

GaAs SPDT Switch DC - 3.0 GHz

Rev. V6

Features

- Insertion Loss: 0.3 dB @ 2.4 GHz
- Isolation: 22 dB @ 2.4 GHz
- Power Consumption: <math>< 5 \mu\text{A}</math> @ +2.3V
- Lead-Free SOT-363 Package
- Halogen-Free Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of SW-485

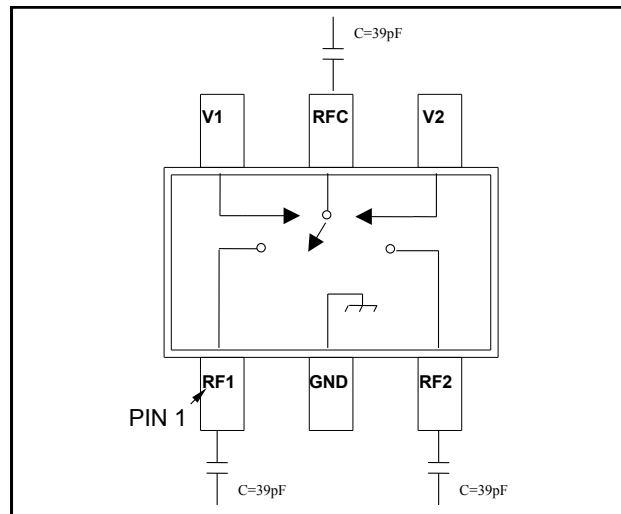
Description

M/A-COM's MASWSS0115 is a GaAs PHEMT MMIC single pole, double throw (SPDT) switch in a low cost, lead-free SC-70 (SOT-363) surface mount plastic package. The MASWSS0115 is ideally suited for applications where very small size and low cost are required.

Typical applications are dual band systems which require switching between small signal components such as filter banks, single-band LNAs, converters, etc. This part can be used for low power, low loss requirements in all systems operating up to 3 GHz, including PCS, GSM, DCS, Blue Tooth, and other receive chain applications.

The MASWSS0115 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Functional Schematic



Pin Configuration

| Pin No. | Function | Description |
|---------|----------|-------------|
| 1 | RF1 | RF Port 1 |
| 2 | GND | Ground |
| 3 | RF2 | RF Port 2 |
| 4 | V2 | Control 2 |
| 5 | RFC | RF Input |
| 6 | V1 | Control 1 |

Ordering Information^{1,2}

| Part Number | Package |
|-------------------|---|
| MASWSS0115 | Bulk packaging |
| MASWSS0115TR-3000 | 3000 piece reel |
| MASWSS0115SMB | Sample Board |
| MASWSS0115-DIE | Separated Die on Grip Ring ³ |

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

Absolute Maximum Ratings^{4,5}

| Parameter | Absolute Maximum |
|---|--------------------|
| Input Power (0.5 - 3.0 GHz) 2.5 V Control 5 V Control | +27 dBm +34 dBm |
| Voltage | ± 8.5 volts |
| Operating Temperature | -40 °C to +85 °C |
| Storage Temperature | -65 °C to +150 °C |

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

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

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V}/2.5\text{ V}$, $Z_0 = 50\ \Omega$ ⁶

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|-----------------------------|---|---------------|------|------|------|
| Insertion Loss ⁷ | DC - 1 GHz | dB | — | 0.25 | 0.40 |
| | 1 - 3 GHz | dB | — | 0.30 | 0.55 |
| Isolation | DC - 1 GHz | dB | 20 | 24 | — |
| | 1 - 3 GHz | dB | — | 22 | — |
| Return Loss | 0.05 - 3 GHz | dB | — | 20 | — |
| IP2 | Two Tone, +5 dBm/tone, 5 MHz Spacing, >50 MHz | dBm | — | 90 | — |
| IP3 | Two Tone, +5 dBm/tone, 5 MHz Spacing, >50 MHz | dBm | — | 46 | — |
| P1dB | $V_C = 0\text{ V}/2.5\text{ V}$ | dBm | — | 21 | — |
| | $V_C = 0\text{ V}/3.0\text{ V}$ | dBm | — | 25 | — |
| Trise, Tfall | 10% to 90% RF, 90% to 10% RF | ns | — | 35 | — |
| Ton, Toff | 50% control to 90% RF, 50% control to 10% RF | ns | — | 40 | — |
| Transients | In band | mV | — | 10 | — |
| Control Current | $V_C = 2.5\text{ V}$ | μA | — | 5 | 20 |

6. External DC blocking capacitors are required on all RF ports.

7. Insertion loss can be optimized by varying the DC blocking capacitor value, e.g. 1000 pF for 100 MHz - 1 GHz, 39 pF for 0.5 - 3 GHz.

Truth Table ^{8,9}

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

8. Differential voltage, $V(\text{state } 1) - V(\text{state } 0)$, must be +2.3 V minimum.

9. 0 = 0 V \pm 0.2 V, 1 = +2.3 V to 5.0 V

Qualification

Qualified to M/A-COM specification REL-201, Process Flow -2.

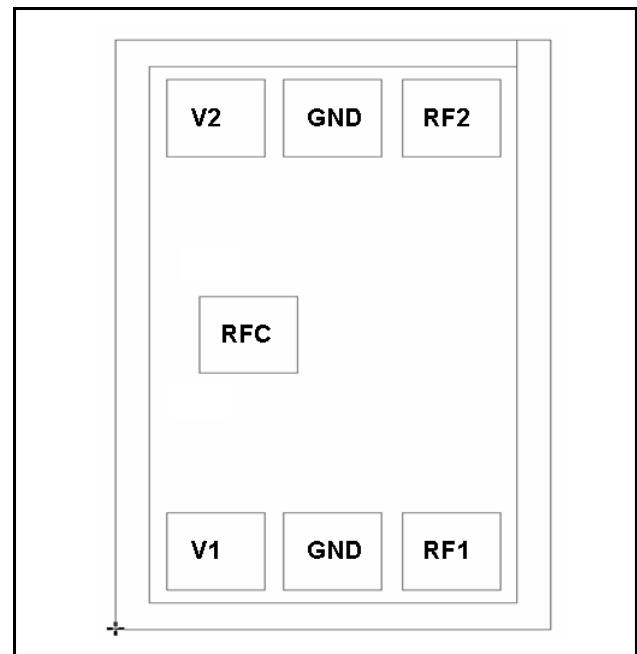
Handling Procedures

The following precautions should be observed to avoid damage:

Static Sensitivity

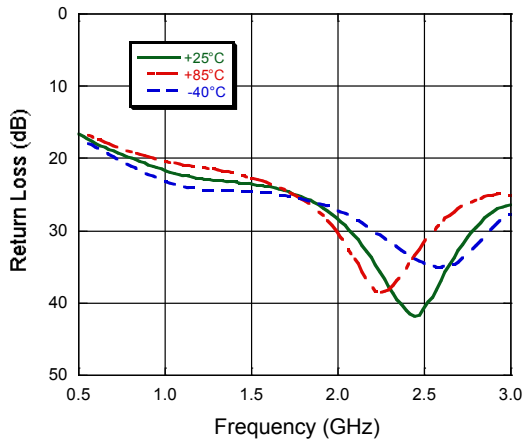
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Die Bond Pad Layout

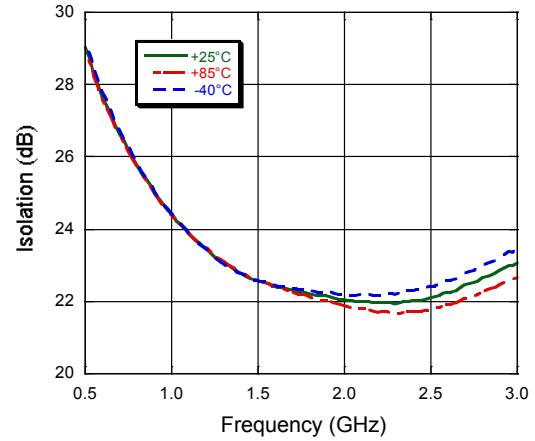


Typical Performance Curves

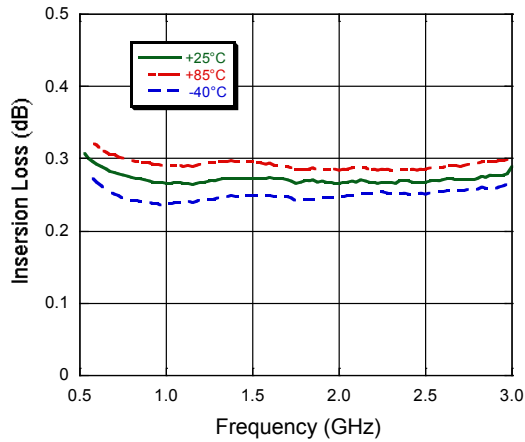
Return Loss vs. Frequency



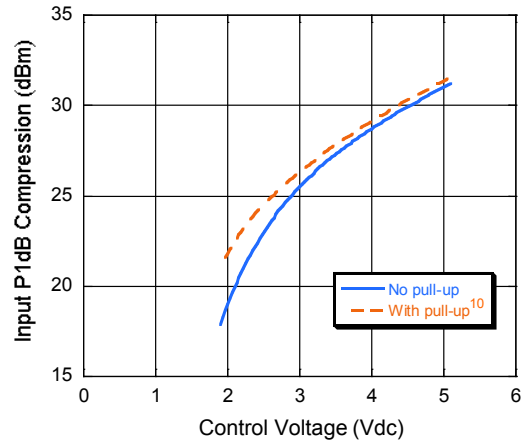
Isolation vs. Frequency



Insertion Loss vs. Frequency

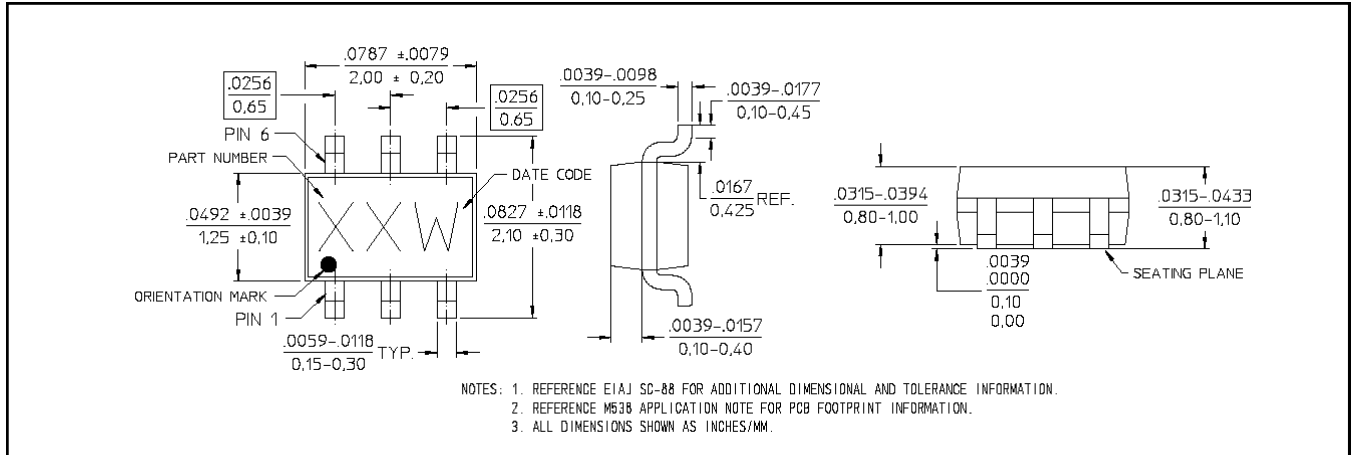


Input P1dB Compression vs. Control Voltage @ 2.4 GHz, T=+25°C



10. RFC port is pulled up with a 5.1K resistor to fixed V_{DD} equal V_{CTL} high level.

Lead-Free SC-70 (SOT-363)[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

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