

## HMIC™ PIN Diode SPDT 80 Watt Switch for 0.01 - 4.0 GHz Higher Power Applications

Rev. V1

### Features

- Exceptional Broadband Performance
- Low Loss:  $T_x = 0.25$  dB @ 2010 MHz
- High Isolation:  $R_x = 43$  dB @ 2010 MHz
- Suitable for High Power LTE, TD-SCDMA, WiMAX, and Military Radio Applications
- Surface Mount 4mm PQFN Package
- RoHS\* Compliant and 260°C Reflow Compatible
- Class 2 ESD Rating (HBM 2kv)

### Description

The MASW-000932 is a SPDT high power, broadband, high linearity, PIN diode T/R switch for 0.01 - 4.0 GHz applications, including WiMAX & WiFi. The device is provided in an industry standard lead free 4mm PQFN plastic package. This device incorporates a PIN diode die fabricated with M/A-COM Technology Solutions' patented Silicon-Glass HMIC™ process. This chip features two silicon pedestals embedded in a low loss, low dispersion glass. The diodes are formed on the top of each pedestal. The topside is fully encapsulated with silicon nitride and has an additional polymer passivation layer. These polymer protective coatings prevent damage and contamination during handling and assembly.

This compact 4mm PQFN packaged SPDT switch offers wideband 0.05 - 4.0 GHz performance with excellent isolation to loss ratio for both  $T_x$  and  $R_x$  states. The PIN diode provides 45 W C.W. power handling at an 85°C baseplate temperature and 72 dBm IIP3 at 2010 MHz for maximum switch performance.

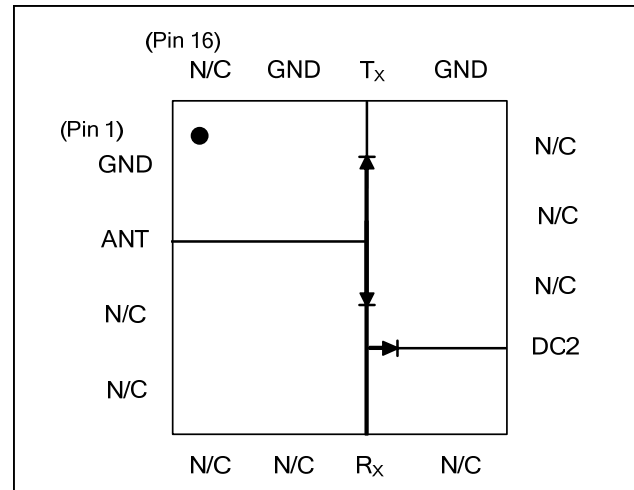
### Ordering Information<sup>1</sup>

Part Number	Package
MASW-000932-13560T	Tape and Reel (1K)
MASW-000932-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

### Functional Diagram (Top View)



### Pin Configuration<sup>2</sup>

Pin	Function	Pin	Function
1	GND	9	DC2
2	ANT	10	N/C
3	N/C	11	N/C
4	N/C	12	N/C
5	N/C	13	GND
6	N/C	14	TX
7	RX	15	GND
8	N/C	16	N/C

2. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

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### Electrical Specifications<sup>3</sup>: Freq. = 2.0, 2.7, 3.5 GHz, T<sub>A</sub> = 25°C, Bias = 100 mA / 28 V

Parameter	100 mA / 28V Conditions	Units	Min.	Typ.	Max.
Insertion Loss <sup>3</sup> , R <sub>X</sub> Pin= 0 dBm	R <sub>X</sub> , 2.0 GHz	dB	—	.60	.80
	T <sub>X</sub> , 2.0 GHz		—	.25	—
	R <sub>X</sub> , 2.7 GHz		—	.72	.90
	T <sub>X</sub> , 2.7 GHz		—	.35	—
	R <sub>X</sub> , 3.5 GHz		—	.80	.95
	T <sub>X</sub> , 3.5 GHz		—	.45	—
Isolation <sup>3</sup> Pin= 0 dBm	R <sub>X</sub> to Antenna, 2.0 GHz	dB	40.0	43.0	—
	T <sub>X</sub> to Antenna, 2.0 GHz		—	14.0	—
	R <sub>X</sub> to Antenna, 2.7 GHz		39.0	41.5	—
	T <sub>X</sub> to Antenna, 2.7 GHz		—	12.0	—
	R <sub>X</sub> to Antenna, 3.5 GHz		34.0	35.0	—
	T <sub>X</sub> to Antenna, 3.5 GHz		—	10.0	—
Input Return Loss <sup>3</sup>	Pin= 0 dBm	dB	—	34	—
	R <sub>X</sub>		—	17	—
	T <sub>X</sub>		—	—	—
T <sub>X</sub> Input P0.1dB	T <sub>X</sub> to Antenna	dBm	—	49	—
T <sub>X</sub> 2 <sup>nd</sup> Harmonic	Pin = + 30 dBm	dBc	—	80	—
T <sub>X</sub> 3 <sup>rd</sup> Harmonic	Pin = + 30 dBm	dBc	—	95	—
T <sub>X</sub> IIP3	Pin = +10 dBm, F1 = 2010 MHz, F2 = 2020 MHz	dBm	—	72	—
T <sub>X</sub> C.W. Input Power	25°C Base plate, 2.01 GHz	dBm	—	49	—
		W	—	80	—
T <sub>X</sub> C.W. Input Power	85°C Base plate, 2.01 GHz	dBm	—	46.5	—
		W	—	45	—
R <sub>X</sub> C.W. Input Power	—	dBm	—	41.5	—
		W	—	14	—
T <sub>X</sub> RF Switching Speed	( 10-90% RF Voltage) 1 MHz Rep Rate in Modulating Mode	ns	—	200	—

3. See Bias Table

### Absolute Maximum Ratings<sup>4,5</sup>

@ T<sub>A</sub> = +25 °C (unless otherwise specified)

Parameter	Absolute Maximum
Forward Current	125 mA
Reverse Voltage ( RF & D.C. )	-200 V
Operating Temperature	-40 °C to +85 °C
Storage Temperature	-55 °C to +150 °C
Junction Temperature	+175 °C
T <sub>X</sub> Incident C.W. Power	80 W (49 dBm) <sup>6</sup> @ 2010MHz
T <sub>X</sub> Peak Incident Power	>2000 W, 5 μs, 1% duty <sup>7</sup>

- Exceeding these limits may cause permanent damage.
- M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
- Baseplate temperature must be controlled to a constant +25°C.
- This rating is guaranteed if the RF ports are terminated.

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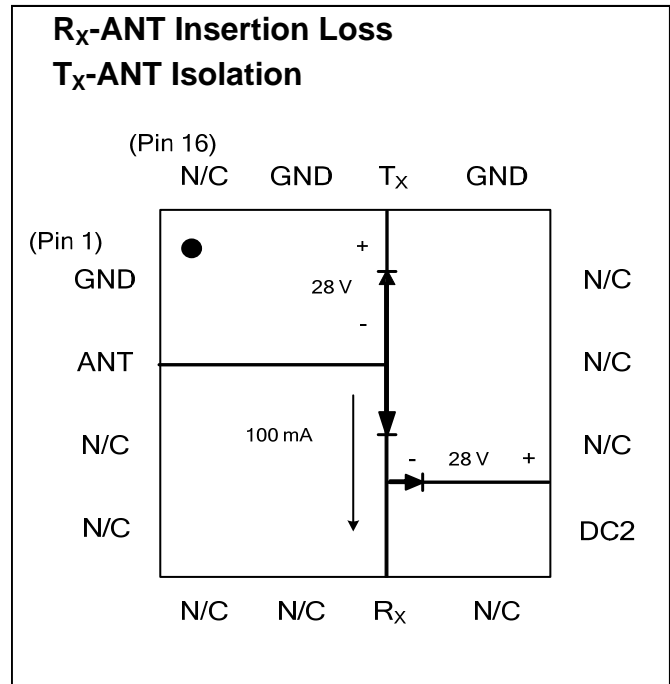
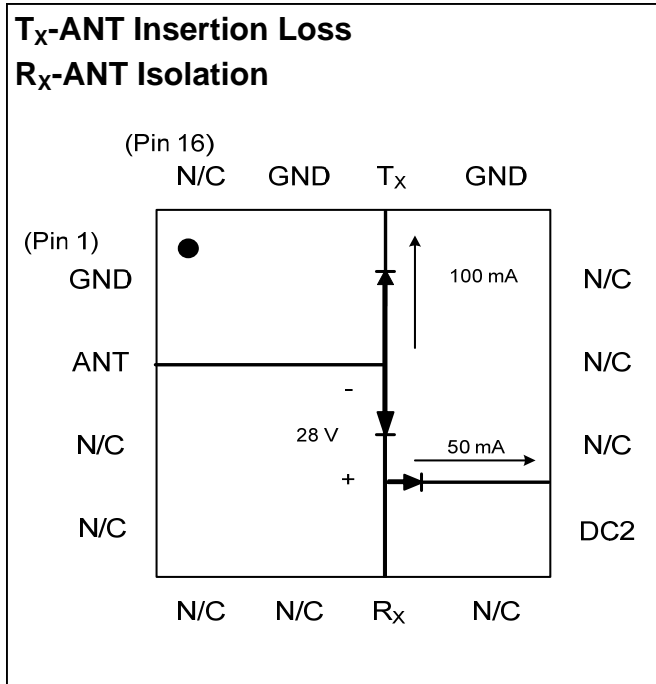
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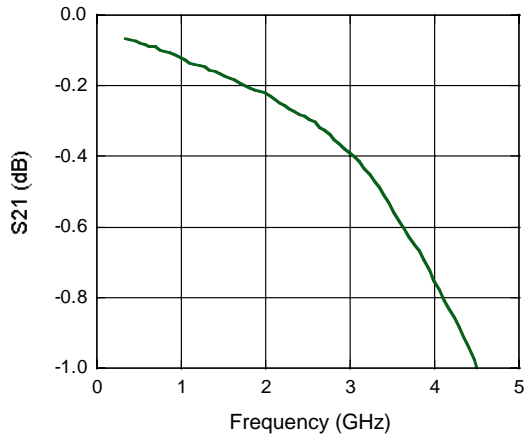
## Bias Diagrams & Tables



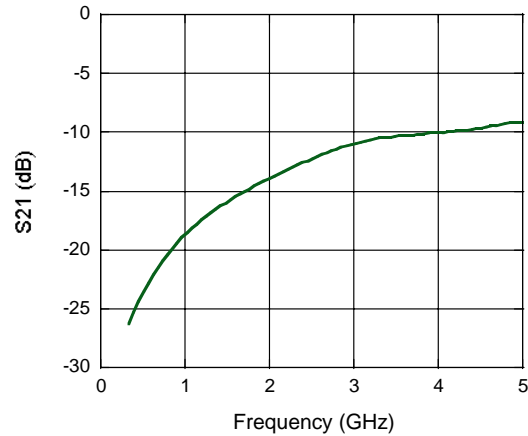
Bias Table	T <sub>X</sub>	R <sub>X</sub>	DC2	ANT
Pin	Pin 14	Pin 7	Pin 9	Pin 2
T <sub>X</sub> -ANT Isolation	+28 V, 0 mA	-100 mA	+28 V, 0 mA	0V
T <sub>X</sub> -ANT Insertion Loss	-100 mA	+28 V, 0 mA	-50 mA	0V
R <sub>X</sub> -ANT Isolation	-100 mA	+28 V, 0 mA	-50 mA	0V
R <sub>X</sub> -ANT Insertion Loss	+28 V, 0 mA	-100 mA	+28 V, 0 mA	0V

## Typical Performance Curves, $T_X$ (100 mA Bias Current)

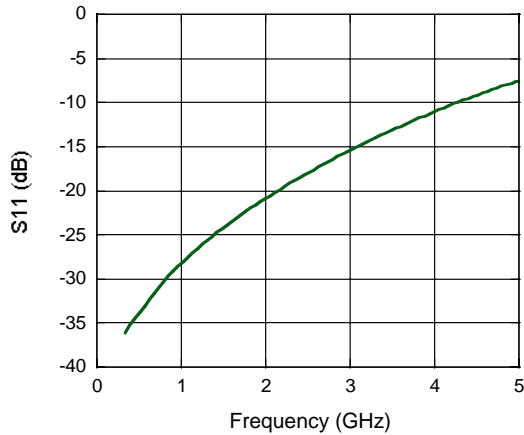
Insertion Loss,  $T_X$



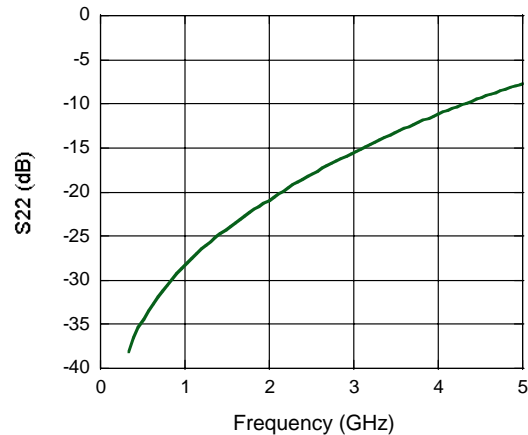
Isolation,  $T_X$



Input Return Loss,  $T_X$

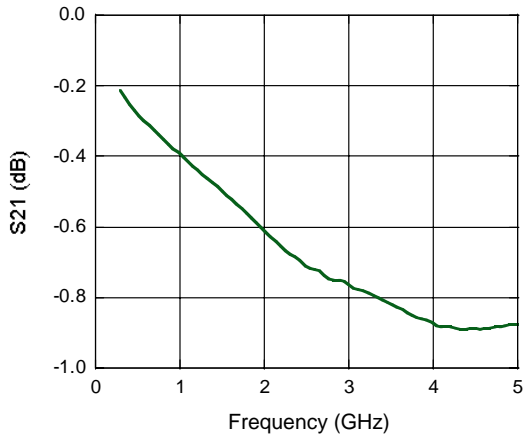


Output Return Loss,  $T_X$

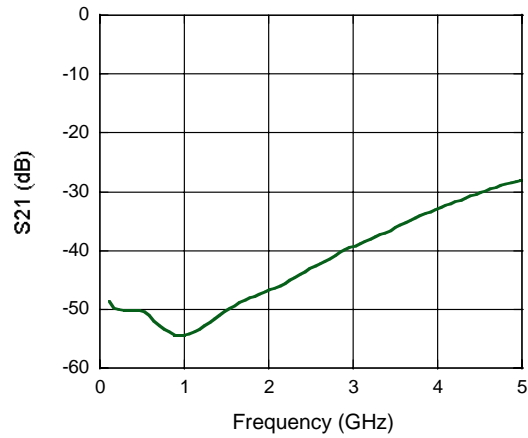


## Typical Performance Curves, $R_x$ (100 mA Bias Current)

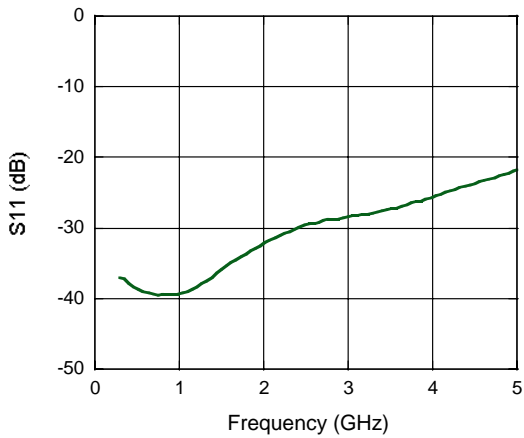
**Insertion Loss,  $R_x$**



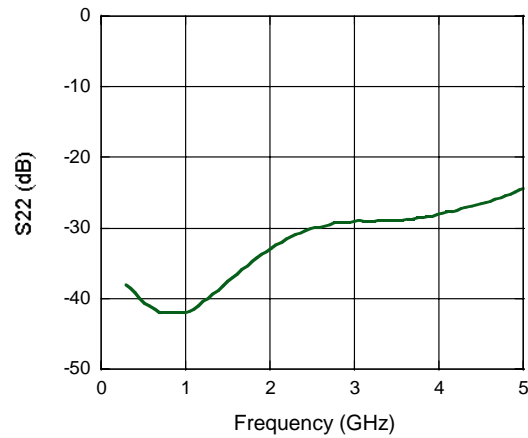
**Isolation,  $R_x$**



**Input Return Loss,  $R_x$**



**Output Return Loss,  $R_x$**

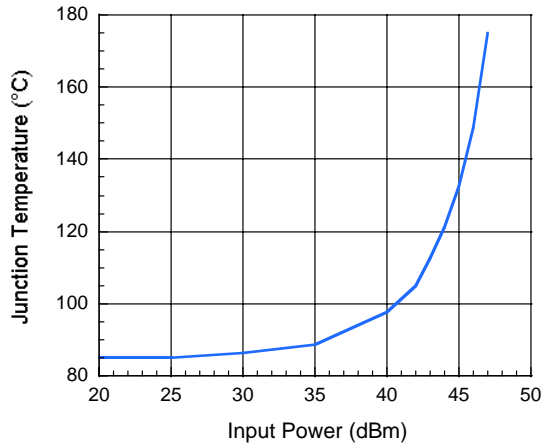


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### Typical Performance Curves<sup>8</sup>: 85°C base plate temperature, 2000 MHz

#### Power



#### Handling Procedures

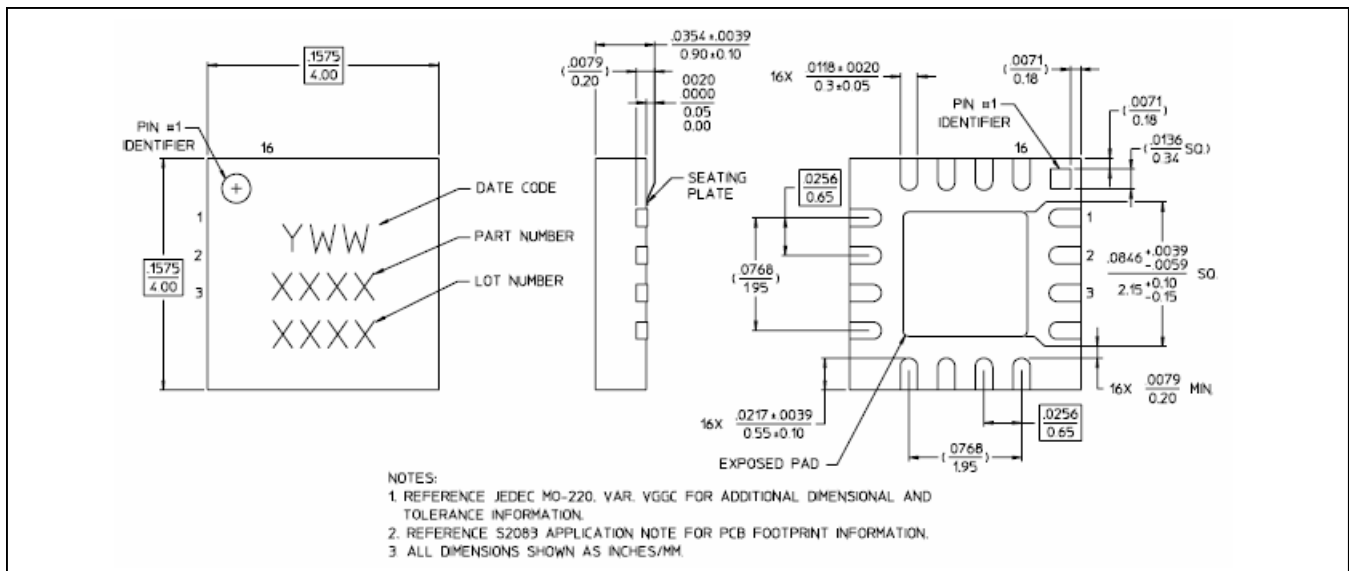
Please observe the following precautions to avoid damage:

#### Static Sensitivity

Silicon 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 Class 2 devices.

8. Maximum Junction Temperature for this device is 175°C.

### Lead Free 4 mm 16-Lead PQFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.  
 Meets JEDEC moisture sensitivity level 1 requirements.  
 Plating is 100% matte tin over copper.

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