

# GaAs SP4T Switch

## DC - 4 GHz

**MASW4060G**

V 2.00

### Features

- Low Insertion Loss, 1.2 dB Typical
- Fast Switching Speed, 4 ns Typical
- Ultra Low DC Power Consumption
- Terminated Option

### Guaranteed Specifications\*

–55°C to +85°C

Frequency Range		DC – 4.0 GHz
Insertion Loss	DC – 0.5 GHz	1.3 dB Max
	DC – 1.0 GHz	1.3 dB Max
	DC – 2.0 GHz	1.3 dB Max
	DC – 4.0 GHz	1.7 dB Max
Isolation	DC – 0.5 GHz	50 dB Min
	DC – 1.0 GHz	45 dB Min
	DC – 2.0 GHz	40 dB Min
	DC – 4.0 GHz	30 dB Min
VSWR	DC – 0.5 GHz	1.4:1 Max
	DC – 1.0 GHz	1.4:1 Max
	DC – 2.0 GHz	1.5:1 Max
	DC – 4.0 GHz	2.0:1 Max

### Operating Characteristics

**Impedance** 50  $\Omega$  Nominal

#### Switching Characteristics

tRISE, tFALL (10/90% or 90/10% RF)	2 ns Typ
tON, tOFF (50% CTL to 90/10% RF)	4 ns Typ
Transients (In-Band)	20 mV Typ

#### Input Power for 1dB Compression

Control Voltages (Vdc)	0/–5
0.05 GHz	+17 dBm Typ
0.5 – 4.0 GHz	+27 dBm Typ

#### Intermodulation Intercept Point

(for two-tone input power up to +5 dBm)

Intercept Points	IP2	IP3
0.5 GHz	+45	+35 dBm Typ
0.5 – 4.0 GHz	+60	+46 dBm Typ

#### Control Voltages (Complementary Logic)

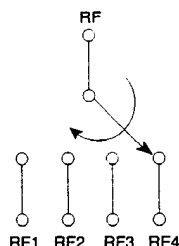
V <sub>IN</sub> Low	0 to –0.2 V @ 25 $\mu$ A Max
V <sub>IN</sub> Hi	–5 V @ 50 $\mu$ A Typ to –5 V @ 200 $\mu$ A Max

**Die Size** 0.059" x 0.077" x 0.010"  
(1.50mm x 1.95mm x 0.25mm)

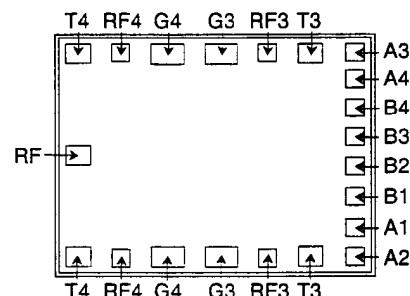
\*\*All specifications apply with 50  $\Omega$  impedance connected to all RF ports, 0 and 0 and –5 Vdc control voltages.

\*\*\*Loss changes  $\pm 0.0025$  dB/°C. (From –55°C to +85°C)

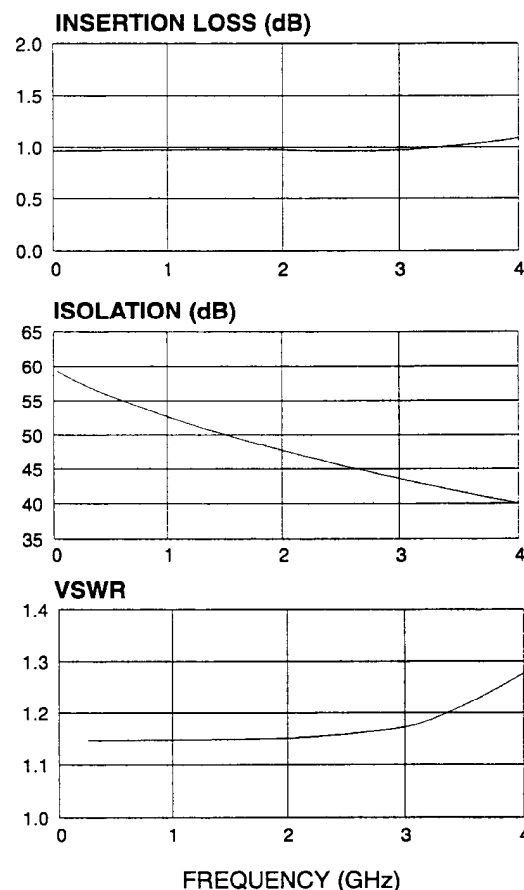
### Schematic



Specifications Subject to Change Without Notice.



### Typical Performance @ +25°C



15-54

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## Handling Precautions

Permanent damage to the MASW4060 may occur if the following precautions are not adhered to:

- A. Cleanliness — The MASW4060 should be handled in a clean environment. DO NOT attempt to clean unit after the MASW4060 is installed.
- B. Static Sensitivity — All chip handling equipment and personnel should be DC grounded.
- C. Transient — Avoid instrument and power supply transients while bias is applied to the MASW4060. Use shielded signal and bias cables to minimize inductive pick-up.
- D. Bias — Apply voltage to either control port V1 or V2 only when the other is grounded. No port should be allowed to "float".
- E. General Handling — It is recommended that the MASW4060 chip be handled along the long side of the die with a sharp pair of bent tweezers. DO NOT touch the surface of the chip with fingers or tweezers.

## Mounting

The MASW4060 is back-metallized with Pd/Ni/Au(100/1,000/10,000Å) metallization. It can be die-mounted with AuSn eutectic preforms or with thermally conductive epoxy. The package surface should be clean and flat before attachment.

### Eutectic Die Attach:

- A. A 80/20 gold/tin preform is recommended with a work surface temperature of approximately 255°C and a tool temperature of 265°C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be approximately 290°C.
- B. DO NOT expose the MASW4060 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 MASW4060 into position. A thin epoxy fillet should be visible around the perimeter of the chip.
- B. Cure epoxy per manufacturer's recommended schedule.
- C. Electrically conductive epoxy may be used but is not required.

## Wire Bonding

- A. Ball or wedge with 1.0 mil diameter pure gold wire.  
Thermosonic wirebonding 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 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.

### Maximum Ratings

A. Control Value (A/C or B/D):	−8.5 Vdc
B. Max Input RF Power:	+34 dBm
C. Storage Temperature:	−65°C to +175°C
D. Max Operating Temperature:	+175°C

### BondPad Dimensions — Inches (mm)

RF	0.005 x 0.005 (0.125 x 0.125)
RF1, RF2, RF3, RF4	0.005 x 0.005 (0.125 x 0.125)
A1, A2, A3, A4 B1, B2, B3, B4	0.004 x 0.004 (0.100 x 0.100)
G1, G2, G3, G4	0.008 x 0.004 (0.200 x 0.100)
T1, T2, T3, T4	0.004 x 0.005 (0.100 x 0.125)

## Truth Table

Control Inputs								Condition of Switch			
A1	B1	A2	B2	A3	B3	A4	B4	RF1	RF2	RF3	RF4
V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	On	Off	Off	Off
V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	Off	On	Off	Off
V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	Off	Off	On	Off
V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	V <sub>IN</sub> Hi	V <sub>IN</sub> Hi	V <sub>IN</sub> Low	Off	Off	Off	On

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