

Solid state

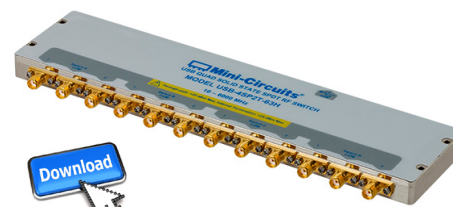
# USB RF SPDT Switch Matrix

## USB-4SP2T-63H

50Ω 10 to 6000 MHz

### The Big Deal

- Very high isolation, 80 dB typ
- High speed switch transition, 200 ns typ
- High power handling, +30 dBm max
- Daisy-chain control of up to 35 modules



Software Package  
Case Style: QM2279

### Typical Applications

- Cellular handset / BTS testing
- High volume production testing / ATE
- Design verification testing
- RF signal routing / switch matrices

Model No.	Description	Qty.
USB-4SP2T-63H	Switch Matrix	1

#### Included Accessories

MUSB-CBL-3+	2.6 ft USB cable	1
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**RoHS Compliant**

See our web site for RoHS Compliance methodologies and qualifications

### Product Overview

Mini-Circuits' USB-4SP2T-63H is a low cost, USB controlled, solid state matrix, containing four independent SPDT RF switches. Each fast switching, absorptive switch operates from 10 MHz to 6000 MHz with 200 ns typical switch transition speed. High linearity (+50 dBm typ IP3), and high isolation (80 dB typical) allow the model to be used for a wide variety of RF applications.

Full software support is provided for USB control, 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). The latest version of the full software package can be downloaded from <https://www.minicircuits.com/softwaredownload/solidstate.html> at any time.

The USB-4SP2T-63H is housed in a compact, low profile, rugged metal case (8.4" x 2.00" x 0.475") with 12 SMA (F) connectors (COM, 1 and 2 for each switch), and a USB Mini-B port for power and control, and two data bus connectors for Master / Slave connections to other modules.

### Key Features

Feature	Advantages
Four RF SPDT absorptive switches	Wideband (10 to 6000 MHz) with low insertion loss (2.3 dB typ.), high isolation (80 dB typ), and high power rating (+30 dBm through path).
High Linearity (IP3 50 dBm typ.)	Results in little or negligible inter-modulation generation, meeting requirements for digital communications signals
Internal DC Blocking capacitors	No need for external DC blocking circuitry
Dynamic daisy-chain control	Simplify control software and interconnections by cascading up to 35 modules of multiple switch types into a Master / Slave chain with a single USB interface.
Full software support included	Mini-Circuits' full software package, programming and user manual are available for download from <a href="https://www.minicircuits.com/softwaredownload/solidstate.html">https://www.minicircuits.com/softwaredownload/solidstate.html</a> at no extra cost.

**Trademarks:** Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Linux is a registered trademark of Linus Torvalds. Pentium is a registered trademark of Intel Corporation. Neither Mini-Circuits nor the Mini-Circuits USB-4SP2T-63H are affiliated with or endorsed by the owners of the above referenced trademarks

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## Electrical Specifications @ 0 to 50°C

Parameter	Port	Conditions	Min.	Typ.	Max.	Units
Operating Frequency			10		6000	MHz
Insertion Loss	COM to any active port	10 to 700 MHz	-	1.6	2.8	dB
		700 to 2500 MHz	-	2.0	3.2	
		2500 to 5000 MHz	-	2.8	4.0	
		5000 to 6000 MHz	-	3.0	4.2	
Isolation	Between ports 1 and 2 of each switch	10 to 700 MHz	82	100	-	dB
		700 to 2500 MHz	67	82	-	
		2500 to 5000 MHz	55	65	-	
		5000 to 6000 MHz	50	61	-	
	COM to any terminated port	10 to 700 MHz	85	100	-	
		700 to 2500 MHz	70	85	-	
		2500 to 5000 MHz	58	70	-	
		5000 to 6000 MHz	52	63	-	
	Between adjacent switches	10 to 6000 MHz	63	100	-	
	VSWR	COM port	10 to 700 MHz	-	1.25	
700 to 2500 MHz			-	1.25	-	
2500 to 5000 MHz			-	1.25	-	
5000 to 6000 MHz			-	1.25	-	
Any port connected to COM		10 to 700 MHz	-	1.25	-	
		700 to 2500 MHz	-	1.25	-	
		2500 to 5000 MHz	-	1.25	-	
		5000 to 6000 MHz	-	1.25	-	
Any terminated port		10 to 700 MHz	-	1.15	-	
		700 to 2500 MHz	-	1.15	-	
		2500 to 5000 MHz	-	1.20	-	
		5000 to 6000 MHz	-	1.30	-	
Power Input @ 1 dB Compression <sup>1,2</sup>	COM to any active port	100 to 6000 MHz	-	38	-	dBm
IP3 <sup>2,3</sup>	COM to any active port	100 to 6000 MHz	-	50	-	dBm
Transition Time <sup>4</sup>	-	-	-	200	300	ns
Minimum dwell time <sup>5</sup>	High Speed Mode	-	-	25	-	µs
Switching Time (USB) <sup>6</sup>	-	-	-	2	-	ms
Supply voltage (Vcc) <sup>7</sup>	USB port	-	4.75	5	5.25	V <sub>DC</sub>
Supply Current (Icc) <sup>7</sup>		-	-	55	85	mA
Current Pass-through <sup>8</sup>		-	-	-	500	
Operating RF Input Power <sup>1</sup>		Any active port to COM port	Hot Switching	-	-	+23
	Any active port to COM port	Cold Switching	-	-	+30	
	Any terminated port	-	-	-	+23	
	COM to any port	-	-	-	+30	

<sup>1</sup> Max power at through path derates linearly from +30 dBm @ 40 MHz to +23 dBm @ 10 MHz

<sup>2</sup> Compression and IP3 may degrade below 100 MHz.

<sup>3</sup> IP3 is tested with 1 MHz span between signals.

<sup>4</sup> Transition time spec represents the time that the RF signal paths are interrupted during switching and thus is specified without communication delays.

<sup>5</sup> Minimum dwell time is the shortest time that can be achieved between 2 switch transitions when programming an automated switch sequence.

<sup>6</sup> 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.

<sup>7</sup> Current consumption specified for a single unit without any slave modules.

<sup>8</sup> Pass through current is the maximum 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 4 for details.

## Absolute Maximum Ratings

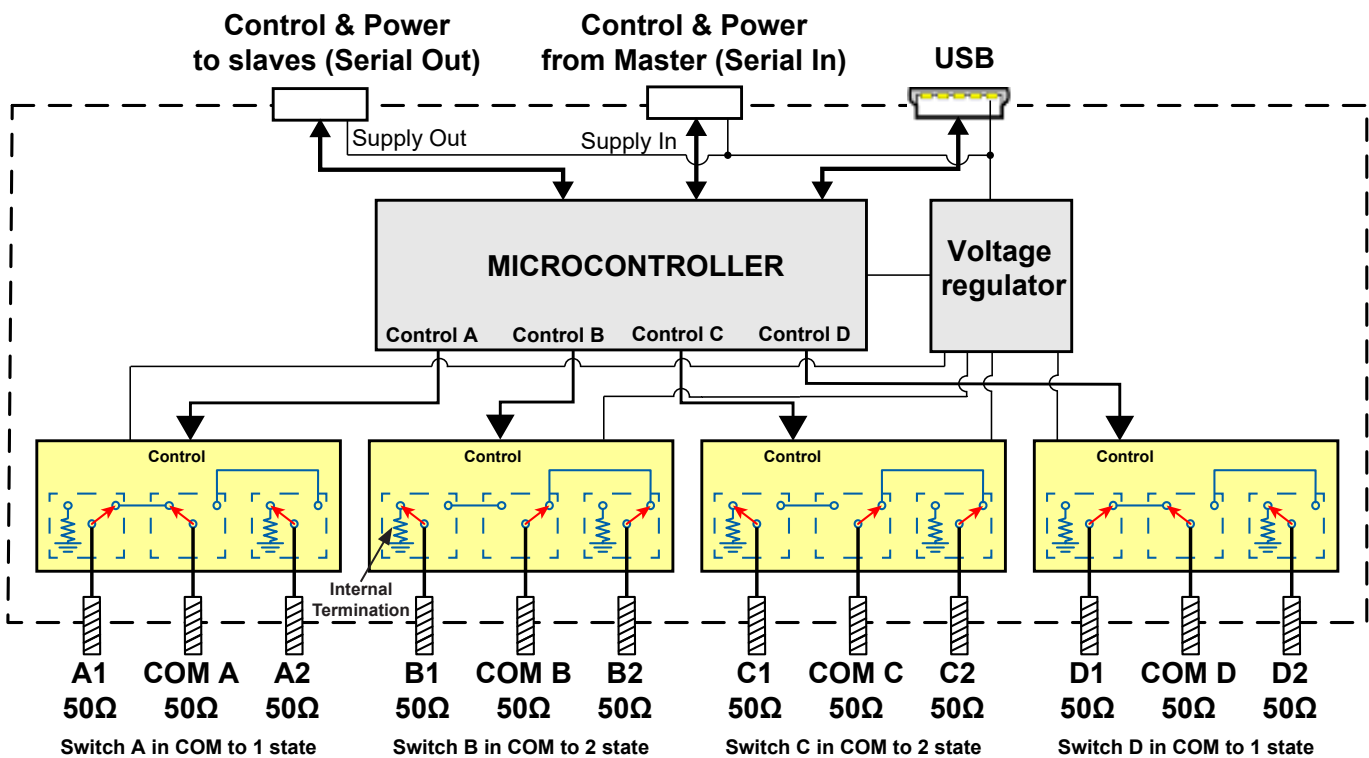
Operating Temperature		0°C to 50°C
Storage Temperature		-20°C to 60°C
DC supply voltage max.		6V
RF power @ 10 - 6000 MHz into termination		+24 dBm
RF power @ Through path	10 to 40 MHz	Derate linearly from +35 dBm @ 40 MHz to +30 dBm @ 10 MHz
	40 to 6000 MHz	+35 dBm
DC voltage @ RF Ports		16V

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

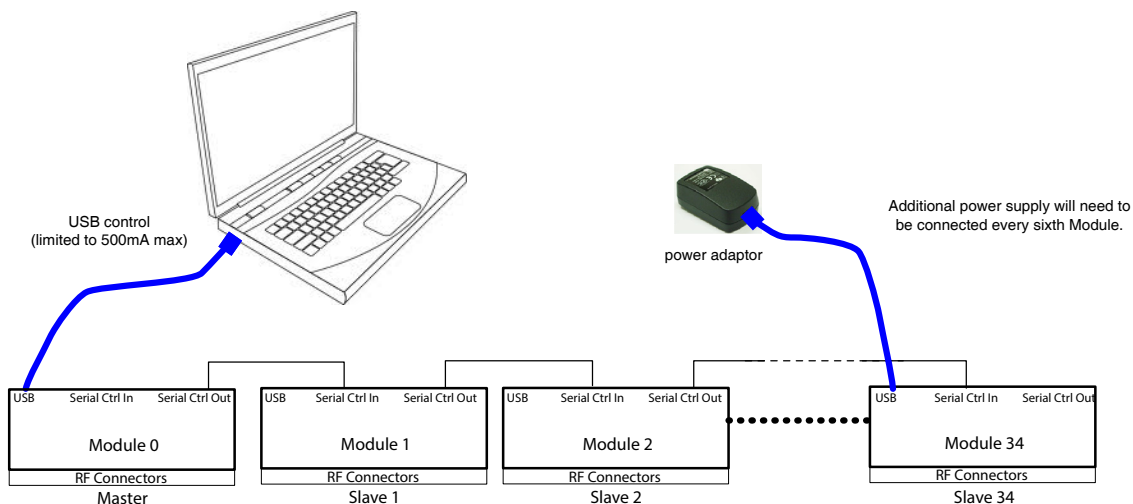
RF SPDT Switch A (1, 2, COM)	(SMA female)
RF SPDT Switch B (1, 2, COM)	(SMA female)
RF SPDT Switch C (1, 2, COM)	(SMA female)
RF SPDT Switch D (1, 2, COM)	(SMA female)
USB	(USB type Mini-B receptacle)
Serial In (Digital Control 2 port)	(Digital Snap Fit Connector)
Serial Out (Digital Control 1 port)	(Digital Snap Fit Connector)

## Simplified Diagram



## Connecting multiple modules (Daisy Chain)

The USB-4SP2T-63H is designed to connect up to 35 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 PC. The module connected to the PC 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 34 (slave).



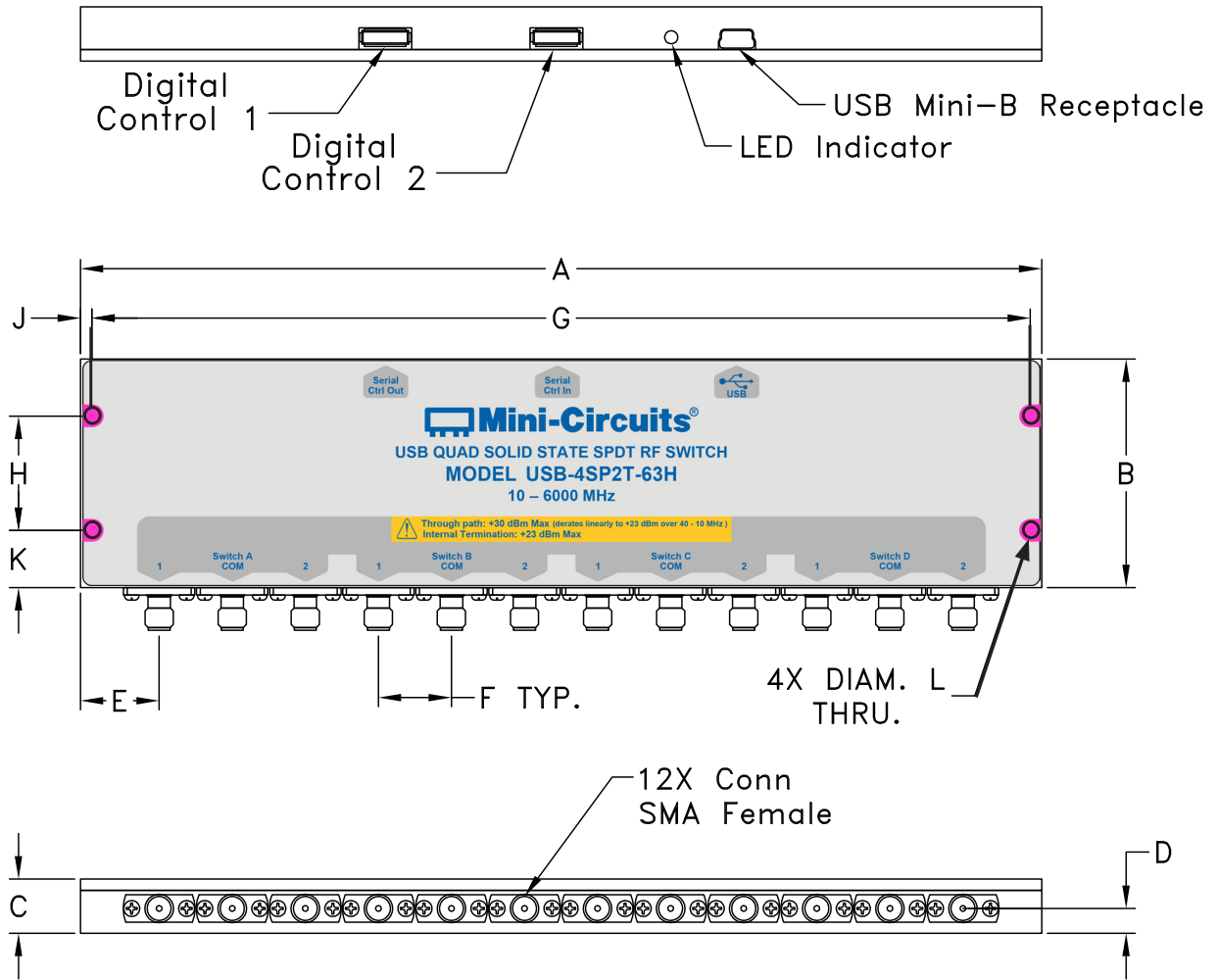
Connections between modules will be made using the serial in/out ports with the module connected to the PC as a master and all others as slave modules. All control will be through the master module (address zero) which is the only one communicating with the PC. Serial control out port of each module 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 500mA.

If connecting USB-4SP2T-63H units in series, additional power supply will generally be needed every six to eight modules. If mixing modules of different types ensure the max current through any unit does not exceed 500mA. 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 set up simply connect the module to the setup and refresh the address listing, no need to reset any of the existing modules or assign addresses manually.

Connecting slave units should be done only with control cables provided by Mini-Circuits

## Outline Drawing (QM2279)

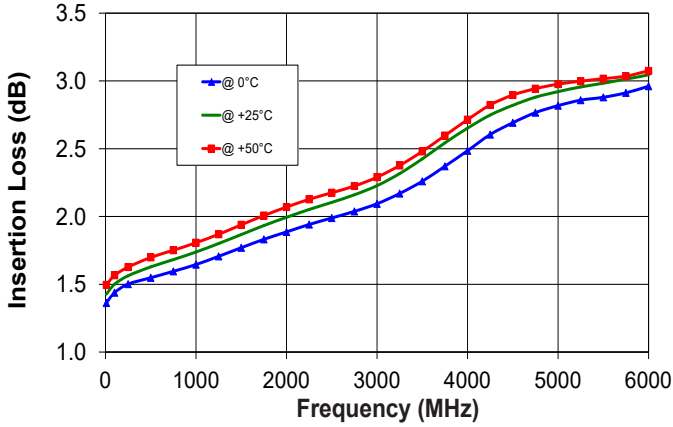


### Outline Dimensions (inch/mm)

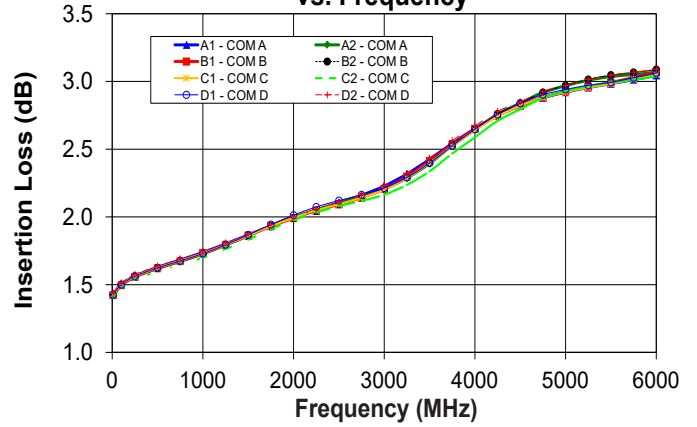
A	B	C	D	E	F	G	H	J	K	L	WT. GRAMS
8.42	2.00	0.475	0.217	0.69	0.640	8.220	1.000	0.10	0.50	0.106	450
213.9	50.8	12.06	5.51	17.53	16.26	208.79	25.40	2.54	12.70	2.69	

## Typical Performance Curves

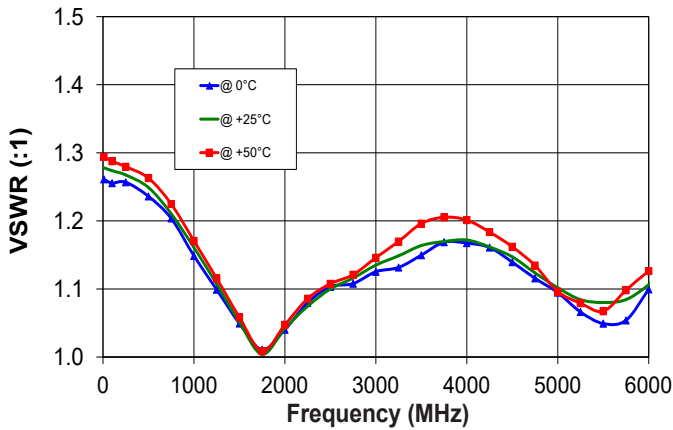
Insertion Loss over Temp.



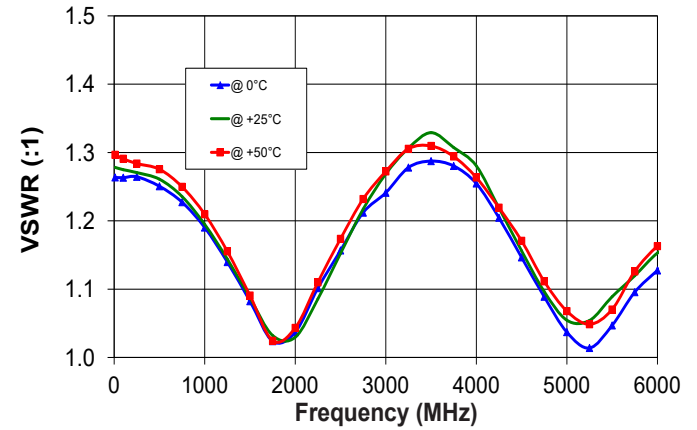
Insertion Loss of all switches in module vs. Frequency



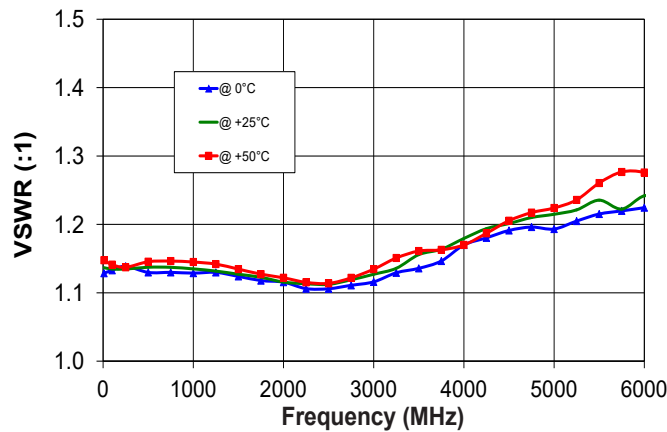
Common Port VSWR over Temp.



Active Port VSWR over Temp.

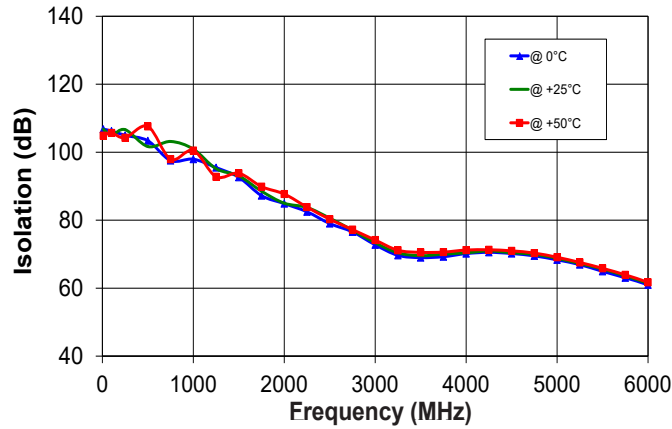


Internal Term. VSWR over Temp.

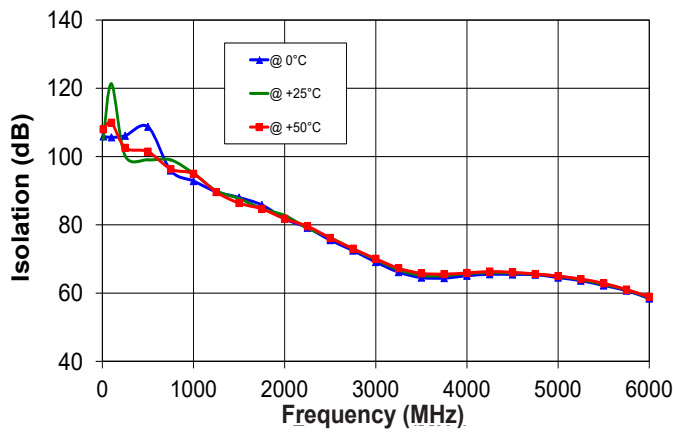


## Typical Performance Curves (Continued)

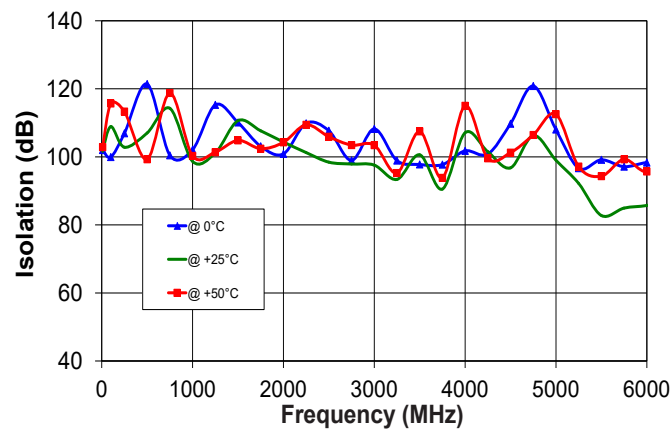
Com to Port 1 Isolation over Temp.



Port 1 to Port 2 Isolation over Temp.



Isolation between switches over Temp.



## 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](mailto:testsolutions@minicircuits.com) for support

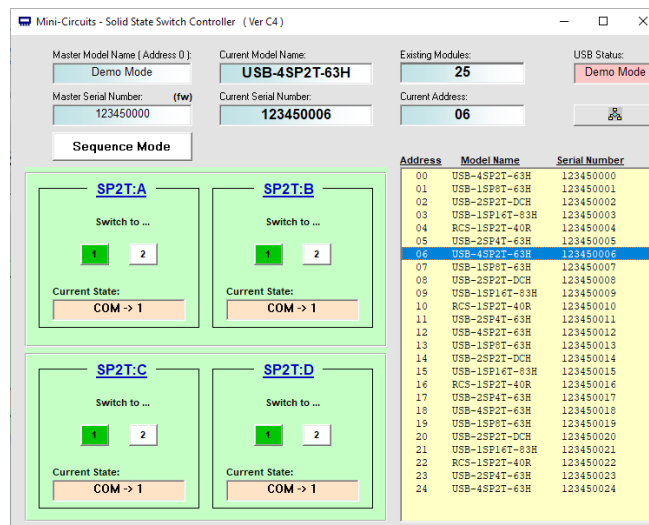
## Minimum System Requirements

Parameter	Requirements	
Interface	USB HID	
System requirements (USB)	GUI	Windows 32 & 64 bit systems from Windows 98 up to Windows 10
	API DLL	Windows 32 & 64 bit systems with ActiveX or .Net support from Windows 98 up to Windows 10
	Daisy Chain Dynamic addressing	Additional unit of this model or another Mini-Circuits model supporting Dynamic addressing
	USB interrupt	Linux, Windows systems from Windows 98 up to Windows 10
Hardware	Pentium® II or higher, RAM 256 MB	

## Graphical User Interface (GUI) for Windows

### Key Features:

- Set each switch manually
- Set timed sequence of switching states
- Configure switch address and upgrade Firmware
- Controlling up to 35 modules in 'daisy chain' configuration



## Application Programming Interface (API)

### Windows Support:

- API DLL files exposing the full switch functionality See programming manual for details
  - 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 tested environments)


### Linux Support:

- Full switch control in a Linux environment is achieved by way of USB interrupt commands. See programming manual at [https://www.minicircuits.com/softwaredownload/Prog\\_Manual-H\\_Series\\_Switches.pdf](https://www.minicircuits.com/softwaredownload/Prog_Manual-H_Series_Switches.pdf) for details



Ordering, Pricing & Availability Information see our web site

Model	Description
USB-4SP2T-63H	USB RF SPDT Switch matrix

Included Accessories	Part No.	Description
	MUSB-CBL-3+	2.6 ft (0.8 m) USB Cable: USB type A(Male) to USB type Mini-B(Male)

Optional Accessories	Description
MUSB-CBL-3+ (Spare)	2.6 ft (0.8 m) USB Cable: USB type A(Male) to USB type Mini-B(Male)
MUSB-CBL-7+	6.6 ft (2.0 m) USB Cable: USB type A(Male) to USB type Mini-B(Male)
CBL-1.5FT-MMD+	1.5 ft cable assembly for serial control Daisy Chain with snap fit connectors
USB-AC/DC-5+	AC/DC +5V power adaptor with USB connector <sup>9,10</sup>

<sup>9</sup> The USB-AC/DC-5 may be used to provide additional power if needing to connect a number of switches in series exceeding 500mA total current draw.

<sup>10</sup> Includes power plugs for US, UK, EU, IL, AU & China. Plugs for other countries are also available, if you need a power plug for a country not listed please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com)

### Additional Notes

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# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Data

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm

FREQUENCY (MHz)	INSERTION LOSS		VSWR, Active Ports			VSWR, Internally Terminated Ports	
	(dB)		(:1)			(:1)	
	COM-1	COM-2	COM	Port 1	Port 2	Port 1	Port 2
10	1.36	1.35	1.26	1.26	1.26	1.13	1.13
20	1.38	1.37	1.26	1.26	1.26	1.13	1.13
40	1.40	1.38	1.26	1.26	1.26	1.13	1.13
50	1.40	1.39	1.26	1.26	1.26	1.13	1.13
60	1.41	1.40	1.26	1.26	1.26	1.13	1.13
70	1.42	1.41	1.26	1.26	1.26	1.13	1.13
80	1.43	1.42	1.26	1.26	1.26	1.13	1.13
90	1.43	1.42	1.26	1.26	1.26	1.13	1.13
100	1.44	1.43	1.26	1.26	1.26	1.13	1.13
200	1.49	1.48	1.26	1.27	1.26	1.14	1.14
300	1.51	1.50	1.25	1.27	1.26	1.14	1.14
400	1.53	1.52	1.25	1.25	1.25	1.13	1.13
500	1.55	1.54	1.24	1.25	1.24	1.13	1.13
600	1.57	1.56	1.23	1.24	1.23	1.13	1.13
700	1.59	1.58	1.21	1.23	1.22	1.13	1.14
800	1.61	1.60	1.19	1.22	1.21	1.13	1.13
900	1.62	1.61	1.17	1.21	1.20	1.13	1.13
1000	1.64	1.63	1.15	1.19	1.17	1.13	1.14
1100	1.67	1.66	1.13	1.17	1.16	1.13	1.14
1200	1.69	1.68	1.11	1.15	1.13	1.13	1.14
1300	1.72	1.71	1.09	1.13	1.11	1.13	1.14
1400	1.74	1.73	1.07	1.11	1.08	1.13	1.14
1500	1.77	1.76	1.05	1.08	1.06	1.12	1.14
1600	1.79	1.79	1.03	1.06	1.04	1.12	1.14
1700	1.82	1.82	1.01	1.04	1.04	1.12	1.15
1800	1.84	1.84	1.01	1.02	1.04	1.12	1.15
1900	1.86	1.86	1.03	1.01	1.05	1.12	1.15
2000	1.89	1.89	1.04	1.04	1.06	1.12	1.15
2200	1.93	1.93	1.07	1.09	1.09	1.11	1.15
2400	1.97	1.97	1.09	1.13	1.12	1.11	1.15
2600	2.01	2.00	1.12	1.18	1.15	1.11	1.15
2800	2.05	2.03	1.12	1.21	1.17	1.11	1.15
3000	2.09	2.07	1.13	1.24	1.20	1.12	1.15
3200	2.15	2.12	1.13	1.27	1.22	1.12	1.16
3400	2.22	2.19	1.15	1.28	1.23	1.13	1.17
3600	2.30	2.27	1.16	1.29	1.25	1.14	1.17
3800	2.40	2.38	1.18	1.28	1.26	1.16	1.18
4000	2.48	2.48	1.17	1.25	1.25	1.17	1.18
4200	2.58	2.57	1.15	1.22	1.22	1.18	1.19
4400	2.66	2.66	1.15	1.17	1.18	1.19	1.19
4600	2.72	2.74	1.13	1.13	1.16	1.20	1.19
4800	2.78	2.81	1.11	1.08	1.10	1.19	1.19
5000	2.82	2.85	1.09	1.04	1.06	1.19	1.19
5200	2.85	2.89	1.06	1.00	1.02	1.19	1.18
5400	2.87	2.91	1.05	1.03	1.03	1.21	1.19
5600	2.90	2.93	1.04	1.07	1.05	1.21	1.18
5800	2.93	2.95	1.06	1.10	1.10	1.22	1.19
6000	2.96	2.97	1.10	1.13	1.13	1.22	1.19
6200	3.00	3.00	1.16	1.16	1.16	1.23	1.20
6400	3.04	3.03	1.17	1.18	1.17	1.23	1.21
6500	3.05	3.04	1.18	1.19	1.17	1.23	1.21

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# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Data

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm

FREQUENCY (MHz)	ISOLATION (dB)			
	COM- Port1	COM- Port2	Port1- Port2	Between Switches
10	106.76	108.20	103.71	106.92
20	104.09	103.34	101.25	101.00
40	103.05	103.55	105.14	102.74
50	104.45	100.05	104.04	109.64
60	107.00	107.19	99.19	108.94
70	103.98	104.66	115.10	110.29
80	104.60	101.75	101.91	106.36
90	112.51	107.46	102.60	115.10
100	106.25	109.06	104.16	106.00
200	111.23	122.43	108.58	104.73
300	110.71	111.54	106.14	101.32
400	100.79	107.83	98.20	114.74
500	103.37	118.94	111.69	115.79
600	106.91	104.46	100.97	104.33
700	103.59	103.06	95.10	107.93
800	101.81	98.11	93.94	118.13
900	98.78	97.09	94.23	101.20
1000	97.94	95.17	93.67	97.93
1100	101.22	92.37	90.20	106.91
1200	95.28	95.67	87.55	108.04
1300	93.21	91.91	87.83	105.93
1400	93.16	93.38	87.40	106.17
1500	92.62	89.61	87.06	100.96
1600	90.93	91.05	85.85	113.04
1700	89.31	88.69	84.40	101.96
1800	87.29	87.53	83.26	113.46
1900	86.03	86.21	81.34	121.45
2000	84.87	85.96	81.97	99.19
2200	84.44	82.85	79.13	105.02
2400	80.98	80.19	76.66	107.58
2600	78.66	77.85	74.31	104.76
2800	75.28	75.58	71.86	99.79
3000	72.75	72.75	68.67	105.43
3200	70.10	69.80	66.09	105.01
3400	69.05	68.53	64.41	102.77
3600	68.89	68.11	63.66	102.85
3800	69.40	69.21	63.86	102.69
4000	70.16	69.82	64.27	103.46
4200	70.37	70.27	64.81	102.86
4400	70.23	70.38	64.96	100.23
4600	70.28	70.01	64.79	109.39
4800	69.23	69.10	64.44	99.36
5000	68.32	68.33	63.85	109.97
5200	67.22	66.94	63.10	104.54
5400	65.89	65.28	62.21	106.59
5600	64.08	63.73	61.22	101.95
5800	62.79	62.01	59.67	99.31
6000	60.97	60.30	58.07	98.73
6200	58.75	58.12	56.44	111.23
6400	56.42	55.80	54.38	101.86
6500	55.33	54.76	53.34	101.27

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# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Data

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm

FREQUENCY (MHz)	INSERTION LOSS (dB)		VSWR, Active Ports (:1)			VSWR, Internally Terminated Ports (:1)	
	COM-1	COM-2	COM	Port 1	Port 2	Port 1	Port 2
	10	1.43	1.42	1.28	1.28	1.28	1.14
20	1.44	1.44	1.28	1.28	1.28	1.14	1.14
40	1.46	1.45	1.28	1.28	1.27	1.14	1.14
50	1.47	1.46	1.28	1.28	1.27	1.14	1.14
60	1.47	1.47	1.27	1.27	1.27	1.14	1.14
70	1.48	1.48	1.27	1.27	1.27	1.14	1.14
80	1.49	1.48	1.27	1.27	1.27	1.13	1.14
90	1.49	1.49	1.27	1.27	1.27	1.13	1.14
100	1.50	1.50	1.27	1.27	1.27	1.13	1.14
200	1.55	1.54	1.27	1.27	1.27	1.14	1.14
300	1.58	1.57	1.26	1.27	1.27	1.13	1.14
400	1.61	1.60	1.26	1.27	1.26	1.14	1.14
500	1.63	1.62	1.25	1.26	1.26	1.14	1.14
600	1.65	1.64	1.23	1.25	1.24	1.14	1.14
700	1.67	1.66	1.22	1.24	1.23	1.14	1.14
800	1.69	1.68	1.20	1.23	1.22	1.14	1.14
900	1.72	1.70	1.18	1.21	1.20	1.14	1.14
1000	1.74	1.73	1.16	1.19	1.18	1.13	1.14
1100	1.76	1.75	1.14	1.17	1.16	1.13	1.14
1200	1.79	1.78	1.12	1.15	1.13	1.13	1.14
1300	1.81	1.81	1.09	1.13	1.11	1.13	1.14
1400	1.84	1.83	1.07	1.11	1.09	1.13	1.15
1500	1.87	1.86	1.05	1.09	1.06	1.13	1.14
1600	1.89	1.89	1.03	1.07	1.04	1.13	1.15
1700	1.92	1.92	1.01	1.04	1.03	1.12	1.15
1800	1.95	1.95	1.01	1.02	1.03	1.12	1.15
1900	1.97	1.97	1.03	1.01	1.05	1.12	1.15
2000	1.99	2.00	1.04	1.03	1.06	1.12	1.15
2200	2.04	2.04	1.07	1.08	1.09	1.11	1.15
2400	2.08	2.08	1.09	1.12	1.12	1.11	1.15
2600	2.12	2.12	1.11	1.18	1.15	1.12	1.16
2800	2.17	2.16	1.12	1.23	1.18	1.12	1.17
3000	2.23	2.20	1.13	1.27	1.21	1.13	1.18
3200	2.30	2.27	1.15	1.30	1.24	1.14	1.19
3400	2.38	2.35	1.15	1.32	1.26	1.14	1.20
3600	2.47	2.44	1.17	1.32	1.27	1.16	1.20
3800	2.57	2.55	1.18	1.31	1.27	1.17	1.21
4000	2.65	2.64	1.17	1.28	1.24	1.18	1.22
4200	2.73	2.74	1.16	1.24	1.21	1.19	1.22
4400	2.79	2.81	1.15	1.18	1.19	1.20	1.22
4600	2.84	2.88	1.14	1.13	1.15	1.21	1.22
4800	2.89	2.93	1.12	1.09	1.11	1.21	1.23
5000	2.92	2.97	1.10	1.05	1.08	1.21	1.22
5200	2.95	3.00	1.09	1.05	1.06	1.23	1.22
5400	2.97	3.03	1.08	1.07	1.07	1.23	1.21
5600	2.99	3.05	1.09	1.11	1.09	1.23	1.21
5800	3.02	3.06	1.09	1.13	1.12	1.23	1.20
6000	3.04	3.07	1.11	1.15	1.16	1.24	1.20
6200	3.08	3.09	1.13	1.17	1.17	1.23	1.19
6400	3.12	3.13	1.16	1.18	1.17	1.24	1.18
6500	3.13	3.15	1.17	1.18	1.19	1.25	1.19

**Notes**

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# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Data

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm

FREQUENCY (MHz)	ISOLATION (dB)			
	COM-Port1	COM-Port2	Port1-Port2	Between Switches
10	106.79	102.63	106.06	103.80
20	101.56	99.85	110.29	106.74
40	107.18	102.33	99.46	102.14
50	102.77	99.92	114.57	104.33
60	99.82	104.81	109.16	96.47
70	100.33	104.79	108.19	108.09
80	117.67	103.13	109.21	108.86
90	100.57	117.07	104.73	105.31
100	105.03	114.71	107.30	109.35
200	107.70	114.33	102.84	105.86
300	101.37	103.00	103.71	103.87
400	106.04	104.72	100.47	108.31
500	101.67	101.50	105.27	104.61
600	97.89	104.30	98.70	106.88
700	102.47	98.83	99.30	107.47
800	105.17	99.75	94.51	115.52
900	95.66	98.28	94.01	105.40
1000	100.93	96.59	93.93	101.78
1100	97.64	94.57	91.29	102.32
1200	95.10	98.06	92.72	108.27
1300	93.81	96.49	88.61	104.17
1400	97.49	91.57	88.54	111.16
1500	93.05	93.87	89.80	101.38
1600	92.08	88.81	87.10	106.26
1700	89.56	92.09	84.75	100.56
1800	90.63	88.92	84.48	109.63
1900	87.39	88.94	82.50	109.07
2000	84.99	86.31	81.14	106.51
2200	83.55	84.63	79.22	111.50
2400	81.21	81.67	76.72	105.45
2600	78.62	78.23	74.28	112.25
2800	75.90	76.12	71.59	102.49
3000	73.35	73.48	69.15	107.10
3200	70.90	70.56	66.69	114.17
3400	69.86	69.31	64.98	115.43
3600	69.52	69.29	64.06	112.67
3800	70.00	69.81	64.44	102.50
4000	70.39	70.28	64.76	102.95
4200	70.63	70.73	65.05	99.64
4400	70.84	70.89	65.14	120.78
4600	70.29	70.45	65.07	114.88
4800	69.77	69.61	64.78	99.20
5000	68.79	68.66	64.19	105.80
5200	67.52	67.10	63.43	105.45
5400	66.51	65.76	62.58	91.21
5600	64.49	63.91	61.46	95.15
5800	63.23	62.42	59.98	105.63
6000	61.41	60.73	58.39	97.72
6200	59.19	58.58	56.73	98.71
6400	56.87	56.34	54.74	106.42
6500	55.83	55.31	53.72	97.47

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# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Data

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm

FREQUENCY (MHz)	INSERTION LOSS		VSWR, Active Ports			VSWR, Internally Terminated Ports	
	(dB)		(:1)			(:1)	
	COM-1	COM-2	COM	Port 1	Port 2	Port 1	Port 2
10	1.50	1.49	1.29	1.30	1.30	1.15	1.15
20	1.51	1.50	1.29	1.30	1.30	1.15	1.15
40	1.53	1.52	1.29	1.30	1.29	1.15	1.15
50	1.54	1.53	1.29	1.29	1.29	1.15	1.15
60	1.54	1.54	1.29	1.29	1.29	1.15	1.15
70	1.55	1.55	1.29	1.29	1.29	1.14	1.14
80	1.56	1.55	1.29	1.29	1.29	1.14	1.14
90	1.56	1.56	1.29	1.29	1.29	1.14	1.14
100	1.57	1.56	1.29	1.29	1.29	1.14	1.14
200	1.61	1.60	1.28	1.29	1.29	1.14	1.14
300	1.64	1.64	1.28	1.29	1.29	1.14	1.14
400	1.67	1.67	1.27	1.28	1.28	1.14	1.14
500	1.70	1.69	1.26	1.28	1.27	1.15	1.15
600	1.72	1.71	1.25	1.26	1.26	1.15	1.15
700	1.74	1.73	1.23	1.26	1.25	1.15	1.15
800	1.76	1.76	1.22	1.24	1.23	1.15	1.15
900	1.78	1.78	1.19	1.23	1.21	1.15	1.15
1000	1.81	1.80	1.17	1.21	1.19	1.15	1.15
1100	1.83	1.82	1.15	1.19	1.17	1.14	1.16
1200	1.86	1.85	1.13	1.17	1.14	1.14	1.16
1300	1.88	1.88	1.11	1.15	1.12	1.14	1.16
1400	1.91	1.91	1.08	1.12	1.09	1.14	1.16
1500	1.94	1.94	1.06	1.09	1.07	1.13	1.16
1600	1.96	1.97	1.03	1.06	1.05	1.13	1.16
1700	1.99	2.00	1.01	1.04	1.04	1.13	1.16
1800	2.02	2.02	1.01	1.01	1.04	1.13	1.16
1900	2.05	2.05	1.03	1.01	1.05	1.12	1.16
2000	2.07	2.08	1.05	1.04	1.06	1.12	1.16
2200	2.11	2.12	1.07	1.10	1.10	1.12	1.16
2400	2.16	2.16	1.10	1.15	1.13	1.11	1.16
2600	2.20	2.19	1.12	1.20	1.17	1.12	1.16
2800	2.24	2.23	1.13	1.24	1.19	1.13	1.16
3000	2.29	2.27	1.15	1.27	1.23	1.13	1.17
3200	2.35	2.34	1.17	1.29	1.25	1.14	1.17
3400	2.44	2.43	1.19	1.31	1.27	1.15	1.18
3600	2.53	2.52	1.20	1.31	1.29	1.17	1.19
3800	2.63	2.63	1.21	1.29	1.27	1.17	1.19
4000	2.71	2.72	1.20	1.26	1.24	1.17	1.19
4200	2.80	2.81	1.19	1.22	1.21	1.18	1.20
4400	2.87	2.89	1.17	1.19	1.19	1.20	1.21
4600	2.92	2.95	1.15	1.15	1.16	1.21	1.22
4800	2.96	2.99	1.13	1.10	1.12	1.21	1.22
5000	2.98	3.02	1.10	1.07	1.09	1.22	1.22
5200	3.00	3.04	1.09	1.06	1.08	1.24	1.23
5400	3.01	3.06	1.08	1.07	1.08	1.26	1.24
5600	3.03	3.07	1.08	1.08	1.08	1.25	1.23
5800	3.02	3.08	1.10	1.12	1.13	1.26	1.22
6000	3.07	3.11	1.13	1.16	1.18	1.28	1.23
6200	3.08	3.13	1.16	1.19	1.21	1.29	1.24
6400	3.12	3.15	1.17	1.20	1.21	1.27	1.23
6500	3.15	3.17	1.18	1.20	1.21	1.26	1.22

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# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Data

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm

FREQUENCY (MHz)	ISOLATION			
	(dB)			
	COM-Port1	COM-Port2	Port1-Port2	Between Switches
10	104.87	120.83	115.48	106.15
20	104.18	104.04	106.14	111.56
40	113.89	105.64	104.14	127.28
50	121.98	105.24	106.17	97.97
60	108.66	103.99	103.39	107.20
70	107.66	110.60	113.74	108.02
80	103.65	121.08	105.86	102.77
90	102.63	100.94	102.93	103.07
100	105.67	105.86	111.80	99.79
200	109.94	102.87	101.66	104.11
300	108.12	107.32	107.51	109.39
400	98.97	103.85	102.78	107.50
500	107.59	100.85	98.89	99.28
600	104.47	98.87	103.39	115.94
700	97.61	99.13	91.99	98.43
800	103.47	97.40	97.62	103.22
900	101.26	98.08	96.33	120.42
1000	100.49	97.05	93.31	101.71
1100	99.07	97.09	95.81	110.28
1200	91.52	97.27	90.26	106.11
1300	96.01	97.76	88.03	106.68
1400	93.57	92.40	88.48	104.05
1500	93.80	89.55	90.10	105.68
1600	90.99	90.41	86.76	114.71
1700	90.35	89.06	85.58	119.70
1800	88.08	92.00	83.67	110.18
1900	87.88	88.48	83.39	105.59
2000	87.70	87.56	81.58	103.73
2200	85.07	84.40	79.43	97.82
2400	82.58	82.34	77.24	107.59
2600	79.04	79.07	74.80	98.68
2800	76.60	76.46	72.42	112.84
3000	74.17	74.11	69.78	109.16
3200	71.38	71.34	67.25	112.39
3400	70.56	70.09	65.81	99.10
3600	70.45	69.95	64.83	105.05
3800	70.88	70.46	64.92	103.58
4000	71.21	70.97	65.18	103.57
4200	71.22	71.54	65.28	106.63
4400	71.48	71.41	65.57	102.77
4600	70.81	70.94	65.29	113.02
4800	69.88	69.85	64.87	116.66
5000	69.09	68.91	64.39	112.69
5200	67.84	67.62	63.70	105.95
5400	66.56	65.97	62.77	96.95
5600	64.78	64.23	61.70	95.94
5800	63.59	62.71	60.25	103.54
6000	61.71	61.21	58.84	102.63
6200	59.64	58.97	57.15	106.99
6400	57.33	56.83	55.13	106.63
6500	56.35	55.78	54.16	102.51

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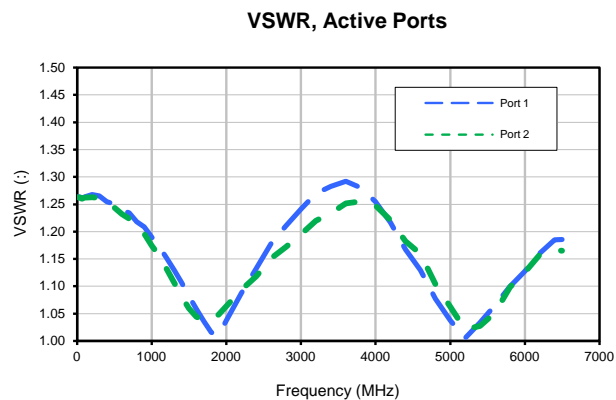
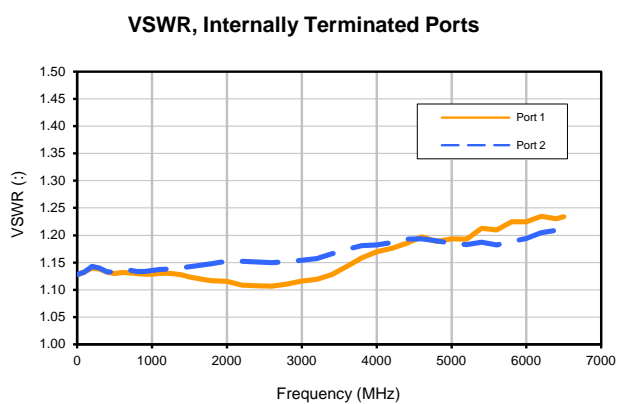
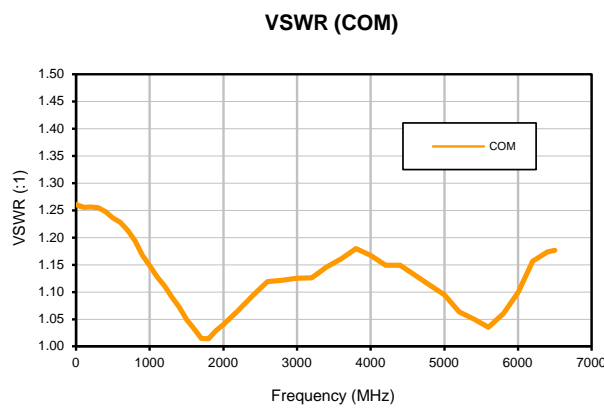
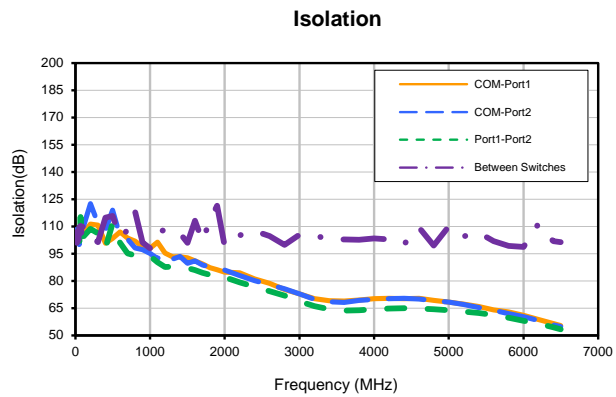
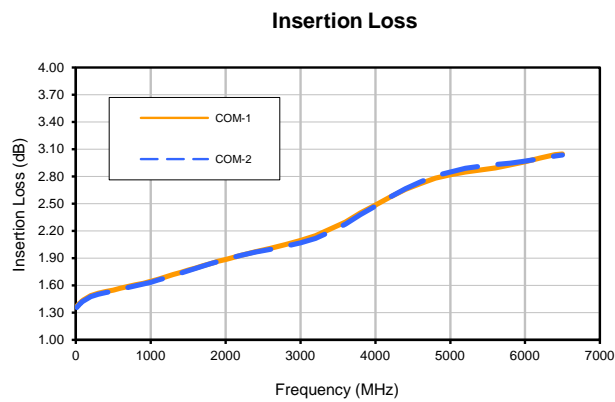


# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Curves

TEST CONDITIONS: @Temperature = 0°C, Pin=8dBm



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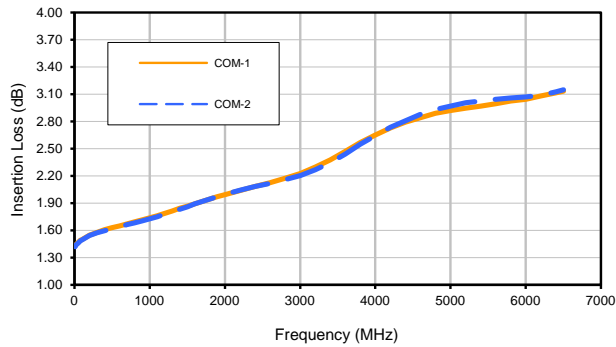
# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

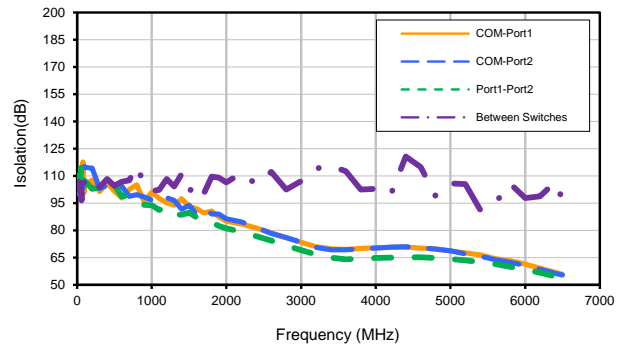
## Typical Performance Curves

TEST CONDITIONS: @Temperature =25°C, Pin=8dBm

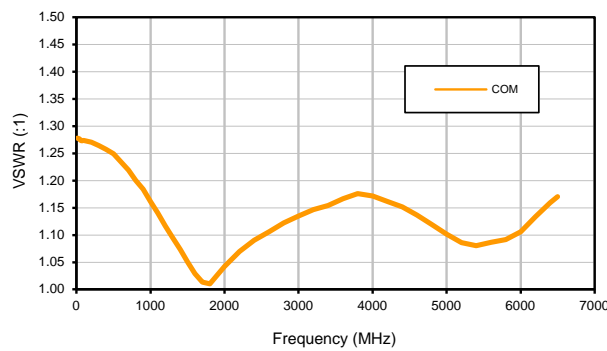
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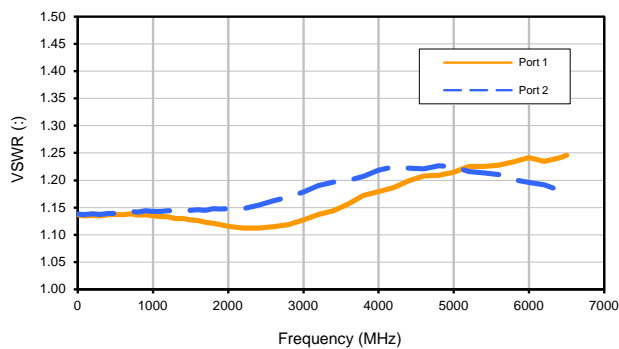
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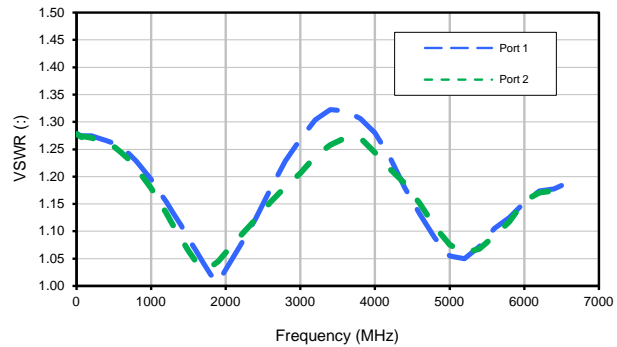
VSWR (COM)



VSWR, Internally Terminated Ports



VSWR, Active Ports



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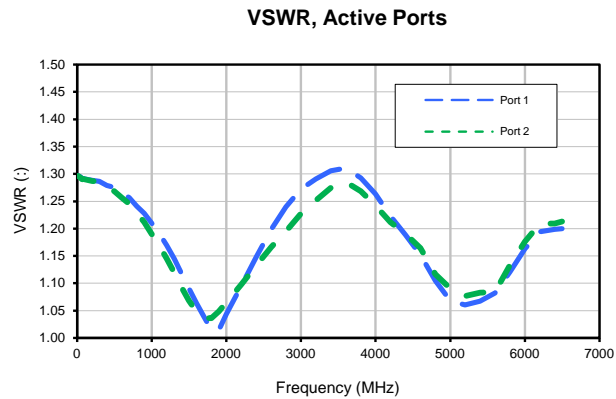
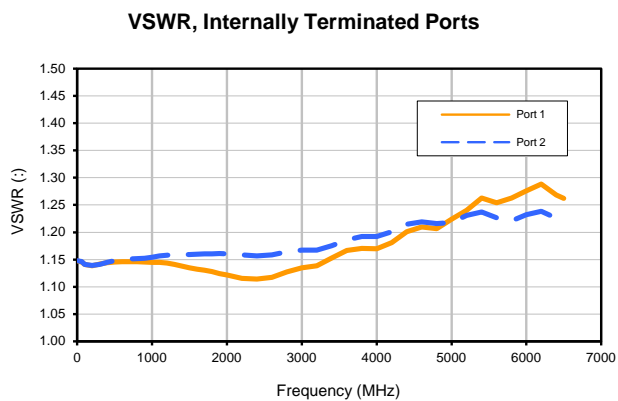
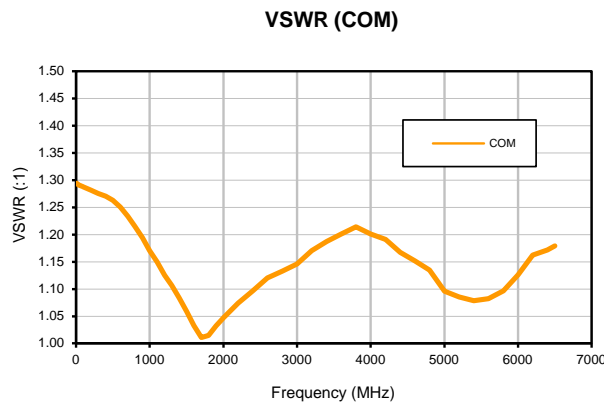
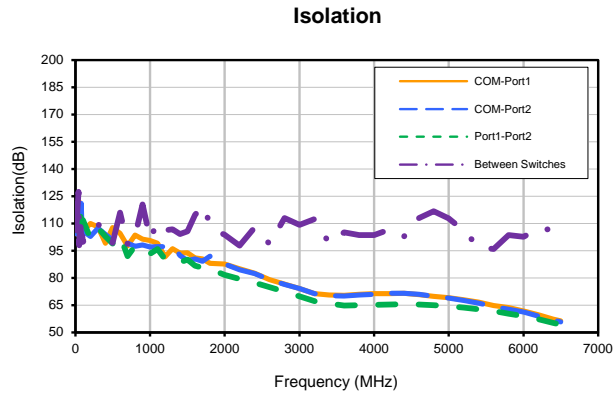
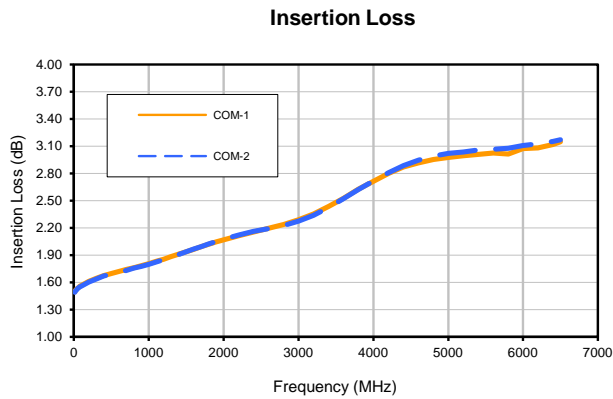


# Solid State USB RF QUAD SPDT Switch

# USB-4SP2T-63H

## Typical Performance Curves

TEST CONDITIONS: @Temperature = 50°C, Pin=8dBm



**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-Circuit's 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-Circuit's website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

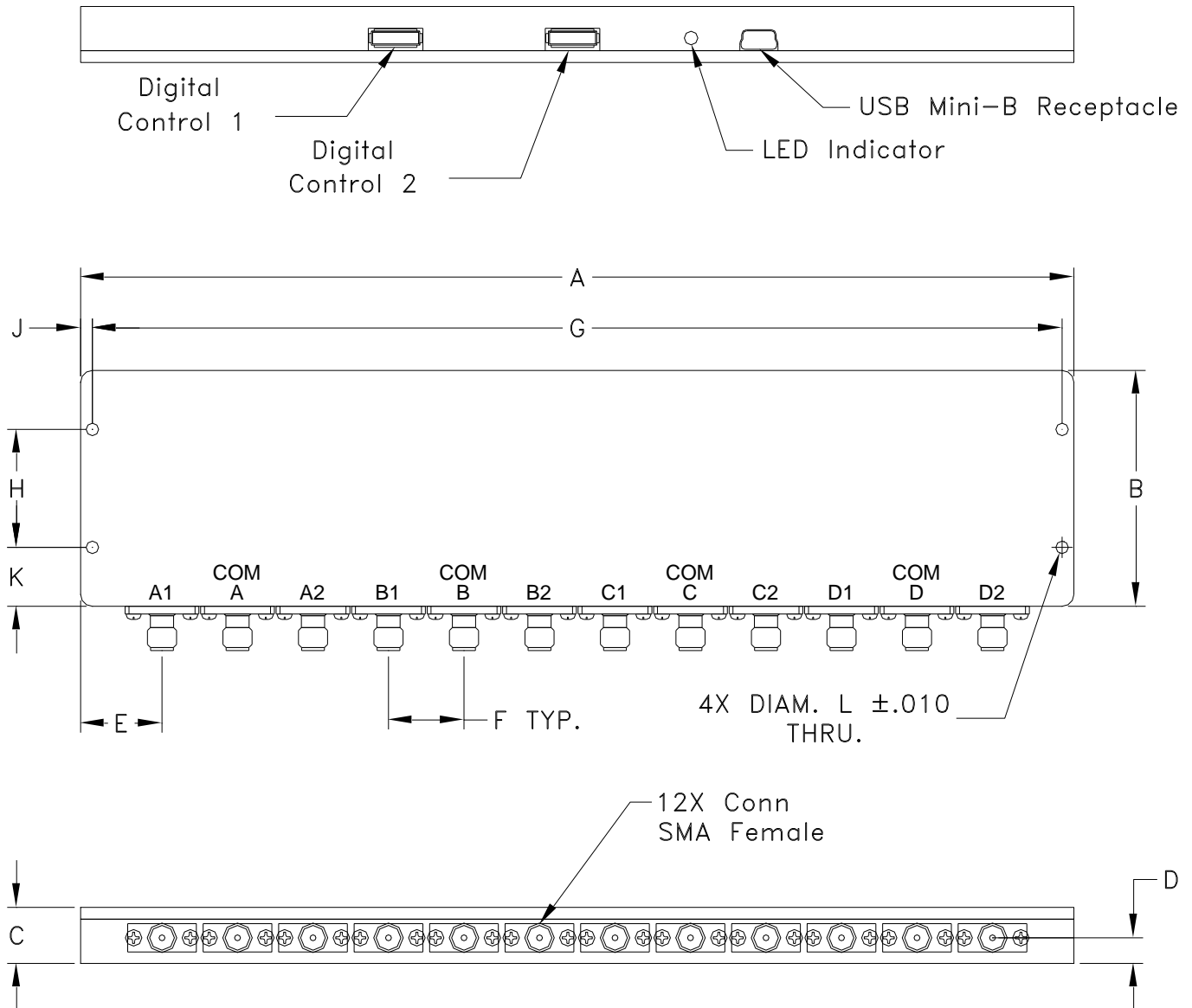


# Case Style

# QM

## Outline Dimensions

## QM2279



CASE#	A	B	C	D	E	F	G	H	J	K	L	WT. GRAMS
QM2279	8.42 (213.9)	2.00 (50.8)	.475 (12.06)	.217 (5.51)	.69 (17.53)	.640 (16.26)	8.220 (208.79)	1.000 (25.40)	.10 (2.54)	.50 (12.70)	0.106 (2.69)	450

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

### Notes:

1. Case material: Nickel Plated Aluminum.

**Mini-Circuits**<sup>®</sup>

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Mini-Circuits ISO 9001 & ISO 14001 Certified



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 Ambient Environment	Individual Model Data Sheet
Storage Temperature	-20° to 60° C 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