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, 20µA 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.

SPDT RF Switch

50Ω 50-3000 MHz

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

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

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

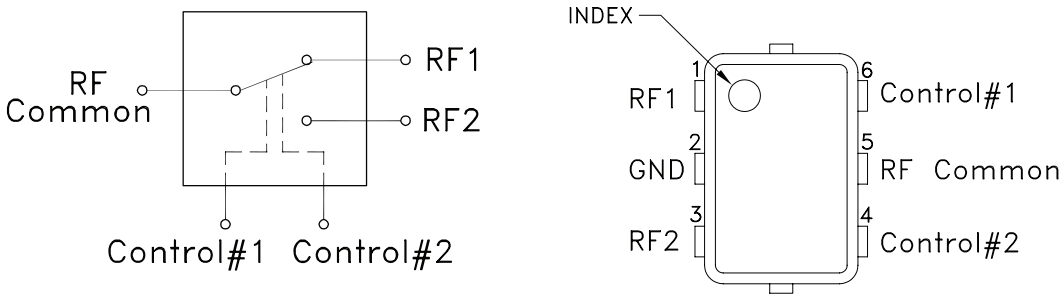
Typical Applications

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

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

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/MCLStore/terms.jsp

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	—	—	—	µA
(V_{CTL})= 3V	—	20	—	
(V_{CTL})= 5V	—	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		

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

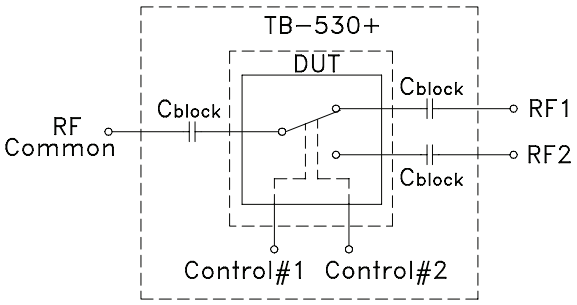


Figure 1: Block Diagram Of Test Circuit Used For Characterization.
(DUT soldered on Mini-Circuit's TB-530+, Cblock=1000pF)

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.

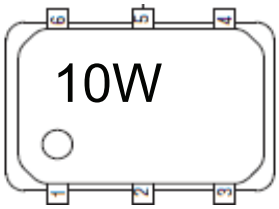
For Input IP3:
Agilent's E8257D signal generators, E4418B power meter,
N9020A Signal analyzer and E3631A power supply.

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

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

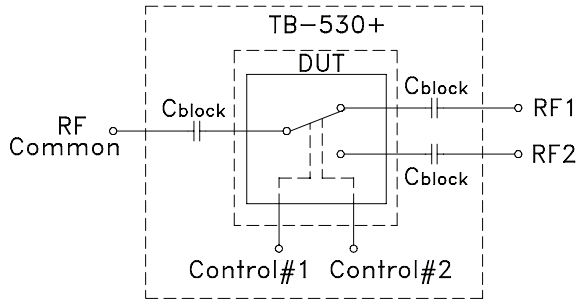


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.

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

Cblock should be free of resonance over frequency of operation.

ESD Rating

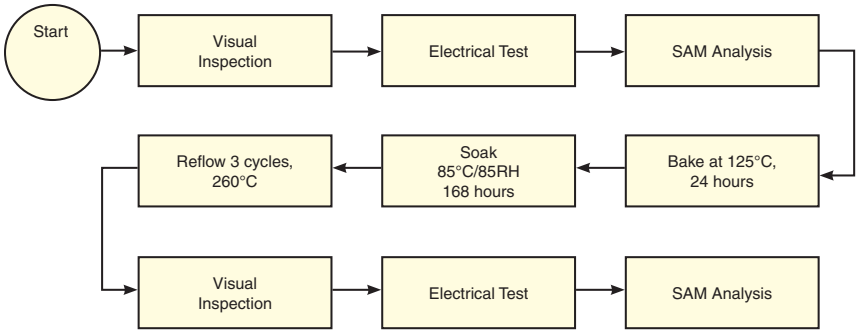
Human Body Model (HBM): Class 1A (250 to < 500V) in accordance with JESD22-A114

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



RF Switch SPDT VSW2-33-10W+

Typical Performance Data

RF FREQ (MHz)	INSERTION LOSS @ Vctl=+3V OVER TEMPERATURE					
	RF COM-RF1 (dB)			RF COM-RF2 (dB)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
5.0	0.28	0.32	0.35	0.27	0.31	0.34
7.0	0.29	0.33	0.37	0.28	0.32	0.36
10.0	0.30	0.34	0.38	0.29	0.33	0.37
50.0	0.30	0.35	0.39	0.30	0.35	0.40
100.0	0.30	0.36	0.40	0.30	0.36	0.40
200.0	0.30	0.36	0.41	0.30	0.36	0.41
300.0	0.30	0.37	0.42	0.29	0.36	0.42
400.0	0.30	0.37	0.43	0.29	0.37	0.43
500.0	0.30	0.38	0.45	0.29	0.38	0.44
600.0	0.32	0.40	0.47	0.29	0.38	0.45
700.0	0.30	0.40	0.48	0.29	0.39	0.47
800.0	0.30	0.41	0.48	0.29	0.40	0.47
900.0	0.34	0.43	0.50	0.32	0.42	0.49
1000.0	0.33	0.44	0.52	0.31	0.43	0.51
1100.0	0.34	0.45	0.54	0.32	0.44	0.53
1200.0	0.34	0.46	0.55	0.33	0.45	0.54
1300.0	0.35	0.47	0.57	0.33	0.46	0.56
1400.0	0.36	0.49	0.58	0.34	0.48	0.57
1500.0	0.37	0.50	0.60	0.36	0.49	0.58
1600.0	0.38	0.52	0.62	0.36	0.50	0.60
1700.0	0.39	0.52	0.63	0.36	0.51	0.61
1800.0	0.40	0.53	0.64	0.36	0.52	0.62
1900.0	0.39	0.54	0.65	0.37	0.52	0.63
2000.0	0.39	0.54	0.66	0.37	0.53	0.64
2100.0	0.40	0.55	0.67	0.38	0.54	0.65
2200.0	0.40	0.56	0.68	0.39	0.55	0.67
2300.0	0.41	0.57	0.69	0.39	0.56	0.68
2400.0	0.40	0.56	0.69	0.39	0.56	0.68
2500.0	0.41	0.56	0.70	0.39	0.56	0.69
3000.0	0.41	0.58	0.73	0.39	0.58	0.73
3500.0	0.43	0.62	0.78	0.40	0.60	0.76
4000.0	0.48	0.67	0.84	0.44	0.65	0.82
4500.0	0.57	0.75	0.94	0.51	0.73	0.91
5000.0	0.70	0.88	1.09	0.63	0.85	1.04
5500.0	0.87	1.07	1.30	0.83	1.05	1.27
6000.0	1.03	1.26	1.51	1.02	1.28	1.51
6500.0	1.15	1.40	1.68	1.10	1.40	1.67
7000.0	1.18	1.43	1.74	1.14	1.44	1.72
7500.0	1.26	1.48	1.76	1.16	1.42	1.71
8000.0	1.33	1.53	1.84	1.22	1.45	1.74

RF FREQ (MHz)	ISOLATION @ Vctl=+3V OVER TEMPERATURE											
	RF COM-RF1 (dB)			RF COM-RF2 (dB)			RF1-RF2 (dB) ON1			RF1-RF2 (dB) ON2		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
5.0	49.67	50.02	50.18	49.67	50.05	50.18	50.04	50.34	50.57	49.91	50.40	50.64
7.0	48.42	48.89	49.16	48.52	49.05	49.18	48.91	49.49	49.71	48.83	49.39	49.71
10.0	46.29	47.19	47.65	46.33	47.13	47.62	46.83	47.61	48.16	46.70	47.69	48.22
50.0	41.27	42.16	42.73	41.36	42.19	42.78	41.79	42.71	43.36	41.68	42.65	43.32
100.0	39.03	39.83	40.35	39.09	39.84	40.38	39.49	40.33	40.93	39.44	40.29	40.90
200.0	36.43	37.11	37.42	36.54	37.12	37.44	36.90	37.58	37.93	36.77	37.52	37.91
300.0	34.60	35.07	35.17	34.62	35.05	35.13	35.01	35.47	35.64	34.90	35.44	35.63
400.0	33.00	33.33	33.30	32.97	33.27	33.24	33.37	33.68	33.73	33.28	33.67	33.70
500.0	31.64	31.81	31.74	31.61	31.76	31.68	31.95	32.16	32.14	31.92	32.13	32.10
600.0	30.47	30.50	30.42	30.41	30.44	30.34	30.69	30.81	30.76	30.73	30.80	30.76
700.0	29.33	29.34	29.22	29.28	29.29	29.16	29.56	29.65	29.58	29.60	29.66	29.60
800.0	28.29	28.35	28.21	28.23	28.28	28.14	28.55	28.65	28.55	28.55	28.66	28.58
900.0	27.44	27.48	27.34	27.38	27.42	27.27	27.73	27.79	27.69	27.71	27.81	27.71
1000.0	26.66	26.67	26.54	26.60	26.61	26.49	26.93	26.99	26.90	26.98	27.03	26.95
1100.0	25.95	25.94	25.83	25.87	25.87	25.76	26.19	26.25	26.17	26.27	26.36	26.26
1200.0	25.22	25.23	25.11	25.22	25.27	25.12	25.55	25.64	25.53	25.61	25.66	25.56
1300.0	24.74	24.71	24.60	24.71	24.70	24.58	25.02	25.07	25.00	25.08	25.11	25.04
1400.0	24.23	24.19	24.08	24.19	24.17	24.05	24.48	24.55	24.47	24.59	24.60	24.54
1500.0	23.71	23.71	23.60	23.67	23.69	23.57	24.01	24.09	24.00	24.09	24.13	24.05
1600.0	23.24	23.28	23.15	23.17	23.25	23.08	23.56	23.65	23.53	23.60	23.69	23.61
1700.0	22.83	22.86	22.73	22.78	22.83	22.69	23.22	23.27	23.17	23.21	23.29	23.20
1800.0	22.51	22.49	22.36	22.44	22.45	22.31	22.86	22.90	22.79	22.92	22.93	22.84
1900.0	22.13	22.10	21.98	22.09	22.09	21.95	22.48	22.54	22.44	22.54	22.55	22.47
2000.0	21.78	21.76	21.63	21.74	21.75	21.59	22.16	22.21	22.11	22.20	22.23	22.13
2100.0	21.45	21.44	21.31	21.39	21.41	21.26	21.82	21.87	21.77	21.89	21.93	21.82
2200.0	21.14	21.15	21.00	21.07	21.10	20.95	21.54	21.59	21.48	21.59	21.64	21.52
2300.0	20.81	20.84	20.67	20.77	20.82	20.64	21.26	21.31	21.18	21.27	21.33	21.20
2400.0	20.49	20.51	20.35	20.45	20.49	20.31	20.93	20.98	20.86	20.97	21.04	20.91
2500.0	20.25	20.21	20.05	20.20	20.20	20.02	20.65	20.69	20.59	20.74	20.76	20.65
3000.0	18.80	18.81	18.64	18.76	18.79	18.62	19.36	19.38	19.24	19.34	19.40	19.28
3500.0	17.16	17.15	17.03	17.11	17.14	17.00	17.68	17.71	17.61	17.77	17.79	17.70
4000.0	15.68	15.65	15.56	15.58	15.59	15.49	15.93	16.04	15.97	16.10	16.14	16.09
4500.0	14.19	14.20	14.16	14.11	14.15	14.10	14.32	14.48	14.44	14.50	14.59	14.57
5000.0	13.15	13.20	13.18	13.05	13.13	13.10	13.27	13.34	13.33	13.46	13.49	13.49
5500.0	12.58	12.64	12.60	12.46	12.56	12.52	12.62	12.67	12.64	12.84	12.86	12.82
6000.0	12.31	12.34	12.36	12.21	12.29	12.30	12.33	12.36	12.39	12.48	12.50	12.53
6500.0	12.13	12.18	12.23	12.01	12.12	12.16	12.16	12.23	12.25	12.19	12.23	12.27
7000.0	11.78	11.89	11.96	11.64	11.82	11.88	11.89	12.09	12.16	11.82	12.02	12.11
7500.0	11.37	11.50	11.62	11.19	11.39	11.49	11.42	11.70	11.89	11.35	11.61	11.80
8000.0	10.98	11.05	11.18	10.77	10.93	11.02	11.02	11.16	11.26	10.99	11.12	11.26

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

State of Control Voltage V_{CTL1}	State of Control Voltage V_{CTL2}	RF Common to RF1	RF Common to RF2
Low	High	OFF	ON
High	Low	ON	OFF
Low	Low	Not recommended	Not recommended
High	High	Not recommended	Not recommended

ON- low insertion loss state OFF- Isolation State

Typical Performance Data

RF FREQ (MHz)	RETURN LOSS @ Vctl=+3V OVER TEMPERATURE (dB)											
	RF COM			RF COM			RF1			RF2		
	ON1			ON2			ON1			ON2		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
5.0	5.5	5.6	5.6	5.6	5.6	5.6	5.5	5.6	5.6	5.6	5.6	5.6
7.0	7.8	7.8	7.9	7.8	7.9	7.9	7.8	7.8	7.9	7.8	7.9	7.9
10.0	10.5	10.6	10.6	10.5	10.6	10.6	10.5	10.6	10.6	10.5	10.6	10.6
50.0	23.0	23.3	23.3	23.1	23.3	23.3	23.0	23.3	23.2	23.1	23.3	23.3
100.0	27.1	27.0	26.9	27.2	27.1	27.0	27.2	27.1	26.4	27.4	27.1	26.7
200.0	30.7	28.0	27.5	30.0	28.3	27.4	30.1	28.3	27.3	29.5	28.2	27.3
300.0	29.3	27.2	25.9	29.2	27.7	26.1	30.9	27.7	27.4	28.8	27.5	26.7
400.0	26.6	26.3	24.8	28.1	26.7	25.4	28.1	26.6	26.1	27.8	26.5	25.5
500.0	25.1	25.3	24.0	26.7	25.6	24.7	25.4	25.7	24.3	26.7	25.6	24.3
600.0	24.4	23.8	22.8	25.3	24.4	23.5	24.1	24.2	23.0	25.4	24.5	23.5
700.0	24.6	22.9	22.1	24.4	23.3	22.4	24.7	23.3	22.6	24.7	23.7	23.0
800.0	23.0	21.6	20.9	23.1	22.0	21.1	23.8	22.2	21.5	23.7	22.7	21.9
900.0	20.8	20.4	19.8	21.3	20.7	20.1	21.7	21.1	20.5	22.0	21.6	20.9
1000.0	20.0	19.7	19.3	20.6	20.0	19.5	20.8	20.5	20.0	21.4	21.0	20.4
1100.0	19.5	19.1	18.8	19.9	19.4	19.0	20.2	20.0	19.6	20.7	20.3	20.0
1200.0	18.7	18.6	18.3	19.1	18.8	18.5	19.5	19.5	19.2	19.9	19.7	19.5
1300.0	18.3	18.2	17.9	18.7	18.4	18.1	19.1	19.2	18.9	19.5	19.3	19.1
1400.0	18.2	17.8	17.7	18.2	18.0	17.8	19.0	18.8	18.7	19.0	18.9	18.8
1500.0	18.0	17.5	17.5	17.7	17.6	17.5	19.0	18.5	18.5	18.5	18.6	18.5
1600.0	17.4	17.2	17.1	17.5	17.3	17.3	18.4	18.2	18.3	18.3	18.4	18.4
1700.0	16.7	17.0	17.0	17.2	17.2	17.2	17.6	18.1	18.1	18.1	18.3	18.4
1800.0	16.7	16.9	16.9	17.2	17.1	17.1	17.4	17.9	18.0	18.1	18.3	18.3
1900.0	16.9	16.9	16.9	17.2	17.1	17.1	17.7	18.0	18.2	18.1	18.3	18.4
2000.0	17.0	17.0	17.1	17.2	17.1	17.2	17.9	18.1	18.3	18.1	18.3	18.5
2100.0	17.2	17.1	17.1	17.3	17.2	17.3	18.1	18.2	18.4	18.3	18.5	18.7
2200.0	17.2	17.1	17.2	17.3	17.3	17.3	18.2	18.4	18.6	18.2	18.5	18.8
2300.0	17.4	17.4	17.5	17.4	17.4	17.5	18.5	18.7	19.2	18.5	18.8	19.2
2400.0	17.6	17.8	17.8	17.9	17.9	17.9	18.7	19.3	19.5	19.0	19.4	19.7
2500.0	17.9	18.4	18.2	18.4	18.4	18.3	19.0	19.9	20.0	19.6	20.1	20.5
3000.0	22.0	22.0	21.6	23.1	22.3	21.9	24.6	25.7	25.8	26.3	26.4	26.6
3500.0	30.1	28.5	26.8	28.9	27.4	26.1	34.2	38.5	38.0	31.3	34.3	36.5
4000.0	33.6	33.2	29.8	36.2	33.0	29.6	40.0	37.6	38.6	32.5	34.2	35.1
4500.0	21.9	23.0	22.3	23.6	23.5	22.8	26.6	27.4	27.0	27.2	27.1	27.1
5000.0	16.1	16.6	16.4	16.5	16.6	16.4	18.0	18.9	18.8	17.9	18.4	18.2
5500.0	13.1	13.1	12.9	12.7	12.9	12.7	14.9	15.0	15.0	14.0	14.5	14.4
6000.0	11.6	11.3	11.2	10.9	10.8	10.8	13.5	13.2	13.2	11.9	12.1	12.1
6500.0	10.7	10.4	10.2	10.2	10.1	9.9	12.3	12.2	12.1	11.6	11.6	11.5
7000.0	10.8	10.5	10.4	10.5	10.3	10.4	12.5	12.3	12.3	11.9	11.8	11.9
7500.0	10.8	11.0	11.3	10.9	11.3	11.5	13.0	13.1	13.5	13.0	13.3	13.6
8000.0	11.5	11.9	12.2	11.6	12.3	12.6	13.8	14.1	14.7	13.6	14.6	15.2

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	Not recommended	Not recommended
High	High	Not recommended	Not recommended

ON- low insertion loss state OFF- Isolation State

Typical Performance Data

RF FREQ (MHz)	INSERTION LOSS @ Vctl=+5V OVER TEMPERATURE					
	RF COM-RF1 (dB)			RF COM-RF2 (dB)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
5.0	0.32	0.35	0.38	0.25	0.28	0.31
7.0	0.31	0.35	0.38	0.27	0.30	0.34
10.0	0.30	0.34	0.38	0.28	0.32	0.36
50.0	0.30	0.35	0.39	0.30	0.35	0.39
100.0	0.30	0.35	0.39	0.30	0.35	0.40
200.0	0.29	0.35	0.40	0.30	0.36	0.40
300.0	0.29	0.35	0.41	0.30	0.36	0.41
400.0	0.29	0.36	0.42	0.29	0.36	0.42
500.0	0.29	0.36	0.43	0.29	0.36	0.43
600.0	0.30	0.37	0.44	0.29	0.37	0.43
700.0	0.28	0.37	0.45	0.29	0.37	0.45
800.0	0.29	0.38	0.45	0.30	0.39	0.45
900.0	0.32	0.40	0.47	0.31	0.39	0.46
1000.0	0.30	0.40	0.48	0.30	0.40	0.48
1100.0	0.30	0.41	0.49	0.30	0.41	0.49
1200.0	0.31	0.42	0.51	0.31	0.42	0.51
1300.0	0.31	0.43	0.52	0.32	0.43	0.52
1400.0	0.33	0.44	0.53	0.33	0.45	0.53
1500.0	0.34	0.45	0.55	0.34	0.46	0.55
1600.0	0.35	0.47	0.56	0.35	0.47	0.56
1700.0	0.35	0.48	0.58	0.35	0.48	0.58
1800.0	0.36	0.49	0.59	0.36	0.49	0.59
1900.0	0.36	0.50	0.60	0.37	0.50	0.61
2000.0	0.36	0.50	0.61	0.37	0.51	0.62
2100.0	0.37	0.51	0.62	0.37	0.52	0.63
2200.0	0.37	0.52	0.63	0.38	0.52	0.64
2300.0	0.38	0.53	0.64	0.39	0.54	0.65
2400.0	0.38	0.54	0.66	0.39	0.54	0.67
2500.0	0.39	0.54	0.67	0.40	0.55	0.68
3000.0	0.40	0.58	0.72	0.42	0.60	0.74
3500.0	0.45	0.64	0.80	0.47	0.66	0.81
4000.0	0.53	0.73	0.90	0.54	0.75	0.92
4500.0	0.65	0.86	1.04	0.65	0.87	1.05
5000.0	0.83	1.06	1.25	0.82	1.05	1.24
5500.0	1.02	1.29	1.50	1.01	1.28	1.50
6000.0	1.19	1.49	1.72	1.18	1.48	1.72
6500.0	1.29	1.58	1.82	1.24	1.55	1.82
7000.0	1.37	1.69	1.94	1.31	1.64	1.91
7500.0	1.42	1.75	2.02	1.40	1.75	2.04
8000.0	1.48	1.81	2.11	1.56	1.88	2.19

RF FREQ (MHz)	ISOLATION @ Vctl=+5V OVER TEMPERATURE											
	RF COM-RF1 (dB)			RF COM-RF2 (dB)			RF1-RF2 (dB) ON1			RF1-RF2 (dB) ON2		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
5.0	49.48	49.30	48.97	49.32	49.30	49.08	51.20	51.22	51.12	51.11	51.13	50.82
7.0	47.71	47.97	48.01	47.65	48.00	48.03	48.85	49.27	49.42	48.86	49.20	49.36
10.0	46.24	46.73	47.02	46.20	46.69	47.18	47.11	47.60	48.01	47.04	47.65	48.03
50.0	40.82	41.57	42.17	40.85	41.60	42.25	41.26	42.11	42.82	41.26	42.09	42.76
100.0	38.48	39.21	39.81	38.52	39.23	39.86	38.93	39.71	40.39	38.88	39.70	40.34
200.0	36.06	36.64	36.99	36.09	36.65	37.06	36.50	37.12	37.58	36.46	37.10	37.52
300.0	34.25	34.64	34.80	34.29	34.68	34.90	34.66	35.13	35.41	34.63	35.09	35.31
400.0	32.65	32.90	32.94	32.67	32.94	33.05	33.07	33.38	33.55	33.05	33.35	33.43
500.0	31.25	31.40	31.35	31.27	31.44	31.48	31.66	31.86	31.94	31.65	31.84	31.83
600.0	29.99	30.06	29.96	30.00	30.11	30.09	30.40	30.53	30.56	30.40	30.52	30.47
700.0	28.85	28.87	28.73	28.87	28.92	28.88	29.25	29.35	29.36	29.26	29.34	29.26
800.0	27.77	27.80	27.66	27.80	27.86	27.80	28.22	28.31	28.31	28.24	28.30	28.21
900.0	26.93	26.94	26.79	26.94	26.98	26.93	27.35	27.43	27.41	27.37	27.42	27.31
1000.0	26.12	26.12	25.97	26.14	26.17	26.11	26.53	26.60	26.59	26.56	26.59	26.49
1100.0	25.38	25.37	25.21	25.40	25.42	25.35	25.78	25.83	25.81	25.81	25.82	25.70
1200.0	24.65	24.65	24.49	24.68	24.71	24.64	25.07	25.14	25.12	25.10	25.13	25.01
1300.0	24.01	24.02	23.87	24.04	24.09	24.03	24.45	24.53	24.52	24.47	24.51	24.41
1400.0	23.46	23.46	23.32	23.49	23.53	23.47	23.92	23.99	23.97	23.94	23.97	23.86
1500.0	22.99	22.97	22.81	23.02	23.04	22.97	23.44	23.50	23.47	23.47	23.49	23.36
1600.0	22.51	22.49	22.32	22.53	22.55	22.47	22.99	23.04	23.01	23.01	23.03	22.91
1700.0	22.03	22.02	21.85	22.05	22.08	22.01	22.50	22.57	22.54	22.52	22.56	22.45
1800.0	21.60	21.58	21.42	21.62	21.65	21.58	22.08	22.15	22.12	22.11	22.15	22.03
1900.0	21.23	21.21	21.03	21.25	21.27	21.19	21.74	21.78	21.76	21.75	21.77	21.64
2000.0	20.85	20.83	20.65	20.88	20.90	20.81	21.38	21.42	21.38	21.39	21.39	21.26
2100.0	20.46	20.44	20.26	20.49	20.52	20.43	21.00	21.05	21.01	21.00	21.02	20.90
2200.0	20.10	20.08	19.90	20.12	20.15	20.06	20.64	20.70	20.66	20.64	20.67	20.54
2300.0	19.75	19.74	19.55	19.79	19.81	19.71	20.31	20.36	20.30	20.32	20.32	20.17
2400.0	19.45	19.45	19.25	19.48	19.53	19.42	20.01	20.05	19.99	20.02	20.02	19.86
2500.0	19.18	19.17	18.98	19.22	19.25	19.13	19.71	19.77	19.71	19.71	19.73	19.59
3000.0	17.67	17.64	17.45	17.71	17.72	17.62	18.26	18.29	18.22	18.25	18.25	18.10
3500.0	16.03	16.03	15.89	16.08	16.13	16.09	16.63	16.73	16.75	16.54	16.61	16.53
4000.0	14.57	14.64	14.53	14.59	14.71	14.70	15.08	15.25	15.31	15.01	15.10	15.05
4500.0	13.30	13.39	13.32	13.36	13.50	13.49	13.85	13.98	13.98	13.78	13.84	13.77
5000.0	12.44	12.54	12.47	12.48	12.63	12.65	12.81	12.93	13.00	12.84	12.91	12.85
5500.0	11.96	12.09	12.02	12.01	12.18	12.20	12.38	12.49	12.52	12.37	12.46	12.45
6000.0	11.61	11.74	11.68	11.66	11.83	11.85	12.14	12.30	12.34	12.14	12.29	12.29
6500.0	11.27	11.41	11.37	11.31	11.49	11.54	11.82	12.04	12.16	11.85	12.04	12.11
7000.0	10.80	10.98	11.00	10.85	11.07	11.16	11.44	11.74	11.89	11.59	11.85	11.92
7500.0	10.26	10.53	10.62	10.32	10.61	10.78	11.00	11.19	11.36	11.28	11.40	11.47
8000.0	10.07	10.32	10.48	10.15	10.43	10.66	10.68	10.93	11.15	10.94	11.16	11.28

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

State of Control Voltage V_{CTL1}	State of Control Voltage V_{CTL2}	RF Common to RF1	RF Common to RF2
Low	High	OFF	ON
High	Low	ON	OFF
Low	Low	Not recommended	Not recommended
High	High	Not recommended	Not recommended

ON- low insertion loss state OFF- Isolation State

Typical Performance Data

RF FREQ (MHz)	RETURN LOSS @ Vctl=+5V OVER TEMPERATURE (dB)											
	RF COM			RF COM			RF1			RF2		
	ON1			ON2			ON1			ON2		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
5.0	5.5	5.5	5.5	5.6	5.7	5.7	5.5	5.5	5.5	5.7	5.7	5.7
7.0	7.7	7.8	7.8	7.9	8.0	8.0	7.7	7.8	7.8	7.9	8.0	8.0
10.0	10.4	10.5	10.5	10.6	10.7	10.7	10.4	10.5	10.5	10.7	10.7	10.8
50.0	23.3	23.5	23.6	23.6	23.8	23.8	23.4	23.6	23.5	23.7	23.8	23.8
100.0	27.8	27.8	27.6	28.2	28.2	27.9	28.2	27.8	27.2	28.6	28.2	27.5
200.0	31.5	29.7	28.4	32.1	30.1	28.7	32.0	30.0	28.5	32.6	30.5	29.1
300.0	32.0	29.6	27.8	33.0	30.1	27.9	32.1	30.3	28.9	33.0	31.1	29.6
400.0	30.8	29.2	27.8	31.6	29.8	28.1	32.0	30.0	28.3	33.3	31.0	29.2
500.0	30.6	29.1	27.9	30.9	29.2	27.9	31.5	29.2	27.3	32.9	30.4	28.3
600.0	29.5	28.0	26.7	30.3	28.4	26.8	29.4	27.9	26.5	31.3	29.5	27.9
700.0	29.4	27.8	26.4	29.7	27.8	26.1	28.6	27.2	26.0	30.2	28.5	27.1
800.0	28.0	26.3	25.1	27.8	26.0	24.7	27.4	25.7	24.5	28.4	26.4	25.1
900.0	25.5	24.6	23.8	25.7	24.5	23.6	25.4	24.4	23.5	26.0	24.9	23.9
1000.0	24.9	24.3	23.6	24.9	24.2	23.4	24.8	24.1	23.5	25.2	24.5	23.7
1100.0	24.5	23.8	23.3	24.4	23.7	23.1	24.6	23.7	23.1	24.8	23.9	23.3
1200.0	23.9	23.0	22.4	23.8	22.9	22.1	24.2	23.3	22.6	24.3	23.5	22.8
1300.0	22.8	22.2	21.8	22.7	22.1	21.5	23.3	22.8	22.3	23.3	22.9	22.4
1400.0	21.7	21.5	21.3	21.6	21.3	21.1	22.5	22.2	21.9	22.5	22.2	21.9
1500.0	21.2	21.0	20.7	20.9	20.7	20.5	22.1	21.8	21.5	21.9	21.7	21.5
1600.0	21.0	20.7	20.5	20.8	20.5	20.2	22.1	21.7	21.4	21.6	21.5	21.4
1700.0	20.6	20.4	20.3	20.4	20.1	19.9	21.7	21.5	21.3	21.2	21.1	21.0
1800.0	19.9	20.0	20.1	19.6	19.6	19.5	20.9	21.0	21.0	20.4	20.5	20.5
1900.0	19.6	19.8	19.9	19.2	19.3	19.3	20.6	20.7	20.9	20.0	20.1	20.2
2000.0	19.8	19.8	19.9	19.3	19.3	19.4	20.8	20.8	20.9	20.1	20.1	20.3
2100.0	19.9	19.9	19.9	19.5	19.4	19.4	20.9	20.9	21.0	20.2	20.2	20.4
2200.0	19.8	20.0	20.1	19.6	19.7	19.7	20.7	21.0	21.2	20.2	20.4	20.6
2300.0	19.6	19.9	20.2	19.4	19.6	19.8	20.6	20.9	21.2	20.2	20.4	20.7
2400.0	19.9	20.0	20.1	19.6	19.7	19.7	20.9	21.0	21.2	20.4	20.5	20.7
2500.0	20.3	20.3	20.3	20.0	20.0	20.0	21.4	21.5	21.7	20.8	21.0	21.2
3000.0	23.0	22.8	22.6	21.8	21.6	21.3	26.2	25.8	25.5	23.9	23.7	23.4
3500.0	23.7	23.9	23.2	22.6	22.5	21.8	27.8	27.7	27.2	25.9	25.3	24.5
4000.0	20.7	20.7	20.4	20.4	20.3	19.9	24.2	24.4	23.9	24.5	24.2	23.6
4500.0	16.0	16.2	16.2	16.2	16.5	16.5	18.1	18.5	18.4	18.9	19.3	19.3
5000.0	12.6	12.7	12.5	13.0	13.1	12.9	14.1	14.2	14.2	14.6	14.9	15.0
5500.0	10.5	10.5	10.4	10.7	10.7	10.6	11.9	11.9	11.9	12.1	12.3	12.3
6000.0	9.3	9.3	9.4	9.5	9.5	9.5	10.6	10.6	10.7	10.9	11.0	11.1
6500.0	9.1	9.3	9.4	9.4	9.6	9.5	10.4	10.7	10.9	10.9	11.2	11.3
7000.0	9.0	9.3	9.5	9.4	9.6	9.7	10.5	10.8	11.1	11.0	11.2	11.4
7500.0	9.4	9.6	9.8	9.5	9.6	9.7	10.9	11.3	11.6	11.0	11.3	11.6
8000.0	9.5	9.6	9.6	9.1	9.3	9.3	11.3	11.6	11.8	10.5	10.9	11.2

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	Not recommended	Not recommended
High	High	Not recommended	Not recommended

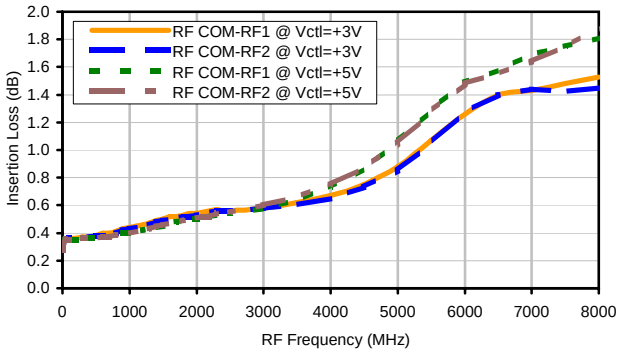
ON- low insertion loss state OFF- Isolation State

Typical Performance Data

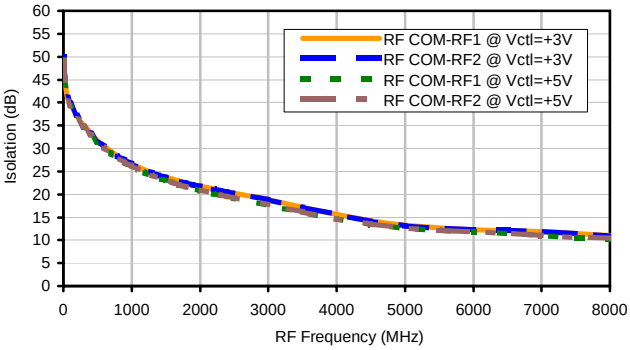
RF FREQ (MHz)	INPUT IP3	
	Vctl=+3V (dBm)	Vctl =+5V (dBm)
	RF COM-RF1	RF COM-RF1
100.0	59.54	60.57
300.0	57.79	58.53
500.0	56.49	57.90
700.0	57.57	60.31
900.0	56.93	62.42
1000.0	59.52	59.07
1200.0	58.70	59.40
1400.0	57.70	58.88
1600.0	55.80	56.80
1800.0	55.24	57.85
2000.0	56.81	58.06
2250.0	59.39	59.21
2500.0	55.98	58.40
2750.0	58.24	57.03
3000.0	54.39	57.43
3250.0	54.20	56.44
3500.0	53.27	54.28
3750.0	53.06	54.66
4000.0	55.09	55.02

Typical Performance Curves

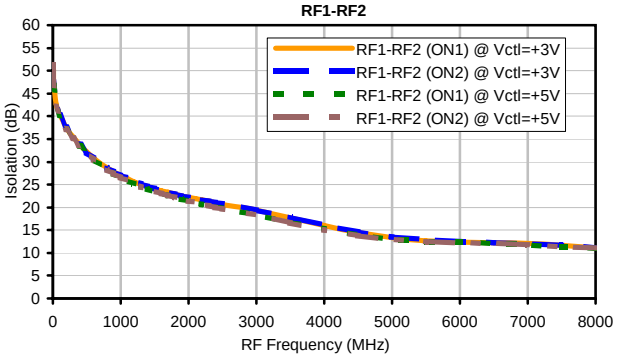
Insertion Loss



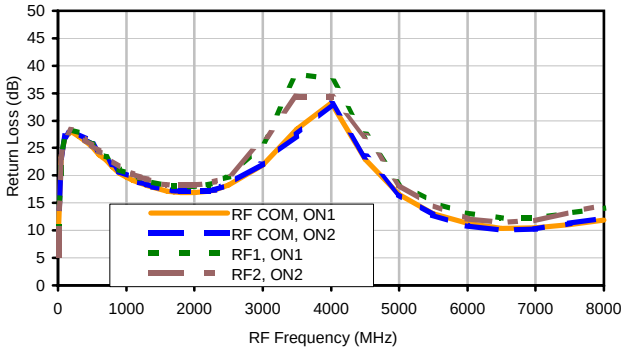
Isolation



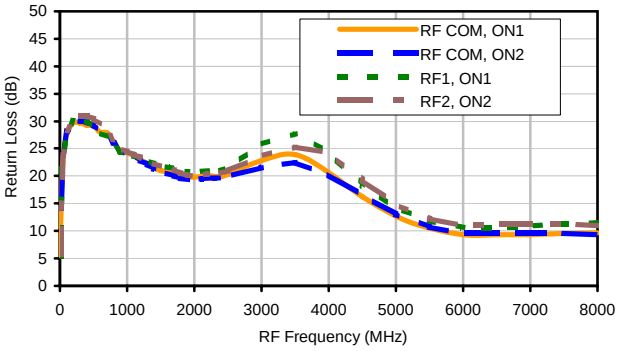
Isolation RF1-RF2



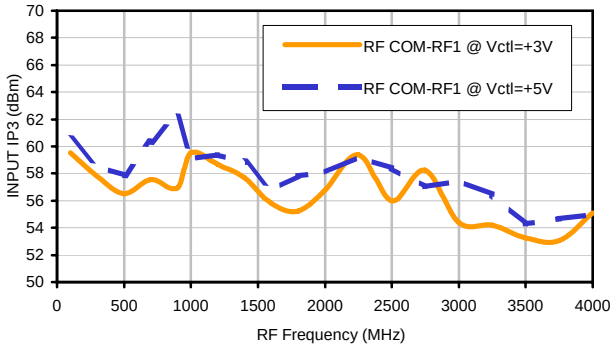
Return Loss @ Vctl=3V



Return Loss @ Vctl=+5V



Input IP3



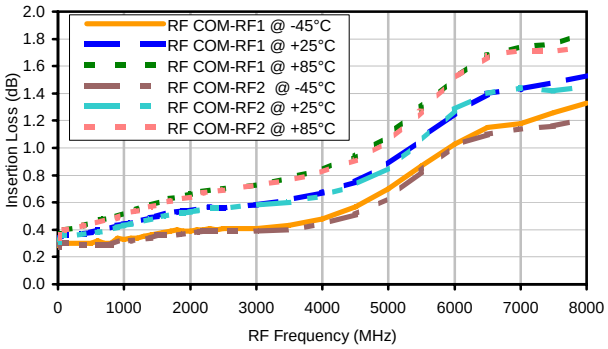
Truth Table (State of control voltage selects the desired switch state)

State of Control Voltage		RF Common to	
V_{CTL1}	V_{CTL2}	RF1	RF2
Low	High	OFF	ON
High	Low	ON	OFF
Low	Low	Not recommended	Not recommended
High	High	Not recommended	Not recommended

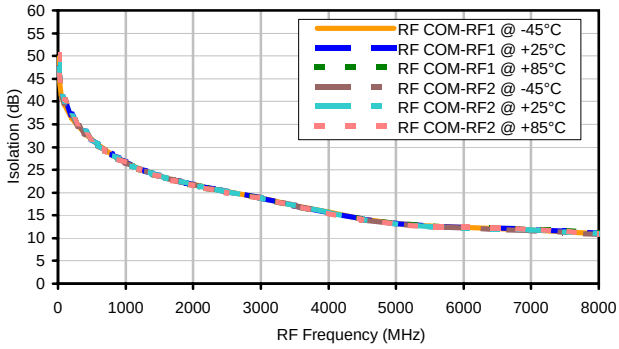
ON- low insertion loss state OFF- Isolation State

Typical Performance Curves

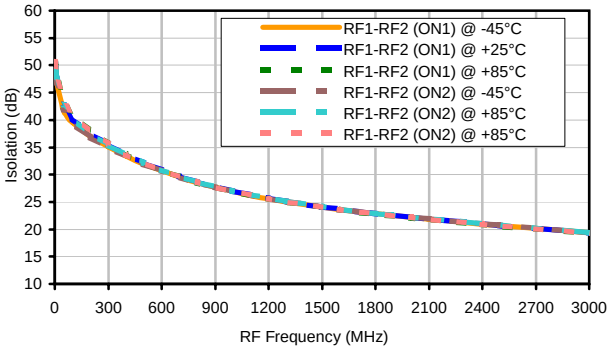
Insertion Loss @ Vctl=+3V over Temperature
RF COM-RF1 & RF COM-RF2



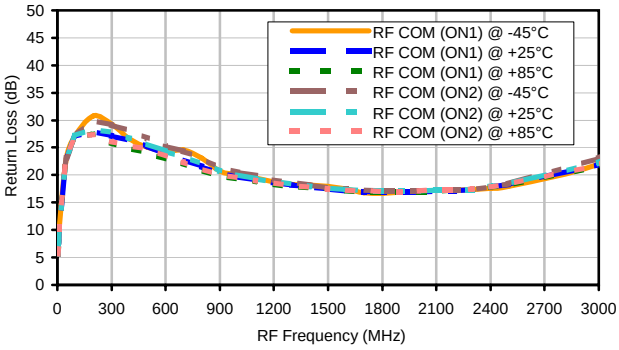
Isolation @ Vctl=+3V over Temperature
RF COM-RF1 & RF COM-RF2



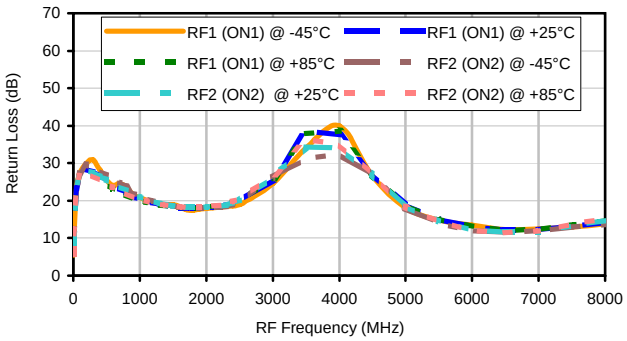
Isolation @ Vctl=+3V over Temperature,
RF1-RF2



Return Loss @ Vctl=+3V over Temperature
RF COM



Return Loss @ Vctl=+3V over Temperature
RF1(ON1) & RF2 (ON2)



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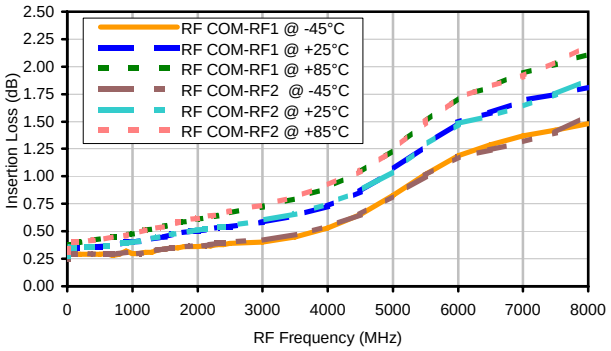
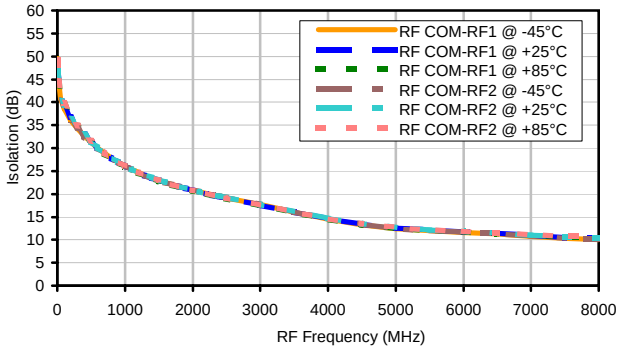
ON- low insertion loss state OFF- Isolation State

Typical Performance Curves

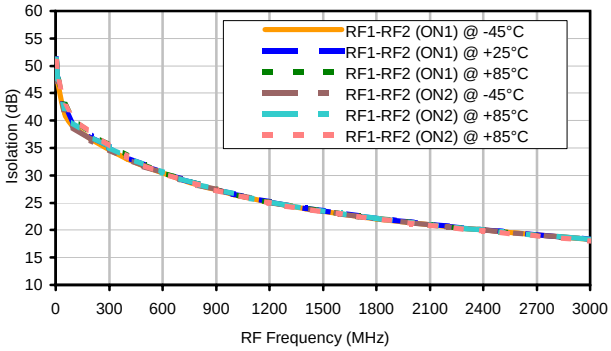
Insertion Loss @ Vctl=+5V over Temperature
RF COM-RF1 & RF COM-RF2



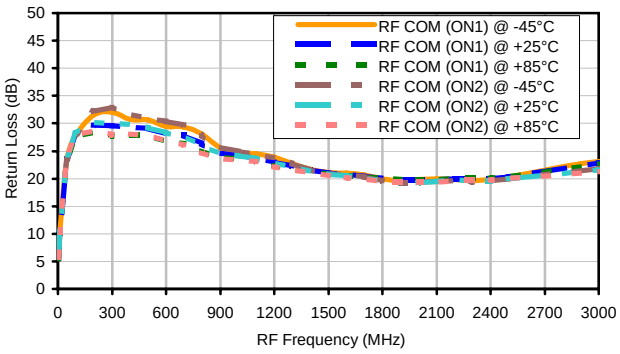
Isolation @ Vctl=+5V over Temperature
RF COM-RF1 & RF COM-RF2



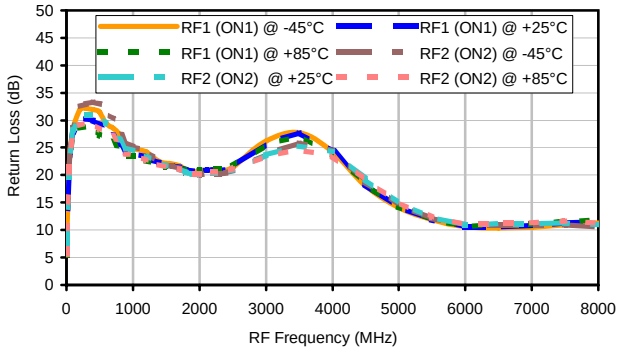
Isolation @ Vctl=+5V over Temperature,
RF1-RF2



Return Loss @ Vctl=+5V over Temperature
RF COM



Return Loss @ Vctl=+5V over Temperature
RF1(ON1) & RF2 (ON2)



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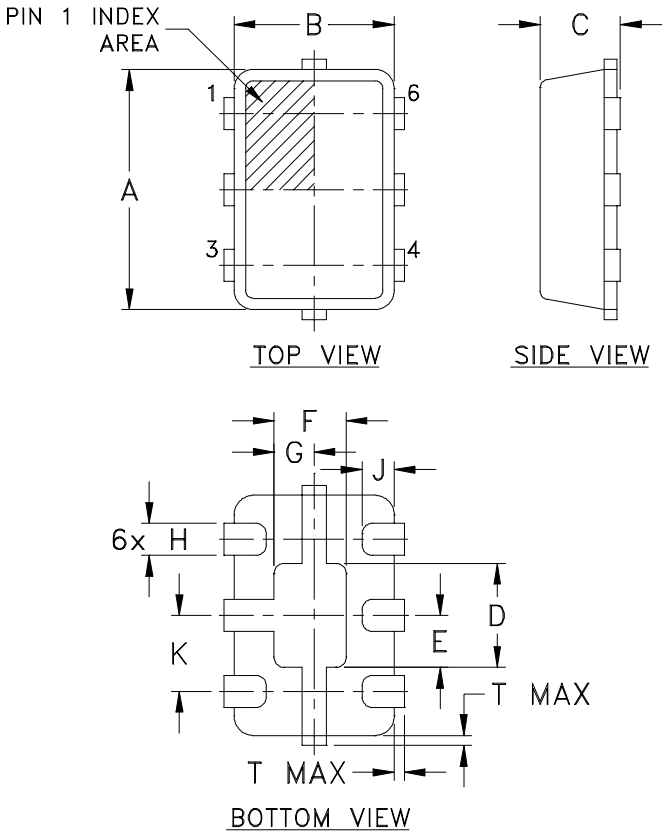
ON- low insertion loss state OFF- Isolation State

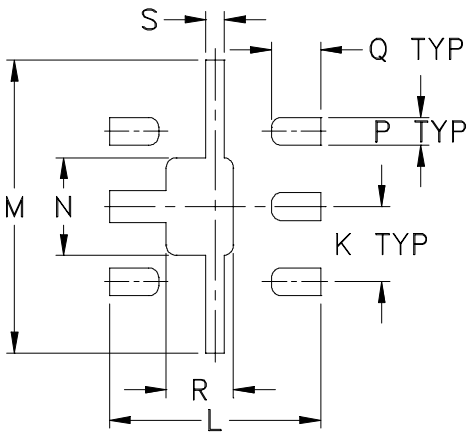
Case Style JZ

JZ1436

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
JZ1436	.118 (3.00)	.079 (2.00)	.035 (.89)	.048 (1.22)	.024 (.61)	.033 (.84)	.024 (.61)	.015 (.38)	.013 (.33)	.037 (.94)	.104 (2.64)	.144 (3.66)	.048 (1.22)

CASE#	P	Q	R	S	T	WT, GRAM
JZ1436	.014 (.36)	.024 (.61)	.033 (.84)	.009 (.23)	.005 (.125)	.015

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Matte Tin plate.

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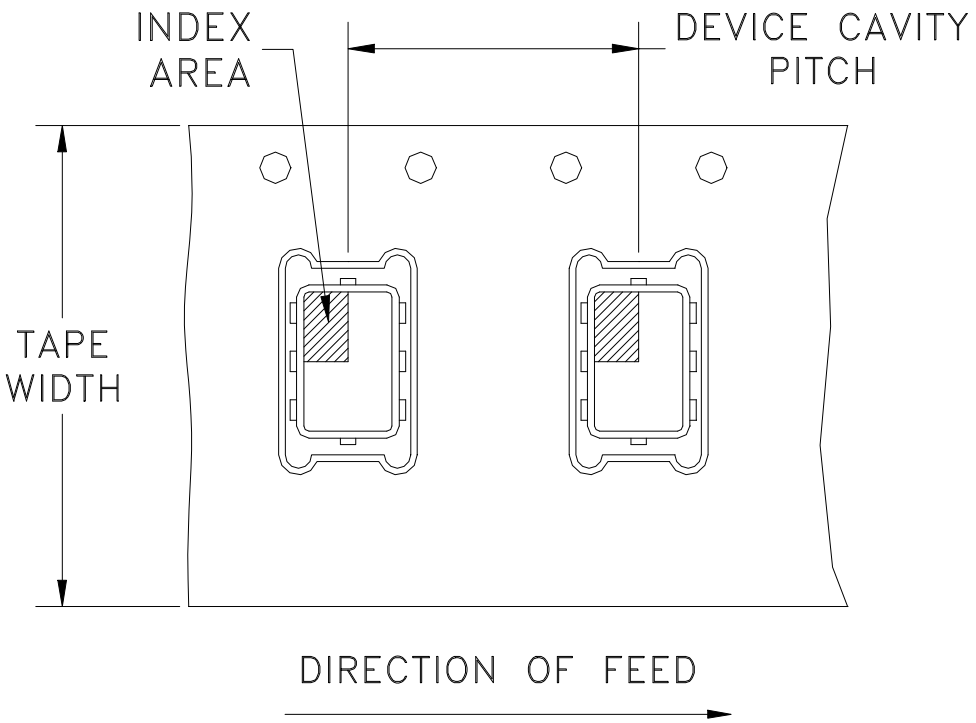
Tape & Reel Packaging TR-F93

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel See note
12	4	7	20
			50
			100
			200
			500
			1000
		13	3000

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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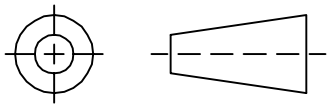
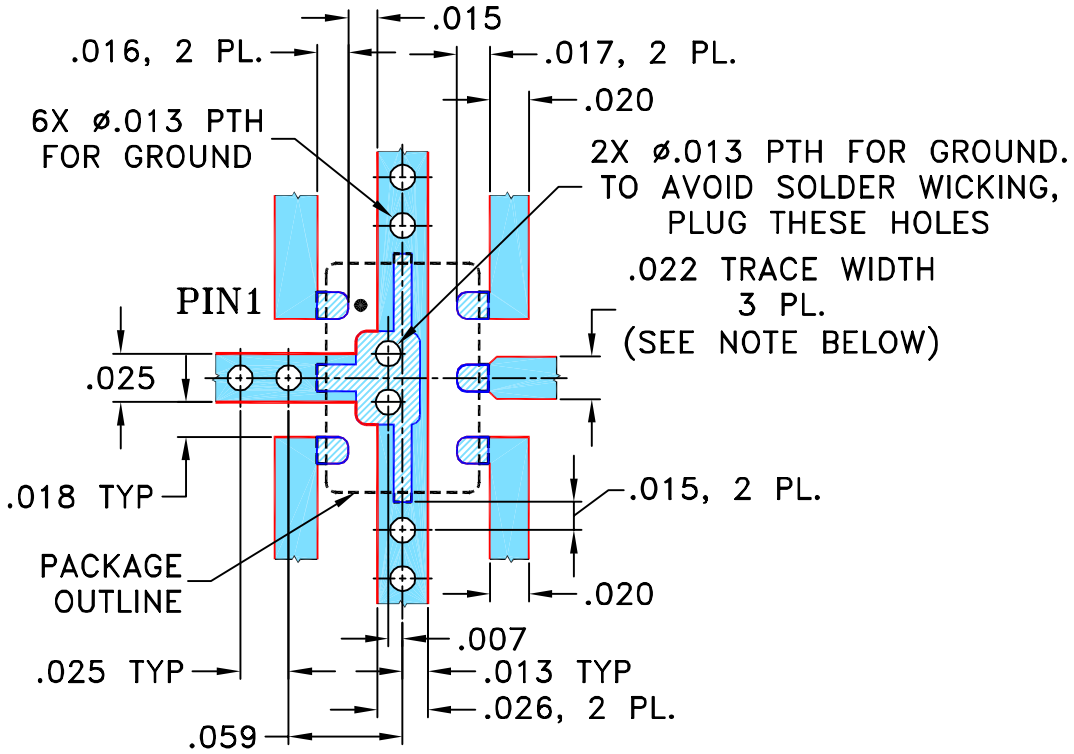
THIRD ANGLE PROJECTION



REVISIONS

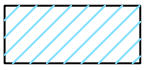
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M125849	NEW RELEASE	01/05/10	MMG	RD

SUGGESTED MOUNTING CONFIGURATION FOR JZ1436 CASE STYLE, "06SW01" PIN CODE



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	MMG	12/23/09
TOLERANCES ON:	CHECKED	AV	01/04/10
2 PL DECIMALS ±	APPROVED	RD	01/05/10
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

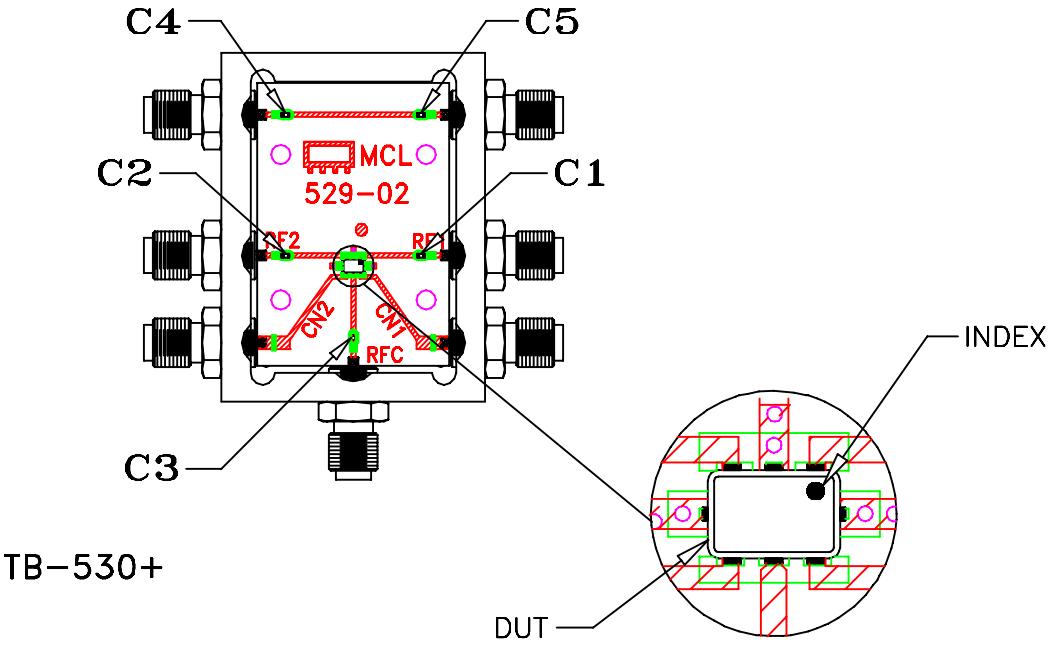
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06SW01, JZ1436, TB-530+

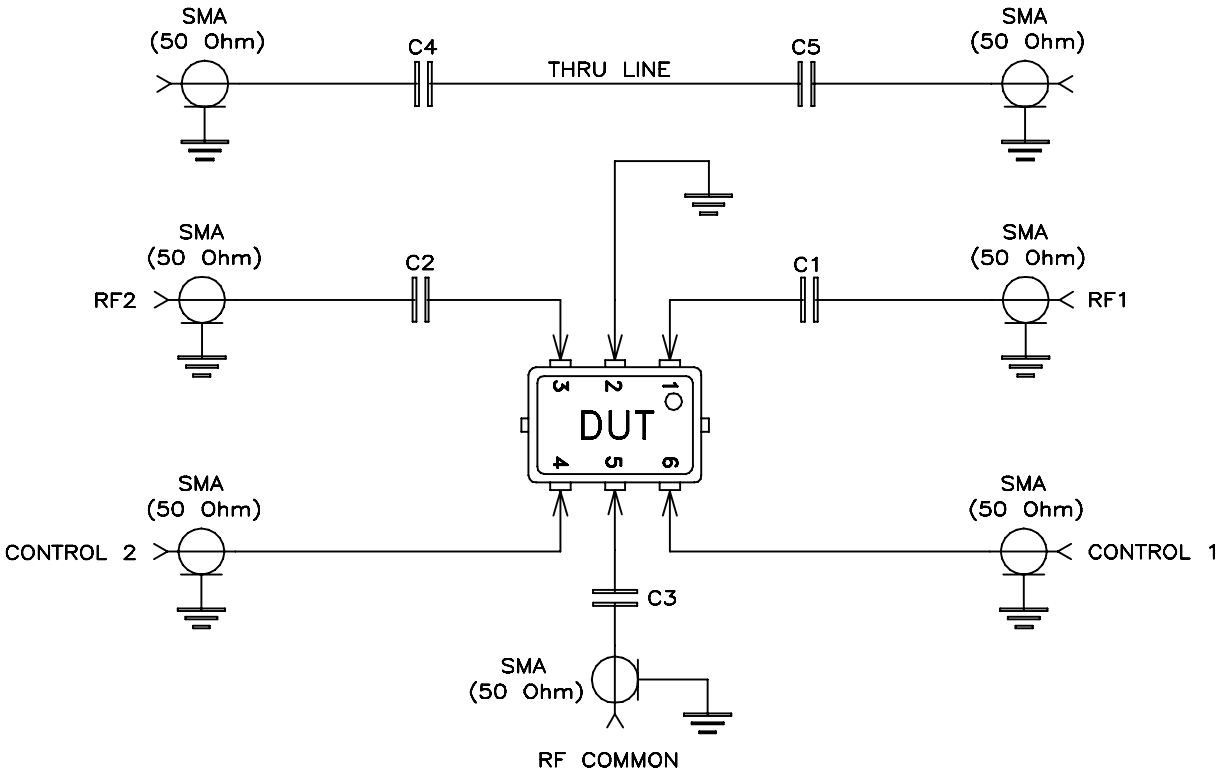
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-324	OR

FILE:	SCALE:	SHEET:
98PL324	10:1	1 OF 1

Evaluation Board and Circuit



TB-530+



COMPONENT	VALUE/PART NUMBER
DUT	Mini-Circuits VSW2-33-10W+
C1 - C5	0.001 uF

Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

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Environmental Specifications ENV41

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Temperature Cycling	-65° to 150°C, 500 cycles	JESD22-A104, condition C
Autoclave	121°C, 100% RH, 30 PSIA, 96 hours, unbiased	JESD22-A102
High Temp Storage	150°C 1008 hours	JESD22-A103
Solderability	Per Reference Spec	JESD22-B102
Resistance to Solvent	Per Reference Spec	MIL-STD-202, Method 215J
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	JESD22-A113