USB & ETHERNET

Mechanical Switch Assembly RCM-2SP12T-18

50Ω DC to 18 GHz 2 x SP12T SMA-Female

THE BIG DEAL

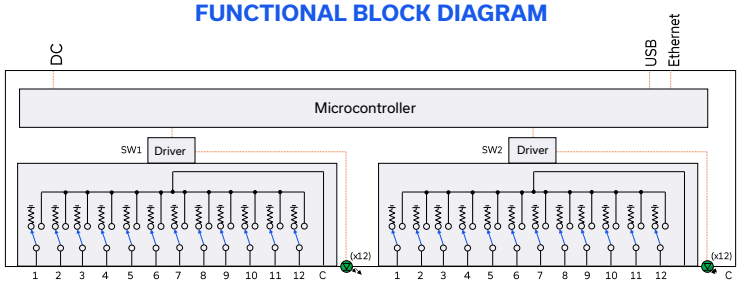
- Mechanical SP12T absorptive switches
- High port count with excellent performance to 18 GHz
- High reliability, millions of cycles
- Compact benchtop package with power supply
- Software control & automation
- LED switch state indicators

Generic photo used for illustration purposes only

APPLICATIONS

- Benchtop and rack-mounted automated test systems
- 5G FR1, WiFi 6E, millimeter wave radio infrastructure
- Military radio, radar & electronic warfare
- Quantum computing
- Switch matrices

FUNCTIONAL BLOCK DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' RCM-2SP12T-18 contains a pair of electro-mechanical SP12T switches operating over a wide bandwidth from DC to 18 GHz with high isolation and low insertion loss. Each absorptive switch is fail-safe / 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 compact benchtop package with all SMA (female) RF connectors on the front along with LED indicators for a quick read out of switch states. Control and power connections are located on the rear panel.

The switch assembly can be controlled via USB or Ethernet (supporting 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 switch reverts 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
Ethernet & USB control	USB HID and Ethernet (HTTP & Telnet) interfaces ensure compatibility with most software environments and connection requirements.
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.

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50Ω DC to 18 GHz 2 x SP12T SMA-Female

ELECTRICAL SPECIFICATIONS AT +25°C

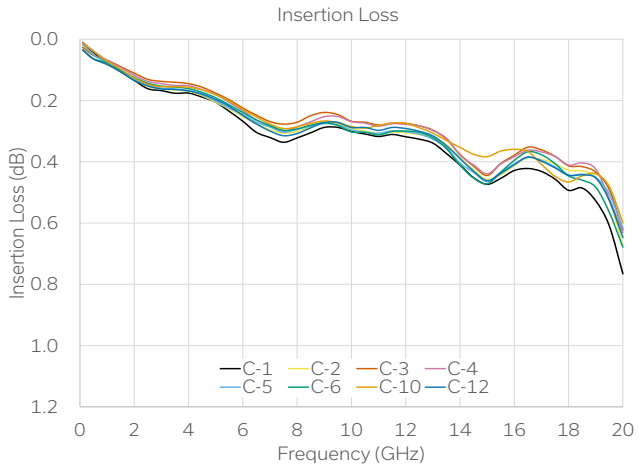
Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		DC		18	GHz
Insertion Loss	DC – 8 GHz		0.25	0.50	dB
	8 – 12 GHz		0.40	0.70	
	12 – 18 GHz		0.60	1.00	
Isolation[1]	DC – 8 GHz	70	90		dB
	8 – 12 GHz	70	85		
	12 – 18 GHz	50	80		
Return Loss[2]	DC – 8 GHz		19		dB
	8 – 12 GHz		17		
	12 – 18 GHz		15		
Switching Time			25		ms
RF Input Power	Cold switching			20	W
	Hot switching[3]			0.1	
	Into internal terminations[4]			1	
Switch Lifetime			2		million cycles

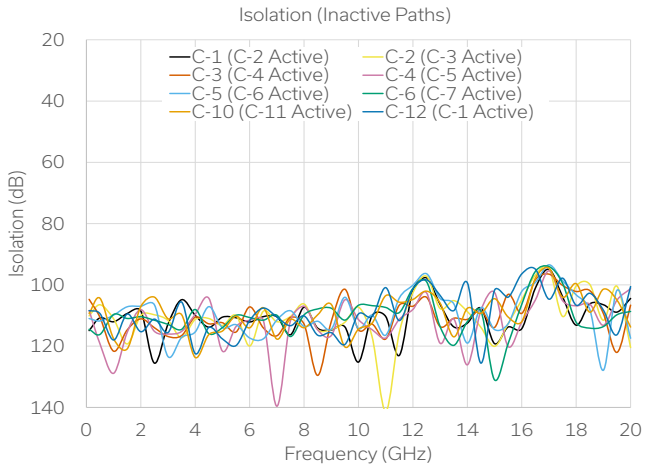
1. Isolation measured between Com and any disconnected port. Example: Isolation for Com to 1 is the leakage measured at port 1 from a signal input at Com when the active switch path is set to Com to 2
2. Return loss into Com when active or ports 1-12 in any state; Com is reflective when disconnected
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

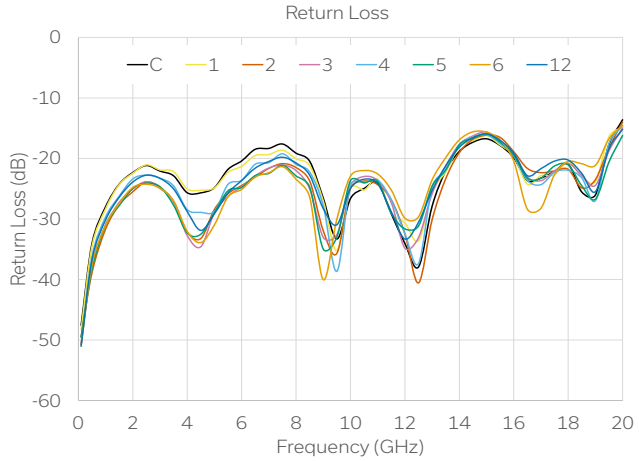
Mechanical Switch Assembly RCM-2SP12T-18

50Ω DC to 18 GHz 2 x SP12T SMA-Female

TYPICAL PERFORMANCE GRAPHS







Mechanical Switch Assembly RCM-2SP12T-18

50Ω DC to 18 GHz 2 x SP12T SMA-Female

ABSOLUTE MAXIMUM RATINGS[5]

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	20	W
	Hot switching	1	
	Into internal termination	1	

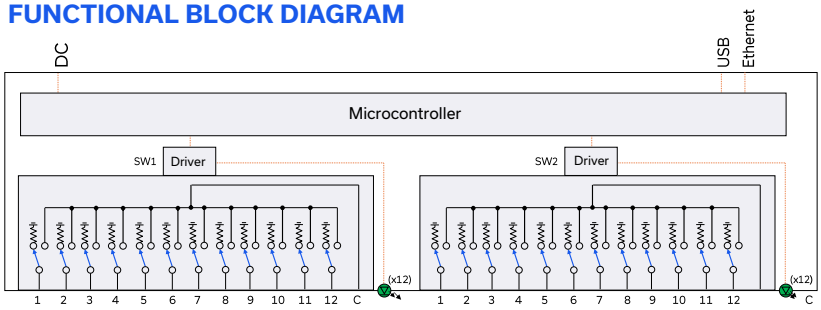
5. Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

POWER SUPPLY

Parameter	Conditions	Typ	Max	Units
DC Voltage		24	26	V
Current Consumption	Switch disconnected	100		mA
	Switch connected	700		

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

FUNCTIONAL BLOCK DIAGRAM



CONNECTIONS

Port	Connector
SW1 & SW2 - C & 1-12	SMA female
USB	USB type B
Ethernet / LAN	RJ45
24V DC Input	2.1 mm center positive DC socket

C = Common port
1-12 = Input / output ports

SWITCH STATE TABLE (EACH SWITCH)

Switch Command	Switch State	LED State											
		LED1	LED2	LED3	LED4	LED5	LED6	LED7	LED8	LED9	LED10	LED11	LED12
:SP12T:x:STATE:0	All ports disconnected (C open; ports 1-12 terminated)	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:1	C to 1	On	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:2	C to 2	Off	On	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:3	C to 3	Off	Off	On	Off	Off	Off	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:4	C to 4	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:5	C to 5	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:6	C to 6	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	Off
:SP12T:x:STATE:7	C to 7	Off	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	Off
:SP12T:x:STATE:8	C to 8	Off	Off	Off	Off	Off	Off	Off	On	Off	Off	Off	Off
:SP12T:x:STATE:9	C to 9	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	Off	Off
:SP12T:x:STATE:10	C to 10	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	Off
:SP12T:x:STATE:11	C to 11	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	On	Off
:SP12T:x:STATE:12	C to 12	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	On

x = switch number (1 to 2)

POWER-UP OPTIONS

Mode	Initial Switch Paths
Default	Switches power up in the default state (all ports disconnected)
Last State	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

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CONTROL INTERFACES

Ethernet Control	Supported Protocols	TCP / IP, HTTP, Telnet, DHCP, UDP (limited)
	Max Data Rate	10 Mbps (10Base-T Half Duplex)
USB Control	Supported Protocols	HID – Full Speed
	Min Communication Time[6]	3 ms typ

6. 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

	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
:SP12T:[sw_label]:STATE:[port]	Set a single switch state: [sw_label] = 1 to 2 [port] = 0 (all ports disconnected) to 12 (Com to 12)
:SP12T:[sw_label]:STATE?	Get a single switch state: [sw_label] = 1 to 2

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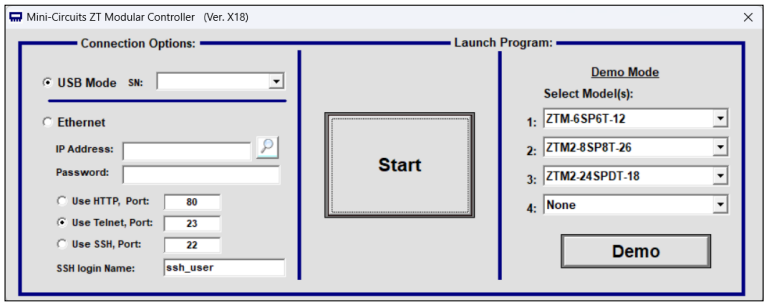
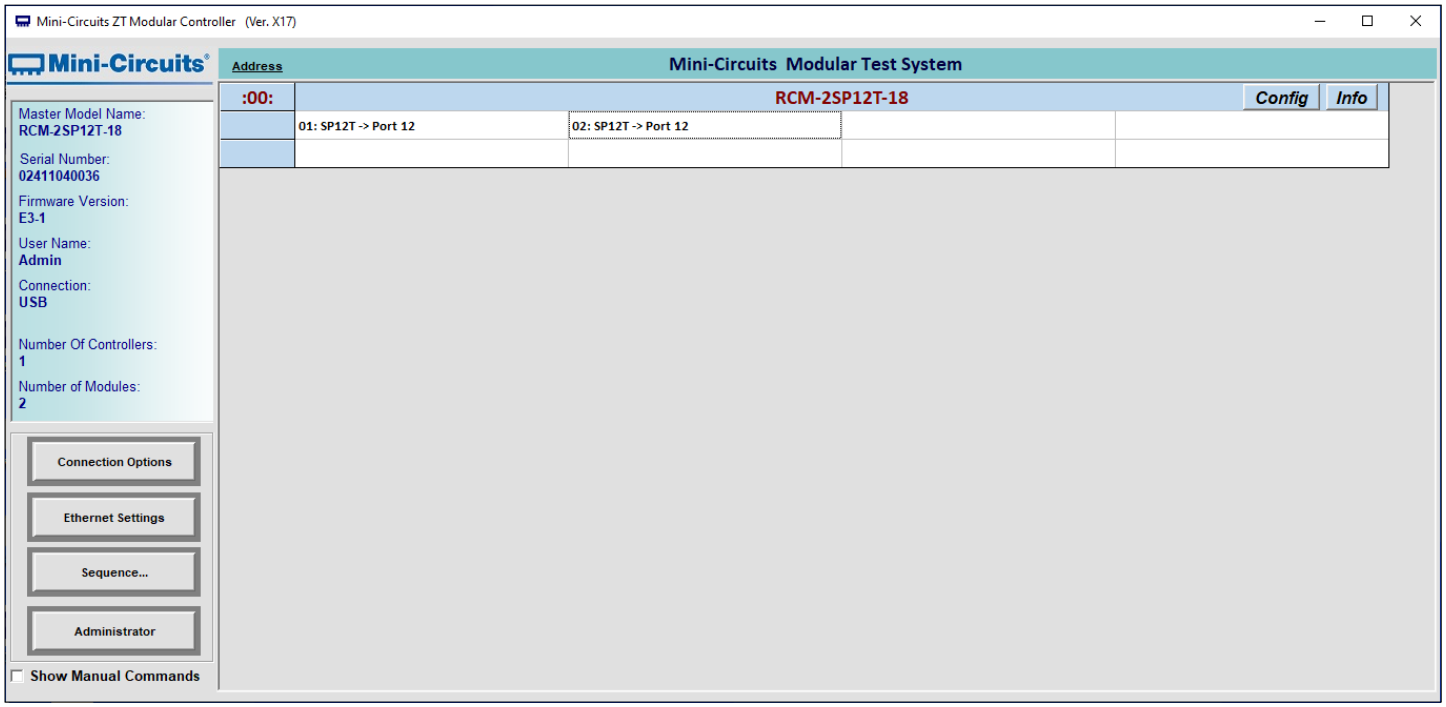
GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

- 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



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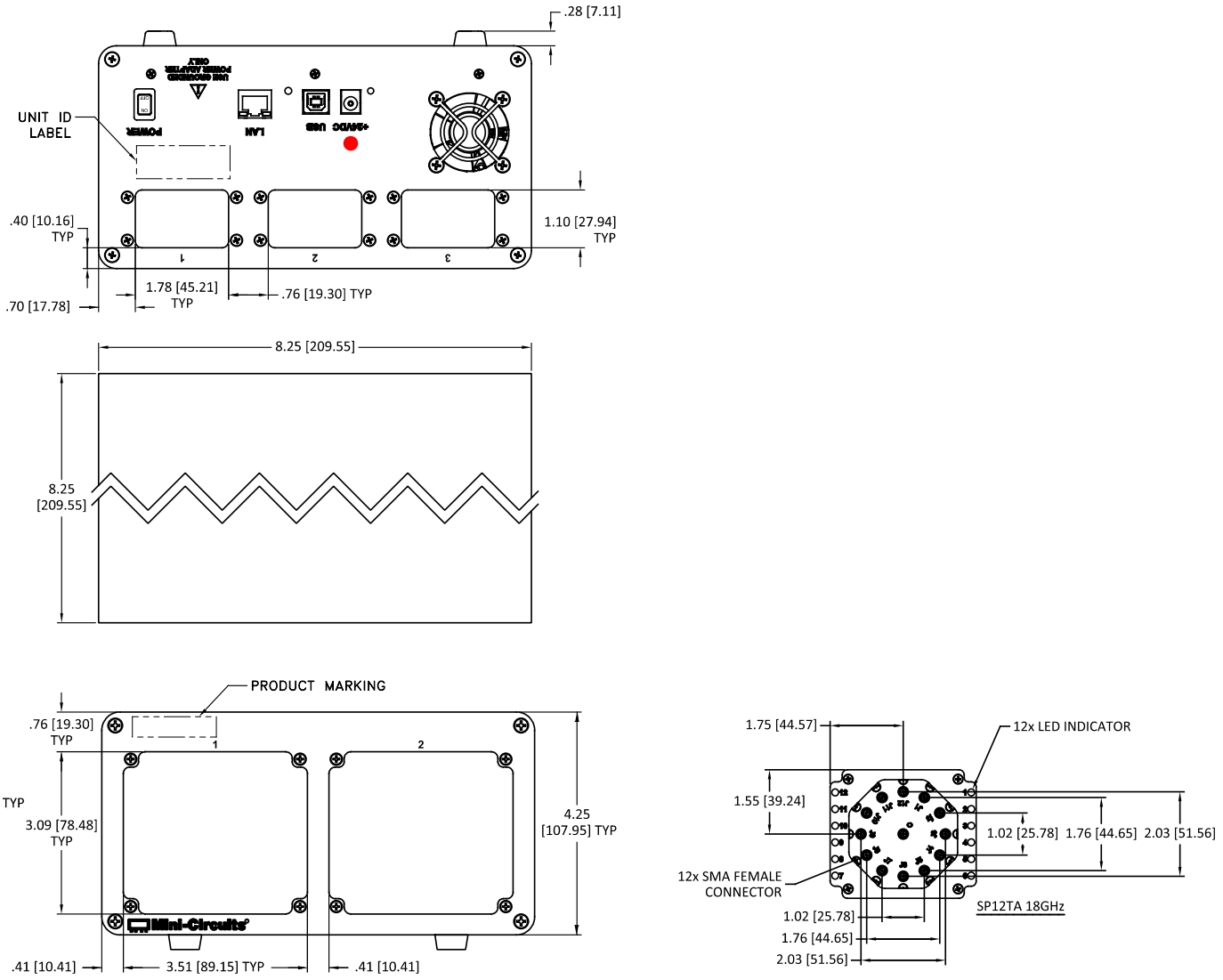
CASE STYLE DRAWING



Weight: 2350 grams.
Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch

PRODUCT MARKING

Product Marking: RCM-2SP12T-18
Serial Number
Marking may contain other features or characters for internal lot control

USB & ETHERNET

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DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE CLICK HERE

Case Style	UV2068
Software, User Guide & Programming Manual	www.minicircuits.com/softwaredownload/ztm_rcm.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-7+	USB cable (6.8ft) type A to type B
	CBL-RJ45-MM-5+	Ethernet cable (5 ft)

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

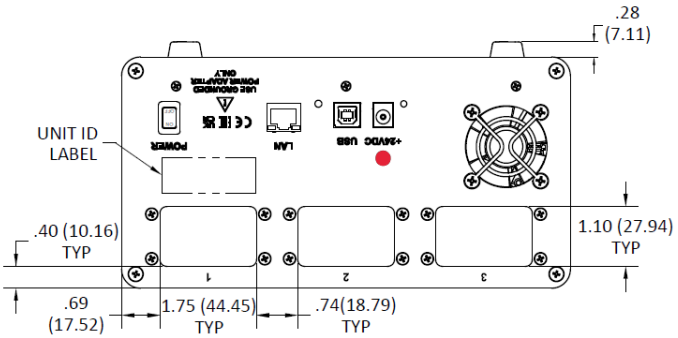
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

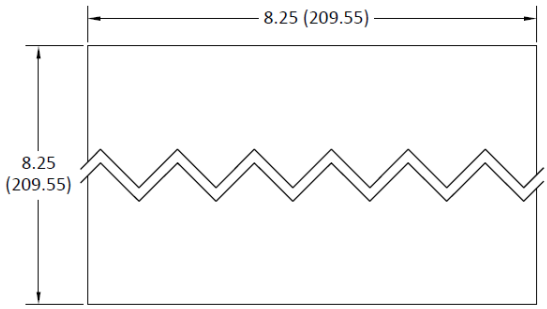
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

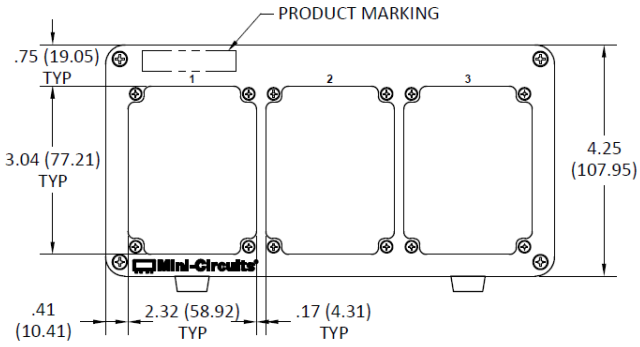
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

Outline Dimensions

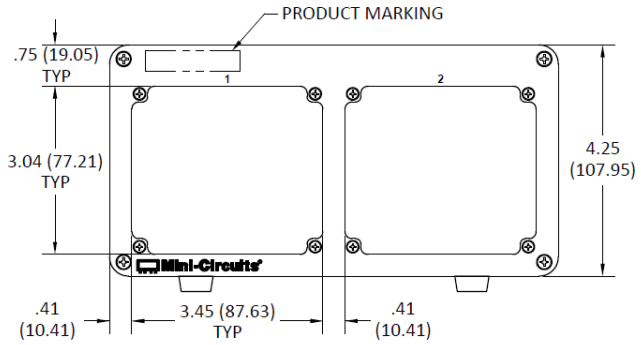
UV2068







FRONT PANEL FOR RCM WITH RUDAT, SPDT, SP4T, SP6T & MTS SWITCHES



FRONT PANEL FOR RCM WITH SP8T SWITCHES

Notes:

1. Case material: Aluminum alloy.
2. Finish: Clear chemical conversion coating
3. Dimensions are in inches (mm). Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch
4. Weight: 2350 grams.
5. Marking may contain other features or characters for internal lot control.

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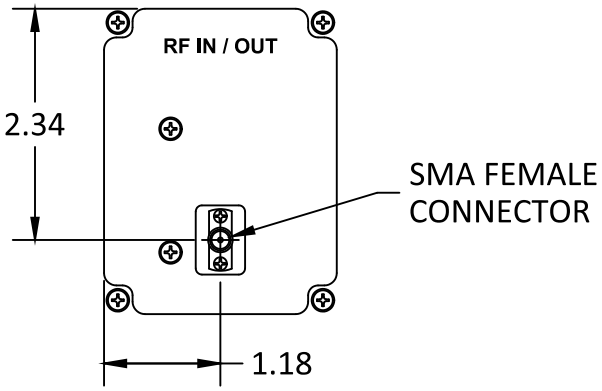
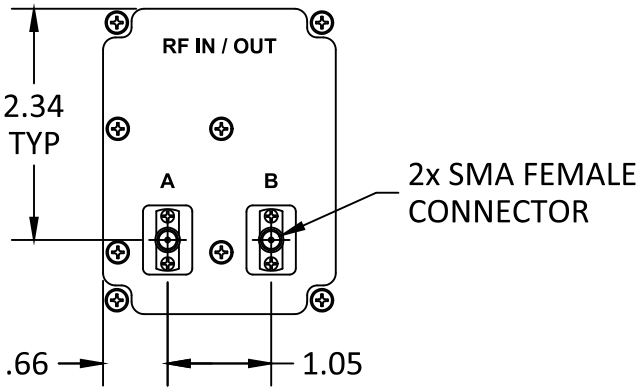
RUDAT Programmable Attenuator Options:

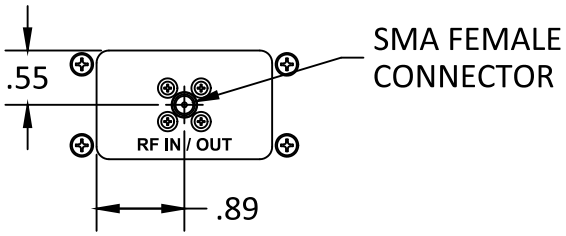
UV2068



FRONT PANEL

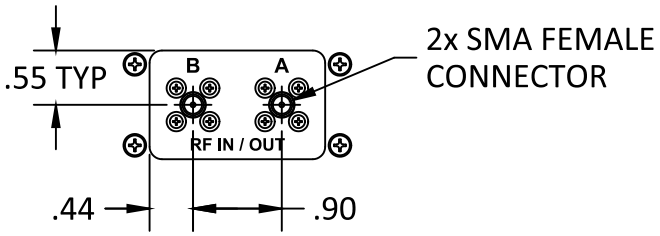


FRONT PANEL



REAR PANEL

SINGLE RUDAT



REAR PANEL

DUAL RUDAT

SPDT Switch Options:

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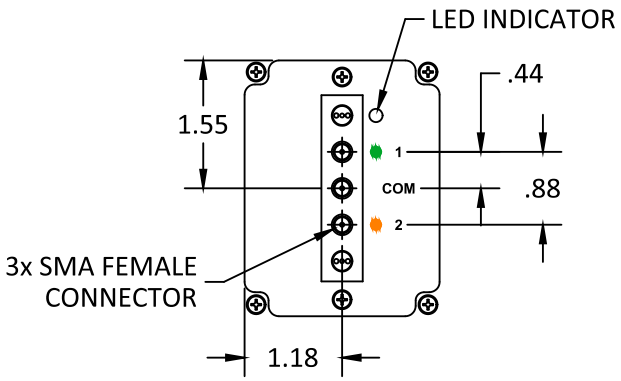
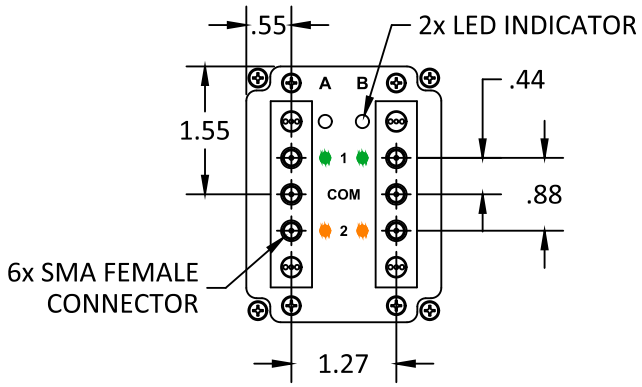
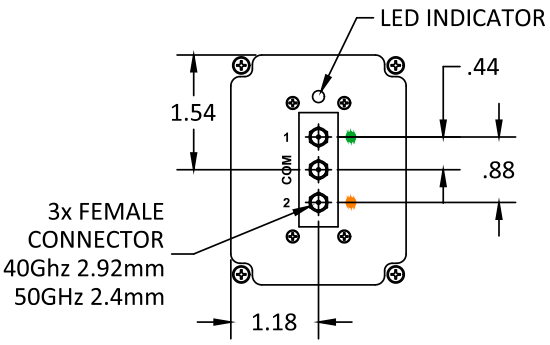


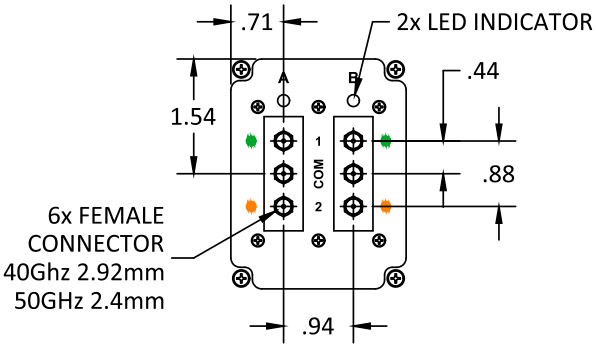
SPDTA 18GHz
SPDTA 26GHz



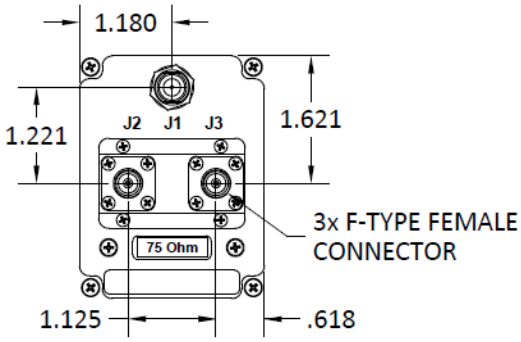
DUAL SPDTA 18GHz
DUAL SPDTA 26GHz



SPDT 40GHz
SPDT 50GHz



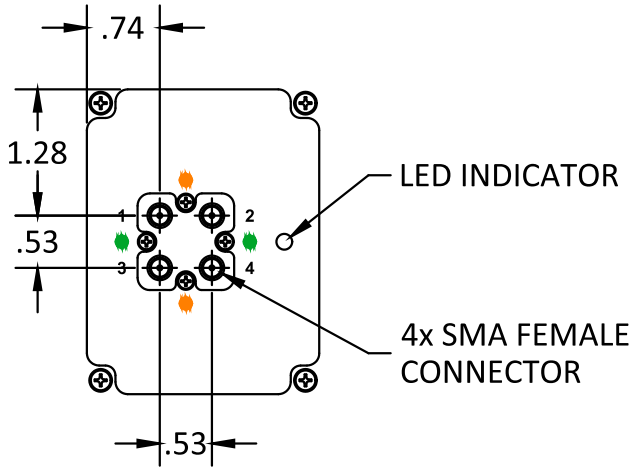
DUAL SPDT 40GHz
DUAL SPDT 50GHz



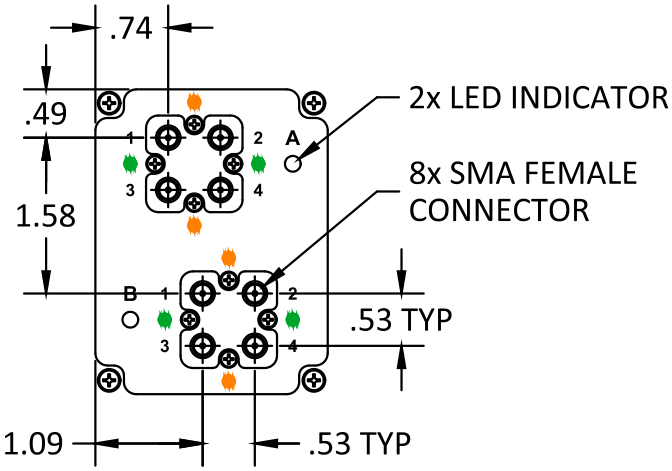
SPDT 2.15GHz

MTS (Transfer) Switch Options:

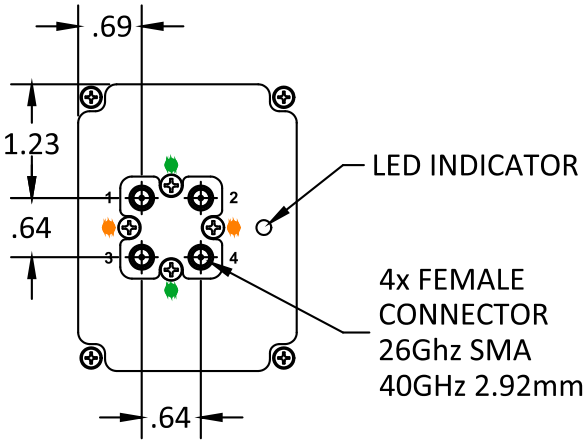
UV2068



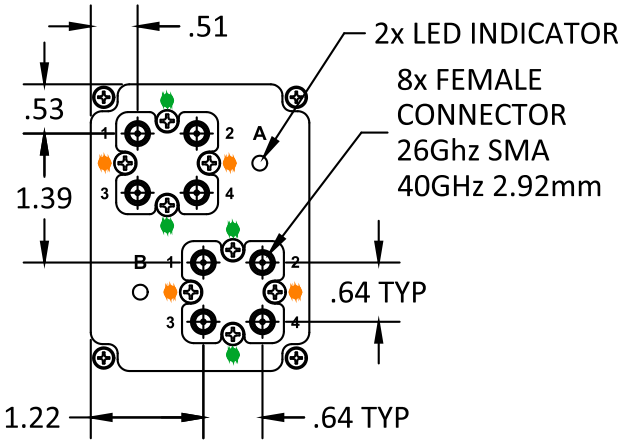
MTS 18GHz



DUAL MTS 18GHz



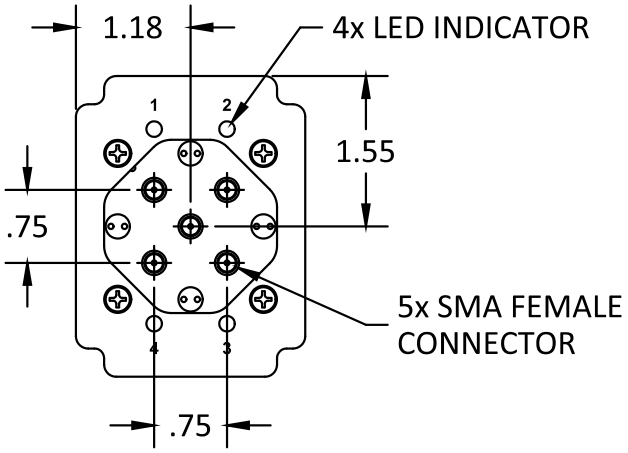
MTS 26GHz



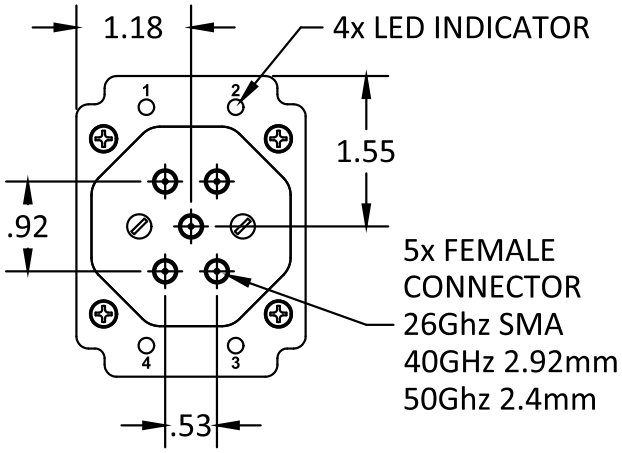
DUAL MTS 26GHz

SP4T and SP6T Switch Options:

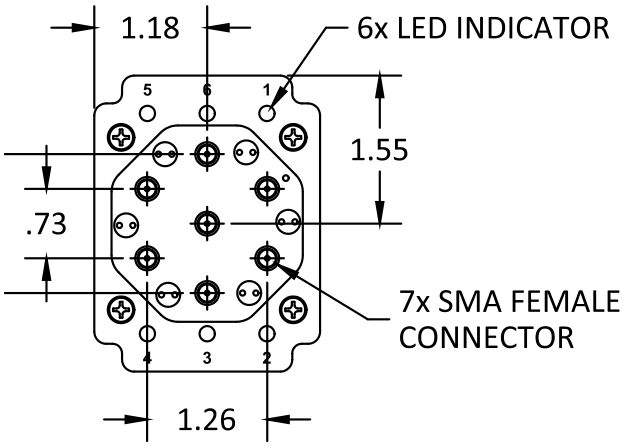
UV2068



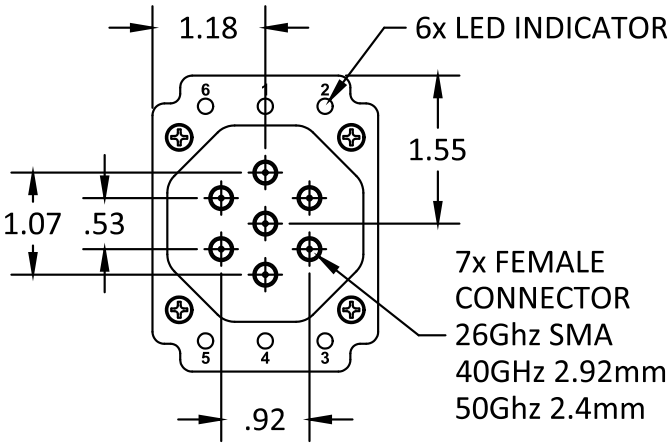
SP4TA 18GHz



SP4TA 26GHz
SP4TA 40GHz
SP4TA 50GHz



SP6TA 12GHz
SP6TA 18GHz



SP6TA 26GHz
SP6TA 40GHz
SP6TA 50GHz

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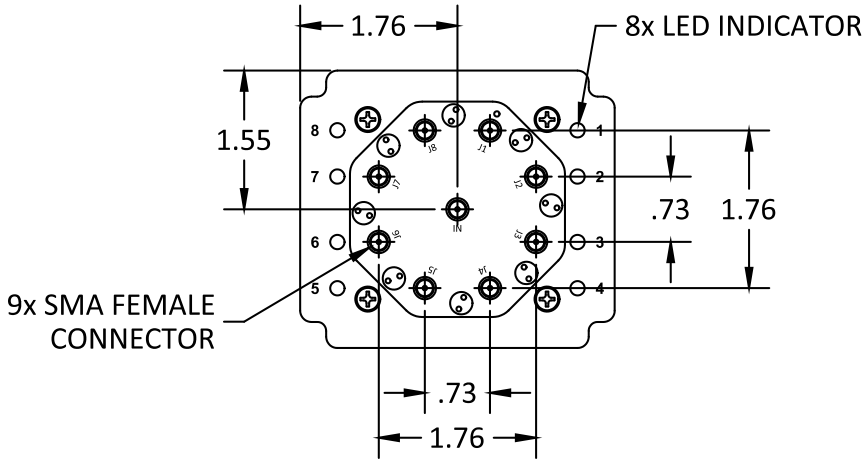
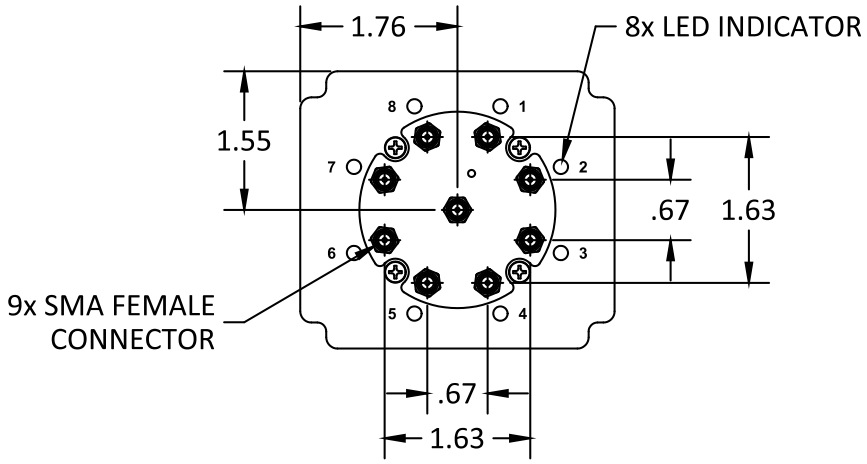
SP8T Switch Options:

UV2068



SP8TA 12GHz



SP8TA 18GHz

SP8TA 26GHz

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 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