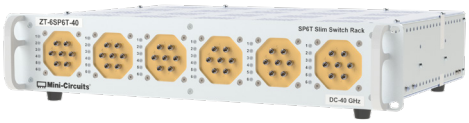
USB & ETHERNET

# Mechanical Switch Assembly ZT-6SP6T-40

50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm Female

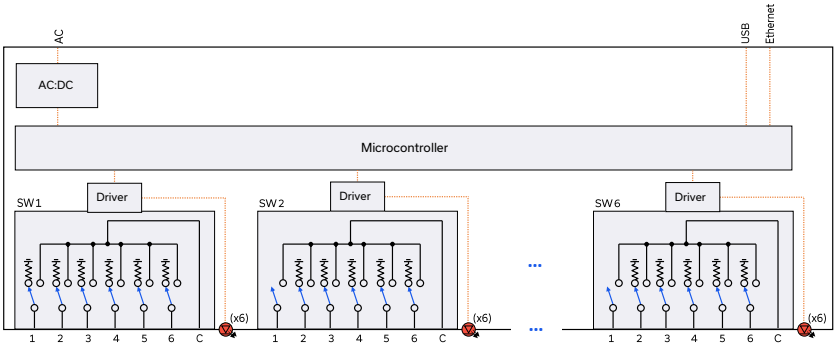
## THE BIG DEAL

- 6 x mechanical SP6T absorptive switches
- High reliability, millions of cycles
- Software control & automation
- SSH secure Ethernet communication
- Compact rack-mountable chassis
- 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' ZT-6SP6T-40 houses 6 independently controlled electro-mechanical SP6T 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 failsafe / 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 slim 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 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.

## 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. HTTP & Telnet communication via Ethernet are also supported. |
| Rack-mount chassis | Slim 2U height, 19" rack-mountable chassis minimizes the rack space required in crowded 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. |

# Mechanical Switch Assembly ZT-6SP6T-40

50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm Female

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

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency | | DC | | 40 | MHz |
| Path Loss | DC – 12 GHz | | 0.2 | 0.4 | dB |
| | 12 – 26 GHz | | 0.4 | 0.7 | |
| | 26 – 40 GHz | | 0.7 | 1.1 | |
| Isolation (Inactive Paths)[1] | DC – 12 GHz | 60 | 90 | | dB |
| | 12 – 26 GHz | 55 | 80 | | |
| | 26 – 40 GHz | 50 | 65 | | |
| Return Loss[2] | DC – 12 GHz | | 23 | | dB |
| | 12 – 26 GHz | | 17 | | |
| | 26 – 40 GHz | | 14 | | |
| Switching Time | | | 25 | | ms |
| RF Input Power (Cold Switching) | DC – 12 GHz | | | 20 | dB |
| | 12 – 26 GHz | | | 10 | |
| | 26 – 40 GHz | | | 5 | |
| | Into internal termination[3] | | | 1 | |
| Switch Lifetime | 100 mW hot switching[4] | 2 | | | million cycles |
| | 1 W 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 1-6 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 ZT-6SP6T-40

50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm 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[5] | 400 µs typ |

5. Based on the polling interval of the USB HID protocol (1 ms 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):

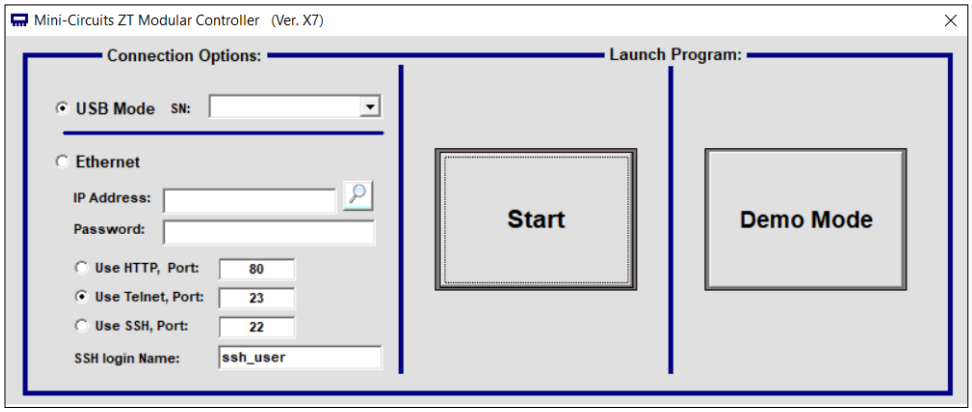
| Command / Query | Description |
|---|---|
| :MN? | Read model name |
| :SN? | Read serial number |
| :FIRMWARE? | Read firmware version |
| :SP6T:[sw_label]:STATE:[port] | Set a single path:<br>• [sw_label] = Switch number (1 to 6)<br>• [port] = The port to be connected to Com of the specified switch (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 ZT-6SP6T-40

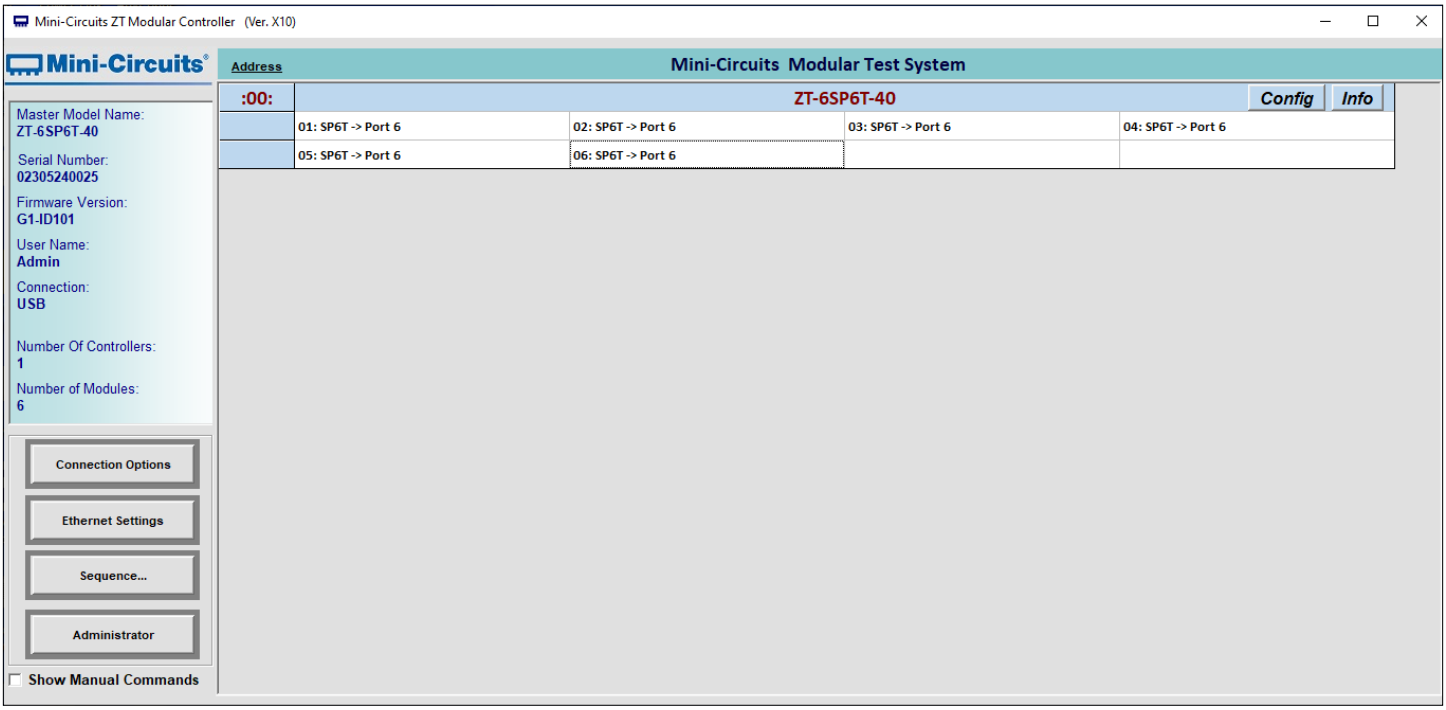
50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm Female

## GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

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



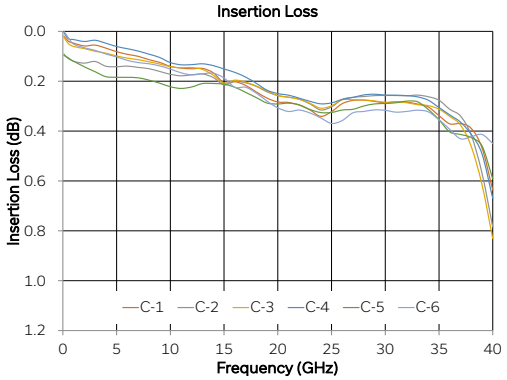

- View and set all switch states at the click of a button
- Configure automated switching sequences
- Define custom switch and port labels
- Set switch power-up states
- Configure Ethernet settings
- Update firmware

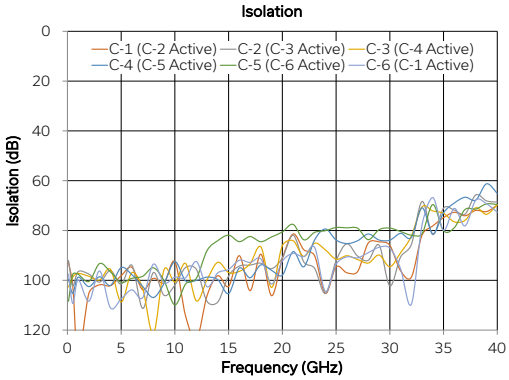


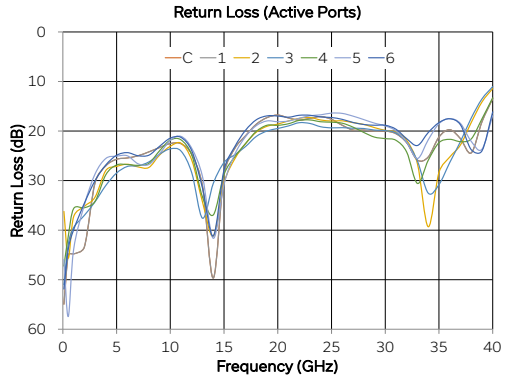
# Mechanical Switch Assembly ZT-6SP6T-40

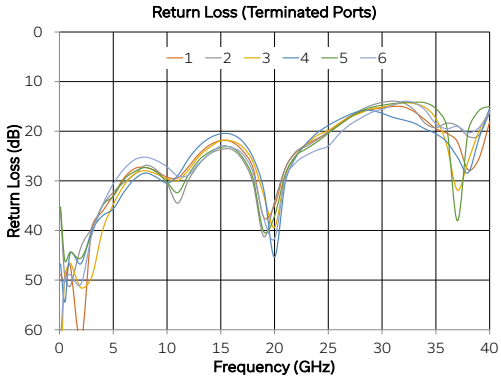
50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm Female

## TYPICAL PERFORMANCE GRAPHS



# Mechanical Switch Assembly ZT-6SP6T-40

50Ω DC to 40 GHz 6 x SP6T 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 | 10 | |
| | 26-40 GHz | 5 | |
| | 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

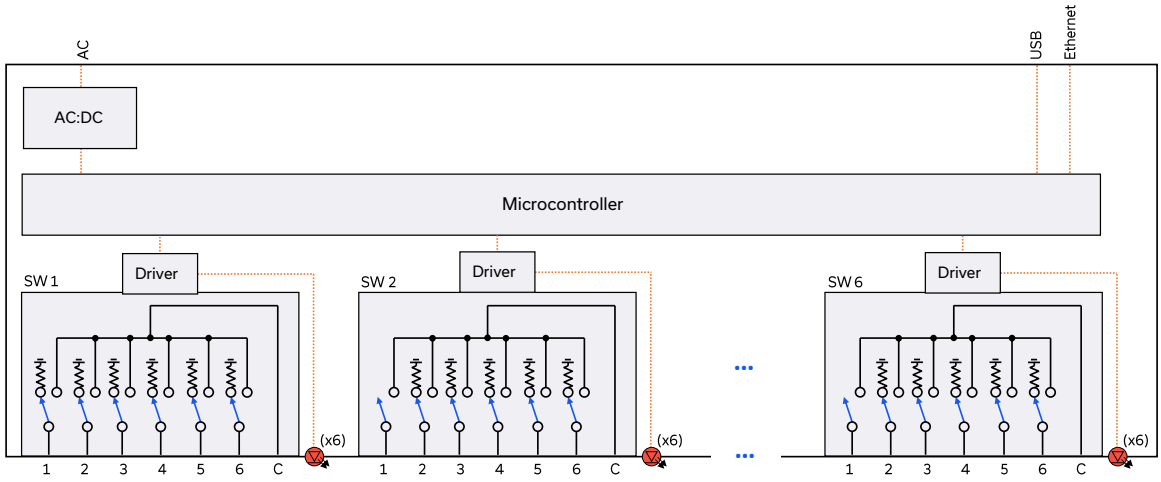
| | |
|---|---|
| **Power Supply** | AC mains input: 100-240 V, 50 / 60 Hz |
| **Fuse** | 2A, 250V rating |
| **Power Consumption** | 150W maximum |

## CONNECTIONS

| Port | Connector |
|---|---|
| C & 1-6 (each SP6T) | 2.92 mm female |
| USB | USB type B |
| Ethernet / LAN | RJ45 |
| AC Input | IEC C14 inlet |

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

## FUNCTIONAL BLOCK DIAGRAM




## SWITCH STATE TABLE (EACH SWITCH)

| Switch Command | Switch x State | Switch x LED State | | | | | |
|---|---|---|---|---|---|---|---|
| | | LED1 | LED2 | LED3 | LED4 | LED5 | LED6 |
| :SP6T:[x]:STATE:0 | All ports disconnected (C open; 1-6 terminated) | Off | Off | Off | Off | Off | Off |
| :SP6T:[x]:STATE:1 | C to 1 | On | Off | Off | Off | Off | Off |
| :SP6T:[x]:STATE:2 | C to 2 | Off | On | Off | Off | Off | Off |
| :SP6T:[x]:STATE:3 | C to 3 | Off | Off | On | Off | Off | Off |
| :SP6T:[x]:STATE:4 | C to 4 | Off | Off | Off | On | Off | Off |
| :SP6T:[x]:STATE:5 | C to 5 | Off | Off | Off | Off | On | Off |
| :SP6T:[x]:STATE:6 | C to 6 | Off | Off | Off | Off | Off | On |

x = switch number (1 to 6)

## POWER-UP OPTIONS

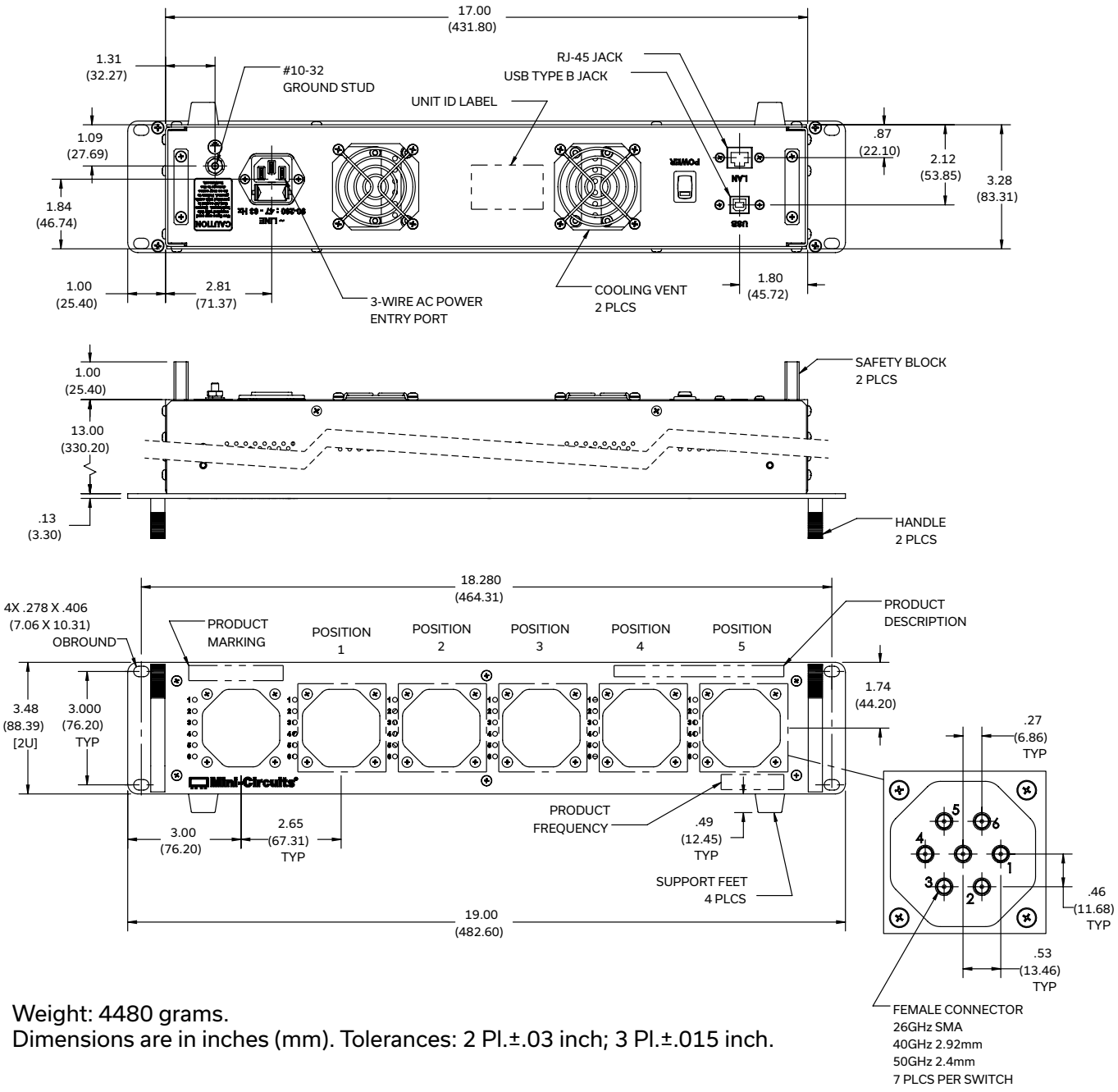
| Mode | Initial Switch Paths |
|---|---|
| Default | All switches power up in the default state (all ports disconnected) |
| Last States | All switches resume the previous state from the point of last power supply disconnection |

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

# Mechanical Switch Assembly ZT-6SP6T-40

50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm Female

## CASE STYLE DRAWING




Weight: 4480 grams.
Dimensions are in inches (mm). Tolerances: 2 Pl.±.03 inch; 3 Pl.±.015 inch.

## PRODUCT MARKING*

Product Marking: ZT-6SP6T-40
Product Description: SP6T Slim Switch Rack
Product Frequency: DC-40 GHz
Unit ID Label: Serial number and other identification marks
*Marking may contain other features or characters for internal lot control

USB & ETHERNET

# Mechanical Switch Assembly ZT-6SP6T-40

50Ω DC to 40 GHz 6 x SP6T Rack-Mount 2.92 mm Female

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

| | |
|---|---|
| **Case Style** | BAJ3229 |
| **Software, User Guide & Programming Manual** | https://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 |
|---|---|---|
|  | 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) |
| | 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. |

| 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

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

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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