

SPDT RF Switch

VSW2-33-10W+

The Big Deal

- High Input Power, 10W (cold switching)
- Very low insertion loss, 0.5 dB typ. at 1GHz
- Positive Control Voltage, 0/3V or 0/5V
- Small Size: 2mm x 3mm x 1mm



CASE STYLE: JZ1436

Product Overview

VSW2-33-10W+ is a PHEMT high power reflective SPDT switch operates with positive control voltage while consuming, 20 μ A typical. Compared to competitive models, it operates over a wide frequency range, 50-3000 MHz and control voltages up to +5V. It is packaged in a tiny 2mm x 3mm x 1mm package and is rated MSL1 and class 1A for HBM.

| Feature | Advantages |
|---|--|
| Broadband: 50-3000 MHz | Covers a range of wireless applications such as Cellular, PCS, LTE, WiMAX, Avionics, Broadcast, CATV, GPS, Radar etc. |
| High Input Power: 10W (cold switching) at +5V control | Suitable for Transmit/receive switching |
| Low Insertion Loss: 0.5 dB typ. at 1 GHz | Premium high power is transmitted with minimal loss and temperature rise of the DUT. In receive path results in minimal increase of system noise figure. |
| Positive control Voltage: 0/3V or 0/5V | No external components are required for change of operating voltage from 3 to 5V |
| Good Isolation: 26 dB to 1 GHz and 18 dB to 3 GHz | Minimizes filtering requirement. |

Notes

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SPDT RF Switch

50Ω 50-3000 MHz

Reflective RF Switch 10W
Positive Control Voltage; +3V to +5V

Product Features

- High Power, 10 W (cold switching)
- Good Isolation, 26 dB typ. at 1 GHz
- Low insertion loss, 0.5 dB typ. at 1 GHz
- High IP3, 56 dBm typ. at 1 GHz
- Small size, 3mm x 2mm x 0.89 mm
- Aqueous washable

Typical Applications

- Automated switching networks
- Cellular/ PCS
- ISM, WCDMA, WiMAX, LTE, TD-SCDMA



Generic photo used for illustration purposes only

VSW2-33-10W+

CASE STYLE: JZ1436

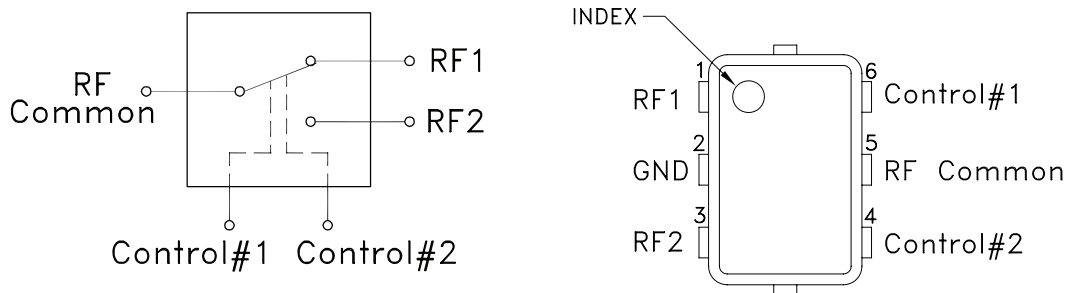
+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

General Description

VSW2-33-10W+ is a high power reflective SPDT switch operates with positive control voltage while consuming, 20μA typical. It has been designed for very wideband operation of 50-3000 MHz for 50Ω systems. It is packaged in a tiny 2mm x 3mm x 1mm package and is rated MSL1 and class 1A for HBM.

Simplified Schematic and Pad Description



| Function | Pad Number | Description |
|---------------------------|------------|--|
| RF COM | 5 | RF Common/ SUM Port, requires DC block (see Fig. 2) |
| RF1 | 1 | RF Out #1/In Port #1, requires DC block (see Fig. 2) |
| RF2 | 3 | RF Out #2/In Port #2, requires DC block (see Fig. 2) |
| Control #1 (V_{CTL1}) | 6 | Control IN #1 |
| Control #2 (V_{CTL2}) | 4 | Control IN #2 |
| GND | 2 | RF DC Ground |

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RF Electrical Specifications⁽¹⁾, 50 - 3000 MHz, T_{AMB}=25°C, V_{CTL}= +3V to +5V

| Parameter | Condition (MHz) | Min. | Typ. | Max. | Units | |
|--|----------------------|------|------|------|-------|---|
| Frequency Range | | 50 | | 3000 | MHz | |
| Insertion Loss ⁽²⁾ | 50 | — | 0.4 | — | dB | |
| | 500 | — | 0.4 | 0.6 | | |
| | 1000 | — | 0.5 | 0.7 | | |
| | 2000 | — | 0.6 | 0.8 | | |
| | 3000 | — | 0.6 | 0.8 | | |
| Isolation (From RF COM to RF1/RF2 and RF1 to RF2 ports) | 50 | — | 42 | — | dB | |
| | 500 | 28 | 31 | — | | |
| | 1000 | 23 | 26 | — | | |
| | 2000 | 17 | 22 | — | | |
| | 3000 | 15 | 18 | — | | |
| Return Loss (ON STATE) | 50 | — | 24 | — | dB | |
| | 500 | — | 27 | — | | |
| | 1000 | — | 21 | — | | |
| | 2000 | — | 17 | — | | |
| | 3000 | — | 19 | — | | |
| Input IP3 | 100 | — | 55 | — | dBm | |
| | 500 | — | 56 | — | | |
| | 1000 | — | 56 | — | | |
| | 2000 | — | 55 | — | | |
| | 3000 | — | 53 | — | | |
| Operating Power ^(4,5) (cold switching) | V _{CTL} =3V | 50 | — | — | 7 | W |
| | | 1000 | — | — | 7 | |
| | | 2000 | — | — | 7 | |
| | | 3000 | — | — | 7 | |
| | V _{CTL} =5V | 50 | — | — | 10 | |
| | | 1000 | — | — | 10 | |
| | | 2000 | — | — | 9 | |
| | | 3000 | — | — | 7 | |

DC Electrical Specifications

| Parameter | Min. | Typ. | Max. | Units |
|--|------|------|------|-------|
| Control Voltage Low (V _{CTL}) | 0 | — | 0.2 | V |
| Control Voltage High (V _{CTL}) | 2.8 | — | 5.2 | V |
| Control Current at (V _{CTL})= 3V (V _{CTL})= 5V | — | — | — | µA |
| | — | 20 | — | |
| | — | 42 | — | |

Notes:

1. Tested on Mini-Circuits' test board TB-530+, (see Characterization Test Circuit, Fig.1).
2. Insertion loss values are deembedded from test board loss.
3. Do not exceed RF input power as shown in Absolute Maximum Rating table.
4. Derate linearly to 3W at 85°C ground lead temperature.
5. Compression 0.1 dB typ. over 1000-3000 MHz and 0.5dB typical at 50 MHz at max. operating power.

Switching Specifications

| Parameter | Control Voltage (V) | Min. | Typ. | Max. | Units |
|---|---------------------|------|------|------|-------------------|
| Rise/Fall Time (10 to 90% or 90 to 10% RF) | 0/3 | | 433 | | nSec |
| | 0/5 | | 150 | | |
| Switching Time, 50% CTRL to 90/10% RF | 0/3 | | 550 | | nSec |
| | 0/5 | | 306 | | |
| Video Feedthrough, (control 0 to 3V, freq.=500 KHz) | 0/3 | | 20 | | mV _{p,p} |
| | 0/5 | | 28 | | |

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Absolute Maximum Ratings⁽⁴⁾

| Parameter | Ratings |
|-----------------------|--|
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to 150°C |
| Control Voltage | 10V |
| RF input power | 22W, 50-2000 MHz 17W, 2000-3000 MHz |

4. Operation of this device above any of these conditions may cause permanent damage.

Truth Table (State of control voltage selects the desired switch state)

| State of Control Voltage | | RF Common to | |
|--------------------------|-------------------|--------------|-----|
| V _{CTL1} | V _{CTL2} | RF1 | RF2 |
| Low | High | OFF | ON |
| High | Low | ON | OFF |
| Low | Low | N/A | N/A |
| High | High | N/A | N/A |

ON- low insertion loss state OFF- Isolation State

Characterization Test Circuit

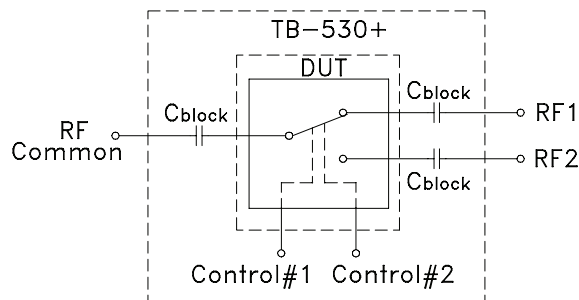


Figure 1: Block Diagram Of Test Circuit Used For Characterization.
(DUT soldered on Mini-Circuit's TB-530+, Cblock=1000pF)

Test Equipment:

For Insertion loss, Isolation, Return loss and DC current:

Agilent's N5230A Network Analyzer , E3631A power supply.

For Switching Time and DC Current:

Agilent's 54832B oscilloscope, 81110A pulse generator and E3631A power supply.

For Input IP3:

Agilent's E8257D signal generators, E4418B power meter, N9020A Signal analyzer and E3631A power supply.

For Compression:

LZY-1+/LZY-2+/ZHL-900A-10W/ZHL-16W-43+ amplifier as driver amplifier at RF Common.
Agilent's N5230A Network Analyzer, E3631A power supply

Conditions:

Control= 0 and 3V/5V

For Insertion loss, isolation and return loss: Pin=0 dBm

For Input IP3: Pin=+5dBm/tone.

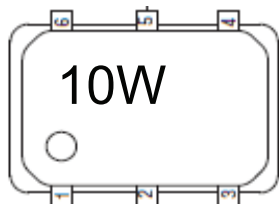
For Switching time: RF frequency: 500 MHz at 0 dBm, Control Frequency: 100 KHz and 0 and +3/5V

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Product Marking



Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs

Case Style: JZ1436

Plastic, finish: matte tin

Tape & Reel: F93

Suggested Layout for PCB Design: PL-324

Evaluation Board: TB-530+

Environmental Ratings: ENV57

Recommended Application Circuit

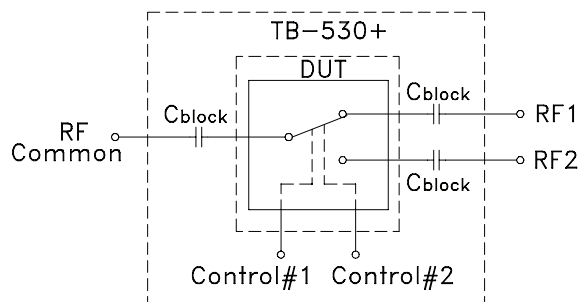


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.

| Frequency (MHz) | Cblock (Suggested value) |
|-----------------|--------------------------|
| 50-3000 | 1000 pF |

Cblock should be free of resonance over frequency of operation.

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ESD Rating

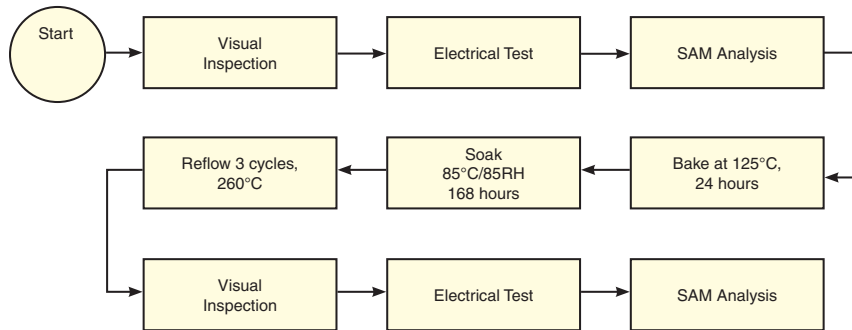
Human Body Model (HBM): Class 1A (250 to < 500V) in accordance with JESD22-A114

Machine Model (MM): Class A (Passes 150V) in accordance with JESD22-A115

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL Test Flow Chart



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