

Switch, SP3T 200 W

0.05 - 1.0 GHz

Rev. V1

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
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

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 +85°C.

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.

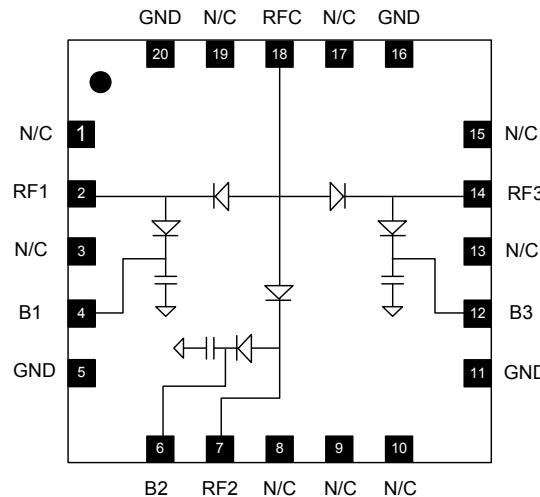
Ordering Information¹

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

1. Reference Application Note M513 for reel size information.

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

Functional Schematic



Pin Configuration

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

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Electrical Specifications: $T_A = 25^\circ\text{C}$, $P_{IN} = 0 \text{ dBm}$ (unless otherwise defined), $Z_0 = 50 \Omega$
Bias⁴ = 5 V / 400 mA, 3 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 | $P_{IN} = 0 \text{ dBm}$ | dB | — | >14 | — |
| Input Return Loss RFC - RF2 | $P_{IN} = 0 \text{ dBm}$ | 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 | $P_{IN} = 49 \text{ dBm}$, $F = 950 \text{ MHz}$ | dBc | — | -75 | — |
| 3rd Harmonics | $P_{IN} = 49 \text{ dBm}$, $F = 950 \text{ MHz}$ | 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.

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Bias Table⁵

| RF State | V1 Bias (V) | V2 Bias (V) | V3 Bias (V) | V4 Bias (V) | B1 Bias (V) | B2 Bias (V) | B3 Bias (V) |
|--|---------------|---------------|---------------|--------------|--------------|--------------|--------------|
| RFC - RF1 Low Loss RFC - RF2 Isolation RFC - RF3 Isolation | 0 V @ 400 mA | 100 V @ 25 mA | 100 V @ 25 mA | 5 V @ 400 mA | 100 V @ 0 mA | 0 V @ 25 mA | 0 V @ 25 mA |
| RFC - RF2 Low Loss RFC - RF1 Isolation RFC - RF3 Isolation | 100 V @ 25 mA | 0 V @ 200 mA | 100 V @ 25 mA | 3 V @ 200 mA | 0 V @ 25 mA | 100 V @ 0 mA | 0 V @ 25 mA |
| RFC - RF3 Low Loss RFC - RF1 Isolation RFC - RF2 Isolation | 100 V @ 25 mA | 100 V @ 25 mA | 0 V @ 400 mA | 5 V @ 400 mA | 0 V @ 25 mA | 0 V @ 25 mA | 100 V @ 0 mA |

5. 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.

Absolute Maximum Ratings^{6,7}

| Parameter | Absolute Maximum |
|-----------------------|------------------|
| Forward Current | +400 mA |
| Reverse DC Voltage | -150 V |
| Operating Temperature | -55°C to +85°C |
| Storage Temperature | -65°C to +150°C |
| Junction Temperature | +175°C |

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

Minimum Reverse DC Voltage⁸

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

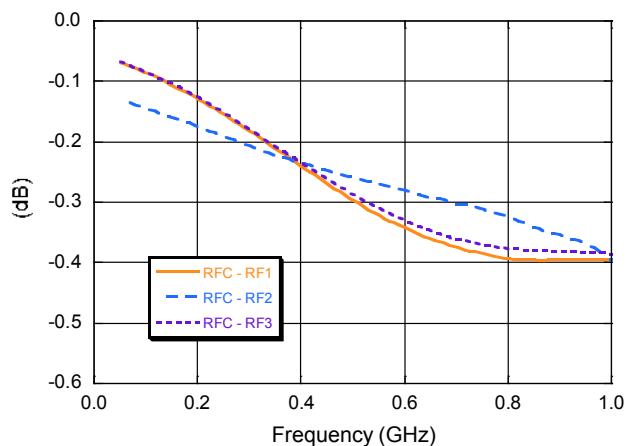
8. Required to maintain low loss under 200 W of incident power with 1.5:1 VSWR.

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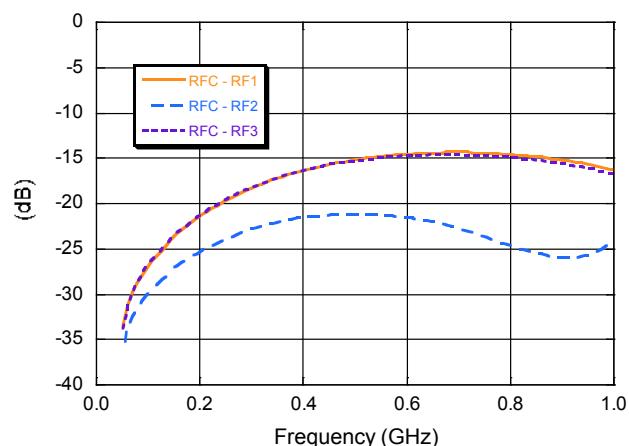
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Typical Performance Curves:

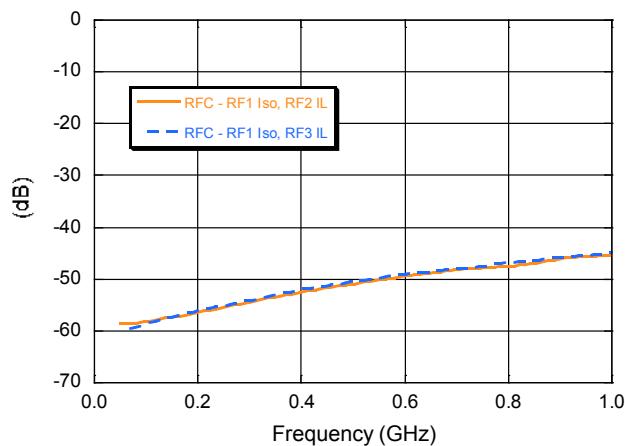
Insertion Loss



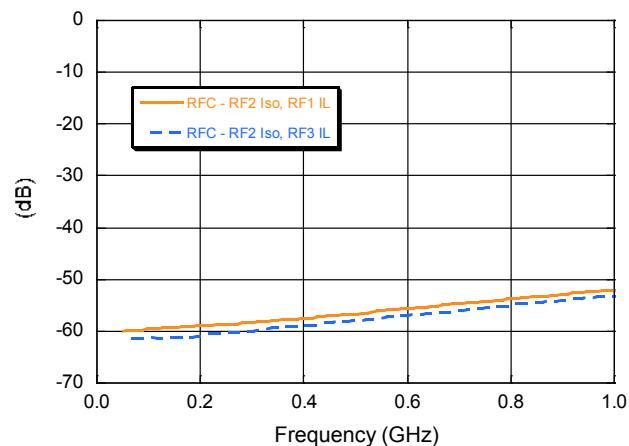
Return Loss



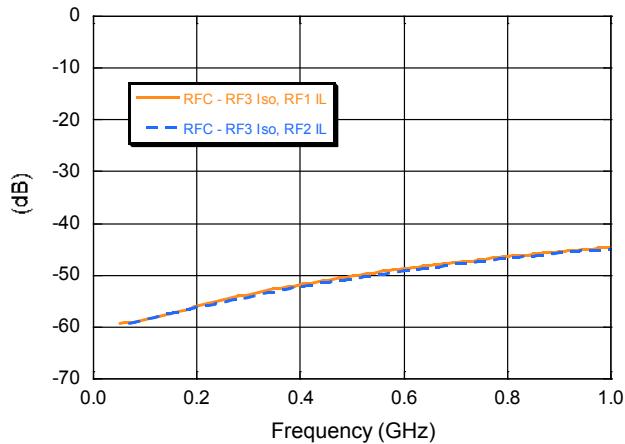
Isolation RFC - RF1



Isolation RFC - RF2



Isolation RFC - RF3

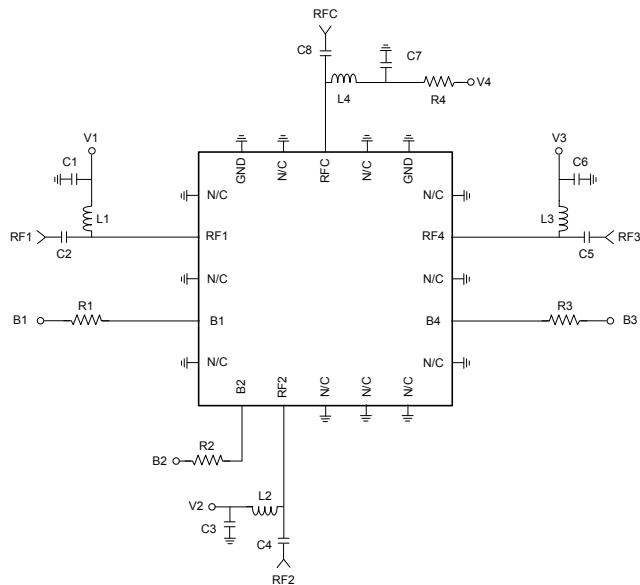


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Application Schematic



Off-Chip Component Values

| Component | Value |
|-----------------|---------|
| C1,C3,C6,C7 | 1000 pF |
| C2,C4,C5,C8 | 270 pF |
| L1 - L4 | 680 nH |
| R1 - R3 | 4.4 kΩ |
| R4 ⁹ | 10 Ω |

9. Must be rated for appropriate power handling.

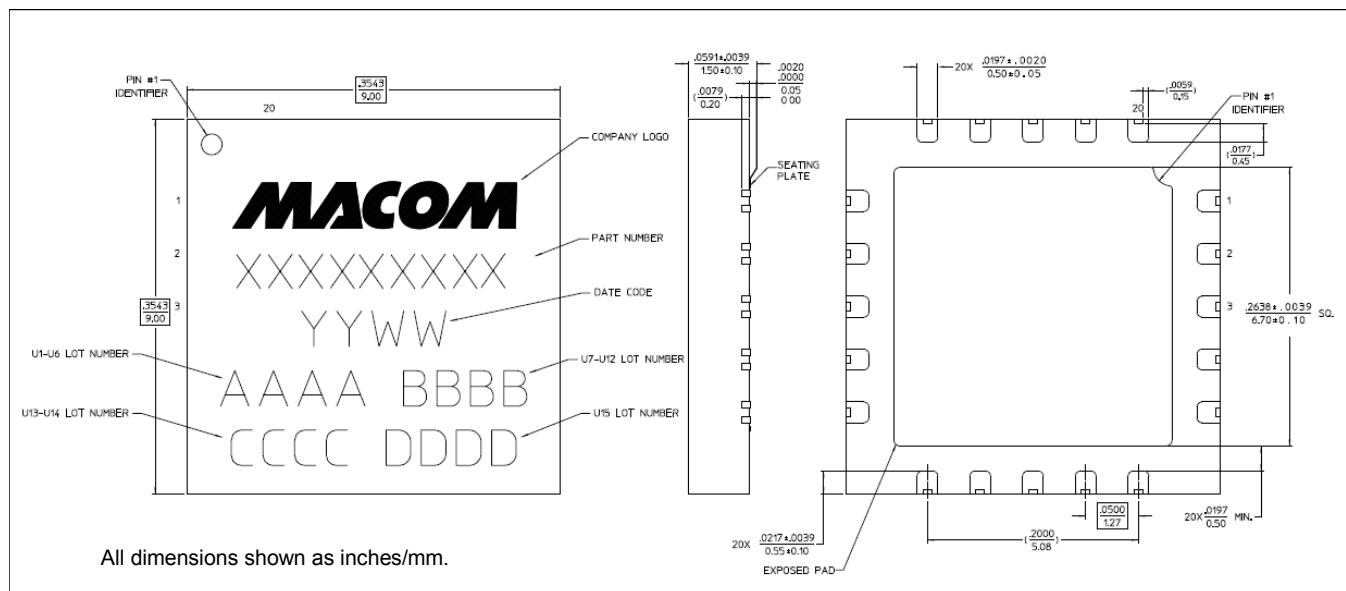
Handling Procedures

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.