

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.

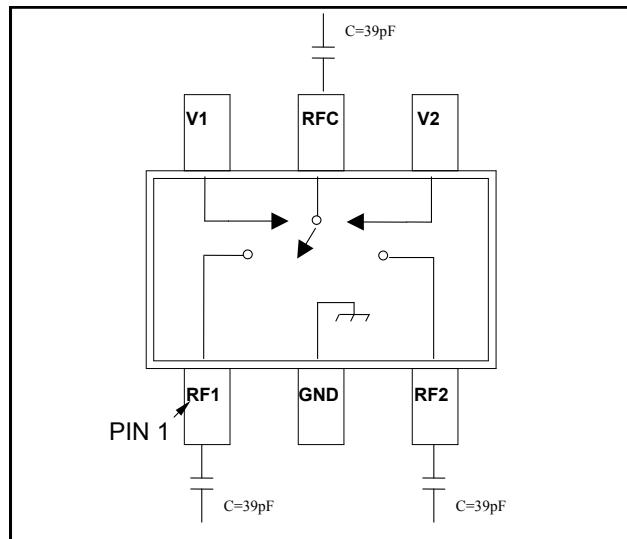
The MASWSS0192 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

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	+25 dBm
5.0 V Control	+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.

**GaAs SPDT Switch
DC - 3.0 GHz**

Rev. V1

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 DC - 3.0 GHz	dB dB	— —	0.18 0.35	0.40 0.60
Isolation	DC - 1.0 GHz DC - 3.0 GHz	dB dB	20.0 9.5	24.0 13.5	— —
VSWR	DC - 1.0 GHz DC - 3.0 GHz	Ratio Ratio	— —	1.1:1 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	$V_C = 0.2 \text{ V} / 2.7 \text{ V}$ $V_C = 0.2 \text{ V} / 3.0 \text{ V}$	dBm dBm	— —	27.5 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

4. 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.
5. For positive voltage control, external DC blocking capacitors are required on all RF ports.
6. 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

7. Differential voltage, V (state 1) - V (state 0), must be 2.5 V minimum, but must not exceed 8.5 V.
8. $0 = 0 \text{ V}$ to 0.5 V ; $1 = 2.5 \text{ V}$ to 5 V or $0 = -5 \text{ V}$ 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

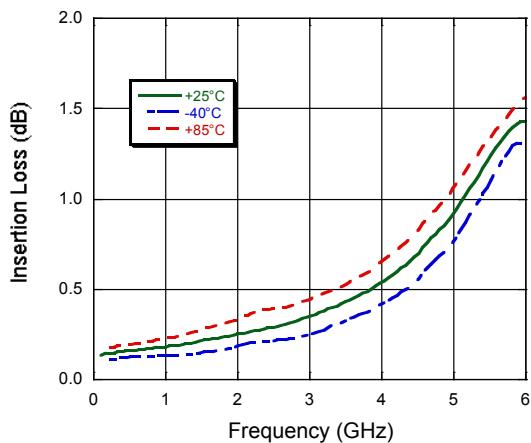
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

GaAs SPDT Switch DC - 3.0 GHz

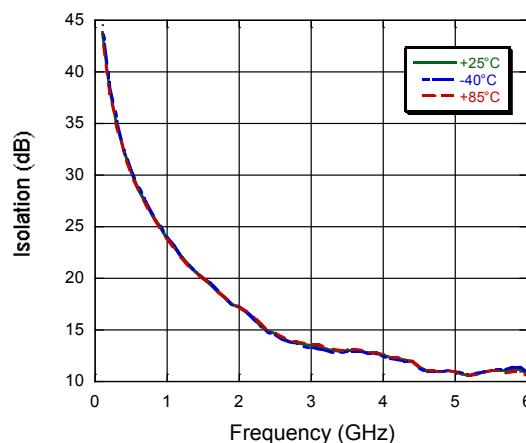
Rev. V1

Typical Performance Curves

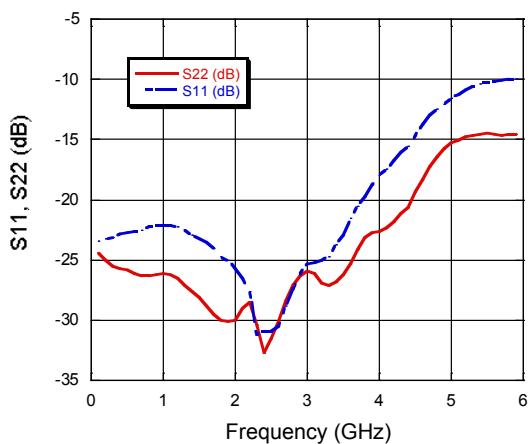
Insertion Loss



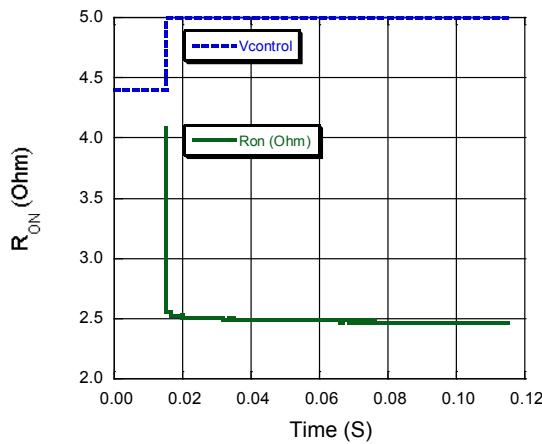
Isolation



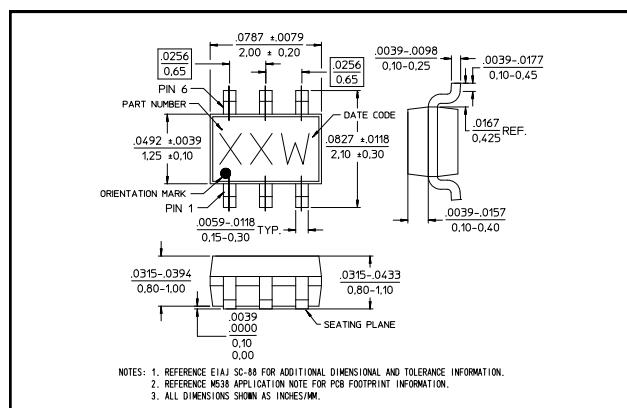
S11, S22



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.

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.