PRELIMINARY

Wei Bo Associates HK Limited

MSW3T-402103-332

SP3T Surface Mount High Power PIN Diode Switch

Features:

- Frequency Range: 400 MHz to 1.0 GHz
- Power (Peak): +59 dBm
- Power (CW): +53 dBm
- Low Insertion Loss: < 1.0 dB
- Return Loss: > 15 dB
- Isolation: > 30 dB
- High IP3: > 65 dBm
- Surface Mount Module: 8mm x 8mm x 2.5mm
- High Bias Voltage supports High Linearity
- RoHS Compliant

Description:

The MSW3T-402103-332 SP3T surface mount High Power PIN Diode switch leverages high reliability hybrid manufacturing processes which yield proven superior performance to both MMIC and Glass Carrier based technologies. The hybrid design approach permits precise PIN Diode selection to optimize RF performance while maintaining competitive cost targets. The small form factor (8mm x 8mm x 2.5mm) offers world class power handling, low insertion loss, and superior intermodulation performance exceeding all competitive technologies.

Typical Applications:

- Radar T/R Modules
- Switch Bank Filters
- Mil-Com Radios

The MSW3T-402103-332 High Power SP3T switch are intended for use in high power, high reliability, mission critical applications across the 400 MHz to 1.0 GHz frequency ranges. The manufacturing process has been proven through years of extensive use in high reliability applications.

The MSW3T-402103-332 SP3T switch is fully RoHS compliant.

ESD and Moisture Sensitivity Level Rating:

The MSW3T-402103-332 carries an ESD ratings of Class 1C, Human Body Model (HBM) and a moisture sensitivity rating of MSL 1.

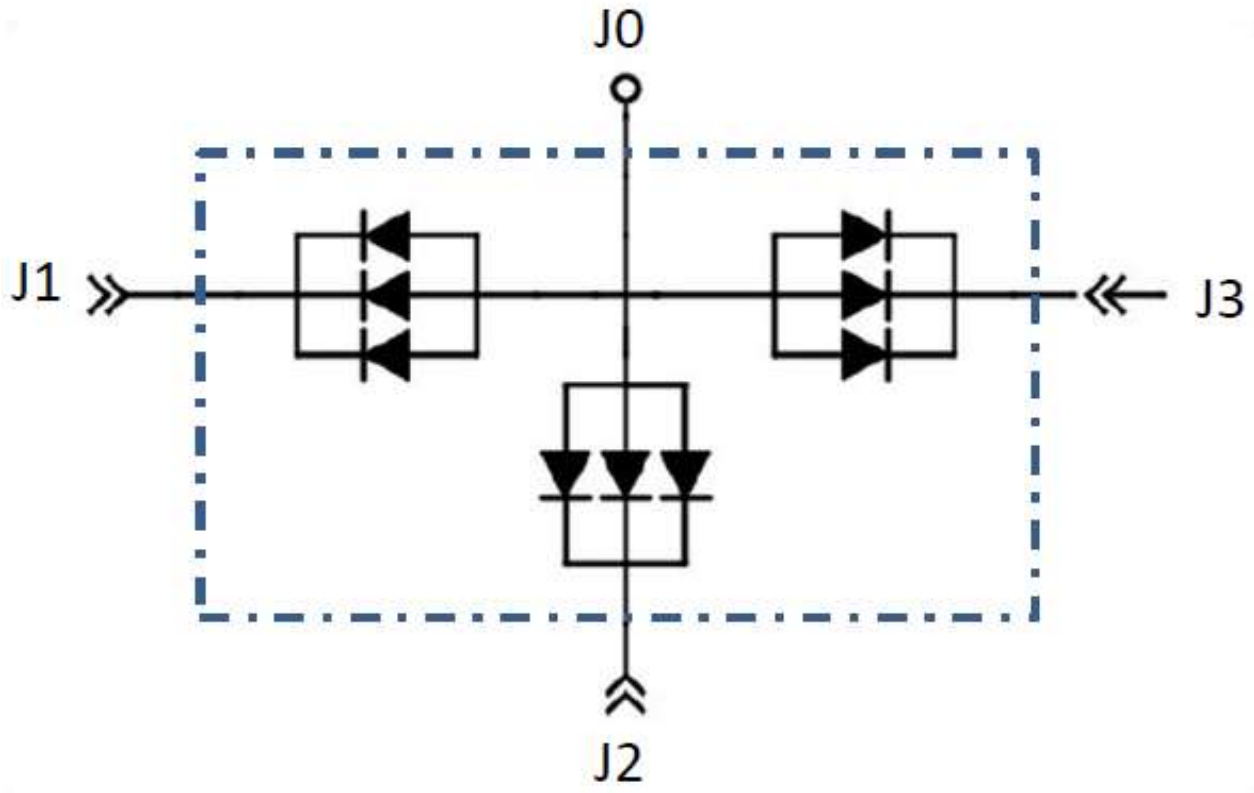
MSW3T-402103-332 Specifications@ Zo = 50Ω; Ta = +25°C

Parameter	Symbol	Units	Test Conditions	Min Value	Typical Value	Max Value
Frequency	F	MHz		400		1,000
J0-J1, J0-J2 or J0-J3 Insertion Loss (Note 1)	IL	dB	State 1, 2 & 3			1.0
J0-J1, J0-J2 or J0-J3 Return Loss (Note 1)	RL	dB	State 1, 2 & 3	15		
J0-J1, J0-J2 or J0-J3 Isolation (Note 1)	ISO	dB	State 1, 2 & 3	30		
CW Incident Power (Note 2)	P_{inc}(CW)	dBm	State 1, 2 & 3 Baseplate: < +55°C		53	
Peak Incident Power (Note 2)	P_{inc} (Pk)	dBm	State 1, 2 & 3 1.5:1 Source & Load VSWR; Pulse Width: 60 usec, Duty Cycle: 20%; Baseplate: < +55°C		59	
Switching Speed	Ts	us	(10%-90%) RF Voltage TTL rep rate = 100 kHz		1	2
Input 3rd Order Intercept Point	IIP3	dBm	F1 = 500 MHz F2 = 510 MHz P1 = P2 = +40 dBm State 1, 2 & 3	60	65	

Note 1: Low signal test. For higher power and bias setting, see section on Minimum Reverse Bias Voltage.

Note 2: The bias setting for high power is frequency and RF power dependent. See section on Minimum Reverse Bias Voltage.

MSW3T-402103-332SP3T Schematic



RF Truth Table (Low Signal)

RF State	Vcc1 Bias	Vcc2 Bias	Vcc3 Bias
J1–J0 **"ON"** J2–J0 "OFF" J3-J0 "OFF"	V_{LOW} @ 100 mA	V_{HIGH} @ 25 mA	V_{HIGH} @ +25 mA
J1–J0 "OFF" J2–J0 **"ON"** J3-J0 "OFF"	V_{HIGH} @ 25 mA	V_{LOW} @ 100 mA	V_{HIGH} @ 25 mA
J1–J0 "OFF" J2–J0 "OFF" J3-J0 **"ON"**	V_{HIGH} @ 25 mA	V_{HIGH} @ 25 mA	V_{LOW} @ 100 mA

Note: Current Limiting Resistors power rating must be considered; heat sinking must be provided, based on bias conditions chosen. For the small signal test, R1 = 50 ohms typ, R2 = R3 = R4 = 300 ohms typ. Resistor Power Dissipation is < 1 watt in this scenario.

Minimum Reverse Bias Voltage @ J1, J2, J3 vs. Frequency @ 800W (CW) VSWR: 1.5:1

MSW3T-402103-332	Frequency & Min Bias Voltage	Frequency & Min Bias Voltage
Frequency	400 MHz	1 GHz
Minimum Bias Voltage	110V	55V

MSW3T-402103-332 Absolute Maximum Ratings @ T_A = +25 °C

(unless otherwise denoted)

Parameter	Absolute Maximum Value
Forward Current @ J1, J2 or J3	250 mA
Reverse Voltage @ J1, J2 or J3	300 V
Forward Diode Voltage	1.2 V @ 10 mA
Operating Temperature	-65 °C to +125 °C
Storage Temperature	-65 °C to +150°C
Junction Temperature	+175 °C
Assembly Temperature	+260 °C for 10 seconds
CW Incident Power Handling Source & Load VSWR = 1.5 : 1 (Cold Switching) See Notes below: 1 & 2	+53 dBm @ +55 °C Case Temp
Peak Incident Power Handling Source & Load VSWR = 1.5 : 1 (Cold Switching) See Notes below: 1& 2	+59dBm @ 60 usec pulse, 20% duty cycle @ +55 °C Case Temp

Notes:

1) For Hot Switching, PIN Diode Drivers must transition between states in less than 100 nsec with a parallel RC spiking network at the Driver Output.
2) Backside RF and DC grounding area of the MSW3T-402103-332 must be completely solder attached to the RF Circuit board for proper electrical and thermal circuit grounding.

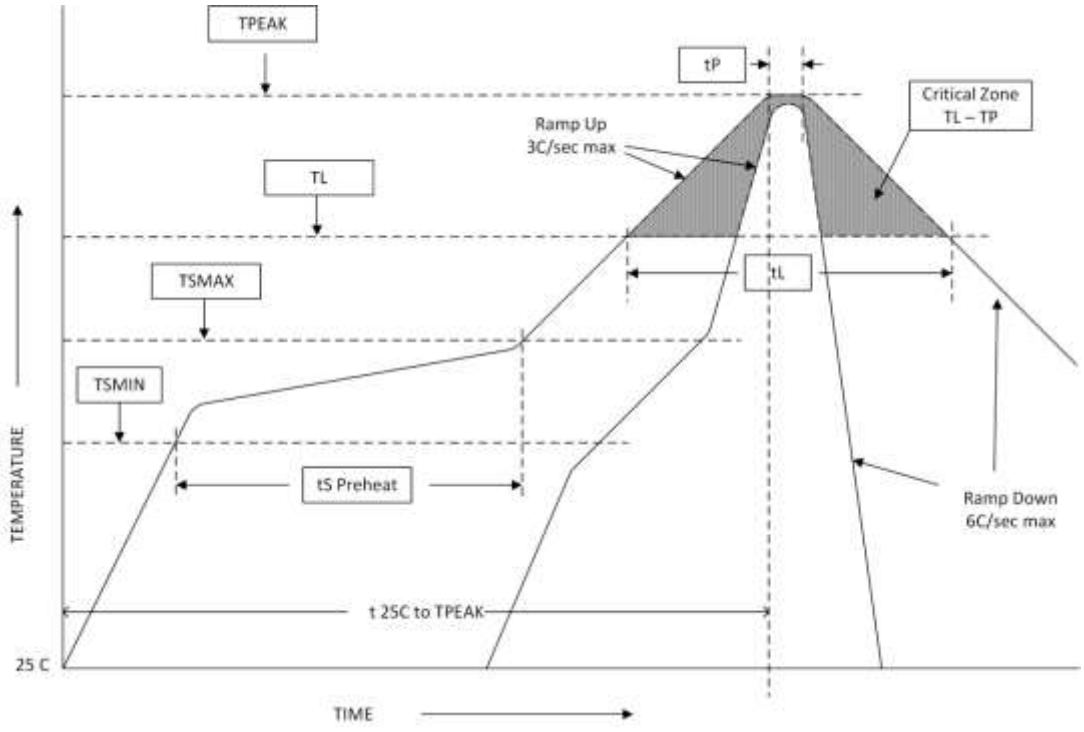
MSW3T-402103-332 Small Signal Parametric Performance:

Assembly Instructions

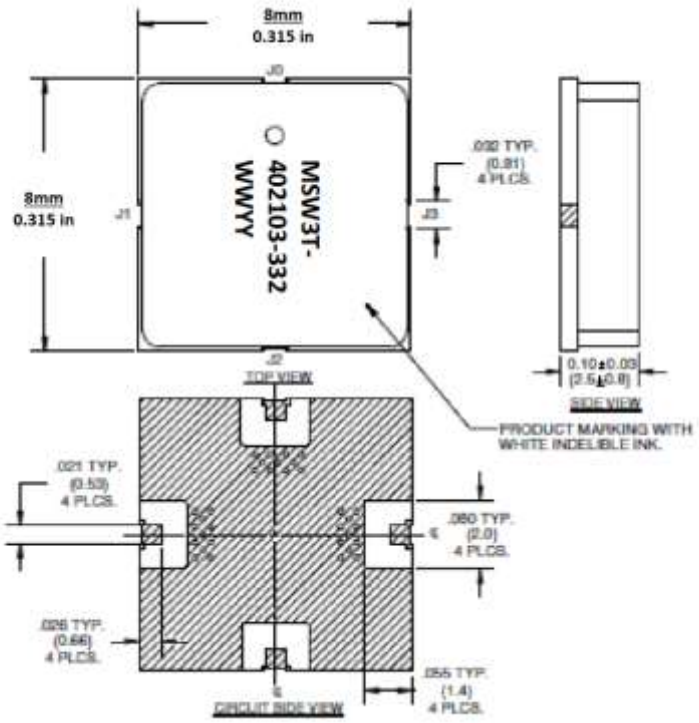
The MSW3T-402103-332 may be attached to the printed circuit card using solder reflow procedures using either RoHS or Sn63/ Pb37 type solders per the Table and Temperature Profile Graph shown below:

Profile Parameter	Sn-Pb Assembly Technique	RoHS Assembly Technique
Average ramp-up rate (T_L to T_P)	3°C/sec (max)	3°C/sec (max)
Preheat Temp Min (T_{smin}) Temp Max (T_{smax}) Time (min to max) (t_s)	 100°C 150°C 60 – 120 sec	 100°C 150°C 60 – 120 sec
T_{smax} to T_L Ramp up Rate		 3°C/sec (max)
Peak Temp (T_P)	225°C +0°C / -5°C	245°C +0°C / -5°C
Time within 5°C of Actual Peak Temp (T_P)	10 to 30 sec	20 to 40 sec
Time Maintained Above: Temp (T_L) Time (t_L)	 183°C 60 to 150 sec	 217°C 60 to 150 sec
Ramp Down Rate	6°C/sec (max)	6°C/sec (max)
Time 25°C to T_P	6 minutes (max)	8 minutes (max)

Solder Re-Flow Time-Temperature Profile



MSW3T-402103-332 SP3T Package Outline Drawing



Thermal Design Considerations:

The design of the MSW3T-402103-332 High Power Switch permits the maximum efficiency in thermal management of the PIN Diodes while maintaining extremely high reliability. Optimum switch performance and reliability of the switch can be achieved by the maintaining the base ground surface temperature of less than +55^{o}C.

Part Number Ordering Details:

The MSW3T-402103-332 High Power Switch is available in the following formats:

Part Number	Packaging
MSW3T-402103-332	Gel Pack