

## GaAs DPDT Diversity Switch 0.5 - 3.0 GHz

Rev. V1

### Features

- Low Insertion Loss 0.7 dB at 2.4 GHz
- Ideal for WLAN IEEE 802.11b
- 0.5 micron GaAs pHEMT Process
- Lead-Free 3 mm 12-Lead PQFN Package
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant version of MASWSS0040

### Description

M/A-COM’s MASW-009460 is a GaAs pHEMT MMIC DPDT diversity switch in a lead-free 3 mm 12-lead PQFN package. The MASW-009460 is ideally suited for applications where very small size and low cost are required.

Typical applications are for WLAN IEEE 802.11b/g systems that employ two antennas for transmit and receive diversity. This part is designed for low insertion loss and allows for independent control and selection of each switch path. This part can be used in all systems operating up to 3.0 GHz requiring moderate power and diversity switching.

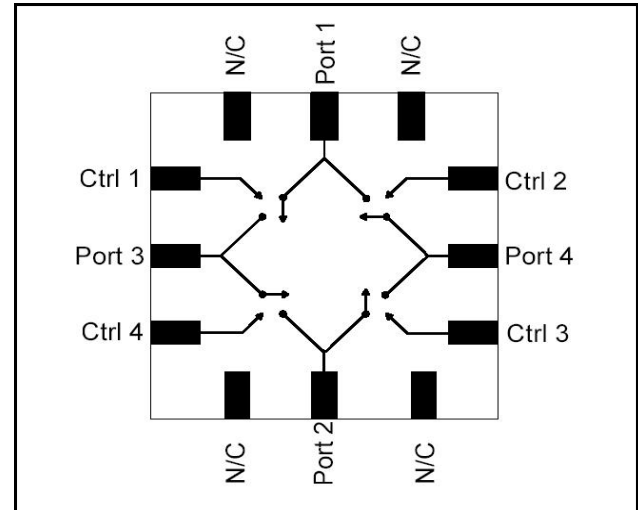
The MASW-009460 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

### Ordering Information <sup>1,2</sup>

Part Number	Package
MASW-009460-TR1000	1000 piece reel
MASW-009460-TR3000	3000 piece reel
MASW-009460-001SMB	Sample Test Board

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

### Functional Schematic



### Pin Configuration

Pin No.	Pin Name	Description
1	Ctrl 1	Control 1
2	Port 3	RF Port 3
3	Ctrl 4	Control 4
4	N/C	No Connection
5	Port 2	RF Port 2
6	N/C	No Connection
7	Ctrl 3	Control 3
8	Port 4	RF Port 4
9	Ctrl 2	Control 2
10	N/C	No Connection
11	Port 1	RF Port 1
12	N/C	No Connection
Pad	Paddle <sup>3</sup>	RF & DC Ground

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

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

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**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ ,  $V_C = 3\text{ V}$ ,  $P_{IN} = 10\text{ dBm}$ ,  $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss <sup>4</sup>	0.5 - 1.0 GHz	dB	—	0.5	—
	1.0 - 2.0 GHz	dB	—	0.6	—
	2.0 - 2.5 GHz	dB	—	0.7	1.2
	2.5 - 3.0 GHz	dB	—	0.8	—
Isolation <sup>5</sup>	0.5 - 1.0 GHz	dB	—	28.0	—
	1.0 - 2.0 GHz	dB	—	21.0	—
	2.0 - 2.5 GHz	dB	17.0	19.0	—
	2.5 - 3.0 GHz	dB	—	18.0	—
Return Loss	0.5 - 3.0 GHz	dB	—	20	—
IP3	Two Tone +5 dBm, 5 MHz Spacing, > 50 MHz $V_C = 0.2\text{ V} / 2.3\text{ V}$ $V_C = 0.2\text{ V} / 3.0\text{ V}$	dBm	—	47	—
		dBm	—	52	—
P1dB	$V_C = 0.2\text{ V} / 2.3\text{ V}$ $V_C = 0.2\text{ V} / 3.0\text{ V}$	dBm	—	26	—
		dBm	—	31	—
2 <sup>nd</sup> Harmonic	2.4 GHz, $P_{IN} = 20\text{ dBm}$ , $V_C = 0.2\text{ V} / 2.5\text{ V}$	dBc	—	70	—
3 <sup>rd</sup> Harmonic	2.4 GHz, $P_{IN} = 20\text{ dBm}$ , $V_C = 0.2\text{ V} / 2.5\text{ V}$	dBc	—	60	—
$T_{RISE}$ , $T_{FALL}$	10% to 90% RF and 90% to 10% RF	ns	—	12/20	—
$T_{ON}$ , $T_{OFF}$	50% Control to 90% RF 50% Control to 10% RF	ns	—	35	—
		ns	—	40	—
Control Current	$ V_C  = 3\text{ V}$	$\mu\text{A}$	—	5	25

4. Insertion Loss can be optimized by varying the DC Blocking Capacitor value, i.e. 1000 pF for 100 MHz - 1.0 GHz, 27 pF for 0.5 - 3.0 GHz.

5. Isolation of two paths on either side of the selected path.

### Absolute Maximum Ratings<sup>6,7</sup>

Parameter	Absolute Maximum
Input Power 3V Control	+32 dBm
Input Power 5V Control	+34 dBm
Operating Voltage	+8.5 volts
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 does not recommend sustained operation near these survivability limits.

### Handling Procedures

Please observe the following precautions to avoid damage:

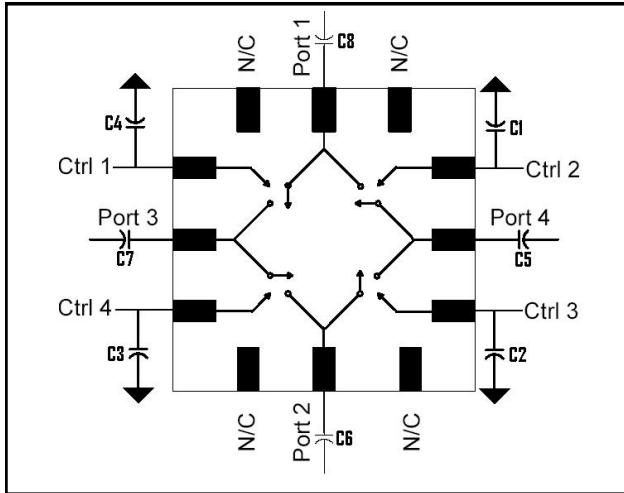
### Static Sensitivity

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.

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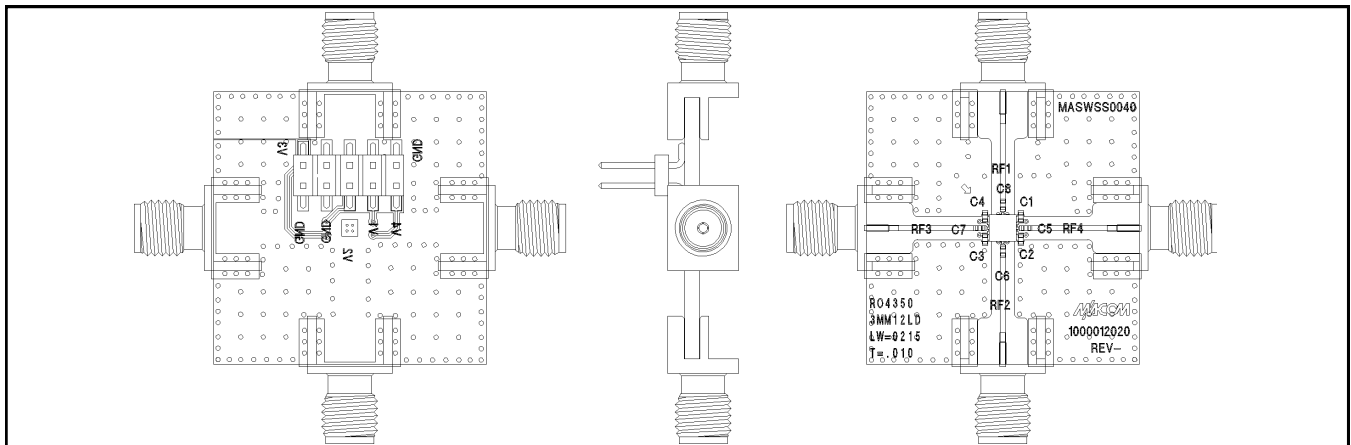
### Circuit Block Diagram



### Parts List

Part	Description
C1 – C4	27 pF Decoupling Capacitor
C5 – C8	27 pF DC Blocking Capacitor
RF1 – RF4	RF connector
Item 3	10-pin solder connector

### Evaluation Board



### Truth Table <sup>8,9</sup>

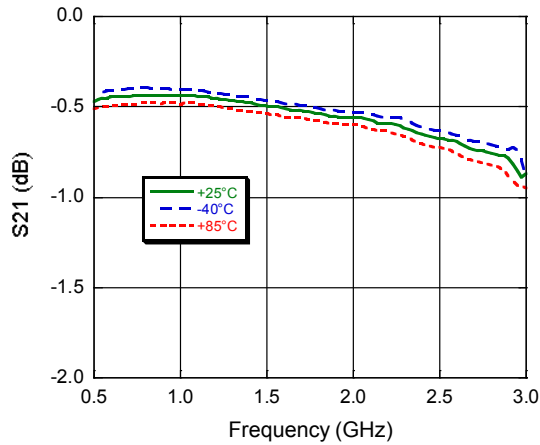
Control V1	Control V2	Control V3	Control V4	Port 1 - Port 3	Port 1 - Port 4	Port 2 - Port 4	Port 2 - Port 3
1	0	0	0	On	Off	Off	Off
0	1	0	0	Off	On	Off	Off
0	0	1	0	Off	Off	On	Off
0	0	0	1	Off	Off	Off	On
1	0	1	0	On	Off	On	Off
0	1	0	1	Off	On	Off	On

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

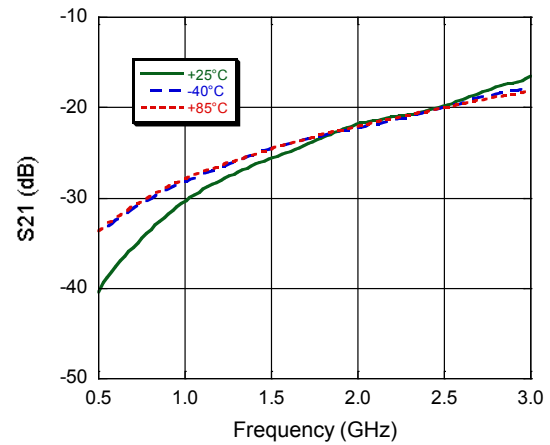
9. 0 = 0 V ± 0.2 V, 1 = +2.3 V to 5.0 V

## Typical Performance Curves

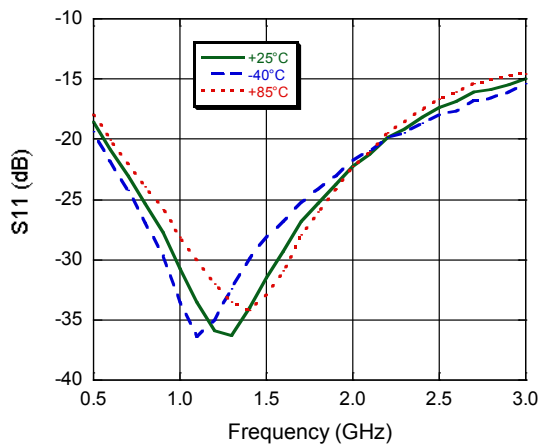
**Insertion Loss, 27 pF**



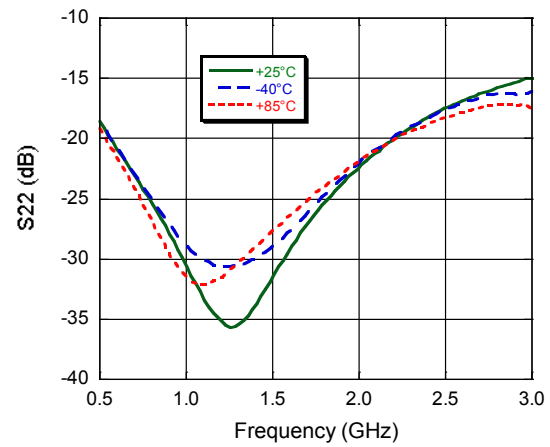
**Isolation, 27 pF**



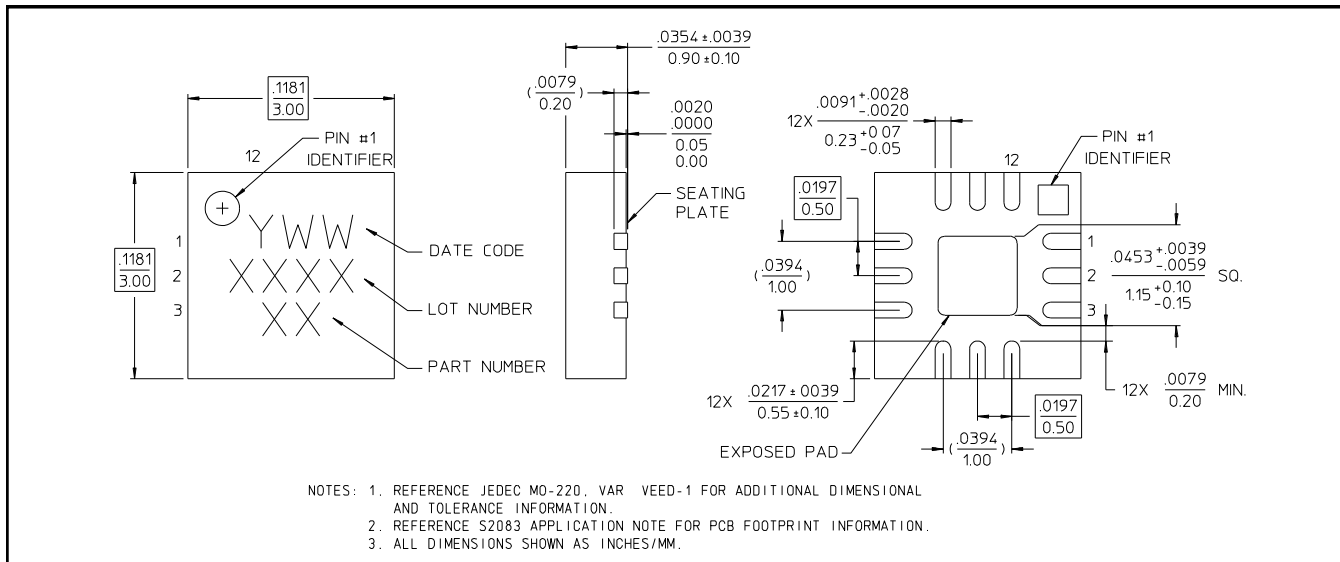
**Input Return Loss**



**Output Return Loss**



**Lead-Free 3 mm 12-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

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