USB & ETHERNET & DAISY-CHAIN

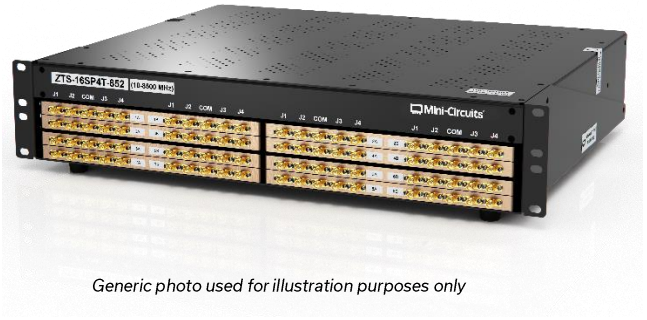
Solid-State Switch

ZTS-16SP4T-852

50Ω 10 – 8500 MHz 16 x SP4T SMA

THE BIG DEAL

- 16 x solid-state SP4T absorptive switches
- Convenient rack-mountable chassis
- SSH secure Ethernet communication
- Daisy-chain control stacking of multiple switch racks



Generic photo used for illustration purposes only

APPLICATIONS

- RF test automation & signal routing
- 5G FR1, Bluetooth & WiFi signal distribution
- MIMO antenna testing
- C-band radar & satcom
- Switch matrices

PRODUCT OVERVIEW

Mini-Circuits' ZTS series platform allows multiple solid-state switch types to be combined and integrated into a single rack-mount package with software control via USB and Ethernet. ZTS-16SP4T-852 integrates 16 solid-state SP4T switches into a chassis, operating from 10 MHz to 8.5 GHz with fast switching and high isolation.

The system is housed in a compact, 2U height, 19-inch rack chassis, with all RF connectors (SMA female) on the front panel and power and control connections out of the way on the rear panel.

The switch is controlled via USB or Ethernet (supporting SSH, HTTP & Telnet protocols). Full software support is provided, including our user-friendly GUI application for Windows, flexible API, and programming instructions for Windows and Linux environments.

The daisy-chain control interface further simplifies control integration by allowing multiple switch racks to be interconnected via their respective serial in and out connections. The complete set of daisy-chained switches can then be independently controlled through a single USB / Ethernet connection.

KEY FEATURES

Feature	Advantages
Multiple switches	16 x SP4T configuration with high isolation is well suited to automated test setups with large numbers of devices or channels under test
Wide bandwidth	Operation from 10 MHz to 8.5 GHz incorporates most of the key commercial wireless mesh network applications, including WiFi 6E, 5G FR1 and Zigbee.
Rack-mount chassis	Compact, 2U height 19" rack-chassis minimizes the rack space required in crowded production test environments.
Secure Ethernet communication	Support for SSH (Secure Shell protocol) provides a means for secure communication over Ethernet networks with strict security policies. HTTP & Telnet communication via Ethernet are also supported.

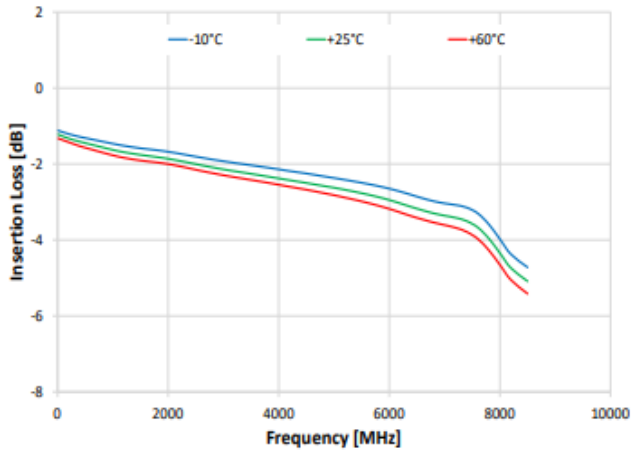
ELECTRICAL SPECIFICATIONS @ 25°C

Parameter	Conditions	Min	Typ	Max	Units
Frequency		10		8500	MHz
Insertion Loss	10 – 2500 MHz		2.5	4.0	dB
	2500 – 6000 MHz		3.3	4.7	
	6000 – 7200 MHz		3.7	6.0	
	7200 – 8500 MHz		5.0	7.0	
Isolation (Between Outputs)[1]	10 – 2500 MHz	74	105		dB
	2500 – 6000 MHz	58	80		
	6000 – 7200 MHz	58	72		
	7200 – 8500 MHz	50	60		
Isolation (Inactive Paths)[2]	10 – 2500 MHz	73	100		dB
	2500 – 6000 MHz	58	70		
	6000 – 7200 MHz	55	64		
	7200 – 8500 MHz	45	57		
Isolation (COM to J1 / J2 / J4 in Disconnected State)[3]	10 – 2500 MHz	73	100		dB
	2500 – 6000 MHz	58	70		
	6000 – 7200 MHz	55	64		
	7200 – 8500 MHz	45	57		
Isolation (COM to J3 in Disconnected State)[3]	10 – 2500 MHz	37	48		dB
	2500 – 6000 MHz	28	36		
	6000 – 7200 MHz	24	34		
	7200 – 8500 MHz	18	32		
Return Loss (COM Port)[4]	10 – 2500 MHz		19.0		dB
	2500 – 6000 MHz		15.5		
	6000 – 7200 MHz		15.0		
	7200 – 8500 MHz		7.0		
Return Loss (Active Ports)[5]	10 – 2500 MHz		19.0		dB
	2500 – 6000 MHz		17.5		
	6000 – 7200 MHz		13.5		
	7200 – 8500 MHz		8.5		
Return Loss (Terminated Ports)[6]	10 – 2500 MHz		21.0		dB
	2500 – 6000 MHz		19.0		
	6000 – 7200 MHz		15.5		
	7200 – 8500 MHz		12.0		
Input Power	Hot Switching			+24	dBm
	Cold Switching, 10 – 50 MHz			+25	
	Cold Switching, 50 – 8500 MHz			+29	
	Into internal terminations			+24	

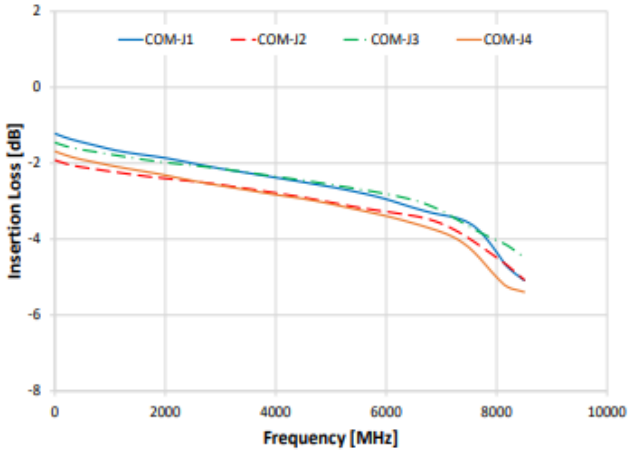
1. Isolation measured between any pair of ports J1 to J4
2. Isolation measured between COM and any disconnected port. Example: Isolation for COM to J1 is the leakage measured at port J1 from a signal input at COM when the active switch path is set COM to J2.
3. In disconnected state, all ports J1-J4 are internally terminated and COM is reflective. Isolation on the COM to J3 path is lower than for the other paths.
4. Return loss into COM port for any active switch path (eg. COM to J1). COM is reflective when disconnected.
5. Return loss into any of ports J1-J4 when connected to COM
6. Return loss into any of ports J1-J4 when internally terminated

TYPICAL PERFORMANCE DATA

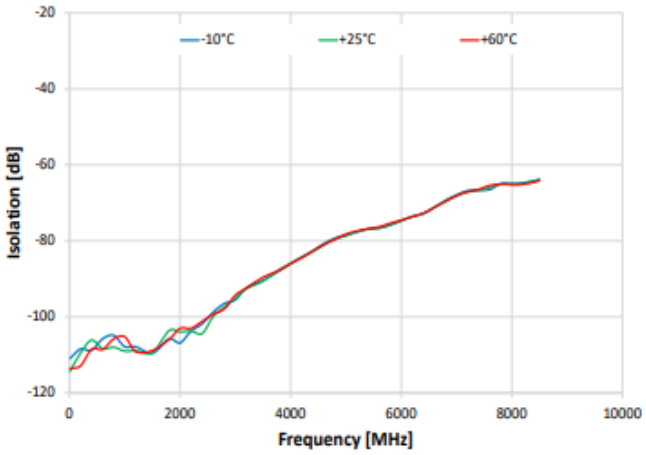
Insertion Loss over Temperature (J1 Active)



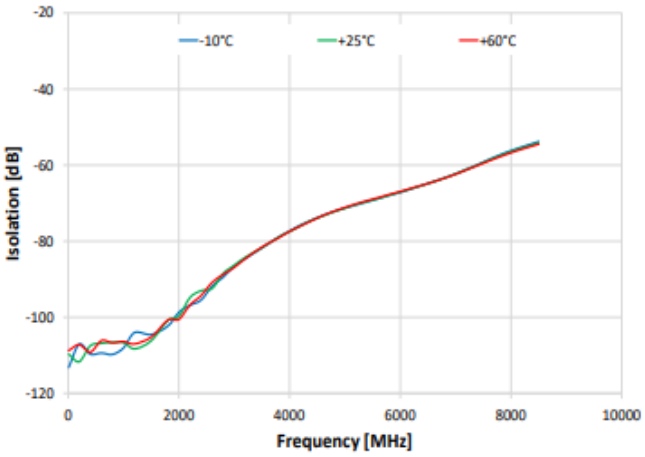
Insertion Loss J1 - J4 Active



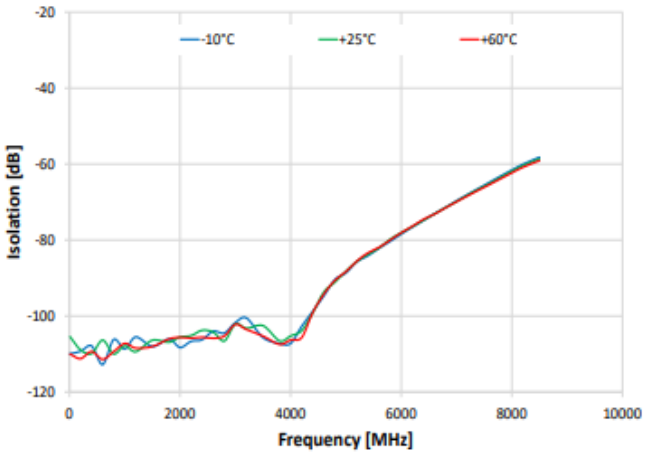
Isolation Com to J1 (J2 Active)



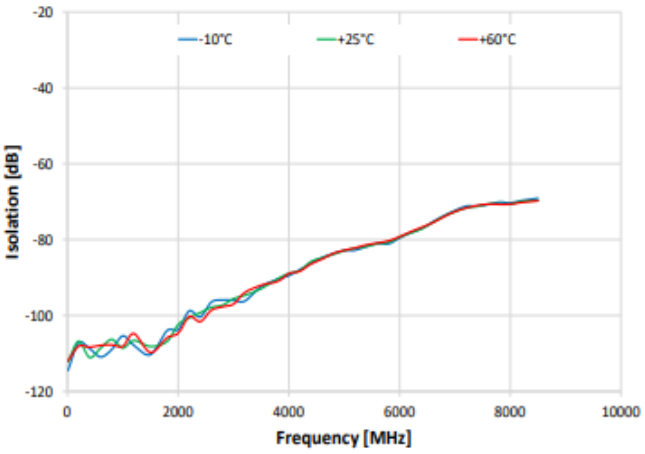
Isolation Com to J3 (J4 Active)



Isolation J2 to J3 (J2 Active)

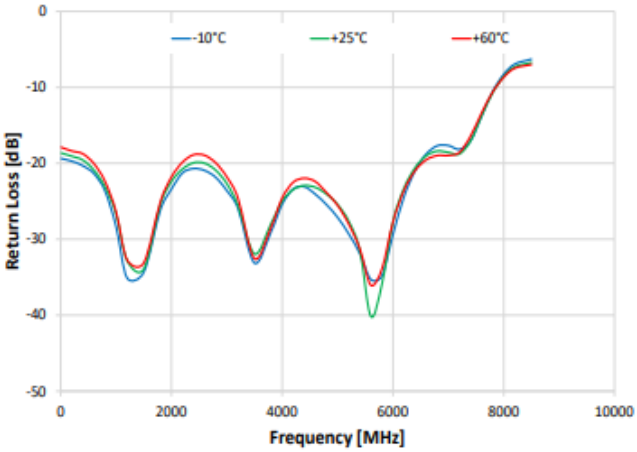


Isolation J3 to J4 (J3 Active)

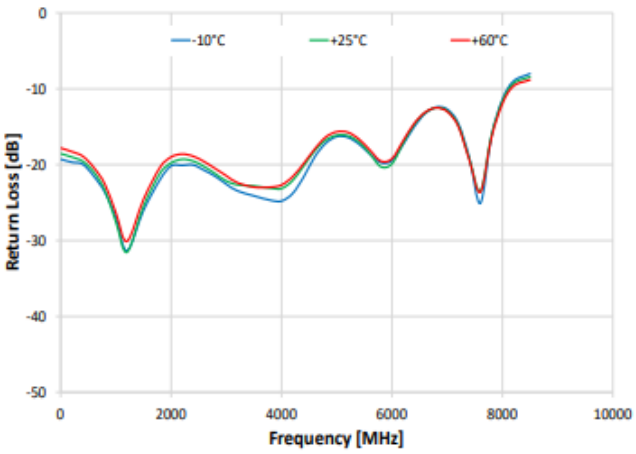


TYPICAL PERFORMANCE DATA

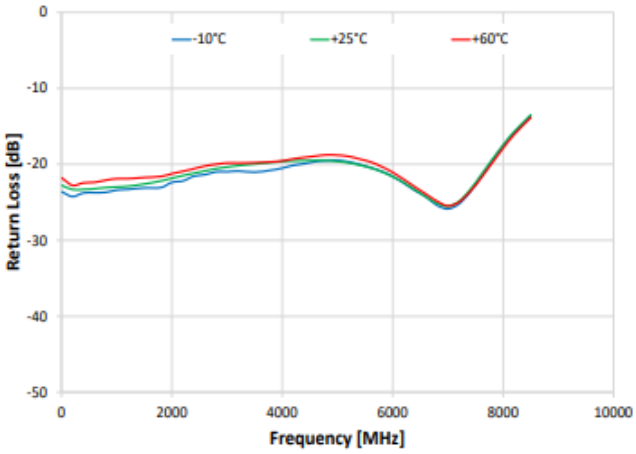
Return Loss @ COM over Temperature (J1 Active)



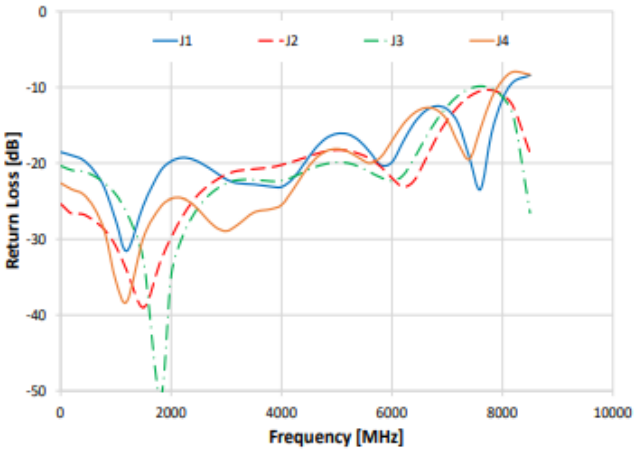
Return Loss @ J1 over Temperature (J1 Active)



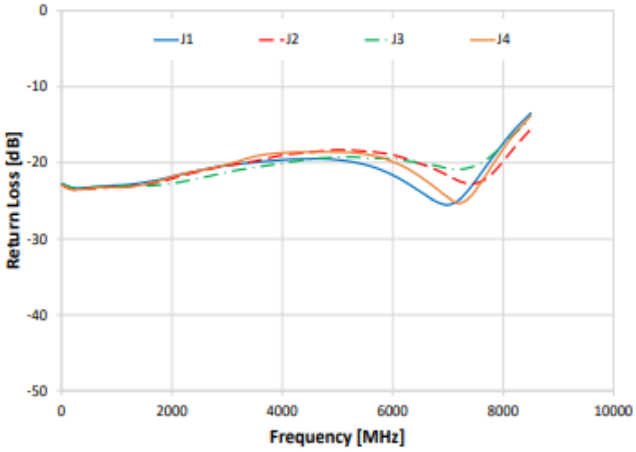
Return Loss @ J1 over Temperature (J1 Terminated)



Return Loss @ Active ports (J1- J4 Active)



Return Loss @ Terminated ports (J1 - J4 Terminated)



CONTROL INTERFACES

Ethernet Control	**Supported Protocols**	TCP / IP, SSH, HTTP, Telnet, DHCP, UDP
	Max Data Rate	100 Mbps (100Base-T Full Duplex)
USB Control	**Supported Protocols**	HID - High Speed
	Min Communication Time	400 µs typ[1]

1. Based on the polling interval of the USB HID protocol (125 µs with 64 bytes per packet) and no other significant CPU or USB activity

SOFTWARE & DOCUMENTATION

Mini-Circuits' full software and support package including user guide, Windows GUI, API, programming manual and examples can be downloaded free of charge (refer to the last page for the download path).

A comprehensive set of software control options is provided:

- GUI for Windows – Simple software interface for control via Ethernet and USB
- Programming / automation via Ethernet
  - Complete set of control commands which can be sent via any supported protocol – simple to implement in the majority of modern programming environments
- Programming / automation via USB
  - DLL files provide a full API for Windows with a set of intuitive functions which can be implemented in any programming environment supporting .Net Framework or ActiveX
  - Direct USB programming is possible in any other environment (not supporting .Net or ActiveX)

Please contact testsolutions@minicircuits.com for support

MINIMUM SYSTEM REQUIREMENTS

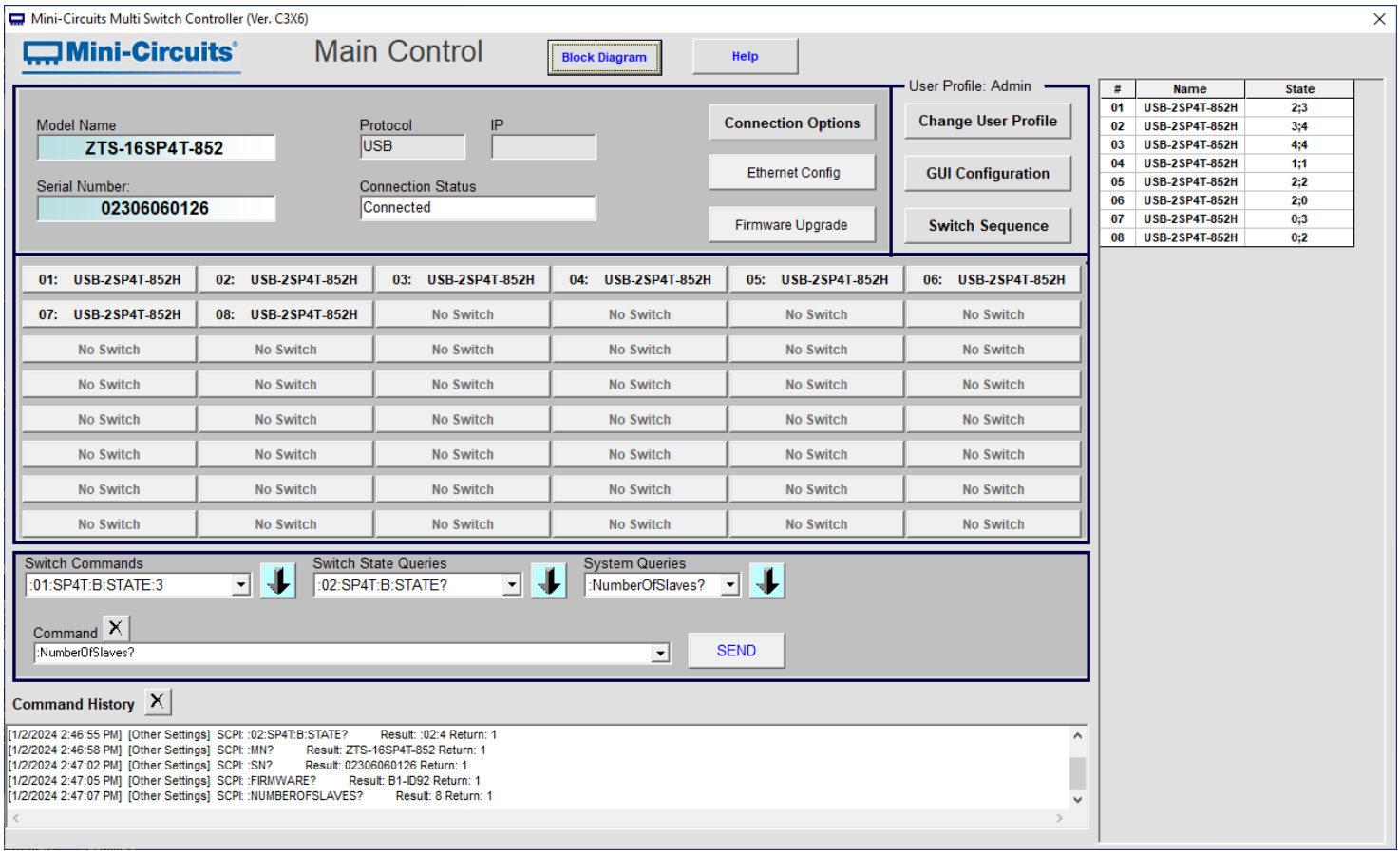
Hardware	Intel i3 (or equivalent) or later
GUI (USB or Ethernet Control)	Windows 7 or later
USB API DLL	Windows 7 or later with support for Microsoft .Net Framework or ActiveX
USB Direct Programming	Windows 7 or later; Linux
Ethernet	Windows, Linux or macOS with Ethernet TCP / IP support

PROGRAMMING COMMANDS

The key ASCII / SCPI commands for control of the system for control via the Ethernet or USB API are summarized below (refer to the programming manual for full details):

Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
:address:SP4T:sw_number:STATE:port	Set a single switch state: • address = 01 – 08 • sw_number = A – B • port = the switch state to set Example: :02:SP4T:B:STATE:2 (set module 2, SP4T switch B to state 2)
:address:SP4T:sw_number:STATE?	Get the state of a single switch: • address = 01 – 08 • sw_number = A – B Example: :02:SP4T:A:STATE? (get the state of module 2, SP4T switch A)

GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS



- Connect via USB or Ethernet
- Run GUI in demo mode to evaluate the software without a hardware connection
- View and set all switch states at the click of a button
- Configure automated switch sequences
- Update Ethernet settings and firmware

ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-20 to +60	
Input Power (No Damage)	Hot Switching	+24	dBm
	Cold Switching 10-50 MHz	+25	
	Cold Switching 50 – 8500 MHz	+29	
	Into internal termination	+24	

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.

POWER SUPPLY

Power Supply	AC mains input: 100-240 V, 50 / 60 Hz
Fuse	2A, 250V rating
Power Consumption	150W maximum

SWITCH STATE TABLE

Command	Switch Path
:xx:SP4T:y:STATE:0	All ports disconnected
:xx:SP4T:y:STATE:1	COM to port J1
:xx:SP4T:y:STATE:2	COM to port J2
:xx:SP4T:y:STATE:3	COM to port J3
:xx:SP4T:y:STATE:4	COM to port J4

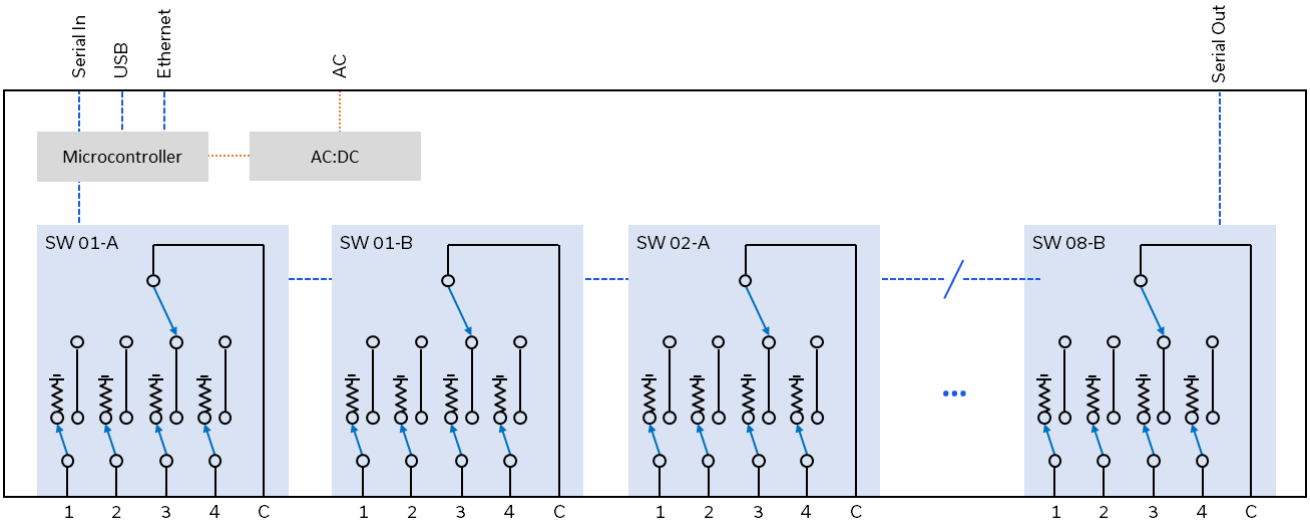
xx = Switch module number (01 to 08)
y = Switch name within module (A or B)
COM = Common port
J1-J4 = Input / output port

CONNECTIONS

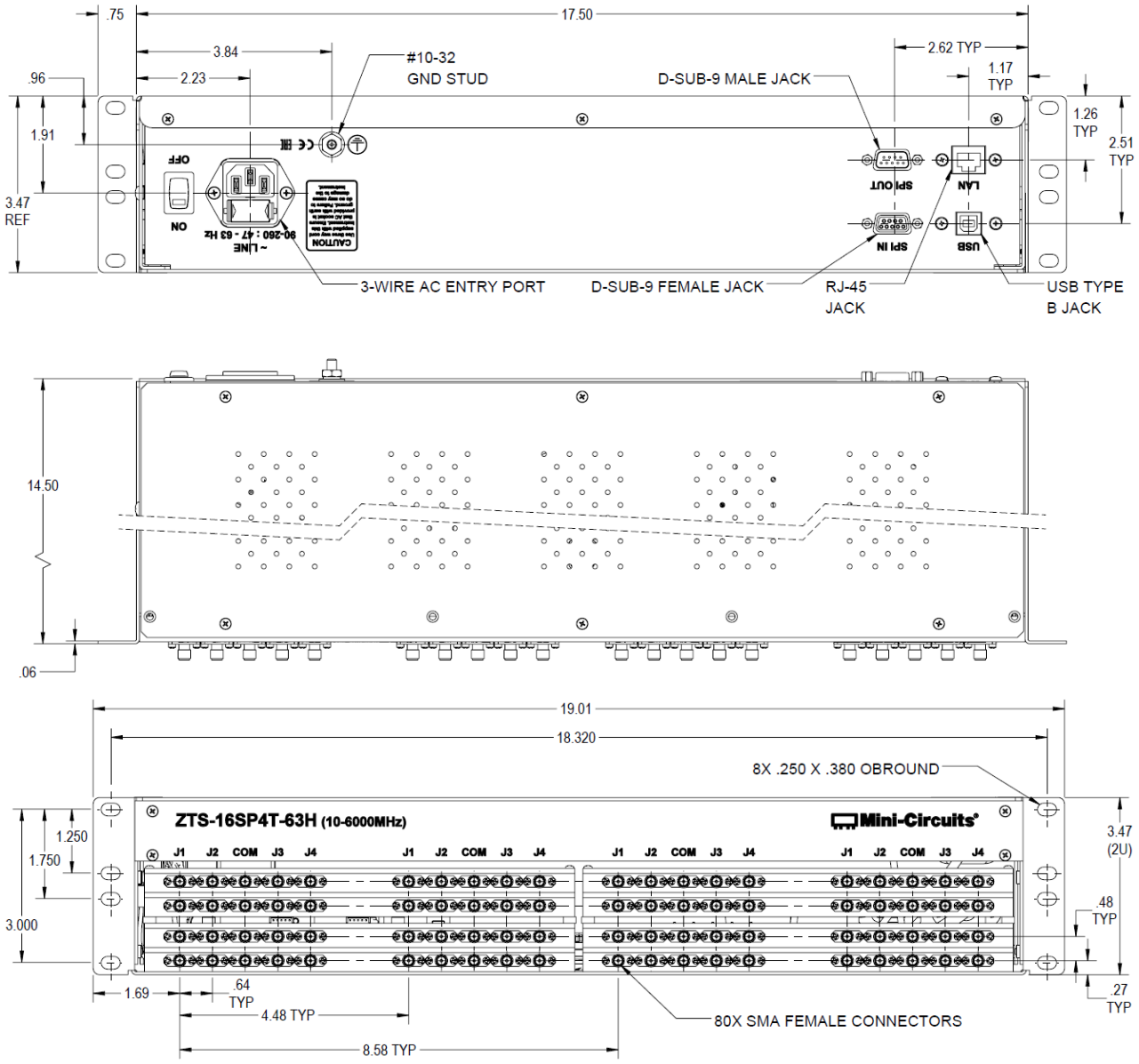
Port	Connector
Switch 1A to 8B, COM & J1-J4	SMA female
USB	USB type B
Ethernet / LAN	RJ45
Serial In & Out	D-Sub 9-pin
AC Input	IEC C14 inlet

FUNCTIONAL BLOCK DIAGRAM

- 16 x absorptive SP4T (single-pole, four throw) switches
- Ports J1 to J4 are internally terminated in 50Ω when disconnected
- Isolation on the COM to J3 path is lower than on the COM to J1 / J2 / J4 paths in the disconnected state (with COM reflective and all ports J1-J4 internally terminated)



OUTLINE DRAWING



DIMENSIONS ARE IN INCHES

TOLERANCES ON:
2 PL DECIMALS ± .03
3 PL DECIMALS ± .015

PRODUCT MARKING*

Product Marking: ZTS-16SP4T-852
Product Frequency: 10-8500 MHz
Unit ID Label: Serial number and other identification marks
*Marking may contain other features or characters for internal lot control

DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE

Case Style	99-01-3070
Software, User Guide & Programming Manual	www.minicircuits.com/softwaredownload/multissw.html
Environmental Rating	ENV55
Regulatory Compliance	Refer to our website for compliance methodologies and qualifications CE UK CA www.minicircuits.com/quality/environmental_introduction.html

Contact Us: testsolutions@minicircuits.com

Included Accessories	Part Number	Description
	CBL-3W-xx	AC power cord (IEC C13 connector to local plug) Select one option from the list below. Please contact testsolutions@minicircuits.com if your regions is not listed.
	USB-CBL-AB-7+	USB cable (6.8ft) type A to type B
	CBL-RJ45-MM-5+	Ethernet cable (5 ft)
	HT-4-SMA	SMA connector wrench (4" length)
	D-SUB9-MF-6+	D-Sub (9-pin) serial cable (6 ft)

AC Power Cord Options	Part Number	Description
	CBL-3W-US	USA NEMA 5-15 plug (type B) to IEC C13 connector
	CBL-3W-EU	Europe CEE 7/7 plug (type E/F) to IEC C13 connector
	CBL-3W-UK	UK BS-1363 plug (type G) to IEC C13 connector
	CBL-3W-AU	Australia & China AS/NZS 3112 plug (type I) to IEC C13 connector
	CBL-3W-IL	Israel SI-32 plug (type H) to IEC C13 connector

Revision	Updates	Date	Creator	Reviewer
3	Extended frequency range	28-Aug-24	LW	WT

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