

SPDT High Isolation CATV and Satellite Communications Switch, 5 – 3000 MHz

Rev. V1

Features

- 75 Ω Impedance
- Input Terminated
- Positive Voltage Control
- High Isolation: 50 dB at 2500 MHz
- 0.5 micron GaAs pHEMT Process
- Achieve 80 dB isolation at 216 MHz
- Lead-Free 3 mm 16-Lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MASW-008801 is a GaAs pHEMT MMIC single pole double throw (SPDT) switch in a lead-free 3 mm 16-lead PQFN package. The MASW-008801 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.

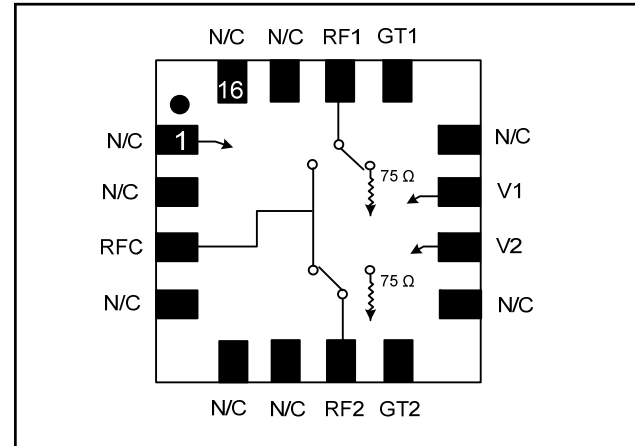
The MASW-008801 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

Ordering Information ^{1,2}

| Part Number | Package |
|--------------------|-----------------|
| MASW-008801-TR3000 | 3000 piece reel |
| MASW-008801-001SMB | Sample Board |

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

Functional Schematic



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 Ground |
| 9 | N/C | No Connection |
| 10 | V2 | Vcontrol 2 |
| 11 | V1 | Vcontrol 1 |
| 12 | N/C | No Connection |
| 13 | GT1 | RF Ground |
| 14 | RF1 | RF Port 1 |
| 15 | N/C | No Connection |
| 16 | N/C | No Connection |

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.

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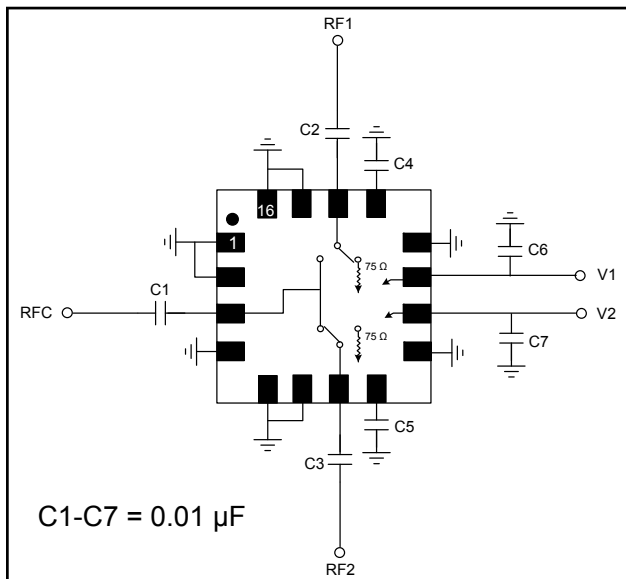
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Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 75 \Omega^4$, $V_C = 0 \text{ V} / 2.9 \text{ V}$, $P_{IN} = 5 \text{ dBm}$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|--------------------------|--|---------------|------|------|------|
| Insertion Loss | 216 MHz | dB | — | 0.6 | — |
| | 550 MHz | dB | — | 0.65 | — |
| | 810 MHz | dB | — | 0.7 | — |
| | 1000 MHz | dB | — | 0.75 | — |
| | 2200 MHz | dB | — | 0.85 | — |
| | 2500 MHz | dB | — | 0.9 | 1.2 |
| | 3000 MHz | dB | — | 1 | — |
| Isolation RFC-RF1,RF2 | 216 MHz | dB | 65 | 69 | — |
| | 550 MHz | dB | — | 61 | — |
| | 810 MHz | dB | — | 58 | — |
| | 1000 MHz | dB | 52 | 56 | — |
| | 2200 MHz | dB | — | 52 | — |
| | 2500 MHz | dB | 50 | 54 | — |
| | 3000 MHz | dB | — | 56 | — |
| Isolation RF1-RF2 | 216 MHz | dB | 80 | 85 | — |
| | 550 MHz | dB | — | 83 | — |
| | 810 MHz | dB | — | 74 | — |
| | 1000 MHz | dB | 70 | 72 | — |
| Return Loss (on-state) | 5 - 1000 MHz | dB | — | 14 | — |
| | 5 - 2500 MHz | dB | — | 12 | — |
| Return Loss (off-state) | 5 - 1000 MHz | dB | — | 18 | — |
| | 5 - 2500 MHz | dB | — | 18 | — |
| Input P1dB | 1000 MHz | dBm | — | 24 | — |
| IIP3 | 2 tone, 5 dBm/tone, 6MHz spacing, f1 & f2 = 988 & 994 MHz | dBm | — | 47 | — |
| IIP2 | 2 tone, 5 dBm/tone, 6MHz spacing, f1 & f2 = 988 & 994 MHz | dBm | — | 90 | — |
| CSO | 132 channels, 18 dBmV/channel at the input | dBm | — | 80 | — |
| CTB | 132 channels, 18 dBmV/channel at the input | dBm | — | 80 | — |
| 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 | — | 8 | — |
| Transients | In Band | mV | — | 70 | — |
| Control Current | $ V_C = 2.9 \text{ V}$ | μA | — | 5 | 10 |

4. External 0.01 μF DC blocking capacitors are required on all RF In/Out and RF ground ports. See Application Schematic.

Application Schematic



Truth Table ⁷

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

7. 1 = +2.9 to +5 V, 0 = 0 \pm 0.2 V.

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.

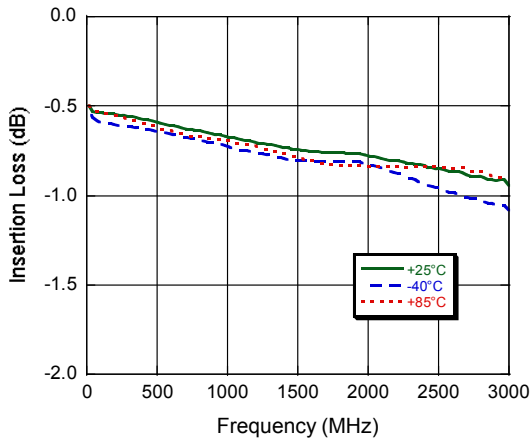
Absolute Maximum Ratings ^{5,6}

| Parameter | Absolute Maximum |
|--|------------------|
| Input Power (5 - 3000 MHz, 2.9 V Control) | +32 dBm |
| Operating Voltage | +8.5 volts |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |

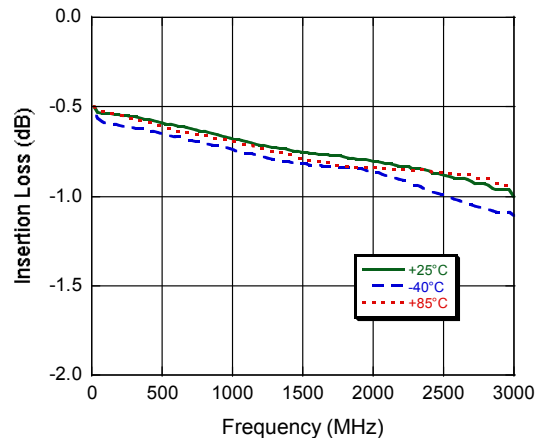
- Exceeding any one or combination of these limits may cause permanent damage.
- Tyco Electronics does not recommend sustained operation near these survivability limits.

Typical Performance Curves

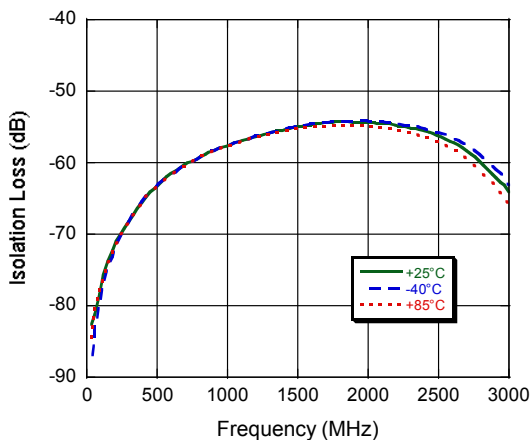
Insertion Loss RFC - RF1



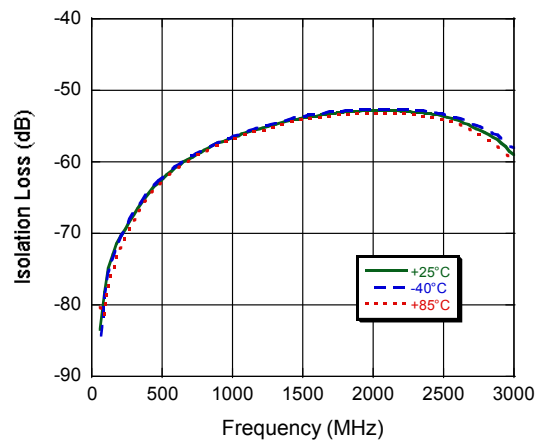
Insertion Loss RFC - RF2



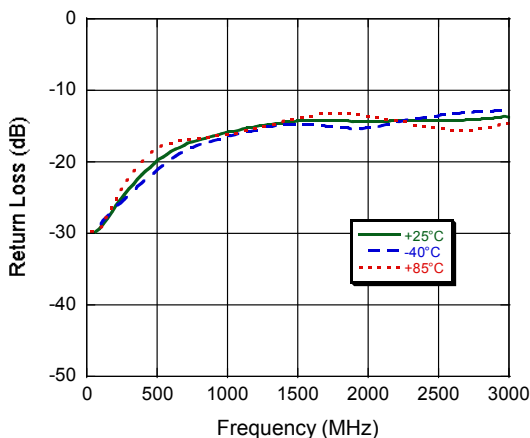
Isolation RFC - RF1



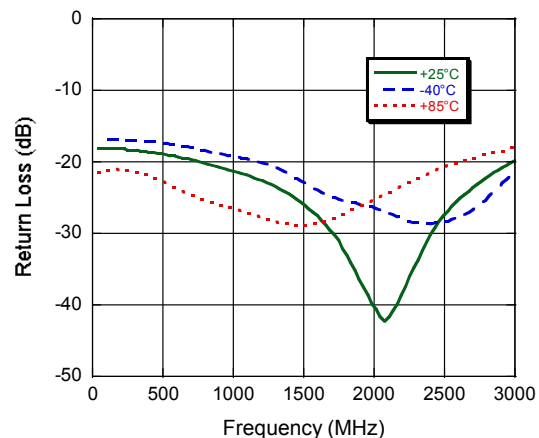
Isolation RFC - RF2



Return Loss On-state match



Return Loss Off-state match



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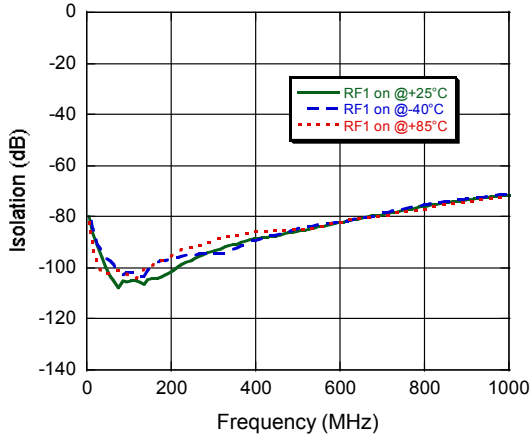
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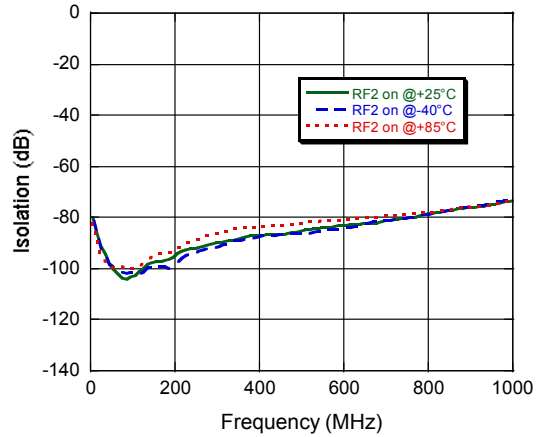
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Typical Performance Curves

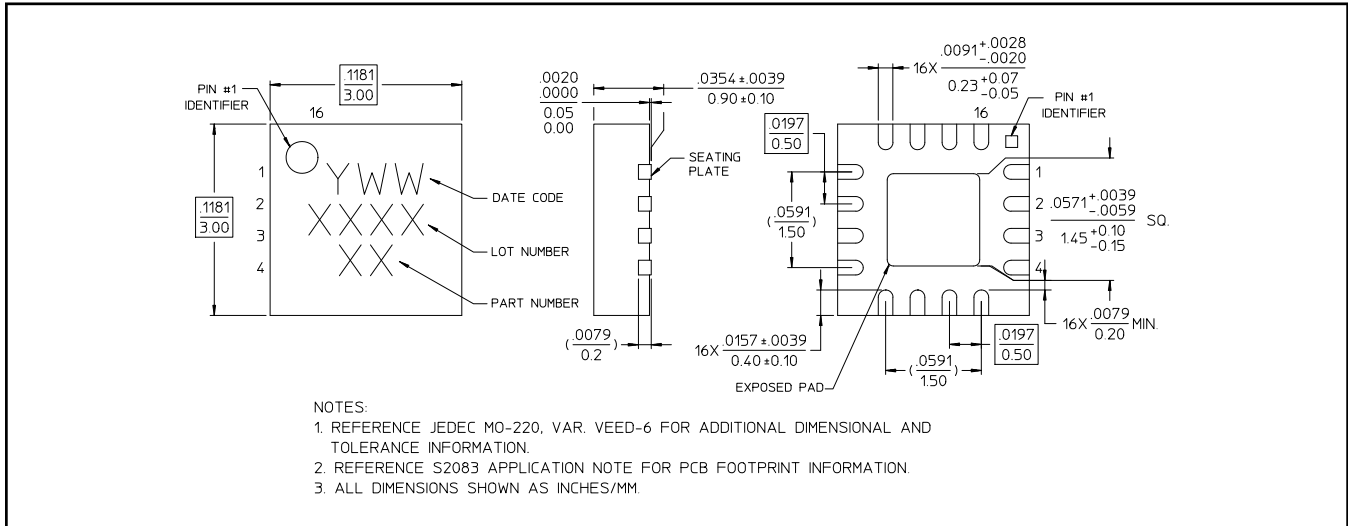
Isolation RF1 to RF2 (RF1 on)



Isolation RF1 to RF2 (RF2 on)



Lead-Free 3 mm 16-Lead PQFN[†]



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