



### THE BIG DEAL

- 3 mechanical transfer switches
- High reliability, 10 million switch cycles
- 10W power rating (cold switching)
- High isolation, 85 dB typ.

### APPLICATIONS

- Automated test equipment
- Fail-safe / redundancy switching
- Switch matrices



CASE STYLE: SH3022

[DOWNLOAD](#) SOFTWARE PACKAGE

**RoHS Compliant**

See our website for RoHS Compliance methodologies and qualifications

### PRODUCT OVERVIEW

Mini-Circuits' RC-3MTS-18 comprises 3 independently controlled, electro-mechanical transfer switches. Each switch operates over a wide bandwidth from DC to 18 GHz, with high isolation (85 dB typical), low insertion loss (0.2 dB typical) and high input power rating (10W for cold switching). The switches are of a failsafe and break-before-make-configuration, using a patented design which ensures long-term reliability, with a minimum lifetime of 10 million switching cycles when used within the noted specifications.

The switch box is constructed in a compact, rugged metal case (4.5 x 6.0 x 2.25") with all RF connectors (SMA female) 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                                                                                                                                                                                                                                                 |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Three transfer switches         | Transfer switches provide a simple DPDT switch application (2 input to 2 output switch matrix) and are a useful building block in much larger switch matrices                                                                                              |
| 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                                                                               |
| 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 |



USB & ETHERNET CONTROLLED

# RF Transfer Switch Matrix **RC-3MTS-18**

Mini-Circuits

50Ω DC to 18 GHz SMA-Female

## ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter                               | Conditions (GHz)                 | Min. | Typ. | Max. | Units          |
|-----------------------------------------|----------------------------------|------|------|------|----------------|
| Frequency Range                         |                                  | DC   |      | 18   | GHz            |
| Insertion Loss                          | DC - 1                           | —    | 0.10 | 0.15 | dB             |
|                                         | 1 - 8                            | —    | 0.10 | 0.25 |                |
|                                         | 8 - 12                           | —    | 0.20 | 0.36 |                |
|                                         | 12 - 18                          | —    | 0.25 | 0.45 |                |
| Isolation                               | DC - 1                           | 85   | 100  | —    | dB             |
|                                         | 1 - 8                            | 75   | 90   | —    |                |
|                                         | 8 - 12                           | 70   | 86   | —    |                |
|                                         | 12 - 18                          | 60   | 76   | —    |                |
| VSWR                                    | DC - 1                           | —    | 1.05 | —    | :1             |
|                                         | 1 - 8                            | —    | 1.15 | —    |                |
|                                         | 8 - 12                           | —    | 1.15 | —    |                |
|                                         | 12 - 18                          | —    | 1.15 | —    |                |
| Switching Time                          | —                                | —    | 25   | —    | ms             |
| RF Input Power <sup>1</sup>             | Cold Switching                   | —    | —    | 10   | W              |
| Switch Lifetime (per Switch)            | <0.1W hot switching <sup>2</sup> | 10   | —    | —    | million cycles |
|                                         | 0.1-1W hot switching             | —    | 3    | —    |                |
| Rated Voltage                           | 24V <sub>DC</sub> input          | 23   | 24   | 25   | V              |
|                                         | USB port                         | —    | 5    | —    |                |
| Rated Current (24V <sub>DC</sub> input) | All switches in state 2          | —    | 610  | 850  | mA             |
|                                         | All switches in state 1          | —    | 105  | 130  |                |
| Rated Current (USB)                     |                                  | —    | 10   | 20   | mA             |

1. Maximum power for cold switching is 10W per path, 20W total, with all ports terminated into 50Ω.
2. Hot switching power 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              |
| Total RF Power        | 20W <sup>1</sup> |





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50Ω DC to 18 GHz SMA-Female

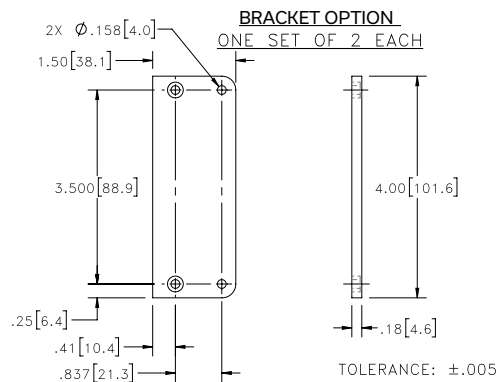
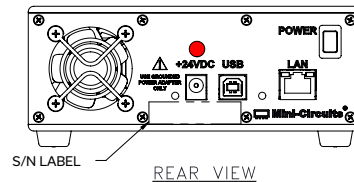
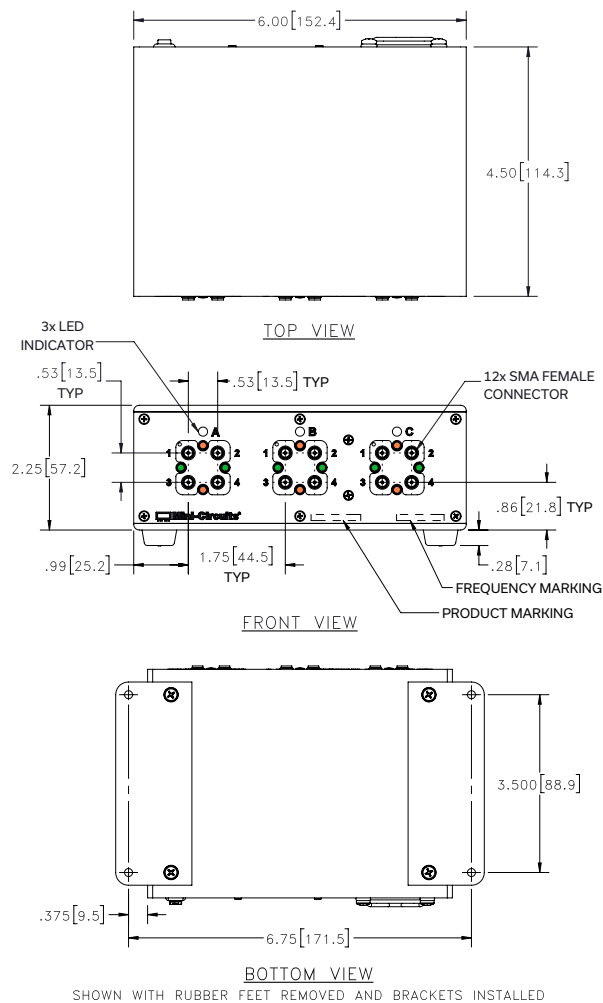
## SWITCHING STATES (PER SWITCH)



## CONNECTIONS

| Port Name                     | Connector Type                  |
|-------------------------------|---------------------------------|
| RF Switch A (J1, J2, J3 & J4) | SMA female                      |
| RF Switch B (J1, J2, J3 & J4) | SMA female                      |
| RF Switch C (J1, J2, J3 & J4) | SMA female                      |
| USB                           | USB type-B                      |
| Ethernet / LAN                | RJ45                            |
| 24V <sub>DC</sub> Input       | 2.1mm center positive DC socket |

## OUTLINE DRAWING (SH3022)



**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: 1000 grams  
Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.03 inch; 3Pl. ±.015 inch





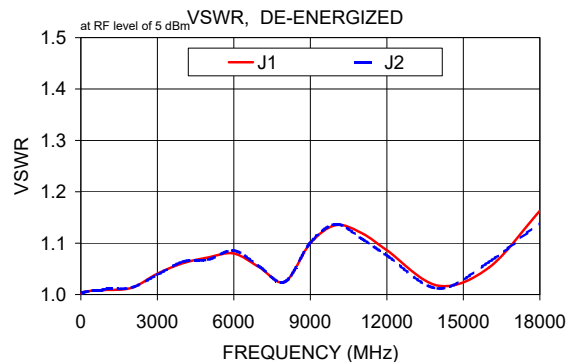
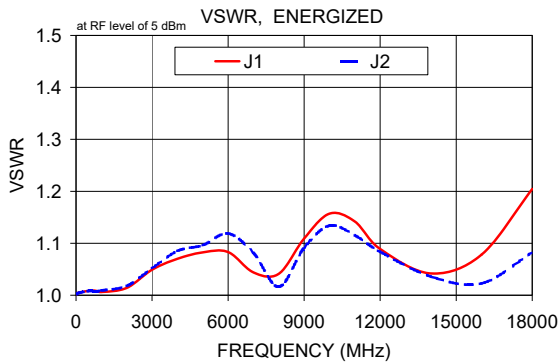
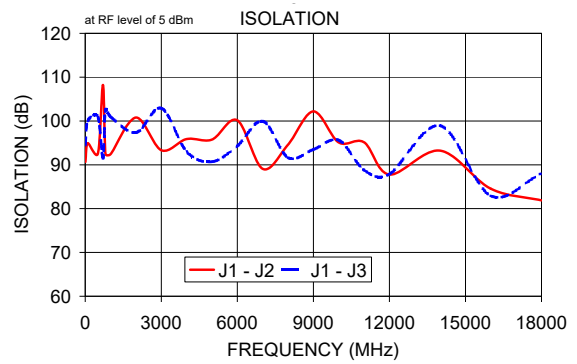
USB & ETHERNET CONTROLLED

# RF Transfer Switch Matrix RC-3MTS-18

50Ω DC to 18 GHz SMA-Female

### TYPICAL PERFORMANCE DATA (PER SWITCH)

| FREQ.<br>(MHz) | ON INSERTION LOSS (dB) |       | OFF ISOLATION (dB) |        | VSWR ENERGIZED (:1) |      | VSWR DE-ENERGIZED (:1) |      |
|----------------|------------------------|-------|--------------------|--------|---------------------|------|------------------------|------|
|                | J1-J2                  | J1-J3 | J1-J2              | J1-J3  | J1                  | J2   | J1                     | J2   |
| 10.00          | 0.01                   | 0.01  | 90.66              | 94.50  | 1.00                | 1.00 | 1.00                   | 1.00 |
| 100.00         | 0.01                   | 0.01  | 94.93              | 100.05 | 1.00                | 1.00 | 1.00                   | 1.00 |
| 500.00         | 0.03                   | 0.03  | 92.59              | 100.93 | 1.01                | 1.01 | 1.01                   | 1.01 |
| 700.00         | 0.03                   | 0.03  | 108.21             | 91.48  | 1.01                | 1.01 | 1.01                   | 1.01 |
| 800.00         | 0.04                   | 0.04  | 92.52              | 102.45 | 1.01                | 1.01 | 1.01                   | 1.01 |
| 1000.00        | 0.04                   | 0.04  | 92.45              | 100.96 | 1.01                | 1.01 | 1.01                   | 1.01 |
| 2000.00        | 0.06                   | 0.06  | 100.79             | 97.34  | 1.01                | 1.02 | 1.01                   | 1.01 |
| 3000.00        | 0.07                   | 0.07  | 93.32              | 102.92 | 1.05                | 1.05 | 1.04                   | 1.04 |
| 4000.00        | 0.08                   | 0.08  | 95.89              | 93.03  | 1.07                | 1.09 | 1.06                   | 1.06 |
| 5000.00        | 0.10                   | 0.09  | 95.75              | 90.70  | 1.08                | 1.10 | 1.07                   | 1.07 |
| 6000.00        | 0.11                   | 0.10  | 100.15             | 94.32  | 1.08                | 1.12 | 1.08                   | 1.09 |
| 7000.00        | 0.11                   | 0.11  | 89.08              | 99.96  | 1.04                | 1.08 | 1.05                   | 1.05 |
| 8000.00        | 0.12                   | 0.12  | 94.59              | 91.64  | 1.04                | 1.02 | 1.02                   | 1.02 |
| 9000.00        | 0.14                   | 0.14  | 102.19             | 93.50  | 1.11                | 1.09 | 1.10                   | 1.10 |
| 10000.00       | 0.16                   | 0.16  | 95.10              | 95.63  | 1.16                | 1.13 | 1.14                   | 1.14 |
| 11000.00       | 0.17                   | 0.16  | 95.14              | 88.79  | 1.14                | 1.12 | 1.12                   | 1.11 |
| 12000.00       | 0.16                   | 0.16  | 87.77              | 87.85  | 1.09                | 1.08 | 1.09                   | 1.08 |
| 14000.00       | 0.18                   | 0.17  | 93.24              | 98.95  | 1.04                | 1.04 | 1.02                   | 1.01 |
| 16000.00       | 0.21                   | 0.20  | 84.54              | 82.94  | 1.08                | 1.02 | 1.05                   | 1.06 |
| 18000.00       | 0.25                   | 0.21  | 81.87              | 88.03  | 1.20                | 1.08 | 1.16                   | 1.14 |





## 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](mailto: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 supported environments)

#### USB SUPPORT (LINUX):

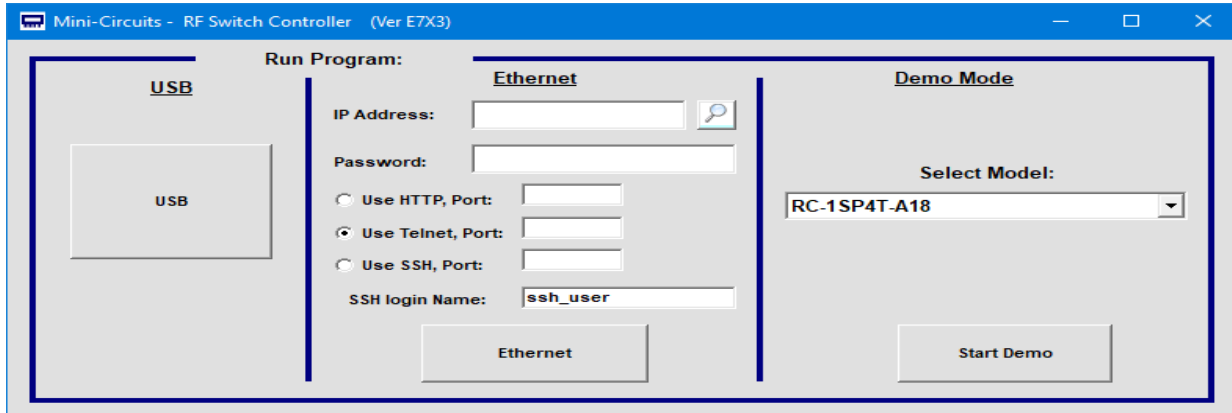
- Direct USB programming using a series of USB interrupt codes

Full programming instructions and examples available for a wide range of programming environments / languages.

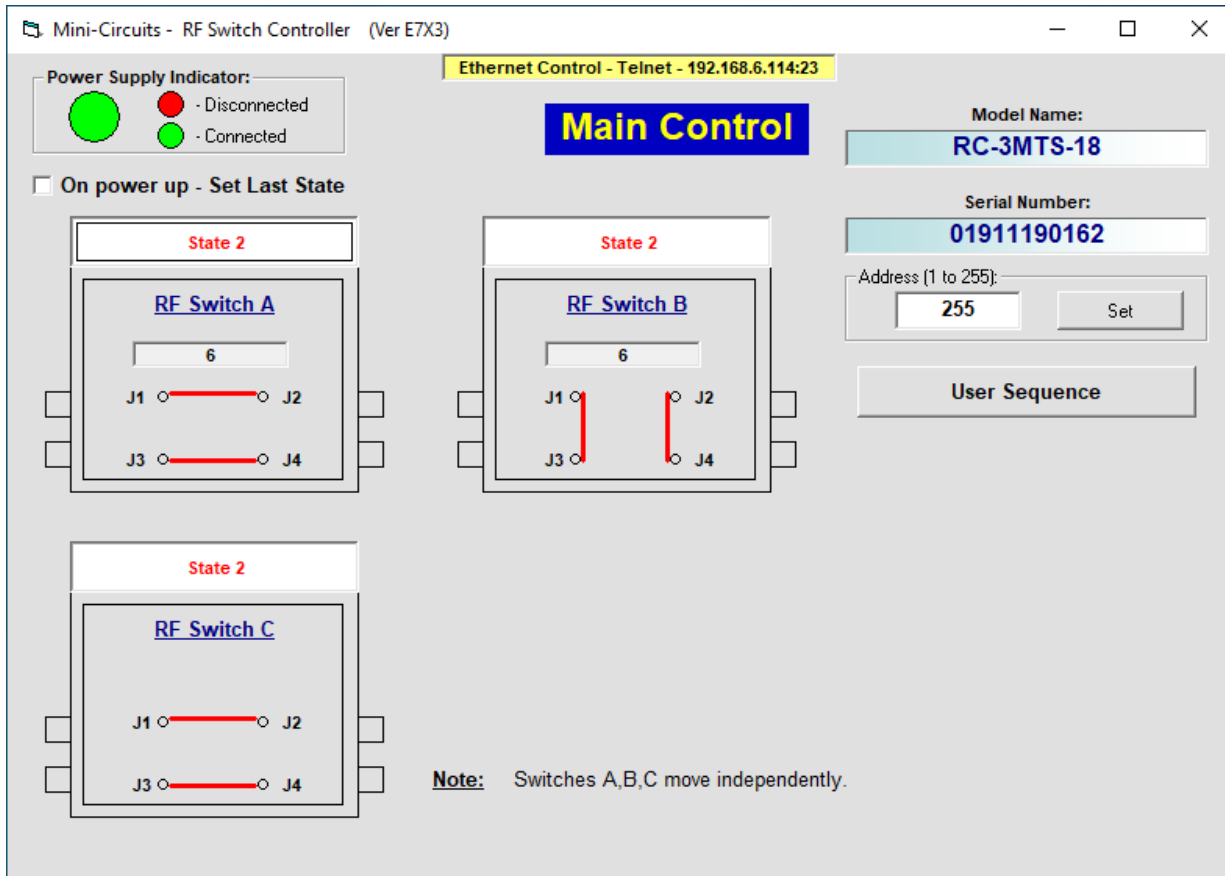


### GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS - KEY FEATURES

- 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





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Mini-Circuits



50Ω DC to 18 GHz SMA-Female






### ORDERING INFORMATION

Refer to Mini-Circuits' website for pricing and availability information:

<https://www.minicircuits.com/WebStore/dashboard.html?model=RC-3MTS-18>

| Model      | Description                                      |
|------------|--------------------------------------------------|
| RC-3MTS-18 | USB & Ethernet controlled transfer switch matrix |

| Included Accessories                                                              | Part No.      | Description                                                                                                    |
|-----------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------|
|  | AC/DC-24-3W1  | AC/DC 24V <sub>DC</sub> Grounded Power Adaptor.<br>Operating temperature: 0°C to +40°C, I <sub>Max</sub> =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 <sup>5</sup>                                                         | 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              |

<sup>5</sup> If you need a Power cord for a country not listed please contact [testsolutions@minicircuits.com](mailto: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)      |
| CBL-RJ45-MM-5+ | 5 ft (1.5 m) Ethernet cable: RJ45(Male) to RJ45(Male) Cat 5E cable |
| BKT-272-08+    | Bracket (One set of 2 each)                                        |

- 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](http://www.minicircuits.com/MCLStore/terms.jsp)

