



Mini-Circuits

COAXIAL SOLID STATE

SP4T RF Switch

ZSW4-E673+

50Ω 10 MHz to 67 GHz Reflective

THE BIG DEAL

- Ultra wideband operation, 10 MHz to 67 GHz
- High Isolation, 45 dB
- Low VSWR, 1.4:1 typ. Across Operating Band
- All-OFF State Available
- Bi-directional

APPLICATIONS

- LTE & 5G MIMO Infrastructure
- Test & Measurement Equipment
- R&D, Production, and OTA Test Systems
- WiFi6E, IoT, UWB, and SATCOM
- Communications, Radar, EW, and ECM Defense Systems



Generic photo used for illustration purposes only

Model No.	ZSW4-E673+
Case Style	WV2820
Connectors	1.85mm-Female

+RoHS Compliant

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

PRODUCT OVERVIEW

Mini-Circuits' ZSW4-E673+ is an SP4T reflective, solid-state switch with an internal driver. This switch is designed for wideband operation from 10 MHz to 67 GHz and supports many applications requiring high performance from 5G infrastructure to automated test equipment and various defense applications. The bidirectional switch provides excellent isolation, and high linearity. It operates on a positive +5.0V supply and utilizes standard 3.3V TTL logic. The switch comes housed in a compact, aluminum alloy case (1.48" x 1.39" x 0.71") with 1.85mm-female connectors at all RF ports and a 10-pin digital control snap connector for DC power and control signals.

KEY FEATURES

Feature	Advantages
Ultra Wideband, 10 MHz to 67GHz	One model can be used in many applications, ideal for wideband applications such as military and instrumentation.
Low VSWR, 1.4:1 across the entire band	Low VSWR across the entire band helps to improve system performance by reducing component interaction.
High Isolation, 45 dB Across Operating Band	High isolation significantly reduces leakage of power into OFF ports.





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50Ω 10 MHz to 67 GHz Reflective

ELECTRICAL SPECIFICATIONS AT 25°C, VDD=+5V

Parameter	Port	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range			0.01		67	GHz
Insertion Loss ³	RF-IN to any ON port	0.01 to 10	-	2.5	4.0	dB
		10 to 30	-	4.0	5.75	
		30 to 40	-	5.0	6.5	
		40 to 50	-	6.0	7.5	
		50 to 60	-	7.0	9.0	
		60 to 67	-	9.0	12.5	
Isolation	RF-IN to any OFF port @Active states ¹	0.01 to 20	38	50	-	dB
		20 to 50	28	40	-	
		50 to 60	32	45	-	
		60 to 67	28	40	-	
VSWR	RF-IN ² Port	0.01 to 67	-	1.4	-	:1
	Any ON port connected to RF-IN port	0.01 to 67	-	1.4	-	

1. See truth table on page 3 for list of states.

2. VSWR defined for RF-IN only at active state.

3. Switch is bi-directional

ABSOLUTE MAXIMUM RATINGS^{4,5}

Parameter	Ratings
Operating Temperature	-20°C to 85°C
Storage Temperature	-20°C to 85°C
Supply Voltage ⁶ (VDD)	+5.5V
Control Voltage (V1, V2, V3)	0V to +3.5V
RF Input Power (10 MHz – 1 GHz) ^{7,8}	+17 dBm
RF Input Power (1 GHz – 67 GHz) ^{7,8}	+27 dBm

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

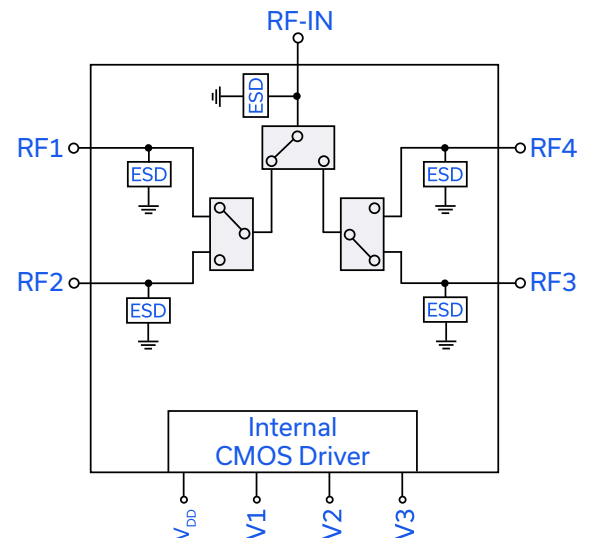
5. Operation in the range between the max operating power and the absolute maximum rating for extended periods of time may result in reduced life and reliability.

6. Do not apply DC voltage at any of the RF ports. In Application where DC voltage is present at either input or output port, coupling capacitors are required. For DC Block, please use Mini Circuits P/N. BLK-E653+

7. Applicable at any port.

8. Compression level not noted as it exceeds max safe operating power level

FUNCTIONAL DIAGRAM



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DC ELECTRICAL SPECIFICATIONS

Parameter	Min.	Typ.	Max.	Units
Supply Voltage, V_{DD}	4.7	5.0	5.3	V
Supply Current, I_{DD}	-	10	25 ⁹	mA
Control Voltage Low ("0") V1, V2, V3	0	0.4	0.8	V
Control Voltage High ("1") V1, V2, V3	2.0	3.0	3.3	V
Control Current ("1" or "0") V1, V2, V3	-	1	1.5	mA

9. Specified for steady state condition

SWITCHING SPECIFICATIONS

Parameter	Condition	Min.	Typ.	Max.	Units
Switching time 50% trigger to 10/90% signal level (ON time and OFF time)	Pulse rate = 10 kHz Control voltage = 0/3.3V Duty cycle = 50%	-	7	-	μs
Video feedthrough @ all ports		-	15	-	mVp-p

TRUTH TABLE

State of Control Voltage	CONTROL LOGIC LEVELS			RF ROUTING			
	V1	V2	V3 ¹⁰	RF1	RF2	RF3	RF4
1	0	0	1	ON	OFF	OFF	OFF
2	0	1	1	OFF	ON	OFF	OFF
3	1	0	1	OFF	OFF	ON	OFF
4	1	1	1	OFF	OFF	OFF	ON
5	0	0	0	OFF	OFF	OFF	OFF

10. V3: An internal pull-up resistor sets this bit high. V3 can be left floating and switch can be controlled with only V1 & V2 if the "All-Off" Control State 5 is not required. LOGIC "0" and LOGIC "1" are defined in the DC ELECTRICAL SPECIFICATION table above.



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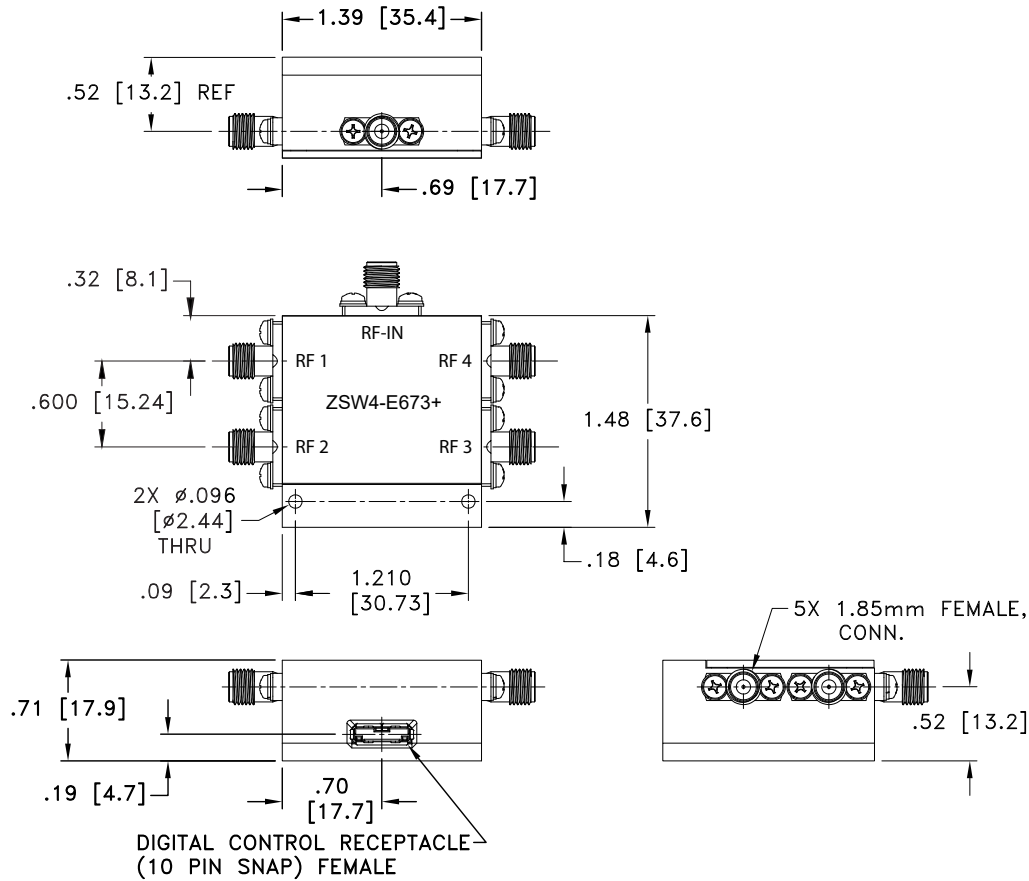
COAXIAL SOLID STATE

SP4T RF Switch

ZSW4-E673+

50Ω 10 MHz to 67 GHz Reflective

OUTLINE DRAWING



Weight: 70 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl. ± 0.03 [.76]; 3 Pl. ± 0.015 [.38]

CONNECTORS

RF ports (RF1, RF2, RF3, RF4, RF-IN)	1.85mm female
Supply & control port	10 pin digital control snap ¹¹ connector female

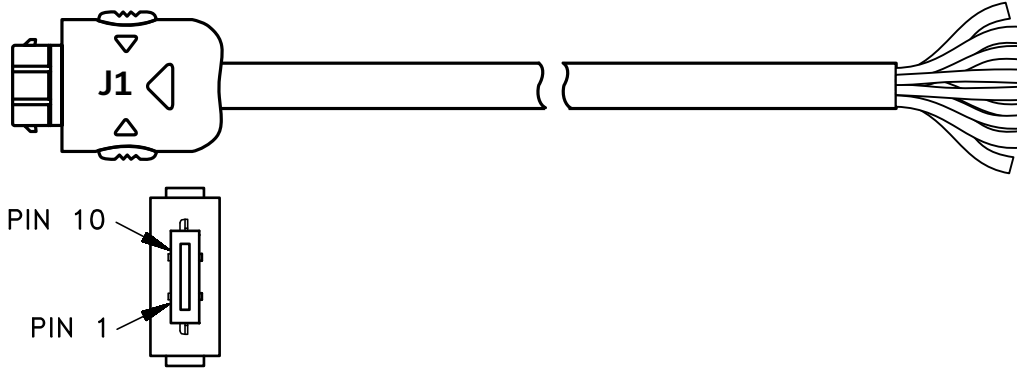
11. Mating connector is Hirose ST40X-10S-CV(30).

Function	Pin Number on Snap Connector	Description
VDD	J1-1	Positive Supply Voltage
	J1-2	
	J1-3	
C4	J1-4	Ground
	J1-5	
	J1-9	
	J1-10	
V1	J1-6	Control bit 1
V2	J1-8	Control bit 2
V3	J1-7	Enable

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CONTROL CABLE



INCLUDED ACCESSORIES

CBL-5FT-MPD+ is a "Pigtail" connector included with every purchase of ZSW4-E673+. CBL-5FT-MPD+ is a shielded cable with stripped wires (#32AWG) on one end and a connector on the other designed to mate to the ZSW4-E673+. These bare wires enable the customer to assemble their own cable as required to interface with the ZSW4-E673+ (cable length is 4.9ft/ 1.5meters).

CBL-5FT-MPD+ WIRING INFORMATION

J1 Pin Number	Function	Description	Wire Color
1	VDD	Positive Supply Voltage	Green
2	VDD	Positive Supply Voltage	Green & Black
3	VDD	Positive Supply Voltage	Red
4	GND	Ground	Orange
5	GND	Ground	Orange & Black
6	V1	Control bit 1	Red & Black
7	V3	Enable	Black
8	V2	Control bit 2	Blue
9	GND	Ground	White
10	GND	Ground	White & Black
Shield	-	Shield Braid	-



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SP4T RF Switch

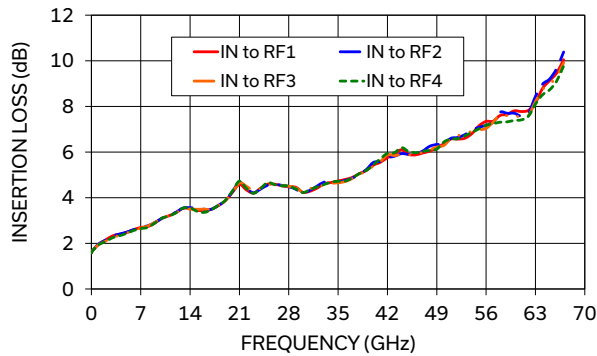
ZSW4-E673+

50Ω 10 MHz to 67 GHz Reflective

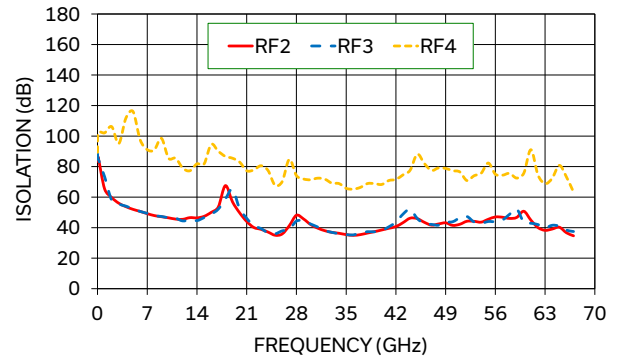
TYPICAL PERFORMANCE DATA/GRAPHS

Frequency (GHz)	Insertion Loss (dB)				Isolation (dB)			VSWR (:1)				
	RF-IN to RF1	RF-IN to RF2	RF-IN to RF3	RF-IN to RF4	RF2	RF3	RF4	IN	RF1 (ON 1)	RF2 (ON 2)	RF3 (ON 3)	RF4 (ON 4)
0.0	1.6	1.6	1.6	1.6	83.5	88.4	89.4	1.3	1.3	1.3	1.4	1.4
4.0	2.4	2.4	2.3	2.3	53.7	54.1	111.8	1.1	1.1	1.1	1.1	1.1
8.0	2.7	2.8	2.8	2.7	47.9	47.9	90.9	1.2	1.3	1.4	1.4	1.3
12.0	3.3	3.4	3.3	3.3	45.5	44.4	79.0	1.1	1.2	1.3	1.2	1.3
16.0	3.4	3.5	3.5	3.4	50.0	48.8	94.5	1.4	1.4	1.5	1.5	1.3
20.0	4.2	4.3	4.2	4.3	49.7	52.6	83.0	1.4	1.5	1.5	1.3	1.5
24.0	4.4	4.4	4.4	4.4	37.1	36.6	77.5	1.3	1.2	1.1	1.2	1.2
28.0	4.5	4.5	4.5	4.5	48.1	44.3	74.1	1.4	1.3	1.3	1.3	1.3
32.0	4.4	4.5	4.4	4.5	38.0	38.2	71.8	1.2	1.1	1.3	1.2	1.2
36.0	4.8	4.8	4.7	4.7	35.0	35.2	65.2	1.1	1.3	1.0	1.0	1.2
40.0	5.4	5.5	5.4	5.4	38.5	38.1	68.3	1.4	1.3	1.5	1.3	1.4
44.0	6.1	5.9	5.9	6.2	46.2	52.0	77.6	1.4	1.6	1.2	1.3	1.7
48.0	6.0	6.3	6.1	6.1	42.4	41.6	79.1	1.3	1.1	1.4	1.3	1.2
52.0	6.6	6.6	6.7	6.6	44.2	47.3	70.9	1.4	1.3	1.3	1.4	1.2
56.0	7.3	7.2	7.0	7.2	47.0	43.9	75.0	1.4	1.6	1.3	1.1	1.5
60.0	7.8	7.7	7.6	7.4	50.7	43.6	75.6	1.4	1.9	1.7	1.6	1.4
67.0	10.0	10.4	9.9	9.8	34.7	37.5	63.3	1.1	1.5	1.4	1.3	1.2

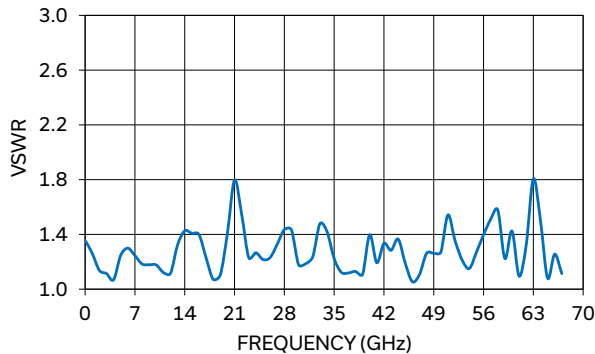
ZSW4-E673+
INSERTION LOSS



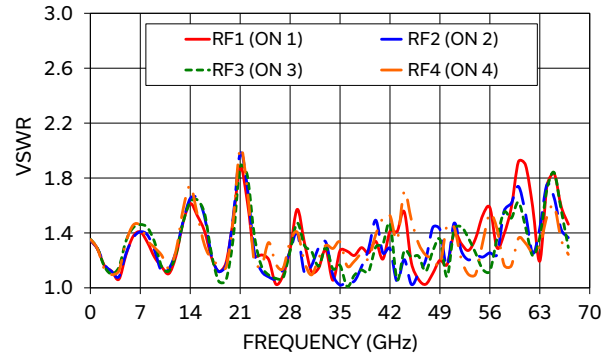
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ISOLATION (IN to OFF, RF1 Active)



ZSW4-E673+
VSWR (IN (RF1 Active))



ZSW4-E673+
VSWR (RF1, RF2, RF3, RF4)



- NOTES**
- 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.
 - Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
 - 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 SP4T Switch

ZSW4-E673+

Typical Performance Data

FREQUENCY (GHz)	INSERTION LOSS (dB)				ISOLATION (dB)		
	IN to RF1	IN to RF2	IN to RF3	IN to RF4	IN to OFF, RF1 Active		
					RF2	RF3	RF4
0.01	1.6	1.6	1.6	1.6	83	88	89
0.1	1.6	1.7	1.7	1.7	86	85	102
1.0	2.0	2.0	1.9	1.9	65	73	102
2.0	2.1	2.1	2.1	2.1	60	58	106
3.0	2.3	2.3	2.3	2.2	56	55	95
4.0	2.4	2.4	2.3	2.3	54	54	112
5.0	2.5	2.5	2.4	2.4	52	52	116
6.0	2.6	2.6	2.6	2.6	51	51	98
7.0	2.7	2.7	2.7	2.6	49	49	91
8.0	2.7	2.8	2.8	2.7	48	48	91
9.0	2.9	2.9	2.9	2.9	47	47	99
10.0	3.1	3.1	3.1	3.1	46	46	85
11.0	3.2	3.2	3.2	3.2	46	46	85
12.0	3.3	3.4	3.3	3.3	45	44	79
13.0	3.5	3.5	3.5	3.5	47	45	77
14.0	3.5	3.6	3.5	3.6	46	45	82
15.0	3.4	3.5	3.5	3.4	47	47	82
16.0	3.4	3.5	3.5	3.4	50	49	95
17.0	3.5	3.5	3.5	3.5	54	52	90
18.0	3.7	3.7	3.7	3.7	68	59	87
19.0	3.9	3.9	3.9	3.9	57	65	85
20.0	4.2	4.3	4.2	4.3	50	53	83
21.0	4.6	4.7	4.6	4.7	44	46	77
22.0	4.3	4.4	4.5	4.4	40	41	78
23.0	4.2	4.2	4.3	4.2	39	39	81
24.0	4.4	4.4	4.4	4.4	37	37	77
25.0	4.6	4.5	4.6	4.7	35	36	68
26.0	4.6	4.6	4.6	4.6	36	38	70
27.0	4.5	4.5	4.5	4.5	41	39	85
28.0	4.5	4.5	4.5	4.5	48	44	74
29.0	4.5	4.4	4.4	4.4	46	44	72
30.0	4.2	4.2	4.3	4.2	42	42	71
31.0	4.3	4.3	4.4	4.4	40	40	72
32.0	4.4	4.5	4.4	4.5	38	38	72
33.0	4.6	4.7	4.6	4.6	37	37	69
34.0	4.7	4.7	4.6	4.7	36	36	69
35.0	4.7	4.7	4.7	4.7	35	36	66
36.0	4.8	4.8	4.7	4.7	35	35	65
37.0	4.9	4.9	4.8	4.9	35	36	66
38.0	5.1	5.0	5.0	5.1	36	37	69
39.0	5.2	5.2	5.2	5.2	37	37	69
40.0	5.4	5.5	5.4	5.4	38	38	68
41.0	5.6	5.6	5.6	5.7	40	41	71
42.0	5.8	5.7	5.9	5.9	41	44	72
43.0	5.9	5.8	5.8	6.0	43	49	75
44.0	6.1	5.9	5.9	6.2	46	52	78
45.0	5.9	5.9	5.9	6.0	46	46	88
46.0	5.9	5.9	5.9	6.0	44	43	82
47.0	6.0	6.0	6.0	6.0	42	42	77
48.0	6.0	6.3	6.1	6.1	42	42	79
49.0	6.2	6.3	6.2	6.1	43	44	79
50.0	6.4	6.3	6.3	6.4	41	44	77
51.0	6.6	6.6	6.6	6.6	42	46	76
52.0	6.6	6.6	6.7	6.6	44	47	71
53.0	6.6	6.8	6.8	6.7	44	44	74
54.0	6.8	7.0	6.9	6.9	44	43	76
55.0	7.2	7.1	7.0	7.0	45	44	82
56.0	7.3	7.2	7.0	7.2	47	44	75
57.0	7.4	7.3	7.3	7.2	47	45	74
58.0	7.6	7.7	7.6	7.3	46	49	76
59.0	7.7	7.7	7.6	7.3	47	52	72
60.0	7.8	7.7	7.6	7.4	51	44	76
61.0	7.8	7.6	7.5	7.4	45	43	91
62.0	7.8	7.7	7.6	7.6	40	42	74
63.0	8.2	8.4	8.2	8.1	38	40	69
64.0	8.8	9.0	8.7	8.5	39	42	72
65.0	9.1	9.2	9.0	8.7	40	41	81
66.0	9.5	9.7	9.3	9.1	37	38	73
67.0	10.0	10.4	9.9	9.8	35	37	63

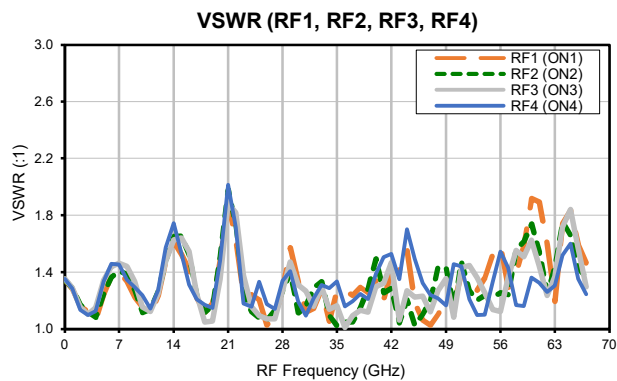
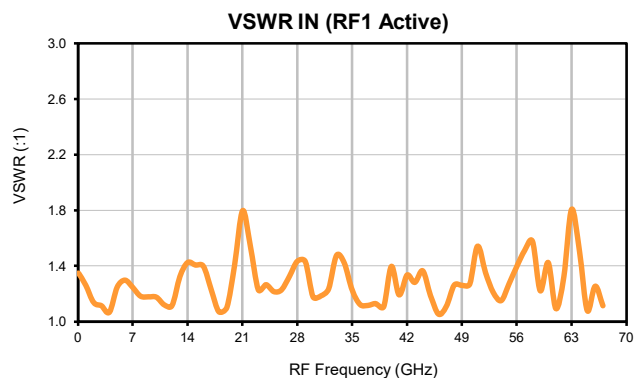
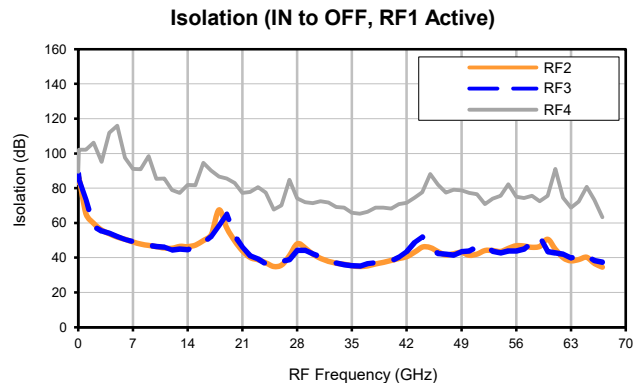
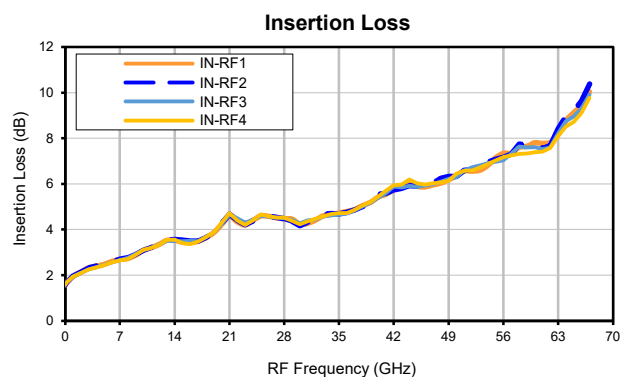
RF SP4T Switch

ZSW4-E673+

Typical Performance Data

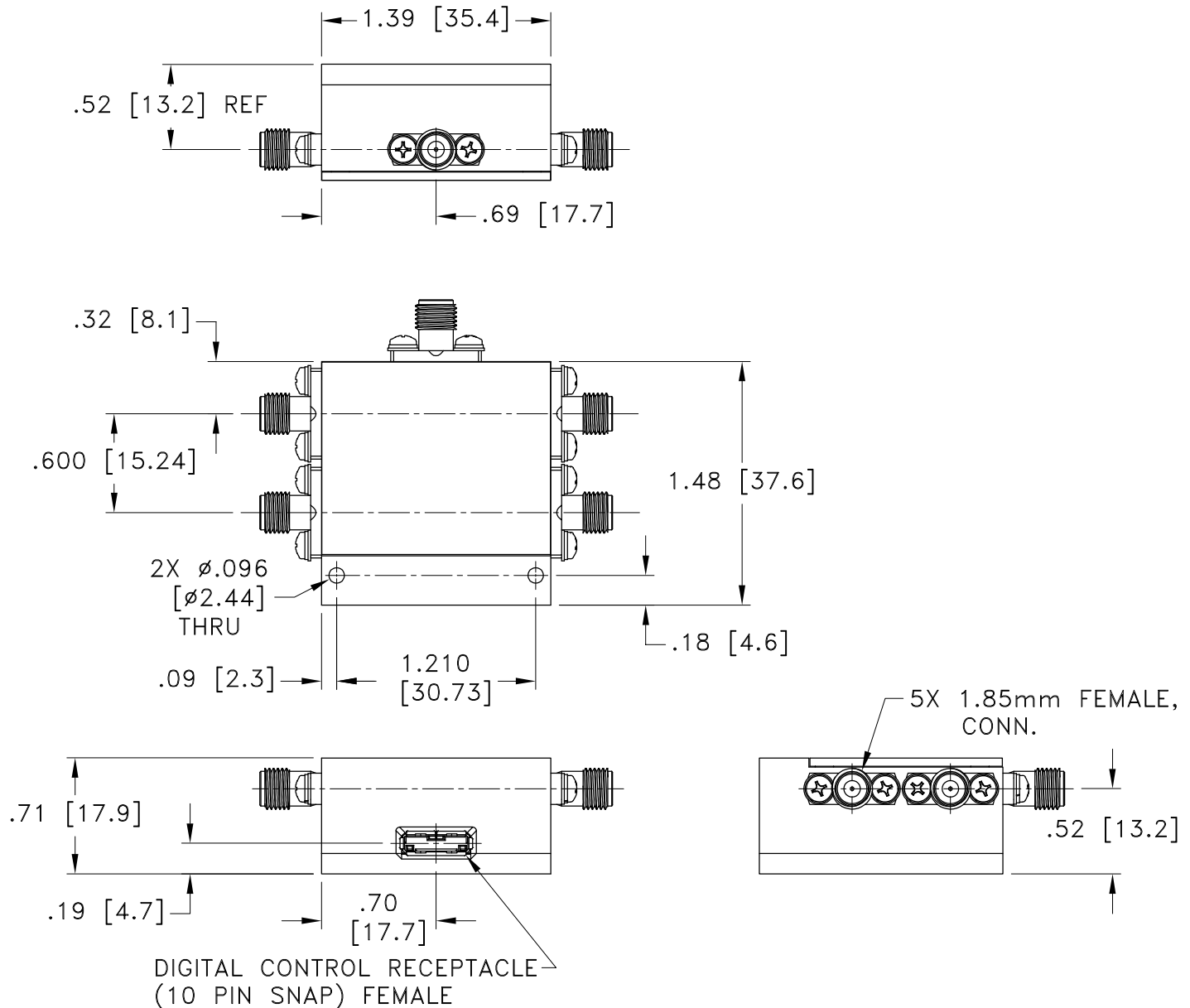
FREQUENCY (GHz)	VSWR (:1)				
	RF1 Active	RF1 Active	RF2 Active	RF3 Active	RF4 Active
	IN	RF1	RF2	RF3	RF4
0.01	1.35	1.35	1.35	1.35	1.35
0.1	1.35	1.34	1.34	1.35	1.35
1.0	1.26	1.28	1.29	1.29	1.28
2.0	1.14	1.16	1.17	1.15	1.13
3.0	1.11	1.12	1.12	1.10	1.10
4.0	1.07	1.06	1.08	1.15	1.12
5.0	1.25	1.24	1.25	1.34	1.33
6.0	1.30	1.38	1.36	1.44	1.46
7.0	1.25	1.41	1.41	1.46	1.45
8.0	1.18	1.33	1.39	1.44	1.35
9.0	1.18	1.22	1.27	1.33	1.29
10.0	1.18	1.15	1.12	1.15	1.24
11.0	1.12	1.10	1.14	1.12	1.14
12.0	1.12	1.23	1.26	1.25	1.27
13.0	1.32	1.48	1.48	1.48	1.57
14.0	1.43	1.61	1.65	1.63	1.74
15.0	1.41	1.52	1.65	1.64	1.53
16.0	1.40	1.41	1.52	1.54	1.31
17.0	1.23	1.22	1.23	1.24	1.21
18.0	1.07	1.12	1.12	1.05	1.17
19.0	1.10	1.18	1.16	1.05	1.15
20.0	1.41	1.49	1.51	1.35	1.48
21.0	1.80	1.88	1.98	1.88	2.02
22.0	1.55	1.63	1.74	1.82	1.71
23.0	1.23	1.24	1.25	1.38	1.18
24.0	1.27	1.24	1.12	1.16	1.16
25.0	1.22	1.21	1.08	1.09	1.33
26.0	1.23	1.03	1.06	1.07	1.17
27.0	1.33	1.09	1.13	1.07	1.14
28.0	1.44	1.28	1.27	1.27	1.34
29.0	1.43	1.57	1.40	1.47	1.41
30.0	1.18	1.33	1.11	1.31	1.19
31.0	1.19	1.12	1.16	1.27	1.09
32.0	1.24	1.14	1.29	1.16	1.21
33.0	1.48	1.28	1.33	1.30	1.31
34.0	1.42	1.05	1.09	1.14	1.29
35.0	1.22	1.27	1.02	1.16	1.33
36.0	1.12	1.27	1.05	1.01	1.16
37.0	1.12	1.24	1.05	1.09	1.19
38.0	1.13	1.29	1.15	1.13	1.25
39.0	1.11	1.25	1.28	1.12	1.21
40.0	1.40	1.34	1.49	1.30	1.39
41.0	1.19	1.21	1.25	1.32	1.51
42.0	1.33	1.41	1.29	1.47	1.53
43.0	1.28	1.41	1.04	1.06	1.35
44.0	1.37	1.55	1.21	1.27	1.70
45.0	1.19	1.18	1.03	1.22	1.49
46.0	1.05	1.06	1.10	1.23	1.32
47.0	1.11	1.03	1.20	1.12	1.24
48.0	1.26	1.10	1.44	1.27	1.21
49.0	1.26	1.20	1.43	1.35	1.16
50.0	1.27	1.17	1.16	1.08	1.46
51.0	1.54	1.40	1.47	1.43	1.44
52.0	1.35	1.32	1.27	1.45	1.21
53.0	1.21	1.27	1.20	1.36	1.10
54.0	1.15	1.36	1.24	1.25	1.10
55.0	1.27	1.53	1.22	1.13	1.33
56.0	1.40	1.58	1.26	1.12	1.54
57.0	1.51	1.29	1.24	1.36	1.43
58.0	1.58	1.39	1.56	1.55	1.17
59.0	1.22	1.58	1.62	1.51	1.16
60.0	1.42	1.92	1.74	1.62	1.36
61.0	1.10	1.90	1.54	1.44	1.33
62.0	1.32	1.59	1.25	1.24	1.26
63.0	1.81	1.19	1.43	1.37	1.30
64.0	1.50	1.74	1.75	1.72	1.52
65.0	1.08	1.83	1.66	1.84	1.60
66.0	1.26	1.59	1.43	1.57	1.35
67.0	1.11	1.46	1.37	1.29	1.24

Typical Performance Curves



Outline Dimensions

WV2820



Weight: 70 grams

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm$.03[.76]; 3 Pl. $\pm$.015[0.38]

Notes:

Case material: Aluminum Alloy.
Case Finish: Gold Plated.

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RF/IF MICROWAVE COMPONENTS



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	-20° to +85°C Baseplate Temp	Individual Model data Sheet
Storage Temperature	-20°C to +85°C Ambient Environment	Individual Model Data Sheet
Thermal Shock	-20°C to +85°C 100 cycles	Transition time=5 mins, Dwell time = 30 mins
Vibration	Random Vibration (Non-operating)	MIL-STD-810F Method 514.5 Procedure I, Category 24, Figure 513C-17
Mechanical Shock	Non-operation	MIL-STD 810F Method 516.5 Procedure 1, Table 516.5-II