USB & ETHERNET

# Mechanical Switch Assembly ZTM-6SP6T-12

50Ω DC to 12 GHz 6 x SP6T Rack-Mount SMA Female

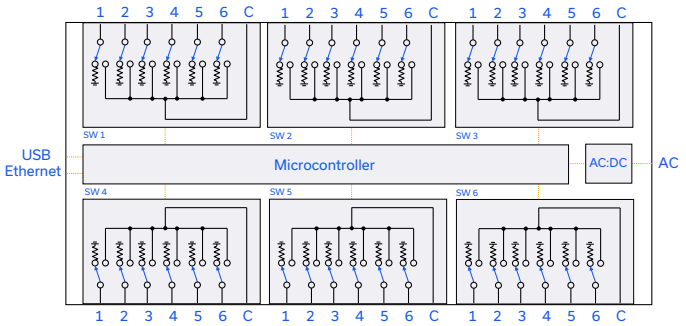
## THE BIG DEAL

- 6 x mechanical SP6T absorptive switches
- Convenient rack-mountable chassis
- SSH secure Ethernet communication
- Fail-safe / redundancy switching
- LED switch state indicators



*Generic photo used for illustration purposes only*

## FUNCTIONAL BLOCK DIAGRAM




## APPLICATIONS

- Benchtop and rack-mounted automated test systems
- 5G FR1, WiFi 6E MIMO, UWB, Bluetooth
- Military radio, radar & electronic warfare
- Microwave radio & cellular infrastructure
- Switch matrices

## PRODUCT OVERVIEW

Mini-Circuits' ZTM-6SP6T-12 houses 6 independently controlled electro-mechanical SP6T switches. Each switch operates over a wide bandwidth, from DC to 12 GHz with high isolation and low insertion loss. The absorptive switches are failsafe, with a break-before-make configuration, and lifetime of 10 million switching cycles when used within the noted specifications.

The switches are housed in a compact 19-inch rack chassis, 3U height, with all SMA (female) RF connectors on the front. LED switch state indicators on the front panel enable visual display of all switch states. 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.

The modular design of the ZTM 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. Custom switch configurations can be configured to fit any requirement, using Mini-Circuits' online configurator tool at www.minicircuits.com/WebStore/ztm.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 |
| Flexible & modular design | Configure just the switch combination needed for your test application, with the flexibility to add or change switch modules in future as test requirements evolve. |
| 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. |
| 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 |
| Rack-mount chassis | Compact 3U height, 19" rack-mountable chassis suits integration in automated production test environments. |

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ZTM-6SP6T-12
MCL NY
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# Mechanical Switch Assembly ZTM-6SP6T-12

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## ELECTRICAL SPECIFICATIONS AT +25°C (EACH SWITCH)

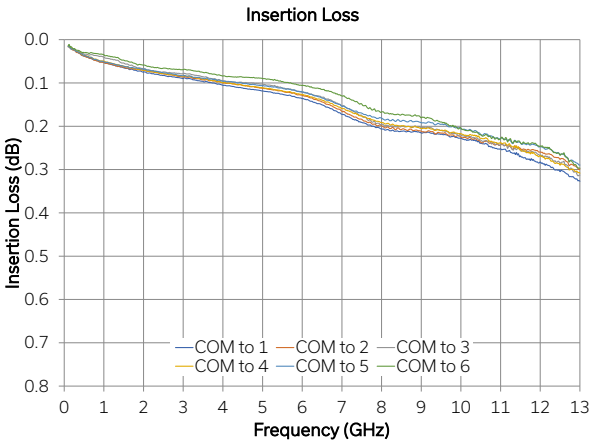
| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | - | DC | | 12 | GHz |
| Insertion Loss | DC – 6 GHz<br>6 – 8 GHz<br>8 – 12 GHz | | 0.15<br>0.20<br>0.25 | 0.25<br>0.30<br>0.45 | dB |
| Isolation (Inactive Paths)[1] | DC – 6 GHz<br>6 – 8 GHz<br>8 – 12 GHz | 80<br>80<br>80 | 95<br>90<br>90 | | dB |
| Return Loss[2] | DC – 6 GHz<br>6 – 8 GHz<br>8 – 12 GHz | | 20<br>20<br>20 | | dB |
| Switching Time | | | 25 | | ms |
| RF Input Power | Cold Switching<br>Hot Switching[3]<br>Into Internal Termination[4] | | | 20<br>0.1<br>1 | W |
| Switch Lifetime | | | 10 | | Million Cycles |

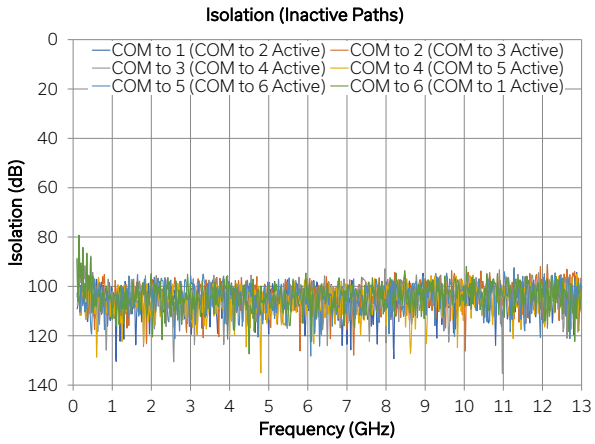
1. Isolation measured between COM and any disconnected port. Example: Isolation for COM to 1 is the leakage measured at port 1 from a signal input at COM when the active switch path is set to COM to 2
2. Return loss into COM when active or ports 1-6 in any state; COM is reflective when disconnected
3. Hot switching power above this level will degrade the switch lifetime
4. Maximum power into any internal termination is 1 W per port, 3 W total per switch

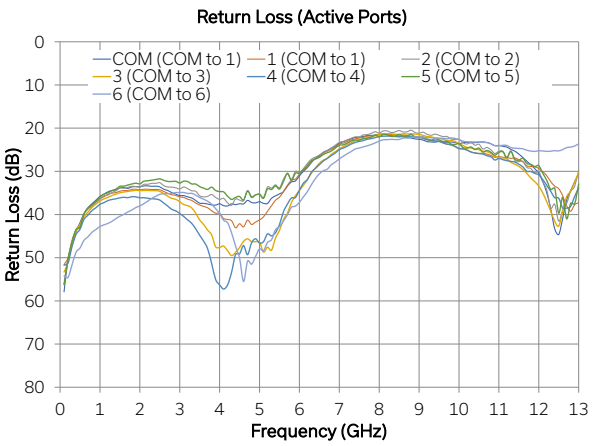
# Mechanical Switch Assembly ZTM-6SP6T-12

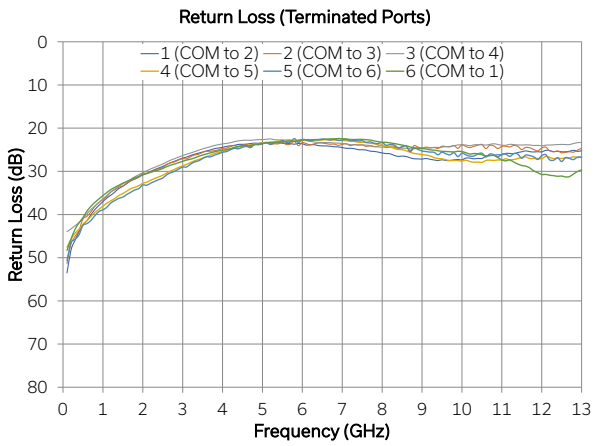
50Ω DC to 12 GHz 6 x SP6T Rack-Mount SMA Female

## TYPICAL PERFORMANCE GRAPHS



# Mechanical Switch Assembly ZTM-6SP6T-12

50Ω DC to 12 GHz 6 x SP6T Rack-Mount SMA Female

## 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 | 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):

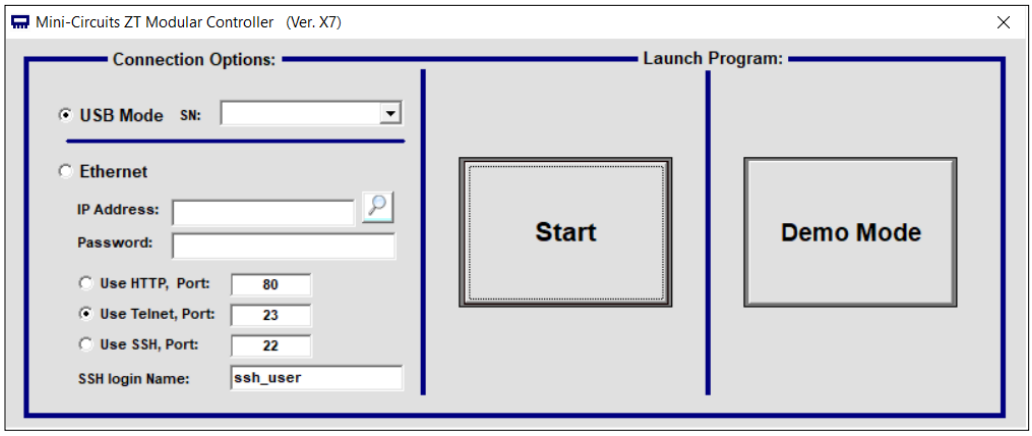
| Command / Query | Description |
|---|---|
| :MN? | Read model name |
| :SN? | Read serial number |
| :FIRMWARE? | Read firmware version |
| SP6T:[sw_label]:STATE:[port] | Set a switch state:<br>• [sw_label] = Switch number (1 to 6)<br>• [port] = The port to be connected to Com of the specified switch (1 to 6)<br>• Example: SP6T:1:STATE:2 |
| :SP6T:[sw_label]:STATE? | Get the state of all switches:<br>• sw_label] = Switch number (1 to 6)<br>• Example: SP6T:1:STATE? |

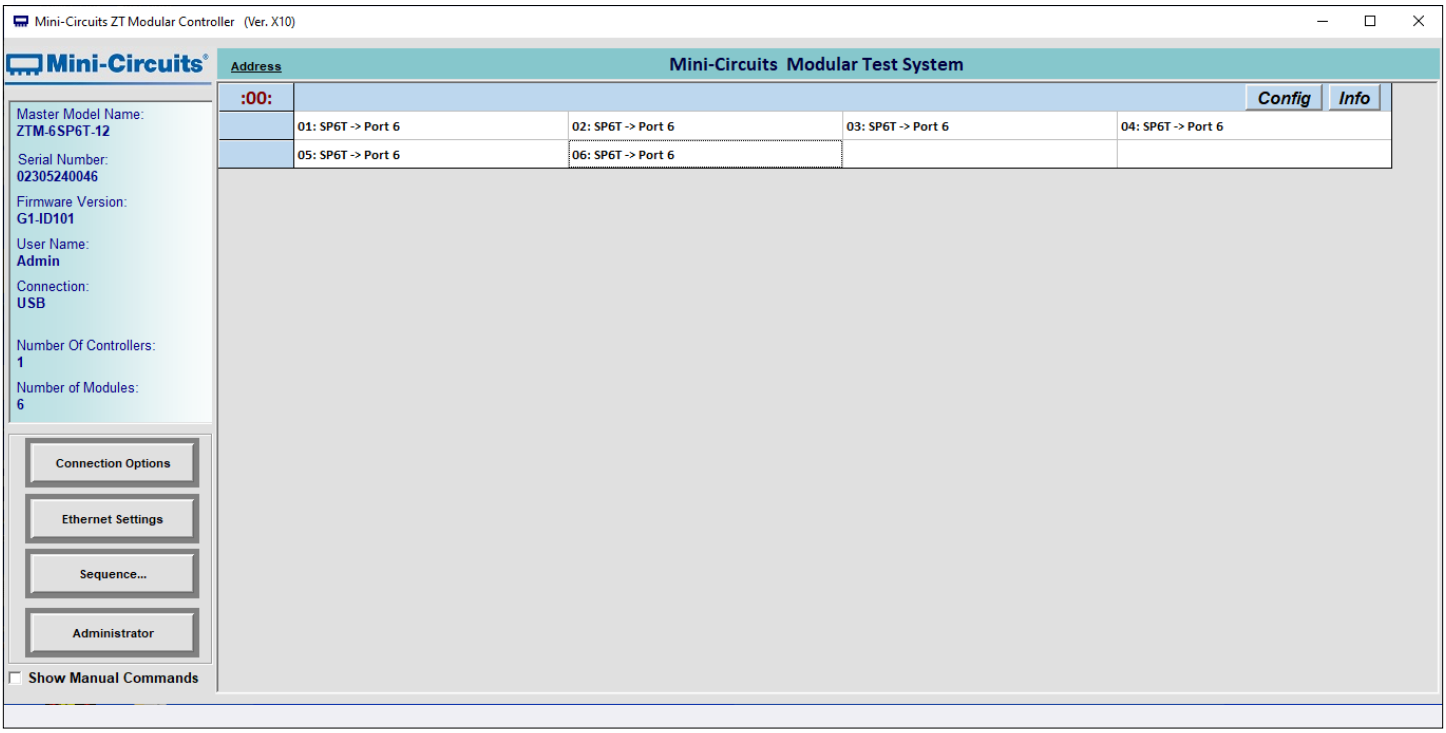
# Mechanical Switch Assembly ZTM-6SP6T-12

50Ω DC to 12 GHz 6 x SP6T 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 all switch states at the click of a button
- Configure automated switching sequences
- Define custom switch and port labels
- Set switch power-up states
- Configure Ethernet settings



# Mechanical Switch Assembly ZTM-6SP6T-12

50Ω DC to 12 GHz 6 x SP6T Rack-Mount SMA Female

## ABSOLUTE MAXIMUM RATINGS

| Parameter | Conditions | Limits | Units |
|---|---|---|---|
| Temperature | Operating | 0 to +50 | °C |
| | Storage | -20 to +60 | |
| Input Power (No Damage) | Cold switching | 20 | W |
| | 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 |

## SWITCH STATE TABLE

| Switch Command | Switch Path |
|---|---|
| :SP6T:x:STATE:0 | All ports disconnected |
| :SP6T:x:STATE:1 | COM to 1 |
| :SP6T:x:STATE:2 | COM to 2 |
| :SP6T:x:STATE:3 | COM to 3 |
| :SP6T:x:STATE:4 | COM to 4 |
| :SP6T:x:STATE:5 | COM to 5 |
| :SP6T:x:STATE:6 | COM to 6 |

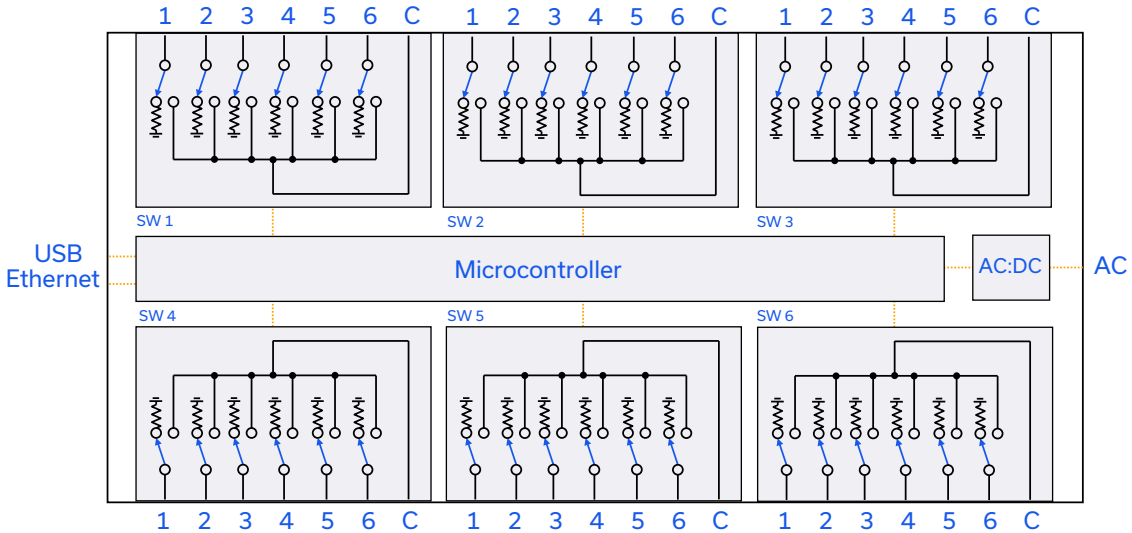
x = switch number (1 to 6)

## CONNECTIONS

| Port | Connector |
|---|---|
| COM & 1-6 (each SP6T) | SMA female |
| USB | USB type B |
| Ethernet / LAN | RJ45 |
| AC Input | IEC C14 inlet |

COM = Common port
1-6 = input / output ports

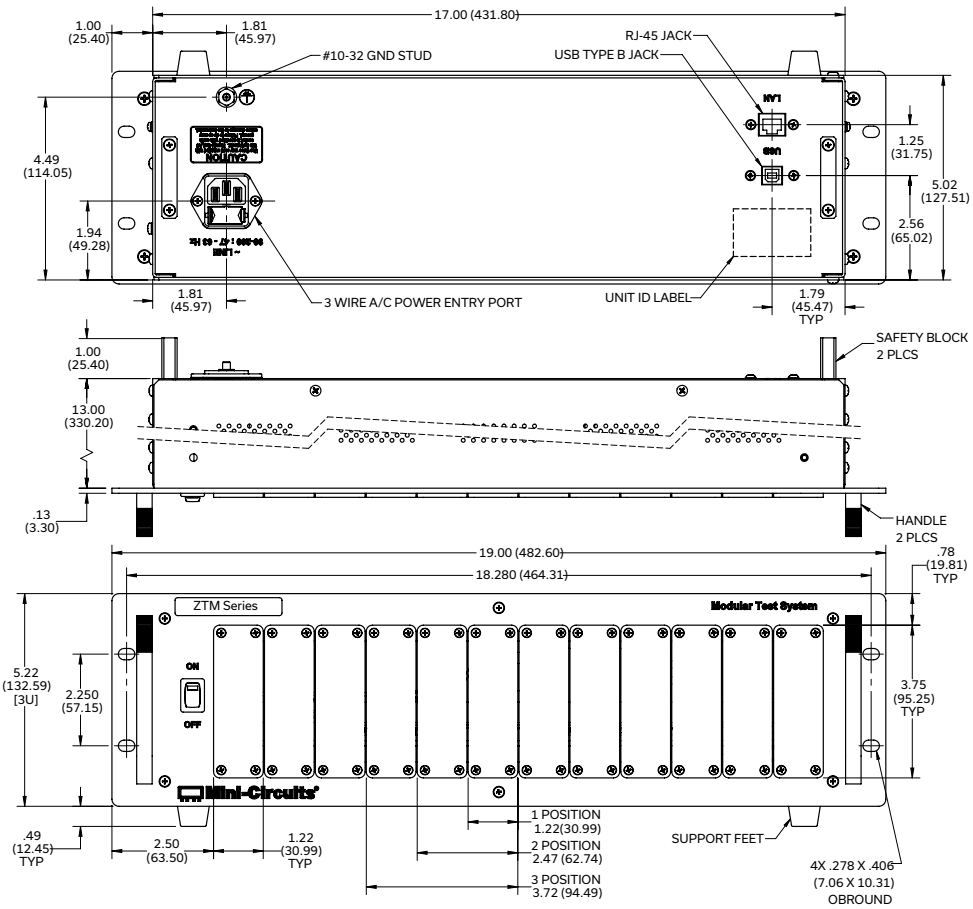
## FUNCTIONAL BLOCK DIAGRAM

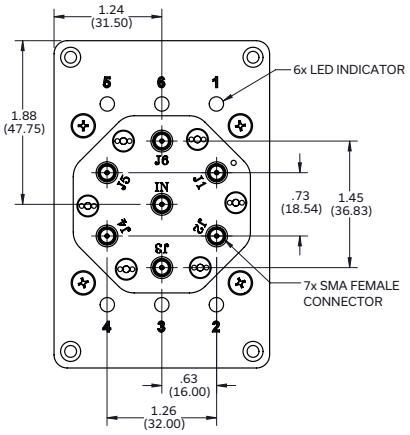


# Mechanical Switch Assembly ZTM-6SP6T-12

50Ω DC to 12 GHz 6 x SP6T 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.± .03 inch; 3 Pl. ±.015 inch.
3. Weight: 4535 grams.
4. Marking may contain features or characters for internal lot control.

## PRODUCT MARKING*

Product Marking: ZTM-6SP6T-12
Unit ID Label: Serial number and other identification marks
*Marking may contain other features or characters for internal lot control

# Mechanical Switch Assembly ZTM-6SP6T-12

50Ω DC to 12 GHz 6 x SP6T Rack-Mount SMA Female

**DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE** CLICK HERE

| | |
|---|---|
| **Case Style** | YD2861 |
| **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 UKCA 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<br>NEMA 5-15 plug (type B) to IEC C13 connector |
|  | CBL-3W-EU | Europe<br>CEE 7/7 plug (type E/F) to IEC C13 connector |
|  | CBL-3W-UK | UK<br>BS-1363 plug (type G) to IEC C13 connector |
|  | CBL-3W-AU | Australia & China<br>AS/NZS 3112 plug (type I) to IEC C13 connector |
|  | CBL-3W-IL | Israel<br>SI-32 plug (type H) to IEC C13 connector |

**NOTES**

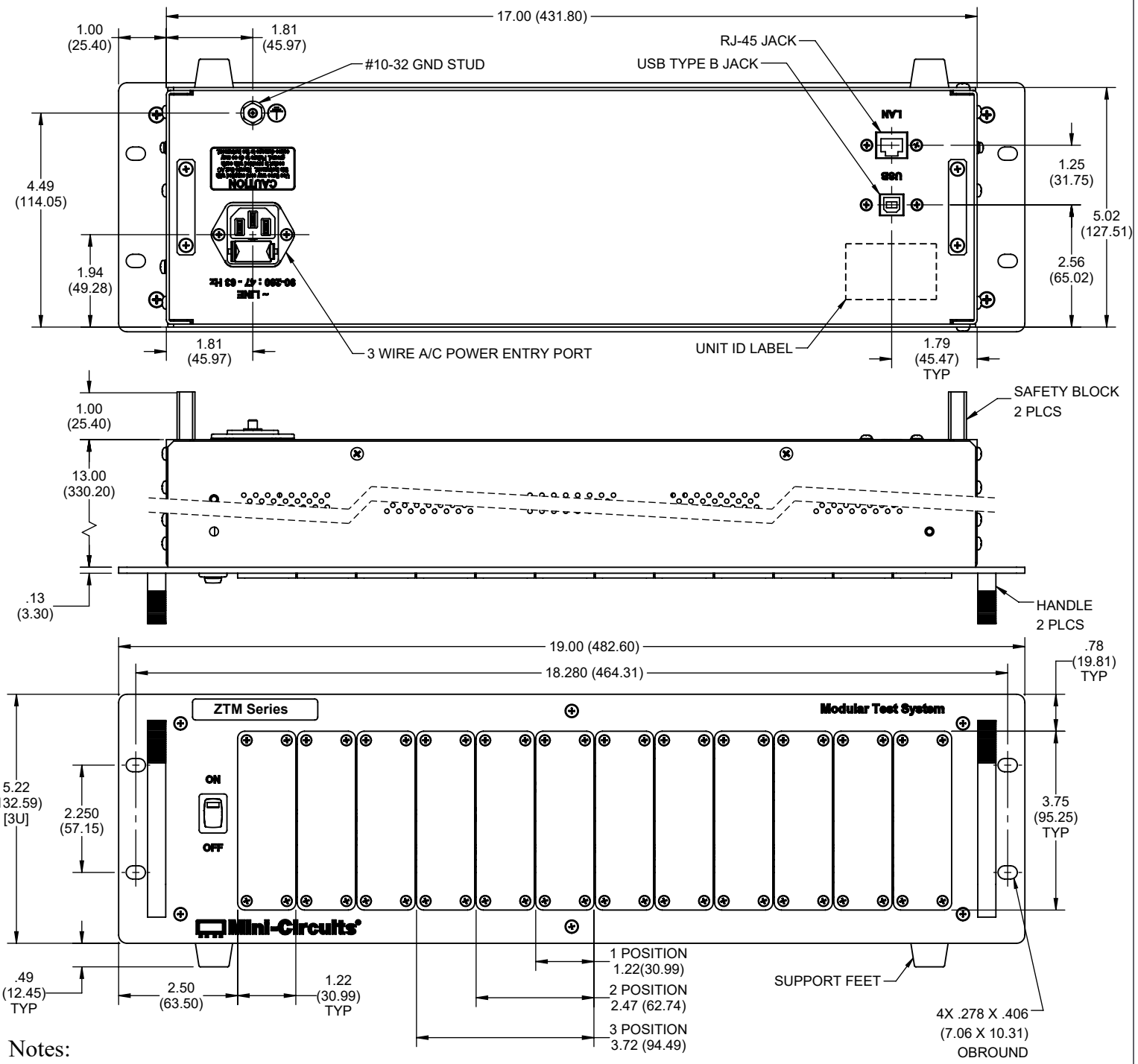
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B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

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

# Case Style YD

## Outline Dimensions YD2861



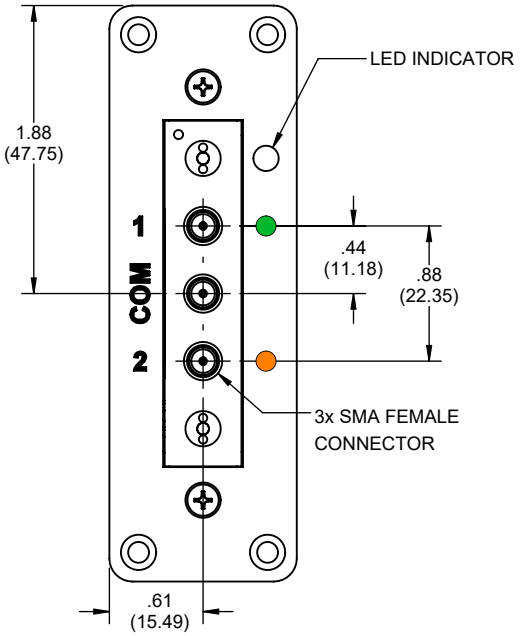

Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion).
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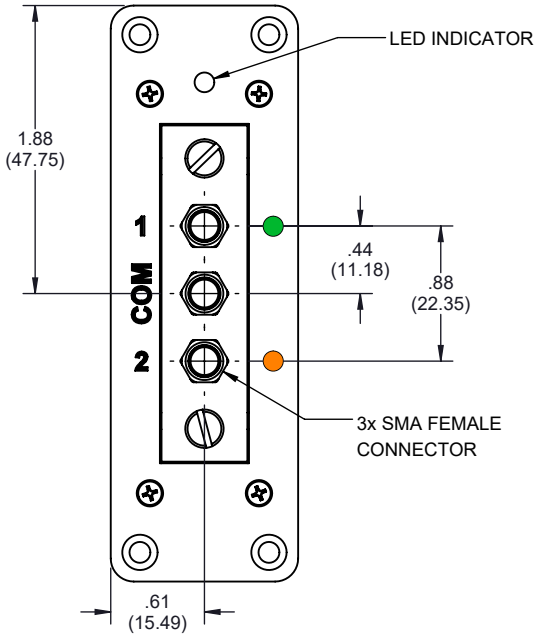

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RF/IF MICROWAVE COMPONENTS

# Case Style YD

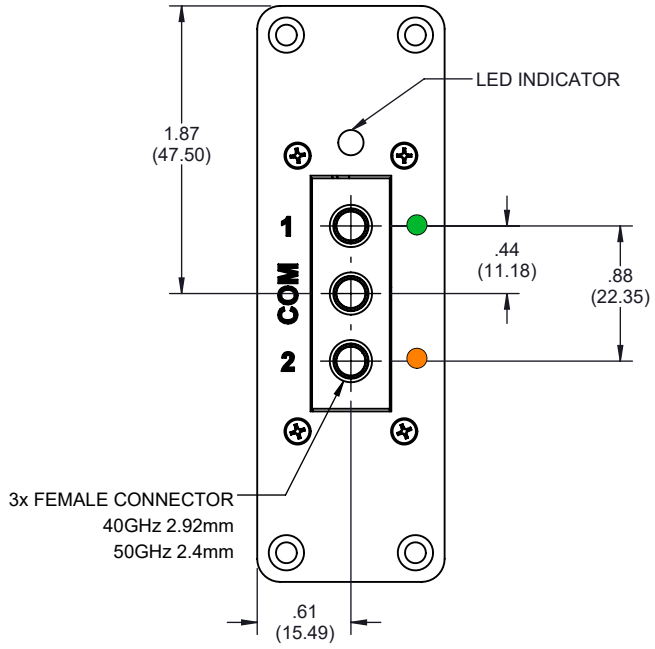
## SPDT Switch Options: YD2861




**SPDTA 18GHz**




**SPDTA 26GHz**

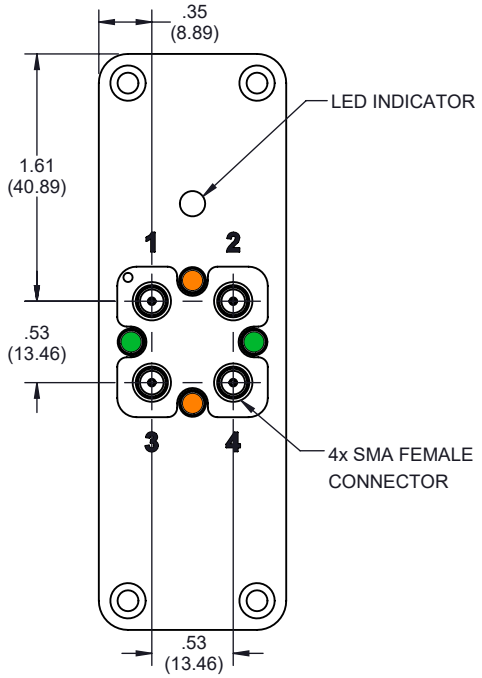



**SPDT 40GHz**
**SPDT 50GHz**

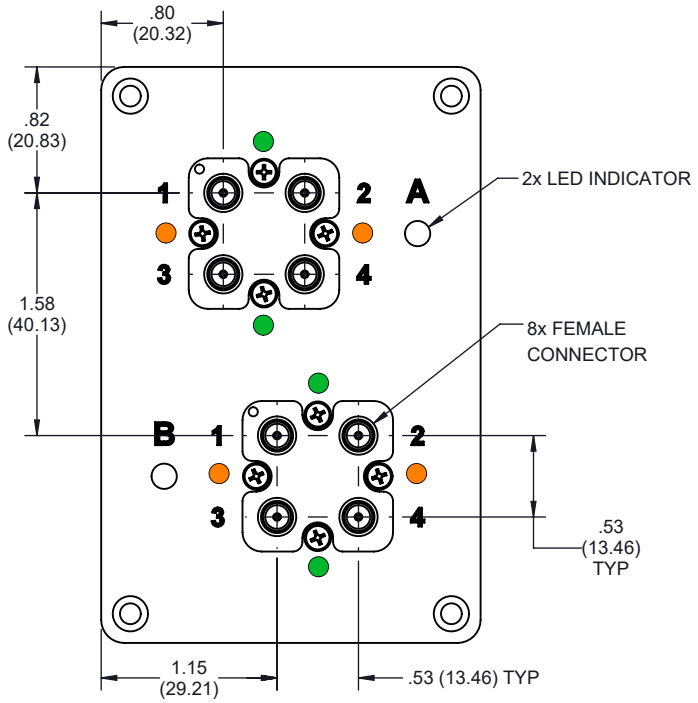

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## MTS (Transfer) Switch Options:

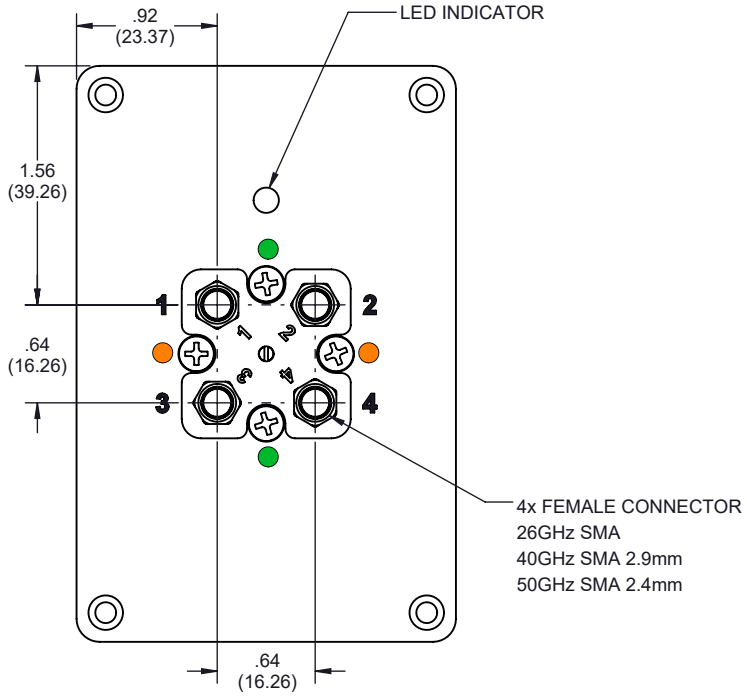
**YD2861**



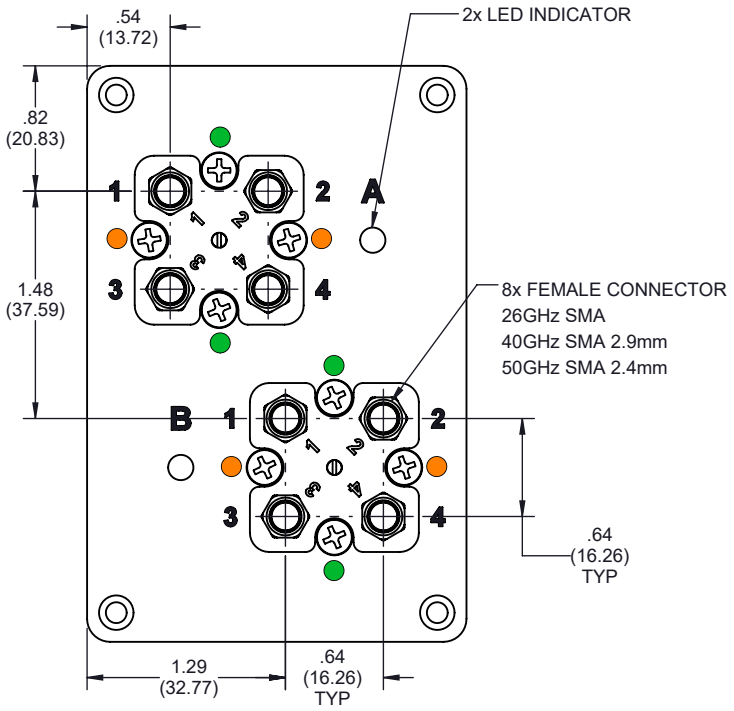

**MTS 18GHz**




**MTS 18GHz**




**MTS 26GHz**
**MTS 40GHz**
**MTS 50GHz**

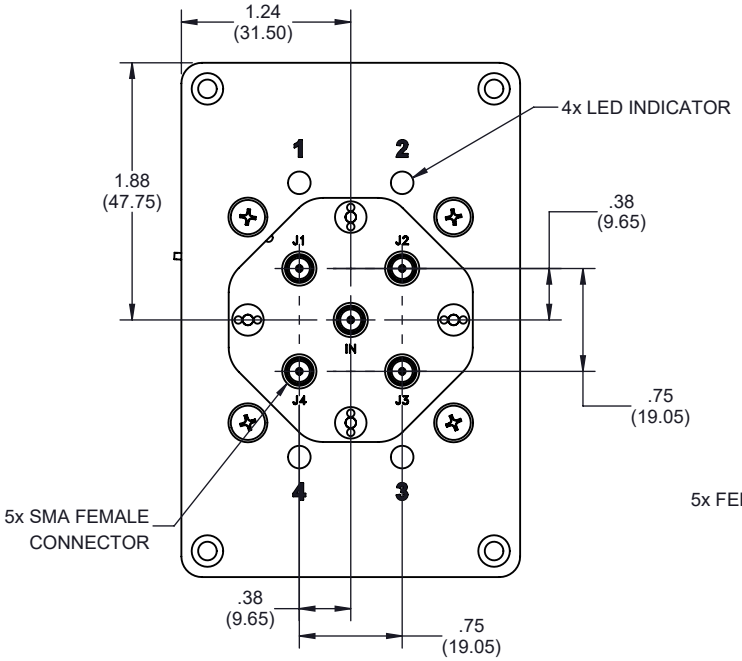



**MTS 26GHz**
**MTS 40GHz**
**MTS 50GHz**

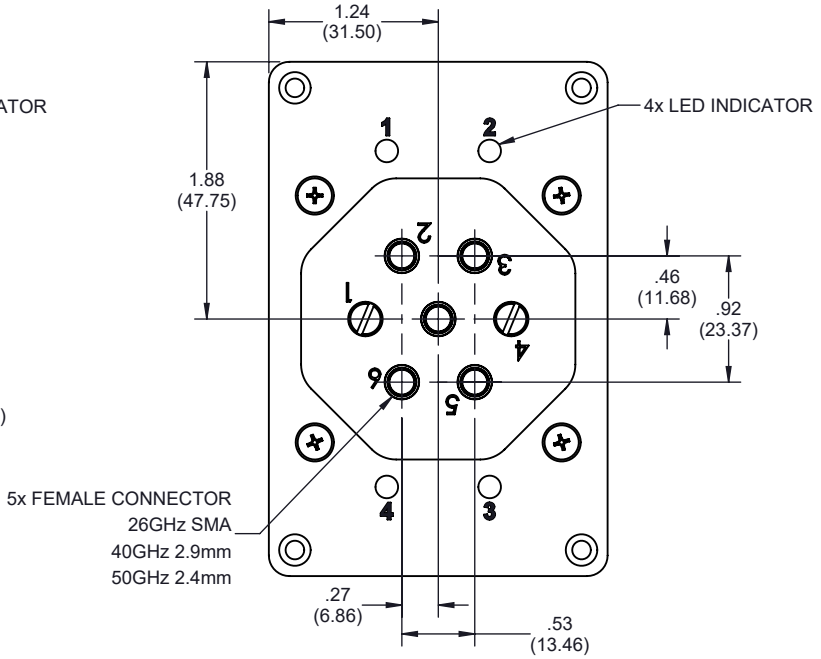

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# Case Style YD

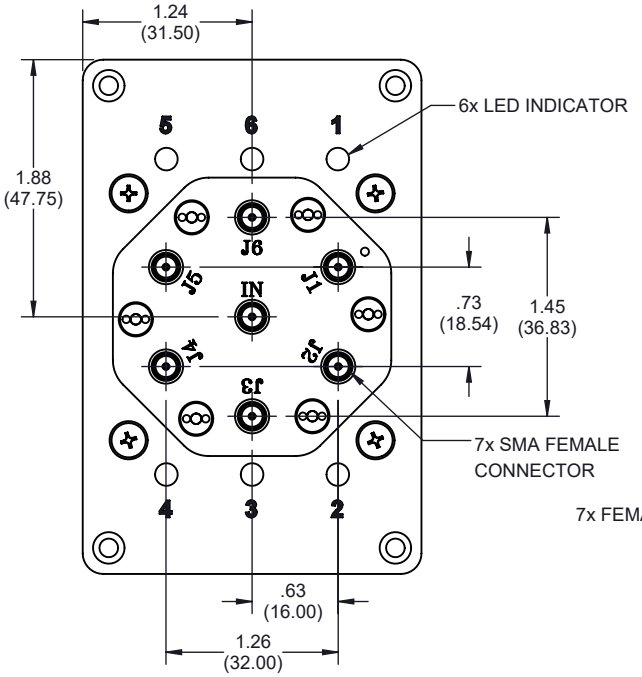
## SP4T and SP6T Switch Options: YD2861



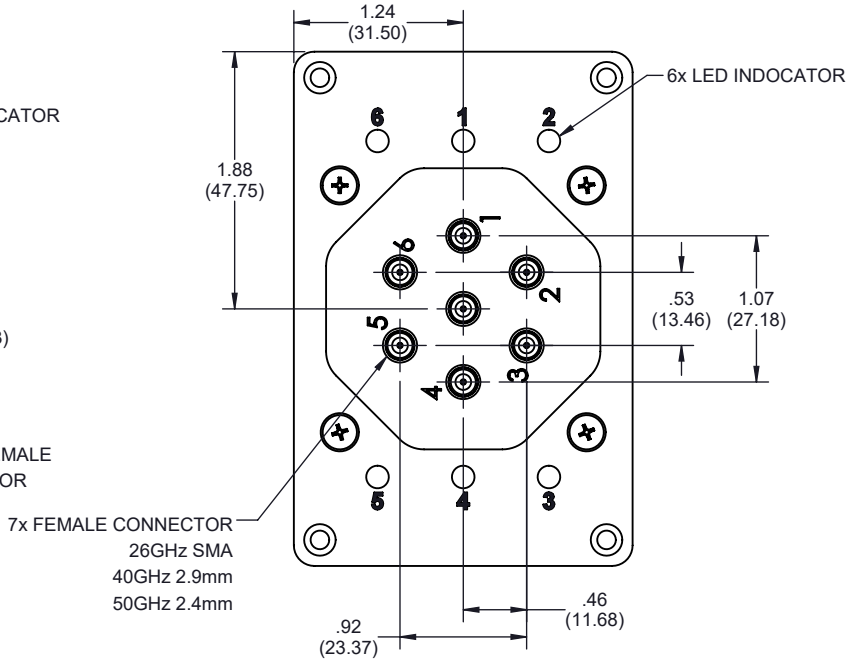

**SP4TA 18GHz**




**SP4TA 26GHz**
**SP4TA 40GHz**
**SP4TA 50GHz**




**SP6TA 12GHz**
**SP6TA 18GHz**

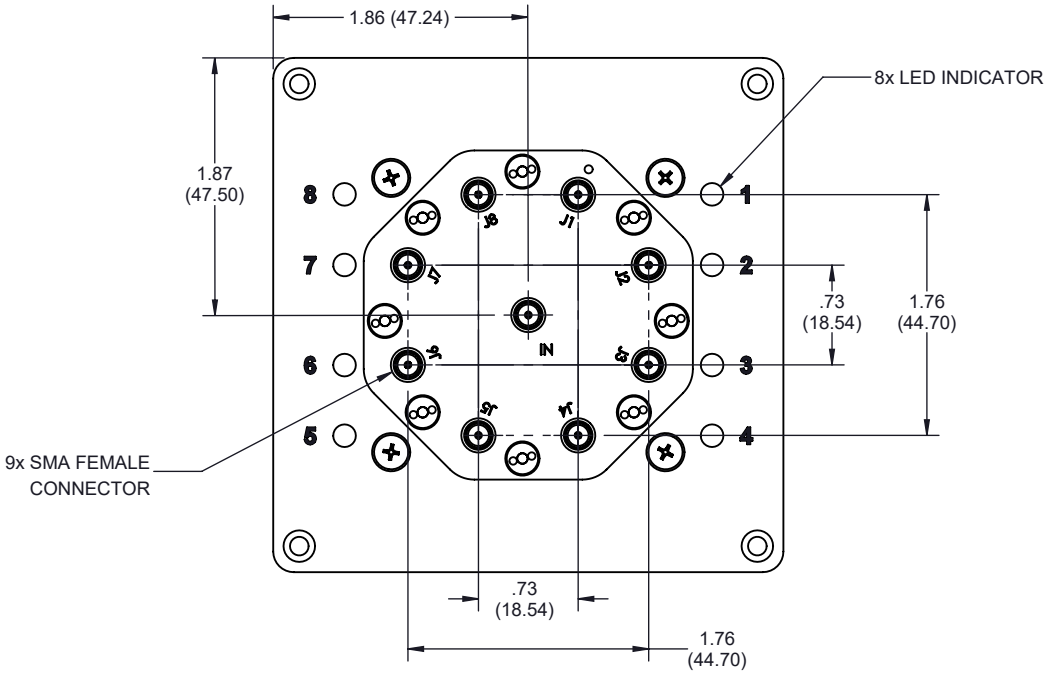



**SP6TA 26GHz**
**SP6TA 40GHz**
**SP6TA 50GHz**

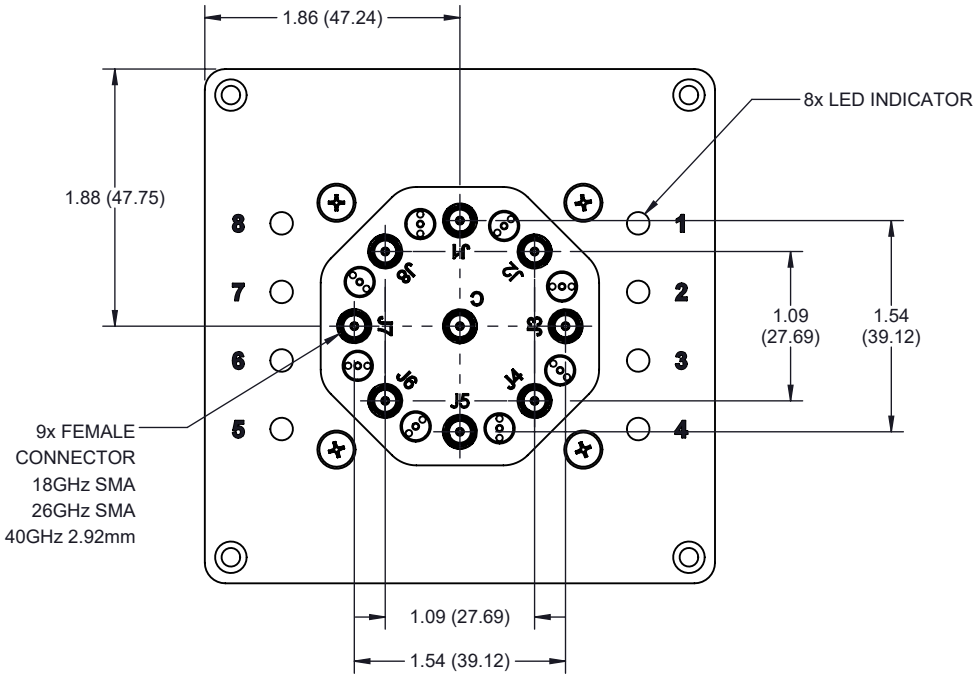

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# Case Style YD

## SP8T Switch Options: YD2861



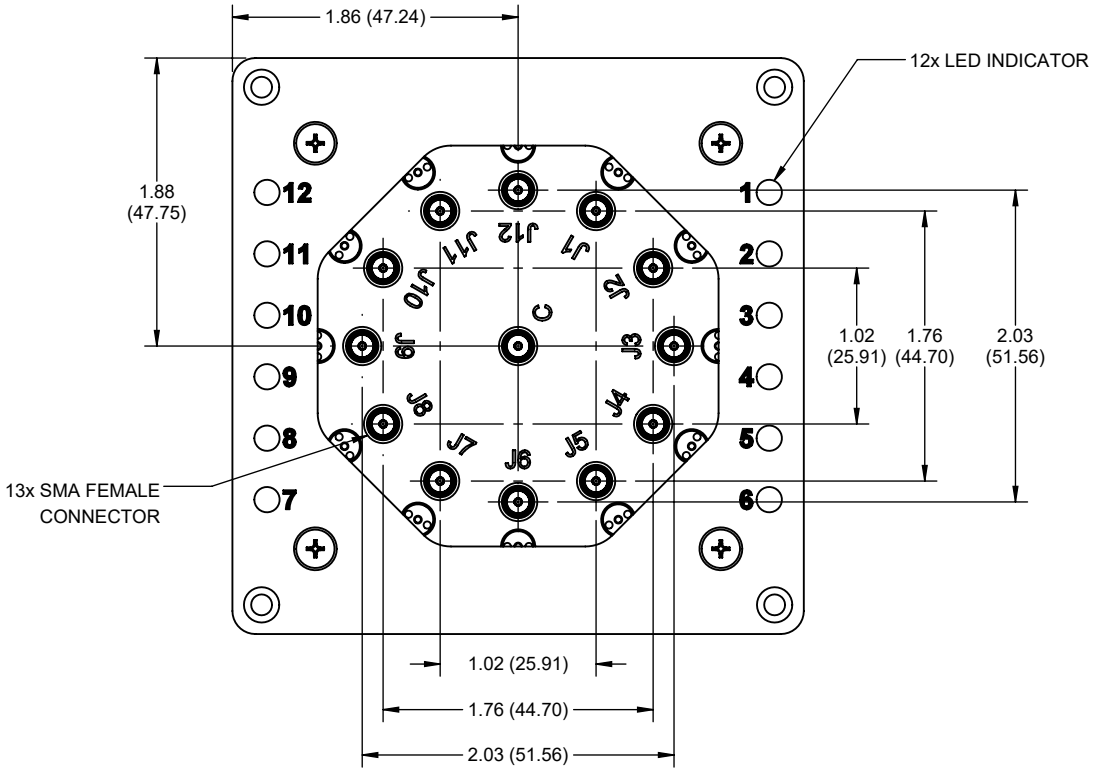

**SP8TA 12GHz**




**SP8TA 18GHz**
**SP8TA 26GHz**
**SP8TA 40GHz**


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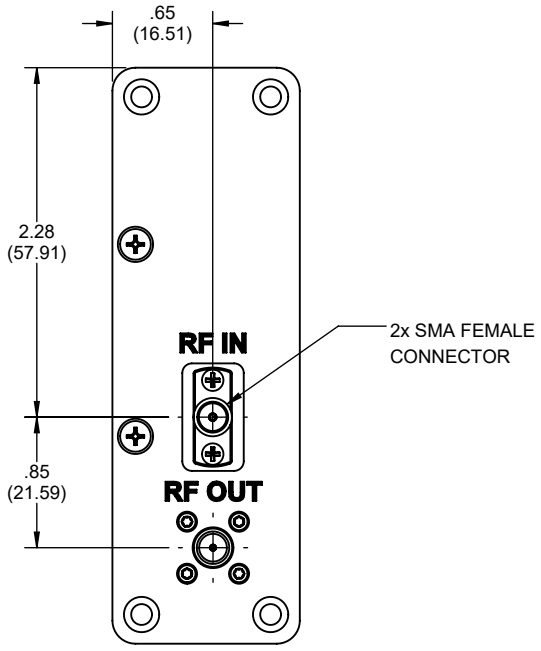
## SP12T Switch Options: YD2861




**SP12TA 18GHz**


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## RUDAT Options: YD2861




**RUDAT 6GHz 110dB**


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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<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -20° to 60° C<br>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 |



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