Rev 9: 11-Aug-2022

Arduino For Total Newbies

w/ TV-B-Gone as example project

Mitch Altman

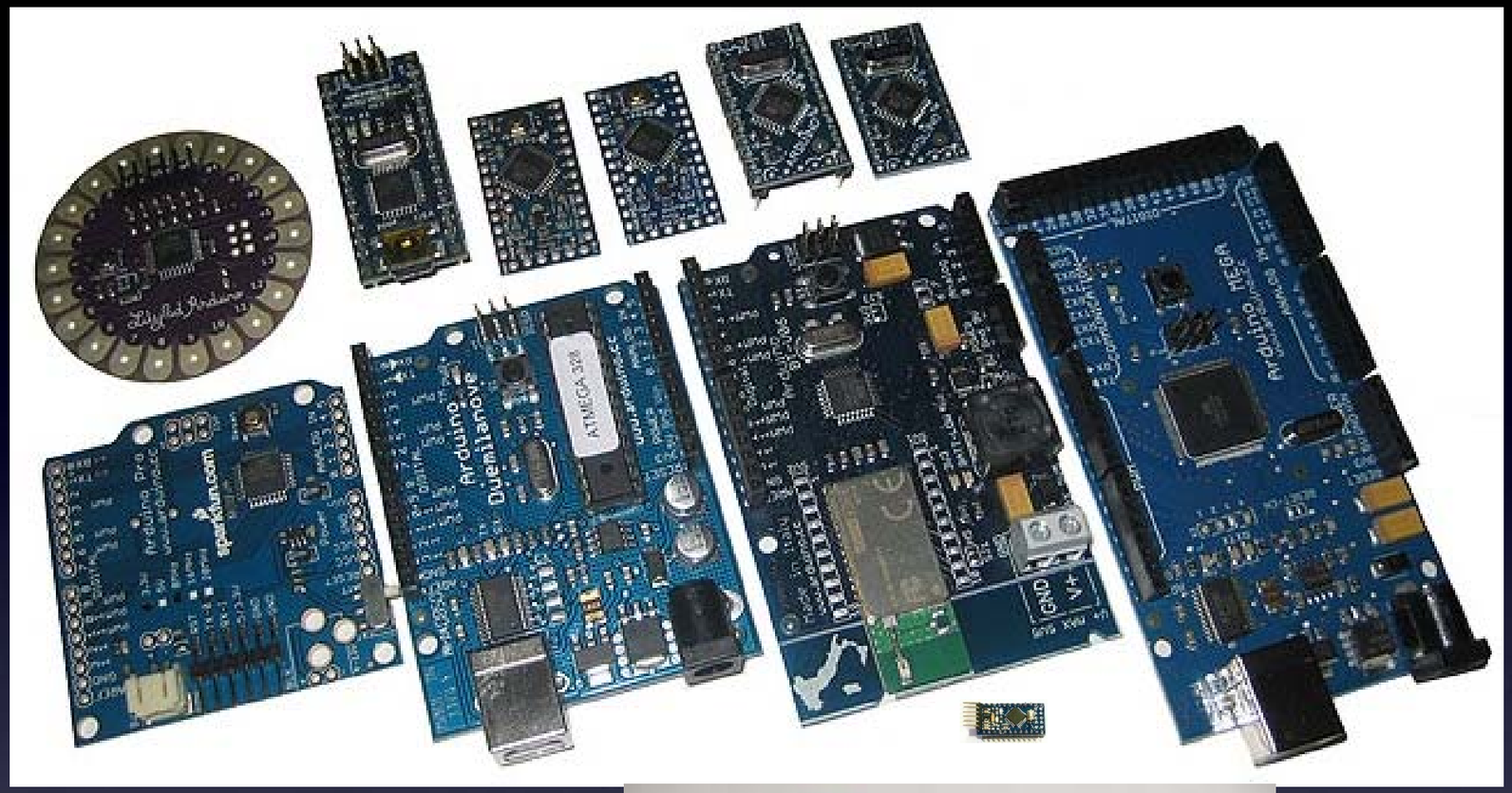
Chief Scientist, **Cornfield Electronics**, San Francisco, CA
Inventor of **TV-B-Gone** universal remote controls
Co-founder of **3Ware** (successful Silicon Valley startup)
Pioneer of **VR** (in the mid-1980s)
Founding mentor at **HAX** (1st and biggest hardware accelerator)
Co-founder of **Noisebridge** (San Francisco hackerspace)

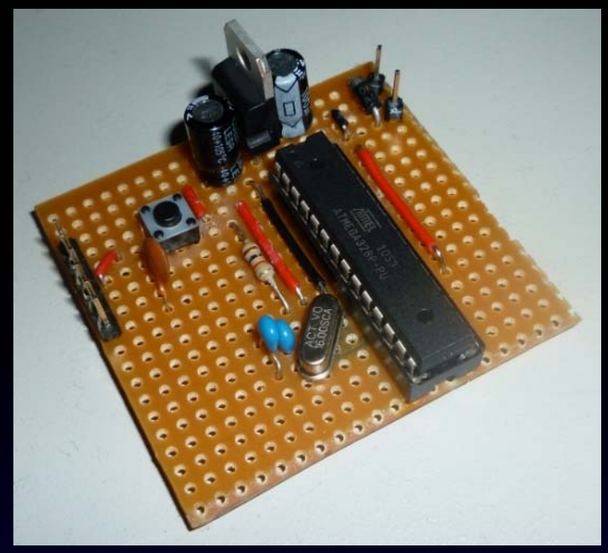
email: **mitch@CornfieldElectronics.com**
site: **www.CornfieldElectronics.com**
twitter: **@maltman23**
flickr: **maltman23**
WeChat: **mitchaltman**

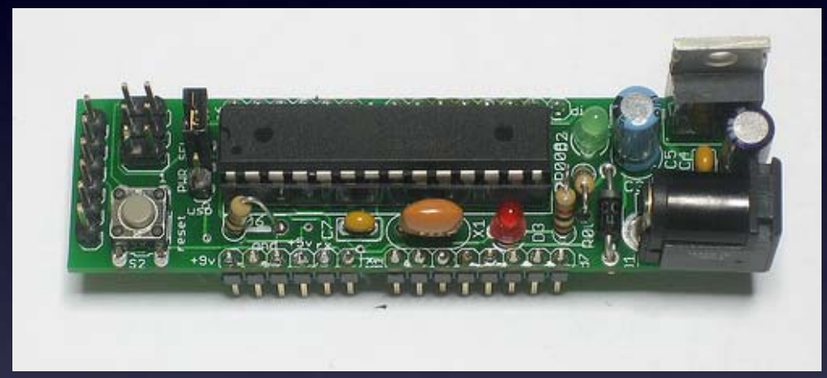
Syllabus

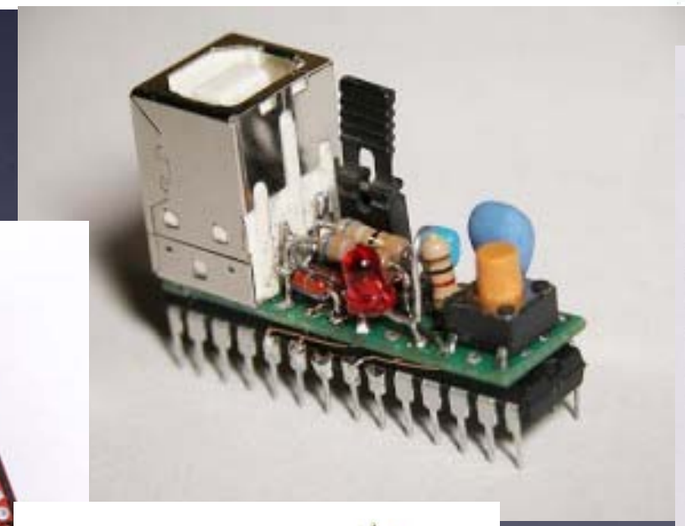
- Intro
- Everything You Need to Know About Electronics
- *[How to solder / make your own Arduino]* ← *not in today's workshop*
- How to Set Up and Use the Arduino Software
- How to Hack Arduino Programs ("Sketches")
- How to Use Solderless Breadboards
- How to Read a Schematic
- Make a TV-B-Gone Remote Control with your Arduino Clone without soldering

Intro

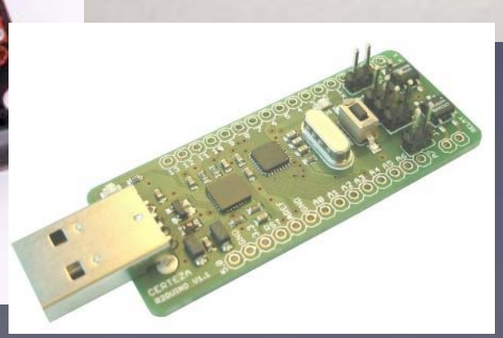

Arduino Duemilanove
ATMEGA 328
Arduino MEGA

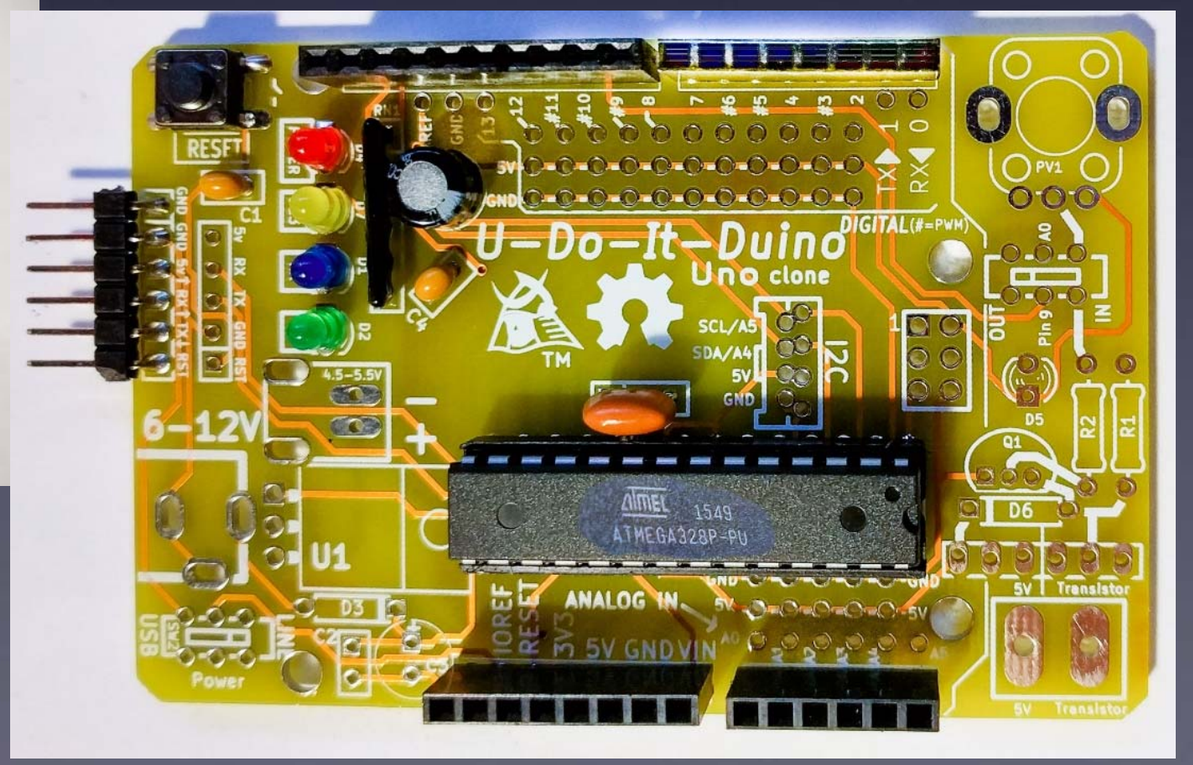




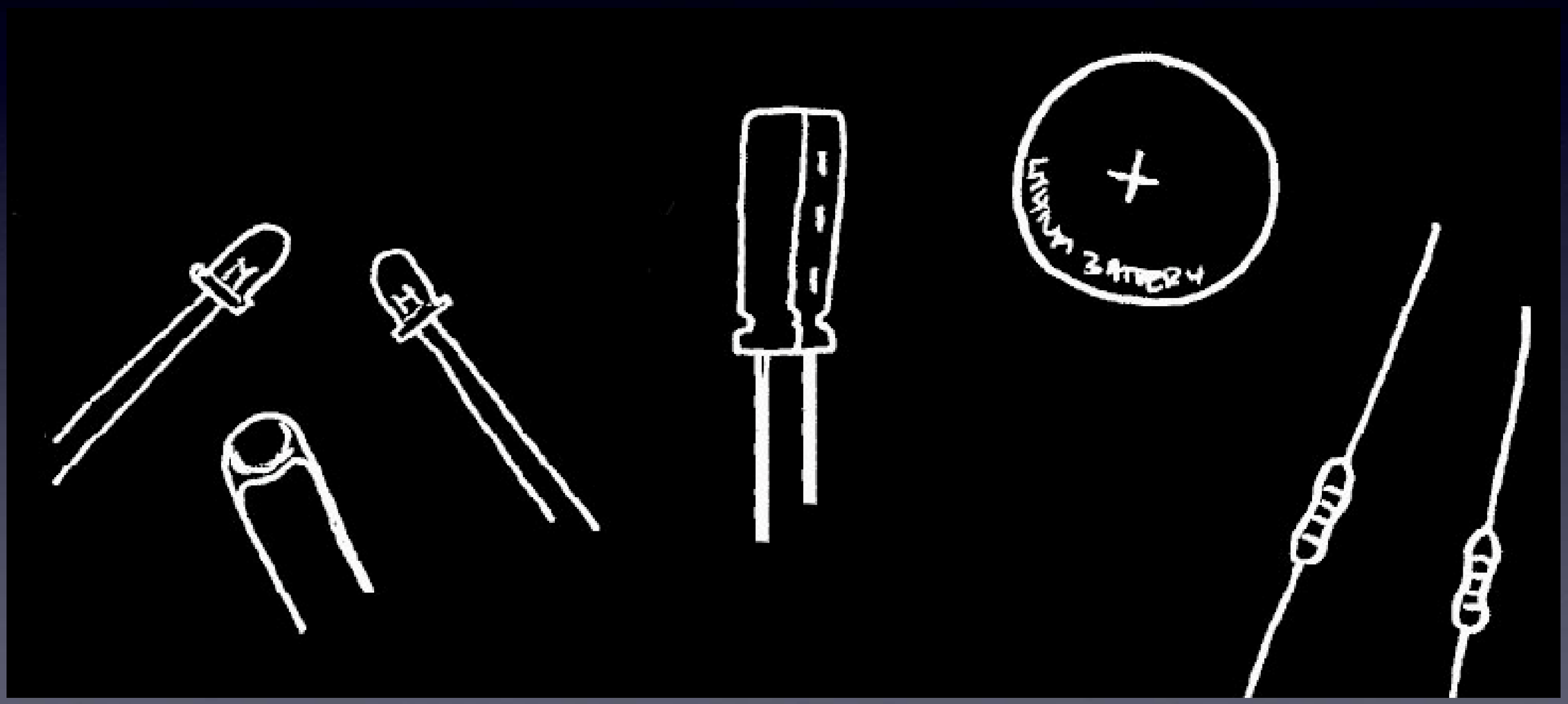


Diavolino
by Evil Mad Science

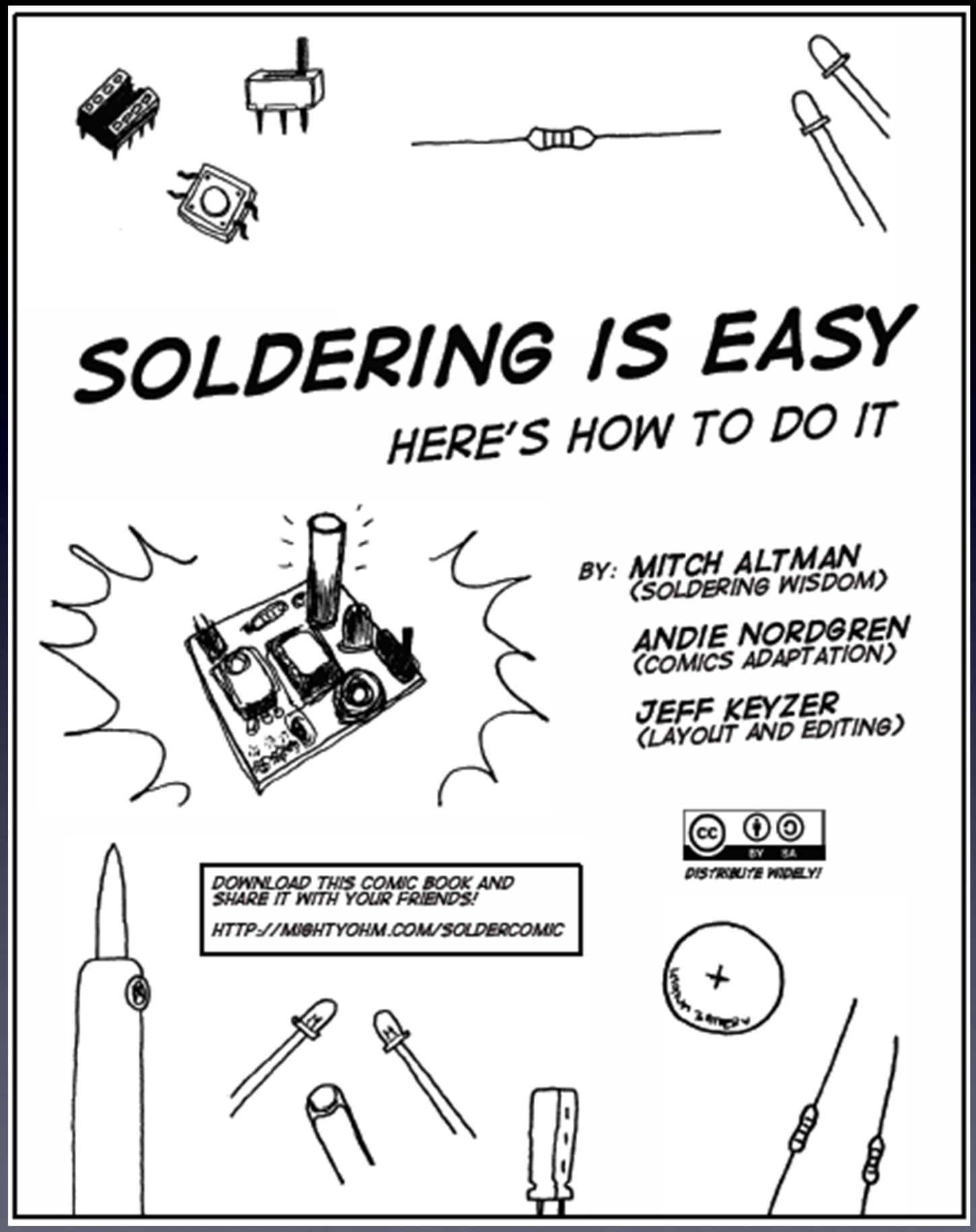



U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
6-12V
ATMEGA328P-PU
ANALOG IN
5V GND VIN
Power
Transistor

Everything You Need to Know About
Electronics



Learn To Solder



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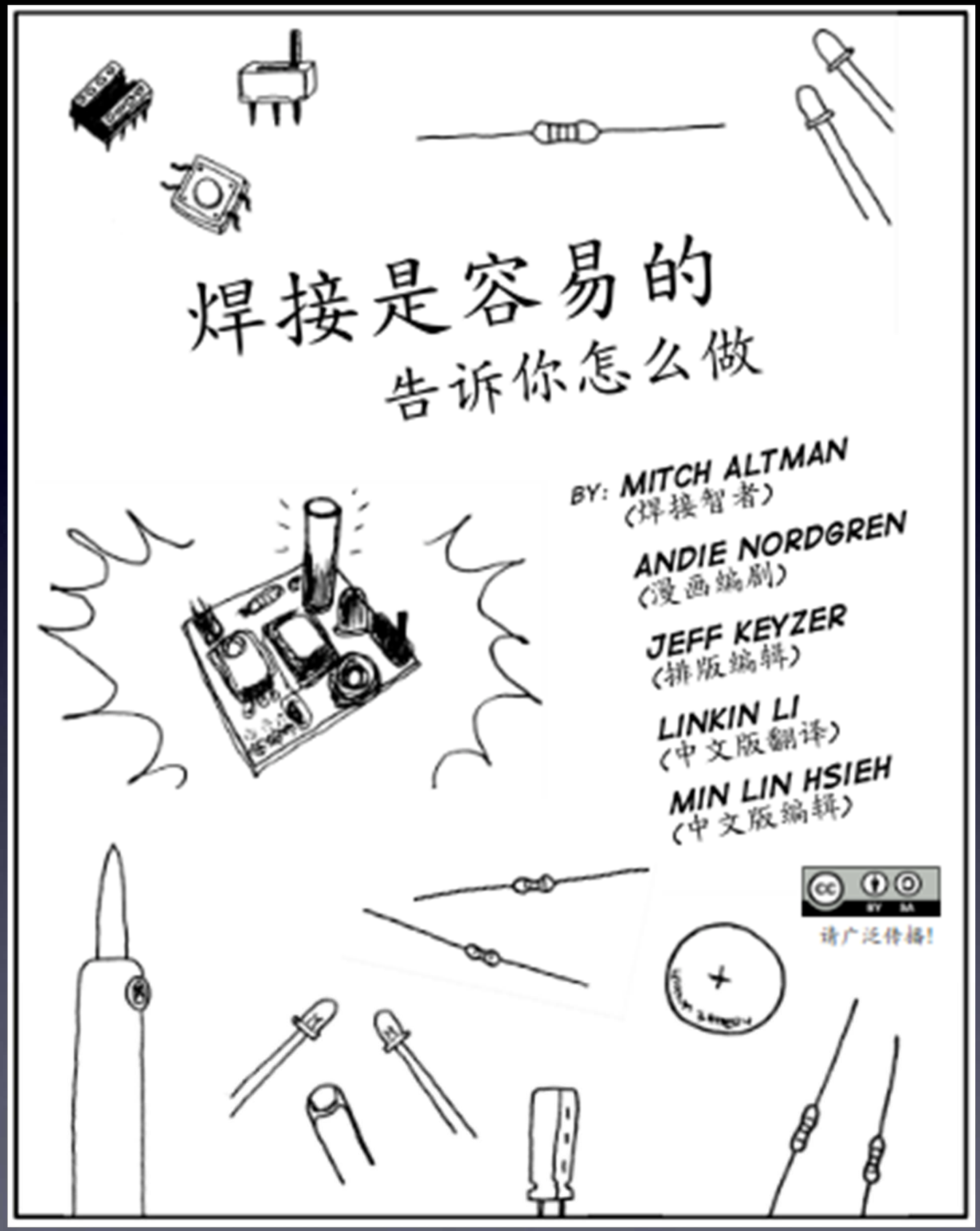

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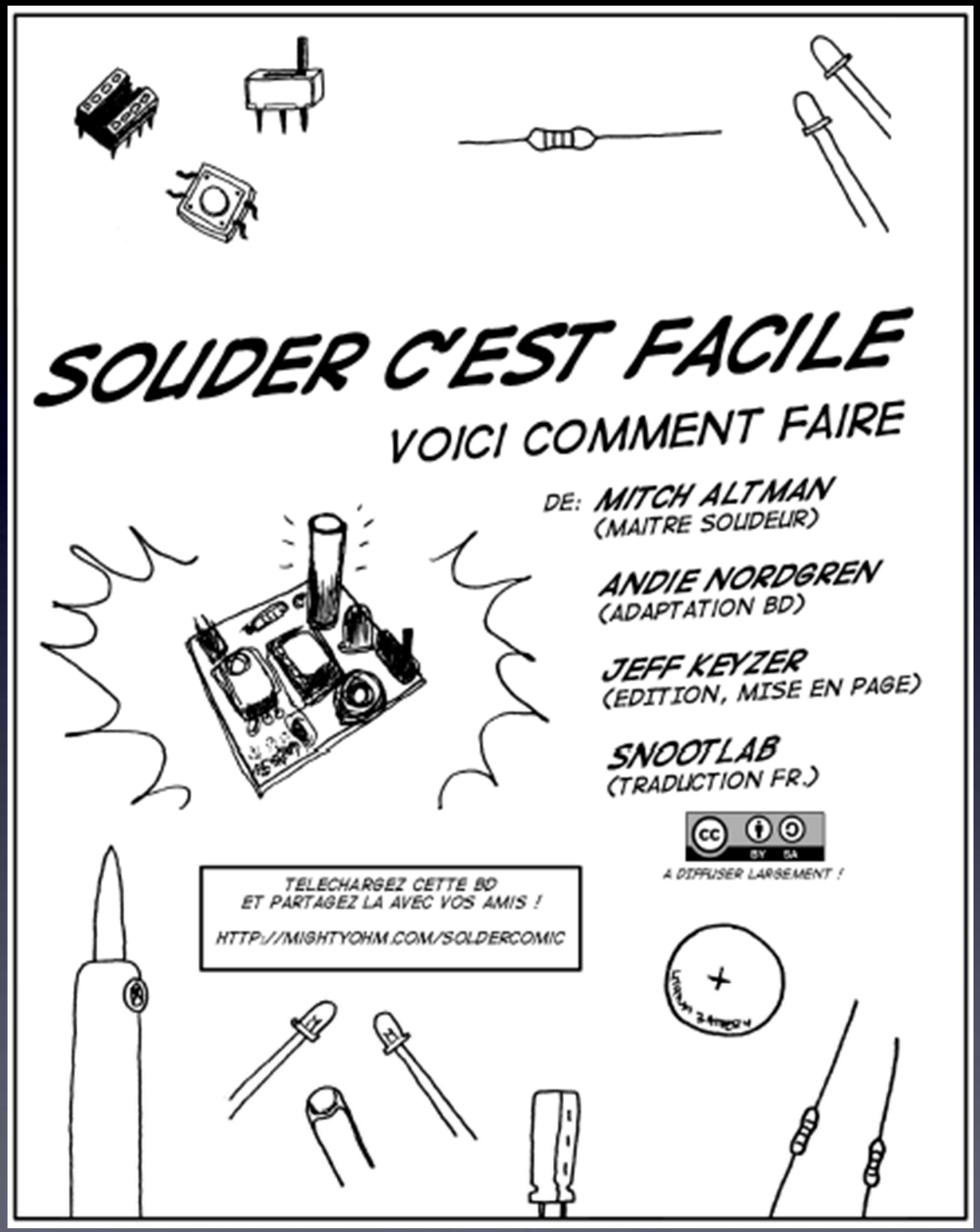

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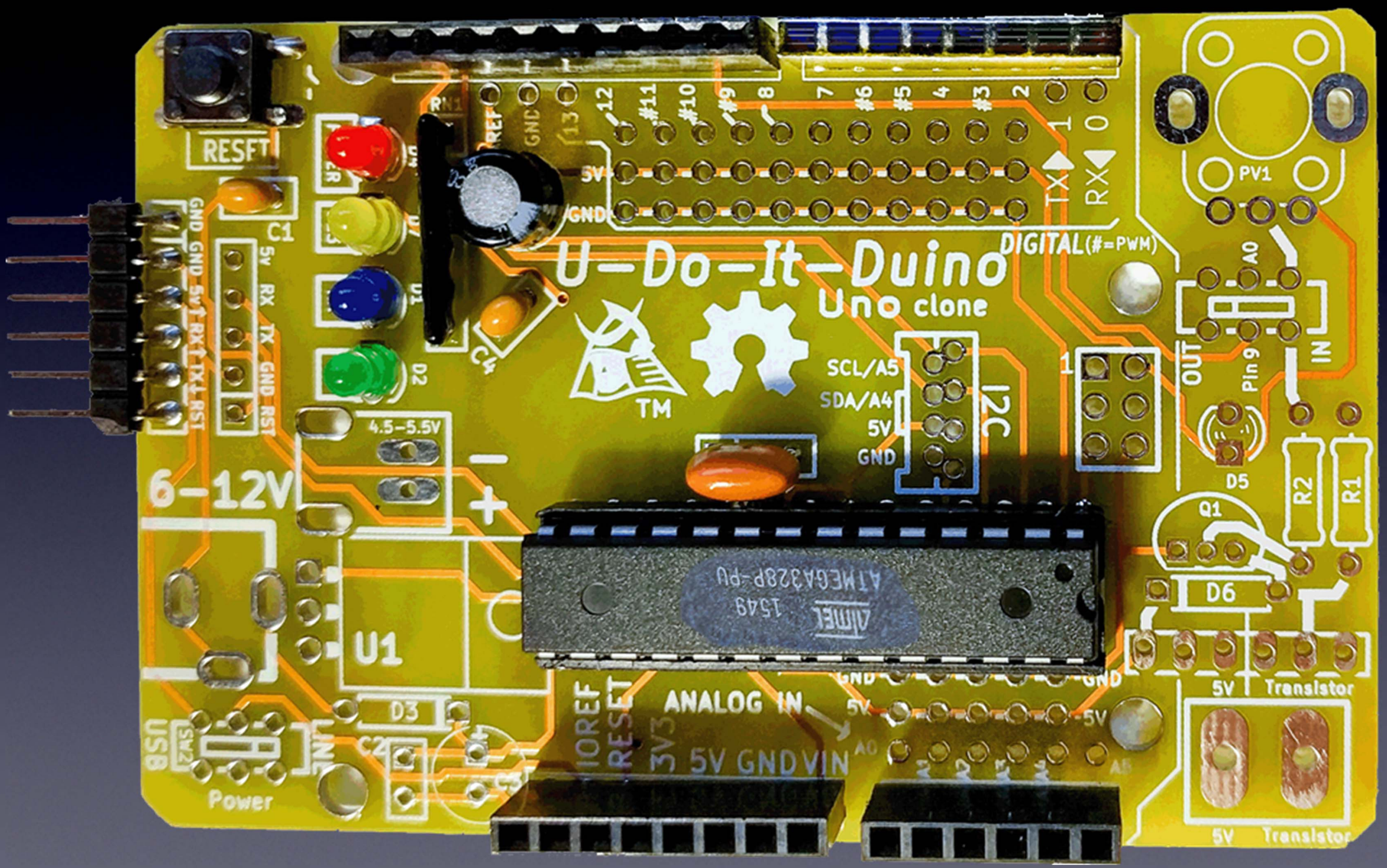
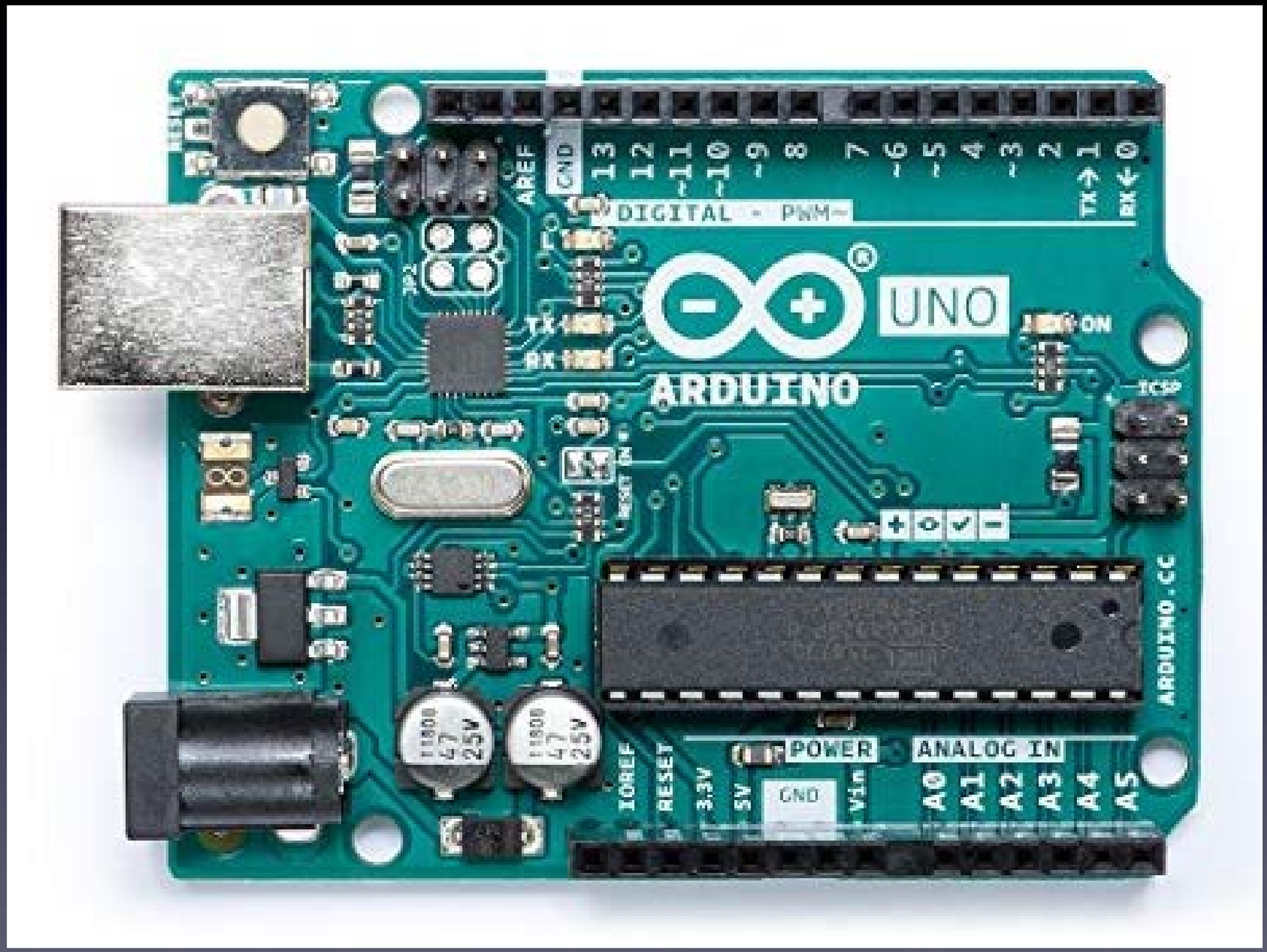
We Won’t Solder Our Own Arduino Clone



We will use a ready-made Arduino “Clone”



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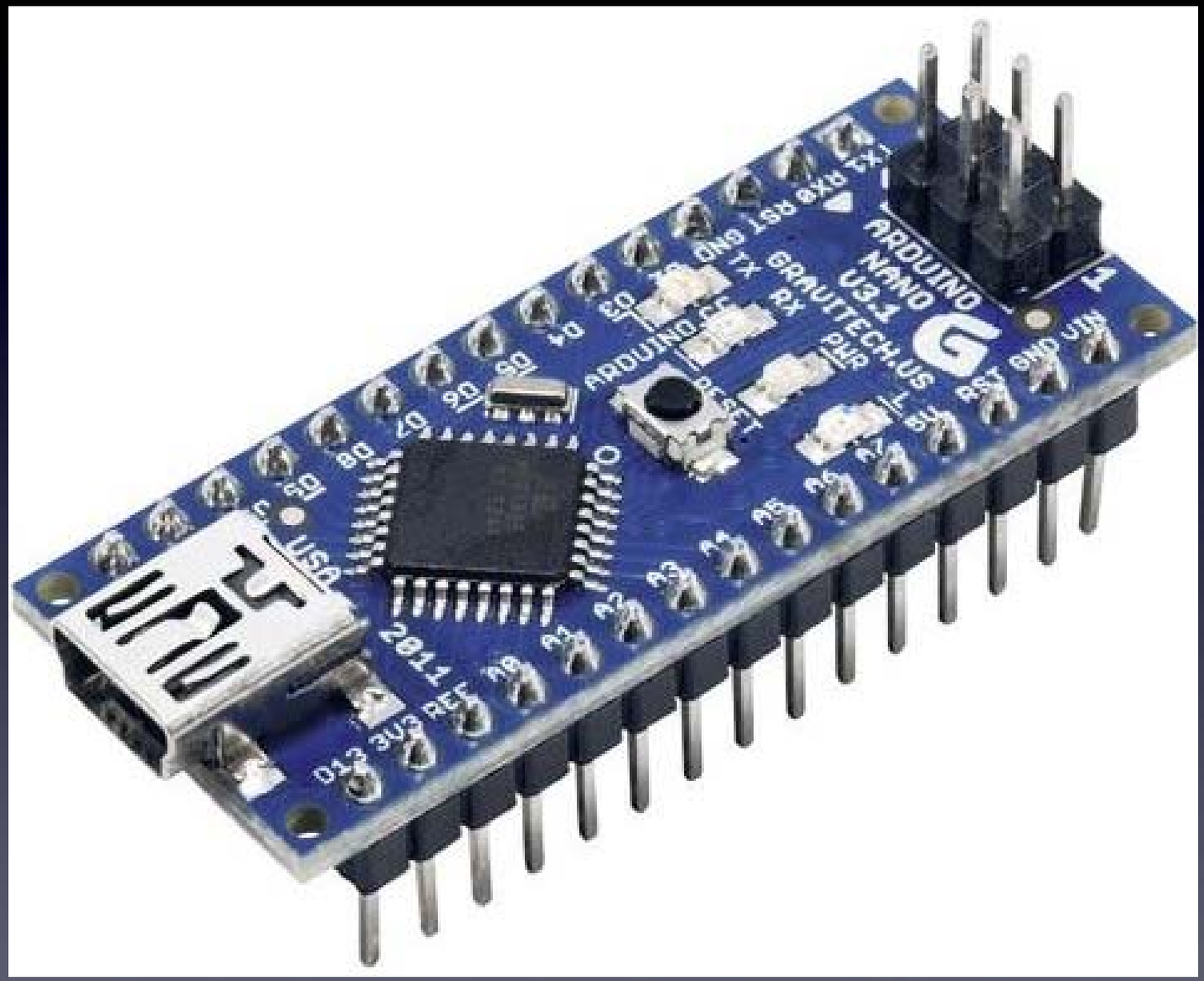
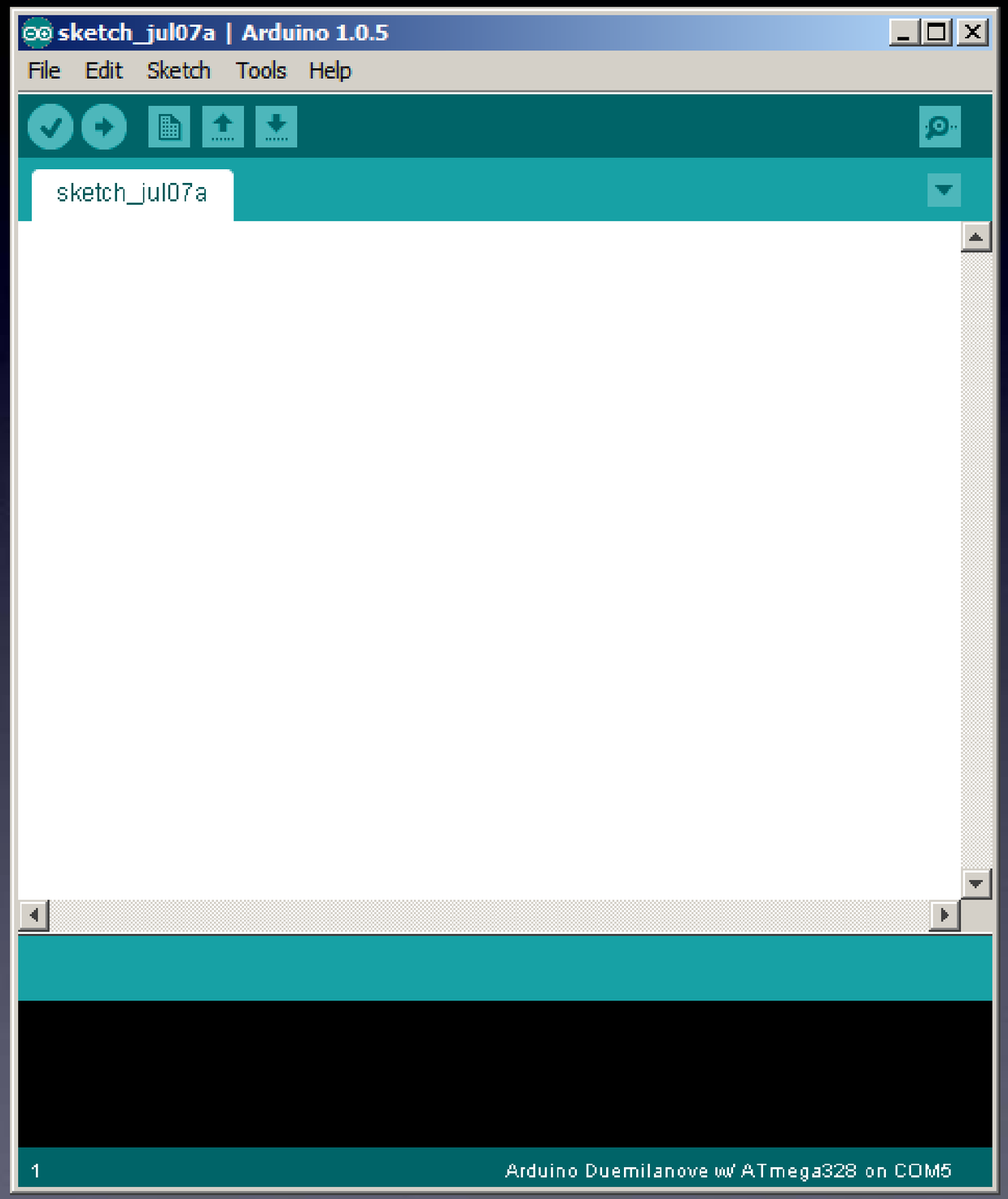
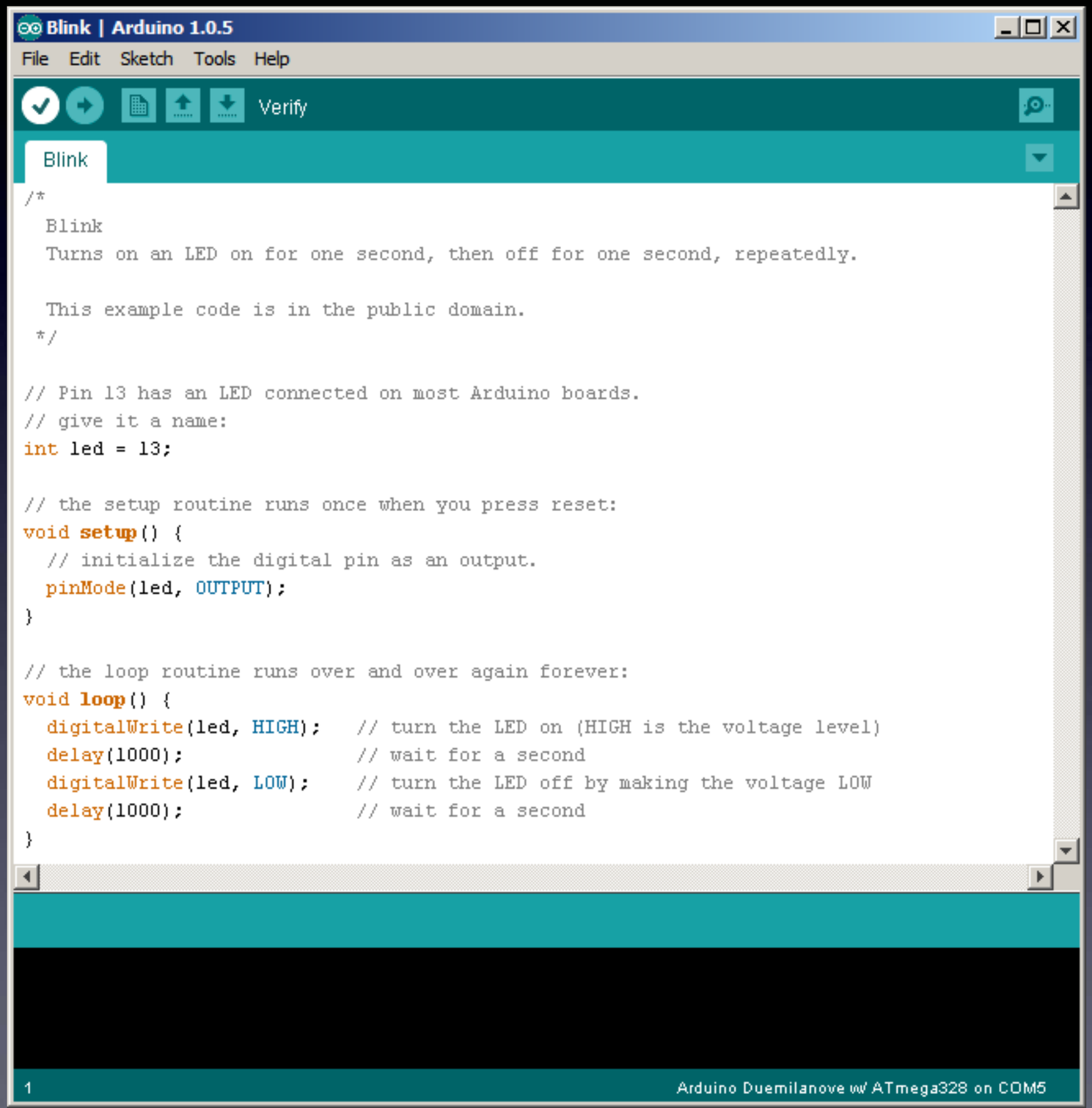


How to Set Up and Use the Arduino Software

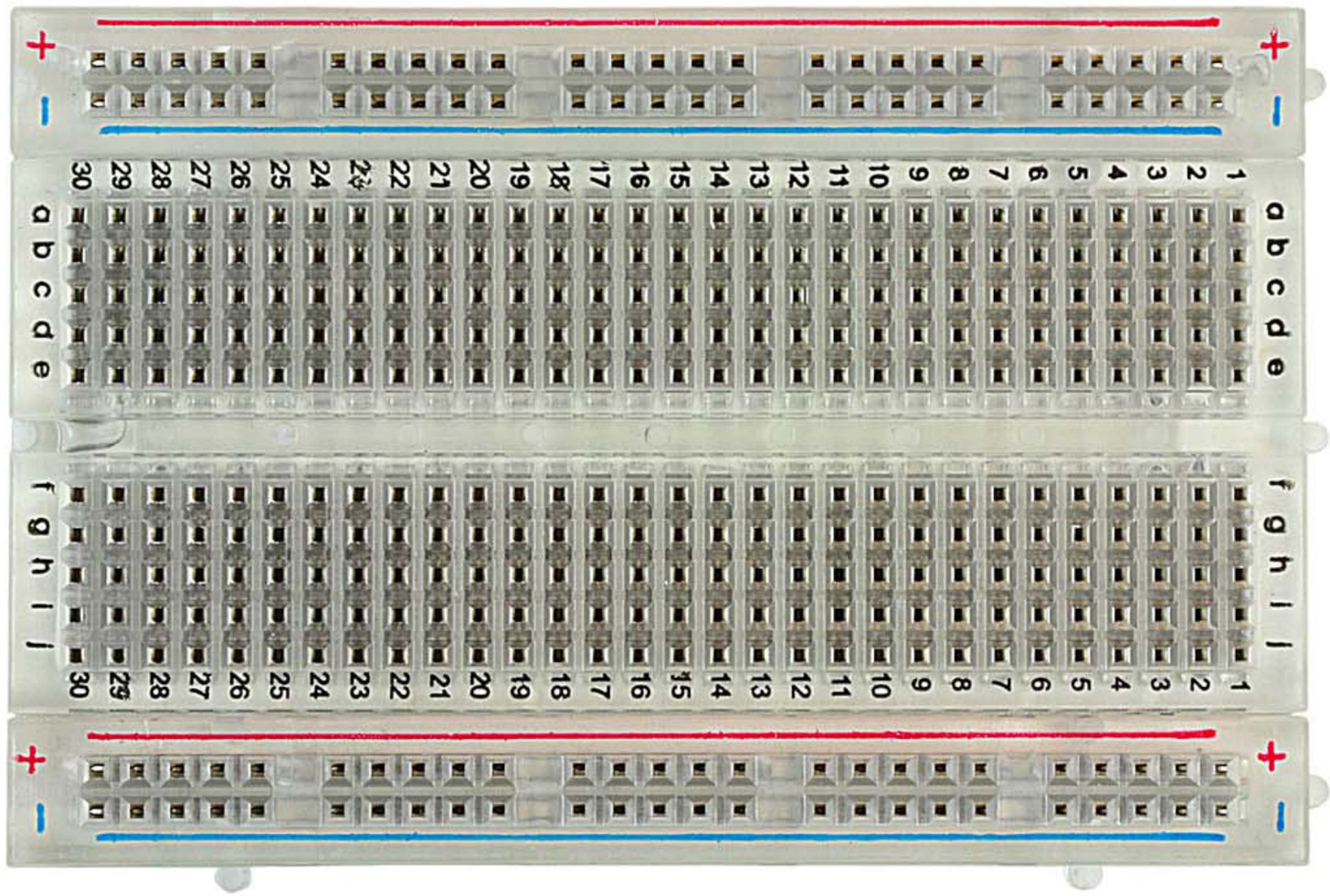


How to Hack Arduino Programs (“Sketches”)

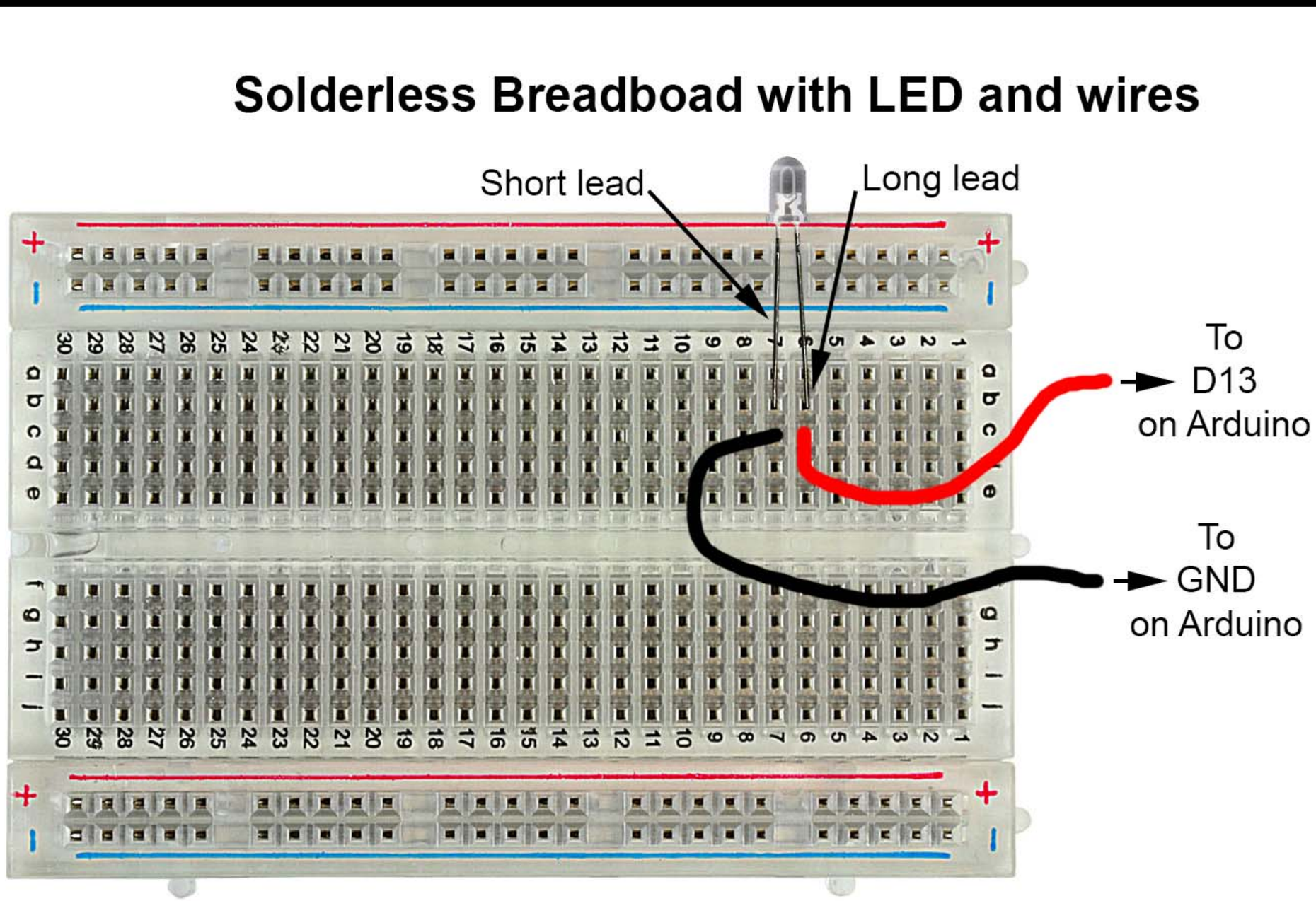


How to Use Solderless Breadboards

Solderless Breadboard



How to Use Solderless Breadboards



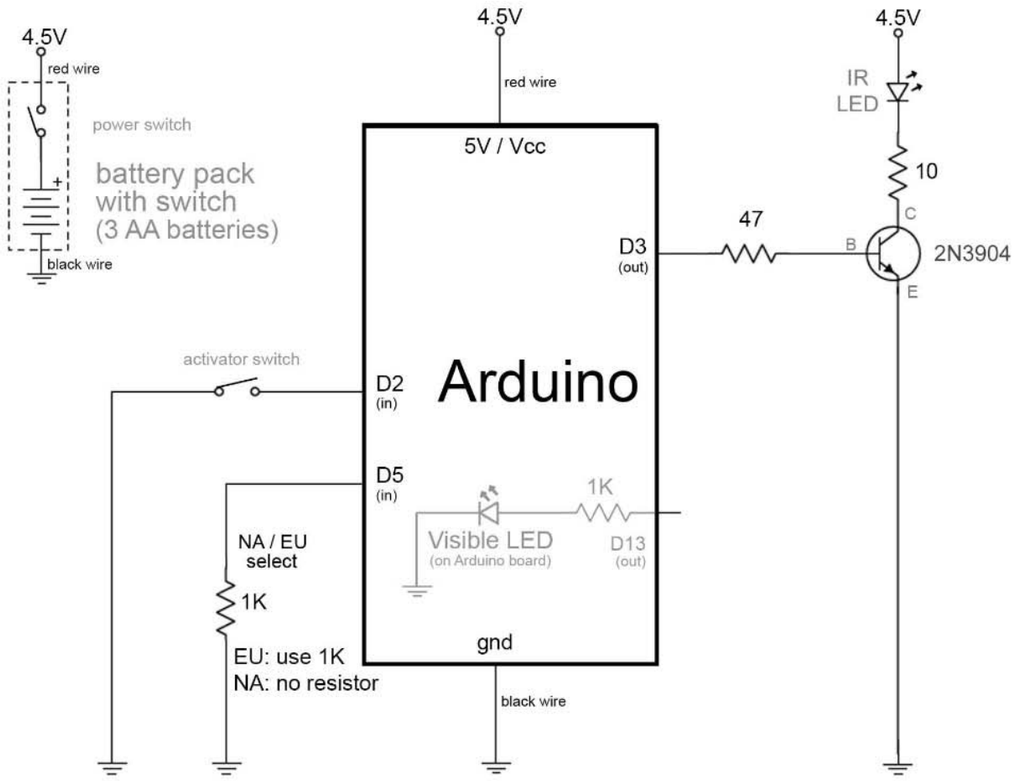
How to Read a Schematic

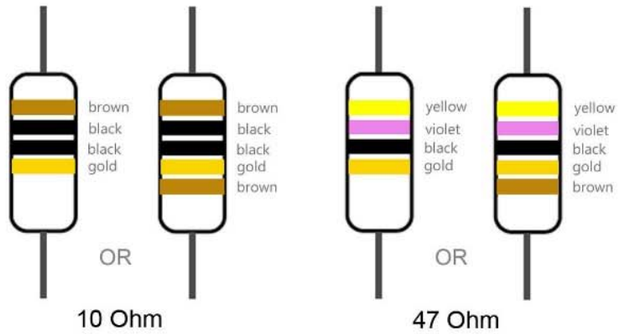
4-Sep-2015

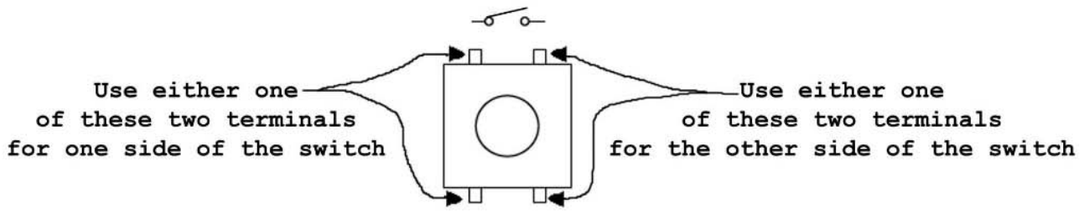
Arduino For Total Newbies

Mitch Altman (original TV-B-Gone hardware and firmware, modified TV-B-Gone Arduino design)
Limore Fried (firmware modifications, kit design)
Ken Shirriff (original modifications for Arduino)
Johannes Schneemann (documentation)

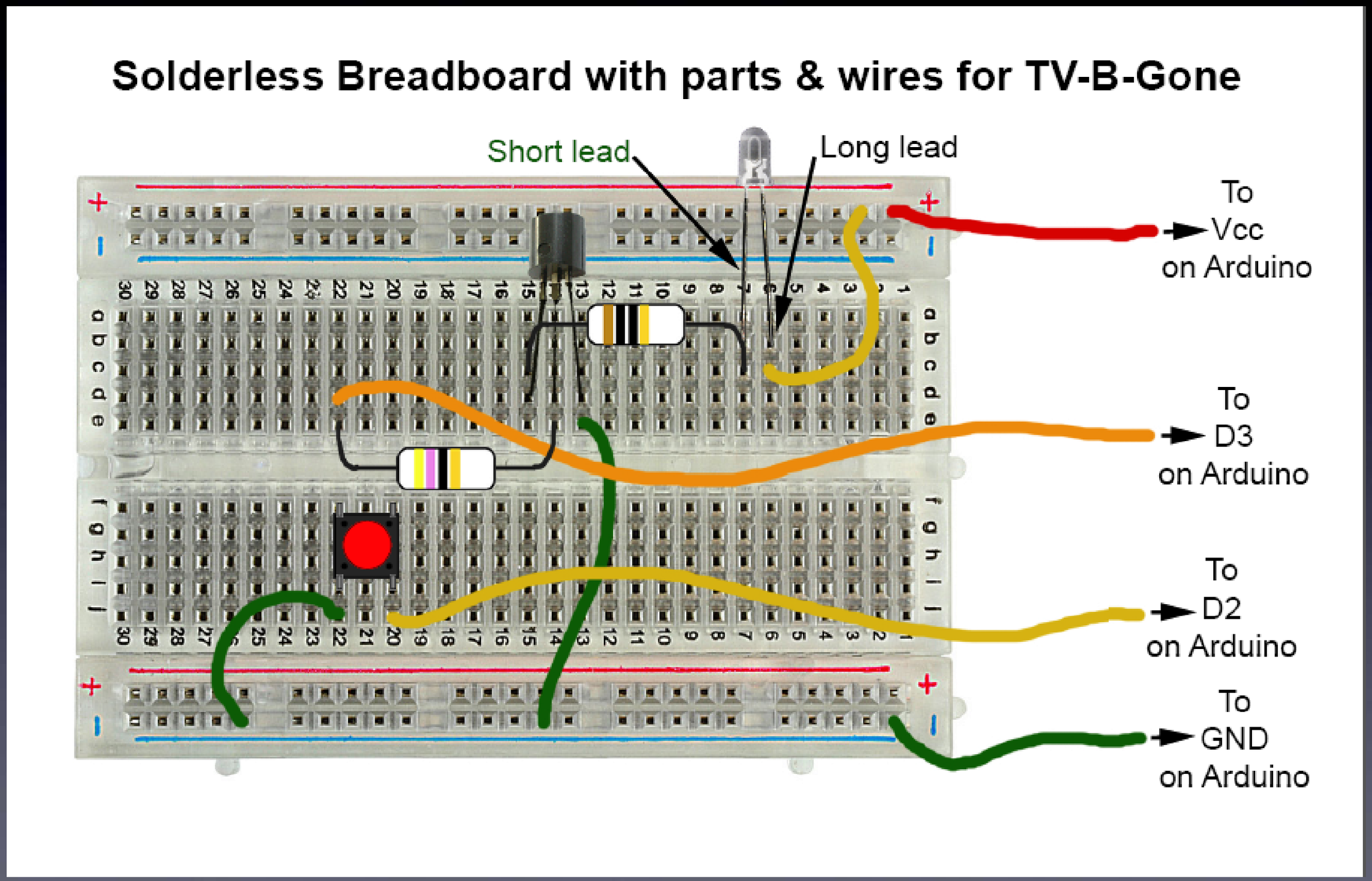
CC BY SA

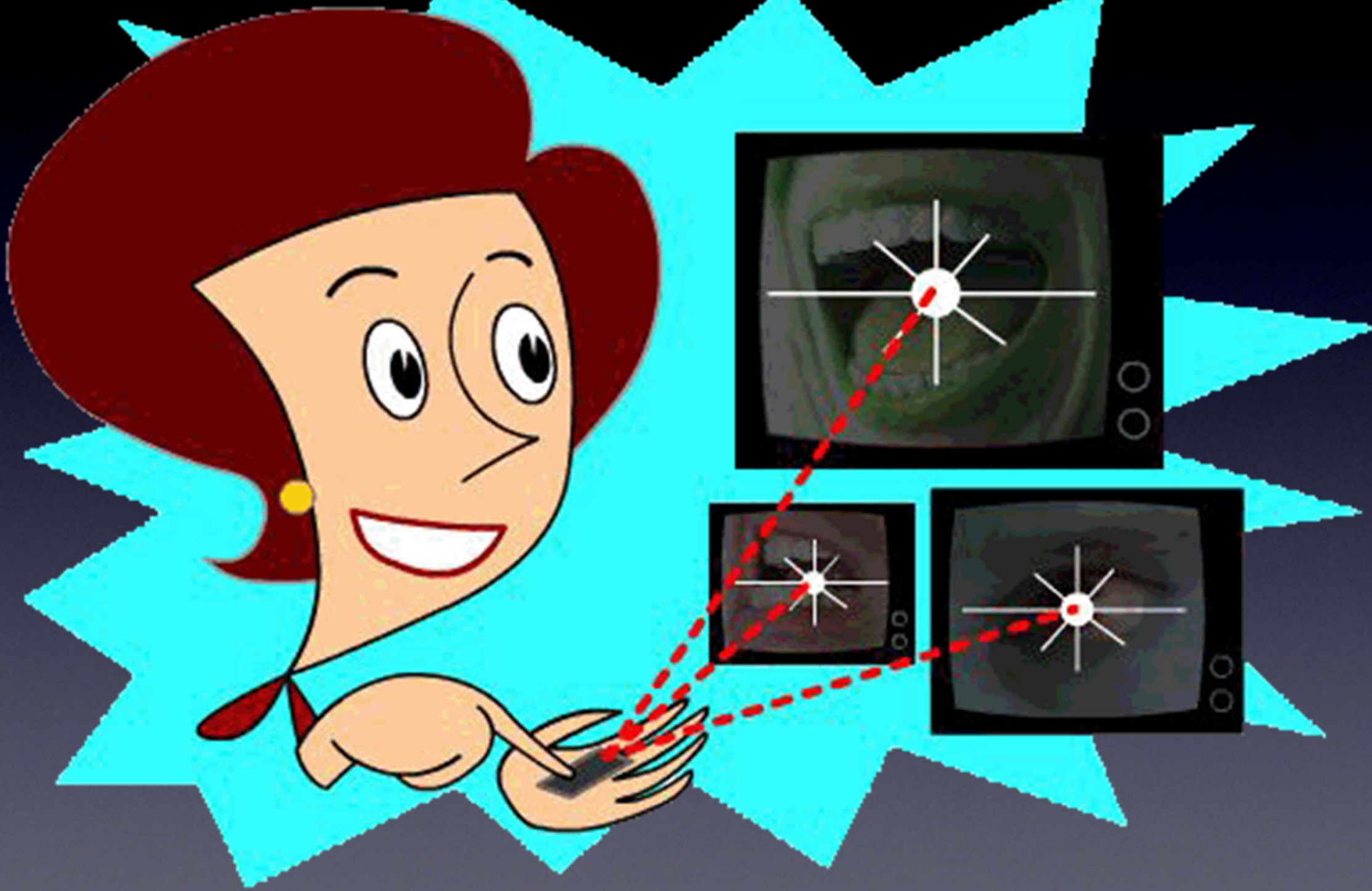






Make a TV-B-Gone Remote Control with your Arduino Clone without soldering





Questions?

Intro

Noisebridge Hacker Space
https://noisebridge.net
2169.mission.sf.ca.us

Intro

TV B-Gone™
Universal Remote Control
www.tvbgone.com

.01
.10
.50
$10
BUDDY L
.01
.10
.25
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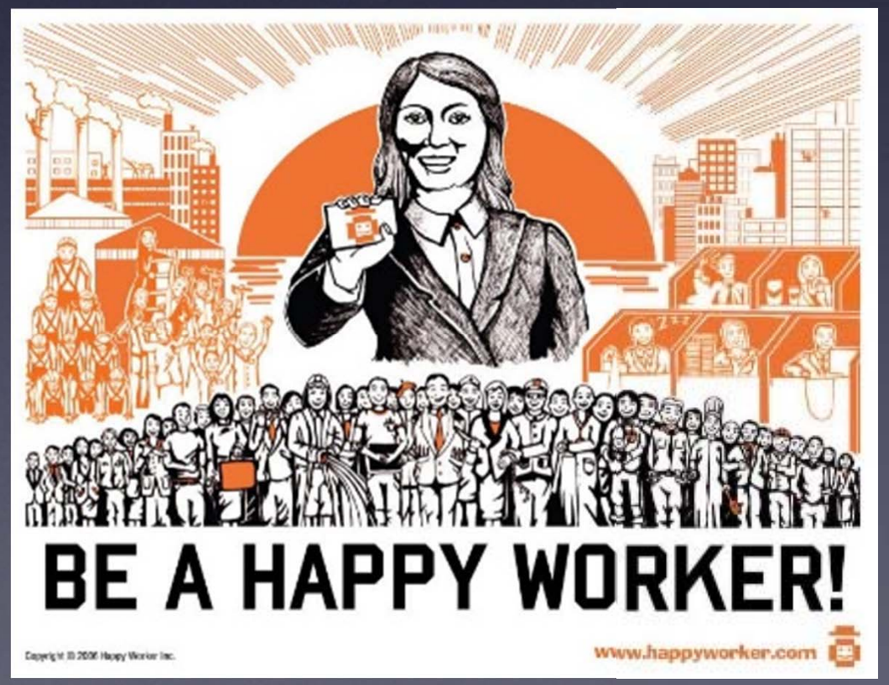
.05
.20
.50
$100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Intro

Cornfield Electronics, Inc.

MITCH ALTMAN

Chief Scientist / CEO

"Useful Electronics for a Better World"

www.CornfieldElectronics.com

572 Hill St. #Penthouse, San Francisco, CA 94114

phone: +1 415 / 377 - 5993

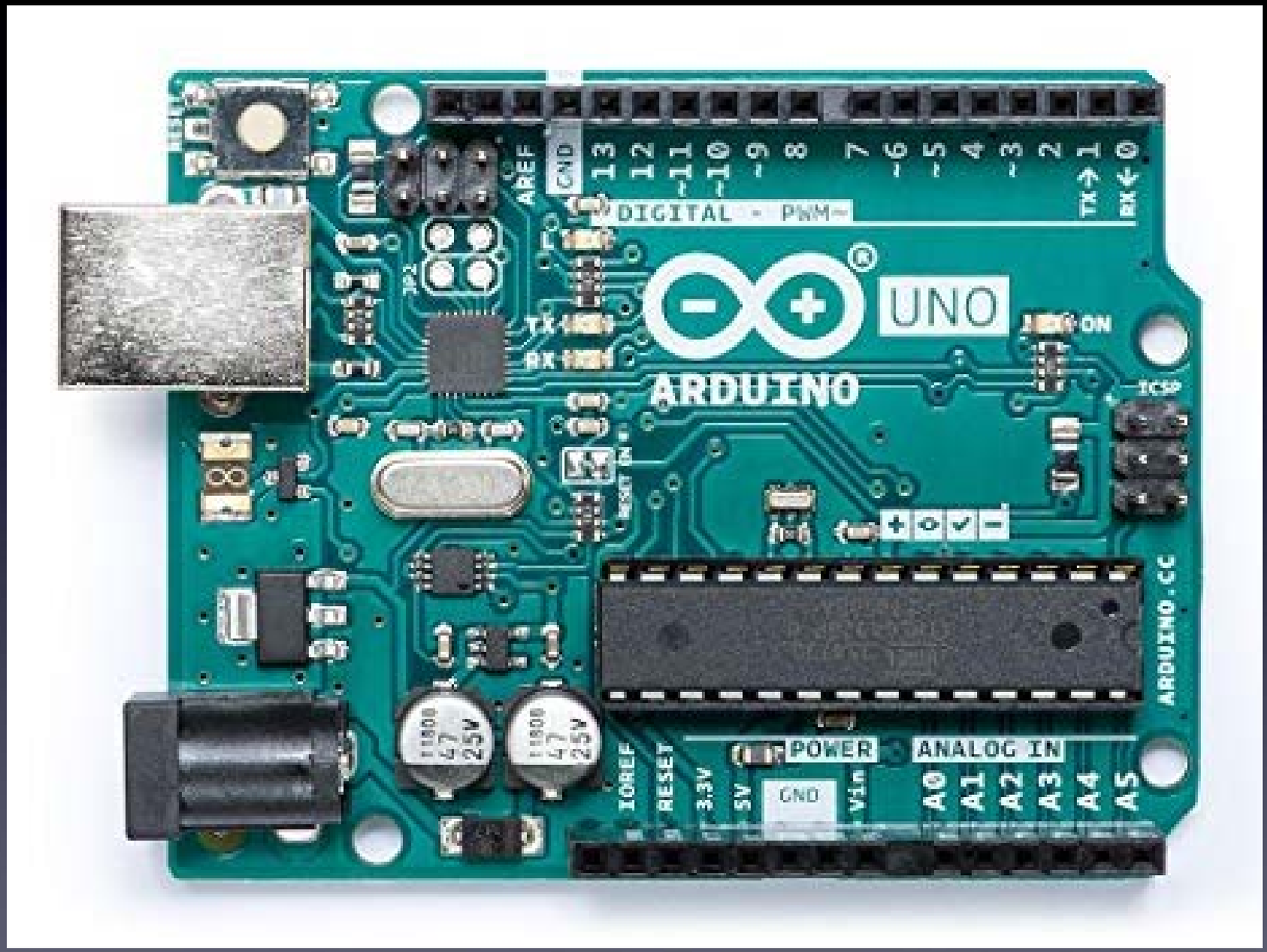
mitch@CornfieldElectronics.com

@maltman23

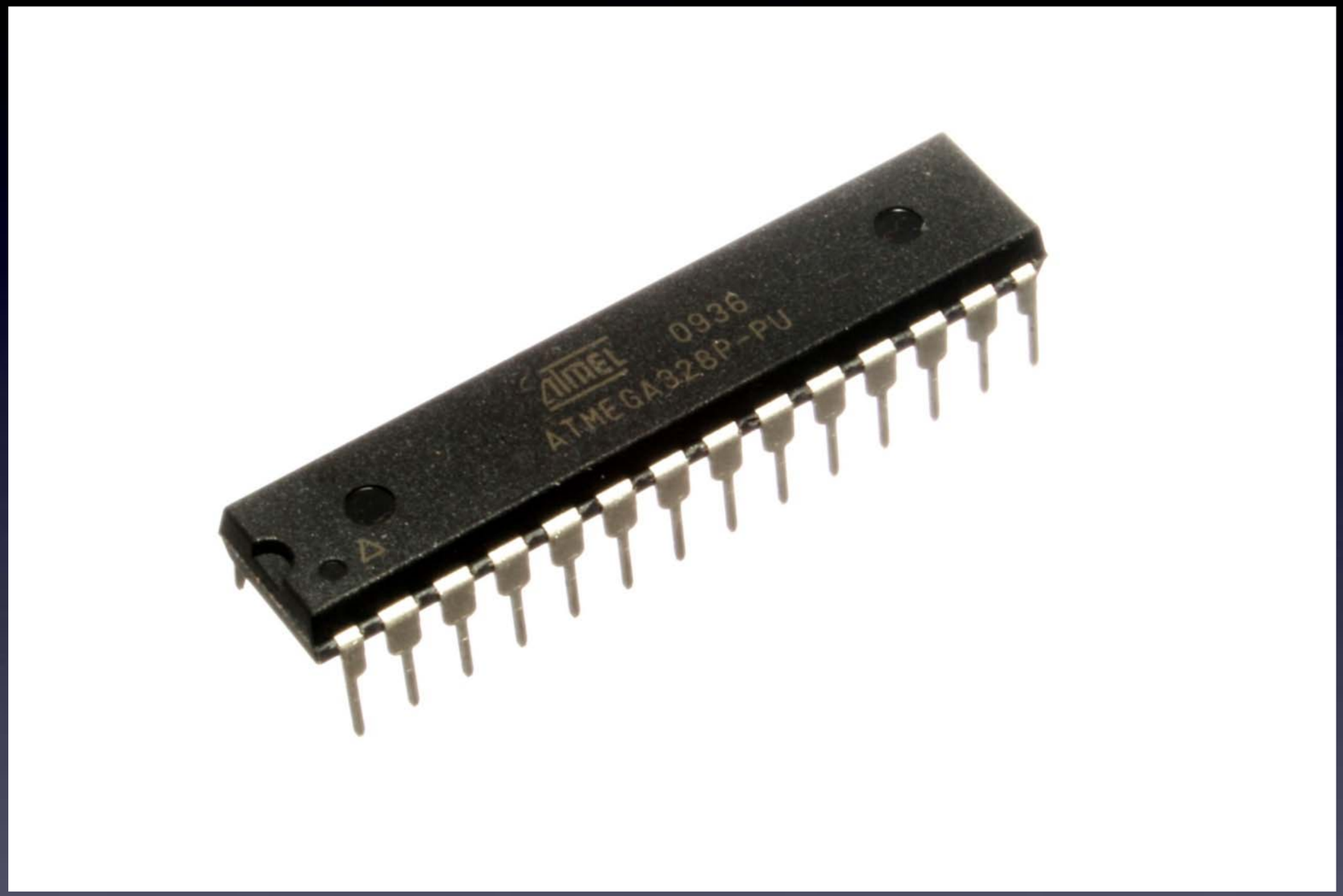
Intro

Arduino For Total Newbies Workshop at 30C3, Hamburg Germany

Intro to Arduino

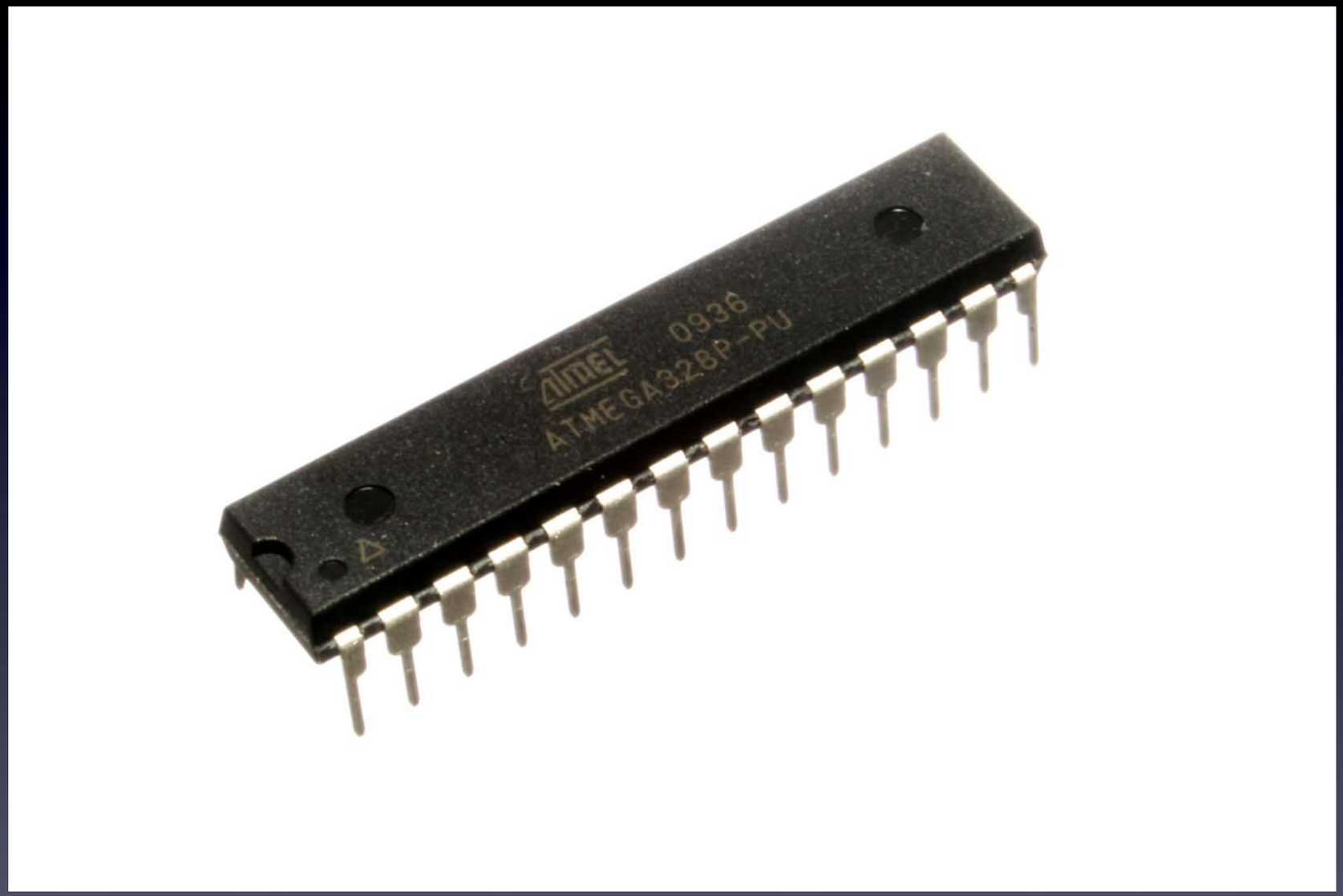


Intro to Arduino: microcontrollers



A complete computer on a chip

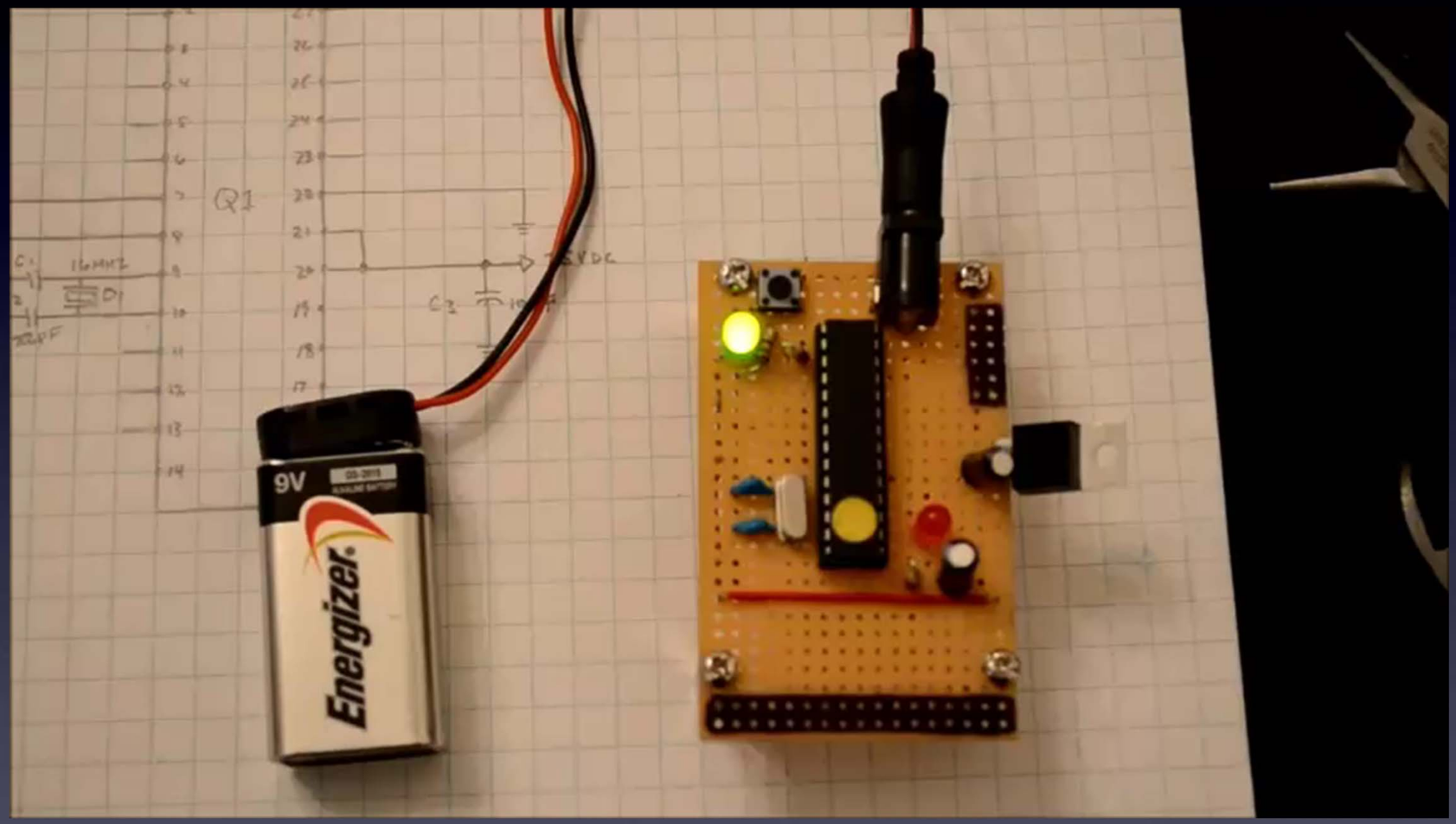
Intro to Arduino: microcontrollers



A complete computer on a chip:

they control parts connected to their pins

Intro to Arduino: microcontrollers



Intro to Arduino: microcontrollers

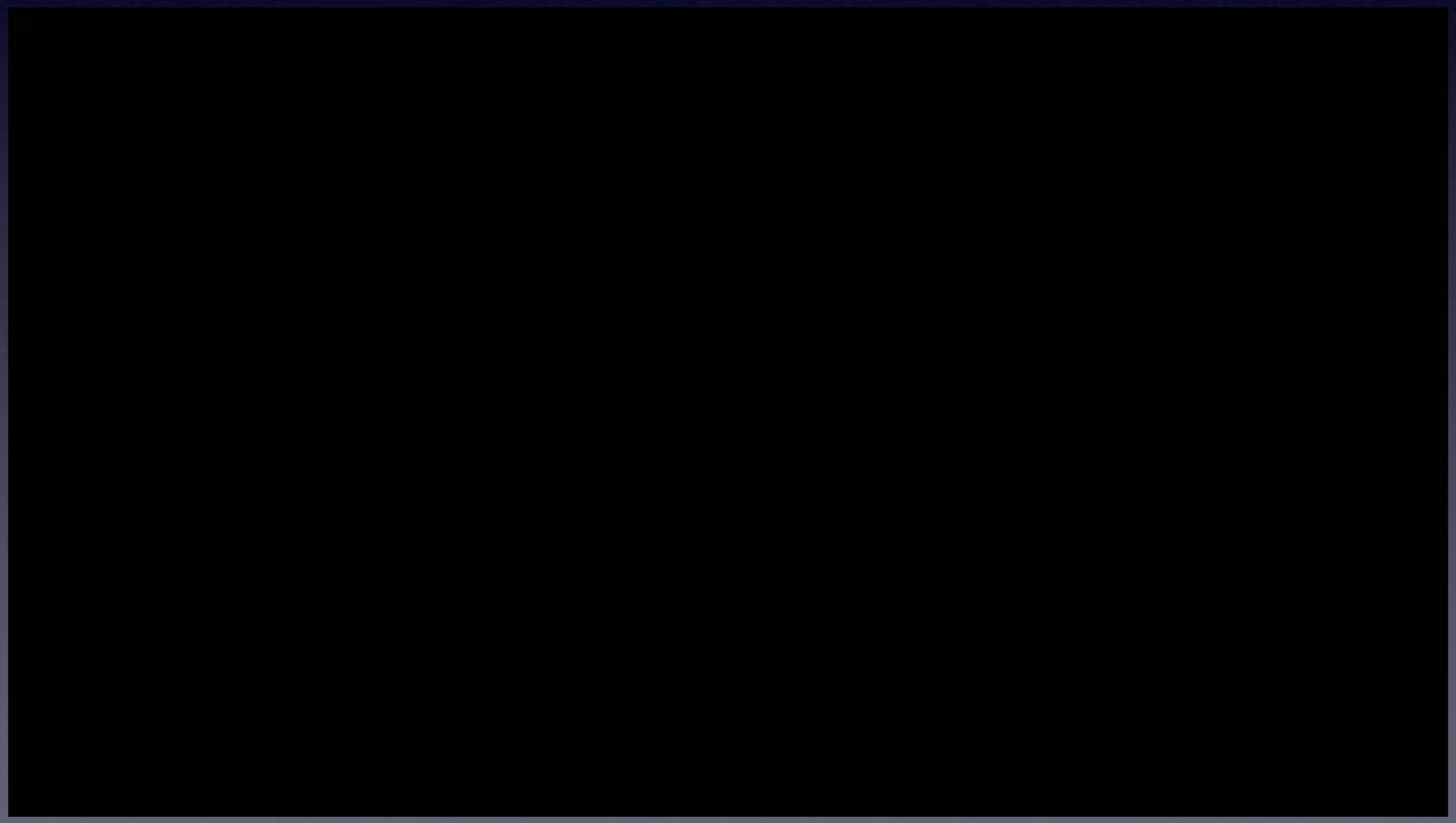
-- some of Mitch's projects --

***Trippy RGB Waves** kit*

Intro to Arduino: microcontrollers

-- some of Mitch's projects --

ArduTouch music synthesizer *kit*



Intro to Arduino: microcontrollers

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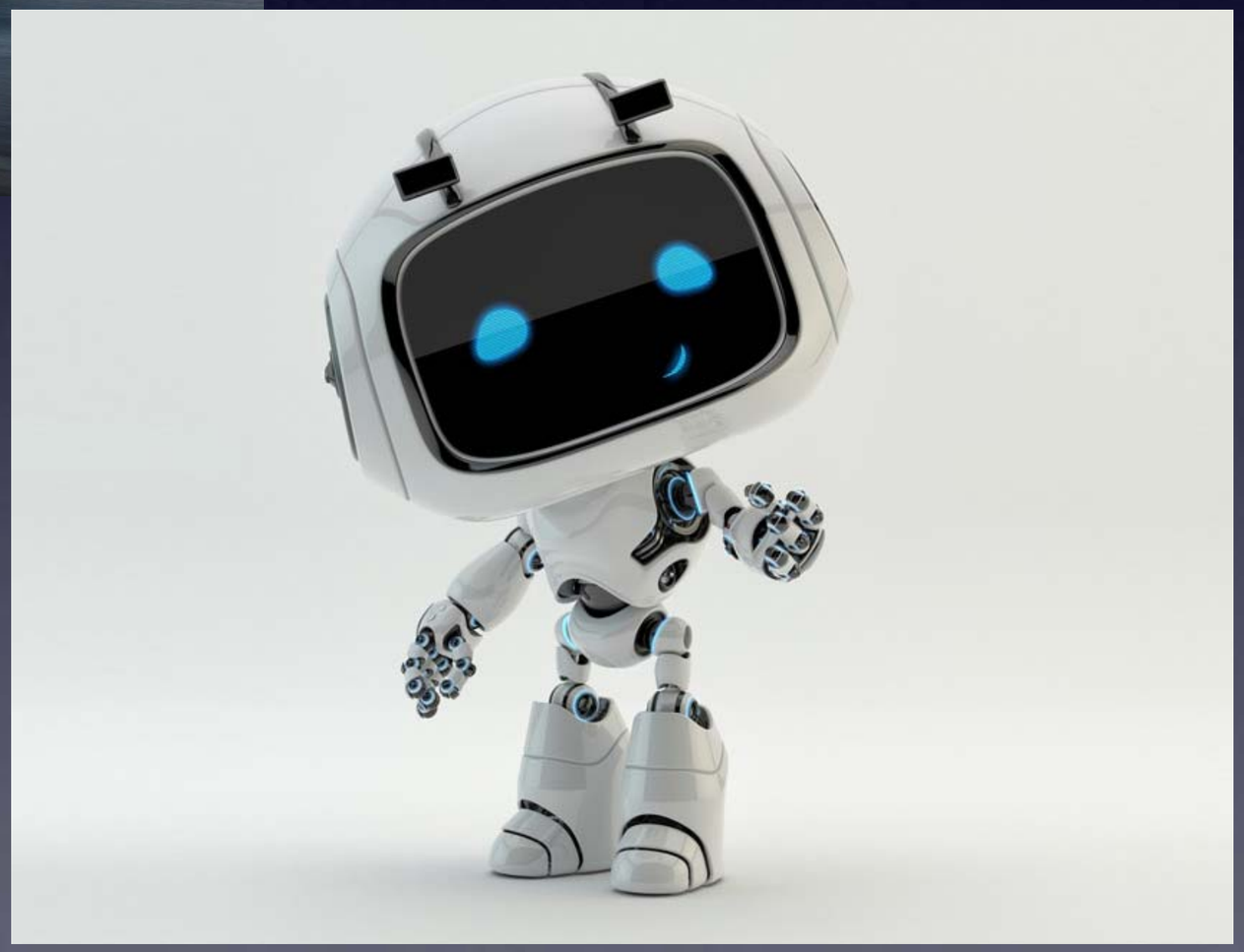

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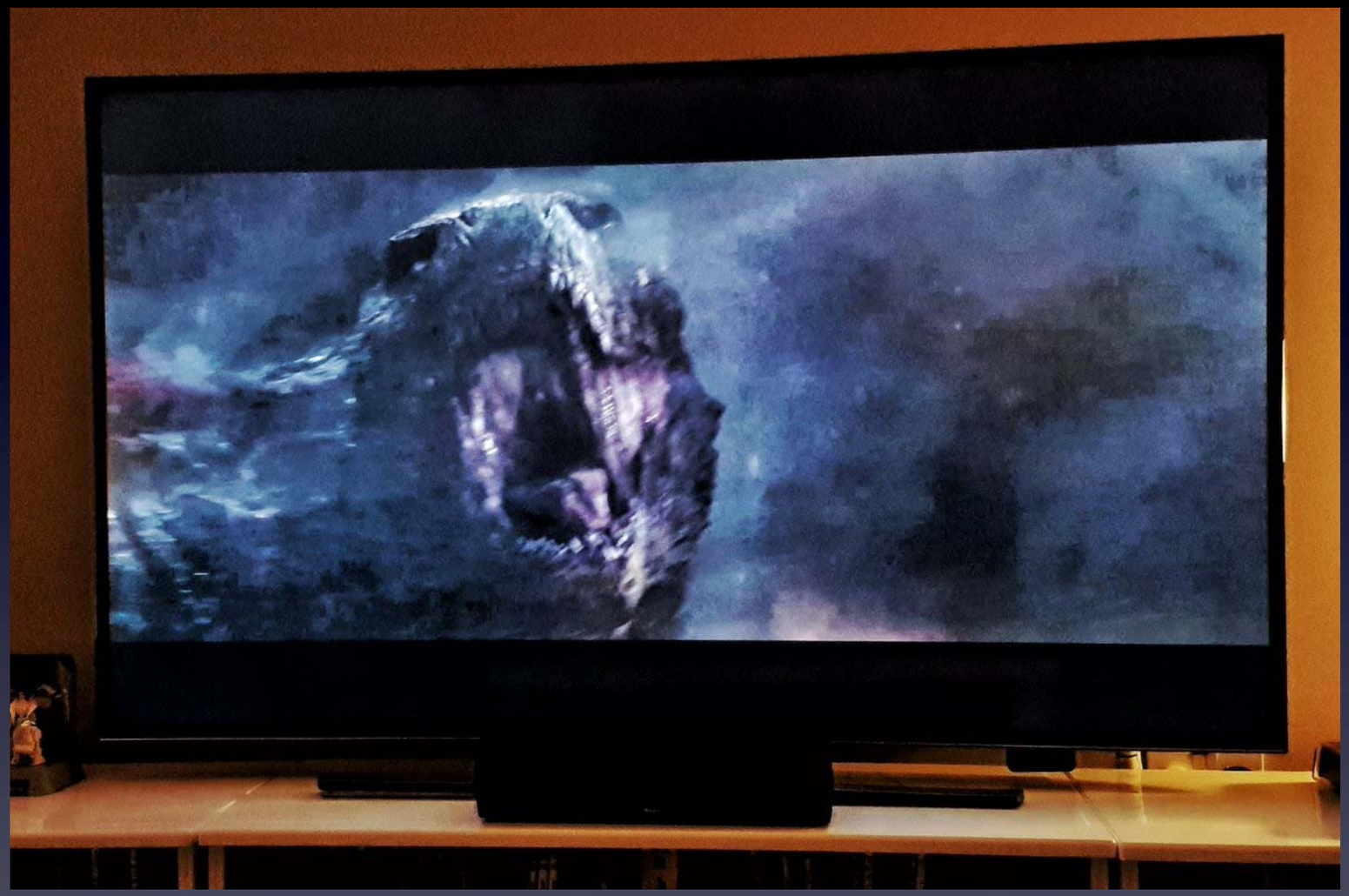

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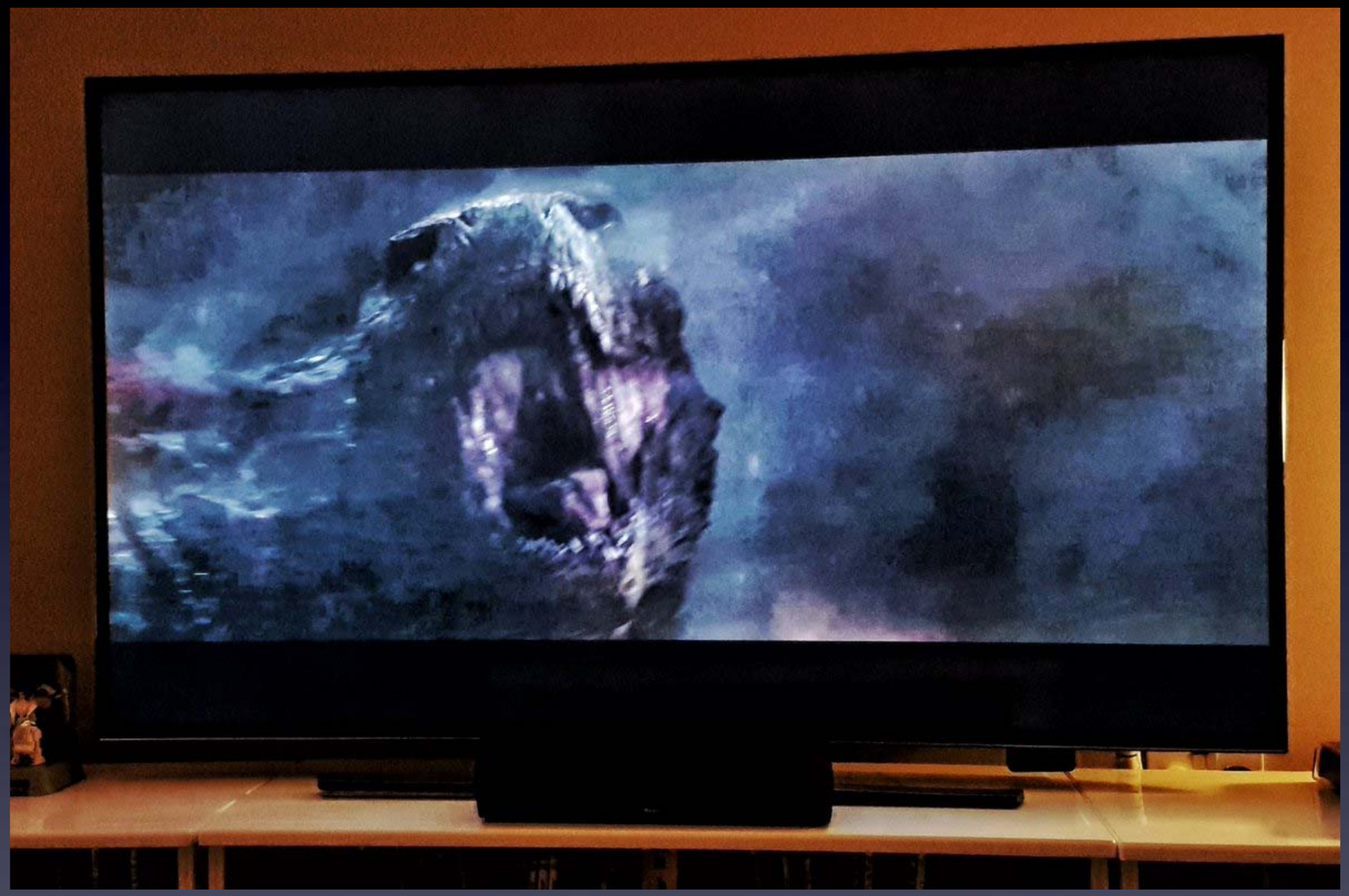


Intro to Arduino: microcontrollers

-- some of Mitch's projects --

TV-B-Gone

Intro to Arduino: microcontrollers

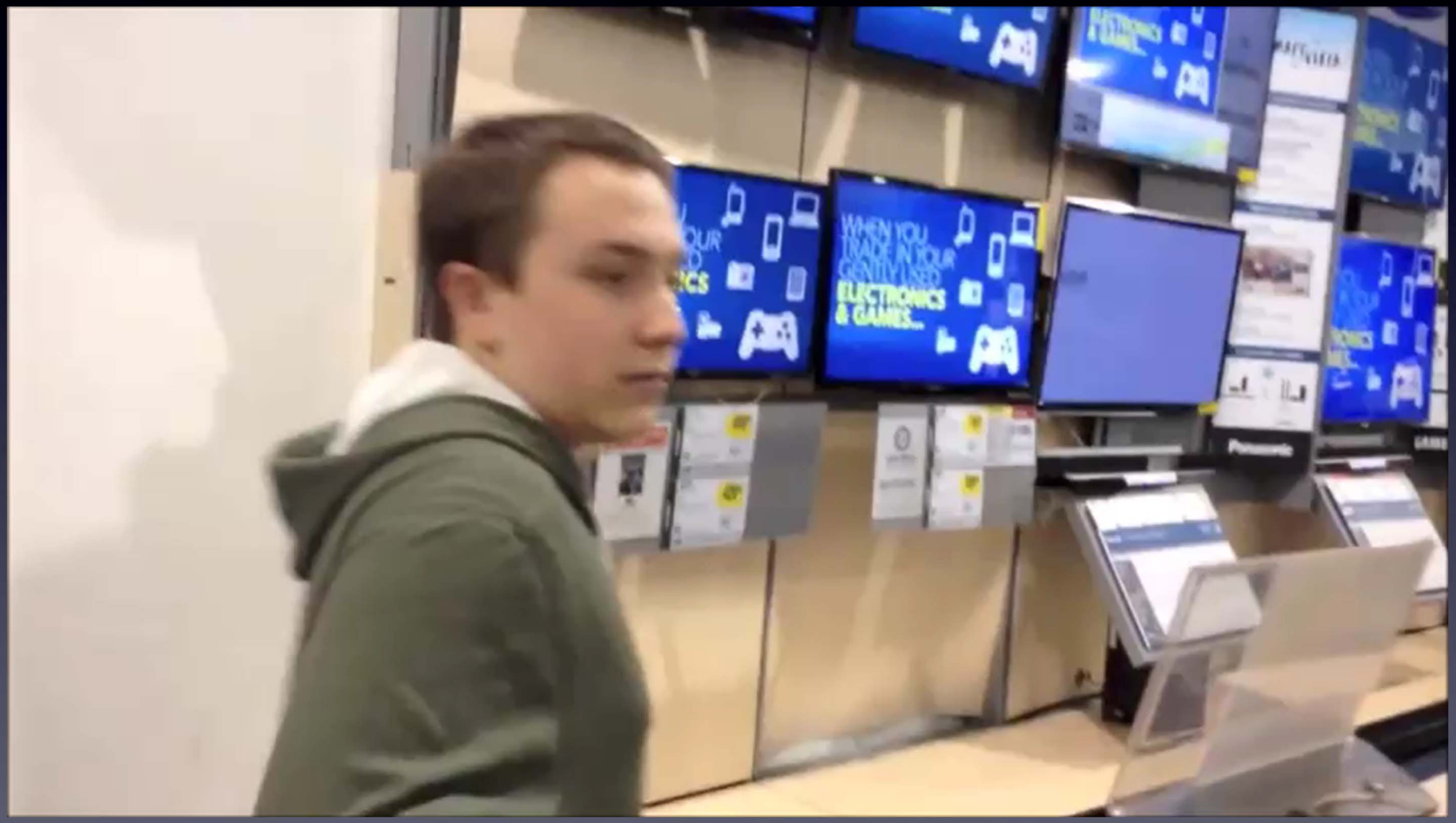
-- some of Mitch's projects --

TV-B-Gone

Just a remote control, but only one button: OFF !

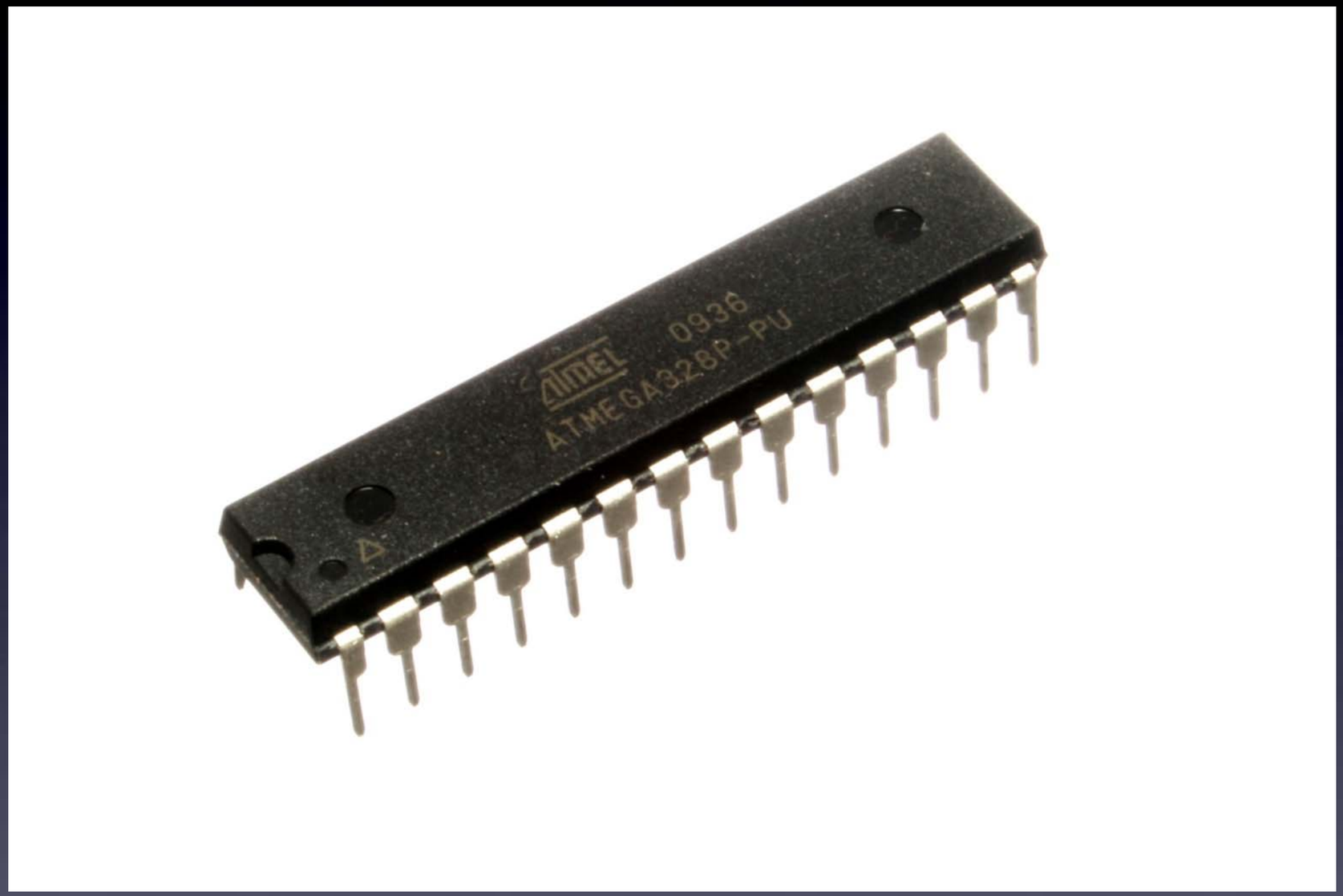
Intro to Arduino: microcontrollers

-- some of Mitch's projects --



TV-B-Gone

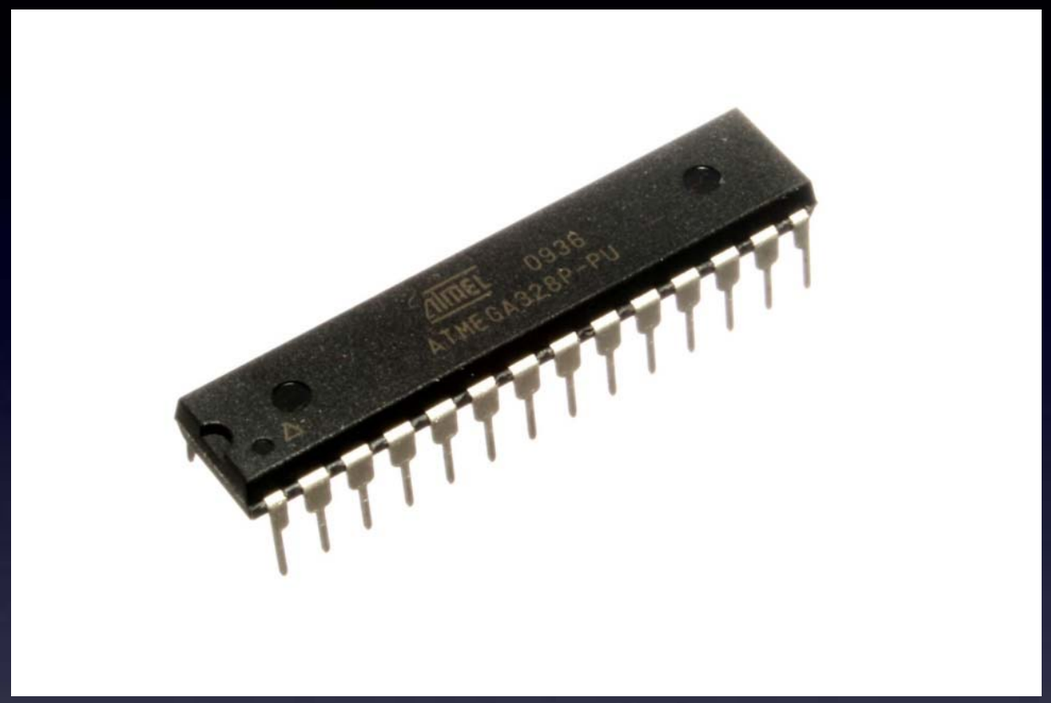
Intro to Arduino: microcontrollers



A complete computer on a chip:

they control parts connected to their pins

Intro to Arduino: microcontrollers



A complete computer on a chip:

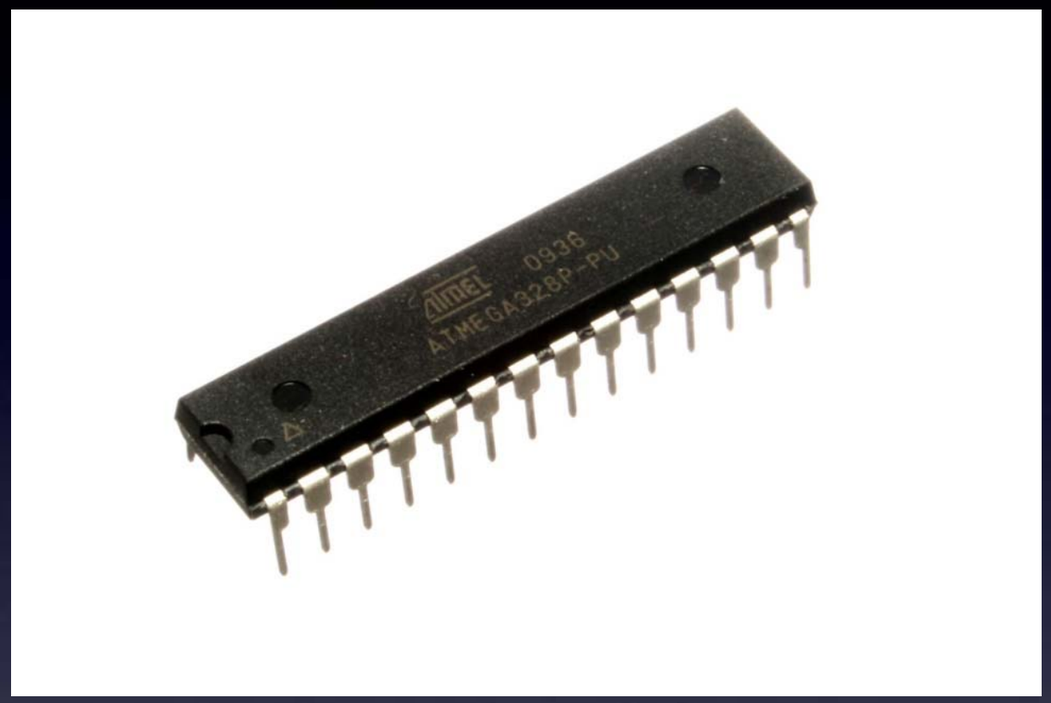
they control parts connected to their pins

But,

How do you
connect parts to its pins?

How do you
create and upload a program
to control the parts?

Intro to Arduino: microcontrollers



A complete computer on a chip:

they control parts connected to their pins

But,

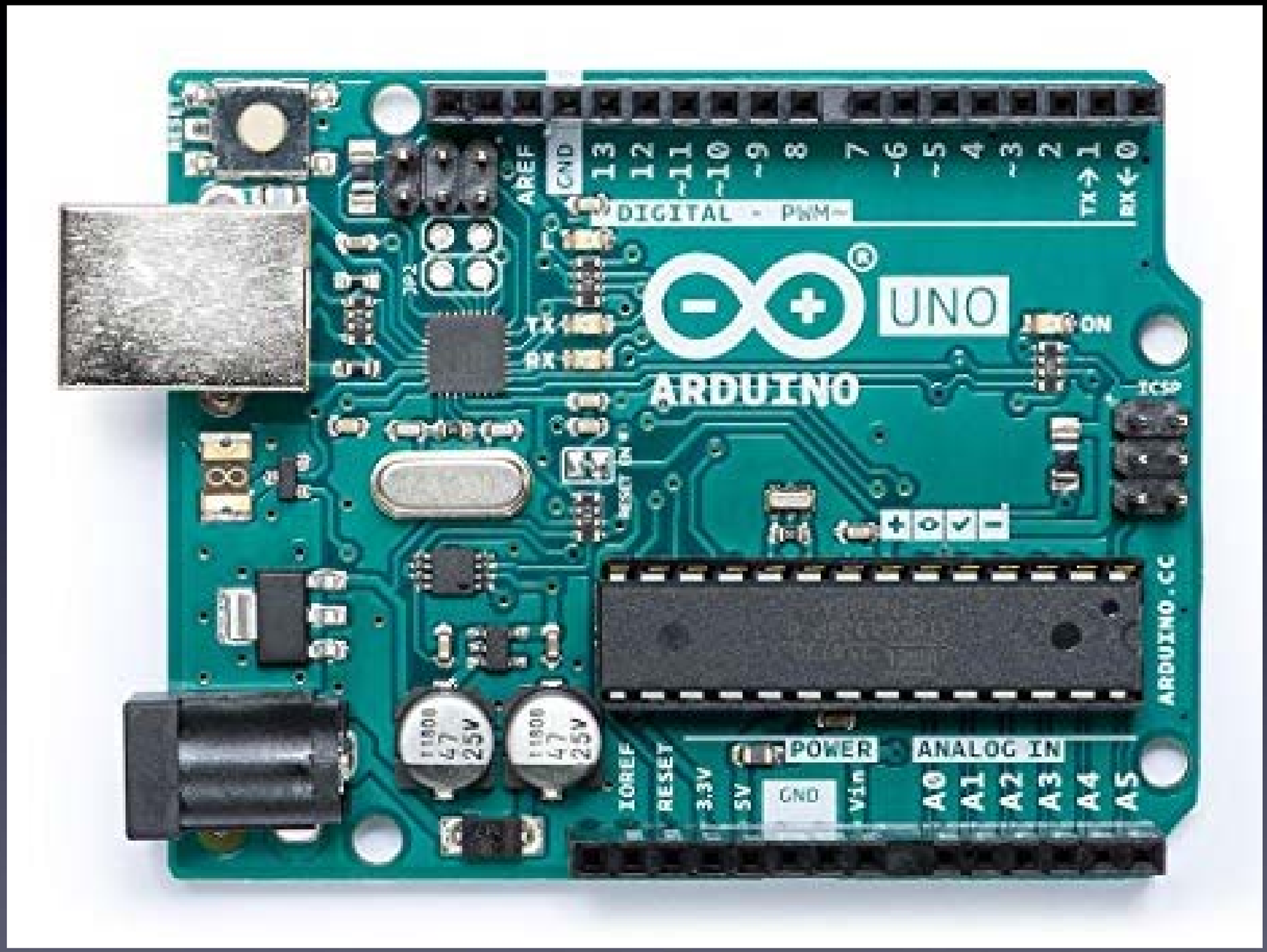
How do you
connect parts to its pins?

How do you
create and upload a program
to control the parts?

Answer: Be a geek, and learn how!

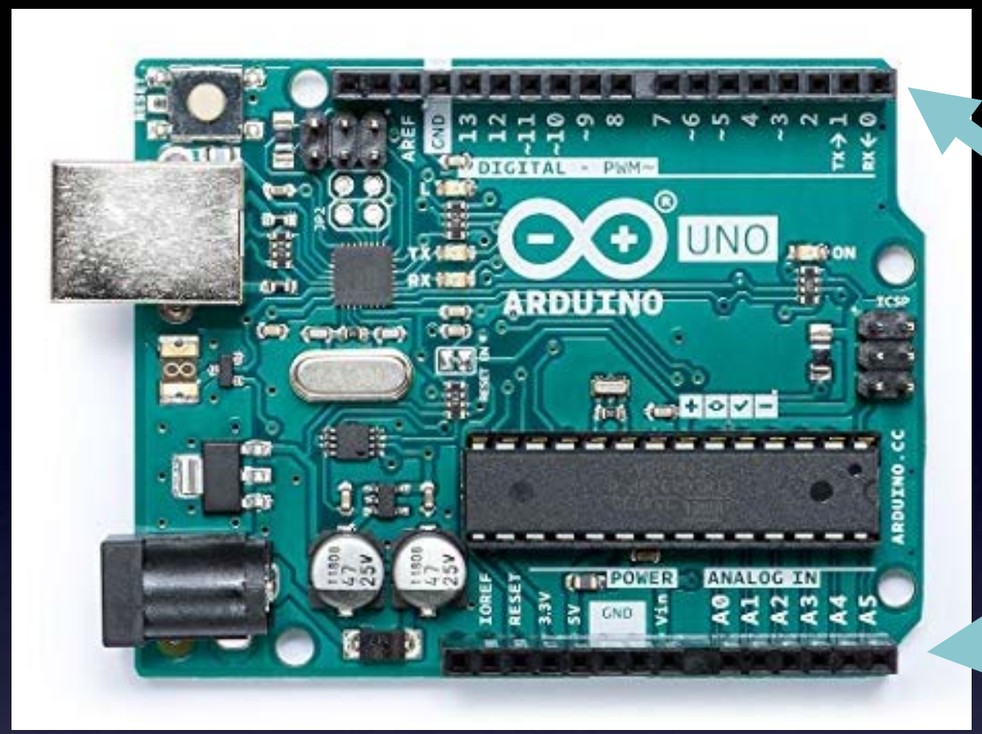
Or

Intro to Arduino



Use an Arduino board

Intro to Arduino



Super easy to
connect parts
to its microcontroller's pins

Use an Arduino board

Intro to Arduino

Use an Arduino board

Super easy to
connect parts
to its microcontroller's pins

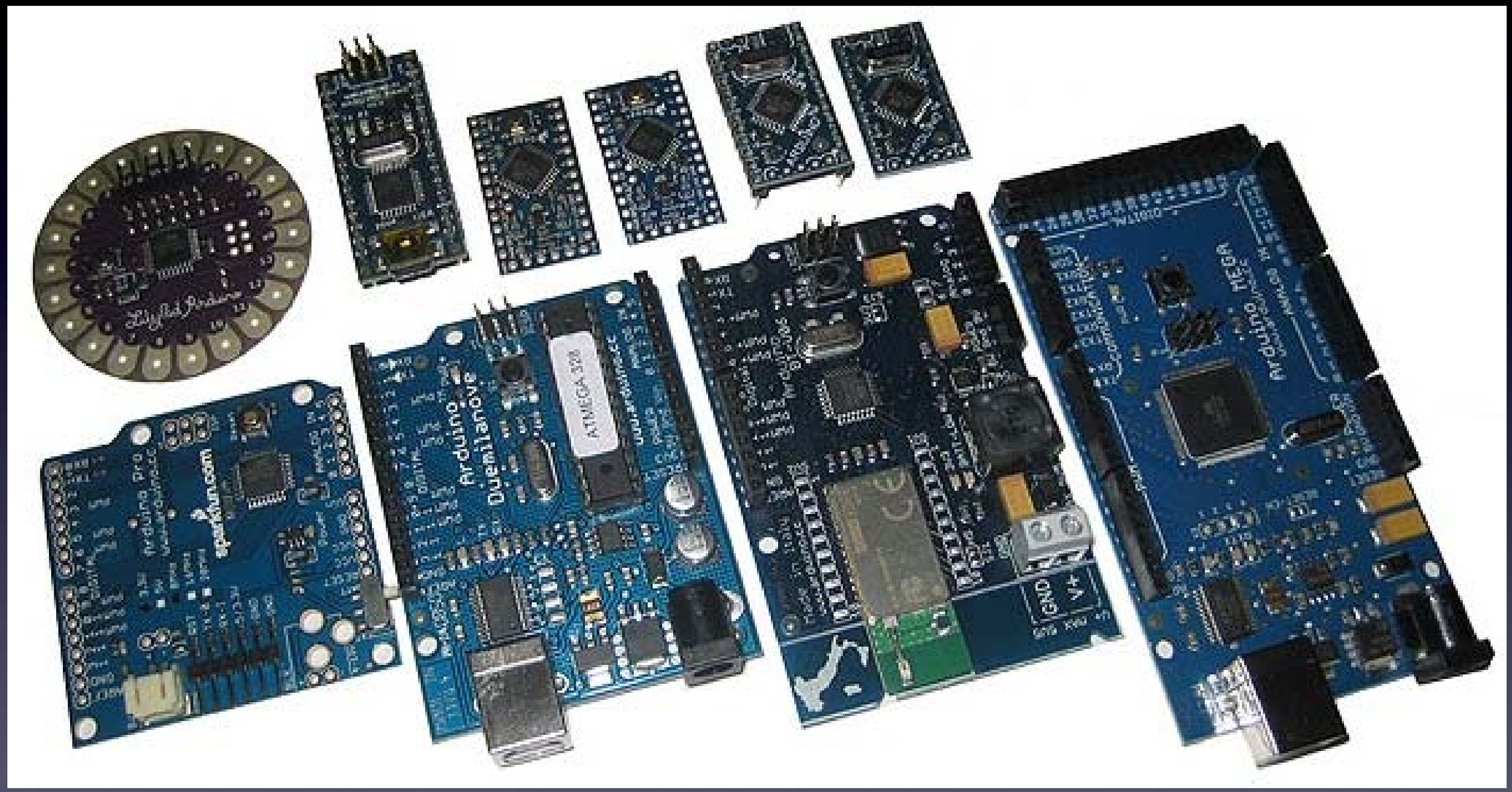
Super easy to
create and upload a program
to control the parts

Intro to Arduino

Arduino board

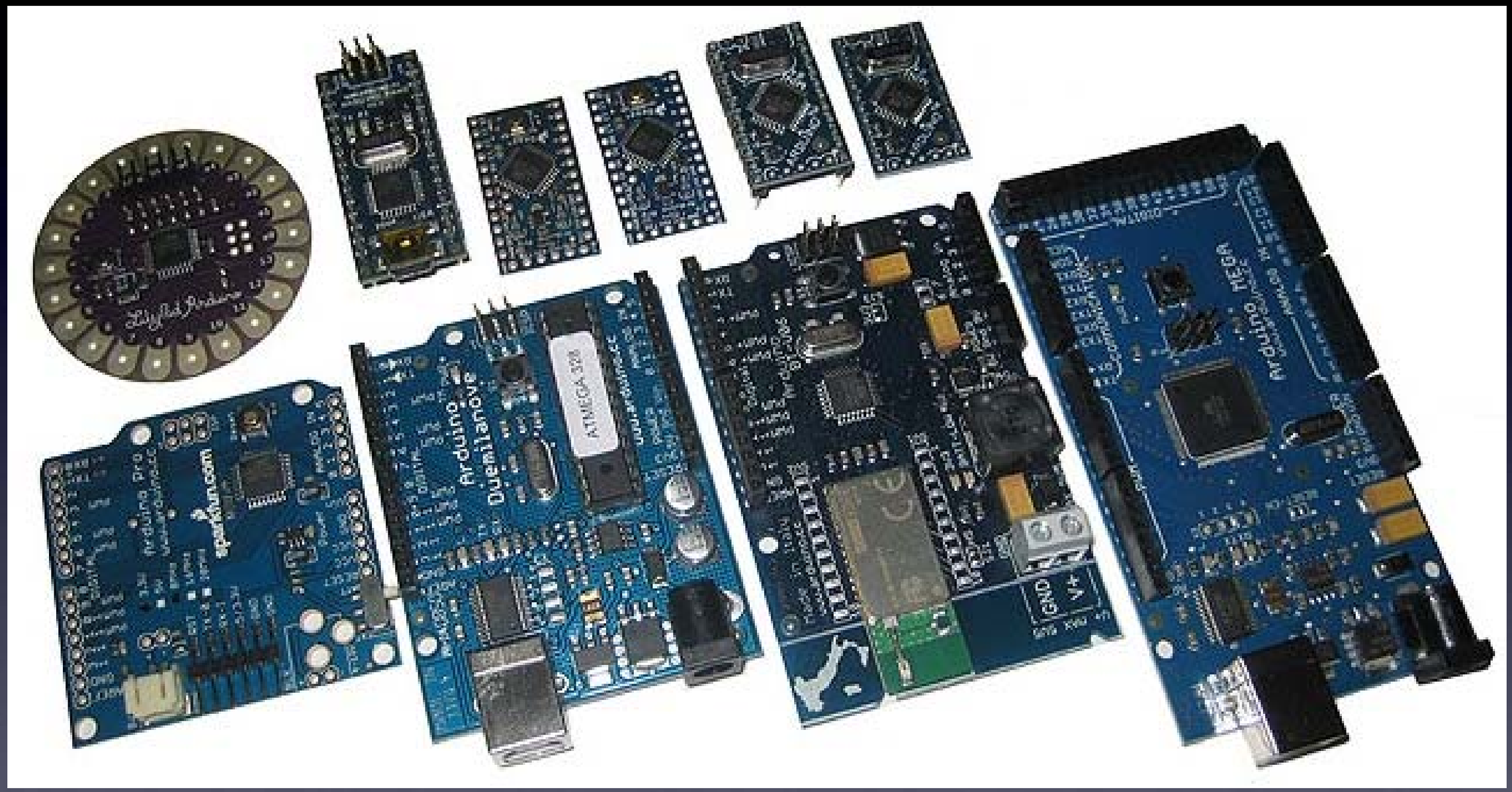
Designed for
non-geeky artists

Intro to Arduino



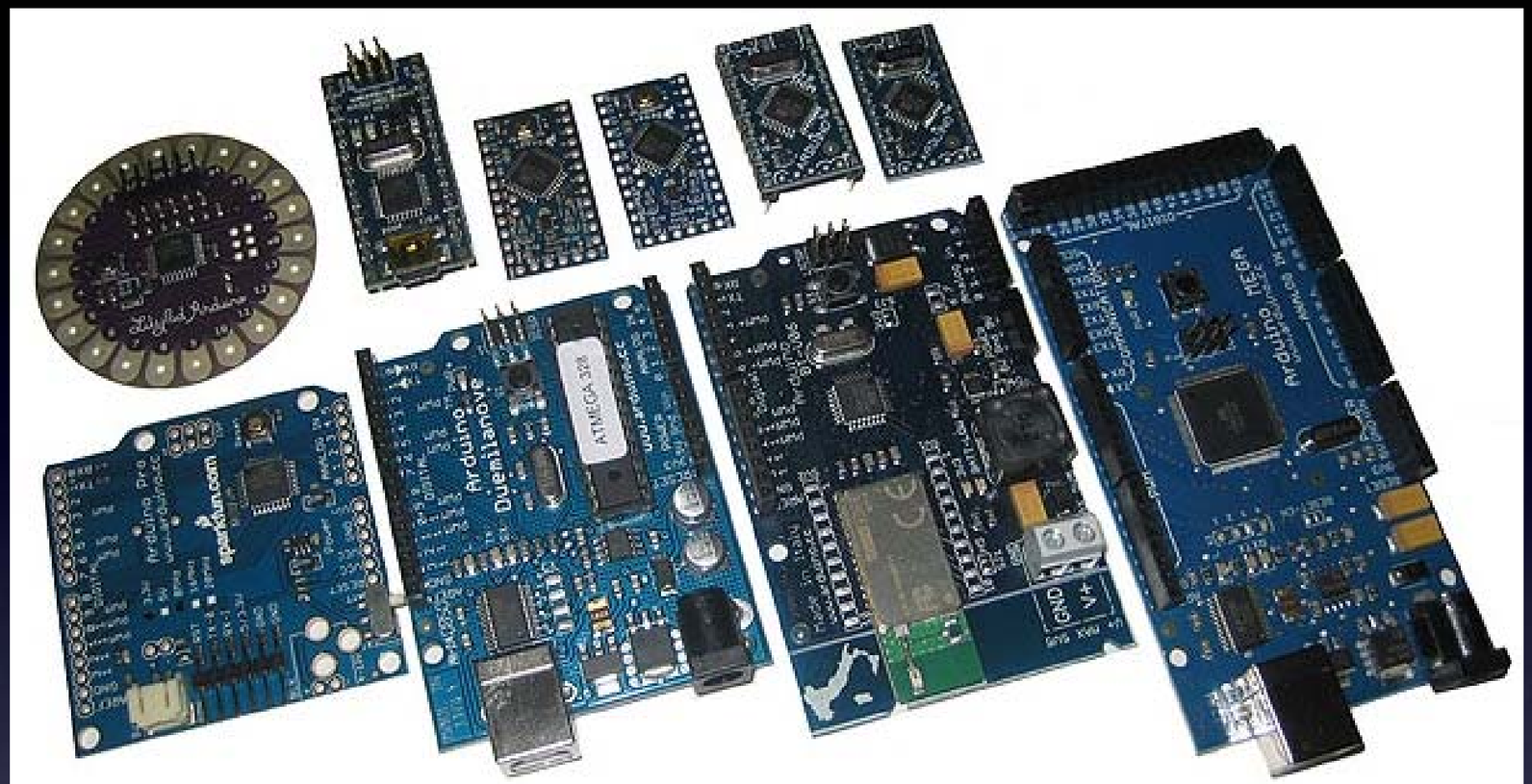
Many Arduino boards to choose from

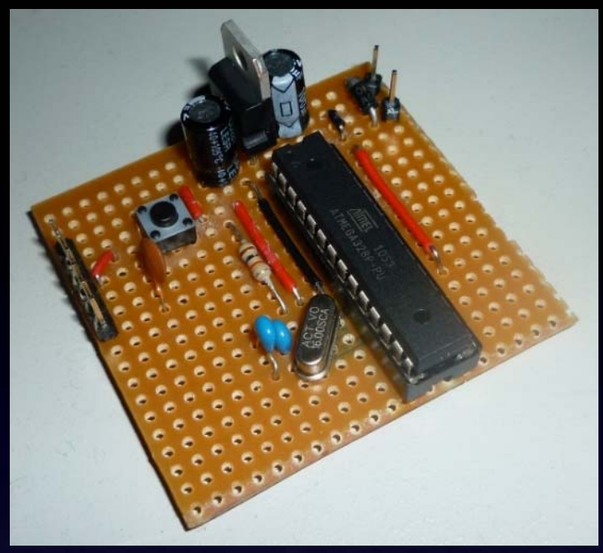
Intro to Arduino

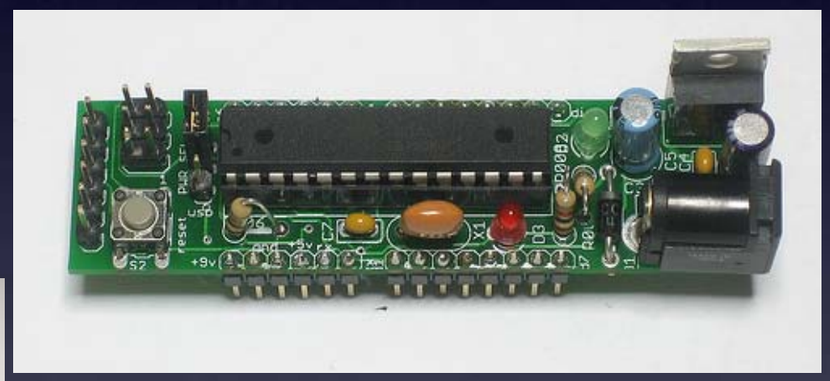


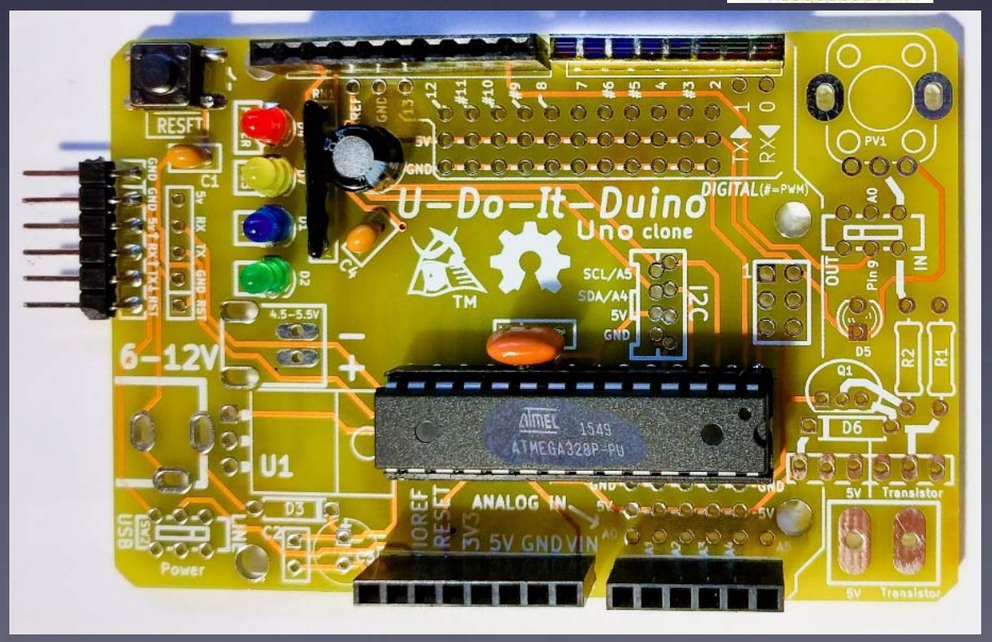
Open Source

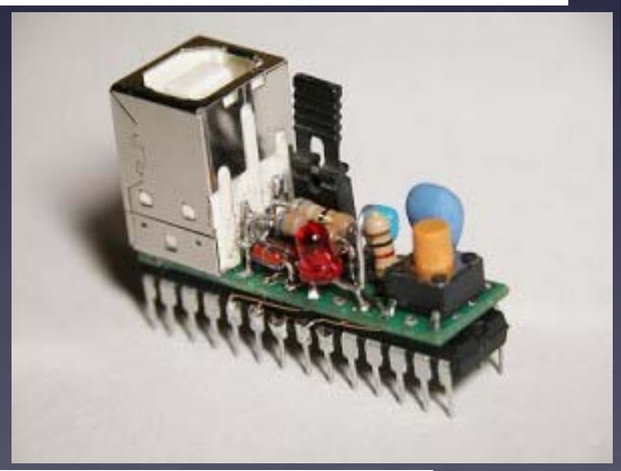
Intro to Arduino

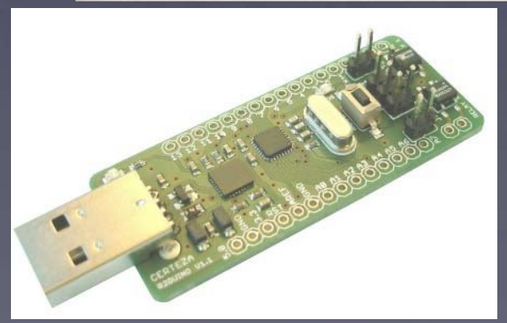












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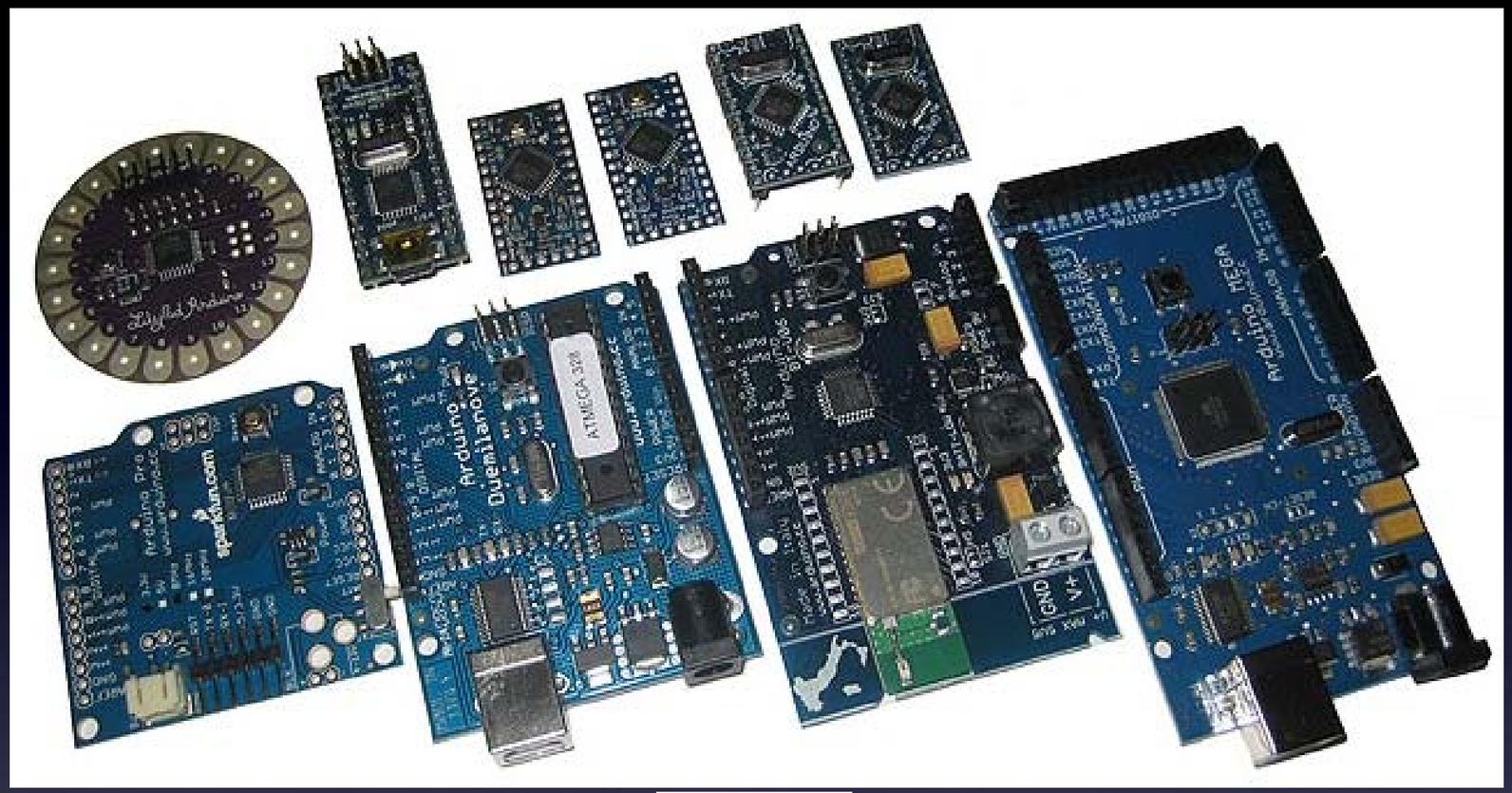
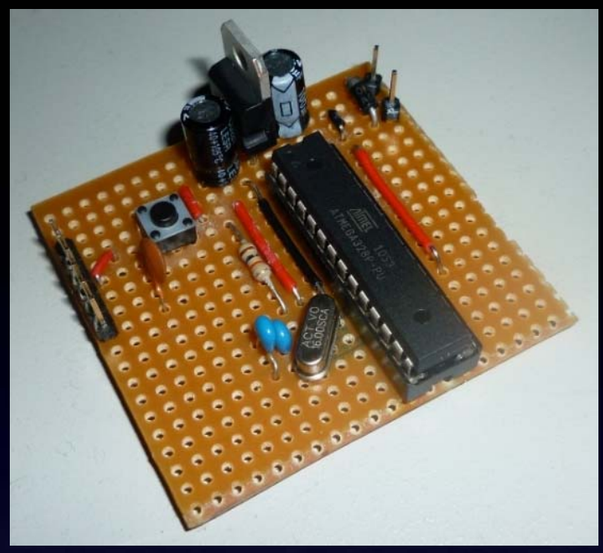
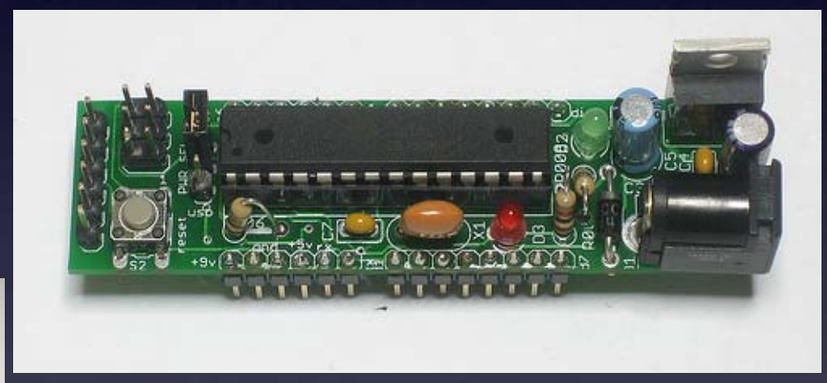
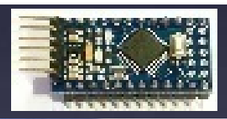
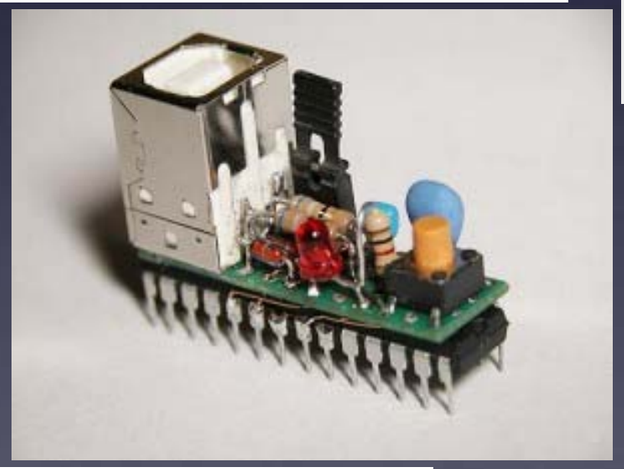
Intro to Arduino

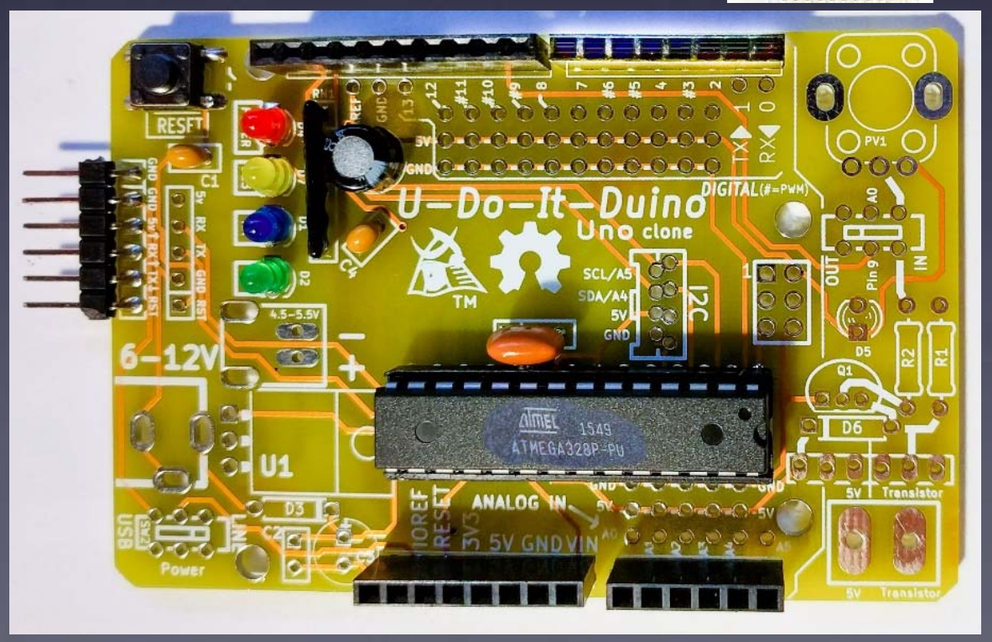


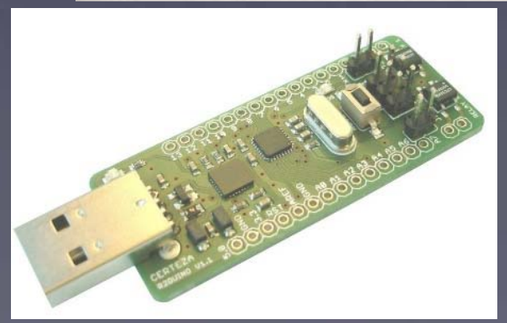






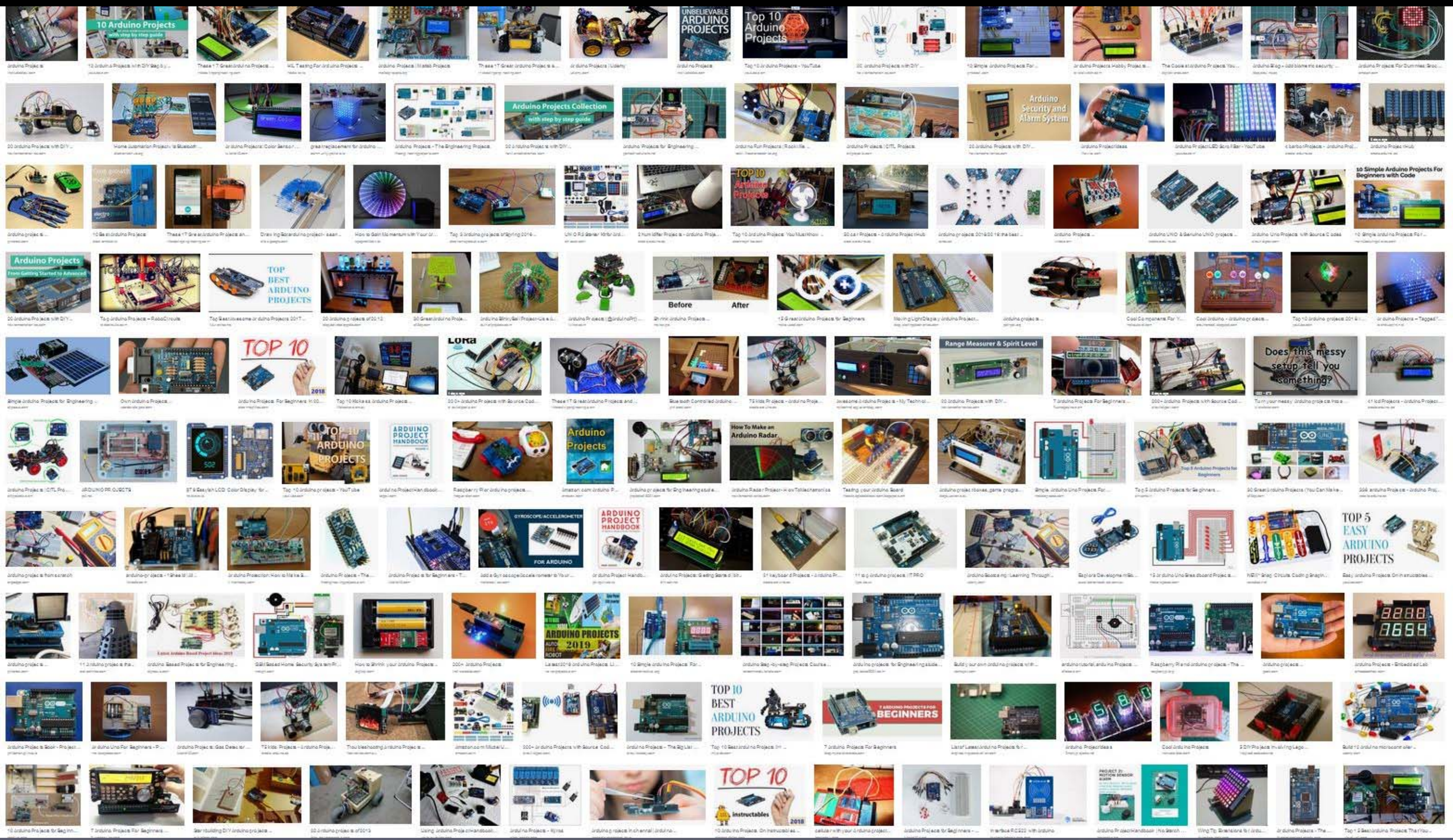






Arduino “Clones”

Intro to Arduino



hundreds of thousands of projects online!

Intro to Arduino

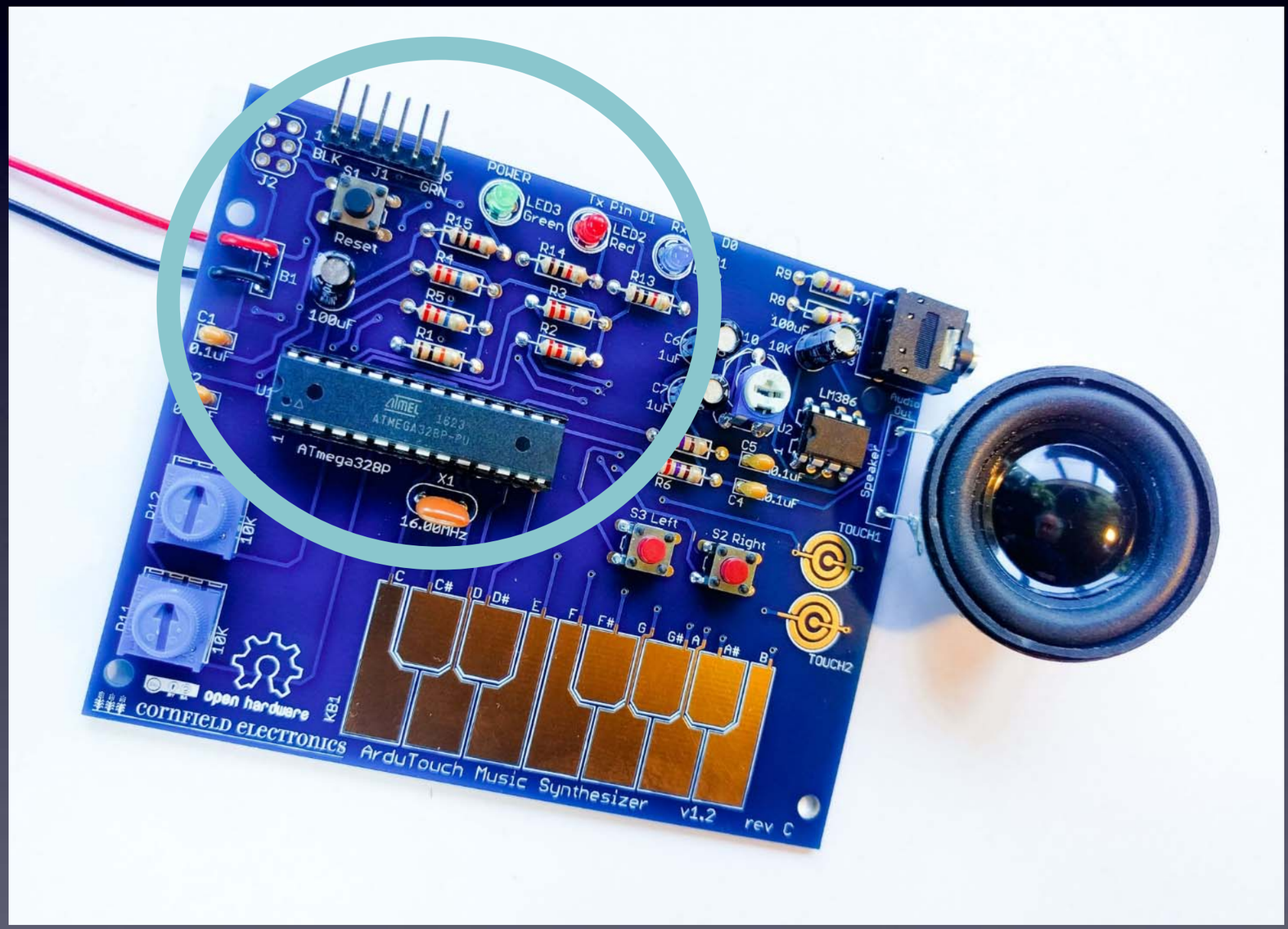
“Arduino-Compatible”

ArduTouch

music

synthesizer

kit

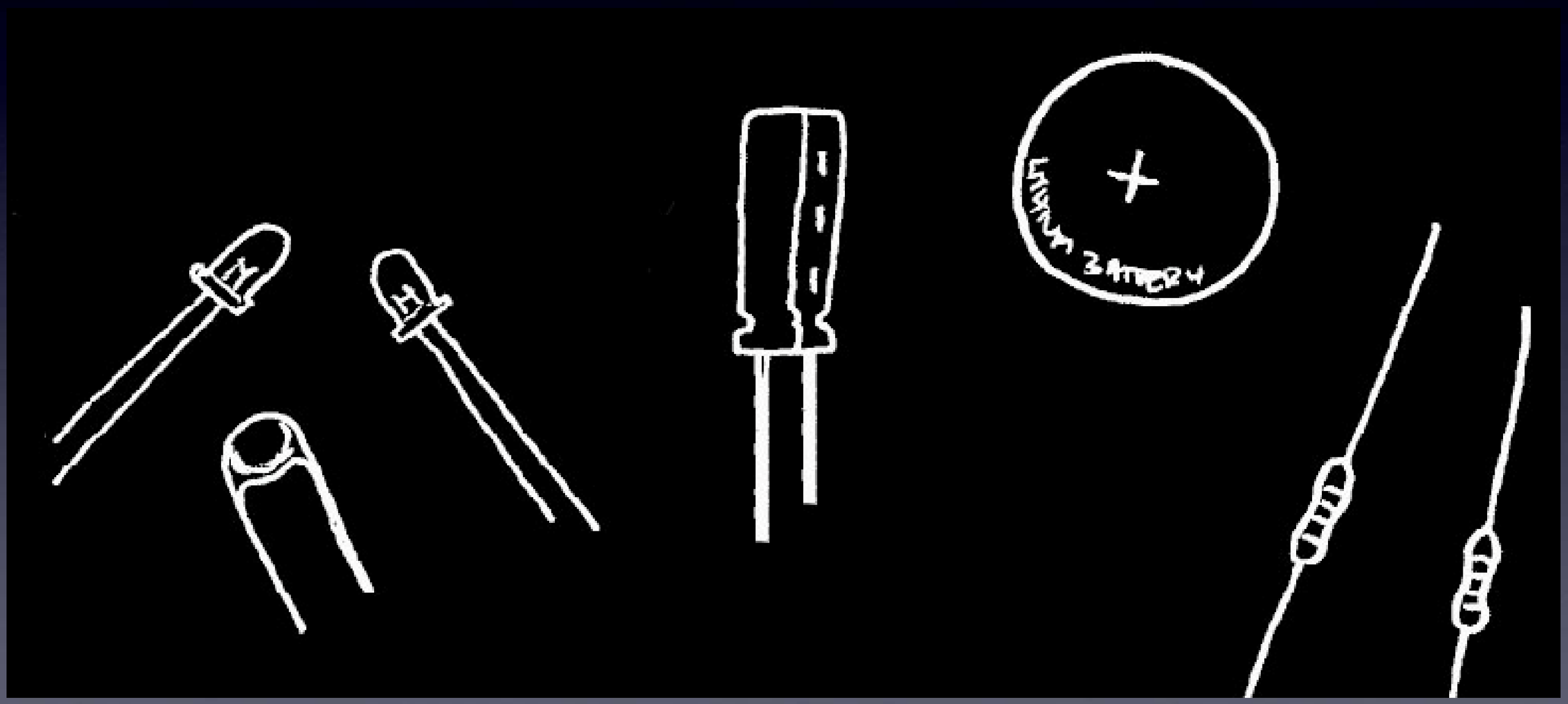


Intro

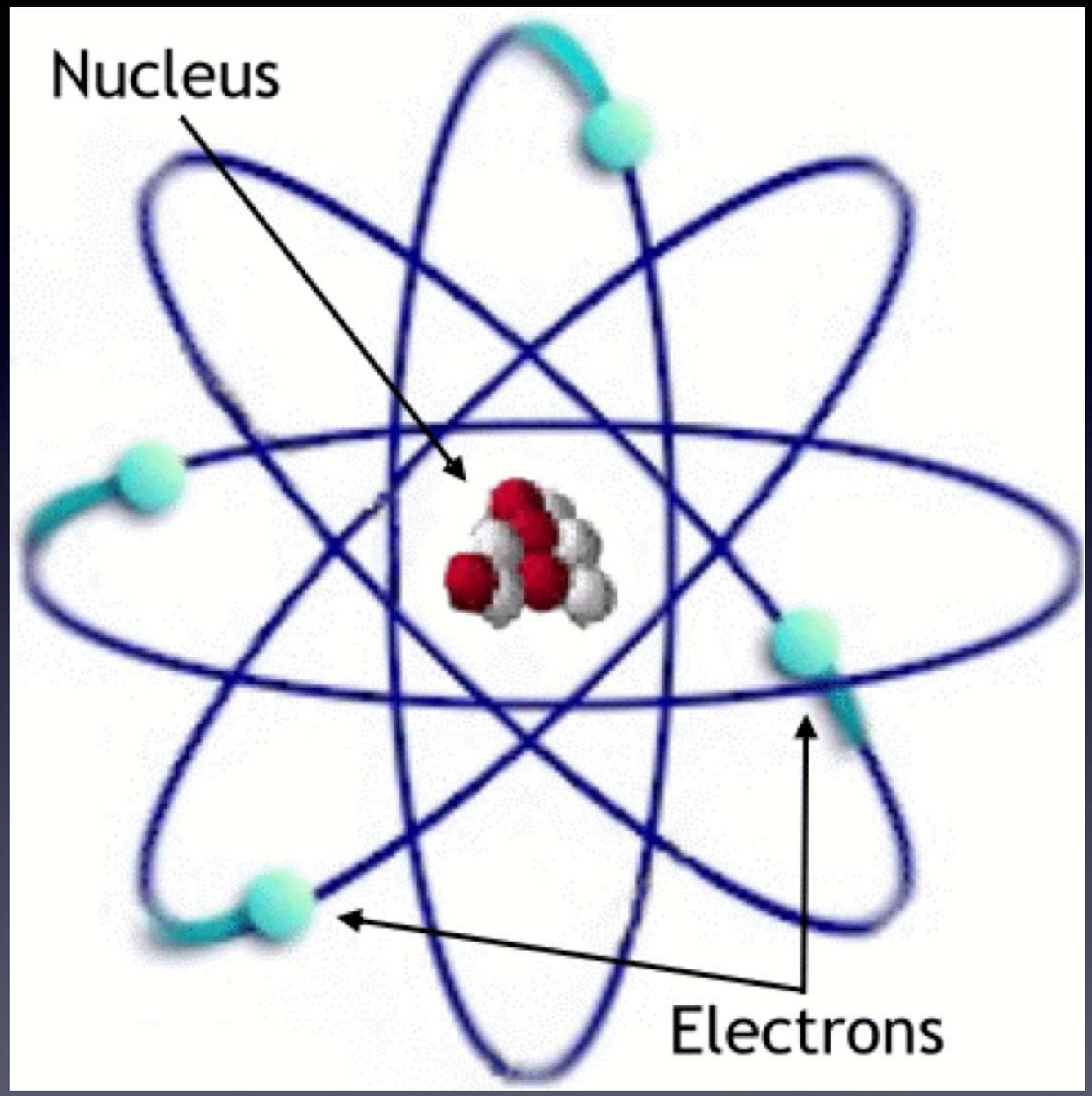
DIGITAL ~ PWM~
UNO
ON
ARDUINO
ICSP
POWER
ANALOG IN
GND
ARDUINO.CC

Questions?

Everything You Need to Know About
Electronics

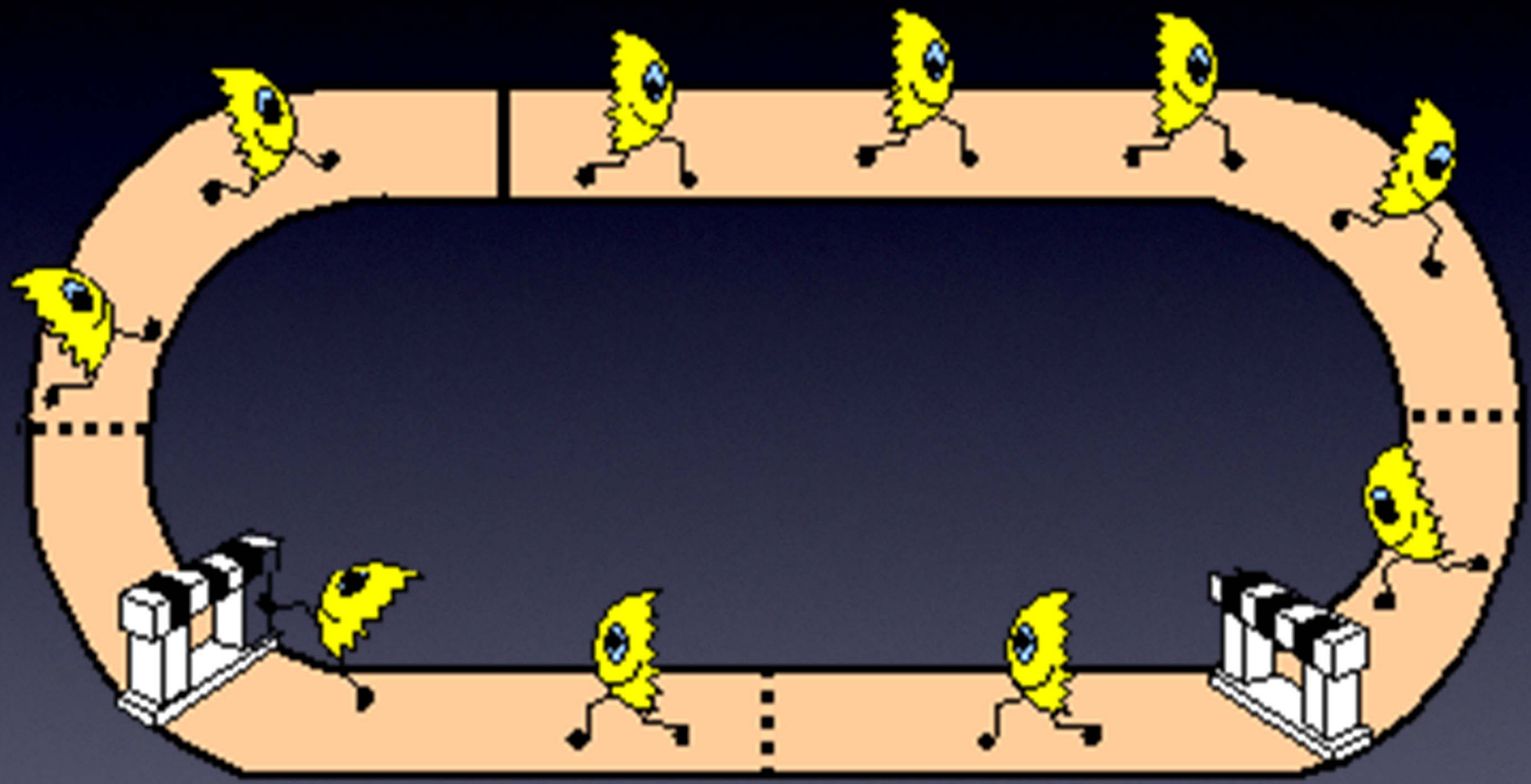


Everything You Need to Know About Electronics



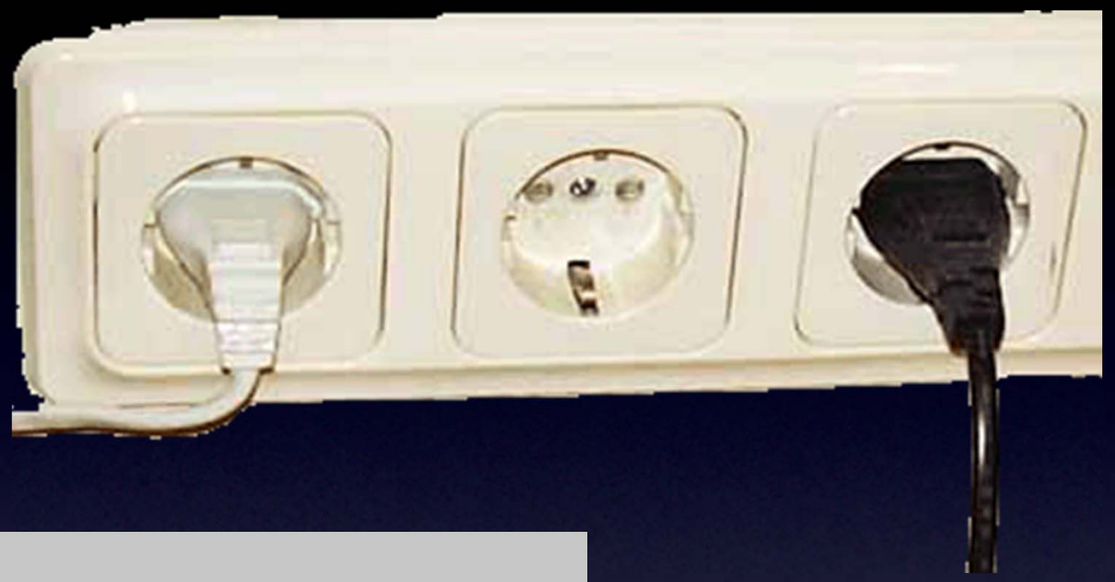
Electrons

Everything You Need to Know About Electronics



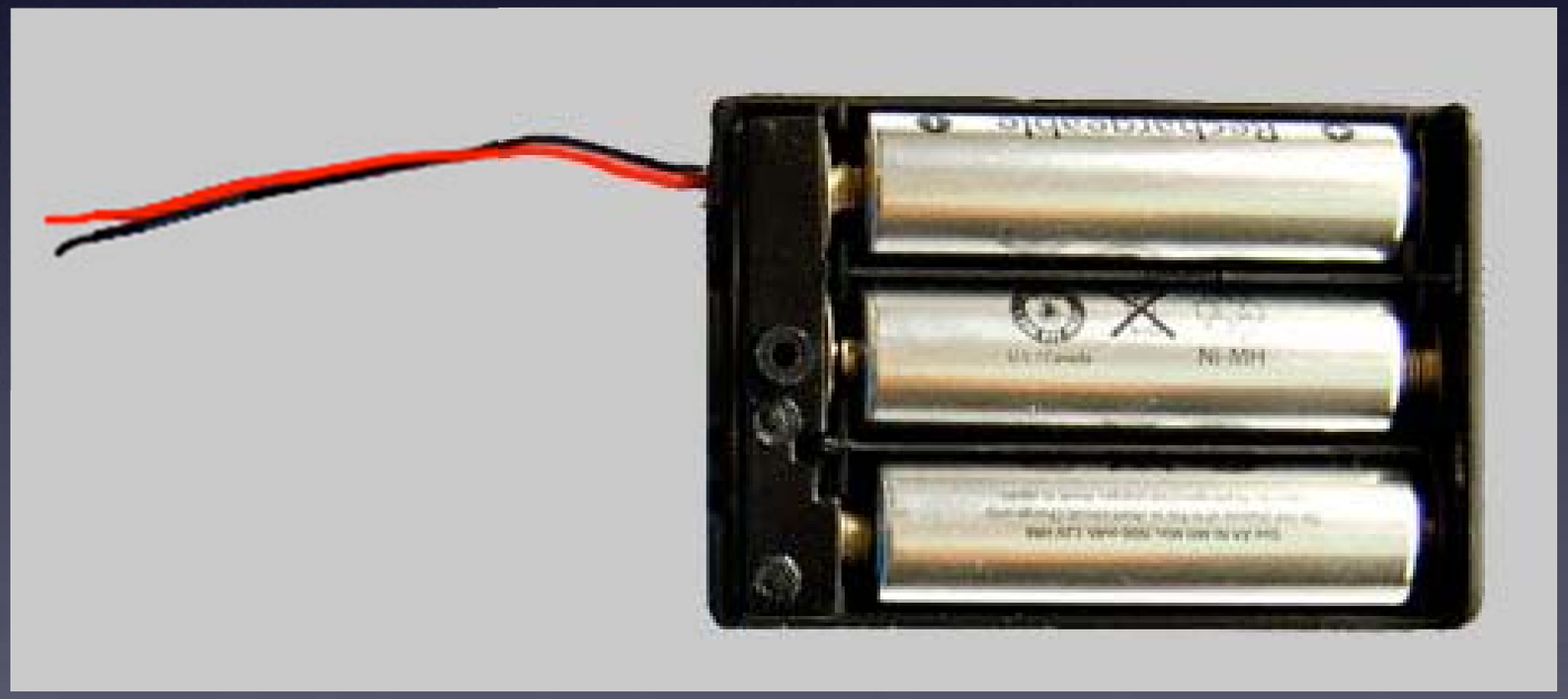
Circuit = Electrons going in complete circle = Magic!

Everything You Need to Know About Electronics



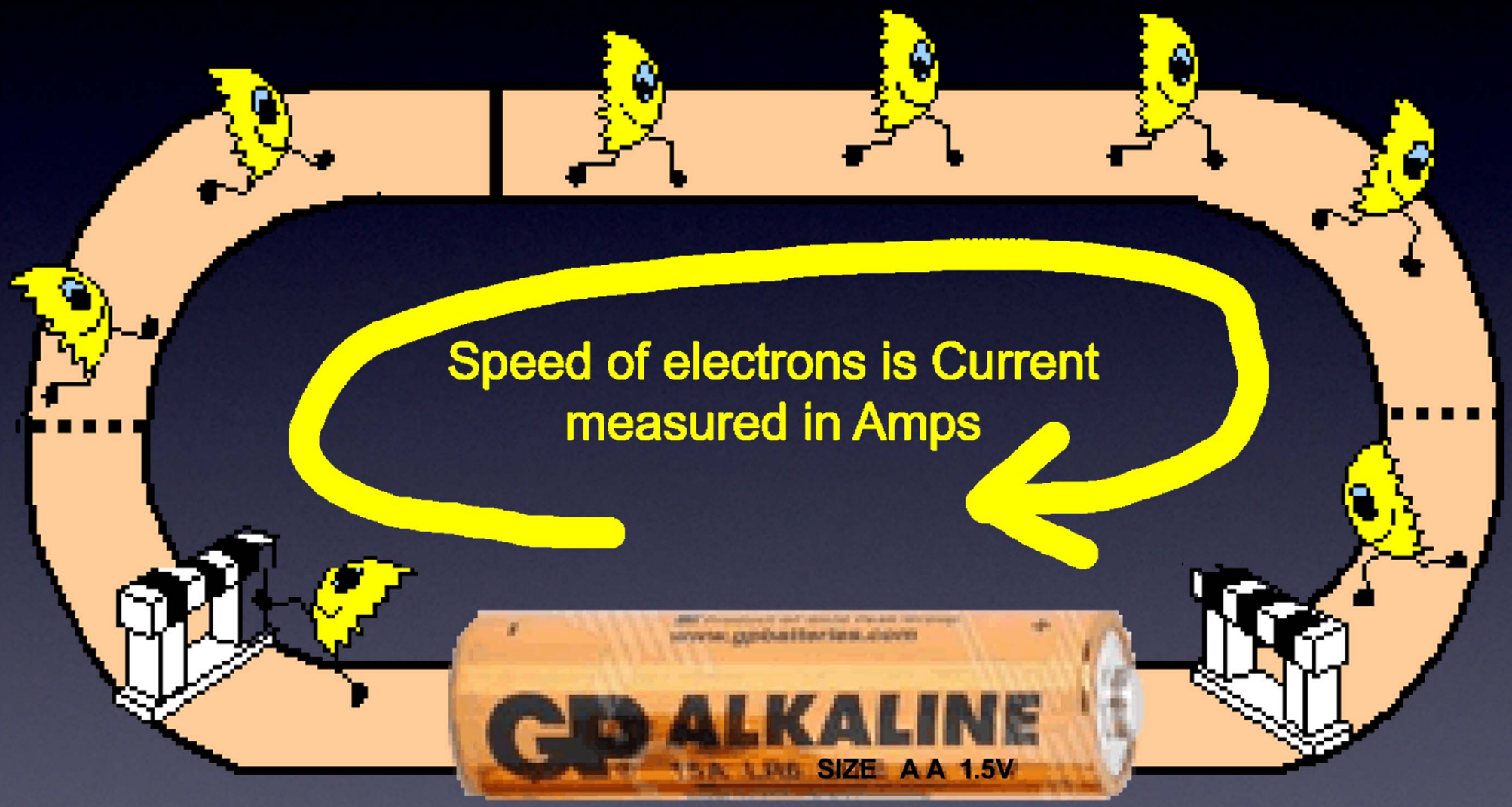
Power Supplies

Everything You Need to Know About Electronics



Volts / Voltage

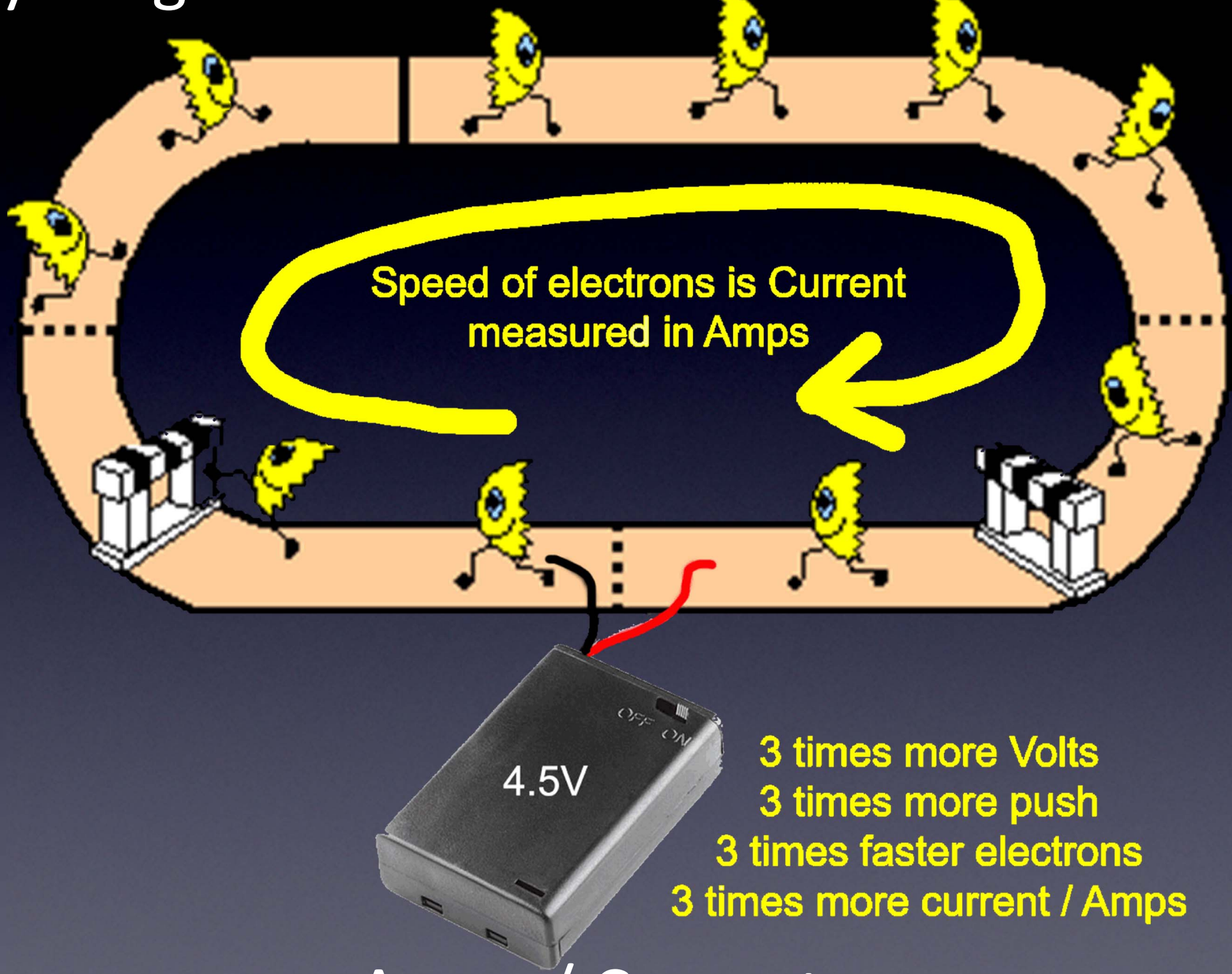
Everything You Need to Know About Electronics



Electrons pushed with 1.5V.
So, they move!

Amps / Current

Everything You Need to Know About Electronics

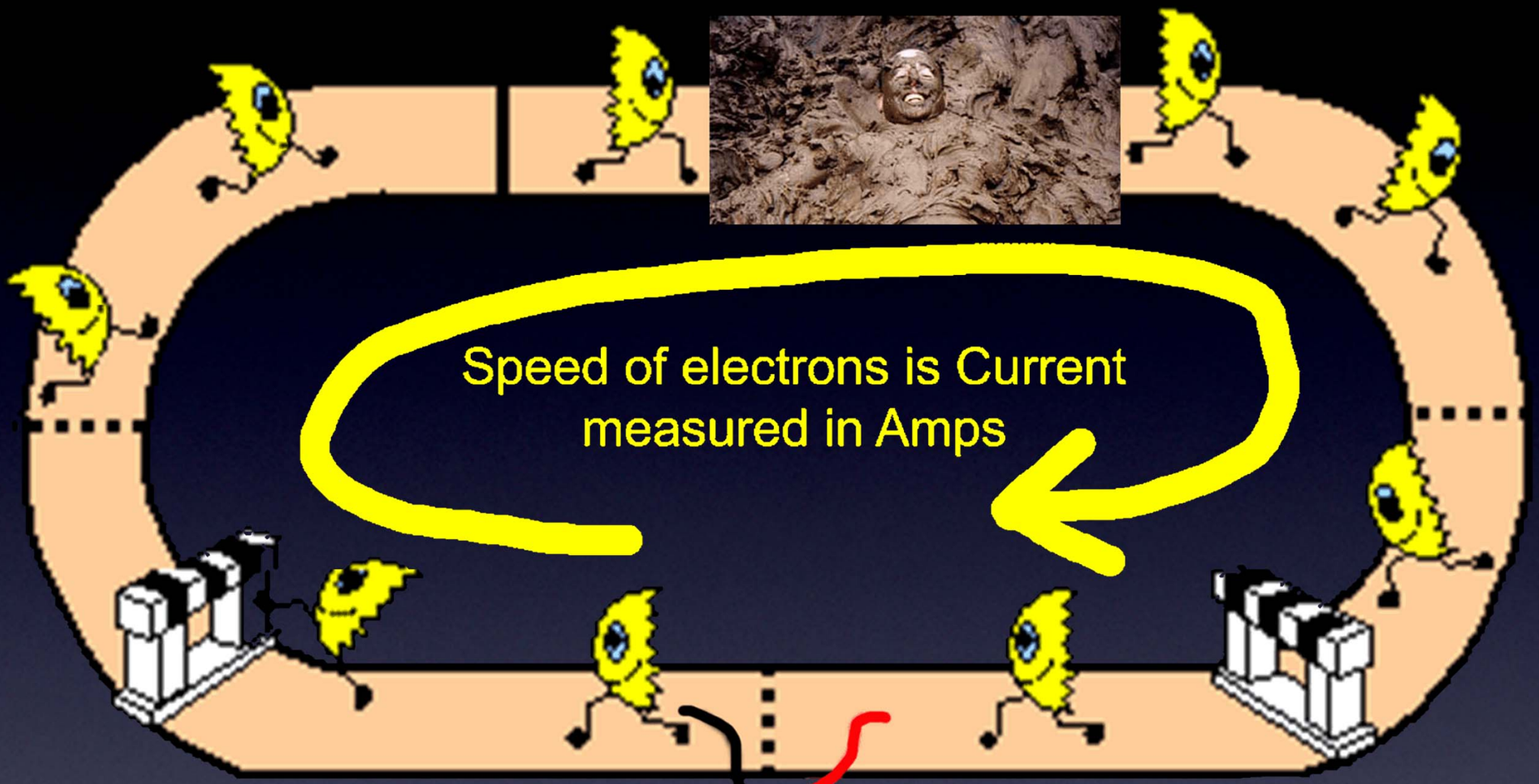


Amps / Current

Everything You Need to Know About Electronics

Amps / Current

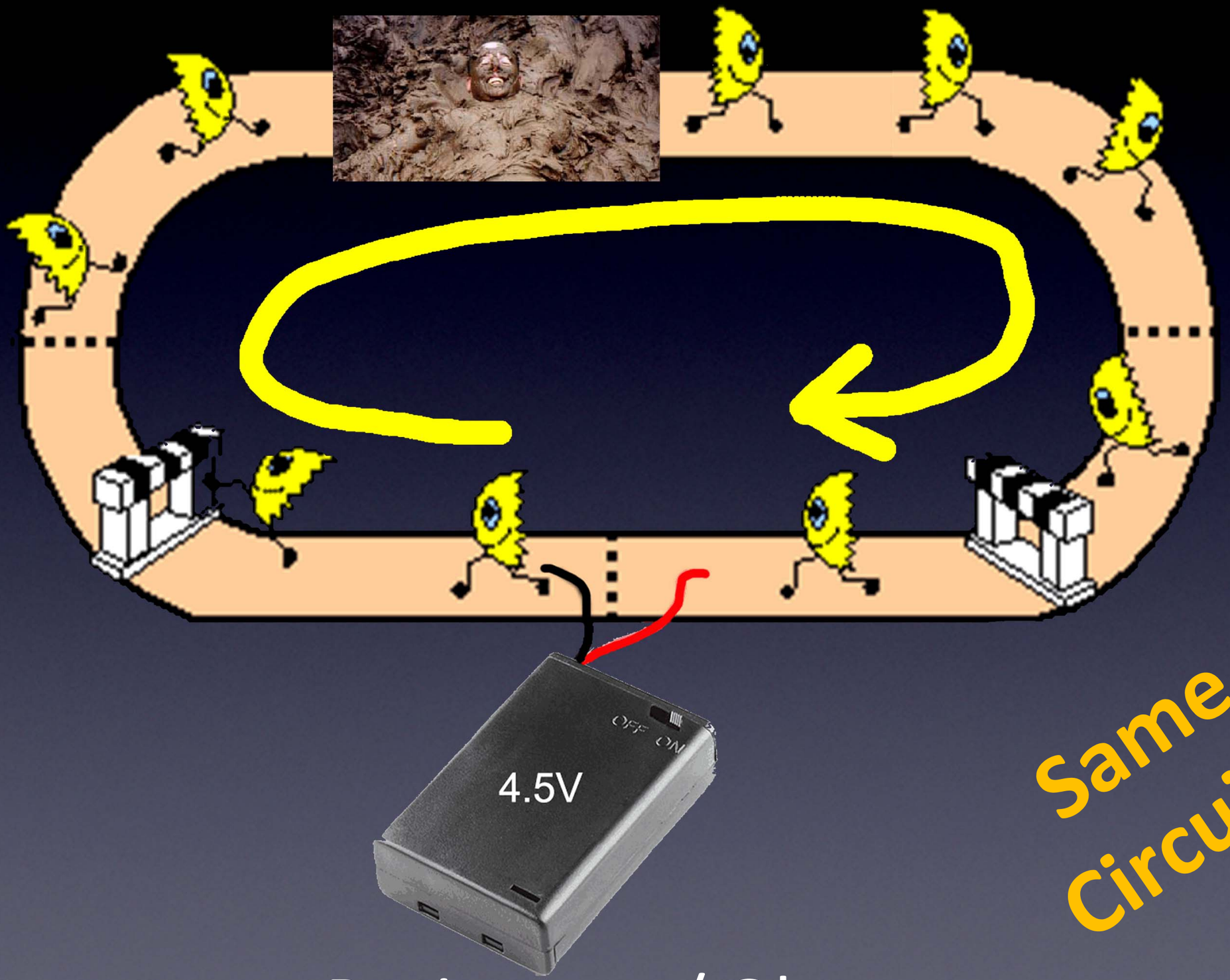
Everything You Need to Know About Electronics



Resistance in the electrons' path
slows them down,
which means
less current (less Amps).

Resistance / **Ohms**

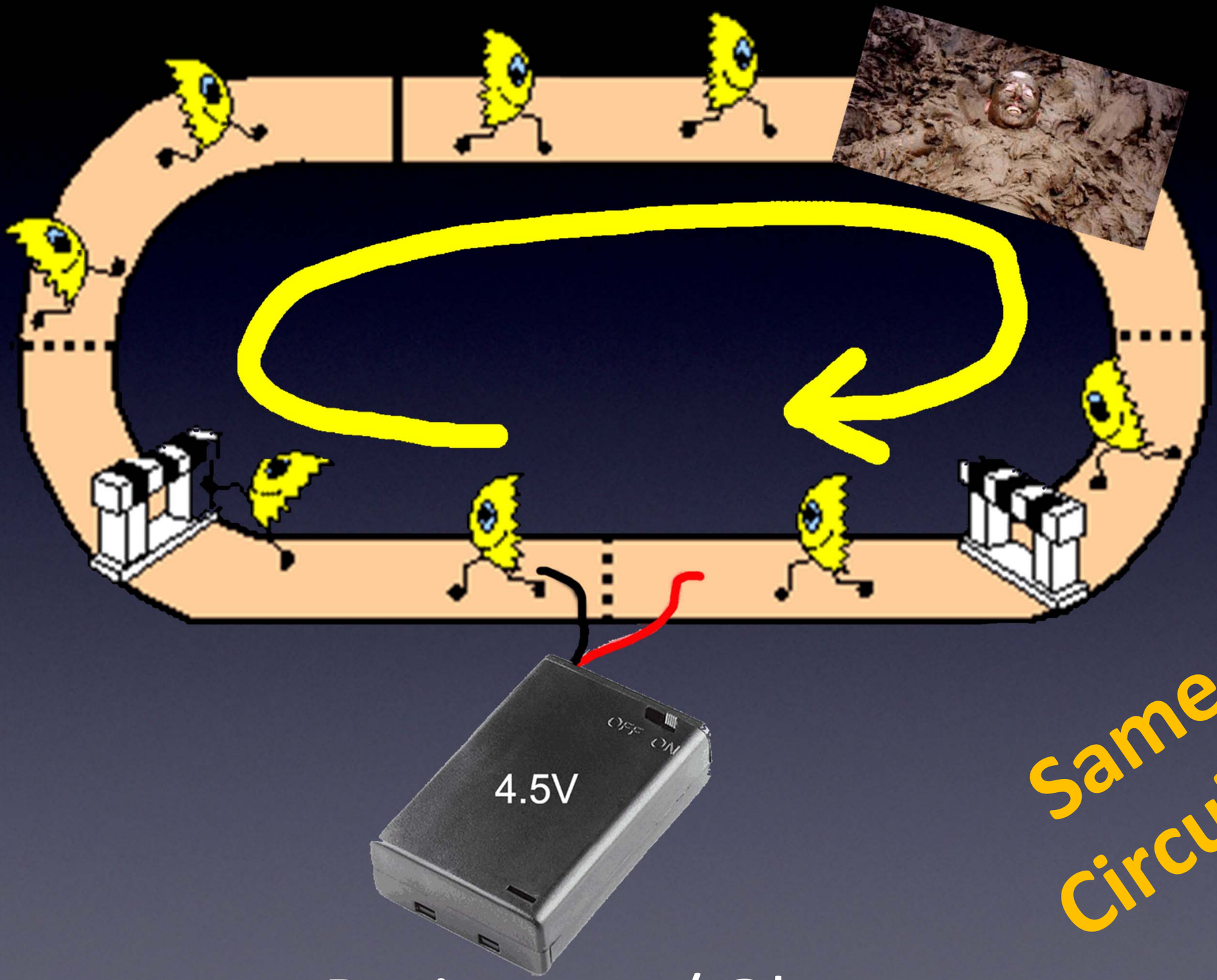
Everything You Need to Know About Electronics



Same Circuit !

Resistance / Ohms

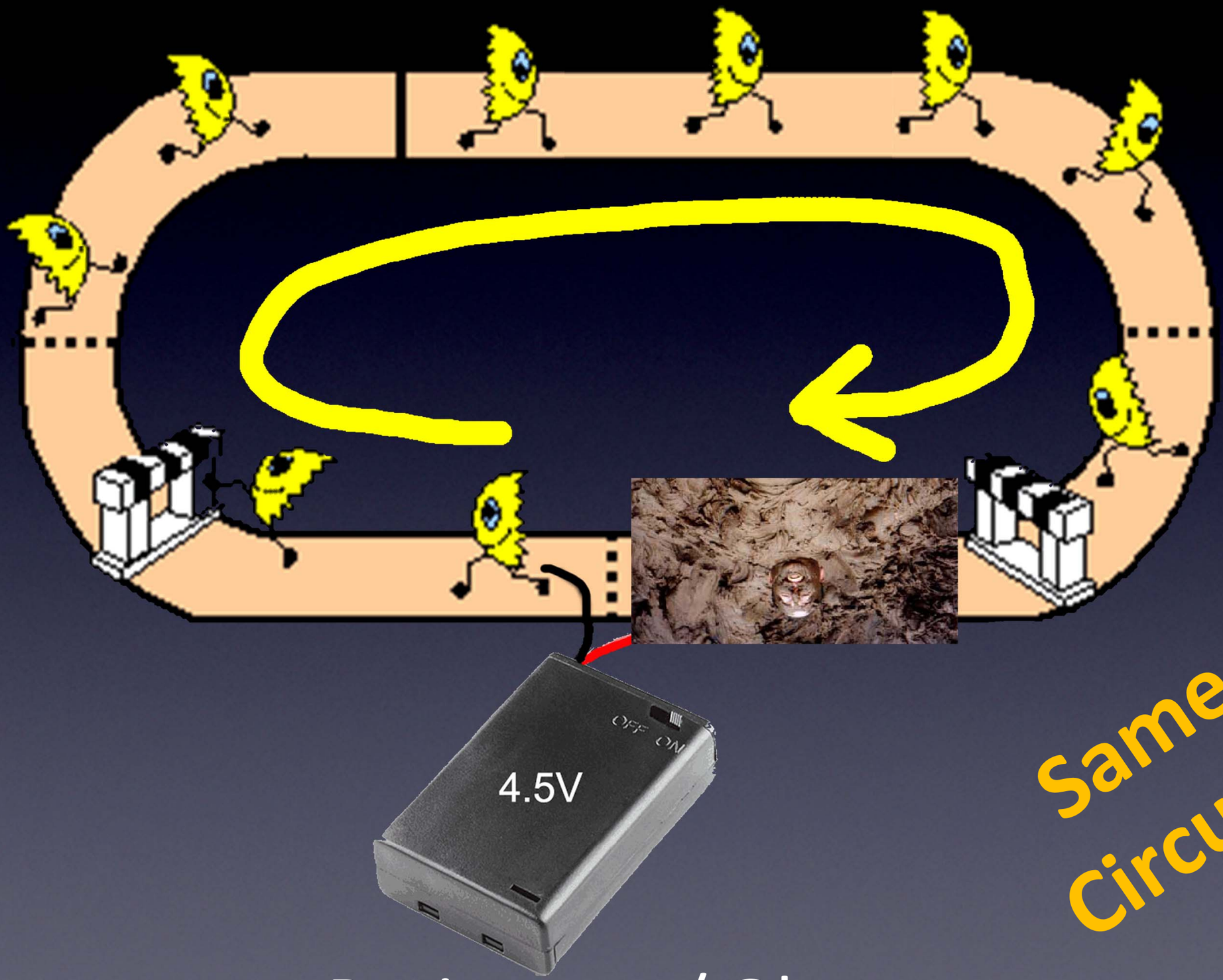
Everything You Need to Know About Electronics



Same Circuit !

Resistance / Ohms

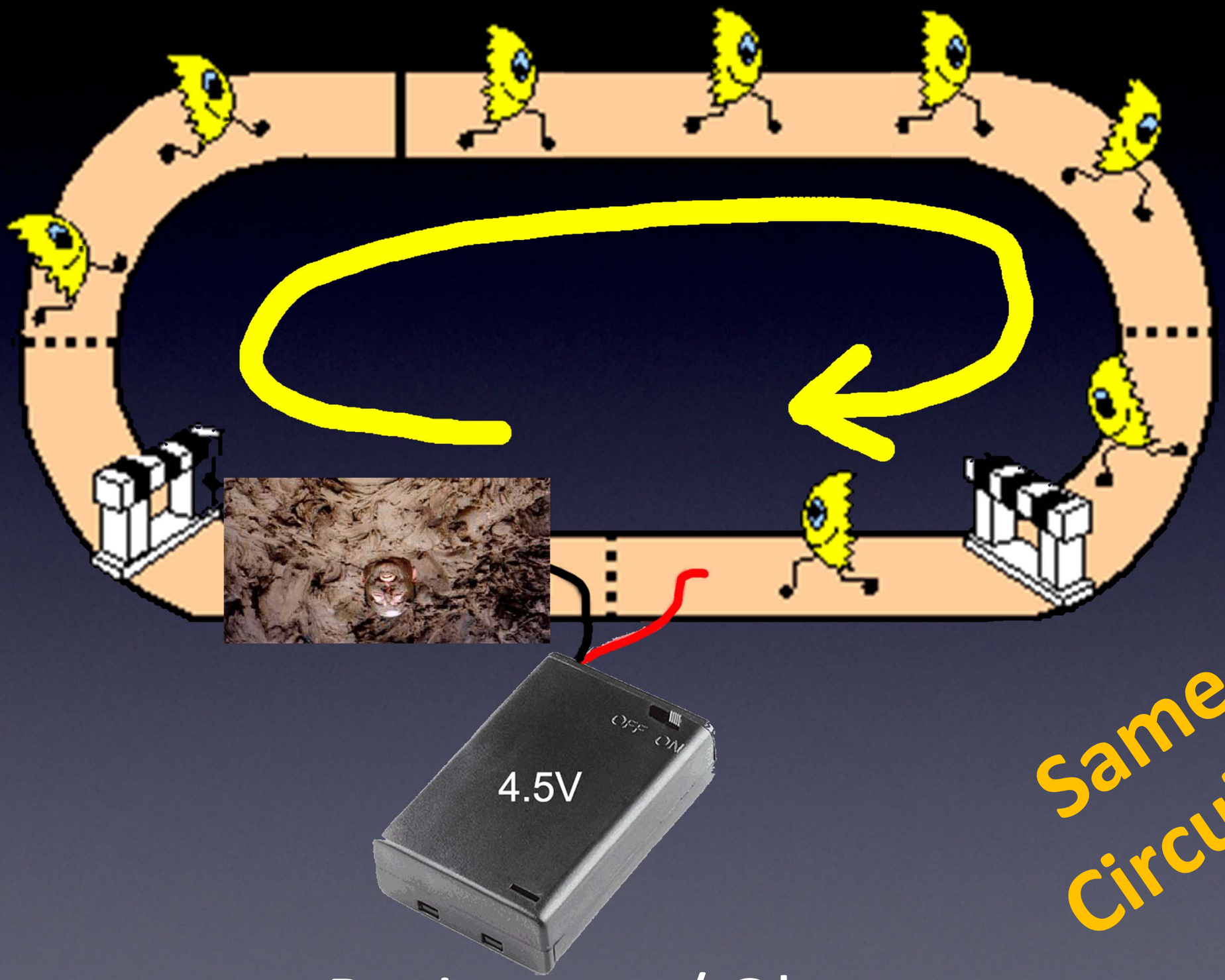
Everything You Need to Know About Electronics



Same Circuit !

Resistance / Ohms

Everything You Need to Know About Electronics



Same Circuit !

Resistance / Ohms

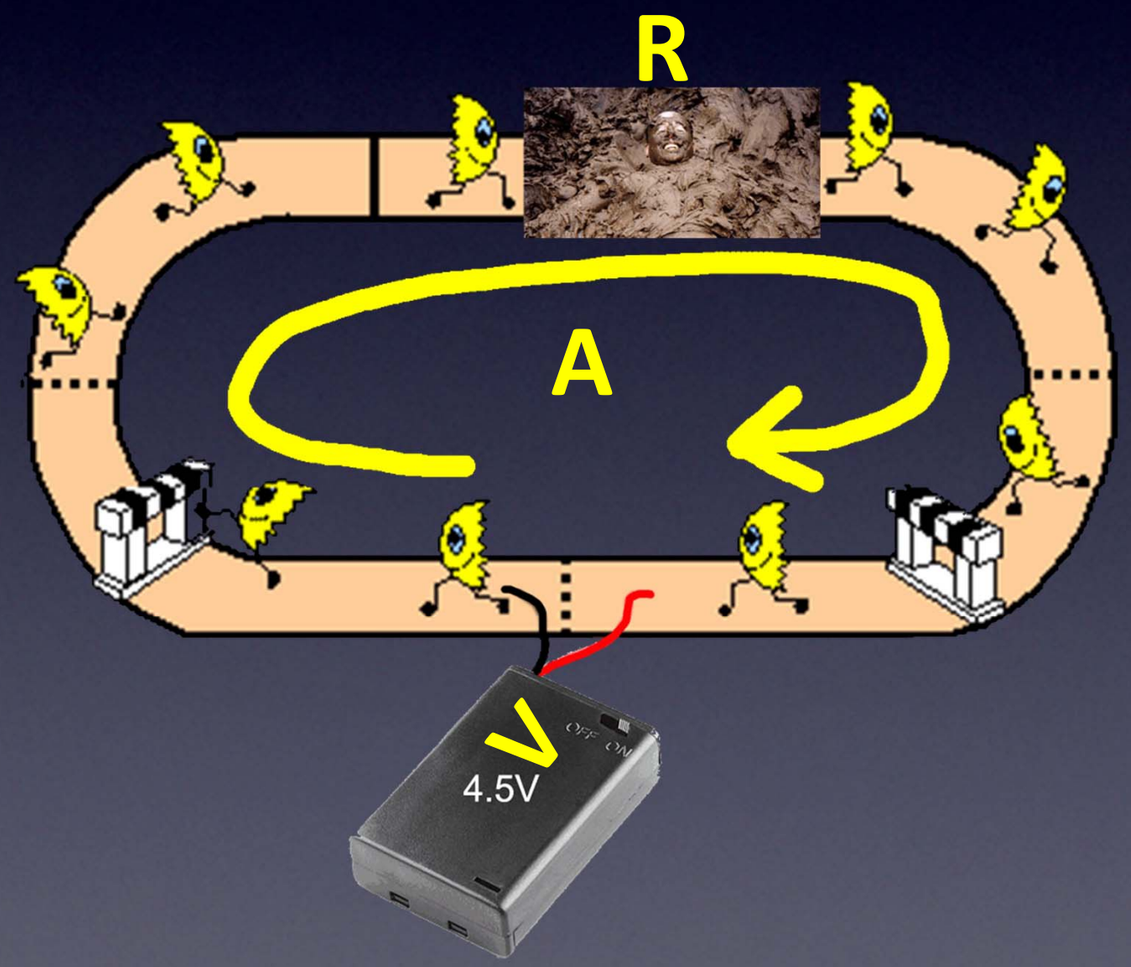
Everything You Need to Know About Electronics

Ohm's Law

Volts -- ***force*** pushing electrons

Amps -- ***speed*** of electrons

Ohms -- ***Resistance*** to flow of electrons



Everything You Need to Know About Electronics

Ohm's Law

Volts -- ***force*** pushing electrons

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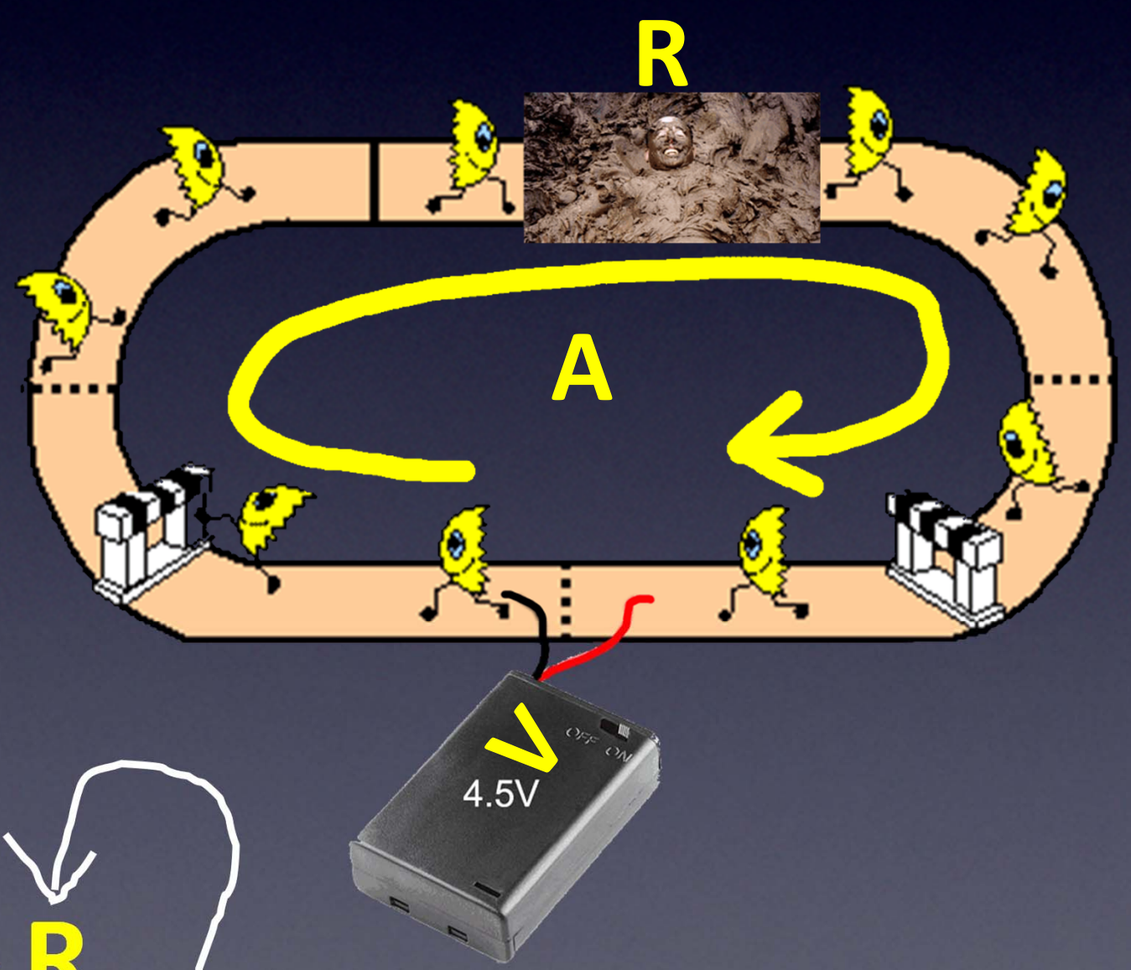


Volts = **A**mps x **R**

(Ohms)

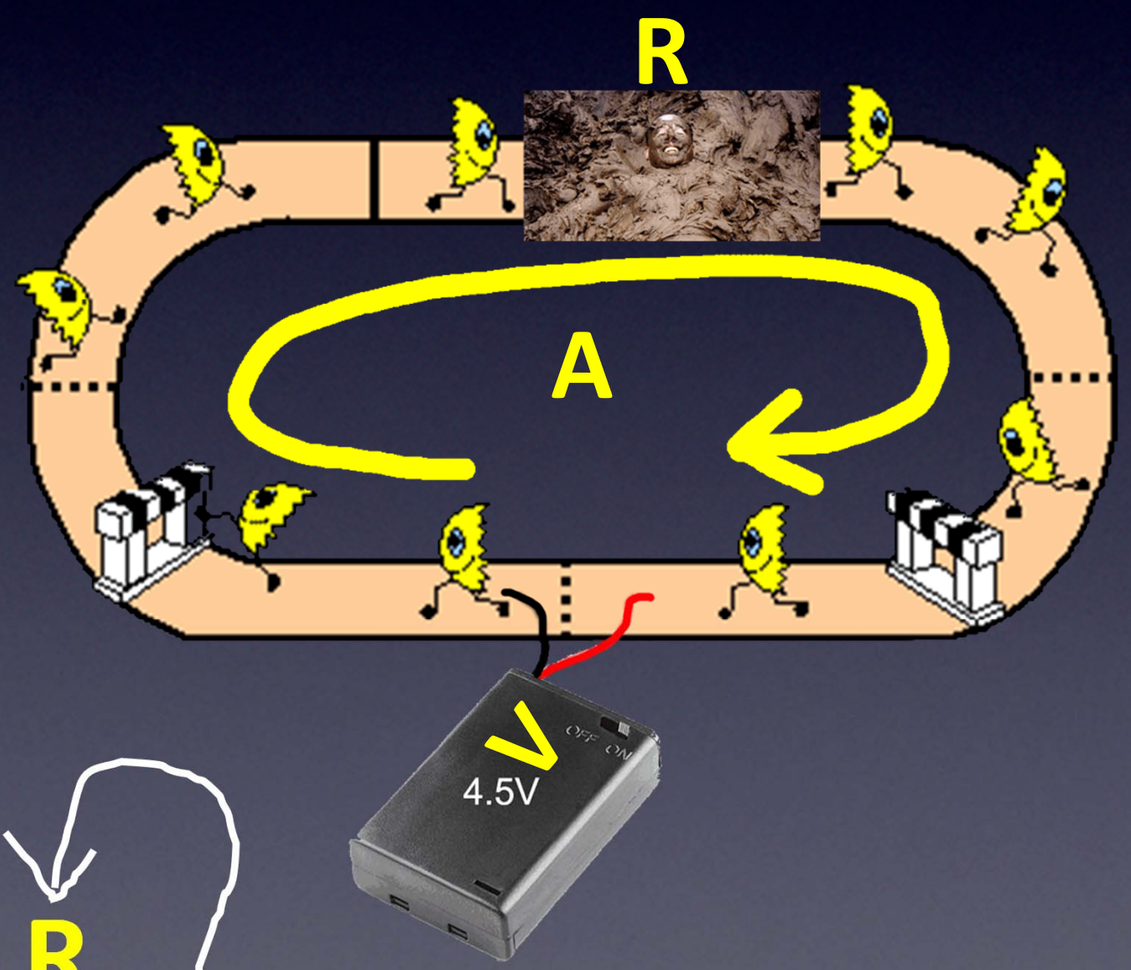
Everything You Need to Know About Electronics

Ohm's Law

Volts -- ***force*** pushing electrons

Amps -- ***speed*** of electrons

Ohms -- ***Resistance*** to flow of electrons



Volts = **A**mps x **R**

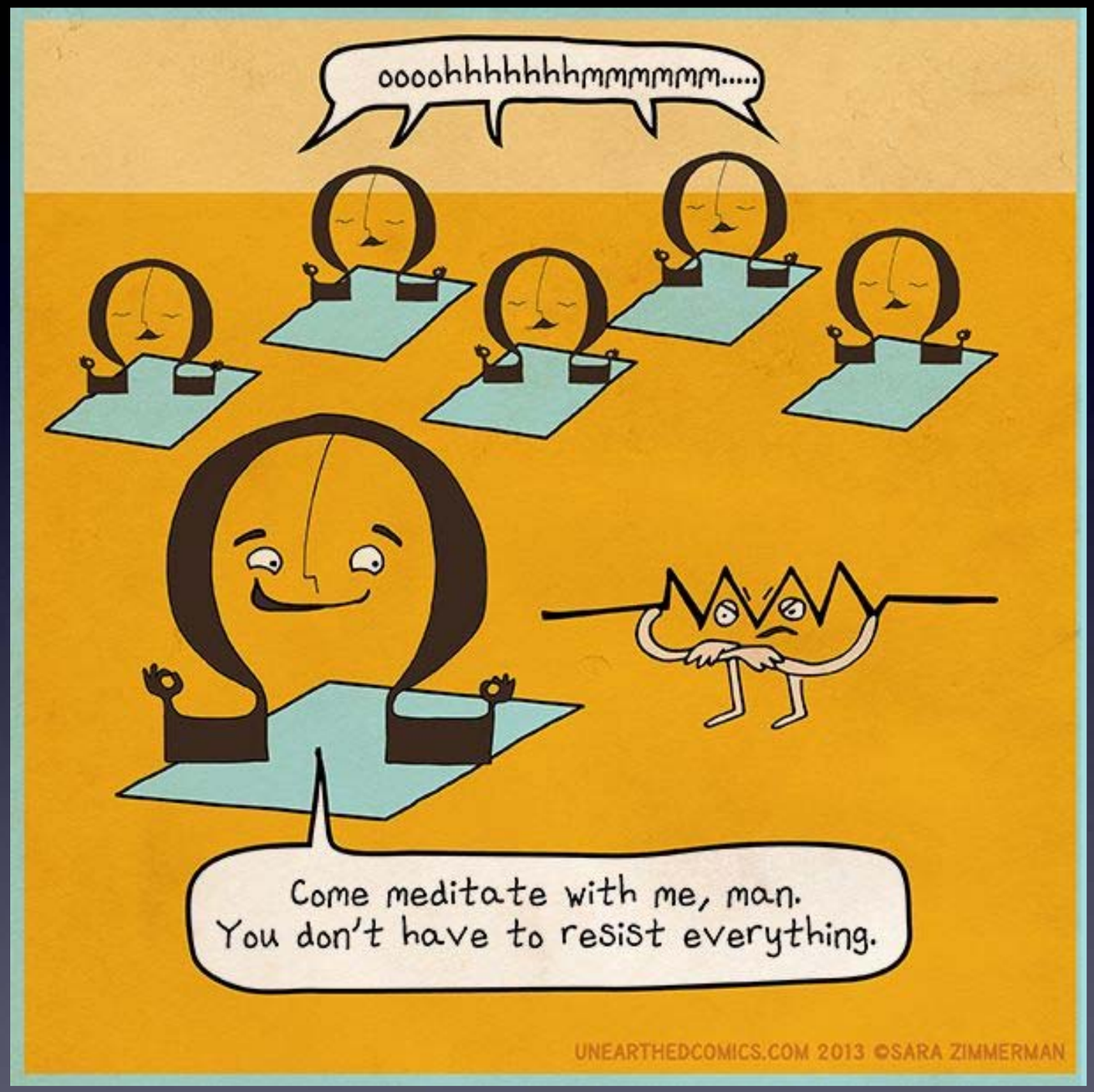
(Ohms)

Also commonly written: **E** = **I** x **R**

Everything You Need to Know About Electronics

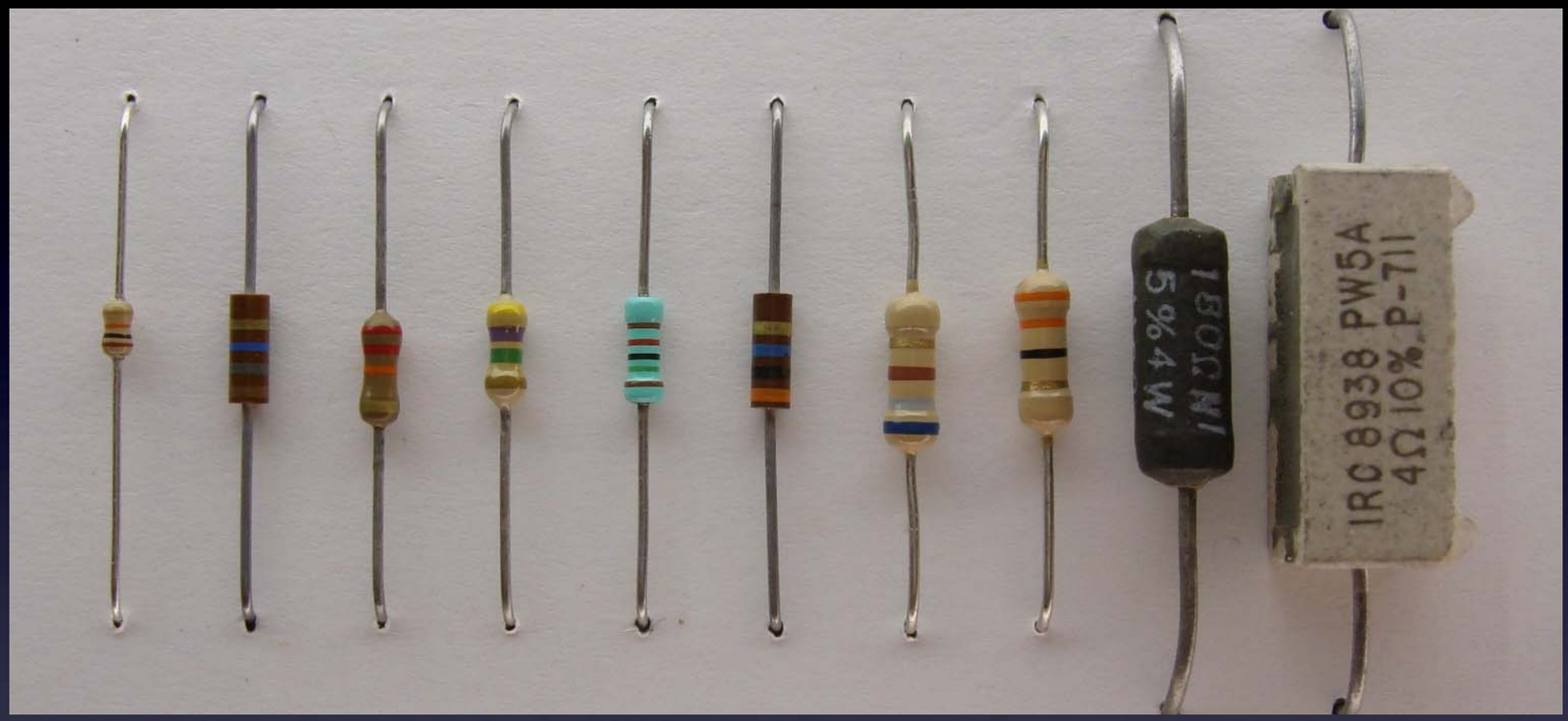
The symbol for **Resistance**:

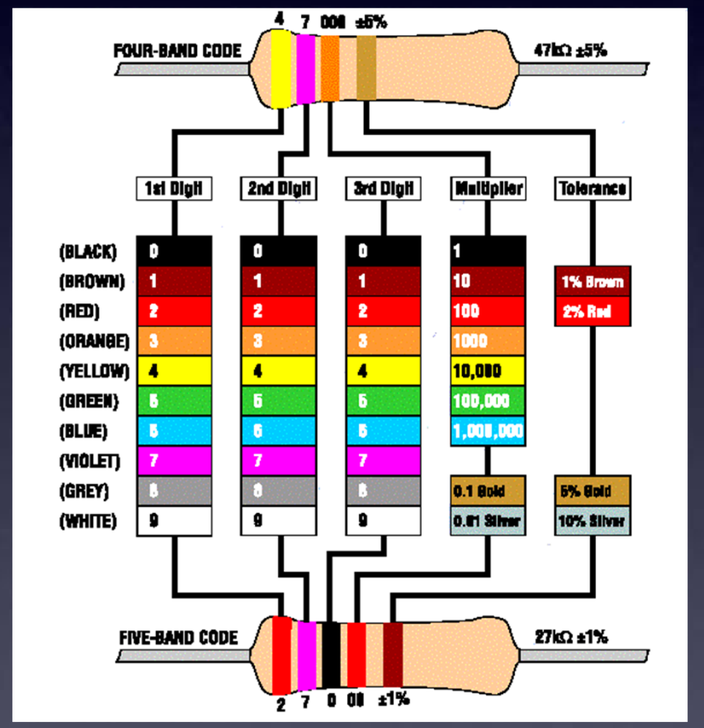
Ω



Resistors / Ohms

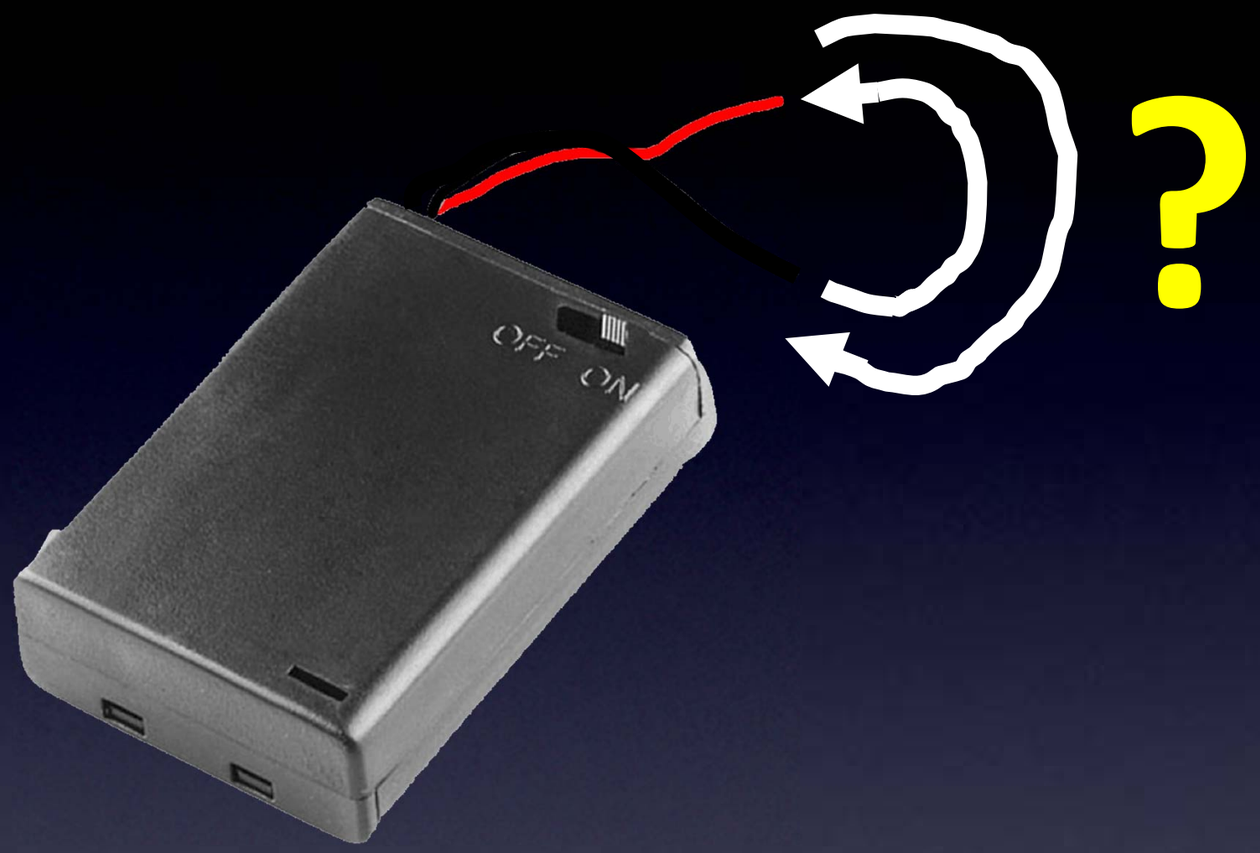
Everything You Need to Know About Electronics





Resistors / Ohms

Everything You Need to Know About Electronics

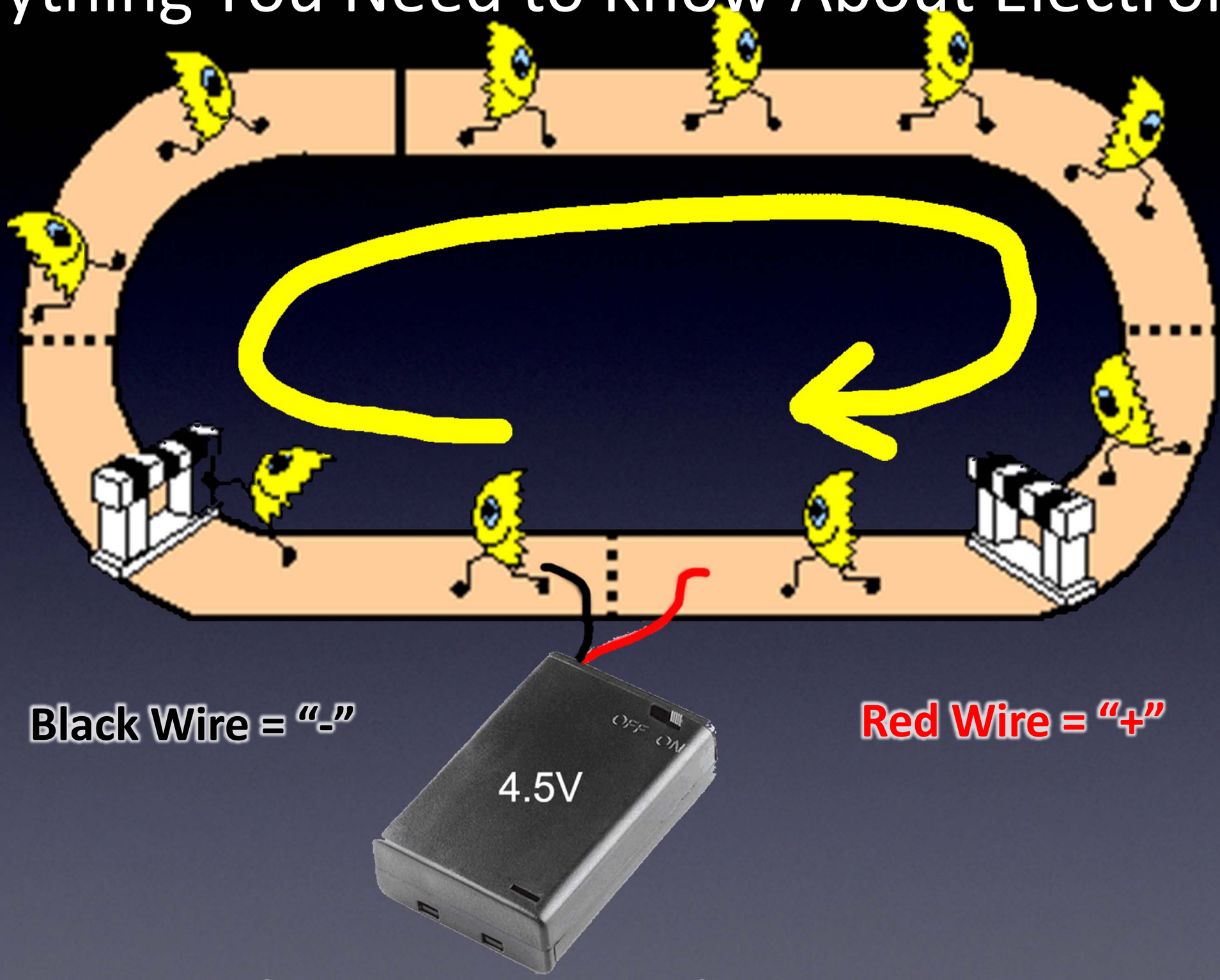


What happens?

Polarity

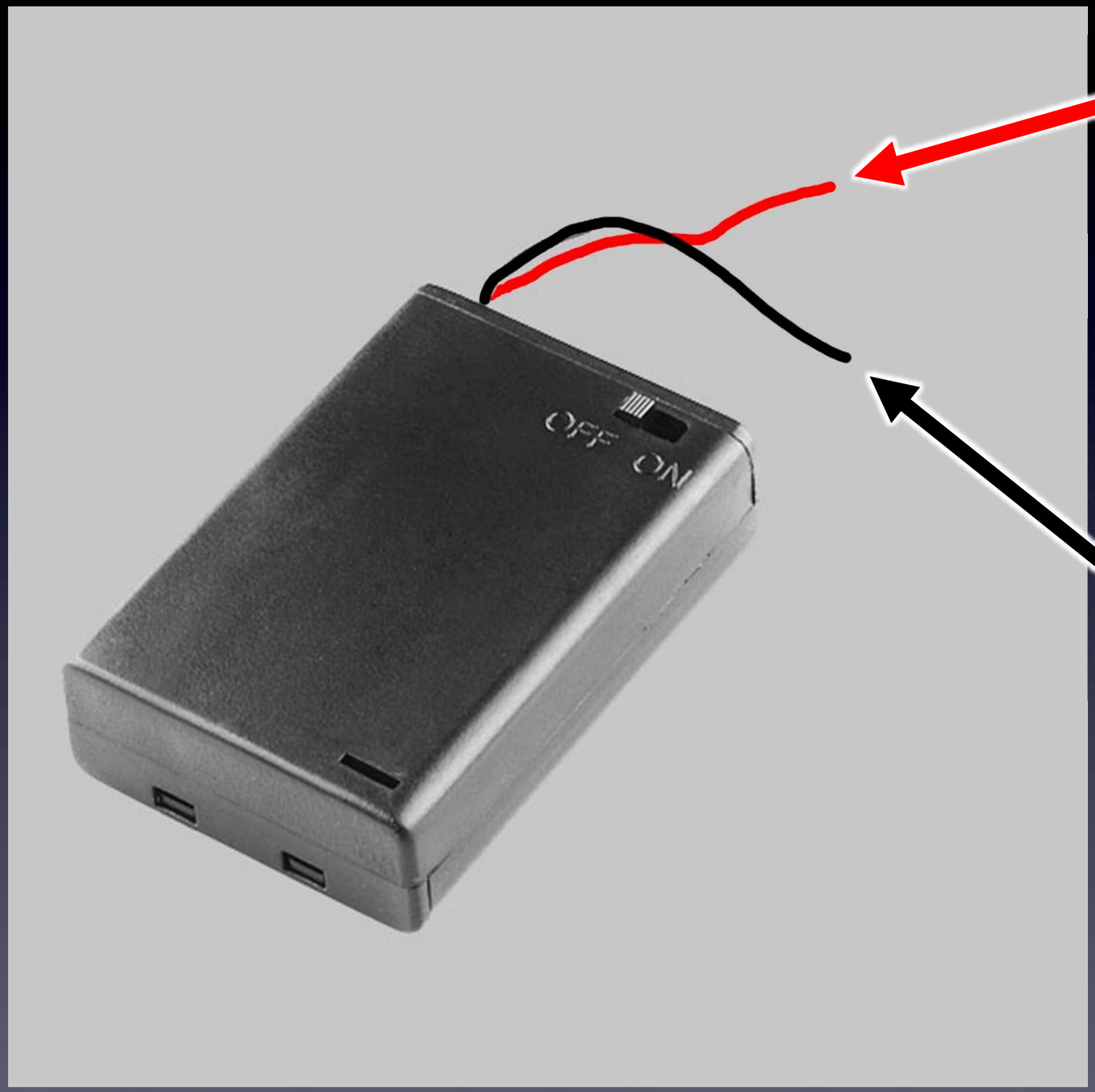
Power Supply – it matters how you connect it!

Everything You Need to Know About Electronics



Power Supply – it matters how you connect it!

Everything You Need to Know About Electronics



<u>Red wire</u>:
Power,
Plus, Positive,
4.5V,
Vcc

<u>Black wire</u>:
Minus, Negative,
0V,
Ground (GND)

Power Supply – it matters how you connect it!

Everything You Need to Know About Electronics

or

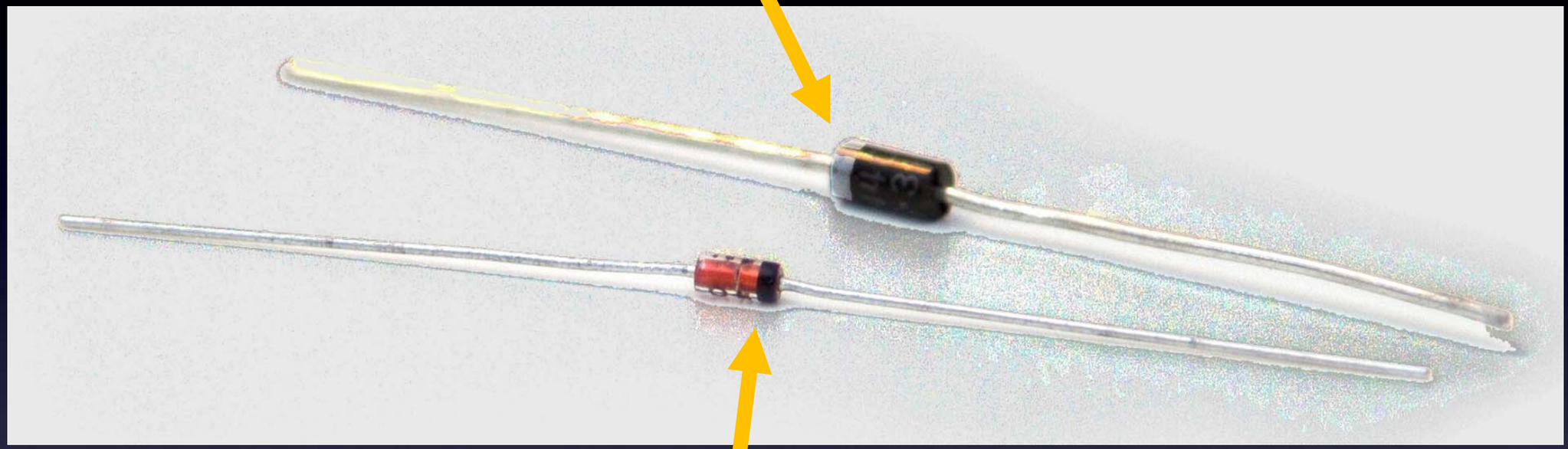
or

(electrons slowed down the same either way)

Resistors – it doesn’t matter which way

Everything You Need to Know About Electronics

Minus / Negative side



Minus / Negative side

Diodes – One-Way valve for electrons

Diodes – it matters which way!

Everything You Need to Know About Electronics

Short wire is Minus / Negative

Special kind of Diode – it Emits Light!

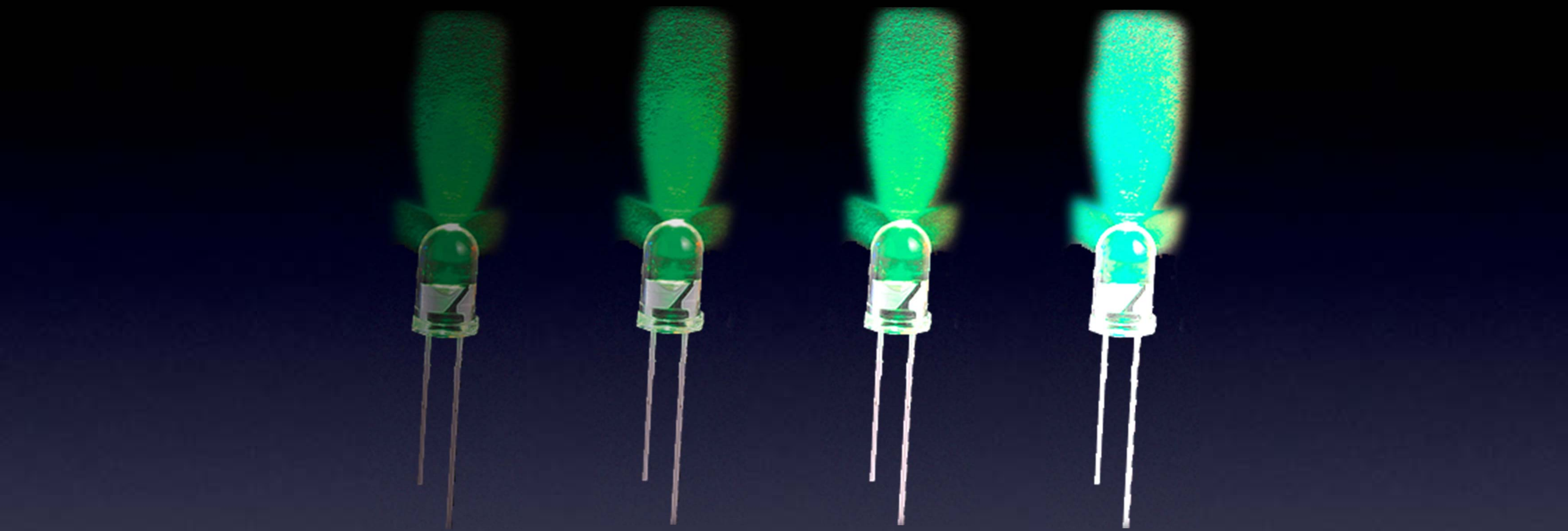
LED – it matters which way!

Everything You Need to Know About Electronics

Lots of different colored LEDs! (including IR)

LED

Everything You Need to Know About Electronics



More current → More brightness! (until…)

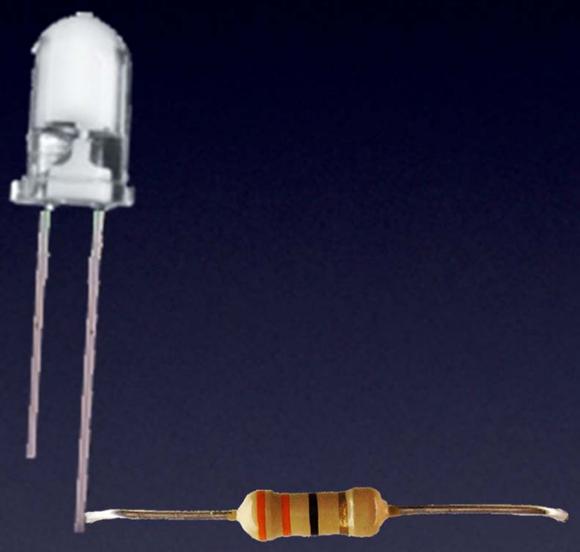
LED

Everything You Need to Know About Electronics

More current → More brightness! (until…)

LED

Everything You Need to Know About Electronics

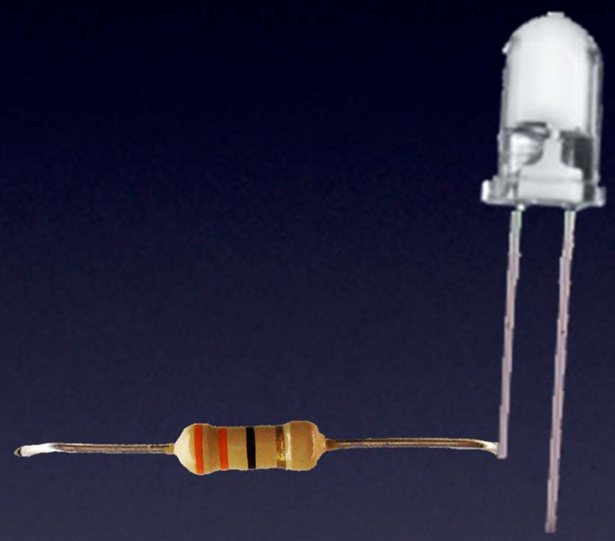


(with a resistor
so no magic smoke goes away)

This is why we put a resistor in line with an LED

LED

Everything You Need to Know About Electronics



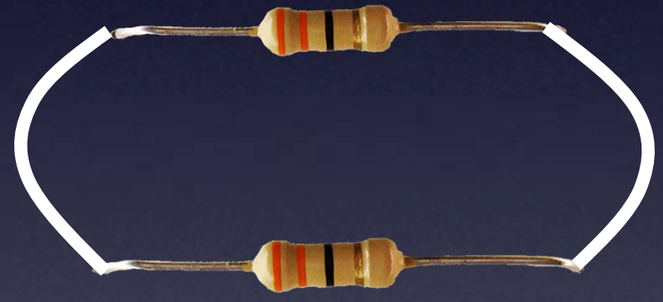
(the resistor can go on either side)

This is why we put a resistor in line with an LED

LED

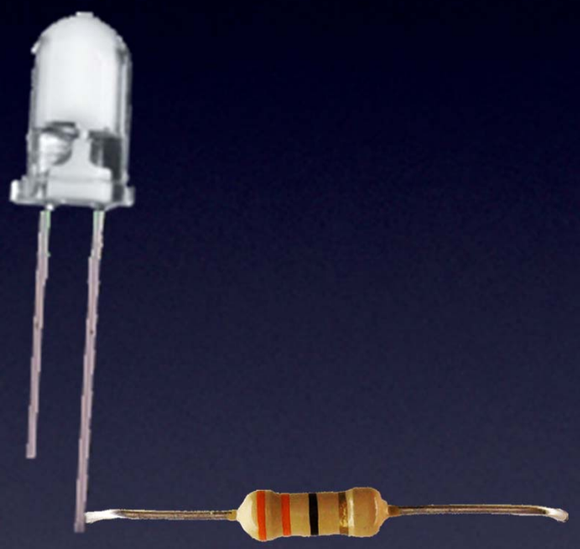
Everything You Need to Know About Electronics

Series = in line



Parallel = across

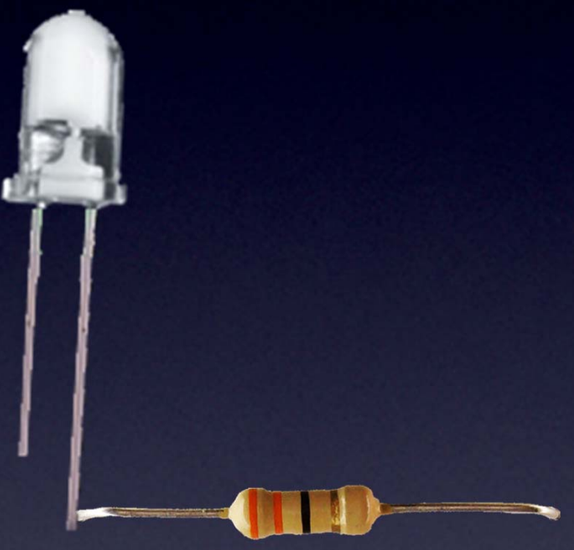
Everything You Need to Know About Electronics



Let’s make this light up!

LED

Everything You Need to Know About Electronics

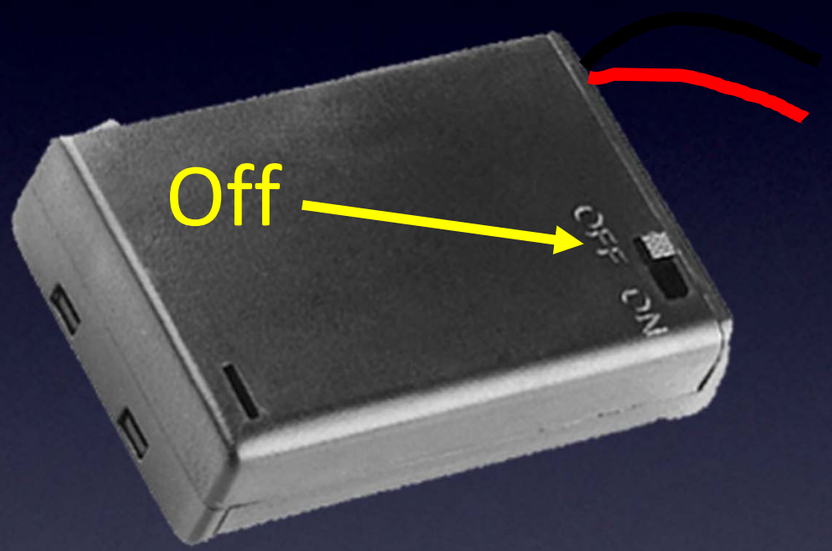


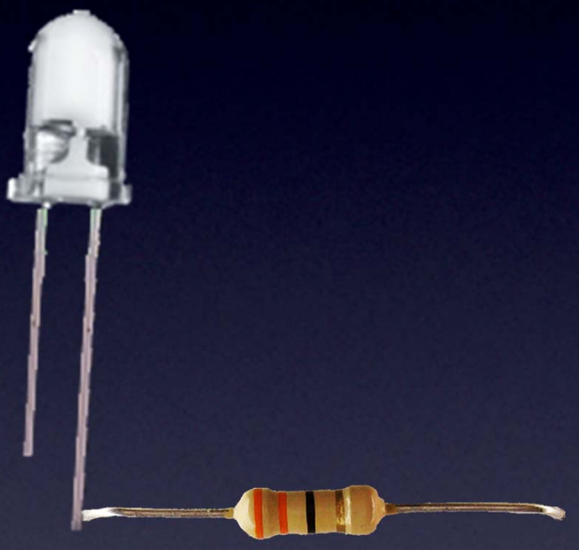
(add a power supply)

Let’s make this light up!

LED

Everything You Need to Know About Electronics



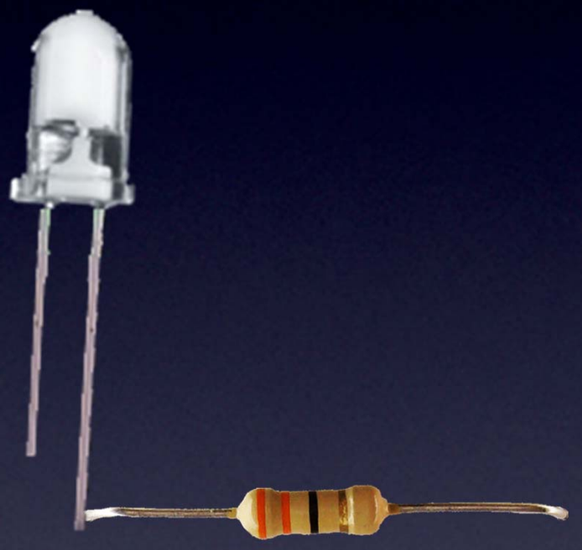


Let’s make this light up!

LED

Everything You Need to Know About Electronics

Black wire: “-” (ground)



Red wire: “+” power)

Let’s make this light up!

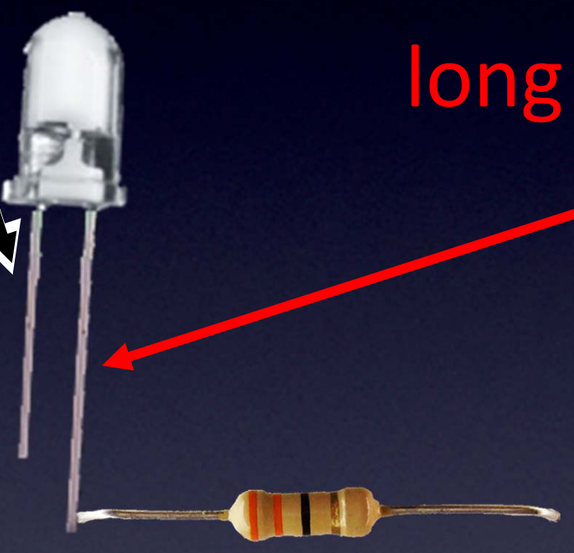
LED

Everything You Need to Know About Electronics

short lead: “-”

Black wire: “-” (ground)

long lead: “+”

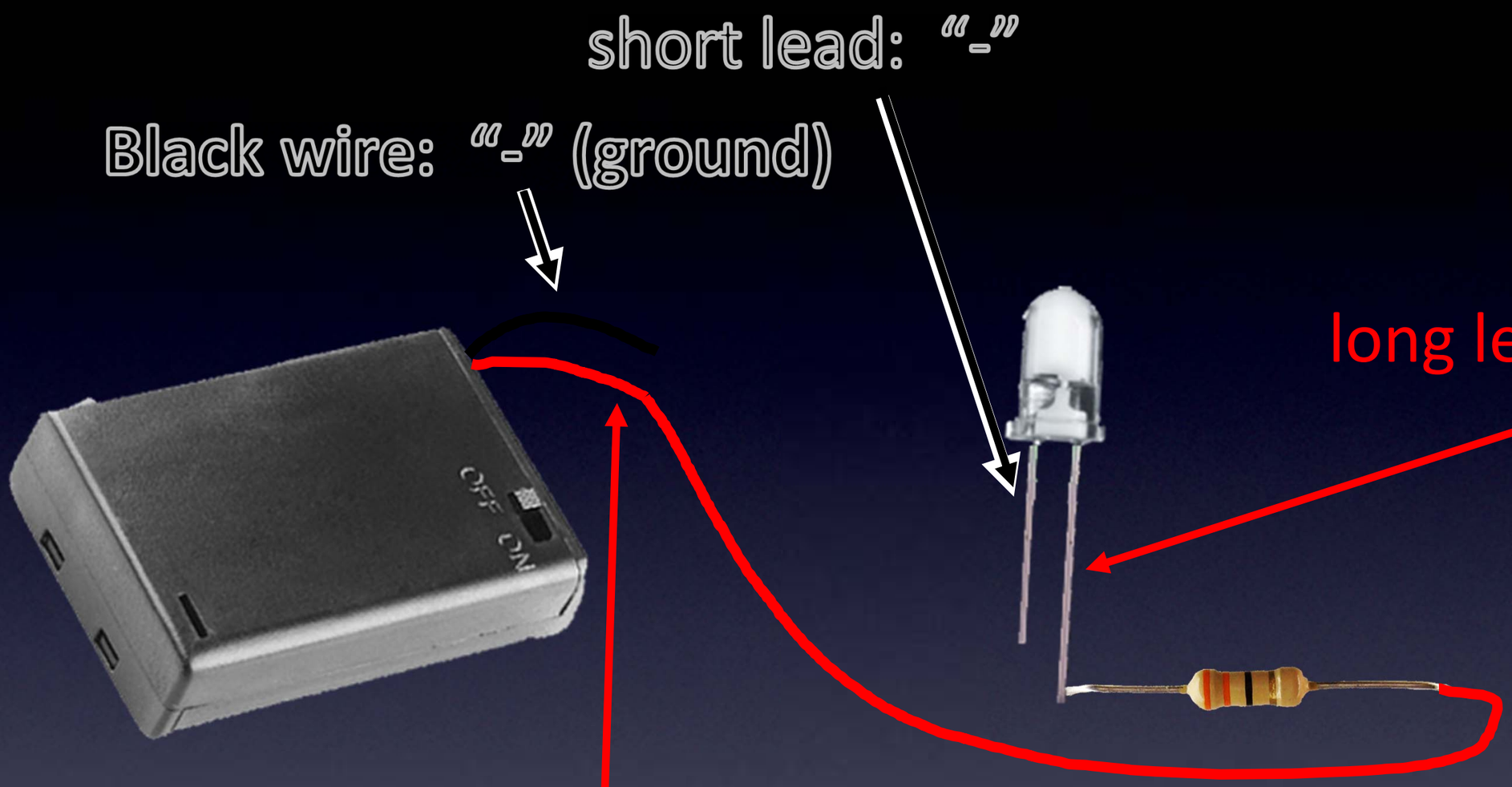


Red wire: “+” power)

Let’s make this light up!

LED

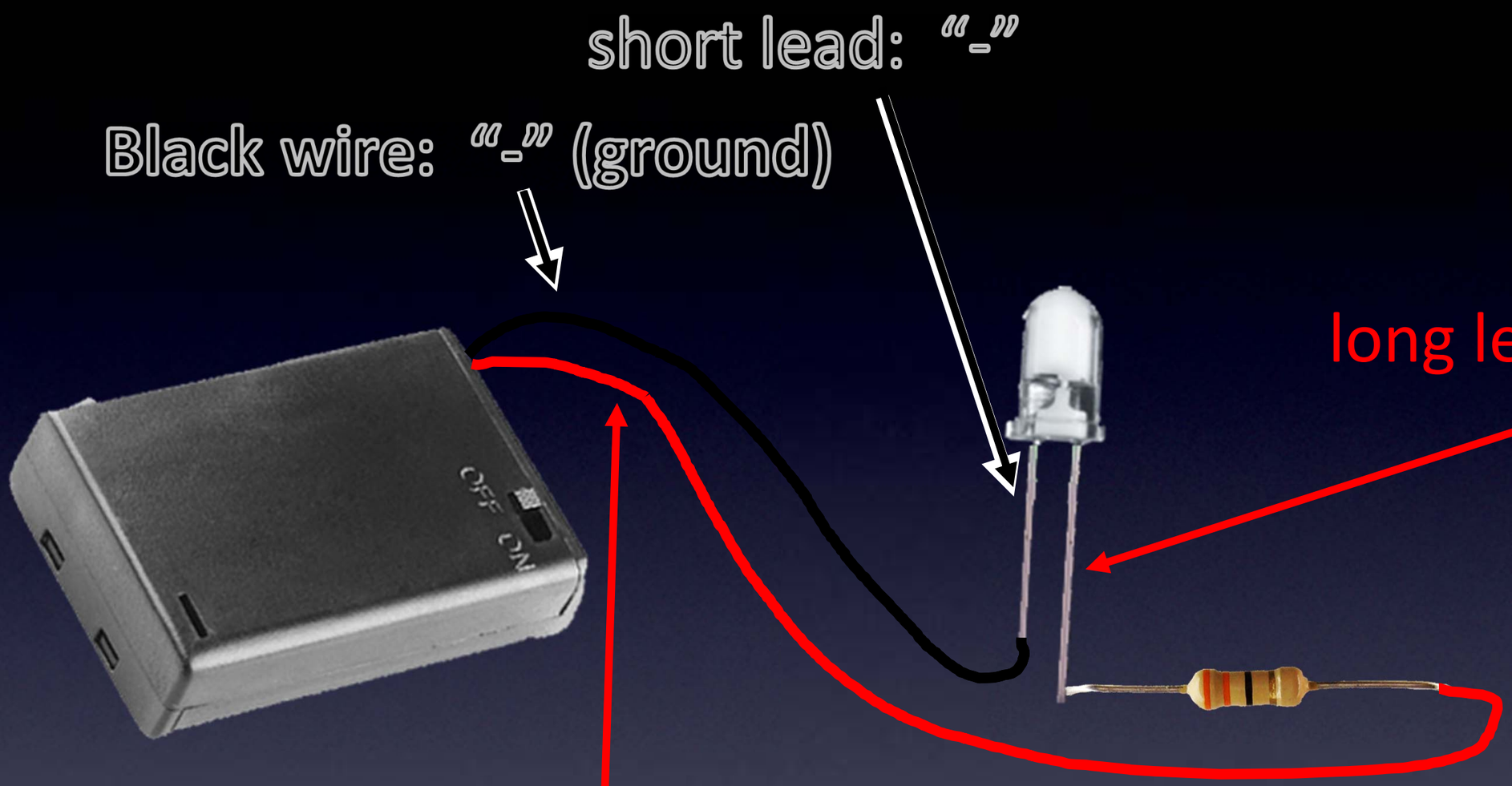
Everything You Need to Know About Electronics



Let’s make this light up!

LED

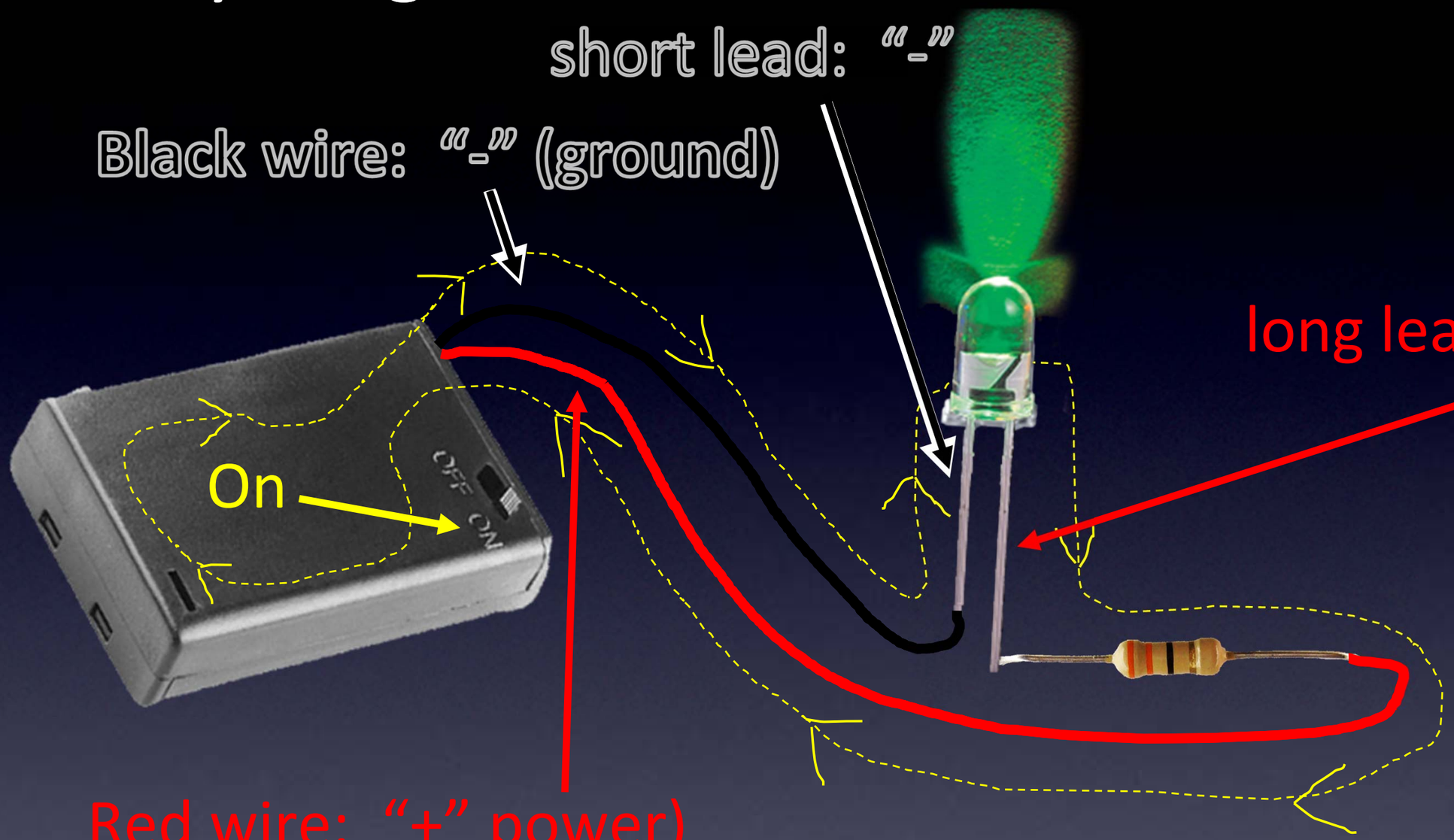
Everything You Need to Know About Electronics



Let’s make this light up!

LED

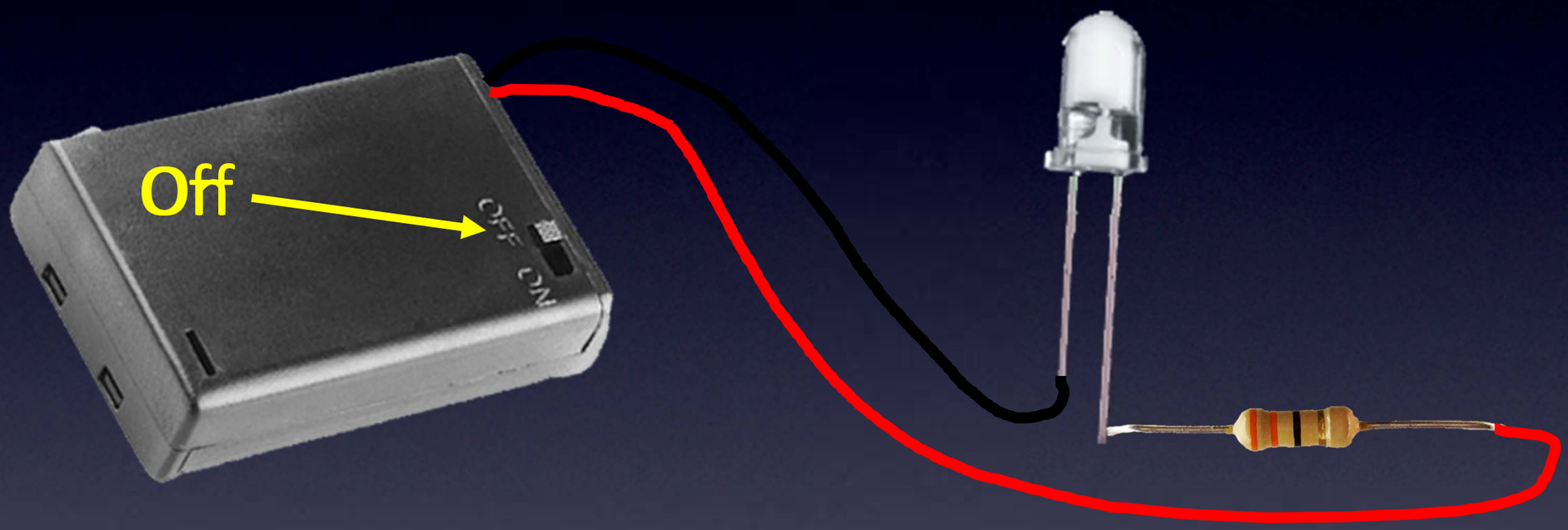
Everything You Need to Know About Electronics



It lights!

LED

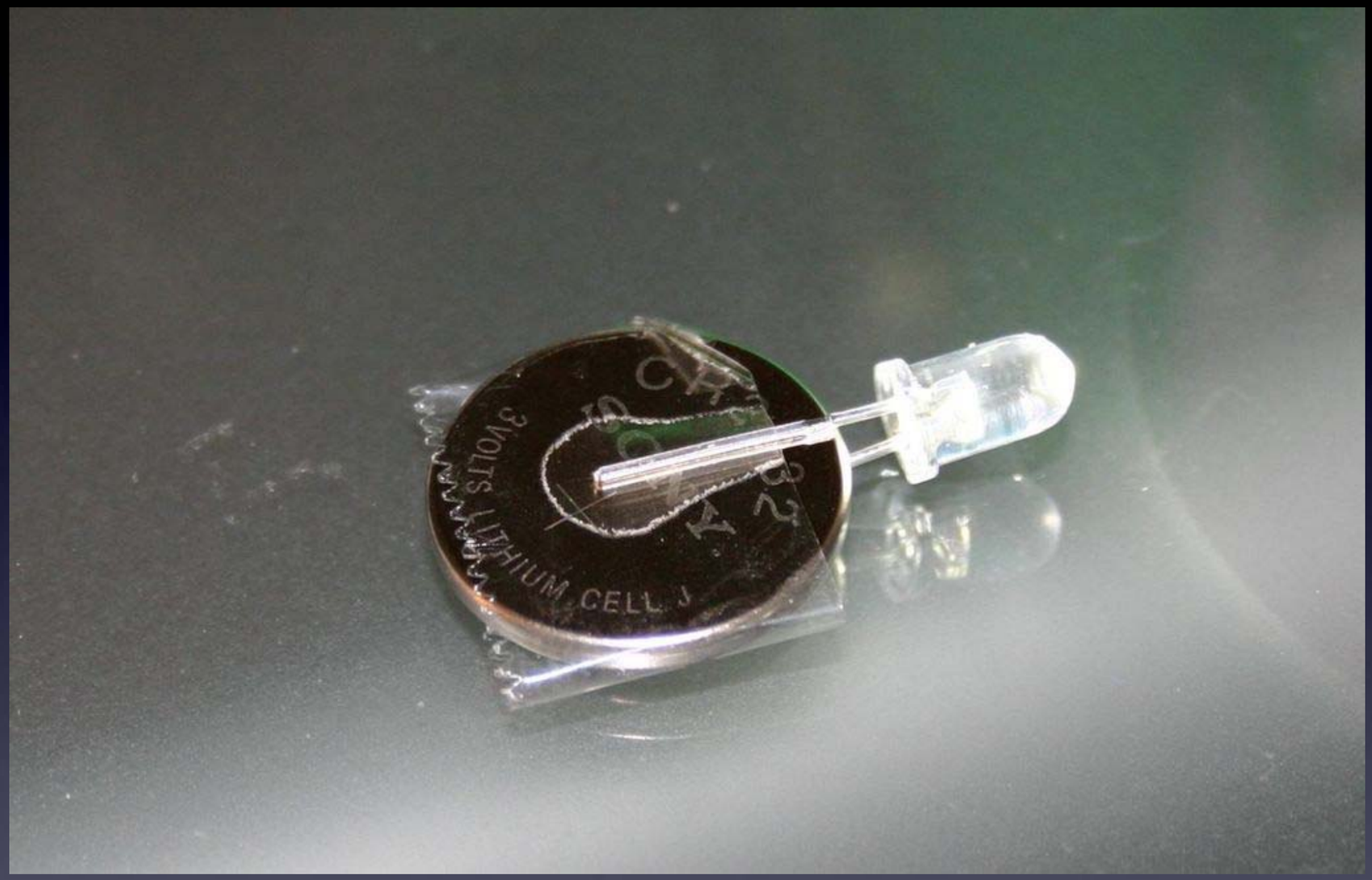
Everything You Need to Know About Electronics



It’s off

LED

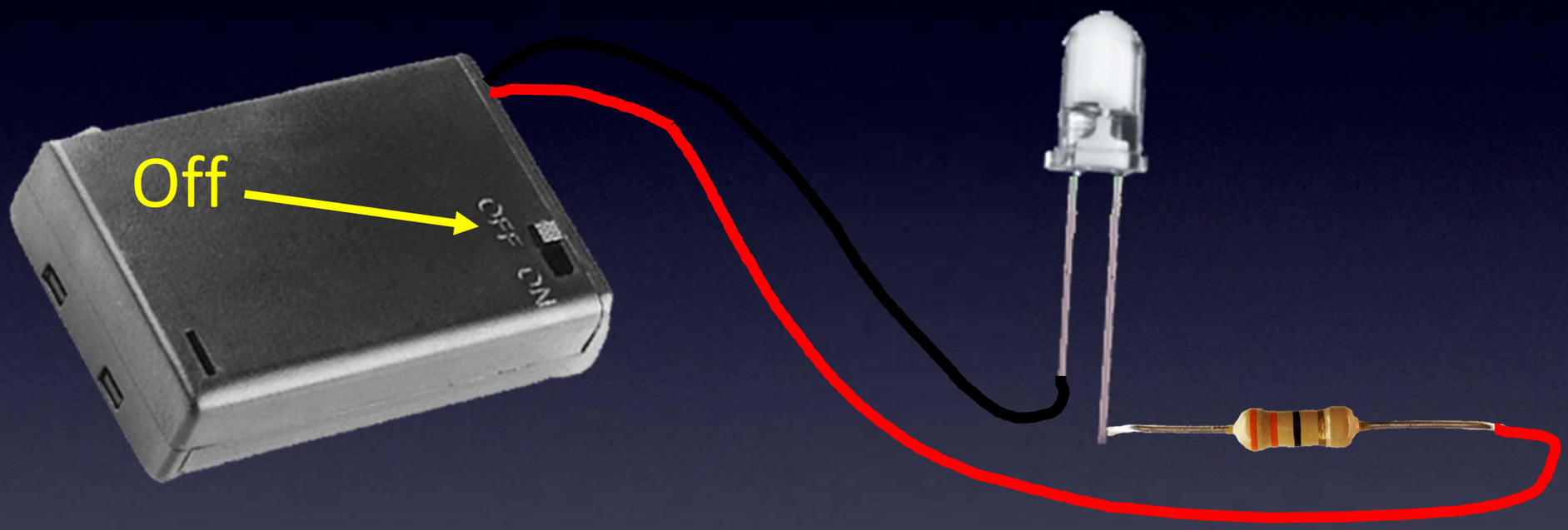
Everything You Need to Know About Electronics



LED & battery

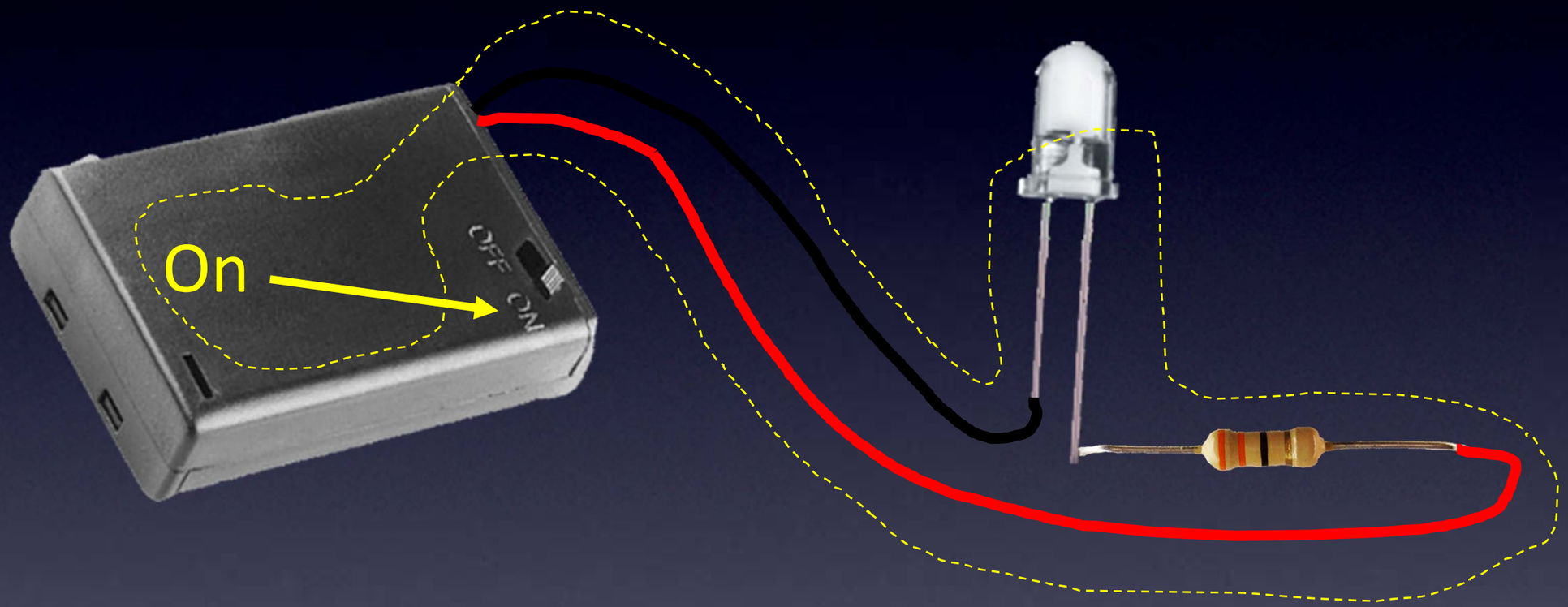
Our first circuit

Everything You Need to Know About Electronics



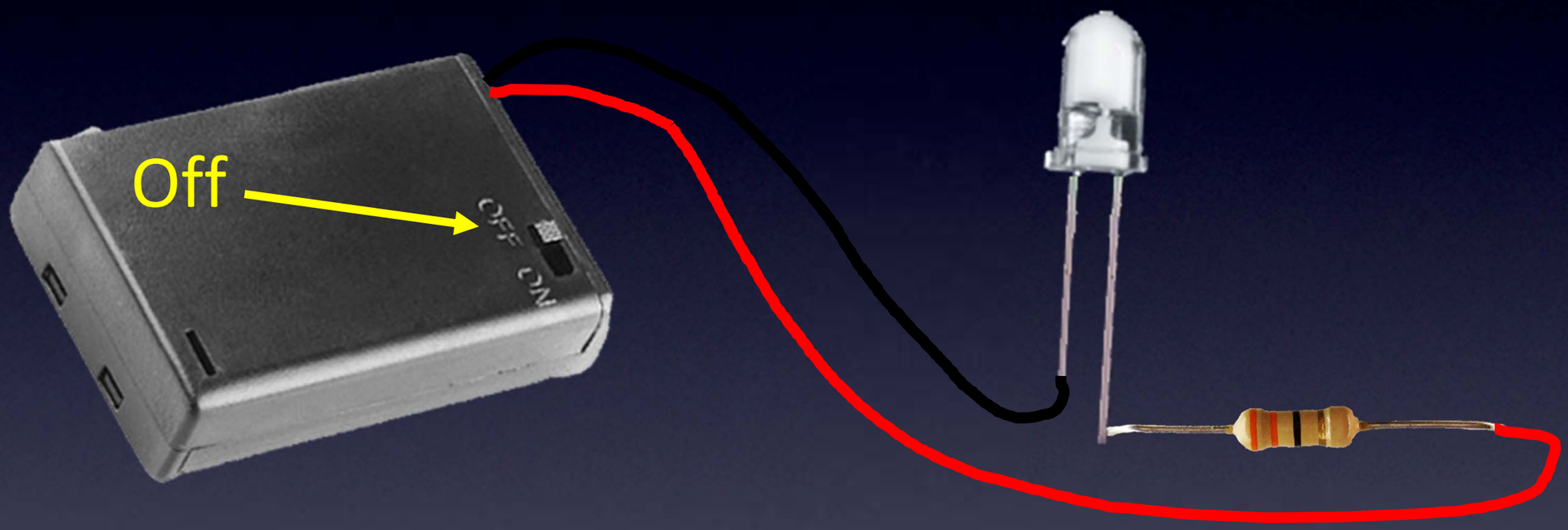
IR LED

Everything You Need to Know About Electronics



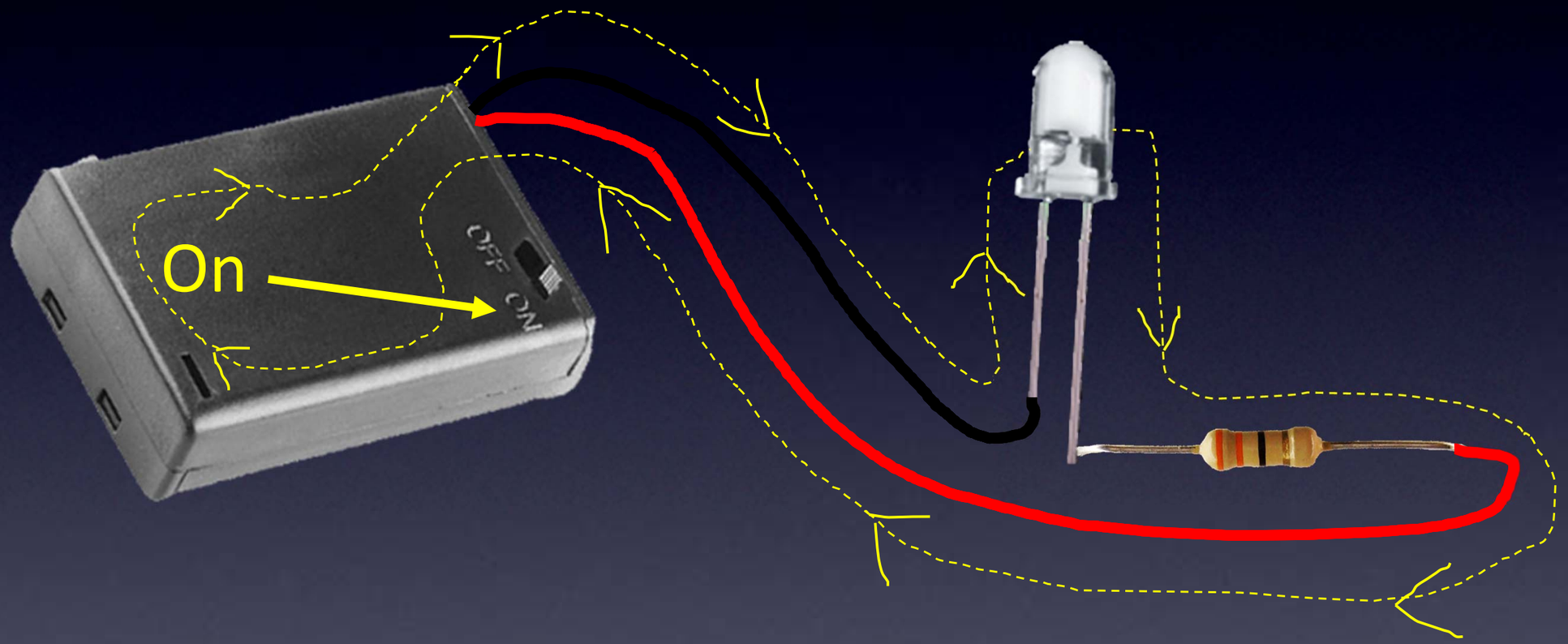
IR LED

Everything You Need to Know About Electronics



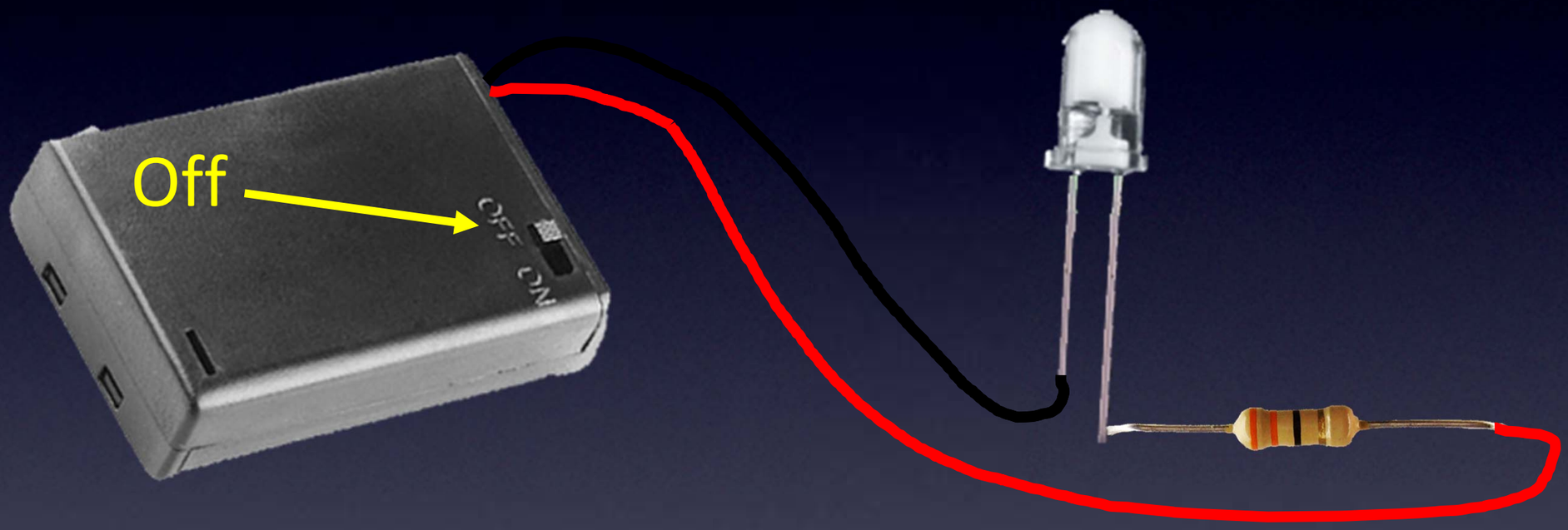
IR LED

Everything You Need to Know About Electronics



IR LED

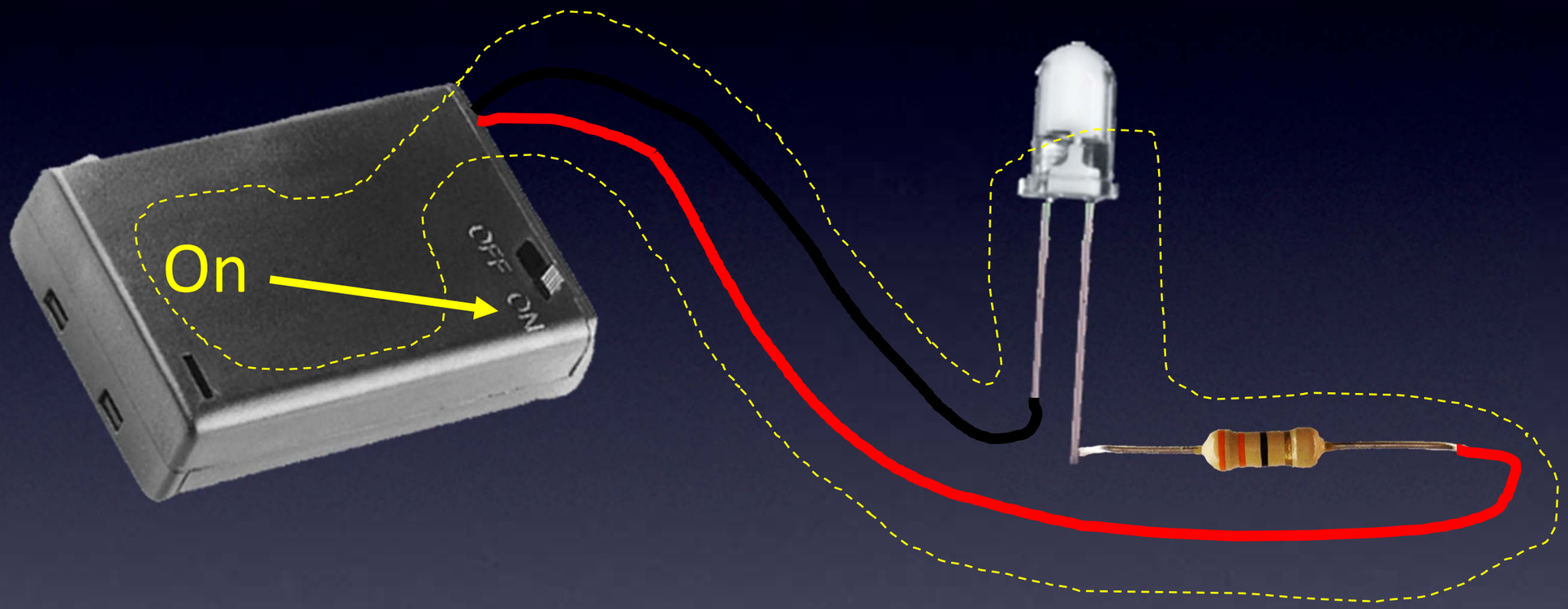
Everything You Need to Know About Electronics



A “code” is IR light blinking on-off-on-off…

IR Remote Control

Everything You Need to Know About Electronics



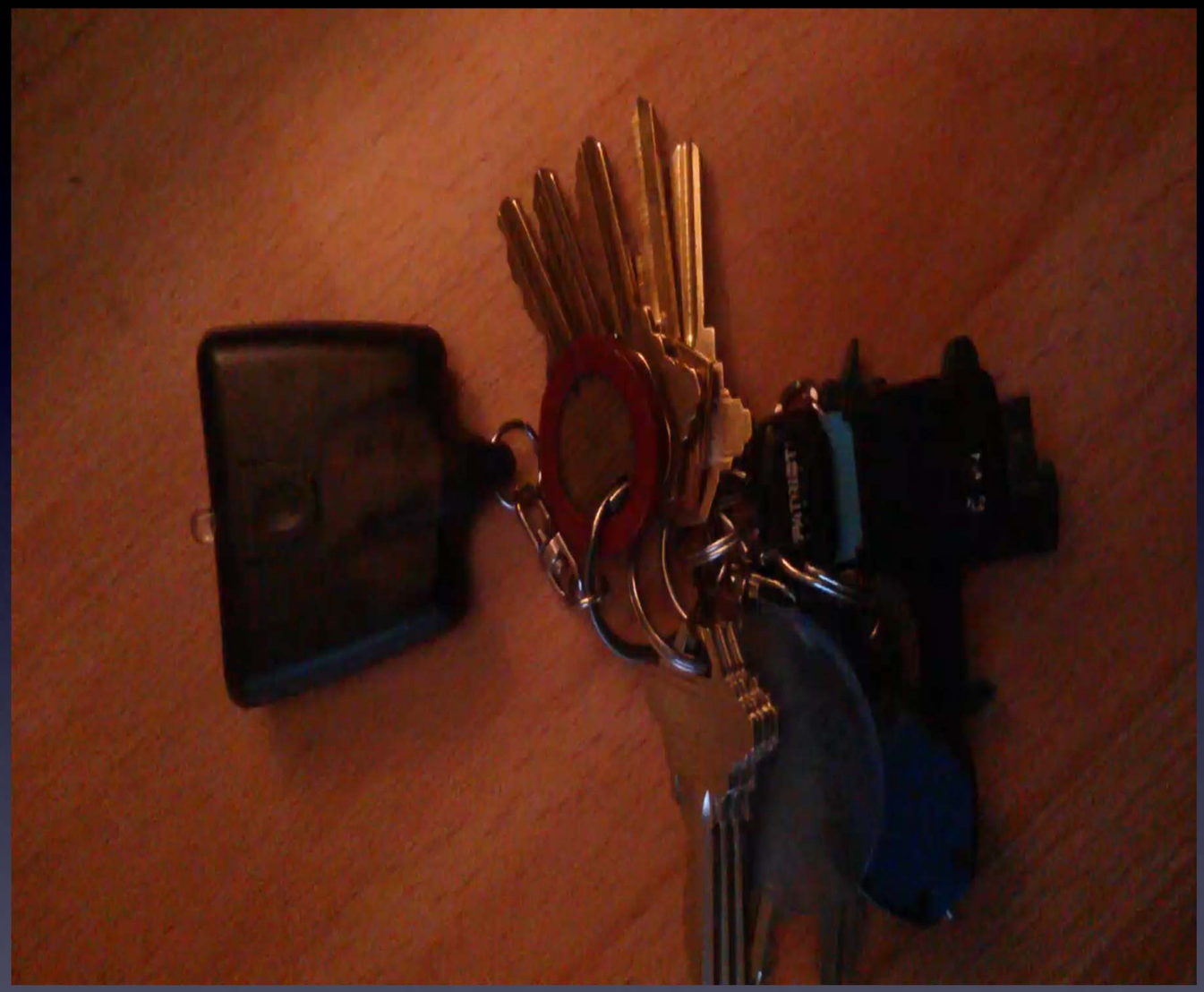
A “code” is IR light blinking on-off-on-off…

(we can’t do this, but microcontrollers can!)

IR Remote Control

Everything You Need to Know About Electronics

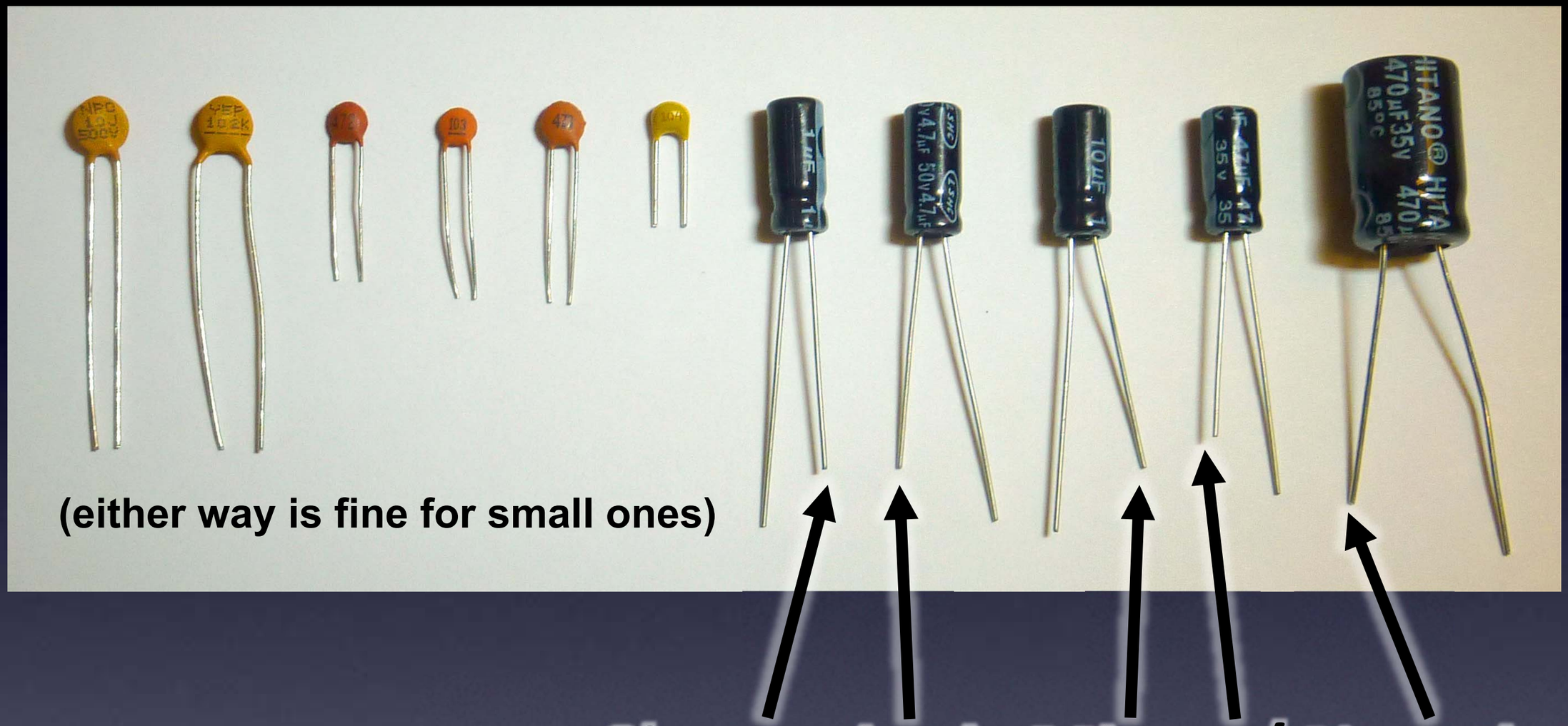
Takes about 60 seconds



About 150 IR “OFF” codes (one per blink)

TV-B-Gone universal remote control

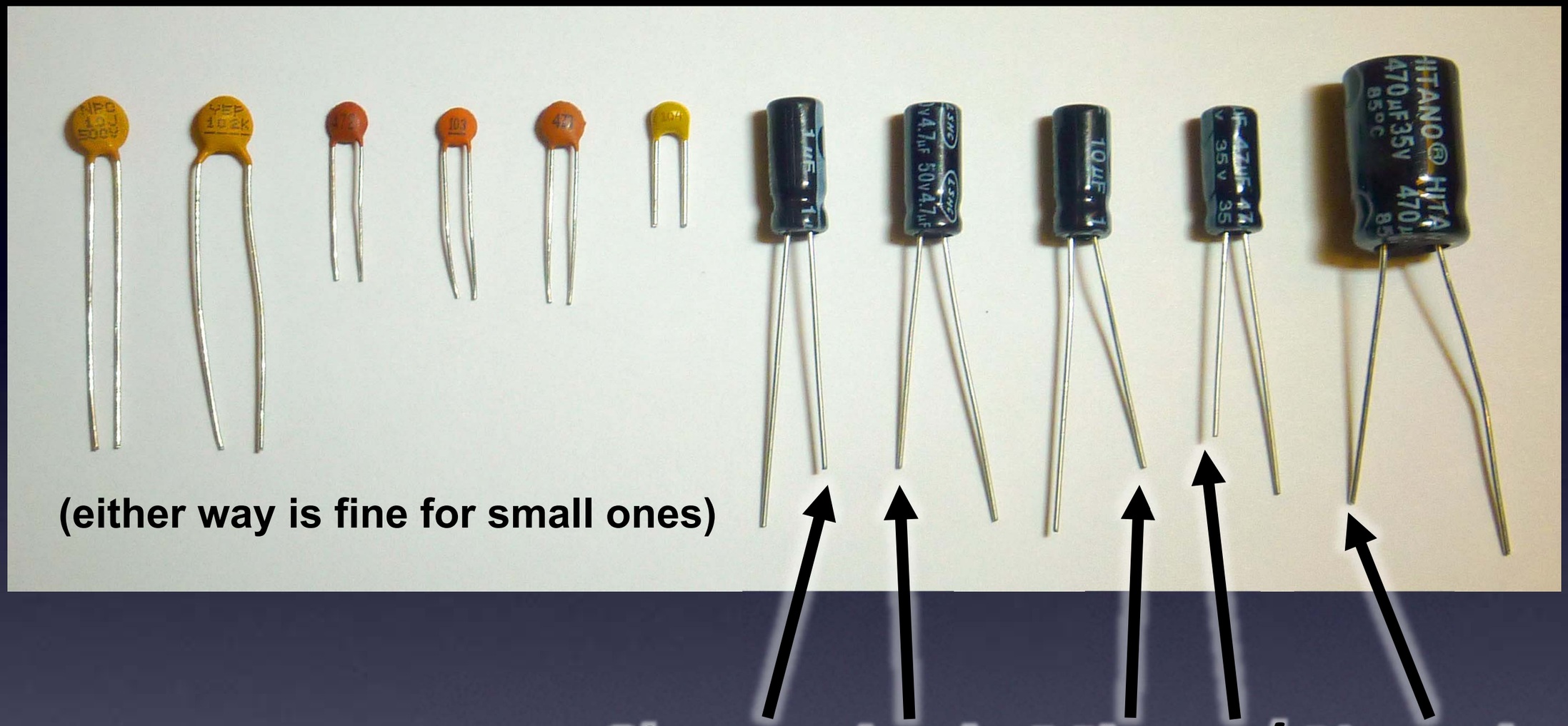
Everything You Need to Know About Electronics



Little buckets for electrons

Capacitor / Farads

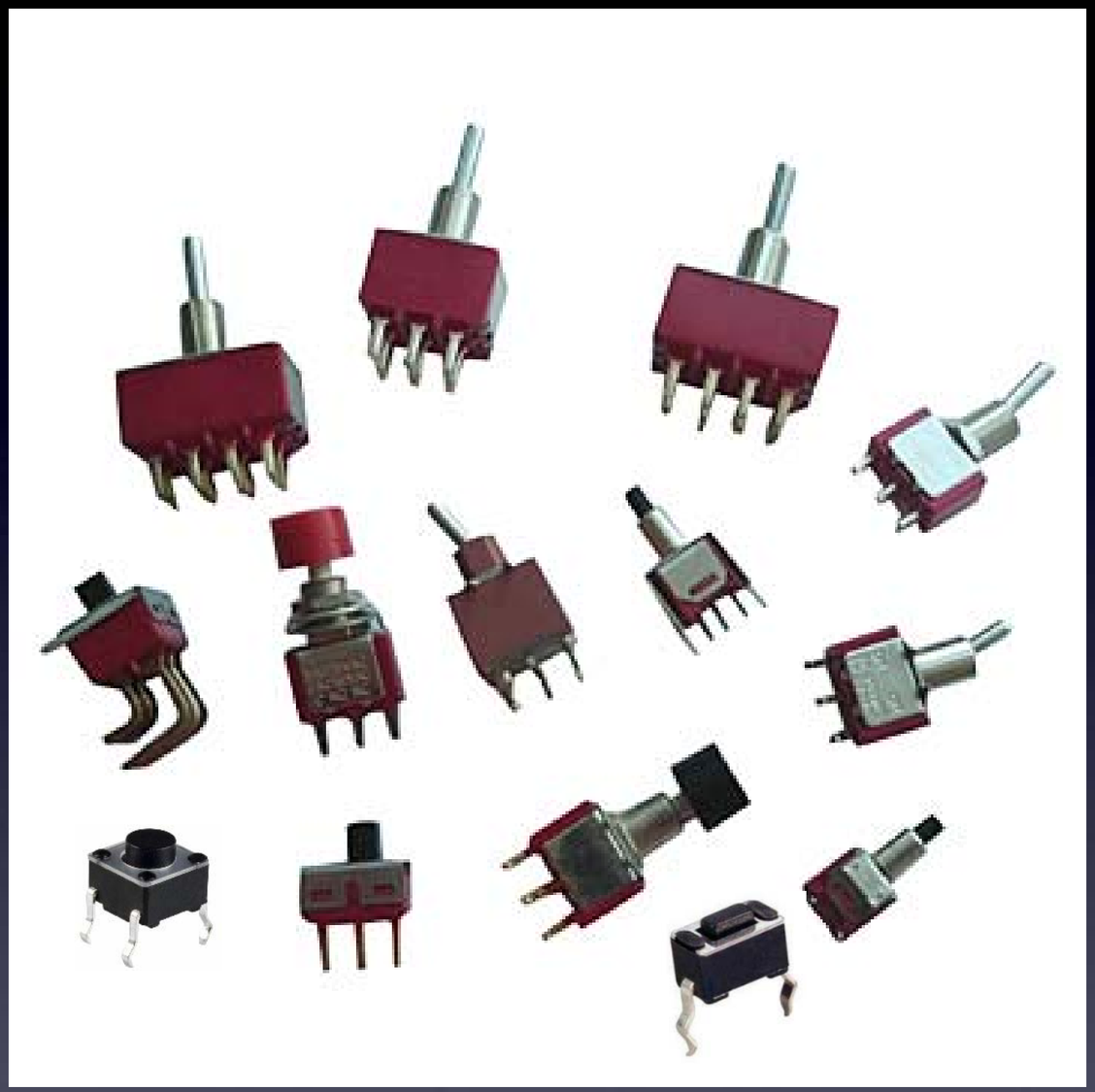
Everything You Need to Know About Electronics



Little buckets for electrons

Capacitor / **Farads**

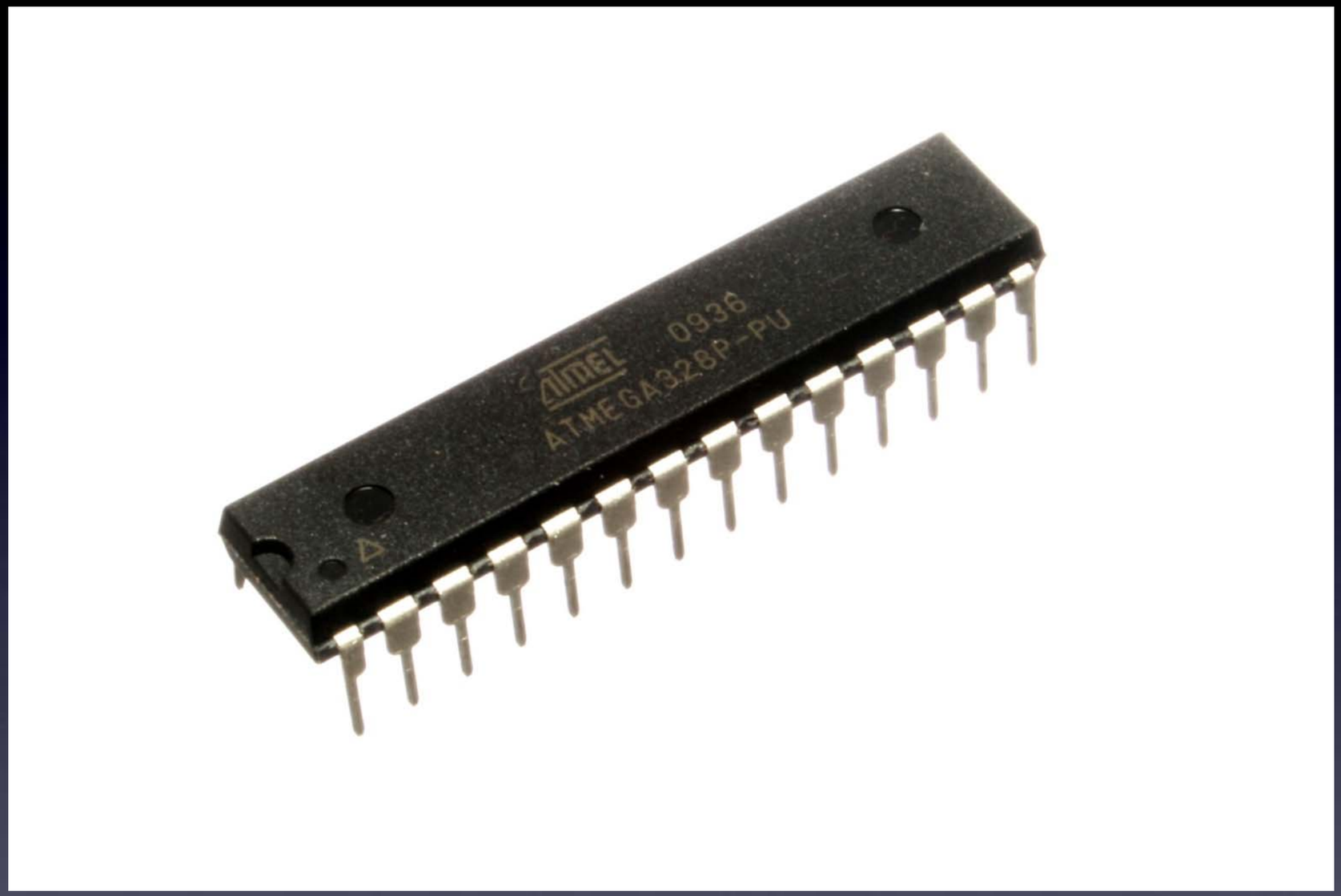
Everything You Need to Know About Electronics



Strips of metal connected together – or not

Switch

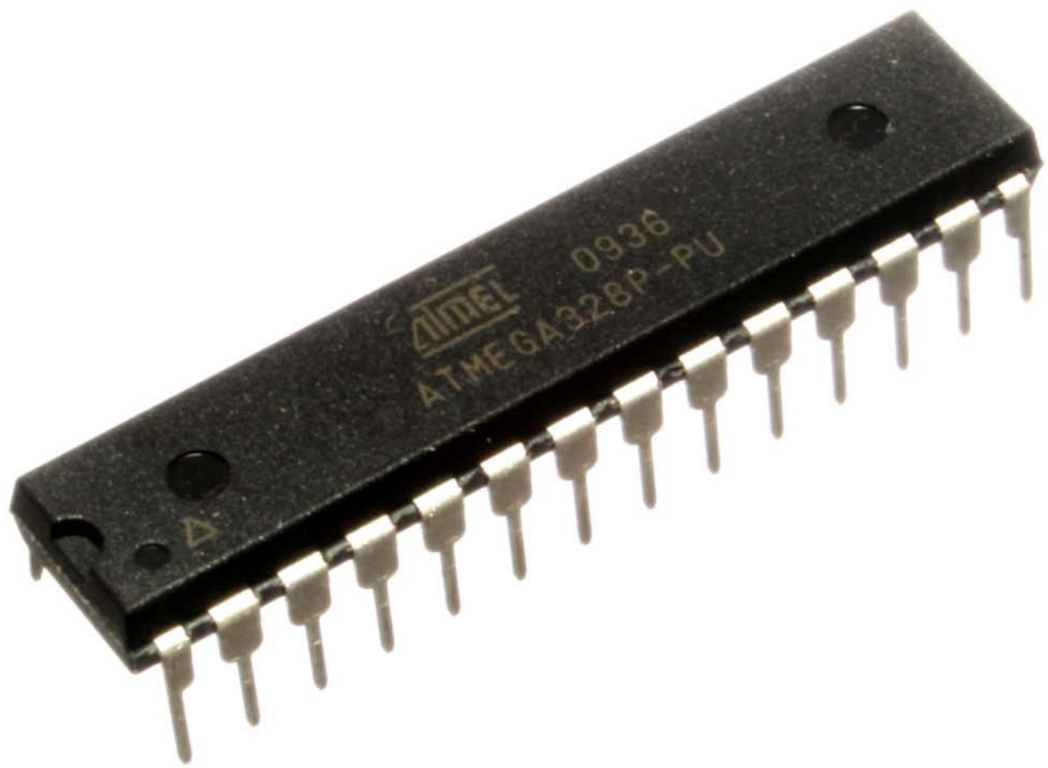
Everything You Need to Know About Electronics



A complete computer on a chip

Microcontroller

Everything You Need to Know About Electronics



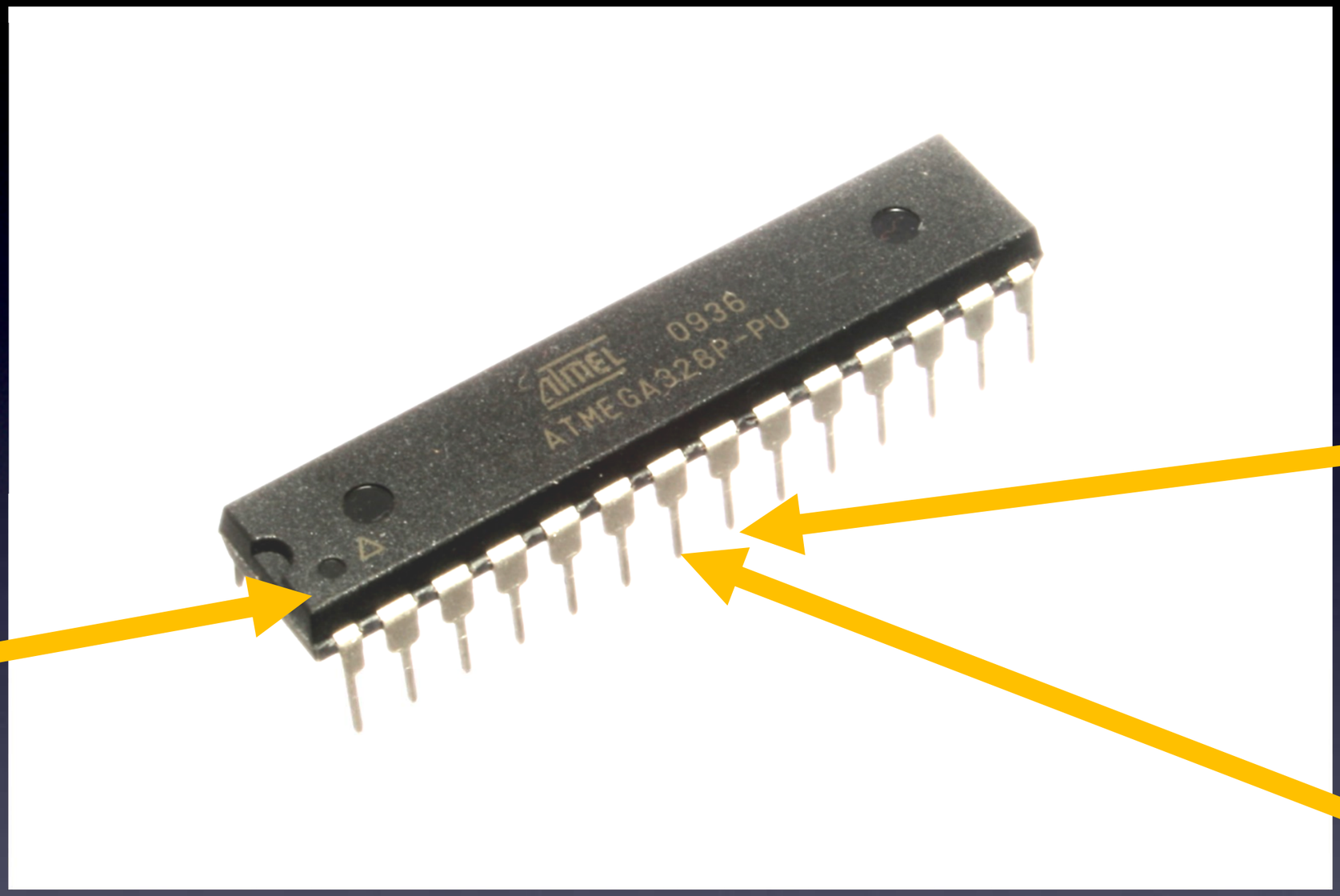
It runs programs

that control electronic parts connected to its pins.

Microcontroller

Everything You Need to Know About Electronics

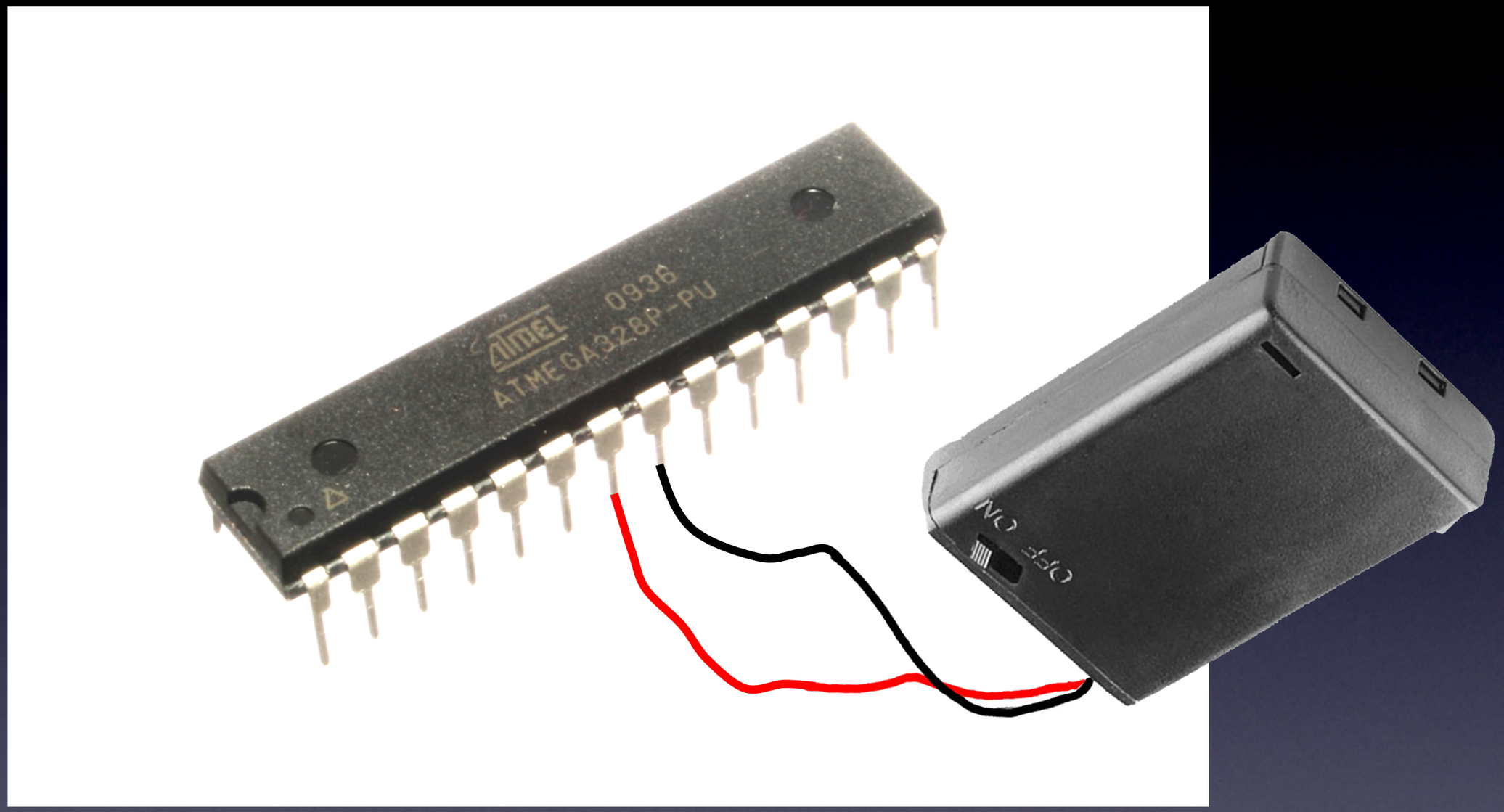
2 special pins:



A complete computer on a chip

Microcontroller – it matters how you hook it up!

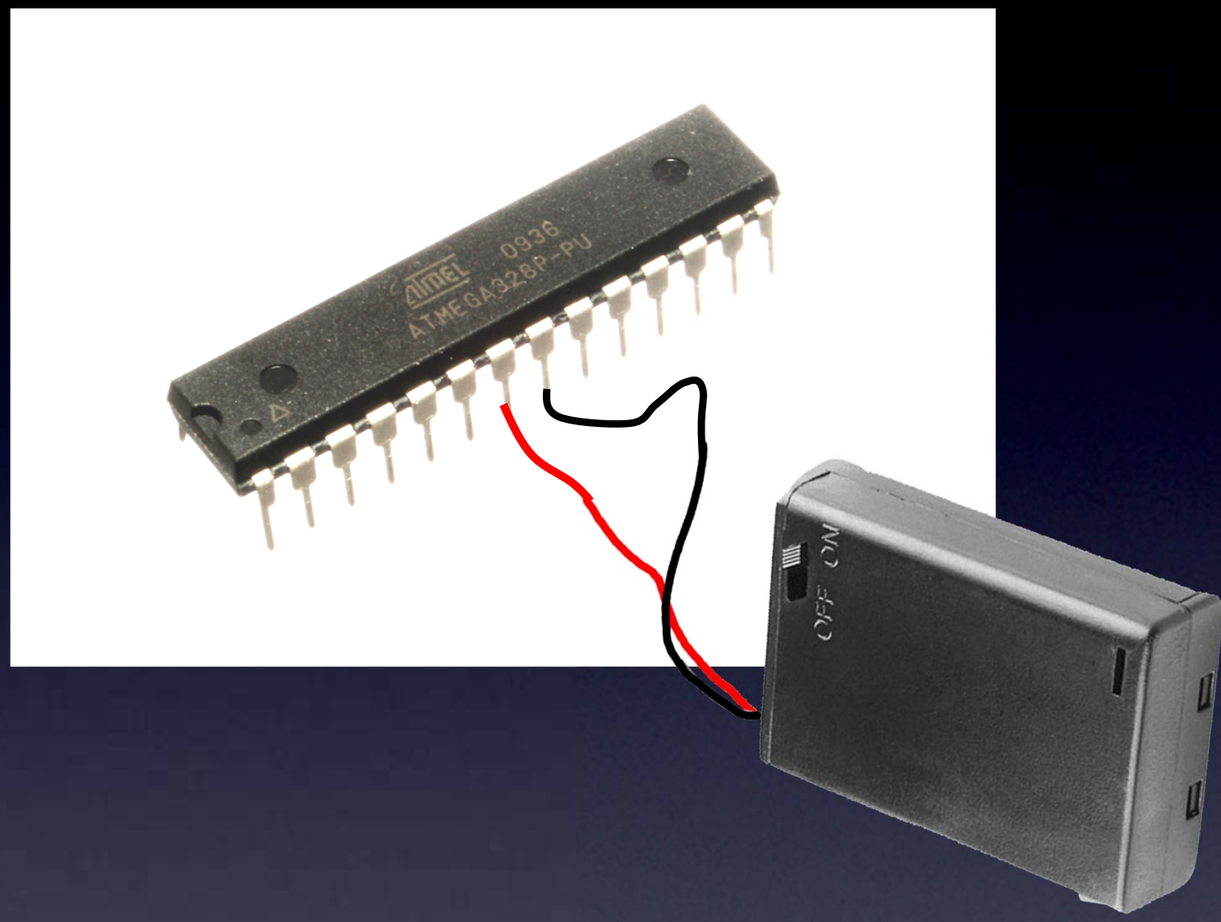
Everything You Need to Know About Electronics



A complete computer – running a program!

Microcontroller – turned on!

Everything You Need to Know About Electronics



all other pins are

Input pins

or

Output pins

Your program controls electronics parts
on these other pins

Microcontroller

Everything You Need to Know About Electronics

Analog Electronics:

Any voltage between Ground (0V) and Vcc

Digital Electronics:

Only 2 choices: Ground (0V) or Vcc

2 types of electronics

Everything You Need to Know About Electronics

Ground (0V)	**Power / Vcc**
Low	**High**
Off	**On**
0	**1**

(without Voltage / with Voltage)
(without current / with current)

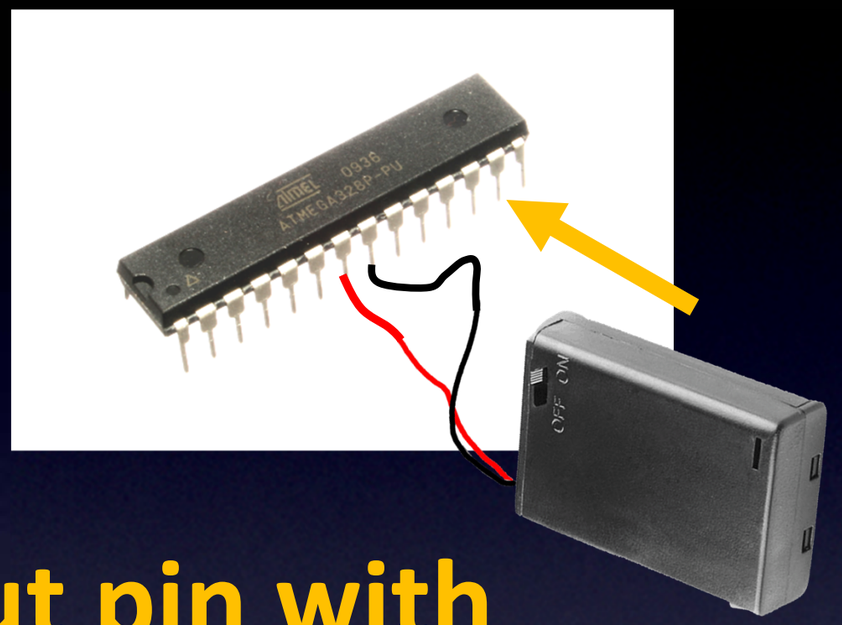
Digital Electronics:

Only 2 choices: Ground (0V) or Vcc

Digital Electronics

Everything You Need to Know About Electronics

To make a pin an
Output pin



you tell it to become an Output pin with a statement in your program

Let’s tell pin 13 to be an Output pin

Microcontroller – Output pins

Everything You Need to Know About Electronics

Low	**High**
Off	**On**
(0V)	(Power supply voltage)
	-- like the Red wire of our power supply
	-- but controlled by our program!

Only 2 choices: High or Low

Microcontroller – Output pins

A real world example

How to make an LED blink?

`Hello World`

Microcontroller

Everything You Need to Know About Electronics

Software

Type:

```
Hello World
```

on your screen

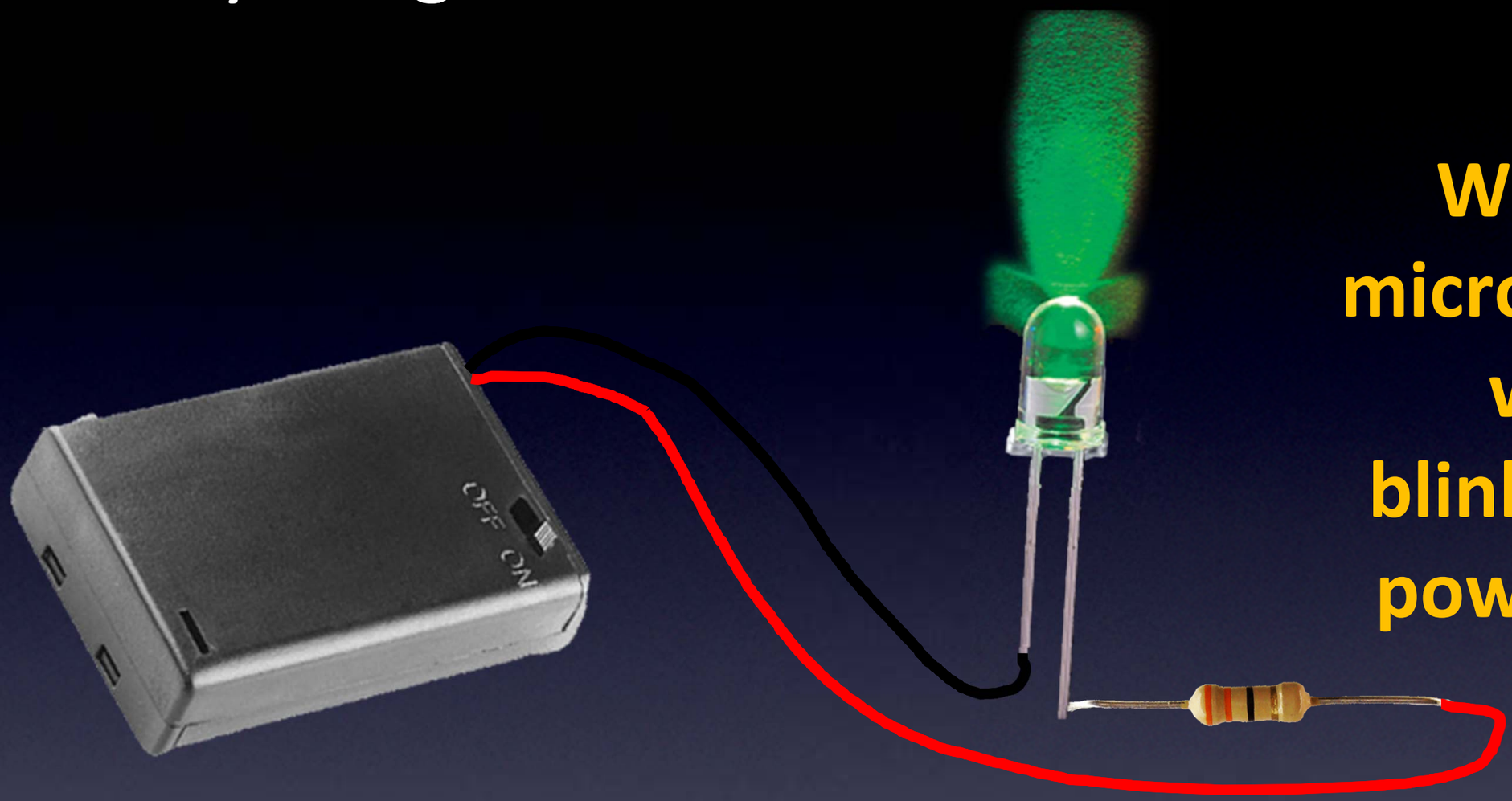
Microcontrollers

make an LED blink

```
Hello World
```

Microcontroller

Everything You Need to Know About Electronics



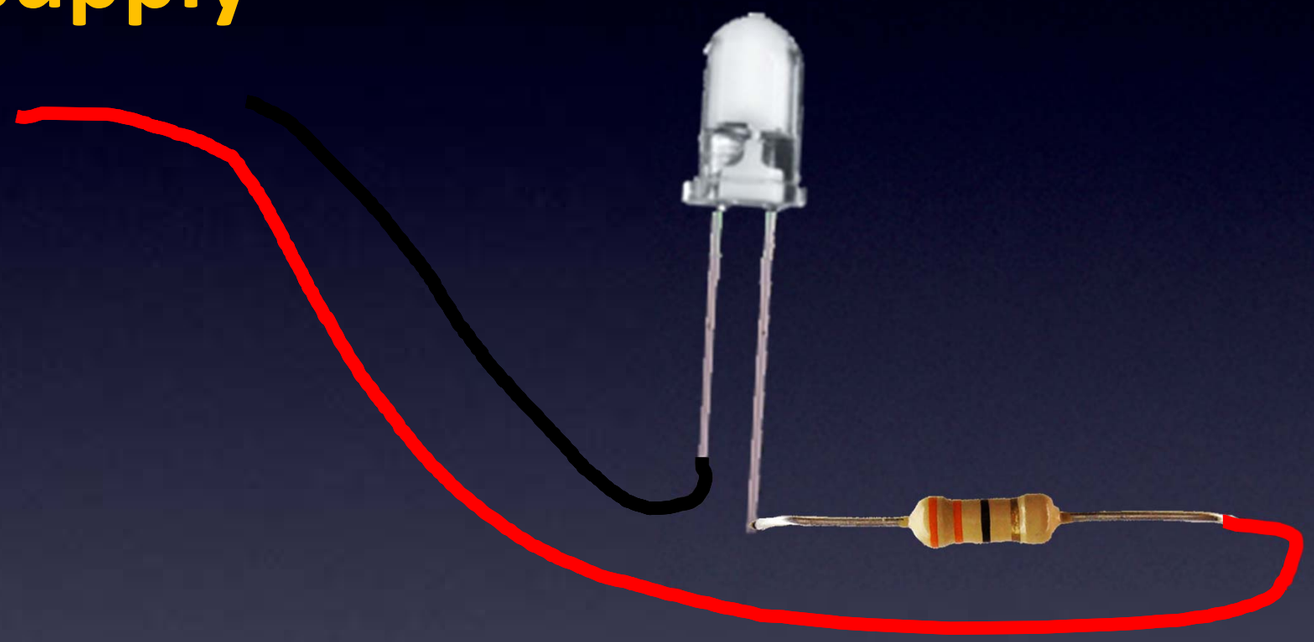
Without a microcontroller we can blink with our power supply

Turning an LED on and off

(Leading up to `Hello World`)

Everything You Need to Know About Electronics

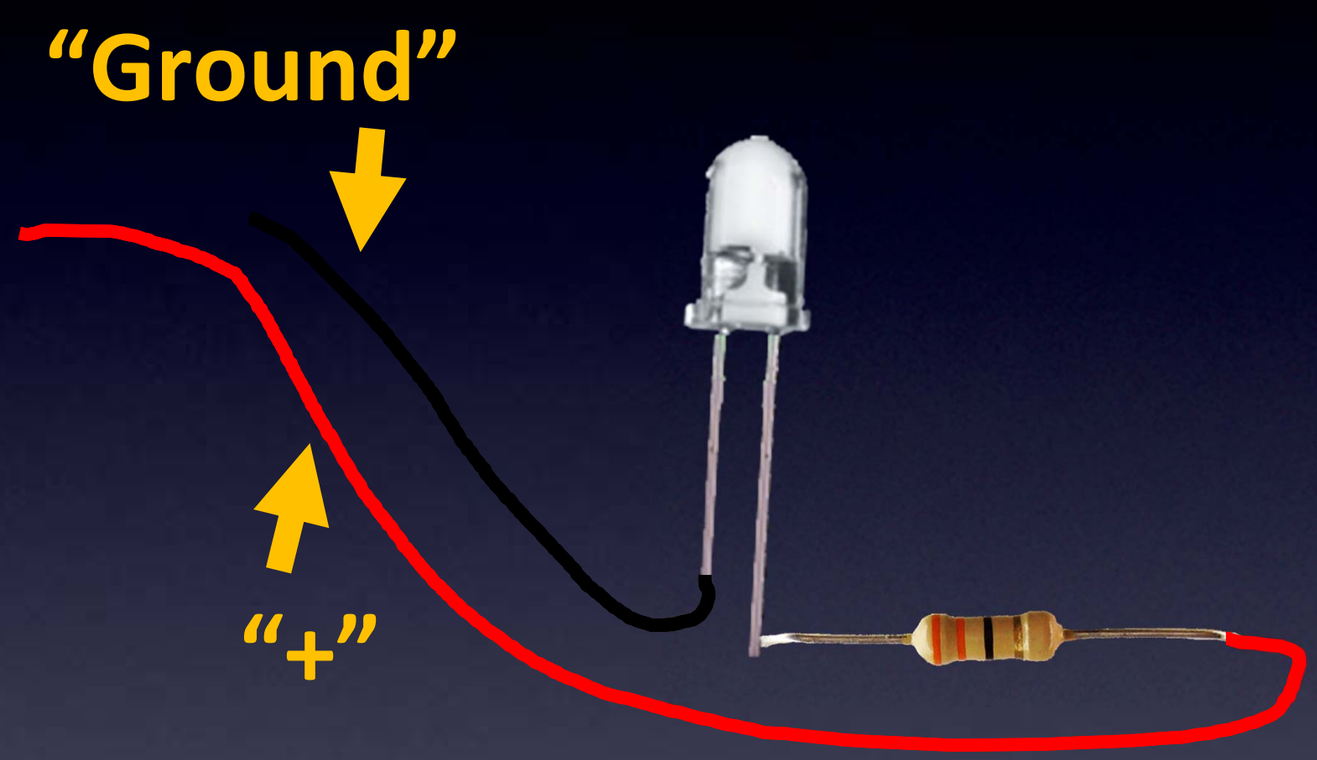
Let's replace the power supply



Turning an LED on and off

(Leading up to `Hello World`)

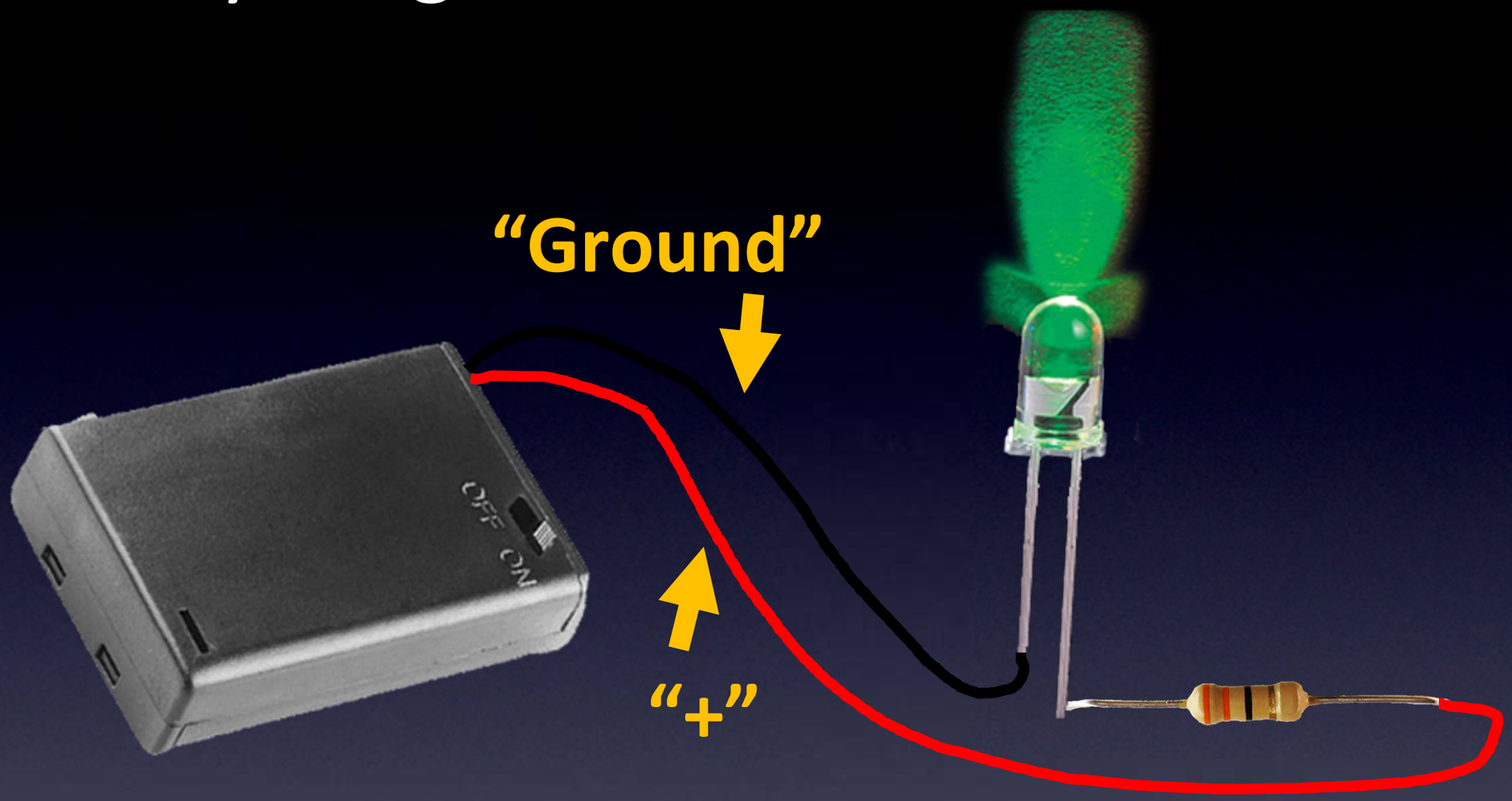
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

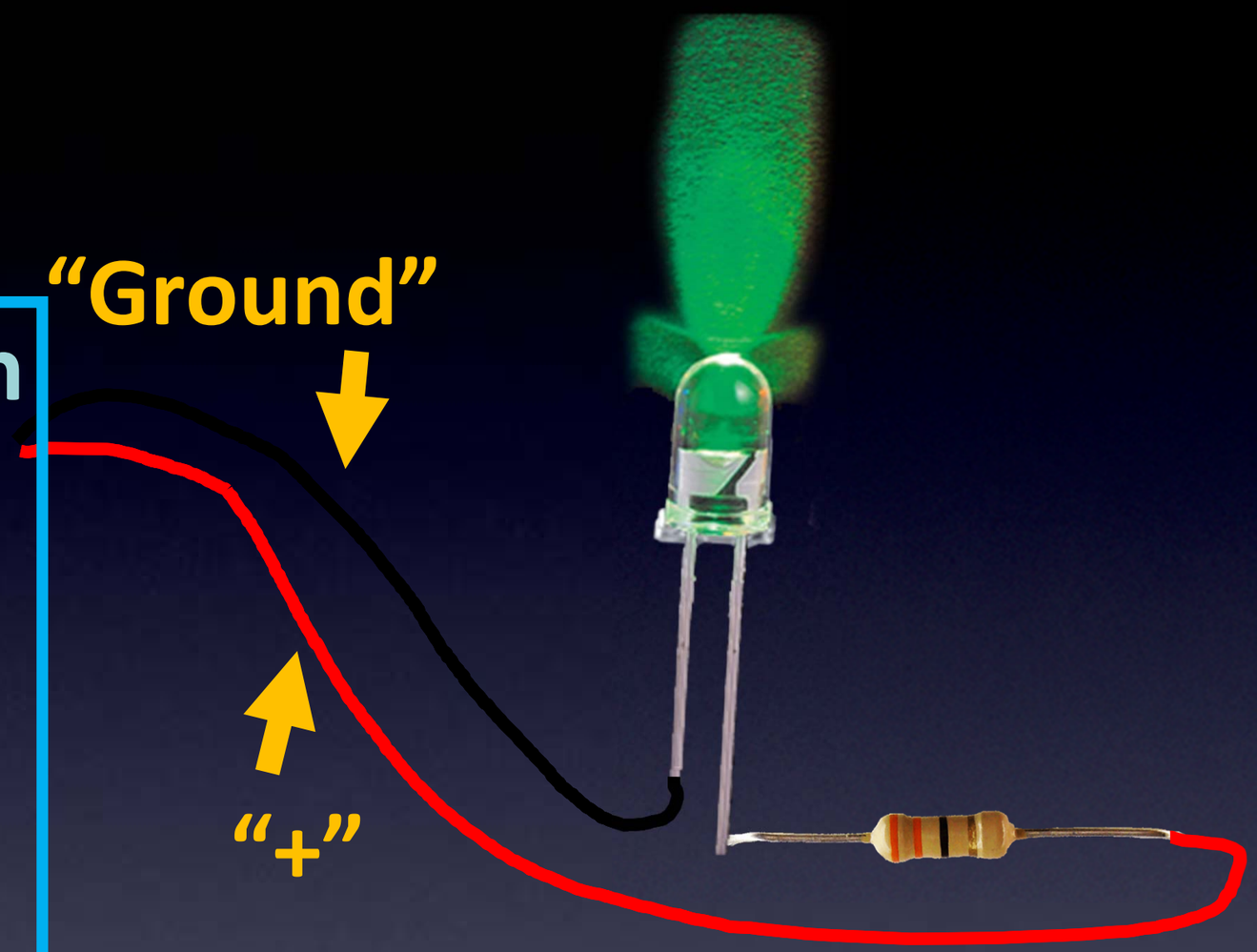
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

Everything You Need to Know About Electronics



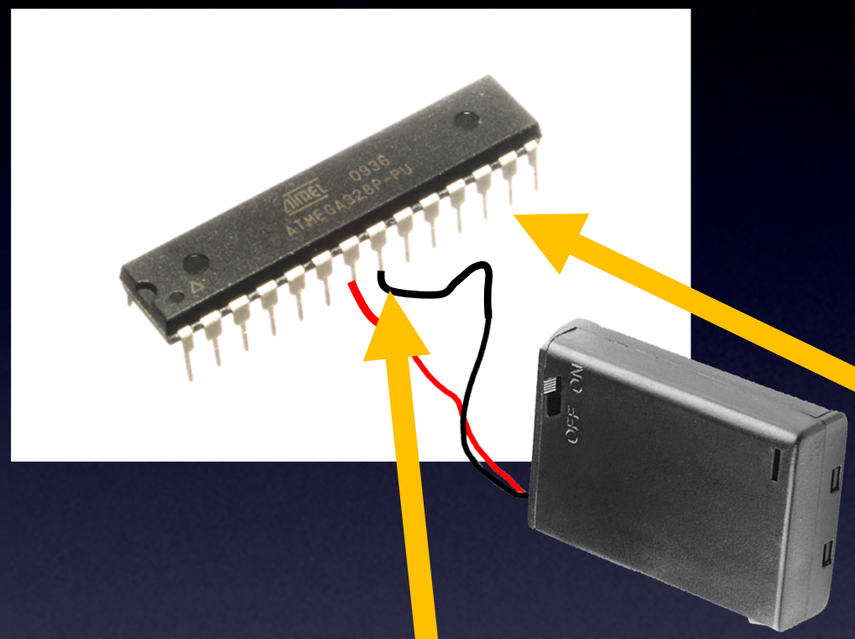
We can use an Output pin (and Ground)

as our power supply

Turning an LED on and off

(Leading up to `Hello World`)

Everything You Need to Know About Electronics



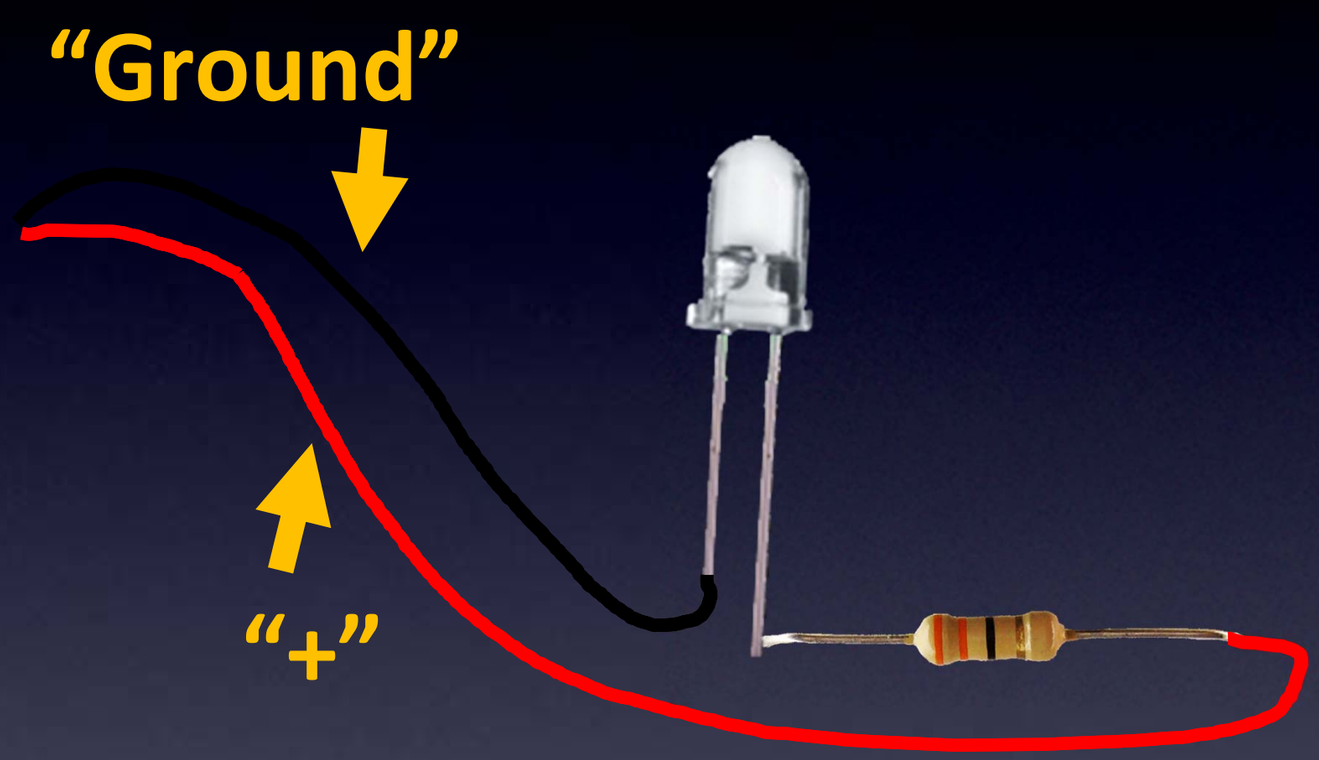
Ground

Let's use Pin 13
as our Output pin
(it can be High or Low)

Turning an LED on and off

(Leading up to `Hello World`)

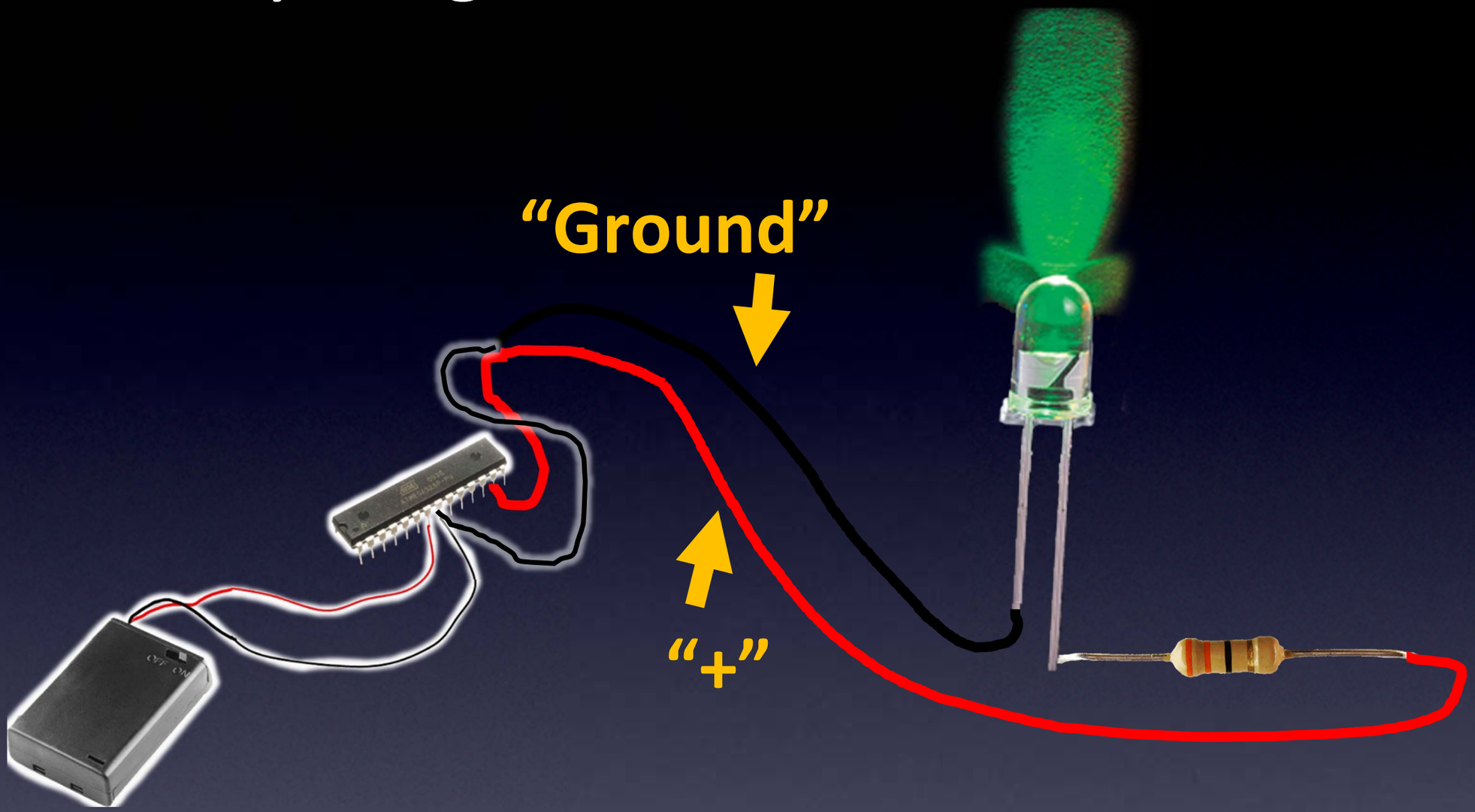
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

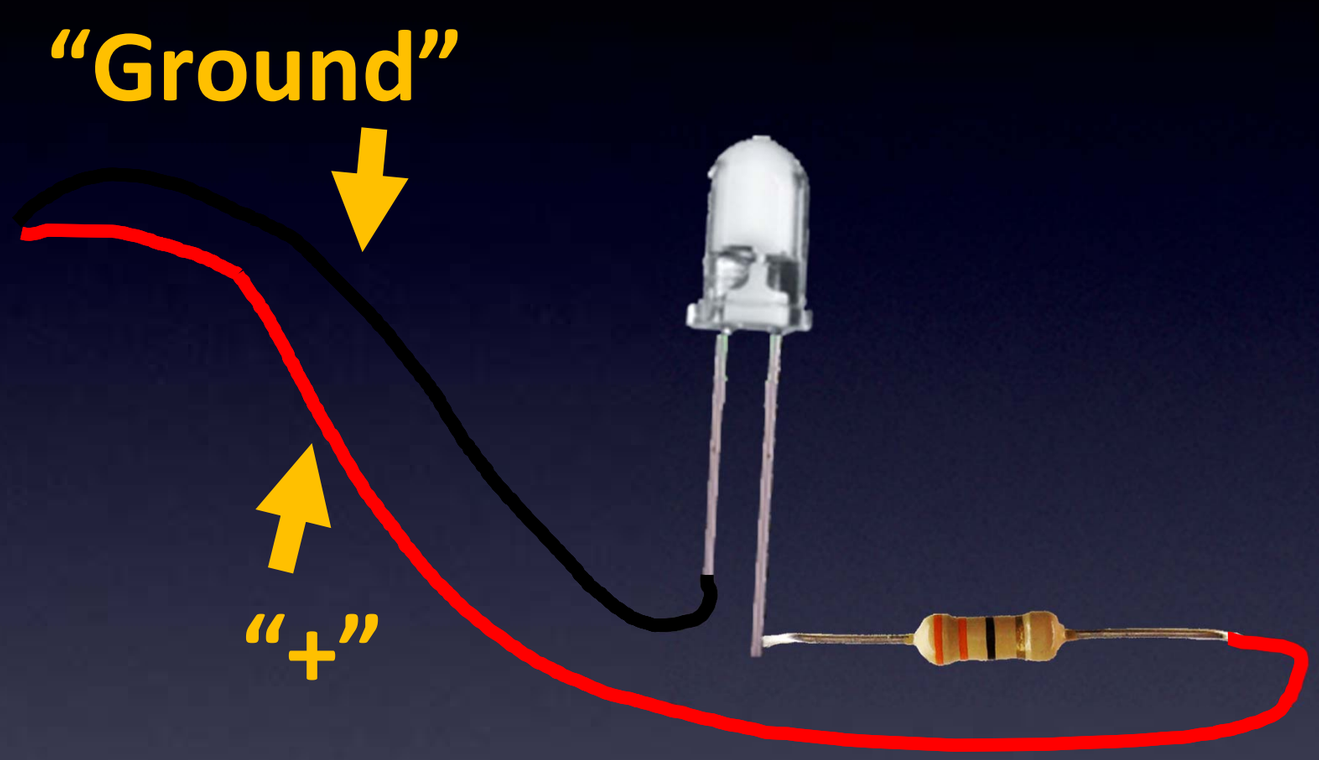
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

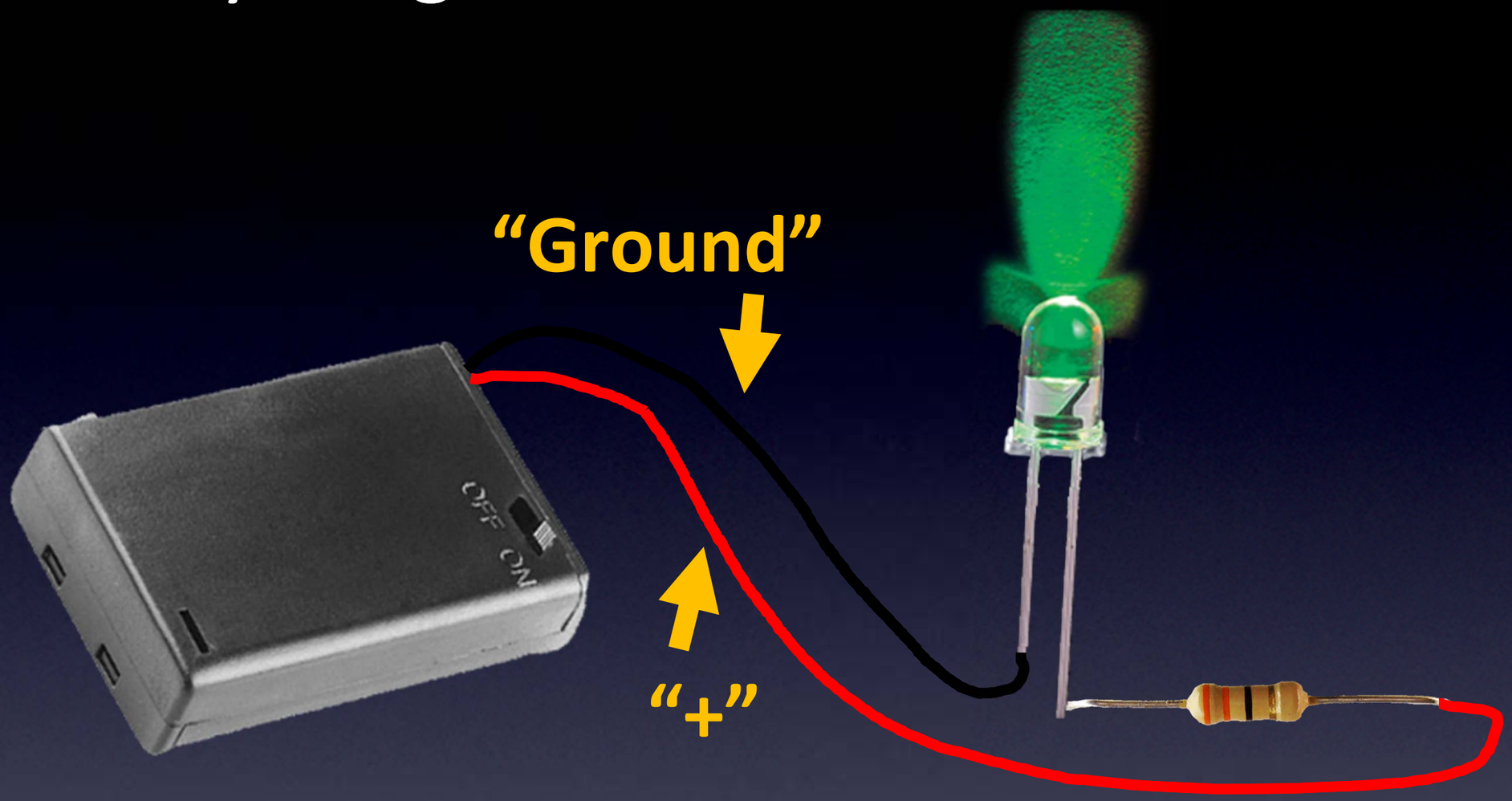
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

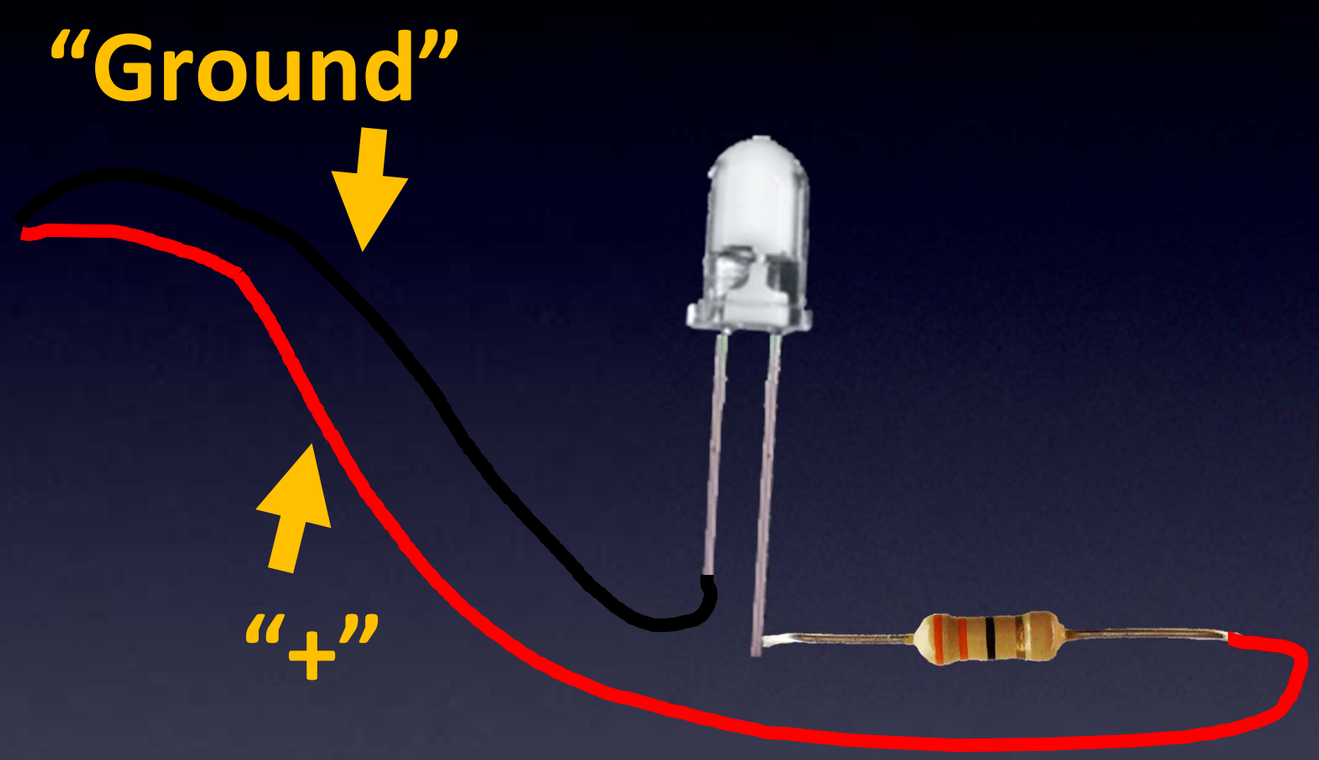
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

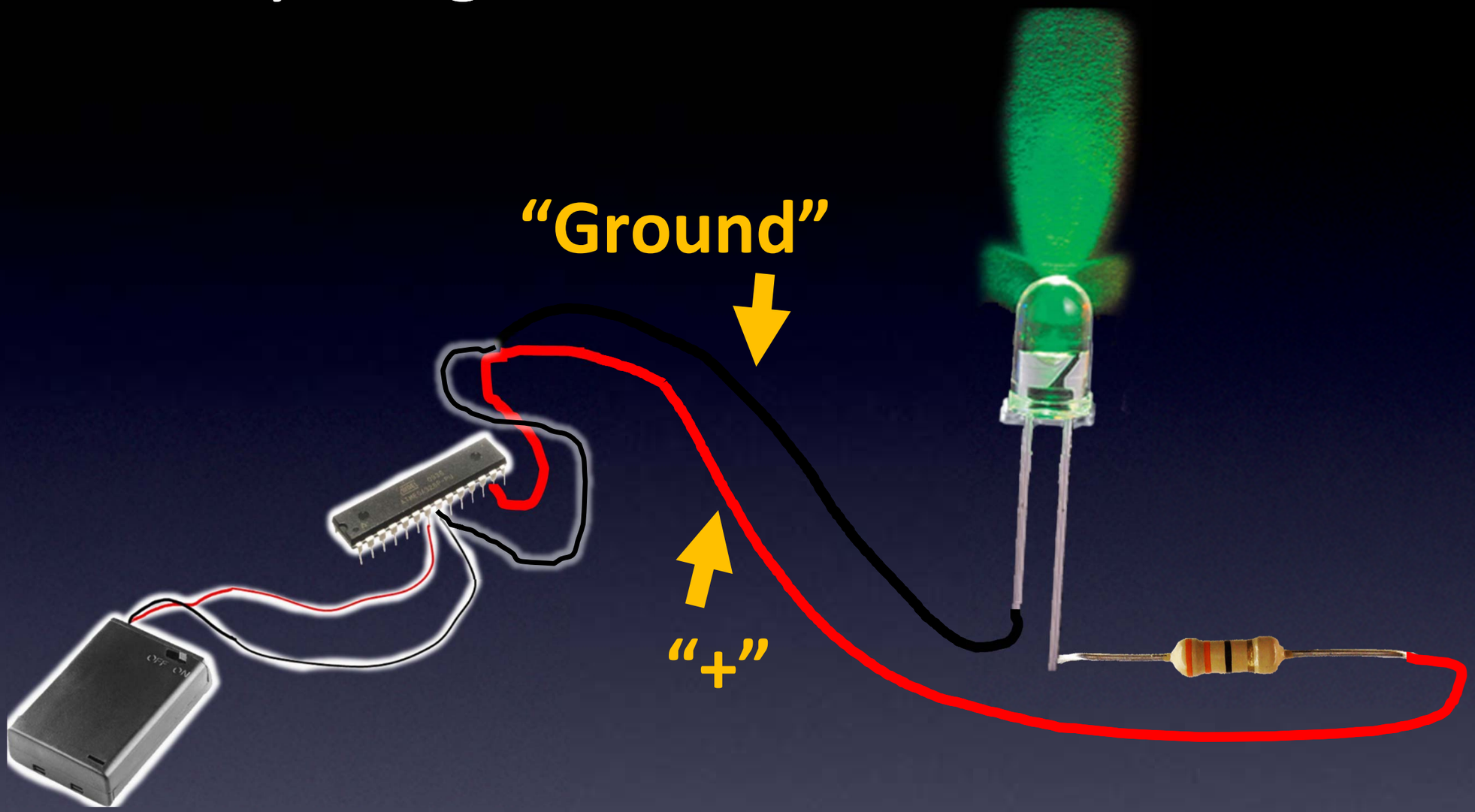
Everything You Need to Know About Electronics



Turning an LED on and off

(Leading up to `Hello World`)

Everything You Need to Know About Electronics

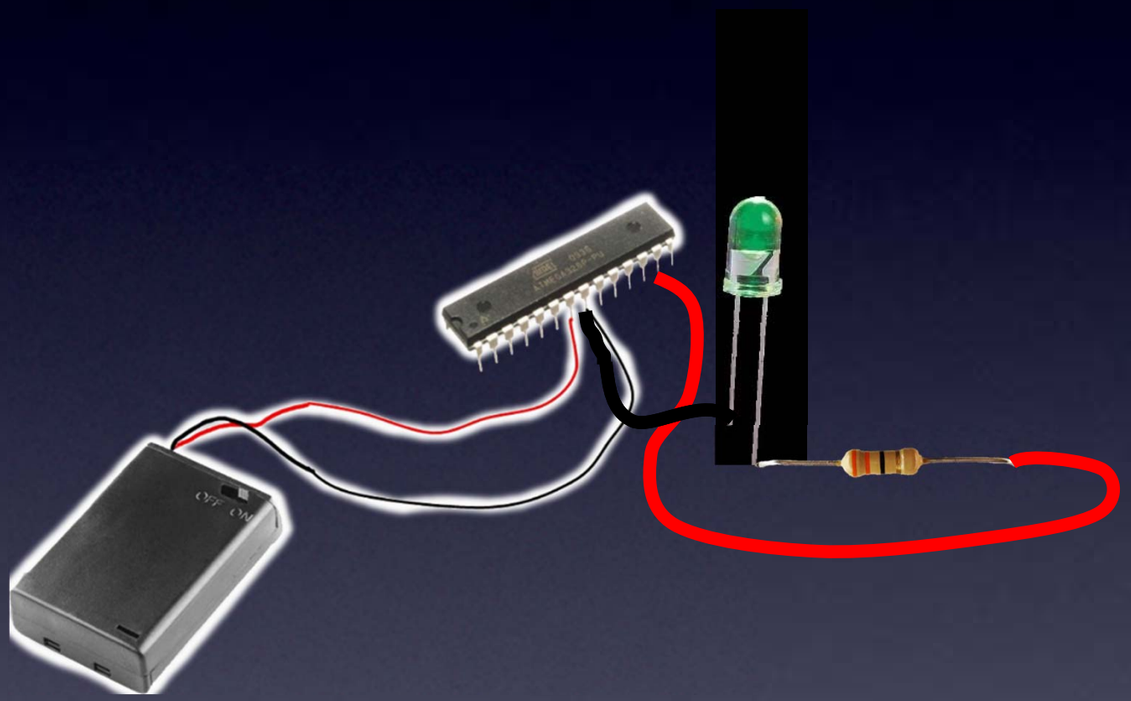


Turning an LED on and off

(Leading up to `Hello World`)

Everything You Need to Know About Electronics

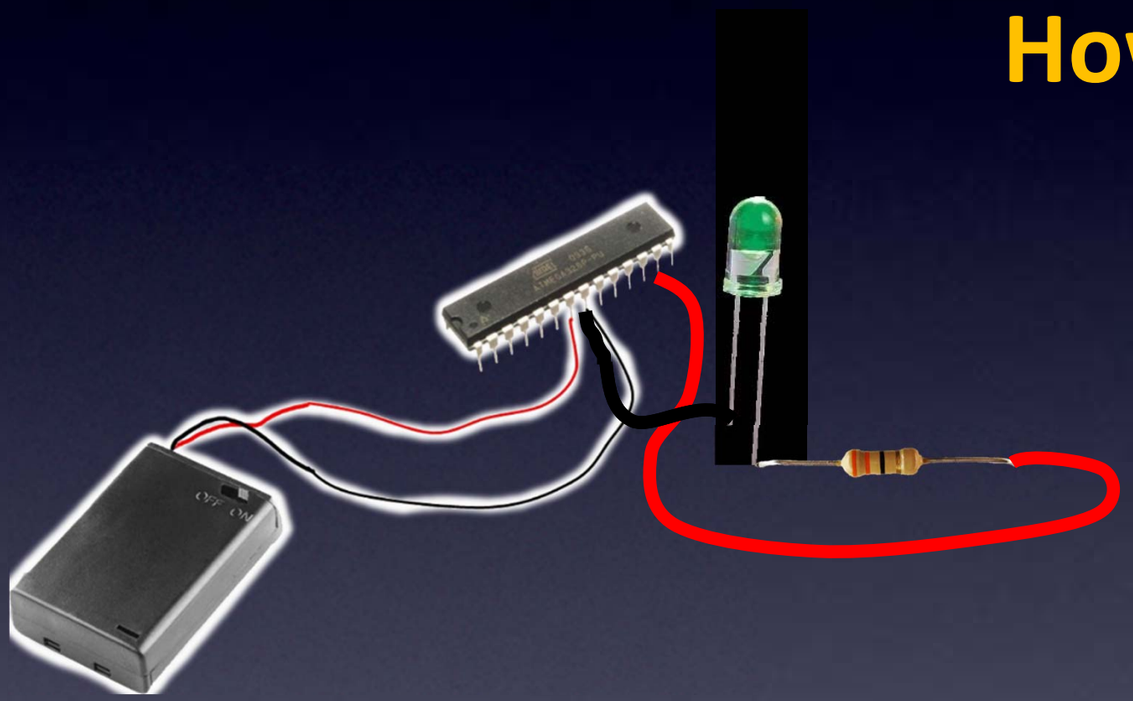
This is our **Hardware** for `Hello World!`



Turning an LED on and off

`Hello World`

Everything You Need to Know About Electronics



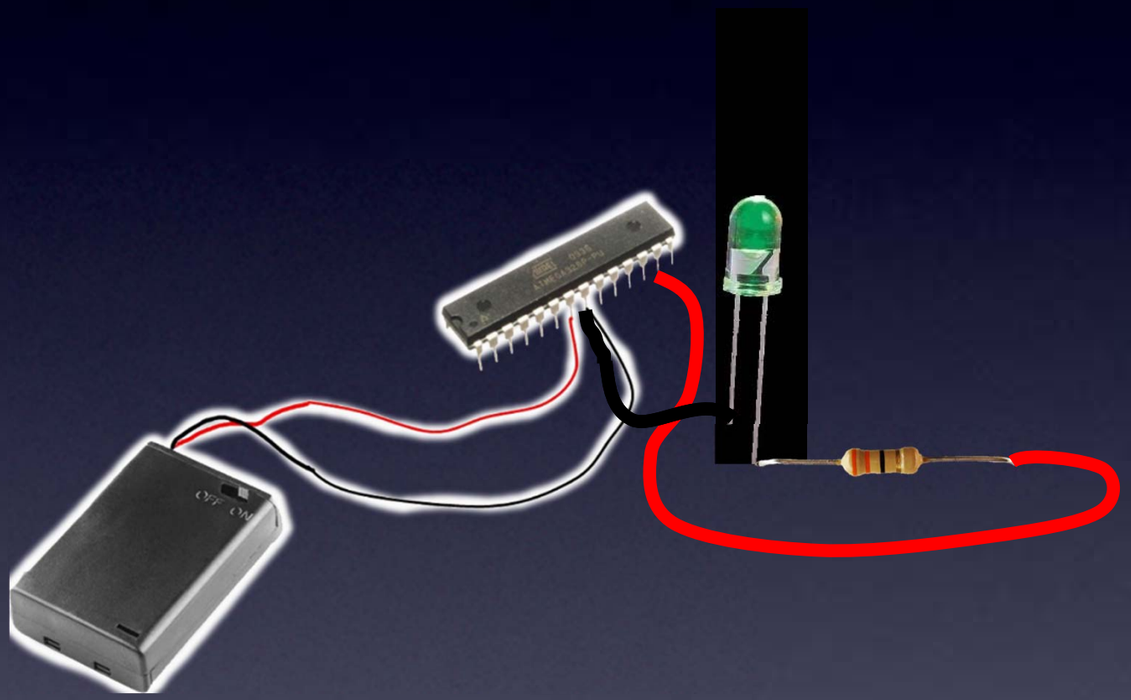
How about our program?

Turning an LED on and off

```
Hello World
```

Everything You Need to Know About Electronics

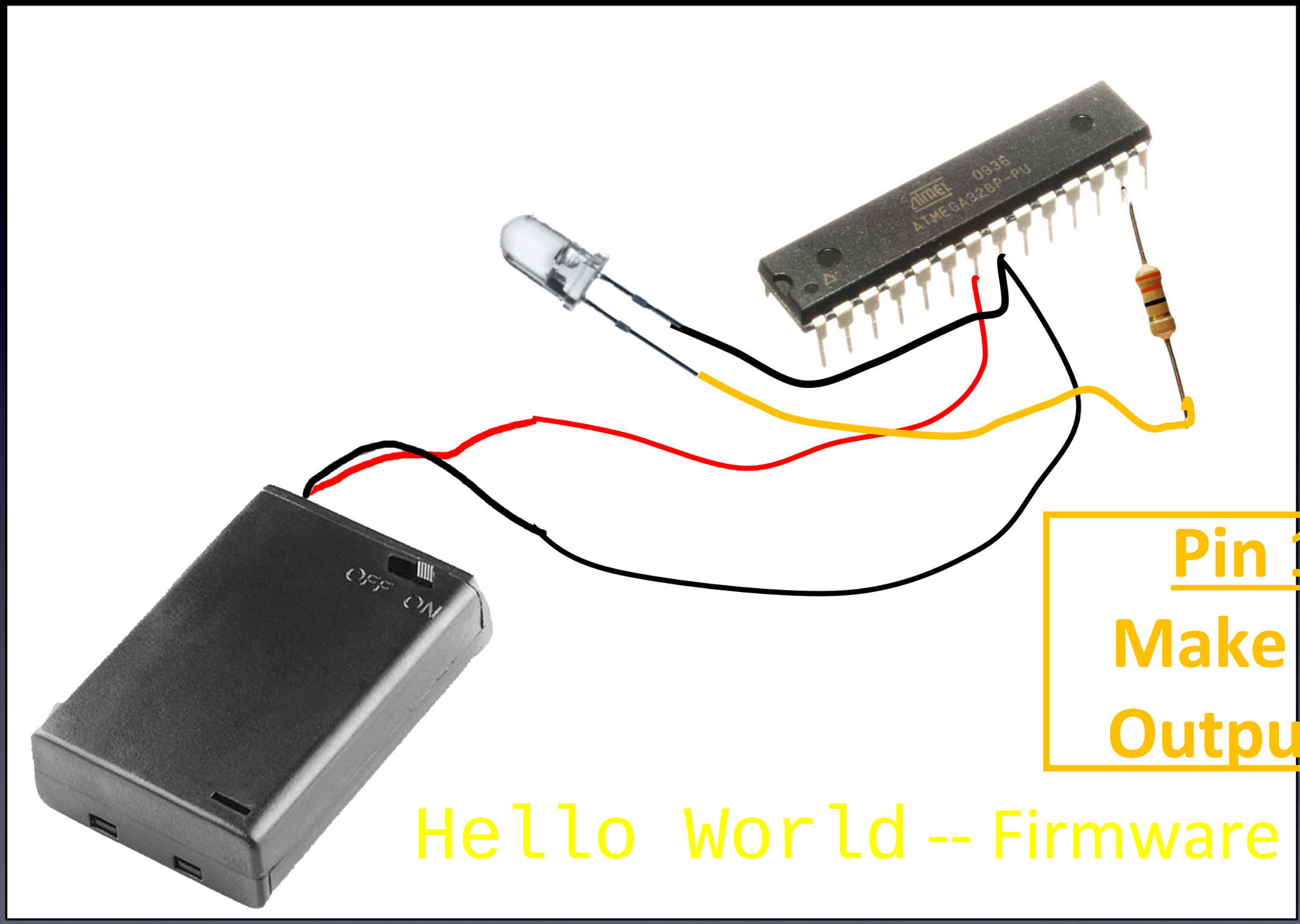
Programs on microcontrollers are called “Firmware”



Turning an LED on and off

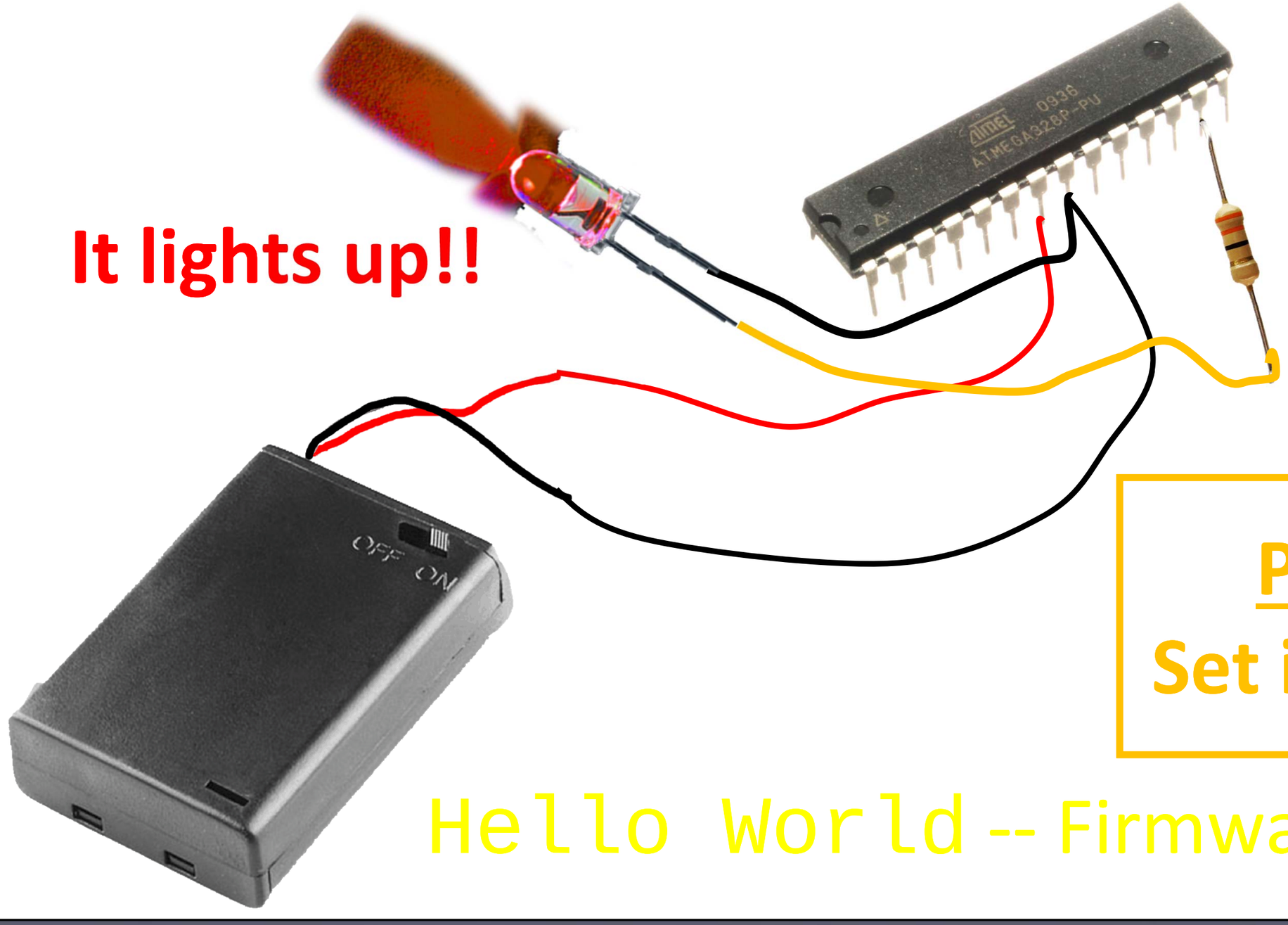
```
Hello World
```

Everything You Need to Know About Electronics



Microcontroller

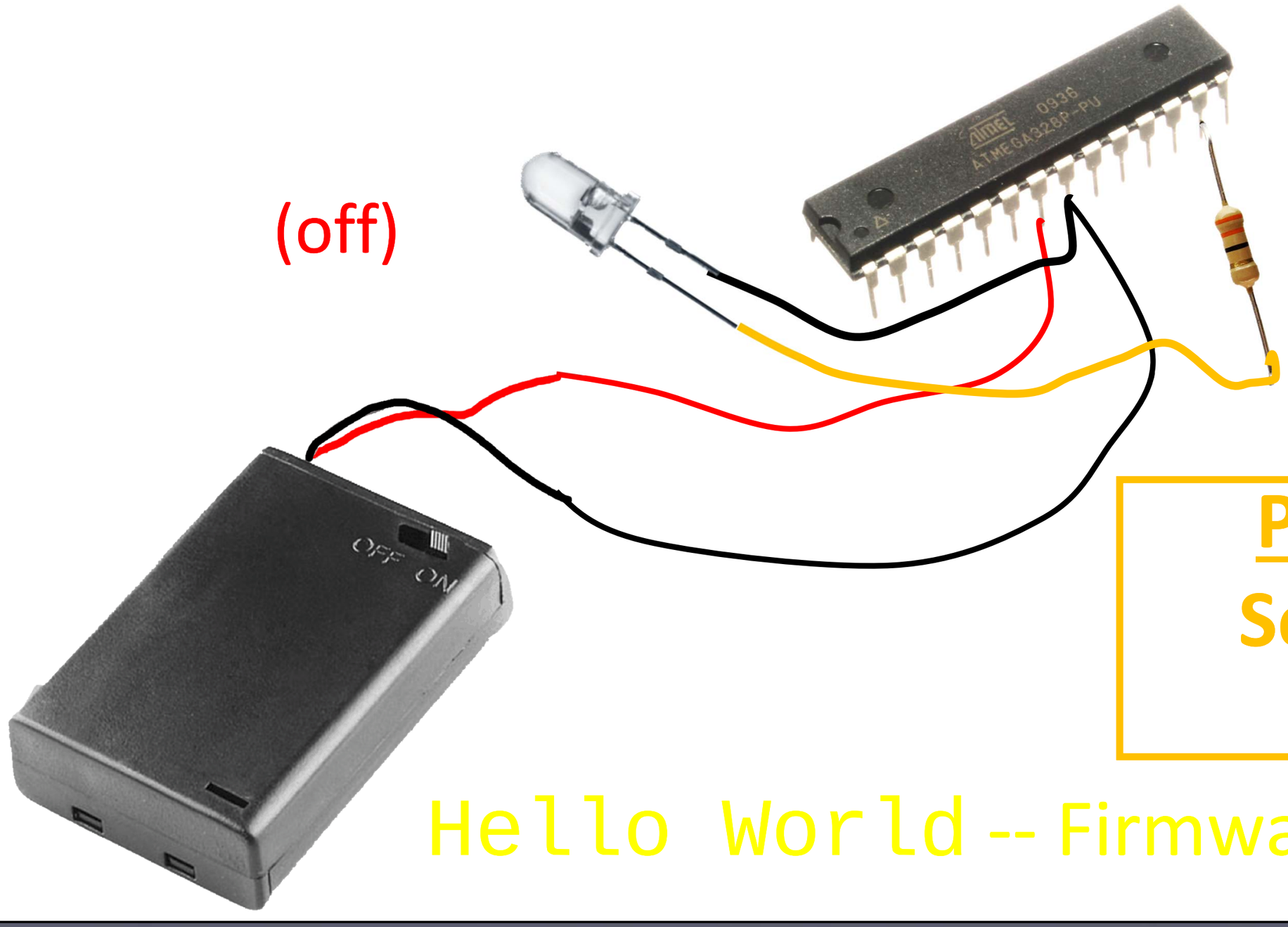
Everything You Need to Know About Electronics



Microcontroller

Everything You Need to Know About Electronics

(off)



Pin 13:
Set it to Low

`Hello World` -- Firmware

Microcontroller

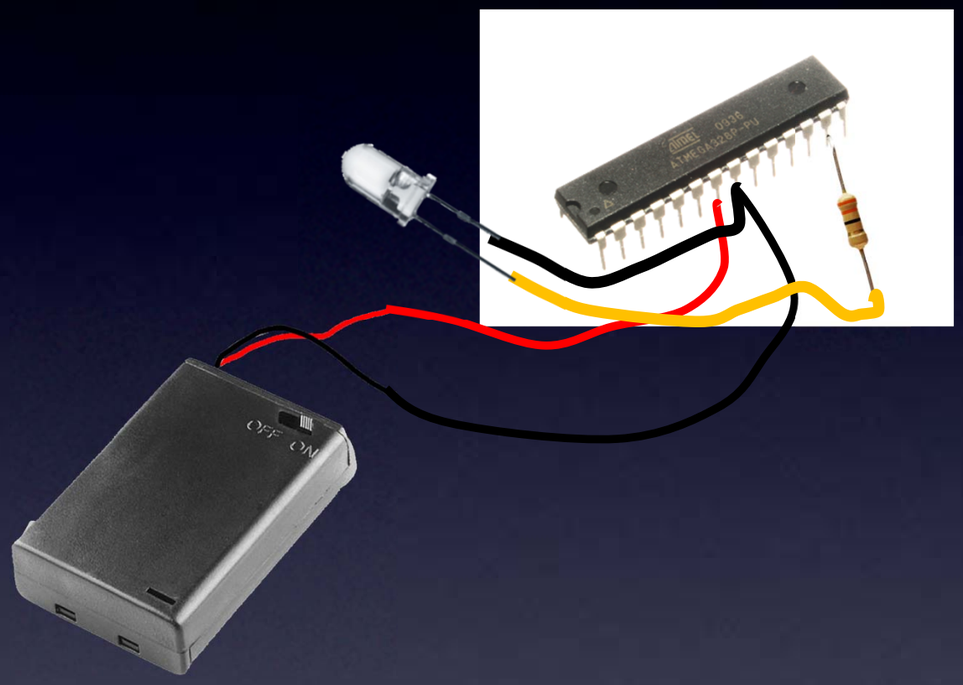
Everything You Need to Know About Electronics

We now have

`Hello World !`

Microcontroller

Everything You Need to Know About Electronics



We now have

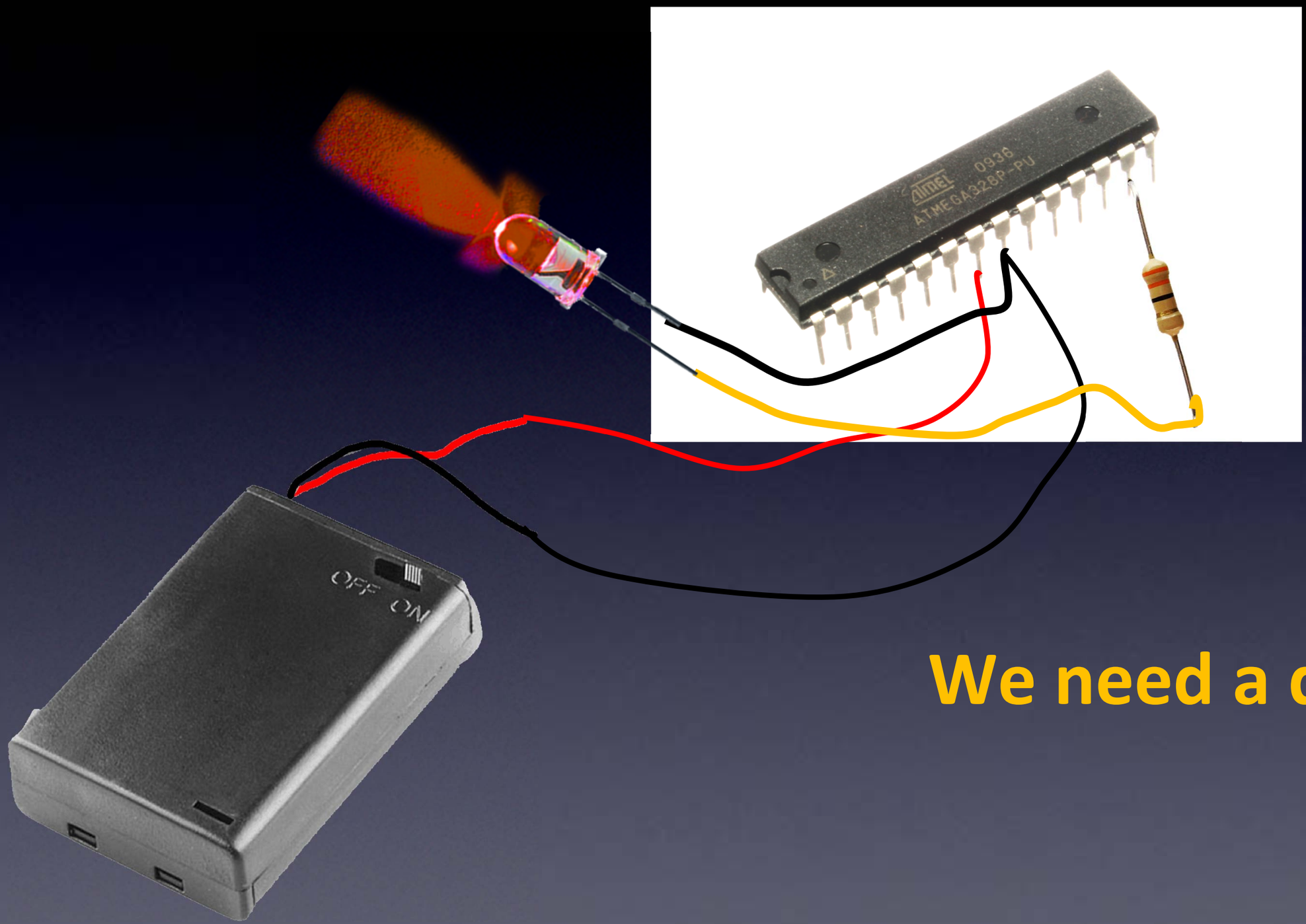
`Hello World !`

Except

We won’t see it

Microcontroller

Everything You Need to Know About Electronics

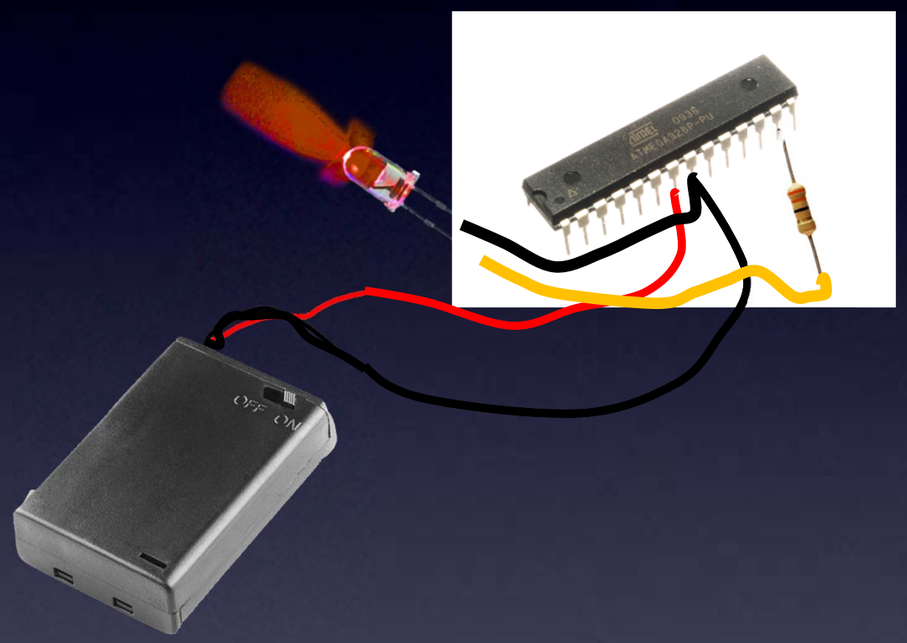


We need a delay

Microcontrollers – they go really fast!

Everything You Need to Know About Electronics

Hardware



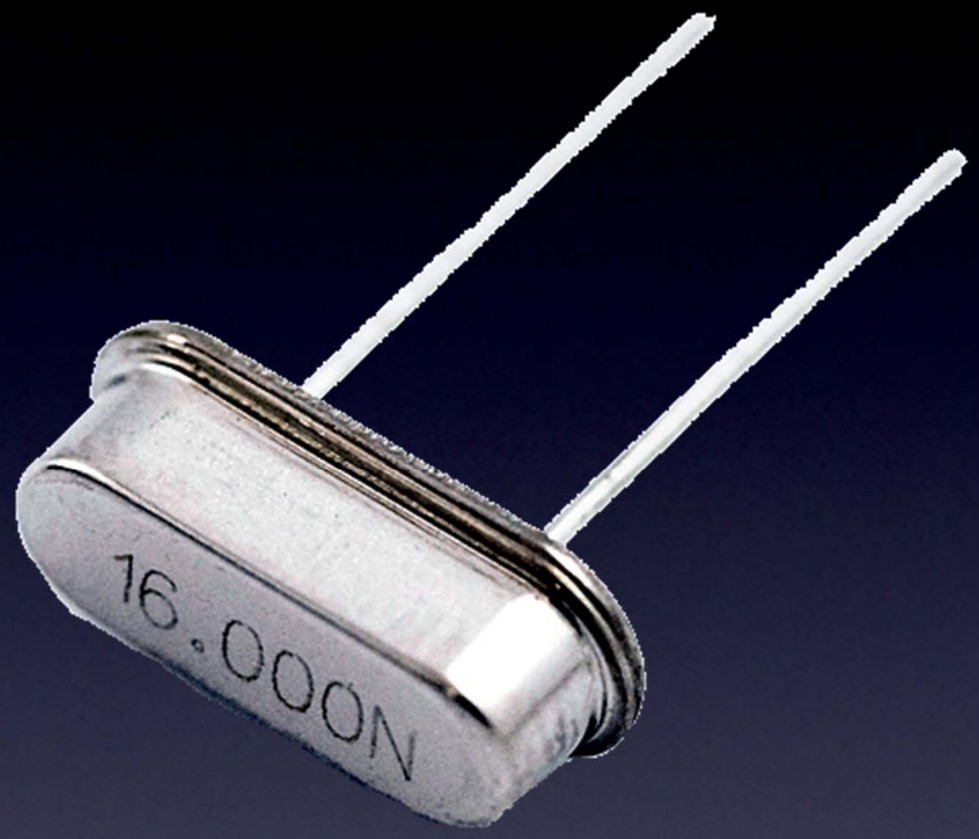
Firmware

- **pin 13 is Output pin**
- **set pin 13 High**
- **delay**
- **set pin 13 Low**

`Hello World` – for real now!

Microcontroller – Firmware

Everything You Need to Know About Electronics

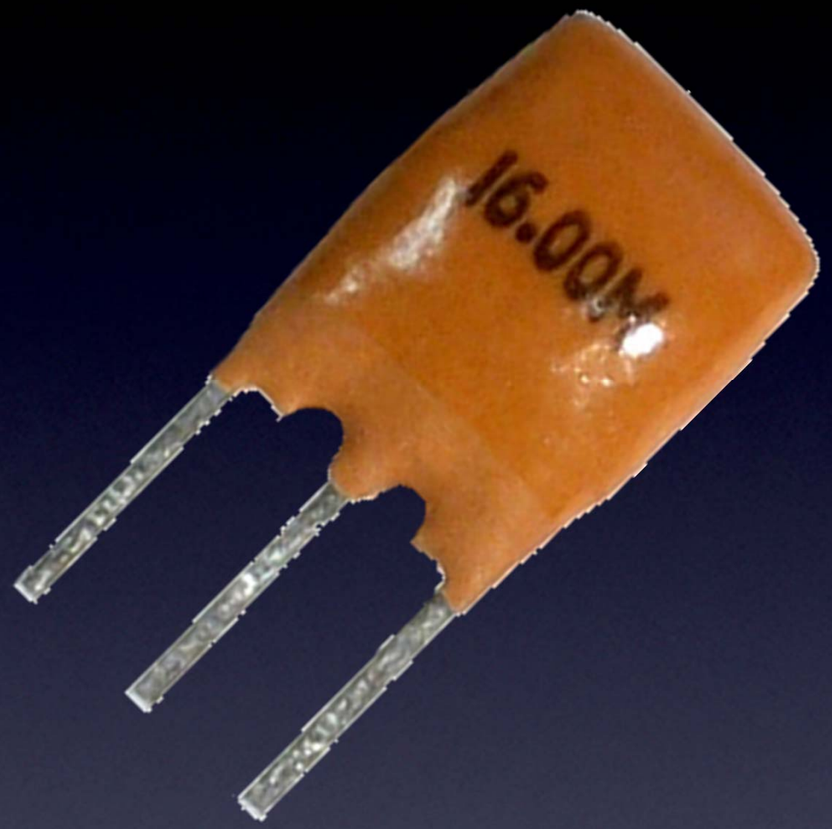


A precision cut piece of quartz crystal

For precise timing

Crystal

Everything You Need to Know About Electronics

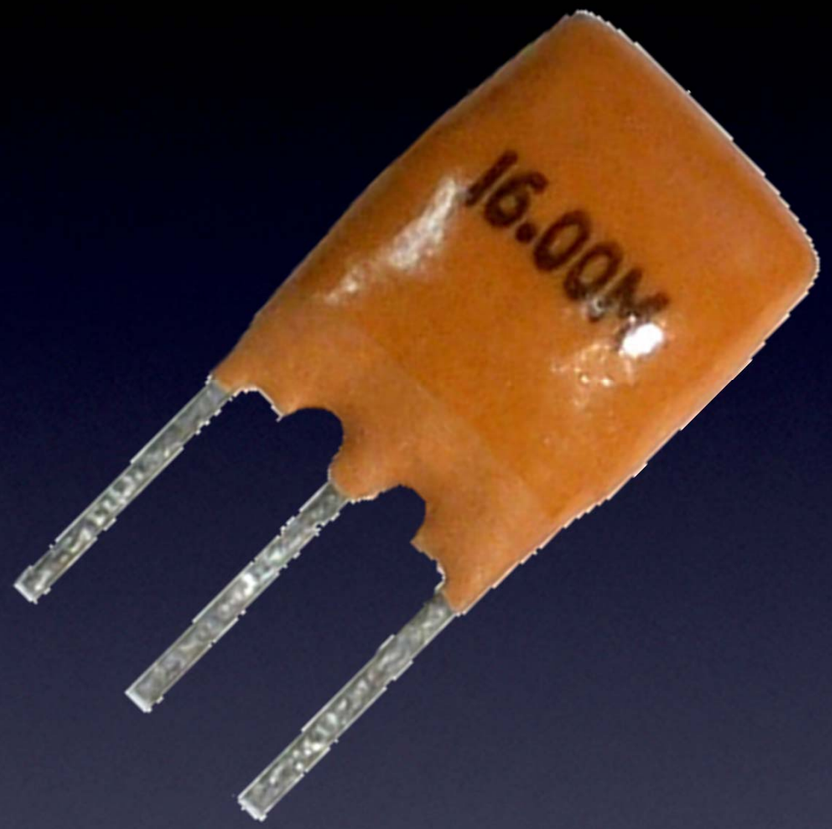


A bunch of resistors and capacitors

For precise timing (but less than a crystal)

Ceramic Resonator

Everything You Need to Know About Electronics



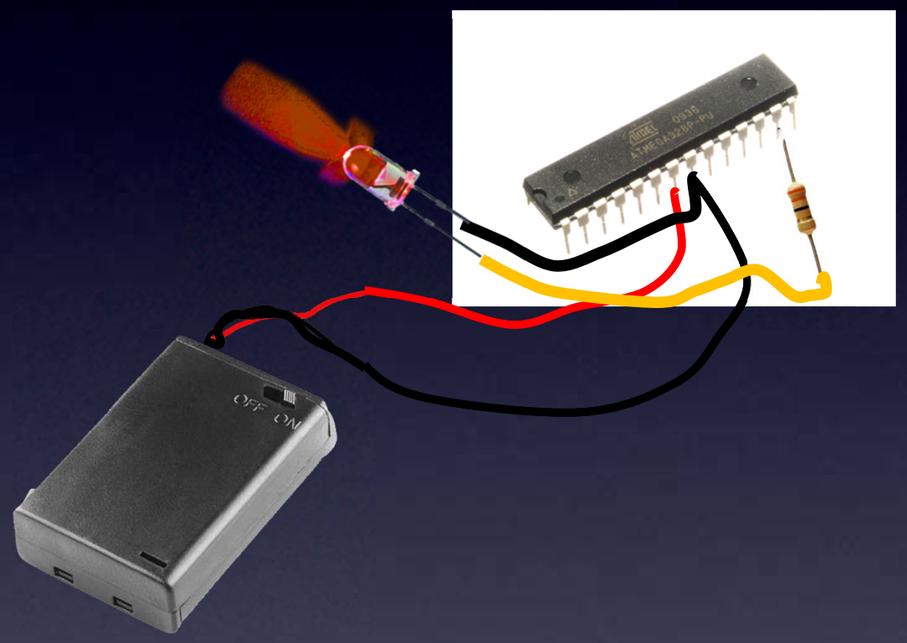
Frequency, measured in Hertz

For precise timing (but less than a crystal)

Ceramic Resonator / **Hertz**

Everything You Need to Know About Electronics

Hardware



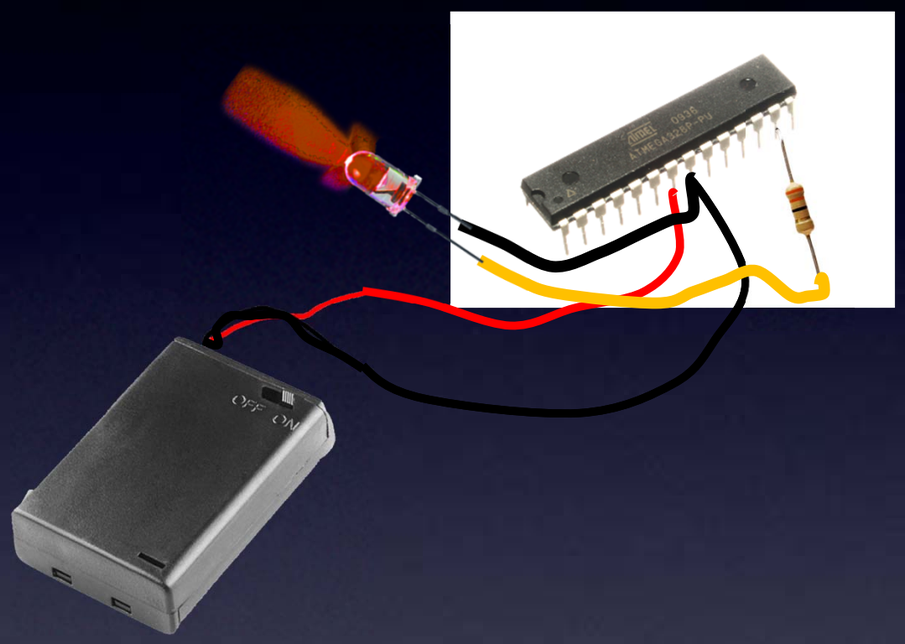
Firmware

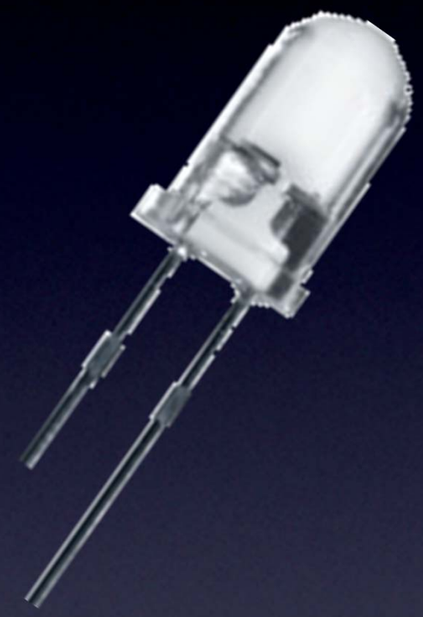
- **pin 13 is Output pin**
- **set pin 13 High**
- **delay**
- **set pin 13 Low**

Let's hack Hello World!

Microcontroller

Everything You Need to Know About Electronics



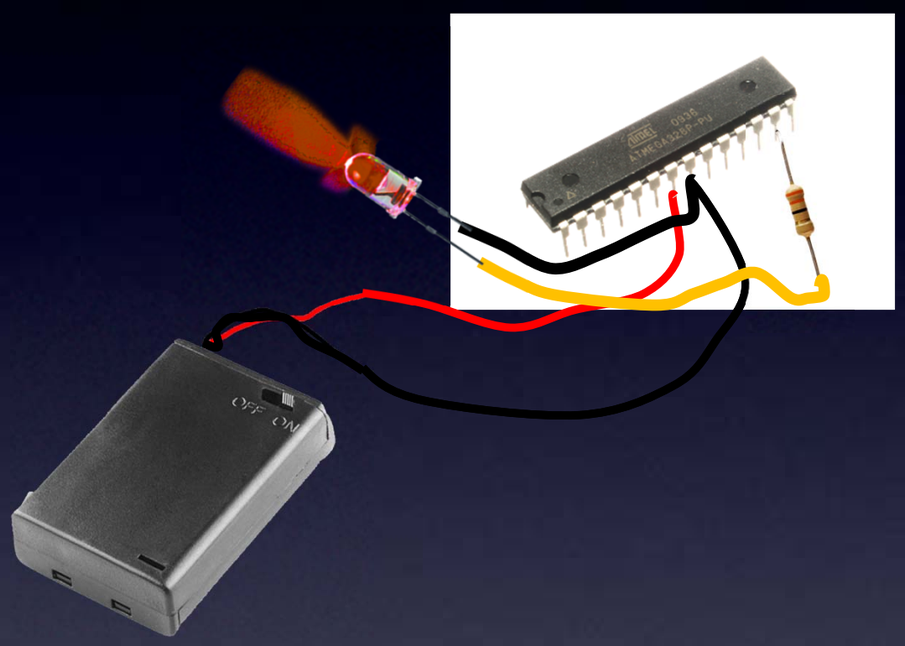


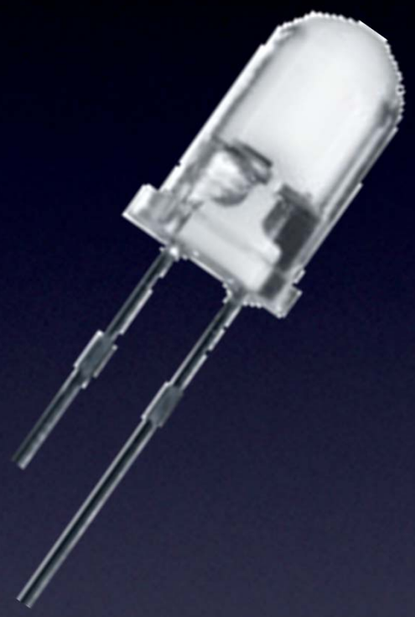
Add an IR LED to another pin

IR “OFF” codes

Microcontroller

Everything You Need to Know About Electronics



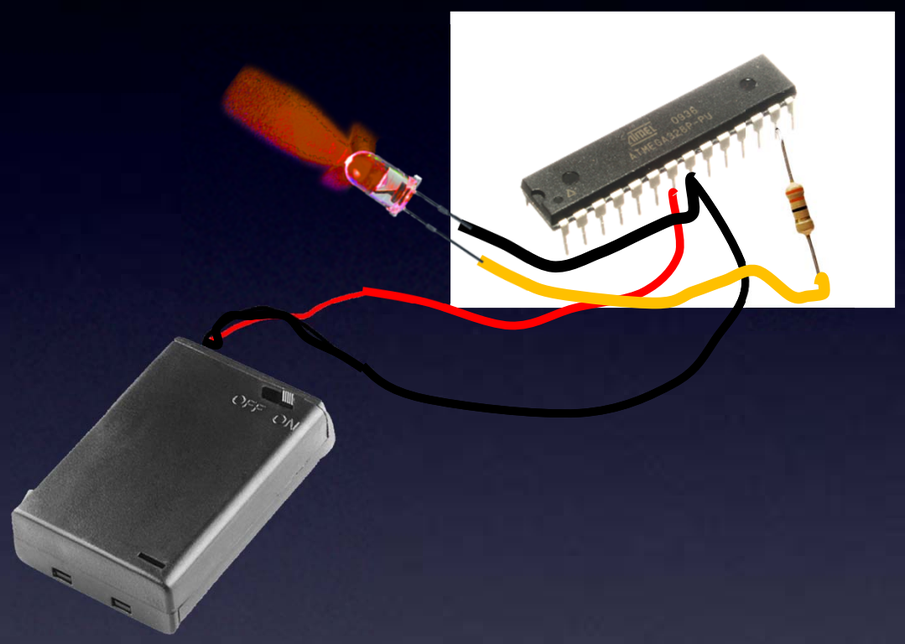


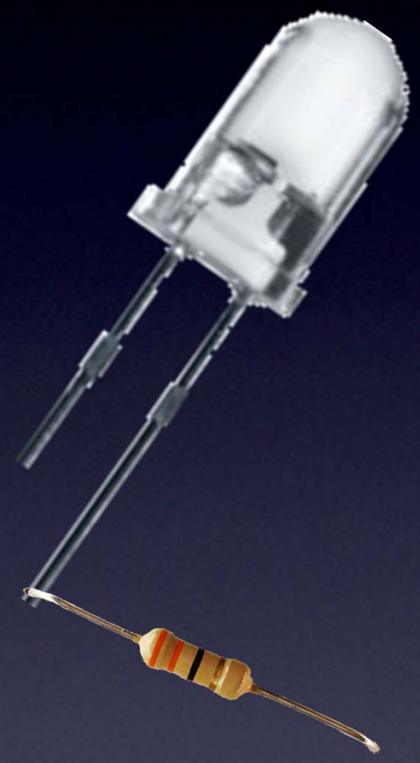
Add an IR LED to another pin (say, pin3)

IR “OFF” codes

Microcontroller

Everything You Need to Know About Electronics





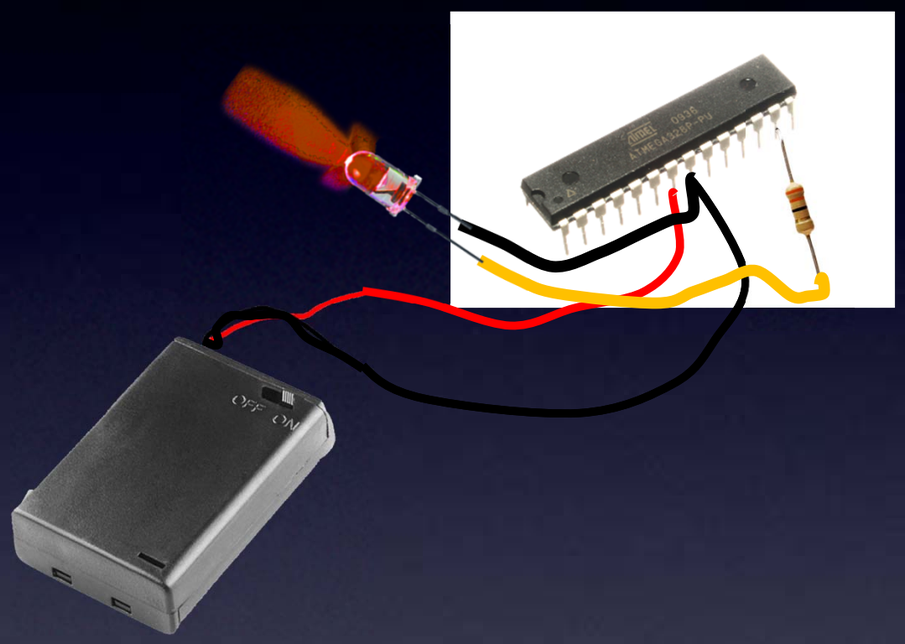
Add an IR LED to another pin (say, pin3)

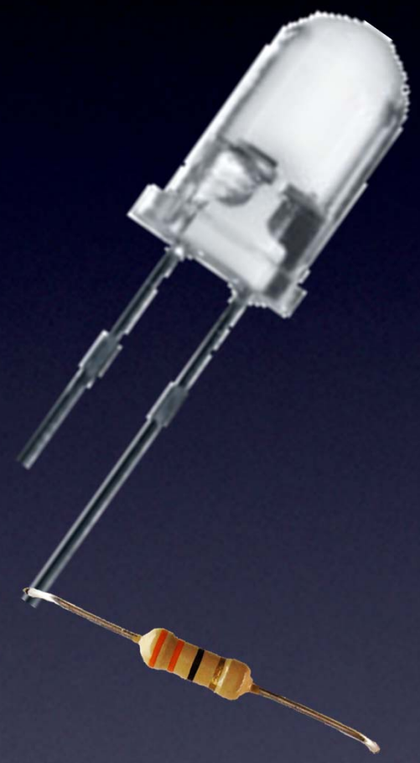
and a resistor so no magic smoke goes away

IR “OFF” codes

Microcontroller

Everything You Need to Know About Electronics



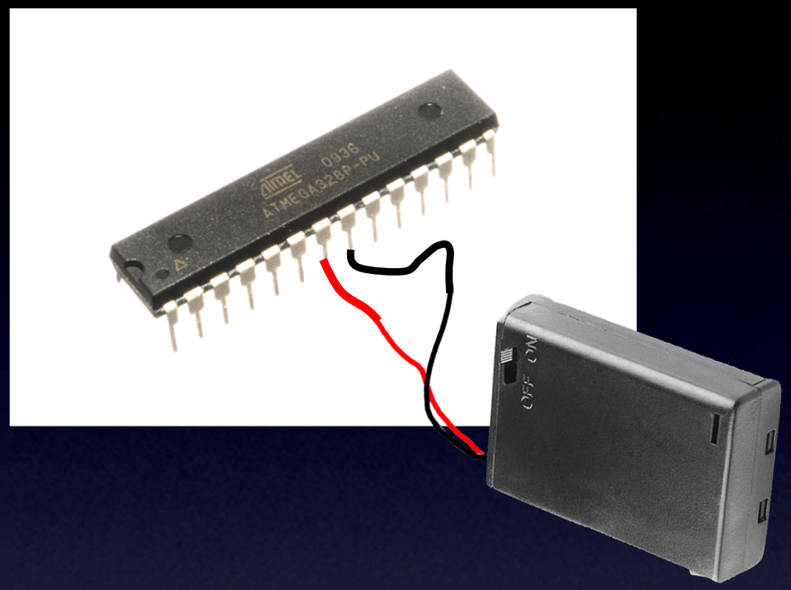


But, *When*?

IR “OFF” codes

Microcontroller

Everything You Need to Know About Electronics



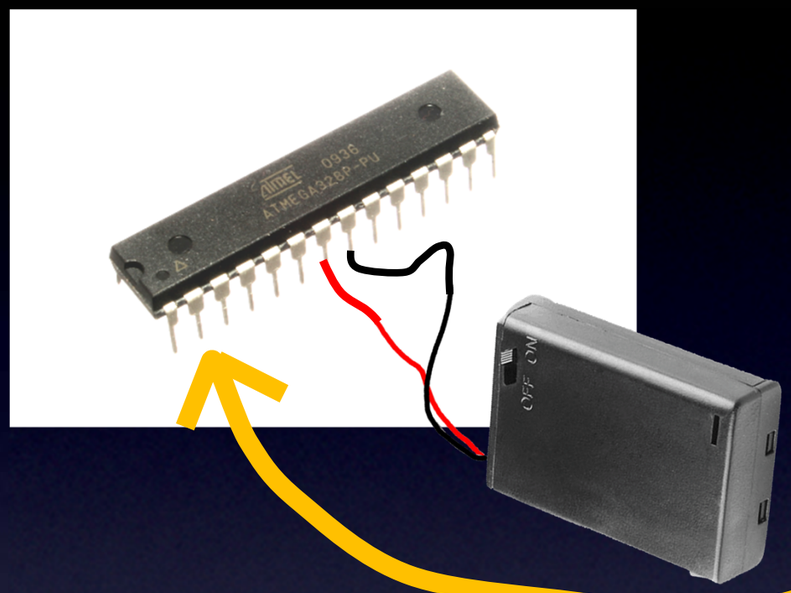
Let’s add an Input pin!

and

We can add a Start button

Microcontroller

Everything You Need to Know About Electronics



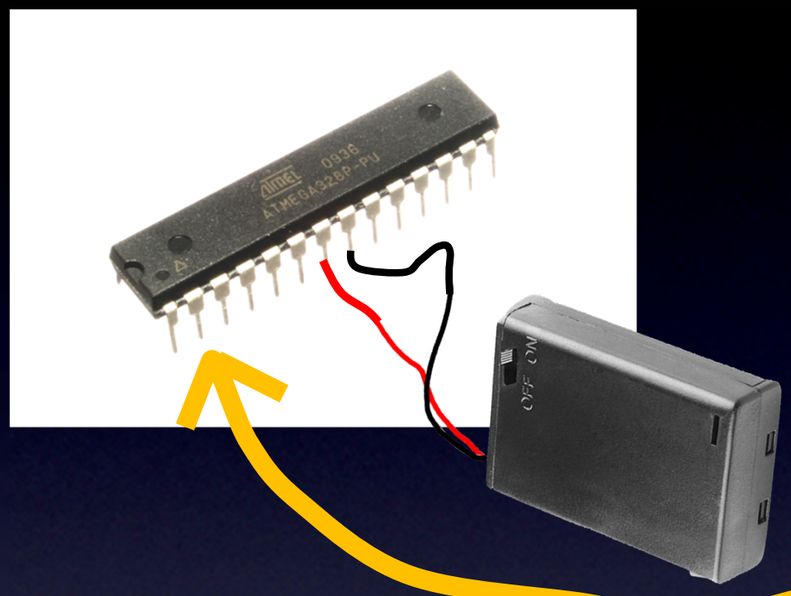
How do we make a pin an Input pin?

We tell it to be one – with our program.

Any pin can be an Input pin (like, pin 2).

Microcontroller – Input pins

Everything You Need to Know About Electronics

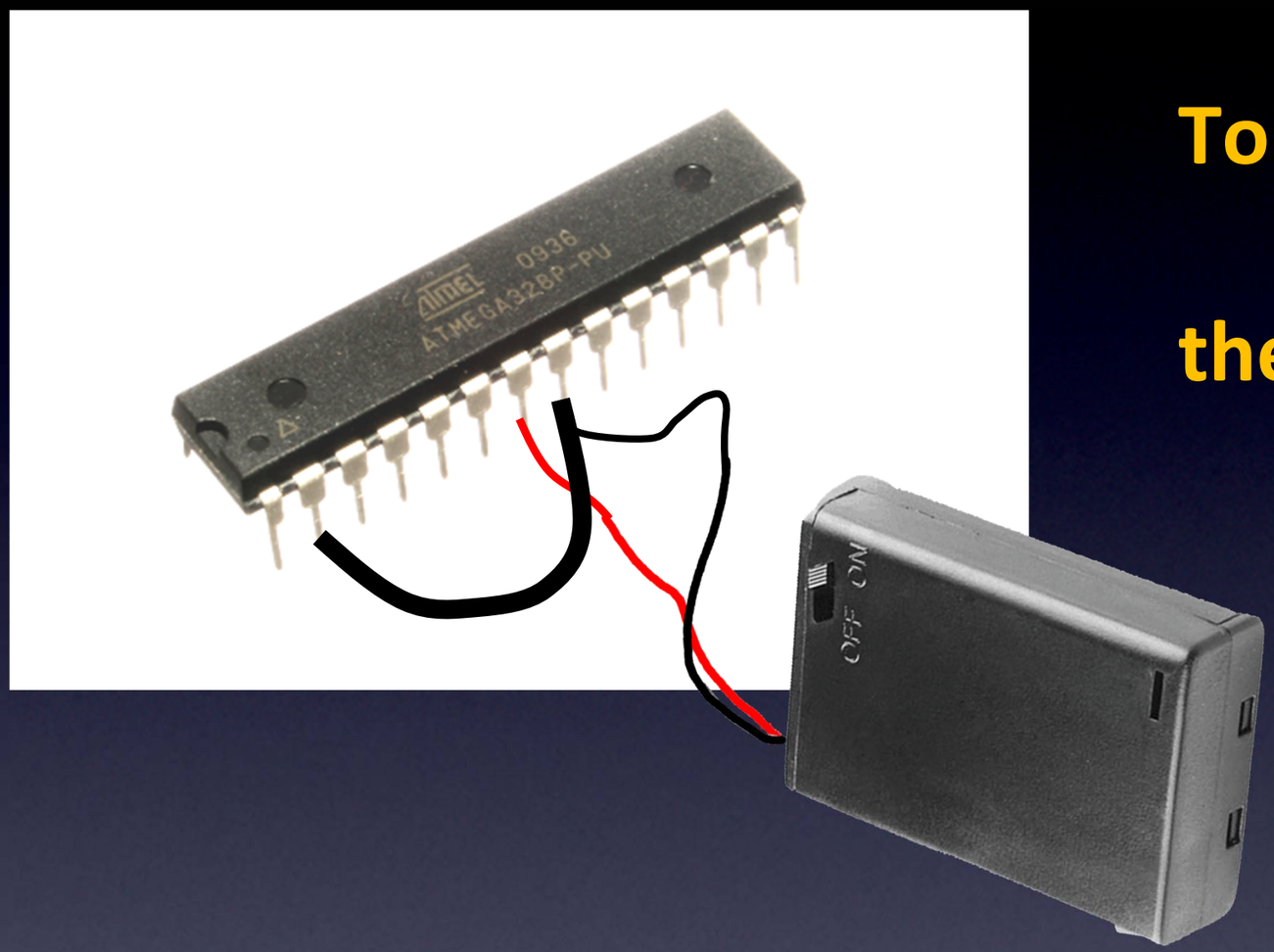


Once we have an **Input pin** (like, pin 2):

only 2 choices – is the Input pin: **High** or **Low** ?

Microcontroller – Input pins

Everything You Need to Know About Electronics

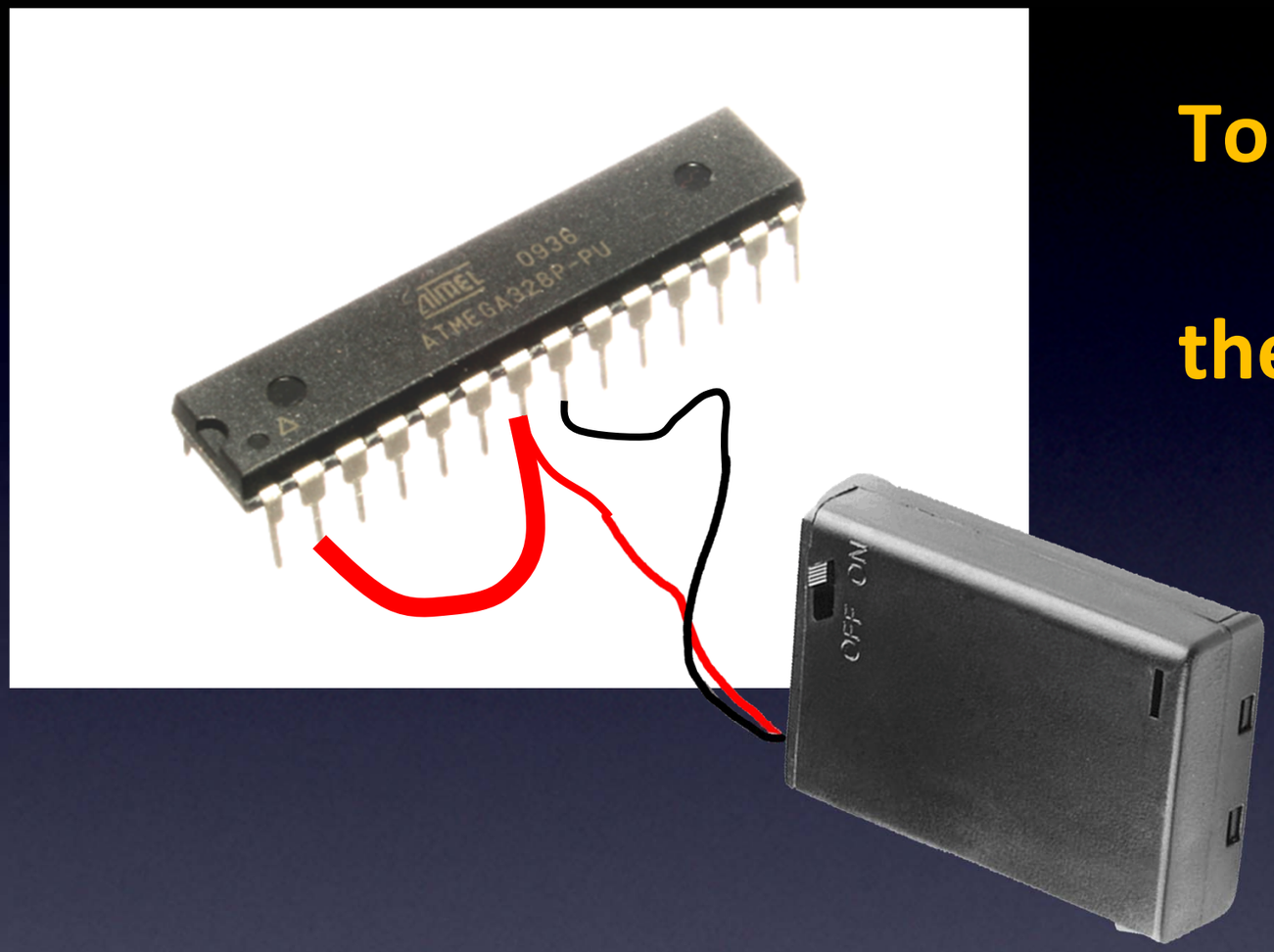


To make the Input pin Low, connect it to the Black wire of our power supply (Ground).

Low

Microcontroller – Input pins

Everything You Need to Know About Electronics

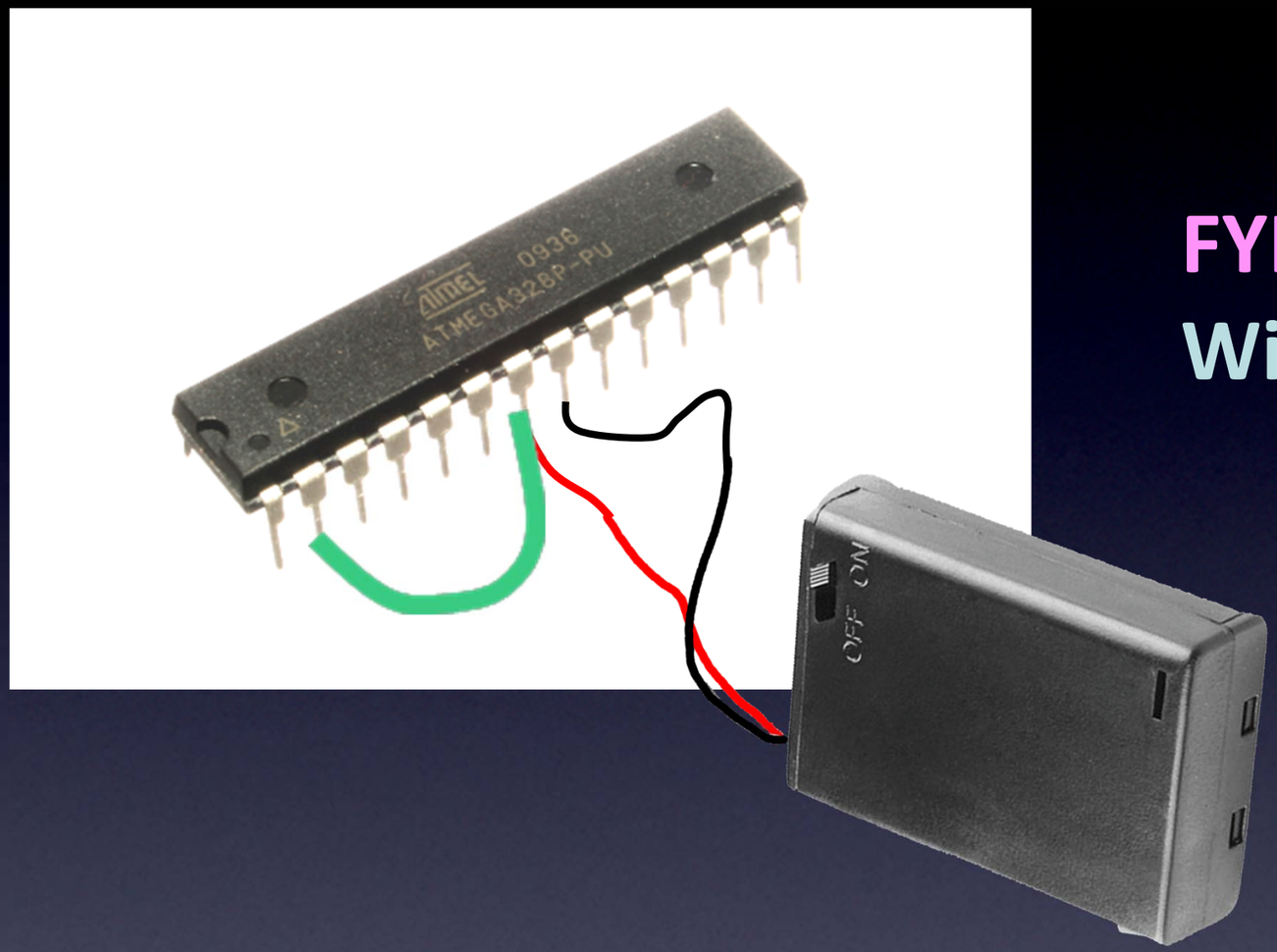


To make the Input pin High, connect it to the Red wire of our power supply (Vcc).

High

Microcontroller – Input pins

Everything You Need to Know About Electronics



FYI:

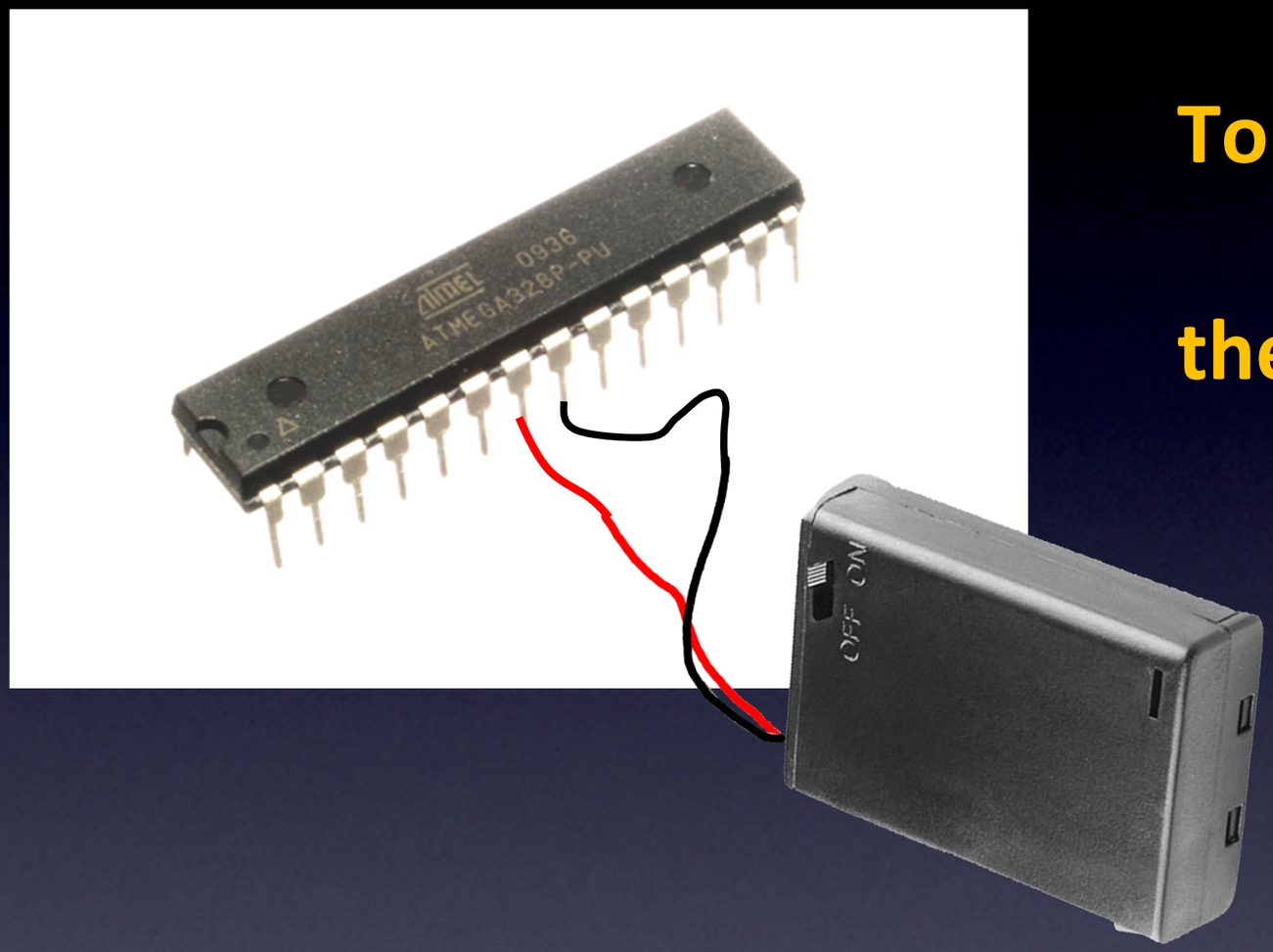
Wire color does not matter !

(electrons don’t care)

High

Microcontroller – Input pins

Everything You Need to Know About Electronics



To make the Input pin High, connect it to the Red wire of our power supply (Vcc).

OR:

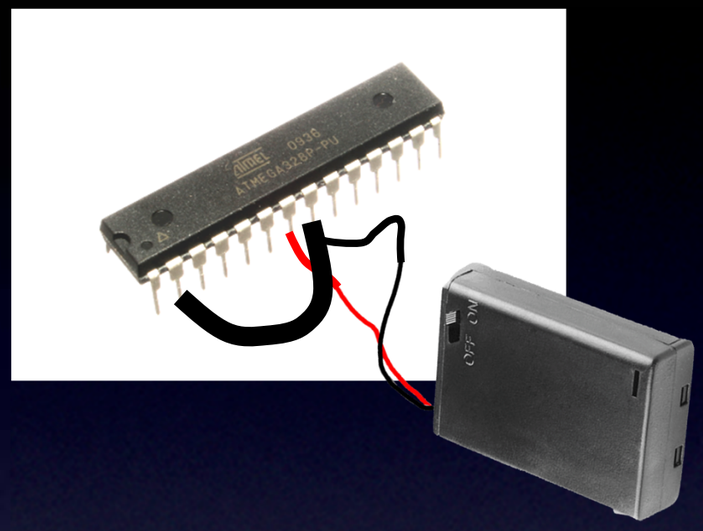
just leave it blank

(built-in resistors on each pin)

High

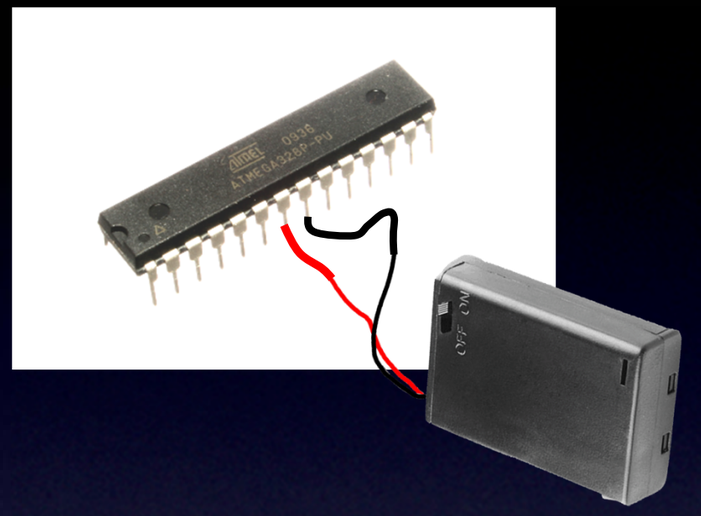
Microcontroller – Input pins

Everything You Need to Know About Electronics



If firmware looks at
Pin 2 when it's like this,
it reports back:

Low



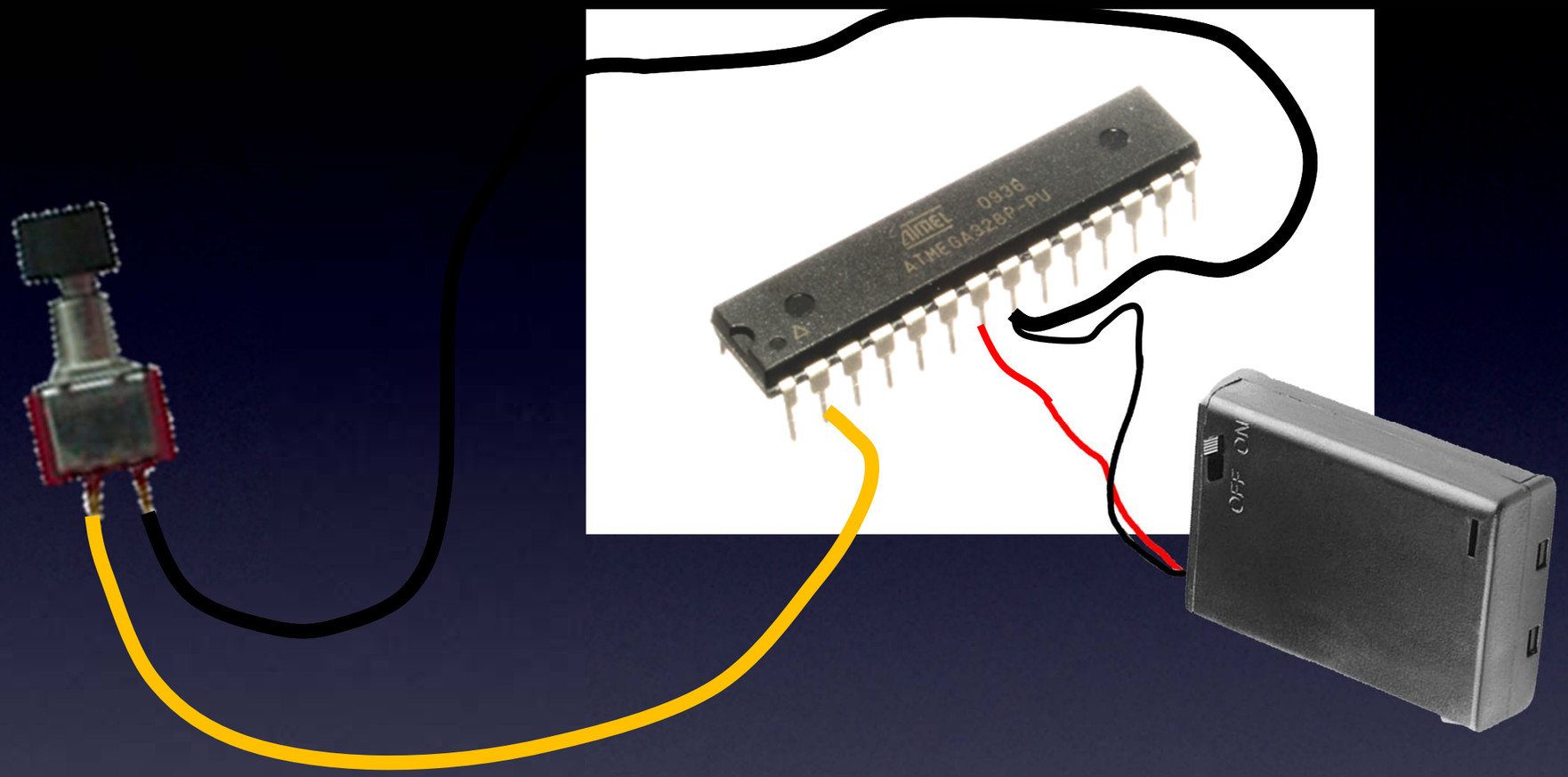
If firmware looks at
Pin 2 when it's like this,
it reports back:

High

Reading the Input pin

Microcontroller – Input pins

Everything You Need to Know About Electronics



Reading the Input pin, with Switch

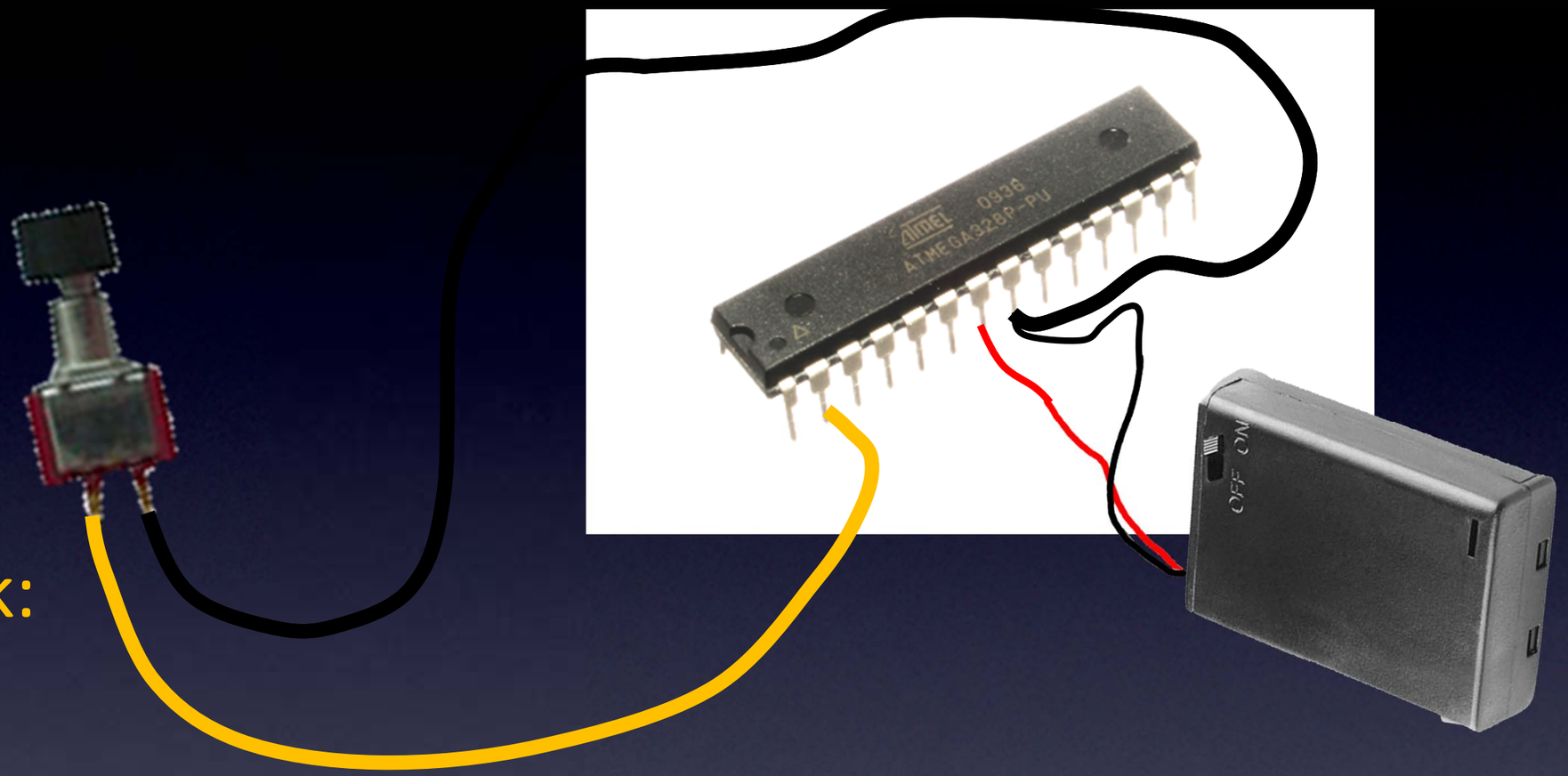
Microcontroller – Input pins

Everything You Need to Know About Electronics

If firmware looks at Pin 2 when switch NOT pushed,

it reports back:

High



Reading the Input pin, with Switch

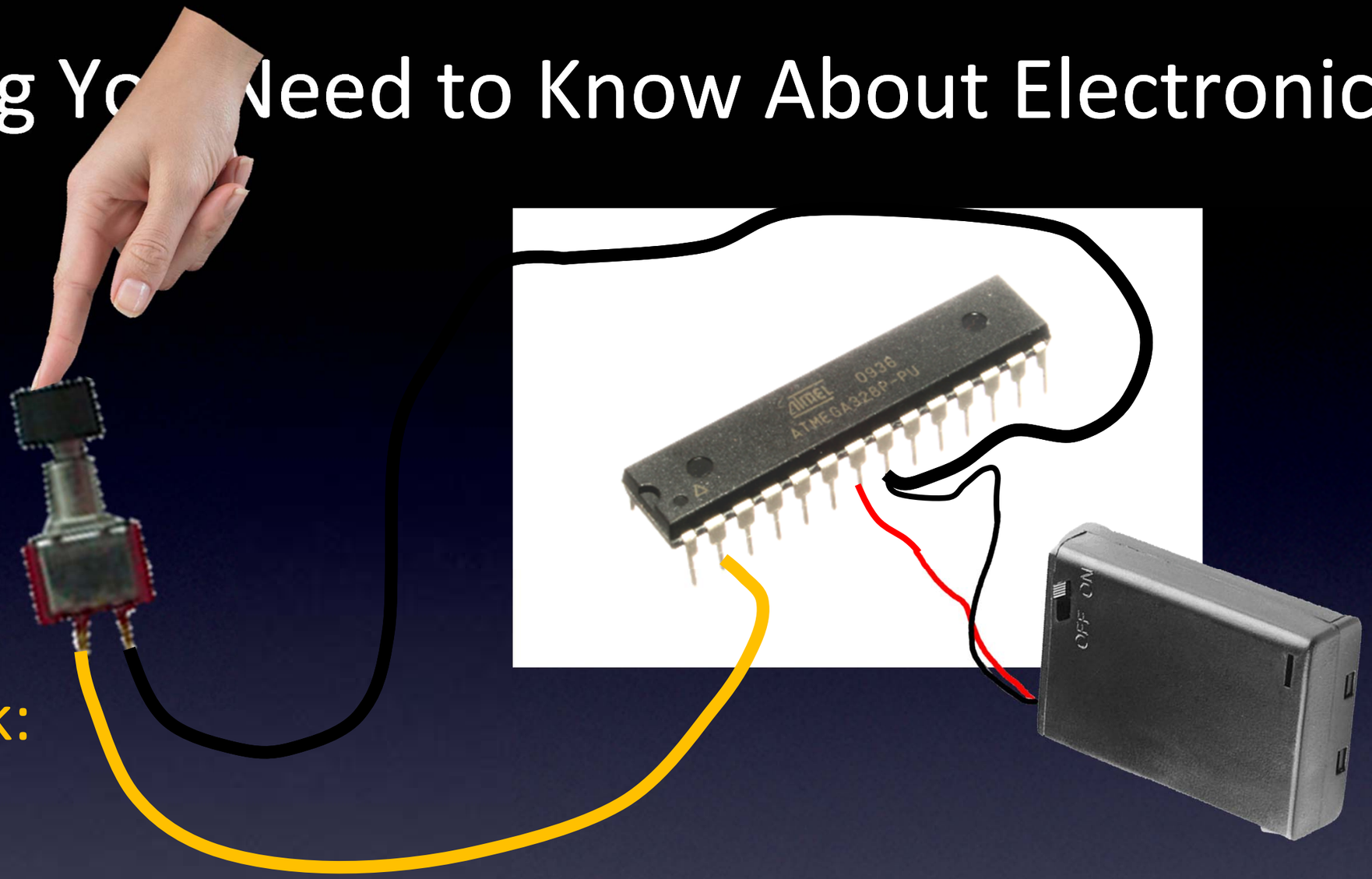
Microcontroller – Input pins

Everything Yo Need to Know About Electronics

If firmware looks at Pin 2 when switch pushed,

it reports back:

Low



Reading the Input pin, with Switch

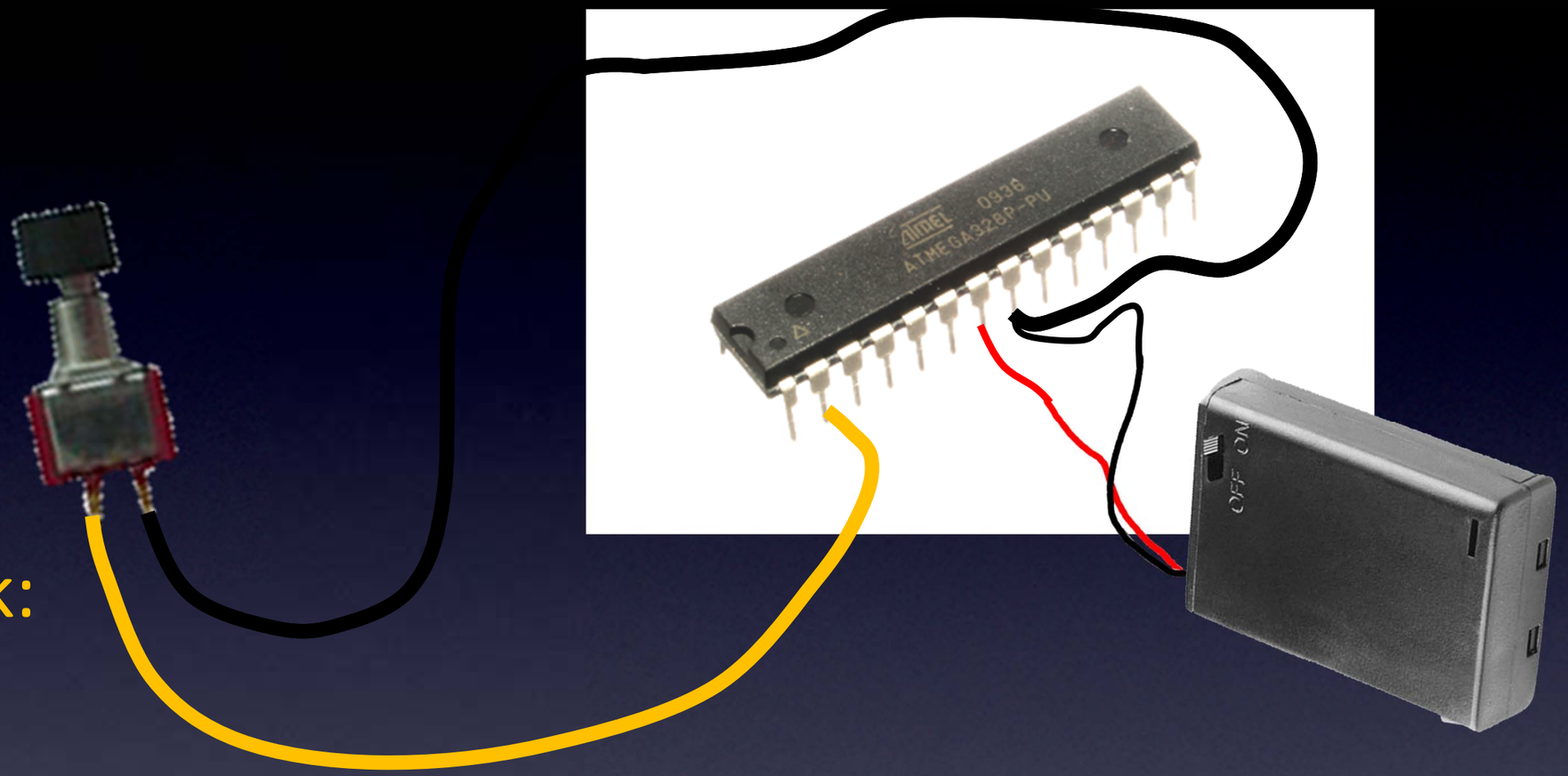
Microcontroller – Input pins

Everything You Need to Know About Electronics

If firmware looks at Pin 2 when switch NOT pushed,

it reports back:

High

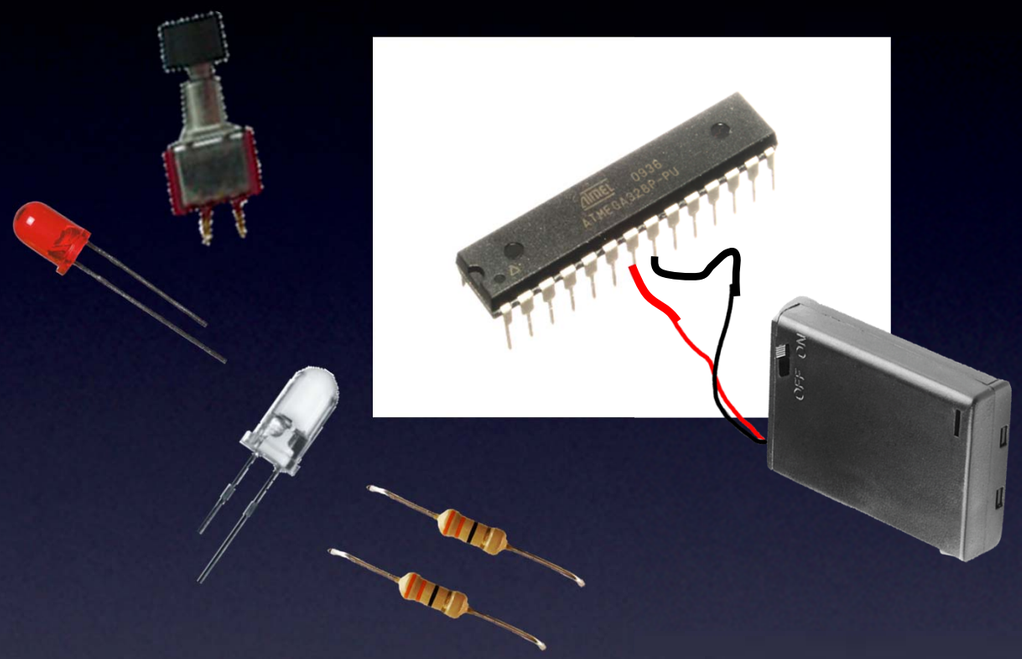


Reading the Input pin, with Switch

Microcontroller – Input pins

Everything You Need to Know About Electronics

Hardware



Firmware

Pin 13 Output – visible LED pin
Pin 3 Output – IR LED pin
Pin 2 Input – Push Button

Wait for Switch to be Low

Blink visible LED:
High, Delay, Low
Pulse IR LED for Sony “OFF” code:
High, Delay, Low, Delay…

Blink visible LED:
High, Delay, Low
Pulse IR LED for Panasonic “OFF” code:
High, Delay, Low, Delay…

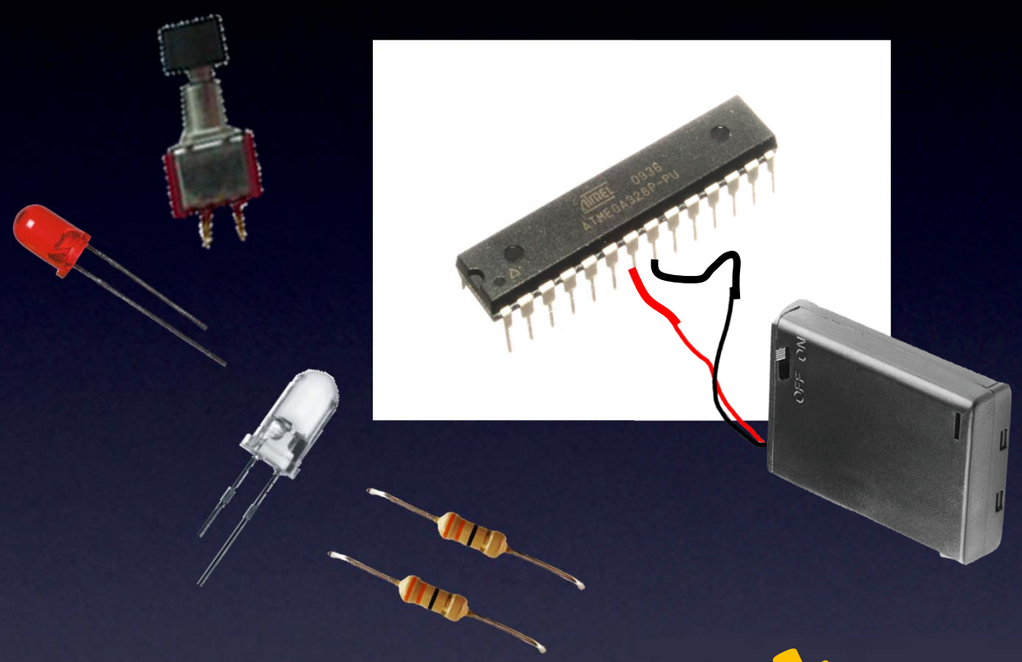
Etc for all “OFF” codes

TV-B-Gone remote control

Microcontroller

Everything You Need to Know About Electronics

Hardware



Except

doesn't go very far

Firmware

Pin 13 Output – visible LED pin
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Pin 2 Input – Push Button

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Blink visible LED:
High, Delay, Low
Pulse IR LED for Sony "OFF" code:
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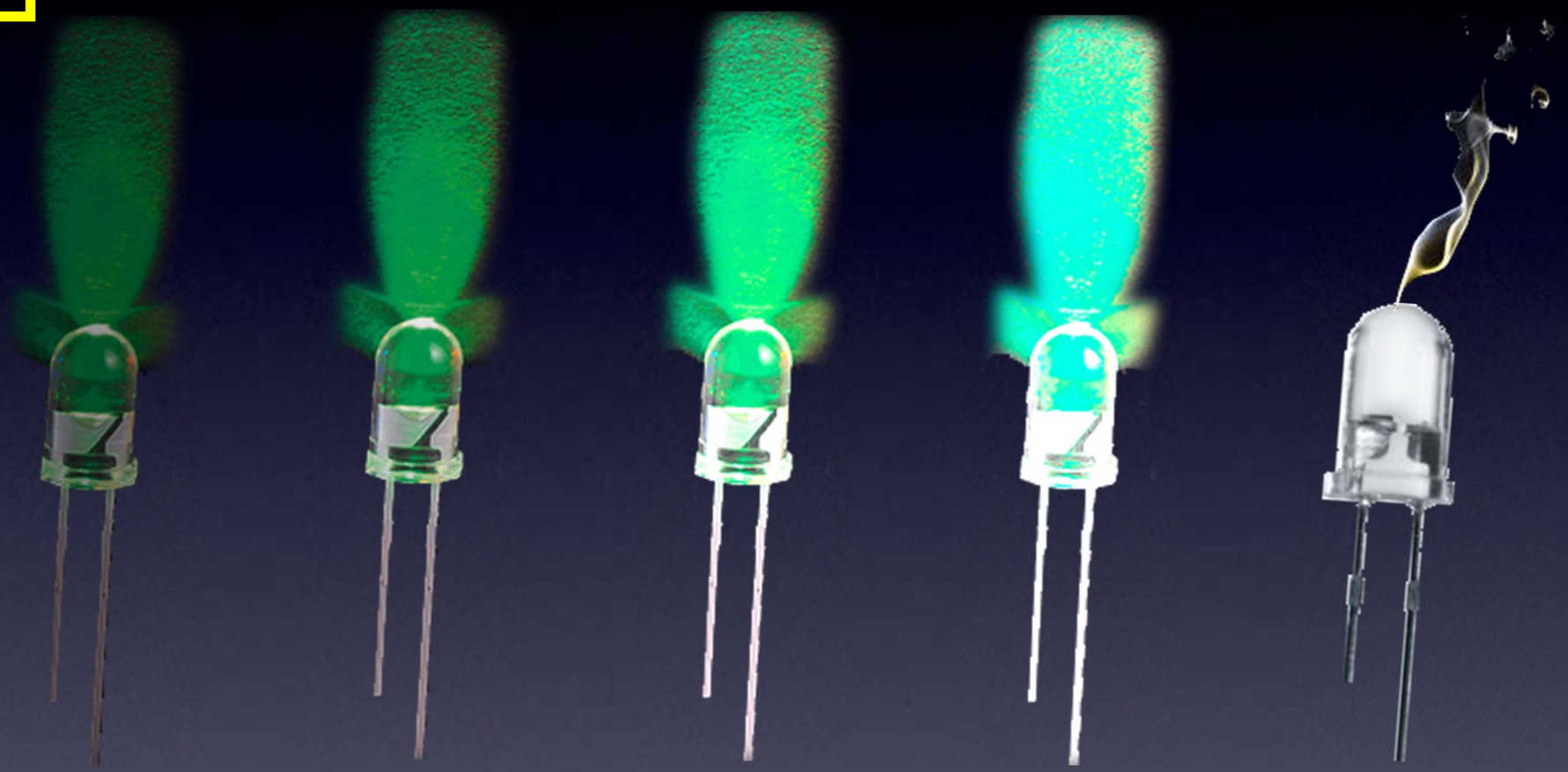
Etc for all "OFF" codes

TV-B-Gone remote control

Microcontroller

Everything You Need to Know About Electronics

Review:



More current → More brightness! (until…)

LED

Everything You Need to Know About Electronics

Output pin – only 2 choices:

Low

Off

(0V)

High

On

(Power supply voltage

-- controlled by our Firmware!)

Output pins

only allow

limited current

(built-in resistors on each pin)

Microcontroller – Output pins

Everything You Need to Know About Electronics

dimmly lit LED

So,
IR LED
can only light up
dimly
from the Output pin

Output pin – only 2 choices:

Low	**High**
Off	**On**
(0V)	(Power supply voltage
	-- controlled by our Firmware!)

Output pin – only limited current

Microcontroller – Output pins

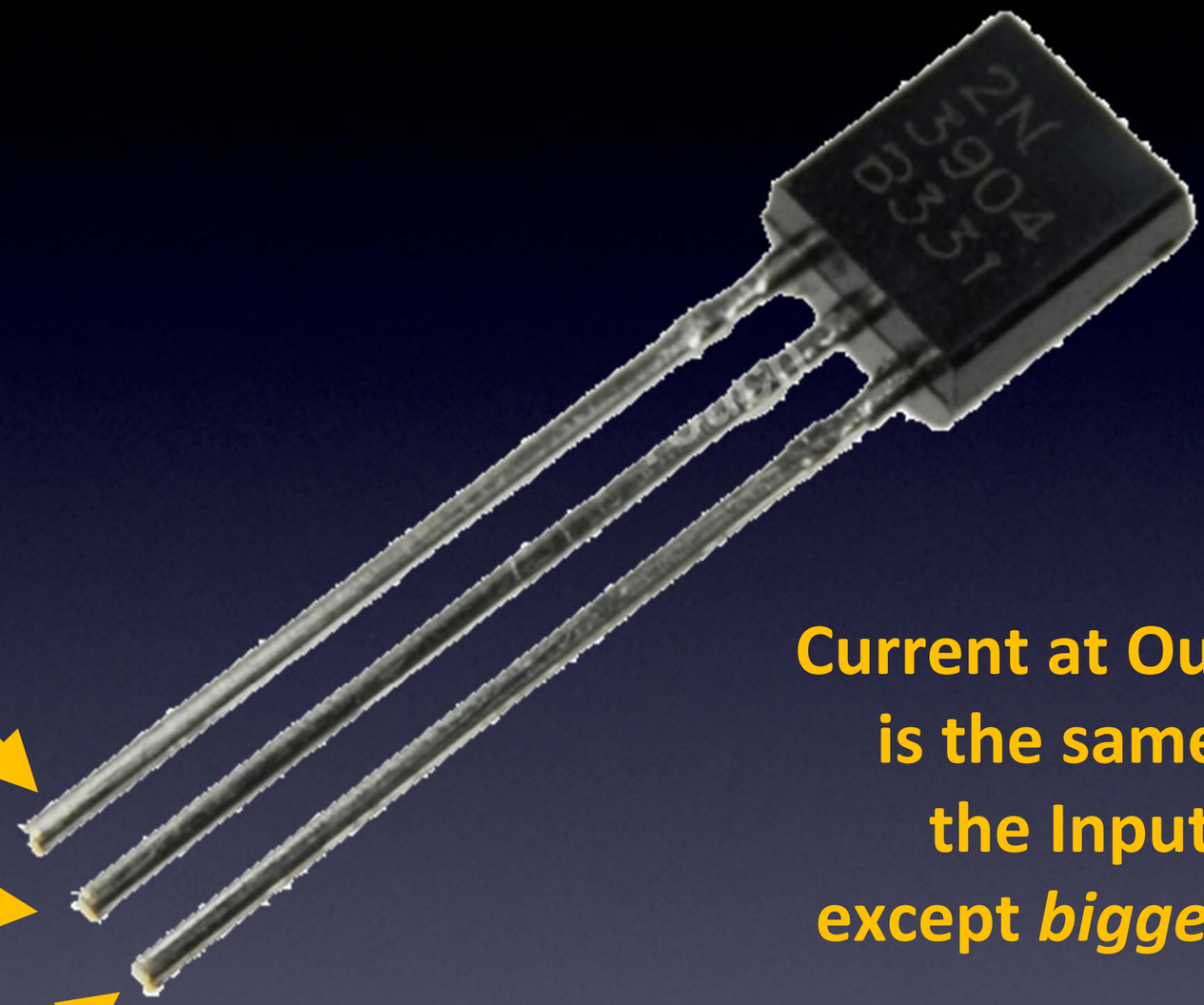
Everything You Need to Know About Electronics

So,
let's amplify
the current
from the Output pin

with
a

Current amplifier !

Everything You Need to Know About Electronics



Ground

Input

Output

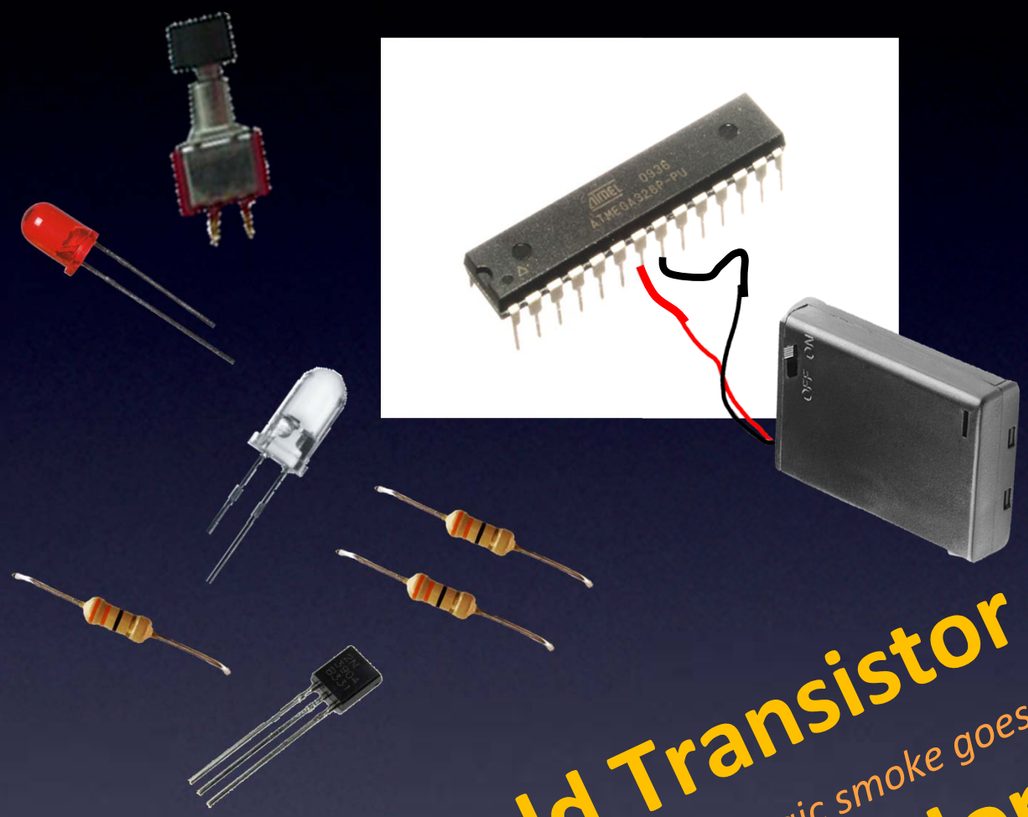
Current at Output lead is the same as for the Input lead except *bigger current*

Current amplifier

Transistor

Everything You Need to Know About Electronics

Hardware



Add Transistor

(and a resistor so no magic smoke goes away)

and, we're done!

Firmware

Pin 13 Output – visible LED pin
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Etc for all "OFF" codes

TV-B-Gone remote control – we're done!

Microcontroller

And, that is

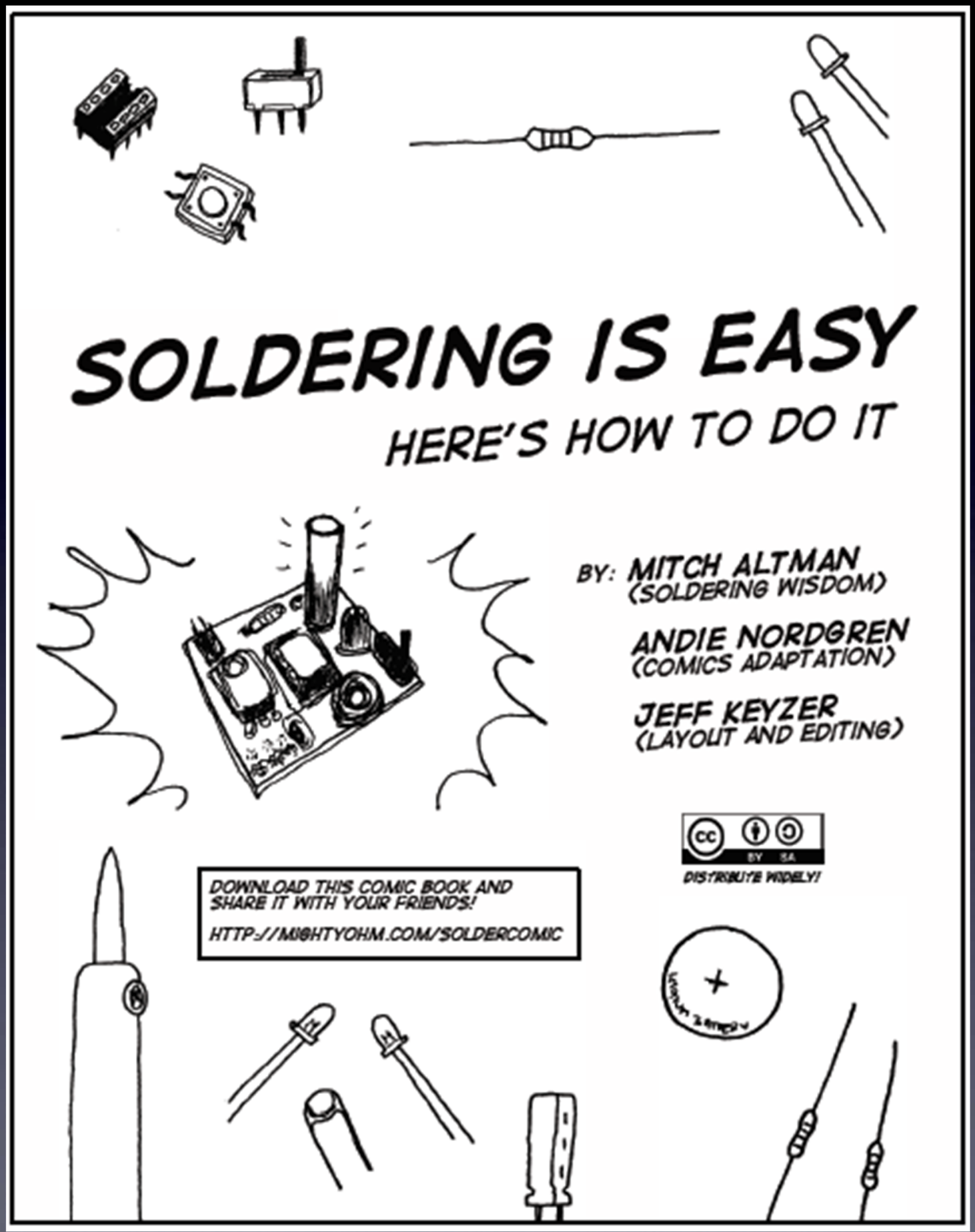
And, that is

Everything You Need to Know About

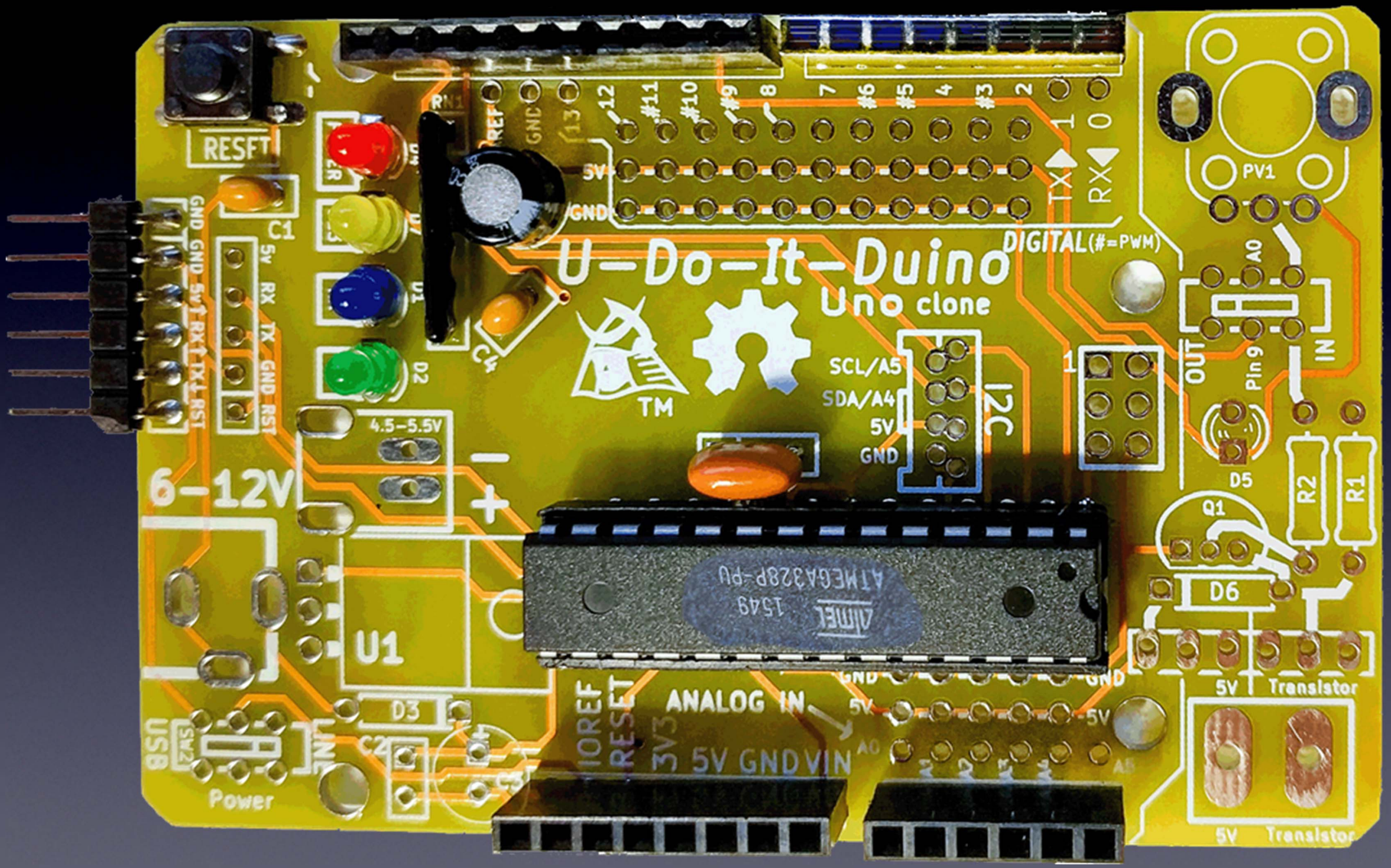
Electronics

Questions?

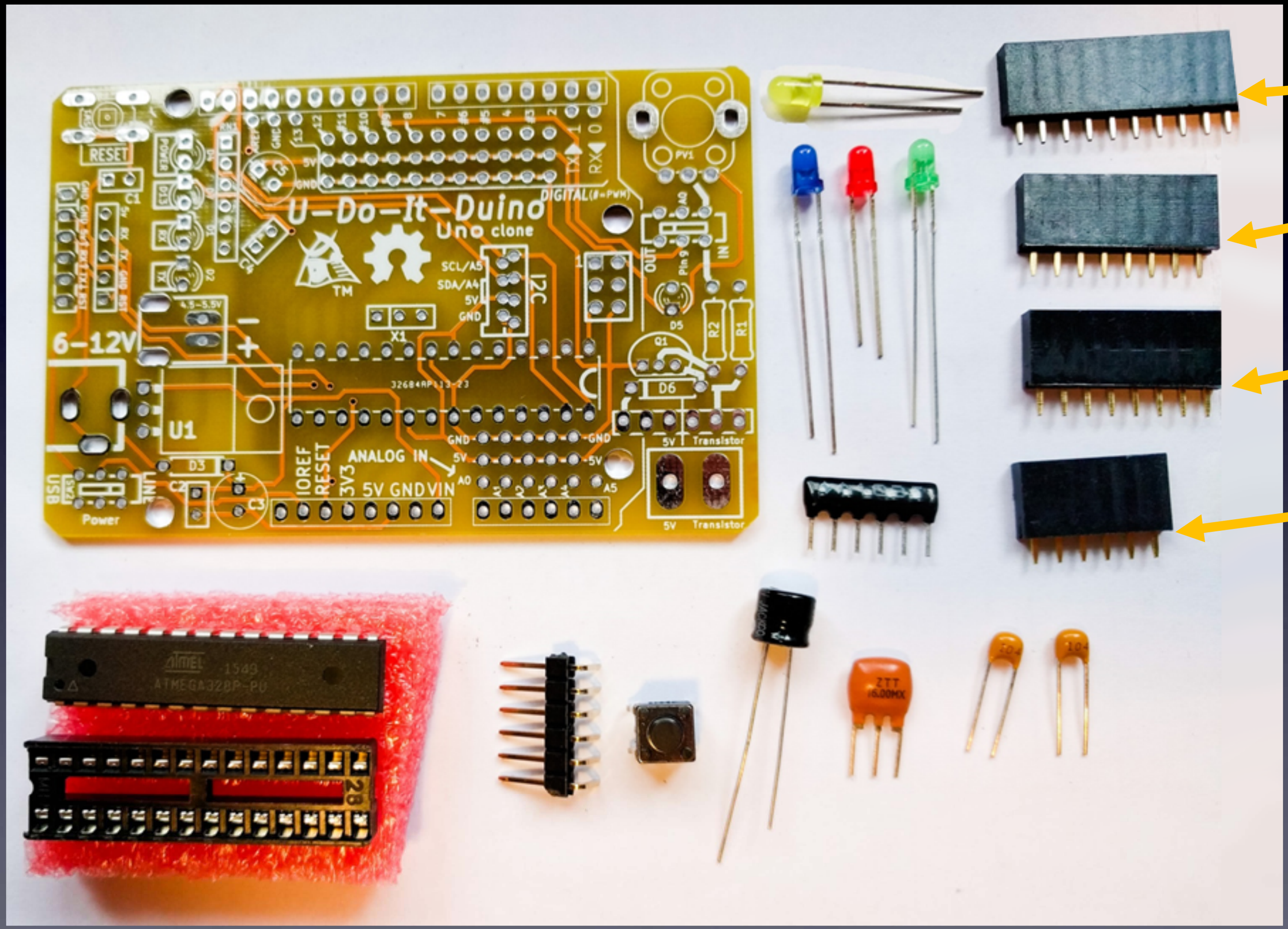
Learn To Solder



download for free at:
http://mightyohm.com/soldercomic

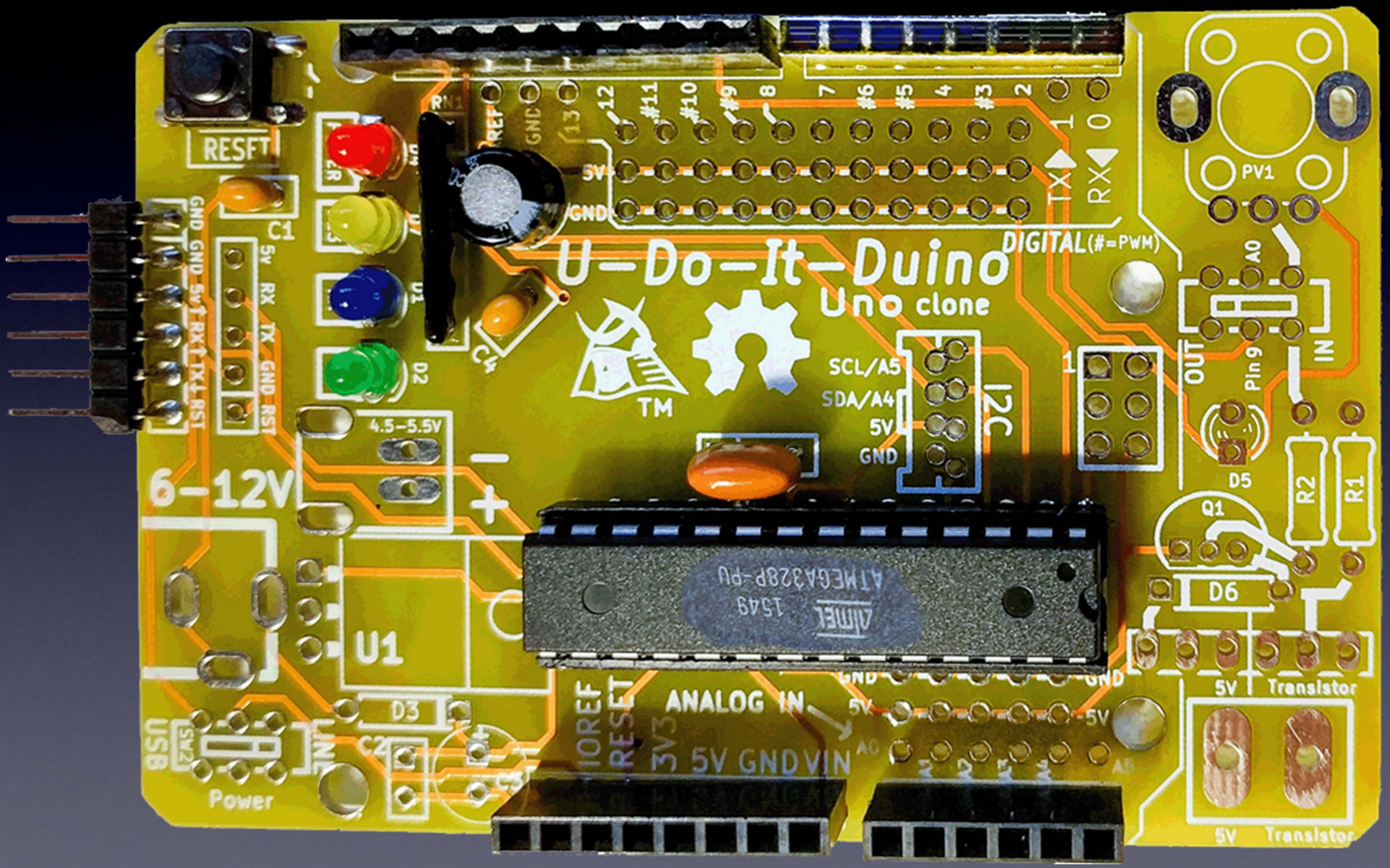

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
6-12V
4.5-5.5V
U1
ANALOG IN
5V GND VIN
Power
SCL/A5
SDA/A4
5V
GND
I2C
PV1
OUT
IN
Pin 9
D5
D6
Q1
R2
R1
5V
Transistor
ATMEGA328P-PU
1549

Parts to use



U-Do-It-Duino
Uno clone
6-12V
U1
ANALOG IN
5V GND VIN
10 pins
8 pins
8 pins
6 pins

We’re done!



RESET
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DIGITAL(#=PWM)
TM
SCL/A5
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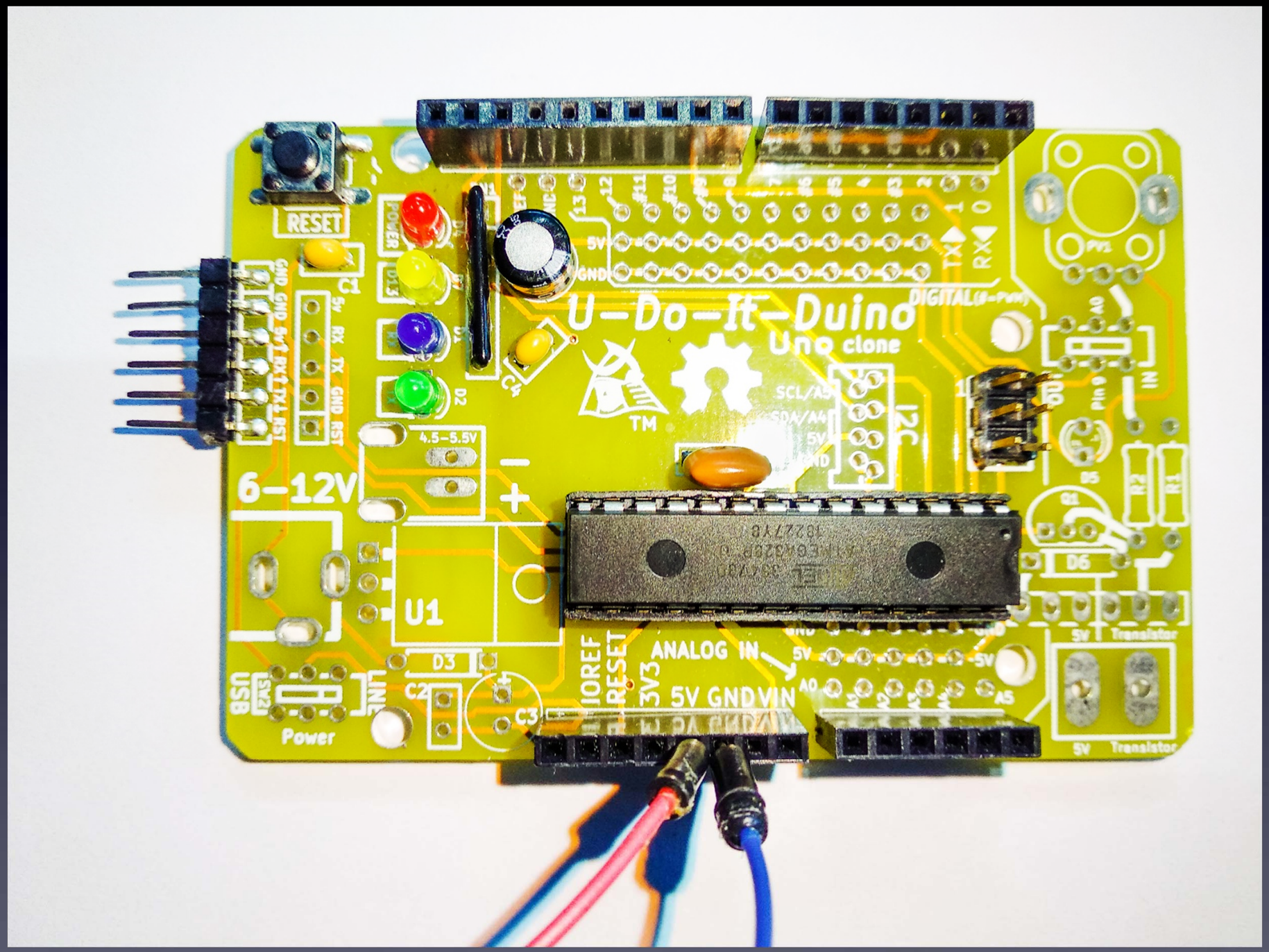
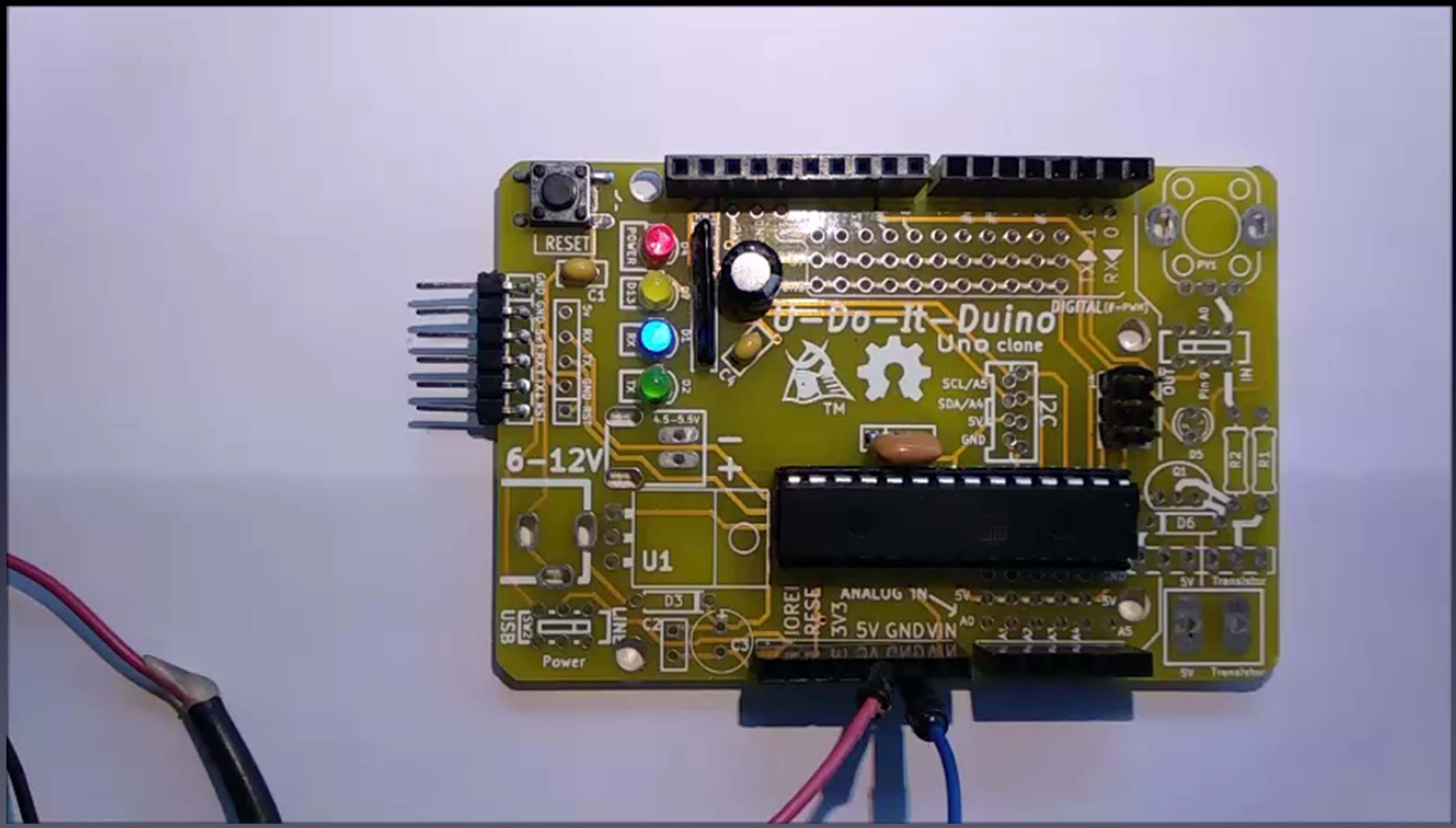
U1
ANALOG IN
5V GND VIN
Power
PV1
OUT
IN
Pin 9
D5
Q1
D6
R2
R1
5V
Transistor

First test:



Connect power with a battery pack…

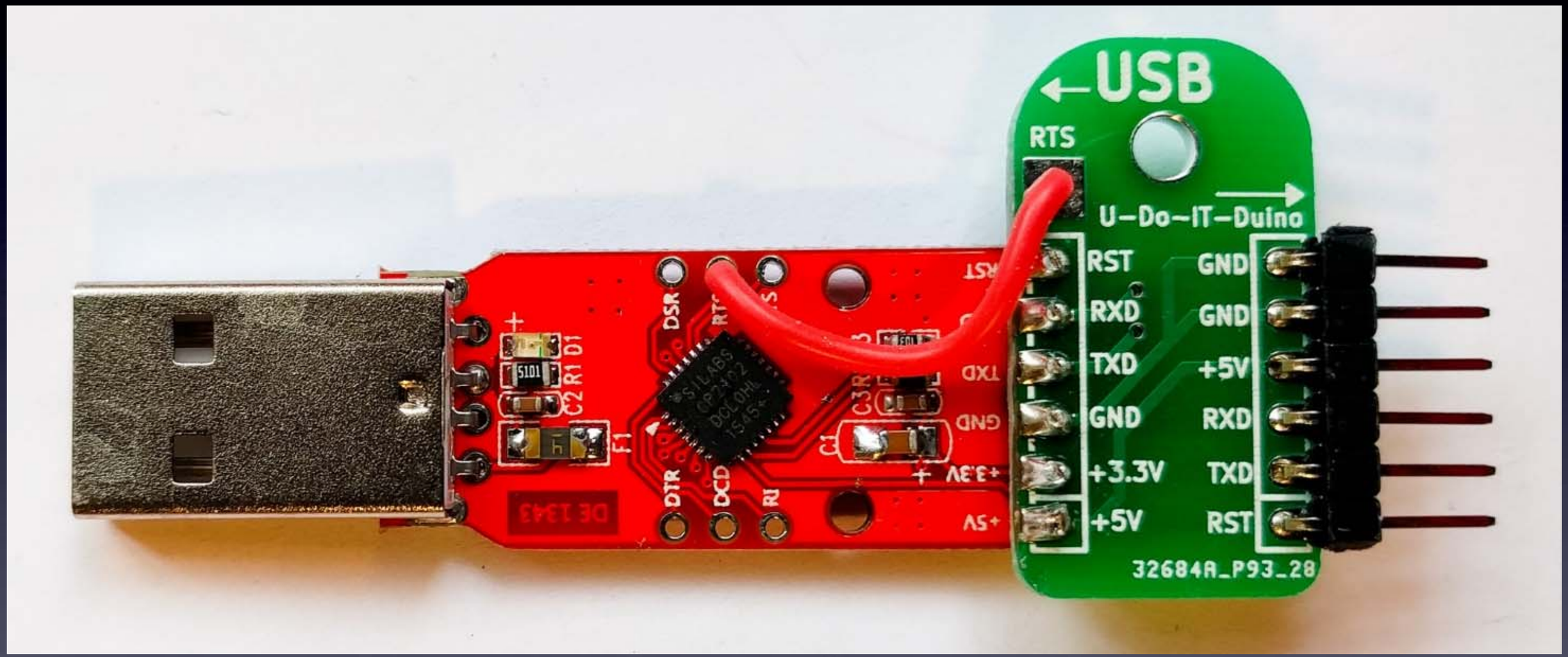
First test:



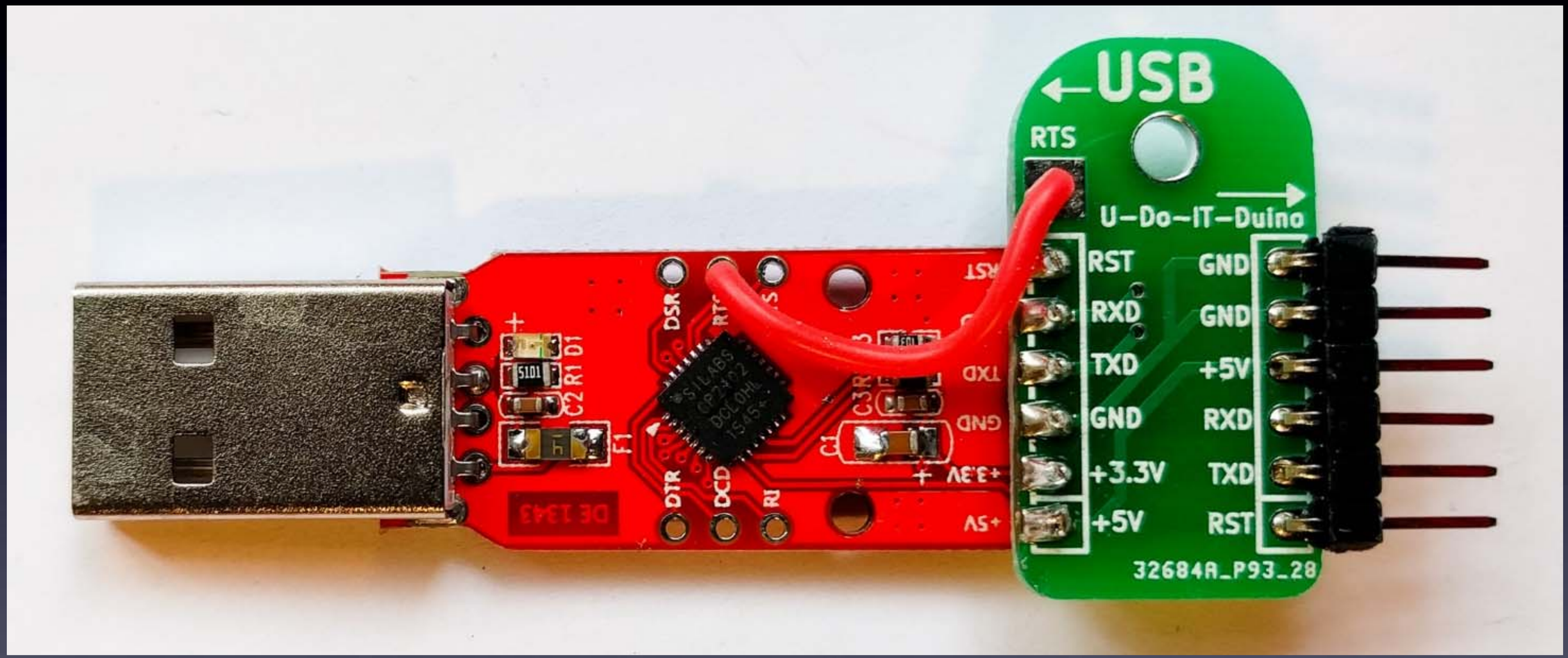
… and it blinks !

Now we can
connect parts to our Arduino,
and program it!

USB-Serial Cable



USB-Serial Cable Driver



You will need to download and install a driver for your Operating System (Windows, MacOS, or Linux):

<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>

Helpful info
on the
Arduino for(4) Total Newbies

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workshop
web-page:

https://cornfieldelectronics.com/cfe/projects/tvbg_arduino/tvbg_arduino_workshop.php

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Take control

**At Cornfield Electronics we create devices that give people opportunities for effective choices in their lives.
Each of us can decide whether to watch TV, and when to watch. Each of us can decide when to get the rest we want, and how we dream. Everyone can learn to make cool things with our kits.
Please explore our products, make your own choices, and see how *your* life can be enhanced.**

join our mailing list

Love it or hate it, TV is all around us. TV-B-Gone® universal remote control is the first fruit of our technical savvy, embodying our belief in empowerment, and sense of humor. This universal remote control fits in your pocket and allows you to discreetly turn TVs off or on wherever you go. TV-B-Gone fans around the world are using it for a variety of practical, philosophical, and humorous purposes. Imagine the possibilities...

Years in the making NeuroDreamer® sleep mask is the latest of our tools for personal empowerment. We all need rest, but we don't always get it in our busy lives. Now with the help of NeuroDreamer sleep mask you can use your own brainwaves to bring you the rest you need. And with the lucid dreaming model, you can take control of your dreams. You can enhance your life. The choice is yours.

Want to learn electronics? We make fun, intriguing, educational, useful kits! NEW: ArduTouch music synthesizer kit!

We make truly useful technological solutions that put you in charge.

Welcome to our better world!

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DO-IT-YOURSELF PROJECTS

by Mitch Altman, and friends.
Last modified: 28-February-2019

You Can Make Cool Things With Microcontrollers!

The projects on this page were all created for total beginners, with no experience, to complete successfully at my workshops, or at home, or anywhere!

All you need is a desire, a handful of parts, a soldering iron (with stand and sponge), a wire-cutter, a wire-stripper, solder, and an afternoon.

Open Hardware!

Everything on this page (and everything I do) is free and open source!
(That's *free* as in *freedom*.)
If you have any questions on anything, please feel free to email me:
mitch AT CornfieldElectronics DOT com

open source hardware

Soldering!

Soldering is fun! And it is easy! Really, it is!

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https://cornfieldelectronics.com/cfe/projects.php?PHPSESSID=86aca9i4t3ndngfp83

scroll down

The TV-B-Gone Kit was originally developed from a MiniPOV3 hack (see below)
(which, of course, I hacked from my original **TV-B-Gone**.)

For excellent **assembly instructions**, please go to the **TV-B-Gone Kit page** of the of the Adafruit.com website.

For **questions** about the TV-B-Gone Kit, please go to the **TV-B-Gone Kit user forum**.
To see the **schematic, firmware, and board layout**, please go to **TV-B-Gone Kit downloads**.

TV-B-Gone Kits are available for **purchase** from the **TVBGone.com** website.

Project: Arduino For Total Newbies workshop
-- Learn Arduino, and make your own TV-B-Gone!

This workshop covers lots of ground -- all you need to learn how to play with Arduinos.
As an example project, you can make your own TV-B-Gone using **Arduino**.
*Many thanks to Ken Shirriff for the original **TV-B-Gone for Arduino project**!*
For documentation on this workshop, please see the:
Arduino For Total Newbies Workshop page.

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Cornfield Electronics :: Projects
https://cornfieldelectronics.com/cfe/projects.php?PHPSESSID=86aca9i4t3ndngfp83

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Arduino For Total Newbies Workshop

last updated: 5-March-2019

Learn how to make your own way cool projects with Arduino, using TV-B-Gone as an example project to learn from.

I've given this workshop at **Noisebridge** hackerspace in San Francisco (several times), at **27C3** and **28C3** in Berlin, and **29C3**, **30C3**, **31C3**, **32C3**, and **33C3** in Hamburg, and at **34C3** and **35C3** in Leipzig, at **CCCamp2011** and **CCCamp2015** outside of Berlin, at **HeatSync Labs** hackerspace in Phoenix, AZ, at **Fabelier** hackerspace in Paris, at Unit One in **2012**, **2014**, **2016**, and **2018** as Hacker In Residence at the University of Illinois, in Urbana, IL, at Makerspace Urbana in Urbana, IL in **2012** and in **2016**, at **Workshop Weekend** in Oakland, CA (twice), at **XinCheJian** hackerspace in Shanghai, at **Maker Carnival** in Beijing (twice) at several conferences and hackerspaces on my **Hackers on a Train Workshop Tour 2012** including at **HOPE Number 9** in New York City, at **ToorCamp 2012** in Neah Bay, WA, at **OHM 2013** and **SHA 2017** outside of Amsterdam, at **RockIT CoLabs** in San Francisco, at **BalcCon2k14** in Novi Sad, Serbia, at **HOPE X**, **The Eleventh HOPE**, and **The Circle of HOPE** in New York City, at **at the iCenter** as Hacker In Residence at Tsingua Univeristy in Beijing, at **EMF Camp 2016** and **EMF Camp 2018** outside of London, at **Tami** hackerspace in Tel Aviv, at **Le Wagon** in Chengdu,

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https://cornfieldelectronics.com/cfe/projects/tvbg_arduino/tvbg_arduino_workshop

Here is what is available for downloading for the Arduino For Total Newbies Workshop:

1) You need to download the latest **Arduino software for your computer** (Windows, Mac OS, or Linux):
Arduino download page

2) You need a **driver for your USB communications/programming cable**. Several different ones are available. Choose the driver for the cable you have and the operating system for your computer.

Samurai Circuits board (SiLabs CP210x USB-to-Serial TTL) drivers:
The latest drivers from SiLabs' website
The SiLabs driver is installed by default on most Linux systems.

Adafruit FTDI Friend drivers:
The latest drivers from FTDI's website
The FTDI driver is installed by default on most Linux systems.

FTDI Cable drivers:
The latest drivers from FTDI's website
The FTDI driver is installed by default on most Linux systems.

3) You also need the **TV-B-Gone Arduino Sketch** (download this, unzip it, and copy it to your computer in the "examples" folder inside your "arduino" folder that you downloaded):
TV-B-Gone Arduino sketch*(22KB)*

4) Schematic Diagram for Arduino TV-B-Gone remote control:
Schematic Diagram*(449KB)*

Parts List for Arduino TV-B-Gone remote control:
Parts List (Open Office)*(12KB)*
Parts List (MS Office)*(9KB)*

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https://cornfieldelectronics.com/cfe/projects/tvbg_arduino/tvbg_arduino_workshop

The latest drivers from FTDI's website
The FTDI driver is installed by default on most Linux systems.

FTDI Cable drivers:
The latest drivers from FTDI's website
The FTDI driver is installed by default on most Linux systems.

3) You also need the **TV-B-Gone Arduino Sketch**
(download this, unzip it, and copy it to your computer in the "examples" folder inside your "arduino" folder that you downloaded):
TV-B-Gone Arduino sketch*(22KB)*

4) Schematic Diagram for Arduino TV-B-Gone remote control:
Schematic Diagram*(449KB)*

Parts List for Arduino TV-B-Gone remote control:
Parts List (Open Office)*(12KB)*
Parts List (MS Office)*(9KB)*

Schematics for the Arduino clone kits:
U-Do-It-Duino schematic *(110KB)*
BoArduino schematic *(40KB)*
Diavolino schematic *(38KB)*

Soldering Is Easy comic book:
Solder Comic (English) *(809KB)*
Many other languages are available!

Here are links to the slides I use in the workshop:
Arduino For Total Newbies workshop slides (with U-Do-It-Duino kit) *(65.5MB)*
Arduino For Total Newbies workshop slides (with Arduino Uno -- no soldering) (55.5MB)

scroll down

1) You need to download the latest **Arduino software for your computer** (Windows, Mac OS, or Linux):

Arduino download page

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Cornfield Electronics :: Projects | Cornfield Electronics :: Arduino | Arduino - Software

https://www.arduino.cc/en/Main/Software

ARDUINO

HOME STORE SOFTWARE EDUCATION RESOURCES COMMUNITY HELP

SIGN IN

SOFTWARE

ENGLISH

ARDUINO WEB EDITOR

Start coding online with the Arduino Web Editor, save your sketches in the cloud, and always have the most up-to-date version of the IDE, including all the contributed libraries and support for new Arduino boards.

GETTING STARTED

CODE ONLINE

Download the Arduino IDE

Windows Installer, for Windows XP and up

Windows ZIP file for non admin install

2) You need a **driver for your USB communications/programming cable.** Several different ones are available. Choose the driver for the cable you have and the operating system for your computer.

Samurai Circuits board (SiLabs CP210x USB-to-Serial TTL) drivers:

The latest drivers from SiLabs' website

The SiLabs driver is installed by default on most Linux systems.

https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-

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CP210x USB to UART Bridge VCP Drivers

The CP210x USB to UART Bridge Virtual COM Port (VCP) drivers are required for device operation as a Virtual COM Port to facilitate host communication with CP210x products. These devices can also interface to a host using the direct access driver. These drivers are static examples detailed in application note 197: The Serial Communications Guide for the CP210x, download an example below:

AN197: The Serial Communications Guide for the CP210x

Download Software

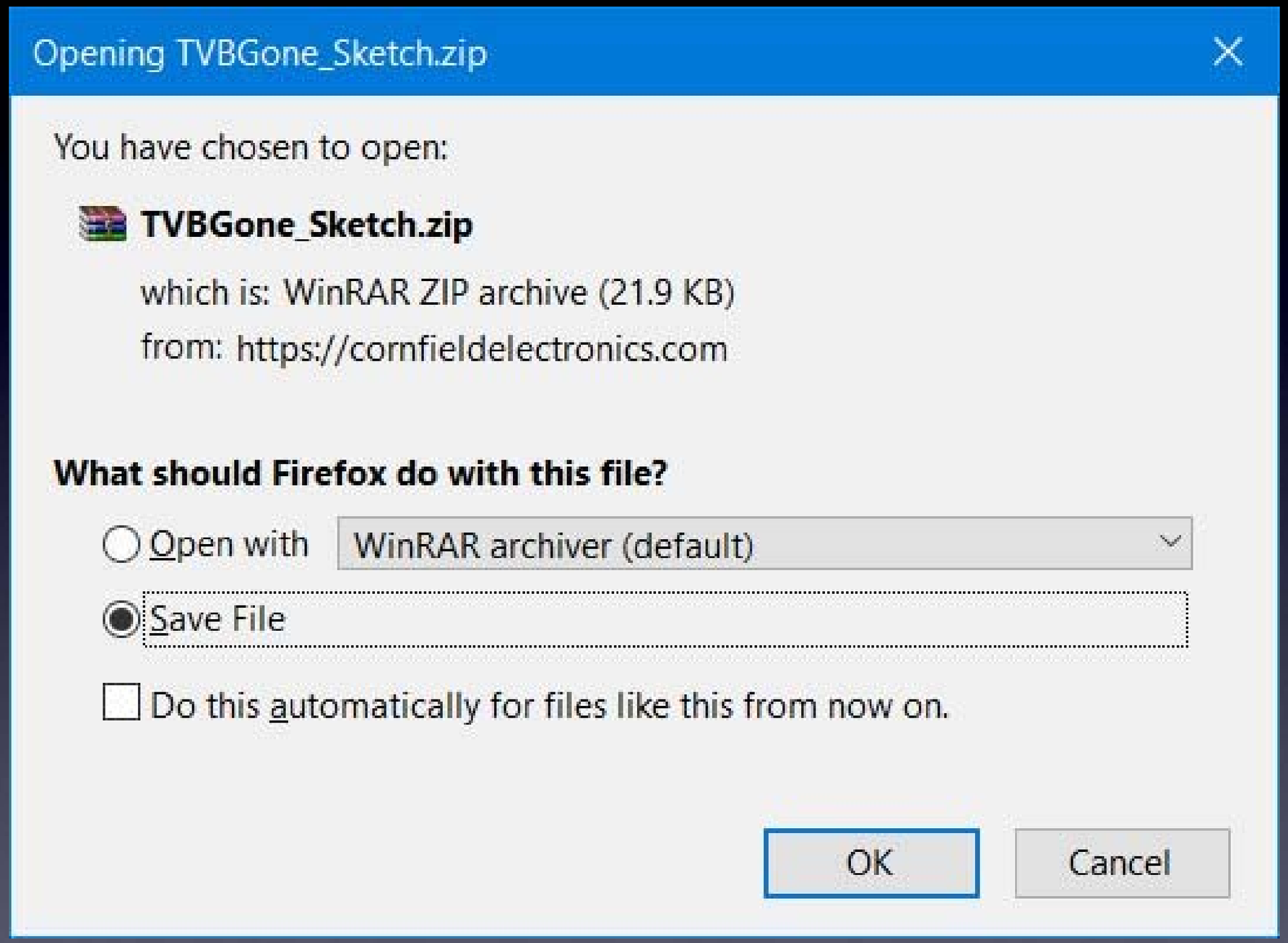
The CP210x Manufacturing DLL and Runtime DLL have been updated and must be used with v6.0 and later of the CP210x Windows VCP Driver. Application Note Software downloads affected are AN144SW.zip, AN205SW.zip and AN223SW.zip. If you are using a 5.x driver and need support you can download archived Application Note Software.

Legacy OS software and driver package download links and support information ›

Download for Windows 10 Universal (v10.1.4)

community.silabs.com/t5/Interface-Knowledge-Base/Legacy-OS-Software-and-Driver-Packages/ta-p/182585

3) You also need the **TV-B-Gone Arduino Sketch**
(download this, unzip it, and copy it to your computer in the "examples" folder inside your "arduino" folder that you downloaded):
TV-B-Gone Arduino sketch*(22KB)*



4) Schematic Diagram for Arduino TV-B-Gone remote control:

[Schematic Diagram(449KB)]

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Cornfield Electronics :: Projects | Cornfield Electronics :: Arduino | arduino_tvbgone_schematic.pd

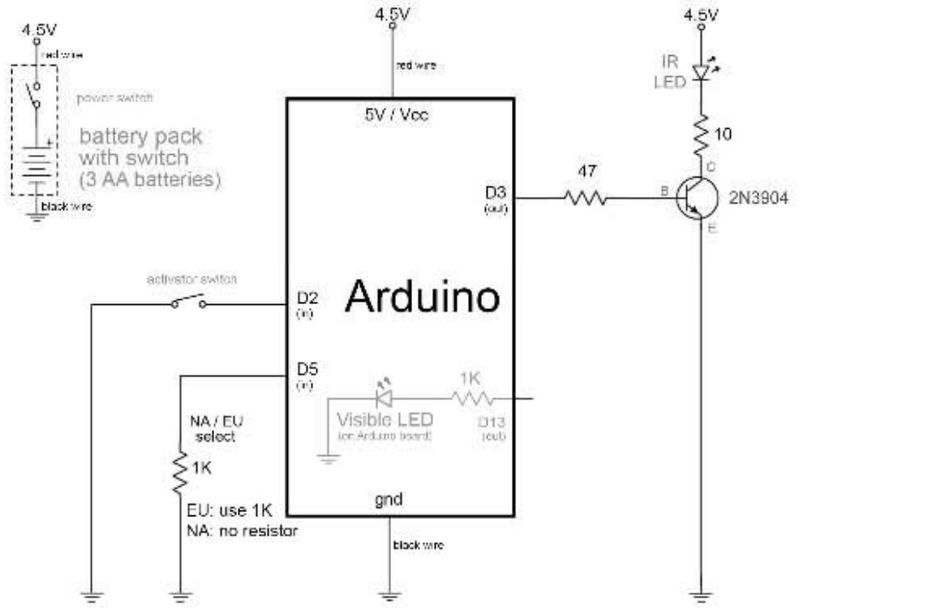
https://cornfieldelectronics.com/cfe/projects/tvbg_arduino/arduino_tvbgone_schematic.pd

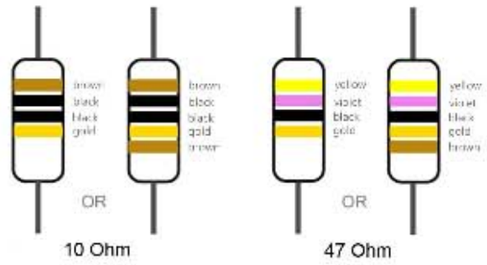
1 of 1 — 70%

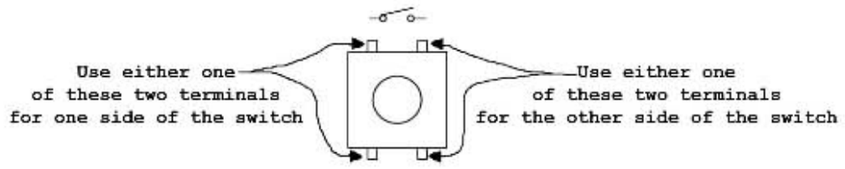
Arduino For Total Newbies

4-Sep-2015

Mitch Altman (original TV-B-Gone hardware and firmware, modified TV-B-Gone Arduino design)
Limore Fried (firmware modifications, kit design)
Ken Shirriff (original modifications for Arduino)
Johannes Schneemann (documentation)

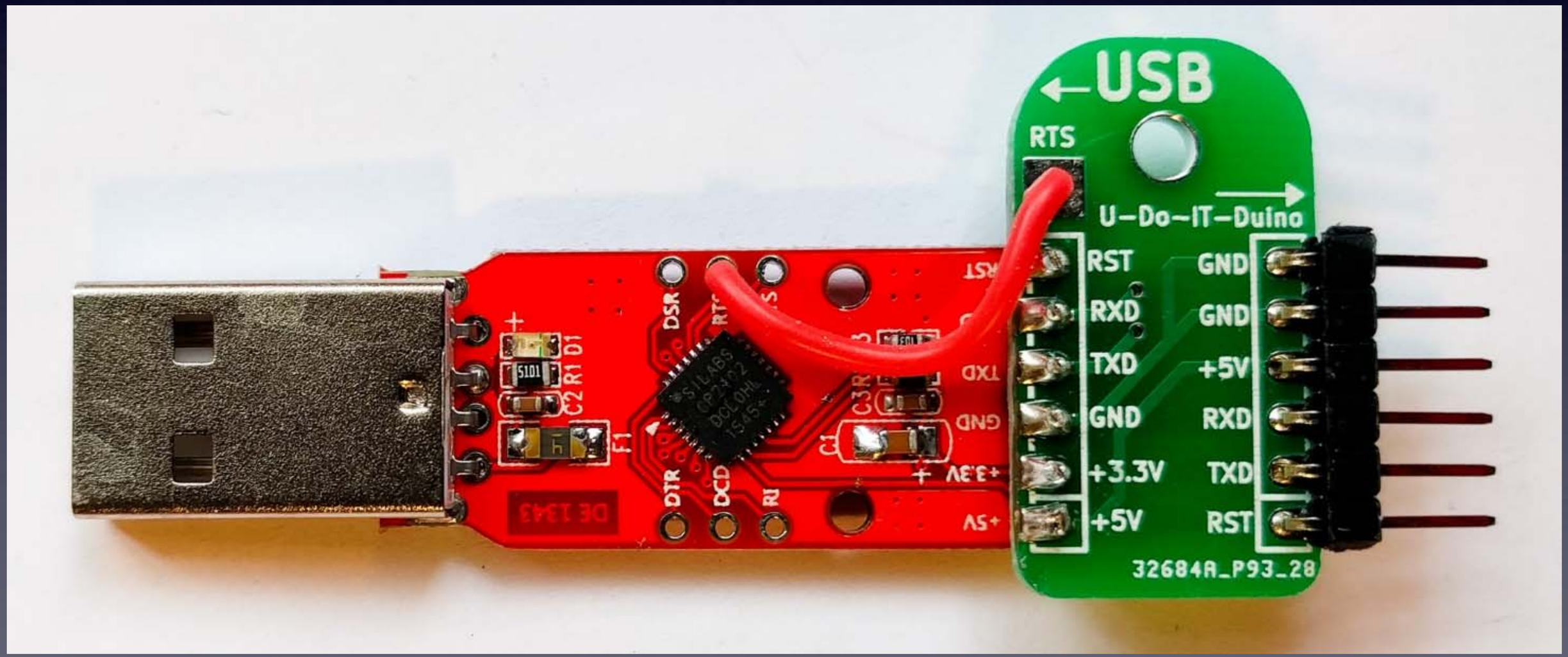






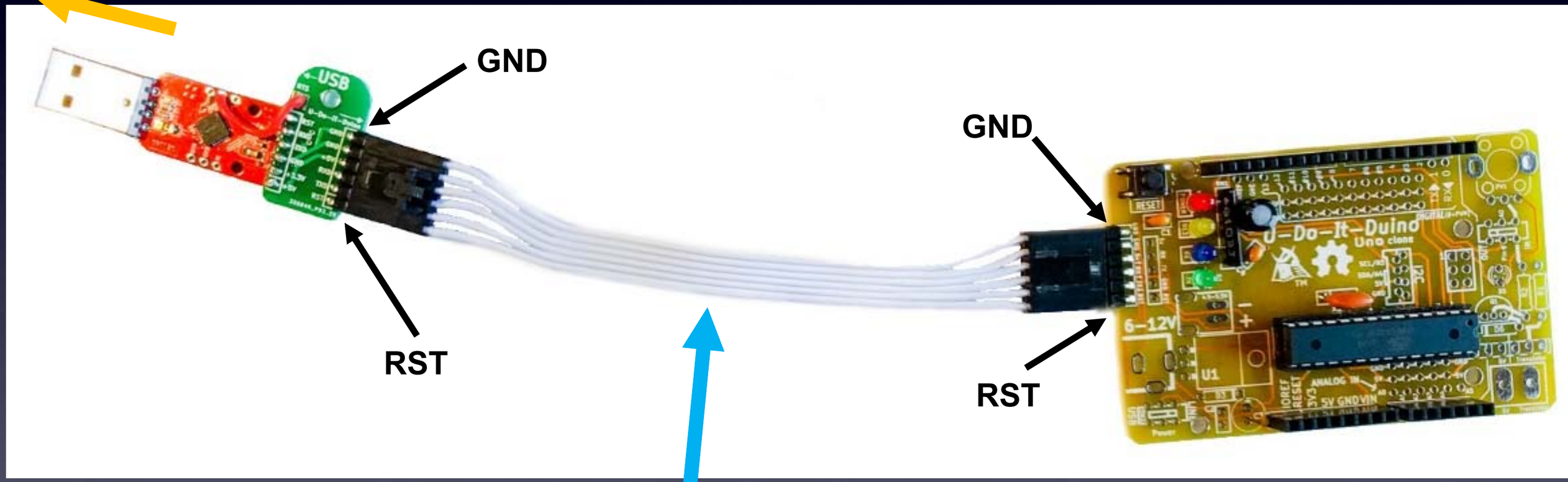
Connect your Arduino to your computer

USB-Serial Cable

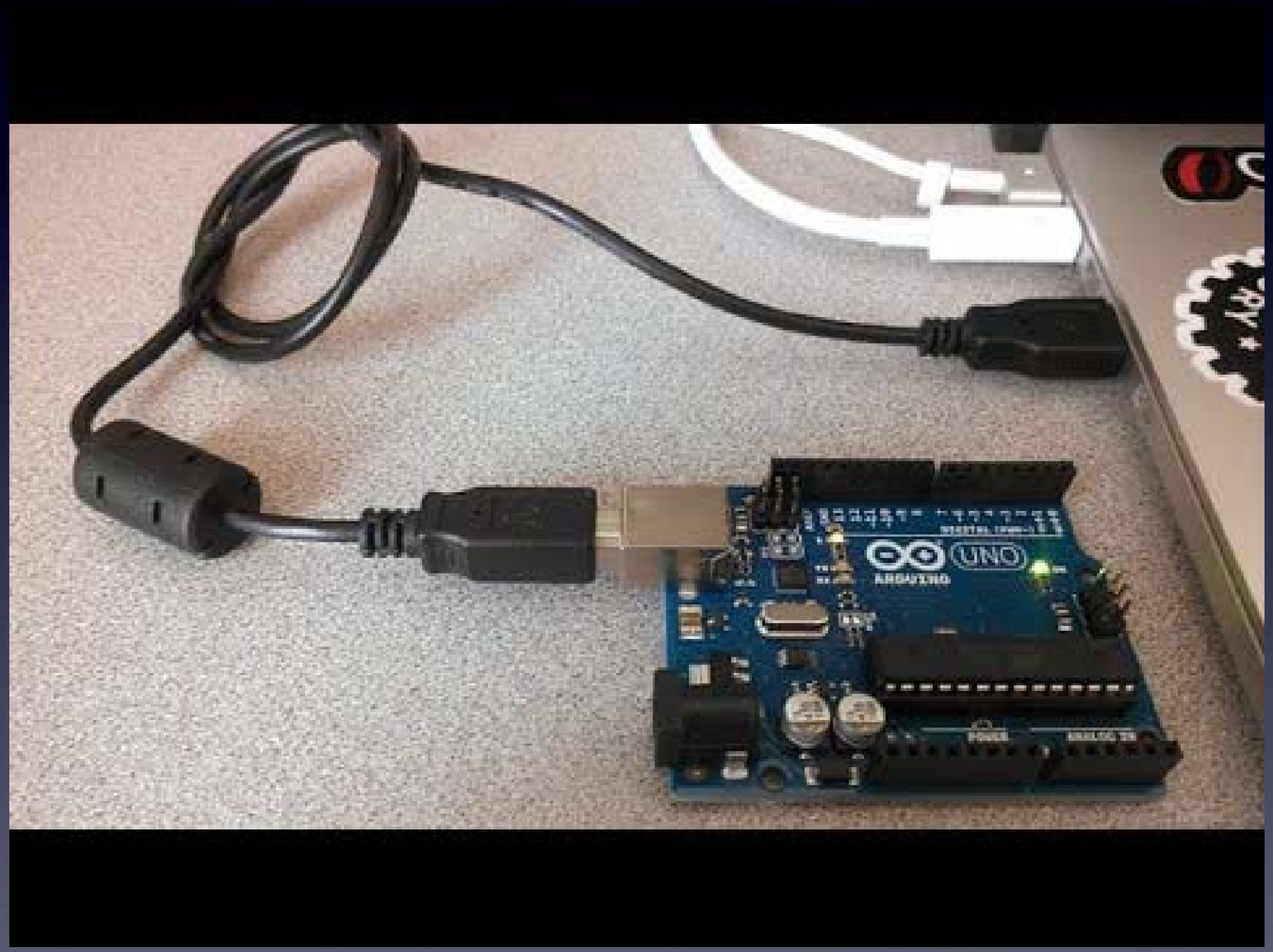


Connect your Arduino to your computer

To computer's USB

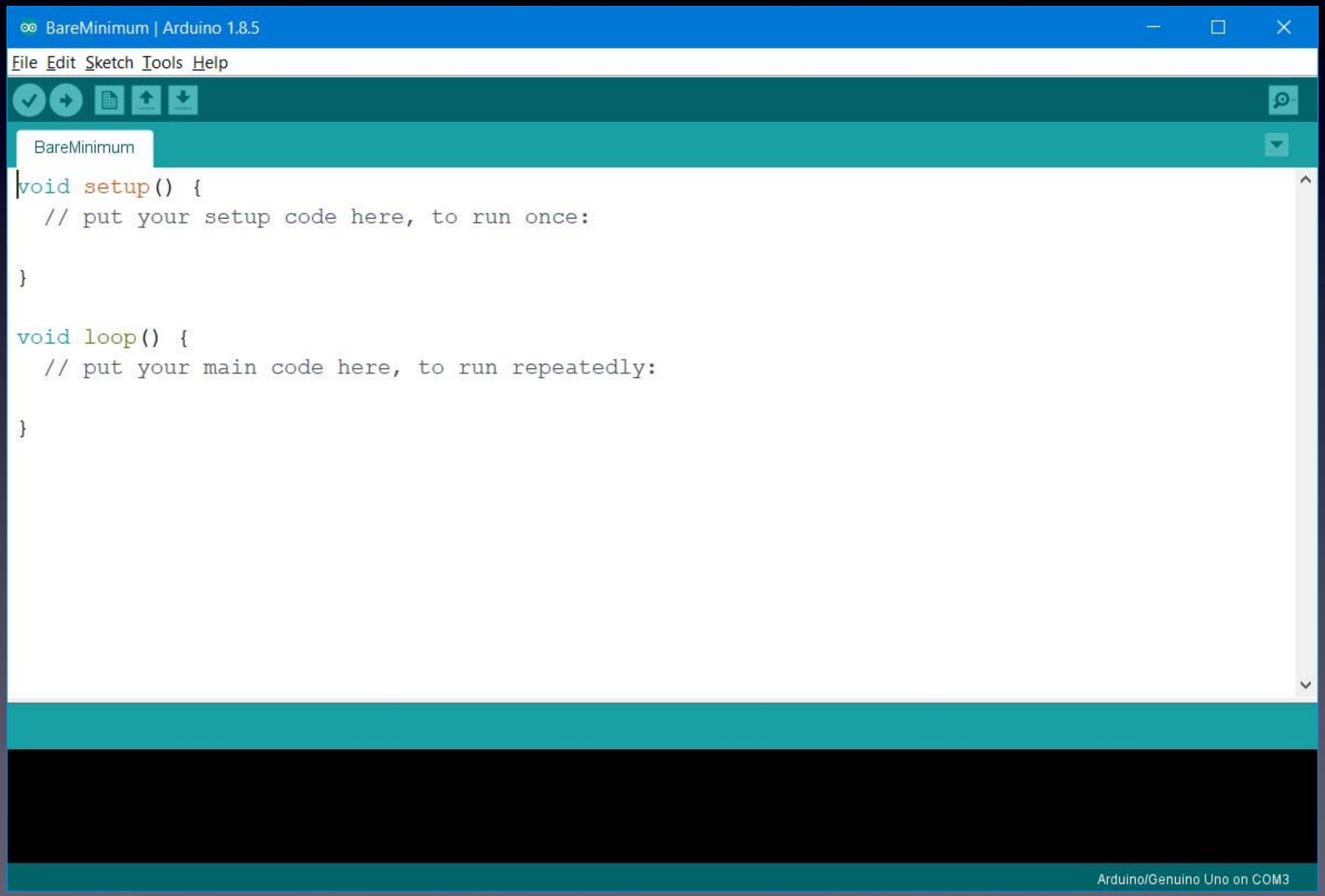


Connect your Arduino to your computer



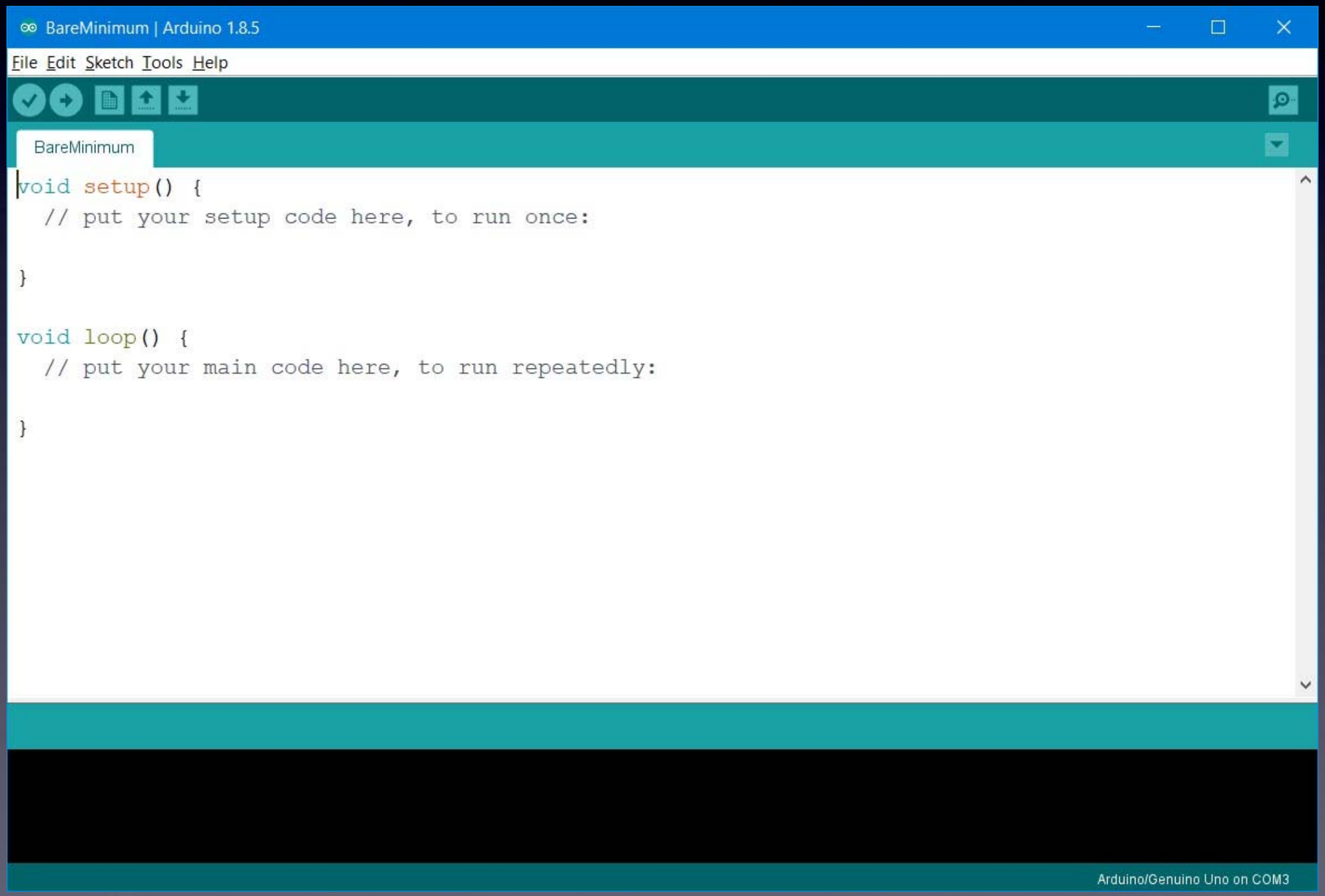
Arduino

After you download and install the Arduino software start it, and you will see a screen that looks like this:



Arduino

How to Set Up and Use the Arduino Software

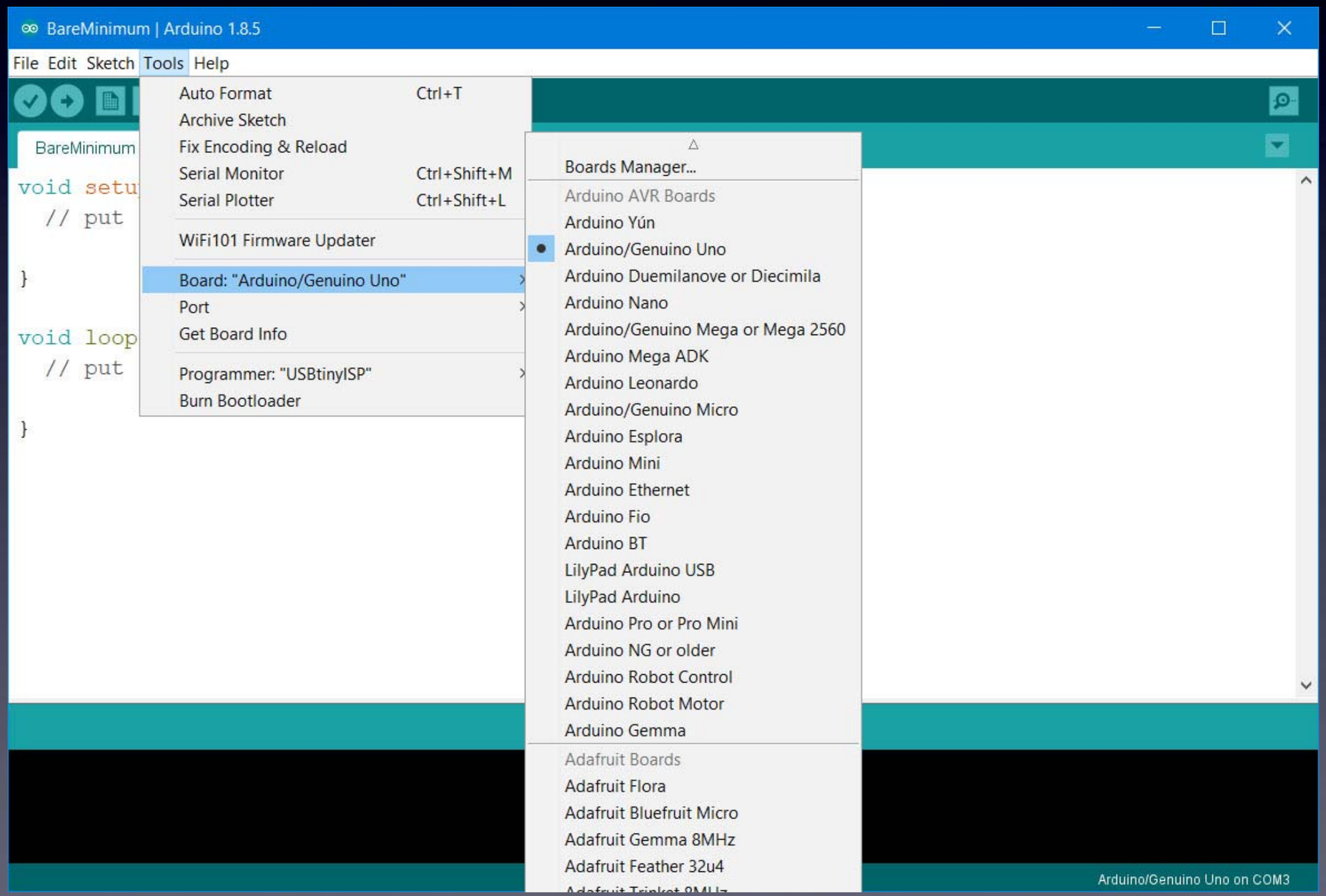


Arduino

The ***first time*** you start your Arduino software
you need to do ***two things*** to set things up:

(1)
Choose "Uno"
as the Board

(Your
U-Do-It-Duino
acts
just like
an
Arduino Uno board)

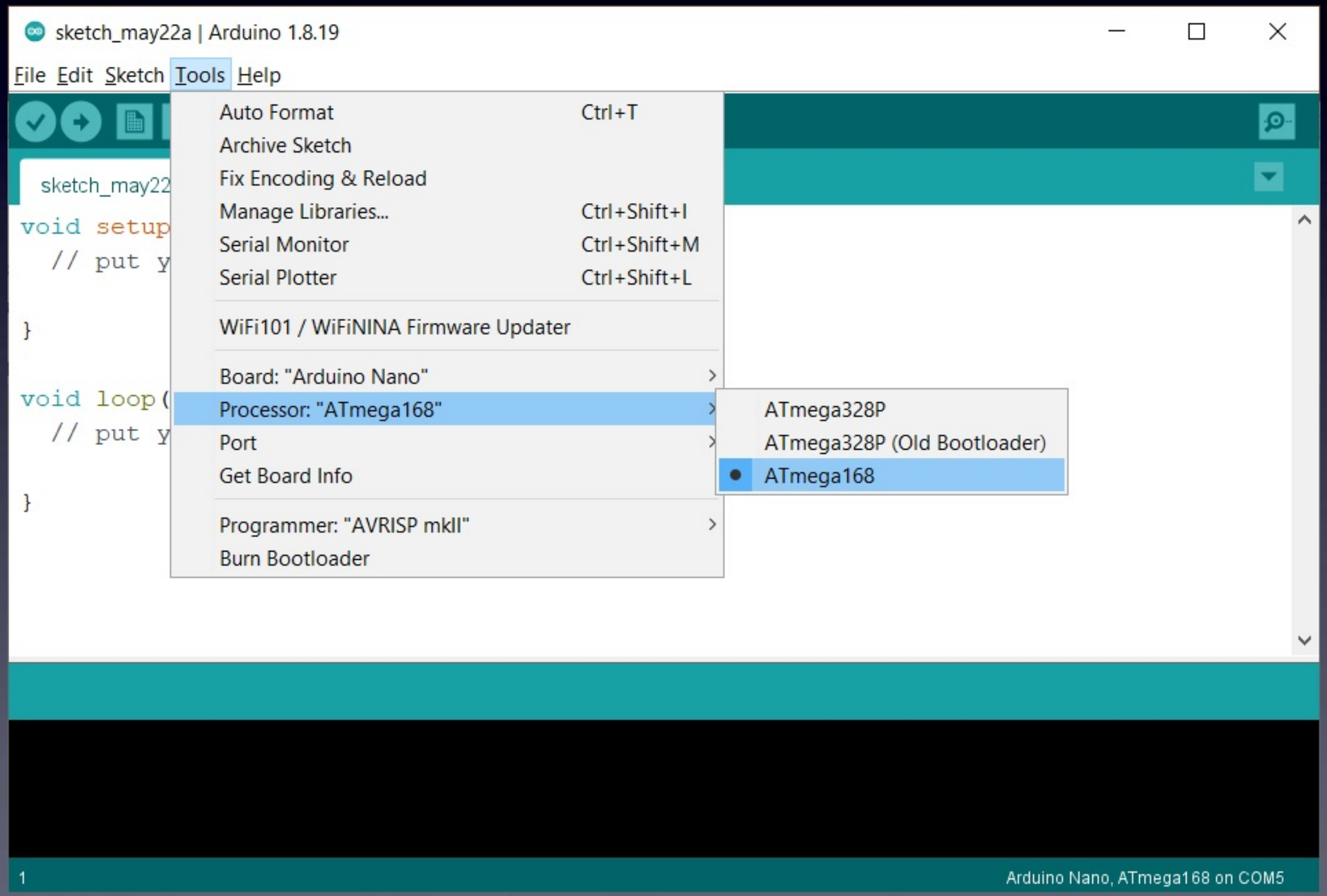


Arduino

The first time you start your Arduino software you need to set things up

For Arduino Nano:

(1b) Choose your Processor as the Board

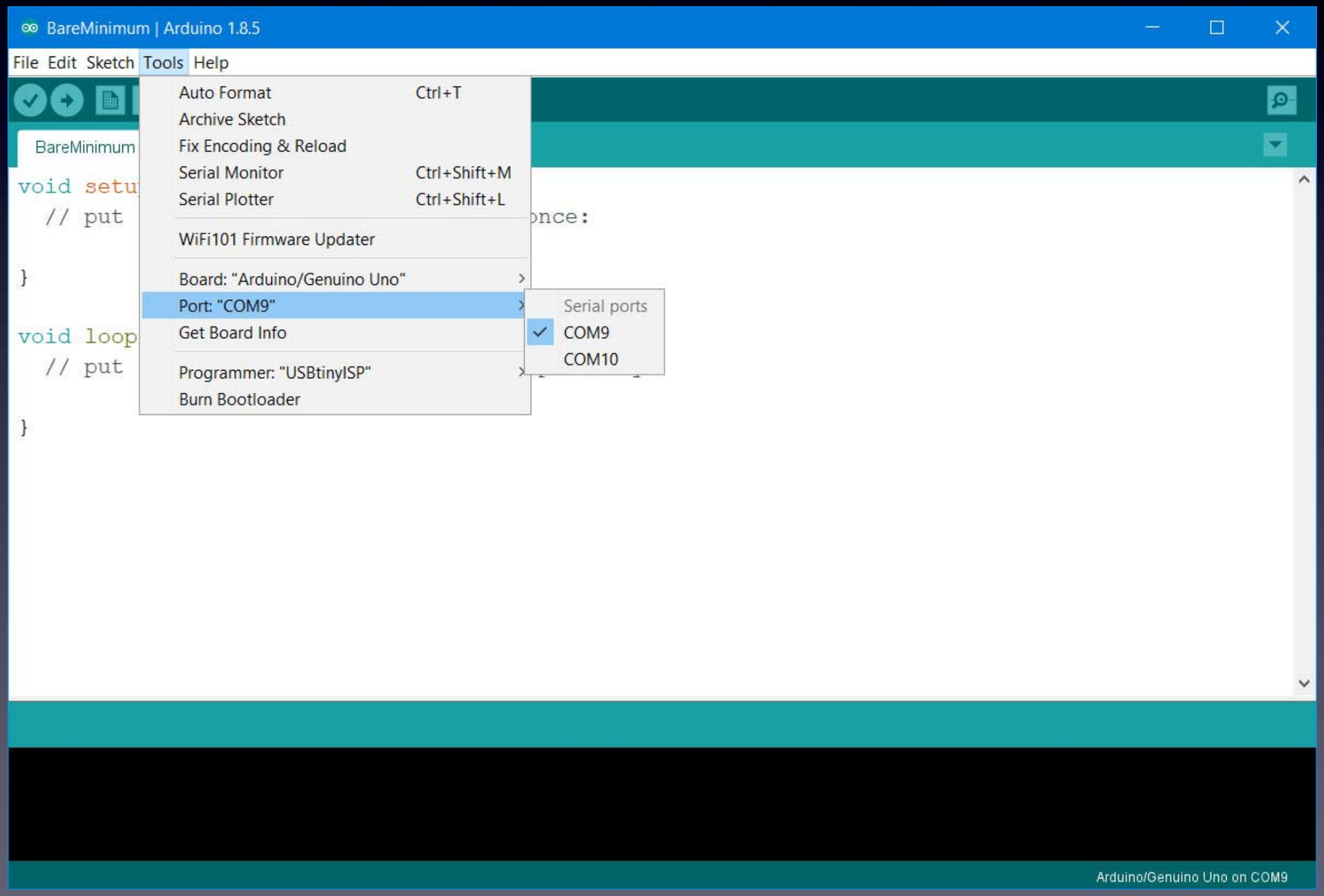


Arduino

The ***first time*** you start your Arduino software you need to do ***two things*** to set things up:

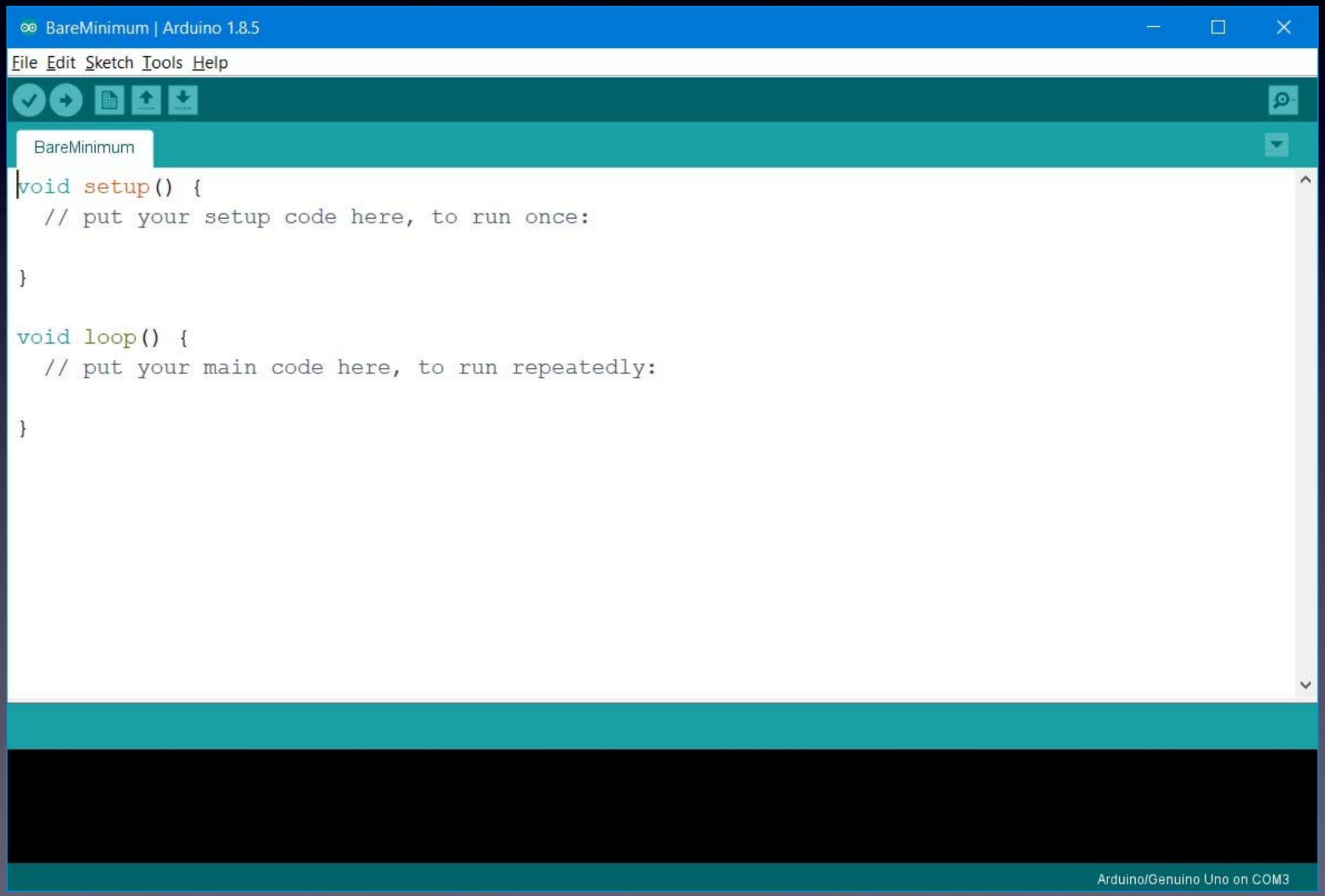
(2) Choose the Port (this will be different depending on your Operating System)

(After installing the driver for your USB-Serial cable and plugging it in your operating system will see a serial port and it appears here.)



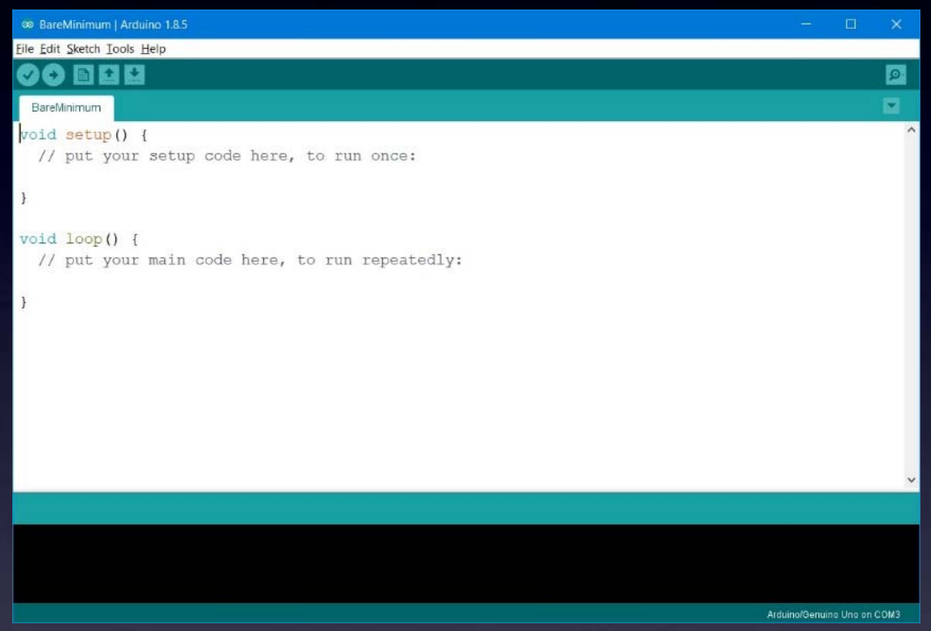
Arduino

Your Arduino software is now ready to program your U-Do-It-Duino !



Arduino

Designed for non-geeky artists

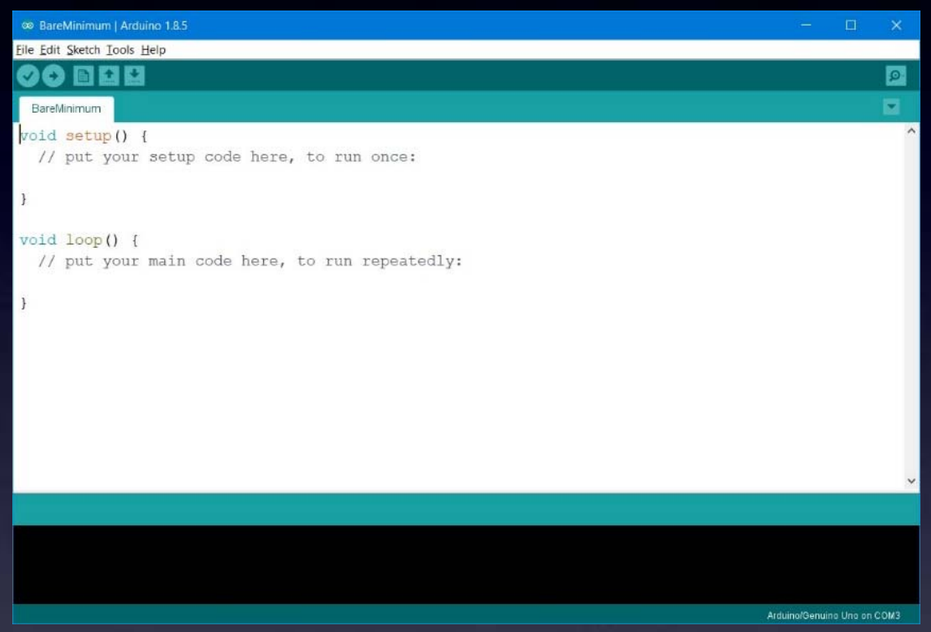


“Sketch” :

an Arduino program

Arduino

Designed for non-geeky artists



The Arduino language :

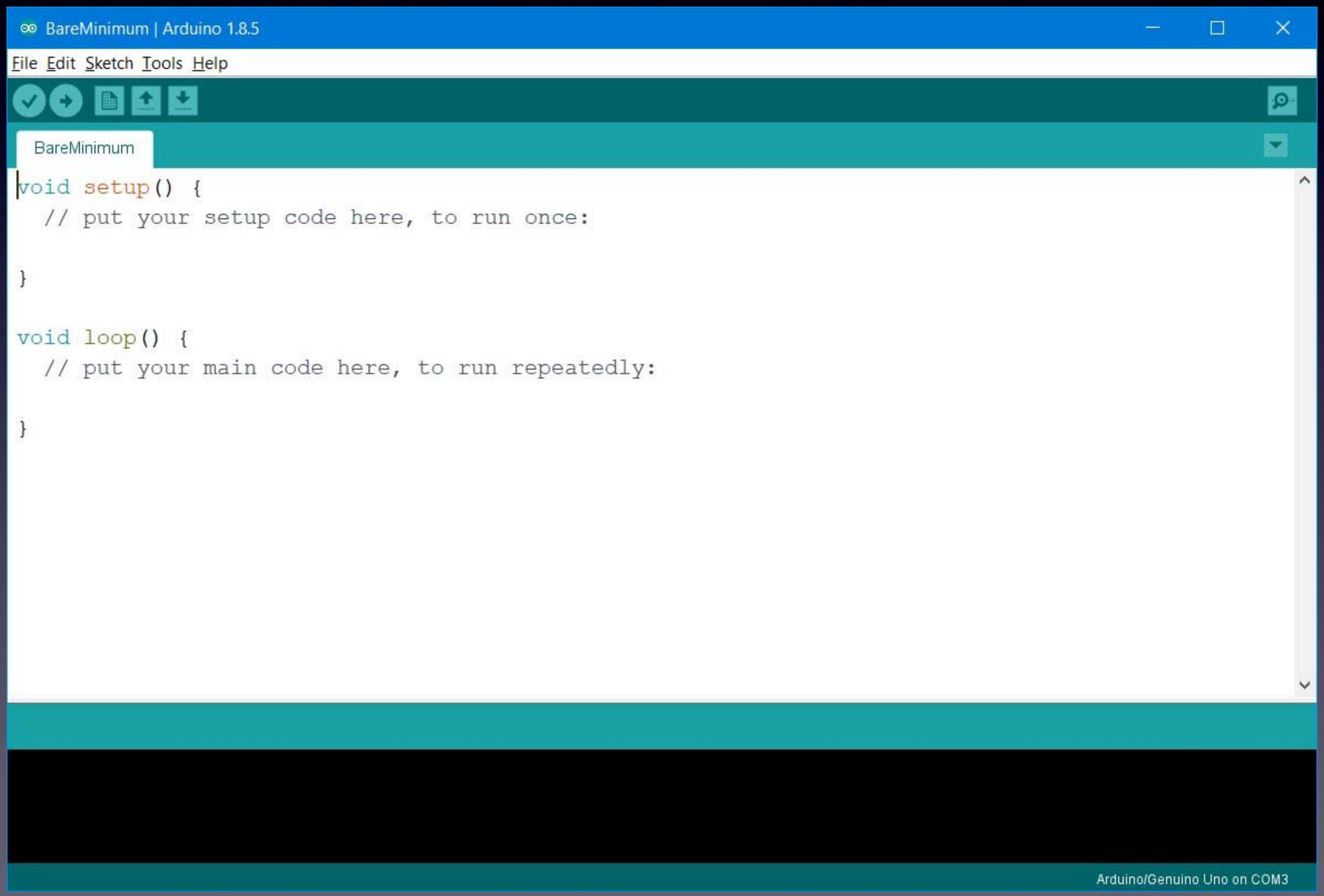
“Wiring”

(actually C/C++)

Arduino

Your Arduino software is now ready to program your U-Do-It-Duino !

Let's make an LED blink! `Hello World`



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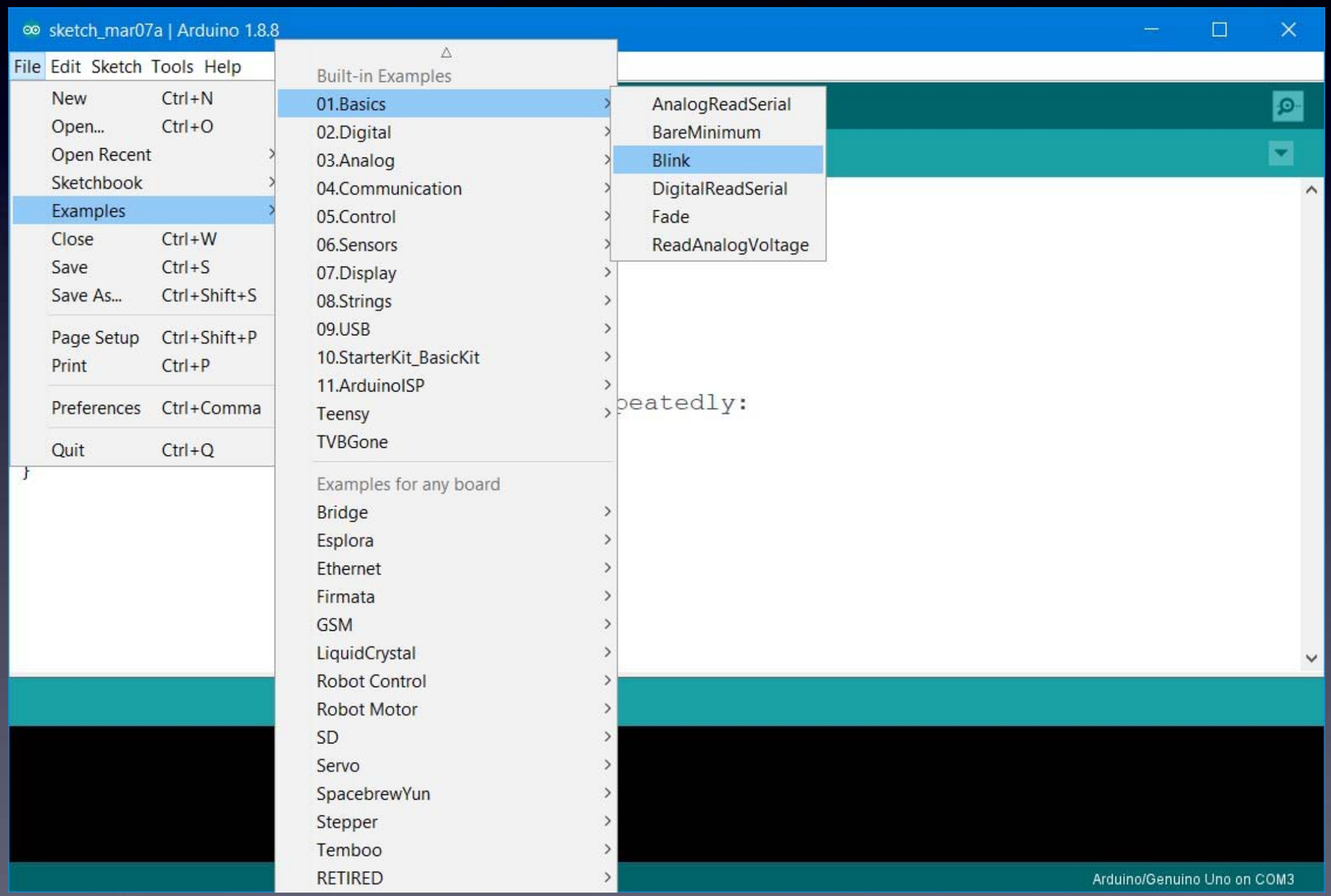

Arduino

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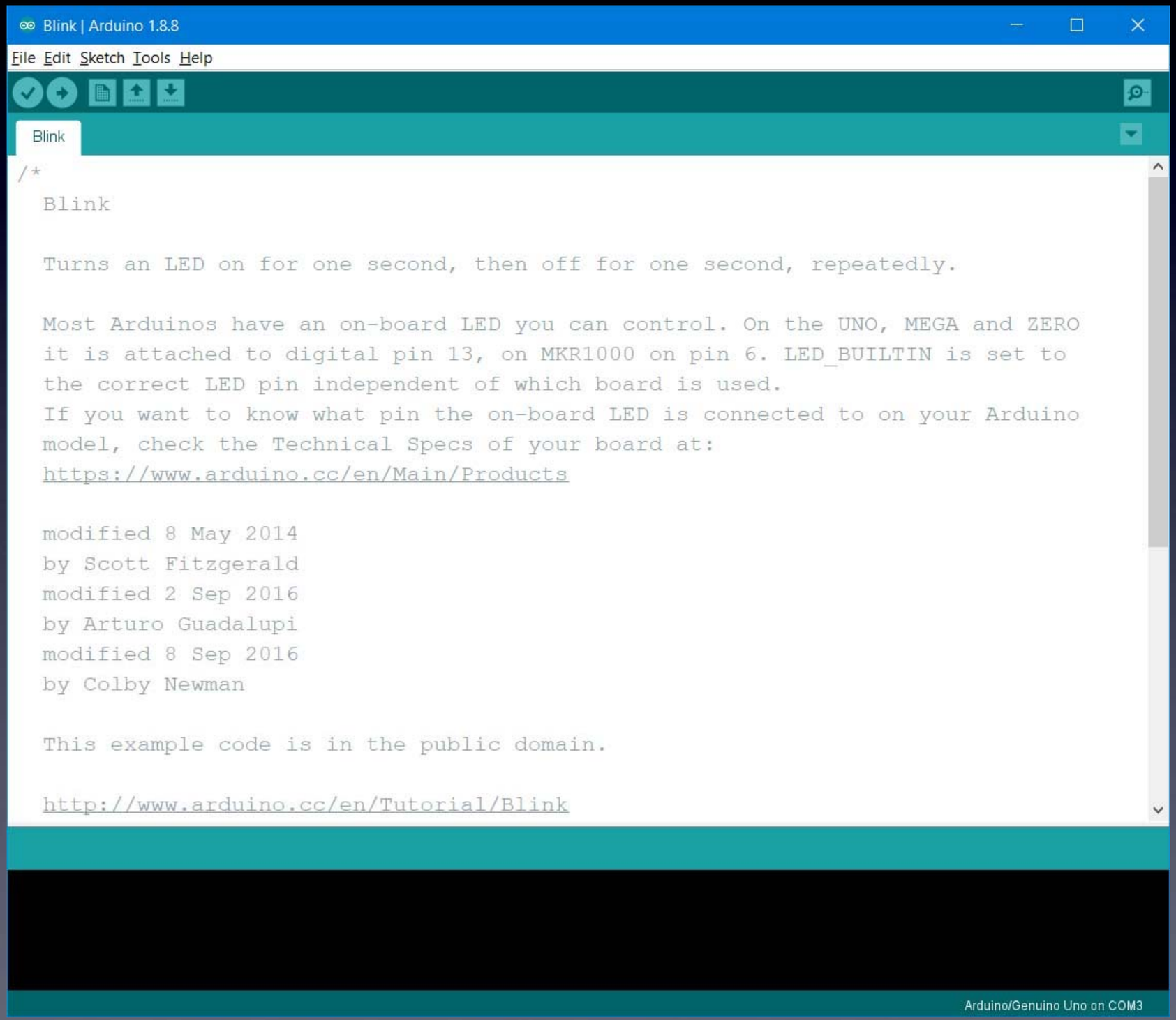

Arduino

Let's make an LED blink! `Hello World`

Blink | Arduino 1.8.8

File Edit Sketch Tools Help

Blink

```
  by Arturo Guadalupi
  modified 8 Sep 2016
  by Colby Newman

  This example code is in the public domain.

  http://www.arduino.cc/en/Tutorial/Blink
*/

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```

Arduino/Genuino Uno on COM3

How to Hack Arduino Programs (“Sketches”)

Blink | Arduino 1.8.8

File Edit Sketch Tools Help

Blink

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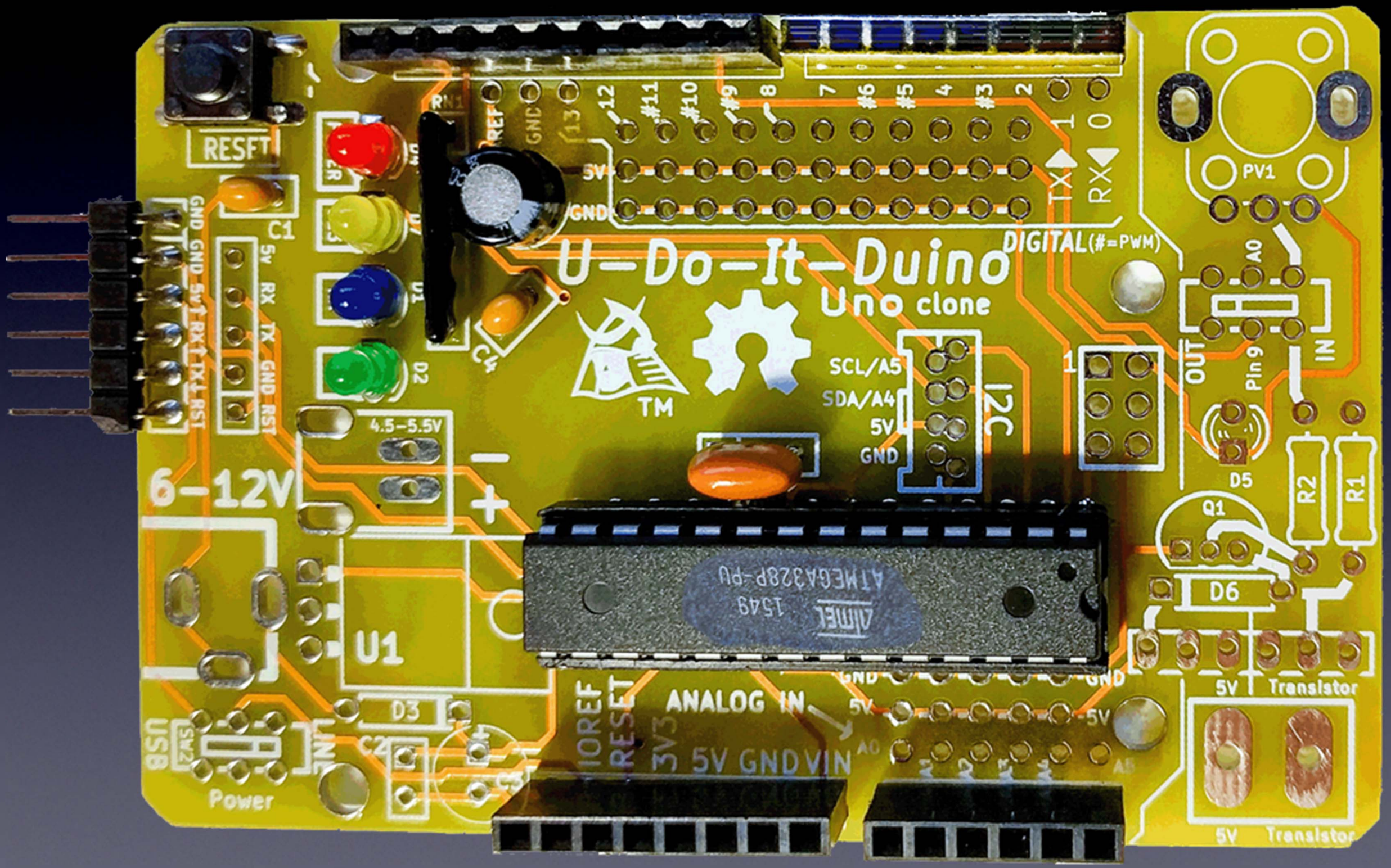
Arduino/Genuino Uno on COM3

How to Hack Arduino Programs (“Sketches”)



How to Hack Arduino Programs (“Sketches”)

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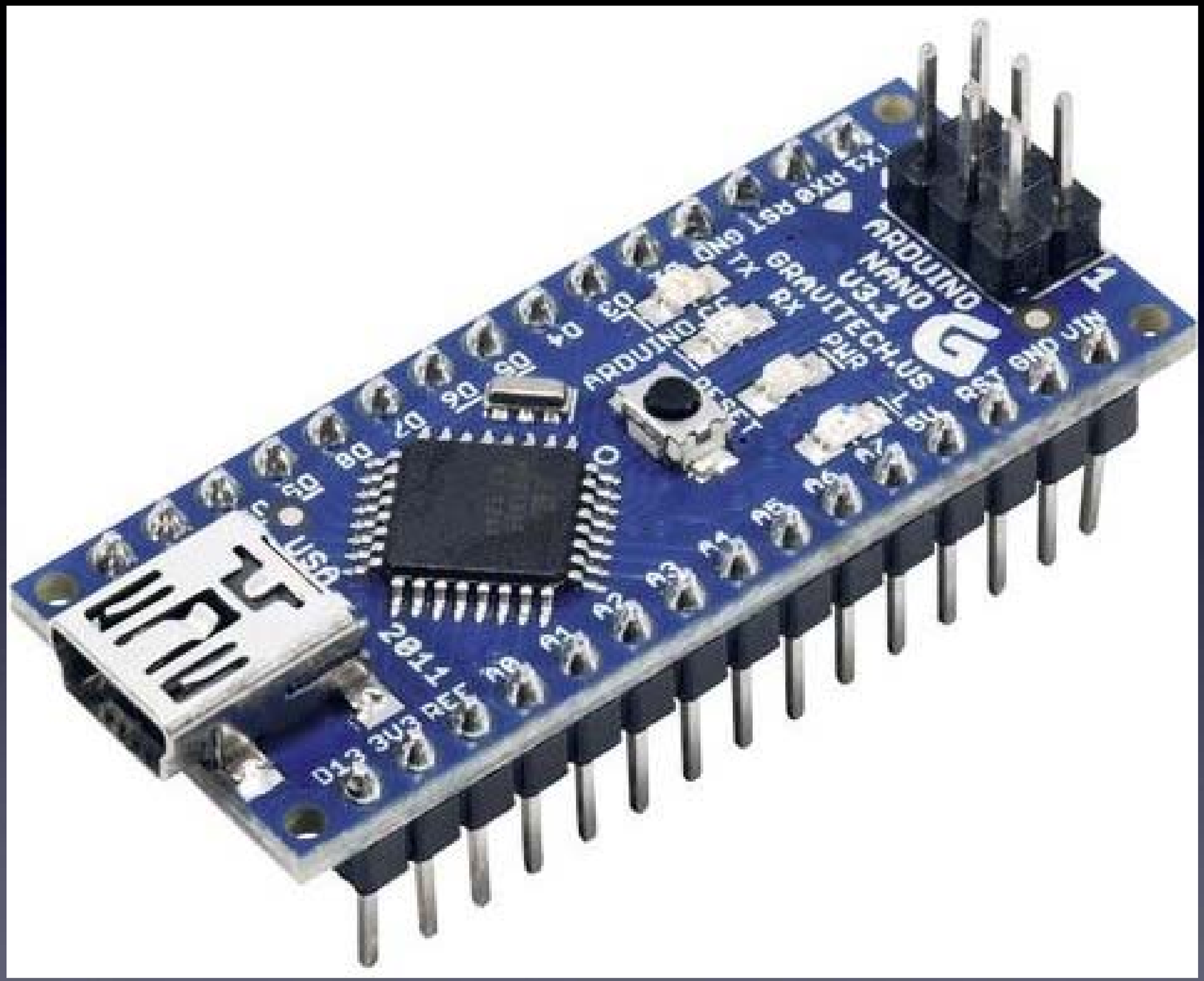
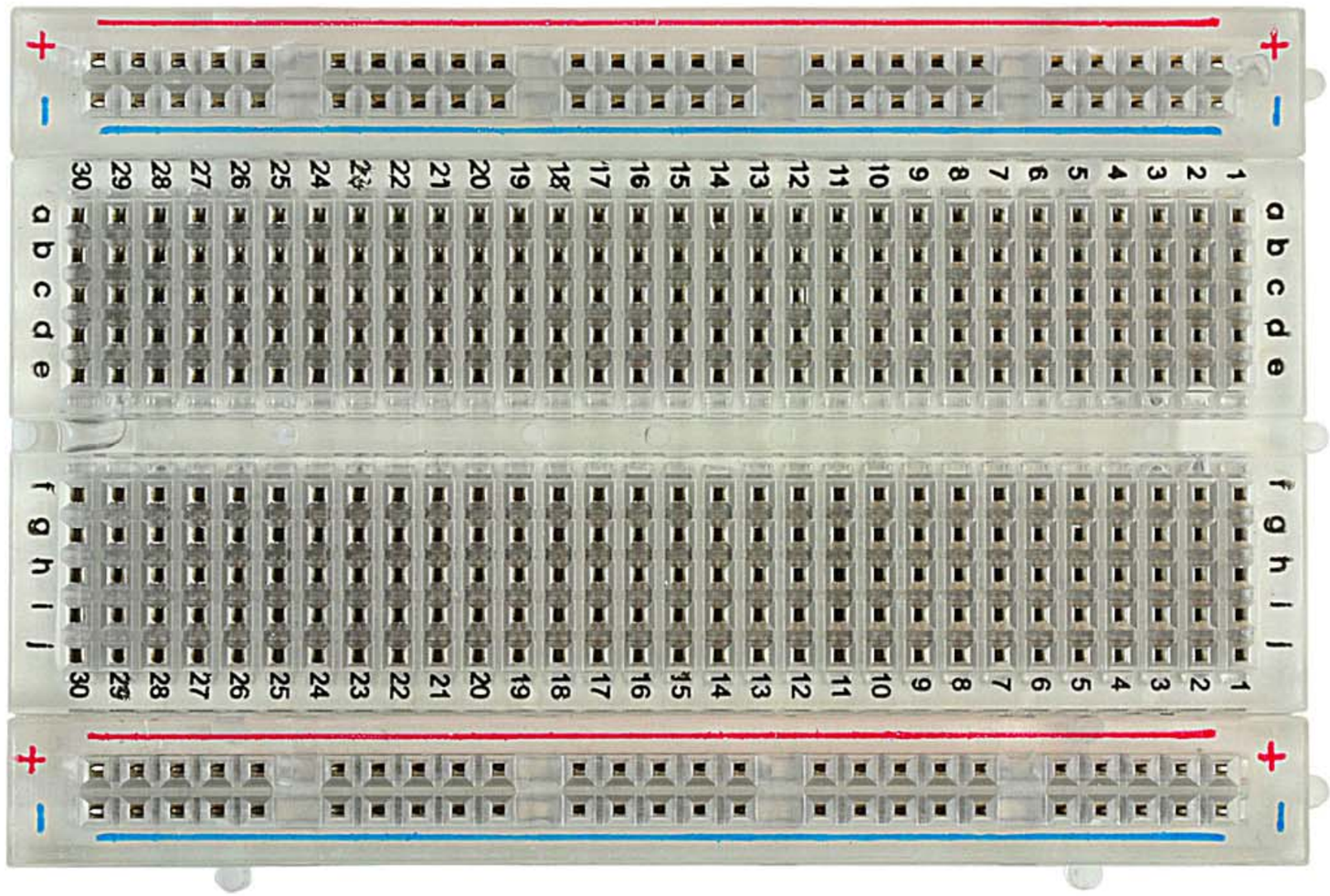
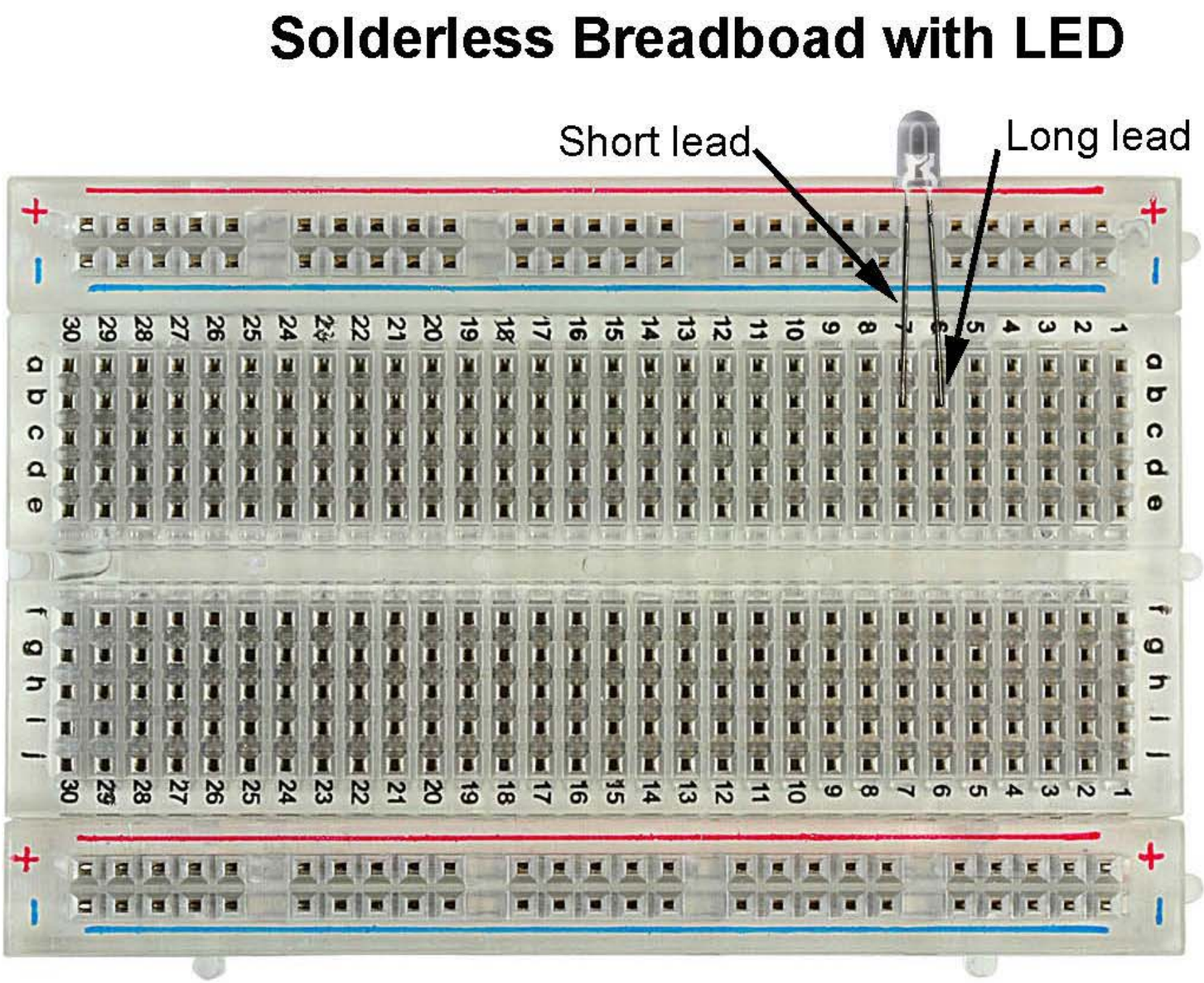


How to Use Solderless Breadboards

Solderless Breadboard



How to Use Solderless Breadboards



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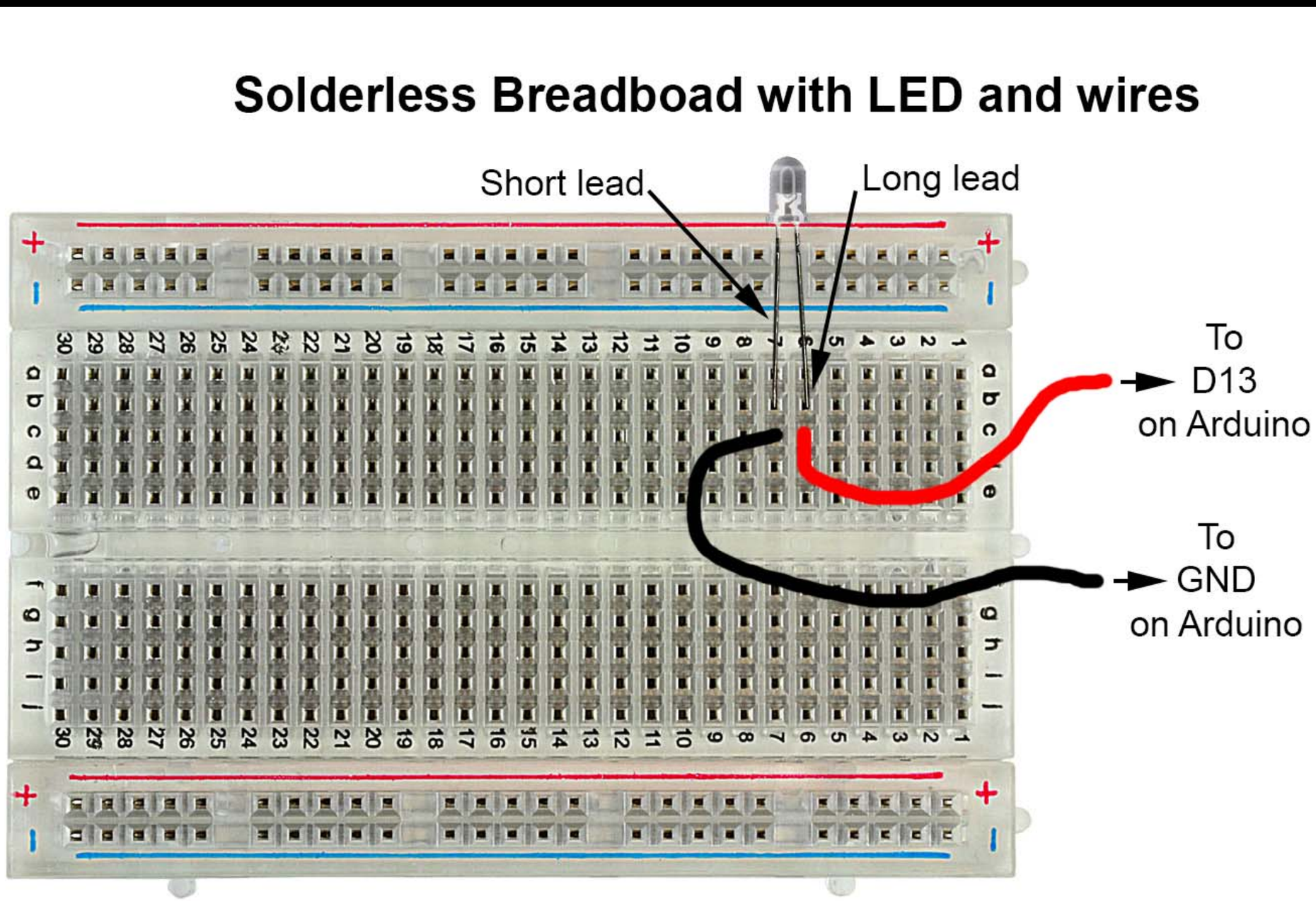
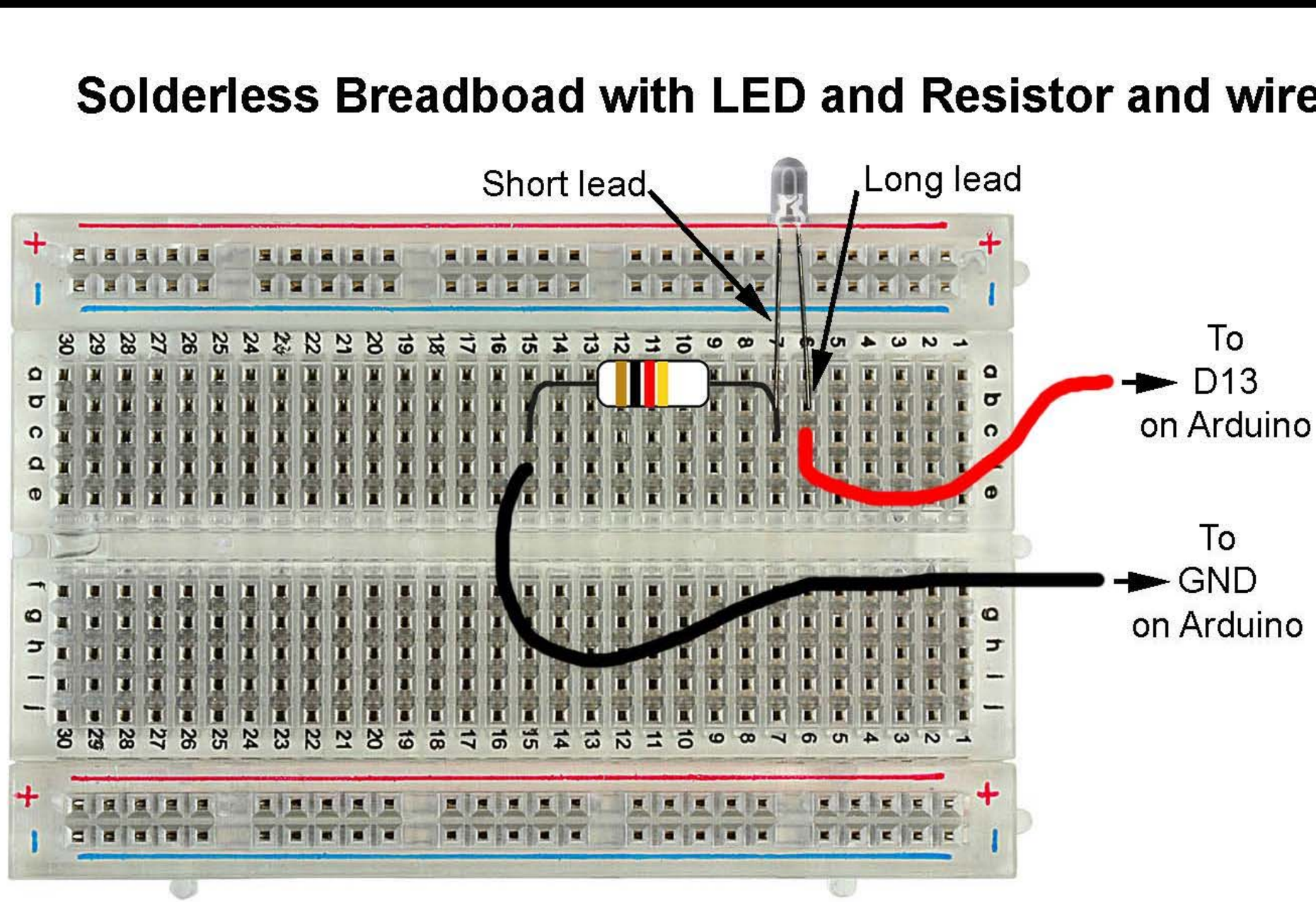
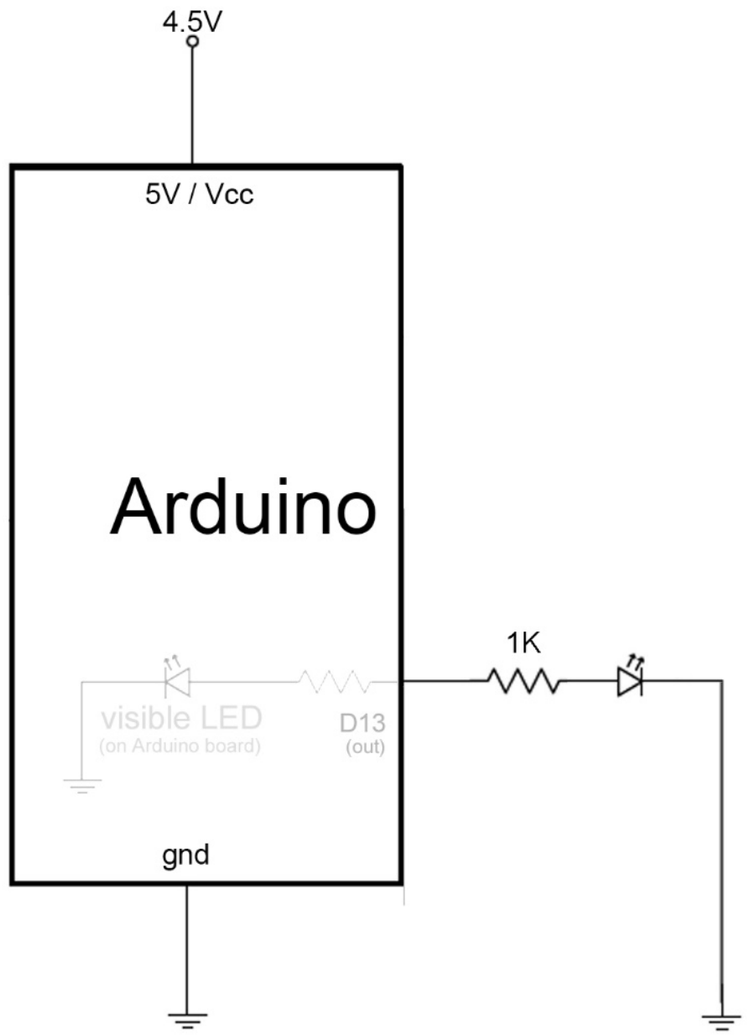


How to Use Solderless Breadboards



How to Read a Schematic



How to Read a Schematic

4-Sep-2015

Arduino For Total Newbies

Mitch Altman (original TV-B-Gone hardware and firmware, modified TV-B-Gone Arduino design)
Limore Fried (firmware modifications, kit design)
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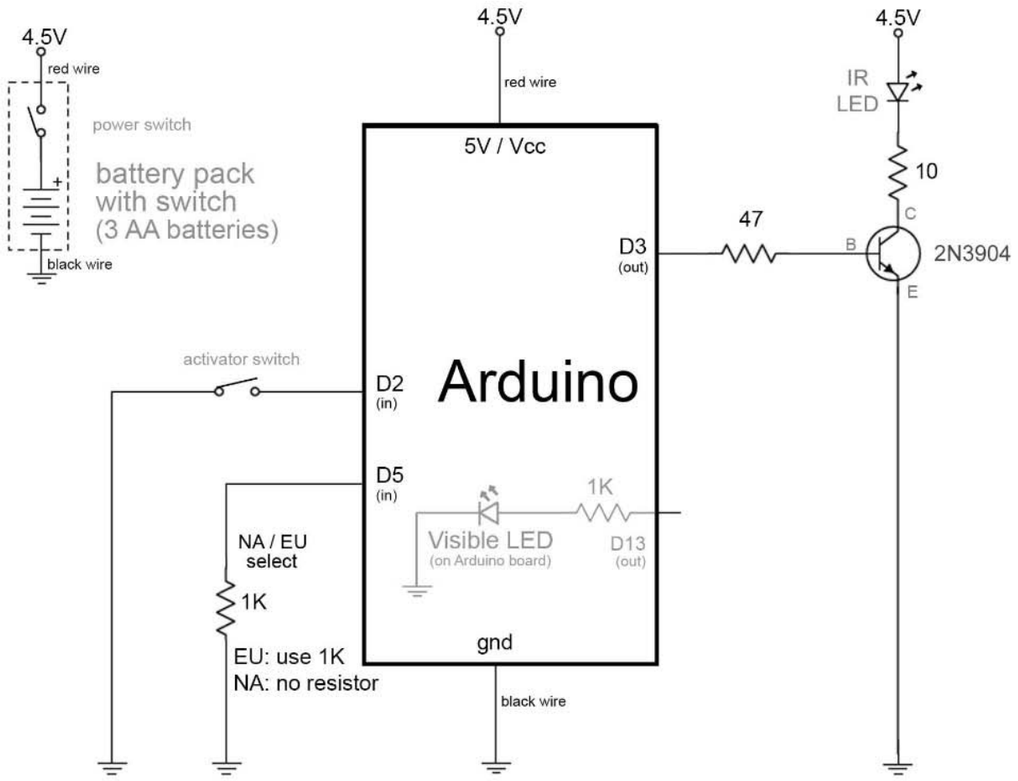
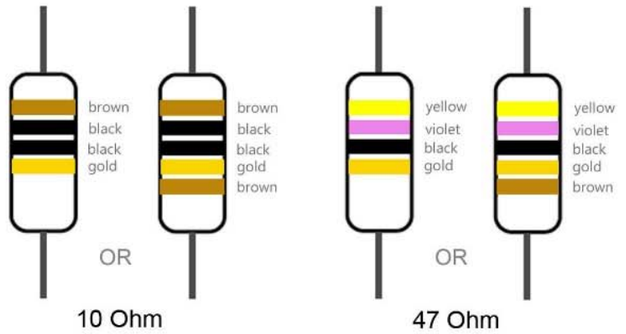
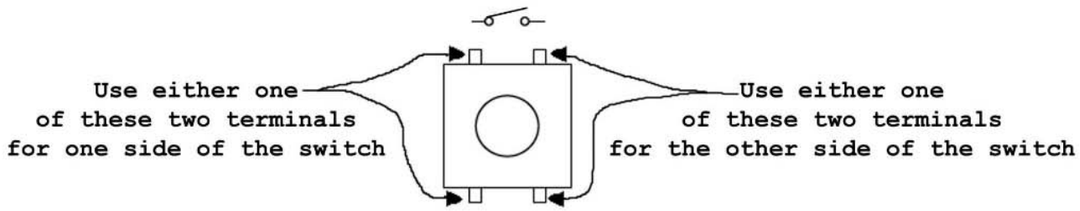
Johannes Schneemann (documentation)

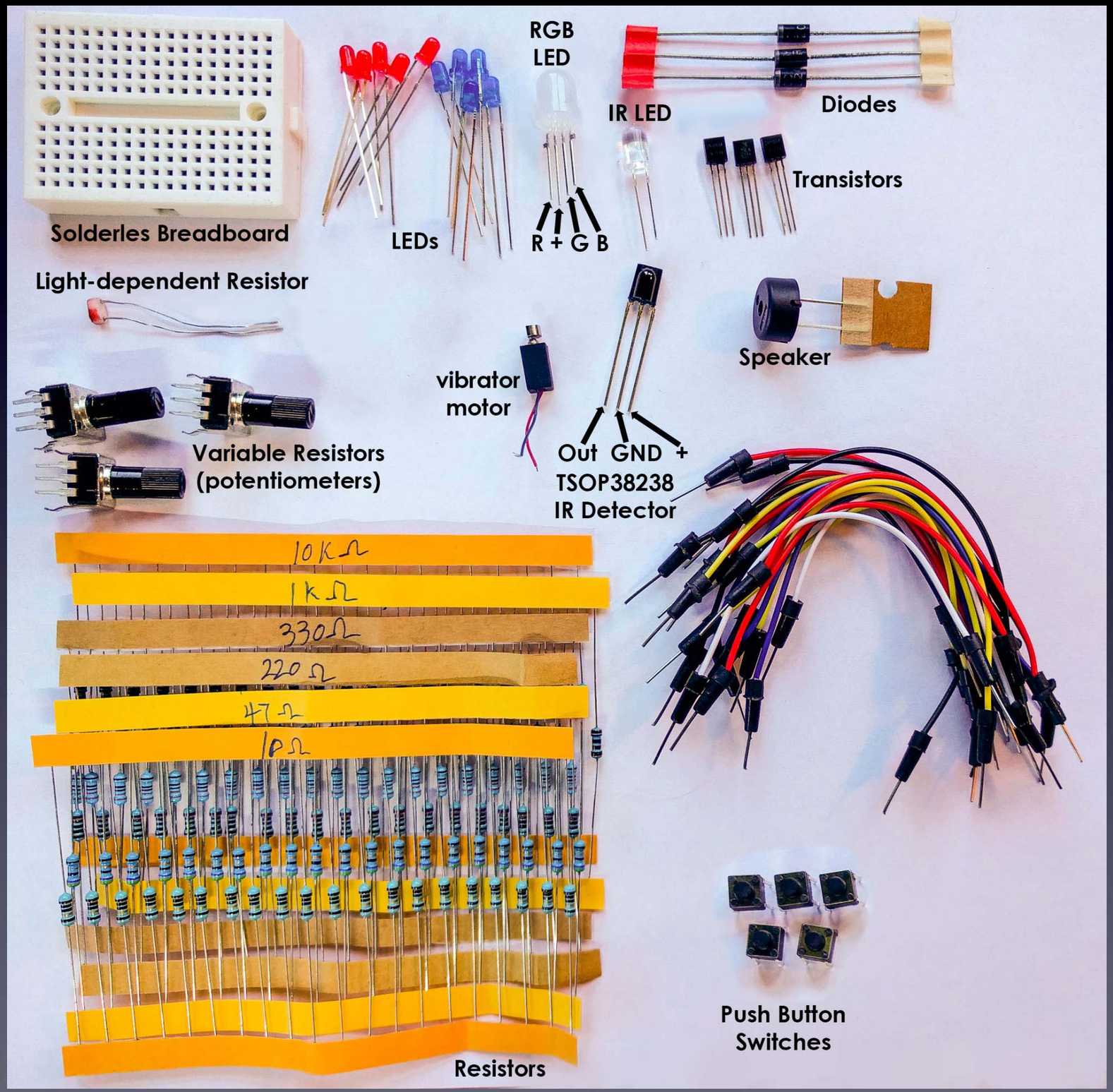
CC BY SA







Parts Pack Contents



Rev 9: 11-Aug-2022

Arduino For Total Newbies

w/ TV-B-Gone as example project

Mitch Altman

Chief Scientist, **Cornfield Electronics**, San Francisco, CA
Inventor of **TV-B-Gone** universal remote controls
Co-founder of **3Ware** (successful Silicon Valley startup)
Pioneer of **VR** (in the mid-1980s)
Founding mentor at **HAX** (1st and biggest hardware accelerator)
Co-founder of **Noisebridge** (San Francisco hackerspace)

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site: **www.CornfieldElectronics.com**
twitter: **@maltman23**
flickr: **maltman23**
WeChat: **mitchaltman**