Solid state

USB RF SP4T Switch

USB-SP4T-63

50Ω   1 to 6000 MHz

The Big Deal

- USB power & control
- High speed switch transition (3 µsec typ)
- High power handling (+27 dBm max)
- Small case (2.25" x 1.50" x 0.475")

Typical Applications

- R&D
- Signal routing / switch matrices
- High volume production testing / ATE
- Design verification testing

Case Style: NR1982

Software Package

Included Accessories

Model No.	Description	Qty.
MUSB-CBL-3+	2.6 ft USB cable	1

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

Product Overview

Mini-Circuits' USB-SP4T-63 is a low cost, absorptive SP4T switch with USB control. The fast switching, solid state switch operates from 1 MHz to 6000 MHz with 3 µs typical switch transition speed. High linearity (+54 dBm typ IP3), and high isolation (50 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-SP4T-63 is housed in a compact, low profile, rugged metal case (2.25" x 1.50" x 0.475") with 5 SMA (F) connectors (COM, and J1 to J4), and a USB Mini-B port for power and control.

Key Features

Feature	Advantages
RF SP4T absorptive switch	Wideband (1 to 6000 MHz) with low insertion loss (1.25 dB typ.), high isolation (50 dB typ.), and high power rating (+27 dBm through path).
High Linearity (IP3 54 dBm typ.)	Results in little or negligible inter-modulation generation, meeting requirements for digital communications signals
DC Blocking	No need for external DC blocking circuitry
Programmable switching sequence	The USB-SP4T-63 allows the user to set up a sequence of up to 100 switching settings (from 5 µsec to 10 seconds) to run automatically without waiting for commands from the PC.
Full software support included	Mini-Circuits' full software package, programming and user manual are available for down load from **https://www.minicircuits.com/softwaredownload/solidstate.html** at no extra cost.

Mini-Circuits®

Electrical Specifications

Parameter	Port	Conditions	Min.	Typ.	Max.	Units
Operating Frequency			1		6000	MHz
Insertion Loss	COM to any active port	1 to 3000 MHz	–	1.0	2.0	dB
		3000 to 6000 MHz	–	1.6	3.0	
Isolation	Between ports J1,J2,J3, and J4	1 to 500 MHz	50	85	–	dB
		500 to 5000 MHz	35	60		
		5000 to 6000 MHz	33	55	–	
	COM to any terminated port	1 to 500 MHz	55	85		
		500 to 5000 MHz	30	50		
		5000 to 6000 MHz	25	40	–	
VSWR	COM port	1 to 3000 MHz	–	1.10	1.40	:1
		3000 to 6000 MHz	–	1.15	1.60	
	Any port connected to COM	1 to 3000 MHz	–	1.20	1.50	
		3000 to 6000 MHz	–	1.20	1.55	
	Any terminated port	1 to 3000 MHz	–	1.10	1.60	
		3000 to 6000 MHz	–	1.25	2.00	
Power Input @1 dB Compression [1,2]	COM to any active port	10 to 6000 MHz	30	–	–	dBm
IP3 [3]	COM to any active port	10 to 6000 MHz	–	54	–	dBm
Transition Time [4]	–	–	–	3	8	µs
Minimum dwell time [5]	High Speed Mode	–	–	5	–	µs
Switching Time (USB) [6]	–	–	–	2	–	ms
Minimum dwell time	–	Using switching sequence function	–	5	–	µsec
Rated voltage	USB port	–	4.75	5	5.25	V
Rated Current		–	–	30	80	mA
Operating RF Input Power	COM to any active port	Hot Switching	–	–	+17	dBm
	Any terminated port	–	–	–	+17	
	COM to any active port	Through path [1]	–	–	+27	

[1] Max operating power degrades linearly below 10 MHz to +22 dBm at 1 MHz.

[2] Note absolute maximum ratings in table below

[3] Tested with 1 MHz span between signals.

[4] Transition time spec represents the time that the RF signal paths are interrupted during switching and thus is specified without communication delays.

[5] Minimum dwell time is the shortest time that can be achieved between 2 switch transitions when programming an automated switch sequence.

[6] 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.
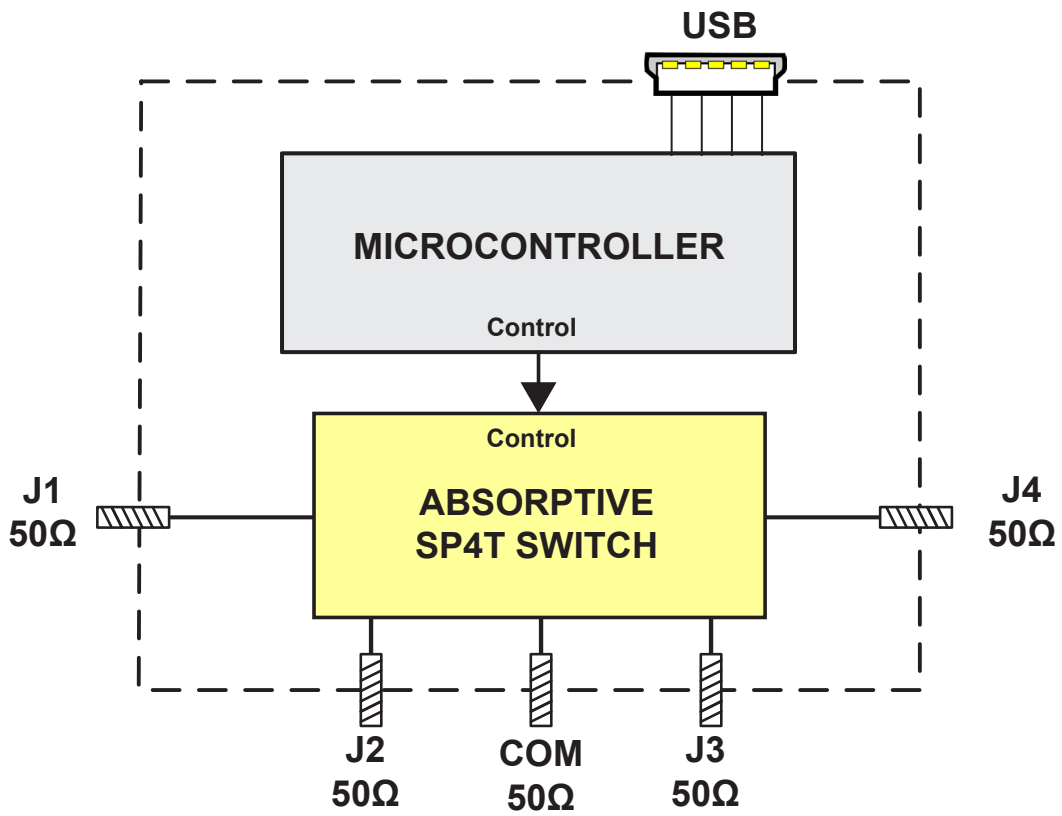
Absolute Maximum Ratings

Operating Temperature	0°C to 50°C
Storage Temperature	-20°C to 60°C
DC supply voltage max.	6V
RF power @ 1 -6000 MHz into termination	+20 dBm
RF power @ 10 -6000 MHz into COM or active port	+30 dBm
RF power @ 1 -10 MHz into COM or active port	+25 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.
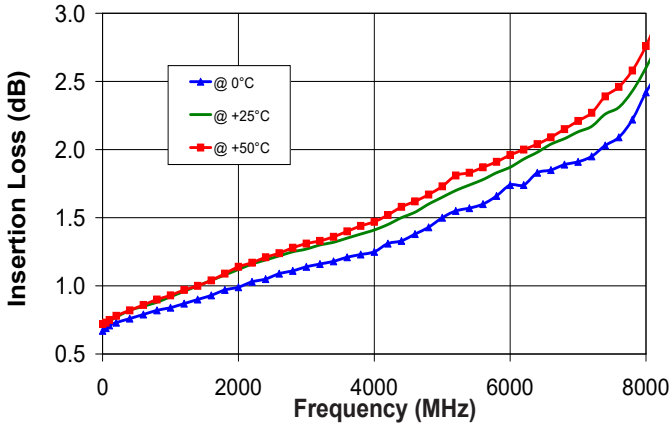
Connections

RF Switch (J1, J2, J3, J4, COM)	(SMA female)
USB	(USB type Mini-B receptacle)

Block Diagram

USB

MICROCONTROLLER

Control

Control

**ABSORPTIVE
SP4T SWITCH**

J1
50Ω
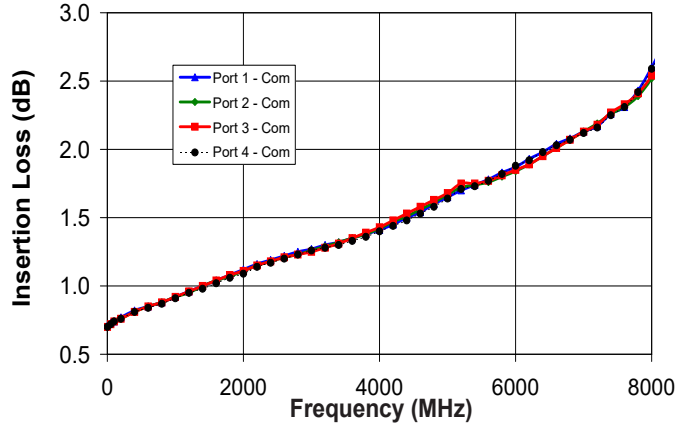
J4
50Ω

J2
50Ω

COM
50Ω

J3
50Ω

Mini-Circuits®

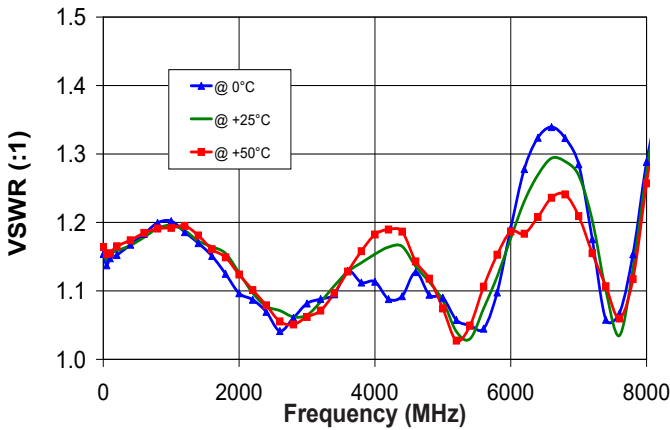**Typical Performance Curves**

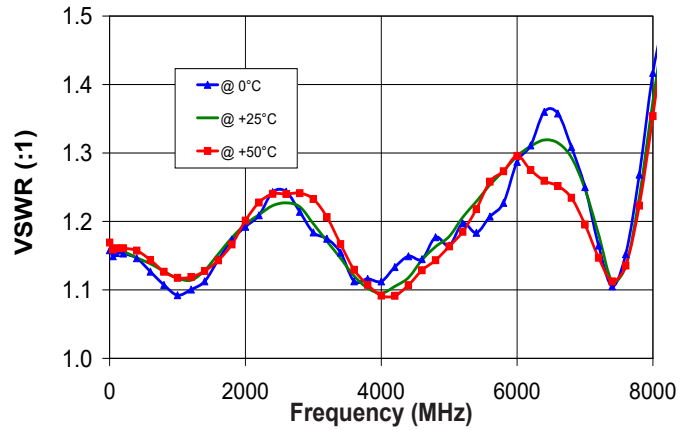### Insertion Loss over Temprature

Insertion Loss at Ports 1-4 vs. Frequency
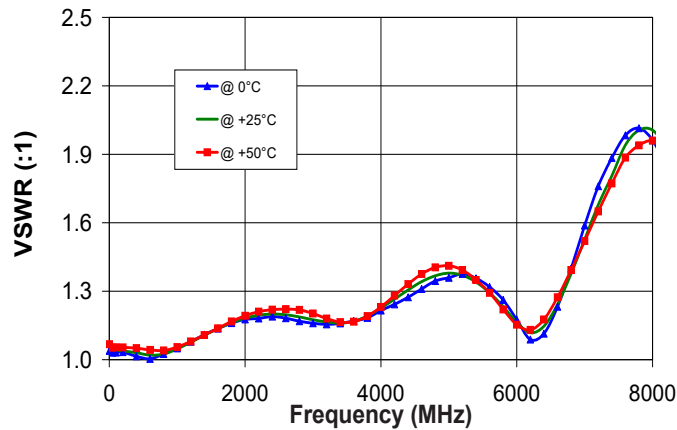

Common Port VSWR over Temp.
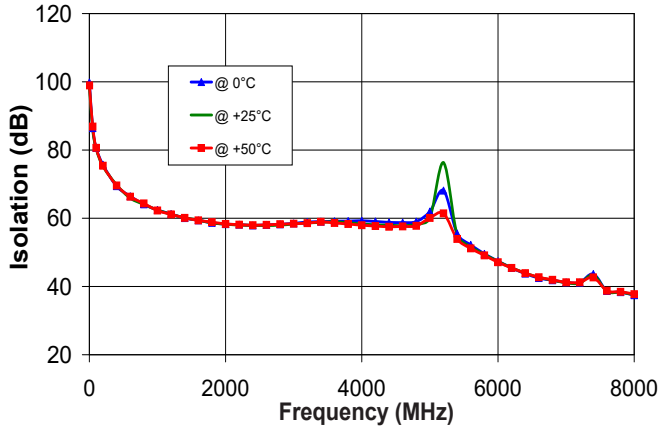

Active Port VSWR over Temp.

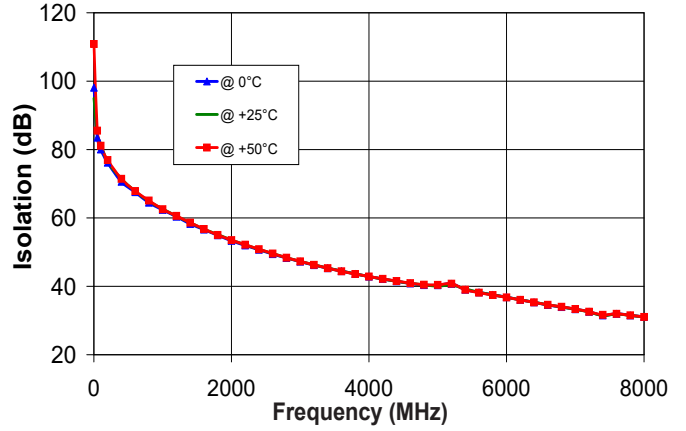### Internal Term. VSWR over Temp.

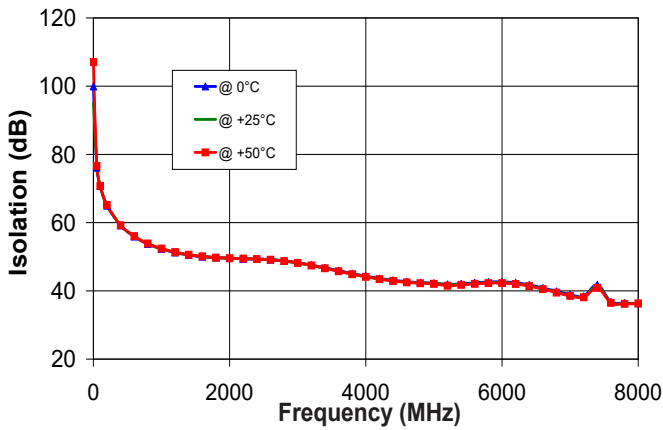**Typical Performance Curves (Continued)**

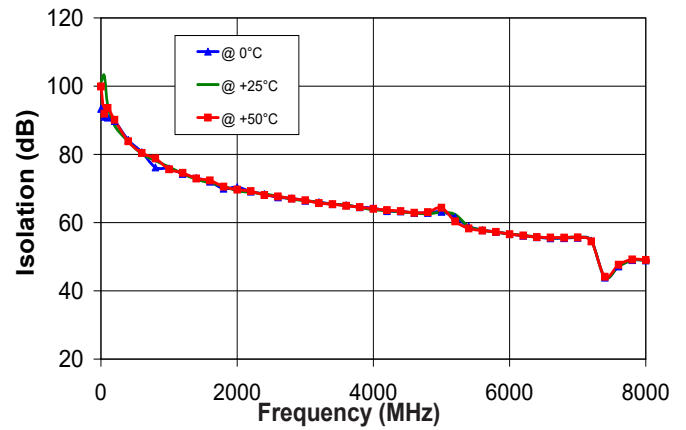Com to Port 1 Isolation with Port 4 active

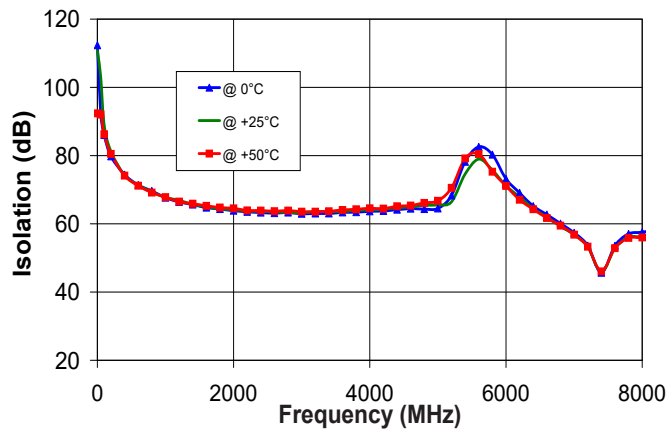Com to Port 1 Isolation with Port 2 active
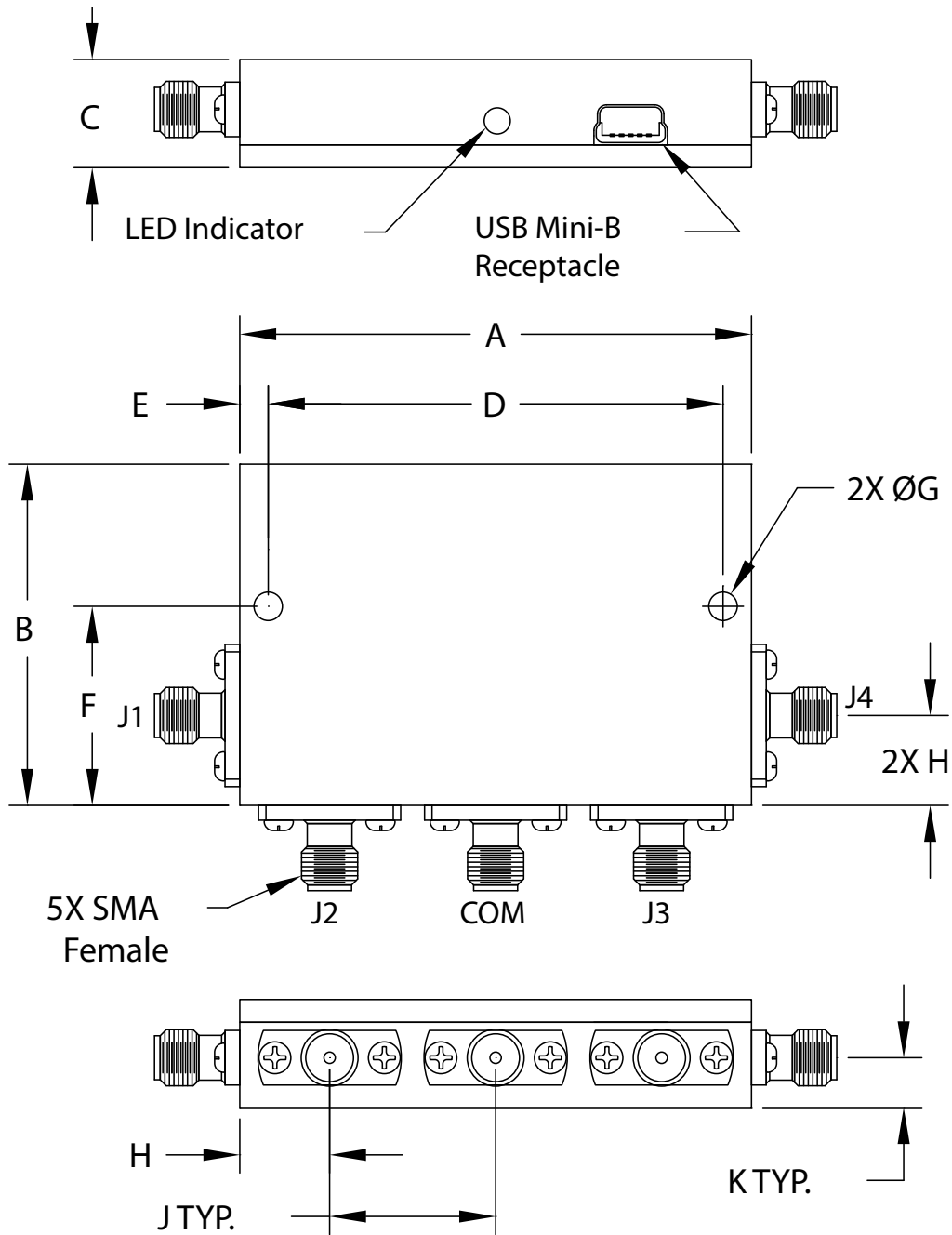

Port 1 to Port 2 Isolation with Port 4 active

Port 1 to Port 3 Isolation with Port 4 active

Port 2 to Port 3 Isolation with Port 4 active

Outline Drawing (NR1982)

LED Indicator   USB Mini-B Receptacle

2X ØG

5X SMA Female

J1   J2   COM   J3   J4

2X H

H   J TYP.   K TYP.

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	WT. GRAMS
2.25	**1.50**	**0.475**	**2.000**	**0.125**	**0.875**	**0.125**	**0.395**	**.730**	**0.219**	85
57.2	38.1	12.07	50.80	3.18	22.23	3.18	10.03	18.54	5.56	

Mini-Circuits®

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	
System requirements	GUI:	Windows 32 & 64 bit systems from Windows 98 up to Windows 10
	USB API (ActiveX & .Net)	Windows 32 & 64 bit systems with ActiveX or .Net support from Windows 98 up to Windows 10
	USB direct programming support	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
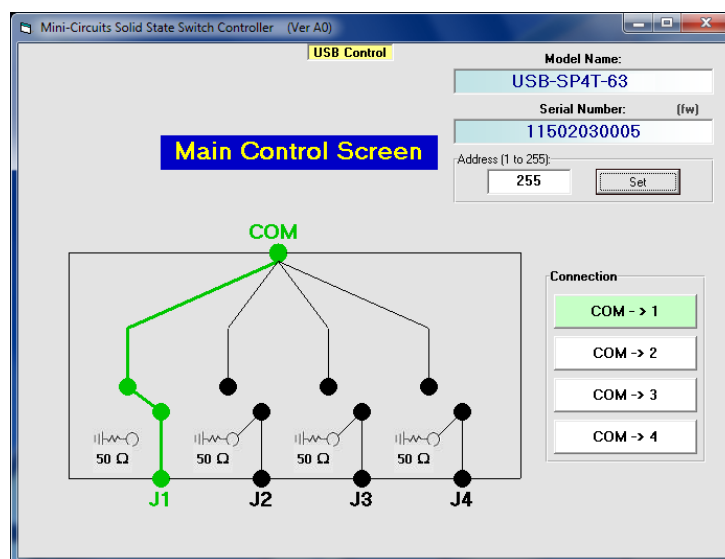
Application Programming Interface (API)
Windows Support:

- API DLL files exposing the full switch functionality
  - 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-Solid_State_Switch.pdf** for details

Ordering, Pricing & Availability Information see our web site

Model	Description
USB-SP4T-63	USB RF SP4T Switch

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)

Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

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

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp