

Features

- 75 Ω Terminations RF1 / RF2
- Positive Voltage Control
- High Isolation: 90 dB @ 216 MHz
- Low Insertion Loss: 1.4 dB @ 2200 MHz
- Lead-Free 3 mm 16-Lead PQFN Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MASW-009101 is a single pole double throw (SPDT) switch in a lead-free 3 mm 16-lead PQFN package. It meets FCC 15.115 specification of 80 dB isolation between RF1 and RF2 at 216 MHz during powered and un-powered states. The default on un-powered state provides a low insertion loss path from RFC to RF1 while maintaining high isolation between RF2 and RFC/RF1.

This device is ideally suited for applications where low control voltage, high isolation, small size and low cost are required.

Typical applications are to replace mechanical relays in CATV and satellite systems. This part can be used in all 75 Ω systems operating up to 3 GHz.

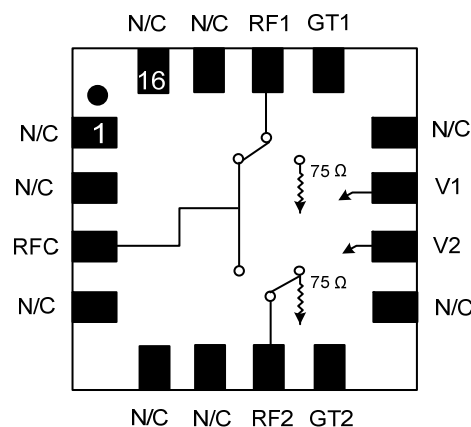
The MASW-009101 is fabricated using a GaAs pHEMT process. The process features full passivation for performance and reliability.

Ordering Information ^{1,2}

| Part Number | Package |
|--------------------|-----------------|
| MASW-009101-TR3000 | 3000 piece reel |
| MASW-009101-001SMB | Sample Board |

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

Functional Schematic**



** Default On path shown

Pin Configuration ³

| Pin No. | Pin Name | Description |
|---------|------------------|-------------------|
| 1 | N/C | No Connection |
| 2 | N/C | No Connection |
| 3 | RFC | RF Common Port |
| 4 | N/C | No Connection |
| 5 | N/C | No Connection |
| 6 | N/C | No Connection |
| 7 | RF2 | RF Port 2 |
| 8 | GT2 | RF Termination |
| 9 | N/C | No Connection |
| 10 | V2 | Control Voltage 2 |
| 11 | V1 | Control Voltage 1 |
| 12 | N/C | No Connection |
| 13 | GT1 | RF Termination |
| 14 | RF1 | RF Port 1 |
| 15 | N/C | No Connection |
| 16 | N/C | No Connection |
| 17 | PAD ³ | RF and DC Ground |

3. 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.

SPDT Default On High Isolation CATV Switch 5 – 3000 MHz

Rev. V3

Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V} / 3\text{ V}$, $Z_0 = 75\ \Omega^4$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---------------------------|--|---------------|----------------|--------------------------|------|
| Insertion Loss RF1 to RFC | 50 MHz 220 MHz 1000 MHz 2200 MHz | dB | — | 0.5 0.6 0.8 1.0 | 1.4 |
| Insertion Loss RF2 to RFC | 50 MHz 220 MHz 1000 MHz 2200 MHz | dB | — | 0.8 0.9 1.2 1.4 | 1.9 |
| Isolation RFC-RF1/RF2 | 50 MHz 220 MHz 1000 MHz 2200 MHz | dB | 52 47 | 80 70 55 50 | — |
| Isolation RF1-RF2 | 50 MHz 220 MHz 1000 MHz 2200 MHz | dB | 80 60 47 | 95 95 70 50 | — |
| Return Loss | 50 MHz 220 MHz 1000 MHz 2200 MHz | dB | — | 25 20 15 13 | — |
| Input P1dB (RF1/RF2) | 1000 MHz | dBm | — | 28/18 | — |
| IIP3 (RF1/RF2) | 2 tone, 5 dBm/tone, 6MHz spacing, 1000 MHz | dBm | — | 40/37 | — |
| IIP2 (RF1/RF2) | 2 tone, 5 dBm/tone, 6MHz spacing, 1000 MHz | dBm | — | 58/53 | — |
| CSO (RF1/RF2) | 132 channels, 18 dBmV / channel in | dBc | — | -80/-70 | — |
| CTB (RF1/RF2) | 132 channels, 18 dBmV / channel in | dBc | — | -85/-85 | — |
| Trise, Tfall | 10% to 90% RF, 90% to 10% RF | ns | — | 16 | — |
| Ton, Toff | 50% control to 90% RF, 50% control to 10% RF | ns | — | 120 | — |
| Transients | In Band | mV | — | 80 | — |
| Control Current | $ V_C = 3.0\text{ V}$ | μA | — | 500 | 600 |

Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 75\ \Omega^4$, Unpowered Operation

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---------------------------|---|-------|----------|----------------------|------|
| Insertion Loss RF1 to RFC | 2200 MHz | dB | — | — | 1.4 |
| Isolation RF1-RF2 | 50 MHz 220 MHz 1000 MHz 2200 MHz | dB | 60 47 | 90 90 70 50 | — |
| CSO / CTB | 132 channels, 18 dBmV / channel in | dBc | — | -80/-80 | — |

4. External 0.1 μF DC blocking capacitors are required on all RF In/Out and RF ground ports. See Application Schematic.

SPDT Default On High Isolation CATV Switch 5 – 3000 MHz

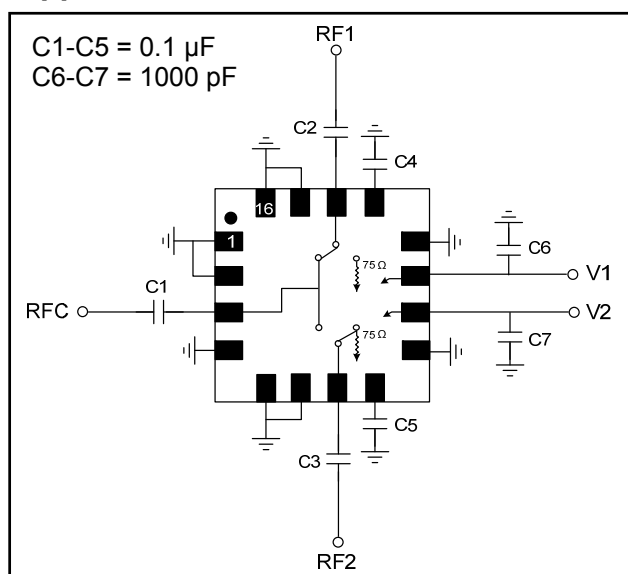
Rev. V3

Truth Table ⁵

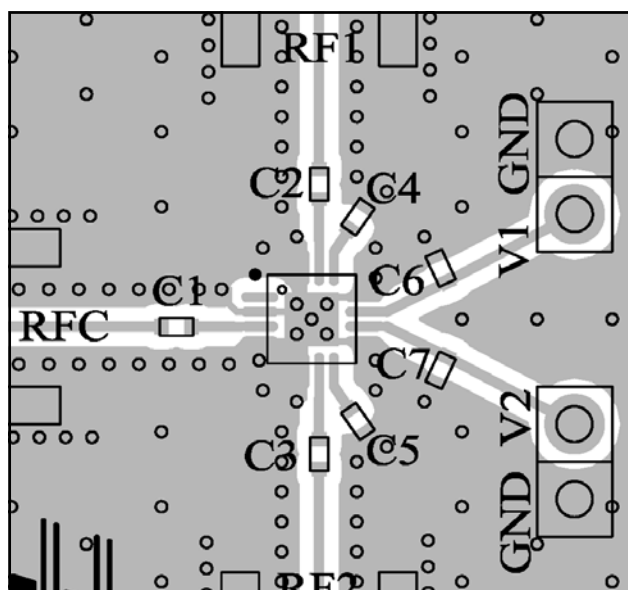
| V1 | V2 | RFC - RF1 | RFC - RF2 |
|----|----|-----------|-----------|
| 0 | 0 | On | Off |
| 1 | 0 | On | Off |
| 0 | 1 | Off | On |

5. Powered Operation: 1 = +3 to +5 V, 0 = 0 ± 0.2 V.
Unpowered Operation: V1 = V2 = 0 V, |V1-V2| ≤ 0.1 V.

Application Schematic



Recommended PCB



Absolute Maximum Ratings ^{6,7}

| Parameter | Absolute Maximum |
|--|------------------|
| Input Power (5 - 3000 MHz, 3 V Control) | +29 dBm |
| Operating Voltage | +8.5 volts |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |

- Exceeding any one or combination of these limits may cause permanent damage.
- M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.

Off-Chip Component Values

| Component | Value | Package |
|-----------|---------|---------|
| C1-C5 | 0.1 μF | 0402 |
| C6-C7 | 1000 pF | 0402 |

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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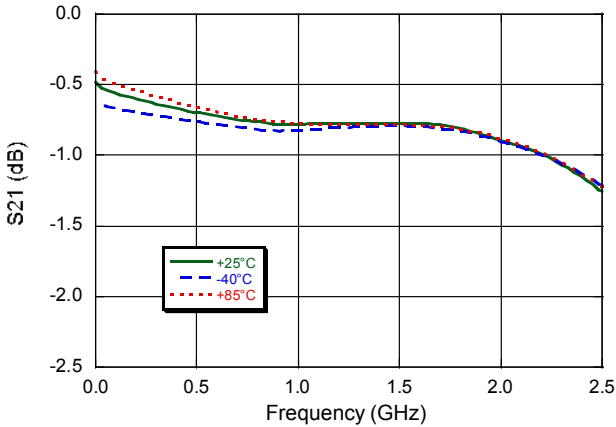
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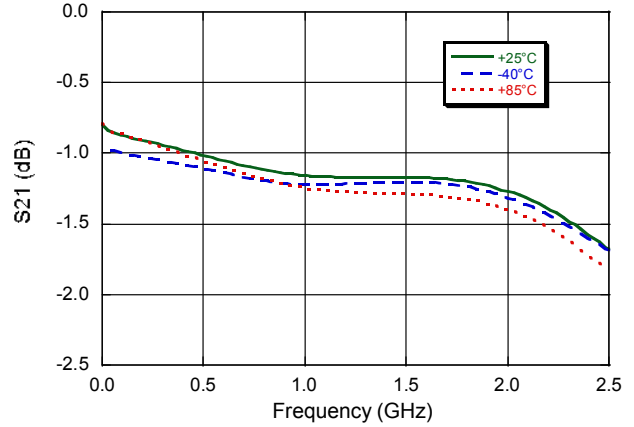
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Typical Performance Curves: Powered State

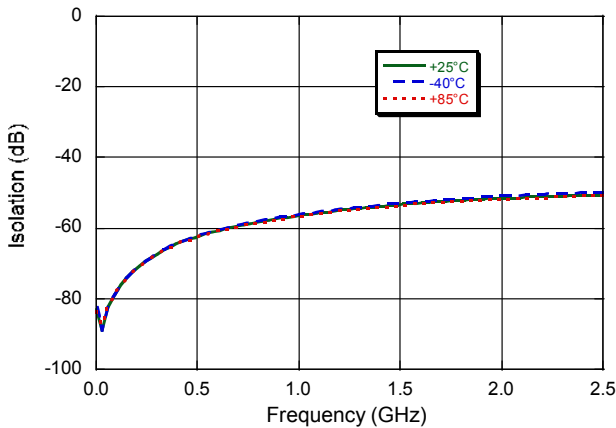
Insertion Loss, RFC to RF1



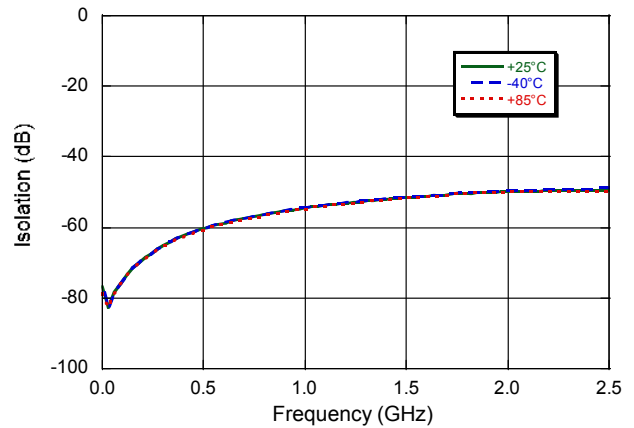
Insertion Loss, RFC to RF2



Isolation, RFC to RF1

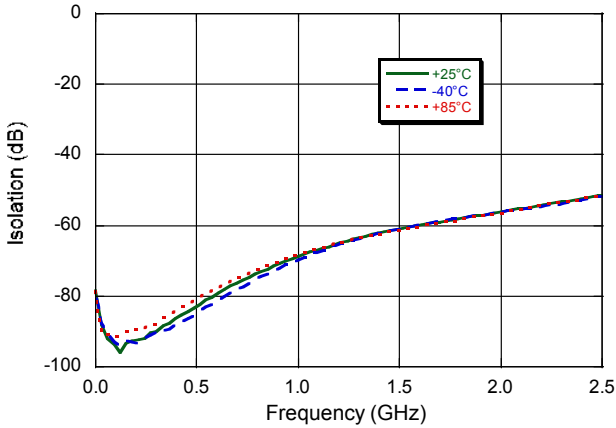


Isolation, RFC to RF2

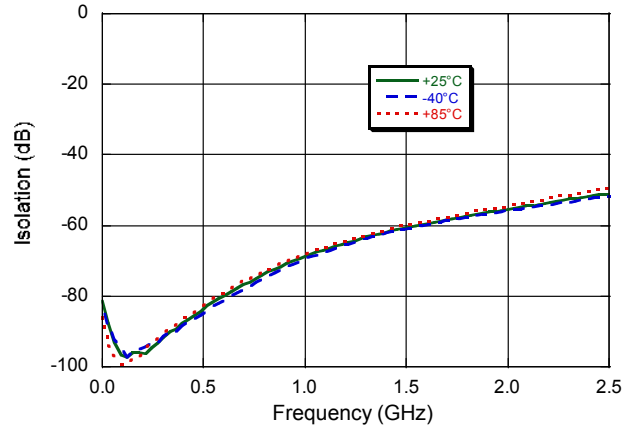


Typical Performance Curves: Powered State

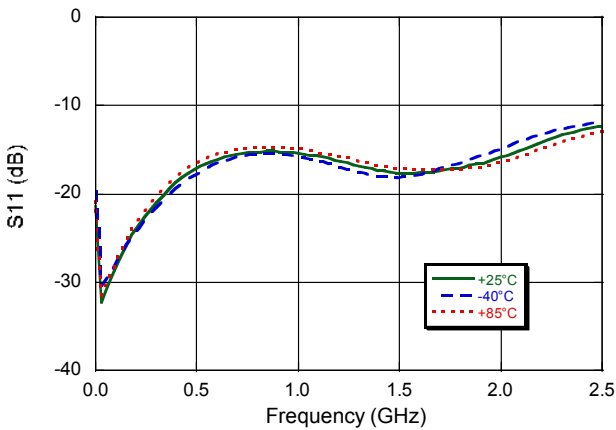
Isolation, RF1 to RF2 (RFC to RF1 State)



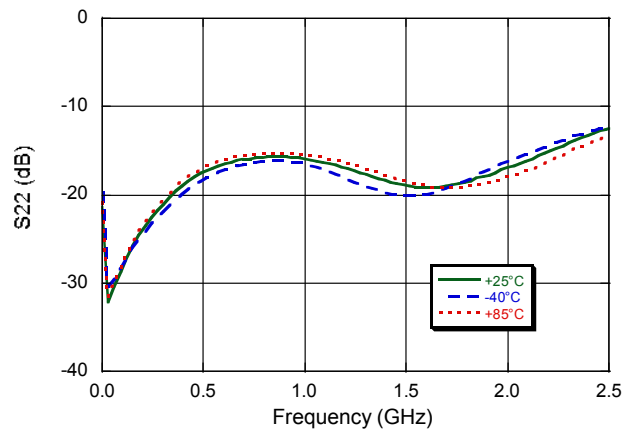
Isolation, RF1 to RF2 (RFC to RF2 State)



Input Return Loss, RFC

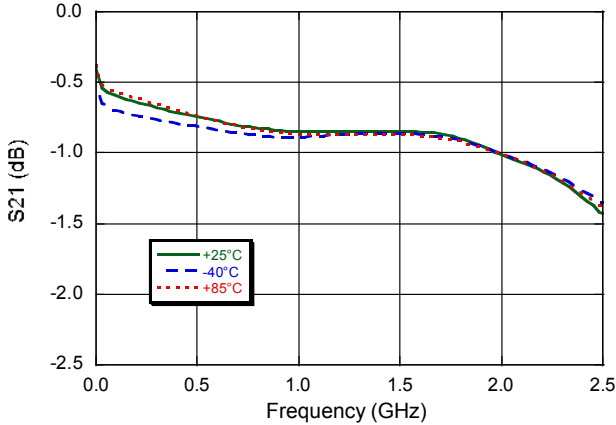


Output Return Loss, RF1/RF2

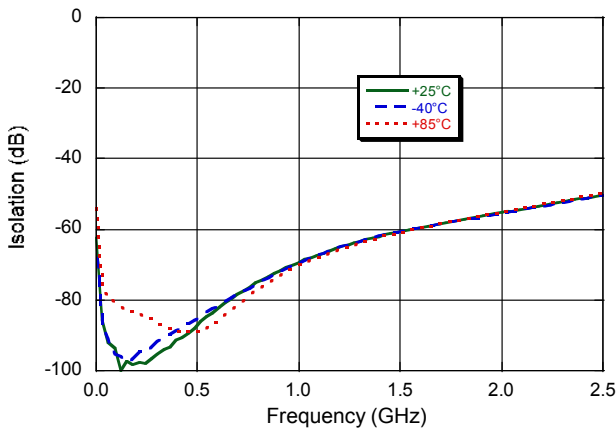


Typical Performance Curves: Unpowered State

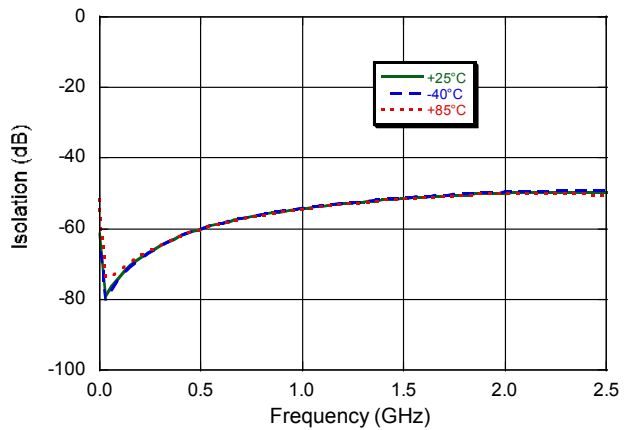
Insertion Loss, RFC to RF1 (unpowered state)



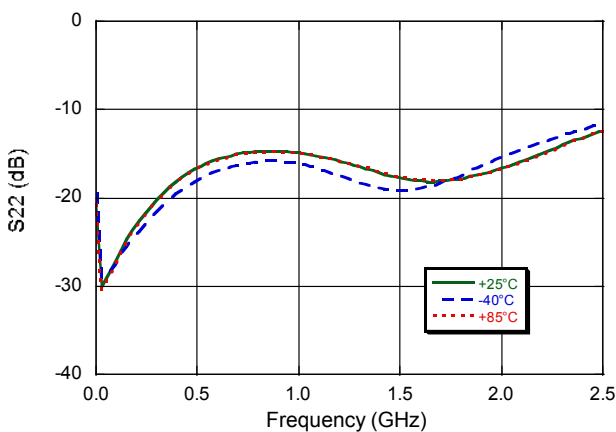
Isolation, RF1 to RF2 (RFC to RF1 unpowered state)



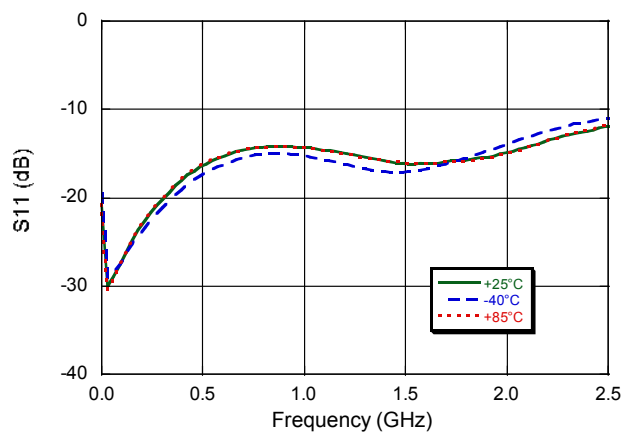
Isolation, RFC to RF2 (unpowered state)



Output Return Loss, RF1/RF2 (unpowered state)



Input Return Loss, RFC (unpowered state)



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