

# GaAs SP3T 2.5V High Power Switch

## DC - 2.5 GHz

Feb 12 2002

Preliminary

MASWSS0033

### Features

- Low Harmonic Knee Voltage < 2.5V
- Low Harmonics > 65 dBc at +34 dBm & 1 GHz
- Low Insertion Loss 0.45 dB at 1 GHz
- High Isolation 18.5 dB at 2 GHz
- FQFP 12-lead 3x3mm Low Profile Package
- 0.5 micron GaAs pHEMT Process

### Description

M/A-COM's MASWSS0033 is a GaAs PHEMT MMIC SP3T high power switch in a low cost miniature FQFP 12-lead 3x3mm thin profile package. This package represents a lower profile than standard FQFP style, featuring a 0.8mm maximum thickness.

The MASWSS0033 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 other handset and related applications. This part can be used in all systems operating up to 2.5 GHz requiring high power at low control voltage.

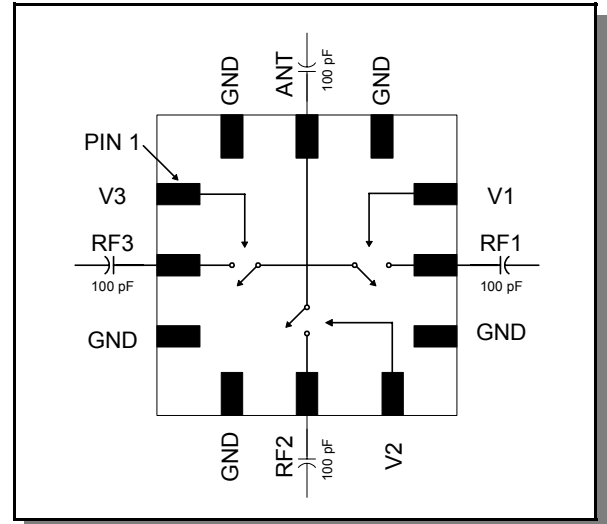
The MASWSS0033 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

### Absolute Maximum Ratings <sup>1</sup>

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

1. Exceeding any one or combination of these limits may cause permanent damage.

### Functional Schematic



### Pin Configuration

| PIN No. | PIN Name     | Description  |
|---------|--------------|--------------|
| 1       | V3           | Control 3    |
| 2       | RF3          | RF Port 3    |
| 3       | GND          | RF Ground    |
| 4       | GND          | RF Ground    |
| 5       | RF2          | RF Port 2    |
| 6       | V2           | Control 2    |
| 7       | GND          | RF Ground    |
| 8       | RF1          | RF Port 1    |
| 9       | V1           | Control 1    |
| 10      | GND          | RF Ground    |
| 11      | ANT          | Antenna Port |
| 12      | GND          | RF Ground    |
| 13      | GND (paddle) | RF Ground    |

| Parameter                                   | Test Conditions   | Units | Min. | Typ. | Max. |
|---|---|-------|------|------|------|
| Insertion Loss                              | DC – 1 GHz  | dB    |      | 0.5  | 0.65 |
|   | 1 – 2 GHz   | dB    |      | 0.6  | 0.8  |
|   | 2 - 2.5 GHz   | dB    |      | 0.8  | 1.0  |
| Isolation                                   | DC – 1 GHz  | dB    | 23   | 25   |      |
|   | 1 – 2 GHz   | dB    | 18   | 18.5 |      |
|   | 2 - 2.5 GHz   | dB    | 15   | 16   |      |
| Return Loss                                 | DC – 2.5 GHz  | dB    |      | 20   |      |
| P1dB  | V <sub>c</sub> = 0V/2.5V  | dBm   |      | 38   |      |
| 2 <sup>nd</sup> Harmonic                    | 1 GHz, P <sub>IN</sub> = +34 dBm, V <sub>c</sub> = 0V/2.5V          | dBc   | 65   |      |      |
| 3 <sup>rd</sup> Harmonic                    | 1 GHz, P <sub>IN</sub> = +34 dBm, V <sub>c</sub> = 0V/2.5V          | dBc   | 65   |      |      |
| Trise, Tfall                                | 10% to 90% RF, 90% to 10% RF  | μS    |      | 1    |      |
| Cross Modulation<br>ANT - CELL <sup>3</sup> | Two Tone +22 dBm, 1 MHz Spacing, 820 MHz,                           | dBm   |      | 59   |      |
|   | Two Tone +19 dBm, 1 MHz Spacing, 1950 MHz,                          | dBm   |      | 57   |      |
| Cross Modulation<br>ANT - PCS <sup>3</sup>  | Two Tones +22 dBm @ 820 & 821 MHz,<br>One Tone -27 dBm @ 865 MHz    | dBm   |      | -108 |      |
|   | Two Tones +17 dBm @ 1950 & 1951 MHz,<br>One Tone -27 dBm @ 1870 MHz | dBm   |      | TBD  |      |
| Ton, Toff                                   | 50% control to 90% RF, and 50% control to 10% RF                    | μS    |      | 1    |      |
| Transients                                  | In Band   | mV    |      | 10   |      |
| Gate Leakage                                | V <sub>c</sub>   = 2.5V   | uA    |      |      | 100  |

2. Insertion Loss can be optimized by varying the DC Blocking Capacitor value, ie. 1000 pF for 100 MHz - 500 MHz, 100 pF for 0.5 GHz - 2.5 GHz.

3. IP3 slope versus input power is approximately 1.5:1.

### Truth Table <sup>4</sup>

| V1          | V2          | V3          | ANT- RF1 | ANT - RF2 | ANT - RF3 |
|-------------|-------------|-------------|----------|-----------|-----------|
| +2.5 to +5V | 0 ± 0.2V    | 0 ± 0.2V    | On       | Off       | Off       |
| 0 ± 0.2V    | +2.5 to +5V | 0 ± 0.2V    | Off      | On        | Off       |
| 0 ± 0.2V    | 0 ± 0.2V    | +2.5 to +5V | Off      | Off       | On        |

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

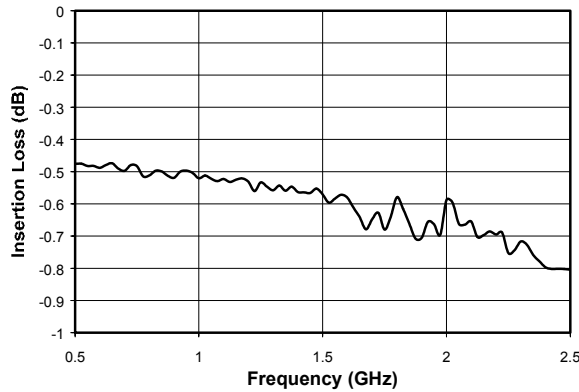
Specifications subject to change without notice.

- North America: Tel. (800) 366-2266, Fax (800) 618-8883
- Asia/Pacific: Tel. +81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

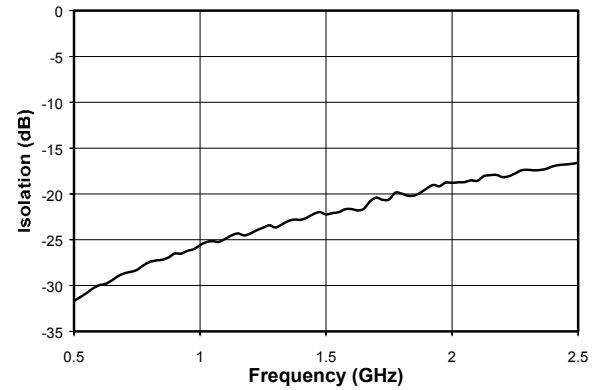
Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

Typical Performance Curves

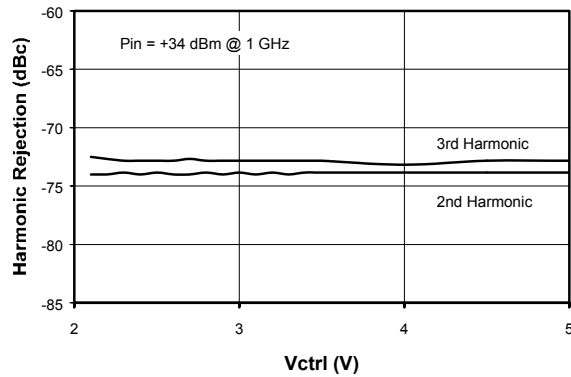
Insertion Loss vs. Frequency,  
25 °C, 100 pF



Isolation vs. Frequency,  
25 °C, 100 pF



Harmonic Rejection vs. Frequency,  
25 °C, 100 pF

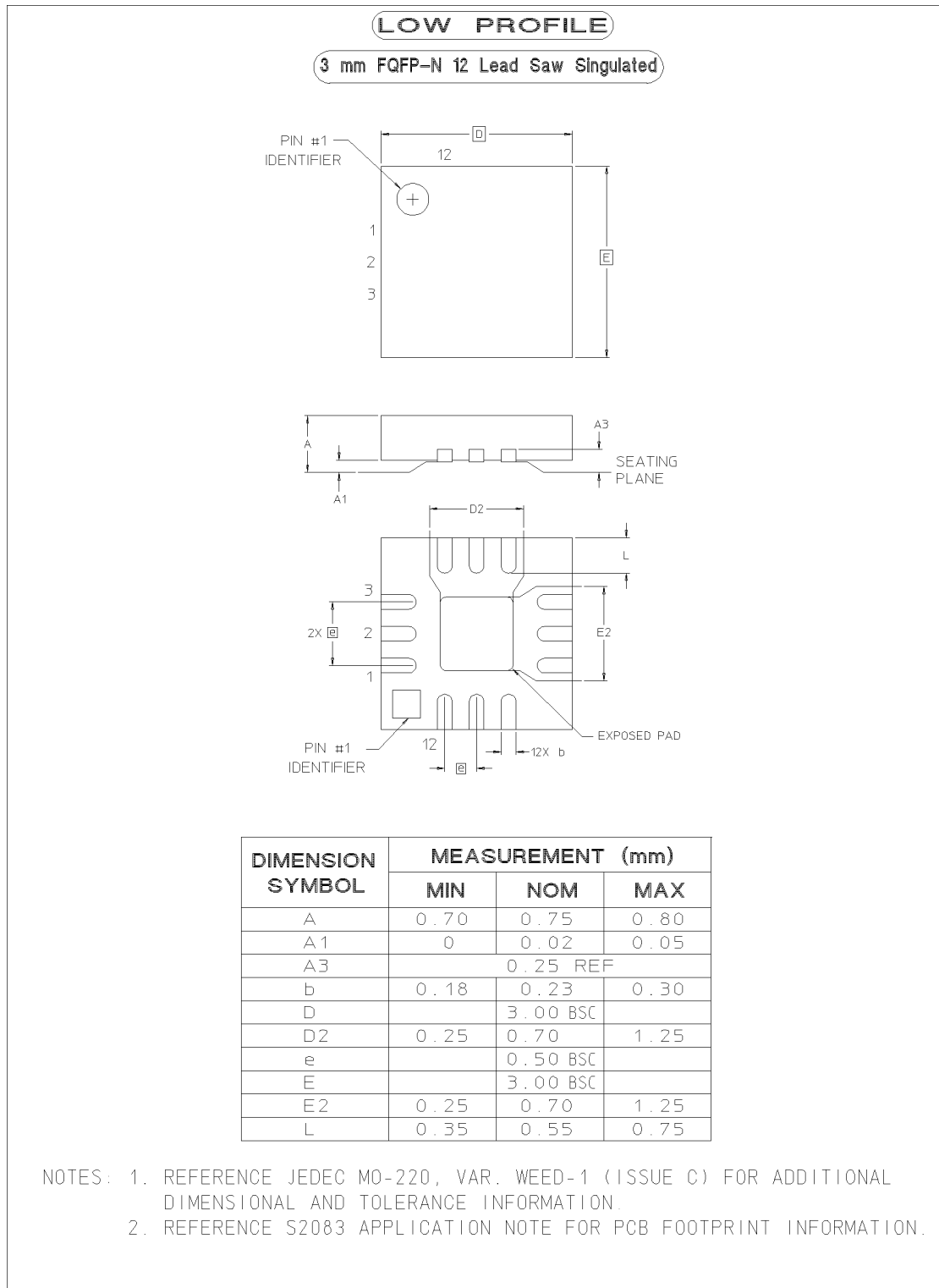


Specifications subject to change without notice.

- North America: Tel. (800) 366-2266, Fax (800) 618-8883
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

## FQFP 12-lead 3x3 mm Low Profile



Specifications subject to change without notice.

- North America: Tel. (800) 366-2266, Fax (800) 618-8883
- Asia/Pacific: Tel. +81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax +44 (1344) 300 020

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

**tyco** / Electronics

**MACOM**

## Handling Procedures

The following precautions should be observed to avoid damage:

### *Static Sensitivity*

Gallium Arsenide Integrated Circuits are ESD sensitive and can be damaged by static electricity. Proper ESD techniques should be used when handling these devices.

## Ordering Information

| Part Number   | Package                             |
|---------------|-------------------------------------|
| MASWSS0033    | FQFP-N 12-lead Thin Plastic Package |
| MASWSS0033TR  | 1000 piece reel                     |
| MASWSS0033SMB | Sample Test Board                   |

*Specifications subject to change without notice.*

- North America: Tel. (800) 366-2266, Fax (800) 618-8883
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.