

**GaAs SP3T 2.6 V CDMA-GPS Switch
DC - 2.5 GHz**

**MASWSS0199
V1**

Features

- Unbalanced (asymmetric) RF Paths
- Low Cross Modulation
- Low Insertion Loss: 0.5 dB at 1.0 GHz
- High Isolation: 20 dB at 2.0 GHz
- 0.5 micron GaAs PHEMT Process
- Lead-Free 3 mm 12-lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of MASWSS0065

Description

M/A-COM’s MASWSS0199 is an industry leading GaAs PHEMT MMIC single pole three throw (SP3T) CDMA-GPS switch in a lead-free 3 mm 12-lead PQFN package.

The MASWSS0199 is uniquely configured to enable switching from a common antenna port to CDMA cellular, CDMA PCS, or GPS ports. The design is asymmetric and has been fully optimized for excellent cross modulation performance in CELL and PCS paths while still maintaining excellent insertion loss and isolation.

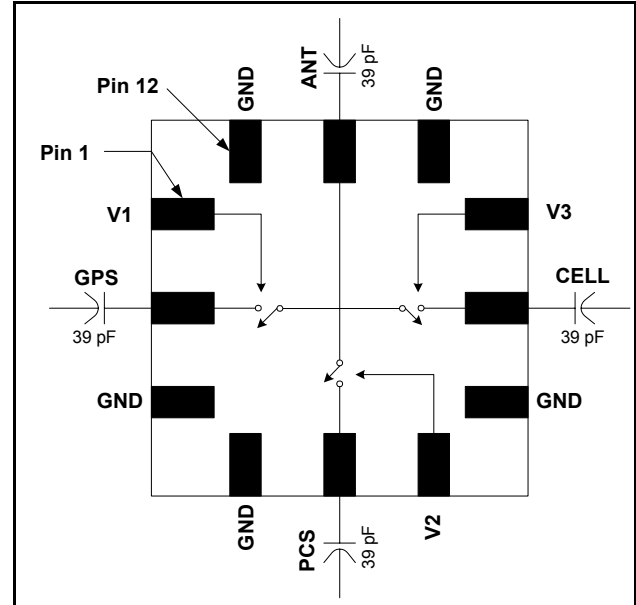
The MASWSS0199 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Ordering Information

| Part Number | Package |
|-------------------|-------------------|
| MASWSS0199TR-3000 | 3000 Piece Reel |
| MASWSS0199SMB | Sample Test Board |

Note: Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

| Pin No. | Pin Name | Description |
|---------|---------------------------|---------------------------|
| 1 | V1 | Control 1 |
| 2 | GPS | GPS Receive |
| 3 | GND | RF Ground |
| 4 | GND | RF Ground |
| 5 | PCS | PCS Transmit/Receive |
| 6 | V2 | Control 2 |
| 7 | GND | RF Ground |
| 8 | CELL | Cellular Transmit/Receive |
| 9 | V3 | Control 3 |
| 10 | GND | RF Ground |
| 11 | ANT | Antenna Port |
| 12 | GND | RF Ground |
| 13 | GND (paddle) ¹ | RF Ground |

1. 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.

**GaAs SP3T 2.6 V CDMA-GPS Switch
DC - 2.5 GHz**

**MASWSS0199
V1**

Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V}/2.6\text{ V}$, $Z_0 = 50\text{ Ohms}^2$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. | |
|-------------------------------|---|--|------|------|------|------|
| Insertion Loss ³ | CELL Path | 820 MHz | dB | — | 0.5 | 0.7 |
| | GPS Path | 1.5 GHz | dB | — | 0.75 | 0.95 |
| | PCS Path | 1.9 GHz | dB | — | 0.5 | 0.7 |
| Isolation (CELL Path) | 820 MHz | dB | 27 | 30 | — | |
| | 1.5 GHz | dB | — | 26 | — | |
| | 1.9 GHz | dB | — | 24 | — | |
| Isolation (GPS Path) | 820 MHz | dB | 29 | 32 | — | |
| | 1.5 GHz | dB | — | 27 | — | |
| | 1.9 GHz | dB | — | 25 | — | |
| Isolation (PCS Path) | 820 MHz | dB | 25 | 27 | — | |
| | 1.5 GHz | dB | — | 22 | — | |
| | 1.9 GHz | dB | — | 20 | — | |
| Return Loss | All RF ports, DC – 2.5 GHz | dB | — | 20 | — | |
| IP3 | CELL Path | Two Tones, +22 dBm / tone, 1 MHz Spacing, 820 MHz | dBm | — | 58 | — |
| | PCS Path | Two Tones, +22 dBm / tone, 1 MHz Spacing, 1880 MHz | dBm | — | 59 | — |
| Cross Modulation CELL Path | Cell Band: Two-tone signal input: Tx1 = +22 dBm @ 820 MHz, Tx2 = +22 dBm @ 821 MHz, RX interfere = -30 dBm @ 869 MHz. | dBm | — | -113 | — | |
| Cross Modulation PCS Path | PCS Band: Two-tone signal input: Tx1 = +18 dBm @ 1880 MHz, Tx2 = +18 dBm @ 1881 MHz, RX interfere = -30 dBm @ 1960 MHz. | dBm | — | -115 | — | |
| P0.1 dB | CELL Path | 820 MHz | dBm | — | 37 | — |
| | GPS Path | 1.5 GHz | dBm | — | 35 | — |
| | PCS Path | 1.9 GHz | dBm | — | 35 | — |
| Trise, Tfall | 10% to 90% RF, 90% to 10% RF | μS | — | 0.05 | — | |
| Ton, Toff | 50% control to 90% RF, and 50% control to 10% RF | μS | — | 0.07 | — | |
| Transients | In Band | mV | — | 50 | — | |
| Control Current | $ V_C = 2.6\text{ V}$ | μA | — | 5 | 20 | |

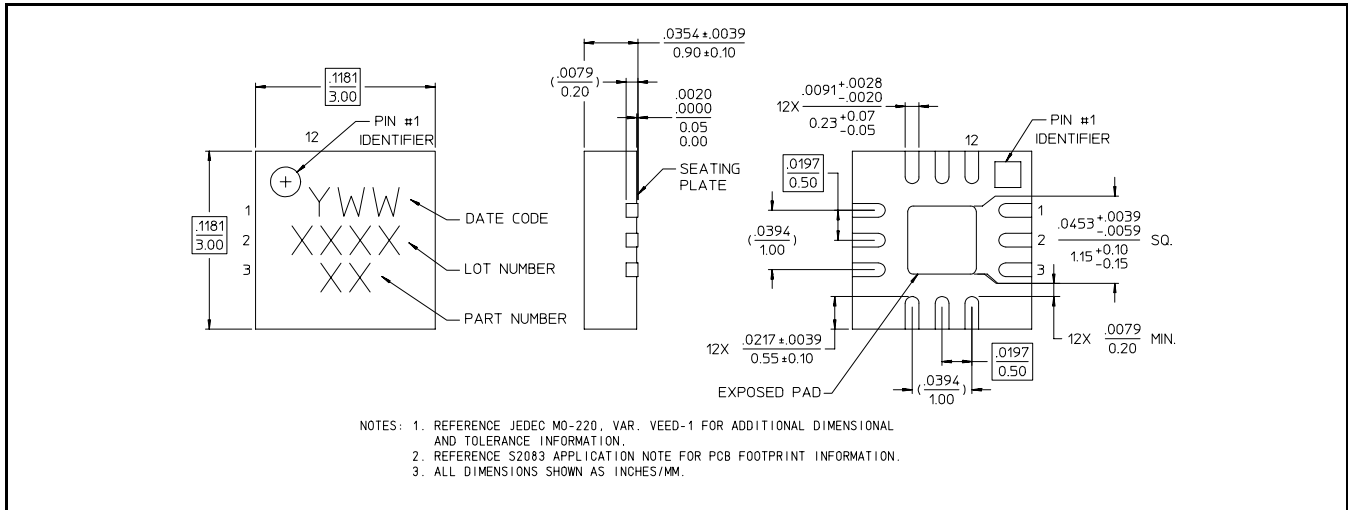
2. For positive voltage control, external DC blocking capacitors are required on all RF ports.

3. 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 GHz - 3 GHz.

**GaAs SP3T 2.6 V CDMA-GPS Switch
DC - 2.5 GHz**

**MASWSS0199
V1**

Lead-Free 3 mm 12-Lead PQFN[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.

Absolute Maximum Ratings^{4,5}

| Parameter | Absolute Maximum |
|---|------------------|
| Input Power (0.5 - 2.5 GHz, 2.6 V Control) | +35 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 to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.

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.

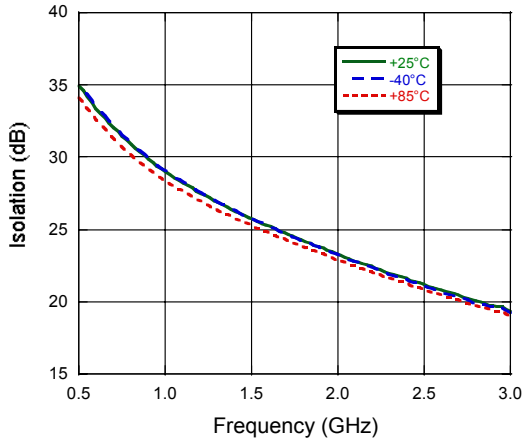
Truth Table^{6,7,8}

| V1 | V2 | V3 | ANT-GPS | ANT-PCS | ANT-CELL |
|----|----|----|---------|---------|----------|
| 1 | 0 | 0 | On | Off | Off |
| 0 | 1 | 0 | Off | On | Off |
| 0 | 0 | 1 | Off | Off | On |

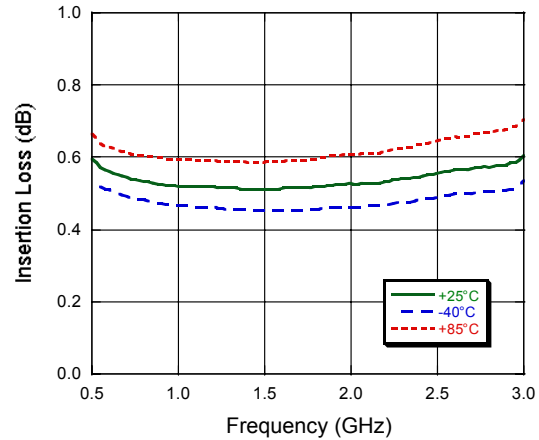
- For positive voltage control, external DC blocking capacitors are required on all RF ports.
- Differential voltage, V(state 1) - V(state 0), must be +2.6 V minimum, but must not exceed +8.5 V.
- 0 = -5 V to +2.4 V, 1 = -2.4 V to +5 V.

Typical Performance Curves

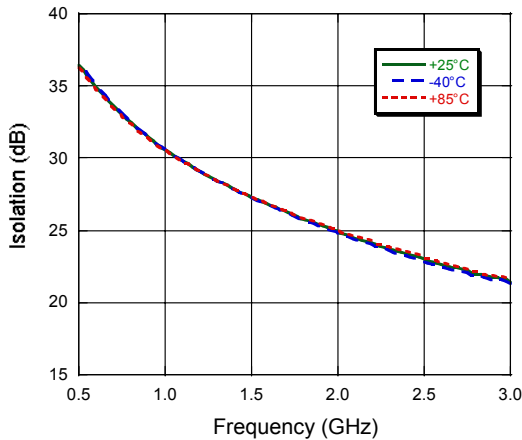
Cell Path Isolation



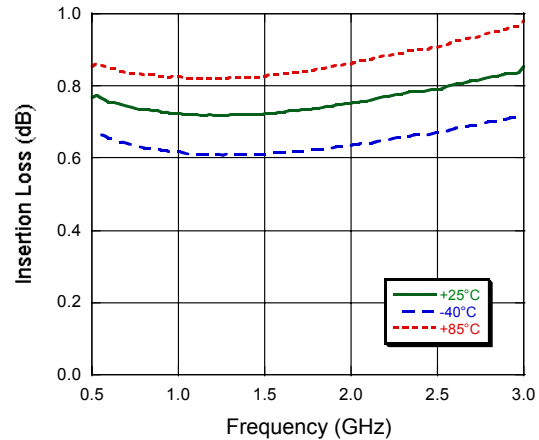
Cell Path Insertion Loss



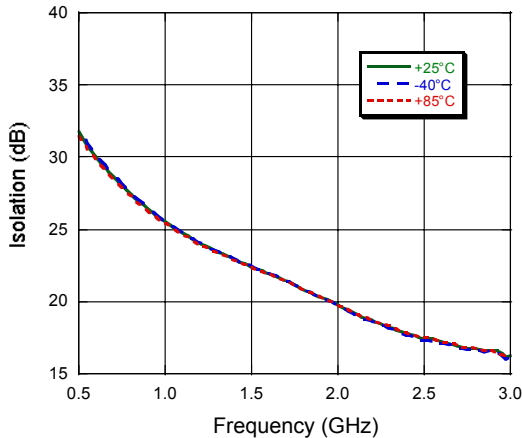
GPS Path Isolation



GPS Path Insertion Loss



PCS Path Isolation



PCS Path Insertion Loss

