# MASW2000

GaAs SPDT Switch
DC - 3.0 GHz

Rev. V4

## Features

- Low Insertion Loss: 0.5 dB Typical @ 2 GHz
- Fast Switching Speed: 22 ns Typical
- Reflective/Absorptive Configuration
- Ultra Low DC Power Consumption

## Description

M/A-COM's MASW2000 is a use-configuratble, high isolation SPDT switch. It can be absorptive or reflective based on user requirements[5]. Designed on M/A-COM's mature 1-micron MESFET process, this parts is ideal for modules or other packaging for use in the Cellular, GPS, LAN and infrastructure markets.

## Ordering Information[1]

| Part Number | Package |
|---|---|
| MASW2000 | Die |

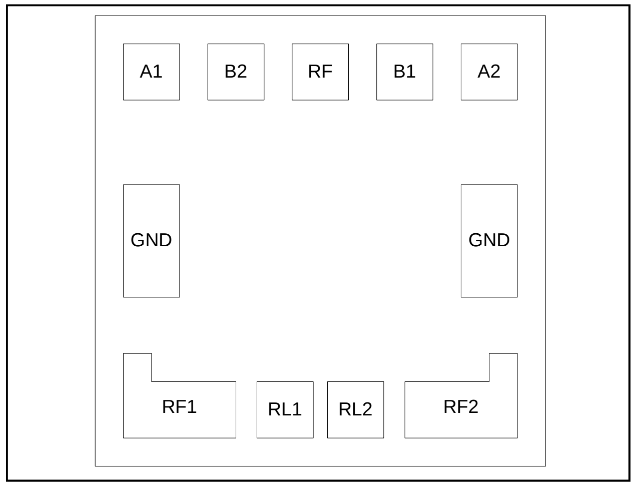
1. Die quantity varies.

## Absolute Maximum Ratings [2]

| Parameter | Absolute Maximum |
|---|---|
| Control Voltage (A1/B2 or A2/B1) | -8.5 VDC |
| Input RF Power | +34 dBm |
| Operating Temperature | +175°C |
| Storage Temperature | -65°C to +175°C |

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

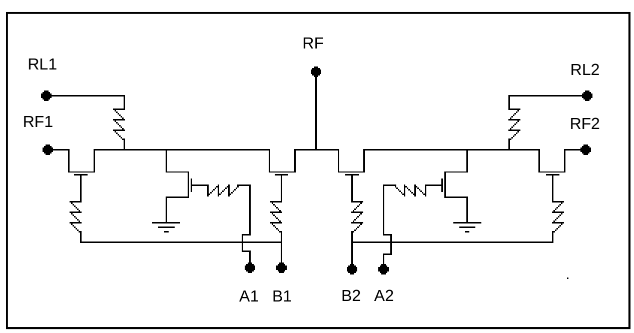
## Pad Layout




## Bond Pad Dimensions

| Bond Pad | Dimension Inches (mm) |
|---|---|
| RF | 0.004 x 0.004 (0.100 x 0.100) |
| RF1, RF2 | 0.009 x 0.009 (0.225 x 0.225) |
| A1, A2, B1, B2 | 0.004 x 0.004 (0.100 x 0.100) |
| GND1, GND2 | 0.009 x 0.004 (0.225 x 0.105) |
| RL1, RL2 | 0.004 x 0.005 (0.100 x 0.125) |
| DIE Size | 0.056 x 0.056 x 0.010 (1.40 x 1.40 x 0.25) |

## Schematic





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## Electrical Specifications [3,4]: $T_A$ = 25°C, $Z_0$ = 50Ω, -55°C to +85°C

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Insertion Loss | DC - 0.5 GHz<br>DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 3.0 GHz | dB<br>dB<br>dB<br>dB | —<br>—<br>—<br>— | —<br>—<br>—<br>— | 0.5<br>0.6<br>0.8<br>1.0 |
| Isolation | DC - 0.5 GHz<br>DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 3.0 GHz | dB<br>dB<br>dB<br>dB | 43<br>35<br>27<br>24 | —<br>—<br>—<br>— | —<br>—<br>—<br>— |
| Reflective VSWR [5] | DC - 0.5 GHz<br>DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 3.0 GHz | Ratio<br>Ratio<br>Ratio<br>Ratio | —<br>—<br>—<br>— | —<br>—<br>—<br>— | 1.20:1<br>1.20:1<br>1.20:1<br>1.40:1 |
| Absorptive VSWR [6] | DC - 2.0 GHz<br>DC - 3.0 GHz | Ratio<br>Ratio | —<br>— | —<br>— | 1.20:1<br>1.40:1 |
| Trise, Tfall | 10% to 90% RF and 90% to 10% RF | ns | — | 22 | — |
| Ton, Toff | 50% control to 90% RF, and 50% control to 10% RF | ns | — | 27 | — |
| Transients | In-Band | mV | — | 25 | — |
| Input P1dB | 0.05 GHz, 0/-5 V<br>0.5 - 3.0 GHz, 0/-5 V<br>0.05 GHz, 0/-8 V<br>0.5 - 3.0 GHz, 0/-8 V | dBm<br>dBm<br>dBm<br>dBm | —<br>—<br>—<br>— | 24<br>26<br>26<br>32 | —<br>—<br>—<br>— |
| IP2 | Two Tone, +5 dBm/Tone, 5 MHz Spacing, >50 MHz<br>0.05 GHz<br>0.5 - 3.0 GHz | dBm<br>dBm | —<br>— | +63<br>+80 | —<br>— |
| IIP3 | Two Tone, +5 dBm/Tone, 5 MHz Spacing, >50 MHz<br>0.05 GHz<br>0.5 - 3.0 GHz | dBm<br>dBm | —<br>— | +43<br>+53 | —<br>— |

3. All specifications apply with 50-ohm impedance connected to all RF ports, 0 and –5 VDC control voltages.
4. Loss changes 0.0025 dB/°C (From –55°C to +85°C).
5. For reflective operation RL1/RL2 are unconnected.
6. For absorptive operation RL1 connects to RF1 and RL2 connects to RF2.

## 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.

## Truth Table [7]

| Control Inputs | | Condition of Switch | |
|---|---|---|---|
| A1/B2 | A2/B1 | RF1 | RF2 |
| $V_{IN}$ Hi | $V_{IN}$ Low | On | Off |
| $V_{IN}$ Low | $V_{IN}$ Hi | Off | On |

7. For normal SPDT operation A1 is connected to B2 and A2 is connected to B1.





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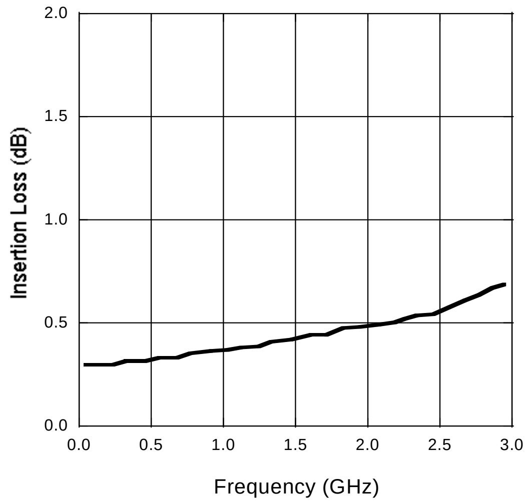
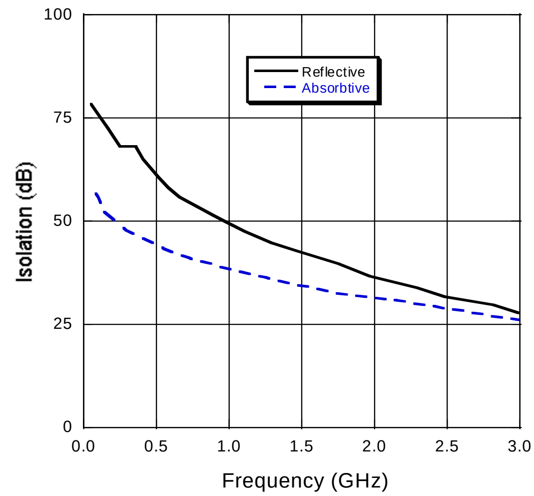
## Typical Performance Curves

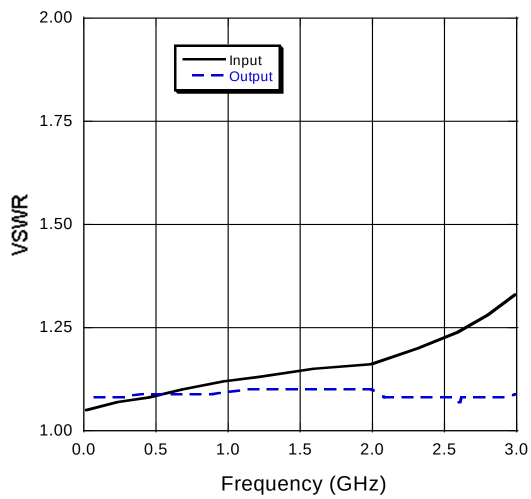
***Insertion Loss***




***Isolation***




***VSWR***





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## Handling Procedures

Permanent damage to the MASW2000 may occur if the following precautions are not adhered to:

A. Cleanliness - The MASW2000 should be handled in a clean environment. DO NOT attempt to clean assembly after the MASW2000 is installed.
B. Static Sensitivity - All die handling equipment and personnel should be DC grounded.
C. Transients - Avoid instrument and power supply transients while bias is connected to the MASW2000. Use shielded signal and bias cables to minimize inductive pick-up.
D. Bias - Apply voltage to either control port A1/B2 or A2/B1 only when the other is grounded. Neither port should be allowed to “float”.
E. General Handling - It is recommended that the MASW2000 chip be handled along the long side of the die with a sharp pair of bend tweezers. DO NOT touch the surface of the chip with fingers or tweezers.

## Mounting

The MASW2000 is back-metallized with Pd/Ni/Au (100/1,000/10,000Å) metallization. It can be die-mounted using Au/Sn eutectic preforms or a thermally conductive epoxy. The package surface should be clean and flat before attachment.

Eutectic Die Attach:

A. An 80/20 Au/Sn preform is recommended with a work surface temperature of approximately 255°C and a tool temperature of 265°C. When hot 90/5 nitrogen/hydrogen gas is applied, solder temperature should be approximately 290°C.
B. DO NOT expose the MASW2000 to a temperature greater than 320°C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

Epoxy Die Attach:

A. Apply a minimum amount of epoxy and place the MASW2000 into position. A thin epoxy fillet should be visible around the perimeter of the die.
B. Cure epoxy per manufacturer’s recommended schedule.
C. Electrically conductive epoxy is recommended but is not required.

## Bonding

A. Ball or wedge bond with 1.0 mil diameter pure gold wire. Thermosonic bonding with a nominal stage temperature of 150°C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Ultrasonic energy and time should be adjusted to the minimum levels necessary to achieve reliable wirebonds.
B. Wirebonds should be started on the chip and terminated on the package. GND bonds should be as short as possible; at least three and no more than four bond wires from ground pads to package are recommended.





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