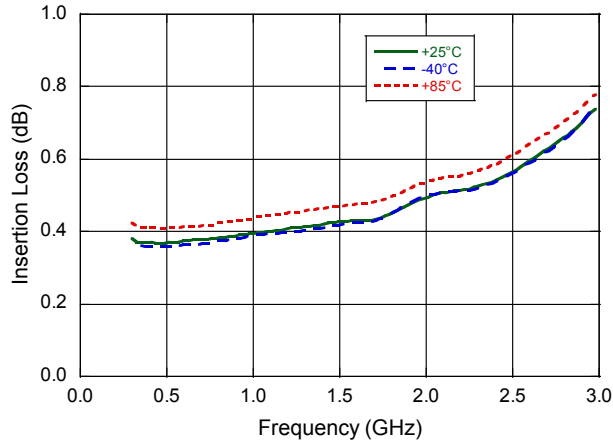
| V1 | V2 | ANT- RF1 | ANT - RF2 |
|----|----|----------|-----------|
| 1  | 0  | On       | Off       |
| 0  | 1  | Off      | On        |

6. Differential voltage, V (state 1) - V (state 0), must be +2.5 V minimum and must not exceed +8 V.

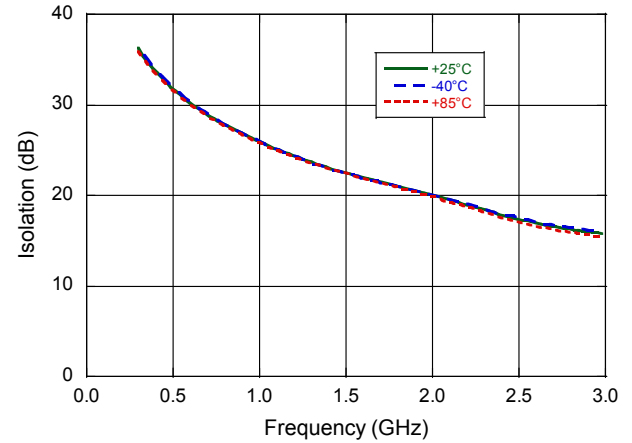
7. 0 = -5 V to 2.5 V, 1 = -2.5 V to +5 V.

## Typical Performance Curves vs. Temperature, 100 pF blocking capacitors

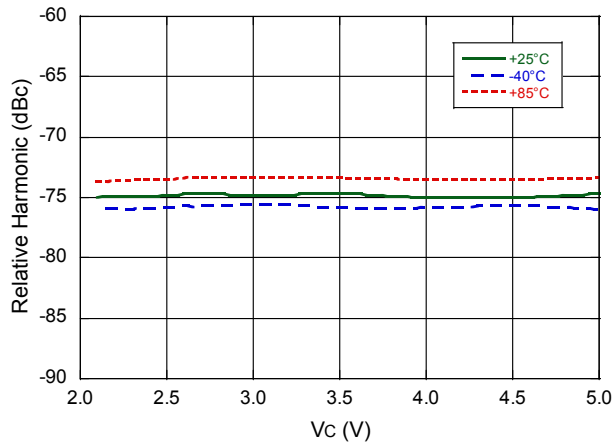
**Insertion Loss vs. Frequency**



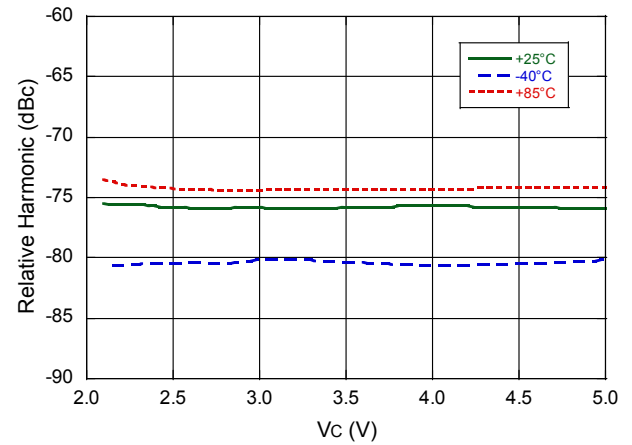
**Isolation vs. Frequency**



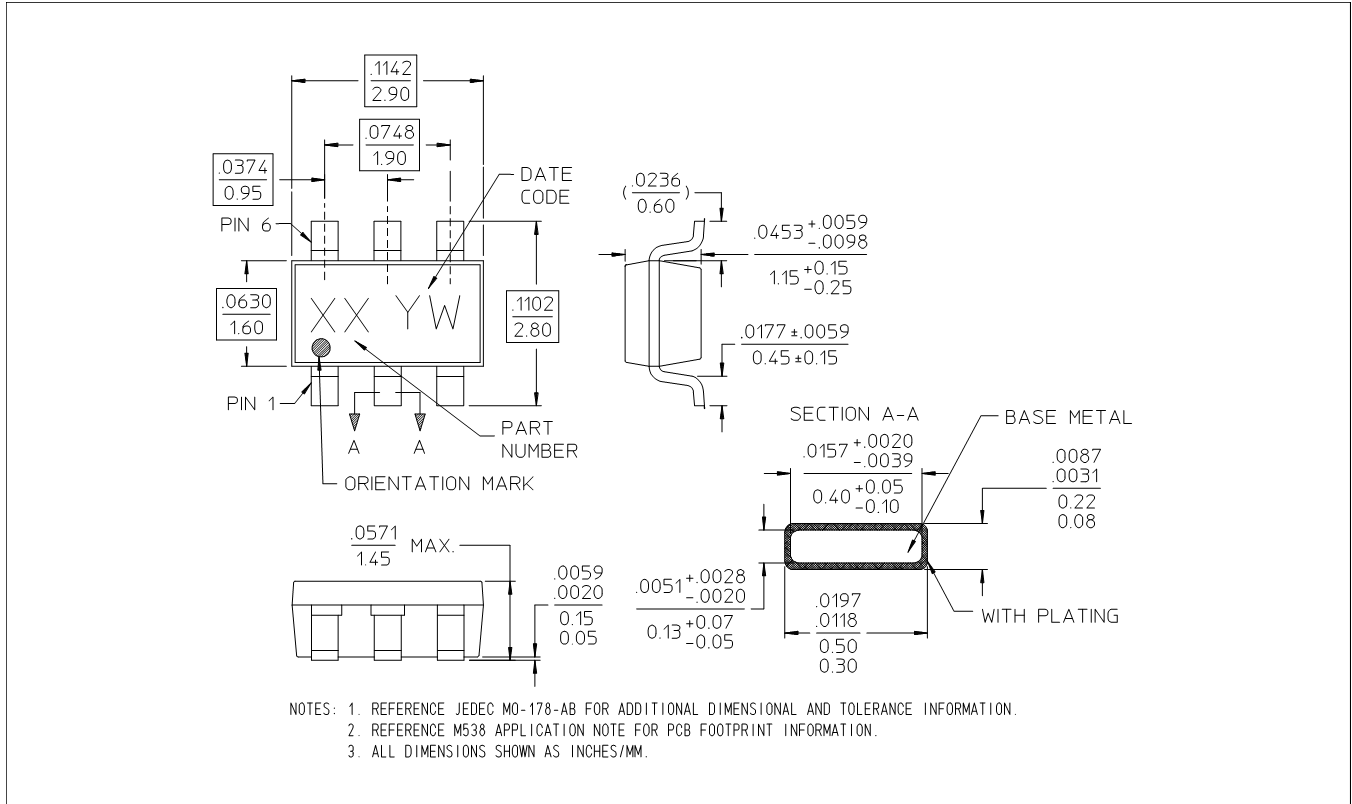
**2nd Harmonic vs. Control Voltage,**  
 $P_{IN} = 34 \text{ dBm CW, 1 GHz}$



**3rd Harmonic vs. Control Voltage,**  
 $P_{IN} = 34 \text{ dBm CW, 1 GHz}$



**Lead-Free SOT-26 Plastic Package†**



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

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