SOLID STATE

# USB RF SPDT Switch

# USB-1SP2T-673

50Ω 0.1 to 67 GHz

## THE BIG DEAL

- Super wide bandwidth, solid-state design
- High isolation, 30 dB @ 67 GHz
- USB control and automation
- Daisy-chain control of up to 25 switches
- LED indicator on active port

## APPLICATIONS

- RF signal routing / switch matrices
- Satellite communications up to V band
- Military radio, radar & electronic warfare
- Microwave radio / cellular infrastructure
- Test & measurement systems

| | |
|---|---|
| **Model No.** | USB-1SP2T-673 |
| **Case Style** | WP3211 |
| **Connectors** | 1.85 mm |

DOWNLOAD

SOFTWARE PACKAGE

***RoHS Compliant***

*See our web site for RoHS Compliance methodologies and qualifications*

## PRODUCT OVERVIEW

Mini-Circuits' USB-1SP2T-673 is a fast switching solid-state reflective SPDT covering an ultra-wide bandwidth, from 0.1 to 67 GHz. The solid-state design features an impressive combination of high isolation, low insertion loss and good linearity across the entire band. The switch is supplied in a low profile package with precision 1.85 mm RF connectors. LED indicators on the switch package provide a convenient indicator of the current switch state.

The daisy-chain control interface with "dynamic addressing" simplifies control integration, allowing multiple switches to be combined into a Master / Slave chain. Simply connect, then power on and the whole chain of up to 25 compatible switches can be controlled independently through a single USB and software interface.

Full software support is provided, including our user-friendly GUI application for Windows and a full API with programming instructions for Windows and Linux environments (both 32-bit and 64-bit systems).

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Fast switching sequences | Program automated switching sequences to run with extremely fast transitions and no external control. |
| High performance | Solid-state design combining high isolation with low insertion loss from 0.1 to 67 GHz. |
| Dynamic daisy-chain control | Control up to 25 switches through a single USB interface. |
| USB control | USB HID interface provides easy compatibility with a wide range of software setups and programming environments. |
| Full software support | User friendly Windows GUI (graphical user interface) allows manual control straight out of the box, while the comprehensive API (application programming interface) with examples and instructions allows easy automation in most programming environments. |





www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

# USB RF SPDT Switch

# USB-1SP2T-673

## ELECTRICAL SPECIFICATIONS AT 0 TO 50°C

| Parameter | Ports | Condition (GHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frequency Range | - | - | 0.1 | | 67 | GHz |
| Insertion Loss | COM to any active port | 0.1 - 26 | - | 1.10 | 3.50 | dB |
| | | 26 - 40 | - | 2.20 | 4.00 | |
| | | 40 - 60 | - | 3.00 | 6.50 | |
| | | 60 - 67 | - | 5.10 | 9.00 | |
| Isolation | Between ports J1 & J2 | 0.1 - 26 | - | 45 | - | dB |
| | | 26 - 40 | - | 40 | - | |
| | | 40 - 60 | - | 30 | - | |
| | | 60 - 67 | - | 30 | - | |
| | COM to Inactive port | 0.1 - 26 | - | 45 | - | |
| | | 26 - 40 | - | 40 | - | |
| | | 40 - 60 | - | 27 | - | |
| | | 60 - 67 | - | 27 | - | |
| VSWR | COM port | 0.1 - 18 | - | 1.25 | - | :1 |
| | | 18 - 26 | - | 1.75 | - | |
| | | 26 - 60 | - | 1.85 | - | |
| | | 60 - 67 | - | 3.15 | - | |
| | Any port connected to COM | 0.1 - 18 | - | 1.30 | - | |
| | | 18 - 26 | - | 1.65 | - | |
| | | 26 - 60 | - | 1.85 | - | |
| | | 60 - 67 | - | 4.40 | - | |
| Power Input @1 dB Compression [1] | COM to any active port | 0.1 - 67 | - | 27 | - | dBm |
| IP3 | COM to any active port | 0.5 - 67 | - | 40 | - | dBm |
| Transition Time [2] | - | - | - | 5 | - | µs |
| Minimum Dwell Time [3] | High speed mode | - | - | 10 | - | µs |
| Switching Time (USB) [4] | - | - | - | 2 | - | ms |
| Supply Voltage (Vcc) | USB port | - | 4.75 | 5 | 5.25 | $V_{DC}$ |
| Supply Current (Icc) [5] | | - | - | 70 | 120 | mA |
| Current Pass-through [6] | - | - | - | - | 500 | mA |
| Operating RF Input Power [1] | Through path | Hot switching | - | - | +27 | dBm |
| | Through path | Cold switching | - | - | +27 | |
| | Isolation path | - | - | - | +27 | |

1. Max power derates linearly from +27 dBm @ 2 GHz to +24 dBm @ 100 MHz.
2. Transition time spec represents the time that the RF signal paths are interrupted during switching and thus is specified without communication delays.
3. Minimum dwell time is the shortest time that can be achieved between 2 switch transitions when programming an automated switch sequence.
4. Switching time (USB) is the time from issuing a single software command via USB to the switch state changing. The most significant factor is the host PC, influenced by CPU load and USB protocol. The time shown is an estimate for a medium CPU load and USB 2.0 connection.
5. USB current draw for a single unit with no slave units.
6. Pass through current is the maximum supply current handling of a unit with slave modules attached. If controlling a large number of slave modules additional power supplies should be included to ensure this limit is not exceeded. See page 5 for details.

# USB RF SPDT Switch

# USB-1SP2T-673

## ABSOLUTE MAXIMUM RATINGS

| | |
|---|---|
| Operating Temperature | 0°C to 50°C |
| Storage Temperature | -20°C to 60°C |
| DC supply voltage max. | 6V |
| DC voltage @ RF Ports | 0V |

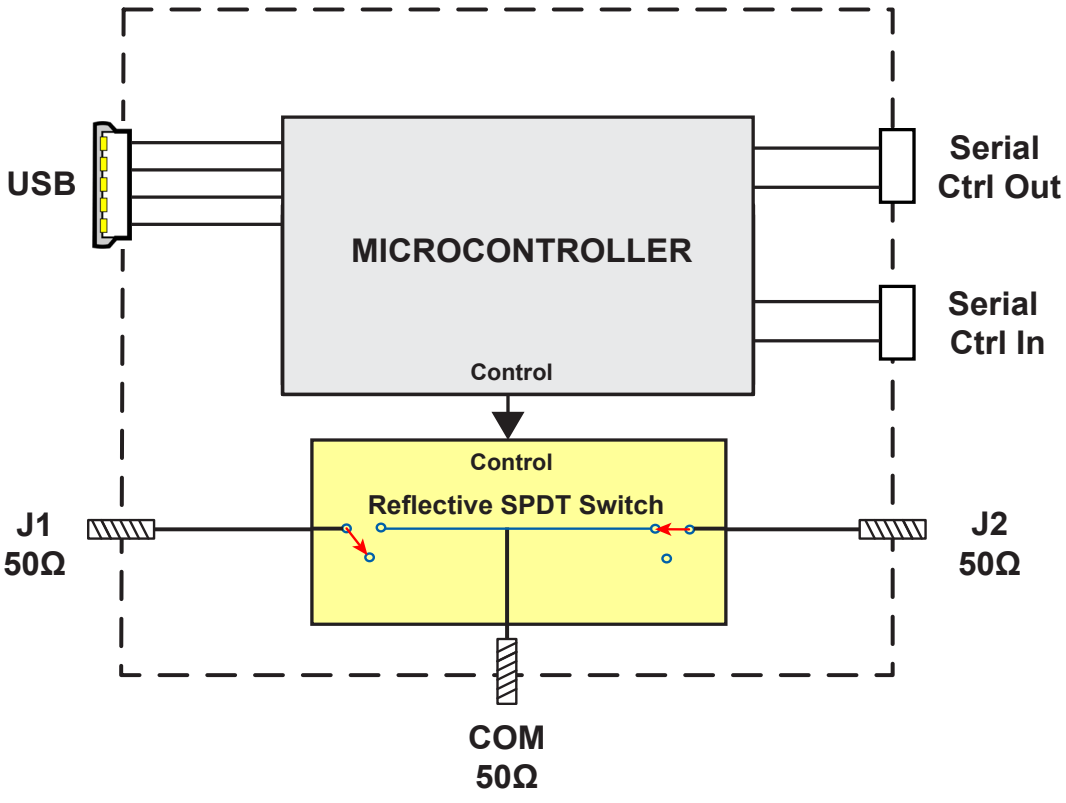
Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

## CONNECTIONS

| Port Name | Connector Type |
|---|---|
| RF Ports (COM, 1 & 2) | 1.85 mm female |
| USB | USB type-C receptacle |
| Serial In (Digital Control 2 port) | Digital Snap Fit Connector [7] |
| Serial Out (Digital Control 1 port) | Digital Snap Fit Connector [7] |

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

## BLOCK DIAGRAM

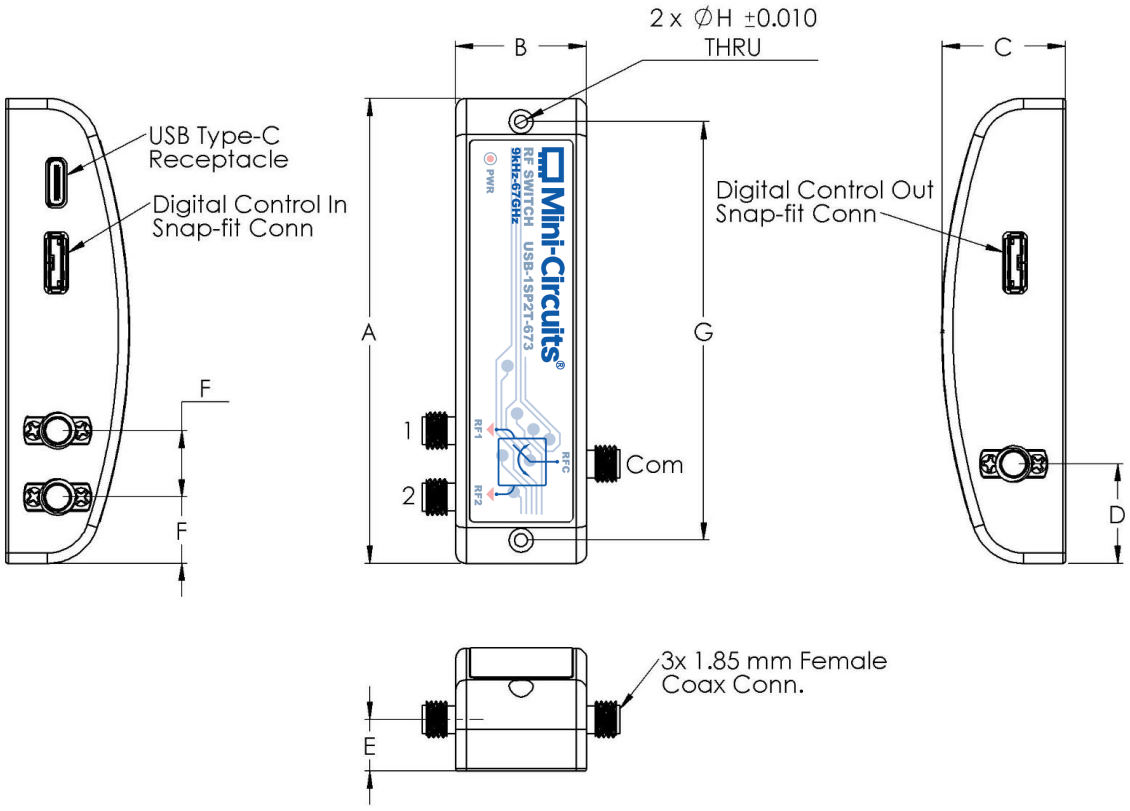



Switch in COM to 2 state

# USB RF SPDT Switch

**USB-1SP2T-673**

## OUTLINE DRAWING (WP3211)

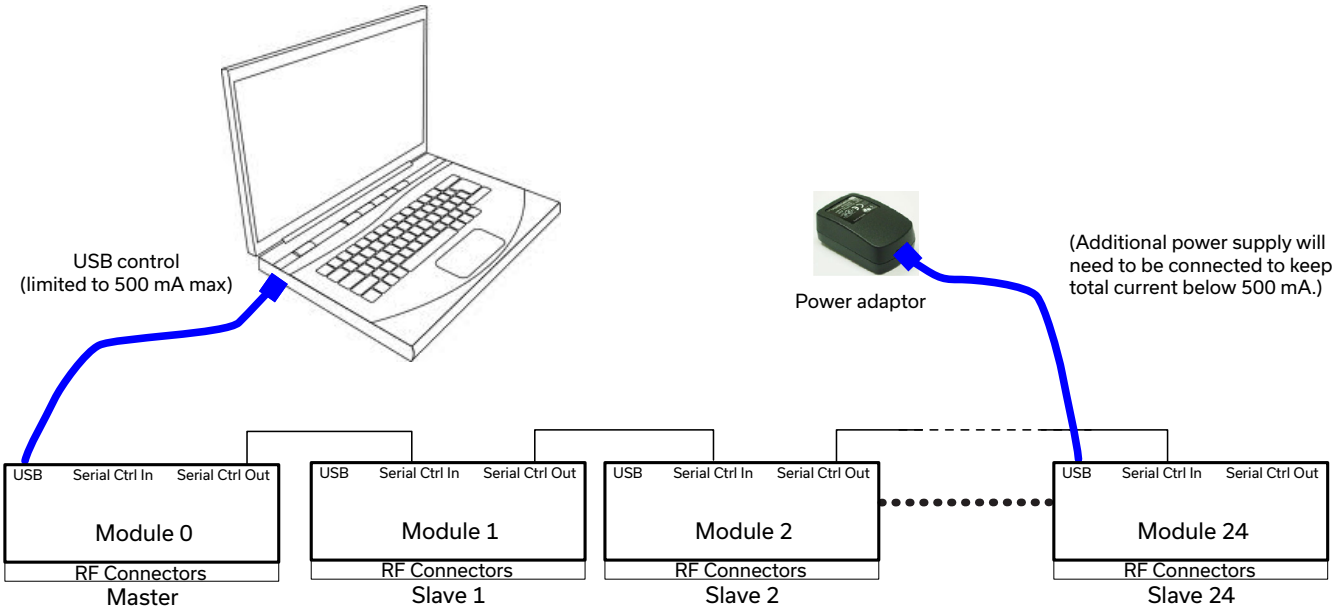



## OUTLINE DIMENSIONS ( INCH / MM )

| A | B | C | D | E | F | G | H | weight |
|---|---|---|---|---|---|---|---|---|
| **3.50** | **0.984** | **0.925** | **0.75** | **0.389** | **0.50** | **3.15** | **0.96** | grams |
| 88.90 | 25.000 | 23.500 | 19.00 | 9.900 | 12.70 | 80.00 | 2.44 | 94 |

## CONNECTING MULTIPLE MODULES (DAISY CHAIN)

The USB-1SP2T-673 model is designed to connect up to 25 modules in series (daisy chain) using dynamic addressing, meaning there is no need to specifically set the address of the modules. The addresses will be set automatically as part of establishing the communications with the computer. The module connected to the computer's USB port will be assigned address 0 (master), the first module connected to it will get address 1 (slave) and subsequent modules incrementing up to address 24 (slave).




Connections between modules will be made using the serial in/out ports with the module connected to the PC act as a master and all other as slave modules. All control will be through the master module (address 0) which is the only one communicating with the PC. Serial control out port of each module should be connected to the serial control in port of the next module.

Power will be supplied from the PC via the master module up to a maximum of 500 mA. Generally, additional power supply will be needed to keep total current below 500 mA. All power supplies should be connected to the module via the module's USB port. Connecting an additional power supply will automatically cut off power draw from the serial control in port for that module.

The serial master/slave bus allows connecting modules of different types to the same daisy chain as long as all support Mini-Circuits Dynamic addressing setup. To add a new module to the setup, simply connect the module and refresh the address listing, no need to reset any of the existing modules or assign addresses manually.

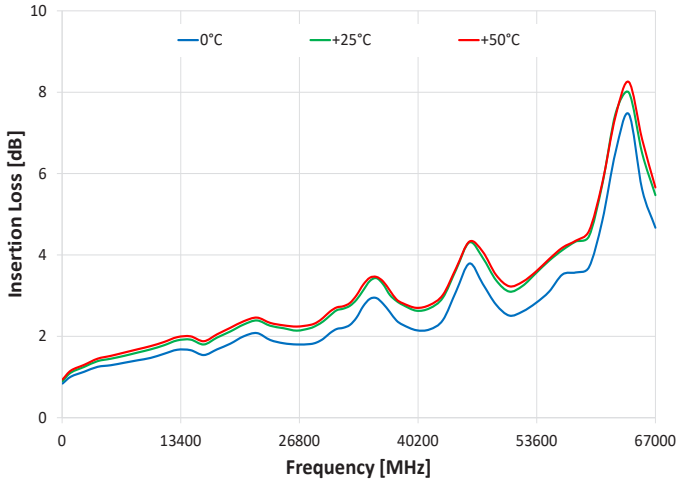
Note: Different module types may have different current consumption which will change the number of units which can be connected before an additional power supply is needed.

# USB RF SPDT Switch

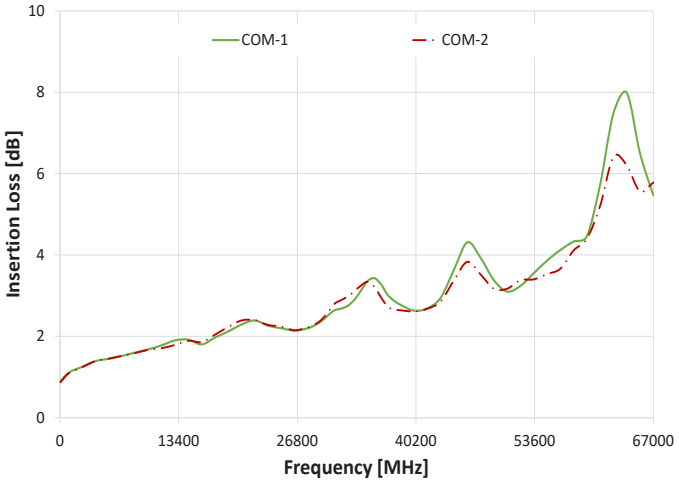
**USB-1SP2T-673**

## TYPICAL PERFORMANCE CURVES

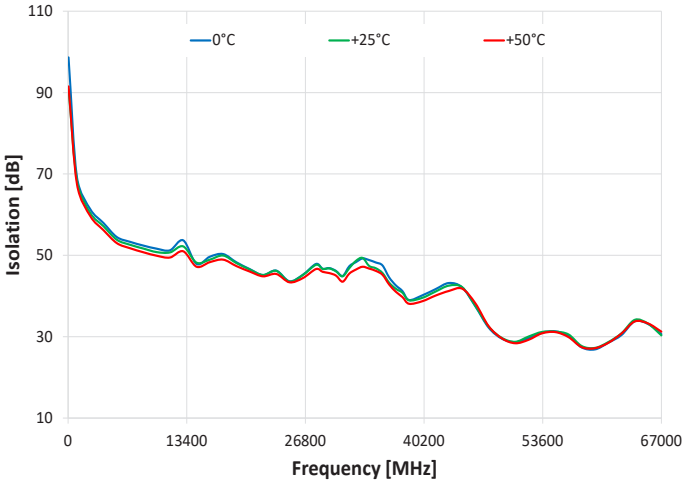
### Insertion Loss over Temperature (J1 Active)



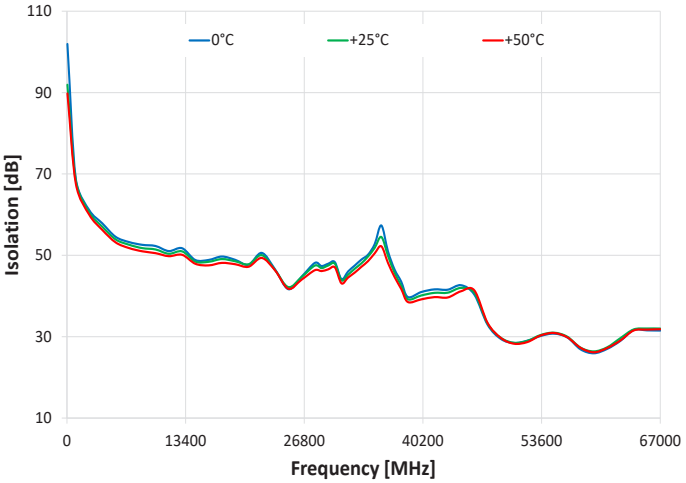

### Insertion Loss J1 - J2 Active



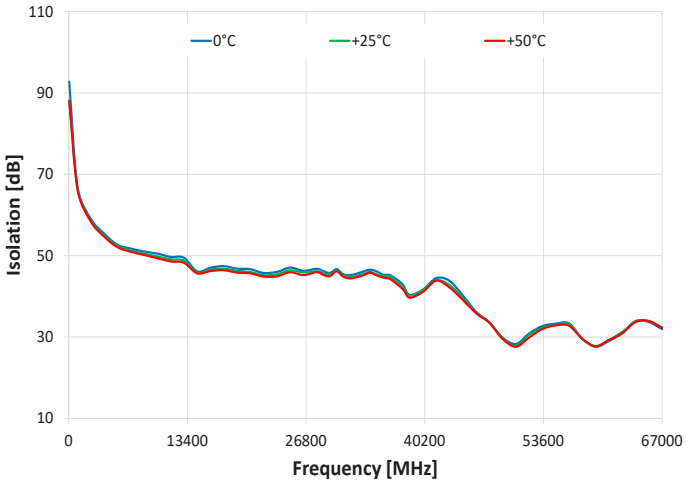

### Isolation Com to J1 (J2 Active)




### Isolation Com to J2 (J1 Active)

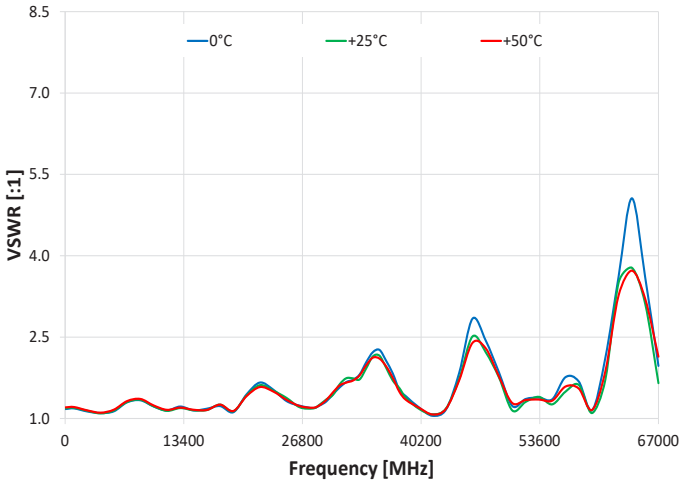



### Isolation J2 to J1 (J2 Active)

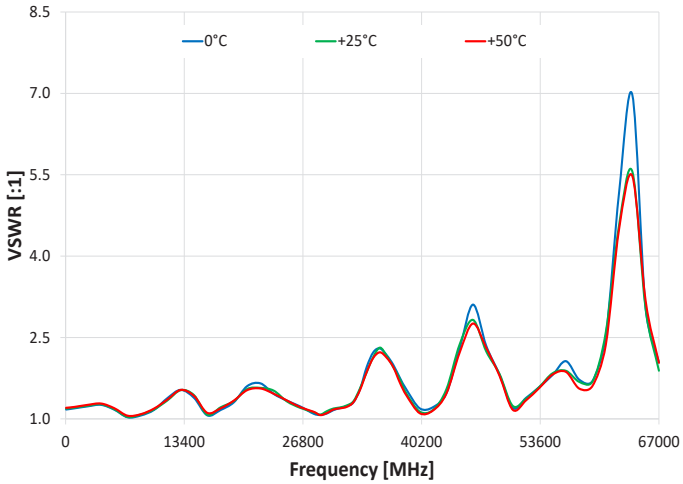


## TYPICAL PERFORMANCE CURVES (CONTINUED)

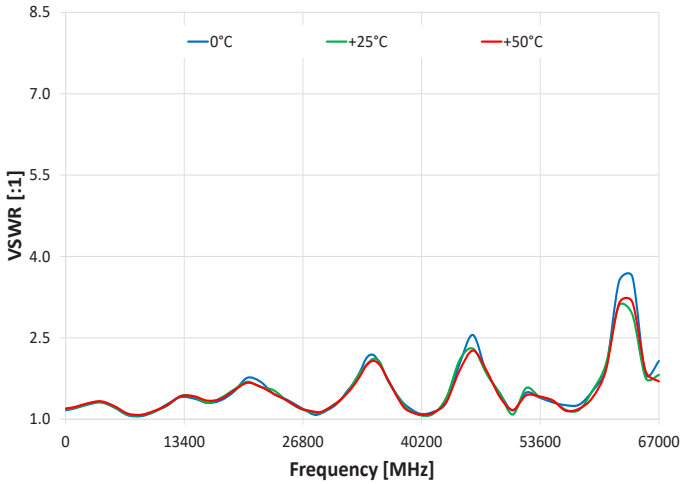
VSWR @ COM over Temperature (J1 Active)




VSWR @ J1 over Temperature (J1 Active)




VSWR @ J2 over Temperature (J2 Active)



## SOFTWARE SPECIFICATIONS

### SOFTWARE & DOCUMENTATION DOWNLOAD:

- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge from: https://www.minicircuits.com/softwaredownload/solidstate.html
- Please contact testsolutions@minicircuits.com for support

### MINIMUM SYSTEM REQUIREMENTS:

| Parameter | Requirements | |
|---|---|---|
| Interface | USB HID or Daisy Chain dynamic addressing | |
| System Requirements | GUI | Windows 98 or later |
| | USB API DLL | Windows 98 or later and programming environment with ActiveX or .NET support |
| | USB Direct Programming | Linux, Windows 98 or later |
| | Daisy Chain dynamic addressing | An additional Mini-Circuits model supporting dynamic addressing |
| Hardware | Pentium II or later with 256 MB RAM | |

## APPLICATION PROGRAMMING INTERFACE (API)

### USB SUPPORT (WINDOWS):

- ActiveX COM DLL file for creation of 32-bit programs
- .NET library DLL file for creation of 32 / 64-bit programs
- Supported by most common programming environments (refer to application note AN-49-001 for summary of suported environments)

### USB SUPPORT (LINUX):

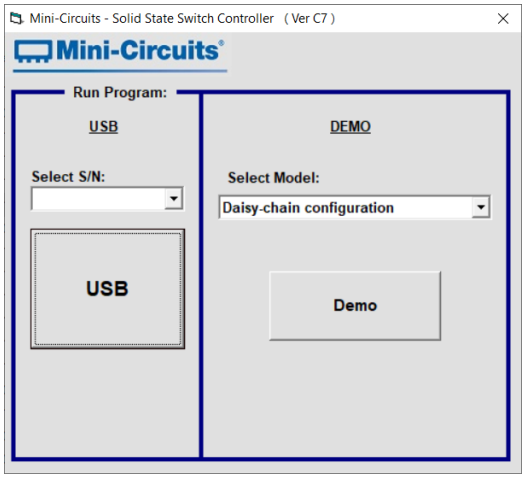
- Direct USB programming using a series of USB interrupt codes
- Full programming instructions and examples available for a wide range of programming environments / languages.

# USB RF SPDT Switch

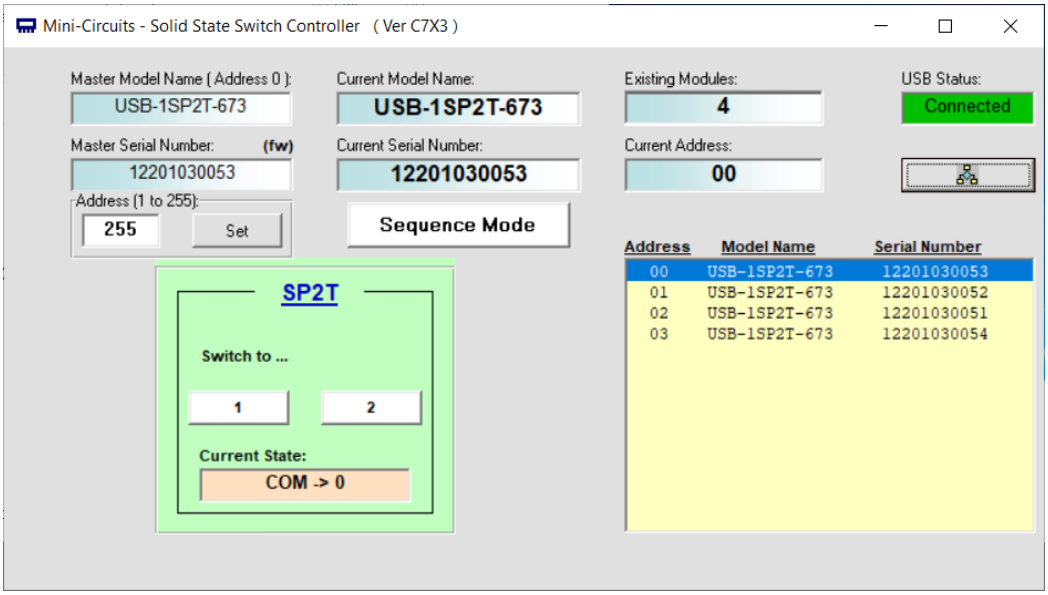
**USB-1SP2T-673**

## GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS - KEY FEATURES

- Connect via USB
- Run GUI in "demo mode" to evaluate software without a hardware connection




- View and set switch states at the click of a button
- Control up to 25 units from a single USB control
- Configure and run timed switching sequences
- Set start-up switch state



## ORDERING INFORMATION

Please contact Mini-Circuits' Test Solutions department for price and availability: testsolutions@minicircuits.com

| Model | Description |
|---|---|
| USB-1SP2T-673 | USB RF SPDT switch |

| Included Accessories | Part No. | Description |
|---|---|---|
|  | USB-CBL-AC-3+ | 3.3 ft (1.0 m) USB cable: USB type A (Male) to USB type C (Male) |

## OPTIONAL ACCESSORIES

| | |
|---|---|
| USB-CBL-AC-3+ | 3.3 ft (1.0 m) USB Cable: USB type A (Male) to USB type C (Male) |
| CBL-1.5FT-MMD+ | 1.5 ft (0.45 m) cable assembly for serial control Daisy Chain with snap fit connectors |
| USB-AC/DC-5+ | AC/DC +5V power adaptor with USB connector [8, 9] |

8. The power adaptor may be used to provide additional power via USB port when connecting several units in daisy chain.
9. Includes power plugs for US, UK, EU, IL, AU & China. Plugs for other countries are also available. If you need a power cord for a country not listed please contact testsolutions@minicircuits.com

**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 https://www.minicircuits.com/terms/viewterm.html

# Solid State
# USB RF SPDT Switch USB-1SP2T-673

## *Typical Performance Data*

TEST CONDITIONS: @Temperature = 0°C, Pin = 0 dBm

| Frequency (MHz) | Insertion Loss (dB) | | VSWR, Active Ports (:1) | | |
|---|---|---|---|---|---|
| | COM-1 | COM-2 | COM | J1 | J2 |
| 50 | 0.80 | 0.77 | 1.18 | 1.19 | 1.18 |
| 1000 | 1.00 | 0.99 | 1.18 | 1.19 | 1.20 |
| 2500 | 1.11 | 1.10 | 1.14 | 1.23 | 1.26 |
| 4000 | 1.24 | 1.24 | 1.10 | 1.26 | 1.31 |
| 5500 | 1.29 | 1.29 | 1.12 | 1.19 | 1.24 |
| 7000 | 1.34 | 1.33 | 1.28 | 1.04 | 1.09 |
| 8500 | 1.41 | 1.39 | 1.34 | 1.05 | 1.05 |
| 10000 | 1.47 | 1.46 | 1.25 | 1.15 | 1.12 |
| 11500 | 1.56 | 1.49 | 1.14 | 1.37 | 1.27 |
| 13000 | 1.66 | 1.54 | 1.22 | 1.52 | 1.39 |
| 14500 | 1.64 | 1.60 | 1.16 | 1.40 | 1.39 |
| 16000 | 1.54 | 1.59 | 1.15 | 1.12 | 1.32 |
| 17500 | 1.65 | 1.72 | 1.23 | 1.13 | 1.34 |
| 19000 | 1.81 | 1.90 | 1.12 | 1.26 | 1.46 |
| 20500 | 1.97 | 2.08 | 1.40 | 1.58 | 1.75 |
| 22000 | 2.11 | 2.13 | 1.67 | 1.70 | 1.75 |
| 23500 | 1.93 | 1.94 | 1.57 | 1.48 | 1.48 |
| 25000 | 1.84 | 1.90 | 1.35 | 1.35 | 1.39 |
| 26500 | 1.80 | 1.81 | 1.24 | 1.26 | 1.25 |
| 28000 | 1.80 | 1.82 | 1.20 | 1.11 | 1.08 |
| 28750 | 1.84 | 1.87 | 1.22 | 1.10 | 1.12 |
| 29500 | 1.92 | 1.96 | 1.29 | 1.08 | 1.15 |
| 30250 | 2.04 | 2.10 | 1.40 | 1.14 | 1.19 |
| 31000 | 2.16 | 2.30 | 1.53 | 1.20 | 1.32 |
| 31750 | 2.20 | 2.39 | 1.64 | 1.22 | 1.47 |
| 32500 | 2.26 | 2.49 | 1.69 | 1.27 | 1.61 |
| 33250 | 2.41 | 2.65 | 1.78 | 1.46 | 1.81 |
| 34000 | 2.67 | 2.84 | 2.00 | 1.84 | 2.06 |
| 34750 | 2.90 | 2.94 | 2.23 | 2.19 | 2.21 |
| 35500 | 2.96 | 2.83 | 2.30 | 2.32 | 2.11 |
| 36250 | 2.84 | 2.58 | 2.10 | 2.23 | 1.85 |
| 37000 | 2.66 | 2.37 | 1.91 | 2.09 | 1.64 |
| 37750 | 2.44 | 2.21 | 1.59 | 1.79 | 1.40 |
| 38500 | 2.32 | 2.19 | 1.43 | 1.60 | 1.30 |
| 40000 | 2.16 | 2.14 | 1.25 | 1.25 | 1.13 |
| 41500 | 2.16 | 2.16 | 1.07 | 1.19 | 1.14 |
| 43000 | 2.32 | 2.28 | 1.15 | 1.41 | 1.25 |
| 44500 | 3.02 | 2.80 | 1.72 | 2.12 | 1.87 |
| 46000 | 3.75 | 3.33 | 2.67 | 3.10 | 2.61 |
| 47500 | 3.38 | 2.97 | 2.55 | 2.54 | 2.00 |
| 49000 | 2.85 | 2.68 | 1.93 | 1.83 | 1.51 |
| 50500 | 2.50 | 2.60 | 1.28 | 1.27 | 1.20 |
| 52000 | 2.58 | 2.75 | 1.33 | 1.29 | 1.41 |
| 53500 | 2.81 | 2.76 | 1.43 | 1.61 | 1.43 |
| 55000 | 2.99 | 2.79 | 1.31 | 1.72 | 1.31 |
| 56500 | 3.53 | 3.03 | 1.78 | 2.14 | 1.32 |
| 58000 | 3.57 | 3.36 | 1.67 | 1.74 | 1.27 |
| 59500 | 3.68 | 3.68 | 1.16 | 1.63 | 1.49 |
| 61000 | 4.62 | 4.21 | 1.89 | 2.39 | 1.88 |
| 62500 | 6.29 | 5.31 | 2.97 | 4.42 | 3.11 |
| 64000 | 7.49 | 5.57 | 5.23 | 6.44 | 3.46 |
| 65500 | 5.93 | 4.71 | 4.33 | 3.47 | 1.84 |
| 67000 | 4.64 | 4.89 | 2.14 | 2.04 | 2.12 |

# Solid State
# USB RF SPDT Switch USB-1SP2T-673

## *Typical Performance Data*

TEST CONDITIONS: @Temperature = 0°C, Pin = 0 dBm

| Frequency (MHz) | Isolation @ Active states (dB) | | |
|---|---|---|---|
| | COM-1 | COM-2 | J2-J1 |
| 50 | 73.97 | 83.28 | 79.17 |
| 1000 | 69.56 | 69.19 | 67.28 |
| 2500 | 62.03 | 61.99 | 59.62 |
| 4000 | 58.27 | 58.22 | 55.65 |
| 5500 | 54.68 | 54.79 | 52.94 |
| 7000 | 53.35 | 53.40 | 51.79 |
| 8500 | 52.51 | 52.64 | 51.14 |
| 10000 | 51.77 | 52.51 | 50.56 |
| 11500 | 51.28 | 51.02 | 49.74 |
| 13000 | 53.62 | 51.75 | 49.21 |
| 14500 | 48.45 | 49.12 | 46.58 |
| 16000 | 49.48 | 48.81 | 47.05 |
| 17500 | 50.11 | 49.37 | 47.25 |
| 19000 | 48.42 | 49.03 | 46.77 |
| 20500 | 46.77 | 47.87 | 46.64 |
| 22000 | 45.34 | 49.85 | 45.71 |
| 23500 | 46.25 | 46.93 | 46.18 |
| 25000 | 43.78 | 41.72 | 46.15 |
| 26500 | 44.79 | 45.10 | 46.65 |
| 28000 | 48.28 | 48.95 | 47.21 |
| 28750 | 47.07 | 47.11 | 46.37 |
| 29500 | 46.57 | 47.43 | 45.92 |
| 30250 | 46.66 | 48.38 | 46.56 |
| 31000 | 44.75 | 44.54 | 46.02 |
| 31750 | 46.56 | 45.36 | 44.79 |
| 32500 | 48.09 | 46.92 | 45.51 |
| 33250 | 49.10 | 48.46 | 46.01 |
| 34000 | 49.17 | 49.75 | 46.42 |
| 34750 | 47.89 | 51.80 | 46.31 |
| 35500 | 48.21 | 57.99 | 45.34 |
| 36250 | 45.19 | 52.90 | 45.30 |
| 37000 | 42.95 | 47.56 | 44.50 |
| 37750 | 41.57 | 44.22 | 43.26 |
| 38500 | 39.61 | 40.64 | 41.02 |
| 40000 | 40.25 | 41.10 | 41.54 |
| 41500 | 41.47 | 41.42 | 44.43 |
| 43000 | 43.56 | 41.70 | 44.06 |
| 44500 | 42.23 | 42.23 | 40.75 |
| 46000 | 38.59 | 41.82 | 36.75 |
| 47500 | 32.63 | 33.53 | 34.35 |
| 49000 | 29.67 | 29.75 | 30.52 |
| 50500 | 28.66 | 28.40 | 28.21 |
| 52000 | 29.37 | 28.89 | 30.39 |
| 53500 | 30.72 | 29.95 | 32.31 |
| 55000 | 31.44 | 30.79 | 33.40 |
| 56500 | 30.36 | 29.98 | 33.35 |
| 58000 | 27.39 | 26.83 | 29.69 |
| 59500 | 26.71 | 25.71 | 27.59 |
| 61000 | 28.23 | 26.81 | 28.75 |
| 62500 | 29.43 | 29.06 | 30.31 |
| 64000 | 33.97 | 31.89 | 34.11 |
| 65500 | 33.46 | 31.73 | 33.84 |
| 67000 | 30.84 | 31.44 | 32.30 |





Mini-Circuits®
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# Solid State
# USB RF SPDT Switch USB-1SP2T-673

## *Typical Performance Data*

TEST CONDITIONS: @Temperature = +25°C, Pin = 0 dBm

| Frequency (MHz) | Insertion Loss (dB) | | VSWR, Active Ports (:1) | | |
|---|---|---|---|---|---|
| | COM-1 | COM-2 | COM | J1 | J2 |
| 50 | 0.85 | 0.84 | 1.20 | 1.20 | 1.19 |
| 1000 | 1.10 | 1.08 | 1.20 | 1.21 | 1.21 |
| 2500 | 1.22 | 1.22 | 1.15 | 1.23 | 1.27 |
| 4000 | 1.37 | 1.37 | 1.10 | 1.27 | 1.32 |
| 5500 | 1.45 | 1.44 | 1.12 | 1.20 | 1.25 |
| 7000 | 1.51 | 1.51 | 1.28 | 1.05 | 1.10 |
| 8500 | 1.59 | 1.58 | 1.35 | 1.07 | 1.06 |
| 10000 | 1.67 | 1.67 | 1.25 | 1.18 | 1.15 |
| 11500 | 1.77 | 1.70 | 1.14 | 1.36 | 1.27 |
| 13000 | 1.88 | 1.76 | 1.19 | 1.45 | 1.34 |
| 14500 | 1.91 | 1.88 | 1.16 | 1.46 | 1.45 |
| 16000 | 1.80 | 1.86 | 1.15 | 1.17 | 1.33 |
| 17500 | 1.93 | 2.00 | 1.25 | 1.13 | 1.31 |
| 19000 | 2.12 | 2.21 | 1.15 | 1.31 | 1.49 |
| 20500 | 2.28 | 2.39 | 1.39 | 1.61 | 1.77 |
| 22000 | 2.40 | 2.41 | 1.61 | 1.62 | 1.65 |
| 23500 | 2.26 | 2.28 | 1.52 | 1.45 | 1.46 |
| 25000 | 2.20 | 2.26 | 1.36 | 1.39 | 1.41 |
| 26500 | 2.16 | 2.17 | 1.22 | 1.23 | 1.22 |
| 28000 | 2.19 | 2.21 | 1.17 | 1.11 | 1.11 |
| 28750 | 2.25 | 2.27 | 1.23 | 1.09 | 1.11 |
| 29500 | 2.34 | 2.37 | 1.28 | 1.13 | 1.18 |
| 30250 | 2.47 | 2.53 | 1.46 | 1.15 | 1.22 |
| 31000 | 2.61 | 2.75 | 1.60 | 1.22 | 1.31 |
| 31750 | 2.66 | 2.85 | 1.68 | 1.27 | 1.50 |
| 32500 | 2.73 | 2.97 | 1.71 | 1.30 | 1.63 |
| 33250 | 2.85 | 3.07 | 1.76 | 1.45 | 1.76 |
| 34000 | 3.07 | 3.22 | 1.83 | 1.76 | 1.96 |
| 34750 | 3.30 | 3.32 | 2.07 | 2.13 | 2.15 |
| 35500 | 3.45 | 3.29 | 2.23 | 2.33 | 2.10 |
| 36250 | 3.34 | 3.04 | 2.10 | 2.21 | 1.84 |
| 37000 | 3.11 | 2.79 | 1.76 | 2.11 | 1.64 |
| 37750 | 2.87 | 2.65 | 1.52 | 1.69 | 1.33 |
| 38500 | 2.80 | 2.64 | 1.41 | 1.60 | 1.29 |
| 40000 | 2.64 | 2.61 | 1.26 | 1.19 | 1.14 |
| 41500 | 2.68 | 2.67 | 1.07 | 1.15 | 1.18 |
| 43000 | 2.88 | 2.81 | 1.10 | 1.38 | 1.25 |
| 44500 | 3.51 | 3.27 | 1.65 | 2.03 | 1.83 |
| 46000 | 4.27 | 3.84 | 2.34 | 3.12 | 2.65 |
| 47500 | 4.02 | 3.56 | 2.42 | 2.41 | 1.89 |
| 49000 | 3.44 | 3.19 | 1.66 | 1.71 | 1.42 |
| 50500 | 3.12 | 3.17 | 1.26 | 1.32 | 1.18 |
| 52000 | 3.20 | 3.34 | 1.27 | 1.25 | 1.35 |
| 53500 | 3.53 | 3.40 | 1.33 | 1.71 | 1.53 |
| 55000 | 3.73 | 3.44 | 1.31 | 1.70 | 1.29 |
| 56500 | 4.15 | 3.69 | 1.60 | 1.92 | 1.22 |
| 58000 | 4.34 | 4.13 | 1.60 | 1.53 | 1.25 |
| 59500 | 4.43 | 4.38 | 1.14 | 1.63 | 1.47 |
| 61000 | 5.47 | 5.06 | 1.74 | 2.33 | 1.86 |
| 62500 | 7.28 | 6.33 | 2.93 | 4.26 | 3.01 |
| 64000 | 8.03 | 6.30 | 4.22 | 5.39 | 3.04 |
| 65500 | 6.77 | 5.60 | 3.16 | 3.54 | 2.08 |
| 67000 | 5.51 | 5.75 | 2.04 | 2.00 | 1.80 |





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# Solid State
# USB RF SPDT Switch USB-1SP2T-673

## *Typical Performance Data*

TEST CONDITIONS: @Temperature = +25°C, Pin = 0 dBm

| Frequency (MHz) | Isolation @ Active states (dB) | | |
|---|---|---|---|
| | COM-1 | COM-2 | J2-J1 |
| 50 | 84.53 | 83.87 | 93.66 |
| 1000 | 68.57 | 68.80 | 66.35 |
| 2500 | 61.24 | 61.22 | 59.21 |
| 4000 | 57.36 | 57.40 | 55.25 |
| 5500 | 54.03 | 54.09 | 52.49 |
| 7000 | 52.67 | 52.72 | 51.40 |
| 8500 | 51.78 | 51.94 | 50.58 |
| 10000 | 50.89 | 51.53 | 49.88 |
| 11500 | 50.55 | 50.38 | 49.17 |
| 13000 | 52.30 | 51.09 | 48.63 |
| 14500 | 48.62 | 48.66 | 46.05 |
| 16000 | 48.81 | 48.34 | 46.57 |
| 17500 | 49.79 | 48.80 | 46.60 |
| 19000 | 48.32 | 48.68 | 46.25 |
| 20500 | 46.72 | 47.83 | 46.06 |
| 22000 | 45.30 | 49.66 | 45.18 |
| 23500 | 46.23 | 46.70 | 45.58 |
| 25000 | 43.75 | 42.06 | 45.85 |
| 26500 | 44.66 | 44.72 | 46.01 |
| 28000 | 47.85 | 48.01 | 46.43 |
| 28750 | 46.82 | 46.73 | 45.67 |
| 29500 | 46.24 | 46.77 | 45.47 |
| 30250 | 46.47 | 47.82 | 46.10 |
| 31000 | 44.77 | 44.28 | 45.39 |
| 31750 | 46.30 | 44.86 | 44.54 |
| 32500 | 48.15 | 46.39 | 44.96 |
| 33250 | 49.20 | 47.74 | 45.42 |
| 34000 | 48.04 | 49.13 | 45.67 |
| 34750 | 46.73 | 50.71 | 45.65 |
| 35500 | 46.12 | 54.96 | 44.92 |
| 36250 | 43.82 | 51.32 | 44.89 |
| 37000 | 41.97 | 46.71 | 43.92 |
| 37750 | 41.13 | 43.39 | 42.82 |
| 38500 | 39.42 | 39.93 | 40.44 |
| 40000 | 39.57 | 40.27 | 41.25 |
| 41500 | 40.82 | 40.77 | 43.71 |
| 43000 | 43.04 | 40.85 | 43.30 |
| 44500 | 42.15 | 41.69 | 40.16 |
| 46000 | 38.66 | 42.44 | 36.31 |
| 47500 | 32.82 | 33.86 | 34.37 |
| 49000 | 29.94 | 30.10 | 30.21 |
| 50500 | 28.69 | 28.46 | 27.84 |
| 52000 | 29.71 | 28.85 | 30.06 |
| 53500 | 31.06 | 30.18 | 31.95 |
| 55000 | 31.24 | 31.01 | 33.04 |
| 56500 | 30.64 | 30.08 | 33.21 |
| 58000 | 27.79 | 27.36 | 29.72 |
| 59500 | 27.02 | 26.15 | 27.69 |
| 61000 | 28.44 | 27.15 | 28.95 |
| 62500 | 29.89 | 29.47 | 30.62 |
| 64000 | 34.21 | 31.87 | 33.81 |
| 65500 | 33.73 | 32.14 | 34.11 |
| 67000 | 30.64 | 31.92 | 32.83 |





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# Solid State
# USB RF SPDT Switch USB-1SP2T-673

## *Typical Performance Data*

TEST CONDITIONS: @Temperature = +50°C, Pin = 0 dBm

| Frequency (MHz) | Insertion Loss (dB) | | VSWR, Active Ports (:1) | | |
|---|---|---|---|---|---|
| | COM-1 | COM-2 | COM | J1 | J2 |
| 50 | 0.91 | 0.90 | 1.20 | 1.21 | 1.20 |
| 1000 | 1.16 | 1.14 | 1.21 | 1.22 | 1.22 |
| 2500 | 1.28 | 1.28 | 1.16 | 1.25 | 1.28 |
| 4000 | 1.43 | 1.43 | 1.11 | 1.28 | 1.33 |
| 5500 | 1.51 | 1.51 | 1.14 | 1.22 | 1.26 |
| 7000 | 1.59 | 1.58 | 1.30 | 1.07 | 1.12 |
| 8500 | 1.66 | 1.65 | 1.37 | 1.07 | 1.07 |
| 10000 | 1.75 | 1.73 | 1.26 | 1.19 | 1.15 |
| 11500 | 1.85 | 1.79 | 1.16 | 1.35 | 1.26 |
| 13000 | 1.96 | 1.86 | 1.20 | 1.49 | 1.38 |
| 14500 | 1.99 | 1.96 | 1.16 | 1.44 | 1.43 |
| 16000 | 1.88 | 1.96 | 1.14 | 1.17 | 1.37 |
| 17500 | 2.01 | 2.10 | 1.26 | 1.14 | 1.34 |
| 19000 | 2.21 | 2.31 | 1.14 | 1.31 | 1.49 |
| 20500 | 2.35 | 2.45 | 1.37 | 1.54 | 1.69 |
| 22000 | 2.47 | 2.50 | 1.60 | 1.61 | 1.66 |
| 23500 | 2.35 | 2.37 | 1.52 | 1.44 | 1.46 |
| 25000 | 2.30 | 2.35 | 1.37 | 1.38 | 1.39 |
| 26500 | 2.25 | 2.27 | 1.23 | 1.24 | 1.23 |
| 28000 | 2.27 | 2.31 | 1.19 | 1.13 | 1.13 |
| 28750 | 2.32 | 2.37 | 1.23 | 1.10 | 1.14 |
| 29500 | 2.43 | 2.48 | 1.32 | 1.11 | 1.17 |
| 30250 | 2.56 | 2.64 | 1.44 | 1.13 | 1.21 |
| 31000 | 2.69 | 2.85 | 1.58 | 1.19 | 1.31 |
| 31750 | 2.72 | 2.93 | 1.65 | 1.23 | 1.46 |
| 32500 | 2.79 | 3.03 | 1.68 | 1.26 | 1.55 |
| 33250 | 2.94 | 3.18 | 1.75 | 1.44 | 1.74 |
| 34000 | 3.20 | 3.37 | 1.93 | 1.78 | 1.96 |
| 34750 | 3.40 | 3.45 | 2.09 | 2.12 | 2.11 |
| 35500 | 3.49 | 3.36 | 2.14 | 2.25 | 2.06 |
| 36250 | 3.39 | 3.15 | 1.98 | 2.17 | 1.84 |
| 37000 | 3.19 | 2.92 | 1.81 | 2.02 | 1.61 |
| 37750 | 2.96 | 2.76 | 1.55 | 1.70 | 1.35 |
| 38500 | 2.84 | 2.73 | 1.38 | 1.51 | 1.21 |
| 40000 | 2.71 | 2.72 | 1.21 | 1.14 | 1.10 |
| 41500 | 2.75 | 2.78 | 1.08 | 1.14 | 1.13 |
| 43000 | 2.96 | 2.94 | 1.14 | 1.37 | 1.25 |
| 44500 | 3.55 | 3.34 | 1.60 | 2.06 | 1.82 |
| 46000 | 4.28 | 3.88 | 2.31 | 2.92 | 2.43 |
| 47500 | 4.14 | 3.73 | 2.37 | 2.48 | 1.98 |
| 49000 | 3.56 | 3.35 | 1.84 | 1.77 | 1.45 |
| 50500 | 3.26 | 3.39 | 1.34 | 1.25 | 1.20 |
| 52000 | 3.30 | 3.51 | 1.31 | 1.25 | 1.35 |
| 53500 | 3.57 | 3.53 | 1.40 | 1.60 | 1.45 |
| 55000 | 3.79 | 3.58 | 1.33 | 1.70 | 1.32 |
| 56500 | 4.19 | 3.79 | 1.57 | 1.81 | 1.16 |
| 58000 | 4.36 | 4.20 | 1.54 | 1.50 | 1.22 |
| 59500 | 4.57 | 4.53 | 1.17 | 1.57 | 1.36 |
| 61000 | 5.58 | 5.29 | 1.76 | 2.26 | 1.83 |
| 62500 | 7.22 | 6.37 | 2.85 | 3.93 | 2.79 |
| 64000 | 8.28 | 6.62 | 3.83 | 5.06 | 2.97 |
| 65500 | 7.10 | 5.98 | 3.57 | 3.23 | 1.94 |
| 67000 | 5.69 | 5.89 | 2.22 | 1.96 | 1.76 |

# Solid State
# USB RF SPDT Switch USB-1SP2T-673

## *Typical Performance Data*

TEST CONDITIONS: @Temperature = +50°C, Pin = 0 dBm

| Frequency (MHz) | Isolation @ Active states (dB) | | |
|---|---|---|---|
| | COM-1 | COM-2 | J2-J1 |
| 50 | 79.10 | 77.97 | 83.63 |
| 1000 | 67.77 | 68.49 | 66.66 |
| 2500 | 60.58 | 60.63 | 59.09 |
| 4000 | 56.52 | 56.67 | 54.98 |
| 5500 | 53.24 | 53.41 | 52.22 |
| 7000 | 51.79 | 51.95 | 51.11 |
| 8500 | 50.89 | 51.08 | 50.31 |
| 10000 | 49.99 | 50.55 | 49.49 |
| 11500 | 49.57 | 49.89 | 48.71 |
| 13000 | 51.01 | 50.15 | 48.09 |
| 14500 | 47.65 | 48.32 | 45.98 |
| 16000 | 48.24 | 47.49 | 46.20 |
| 17500 | 48.76 | 47.93 | 46.30 |
| 19000 | 47.48 | 47.96 | 45.79 |
| 20500 | 46.16 | 47.27 | 45.61 |
| 22000 | 44.97 | 48.90 | 44.80 |
| 23500 | 45.47 | 46.62 | 45.07 |
| 25000 | 43.52 | 41.86 | 45.29 |
| 26500 | 43.98 | 44.05 | 45.35 |
| 28000 | 46.84 | 46.91 | 46.15 |
| 28750 | 46.02 | 46.08 | 45.30 |
| 29500 | 45.42 | 46.07 | 45.04 |
| 30250 | 45.59 | 46.96 | 45.83 |
| 31000 | 43.63 | 43.53 | 45.23 |
| 31750 | 44.96 | 44.15 | 44.26 |
| 32500 | 46.23 | 45.19 | 44.64 |
| 33250 | 47.11 | 46.92 | 45.09 |
| 34000 | 47.18 | 48.21 | 45.61 |
| 34750 | 46.14 | 49.48 | 45.35 |
| 35500 | 45.96 | 52.21 | 44.57 |
| 36250 | 43.29 | 49.15 | 44.52 |
| 37000 | 41.50 | 45.38 | 43.52 |
| 37750 | 40.22 | 42.50 | 42.23 |
| 38500 | 38.42 | 39.31 | 40.03 |
| 40000 | 38.83 | 39.21 | 40.91 |
| 41500 | 39.82 | 39.59 | 43.42 |
| 43000 | 41.23 | 39.69 | 42.82 |
| 44500 | 41.61 | 40.61 | 39.48 |
| 46000 | 39.16 | 42.82 | 36.19 |
| 47500 | 33.10 | 34.04 | 34.08 |
| 49000 | 29.85 | 30.10 | 30.01 |
| 50500 | 28.43 | 28.34 | 27.64 |
| 52000 | 28.98 | 28.54 | 29.39 |
| 53500 | 30.58 | 30.03 | 31.79 |
| 55000 | 31.17 | 30.95 | 32.85 |
| 56500 | 30.07 | 29.98 | 32.76 |
| 58000 | 27.49 | 27.30 | 29.63 |
| 59500 | 26.93 | 25.96 | 27.70 |
| 61000 | 28.34 | 26.93 | 29.02 |
| 62500 | 29.85 | 28.86 | 30.35 |
| 64000 | 33.55 | 31.55 | 33.63 |
| 65500 | 33.49 | 31.94 | 34.03 |
| 67000 | 31.51 | 31.82 | 32.68 |





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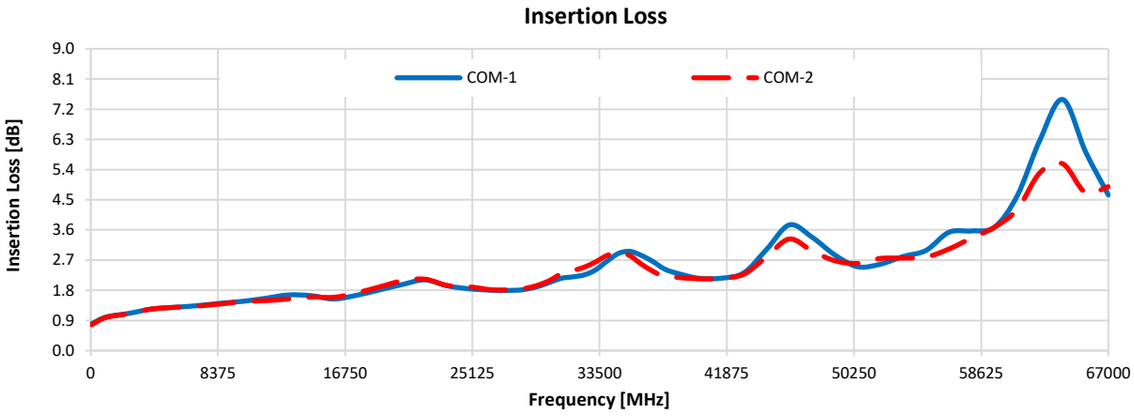
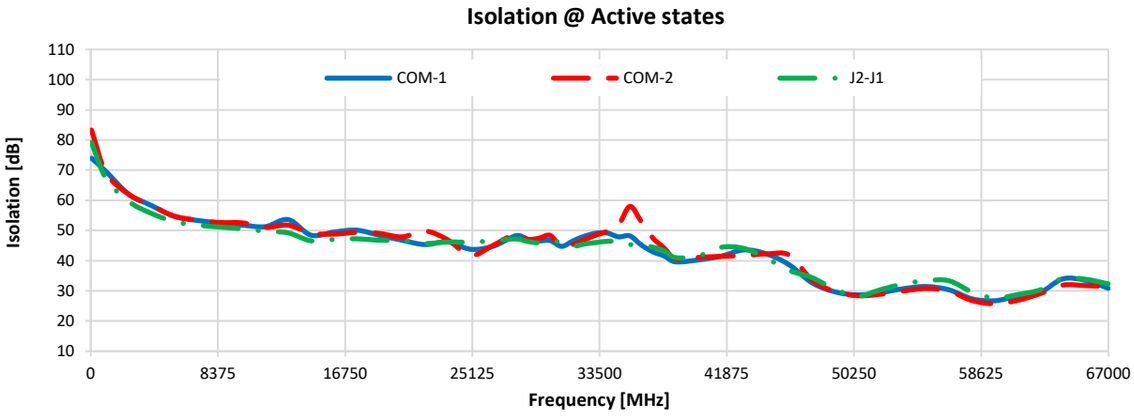
# USB RF SPDT Switch

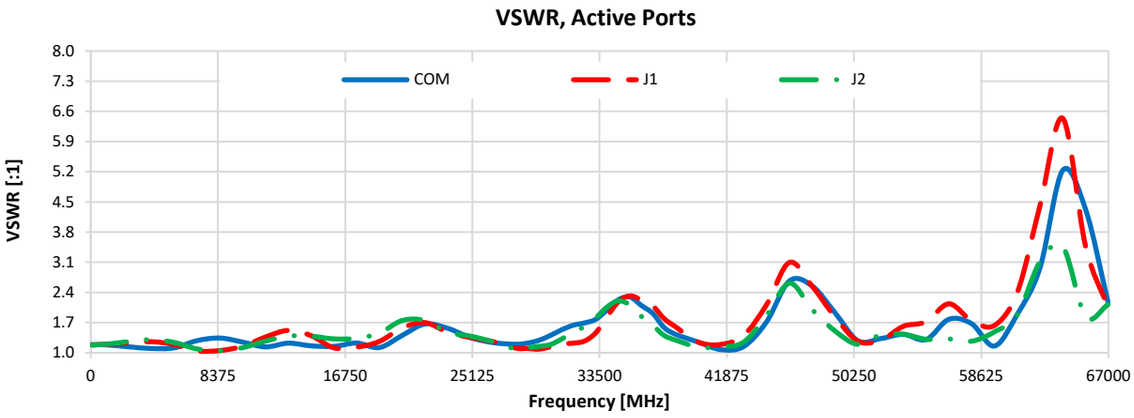
# USB-1SP2T-673

## Typical Performance Curves

Test Conditions: @ Temperature = 0°C, pin = 0 dBm



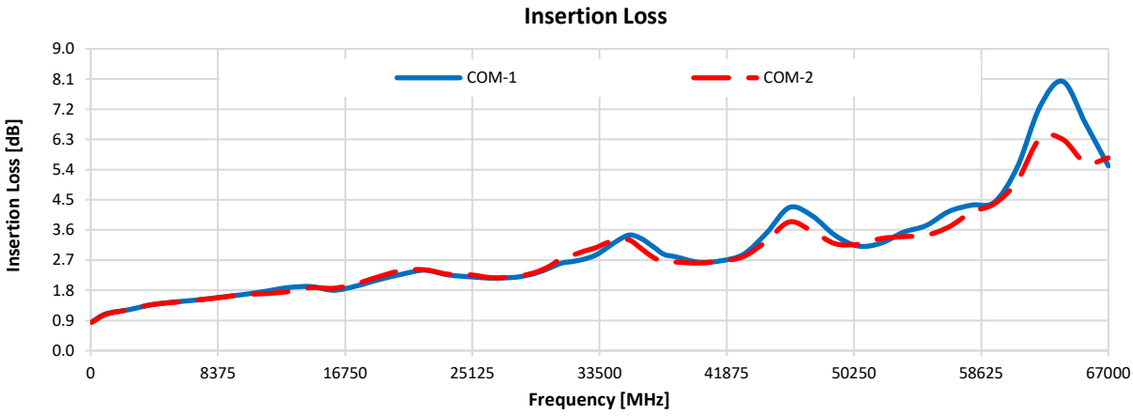



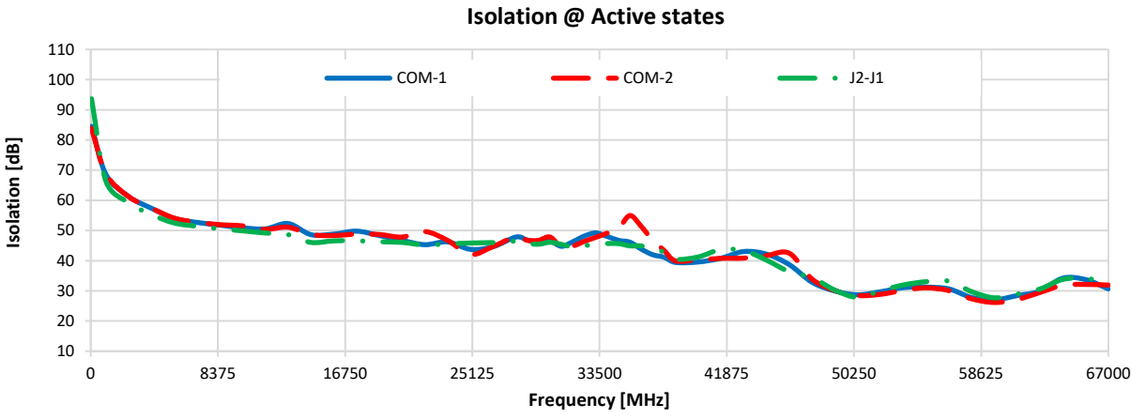
# USB RF SPDT Switch

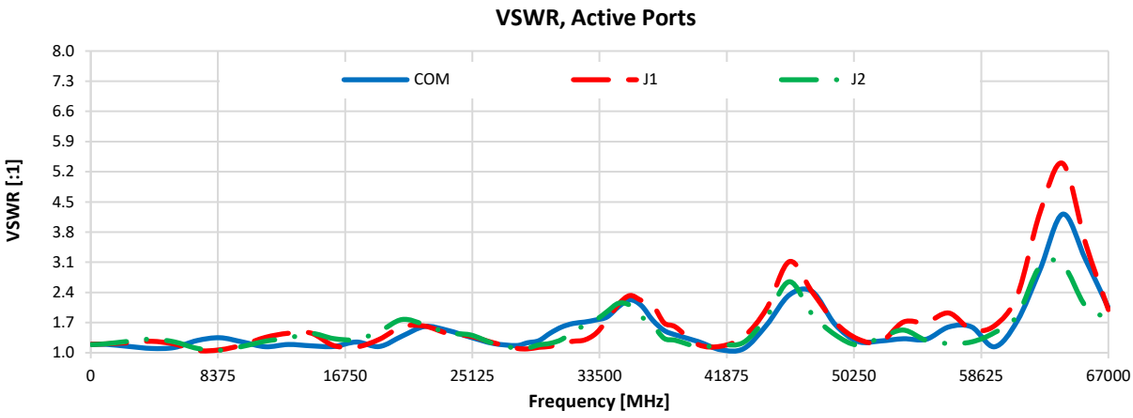
**USB-1SP2T-673**

## Typical Performance Curves

Test Conditions: @ Temperature = +25°C, pin = 0 dBm



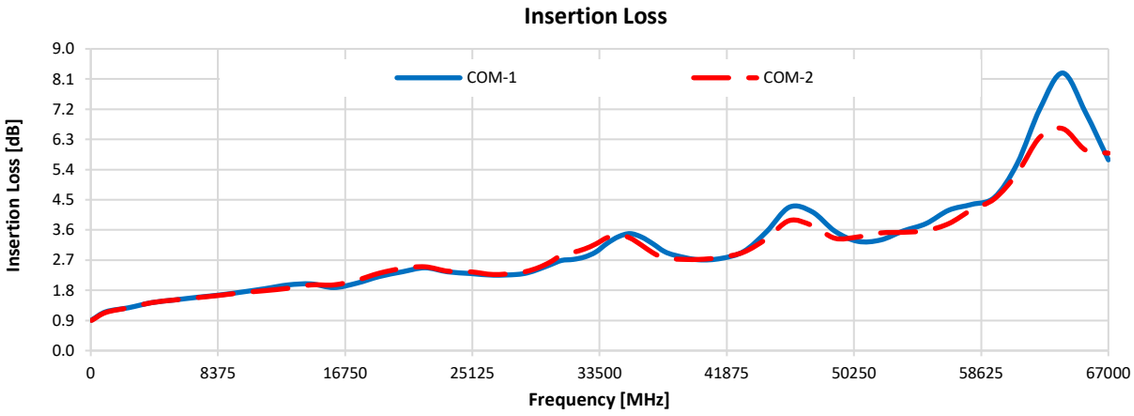



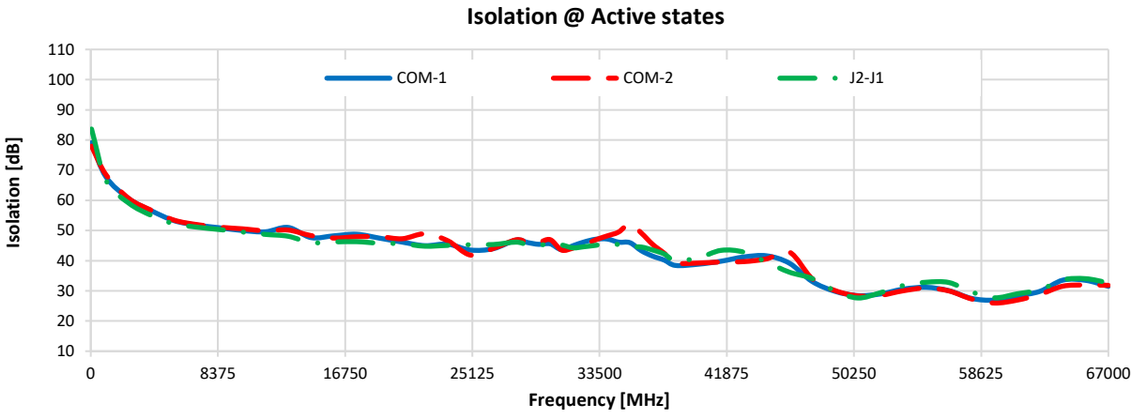
# USB RF SPDT Switch

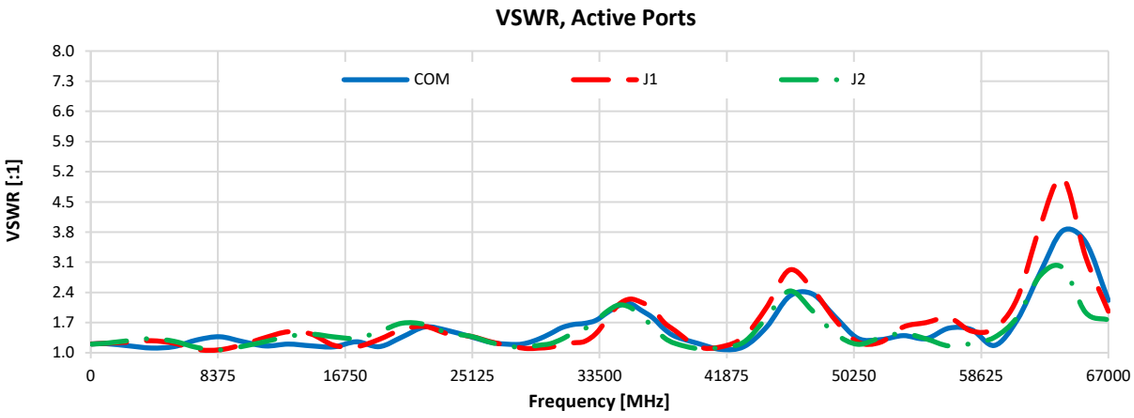
**USB-1SP2T-673**

## Typical Performance Curves

Test Conditions: @ Temperature = +50°C, pin = 0 dBm

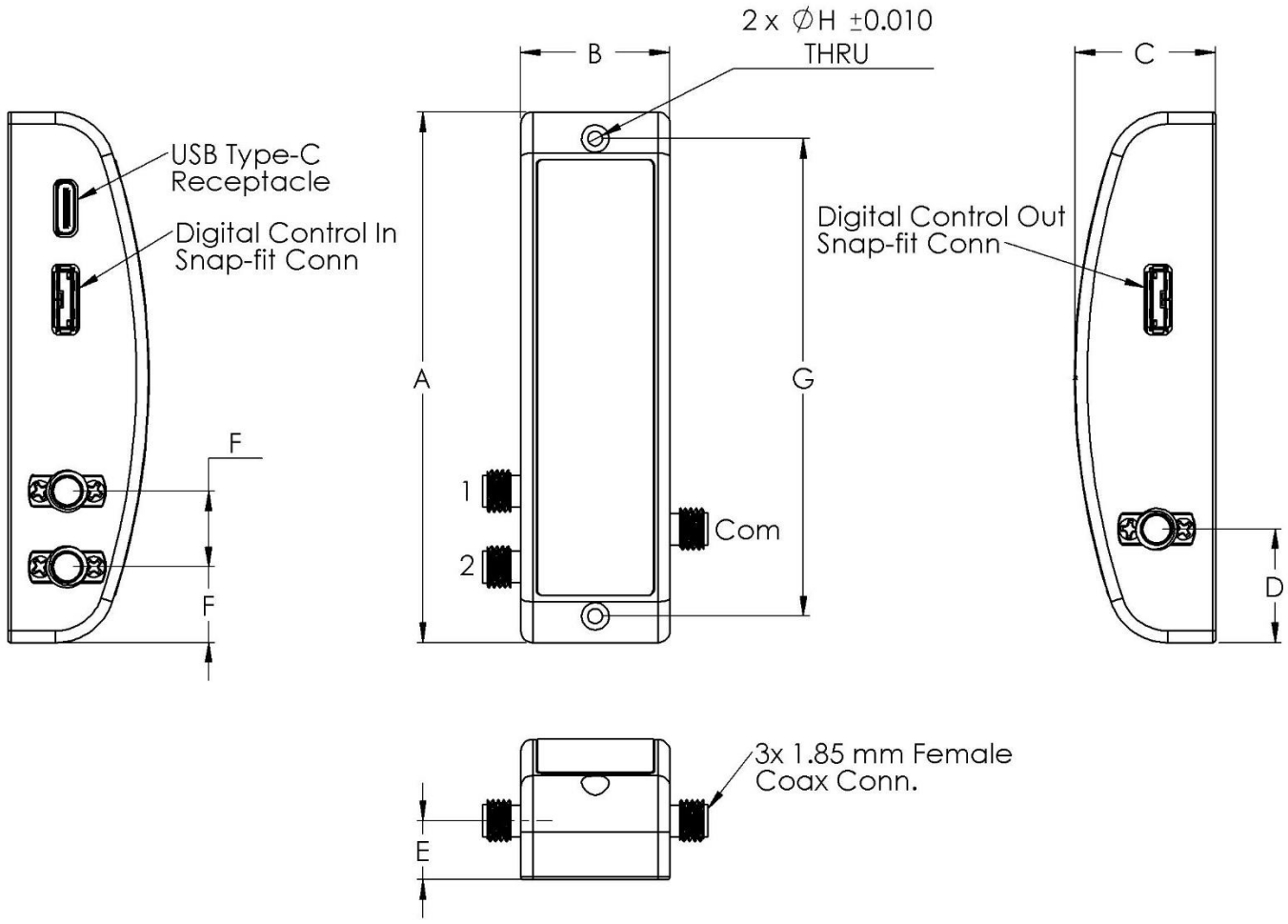


# Case Style WP

## Outline Dimensions WP3211




| CASE# | A | B | C | D | E | F | G | H | WT. GRAMS |
|---|---|---|---|---|---|---|---|---|---|
| WP3211 | 3.500 (88.9) | .984 (25.0) | .925 (23.5) | .750 (19.0) | .389 (9.9) | .500 (12.7) | 3.150 (80.0) | .096 (2.44) | 94 |

**Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015**

**Notes:**

1. Case material: Nickel Plated Aluminum.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**Environmental Specifications** **ENV55**

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 | -0° to 50° C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -20° to 60° C<br>Ambient Environment | Individual Model Data Sheet |
| Operating and Storage Humidity | 5% to 85% RH (non-condensing) | Ambient |
| Bench Handling Test | Bench Top Tip 45° & Drop | MIL-PRF-28800F |
| Transit Drop Test | Free Fall Drop, 20 cm (7.9 inches) | MIL-PRF-28800F Class 3 |