

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 SW90-0002 is a SPDT absorptive pHEMT switch with integral TTL driver. This device is in an PQFN plastic surface mount package. This switch offers excellent broadband performance and repeatability from DC to 4 GHz, while maintaining low DC power dissipation. The SW90-0002 is ideally suited for wireless infrastructure applications.

Ordering Information

| Part Number | Package |
|--------------|-------------------|
| SW90-0002 | Bulk Packaging |
| SW90-0002TR | 1000 piece reel |
| SW90-0002-TB | Sample Test Board |

Note: Reference Application Note M513 for reel size information.

Pin Configuration^{1,2,3,4}

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

1. NC = No Connection
2. V_{EE} 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 20 & 26.
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 | |
|---------------|---------------------------|-----|
| | RF Common to each RF Port | |
| | RF1 | RF2 |
| 0 | Off | On |
| 1 | On | Off |

"0" = TTL Low "1" = TTL High

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

| Parameter | Test Conditions | Frequency | Units | Min | Typ | Max |
|---|---|-------------------------|------------|--------|----------|--------|
| Insertion Loss | RFC—RF1,RF2 (Logic per truth table) | DC - 4.0 GHz | dB | — | — | 1.8 |
| Isolation | RF1—RF2 (All Logic "0") | DC - 4.0 GHz | dB | 30 | — | — |
| VSWR | On (RFC,RF1, RF2) (Logic per truth table) | DC - 4.0 GHz | Ratio | — | — | 2.0:1 |
| VSWR | Off (RF1, RF2) (Logic per truth table) | DC - 4.0 GHz | Ratio | — | — | 1.8:1 |
| 1 dB Compression | — — | 50 MHz 0.5 - 4.0 GHz | dBm dBm | — — | 18 29 | — — |
| Input IP ₃ | Two-tone inputs up to +5 dBm | 50 MHz 0.5 - 4.0 GHz | dBm dBm | — — | 36 46 | — — |
| Switching Speed | Ton (50% Control to 10% RF) | — | ns | — | 31 | — |
| | Toff (50% Control to 90% RF) | — | ns | — | 19 | — |
| | Trise (10% to 90% RF) | — | ns | — | 6 | — |
| | 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 |
| I _{in} (Input Leakage Current) | V _{in} = V _{CC} or GND | — | uA | -1.0 | — | 1.0 |
| I _{cc} ⁵ | V _{cc} min to max, Logic "0" or "1" | — | mA | — | 5 | 8 |
| Turn-on Current ⁶ | For guaranteed start-up | — | mA | — | — | 125 |
| ΔI_{cc} (Additional Supply Current Per TTL Input Pin) | V _{CC} = Max, V _{cntrl} = V _{CC} - 2.1 V | — | mA | — | — | 1.0 |
| Switching Noise | Generated from DC-DC Converter with recommended capacitors | 3.5 MHz | dBm | — | -93 | — |
| Thermal Resistance θ_{jc} | — | — | °C/W | — | 15 | — |

5. 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.
6. The DC-DC converter is guaranteed to start in 100 μs as long as the power supplies have the maximum turn-on current available for start-up.

Absolute Maximum Ratings^{7,8}

| Parameter | Absolute Maximum |
|--|--|
| Max. Input Power 0.05 GHz 0.5 - 4.0 GHz ⁹ | +27 dBm +34 dBm |
| V _{CC} | -0.5V ≤ V _{CC} ≤ +6.0V |
| V _{in} ¹⁰ | -0.5V ≤ V _{in} ≤ V _{CC} + 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.

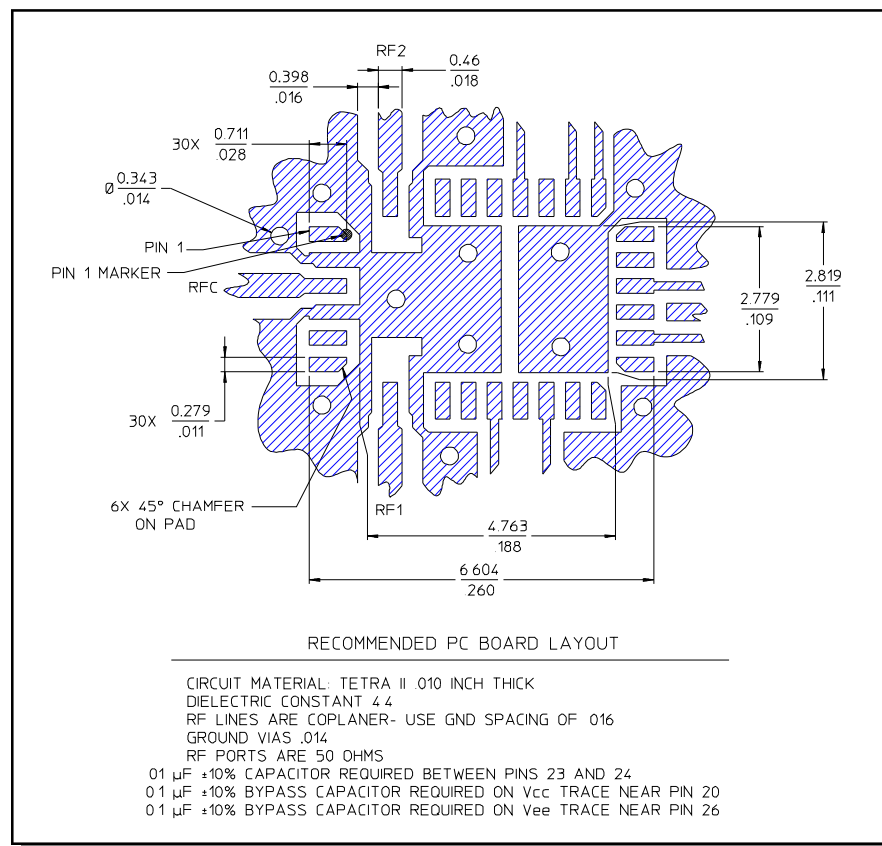
Handling Procedures

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.

Recommended PCB Configuration¹¹



11. Application Note S2083 is available on line at www.macom.com

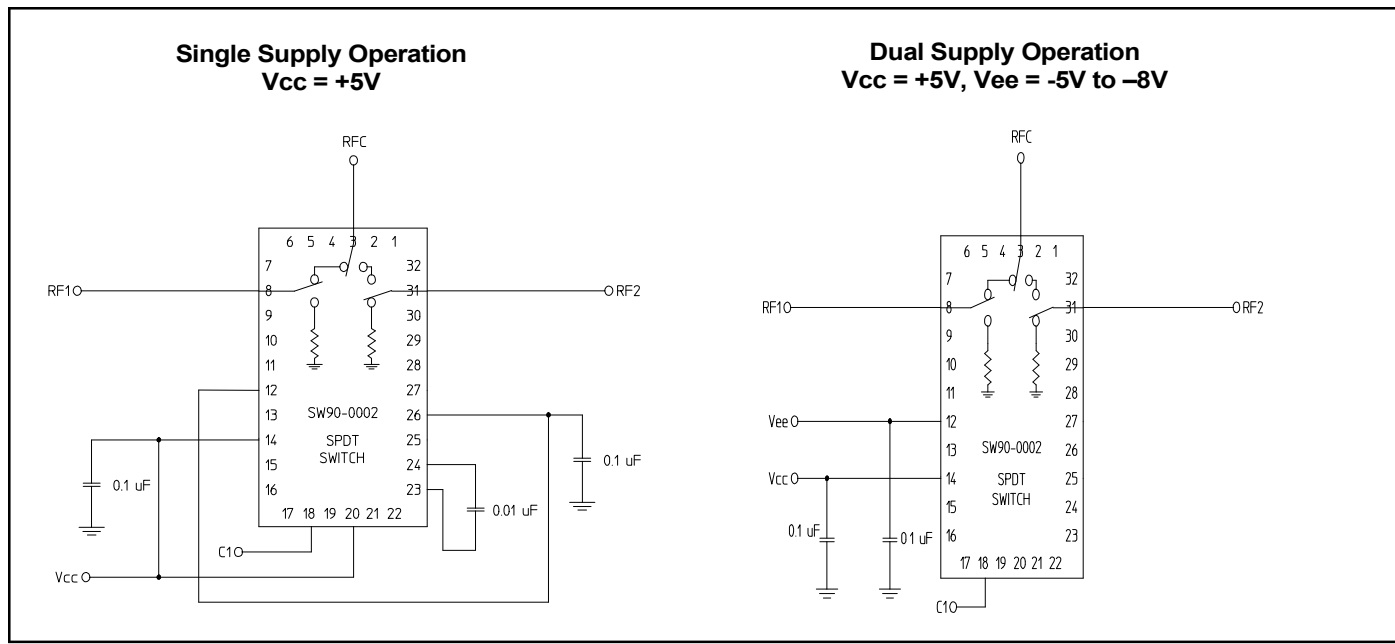
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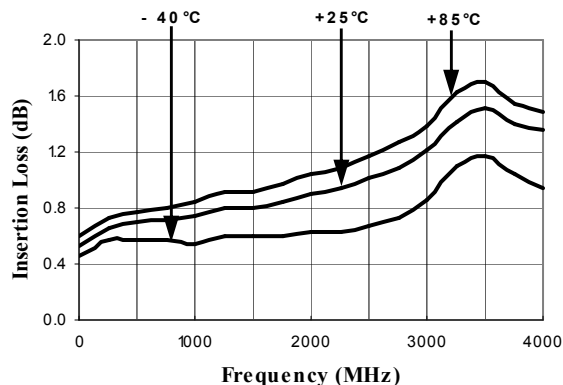
Functional Schematic¹²



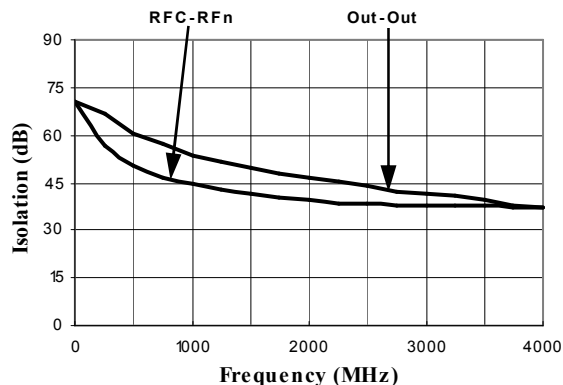
12. Dual Supply Operation will eliminate the start-up current mentioned in Note 5. It will also eliminate spurious signals caused by the DC-DC converter that are present in single supply operation.

Typical Performance Curves

Insertion Loss vs. Frequency



Isolation (dB) vs. Frequency



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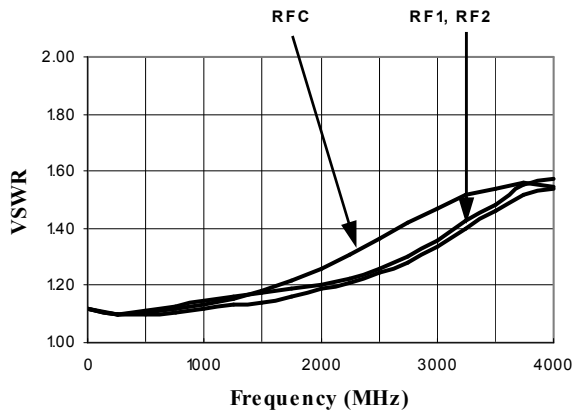
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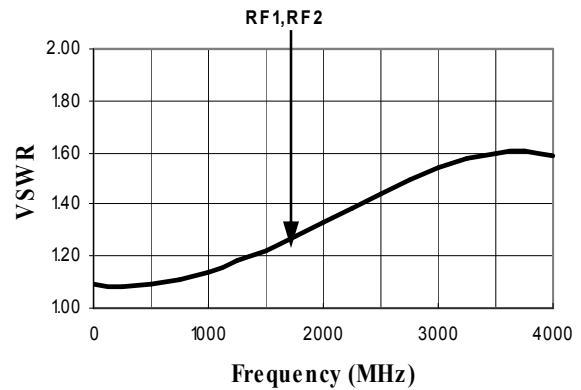
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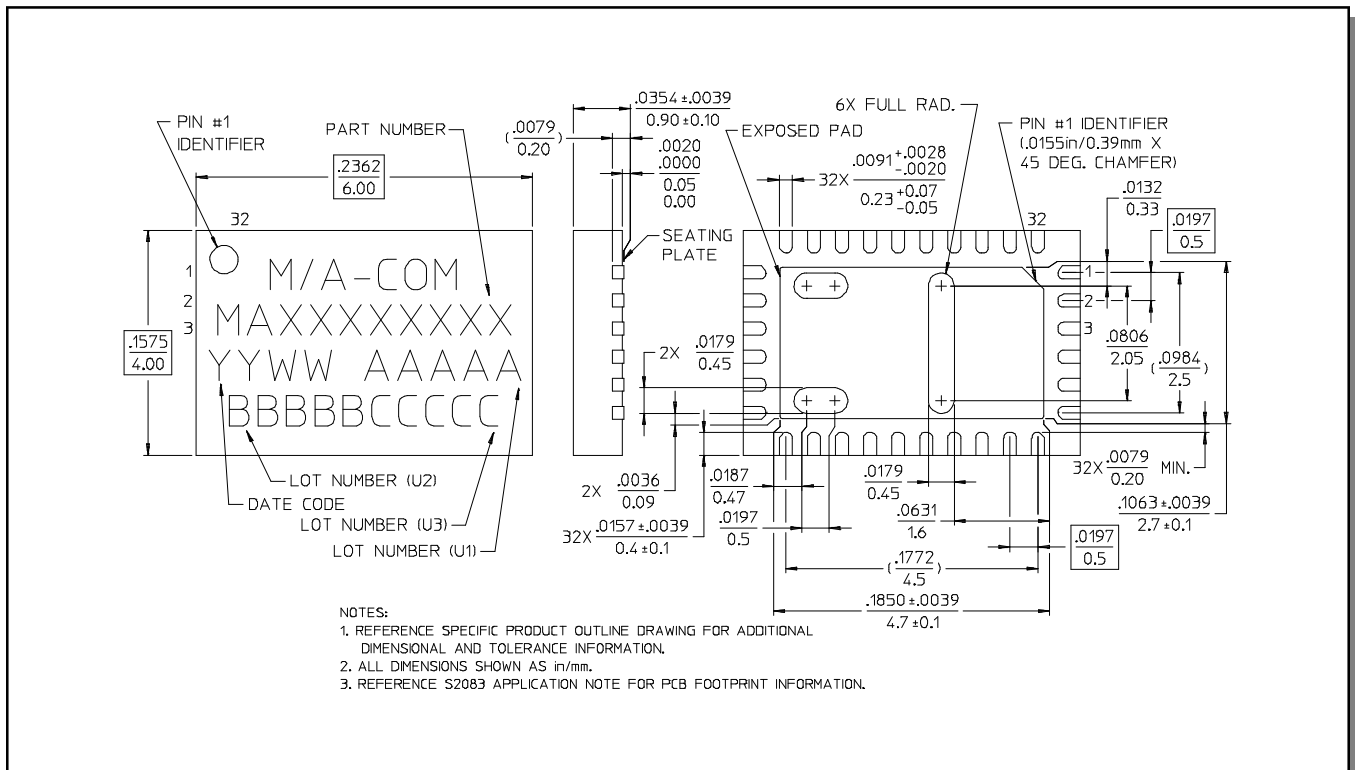
On VSWR vs. Frequency



VSWR (Terminations) vs. Frequency



CSP-1, 4 x 6 mm, 32-lead PQFN†



† Reference Application Note M538 for lead-free solder reflow recommendations.