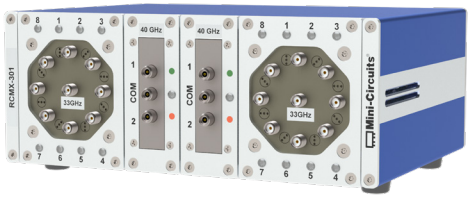
USB & ETHERNET

Mechanical Switch Assembly RCMX-301

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

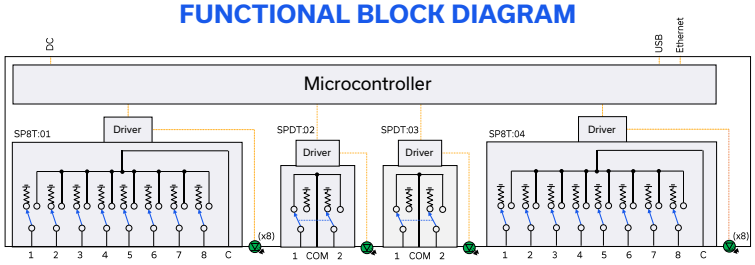
THE BIG DEAL

- Mechanical SP8T & SPDT Absorptive Switches
- Customizable switch configuration
- 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 & 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-301 is a modular test system integrating a set of electro-mechanical absorptive switches operating over a wide bandwidth with high isolation and low insertion loss. The front panel incorporates a pair of SP8T switches with a normally open configuration, covering DC to 32.5 GHz, and a pair of SPDT fail-safe switches covering DC-40 GHz. The switches have a 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.

REV. OR
NPO-006242
RCMX-301
MCL NY
260511

Mechanical Switch Assembly RCMX-301

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

ELECTRICAL SPECIFICATIONS AT +25 °C (EACH SP8T)

Parameter	Conditions	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[1] (Inactive Paths)	DC – 12 GHz	75	90	-	dB
	12 – 26 GHz	65	80	-	
	26-32.5 GHz	60	75	-	
Return Loss[2]	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[3]	-	-	0.1	
	Into Internal Termination[4]	-	-	0.5	
Switch Lifetime	-	-	2	-	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 1-8 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

ELECTRICAL SPECIFICATIONS AT +25 °C (EACH SPDT)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	DC	-	40	GHz
Insertion Loss	DC – 12 GHz	-	0.2	0.5	dB
	12 – 26 GHz	-	0.3	0.7	
	26 – 40 GHz	-	0.6	1.1	
Isolation[5] (Inactive Paths)	DC – 12 GHz	60	80	-	dB
	12 – 26 GHz	55	75	-	
	26 – 40 GHz	50	65	-	
Return Loss[6]	DC – 12 GHz	-	19	-	dB
	12 – 26 GHz	-	17	-	
	26 – 40 GHz	-	14	-	
Switching Time	-	-	25	-	ms
RF Input Power	Cold Switching, DC – 12 GHz	-	-	20	W
	Cold Switching, 12 – 26 GHz	-	-	10	
	Cold Switching, 26 – 40 GHz	-	-	5	
	Hot Switching[7]	-	-	0.1	
	Into Internal Termination	-	-	1	
Switch Lifetime	-	-	2	-	million cycles

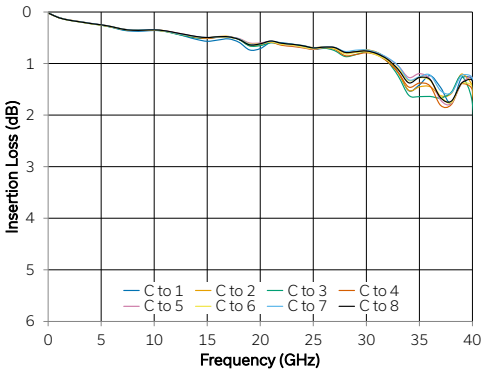
5. Isolation measured between COM and the disconnected port. Example: Isolation for COM to 1 is the leakage measured at port 1 from a signal input at COM when the active switch path is set to COM to 2.
6. Return loss into all ports in all states
7. Hot switching power above this level will degrade the switch lifetime

Mechanical Switch Assembly RCMX-301

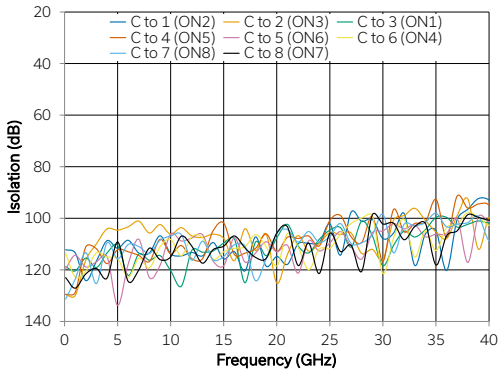
50Ω DC to 32.5 GHz 2 x SP8T + 2 x SPDT 2.92 mm Female

TYPICAL PERFORMANCE GRAPHS (EACH SP8T SWITCH)

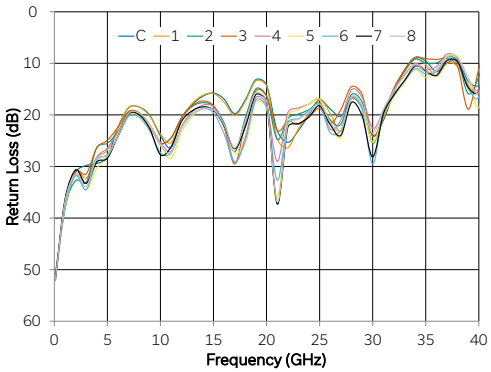
Insertion Loss



Isolation

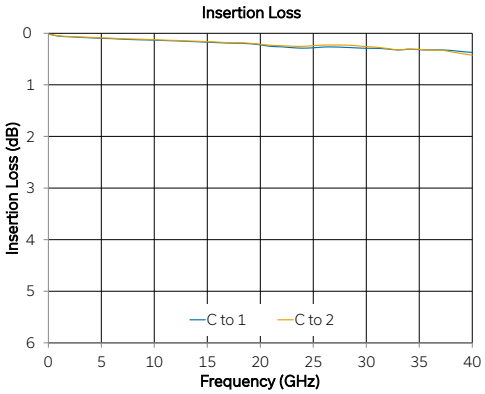


Return Loss

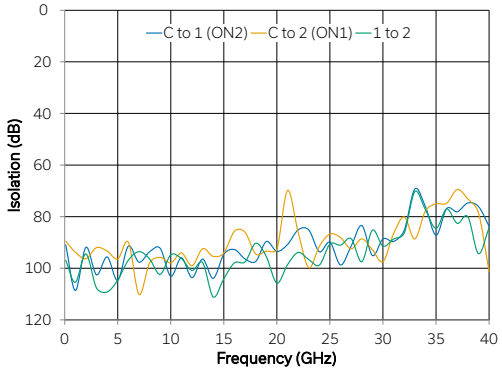


TYPICAL PERFORMANCE GRAPHS (EACH SPDT SWITCH)

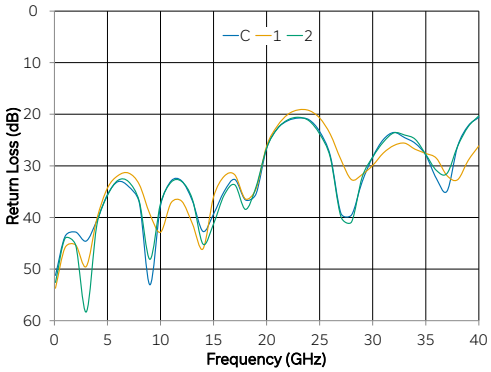
Insertion Loss



Isolation



Return Loss



Mechanical Switch Assembly RCMX-301

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

ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-20 to +60	
DC Supply Voltage		26	V
Input Power (No Damage)	Cold Switching, DC-12 GHz	20	W
	Cold Switching, 12-26 GHz	10	
	Cold Switching, 26-32.5 GHz	5	
	Cold Switching, 32.5-40 GHz (SPDT)	5	
	Hot Switching	0.1	
	Into Internal Termination (SP8T)	0.5	
	Into Internal Termination (SPDT)	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

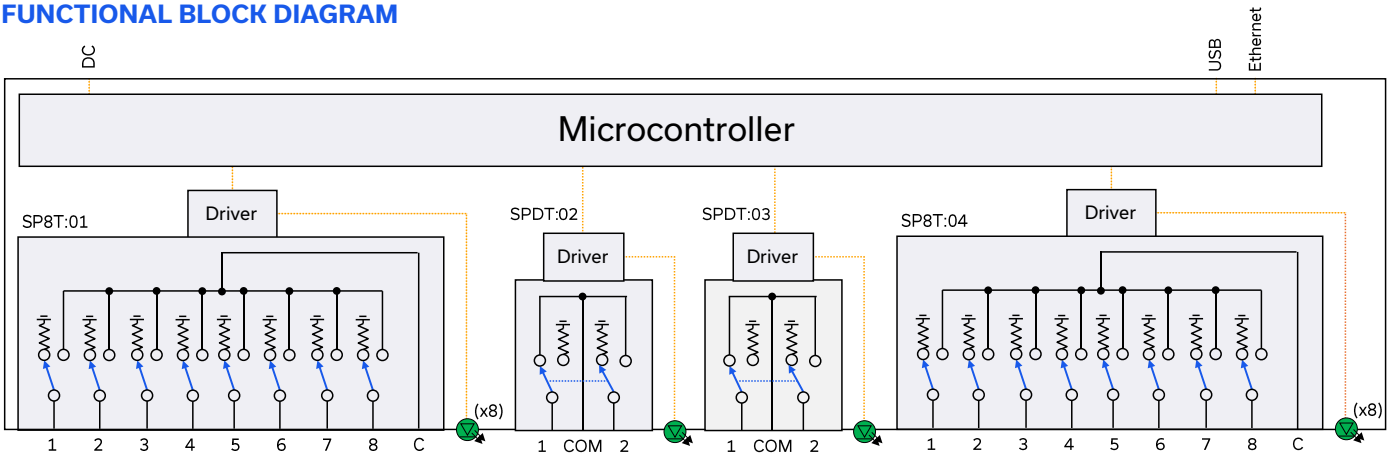
Using included AC/DC-24-3W1 power supply adapter (110 / 240 V AC input)

CONNECTIONS

Port	Connector
SW1 & SW4 - COM & 1-8	2.92 mm Female
SW2 & SW3 – COM & 1-2	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)	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

x = switch number (1 or 4)

POWER-UP OPTIONS

Mode	Initial Switch Paths
Default	Switches power up in the default state: SP8T = All ports disconnected SPDT = COM to 1
Last States	Switches resume the previous state from the point of last power supply disconnection

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

Switch Command	Switch x State	Switch x LED Color
:SPDT:[x]:STATE:1	COM to 1	Green
:SPDT:[x]:STATE:2	COM to 2	Red

x = switch number (2 or 3)

Mechanical Switch Assembly RCMX-301

50Ω DC to 32.5 GHz 2 x SP8T + 2 x SPDT 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[9]	400 µs typ

9. 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 & 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):

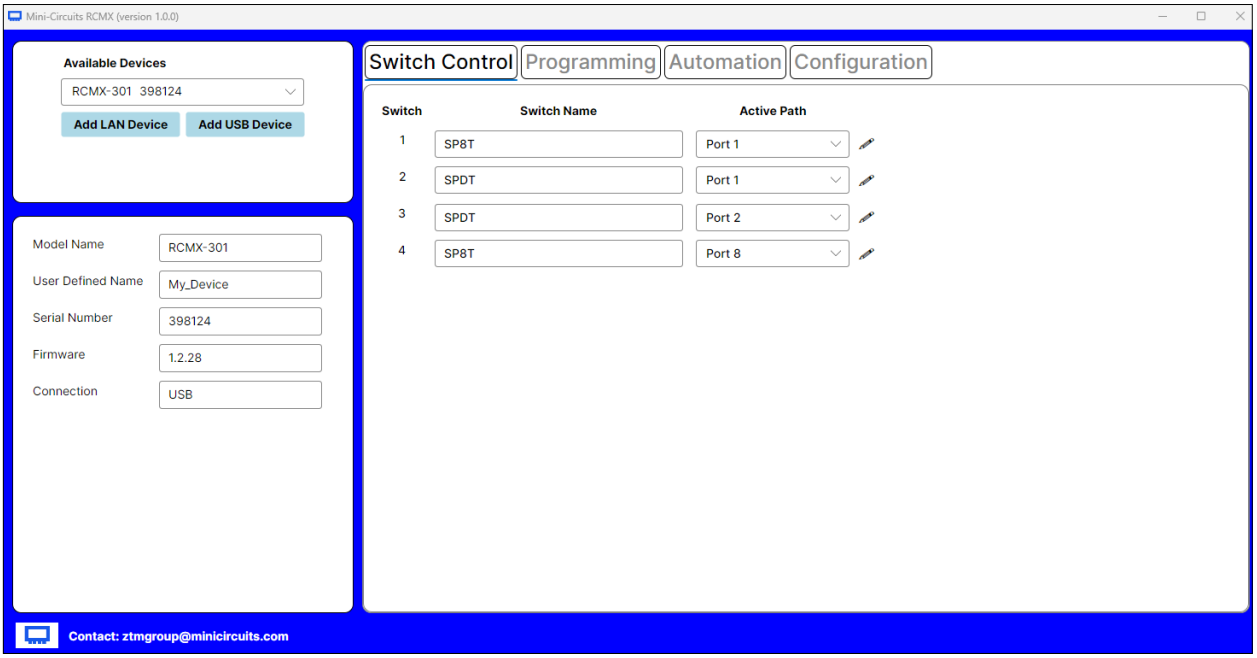
Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
:[sw_type]:[sw_label]:STATE:[port]	Set a single switch state: • [sw_type] = SP8T or SPDT • [sw_label] = 1 to 4 • [port] = 0 to 8 (SP8T switches) or 1 to 2 (SPDT switches)
:[sw_type]:[sw_label]:STATE?	Get a single switch state: • [sw_type] = SP8T or SPDT • [sw_label] = 1 to 4

Mechanical Switch Assembly RCMX-301

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

GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

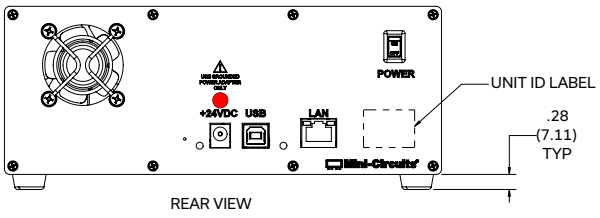
- Connect via USB or Ethernet
- Run GUI in “demo mode” to evaluate software without a hardware connection
- View and set all switch states at the click of a button
- Configure automated / timed switching sequences
- Set switch power-up states
- Configure Ethernet settings
- Update firmware

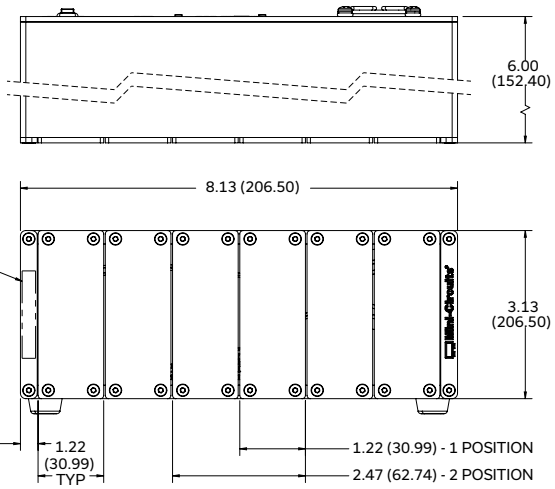


Mechanical Switch Assembly RCMX-301

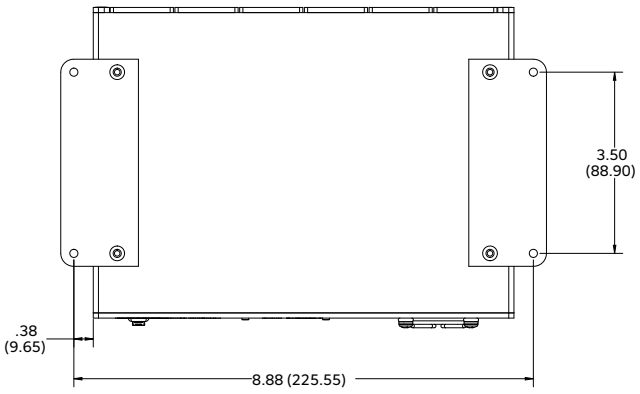
50Ω DC to 32.5 GHz 2 x SP8T + 2 x SPDT 2.92 mm Female

CASE STYLE DRAWING

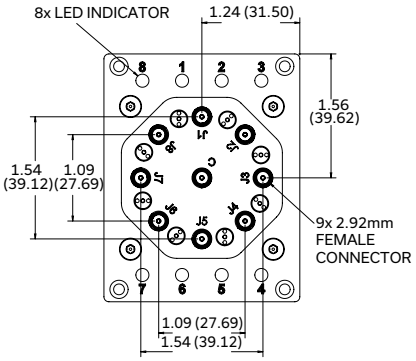




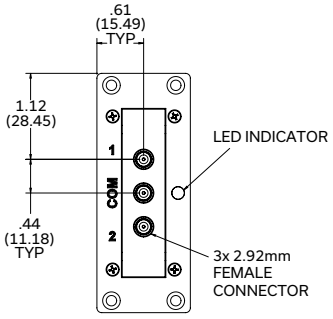
BRACKET OPTION
ONE SET OF 2 EACH



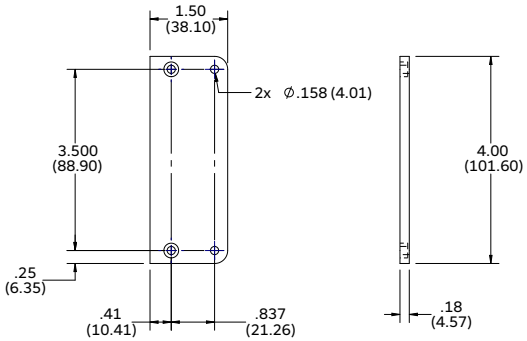
BOTTOM VIEW
SHOWN WITH RUBBER FEET REMOVED AND BRACKETS INSTALLED



SP8TA-33GHz
SP8TA-43GHz



SPDTA-40GHz



INSTRUCTION FOR MOUNTING BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD SCREW DRIVER

STEP 1: REMOVE RUBBER FEET FROM THE BOTTOM OF THE UNIT,
DO NOT DISCARD THE FASTENERS.

STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED
IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.

PRODUCT MARKING*

RCMX-301

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

Mechanical Switch Assembly RCMX-301

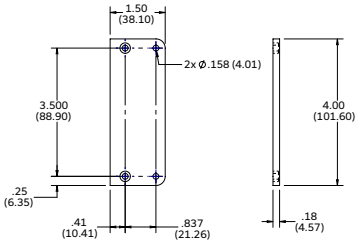
50Ω DC to 32.5 GHz 2 x SP8T + 2 x SPDT 2.92 mm Female

DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE CLICK HERE

Case Style	BBY3749
Software, User Guide & Programming Manual	www.minicircuits.com/softwaredownload/rcmx.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
	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) Select one option from the list below. Please contact testsolutions@minicircuits.com 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
	BKT-272-08+	Pair of base mounting brackets

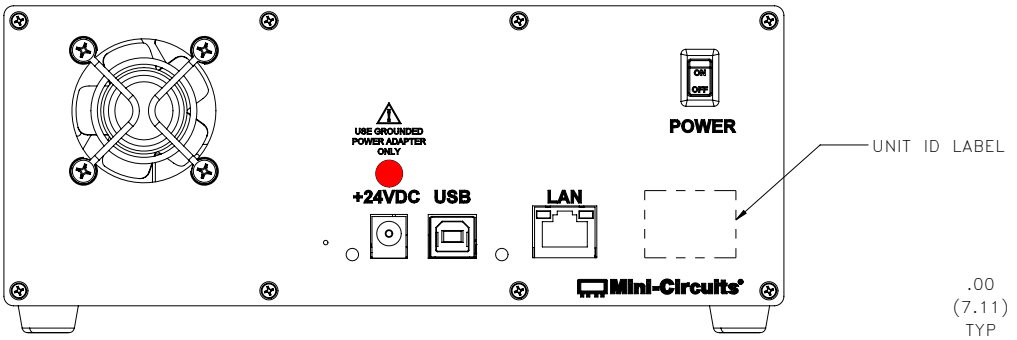
AC Power Cord Options	Part Number	Description
	CBL-3W1-US	USA NEMA 5-15 plug (type B) to IEC C5 connector
	CBL-3W1-EU	Europe CEE 7/7 plug (type E/F) to IEC C5 connector
	CBL-3W1-UK	UK BS-1363 plug (type G) to IEC C5 connector
	CBL-3W1-AU	Australia & China AS/NZS 3112 plug (type I) to IEC C5 connector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

NOTES

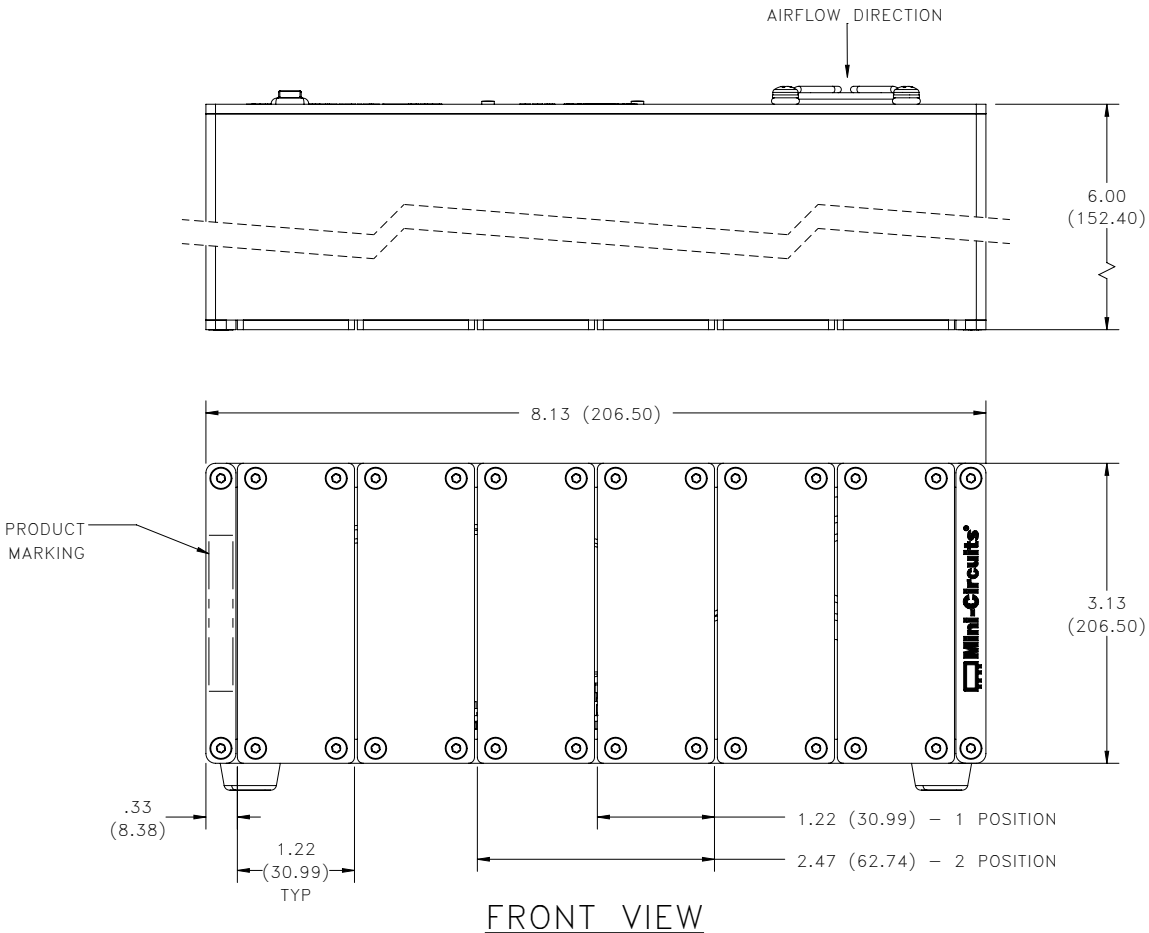
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' 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

Outline Dimensions

BBY3749



REAR VIEW



FRONT VIEW

Notes:

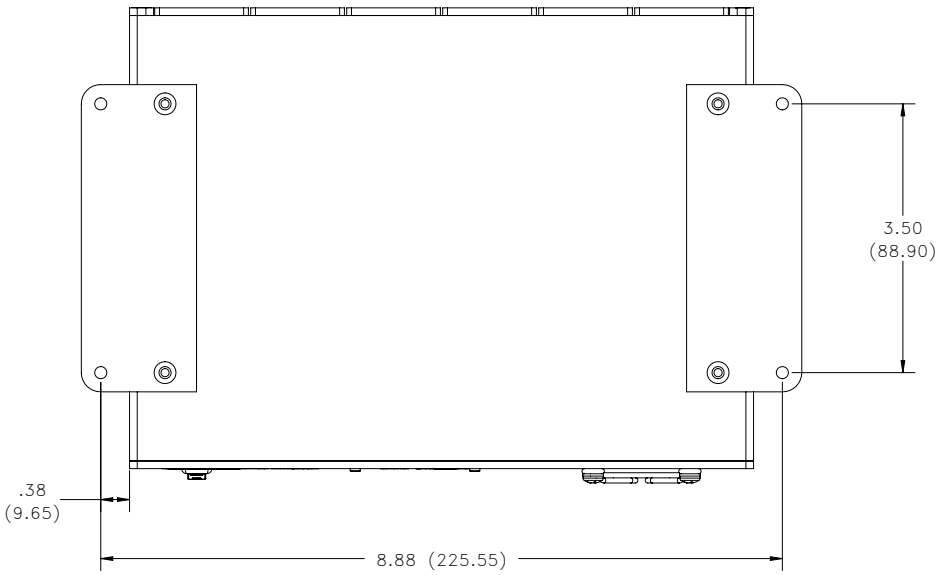
1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches (mm). Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.
3. Weight: 2150 grams.
4. Marking may contain other features or characters for internal lot control.

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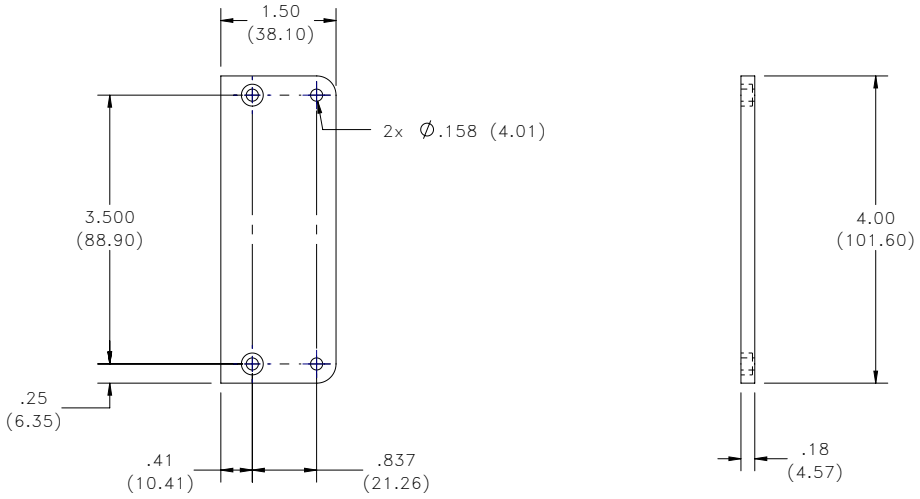
Outline Dimensions

BBY3749

BRACKET OPTION
ONE SET OF 2 EACH



BOTTOM VIEW
SHOWN WITH RUBBER FEET REMOVED AND BRACKETS INSTALLED



INSTRUCTION FOR MOUNTING BRACKETS:

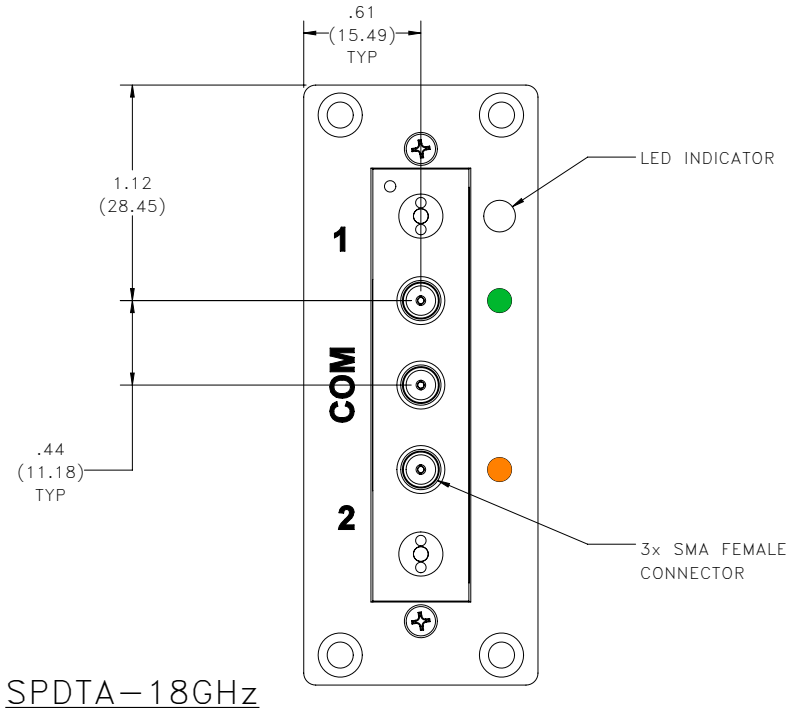
TOOL REQUIRED: PHILLIPS HEAD SCREW DRIVER

STEP 1: REMOVE RUBBER FEET FROM THE BOTTOM OF THE UNIT,
DO NOT DISCARD THE FASTENERS.
STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED
IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.

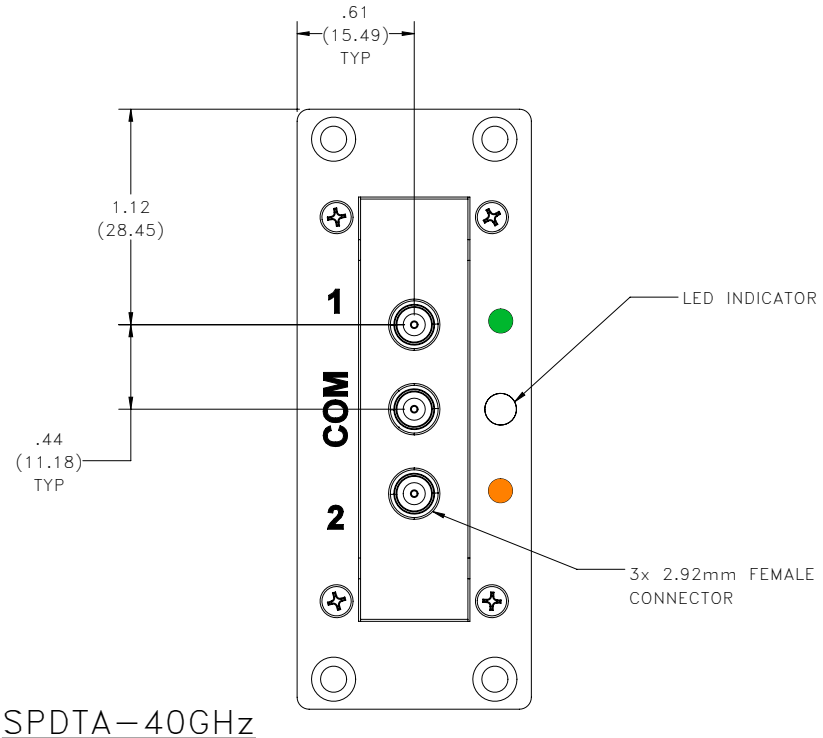
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Outline Dimensions

BBY3749



SPDTA-18GHz

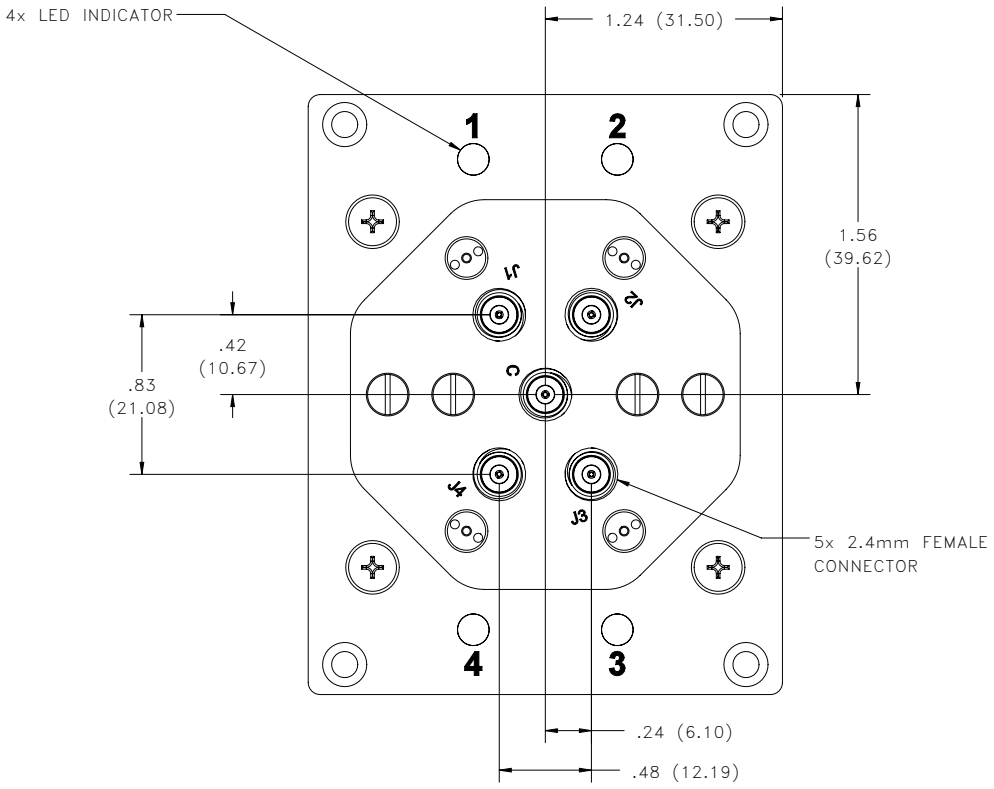


SPDTA-40GHz

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Outline Dimensions

BBY3749

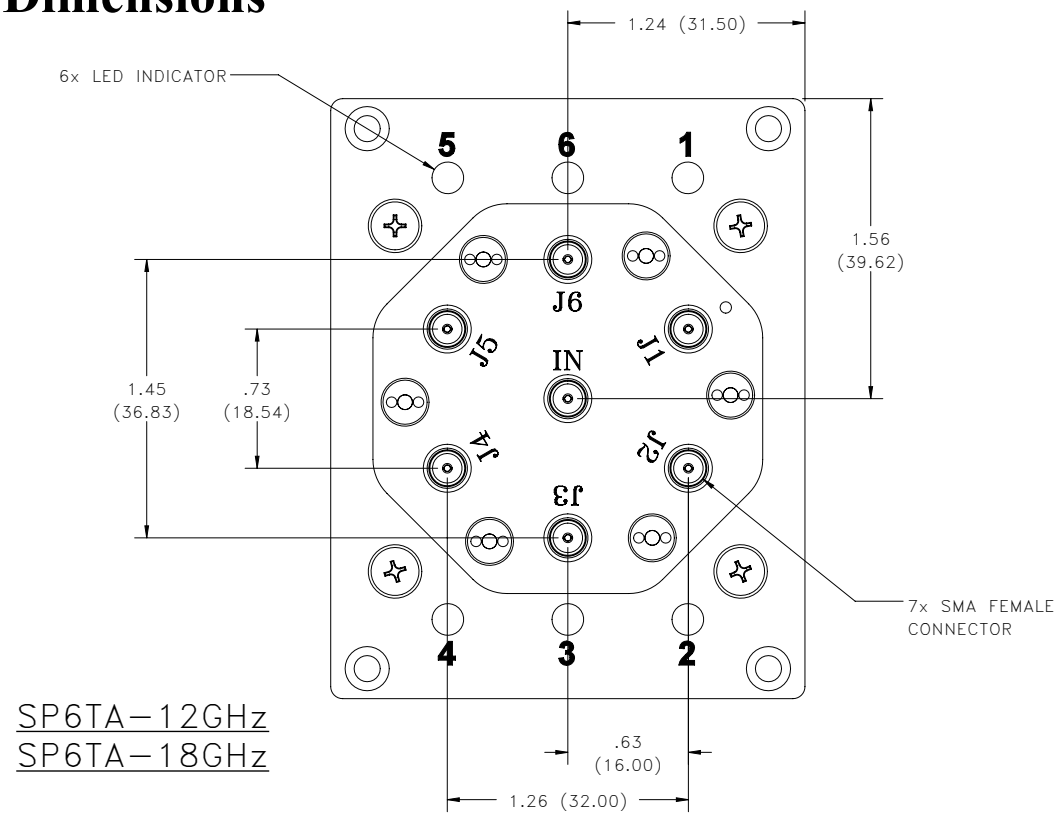


SP4TA-53GHz

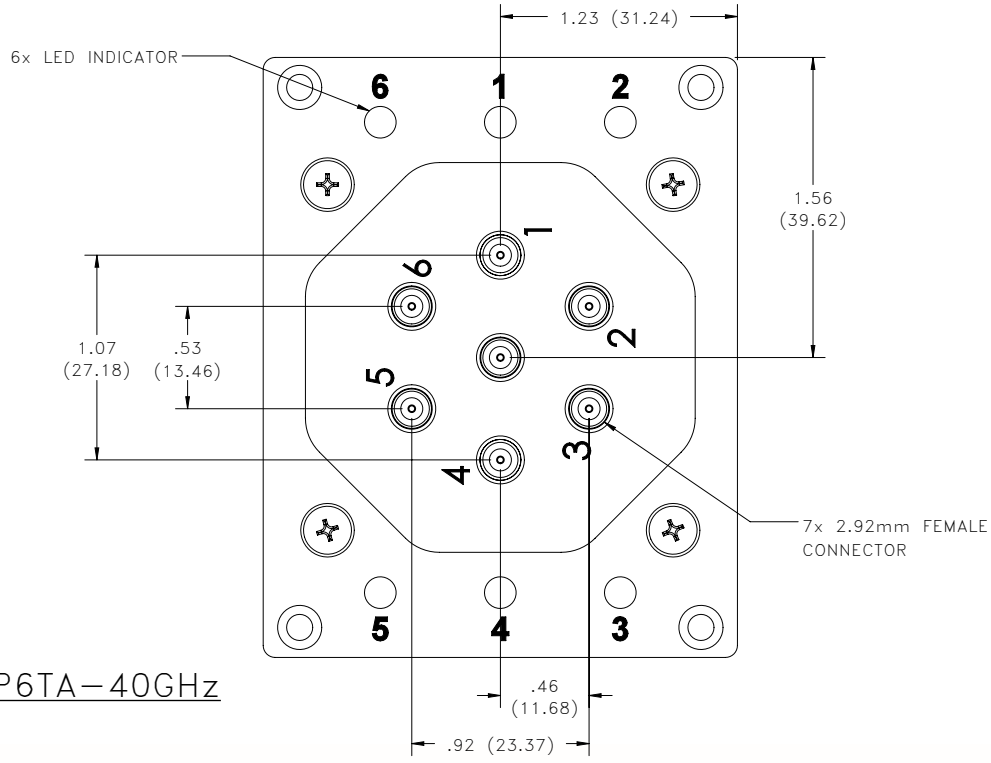
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Outline Dimensions

BBY3749



SP6TA-12GHz
SP6TA-18GHz

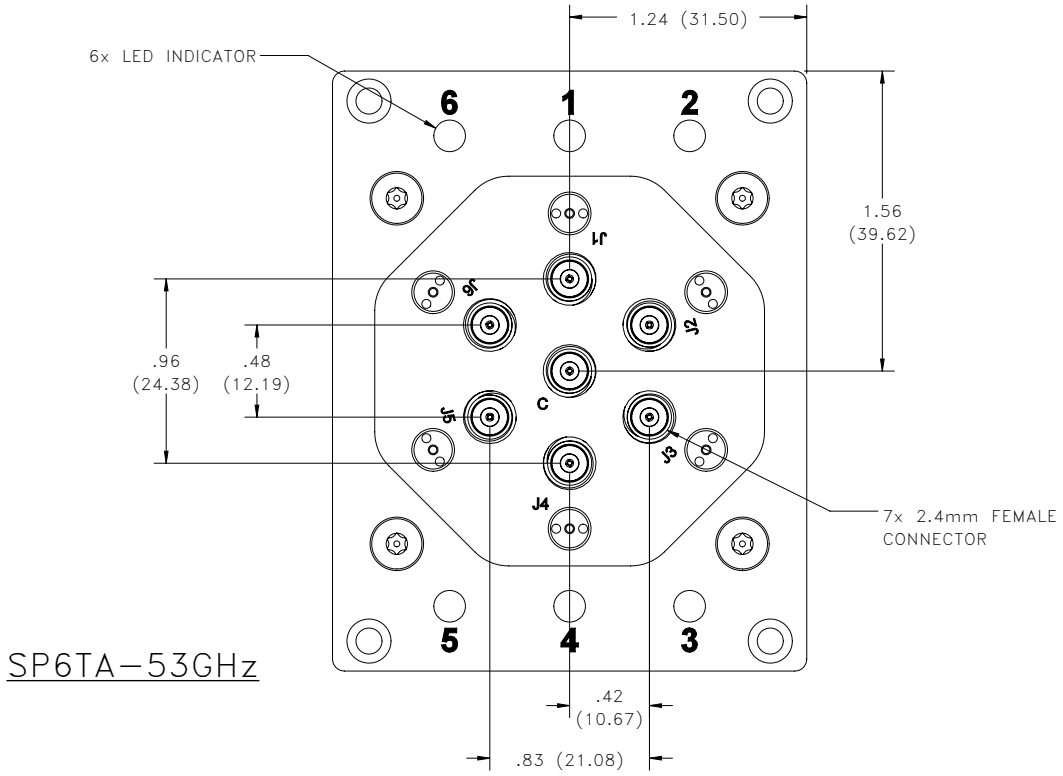


SP6TA-40GHz

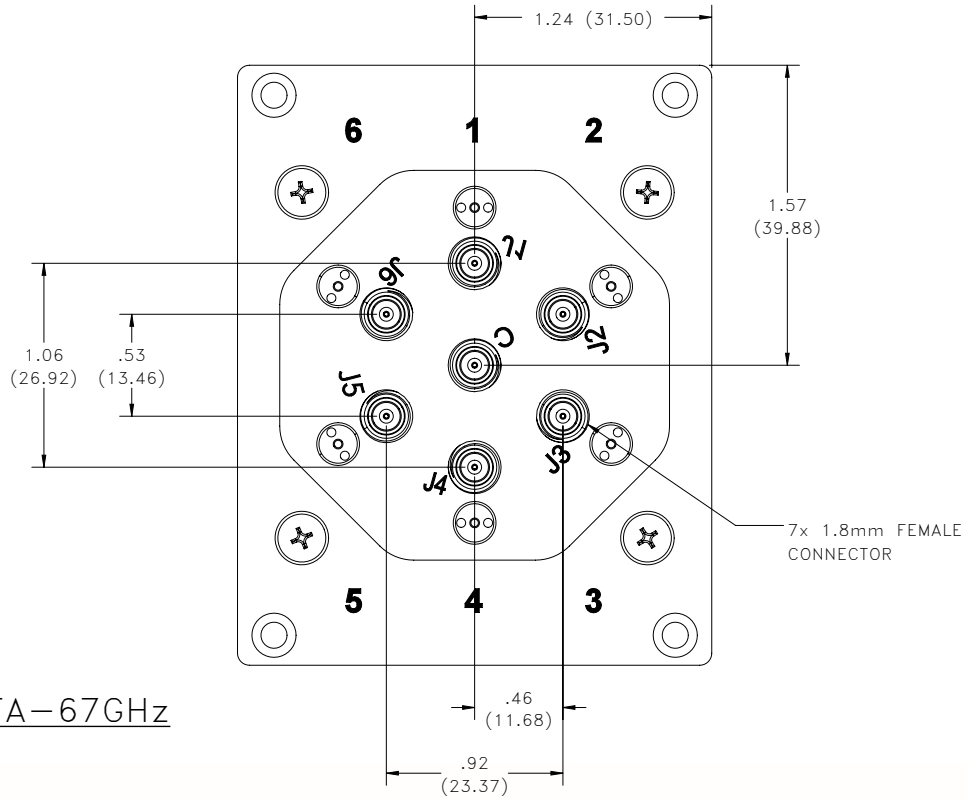
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Outline Dimensions

BBY3749



SP6TA-53GHz

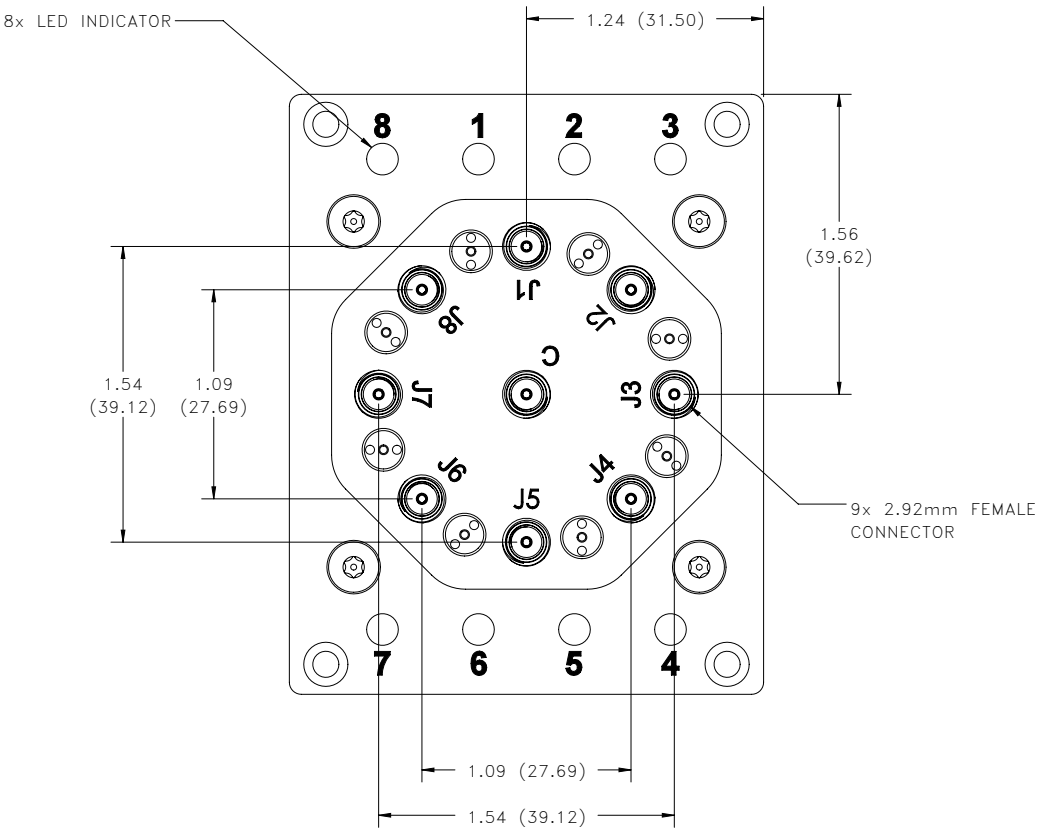


SP6TA-67GHz

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Outline Dimensions

BBY3749



SP8TA-33GHz
SP8TA-43GHz

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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

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