

M/A-COM GaAs Broadband SPDT Switch

DC - 6.0 GHz

V1

MASWSS0070

MASWSS0070

Features

- 802.11a + b/g Dual Band Applications
- Broadband Performance: DC - 6.0 GHz
- Low Insertion Loss: 0.75 dB at 6.0 GHz
- High Isolation: 25 dB Typical
- Low Cost 3 mm FQFP-N 12 Lead Package
- Fast Switching Speed: 0.5 μ m GaAs PHEMT Process

Description

M/A-COM's MASWSS0070 is a broadband GaAs PHEMT MMIC SPDT switch in a low cost 3 mm FQFP-N 12 lead package (JEDEC). The MASWSS0070 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 PC cards and access points. Designed for high power, this SPDT switch maintains high linearity up to 6.0 GHz.

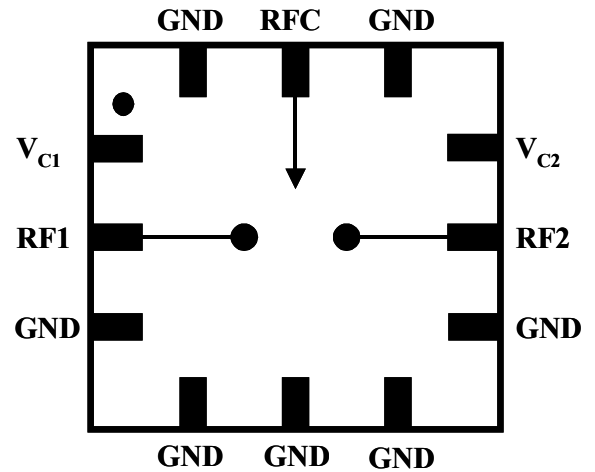
The MASWSS0070 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Ordering Information ¹

Part Number	Package
MASWSS0070	FQFP-N 12-lead Plastic Package
MASWSS0070TR	7 inch, 1000 piece reel
MASWSS0070TR-3000	13 inch, 3000 piece reel
MASWSS0070SMB	Sample Test Board (Includes 5 Samples)

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

PIN No.	PIN Name	Description
1	V_{C1}	Control 1
2	RF1	RF Port
3	GND	Ground
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	RF2	RF Port
9	V_{C2}	Control 2
10	GND	Ground
11	RFC	RF Port
12	GND	Ground

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 50 \Omega$, $V_C = 0 \text{ V} / 3 \text{ V}$, 8 pF Capacitor^{2,3}

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss ³	2 - 3 GHz	dB		0.55	0.9
	3 - 4 GHz	dB		0.55	0.9
	4 - 5 GHz	dB		0.65	1.0
	5 - 6 GHz	dB		0.75	1.1
Isolation	2 - 6 GHz	dB	22	25	
Return Loss	DC - 6 GHz	dB		20	
IIP2	Two Tone, +5 dBm/Tone, 5 MHz Spacing, > 50 MHz				
	$V_C = 0.0 \text{ V}/3 \text{ V}$ @ 2.4 GHz	dBm		90	
	$V_C = 0.0 \text{ V}/3 \text{ V}$ @ 5.8 GHz	dBm		84	
	$V_C = 0.0 \text{ V}/5 \text{ V}$ @ 2.4 GHz	dBm		91	
IIP3	Two Tone, +5 dBm/Tone, 5 MHz Spacing, > 50 MHz				
	$V_C = 0.0 \text{ V}/3 \text{ V}$ @ 2.4 GHz	dBm		46	
	$V_C = 0.0 \text{ V}/3 \text{ V}$ @ 5.8 GHz	dBm		40	
	$V_C = 0.0 \text{ V}/5 \text{ V}$ @ 2.4 GHz	dBm		47	
Input P-1dB	$V_C = 0.0 \text{ V}/3 \text{ V}$ @ 2.4 GHz	dBm		30	
	$V_C = 0.0 \text{ V}/3 \text{ V}$ @ 5.8 GHz	dBm		29	
	$V_C = 0.0 \text{ V}/5 \text{ V}$ @ 2.4 GHz	dBm		31	
	$V_C = 0.0 \text{ V}/5 \text{ V}$ @ 5.8 GHz	dBm		31	
T-rise, T-fall	10% to 90% RF and 90% to 10% RF	nS		13	
Ton, Toff	50 - 350 MHz	nS		35	
Transients	$V_C = 5 \text{ V}$, square wave, in band	mV		14	
Control Current	$ V_C = 3 \text{ V}$	μA		10	25

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

3. Insertion loss can be optimized by varying the DC blocking capacitor value.

Absolute Maximum Ratings⁴

Parameter	Absolute Maximum
Max Input Power @ 3V Control	+32 dBm
Max 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

4. Exceeding any one or combination of these limits may cause permanent damage.

Qualification

Qualified to M/A-COM Specification Rel 201, Process Flow -2.

Handling Procedures

The following precautions should be observed to avoid damage:

Static Sensitivity

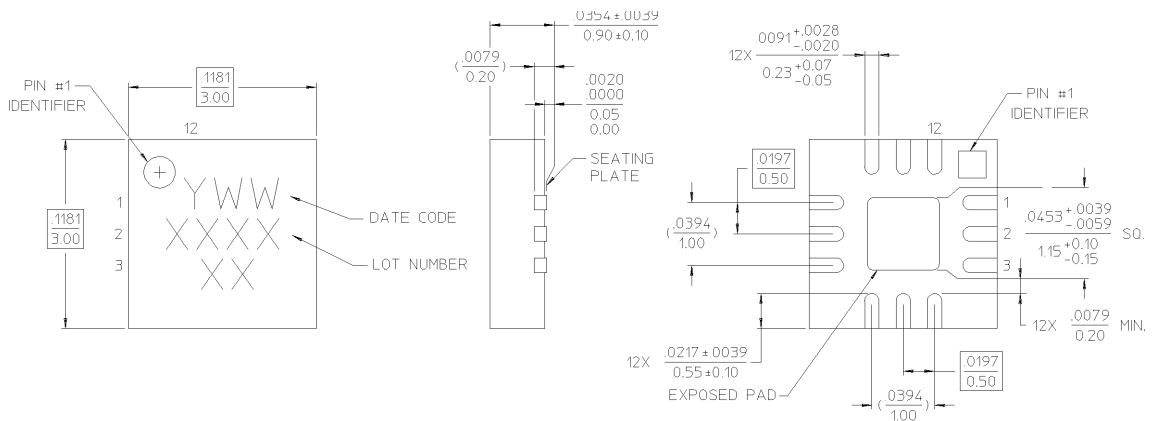
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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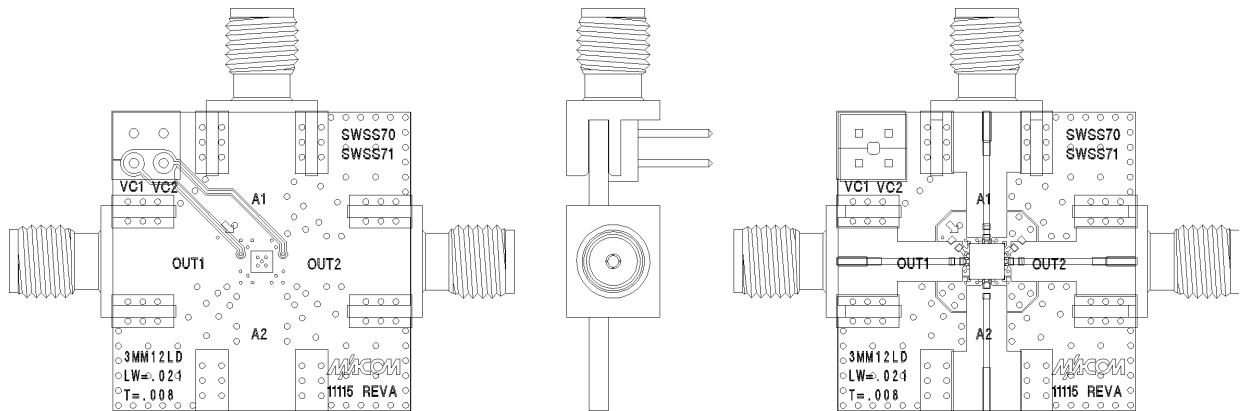
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3 mm FQFP-N 12 Lead

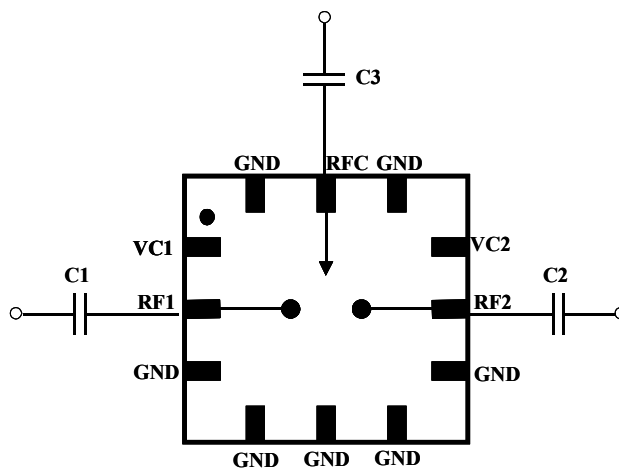


NOTES: 1. REFERENCE JEDEC MO-220, VAR. VEED-1 FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.
 2. REFERENCE S2083 APPLICATION NOTE FOR PCB FOOTPRINT INFORMATION.
 3. ALL DIMENSIONS SHOWN AS INCHES/MMM

Evaluation Board



Application Schematic



Truth Table ⁵

Control V1	Control V2	RFC- RF1	RFC- RF2
1	0	On	Off
0	1	Off	On

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

Application #1: Optimized for 802.11a

Qty	Description
3	Capacitor, 3.0 pF, 0402, SMT, 5% (C1-C3)

Application #2: Optimized for 802.11b/g

Qty	Description
3	Capacitor, 8.0 pF, 0402, SMT, 5% (C1-C3)

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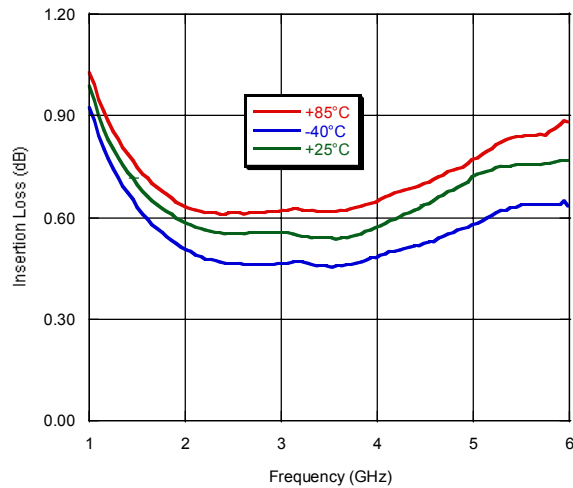
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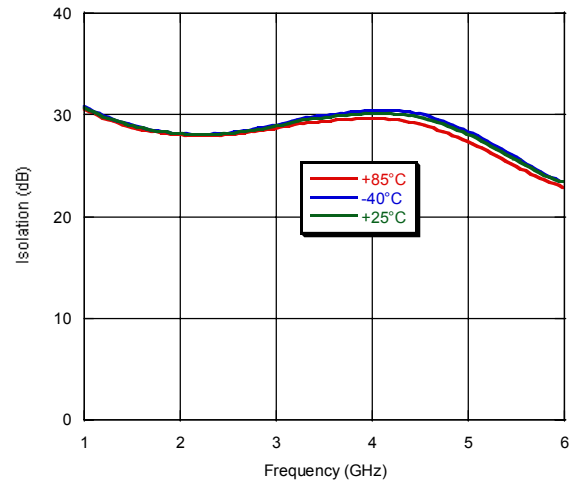
Typical Performance Curves with 0/3 V Control, 8 pF Capacitors

V1

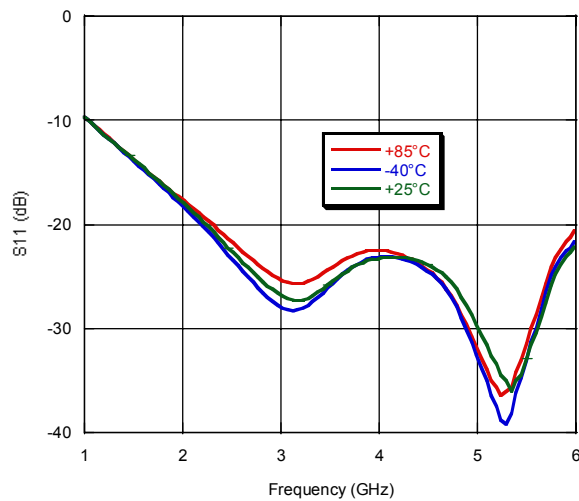
Insertion Loss vs. Frequency



Isolation vs. Frequency



Return Loss vs. Frequency



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S-Parameters

Insertion

Temp: Freq (GHz)	+25 C S11 (dB)	+25 C S21 (dB)	+25 C S22 (dB)	-35C S11 (dB)	-35 C S21 (dB)	-35 C S22 (dB)	+85 C S11 (dB)	+85 C S21 (dB)	+85 C S22 (dB)
1.00	-9.730	-0.936	-9.783	-9.709	-0.926	-9.770	-9.655	-1.000	-9.709
1.20	-11.319	-0.809	-11.403	-11.344	-0.775	-11.405	-11.294	-0.855	-11.363
1.40	-12.940	-0.690	-13.036	-13.033	-0.657	-13.137	-12.952	-0.743	-13.075
1.60	-14.517	-0.631	-14.651	-14.729	-0.587	-14.813	-14.609	-0.669	-14.764
1.80	-16.169	-0.583	-16.399	-16.423	-0.544	-16.608	-16.228	-0.639	-16.540
2.00	-17.831	-0.525	-18.244	-18.196	-0.486	-18.523	-17.646	-0.572	-18.224
2.20	-19.579	-0.508	-20.116	-20.082	-0.467	-20.566	-19.158	-0.558	-19.850
2.40	-21.563	-0.494	-22.472	-22.211	-0.459	-23.055	-20.823	-0.552	-22.042
2.60	-23.491	-0.508	-25.390	-24.358	-0.452	-26.033	-22.550	-0.556	-24.690
2.80	-25.655	-0.482	-29.225	-26.841	-0.450	-29.970	-24.322	-0.546	-28.310
3.00	-27.131	-0.506	-31.582	-28.525	-0.455	-32.320	-25.571	-0.567	-32.018
3.20	-28.233	-0.524	-37.545	-29.183	-0.485	-36.357	-26.446	-0.576	-46.959
3.40	-26.167	-0.480	-35.105	-26.499	-0.447	-32.010	-24.801	-0.549	-34.090
3.60	-24.982	-0.487	-29.647	-25.001	-0.452	-28.053	-23.687	-0.545	-28.422
3.80	-23.481	-0.433	-26.075	-23.277	-0.421	-25.022	-22.337	-0.482	-24.848
4.00	-23.068	-0.499	-24.325	-22.887	-0.465	-23.786	-22.247	-0.581	-23.499
4.20	-22.827	-0.545	-23.247	-22.751	-0.500	-22.993	-22.554	-0.606	-23.039
4.40	-23.576	-0.556	-23.157	-23.852	-0.517	-23.322	-23.734	-0.629	-23.589
4.60	-24.319	-0.565	-23.677	-25.195	-0.513	-24.168	-24.969	-0.635	-24.313
4.80	-25.425	-0.616	-24.410	-26.756	-0.556	-25.329	-26.764	-0.679	-25.821
5.00	-28.654	-0.629	-27.373	-31.190	-0.592	-29.149	-31.236	-0.716	-30.464
5.20	-33.904	-0.657	-33.320	-39.824	-0.608	-37.045	-38.072	-0.747	-39.195
5.40	-37.711	-0.713	-31.161	-36.879	-0.636	-30.283	-35.463	-0.794	-32.217
5.60	-30.135	-0.689	-27.491	-28.743	-0.639	-26.470	-27.844	-0.770	-27.194
5.80	-24.684	-0.694	-23.740	-23.996	-0.639	-23.193	-23.153	-0.795	-22.876
6.00	-21.882	-0.722	-20.517	-21.396	-0.625	-20.171	-20.312	-0.812	-19.567

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S-Parameters (continued)

Isolation

Temp:	+25 C	+25 C	+25 C	-35 C	-35 C	-35 C	+85 C	+85 C	+85 C
Freq (GHz)	S11 (dB)	S21 (dB)	S22 (dB)	S11 (dB)	S21 (dB)	S22 (dB)	S11 (dB)	S21 (dB)	S22 (dB)
1.00	-9.618	-30.729	-0.540	-9.637	-30.782	-0.501	-9.560	-30.592	-0.607
1.20	-11.302	-29.739	-0.691	-11.385	-29.824	-0.633	-11.294	-29.626	-0.778
1.40	-13.046	-29.152	-0.826	-13.061	-29.218	-0.763	-13.059	-29.016	-0.962
1.60	-14.280	-28.617	-0.963	-14.398	-28.632	-0.879	-14.332	-28.398	-1.112
1.80	-16.501	-28.177	-1.083	-16.813	-28.224	-0.983	-16.636	-28.091	-1.248
2.00	-18.331	-28.113	-1.187	-18.679	-28.160	-1.075	-18.210	-28.009	-1.382
2.20	-19.492	-28.078	-1.268	-19.859	-28.077	-1.124	-19.021	-27.943	-1.446
2.40	-21.777	-28.065	-1.318	-22.571	-28.074	-1.183	-20.995	-27.930	-1.530
2.60	-22.653	-28.277	-1.386	-23.881	-28.324	-1.235	-21.948	-28.106	-1.605
2.80	-24.000	-28.571	-1.433	-25.063	-28.660	-1.277	-22.980	-28.409	-1.658
3.00	-25.864	-28.827	-1.480	-26.650	-28.916	-1.336	-24.406	-28.573	-1.735
3.20	-29.935	-29.510	-1.521	-31.809	-29.604	-1.348	-27.784	-29.200	-1.768
3.40	-26.921	-29.681	-1.542	-28.337	-29.909	-1.358	-25.601	-29.286	-1.786
3.60	-24.732	-29.860	-1.528	-24.789	-30.078	-1.346	-23.568	-29.467	-1.789
3.80	-23.580	-30.033	-1.481	-22.901	-30.267	-1.318	-22.493	-29.588	-1.737
4.00	-23.581	-30.309	-1.500	-23.240	-30.549	-1.320	-22.471	-29.723	-1.747
4.20	-20.116	-30.200	-1.458	-20.375	-30.524	-1.288	-20.062	-29.649	-1.696
4.40	-20.961	-29.994	-1.426	-21.243	-30.357	-1.270	-21.402	-29.390	-1.659
4.60	-24.644	-29.396	-1.394	-25.127	-29.760	-1.228	-24.744	-28.796	-1.623
4.80	-21.845	-28.768	-1.374	-22.958	-29.052	-1.209	-22.518	-28.144	-1.594
5.00	-27.006	-28.028	-1.387	-29.786	-28.275	-1.239	-29.669	-27.479	-1.589
5.20	-37.311	-27.028	-1.365	-33.629	-27.243	-1.209	-31.803	-26.428	-1.588
5.40	-27.670	-25.778	-1.375	-27.531	-26.003	-1.220	-26.783	-25.435	-1.590
5.60	-29.533	-24.785	-1.415	-26.927	-24.994	-1.288	-26.695	-24.421	-1.607
5.80	-22.688	-23.812	-1.409	-21.365	-23.868	-1.288	-20.791	-23.541	-1.596
6.00	-21.271	-23.038	-1.426	-21.038	-23.137	-1.296	-19.761	-22.750	-1.620

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