

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.

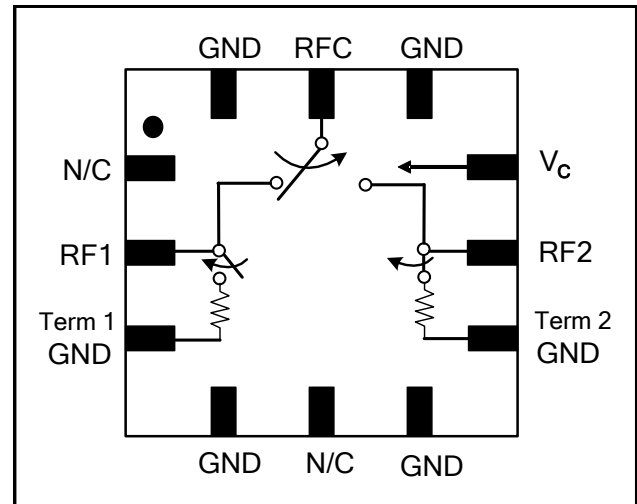
The MASWSS0201 is fabricated using a 0.5 micron gate length GaAs E/D PHEMT process. The process features full passivation for performance and reliability.

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.

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 75\ \Omega$, $V_C = 0\ \text{V}/3\ \text{V}$, $P_{\text{IN}} = 0\ \text{dBm}$ 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 | dBm | — | 72 / 70 / 70 | — |
| IIP3 ($V_C = 0\text{V} / 3\text{V} / 5\text{V}$) | Two Tone, +5 dBm/Tone, 10 MHz Spacing | dBm | — | 38 / 38 / 39 | — |
| | 100 MHz | dBm | — | 41 / 44 / 44 | — |
| Input P1dB ($V_C = 0\text{V} / 3\text{V} / 5\text{V}$) | 100 MHz | dBm | — | 21 / 21 / 22 | — |
| | 1.0 GHz | dBm | — | 29 / 28 / 29 | — |
| 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 | — |
| | 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 |

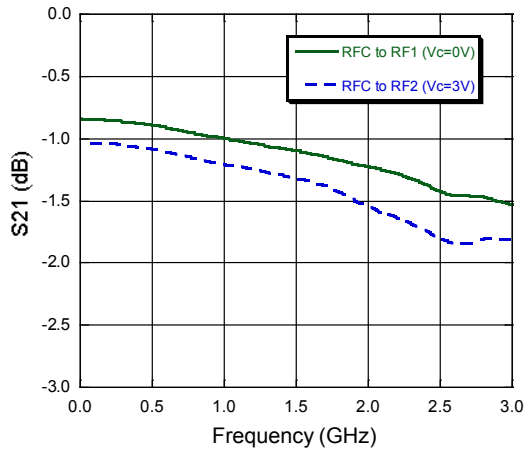
8. External DC blocking capacitors are required on all RF ports.
9. 0 = $0 \pm 0.1\ \text{V}$, 1 = +2.9 V to +5 V.
10. The unpowered on state is the same as $V_C = 0$.

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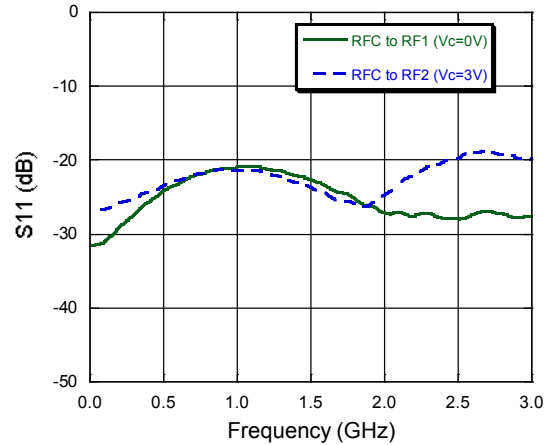
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Typical Performance Curves: $T_A = 25^\circ\text{C}$, $Z_0 = 75\ \Omega$, Components per Application Schematic

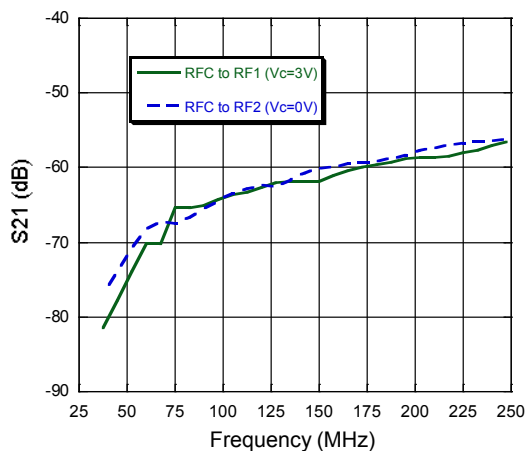
Insertion Loss



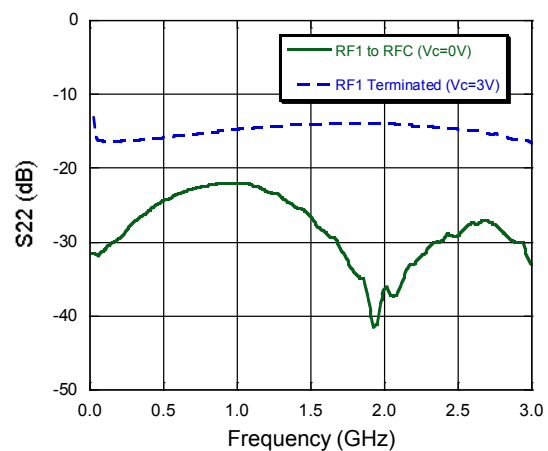
RFC Return Loss



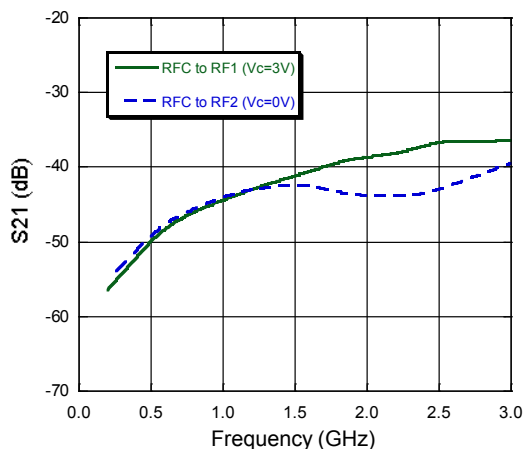
Isolation (Below 200 MHz)



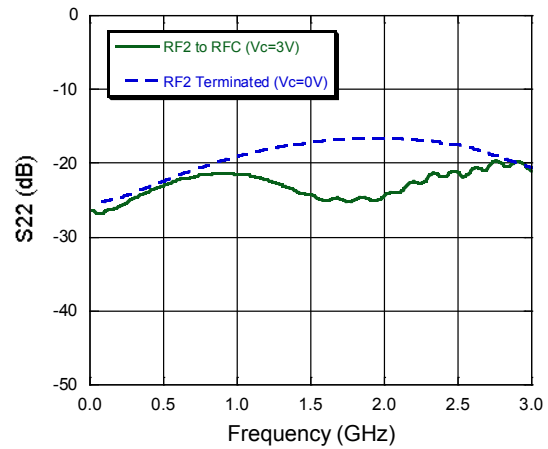
RF1 Return Loss



Isolation (Above 200 MHz)



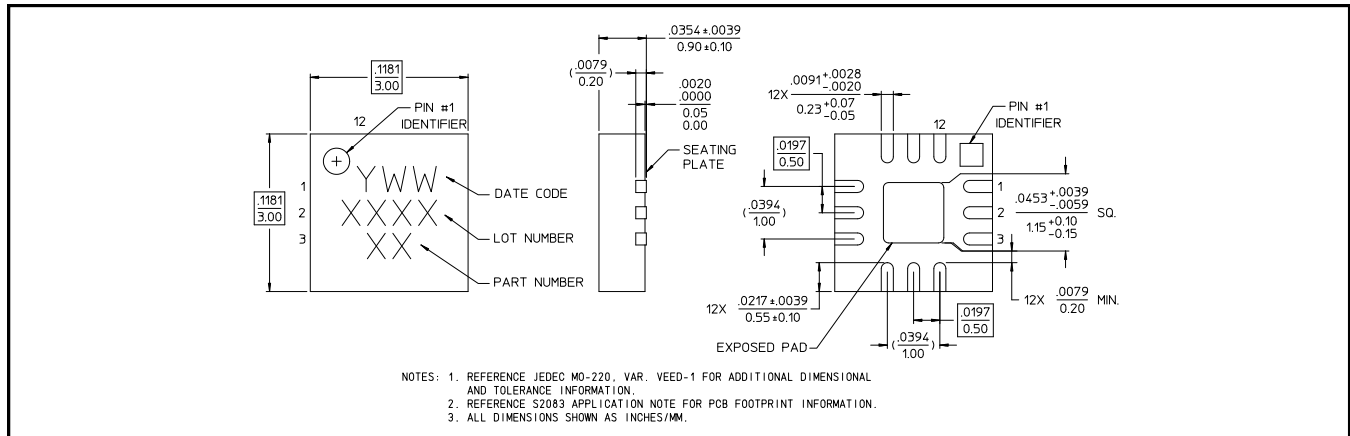
RF2 Return Loss



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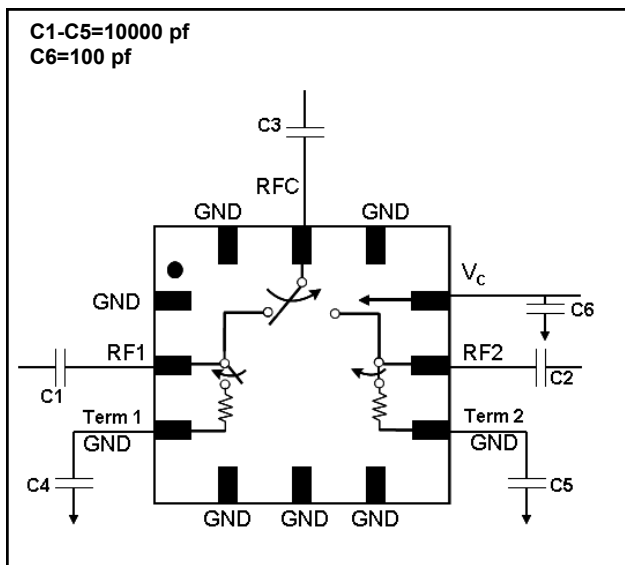
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Lead-Free 3 mm 12-lead PQFN[†]



† 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.

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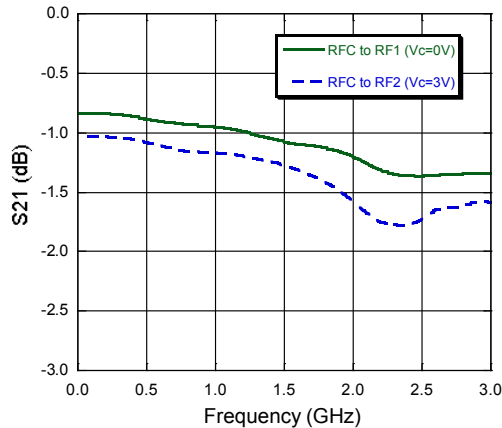
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Application Section

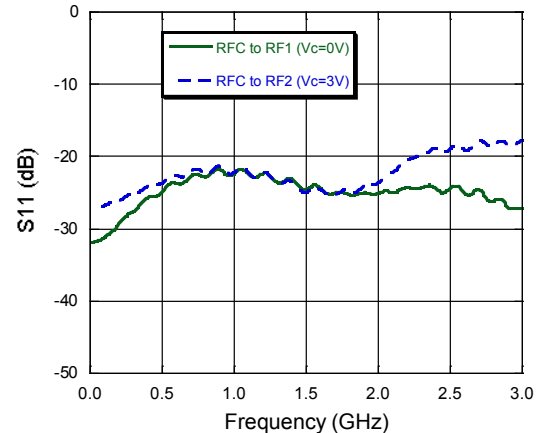
Typical Performance Curves:

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

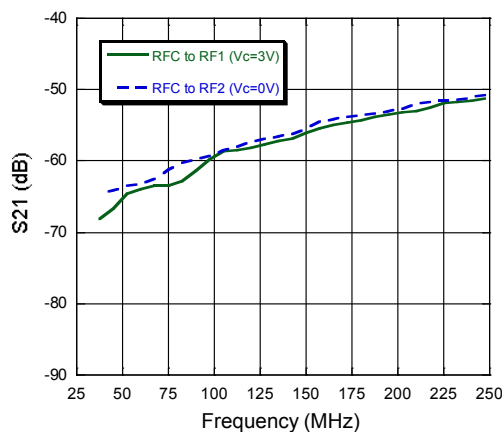
Insertion Loss



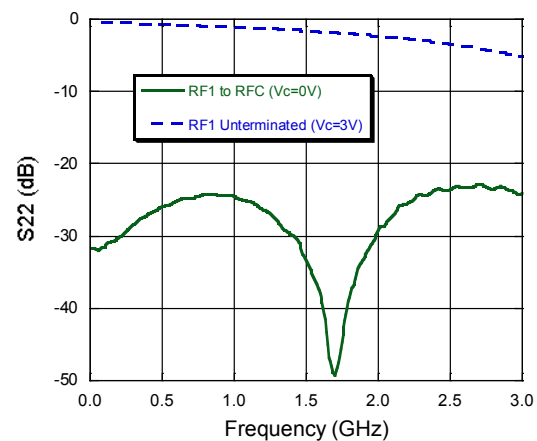
RFC Return Loss



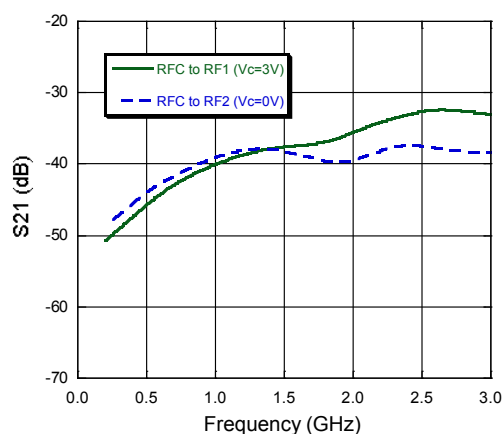
Isolation (Below 200 MHz)



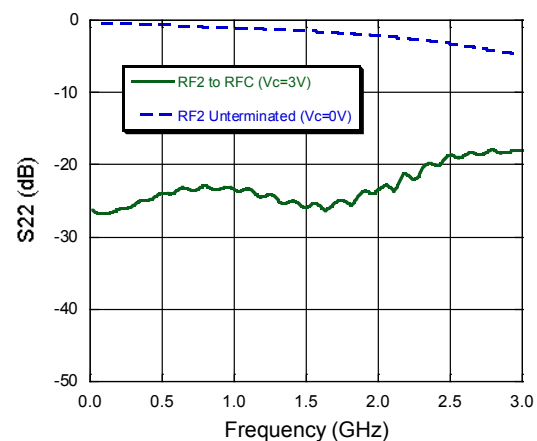
RF1 Return Loss



Isolation (Above 200 MHz)

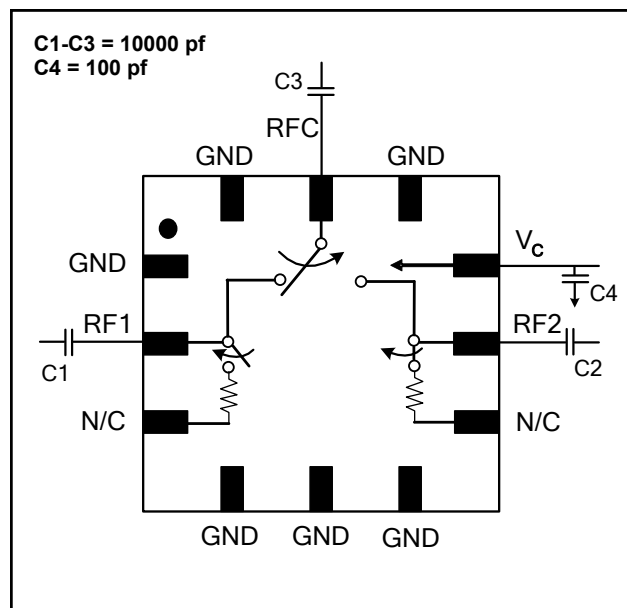


RF2 Return Loss



Application Section

Application Schematic – Unterminated Configuration



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