GaAs SPDT Switch
DC-4 GHz

MASW4040

V 2.00

Features

- Absortive or Reflective
- Excellent Intermodulation Products
- Excellent Temperature Stability
- Fast Switching Speed,3 ns Typical
- Ultra Low DC Power Consumption
- Independent Bias Control

Guaranteed Specifications* –55°C to +85°C

Frequency Range		DC – 4.0 GHz
Insertion Loss	DC – 1.0 GHz	0.6 dB Max
	DC – 2.0 GHz	0.8 dB Max
	DC – 4.0 GHz	1.0 dB Max
Isolation	DC – 1.0 GHz	60 dB Min
Absorptive Mode	DC – 2.0 GHz	50 dB Min
Reflective Mode	DC – 2.0 GHz	46 dB Min
	DC – 4.0 GHz	40 dB Min
VSWR	DC – 1.0 GHz	1.1:1 Max
	DC – 2.0 GHz	1.2:1 Max
	DC – 4.0 GHz	1.5:1 Max

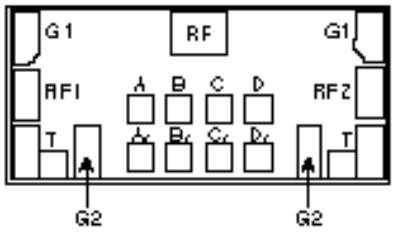
Operating Characteristics

Impedance		50 Ω Nominal
Switching Characteristics		
Trise, Tfall (10%/90% or 90%/10% RF)		3 ns Typ
Ton, Toff (50% CTL to 90%/10% RF)		6 ns Typ
Transients (In-Band)		20 mV Typ
Input Power for 1dB Compression**		
Control Voltages (Vdc)	0/–5	0/–8
0.05 GHz	24 dBm	25 dBm Typ
0.5 – 4.0 GHz	30 dBm	33 dBm Typ
Intermodulation Intercept Point (for two-tone input power up to +5 dBm)		
Intercept Points	IP2	IP3
0.5 GHz	62	39 dBm Typ
0.5 – 4.0 GHz	68	46 dBm Typ
Control Voltages (Complementary Logic)		
VinLow		0 to –0.2V @ 3 µA Max
VinHi		–5V @ 25 µA Typ to –8V @ 0.75 µA Max
Die Size		0.031" x 0.062" x 0.010" (0.79 mm x 1.58 mm x 0.25 mm)

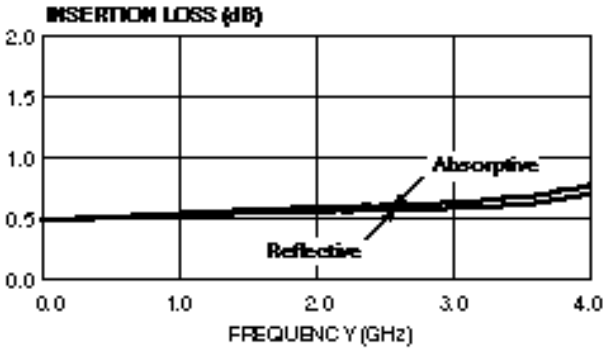
** All specifications apply with 50 Ω connected to all RF ports, 0 and -5 Vdc control voltages.

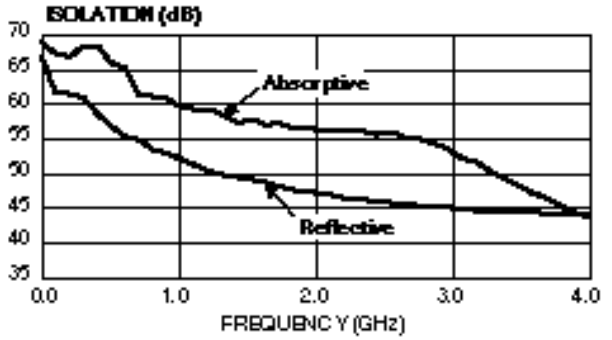
*** Loss changes 0.0025 dB/°C.

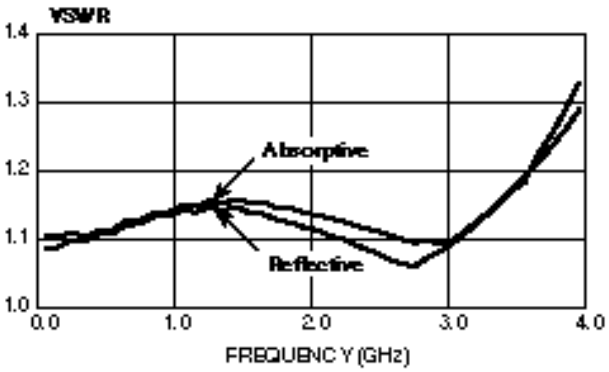
Bond Pad Layout



Typical Performance @ +25°C







Handling Precautions

Permanent damage to the MASW4040 may occur if the following precautions are not adhered to:

A. Cleanliness — The MASW4040 should be handled in a clean environment. DO NOT attempt to clean unit after the MASW4040 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 MASW4040. Use shielded signal and bias cables to minimize inductive pick-up.

D. Bias — Apply voltage to either of the complementary control ports only when the other is grounded. No port should be allowed to "float".

E. General Handling — It is recommended that the MASW4040 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 MASW4040 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 MASW4040 to a temperature greater than 320°C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

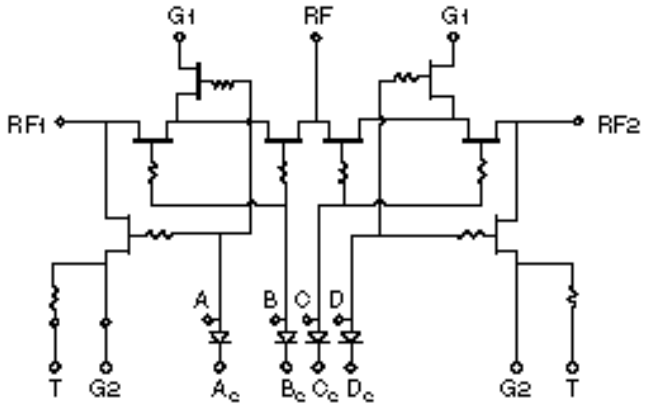
Epoxy Die Attach:

A. Apply a minimum amount of epoxy and place the MASW4040 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.

Schematic



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 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.

Maximum Ratings	
A. Control Value (A or B):	–8.5 Vdc
B. Max Input RF Power:	+34 dBm (500 MHz–2 GHz)
C. Storage Temperature:	–65°C to +175°C
D. Max Operating Temperature:	+175°C

BondPad Dimensions — Inches (mm)	
RF	0.005 x 0.008 (0.125 x 0.200)
RF1, RF2	0.008 x 0.004 (0.200 x 0.100)
A, B, C, D	0.004 x 0.004 (0.100 x 0.100)
G1, T	0.008 x 0.004 (0.200 x 0.100)
G2	0.004 x 0.004 (0.100 x 0.100)

Truth Table

	Control Inputs				Condition of BondPad			Condition of Switch	
	A	B	C	D	T	G1	G2	RF1	RF2
Absorbtive SPDT	V_{IN} High	V_{IN} Low	V_{IN} High	V_{IN} Low	GND	GND	—	On	Off
	V_{IN} Low	V_{IN} High	V_{IN} Low	V_{IN} High	GND	GND	—	Off	On
Reflective SPDT	V_{IN} High	V_{IN} Low	V_{IN} High	V_{IN} Low	—	GND	GND	On	Off
	V_{IN} Low	V_{IN} High	V_{IN} Low	V_{IN} High	—	GND	GND	Off	On