

## PIN Diode SPDT 120 Watt Switch for 0.05 - 6.0 GHz Higher Power Applications

Rev. V6

### Features

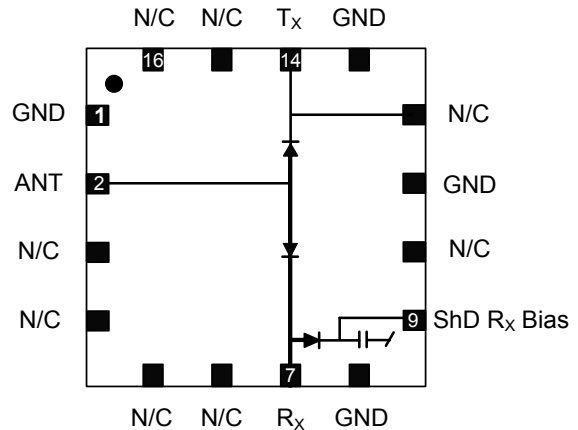
- Exceptional Broadband Performance
- Low Insertion Loss:  $T_x = 0.20$  dB @ 2.7 GHz
- High Isolation:  $R_x = 50$  dB @ 2.7 GHz
- High  $T_x$  RF Input Power = 120 W CW @ 2.0 GHz, 85°C
- High TX RF Input Peak Power: 1000 W
- Suitable for High Power LTE, TD-SCDMA, WiMAX, and Military Radio Applications
- Surface Mount 4 mm PQFN Package
- RoHS\* Compliant and 260°C Reflow Compatible

### Description

The MASW-000936 is a SPDT high power, broadband, high linearity, PIN diode T/R switch for 0.05 - 6.0 GHz applications, including WiMAX & WiFi. The device is provided in an industry standard lead free 4 mm PQFN plastic package.

This device incorporates PIN diode die fabricated with a low loss, high isolation switching diode processes.

### Functional Diagram (Top View)



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

Pin	Pin Name	Description
1	GND	Ground
2	ANT	Antenna
3	N/C	Connect to Ground
4	N/C	No Connection
5	N/C	No Connection
6	N/C	Connect to Ground
7	RX	Receive
8	GND	Ground
9	ShD Rx Bias	ShD Rx Bias
10	N/C	No Connection
11	GND	Ground
12	N/C <sup>3</sup>	Do Not Use
13	GND	Ground
14	TX	Transmit
15	N/C	Connect to Ground
16	N/C	No Connection

2. The exposed pad centered on the package bottom must be connected to RF, DC and Thermal ground.
3. Do not ground pin 12.

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

Part Number	Package
MASW-000936-14000T	1000 piece reel
MASW-000936-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

\* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

1

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DC-0008140

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### Electrical Specifications<sup>4</sup>: Freq. = 2.0, 2.7, 3.5 GHz, T<sub>A</sub> = 25°C, Bias = 100 mA / 28 V

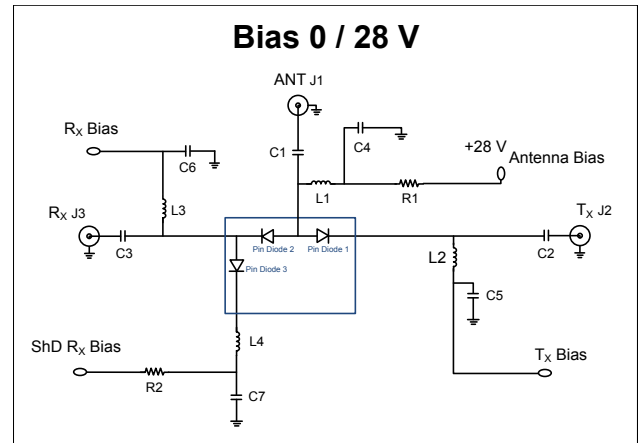
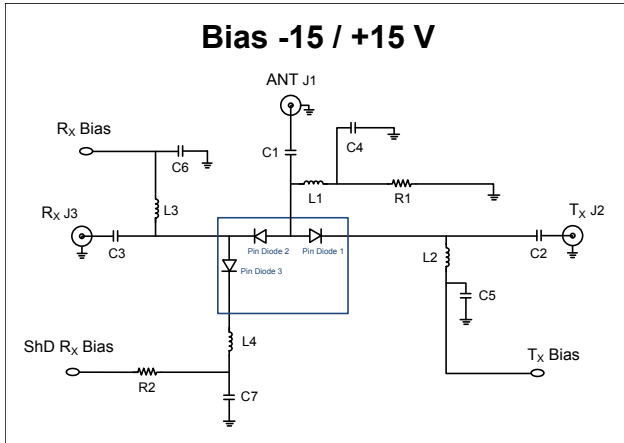
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss <sup>4</sup> P <sub>IN</sub> = 0 dBm	R <sub>X</sub> , 0.8 GHz	dB	—	0.20	—
	T <sub>X</sub> , 0.8 GHz			0.07	—
	R <sub>X</sub> , 2.0 GHz			0.35	0.55
	T <sub>X</sub> , 2.0 GHz			0.15	—
	R <sub>X</sub> , 2.7 GHz			0.50	0.75
	T <sub>X</sub> , 2.7 GHz			0.20	—
	R <sub>X</sub> , 3.5 GHz			0.70	0.90
	T <sub>X</sub> , 3.5 GHz			0.25	—
Isolation <sup>4</sup> P <sub>IN</sub> = 0 dBm	R <sub>X</sub> to Antenna, 2.0 GHz	dB	41	45	—
	T <sub>X</sub> to Antenna, 2.0 GHz		—	16	
	R <sub>X</sub> to Antenna, 2.7 GHz		40	50	
	T <sub>X</sub> to Antenna, 2.7 GHz		—	13	
	R <sub>X</sub> to Antenna, 3.5 GHz		33	40	
	T <sub>X</sub> to Antenna, 3.5 GHz		—	11	
Input Return Loss <sup>4</sup> P <sub>IN</sub> = 0 dBm	R <sub>X</sub>	dB	—	23	—
	T <sub>X</sub>			34	
T <sub>X</sub> Input P0.1 dB	T <sub>X</sub> to Antenna	dBm	—	>50	—
T <sub>X</sub> IIP3 P <sub>IN</sub> = +30 dBm	F1 = 2010 MHz, F2 = 2020 MHz	dBm	—	72	—
T <sub>X</sub> CW Input Power	85°C Base plate	dBm / W dBm / W dBm / W	—	50.8 / 120	—
	2.0 GHz			50 / 100	
	2.7 GHz			49 / 80	
	3.5 GHz				
R <sub>X</sub> CW Input Power	85°C Base plate	dBm W	—	41.5	—
	2.0 GHz			14	
T <sub>X</sub> RF Switching Speed	(10 - 90% RF Voltage) 1 MHz Rep Rate in Modulating Mode	ns	—	200	—

4. See Bias Table

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### Bias Diagrams & Tables



### Bias -15 / +15 V

Bias Table	T <sub>x</sub>	R <sub>x</sub>	R <sub>x</sub> ShDBias	ANT
Pin	Pin 14	Pin 7	Pin 9	Pin 2
T <sub>x</sub> -ANT Isolation	(+15 V), 0 mA	(-15 V), -100 mA	GND	GND
T <sub>x</sub> -ANT Insertion Loss	(-15 V), -100 mA	(+15 V), 100 mA	GND	GND
R <sub>x</sub> -ANT Isolation	(-15 V), -100 mA	(+15 V), 100 mA	GND	GND
R <sub>x</sub> -ANT Insertion Loss	(+15 V), 0 mA	(-15 V), 100 mA	GND	GND

### Bias 0 / 28 V

Bias Table	T <sub>x</sub>	R <sub>x</sub>	R <sub>x</sub> ShDBias	ANT
Pin	Pin 14	Pin 7	Pin 9	Pin 2
T <sub>x</sub> -ANT Isolation	(+28 V), 0 mA	(GND), -100 mA	(+28 V), 0 mA	+28 V
T <sub>x</sub> -ANT Insertion Loss	(GND), -100 mA	(+28 V), 100 mA	(GND), -100 mA	+28 V
R <sub>x</sub> -ANT Isolation	(GND), -100 mA	(+28 V), 100 mA	(GND), -100 mA	+28 V
R <sub>x</sub> -ANT Insertion Loss	(+28 V), 0 mA	(GND), -100 mA	(+28 V), 0 mA	+28 V

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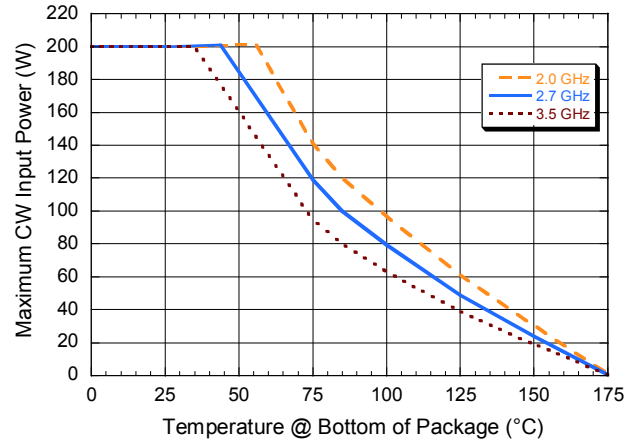
### Absolute Maximum Ratings<sup>5,6,7</sup>

@  $T_A = +25^\circ\text{C}$  (unless otherwise specified)

Parameter	Absolute Maximum
Forward Current	150 mA
Reverse Voltage (RF & DC)	200 V
$T_X$ Incident CW Power	See Power De-rating Curve
$T_X$ Incident Peak Power (10 $\mu\text{s}$ Pulse Width <sup>8</sup> )	1000 W
$R_X$ Incident CW Power	41.5 dBm (14 W) @ 2 GHz, 85°C
Junction Temperature	+175°C
Operating Temperature	-40°C to +100°C
Storage Temperature	-55°C to +150°C

5. Exceeding these limits may cause permanent damage.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with  $T_J \leq +175^\circ\text{C}$  will ensure  $\text{MTTF} > 1 \times 10^6$  hours.
8. Measured with 4 ms pulse period, up to 100°C case temperature.

### $T_X$ Input Power De-rating @ 20 dB I/O Return Loss



### Handling Procedures

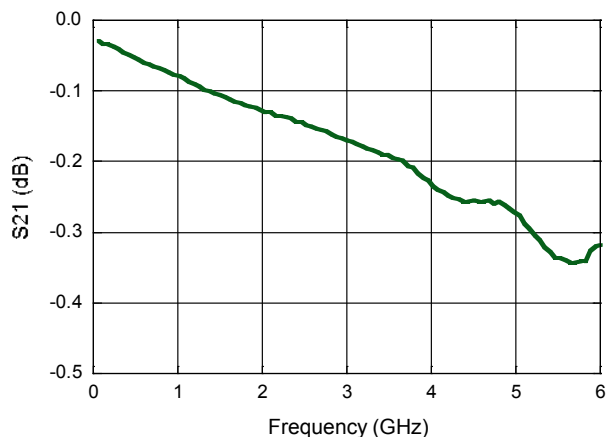
Please observe the following precautions to avoid damage:

### Static Sensitivity

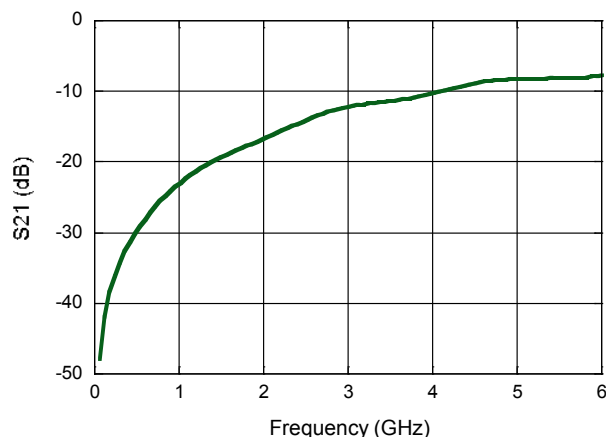
Silicon Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1C Human Body devices.

**Typical Performance Curves (RF-probed parts),  
 $T_x$  (100 mA Bias Current)**

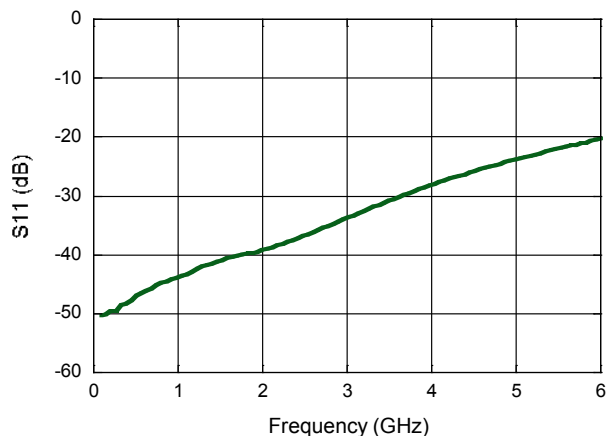
**Insertion Loss,  $T_x$**



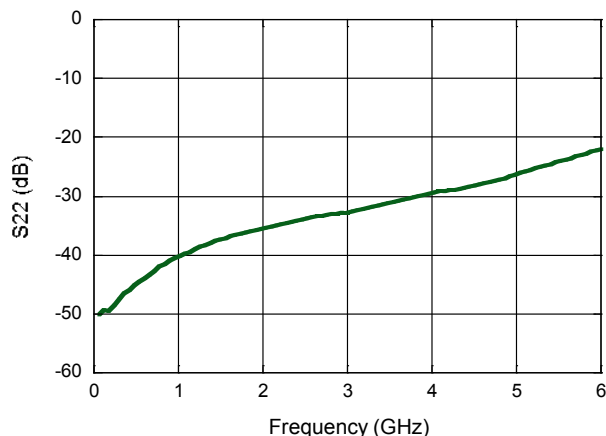
**Isolation,  $T_x$**



**Input Return Loss,  $T_x$**

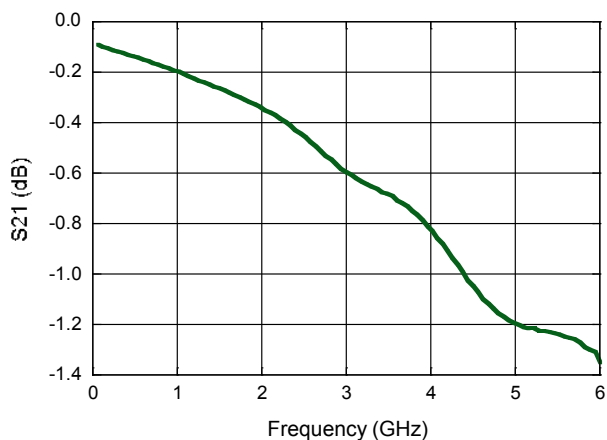


**Output Return Loss,  $T_x$**

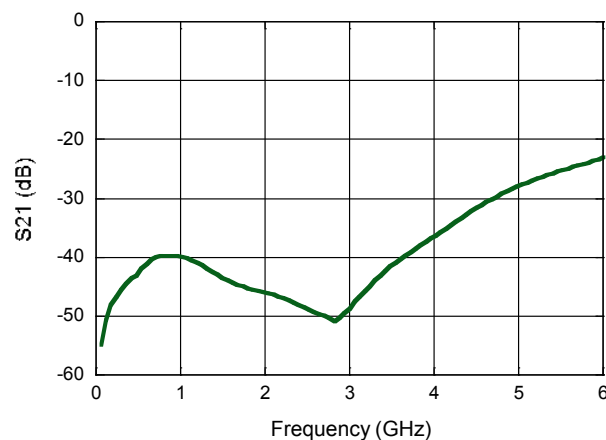


**Typical Performance Curves (RF-probed parts),  
R<sub>x</sub> (100 mA Bias Current)**

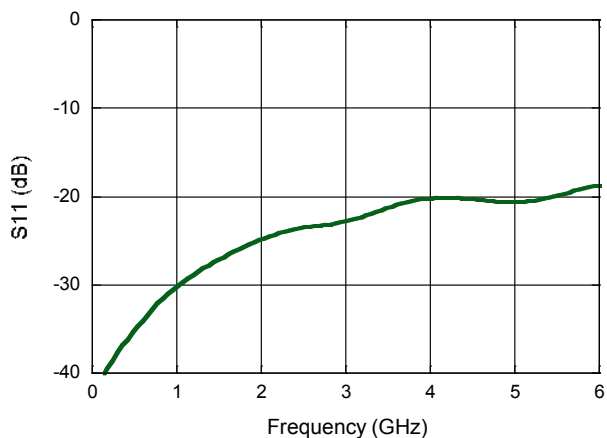
**Insertion Loss, R<sub>x</sub>**



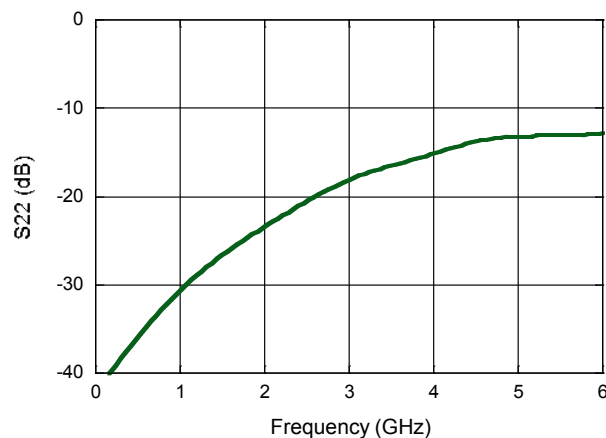
**Isolation, R<sub>x</sub>**



**Input Return Loss, R<sub>x</sub>**



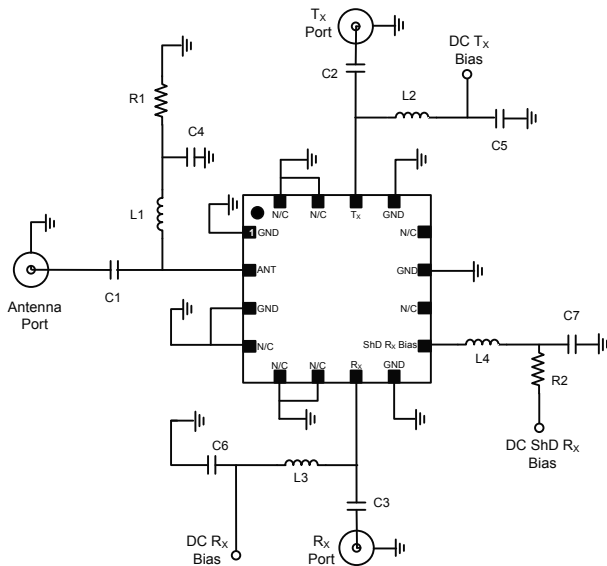
**Output Return Loss, R<sub>x</sub>**



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### Application Schematic<sup>9</sup>

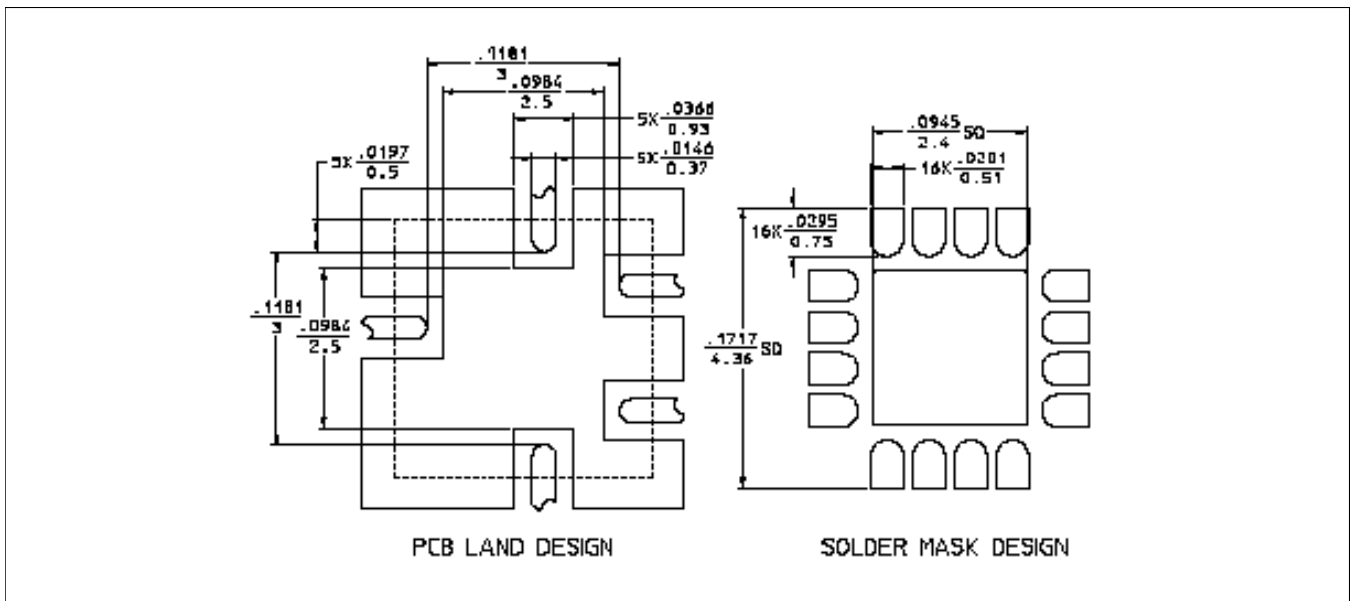


### Parts List

Component	Value	Package
C1-C3	22 pF	0603
C4-C6	27 pF	0603
L1-L4	68 nH	0603
R1, R2	137 Ω	0603

9. Adding an LC network to pin 12 can improve  $R_x$  performance between 2.0 and 2.7 GHz but may limit performance above 3 GHz. For broadband applications MACOM recommends not using pin 12 and not connecting it to any metal trace.

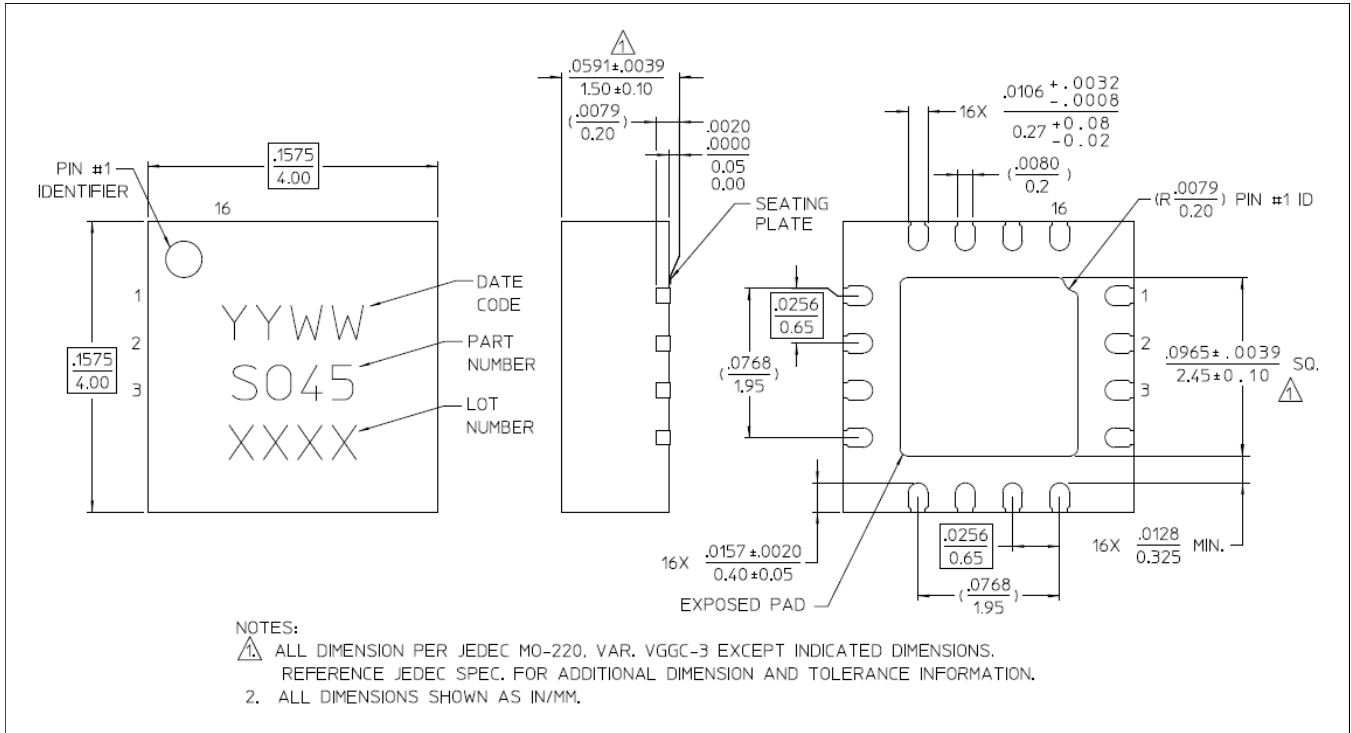
### PCB Footprint



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### Lead Free 4 mm 16-Lead PQFN†



† Reference Application Note S2083 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is NiPdAuAg.



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