

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

Rev. V4

Features

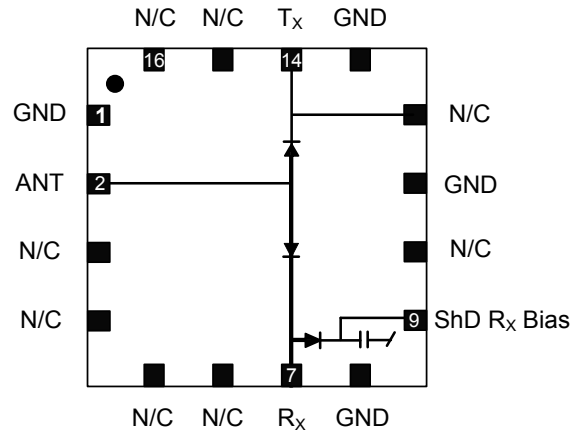
- Exceptional Broadband Performance
- Low Insertion Loss: $T_x = 0.20$ dB @ 2.7 GHz
- High Isolation: $R_x = 50$ dB @ 2.7 GHz
- High T_x RF Input Power = 120 W CW @ 2.0 GHz, 85°C
- Suitable for High Power LTE, TD-SCDMA, WiMAX, and Military Radio Applications
- Surface Mount 4 mm PQFN Package
- RoHS* 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 Configuration²

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 ³	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 Information¹

Part Number	Package
MASW-000936-14000T	Tape and Reel (1K)
MASW-000936-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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

Rev. V4

Electrical Specifications⁴: Freq. = 2.0, 2.7, 3.5 GHz, T_A = 25°C, Bias = 100 mA / 28 V

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

4. See Bias Table

Absolute Maximum Ratings^{5,6}

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

Parameter	Absolute Maximum
Forward Current	150 mA
Reverse Voltage (RF & DC)	160 V
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C
Junction Temperature	+175°C
T _X Incident CW Power	50.8 dBm (120 W) ⁷ @ 2 GHz, 85°C
R _X Incident CW Power	41.5 dBm (14 W) ⁷ @ 2 GHz, 85°C

5. Exceeding these limits may cause permanent damage.

6. MACOM does not recommend sustained operation near these survivability limits.

7. Base-plate temperature must be controlled to a constant +85°C.

Handling Procedures

Please observe the following precautions to avoid damage:

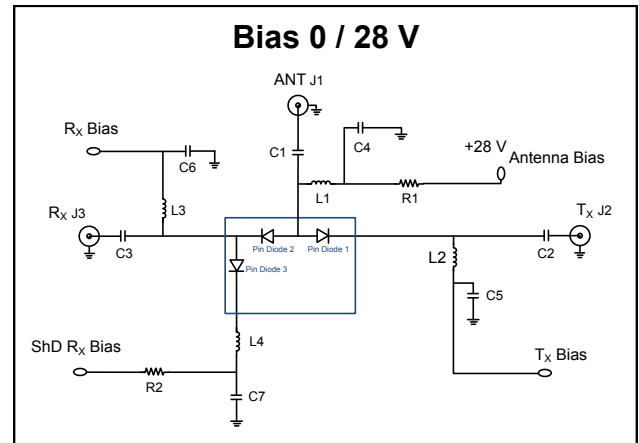
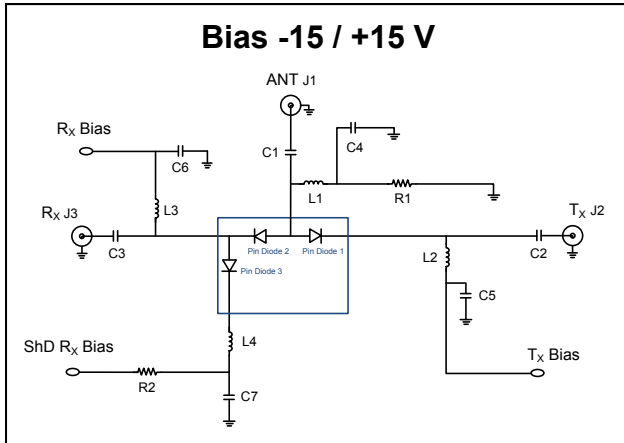
Static Sensitivity

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.

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

Rev. V4

Bias Diagrams & Tables



Bias -15 / +15 V

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

Bias 0 / 28 V

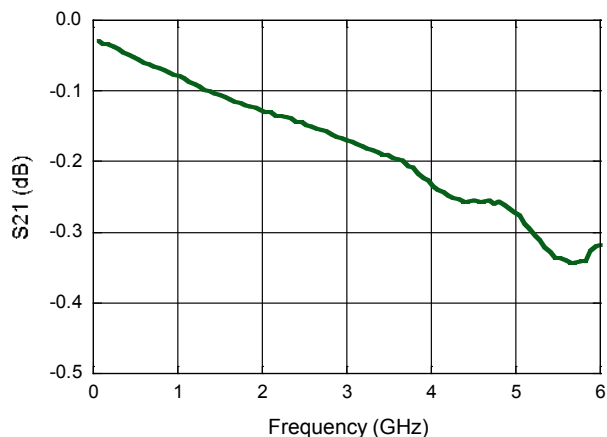
Bias Table	T _x	R _x	R _x ShDBias	ANT
Pin	Pin 14	Pin 7	Pin 9	Pin 2
T _x -ANT Isolation	(+28 V), 0 mA	(GND), -100 mA	(+28 V), 0 mA	+28 V
T _x -ANT Insertion Loss	(GND), -100 mA	(+28 V), 100 mA	(GND), -100 mA	+28 V
R _x -ANT Isolation	(GND), -100 mA	(+28 V), 100 mA	(GND), -100 mA	+28 V
R _x -ANT Insertion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

Typical Performance Curves (RF-probed parts), T_x (100 mA Bias Current)
 PIN Diode SPDT 120 Watt Switch for
 0.05 - 6.0 GHz Higher Power Applications

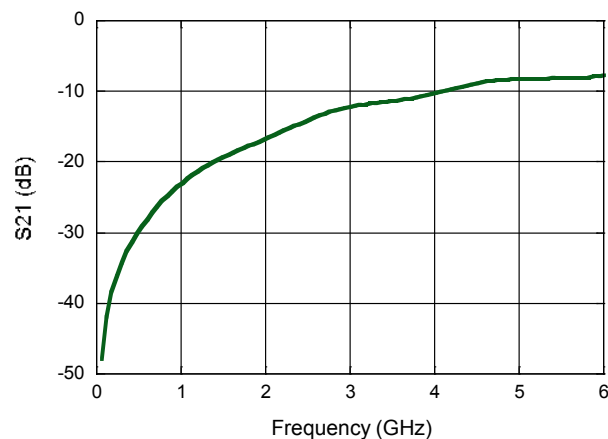
Rev. V4

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

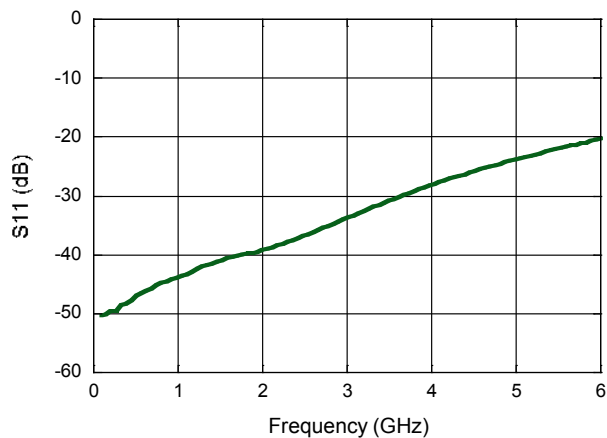
Insertion Loss, T_x



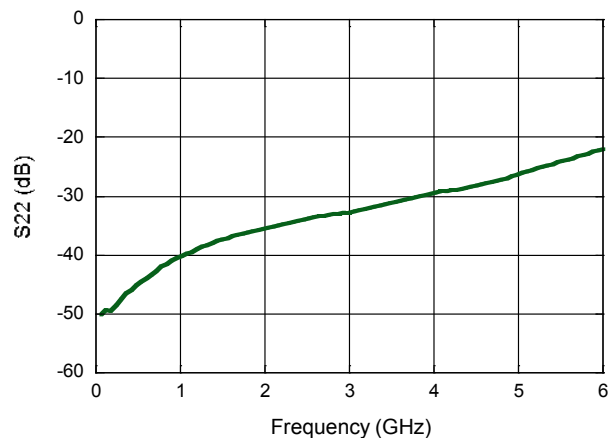
Isolation, T_x



Input Return Loss, T_x

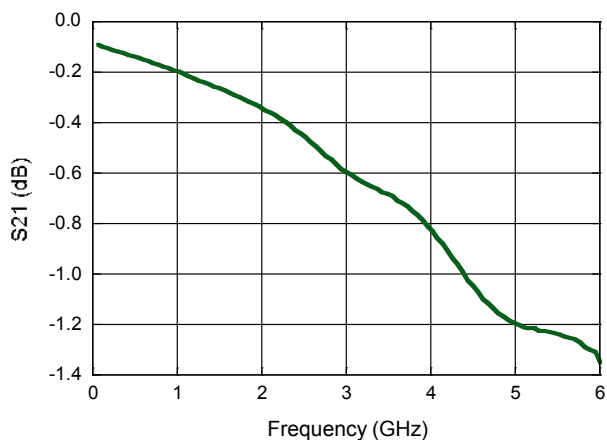


Output Return Loss, T_x

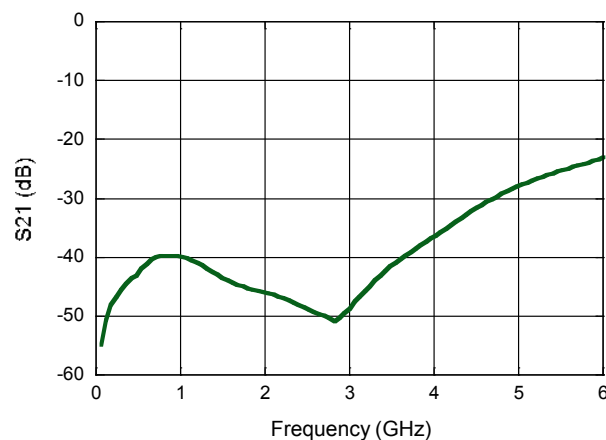


**Typical Performance Curves (RF-probed parts),
R_x (100 mA Bias Current)**

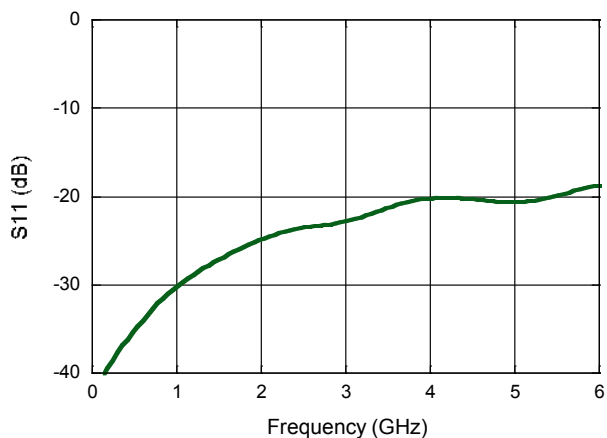
Insertion Loss, R_x



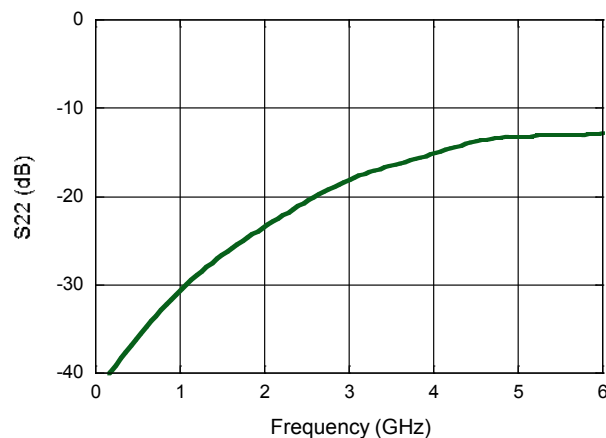
Isolation, R_x



Input Return Loss, R_x



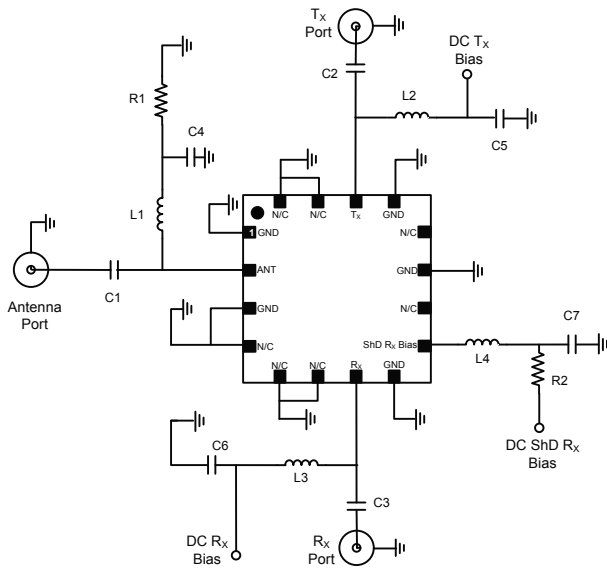
Output Return Loss, R_x



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

Rev. V4

Application Schematic⁸

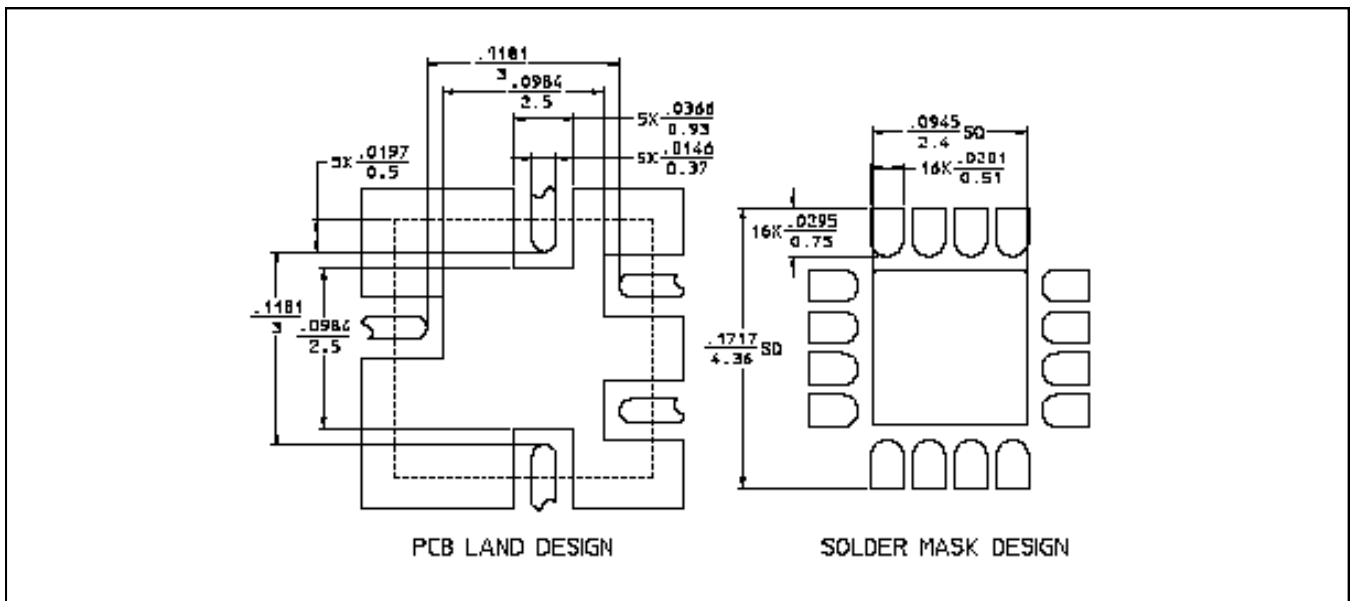


Parts List

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

8. 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.

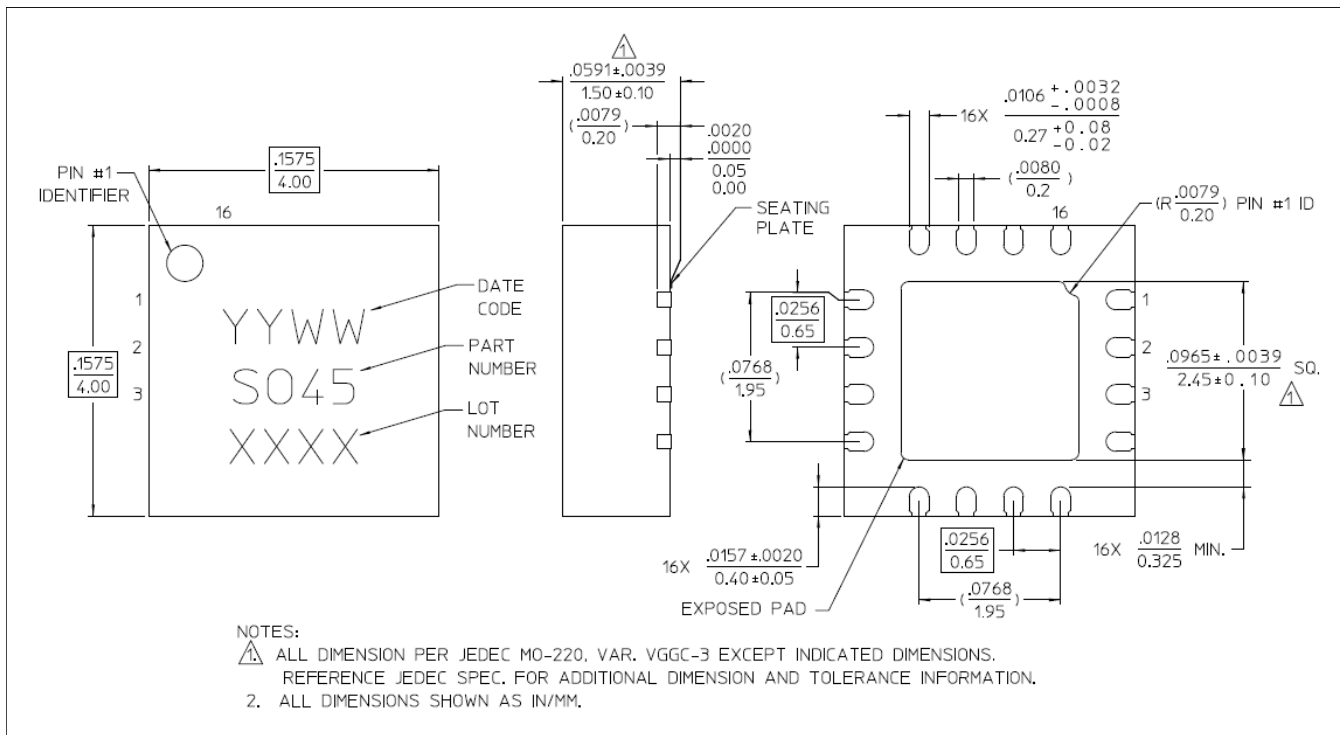
PCB Footprint



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

Rev. V4

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.

MACOM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with MACOM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.