SURFACE MOUNT

SPDT RF Switch

VSW2-33-10W+

50Ω 50 to 3000 MHz Reflective RF Switch 10 W
Positive Control Voltage; +3 V to +5 V

THE BIG DEAL

- 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, 3 x 2 x 0.89 mm
- Aqueous Washable

Generic photo used for illustration purposes only

CASE STYLE: JZ1436

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- Automated Switching Networks
- Cellular/ PCS
- ISM, WCDMA, WiMAX, LTE, TD-SCDMA

PRODUCT OVERVIEW

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

KEY FEATURES

Features	Advantages
Broadband, 50 to 3000 MHz	Covers a range of wireless applications such as Cellular, PCS, LTE, WiMAX, Avionics, Broadcast, CATV, GPS, Radar, etc.
High Input Power, 10 W (Cold Switching) at +5 V 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/+3 V or 0/+5 V	No external components are required for change of operating voltage from +3 to +5 V.
Good Isolation, 26 dB to 1 GHz and 18 dB to 3 GHz	Minimizes filtering requirement.

REV. B
ECO-026600
VSW2-33-10W+
MCL NY
260429

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RF ELECTRICAL SPECIFICATIONS[1], T_{AMB} = +25°C, V_{CTL} = +3 V TO +5 V

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[3,4,5] (Cold Switching) V_{CTL} = +3 V	50	–	–	7	W
	1000	–	–	7	
	2000	–	–	7	
	3000	–	–	7	
V_{CTL} = +5 V	50	–	–	10	
	1000	–	–	10	
	2000	–	–	9	
	3000	–	–	7	

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

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}) = +3 V	–	20	–	µA
	(V_{CTL}) = +5 V	–	42	–	

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SWITCHING SPECIFICATIONS

Parameter	Control Voltage (V)	Min.	Typ.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	0/+3	–	433	–	ns
	0/+5	–	150	–	
Switching Time, 50% CTRL to 90/10% RF	0/+3	–	550	–	ns
	0/+5	–	306	–	
Video Feed-Through, (Control 0 to +3 V, Freq. = 500 KHz)	0/+3	–	20	–	mV_{P-P}
	0/+5	–	28	–	

ABSOLUTE MAXIMUM RATINGS[6]

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

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

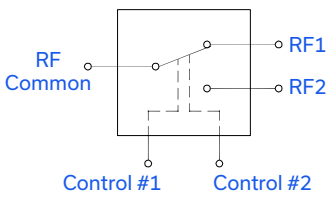
TRUTH TABLE

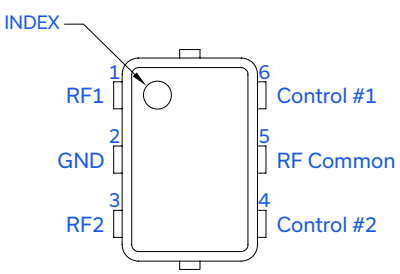
(State of control voltage selects the desired switch state)

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

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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CHARACTERIZATION TEST CIRCUIT

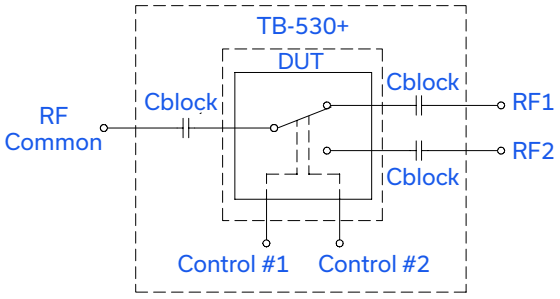


Figure 1. Block Diagram of Test Circuit Used for Characterization
(DUT Soldered on Mini-Circuits' TB-530+, Cblock = 1000 pF)

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:

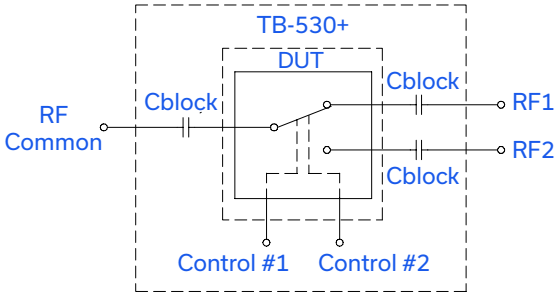
Control = 0 and +3 V/+5 V

For Insertion Loss, Isolation and Return Loss: P_{IN} = 0 dBm

For Input IP3: P_{IN} = +5 dBm/tone

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

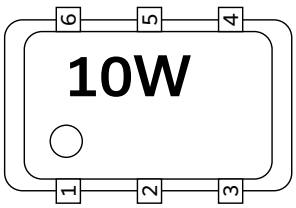
RECOMMENDED APPLICATION CIRCUIT



Frequency (MHz)	Cblock (Suggested Value)
50-3000	1000 pF

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

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.

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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs
Case Style	JZ1436 Plastic package, Lead Finish: Matte Tin
Tape & Reel **Standard Quantities Available on Reel**	F93 7" Reels with 20, 50, 100, 200, 500, or 1000 devices 13" Reels with 3000 devices
Suggested Layout for PCB Design	PL-324
Evaluation Board	TB-530+
Environmental Ratings	ENV41

ESD RATING

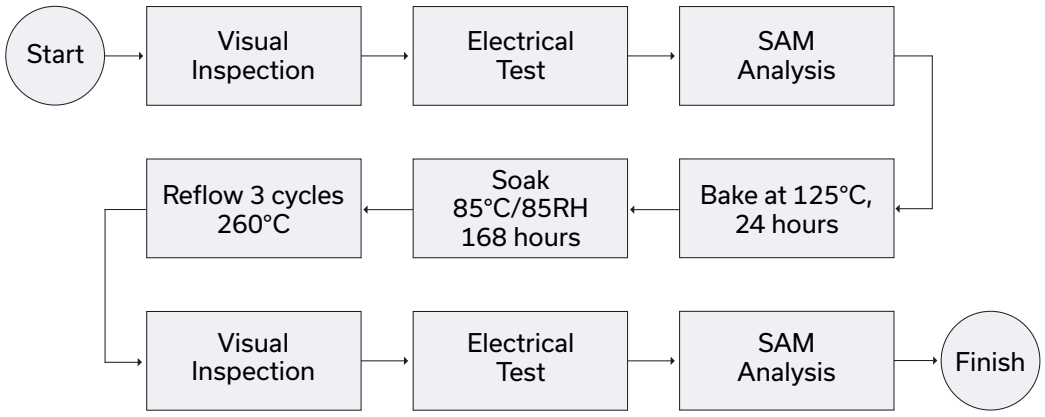
Human Body Model (HBM): Class 1A (250 to < 500 V) in accordance with JESD22-A114

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

MSL RATING

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

MSL TEST FLOW CHART



NOTES

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/terms/viewterm.html