Transistor Tennis Ball Exercise

15min

Since a transistor can be in two distinct states (off or on), it can store two different numbers (zero or one).

With billions of transistors, a chip can store billions of zeroes and ones.
-Computers store data using 0's and 1's.

A transistor acts a wire that conducts electricity or as a resistor that blocks the flow of electricity.A transistor has no moving parts, but acts like a switch. A transistor is made of a semiconductive material, usually silicon; a semiconductor in that it is neither a particularly good conductor of electricity (unlike copper), nor a good insulator (unlike rubber).

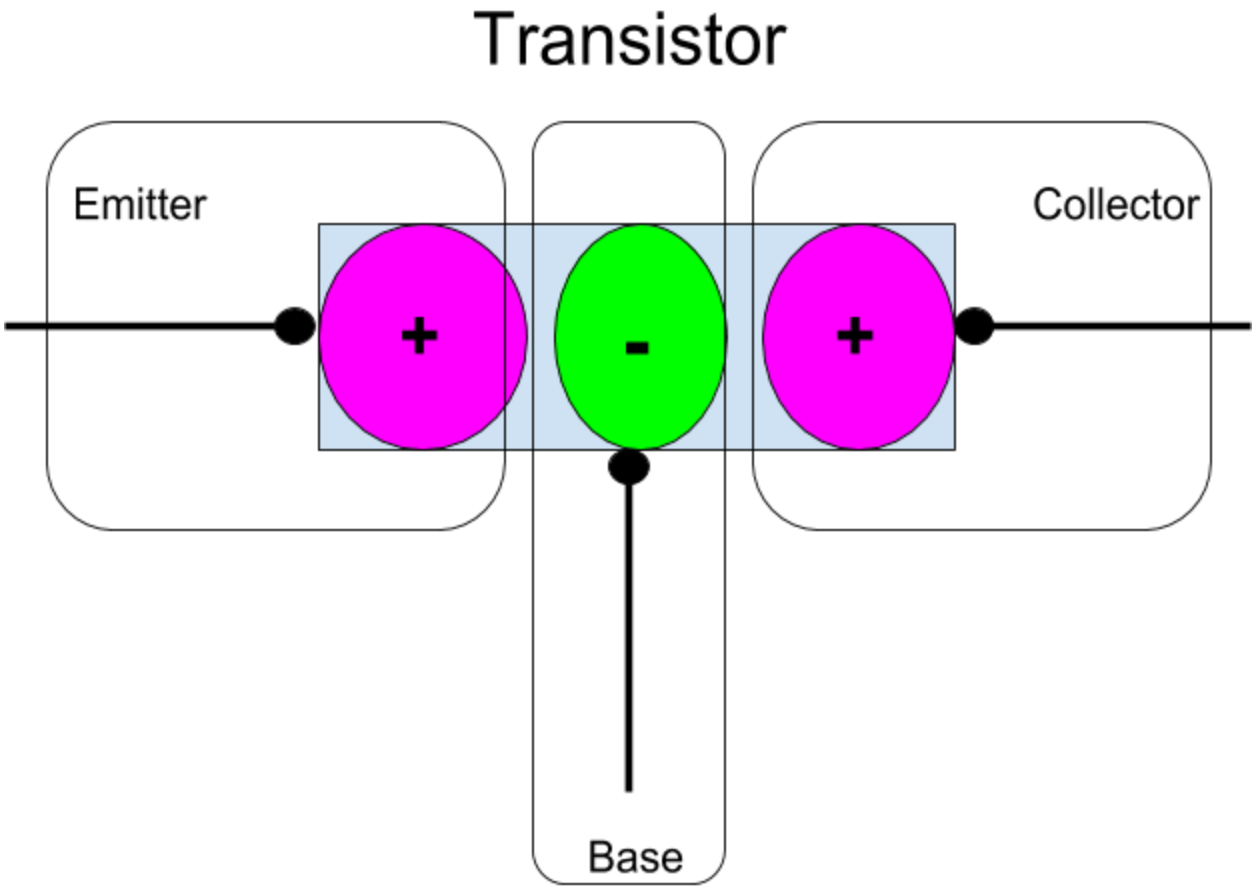
An electrical signal has a source, like a battery or outlet in your wall.

A transistor has three terminals: a source (or collector), a base, and an emitter. The base value regulates a gate that determines whether the connection between the source and the ground/emitter is made.

Let's physically demonstrate how a transistor works:

- Select 4 kids, 1 transistor with its 3 connectors (base, collector, and emitter). Arrange the collector, transistor, and emitter in a line and stand the base beside the transistor, perpendicular to the line.
- Explain that the transistor can only have 1 tennis ball at a time and give her a tennis ball to hold.
- Give the collector several tennis balls and explain that they need to get those balls to the emitter through the transistor — one ball at a time.
- Explain that the transistor is "closed" because they are holding a tennis ball and therefore they are blocked. [Transistor is off, "0"]
    - So, the base can take away the tennis ball, which will allow the collector to pass balls to the emitter one ball at a time using the "free space" in the transistor. [Transistor is on, "1"]
- The base can stop the flow, by giving the ball back to the transistor — shutting down the collector to emitter flow.

- if you have pink tennis balls, those can be the “special” ones that block the flow, so the base takes away a pink ball to open up the circuit.



The image above shows electron flow in a transistor. The arrows indicate the flow of electrons.

The small current switches on the larger one. This is essentially how all computer chips work.

Transistors create various types of gates.

One transistor by itself works just like a NOT gate.