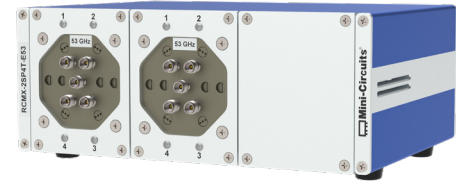




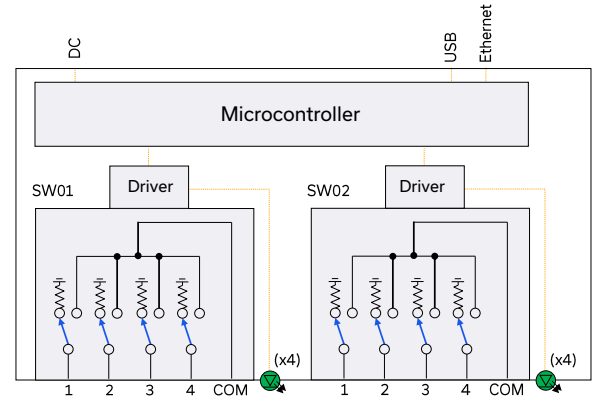
THE BIG DEAL

- Mechanical SP4T Absorptive Switches
- High Port Count with Excellent Performance to 52.5 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 FR2 & Millimeter Wave Radio Infrastructure
- Satellite Communications & Radio-Astronomy
- Military Radio, Radar & Electronic Warfare
- Switch Matrices

PRODUCT OVERVIEW

Mini-Circuits' RCMX-2SP4T-E53 contains a pair of electro-mechanical SP4T switches operating over a wide bandwidth from DC to 52.5 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

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	DC	-	52.5	GHz
Insertion Loss	DC – 8 GHz	-	0.30	0.50	dB
	8 – 18 GHz	-	0.35	0.60	
	18 – 26.5 GHz	-	0.45	0.70	
	26.5 – 39 GHz	-	0.55	0.75	
	39 – 52.5 GHz	-	0.90	1.25	
Isolation ¹ (Inactive Paths)	DC – 8 GHz	70	85	-	dB
	8 – 18 GHz	65	80	-	
	18 – 26.5 GHz	65	80	-	
	26.5 – 39 GHz	55	75	-	
	39 – 52.5 GHz	55	70	-	
Return Loss ²	DC – 8 GHz	-	22	-	dB
	8 – 18 GHz	-	20	-	
	18 – 26.5 GHz	-	20	-	
	26.5 – 39 GHz	-	20	-	
	39 – 52.5 GHz	-	14	-	
Switching Time	-	-	25	-	ms
RF Input Power	Cold Switching, DC – 18 GHz	-	-	20	W
	Cold Switching, 18 – 26.5 GHz	-	-	10	
	Cold Switching, 26.5 – 52.5 GHz	-	-	3	
	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

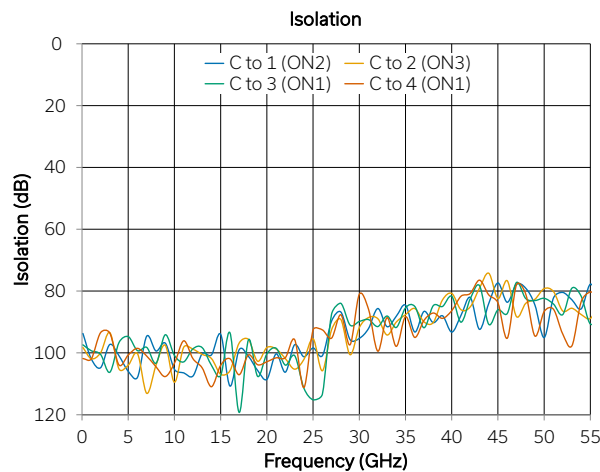
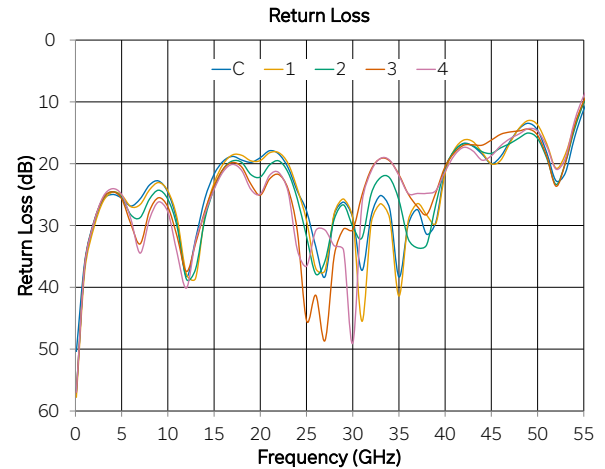
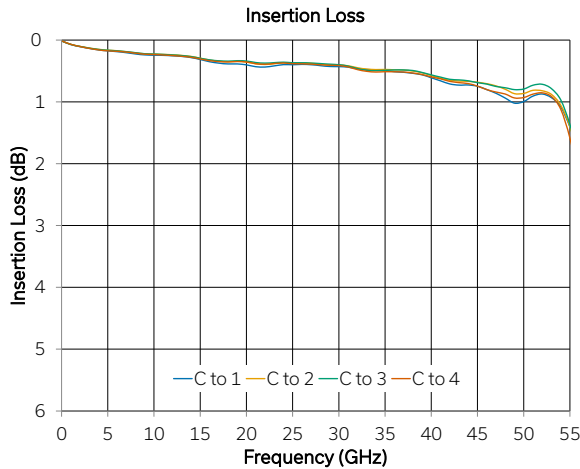
2. Return loss into COM when active or ports 1-4 in any state; COM is reflective when disconnected

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



TYPICAL PERFORMANCE GRAPHS





USB & ETHERNET

Mechanical Switch Assembly

RCMX-2SP4T-E53

50Ω DC to 52.5 GHz 2 x SP4T 2.4 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-18 GHz	20	W
	Cold Switching, 18-26.5 GHz	10	
	Cold Switching, 26.5-52.5 GHz	3	
	Hot Switching	0.1	
	Into Internal Termination	0.5	

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

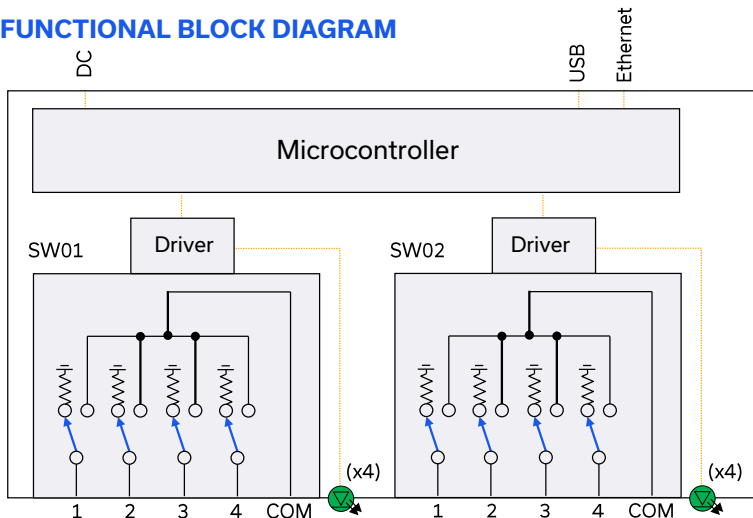
Using included AC/DC-24-3W1 power supply adapter (110 / 240 V AC input)

CONNECTIONS

Port	Connector
SW1 & SW2 - C & 1-4	2.4 mm female
USB	USB type B
Ethernet / LAN	RJ45
24V DC Input	2.1 mm center positive DC socket

C = Common port
1-4 = Input / output ports

FUNCTIONAL BLOCK DIAGRAM



SWITCH STATE TABLE (EACH SWITCH)

Switch Command	Switch x State	Switch x LED State			
		LED1	LED2	LED3	LED4
:SP4T:[x]:STATE:0	All ports disconnected (C open; 1-4 terminated)	On	Off	Off	Off
:SP4T:[x]:STATE:1	C to 1	On	Off	Off	Off
:SP4T:[x]:STATE:2	C to 2	Off	On	Off	Off
:SP4T:[x]:STATE:3	C to 3	Off	Off	On	Off
:SP4T:[x]:STATE:4	C to 4	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

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 ⁵	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 & 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
:SP4T:[sw_label]:STATE:[port]	Set a single switch state: • [sw_label] = 1 to 2 • [port] = 0 (all ports disconnected) to 4 (C to 4)
:SP4T:[sw_label]:STATE?	Get a single switch state: • [sw_label] = 1 to 2

**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-2SP4T-E53 976275

Add LAN Device **Add USB Device**

Model Name RCMX-2SP4T-E53

User Defined Name My_Device

Serial Number 976275

Firmware 6.5.55

Connection Ethernet

IP Address 192.168.20.19

TCP Port 22

Network Protocol SSH

Switch Control **Programming** **Automation** **Configuration**

Switch	Switch Name	Active Path
1	SP4T	Disconnected
2	SP4T	Port 3

Contact: ztmgroup@minicircuits.com



USB & ETHERNET

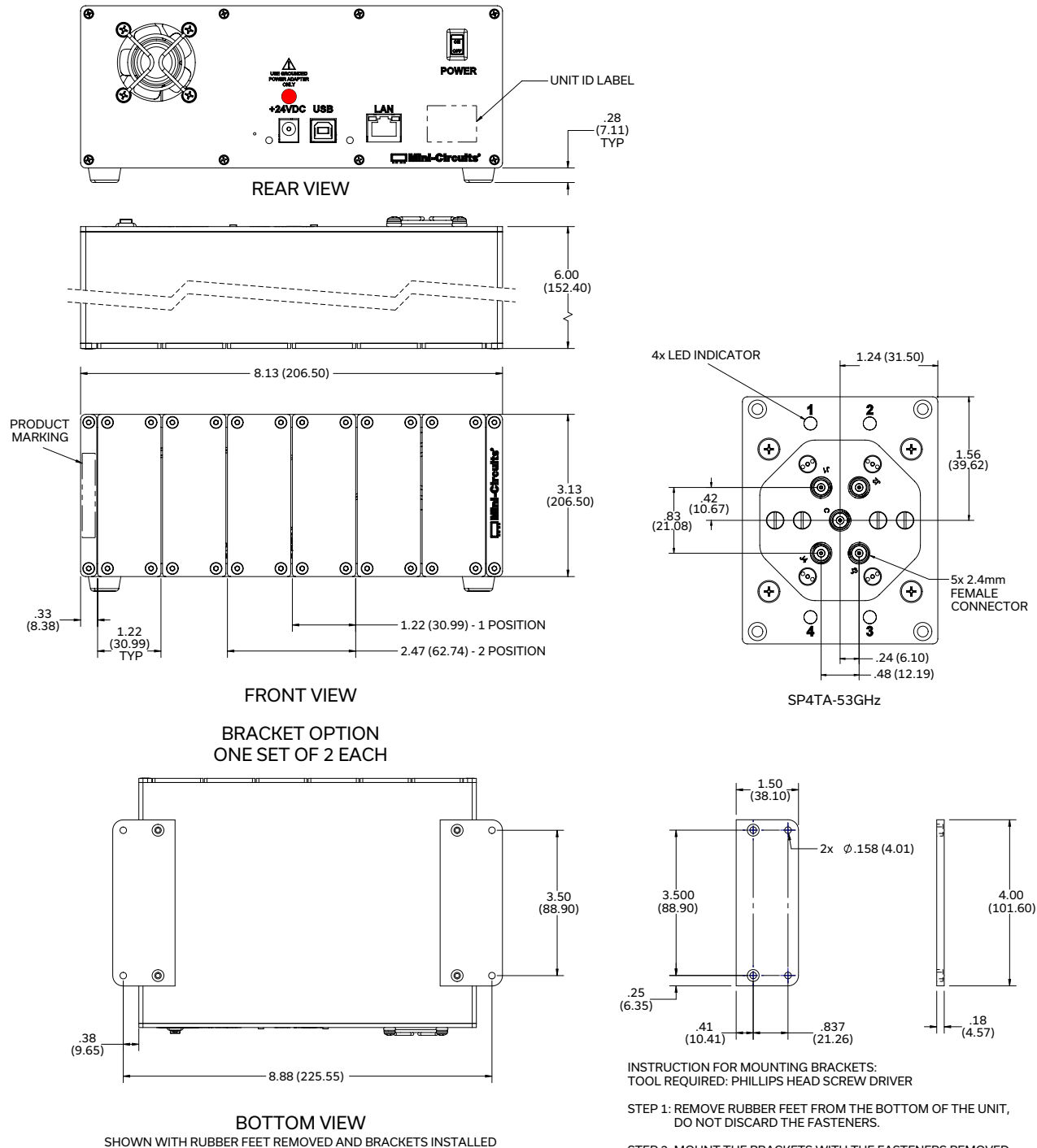
Mechanical Switch Assembly

RCMX-2SP4T-E53

Mini-Circuits

50Ω DC to 52.5 GHz 2 x SP4T 2.4 mm Female

CASE STYLE DRAWING



PRODUCT MARKING*

RCMX-2SP4T-E53

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

Mini-Circuits

www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

PAGE 7 OF 8



USB & ETHERNET

Mechanical Switch Assembly

RCMX-2SP4T-E53

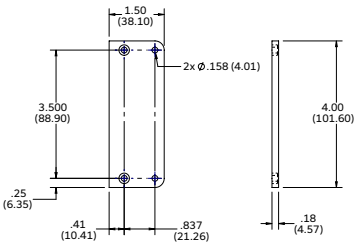
50Ω DC to 52.5 GHz 2 x SP4T 2.4 mm Female

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   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
 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)	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



BBY3749



FRONT VIEW

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.

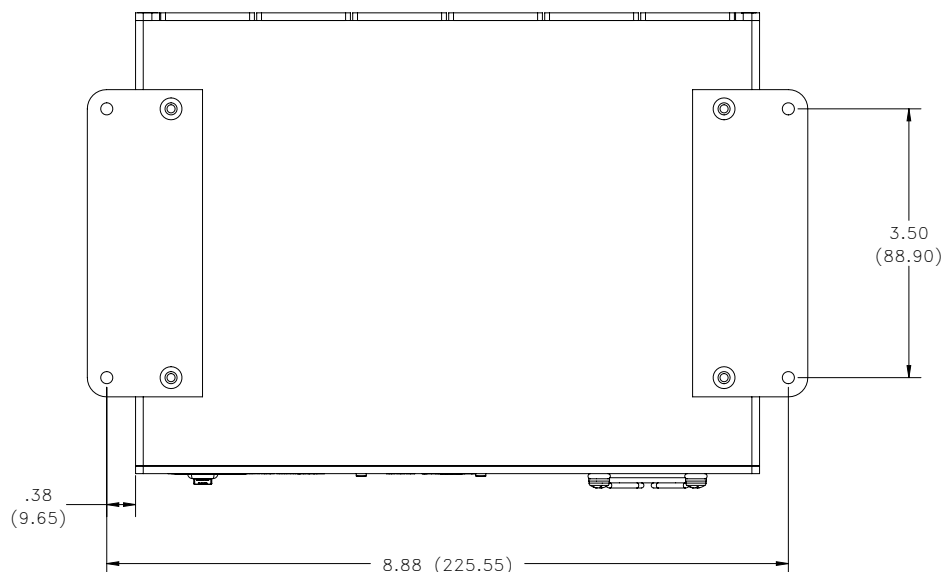


RF/IF MICROWAVE COMPONENTS

Outline Dimensions

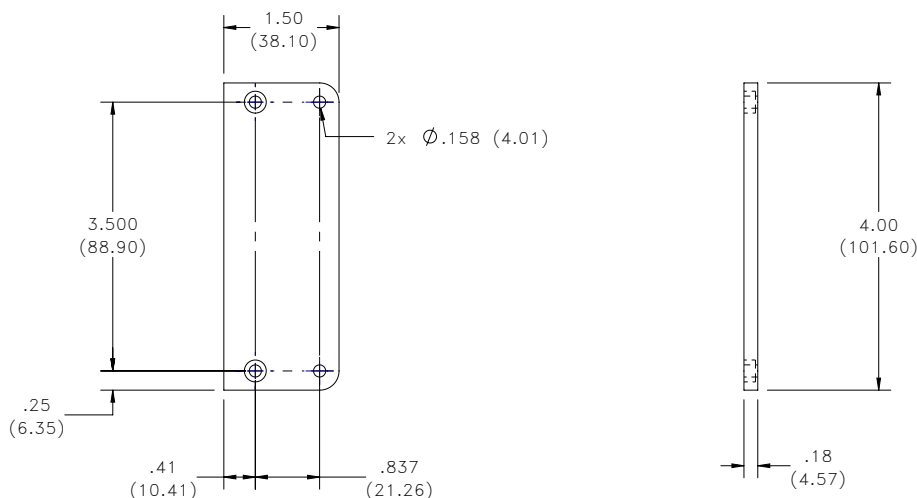
BBY3749

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.



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

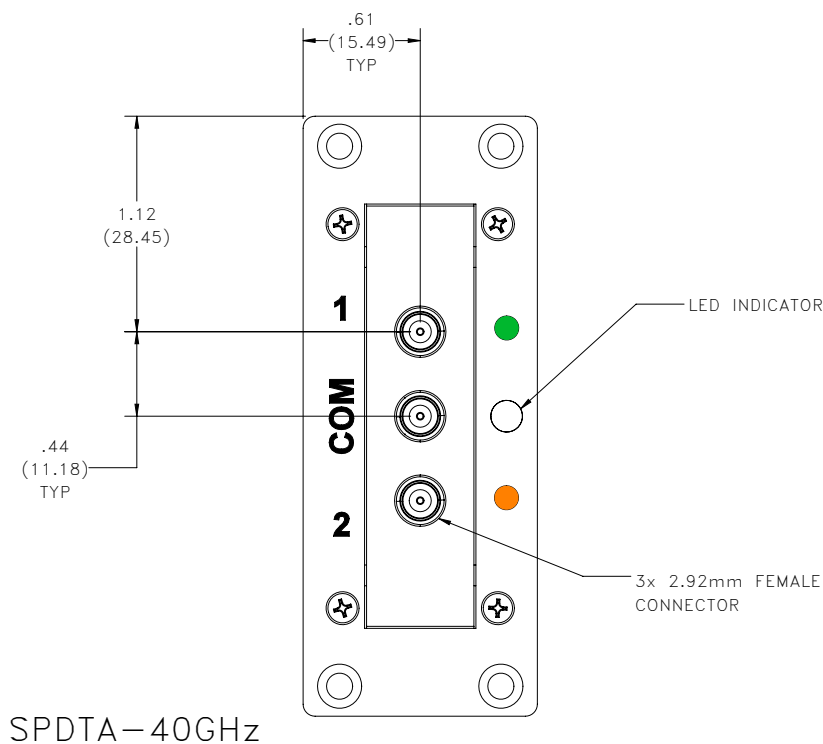
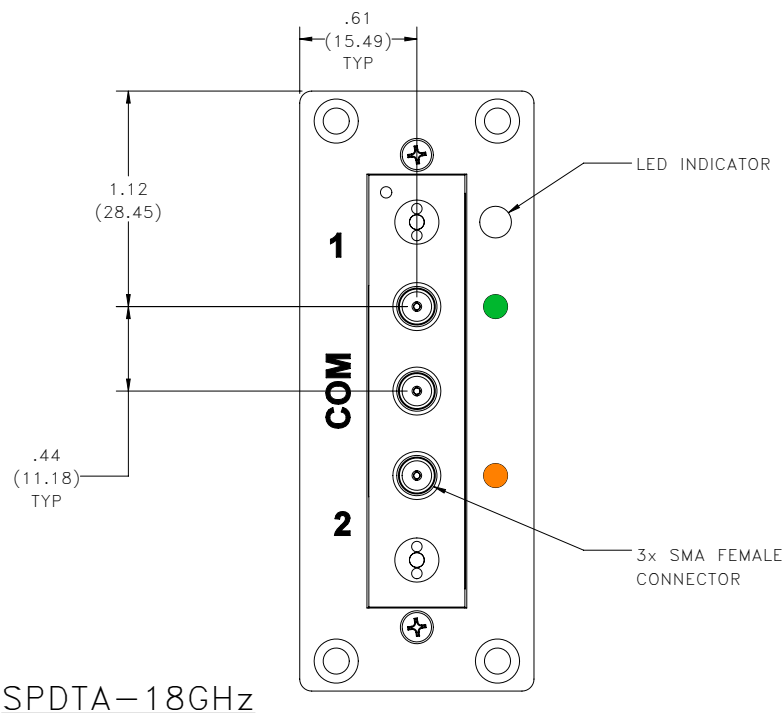


Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Outline Dimensions

BBY3749



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

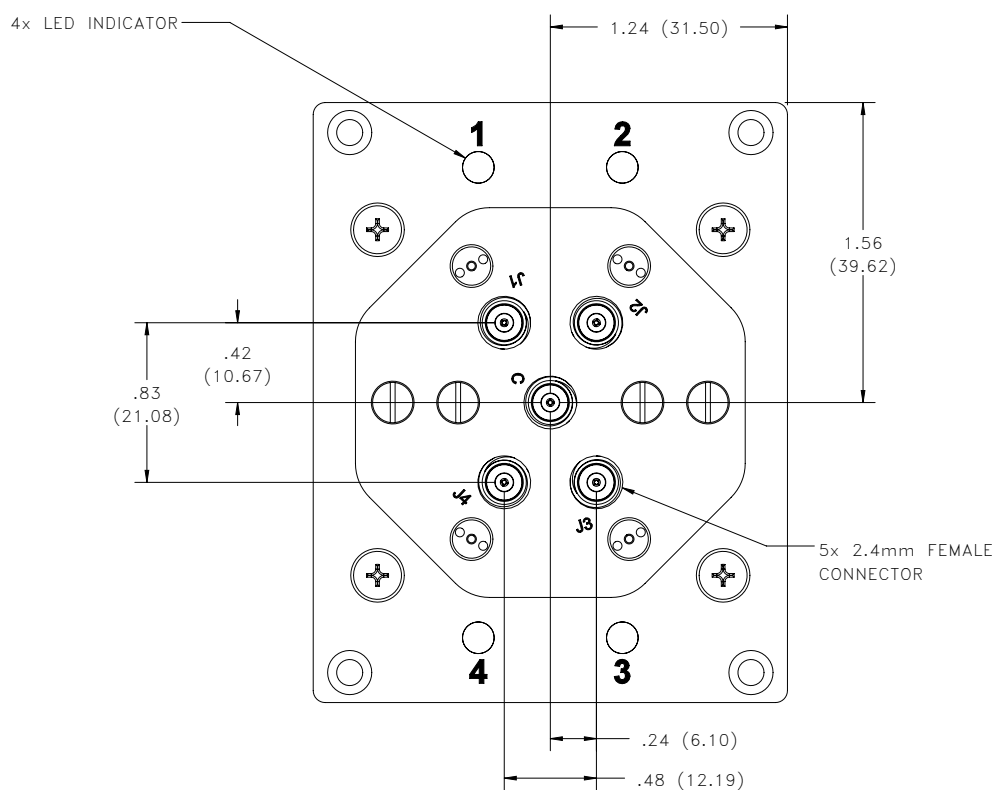


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Outline Dimensions

BBY3749



SP4TA-53GHz



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

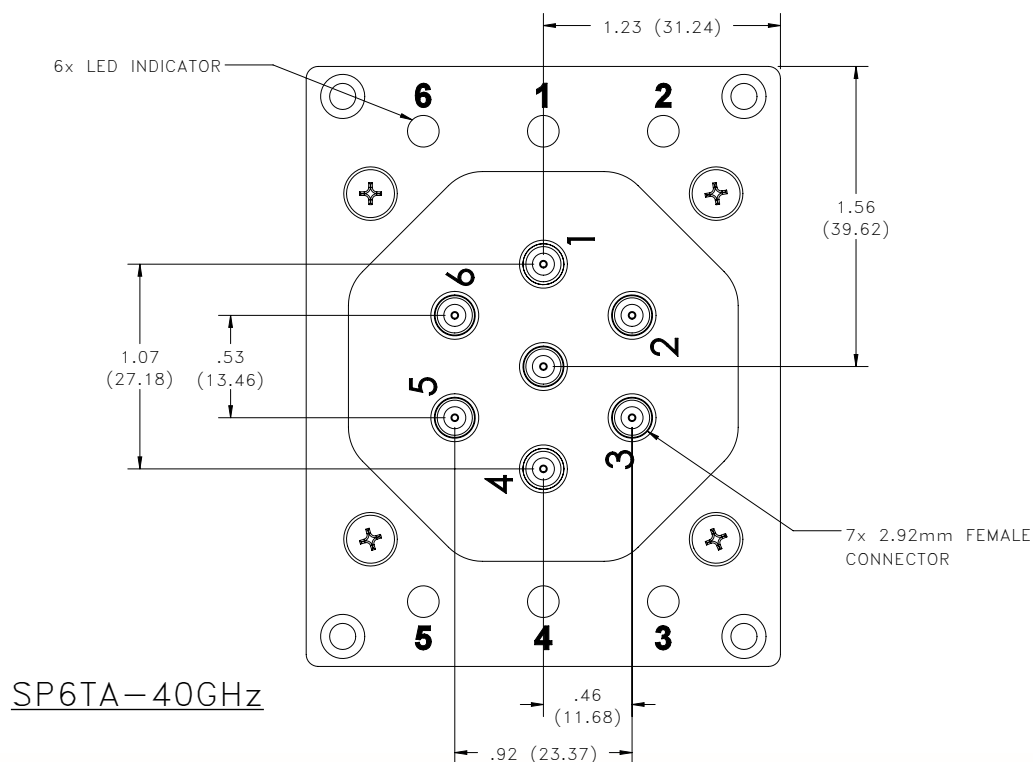
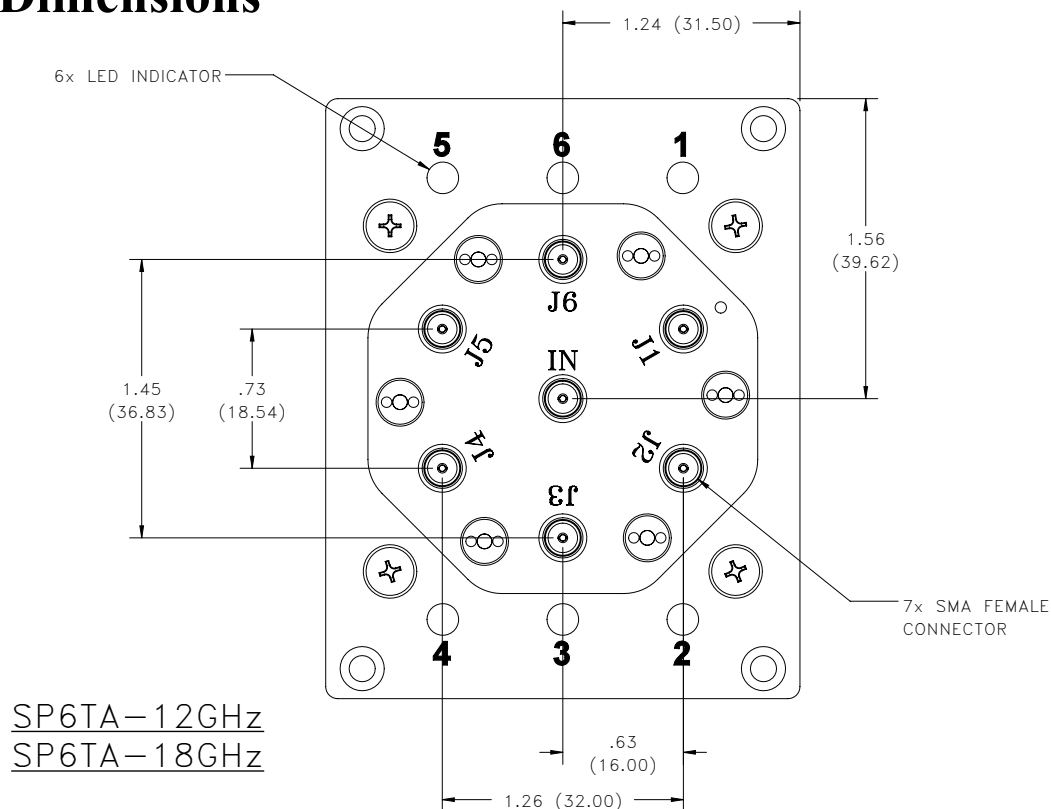


Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Outline Dimensions

BBY3749



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

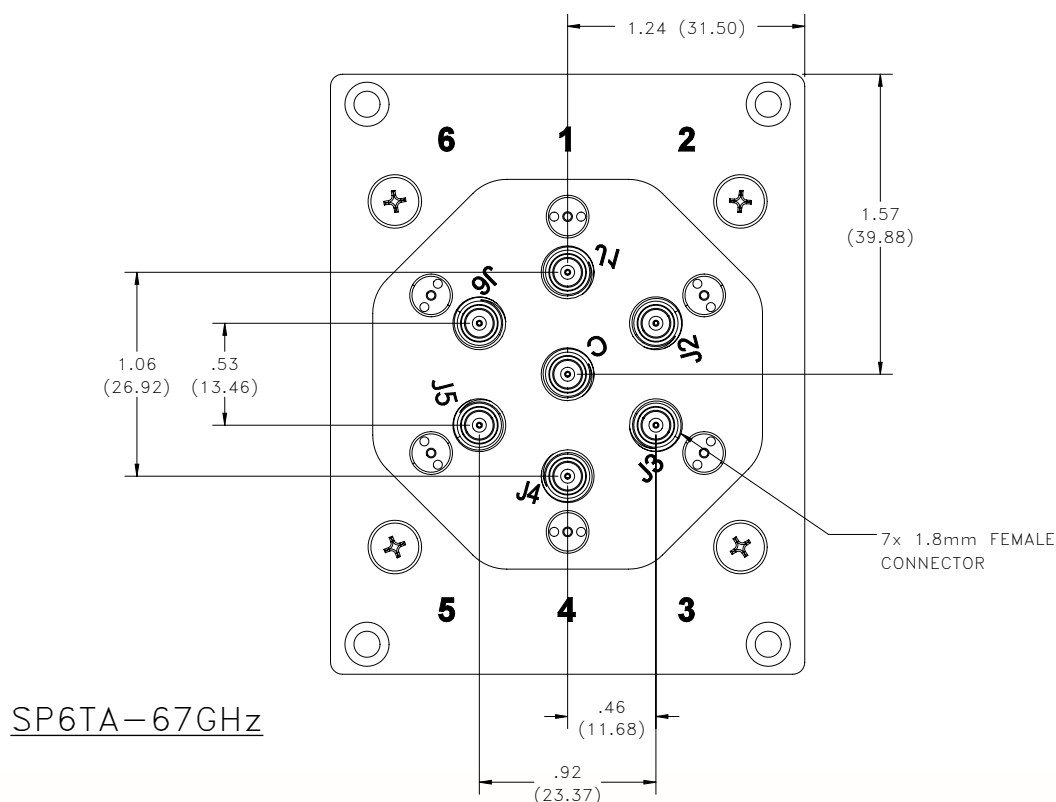
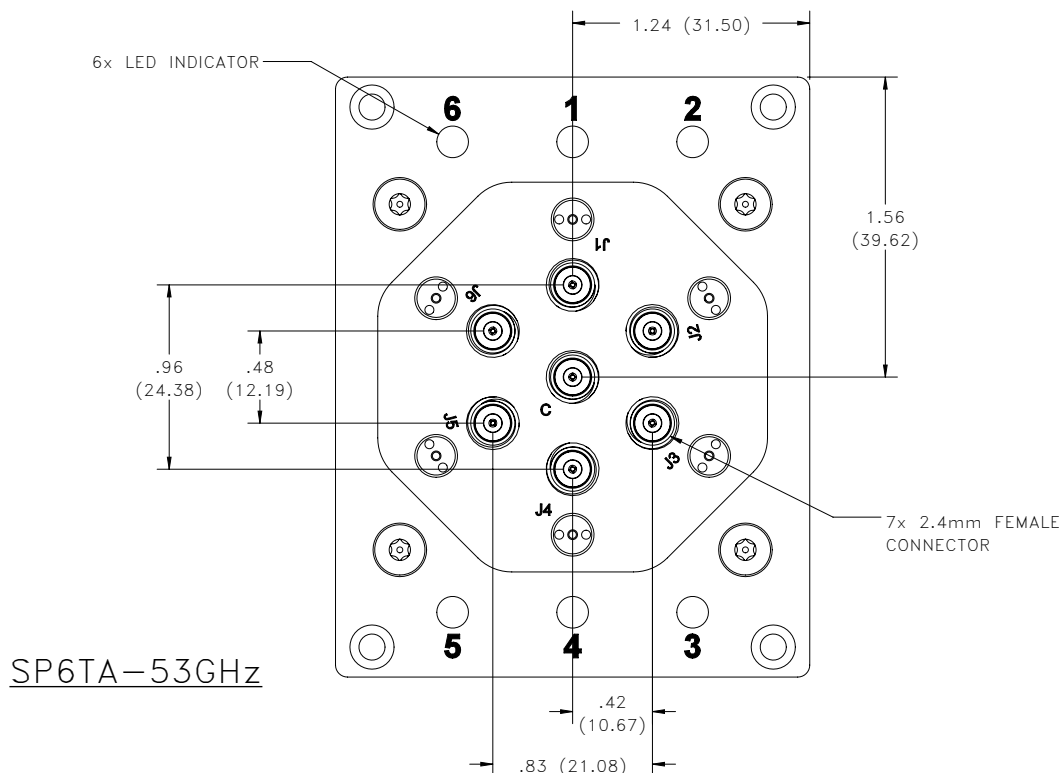


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Outline Dimensions

BBY3749



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

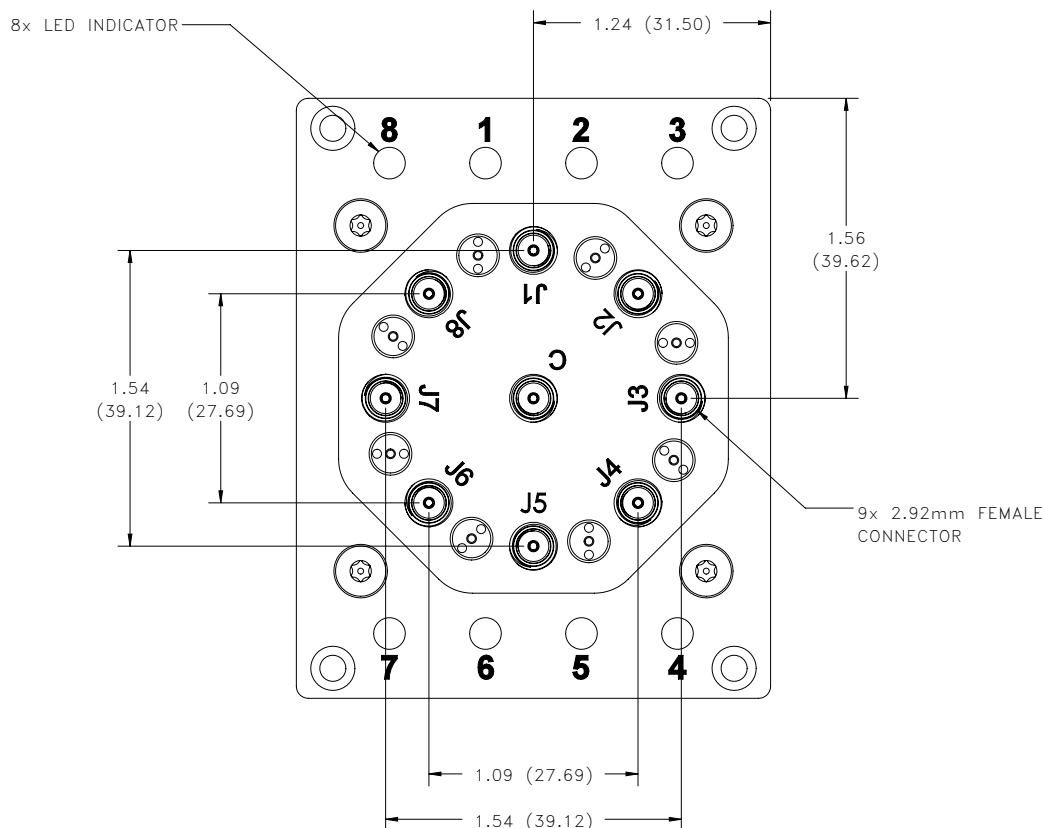


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Outline Dimensions

BBY3749



SP8TA-33GHz
SP8TA-43GHz

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



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