1 - Binary and logic

Agenda

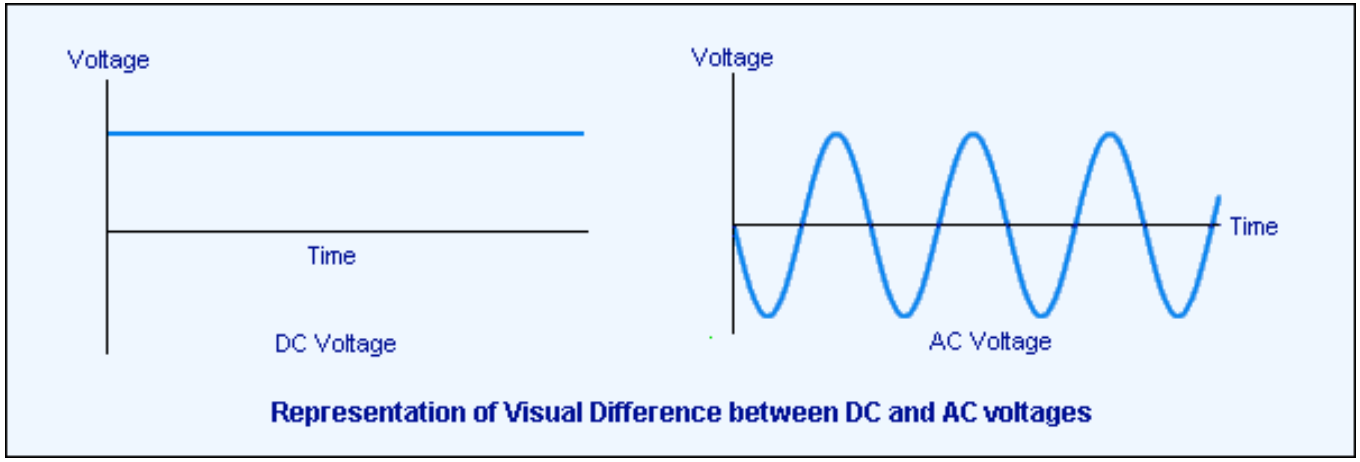
Inside the computer: power supply unit

Electricity

Electronic switches: transistors

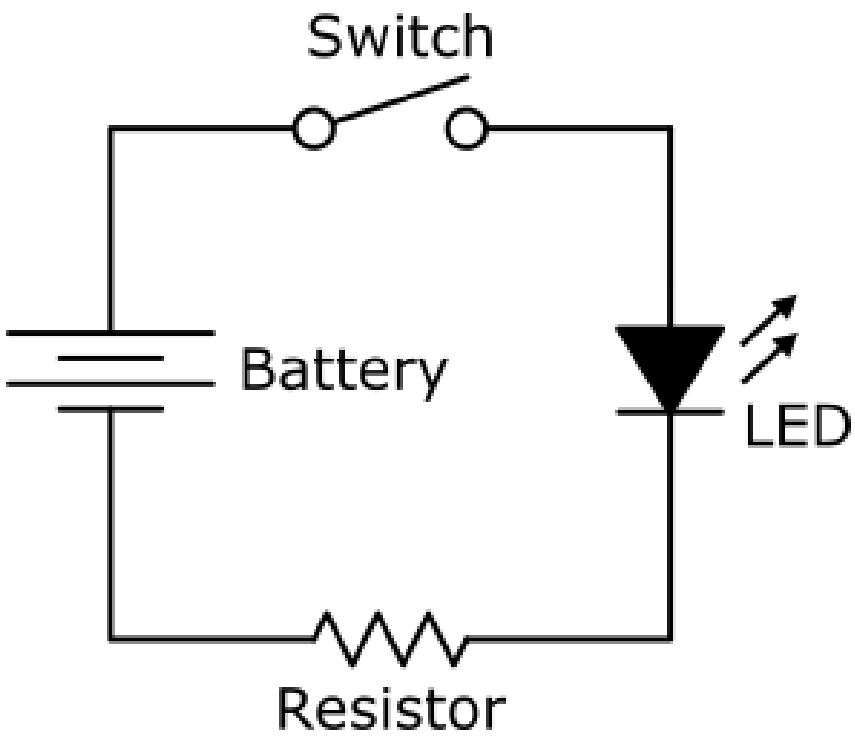
Logic gates

Who's this? The power supply unit!



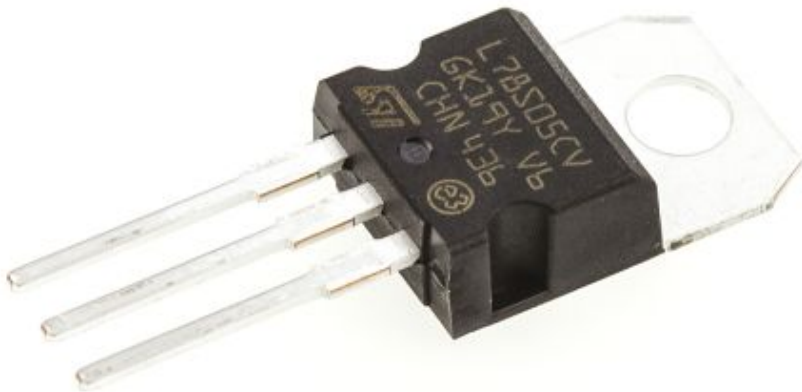
Representation of Visual Difference between DC and AC voltages

Electricity & our first circuit



- Current flows clockwise in this diagram.
- The battery generates direct current.
- We associate a positive voltage with `true` and the negative voltage with `false`: *binary!*
- We can build this circuit on a *breadboard.*

Keeping things aligned

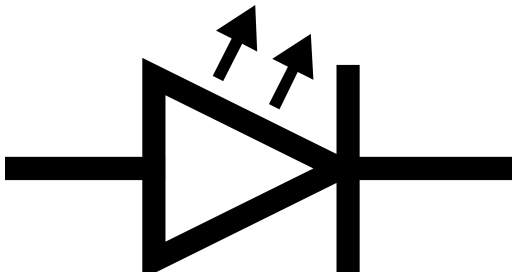


- The *(linear) voltage regulator* lowers its input voltage to a fixed value.
- We use this to convert down from the 9 V battery to 5 V, which is closer to the range our other components are meant for.

Vive la resistance

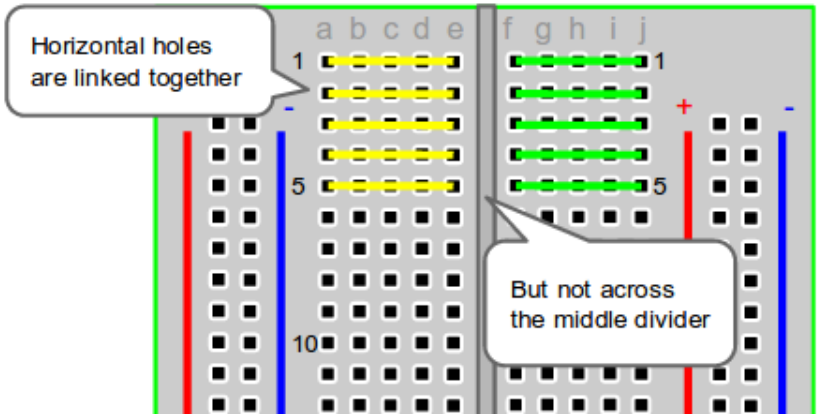
A resistor *slows down* the current moving through it. We need this so that our light doesn't blow up!

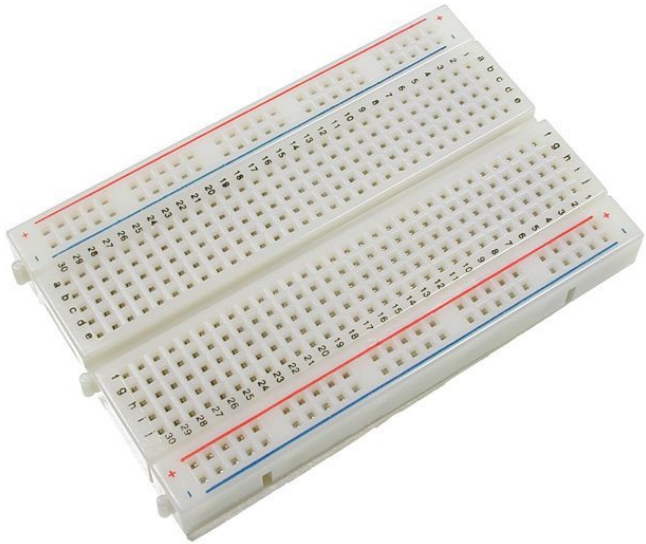
The light of my life



- *LED*s emit light when current passes through.
- LEDs have *polarity*: the direction they're facing in the circuit makes a difference! (In contrast, resistors do not have polarity.)
- The long leg is the *positive* terminal.

A board for cutting bread? Not really.



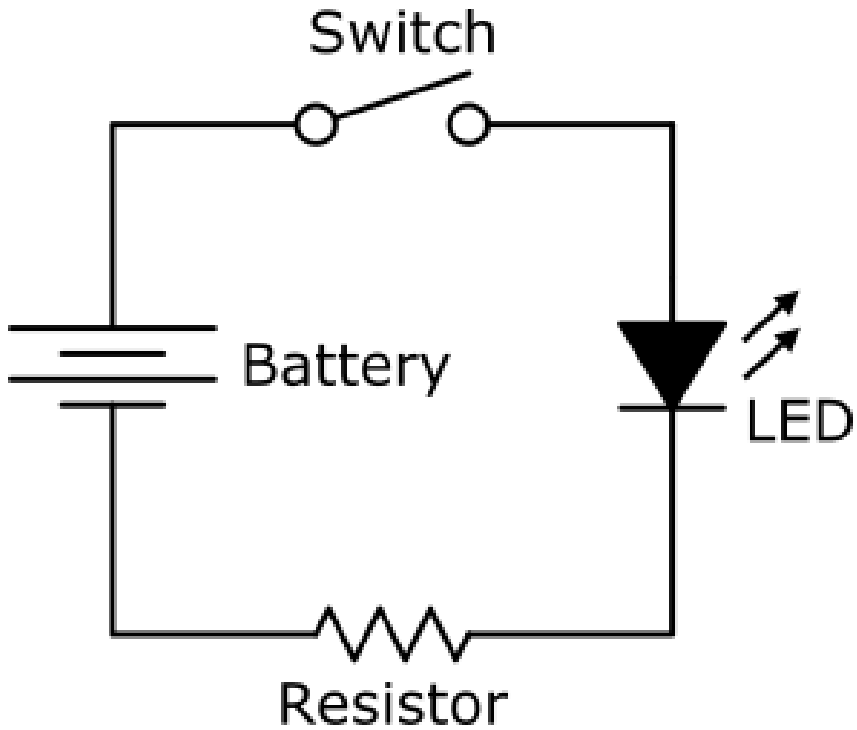


And the holes on the left and right, called *rails*, are connected vertically.

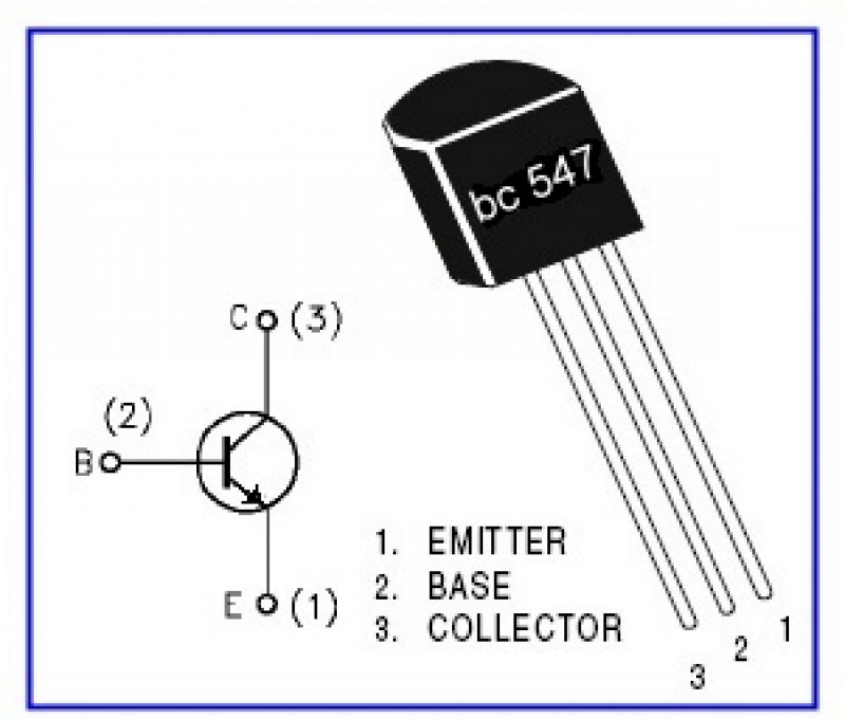
Last but not least

- In its neutral state, the button allows current to flow top-down through it.
- Pushing down on the button causes electricity to flow *across* it.

Now let's build it!



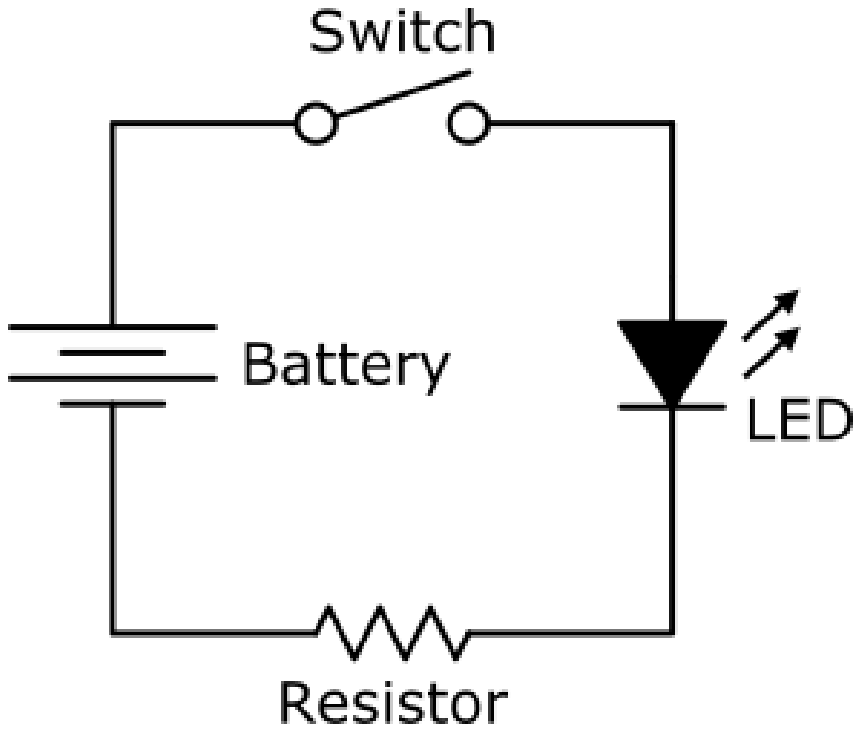
Transistors: electronic switches



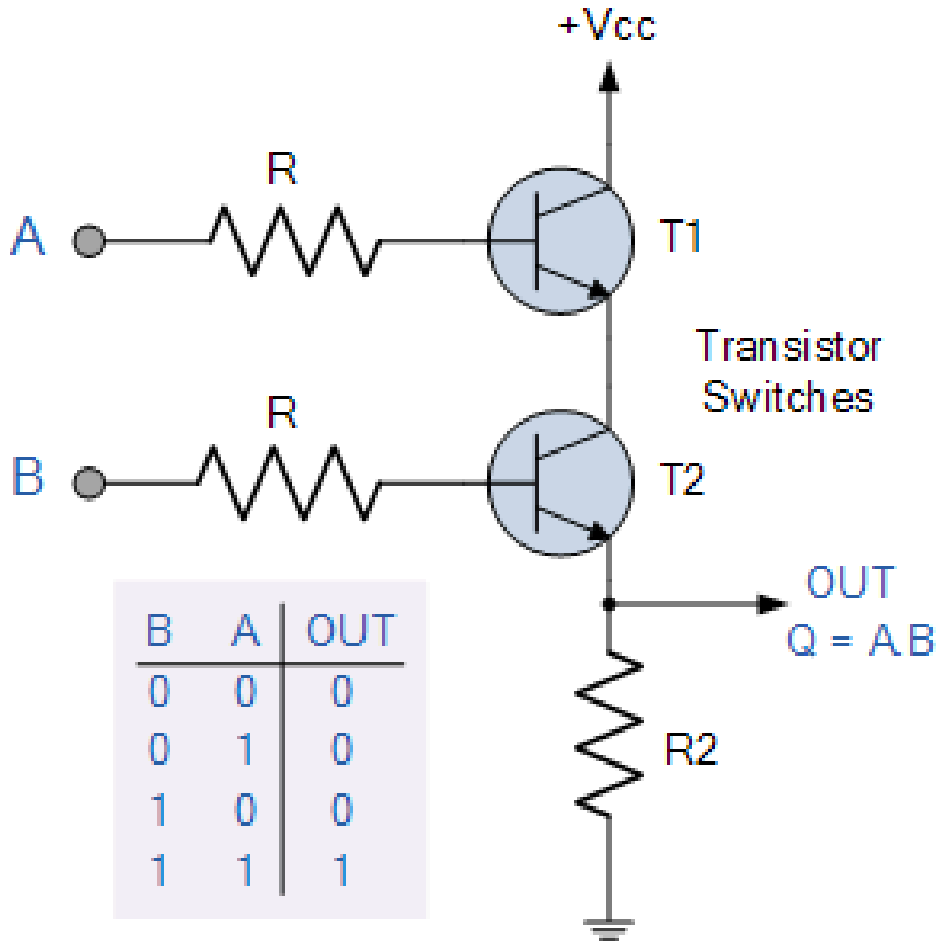
- When current is applied to the *base* of the transistor, current is allowed to flow from the *collector* to the *emitter*.
- Transistors are the basic building blocks of more complex circuits, such as CPUs!

Now let's use a transistor!

Replace the switch with a transistor, and use the *base* to control the LED.



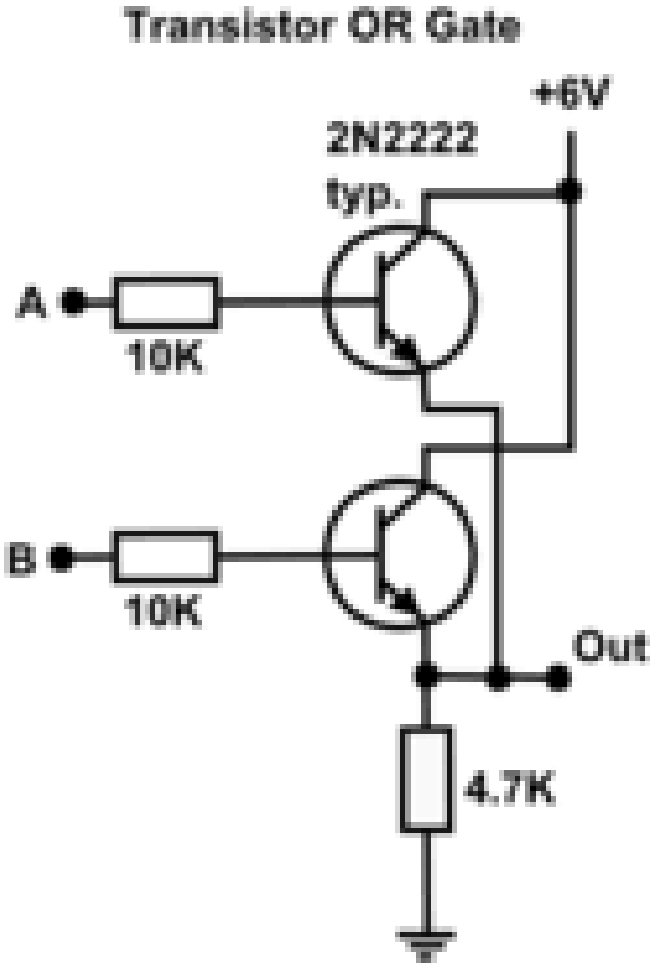
Two transistors in series makes an AND gate



B	A	OUT
0	0	0
0	1	0
1	0	0
1	1	1

Try putting the LED both on the collector side and emitter side of the transistor pair.

Two transistors in parallel makes an OR gate



Recap

Inside the computer: power supply unit

Electricity

Electronic switches: transistors

Logic gates

Homework

- Check out `https://tryhaskell.org/`!
- Try getting to lesson 4.