

GaAs SP3T 2.6 V CDMA-GPS Switch 0.5 - 3.0 GHz

Rev. V1

Features

- Optimized RF Paths
- Low Cross Modulation
- Low Insertion Loss: 0.7 dB at 820 MHz (Cell)
- High Isolation: 21.5 dB at 1.9 GHz (PCS)
- 0.5 micron GaAs PHEMT Process
- Lead-Free 2 mm 8-lead STDFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

M/A-COM's MASWSS0191 is an industry leading GaAs PHEMT MMIC single pole three throw (SP3T) CDMA-GPS switch in a 2 mm 8-lead STDFN package.

The MASWSS0191 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.

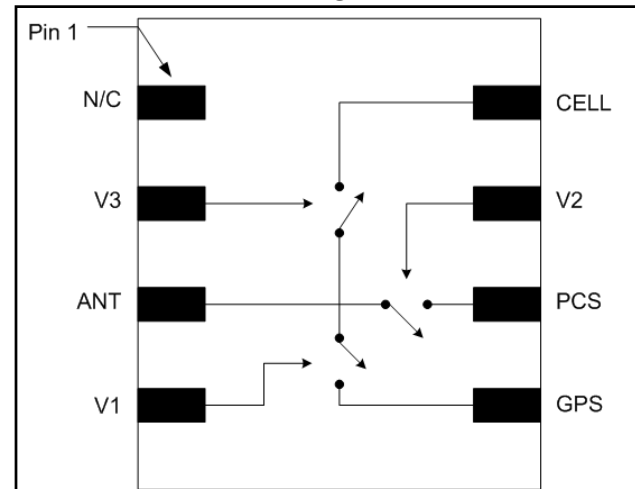
The MASWSS0191 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Ordering Information ¹

Part Number	Package
MASWSS0191TR-3000	3000 Piece Reel
MASWSS0191SMB	Sample Test Board (Includes 5 Samples)

1. Reference Application Note M513 for reel size information.

Functional Block Diagram



Pin Configuration

Pin No.	Pin Name	Description
1	N/C	No Connection
2	V3	Control 3
3	ANT	Antenna Port
4	V1	Control 1
5	GPS	GPS Receive
6	PCS	PCS Transmit/Receive
7	V2	Control 2
8	CELL	Cellular Transmit/Receive
9	GND (paddle) ²	RF & DC Ground

2. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Absolute Maximum Ratings ^{3,4}

Parameter	Absolute Maximum
Input Power (0.5 - 3.0 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

3. Exceeding any one or combination of these limits may cause permanent damage to this device.

4. 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: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V} / 2.6\text{ V}^5$, $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss ⁶ (CELL Path)	820 MHz	dB	—	0.65	0.80
	1.5 GHz	dB	—	0.70	—
	1.9 GHz	dB	—	0.70	—
Insertion Loss ⁶ (GPS Path)	820 MHz	dB	—	0.95	1.1
	1.5 GHz	dB	—	0.95	—
	1.9 GHz	dB	—	0.95	—
Insertion Loss ⁶ (PCS Path)	820 MHz	dB	—	0.65	0.8
	1.5 GHz	dB	—	0.70	—
	1.9 GHz	dB	—	0.65	—
Isolation (CELL Path)	820 MHz	dB	30.0	32.0	—
	1.5 GHz	dB	—	27.0	—
	1.9 GHz	dB	—	24.5	—
Isolation (GPS Path)	820 MHz	dB	29.0	31.0	—
	1.5 GHz	dB	—	26.0	—
	1.9 GHz	dB	—	23.5	—
Isolation (PCS Path)	820 MHz	dB	25.0	27.0	—
	1.5 GHz	dB	—	23.5	—
	1.9 GHz	dB	—	21.5	—
Return Loss	All RF ports, DC – 2.5 GHz	dB	—	20	—
IP3 CELL Path PCS Path	Two Tones +22 dBm / tone, 1 MHz Spacing, 820 MHz	dBm	—	58	—
	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 GPS Path PCS Path	820 MHz	dBm	—	37	—
	1.5 GHz	dBm	—	35	—
	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	—	2	20

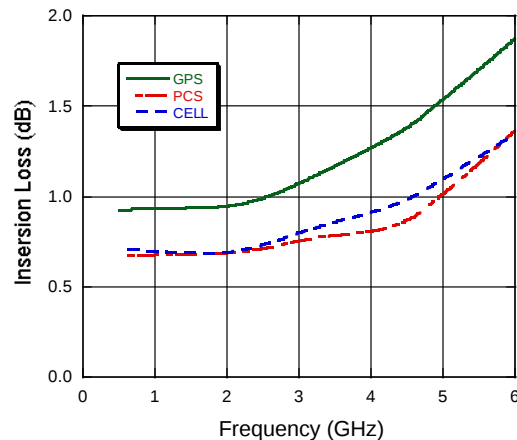
- For positive voltage control, external DC blocking capacitors are required on all RF ports.
- Insertion loss can be optimized by varying the DC blocking capacitor value, e.g. 1000 pF for 100 MHz - 1 GHz, 39 pF for 0.5 GHz - 3 GHz.

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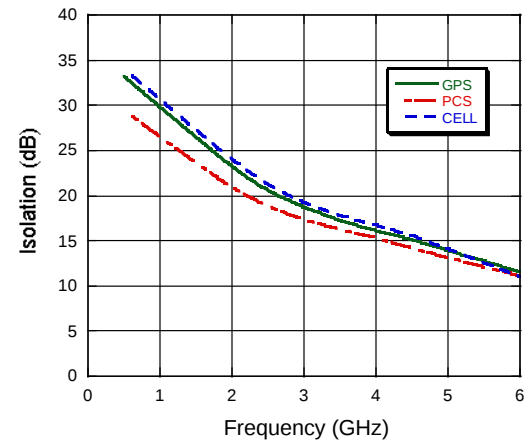
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Typical Performance Curves

Insertion Loss



Isolation



Truth Table ^{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

7. Differential voltage, V (state 1) - V (state 0), must be +2.6 V minimum, but must not exceed +8.5 V.
8. 0 = -5 V to +2.4 V, 1 = -2.4 V to +5 V.

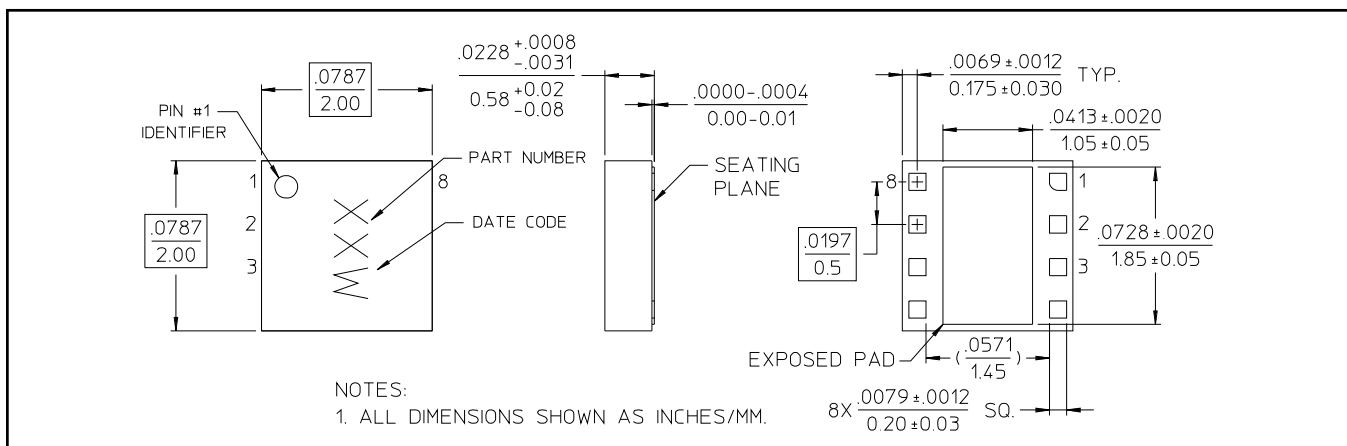
Handling Procedures

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.

Lead-Free 2 mm 8-Lead STDFN[†]



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