True RMS

USB *Smart* Power Sensor PWR-4RMS

50Ω -35 dBm to +20 dBm, 50 to 4000 MHz

The Big Deal

- True RMS power sensor (Measure CW and modulated signals)
- USB HID device compatible with 32/64 Bit operating systems
- Includes “Measurement Application” GUI (Graphical User Interface) software with an API-DLL com object
- High speed measurement capability

Software Package

CASE STYLE: JL1504

Product Overview

The Mini-Circuits PWR-4RMS true RMS Smart Power Sensor is a pocket-sized, 4.89” x 1.74” x 0.95”, precision test USB HID device (no driver installation required) that turns a Windows® or Linux® PC into a true RMS power meter. The power sensor provides highly accurate measurements of CW, modulated and multi tone signals, supporting a wide variety of applications including testing 3G and 4G products, cell phones and general RF components. Each power sensor is shipped with our N-to-SMA adapter and a quick-locking USB cable for reliable connectivity. Native software and detailed user guides are available for download from **http://www.minicircuits.com/softwaredownload/pm.html** anywhere an internet connection is available, providing a full range of data analysis options.

Key Features

Feature	Advantages
True RMS	Allows measurement of CW, modulated and multi tone signals
USB HID (Human Interface Device)	Plug-and-Play (no need to install driver for the device).
GUI Measurement Application Software built-in	Enables the user to perform measurements on RF components such as Couplers, Filters, Amplifiers etc. and displays numerical data and graphs.
32/64 Bit operating systems	Compatible with Windows® and Linux® operating systems.
No calibration required before taking measurement	The PWR-4RMS does not require any reference signal for calibration.
Low current consumption (105mA)	Preserves Laptop battery when operating in the field and allows operating multiple units with no need for an active USB hub.

True RMS

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PWR-4RMS

50Ω 50 to 4000 MHz

Product Features

- True RMS detection enables measuring CW, modulated and multi-tone signals.
- 55 dB Dynamic Range, -35 to +20 dBm
- Good VSWR, 1.05:1 typ.
- Fast measurement speed, 30 msec typ.
- Automatic frequency calibration & temperature compensation
- Multi-sensor capability (up to 24)
- Built in Application Measurement Software
- Remote operation via internet
- Effective, easy-to-use Windows® GUI
- Compatible with 32/64-bit Windows® or Linux® operating systems
- Supports a wide range of programming environments (See application note **AN-49-001** for details)
- CE Compliant

Software Package

CASE STYLE: JL1504

Model No.	Description
PWR-4RMS	**USB *smart* Power Sensor**
Included Accessories	
PWR-SEN-4RMS	Power Sensor Head
USB-CBL+	Data cable (USB Type-A plug)
NF-SM50+	N-Type (F) to SMA(M) Adapter

Typical Applications

- Turn almost any Windows or Linux PC into a Power Meter
- Pocket-sized portability for benchtop testing anywhere
- Remote location monitoring
- Automatic, scheduled data collection
- Evaluate high-power, multi-port devices with built-in virtual couplers/attenuators & other software tools
- Wide variety of applications including testing 3G and 4G products

RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

Mini-Circuits Power Meter Program for *Smart* USB Power Sensor

Electrical Specifications, -35 dBm to +20 dBm, 50 to 4000 MHz

Parameter		Freq. Range (MHz)	Min.	Typ.	Max.	Units
Dynamic Range [1]		50 - 4000	-35	-	+20	dBm
VSWR		50 - 4000	-	1.05	1.35	:1
Uncertainty of Power Measurement [2] @ 25ºC	@ -35 to +5 dBm	50 - 1500	-	± 0.05	± 0.30	dB
		1500 - 4000	-	± 0.05	± 0.35	dB
	@ +5 to +12 dBm	50 - 1500	-	± 0.05	± 0.30	dB
		1500 - 4000	-	± 0.05	± 0.35	dB
	@ +12 to +20 dBm	50 - 1500	-	± 0.05	± 0.30	dB
		1500 - 4000	-	± 0.10	± 0.35	dB
Uncertainty of Power Measurement [2] @ 0ºC to 50ºC	@ -35 to +5 dBm	50 - 1500	-	± 0.10	-	dB
		1500 - 4000	-	± 0.10	-	dB
	@ +5 to +12 dBm	50 - 1500	-	± 0.10	-	dB
		1500 - 4000	-	± 0.10	-	dB
	@ +12 to +20 dBm	50 - 1500	-	± 0.10	-	dB
		1500 - 4000	-	± 0.15	-	dB
Linearity @ 25ºC		50 - 4000	-	± 1.5	-	%
Measurement Resolution		50 - 4000	0.01	-	-	dB
Averaging Range		50 - 4000	1	-	999	-
Measurement Speed	@ Low Noise Mode	50 - 4000	-	100	-	msec
	@ Faster Mode		-	30	-	
Current (via host USB)		50 - 4000	-	105	140	mA

[1] Maximum continuous safe operational power limit: +23 dBm. Performance is guaranteed up to +20 dBm.
[2] Tested with CW signal

Electrical Specifications(Continued), -35 dBm to +20 dBm, 50 to 4000 MHz

Parameter			Freq. Range (MHz)	Min.	Typ.	Max.	Units
Uncertainty of Power Measurement (digital modulation) [4] @ 25ºC	QPSK in LTE Downlink setup [3]	@ -30dBm	50 - 4000	-	±0.10	±0.35	dB
		@ 0dBm		-	±0.10	±0.35	
		@ +10dBm		-	±0.10	±0.35	
	QPSK in LTE Uplink setup [3]	@ -30dBm	50 - 4000	-	±0.10	±0.25	dB
		@ 0dBm		-	±0.05	±0.25	
		@ +10dBm		-	±0.05	±0.30	
	MSK in GSM setup (Gausian filter @270,833 sps	@ -30dBm	50 - 4000	-	±0.10	±0.25	dB
		@ 0dBm		-	±0.05	±0.25	
		@ +10dBm		-	±0.05	±0.30	
	DQPSK in NADC setup (RNYQ filter@24.3 ksps)	@ -30dBm	50 - 4000	-	±0.10	±0.30	dB
		@ 0dBm		-	±0.05	±0.25	
		@ +10dBm		-	±0.05	±0.25	
	DQPSK in PWT setup (RNYQ filter@576 ksps)	@ -30dBm	50 - 4000	-	±0.10	±0.30	dB
		@ 0dBm		-	±0.05	±0.25	
		@ +10dBm		-	±0.05	±0.30	
	256QAM in DECT setup (Gausian filter@1.152Msps)	@ -30dBm	50 - 4000	-	±0.10	±0.35	dB
		@ 0dBm		-	±0.05	±0.25	
		@ +10dBm		-	±0.05	±0.30	
	4QAM in PHS setup (RNYQ filter@192ksps)	@ -30dBm	50 - 4000	-	±0.10	±0.30	dB
		@ 0dBm		-	±0.05	±0.25	
		@ +10dBm		-	±0.05	±0.25	
Pulse Modulation, modulating signal frequency			50 - 4000	500	-	-	Hz
Effect of multi-tone signals (within span of 15 MHz) [5,6]			50 - 100	-	±0.3	-	dB
Effect of multi-tone signals (within span of 50 MHz) [5,6]			100 - 4000	-	-	±0.1	dB

[3] Advanced LTE (2010-06) Freq. domain QPSK with 25 Resource Blocks (BW 5MHz)
[4] Digital modulation transmission rates are measured in 'symbols per second' (sps) and use a bandpass filter on the output to limit spectral spreading.
[5] Relative to an equivalent CW signal @+25°C
[6] Tested at -30 to 0 dBm @+25°C

Minimum System Requirements

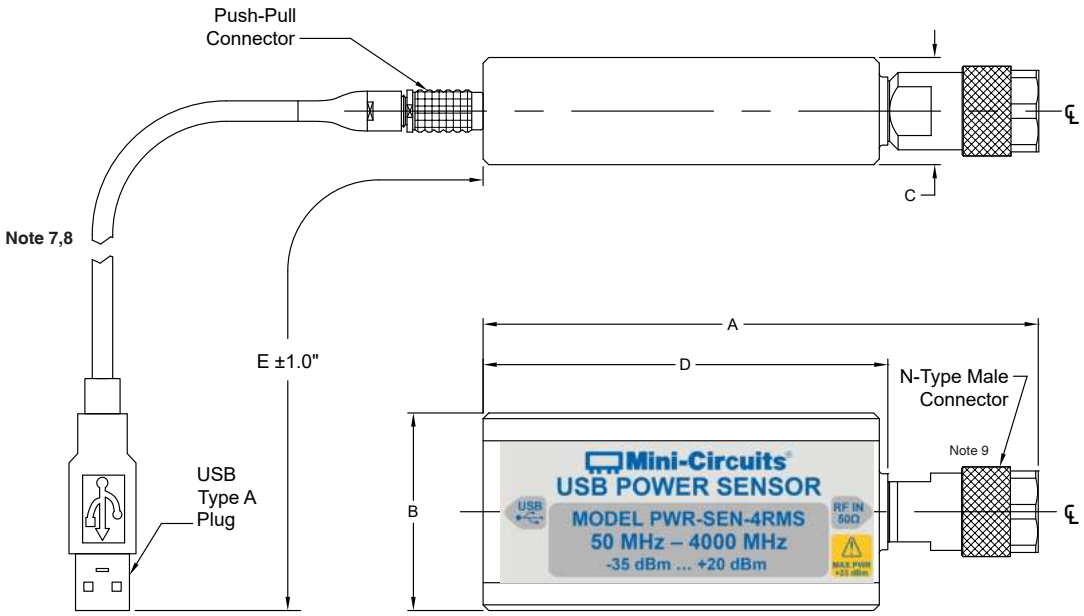
Parameter	Requirements
Interface	USB HID
Host operating system	**Windows 32/64 Bit operating system:** Windows 98®, Windows XP®, Windows Vista®, Windows 7®, Windows 8®, Windows 10® Linux® support: 32/64 Bit operating system
Hardware	Pentium® II or higher, RAM 256 Mb, USB port
Control cable (supplied)	Power sensor to be used with the supplied control cable only

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	0°C to 50°C
Storage Temperature	-30°C to 70°C
DC Voltage at RF port	4 V
CW Power	+25 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.

Outline Drawing (JL1504)

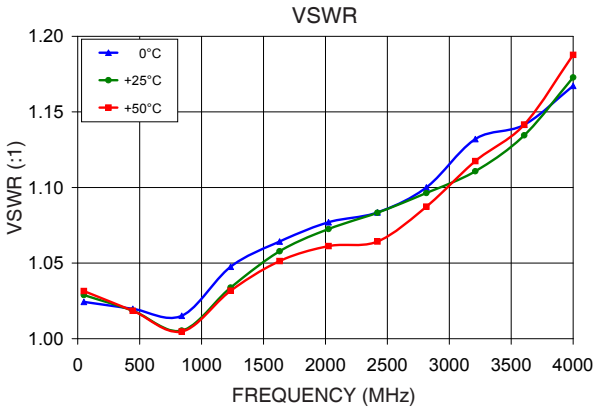


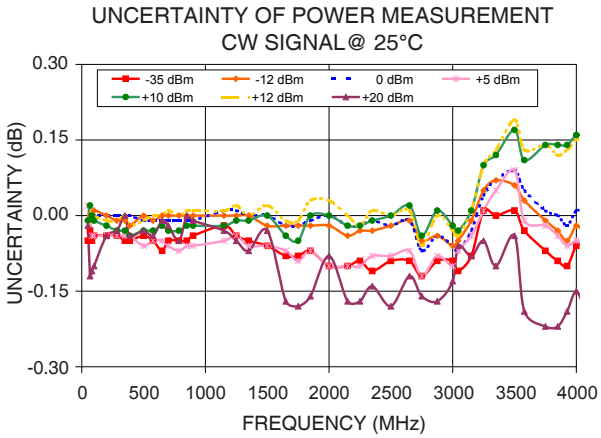
Outline Dimensions (inch / mm)

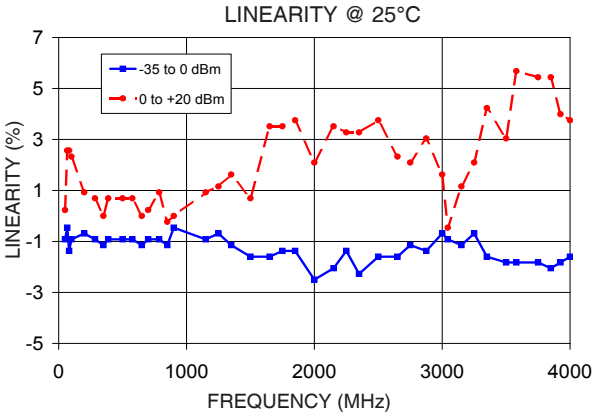
A	B	C	D	E	WT. GRAMS
4.89 124.2	**1.74** 44.2	**.95** 24.1	**3.50** 88.9	**81.9** 2080	250

[7] Power sensor to be used with the supplied control cable only.
[8] Length shown for USB-CBL+. USB-CBL-2+ length is :15.2 in / 385 mm
[9] Maximum torque 8 in-lb (90 N-cm).

Typical Performance Curves

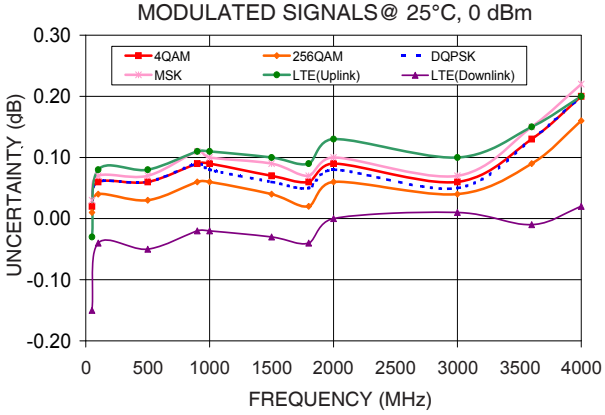




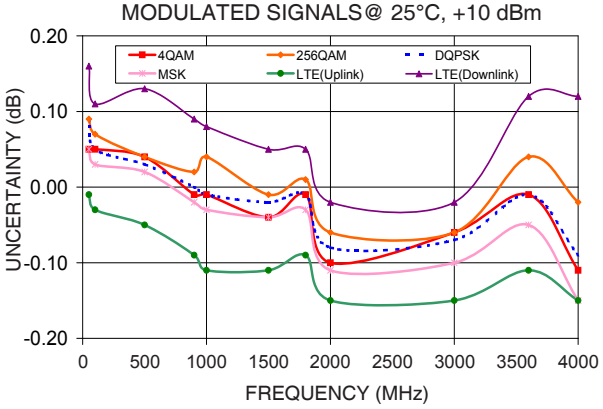


Typical Performance Curves (Continued)

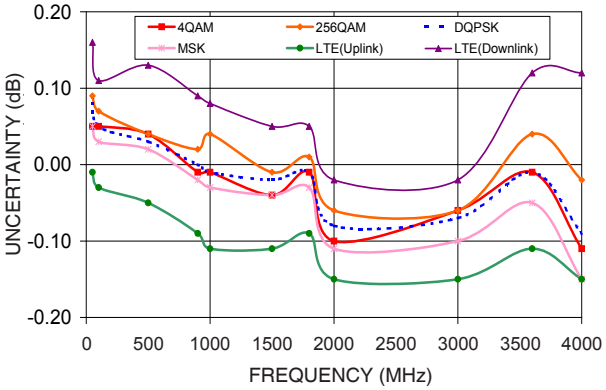
UNCERTAINTY OF POWER MEASUREMENT
MODULATED SIGNALS@ 25°C, 0 dBm



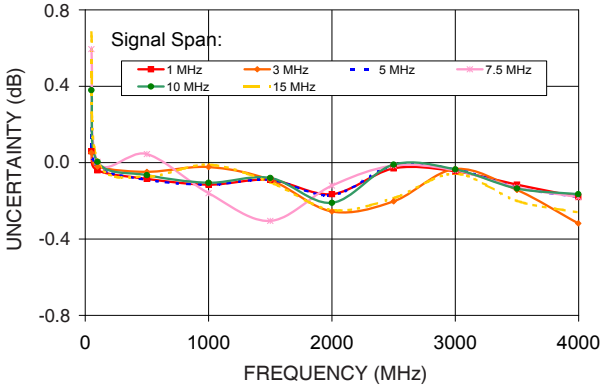
UNCERTAINTY OF POWER MEASUREMENT
MODULATED SIGNALS@ 25°C, +10 dBm



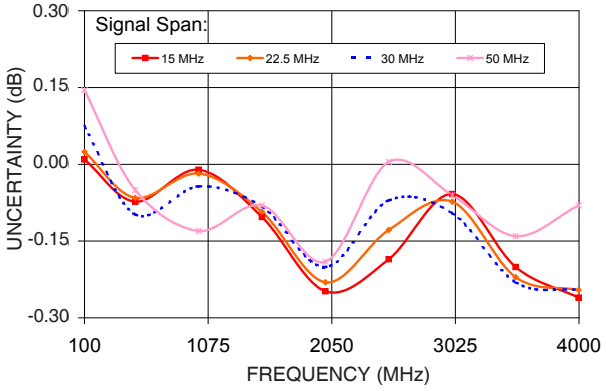
UNCERTAINTY OF POWER MEASUREMENT
MODULATED SIGNALS@ 25°C, -30 dBm



UNCERTAINTY OF POWER MEASUREMENT
MULTI-TONE SIGNAL(low spans)@ 25°C



UNCERTAINTY OF POWER MEASUREMENT
MULTI-TONE SIGNAL(high spans)@ 25°C



Ordering Information

Model	Description
PWR-4RMS	USB *Smart* Power Sensor

Included Accessories	Part No.	Description
	PWR-4RMS	Power Sensor Head
	USB-CBL+[10]	6.6 ft data cable with USB Type-A plug connector
	NF-SM50+	N-Type Female to SMA Male Adapter.

[10] Power sensor to be used with the supplied control cable only.

Optional Accessories	Description
PWR-SEN-CD[11]	Software CD
USB-CBL+ (spare)	6.6 ft data cable with USB Type-A plug connector
USB-CBL-2+	15 in data cable with USB Type-A plug connector
NF-SM50+ (spare)	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.

[11] To receive the CD at no extra cost, request when placing order. CD contents can be downloaded from Mini-Circuits website at http://www.minicircuits.com/softwaredownload/pm.html

Calibration	Description	
CALSN-PWR-4RMS	Calibration Service	Click Here

Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

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

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at **www.minicircuits.com/MCLStore/terms.jsp**