Switch, SP3T 200 W
0.05 - 1.0 GHz

MASW-011041
Rev. V3

Features

- 200 W CW Incident Power @ +85°C
- Low Insertion Loss: <0.5 dB
- High Isolation: >40 dB
- Harmonics: <-70 dBc
- Operates from +V DC Bias Only
- Lead-Free 9 mm HQFN 20-lead Package
- RoHS* Compliant

Applications

- CW, Pulsed Power

Description

The MASW-011041 is a high power PIN diode SP3T switch in a common anode configuration, operating from 50 MHz to 1 GHz. It features low insertion loss and excellent linearity. It includes two high-power ports capable of handling up to 200 Watts CW and one low-power port capable of handling up to 100 Watts CW of incident power at a base plate temperature of +85ºC.

This high power switch is ideal for use on land mobile radio and MIL-COM applications that require higher CW and pulsed power operation. This device can operate with positive-only DC supplies, making it suitable for switch-filter and power amplifier control circuits.

The MASW-011041 is manufactured using MACOM's hybrid manufacturing process featuring high voltage PIN diodes and passive devices integrated in a 9 mm HQFN 20-lead plastic package.

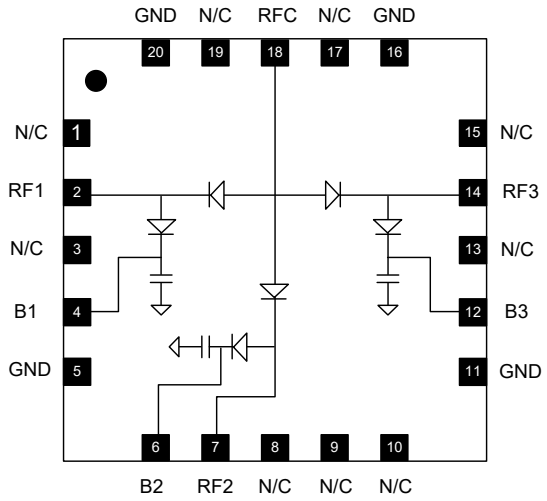
The MASW-011041 is compatible with MACOM's MADR-010574 PIN Diode Driver.

Ordering Information[1]

Part Number	Package
MASW-011041-TR0500	500 pc reel
MASW-011041-001SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

Pin #	Function
1,3,8,9,10,13,15,17,19	No Connection
2[2]	RF1 Input / V1 Bias
4	B1 Bias
5,11,16,20	Ground
6	B2 Bias
7[2]	RF2 Input / V2 Bias
12	B3 Bias
14[2]	RF3 Input / V3 Bias
18	RF Common / V4 Bias
Paddle[3]	Ground

2. RF1 and RF3 are high power ports (200 W); RF2 is a low power port (100 W).
3. The exposed paddle centered on the package bottom must be connected to RF, DC and thermal ground.

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

Electrical Specifications: T_A = 25°C, P_{IN} = 0 dBm (unless otherwise defined), Z_0 = 50 Ω
Bias[4] = 5 V / 400 mA, 5 V / 200 mA, 100 V / 25 mA

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss RFC - RF1 & RFC - RF3	0.5 GHz 1.0 GHz	dB	—	0.30 0.40	— 0.60
Insertion Loss RFC - RF2	0.5 GHz 1.0 GHz	dB	—	0.25 0.40	— 0.55
Isolation RFC - RF1 & RFC - RF3	0.5 GHz 1.0 GHz	dB	— 40	51 45	—
Isolation RFC - RF2	0.5 GHz 1.0 GHz	dB	— 45	56 52	—
Input Return Loss RFC - RF1 & RFC - RF3	P_{IN} = 0 dBm	dB	—	>14	—
Input Return Loss RFC - RF2	P_{IN} = 0 dBm	dB	—	>21	—
CW Input Power RFC - RF1 & RFC - RF3	85°C base plate, 550 MHz 950 MHz	dBm / W	—	53 / 200 52 / 158	—
CW Input Power RFC - RF2	85°C base plate, 550 MHz 950 MHz	dBm / W	—	50 / 100 49 / 80	—
P0.1dB RFC - RF1 & RFC - RF3	85°C base plate, 550 MHz 950 MHz	dBm	—	54 53	—
P0.1dB RFC - RF2	85°C base plate, 550 MHz 950 MHz	dBm	—	51 50	—
2nd Harmonics	P_{IN} = 49 dBm, F = 950 MHz	dBc	—	-75	—
3rd Harmonics	P_{IN} = 49 dBm, F = 950 MHz	dBc	—	-85	—
T_{ON}, T_{OFF}	(50% CTL - 90% RF and 10% RF) 1 MHz Rep Rate in Modulating Mode	µs	—	3.5	—
T_{RISE}, T_{FALL}	(10-90% RF Voltage) 1 MHz Rep Rate in Modulating Mode	µs	—	0.8	—

4. See Bias table.

Nominal Operating Conditions

Parameter	Value
Forward Current J1 & J3 J2	 400 mA 200 mA
Reverse DC Voltage	| -140 V |
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to +150°C
Junction Temperature	+175°C

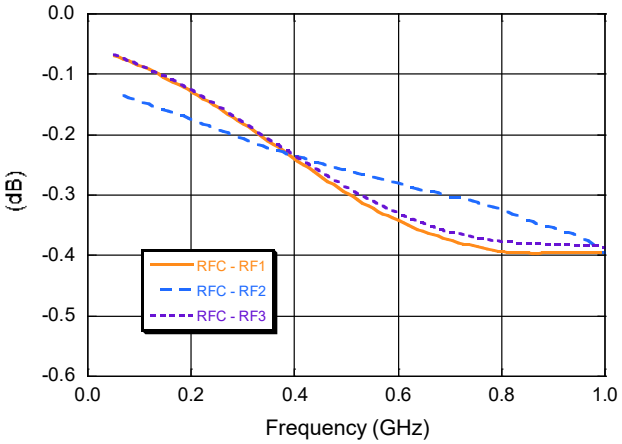
Absolute Maximum Ratings[5,6]

Parameter	Absolute Maximum
Forward Current J1 & J3 J2	 450 mA 250 mA
Reverse DC Voltage	| -150 V |
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to +150°C
Junction Temperature	+175°C

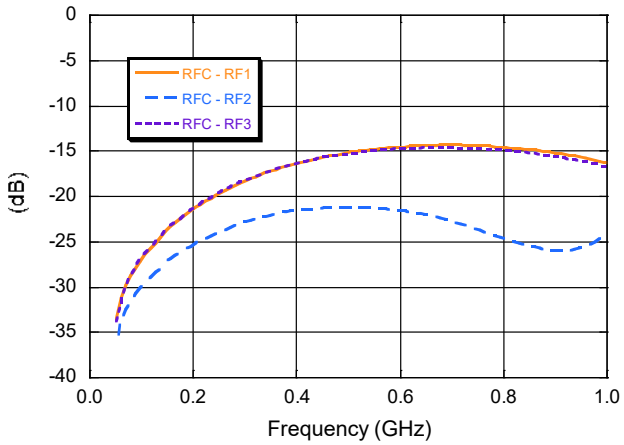
5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.

Typical Performance Curves:

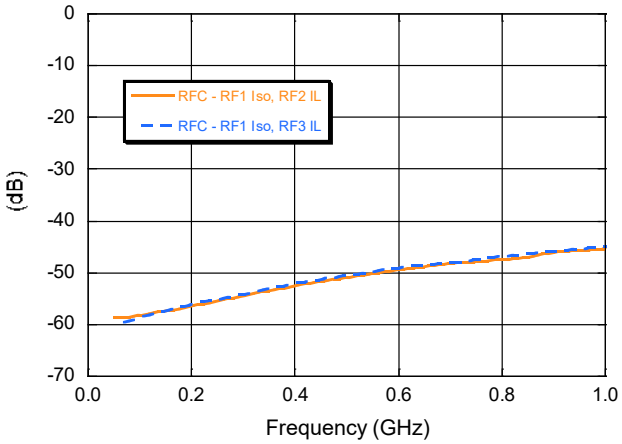
Insertion Loss



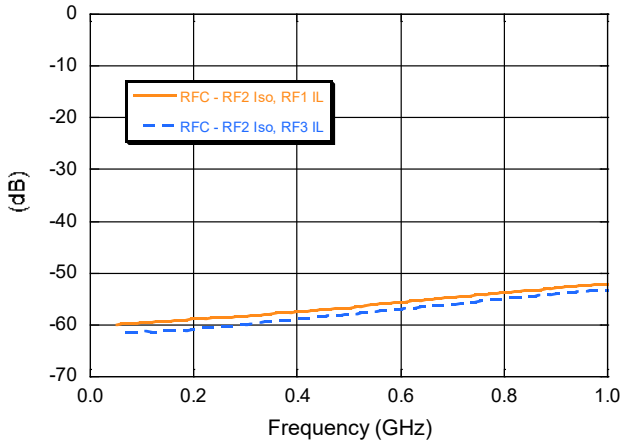
Return Loss



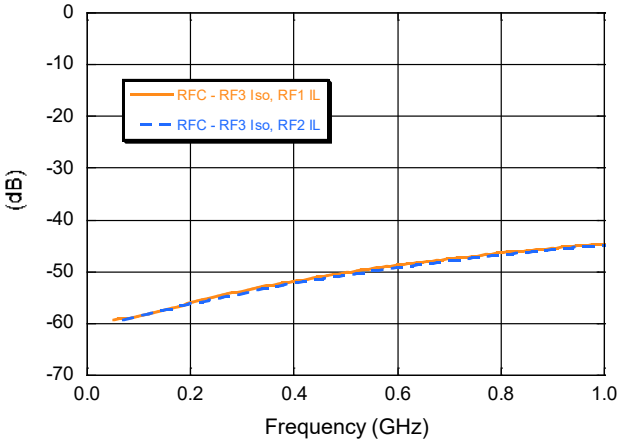
Isolation RFC - RF1



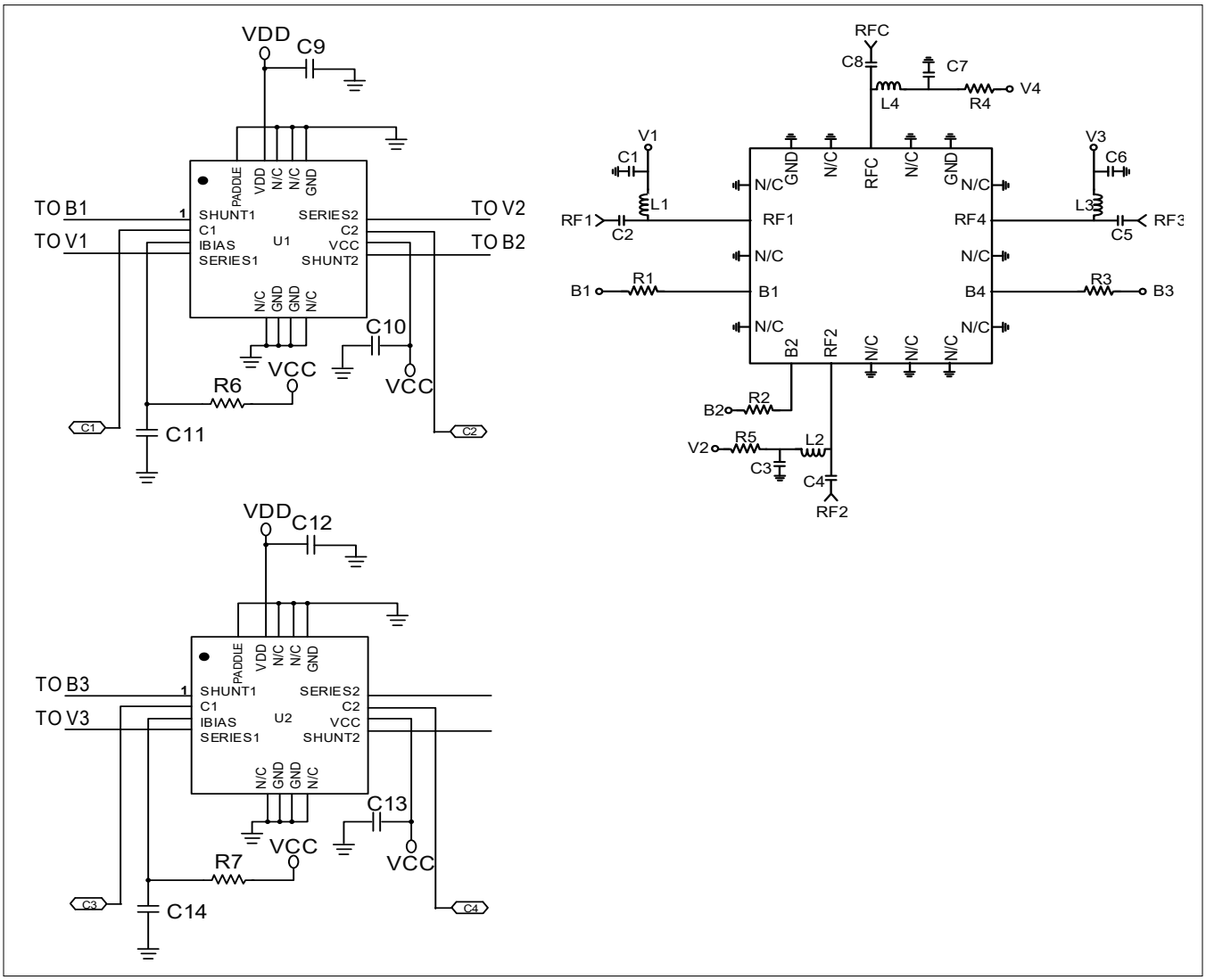
Isolation RFC - RF2



Isolation RFC - RF3



Application Schematic with MADR-010574 Driver[7]



Parts List

Part	Value	Part	Value
C1,C3,C6,C7	1000 pF	L1 - L4	680 nH
C2,C4,C5,C8	270 pF	R1 - R3[7]	4.4 kΩ
C9,C12	0.01 µF	R4,R5	10 Ω
C10,C11,C13,C14	0.1 µF	R6,R7	499 kΩ

7. Resistor values calculated to provide ~25 mA of shunt diode bias current given V_{CC} = 5 V, V_4 = 5 V and V_{DD} = 100 V.

Truth and Bias Table using MADR-010574 Driver (V_{DD} = +100 V[8])

RF State	C1	C2	C3	C4	V1 (V)	V2 (V)	V3 (V)	B1 (V)	B2 (V)	B3 (V)	V4 (V)
RFC – RF1 Isolation RFC – RF2 Isolation RFC – RF3 Isolation	1	1	1	1	+100 V 25 mA	+100 V 25 mA	+100 V 25 mA	0 V -25 mA	0 V -25 mA	0 V -25 mA	+5 V 0 mA
RFC – RF1 Low Loss RFC – RF2 Isolation RFC – RF3 Isolation	0	1	1	1	0 V -400 mA	+100 V 25 mA	+100 V 25 mA	+100 V 0 mA	0 V -25 mA	0 V -25 mA	+5 V 400 mA
RFC – RF2 Low Loss RFC – RF1 Isolation RFC – RF3 Isolation	1	0	1	1	+100 V 25 mA	0 V -200 mA	+100 V 25 mA	0 V -25 mA	+100 V 0 mA	0 V -25 mA	+5 V 200 mA
RFC – RF3 Low Loss RFC – RF1 Isolation RFC – RF2 Isolation	1	1	0	1	+100 V 25 mA	+100 V 25 mA	0 V -400 mA	0 V -25 mA	0 V -25 mA	+100 V 0 mA	+5 V 400 mA

8. DC reverse bias of a PIN diode operating at a high power is dependent on RF frequency, incident power, and VSWR. See Minimum Reverse DC Voltage table for high power operation.

Minimum Reverse DC Voltage[9]

Frequency (MHz)	Minimum Reverse DC Voltage
50	| -142 V |
100	| -102 V |
200	| -60 V |
500	| -26 V |
1000	| -13 V |

9. Required to maintain low loss under 200 W of incident power with 1.5:1 VSWR.

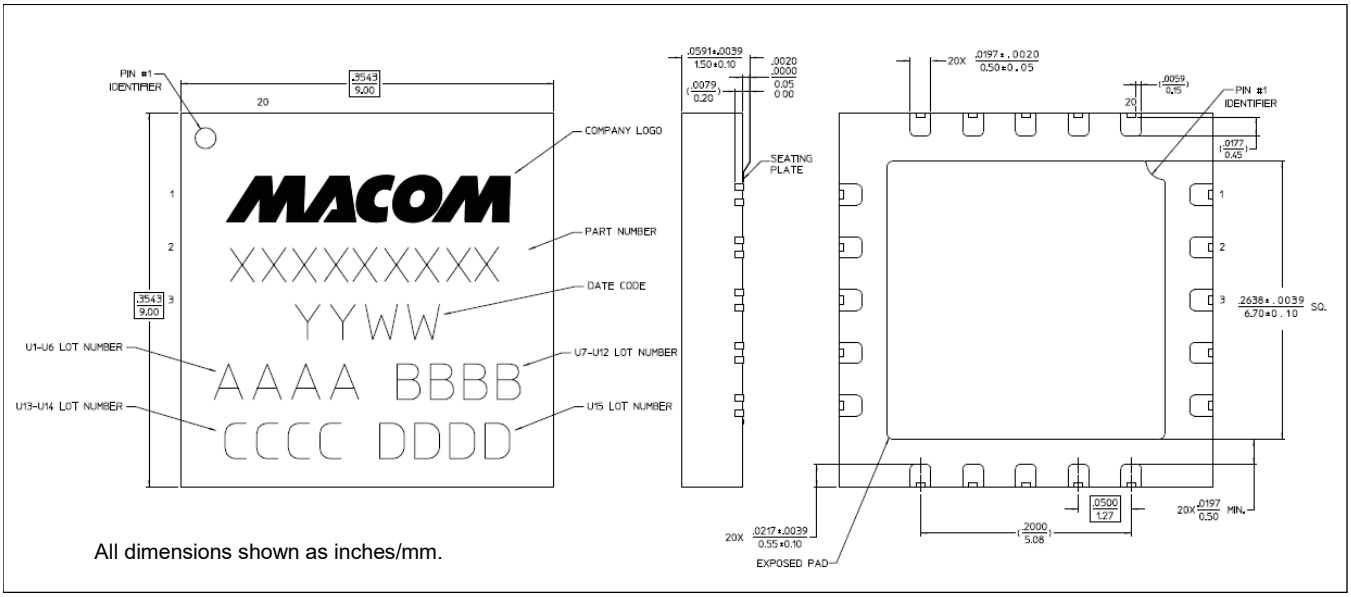
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1B HBM devices.

Lead Free 9 mm HQFN 20-Lead†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 3 requirements.
Plating is NiPdAuAg.