USB & ETHERNET

Mechanical Switch Assembly ZTM2-8SP8T-40

50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

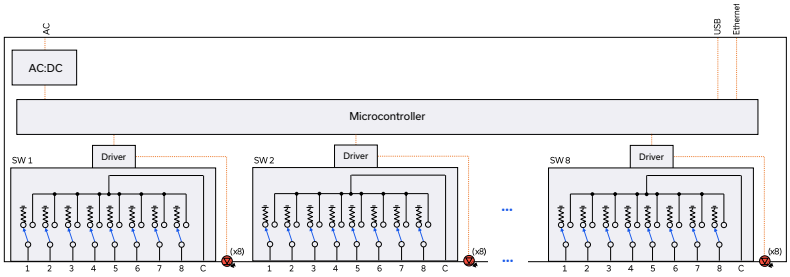
THE BIG DEAL

- 8 x mechanical SP8T absorptive switches
- High port count with excellent performance to 40 GHz
- Rack-mountable chassis with easy field maintenance
- Software control & automation
- SSH secure Ethernet communication
- LED switch state indicators



Generic photo used for illustration purposes only

FUNCTIONAL BLOCK DIAGRAM



APPLICATIONS

- Benchtop and rack-mounted automated test systems
- 5G FR1 & FR2, WiFi 6E, millimeter wave radio infrastructure
- Military radio, radar & electronic warfare
- Switch matrices

PRODUCT OVERVIEW

Mini-Circuits' ZTM2-8SP8T-40 houses 8 independently controlled electro-mechanical SP8T switches. Each switch operates over an exceptionally wide bandwidth from DC to 40 GHz with high isolation and low insertion loss. The absorptive switches are fail-safe / normally open with a break before make configuration and lifetime of 2 million switching cycles when used within the noted specifications.

The switches are housed in a rugged 19-inch rack chassis with all 2.92 mm (female) RF connectors on the front. LED switch state indicators on the front panel enable visual display of all switch states. The modular design of the ZTM2 series switch rack supports easy maintenance and re-configuration in the field without the need to return the whole system to a Mini-Circuits facility.

The switch assembly can be controlled via USB or Ethernet (supporting SSH, HTTP and Telnet network protocols). 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.
Custom switch configurations can be configured to fit any requirement, using Mini-Circuits' online configurator tool at www.minicircuits.com/WebStore/ztm2.html.

KEY FEATURES

Feature	Advantages
Mechanical switches	Mechanical absorptive switches provide low loss, high isolation, high reliability, repeatable performance and internal termination of input signals on the disconnected paths
Fail-safe design	The switches revert to a known default state when the DC supply is removed, allowing their use in systems that must continue to operate safely in the event of power failure
Secure Ethernet communication	Support for SSH (Secure Shell protocol) provides a means for secure communication over Ethernet networks with strict security policies.
Rack-mount chassis	19", 5U rack-mountable chassis suits integration in automated production test environments.
Integrated control & power	Easy to use on the lab bench or integrate into larger automated test systems without the need to develop custom control systems.

REV. A
ECO-024239
ZTM2-8SP8T-40
MCL NY
250129

Mechanical Switch Assembly ZTM2-8SP8T-40

50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

ELECTRICAL SPECIFICATIONS AT +25°C (EACH SWITCH)

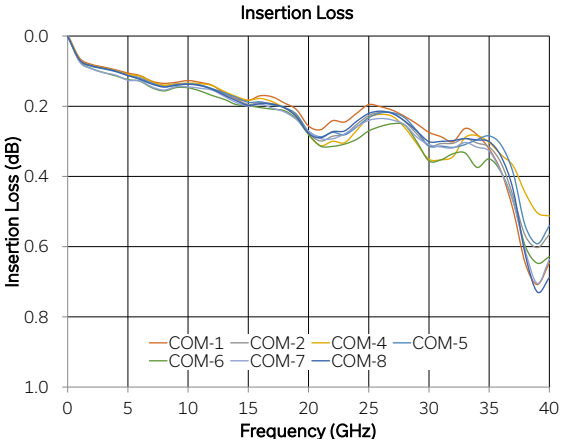
Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	DC		18	GHz
Insertion Loss	DC – 12 GHz		0.20	0.40	dB
	12 – 26 GHz		0.30	0.70	
	26 – 40 GHz		0.70	1.50	
Isolation (Inactive Paths)	DC – 12 GHz	75	100		dB
	12 – 26 GHz	70	80		
	26 – 40 GHz	55	70		
Return Loss[1]	DC – 12 GHz		22		:1
	12 – 26 GHz		16		
	26 – 40 GHz		12		
Switching Time			25		ms
RF Input Power (Cold Switching)	DC – 12 GHz			20	W
	12 – 26 GHz			5	
	26 – 40 GHz			1	
	Into internal terminations[3]			1	
Switch Lifetime	100 mW hot switching[4]	2			million cycles
	1W hot switching		1		

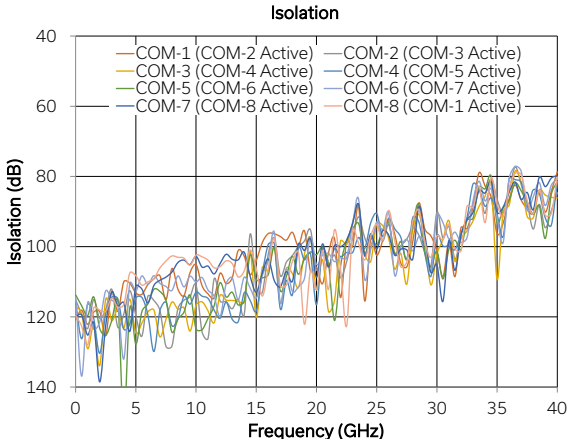
1. Isolation measured between Com and any disconnected port. Example: Isolation for Com to 1 is the leakage measured at port 1 from a signal input at Com when the active switch path is set to Com to 2
2. Return loss into Com when active or ports 1-8 in any state; Com is reflective when disconnected
3. Maximum power into any internal termination is 1W per port, 3W total per switch
4. Hot switching power above this level will degrade the switch lifetime

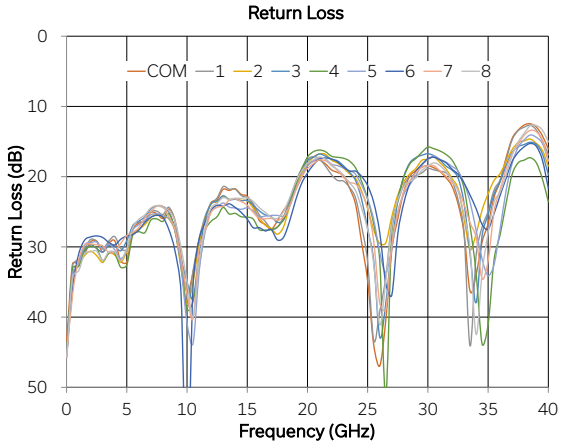
Mechanical Switch Assembly ZTM2-8SP8T-40

50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

TYPICAL PERFORMANCE GRAPHS







CONTROL INTERFACES

Ethernet Control	Supported Protocols	TCP / IP, SSH, HTTP, Telnet, DHCP, UDP (limited)
	Max Data Rate	100 Mbps (100Base-T Full Duplex)
USB Control	Supported Protocols	HID – High Speed
	Min Communication Time[5]	400 µs typ

5. 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):

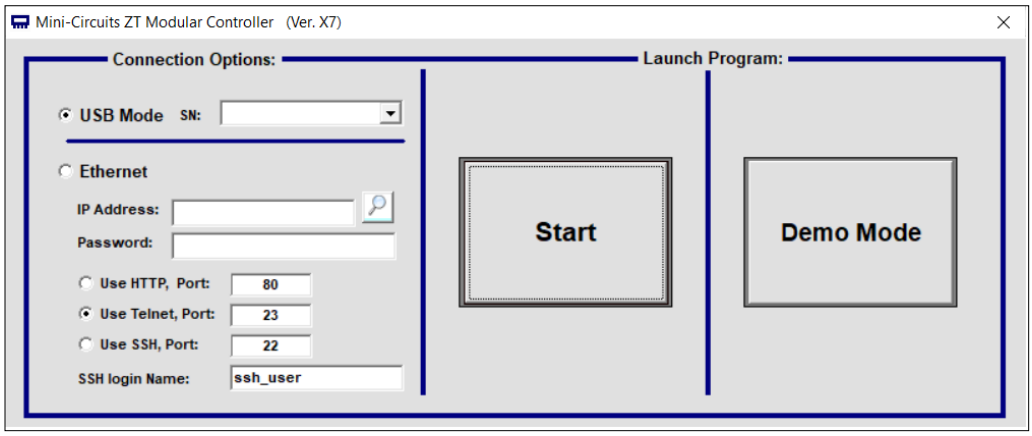
Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
:SP8T:[sw_label]:STATE:[port]	Set a single switch state: • sw_label] = 1 to 8 • [port] = 0 (all ports disconnected) to 8 (Com to 8) • Example :SP8T:3:STATE:8 (set switch SP8T switch 3 to state 8)
:SP8T:[sw_label]:STATE?	Get the state of all switches: • [sw_label] = 1 to 8 • Example :SP8T:3:STATE:8 (set switch SP8T switch 3 to state 8)

Mechanical Switch Assembly ZTM2-8SP8T-40

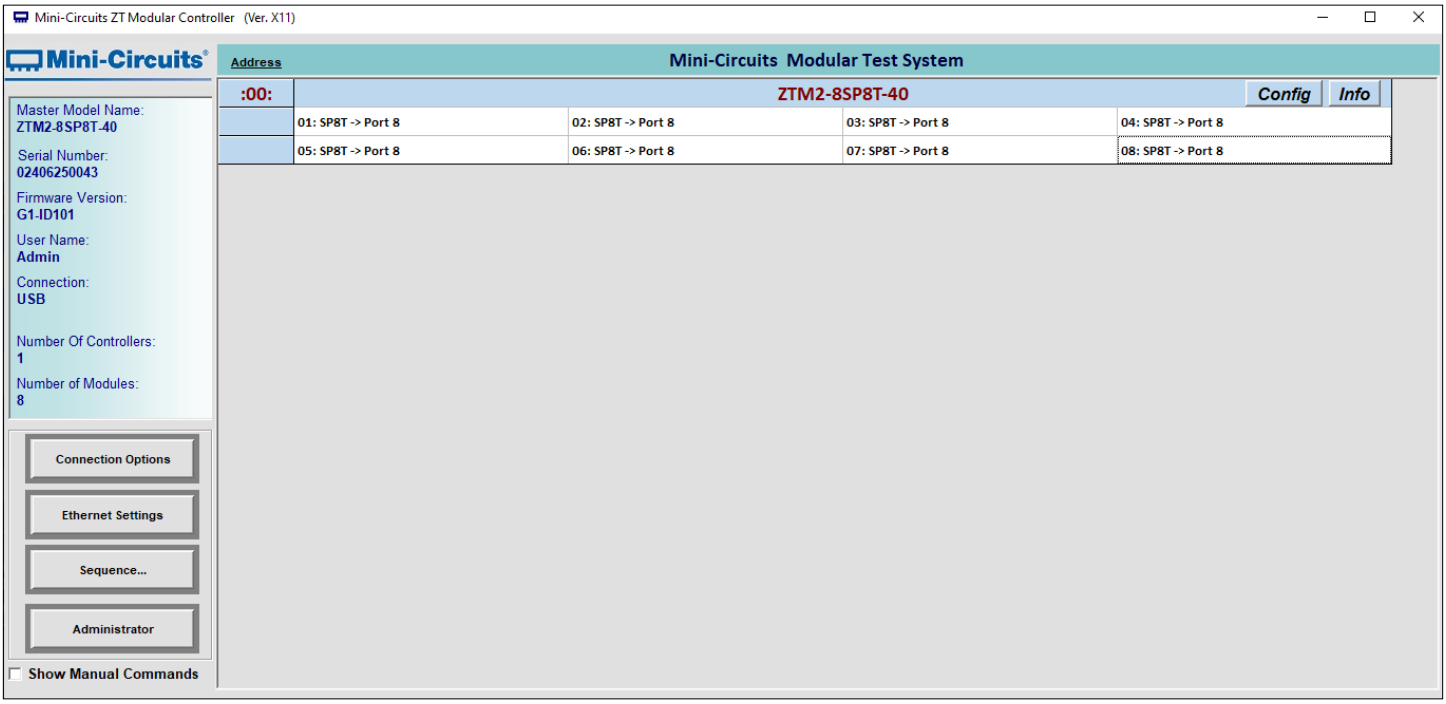
50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS - KEY FEATURES

- Connect via USB or Ethernet
- Run GUI in "demo mode" to evaluate software without a hardware connection



- View and set all switch states at the click of a button
- Set switch power-up states
- Configure Ethernet settings
- Update firmware



Mechanical Switch Assembly ZTM2-8SP8T-40

50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-20 to +60	
Input Power (No Damage)	Cold switching		W
	DC-12 GHz	20	
	12-26 GHz	5	
	26-40 GHz	1	
	Hot switching	1	
	Into internal termination	1	

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.

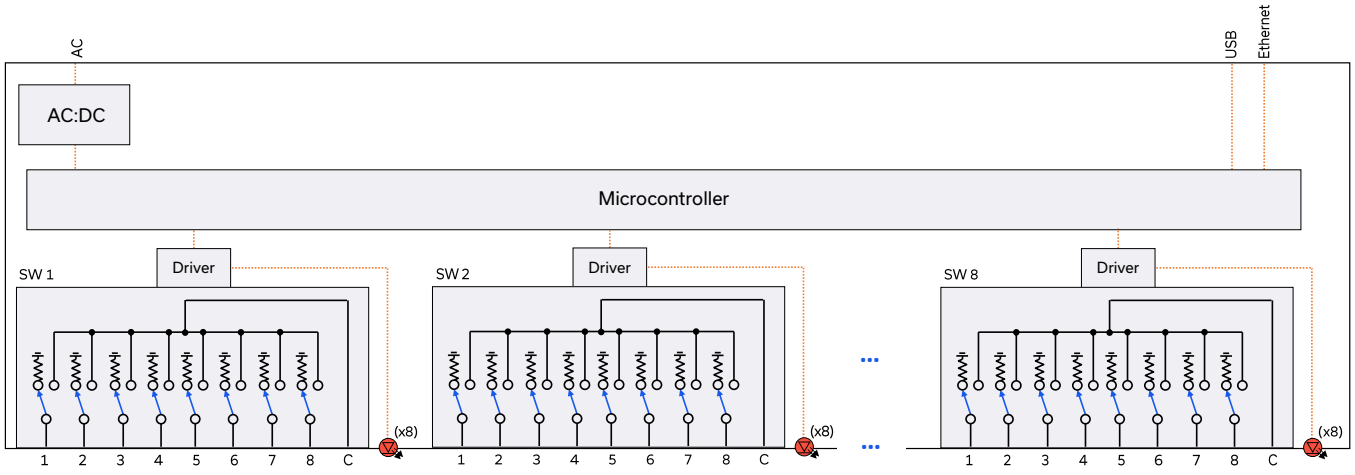
POWER SUPPLY

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

CONNECTIONS

Port	Connector
C & 1-8	2.92 mm female
USB	USB type B
Ethernet / LAN	RJ45
AC Input	IEC C14 inlet

FUNCTIONAL BLOCK DIAGRAM



SWITCH STATE TABLE (EACH SPDT SWITCH)

Switch Command	Switch x State	Switch x LED State							
		LED1	LED2	LED3	LED4	LED5	LED6	LED7	LED8
:SP8T:[x]:STATE:0	All ports disconnected (C open; 1-8 terminated)	Off	Off	Off	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:1	C to 1	On	Off	Off	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:2	C to 2	Off	On	Off	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:3	C to 3	Off	Off	On	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:4	C to 4	Off	Off	Off	On	Off	Off	Off	Off
:SP8T:[x]:STATE:5	C to 5	Off	Off	Off	Off	On	Off	Off	Off
:SP8T:[x]:STATE:6	C to 6	Off	Off	Off	Off	Off	On	Off	Off
:SP8T:[x]:STATE:7	C to 7	Off	Off	Off	Off	Off	Off	On	Off
:SP8T:[x]:STATE:8	C to 8	Off	Off	Off	Off	Off	Off	Off	On

POWER-UP OPTIONS

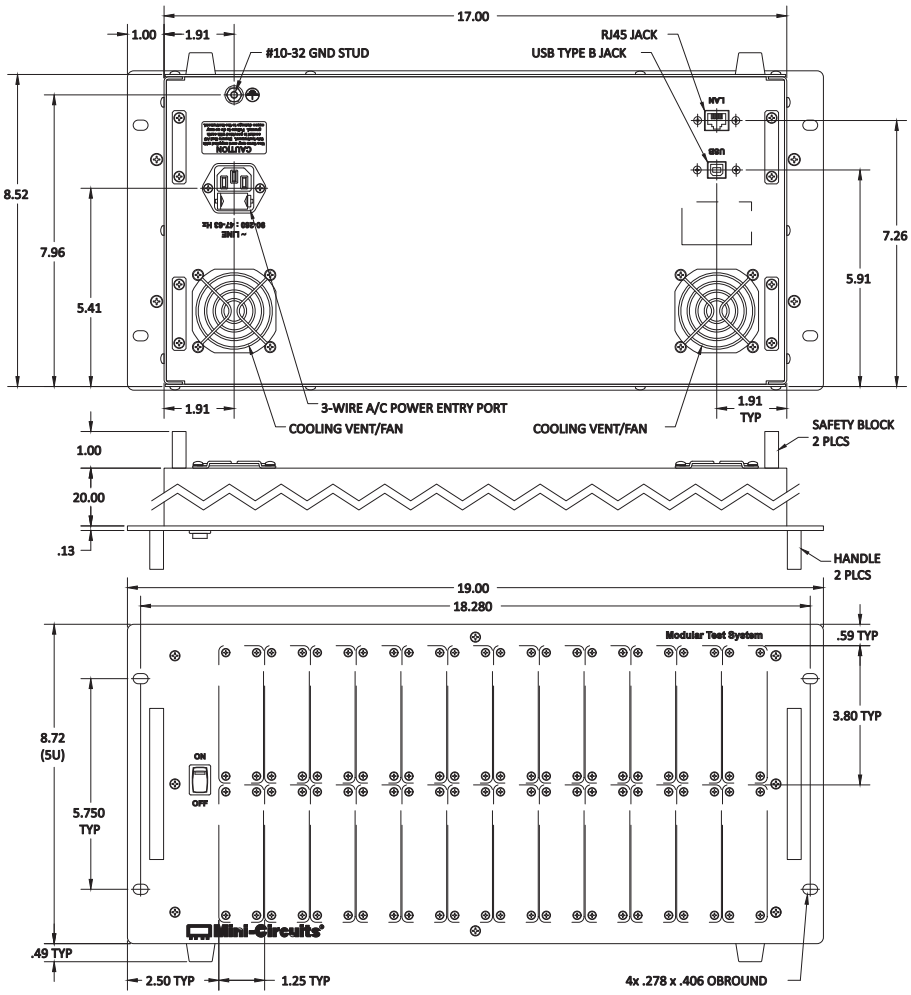
Mode	Initial Switch Paths
Default	All switches power up in the default state (all ports disconnected)
Last States	All switches resume the previous state from the point of last power supply disconnection

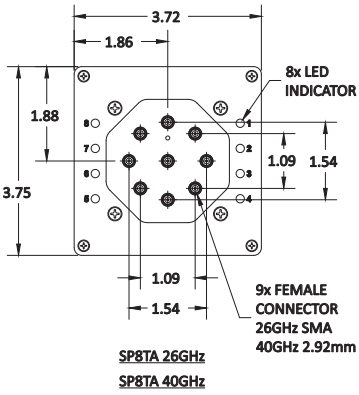
All switches revert to the default state when the power supply is turned off or disconnected.

Mechanical Switch Assembly ZTM2-8SP8T-40

50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

CASE STYLE DRAWING





Weight: 9595 grams
Dimensions are in inches (mm). Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.

PRODUCT MARKING*

Product Marking: ZTM2-8SP8T-40
Product Description: Modular Test System
Unit ID Label: Serial number and other identification marks
*Marking may contain other features or characters for internal lot control

Mechanical Switch Assembly ZTM2-8SP8T-40

50Ω DC to 40 GHz 8 x SP8T Rack-Mount 2.92 mm Female

DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE CLICK HERE

Case Style	YZ2891
Software, User Guide & Programming Manual	www.minicircuits.com/softwaredownload/ztm_ztm2.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 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)

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

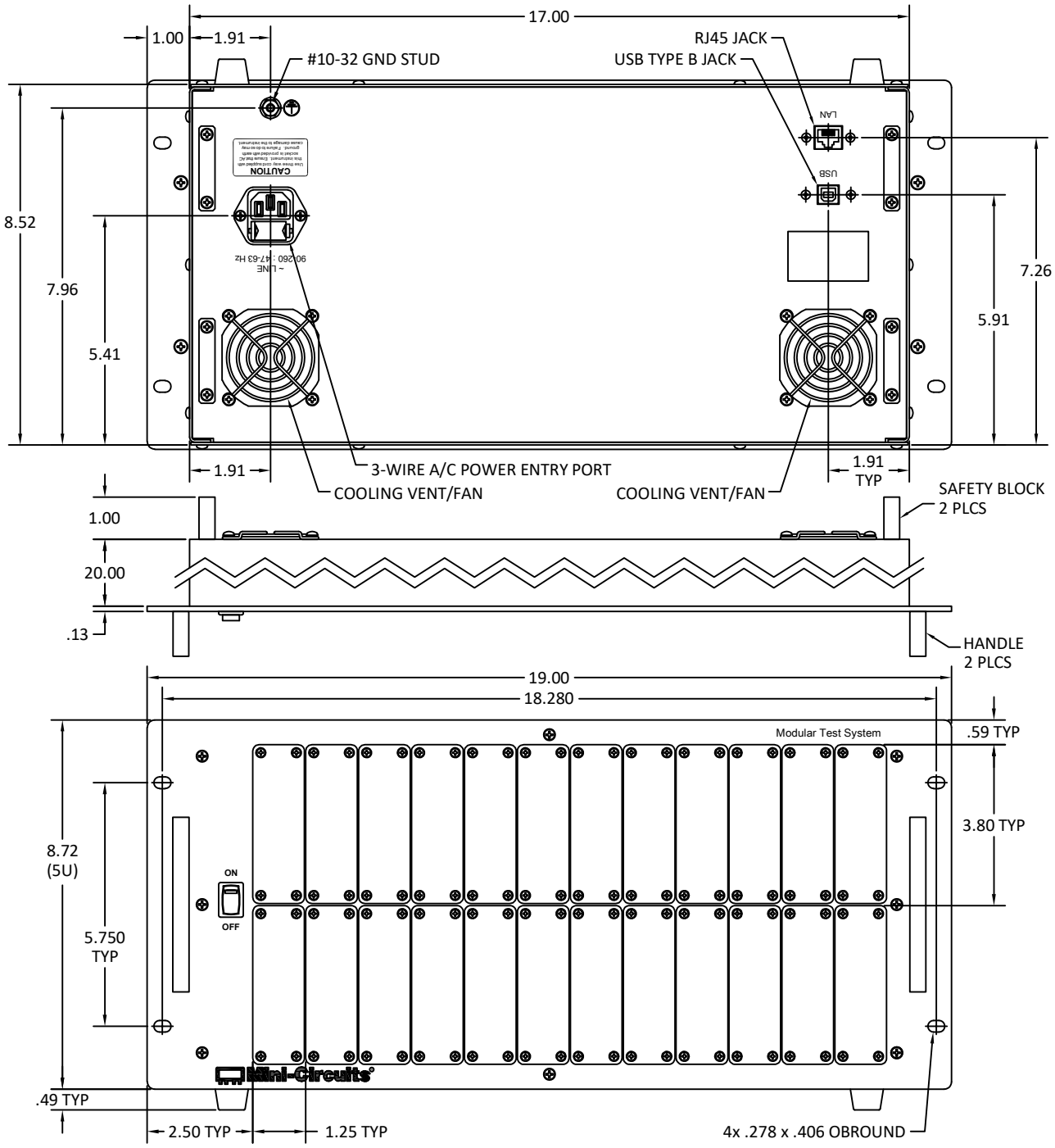
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

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/terms/viewterm.html

Case Style YZ

Outline Dimensions YZ2891



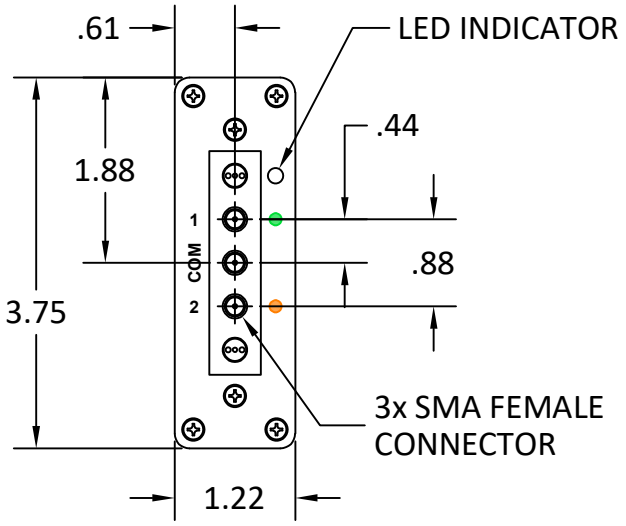
Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches (mm). Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.
3. Weight: 9595 grams.
4. Marking may contain other 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
RF/IF MICROWAVE COMPONENTS

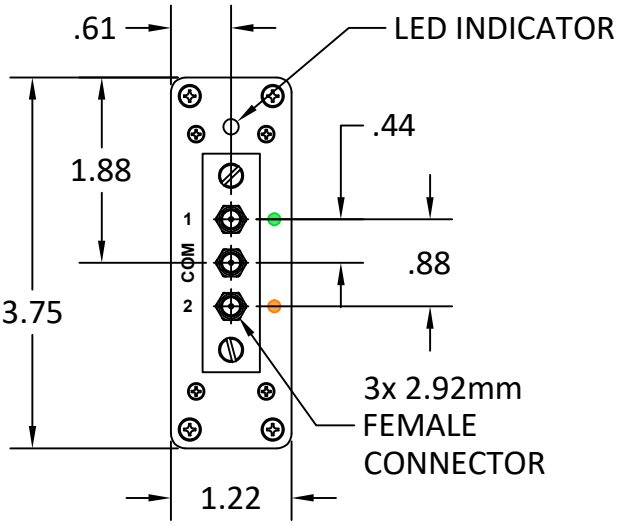
SPDT Module Options:

YZ2891

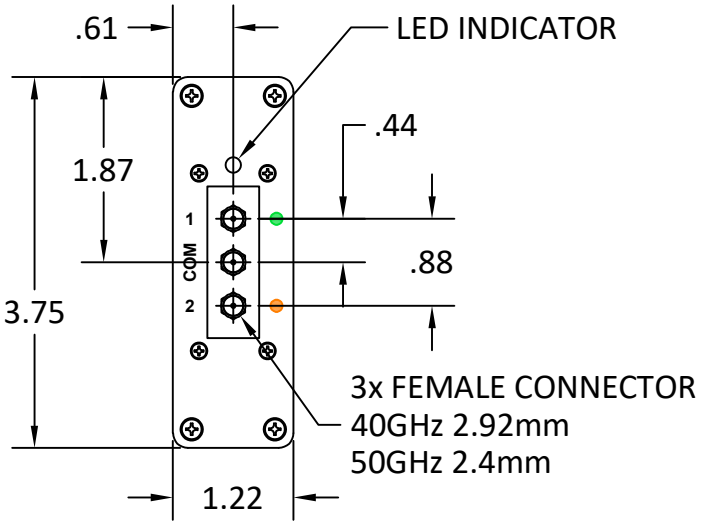


SPDTA 18GHz

SPDTA 26GHz

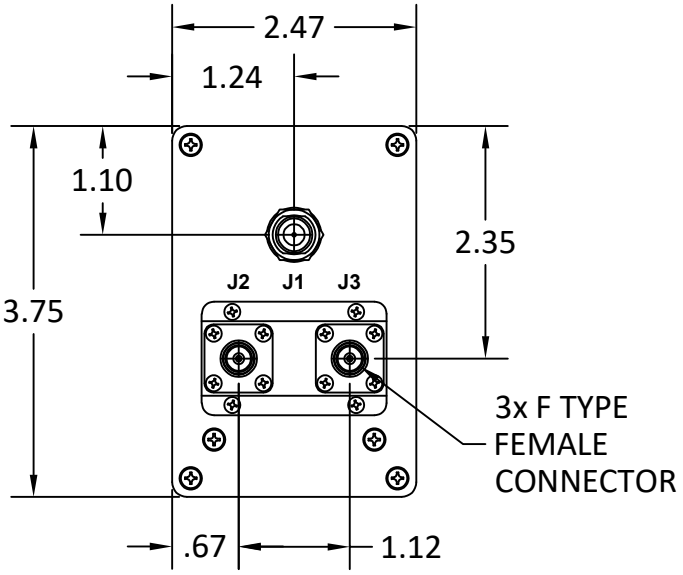


SPDTA 40GHz



SPDT 40GHz

SPDT 50GHz

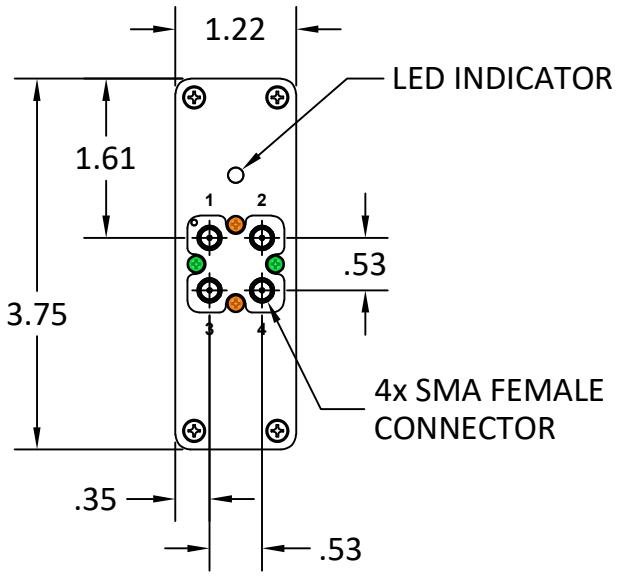


SPDTA 2.15GHz (75Ω)

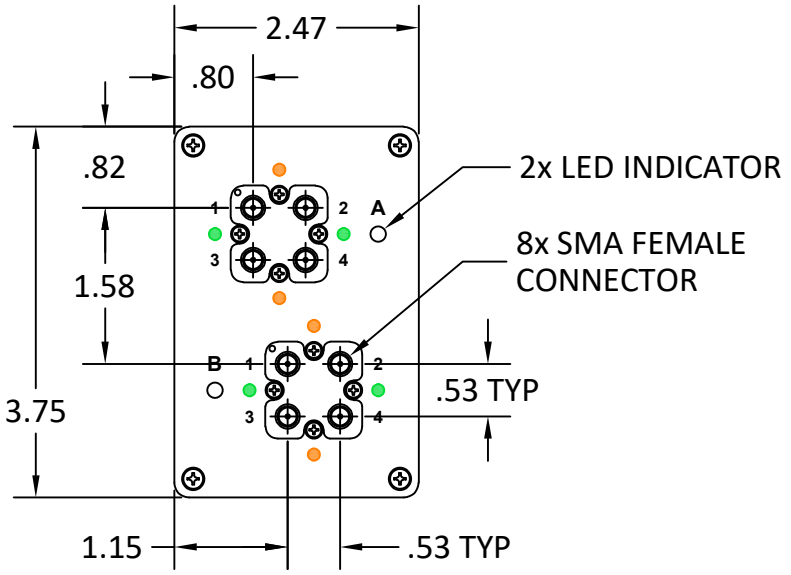
This document and its contents are the property of Mini-Circuits

DPDT (MTS) Module Options:

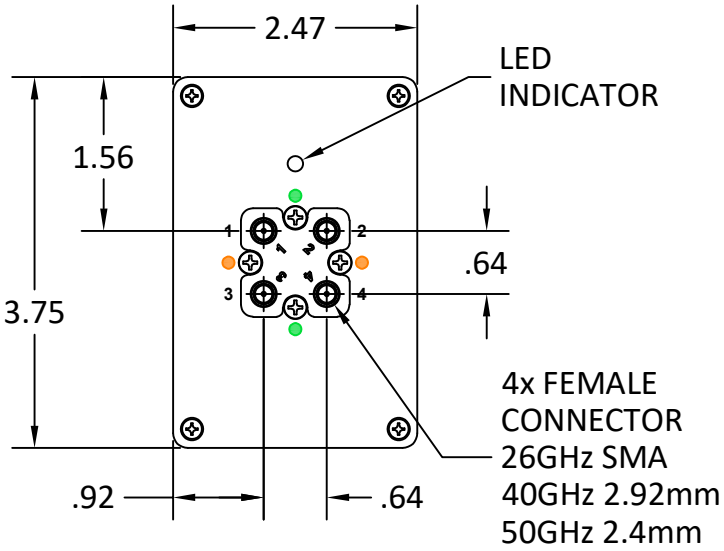
YZ2891



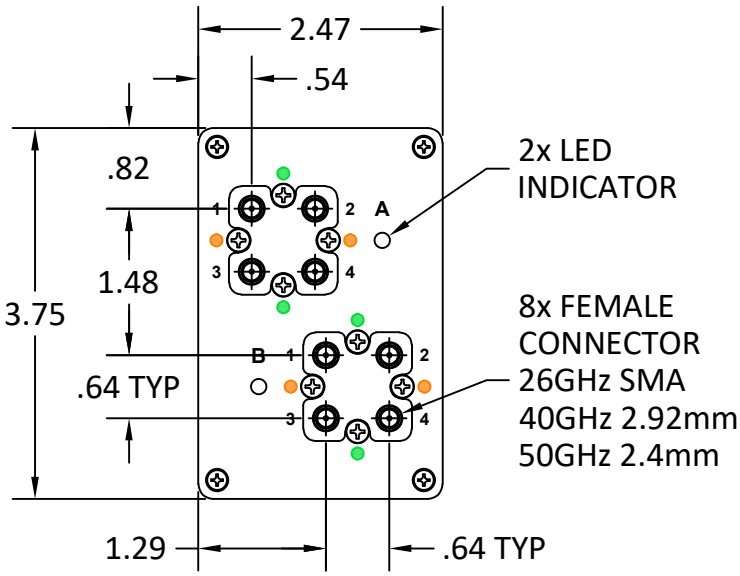
MTS 18GHz



DUAL MTS 18GHZ



MTS 26GHz
MTS 40GHz
MTS 50GHz

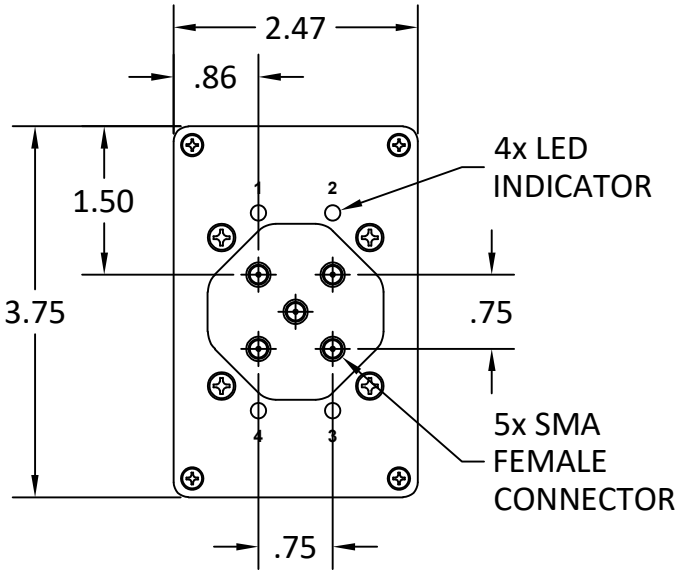


MTS 26GHz
MTS 40GHz
MTS 50GHz

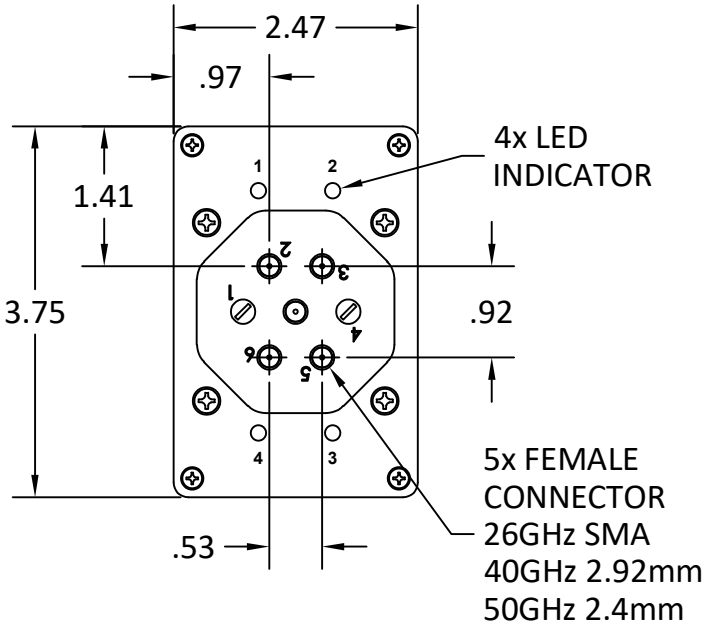
This document and its contents are the property of Mini-Circuits

SP4T Module Options:

YZ2891



SP4TA 18GHz



SP4TA 26GHz

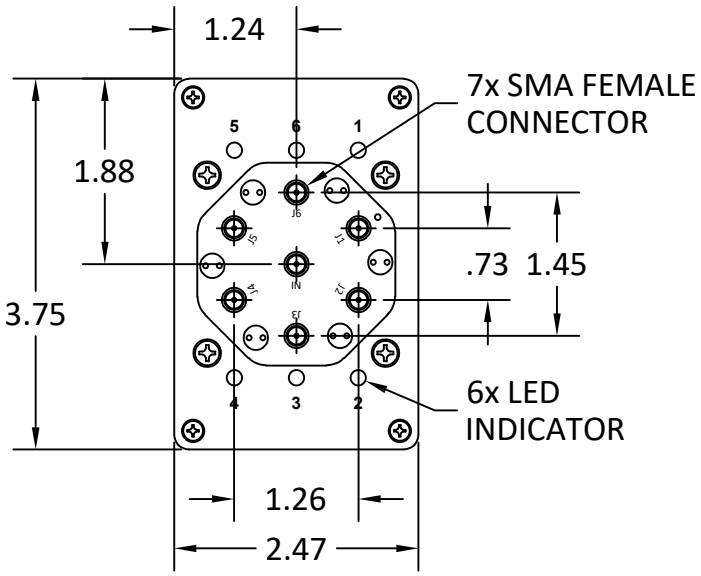
SP4TA 40GHz

SP4TA 50GHz

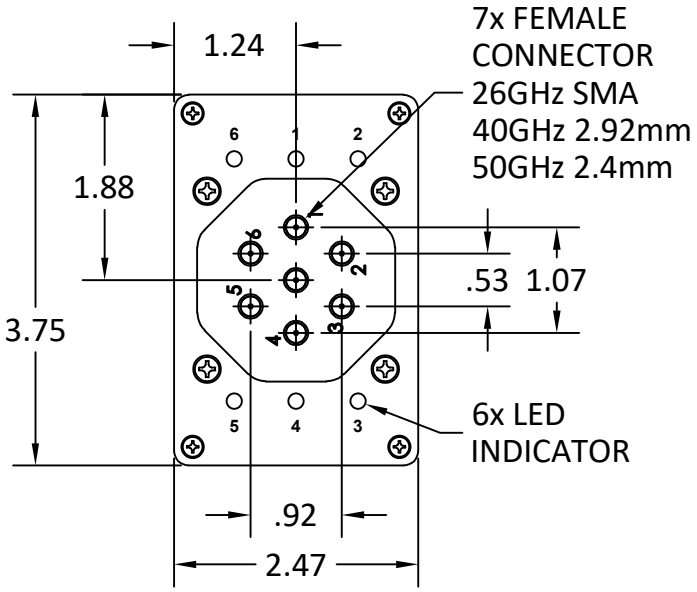
Mini-Circuits®
ISO 9001 ISO 14001 CERTIFIED
ALL NEW minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com
RF/IF MICROWAVE COMPONENTS

SP6T Module Options:

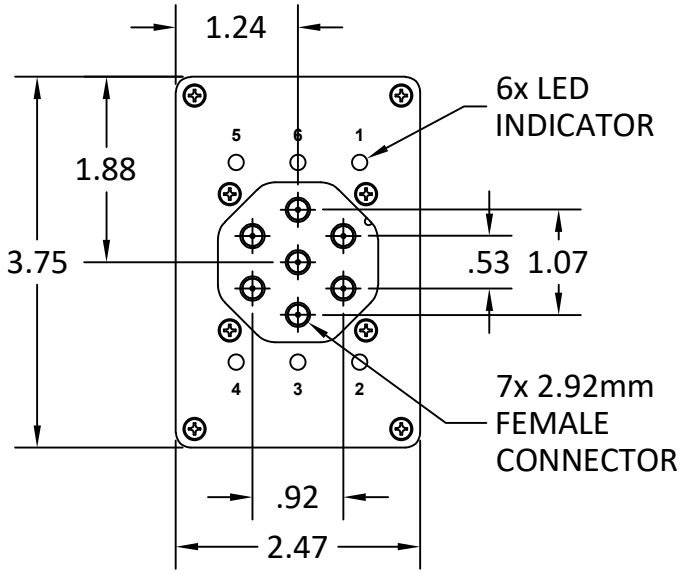
YZ2891



SP6TA 12GHz
SP6TA 18GHz



SP6TA 26GHz
SP6TA 40GHz
SP6TA 50GHz

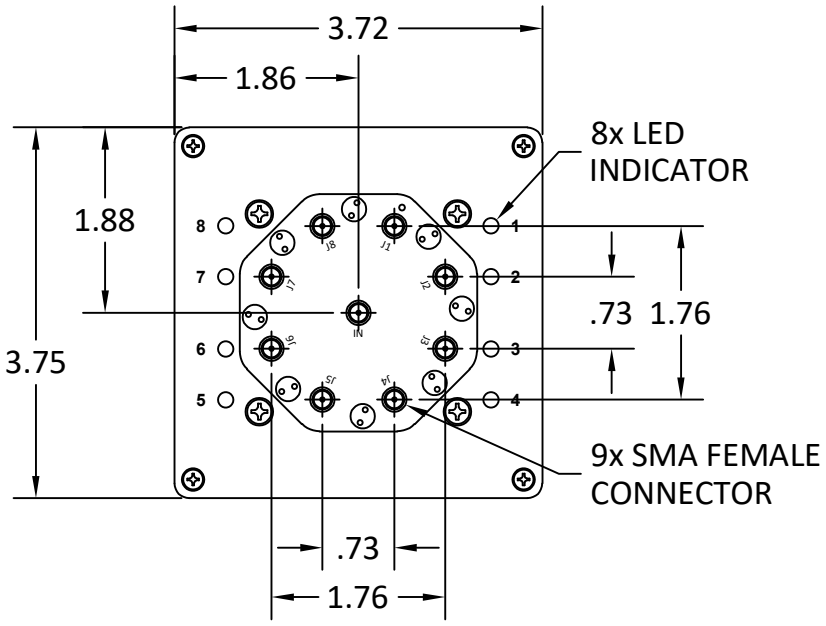


SP6T 40GHz

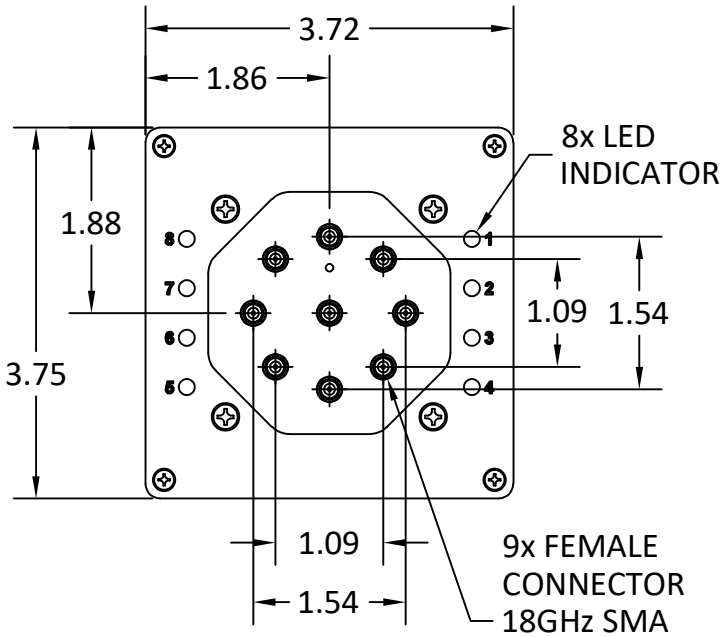
This document and its contents are the property of Mini-Circuits

SP8T Module Options:

YZ2891



SP8TA 12GHz



SP8TA 18GHz

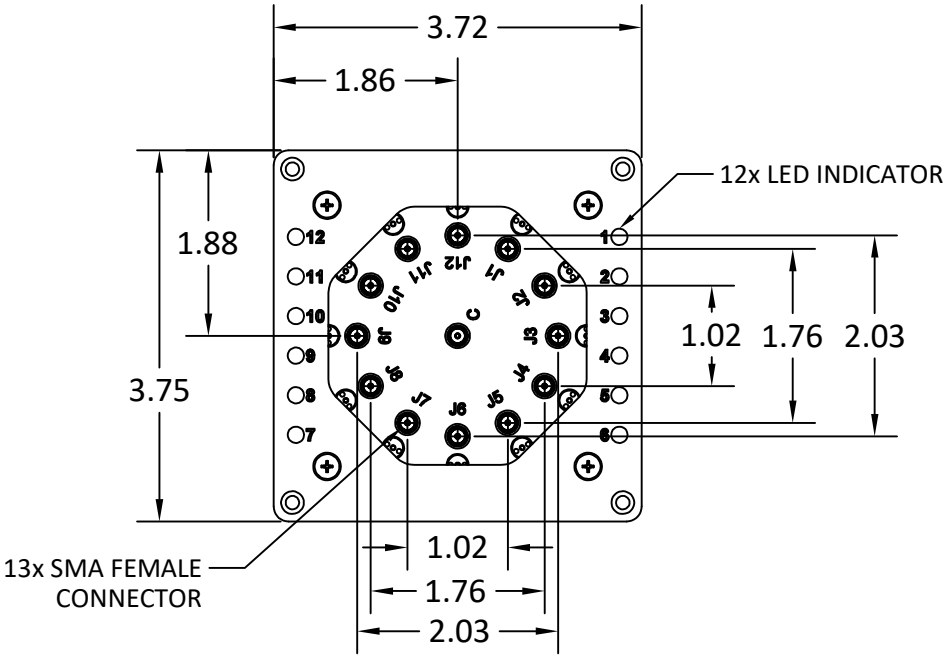
SP8TA 26GHz

SP8TA 40GHz

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
RF/IF MICROWAVE COMPONENTS

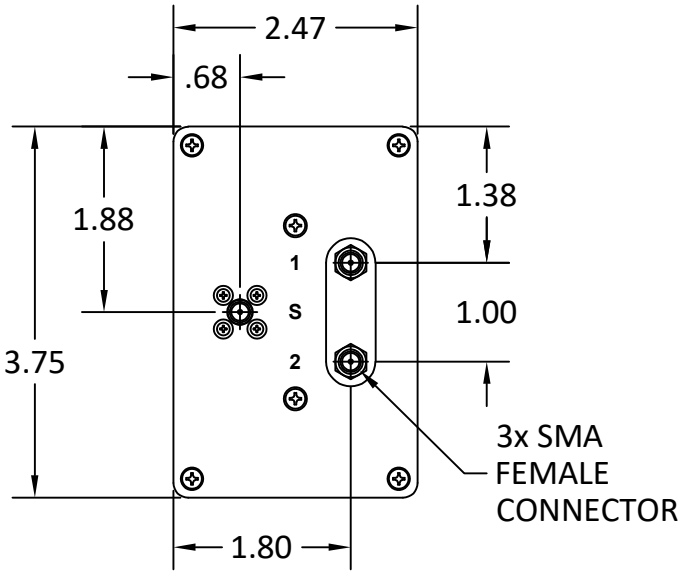
SP12T Module Options:

YZ2891

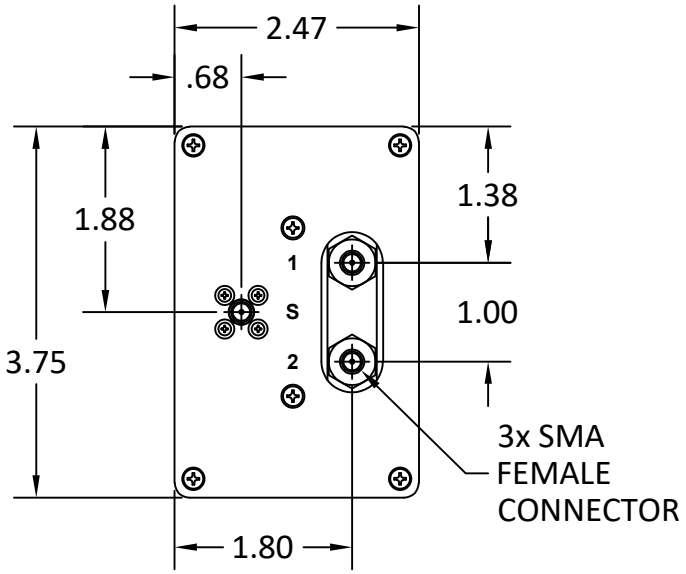


SP12TA 18GHz

Component Case Style Module Options:



CASE STYLE VVV845

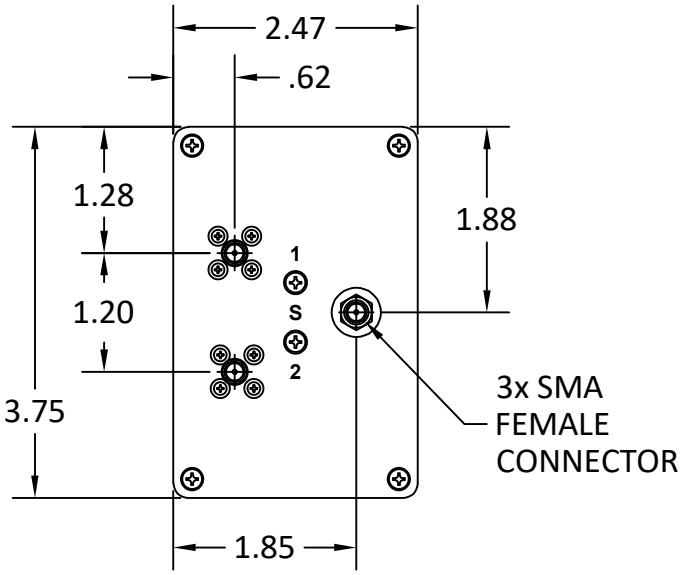


CASE STYLE F14

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
RF/IF MICROWAVE COMPONENTS

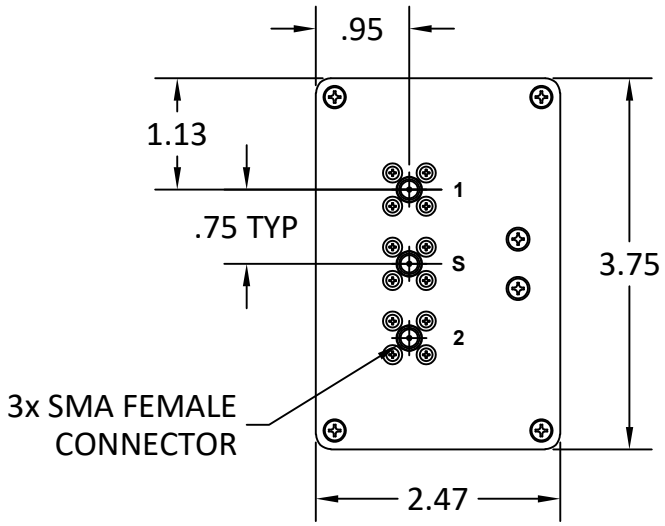
Component Case Style Module Options:

YZ2891

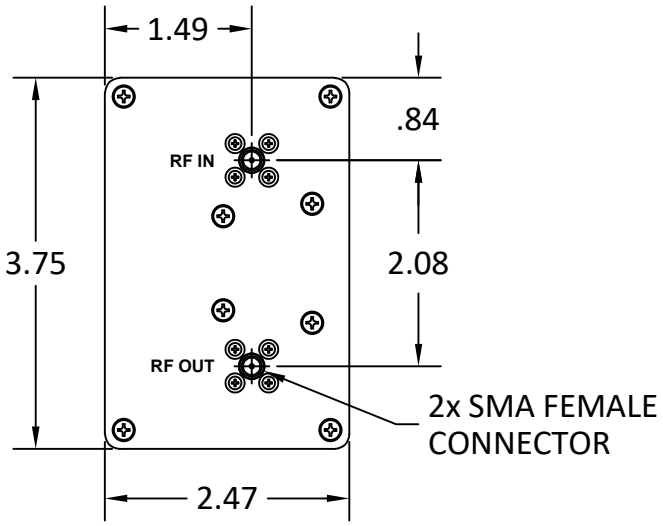


CASE STYLE K18

SPDT Module Options:



CASE STYLE FL905



CASE STYLE GC957

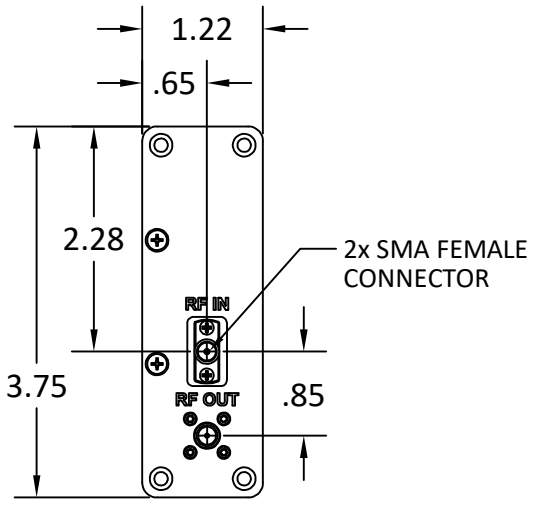
CASE STYLE Y460

CASE STYLE BW459

This document and its contents are the property of Mini-Circuits

RUDAT Module Options:

YZ2891



RUDAT 6GHz 110dB

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
RF/IF MICROWAVE COMPONENTS

This document and its contents are the property of Mini-Circuits

Mini-Circuits

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

This document and its contents are the property of Mini-Circuits