

GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch DC - 2.5 GHz

Rev. V1

Features

- Ideal for CATV, DTV, DVR, STB Applications
- Default-On in Unpowered State (RFC-RF1 Path)
- Broadband Performance: DC-2.5 GHz
- Low Insertion Loss: 1.1 dB at 1 GHz
- High Isolation: > 60dB @ 100MHz
- Single Control Operation
- Power Handling: > 20 dBm P1dB
- Lead-Free 3 mm 12-lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible
- Configurable for Non-terminated Operation

Description

M/A-COM’s MASWSS0201 is a broadband GaAs PHEMT MMIC SPDT terminated switch in a low cost, lead-free 3 mm 12-lead PQFN package. The MASWSS0201 is ideally suited for applications where an unpowered on state is critical in a single control line SPDT terminated switch. The unpowered condition is the same as the $V_C = 0$ condition. This part can also be configured as a reflective switch with minimal impact to the RF performance.

The MASWSS0201 delivers high isolation, low insertion loss and high linearity up to 2.5 GHz.

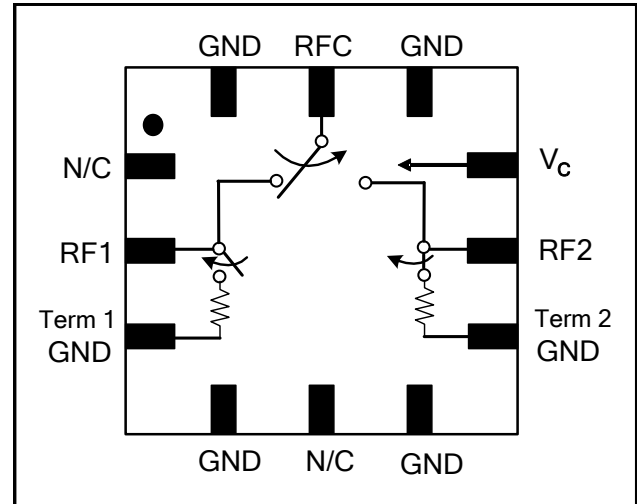
The MASWSS0201 is fabricated using a 0.5 micron gate length GaAs E/D PHEMT process. The process features full passivation for performance and reliability.

Ordering Information ¹

Part Number	Package
MASWSS0201TR-3000	3000 piece reel
MASWSS0201SMB	Sample Test Board (Includes 5 Samples)

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration ²

Pin No.	Pin Name	Description
1	N/C	No Connection
2	RF1	RF Port 1
3	Term 1 GND ³	Termination 1 Ground
4	GND	Ground
5	N/C	No Connection
6	GND	Ground
7	Term 2 GND ³	Termination 2 Ground
8	RF2	RF Port 2
9	VC	Control
10	GND	Ground
11	RFC	RF Input
12	GND	Ground
13	Paddle ⁴	RF and DC Ground

2. M/A-COM recommends that all unused (N/C) pins be connected to ground. All data on this datasheet was taken with N/C pins connected to ground.

3. Terminated grounds require DC blocking capacitors; see application schematic.

4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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

GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch DC - 2.5 GHz

Rev. V1

Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 75 \Omega$, $V_C = 0 \text{ V}/3 \text{ V}$, $P_{IN} = 0 \text{ dBm}$ ⁵

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss RFC to RF1 ($V_C = 0\text{V}$)	100 MHz	dB	—	0.9	1.75
	1.0 GHz	dB	—	1.0	1.85
	2.0 GHz	dB	—	1.3	—
Insertion Loss RFC to RF2 ($V_C = 3\text{V}$)	100 MHz	dB	—	1.0	1.65
	1.0 GHz	dB	—	1.2	1.85
	2.0 GHz	dB	—	1.5	—
Isolation	100 MHz	dB	60	65	—
	1.0 GHz	dB	40	45	—
	2.0 GHz (RFC - RF1)	dB	—	38	—
	2.0 GHz (RFC - RF2)	dB	—	43	—
Return Loss	DC - 2.0 GHz	dB	—	25	—
IIP2 ($V_C = 0\text{V} / 3\text{V} / 5\text{V}$)	Two Tone, +5 dBm/Tone, 10 MHz Spacing	dBm	—	54 / 51 / 53	—
	100 MHz				
IIP3 ($V_C = 0\text{V} / 3\text{V} / 5\text{V}$)	Two Tone, +5 dBm/Tone, 10 MHz Spacing	dBm	—	38 / 38 / 39	—
	1.0 GHz				
Input P1dB ($V_C = 0\text{V} / 3\text{V} / 5\text{V}$)	100 MHz	dBm	—	21 / 21 / 22	—
	1.0 GHz				
T-rise	10% to 90% RF	μS	—	1.4	—
T-fall	90% to 10% RF	nS	—	12	—
Ton	50% control to 90% RF	μS	—	1.6	—
Toff	50% control to 10% RF	nS	—	12	—
Transients	—	mV	—	550	—
Control Current	$V_C = 3\text{V}$	μA	—	250	500

5. Electrical specifications apply to terminated configuration only.

Absolute Maximum Ratings ^{6,7}

Parameter	Absolute Maximum
Input Power @ 100 MHz	+22 dBm
Input Power @ 1 GHz	+29 dBm
Operating Voltage	+8.5 volts
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

6. Exceeding any one or combination of these limits may cause permanent damage to this device.
7. M/A-COM does not recommend sustained operation near these survivability limits.

Truth Table ^{8,9,10}

Control V_C	RFC-RF1	RFC-RF2
0	On	Off
1	Off	On

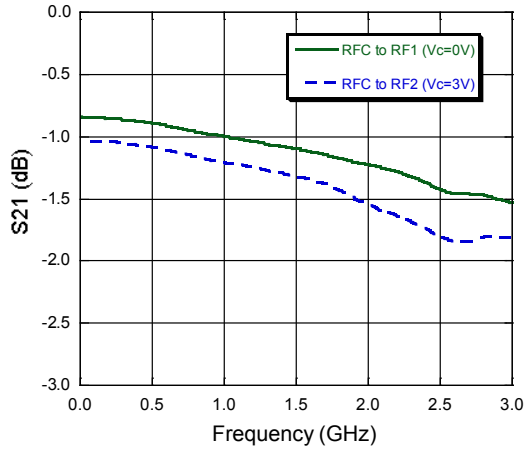
8. External DC blocking capacitors are required on all RF ports.
9. 0 = $0 \pm 0.1 \text{ V}$, 1 = +2.9 V to +5 V.
10. The unpowered on state is the same as $V_C=0$.

GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch DC - 2.5 GHz

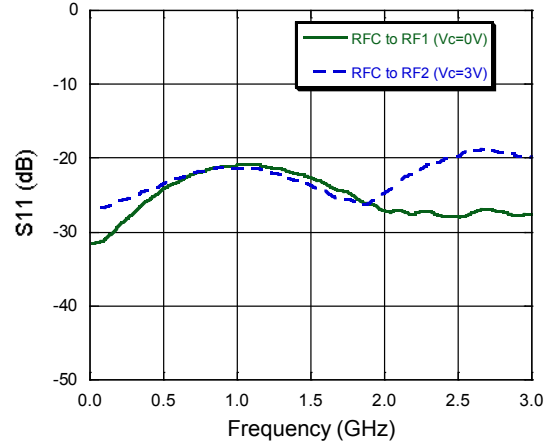
Rev. V1

Typical Performance Curves: $T_A = 25^\circ\text{C}$, $Z_0 = 75 \Omega$, Components per Application Schematic

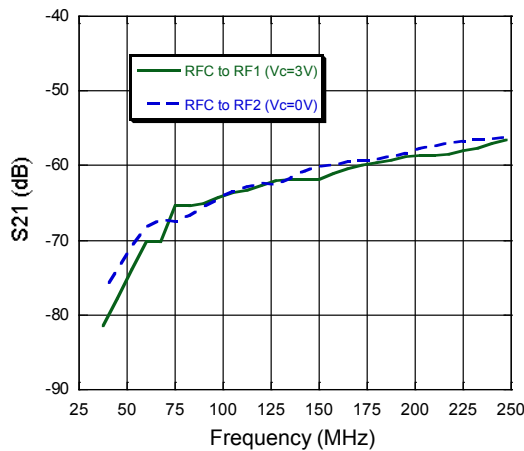
Insertion Loss



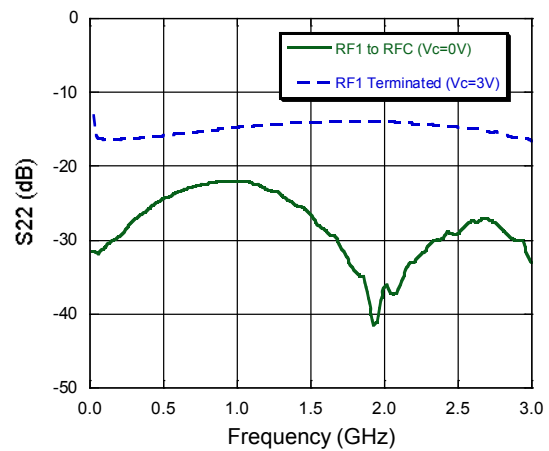
RFC Return Loss



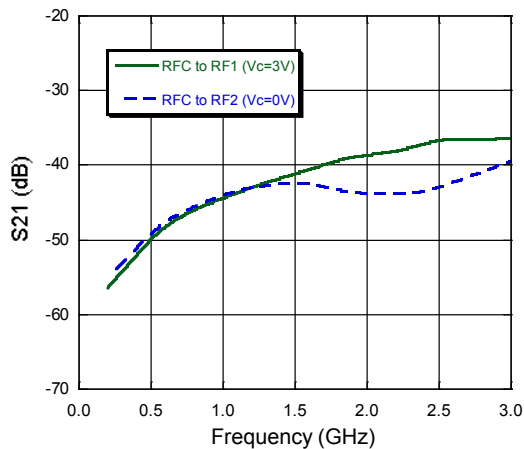
Isolation (Below 200 MHz)



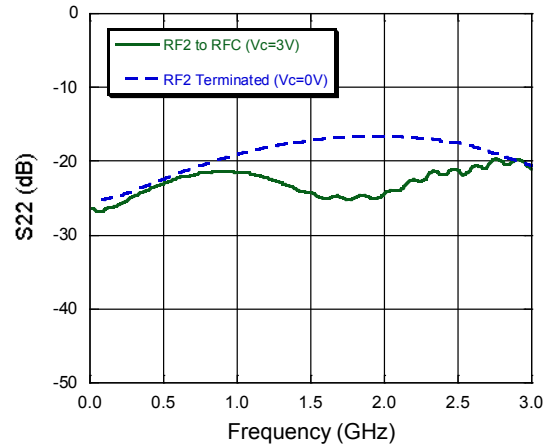
RF1 Return Loss



Isolation (Above 200 MHz)



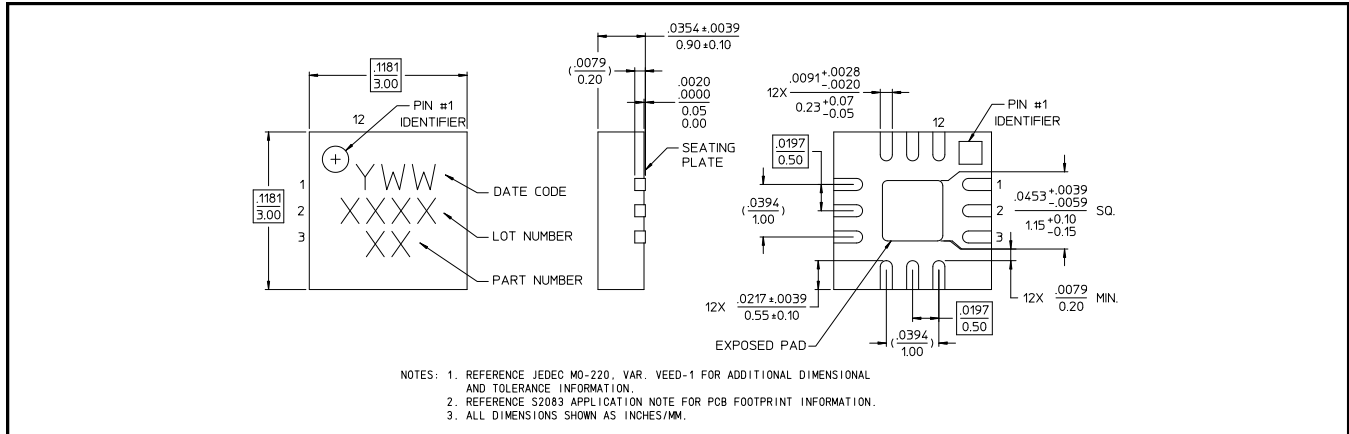
RF2 Return Loss



GaAs Broadband 75 Ohm Default-On, SPDT Terminated Switch DC - 2.5 GHz

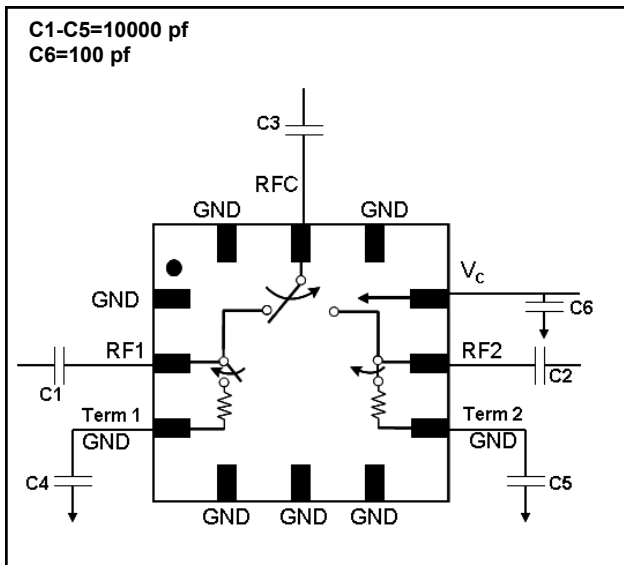
Rev. V1

Lead-Free 3 mm 12-lead PQFN†



† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

Application Schematic ^{11,12}



11. Non-connected pins (P1 and P5) are shown connected to ground as recommended. All data on this datasheet was taken with N/C pins connected to ground.
12. Application schematic shown is for terminated configuration. For non-terminated operation Term 1 and Term 2 ground pins are left open. See application section for data in unterminated configuration.

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.

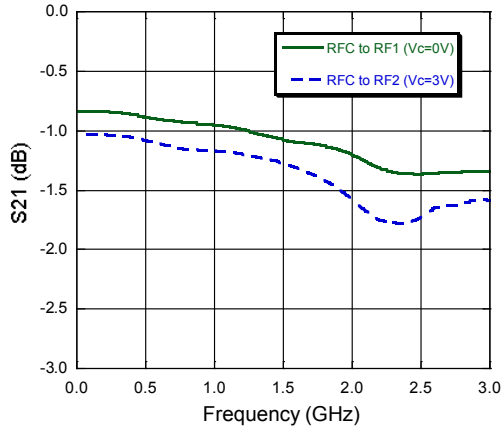
M/A-COM's AN3007 Application Note outlines a method for ESD sensitivity mitigation. It can be found at the Tech/Apps section of the MACOM.COM website.

Application Section

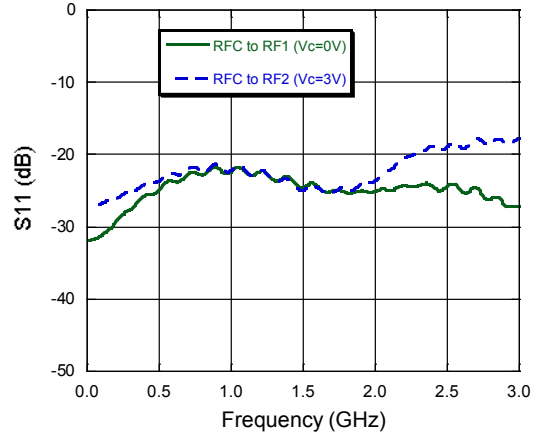
Typical Performance Curves:

$T_A = 25^\circ\text{C}$, $Z_0 = 75 \Omega$, Unterminated Configuration (Term 1&2 GND pins open)

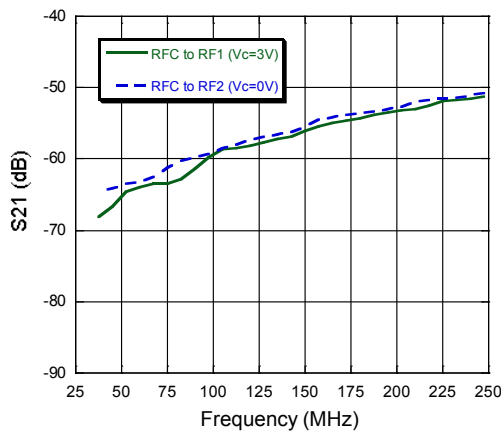
Insertion Loss



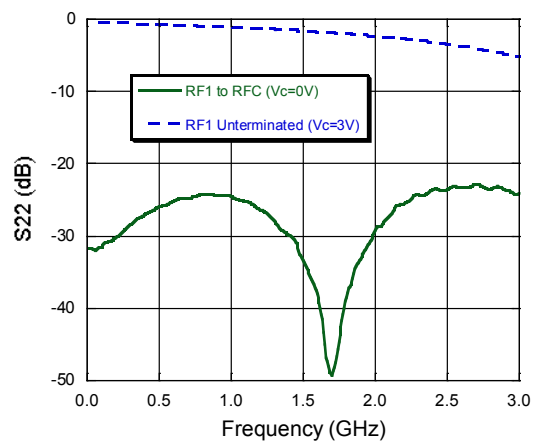
RFC Return Loss



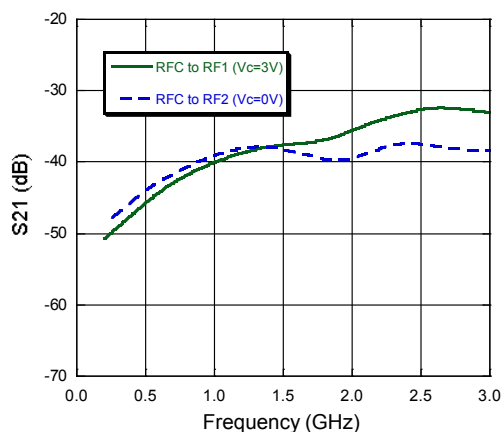
Isolation (Below 200 MHz)



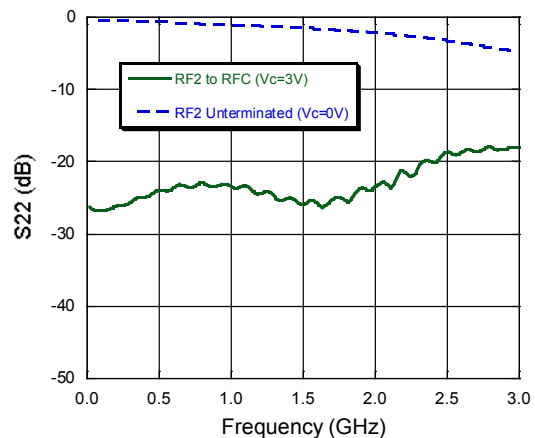
RF1 Return Loss



Isolation (Above 200 MHz)

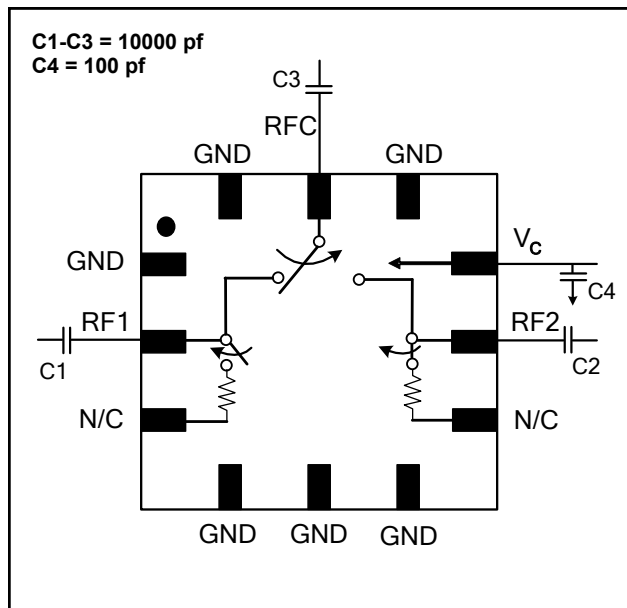


RF2 Return Loss



Application Section

Application Schematic – Unterminated Configuration



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 estoppel 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.

7

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.