

M/A-COM GaAs SP3T 2.5V High Power Switch DC - 2.5 GHz

Feb 12 2002

Preliminary

SW-489



Features

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

Description

M/A-COM's SW-489 is a GaAs PHEMT MMIC single pole three throw (SP3T) high power switch in a low cost miniature FQFP 12-lead 3x3mm thin profile package. The SW-489 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 2.5 GHz requiring high power at low control voltage.

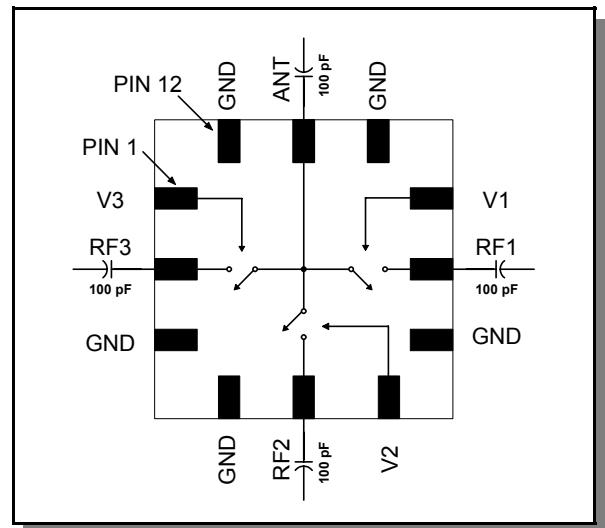
The SW-489 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Absolute Maximum Ratings ¹

| 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 |

Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 50\Omega$ ²

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|-------|----------------|-------------------|--------------------|
| Insertion Loss | DC – 1 GHz 1 – 2 GHz 2 – 2.5 GHz | dB | | 0.5 0.6 0.8 | 0.65 0.8 1.0 |
| Isolation | DC – 1 GHz 1 – 2 GHz 2 – 2.5 GHz | dB | 23 18 15 | 25 18.5 16 | |
| Return Loss | DC – 2.5 GHz | dB | | 20 | |
| P1dB | $V_c = 0\text{V}/2.5\text{V}$ | dBm | | 38 | |
| 2 nd Harmonic | 1 GHz, $P_{IN} = +34 \text{ dBm}$, $V_c = 0\text{V}/2.5\text{V}$ | dBc | 65 | | |
| 3 rd Harmonic | 1 GHz, $P_{IN} = +34 \text{ dBm}$, $V_c = 0\text{V}/2.5\text{V}$ | dBc | 65 | | |
| Trise, Tfall | 10% to 90% RF, 90% to 10% RF | μS | | 1 | |
| Cross Modulation ANT - CELL ³ | Two Tone +22 dBm, 1 MHz Spacing, 820 MHz, | dBm | | 59 | |
| ANT - PCS ³ | Two Tone +19 dBm, 1 MHz Spacing, 1950 MHz, | dBm | | 57 | |
| Cross Modulation ANT - CELL | Two Tones +22 dBm @ 820 & 821 MHz, One Tone -27 dBm @ 865 MHz | dBm | | -108 | |
| ANT - PCS | Two Tones +17 dBm @ 1950 & 1951 MHz, 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_c = 2.5\text{V}$ | 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 Table⁴

| V1 | V2 | V3 | ANT- RF1 | ANT - RF2 | ANT - RF3 |
|---------------------|---------------------|---------------------|----------|-----------|-----------|
| +2.5 to +5V | $0 \pm 0.2\text{V}$ | $0 \pm 0.2\text{V}$ | On | Off | Off |
| $0 \pm 0.2\text{V}$ | +2.5 to +5V | $0 \pm 0.2\text{V}$ | Off | On | Off |
| $0 \pm 0.2\text{V}$ | $0 \pm 0.2\text{V}$ | +2.5 to +5V | Off | Off | On |

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

Specifications subject to change without notice.

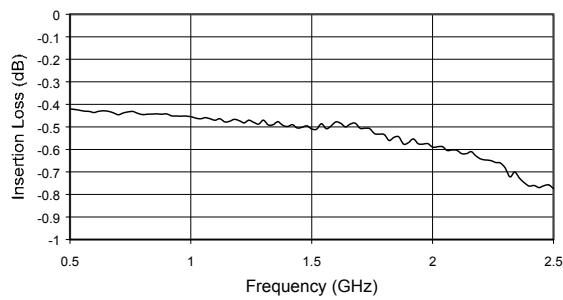
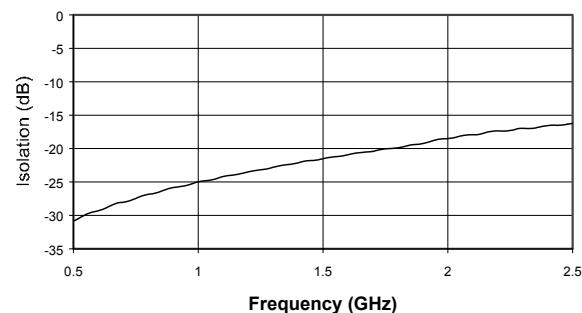
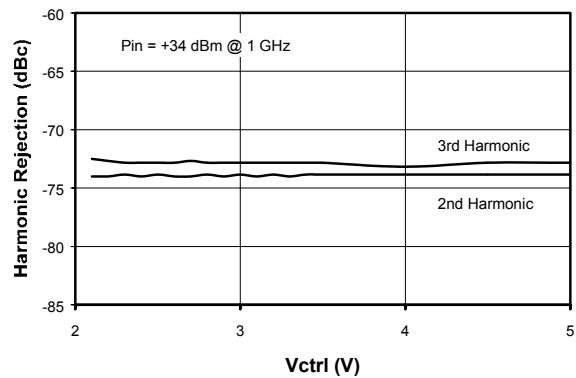
- North America: Tel. (800) 366-2266, Fax (800) 618-8883
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

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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*

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FQFP 12-lead 3x3 mm

| 3 mm FQFP-N 12 Lead Saw Singulated | | | 3 mm FQFP-N 12 Lead Anvill Singulated | | | | |
|------------------------------------|------------------|------|---------------------------------------|------------------|------------------|------|------|
| DIMENSION SYMBOL | MEASUREMENT (mm) | | | DIMENSION SYMBOL | MEASUREMENT (mm) | | |
| | MIN | NOM | MAX | | MIN | NOM | MAX |
| A | 0.80 | 0.90 | 1.00 | A | 0.80 | 0.90 | 1.00 |
| A1 | 0 | 0.02 | 0.05 | A1 | 0 | 0.02 | 0.05 |
| A3 | 0.25 REF | | | A2 | 0 | 0.65 | 1.00 |
| b | 0.18 | 0.23 | 0.30 | A3 | 0.25 REF | | |
| D | 3.00 BSC | | | b | 0.18 | 0.23 | 0.30 |
| D2 | 0.25 | 0.70 | 1.25 | D | 3.00 BSC | | |
| e | 0.50 BSC | | | D1 | 2.75 BSC | | |
| E | 3.00 BSC | | | D2 | 0.25 | 0.70 | 1.25 |
| E2 | 0.25 | 0.70 | 1.25 | e | 0.50 BSC | | |
| L | 0.35 | 0.55 | 0.75 | E | 3.00 BSC | | |
| | | | | E1 | 2.75 BSC | | |
| | | | | E2 | 0.25 | 0.70 | 1.25 |
| | | | | L | 0.35 | 0.55 | 0.75 |

NOTES: 1. REFERENCE JEDEC MO-220, VAR. VEED-1 (ISSUE C) FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.
 2. REFERENCE S2083 APPLICATION NOTE FOR PCB FOOTPRINT INFORMATION.

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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 |
|-------------|--------------------------------|
| SW-489 | FQFP-N 12-lead Plastic Package |
| SW-489TR | 1000 piece reel |
| SW-489SMB | Sample Test Board |

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