# Millimeter Wave Switch Matrix  **RC-2SP4T-50**

50Ω     DC to 50 GHz     2.4 mm-Female

## THE BIG DEAL

- Millimeter wave switching (up to 50 GHz)
- Excellent performance to 50 GHz
- High reliability, 2 million switch cycles
- 3W power rating (cold switching)

CASE STYLE: MR2616

DOWNLOAD  SOFTWARE PACKAGE

**RoHS Compliant**
See our website for RoHS Compliance
methodologies and qualifications

## APPLICATIONS

- 5G node / device testing
- Automated test equipment
- Fail-safe / redundancy switching

## PRODUCT OVERVIEW

Mini-Circuits' RC-2SP4T-50 houses a pair of electro-mechanical SP4T switch operating over an extremely wide bandwidth, from DC to 50 GHz with high isolation and low insertion loss. The absorptive switches are of a failsafe and break-before-make-configuration, with a minimum lifetime of 2 million switching cycles per switch position, 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 2.4 mm (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 (both 32-bit and 64-bit systems).

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Mechanical SP4T switches | Mechanical absorptive switches provide high reliability, repeatable high performance and internal terminations of input signals on the disconnected paths |
| Operation from DC to 50 GHz | Supports a wide range of RF test and signal routing applications, including 2G, 3G, 4G and 5G, with a single device. |
| 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 |
| USB & Ethernet control | USB HID and Ethernet (HTTP / Telnet) interfaces provide easy compatibility with a wide range of software setups and programming environments |
| Full software support | User friendly Windows GUI (graphical user interface) allows manual control straight out of the box, while the comprehensive API (application programming interface) with examples and instructions allows easy automation in most programming environments |

## ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter | Conditions (GHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | DC | | 50 | GHz |
| Insertion Loss | DC - 18 | — | 0.2 | 0.5 | dB |
| | 18 - 26.5 | — | 0.2 | 0.7 | |
| | 26.5 - 40 | — | 0.3 | 0.9 | |
| | 40 - 50 | — | 0.4 | 1.2 | |
| Isolation | DC - 18 | 60 | 90 | — | dB |
| | 18 - 26.5 | 55 | 85 | — | |
| | 26.5 - 40 | 50 | 75 | — | |
| | 40 - 50 | 50 | 75 | — | |
| VSWR | DC - 18 | — | 1.2 | — | :1 |
| | 18 - 26.5 | — | 1.2 | — | |
| | 26.5 - 40 | — | 1.3 | — | |
| | 40 - 50 | — | 1.5 | — | |
| Switching Time | — | — | 25 | — | ms |
| RF Input Power (Cold Switching)[1] | DC - 18 | — | — | 20 | W |
| | 18 - 26.5 | — | — | 10 | |
| | 26.5 - 50 | — | — | 3 | |
| Switch Lifetime (per Switch) | 100mW hot switching[2] | 2 | — | — | million cycles |
| | 1W hot switching | — | 1 | — | |
| Rated Voltage | 24V$_{DC}$ input | 23 | 24 | 25 | V |
| | USB port | — | 5 | — | |
| Rated Current (24V DC Input) | State 1-4 | — | 330 | — | mA |
| | State 0 | — | 90 | 120 | |
| Rated Current (USB) | | — | 10 | 20 | mA |

1. Maximum power for any connected through path as stated; maximum power into any internal termination is 1W per port, 3W total per switch
2. Hot switching powers above this level will degrade the switch lifetime

## ABSOLUTE MAXIMUM RATINGS

| Parameters | Ratings |
|---|---|
| Operating  Temperature | 0°C to 40°C |
| Storage Temperature | -15°C to 85°C |
| Supply Voltage | 26V |

## SWITCHING CONFIGURATION:
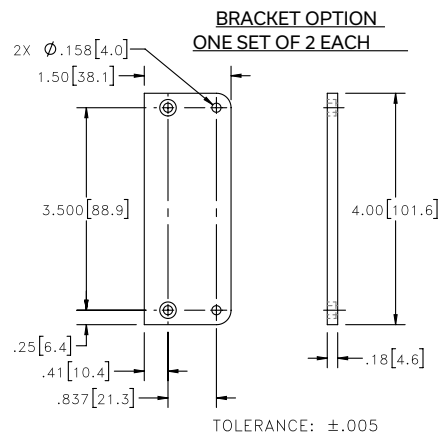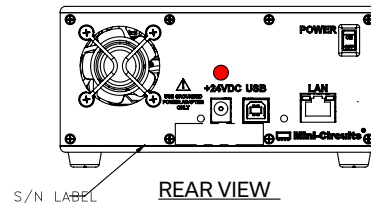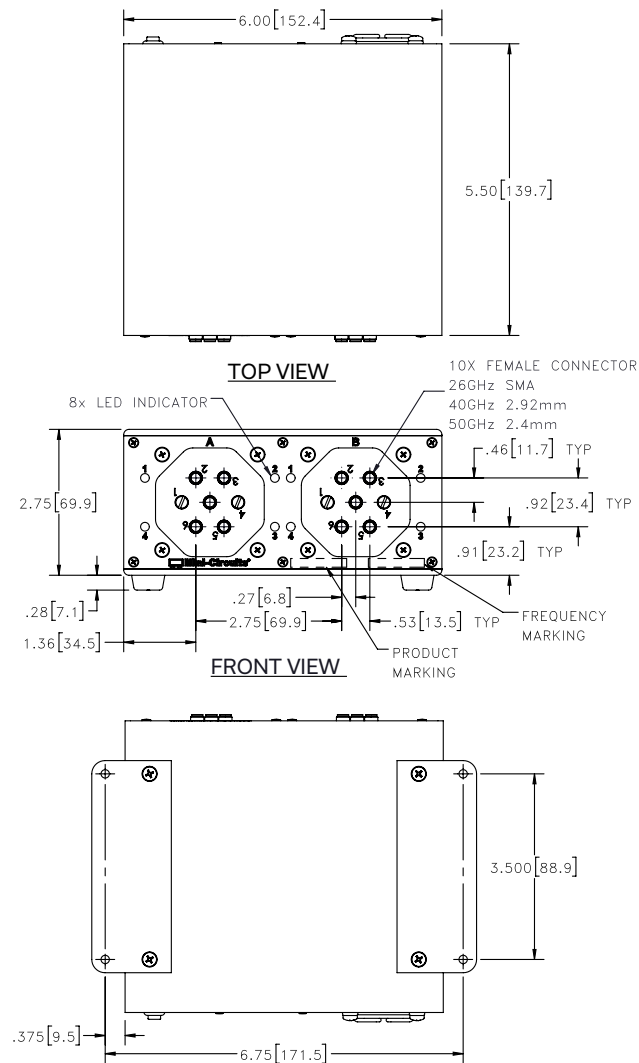
- Normally open (all port disconnected)
- Absorptive (internal terminations on ports J1-J4)
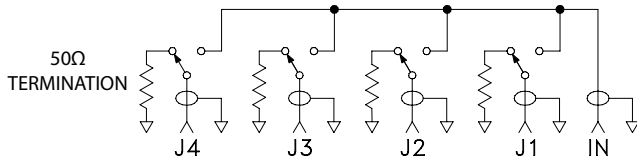


## CONNECTIONS

| Port Name | Connector Type |
|---|---|
| RF Switch A & B (COM & 1-4 each | 2.4 mm female |
| USB | USB type-B |
| Ethernet / LAN | RJ45 |
| 24V DC Input | 2.1mm center positive DC socket |

## OUTLINE DRAWING (MR2616)



TOP VIEW

FRONT VIEW

REAR VIEW

BOTTOM VIEW
SHOWN WITH RUBBER FEET REMOVED AND BRACKETS INSTALLED.

BRACKET OPTION
ONE SET OF 2 EACH

TOLERANCE: ±.005

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: 1290 grams.
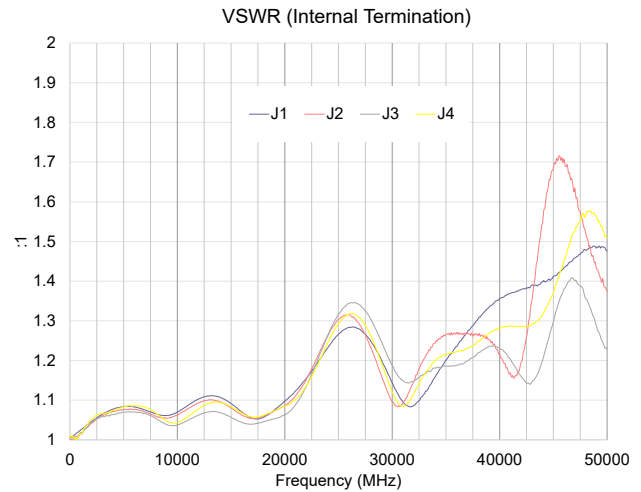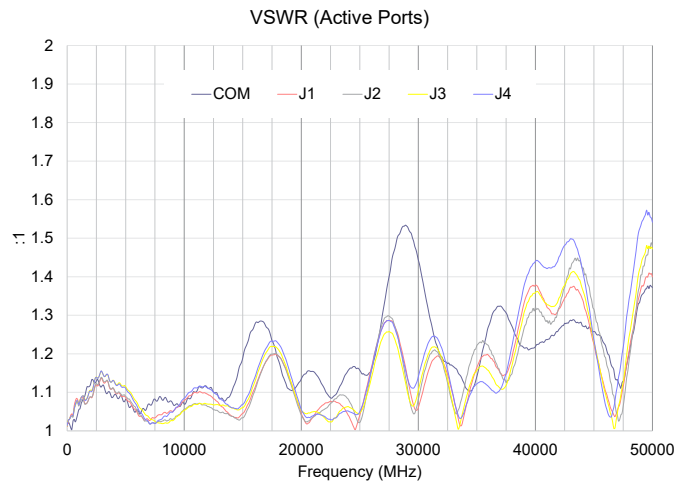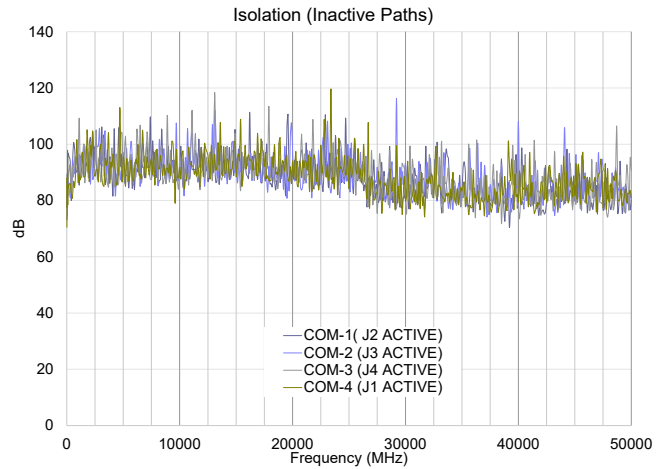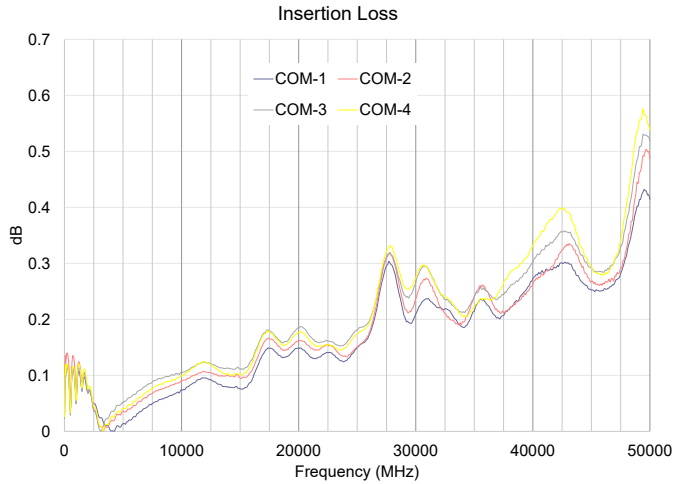Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03 inch; 3 Pl.±.015 inch.

## TYPICAL PERFORMANCE DATA (PER SWITCH)



Insertion Loss

COM-1  COM-2
COM-3  COM-4



Isolation (Inactive Paths)

COM-1( J2 ACTIVE)
COM-2 (J3 ACTIVE)
COM-3 (J4 ACTIVE)
COM-4 (J1 ACTIVE)



VSWR (Active Ports)

COM  J1  J2  J3  J4



VSWR (Internal Termination)

J1  J2  J3  J4

## SOFTWARE SPECIFICATIONS
### SOFTWARE & DOCUMENTATION DOWNLOAD:
- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge from: https://www.minicircuits.com/softwaredownload/rfswitchcontroller.html
- Please contact testsolutions@minicircuits.com for support

### MINIMUM SYSTEM REQUIREMENTS:

| Parameter | Requirements | |
|---|---|---|
| Interface | USB HID & Ethernet (HTTP & Telnet) | |
| System Requirements | GUI | Windows 98 or later |
| | USB API DLL | Windows 98 or later and programming environment with ActiveX or .NET support |
| | USB Direct Programming | Linux, Windows 98 or later |
| | Ethernet | Windows, Linux or Mac computer with a network port and Ethernet TCP/IP support |
| Hardware | Pentium II or later with 256 MB RAM | |

## APPLICATION PROGRAMMING INTERFACE (API)
### ETHERNET SUPPORT:
- Simple ASCII / SCPI command set for attenuator control
- Communication via HTTP or Telnet
- Supported by most common programming environment

### USB SUPPORT (WINDOWS):
- ActiveX COM DLL file for creation of 32-bit programs
- .NET library DLL file for creation of 32 / 64-bit programs
- Supported by most common programming environments (refer to application note AN-49-001 for summary of suported environments)

### USB SUPPORT (LINUX):
- Direct USB programming using a series of USB interrupt codes

Full programming instructions and examples available for a wide range of programming environments / languages.
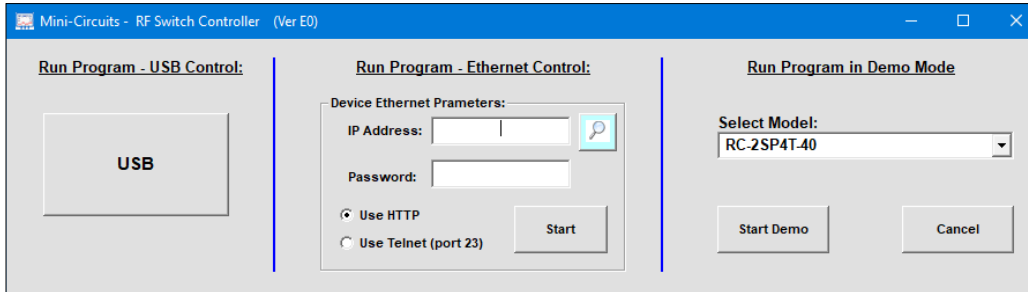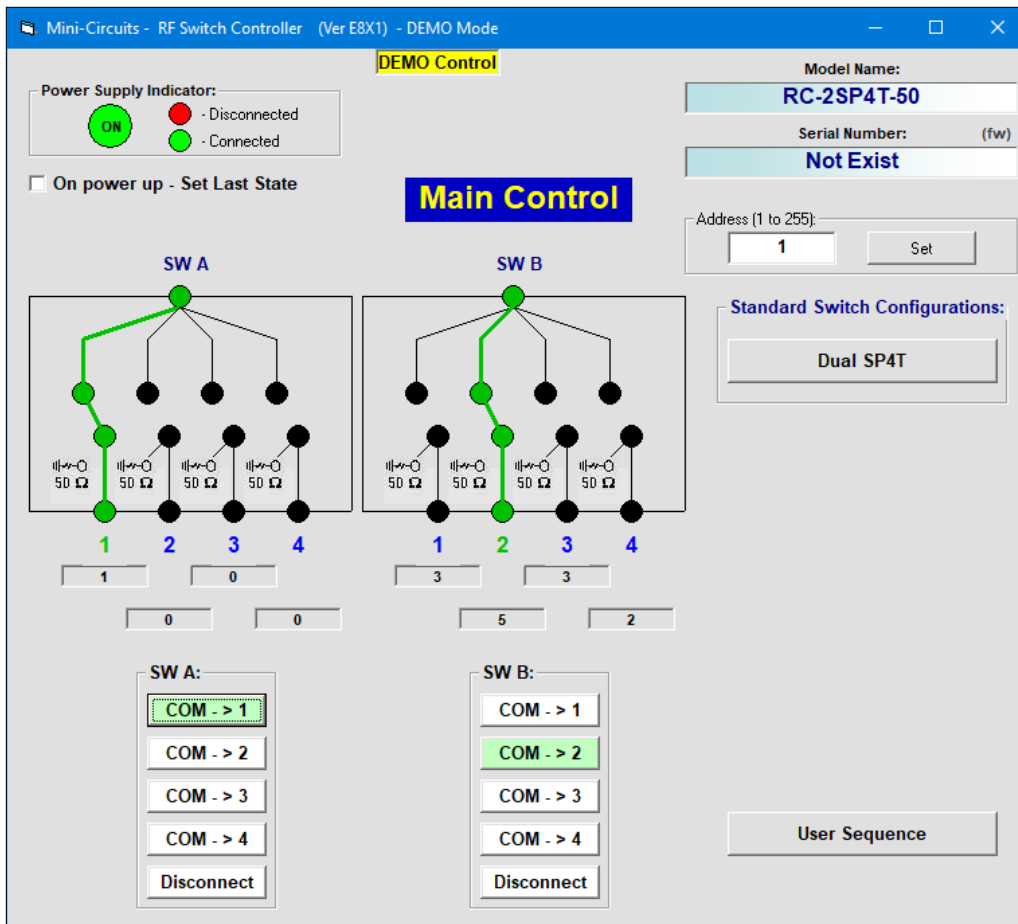
## GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS - KEY FEATURES

• Connect via USB or Ethernet
• Run GUI in "demo mode" to evaluate software without a hardware connection



• View and set switch states at the click of a button
• Configure and run timed switching sequences
• Set start-up switch state
• Configure Ethernet IP settings

## ORDERING INFORMATION

Please contact Mini-Circuits' Test Solutions department for price and availability: testsolutions@minicircuits.com

| Model | Description |
|---|---|
| RC-2SP4T-50 | USB & Ethernet controlled SP4T switch matrix |

| Included Accessories | Part No. | Description |
|---|---|---|
|  | AC/DC-24-3W1 | AC/DC 24V$_{DC}$ Grounded Power Adaptor. Operating temperature: 0°C to +40°C, I$_{Max}$=2.5A |
| See Below | CBL-3W1-XX | AC Power Cord (Select one power cord from below with each Switch Matrix box) |
|  | USB-CBL-AB-3+ | 2.7 ft (0.8 m) USB Cable: USB type A(Male) to USB type B(Male) |

| AC Power Cords[3] | Part No. | Description |
|---|---|---|
|  | CBL-3W1-US | Power Cord for United States |
|  | CBL-3W1-EU | Power Cord for Europe |
|  | CBL-3W1-UK | Power Cord for United Kingdom |
|  | CBL-3W1-AU | Power Cord for Australia and China |
|  | CBL-3W1-IL | Power Cord for Israel |

3. If you need a Power cord for a country not listed please contact testsolutions@minicircuits.com

## OPTIONAL ACCESSORIES

| | |
|---|---|
| USB-CBL-AB-3+ | 2.7 ft (0.8 m) USB Cable: USB type A(Male) to USB type B(Male) |
| USB-CBL-AB-7+ | 6.8 ft (2.1 m) USB Cable: USB type A(Male) to USB type B(Male) |
| USB-CBL-AB-11+ | 11 ft (3.4 m) USB Cable: USB type A(Male) to USB type B(Male) |

**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