

GaAs SPDT Switch DC - 3.0 GHz

Rev. V1

Features

- Test and Measurement and Low/Medium Power Telecommunication Applications
- Low Insertion Loss: 0.18 dB @ 1 GHz
- Moderate Isolation: 25 dB @ 1 GHz
- Low Power Consumption: < 2 μ A @ 2.5 V
- Fast Settling for Low Gate Lag Requirements
- Lead-Free SC-70 (SOT-363) Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

M/A-COM’s MASWSS0192 is a GaAs PHEMT MMIC SPDT switch in a lead-free SC-70 (SOT-363) surface mount plastic package. The MASWSS0192 is ideally suited for applications where very small size and low cost are required.

The MASWSS0192 can be used for low / medium power, low loss requirements in all systems operating up to 3 GHz, including PCS, GSM, DCS, Blue Tooth, T&M, and other receive chain applications.

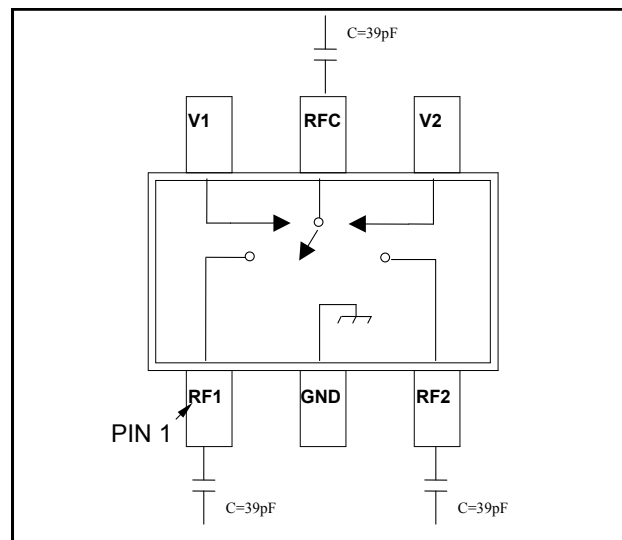
The MASWSS0192 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Ordering Information ¹

| Part Number | Package |
|-------------------|-----------------|
| MASWSS0192 | Bulk Packaging |
| MASWSS0192TR-3000 | 3000 piece reel |
| MASWSS0192SMB | Sample Board |

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

| Pin No. | Pin Name | Description |
|---------|----------|-------------|
| 1 | RF1 | RF Port 1 |
| 2 | GND | Ground |
| 3 | RF2 | RF Port 2 |
| 4 | V2 | Control 2 |
| 5 | RFC | RF Input |
| 6 | V1 | Control 1 |

Absolute Maximum Ratings ^{2,3}

| Parameter | Absolute Maximum |
|---|--------------------|
| Input Power (0.5 - 3.0 GHz) 2.5 V Control 5.0 V Control | +25 dBm +34 dBm |
| Operating Voltage | +8.5 volts |
| 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. M/A-COM does not recommend sustained operation near these survivability limits.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V} / 2.5\text{ V}^4$, $P_{IN} = +10\text{ dBm}$, $Z_0 = 50\ \Omega^5$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|-----------------------------|--|---------------|------|-------|------|
| Insertion Loss ⁶ | DC - 1.0 GHz | dB | — | 0.18 | 0.40 |
| | DC - 3.0 GHz | dB | — | 0.35 | 0.60 |
| Isolation | DC - 1.0 GHz | dB | 20.0 | 24.0 | — |
| | DC - 3.0 GHz | dB | 9.5 | 13.5 | — |
| VSWR | DC - 1.0 GHz | Ratio | — | 1.1:1 | — |
| | DC - 3.0 GHz | Ratio | — | 1.2:1 | — |
| IP2 | 1 GHz, Two Tone, +7 dBm / tone, 20 MHz Spacing, 3 V | dBm | — | 93 | — |
| IP3 | 1 GHz, Two Tone, +7 dBm / tone, 20 MHz Spacing, 3 V | dBm | — | 53 | — |
| P1dB | $V_C = 0.2\text{ V} / 2.7\text{ V}$ | dBm | — | 27.5 | — |
| | $V_C = 0.2\text{ V} / 3.0\text{ V}$ | dBm | — | 28.5 | — |
| Trise, Tfall | 10% to 90% RF and 90% to 10% RF | nS | — | 22 | — |
| Ton, Toff | 50% control to 90% RF, 50% control to 10% RF | nS | — | 5 | — |
| Transients | In-band | mV | — | 36 | — |
| Control Current | — | μA | — | 0.20 | 5 |
| R_{ON} | $t > 90\text{ mS}$ after OFF to ON Switching (settled) | Ω | — | 2.50 | 4.7 |
| Gate Lag | $ \Delta R_{on} $ between 15 μS and 90 mS after OFF to ON Switching | Ω | — | 0.15 | 0.7 |

- Alternate voltage operation of $V_C = 0\text{ V} / 5\text{ V}$ or $-5\text{ V} / 0\text{ V}$ will yield similar insertion loss, isolation, VSWR, switching, R_{ON} , and gate lag results.
- For positive voltage control, external DC blocking capacitors are required on all RF ports.
- 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 - 3 GHz.

Truth Table ^{7,8}

| Control V1 | Control V2 | RFC-RF1 | RFC-RF2 |
|------------|------------|---------|---------|
| 1 | 0 | On | Off |
| 0 | 1 | Off | On |

- Differential voltage, V (state 1) - V (state 0), must be 2.5 V minimum, but must not exceed 8.5 V.
- 0 = 0 V to 0.5 V; 1 = 2.5 V to 5 V or 0 = -5 V to -2.5 V, 1 = -0.5 to 0 V.

Qualification

Qualified to M/A-COM specification REL-201, Process Flow -2.

Handling Procedures

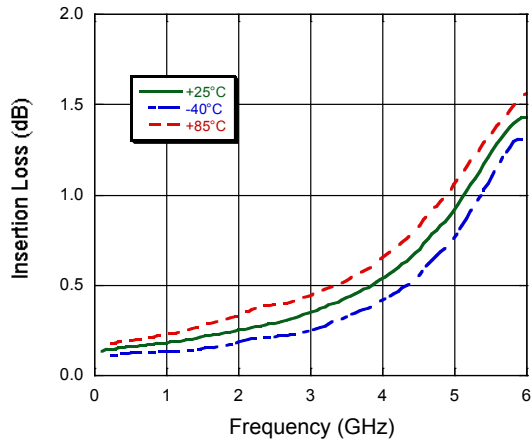
Please observe the following precautions to avoid damage:

Static Sensitivity

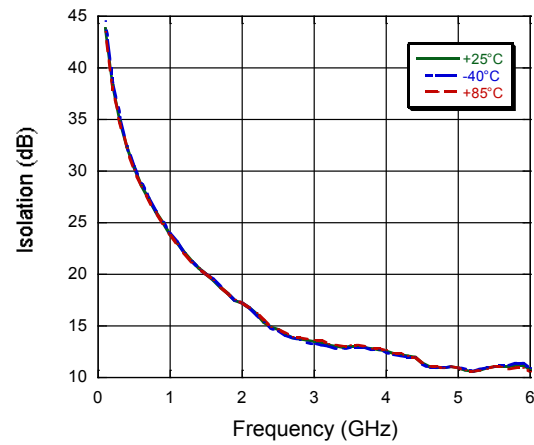
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves

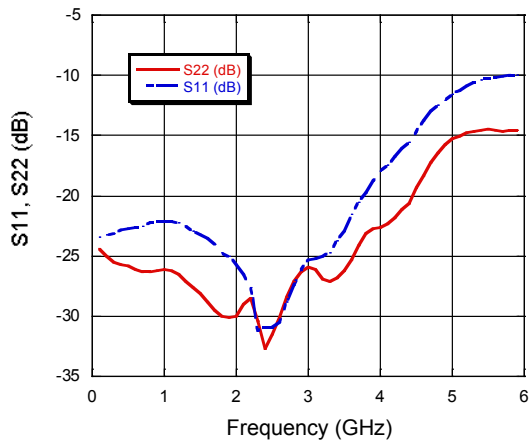
Insertion Loss



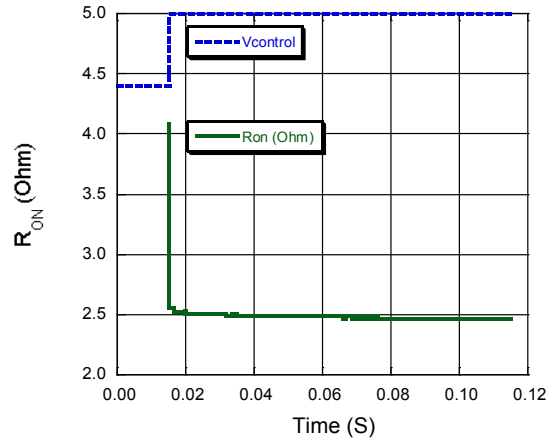
Isolation



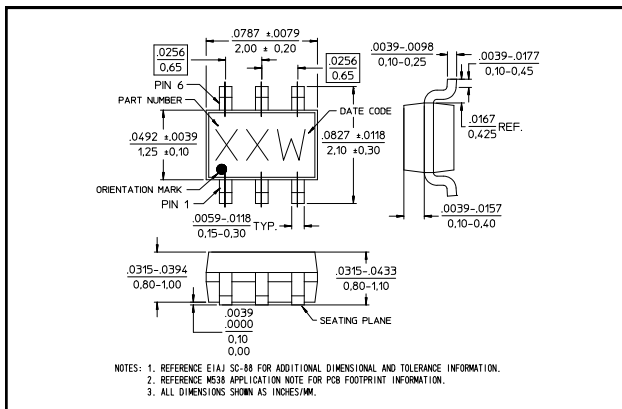
S11, S22



Gate Lag (R_{ON} vs. Time) Including V_{CTL} , 0-3 V Step



Lead-Free SC-70 (SOT-363)[†]



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

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