MACCM Technology Solutions

GaAs DPDT Diversity Switch 0.5 - 3.0 GHz

Features

- Low Insertion Loss 0.7 dB at 2.4 GHz
- Low Cost 3 mm 12-Lead PQFN Package
- Ideal for WLAN IEEE 802.11b
- 0.5 micron GaAs PHEMT Process

Description

M/A-COM's MASWSS0040 is a GaAs pHEMT MMIC DPDT diversity switch in a low cost miniature 3 mm 12-lead PQFN package. The MASWSS0040 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 MASWSS0040 is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability.

Ordering Information ^{1,2}

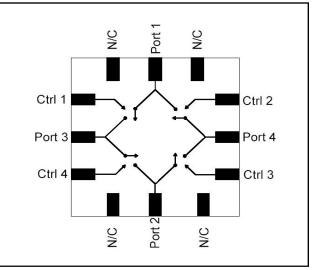
Part Number	Package		
MASWSS0040	Bulk Packaging		
MASWSS0040TR	1000 piece reel		
MASWSS0040TR-3000	3000 piece reel		
MASWSS0040SMB	Sample Test Board 0.5 - 3.0 GHz Tuning		

1. Reference Application Note M513 for reel size information.

2. All sample boards include 5 loose parts.

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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 ³	No Connection		

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

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

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Insertion Loss ⁴	0.5 - 1.0 GHz 1.0 - 2.0 GHz 2.0 - 2.5 GHz 2.5 - 3.0 GHz	dB dB dB dB	 	0.5 0.6 0.7 0.8	1.2 1.2 1.2 1.2
Isolation ⁵	0.5 - 1.0 GHz 1.0 - 2.0 GHz 2.0 - 2.5 GHz 2.5 - 3.0 GHz	dB dB dB dB	17.0 17.0 17.0 17.0	28.0 21.0 19.0 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 dBm	_	47 52	
P1dB	$V_{C} = 0.2 V / 2.3 V V_{C} = 0.2 V / 3.0 V$	dBm dBm		26 31	
2 nd Harmonic	2.4 GHz, P_{IN} = 20 dBm, V_C = 0.2 V / 2.5 V	dBc	_	70	_
3 rd Harmonic	2.4 GHz, P_{IN} = 20 dBm, V_C = 0.2 V / 2.5 V	dBc	_	60	—
Trise, Tfall	10% to 90% RF and 90% to 10% RF	ns	_	12/20	
Ton, Toff	50% Control to 90% RF 50% Control to 10% RF	ns ns	_	35 40	_
Control Current	V _c = 3V	μA	_	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 ^{6,7}

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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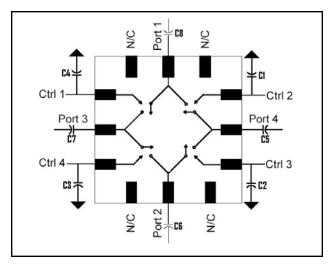
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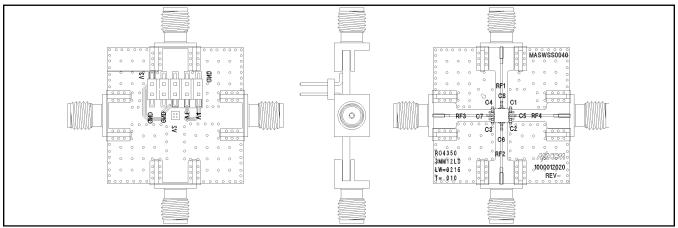
Circuit Block Diagram



Evaluation Board MASWSS0040

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			



Truth Table 8,9

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.

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

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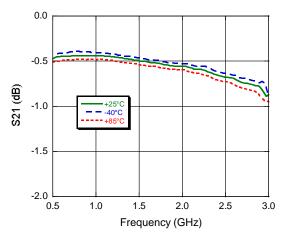
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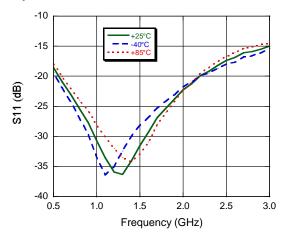
Typical Performance Curves

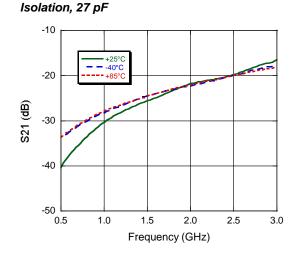
Insertion Loss, 27 pF



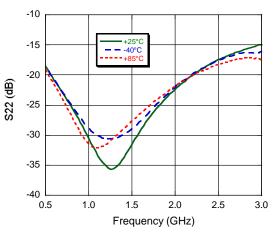
Input Return Loss

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Output Return Loss



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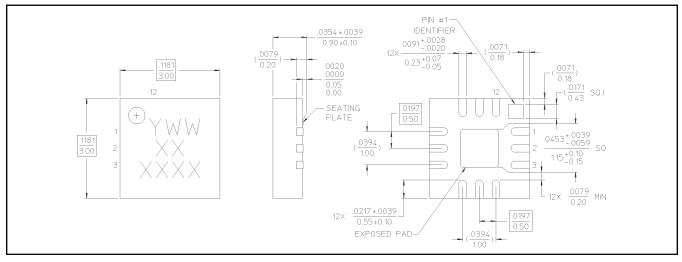
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3 mm 12-Lead PQFN[†]



† Meets JEDEC moisture sensitivity level 1 requirements

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