

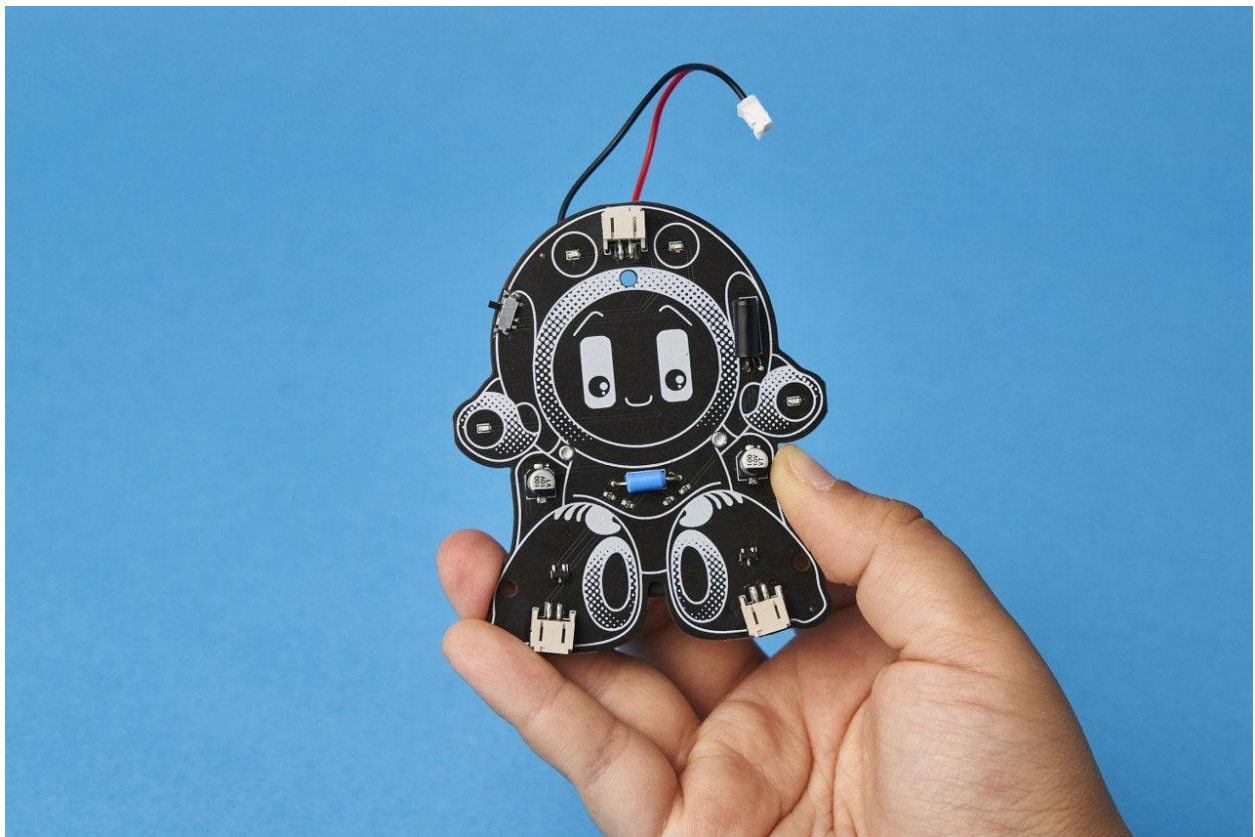
Explore the components!

Let's learn something about the components you've got!

1. Circuit board

The black body-shaped thingy you've gotten in your kit is called a circuit board. Professionals call this a printed circuit board or PCB.

A PCB is a laminated sandwich structure of conductive and insulating layers.



What does it do?

Your circuit board has two functions:

- It holds all the electronic components in place.
- It provides electrical connections between the electronic components.

Because of the circuit board, all electronic components can work together as a team.

What are those tiny lines on my circuit board?

They allow electrical charges to flow between components. This way, electronic components are powered, and they can do clever stuff using electricity.

What is my circuit board made of?

Circuit boards are usually made out of fiberglass-reinforced epoxy-laminated sheets.

These are also referred to as “FR4” sheets.

The FR4 sheets are used as the insulating non-conductive material, and copper is used as a conductive material.

If material is conductive, it conducts electricity; electrical charge can flow through that material easily.

FR4 and copper are both sandwiched together in thin sheets, and that’s how you get a circuit board.

Where are PCBs used?

They’re used everywhere!

In your phone, in your laptop, in your refrigerator, air conditioner. Basically, every electronic device you use has a unique printed circuit board that makes it work.

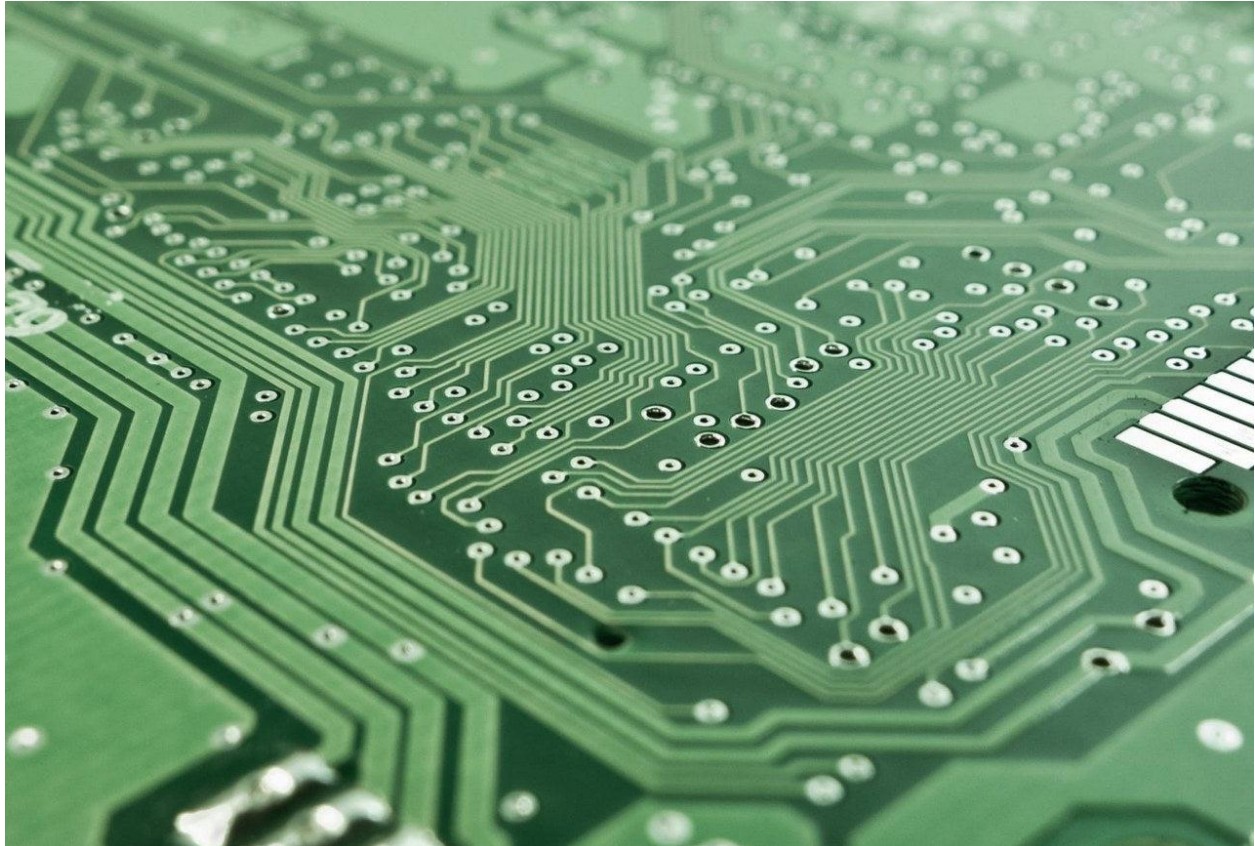
Did you know?

A PCB is one of the most important inventions of the last 100 years.

Space travel wouldn't be possible without them.

PCBs were invented by Paul Eisler.

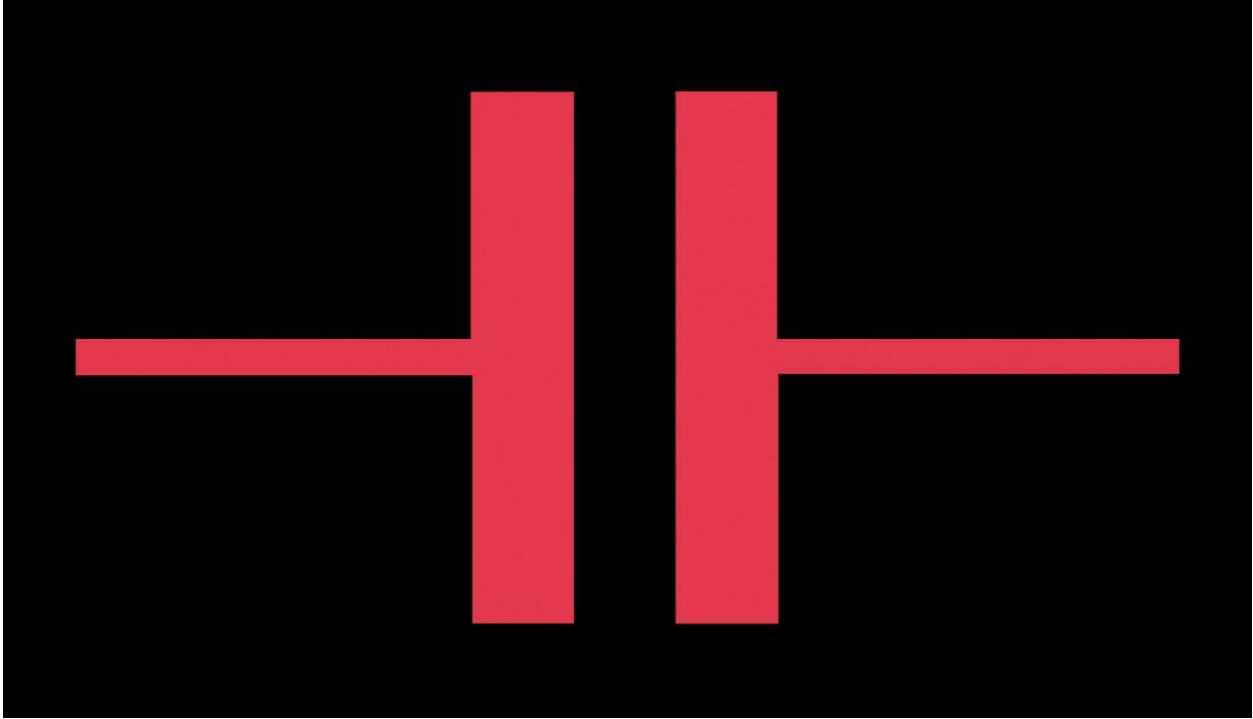
He invented it in the 1930s, but the predecessors of modern-day PCBs have been around since the age of gramophones and vacuum tube radios, just in a somewhat different form.



2. Capacitor

A capacitor is a component that has the ability to store energy, much like a small rechargeable battery.

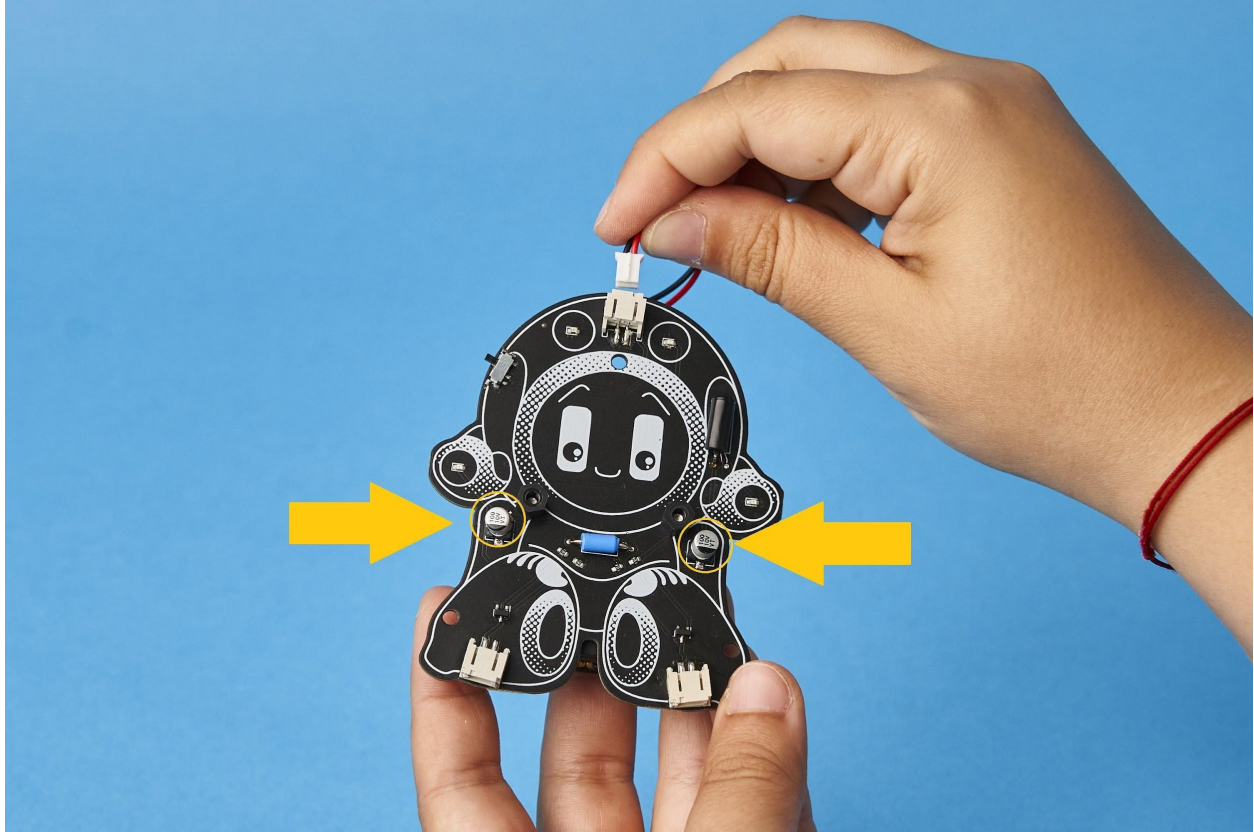
This is an electronic symbol of a capacitor:



A capacitor can absorb energy from a circuit and store it temporarily.

Later on, this stored energy can be released back to the electronic circuit.

We can measure the ability of a capacitor to store electrical energy.



We call this property - capacitance.

The unit of capacitance is called Farad (we use the letter F as a short for Farads).

This unit was named after physicist Michael Faraday.

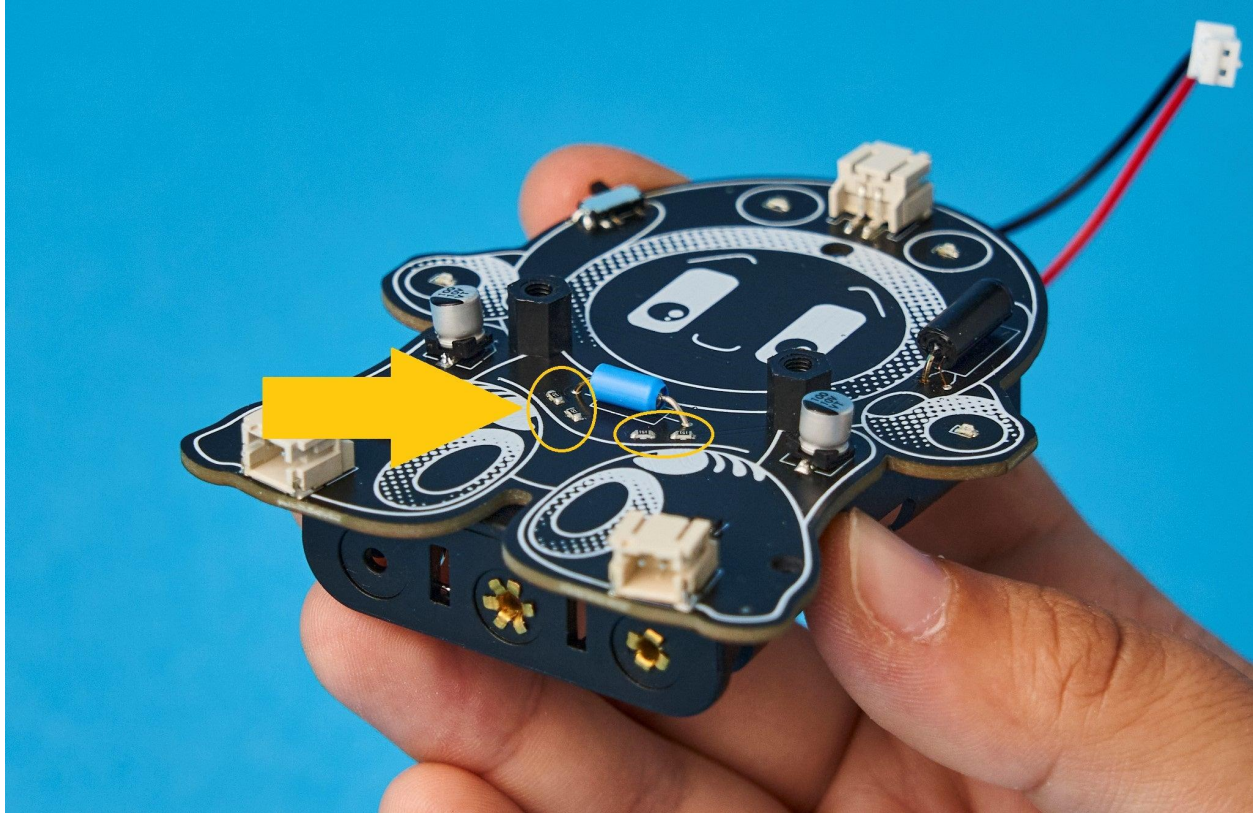
Historical fun facts:

Capacitors were discovered by Pieter van Musschenbroek a looong time ago - in 1746.

The first capacitor was a glass jar wrapped inside and out by a thin metal foil.

3. Resistors

These resistors don't look like the ones you saw on our previous Wacky Robots.



Resistors are the most basic electronic components found in almost every electronic device.

They fall in the category of passive electronic components.

Passive electronic components do not generate electrical power and do not need electrical power to work.

They just modify the flow of electrical energy in their own unique way.

Resistance

Resistors have a property of resistance - they lower the amount of electrical energy flowing through the circuit.

They “resist” the flow of electrical energy.

The unit of resistance is called ohm and it was named after German physicist Georg Simon Ohm.

Resistors are used for tasks such as adjusting the flow of electricity through an electronic

circuit.

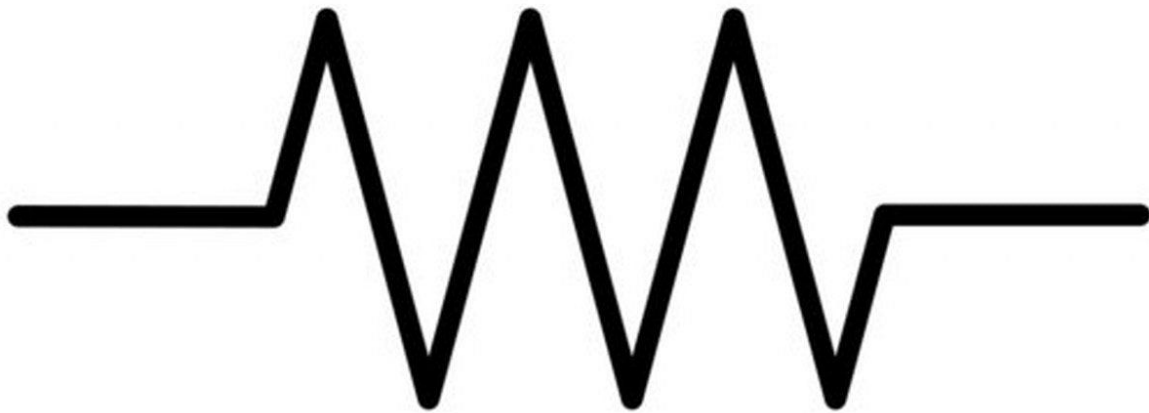
The exact value of a resistor is measured with a device called an ohmmeter.

Can we compare it to something we see in everyday life?

If we make an analogy to water flowing through pipes, the resistor is a thin pipe that reduces the water flow.

Scientists and engineers have come up with different symbols for each and every electronic component.

This is an electronic symbol for a resistor:



This is Georg Simon Ohm:



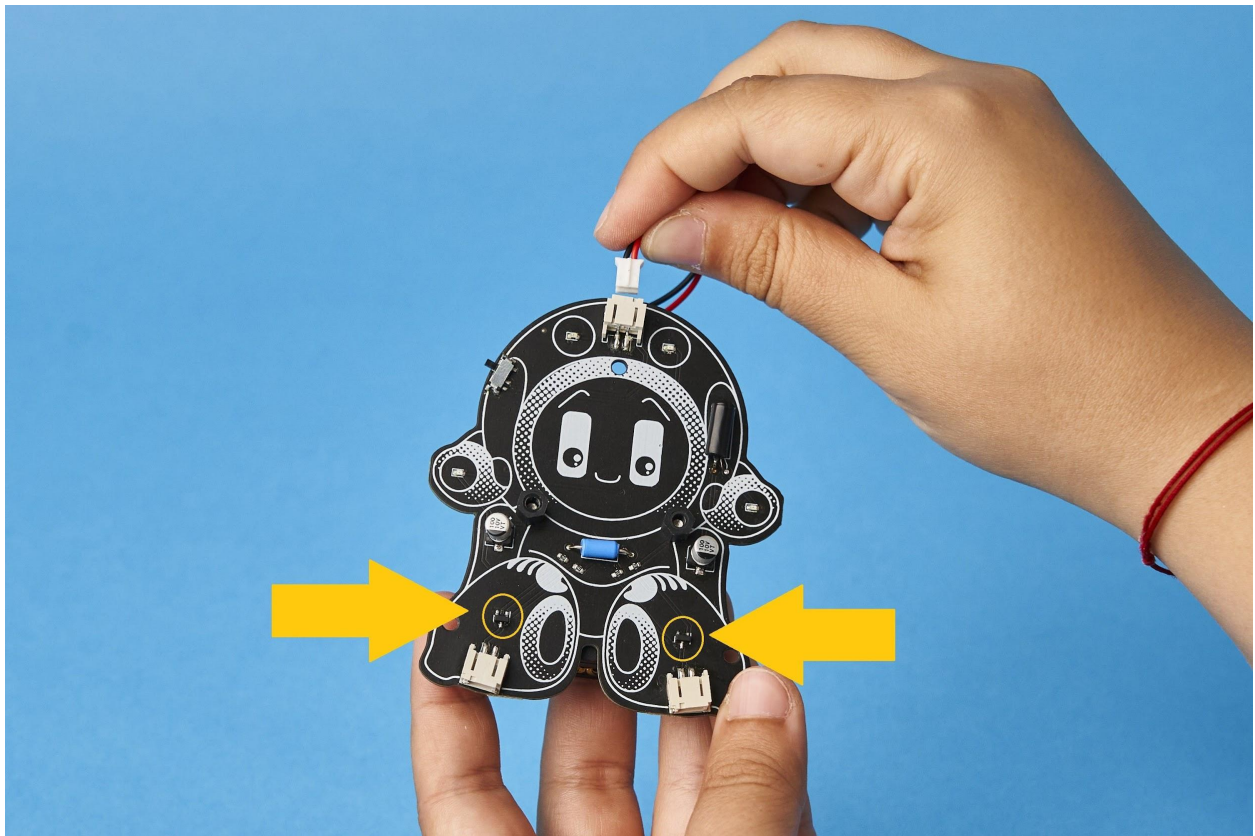
4. Transistor

The transistor is an electronic component that can be used as part of an amplifier or as a switch.

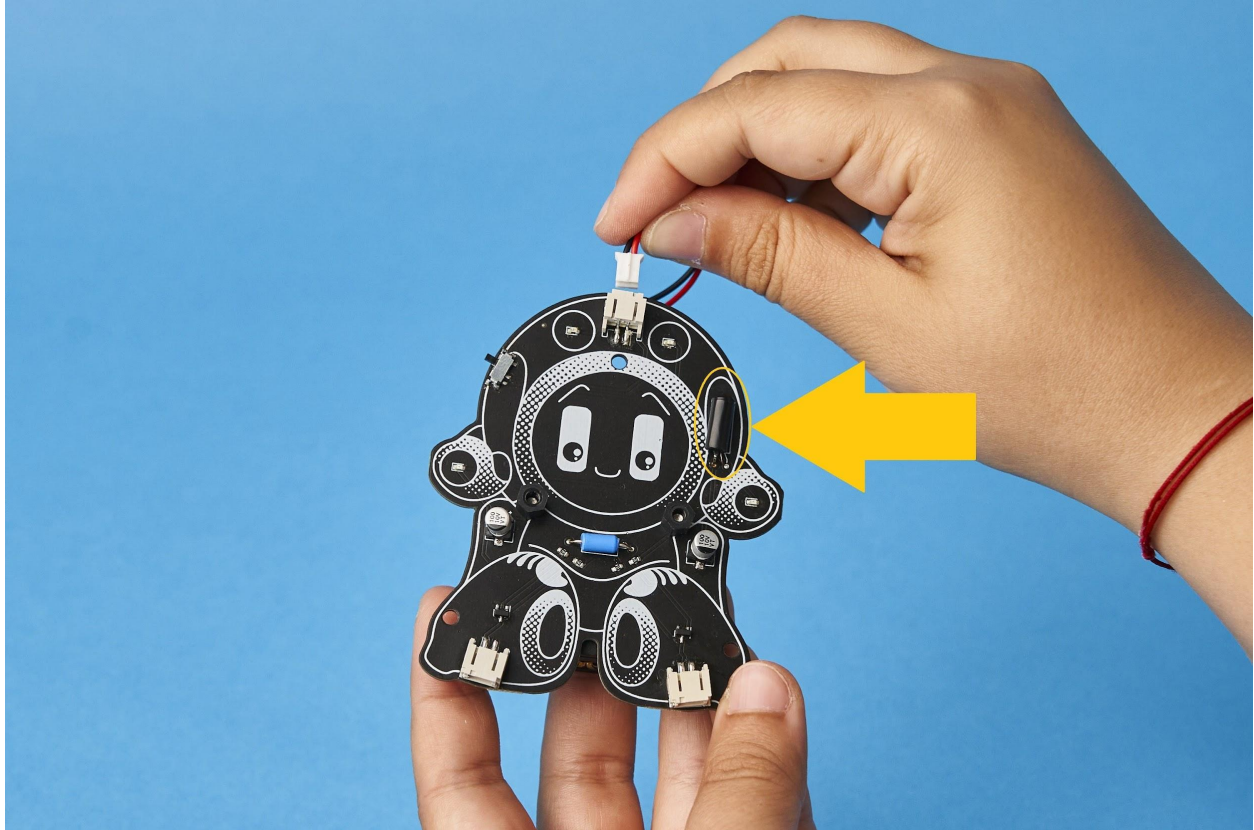
It is made of semiconductor material.

Transistors have 3 terminals: the emitter, the collector, and the base. When the emitter is connected to the negative terminal of the battery and the collector to the positive terminal, no electricity will flow in the circuit.

This is what transistors on Robby look like:



5. Vibration sensor

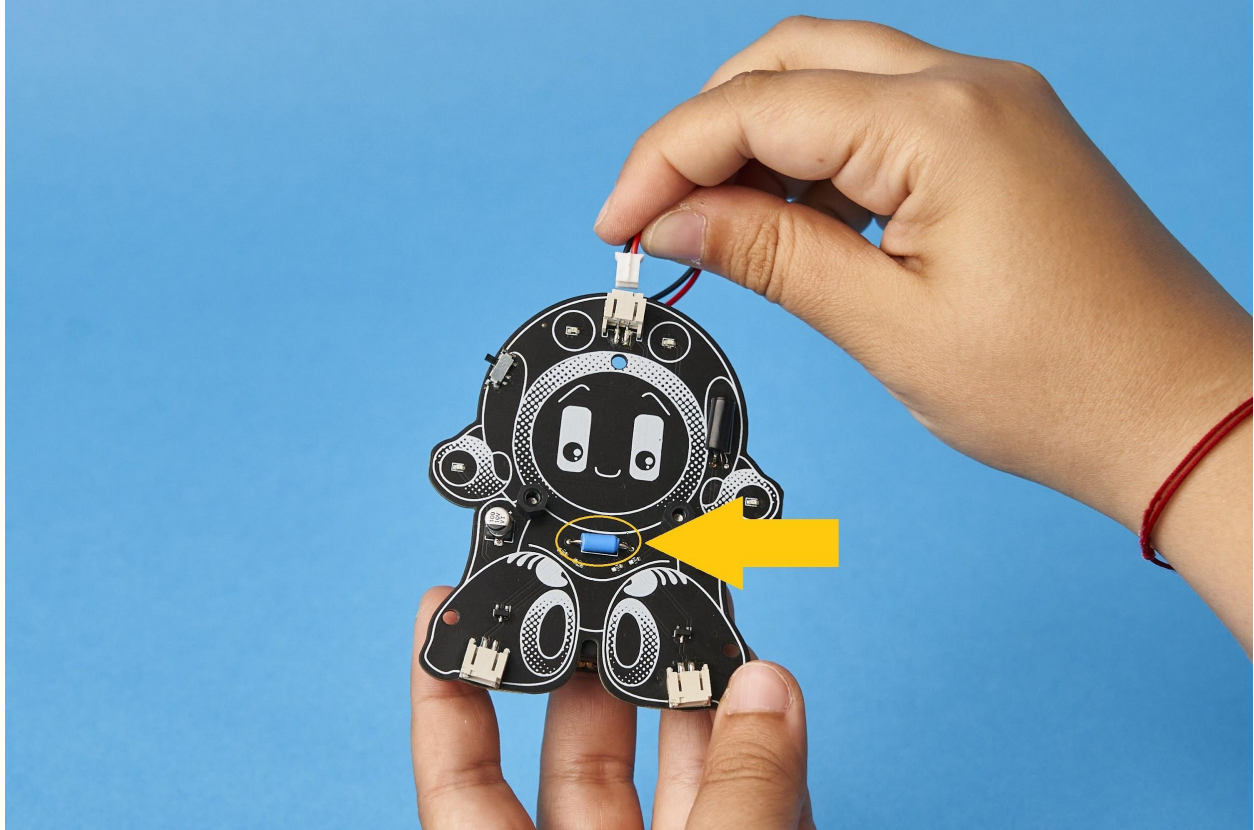


A vibration sensor detects changes in acceleration or vibration in its environment.

It converts mechanical vibrations into electrical signals, which the robot's microcontroller can then process and analyze.

In Robby, both the tilt and vibration sensors are programmed to recognize when he is being shaken or moved, causing him to light up in various colors and respond to the movement.

6. Tilt sensor



A tilt sensor, also known as a tilt switch, is an electronic component that detects changes in orientation or inclination.

It works by using a small metal ball or a mercury switch that is suspended in a conductive liquid.

When the sensor is tilted or moved, the ball or mercury switch contacts two metal contacts inside the sensor, completing an electrical circuit and triggering a response.

Tilt sensors are widely used in many everyday products and gadget like in Nintendo Switch Joy-Con controllers, smartphones, fitness trackers and smartwatches, etc.