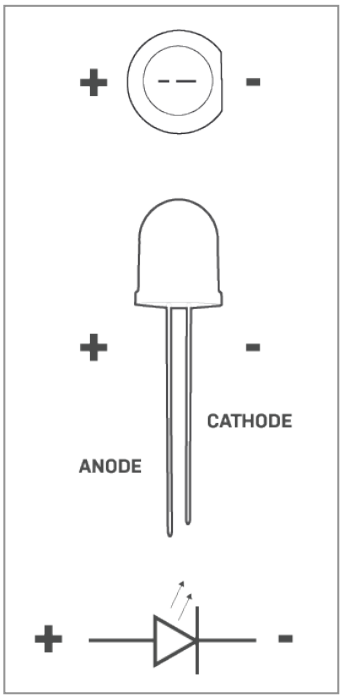
LEDstuff

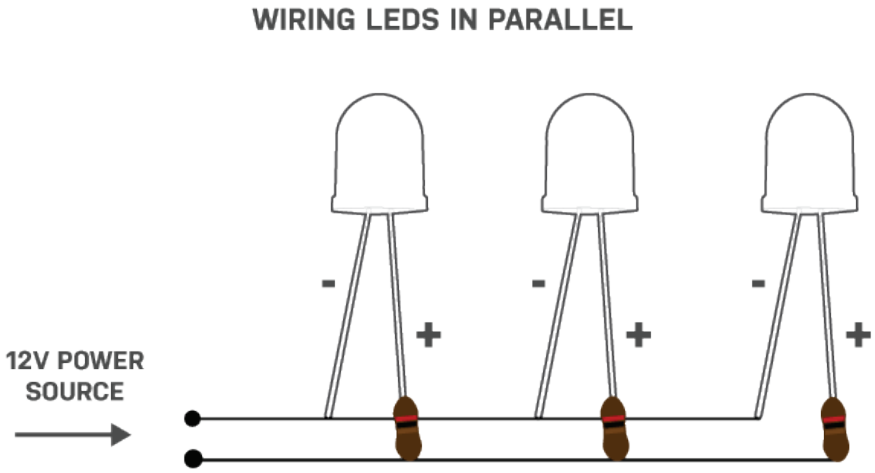
LED WIRING

There are two ways to run more than one LED from a single source: Series or Parallel. Let's use the example of running LEDs from a 12V car battery.



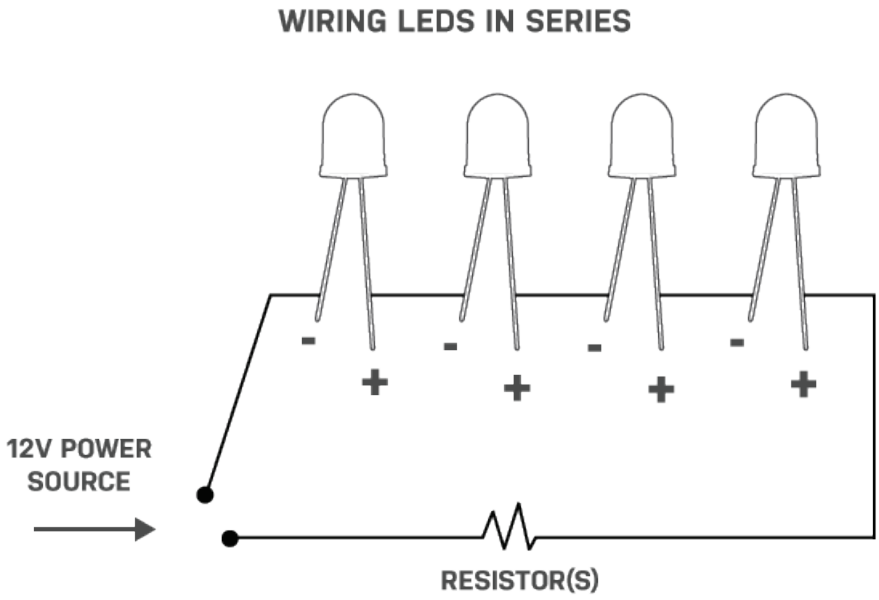
Parallel Wiring

For parallel wiring, all the cathodes (-) are connected together, and all the anodes (+) are connected through resistors. For example, running three 2V LEDs in parallel the total voltage will be the same as a single LED (2V). For 20mA per LED, each resistor needs to be about 500 Ohms, and a total of 60mA will be drawn from the battery.



Series Wiring

Series means the LEDs are daisy chained together so that the same current flows through all the LEDs. Here, the total voltage across all the LEDs is summed. For example, running four 2V LEDs in series gives a total voltage of 8V. For 20mA, the resistor needed here will be about 200 Ohms, and 20mA will be drawn from the battery.



Note: You could connect all the anodes together and use only one resistor, but this requires that ALL the LEDs have exactly the same voltage drop. If they don't, the current won't be shared equally, and the LEDs won't all be the same brightness (voltage drop can vary between different colours and so not all can be run together).

Summary

If you are just running a few LEDs, we recommend you run them in series. This means you only need one resistor, and you reduce power consumption. If the LEDs are physically spaced apart quite a bit, then this may not be practical.

If you are running quite a few, we recommend you use a combination of series and parallel. For example, you should not run more than three 3V LEDs in series from a 12V battery, as you will run out of voltage. If you have 12 LEDs to run, run 4 sets of 3 LEDs in series, where each set has a single resistor. Each set can then run in parallel from the power source.

Calculating Resistor Value to Drive an LED

For example, a 12V battery with a 3V LED with a typical current of 20mA (=0.02 Amps), you work out the resistor value as:

R = V / I

= (12VDC – 3V LED) / 20mA

= (12 – 3) / 0.02

= 9 / 0.02

= 450 Ohms (closest is 470Ω)

Or to run 2x 3.3V 30mA LEDs off 12V:

= (12 – 6.6) / 0.03

= 5.4 / 0.03

= 180 Ohms (closest is 220 Ω)