

# USB Smart Power Sensor

**PWR-6LGHS**

50Ω -45 dBm to +10 dBm, 50 to 6000 MHz

## The Big Deal

- Measure power levels down to -45 dBm
- Fast Measurement rate: 30 ms
- Cost effective power measurements
- USB control with full software support



CASE STYLE: JL2169

## Typical Applications

- Turn any Windows or Linux PC into a Power Meter
- Lab & benchtop testing
- Signal level calibration in production test systems
- Power monitoring in remote installations / base-stations
- Bluetooth / Wi-Fi / 2G / 3G / 4G bands covered

| Model No.                   | Description                         |
|-----------------------------|-------------------------------------|
| <b>PWR-6LGHS</b>            | <b>USB smart Power Sensor</b>       |
| <b>Included Accessories</b> |                                     |
| PWR-SEN-6LGHS               | Power Sensor Head                   |
| USB-CBL-3+                  | 6.6 ft data cable (USB Type-A Plug) |

**FC, CE, UK & RoHS Compliant**  
See our web site for RoHS Compliance methodologies and qualifications

## Product Overview

Mini-Circuits' PWR-6LGHS is a low cost, compact sensor-head that turns any PC with a USB port into an average power meter for CW (continuous waveform) signals. The sensor has a 55 dB input dynamic range allowing measurement of RF powers down to -45 dBm, over 50 to 6000 MHz.

The USB HID interface is "plug & play" compatible, meaning no driver installation is required. Full software support is provided, including our user-friendly GUI application for Windows and a full API with programming instructions for Windows and Linux environments (both 32-bit and 64-bit systems).

Download from <http://www.minicircuits.com/softwaredownload/pm.html>

## Key Features

| Feature                             | Advantages                                                                                                                                                         |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low power measurement @ 30 ms speed | Accurate and fast power measurements @ 30 ms all the way down to -45 dBm facilitates test applications with high loss and rapid power variations                   |
| Automatic measurement compensation  | Power measurements are automatically adjusted by the sensor to maintain accuracy with variations in the ambient temperature and across the bandwidth of the sensor |
| No User calibration required        | Accurate power measurements can commence as soon as the sensor is connected since it does not require any zero or reference measurements                           |
| Excellent impedance match           | Input VSWR of 1.10:1 typ reduces measurement errors due to impedance mismatch                                                                                      |

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Rev. E  
ECO-012404  
EDR-11185/2  
PWR-6LGHS  
MCIL  
220322  
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## Electrical Specifications(CW)<sup>1</sup>, -45 dBm to +10 dBm, 50 to 6000 MHz

| Parameter                                      |                                 | Freq. Range (MHz) | Min. | Typ.  | Max.  | Units |
|------------------------------------------------|---------------------------------|-------------------|------|-------|-------|-------|
| Dynamic Range <sup>2</sup>                     |                                 | 50 - 6000         | -45  | -     | +10   | dBm   |
| VSWR                                           |                                 | 50 - 6000         | -    | 1.10  | 1.30  | :1    |
| Uncertainty of Power Measurement @ 25°C        | @ -45 to -40 dBm <sup>3,4</sup> | 50 - 3000         | -    | ±0.15 | ±0.35 | dB    |
|                                                |                                 | 3000 - 6000       | -    | ±0.15 | ±0.45 | dB    |
|                                                | @ -40 to -10 dBm <sup>3,4</sup> | 50 - 3000         | -    | ±0.10 | ±0.35 | dB    |
|                                                |                                 | 3000 - 6000       | -    | ±0.10 | ±0.40 | dB    |
|                                                | @ -10 to +10 dBm                | 50 - 3000         | -    | ±0.10 | ±0.35 | dB    |
|                                                |                                 | 3000 - 6000       | -    | ±0.10 | ±0.40 | dB    |
| Uncertainty of Power Measurement @ 0°C to 50°C | @ -45 to -40 dBm <sup>3,4</sup> | 50 - 3000         | -    | ±0.30 | -     | dB    |
|                                                |                                 | 3000 - 6000       | -    | ±0.30 | -     | dB    |
|                                                | @ -40 to -10 dBm <sup>3,4</sup> | 50 - 3000         | -    | ±0.20 | -     | dB    |
|                                                |                                 | 3000 - 6000       | -    | ±0.20 | -     | dB    |
|                                                | @ -10 to +10 dBm                | 50 - 3000         | -    | ±0.20 | -     | dB    |
|                                                |                                 | 3000 - 6000       | -    | ±0.20 | -     | dB    |
| Linearity @ 25°C                               |                                 | 50 - 6000         | -    | ± 1.6 | -     | %     |
| Measurement Resolution                         |                                 | 50 - 6000         | 0.01 | -     | -     | dB    |
| Averaging Range                                |                                 | 50 - 6000         | 1    | -     | 999   | -     |
| Measurement Speed                              | @ Low Noise Mode                | 50 - 6000         | -    | 100   | -     | msec  |
|                                                | @ Faster Mode                   |                   | -    | 30    | -     |       |
| Current (via host USB)                         |                                 | 50 - 6000         | -    | 80    | 110   | mA    |

<sup>1</sup> All specifications apply to continuous wave (CW) signals.

<sup>2</sup> Maximum continuous safe operational power limit: +13 dBm.

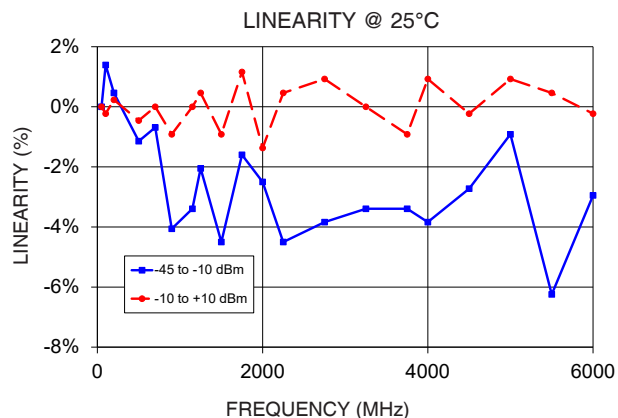
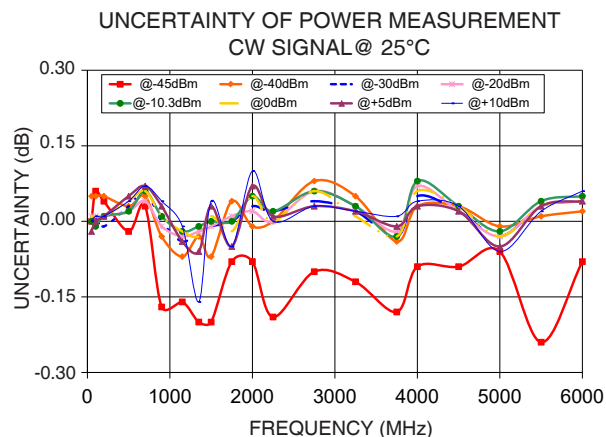
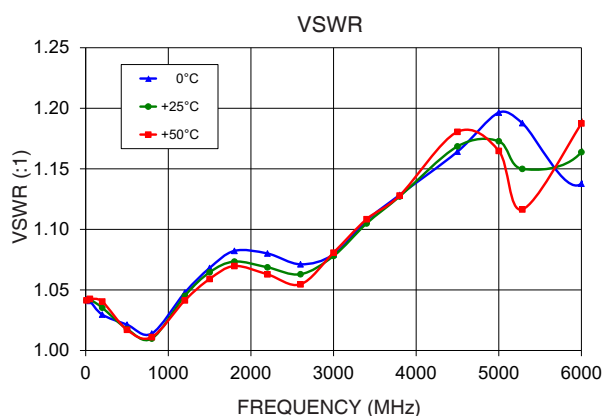
<sup>3</sup> When using Faster mode at high frequencies below -30dBm, use of averaging is recommended to prevent noise errors.

<sup>4</sup> When using Faster mode below -30dBm, uncertainty value may increase by up to 0.2 dB relative to Low noise mode

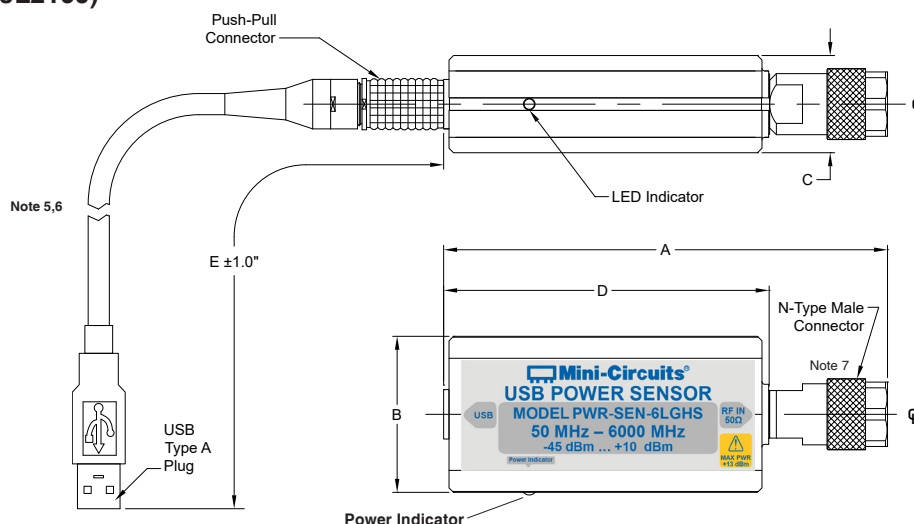
## Absolute Maximum Ratings

| Parameter             | Ratings       |
|-----------------------|---------------|
| Operating Temperature | 0°C to 50°C   |
| Storage Temperature   | -30°C to 70°C |
| DC Voltage at RF port | 16 V          |
| CW Power              | +15 dBm       |

## Typical Performance Curves



## Outline Drawing (JL2169)



## Outline Dimensions (inch mm)

| A             | B            | C            | D            | E            | WT. GRAMS |
|---------------|--------------|--------------|--------------|--------------|-----------|
| 4.95<br>125.7 | 1.74<br>44.2 | 1.08<br>27.4 | 3.63<br>92.2 | 81.9<br>2080 | 250       |

<sup>5</sup> Power sensor to be used with the supplied control cable only.

<sup>6</sup> Length shown for USB-CBL+. USB-CBL-2+ length is :15.2 in / 385 mm

<sup>7</sup> Maximum torque 8 in-lb (90 N-cm).

**Software & Documentation Download:**

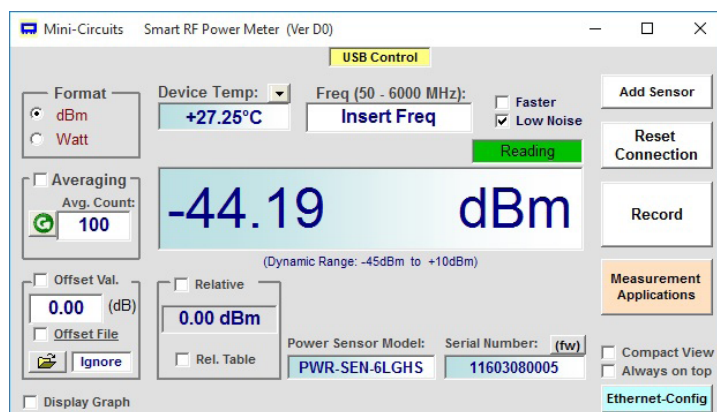
- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge from <http://www.minicircuits.com/softwaredownload/pm.html>.
- Please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com)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

**Minimum System Requirements**

| Parameter                | Requirements                                             |                                                                                           |
|--------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Interface                | USB HID                                                  |                                                                                           |
| 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                                   |
| Hardware                 | Pentium® II or higher, RAM 256 MB                        |                                                                                           |
| Control cable (supplied) | Power sensor to be used with the supplied USB cable only |                                                                                           |

**Graphical User Interface (GUI) for Windows****Key Features:**

- Set compensation frequency and monitor power measurement
- Configure measurement offsets and relative power readings
- Set measurement mode (speed and averaging)
- Control multiple power sensors at once
- Schedule data recording
- Guided measurements for a variety of applications (characterizing a two port device, power monitoring, etc.)

**Application Programming Interface (API)****Windows Support:**

- API DLL files exposing the full power sensor functionality. See programming manual at [https://www.minicircuits.com/softwaredownload/Prog\\_Manual-4-Power\\_Meter.pdf](https://www.minicircuits.com/softwaredownload/Prog_Manual-4-Power_Meter.pdf) for details.
  - ActiveX COM DLL file for creation of 32-bit programs
  - .Net library DLL file for creation of 32 / 64-bit programs
- Supported by most common programming environments (refer to application note [AN-49-001](#) for summary of tested environments)

**Linux Support:**

- Full power sensor control in a Linux environment is achieved by way of USB interrupt commands. See programming manual at [https://www.minicircuits.com/softwaredownload/Prog\\_Manual-4-Power\\_Meter.pdf](https://www.minicircuits.com/softwaredownload/Prog_Manual-4-Power_Meter.pdf) for details.



## Ordering Information

| Model     | Description            |
|-----------|------------------------|
| PWR-6LGHS | USB Smart Power Sensor |

| Included Accessories                                                              | Part No.      | Description                                                        |
|-----------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------|
|  | PWR-SEN-6LGHS | Power Sensor Head                                                  |
|  | USB-CBL-3+    | 6.6 ft data cable USB Type-A plug to 10 pin push-pull <sup>8</sup> |

<sup>8</sup> Power sensor to be used with the supplied control cable only.

| Optional Accessories | Description                                               |
|----------------------|-----------------------------------------------------------|
| USB-CBL-3+ (spare)   | 6.6 ft data cable USB Type-A plug to 10 pin push-pull     |
| USB-CBL-4+           | 15 in data cable with USB Type-A plug to 10 pin push-pull |
| NF-SM50+             | N-Type Female to SMA Male Adapter                         |
| NF-SF50+             | N-Type Female to SMA Female Adapter                       |
| NF-BM50+             | N-Type Female to BNC Male Adapter                         |

| Calibration  | Description         |                            |
|--------------|---------------------|----------------------------|
| CALSEN-6LGHS | Calibration Service | <a href="#">Click Here</a> |

## 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.
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## Typical Performance Data

| FREQ.<br>(MHz) | VSWR<br>(:1) |       |       |
|----------------|--------------|-------|-------|
|                | 0°C          | +25°C | +50°C |
| 1              | 1.05         | 1.05  | 1.05  |
| 10             | 1.04         | 1.04  | 1.04  |
| 20             | 1.04         | 1.04  | 1.04  |
| 50             | 1.04         | 1.04  | 1.04  |
| 100            | 1.04         | 1.04  | 1.04  |
| 200            | 1.03         | 1.04  | 1.04  |
| 400            | 1.03         | 1.02  | 1.02  |
| 500            | 1.02         | 1.02  | 1.02  |
| 600            | 1.01         | 1.01  | 1.01  |
| 800            | 1.01         | 1.01  | 1.01  |
| 1000           | 1.03         | 1.03  | 1.03  |
| 1200           | 1.05         | 1.05  | 1.04  |
| 1400           | 1.06         | 1.06  | 1.05  |
| 1500           | 1.07         | 1.06  | 1.06  |
| 1600           | 1.07         | 1.07  | 1.06  |
| 1800           | 1.08         | 1.07  | 1.07  |
| 2000           | 1.08         | 1.07  | 1.07  |
| 2200           | 1.08         | 1.07  | 1.06  |
| 2400           | 1.07         | 1.06  | 1.06  |
| 2600           | 1.07         | 1.06  | 1.05  |
| 2800           | 1.08         | 1.07  | 1.06  |
| 3000           | 1.08         | 1.08  | 1.08  |
| 3200           | 1.09         | 1.09  | 1.10  |
| 3400           | 1.11         | 1.10  | 1.11  |
| 3600           | 1.12         | 1.12  | 1.12  |
| 3800           | 1.13         | 1.13  | 1.13  |
| 4000           | 1.13         | 1.14  | 1.14  |
| 4500           | 1.16         | 1.17  | 1.18  |
| 4735           | 1.19         | 1.18  | 1.19  |
| 5000           | 1.20         | 1.17  | 1.16  |
| 5100           | 1.20         | 1.17  | 1.15  |
| 5285           | 1.19         | 1.15  | 1.12  |
| 5500           | 1.16         | 1.13  | 1.10  |
| 5650           | 1.13         | 1.12  | 1.11  |
| 6000           | 1.14         | 1.16  | 1.19  |
| 6310           | 1.22         | 1.23  | 1.23  |
| 6500           | 1.25         | 1.24  | 1.25  |
| 7000           | 1.17         | 1.18  | 1.20  |
| 7500           | 1.16         | 1.13  | 1.10  |

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## Typical Performance Data

| LINEARITY @ -45 to -10 dBm |          |
|----------------------------|----------|
| FREQ<br>(MHz)              | -<br>(%) |
| 40                         | -0.69    |
| 50                         | -1.60    |
| 67                         | 0.93     |
| 82                         | 0.69     |
| 100                        | 1.86     |
| 200                        | -2.28    |
| 284                        | -2.28    |
| 350                        | 1.16     |
| 388                        | 1.62     |
| 500                        | 1.86     |
| 576                        | -0.92    |
| 650                        | -2.05    |
| 700                        | -2.95    |
| 786                        | -0.92    |
| 850                        | -0.46    |
| 900                        | 0.23     |
| 1150                       | -0.92    |
| 1250                       | -1.60    |
| 1350                       | -1.60    |
| 1500                       | -2.73    |
| 1650                       | -3.39    |
| 1750                       | 1.62     |
| 1850                       | 1.39     |
| 2000                       | -0.46    |
| 2150                       | -0.23    |
| 2250                       | 0.46     |
| 2500                       | -2.95    |
| 2750                       | -1.60    |
| 3000                       | -1.60    |
| 3250                       | -2.73    |
| 3500                       | -4.94    |
| 3750                       | -5.81    |
| 3850                       | -5.16    |
| 4000                       | -0.46    |
| 4500                       | -3.84    |
| 4750                       | -2.28    |
| 5250                       | -1.60    |
| 5500                       | -3.62    |
| 6000                       | -2.95    |
| 6100                       | -2.95    |

| LINEARITY @ -10 to +10 dBm |          |
|----------------------------|----------|
| FREQ<br>(MHz)              | -<br>(%) |
| 40                         | -0.23    |
| 50                         | -0.92    |
| 67                         | -0.23    |
| 82                         | -0.23    |
| 100                        | -0.23    |
| 200                        | -0.69    |
| 284                        | 2.09     |
| 350                        | 2.09     |
| 388                        | 1.62     |
| 500                        | 0.23     |
| 576                        | 0.00     |
| 650                        | 0.00     |
| 700                        | -0.23    |
| 786                        | -0.23    |
| 850                        | 0.46     |
| 900                        | 0.69     |
| 1150                       | 0.00     |
| 1250                       | -0.23    |
| 1350                       | 2.33     |
| 1500                       | 0.23     |
| 1650                       | -0.69    |
| 1750                       | -0.69    |
| 1850                       | -0.69    |
| 2000                       | -0.46    |
| 2150                       | 0.23     |
| 2250                       | -0.46    |
| 2500                       | 0.46     |
| 2750                       | 0.46     |
| 3000                       | 0.69     |
| 3250                       | 0.00     |
| 3500                       | 0.46     |
| 3750                       | -0.46    |
| 3850                       | -0.46    |
| 4000                       | 0.93     |
| 4500                       | -0.23    |
| 4750                       | -1.37    |
| 5250                       | -1.37    |
| 5500                       | -0.23    |
| 6000                       | 0.23     |
| 6100                       | 0.23     |

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## Typical Performance Data

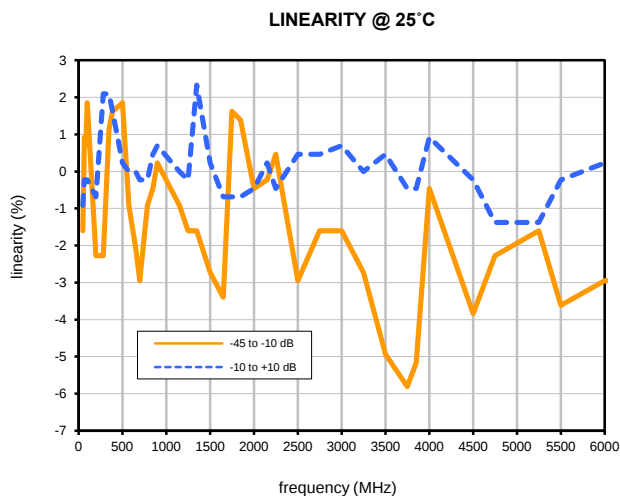
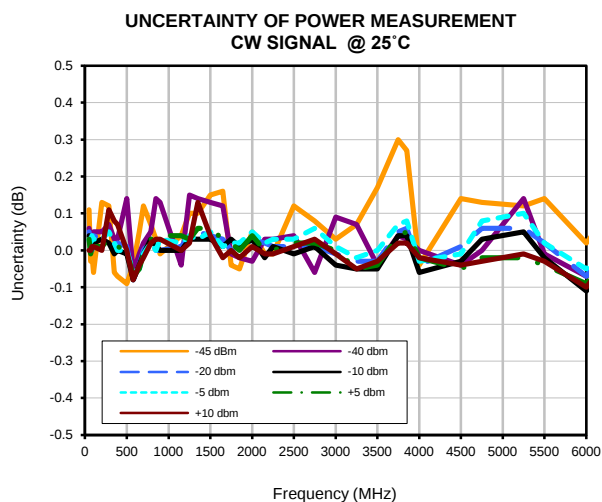
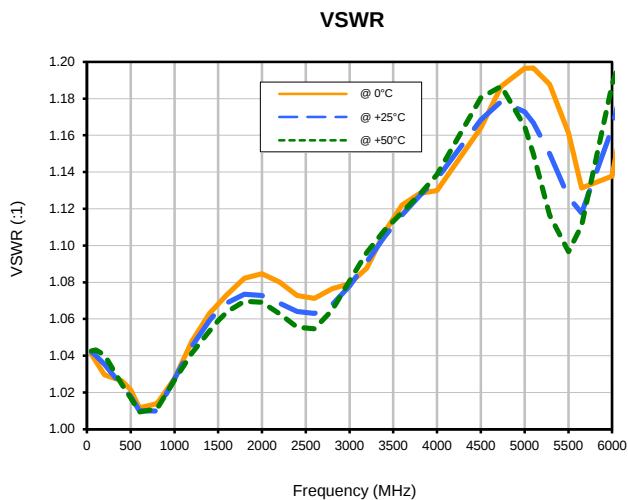
| FREQ.<br>(MHz) | UNCERTAINTY OF POWER MEASUREMENTS<br>AT CW @ 25°C<br>(dB) |       |       |       |       |       |       |       |
|----------------|-----------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                | -45                                                       | -40   | -20   | -10   | -5    | 0     | +5    | +10   |
| 40             | 0.59                                                      | 0.55  | 0.55  | 0.56  | 0.57  | 0.56  | 0.56  | 0.55  |
| 50             | 0.11                                                      | 0.06  | 0.05  | 0.04  | 0.03  | 0.03  | 0.03  | 0.00  |
| 67             | -0.03                                                     | 0.03  | 0.02  | 0.01  | 0.00  | 0.02  | -0.01 | 0.00  |
| 82             | -0.01                                                     | 0.04  | 0.00  | 0.02  | 0.04  | 0.02  | 0.01  | 0.01  |
| 100            | -0.06                                                     | 0.05  | 0.04  | 0.02  | 0.03  | 0.02  | 0.01  | 0.01  |
| 200            | 0.13                                                      | 0.05  | 0.03  | 0.03  | 0.03  | 0.02  | 0.01  | 0.00  |
| 284            | 0.12                                                      | 0.07  | 0.03  | 0.02  | 0.05  | 0.04  | 0.03  | 0.11  |
| 350            | -0.06                                                     | 0.03  | 0.00  | -0.01 | 0.02  | 0.02  | 0.01  | 0.08  |
| 388            | -0.07                                                     | 0.03  | 0.02  | 0.00  | 0.00  | 0.00  | 0.01  | 0.07  |
| 500            | -0.09                                                     | 0.14  | 0.01  | -0.01 | 0.00  | 0.02  | 0.00  | 0.00  |
| 576            | -0.04                                                     | -0.06 | -0.08 | -0.08 | -0.06 | -0.06 | -0.07 | -0.08 |
| 650            | 0.05                                                      | -0.01 | -0.04 | -0.04 | -0.05 | -0.06 | -0.05 | -0.04 |
| 700            | 0.12                                                      | 0.02  | 0.00  | -0.01 | -0.01 | -0.02 | -0.01 | -0.02 |
| 786            | 0.07                                                      | 0.05  | 0.03  | 0.03  | 0.02  | 0.03  | 0.03  | 0.02  |
| 850            | 0.03                                                      | 0.14  | 0.00  | 0.01  | 0.00  | 0.03  | 0.03  | 0.03  |
| 900            | -0.01                                                     | 0.13  | 0.00  | 0.00  | 0.03  | 0.04  | 0.04  | 0.03  |
| 1150           | 0.04                                                      | -0.04 | 0.01  | 0.00  | 0.02  | 0.03  | 0.04  | 0.00  |
| 1250           | 0.10                                                      | 0.15  | 0.04  | 0.03  | 0.04  | 0.04  | 0.03  | 0.02  |
| 1350           | 0.10                                                      | 0.14  | 0.05  | 0.03  | 0.03  | 0.06  | 0.06  | 0.13  |
| 1500           | 0.15                                                      | 0.13  | 0.04  | 0.03  | 0.05  | 0.05  | 0.06  | 0.04  |
| 1650           | 0.16                                                      | 0.12  | 0.03  | 0.01  | 0.01  | 0.00  | 0.03  | -0.02 |
| 1750           | -0.04                                                     | -0.01 | 0.00  | 0.03  | 0.02  | 0.01  | 0.02  | 0.00  |
| 1850           | -0.05                                                     | -0.02 | 0.00  | 0.01  | 0.02  | 0.01  | 0.00  | -0.02 |
| 2000           | 0.05                                                      | -0.03 | 0.03  | 0.03  | 0.05  | 0.05  | 0.04  | 0.01  |
| 2150           | -0.01                                                     | 0.03  | 0.02  | -0.02 | 0.02  | 0.00  | 0.00  | -0.01 |
| 2250           | -0.01                                                     | 0.03  | 0.01  | 0.01  | 0.03  | 0.01  | 0.00  | -0.01 |
| 2500           | 0.12                                                      | 0.04  | 0.01  | -0.01 | 0.03  | 0.02  | 0.02  | 0.01  |
| 2750           | 0.08                                                      | -0.06 | 0.01  | 0.01  | 0.06  | 0.04  | 0.02  | 0.03  |
| 3000           | 0.03                                                      | 0.09  | -0.01 | -0.04 | 0.01  | 0.01  | 0.00  | -0.01 |
| 3250           | 0.07                                                      | 0.07  | -0.03 | -0.05 | -0.02 | -0.04 | -0.05 | -0.05 |
| 3500           | 0.17                                                      | -0.04 | -0.03 | -0.05 | 0.00  | -0.01 | -0.04 | -0.03 |
| 3750           | 0.30                                                      | 0.04  | 0.05  | 0.04  | 0.07  | 0.05  | 0.04  | 0.02  |
| 3850           | 0.27                                                      | 0.03  | 0.06  | 0.04  | 0.08  | 0.06  | 0.05  | 0.02  |
| 4000           | -0.04                                                     | 0.00  | -0.04 | -0.06 | -0.03 | -0.03 | -0.02 | -0.02 |
| 4500           | 0.14                                                      | -0.04 | 0.01  | -0.03 | -0.01 | -0.05 | -0.05 | -0.04 |
| 4750           | 0.13                                                      | 0.00  | 0.06  | 0.03  | 0.08  | -0.01 | -0.02 | -0.03 |
| 5250           | 0.12                                                      | 0.14  | 0.06  | 0.05  | 0.10  | 0.00  | -0.02 | -0.01 |
| 5500           | 0.14                                                      | -0.01 | 0.02  | -0.02 | 0.02  | -0.04 | -0.04 | -0.03 |
| 6000           | 0.02                                                      | -0.07 | -0.07 | -0.11 | -0.05 | -0.06 | -0.09 | -0.10 |
| 6100           | 0.05                                                      | -0.05 | -0.04 | -0.08 | -0.01 | -0.06 | -0.06 | -0.07 |

### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.  
 C. The parts covered by this specification document are subject to Mini-Circuits' standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCStore/terms.jsp](http://www.minicircuits.com/MCStore/terms.jsp)



## Typical Performance Curves



### 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.
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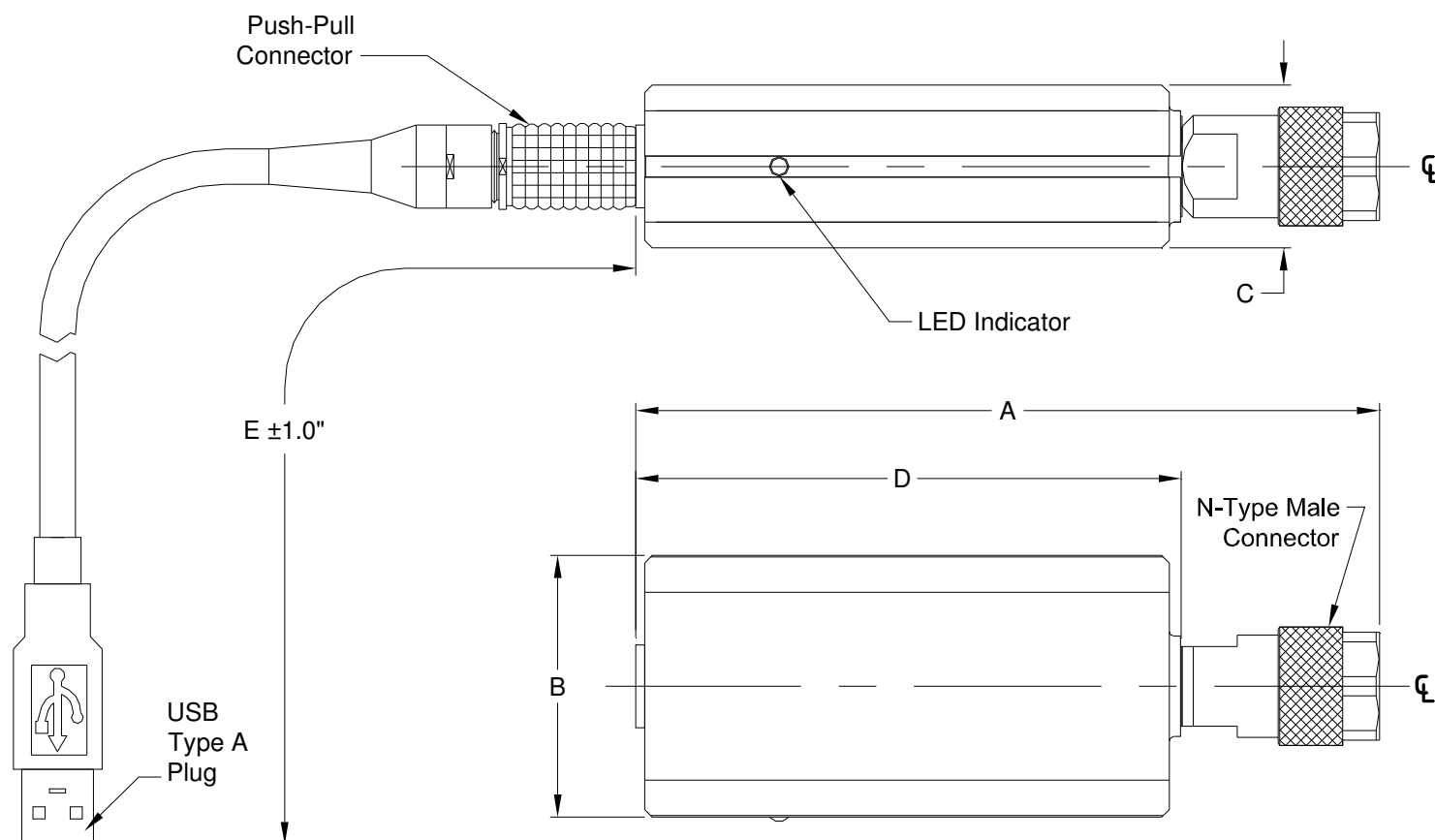


# Case Style

# JL

## Outline Dimensions

## JL2169



| CASE#  | A               | B              | C              | D              | E              | WT. GRAMS |
|--------|-----------------|----------------|----------------|----------------|----------------|-----------|
| JL2169 | 4.95<br>(125.7) | 1.74<br>(44.2) | 1.08<br>(27.4) | 3.63<br>(92.2) | 81.9<br>(2080) | 250       |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

1. Case material: Plastic & Aluminum Alloy with Clear chemical conversion coating.



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Mini-Circuits ISO 9001 & ISO 14001 Certified

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## Environmental Specifications ENV50

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            | -30° to 70° 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      |