



USB & ETHERNET & DAISY-CHAIN

# Solid-State Switch

**ZTS-2SP16T-852**

50  $\Omega$  1 to 8500 MHz 2 x SP16T Rack-Mount SMA Female

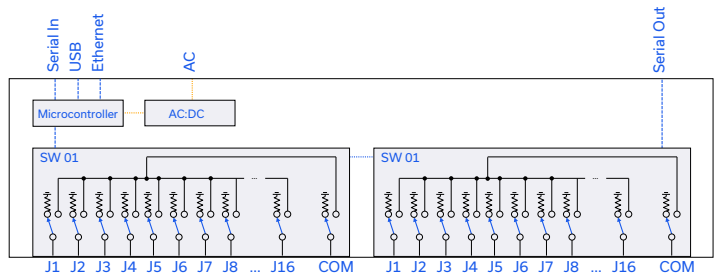
## THE BIG DEAL

- 2 x solid-state SP16T 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

## FUNCTIONAL BLOCK DIAGRAM



## 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-2SP16T-852 integrates 2 solid-state SP16T switches into a chassis, operating from 1 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
Solid-state switches	Fast switching and high isolation switch, well suited to automated test setups with large numbers of devices or channels under test
Wide bandwidth	Operation from 1 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.





USB & ETHERNET & DAISY-CHAIN

# Solid-State Switch

**ZTS-2SP16T-852**

Mini-Circuits

50  $\Omega$  1 to 8500 MHz 2 x SP16T Rack-Mount SMA Female

## ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	1		8500	MHz
Insertion Loss	1 – 3000 MHz		6.0	8.0	dB
	3000 – 7000 MHz		8.5	10.5	
	7000 – 8500 MHz		10.5	14.0	
Isolation (Between Outputs) <sup>1</sup>	1 – 3000 MHz	75	85		dB
	3000 – 7000 MHz	65	80		
	7000 – 8500 MHz	60	70		
Isolation (Inactive Paths) <sup>2</sup>	1 – 3000 MHz	80	100		dB
	3000 – 7000 MHz	80	90		
	7000 – 8500 MHz	75	85		
Return Loss (COM Port) <sup>3</sup>	1 – 3000 MHz	80	90		dB
	3000 – 7000 MHz	70	80		
	7000 – 8500 MHz	60	75		
Return Loss (Active Ports) <sup>4</sup>	1 – 3000 MHz		19		dB
	3000 – 7000 MHz		14		
	7000 – 8500 MHz		13		
Return Loss (Terminated Ports) <sup>5</sup>	1 – 3000 MHz		19		dB
	3000 – 7000 MHz		20		
	7000 – 8500 MHz		17		
Input Power	Hot Switching			+20	dBm
	Into internal terminations			+25	
	Cold Switching, 1 – 10 MHz			+25	
	Cold Switching, 10 – 8000 MHz			+30	

1. Isolation measured between any pair of ports J1 to J16

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. Return loss into COM port for any active switch path (eg. COM to J1)

4. Return loss into any of ports J1-J16 when connected to COM

5. Return loss into any port when internally terminated (including COM)





USB & ETHERNET & DAISY-CHAIN

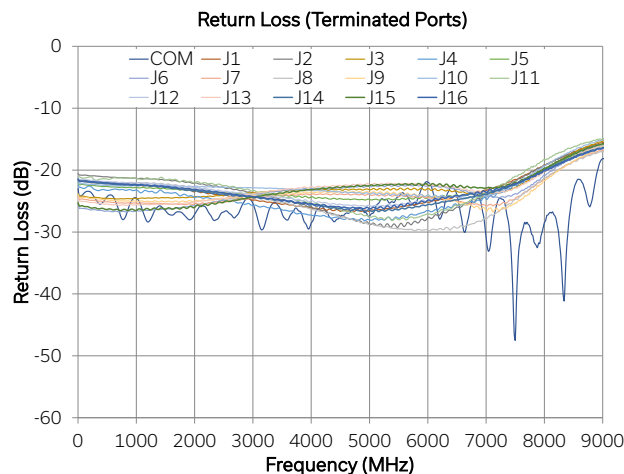
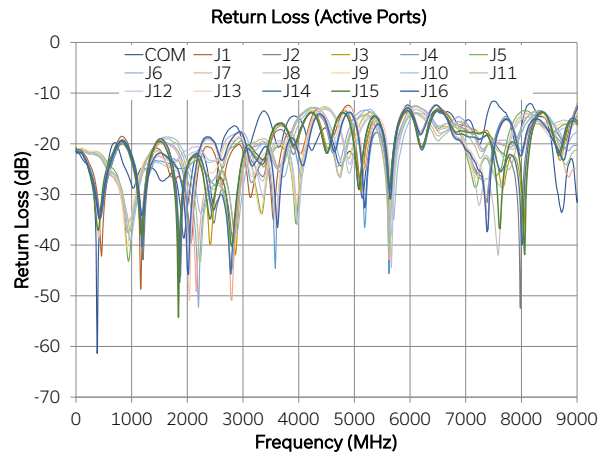
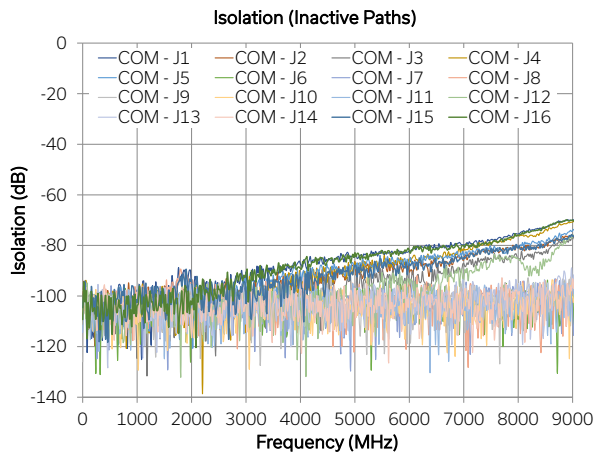
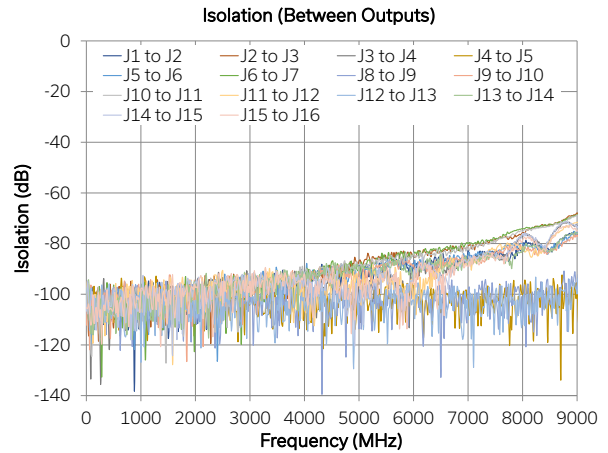
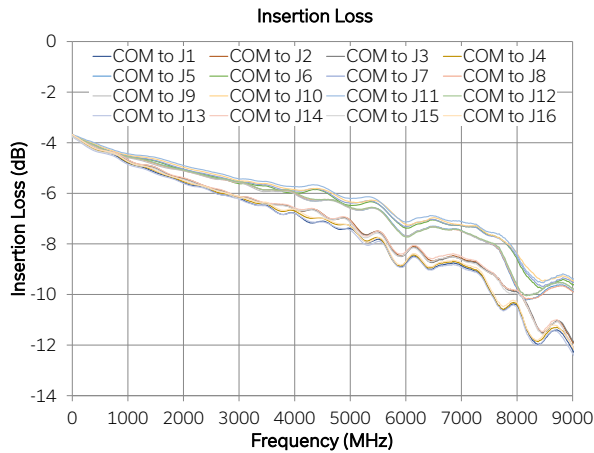
# Solid-State Switch

**ZTS-2SP16T-852**

Mini-Circuits

50  $\Omega$  1 to 8500 MHz 2 x SP16T Rack-Mount SMA Female

## TYPICAL PERFORMANCE GRAPHS





## CONTROL INTERFACES

Ethernet Control	Supported Protocols	TCP / IP, SSH, HTTP, Telnet, DHCP, UDP (limited)
	Max Data Rate	100 Mbps (100 Base-T Full Duplex)
USB Control	Supported Protocols	HID – High Speed
	Min Communication Time <sup>1</sup>	400 $\mu$ s typ <sup>1</sup>

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

## SOFTWARE &amp; 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](mailto: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:SP16T:STATE:port	Set a switch state: <ul style="list-style-type: none"> <li>• address = switch number (01 or 02)</li> <li>• port = the switch state to set</li> </ul> Example: :01:SP16T:STATE:8 (set the switch to state 8)
:address:SP16T:STATE?	Get the state of all switches: <ul style="list-style-type: none"> <li>• address = switch number (01 or 02)</li> </ul> Example: :01:SP16T:STATE?



USB & ETHERNET & DAISY-CHAIN

# Solid-State Switch

**ZTS-2SP16T-852**

Mini-Circuits

50 Ω 1 to 8500 MHz 2 x SP16T Rack-Mount SMA Female

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

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

Mini-Circuits Multi Switch Controller (Ver. C3X6)

**Mini-Circuits** Main Control [Block Diagram](#) [Help](#)

User Profile: Admin

Model Name: **ZTS-2SP16T-852** Protocol: **USB** IP:  Connection Options: [Change User Profile](#)

Serial Number: **02301030126** Connection Status: **Connected** [Ethernet Config](#) [GUI Configuration](#)

[Firmware Upgrade](#) [Switch Sequence](#)

#	Name	State
01	B35-1SP16T	0
02	B35-1SP16T	13

01: B35-1SP16T	02: B35-1SP16T	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch
No Switch	No Switch	No Switch	No Switch	No Switch	No Switch

Switch Commands:  Switch State Queries:  System Queries:

Command:  [SEND](#)

Command History

[12/20/2023 9:22:29 AM]	[Other Settings]	SCPI: :01:SP16T:STATE:0	Result: :01:1 Return: 1
[12/20/2023 9:22:32 AM]	[Other Settings]	SCPI: :02:SP16T:STATE?	Result: :02:13 Return: 1
[12/20/2023 9:22:35 AM]	[Other Settings]	SCPI: :MN?	Result: ZTS-2SP16T-852 Return: 1
[12/20/2023 9:22:41 AM]	[Other Settings]	SCPI: :SN?	Result: 02301030126 Return: 1





## 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 1-10 MHz	+25	
	Cold Switching 10 - 8500 MHz	+30	
	Into internal termination	+25	

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

Switch Command	Switch Path
:xx:SP16T:STATE:0	All ports disconnected
:xx:SP16T:STATE:1	COM to port J1
:xx:SP16T:STATE:2	COM to port J2
:xx:SP16T:STATE:3	COM to port J3
:xx:SP16T:STATE:4	COM to port J4
:xx:SP16T:STATE:5	COM to port J5
:xx:SP16T:STATE:6	COM to port J6
:xx:SP16T:STATE:7	COM to port J7
-	-
:xx:SP16T:STATE:16	COM to port J16

xx = Switch number (01 or 02)

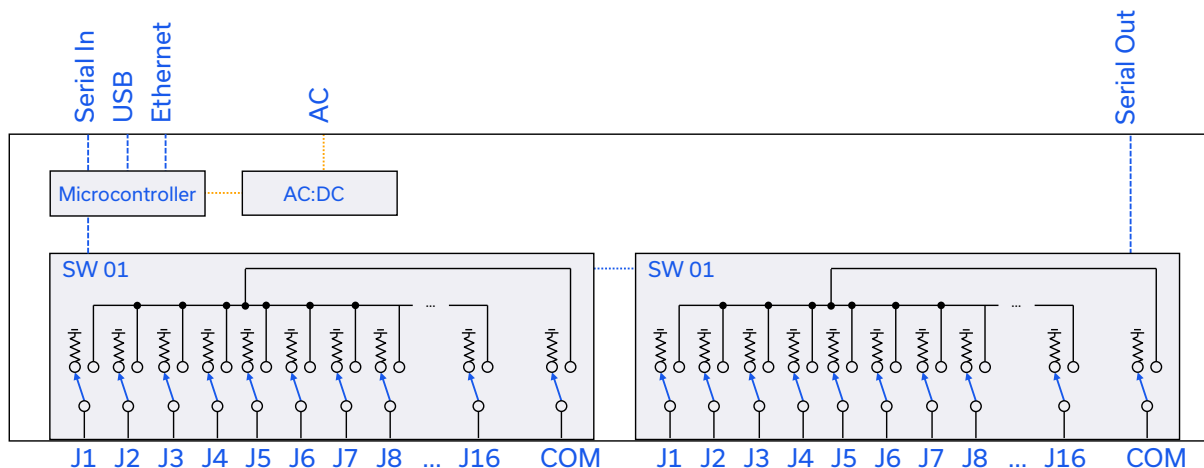
COM = Common port

J1-J16 = Input / output port

## CONNECTIONS

Port	Connector
SW1 & SW2, COM & J1-J16	SMA female
USB	USB type B
Ethernet / LAN	RJ45
Serial In & Out	D-Sub 9-pin
AC Input	IEC C14 inlet

## FUNCTIONAL BLOCK DIAGRAM





USB & ETHERNET & DAISY-CHAIN

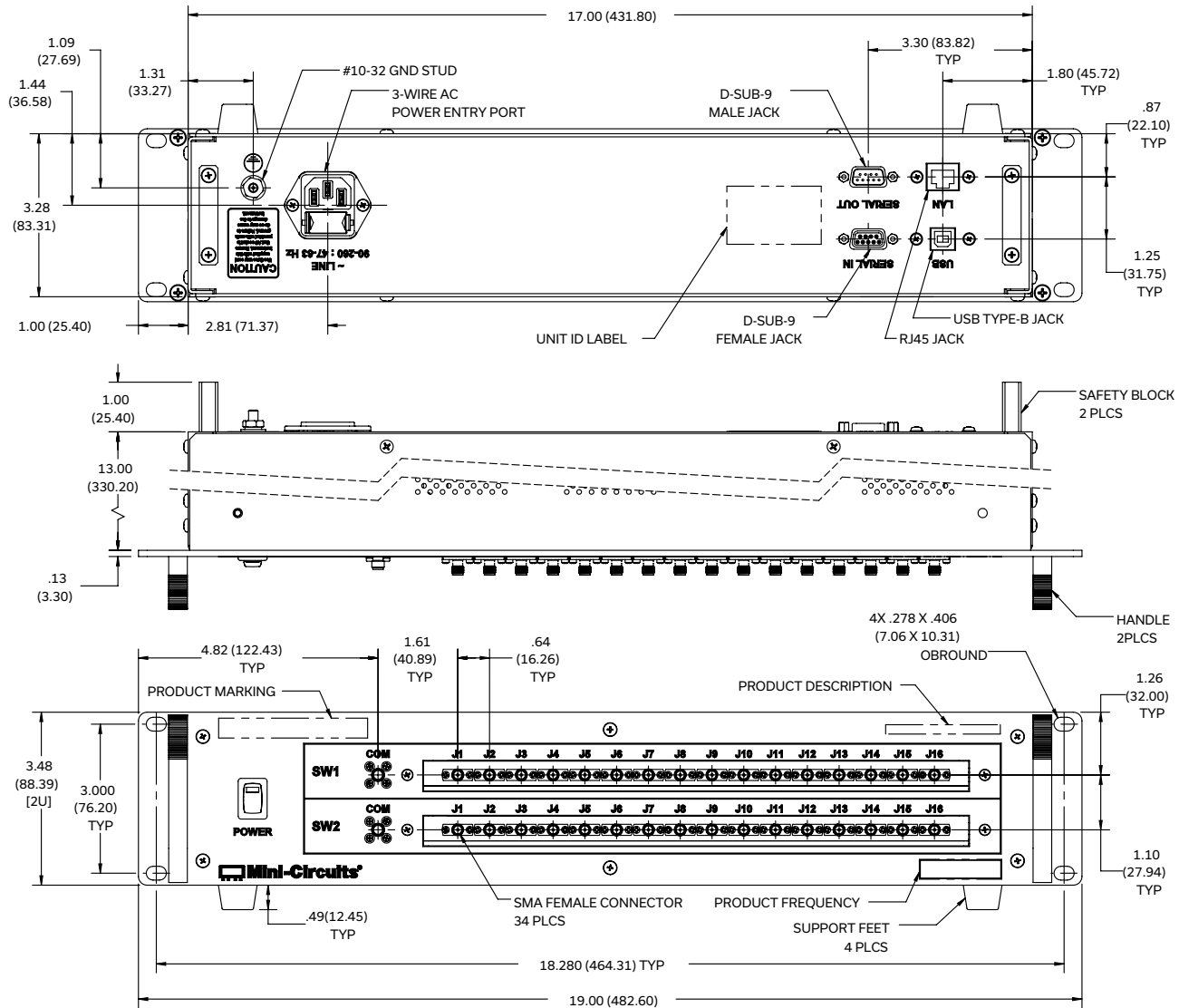
# Solid-State Switch

**ZTS-2SP16T-852**

Mini-Circuits

50  $\Omega$  1 to 8500 MHz 2 x SP16T Rack-Mount SMA Female

## CASE STYLE DRAWING



1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$  inch; 3 Pl.  $\pm .015$  inch.
3. Weight: 4450 grams.
4. Marking may contain features or characters for internal lot control.

## PRODUCT MARKING\*

Product Marking: ZTS-2SP16T-852

Product Description: Dual SP16T Switch

Product Frequency: 1-8500 MHz

Unit ID Label: Serial number and other identification marks

\*Marking may contain other features or characters for internal lot control

Mini-Circuits



USB & ETHERNET & DAISY-CHAIN

# Solid-State Switch

**ZTS-2SP16T-852**




Mini-Circuits






50  $\Omega$  1 to 8500 MHz 2 x SP16T Rack-Mount SMA Female

DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE [CLICK HERE](#)

Case Style	BAC3590
Software, User Guide & Programming Manual	<a href="http://www.minicircuits.com/softwaredownload/multissw.html">www.minicircuits.com/softwaredownload/multissw.html</a>
Environmental Rating	ENV55
Regulatory Compliance	<p>Refer to our website for compliance methodologies and qualifications</p>  <p><a href="http://www.minicircuits.com/quality/environmental_introduction.html">www.minicircuits.com/quality/environmental_introduction.html</a></p>

Contact Us: [testsolutions@minicircuits.com](mailto: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 <a href="mailto:testsolutions@minicircuits.com">testsolutions@minicircuits.com</a> if your region 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

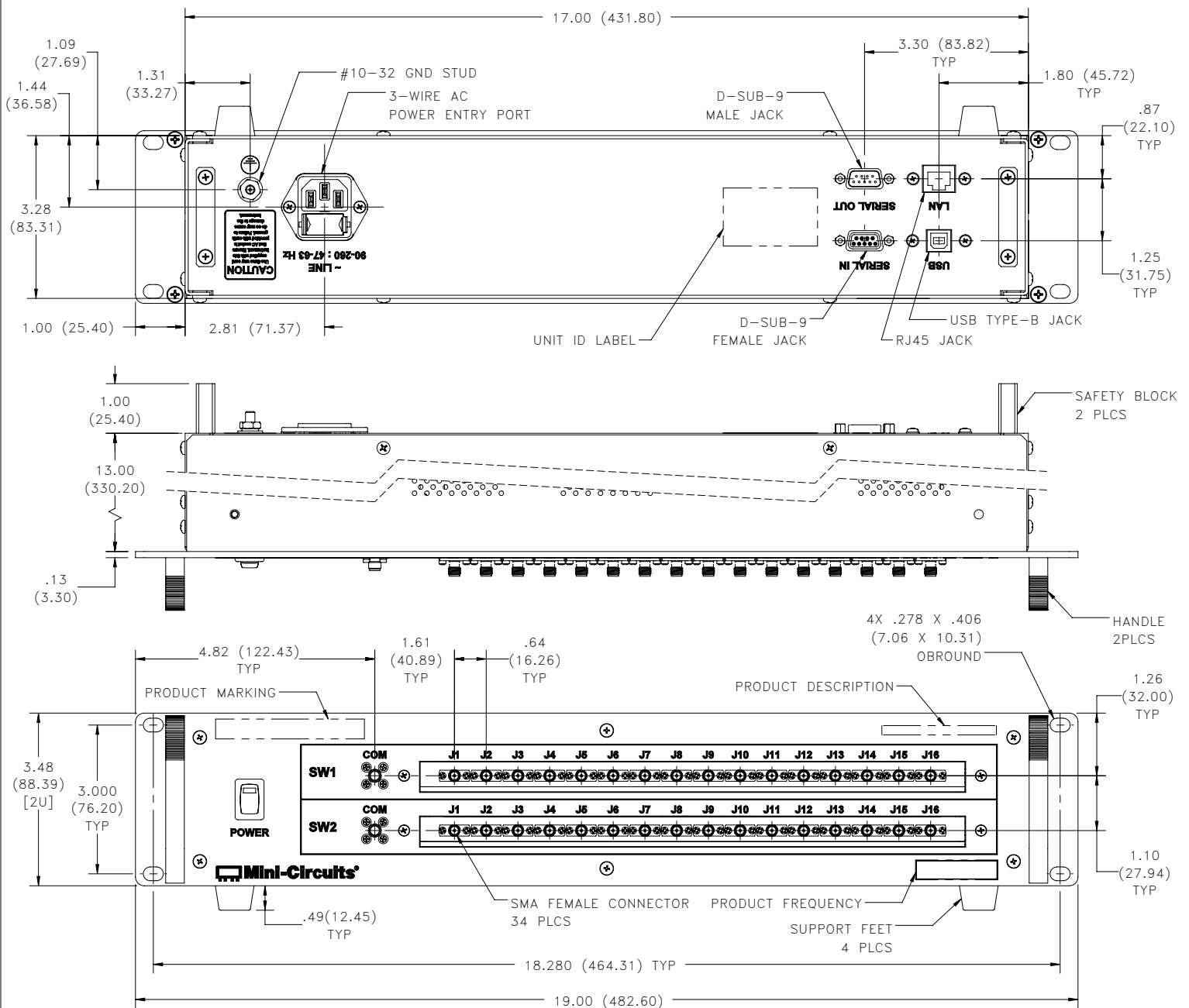
## NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)



## Outline Dimensions

BAC3590



### Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$  inch; 3 Pl.  $\pm .015$  inch.
3. Weight: 4450 grams.
4. Marking may contain features or characters for internal lot control.

**Mini-Circuits®**  
ISO 9001 ISO 14001 CERTIFIED

ALL NEW  
minicircuits.com

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS



## 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