

# Programmable Attenuator

RCDAT-18G-63

50Ω 0 – 63 dB, 0.25 dB step 100 to 18000 MHz

## The Big Deal

- High Frequency, 18 GHz
- Fine attenuation resolution, 0.25 dB
- Fast switching speed
- **USB, Ethernet, RS232 and TTL control**



Software Package

Case Style: QF3189

## Applications

- Automated Test Equipment (ATE)
- Transmission Loss / Fading Simulators
- Ku band satellite communications
- Receiver sensitivity testing (eg: GPS)
- Military radio, radar & electronic warfare

| Connector | Model No.    | Description             | Qty. |
|-----------|--------------|-------------------------|------|
| 2.92mm*   | RCDAT-18G-63 | Programmable Attenuator | 1    |

\* Compatible with SMA and 3.5mm (no adaptor needed)

### Included Accessories

|               |                  |   |
|---------------|------------------|---|
| USB-CBL-AC-3+ | 3.3 ft USB cable | 1 |
|---------------|------------------|---|

### RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

## Product Overview

Mini-Circuits' RCDAT-18G-63 is a general purpose, single channel programmable attenuator suitable for a wide range of signal level control applications from 100 MHz to 18 GHz. The Attenuator provides 0 to 63 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 2.92 mm female RF connectors and USB type C, Ethernet (RJ45) and 15-pin D-sub control ports. The DC supply can be provided via the USB or D-sub ports.

The attenuator can be controlled via USB, Ethernet, RS232 or TTL (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 & Ethernet control                           | USB HID and Ethernet (HTTP / Telnet / SSH) interfaces provide easy compatibility with a wide range of software setups and programming environments. The device draws all power requirements through the USB port. |
| RS232 and TTL control                            | The user may also control the RCDAT-18G-63 via RS232 or TTL connection, allowing also serial asynchronous or direct, high speed parallel control of the device.                                                   |
| Programmable attenuation sweep and Hop sequences | The RCDAT-18G-63 can be programmed with a timed sequence of attenuation settings, to run without any additional external control                                                                                  |
| 63 dB attenuation range.                         | The RCDAT-18G-63 provides high-accuracy attenuation up to 63 dB in 0.25 dB steps, allowing the user precise level control over a broad attenuation range.                                                         |

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EDR-11845  
RCDAT-18G-63  
RAV  
210909  
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Electrical Specifications <sup>1</sup> at 0°C to 50°C

| Parameter                                 |                                  | Frequency range                      | Conditions                                                                                                             | Min. | Typ. | Max.                    | Units           |
|-------------------------------------------|----------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------|------|------|-------------------------|-----------------|
| Attenuation range                         |                                  | 100 - 18000 MHz                      | 0.25 dB step                                                                                                           | 0    | –    | 63                      | dB              |
| Attenuation accuracy <sup>2</sup>         |                                  | 100 - 10000 MHz                      | @ 0.25-63 dB                                                                                                           | –    | 0.6  | ±(0.35+2.5% of setting) | dB              |
|                                           |                                  | 10000 - 18000 MHz                    |                                                                                                                        | –    | 0.8  | ±(0.30+3.5% of setting) |                 |
| Insertion Loss                            |                                  | 100 - 4000 MHz                       | @ 0 dB                                                                                                                 | –    | 4.0  | 5.5                     | dB              |
|                                           |                                  | 4000 - 10000 MHz                     |                                                                                                                        | –    | 5.3  | 7.0                     |                 |
|                                           |                                  | 10000 - 15000 MHz                    |                                                                                                                        | –    | 6.5  | 8.5                     |                 |
|                                           |                                  | 15000 - 18000 MHz                    |                                                                                                                        | –    | 7.5  | 10.0                    |                 |
| Input operating power <sup>3,4</sup>      | (RF In port)                     | 100 - 18000 MHz                      | @ 0 - 63 dB                                                                                                            | –    | –    | +24                     | dBm             |
|                                           | (RF Out port)                    | 100 - 18000 MHz                      | @ 0 - 63 dB                                                                                                            | –    | –    | +15                     | dBm             |
| Isolation In-Out                          |                                  | 100 - 18000 MHz                      | Note 5                                                                                                                 | –    | 70   | –                       | dB              |
| IP3 Input <sup>6</sup>                    |                                  | 200 - 18000 MHz                      | @ 0 dB setting (P <sub>IN</sub> =+5 dBm)                                                                               | –    | 50   | –                       | dBm             |
| VSWR                                      |                                  | 100 - 18000 MHz                      | @ 0 - 63 dB                                                                                                            | –    | 1.30 | –                       | :1              |
| Trigger response (USB, Ethernet or RS232) |                                  | 100 - 18000 MHz                      | Note 7, 8                                                                                                              | –    | 120  | –                       | nsec            |
| TTL control response                      |                                  | 100 - 18000 MHz                      | Note 7, 8                                                                                                              | –    | 120  | –                       | nsec            |
| Min Dwell Time <sup>9</sup>               |                                  | 100 - 18000 MHz                      | High speed mode                                                                                                        | –    | 600  | –                       | µsec            |
| Attenuation Transition Time <sup>10</sup> |                                  | 100 - 18000 MHz                      | –                                                                                                                      | –    | 80   | –                       | nsec            |
| Supply Voltage                            |                                  | –                                    | –                                                                                                                      | 4.75 | 5    | 5.25                    | V <sub>DC</sub> |
| DC current draw                           | Ethernet                         | –                                    | –                                                                                                                      | –    | 275  | 350                     | mA              |
|                                           | USB or RS232 (Ethernet disabled) | –                                    | –                                                                                                                      | –    | 160  | 220                     |                 |
|                                           | TTL                              | –                                    | –                                                                                                                      | –    | 40   | 60                      |                 |
| Ethernet Communication                    |                                  | Protocol                             | TCP / IP, HTTP, Telnet, SSH, DHCP, UDP (limited)                                                                       |      |      |                         |                 |
|                                           |                                  | Max Data Rate                        | 100 Mbps (100 Base-T Full Duplex)                                                                                      |      |      |                         |                 |
| USB Communication                         |                                  | Protocol                             | HID (Human Interface Device) - High Speed                                                                              |      |      |                         |                 |
|                                           |                                  | Min Communication Time <sup>11</sup> | 400 µs Typ (full transmit/receive cycle)                                                                               |      |      |                         |                 |
| TTL Communication                         |                                  | Protocol                             | Logic low=0.8V Max, Logic High=1.2V Min, 3.3V Max                                                                      |      |      |                         |                 |
|                                           |                                  | Min Communication Time               | 120 ns Typ (after TTL control is enabled)                                                                              |      |      |                         |                 |
| RS232 Communication                       |                                  | Protocol                             | 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, within the specified power limits. 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 50 dB attenuation the maximum error at 12000 MHz will be: ±(0.01x50+0.20)= ±(0.50+0.20)= ± 0.70 dB

<sup>3</sup> Compression level not noted as it exceeds max safe operating power level.

<sup>4</sup> With proper DC power connected. If DC power not connected (via either USB connector or D-Sub Pin#1), derate max power by 3dB.

<sup>5</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>6</sup> Tested with 1 MHz span between signals. IP3 degrades below 200 MHz.

<sup>7</sup> Trigger response measured from 50% of Trigger to signal within 10% of final value.

<sup>8</sup> Pin#6 of the D-sub connector is used as LE in TTL control and Trigger in in USB and RS232 control

<sup>9</sup> Minimum Dwell Time is the time the RCDAT will take to respond to a command to change attenuation states.

<sup>10</sup> Attenuation Transition Time is specified as the time between starting to change the attenuation state and settling on the requested attenuation state.

<sup>11</sup> USB min communication time is based on the polling interval of the USB HID protocol (125 µs polling interval, 1024 bytes per packet), medium CPU load and no other high speed USB devices using the USB bus.

## Absolute Maximum Ratings

|                                 |          |                    |
|---------------------------------|----------|--------------------|
| Operating Temperature           |          | 0°C to 50°C        |
| Storage Temperature             |          | -20°C to 85°C      |
| Voltage input at D-Sub Pin#5-14 |          | -0.3V to +5.5V     |
| Voltage input at D-Sub Pin#3,4  |          | -30V to +30V       |
| Voltage input at D-Sub Pin#2    |          | +5.5V (GND to Vcc) |
| Voltage input at D-Sub Pin#1    |          | -1V to +6V         |
| V <sub>USB</sub> Max.           |          | 6V                 |
| DC voltage at RF port           |          | 16V                |
| Max RF power                    | @ RF In  | +25 dBm            |
|                                 | @ RF Out | +16 dBm            |

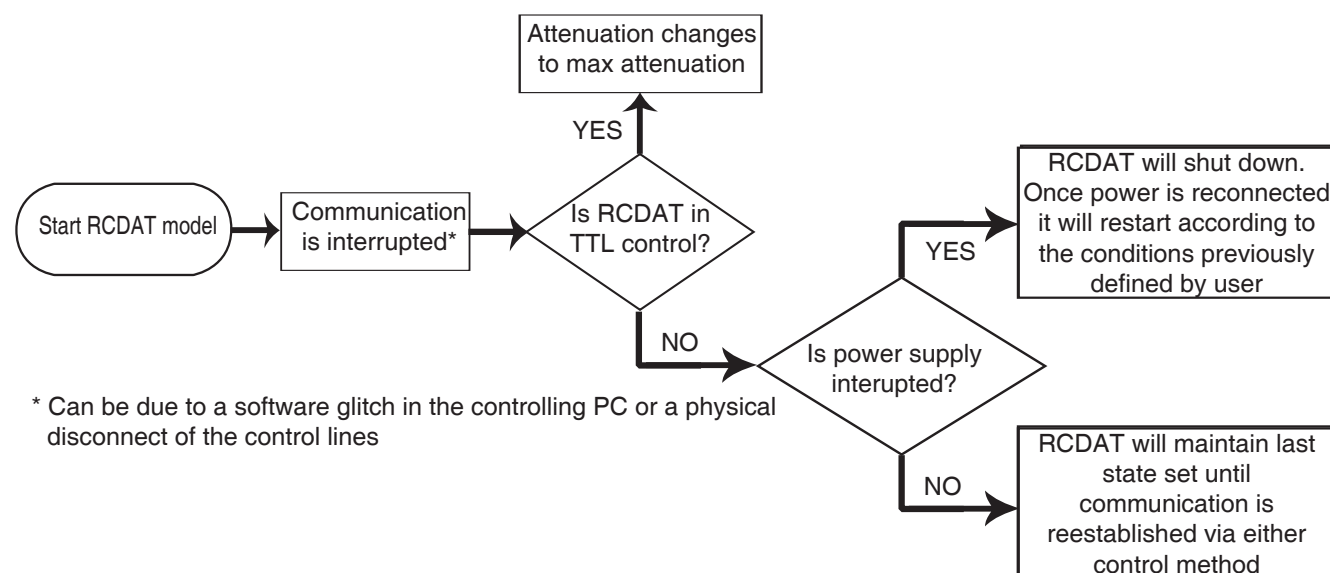
Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

## Connections

|                           |                     |
|---------------------------|---------------------|
| RF IN                     | (2.92 mm female)    |
| RF OUT                    | (2.92 mm female)    |
| USB                       | (USB type C female) |
| RS232 & TTL <sup>12</sup> | (15 Pin D-Sub male) |
| Network (Ethernet/LAN)    | (RJ45 socket)       |

<sup>12</sup> Refer to D-Sub pin connections table for details.

## RCDAT response to communication interrupt



## Trigger in

In USB, RS232 or Ethernet control the LE control bit can be used as trigger by holding it at logic low until you are ready to implement the command. As long as the LE is held at logic low the DSA state will remain unchanged regardless of commands sent. Once the trigger is set to logic high the latest attenuation command will be implemented. Lowering it again to logic low will keep the attenuation at that state until the next trigger is received.

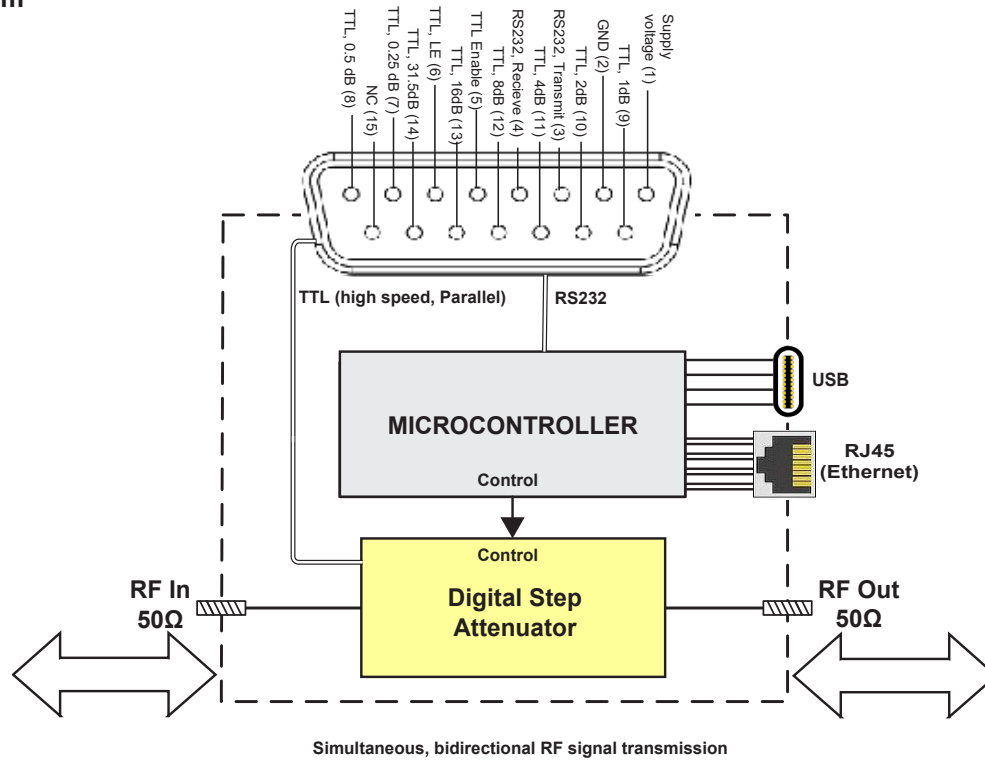
This allows synchronizing the change of attenuation level with outside processes and eliminates the need to wait for communication delays caused by USB, Ethernet or RS232 communication speeds.

## 15 Pin D-Sub Pin Connections

| PIN Number | RS232 Function                            | TTL Function                              | USB / Ethernet Function                   |
|------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 1          | Optional +5 V <sub>DC</sub> <sup>13</sup> | Optional +5 V <sub>DC</sub> <sup>13</sup> | Optional +5 V <sub>DC</sub> <sup>13</sup> |
| 2          | GND                                       | GND                                       | GND                                       |
| 3          | RS232 Transmit                            | Do not connect                            | Do not connect                            |
| 4          | RS232 Receive                             | Do not connect                            | Do not connect                            |
| 5          | Do not connect                            | TTL Enable                                | Do not connect                            |
| 6          | Trigger In                                | LE                                        | Trigger In                                |
| 7          | Do not connect                            | 0.25 dB                                   | Do not connect                            |
| 8          | Do not connect                            | 0.5 dB                                    | Do not connect                            |
| 9          | Do not connect                            | 1 dB                                      | Do not connect                            |
| 10         | Do not connect                            | 2 dB                                      | Do not connect                            |
| 11         | Do not connect                            | 4 dB                                      | Do not connect                            |
| 12         | Do not connect                            | 8 dB                                      | Do not connect                            |
| 13         | Do not connect                            | 16 dB                                     | Do not connect                            |
| 14         | Do not connect                            | 31.5 dB                                   | Do not connect                            |
| 15         | Do not connect                            | Do not connect                            | Do not connect                            |

<sup>13</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.

## Block Diagram



## TTL communication parameters

| Parameter       |             | Conditions         | Min. | Typ. | Max. | Units |
|-----------------|-------------|--------------------|------|------|------|-------|
| Voltage levels  |             | Logic High Voltage | 2.2  | –    | 5    | V     |
|                 |             | Logic Low Voltage  | 0    | –    | 0.6  |       |
| Control Current | Vcntrl=0V   | Per pin            | -400 | –    | –    | μA    |
|                 | Vcntrl=3.3V |                    | 0    | –    | 40   |       |
|                 | Vcntrl=5V   |                    | –    | –    | 300  |       |

TTL control allows direct parallel control of the RCDAT attenuation state, bypassing the micro controller for high speed response (120 nsec typical response). In order to start working with TTL, need to raise the TTL Enable momentarily to logic high, the internal micro-controller will go to sleep mode, disabling USB, Ethernet and RS232 control options and enabling the parallel TTL until power is cycled.

The TTL controls use 8 control bits buffered by a transparent latch to select the attenuation state. All TTL controls except the TTL Enable are connected through an internal 10 kΩ pull-up resistor to 3.3V, which sets the default state of the buffer to Max attenuation state (63.25 dB) with the latch set to 'transparent', allowing any signal on the attenuation control bits to translate immediately to a change in the attenuation state. When the LE is held at logic low the buffer is latched and the RCDAT will maintain the same attenuation state regardless of the input.

Table 1. Truth Table

| Attenuation State | C31.5 | C16 | C8 | C4 | C2 | C1 | C0.5 | C0.25 |
|-------------------|-------|-----|----|----|----|----|------|-------|
| Reference         | 0     | 0   | 0  | 0  | 0  | 0  | 0    | 0     |
| 0.25 (dB)         | 0     | 0   | 0  | 0  | 0  | 0  | 0    | 1     |
| 0.5 (dB)          | 0     | 0   | 0  | 0  | 0  | 0  | 1    | 0     |
| 1 (dB)            | 0     | 0   | 0  | 0  | 0  | 1  | 0    | 0     |
| 2 (dB)            | 0     | 0   | 0  | 0  | 1  | 0  | 0    | 0     |
| 4 (dB)            | 0     | 0   | 0  | 1  | 0  | 0  | 0    | 0     |
| 8 (dB)            | 0     | 0   | 1  | 0  | 0  | 0  | 0    | 0     |
| 16 (dB)           | 0     | 1   | 0  | 0  | 0  | 0  | 0    | 0     |
| 31.5 (dB)         | 1     | 0   | 0  | 0  | 0  | 0  | 0    | 0     |
| 63 (dB)           | 1     | 1   | 1  | 1  | 1  | 1  | 1    | 0     |

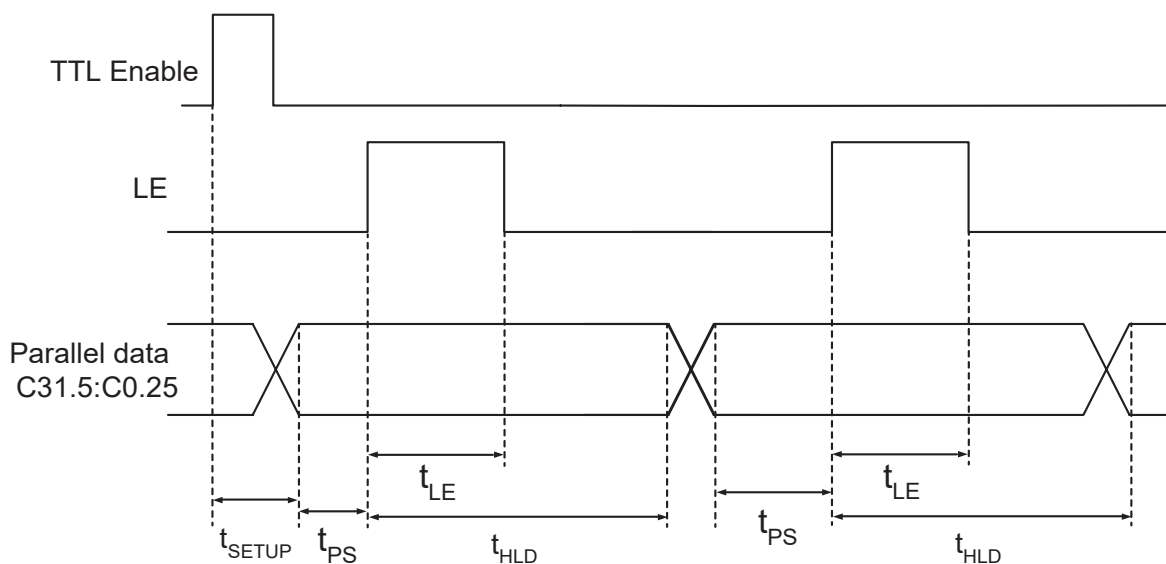
Note: Not all 256 possible combinations of C0.25 - C31.5 are shown in table

The parallel interface timing requirements are defined by the Timing diagram and Parallel TTL AC interface on page 5.

For latched parallel programming the Latch Enable (LE) should be held LOW while changing attenuation state control values, then pulses HIGH to LOW (per Figure 1) to latch new attenuation state into device.

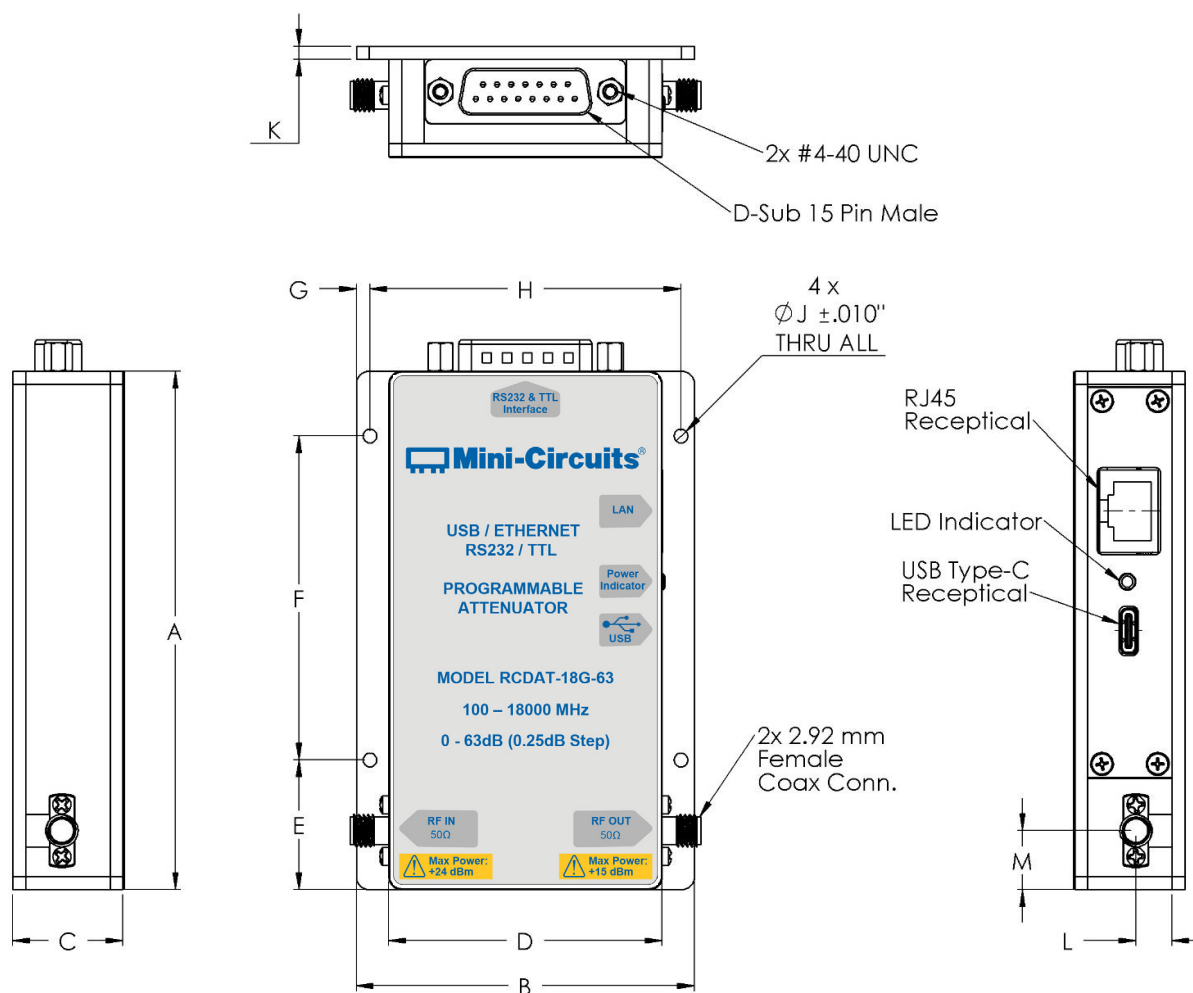
For direct parallel programming, the Latch Enable (LE) line should be pulled HIGH. Changing attenuation state control values will change device state to new attenuation. Direct mode is ideal for manual control of the device.

## TTL timing diagram



| Parallel TTL Interface AC Characteristics |                                                                                      |      |      |               |
|-------------------------------------------|--------------------------------------------------------------------------------------|------|------|---------------|
| Symbol                                    | Parameter                                                                            | Min. | Max. | Units         |
| $t_{\text{SETUP}}$                        | TTL Enable setup time, used only to start the TTL control and afterwards not needed. | 10   | –    | $\mu\text{s}$ |
| $t_{\text{PS}}$                           | LE Setup time - time from when controls C0.25-C31.5 are set to LE rising edge.       | 2    | –    | ns            |
| $t_{\text{LE}}$                           | LE pulse width                                                                       | 10   | –    | ns            |
| $t_{\text{HLD}}$                          | Hold time the controls C0.25-C31.5 need to remain stable after the LE rising edge    | 10   | –    | ns            |

## Outline Drawing (QF3189)



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

| A     | B     | C     | D     | E     | F     | G     | H     | J     | K    | L     | M     | WT.<br>GRAMS |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|--------------|
| 4.00  | 2.61  | 0.85  | 2.11  | 1.00  | 2.50  | 0.105 | 2.40  | 0.106 | 0.10 | 0.278 | 0.455 | 250          |
| 101.6 | 66.29 | 21.59 | 53.59 | 25.40 | 63.50 | 2.67  | 60.96 | 2.69  | 2.54 | 7.06  | 11.56 |              |

## Typical Performance Data @ +25°C

| FREQ.<br>(MHz) | I. Loss<br>(dB) | Attenuation relative to I. Loss<br>(dB) |      |      |       |       |       |       |       |       |       |
|----------------|-----------------|-----------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                |                 | @ Attenuation setting (dB)              |      |      |       |       |       |       |       |       |       |
|                |                 | 0.25                                    | 1    | 5    | 10    | 20    | 30    | 40    | 50    | 60    | 63    |
| 100            | 3.20            | 0.28                                    | 1.00 | 5.05 | 10.01 | 19.99 | 29.90 | 39.95 | 49.86 | 60.05 | 62.69 |
| 500            | 3.49            | 0.27                                    | 0.99 | 5.02 | 10.01 | 19.96 | 29.86 | 39.91 | 49.84 | 59.75 | 62.72 |
| 1000           | 3.84            | 0.24                                    | 0.98 | 4.93 | 9.94  | 19.84 | 29.74 | 39.77 | 49.69 | 59.60 | 62.54 |
| 1500           | 3.99            | 0.20                                    | 0.98 | 4.93 | 9.94  | 19.85 | 29.75 | 39.76 | 49.67 | 59.61 | 62.56 |
| 2000           | 4.03            | 0.18                                    | 0.99 | 5.00 | 10.01 | 19.95 | 29.87 | 39.87 | 49.79 | 59.70 | 62.65 |
| 2500           | 4.14            | 0.18                                    | 0.99 | 5.01 | 10.01 | 19.98 | 29.91 | 39.91 | 49.83 | 59.76 | 62.70 |
| 3000           | 4.35            | 0.18                                    | 0.98 | 4.96 | 9.96  | 19.91 | 29.85 | 39.85 | 49.77 | 59.72 | 62.69 |
| 3500           | 4.54            | 0.20                                    | 0.97 | 4.92 | 9.93  | 19.86 | 29.80 | 39.80 | 49.73 | 59.68 | 62.65 |
| 4000           | 4.64            | 0.22                                    | 0.98 | 4.94 | 9.96  | 19.90 | 29.86 | 39.83 | 49.77 | 59.75 | 62.70 |
| 4500           | 4.73            | 0.23                                    | 0.98 | 4.98 | 9.98  | 19.95 | 29.92 | 39.88 | 49.82 | 59.81 | 62.78 |
| 5000           | 4.88            | 0.22                                    | 0.97 | 4.97 | 9.96  | 19.94 | 29.93 | 39.88 | 49.82 | 59.81 | 62.78 |
| 5500           | 5.02            | 0.22                                    | 0.96 | 4.96 | 9.94  | 19.92 | 29.93 | 39.88 | 49.84 | 59.83 | 62.80 |
| 6500           | 5.25            | 0.22                                    | 0.95 | 4.95 | 9.93  | 19.93 | 29.97 | 39.96 | 49.94 | 59.99 | 63.00 |
| 7500           | 5.33            | 0.18                                    | 0.96 | 5.02 | 10.01 | 20.05 | 30.13 | 40.20 | 50.20 | 60.26 | 63.26 |
| 8500           | 5.82            | 0.17                                    | 0.94 | 4.91 | 9.93  | 19.93 | 30.01 | 40.02 | 50.02 | 60.09 | 63.10 |
| 9500           | 5.85            | 0.25                                    | 0.98 | 5.02 | 10.08 | 20.11 | 30.22 | 40.20 | 50.23 | 60.33 | 63.33 |
| 10500          | 5.98            | 0.28                                    | 0.97 | 5.02 | 10.06 | 20.13 | 30.27 | 40.31 | 50.34 | 60.49 | 63.53 |
| 11500          | 6.34            | 0.25                                    | 0.97 | 4.99 | 10.06 | 20.11 | 30.26 | 40.26 | 50.30 | 60.40 | 63.49 |
| 12500          | 6.63            | 0.25                                    | 0.97 | 5.02 | 10.10 | 20.16 | 30.32 | 40.26 | 50.33 | 60.45 | 63.48 |
| 12750          | 6.69            | 0.25                                    | 0.96 | 5.01 | 10.07 | 20.14 | 30.31 | 40.24 | 50.31 | 60.46 | 63.47 |
| 13250          | 6.80            | 0.24                                    | 0.94 | 4.99 | 10.03 | 20.11 | 30.29 | 40.25 | 50.32 | 60.48 | 63.51 |
| 13500          | 6.84            | 0.23                                    | 0.94 | 4.99 | 10.02 | 20.10 | 30.29 | 40.27 | 50.34 | 60.49 | 63.55 |
| 14000          | 6.95            | 0.23                                    | 0.94 | 4.98 | 10.02 | 20.09 | 30.28 | 40.27 | 50.34 | 60.50 | 63.57 |
| 14250          | 7.03            | 0.23                                    | 0.94 | 4.97 | 10.02 | 20.08 | 30.27 | 40.25 | 50.33 | 60.49 | 63.50 |
| 14750          | 7.21            | 0.23                                    | 0.94 | 4.96 | 10.01 | 20.06 | 30.26 | 40.21 | 50.30 | 60.47 | 63.52 |
| 15000          | 7.28            | 0.24                                    | 0.93 | 4.96 | 10.01 | 20.06 | 30.26 | 40.20 | 50.29 | 60.45 | 63.44 |
| 15500          | 7.36            | 0.25                                    | 0.93 | 4.99 | 10.03 | 20.10 | 30.32 | 40.27 | 50.36 | 60.51 | 63.56 |
| 15750          | 7.38            | 0.25                                    | 0.93 | 5.00 | 10.04 | 20.12 | 30.35 | 40.33 | 50.42 | 60.57 | 63.60 |
| 16250          | 7.41            | 0.26                                    | 0.92 | 5.02 | 10.05 | 20.15 | 30.39 | 40.42 | 50.53 | 60.72 | 63.73 |
| 16500          | 7.45            | 0.26                                    | 0.92 | 5.02 | 10.06 | 20.16 | 30.40 | 40.46 | 50.57 | 60.76 | 63.78 |
| 17000          | 7.57            | 0.25                                    | 0.92 | 5.03 | 10.05 | 20.17 | 30.42 | 40.49 | 50.61 | 60.88 | 63.88 |
| 17250          | 7.65            | 0.25                                    | 0.92 | 5.02 | 10.04 | 20.17 | 30.43 | 40.49 | 50.60 | 60.84 | 63.87 |
| 17750          | 7.87            | 0.24                                    | 0.92 | 5.01 | 10.01 | 20.15 | 30.41 | 40.47 | 50.59 | 60.84 | 63.87 |
| 18000          | 8.03            | 0.23                                    | 0.92 | 5.00 | 9.99  | 20.13 | 30.39 | 40.44 | 50.56 | 60.78 | 63.76 |

| FREQ.<br>(MHz) | VSWR In<br>(:1)            |      |      |      |      |      |      |      |      |      |      | VSWR Out<br>(:1)           |      |      |      |      |      |      |      |      |      |      |
|----------------|----------------------------|------|------|------|------|------|------|------|------|------|------|----------------------------|------|------|------|------|------|------|------|------|------|------|
|                | @ Attenuation setting (dB) |      |      |      |      |      |      |      |      |      |      | @ Attenuation setting (dB) |      |      |      |      |      |      |      |      |      |      |
|                | 0                          | 0.25 | 1    | 5    | 10   | 20   | 30   | 40   | 50   | 60   | 63   | 0                          | 0.25 | 1    | 5    | 10   | 20   | 30   | 40   | 50   | 60   | 63   |
| 100            | 1.56                       | 1.49 | 1.40 | 1.22 | 1.05 | 1.05 | 1.06 | 1.04 | 1.05 | 1.05 | 1.08 | 1.56                       | 1.49 | 1.53 | 1.41 | 1.43 | 1.35 | 1.34 | 1.10 | 1.10 | 1.10 | 1.10 |
| 500            | 1.36                       | 1.31 | 1.25 | 1.12 | 1.01 | 1.03 | 1.03 | 1.02 | 1.03 | 1.03 | 1.05 | 1.38                       | 1.32 | 1.36 | 1.30 | 1.31 | 1.28 | 1.27 | 1.06 | 1.06 | 1.06 | 1.06 |
| 1000           | 1.09                       | 1.07 | 1.06 | 1.04 | 1.04 | 1.05 | 1.06 | 1.03 | 1.05 | 1.05 | 1.07 | 1.13                       | 1.09 | 1.13 | 1.17 | 1.17 | 1.21 | 1.21 | 1.07 | 1.07 | 1.07 | 1.07 |
| 1500           | 1.09                       | 1.12 | 1.07 | 1.05 | 1.07 | 1.07 | 1.07 | 1.05 | 1.07 | 1.07 | 1.09 | 1.07                       | 1.10 | 1.07 | 1.11 | 1.10 | 1.14 | 1.15 | 1.08 | 1.08 | 1.08 | 1.08 |
| 2000           | 1.20                       | 1.24 | 1.12 | 1.06 | 1.06 | 1.07 | 1.08 | 1.06 | 1.08 | 1.08 | 1.10 | 1.23                       | 1.26 | 1.21 | 1.15 | 1.15 | 1.13 | 1.13 | 1.08 | 1.08 | 1.08 | 1.08 |
| 2500           | 1.24                       | 1.27 | 1.16 | 1.07 | 1.06 | 1.08 | 1.08 | 1.07 | 1.08 | 1.08 | 1.10 | 1.30                       | 1.34 | 1.28 | 1.20 | 1.22 | 1.16 | 1.15 | 1.07 | 1.07 | 1.07 | 1.07 |
| 3000           | 1.20                       | 1.23 | 1.16 | 1.09 | 1.08 | 1.08 | 1.08 | 1.07 | 1.08 | 1.08 | 1.10 | 1.22                       | 1.25 | 1.22 | 1.18 | 1.20 | 1.17 | 1.17 | 1.06 | 1.06 | 1.06 | 1.06 |
| 3500           | 1.10                       | 1.13 | 1.10 | 1.07 | 1.09 | 1.09 | 1.09 | 1.08 | 1.09 | 1.09 | 1.11 | 1.06                       | 1.10 | 1.08 | 1.12 | 1.12 | 1.15 | 1.16 | 1.06 | 1.06 | 1.06 | 1.06 |
| 4000           | 1.06                       | 1.06 | 1.04 | 1.07 | 1.09 | 1.10 | 1.10 | 1.09 | 1.10 | 1.10 | 1.11 | 1.08                       | 1.07 | 1.07 | 1.10 | 1.08 | 1.12 | 1.13 | 1.07 | 1.07 | 1.07 | 1.07 |
| 4500           | 1.20                       | 1.17 | 1.14 | 1.13 | 1.10 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.12 | 1.17                       | 1.15 | 1.16 | 1.12 | 1.11 | 1.10 | 1.10 | 1.07 | 1.07 | 1.07 | 1.07 |
| 5000           | 1.30                       | 1.26 | 1.24 | 1.20 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.18                       | 1.15 | 1.18 | 1.15 | 1.18 | 1.14 | 1.13 | 1.06 | 1.06 | 1.06 | 1.06 |
| 5500           | 1.36                       | 1.33 | 1.29 | 1.24 | 1.15 | 1.15 | 1.14 | 1.15 | 1.14 | 1.15 | 1.14 | 1.21                       | 1.18 | 1.21 | 1.22 | 1.23 | 1.23 | 1.23 | 1.05 | 1.05 | 1.05 | 1.05 |
| 6500           | 1.40                       | 1.43 | 1.32 | 1.28 | 1.16 | 1.15 | 1.15 | 1.19 | 1.15 | 1.15 | 1.13 | 1.31                       | 1.32 | 1.31 | 1.34 | 1.33 | 1.35 | 1.36 | 1.06 | 1.06 | 1.06 | 1.06 |
| 7500           | 1.34                       | 1.38 | 1.27 | 1.23 | 1.14 | 1.13 | 1.14 | 1.13 | 1.14 | 1.13 | 1.12 | 1.26                       | 1.28 | 1.25 | 1.19 | 1.20 | 1.16 | 1.15 | 1.08 | 1.08 | 1.08 | 1.08 |
| 8500           | 1.20                       | 1.16 | 1.17 | 1.16 | 1.14 | 1.12 | 1.13 | 1.13 | 1.13 | 1.12 | 1.12 | 1.11                       | 1.09 | 1.10 | 1.04 | 1.05 | 1.02 | 1.01 | 1.08 | 1.08 | 1.08 | 1.08 |
| 9500           | 1.32                       | 1.28 | 1.22 | 1.14 | 1.13 | 1.14 | 1.14 | 1.12 | 1.14 | 1.14 | 1.14 | 1.22                       | 1.18 | 1.20 | 1.14 | 1.14 | 1.11 | 1.10 | 1.09 | 1.09 | 1.09 | 1.09 |
| 10500          | 1.07                       | 1.04 | 1.09 | 1.06 | 1.16 | 1.17 | 1.17 | 1.15 | 1.17 | 1.18 | 1.18 | 1.15                       | 1.13 | 1.15 | 1.12 | 1.15 | 1.13 | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 |
| 11500          | 1.02                       | 1.03 | 1.06 | 1.09 | 1.19 | 1.22 | 1.20 | 1.19 | 1.20 | 1.22 | 1.23 | 1.10                       | 1.09 | 1.09 | 1.10 | 1.08 | 1.10 | 1.11 | 1.12 | 1.12 | 1.12 | 1.12 |
| 12500          | 1.34                       | 1.36 | 1.27 | 1.20 | 1.20 | 1.23 | 1.22 | 1.21 | 1.21 | 1.23 | 1.24 | 1.24                       | 1.26 | 1.25 | 1.25 | 1.28 | 1.26 | 1.25 | 1.09 | 1.09 | 1.09 | 1.09 |
| 12750          | 1.42                       | 1.44 | 1.35 | 1.26 | 1.21 | 1.23 | 1.22 | 1.22 | 1.22 | 1.23 | 1.24 | 1.27                       | 1.29 | 1.29 | 1.29 | 1.32 | 1.30 | 1.29 | 1.08 | 1.08 | 1.08 | 1.08 |
| 13250          | 1.41                       | 1.41 | 1.36 | 1.28 | 1.21 | 1.22 | 1.20 | 1.22 | 1.20 | 1.21 | 1.22 | 1.30                       | 1.30 | 1.29 | 1.30 | 1.30 | 1.31 | 1.31 | 1.06 | 1.06 | 1.06 | 1.06 |
| 13500          | 1.35                       | 1.34 | 1.31 | 1.25 | 1.20 | 1.20 | 1.19 | 1.21 | 1.19 | 1.20 | 1.21 | 1.28                       | 1.28 | 1.27 | 1.28 | 1.27 | 1.28 | 1.29 | 1.06 | 1.06 | 1.06 | 1.06 |
| 14000          | 1.31                       | 1.30 | 1.28 | 1.25 | 1.18 | 1.19 | 1.18 | 1.20 | 1.18 | 1.19 | 1.20 | 1.22                       | 1.22 | 1.22 | 1.23 | 1.21 | 1.23 | 1.24 | 1.05 | 1.05 | 1.05 | 1.05 |
| 14250          | 1.38                       | 1.37 | 1.33 | 1.28 | 1.19 | 1.19 | 1.18 | 1.21 | 1.19 | 1.19 | 1.20 | 1.22                       | 1.21 | 1.22 | 1.23 | 1.21 | 1.22 | 1.22 | 1.05 | 1.05 | 1.05 | 1.05 |
| 14750          | 1.53                       | 1.51 | 1.44 | 1.32 | 1.19 | 1.17 | 1.17 | 1.20 | 1.17 | 1.17 | 1.18 | 1.29                       | 1.27 | 1.30 | 1.27 | 1.29 | 1.27 | 1.25 | 1.06 | 1.06 | 1.06 | 1.06 |
| 15000          | 1.55                       | 1.54 | 1.46 | 1.32 | 1.19 | 1.16 | 1.16 | 1.18 | 1.16 | 1.15 | 1.17 | 1.33                       | 1.32 | 1.33 | 1.30 | 1.33 | 1.30 | 1.29 | 1.06 | 1.06 | 1.06 | 1.06 |
| 15500          | 1.51                       | 1.50 | 1.44 | 1.31 | 1.17 | 1.13 | 1.14 | 1.17 | 1.14 | 1.13 | 1.15 | 1.34                       | 1.33 | 1.34 | 1.34 | 1.36 | 1.35 | 1.35 | 1.07 | 1.07 | 1.07 | 1.07 |
| 15750          | 1.43                       | 1.44 | 1.38 | 1.28 | 1.16 | 1.12 | 1.13 | 1.17 | 1.14 | 1.12 | 1.14 | 1.31                       | 1.30 | 1.31 | 1.33 | 1.33 | 1.34 | 1.35 | 1.07 | 1.07 | 1.07 | 1.07 |
| 16250          | 1.29                       | 1.30 | 1.26 | 1.22 | 1.12 | 1.08 | 1.10 | 1.12 | 1.10 | 1.08 | 1.10 | 1.24                       | 1.24 | 1.23 | 1.27 | 1.25 | 1.28 | 1.29 | 1.07 | 1.07 | 1.07 | 1.07 |
| 16500          | 1.25                       | 1.25 | 1.22 | 1.18 | 1.09 | 1.06 | 1.08 | 1.10 | 1.08 | 1.06 | 1.08 | 1.22                       | 1.22 | 1.21 | 1.24 | 1.21 | 1.24 | 1.25 | 1.06 | 1.06 | 1.06 | 1.06 |
| 17000          | 1.17                       | 1.18 | 1.17 | 1.15 | 1.07 | 1.05 | 1.06 | 1.07 | 1.06 | 1.05 | 1.07 | 1.19                       | 1.19 | 1.19 | 1.18 | 1.16 | 1.17 | 1.18 | 1.06 | 1.06 | 1.06 | 1.06 |
| 17250          | 1.13                       | 1.14 | 1.13 | 1.13 | 1.07 | 1.05 | 1.06 | 1.06 | 1.06 | 1.05 | 1.07 | 1.16                       | 1.16 | 1.16 | 1.15 | 1.13 | 1.13 | 1.13 | 1.06 | 1.06 | 1.06 | 1.06 |
| 17750          | 1.07                       | 1.08 | 1.08 | 1.13 | 1.09 | 1.09 | 1.09 | 1.08 | 1.09 | 1.09 | 1.11 | 1.06                       | 1.06 | 1.07 | 1.05 | 1.05 | 1.04 | 1.04 | 1.10 | 1.10 | 1.10 | 1.10 |
| 18000          | 1.10                       | 1.11 | 1.10 | 1.16 | 1.12 | 1.11 | 1.12 | 1.10 | 1.12 | 1.11 | 1.13 | 1.07                       | 1.05 | 1.07 | 1.07 | 1.04 | 1.06 | 1.07 | 1.13 | 1.13 | 1.13 | 1.13 |



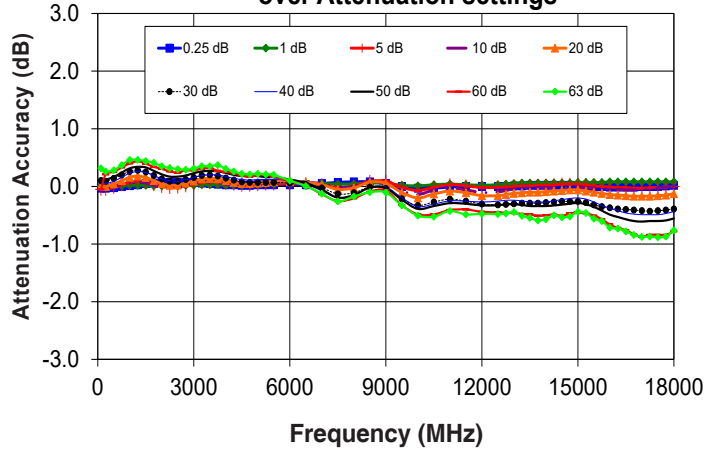
## Typical Performance Data (Continued)

| FREQ.<br>(MHz) | I. Loss<br>(dB) | Attenuation relative to I. Loss @0°C<br>(dB) |      |      |       |       |       |       |       |       |       |
|----------------|-----------------|----------------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                |                 | @ Attenuation setting (dB)                   |      |      |       |       |       |       |       |       |       |
|                |                 | 0.25                                         | 1    | 5    | 10    | 20    | 30    | 40    | 50    | 60    | 63    |
| 100            | 3.01            | 0.28                                         | 1.00 | 5.06 | 10.08 | 20.12 | 30.11 | 40.22 | 50.25 | 60.21 | 63.02 |
| 500            | 3.28            | 0.27                                         | 1.00 | 5.04 | 10.08 | 20.10 | 30.09 | 40.21 | 50.22 | 60.19 | 63.20 |
| 1000           | 3.59            | 0.24                                         | 0.99 | 4.96 | 10.01 | 19.99 | 29.97 | 40.09 | 50.10 | 60.09 | 63.05 |
| 1500           | 3.73            | 0.20                                         | 0.99 | 4.96 | 10.02 | 20.00 | 29.98 | 40.08 | 50.09 | 60.09 | 63.08 |
| 2000           | 3.76            | 0.19                                         | 1.00 | 5.03 | 10.08 | 20.10 | 30.10 | 40.18 | 50.19 | 60.21 | 63.15 |
| 2500           | 3.87            | 0.18                                         | 1.00 | 5.04 | 10.08 | 20.12 | 30.14 | 40.21 | 50.22 | 60.24 | 63.20 |
| 3000           | 4.06            | 0.19                                         | 0.99 | 4.99 | 10.03 | 20.06 | 30.08 | 40.16 | 50.18 | 60.22 | 63.21 |
| 3500           | 4.23            | 0.20                                         | 0.98 | 4.95 | 10.01 | 20.01 | 30.04 | 40.12 | 50.14 | 60.15 | 63.14 |
| 4000           | 4.33            | 0.22                                         | 0.99 | 4.97 | 10.03 | 20.05 | 30.09 | 40.15 | 50.18 | 60.21 | 63.22 |
| 4500           | 4.41            | 0.23                                         | 0.99 | 5.00 | 10.06 | 20.10 | 30.16 | 40.20 | 50.23 | 60.29 | 63.28 |
| 5000           | 4.55            | 0.23                                         | 0.98 | 5.00 | 10.04 | 20.09 | 30.17 | 40.20 | 50.24 | 60.31 | 63.32 |
| 5500           | 4.69            | 0.22                                         | 0.97 | 4.99 | 10.01 | 20.07 | 30.17 | 40.20 | 50.24 | 60.33 | 63.35 |
| 6500           | 4.90            | 0.22                                         | 0.96 | 4.98 | 10.01 | 20.07 | 30.19 | 40.28 | 50.34 | 60.47 | 63.46 |
| 7500           | 4.97            | 0.19                                         | 0.97 | 5.05 | 10.08 | 20.19 | 30.35 | 40.50 | 50.58 | 60.73 | 63.75 |
| 8500           | 5.42            | 0.17                                         | 0.95 | 4.94 | 10.00 | 20.08 | 30.25 | 40.34 | 50.42 | 60.56 | 63.60 |
| 9500           | 5.48            | 0.25                                         | 0.99 | 5.03 | 10.15 | 20.25 | 30.43 | 40.50 | 50.61 | 60.77 | 63.81 |
| 10500          | 5.57            | 0.28                                         | 0.98 | 5.05 | 10.15 | 20.29 | 30.52 | 40.63 | 50.76 | 60.95 | 64.00 |
| 11500          | 5.89            | 0.25                                         | 0.98 | 5.01 | 10.13 | 20.26 | 30.50 | 40.58 | 50.72 | 60.94 | 63.99 |
| 12500          | 6.16            | 0.25                                         | 0.98 | 5.04 | 10.17 | 20.30 | 30.55 | 40.59 | 50.74 | 60.95 | 63.94 |
| 12750          | 6.22            | 0.25                                         | 0.97 | 5.03 | 10.15 | 20.29 | 30.55 | 40.58 | 50.73 | 60.95 | 63.98 |
| 13250          | 6.31            | 0.24                                         | 0.96 | 5.02 | 10.11 | 20.27 | 30.55 | 40.59 | 50.76 | 60.99 | 64.06 |
| 13500          | 6.35            | 0.24                                         | 0.95 | 5.02 | 10.10 | 20.26 | 30.54 | 40.61 | 50.78 | 61.01 | 64.07 |
| 14000          | 6.45            | 0.23                                         | 0.96 | 5.01 | 10.10 | 20.25 | 30.53 | 40.61 | 50.78 | 61.02 | 64.07 |
| 14250          | 6.53            | 0.23                                         | 0.96 | 5.00 | 10.10 | 20.24 | 30.52 | 40.60 | 50.76 | 61.03 | 64.08 |
| 14750          | 6.70            | 0.23                                         | 0.95 | 4.99 | 10.10 | 20.22 | 30.51 | 40.55 | 50.72 | 61.00 | 64.01 |
| 15000          | 6.78            | 0.23                                         | 0.94 | 4.98 | 10.09 | 20.22 | 30.50 | 40.53 | 50.72 | 60.95 | 63.97 |
| 15500          | 6.88            | 0.25                                         | 0.94 | 5.01 | 10.10 | 20.25 | 30.56 | 40.58 | 50.76 | 60.98 | 64.06 |
| 15750          | 6.89            | 0.25                                         | 0.93 | 5.03 | 10.11 | 20.27 | 30.59 | 40.64 | 50.82 | 61.01 | 64.06 |
| 16250          | 6.92            | 0.26                                         | 0.93 | 5.05 | 10.13 | 20.30 | 30.64 | 40.75 | 50.95 | 61.22 | 64.29 |
| 16500          | 6.95            | 0.26                                         | 0.93 | 5.05 | 10.13 | 20.31 | 30.65 | 40.78 | 50.99 | 61.26 | 64.33 |
| 17000          | 7.06            | 0.26                                         | 0.93 | 5.05 | 10.12 | 20.32 | 30.67 | 40.81 | 51.02 | 61.33 | 64.39 |
| 17250          | 7.13            | 0.25                                         | 0.93 | 5.05 | 10.11 | 20.32 | 30.67 | 40.81 | 51.02 | 61.35 | 64.41 |
| 17750          | 7.33            | 0.25                                         | 0.93 | 5.05 | 10.08 | 20.30 | 30.66 | 40.80 | 51.00 | 61.29 | 64.40 |
| 18000          | 7.47            | 0.24                                         | 0.93 | 5.04 | 10.07 | 20.28 | 30.64 | 40.77 | 50.97 | 61.25 | 64.36 |

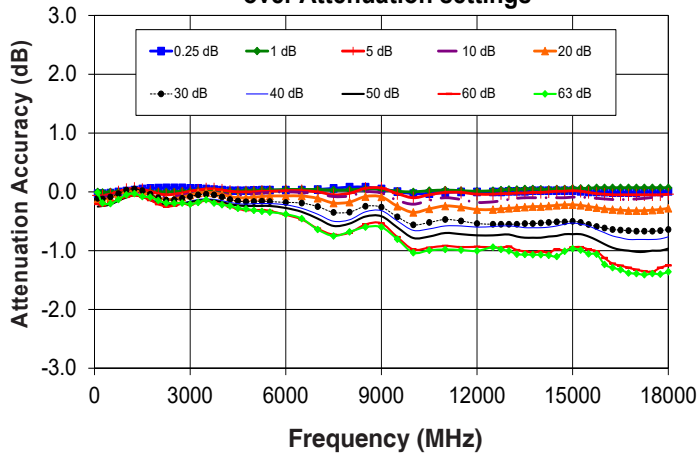
| FREQ.<br>(MHz) | I. Loss<br>(dB) | Attenuation relative to I. Loss @+50°C<br>(dB) |      |      |       |       |       |       |       |       |       |
|----------------|-----------------|------------------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                |                 | @ Attenuation setting (dB)                     |      |      |       |       |       |       |       |       |       |
|                |                 | 0.25                                           | 1    | 5    | 10    | 20    | 30    | 40    | 50    | 60    | 63    |
| 100            | 3.33            | 0.29                                           | 0.99 | 5.04 | 9.97  | 19.90 | 29.75 | 39.73 | 49.59 | 59.25 | 62.65 |
| 500            | 3.63            | 0.27                                           | 0.99 | 5.01 | 9.96  | 19.87 | 29.72 | 39.71 | 49.58 | 59.43 | 62.36 |
| 1000           | 3.99            | 0.24                                           | 0.98 | 4.91 | 9.89  | 19.74 | 29.58 | 39.56 | 49.43 | 59.28 | 62.24 |
| 1500           | 4.16            | 0.20                                           | 0.97 | 4.91 | 9.90  | 19.75 | 29.59 | 39.54 | 49.41 | 59.26 | 62.21 |
| 2000           | 4.19            | 0.18                                           | 0.99 | 4.99 | 9.96  | 19.86 | 29.72 | 39.66 | 49.52 | 59.36 | 62.33 |
| 2500           | 4.31            | 0.18                                           | 0.99 | 5.00 | 9.97  | 19.88 | 29.76 | 39.69 | 49.55 | 59.43 | 62.39 |
| 3000           | 4.53            | 0.18                                           | 0.97 | 4.94 | 9.91  | 19.81 | 29.69 | 39.63 | 49.50 | 59.40 | 62.35 |
| 3500           | 4.72            | 0.20                                           | 0.96 | 4.90 | 9.89  | 19.75 | 29.64 | 39.57 | 49.45 | 59.36 | 62.32 |
| 4000           | 4.82            | 0.22                                           | 0.97 | 4.93 | 9.92  | 19.80 | 29.70 | 39.61 | 49.49 | 59.40 | 62.34 |
| 4500           | 4.92            | 0.23                                           | 0.97 | 4.96 | 9.94  | 19.85 | 29.77 | 39.66 | 49.54 | 59.46 | 62.41 |
| 5000           | 5.07            | 0.23                                           | 0.96 | 4.96 | 9.92  | 19.84 | 29.77 | 39.66 | 49.56 | 59.49 | 62.43 |
| 5500           | 5.21            | 0.22                                           | 0.95 | 4.94 | 9.89  | 19.83 | 29.77 | 39.66 | 49.56 | 59.51 | 62.46 |
| 6500           | 5.43            | 0.21                                           | 0.94 | 4.94 | 9.89  | 19.83 | 29.81 | 39.74 | 49.67 | 59.65 | 62.65 |
| 7500           | 5.52            | 0.18                                           | 0.96 | 5.01 | 9.97  | 19.96 | 29.97 | 39.99 | 49.93 | 59.95 | 62.88 |
| 8500           | 6.03            | 0.17                                           | 0.94 | 4.90 | 9.89  | 19.83 | 29.85 | 39.79 | 49.73 | 59.75 | 62.73 |
| 9500           | 6.04            | 0.25                                           | 0.98 | 5.00 | 10.03 | 20.01 | 30.06 | 39.98 | 49.96 | 60.01 | 63.00 |
| 10500          | 6.19            | 0.28                                           | 0.96 | 4.99 | 10.01 | 20.02 | 30.10 | 40.06 | 50.03 | 60.09 | 63.12 |
| 11500          | 6.57            | 0.26                                           | 0.97 | 4.97 | 10.02 | 20.01 | 30.08 | 40.01 | 50.00 | 60.05 | 63.08 |
| 12500          | 6.85            | 0.25                                           | 0.97 | 5.00 | 10.04 | 20.05 | 30.14 | 40.01 | 50.01 | 60.07 | 63.09 |
| 12750          | 6.92            | 0.25                                           | 0.96 | 4.99 | 10.02 | 20.03 | 30.14 | 40.00 | 50.01 | 60.07 | 63.02 |
| 13250          | 7.03            | 0.24                                           | 0.94 | 4.98 | 9.98  | 20.01 | 30.13 | 40.01 | 50.01 | 60.12 | 63.14 |
| 13500          | 7.07            | 0.24                                           | 0.94 | 4.97 | 9.97  | 20.00 | 30.12 | 40.02 | 50.03 | 60.13 | 63.15 |
| 14000          | 7.18            | 0.23                                           | 0.94 | 4.97 | 9.97  | 19.99 | 30.11 | 40.03 | 50.04 | 60.15 | 63.16 |
| 14250          | 7.26            | 0.23                                           | 0.94 | 4.96 | 9.97  | 19.98 | 30.10 | 40.01 | 50.03 | 60.15 | 63.17 |
| 14750          | 7.43            | 0.23                                           | 0.93 | 4.94 | 9.96  | 19.96 | 30.08 | 39.97 | 49.98 | 60.08 | 63.08 |
| 15000          | 7.51            | 0.24                                           | 0.93 | 4.95 | 9.96  | 19.96 | 30.09 | 39.97 | 49.97 | 60.04 | 63.10 |
| 15500          | 7.58            | 0.25                                           | 0.92 | 4.97 | 9.98  | 19.99 | 30.14 | 40.03 | 50.05 | 60.11 | 63.13 |
| 15750          | 7.60            | 0.25                                           | 0.92 | 4.99 | 9.99  | 20.02 | 30.17 | 40.08 | 50.12 | 60.24 | 63.18 |
| 16250          | 7.64            | 0.26                                           | 0.92 | 5.01 | 10.01 | 20.05 | 30.21 | 40.17 | 50.22 | 60.33 | 63.32 |
| 16500          | 7.68            | 0.26                                           | 0.92 | 5.01 | 10.01 | 20.05 | 30.23 | 40.21 | 50.26 | 60.40 | 63.39 |
| 17000          | 7.79            | 0.25                                           | 0.92 | 5.01 | 10.01 | 20.07 | 30.25 | 40.26 | 50.32 | 60.47 | 63.49 |
| 17250          | 7.88            | 0.25                                           | 0.92 | 5.01 | 10.00 | 20.06 | 30.25 | 40.26 | 50.32 | 60.46 | 63.47 |
| 17750          | 8.11            | 0.24                                           | 0.92 | 5.00 | 9.96  | 20.04 | 30.24 | 40.23 | 50.29 | 60.44 | 63.43 |
| 18000          | 8.28            | 0.23                                           | 0.92 | 4.99 | 9.95  | 20.02 | 30.22 | 40.19 | 50.26 | 60.38 | 63.42 |

## Typical Performance Curves

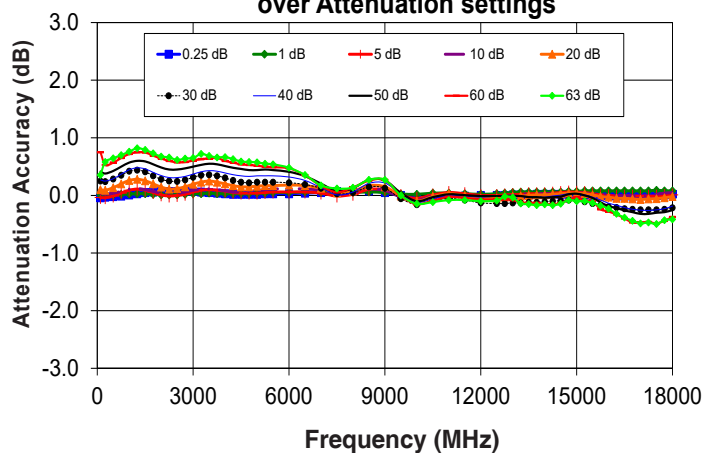
**Attenuation Accuracy @25°C vs. Frequency over Attenuation settings**



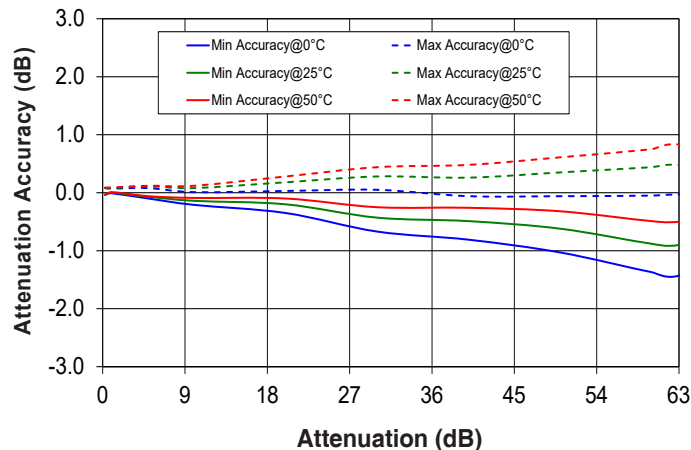
**Attenuation Accuracy @0°C vs. Frequency over Attenuation settings**



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

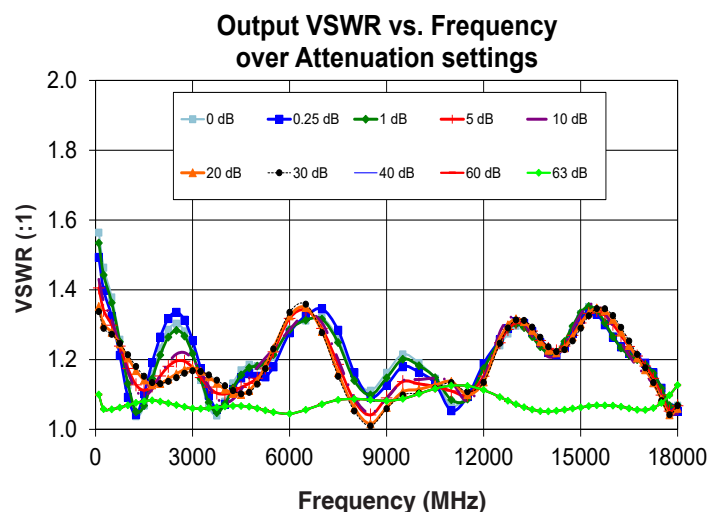
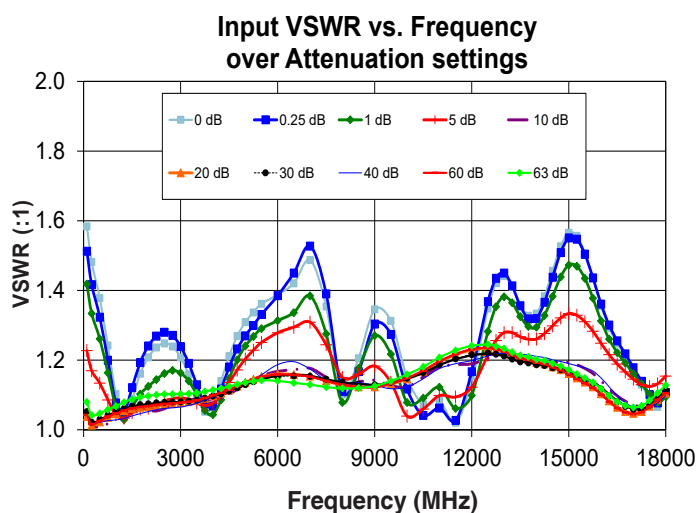
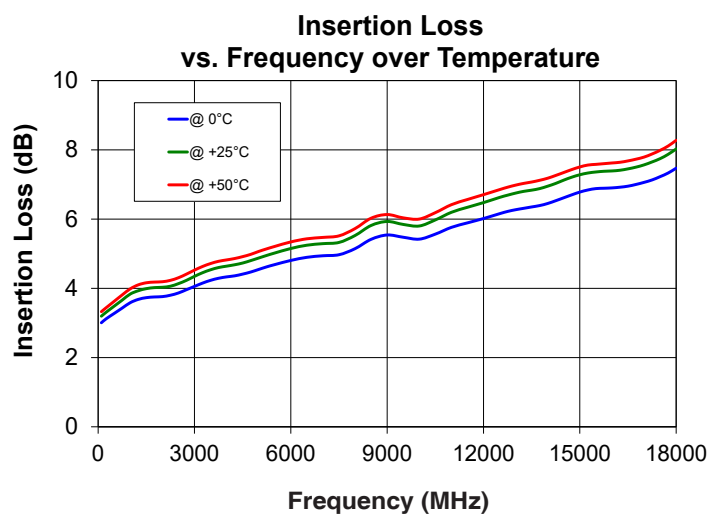


**Typical Attenuation Accuracy @0.1-18GHz vs. Attenuation settings over Temperature**



## Typical Performance Curves (Continued) \*

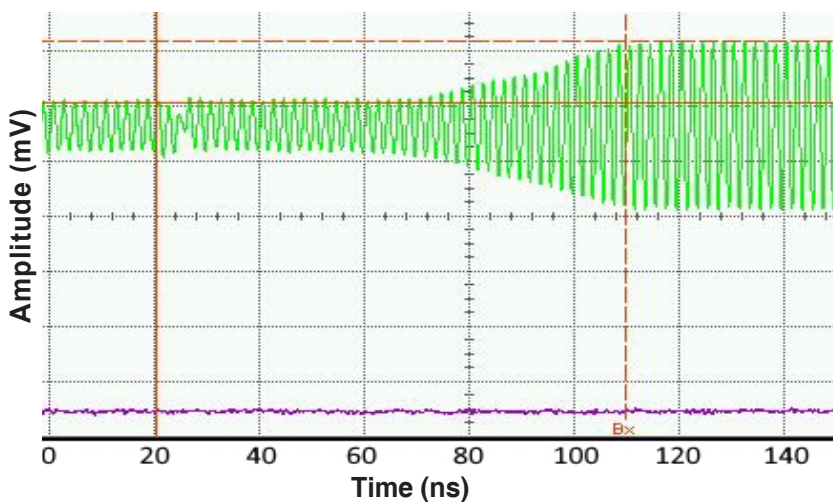
\*at +25°C unless noted otherwise



## Typical Transition times @ +25°C

Note: All transition time tests performed with input signal of 501 MHz, 0 dBm.

Transition (without Trigger) 5 dB to 15.75 dB,  
tested using Oscilloscope

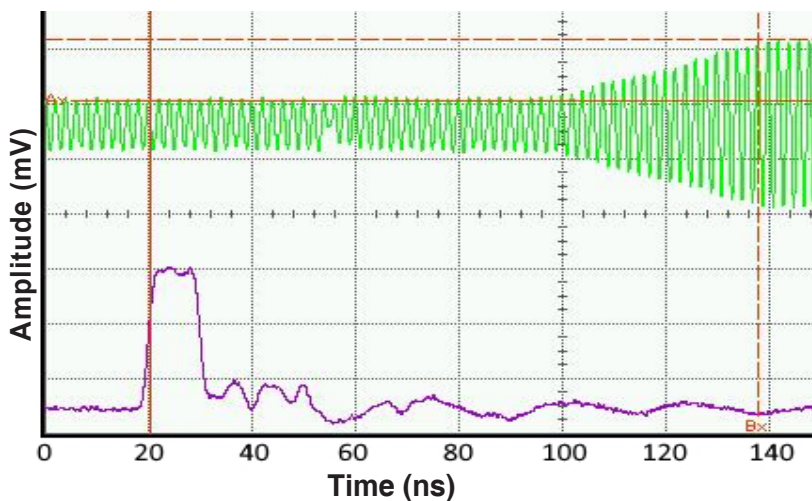


Rise time at transition 5 to 15.75 dB:

$\Delta t$ : 89.5 ns ;  $\Delta V$ : 110.3 mV

Scale 20 ns/dev ; 100 mV/dev

Trigger delay 5 dB to 15.75 dB,  
tested using Oscilloscope



Rise time at transition 5 to 15.75 dB:

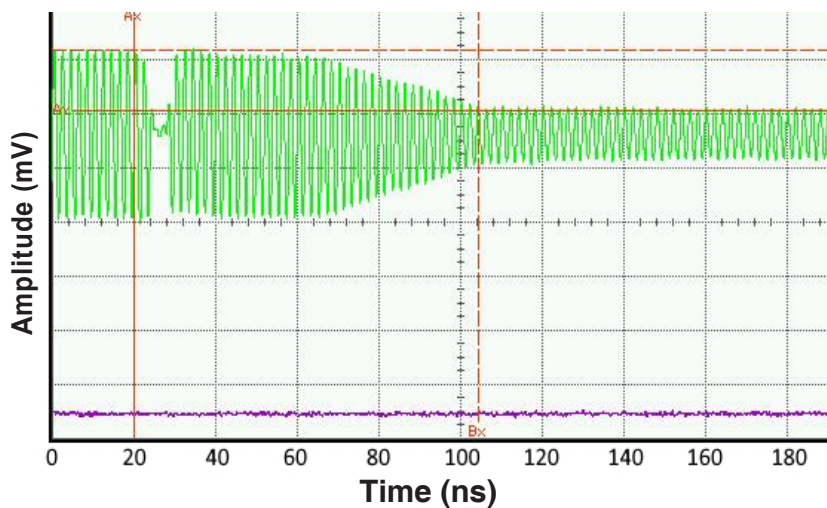
$\Delta t$ : 117.4 ns ;  $\Delta V$ : 110.3 mV

Scale 20 ns/dev ; 100 mV/dev

## Typical Transition times @ +25°C (Continued)

Note: All transition time tests performed with input signal of 501 MHz, 0 dBm.

Transition (without Trigger) 15.75 dB to 5 dB,  
tested using Oscilloscope

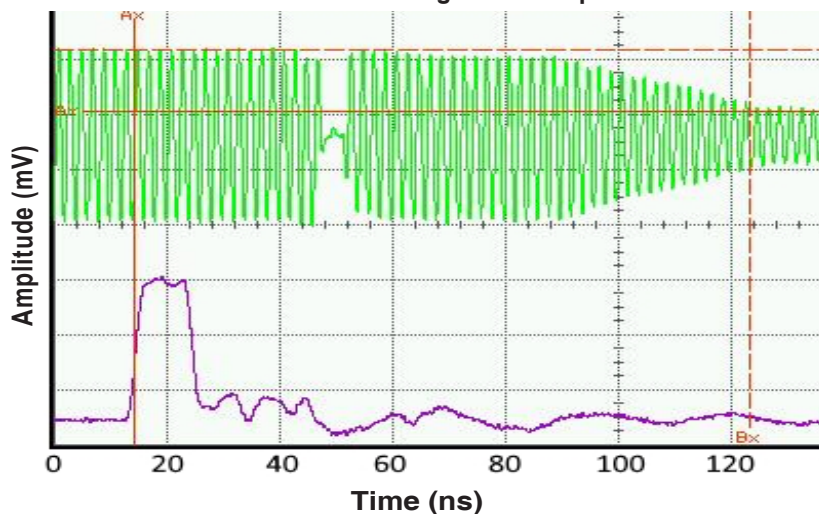


Fall time at transition 15.75 to 5 dB:

$\Delta t$ : 84.4 ns ;  $\Delta V$ : 110.3 mV

Scale 20 ns/dev ; 100 mV/dev

Trigger delay 15.75 dB to 5 dB,  
tested using Oscilloscope



Fall time at transition 15.75 to 5 dB:

$\Delta t$ : 109.1 ns ;  $\Delta V$ : 110.3 mV

Scale 20 ns/dev ; 100 mV/dev

**Software & Documentation Download:**

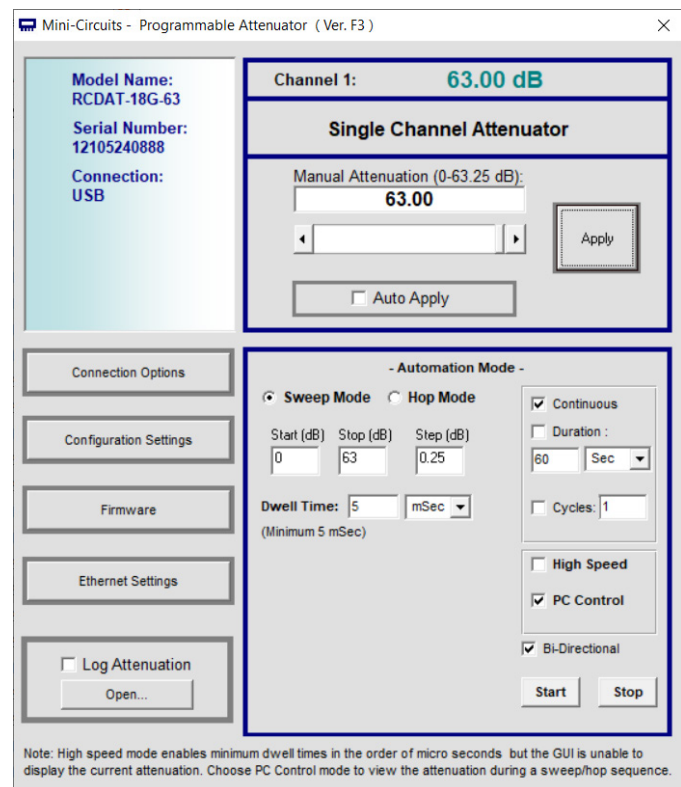
- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge from <http://www.minicircuits.com/softwaredownload/patt.html>
- Please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com) for support

**Minimum System Requirements**

| Parameter           | Requirements                      |                                                                                           |
|---------------------|-----------------------------------|-------------------------------------------------------------------------------------------|
| Interface           | USB HID or RS232 or TTL protocols |                                                                                           |
| 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                                   |
|                     | TTL                               | Any computer with a suitable I/O port                                                     |
|                     | RS232                             | Any computer with a serial port and Russ 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 RCDAT.
- Attenuator address configuration and Firmware upgrade
- Attenuation at power up may be set to selected attenuation level or last attenuation state recorded.
- USB, Ethernet or RS232 control of RCDAT

**Application Programming Interface (API)**

Programming manual: [https://www.minicircuits.com/softwaredownload/Prog\\_Manual-6-Programmable\\_Attenuator.pdf](https://www.minicircuits.com/softwaredownload/Prog_Manual-6-Programmable_Attenuator.pdf)

**Windows Support:**

- API DLL files exposing the full switch functionality
  - 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:**

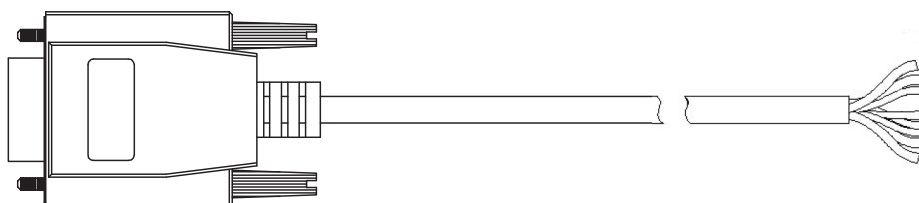
- Full attenuator control in a Linux environment is achieved by way of USB interrupt commands.



## Recommended Accessories

An optional cable accessory for RS232 and TTL control which is available with RCDAT-18G-63, the DSUB15-FPT-1.5+ 'pig tail' cable. DSUB15-FPT-1.5+ is a shielded cable with a 'pig tail' (bare wires) end allowing customer to assemble their own cable with any connector they need. Cable length is 1.5 feet / 0.46 meters using 28 AWG wires.

**Control Cable DSUB15-FPT-1.5+**



| Pin Number | when used for RS232 control |                   | when used for TTL control |                   | Pigtail Wire Color |
|------------|-----------------------------|-------------------|---------------------------|-------------------|--------------------|
|            | Function                    | Description       | Function                  | Description       |                    |
| 1          | Vcc                         | Supply Voltage    | Vcc                       | Supply Voltage    | Red                |
| 2          | GND                         | Ground connection | GND                       | Ground connection | Black              |
| 3          | Tx                          | RS232 Transmit    | N/A                       | Do not connect    | White              |
| 4          | Rx                          | RS232 Receive     | N/A                       | Do not connect    | Green              |
| 5          | N/A                         | Do not connect    | TE                        | TTL Enable        | Orange             |
| 6          | Trig                        | Trigger In        | LE                        | Latch Enable      | Blue               |
| 7          | N/A                         | Do not connect    | C0.25                     | 0.25 dB           | White/Black        |
| 8          | N/A                         | Do not connect    | C0.5                      | 0.5 dB            | Red/Black          |
| 9          | N/A                         | Do not connect    | C1                        | 1 dB              | Green/Black        |
| 10         | N/A                         | Do not connect    | C2                        | 2 dB              | Orange/Black       |
| 11         | N/A                         | Do not connect    | C4                        | 4 dB              | Blue/Black         |
| 12         | N/A                         | Do not connect    | C8                        | 8 dB              | Black/White        |
| 13         | N/A                         | Do not connect    | C16                       | 16 dB             | Red/White          |
| 14         | N/A                         | Do not connect    | C31.5                     | 31.5 dB           | Green/White        |
| 15         | N/A                         | Do not connect    | N/A                       | Do not connect    | Blue/White         |

## Ordering Information

| Model        | Description                                    |
|--------------|------------------------------------------------|
| RCDAT-18G-63 | USB/Ethernet/RS232/TTL Programmable Attenuator |

| Included Accessories                                                              | Part No.      | Description                                                    |
|-----------------------------------------------------------------------------------|---------------|----------------------------------------------------------------|
|  | USB-CBL-AC-3+ | 3.3 ft (1.0 m) USB Cable: USB type A(Male) to USB type C(Male) |

| Optional Accessories         | Description                                                                          |
|------------------------------|--------------------------------------------------------------------------------------|
| USB-AC/DC-5 <sup>14,15</sup> | AC/DC 5V <sub>DC</sub> Power Adapter with US, EU, IL, UK, AUS, and China power plugs |
| USB-CBL-AC-3+ (spare)        | 3.3 ft (1.0 m) USB Cable: USB type A(Male) to USB type C(Male)                       |
| CBL-RJ45-MM-5+               | 5 ft (1.5 m) Ethernet cable: RJ45(Male) to RJ45(Male) Cat 5E cable                   |
| DSUB15-FPT-1.5+              | 1.5 ft (0.46 m) RS232 & TTL Cable: 15 pin D-sub(Female) to Pig-Tail (Bare wires)     |

<sup>14</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 or TTL; units can also accept DC supply voltage at Pin#1 of the D-sub connector.

<sup>15</sup> Power 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

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





# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | Attenuation relative to Insertion Loss<br>(dB) |      |      |       |       |       |       |       |       |       |
|--------------------|------------------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                        | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 0.28                                           | 1.00 | 5.06 | 10.08 | 20.12 | 30.11 | 40.22 | 50.25 | 60.21 | 63.02 |
| 250                | 0.28                                           | 1.01 | 5.07 | 10.09 | 20.13 | 30.12 | 40.24 | 50.24 | 60.23 | 63.19 |
| 500                | 0.27                                           | 1.00 | 5.04 | 10.08 | 20.10 | 30.09 | 40.21 | 50.22 | 60.19 | 63.20 |
| 750                | 0.25                                           | 1.00 | 5.00 | 10.04 | 20.04 | 30.03 | 40.15 | 50.15 | 60.13 | 63.13 |
| 1000               | 0.24                                           | 0.99 | 4.96 | 10.01 | 19.99 | 29.97 | 40.09 | 50.10 | 60.09 | 63.05 |
| 1250               | 0.22                                           | 0.99 | 4.94 | 10.00 | 19.97 | 29.95 | 40.06 | 50.06 | 60.06 | 63.03 |
| 1500               | 0.20                                           | 0.99 | 4.96 | 10.02 | 20.00 | 29.98 | 40.08 | 50.09 | 60.09 | 63.08 |
| 1750               | 0.19                                           | 1.00 | 4.99 | 10.05 | 20.05 | 30.04 | 40.13 | 50.14 | 60.14 | 63.09 |
| 2000               | 0.19                                           | 1.00 | 5.03 | 10.08 | 20.10 | 30.10 | 40.18 | 50.19 | 60.21 | 63.15 |
| 2250               | 0.18                                           | 1.00 | 5.05 | 10.09 | 20.13 | 30.14 | 40.21 | 50.22 | 60.25 | 63.19 |
| 2500               | 0.18                                           | 1.00 | 5.04 | 10.08 | 20.12 | 30.14 | 40.21 | 50.22 | 60.24 | 63.20 |
| 2750               | 0.18                                           | 0.99 | 5.02 | 10.06 | 20.09 | 30.11 | 40.19 | 50.20 | 60.20 | 63.19 |
| 3000               | 0.19                                           | 0.99 | 4.99 | 10.03 | 20.06 | 30.08 | 40.16 | 50.18 | 60.22 | 63.21 |
| 3250               | 0.19                                           | 0.98 | 4.97 | 10.01 | 20.02 | 30.05 | 40.13 | 50.15 | 60.18 | 63.18 |
| 3500               | 0.20                                           | 0.98 | 4.95 | 10.01 | 20.01 | 30.04 | 40.12 | 50.14 | 60.15 | 63.14 |
| 3750               | 0.21                                           | 0.98 | 4.95 | 10.01 | 20.02 | 30.05 | 40.13 | 50.15 | 60.18 | 63.19 |
| 4000               | 0.22                                           | 0.99 | 4.97 | 10.03 | 20.05 | 30.09 | 40.15 | 50.18 | 60.21 | 63.22 |
| 4250               | 0.23                                           | 0.99 | 4.99 | 10.05 | 20.08 | 30.13 | 40.18 | 50.21 | 60.25 | 63.24 |
| 4500               | 0.23                                           | 0.99 | 5.00 | 10.06 | 20.10 | 30.16 | 40.20 | 50.23 | 60.29 | 63.28 |
| 4750               | 0.23                                           | 0.98 | 5.00 | 10.05 | 20.10 | 30.17 | 40.21 | 50.24 | 60.31 | 63.29 |
| 5000               | 0.23                                           | 0.98 | 5.00 | 10.04 | 20.09 | 30.17 | 40.20 | 50.24 | 60.31 | 63.32 |
| 5250               | 0.22                                           | 0.97 | 4.99 | 10.02 | 20.08 | 30.16 | 40.20 | 50.24 | 60.31 | 63.33 |
| 5500               | 0.22                                           | 0.97 | 4.99 | 10.01 | 20.07 | 30.17 | 40.20 | 50.24 | 60.33 | 63.35 |
| 6000               | 0.22                                           | 0.96 | 4.98 | 10.00 | 20.07 | 30.18 | 40.22 | 50.28 | 60.39 | 63.38 |
| 6500               | 0.22                                           | 0.96 | 4.98 | 10.01 | 20.07 | 30.19 | 40.28 | 50.34 | 60.47 | 63.46 |
| 7000               | 0.21                                           | 0.96 | 5.00 | 10.03 | 20.11 | 30.25 | 40.38 | 50.46 | 60.63 | 63.64 |
| 7500               | 0.19                                           | 0.97 | 5.05 | 10.08 | 20.19 | 30.35 | 40.50 | 50.58 | 60.73 | 63.75 |
| 8000               | 0.17                                           | 0.97 | 5.03 | 10.07 | 20.18 | 30.35 | 40.48 | 50.54 | 60.70 | 63.68 |
| 8500               | 0.17                                           | 0.95 | 4.94 | 10.00 | 20.08 | 30.25 | 40.34 | 50.42 | 60.56 | 63.60 |
| 9000               | 0.20                                           | 0.96 | 4.94 | 10.02 | 20.09 | 30.26 | 40.32 | 50.42 | 60.54 | 63.60 |
| 9500               | 0.25                                           | 0.99 | 5.03 | 10.15 | 20.25 | 30.43 | 40.50 | 50.61 | 60.77 | 63.81 |
| 10000              | 0.28                                           | 1.00 | 5.10 | 10.21 | 20.35 | 30.56 | 40.66 | 50.79 | 60.98 | 64.04 |
| 10500              | 0.28                                           | 0.98 | 5.05 | 10.15 | 20.29 | 30.52 | 40.63 | 50.76 | 60.95 | 64.00 |
| 11000              | 0.26                                           | 0.97 | 5.01 | 10.10 | 20.24 | 30.47 | 40.58 | 50.70 | 60.92 | 63.98 |
| 11500              | 0.25                                           | 0.98 | 5.01 | 10.13 | 20.26 | 30.50 | 40.58 | 50.72 | 60.94 | 63.99 |
| 12000              | 0.25                                           | 0.99 | 5.04 | 10.18 | 20.30 | 30.54 | 40.60 | 50.74 | 60.94 | 64.01 |
| 12500              | 0.25                                           | 0.98 | 5.04 | 10.17 | 20.30 | 30.55 | 40.59 | 50.74 | 60.95 | 63.94 |
| 12750              | 0.25                                           | 0.97 | 5.03 | 10.15 | 20.29 | 30.55 | 40.58 | 50.73 | 60.95 | 63.98 |
| 13000              | 0.24                                           | 0.96 | 5.03 | 10.13 | 20.28 | 30.55 | 40.58 | 50.73 | 60.93 | 64.01 |
| 13250              | 0.24                                           | 0.96 | 5.02 | 10.11 | 20.27 | 30.55 | 40.59 | 50.76 | 60.99 | 64.06 |
| 13500              | 0.24                                           | 0.95 | 5.02 | 10.10 | 20.26 | 30.54 | 40.61 | 50.78 | 61.01 | 64.07 |
| 13750              | 0.23                                           | 0.95 | 5.01 | 10.10 | 20.25 | 30.54 | 40.61 | 50.78 | 61.03 | 64.07 |
| 14000              | 0.23                                           | 0.96 | 5.01 | 10.10 | 20.25 | 30.53 | 40.61 | 50.78 | 61.02 | 64.07 |
| 14250              | 0.23                                           | 0.96 | 5.00 | 10.10 | 20.24 | 30.52 | 40.60 | 50.76 | 61.03 | 64.08 |
| 14500              | 0.23                                           | 0.95 | 4.99 | 10.10 | 20.23 | 30.51 | 40.58 | 50.75 | 60.98 | 64.10 |
| 14750              | 0.23                                           | 0.95 | 4.99 | 10.10 | 20.22 | 30.51 | 40.55 | 50.72 | 61.00 | 64.01 |
| 15000              | 0.23                                           | 0.94 | 4.98 | 10.09 | 20.22 | 30.50 | 40.53 | 50.72 | 60.95 | 63.97 |
| 15250              | 0.24                                           | 0.94 | 4.99 | 10.09 | 20.23 | 30.52 | 40.55 | 50.72 | 60.94 | 63.99 |
| 15500              | 0.25                                           | 0.94 | 5.01 | 10.10 | 20.25 | 30.56 | 40.58 | 50.76 | 60.98 | 64.06 |
| 15750              | 0.25                                           | 0.93 | 5.03 | 10.11 | 20.27 | 30.59 | 40.64 | 50.82 | 61.01 | 64.06 |
| 16000              | 0.26                                           | 0.93 | 5.04 | 10.12 | 20.29 | 30.62 | 40.70 | 50.89 | 61.13 | 64.24 |
| 16250              | 0.26                                           | 0.93 | 5.05 | 10.13 | 20.30 | 30.64 | 40.75 | 50.95 | 61.22 | 64.29 |
| 16500              | 0.26                                           | 0.93 | 5.05 | 10.13 | 20.31 | 30.65 | 40.78 | 50.99 | 61.26 | 64.33 |
| 16750              | 0.26                                           | 0.93 | 5.05 | 10.13 | 20.32 | 30.66 | 40.81 | 51.00 | 61.29 | 64.38 |
| 17000              | 0.26                                           | 0.93 | 5.05 | 10.12 | 20.32 | 30.67 | 40.81 | 51.02 | 61.33 | 64.39 |
| 17250              | 0.25                                           | 0.93 | 5.05 | 10.11 | 20.32 | 30.67 | 40.81 | 51.02 | 61.35 | 64.41 |
| 17500              | 0.25                                           | 0.93 | 5.05 | 10.10 | 20.31 | 30.67 | 40.81 | 51.00 | 61.36 | 64.39 |
| 17750              | 0.25                                           | 0.93 | 5.05 | 10.08 | 20.30 | 30.66 | 40.80 | 51.00 | 61.29 | 64.40 |
| 18000              | 0.24                                           | 0.93 | 5.04 | 10.07 | 20.28 | 30.64 | 40.77 | 50.97 | 61.25 | 64.36 |

### 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.  
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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | Attenuation accuracy relative to nominal attenuation setting<br>(dB) |       |       |       |       |       |       |       |       |       |
|--------------------|----------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                                              | 1 dB  | 5 dB  | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | -0.03                                                                | 0.00  | -0.06 | -0.08 | -0.12 | -0.11 | -0.22 | -0.25 | -0.21 | -0.02 |
| 250                | -0.03                                                                | -0.01 | -0.07 | -0.09 | -0.13 | -0.12 | -0.24 | -0.24 | -0.23 | -0.19 |
| 500                | -0.02                                                                | 0.00  | -0.04 | -0.08 | -0.10 | -0.09 | -0.21 | -0.22 | -0.19 | -0.20 |
| 750                | 0.00                                                                 | 0.00  | 0.00  | -0.04 | -0.04 | -0.03 | -0.15 | -0.15 | -0.13 | -0.13 |
| 1000               | 0.02                                                                 | 0.01  | 0.04  | -0.01 | 0.01  | 0.03  | -0.09 | -0.10 | -0.09 | -0.05 |
| 1250               | 0.03                                                                 | 0.01  | 0.06  | 0.00  | 0.03  | 0.05  | -0.06 | -0.06 | -0.06 | -0.03 |
| 1500               | 0.05                                                                 | 0.01  | 0.04  | -0.02 | 0.01  | 0.02  | -0.08 | -0.09 | -0.09 | -0.08 |
| 1750               | 0.06                                                                 | 0.00  | 0.01  | -0.05 | -0.05 | -0.04 | -0.13 | -0.14 | -0.14 | -0.09 |
| 2000               | 0.07                                                                 | 0.00  | -0.03 | -0.08 | -0.10 | -0.10 | -0.18 | -0.19 | -0.21 | -0.15 |
| 2250               | 0.07                                                                 | 0.00  | -0.05 | -0.09 | -0.13 | -0.14 | -0.21 | -0.22 | -0.25 | -0.19 |
| 2500               | 0.07                                                                 | 0.00  | -0.04 | -0.08 | -0.12 | -0.14 | -0.21 | -0.22 | -0.24 | -0.20 |
| 2750               | 0.07                                                                 | 0.01  | -0.02 | -0.06 | -0.09 | -0.11 | -0.19 | -0.20 | -0.20 | -0.19 |
| 3000               | 0.06                                                                 | 0.01  | 0.01  | -0.03 | -0.06 | -0.08 | -0.16 | -0.18 | -0.22 | -0.21 |
| 3250               | 0.06                                                                 | 0.02  | 0.03  | -0.01 | -0.02 | -0.05 | -0.13 | -0.15 | -0.18 | -0.18 |
| 3500               | 0.05                                                                 | 0.02  | 0.05  | -0.01 | -0.01 | -0.04 | -0.12 | -0.14 | -0.15 | -0.14 |
| 3750               | 0.04                                                                 | 0.02  | 0.05  | -0.01 | -0.02 | -0.05 | -0.13 | -0.15 | -0.18 | -0.19 |
| 4000               | 0.03                                                                 | 0.01  | 0.03  | -0.03 | -0.05 | -0.09 | -0.15 | -0.18 | -0.21 | -0.22 |
| 4250               | 0.02                                                                 | 0.01  | 0.01  | -0.05 | -0.08 | -0.13 | -0.18 | -0.21 | -0.25 | -0.24 |
| 4500               | 0.02                                                                 | 0.01  | 0.00  | -0.06 | -0.10 | -0.16 | -0.20 | -0.23 | -0.29 | -0.28 |
| 4750               | 0.02                                                                 | 0.02  | 0.00  | -0.05 | -0.10 | -0.17 | -0.21 | -0.24 | -0.31 | -0.29 |
| 5000               | 0.03                                                                 | 0.02  | 0.00  | -0.04 | -0.09 | -0.17 | -0.20 | -0.24 | -0.31 | -0.32 |
| 5250               | 0.03                                                                 | 0.03  | 0.01  | -0.02 | -0.08 | -0.16 | -0.20 | -0.24 | -0.31 | -0.33 |
| 5500               | 0.03                                                                 | 0.03  | 0.01  | -0.01 | -0.07 | -0.17 | -0.20 | -0.24 | -0.33 | -0.35 |
| 6000               | 0.03                                                                 | 0.04  | 0.02  | 0.00  | -0.07 | -0.18 | -0.22 | -0.28 | -0.39 | -0.38 |
| 6500               | 0.03                                                                 | 0.04  | 0.02  | -0.01 | -0.07 | -0.19 | -0.28 | -0.34 | -0.47 | -0.46 |
| 7000               | 0.04                                                                 | 0.04  | 0.00  | -0.03 | -0.11 | -0.25 | -0.38 | -0.46 | -0.63 | -0.64 |
| 7500               | 0.06                                                                 | 0.03  | -0.05 | -0.08 | -0.19 | -0.35 | -0.50 | -0.58 | -0.73 | -0.75 |
| 8000               | 0.08                                                                 | 0.04  | -0.03 | -0.07 | -0.18 | -0.35 | -0.48 | -0.54 | -0.70 | -0.68 |
| 8500               | 0.08                                                                 | 0.05  | 0.06  | 0.00  | -0.08 | -0.25 | -0.34 | -0.42 | -0.56 | -0.60 |
| 9000               | 0.05                                                                 | 0.04  | 0.07  | -0.02 | -0.09 | -0.26 | -0.32 | -0.42 | -0.54 | -0.60 |
| 9500               | 0.01                                                                 | 0.01  | -0.03 | -0.15 | -0.25 | -0.43 | -0.50 | -0.61 | -0.77 | -0.81 |
| 10000              | -0.03                                                                | 0.00  | -0.10 | -0.21 | -0.35 | -0.56 | -0.66 | -0.79 | -0.98 | -1.04 |
| 10500              | -0.03                                                                | 0.02  | -0.05 | -0.15 | -0.29 | -0.52 | -0.63 | -0.76 | -0.95 | -1.00 |
| 11000              | -0.01                                                                | 0.03  | -0.01 | -0.10 | -0.24 | -0.47 | -0.58 | -0.70 | -0.92 | -0.98 |
| 11500              | 0.00                                                                 | 0.02  | -0.01 | -0.13 | -0.26 | -0.50 | -0.58 | -0.72 | -0.94 | -0.99 |
| 12000              | 0.00                                                                 | 0.01  | -0.04 | -0.18 | -0.30 | -0.54 | -0.60 | -0.74 | -0.94 | -1.01 |
| 12500              | 0.00                                                                 | 0.02  | -0.04 | -0.17 | -0.30 | -0.55 | -0.59 | -0.74 | -0.95 | -0.94 |
| 12750              | 0.00                                                                 | 0.03  | -0.03 | -0.15 | -0.29 | -0.55 | -0.58 | -0.73 | -0.95 | -0.98 |
| 13000              | 0.01                                                                 | 0.04  | -0.03 | -0.13 | -0.28 | -0.55 | -0.58 | -0.73 | -0.93 | -1.01 |
| 13250              | 0.01                                                                 | 0.04  | -0.02 | -0.11 | -0.27 | -0.55 | -0.59 | -0.76 | -0.99 | -1.06 |
| 13500              | 0.01                                                                 | 0.05  | -0.02 | -0.10 | -0.26 | -0.54 | -0.61 | -0.78 | -1.01 | -1.07 |
| 13750              | 0.02                                                                 | 0.05  | -0.01 | -0.10 | -0.25 | -0.54 | -0.61 | -0.78 | -1.03 | -1.07 |
| 14000              | 0.02                                                                 | 0.05  | -0.01 | -0.10 | -0.25 | -0.53 | -0.61 | -0.78 | -1.02 | -1.07 |
| 14250              | 0.02                                                                 | 0.04  | 0.00  | -0.10 | -0.24 | -0.52 | -0.60 | -0.76 | -1.03 | -1.08 |
| 14500              | 0.02                                                                 | 0.05  | 0.01  | -0.10 | -0.23 | -0.51 | -0.58 | -0.75 | -0.98 | -1.10 |
| 14750              | 0.02                                                                 | 0.05  | 0.01  | -0.10 | -0.22 | -0.51 | -0.55 | -0.72 | -1.00 | -1.01 |
| 15000              | 0.02                                                                 | 0.06  | 0.02  | -0.09 | -0.22 | -0.50 | -0.53 | -0.72 | -0.95 | -0.97 |
| 15250              | 0.01                                                                 | 0.06  | 0.01  | -0.09 | -0.23 | -0.52 | -0.55 | -0.72 | -0.94 | -0.99 |
| 15500              | 0.00                                                                 | 0.06  | -0.01 | -0.10 | -0.25 | -0.56 | -0.58 | -0.76 | -0.98 | -1.06 |
| 15750              | 0.00                                                                 | 0.07  | -0.03 | -0.11 | -0.27 | -0.59 | -0.64 | -0.82 | -1.01 | -1.06 |
| 16000              | -0.01                                                                | 0.07  | -0.04 | -0.12 | -0.29 | -0.62 | -0.70 | -0.89 | -1.13 | -1.24 |
| 16250              | -0.01                                                                | 0.07  | -0.05 | -0.13 | -0.30 | -0.64 | -0.75 | -0.95 | -1.22 | -1.29 |
| 16500              | -0.01                                                                | 0.07  | -0.05 | -0.13 | -0.31 | -0.65 | -0.78 | -0.99 | -1.26 | -1.33 |
| 16750              | -0.01                                                                | 0.07  | -0.05 | -0.13 | -0.32 | -0.66 | -0.81 | -1.00 | -1.29 | -1.38 |
| 17000              | -0.01                                                                | 0.07  | -0.05 | -0.12 | -0.32 | -0.67 | -0.81 | -1.02 | -1.33 | -1.39 |
| 17250              | 0.00                                                                 | 0.07  | -0.05 | -0.11 | -0.32 | -0.67 | -0.81 | -1.02 | -1.35 | -1.41 |
| 17500              | 0.00                                                                 | 0.07  | -0.05 | -0.10 | -0.31 | -0.67 | -0.81 | -1.00 | -1.36 | -1.39 |
| 17750              | 0.00                                                                 | 0.07  | -0.05 | -0.08 | -0.30 | -0.66 | -0.80 | -1.00 | -1.29 | -1.40 |
| 18000              | 0.01                                                                 | 0.07  | -0.04 | -0.07 | -0.28 | -0.64 | -0.77 | -0.97 | -1.25 | -1.36 |

### Notes

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 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

# RCDAT-18G-63

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | Input VSWR<br>(:1) |      |      |       |       |       |       |       |       |       |
|--------------------|--------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB            | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 1.47               | 1.39 | 1.21 | 1.04  | 1.05  | 1.06  | 1.03  | 1.06  | 1.06  | 1.09  |
| 250                | 1.38               | 1.30 | 1.15 | 1.01  | 1.02  | 1.03  | 1.01  | 1.03  | 1.03  | 1.05  |
| 500                | 1.29               | 1.24 | 1.12 | 1.01  | 1.03  | 1.04  | 1.02  | 1.04  | 1.03  | 1.05  |
| 750                | 1.18               | 1.15 | 1.07 | 1.03  | 1.04  | 1.05  | 1.03  | 1.05  | 1.05  | 1.07  |
| 1000               | 1.06               | 1.06 | 1.03 | 1.05  | 1.06  | 1.06  | 1.04  | 1.06  | 1.06  | 1.08  |
| 1250               | 1.04               | 1.04 | 1.03 | 1.07  | 1.07  | 1.07  | 1.04  | 1.07  | 1.07  | 1.09  |
| 1500               | 1.12               | 1.07 | 1.05 | 1.08  | 1.07  | 1.08  | 1.05  | 1.08  | 1.07  | 1.10  |
| 1750               | 1.19               | 1.10 | 1.05 | 1.07  | 1.08  | 1.08  | 1.06  | 1.08  | 1.08  | 1.10  |
| 2000               | 1.23               | 1.12 | 1.05 | 1.07  | 1.08  | 1.09  | 1.06  | 1.08  | 1.08  | 1.11  |
| 2250               | 1.26               | 1.13 | 1.06 | 1.06  | 1.08  | 1.09  | 1.07  | 1.09  | 1.08  | 1.11  |
| 2500               | 1.27               | 1.15 | 1.07 | 1.07  | 1.08  | 1.09  | 1.07  | 1.09  | 1.08  | 1.11  |
| 2750               | 1.26               | 1.16 | 1.08 | 1.08  | 1.08  | 1.09  | 1.07  | 1.09  | 1.08  | 1.11  |
| 3000               | 1.23               | 1.15 | 1.08 | 1.08  | 1.08  | 1.09  | 1.07  | 1.09  | 1.08  | 1.11  |
| 3250               | 1.19               | 1.13 | 1.08 | 1.09  | 1.09  | 1.09  | 1.07  | 1.09  | 1.09  | 1.11  |
| 3500               | 1.13               | 1.10 | 1.07 | 1.09  | 1.09  | 1.09  | 1.08  | 1.09  | 1.09  | 1.11  |
| 3750               | 1.07               | 1.05 | 1.06 | 1.09  | 1.09  | 1.09  | 1.08  | 1.09  | 1.09  | 1.11  |
| 4000               | 1.06               | 1.03 | 1.06 | 1.09  | 1.10  | 1.10  | 1.09  | 1.10  | 1.10  | 1.11  |
| 4250               | 1.10               | 1.07 | 1.09 | 1.09  | 1.10  | 1.10  | 1.10  | 1.10  | 1.11  | 1.12  |
| 4500               | 1.17               | 1.13 | 1.12 | 1.10  | 1.11  | 1.11  | 1.11  | 1.11  | 1.11  | 1.12  |
| 4750               | 1.22               | 1.19 | 1.16 | 1.11  | 1.12  | 1.12  | 1.12  | 1.12  | 1.12  | 1.13  |
| 5000               | 1.26               | 1.23 | 1.19 | 1.13  | 1.13  | 1.12  | 1.12  | 1.12  | 1.13  | 1.13  |
| 5250               | 1.29               | 1.26 | 1.21 | 1.14  | 1.14  | 1.13  | 1.13  | 1.13  | 1.13  | 1.13  |
| 5500               | 1.32               | 1.28 | 1.23 | 1.14  | 1.14  | 1.13  | 1.14  | 1.13  | 1.14  | 1.13  |
| 6000               | 1.37               | 1.30 | 1.26 | 1.15  | 1.14  | 1.14  | 1.17  | 1.14  | 1.14  | 1.13  |
| 6500               | 1.42               | 1.31 | 1.27 | 1.16  | 1.14  | 1.14  | 1.18  | 1.14  | 1.14  | 1.12  |
| 7000               | 1.49               | 1.35 | 1.28 | 1.16  | 1.13  | 1.13  | 1.15  | 1.14  | 1.13  | 1.11  |
| 7500               | 1.37               | 1.26 | 1.22 | 1.13  | 1.12  | 1.13  | 1.12  | 1.13  | 1.12  | 1.11  |
| 8000               | 1.10               | 1.07 | 1.14 | 1.12  | 1.12  | 1.13  | 1.12  | 1.13  | 1.12  | 1.11  |
| 8500               | 1.16               | 1.17 | 1.16 | 1.13  | 1.12  | 1.13  | 1.13  | 1.13  | 1.12  | 1.12  |
| 9000               | 1.30               | 1.27 | 1.18 | 1.14  | 1.13  | 1.13  | 1.13  | 1.13  | 1.13  | 1.13  |
| 9500               | 1.28               | 1.22 | 1.14 | 1.13  | 1.14  | 1.14  | 1.12  | 1.14  | 1.14  | 1.14  |
| 10000              | 1.12               | 1.08 | 1.05 | 1.13  | 1.16  | 1.16  | 1.13  | 1.16  | 1.16  | 1.17  |
| 10500              | 1.03               | 1.08 | 1.06 | 1.16  | 1.18  | 1.17  | 1.16  | 1.17  | 1.18  | 1.19  |
| 11000              | 1.06               | 1.12 | 1.10 | 1.18  | 1.20  | 1.19  | 1.18  | 1.19  | 1.20  | 1.21  |
| 11500              | 1.03               | 1.06 | 1.09 | 1.19  | 1.22  | 1.20  | 1.19  | 1.20  | 1.22  | 1.23  |
| 12000              | 1.16               | 1.09 | 1.11 | 1.19  | 1.23  | 1.21  | 1.20  | 1.21  | 1.23  | 1.24  |
| 12500              | 1.34               | 1.26 | 1.19 | 1.19  | 1.22  | 1.21  | 1.20  | 1.21  | 1.23  | 1.23  |
| 12750              | 1.41               | 1.32 | 1.22 | 1.20  | 1.22  | 1.20  | 1.20  | 1.20  | 1.22  | 1.23  |
| 13000              | 1.42               | 1.35 | 1.24 | 1.20  | 1.21  | 1.20  | 1.20  | 1.20  | 1.21  | 1.22  |
| 13250              | 1.39               | 1.34 | 1.25 | 1.20  | 1.20  | 1.19  | 1.20  | 1.19  | 1.20  | 1.21  |
| 13500              | 1.33               | 1.30 | 1.24 | 1.19  | 1.19  | 1.18  | 1.20  | 1.18  | 1.19  | 1.20  |
| 13750              | 1.29               | 1.27 | 1.23 | 1.18  | 1.19  | 1.18  | 1.20  | 1.18  | 1.19  | 1.20  |
| 14000              | 1.28               | 1.26 | 1.23 | 1.18  | 1.18  | 1.18  | 1.20  | 1.18  | 1.18  | 1.19  |
| 14250              | 1.32               | 1.29 | 1.24 | 1.17  | 1.18  | 1.17  | 1.19  | 1.17  | 1.18  | 1.19  |
| 14500              | 1.39               | 1.34 | 1.27 | 1.17  | 1.17  | 1.16  | 1.18  | 1.17  | 1.17  | 1.18  |
| 14750              | 1.46               | 1.40 | 1.29 | 1.18  | 1.16  | 1.16  | 1.18  | 1.16  | 1.16  | 1.17  |
| 15000              | 1.52               | 1.45 | 1.31 | 1.18  | 1.15  | 1.15  | 1.17  | 1.15  | 1.15  | 1.17  |
| 15250              | 1.54               | 1.46 | 1.31 | 1.18  | 1.14  | 1.14  | 1.17  | 1.15  | 1.14  | 1.16  |
| 15500              | 1.51               | 1.44 | 1.30 | 1.17  | 1.13  | 1.13  | 1.16  | 1.14  | 1.12  | 1.14  |
| 15750              | 1.44               | 1.38 | 1.27 | 1.15  | 1.11  | 1.12  | 1.15  | 1.12  | 1.11  | 1.13  |
| 16000              | 1.37               | 1.32 | 1.24 | 1.13  | 1.09  | 1.10  | 1.14  | 1.11  | 1.09  | 1.11  |
| 16250              | 1.30               | 1.27 | 1.21 | 1.11  | 1.08  | 1.09  | 1.12  | 1.09  | 1.07  | 1.10  |
| 16500              | 1.25               | 1.22 | 1.18 | 1.09  | 1.06  | 1.07  | 1.10  | 1.07  | 1.06  | 1.08  |
| 16750              | 1.22               | 1.19 | 1.16 | 1.08  | 1.05  | 1.06  | 1.08  | 1.06  | 1.05  | 1.07  |
| 17000              | 1.18               | 1.17 | 1.14 | 1.07  | 1.06  | 1.06  | 1.08  | 1.06  | 1.05  | 1.07  |
| 17250              | 1.15               | 1.14 | 1.13 | 1.08  | 1.07  | 1.07  | 1.08  | 1.07  | 1.06  | 1.08  |
| 17500              | 1.11               | 1.11 | 1.13 | 1.09  | 1.08  | 1.08  | 1.08  | 1.08  | 1.08  | 1.10  |
| 17750              | 1.08               | 1.09 | 1.14 | 1.10  | 1.10  | 1.10  | 1.09  | 1.10  | 1.10  | 1.12  |
| 18000              | 1.11               | 1.10 | 1.16 | 1.12  | 1.12  | 1.13  | 1.11  | 1.12  | 1.12  | 1.14  |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | Output VSWR<br>(:1) |      |      |       |       |       |       |       |       |       |
|--------------------|---------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB             | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 1.45                | 1.49 | 1.37 | 1.38  | 1.31  | 1.30  | 1.11  | 1.11  | 1.11  | 1.11  |
| 250                | 1.36                | 1.40 | 1.30 | 1.32  | 1.26  | 1.25  | 1.07  | 1.07  | 1.07  | 1.07  |
| 500                | 1.29                | 1.33 | 1.27 | 1.28  | 1.25  | 1.24  | 1.07  | 1.07  | 1.07  | 1.07  |
| 750                | 1.19                | 1.23 | 1.21 | 1.21  | 1.22  | 1.22  | 1.07  | 1.07  | 1.07  | 1.07  |
| 1000               | 1.07                | 1.11 | 1.16 | 1.15  | 1.19  | 1.20  | 1.08  | 1.08  | 1.08  | 1.08  |
| 1250               | 1.03                | 1.04 | 1.11 | 1.10  | 1.16  | 1.17  | 1.09  | 1.09  | 1.09  | 1.09  |
| 1500               | 1.10                | 1.06 | 1.10 | 1.08  | 1.13  | 1.14  | 1.09  | 1.09  | 1.09  | 1.09  |
| 1750               | 1.18                | 1.13 | 1.11 | 1.10  | 1.12  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| 2000               | 1.25                | 1.20 | 1.14 | 1.14  | 1.12  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| 2250               | 1.30                | 1.25 | 1.16 | 1.17  | 1.13  | 1.12  | 1.08  | 1.08  | 1.08  | 1.08  |
| 2500               | 1.32                | 1.27 | 1.18 | 1.20  | 1.14  | 1.13  | 1.08  | 1.08  | 1.08  | 1.08  |
| 2750               | 1.30                | 1.25 | 1.18 | 1.20  | 1.16  | 1.15  | 1.07  | 1.07  | 1.07  | 1.07  |
| 3000               | 1.24                | 1.21 | 1.16 | 1.19  | 1.16  | 1.16  | 1.07  | 1.07  | 1.07  | 1.07  |
| 3250               | 1.17                | 1.14 | 1.14 | 1.15  | 1.16  | 1.16  | 1.07  | 1.07  | 1.07  | 1.07  |
| 3500               | 1.09                | 1.07 | 1.11 | 1.12  | 1.14  | 1.15  | 1.07  | 1.07  | 1.07  | 1.07  |
| 3750               | 1.05                | 1.04 | 1.10 | 1.09  | 1.13  | 1.13  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4000               | 1.06                | 1.06 | 1.09 | 1.07  | 1.11  | 1.12  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4250               | 1.10                | 1.11 | 1.10 | 1.08  | 1.09  | 1.10  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4500               | 1.14                | 1.14 | 1.11 | 1.10  | 1.09  | 1.09  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4750               | 1.15                | 1.16 | 1.12 | 1.13  | 1.10  | 1.09  | 1.07  | 1.07  | 1.07  | 1.07  |
| 5000               | 1.14                | 1.17 | 1.14 | 1.16  | 1.13  | 1.12  | 1.06  | 1.06  | 1.06  | 1.06  |
| 5250               | 1.14                | 1.18 | 1.17 | 1.20  | 1.17  | 1.16  | 1.05  | 1.05  | 1.05  | 1.05  |
| 5500               | 1.17                | 1.21 | 1.22 | 1.23  | 1.23  | 1.22  | 1.04  | 1.04  | 1.04  | 1.04  |
| 6000               | 1.26                | 1.27 | 1.31 | 1.28  | 1.31  | 1.32  | 1.03  | 1.03  | 1.03  | 1.03  |
| 6500               | 1.29                | 1.28 | 1.31 | 1.30  | 1.32  | 1.33  | 1.05  | 1.05  | 1.05  | 1.05  |
| 7000               | 1.32                | 1.29 | 1.26 | 1.27  | 1.25  | 1.25  | 1.08  | 1.08  | 1.08  | 1.08  |
| 7500               | 1.27                | 1.23 | 1.17 | 1.18  | 1.14  | 1.13  | 1.09  | 1.09  | 1.09  | 1.09  |
| 8000               | 1.16                | 1.13 | 1.07 | 1.08  | 1.05  | 1.04  | 1.10  | 1.10  | 1.10  | 1.10  |
| 8500               | 1.10                | 1.11 | 1.05 | 1.05  | 1.02  | 1.02  | 1.10  | 1.10  | 1.10  | 1.10  |
| 9000               | 1.14                | 1.16 | 1.10 | 1.09  | 1.06  | 1.06  | 1.10  | 1.10  | 1.10  | 1.10  |
| 9500               | 1.17                | 1.20 | 1.13 | 1.13  | 1.10  | 1.09  | 1.10  | 1.10  | 1.10  | 1.10  |
| 10000              | 1.16                | 1.18 | 1.12 | 1.14  | 1.11  | 1.10  | 1.11  | 1.11  | 1.11  | 1.11  |
| 10500              | 1.12                | 1.14 | 1.11 | 1.14  | 1.12  | 1.11  | 1.12  | 1.12  | 1.12  | 1.12  |
| 11000              | 1.04                | 1.07 | 1.10 | 1.13  | 1.13  | 1.12  | 1.12  | 1.12  | 1.12  | 1.12  |
| 11500              | 1.08                | 1.07 | 1.09 | 1.07  | 1.09  | 1.10  | 1.12  | 1.12  | 1.12  | 1.12  |
| 12000              | 1.17                | 1.15 | 1.13 | 1.12  | 1.11  | 1.11  | 1.10  | 1.10  | 1.10  | 1.10  |
| 12500              | 1.24                | 1.23 | 1.22 | 1.26  | 1.23  | 1.22  | 1.08  | 1.08  | 1.08  | 1.08  |
| 12750              | 1.27                | 1.27 | 1.27 | 1.30  | 1.28  | 1.27  | 1.07  | 1.07  | 1.07  | 1.07  |
| 13000              | 1.29                | 1.29 | 1.29 | 1.32  | 1.30  | 1.30  | 1.06  | 1.06  | 1.06  | 1.06  |
| 13250              | 1.29                | 1.28 | 1.29 | 1.30  | 1.30  | 1.30  | 1.05  | 1.05  | 1.05  | 1.05  |
| 13500              | 1.27                | 1.25 | 1.27 | 1.26  | 1.27  | 1.28  | 1.04  | 1.04  | 1.04  | 1.04  |
| 13750              | 1.23                | 1.22 | 1.24 | 1.21  | 1.24  | 1.25  | 1.04  | 1.04  | 1.04  | 1.04  |
| 14000              | 1.20                | 1.19 | 1.21 | 1.18  | 1.20  | 1.22  | 1.03  | 1.03  | 1.03  | 1.03  |
| 14250              | 1.18                | 1.19 | 1.20 | 1.18  | 1.19  | 1.19  | 1.03  | 1.03  | 1.03  | 1.03  |
| 14500              | 1.20                | 1.21 | 1.20 | 1.21  | 1.20  | 1.19  | 1.03  | 1.03  | 1.03  | 1.03  |
| 14750              | 1.24                | 1.26 | 1.24 | 1.26  | 1.23  | 1.22  | 1.03  | 1.03  | 1.03  | 1.03  |
| 15000              | 1.29                | 1.31 | 1.28 | 1.31  | 1.28  | 1.26  | 1.04  | 1.04  | 1.04  | 1.04  |
| 15250              | 1.32                | 1.34 | 1.31 | 1.35  | 1.32  | 1.31  | 1.04  | 1.04  | 1.04  | 1.04  |
| 15500              | 1.33                | 1.34 | 1.33 | 1.36  | 1.34  | 1.34  | 1.05  | 1.05  | 1.05  | 1.05  |
| 15750              | 1.31                | 1.32 | 1.33 | 1.35  | 1.35  | 1.35  | 1.05  | 1.05  | 1.05  | 1.05  |
| 16000              | 1.27                | 1.28 | 1.31 | 1.31  | 1.33  | 1.34  | 1.05  | 1.05  | 1.05  | 1.05  |
| 16250              | 1.24                | 1.24 | 1.28 | 1.26  | 1.29  | 1.31  | 1.06  | 1.06  | 1.06  | 1.06  |
| 16500              | 1.22                | 1.21 | 1.25 | 1.21  | 1.25  | 1.27  | 1.05  | 1.05  | 1.05  | 1.05  |
| 16750              | 1.20                | 1.19 | 1.21 | 1.18  | 1.21  | 1.22  | 1.05  | 1.05  | 1.05  | 1.05  |
| 17000              | 1.18                | 1.18 | 1.18 | 1.15  | 1.17  | 1.18  | 1.05  | 1.05  | 1.05  | 1.05  |
| 17250              | 1.15                | 1.15 | 1.14 | 1.12  | 1.13  | 1.13  | 1.06  | 1.06  | 1.06  | 1.06  |
| 17500              | 1.11                | 1.11 | 1.09 | 1.08  | 1.08  | 1.08  | 1.07  | 1.07  | 1.07  | 1.07  |
| 17750              | 1.06                | 1.07 | 1.06 | 1.04  | 1.05  | 1.05  | 1.09  | 1.09  | 1.09  | 1.09  |
| 18000              | 1.05                | 1.07 | 1.08 | 1.05  | 1.07  | 1.08  | 1.12  | 1.12  | 1.12  | 1.12  |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 0°C

| FREQUENCY<br>(MHz) | I. Loss<br>(dB) |
|--------------------|-----------------|
| 100                | 3.01            |
| 250                | 3.12            |
| 500                | 3.28            |
| 750                | 3.43            |
| 1000               | 3.59            |
| 1250               | 3.68            |
| 1500               | 3.73            |
| 1750               | 3.75            |
| 2000               | 3.76            |
| 2250               | 3.80            |
| 2500               | 3.87            |
| 2750               | 3.96            |
| 3000               | 4.06            |
| 3250               | 4.15            |
| 3500               | 4.23            |
| 3750               | 4.29            |
| 4000               | 4.33            |
| 4250               | 4.36            |
| 4500               | 4.41            |
| 4750               | 4.47            |
| 5000               | 4.55            |
| 5250               | 4.62            |
| 5500               | 4.69            |
| 6000               | 4.81            |
| 6500               | 4.90            |
| 7000               | 4.94            |
| 7500               | 4.97            |
| 8000               | 5.15            |
| 8500               | 5.42            |
| 9000               | 5.54            |
| 9500               | 5.48            |
| 10000              | 5.42            |
| 10500              | 5.57            |
| 11000              | 5.76            |
| 11500              | 5.89            |
| 12000              | 6.02            |
| 12500              | 6.16            |
| 12750              | 6.22            |
| 13000              | 6.27            |
| 13250              | 6.31            |
| 13500              | 6.35            |
| 13750              | 6.39            |
| 14000              | 6.45            |
| 14250              | 6.53            |
| 14500              | 6.62            |
| 14750              | 6.70            |
| 15000              | 6.78            |
| 15250              | 6.84            |
| 15500              | 6.88            |
| 15750              | 6.89            |
| 16000              | 6.90            |
| 16250              | 6.92            |
| 16500              | 6.95            |
| 16750              | 7.00            |
| 17000              | 7.06            |
| 17250              | 7.13            |
| 17500              | 7.23            |
| 17750              | 7.33            |
| 18000              | 7.47            |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 25°C

| FREQUENCY<br>(MHz) | Attenuation relative to Insertion Loss<br>(dB) |      |      |       |       |       |       |       |       |       |
|--------------------|------------------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                        | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 0.28                                           | 1.00 | 5.05 | 10.01 | 19.99 | 29.90 | 39.95 | 49.86 | 60.05 | 62.69 |
| 250                | 0.28                                           | 1.00 | 5.05 | 10.02 | 20.00 | 29.91 | 39.95 | 49.88 | 59.79 | 62.74 |
| 500                | 0.27                                           | 0.99 | 5.02 | 10.01 | 19.96 | 29.86 | 39.91 | 49.84 | 59.75 | 62.72 |
| 750                | 0.25                                           | 0.99 | 4.97 | 9.97  | 19.90 | 29.80 | 39.84 | 49.76 | 59.67 | 62.63 |
| 1000               | 0.24                                           | 0.98 | 4.93 | 9.94  | 19.84 | 29.74 | 39.77 | 49.69 | 59.60 | 62.54 |
| 1250               | 0.22                                           | 0.98 | 4.91 | 9.92  | 19.82 | 29.72 | 39.74 | 49.66 | 59.56 | 62.54 |
| 1500               | 0.20                                           | 0.98 | 4.93 | 9.94  | 19.85 | 29.75 | 39.76 | 49.67 | 59.61 | 62.56 |
| 1750               | 0.19                                           | 0.99 | 4.97 | 9.98  | 19.90 | 29.81 | 39.81 | 49.73 | 59.66 | 62.59 |
| 2000               | 0.18                                           | 0.99 | 5.00 | 10.01 | 19.95 | 29.87 | 39.87 | 49.79 | 59.70 | 62.65 |
| 2250               | 0.18                                           | 0.99 | 5.02 | 10.02 | 19.98 | 29.91 | 39.90 | 49.83 | 59.74 | 62.68 |
| 2500               | 0.18                                           | 0.99 | 5.01 | 10.01 | 19.98 | 29.91 | 39.91 | 49.83 | 59.76 | 62.70 |
| 2750               | 0.18                                           | 0.98 | 4.99 | 9.98  | 19.94 | 29.88 | 39.88 | 49.81 | 59.72 | 62.71 |
| 3000               | 0.18                                           | 0.98 | 4.96 | 9.96  | 19.91 | 29.85 | 39.85 | 49.77 | 59.72 | 62.69 |
| 3250               | 0.19                                           | 0.97 | 4.93 | 9.94  | 19.87 | 29.81 | 39.81 | 49.74 | 59.69 | 62.65 |
| 3500               | 0.20                                           | 0.97 | 4.92 | 9.93  | 19.86 | 29.80 | 39.80 | 49.73 | 59.68 | 62.65 |
| 3750               | 0.21                                           | 0.97 | 4.92 | 9.94  | 19.87 | 29.82 | 39.80 | 49.74 | 59.73 | 62.63 |
| 4000               | 0.22                                           | 0.98 | 4.94 | 9.96  | 19.90 | 29.86 | 39.83 | 49.77 | 59.75 | 62.70 |
| 4250               | 0.22                                           | 0.98 | 4.96 | 9.98  | 19.93 | 29.89 | 39.86 | 49.80 | 59.77 | 62.74 |
| 4500               | 0.23                                           | 0.98 | 4.98 | 9.98  | 19.95 | 29.92 | 39.88 | 49.82 | 59.81 | 62.78 |
| 4750               | 0.23                                           | 0.97 | 4.98 | 9.98  | 19.95 | 29.93 | 39.89 | 49.82 | 59.83 | 62.79 |
| 5000               | 0.22                                           | 0.97 | 4.97 | 9.96  | 19.94 | 29.93 | 39.88 | 49.82 | 59.81 | 62.78 |
| 5250               | 0.22                                           | 0.96 | 4.96 | 9.95  | 19.93 | 29.93 | 39.88 | 49.84 | 59.80 | 62.79 |
| 5500               | 0.22                                           | 0.96 | 4.96 | 9.94  | 19.92 | 29.93 | 39.88 | 49.84 | 59.83 | 62.80 |
| 6000               | 0.22                                           | 0.95 | 4.95 | 9.93  | 19.92 | 29.94 | 39.90 | 49.88 | 59.91 | 62.90 |
| 6500               | 0.22                                           | 0.95 | 4.95 | 9.93  | 19.93 | 29.97 | 39.96 | 49.94 | 59.99 | 63.00 |
| 7000               | 0.20                                           | 0.95 | 4.97 | 9.95  | 19.97 | 30.03 | 40.08 | 50.06 | 60.14 | 63.13 |
| 7500               | 0.18                                           | 0.96 | 5.02 | 10.01 | 20.05 | 30.13 | 40.20 | 50.20 | 60.26 | 63.26 |
| 8000               | 0.17                                           | 0.96 | 5.00 | 10.00 | 20.03 | 30.11 | 40.16 | 50.15 | 60.21 | 63.18 |
| 8500               | 0.17                                           | 0.94 | 4.91 | 9.93  | 19.93 | 30.01 | 40.02 | 50.02 | 60.09 | 63.10 |
| 9000               | 0.20                                           | 0.95 | 4.91 | 9.96  | 19.95 | 30.04 | 40.01 | 50.03 | 60.07 | 63.11 |
| 9500               | 0.25                                           | 0.98 | 5.02 | 10.08 | 20.11 | 30.22 | 40.20 | 50.23 | 60.33 | 63.33 |
| 10000              | 0.28                                           | 0.99 | 5.07 | 10.14 | 20.20 | 30.33 | 40.35 | 50.39 | 60.49 | 63.51 |
| 10500              | 0.28                                           | 0.97 | 5.02 | 10.06 | 20.13 | 30.27 | 40.31 | 50.34 | 60.49 | 63.53 |
| 11000              | 0.26                                           | 0.96 | 4.97 | 10.03 | 20.08 | 30.22 | 40.25 | 50.29 | 60.41 | 63.43 |
| 11500              | 0.25                                           | 0.97 | 4.99 | 10.06 | 20.11 | 30.26 | 40.26 | 50.30 | 60.40 | 63.49 |
| 12000              | 0.25                                           | 0.98 | 5.02 | 10.11 | 20.16 | 30.31 | 40.27 | 50.33 | 60.44 | 63.48 |
| 12500              | 0.25                                           | 0.97 | 5.02 | 10.10 | 20.16 | 30.32 | 40.26 | 50.33 | 60.45 | 63.48 |
| 12750              | 0.25                                           | 0.96 | 5.01 | 10.07 | 20.14 | 30.31 | 40.24 | 50.31 | 60.46 | 63.47 |
| 13000              | 0.24                                           | 0.95 | 5.00 | 10.05 | 20.12 | 30.30 | 40.24 | 50.31 | 60.46 | 63.45 |
| 13250              | 0.24                                           | 0.94 | 4.99 | 10.03 | 20.11 | 30.29 | 40.25 | 50.32 | 60.48 | 63.51 |
| 13500              | 0.23                                           | 0.94 | 4.99 | 10.02 | 20.10 | 30.29 | 40.27 | 50.34 | 60.49 | 63.55 |
| 13750              | 0.23                                           | 0.94 | 4.98 | 10.02 | 20.10 | 30.29 | 40.27 | 50.34 | 60.51 | 63.59 |
| 14000              | 0.23                                           | 0.94 | 4.98 | 10.02 | 20.09 | 30.28 | 40.27 | 50.34 | 60.50 | 63.57 |
| 14250              | 0.23                                           | 0.94 | 4.97 | 10.02 | 20.08 | 30.27 | 40.25 | 50.33 | 60.49 | 63.50 |
| 14500              | 0.23                                           | 0.94 | 4.96 | 10.01 | 20.07 | 30.26 | 40.23 | 50.32 | 60.51 | 63.54 |
| 14750              | 0.23                                           | 0.94 | 4.96 | 10.01 | 20.06 | 30.26 | 40.21 | 50.30 | 60.47 | 63.52 |
| 15000              | 0.24                                           | 0.93 | 4.96 | 10.01 | 20.06 | 30.26 | 40.20 | 50.29 | 60.45 | 63.44 |
| 15250              | 0.24                                           | 0.93 | 4.97 | 10.02 | 20.08 | 30.28 | 40.22 | 50.31 | 60.47 | 63.46 |
| 15500              | 0.25                                           | 0.93 | 4.99 | 10.03 | 20.10 | 30.32 | 40.27 | 50.36 | 60.51 | 63.56 |
| 15750              | 0.25                                           | 0.93 | 5.00 | 10.04 | 20.12 | 30.35 | 40.33 | 50.42 | 60.57 | 63.60 |
| 16000              | 0.26                                           | 0.92 | 5.01 | 10.05 | 20.14 | 30.37 | 40.38 | 50.49 | 60.66 | 63.72 |
| 16250              | 0.26                                           | 0.92 | 5.02 | 10.05 | 20.15 | 30.39 | 40.42 | 50.53 | 60.72 | 63.73 |
| 16500              | 0.26                                           | 0.92 | 5.02 | 10.06 | 20.16 | 30.40 | 40.46 | 50.57 | 60.76 | 63.78 |
| 16750              | 0.26                                           | 0.92 | 5.03 | 10.06 | 20.17 | 30.41 | 40.48 | 50.60 | 60.83 | 63.84 |
| 17000              | 0.25                                           | 0.92 | 5.03 | 10.05 | 20.17 | 30.42 | 40.49 | 50.61 | 60.88 | 63.88 |
| 17250              | 0.25                                           | 0.92 | 5.02 | 10.04 | 20.17 | 30.43 | 40.49 | 50.60 | 60.84 | 63.87 |
| 17500              | 0.25                                           | 0.92 | 5.02 | 10.02 | 20.16 | 30.42 | 40.49 | 50.60 | 60.84 | 63.88 |
| 17750              | 0.24                                           | 0.92 | 5.01 | 10.01 | 20.15 | 30.41 | 40.47 | 50.59 | 60.84 | 63.87 |
| 18000              | 0.23                                           | 0.92 | 5.00 | 9.99  | 20.13 | 30.39 | 40.44 | 50.56 | 60.78 | 63.76 |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 25°C

| FREQUENCY<br>(MHz) | Attenuation accuracy relative to nominal attenuation setting<br>(dB) |      |       |       |       |       |       |       |       |       |
|--------------------|----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                                              | 1 dB | 5 dB  | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | -0.03                                                                | 0.01 | -0.05 | -0.01 | 0.01  | 0.10  | 0.05  | 0.15  | -0.05 | 0.32  |
| 250                | -0.03                                                                | 0.00 | -0.05 | -0.02 | 0.00  | 0.09  | 0.05  | 0.12  | 0.21  | 0.26  |
| 500                | -0.02                                                                | 0.01 | -0.02 | -0.01 | 0.05  | 0.14  | 0.09  | 0.17  | 0.26  | 0.28  |
| 750                | 0.00                                                                 | 0.01 | 0.03  | 0.03  | 0.10  | 0.20  | 0.16  | 0.24  | 0.33  | 0.37  |
| 1000               | 0.02                                                                 | 0.02 | 0.07  | 0.06  | 0.16  | 0.26  | 0.23  | 0.32  | 0.40  | 0.46  |
| 1250               | 0.03                                                                 | 0.02 | 0.09  | 0.08  | 0.18  | 0.28  | 0.26  | 0.34  | 0.44  | 0.46  |
| 1500               | 0.05                                                                 | 0.02 | 0.07  | 0.06  | 0.16  | 0.25  | 0.24  | 0.33  | 0.40  | 0.44  |
| 1750               | 0.06                                                                 | 0.01 | 0.03  | 0.02  | 0.10  | 0.19  | 0.19  | 0.27  | 0.34  | 0.41  |
| 2000               | 0.07                                                                 | 0.01 | 0.00  | -0.01 | 0.05  | 0.13  | 0.13  | 0.21  | 0.31  | 0.35  |
| 2250               | 0.07                                                                 | 0.01 | -0.02 | -0.02 | 0.02  | 0.09  | 0.10  | 0.17  | 0.26  | 0.32  |
| 2500               | 0.07                                                                 | 0.01 | -0.01 | -0.01 | 0.03  | 0.09  | 0.09  | 0.17  | 0.24  | 0.30  |
| 2750               | 0.07                                                                 | 0.02 | 0.01  | 0.02  | 0.06  | 0.12  | 0.12  | 0.19  | 0.28  | 0.29  |
| 3000               | 0.07                                                                 | 0.02 | 0.04  | 0.05  | 0.10  | 0.16  | 0.16  | 0.23  | 0.28  | 0.31  |
| 3250               | 0.06                                                                 | 0.03 | 0.07  | 0.06  | 0.13  | 0.19  | 0.19  | 0.26  | 0.31  | 0.35  |
| 3500               | 0.05                                                                 | 0.03 | 0.08  | 0.07  | 0.14  | 0.20  | 0.20  | 0.27  | 0.32  | 0.35  |
| 3750               | 0.04                                                                 | 0.03 | 0.08  | 0.06  | 0.13  | 0.18  | 0.20  | 0.26  | 0.27  | 0.37  |
| 4000               | 0.03                                                                 | 0.02 | 0.06  | 0.04  | 0.10  | 0.15  | 0.17  | 0.24  | 0.26  | 0.31  |
| 4250               | 0.03                                                                 | 0.02 | 0.04  | 0.02  | 0.07  | 0.11  | 0.14  | 0.20  | 0.23  | 0.26  |
| 4500               | 0.02                                                                 | 0.02 | 0.02  | 0.02  | 0.05  | 0.08  | 0.12  | 0.18  | 0.19  | 0.22  |
| 4750               | 0.02                                                                 | 0.03 | 0.02  | 0.02  | 0.05  | 0.07  | 0.11  | 0.18  | 0.17  | 0.21  |
| 5000               | 0.03                                                                 | 0.03 | 0.03  | 0.04  | 0.06  | 0.07  | 0.12  | 0.18  | 0.20  | 0.22  |
| 5250               | 0.03                                                                 | 0.04 | 0.04  | 0.05  | 0.07  | 0.07  | 0.12  | 0.16  | 0.20  | 0.21  |
| 5500               | 0.03                                                                 | 0.04 | 0.04  | 0.06  | 0.08  | 0.07  | 0.12  | 0.16  | 0.17  | 0.20  |
| 6000               | 0.03                                                                 | 0.05 | 0.05  | 0.07  | 0.08  | 0.06  | 0.10  | 0.12  | 0.10  | 0.10  |
| 6500               | 0.03                                                                 | 0.05 | 0.05  | 0.07  | 0.07  | 0.04  | 0.04  | 0.06  | 0.02  | 0.01  |
| 7000               | 0.05                                                                 | 0.05 | 0.03  | 0.05  | 0.03  | -0.03 | -0.08 | -0.06 | -0.14 | -0.13 |
| 7500               | 0.07                                                                 | 0.04 | -0.02 | -0.01 | -0.05 | -0.13 | -0.20 | -0.20 | -0.26 | -0.26 |
| 8000               | 0.08                                                                 | 0.05 | 0.01  | 0.00  | -0.03 | -0.11 | -0.16 | -0.15 | -0.21 | -0.18 |
| 8500               | 0.08                                                                 | 0.06 | 0.09  | 0.07  | 0.08  | -0.01 | -0.02 | -0.02 | -0.09 | -0.10 |
| 9000               | 0.05                                                                 | 0.05 | 0.09  | 0.05  | 0.06  | -0.04 | -0.01 | -0.03 | -0.07 | -0.11 |
| 9500               | 0.00                                                                 | 0.02 | -0.02 | -0.08 | -0.11 | -0.22 | -0.20 | -0.23 | -0.33 | -0.33 |
| 10000              | -0.03                                                                | 0.01 | -0.07 | -0.14 | -0.20 | -0.33 | -0.35 | -0.39 | -0.49 | -0.51 |
| 10500              | -0.03                                                                | 0.03 | -0.02 | -0.06 | -0.13 | -0.27 | -0.31 | -0.34 | -0.49 | -0.53 |
| 11000              | -0.01                                                                | 0.04 | 0.03  | -0.03 | -0.08 | -0.22 | -0.25 | -0.29 | -0.41 | -0.43 |
| 11500              | 0.00                                                                 | 0.03 | 0.01  | -0.06 | -0.11 | -0.26 | -0.26 | -0.30 | -0.40 | -0.49 |
| 12000              | 0.00                                                                 | 0.02 | -0.02 | -0.11 | -0.16 | -0.31 | -0.27 | -0.33 | -0.44 | -0.48 |
| 12500              | 0.00                                                                 | 0.03 | -0.02 | -0.10 | -0.16 | -0.32 | -0.26 | -0.33 | -0.45 | -0.48 |
| 12750              | 0.00                                                                 | 0.04 | -0.01 | -0.07 | -0.14 | -0.31 | -0.24 | -0.31 | -0.46 | -0.47 |
| 13000              | 0.01                                                                 | 0.05 | 0.00  | -0.05 | -0.12 | -0.30 | -0.24 | -0.31 | -0.46 | -0.45 |
| 13250              | 0.01                                                                 | 0.06 | 0.01  | -0.03 | -0.11 | -0.29 | -0.25 | -0.32 | -0.48 | -0.51 |
| 13500              | 0.02                                                                 | 0.06 | 0.01  | -0.02 | -0.10 | -0.29 | -0.27 | -0.34 | -0.49 | -0.55 |
| 13750              | 0.02                                                                 | 0.06 | 0.02  | -0.02 | -0.10 | -0.29 | -0.27 | -0.34 | -0.51 | -0.59 |
| 14000              | 0.02                                                                 | 0.06 | 0.02  | -0.02 | -0.09 | -0.28 | -0.27 | -0.34 | -0.50 | -0.57 |
| 14250              | 0.02                                                                 | 0.06 | 0.03  | -0.02 | -0.08 | -0.27 | -0.25 | -0.33 | -0.49 | -0.50 |
| 14500              | 0.02                                                                 | 0.06 | 0.04  | -0.01 | -0.07 | -0.26 | -0.23 | -0.32 | -0.51 | -0.54 |
| 14750              | 0.02                                                                 | 0.06 | 0.04  | -0.01 | -0.06 | -0.26 | -0.21 | -0.30 | -0.47 | -0.52 |
| 15000              | 0.01                                                                 | 0.07 | 0.04  | -0.01 | -0.06 | -0.26 | -0.20 | -0.29 | -0.45 | -0.44 |
| 15250              | 0.01                                                                 | 0.07 | 0.03  | -0.02 | -0.08 | -0.28 | -0.22 | -0.31 | -0.47 | -0.46 |
| 15500              | 0.00                                                                 | 0.07 | 0.01  | -0.03 | -0.10 | -0.32 | -0.27 | -0.36 | -0.51 | -0.56 |
| 15750              | 0.00                                                                 | 0.07 | 0.00  | -0.04 | -0.12 | -0.35 | -0.33 | -0.42 | -0.57 | -0.60 |
| 16000              | -0.01                                                                | 0.08 | -0.01 | -0.05 | -0.14 | -0.37 | -0.38 | -0.49 | -0.66 | -0.72 |
| 16250              | -0.01                                                                | 0.08 | -0.02 | -0.05 | -0.15 | -0.39 | -0.42 | -0.53 | -0.72 | -0.73 |
| 16500              | -0.01                                                                | 0.08 | -0.02 | -0.06 | -0.16 | -0.40 | -0.46 | -0.57 | -0.76 | -0.78 |
| 16750              | -0.01                                                                | 0.08 | -0.03 | -0.06 | -0.17 | -0.41 | -0.48 | -0.60 | -0.83 | -0.84 |
| 17000              | 0.00                                                                 | 0.08 | -0.03 | -0.05 | -0.17 | -0.42 | -0.49 | -0.61 | -0.88 | -0.88 |
| 17250              | 0.00                                                                 | 0.08 | -0.02 | -0.04 | -0.17 | -0.43 | -0.49 | -0.60 | -0.84 | -0.87 |
| 17500              | 0.00                                                                 | 0.08 | -0.02 | -0.02 | -0.16 | -0.42 | -0.49 | -0.60 | -0.84 | -0.88 |
| 17750              | 0.01                                                                 | 0.08 | -0.01 | -0.01 | -0.15 | -0.41 | -0.47 | -0.59 | -0.84 | -0.87 |
| 18000              | 0.02                                                                 | 0.08 | 0.00  | 0.01  | -0.13 | -0.39 | -0.44 | -0.56 | -0.78 | -0.76 |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 25°C

| FREQUENCY<br>(MHz) | Input VSWR<br>(:1) |      |      |       |       |       |       |       |       |       |
|--------------------|--------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB            | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 1.51               | 1.42 | 1.23 | 1.05  | 1.04  | 1.05  | 1.05  | 1.05  | 1.04  | 1.08  |
| 250                | 1.42               | 1.33 | 1.17 | 1.02  | 1.01  | 1.02  | 1.02  | 1.02  | 1.02  | 1.04  |
| 500                | 1.32               | 1.26 | 1.13 | 1.01  | 1.02  | 1.03  | 1.02  | 1.03  | 1.03  | 1.05  |
| 750                | 1.20               | 1.16 | 1.09 | 1.02  | 1.04  | 1.04  | 1.03  | 1.04  | 1.04  | 1.06  |
| 1000               | 1.08               | 1.07 | 1.04 | 1.04  | 1.05  | 1.05  | 1.03  | 1.05  | 1.05  | 1.07  |
| 1250               | 1.05               | 1.03 | 1.03 | 1.06  | 1.05  | 1.06  | 1.03  | 1.06  | 1.05  | 1.08  |
| 1500               | 1.12               | 1.06 | 1.05 | 1.07  | 1.06  | 1.07  | 1.04  | 1.07  | 1.06  | 1.09  |
| 1750               | 1.19               | 1.10 | 1.06 | 1.06  | 1.06  | 1.07  | 1.05  | 1.07  | 1.07  | 1.09  |
| 2000               | 1.24               | 1.12 | 1.06 | 1.06  | 1.07  | 1.07  | 1.05  | 1.07  | 1.07  | 1.10  |
| 2250               | 1.27               | 1.14 | 1.07 | 1.05  | 1.07  | 1.08  | 1.06  | 1.08  | 1.07  | 1.10  |
| 2500               | 1.28               | 1.16 | 1.08 | 1.06  | 1.07  | 1.08  | 1.06  | 1.08  | 1.07  | 1.10  |
| 2750               | 1.27               | 1.17 | 1.09 | 1.07  | 1.07  | 1.08  | 1.06  | 1.08  | 1.08  | 1.10  |
| 3000               | 1.24               | 1.16 | 1.09 | 1.08  | 1.08  | 1.08  | 1.07  | 1.08  | 1.08  | 1.10  |
| 3250               | 1.19               | 1.14 | 1.09 | 1.09  | 1.08  | 1.08  | 1.07  | 1.08  | 1.08  | 1.10  |
| 3500               | 1.13               | 1.10 | 1.08 | 1.09  | 1.08  | 1.09  | 1.08  | 1.08  | 1.08  | 1.11  |
| 3750               | 1.07               | 1.06 | 1.07 | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.11  |
| 4000               | 1.07               | 1.04 | 1.08 | 1.09  | 1.10  | 1.10  | 1.09  | 1.10  | 1.10  | 1.11  |
| 4250               | 1.12               | 1.09 | 1.10 | 1.09  | 1.11  | 1.10  | 1.10  | 1.10  | 1.11  | 1.12  |
| 4500               | 1.18               | 1.15 | 1.14 | 1.10  | 1.11  | 1.11  | 1.11  | 1.11  | 1.12  | 1.12  |
| 4750               | 1.23               | 1.20 | 1.17 | 1.12  | 1.13  | 1.12  | 1.12  | 1.12  | 1.13  | 1.13  |
| 5000               | 1.27               | 1.24 | 1.20 | 1.13  | 1.14  | 1.13  | 1.13  | 1.13  | 1.14  | 1.14  |
| 5250               | 1.30               | 1.27 | 1.23 | 1.15  | 1.15  | 1.14  | 1.14  | 1.14  | 1.14  | 1.14  |
| 5500               | 1.33               | 1.29 | 1.25 | 1.16  | 1.15  | 1.15  | 1.16  | 1.15  | 1.15  | 1.14  |
| 6000               | 1.39               | 1.31 | 1.28 | 1.17  | 1.16  | 1.15  | 1.19  | 1.16  | 1.16  | 1.14  |
| 6500               | 1.45               | 1.34 | 1.29 | 1.17  | 1.16  | 1.15  | 1.20  | 1.16  | 1.16  | 1.13  |
| 7000               | 1.53               | 1.38 | 1.31 | 1.18  | 1.15  | 1.15  | 1.17  | 1.15  | 1.15  | 1.13  |
| 7500               | 1.39               | 1.28 | 1.24 | 1.15  | 1.14  | 1.15  | 1.14  | 1.14  | 1.14  | 1.12  |
| 8000               | 1.11               | 1.08 | 1.15 | 1.13  | 1.13  | 1.14  | 1.13  | 1.14  | 1.13  | 1.12  |
| 8500               | 1.17               | 1.18 | 1.16 | 1.14  | 1.12  | 1.13  | 1.14  | 1.13  | 1.12  | 1.12  |
| 9000               | 1.30               | 1.27 | 1.18 | 1.14  | 1.12  | 1.13  | 1.13  | 1.13  | 1.12  | 1.13  |
| 9500               | 1.27               | 1.22 | 1.14 | 1.13  | 1.13  | 1.14  | 1.12  | 1.14  | 1.13  | 1.14  |
| 10000              | 1.12               | 1.08 | 1.04 | 1.12  | 1.15  | 1.15  | 1.12  | 1.15  | 1.15  | 1.16  |
| 10500              | 1.04               | 1.09 | 1.06 | 1.15  | 1.17  | 1.16  | 1.15  | 1.16  | 1.17  | 1.18  |
| 11000              | 1.06               | 1.12 | 1.10 | 1.18  | 1.20  | 1.19  | 1.18  | 1.19  | 1.20  | 1.21  |
| 11500              | 1.03               | 1.06 | 1.09 | 1.19  | 1.22  | 1.20  | 1.19  | 1.20  | 1.22  | 1.23  |
| 12000              | 1.17               | 1.10 | 1.12 | 1.19  | 1.23  | 1.22  | 1.20  | 1.21  | 1.23  | 1.24  |
| 12500              | 1.37               | 1.28 | 1.21 | 1.20  | 1.23  | 1.22  | 1.21  | 1.22  | 1.24  | 1.24  |
| 12750              | 1.44               | 1.35 | 1.26 | 1.21  | 1.23  | 1.22  | 1.22  | 1.22  | 1.23  | 1.24  |
| 13000              | 1.45               | 1.38 | 1.28 | 1.22  | 1.23  | 1.21  | 1.22  | 1.21  | 1.22  | 1.23  |
| 13250              | 1.41               | 1.36 | 1.28 | 1.21  | 1.22  | 1.20  | 1.22  | 1.20  | 1.21  | 1.22  |
| 13500              | 1.36               | 1.33 | 1.27 | 1.20  | 1.21  | 1.20  | 1.22  | 1.20  | 1.21  | 1.21  |
| 13750              | 1.32               | 1.30 | 1.26 | 1.20  | 1.20  | 1.19  | 1.22  | 1.19  | 1.20  | 1.21  |
| 14000              | 1.32               | 1.29 | 1.26 | 1.19  | 1.19  | 1.19  | 1.21  | 1.19  | 1.19  | 1.20  |
| 14250              | 1.37               | 1.33 | 1.28 | 1.19  | 1.19  | 1.18  | 1.21  | 1.19  | 1.19  | 1.20  |
| 14500              | 1.44               | 1.38 | 1.30 | 1.19  | 1.18  | 1.18  | 1.20  | 1.18  | 1.18  | 1.19  |
| 14750              | 1.51               | 1.44 | 1.32 | 1.19  | 1.17  | 1.17  | 1.20  | 1.17  | 1.17  | 1.18  |
| 15000              | 1.55               | 1.47 | 1.33 | 1.19  | 1.16  | 1.16  | 1.19  | 1.17  | 1.16  | 1.17  |
| 15250              | 1.55               | 1.47 | 1.33 | 1.19  | 1.15  | 1.15  | 1.18  | 1.16  | 1.15  | 1.16  |
| 15500              | 1.50               | 1.43 | 1.31 | 1.18  | 1.14  | 1.14  | 1.18  | 1.15  | 1.13  | 1.15  |
| 15750              | 1.44               | 1.38 | 1.28 | 1.16  | 1.12  | 1.13  | 1.17  | 1.14  | 1.12  | 1.14  |
| 16000              | 1.36               | 1.31 | 1.25 | 1.14  | 1.10  | 1.12  | 1.15  | 1.12  | 1.10  | 1.12  |
| 16250              | 1.30               | 1.26 | 1.22 | 1.12  | 1.08  | 1.10  | 1.12  | 1.10  | 1.08  | 1.10  |
| 16500              | 1.26               | 1.22 | 1.19 | 1.10  | 1.06  | 1.08  | 1.10  | 1.08  | 1.06  | 1.08  |
| 16750              | 1.22               | 1.19 | 1.17 | 1.08  | 1.05  | 1.07  | 1.08  | 1.07  | 1.05  | 1.07  |
| 17000              | 1.18               | 1.16 | 1.15 | 1.07  | 1.05  | 1.06  | 1.06  | 1.06  | 1.05  | 1.06  |
| 17250              | 1.14               | 1.13 | 1.13 | 1.07  | 1.05  | 1.06  | 1.06  | 1.06  | 1.05  | 1.07  |
| 17500              | 1.10               | 1.10 | 1.12 | 1.08  | 1.07  | 1.07  | 1.07  | 1.07  | 1.07  | 1.08  |
| 17750              | 1.08               | 1.08 | 1.13 | 1.09  | 1.09  | 1.09  | 1.08  | 1.09  | 1.09  | 1.11  |
| 18000              | 1.11               | 1.09 | 1.15 | 1.11  | 1.11  | 1.11  | 1.10  | 1.11  | 1.10  | 1.13  |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 25°C

| FREQUENCY<br>(MHz) | Output VSWR<br>(:1) |      |      |       |       |       |       |       |       |       |
|--------------------|---------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB             | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 1.49                | 1.53 | 1.41 | 1.43  | 1.35  | 1.34  | 1.10  | 1.10  | 1.10  | 1.10  |
| 250                | 1.40                | 1.44 | 1.34 | 1.37  | 1.30  | 1.29  | 1.06  | 1.06  | 1.06  | 1.06  |
| 500                | 1.32                | 1.36 | 1.30 | 1.31  | 1.28  | 1.27  | 1.06  | 1.06  | 1.06  | 1.06  |
| 750                | 1.21                | 1.25 | 1.24 | 1.24  | 1.24  | 1.25  | 1.06  | 1.06  | 1.06  | 1.06  |
| 1000               | 1.09                | 1.13 | 1.17 | 1.17  | 1.21  | 1.21  | 1.07  | 1.07  | 1.07  | 1.07  |
| 1250               | 1.04                | 1.05 | 1.13 | 1.11  | 1.17  | 1.18  | 1.08  | 1.08  | 1.08  | 1.08  |
| 1500               | 1.10                | 1.07 | 1.11 | 1.10  | 1.14  | 1.15  | 1.08  | 1.08  | 1.08  | 1.08  |
| 1750               | 1.19                | 1.14 | 1.12 | 1.12  | 1.13  | 1.13  | 1.08  | 1.08  | 1.08  | 1.08  |
| 2000               | 1.26                | 1.21 | 1.15 | 1.15  | 1.13  | 1.13  | 1.08  | 1.08  | 1.08  | 1.08  |
| 2250               | 1.32                | 1.26 | 1.18 | 1.19  | 1.14  | 1.14  | 1.07  | 1.07  | 1.07  | 1.07  |
| 2500               | 1.34                | 1.28 | 1.20 | 1.22  | 1.16  | 1.15  | 1.07  | 1.07  | 1.07  | 1.07  |
| 2750               | 1.31                | 1.27 | 1.20 | 1.22  | 1.17  | 1.16  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3000               | 1.25                | 1.22 | 1.18 | 1.20  | 1.17  | 1.17  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3250               | 1.17                | 1.15 | 1.15 | 1.16  | 1.17  | 1.17  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3500               | 1.10                | 1.08 | 1.12 | 1.12  | 1.15  | 1.16  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3750               | 1.06                | 1.05 | 1.10 | 1.09  | 1.13  | 1.14  | 1.06  | 1.06  | 1.06  | 1.06  |
| 4000               | 1.07                | 1.07 | 1.10 | 1.08  | 1.12  | 1.13  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4250               | 1.11                | 1.12 | 1.11 | 1.09  | 1.10  | 1.11  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4500               | 1.15                | 1.16 | 1.12 | 1.11  | 1.10  | 1.10  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4750               | 1.16                | 1.18 | 1.13 | 1.15  | 1.11  | 1.11  | 1.06  | 1.06  | 1.06  | 1.06  |
| 5000               | 1.15                | 1.18 | 1.15 | 1.18  | 1.14  | 1.13  | 1.06  | 1.06  | 1.06  | 1.06  |
| 5250               | 1.15                | 1.19 | 1.18 | 1.20  | 1.18  | 1.17  | 1.05  | 1.05  | 1.05  | 1.05  |
| 5500               | 1.18                | 1.21 | 1.22 | 1.23  | 1.23  | 1.23  | 1.05  | 1.05  | 1.05  | 1.05  |
| 6000               | 1.28                | 1.29 | 1.32 | 1.29  | 1.33  | 1.34  | 1.04  | 1.04  | 1.04  | 1.04  |
| 6500               | 1.32                | 1.31 | 1.34 | 1.33  | 1.35  | 1.36  | 1.06  | 1.06  | 1.06  | 1.06  |
| 7000               | 1.35                | 1.32 | 1.29 | 1.31  | 1.28  | 1.28  | 1.07  | 1.07  | 1.07  | 1.07  |
| 7500               | 1.28                | 1.25 | 1.19 | 1.20  | 1.16  | 1.15  | 1.08  | 1.08  | 1.08  | 1.08  |
| 8000               | 1.16                | 1.14 | 1.08 | 1.09  | 1.06  | 1.05  | 1.09  | 1.09  | 1.09  | 1.09  |
| 8500               | 1.09                | 1.10 | 1.04 | 1.05  | 1.02  | 1.01  | 1.08  | 1.08  | 1.08  | 1.08  |
| 9000               | 1.13                | 1.15 | 1.09 | 1.09  | 1.06  | 1.06  | 1.08  | 1.08  | 1.08  | 1.08  |
| 9500               | 1.18                | 1.20 | 1.14 | 1.14  | 1.11  | 1.10  | 1.09  | 1.09  | 1.09  | 1.09  |
| 10000              | 1.16                | 1.18 | 1.13 | 1.14  | 1.11  | 1.10  | 1.10  | 1.10  | 1.10  | 1.10  |
| 10500              | 1.13                | 1.15 | 1.12 | 1.15  | 1.13  | 1.12  | 1.12  | 1.12  | 1.12  | 1.12  |
| 11000              | 1.05                | 1.08 | 1.11 | 1.14  | 1.14  | 1.13  | 1.13  | 1.13  | 1.13  | 1.13  |
| 11500              | 1.09                | 1.09 | 1.10 | 1.08  | 1.10  | 1.11  | 1.12  | 1.12  | 1.12  | 1.12  |
| 12000              | 1.19                | 1.17 | 1.15 | 1.15  | 1.14  | 1.13  | 1.11  | 1.11  | 1.11  | 1.11  |
| 12500              | 1.26                | 1.25 | 1.25 | 1.28  | 1.26  | 1.25  | 1.09  | 1.09  | 1.09  | 1.09  |
| 12750              | 1.29                | 1.29 | 1.29 | 1.32  | 1.30  | 1.29  | 1.08  | 1.08  | 1.08  | 1.08  |
| 13000              | 1.31                | 1.30 | 1.31 | 1.32  | 1.32  | 1.31  | 1.07  | 1.07  | 1.07  | 1.07  |
| 13250              | 1.30                | 1.29 | 1.30 | 1.30  | 1.31  | 1.31  | 1.06  | 1.06  | 1.06  | 1.06  |
| 13500              | 1.28                | 1.27 | 1.28 | 1.27  | 1.28  | 1.29  | 1.06  | 1.06  | 1.06  | 1.06  |
| 13750              | 1.25                | 1.24 | 1.25 | 1.23  | 1.25  | 1.26  | 1.05  | 1.05  | 1.05  | 1.05  |
| 14000              | 1.22                | 1.22 | 1.23 | 1.21  | 1.23  | 1.24  | 1.05  | 1.05  | 1.05  | 1.05  |
| 14250              | 1.21                | 1.22 | 1.23 | 1.21  | 1.22  | 1.22  | 1.05  | 1.05  | 1.05  | 1.05  |
| 14500              | 1.23                | 1.25 | 1.24 | 1.24  | 1.23  | 1.23  | 1.06  | 1.06  | 1.06  | 1.06  |
| 14750              | 1.27                | 1.30 | 1.27 | 1.29  | 1.27  | 1.25  | 1.06  | 1.06  | 1.06  | 1.06  |
| 15000              | 1.32                | 1.33 | 1.30 | 1.33  | 1.30  | 1.29  | 1.06  | 1.06  | 1.06  | 1.06  |
| 15250              | 1.34                | 1.35 | 1.33 | 1.36  | 1.33  | 1.33  | 1.07  | 1.07  | 1.07  | 1.07  |
| 15500              | 1.33                | 1.34 | 1.34 | 1.36  | 1.35  | 1.35  | 1.07  | 1.07  | 1.07  | 1.07  |
| 15750              | 1.30                | 1.31 | 1.33 | 1.33  | 1.34  | 1.35  | 1.07  | 1.07  | 1.07  | 1.07  |
| 16000              | 1.26                | 1.27 | 1.30 | 1.30  | 1.32  | 1.33  | 1.07  | 1.07  | 1.07  | 1.07  |
| 16250              | 1.24                | 1.23 | 1.27 | 1.25  | 1.28  | 1.29  | 1.07  | 1.07  | 1.07  | 1.07  |
| 16500              | 1.22                | 1.21 | 1.24 | 1.21  | 1.24  | 1.25  | 1.06  | 1.06  | 1.06  | 1.06  |
| 16750              | 1.21                | 1.20 | 1.21 | 1.18  | 1.20  | 1.21  | 1.06  | 1.06  | 1.06  | 1.06  |
| 17000              | 1.19                | 1.19 | 1.18 | 1.16  | 1.17  | 1.18  | 1.06  | 1.06  | 1.06  | 1.06  |
| 17250              | 1.16                | 1.16 | 1.15 | 1.13  | 1.13  | 1.13  | 1.06  | 1.06  | 1.06  | 1.06  |
| 17500              | 1.12                | 1.12 | 1.10 | 1.09  | 1.09  | 1.08  | 1.08  | 1.08  | 1.08  | 1.08  |
| 17750              | 1.06                | 1.07 | 1.05 | 1.05  | 1.04  | 1.04  | 1.10  | 1.10  | 1.10  | 1.10  |
| 18000              | 1.05                | 1.07 | 1.07 | 1.04  | 1.06  | 1.07  | 1.13  | 1.13  | 1.13  | 1.13  |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 25°C

| FREQUENCY<br>(MHz) | I. Loss<br>(dB) |
|--------------------|-----------------|
| 100                | 3.20            |
| 250                | 3.31            |
| 500                | 3.49            |
| 750                | 3.66            |
| 1000               | 3.84            |
| 1250               | 3.93            |
| 1500               | 3.99            |
| 1750               | 4.02            |
| 2000               | 4.03            |
| 2250               | 4.06            |
| 2500               | 4.14            |
| 2750               | 4.23            |
| 3000               | 4.35            |
| 3250               | 4.45            |
| 3500               | 4.54            |
| 3750               | 4.60            |
| 4000               | 4.64            |
| 4250               | 4.68            |
| 4500               | 4.73            |
| 4750               | 4.80            |
| 5000               | 4.88            |
| 5250               | 4.95            |
| 5500               | 5.02            |
| 6000               | 5.15            |
| 6500               | 5.25            |
| 7000               | 5.29            |
| 7500               | 5.33            |
| 8000               | 5.53            |
| 8500               | 5.82            |
| 9000               | 5.93            |
| 9500               | 5.85            |
| 10000              | 5.80            |
| 10500              | 5.98            |
| 11000              | 6.20            |
| 11500              | 6.34            |
| 12000              | 6.48            |
| 12500              | 6.63            |
| 12750              | 6.69            |
| 13000              | 6.75            |
| 13250              | 6.80            |
| 13500              | 6.84            |
| 13750              | 6.88            |
| 14000              | 6.95            |
| 14250              | 7.03            |
| 14500              | 7.13            |
| 14750              | 7.21            |
| 15000              | 7.28            |
| 15250              | 7.33            |
| 15500              | 7.36            |
| 15750              | 7.38            |
| 16000              | 7.39            |
| 16250              | 7.41            |
| 16500              | 7.45            |
| 16750              | 7.50            |
| 17000              | 7.57            |
| 17250              | 7.65            |
| 17500              | 7.75            |
| 17750              | 7.87            |
| 18000              | 8.03            |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 50°C

| FREQUENCY<br>(MHz) | Attenuation relative to Insertion Loss<br>(dB) |      |      |       |       |       |       |       |       |       |
|--------------------|------------------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                        | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 0.29                                           | 0.99 | 5.04 | 9.97  | 19.90 | 29.75 | 39.73 | 49.59 | 59.25 | 62.65 |
| 250                | 0.28                                           | 0.99 | 5.04 | 9.98  | 19.91 | 29.76 | 39.75 | 49.62 | 59.47 | 62.42 |
| 500                | 0.27                                           | 0.99 | 5.01 | 9.96  | 19.87 | 29.72 | 39.71 | 49.58 | 59.43 | 62.36 |
| 750                | 0.26                                           | 0.98 | 4.96 | 9.93  | 19.80 | 29.65 | 39.63 | 49.50 | 59.35 | 62.30 |
| 1000               | 0.24                                           | 0.98 | 4.91 | 9.89  | 19.74 | 29.58 | 39.56 | 49.43 | 59.28 | 62.24 |
| 1250               | 0.22                                           | 0.97 | 4.89 | 9.88  | 19.72 | 29.56 | 39.52 | 49.40 | 59.25 | 62.18 |
| 1500               | 0.20                                           | 0.97 | 4.91 | 9.90  | 19.75 | 29.59 | 39.54 | 49.41 | 59.26 | 62.21 |
| 1750               | 0.19                                           | 0.98 | 4.95 | 9.93  | 19.80 | 29.66 | 39.60 | 49.46 | 59.31 | 62.27 |
| 2000               | 0.18                                           | 0.99 | 4.99 | 9.96  | 19.86 | 29.72 | 39.66 | 49.52 | 59.36 | 62.33 |
| 2250               | 0.18                                           | 0.99 | 5.01 | 9.97  | 19.89 | 29.75 | 39.69 | 49.55 | 59.40 | 62.34 |
| 2500               | 0.18                                           | 0.99 | 5.00 | 9.97  | 19.88 | 29.76 | 39.69 | 49.55 | 59.43 | 62.39 |
| 2750               | 0.18                                           | 0.98 | 4.98 | 9.94  | 19.85 | 29.73 | 39.67 | 49.53 | 59.42 | 62.36 |
| 3000               | 0.18                                           | 0.97 | 4.94 | 9.91  | 19.81 | 29.69 | 39.63 | 49.50 | 59.40 | 62.35 |
| 3250               | 0.19                                           | 0.97 | 4.91 | 9.89  | 19.77 | 29.65 | 39.59 | 49.47 | 59.37 | 62.28 |
| 3500               | 0.20                                           | 0.96 | 4.90 | 9.89  | 19.75 | 29.64 | 39.57 | 49.45 | 59.36 | 62.32 |
| 3750               | 0.21                                           | 0.97 | 4.91 | 9.90  | 19.77 | 29.66 | 39.58 | 49.46 | 59.35 | 62.34 |
| 4000               | 0.22                                           | 0.97 | 4.93 | 9.92  | 19.80 | 29.70 | 39.61 | 49.49 | 59.40 | 62.34 |
| 4250               | 0.23                                           | 0.97 | 4.95 | 9.94  | 19.83 | 29.74 | 39.64 | 49.52 | 59.43 | 62.37 |
| 4500               | 0.23                                           | 0.97 | 4.96 | 9.94  | 19.85 | 29.77 | 39.66 | 49.54 | 59.46 | 62.41 |
| 4750               | 0.23                                           | 0.97 | 4.96 | 9.93  | 19.85 | 29.78 | 39.67 | 49.56 | 59.47 | 62.42 |
| 5000               | 0.23                                           | 0.96 | 4.96 | 9.92  | 19.84 | 29.77 | 39.66 | 49.56 | 59.49 | 62.43 |
| 5250               | 0.22                                           | 0.96 | 4.95 | 9.90  | 19.83 | 29.77 | 39.66 | 49.55 | 59.50 | 62.45 |
| 5500               | 0.22                                           | 0.95 | 4.94 | 9.89  | 19.83 | 29.77 | 39.66 | 49.56 | 59.51 | 62.46 |
| 6000               | 0.22                                           | 0.95 | 4.94 | 9.88  | 19.82 | 29.78 | 39.68 | 49.59 | 59.53 | 62.52 |
| 6500               | 0.21                                           | 0.94 | 4.94 | 9.89  | 19.83 | 29.81 | 39.74 | 49.67 | 59.65 | 62.65 |
| 7000               | 0.20                                           | 0.95 | 4.96 | 9.91  | 19.88 | 29.88 | 39.87 | 49.80 | 59.84 | 62.83 |
| 7500               | 0.18                                           | 0.96 | 5.01 | 9.97  | 19.96 | 29.97 | 39.99 | 49.93 | 59.95 | 62.88 |
| 8000               | 0.17                                           | 0.95 | 4.98 | 9.96  | 19.93 | 29.95 | 39.94 | 49.88 | 59.86 | 62.87 |
| 8500               | 0.17                                           | 0.94 | 4.90 | 9.89  | 19.83 | 29.85 | 39.79 | 49.73 | 59.75 | 62.73 |
| 9000               | 0.20                                           | 0.95 | 4.90 | 9.92  | 19.85 | 29.88 | 39.79 | 49.74 | 59.73 | 62.73 |
| 9500               | 0.25                                           | 0.98 | 5.00 | 10.03 | 20.01 | 30.06 | 39.98 | 49.96 | 60.01 | 63.00 |
| 10000              | 0.29                                           | 0.98 | 5.05 | 10.09 | 20.10 | 30.16 | 40.12 | 50.10 | 60.15 | 63.15 |
| 10500              | 0.28                                           | 0.96 | 4.99 | 10.01 | 20.02 | 30.10 | 40.06 | 50.03 | 60.09 | 63.12 |
| 11000              | 0.27                                           | 0.96 | 4.95 | 9.98  | 19.97 | 30.05 | 40.00 | 49.98 | 60.03 | 63.08 |
| 11500              | 0.26                                           | 0.97 | 4.97 | 10.02 | 20.01 | 30.08 | 40.01 | 50.00 | 60.05 | 63.08 |
| 12000              | 0.25                                           | 0.98 | 5.00 | 10.06 | 20.05 | 30.13 | 40.03 | 50.01 | 60.07 | 63.10 |
| 12500              | 0.25                                           | 0.97 | 5.00 | 10.04 | 20.05 | 30.14 | 40.01 | 50.01 | 60.07 | 63.09 |
| 12750              | 0.25                                           | 0.96 | 4.99 | 10.02 | 20.03 | 30.14 | 40.00 | 50.01 | 60.07 | 63.02 |
| 13000              | 0.24                                           | 0.95 | 4.99 | 10.00 | 20.02 | 30.13 | 40.00 | 50.01 | 60.08 | 63.04 |
| 13250              | 0.24                                           | 0.94 | 4.98 | 9.98  | 20.01 | 30.13 | 40.01 | 50.01 | 60.12 | 63.14 |
| 13500              | 0.24                                           | 0.94 | 4.97 | 9.97  | 20.00 | 30.12 | 40.02 | 50.03 | 60.13 | 63.15 |
| 13750              | 0.23                                           | 0.94 | 4.97 | 9.97  | 19.99 | 30.12 | 40.03 | 50.03 | 60.13 | 63.17 |
| 14000              | 0.23                                           | 0.94 | 4.97 | 9.97  | 19.99 | 30.11 | 40.03 | 50.04 | 60.15 | 63.16 |
| 14250              | 0.23                                           | 0.94 | 4.96 | 9.97  | 19.98 | 30.10 | 40.01 | 50.03 | 60.15 | 63.17 |
| 14500              | 0.23                                           | 0.94 | 4.95 | 9.97  | 19.97 | 30.09 | 40.00 | 50.02 | 60.14 | 63.15 |
| 14750              | 0.23                                           | 0.93 | 4.94 | 9.96  | 19.96 | 30.08 | 39.97 | 49.98 | 60.08 | 63.08 |
| 15000              | 0.24                                           | 0.93 | 4.95 | 9.96  | 19.96 | 30.09 | 39.97 | 49.97 | 60.04 | 63.10 |
| 15250              | 0.24                                           | 0.92 | 4.95 | 9.96  | 19.97 | 30.11 | 39.99 | 50.00 | 60.09 | 63.10 |
| 15500              | 0.25                                           | 0.92 | 4.97 | 9.98  | 19.99 | 30.14 | 40.03 | 50.05 | 60.11 | 63.13 |
| 15750              | 0.25                                           | 0.92 | 4.99 | 9.99  | 20.02 | 30.17 | 40.08 | 50.12 | 60.24 | 63.18 |
| 16000              | 0.26                                           | 0.92 | 5.00 | 10.00 | 20.03 | 30.20 | 40.14 | 50.19 | 60.28 | 63.23 |
| 16250              | 0.26                                           | 0.92 | 5.01 | 10.01 | 20.05 | 30.21 | 40.17 | 50.22 | 60.33 | 63.32 |
| 16500              | 0.26                                           | 0.92 | 5.01 | 10.01 | 20.05 | 30.23 | 40.21 | 50.26 | 60.40 | 63.39 |
| 16750              | 0.26                                           | 0.92 | 5.01 | 10.01 | 20.06 | 30.24 | 40.24 | 50.29 | 60.47 | 63.44 |
| 17000              | 0.25                                           | 0.92 | 5.01 | 10.01 | 20.07 | 30.25 | 40.26 | 50.32 | 60.47 | 63.49 |
| 17250              | 0.25                                           | 0.92 | 5.01 | 10.00 | 20.06 | 30.25 | 40.26 | 50.32 | 60.46 | 63.47 |
| 17500              | 0.25                                           | 0.91 | 5.01 | 9.98  | 20.06 | 30.25 | 40.25 | 50.30 | 60.49 | 63.50 |
| 17750              | 0.24                                           | 0.92 | 5.00 | 9.96  | 20.04 | 30.24 | 40.23 | 50.29 | 60.44 | 63.43 |
| 18000              | 0.23                                           | 0.92 | 4.99 | 9.95  | 20.02 | 30.22 | 40.19 | 50.26 | 60.38 | 63.42 |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 50°C

| FREQUENCY<br>(MHz) | Attenuation accuracy relative to nominal attenuation setting<br>(dB) |      |       |       |       |       |       |       |       |       |
|--------------------|----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB                                                              | 1 dB | 5 dB  | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | -0.04                                                                | 0.01 | -0.04 | 0.04  | 0.10  | 0.25  | 0.27  | 0.42  | 0.75  | 0.36  |
| 250                | -0.03                                                                | 0.01 | -0.04 | 0.02  | 0.09  | 0.24  | 0.25  | 0.38  | 0.53  | 0.58  |
| 500                | -0.02                                                                | 0.01 | -0.01 | 0.04  | 0.14  | 0.29  | 0.29  | 0.43  | 0.57  | 0.65  |
| 750                | -0.01                                                                | 0.02 | 0.04  | 0.07  | 0.20  | 0.35  | 0.37  | 0.50  | 0.65  | 0.70  |
| 1000               | 0.01                                                                 | 0.03 | 0.09  | 0.11  | 0.26  | 0.42  | 0.45  | 0.57  | 0.72  | 0.76  |
| 1250               | 0.03                                                                 | 0.03 | 0.11  | 0.12  | 0.28  | 0.44  | 0.48  | 0.60  | 0.75  | 0.82  |
| 1500               | 0.05                                                                 | 0.03 | 0.09  | 0.10  | 0.26  | 0.41  | 0.46  | 0.59  | 0.75  | 0.79  |
| 1750               | 0.06                                                                 | 0.02 | 0.05  | 0.07  | 0.20  | 0.34  | 0.40  | 0.54  | 0.69  | 0.73  |
| 2000               | 0.07                                                                 | 0.01 | 0.01  | 0.04  | 0.15  | 0.28  | 0.35  | 0.49  | 0.64  | 0.68  |
| 2250               | 0.07                                                                 | 0.01 | -0.01 | 0.03  | 0.11  | 0.25  | 0.31  | 0.45  | 0.60  | 0.66  |
| 2500               | 0.07                                                                 | 0.01 | 0.00  | 0.04  | 0.12  | 0.25  | 0.31  | 0.45  | 0.58  | 0.62  |
| 2750               | 0.07                                                                 | 0.02 | 0.02  | 0.06  | 0.15  | 0.27  | 0.33  | 0.47  | 0.58  | 0.64  |
| 3000               | 0.07                                                                 | 0.03 | 0.06  | 0.09  | 0.20  | 0.32  | 0.37  | 0.50  | 0.61  | 0.65  |
| 3250               | 0.06                                                                 | 0.03 | 0.09  | 0.11  | 0.23  | 0.35  | 0.41  | 0.53  | 0.63  | 0.72  |
| 3500               | 0.05                                                                 | 0.04 | 0.10  | 0.12  | 0.25  | 0.36  | 0.43  | 0.55  | 0.64  | 0.69  |
| 3750               | 0.04                                                                 | 0.03 | 0.09  | 0.10  | 0.23  | 0.34  | 0.42  | 0.54  | 0.65  | 0.66  |
| 4000               | 0.03                                                                 | 0.03 | 0.08  | 0.08  | 0.20  | 0.31  | 0.39  | 0.51  | 0.60  | 0.67  |
| 4250               | 0.02                                                                 | 0.03 | 0.05  | 0.06  | 0.17  | 0.26  | 0.36  | 0.48  | 0.57  | 0.63  |
| 4500               | 0.02                                                                 | 0.03 | 0.04  | 0.06  | 0.15  | 0.23  | 0.34  | 0.46  | 0.54  | 0.59  |
| 4750               | 0.02                                                                 | 0.03 | 0.04  | 0.07  | 0.15  | 0.22  | 0.33  | 0.44  | 0.53  | 0.58  |
| 5000               | 0.02                                                                 | 0.04 | 0.04  | 0.09  | 0.16  | 0.23  | 0.34  | 0.44  | 0.52  | 0.58  |
| 5250               | 0.03                                                                 | 0.04 | 0.05  | 0.10  | 0.17  | 0.23  | 0.34  | 0.45  | 0.50  | 0.55  |
| 5500               | 0.03                                                                 | 0.05 | 0.06  | 0.11  | 0.17  | 0.23  | 0.34  | 0.44  | 0.49  | 0.54  |
| 6000               | 0.03                                                                 | 0.05 | 0.06  | 0.12  | 0.18  | 0.22  | 0.32  | 0.41  | 0.47  | 0.48  |
| 6500               | 0.04                                                                 | 0.06 | 0.06  | 0.11  | 0.17  | 0.19  | 0.26  | 0.34  | 0.35  | 0.36  |
| 7000               | 0.05                                                                 | 0.05 | 0.04  | 0.09  | 0.13  | 0.13  | 0.14  | 0.21  | 0.17  | 0.18  |
| 7500               | 0.07                                                                 | 0.05 | -0.01 | 0.03  | 0.05  | 0.03  | 0.01  | 0.08  | 0.06  | 0.12  |
| 8000               | 0.08                                                                 | 0.05 | 0.02  | 0.05  | 0.08  | 0.05  | 0.06  | 0.13  | 0.14  | 0.14  |
| 8500               | 0.08                                                                 | 0.06 | 0.11  | 0.11  | 0.17  | 0.15  | 0.21  | 0.27  | 0.26  | 0.27  |
| 9000               | 0.05                                                                 | 0.05 | 0.10  | 0.09  | 0.15  | 0.13  | 0.22  | 0.26  | 0.27  | 0.27  |
| 9500               | 0.00                                                                 | 0.03 | 0.00  | -0.03 | -0.01 | -0.06 | 0.03  | 0.05  | -0.01 | 0.00  |
| 10000              | -0.04                                                                | 0.02 | -0.05 | -0.09 | -0.10 | -0.16 | -0.12 | -0.10 | -0.15 | -0.15 |
| 10500              | -0.03                                                                | 0.04 | 0.01  | -0.01 | -0.02 | -0.10 | -0.06 | -0.03 | -0.09 | -0.12 |
| 11000              | -0.02                                                                | 0.04 | 0.05  | 0.02  | 0.03  | -0.05 | 0.00  | 0.02  | -0.03 | -0.08 |
| 11500              | -0.01                                                                | 0.03 | 0.03  | -0.02 | -0.01 | -0.08 | -0.01 | 0.01  | -0.05 | -0.08 |
| 12000              | 0.00                                                                 | 0.02 | 0.00  | -0.06 | -0.05 | -0.13 | -0.03 | -0.01 | -0.07 | -0.10 |
| 12500              | 0.00                                                                 | 0.03 | 0.00  | -0.04 | -0.05 | -0.14 | -0.01 | -0.01 | -0.07 | -0.09 |
| 12750              | 0.00                                                                 | 0.04 | 0.01  | -0.02 | -0.03 | -0.14 | 0.00  | -0.01 | -0.07 | -0.02 |
| 13000              | 0.01                                                                 | 0.05 | 0.02  | 0.00  | -0.02 | -0.13 | 0.00  | -0.01 | -0.08 | -0.04 |
| 13250              | 0.01                                                                 | 0.06 | 0.02  | 0.02  | -0.01 | -0.13 | -0.01 | -0.01 | -0.12 | -0.14 |
| 13500              | 0.01                                                                 | 0.06 | 0.03  | 0.03  | 0.00  | -0.12 | -0.02 | -0.03 | -0.13 | -0.15 |
| 13750              | 0.02                                                                 | 0.06 | 0.03  | 0.03  | 0.01  | -0.12 | -0.03 | -0.03 | -0.13 | -0.17 |
| 14000              | 0.02                                                                 | 0.06 | 0.03  | 0.03  | 0.01  | -0.11 | -0.03 | -0.04 | -0.15 | -0.16 |
| 14250              | 0.02                                                                 | 0.06 | 0.04  | 0.03  | 0.02  | -0.10 | -0.01 | -0.03 | -0.15 | -0.17 |
| 14500              | 0.02                                                                 | 0.06 | 0.05  | 0.03  | 0.03  | -0.09 | 0.01  | -0.02 | -0.14 | -0.15 |
| 14750              | 0.02                                                                 | 0.07 | 0.06  | 0.04  | 0.04  | -0.08 | 0.03  | 0.02  | -0.08 | -0.08 |
| 15000              | 0.01                                                                 | 0.07 | 0.06  | 0.04  | 0.04  | -0.09 | 0.03  | 0.03  | -0.04 | -0.10 |
| 15250              | 0.01                                                                 | 0.08 | 0.05  | 0.04  | 0.03  | -0.11 | 0.01  | 0.00  | -0.09 | -0.10 |
| 15500              | 0.00                                                                 | 0.08 | 0.03  | 0.02  | 0.01  | -0.14 | -0.03 | -0.05 | -0.11 | -0.13 |
| 15750              | 0.00                                                                 | 0.08 | 0.01  | 0.01  | -0.02 | -0.17 | -0.08 | -0.12 | -0.24 | -0.18 |
| 16000              | -0.01                                                                | 0.08 | 0.00  | 0.00  | -0.03 | -0.20 | -0.14 | -0.19 | -0.28 | -0.23 |
| 16250              | -0.01                                                                | 0.08 | -0.01 | -0.01 | -0.05 | -0.21 | -0.17 | -0.22 | -0.33 | -0.32 |
| 16500              | -0.01                                                                | 0.08 | -0.01 | -0.01 | -0.05 | -0.23 | -0.21 | -0.26 | -0.40 | -0.39 |
| 16750              | -0.01                                                                | 0.08 | -0.01 | -0.01 | -0.06 | -0.24 | -0.24 | -0.29 | -0.47 | -0.44 |
| 17000              | 0.00                                                                 | 0.08 | -0.01 | -0.01 | -0.07 | -0.25 | -0.26 | -0.32 | -0.47 | -0.49 |
| 17250              | 0.00                                                                 | 0.08 | -0.01 | 0.00  | -0.06 | -0.25 | -0.26 | -0.32 | -0.46 | -0.47 |
| 17500              | 0.00                                                                 | 0.09 | -0.01 | 0.02  | -0.06 | -0.25 | -0.25 | -0.30 | -0.49 | -0.50 |
| 17750              | 0.01                                                                 | 0.08 | 0.00  | 0.04  | -0.04 | -0.24 | -0.23 | -0.29 | -0.44 | -0.43 |
| 18000              | 0.02                                                                 | 0.08 | 0.01  | 0.05  | -0.02 | -0.22 | -0.19 | -0.26 | -0.38 | -0.42 |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 50°C

| FREQUENCY<br>(MHz) | Input VSWR<br>(:1) |      |      |       |       |       |       |       |       |       |
|--------------------|--------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB            | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 1.54               | 1.44 | 1.24 | 1.06  | 1.02  | 1.04  | 1.06  | 1.04  | 1.03  | 1.07  |
| 250                | 1.44               | 1.35 | 1.18 | 1.02  | 1.01  | 1.02  | 1.03  | 1.01  | 1.01  | 1.04  |
| 500                | 1.35               | 1.28 | 1.15 | 1.01  | 1.02  | 1.03  | 1.03  | 1.03  | 1.02  | 1.04  |
| 750                | 1.22               | 1.18 | 1.10 | 1.01  | 1.03  | 1.04  | 1.03  | 1.04  | 1.04  | 1.05  |
| 1000               | 1.09               | 1.07 | 1.05 | 1.03  | 1.04  | 1.05  | 1.03  | 1.05  | 1.04  | 1.06  |
| 1250               | 1.06               | 1.02 | 1.04 | 1.05  | 1.05  | 1.06  | 1.03  | 1.06  | 1.05  | 1.08  |
| 1500               | 1.12               | 1.06 | 1.05 | 1.06  | 1.06  | 1.06  | 1.03  | 1.06  | 1.06  | 1.08  |
| 1750               | 1.20               | 1.10 | 1.06 | 1.06  | 1.06  | 1.07  | 1.04  | 1.07  | 1.06  | 1.09  |
| 2000               | 1.25               | 1.13 | 1.07 | 1.05  | 1.06  | 1.07  | 1.05  | 1.07  | 1.06  | 1.09  |
| 2250               | 1.28               | 1.15 | 1.08 | 1.05  | 1.06  | 1.07  | 1.05  | 1.07  | 1.07  | 1.10  |
| 2500               | 1.29               | 1.17 | 1.09 | 1.06  | 1.07  | 1.07  | 1.06  | 1.07  | 1.07  | 1.10  |
| 2750               | 1.28               | 1.18 | 1.10 | 1.07  | 1.07  | 1.08  | 1.06  | 1.07  | 1.07  | 1.10  |
| 3000               | 1.25               | 1.17 | 1.10 | 1.08  | 1.07  | 1.08  | 1.06  | 1.08  | 1.07  | 1.10  |
| 3250               | 1.20               | 1.14 | 1.09 | 1.08  | 1.08  | 1.08  | 1.07  | 1.08  | 1.08  | 1.10  |
| 3500               | 1.13               | 1.10 | 1.08 | 1.09  | 1.08  | 1.08  | 1.08  | 1.08  | 1.08  | 1.11  |
| 3750               | 1.08               | 1.06 | 1.07 | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.11  |
| 4000               | 1.07               | 1.05 | 1.08 | 1.09  | 1.10  | 1.10  | 1.10  | 1.10  | 1.10  | 1.12  |
| 4250               | 1.12               | 1.09 | 1.11 | 1.09  | 1.11  | 1.11  | 1.11  | 1.11  | 1.11  | 1.12  |
| 4500               | 1.19               | 1.15 | 1.14 | 1.11  | 1.12  | 1.12  | 1.12  | 1.12  | 1.12  | 1.13  |
| 4750               | 1.24               | 1.21 | 1.18 | 1.12  | 1.13  | 1.13  | 1.13  | 1.13  | 1.13  | 1.14  |
| 5000               | 1.28               | 1.25 | 1.21 | 1.14  | 1.14  | 1.14  | 1.14  | 1.14  | 1.14  | 1.14  |
| 5250               | 1.31               | 1.28 | 1.24 | 1.15  | 1.15  | 1.15  | 1.15  | 1.14  | 1.15  | 1.15  |
| 5500               | 1.34               | 1.30 | 1.26 | 1.16  | 1.16  | 1.15  | 1.17  | 1.15  | 1.16  | 1.15  |
| 6000               | 1.40               | 1.32 | 1.29 | 1.17  | 1.17  | 1.16  | 1.20  | 1.16  | 1.17  | 1.15  |
| 6500               | 1.47               | 1.35 | 1.31 | 1.18  | 1.17  | 1.16  | 1.20  | 1.16  | 1.16  | 1.14  |
| 7000               | 1.53               | 1.39 | 1.31 | 1.18  | 1.16  | 1.16  | 1.18  | 1.16  | 1.16  | 1.13  |
| 7500               | 1.39               | 1.28 | 1.24 | 1.15  | 1.14  | 1.15  | 1.14  | 1.14  | 1.14  | 1.12  |
| 8000               | 1.11               | 1.07 | 1.14 | 1.12  | 1.12  | 1.13  | 1.13  | 1.13  | 1.12  | 1.11  |
| 8500               | 1.15               | 1.16 | 1.15 | 1.13  | 1.11  | 1.12  | 1.12  | 1.12  | 1.11  | 1.11  |
| 9000               | 1.29               | 1.26 | 1.17 | 1.13  | 1.11  | 1.12  | 1.12  | 1.12  | 1.11  | 1.12  |
| 9500               | 1.26               | 1.21 | 1.13 | 1.12  | 1.12  | 1.12  | 1.11  | 1.12  | 1.12  | 1.13  |
| 10000              | 1.11               | 1.08 | 1.03 | 1.11  | 1.13  | 1.14  | 1.11  | 1.14  | 1.14  | 1.15  |
| 10500              | 1.05               | 1.10 | 1.06 | 1.15  | 1.16  | 1.16  | 1.14  | 1.16  | 1.16  | 1.18  |
| 11000              | 1.06               | 1.13 | 1.10 | 1.17  | 1.19  | 1.18  | 1.17  | 1.18  | 1.19  | 1.20  |
| 11500              | 1.03               | 1.06 | 1.10 | 1.18  | 1.21  | 1.20  | 1.18  | 1.19  | 1.21  | 1.22  |
| 12000              | 1.19               | 1.11 | 1.13 | 1.18  | 1.22  | 1.21  | 1.19  | 1.20  | 1.22  | 1.23  |
| 12500              | 1.38               | 1.29 | 1.22 | 1.20  | 1.22  | 1.21  | 1.20  | 1.21  | 1.22  | 1.23  |
| 12750              | 1.44               | 1.36 | 1.26 | 1.21  | 1.22  | 1.21  | 1.21  | 1.21  | 1.22  | 1.23  |
| 13000              | 1.45               | 1.38 | 1.28 | 1.21  | 1.22  | 1.21  | 1.22  | 1.21  | 1.22  | 1.23  |
| 13250              | 1.42               | 1.37 | 1.29 | 1.21  | 1.22  | 1.20  | 1.22  | 1.20  | 1.21  | 1.22  |
| 13500              | 1.37               | 1.33 | 1.28 | 1.21  | 1.21  | 1.20  | 1.22  | 1.20  | 1.21  | 1.22  |
| 13750              | 1.33               | 1.30 | 1.27 | 1.20  | 1.20  | 1.19  | 1.22  | 1.20  | 1.20  | 1.21  |
| 14000              | 1.33               | 1.30 | 1.27 | 1.20  | 1.20  | 1.19  | 1.22  | 1.19  | 1.20  | 1.21  |
| 14250              | 1.37               | 1.33 | 1.28 | 1.20  | 1.19  | 1.19  | 1.21  | 1.19  | 1.19  | 1.20  |
| 14500              | 1.44               | 1.39 | 1.31 | 1.20  | 1.19  | 1.19  | 1.21  | 1.19  | 1.19  | 1.20  |
| 14750              | 1.51               | 1.44 | 1.33 | 1.20  | 1.18  | 1.18  | 1.21  | 1.18  | 1.18  | 1.19  |
| 15000              | 1.56               | 1.48 | 1.34 | 1.21  | 1.18  | 1.18  | 1.20  | 1.18  | 1.17  | 1.18  |
| 15250              | 1.55               | 1.48 | 1.34 | 1.20  | 1.16  | 1.17  | 1.20  | 1.17  | 1.16  | 1.17  |
| 15500              | 1.51               | 1.44 | 1.32 | 1.19  | 1.15  | 1.16  | 1.19  | 1.16  | 1.15  | 1.16  |
| 15750              | 1.44               | 1.38 | 1.29 | 1.17  | 1.13  | 1.14  | 1.18  | 1.14  | 1.13  | 1.14  |
| 16000              | 1.37               | 1.32 | 1.25 | 1.15  | 1.11  | 1.12  | 1.16  | 1.13  | 1.11  | 1.12  |
| 16250              | 1.31               | 1.27 | 1.22 | 1.12  | 1.09  | 1.11  | 1.13  | 1.11  | 1.09  | 1.10  |
| 16500              | 1.26               | 1.23 | 1.19 | 1.10  | 1.07  | 1.09  | 1.11  | 1.09  | 1.07  | 1.09  |
| 16750              | 1.22               | 1.20 | 1.17 | 1.09  | 1.06  | 1.07  | 1.09  | 1.08  | 1.06  | 1.07  |
| 17000              | 1.19               | 1.17 | 1.15 | 1.08  | 1.06  | 1.07  | 1.07  | 1.07  | 1.05  | 1.07  |
| 17250              | 1.15               | 1.14 | 1.14 | 1.08  | 1.06  | 1.07  | 1.07  | 1.07  | 1.06  | 1.08  |
| 17500              | 1.11               | 1.11 | 1.13 | 1.09  | 1.08  | 1.08  | 1.08  | 1.08  | 1.08  | 1.09  |
| 17750              | 1.09               | 1.09 | 1.14 | 1.10  | 1.10  | 1.10  | 1.09  | 1.10  | 1.10  | 1.12  |
| 18000              | 1.11               | 1.10 | 1.17 | 1.12  | 1.12  | 1.13  | 1.11  | 1.13  | 1.12  | 1.14  |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 50°C

| FREQUENCY<br>(MHz) | Output VSWR<br>(:1) |      |      |       |       |       |       |       |       |       |
|--------------------|---------------------|------|------|-------|-------|-------|-------|-------|-------|-------|
|                    | 0.25 dB             | 1 dB | 5 dB | 10 dB | 20 dB | 30 dB | 40 dB | 50 dB | 60 dB | 63 dB |
| 100                | 1.52                | 1.56 | 1.43 | 1.46  | 1.38  | 1.37  | 1.09  | 1.09  | 1.09  | 1.09  |
| 250                | 1.43                | 1.47 | 1.37 | 1.40  | 1.33  | 1.32  | 1.05  | 1.05  | 1.05  | 1.05  |
| 500                | 1.34                | 1.39 | 1.32 | 1.34  | 1.30  | 1.30  | 1.05  | 1.05  | 1.05  | 1.05  |
| 750                | 1.23                | 1.27 | 1.26 | 1.26  | 1.26  | 1.26  | 1.06  | 1.06  | 1.06  | 1.06  |
| 1000               | 1.11                | 1.14 | 1.19 | 1.18  | 1.22  | 1.23  | 1.06  | 1.06  | 1.06  | 1.06  |
| 1250               | 1.05                | 1.06 | 1.14 | 1.12  | 1.18  | 1.19  | 1.07  | 1.07  | 1.07  | 1.07  |
| 1500               | 1.11                | 1.07 | 1.12 | 1.10  | 1.15  | 1.16  | 1.08  | 1.08  | 1.08  | 1.08  |
| 1750               | 1.19                | 1.15 | 1.13 | 1.12  | 1.13  | 1.14  | 1.08  | 1.08  | 1.08  | 1.08  |
| 2000               | 1.27                | 1.22 | 1.16 | 1.16  | 1.14  | 1.14  | 1.08  | 1.08  | 1.08  | 1.08  |
| 2250               | 1.32                | 1.27 | 1.19 | 1.20  | 1.15  | 1.15  | 1.07  | 1.07  | 1.07  | 1.07  |
| 2500               | 1.34                | 1.29 | 1.20 | 1.23  | 1.17  | 1.16  | 1.07  | 1.07  | 1.07  | 1.07  |
| 2750               | 1.32                | 1.27 | 1.20 | 1.23  | 1.18  | 1.17  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3000               | 1.26                | 1.22 | 1.18 | 1.21  | 1.18  | 1.17  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3250               | 1.18                | 1.15 | 1.16 | 1.17  | 1.17  | 1.17  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3500               | 1.11                | 1.09 | 1.13 | 1.13  | 1.16  | 1.16  | 1.06  | 1.06  | 1.06  | 1.06  |
| 3750               | 1.06                | 1.05 | 1.11 | 1.09  | 1.14  | 1.15  | 1.06  | 1.06  | 1.06  | 1.06  |
| 4000               | 1.08                | 1.08 | 1.11 | 1.08  | 1.12  | 1.13  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4250               | 1.12                | 1.13 | 1.12 | 1.10  | 1.11  | 1.12  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4500               | 1.16                | 1.16 | 1.13 | 1.12  | 1.11  | 1.11  | 1.07  | 1.07  | 1.07  | 1.07  |
| 4750               | 1.17                | 1.18 | 1.14 | 1.16  | 1.12  | 1.11  | 1.07  | 1.07  | 1.07  | 1.07  |
| 5000               | 1.16                | 1.19 | 1.15 | 1.18  | 1.15  | 1.14  | 1.06  | 1.06  | 1.06  | 1.06  |
| 5250               | 1.16                | 1.19 | 1.18 | 1.21  | 1.19  | 1.18  | 1.06  | 1.06  | 1.06  | 1.06  |
| 5500               | 1.18                | 1.22 | 1.23 | 1.23  | 1.24  | 1.23  | 1.05  | 1.05  | 1.05  | 1.05  |
| 6000               | 1.28                | 1.29 | 1.32 | 1.29  | 1.33  | 1.34  | 1.05  | 1.05  | 1.05  | 1.05  |
| 6500               | 1.34                | 1.33 | 1.36 | 1.34  | 1.36  | 1.37  | 1.05  | 1.05  | 1.05  | 1.05  |
| 7000               | 1.36                | 1.33 | 1.31 | 1.32  | 1.30  | 1.29  | 1.07  | 1.07  | 1.07  | 1.07  |
| 7500               | 1.29                | 1.26 | 1.20 | 1.22  | 1.18  | 1.17  | 1.08  | 1.08  | 1.08  | 1.08  |
| 8000               | 1.17                | 1.15 | 1.09 | 1.10  | 1.07  | 1.07  | 1.08  | 1.08  | 1.08  | 1.08  |
| 8500               | 1.09                | 1.10 | 1.04 | 1.05  | 1.02  | 1.01  | 1.08  | 1.08  | 1.08  | 1.08  |
| 9000               | 1.11                | 1.13 | 1.08 | 1.08  | 1.05  | 1.05  | 1.08  | 1.08  | 1.08  | 1.08  |
| 9500               | 1.17                | 1.19 | 1.13 | 1.13  | 1.10  | 1.09  | 1.08  | 1.08  | 1.08  | 1.08  |
| 10000              | 1.18                | 1.20 | 1.14 | 1.15  | 1.12  | 1.11  | 1.09  | 1.09  | 1.09  | 1.09  |
| 10500              | 1.15                | 1.17 | 1.14 | 1.16  | 1.14  | 1.13  | 1.11  | 1.11  | 1.11  | 1.11  |
| 11000              | 1.06                | 1.09 | 1.12 | 1.14  | 1.14  | 1.14  | 1.12  | 1.12  | 1.12  | 1.12  |
| 11500              | 1.09                | 1.09 | 1.10 | 1.08  | 1.10  | 1.11  | 1.12  | 1.12  | 1.12  | 1.12  |
| 12000              | 1.18                | 1.17 | 1.15 | 1.15  | 1.14  | 1.13  | 1.11  | 1.11  | 1.11  | 1.11  |
| 12500              | 1.26                | 1.26 | 1.25 | 1.28  | 1.26  | 1.25  | 1.10  | 1.10  | 1.10  | 1.10  |
| 12750              | 1.29                | 1.29 | 1.29 | 1.31  | 1.30  | 1.29  | 1.09  | 1.09  | 1.09  | 1.09  |
| 13000              | 1.31                | 1.31 | 1.31 | 1.33  | 1.32  | 1.32  | 1.08  | 1.08  | 1.08  | 1.08  |
| 13250              | 1.31                | 1.30 | 1.31 | 1.31  | 1.32  | 1.32  | 1.08  | 1.08  | 1.08  | 1.08  |
| 13500              | 1.29                | 1.28 | 1.30 | 1.28  | 1.30  | 1.31  | 1.07  | 1.07  | 1.07  | 1.07  |
| 13750              | 1.27                | 1.25 | 1.27 | 1.25  | 1.27  | 1.28  | 1.07  | 1.07  | 1.07  | 1.07  |
| 14000              | 1.24                | 1.24 | 1.25 | 1.23  | 1.25  | 1.25  | 1.06  | 1.06  | 1.06  | 1.06  |
| 14250              | 1.23                | 1.24 | 1.24 | 1.23  | 1.23  | 1.24  | 1.06  | 1.06  | 1.06  | 1.06  |
| 14500              | 1.24                | 1.26 | 1.25 | 1.25  | 1.24  | 1.24  | 1.06  | 1.06  | 1.06  | 1.06  |
| 14750              | 1.27                | 1.29 | 1.27 | 1.29  | 1.27  | 1.26  | 1.06  | 1.06  | 1.06  | 1.06  |
| 15000              | 1.31                | 1.33 | 1.30 | 1.32  | 1.30  | 1.29  | 1.07  | 1.07  | 1.06  | 1.06  |
| 15250              | 1.33                | 1.34 | 1.32 | 1.34  | 1.32  | 1.31  | 1.07  | 1.07  | 1.07  | 1.07  |
| 15500              | 1.32                | 1.33 | 1.33 | 1.34  | 1.33  | 1.33  | 1.07  | 1.06  | 1.06  | 1.06  |
| 15750              | 1.29                | 1.30 | 1.32 | 1.33  | 1.33  | 1.34  | 1.06  | 1.06  | 1.06  | 1.06  |
| 16000              | 1.27                | 1.27 | 1.30 | 1.30  | 1.31  | 1.32  | 1.06  | 1.06  | 1.06  | 1.06  |
| 16250              | 1.25                | 1.24 | 1.28 | 1.26  | 1.29  | 1.30  | 1.06  | 1.06  | 1.06  | 1.06  |
| 16500              | 1.24                | 1.23 | 1.26 | 1.23  | 1.26  | 1.27  | 1.05  | 1.05  | 1.05  | 1.05  |
| 16750              | 1.23                | 1.22 | 1.23 | 1.20  | 1.23  | 1.24  | 1.05  | 1.05  | 1.05  | 1.05  |
| 17000              | 1.21                | 1.21 | 1.20 | 1.18  | 1.19  | 1.20  | 1.05  | 1.05  | 1.05  | 1.05  |
| 17250              | 1.18                | 1.18 | 1.17 | 1.15  | 1.15  | 1.16  | 1.06  | 1.06  | 1.06  | 1.06  |
| 17500              | 1.13                | 1.13 | 1.11 | 1.11  | 1.10  | 1.10  | 1.08  | 1.08  | 1.08  | 1.08  |
| 17750              | 1.07                | 1.08 | 1.06 | 1.06  | 1.05  | 1.05  | 1.10  | 1.10  | 1.10  | 1.10  |
| 18000              | 1.05                | 1.07 | 1.06 | 1.05  | 1.06  | 1.06  | 1.12  | 1.12  | 1.12  | 1.12  |

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# Programmable Attenuator

# RCDAT-18G-63

## Typical Performance Data @ 50°C

| FREQUENCY<br>(MHz) | I. Loss<br>(dB) |
|--------------------|-----------------|
| 100                | 3.33            |
| 250                | 3.44            |
| 500                | 3.63            |
| 750                | 3.81            |
| 1000               | 3.99            |
| 1250               | 4.10            |
| 1500               | 4.16            |
| 1750               | 4.18            |
| 2000               | 4.19            |
| 2250               | 4.23            |
| 2500               | 4.31            |
| 2750               | 4.41            |
| 3000               | 4.53            |
| 3250               | 4.63            |
| 3500               | 4.72            |
| 3750               | 4.78            |
| 4000               | 4.82            |
| 4250               | 4.86            |
| 4500               | 4.92            |
| 4750               | 4.98            |
| 5000               | 5.07            |
| 5250               | 5.14            |
| 5500               | 5.21            |
| 6000               | 5.34            |
| 6500               | 5.43            |
| 7000               | 5.47            |
| 7500               | 5.52            |
| 8000               | 5.73            |
| 8500               | 6.03            |
| 9000               | 6.13            |
| 9500               | 6.04            |
| 10000              | 6.00            |
| 10500              | 6.19            |
| 11000              | 6.42            |
| 11500              | 6.57            |
| 12000              | 6.71            |
| 12500              | 6.85            |
| 12750              | 6.92            |
| 13000              | 6.98            |
| 13250              | 7.03            |
| 13500              | 7.07            |
| 13750              | 7.12            |
| 14000              | 7.18            |
| 14250              | 7.26            |
| 14500              | 7.35            |
| 14750              | 7.43            |
| 15000              | 7.51            |
| 15250              | 7.56            |
| 15500              | 7.58            |
| 15750              | 7.60            |
| 16000              | 7.62            |
| 16250              | 7.64            |
| 16500              | 7.68            |
| 16750              | 7.73            |
| 17000              | 7.79            |
| 17250              | 7.88            |
| 17500              | 7.99            |
| 17750              | 8.11            |
| 18000              | 8.28            |

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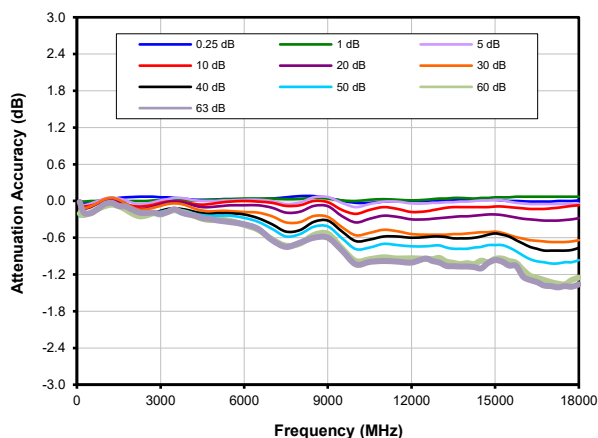


# Programmable Attenuator

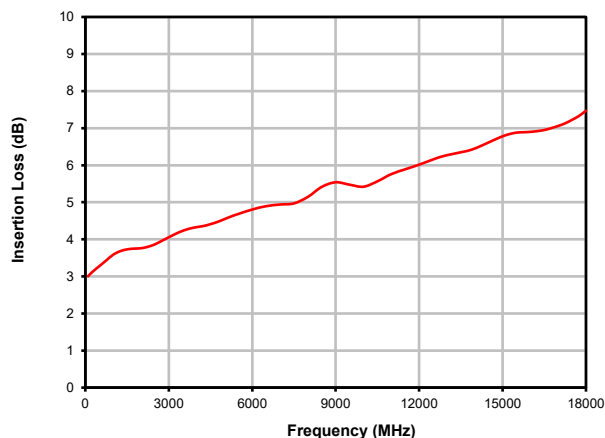
## Typical Performance Curves @ 0°C

RCDAT-18G-63

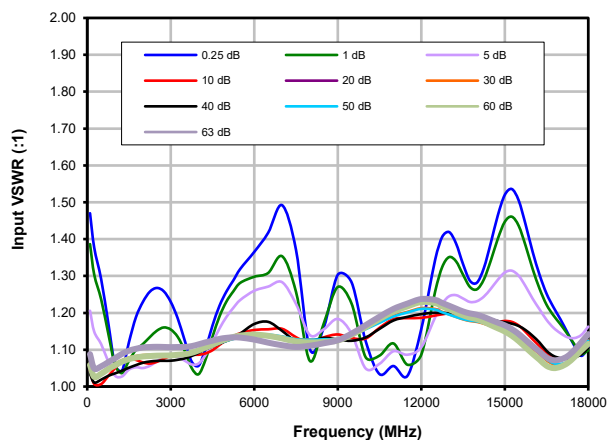
**Attenuation Accuracy  
vs. Frequency over Attenuation settings**



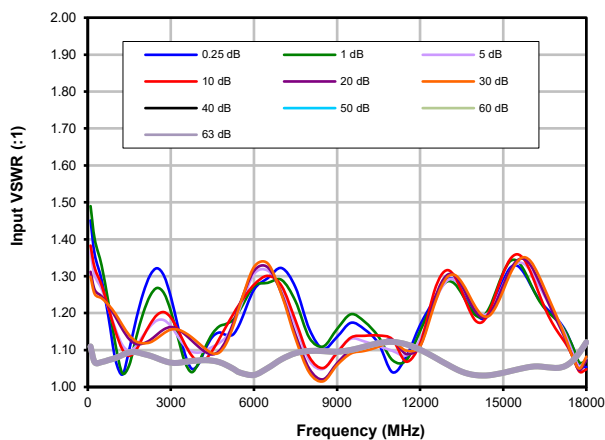
**Insertion Loss**



**Input VSWR  
vs. Frequency over Attenuation settings**



**Output VSWR  
vs. Frequency over Attenuation settings**



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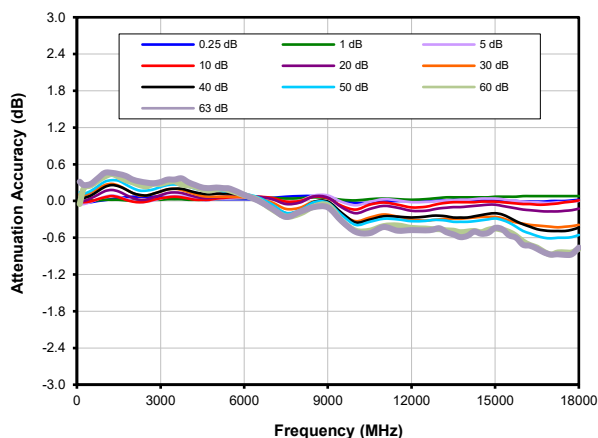


# Programmable Attenuator

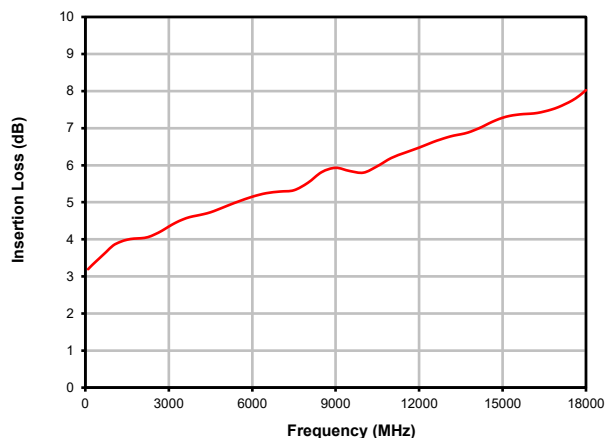
# RCDAT-18G-63

## Typical Performance Curves @ 25°C

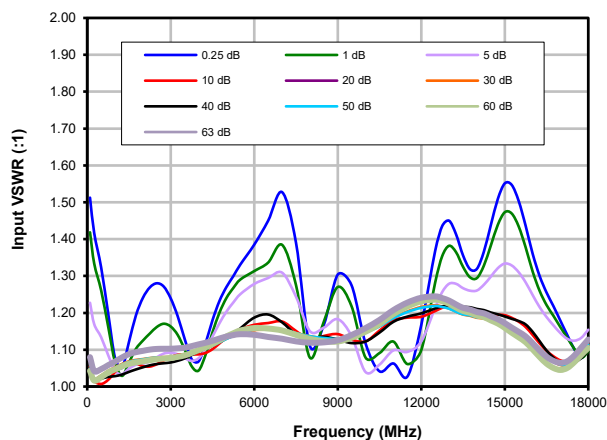
Attenuation Accuracy  
vs. Frequency over Attenuation settings



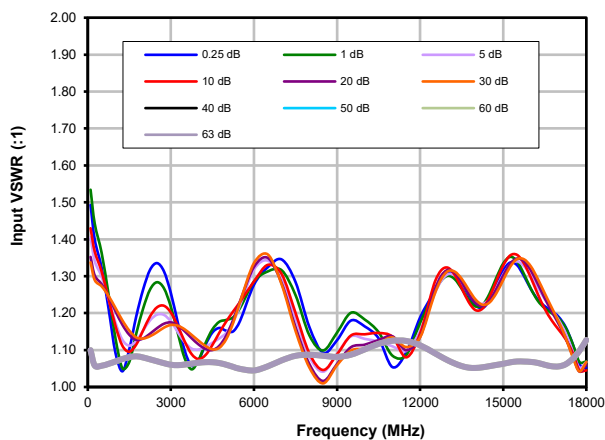
Insertion Loss



Input VSWR  
vs. Frequency over Attenuation settings



Output VSWR  
vs. Frequency over Attenuation settings



### 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)

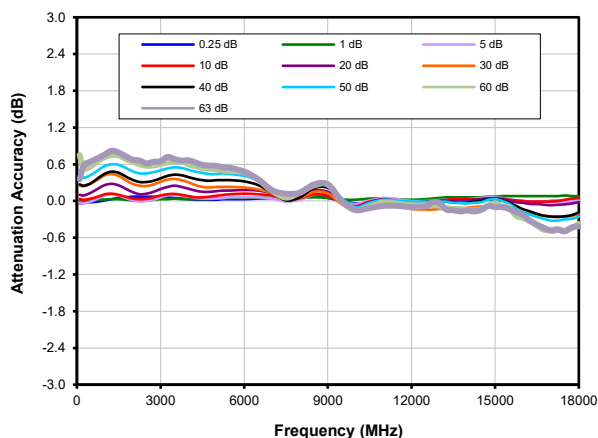


# Programmable Attenuator

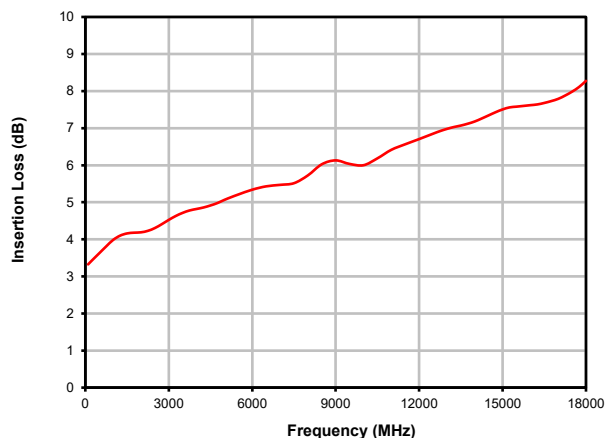
# RCDAT-18G-63

## Typical Performance Curves @ 50°C

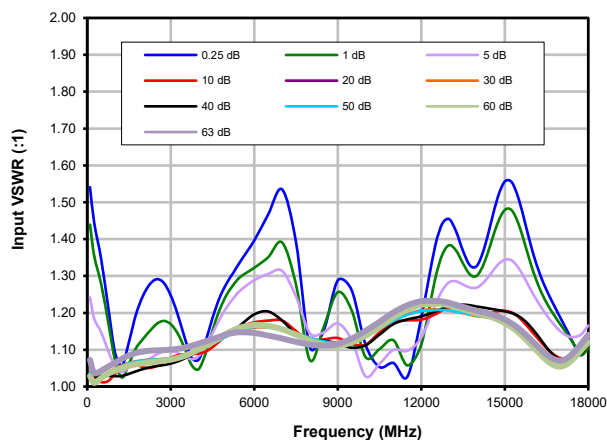
Attenuation Accuracy  
vs. Frequency over Attenuation settings



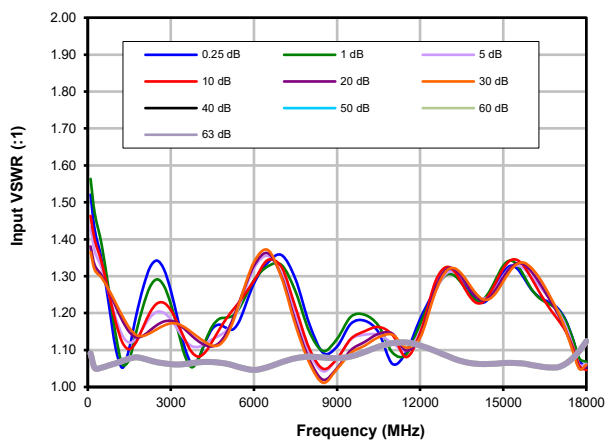
Insertion Loss



Input VSWR  
vs. Frequency over Attenuation settings



Output VSWR  
vs. Frequency over Attenuation settings



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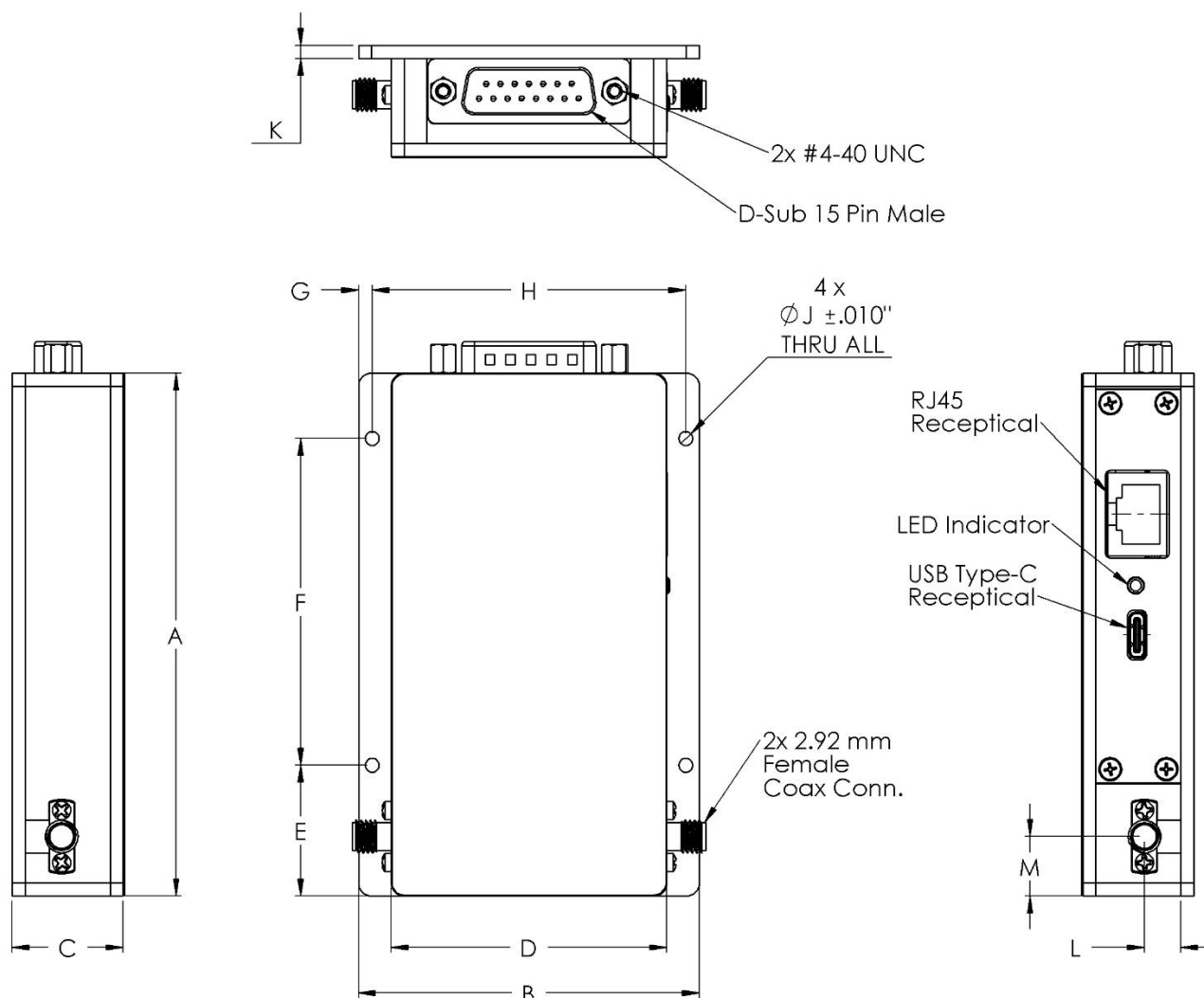


# Case Style

QF

## Outline Dimensions

QF3189



| CASE#  | A                | B               | C               | D               | E               | F                | G              | H                | J               | K               | L              | M               | WT. GRAMS |
|--------|------------------|-----------------|-----------------|-----------------|-----------------|------------------|----------------|------------------|-----------------|-----------------|----------------|-----------------|-----------|
| QM3189 | 4.00<br>(101.60) | 2.61<br>(66.29) | .850<br>(21.59) | 2.11<br>(53.59) | 1.00<br>(25.40) | 2.500<br>(63.50) | .105<br>(2.67) | 2.400<br>(60.96) | 0.106<br>(2.69) | 0.100<br>(2.54) | .278<br>(7.06) | .455<br>(11.56) | 250       |

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

### Notes:

- Case material: Nickel Plated Aluminum.



INTERNET <http://www.minicircuits.com>

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## 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      |