

SP5T High Isolation Terminated Switch 0.01 - 4.0 GHz

Rev. V1

Features

- Isolation: 51 dB @ 2.1 GHz
- Insertion Loss: 1.0 dB @ 2.1 GHz
- Input IP3: 50 dBm Typical @ 2.1 GHz
- Integral CMOS 3:5 Decoder, Only 3 Control Pins
- Low Gate Lag for timing sensitive applications
- 6 States: 5 ON paths and All-Off State
- 50 Ω Terminated Outputs (Off-State)
- Lead-Free 4 mm 24-Lead PQFN package
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MASW-010351 is an industry leading high isolation single pole five throw (SP5T) switch. This device design is optimized to take advantage of separate GaAs pHEMT switch die and CMOS driver die. The switch circuit design is symmetric and combined with the separate CMOS decoder allows it to maintain an excellent combination of insertion loss and isolation for all states. This makes the device ideal for band switching in multi-channel and multi-mode base-station applications as well as other applications where a compact, high isolation, SP5T switch is required.

The MASW-010351 switch die is fabricated using a mature 0.5 micron gate length GaAs pHEMT process and features full passivation for enhanced performance and reliability.

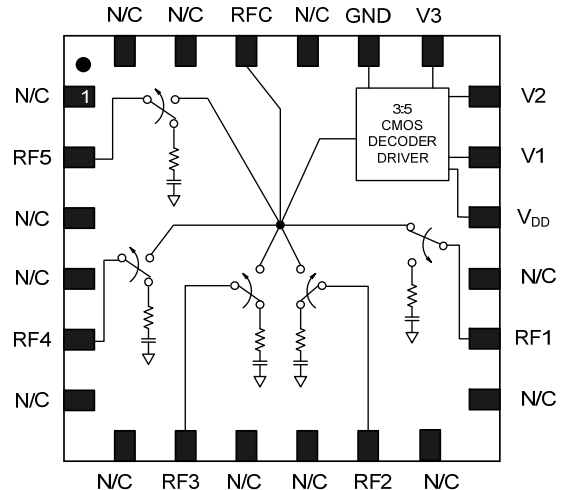
The MASW-010351 is offered in an industry standard lead-free 4mm 24-Lead PQFN RoHS compliant plastic package, which is ideal for high volume surface mount reflow assembly.

Ordering Information ^{1,2}

| Part Number | Package |
|--------------------|-------------------|
| MASW-010351-TR3000 | 3000 piece reel |
| MASW-010351-001SMB | Sample Test Board |

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

Functional Schematic



Pin Configuration ^{3,4}

| Pin No. | Description | Pin No. | Description |
|---------|---------------|---------|-----------------|
| 1 | No Connection | 13 | No Connection |
| 2 | RF5 | 14 | RF1 |
| 3 | No Connection | 15 | No Connection |
| 4 | No Connection | 16 | V _{DD} |
| 5 | RF4 | 17 | V1 Control |
| 6 | No Connection | 18 | V2 Control |
| 7 | No Connection | 19 | V3 Control |
| 8 | RF3 | 20 | Ground |
| 9 | No Connection | 21 | No Connection |
| 10 | No Connection | 22 | RFC |
| 11 | RF2 | 23 | No Connection |
| 12 | No Connection | 24 | No Connection |
| | | 25 | Ground (paddle) |

3. M/A-COM Technology Solutions recommends connecting all N/C pins to RF and DC ground in the PCB layout.
4. The exposed pad centered on the package bottom (P25) MUST be connected to RF and DC ground in the PCB layout.

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

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Electrical Specifications ⁵: $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$, $V_{DD} = +3.0\text{V}$, $V_C = 0\text{V} / +3.0\text{V}$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|-------------------------------|--|---------------|------|------|------|
| Insertion Loss (All Paths) | 0.9 GHz | dB | — | 0.8 | — |
| | 2.1 GHz | | | 1.0 | 1.2 |
| | 2.6 GHz | | | 1.6 | — |
| | 4.0 GHz | | | 1.9 | — |
| Isolation | RFC-RF1, 2.1 GHz | dB | 55 | 60 | — |
| | RFC-RF2, 2.1 GHz | | 52 | 55 | |
| | RFC-RF3, 2.1 GHz | | 51 | 54 | |
| | RFC-RF4, 2.1 GHz | | 48 | 51 | |
| | RFC-RF5, 2.1 GHz | | 48 | 51 | |
| Return Loss (All RF ports) | 2.1 GHz | dB | — | 14 | — |
| Input IP3 | Two Tone, +10 dBm/tone, 5 MHz Spacing, 2.1 GHz | dBm | — | 50 | — |
| Input P1dB | 2.1 GHz | dBm | — | 27 | — |
| Trise, Tfall | 10% to 90% RF, 90% to 10% RF, RF=2.1GHz | ns | — | 20 | — |
| Ton, Toff | 50% control to 90% RF, and 50% control to 10% RF, RF=2.1GHz | ns | — | 40 | — |
| I_{DD} | $V_{DD} = +3.0\text{V}$ | μA | — | 1.0 | — |
| Control Current | $V_C = 0\text{V} / +3.0\text{V}$ | μA | — | 1.0 | 5.0 |

5. External DC blocking capacitors are required on all RF ports. Typical performance specifications are with 1000 pF blocking and decoupling capacitors, as shown on the application schematic.

Absolute Maximum Ratings ^{6,7}

| Parameter | Absolute Maximum |
|-------------------------------------|---|
| Input Power (RFC Port, ON state) | +20 dBm (0.05 - 0.5 GHz) +30 dBm (0.5 - 4.0 GHz) |
| V_{DD} Supply | -0.5 V to +7.0 V |
| Control Voltage | -0.5 V < V_C < $V_{DD} + 0.5$ V (V_C not to exceed 7.0 V) |
| 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 Technology Solutions does not recommend sustained operation near these survivability limits.

Truth Table ⁸

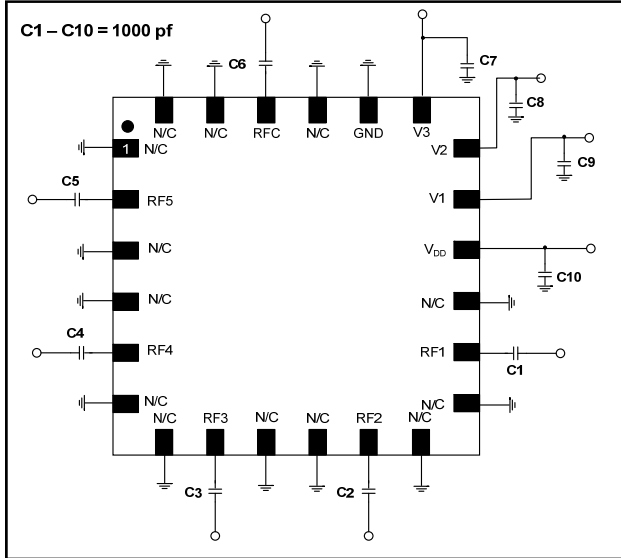
| V1 | V2 | V3 | RFC-RF1 | RFC-RF2 | RFC-RF3 | RFC-RF4 | RFC-RF5 |
|----|----|----|-------------|---------|---------|---------|---------|
| 0 | 0 | 0 | Unsupported | | | | |
| 1 | 0 | 0 | On | Off | Off | Off | Off |
| 0 | 1 | 0 | Off | On | Off | Off | Off |
| 1 | 1 | 0 | Off | Off | On | Off | Off |
| 0 | 0 | 1 | Off | Off | Off | On | Off |
| 1 | 0 | 1 | Off | Off | Off | Off | On |
| 0 | 1 | 1 | Off | Off | Off | Off | Off |
| 1 | 1 | 1 | Off | Off | Off | Off | Off |

8. Positive Control: 1 = $0.7 \cdot V_{DD}$ to V_{DD}
0 = 0 V to $0.3 \cdot V_{DD}$

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Application Schematic^{9,10,11}



9. The exposed pad centered on the package bottom must be connected to ground for RF, DC and thermal considerations.
10. All blocking capacitors and decoupling capacitors = 1000 pF
11. M/A-COM Technology Solutions recommends connecting all N/C pins to RF and DC ground in the PCB layout as shown.

Handling Procedures

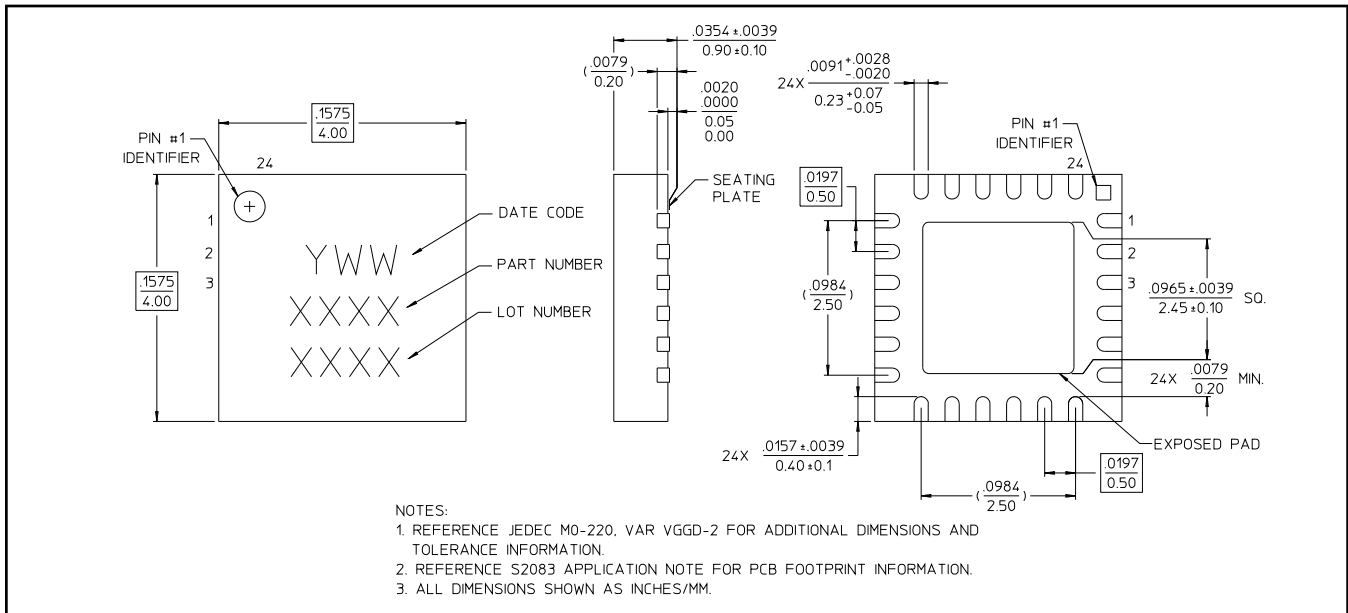
Please observe the following precautions to avoid damage:

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. An external protection circuit using ESD/Transient protection devices on the RF ports can be used to protect the IC if required in application.

Please reference application note AN3007 on <http://www.macomtech.com> for further detail.

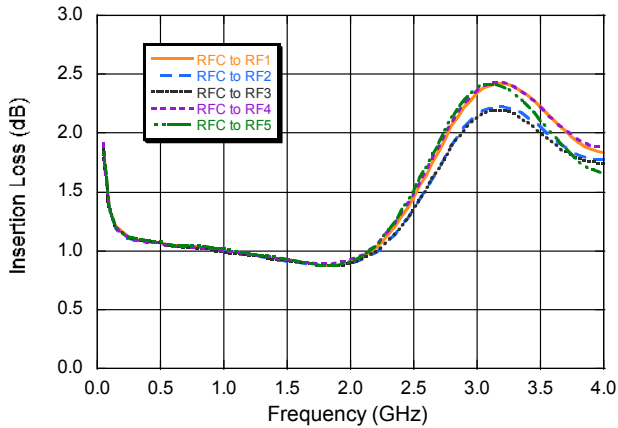
Lead-Free 4 mm 24-Lead PQFN[†]



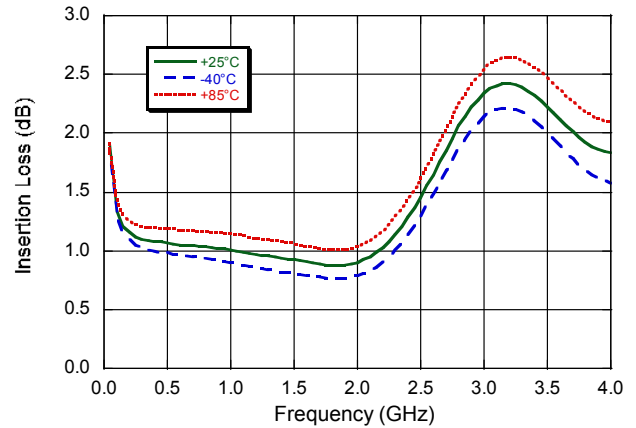
[†] Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

Typical Performance Curves:

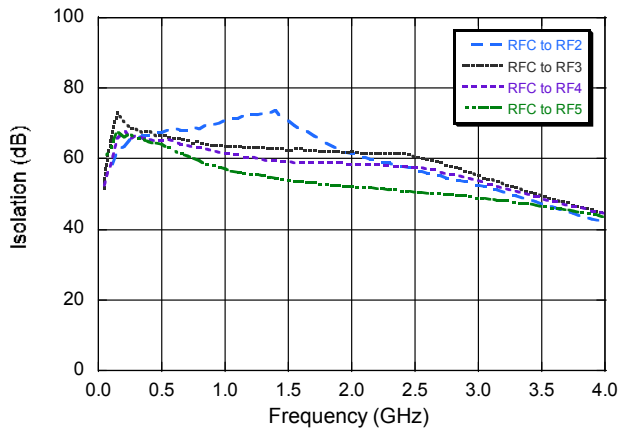
Insertion Loss



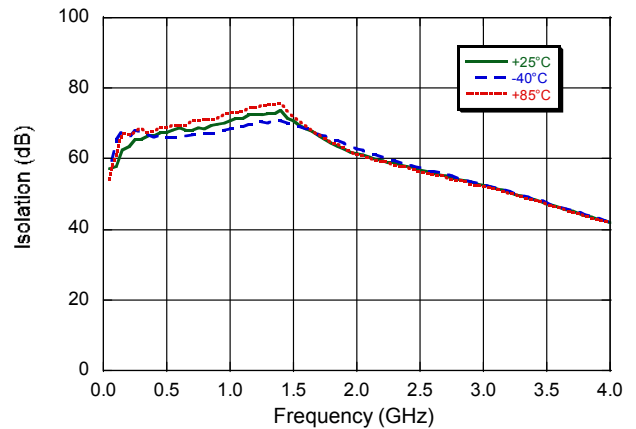
Insertion Loss



Isolation



Isolation RFC - RF1





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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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