

Solid state

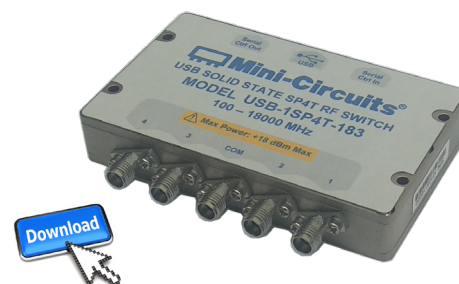
USB RF SP4T Switch

USB-1SP4T-183

50Ω 100 to 18000 MHz

The Big Deal

- Super wide bandwidth, solid-state design
- High isolation, 65 dB @ 18 GHz
- USB control and automation
- Daisy-chain control of up to 25 switches



Software Package

Case Style: NR3218

Connector	Model No.	Description	Qty.
2.92mm*	USB-1SP4T-183	USB RF SP4T Switch Matrix	1

* Compatible with SMA and 3.5mm (no adaptor needed)

Included Accessories

USB-CBL-AC-3+	3.3 ft USB cable	1
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RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

Typical Applications

- RF signal routing / switch matrices
- Ku band satellite communications
- Military radio, radar & electronic warfare
- Test & measurement systems
- Microwave radio / cellular infrastructure

Product Overview

Mini-Circuits' USB-1SP4T-183 is a fast switching solid-state SP4T covering an ultra-wide bandwidth, from 0.1 to 18 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 2.92 mm RF connectors.

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). Download the software from our website at <https://www.minicircuits.com/softwaredownload/solidstate.html>.

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.

Key Features

Feature	Advantages
Fast switching sequences	Program automated switching sequences to run with extremely fast transitions (10ns) and no external control.
High performance	Solid-state design combining high isolation with low insertion loss from 0.1 to 18 GHz.
Dynamic daisy-chain control	Control up to 25 switches through a single USB interface.
USB interface	USB HID interface provides easy compatibility with a wide range of software setups and programming environments.

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Electrical Specifications @ 0 to 50°C

Parameter	Port	Conditions	Min.	Typ.	Max.	Units
Operating Frequency			100		18000	MHz
Insertion Loss	COM to any active port	100 to 6000 MHz	-	2.5	4.0	dB
		6000 to 10000 MHz	-	3.3	4.7	
		10000 to 15000 MHz	-	3.9	5.5	
		15000 to 18000 MHz	-	4.5	6.0	
Isolation	Between any of ports J1 to J4	100 to 6000 MHz	50	70	-	dB
		6000 to 10000 MHz	50	70	-	
		10000 to 15000 MHz	50	65	-	
		15000 to 18000 MHz	50	65	-	
	COM to any terminated port (Including Disconnected State)	100 to 6000 MHz	50	65	-	
		6000 to 10000 MHz	50	65	-	
		10000 to 15000 MHz	50	60	-	
		15000 to 18000 MHz	50	60	-	
VSWR	COM port	100 to 6000 MHz	-	1.25	-	:1
		6000 to 10000 MHz	-	1.25	-	
		10000 to 15000 MHz	-	1.30	-	
		15000 to 18000 MHz	-	1.40	-	
	Any port connected to COM	100 to 6000 MHz	-	1.20	-	
		6000 to 10000 MHz	-	1.20	-	
		10000 to 15000 MHz	-	1.40	-	
		15000 to 18000 MHz	-	1.40	-	
	Any terminated port	100 to 6000 MHz	-	1.15	-	
		6000 to 10000 MHz	-	1.20	-	
		10000 to 15000 MHz	-	1.25	-	
		15000 to 18000 MHz	-	1.30	-	
Power Input @ 1 dB Compression ¹	COM to any active port	100 to 18000 MHz	-	27	-	dBm
IP3 ^{2,3}	COM to any active port	500 to 18000 MHz	-	50	-	dBm
Transition Time ⁴	-	-	-	10	30	ns
Minimum dwell time ⁵	High Speed Mode	-	-	10	-	µs
Switching Time (USB) ⁶	-	-	-	2	-	ms
Supply voltage (Vcc)	USB port	-	4.75	5	5.25	V _{DC}
Supply Current (Icc) ⁷						
DC current pass through	-	-	-	-	500	mA
Operating RF Input Power ¹	Any active port to COM port	Hot Switching	-	-	+18	dBm
	Any active port to COM port	Cold Switching	-	-	+24	
	Any terminated port	-	-	-	+24	
	COM to any port	-	-	-	+24	

¹ Max power at hot switching derates linearly from +18 dBm @ 600 MHz to +17 dBm @ 100 MHz, at all other conditions it derates linearly from +24 dBm @ 600 MHz to +17 dBm @ 100 MHz

² IP3 may degrade below 500 MHz to about +45 dBm.

³ IP3 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.

⁷ USB Current draw for a single unit with no slave units.

Absolute Maximum Ratings

Operating Temperature		0°C to 50°C
Storage Temperature		-20°C to 60°C
DC supply voltage max.		6V
RF power @ Through path	100 to 600 MHz	Derate linearly from +27 dBm @ 600 MHz to +20 dBm @ 100 MHz
	600 to 18000 MHz	+27 dBm
RF power into Termination	100 to 600 MHz	Derate linearly from +25 dBm @ 600 MHz to +18 dBm @ 100 MHz
	600 to 18000 MHz	+25 dBm
DC voltage @ RF Ports		20 V

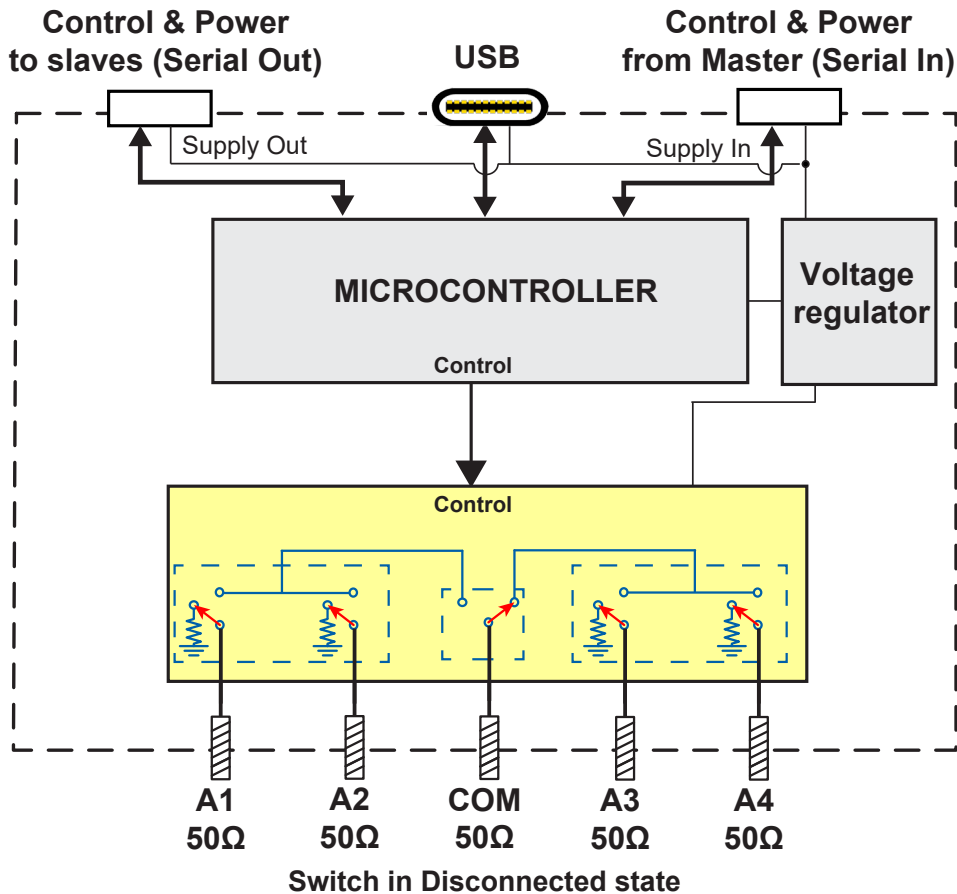
Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

Connections

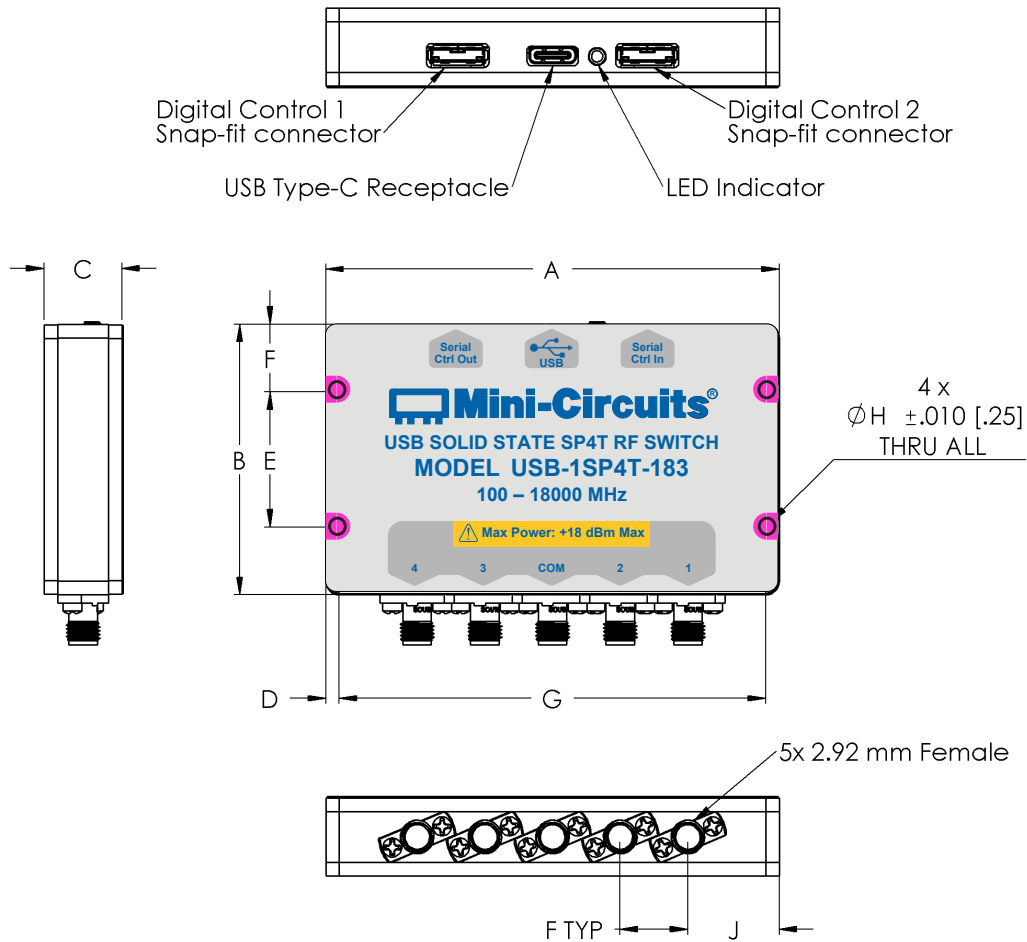
RF SP4T (COM, J1 to J4)	(2.92 mm female)
USB	(USB type C female)
Serial Control Out	(10 Pin Digital Snap Fit female) ⁸
Serial Control In	(10 Pin Digital Snap Fit female) ⁸

⁸ Mating connector is Hirose ST40X-10S-CV(30)

Block Diagram



Outline Drawing (NR3218)

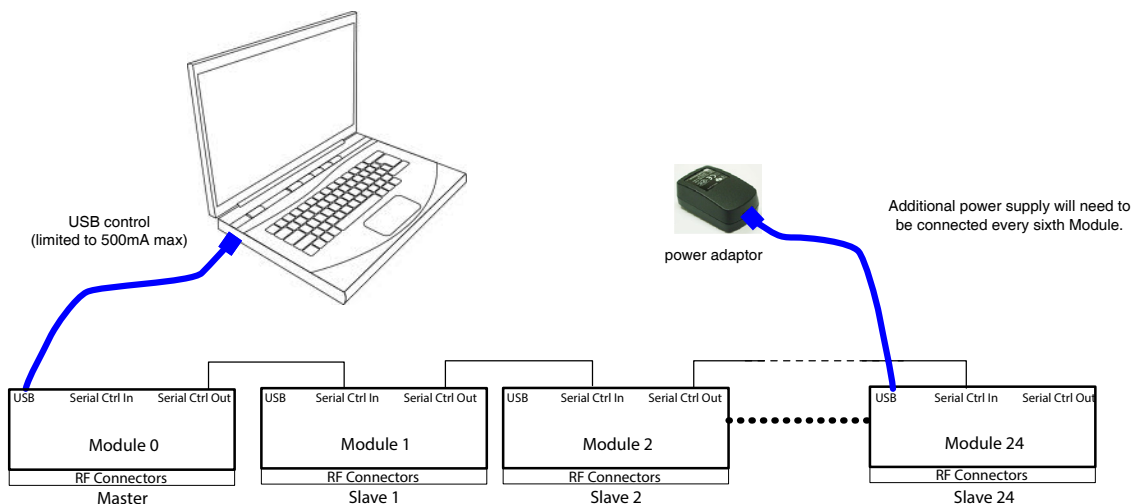


Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	K	WT. GRAMS
2.30	2.00	0.575	0.100	2.250	2.50	2.050	0.106	0.500	0.650	200
58.42	50.80	14.61	2.54	57.15	63.50	52.07	2.69	12.70	16.51	

Connecting multiple modules (Daisy Chain)

The USB-1SP4T-183 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 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 as a master and all other 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.

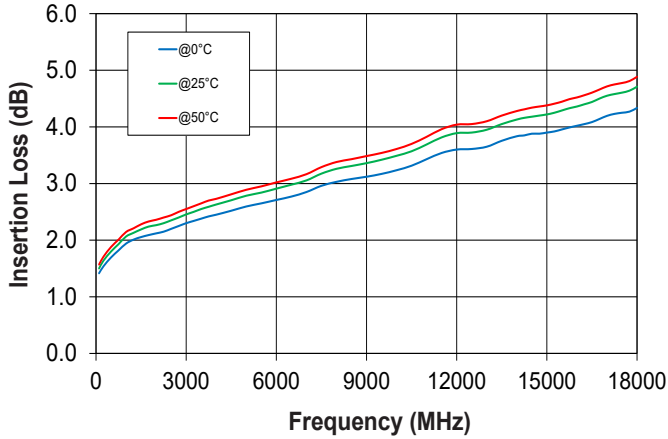
Generally, additional power supply will be needed every sixth module. All power supplies should be connected to the module via the module's USB port, connecting an additional power supply will automatically cut off power draw from the serial control in port for that module.

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.

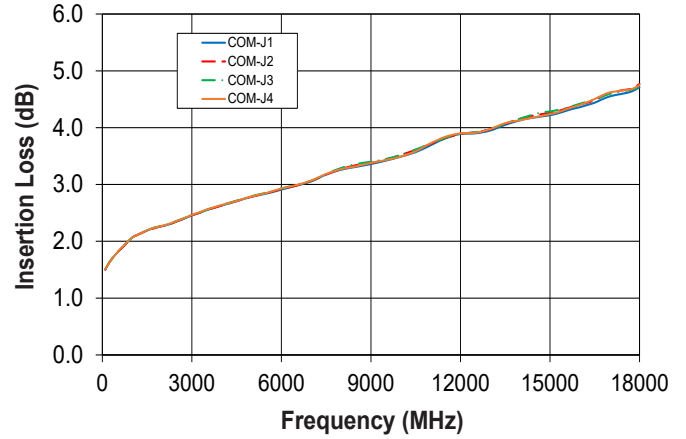
Note: Different module types may have different current consumption which will change the number of units which can be connected before additional power supply is needed.

Typical Performance Curves

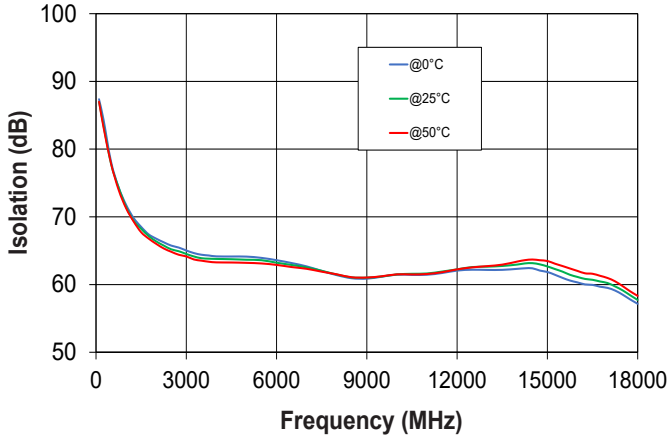
Insertion Loss J1 Active (over Temp.)



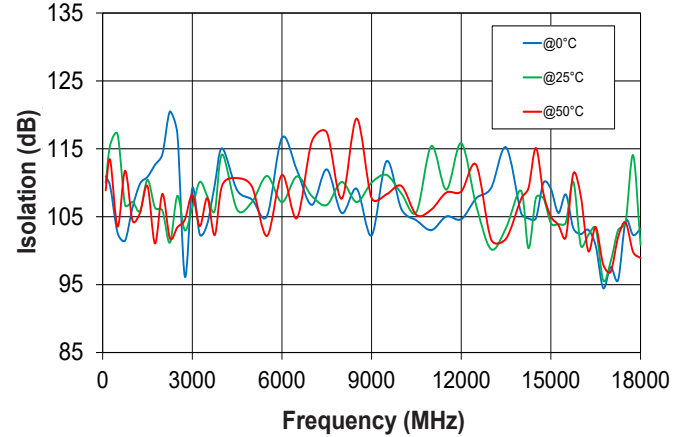
Insertion Loss J1/2/3/4 Active



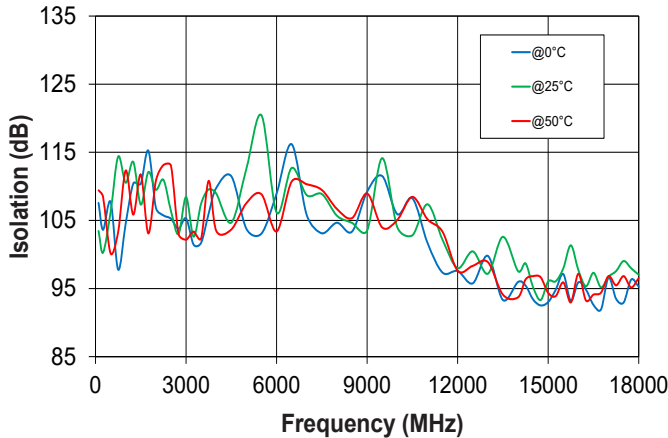
Isolation Com to J1 (J2 Active)



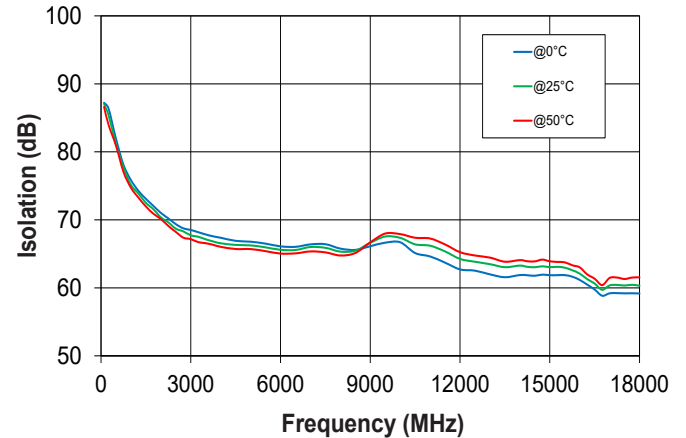
Isolation Com to J2 (J3 Active)



Isolation J2 to J3 (J2 Active)

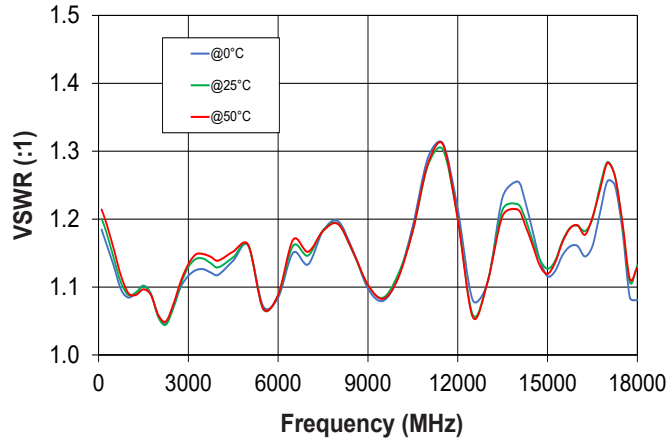


Isolation J3 to J4 (J3 Active)

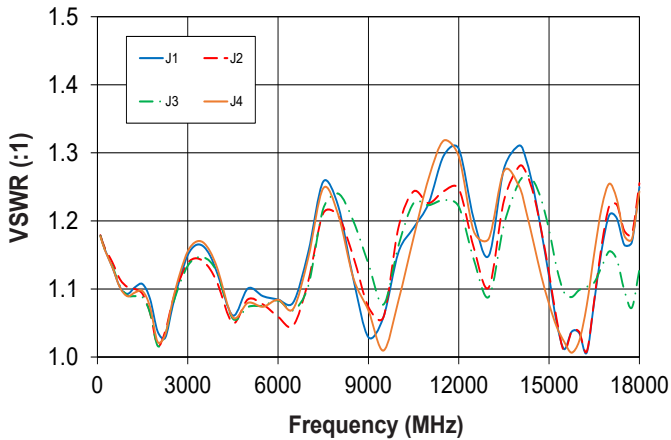


Typical Performance Curves (Continued)

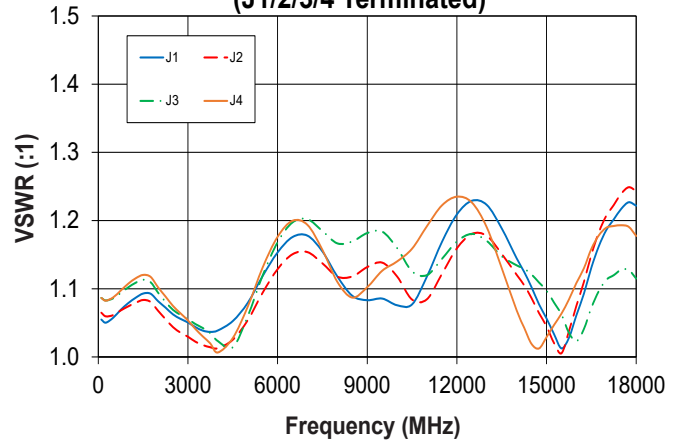
VSWR @ COM over Temp. (J1 Active)



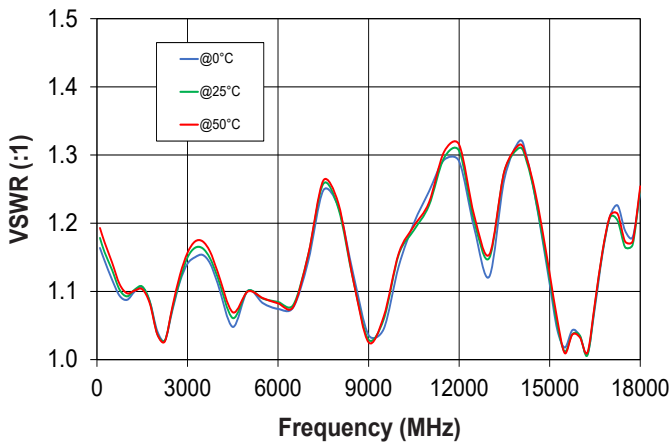
VSWR @ Active ports (J1/2/3/4 Active)



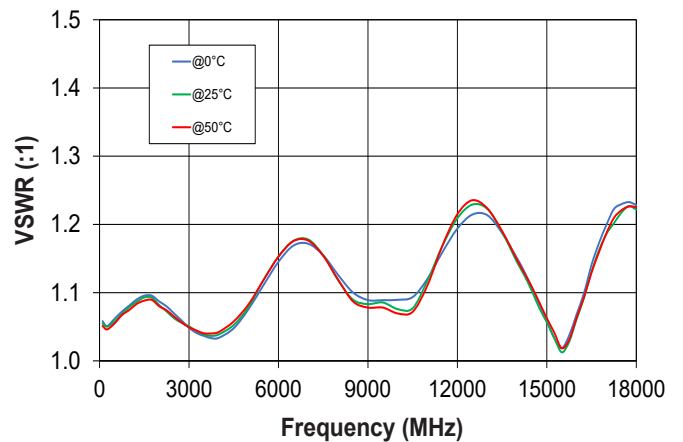
VSWR @ Terminated ports (J1/2/3/4 Terminated)



VSWR @ J1 over Temp. (J1 Active)



VSWR @ J1 over Temp. (J1 Terminated)



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

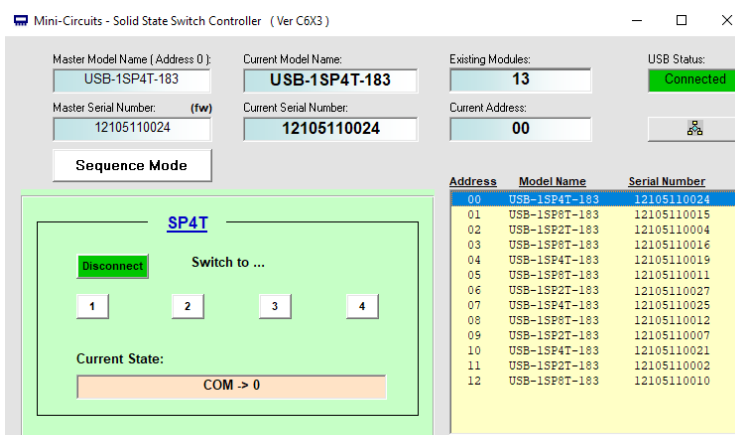
Minimum System Requirements

Parameter	Requirements	
Interface	USB HID or Daisy Chain Dynamic addressing	
System requirements	GUI:	Windows 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
	Daisy Chain Dynamic addressing	A second unit of this model or another Mini-Circuits model supporting Dynamic addressing
	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
- Control up to 25 units from a single USB control
- Configure switch address and upgrade Firmware



Application Programming Interface (API)

Programming Manual: https://www.minicircuits.com/softwaredownload/Prog_Manual-H_Series_Switches.pdf
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.

Ordering, Pricing & Availability Information see our web site

Model	Description
USB-1SP4T-183	USB RF SP4T 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	Description
USB-CBL-AC-3+ (spare)	3.3 ft (1.0 m) USB Cable: USB type A(Male) to USB type C(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 ^{9,10}

⁹ The USB-AC/DC-5 may be used to provide additional power via USB port when connecting several units in Daisy Chain.

¹⁰ 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

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.
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