MASW-000834-13560T

HMIC™ PIN Diode SPDT 50 Watt Switch for 0.05 - 6.0 GHz Higher Power Applications

M/A-COM Products
Rev. V2

Features

- Exceptional Broadband Performance, 0.05 - 6.0 GHz
- Low Loss: T_X = 0.33 dB @ 2010 MHz, 5V / 20mA
- T_X = 0.38 dB @ 3.5 GHz, 5V / 20mA
- High Isolation: Rx = 44dB @ 2010 MHz, 20mA / 5V
- Rx = 36dB @ 3.5 GHz, 20mA / 5V
- High T_X RF Input Power = 50 W C.W. @ 2010MHz
- Suitable for Very High Power TD-SCDMA & WiMAX Applications
- Surface Mount 4mm PQFN Package, RoHS* Compliant

Description and Applications

The MA-COM MASW-000834-13560T is a SPDT Broadband, high linearity, common anode, PIN diode T/R switch for 0.05 - 6.0 GHz applications, including WiMAX & WiFi. The device is provided in industry standard 4mm PQFN plastic packaging. This device incorporates a PIN diode die fabricated with M/A-COM's 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 package, SPDT switch offers wideband 0.05 - 6.0 GHz performance with excellent isolation to loss ratio for both T_X and R_X states. The PIN diode provides exceptional 50 W C.W. power handling and 65 dBm IIP3 at 2010 MHz for maximum switch performance.

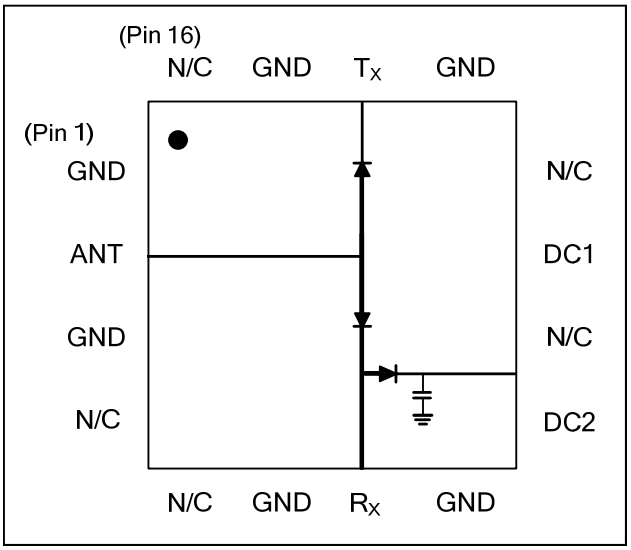
Absolute Maximum Ratings [1]

@ T_A = +25 °C (unless otherwise specified)

Parameter	Absolute Maximum
Forward Current	| 100 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_X Incident C.W. Power	50W (47 dBm) [2] @ 2010MHz
T_X Peak Incident Power	>300 W, 5us, 1% duty
Mounting Temperature	+235 °C for 10 seconds

1. Exceeding these limits may cause permanent damage.
2. Baseplate Temperature must be controlled to a constant 25°C. See page 7 for derating curve.

Functional Diagram (TOP VIEW)



Pin Configuration:

(Center Metal Area is RF, D.C., and Thermal Ground)

Pin	Function	Pin	Function
1	GND	9	DC2
2	ANT	10	N/C
3	GND	11	DC1
4	N/C	12	N/C
5	N/C	13	GND
6	GND	14	TX
7	RX	15	GND
8	GND	16	N/C

Ordering Information

Part Number	Package
MASW-000834-13560T	Tape and Reel
MASW-000834-001SMB	Sample Board

Static Sensitivity

These devices are rated Class 1B Human Body. Proper ESD control techniques should be used when handling these devices.

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

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Electrical Specifications at +25°C, Characteristic Impedance, 20mA / 5V, Z_0 = 50 Ω

Parameter	Symbol	20mA / 5V Conditions	Units	Min.	Typ.	Max.
F = 900 MHz						
Insertion Loss, R_X	R_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.34	0.56
Insertion Loss, T_X	T_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.26	0.445
Isolation, T_X To R_X	R_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	45.8	52.1	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	21.7	27.1	—
F = 1800 MHz						
Insertion Loss, R_X	R_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.40	0.72
Insertion Loss, T_X	Tx IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.32	0.49
Isolation, T_X To R_X	Rx ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	43.7	48.9	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	18.4	21.4	
F = 2010 MHz						
Insertion Loss, R_X	R_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.42	0.75
Insertion Loss, T_X	T_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.33	0.5
Isolation, T_X To R_X	R_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	43.2	44.6	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	17.7	19.9	—
Input Return Loss, T_X	T_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	32.1	—
Input Return Loss, R_X	R_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	24.2	—

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Electrical Specifications at +25°C, Characteristic Impedance, 20mA / 5V, Z_0 = 50 Ω

Parameter	Symbol	20mA / 5V Conditions	Units	Min.	Typ.	Max.
F = 2.3-2.7 GHz						
Insertion Loss, R_X	R_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.46	0.84
Insertion Loss, T_X	T_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.35	0.525
Isolation, T_X To R_X	R_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	40.2	41.2	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	16.2	18.6	—
Input Return Loss, T_X	T_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	30.5	—
Input Return Loss, R_X	R_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	22.9	—
F = 3.3-3.8 GHz						
Insertion Loss, R_X	R_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.56	1.0
Insertion Loss, T_X	T_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.38	0.575
Isolation, T_X To R_X	R_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	33.7	35.9	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	13.6	16.1	—
Input Return Loss, T_X	T_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	27.4	—
Input Return Loss, R_X	R_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	21.9	—
F = 4.9-5.9 GHz						
Insertion Loss, R_X	R_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.78	—
Insertion Loss, T_X	T_X IL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	0.52	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	26.4	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	11.8	—
Input Return Loss, T_X	T_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	20.3	—
Input Return Loss, R_X	R_X RL	See Bias Table 1, pg. 9, Pinc= 0 dBm	dB	—	24.2	—

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Electrical Specifications at +25°C, Characteristic Impedance, 50mA / 25V, Z_0 = 50 Ω

Parameter	Symbol	50mA / 25V Conditions	Units	Min.	Typ.	Max.
F = 900 MHz						
Insertion Loss, R_X	R_X IL	See Bias Table 2, pg. 9 Pinc= 0 dBm	dB	—	0.27	—
Insertion Loss, T_X	T_X IL	See Bias Table 2, pg. 9 Pinc= 0 dBm	dB	—	0.22	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	53.3	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	27.4	—
F = 1800 MHz						
Insertion Loss, R_X	R_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.32	—
Insertion Loss, T_X	T_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.27	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	50.2	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	21.6	—
F = 2010 MHz						
Insertion Loss, R_X	R_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.34	—
Insertion Loss, T_X	T_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.28	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	45.5	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	20.1	—
Input Return Loss, T_X	T_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	33.1	—
Input Return Loss, R_X	R_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	24.1	—

Electrical Specifications at +25°C, Characteristic Impedance, 50mA / 25V, Z_0 = 50 Ω

Parameter	Symbol	50mA / 25V Conditions	Units	Min.	Typ.	Max.
F = 2.3-2.7 GHz						
Insertion Loss, R_X	R_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.38	—
Insertion Loss, T_X	T_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.30	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	41.8	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	18.7	—
Input Return Loss, T_X	T_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	31.3	—
Input Return Loss, R_X	R_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	22.8	—
F = 3.3-3.8 GHz						
Insertion Loss, R_X	R_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.47	—
Insertion Loss, T_X	T_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.33	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	36.2	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	16.2	—
Input Return Loss, T_X	T_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	28.0	—
Input Return Loss, R_X	R_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	21.8	—
F = 4.9-5.9 GHz						
Insertion Loss, R_X	R_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.72	—
Insertion Loss, T_X	T_X IL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	0.48	—
Isolation, T_X To R_X	R_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	26.6	—
Isolation, R_X To T_X	T_X ISO	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	11.8	—
Input Return Loss, T_X	T_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	20.5	—
Input Return Loss, R_X	R_X RL	See Bias Table 2, pg. 9, Pinc= 0 dBm	dB	—	24.2	—

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Electrical Specifications at +25°C, Characteristic Impedance, 50mA / 25V, Z_0 = 50 Ω

Parameter	Symbol	50mA / 25V Conditions	Units	Min.	Typ.	Max.
T_X Input P1dB [2]	T_X P1dB	2010 MHz, T_X to Antenna	dBm	—	>45.5	—
T_X 2nd Harmonic	T_X 2Fo	2010 MHz, Pin = + 30 dBm	dBc	—	80	—
T_X 3rd Harmonic	T_X 3Fo	2010 MHz, Pin = + 30 dBm	dBc	—	95	—
T_X Input Third Order Intercept Point	T_X IIP3	Pi= +10dBm, F1 = 2010 MHz, F2 = 2020 MHz	dBm	—	>64	—
T_X C.W. Input Power [2]	T_X Pinc	F = 2010 MHz	dBm W	—	—	47 50
R_X C.W. Input Power	R_X Pinc	F = 2010 MHz	dBm W	—	—	41.5 14
T_X RF Switching Speed	t_{RF}	F = 2010 MHz (10-90% RF Voltage) 1MHz Rep Rate in Modulating Mode	ns	—	200	—

Parameter	Symbol	50mA / 25V Conditions	Units	Min.	Typ.	Max.
T_X Input P1dB	T_X IP1dB	3.5 GHz, T_X to Antenna	dBm	—	>45	—
T_X 2nd Harmonic	T_X 2Fo	3.5 GHz, Pin = + 30 dBm	dBc	—	88	—
T_X 3rd Harmonic	T_X 3Fo	3.5 GHz, Pin = + 30 dBm	dBc	—	105	—
T_X Input Third Order Intercept Point	T_X IIP3	Pi= +10dBm, F1 = 3.500 GHz, F2 = 3.510 GHz	dBm	—	>64	—
R_X C.W. Input Power	R_X Pinc	F = 3.5 GHz	dBm W	—	—	40.5 11
T_X RF Switching Speed	t_{RF}	F = 3.5 GHz (10-90% RF Voltage) 1MHz Rep Rate in Modulating Mode	ns	—	200	—

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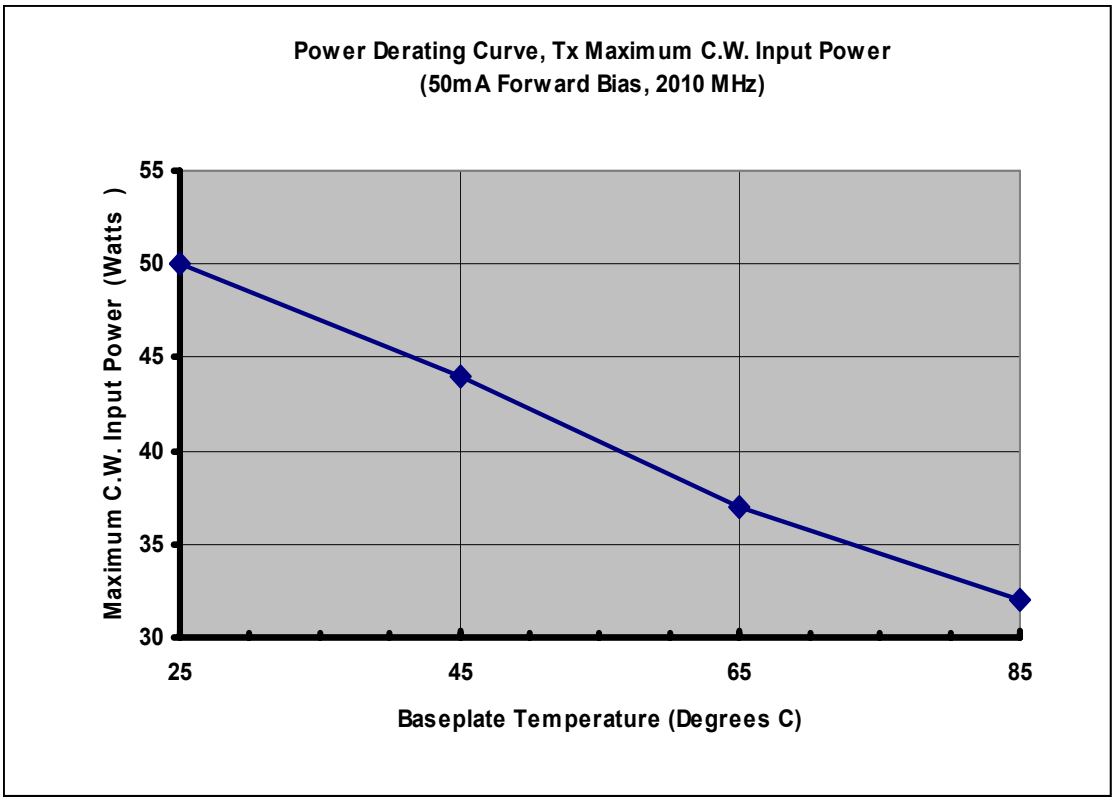
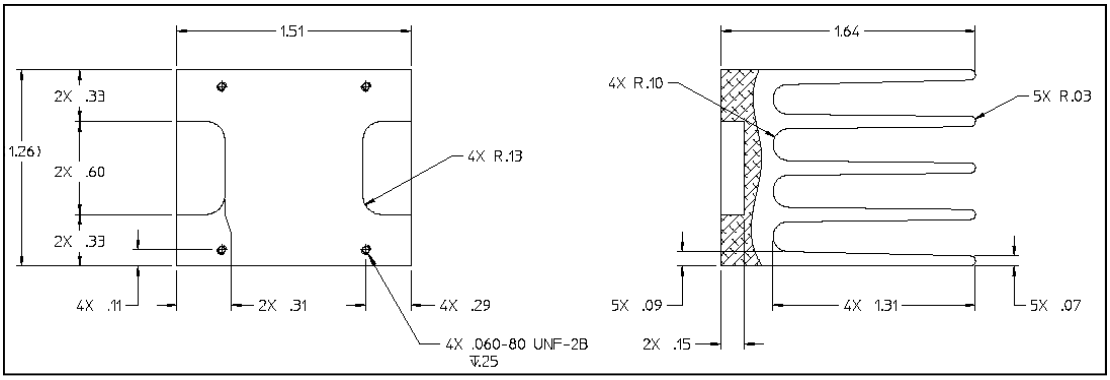
Electrical Specifications at +25°C, Characteristic Impedance, 50mA / 25V, Z_0 = 50 Ω



Note that this part must be held to a constant baseplate temperature to achieve the power handling results specified above. Adding a heatsink to the baseplate will improve performance to values greater than shown here. The increase in maximum input power from using a heatsink depends on the specific heatsink design.

With a sample board mounted onto a heatsink of dimensions and fins shown below, this switch can handle up to 35 Watts C.W. of incident power.



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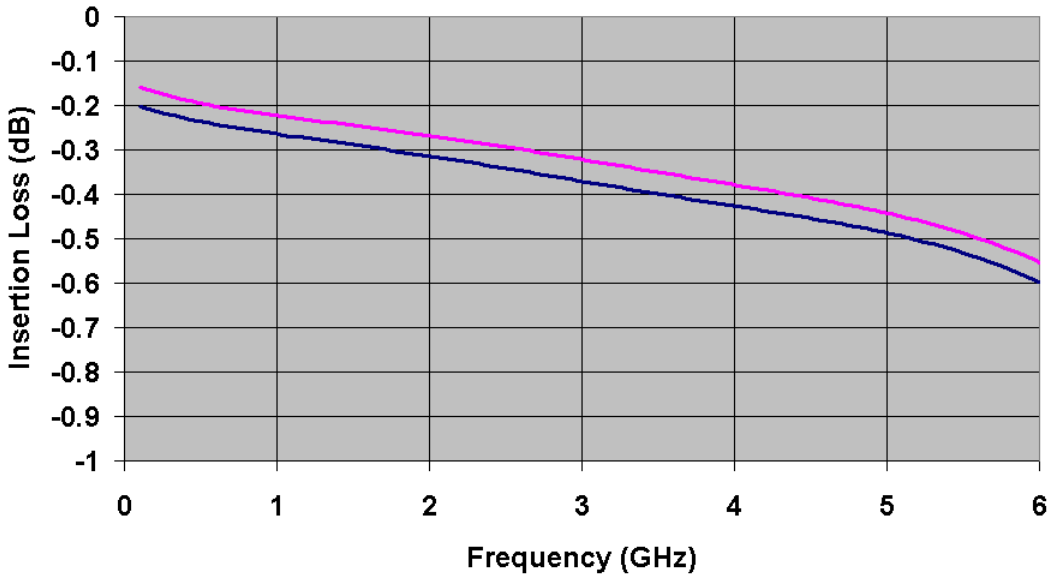
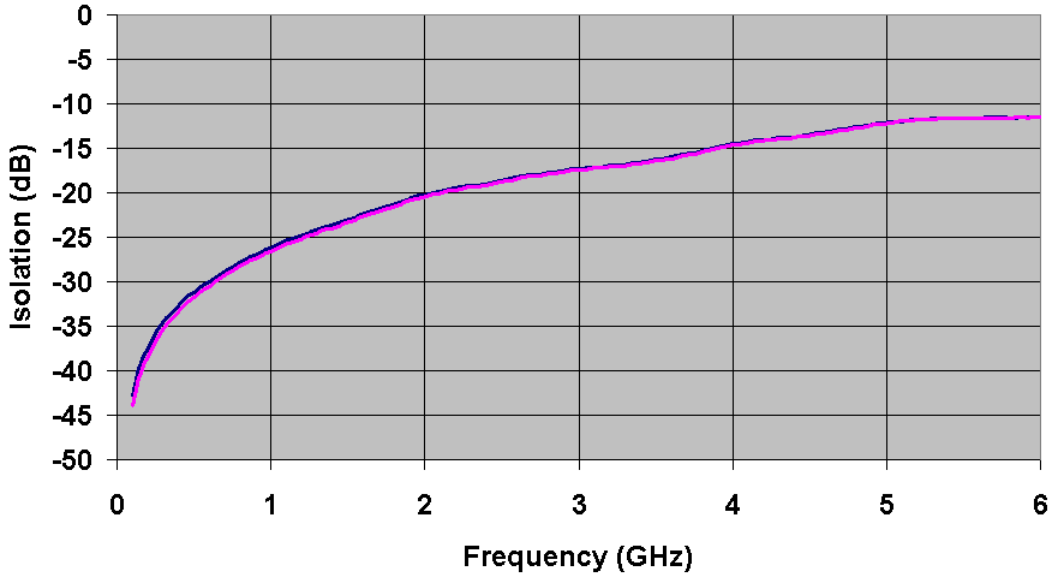
T_X Performance Curves at +25°C, Characteristic Impedance, Z_0 = 50 Ω

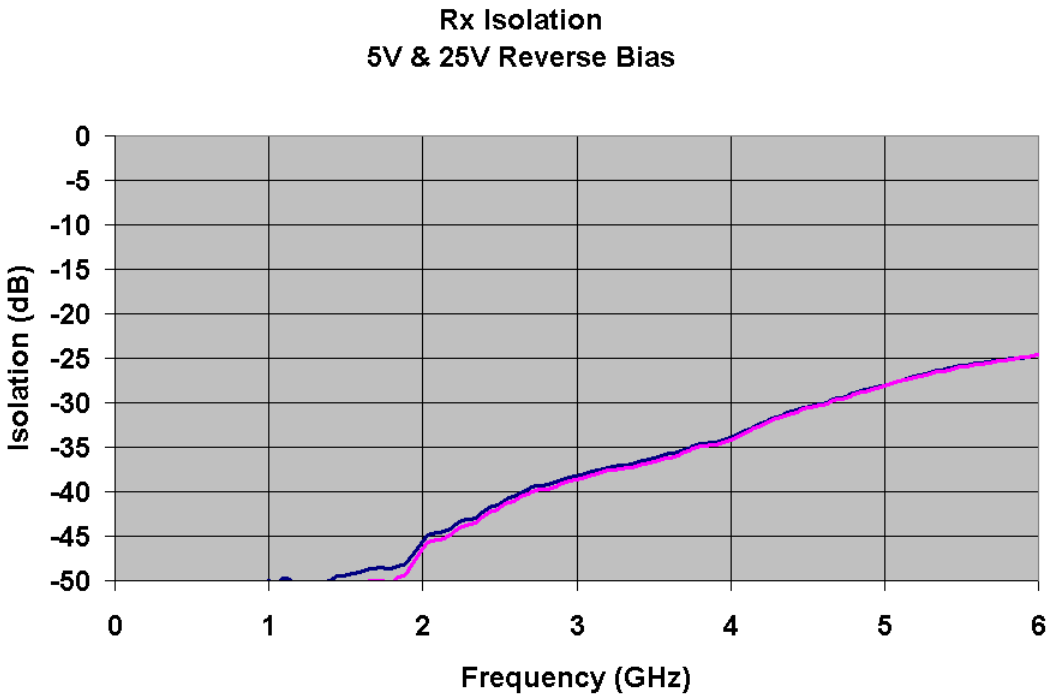
Tx Insertion Loss
20mA & 50mA Forward Bias

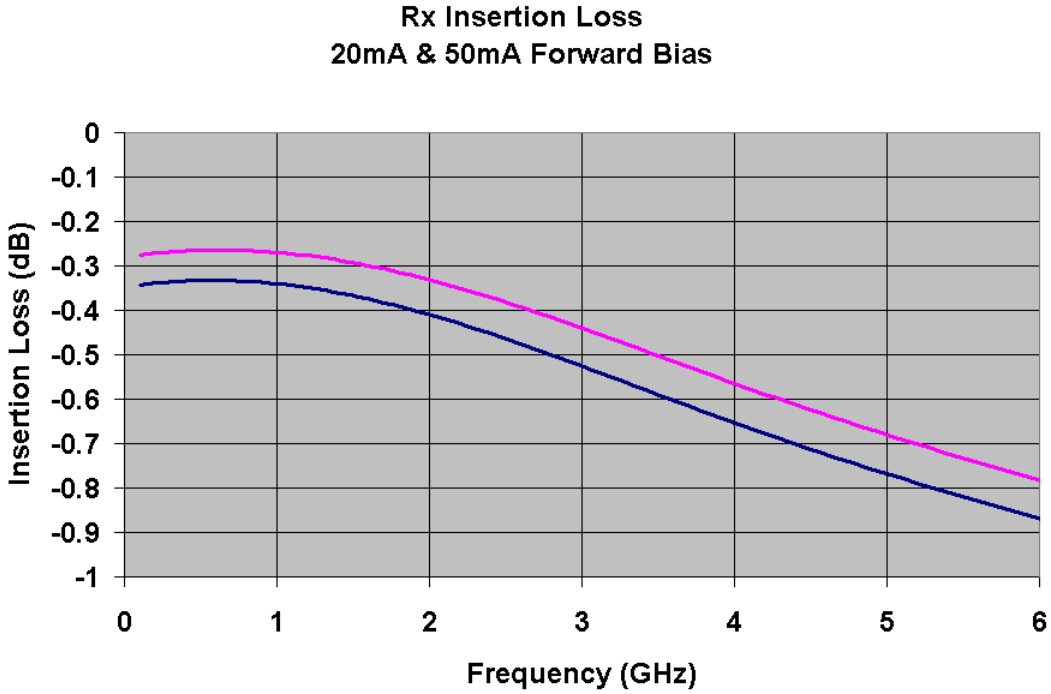


Tx Isolation
5V & 25V Reverse Bias



R_X Performance Curves at +25°C, Characteristic Impedance, Z_0 = 50 Ω





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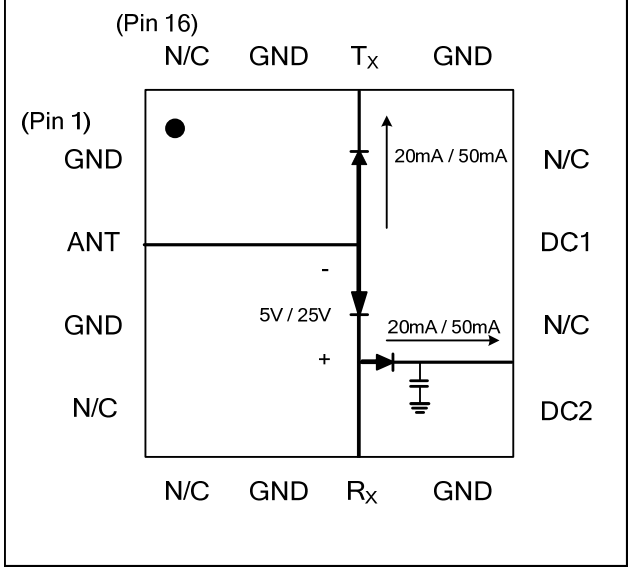
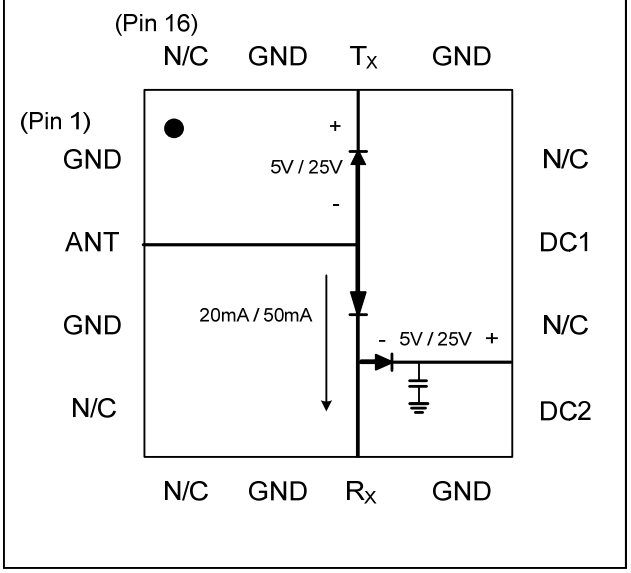
Bias Diagrams & Tables

T_X-ANT Insertion Loss
R_X-ANT Isolation



R_X-ANT Insertion Loss
T_X-ANT Isolation



Bias Table 1	T_X	R_X	DC2	ANT
Pin	**Pin 14**	**Pin 7**	**Pin 9**	**Pin 2**
T_X-ANT Isolation	+5V, 0 mA	-20 mA	+5V, 0 mA	0V
T_X-ANT Insertion Loss	-20 mA	+5V, 0 mA	-20 mA	0V
R_X-ANT Isolation	-20 mA	+5V, 0 mA	-20 mA	0V
R_X-ANT Insertion Loss	+5V, 0 mA	-20 mA	+5V, 0 mA	0V

Bias Table 2	T_X	R_X	DC2	ANT
Pin	**Pin 14**	**Pin 7**	**Pin 9**	**Pin 2**
T_X-ANT Isolation	+25V, 0 mA	-50 mA	+25V, 0 mA	0V
T_X-ANT Insertion Loss	-50 mA	+25V, 0 mA	-50 mA	0V
R_X-ANT Isolation	-50 mA	+25V, 0 mA	-50 mA	0V
R_X-ANT Insertion Loss	+25V, 0 mA	-50 mA	+25V, 0 mA	0V

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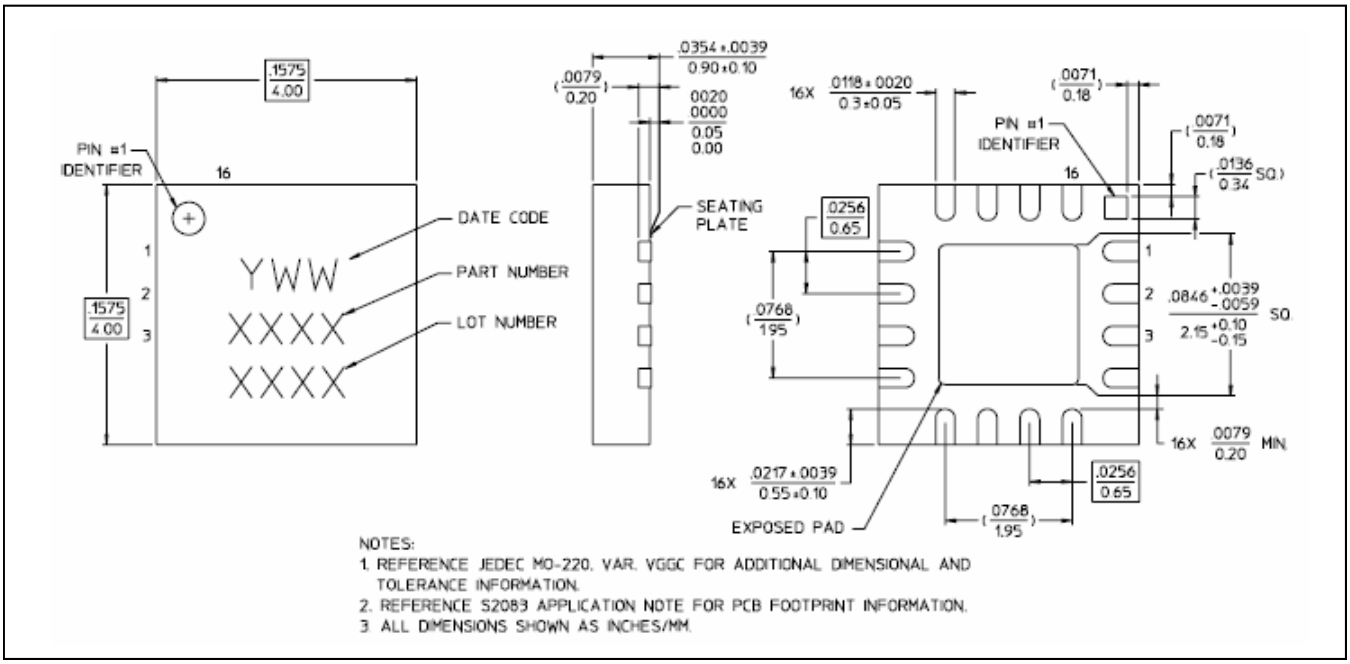
MASW-000834-13560T Outline – 4mm PQFN 16-Lead Saw Singulated



† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

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