

GaAs Broadband DPDT Diversity Switch 2.0 - 6.0 GHz

Rev. V1

Features

- 802.11a + b/g Dual Band Applications
- Broadband Performance: 2.0 - 6.0 GHz
- Low Insertion Loss: 0.75 dB @ 2.4 GHz
0.9 dB @ 4.9 to 6.0 GHz
- High Isolation: 43 dB @ 2.4 GHz
31 dB @ 4.9 to 6.0 GHz
- Fast Switching Speed: 0.5 μ m GaAs PHEMT
- Lead-Free 2 mm 8-Lead UTDFN Package
- Electrolytic Gold Plate over Nickel Plate
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

M/A-COM's MASWSS0190 is a broadband GaAs PHEMT MMIC diversity switch available in a low cost, lead-free, ultra thin 2 mm 8-lead UTDFN package. The MASWSS0190 is ideally suited for applications where very small size and low cost are required.

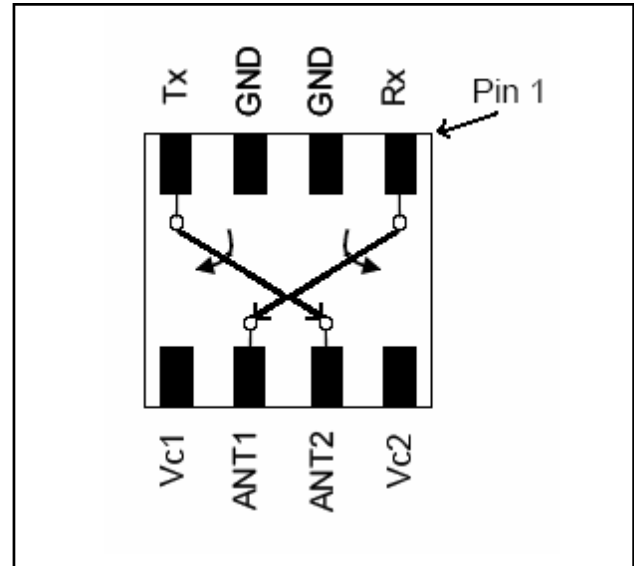
Typical applications are for WLAN IEEE 802.11a and 802.11b/g systems that employ two antennas for transmit and receive diversity. Other applications include cordless phones and base stations. Designed for high power, this DPDT switch maintains high linearity up to 6.0 GHz.

The MASWSS0190 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
MASWSS0190TR-3000	7 inch, 3000 piece reel
MASWSS0190SMB	Sample Test Board

Functional Schematic



Pin Configuration

Pin No.	Pin Name	Description
1	Rx	Receive Port
2	GND	Ground
3	GND	Ground
4	Tx	Transmit Port
5	V _c 1	Control 1
6	ANT1	Antenna Port 1
7	ANT2	Antenna Port 2
8	V _c 2	Control 2
9	Paddle ¹	RF and DC 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.

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $V_C = 0\text{ V} / 3\text{ V}$, 8 pF Capacitor², $Z_0 = 50\ \Omega$

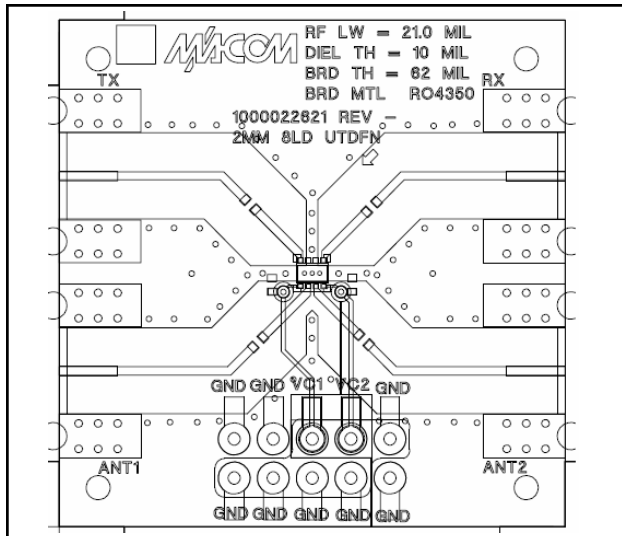
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	2.4 GHz 4.9 - 6 GHz, with 3 pF DC blocking capacitors	dB	—	0.75	1.25
		dB	—	.9	1.4
Isolation (on/off or off/on)	2.4 GHz 4.9 - 6 GHz, with 3 pF DC blocking capacitors	dB	39	43	—
		dB	27	31	—
Isolation (on/on or off/off)	2.4 GHz 4.9 - 6 GHz, with 3 pF DC blocking capacitors	dB	5	7	—
		dB	9	11	—
Return Loss (on/off or off/on)	2.4 GHz 4.9 - 6 GHz, with 3 pF DC blocking capacitors	dB	19	22	—
		dB	17	20	—
IP2	Two Tone, 15 dBm/Tone, 5 MHz Spacing 2.4 GHz 5.3 GHz 5.8 GHz	dBm	—	93	—
		dBm	—	86	—
		dBm	—	84	—
		dBm	—	84	—
IP3	Two Tone, 15 dBm/Tone, 5 MHz Spacing 2.4 GHz 5.3 GHz 5.8 GHz	dBm	—	52	—
		dBm	—	50	—
		dBm	—	50	—
		dBm	—	50	—
Input P-1dB	2.4 GHz 5.3 GHz 5.8 GHz	dBm	—	33	—
		dBm	—	31	—
		dBm	—	31	—
2 nd Harmonic	$P_{IN} = 20\text{ dBm}$ 2.4 GHz 5.8 GHz	dBm	—	-75	—
		dBm	—	-77	—
		dBm	—	-77	—
3 rd Harmonic	$P_{IN} = 20\text{ dBm}$ 2.4 GHz 5.8 GHz	dBm	—	-69	—
		dBm	—	-86	—
		dBm	—	-86	—
Trise, Tfall	10% to 90% RF 90% to 10% RF	nS	—	35	—
		nS	—	60	—
Ton, Toff	50% control to 90% RF, and 50% control to 10% RF	nS	—	90	—
Transients	—	mV	—	6	—
Control Current	$ V_C = 3\text{ V}$	μA	—	3	10

2. For positive voltage control, external DC blocking capacitors are required on all RF ports. Performance values are valid using 8 pF DC blocking capacitors, except where noted. All scattering parameters can be optimized by varying the DC blocking capacitor value, e.g. 8 pF for 2.4 GHz, 3 pF for 4.9 GHz - 6 GHz.

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Evaluation Board for Lead-Free 2 mm 8-lead UTDFN Package



Absolute Maximum Ratings^{3,4}

Parameter	Absolute Maximum
Input Power @ 3 V Control	+31 dBm
Input Power @ 5 V Control	+34 dBm
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.

Handling Procedures

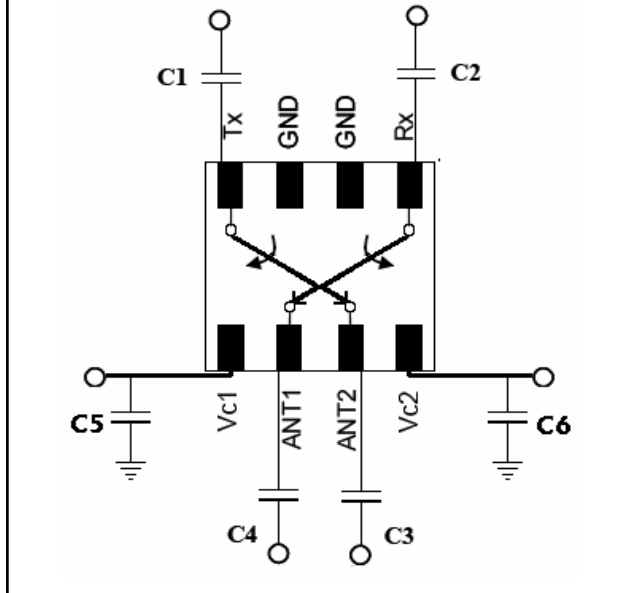
Please observe the following precautions to avoid damage:

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.

Application Schematic

C1,C2,C3,C4 = 8 pF
C5,C6 = 100 pF



Truth Table^{5,6}

Control Vc1	Control Vc2	ANT 1 - Rx	ANT 1 - Tx	ANT 2 - Tx	ANT 2 - Rx
1	0	On	Off	On	Off
0	1	Off	On	Off	On
1	1	Off	Off	Off	Off
0	0	Off	Off	Off	Off

5. 1 = +2.9 V to +5 V, 0 = 0 V ± 0.2 V.

6. Differential voltage, V (state 1) - V (state 0), must be 2.7 V minimum and must not exceed 8.5 V.

Qualification

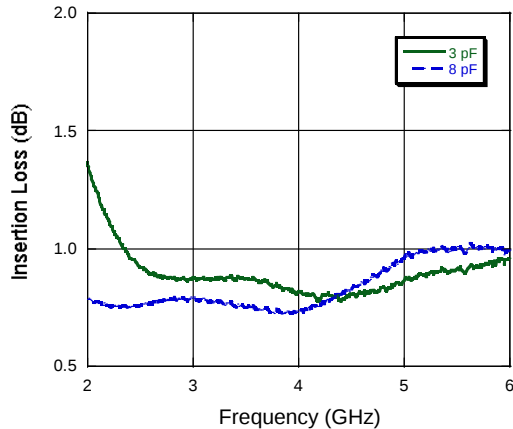
Qualified to M/A-COM specification REL-201, Process Flow -2.

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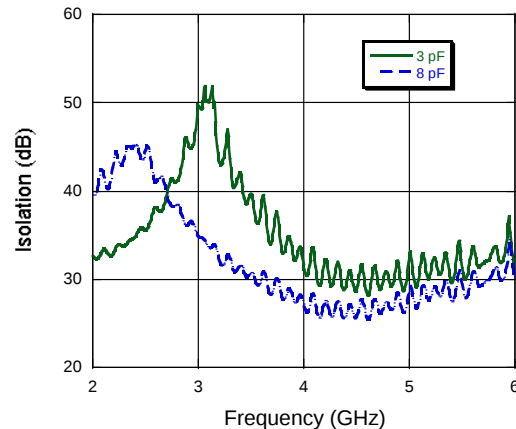
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Typical Performance Curves (on/off or off/on states)

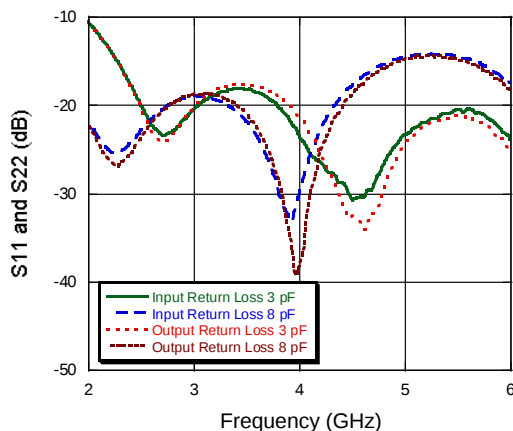
Insertion Loss



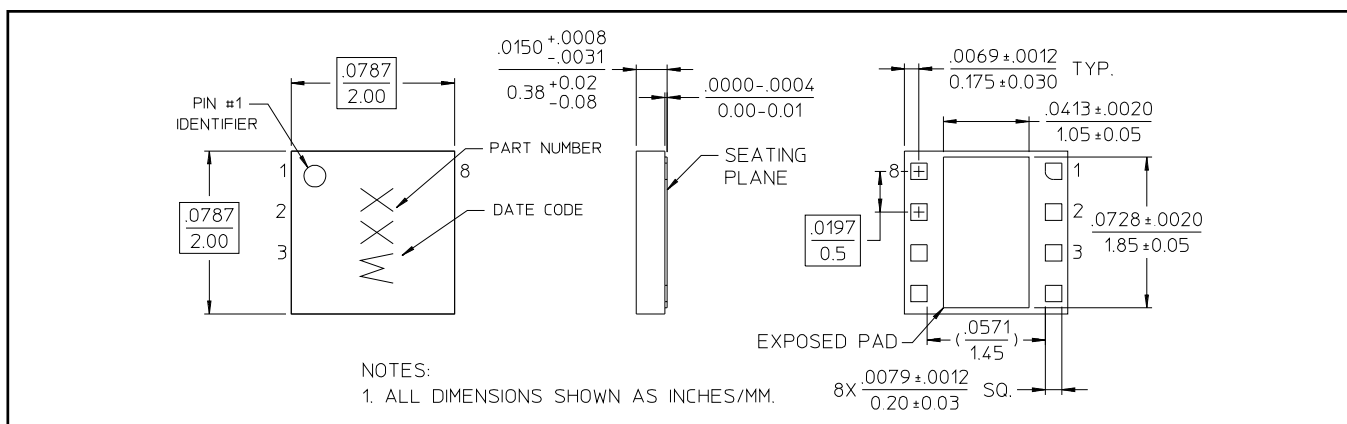
Isolation



Return Loss



Lead-Free 2 mm 8-Lead UTDFN[†]



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

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