

Features

- 75 Ohms
- Positive Voltage Control (0 / +5 V)
- Input Terminated
- High Isolation 65 dB at 870 MHz
- 4 mm FQFP-N 20 Lead Package
- 0.5 micron GaAs PHEMT Process

Description

M/A-COM's MASWSS0103 is a GaAs PHEMT MMIC single pole double throw (SPDT) switch in a low cost 4 mm FQFP-N 20 lead package. The MASWSS0103 is ideally suited for applications where low control voltage, high isolation, small size and low cost are required. Typical applications are to replace mechanical relays in CATV systems. This part can be used in all 75 ohm systems operating up to 1 GHz.

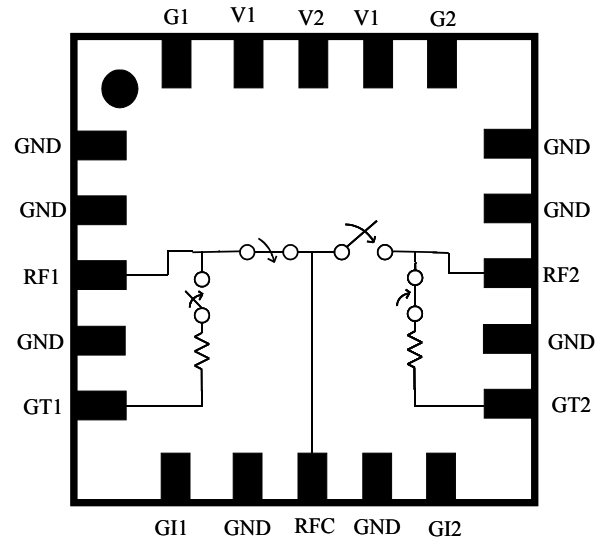
The MASWSS0103 is fabricated using a 0.5 micron gate length GaAs PHEMT process. The process features full passivation for performance and reliability.

Ordering Information ¹

Part Number	Package
MASWSS0103	FQFP-N 20 Lead Plastic Package
MASWSS0103TR	7 inch, 1000 piece reel
MASWSS0103TR-3000	13 inch, 3000 piece reel
MASWSS0103SMB	Sample Test Board (Includes 5 Samples)

1. Reference Application Note M513 for reel size information.

Functional Schematic



Absolute Maximum Ratings ²

Parameter	Absolute Maximum
Max Input Power (5 - 1000 MHz, 2.5V Control)	+32 dBm
Operating Voltage	+8.5 volts
Operating Temperature	-40 °C to +85 °C
Storage Temperature	-65 °C to +150 °C

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

Truth Table ^{3,4}

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

3. 0 = +2.9 to +5V, 1 = 0 + 0.2V

4. External 0.01 μF DC blocking capacitors are required on all RF In/Out and RF Ground ports.

Pin Configuration ⁴

PIN No.	PIN Name	Description
1	GND	Ground
2	GND	Ground
3	RF1	RF In/Out
4	GND	Ground
5	GT1	RF Ground
6	GI1	RF Ground
7	GND	Ground
8	RFC	RF In/Out
9	GND	Ground
10	GI2	RF Ground
11	GT2	RF Ground
12	GND	Ground
13	RF2	RF In/Out
14	GND	Ground
15	GND	Ground
16	G2	RF Ground
17	V1	Control 1
18	V2	Control 2
19	V1	Control 1
20	G1	RF Ground

4. Center paddle should be connected to ground.

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. Use proper ESD control precautions when handling these devices.

Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 75 \Omega$

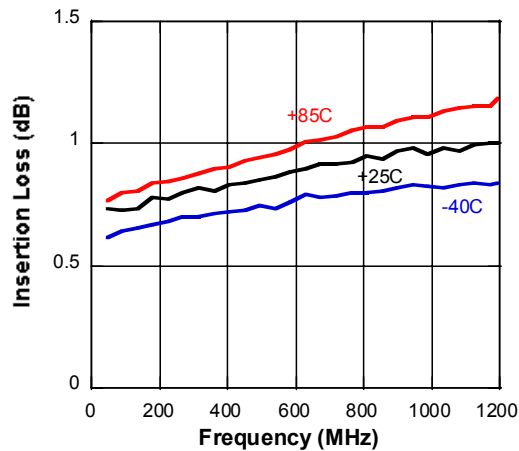
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	5 - 50 MHz	dB		0.75	
	50 - 1000 MHz	dB		1.0	
Isolation	5 - 50 MHz	dB		100	
	50 - 1000 MHz	dB		63	
Return Loss (On)	5 - 50 MHz	dB		28	
	50 - 1000 MHz	dB		16	
Return Loss (Off)	5 - 50 MHz	dB		26	
	50 - 1000 MHz	dB		16	
IP3	Two Tone -10 dBm, 6 MHz Spacing, > 50 MHz $V_c = 0V/5V$	dBm		52	
Trise, Tfall	10% to 90% RF, 90% to 10% RF	nS		8	
Ton, Toff	50% control to 90% RF, and 50% control to 10% RF	nS		18	
Transients	In Band	mV		70	
Gate Leakage	$ V_c = 2.5V$	uA		12	

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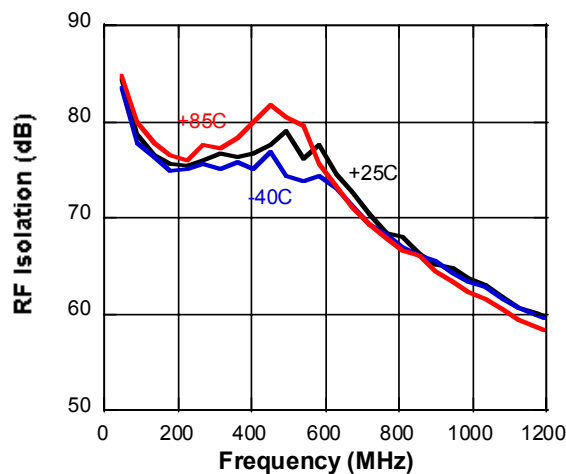
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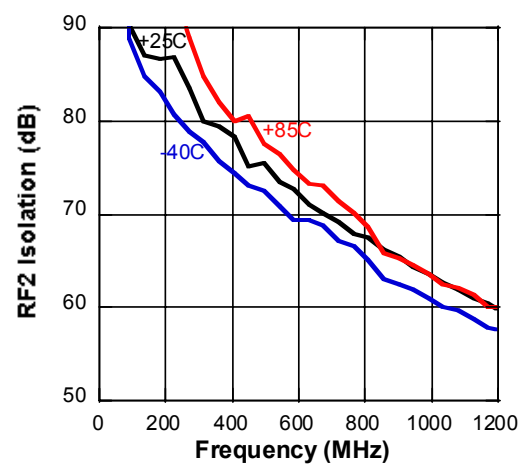
Typical Performance Curves
Insertion Loss



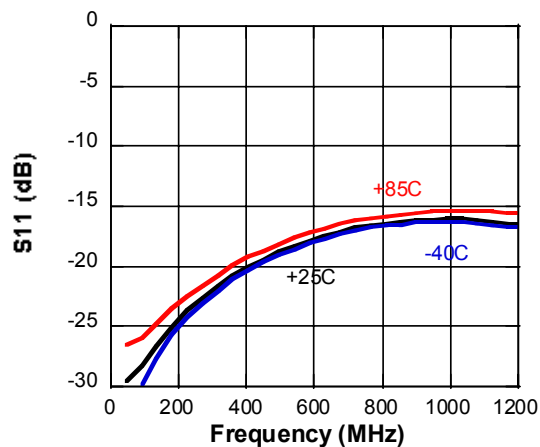
RF1 Isolation



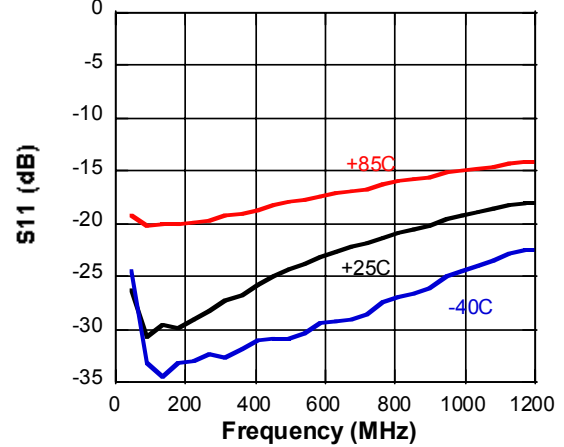
RF2 Isolation



On Return Loss



Off Return Loss

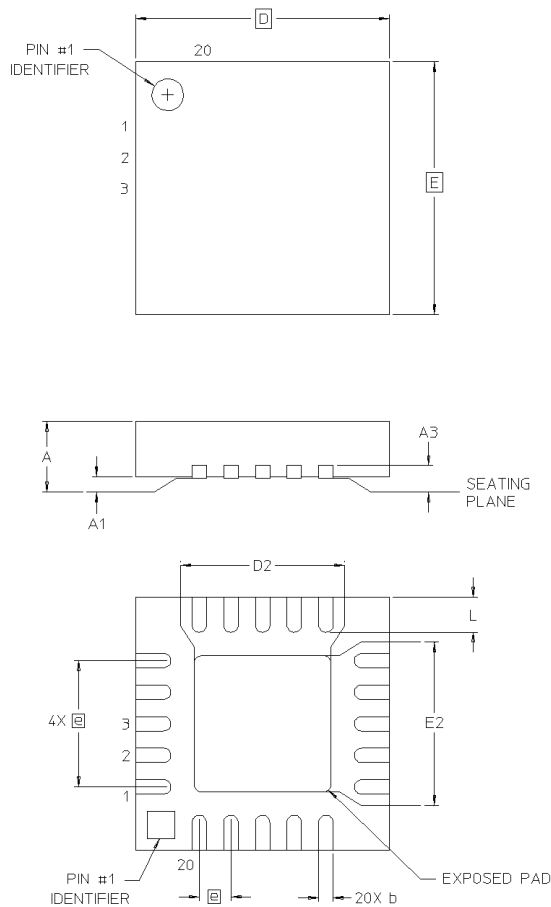


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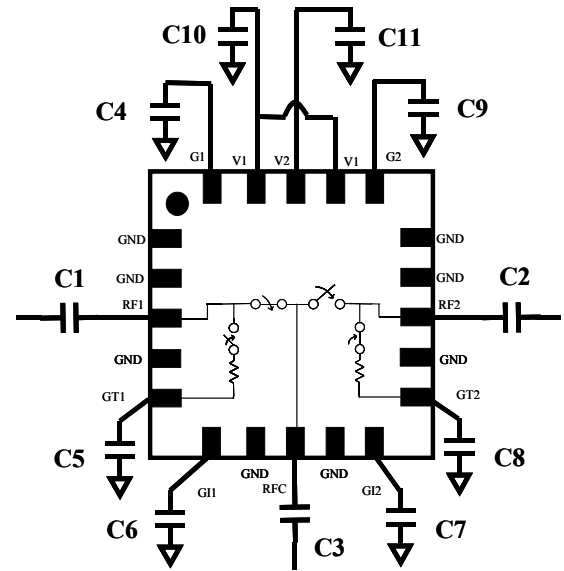
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4 mm FQFP-N 20 Lead Saw Singulated



DIMENSION SYMBOL	MEASUREMENT (mm)		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A3	0.25 REF		
b	0.18	0.23	0.30
D	4.00 BSC		
D2	0.75	1.70	2.25
e	0.50 BSC		
E	4.00 BSC		
E2	0.75	1.70	2.25
L	0.35	0.55	0.75

Application Schematic



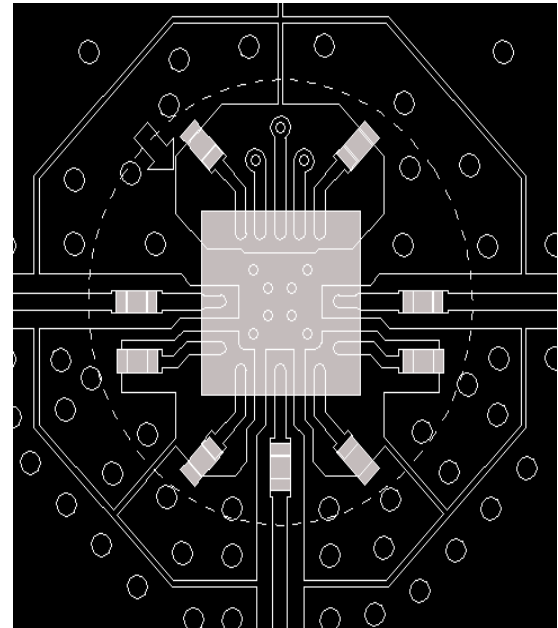
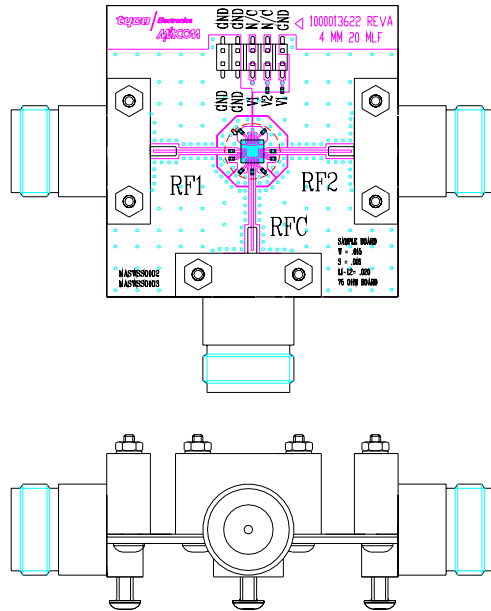
C1 – C9 = 0.01 uF, RF Bypass Capacitors
 C10 – C11 = 0.01 uF, Logic Control Decoupling Capacitors

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Sample Board



Insertion Loss State:

Freq	+25C S11(dB)	+25C S21(dB)	+25C S22(dB)	+85C S11(dB)	+85C S21(dB)	+85C S22(dB)	-40C S11(dB)	-40C S21(dB)	-40C S22(dB)
45	-29.491	-0.732	-29.505	-26.571	-0.769	-26.133	-31.712	-0.619	-31.820
90	-28.225	-0.729	-28.230	-25.893	-0.797	-40.853	-29.800	-0.642	-29.933
135	-26.723	-0.732	-26.720	-24.790	-0.805	-53.022	-27.620	-0.656	-27.738
180	-25.158	-0.777	-25.172	-23.561	-0.838	-62.623	-25.640	-0.668	-25.924
225	-23.721	-0.773	-23.854	-22.531	-0.844	-69.066	-24.233	-0.679	-24.494
270	-22.607	-0.799	-22.748	-21.660	-0.856	-73.949	-23.100	-0.699	-23.371
315	-21.626	-0.816	-21.814	-20.773	-0.876	-79.141	-22.049	-0.704	-22.371
360	-20.777	-0.809	-20.970	-19.918	-0.895	-83.387	-21.122	-0.712	-21.447
405	-20.084	-0.830	-20.227	-19.242	-0.902	-85.960	-20.294	-0.719	-20.581
450	-19.468	-0.840	-19.599	-18.691	-0.932	-88.463	-19.676	-0.726	-19.913
495	-18.804	-0.852	-18.970	-18.120	-0.945	-91.435	-19.083	-0.750	-19.355
540	-18.254	-0.866	-18.384	-17.611	-0.956	-93.965	-18.530	-0.735	-18.845
585	-17.830	-0.882	-17.936	-17.194	-0.977	-95.948	-18.082	-0.757	-18.360
630	-17.439	-0.896	-17.585	-16.830	-1.009	-97.833	-17.687	-0.790	-17.924
675	-17.118	-0.915	-17.217	-16.504	-1.014	-100.377	-17.329	-0.783	-17.596
720	-16.776	-0.915	-16.913	-16.212	-1.030	-102.270	-17.018	-0.789	-17.306
765	-16.588	-0.922	-16.712	-16.008	-1.053	-103.537	-16.792	-0.802	-17.001
810	-16.424	-0.952	-16.535	-15.831	-1.066	-105.481	-16.628	-0.800	-16.825
855	-16.223	-0.938	-16.347	-15.667	-1.069	-107.281	-16.511	-0.805	-16.754
900	-16.132	-0.971	-16.245	-15.501	-1.097	-108.633	-16.341	-0.818	-16.590
945	-16.134	-0.981	-16.241	-15.479	-1.110	-109.941	-16.325	-0.835	-16.543
990	-16.031	-0.959	-16.219	-15.390	-1.109	-111.433	-16.296	-0.828	-16.594
1035	-16.076	-0.982	-16.188	-15.369	-1.134	-113.268	-16.326	-0.819	-16.622
1080	-16.132	-0.970	-16.277	-15.399	-1.148	-114.574	-16.391	-0.831	-16.634
1125	-16.258	-0.998	-16.402	-15.500	-1.156	-115.332	-16.541	-0.838	-16.802
1170	-16.385	-1.005	-16.502	-15.601	-1.155	-116.977	-16.707	-0.832	-17.034
1200	-16.449	-1.003	-16.614	-15.684	-1.190	-118.055	-16.833	-0.847	-17.184

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RF1 Isolation:

V2P

Freq	+25C S11(dB)	+25C S21(dB)	+25C S22(dB)	+85C S11(dB)	+85C S21(dB)	+85C S22(dB)	-40C S11(dB)	-40C S21(dB)	-40C S22(dB)
45	-25.545	-84.357	-26.229	-26.068	-83.460	-19.214	-27.012	-84.816	-24.546
90	-26.677	-78.647	-30.747	-25.749	-77.703	-20.232	-27.631	-79.926	-33.261
135	-25.974	-76.423	-29.644	-24.752	-76.279	-19.967	-26.410	-77.833	-34.472
180	-24.710	-75.670	-29.891	-23.495	-74.924	-20.020	-24.877	-76.563	-33.212
225	-23.370	-75.500	-29.058	-22.353	-75.084	-19.815	-23.513	-75.961	-32.944
270	-22.250	-75.944	-28.294	-21.423	-75.643	-19.644	-22.479	-77.523	-32.394
315	-21.292	-76.698	-27.299	-20.530	-75.013	-19.271	-21.540	-77.242	-32.768
360	-20.513	-76.408	-26.791	-19.827	-75.765	-19.132	-20.777	-78.237	-31.897
405	-19.818	-76.596	-25.746	-19.183	-75.115	-18.685	-20.093	-79.975	-31.089
450	-19.153	-77.545	-25.002	-18.578	-76.931	-18.287	-19.455	-81.775	-30.881
495	-18.604	-79.071	-24.348	-18.063	-74.321	-17.979	-18.943	-80.426	-30.910
540	-18.125	-76.193	-23.885	-17.615	-73.849	-17.757	-18.517	-79.602	-30.369
585	-17.691	-77.616	-23.106	-17.218	-74.366	-17.370	-18.109	-75.688	-29.394
630	-17.355	-74.464	-22.705	-16.851	-73.078	-17.076	-17.740	-73.299	-29.281
675	-17.134	-72.692	-22.225	-16.603	-71.305	-16.848	-17.534	-71.149	-29.010
720	-16.923	-70.454	-21.915	-16.419	-69.366	-16.693	-17.352	-69.321	-28.511
765	-16.690	-68.316	-21.287	-16.171	-68.141	-16.285	-17.141	-67.864	-27.420
810	-16.574	-68.120	-20.829	-16.021	-66.901	-15.972	-17.052	-66.587	-26.920
855	-16.560	-66.156	-20.500	-15.998	-66.061	-15.813	-17.088	-66.086	-26.595
900	-16.414	-65.112	-20.179	-15.849	-65.498	-15.593	-16.976	-64.370	-26.102
945	-16.323	-64.699	-19.600	-15.712	-64.229	-15.185	-16.882	-63.267	-24.970
1035	-16.454	-62.922	-18.919	-15.793	-62.745	-14.816	-17.089	-61.481	-24.066
1080	-16.375	-61.655	-18.584	-15.715	-61.539	-14.563	-17.044	-60.412	-23.424
1125	-16.441	-60.708	-18.311	-15.721	-60.677	-14.338	-17.092	-59.334	-22.877
1170	-16.655	-60.125	-18.025	-15.901	-59.871	-14.194	-17.318	-58.605	-22.493
1200	-16.701	-59.650	-17.943	-15.978	-59.367	-14.170	-17.419	-58.134	-22.509

RF2 Isolation:

Freq	+25C S11(dB)	+25C S21(dB)	+25C S22(dB)	+85C S11(dB)	+85C S21(dB)	+85C S22(dB)	-40C S11(dB)	-40C S21(dB)	-40C S22(dB)
45	-26.168	-112.928	-28.347	-26.216	-99.868	-19.724	-11.046	-92.597	-33.004
90	-27.228	-90.399	-29.983	-26.397	-88.907	-20.322	-19.406	-94.486	-35.290
135	-26.388	-86.983	-28.858	-25.407	-84.799	-19.992	-21.822	-101.505	-36.257
180	-25.040	-86.580	-29.064	-24.152	-83.037	-20.011	-22.306	-92.150	-34.683
225	-23.641	-86.940	-28.146	-22.979	-80.652	-19.808	-21.823	-93.575	-33.905
270	-22.492	-83.514	-27.322	-21.937	-78.933	-19.631	-21.294	-88.861	-32.948
315	-21.486	-80.019	-26.452	-20.957	-77.692	-19.229	-20.799	-84.798	-32.988
360	-20.671	-79.492	-26.038	-20.183	-75.652	-19.048	-20.237	-81.948	-32.187
405	-19.880	-78.309	-24.941	-19.476	-74.410	-18.595	-19.710	-79.912	-31.221
450	-19.155	-75.173	-24.115	-18.781	-72.990	-18.246	-19.178	-80.434	-30.771
495	-18.613	-75.409	-23.565	-18.248	-72.511	-17.932	-18.747	-77.511	-30.371
540	-18.128	-73.440	-23.162	-17.786	-70.822	-17.640	-18.417	-76.489	-29.670
585	-17.679	-72.779	-22.322	-17.344	-69.361	-17.249	-18.044	-74.785	-28.786
630	-17.298	-70.999	-21.888	-16.956	-69.368	-16.980	-17.718	-73.301	-28.648
675	-17.073	-70.087	-21.553	-16.709	-68.782	-16.697	-17.535	-73.132	-28.118
720	-16.872	-69.162	-21.286	-16.493	-67.203	-16.493	-17.368	-71.466	-27.595
765	-16.602	-67.796	-20.616	-16.205	-66.497	-16.174	-17.143	-70.024	-26.882
810	-16.481	-67.519	-20.176	-16.043	-65.031	-15.934	-17.026	-68.578	-26.557
855	-16.479	-66.182	-19.992	-16.003	-62.991	-15.730	-17.069	-65.854	-26.091
900	-16.334	-65.474	-19.722	-15.829	-62.526	-15.484	-16.963	-65.310	-25.575
945	-16.207	-64.405	-19.118	-15.666	-61.909	-15.156	-16.830	-64.599	-24.816
1035	-16.352	-62.698	-18.682	-15.729	-60.085	-14.817	-16.996	-62.569	-23.957
1080	-16.272	-61.828	-18.335	-15.638	-59.716	-14.595	-16.894	-62.030	-23.492
1125	-16.343	-60.930	-18.038	-15.640	-58.841	-14.486	-16.888	-61.430	-23.316
1170	-16.584	-60.372	-17.905	-15.833	-57.802	-14.331	-17.105	-60.120	-22.990
1200	-16.657	-59.754	-17.934	-15.927	-57.397	-14.267	-17.196	-59.832	-22.841

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