

# VOLTAGE, CURRENT, RESISTANCE

*What voltage, current, and resistance actually are, and how they trade off. The three quantities every circuit is built from, in plain terms.*

ONE THOUSAND DRONES ENGINEERING TEAM · VERIFIED 2026-07

Voltage is the push, current is the flow, and resistance is what slows the flow. Those three, and how they trade off, are the core of every circuit you will build.

## WHAT IS VOLTAGE?

Voltage is a difference in electrical potential between two points, measured in volts. It is the push that moves charge from one place to another. With no difference there is no push and no current. On a board you measure it between a node and ground, so a **3.3 V** rail means that node sits 3.3 volts above ground.

## WHAT IS CURRENT?

Current is the rate charge flows past a point, measured in amps, or milliamps on a small board. Push harder or lower the resistance and more current flows. Current is the same all the way around a simple series loop, which is why one fuse in the loop protects the whole loop.

### DEEP DIVE · SACRIFICIAL FUSES VS RESETTABLE ONES

Because the current is the same everywhere in a series loop, one fuse guards the whole chain, but there are two kinds. A standard fuse is sacrificial: it blows once on an overcurrent and you replace it. A resettable fuse, a PTC or polyfuse, instead jumps to a high resistance when it overheats under a fault, choking the current down to a trickle, and then relaxes back to normal once the fault clears and power is cycled. On a bench, where a probe slip shorts things often, a PTC lets you find the mistake and carry on instead of hunting for a spare fuse. (Littelfuse PolySwitch)

- [Littelfuse. PolySwitch resettable PPTC devices \(trip and reset behavior\).](#) [littelfuse.com](#)

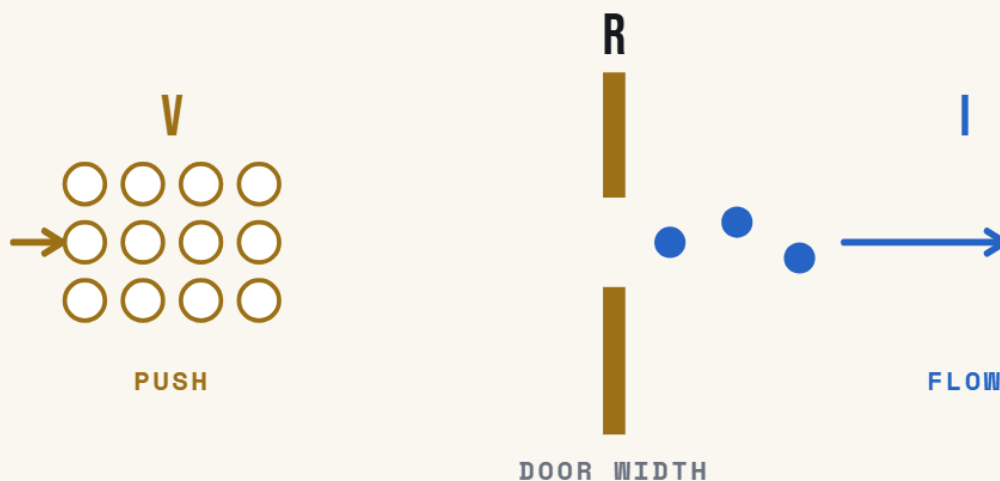
## WHAT IS RESISTANCE?

Resistance is how strongly a material opposes current, measured in ohms. A resistor is a part built to have a chosen, stable resistance. More resistance means less current for the same voltage. All three quantities have fixed SI definitions (BIPM 2019).

- [BIPM. The International System of Units \(SI\), 9th edition \(2019\).](#) [bipm.org](#)

► FUNDAMENTALS · V / I / R

# VOLTAGE, CURRENT, RESISTANCE



A wider door lets more current flow for the same push.

Voltage is the push, the doorway is the resistance, and the flow that gets through is the current.

VOLTAGE PUSHES CURRENT THROUGH RESISTANCE.

## HOW THEY TRADE OFF

Raise the voltage and the current rises. Raise the resistance and the current falls. That trade-off has an exact form, Ohm's law, which the next guide covers. On a One Thousand Drones L1.01 board you can probe the  $3.3\text{ V}$  rail with a meter and read the voltage directly; the current the board draws depends on what it is doing at that moment.

### CHECKPOINT

1. Voltage is best described as what?

- The flow of charge
- The push that moves charge
- The opposition to flow

ANSWER · B

*Voltage is the potential difference that pushes charge; current is the flow itself.*

**2. For the same voltage, higher resistance means what?**

- a. **Less current**
- b. More current
- c. No change in current

ANSWER · A

*More opposition means less current flows for the same push.*

**3. Current is measured in what unit?**

- a. Volts
- b. Ohms
- c. **Amps**

ANSWER · C

*Amps (or milliamps) measure current; volts measure voltage and ohms measure resistance.*

- [Next: Ohm's law](#)