



### 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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## SP4T RF Switch

ZSW4-E673+

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 <sup>3</sup> | 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 <sup>1</sup> | 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 <sup>2</sup> 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<sup>4,5</sup>

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

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

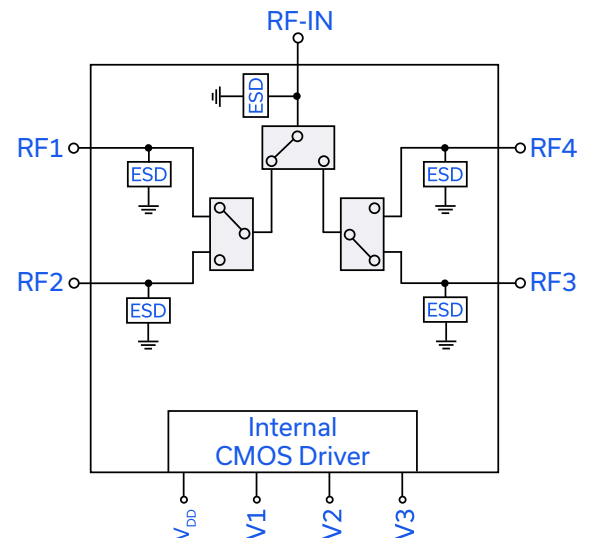
5. Operation in the range between the max operating power and the absolute maximum rating for extended periods of time may result in reduced life and reliability.

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 <sup>9</sup> | mA    |
| Control Voltage Low ("0")<br>V1, V2, V3    | 0    | 0.4  | 0.8             | V     |
| Control Voltage High ("1")<br>V1, V2, V3   | 2.0  | 3.0  | 3.3             | V     |
| Control Current ("1" or "0")<br>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<br>(ON time and OFF time) | Pulse rate = 10 kHz<br>Control voltage = 0/3.3V<br>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 <sup>10</sup> | 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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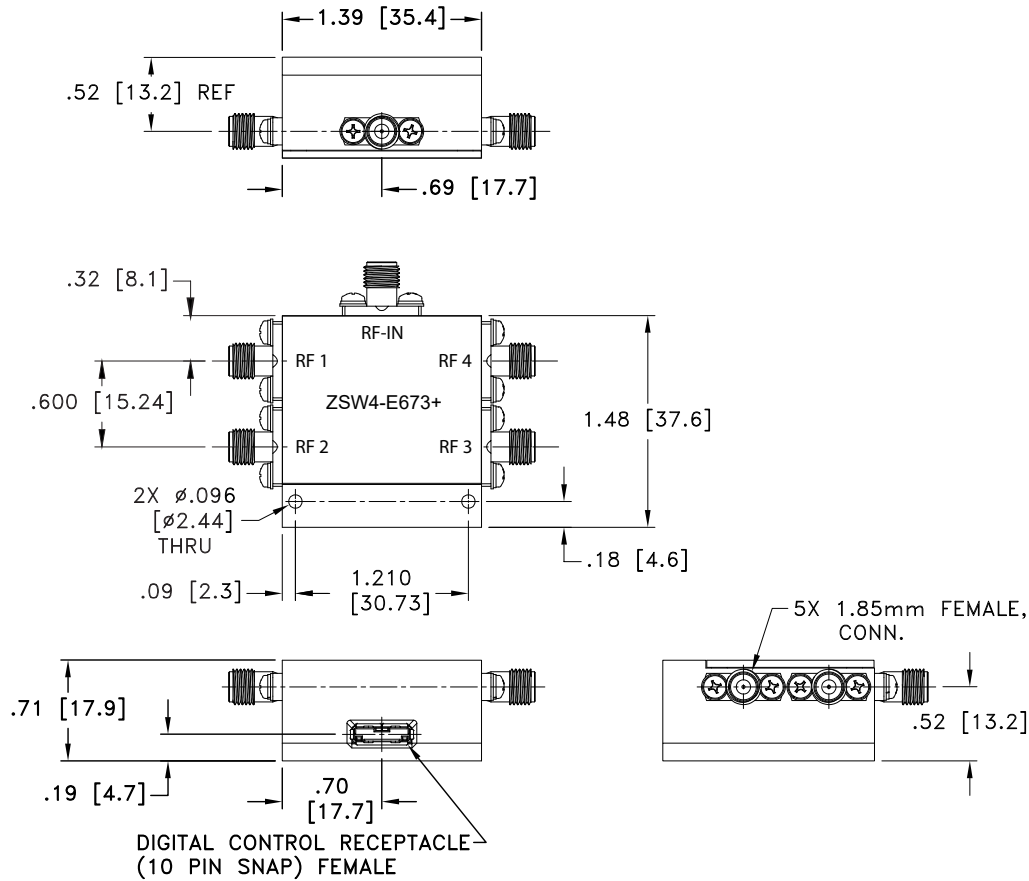
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# SP4T RF Switch

**ZSW4-E673+**

50Ω 10 MHz to 67 GHz Reflective

## OUTLINE DRAWING



Weight: 70 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03[.76]; 3 Pl. ±.015[.38]

## CONNECTORS

|                                      |                                                            |
|--------------------------------------|------------------------------------------------------------|
| RF ports (RF1, RF2, RF3, RF4, RF-IN) | 1.85mm female                                              |
| Supply & control port                | 10 pin digital control snap <sup>11</sup> 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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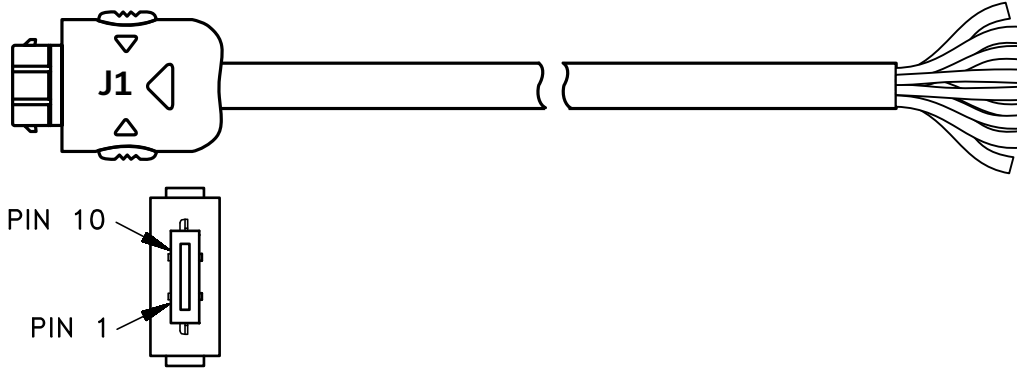


## SP4T RF Switch

ZSW4-E673+

50Ω 10 MHz to 67 GHz Reflective

## 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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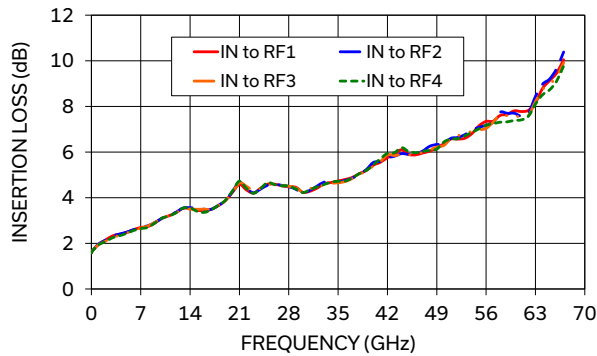
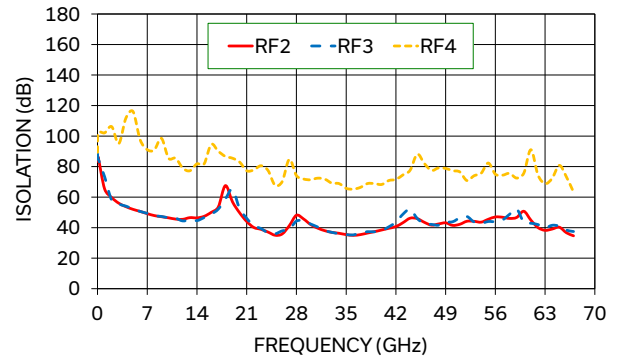
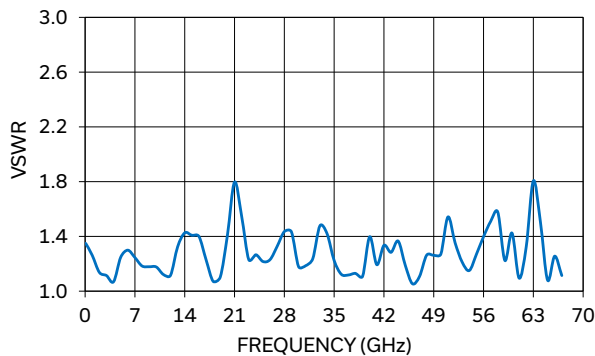
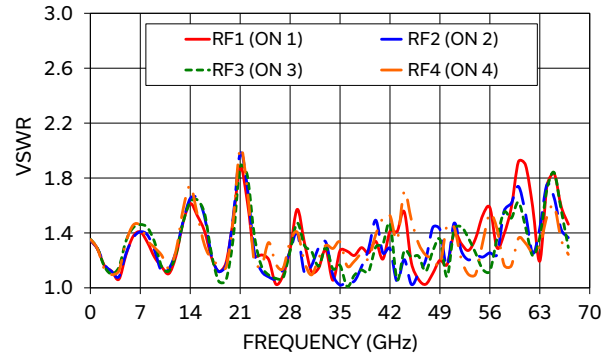
## SP4T RF Switch

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 LOSSZSW4-E673+  
ISOLATION (IN to OFF, RF1 Active)ZSW4-E673+  
VSWR (IN (RF1 Active))ZSW4-E673+  
VSWR (RF1, RF2, RF3, RF4)

## 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.
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# RF SP4T Switch

ZSW4-E673+

## Typical Performance Data

| FREQUENCY<br>(GHz) | INSERTION LOSS<br>(dB) |           |           |           | ISOLATION<br>(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  |

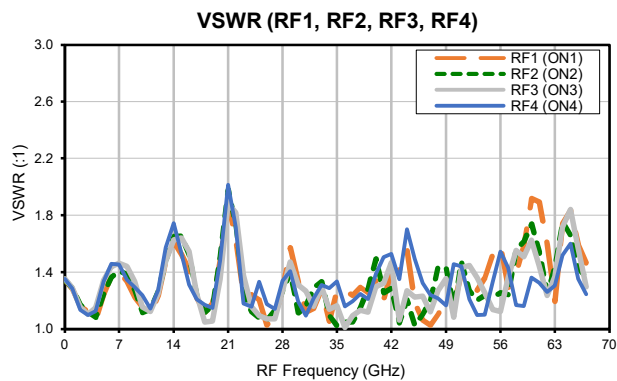
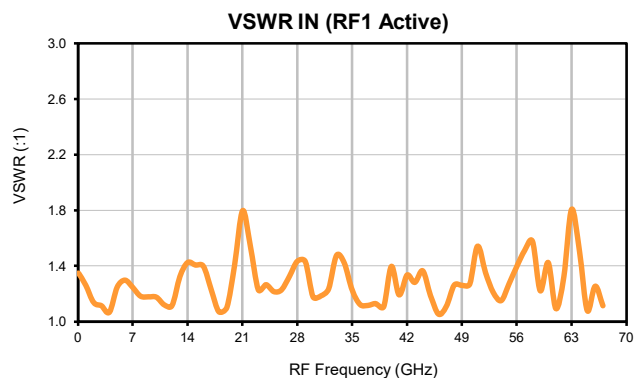
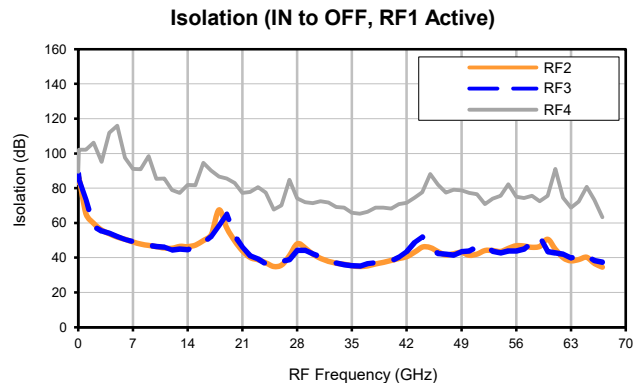
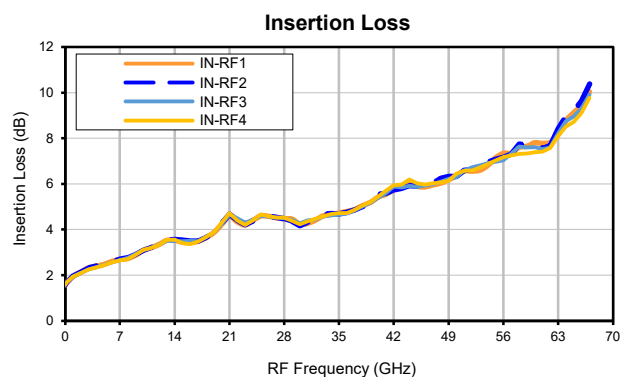
# RF SP4T Switch

ZSW4-E673+

## Typical Performance Data

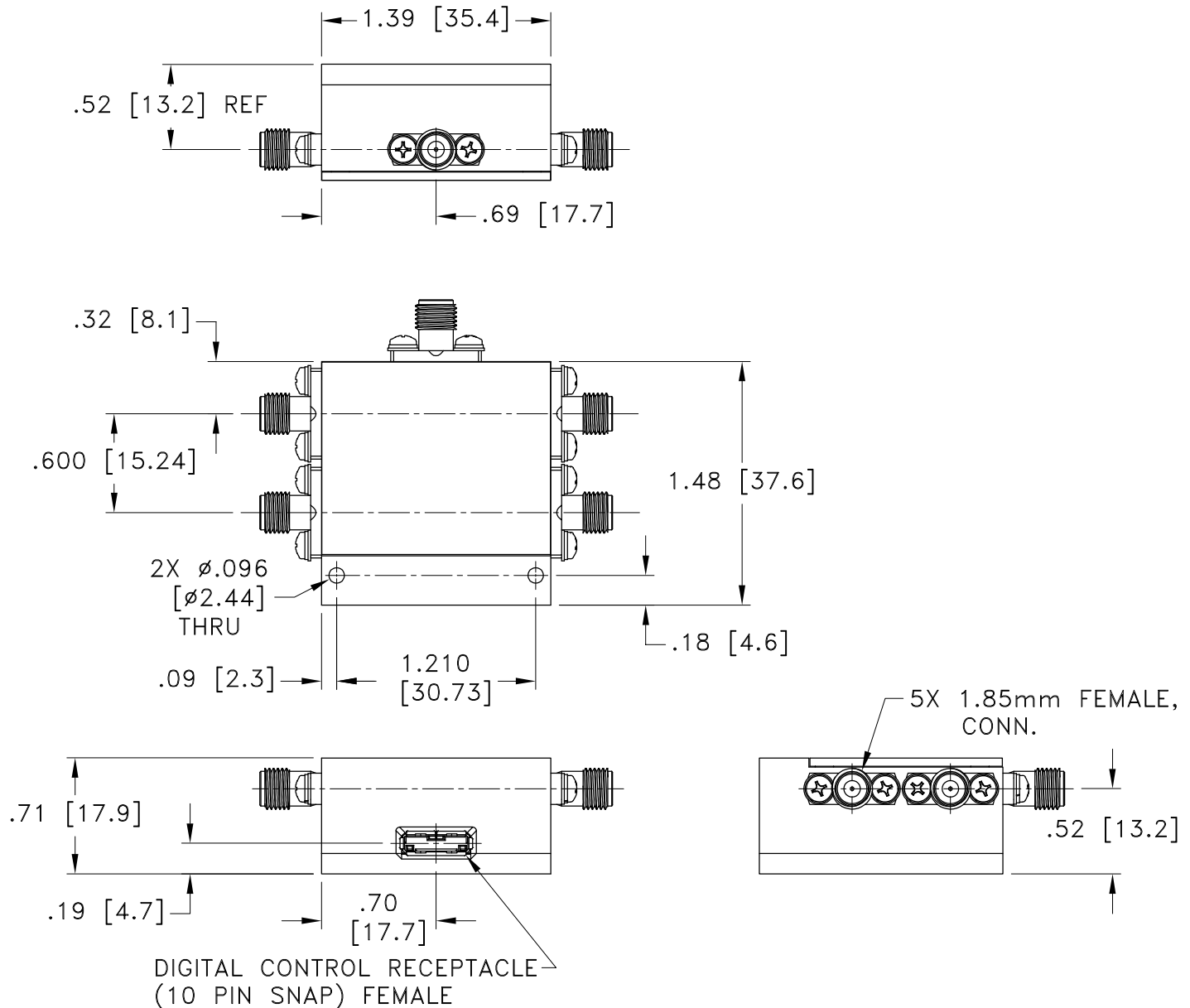
| FREQUENCY<br>(GHz) | VSWR<br>(:1) |            |            |            |            |
|--------------------|--------------|------------|------------|------------|------------|
|                    | RF1 Active   | RF1 Active | RF2 Active | RF3 Active | RF4 Active |
|                    | IN           | 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<br>Baseplate Temp       | Individual Model data Sheet                                           |
| Storage Temperature   | -20°C to +85°C<br>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<br>(Non-operating)   | MIL-STD-810F Method 514.5 Procedure I, Category 24,<br>Figure 513C-17 |
| Mechanical Shock      | Non-operation                         | MIL-STD 810F Method 516.5 Procedure 1,<br>Table 516.5-II              |