Contributors

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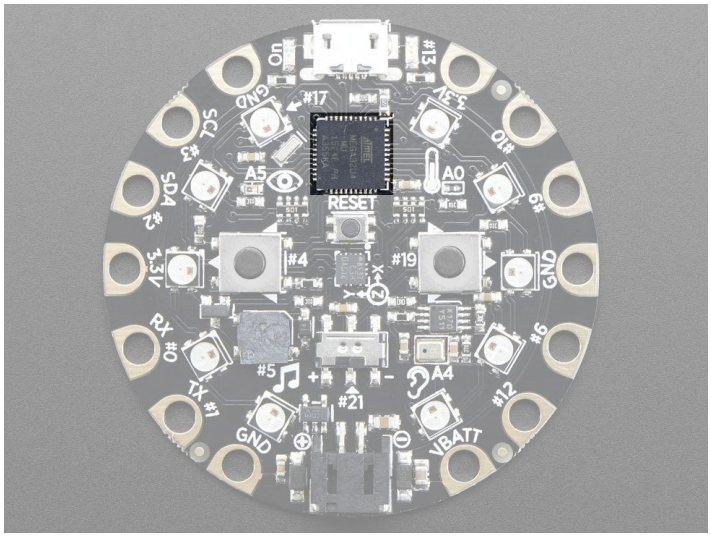
EDUCATORS / CIRCUIT PLAYGROUND PROJECTS CIRCUIT PLAYGROUND / CLASSIC

Microcontroller

by lady ada
Don't feel like you have to understand this part fully! Skim it for now, and consider it a resource for you when you want to take a deeper dive into understanding the hardware!

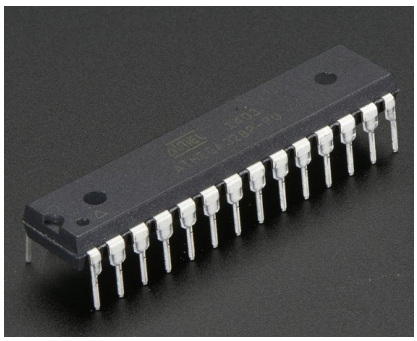
Main Chip / Microcontroller

This is the 'brains' of the Circuit Playground. The thing that you program when you program! It's what runs the code, the **CPU** (Central Processing Unit). Kinda like the processor that runs in your computer but much much much simpler and smaller.



The chip has very thin little *legs* that go around it, you can see the little silver dots that connect each leg of the microcontroller to the circuit board. Those dots both mechanically *and* electrically connect the CPU - so it can send data to and from your computer and those sensors and lights.

Each one of those mini legs are called *pins* because older microcontrollers used to look like this:



Where each of the legs really do look like sharp pins. Those older microcontrollers are really big, though. And so over time the 'controllers got hit with a shrink ray until they looked like this:

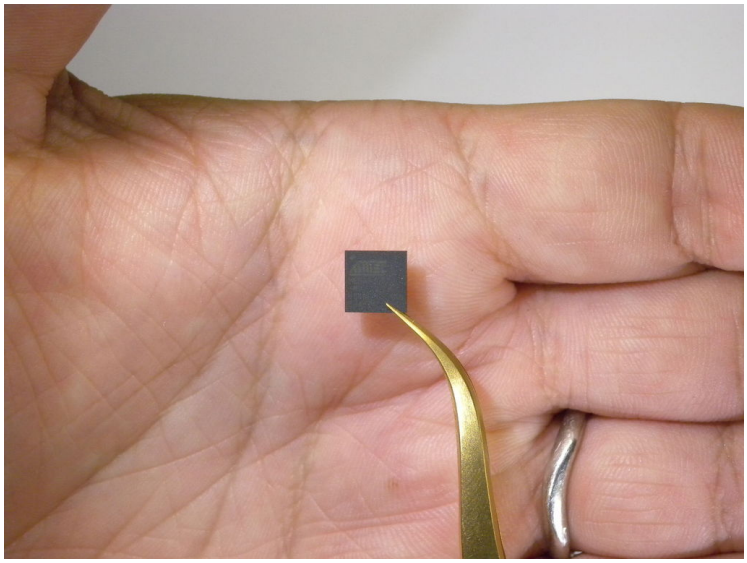


Image by Osamu

Yep that little square has all the circuitry of the bigger chip, but so small you have to use tweezers to pick it up!

Our Pal, the ATMEGA32u4

The Circuit Playground **microcontroller** is called the ATmega32u4 and it has:

- 44 Pins
- Powered by 3 Volts
- Requires about 0.1 Watts of power
- Runs at 8 MHz
- 32 KB of flash storage
- ~2 KB of RAM
- Costs about $5 per

Compare this to, at the time of writing, a common **computer** chip, the Intel i5-6400

- 1151 Pins
- Powered by 1.35 Volts
- Requires about 35 Watts of power
- Runs at 2800 MHz
- No internal Flash storage, but most computers have at least 250 GB = 250,000 MB = 250,000,000 KB* of storage
- No internal RAM but most computers have at least 4 GB = 4,000 MB = 4,000,000* KB of RAM
- Costs about $200

(yes I know its not exactly 1000)*

So, clearly if you want an ultra powerful computer processor that can play the latest games, an i5 is the way to go. But its expensive, and requires a ton of power, and you need to have a full motherboard to run it so it's kinda big. If you just want to do some simple tasks, a microcontroller like the '32u4 is peachy. Also, its quite handy that it has the RAM and storage inside of it - its not a lot but that means you don't need to hook up a hard drive to this chip, its very compact and complete.

Simplicity & Sturdiness

What's cool about the microcontroller is that unlike your computer which requires an operating system (Mac OS X or Windows) and booting up, the microcontroller is 'barebones'. When you plug it in, it immediately runs whatever code you asked it to do.

And, you don't have to worry about a diskette or hard drive or cd-rom getting scratched or damaged. The storage inside of the chip lasts for a *really long time.* You could program your Arduino, leave it alone for decades, even hundreds of years & come back and power it up with a post-apocalyptic-cyber-battery and it would work just as new.

TAKE A TOUR! BATTERY JACK & SUPPLY