

# Programmable Attenuator

RUDAT-6000-30

50Ω 0 – 30 dB, 0.25 dB step 1 to 6000 MHz

## The Big Deal

- Attenuation range, 30 dB
- Fine attenuation resolution, 0.25 dB
- Short attenuation transition time (650 ns)
- Compact size, 2.0 x 3.0 x 0.6"
- **USB and RS232** control

## Applications

- Automated Test Equipment (ATE)
- WiMAX, 3G, 4G, LTE, DVB Fading Simulators
- Laboratory Instrumentation
- Handover system Evaluation
- Power level cycling



Software Package

Case Style: MS1813

### Included Accessories

| Model No.   | Description       | Qty. |
|-------------|-------------------|------|
| MUSB-CBL-3+ | 2.6 ft. USB cable | 1    |

### RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

## Product Overview

Mini-Circuits' RUDAT-6000-30 is a general purpose, single channel programmable attenuator suitable for a wide range of signal level control applications from 1 MHz to 6 GHz. The Attenuator provides 0 to 30 dB attenuation in 0.25 dB steps. Its unique design maintains linear attenuation change per dB, even at the highest attenuation settings.

The attenuator is housed in a compact and rugged package with SMA female connectors on the bi-directional input and output RF ports, a standard 9 pin D-Sub and a USB type Mini-B power and control ports.

The attenuator can be controlled via USB or RS232 (via D-Sub connector). Full software support is provided and can be downloaded from our website any time at <http://www.minicircuits.com/softwaredownload/patt.html>. The package includes 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                                                                                                                                                                   |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USB control                                      | The RUDAT-6000-30 can be controlled from any Windows® or Linux® computer with a USB connection. Power may be supplied via either USB or the D-sub connector                  |
| RS232 control                                    | The user may also control the RUDAT-6000-30 via RS232 connection, allowing serial communication with the device. Power may be supplied via either USB or the D-sub connector |
| Programmable attenuation sweep and Hop sequences | The RUDAT-6000-30 can be programmed with a timed sequence of attenuation settings, to run without any additional external control                                            |
| 30 dB attenuation range.                         | The RUDAT-6000-30 provides high-accuracy attenuation up to 30 dB in 0.25 dB steps, allowing the user precise level control over a broad attenuation and frequency range.     |
| High linearity                                   | Typical input IP3 of +50 dBm up to 6000 MHz                                                                                                                                  |

**Trademarks:** Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Linux is a registered trademark of Linus Torvalds. Mac is a registered trademark of Apple Corporation. Pentium is a registered trademark of Intel Corporation. Neither Mini-Circuits nor the Mini-Circuits RUDAT-series attenuators are affiliated with or endorsed by the owners of the above referenced trademarks.

Mini-Circuits and the Mini-Circuits logo are registered trademarks of Scientific Components Corporation.



[www.minicircuits.com](http://www.minicircuits.com) P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

Rev. K  
ECO-008003  
EDR-10982/5  
RUDAT-6000-30  
RAV  
210518  
Page 1 of 9

## Electrical Specifications <sup>1</sup> at 0°C to 50°C

| Parameter                                                      | Frequency range                                                                                                        | Conditions                                   | Min. | Typ.  | Max.                         | Units |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------|-------|------------------------------|-------|
| Attenuation range                                              | 1 - 6000 MHz                                                                                                           | 0.25 dB step                                 | 0    | –     | 30                           | dB    |
| Attenuation accuracy <sup>2</sup>                              | 1 - 6000 MHz                                                                                                           | @ 0.25 - 10 dB                               | –    | ±0.20 | ±(0.4+7.5% of nominal value) | dB    |
|                                                                |                                                                                                                        | @ 10.25 - 20 dB                              | –    | ±0.40 | ±(0.95+2% of nominal value)  |       |
|                                                                |                                                                                                                        | @ 20.25 - 30 dB                              | –    | ±0.35 | ±1.30                        |       |
| Insertion Loss                                                 | 1 - 3000 MHz                                                                                                           | @ 0 dB                                       | –    | 1.8   | 3.0                          | dB    |
|                                                                | 3000 - 6000 MHz                                                                                                        |                                              | –    | 3.0   | 5.0                          |       |
| Input operating power <sup>3</sup><br>(RF In and RF Out ports) | 1 - 10 MHz                                                                                                             | @ 0 - 30 dB                                  | –    | –     | +10                          | dBm   |
|                                                                | 10 - 6000 MHz                                                                                                          |                                              | –    | –     | +20                          |       |
| Isolation In-Out                                               | 1 - 6000 MHz                                                                                                           | Note 4                                       | –    | 35    | –                            | dB    |
| IP3 Input <sup>5</sup>                                         | 1 - 6000 MHz                                                                                                           | @ 0 dB setting<br>(P <sub>IN</sub> =+10 dBm) | –    | +50   | –                            | dBm   |
| VSWR                                                           | 1 - 500 MHz                                                                                                            | @ 0 - 20 dB                                  | –    | 1.10  | –                            | :1    |
|                                                                |                                                                                                                        | @ 20.25 - 30 dB                              | –    | 1.05  | –                            |       |
|                                                                | 500 - 4000 MHz                                                                                                         | @ 0 - 30 dB                                  | –    | 1.15  | –                            |       |
|                                                                | 4000 - 6000 MHz                                                                                                        | @ 0 - 20 dB                                  | –    | 1.40  | –                            |       |
|                                                                |                                                                                                                        | @ 20.25 - 30 dB                              | –    | 1.40  | –                            |       |
| Min Dwell Time <sup>6</sup>                                    | 1 - 6000 MHz                                                                                                           | High speed mode                              | –    | 600   | –                            | µsec  |
| Attenuation Transition Time <sup>7</sup>                       | 1 - 6000 MHz                                                                                                           | -                                            | –    | 650   | –                            | nsec  |
| Supply Voltage <sup>8,9</sup>                                  | –                                                                                                                      | via USB port or D-Sub Pin#1                  | 4.75 | 5     | 5.25                         | V     |
| DC current draw                                                | –                                                                                                                      |                                              | –    | 60    | 80                           | mA    |
| RS232 logic levels                                             | Meets RS232 standard at all voltages with RS232 communications set to 9600 bps; 8 bit word; no parity; stop bit = ‘1’. |                                              |      |       |                              |       |

<sup>1</sup> Attenuator RF ports are interchangeable, and support simultaneous, bidirectional signal transmission, however the specifications are guaranteed for the RF in and RF out as noted on the label. There may be minor changes in performance when injecting signals to the RF Out port.

<sup>2</sup> Max accuracy defined as ±[absolute error+% of attenuation setting] for example when setting the attenuator to 18 dB attenuation the maximum error will be: ±(0.95+0.02x18)= ±(0.95+0.36)= ± 1.31 dB.

<sup>3</sup> Total operating input power from both RF In and RF Out out ports. Compression level not noted as it exceeds max safe operating power level.

<sup>4</sup> Isolation is defined as max attenuation plus insertion loss; this is the path loss through the attenuator when initially powered up. After a brief delay (~0.5 sec typically) the attenuator will revert to a user defined "power-up" state (either max attenuation or a pre-set value).

<sup>5</sup> Tested with 1 MHz span between signals.

<sup>6</sup> Minimum Dwell Time is the time the RUDAT will take to respond to a command to change attenuation states without communication delays. In PC control add communication delays (on the order of msec for USB) to get actual response time.

<sup>7</sup> Attenuation Transition Time is specified as the time between starting to change the attenuation state and settling on the requested attenuation state.

<sup>8</sup> Supply voltage +5V at Pin#1 of D-sub connector applies to units with S/N 11405010010 and greater.

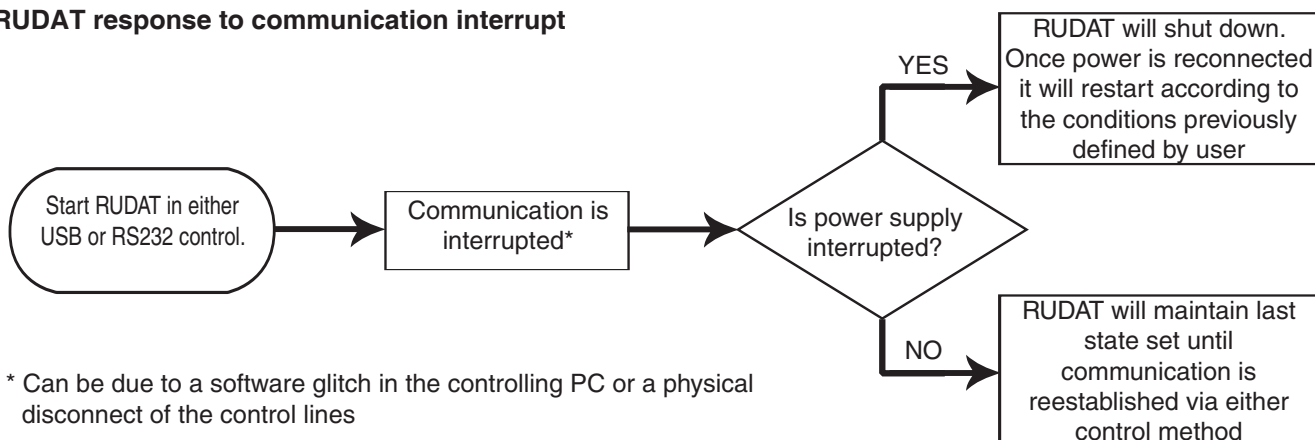
<sup>9</sup> Power on sequence for RS232 control: Connect 5V power followed by the control lines.

## Absolute Maximum Ratings

|                                     |                          |
|-------------------------------------|--------------------------|
| Operating Temperature               | 0°C to 50°C              |
| Storage Temperature                 | -20°C to 85°C            |
| Voltage input at RS232 receive pin  | -30V to +30V             |
| Voltage input at RS232 transmit pin | 0V to +4V                |
| Voltage input at RS232 Pin#1        | -1V to +6V               |
| V <sub>USB</sub> Max.               | 6V                       |
| DC voltage at RF port               | 16V                      |
| Total RF power for                  | @ 1 to 10 MHz +13 dBm    |
| RF In & RF Out                      | @ 10 to 6000 MHz +23 dBm |

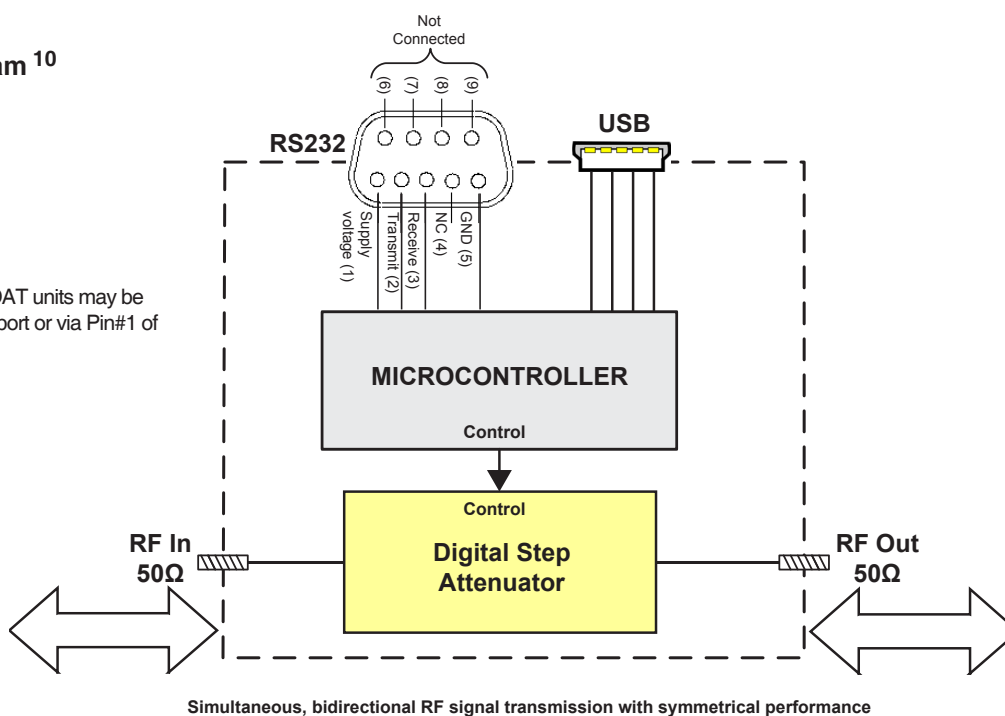
Permanent damage may occur if any of these limits are exceeded. Operation in the range between the max operating power and the absolute maximum rating for extended periods of time may result in reduced life and reliability.

## RUDAT response to communication interrupt



## Block Diagram <sup>10</sup>

The 5V<sub>DC</sub> for RUDAT units may be input via the USB port or via Pin#1 of the D-Sub port.



### Connections

|        |                          |
|--------|--------------------------|
| RF IN  | (SMA female)             |
| RF OUT | (SMA female)             |
| USB    | (USB type Mini-B female) |
| RS232* | (9 Pin D-Sub female)     |

### \*9 Pin D-Sub Pin Connections <sup>10</sup>

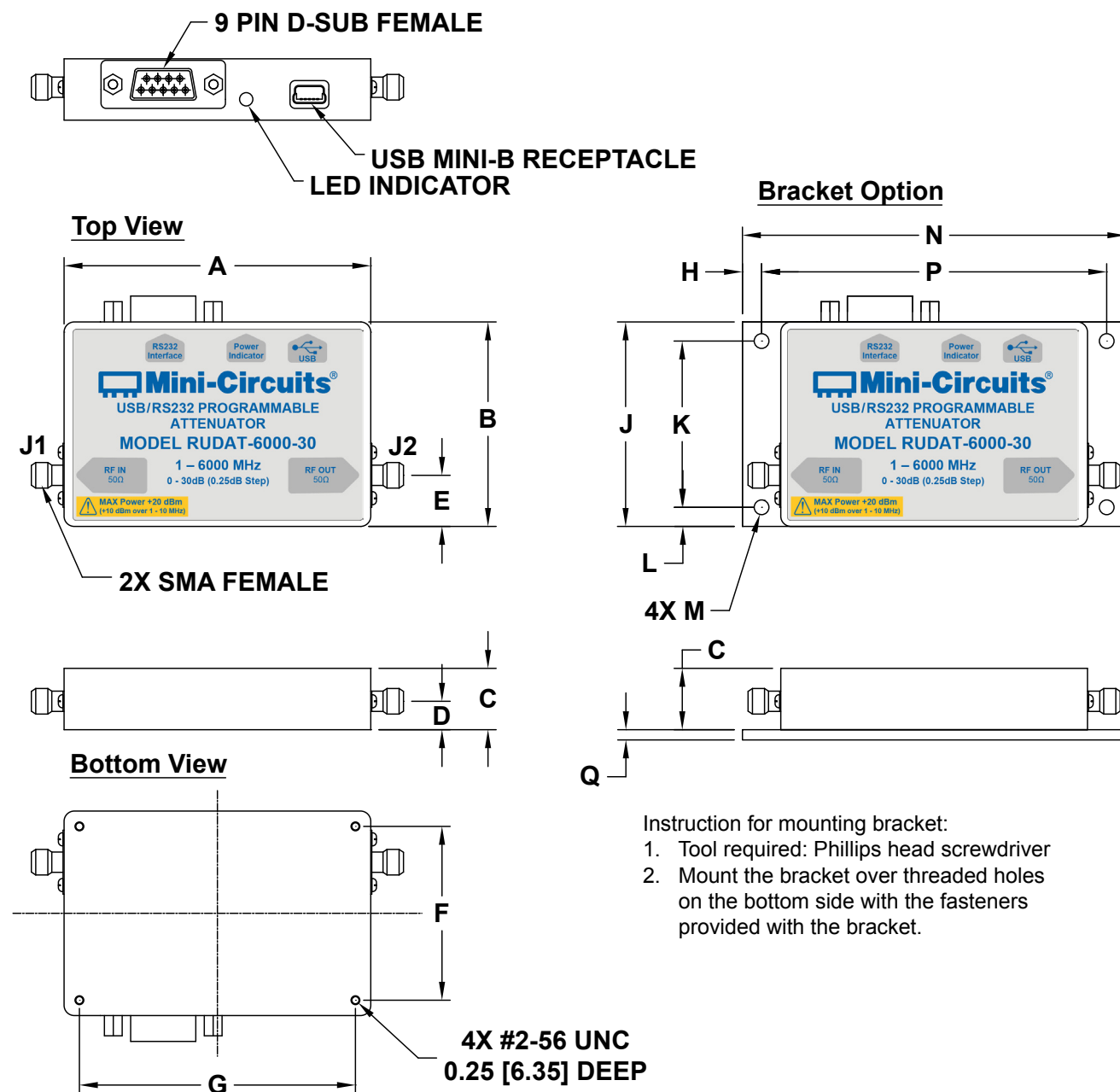
| PIN Number | Function                            |
|------------|-------------------------------------|
| 2          | Transmit                            |
| 3          | Receive                             |
| 5          | GND                                 |
| 1          | +5 V <sub>DC</sub> <sup>11,12</sup> |
| 4,6-9      | Not Connected                       |

<sup>10</sup> Block diagram and connection shown apply to units with S/N 11405010010 and greater, for units with lower S/N see archive section on page 9.

<sup>11</sup> Pin#1 can be used as supply voltage (+) pin instead of USB connection. When USB power is connected, Pin#1 may be connected to GND or supply voltage (+) or remain disconnected.

<sup>12</sup> Power on sequence for RS232 control: Connect 5V power followed by the control lines.

## Outline Drawing (MS1813)

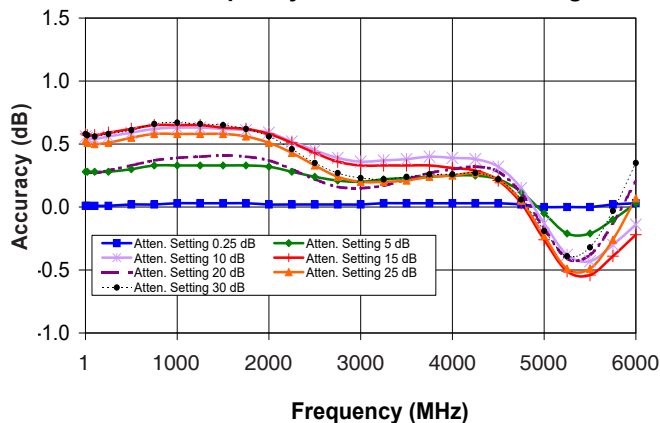


## Outline Dimensions ( $\frac{\text{inch}}{\text{mm}}$ )

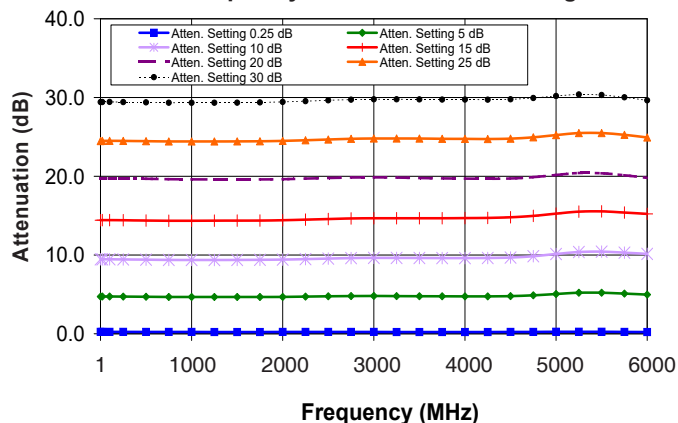
| A    | B    | C    | D    | E    | F     | G     | H     | J    | K     | L     | M     | N    | P     | Q     | WT. GRAMS |
|------|------|------|------|------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-----------|
| 3.00 | 2.00 | 0.60 | 0.28 | 0.50 | 1.700 | 2.700 | 0.188 | 2.00 | 1.625 | 0.188 | 0.144 | 3.75 | 3.375 | 0.100 | 130       |
| 76.2 | 50.8 | 15.2 | 7.1  | 12.7 | 43.18 | 68.58 | 4.76  | 50.8 | 41.28 | 4.76  | 3.66  | 95.3 | 85.72 | 2.54  |           |

## Typical Performance Curves

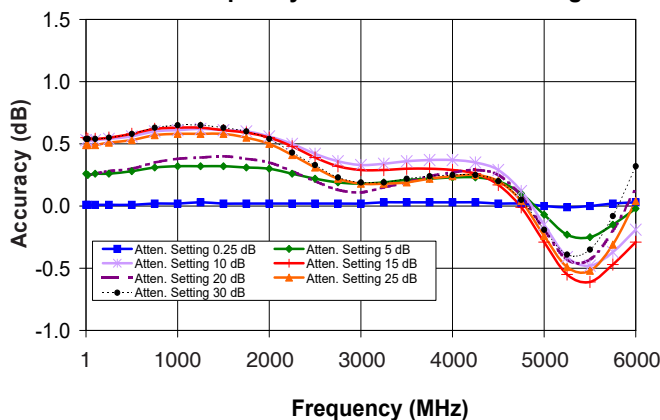
**Attenuation Accuracy @ +25°C  
vs. Frequency over Attenuation settings**



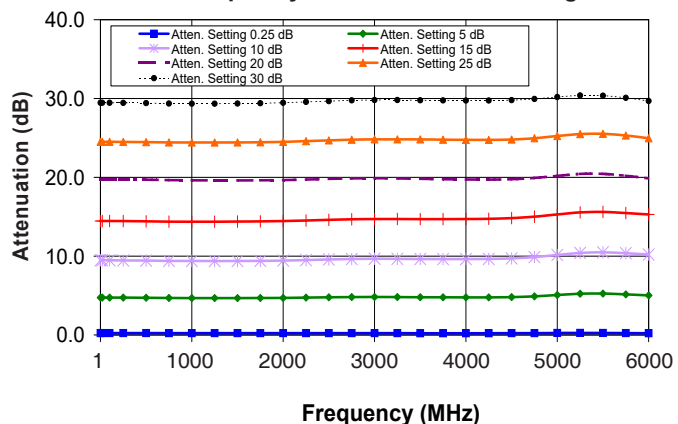
**Attenuation relative to Insertion Loss @ +25°C  
vs. Frequency over Attenuation settings**



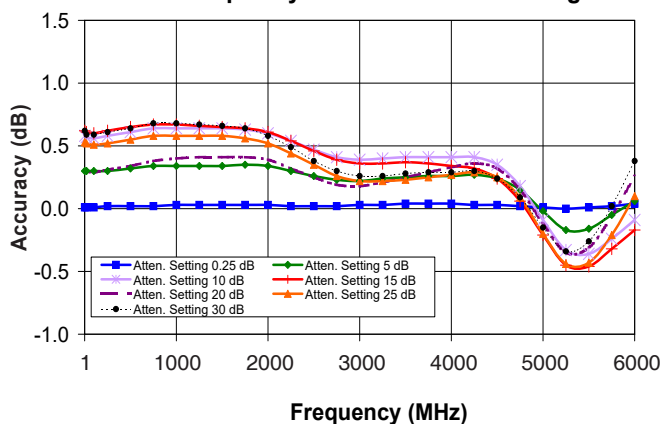
**Attenuation Accuracy @ 0°C  
vs. Frequency over Attenuation settings**



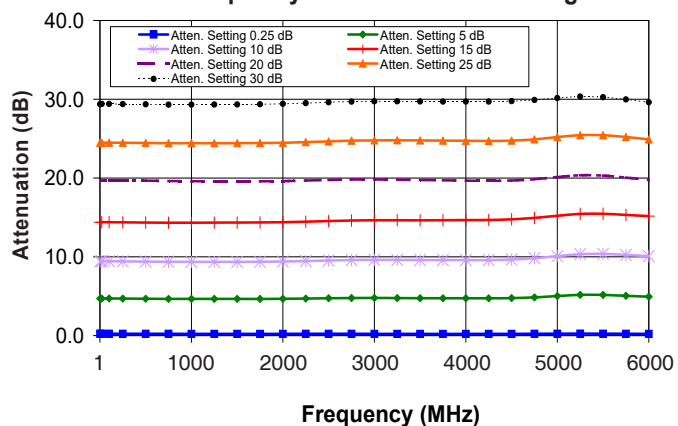
**Attenuation relative to Insertion Loss @ 0°C  
vs. Frequency over Attenuation settings**



**Attenuation Accuracy @ +50°C  
vs. Frequency over Attenuation settings**

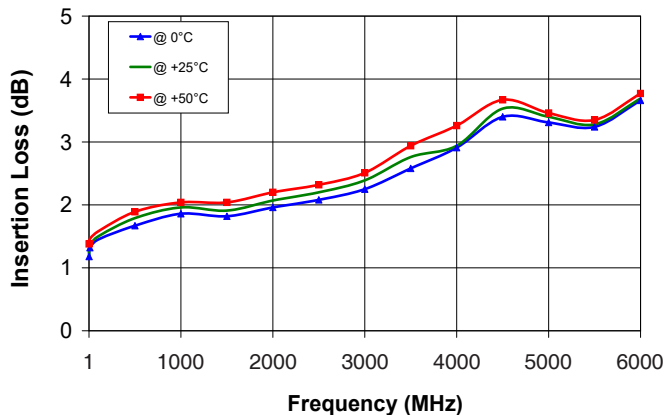


**Attenuation relative to Insertion Loss @ +50°C  
vs. Frequency over Attenuation settings**

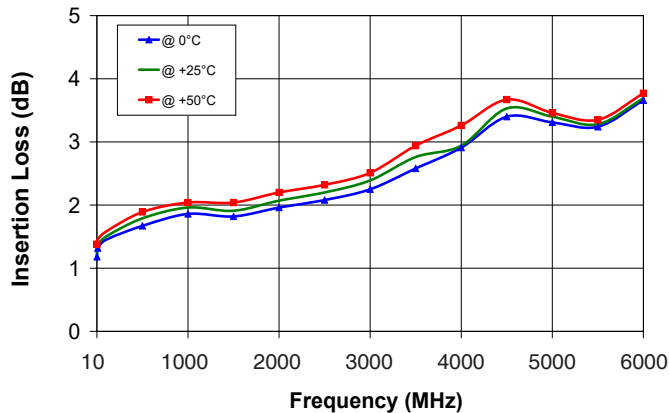


## Typical Performance Curves (Continued)

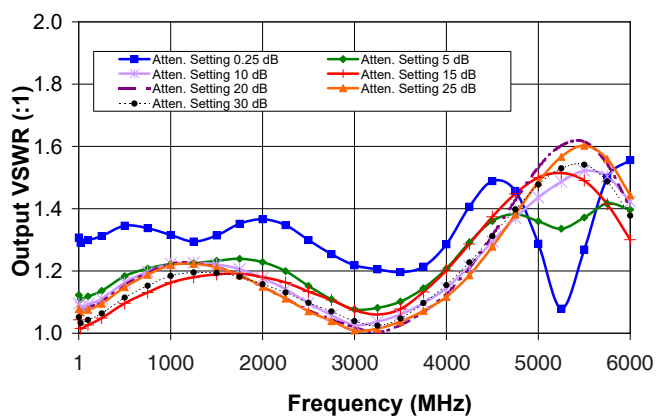
Insertion Loss @ Input Power 0dBm  
vs. Frequency over Temperatures



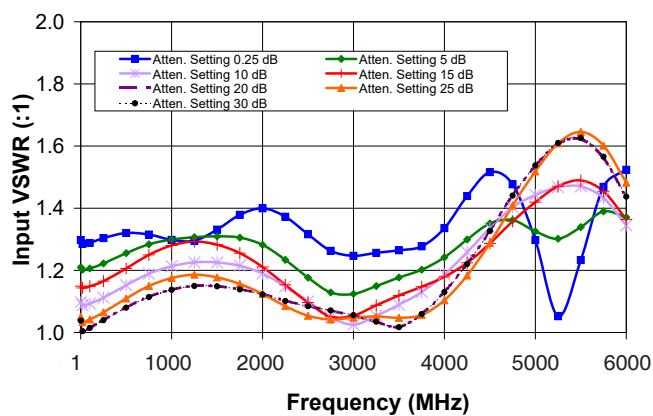
Insertion Loss @ Input Power +20 dBm  
vs. Frequency over Temperatures



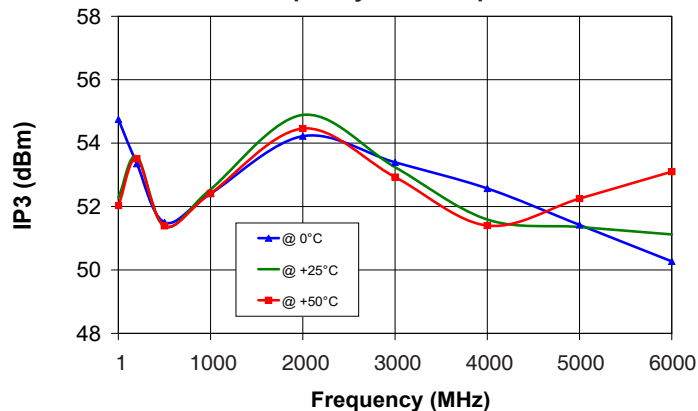
Output VSWR @ +25°C  
vs. Frequency over Attenuation settings



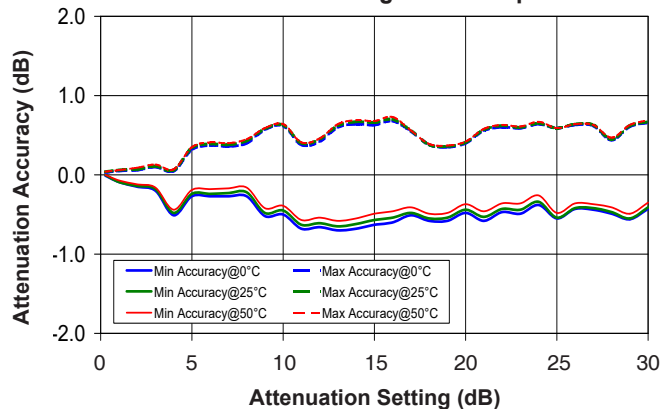
Input VSWR @ +25°C  
vs. Frequency over Attenuation settings



Input IP3 @ 0dB Attenuation  
vs. Frequency over Temperatures



Typical Attenuation Accuracy  
vs. Attenuation settings over Temperature



## 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 <http://www.minicircuits.com/softwaredownload/patt.html>
- Please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com) for support

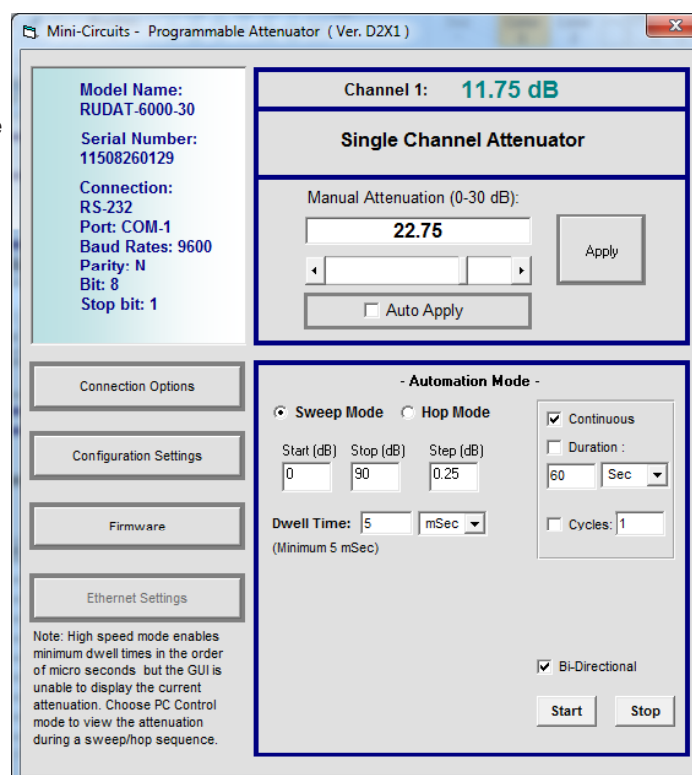
## Minimum System Requirements

| Parameter           | Requirements                      |                                                                                           |
|---------------------|-----------------------------------|-------------------------------------------------------------------------------------------|
| Interface           | USB HID or RS232                  |                                                                                           |
| System requirements | GUI:                              | Windows 32 & 64 bit systems from Windows 98 up to Windows 10                              |
|                     | USB API (ActiveX & .Net)          | Windows 32 & 64 bit systems with ActiveX or .Net support from Windows 98 up to Windows 10 |
|                     | USB direct programming support    | Linux, Windows systems from Windows 98 up to Windows 10                                   |
|                     | RS232                             | Any computer with a serial port and RS232 support                                         |
| Hardware            | Pentium® II or higher, RAM 256 MB |                                                                                           |

## Graphical User Interface (GUI) for Windows

### Key Features:

- Manual attenuation setting
- Sweep and Hop attenuation sequences directed from the PC, or entire sequence loaded into RUDAT.
- Attenuator address configuration and Firmware upgrade
- Attenuation at power up may be set to selected attenuation level or last attenuation state recorded.
- USB or RS232 control of RUDAT



## Application Programming Interface (API)

### Windows Support:

- API DLL files exposing the full switch functionality See programming manual at [https://www.minicircuits.com/softwaredownload/Prog\\_Manual-6-Programmable\\_Attenuator.pdf](https://www.minicircuits.com/softwaredownload/Prog_Manual-6-Programmable_Attenuator.pdf) for details
  - 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 tested environments)

### Linux Support:

- Full switch control in a Linux environment is achieved by way of USB interrupt commands. See programming manual at [https://www.minicircuits.com/softwaredownload/Prog\\_Manual-6-Programmable\\_Attenuator.pdf](https://www.minicircuits.com/softwaredownload/Prog_Manual-6-Programmable_Attenuator.pdf) for details



## Ordering Information

| Model         | Description                       |
|---------------|-----------------------------------|
| RUDAT-6000-30 | USB/RS232 Programmable Attenuator |

| Included Accessories                                                              | Part No.    | Description                                                         |
|-----------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------|
|  | MUSB-CBL-3+ | 2.6 ft (0.8 m) USB Cable: USB type A(Male) to USB type Mini-B(Male) |

| Optional Accessories         | Description                                                                          |
|------------------------------|--------------------------------------------------------------------------------------|
| USB-AC/DC-5 <sup>13,14</sup> | AC/DC 5V <sub>DC</sub> Power Adapter with US, EU, IL, UK, AUS, and China power plugs |
| MUSB-CBL-3+ (spare)          | 2.6 ft (0.8 m) USB Cable: USB type A(Male) to USB type Mini-B(Male)                  |
| MUSB-CBL-7+                  | 6.6 ft (2.0 m) USB Cable: USB type A(Male) to USB type Mini-B(Male)                  |
| D-SUB9-MF-6+                 | 6 ft RS232 Cable: 9 pin D-sub(Male) to 9 pin D-sub(Female)                           |
| BKT-3901+                    | Bracket kit including 3.75" x 2.00" bracket, mounting screws and washers             |

<sup>13</sup> Not used in USB control. USB-AC/DC-5 can be used to provide the 5V<sub>DC</sub> power when control is via RS232; units with S/N 11405010010 and greater can also accept DC supply voltage at Pin#1 of the D-sub connector.

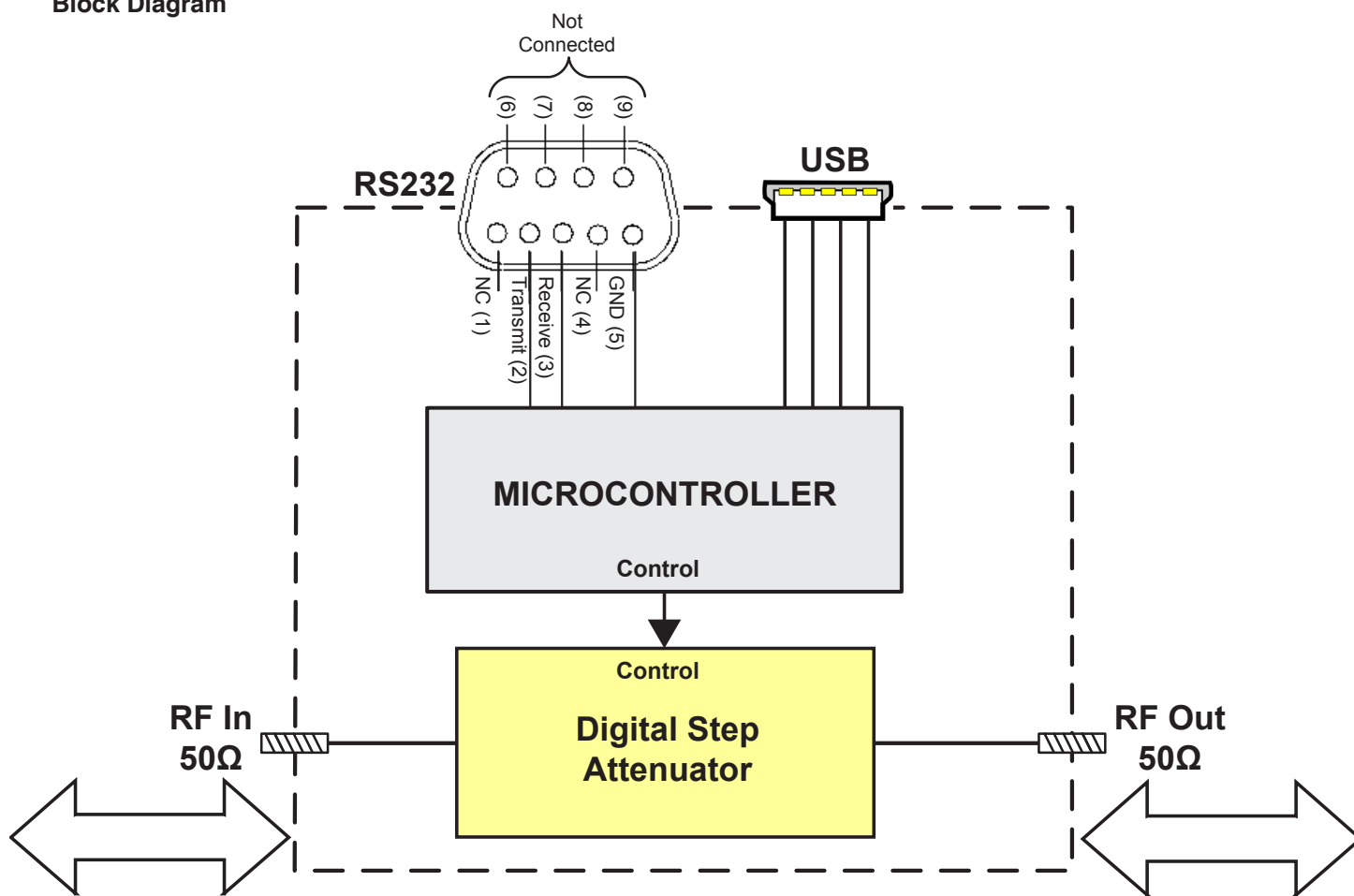
<sup>14</sup> Power plugs for other countries are also available, Plugs for other countries are also available, if you need a power plug for a country not listed please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com)

## Additional 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)

Archive section (applicable to units with S/N lower than 11405010010)

## Block Diagram



Simultaneous, bidirectional RF signal transmission with symmetrical performance

### Connections

|        |                          |
|--------|--------------------------|
| RF IN  | (SMA female)             |
| RF OUT | (SMA female)             |
| USB    | (USB type Mini-B female) |
| RS232* | (9 Pin D-Sub female)     |

### \*9 Pin D-Sub Pin Connections <sup>16</sup>

| Pin Number | Function      |
|------------|---------------|
| 2          | Transmit      |
| 3          | Receive       |
| 5          | GND           |
| 1,4,6-9    | Not Connected |

<sup>16</sup> Supply voltage can be provided via USB port only. When using RS232 control, power must be provided to the USB port via either USB-AC/DC-5 power adaptor or a USB bus.

# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | Attenuation relative to Insertion Loss<br>(dB) |      |       |       |       |       |       |
|--------------------|------------------------------------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                        | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 0.24                                           | 4.55 | 9.27  | 14.30 | 19.32 | 24.11 | 29.12 |
| 5                  | 0.25                                           | 4.55 | 9.28  | 14.30 | 19.33 | 24.12 | 29.13 |
| 10                 | 0.25                                           | 4.55 | 9.28  | 14.31 | 19.33 | 24.12 | 29.13 |
| 20                 | 0.25                                           | 4.55 | 9.28  | 14.31 | 19.33 | 24.12 | 29.13 |
| 50                 | 0.24                                           | 4.55 | 9.28  | 14.30 | 19.32 | 24.12 | 29.12 |
| 100                | 0.24                                           | 4.55 | 9.28  | 14.30 | 19.33 | 24.12 | 29.13 |
| 200                | 0.24                                           | 4.54 | 9.27  | 14.29 | 19.32 | 24.11 | 29.12 |
| 500                | 0.24                                           | 4.52 | 9.23  | 14.26 | 19.27 | 24.08 | 29.08 |
| 750                | 0.23                                           | 4.51 | 9.20  | 14.23 | 19.23 | 24.05 | 29.04 |
| 1000               | 0.23                                           | 4.51 | 9.19  | 14.23 | 19.22 | 24.05 | 29.04 |
| 1500               | 0.23                                           | 4.49 | 9.19  | 14.23 | 19.20 | 24.06 | 29.08 |
| 2000               | 0.24                                           | 4.56 | 9.32  | 14.38 | 19.36 | 24.25 | 29.31 |
| 2500               | 0.24                                           | 4.66 | 9.49  | 14.58 | 19.57 | 24.51 | 29.59 |
| 3000               | 0.23                                           | 4.65 | 9.49  | 14.59 | 19.54 | 24.55 | 29.64 |
| 3500               | 0.23                                           | 4.63 | 9.48  | 14.61 | 19.50 | 24.55 | 29.66 |
| 4000               | 0.25                                           | 4.74 | 9.70  | 14.86 | 19.72 | 24.79 | 29.91 |
| 4500               | 0.28                                           | 5.15 | 10.34 | 15.53 | 20.41 | 25.50 | 30.57 |
| 5000               | 0.28                                           | 5.39 | 10.76 | 15.94 | 20.80 | 25.93 | 30.87 |
| 5500               | 0.25                                           | 5.13 | 10.47 | 15.61 | 20.32 | 25.48 | 30.26 |
| 6000               | 0.22                                           | 4.86 | 10.12 | 15.23 | 19.62 | 24.74 | 29.39 |

| FREQUENCY<br>(MHz) | Attenuation accuracy relative to nominal attenuation setting<br>(dB) |       |       |       |       |       |       |
|--------------------|----------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                                              | 5 dB  | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 0.01                                                                 | 0.45  | 0.73  | 0.70  | 0.68  | 0.89  | 0.88  |
| 5                  | 0.00                                                                 | 0.45  | 0.72  | 0.70  | 0.67  | 0.88  | 0.87  |
| 10                 | 0.00                                                                 | 0.45  | 0.72  | 0.69  | 0.67  | 0.88  | 0.87  |
| 20                 | 0.00                                                                 | 0.45  | 0.72  | 0.69  | 0.67  | 0.88  | 0.87  |
| 50                 | 0.01                                                                 | 0.45  | 0.72  | 0.70  | 0.68  | 0.88  | 0.88  |
| 100                | 0.01                                                                 | 0.45  | 0.72  | 0.70  | 0.67  | 0.88  | 0.87  |
| 200                | 0.01                                                                 | 0.46  | 0.73  | 0.71  | 0.68  | 0.89  | 0.88  |
| 500                | 0.01                                                                 | 0.48  | 0.77  | 0.74  | 0.73  | 0.92  | 0.92  |
| 750                | 0.02                                                                 | 0.49  | 0.80  | 0.77  | 0.77  | 0.95  | 0.96  |
| 1000               | 0.02                                                                 | 0.49  | 0.81  | 0.77  | 0.78  | 0.95  | 0.96  |
| 1500               | 0.02                                                                 | 0.51  | 0.81  | 0.77  | 0.80  | 0.94  | 0.92  |
| 2000               | 0.01                                                                 | 0.44  | 0.68  | 0.62  | 0.64  | 0.75  | 0.69  |
| 2500               | 0.01                                                                 | 0.34  | 0.51  | 0.42  | 0.43  | 0.49  | 0.41  |
| 3000               | 0.02                                                                 | 0.35  | 0.51  | 0.41  | 0.46  | 0.45  | 0.36  |
| 3500               | 0.02                                                                 | 0.37  | 0.52  | 0.39  | 0.50  | 0.45  | 0.34  |
| 4000               | 0.00                                                                 | 0.26  | 0.30  | 0.14  | 0.28  | 0.21  | 0.09  |
| 4500               | -0.03                                                                | -0.15 | -0.34 | -0.53 | -0.41 | -0.50 | -0.57 |
| 5000               | -0.03                                                                | -0.39 | -0.76 | -0.94 | -0.80 | -0.93 | -0.87 |
| 5500               | 0.00                                                                 | -0.13 | -0.47 | -0.61 | -0.32 | -0.48 | -0.26 |
| 6000               | 0.03                                                                 | 0.14  | -0.12 | -0.23 | 0.38  | 0.26  | 0.61  |

### 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-Circuit's 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-Circuit's website at [www.minicircuits.com/MCISStore/terms.jsp](http://www.minicircuits.com/MCISStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | Input VSWR<br>(:1) |      |       |       |       |       |       |
|--------------------|--------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB            | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 1.28               | 1.20 | 1.09  | 1.14  | 1.04  | 1.04  | 1.04  |
| 5                  | 1.27               | 1.20 | 1.08  | 1.13  | 1.01  | 1.02  | 1.02  |
| 10                 | 1.27               | 1.20 | 1.08  | 1.13  | 1.01  | 1.02  | 1.01  |
| 20                 | 1.27               | 1.20 | 1.08  | 1.13  | 1.01  | 1.02  | 1.01  |
| 50                 | 1.27               | 1.20 | 1.08  | 1.13  | 1.01  | 1.03  | 1.02  |
| 100                | 1.27               | 1.21 | 1.09  | 1.14  | 1.02  | 1.04  | 1.02  |
| 200                | 1.28               | 1.22 | 1.10  | 1.16  | 1.03  | 1.06  | 1.03  |
| 500                | 1.30               | 1.26 | 1.15  | 1.21  | 1.08  | 1.11  | 1.08  |
| 750                | 1.31               | 1.30 | 1.20  | 1.26  | 1.12  | 1.15  | 1.12  |
| 1000               | 1.32               | 1.32 | 1.23  | 1.29  | 1.15  | 1.18  | 1.14  |
| 1500               | 1.50               | 1.37 | 1.27  | 1.29  | 1.19  | 1.19  | 1.19  |
| 2000               | 1.49               | 1.30 | 1.24  | 1.21  | 1.22  | 1.18  | 1.22  |
| 2500               | 1.26               | 1.11 | 1.13  | 1.09  | 1.20  | 1.17  | 1.20  |
| 3000               | 1.21               | 1.08 | 1.05  | 1.02  | 1.13  | 1.12  | 1.13  |
| 3500               | 1.37               | 1.20 | 1.15  | 1.12  | 1.14  | 1.10  | 1.14  |
| 4000               | 1.55               | 1.34 | 1.34  | 1.29  | 1.35  | 1.32  | 1.35  |
| 4500               | 1.37               | 1.36 | 1.51  | 1.50  | 1.62  | 1.60  | 1.63  |
| 5000               | 1.06               | 1.38 | 1.61  | 1.63  | 1.80  | 1.81  | 1.81  |
| 5500               | 1.51               | 1.52 | 1.66  | 1.69  | 1.87  | 1.91  | 1.88  |
| 6000               | 1.66               | 1.57 | 1.62  | 1.63  | 1.81  | 1.87  | 1.82  |

| FREQUENCY<br>(MHz) | Output VSWR<br>(:1) |      |       |       |       |       |       |
|--------------------|---------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB             | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 1.28                | 1.11 | 1.08  | 1.04  | 1.07  | 1.06  | 1.04  |
| 5                  | 1.27                | 1.10 | 1.06  | 1.01  | 1.05  | 1.05  | 1.02  |
| 10                 | 1.27                | 1.10 | 1.06  | 1.01  | 1.05  | 1.05  | 1.02  |
| 20                 | 1.27                | 1.10 | 1.06  | 1.00  | 1.05  | 1.05  | 1.02  |
| 50                 | 1.27                | 1.10 | 1.06  | 1.01  | 1.06  | 1.05  | 1.02  |
| 100                | 1.27                | 1.11 | 1.07  | 1.02  | 1.06  | 1.06  | 1.03  |
| 200                | 1.28                | 1.12 | 1.09  | 1.03  | 1.08  | 1.07  | 1.05  |
| 500                | 1.29                | 1.16 | 1.13  | 1.07  | 1.13  | 1.12  | 1.09  |
| 750                | 1.29                | 1.19 | 1.18  | 1.12  | 1.18  | 1.17  | 1.14  |
| 1000               | 1.31                | 1.23 | 1.21  | 1.17  | 1.21  | 1.21  | 1.18  |
| 1500               | 1.46                | 1.30 | 1.24  | 1.24  | 1.22  | 1.22  | 1.22  |
| 2000               | 1.48                | 1.29 | 1.22  | 1.26  | 1.20  | 1.20  | 1.22  |
| 2500               | 1.26                | 1.14 | 1.14  | 1.20  | 1.15  | 1.15  | 1.18  |
| 3000               | 1.19                | 1.07 | 1.07  | 1.13  | 1.10  | 1.09  | 1.11  |
| 3500               | 1.34                | 1.20 | 1.15  | 1.21  | 1.16  | 1.14  | 1.17  |
| 4000               | 1.53                | 1.35 | 1.32  | 1.39  | 1.35  | 1.32  | 1.34  |
| 4500               | 1.36                | 1.39 | 1.50  | 1.59  | 1.60  | 1.56  | 1.56  |
| 5000               | 1.08                | 1.41 | 1.63  | 1.68  | 1.77  | 1.74  | 1.70  |
| 5500               | 1.52                | 1.53 | 1.70  | 1.67  | 1.81  | 1.79  | 1.73  |
| 6000               | 1.65                | 1.51 | 1.60  | 1.51  | 1.65  | 1.66  | 1.59  |

### 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-Circuit's 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-Circuit's website at [www.minicircuits.com/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | IP3<br>(dBm) | Insertion Loss<br>@P <sub>IN</sub> =0 dBm<br>(dB) | Insertion Loss<br>@P <sub>IN</sub> =+20 dBm<br>(dB) |
|--------------------|--------------|---------------------------------------------------|-----------------------------------------------------|
| 1                  | 54.75        | -                                                 | -                                                   |
| 200                | 53.35        | 1.30                                              | 1.14                                                |
| 500                | 51.50        | 1.90                                              | 1.73                                                |
| 1000               | 52.41        | 2.08                                              | 1.92                                                |
| 2000               | 54.22        | 2.11                                              | 1.94                                                |
| 3000               | 53.40        | 2.18                                              | 1.99                                                |
| 4000               | 52.57        | 2.68                                              | 2.49                                                |
| 5000               | 51.42        | 3.18                                              | 2.99                                                |
| 6000               | 50.27        | 3.63                                              | 3.48                                                |

### 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-Circuit's 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-Circuit's website at [www.minicircuits.com/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ +25°C

| FREQUENCY<br>(MHz) | Attenuation relative to Insertion Loss<br>(dB) |      |       |       |       |       |       |
|--------------------|------------------------------------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                        | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 0.24                                           | 4.53 | 9.25  | 14.26 | 19.29 | 24.09 | 29.08 |
| 5                  | 0.24                                           | 4.53 | 9.25  | 14.27 | 19.30 | 24.09 | 29.09 |
| 10                 | 0.24                                           | 4.53 | 9.25  | 14.27 | 19.30 | 24.10 | 29.09 |
| 20                 | 0.24                                           | 4.53 | 9.25  | 14.27 | 19.30 | 24.10 | 29.09 |
| 50                 | 0.24                                           | 4.53 | 9.25  | 14.27 | 19.29 | 24.09 | 29.08 |
| 100                | 0.24                                           | 4.53 | 9.25  | 14.27 | 19.30 | 24.10 | 29.09 |
| 200                | 0.24                                           | 4.53 | 9.24  | 14.26 | 19.29 | 24.10 | 29.08 |
| 500                | 0.23                                           | 4.50 | 9.20  | 14.22 | 19.24 | 24.06 | 29.04 |
| 750                | 0.23                                           | 4.50 | 9.19  | 14.21 | 19.21 | 24.04 | 29.01 |
| 1000               | 0.23                                           | 4.49 | 9.18  | 14.21 | 19.20 | 24.04 | 29.01 |
| 1500               | 0.23                                           | 4.47 | 9.17  | 14.21 | 19.18 | 24.04 | 29.05 |
| 2000               | 0.24                                           | 4.54 | 9.29  | 14.34 | 19.32 | 24.22 | 29.27 |
| 2500               | 0.24                                           | 4.64 | 9.45  | 14.53 | 19.52 | 24.47 | 29.54 |
| 3000               | 0.23                                           | 4.62 | 9.45  | 14.55 | 19.50 | 24.52 | 29.60 |
| 3500               | 0.23                                           | 4.60 | 9.45  | 14.57 | 19.46 | 24.52 | 29.63 |
| 4000               | 0.24                                           | 4.71 | 9.65  | 14.81 | 19.67 | 24.75 | 29.88 |
| 4500               | 0.27                                           | 5.11 | 10.29 | 15.48 | 20.36 | 25.47 | 30.55 |
| 5000               | 0.28                                           | 5.36 | 10.72 | 15.90 | 20.78 | 25.94 | 30.88 |
| 5500               | 0.24                                           | 5.05 | 10.36 | 15.49 | 20.22 | 25.41 | 30.20 |
| 6000               | 0.22                                           | 4.82 | 10.05 | 15.16 | 19.55 | 24.71 | 29.38 |

| FREQUENCY<br>(MHz) | Attenuation accuracy relative to nominal attenuation setting<br>(dB) |       |       |       |       |       |       |
|--------------------|----------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                                              | 5 dB  | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 0.01                                                                 | 0.47  | 0.75  | 0.74  | 0.71  | 0.91  | 0.92  |
| 5                  | 0.01                                                                 | 0.47  | 0.75  | 0.73  | 0.70  | 0.91  | 0.91  |
| 10                 | 0.01                                                                 | 0.47  | 0.75  | 0.73  | 0.70  | 0.90  | 0.91  |
| 20                 | 0.01                                                                 | 0.47  | 0.75  | 0.73  | 0.70  | 0.90  | 0.91  |
| 50                 | 0.01                                                                 | 0.47  | 0.75  | 0.73  | 0.71  | 0.91  | 0.92  |
| 100                | 0.01                                                                 | 0.47  | 0.75  | 0.73  | 0.70  | 0.90  | 0.91  |
| 200                | 0.01                                                                 | 0.47  | 0.76  | 0.74  | 0.71  | 0.90  | 0.92  |
| 500                | 0.02                                                                 | 0.50  | 0.80  | 0.78  | 0.76  | 0.94  | 0.96  |
| 750                | 0.02                                                                 | 0.50  | 0.81  | 0.79  | 0.79  | 0.96  | 0.99  |
| 1000               | 0.02                                                                 | 0.51  | 0.82  | 0.79  | 0.80  | 0.96  | 0.99  |
| 1500               | 0.02                                                                 | 0.53  | 0.83  | 0.79  | 0.82  | 0.96  | 0.95  |
| 2000               | 0.01                                                                 | 0.46  | 0.71  | 0.66  | 0.68  | 0.78  | 0.73  |
| 2500               | 0.01                                                                 | 0.36  | 0.55  | 0.47  | 0.48  | 0.53  | 0.46  |
| 3000               | 0.02                                                                 | 0.38  | 0.55  | 0.45  | 0.50  | 0.48  | 0.40  |
| 3500               | 0.02                                                                 | 0.40  | 0.55  | 0.43  | 0.54  | 0.48  | 0.37  |
| 4000               | 0.01                                                                 | 0.29  | 0.35  | 0.19  | 0.33  | 0.25  | 0.12  |
| 4500               | -0.02                                                                | -0.11 | -0.29 | -0.48 | -0.36 | -0.47 | -0.55 |
| 5000               | -0.03                                                                | -0.36 | -0.72 | -0.90 | -0.78 | -0.94 | -0.88 |
| 5500               | 0.01                                                                 | -0.05 | -0.36 | -0.49 | -0.22 | -0.41 | -0.20 |
| 6000               | 0.03                                                                 | 0.18  | -0.05 | -0.16 | 0.45  | 0.29  | 0.62  |

### 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ +25°C

| FREQUENCY<br>(MHz) | Input VSWR<br>(:1) |      |       |       |       |       |       |
|--------------------|--------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB            | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 1.30               | 1.20 | 1.09  | 1.15  | 1.04  | 1.05  | 1.04  |
| 5                  | 1.29               | 1.20 | 1.08  | 1.14  | 1.01  | 1.03  | 1.01  |
| 10                 | 1.29               | 1.20 | 1.08  | 1.14  | 1.01  | 1.03  | 1.01  |
| 20                 | 1.29               | 1.20 | 1.08  | 1.14  | 1.01  | 1.03  | 1.01  |
| 50                 | 1.29               | 1.20 | 1.08  | 1.14  | 1.01  | 1.03  | 1.01  |
| 100                | 1.30               | 1.20 | 1.09  | 1.14  | 1.02  | 1.04  | 1.02  |
| 200                | 1.31               | 1.21 | 1.10  | 1.16  | 1.04  | 1.06  | 1.04  |
| 500                | 1.34               | 1.27 | 1.16  | 1.22  | 1.09  | 1.12  | 1.09  |
| 750                | 1.34               | 1.31 | 1.21  | 1.28  | 1.14  | 1.17  | 1.14  |
| 1000               | 1.31               | 1.32 | 1.24  | 1.32  | 1.17  | 1.21  | 1.17  |
| 1500               | 1.38               | 1.35 | 1.27  | 1.33  | 1.19  | 1.22  | 1.19  |
| 2000               | 1.52               | 1.34 | 1.24  | 1.24  | 1.17  | 1.16  | 1.17  |
| 2500               | 1.35               | 1.17 | 1.11  | 1.08  | 1.13  | 1.09  | 1.13  |
| 3000               | 1.27               | 1.13 | 1.03  | 1.06  | 1.07  | 1.07  | 1.07  |
| 3500               | 1.25               | 1.20 | 1.12  | 1.15  | 1.05  | 1.07  | 1.05  |
| 4000               | 1.47               | 1.33 | 1.28  | 1.25  | 1.23  | 1.19  | 1.23  |
| 4500               | 1.59               | 1.43 | 1.43  | 1.38  | 1.45  | 1.41  | 1.45  |
| 5000               | 1.16               | 1.33 | 1.50  | 1.49  | 1.62  | 1.61  | 1.63  |
| 5500               | 1.37               | 1.38 | 1.47  | 1.49  | 1.61  | 1.64  | 1.62  |
| 6000               | 1.45               | 1.30 | 1.27  | 1.29  | 1.35  | 1.39  | 1.35  |

| FREQUENCY<br>(MHz) | Output VSWR<br>(:1) |      |       |       |       |       |       |
|--------------------|---------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB             | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 1.30                | 1.11 | 1.09  | 1.04  | 1.08  | 1.07  | 1.05  |
| 5                  | 1.29                | 1.10 | 1.08  | 1.01  | 1.07  | 1.06  | 1.02  |
| 10                 | 1.29                | 1.10 | 1.08  | 1.01  | 1.07  | 1.06  | 1.02  |
| 20                 | 1.29                | 1.10 | 1.08  | 1.01  | 1.07  | 1.06  | 1.02  |
| 50                 | 1.29                | 1.10 | 1.08  | 1.01  | 1.07  | 1.06  | 1.03  |
| 100                | 1.30                | 1.11 | 1.09  | 1.02  | 1.08  | 1.07  | 1.03  |
| 200                | 1.31                | 1.12 | 1.10  | 1.04  | 1.10  | 1.09  | 1.05  |
| 500                | 1.34                | 1.18 | 1.17  | 1.10  | 1.17  | 1.16  | 1.12  |
| 750                | 1.36                | 1.23 | 1.22  | 1.15  | 1.23  | 1.22  | 1.18  |
| 1000               | 1.35                | 1.26 | 1.27  | 1.20  | 1.28  | 1.27  | 1.23  |
| 1500               | 1.44                | 1.33 | 1.32  | 1.28  | 1.31  | 1.31  | 1.29  |
| 2000               | 1.54                | 1.35 | 1.29  | 1.29  | 1.24  | 1.25  | 1.26  |
| 2500               | 1.28                | 1.17 | 1.14  | 1.21  | 1.14  | 1.14  | 1.17  |
| 3000               | 1.21                | 1.05 | 1.07  | 1.06  | 1.10  | 1.09  | 1.07  |
| 3500               | 1.31                | 1.20 | 1.17  | 1.13  | 1.13  | 1.15  | 1.14  |
| 4000               | 1.54                | 1.39 | 1.31  | 1.36  | 1.26  | 1.27  | 1.31  |
| 4500               | 1.62                | 1.51 | 1.46  | 1.55  | 1.49  | 1.45  | 1.49  |
| 5000               | 1.20                | 1.42 | 1.55  | 1.61  | 1.68  | 1.63  | 1.61  |
| 5500               | 1.43                | 1.45 | 1.57  | 1.51  | 1.65  | 1.64  | 1.58  |
| 6000               | 1.56                | 1.39 | 1.38  | 1.27  | 1.35  | 1.39  | 1.34  |

### 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ +25°C

| FREQUENCY<br>(MHz) | IP3<br>(dBm) | Insertion Loss<br>@P <sub>IN</sub> =0 dBm<br>(dB) | Insertion Loss<br>@P <sub>IN</sub> =+20 dBm<br>(dB) |
|--------------------|--------------|---------------------------------------------------|-----------------------------------------------------|
| 1                  | 52.28        | -                                                 | -                                                   |
| 200                | 53.58        | 1.40                                              | 1.23                                                |
| 500                | 51.37        | 1.82                                              | 1.63                                                |
| 1000               | 52.54        | 1.82                                              | 1.64                                                |
| 2000               | 54.89        | 1.92                                              | 1.74                                                |
| 3000               | 53.24        | 2.13                                              | 1.93                                                |
| 4000               | 51.59        | 2.59                                              | 2.40                                                |
| 5000               | 51.36        | 3.05                                              | 2.86                                                |
| 6000               | 51.12        | 3.64                                              | 3.50                                                |

### 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ +50°C

| FREQUENCY<br>(MHz) | Attenuation relative to Insertion Loss<br>(dB) |      |       |       |       |       |       |
|--------------------|------------------------------------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                        | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 0.24                                           | 4.51 | 9.21  | 14.22 | 19.25 | 24.05 | 29.02 |
| 5                  | 0.24                                           | 4.51 | 9.22  | 14.22 | 19.25 | 24.05 | 29.03 |
| 10                 | 0.24                                           | 4.51 | 9.22  | 14.22 | 19.25 | 24.06 | 29.03 |
| 20                 | 0.24                                           | 4.51 | 9.22  | 14.22 | 19.25 | 24.06 | 29.03 |
| 50                 | 0.24                                           | 4.51 | 9.22  | 14.22 | 19.25 | 24.06 | 29.03 |
| 100                | 0.24                                           | 4.51 | 9.22  | 14.23 | 19.26 | 24.06 | 29.04 |
| 200                | 0.24                                           | 4.51 | 9.22  | 14.22 | 19.26 | 24.06 | 29.03 |
| 500                | 0.23                                           | 4.49 | 9.18  | 14.18 | 19.21 | 24.02 | 28.98 |
| 750                | 0.23                                           | 4.48 | 9.16  | 14.17 | 19.18 | 24.01 | 28.96 |
| 1000               | 0.23                                           | 4.48 | 9.16  | 14.18 | 19.17 | 24.01 | 28.97 |
| 1500               | 0.22                                           | 4.46 | 9.14  | 14.17 | 19.15 | 24.01 | 29.00 |
| 2000               | 0.23                                           | 4.51 | 9.25  | 14.29 | 19.27 | 24.17 | 29.21 |
| 2500               | 0.23                                           | 4.61 | 9.40  | 14.47 | 19.46 | 24.41 | 29.47 |
| 3000               | 0.23                                           | 4.60 | 9.41  | 14.49 | 19.45 | 24.46 | 29.54 |
| 3500               | 0.23                                           | 4.58 | 9.41  | 14.52 | 19.41 | 24.47 | 29.58 |
| 4000               | 0.24                                           | 4.67 | 9.59  | 14.73 | 19.59 | 24.67 | 29.81 |
| 4500               | 0.26                                           | 5.07 | 10.23 | 15.40 | 20.29 | 25.41 | 30.50 |
| 5000               | 0.27                                           | 5.31 | 10.65 | 15.81 | 20.71 | 25.89 | 30.84 |
| 5500               | 0.23                                           | 4.98 | 10.26 | 15.36 | 20.10 | 25.33 | 30.12 |
| 6000               | 0.21                                           | 4.78 | 9.99  | 15.09 | 19.48 | 24.67 | 29.36 |

| FREQUENCY<br>(MHz) | Attenuation accuracy relative to nominal attenuation setting<br>(dB) |       |       |       |       |       |       |
|--------------------|----------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                                              | 5 dB  | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 0.01                                                                 | 0.49  | 0.79  | 0.78  | 0.75  | 0.95  | 0.98  |
| 5                  | 0.01                                                                 | 0.49  | 0.78  | 0.78  | 0.75  | 0.95  | 0.97  |
| 10                 | 0.01                                                                 | 0.49  | 0.78  | 0.78  | 0.75  | 0.94  | 0.97  |
| 20                 | 0.01                                                                 | 0.49  | 0.78  | 0.78  | 0.75  | 0.94  | 0.97  |
| 50                 | 0.01                                                                 | 0.49  | 0.78  | 0.78  | 0.75  | 0.94  | 0.97  |
| 100                | 0.01                                                                 | 0.49  | 0.78  | 0.77  | 0.74  | 0.94  | 0.96  |
| 200                | 0.01                                                                 | 0.49  | 0.78  | 0.78  | 0.74  | 0.94  | 0.97  |
| 500                | 0.02                                                                 | 0.51  | 0.82  | 0.82  | 0.79  | 0.98  | 1.02  |
| 750                | 0.02                                                                 | 0.52  | 0.84  | 0.83  | 0.82  | 0.99  | 1.04  |
| 1000               | 0.02                                                                 | 0.52  | 0.84  | 0.82  | 0.83  | 0.99  | 1.03  |
| 1500               | 0.03                                                                 | 0.54  | 0.86  | 0.83  | 0.85  | 0.99  | 1.00  |
| 2000               | 0.02                                                                 | 0.49  | 0.75  | 0.71  | 0.73  | 0.83  | 0.79  |
| 2500               | 0.02                                                                 | 0.39  | 0.60  | 0.53  | 0.54  | 0.59  | 0.53  |
| 3000               | 0.02                                                                 | 0.40  | 0.59  | 0.51  | 0.55  | 0.54  | 0.46  |
| 3500               | 0.02                                                                 | 0.42  | 0.59  | 0.48  | 0.59  | 0.53  | 0.42  |
| 4000               | 0.01                                                                 | 0.33  | 0.41  | 0.27  | 0.41  | 0.33  | 0.19  |
| 4500               | -0.01                                                                | -0.07 | -0.23 | -0.40 | -0.29 | -0.41 | -0.50 |
| 5000               | -0.02                                                                | -0.31 | -0.65 | -0.81 | -0.71 | -0.89 | -0.84 |
| 5500               | 0.02                                                                 | 0.02  | -0.26 | -0.36 | -0.10 | -0.33 | -0.12 |
| 6000               | 0.04                                                                 | 0.22  | 0.01  | -0.09 | 0.52  | 0.33  | 0.64  |

### 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-Circuit's 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-Circuit's website at [www.minicircuits.com/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

## Typical Performance Data @ +50°C

| FREQUENCY<br>(MHz) | Input VSWR<br>(:1) |      |       |       |       |       |       |
|--------------------|--------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB            | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 1.31               | 1.27 | 1.15  | 1.21  | 1.07  | 1.10  | 1.07  |
| 5                  | 1.30               | 1.26 | 1.14  | 1.21  | 1.06  | 1.09  | 1.05  |
| 10                 | 1.30               | 1.26 | 1.14  | 1.21  | 1.06  | 1.09  | 1.05  |
| 20                 | 1.30               | 1.26 | 1.14  | 1.21  | 1.06  | 1.09  | 1.05  |
| 50                 | 1.30               | 1.26 | 1.14  | 1.21  | 1.06  | 1.09  | 1.06  |
| 100                | 1.30               | 1.26 | 1.15  | 1.21  | 1.06  | 1.09  | 1.06  |
| 200                | 1.31               | 1.27 | 1.16  | 1.22  | 1.07  | 1.11  | 1.07  |
| 500                | 1.34               | 1.33 | 1.23  | 1.30  | 1.15  | 1.19  | 1.15  |
| 750                | 1.34               | 1.37 | 1.28  | 1.35  | 1.20  | 1.24  | 1.20  |
| 1000               | 1.36               | 1.40 | 1.31  | 1.38  | 1.23  | 1.27  | 1.23  |
| 1500               | 1.52               | 1.41 | 1.31  | 1.34  | 1.23  | 1.24  | 1.23  |
| 2000               | 1.48               | 1.31 | 1.23  | 1.21  | 1.18  | 1.15  | 1.18  |
| 2500               | 1.27               | 1.12 | 1.09  | 1.05  | 1.13  | 1.10  | 1.13  |
| 3000               | 1.23               | 1.12 | 1.03  | 1.04  | 1.06  | 1.06  | 1.07  |
| 3500               | 1.38               | 1.21 | 1.14  | 1.12  | 1.09  | 1.05  | 1.09  |
| 4000               | 1.57               | 1.32 | 1.30  | 1.24  | 1.28  | 1.24  | 1.28  |
| 4500               | 1.41               | 1.32 | 1.43  | 1.41  | 1.52  | 1.49  | 1.52  |
| 5000               | 1.06               | 1.32 | 1.52  | 1.54  | 1.68  | 1.69  | 1.69  |
| 5500               | 1.48               | 1.47 | 1.56  | 1.58  | 1.73  | 1.77  | 1.73  |
| 6000               | 1.57               | 1.48 | 1.50  | 1.53  | 1.66  | 1.72  | 1.66  |

| FREQUENCY<br>(MHz) | Output VSWR<br>(:1) |      |       |       |       |       |       |
|--------------------|---------------------|------|-------|-------|-------|-------|-------|
|                    | 0.25 dB             | 5 dB | 10 dB | 15 dB | 20 dB | 25 dB | 30 dB |
| 1                  | 1.31                | 1.16 | 1.14  | 1.08  | 1.13  | 1.13  | 1.09  |
| 5                  | 1.30                | 1.16 | 1.13  | 1.07  | 1.13  | 1.12  | 1.09  |
| 10                 | 1.30                | 1.16 | 1.13  | 1.07  | 1.13  | 1.12  | 1.09  |
| 20                 | 1.30                | 1.16 | 1.13  | 1.06  | 1.12  | 1.12  | 1.09  |
| 50                 | 1.30                | 1.15 | 1.13  | 1.06  | 1.12  | 1.12  | 1.08  |
| 100                | 1.30                | 1.16 | 1.13  | 1.07  | 1.12  | 1.12  | 1.09  |
| 200                | 1.31                | 1.17 | 1.14  | 1.08  | 1.14  | 1.13  | 1.10  |
| 500                | 1.33                | 1.23 | 1.21  | 1.15  | 1.21  | 1.21  | 1.17  |
| 750                | 1.32                | 1.26 | 1.25  | 1.20  | 1.26  | 1.26  | 1.22  |
| 1000               | 1.33                | 1.28 | 1.28  | 1.24  | 1.29  | 1.29  | 1.26  |
| 1500               | 1.48                | 1.34 | 1.28  | 1.27  | 1.26  | 1.26  | 1.26  |
| 2000               | 1.48                | 1.29 | 1.22  | 1.25  | 1.18  | 1.18  | 1.21  |
| 2500               | 1.27                | 1.14 | 1.10  | 1.16  | 1.10  | 1.09  | 1.12  |
| 3000               | 1.21                | 1.09 | 1.04  | 1.11  | 1.05  | 1.03  | 1.06  |
| 3500               | 1.35                | 1.21 | 1.13  | 1.19  | 1.11  | 1.10  | 1.14  |
| 4000               | 1.55                | 1.35 | 1.28  | 1.37  | 1.29  | 1.26  | 1.30  |
| 4500               | 1.39                | 1.37 | 1.44  | 1.53  | 1.53  | 1.48  | 1.49  |
| 5000               | 1.07                | 1.34 | 1.53  | 1.58  | 1.67  | 1.63  | 1.59  |
| 5500               | 1.50                | 1.43 | 1.55  | 1.50  | 1.64  | 1.63  | 1.56  |
| 6000               | 1.56                | 1.40 | 1.46  | 1.35  | 1.49  | 1.50  | 1.42  |

### 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-Circuits' 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator RUDAT-6000-30

*Typical Performance Data @ +50°C*

| FREQUENCY<br>(MHz) | IP3<br>(dBm) | Insertion Loss<br>@P <sub>IN</sub> =0 dBm<br>(dB) | Insertion Loss<br>@P <sub>IN</sub> =+20 dBm<br>(dB) |
|--------------------|--------------|---------------------------------------------------|-----------------------------------------------------|
| 1                  | 49.85        | -                                                 | -                                                   |
| 200                | 54.14        | 1.44                                              | 1.28                                                |
| 500                | 55.81        | 2.01                                              | 1.85                                                |
| 1000               | 58.36        | 2.15                                              | 2.01                                                |
| 2000               | 57.25        | 2.21                                              | 2.07                                                |
| 3000               | 57.67        | 2.34                                              | 2.18                                                |
| 4000               | 58.63        | 2.91                                              | 2.73                                                |
| 5000               | 58.32        | 3.47                                              | 3.28                                                |
| 6000               | 56.59        | 3.88                                              | 3.77                                                |

## Notes

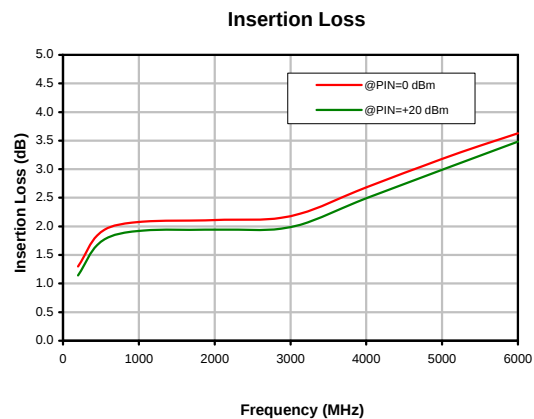
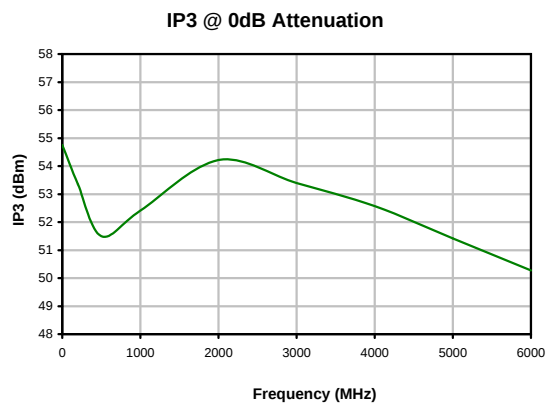
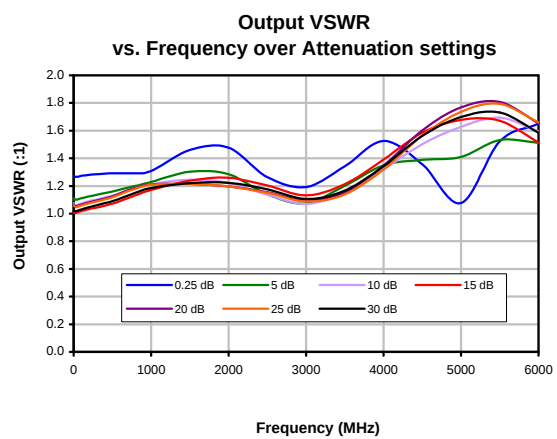
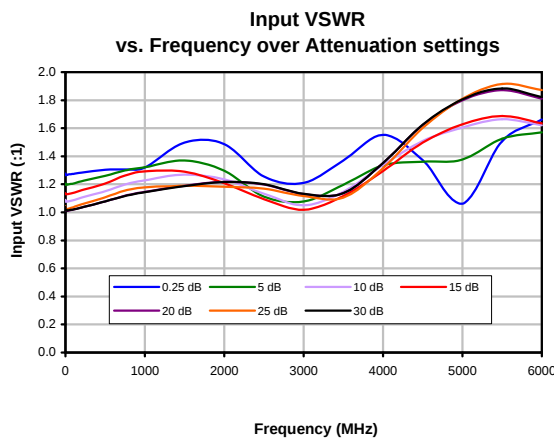
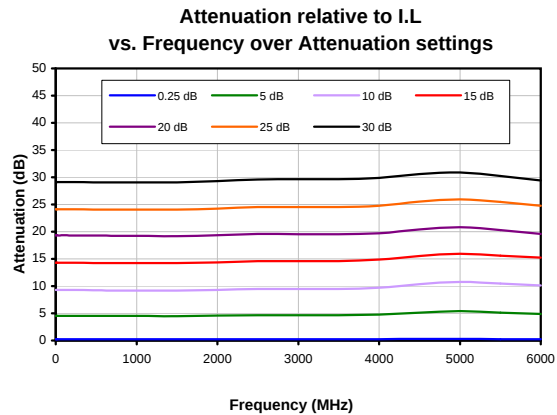
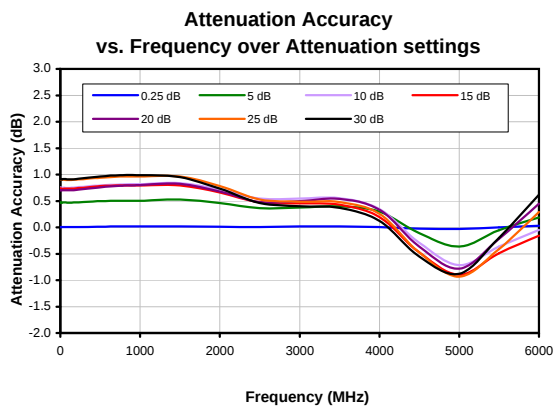
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



# Programmable Attenuator

RUDAT-6000-30

## Typical Performance Curves @ 0°C



### 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-Circuits' 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)

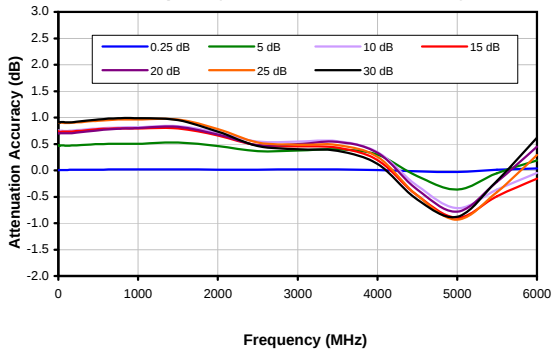


# Programmable Attenuator

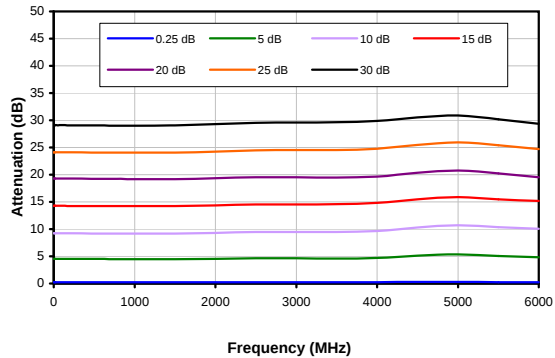
RUDAT-6000-30

## Typical Performance Curves @ +25°C

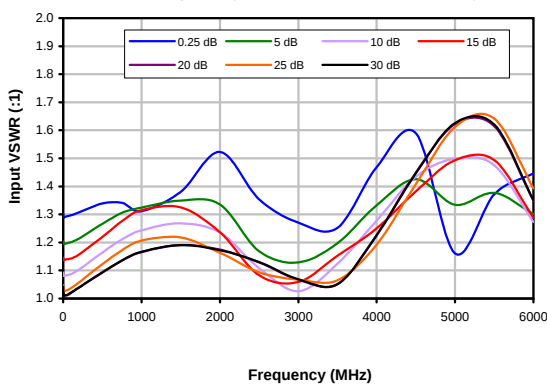
Attenuation Accuracy  
vs. Frequency over Attenuation settings



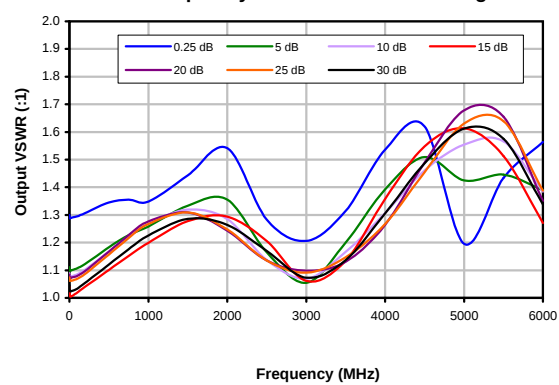
Attenuation relative to I.L.  
vs. Frequency over Attenuation settings



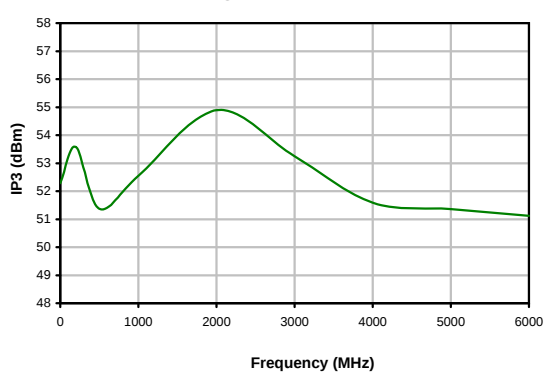
Input VSWR  
vs. Frequency over Attenuation settings



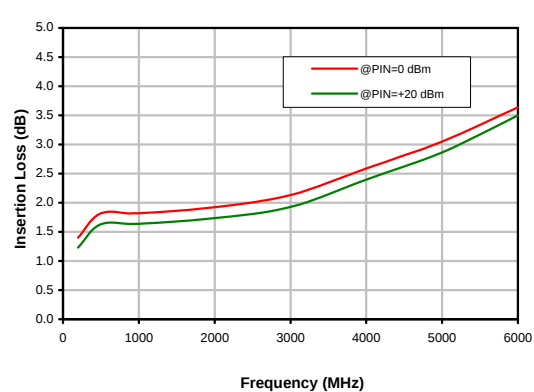
Output VSWR  
vs. Frequency over Attenuation settings



IP3 @ 0dB Attenuation



Insertion Loss



### Notes

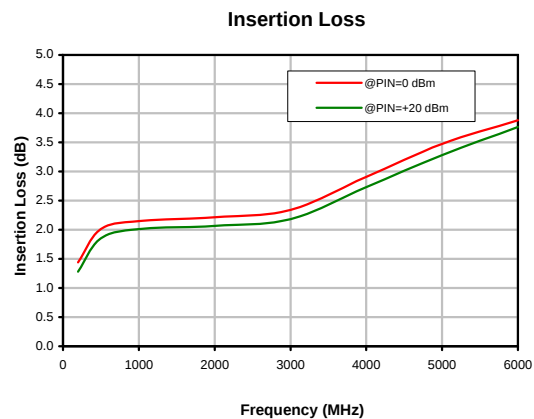
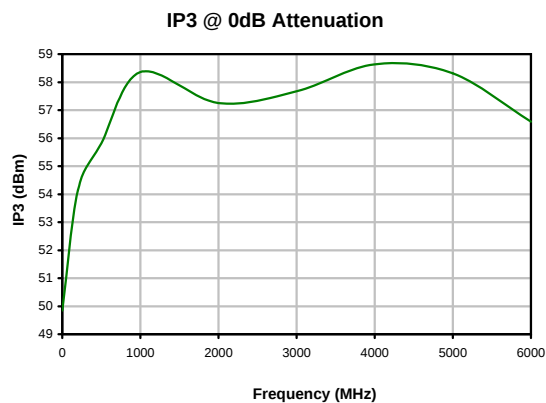
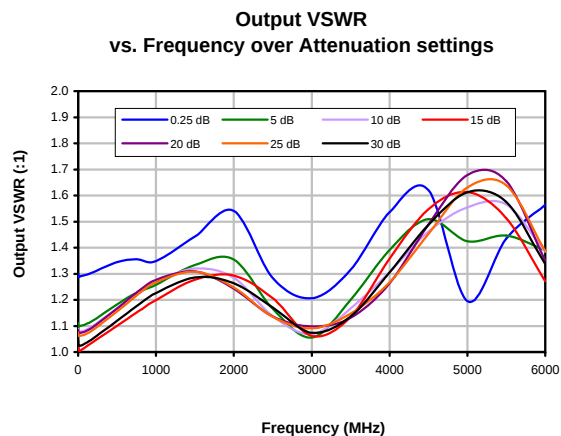
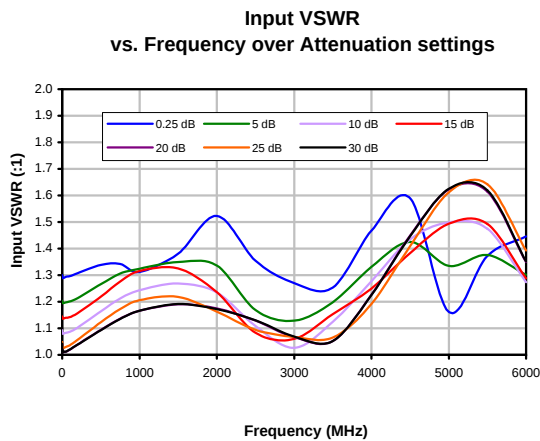
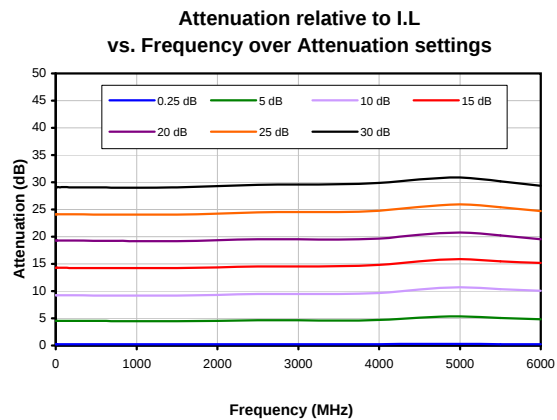
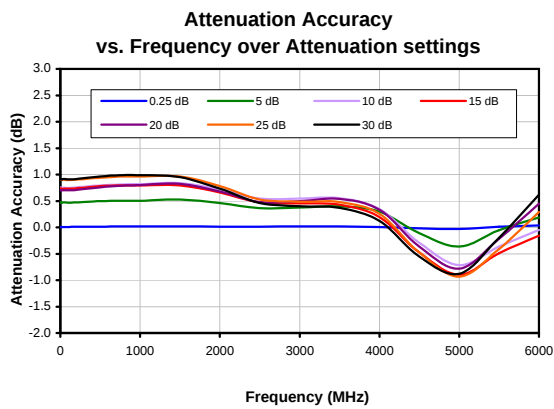
- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' 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/MC/Store/terms.jsp](http://www.minicircuits.com/MC/Store/terms.jsp)



# Programmable Attenuator

RUDAT-6000-30

## Typical Performance Curves @ +50°C



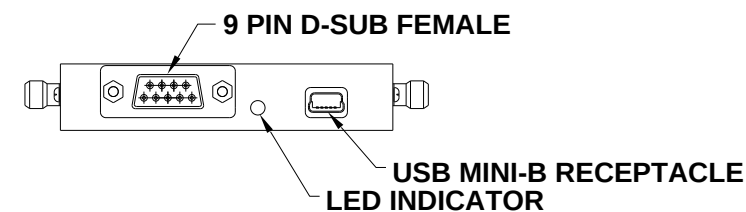
### Notes

- 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-Circuits' 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/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)

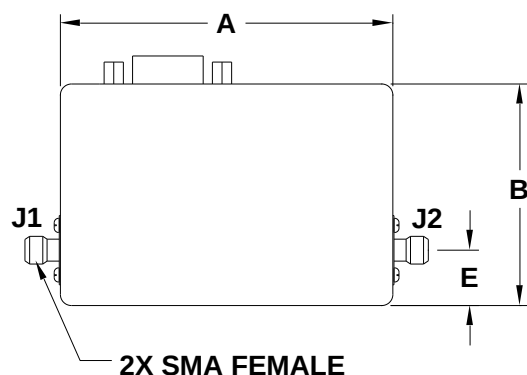


## Outline Dimensions

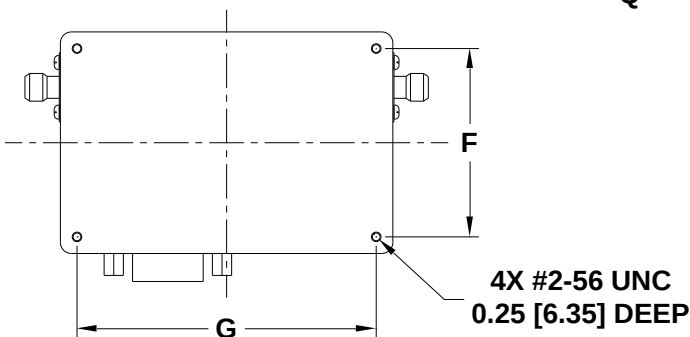
MS1813



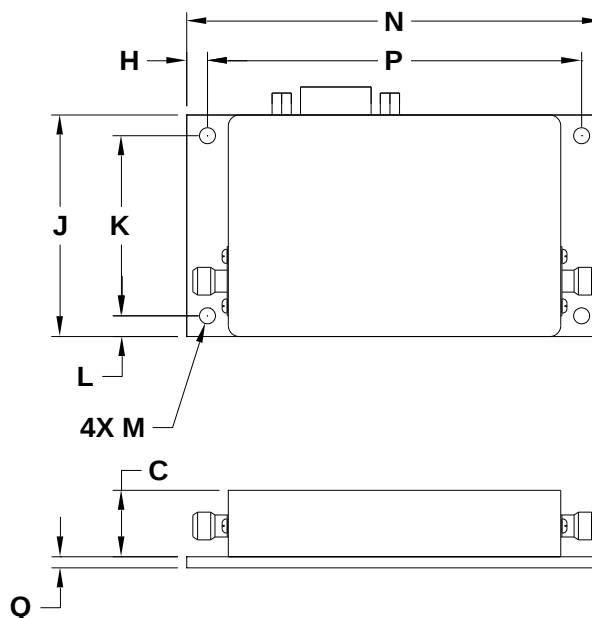
Top View



Bottom View



Bracket Option



Instruction for mounting bracket:

1. Tool required: Phillips head screwdriver
2. Mount the bracket over threaded holes on the bottom side with the fasteners provided with the bracket.

| CASE#  | A              | B              | C             | D            | E             | F                | G                | H              | J              | K                | L              | M              | N              | P                | Q              | WT. GRAMS |
|--------|----------------|----------------|---------------|--------------|---------------|------------------|------------------|----------------|----------------|------------------|----------------|----------------|----------------|------------------|----------------|-----------|
| MS1813 | 3.00<br>(76.2) | 2.00<br>(50.8) | .60<br>(15.2) | .28<br>(7.1) | .50<br>(12.7) | 1.700<br>(43.18) | 2.700<br>(68.58) | .188<br>(4.76) | 2.00<br>(50.8) | 1.625<br>(41.28) | .188<br>(4.76) | .144<br>(3.66) | 3.75<br>(95.3) | 3.375<br>(85.72) | .100<br>(2.54) | 130       |

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015

### Notes:

1. Case material: Nickel Plated Aluminum.



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](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS



## Environmental Specifications ENV55T1

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<br>Ambient Environment  | Individual Model Data Sheet |
| Storage Temperature            | -20° to 85° C<br>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      |