

# Smart Power Sensor

## PWR-8GHS-RC

50Ω -30 dBm to +20 dBm, 1 MHz to 8000 MHz

### The Big Deal

- **USB or Ethernet** control
- Fast Measurement rate: 30 ms
- Cost effective power measurements
- USB control with full software support



CASE STYLE: JL1941



Software Package

### 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 / 4G / 5G bands covered

| Model No.                   | Description                            |
|-----------------------------|----------------------------------------|
| <b>PWR-8GHS-RC</b>          | <b>USB/Ethernet smart Power Sensor</b> |
| <b>Included Accessories</b> |                                        |
| PWR-SEN-8GHS-RC             | Power Sensor Head                      |
| USB-RJ45-CBL-7+             | 6.6 ft "Y" data cable (USB & RJ45)     |

**FC, CE, UK & RoHS Compliant**

See our web site for RoHS Compliance methodologies and qualifications

### Product Overview

Mini-Circuits' PWR-8GHS-RC is a compact sensor-head that turns any PC into an average power meter for CW (continuous waveform) signals. The sensor has an 50 dB input dynamic range and wide bandwidth, allowing measurement of RF powers down to -30 dBm over 1 to 8000 MHz.

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

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

### Key Features

| Feature                             | Advantages                                                                                                                                                         |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USB & Ethernet control              | USB HID and Ethernet (HTTP / Telnet) interfaces provide easy compatibility with a wide range of software setups and programming environments                       |
| Low power measurement @ 30 ms speed | Accurate and fast power measurements @ 30 ms all the way down to -30 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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## Electrical Specifications (CW) <sup>1</sup>, -30 dBm to +20 dBm, 1 to 8000 MHz

| Parameter                                      |                                | Freq. Range (MHz)                                                                   | Min. | Typ.   | Max.   | Units |
|------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------|------|--------|--------|-------|
| Dynamic Range <sup>2</sup>                     |                                | 1 - 8000                                                                            | -30  | -      | +20    | dBm   |
| VSWR                                           |                                | 1 - 8000                                                                            | -    | 1.10   | 1.30   | :1    |
| Uncertainty of Power Measurement @ 25°C        | @ -30 to +5 dBm <sup>3,4</sup> | 1 - 3000                                                                            | -    | ± 0.10 | ± 0.30 | dB    |
|                                                |                                | 3000 - 8000                                                                         | -    | ± 0.15 | ± 0.40 | dB    |
|                                                | @ +5 to +15 dBm                | 1 - 3000                                                                            | -    | ± 0.15 | ± 0.30 | dB    |
|                                                |                                | 3000 - 8000                                                                         | -    | ± 0.15 | ± 0.40 | dB    |
|                                                | @ +15 to +20 dBm               | 1 - 3000                                                                            | -    | ± 0.15 | ± 0.40 | dB    |
|                                                |                                | 3000 - 8000                                                                         | -    | ± 0.20 | ± 0.45 | dB    |
| Uncertainty of Power Measurement @ 0°C to 50°C | @ -30 to +5 dBm <sup>3,4</sup> | 1 - 3000                                                                            | -    | ± 0.20 | -      | dB    |
|                                                |                                | 3000 - 8000                                                                         | -    | ± 0.20 | -      | dB    |
|                                                | @ +5 to +15 dBm                | 1 - 3000                                                                            | -    | ± 0.20 | -      | dB    |
|                                                |                                | 3000 - 8000                                                                         | -    | ± 0.20 | -      | dB    |
|                                                | @ +15 to +20 dBm               | 1 - 3000                                                                            | -    | ± 0.20 | -      | dB    |
|                                                |                                | 3000 - 8000                                                                         | -    | ± 0.20 | -      | dB    |
| Linearity @ 25°C                               |                                | 1 - 8000                                                                            | -    | ± 3.0  | -      | %     |
| Measurement Resolution                         |                                | 1 - 8000                                                                            | 0.01 | -      | -      | dB    |
| Averaging Range                                |                                | 1 - 8000                                                                            | 1    | -      | 999    | -     |
| Measurement Speed                              | @ Low Noise Mode               | 1 - 8000                                                                            | -    | 100    | -      | msec  |
|                                                | @ Faster Mode                  |                                                                                     | -    | 30     | -      |       |
| Supply Voltage                                 |                                | via USB port                                                                        | 4.5  | 5      | 5.5    | V     |
| Current (via USB port, in USB control)         |                                | 1 - 8000                                                                            | -    | 180    | 250    | mA    |
| Current (via USB port, in Ethernet control)    |                                | 1 - 8000                                                                            | -    | 190    | 250    | mA    |
| Ethernet communication                         |                                | Supports both Telnet and HTTP protocols over TCP/IP with dynamic(DHCP) or static IP |      |        |        |       |

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

<sup>2</sup> Maximum continuous safe operational power limit: +23 dBm. Performance is guaranteed up to +20 dBm.

<sup>3</sup> When using Faster mode at high frequencies below -20dBm, use of averaging is recommended to prevent noise errors.

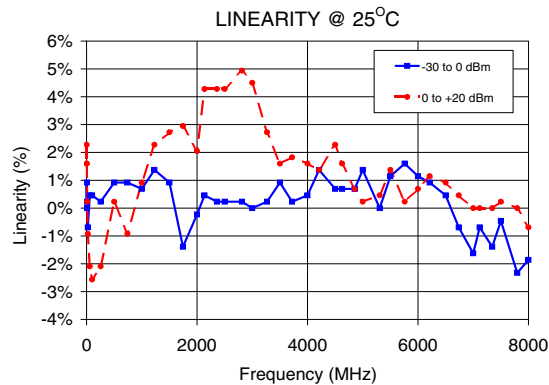
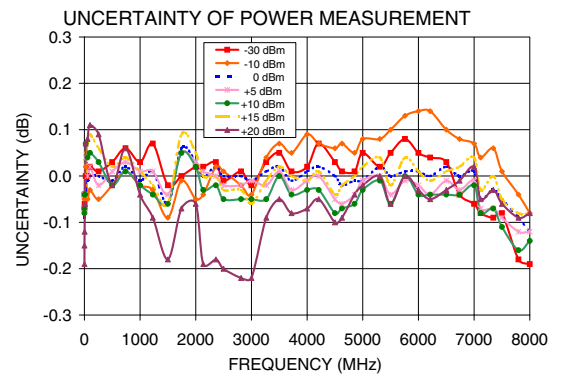
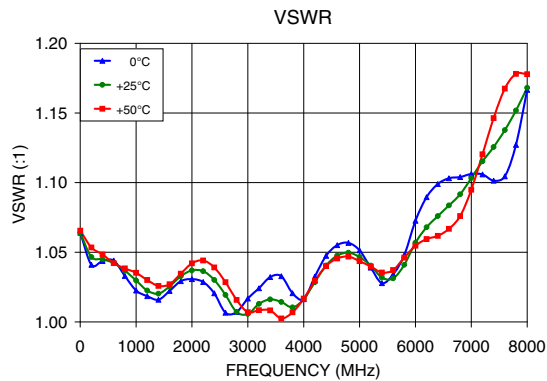
<sup>4</sup> When using Faster mode below -20dBm, uncertainty value may increase by up to 0.2 dB relative to Low noise mode

## Absolute Maximum Ratings

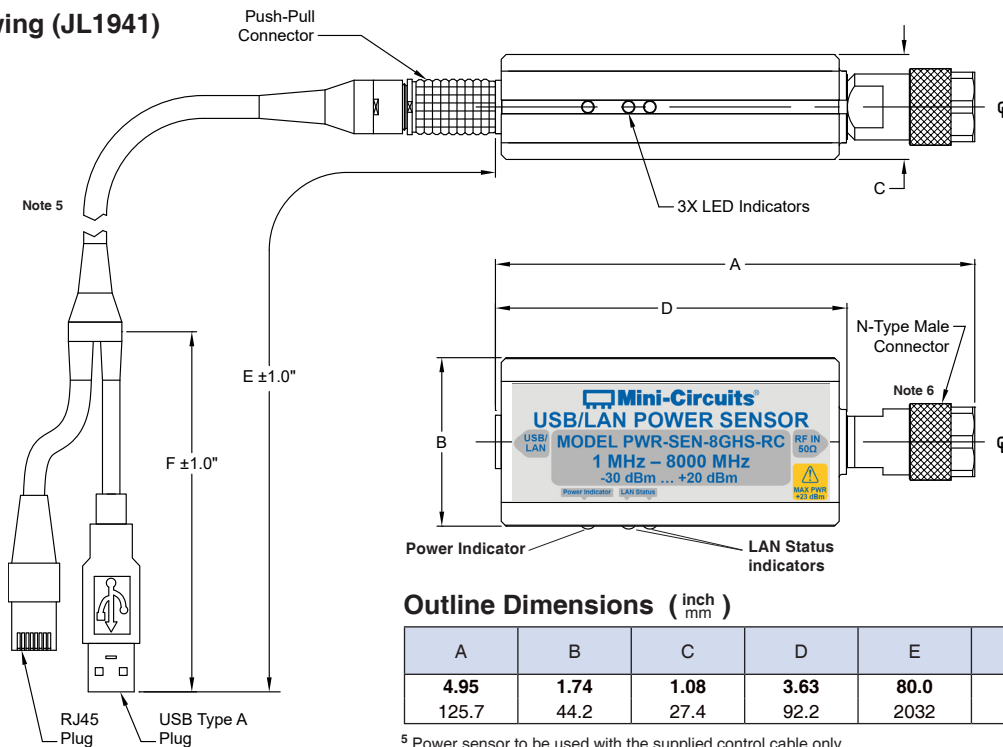
| Parameter             | Ratings       |
|-----------------------|---------------|
| Operating Temperature | 0°C to 50°C   |
| Storage Temperature   | -30°C to 70°C |
| V <sub>USB</sub> Max. | 6V            |
| DC Voltage at RF port | 15V           |
| CW Power              | +27 dBm       |

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.

## Typical Performance Curves



## Outline Drawing (JL1941)



### Outline Dimensions (inches / mm)

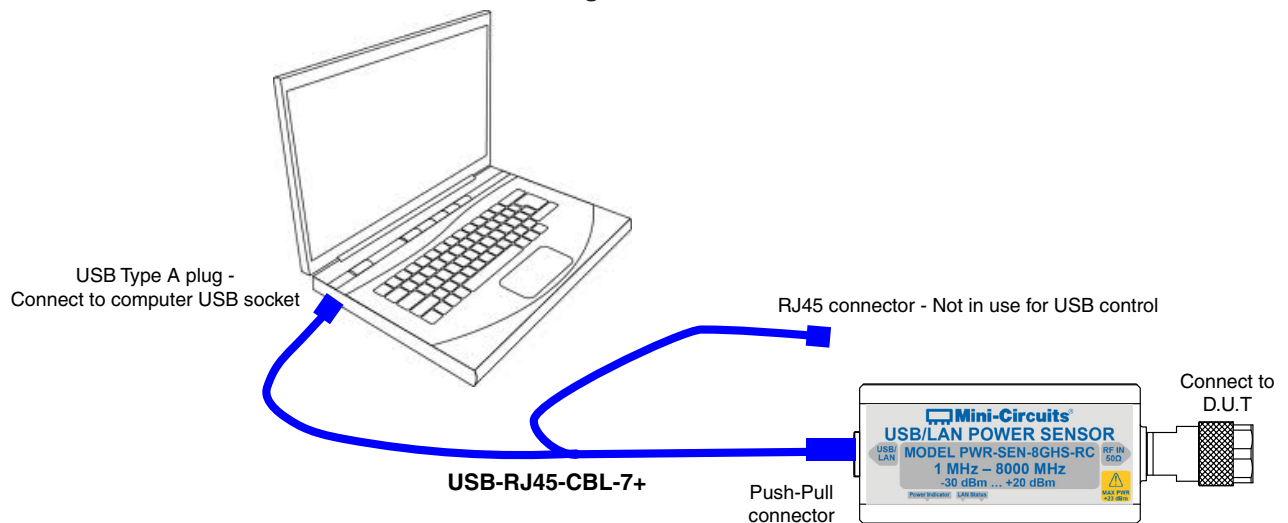
| A     | B    | C    | D    | E    | F    | WT. GRAMS |
|-------|------|------|------|------|------|-----------|
| 4.95  | 1.74 | 1.08 | 3.63 | 80.0 | 20.0 | 250       |
| 125.7 | 44.2 | 27.4 | 92.2 | 2032 | 508  |           |

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

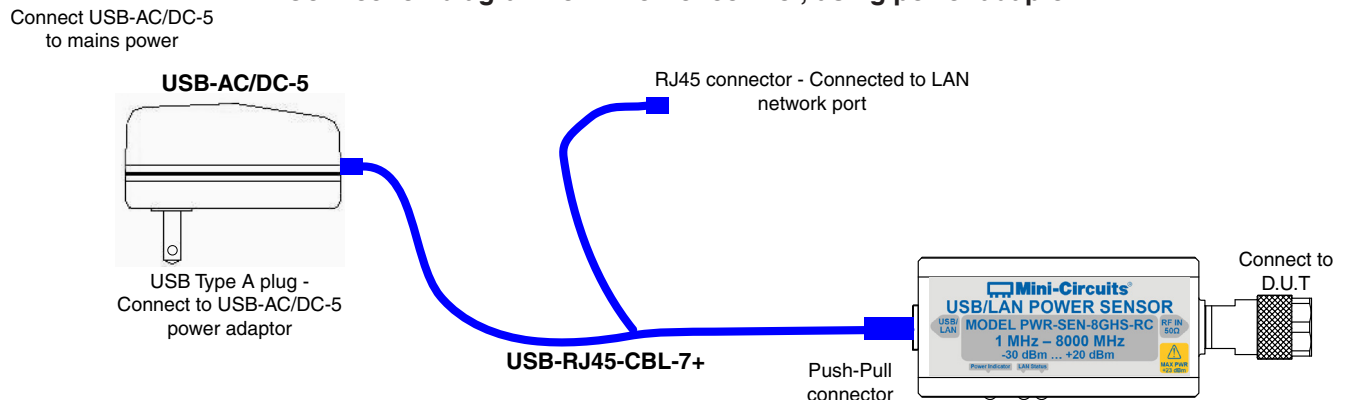
<sup>6</sup> Maximum torque 8 in-lb (90 N-cm).

## Connection diagrams

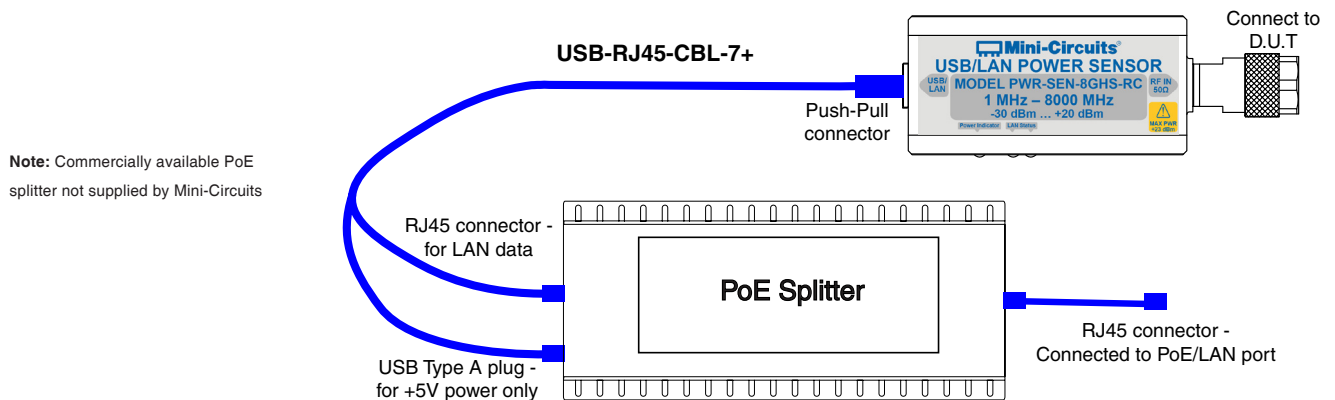
Connection diagram for USB control



Connection diagram for Ethernet control, using power adapter



Connection diagram for Ethernet control, using PoE system



## 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

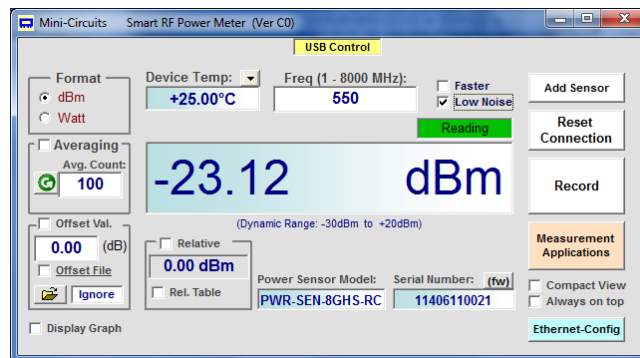
## Minimum System Requirements

| Parameter                                       | Requirements                                                 |                                                                                                                |
|-------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Interface                                       | USB HID or HTTP Get/Post or Telnet 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                                                        |
|                                                 | Telnet & HTTP                                                | Any Windows, Mac, or Linux computer with a network port and Ethernet-TCP/IP (HTTP or Telnet protocols) support |
| Hardware                                        | Pentium® II or higher, RAM 256 MB                            |                                                                                                                |
| Y control cable for USB and Ethernet (supplied) | Power sensor to be used with the supplied control 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
- HTTP Get/Post and Telnet protocols use SCPI commands to provide full control.
- 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-8GHS-RC | USB/Ethernet <i>Smart</i> Power Sensor |

| Included Accessories                                                              | Part No.        | Description                                                                       |
|-----------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------|
|  | PWR-SEN-8GHS-RC | Power Sensor Head                                                                 |
|  | USB-RJ45-CBL-7+ | 6.6 ft (2 m) "Y" data cable with USB Type-A and RJ45 plug connectors <sup>7</sup> |

<sup>7</sup> Power sensor to be used with the supplied control cable only.

| Optional Accessories    | Description                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------|
| USB-AC/DC-5+            | AC/DC 5V <sub>DC</sub> Power Adapter with US, EU, IL, UK, AUS, and China power plugs <sup>8</sup> |
| USB-RJ45-CBL-7+ (spare) | 6.6 ft (2 m) "Y" data cable with USB Type-A and RJ45 plug connectors                              |
| 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.                                                                |

<sup>8</sup> Power plugs for other countries are also available. Plugs for other countries are also available, if you need a power plug for a country not listed please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com).

| Calibration    | Description         |
|----------------|---------------------|
| CALSEN-8GHS-RC | Calibration Service |

[Click Here](#)

## Additional Notes

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# USB Power Sensor

## Typical Performance Data

# PWR-8GHS-RC

| FREQ.<br>(MHz) | VSWR<br>(:1) |       |       |
|----------------|--------------|-------|-------|
|                | 0°C          | +25°C | +50°C |
| 1              | 1.06         | 1.06  | 1.07  |
| 10             | 1.05         | 1.05  | 1.05  |
| 20             | 1.05         | 1.05  | 1.05  |
| 50             | 1.05         | 1.05  | 1.05  |
| 100            | 1.04         | 1.05  | 1.05  |
| 200            | 1.04         | 1.05  | 1.05  |
| 400            | 1.04         | 1.05  | 1.05  |
| 600            | 1.04         | 1.04  | 1.04  |
| 800            | 1.03         | 1.04  | 1.04  |
| 1000           | 1.02         | 1.03  | 1.04  |
| 1200           | 1.02         | 1.02  | 1.03  |
| 1400           | 1.02         | 1.02  | 1.03  |
| 1600           | 1.02         | 1.03  | 1.03  |
| 1800           | 1.03         | 1.03  | 1.03  |
| 2000           | 1.03         | 1.04  | 1.04  |
| 2200           | 1.03         | 1.04  | 1.04  |
| 2400           | 1.02         | 1.03  | 1.04  |
| 2600           | 1.01         | 1.02  | 1.03  |
| 2800           | 1.01         | 1.01  | 1.02  |
| 3000           | 1.02         | 1.01  | 1.01  |
| 3200           | 1.02         | 1.01  | 1.01  |
| 3400           | 1.03         | 1.02  | 1.01  |
| 3600           | 1.03         | 1.01  | 1.00  |
| 3800           | 1.02         | 1.01  | 1.01  |
| 4000           | 1.02         | 1.02  | 1.02  |
| 4200           | 1.03         | 1.03  | 1.03  |
| 4400           | 1.05         | 1.04  | 1.04  |
| 4600           | 1.06         | 1.05  | 1.05  |
| 4800           | 1.06         | 1.05  | 1.05  |
| 5000           | 1.05         | 1.05  | 1.04  |
| 5200           | 1.04         | 1.04  | 1.04  |
| 5400           | 1.03         | 1.03  | 1.04  |
| 5600           | 1.03         | 1.03  | 1.04  |
| 5800           | 1.05         | 1.04  | 1.05  |
| 6000           | 1.07         | 1.06  | 1.05  |
| 6200           | 1.09         | 1.07  | 1.06  |
| 6400           | 1.10         | 1.08  | 1.06  |
| 6600           | 1.10         | 1.08  | 1.07  |
| 6800           | 1.10         | 1.09  | 1.08  |
| 7000           | 1.11         | 1.10  | 1.09  |
| 7500           | 1.10         | 1.13  | 1.16  |
| 8000           | 1.17         | 1.17  | 1.18  |

| LINEARITY @ -30 to 0 |          |
|----------------------|----------|
| FREQ<br>(MHz)        | -<br>(%) |
| 0.5                  | 0.23     |
| 1.0                  | 0.23     |
| 10.0                 | -0.23    |
| 57.0                 | 0.46     |
| 100.0                | 0.23     |
| 500.0                | 1.83     |
| 1000.0               | 1.37     |
| 1500.0               | 0.00     |
| 2000.0               | -1.16    |
| 2500.0               | -0.23    |
| 3000.0               | 0.69     |
| 4000.0               | 1.14     |
| 5000.0               | -0.23    |
| 6000.0               | 0.69     |
| 7000.0               | 0.69     |
| 8000.0               | -2.09    |

| LINEARITY @ 0 to +20 |          |
|----------------------|----------|
| FREQ<br>(MHz)        | -<br>(%) |
| 0.5                  | 0.69     |
| 1.0                  | 0.00     |
| 10.0                 | -1.39    |
| 57.0                 | -3.99    |
| 100.0                | -4.23    |
| 500.0                | -1.39    |
| 1000.0               | -0.93    |
| 1500.0               | 1.37     |
| 2000.0               | 0.00     |
| 2500.0               | 2.73     |
| 3000.0               | 3.39     |
| 4000.0               | -0.23    |
| 5000.0               | -2.09    |
| 6000.0               | -1.86    |
| 7000.0               | -3.28    |
| 8000.0               | -5.20    |

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## Typical Performance Data

| FREQ.<br>(MHz) | UNCERTAINTY OF POWER MEASUREMENT<br>@ 25°C<br>(dBm) |       |       |       |       |       |       |
|----------------|-----------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                | -30                                                 | -10   | 0     | +5    | +10   | +15   | +20   |
| 0              | -0.34                                               | -0.36 | -0.25 | -0.21 | -0.20 | -0.22 | -0.50 |
| 1              | -0.14                                               | -0.13 | -0.12 | -0.10 | -0.10 | -0.10 | -0.26 |
| 1              | -0.07                                               | -0.07 | -0.09 | -0.07 | -0.07 | -0.06 | -0.19 |
| 2              | -0.04                                               | -0.06 | -0.07 | -0.06 | -0.07 | -0.05 | -0.15 |
| 5              | -0.05                                               | -0.04 | -0.05 | -0.04 | -0.04 | -0.02 | -0.12 |
| 10             | -0.05                                               | -0.04 | -0.05 | -0.04 | -0.03 | 0.00  | -0.06 |
| 23             | 0.01                                                | 0.02  | 0.03  | 0.05  | 0.06  | 0.05  | 0.08  |
| 57             | 0.00                                                | -0.04 | 0.00  | 0.01  | 0.03  | 0.06  | 0.08  |
| 100            | 0.01                                                | -0.02 | 0.00  | 0.01  | 0.05  | 0.09  | 0.11  |
| 255            | 0.01                                                | -0.05 | -0.01 | -0.02 | 0.02  | 0.05  | 0.08  |
| 500            | 0.02                                                | -0.03 | -0.01 | 0.01  | -0.02 | 0.02  | -0.01 |
| 739            | 0.06                                                | 0.02  | 0.01  | 0.03  | 0.00  | 0.04  | 0.05  |
| 1000           | 0.02                                                | -0.03 | 0.00  | 0.00  | -0.03 | 0.01  | -0.03 |
| 1229           | 0.06                                                | -0.02 | 0.00  | 0.01  | -0.04 | -0.02 | -0.09 |
| 1500           | -0.03                                               | -0.09 | -0.05 | -0.04 | -0.07 | -0.06 | -0.17 |
| 1744           | 0.00                                                | -0.02 | 0.06  | 0.05  | 0.06  | 0.10  | -0.06 |
| 2000           | 0.01                                                | -0.04 | 0.03  | 0.03  | 0.02  | 0.06  | -0.06 |
| 2135           | 0.02                                                | -0.04 | 0.01  | 0.01  | -0.03 | -0.01 | -0.19 |
| 2361           | 0.03                                                | 0.01  | 0.02  | 0.00  | -0.02 | -0.01 | -0.18 |
| 2500           | -0.01                                               | 0.01  | -0.01 | -0.02 | -0.05 | -0.03 | -0.20 |
| 2814           | 0.00                                                | -0.03 | -0.01 | -0.02 | -0.04 | -0.04 | -0.22 |
| 3000           | -0.02                                               | -0.04 | -0.01 | -0.01 | -0.05 | -0.05 | -0.22 |
| 3267           | 0.04                                                | 0.05  | 0.02  | -0.02 | -0.04 | -0.01 | -0.09 |
| 3500           | 0.06                                                | 0.07  | 0.02  | 0.01  | -0.01 | 0.02  | -0.05 |
| 3720           | 0.00                                                | 0.05  | -0.01 | -0.03 | -0.04 | -0.01 | -0.08 |
| 4000           | 0.01                                                | 0.09  | 0.01  | -0.01 | -0.03 | 0.00  | -0.07 |
| 4209           | 0.06                                                | 0.08  | 0.01  | 0.00  | -0.02 | 0.02  | -0.05 |
| 4500           | 0.03                                                | 0.07  | 0.00  | -0.05 | -0.07 | -0.04 | -0.10 |
| 4626           | 0.01                                                | 0.06  | -0.03 | -0.07 | -0.08 | -0.03 | -0.09 |
| 4853           | 0.02                                                | 0.05  | -0.01 | -0.04 | -0.06 | 0.00  | -0.04 |
| 5000           | 0.05                                                | 0.08  | -0.01 | -0.01 | -0.02 | 0.02  | -0.02 |
| 5306           | 0.03                                                | 0.09  | 0.02  | 0.00  | -0.01 | 0.04  | 0.00  |
| 5500           | 0.05                                                | 0.10  | 0.00  | -0.05 | -0.06 | -0.02 | -0.06 |
| 5759           | 0.08                                                | 0.14  | 0.01  | -0.01 | -0.01 | 0.03  | -0.01 |
| 6000           | 0.05                                                | 0.14  | 0.00  | -0.01 | -0.04 | 0.01  | -0.02 |
| 6212           | 0.04                                                | 0.14  | 0.01  | -0.03 | -0.04 | -0.01 | -0.06 |
| 6500           | 0.03                                                | 0.10  | 0.01  | -0.02 | -0.04 | 0.01  | -0.02 |
| 6738           | -0.03                                               | 0.08  | 0.00  | -0.03 | -0.05 | 0.01  | -0.02 |
| 7000           | -0.06                                               | 0.07  | 0.01  | -0.01 | -0.02 | 0.04  | 0.01  |
| 7118           | -0.08                                               | 0.04  | -0.04 | -0.08 | -0.08 | -0.02 | -0.05 |
| 7344           | -0.08                                               | 0.05  | -0.03 | -0.07 | -0.07 | 0.00  | -0.03 |
| 7500           | -0.08                                               | 0.02  | -0.05 | -0.11 | -0.12 | -0.05 | -0.07 |
| 7797           | -0.18                                               | -0.05 | -0.09 | -0.12 | -0.15 | -0.08 | -0.10 |
| 8000           | -0.19                                               | -0.09 | -0.12 | -0.13 | -0.14 | -0.08 | -0.08 |
| 8250           | -0.13                                               | 0.01  | 0.01  | -0.03 | -0.03 | 0.06  | 0.07  |

### Notes

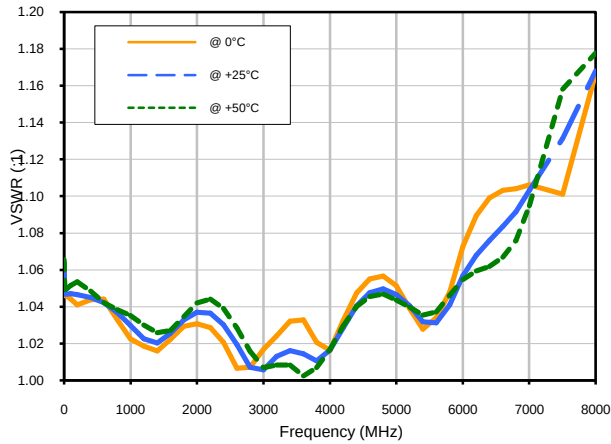
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 C. The parts covered by this specification document are subject to Mini-Circuits' standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. 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)



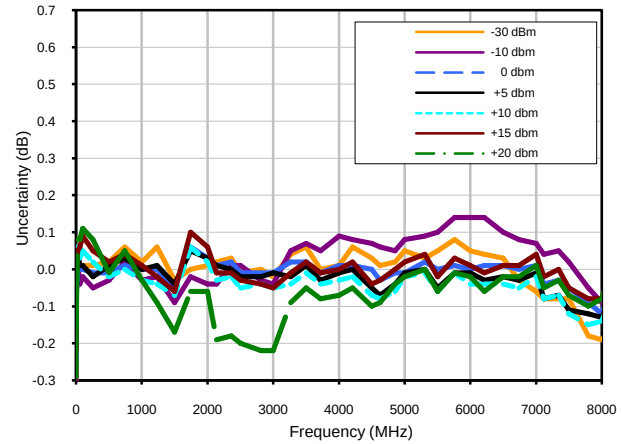


## Typical Performance Curves

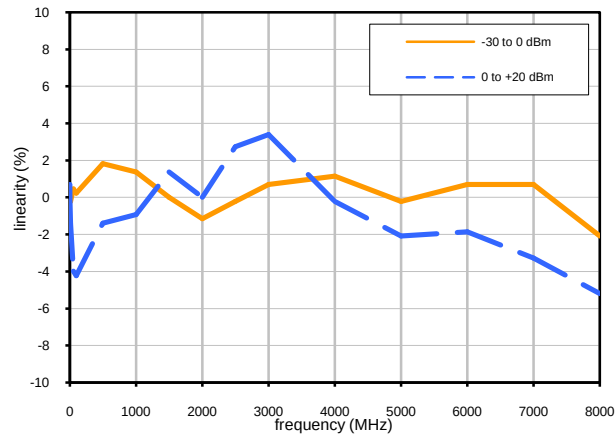
VSWR



UNCERTAINTY OF POWER MEASUREMENT @ 25°C



LINEARITY @ 25°C



### Notes

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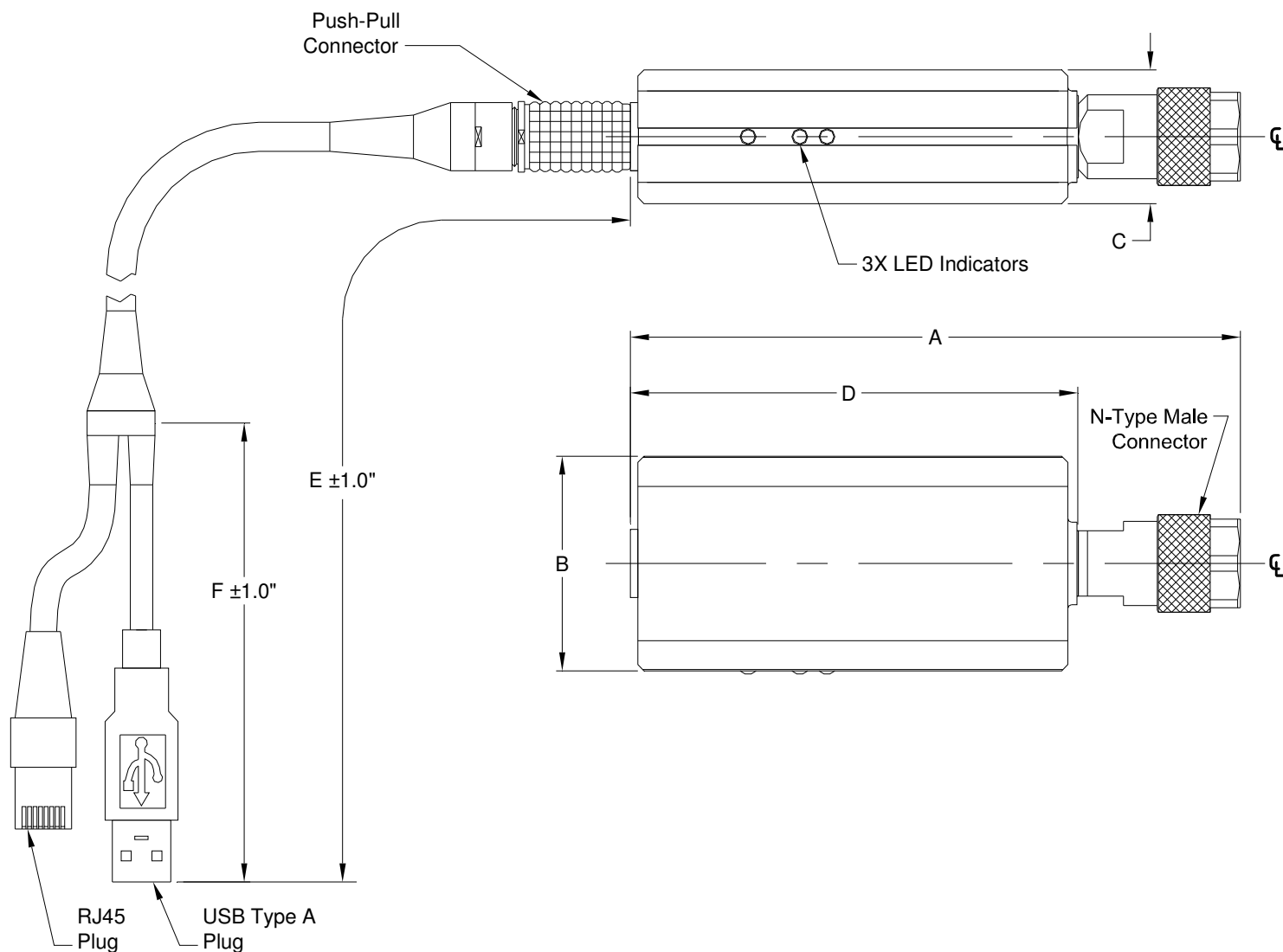


# Case Style

## Outline Dimensions

# JL

## JL1941



| CASE#  | A               | B              | C              | D              | E            | F           | WT. GRAMS |
|--------|-----------------|----------------|----------------|----------------|--------------|-------------|-----------|
| JL1941 | 4.95<br>(125.7) | 1.74<br>(44.2) | 1.08<br>(27.4) | 3.63<br>(92.2) | 80<br>(2032) | 20<br>(508) | 250       |

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

### Notes:

1. Case material: Plastic.



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

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Mini-Circuits ISO 9001 & ISO 14001 Certified



## 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      |