

## Features

- Operates DC - 4 GHz on Single Supply
- ASIC TTL / CMOS Driver
- Low DC Power Consumption
- 50 Ohm Nominal Impedance
- Test Boards are Available
- Tape and Reel are Available
- 4 x 6 mm PQFN Package

## Description

M/A-COM's SW90-0001 is a SPST absorptive pHEMT switch with integral TTL driver. This device is in an MLP plastic surface mount package. This switch offers excellent broadband performance and repeatability from DC to 4 GHz, while maintaining low DC power dissipation. The SW90-0001 is ideally suited for wireless infrastructure applications.

## Ordering Information

Part Number	Package
SW90-0001	Bulk Packaging
SW90-0001TR	1000 piece reel
SW90-0001-TB	Sample Test Board

Note: Reference Application Note M513 for reel size information.

## Pin Configuration<sup>1,2,3,4</sup>

Pin No.	Function	Pin No.	Function
1	NC	17	NC
2	NC	18	NC
3	C1	19	V <sub>CC</sub>
4	NC	20	NC
5	NC	21	CP2
6	NC	22	NC
7	NC	23	CP1
8	NC	24	NC
9	NC	25	V <sub>EE</sub>
10	NC	26	GND
11	GND	27	RF1
12	RF2	28	GND
13	GND	29	NC
14	NC	30	V <sub>EE</sub>
15	NC	31	NC
16	NC	32	V <sub>CC</sub>

1. NC = No Connection
2. VEE is internally generated and must remain isolated from external power supplies. Generated noise is typical of switching DC-DC Converters
3. Connections and external components shown in functional schematic are required. 0.1 μF Capacitors need to be located near pins 30 & 32.
4. The exposed pad centered on the package bottom must be connected to RF and DC ground. (For PQFN Packages)

## Truth Table (Switch)

Control Input	Condition of the Switch
C1	RF1 to RF2
0	Off
1	On

**Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50\Omega$**

Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Insertion Loss	RF1—RF2 (All Logic "1")	DC - 4.0 GHz	dB	—	—	0.85
Isolation	RF1—RF2 (All Logic "0")	DC - 4.0 GHz	dB	25	—	—
VSWR	On (RF1, RF2) (All Logic "1")	DC - 4.0 GHz	Ratio	—	—	1.5:1
VSWR	Off (RF1, RF2) (All Logic "0")	DC - 4.0 GHz	Ratio	—	—	1.5:1
1 dB Compression	—	50 MHz	dBm	—	24	—
	—	0.5 - 4.0 GHz	dBm	—	30	—
Input $IP_3$	Two-tone inputs up to +5 dBm	50 MHz	dBm	—	40	—
		0.5-4.0 GHz	dBm	—	48	—
Switching Speed	Ton (50% Control to 10% RF)	—	ns	—	32	—
	Toff (50% Control to 90% RF)	—	ns	—	20	—
	Trise (10% to 90% RF)	—	ns	—	7	—
	Tfall (90% to 10% RF)	—	ns	—	2	—
$V_{CC}$	—	—	V	4.5	5.0	5.5
$V_{IL}$ $V_{IH}$	LOW-level input voltage	—	V	0.0	—	0.8
	HIGH-level input voltage	—	V	2.0	—	5.0
Iin (Input Leakage Current)	$V_{in} = V_{CC}$ or GND	—	$\mu\text{A}$	-1.0	—	1.0
$I_{CC}^5$	$V_{CC}$ min to max, Logic "0" or "1"	—	mA	—	5	8
Turn-on Current <sup>6</sup>	For guaranteed start-up	—	mA	—	—	125
$\Delta I_{CC}$ (Additional Supply Current Per TTL Input Pin)	$V_{CC} = \text{Max}$ , $V_{cntrl} = V_{CC} - 2.1 \text{ V}$	—	mA	—	—	1.0
Switching Noise	Generated from DC-DC Converter with recommended capacitors	3.5 MHz	dBm	—	-93	—
Thermal Resistance $\theta_{jc}$	—	—	$^\circ\text{C/W}$	—	15	—

- During turn-on, the device requires an initial start up current ( $I_{CC}$ ) specified as "Turn-on Current". Once operational,  $I_{CC}$  will drop to the specified levels.
- The DC-DC converter is guaranteed to start in 100  $\mu\text{s}$  as long as the power supplies have the maximum turn-on current available for start up.

## Absolute Maximum Ratings <sup>7,8</sup>

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 GHz <sup>9</sup>	+27 dBm +34 dBm
V <sub>CC</sub>	-0.5V ≤ V <sub>CC</sub> ≤ +6.0V
V <sub>in</sub> <sup>10</sup>	-0.5V ≤ V <sub>in</sub> ≤ V <sub>CC</sub> + 0.5V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

7. Exceeding any one or combination of these limits may cause permanent damage to this device.
8. M/A-COM does not recommend sustained operation near these survivability limits.
9. When the RF input is applied to the terminated port, the absolute maximum power is +30 dBm.
10. Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

## Handling Procedures

Please observe the following precautions to avoid damage:

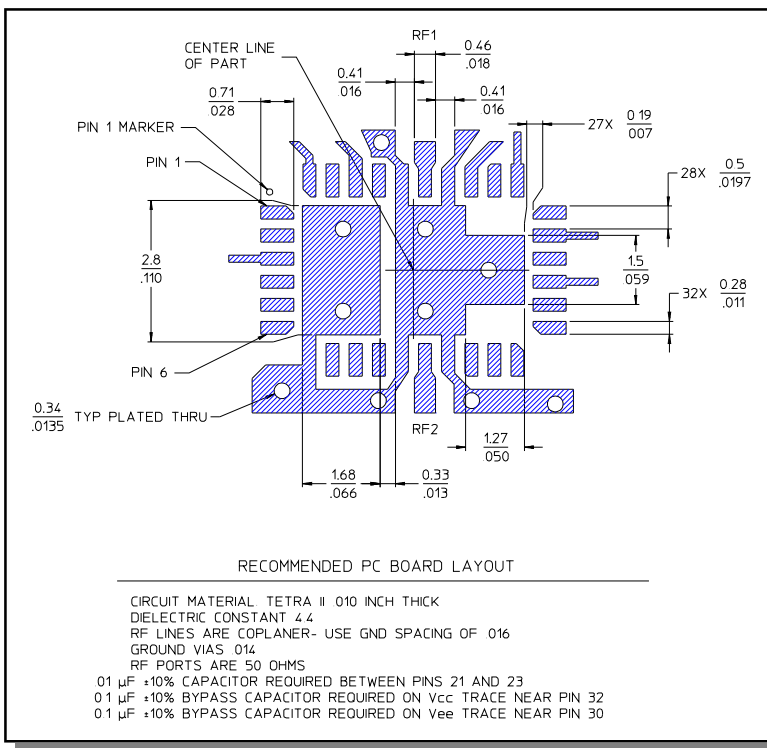
## Static Sensitivity

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.

## Moisture Sensitivity

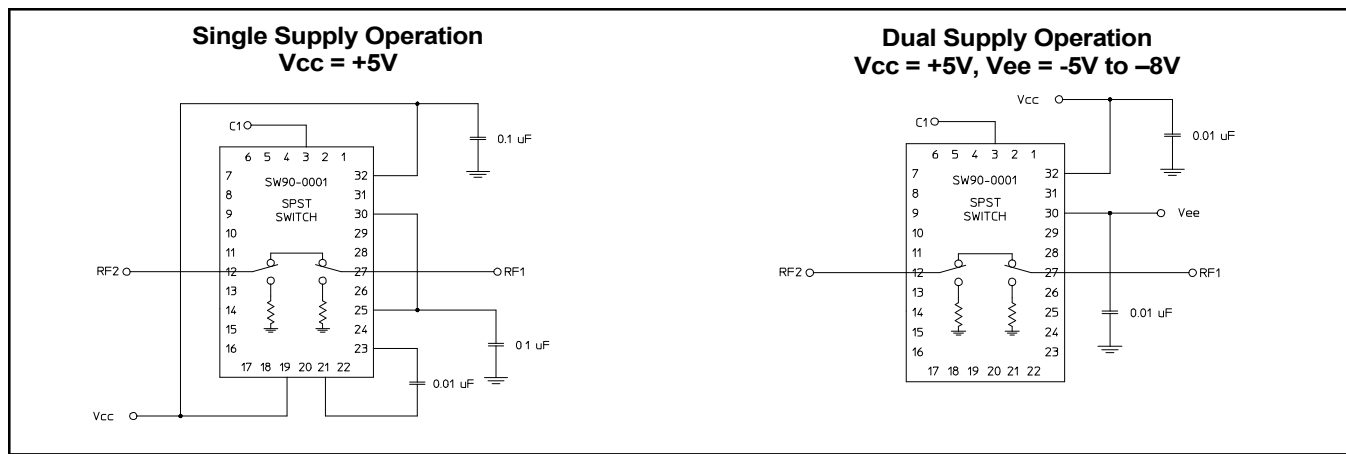
The MSL rating for this part is defined as Level 2 per IPC/JEDEC J-STD-020. Parts shall be stored and/or baked as required for MSL Level 2 parts.

## Recommended PCB Configuration<sup>11</sup>



11. Application Note C2083 is available on line at [www.macom.com](http://www.macom.com)

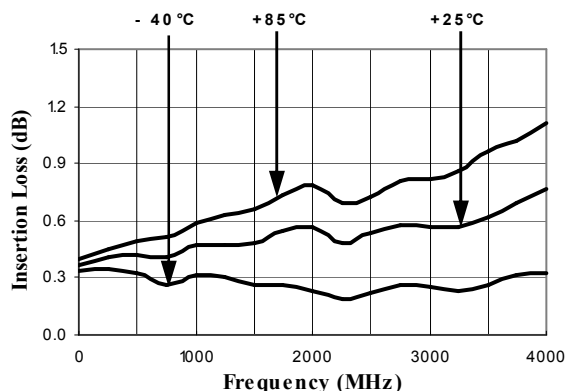
## Functional Schematic<sup>12</sup>



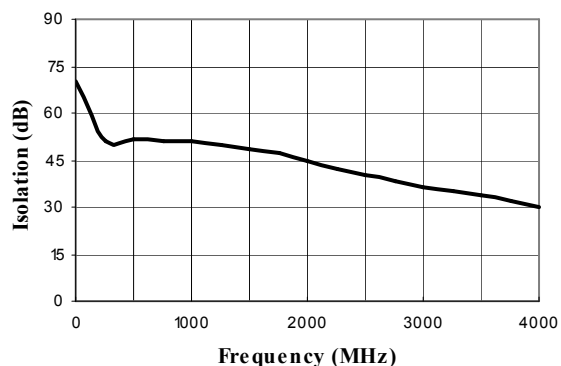
12. Dual Supply Operation will eliminate the start-up current mentioned in Note 5. It will also eliminate spurious signals caused by the DC-DC converter that are present in single supply operation.

## Typical Performance Curves

*Insertion Loss vs. Frequency*

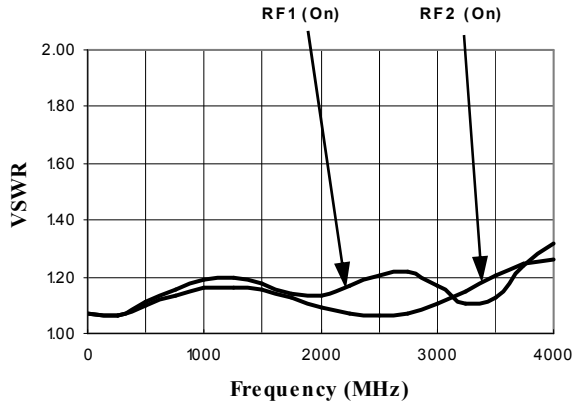


*Isolation (dB) vs. Frequency*

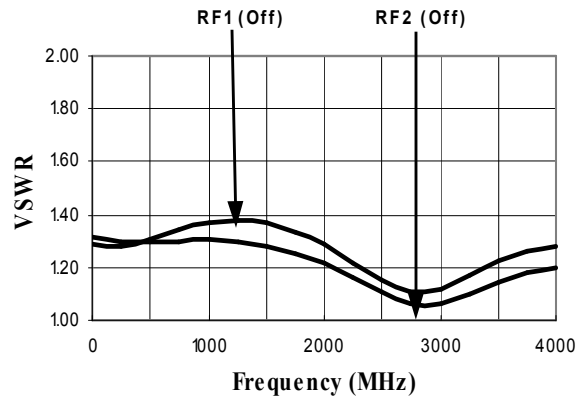


## Typical Performance Curves

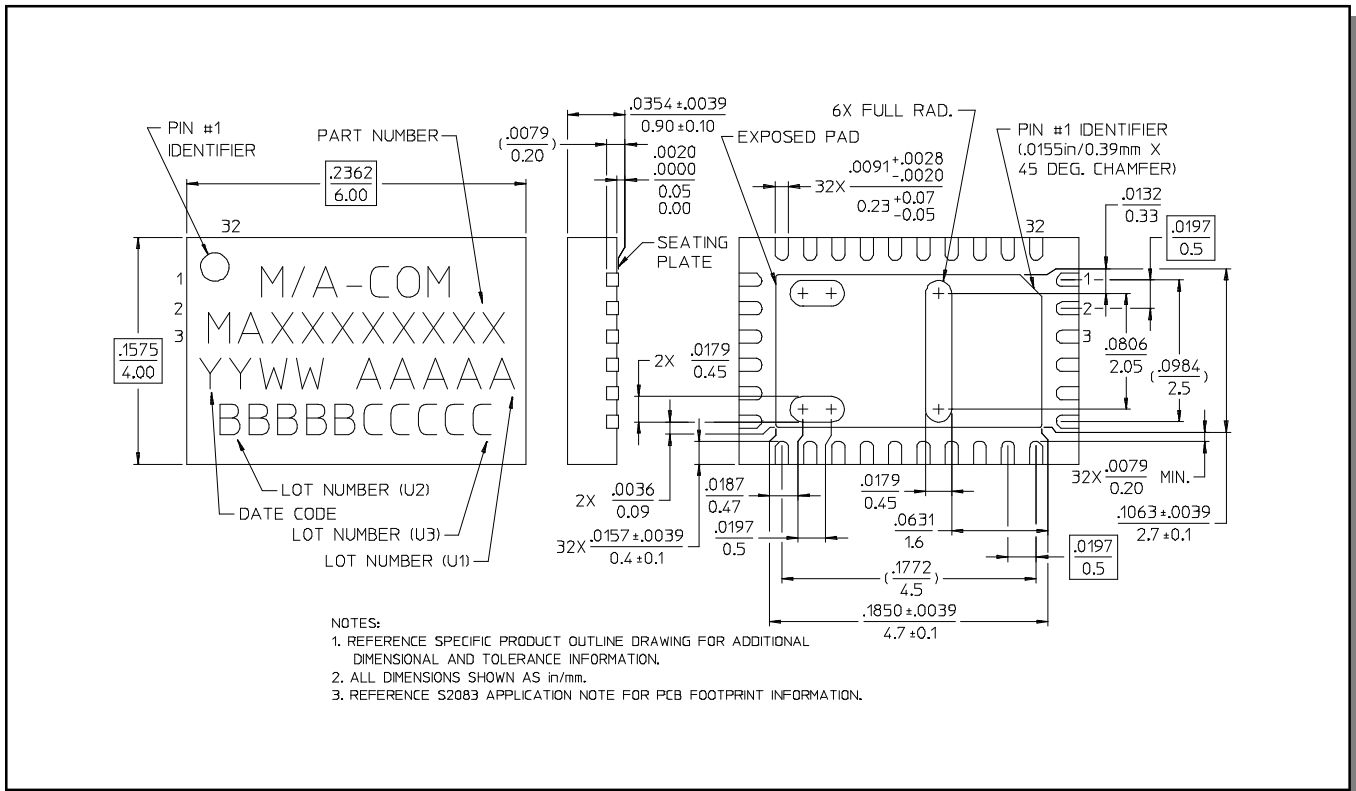
*On VSWR vs. Frequency*



*VSWR (Terminations) vs. Frequency*



## CSP-1, 4 x 6 mm, 32-lead PQFN<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.