



Mechanical Switch Assembly **RC-1SP4T-A18**

50Ω DC to 18 GHz 1 x SP4T SMA-Female

THE BIG DEAL

- Mechanical SP4T absorptive switch
- Software control & automation
- High reliability, millions of cycles
- SSH secure Ethernet communication
- LED switch state indicators



CASE STYLE: MR1853

[DOWNLOAD](#) SOFTWARE PACKAGE

RoHS Compliant

See our website for RoHS Compliance methodologies and qualifications

APPLICATIONS

- Benchtop and rack-mounted automated test systems
- 5G FR1 & FR3, WiFi 6E MIMO, UWB, Bluetooth
- Quantum computing
- Military radio, radar & electronic warfare
- Switch matrices

PRODUCT OVERVIEW

Mini-Circuits' RC-1SP4T-A18 is an electro-mechanical SP4T switch operating over an extremely wide bandwidth from DC to 18 GHz, with high isolation and low insertion loss. The absorptive switch is of a failsafe and break-before-make-configuration with a switching lifetime of 10 million cycles when used within the noted specifications.

The switch box is constructed in a compact, rugged metal case (5.5 x 6.0 x 2.75") with all SMA (f) RF connectors on the front panel. The switches are controlled via USB or Ethernet, allowing control directly from a PC, or remotely over a network. 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 SP4T switch | Mechanical absorptive switches provide high reliability, repeatable high performance and internal terminations of input signals on the disconnected paths |
| 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. |
| Fail-safe / normally open 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. |
| Break-before-make configuration | Prevents a momentary connection of the old and new signal paths, reducing the inconsistent transient effects that could otherwise be observed during switching |

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ECO-024239
RC-1SP4T-A18
MLC NY
250129



Mechanical Switch Assembly **RC-1SP4T-A18**

ELECTRICAL SPECIFICATIONS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|-----------------------------------|------|------|------|----------------|
| Frequency | — | DC | | 18 | GHz |
| Insertion Loss | DC – 8 GHz | – | 0.15 | 0.30 | dB |
| | 8 – 12 GHz | – | 0.25 | 0.40 | |
| | 12 – 18 GHz | – | 0.50 | 0.80 | |
| Isolation (Inactive Paths) ¹ | DC – 8 GHz | 80 | 100 | – | :1 |
| | 8 – 12 GHz | 75 | 95 | – | |
| | 12 – 18 GHz | 60 | 80 | – | |
| Return Loss ² | DC – 8 GHz | – | 20 | – | dB |
| | 8 – 12 GHz | – | 20 | – | |
| | 12 – 18 GHz | – | 17 | – | |
| Switching Time | | – | 25 | – | ms |
| RF Input Power (Cold Switching) | Through path | – | – | 20 | W |
| | Into internal termination | – | – | 1 | |
| Switch Lifetime | 100 mW hot switching ³ | 10 | | – | million cycles |
| | 1W 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 1-4 in any state; Com is reflective when disconnected
3. Hot switching power above this level will degrade the switch lifetime

ABSOLUTE MAXIMUM RATINGS

| Parameter | Conditions | Limits | Units |
|-------------------------|---------------------------|------------|-------|
| Temperature | Operating | 0 to +40 | °C |
| | Storage | -15 to +85 | |
| DC Supply Voltage | | +26 | V |
| Input Power (No Damage) | Cold switching | 20 | W |
| | 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.

SWITCH CONTROL LOGIC

| Command | Switch Path |
|----------------|------------------------|
| :SP4TA:STATE:0 | All ports disconnected |
| :SP4TA:STATE:1 | COM to 1 |
| :SP4TA:STATE:2 | COM to 2 |
| :SP4TA:STATE:3 | COM to 3 |
| :SP4TA:STATE:4 | COM to 4 |

POWER SUPPLY

| Parameter | Conditions | Typ | Max | Units |
|------------------------|-----------------------|-----|-----|-------|
| DC Voltage | | +24 | +26 | V |
| DC Current Consumption | Com disconnected | 100 | | mA |
| | Com to any port (1-4) | 200 | | |

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

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



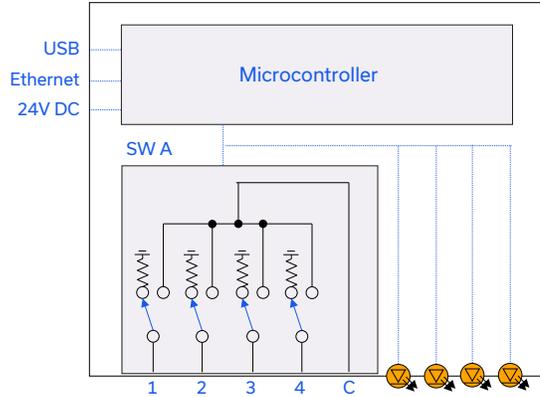
Mechanical Switch Assembly RC-1SP4T-A18

50Ω DC to 18 GHz 1 x SP4T SMA-Female

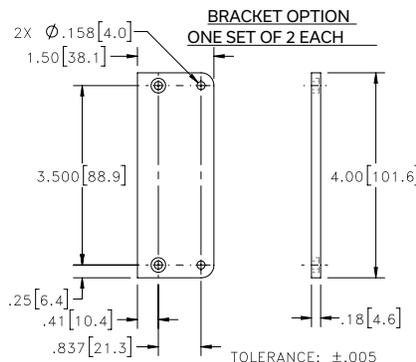
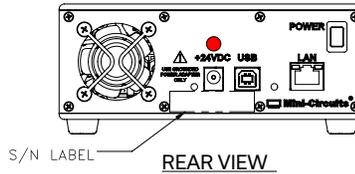
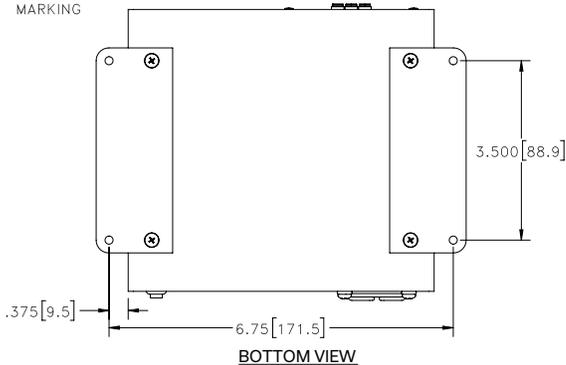
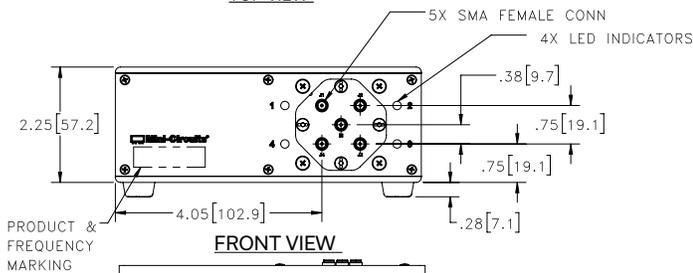
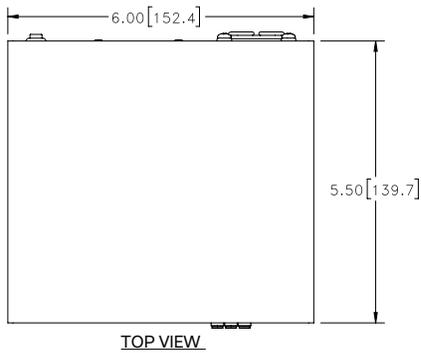
CONNECTIONS

| | |
|------------------------|------------------------------------|
| 24V _{DC} IN | (2.1 mm center positive DC Socket) |
| COM, 1, 2, 3 & 4 | (SMA female) |
| USB | (USB type B receptacle) |
| Network (Ethernet/LAN) | (RJ45 socket) |

BLOCK DIAGRAM



OUTLINE DRAWING (MR1853)



INSTRUCTIONS FOR MOUNTING BRACKETS:
 TOOL REQUIRED: PHILLIPS HEAD SCREWDRIVER
 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.

Weight: 830 grams.
 Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.01 inch; 3 Pl. ±.005 inch

**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 (125 μs 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 |
| :SP4TA:STATE:[port] | Set the switch state: <ul style="list-style-type: none"> • [port] = 0 to 4 |
| :SP4TA:STATE? | Return the switch state |



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50Ω DC to 18 GHz 1 x SP4T SMA-Female

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

| | |
|---|---|
| Case Style | MR1853 |
| Software, User Guide & Programming Manual | www.minicircuits.com/softwaredownload/rfswitchcontroller.html |
| Environmental Rating | ENV104 |
| Regulatory Compliance | <p>Refer to our website for compliance methodologies and qualifications</p>  <p>www.minicircuits.com/quality/environmental_introduction.html</p> |

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 (2.7 ft) 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 C5 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

Xtra Long Life USB/ETHERNET RF SP4T SWITCH

RC-1SP4T-A18

Typical Performance Data

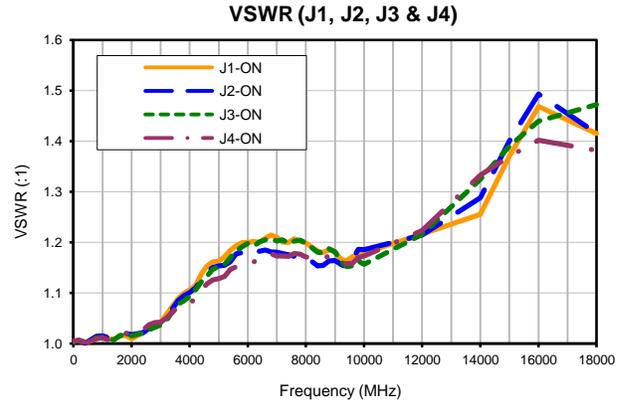
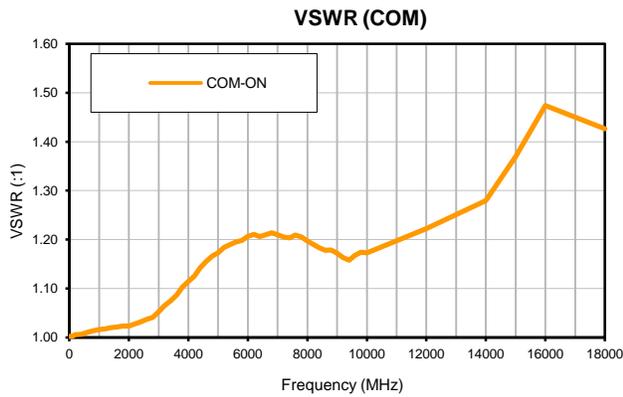
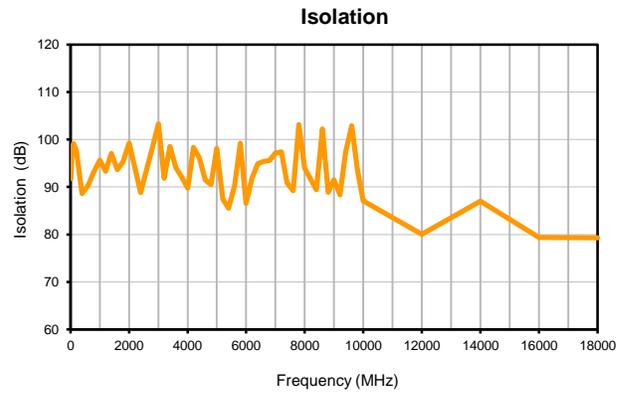
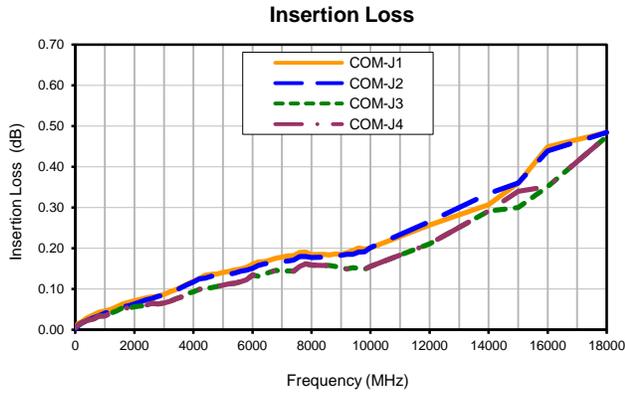
| FREQUENCY (MHz) | INSERTION LOSS (dB) | | | | ISOLATION (dB) | VSWR (:1) | | | | |
|--------------------|------------------------|--------|--------|--------|-------------------|--------------|-------|-------|-------|-------|
| | COM-J1 | COM-J2 | COM-J3 | COM-J4 | | COM | J1-ON | J2-ON | J3-ON | J4-ON |
| 10.0 | 0.01 | 0.00 | 0.01 | 0.01 | 91.75 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 50.0 | 0.01 | 0.01 | 0.01 | 0.01 | 96.53 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 100.0 | 0.02 | 0.01 | 0.01 | 0.01 | 99.16 | 1.00 | 1.01 | 1.00 | 1.00 | 1.01 |
| 200.0 | 0.02 | 0.02 | 0.02 | 0.02 | 97.75 | 1.01 | 1.00 | 1.01 | 1.01 | 1.01 |
| 400.0 | 0.03 | 0.02 | 0.02 | 0.02 | 88.65 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 |
| 600.0 | 0.04 | 0.03 | 0.03 | 0.03 | 90.32 | 1.01 | 1.01 | 1.01 | 1.01 | 1.00 |
| 800.0 | 0.04 | 0.03 | 0.03 | 0.03 | 93.17 | 1.01 | 1.01 | 1.01 | 1.01 | 1.01 |
| 1000.0 | 0.05 | 0.04 | 0.03 | 0.03 | 95.65 | 1.02 | 1.01 | 1.01 | 1.01 | 1.01 |
| 1200.0 | 0.05 | 0.05 | 0.04 | 0.04 | 93.34 | 1.02 | 1.01 | 1.01 | 1.01 | 1.01 |
| 1400.0 | 0.06 | 0.05 | 0.05 | 0.05 | 97.05 | 1.02 | 1.01 | 1.01 | 1.01 | 1.01 |
| 1600.0 | 0.06 | 0.06 | 0.05 | 0.05 | 93.66 | 1.02 | 1.01 | 1.02 | 1.02 | 1.02 |
| 1800.0 | 0.07 | 0.06 | 0.05 | 0.05 | 95.30 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 |
| 2000.0 | 0.07 | 0.06 | 0.06 | 0.06 | 99.26 | 1.02 | 1.01 | 1.02 | 1.01 | 1.02 |
| 2400.0 | 0.08 | 0.07 | 0.06 | 0.06 | 88.82 | 1.03 | 1.02 | 1.02 | 1.02 | 1.03 |
| 2600.0 | 0.08 | 0.08 | 0.06 | 0.06 | 93.69 | 1.04 | 1.03 | 1.03 | 1.03 | 1.04 |
| 2800.0 | 0.08 | 0.08 | 0.06 | 0.06 | 98.29 | 1.04 | 1.03 | 1.03 | 1.03 | 1.04 |
| 3000.0 | 0.09 | 0.09 | 0.07 | 0.07 | 103.28 | 1.05 | 1.04 | 1.04 | 1.04 | 1.04 |
| 3200.0 | 0.09 | 0.09 | 0.07 | 0.07 | 91.85 | 1.06 | 1.06 | 1.05 | 1.05 | 1.05 |
| 3400.0 | 0.10 | 0.10 | 0.08 | 0.08 | 98.51 | 1.07 | 1.07 | 1.07 | 1.06 | 1.06 |
| 3600.0 | 0.10 | 0.10 | 0.08 | 0.08 | 94.06 | 1.09 | 1.09 | 1.08 | 1.08 | 1.07 |
| 3800.0 | 0.11 | 0.11 | 0.09 | 0.09 | 92.14 | 1.10 | 1.10 | 1.09 | 1.08 | 1.08 |
| 4000.0 | 0.12 | 0.12 | 0.09 | 0.09 | 89.75 | 1.11 | 1.11 | 1.10 | 1.09 | 1.08 |
| 4200.0 | 0.13 | 0.12 | 0.10 | 0.10 | 98.32 | 1.13 | 1.12 | 1.11 | 1.11 | 1.09 |
| 4400.0 | 0.13 | 0.13 | 0.10 | 0.10 | 96.20 | 1.14 | 1.14 | 1.13 | 1.12 | 1.11 |
| 4600.0 | 0.14 | 0.13 | 0.10 | 0.10 | 91.48 | 1.16 | 1.15 | 1.14 | 1.13 | 1.12 |
| 4800.0 | 0.14 | 0.13 | 0.11 | 0.11 | 90.48 | 1.17 | 1.16 | 1.15 | 1.15 | 1.13 |
| 5000.0 | 0.14 | 0.13 | 0.11 | 0.11 | 98.14 | 1.17 | 1.16 | 1.15 | 1.15 | 1.13 |
| 5200.0 | 0.14 | 0.14 | 0.11 | 0.11 | 87.51 | 1.18 | 1.17 | 1.15 | 1.16 | 1.13 |
| 5400.0 | 0.15 | 0.14 | 0.11 | 0.11 | 85.54 | 1.19 | 1.18 | 1.16 | 1.17 | 1.15 |
| 5600.0 | 0.15 | 0.14 | 0.12 | 0.12 | 90.20 | 1.19 | 1.19 | 1.18 | 1.18 | 1.15 |
| 5800.0 | 0.15 | 0.15 | 0.12 | 0.12 | 99.20 | 1.20 | 1.20 | 1.18 | 1.19 | 1.15 |
| 6000.0 | 0.16 | 0.15 | 0.13 | 0.13 | 86.54 | 1.21 | 1.20 | 1.17 | 1.20 | 1.16 |
| 6200.0 | 0.17 | 0.16 | 0.13 | 0.13 | 91.90 | 1.21 | 1.20 | 1.18 | 1.19 | 1.16 |
| 6400.0 | 0.17 | 0.16 | 0.14 | 0.14 | 94.93 | 1.21 | 1.20 | 1.18 | 1.20 | 1.17 |
| 6600.0 | 0.17 | 0.16 | 0.14 | 0.14 | 95.37 | 1.21 | 1.21 | 1.18 | 1.20 | 1.18 |
| 6800.0 | 0.18 | 0.17 | 0.15 | 0.15 | 95.56 | 1.21 | 1.21 | 1.18 | 1.21 | 1.18 |
| 7000.0 | 0.18 | 0.17 | 0.14 | 0.14 | 97.12 | 1.21 | 1.21 | 1.18 | 1.20 | 1.17 |
| 7200.0 | 0.18 | 0.17 | 0.14 | 0.14 | 97.39 | 1.21 | 1.20 | 1.18 | 1.20 | 1.17 |
| 7400.0 | 0.18 | 0.17 | 0.14 | 0.14 | 90.84 | 1.20 | 1.20 | 1.18 | 1.20 | 1.17 |
| 7600.0 | 0.19 | 0.18 | 0.16 | 0.16 | 89.24 | 1.21 | 1.21 | 1.17 | 1.20 | 1.18 |
| 7800.0 | 0.19 | 0.18 | 0.16 | 0.16 | 103.15 | 1.21 | 1.20 | 1.17 | 1.20 | 1.18 |
| 8000.0 | 0.18 | 0.18 | 0.16 | 0.16 | 94.00 | 1.20 | 1.20 | 1.17 | 1.20 | 1.17 |
| 8400.0 | 0.19 | 0.18 | 0.16 | 0.16 | 89.44 | 1.18 | 1.18 | 1.15 | 1.18 | 1.17 |
| 8600.0 | 0.18 | 0.18 | 0.16 | 0.16 | 102.21 | 1.18 | 1.18 | 1.15 | 1.18 | 1.17 |
| 8800.0 | 0.19 | 0.18 | 0.16 | 0.16 | 88.92 | 1.18 | 1.19 | 1.16 | 1.19 | 1.17 |
| 9000.0 | 0.19 | 0.18 | 0.15 | 0.15 | 91.54 | 1.17 | 1.18 | 1.16 | 1.18 | 1.17 |
| 9200.0 | 0.19 | 0.19 | 0.15 | 0.15 | 88.35 | 1.16 | 1.17 | 1.16 | 1.16 | 1.16 |
| 9400.0 | 0.19 | 0.18 | 0.15 | 0.15 | 97.41 | 1.16 | 1.16 | 1.15 | 1.15 | 1.16 |
| 9600.0 | 0.20 | 0.19 | 0.15 | 0.15 | 102.87 | 1.17 | 1.17 | 1.17 | 1.15 | 1.16 |
| 9800.0 | 0.20 | 0.19 | 0.15 | 0.15 | 93.57 | 1.17 | 1.18 | 1.19 | 1.16 | 1.17 |
| 10000.0 | 0.20 | 0.20 | 0.16 | 0.16 | 87.10 | 1.17 | 1.18 | 1.19 | 1.16 | 1.17 |
| 12000.0 | 0.26 | 0.27 | 0.21 | 0.21 | 80.07 | 1.22 | 1.22 | 1.21 | 1.22 | 1.22 |
| 14000.0 | 0.31 | 0.33 | 0.29 | 0.29 | 86.99 | 1.28 | 1.26 | 1.29 | 1.32 | 1.33 |
| 15000.0 | 0.36 | 0.36 | 0.30 | 0.34 | 83.22 | 1.37 | 1.37 | 1.40 | 1.39 | 1.37 |
| 16000.0 | 0.45 | 0.44 | 0.35 | 0.35 | 79.39 | 1.47 | 1.47 | 1.49 | 1.44 | 1.40 |
| 18000.0 | 0.48 | 0.48 | 0.47 | 0.47 | 79.34 | 1.43 | 1.41 | 1.42 | 1.47 | 1.38 |



Xtra Long Life USB/ETHERNET RF SP4T SWITCH

RC-1SP4T-A18

Typical Performance Curves



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

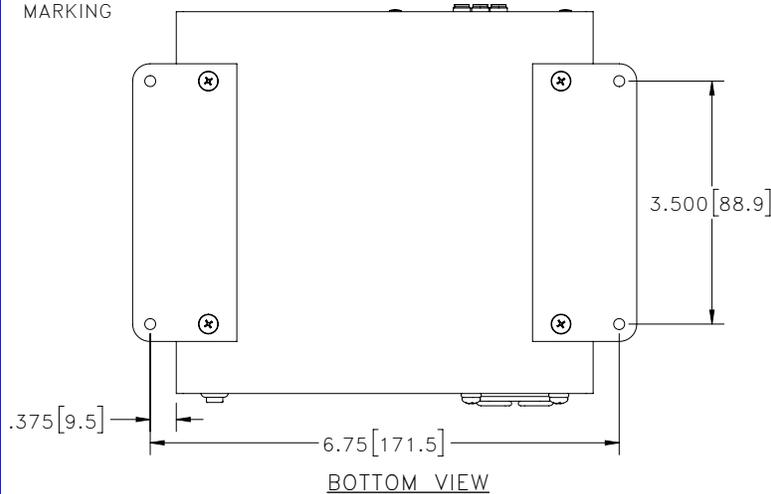
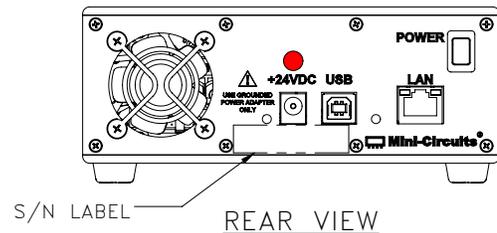
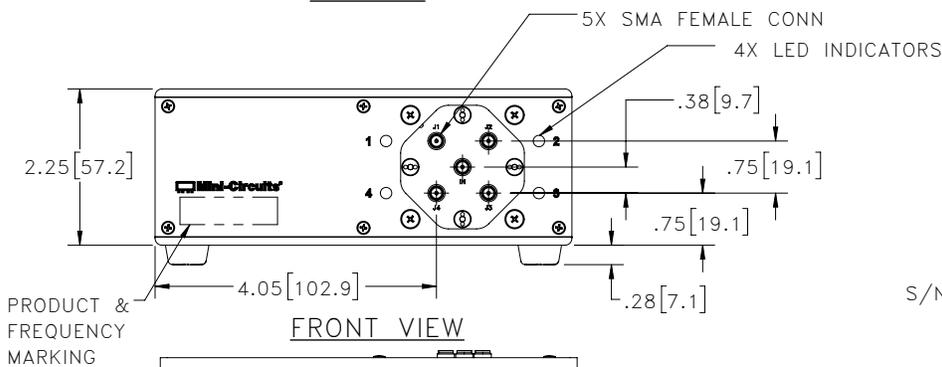
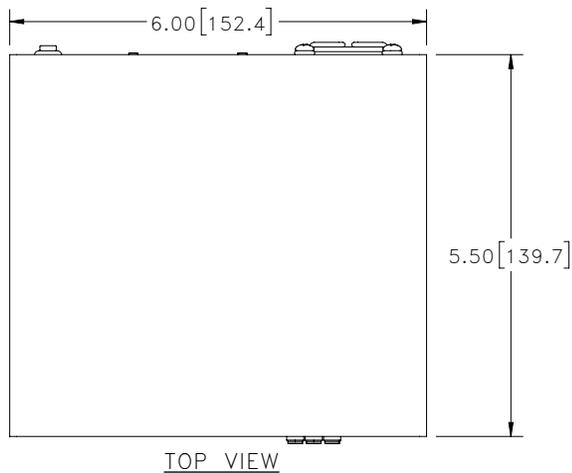


IF/RF MICROWAVE COMPONENTS

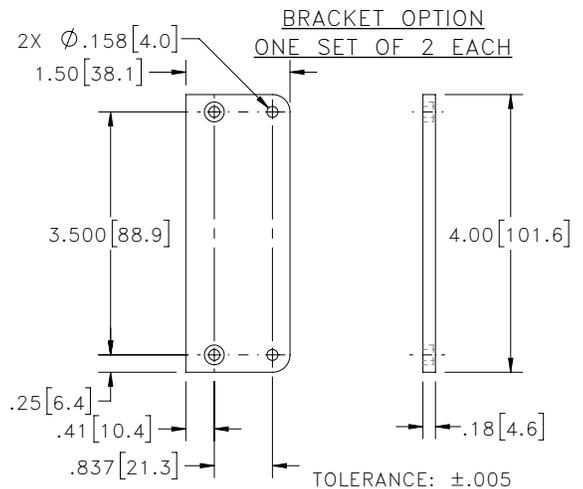
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Outline Dimensions

MR1853



SHOWN WITH RUBBER FEET REMOVED AND BRACKETS INSTALLED.



INSTRUCTIONS FOR MOUNTING BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD SCREWDRIVER
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.

Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.01 inch; 3 Pl. ±.005 inch.
3. Weight: 830 grams.
4. Marking may contain other features or characters for internal lot control.

Mini-Circuits[®]
ISO 9001 ISO 14001 CERTIFIED

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

RF/IF MICROWAVE COMPONENTS



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 40° C Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -15° to 85°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 |