

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.

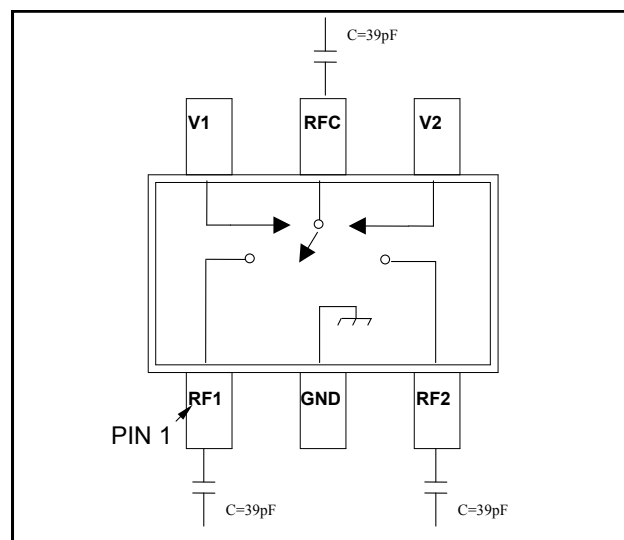
The MASWSS0192 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

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

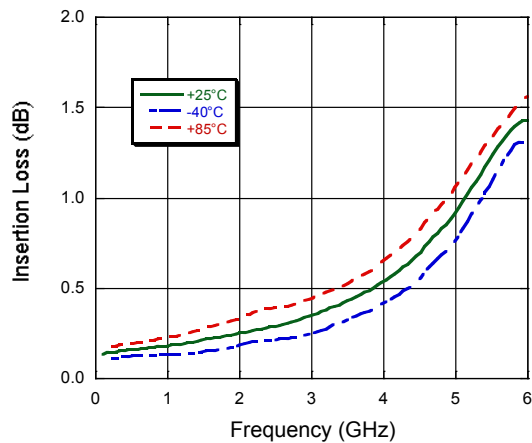
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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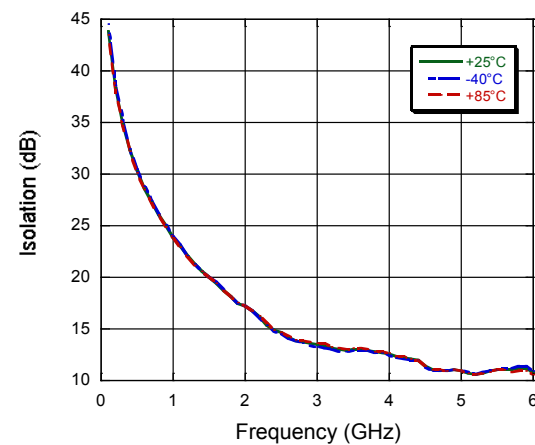
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Typical Performance Curves

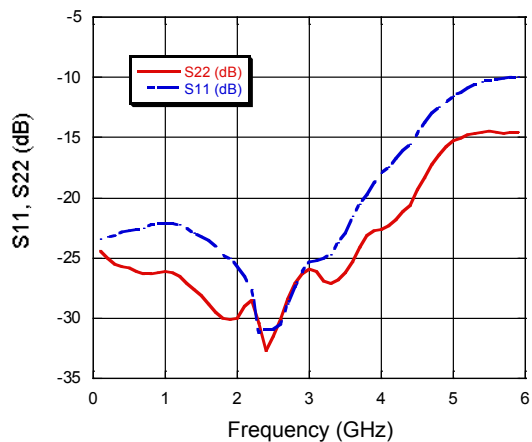
Insertion Loss



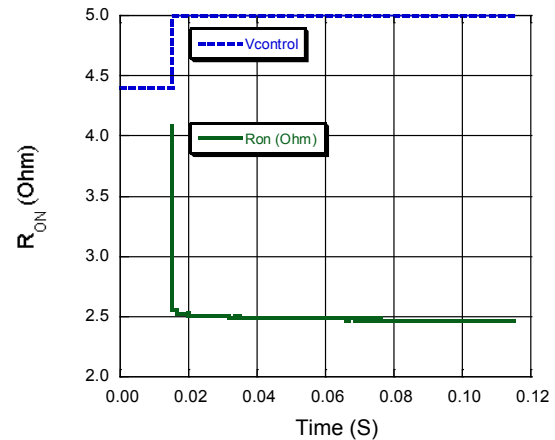
Isolation



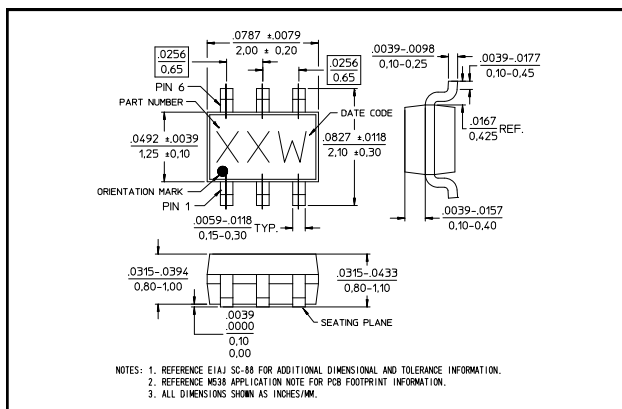
S11, S22



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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