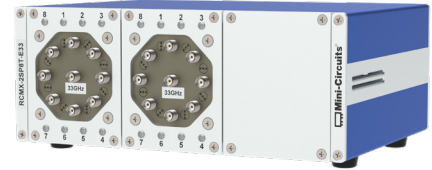
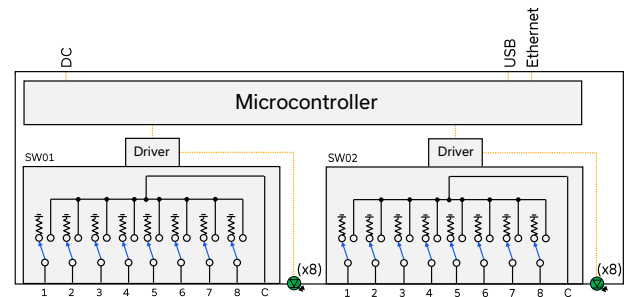


**THE BIG DEAL**

- Mechanical SP8T Absorptive Switches
- High Port Count with Excellent Performance to 32.5 GHz
- High Reliability, Millions of Cycles
- Compact Benchtop Package with Power Supply
- Software Control & Automation
- LED Switch State Indicators



Generic photo used for illustration purposes only

**FUNCTIONAL BLOCK DIAGRAM****APPLICATIONS**

- Benchtop and Rack-Mounted Automated Test Systems
- 5G FR1 & FR3, WiFi 6E, Microwave Radio Infrastructure
- Satellite Communications & Radio-Astronomy
- Military Radio, Radar & Electronic Warfare
- Switch Matrices

**PRODUCT OVERVIEW**

Mini-Circuits' RCMX-2SP8T-E33 contains a pair of electro-mechanical SP8T switches operating over a wide bandwidth from DC to 32.5 GHz with high isolation and low insertion loss. Each absorptive switch is fail-safe / normally open with a break before make configuration and typical lifetime of 2 million switching cycles when used within the noted specifications.

The switches are housed in a compact benchtop package with all 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 RCMX series supports easy maintenance in the field without needing to return to a Mini-Circuits facility.

**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. |
| Compact Package with Flexible Control Options | Easy to use on the lab bench or integrate into larger automated test systems without the need to develop custom control systems.                                                                     |

ELECTRICAL SPECIFICATIONS AT +25 °C,  $Z_0 = 50\Omega$ 

| Parameter                                  | Conditions (GHz)                       | Min. | Typ. | Max. | Units                    |
|--------------------------------------------|----------------------------------------|------|------|------|--------------------------|
| Frequency Range                            | -                                      | DC   | -    | 32.5 | GHz                      |
| Insertion Loss                             | DC-12 GHz                              | -    | 0.4  | 0.9  | dB                       |
|                                            | 12-26 GHz                              | -    | 0.7  | 1.2  |                          |
|                                            | 26-32.5 GHz                            | -    | 1.1  | 1.8  |                          |
| Isolation <sup>1</sup><br>(Inactive Paths) | DC-12 GHz                              | 75   | 90   | -    | dB                       |
|                                            | 12-26 GHz                              | 65   | 80   | -    |                          |
|                                            | 26-32.5 GHz                            | 60   | 75   | -    |                          |
| Return Loss <sup>2</sup>                   | DC-12 GHz                              | -    | 18   | -    | dB                       |
|                                            | 12-26 GHz                              | -    | 15   | -    |                          |
|                                            | 26-32.5 GHz                            | -    | 11   | -    |                          |
| Switching Time                             | -                                      | -    | 25   | -    | ms                       |
| RF Input Power                             | Cold Switching, DC-12 GHz              | -    | -    | 20   | W                        |
|                                            | Cold Switching, 12-26 GHz              | -    | -    | 10   |                          |
|                                            | Cold Switching, 26-32.5 GHz            | -    | -    | 5    |                          |
|                                            | Hot Switching <sup>3</sup>             | -    | -    | 0.1  |                          |
|                                            | Into Internal Termination <sup>4</sup> | -    | -    | 0.5  |                          |
| Switch Lifetime                            | -                                      | -    | 2    | -    | million switching 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 1-8 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 0.5 W per port, 1.5 W total per switch



USB & ETHERNET

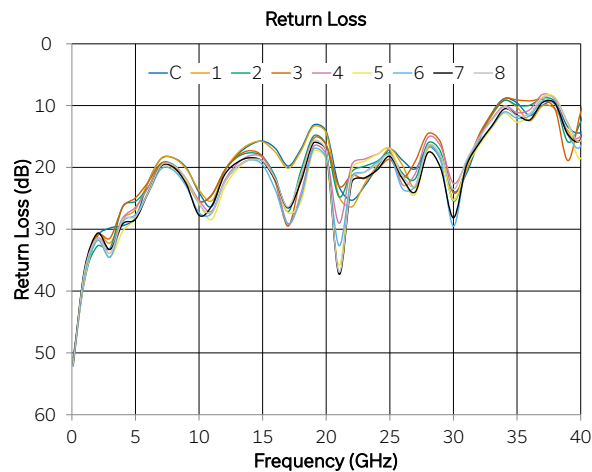
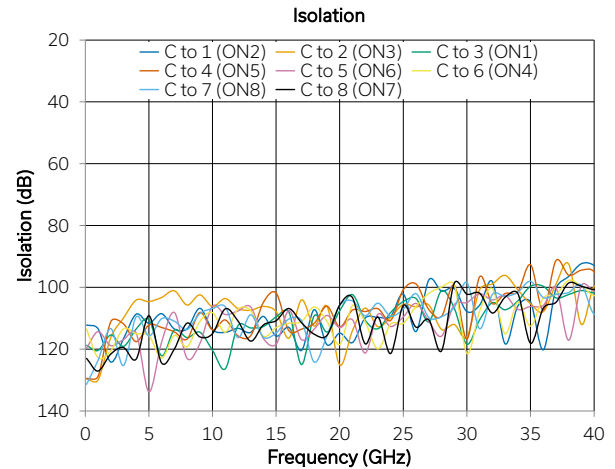
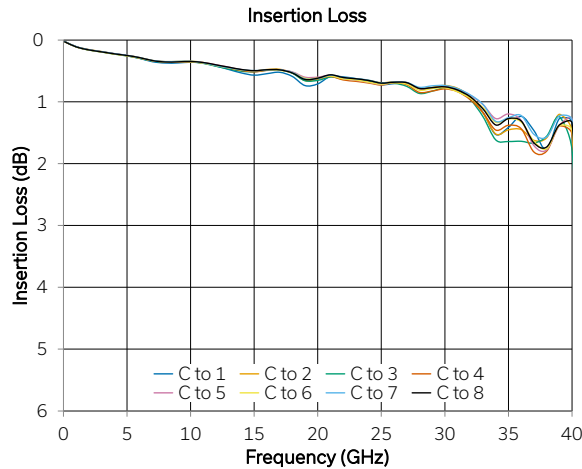
# Mechanical Switch Assembly

RCMX-2SP8T-E33

Mini-Circuits

50Ω DC to 32.5 GHz 2 x SP8T 2.92 mm Female

## TYPICAL PERFORMANCE GRAPHS



Mini-Circuits



## ABSOLUTE MAXIMUM RATINGS

| Parameter                  | Conditions                  | Limits     | Units |
|----------------------------|-----------------------------|------------|-------|
| Temperature                | Operating                   | 0 to +50   | °C    |
|                            | Storage                     | -20 to +60 |       |
| DC Supply Voltage          |                             | 26         | V     |
| Input Power<br>(No Damage) | Cold Switching, DC–12 GHz   | 20         | W     |
|                            | Cold Switching, 12–26 GHz   | 10         |       |
|                            | Cold Switching, 26–32.5 GHz | 5          |       |
|                            | Hot Switching               | 0.1        |       |
|                            | 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

| Parameter  | Conditions | Typ | Max | Units |
|------------|------------|-----|-----|-------|
| DC Voltage |            | 24  | 26  | V     |

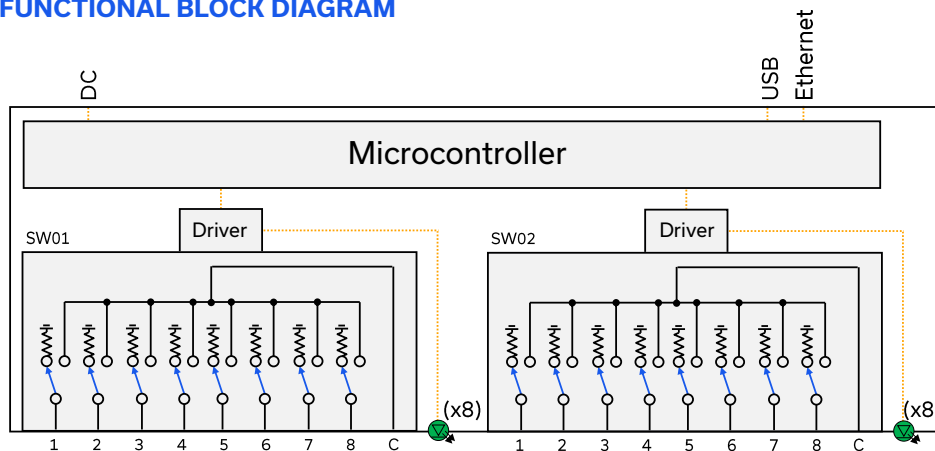
Using included AC/DC-24-3W1 power supply adapter (110 / 240 V AC input)

## CONNECTIONS

| Port                | Connector                        |
|---------------------|----------------------------------|
| SW1 & SW2 - C & 1-8 | 2.92 mm female                   |
| USB                 | USB type B                       |
| Ethernet / LAN      | RJ45                             |
| 24V DC Input        | 2.1 mm center positive DC socket |

C = Common port  
1-8 = 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 | LED7 | LED8 |
| :SP8T:[x]:STATE:0 | All ports disconnected (C open; 1-8 terminated) | On                 | 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   |

x = switch number

## POWER-UP OPTIONS

| Mode        | Initial Switch Paths                                                                 |
|-------------|--------------------------------------------------------------------------------------|
| Default     | Switches power up in the default state (all ports disconnected)                      |
| Last States | 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.



## 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>5</sup> | 400 μs typ                                       |

5. Based on the polling interval of the USB HID protocol 1 ms with 64 bytes per packet / 125 μs with 1024 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                                                                                                                                           |
| :SP8T:[sw_label]:STATE:[port] | Set a single switch state: <ul style="list-style-type: none"> <li>• [sw_label] = 1 to 2</li> <li>• [port] = 0 (all ports disconnected) to 8 (C to 8)</li> </ul> |
| SP8T:[sw_label]:STATE?        | Get a single switch state: <ul style="list-style-type: none"> <li>• [sw_label] = 1 to 2</li> </ul>                                                              |



### 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 / timed switching sequences
- Set switch power-up states
- Configure Ethernet settings
- Update firmware

Mini-Circuits RCMX (version 1.0.0)

Available Devices

RCMX-2SP8T-E33 749923

Add LAN Device Add USB Device

Model Name RCMX-2SP8T-E33

User Defined Name My\_Device

Serial Number 749923

Firmware 8.8.14

Connection USB

Switch Control Programming Automation Configuration

| Switch | Switch Name | Active Path |
|--------|-------------|-------------|
| 1      | SP8T        | Port 2      |
| 2      | SP8T        | Port 8      |

Contact: ztmgroup@minicircuits.com



USB & ETHERNET

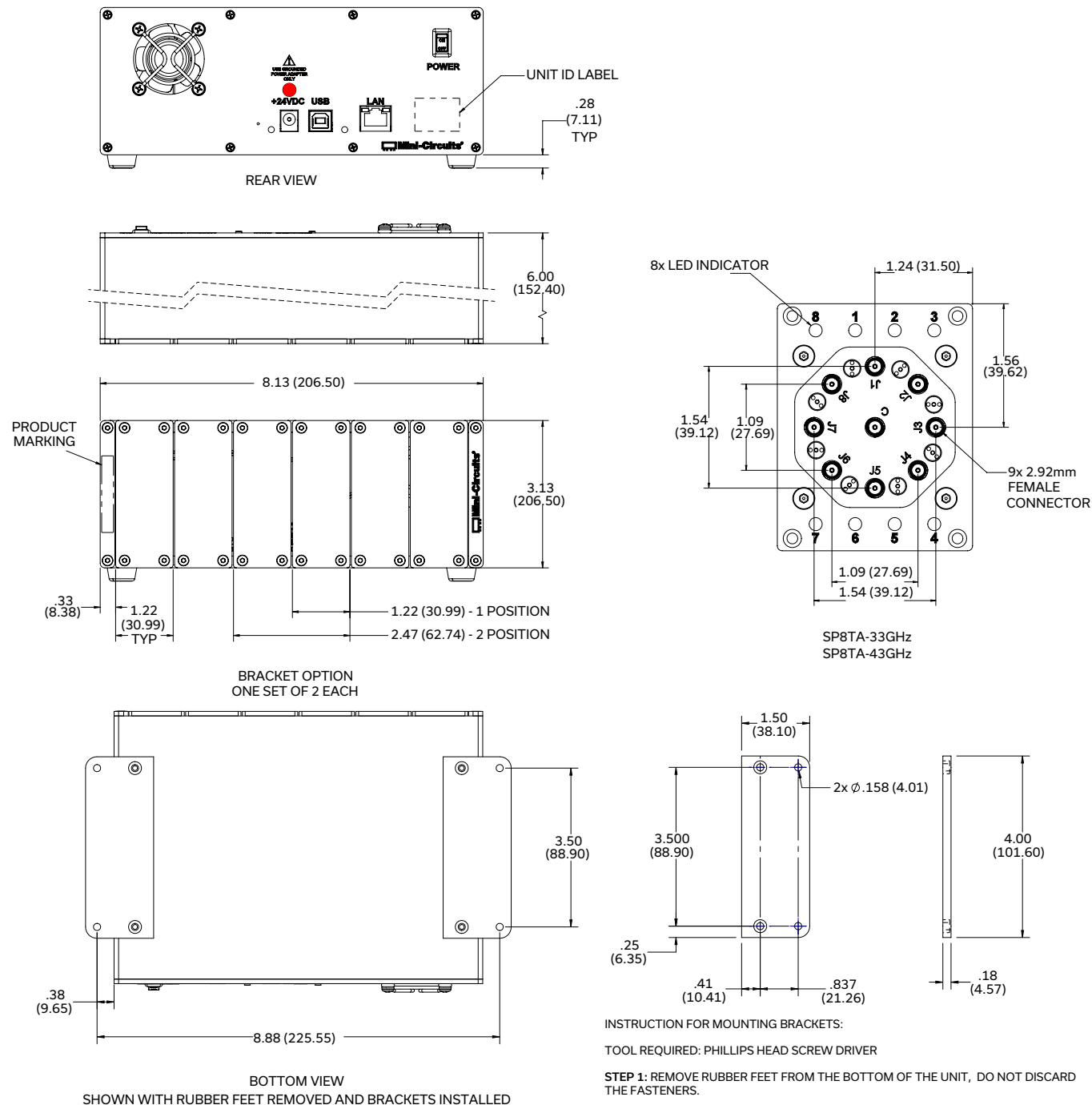
# Mechanical Switch Assembly

RCMX-2SP8T-E33

Mini-Circuits

50Ω DC to 32.5 GHz 2 x SP8T 2.92 mm Female

## CASE STYLE DRAWING



## PRODUCT MARKING\*

RCMX-2SP8T-E33

Unit ID Label: Serial number and other identification marks

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

Mini-Circuits



## USB & ETHERNET

# Mechanical Switch Assembly

## RCMX-2SP8T-E33

Mini-Circuits

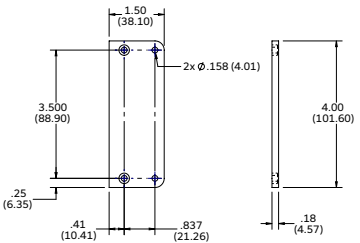
50Ω DC to 32.5 GHz 2 x SP8T 2.92 mm Female

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

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Case Style                                | BBY3749                                                                                                                                                                                                                                                                                                                                                                                                      |
| Software, User Guide & Programming Manual | <a href="http://www.minicircuits.com/softwaredownload/rcmx.html">www.minicircuits.com/softwaredownload/rcmx.html</a>                                                                                                                                                                                                                                                                                         |
| Environmental Rating                      | ENV55                                                                                                                                                                                                                                                                                                                                                                                                        |
| Regulatory Compliance                     | <p>Refer to our website for compliance methodologies and qualifications</p> <p> </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                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | AC/DC-24-3W1   | AC/DC 24V DC grounded power adaptor. Operating temperature 0 to +40 °C, max current 2.5A, IEC C6 AC inlet.                                                                                                                   |
|                                                                                    | CBL-3W1-xx     | AC power cord (IEC C5 connector to local plug)<br>Select one option from the list below.<br>Please contact <a href="mailto:testsolutions@minicircuits.com">testsolutions@minicircuits.com</a> if your regions is not listed. |
|   | USB-CBL-AB-3+  | USB cable (2.7ft) type A to type B                                                                                                                                                                                           |
|  | CBL-RJ45-MM-5+ | Ethernet cable (5 ft)                                                                                                                                                                                                        |

| Optional Accessories                                                                                                                                                                                                   | Part Number | Description                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------|
|  <p>Dimensions: 1.50 (38.10), 3.500 (88.90), 2x Ø .158 (4.01), 4.00 (101.60), .25 (6.35), .41 (10.41), .837 (21.26), .18 (4.57)</p> | BKT-272-08+ | Pair of base mounting brackets |

| AC Power Cord Options                                                               | Part Number | Description                                                        |
|-------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------|
|  | CBL-3W1-US  | USA<br>NEMA 5-15 plug (type B) to IEC C5 connector                 |
|  | CBL-3W1-EU  | Europe<br>CEE 7/7 plug (type E/F) to IEC C5 connector              |
|  | CBL-3W1-UK  | UK<br>BS-1363 plug (type G) to IEC C5 connector                    |
|  | CBL-3W1-AU  | Australia & China<br>AS/NZS 3112 plug (type I) to IEC C5 connector |
|  | CBL-3W1-IL  | Israel<br>SI-32 plug (type H) to IEC C13 connector                 |

### NOTES

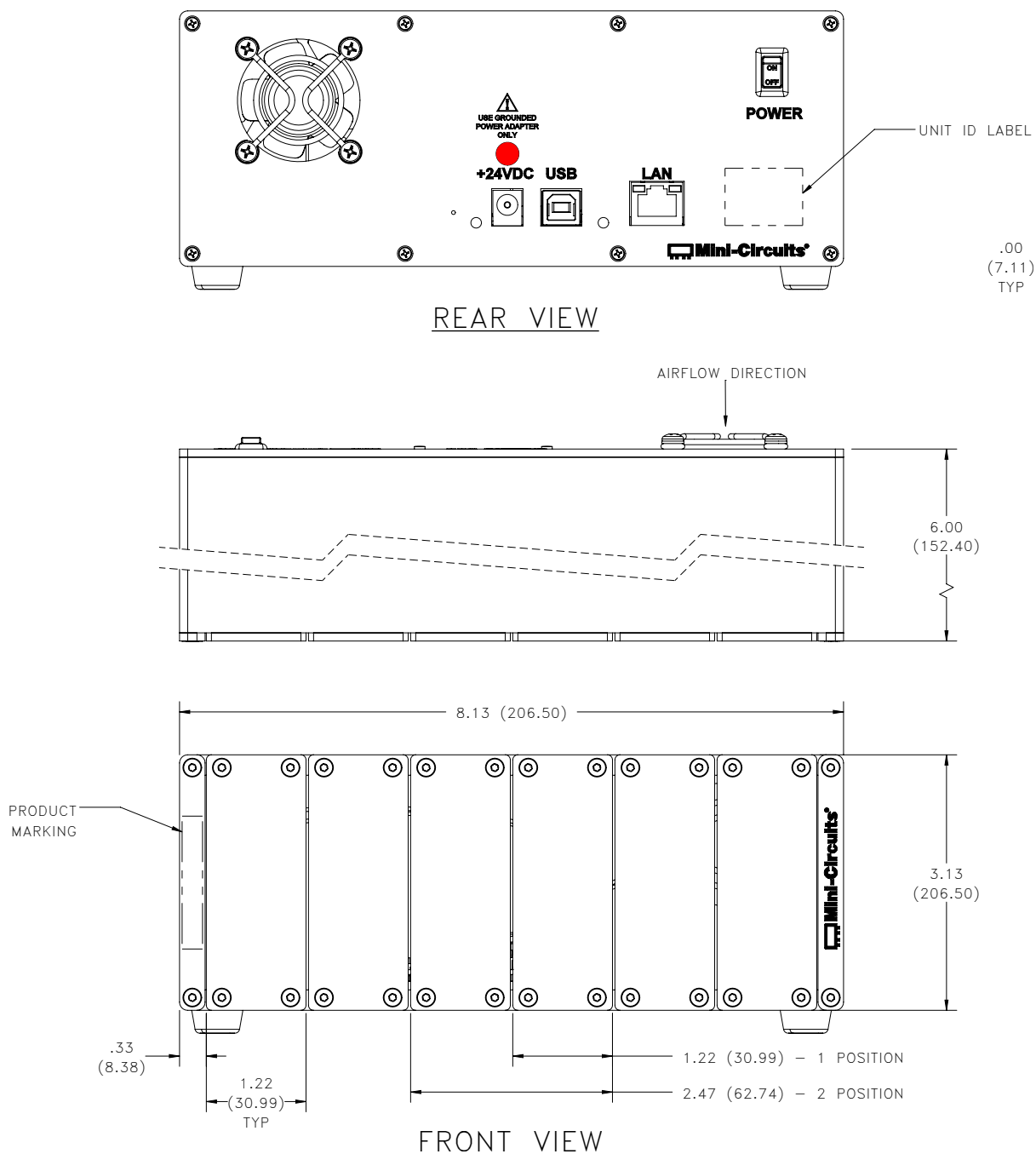
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' 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](http://www.minicircuits.com/MCLStore/terms.jsp)





## Outline Dimensions

BBY3749



### 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: 2150 grams.
4. Marking may contain other features or characters for internal lot control.



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



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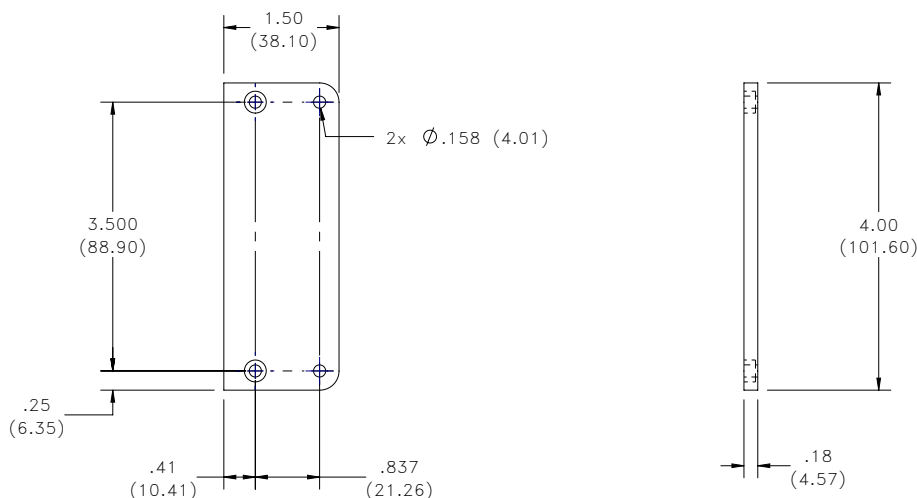
RF/IF MICROWAVE COMPONENTS

## BBY3749

Technical drawing of a rectangular frame assembly. The drawing shows a top-down view of the frame, which consists of two vertical side rails and two horizontal end rails. The side rails are connected to the end rails by corner brackets. The dimensions are as follows:

- Overall width: 8.88 (225.55)
- Overall height: 3.50 (88.90)
- Distance from the left edge to the center of the left side rail: .38 (9.65)

SHOWN WITH RUBBER FEET REMOVED AND BRACKETS INSTALLED



TOOL REQUIRED: PHILLIPS HEAD SCREW DRIVER

## STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED

IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.



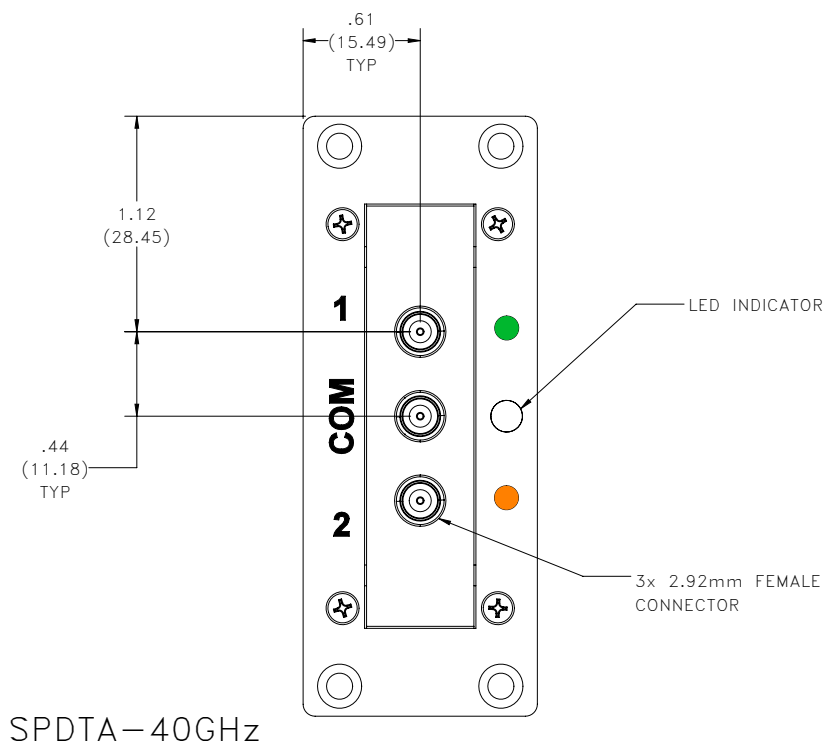
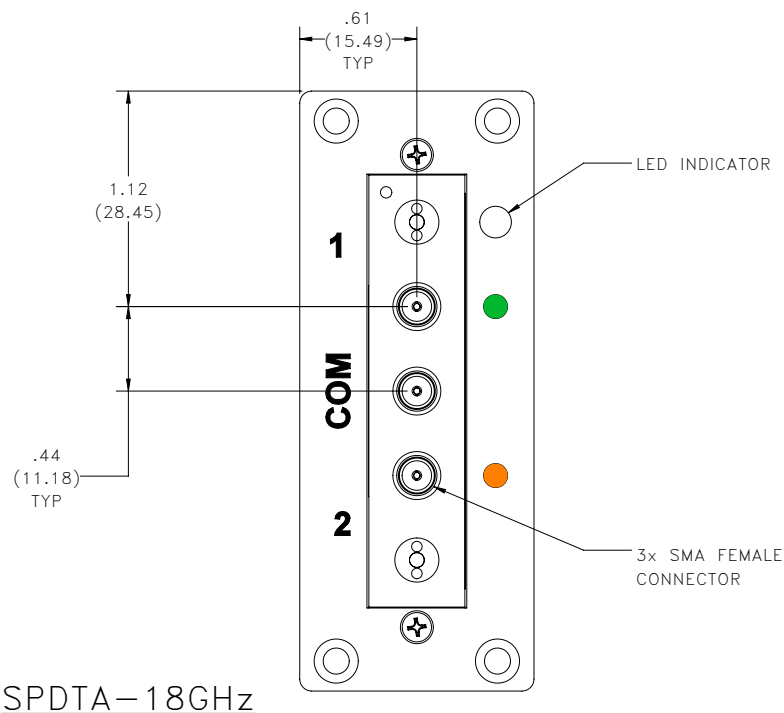
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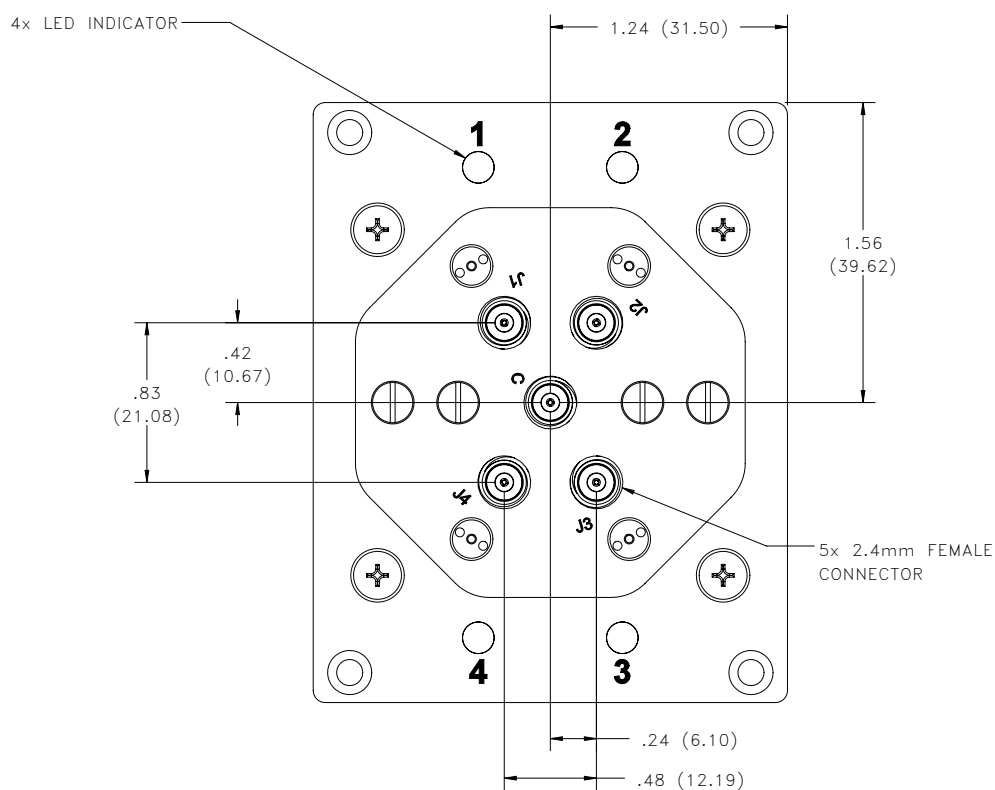


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SP4TA-53GHz



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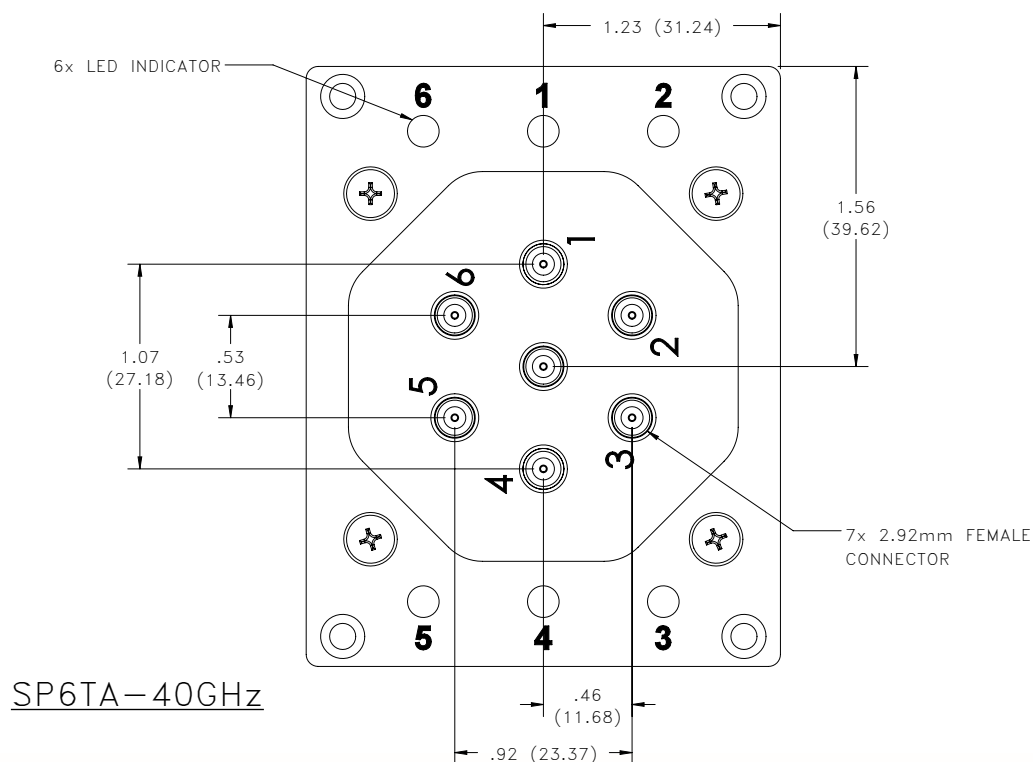
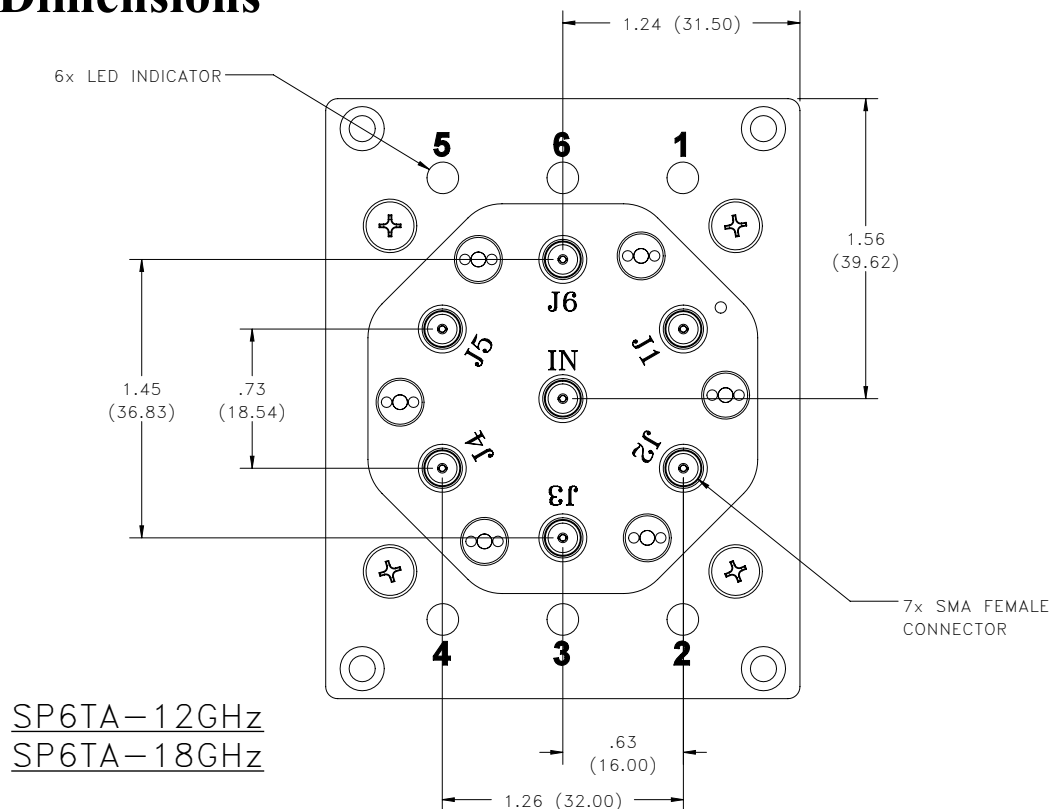


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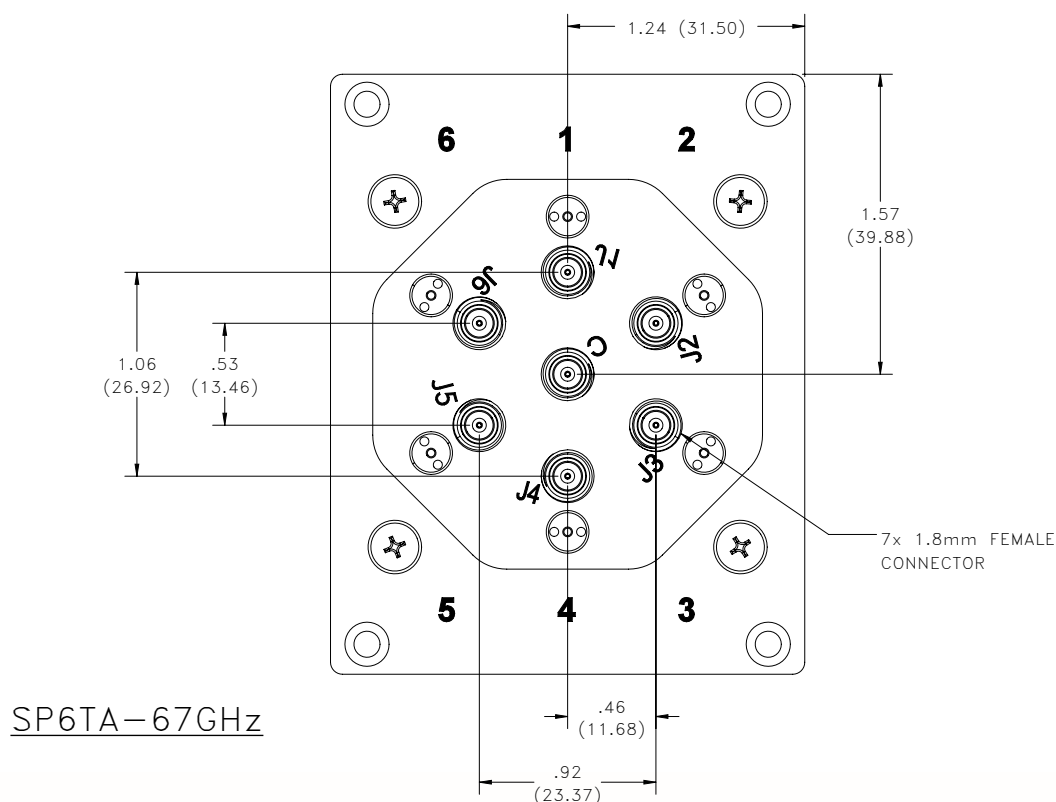
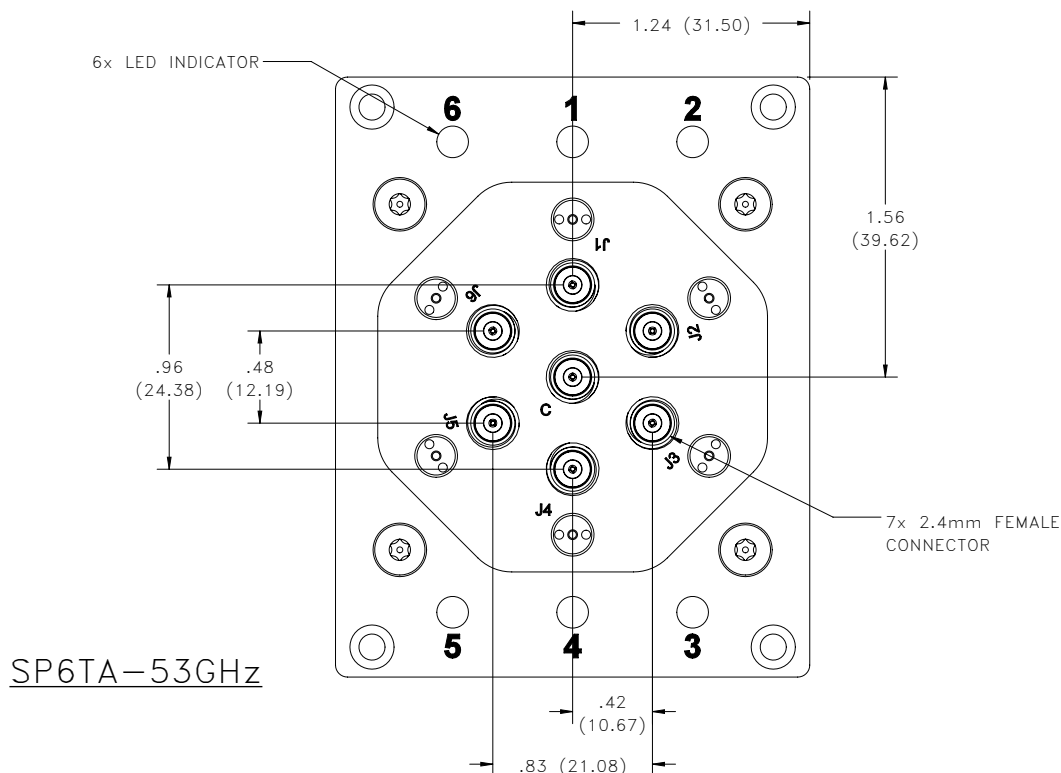


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RF/IF MICROWAVE COMPONENTS

## Outline Dimensions

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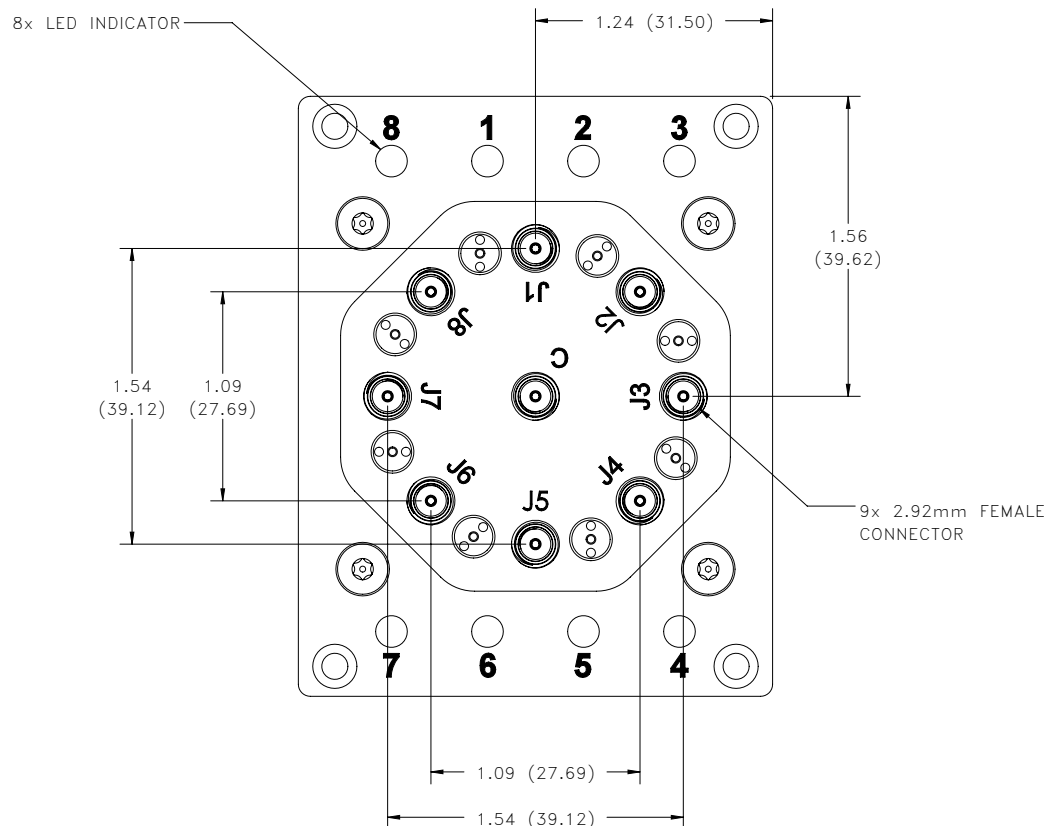
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RF/IF MICROWAVE COMPONENTS


$$\frac{\text{SP8TA}-33\text{GHz}}{\text{SP8TA}-43\text{GHz}}$$


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## 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<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      |