# ~ Intentionally empty ~

# A bit about electronics

- Why? Because I like to build stuff
- .. But can’t find the time for it anymore
- It’s kinda like LEGO, you build stuff
- And also, boring for your family and friends
- .. Kinda like programming
- But it’s just as fun

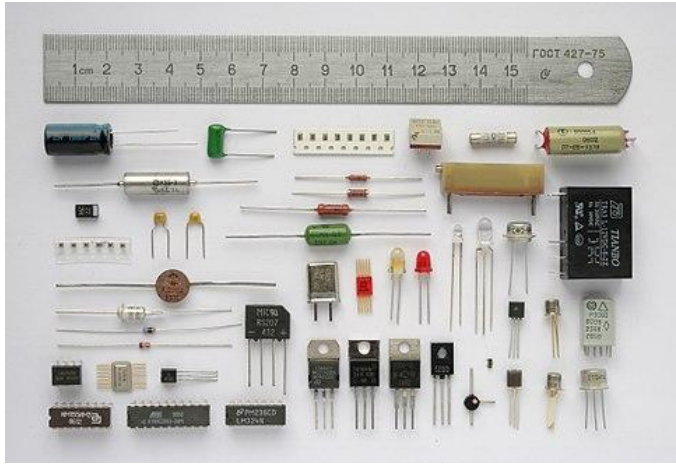
# Structure

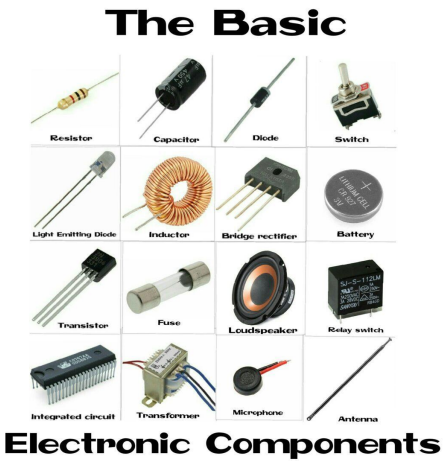
- The basic electronic components
- Electronic schematics, the water-flow analogy
- Breadboards, etching, soldering
- Open Source Hardware: Arduino, Raspberry Pi, etc
- Closing

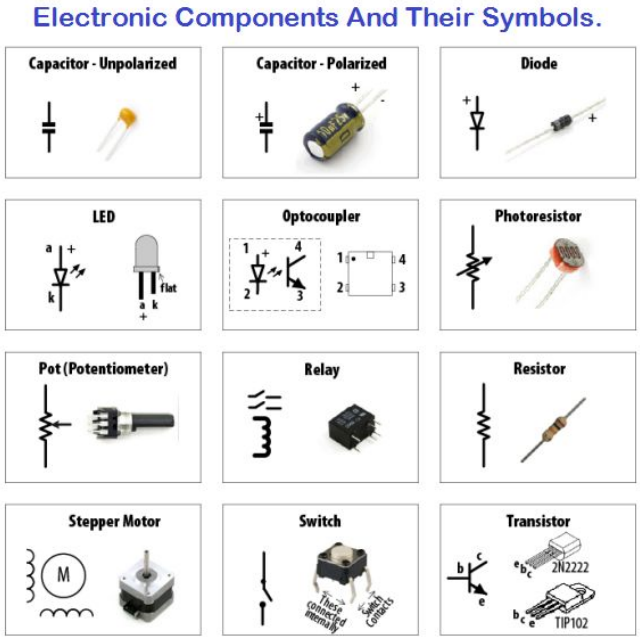
~ I’m not an expert, I’m a hobbyist, this is just my understanding of things

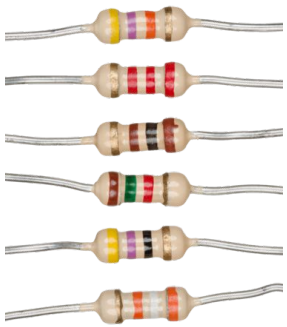
# Basic components

- Resistor - controls the Voltage
- Capacitor - fast charge/discharge battery
- Inductor - like an inertial dampener
- Transistor - the ‘if else’ of electronics

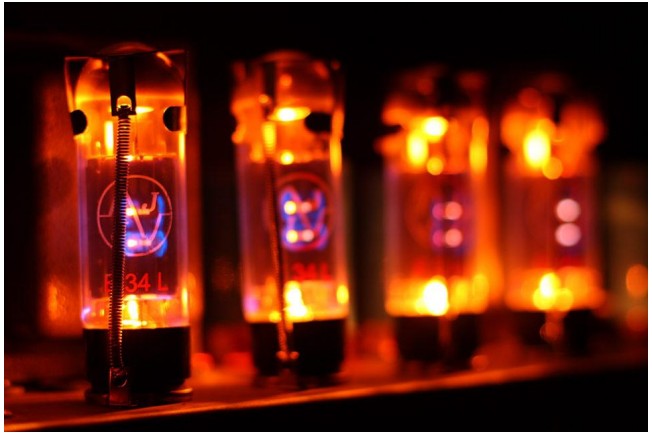




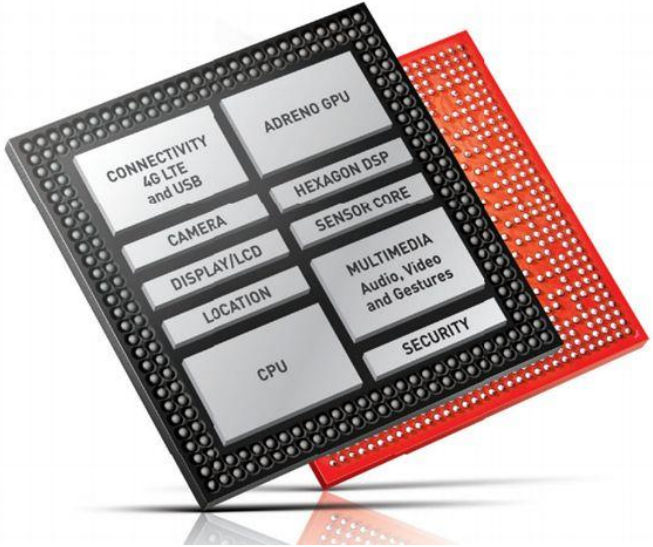


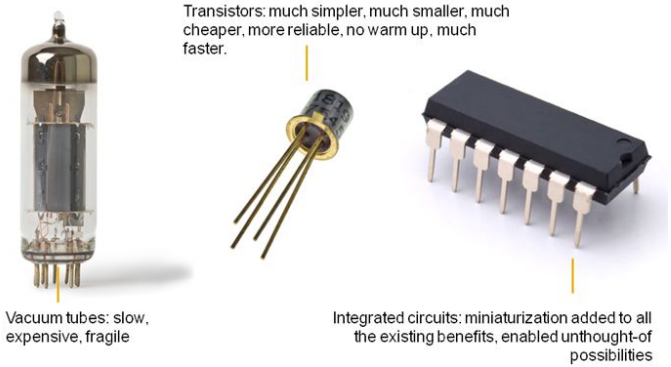
# Transistor - game changer



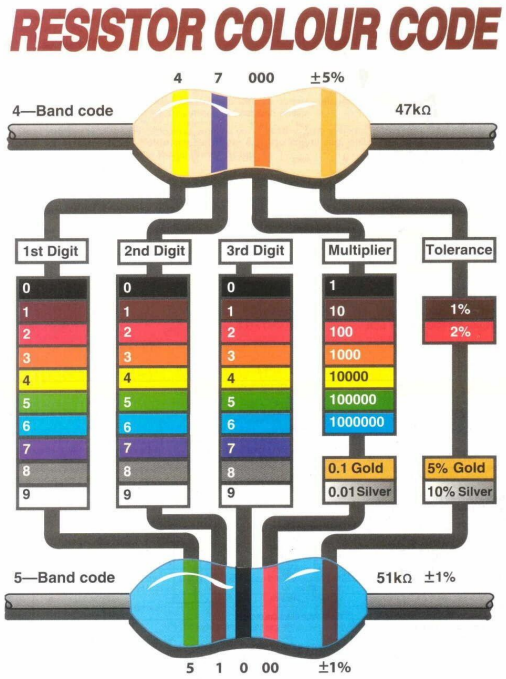
### The Transistor vs the Vacuum Tube

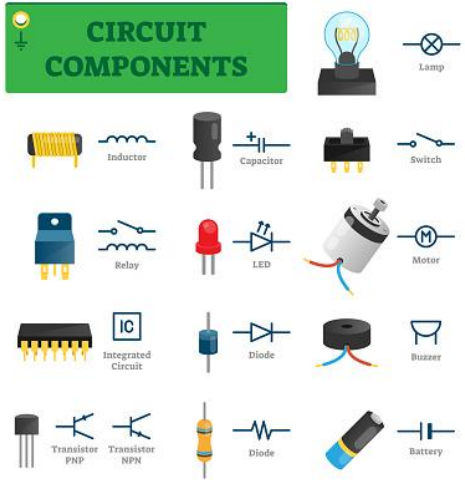
- Vacuum tubes
  - Generate a lot of heat (like light bulbs)
  - Burn out
  - Slow, big, & bulky
- Transistor
  - Small
  - Fast
  - Reliable
  - Require less energy

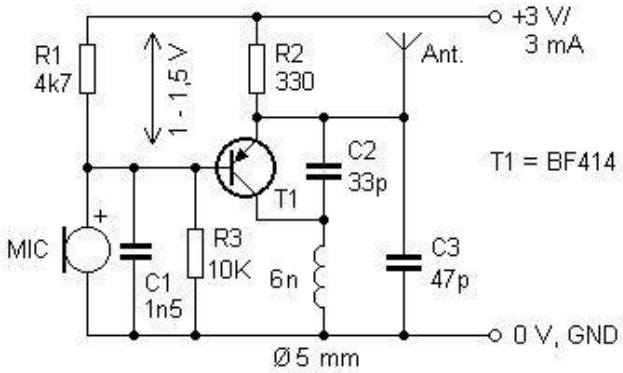


# Symbols



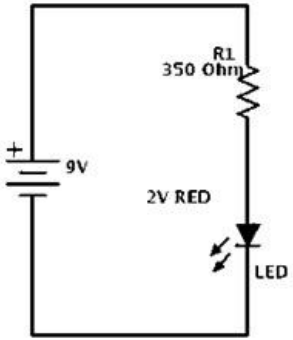



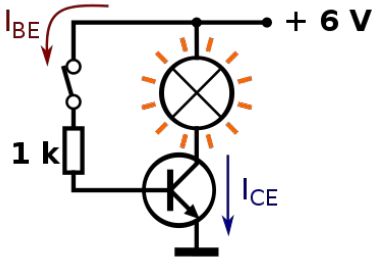



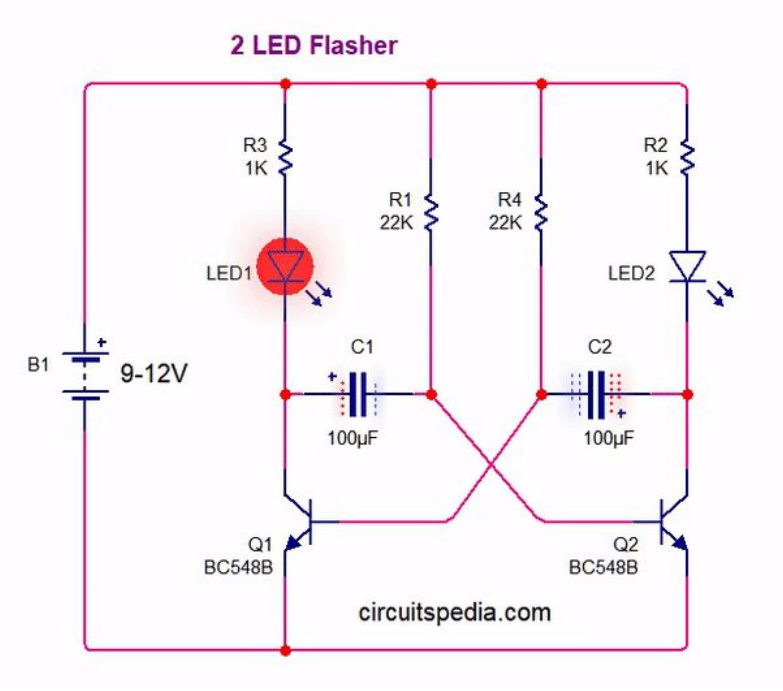

| | | | |
|---|---|---|---|
| 1. | Cell | | A basic building block for a DC power source. Cells are combined to form batteries. |
| 2. | Battery | | A battery has more than one cell and provides a relatively constant amount of voltage between the positive and negative terminal. |
| 3. | AC Power Supply | | Represents the "Alternating Current" or AC type of supply in an electrical circuit. |
| 4. | SPST Switch | | Switch has the basic function of interrupting the current flow and creating an open (or broken) circuit. |
| 5. | Resistor | | Resists the current flowing through a device or opposes the current flow in a circuit. |
| 6. | Capacitor | | Capacitor is a storage device used to store electrical energy by separating two opposing charges, i.e., positive, and negative. |
| 7. | Inductor (Coil) | | Inductor is a passive two terminal component that stores electrical energy in the form of a magnetic field, when electric current flows through it. |
| 8. | Diode | | Diodes are components that allows electricity to flow in a single direction but acts against its flow in opposite direction. |
| 9. | BJT NPN Transistor | | Transistor is an electronic component that amplifies signals or acts as switch in a circuit. |
| 10. | Earth Ground | | Reference point in an electrical circuit, where voltage can be measured as zero. |

# Water-Flow analogy

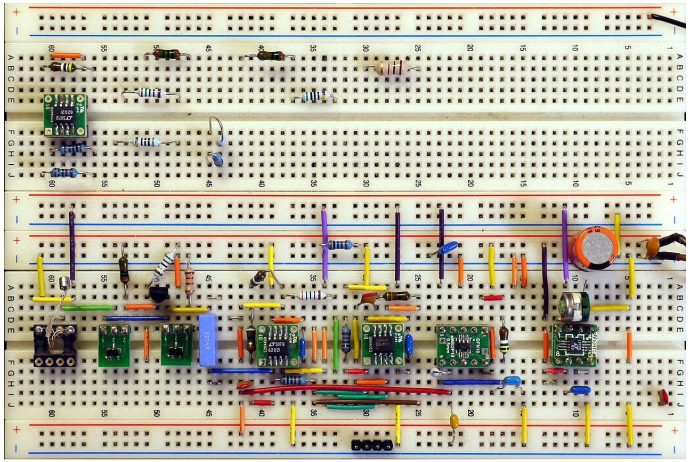
- Electricity doesn't "flow" as I thought
- Resistor, Capacitor, Inductor - in a water pipe

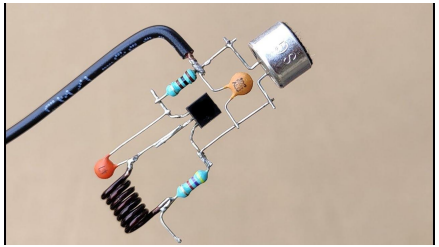


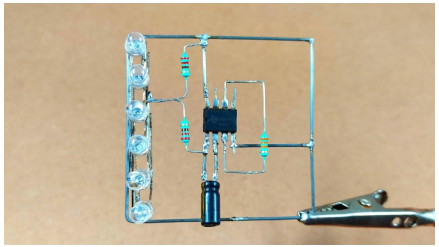



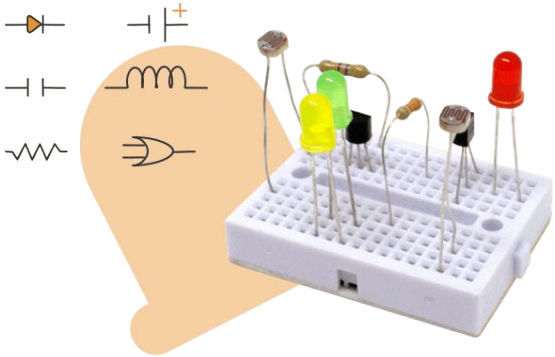



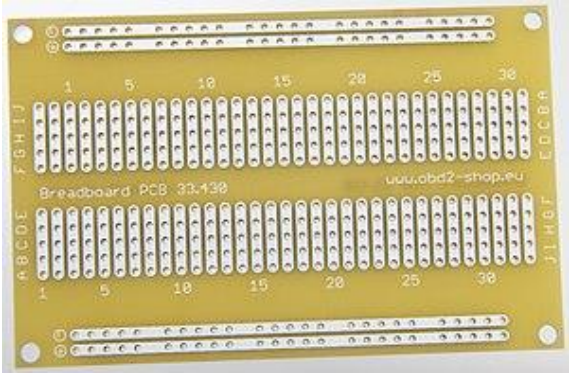
# Breadboards, and loose soldering

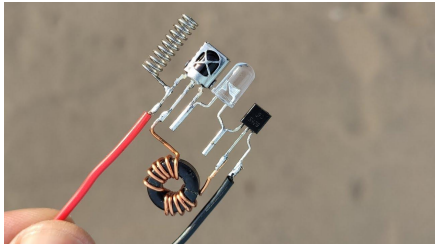




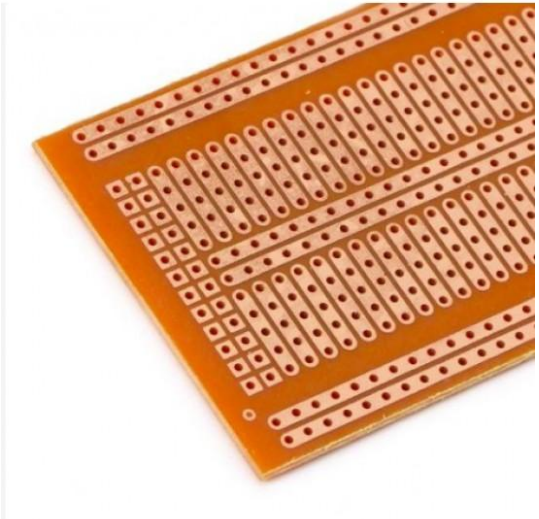


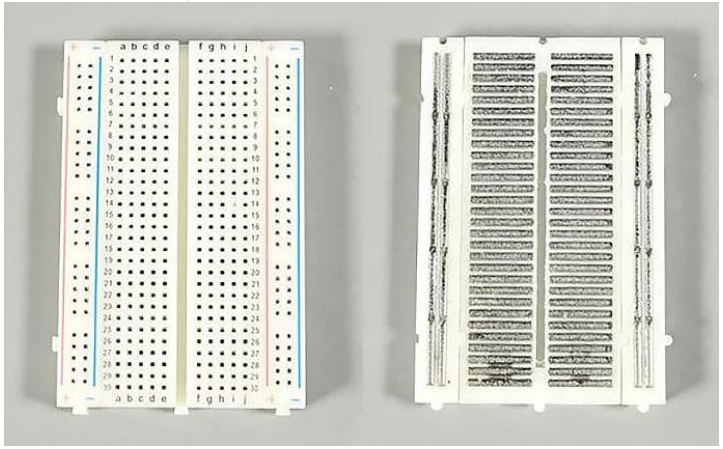




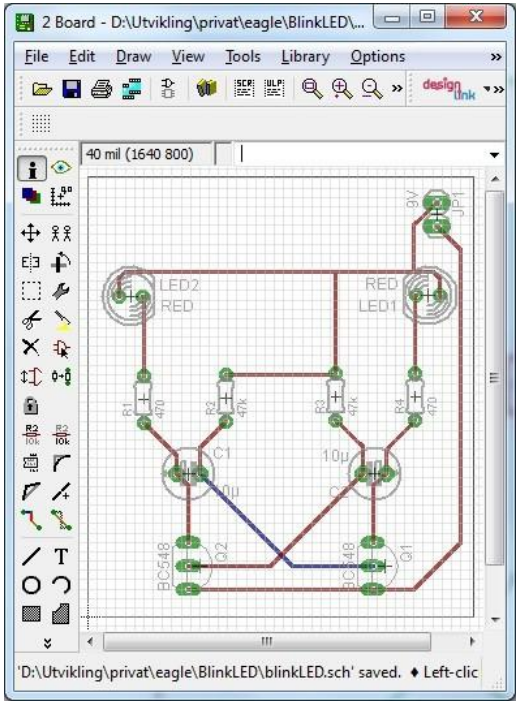



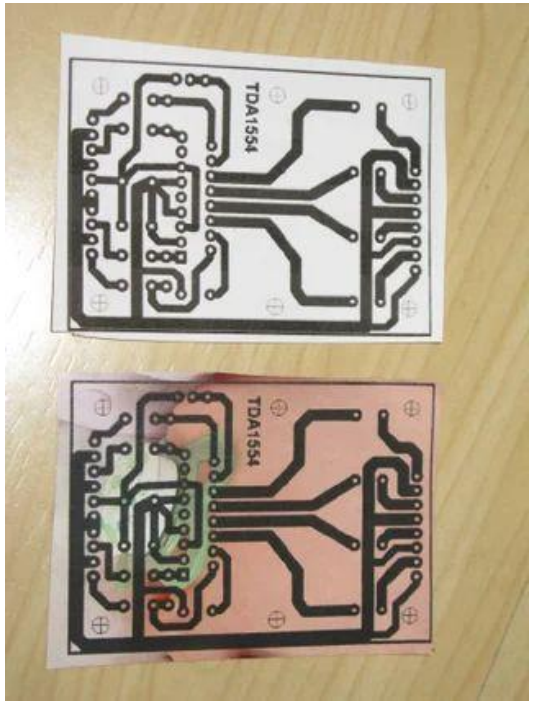
# Breadboard - prototyping

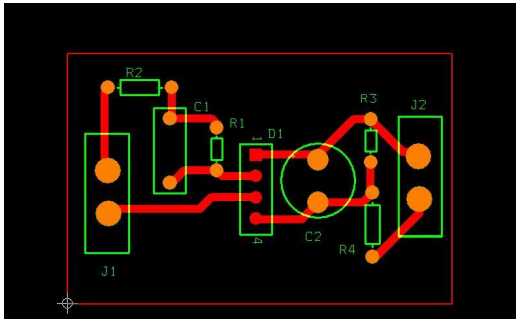


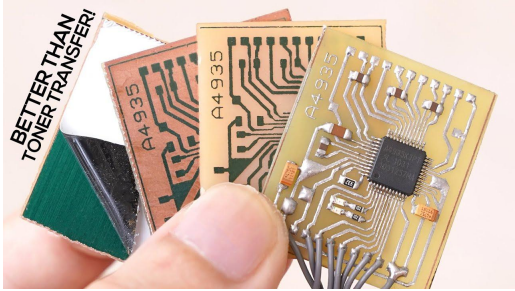


# PCBs and making your own



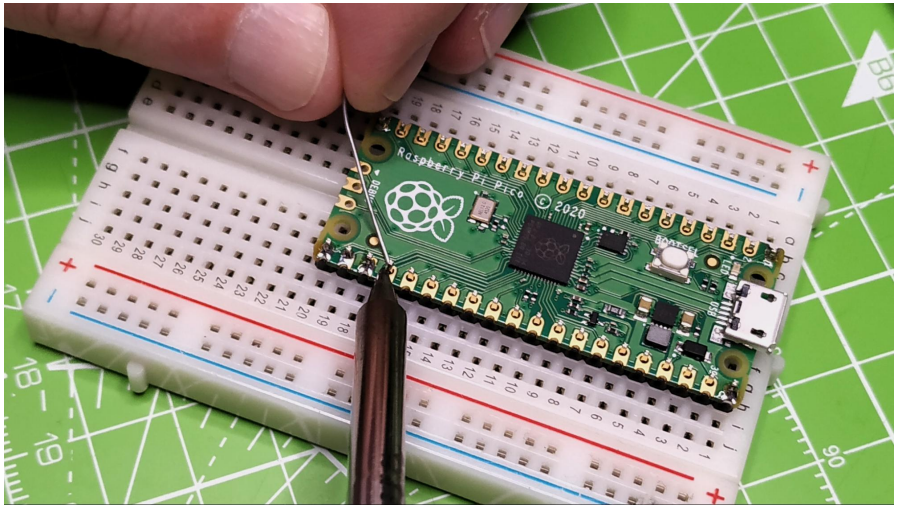



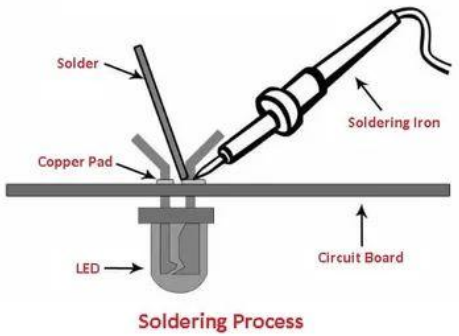



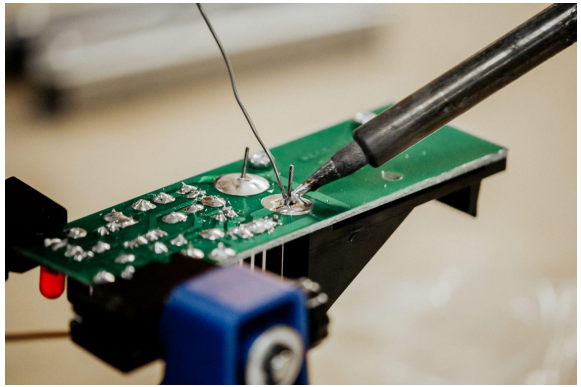



# Soldering

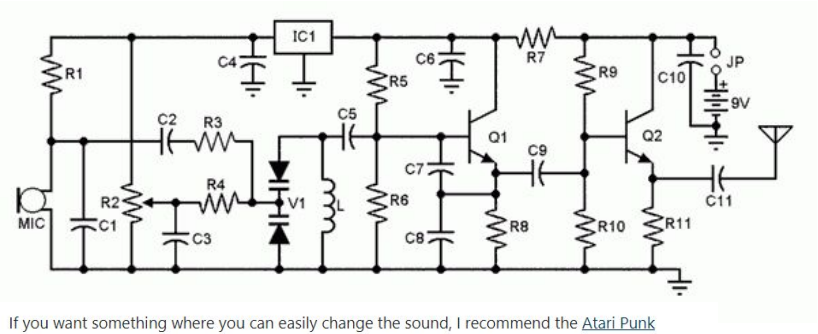
Vastar


Raspberry Pi Pico
© 2020

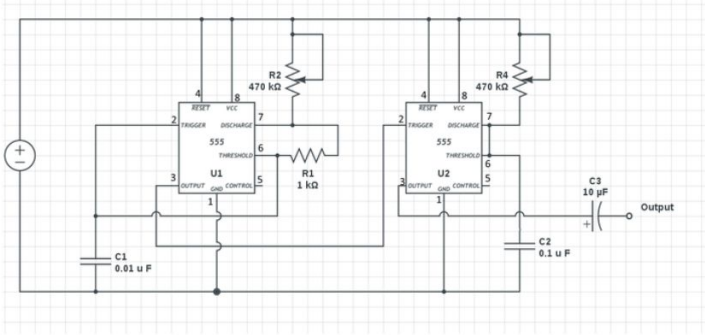

Solder
Soldering Iron
Copper Pad
LED
Circuit Board
Soldering Process



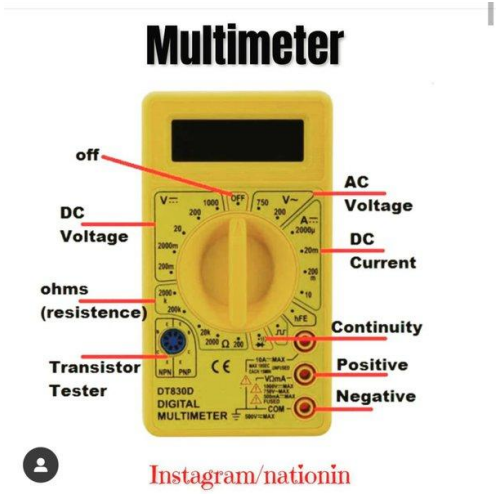
# Schematics, measuring

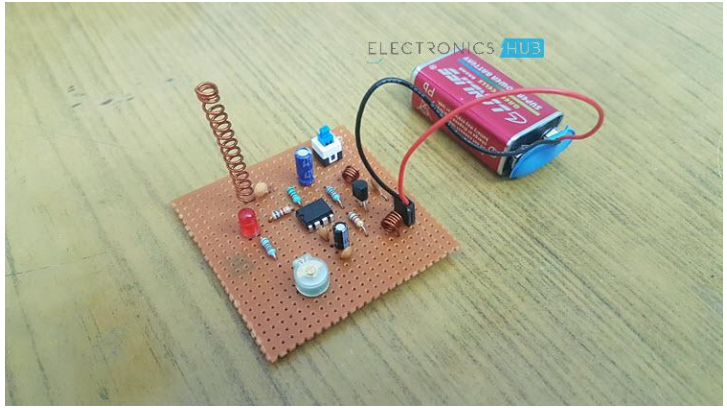



If you want something where you can easily change the sound, I recommend the Atari Punk synthesizer, as published in Radio Shack's Engineer's Notebook, by Forrest Mims.




It certainly wouldn't qualify as "simplest", but it is the simplest circuit that can produce something approaching music. It's also a 1-IC circuit if you use the dual timer 556 package, instead of two 555's.





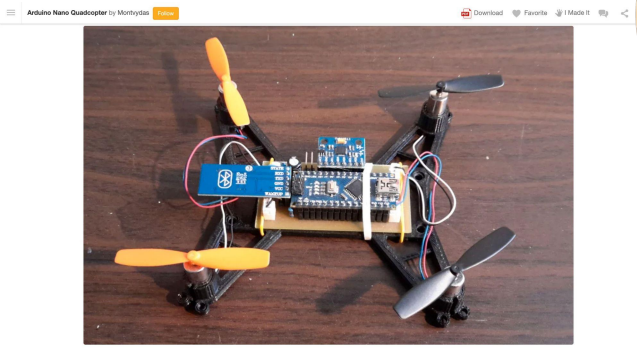
# Open-source hardware (OSH)

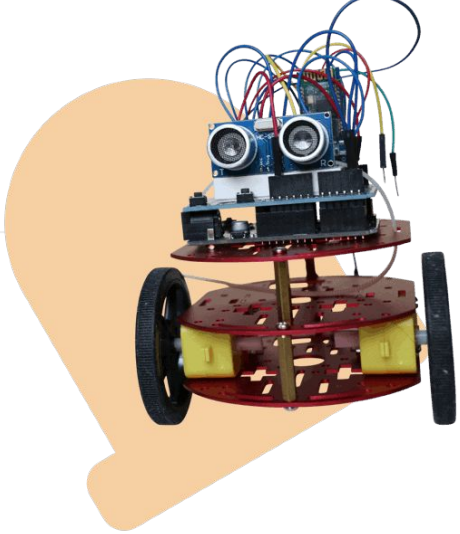
- Similar to Free and Open Source Software (FOSS), but for hardware.
- OSH & FOSS are part of the Open Design Movement
- Just like open source software, the scientific and maker community benefited greatly and contributed in turn to the advancement of the technologies
- Free sharing of schematics, bills and materials led to improved SoC designs

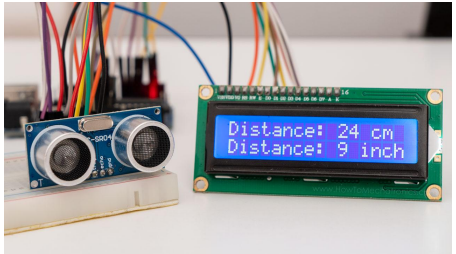
Notable members Arduino and Adafruit - finally some brains for our designs.

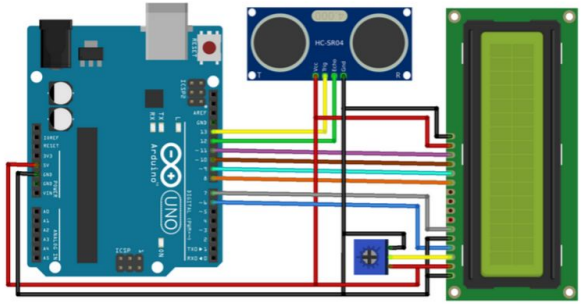
- A program can be loaded to the board via usb cable: C/C++;CircuitPython
- Exposes pins for input and output
- An impressive number of modules: sensors, controllers
- Used by makers and professionals alike
- Used to create robots, IoT, and the like

# Arduino



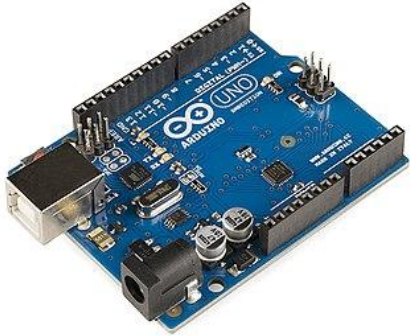





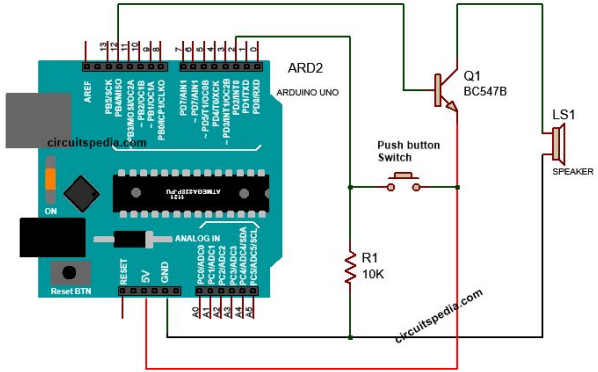



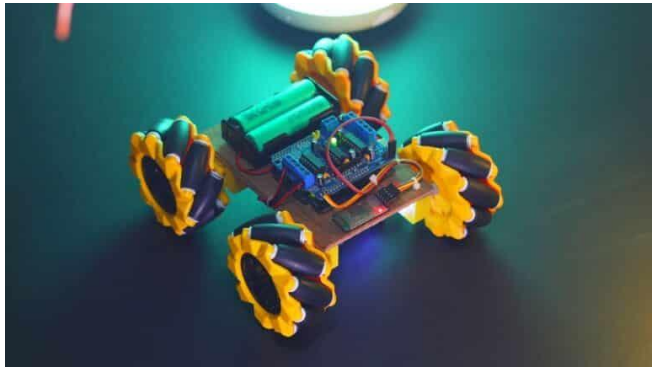

| ARDUINO | >> | LCD 16X2 |
|---|---|---|
| GND | | GND |
| 5V | | VCC |
| D6 | | RS |
| GND | | RW |
| D6 | | EN |
| D7 | | D4 |
| D8 | | D5 |
| D9 | | D6 |
| D10 | | D7 |

| ARDUINO | >> | HC-SR04 |
|---|---|---|
| 5V | | VCC |
| D12 | | ECHO |
| D13 | | TRIG |
| GND | | GND |

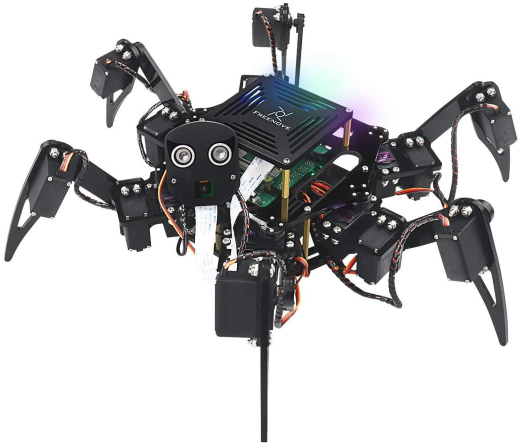


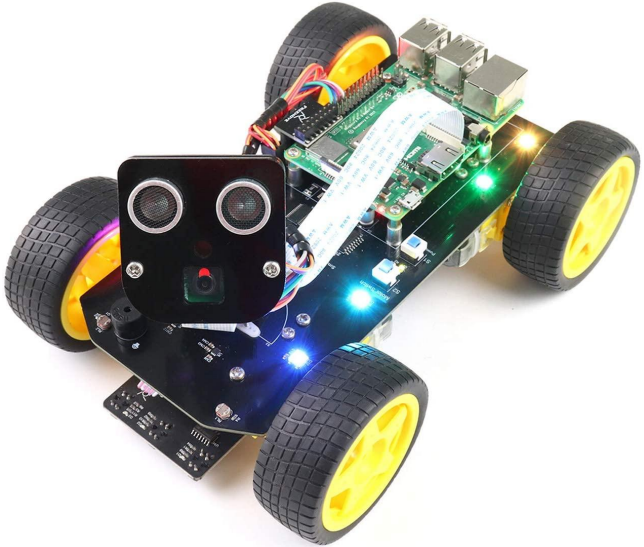
## Birds Sound Generator

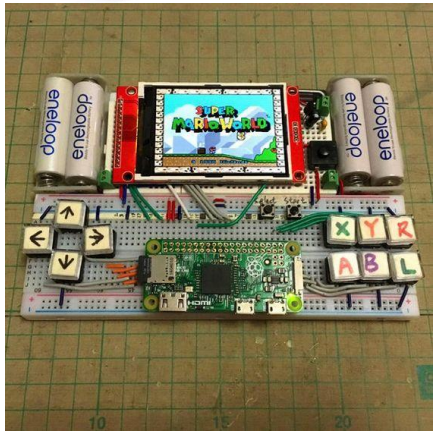


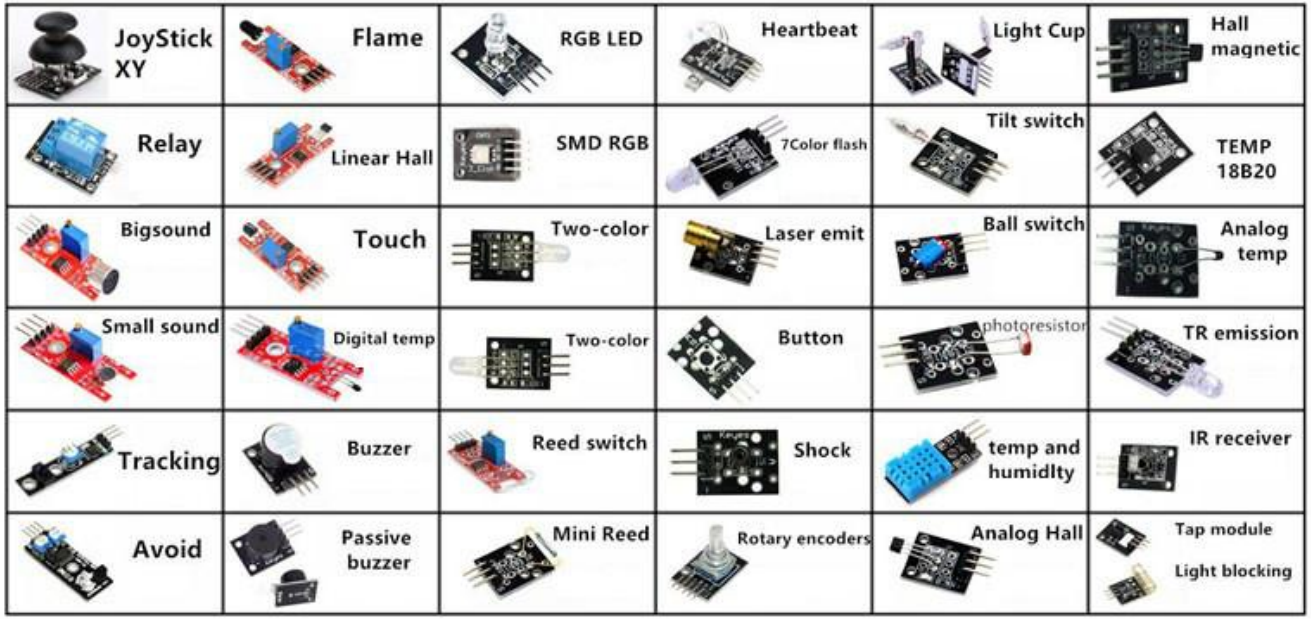
# Raspberry Pi



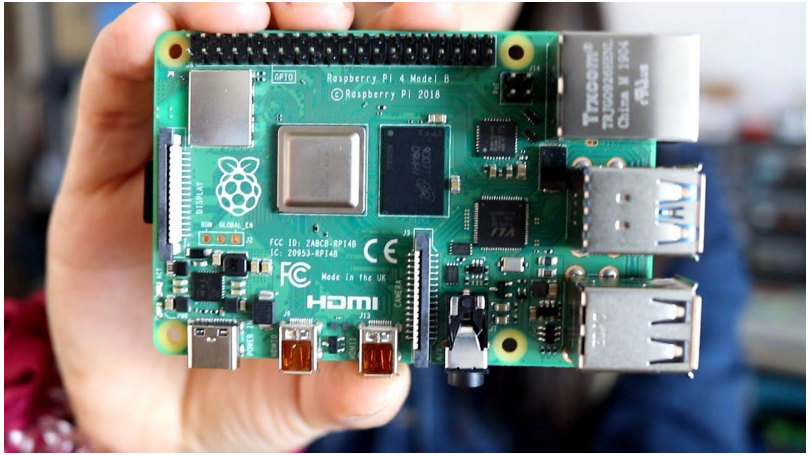


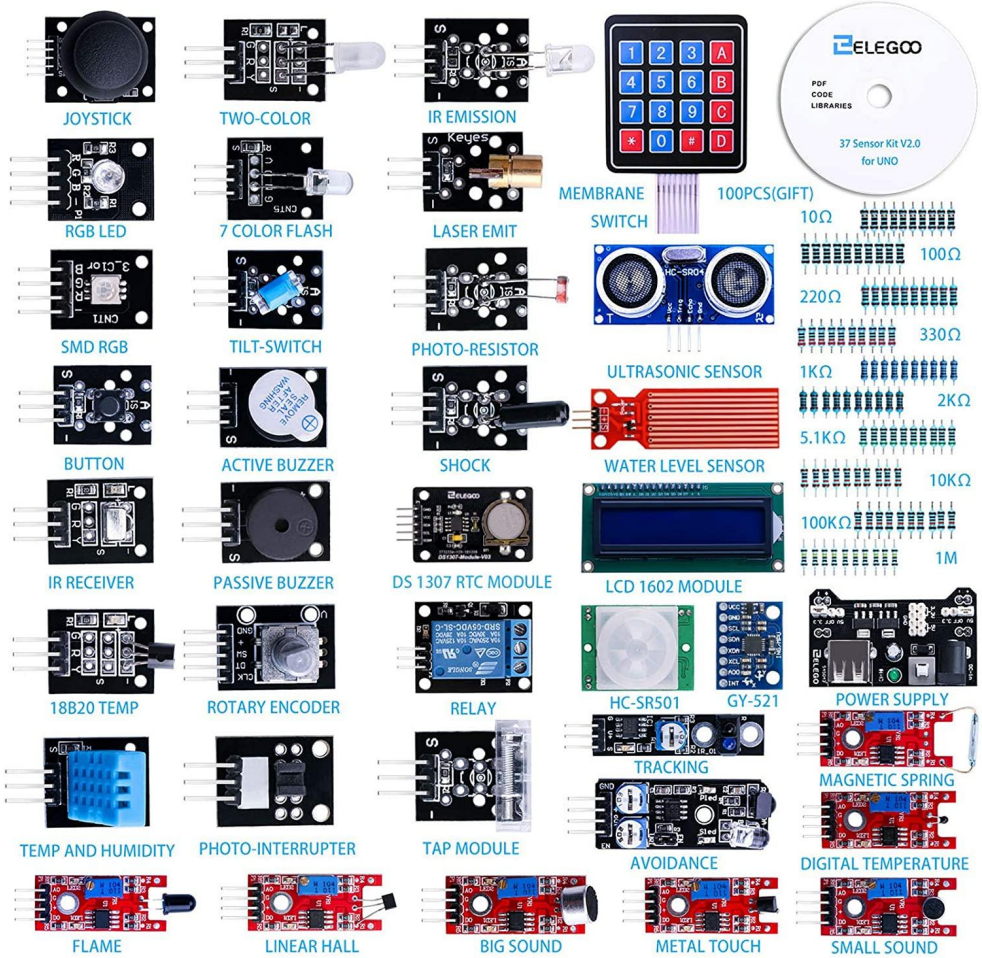


# Arduino modules



# Raspberry Pi mods



# Some links

www.build-electronic-circuits.com/category/basic-electronics/

www.Instructables.com
www.MakeUseOf.com
www.Electromaker.io
www.electronicshub.org

Atari punk synthesizer (https://www.youtube.com/watch?v=0_ckHYgE5LY)
Beet Box with Raspberry Pi (https://scottmadethis.net/interactive/beetbox/)