



USB & ETHERNET CONTROLLED

Millimeter Wave Switch Matrix **RC-2SPDT-50**

50Ω DC to 50 GHz 2.4 mm-Female

THE BIG DEAL

- Millimeter wave switching (up to 50 GHz)
- 2 x mechanical reflective switches
- High reliability, 2 million switch cycles
- 3W power rating (cold switching)

APPLICATIONS

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



CASE STYLE: LM3149

[DOWNLOAD](#)

SOFTWARE PACKAGE

RoHS Compliant

See our website for RoHS Compliance methodologies and qualifications

PRODUCT OVERVIEW

Mini-Circuits' RC-2SPDT-50 houses a pair of electro-mechanical SPDT switches operating over an extremely wide bandwidth, from DC to 50 GHz with high isolation and low insertion loss. The reflective 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 (6.0 x 4.5 x 2.25") 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 SPDT switches | Mechanical reflective switches provide high reliability and repeatable performance |
| 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 |

REV. A
ECO-008050
RC-2SPDT-50
MCL NY
240125





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Millimeter Wave Switch Matrix **RC-2SPDT-50**

50Ω DC to 50 GHz 2.4 mm-Female

ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter | Conditions (GHz) | Min. | Typ. | Max. | Units |
|---------------------------------|----------------------------------|------|------|------|----------------|
| Frequency Range | | DC | | 50 | GHz |
| Path Loss | DC - 12 | — | 0.2 | 0.4 | dB |
| | 12 - 26 | — | 0.3 | 0.7 | |
| | 26 - 40 | — | 0.3 | 0.8 | |
| | 40 - 50 | — | 0.4 | 1.1 | |
| Isolation | DC - 12 | 60 | 100 | — | dB |
| | 12 - 26 | 55 | 90 | — | |
| | 26 - 50 | 50 | 80 | — | |
| VSWR | DC - 12 | — | 1.15 | — | :1 |
| | 12 - 26 | — | 1.30 | — | |
| | 26 - 50 | — | 1.35 | — | |
| Switching Time | — | — | 25 | — | ms |
| RF Input Power (Cold Switching) | DC - 12 | — | — | 20 | W |
| | 12 - 26 | — | — | 10 | |
| | 26 - 40 | — | — | 5 | |
| | 40 - 50 | — | — | 3 | |
| Switch Lifetime (per Switch) | 100mW hot switching ¹ | 2 | — | — | million cycles |
| | 1W hot switching | — | 1 | — | |
| Rated Current (24V DC Input) | All switches COM<>2 | — | 330 | — | mA |
| | All switches COM<>1 | — | 90 | 120 | |
| Rated Current (USB) | | — | 10 | 20 | mA |

1. 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 |





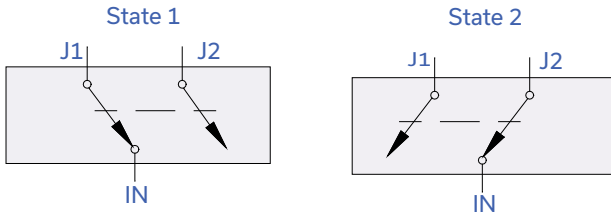
USB & ETHERNET CONTROLLED

Millimeter Wave Switch Matrix **RC-2SPDT-50**

50Ω DC to 50 GHz 2.4 mm-Female

SWITCHING CONFIGURATION:

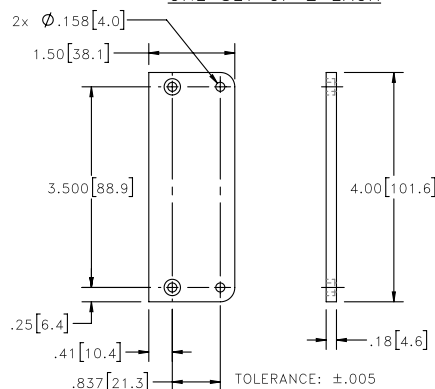
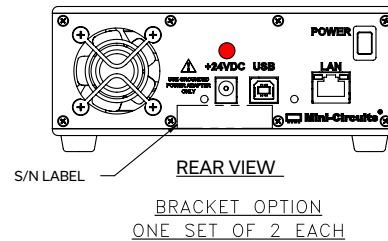
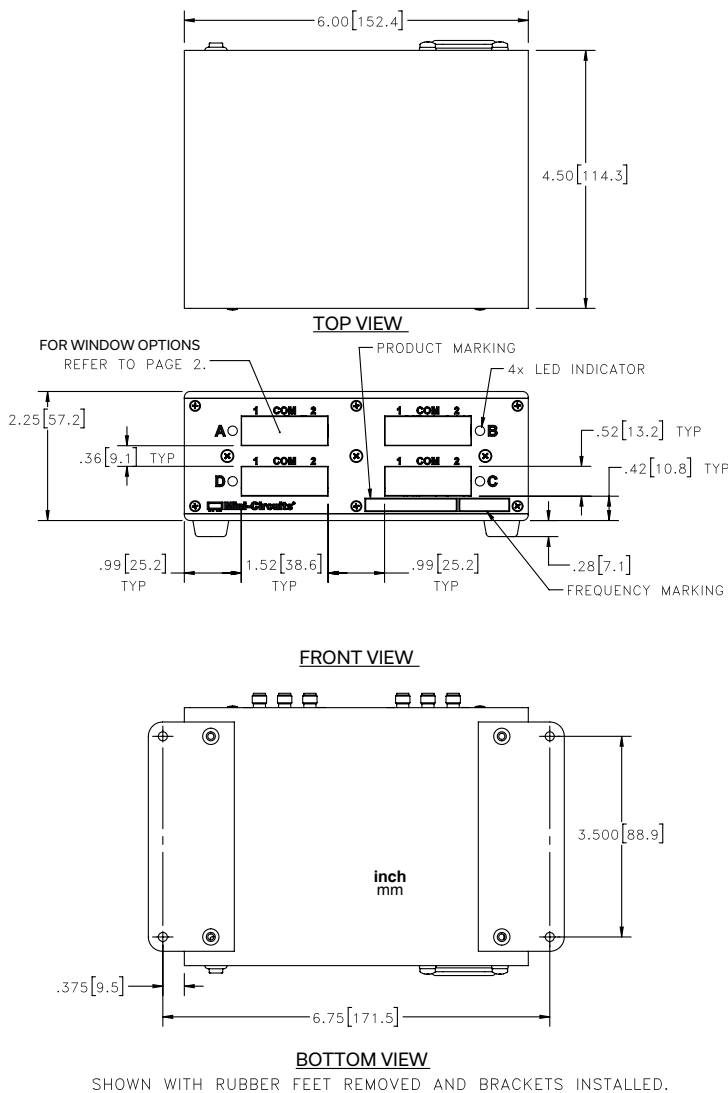
- Fail-safe
- Reflective



CONNECTIONS

| Port Name | Connector Type |
|----------------------------------|---------------------------------|
| RF Switch A & B (COM & 1-2 each) | 2.4 mm female |
| USB | USB type-B |
| Ethernet / LAN | RJ45 |
| 24V DC Input | 2.1mm center positive DC socket |

OUTLINE DRAWING (LM3149)



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 (Model): (2SPDT) 880 grams; (4SPDT) 960 grams
 Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.





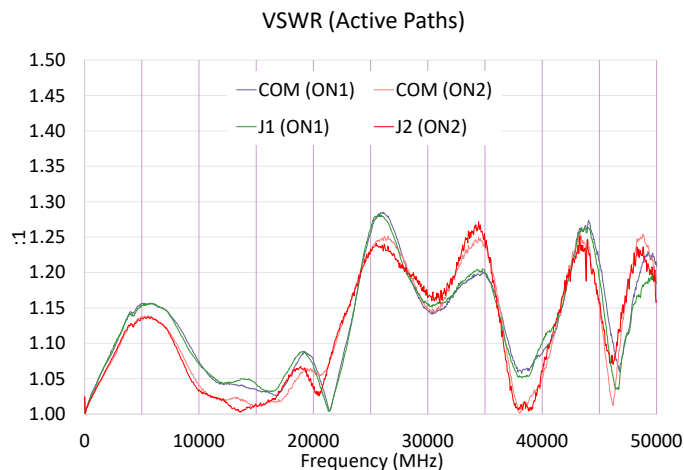
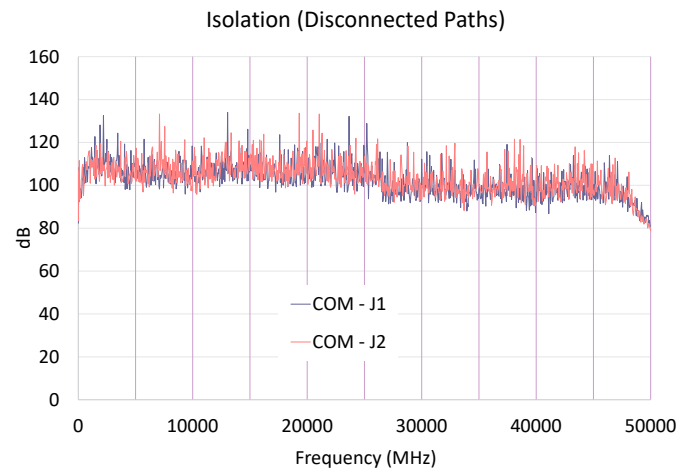
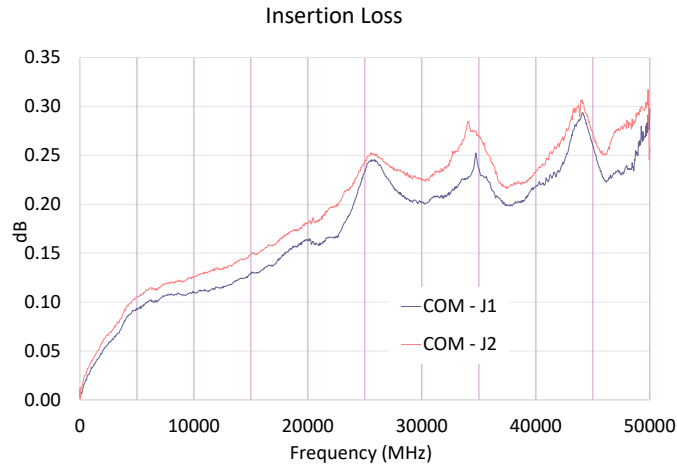
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Millimeter Wave Switch Matrix **RC-2SPDT-50**

Mini-Circuits

50Ω DC to 50 GHz 2.4 mm-Female

TYPICAL PERFORMANCE DATA (PER SWITCH)





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50Ω DC to 50 GHz 2.4 mm-Female

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 environments

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.



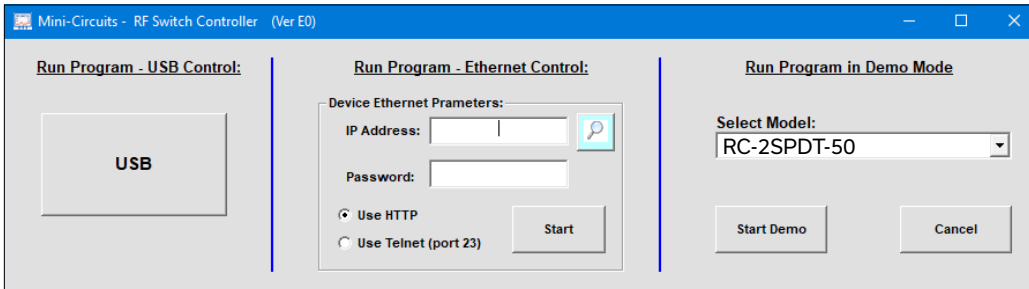
USB & ETHERNET CONTROLLED

Millimeter Wave Switch Matrix **RC-2SPDT-50**

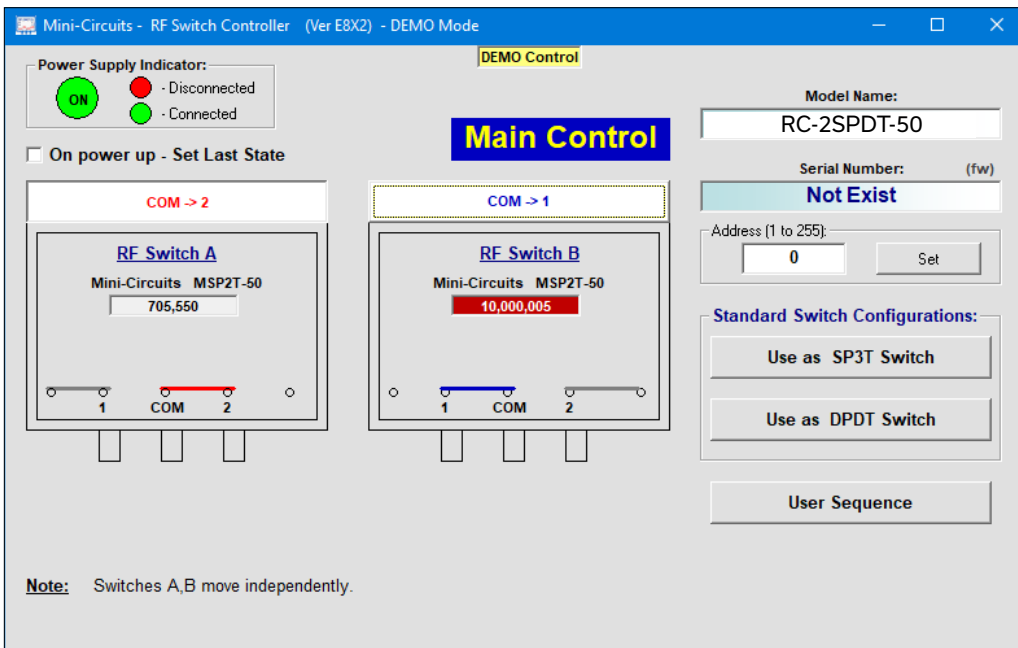
50Ω DC to 50 GHz 2.4 mm-Female

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





USB & ETHERNET CONTROLLED



Millimeter Wave Switch Matrix **RC-2SPDT-50**






50Ω DC to 50 GHz 2.4 mm-Female

ORDERING INFORMATION

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

| Model | Description |
|-------------|--|
| RC-2SPDT-50 | USB & Ethernet controlled SPDT 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 ² | 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 |

2. 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) |
| 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**
- 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.
 - Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
 - 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



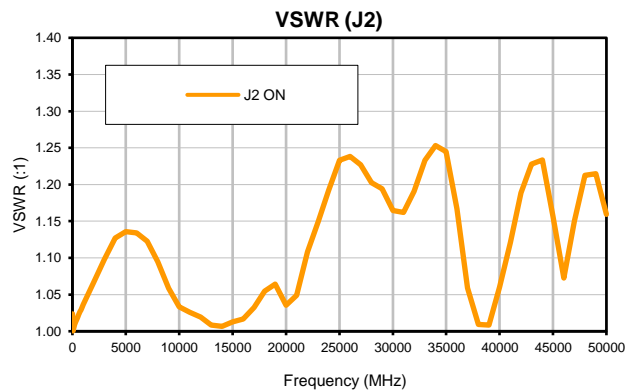
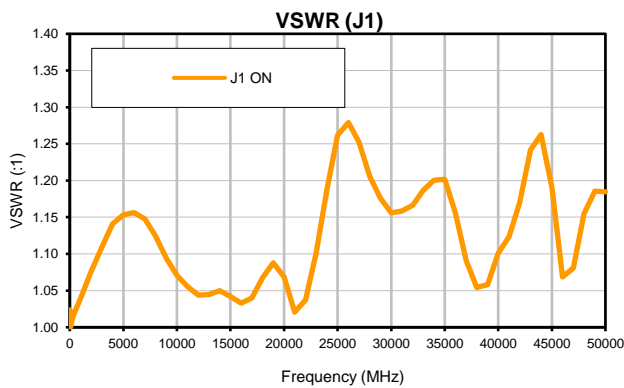
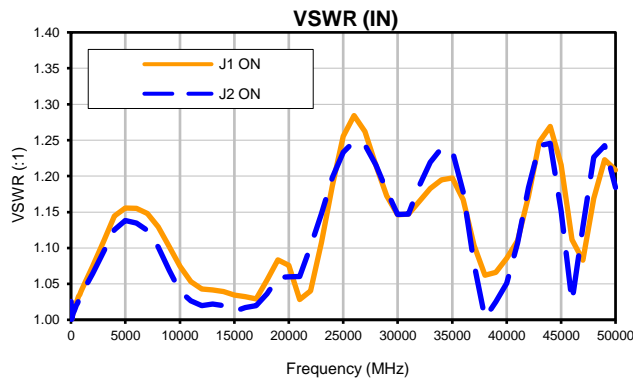
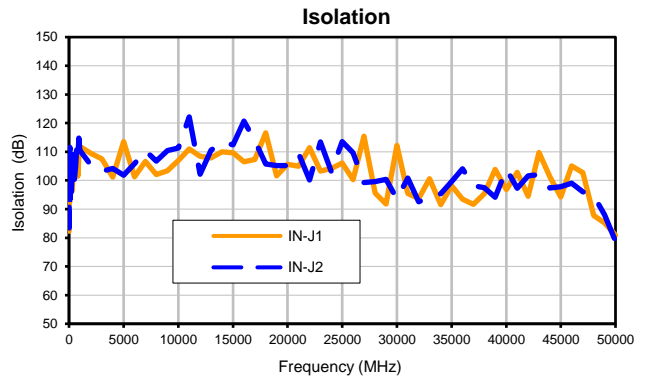
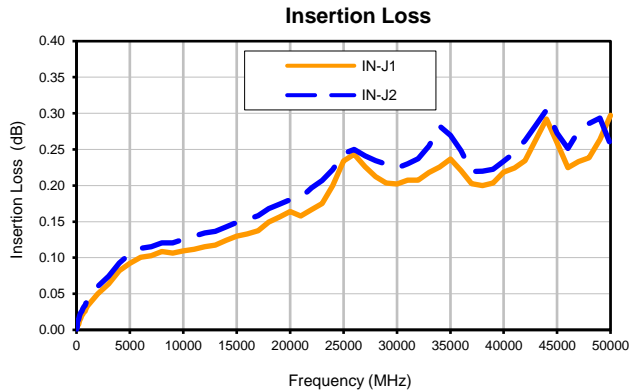
Typical Performance Curves per Switch

| FREQUENCY (MHz) | INSERTION LOSS ON (dB) | | ISOLATION OFF (dB) | | VSWR (:1) | | VSWR (:1) | |
|--------------------|------------------------------|-------|--------------------------|--------|--------------|----------|--------------|----------|
| | IN-J1 | IN-J2 | IN-J1 | IN-J2 | IN-J1 ON | IN-J2 ON | J1-J1 ON | J2-J2 ON |
| | | | | | | | | |
| 10 | 0.01 | 0.01 | 82.30 | 90.71 | 1.03 | 1.03 | 1.02 | 1.02 |
| 20 | 0.01 | 0.00 | 93.05 | 83.47 | 1.01 | 1.01 | 1.01 | 1.01 |
| 30 | 0.00 | 0.00 | 101.71 | 90.90 | 1.01 | 1.01 | 1.01 | 1.01 |
| 40 | 0.00 | 0.01 | 100.57 | 97.38 | 1.00 | 1.00 | 1.00 | 1.00 |
| 50 | 0.00 | 0.01 | 92.24 | 98.05 | 1.00 | 1.00 | 1.00 | 1.00 |
| 60 | 0.00 | 0.01 | 96.84 | 106.71 | 1.00 | 1.00 | 1.00 | 1.00 |
| 70 | 0.01 | 0.01 | 102.16 | 94.49 | 1.00 | 1.00 | 1.00 | 1.00 |
| 80 | 0.01 | 0.01 | 108.37 | 93.38 | 1.00 | 1.00 | 1.00 | 1.00 |
| 90 | 0.01 | 0.01 | 99.93 | 111.53 | 1.00 | 1.00 | 1.00 | 1.00 |
| 100 | 0.01 | 0.01 | 99.05 | 96.71 | 1.00 | 1.00 | 1.00 | 1.00 |
| 200 | 0.01 | 0.01 | 98.44 | 93.94 | 1.01 | 1.01 | 1.01 | 1.01 |
| 300 | 0.01 | 0.02 | 96.41 | 103.71 | 1.02 | 1.01 | 1.01 | 1.01 |
| 400 | 0.02 | 0.02 | 103.77 | 109.75 | 1.02 | 1.02 | 1.02 | 1.02 |
| 500 | 0.02 | 0.03 | 100.69 | 100.37 | 1.02 | 1.02 | 1.02 | 1.02 |
| 600 | 0.02 | 0.03 | 108.86 | 104.91 | 1.03 | 1.02 | 1.03 | 1.02 |
| 700 | 0.03 | 0.03 | 109.87 | 111.02 | 1.03 | 1.03 | 1.03 | 1.03 |
| 800 | 0.03 | 0.03 | 101.54 | 107.55 | 1.04 | 1.03 | 1.03 | 1.03 |
| 900 | 0.03 | 0.04 | 108.20 | 114.82 | 1.04 | 1.03 | 1.04 | 1.03 |
| 1000 | 0.03 | 0.04 | 111.87 | 110.53 | 1.04 | 1.04 | 1.04 | 1.04 |
| 2000 | 0.05 | 0.06 | 109.46 | 105.29 | 1.07 | 1.06 | 1.08 | 1.07 |
| 3000 | 0.06 | 0.07 | 107.57 | 103.22 | 1.11 | 1.09 | 1.11 | 1.10 |
| 4000 | 0.08 | 0.09 | 101.21 | 104.22 | 1.14 | 1.13 | 1.14 | 1.13 |
| 5000 | 0.09 | 0.11 | 113.52 | 101.88 | 1.16 | 1.14 | 1.15 | 1.14 |
| 6000 | 0.10 | 0.11 | 101.26 | 105.86 | 1.15 | 1.13 | 1.16 | 1.13 |
| 7000 | 0.10 | 0.12 | 106.61 | 110.40 | 1.15 | 1.12 | 1.15 | 1.12 |
| 8000 | 0.11 | 0.12 | 102.05 | 106.71 | 1.13 | 1.10 | 1.12 | 1.09 |
| 9000 | 0.11 | 0.12 | 103.46 | 110.40 | 1.10 | 1.07 | 1.09 | 1.06 |
| 10000 | 0.11 | 0.13 | 107.00 | 111.36 | 1.07 | 1.04 | 1.07 | 1.03 |
| 11000 | 0.11 | 0.13 | 110.95 | 122.17 | 1.05 | 1.03 | 1.06 | 1.03 |
| 12000 | 0.12 | 0.13 | 108.48 | 102.15 | 1.04 | 1.02 | 1.04 | 1.02 |
| 13000 | 0.12 | 0.14 | 107.81 | 110.50 | 1.04 | 1.02 | 1.04 | 1.01 |
| 14000 | 0.12 | 0.14 | 109.99 | 113.35 | 1.04 | 1.02 | 1.05 | 1.01 |
| 15000 | 0.13 | 0.15 | 109.63 | 112.49 | 1.03 | 1.01 | 1.04 | 1.01 |
| 16000 | 0.13 | 0.15 | 106.49 | 120.67 | 1.03 | 1.02 | 1.03 | 1.02 |
| 17000 | 0.14 | 0.16 | 107.29 | 113.86 | 1.03 | 1.02 | 1.04 | 1.03 |
| 18000 | 0.15 | 0.17 | 116.61 | 105.69 | 1.06 | 1.04 | 1.07 | 1.05 |
| 19000 | 0.16 | 0.17 | 101.67 | 105.23 | 1.08 | 1.06 | 1.09 | 1.06 |
| 20000 | 0.16 | 0.18 | 105.64 | 105.19 | 1.08 | 1.06 | 1.07 | 1.04 |
| 21000 | 0.16 | 0.18 | 104.93 | 109.37 | 1.03 | 1.06 | 1.02 | 1.05 |
| 22000 | 0.17 | 0.20 | 111.46 | 100.12 | 1.04 | 1.10 | 1.04 | 1.11 |
| 23000 | 0.18 | 0.21 | 103.34 | 113.41 | 1.11 | 1.15 | 1.10 | 1.15 |
| 24000 | 0.20 | 0.22 | 104.21 | 103.04 | 1.19 | 1.20 | 1.19 | 1.19 |
| 25000 | 0.23 | 0.24 | 106.04 | 113.53 | 1.26 | 1.23 | 1.26 | 1.23 |
| 26000 | 0.24 | 0.25 | 100.32 | 109.68 | 1.28 | 1.25 | 1.28 | 1.24 |
| 27000 | 0.23 | 0.24 | 115.44 | 99.29 | 1.26 | 1.24 | 1.25 | 1.23 |
| 28000 | 0.21 | 0.23 | 95.58 | 99.65 | 1.22 | 1.22 | 1.20 | 1.20 |
| 29000 | 0.20 | 0.23 | 91.80 | 100.44 | 1.17 | 1.18 | 1.18 | 1.19 |
| 30000 | 0.20 | 0.22 | 112.18 | 93.62 | 1.15 | 1.15 | 1.16 | 1.16 |
| 31000 | 0.21 | 0.23 | 95.53 | 100.83 | 1.15 | 1.15 | 1.16 | 1.16 |
| 32000 | 0.21 | 0.24 | 93.73 | 92.58 | 1.16 | 1.19 | 1.17 | 1.19 |
| 33000 | 0.22 | 0.25 | 100.62 | 94.19 | 1.18 | 1.22 | 1.19 | 1.23 |
| 34000 | 0.23 | 0.28 | 91.60 | 95.31 | 1.19 | 1.24 | 1.20 | 1.25 |
| 35000 | 0.24 | 0.27 | 98.19 | 99.63 | 1.20 | 1.24 | 1.20 | 1.24 |
| 36000 | 0.22 | 0.25 | 93.50 | 104.12 | 1.17 | 1.18 | 1.16 | 1.17 |
| 37000 | 0.20 | 0.22 | 91.69 | 98.15 | 1.10 | 1.08 | 1.09 | 1.06 |
| 38000 | 0.20 | 0.22 | 95.32 | 97.47 | 1.06 | 1.00 | 1.05 | 1.01 |
| 39000 | 0.20 | 0.22 | 103.87 | 94.16 | 1.07 | 1.03 | 1.06 | 1.01 |
| 40000 | 0.22 | 0.23 | 96.85 | 103.99 | 1.09 | 1.05 | 1.10 | 1.06 |
| 41000 | 0.22 | 0.25 | 102.86 | 97.26 | 1.11 | 1.11 | 1.12 | 1.12 |
| 42000 | 0.23 | 0.26 | 94.43 | 101.56 | 1.17 | 1.18 | 1.17 | 1.19 |
| 43000 | 0.26 | 0.28 | 109.78 | 102.03 | 1.25 | 1.24 | 1.24 | 1.23 |
| 44000 | 0.29 | 0.30 | 101.32 | 97.42 | 1.27 | 1.25 | 1.26 | 1.23 |
| 45000 | 0.26 | 0.27 | 94.26 | 97.77 | 1.22 | 1.15 | 1.19 | 1.16 |
| 46000 | 0.22 | 0.25 | 105.03 | 99.02 | 1.11 | 1.03 | 1.07 | 1.07 |
| 47000 | 0.23 | 0.28 | 102.70 | 95.98 | 1.08 | 1.13 | 1.08 | 1.15 |
| 48000 | 0.24 | 0.29 | 87.77 | 94.66 | 1.17 | 1.23 | 1.15 | 1.21 |
| 49000 | 0.26 | 0.29 | 85.19 | 87.95 | 1.22 | 1.24 | 1.19 | 1.21 |
| 50000 | 0.30 | 0.26 | 80.90 | 78.84 | 1.21 | 1.18 | 1.18 | 1.16 |



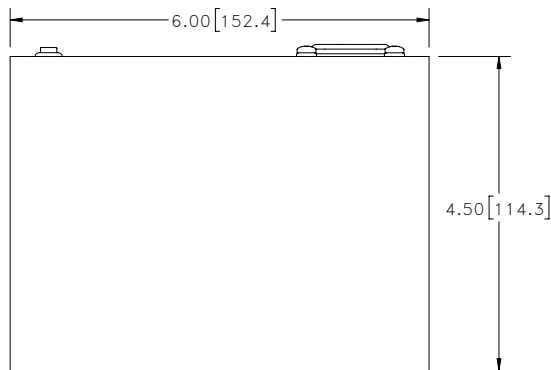
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Typical Performance Curves per Switch

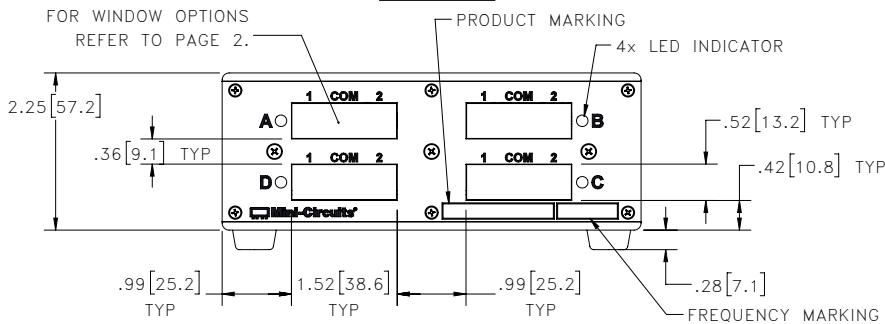


Outline Dimensions

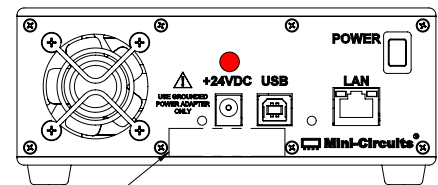
LM3149



TOP VIEW

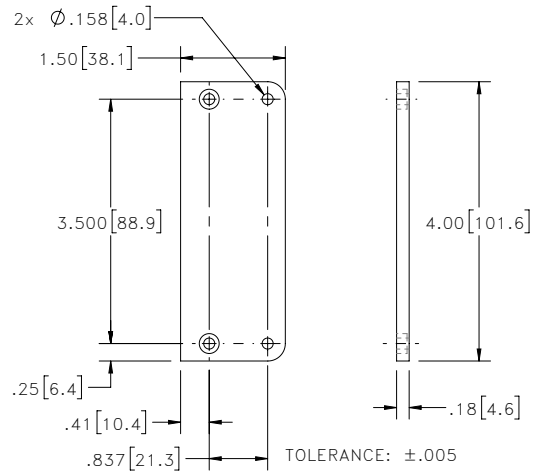


FRONT VIEW



REAR VIEW

BRACKET OPTION
ONE SET OF 2 EACH

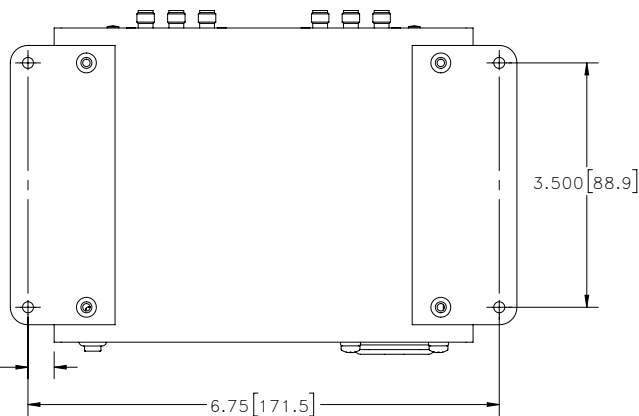


INSTRUCTIONS FOR MOUNTING
BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD
SCREWDRIVER

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.

BOTTOM VIEW
SHOWN WITH RUBBER FEET REMOVED AND BRACKETS INSTALLED.



BOTTOM VIEW

Notes:

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 (Model): (1SPDT) TBD. (2SPDT) 880 grams. (3SPDT) TBD. (4SPDT) 960 grams
4. Marking may contain other features or characters for internal lot control.



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

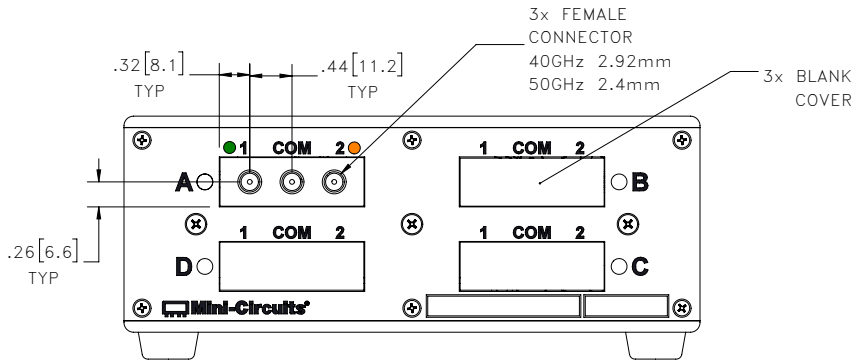


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

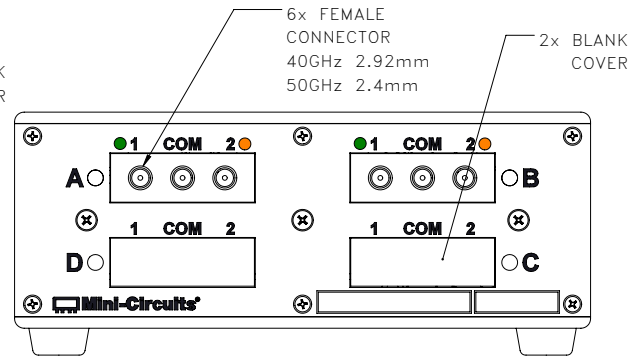
RF/IF MICROWAVE COMPONENTS

Outline Dimensions

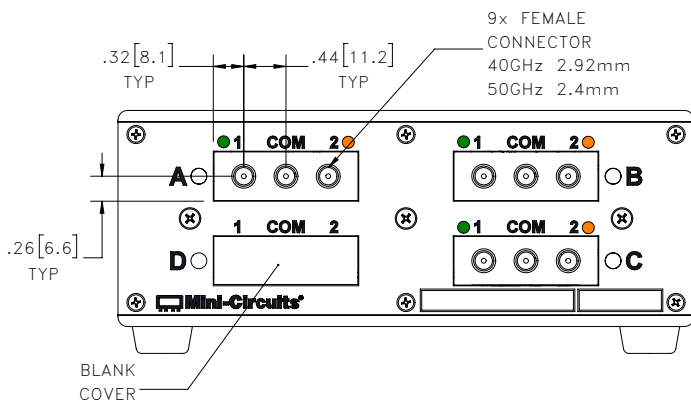
LM3149



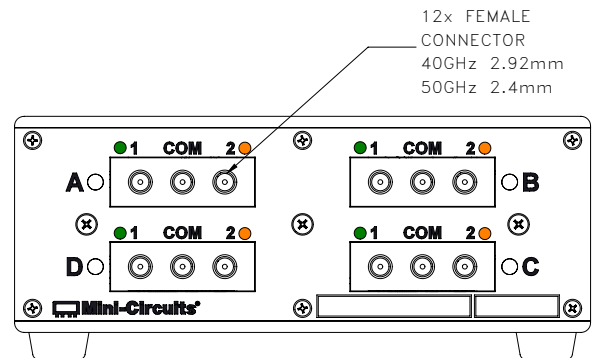
1SPDT 40GHz/1SPDT 50GHz MODELS



2SPDT 40GHz/2SPDT 50GHz MODELS



3SPDT 40GHz/3SPDT 50GHz MODELS



4SPDT 40GHz/4SPDT 50GHz MODELS



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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 |