

How to Measure the Power Consumption of a Circuit

CADENCE PCB SOLUTIONS

Key Takeaways

- Learn why power consumption measurement is important for improving the lifespan of electronics.
- Understand the basics of the various levels of power consumption.
- Discover how to measure the power consumption of a circuit.

My favorite way to de-stress is to head to the kitchen and try a new recipe. Sometimes, I manage to end up with a dish that's palatable, and other times, my cooking completely fails.

While I'm not exceptionally talented at cooking, it never helps my outcome when the recipe involves measurements that are nebulous. For example, when a recipe calls for a "pinch" or "dash" of seasoning, I inevitably capture too much spice and end up with a dish that's less palatable than what it should have been.

Getting an accurate measurement is crucial, whether you're a cook or a [PCB designer](#). For the latter, it's important to know how to measure the power consumption of a circuit so as to keep your power supply and electronics in good working order. In the next section, we'll take a closer look at the significance of understanding a circuit's power consumption.

Why Is Knowing How to Measure the Power Consumption of a Circuit Important?



Knowing the power consumed by a circuit gives you a better estimate of a battery's lifespan

Electronics are usually powered by a fixed [power supply](#), battery, solar, or a combination of these methods. Regardless of how you're powering a circuit, you'll need to know how much power it consumes.

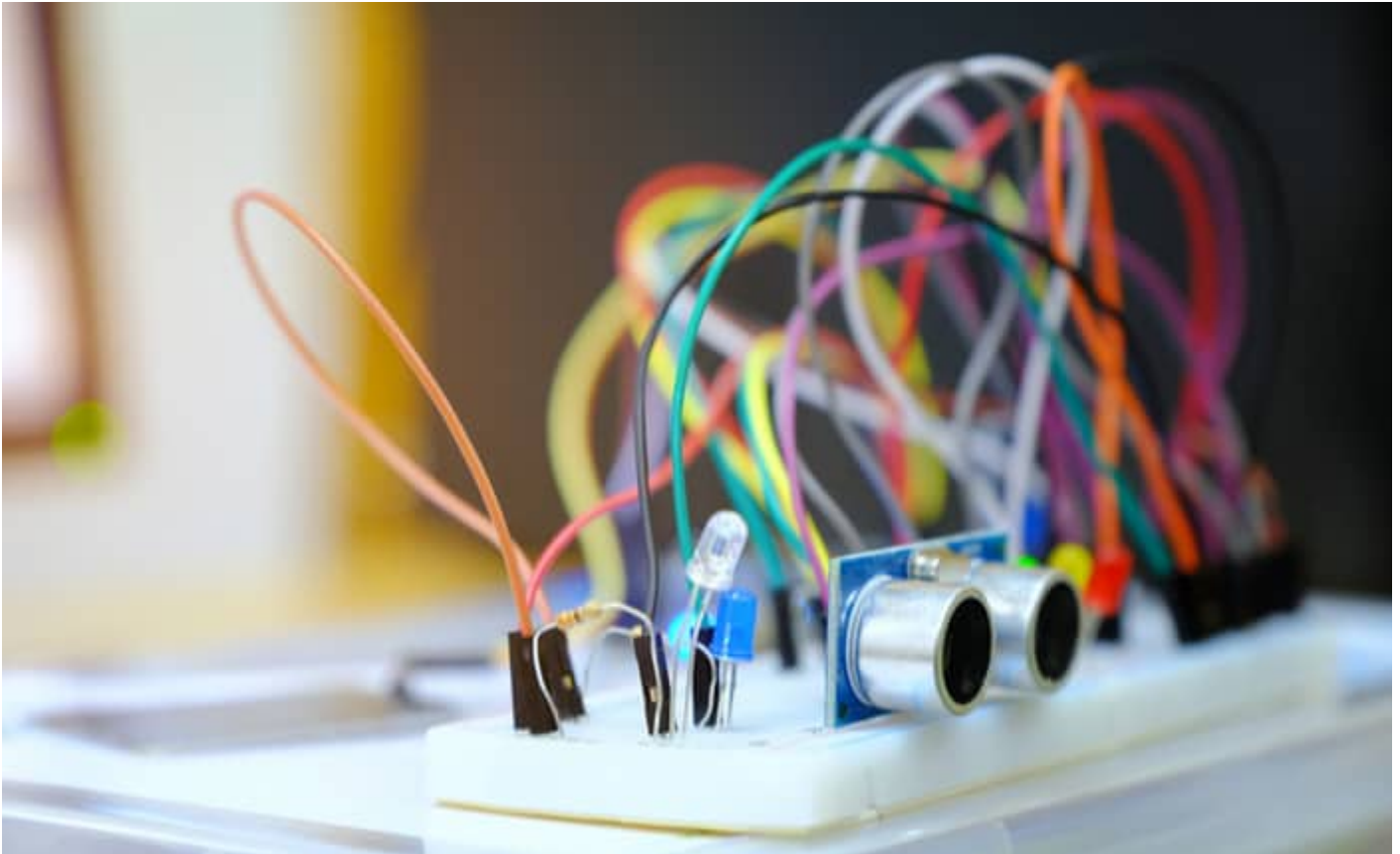
Power is the function of [current and voltage](#). As the voltage for a circuit is constant, the current is a varying factor when it comes to determining power. When you're powering up an industrial controller with a switching power supply that provides insufficient power, you'll find that the voltage is clamped down. As the power supply is unable to provide the needed current, the circuit is unable to function properly.

Therefore, it's important to determine how much power a circuit consumes before choosing the power supply. The same principle applies to solar-powered circuits. Each solar panel produces a rated amount of current and it's important to find the right balance for what the circuit needs.

Failing to calculate power consumption for a battery-powered design can result in [drastically shortened operational time](#). Battery-powered designs are meant

to be power-efficient. Every single μA can make a difference in how quickly the battery is drained. If you're not careful with that, you might witness the battery dying off within minutes.

Understanding Levels of Power Consumption



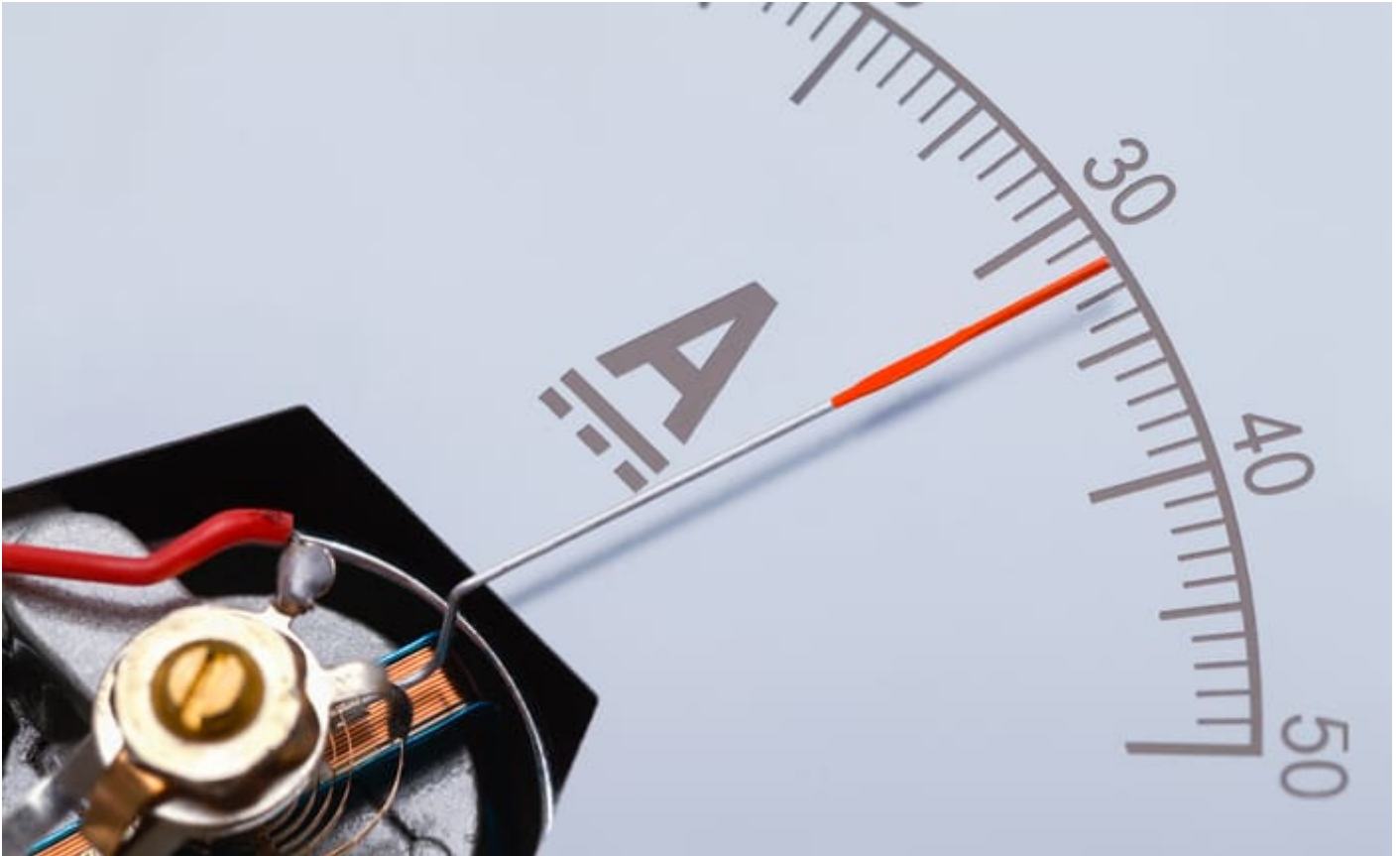
Some circuits may spend most of the time in sleep mode, with occasional peaks of power consumption

Calculating power consumption is important, but so is understanding the various levels of power that a circuit may consume. While an analog watch may consume a constant rate of power, most electronics don't. Circuits either function in an idle, active, or maximum state of power consumption.

For example, an alarm controller would remain in sleep mode, where the current is minimum until it is awakened by an interrupt. It is then in the active state, where it consumes more power by reading biometric thumbprints and comparing them within its database. Upon validation, it triggers the relays, activates buzzers, and communicates with the central server. These simultaneous actions result in maximum power consumption of the device.

When [designing a circuit](#), it is important to project its usage. Estimating how often a device will remain in the active or maximum power consumption stage helps to determine the capacity of the voltage supply or battery lifespan.

How to Measure the Power Consumption of a Circuit



An ammeter is the quickest way to facilitate power consumption measurement, but it is quite limited.

Measuring the power consumption of a circuit is quite straightforward. It all boils down to the equation of $P = IV$. The voltage supplied to the circuit is quite consistent and subject to minor variations in actual applications. What you ought to do is measure the current flowing into the circuit with the aid of an ammeter.

By using an ammeter, you're able to calculate the power consumption of that particular instance. However, ammeters provide limited information, as they don't give a complete picture of power consumption characteristics such as the peak power consumed, duty cycle, and duration of the various levels of power consumption.

To perform an in-depth analysis, you'll need to turn to an oscilloscope and use a current probe to measure the current flowing into the circuit. These readings are stored and can be used for further analysis. As such, you'll get a better picture of the current consumption of the circuit.

Now that you've learned how to measure the power consumption of a circuit, it's time to build one with the right [PCB design software](#). [OrCAD PCB](#) designer provides all the tools needed to create a low-power design.

If you're looking to learn more about how Cadence has the solution for you, [talk to us and our team of experts](#). You can also visit our [YouTube channel](#) for videos about Simulation and System Analysis as well as check out what's new with our suite of design and analysis tools.