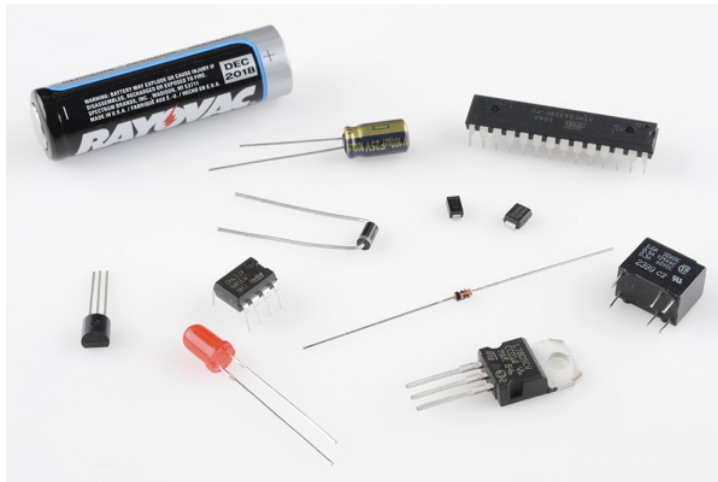


# POLARITY – AN INTRODUCTION

## What is Polarity?

In the realm of electronics, **polarity** indicates whether a circuit component is **symmetric** or not. A non-polarized component – a part *without* polarity – can be connected in any direction and still function the way it's supposed to function. A symmetric component rarely has more than two terminals, and every terminal on the component is equivalent. You can connect a non-polarized component in any direction, and it'll function just the same.

A **polarized** component – a part *with* polarity – can only be connected to a circuit in one direction. A polarized component might have two, twenty, or even two-hundred pins, and each one has a unique function and/or position. If a polarized component was connected to a circuit incorrectly, at best it won't work as intended. At worst, an incorrectly connected polarized component will smoke, spark, and be one very dead part.

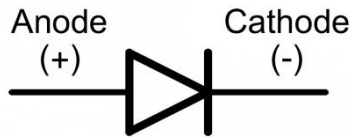


*An assortment of polarized components: batteries, integrated circuits, transistors, voltage regulators, electrolytic capacitors, and diodes, among others.*

Polarity is a very important concept, especially when it comes to physically building circuits. Whether you're plugging parts into a breadboard, soldering them to a PCB, or sewing them into an e-textile project, it's critical to be able to identify polarized components and to connect them in the correct direction. So that's what we're here for! In this tutorial we'll discuss which components do and don't have polarity, how to identify component polarity, and how to test some components for polarity.

# Diode and LED Polarity

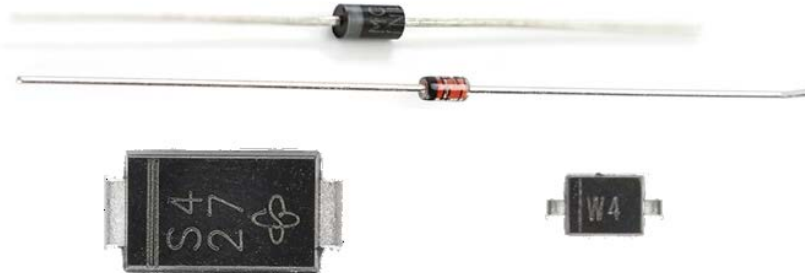
Diodes only allow current to flow in one direction, and they're *always* polarized. A diode has two terminals. The positive side is called the *anode*, and the negative one is called the *cathode*.



*The diode circuit symbol, with the anode and cathode marked.*

Current through a diode can only flow from the anode to the cathode, which would explain why it's important for a diode to be connected in the correct direction. Physically, every diode should have some sort of indication for either the anode or cathode pin. Usually the diode will have a **line near the cathode pin**, which matches the vertical line in the diode circuit symbol.

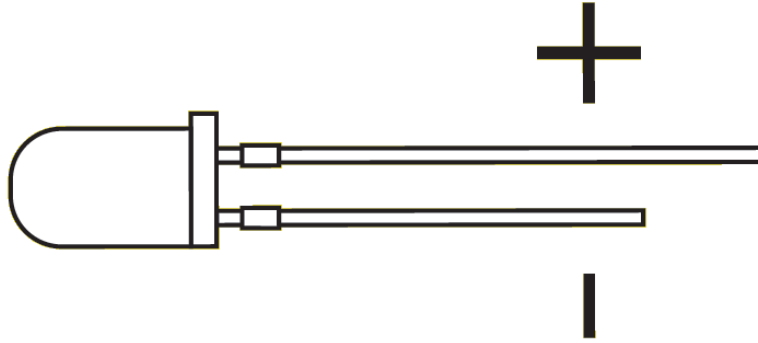
Below are a few examples of diodes. The top diode, a 1N40001 rectifier, has a grey ring near the cathode. Below that, a 1N4148 signal diode uses a black ring to mark the cathode. At the bottom are a couple surface mount diodes, each of which use a line to mark which pin is the cathode.



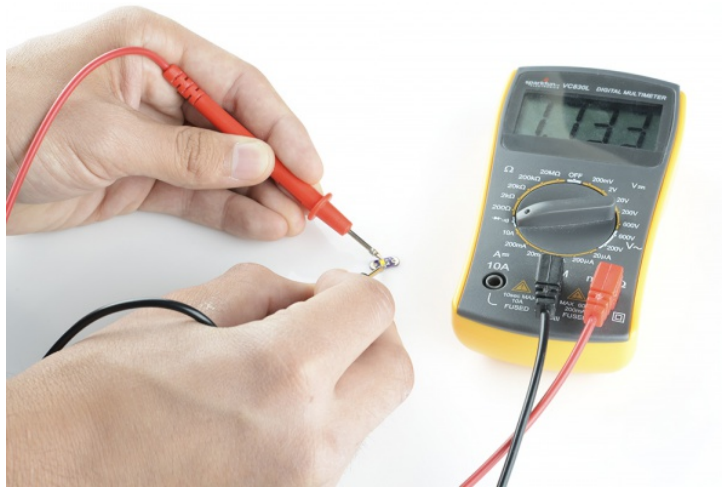
## LEDs

LED stands for light-emitting diode, which means that much like their diode cousins, they're polarized. There are a handful of identifiers for finding the positive and negative pins on an LED. You can try to find the **longer leg**, which should indicate the positive, anode pin.

Or, if someone's trimmed the legs, try finding the flat edge on the LED's outer casing. The pin nearest the **flat edge** will be the negative, cathode pin.



There might be other indicators as well. SMD diodes have a range of anode/cathode identifiers. Sometimes it's easiest to just use a [multimeter](#) to test for polarity. Turn the multimeter to the diode setting (usually indicated by a diode symbol), and touch each probe to one of the LED terminals. If the LED lights up, the positive probe is touching the anode, and the negative probe is touching the cathode. If it doesn't light up, try swapping the probes around.



*The polarity of a tiny, yellow, surface-mount LED is tested with a multimeter. If the positive lead touches the anode and negative touches the cathode, the LED should light up.*

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Diodes certainly aren't the only polarized component. There are tons of parts out there that won't work if connected incorrectly. Next we'll discuss some of the other common polarized components, beginning with integrated circuits.

Source : <https://learn.sparkfun.com/tutorials/polarity>