Boonton

Data Sheet

Peak, CW & Average

Power Sensors

Taking performance to a new peak

Peak, CW & Average Power Sensors

The overall performance of a power meter dependents on the power sensor employed. Boonton has a variety of quality power sensors to meet virtually all applications. Boonton has a complete line of Peak and Average power sensors up to 40 GHz for all of your fast rise time, wide bandwidth and wide dynamic range applications.

- Fast measurement speed
- Wide dynamic range (-70 dBm to +20 dBm)
- Calibration factors, linearity and temperature compensations data stored in EEPROM
- Excellent SWR for reducing mismatch uncertainty
- Accurate calibration and unique traceability to NIST
- Compatible with the most of Boonton power meter series

Features

Boonton has a large variety of power sensors that are compatible with the 4540, 4500B, 4300, 4240 and 4530 series of Boonton power meters. The power meter specifications describe the instrument's warranted performance. These specifications are valid over the instrument's operational and environmental ranges after performing a zeroing/calibration procedure unless otherwise stated. Measurement uncertainty information can be found in the Boonton power sensor manual that is available upon request.

Functions of Power Sensors

The sensor converts the incident RF or microwave power to an equivalent voltage that can be processed by the power meter. Next, the sensor presents to the incident power impedance that is closely matched to the transmission system. Both must be done with minimal drift and noise for the most accurate measurements.

Calibration and Traceability

Boonton employs both a linearity calibration as well as a frequency response calibration. This maximizes the performance of Diode Sensors and corrects non-linearity on all ranges. Linearity calibration can be used to extend the operating range of a Diode Sensor. It can also be used to correct non-linearity throughout a Thermocouple or Diode sensor's dynamic range. Frequency calibration factors (NIST traceable) and other data are stored within all peak power sensors. Linearity calibration is performed using the peak power meter's built-in calibrator.

Sensor Selection

Boonton Diode Sensors are constructed using balanced diode detectors. This dual diode configuration offers increased sensitivity and harmonic suppression when compared to a single diode sensor. When choosing a power sensor, several factors must be considered including frequency range, dynamic range and modulation. The sensor should have a faster rise time than that of the modulated signal. Boonton offers various peak power sensors for a huge variety of frequency ranges allowing measurements with widest dynamic range and fastest rise times.

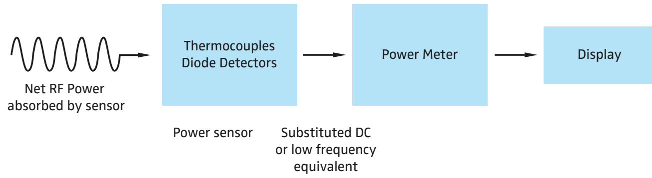

Fig 1: Typical block diagram for direct power measurement. The RF source can be any RF signal attached to the power sensor. Three different types of sensors are available based on different input frequency ranges. The signal is brought into the instrument via a cable connection and the measurement is performed by converting RF to an easily measured quantity using power sensors.

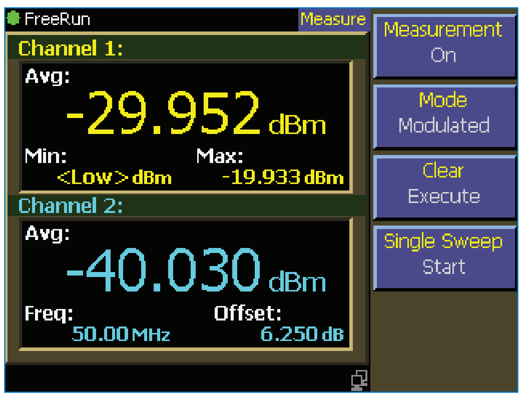

Fig 2: Typical continues power measurement using sensor connected to a CW or modulated signal. This is a common power measurement method and the power meter simply displays the average power of the signal. The display can be either numeric or graphical mode in dBm or watts. With the high sensor bandwidth, frequency and linearity correction applied continuously by the instrument, it is possible to make most accurate measurements of RF signals.

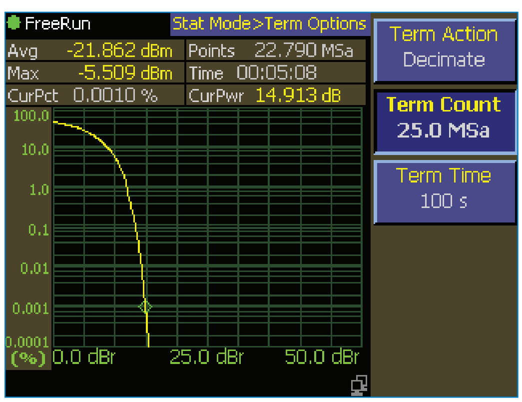

Fig 3: Example of statistical measurement (CCDF) by using a fast peak power sensor with a Boonton 4542 Power Meter. A CCDF value of close to 0% describes the highest measured power level; a CCDF value in the proximity of 100% is the power distribution that is most frequent. This mode allows to analyze the noise like signals as most of the modern communication technologies represent.

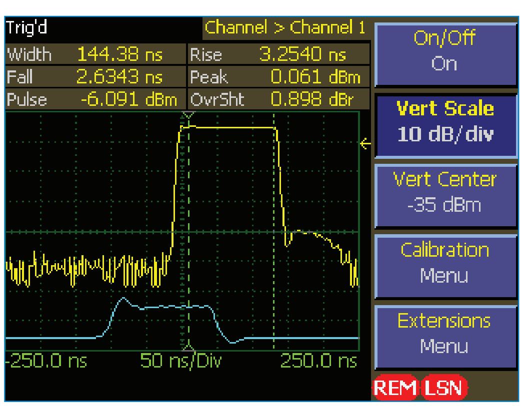

Fig 4: Pulse mode screen of Boonton 4542 using peak power sensors. For periodic waveforms, automatic measurement is usually available in triggered pulse modes. Once a stable periodic signal is detected, the instrument automatically locates the waveform transition and displays parameters such as rise time, fall time, pulse frequency, width, overshoot and average power a full cycle.

CW and Average Power Sensors

Model	Frequency Range	Dynamic Range	Overload Rating	Maximum SWR	
Impedance Connector			Pulse/Continuous	Frequency	SWR @ 0 dBm
Wide Dynamic Range Dual Diode Sensors					
51075A 50 ohm N (M)	500 kHz to 18 GHz	-70 to +20 dBm[1]	1 W for 1µs 300 mW	500 kHz - 2 GHz 2 GHz - 6 GHz 6 GHz - 18 GHz	1.15 1.20 1.40
51077A 50 ohm N (M)	500 kHz to 18 GHz	-60 to +30 dBm[1]	10 W for 1µs 3 W	500 kHz - 2 GHz 2 GHz - 6 GHz 6 GHz - 18 GHz	1.15 1.20 1.40
51079A 50 ohm N (M)	500 kHz to 18 GHz	-50 to +40 dBm[1]	100 W for 1µs 25 W	500 kHz - 2 GHz 2 GHz - 6 GHz 6 GHz - 18 GHz	1.15 1.20 1.40
51071A 50 ohm K (M)	10 MHz to 26.5 GHz	-70 to +20 dBm[1]	1 W for 1µs 300 mW	10 MHz - 2 GHz 2 GHz - 4 GHz 4 GHz - 18 GHz 18 GHz - 26.5 GHz	1.15 1.20 1.45 1.50
51072A 50 ohm K (M)	30 MHz to 40 GHz	-70 to +20 dBm[1]	1 W for 1µs 300 mW	30 MHz - 4 GHz 4 GHz - 38 GHz 38 GHz - 40 GHz	1.25 1.65 2.00
Thermocouple Sensors					
51100(9E) 50 ohm N (M)	10 MHz to 18 GHz	-20 to +20 dBm[1]	15 W for 1µs 300 mW	10 MHz - 30 MHZ 30 MHz - 16 GHz 16 GHz - 18 GHz	1.25 1.18 1.28
51200 50 ohm N (M)	10 MHz to 18 GHz	0 to +37 dBm[1]	150 W for 1µs 10 W	10 MHz - 2 GHz 2 GHz - 12.4 GHz 12.4 GHz - 18 GHz	1.10 1.18 1.28
Special Purpose Dual Diode Sensors					
51011A-EMC 50 ohm N (M)	10 kHz to 8 GHz	-60 to +20 dBm[2]	1 W for 1µs 200 mW	10 kHz - 2 GHz 2 GHz - 4 GHz 4 GHz - 8 GHz	1.12 1.20 1.40
51011A 50 ohm N (M)	100 kHz to 12.4 GHz	-60 to +20 dBm[2]	1 W for 1µs 300 mW	100 kHz - 2 GHz 2 GHz - 4 GHz 4 GHz - 11 GHz 11 GHz - 12.4 GHz	1.12 1.20 1.40 1.60
51013A 50 ohm N (M)	100 kHz to 18 GHz	-60 to +20 dBm[2]	1 W for 1µs 300 mW	100 kHz - 4 GHz 4 GHz - 10 GHz 10 GHz - 18 GHz	1.30 1.50 1.70
51015A 50 ohm N (M)	100 kHz to 18 GHz	-50 to +30 dBm[2]	10 W for 1µs 2 W	100 kHz - 1 GHz 1 GHz - 2 GHz 2 GHz - 4 GHz 4 GHz - 12.4 GHz 12.4 GHz - 18 GHz	1.07 1.10 1.12 1.18 1.28
Diode Average Sensor (For use with 4530, 5230, 4230, 4240, 4540)					
51085 50 ohm N(M)	500 kHz to 18 GHz	-30 to +20 dBm[1]	1 W for 1µs 5W (*)	500 kHz - 4 GHz 4 – 12.4 GHz 12.4 - 18 GHz	1.15 1.20 1.25

[1] Models: All power meter models except 4500B
[2] Models: 4240, 4530, 4540
* For 51085 Peak Power - 1kW peak, 5µs pulse width, 0.25% duty cycle.
For 51085 CW Power - 5W (+37dBm) average to 25°C ambient temperature, derated linearly to 2W (+33dBm) at 85°C.

Peak Power Sensors

Model	Frequency Range	Dynamic Range	Overload Rating	Sensor Response		Maximum SWR	
Impedance RF Connector	(Low Bandwidth)	Peak Power Range** CW Power Range Int. Trigger Range	Pulse/Continuous	Fast Risetime (Bandwidth)	Slow Risetime (Bandwidth)	Frequency	SWR @ 0 dBm
For use with models 4500B, 4540 and 4530*.							
57006 50 ohm N (M)	0.5 - 6 GHz (0.05 - 6 GHz)	-50 to +20 dBm -60 to +20 dBm -40 to +20 dBm	1 W for 1μs 200 mW	<7 ns (70 MHz typical)	<10 μs (350 kHz)	0.05 - 6 GHz	1.25
59318 50 ohm N (M)	0.5 - 18 GHz (0.05 - 18 GHz)	-24 to +20 dBm -34 to +20 dBm -10 to +20 dBm	1 W for 1μs 200 mW	<10 ns (50 MHz typical)	<10 μs (350 kHz)	0.05 - 2 GHz 2 - 16 GHz 16 - 18 GHz	1.15 1.28 1.34
59340 50 ohm K (M)	0.5 - 40 GHz (0.05 - 40 GHz)	-24 to +20 dBm -34 to +20 dBm -10 to +20 dBm	1 W for 1μs 200 mW	<10 ns (50 MHz typical)	<10 μs (350 kHz)	0.05 - 4 GHz 4 - 38 GHz 38 - 40 GHz	1.25 1.65 2.00
For use with models 4400, 4500, 4400A, and 4500A analyzers. Model 4530 w/ 1 GHz calibrator Model 2530.							
56318 50 ohm N (M)	0.5 - 18 GHz	-24 to +20 dBm -34 to +20 dBm -10 to +20 dBm	1 W for 1μs 200 mW	<15 ns (35 MHz)	<200ns (1.75 MHz)	0.5 - 2 GHz 2 - 16 GHz 16 - 18 GHz	1.15 1.28 1.34
56326 50 ohm K (M)	0.5 - 26.5 GHz	-24 to +20 dBm -34 to +20 dBm -10 to +20 dBm	1 W for 1μs 200 mW	<15 ns (35 MHz)	<200 ns (1.75 MHz)	0.5 - 2 GHz 2 - 4 GHz 4 - 18 GHz 18 - 26.5 GHz	1.15 1.20 1.45 1.50
56518 50 ohm N (M)	0.5 - 18 GHz	-40 to +20 dBm -50 to +20 dBm -27 to +20 dBm	1 W for 1μs 200 mW	<100 ns (6 MHz)	<300 ns (1.16 MHz)	0.5 - 2 GHz 2 - 6 GHz 6 - 16 GHz 16 - 18 GHz	1.15 1.20 1.28 1.34
For use with models 4400, 4500, 4400A, 4500A, 4530 and 4540.							
57518 50 ohm N (M)	0.1 - 18 GHz (0.05 - 18 GHz)	-40 to +20 dBm -50 to +20 dBm -27 to +20 dBm	1 W for 1μs 200 mW	<100 ns (6 MHz)	<10 μs (350 kHz)	0.05 - 2 GHz 2 - 16 GHz 16 - 18 GHz	1.15 1.28 1.34
57540 50 ohm K (M)	0.1 - 40 GHz (0.05 - 40 GHz)	-40 to +20 dBm -50 to +20 dBm -27 to +20 dBm	1 W for 1μs 200 mW	<100 ns (6 MHz)	<10 μs (350 kHz)	0.05 - 4 GHz 4 - 38 GHz 38 - 40 GHz	1.25 1.65 2.00
For use with 4500, 4400 and 4530							
56218 50 ohm N (M)	30 MHz to 18 GHz	-24 to +20 dBm -34 to +20 dBm -10 to +20 dBm	1 W for 1μs 200 mW	<150 ns (3 MHz)	<500 ns (700 kHz)	0.03 - 2 GHz 2 - 6 GHz 6 - 18 GHz	1.15 1.20 1.25
For use with 4500 and 4400							
56526 50 ohm K (M)	500 MHz to 26.5 GHz	-40 to +20 dBm -50 to +20 dBm -27 to +20 dBm	1 W for 1μs 200 mW	<100 ns (6 MHz)	<300 ns (1.16 MHz)	0.03 - 2 GHz 2 - 4 GHz 4 - 18 GHz 18 - 26.5 GHz	1.15 1.20 1.45 1.50

* 4530 support only sw version 20070215 and later.
** For pulse signal only.

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