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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flickr: **maltman23**
WeChat: **mitchaltman**

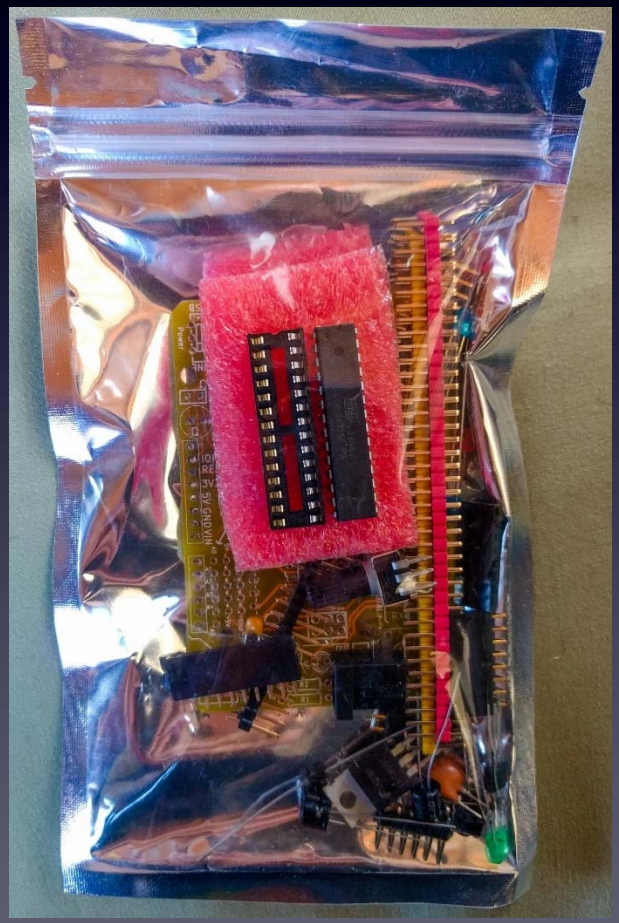
Syllabus

- Intro
- Everything You Need to Know About Electronics
- How to solder / make your own Arduino
- 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

Stuff!

Bring all of this home with you!

DO NOT open this bag yet!



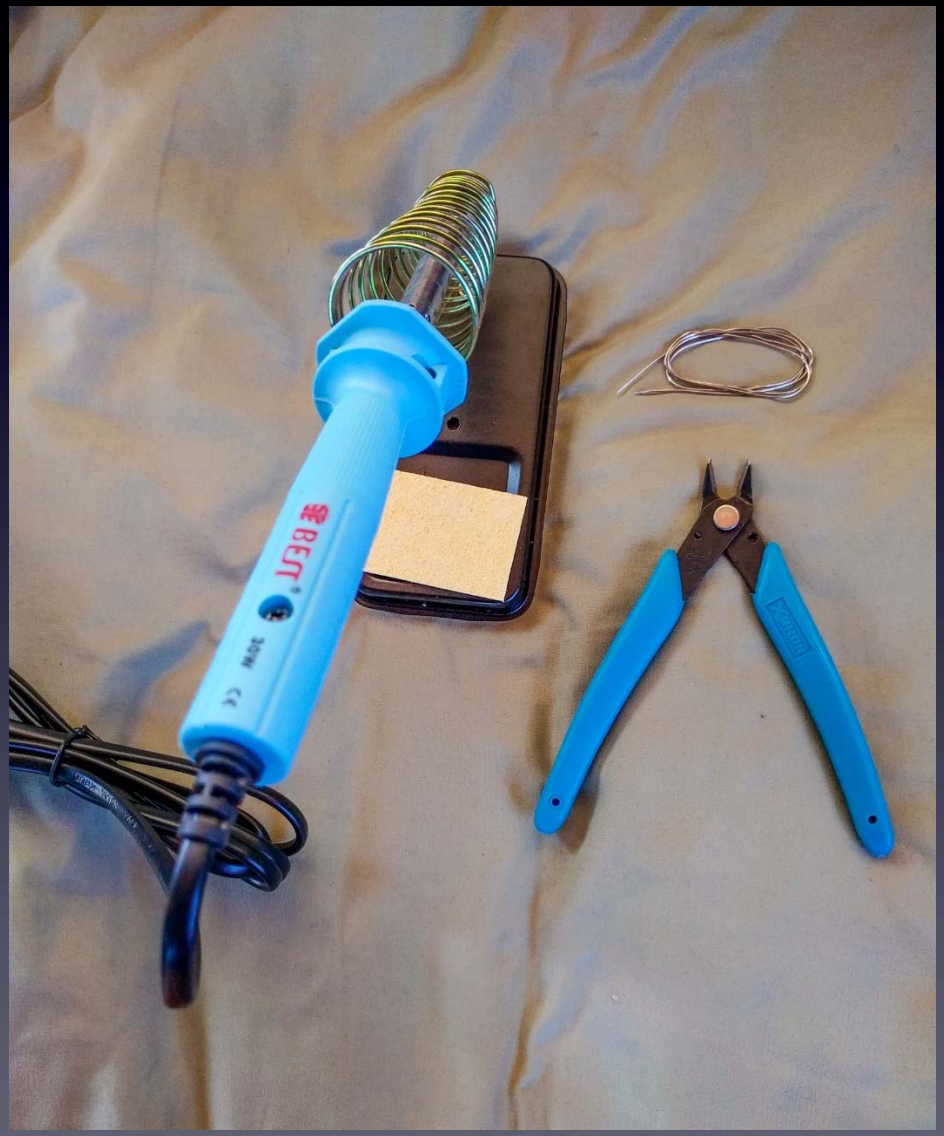
U-Do-It-Duino kit

Parts Pack

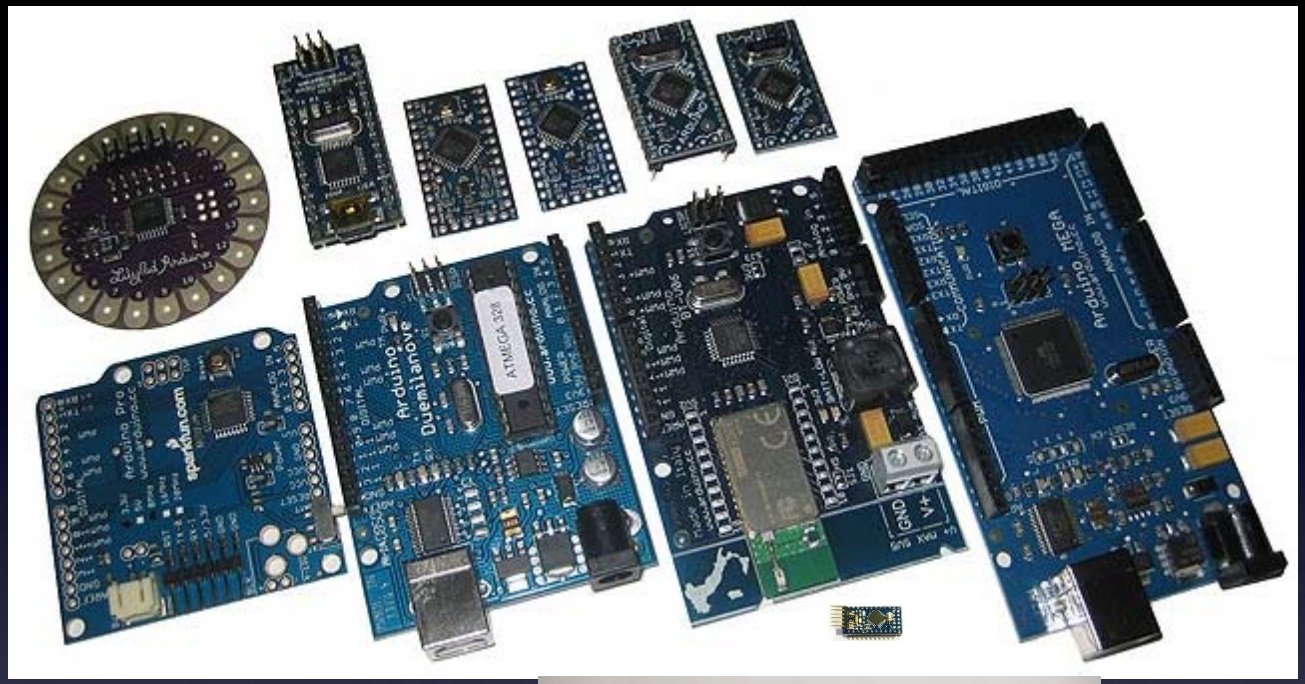
USB-Serial cable

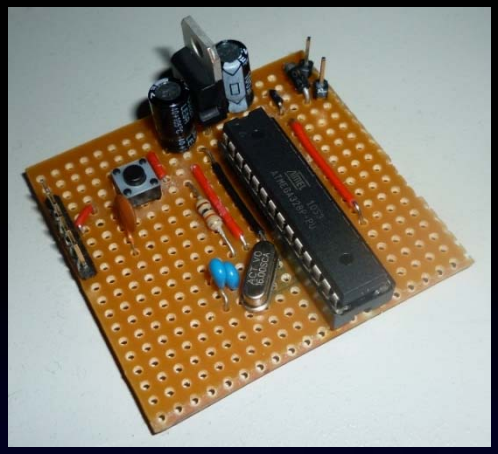
Tools

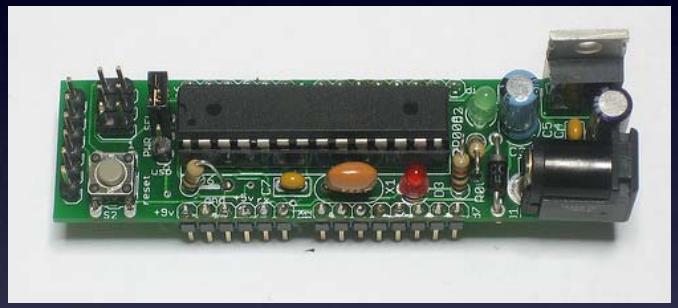
(Don’t bring these home)

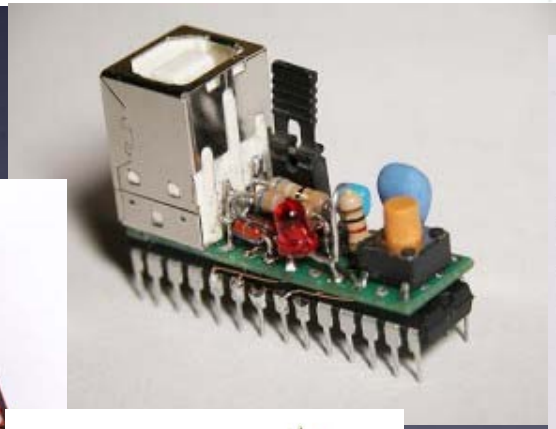


Intro

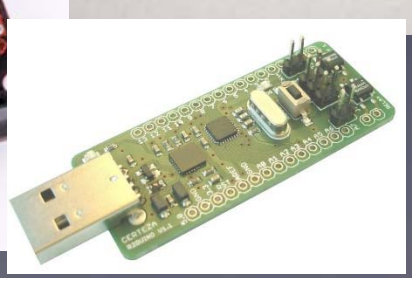

Arduino Pro
sparkfun.com
Arduino
Duemilanove
ATMEGA 328
Arduino MEGA
GND
V+

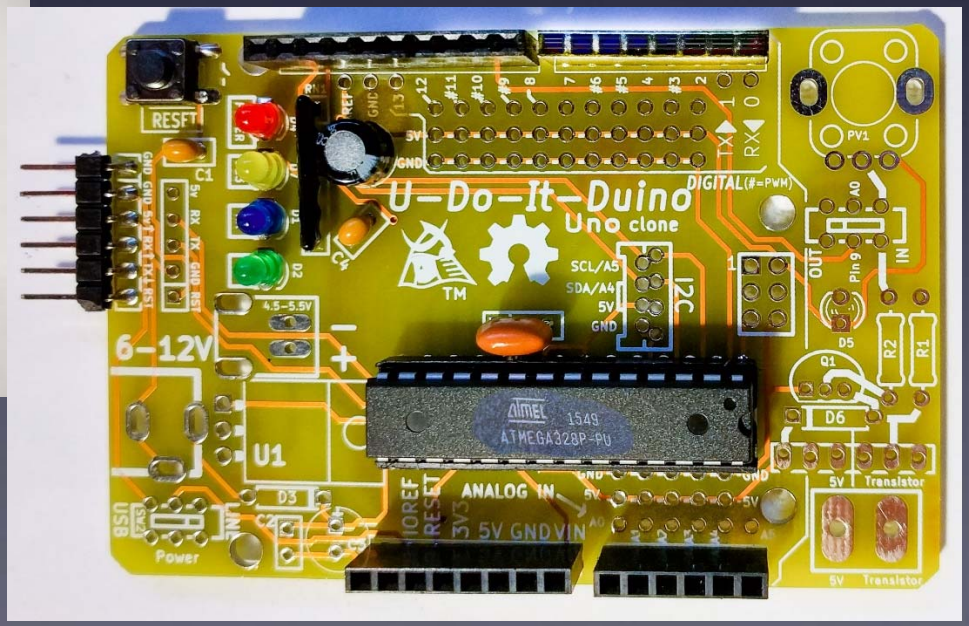




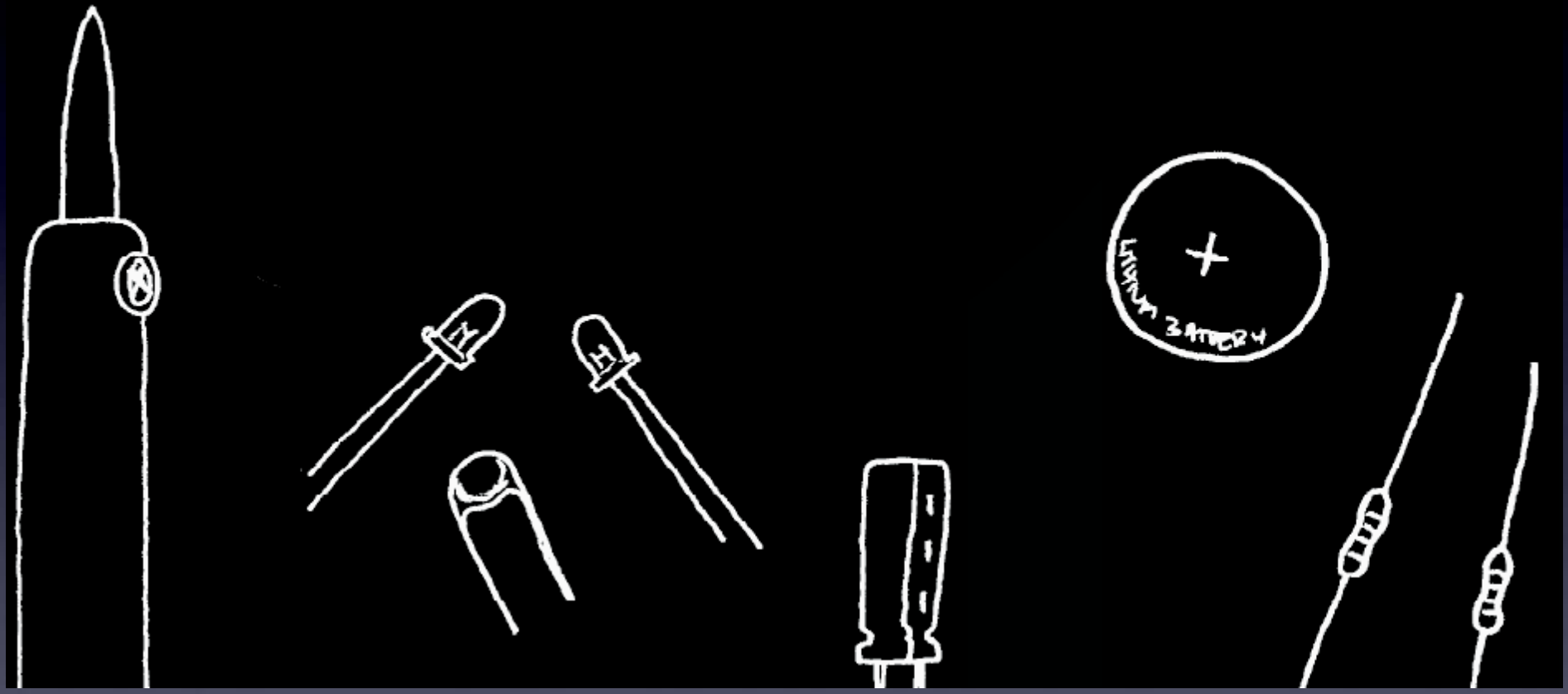



Diavolino
by Evil Mad Science
USB-TTL



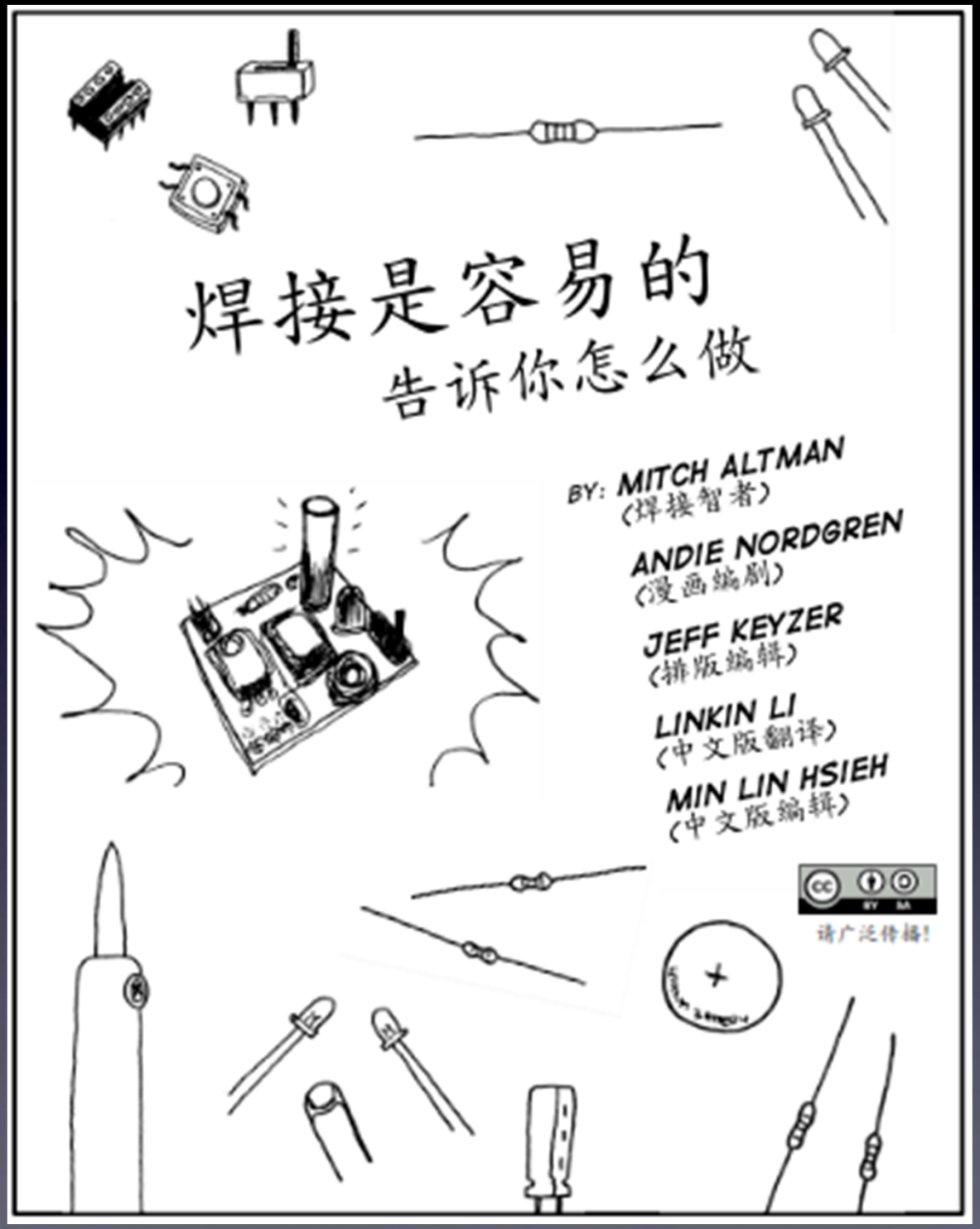

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
6-12V
U1
ATMEGA328P-PU
ANALOG IN
Power
SCL/A5
SDA/A4
5V
GND
Transistor

Everything You Need to Know About Electronics



Learn To Solder

Learn To Solder



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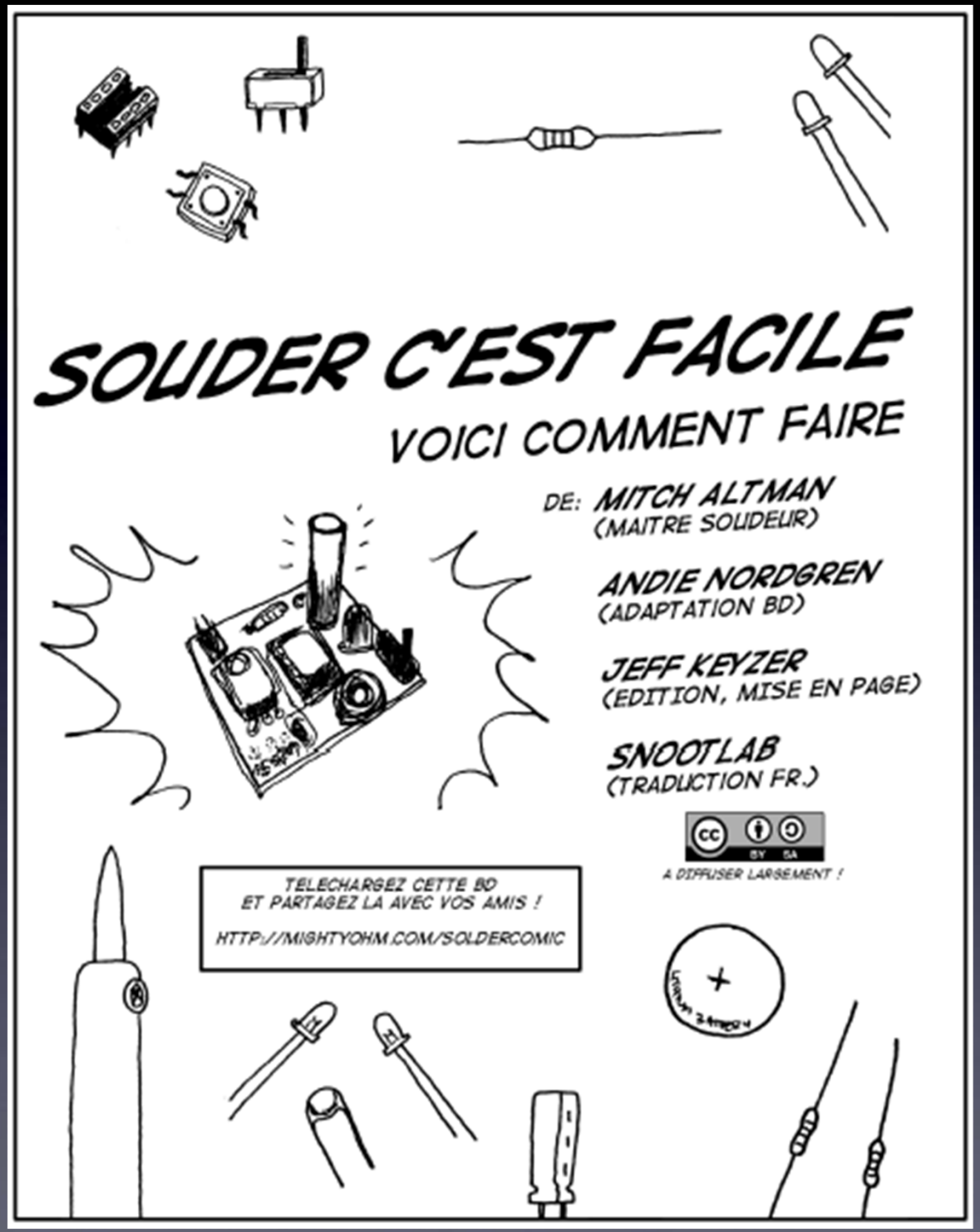
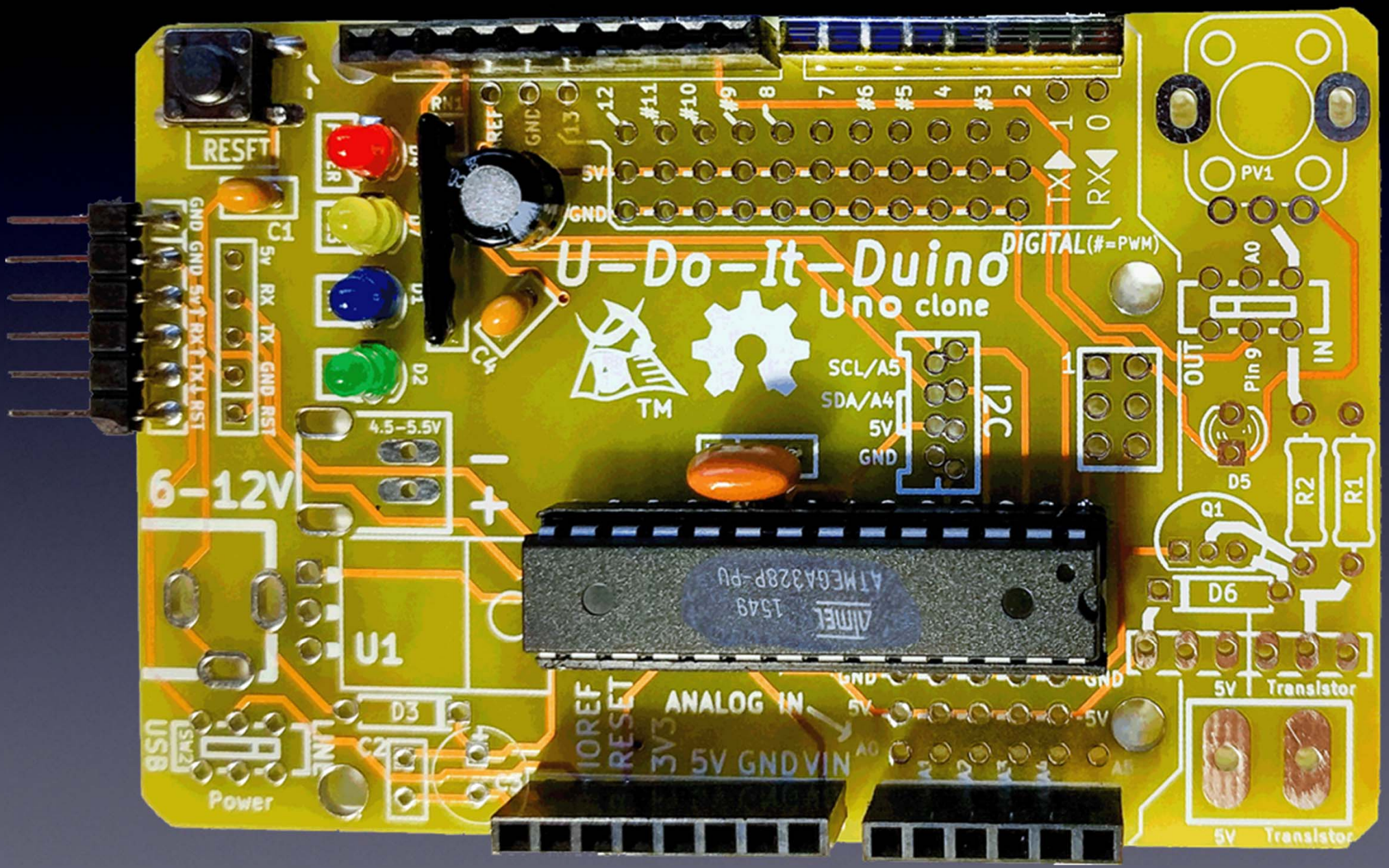


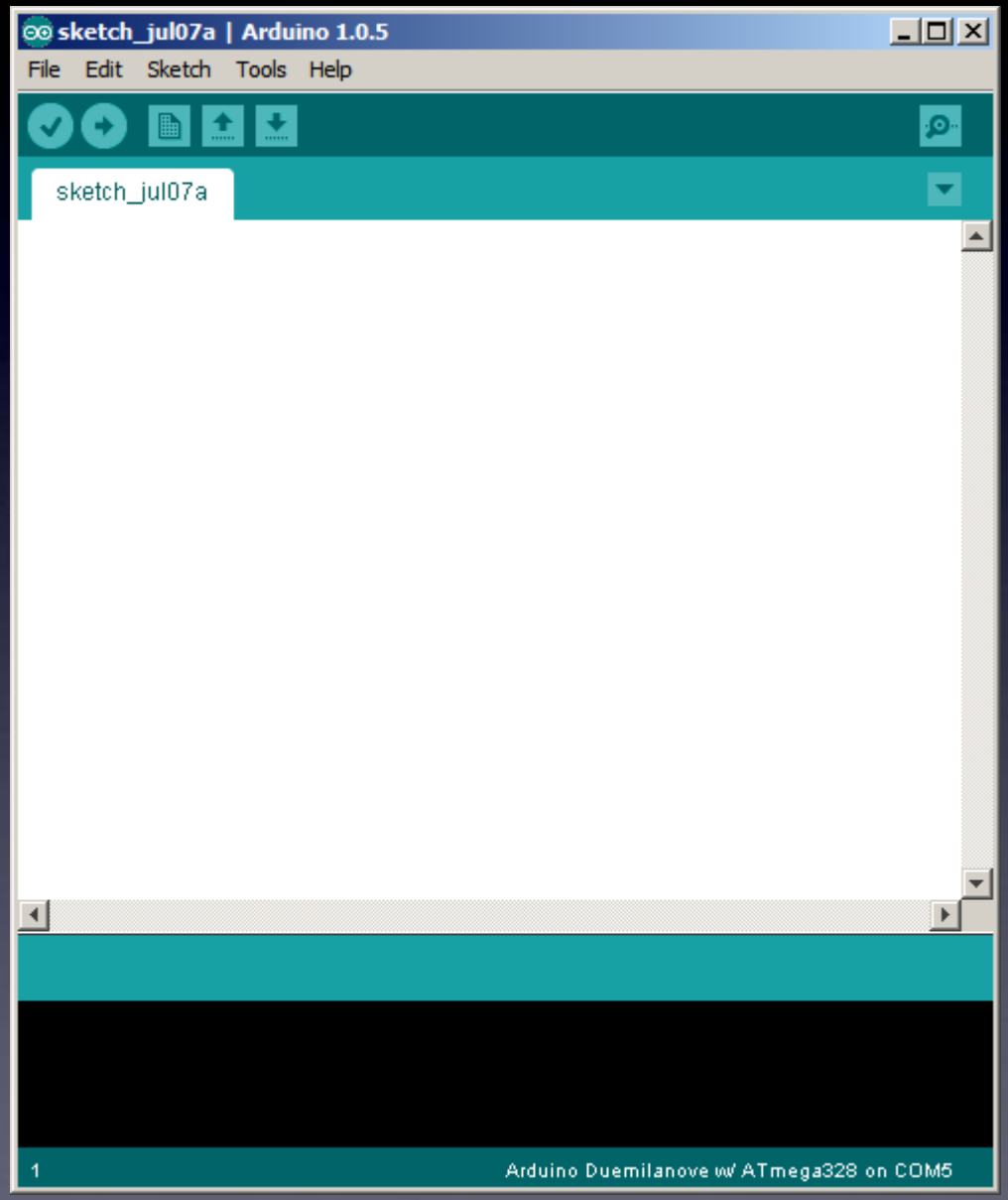
Learn To Solder

Learn To Solder

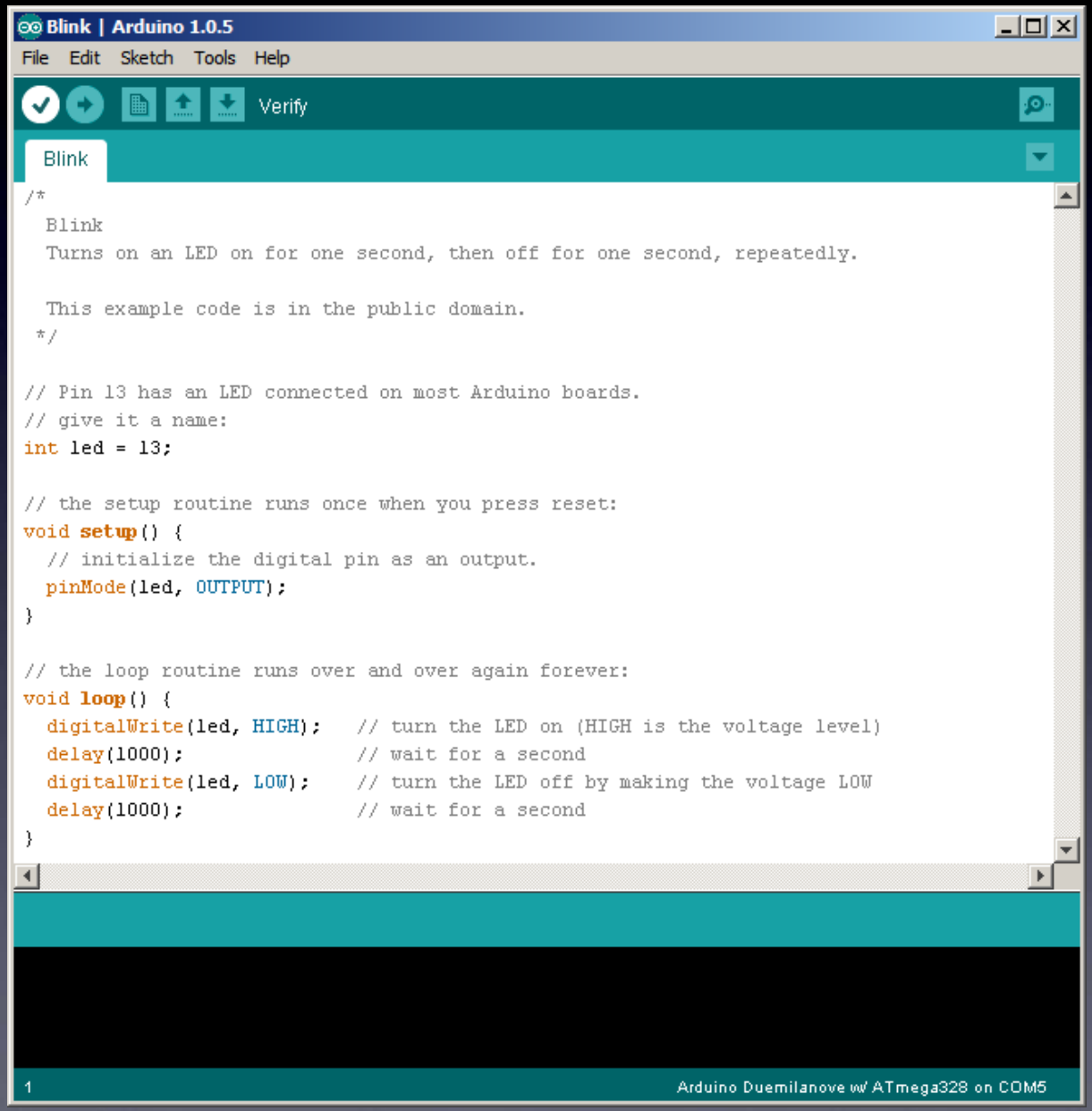
Solder Your Aruino Clone



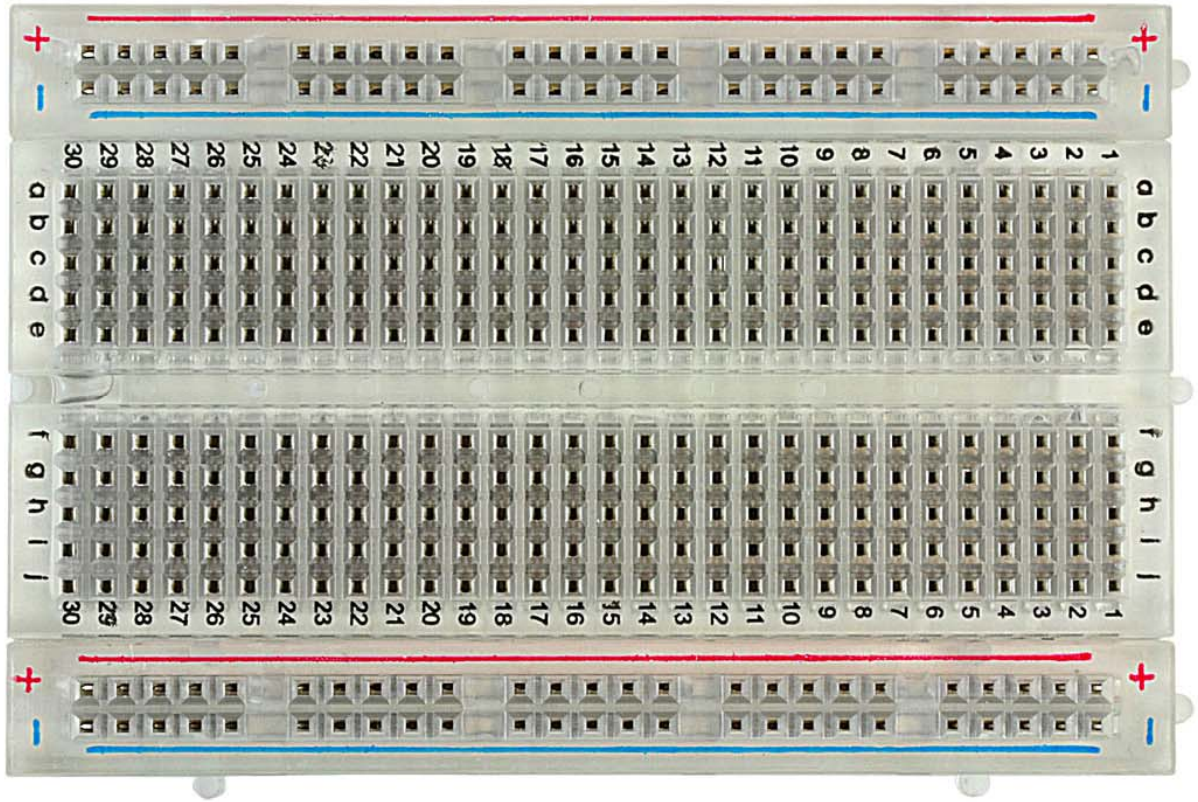
How to Set Up and Use the Arduino Software



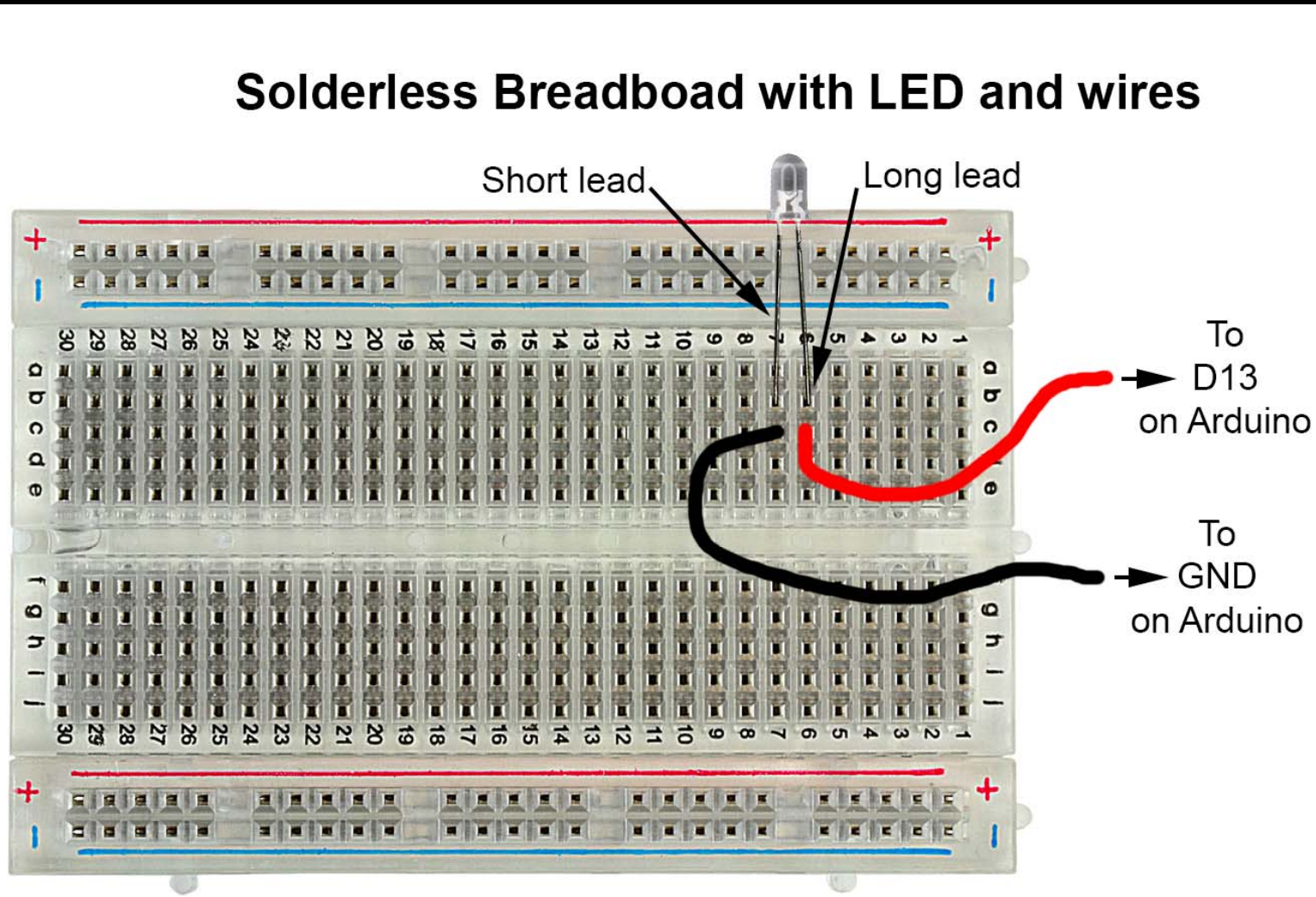
How to Hack Arduino Programs (“Sketches”)



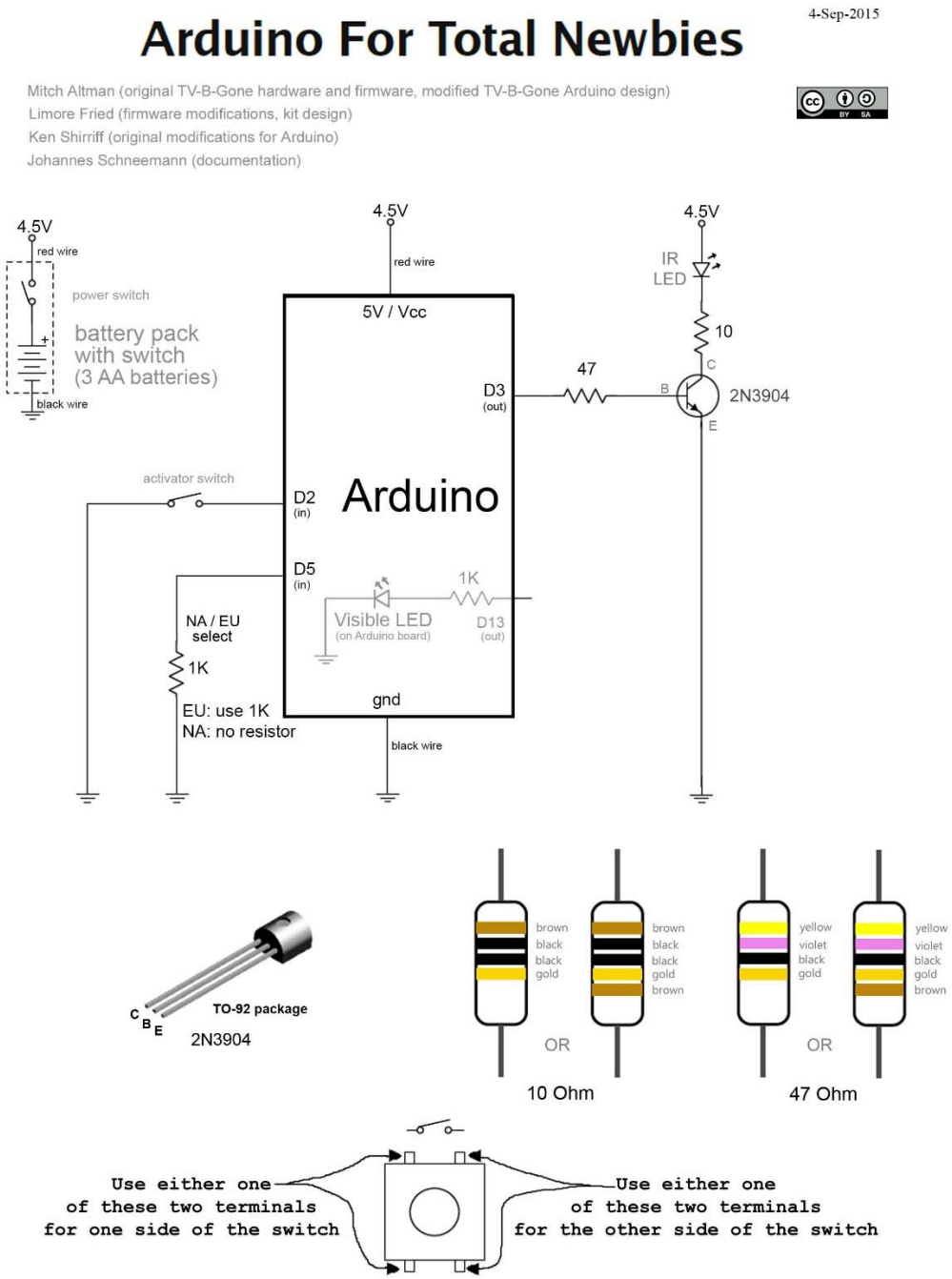
How to Use Solderless Breadboards



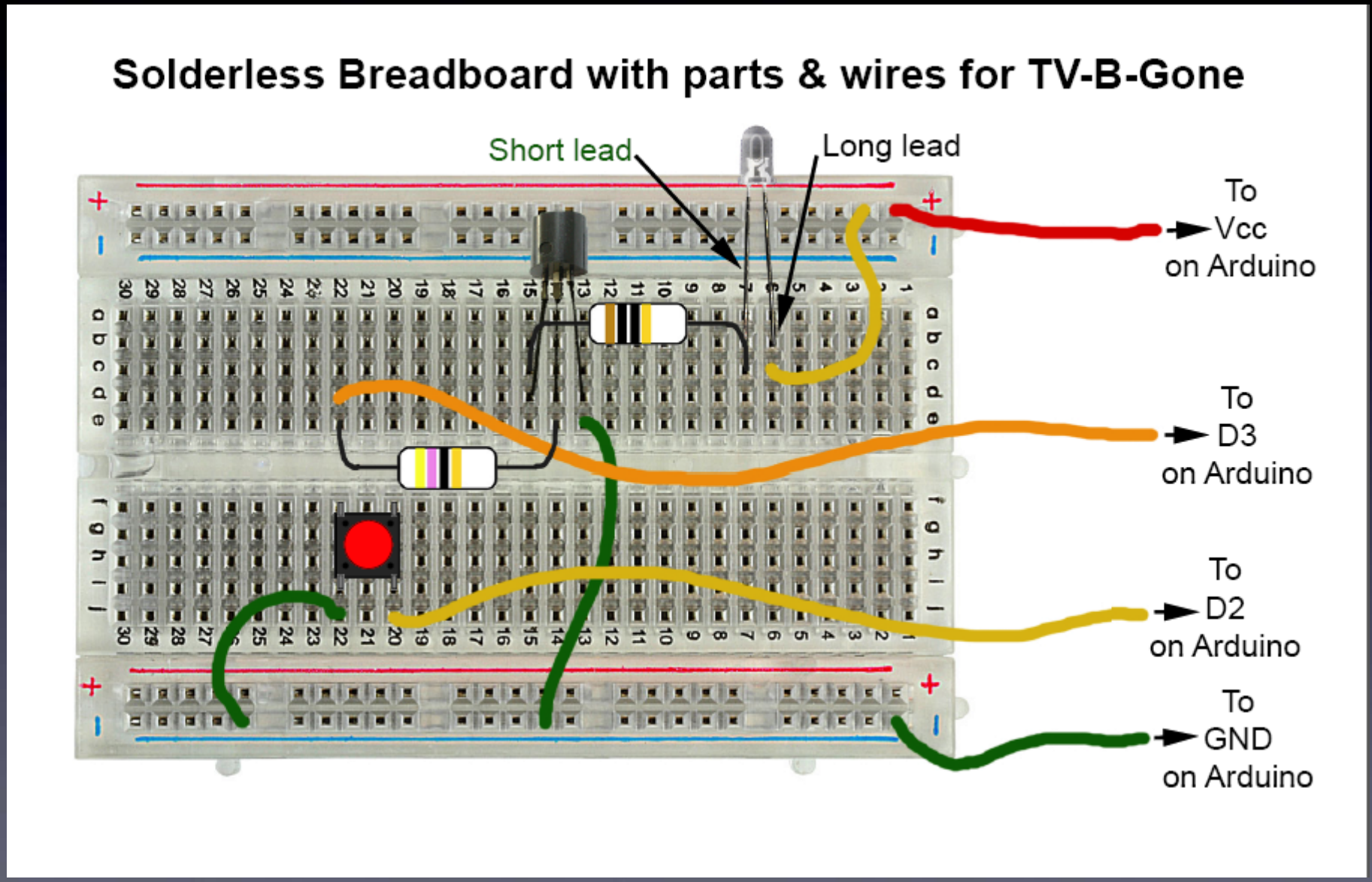
How to Use Solderless Breadboards

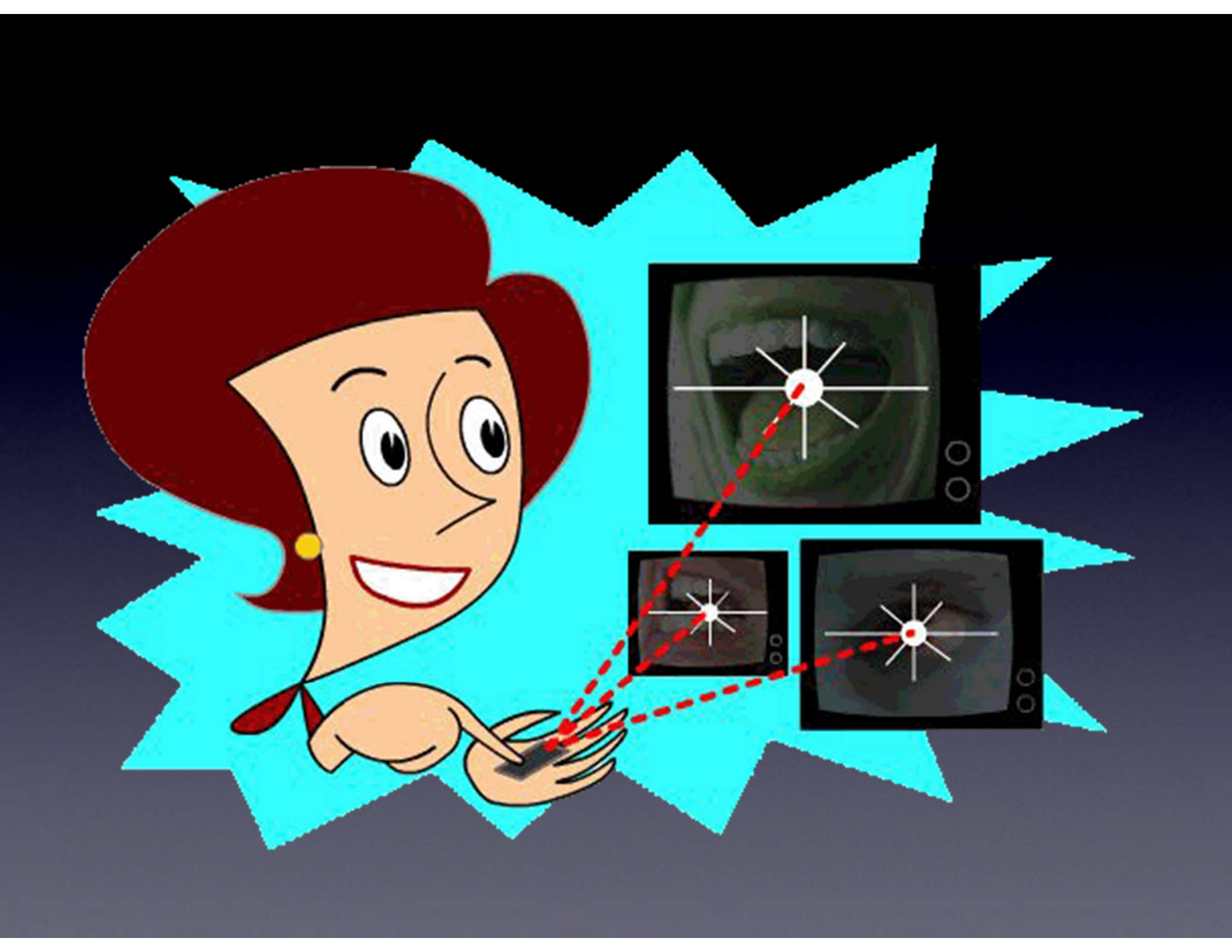


How to Read a Schematic



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





Questions?

Intro


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


BUDDY L


RIO
TOKYO
ROME
WASHINGTON
VIENNA
TORONTO
FRANKFURT


TEDxBrussels

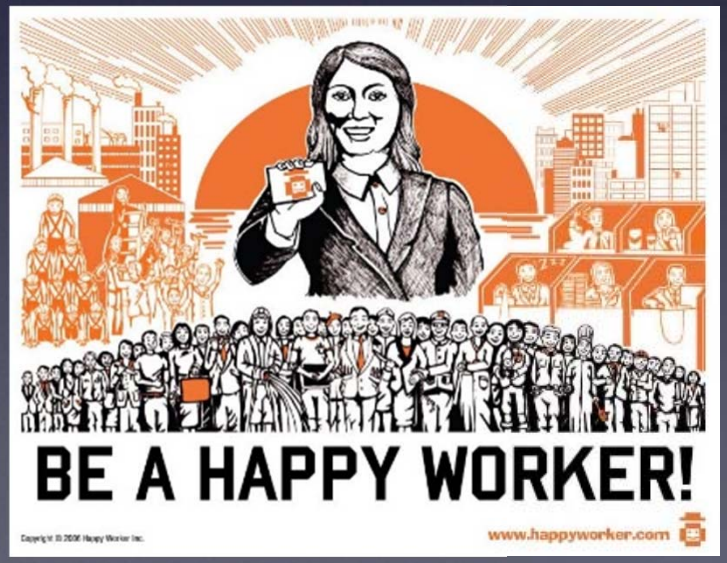

WEST WALL


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

Intro


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


BUDDY L
.01
.10
.25
.75
.05
.20
.50
$1.00


BE A HAPPY WORKER!
www.happyworker.com

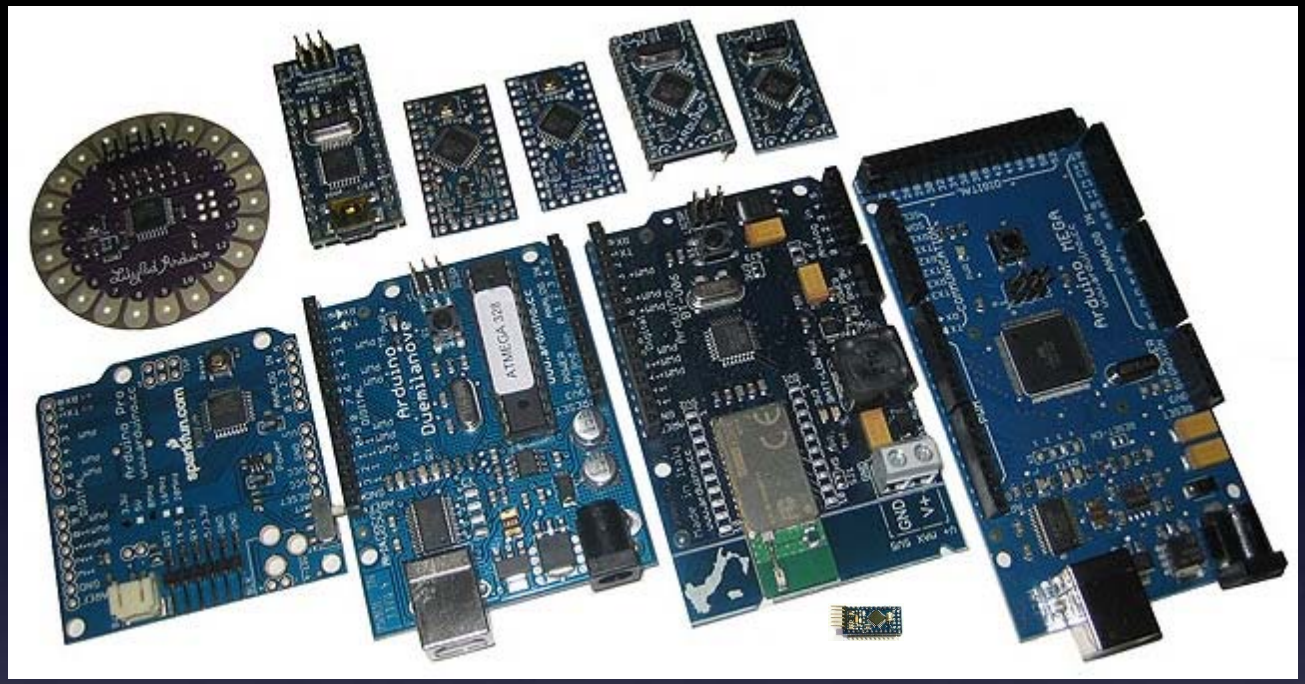
Intro

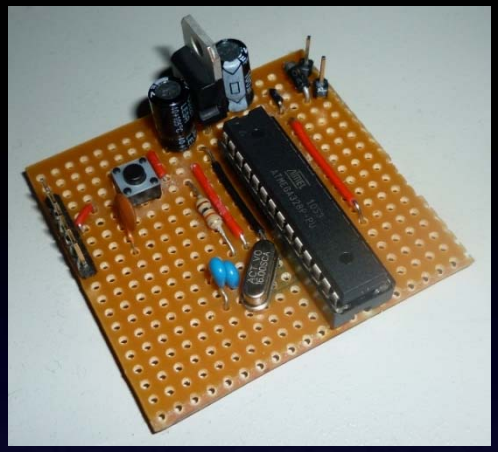

Cornfield
Electronics, Inc.
MITCH ALTMAN
Chief Scientist / CEO
"Useful Electronics for a Better World"
TV B-Gone™
Universal Remote Control
www.CornfieldElectronics.com
572 Hill St. #Penthouse, San Francisco, CA 94114
phone: +1 415 / 377 - 5993
mitch@CornfieldElectronics.com
@maltman23

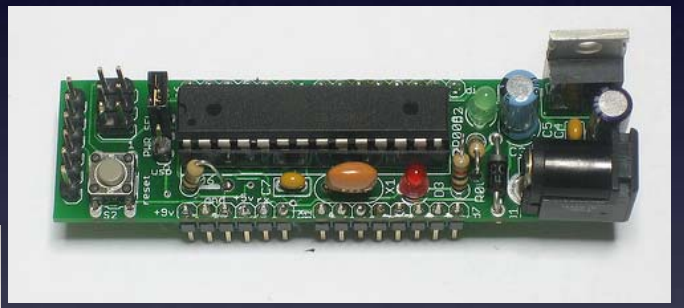
Intro

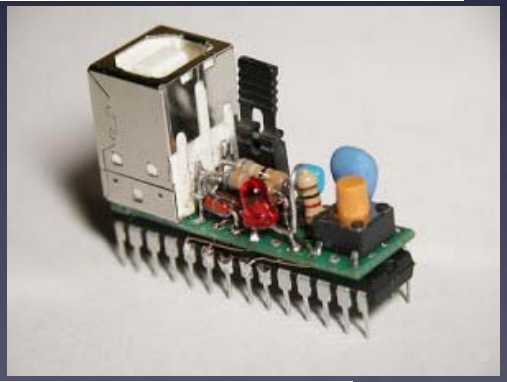
Arduino For Total Newbies Workshop at 30C3, Hamburg Germany

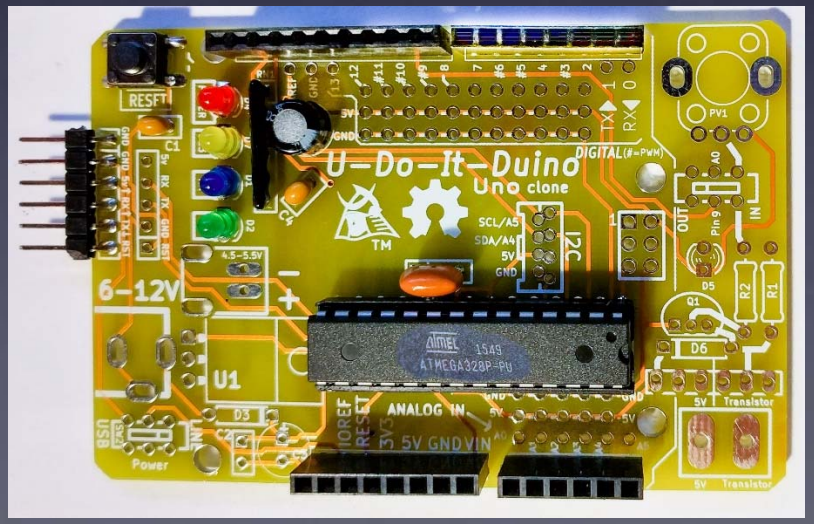
Intro

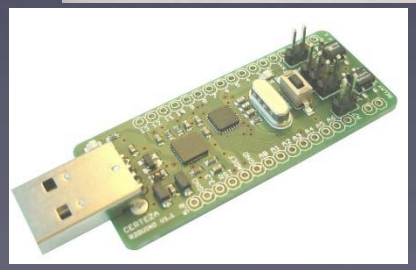






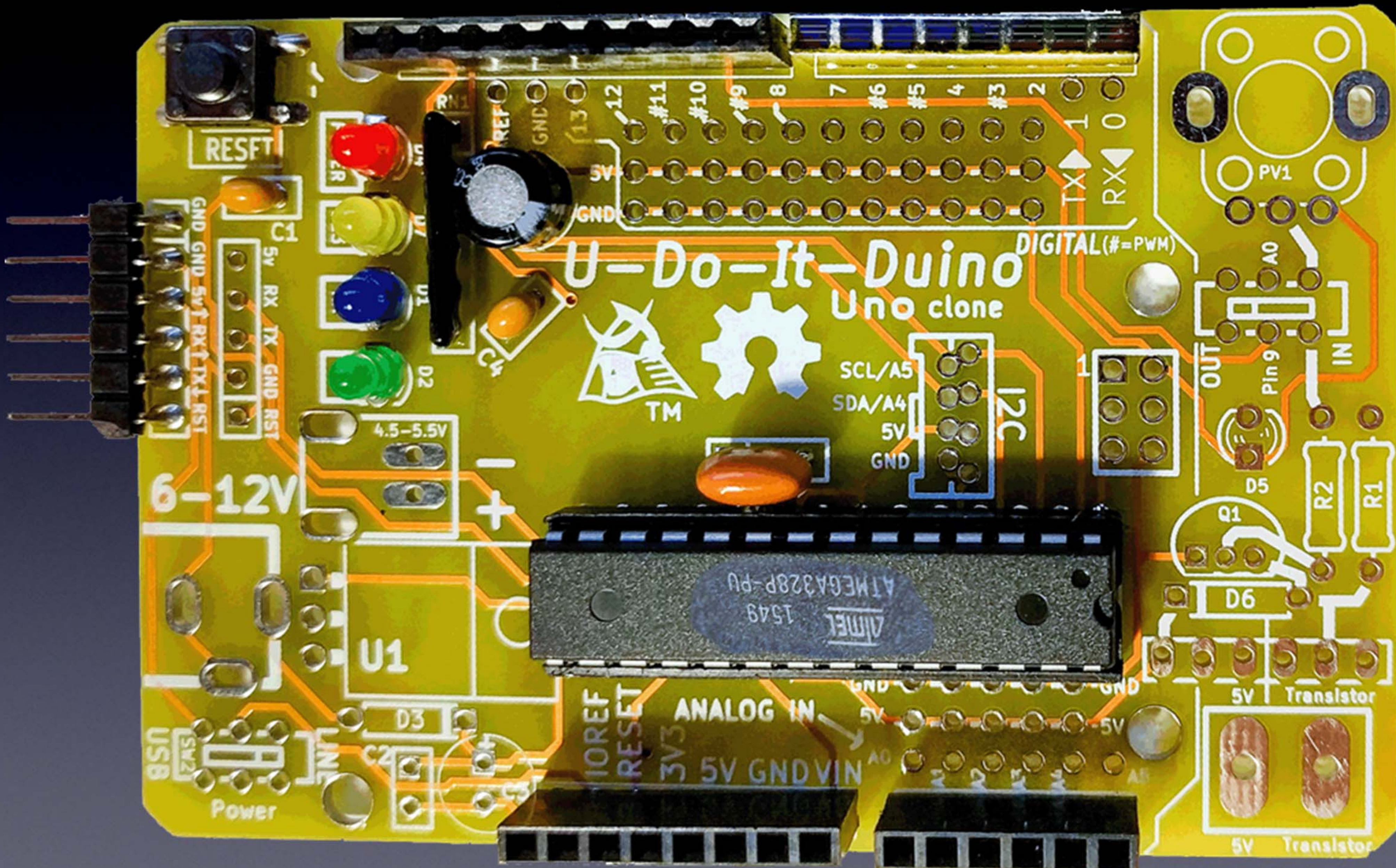






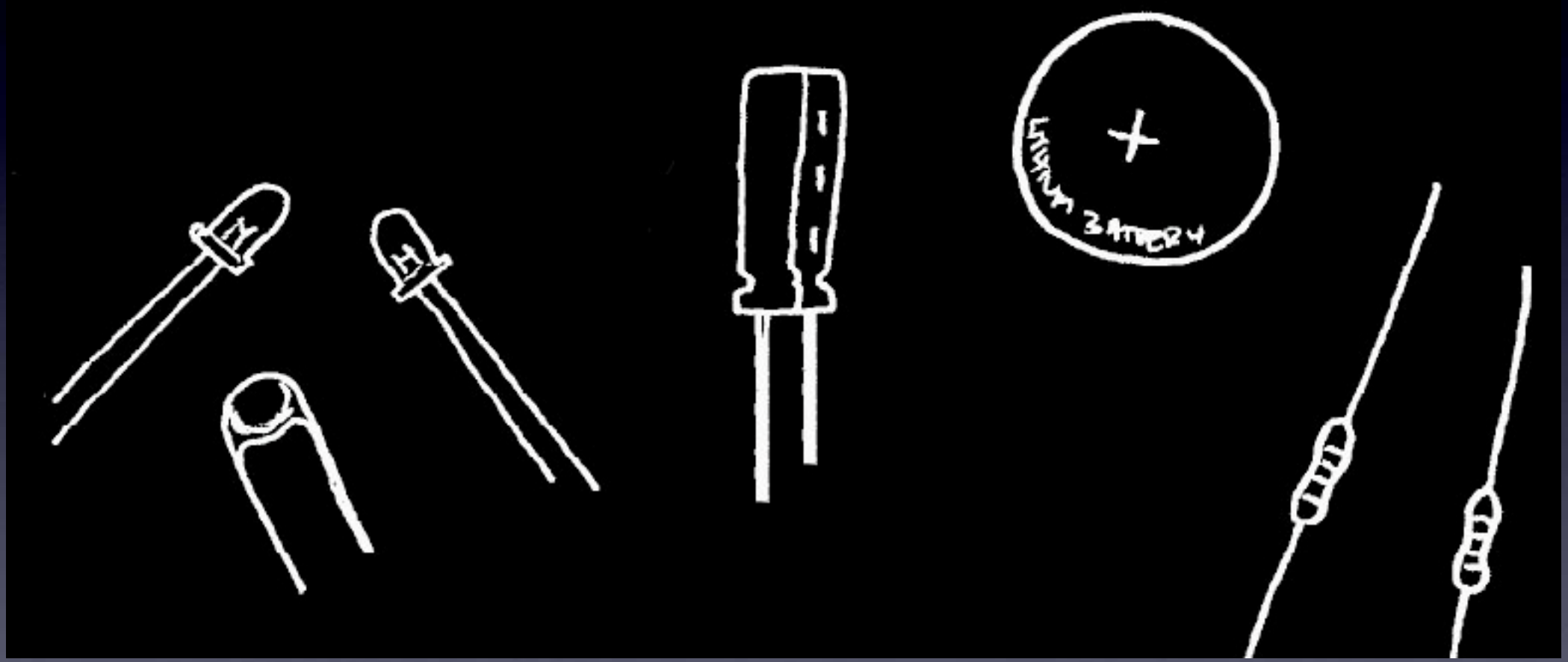
Open Source

Intro

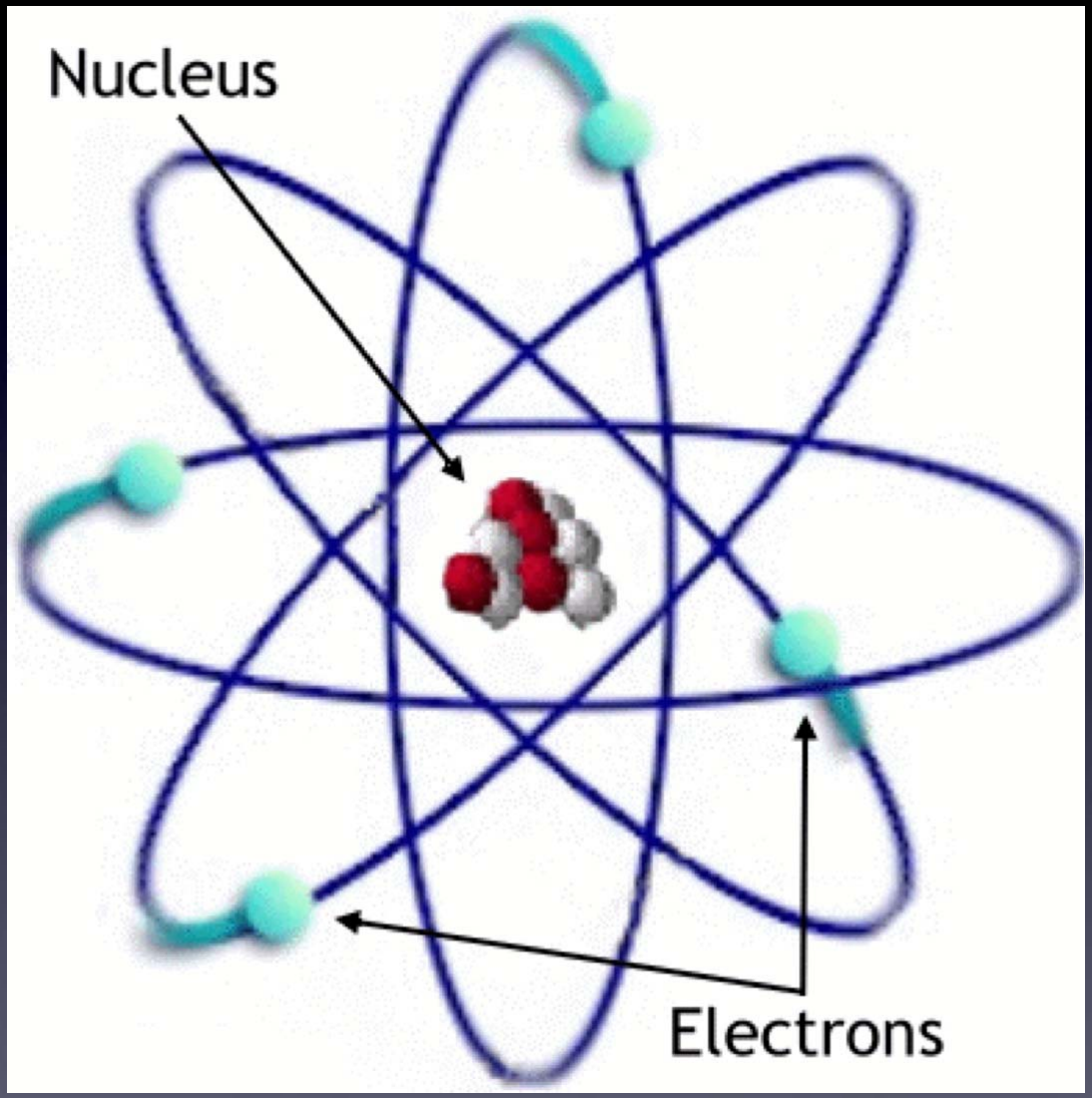

RESET
U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
TX
RX
SCL/A5
SDA/A4
5V
GND
I2C
4.5-5.5V
6-12V
U1
D3
ANALOG IN
IOREF
RESET
3V3
5V GND VIN
ATMEGA328P-PU
1549
D5
D6
Q1
R1
R2
PV1
A0
OUT
IN
Pin 9
Translstor
USB
Power
TM

Questions?

Everything You Need to Know About Electronics

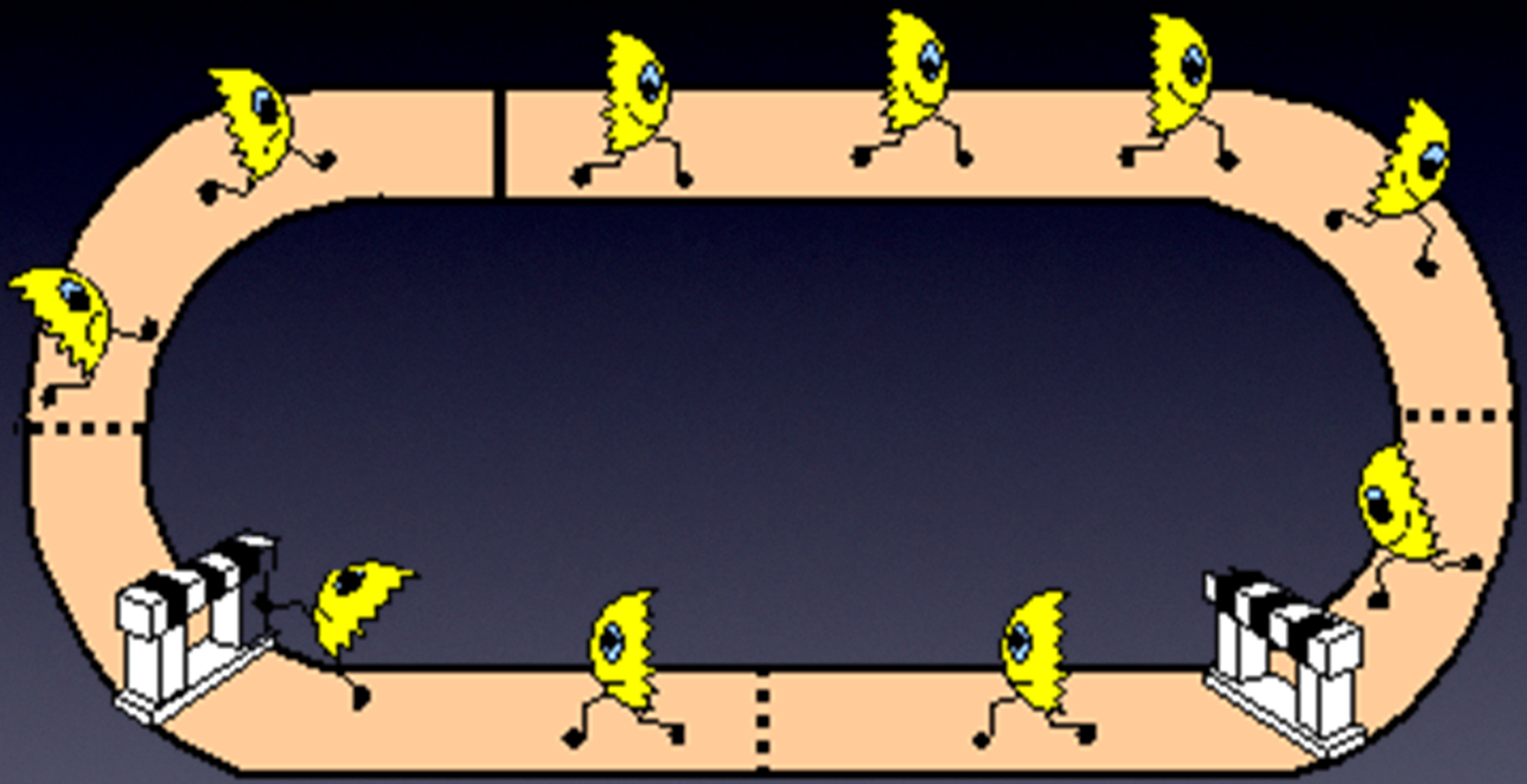


Everything You Need to Know About Electronics



Electrons

Everything You Need to Know About Electronics

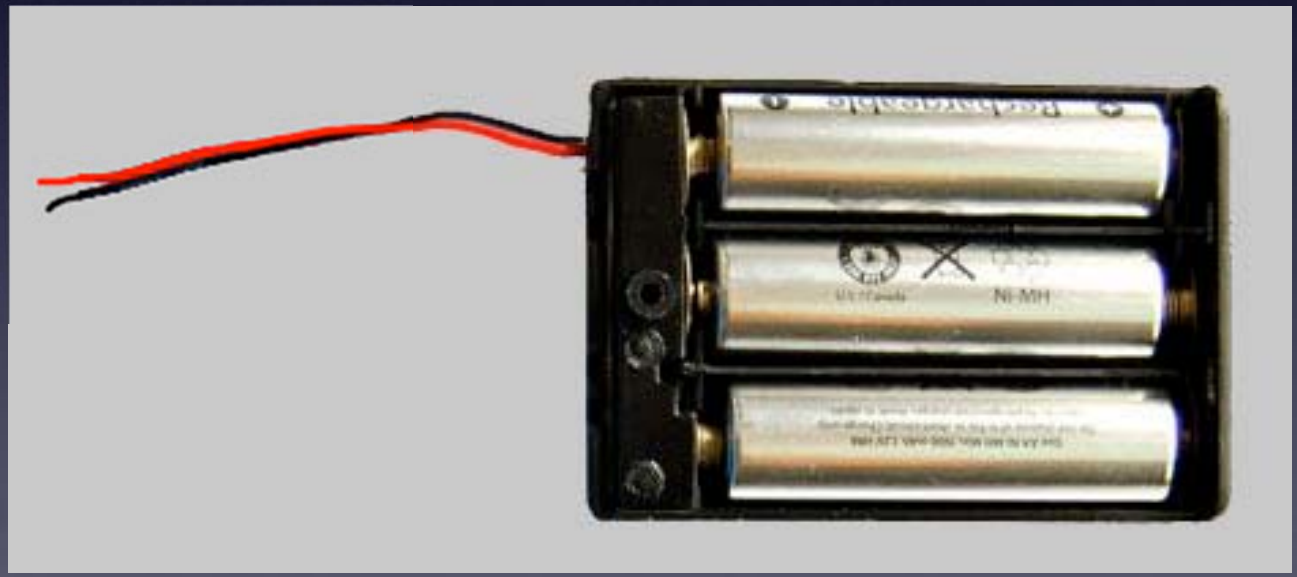


Circuits = Electrons going in circles = Magic!

Everything You Need to Know About Electronics

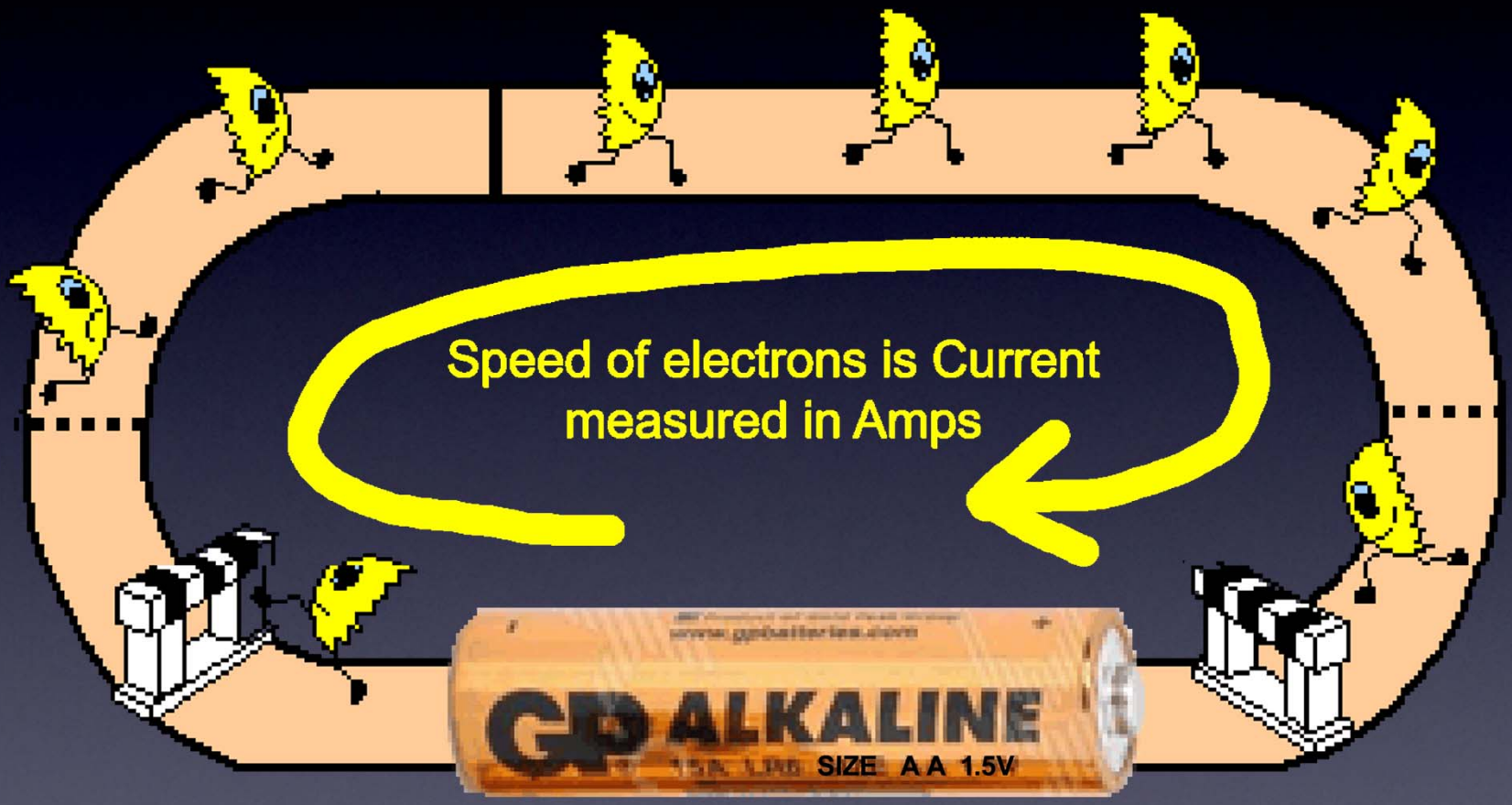
Power Supplies

Everything You Need to Know About Electronics



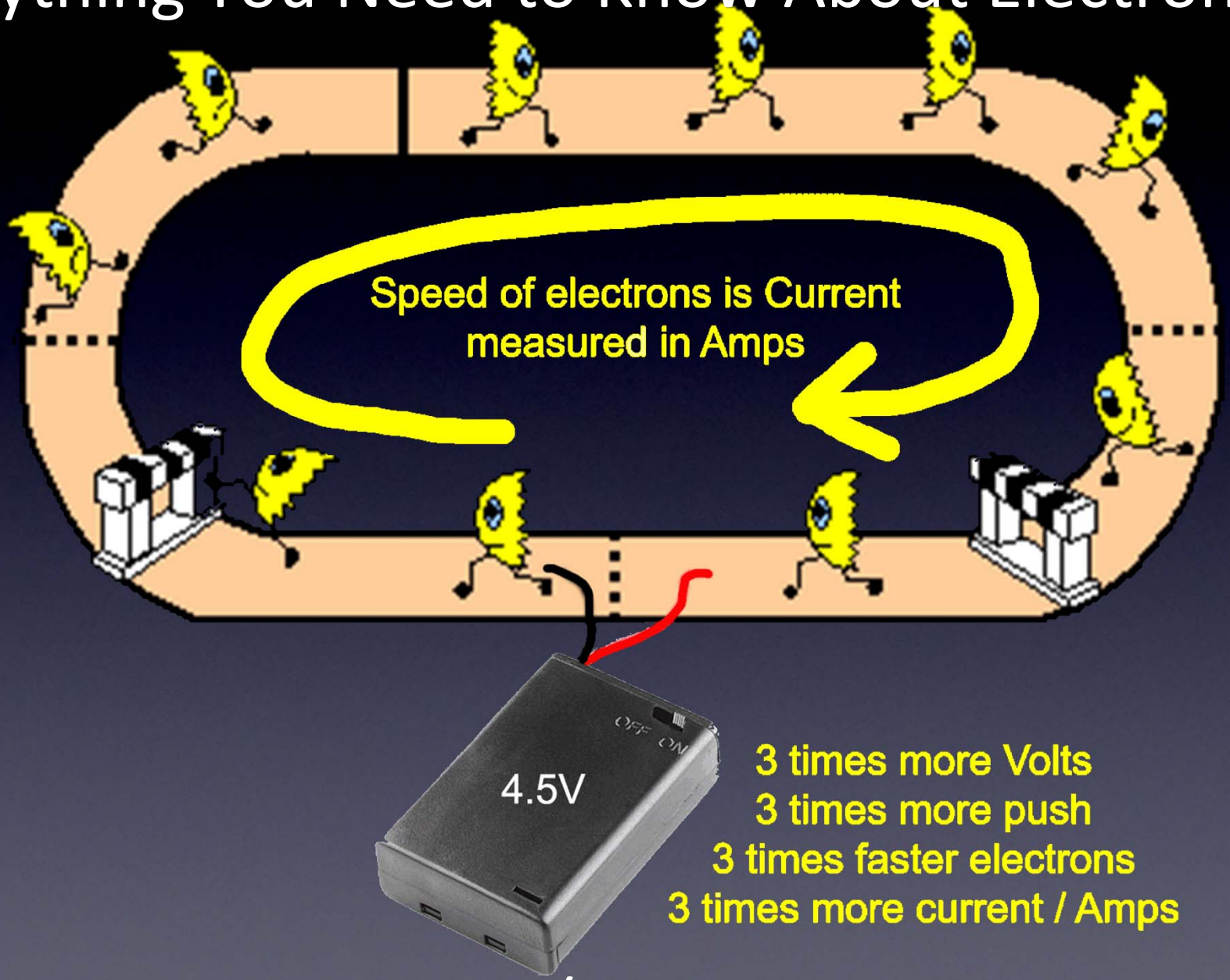
Volts / Voltage

Everything You Need to Know About Electronics



Amps / Current

Everything You Need to Know About Electronics



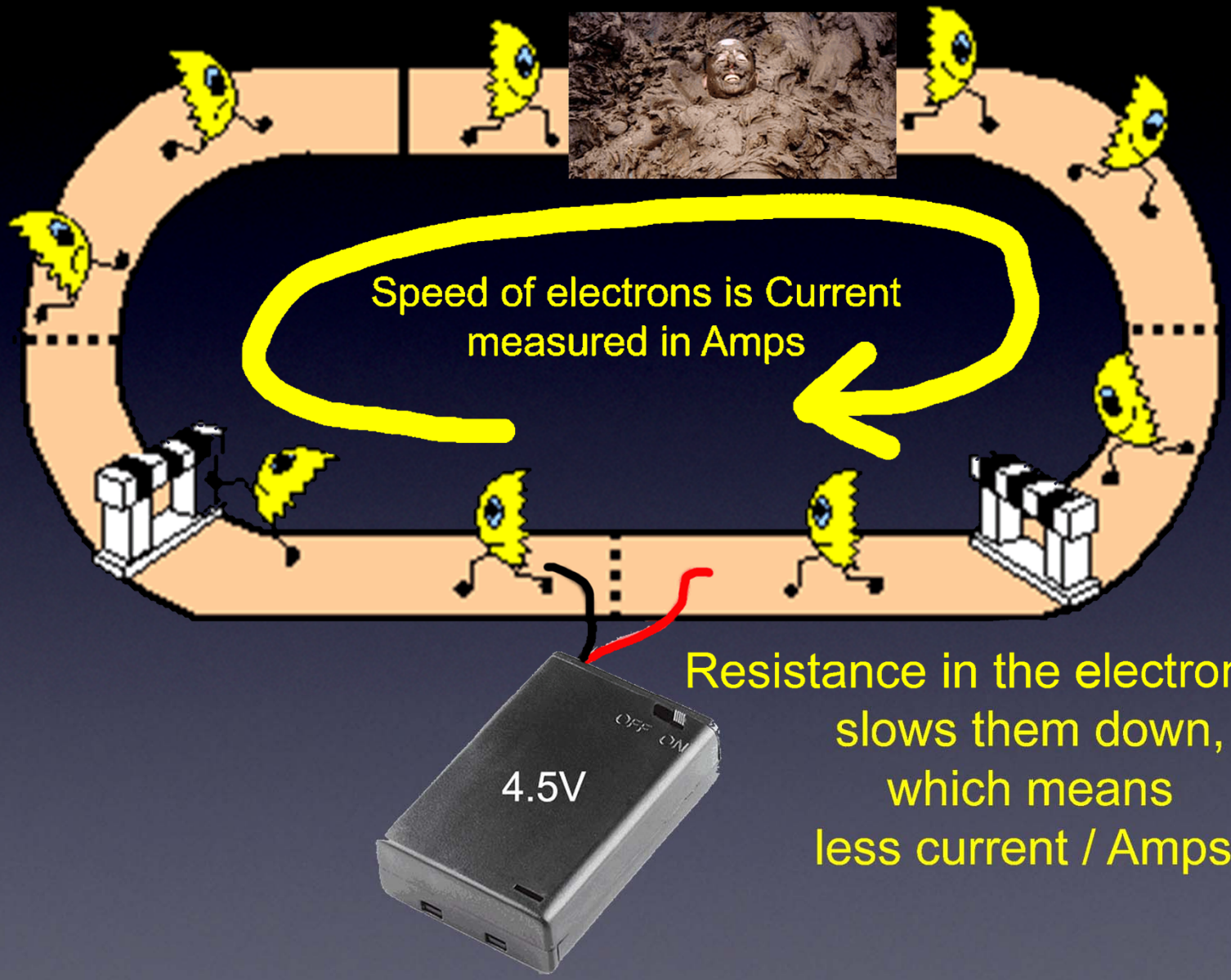
Amps / Current

Everything You Need to Know About Electronics

Too much energy?

Amps / Current

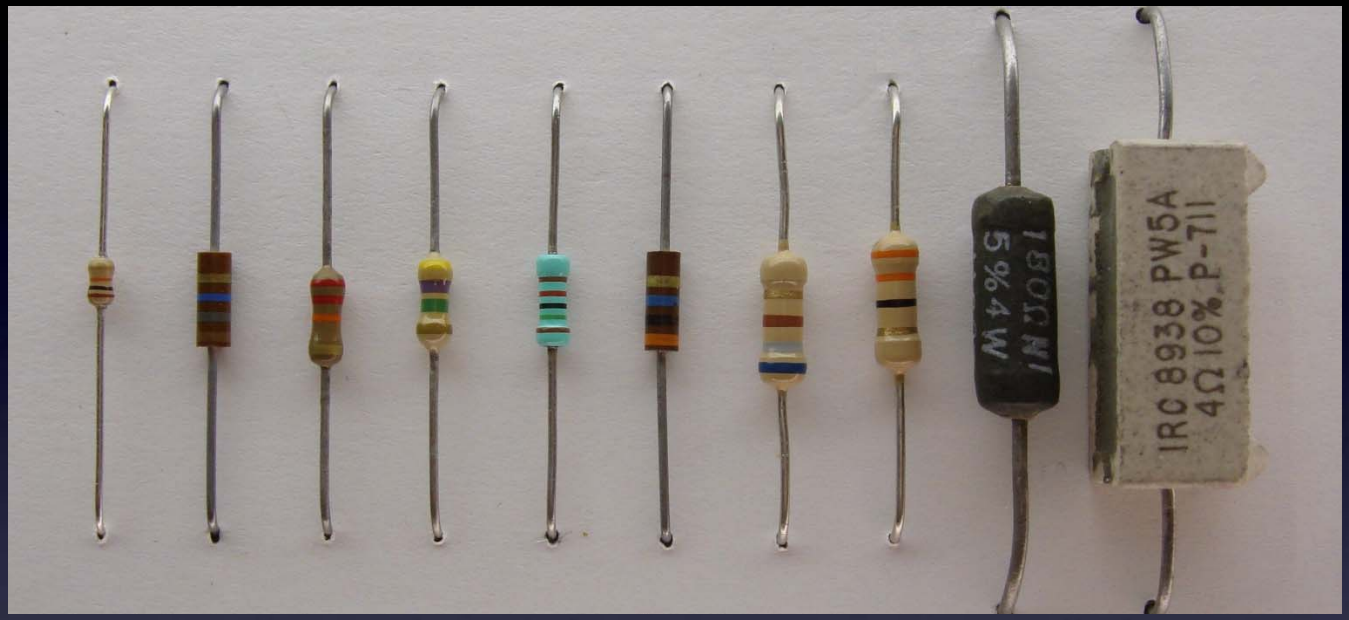
Everything You Need to Know About Electronics

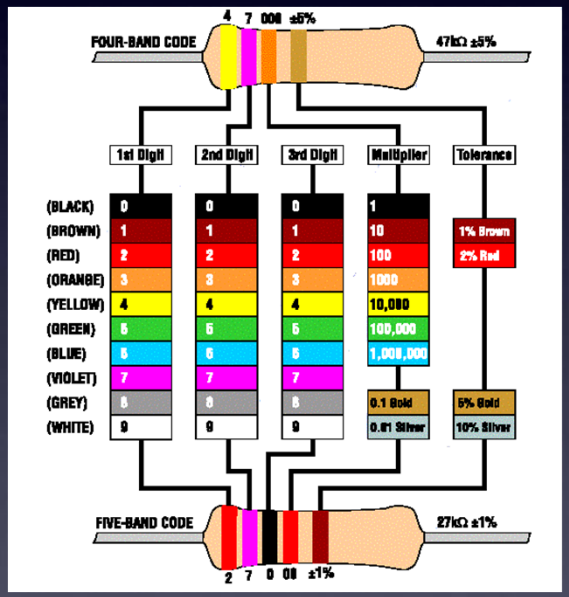


Resistance in the electrons' path
slows them down,
which means
less current / Amps.

Resistance / Ohms

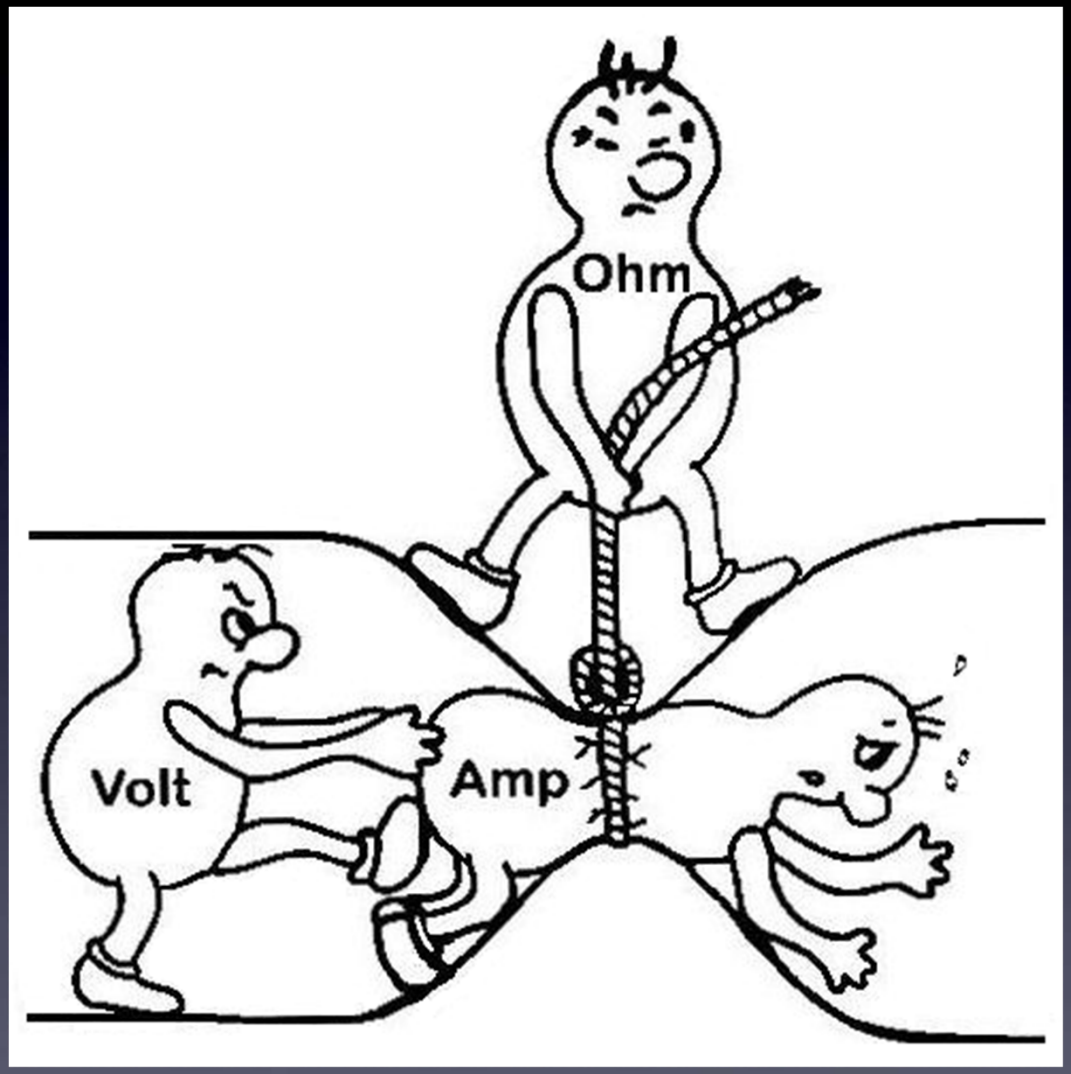
Everything You Need to Know About Electronics





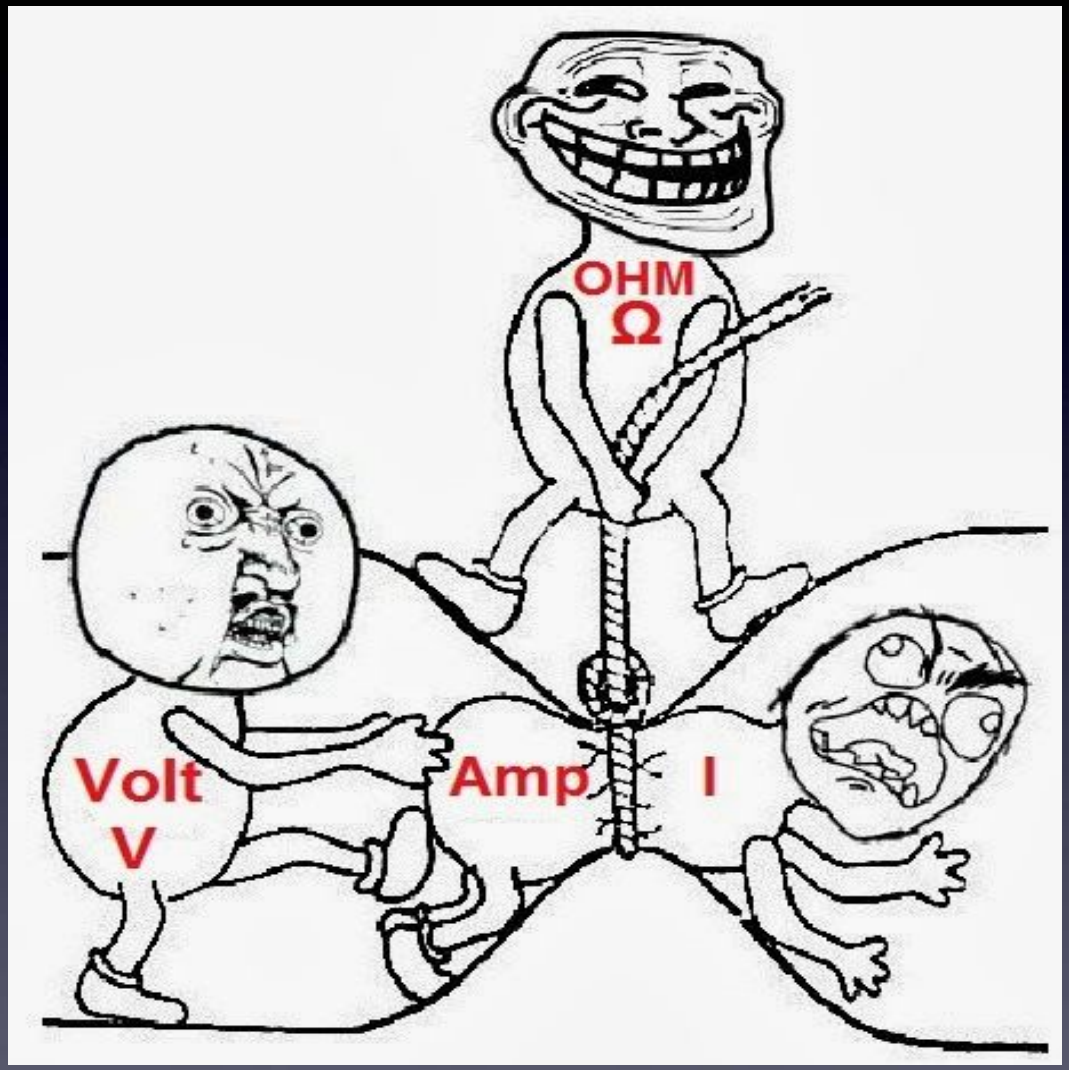
Resistors / Ohms

Everything You Need to Know About Electronics



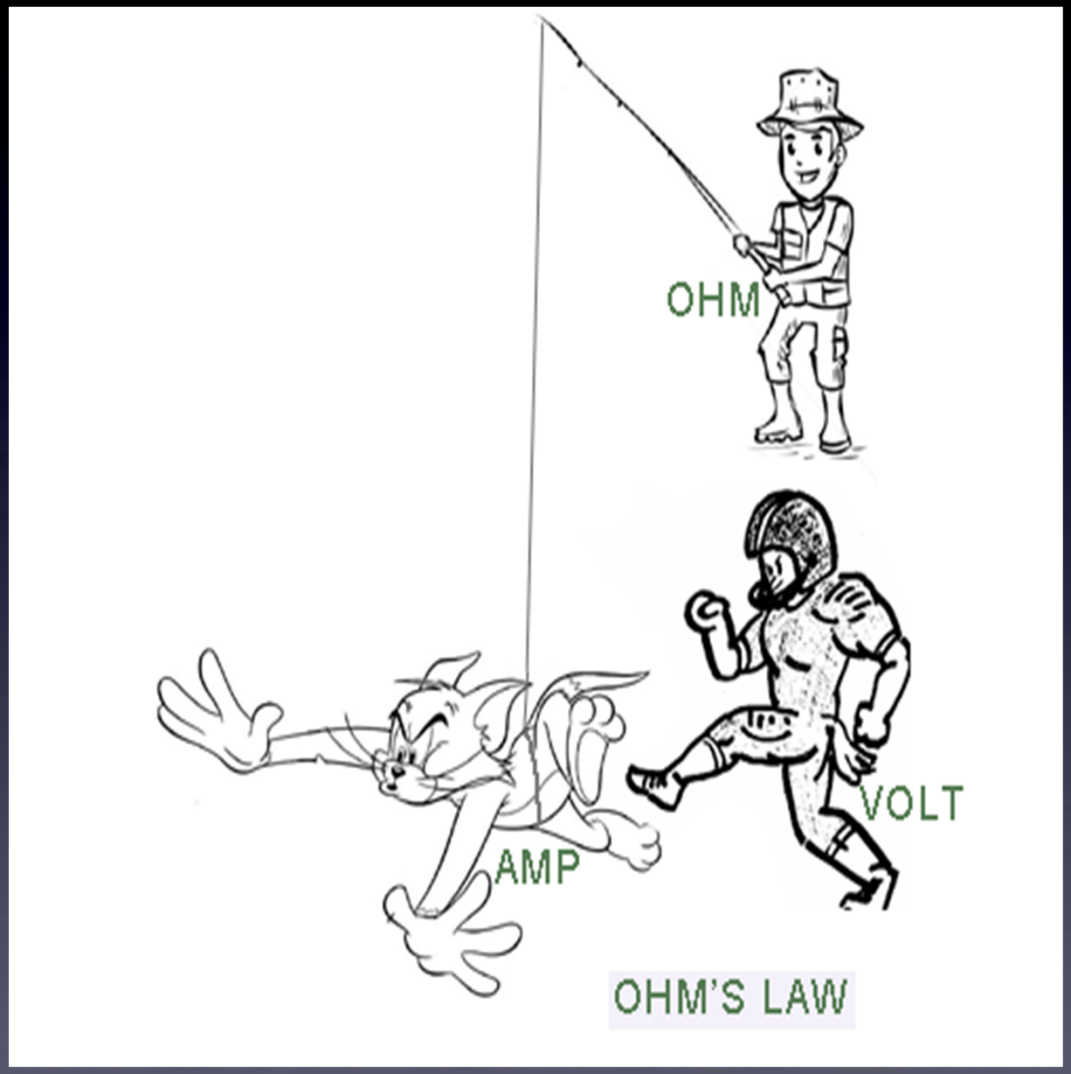
Ohm’s Law

Everything You Need to Know About Electronics



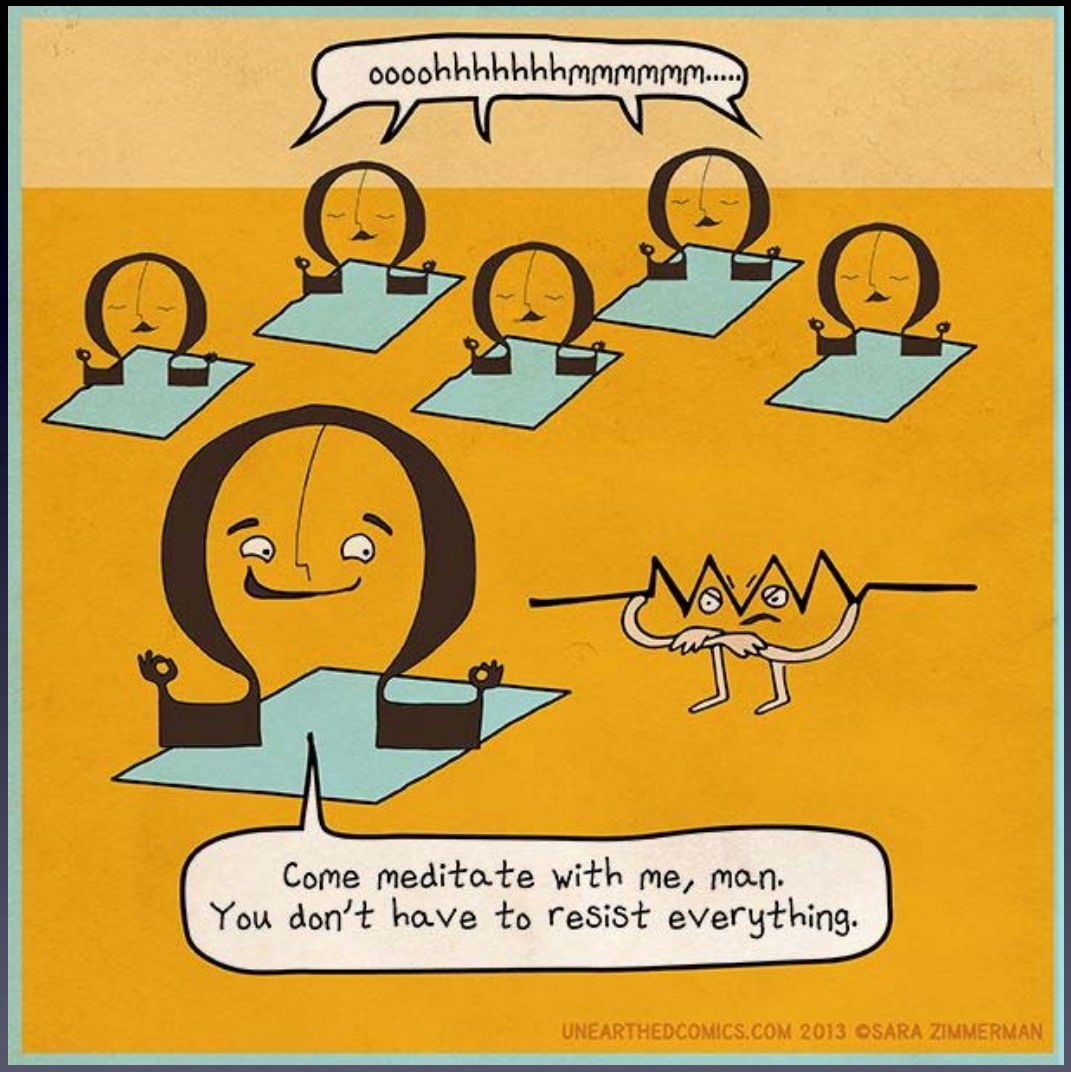
Ohm’s Law

Everything You Need to Know About Electronics



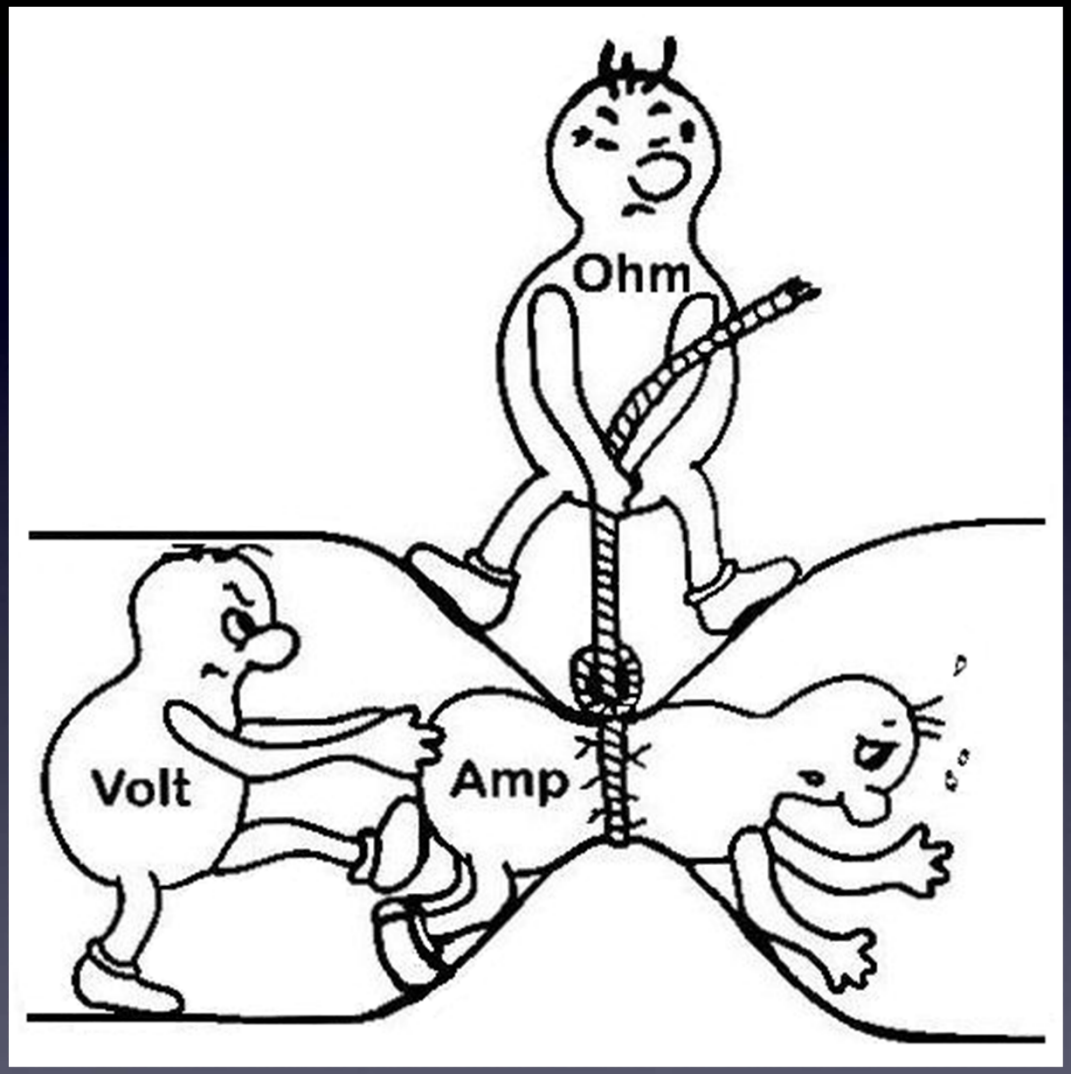
Ohm's Law

Everything You Need to Know About Electronics



Ohm's Law

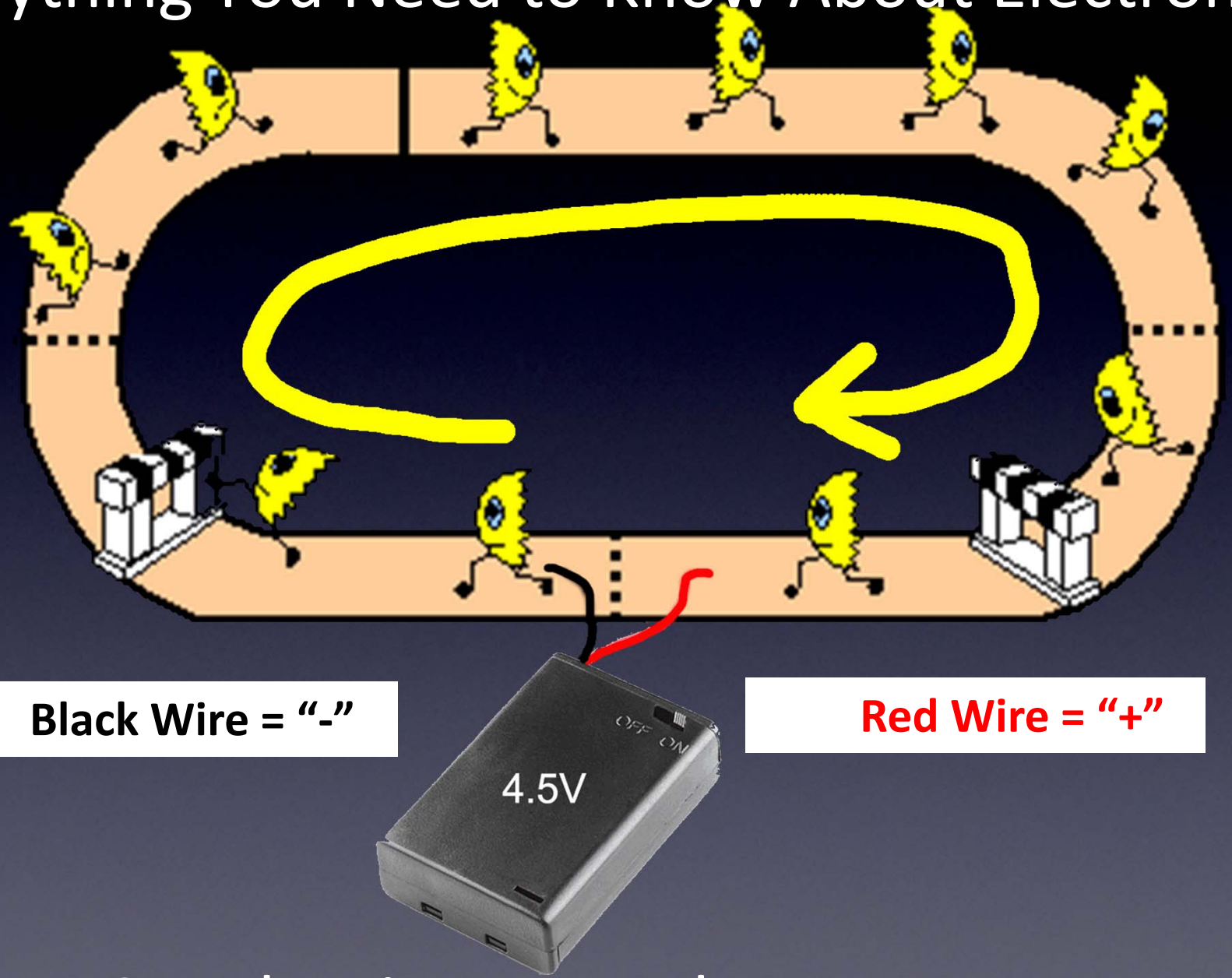
Everything You Need to Know About Electronics



Volts = Amps x Ohms

Ohm's Law

Everything You Need to Know About Electronics



Power Supply – it matters how you connect it!

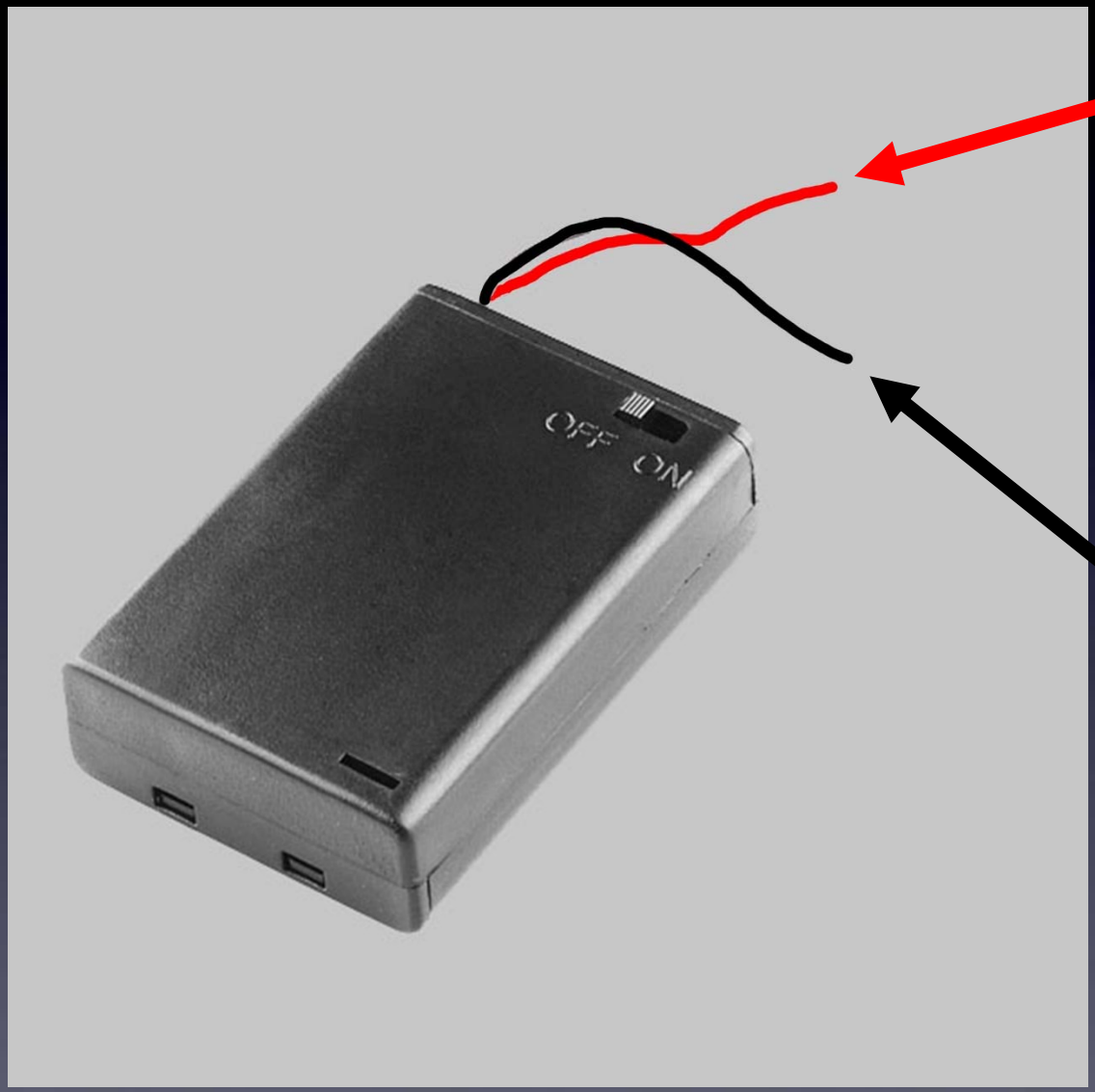
Everything You Need to Know About Electronics

What happens?

Polarity

Power Supply – it matters how you connect it!

Everything You Need to Know About Electronics



<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

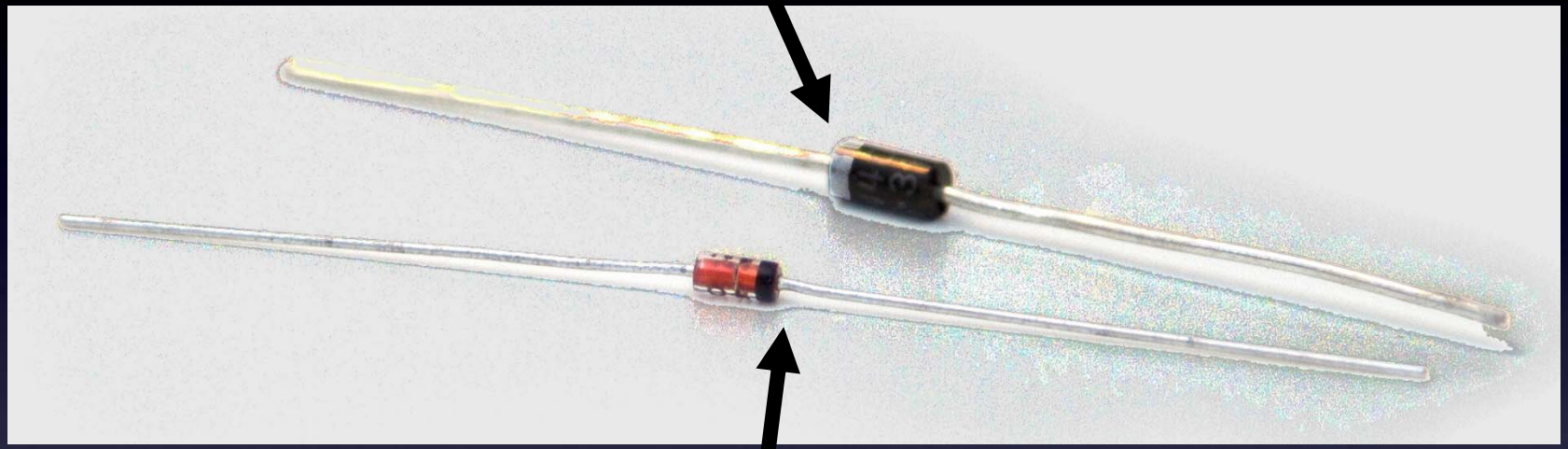
or

(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

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…)

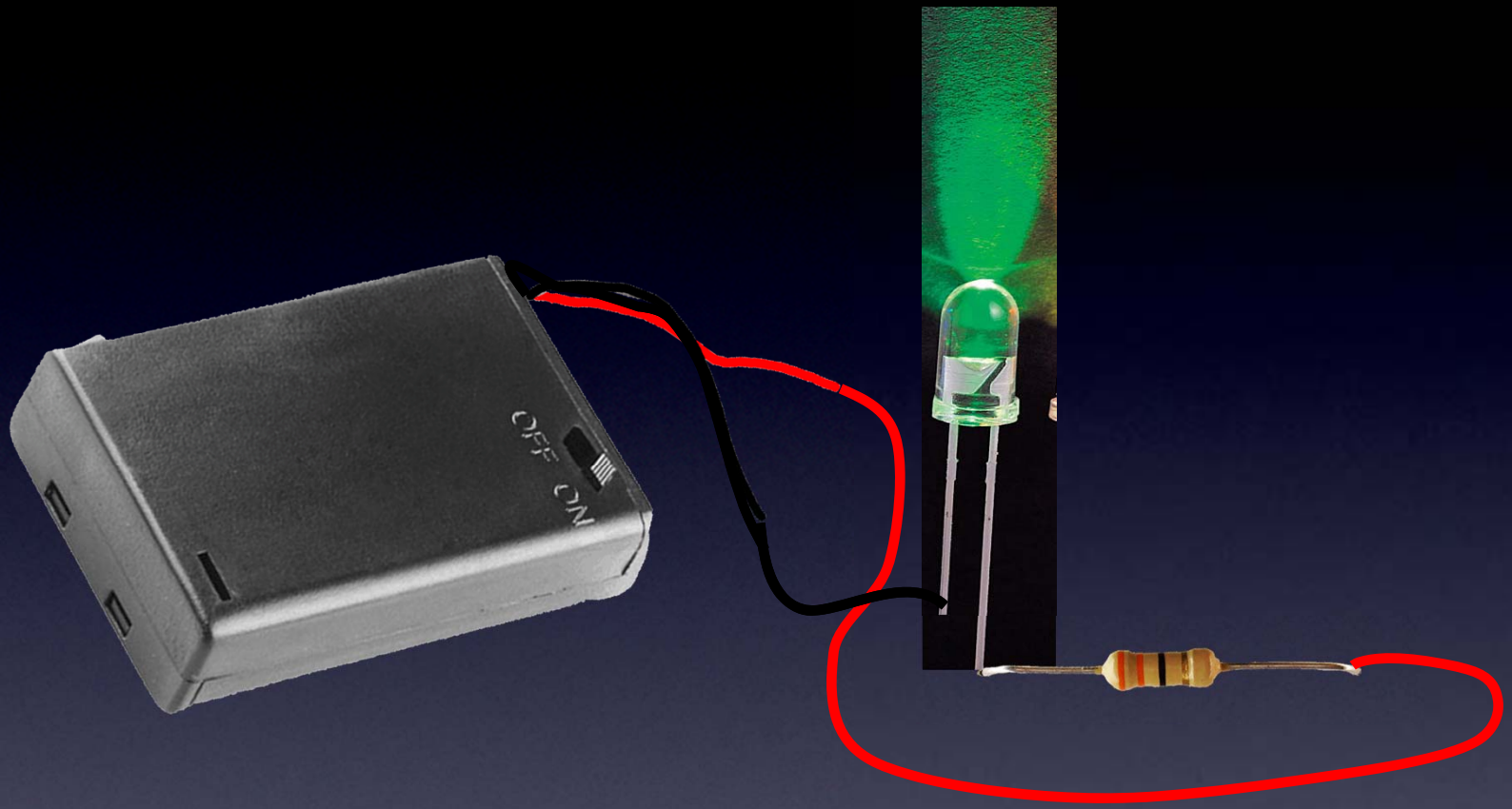
LED

Everything You Need to Know About Electronics

More current → More brightness! (until…)

LED

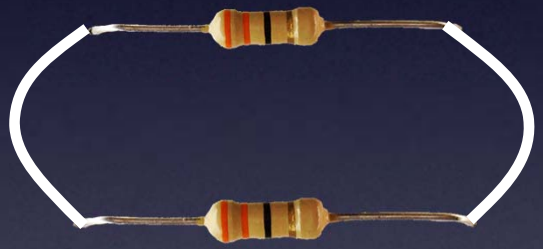
Everything You Need to Know About Electronics



This is why we put a resistor in line

LED

Everything You Need to Know About Electronics



Series = in line

Parallel = across

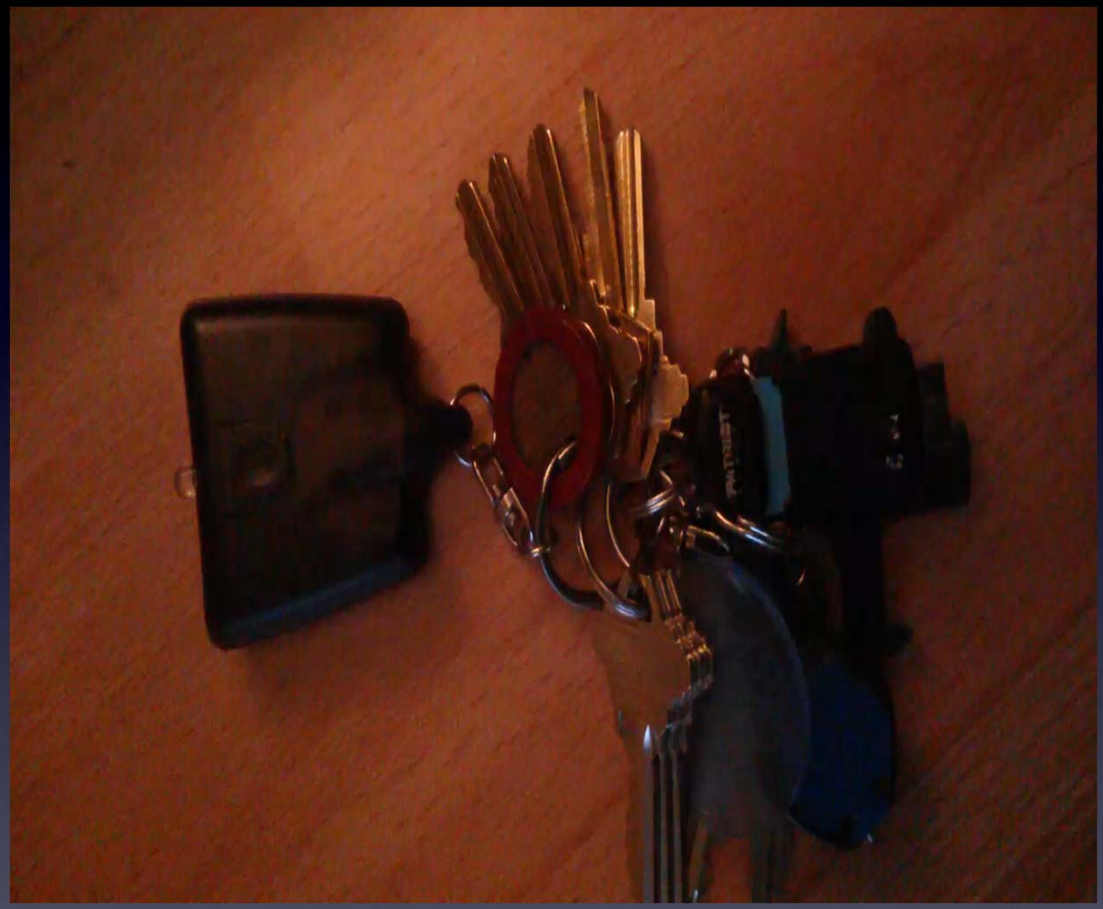
Everything You Need to Know About Electronics

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

IR Remote Control

Everything You Need to Know About Electronics

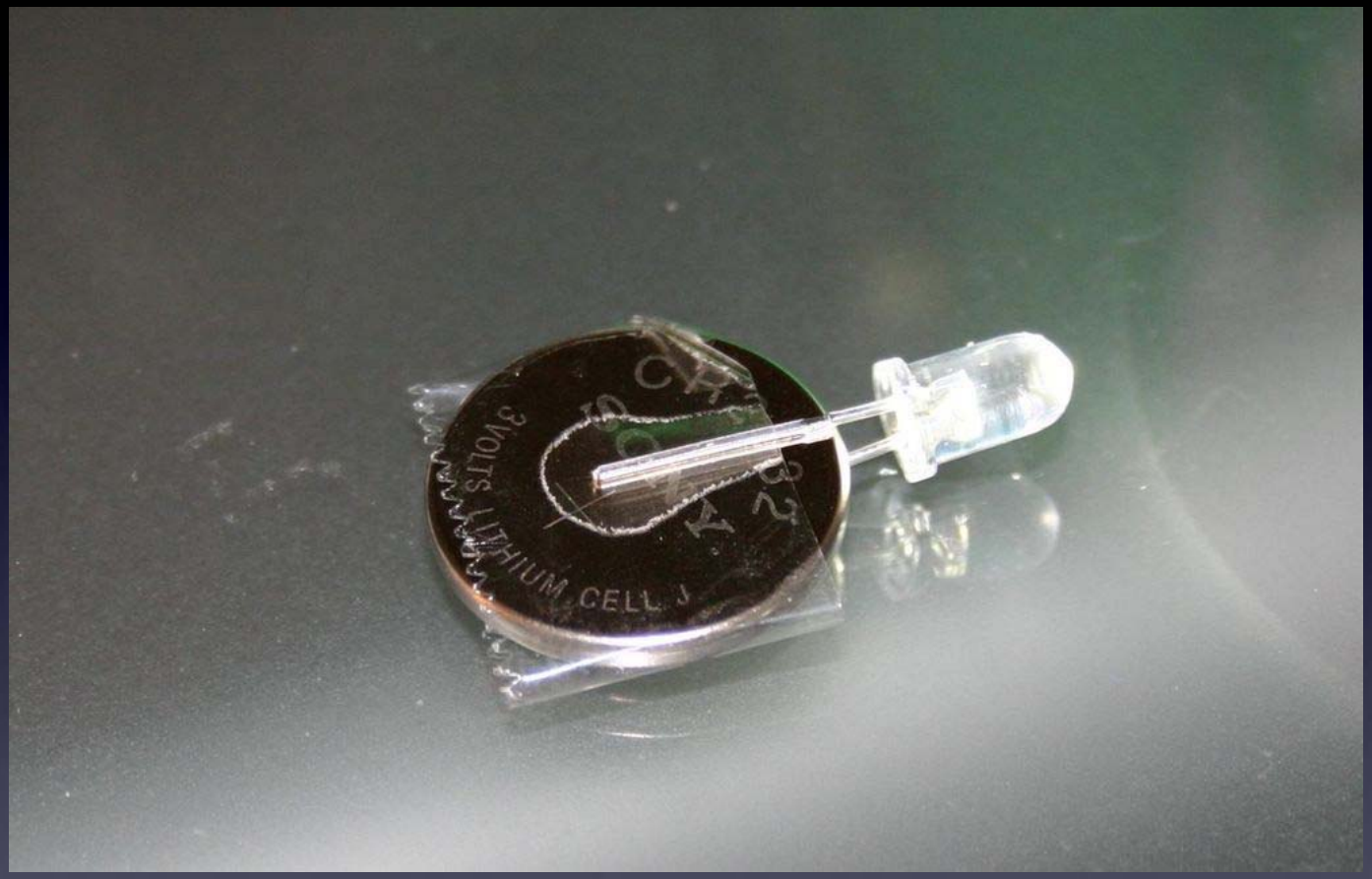
Takes about 60 seconds



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

TV-B-Gone universal remote control

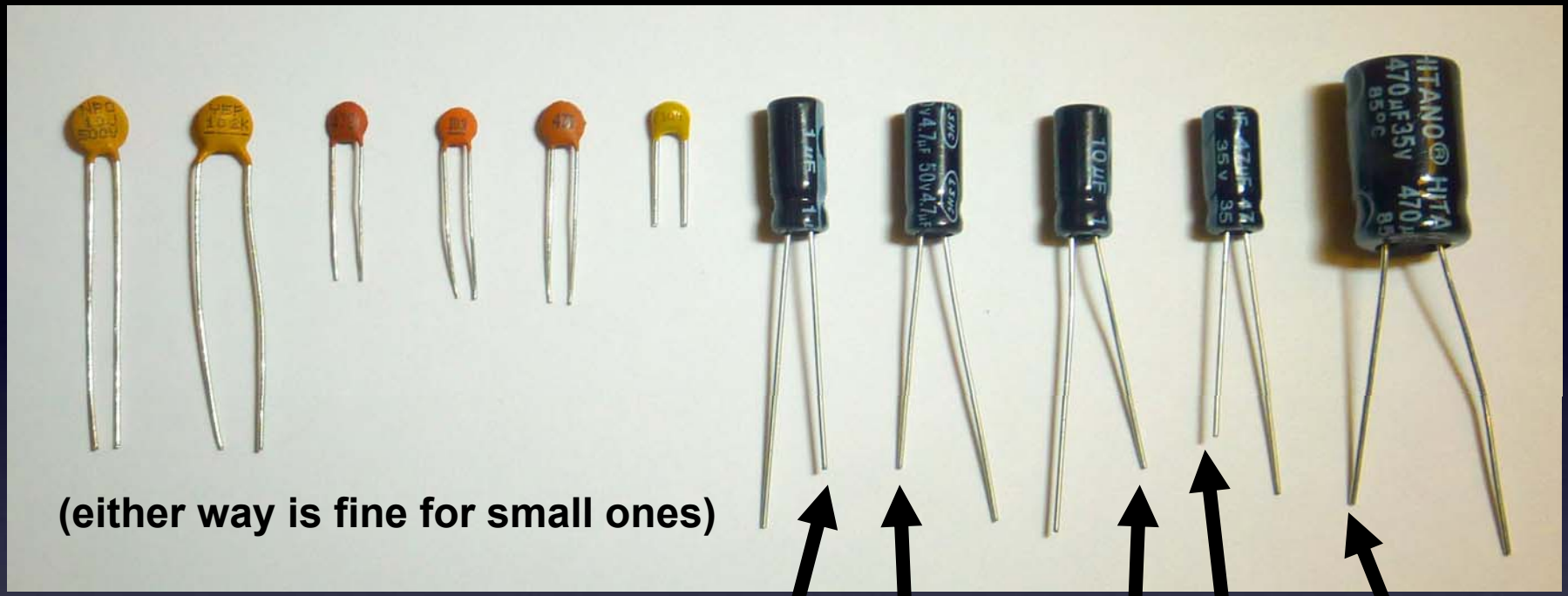
Everything You Need to Know About Electronics



LED & battery

Our first circuit

Everything You Need to Know About Electronics

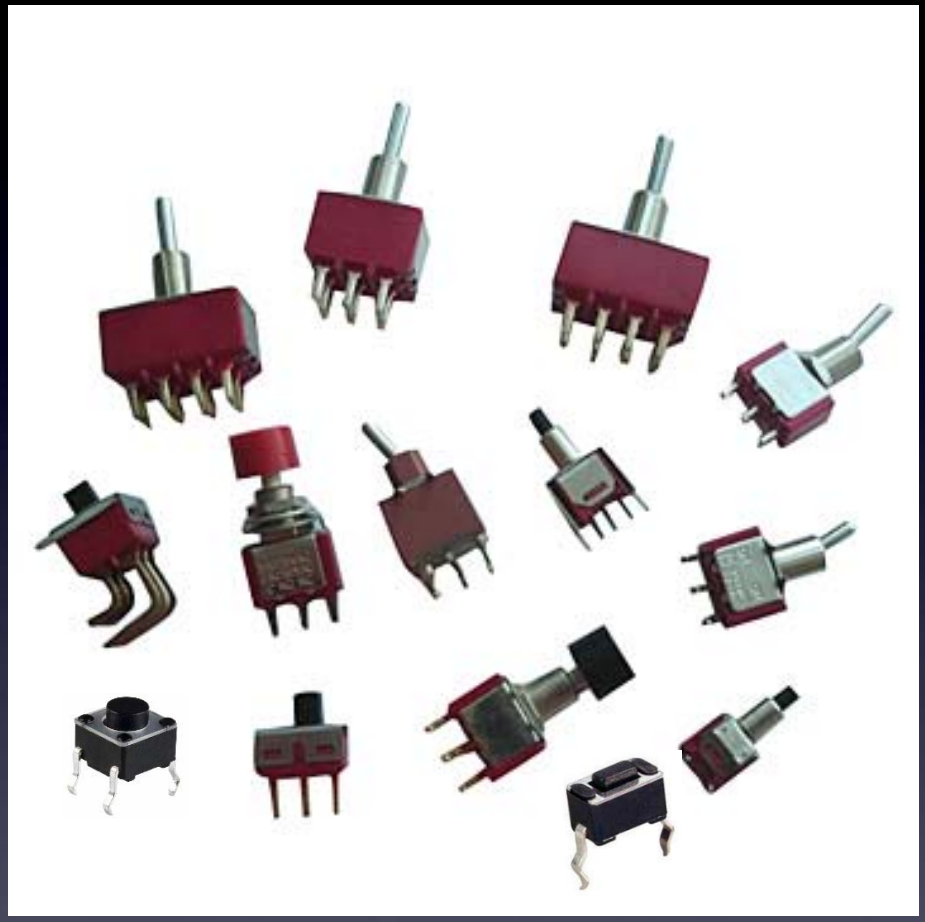


Short wire is Minus / Negative

Little buckets for electrons

Capacitor / Farads

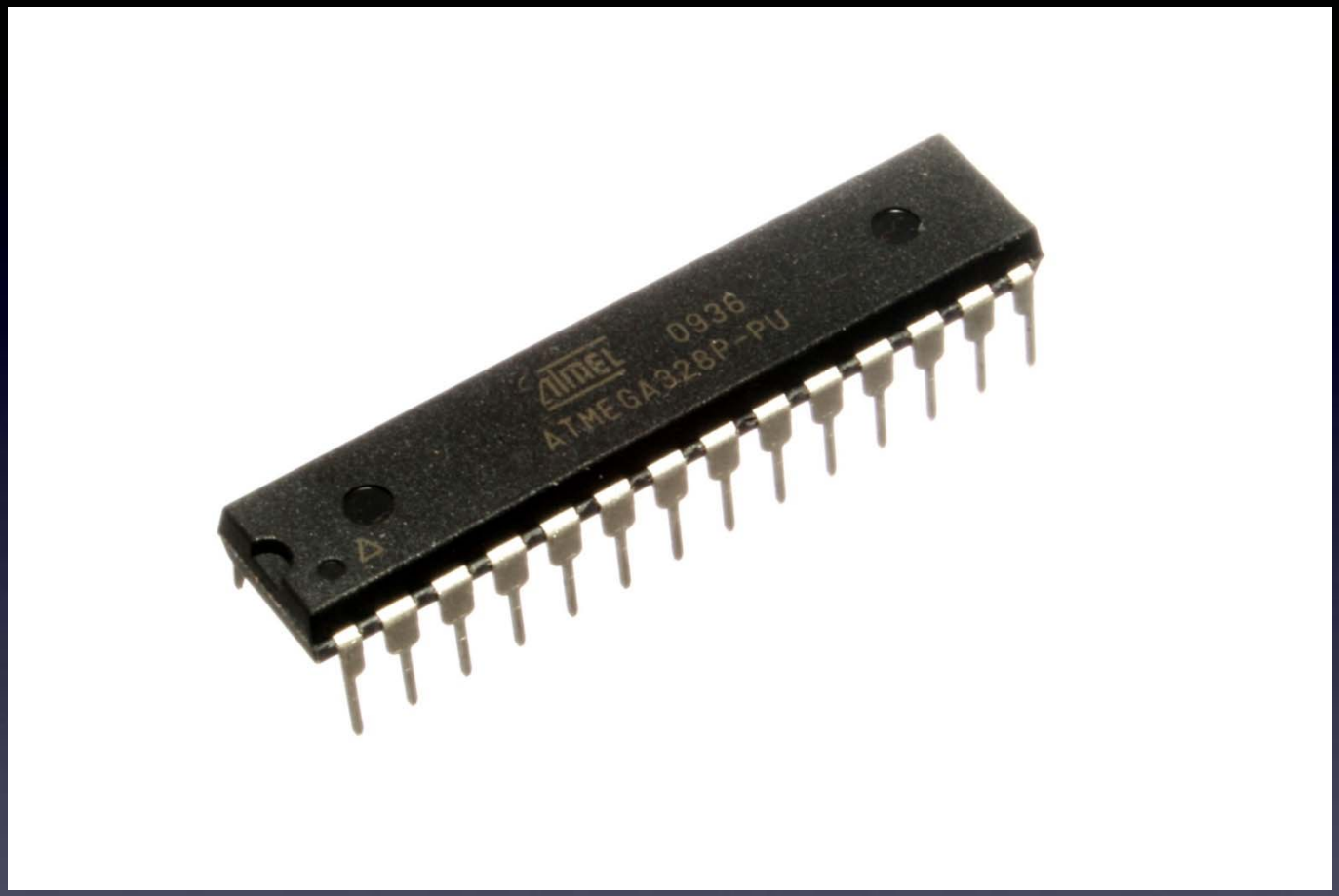
Everything You Need to Know About Electronics



Strips of metal connected together – or not

Switch

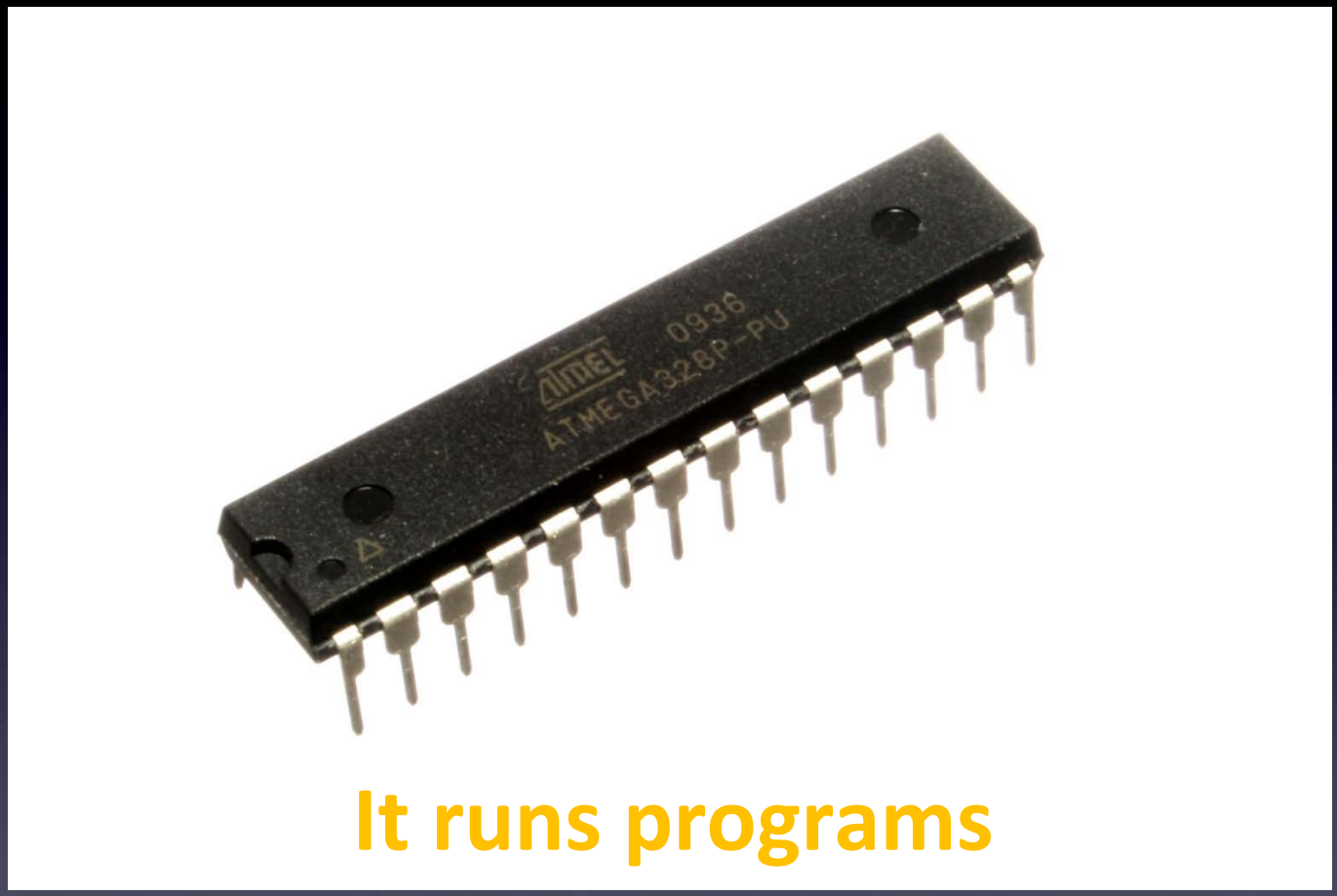
Everything You Need to Know About Electronics



A complete computer on a chip

Microcontroller

Everything You Need to Know About Electronics



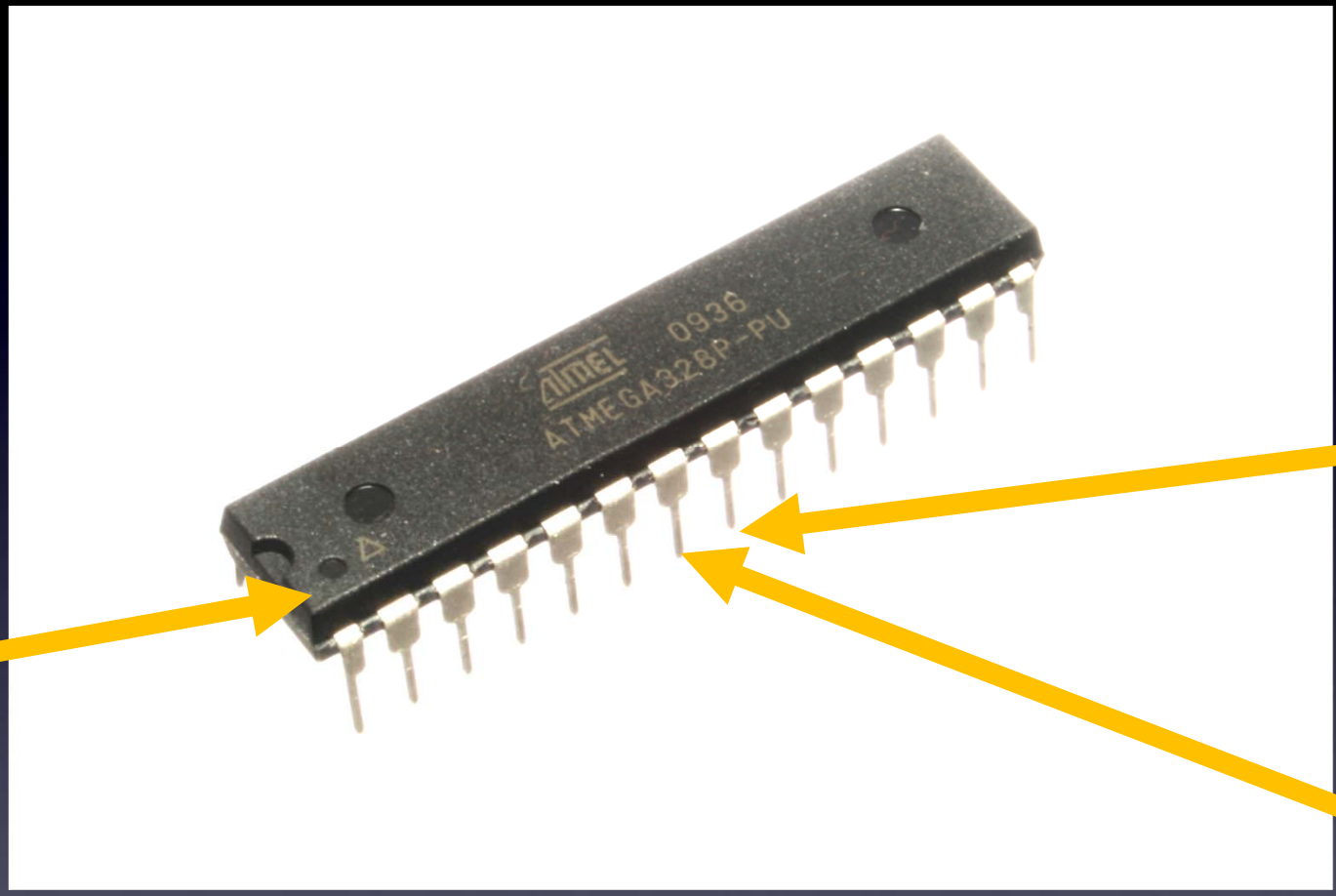
It runs programs

to control electronic parts connected to its pins.

Microcontroller

Everything You Need to Know About Electronics

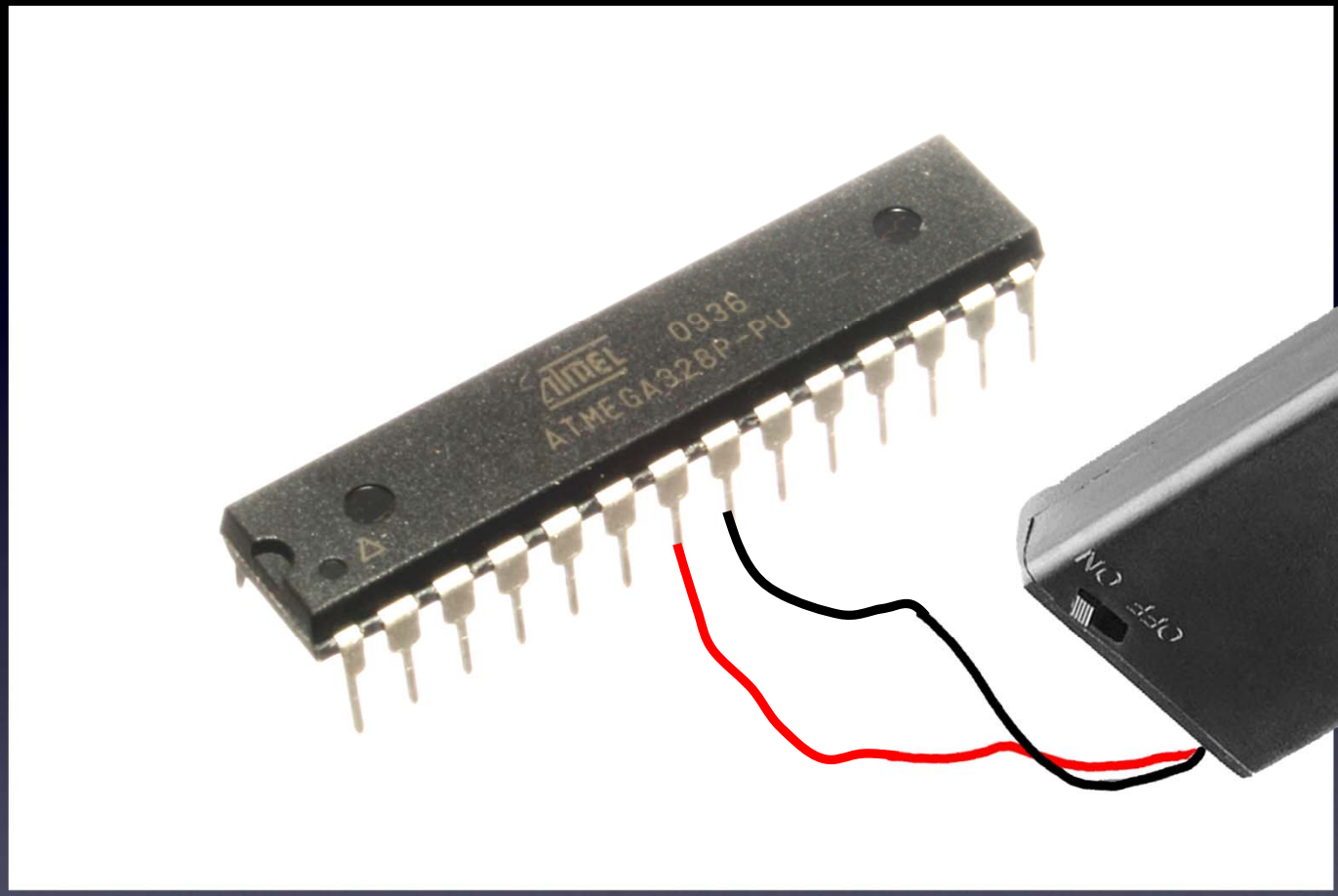
2 special pins:



A complete computer on a chip

Microcontroller – it matters how you hook it up!

Everything You Need to Know About Electronics

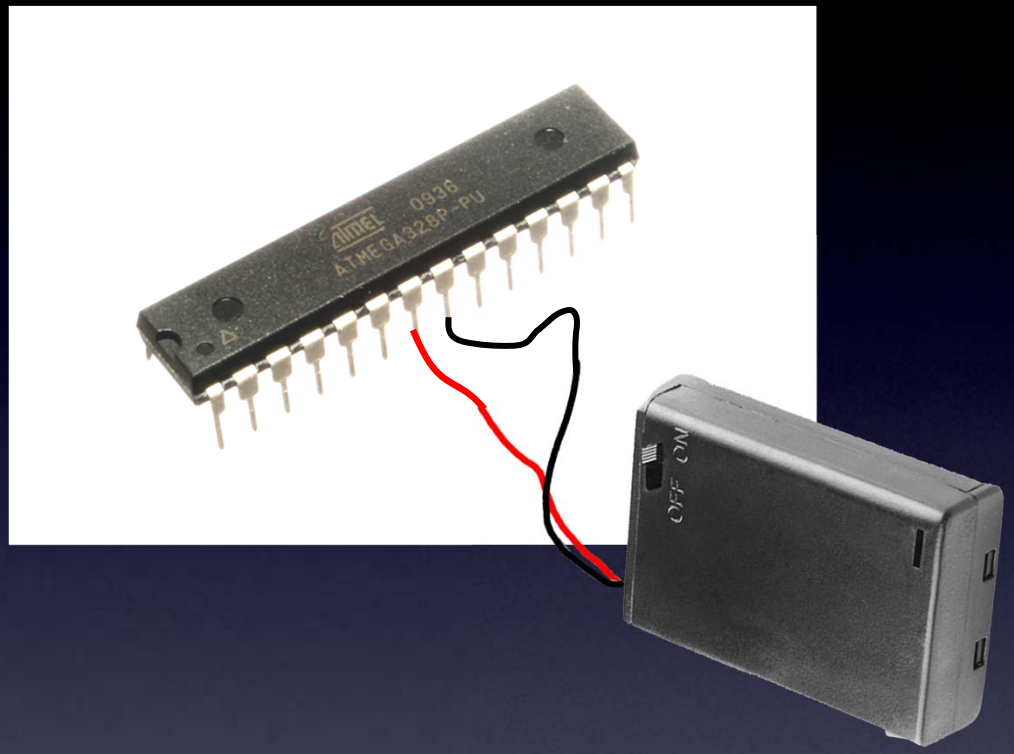


A complete computer – running a program!

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

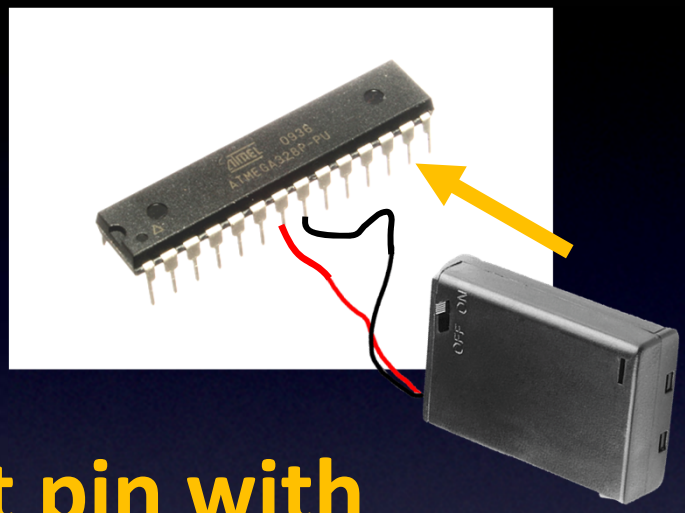
Everything You Need to Know About Electronics

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 Pin

Everything You Need to Know About Electronics

Low	**High**
Off	***almost* the same**
(0V)	**as the Red wire**
	of the power supply

Only 2 choices: High or Low

Microcontroller – Output Pin

Everything You Need to Know About Electronics

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

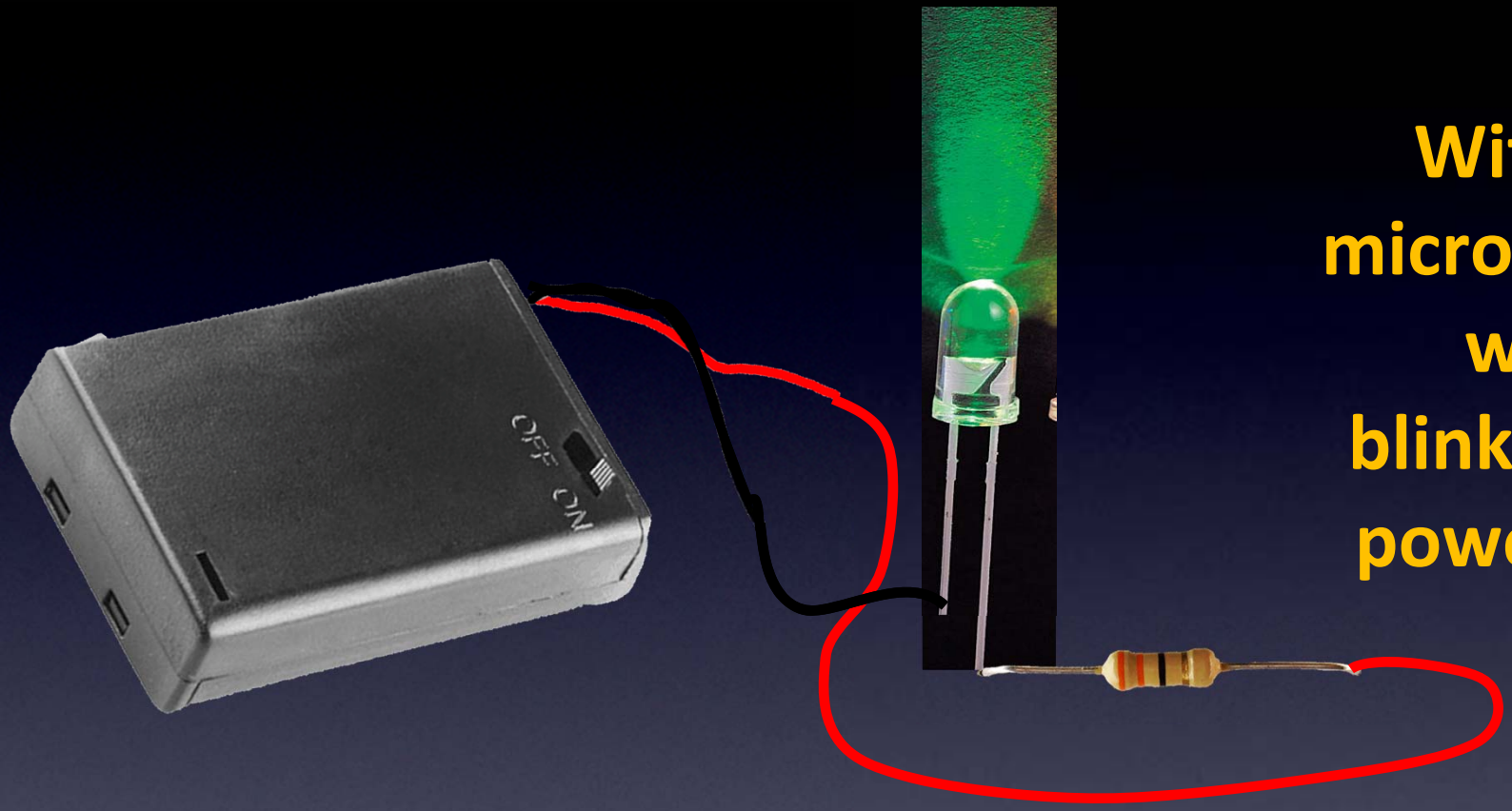
Microcontrollers

make an LED blink

Hello World

Microcontroller

Everything You Need to Know About Electronics



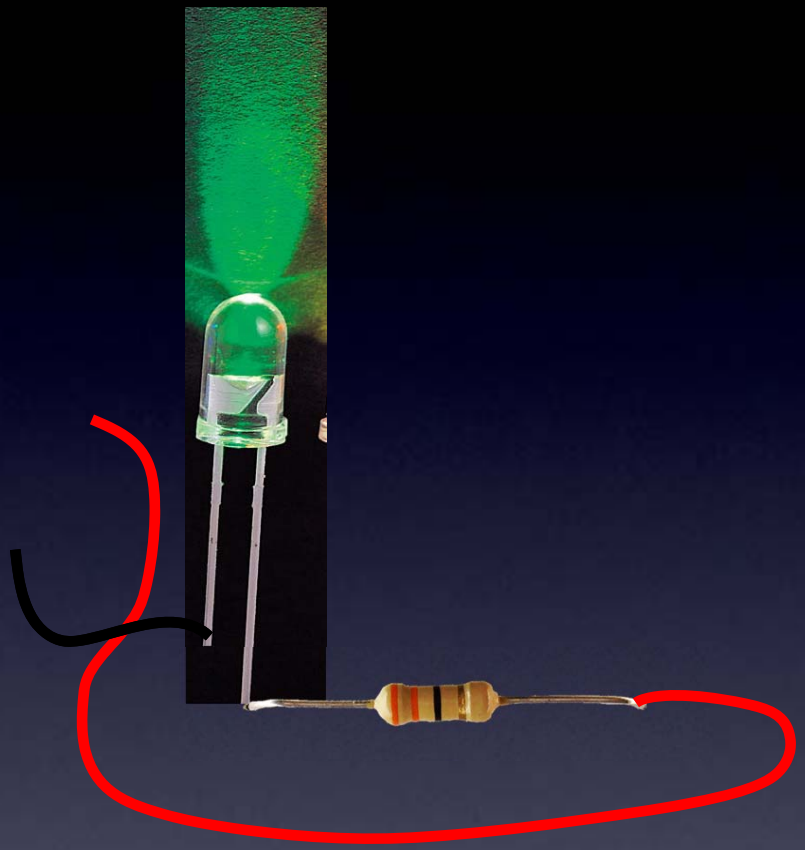
Without a microcontroller we can blink with our power supply

Turning an LED on and off

(Leading up to Hello World)

Everything You Need to Know About Electronics

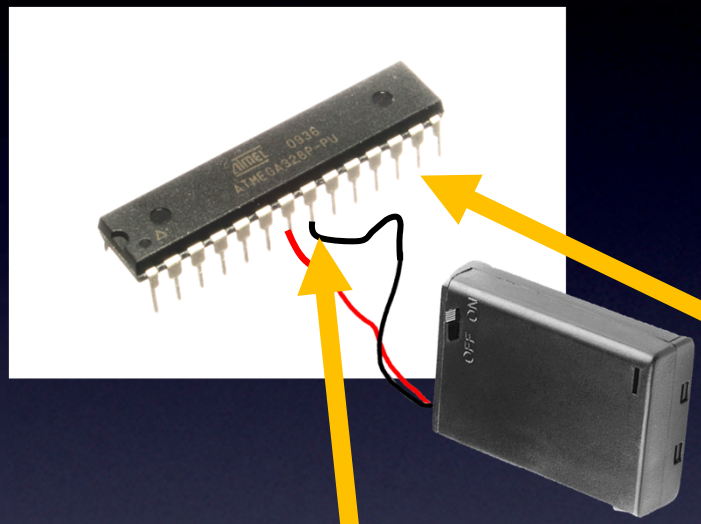
Let's replace the power supply



Turning an LED on and off

(Leading up to Hello World)

Everything You Need to Know About Electronics



With a microcontroller: we can use an Output pin for power (if it's On)

Let's use Pin 13

And we use the Ground pin for Ground

Turning an LED on and off

(Leading up to Hello World)

Everything You Need to Know About Electronics

Since an Output pin
is *almost* like the Red wire of our power supply
when it is On

Let's connect this LED to an Output pin…

…instead of our power supply

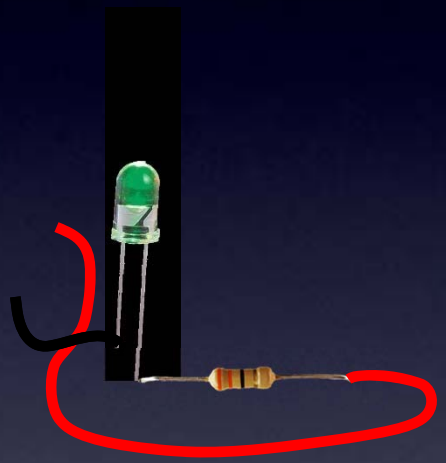
And make it blink!

Turning an LED on and off

(Leading up to Hello World)

Everything You Need to Know About Electronics

Since an Output pin
is *almost* like the Red wire of our power supply
when it is On



Let's connect this LED to an Output pin…
…instead of our power supply

With a resistor
(so no magic smoke goes away)

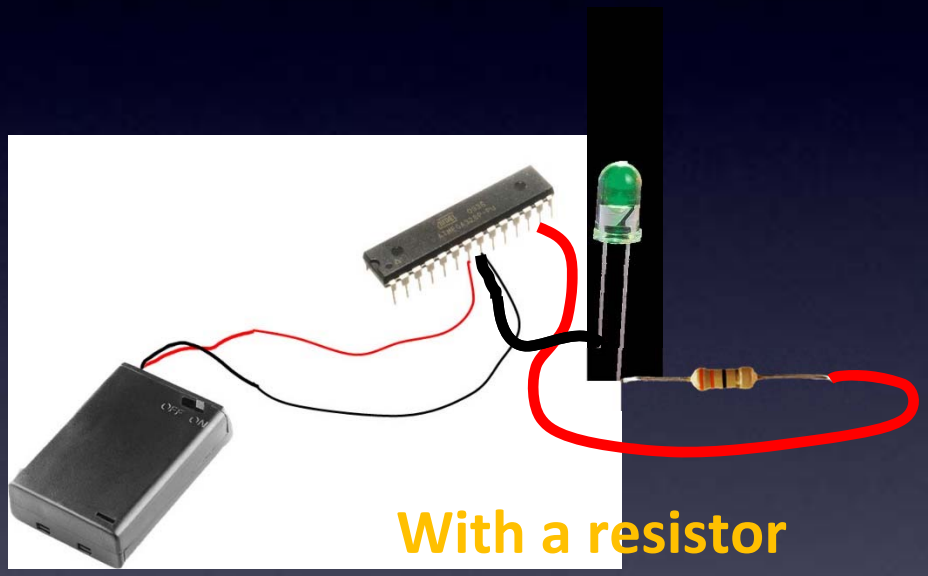
And make it blink!

Turning an LED on and off

(Leading up to Hello World)

Everything You Need to Know About Electronics

Since an Output pin
is *almost* like the Red wire of our power supply
when it is On



With a resistor
(so no magic smoke goes away)

Let's connect this LED to an Output pin…
…instead of our power supply

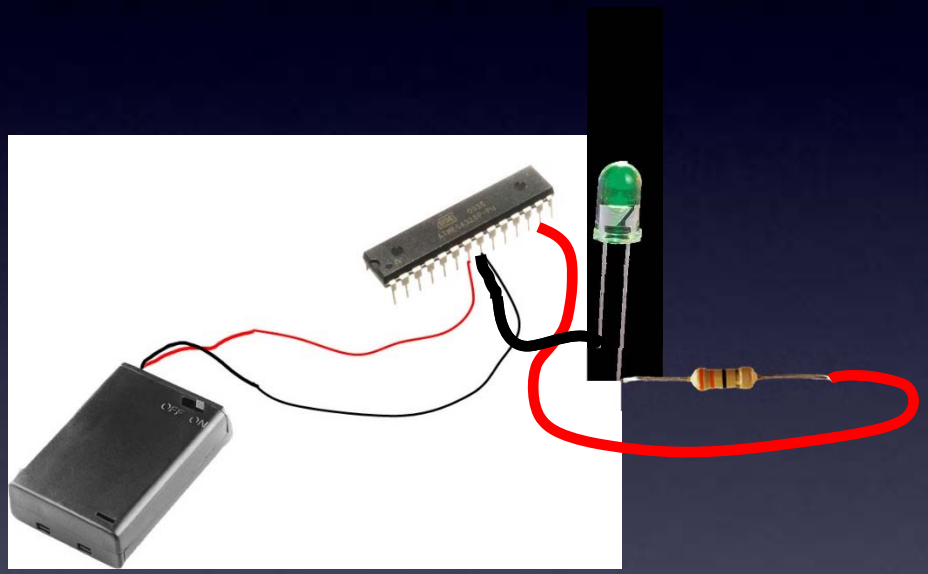
And make it blink!

Turning an LED on and off

Hello World

Everything You Need to Know About Electronics

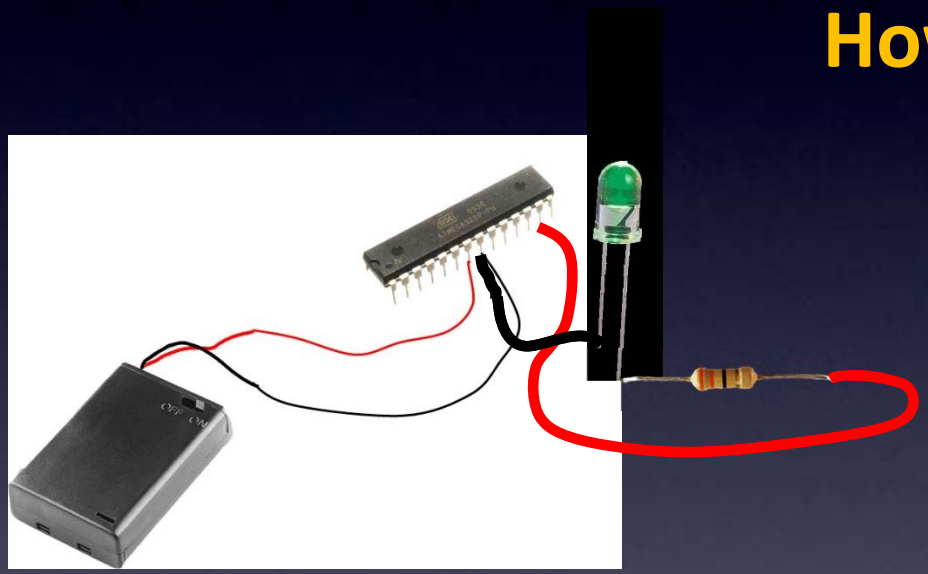
This is our **Hardware** for Hello World!



Turning an LED on and off

Hello World

Everything You Need to Know About Electronics



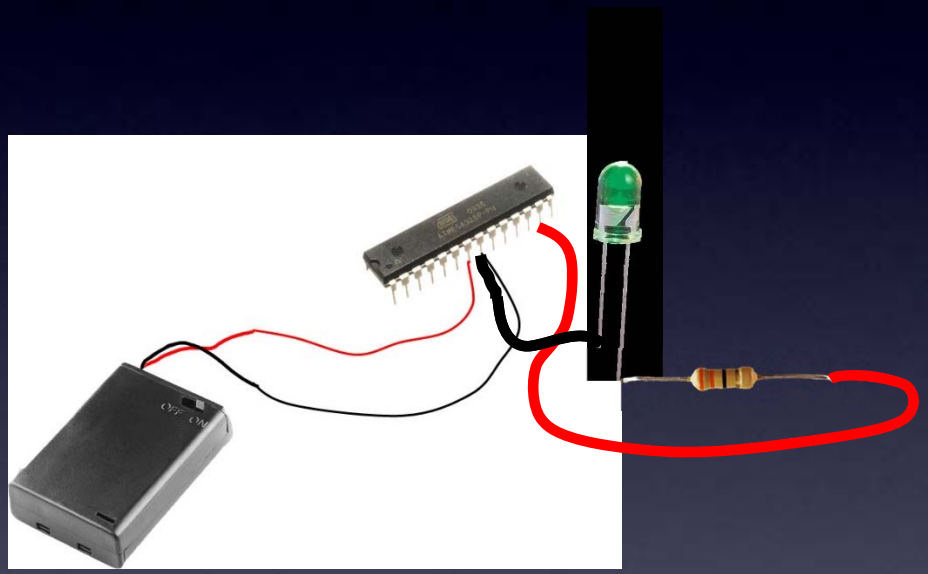
How about our program?

Turning an LED on and off

Hello World

Everything You Need to Know About Electronics

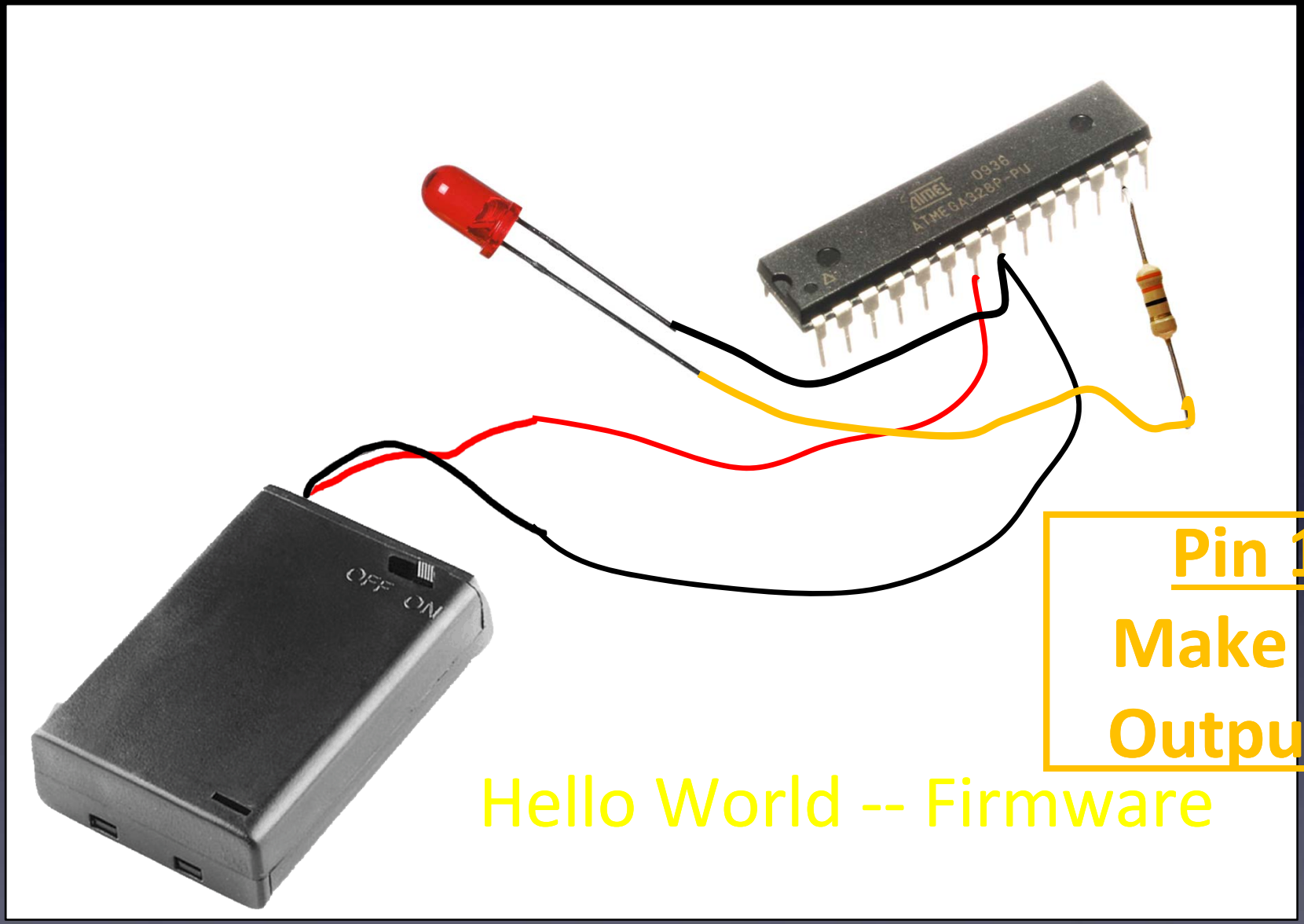
Programs on microcontrollers are called "Firmware"



Turning an LED on and off

Hello World

Everything You Need to Know About Electronics

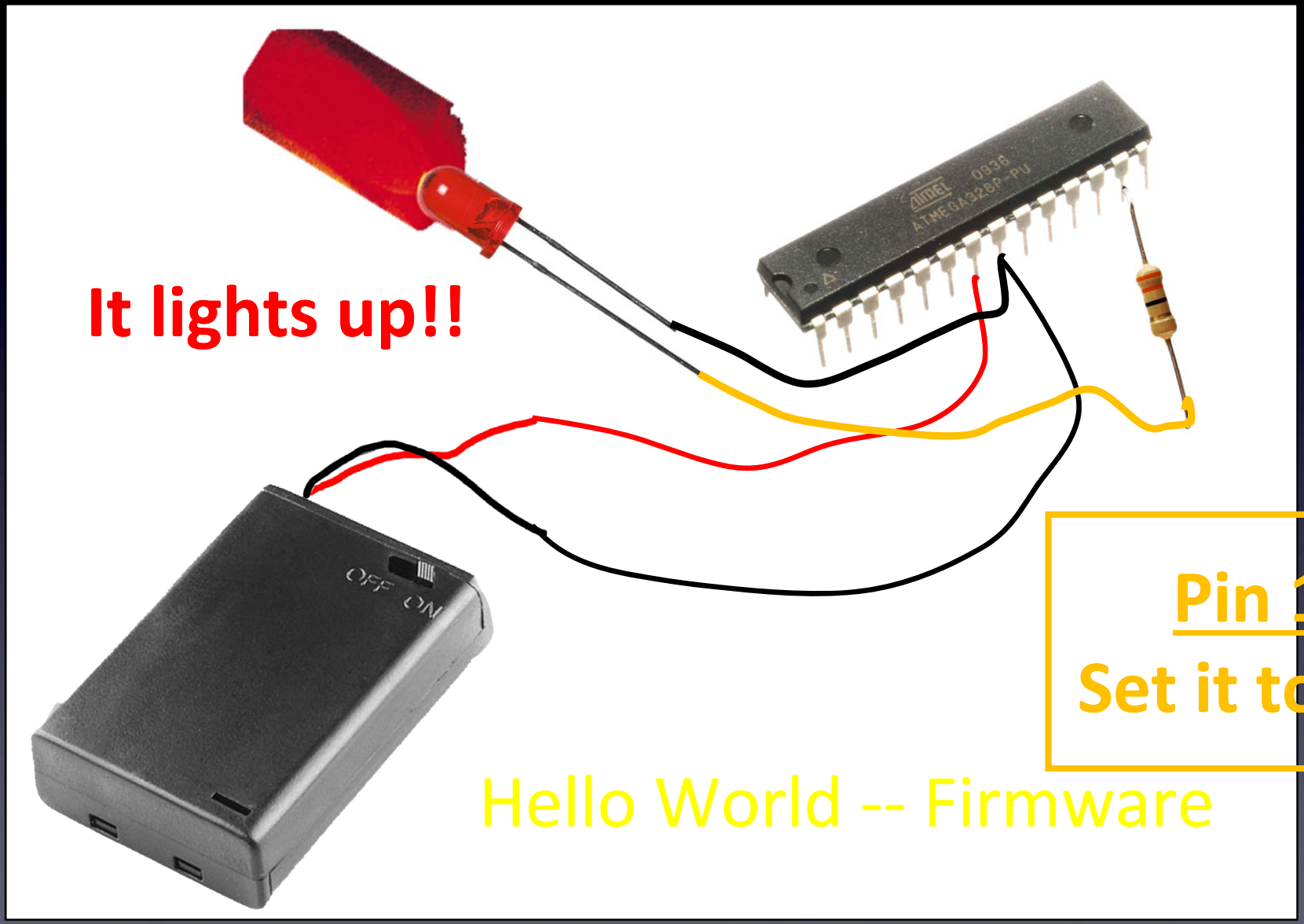


Pin 13:
Make it an Output Pin

Hello World -- Firmware

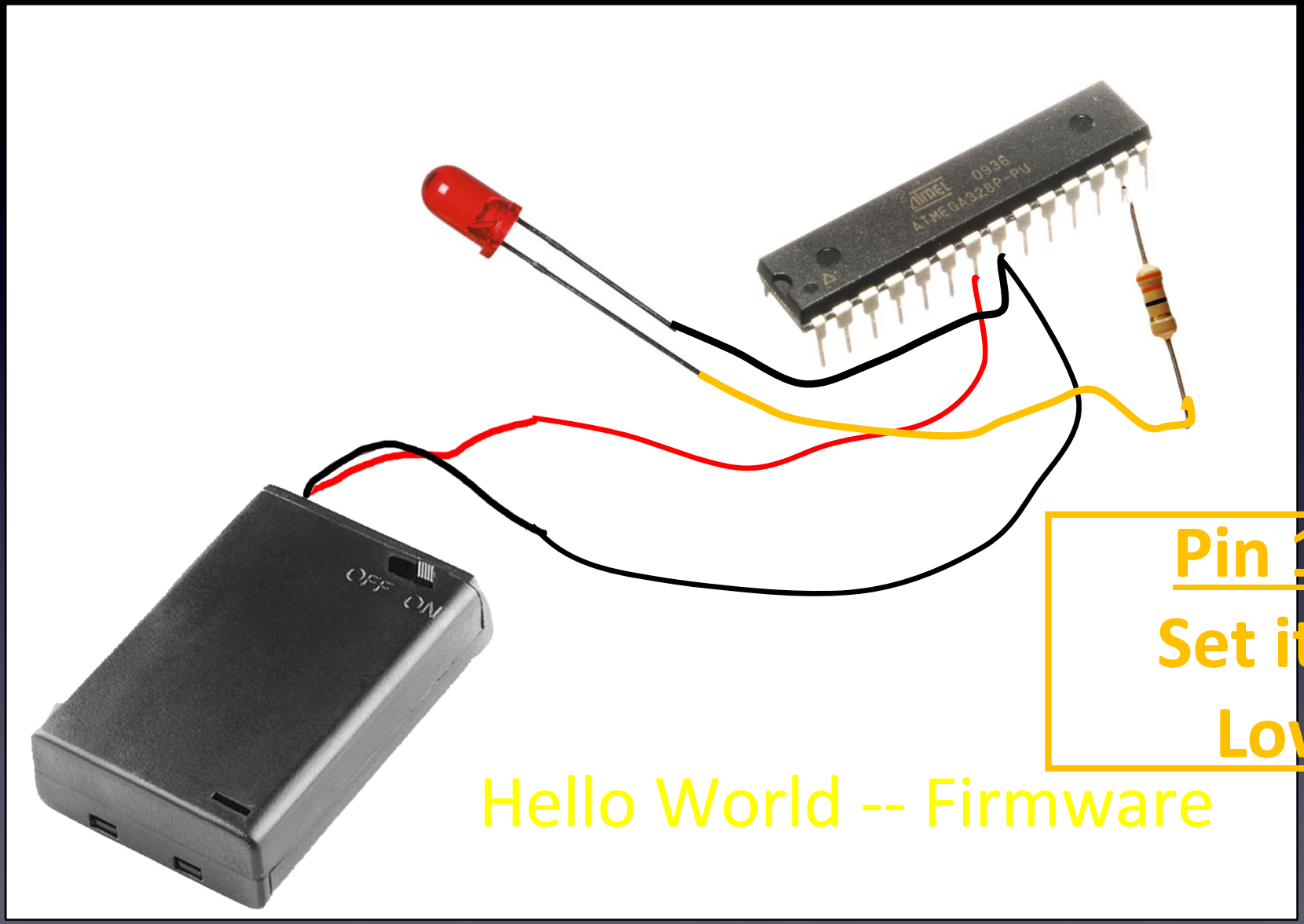
Microcontroller

Everything You Need to Know About Electronics



Microcontroller

Everything You Need to Know About Electronics

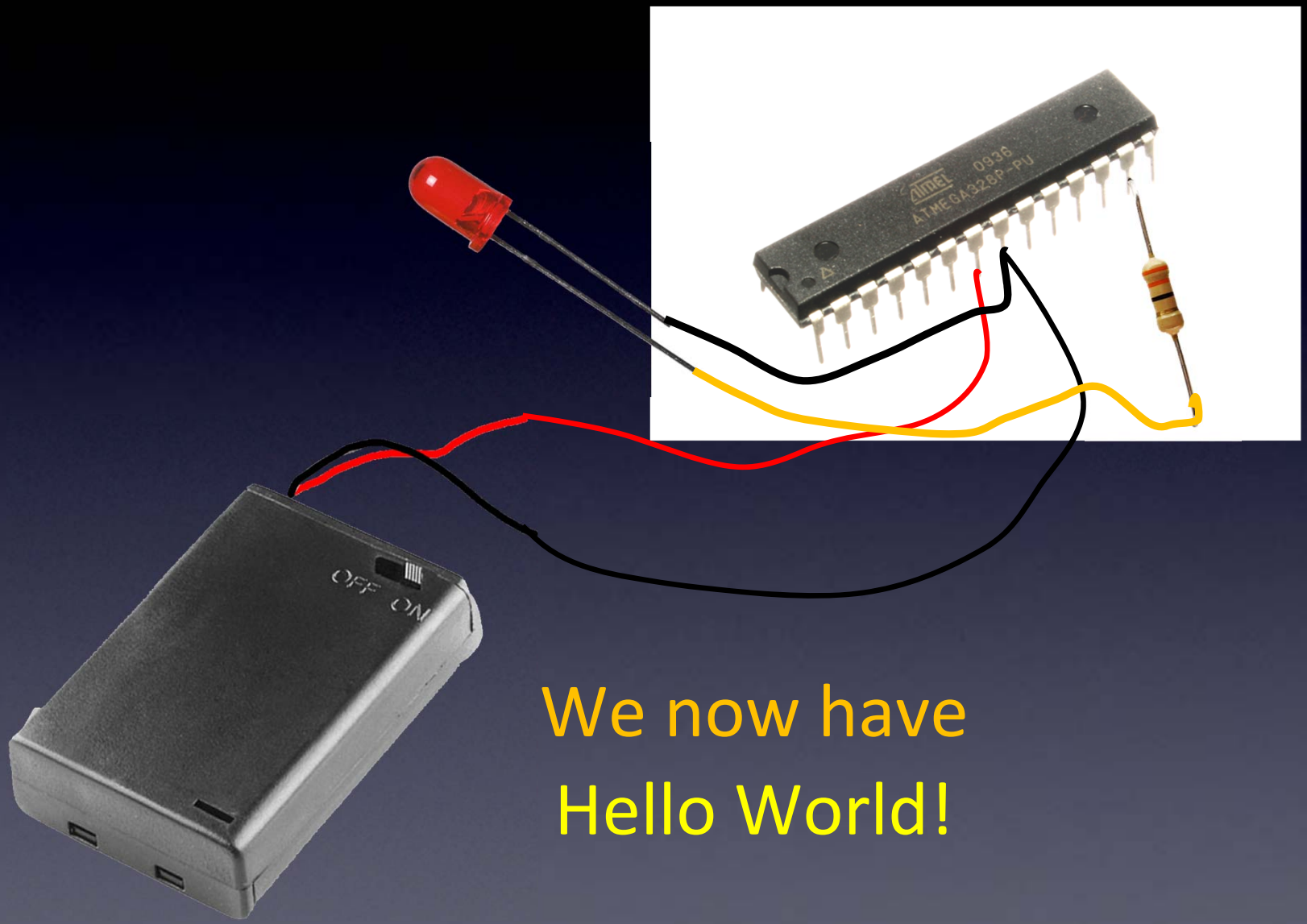


Pin 13:
Set it to Low

Hello World -- Firmware

Microcontroller

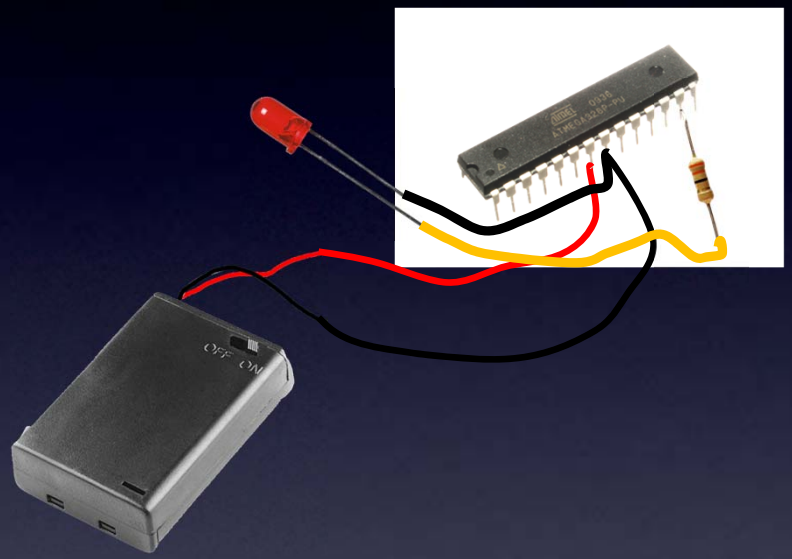
Everything You Need to Know About Electronics



We now have
Hello World!

Microcontroller

Everything You Need to Know About Electronics



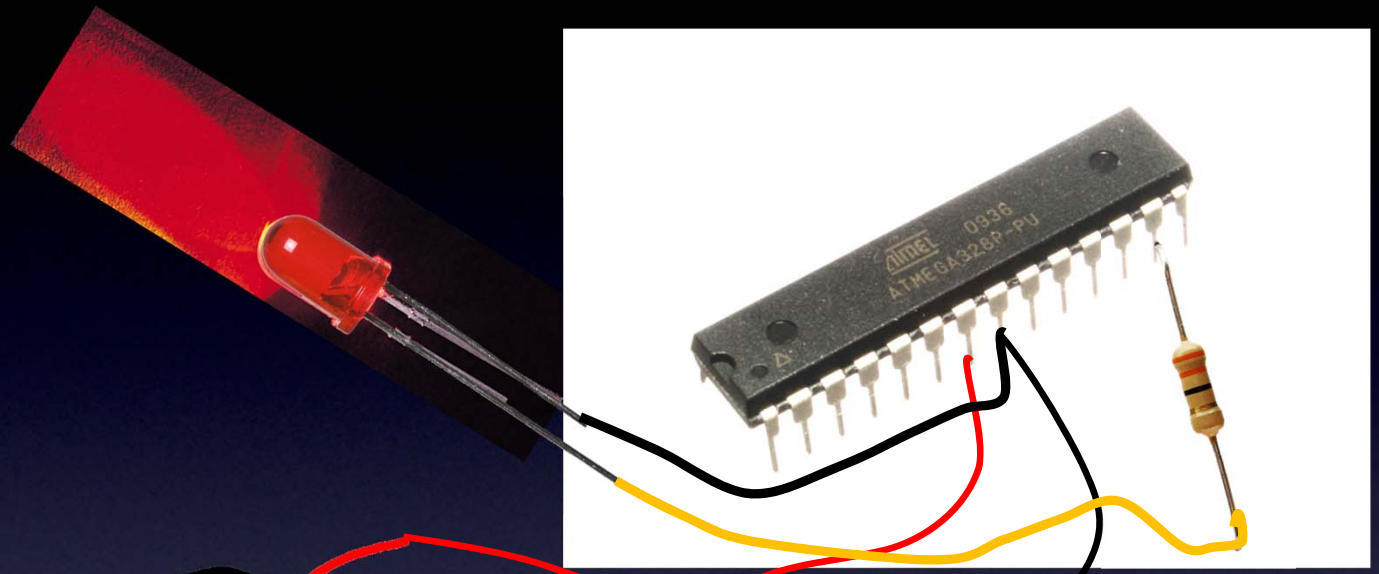
We now have
Hello World!

Except

We won't see it ☹

Microcontroller

Everything You Need to Know About Electronics



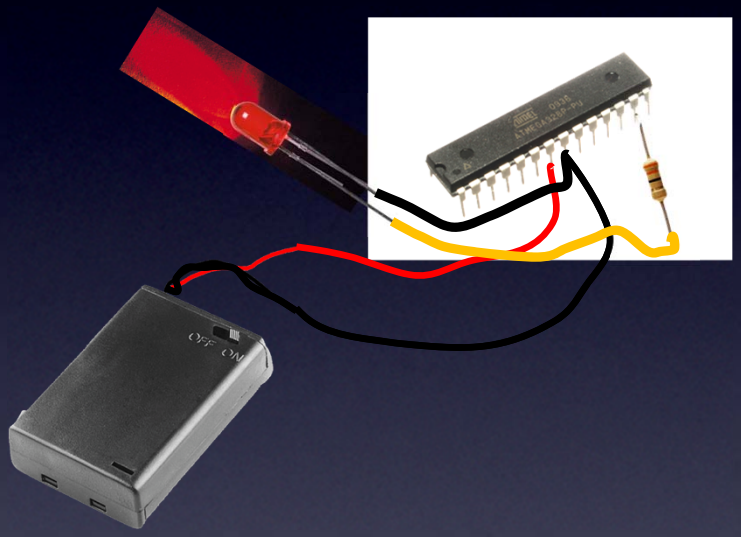
We need a delay

Hello World – for real now!

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**

Programs on microcontrollers are called “Firmware”

Hello World

Microcontroller – Firmware

Everything You Need to Know About Electronics

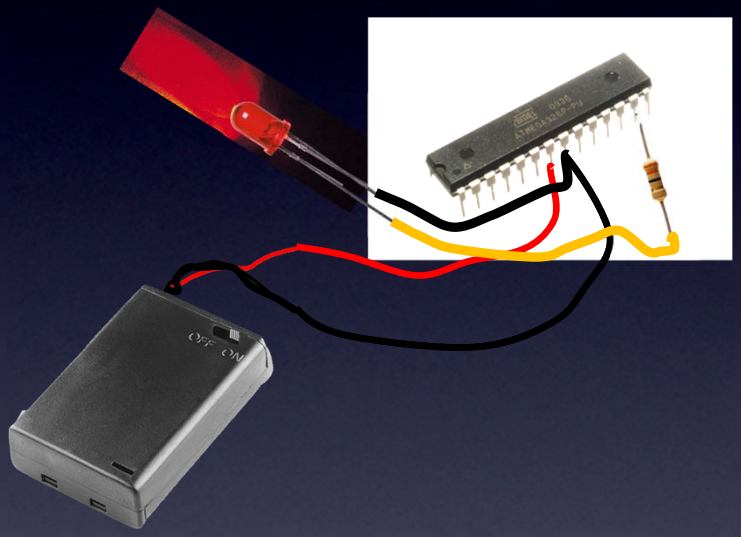
A precision cut piece of quartz crystal

For precise timing

Crystal

Everything You Need to Know About Electronics

Hardware



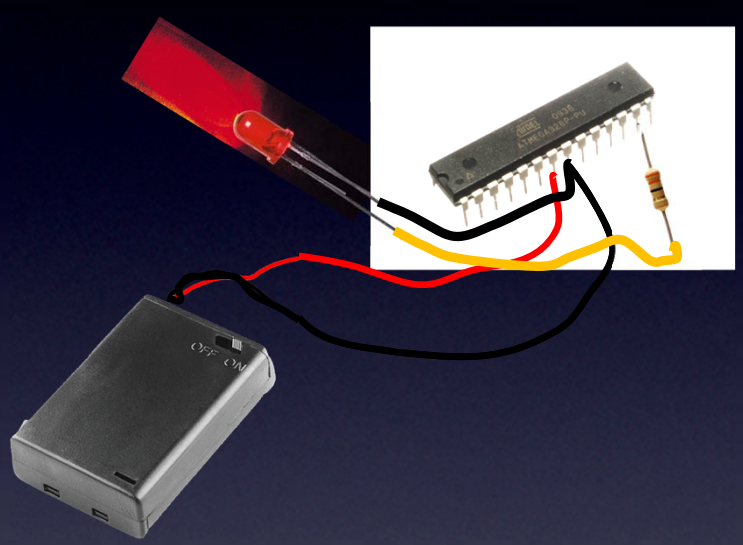
Firmware

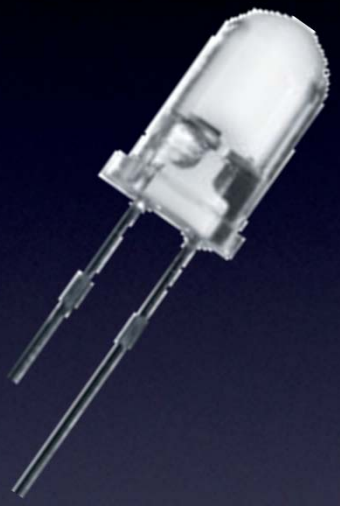
- **pin 13 is Output pin**
- **set pin 13 High**
- **delay**
- **set pin 13 Low**

Let’s hack Hello World!

Microcontroller

Everything You Need to Know About Electronics



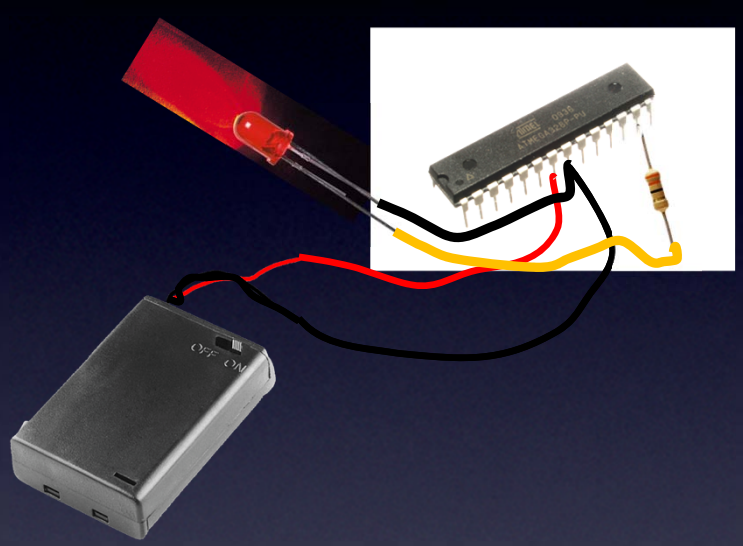


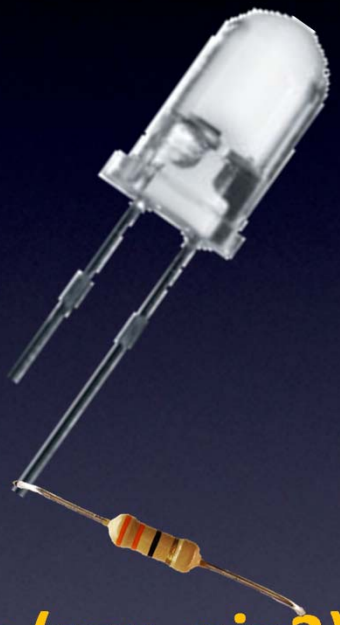
Add an IR LED to another pin

IR “OFF” code

Microcontroller

Everything You Need to Know About Electronics



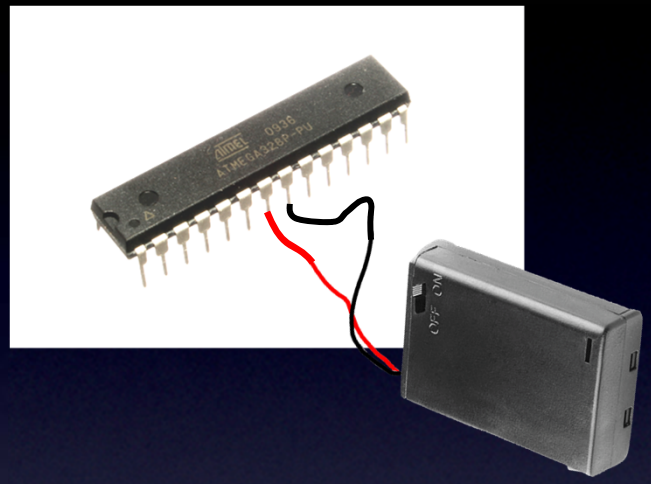


Add an IR LED to another pin (say, pin3)
and a resistor so no magic smoke goes away

IR “OFF” code

Microcontroller

Everything You Need to Know About Electronics

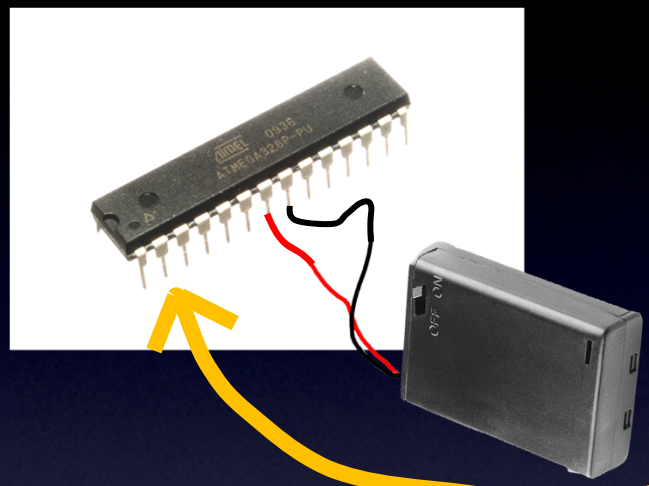


Let’s add an Input pin!

We can add a Start button

Microcontroller

Everything You Need to Know About Electronics



How do we make a pin an Input pin?

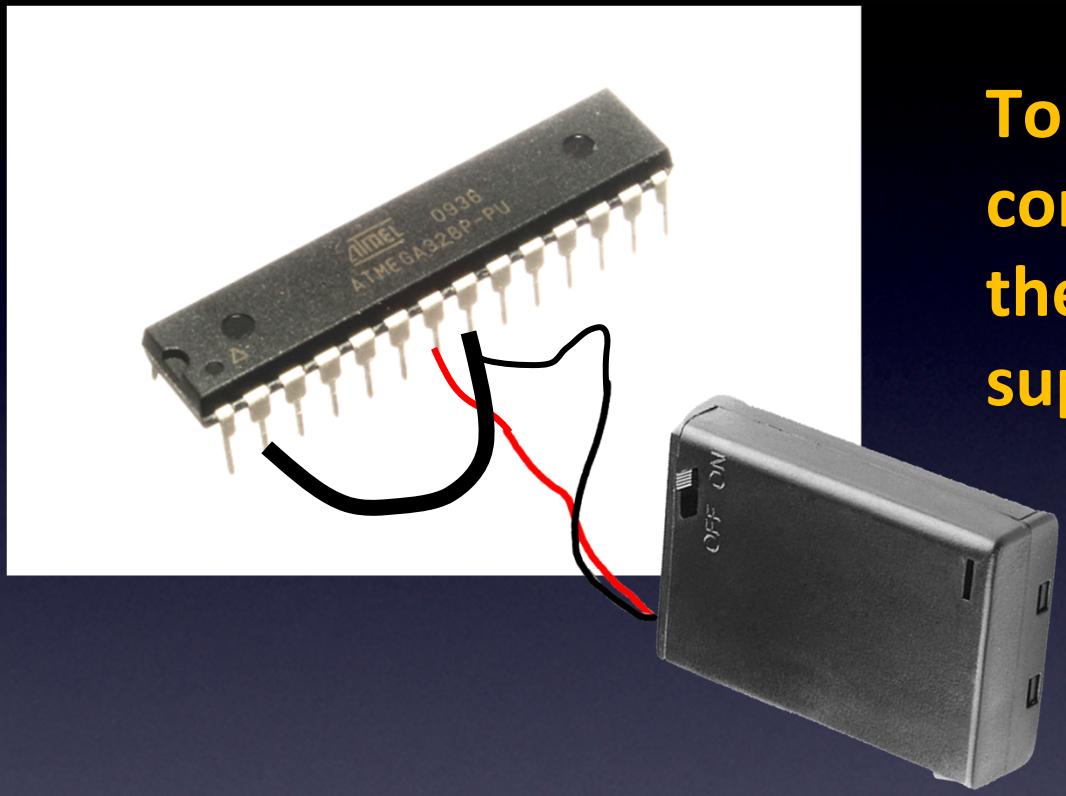
We tell it to be one – with our program.

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

Only 2 choices: High or Low

Microcontroller – Input Pin

Everything You Need to Know About Electronics

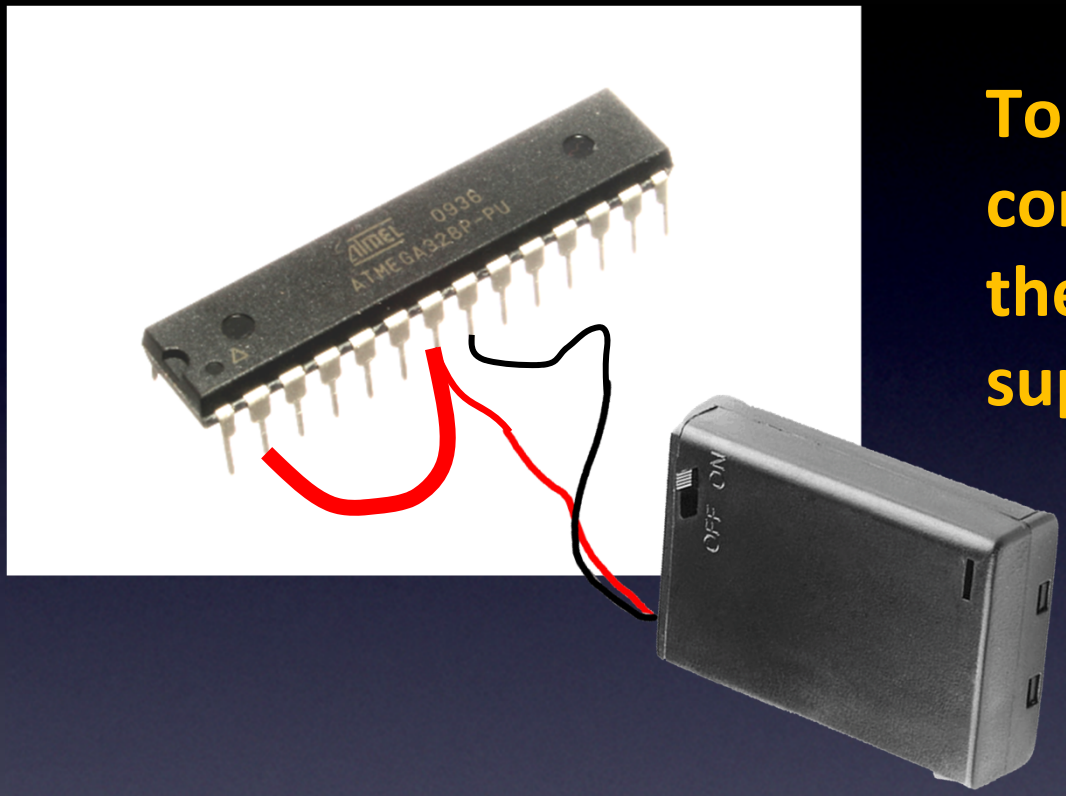


To make the Input pin Low, connect it to the Black wire of our power supply (Ground).

Low

Microcontroller – Input Pin

Everything You Need to Know About Electronics

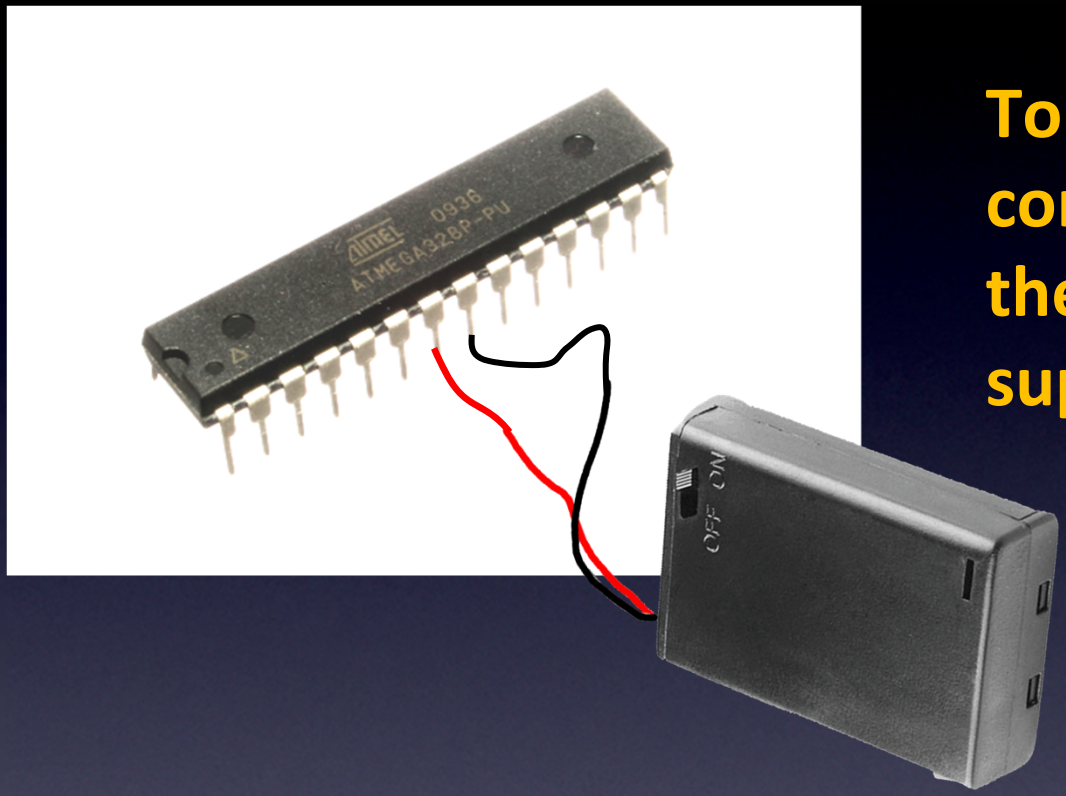


To make the Input pin High, connect it to the Red wire of our power supply (Vcc).

High

Microcontroller – Input Pin

Everything You Need to Know About Electronics



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

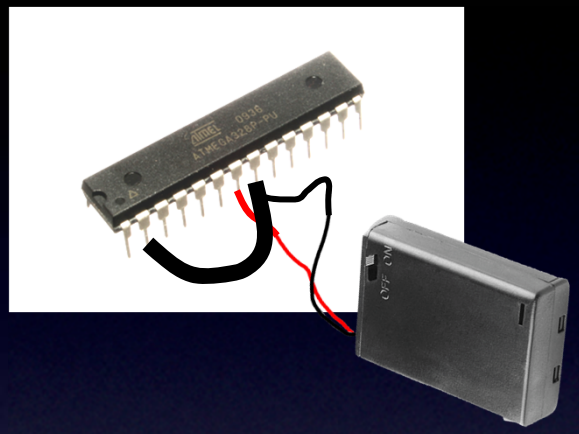
OR:

just leave it blank

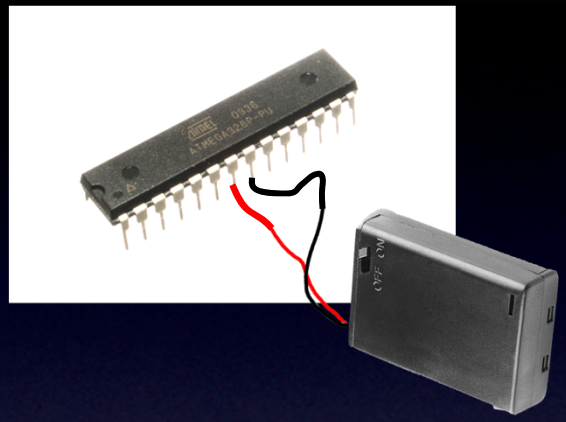
High

Microcontroller – Input Pin

Everything You Need to Know About Electronics



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

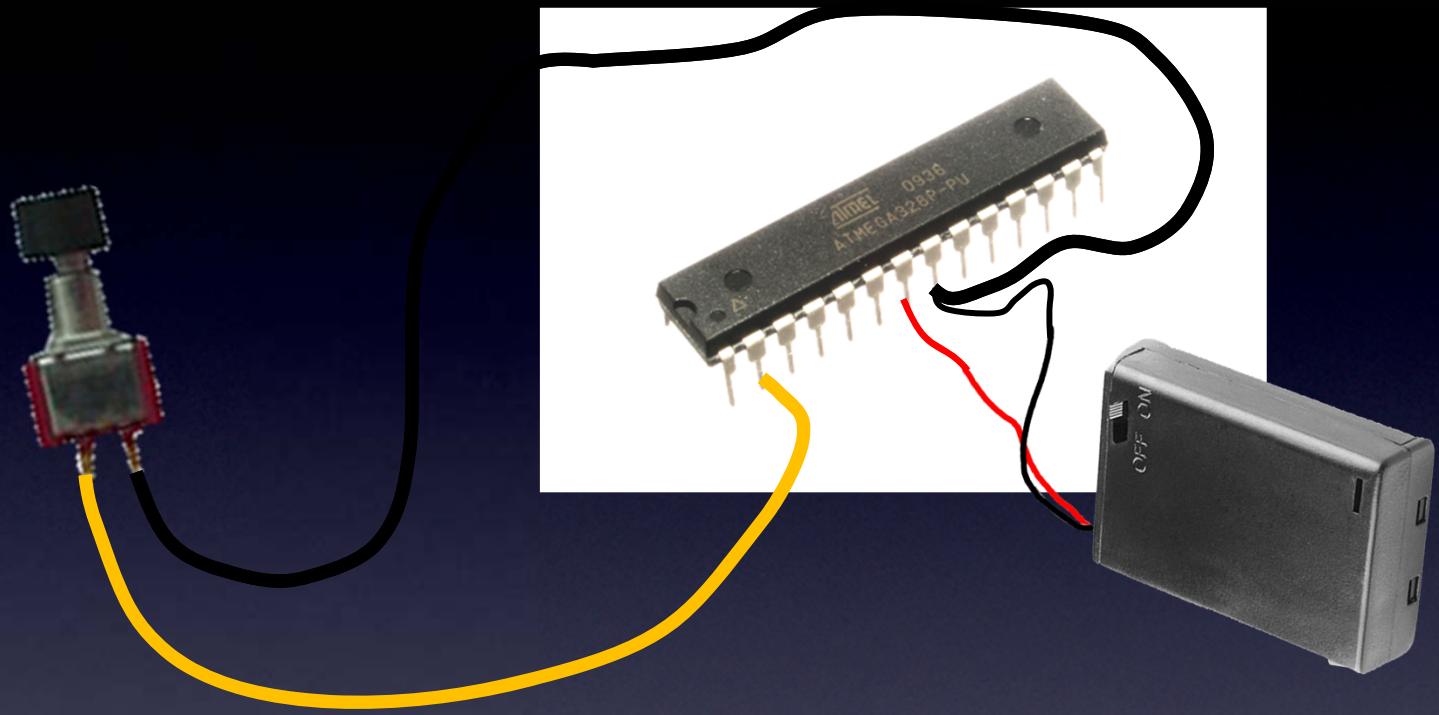


If firmware looks at Pin 2 when it's like this, it reports back: High

Reading the Input pin

Microcontroller – Input Pin

Everything You Need to Know About Electronics

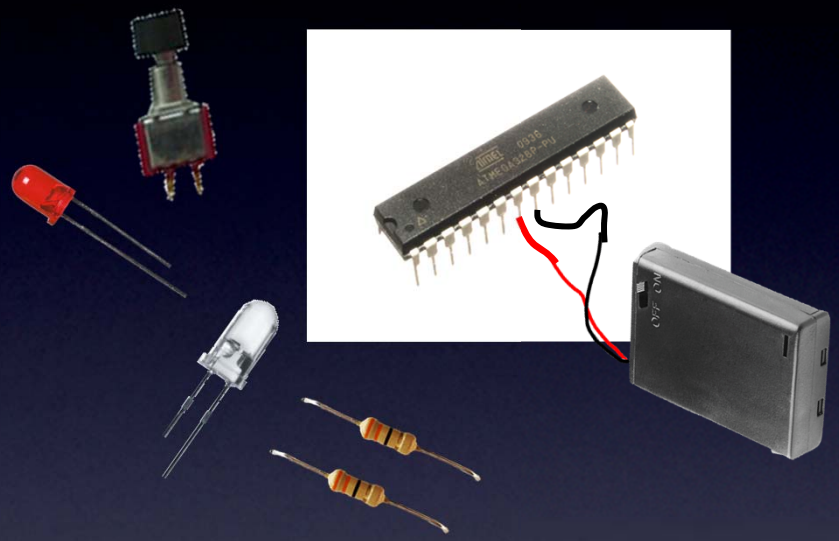


Reading the Input pin with a Switch

Microcontroller – Input Pin

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…

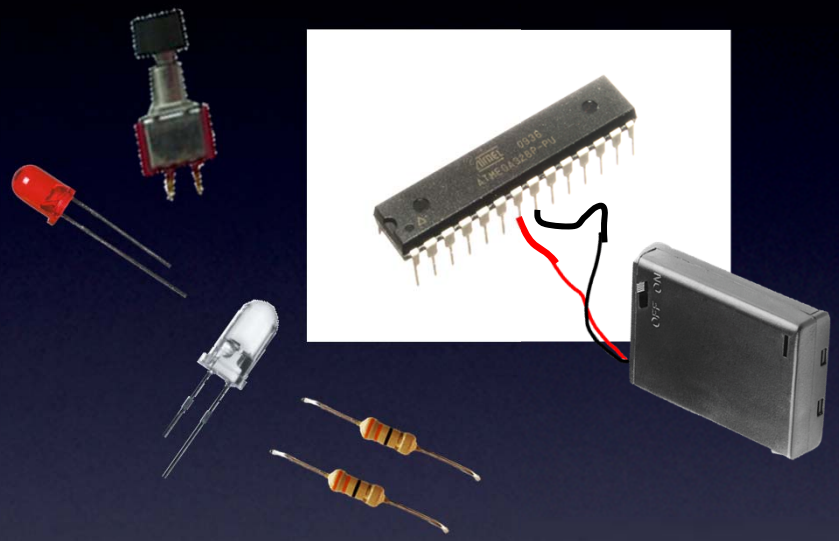
Etc for all "OFF" codes

TV-B-Gone remote control

Microcontroller

Everything You Need to Know About Electronics

Hardware



Except

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

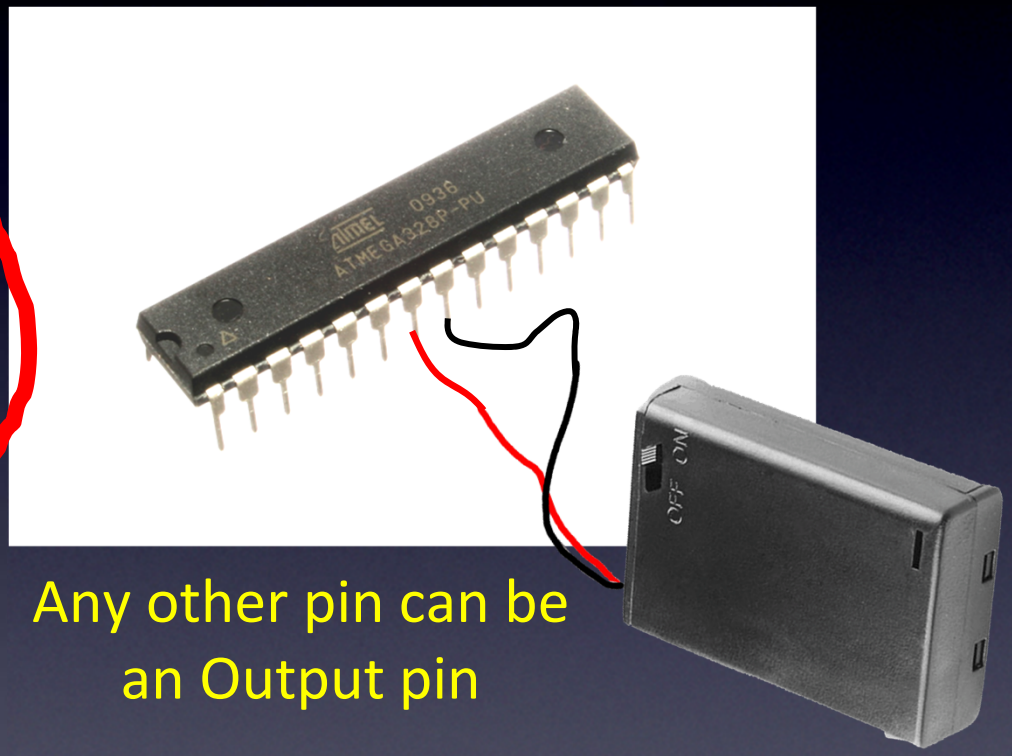
Review:

Low

Off
(0V)

High

almost **the same**
as the Red wire
of the power supply



Any other pin can be
an Output pin

Output pin – only 2 choices: High or Low

Microcontroller – Output Pin

Everything You Need to Know About Electronics

Low

Off

(0V)

High

***almost* the same**

as the Red wire

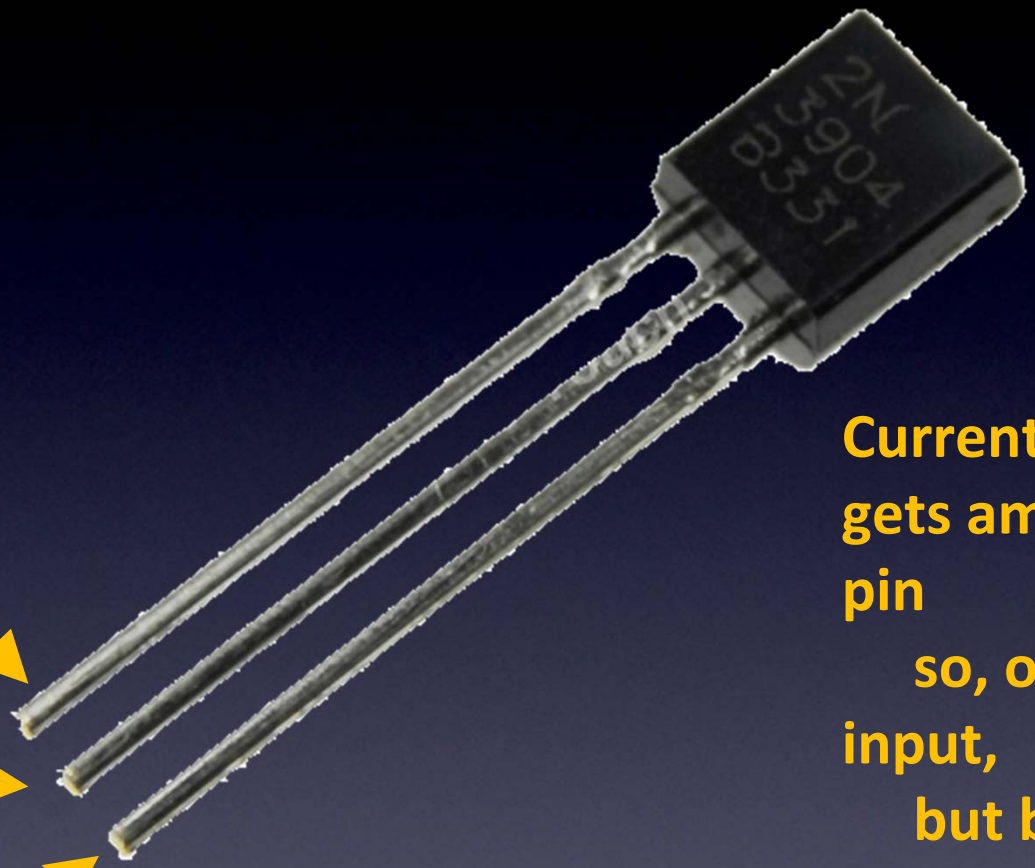
of the power supply

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

Output pin – only limited current

Microcontroller – Output Pin

Everything You Need to Know About Electronics



Ground

Input

Output

Current on input pin gets amplified on output pin

so, output is the same as input,

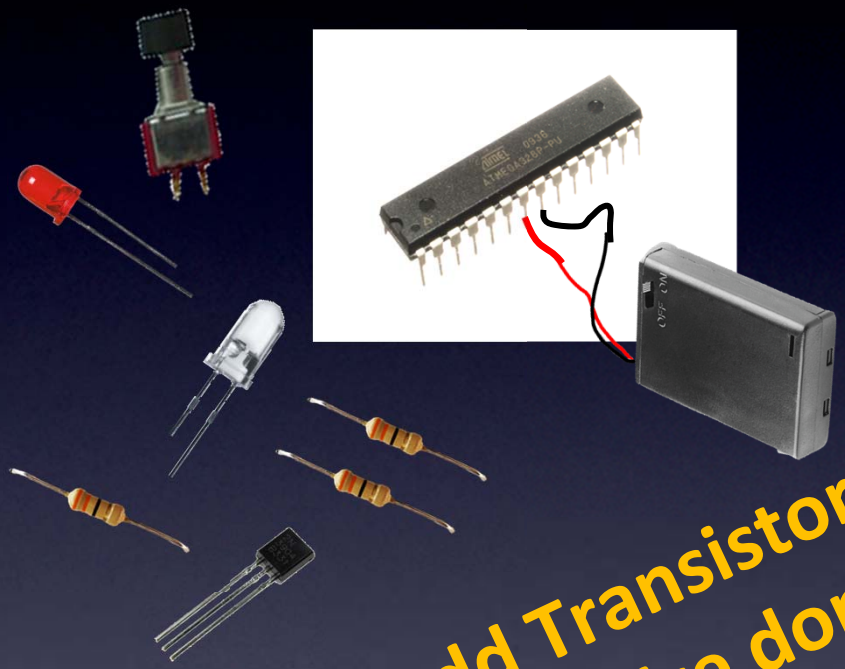
but bigger current!

Current amplifier

Transistor

Everything You Need to Know About Electronics

Hardware



Add Transistor and, we're done!

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

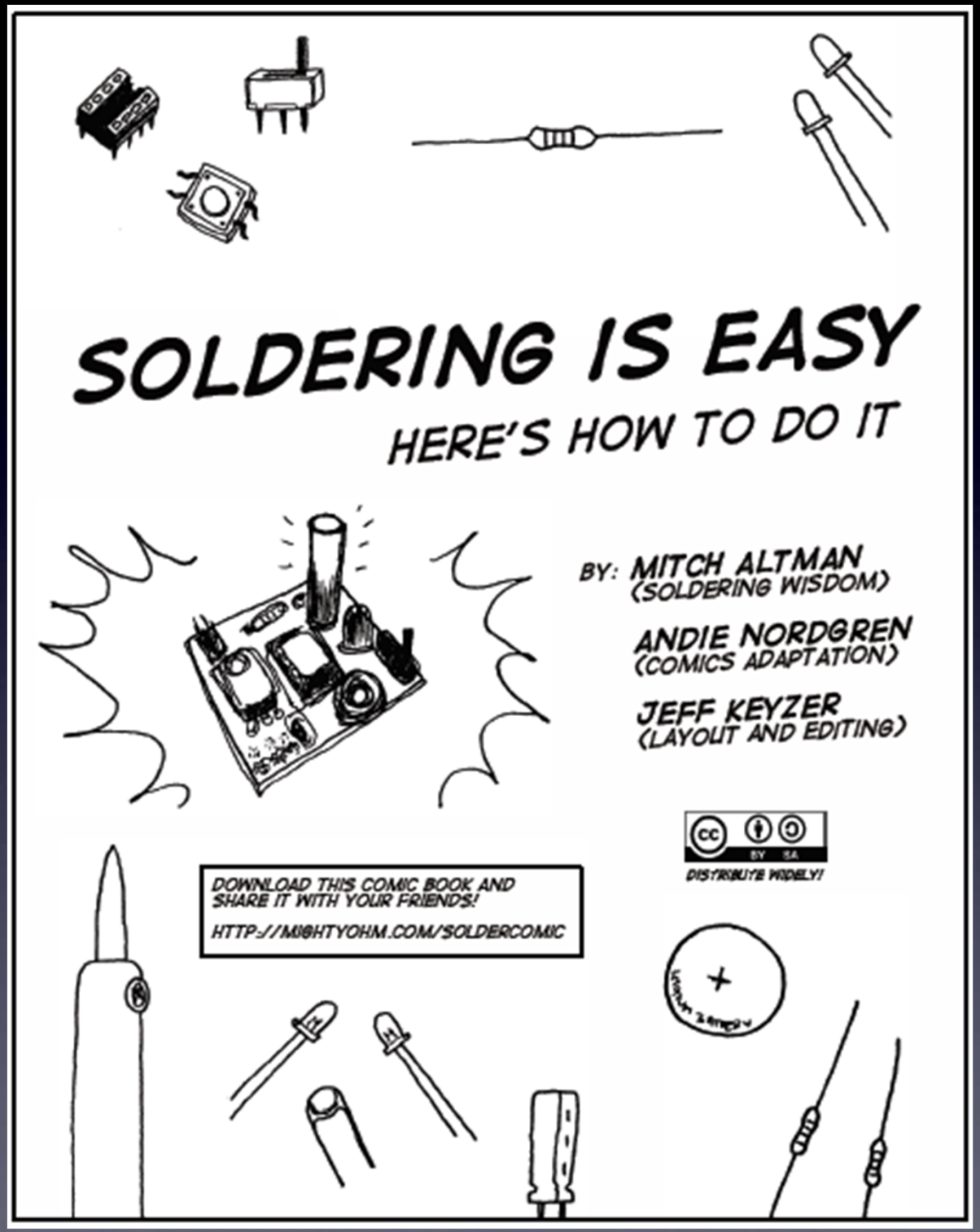
TV-B-Gone remote control – we're done!

Microcontroller

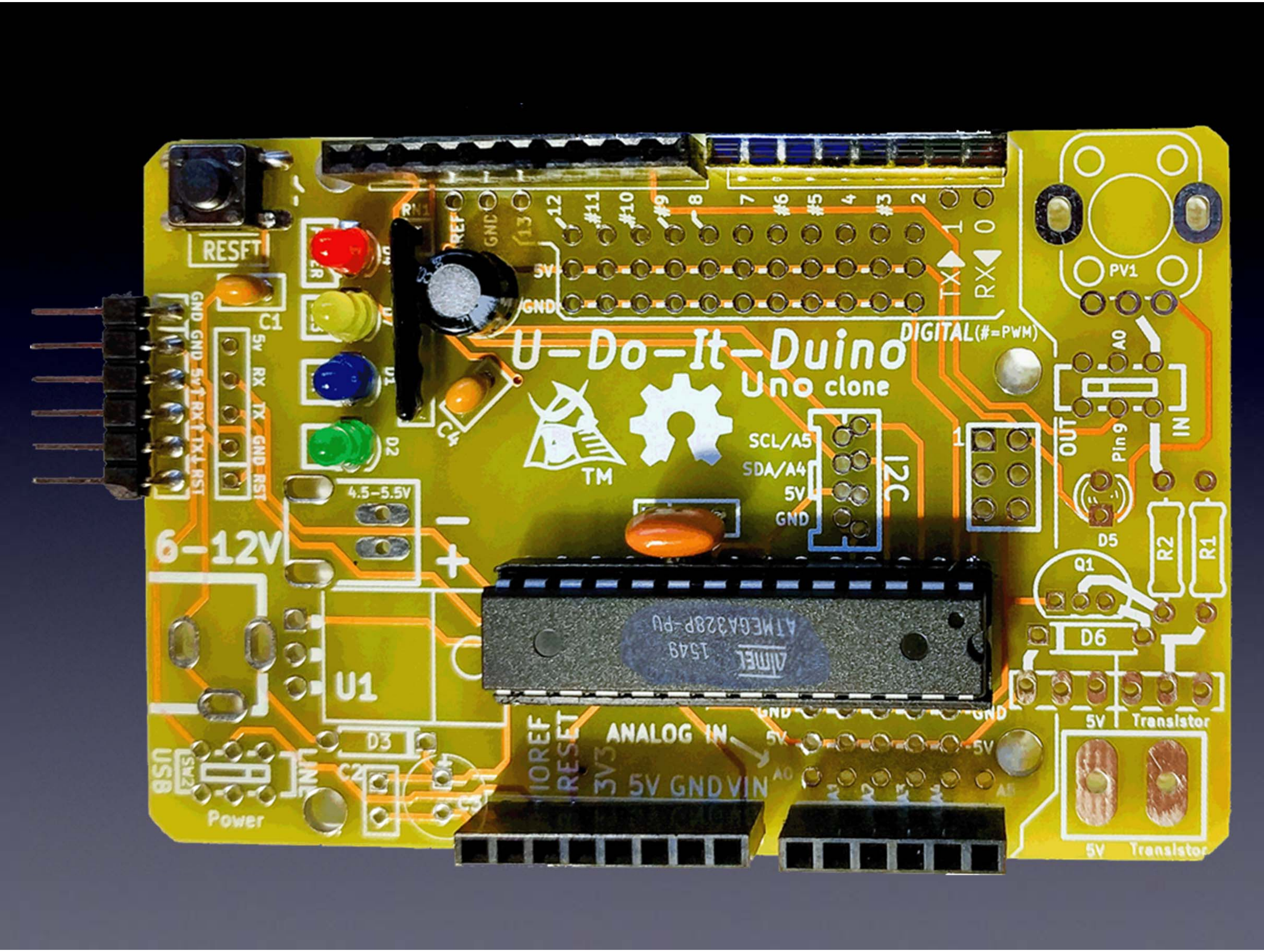
Everything You Need to Know About Electronics

Questions?

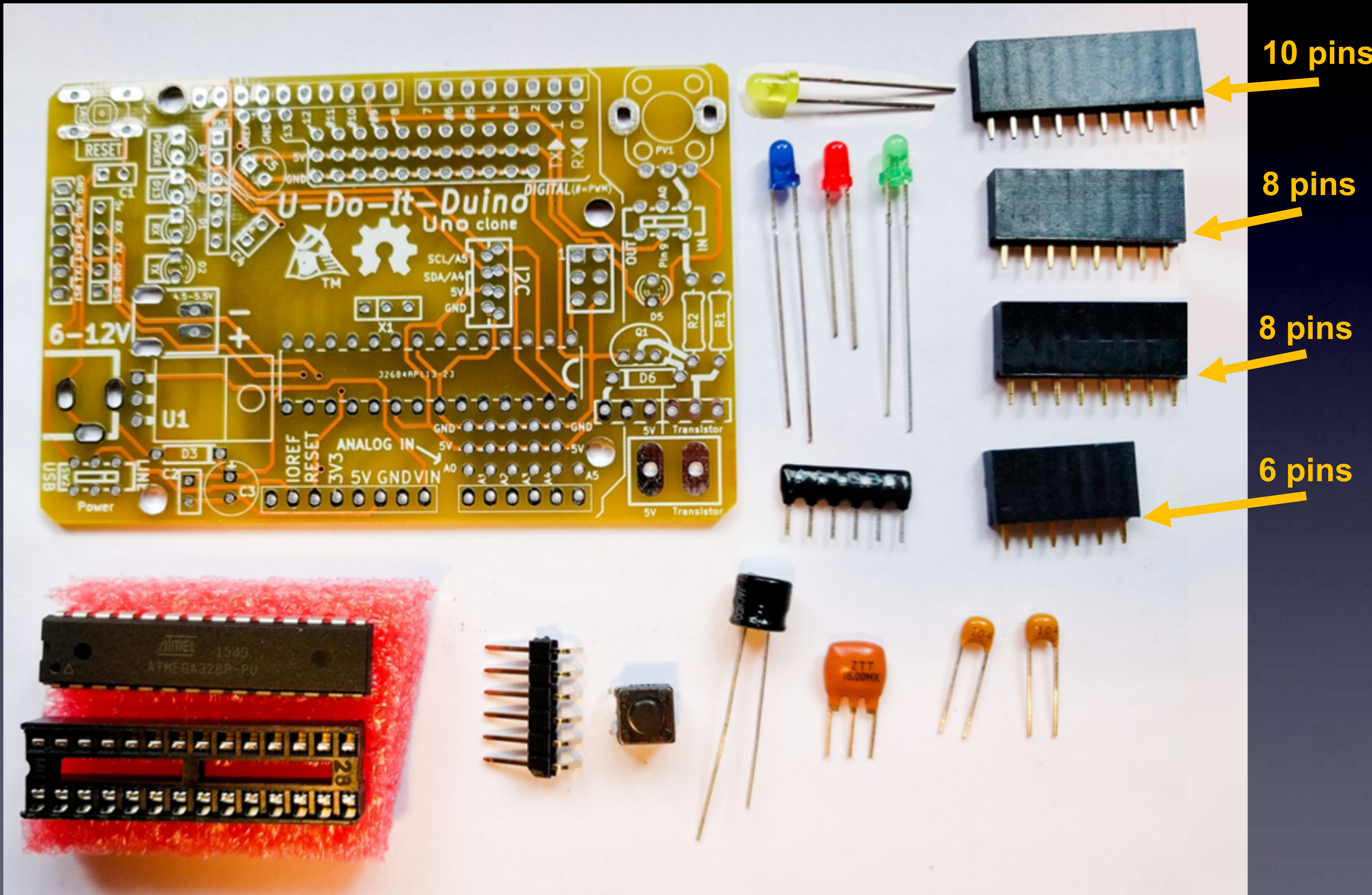
Learn To Solder



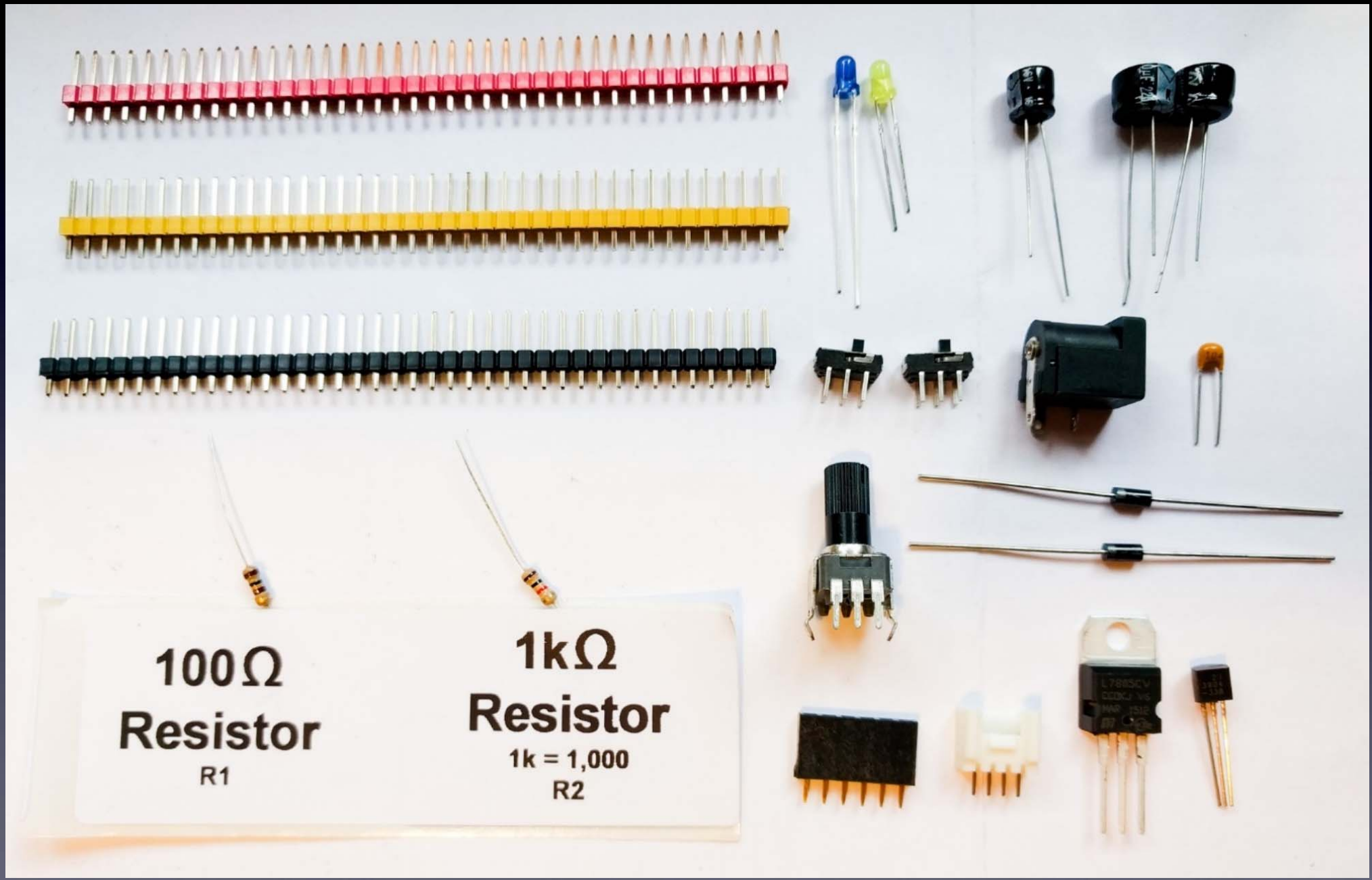
download for free at:
http://mightyohm.com/soldercomic


U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
TX
RX
RESET
C1
C4
D1
D2
6-12V
4.5-5.5V
U1
D3
Power
USB
TM
SCL/A5
SDA/A4
5V
GND
I2C
ATMEGA328P-PU
1549
Atmel
PV1
A0
OUT
IN
Pin 9
D5
D6
Q1
R1
R2
5V
Transistor
ANALOG IN
IOREF
RESET
3V3
5V GND VIN

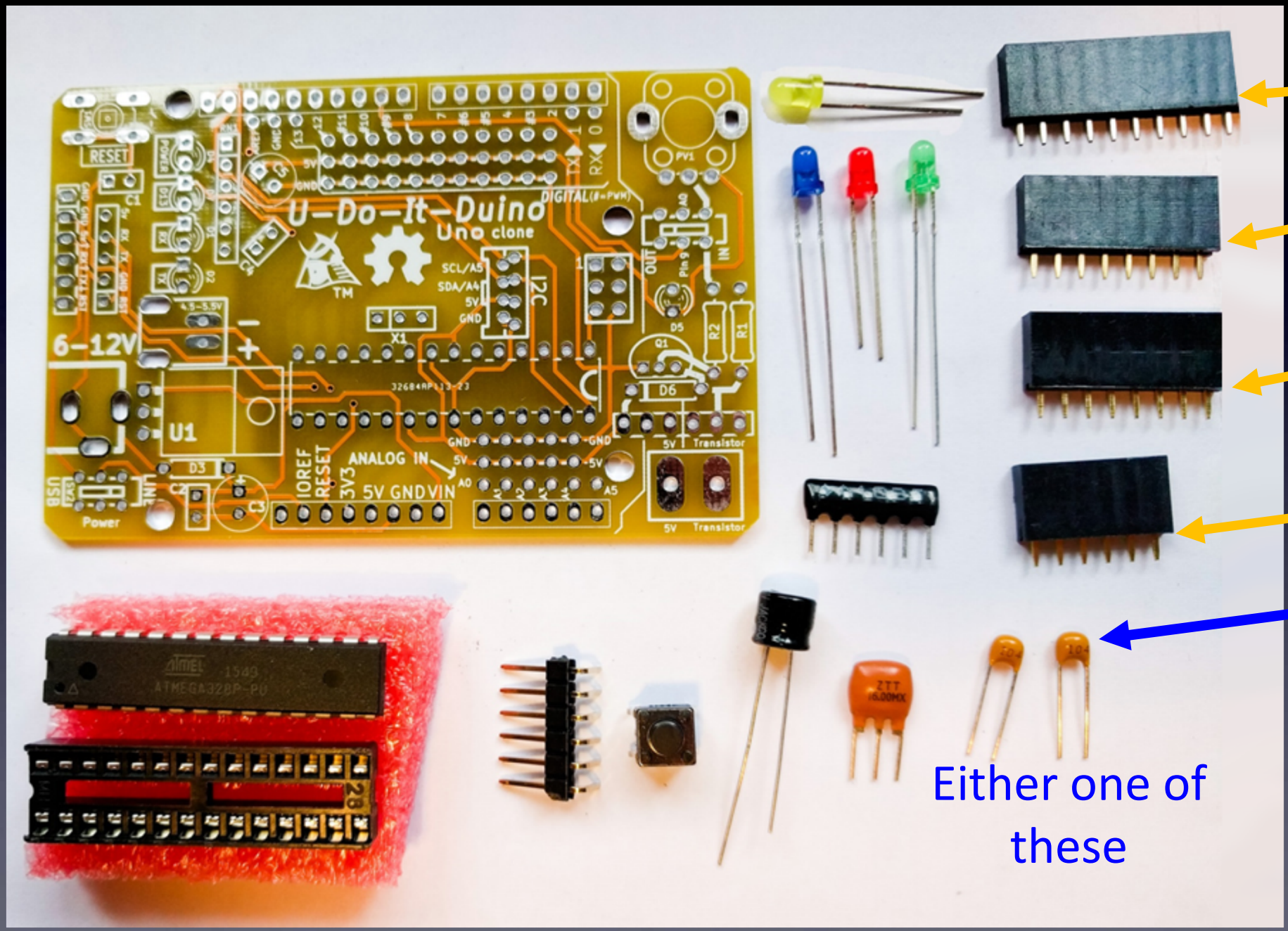
Parts to use



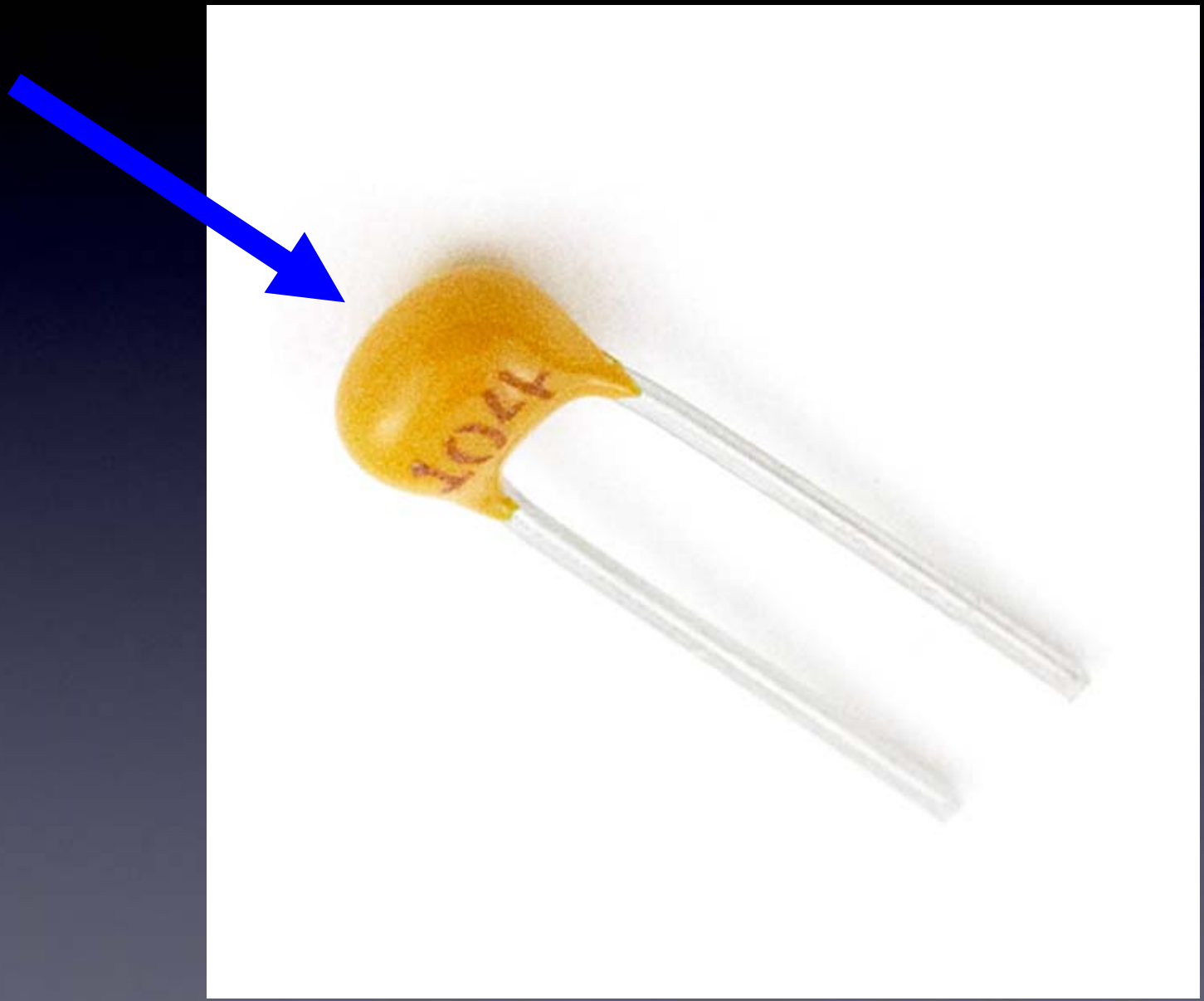
Unused parts

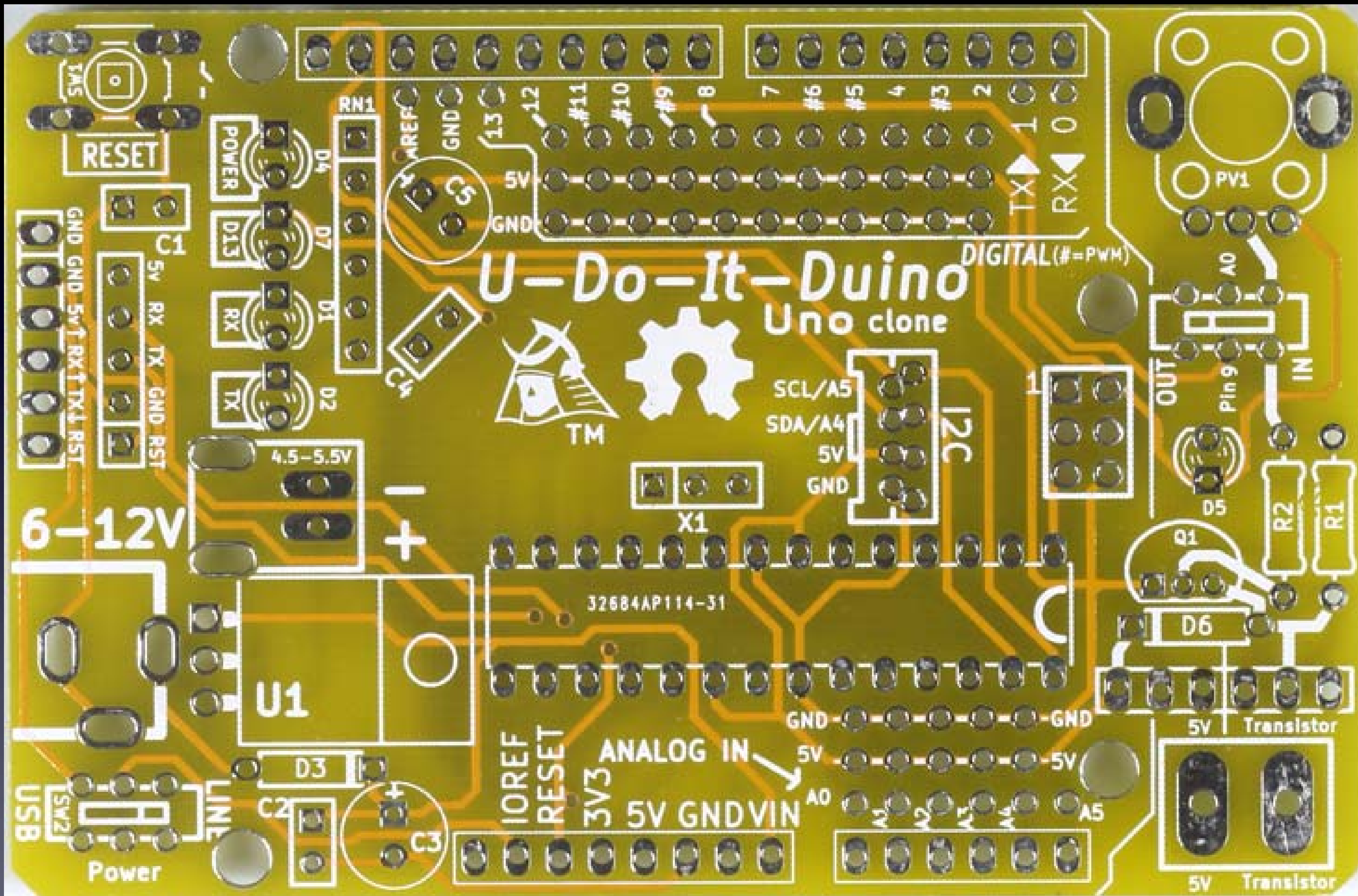


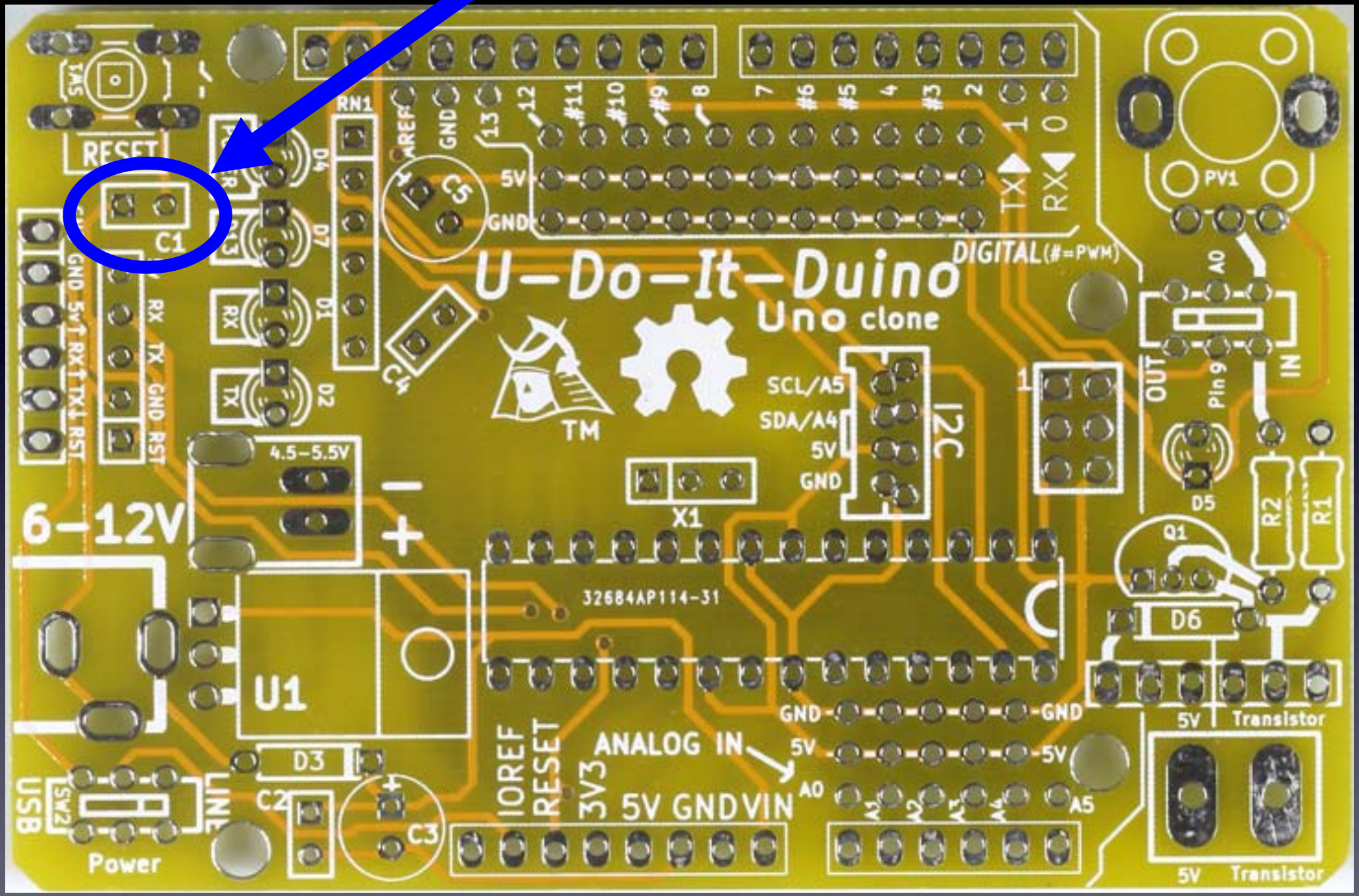
Our first part to solder: C1



C1: Look down at the shape of this part




U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
POWER
RN1
AREF
GND
13
12
#11
#10
#9
8
7
#6
#5
4
#3
2
TX 1
RX 0
5V
GND
C5
C1
C4
D4
D7
D1
D2
D13
RX
TX
PV1
A0
OUT
Pin 9
IN
SCL/A5
SDA/A4
5V
GND
I2C
TM
4.5-5.5V
6-12V
X1
32684AP114-31
D5
R2
R1
Q1
D6
5V
Transistor
U1
D3
C2
C3
USB
SW2
LINE
Power
IOREF
RESET
3V3
5V GND VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
GND
5V


U-Do-It-Duino
Uno clone
TM
DIGITAL(#=PWM)
RESET
SW1
C1
RN1
AREF
GND
13
12
#11
#10
#9
8
7
#6
#5
4
#3
2
1
0
TX
RX
5V
GND
C5
C4
PV1
A0
OUT
IN
Pin 9
D5
R2
R1
Q1
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5V
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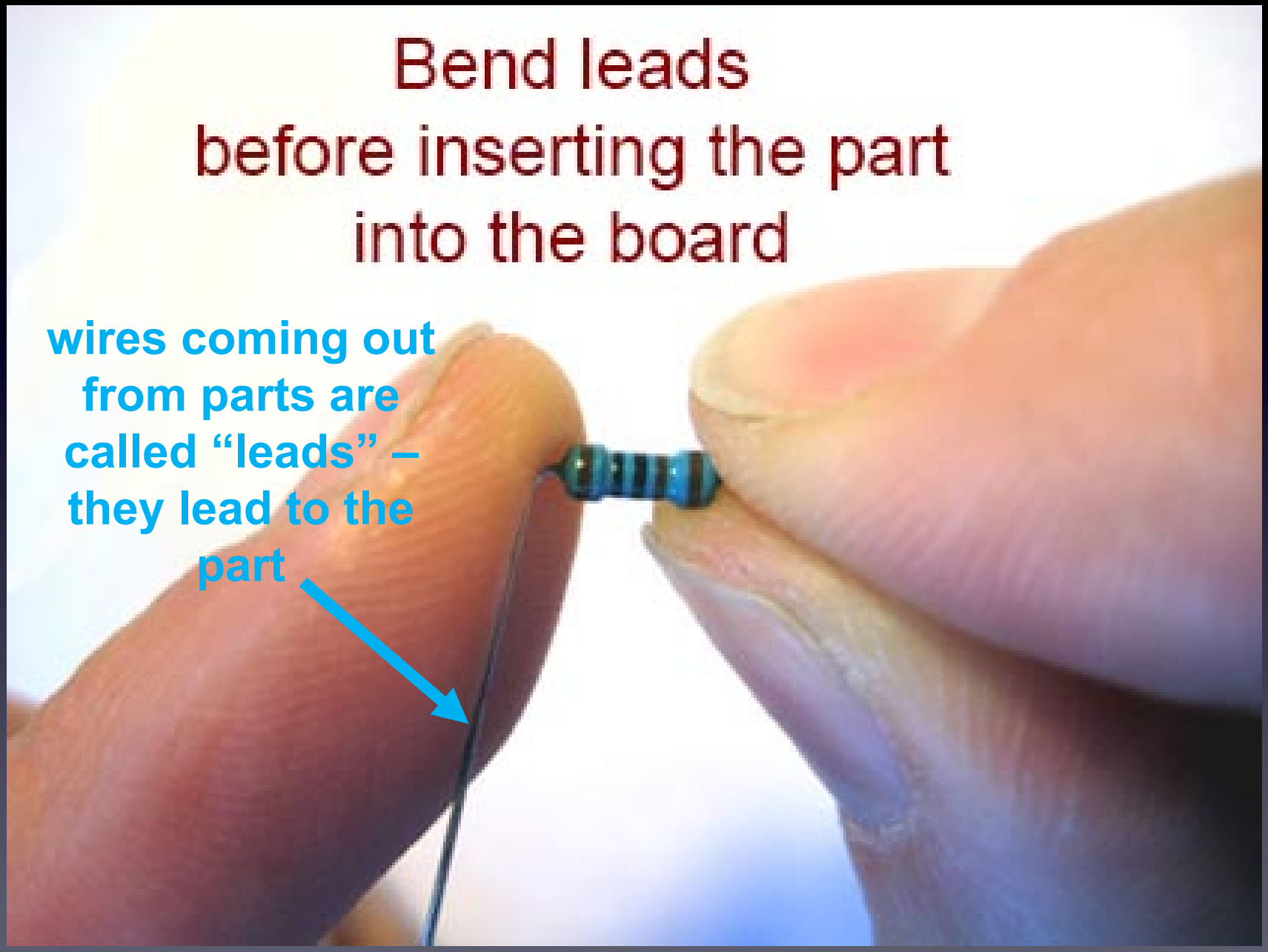
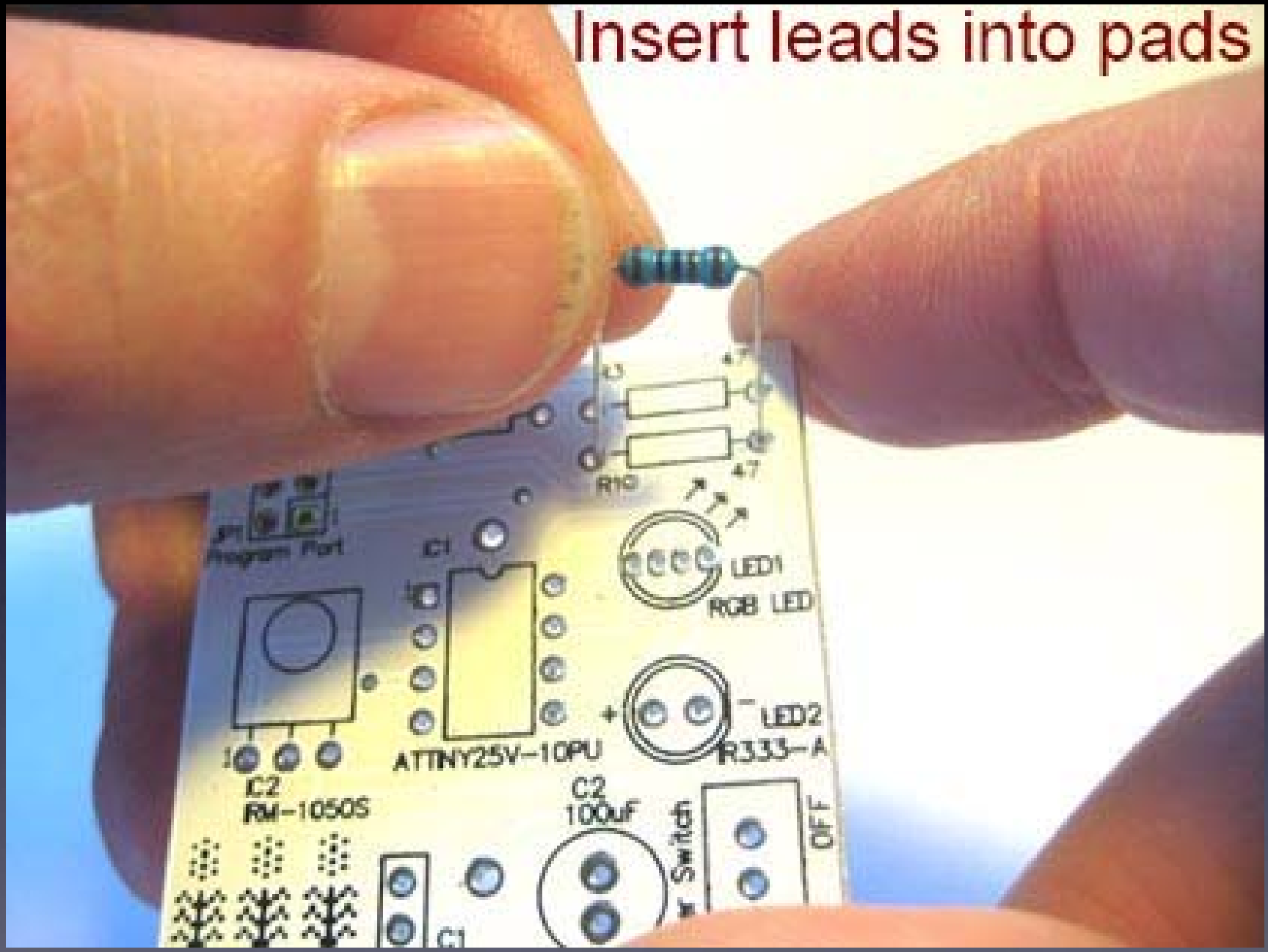
U1
D3
C2
C3
USB
SW2
Power
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
D4
D7
D1
D2
RX
TX
GND
5V
RST

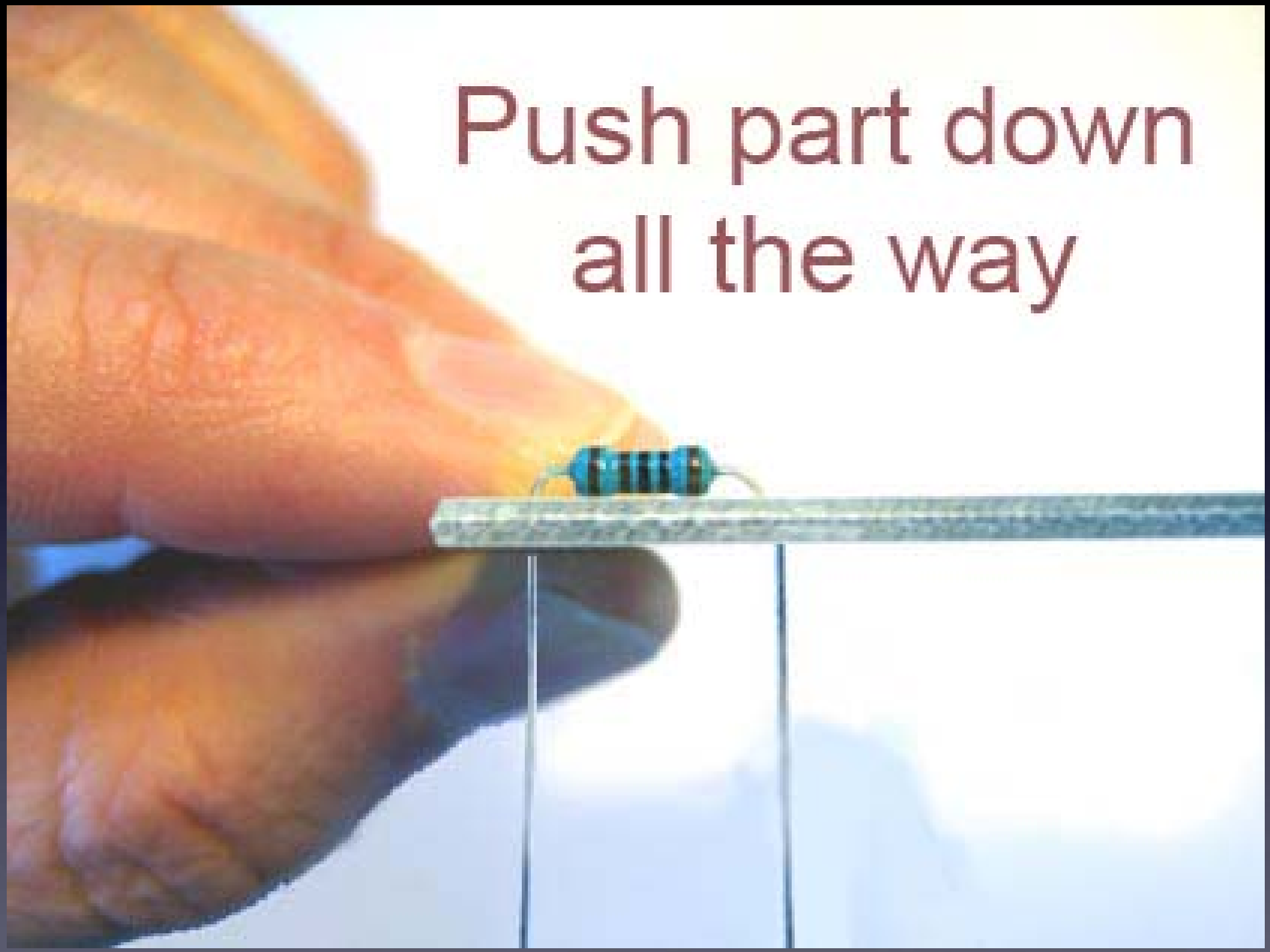
Bend leads before inserting the part into the board

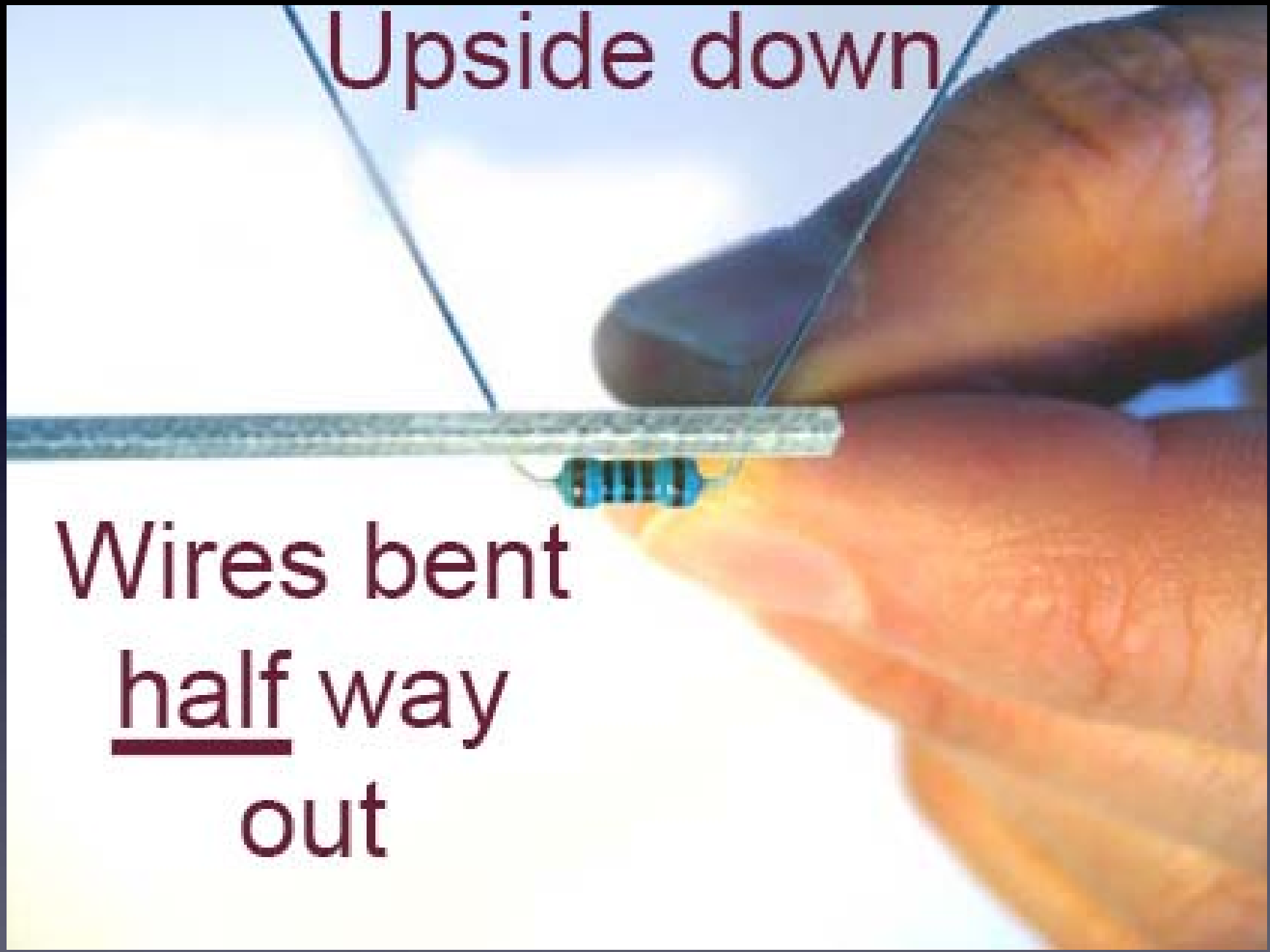


This is how a resistor look before inserting it into the board

C1: No need to bend leads first


Insert leads into pads
R10
LED1
RGB LED
IC1
ATTINY25V-10PU
LED2
IR333-A
IC2
RM-1050S
C2
100uF
Switch
OFF
C1


Push part down
all the way


Upside down
Wires bent
half way
out


104


102

How to hold a soldering iron

(Like a pencil – held from underneath)

The perfect kind of solder for electronics:

60/40 rosin core,

0.031” diameter (or smaller)

Important:

Use solder WITH lead (Pb) !!
Unleaded solder
has very poisonous fumes!

3 Safety Tips…

Safety Tip #1:

Hot !!

(When you touch the tip,
you *will* let go quickly every time!)

Safety Tip #2:

Lead (Pb) is toxic

But it easily washes off your hands with soap and water

Safety Tip #3:

(coming soon)

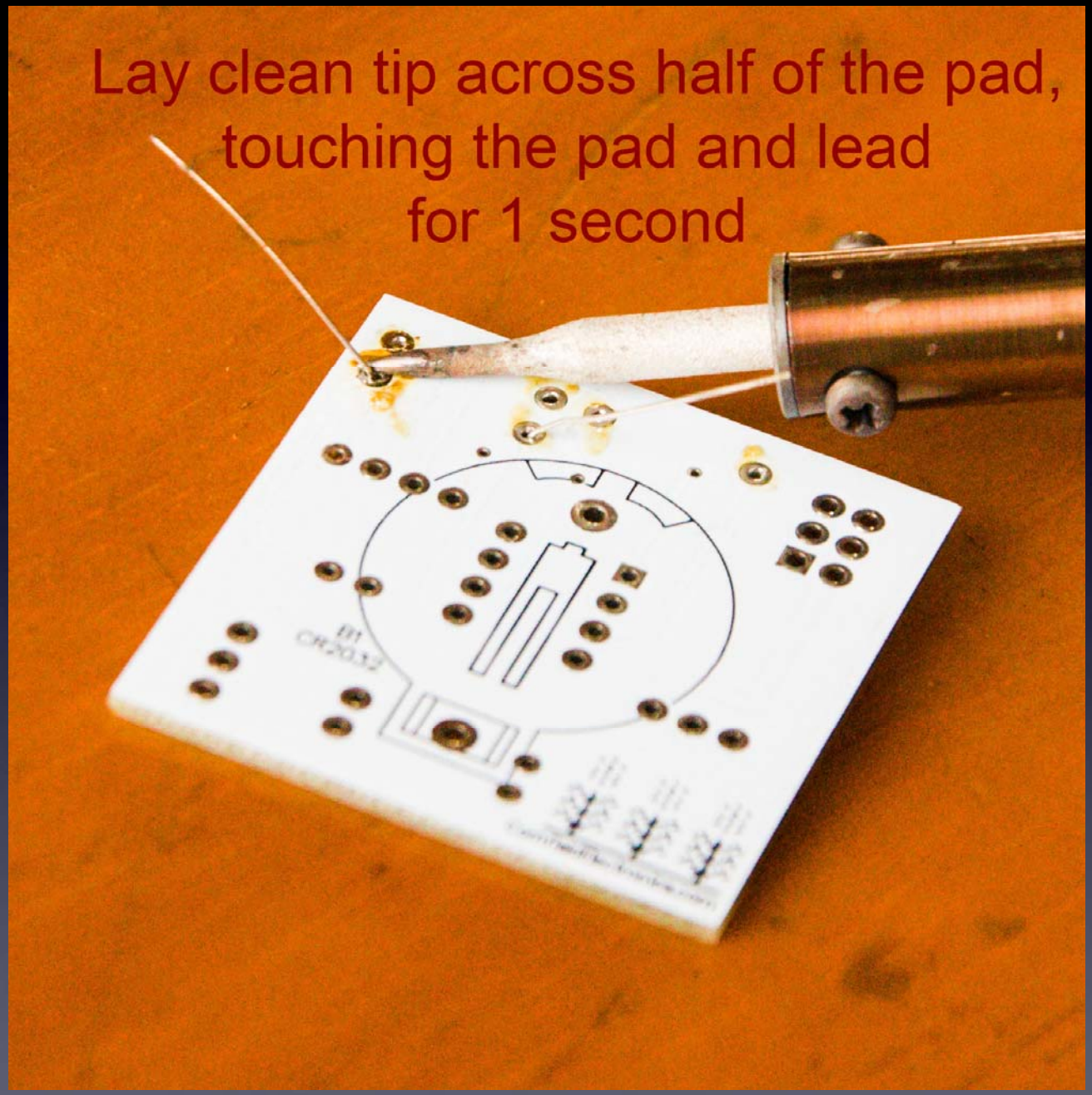
2 secrets
to good soldering…

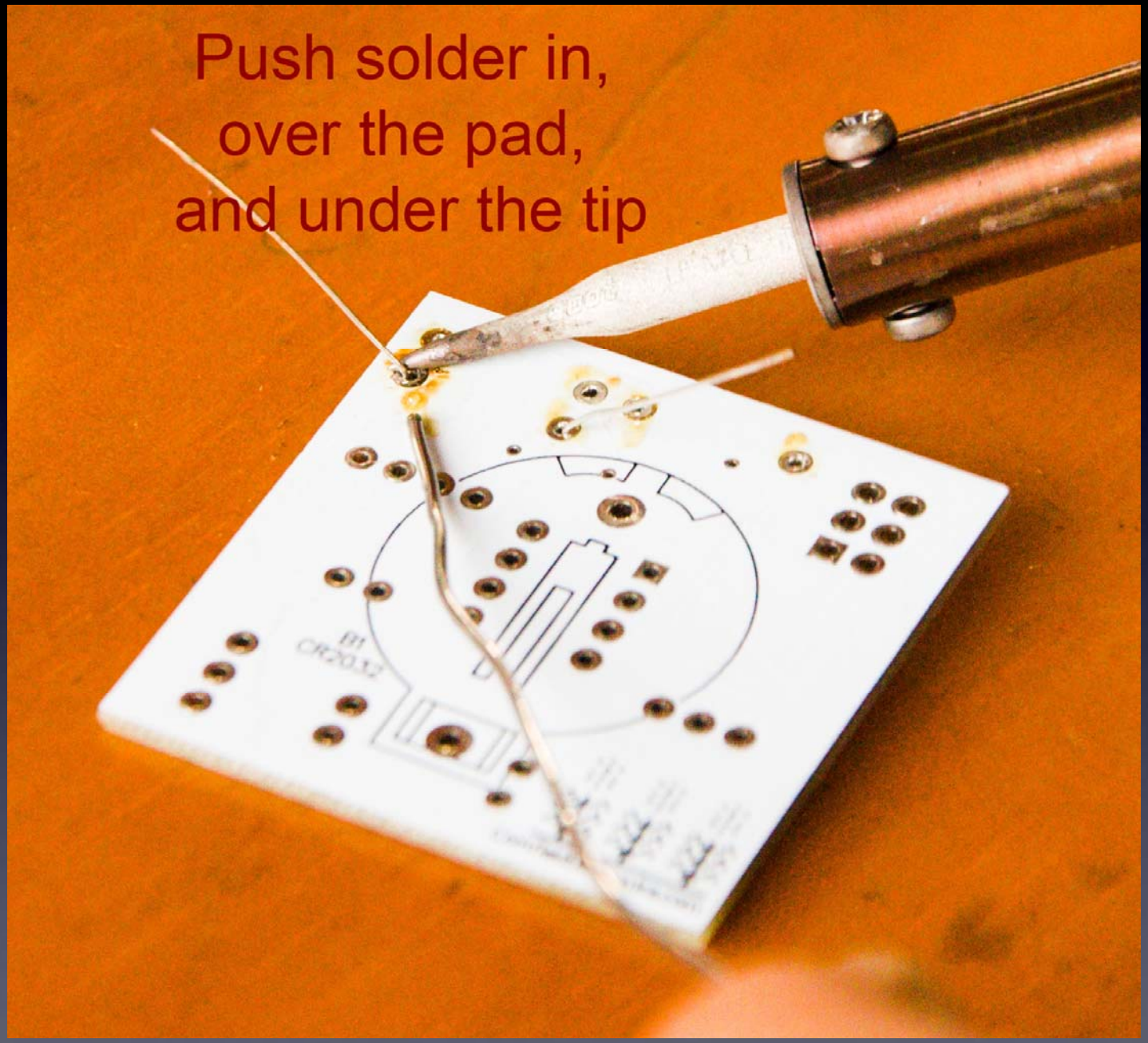
Secret #1:

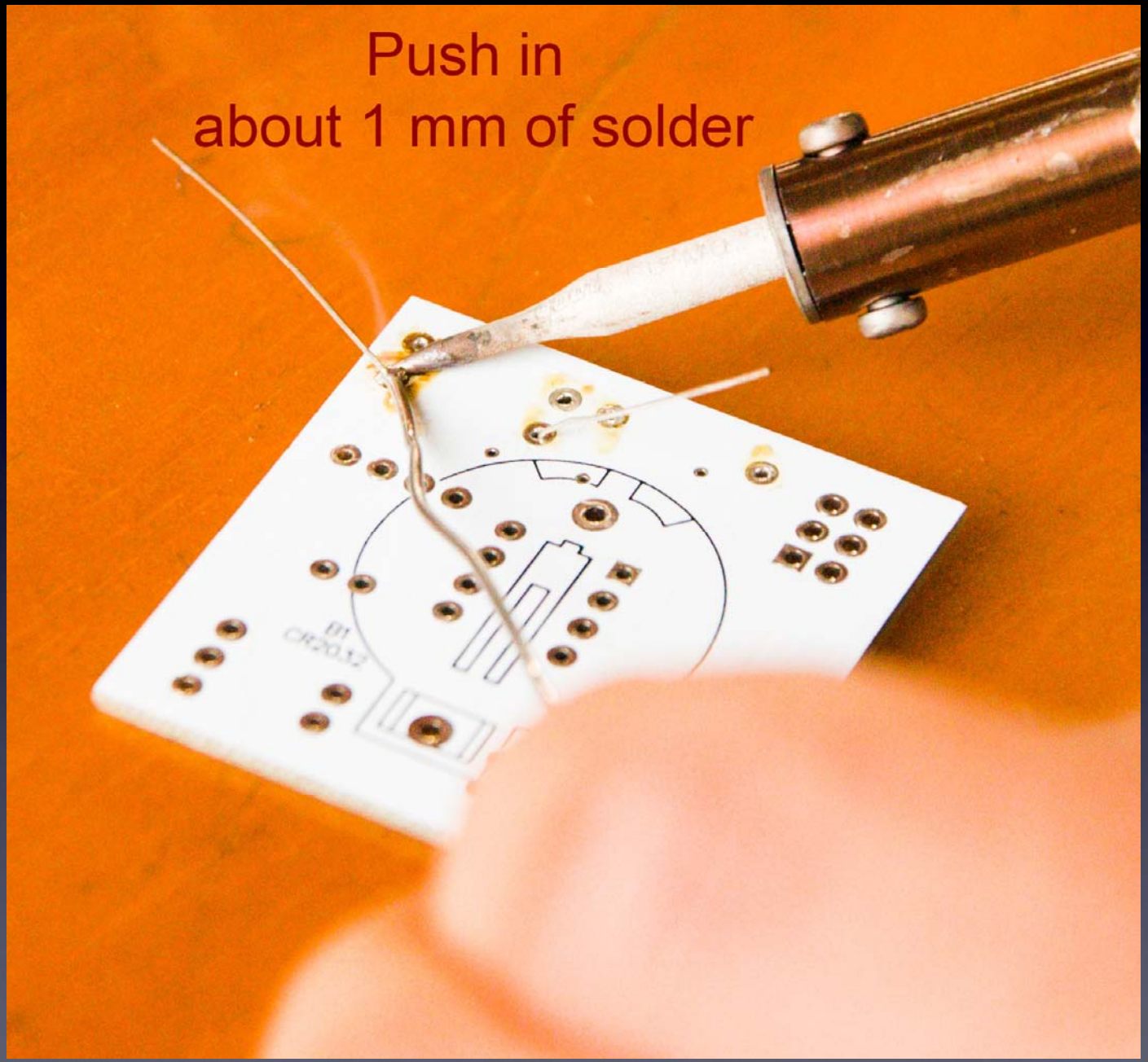
Clean the tip!

(before every solder connection)

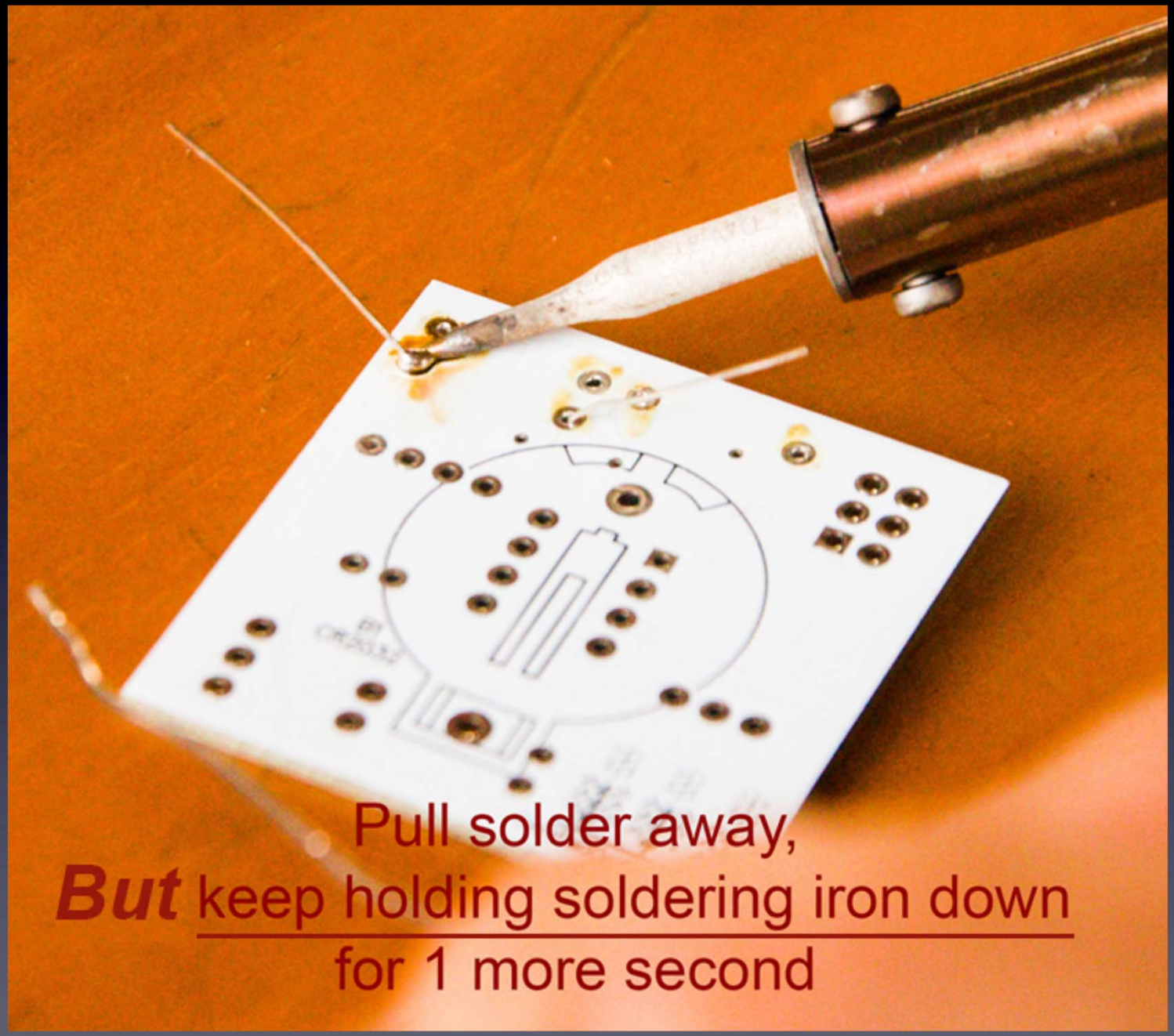
Bang (lightly) 3 times,
Swipe, Rotate, Swipe:
Keep the tip shiny silver!


Lay clean tip across half of the pad,
touching the pad and lead
for 1 second


Push solder in,
over the pad,
and under the tip

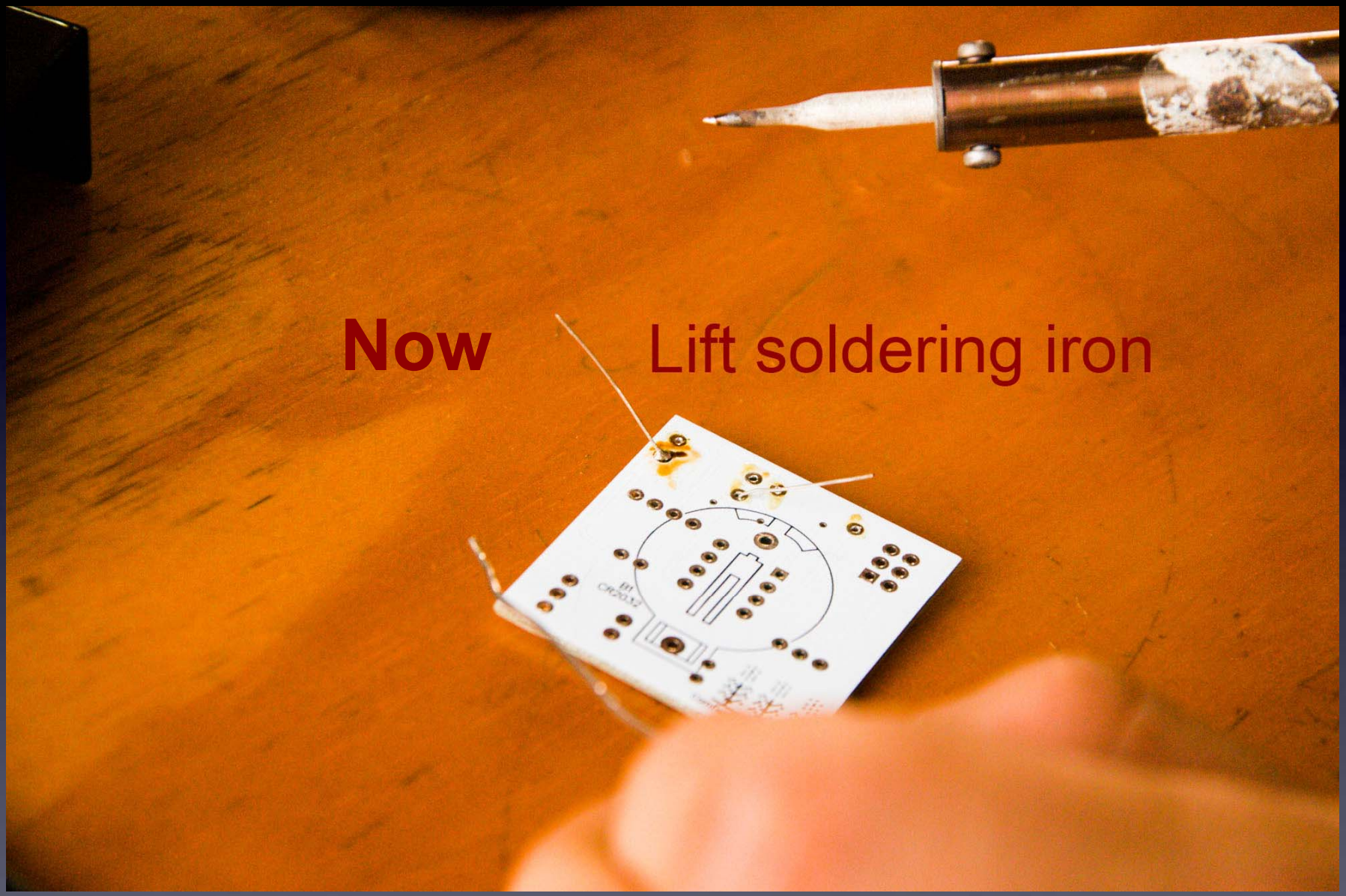


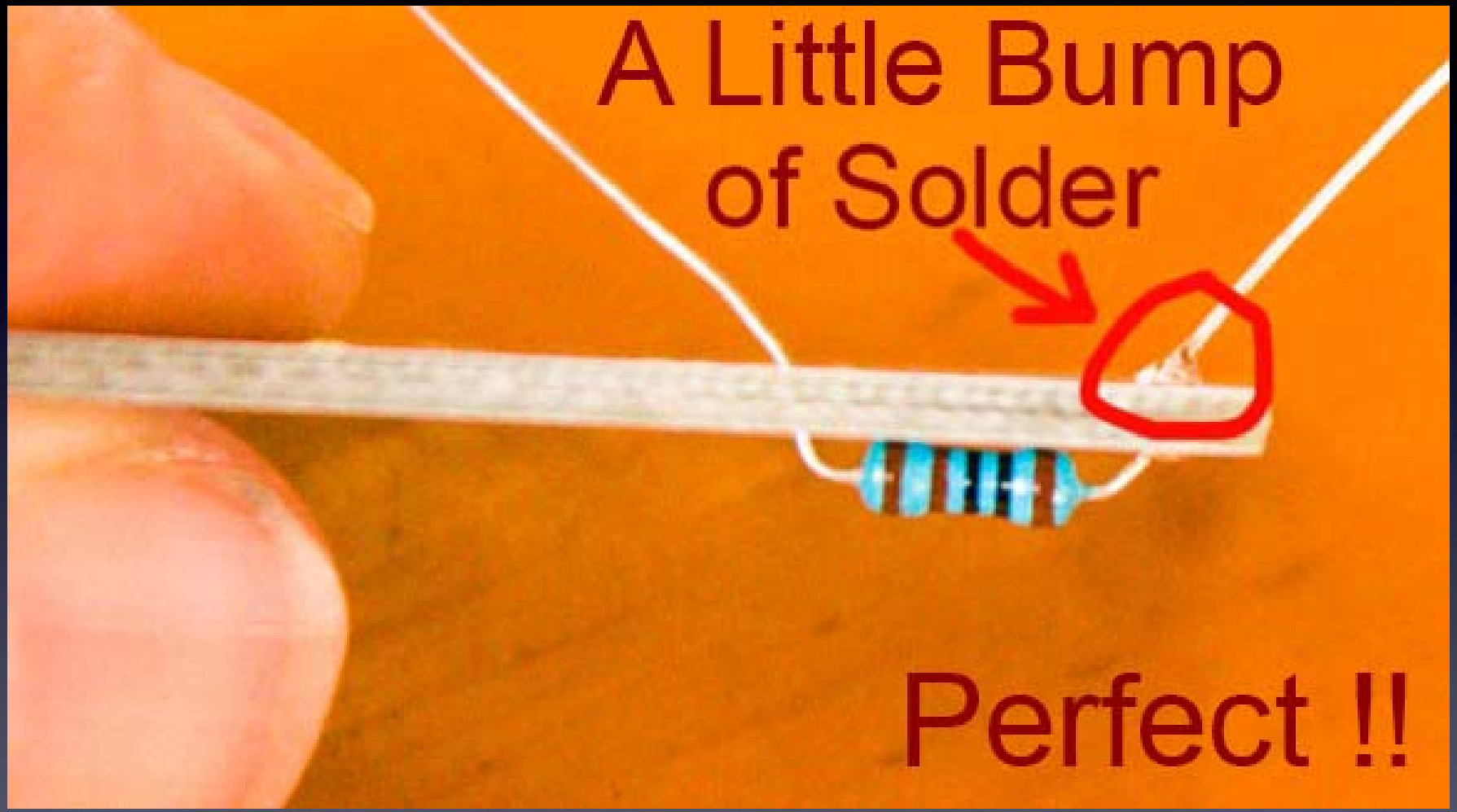
Make sure solder melts on the underside of the soldering iron
(not the side or top of the soldering iron tip)!


Pull solder away,
But keep holding soldering iron down
for 1 more second

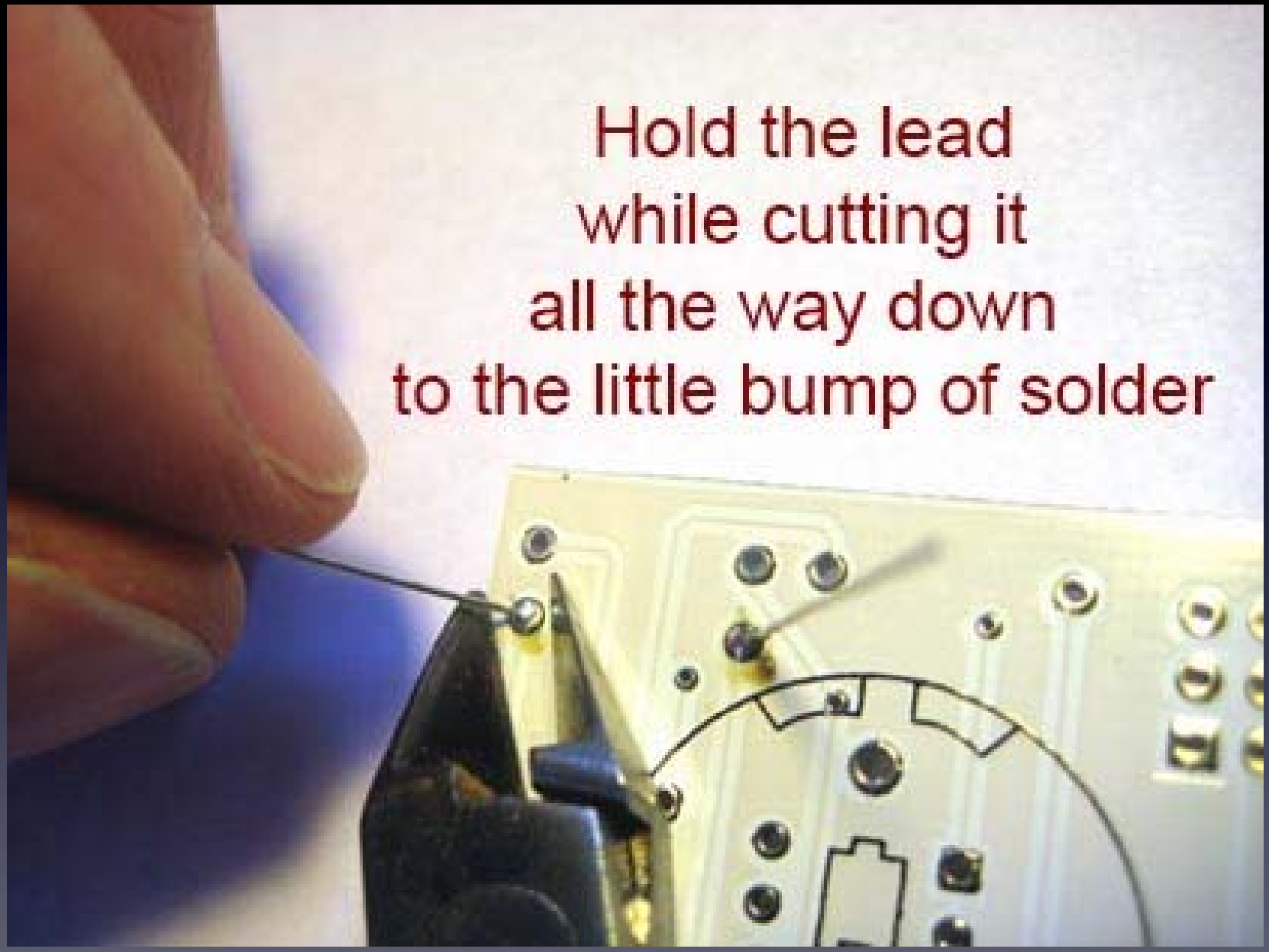
Secret #2:

Keep hot tip down
1 second
for solder to flow !!


Now
Lift soldering iron



If you can see any of the pad, or the hole, you need more solder – so, just do all the steps again to make it perfect.



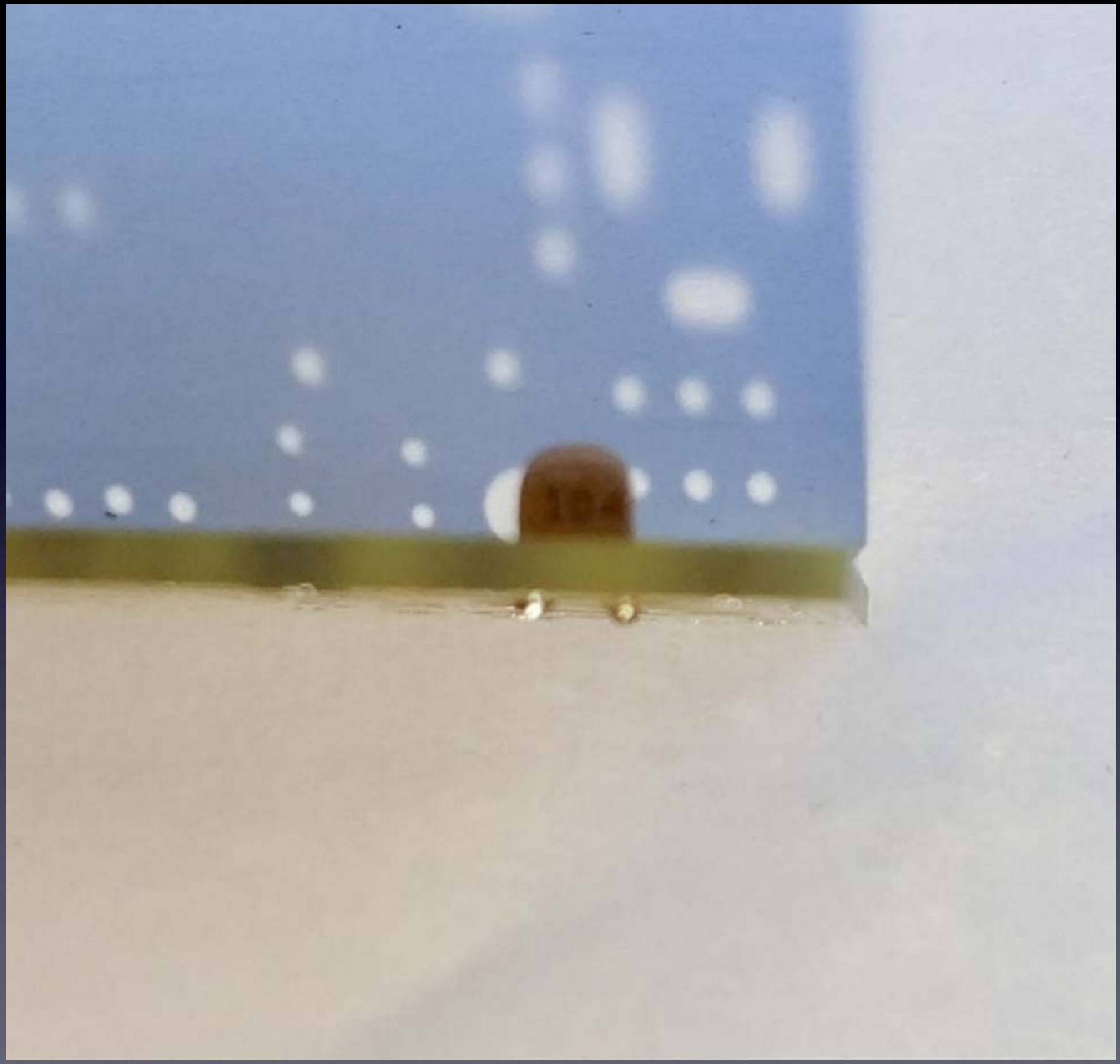
Cutting with the tip of the wire cutter gives you more control

Safety Tip #3:

Hold or cover the lead !

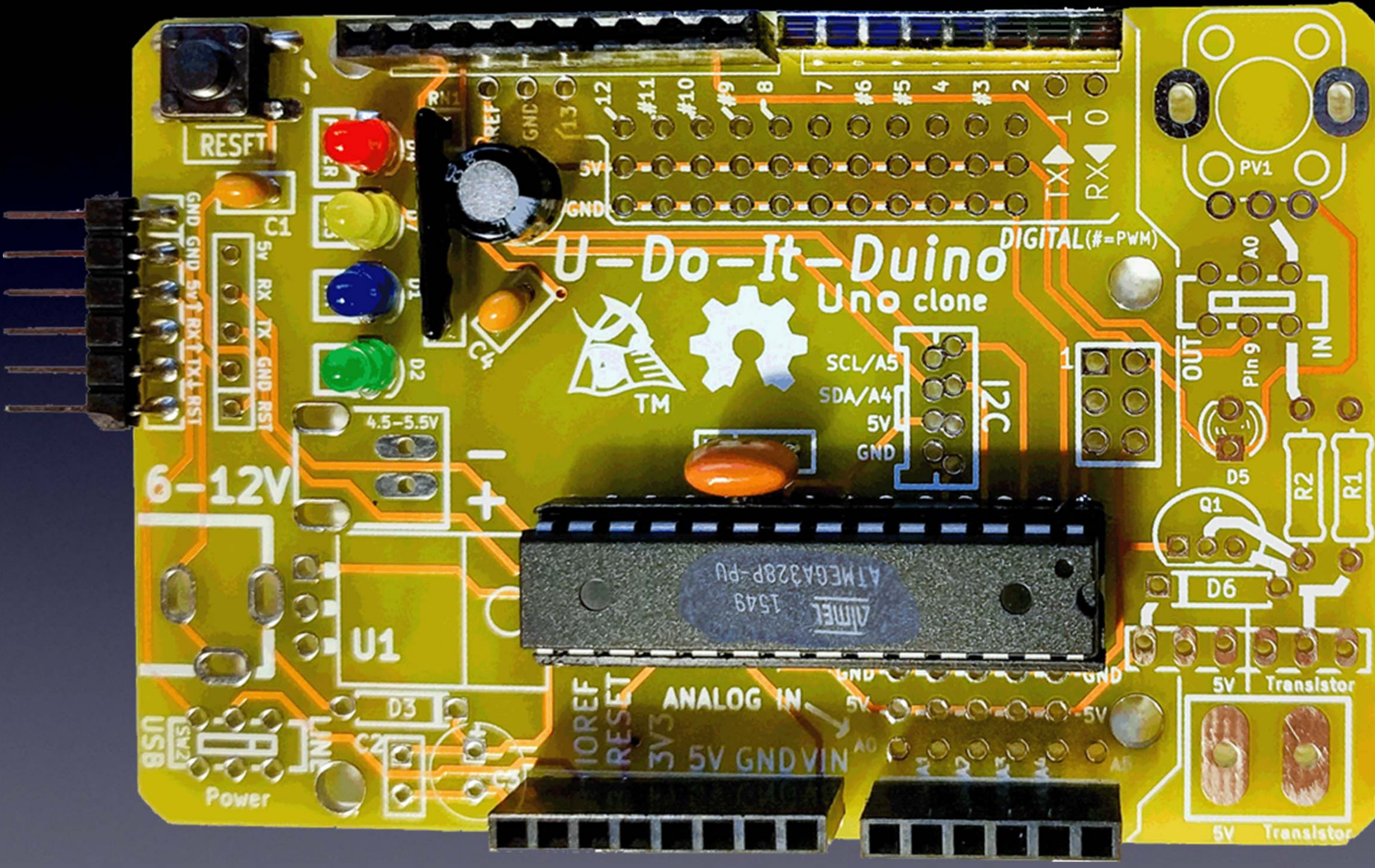
(Keep the leads from turning into missiles that go into your eyes!)

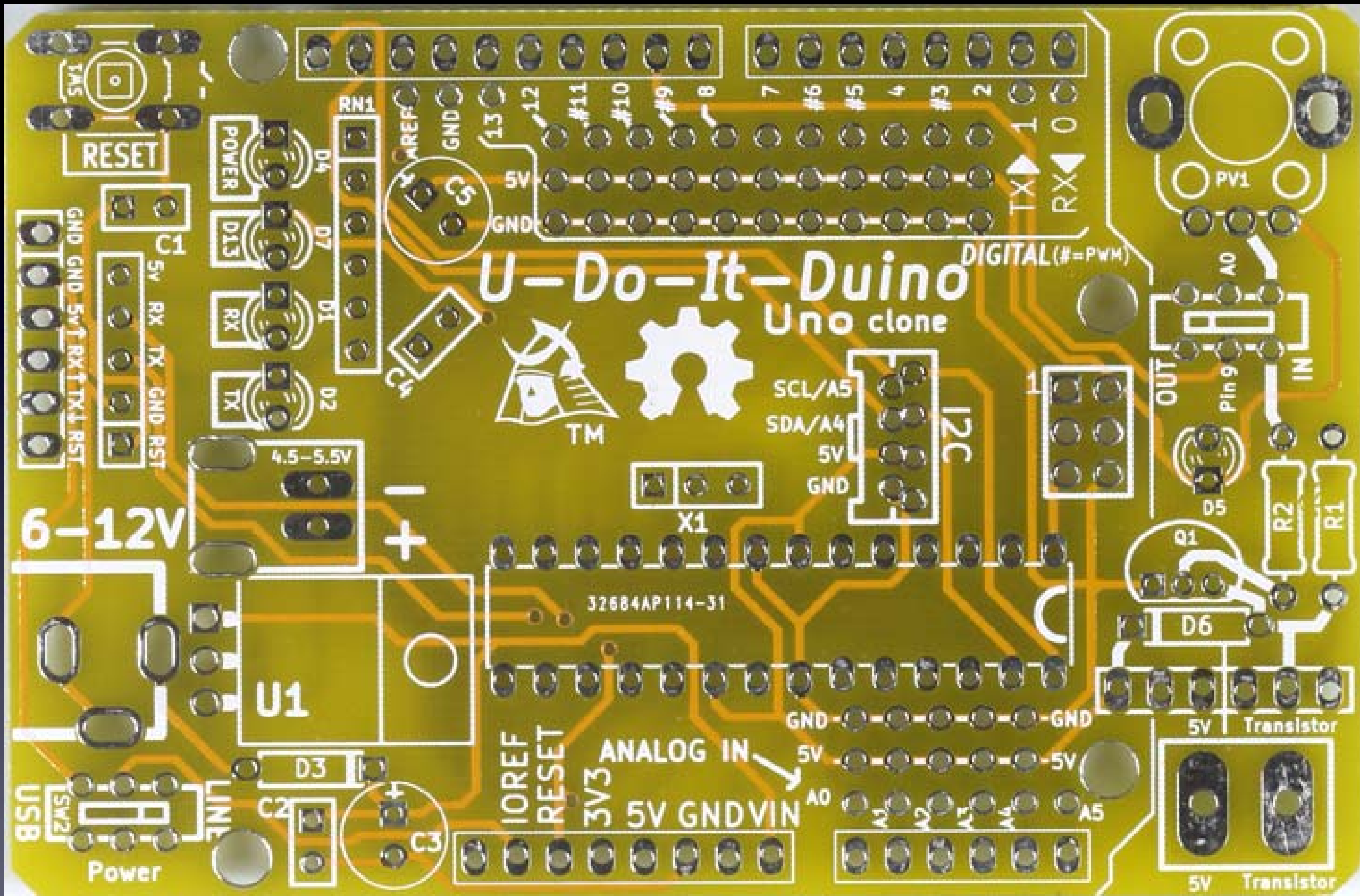
No wire sticking out



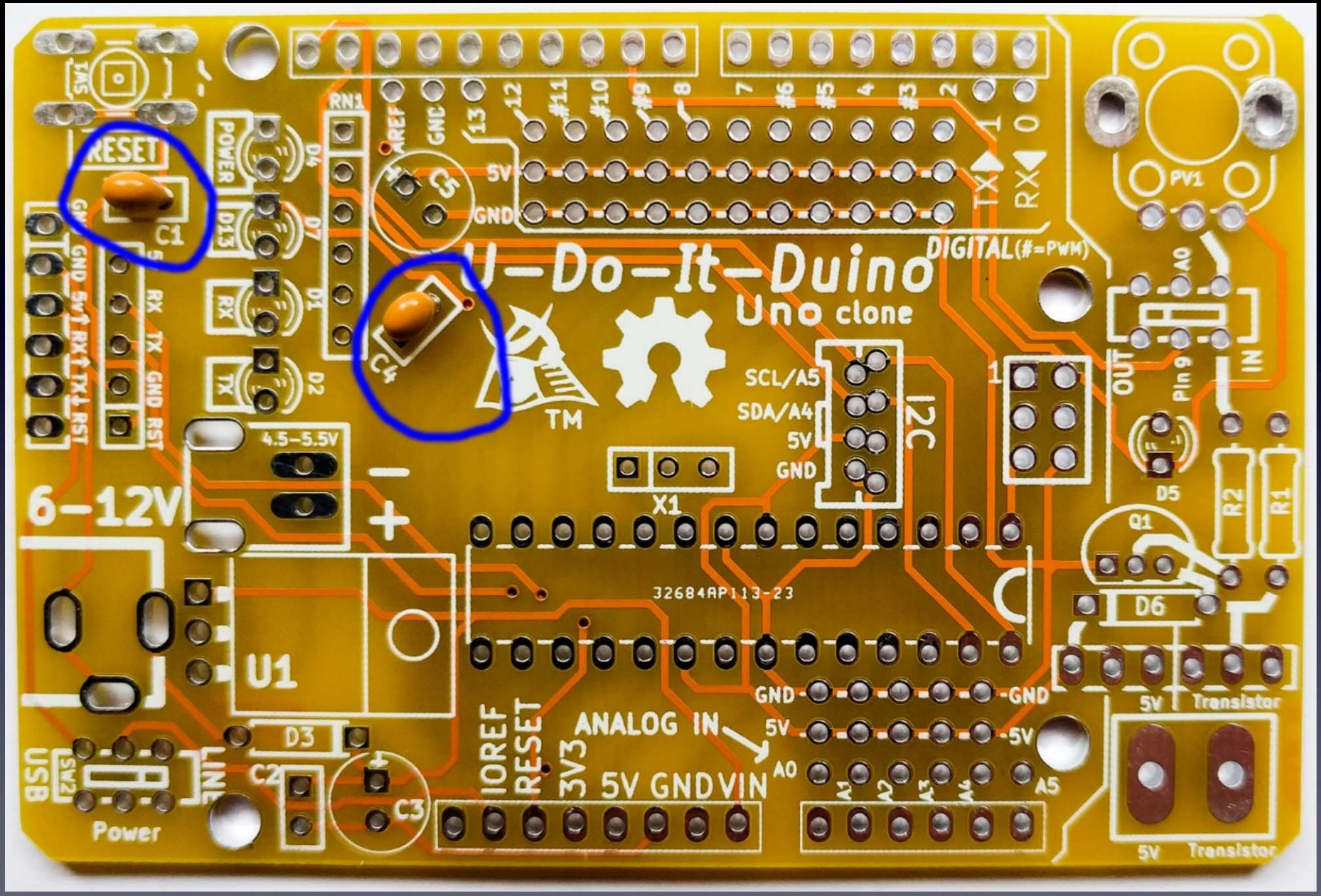
One part at a time

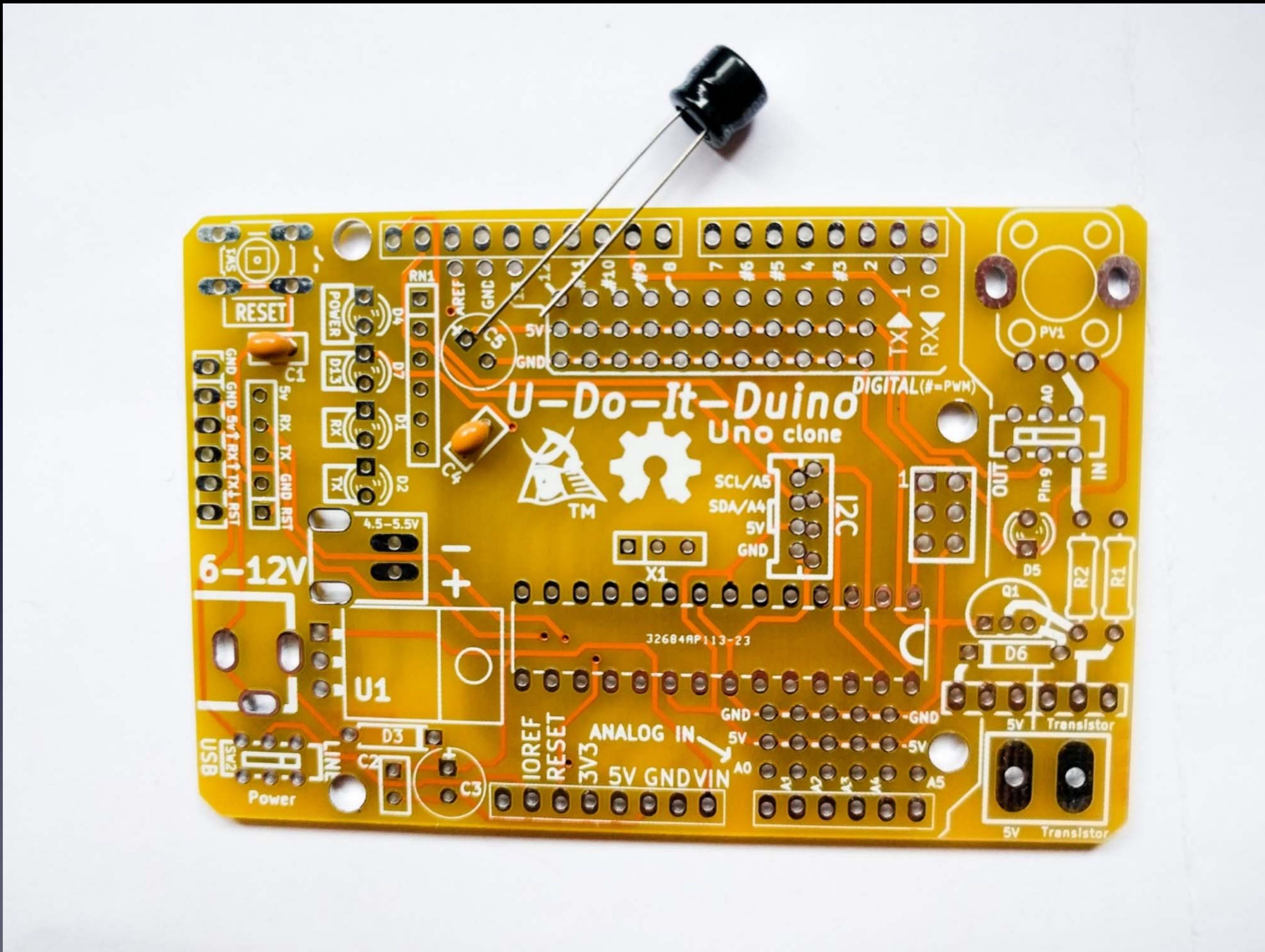
Till all the parts are soldered


RESET
C1
6-12V
4.5-5.5V
U1
D3
Power
USB
D1
D2
C4
U-Do-It-Duino
Uno clone
TM
DIGITAL(#=PWM)
TX
RX
12
#11
#10
#9
8
7
#6
#5
4
#3
2
1
0
5V
GND
SCL/A5
SDA/A4
5V
GND
I2C
ATMEGA328P-PU
1549
Atmel
ANALOG IN
IOREF
RESET
3V3
5V
GND
VIN
A0
PV1
A0
OUT
IN
Pin 9
D5
R2
R1
Q1
D6
5V
Translstor

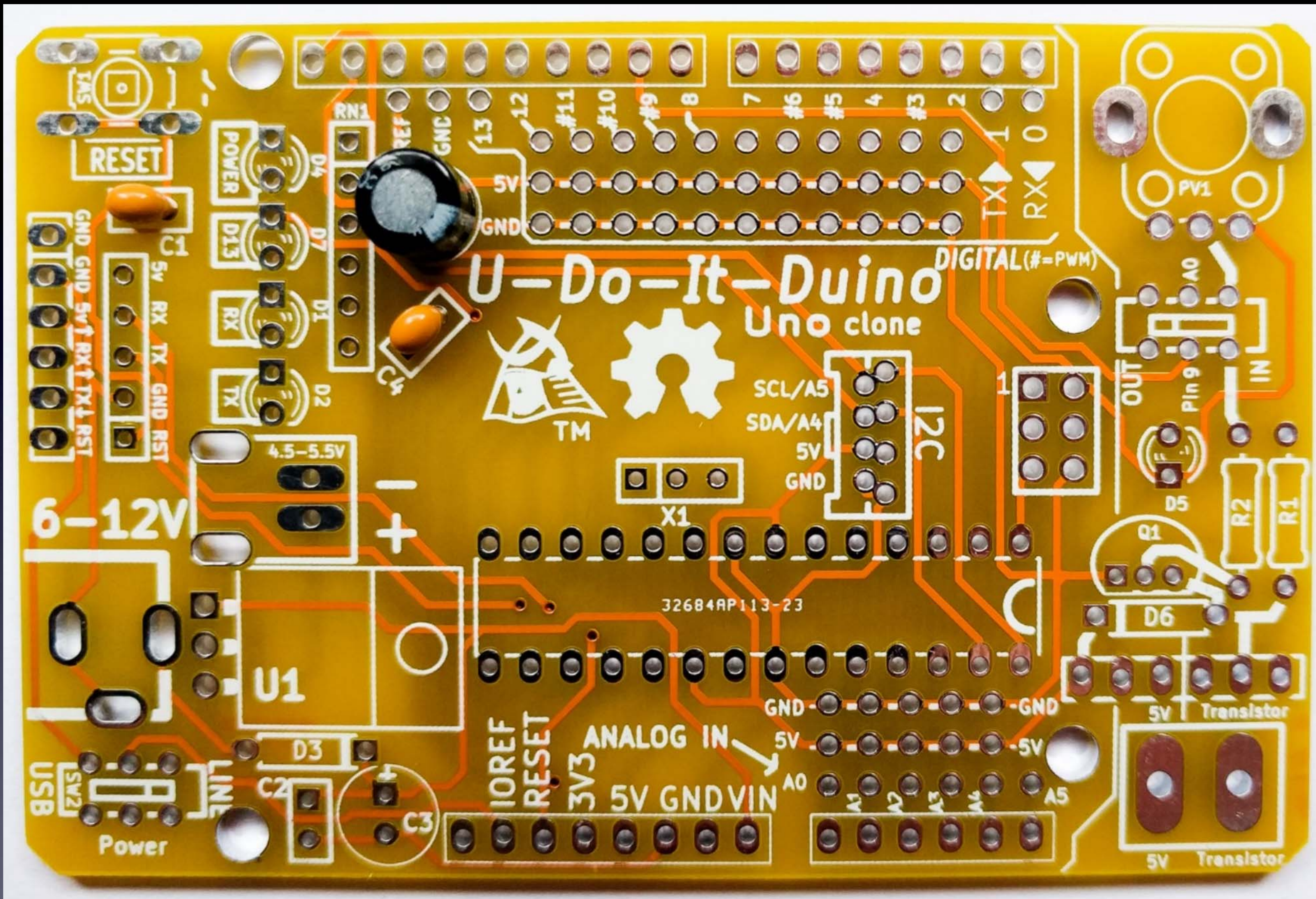


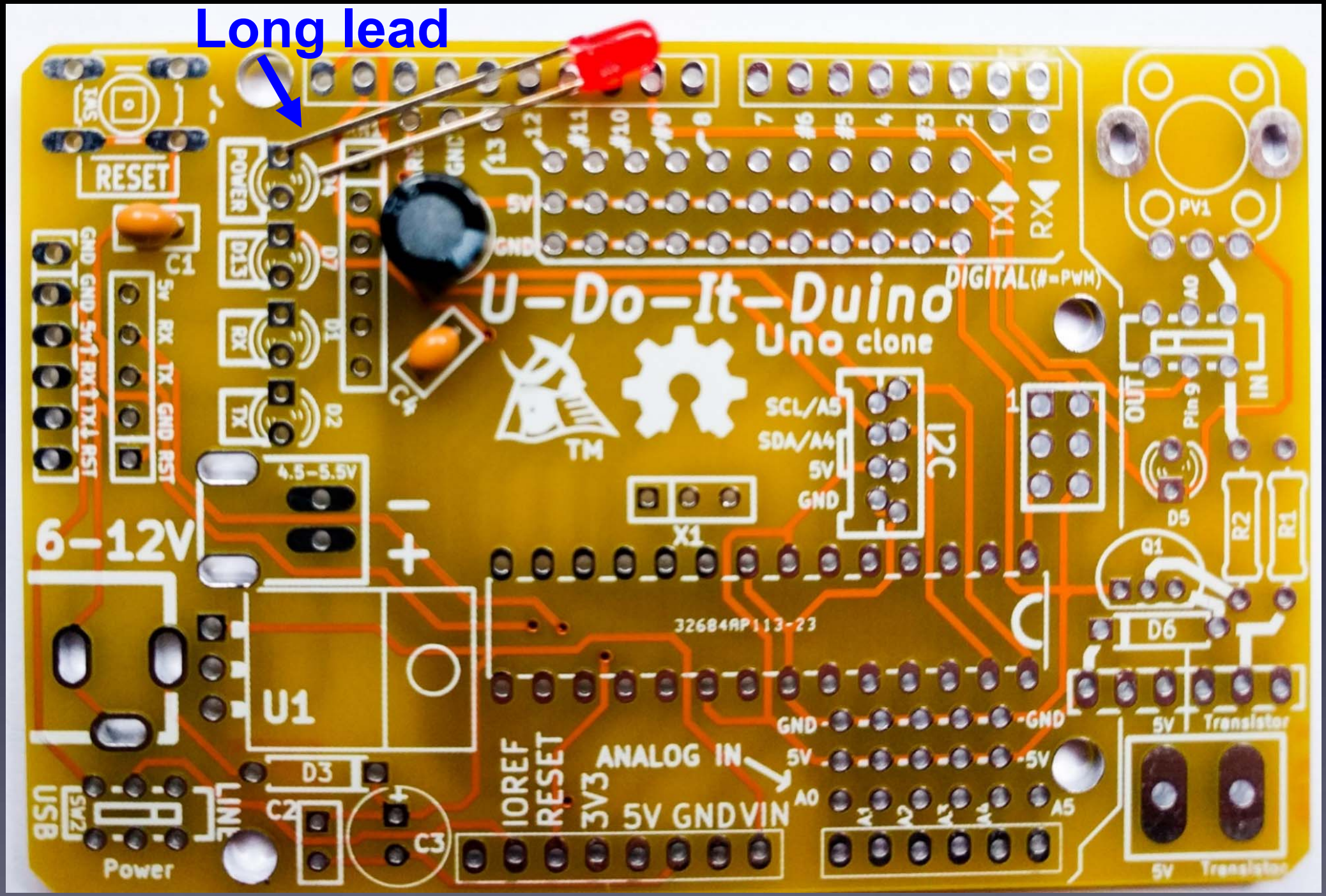
U-Do-It-Duino
Uno clone
DIGITAL (#=PWM)
AREF
GND
13
12
#11
#10
#9
8
7
#6
#5
4
#3
2
1
0
TX
RX
5V
GND
RN1
C5
C4
C1
RESET
POWER
D13
RX
TX
D4
D7
D1
D2
GND GND 5V RX TX RST
5V RX TX GND RST
4.5-5.5V
6-12V
U1
D3
C2
C3
SW2
USB
LINE
Power
X1
32684AP114-31
SCL/A5
SDA/A4
5V
GND
I2C
TM
IOREF
RESET
3V3
5V GND VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
GND
5V
PV1
A0
OUT
IN
Pin 9
D5
R1
R2
Q1
D6
5V
Transistor
5V
Transistor


RESET
C1
C4
C5
U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
TM
SCL/A5
SDA/A4
5V
GND
I2C
X1
6-12V
4.5-5.5V
U1
32684AP113-23
D3
C2
C3
Power
USB
VIN
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
PV1
OUT
IN
Pin 9
D5
Q1
R2
R1
D6
Transistor
RN1
POWER
L
TX
RX



U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
POWER
D13
RX
TX
RN1
AREF
GND
5V
GND
C1
C4
C5
TM
SCL/A5
SDA/A4
5V
GND
I2C
X1
PV1
A0
OUT
IN
Pin 9
D5
R2
R1
Q1
D6
6-12V
4.5-5.5V
U1
D3
C2
C3
Power
USB
LINE
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
5V
Transistor
32684AP113-23


RESET
POWER
D13
RX
TX
RN1
C1
C4
6-12V
4.5-5.5V
U1
D3
C2
C3
USB
Power
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
TM
SCL/A5
SDA/A4
5V
GND
I2C
X1
32684AP113-23
PV1
OUT
IN
Pin 9
D5
Q1
R2
R1
D6
5V
Transistor


Long lead
RESET
POWER
U-Do-It-Duino
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SCL/A5
SDA/A4
5V
GND
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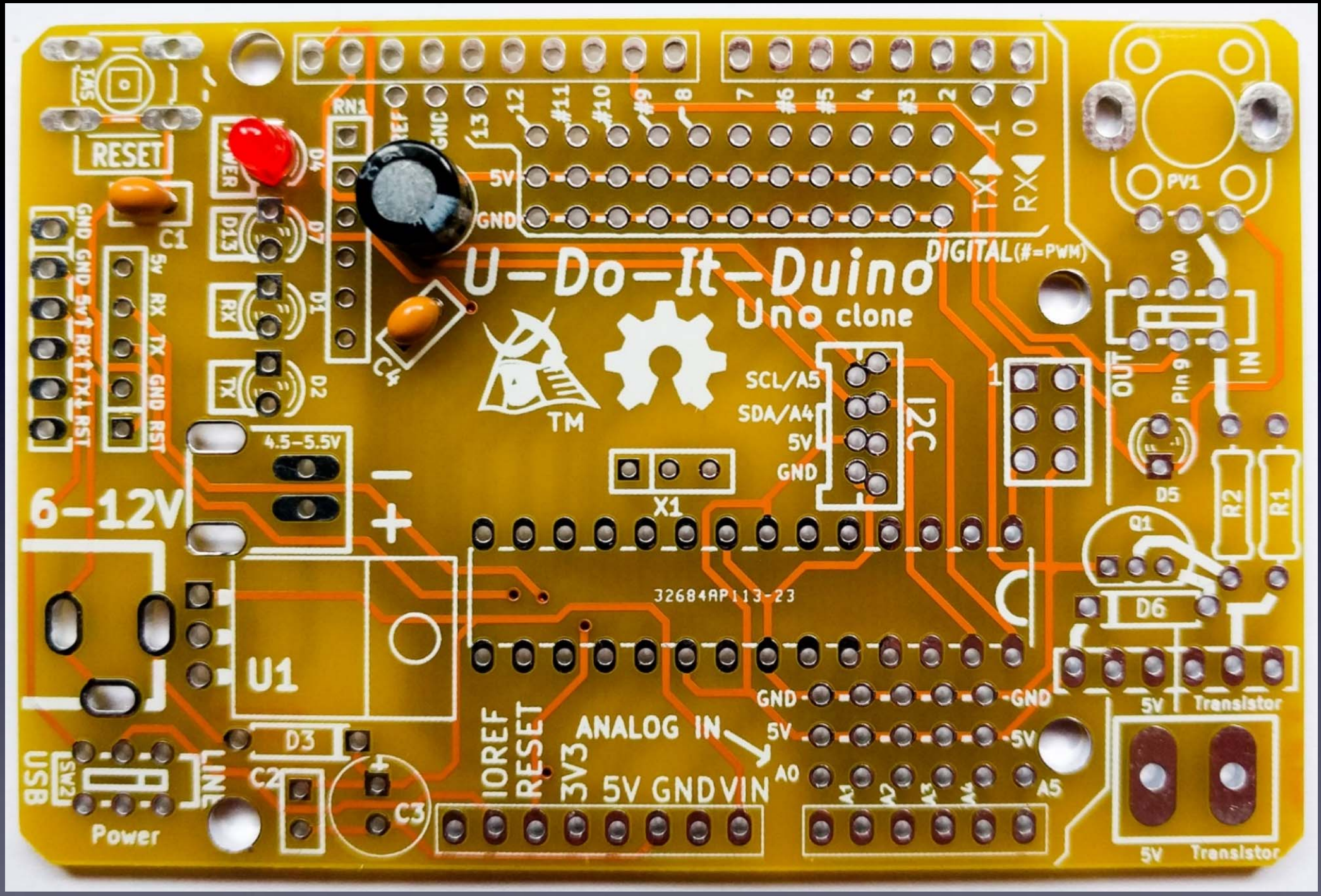
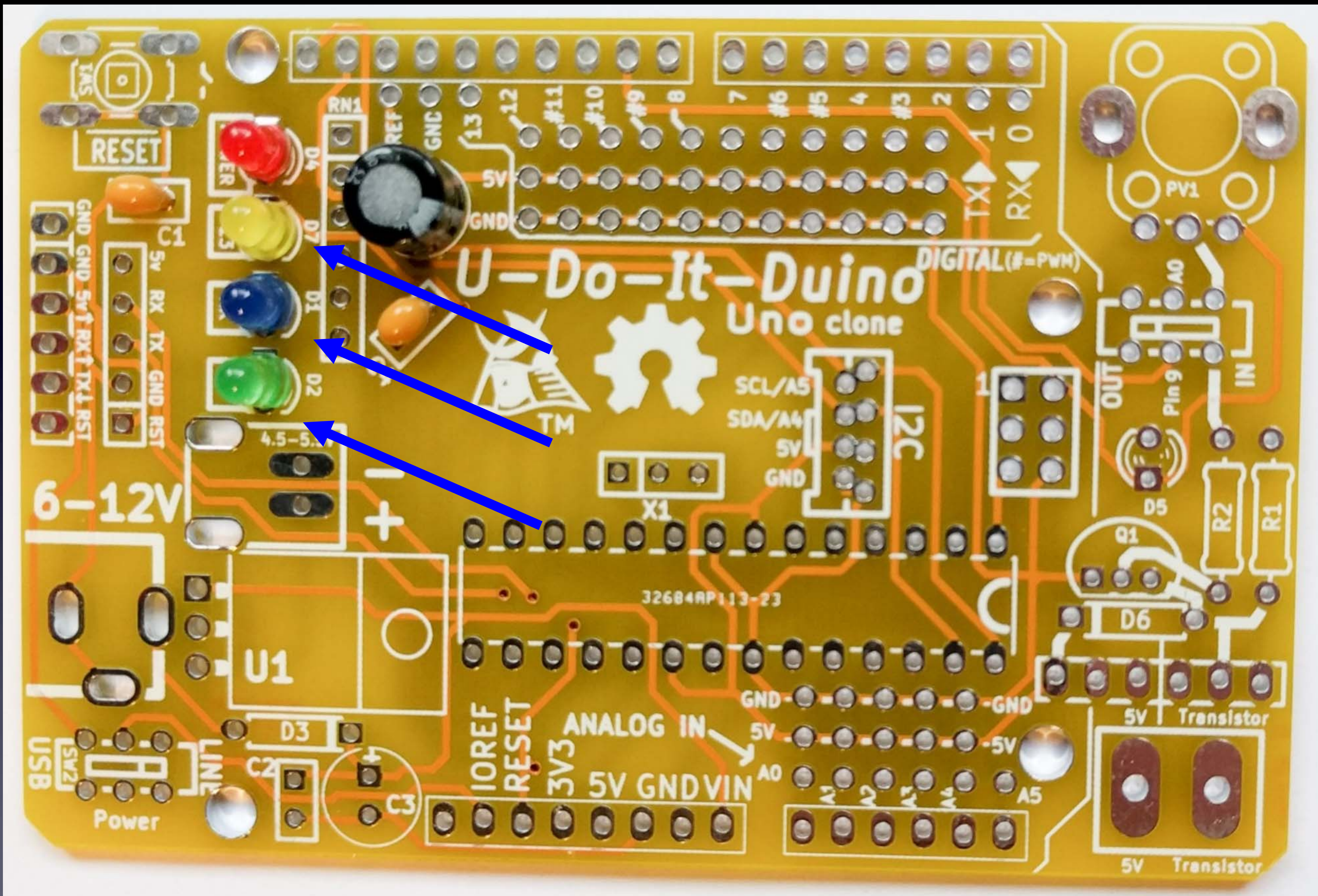
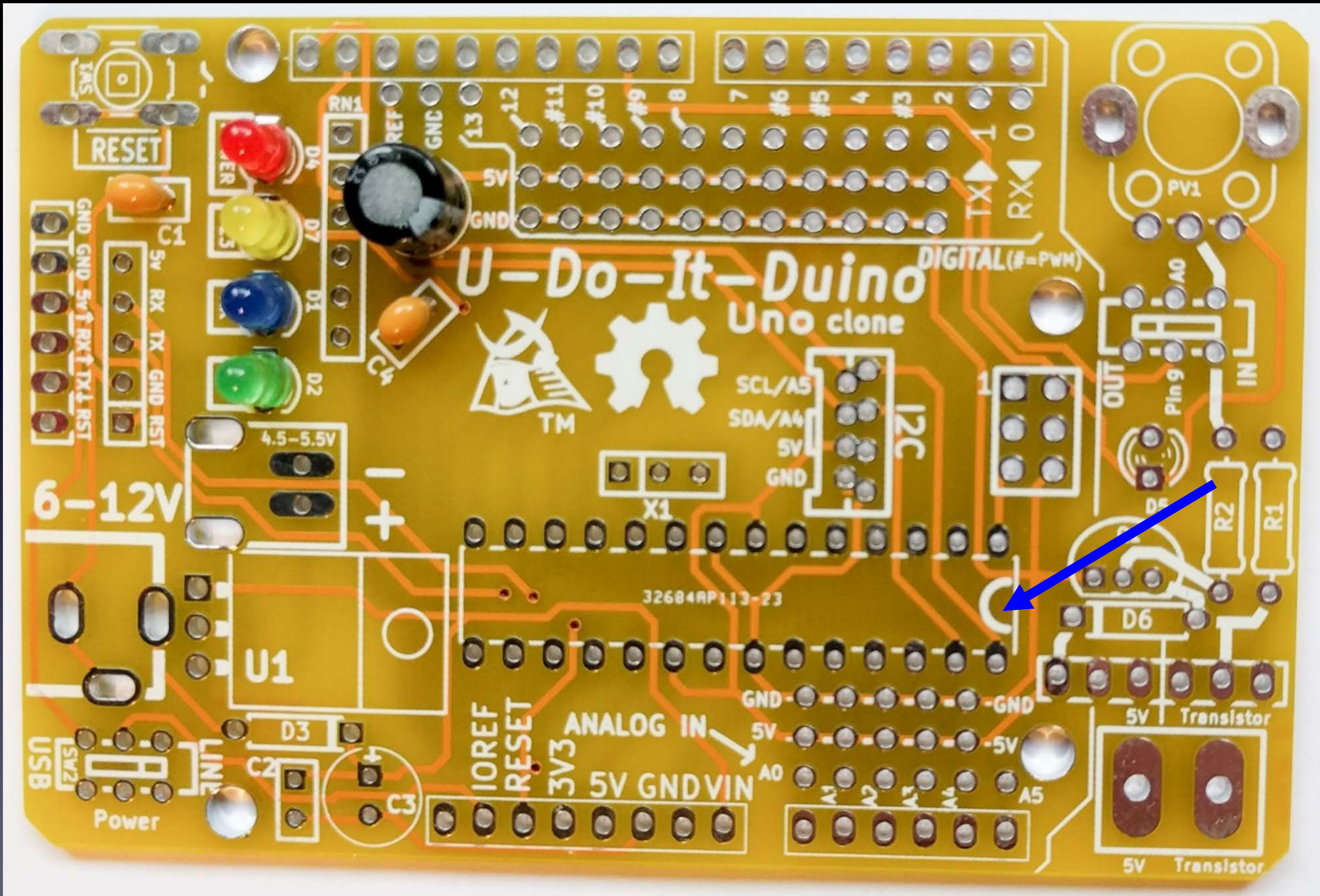
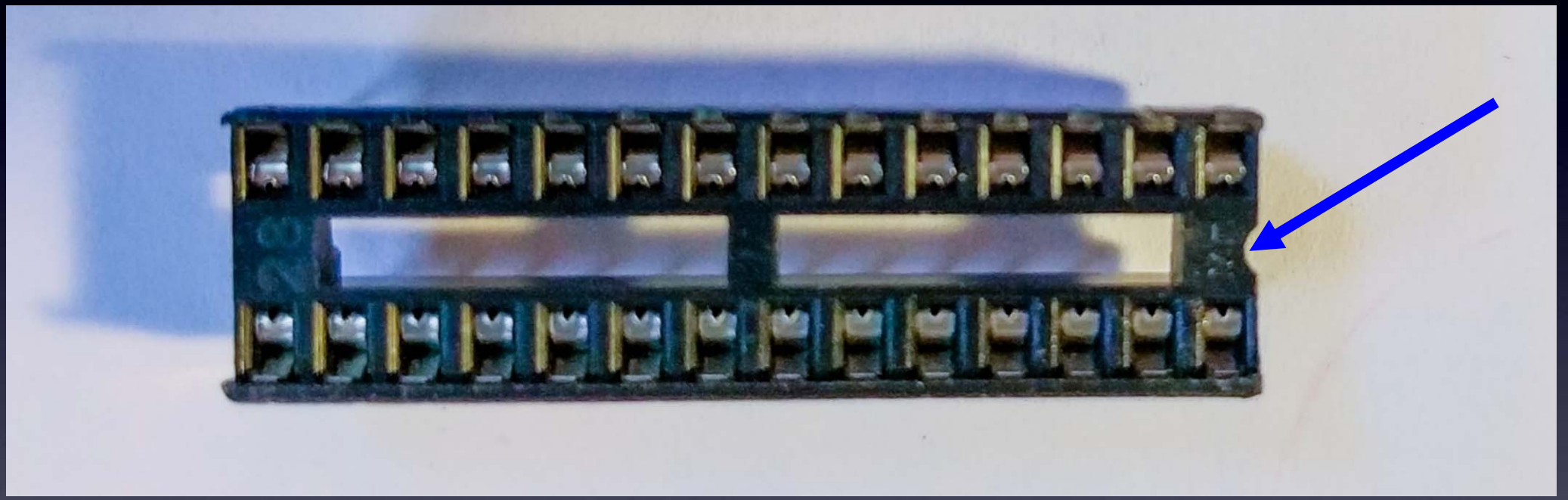
X1
6-12V
4.5-5.5V
U1
D3
C1
C2
C3
C4
D5
D6
Q1
R1
R2
PV1
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
Power
USB
LINE
Transistor

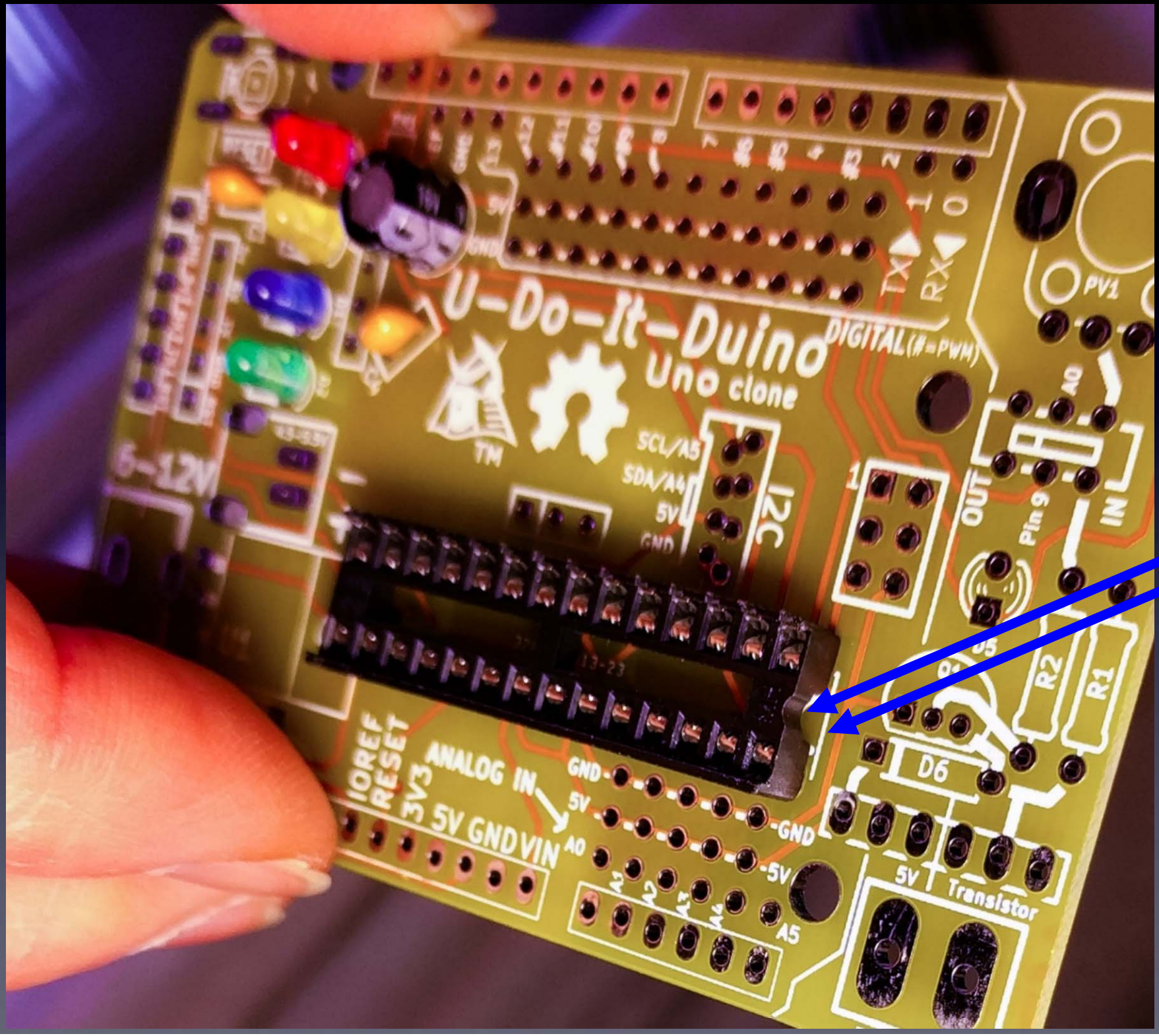

U-Do-It-Duino
Uno clone
TM
DIGITAL(#=PWM)
RESET
SW1
RN1
D4
D7
D13
D1
RX
TX
D2
C1
C4
5V
GND
SCL/A5
SDA/A4
I2C
X1
6-12V
4.5-5.5V
U1
32684AP113-23
D3
C2
C3
SW2
USB
Power
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
PV1
OUT
IN
Pin 9
D5
R2
R1
Q1
D6
Transistor



RESET
C1
RN1
D4
D7
D2
U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
TM
SCL/A5
SDA/A4
5V
GND
I2C
X1
PV1
D5
R2
R1
Q1
D6
6-12V
U1
D3
C2
C3
USB
Power
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
5V
Transistor

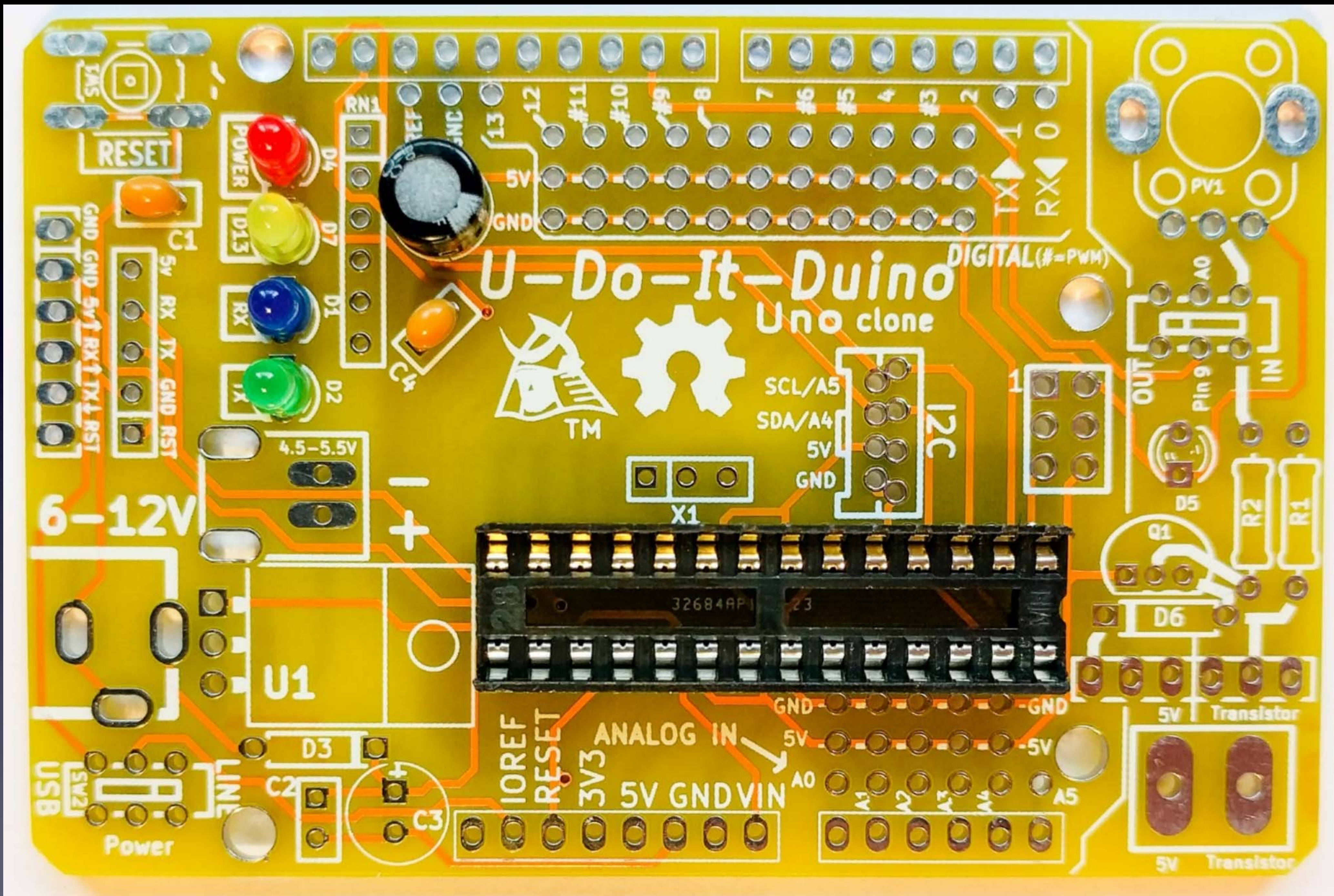

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
SW1
RN1
REF
GND
13
12
#11
#10
#9
8
7
#6
#5
4
#3
2
1
0
TX
RX
5V
GND
C1
C4
D4
D7
D1
D2
PV1
A0
OUT
IN
Pin 9
SCL/A5
SDA/A4
5V
GND
I2C
X1
4.5-5.5V
6-12V
U1
32684AP113-23
D3
D5
D6
R1
R2
C2
C3
SW2
USB
LINE
Power
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
5V
Transistor
TM

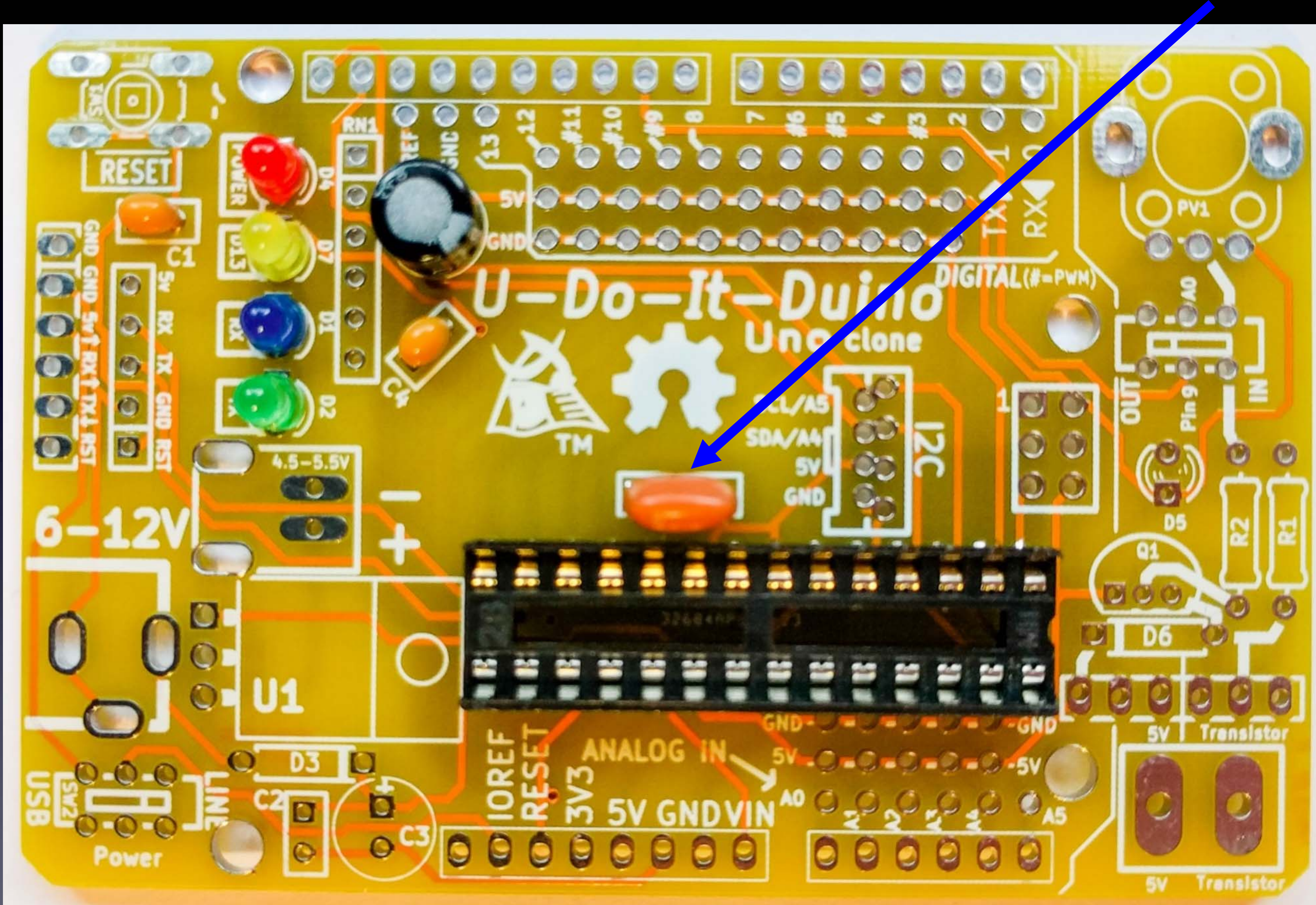



U-Do-It-Duino
Uno clone
DIGITAL (~ = PWM)
TX
RX
PV1
SCL/A5
SDA/A4
5V
GND
I2C
OUT
IN
Pin 9
D5
D6
R2
R1
6-12V
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
5V
Transistor

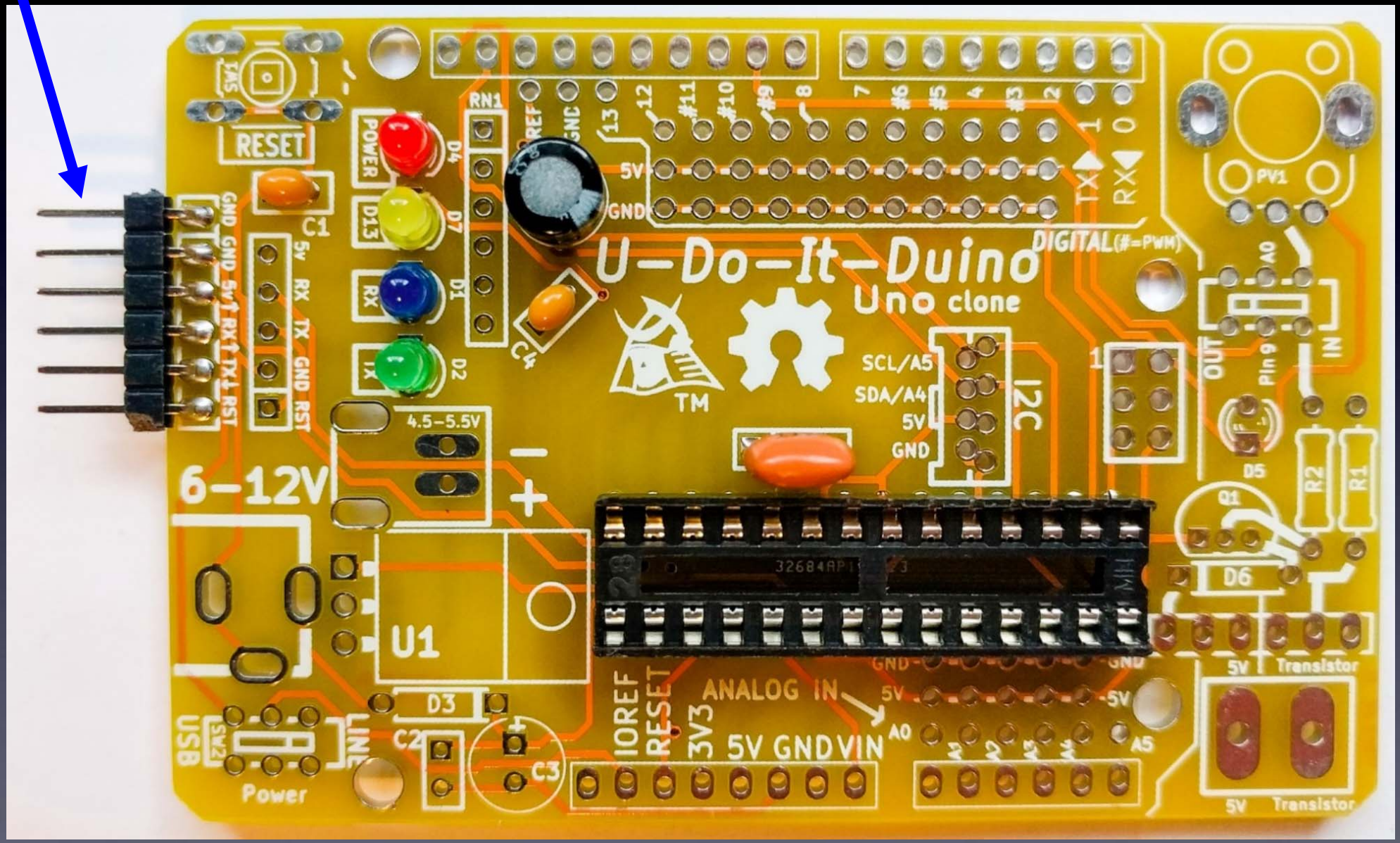
Bend pins down on two opposite corners

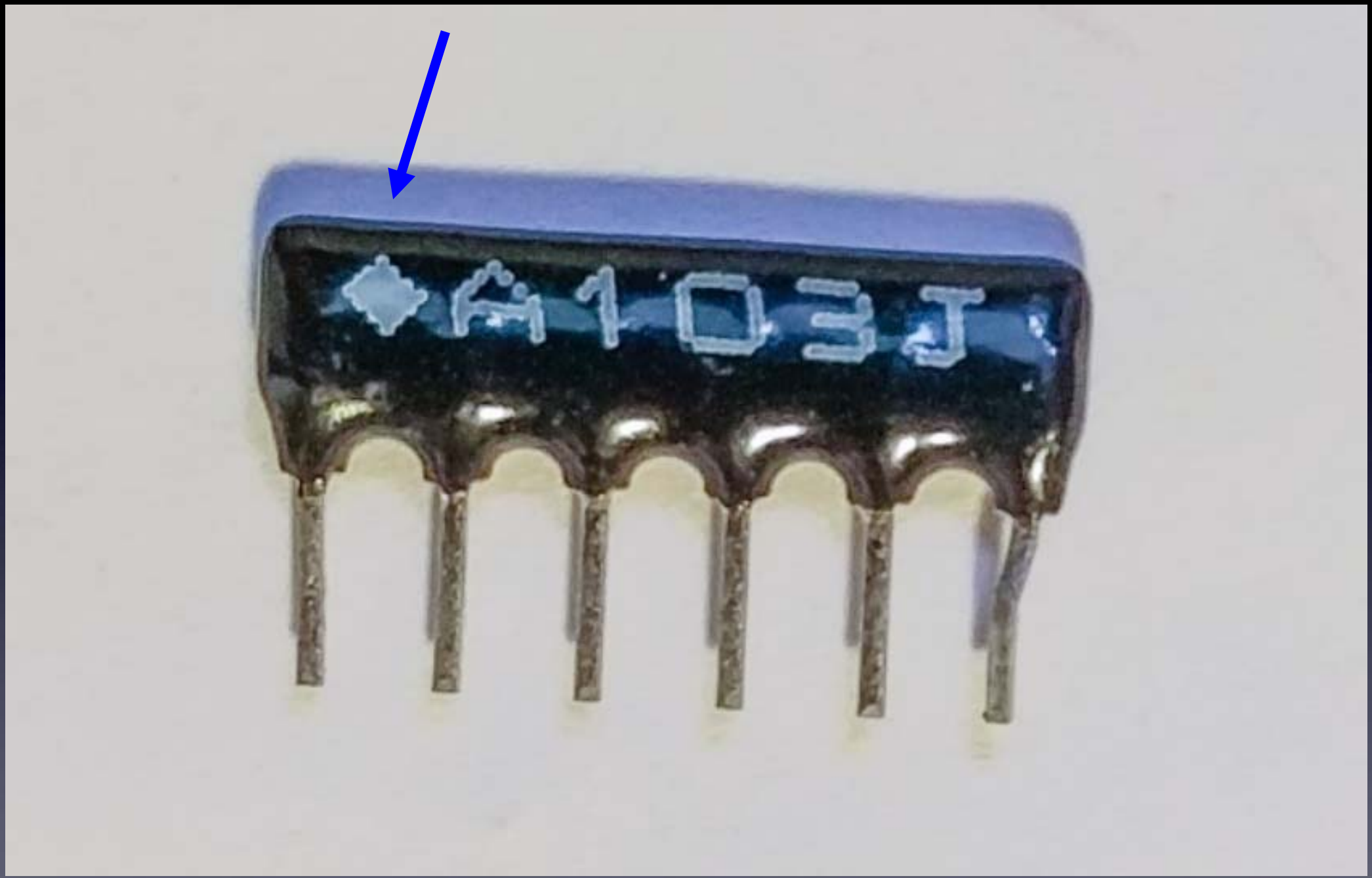
- Solder all 28 pins.
- Only need to clean the tip after it gets dirty.
- No need to cut the pins short after soldering.

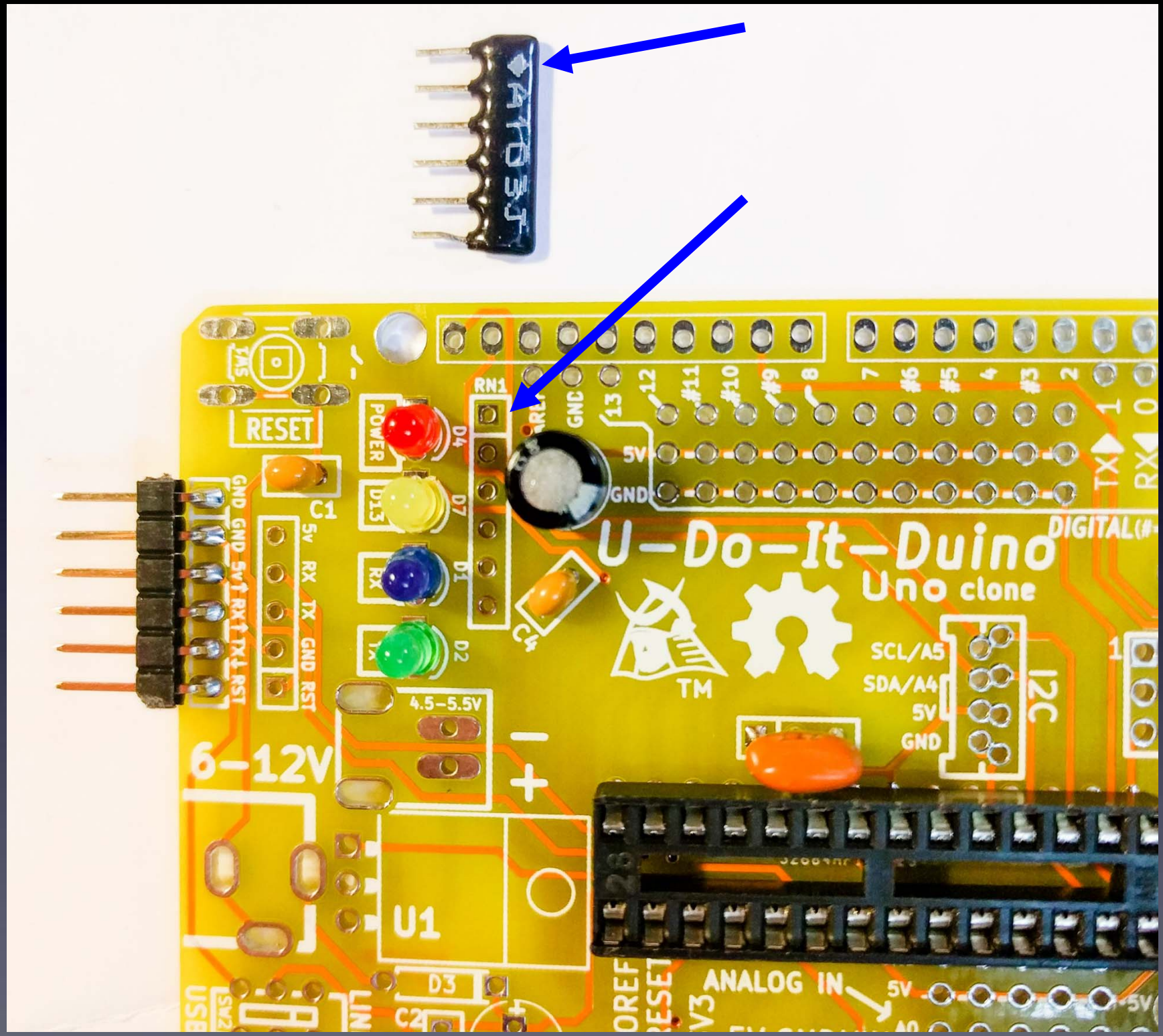

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
POWER
D13
RX
TX
D4
D7
D1
D2
C1
C4
RN1
5V
GND
TX
RX
PV1
A0
OUT
Pin 9
IN
SCL/A5
SDA/A4
5V
GND
I2C
X1
TM
6-12V
4.5-5.5V
U1
D3
C2
C3
USB
LINE
Power
D5
R2
R1
Q1
D6
5V
Transistor
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
GND
5V

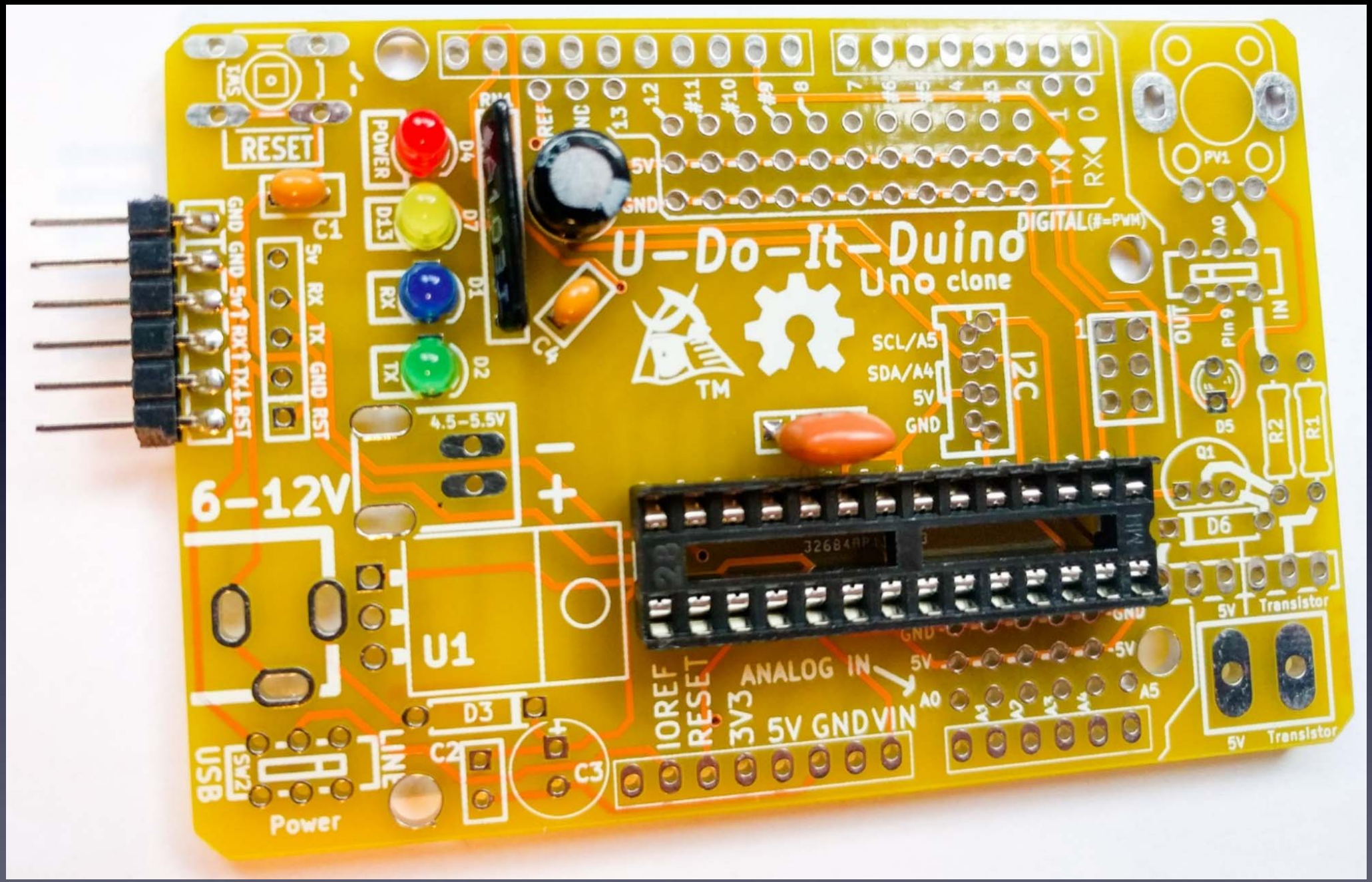

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
POWER
RN1
C1
C4
TM
SCL/A5
SDA/A4
5V
GND
I2C
4.5-5.5V
6-12V
U1
D3
C2
C3
IOREF
RESET
3V3
5V
GND
VIN
ANALOG IN
A0
A5
PV1
D5
D6
Q1
R2
R1
OUT
IN
Pin9
Transistor
Power
USB
LINE

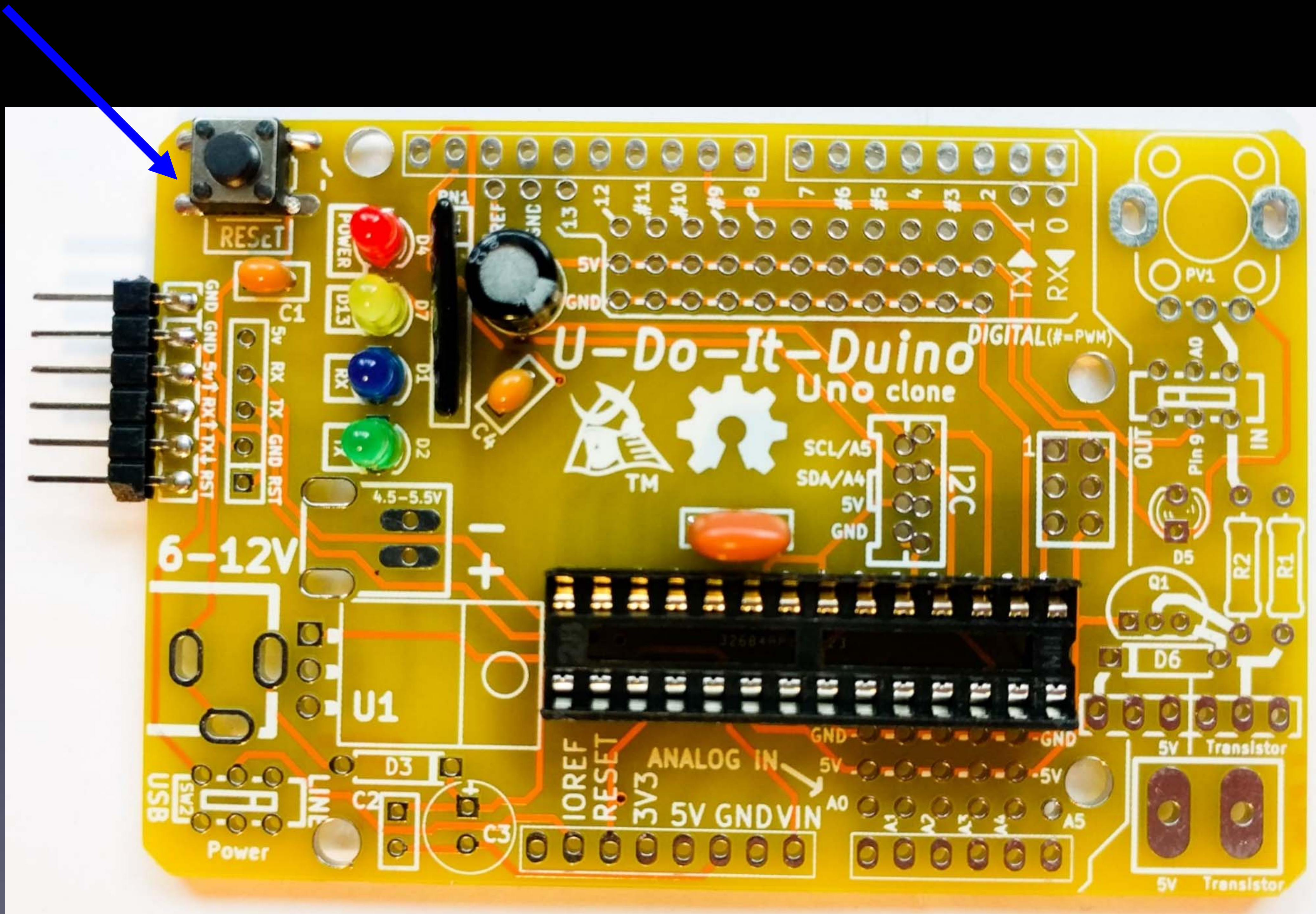
Solder on top of board if it falls out upside down



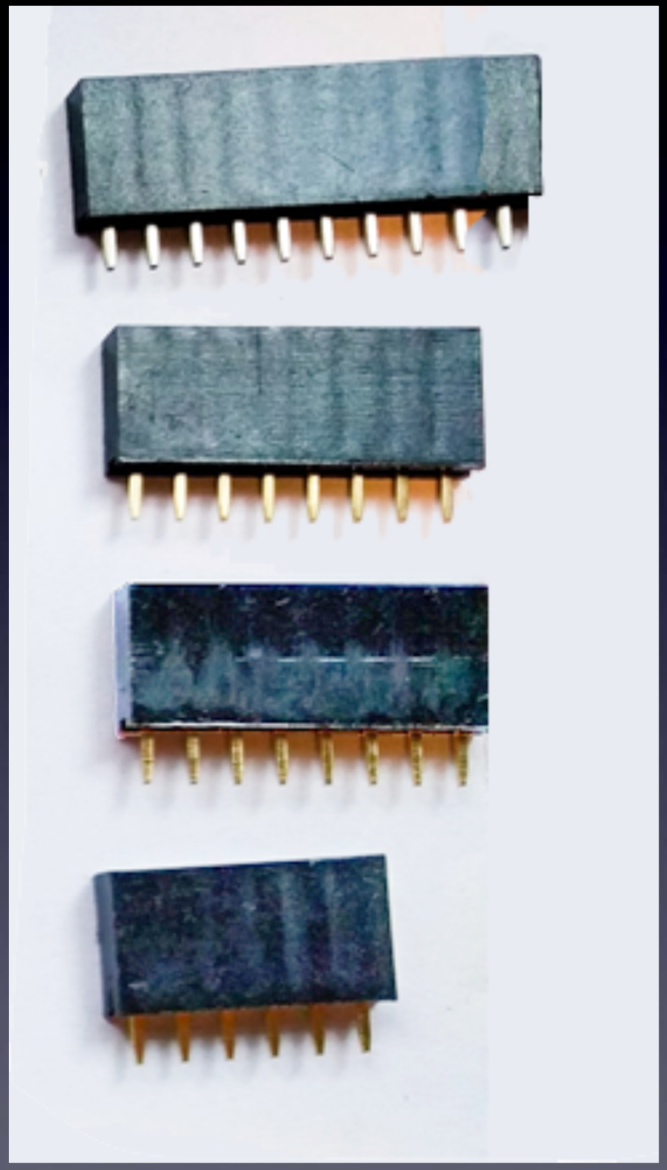

A 1 0 3 J


RESET
POWER
D4
D13
D7
RX
D1
TX
D2
RN1
C1
C4
5V
GND
U-Do-It-Duino
Uno clone
TM
SCL/A5
SDA/A4
5V
GND
I2C
6-12V
4.5-5.5V
U1
D3
ANALOG IN
DIGITAL(#


U-Do-It-Duino
Uno clone
RESET
POWER
6-12V
4.5-5.5V
U1
I2C
SCL/A5
SDA/A4
5V
GND
DIGITAL(#=PWM)
ANALOG IN
IOREF
RESET
3V3
5V
GND
VIN
USB
Power
Transistor
Transistor


RESET
C1
POWER
D13
RX
TX
D4
D7
D1
D2
C4
GND
5V
RX
TX
RST
6-12V
4.5-5.5V
U1
D3
C2
C3
USB
Power
LINE
IOREF
RESET
3V3
5V GND VIN
ANALOG IN
A0
A1
A2
A3
A4
A5
U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
TM
SCL/A5
SDA/A4
GND
I2C
PV1
OUT
IN
Pin 9
D5
R2
R1
Q1
D6
Transistor

Headers



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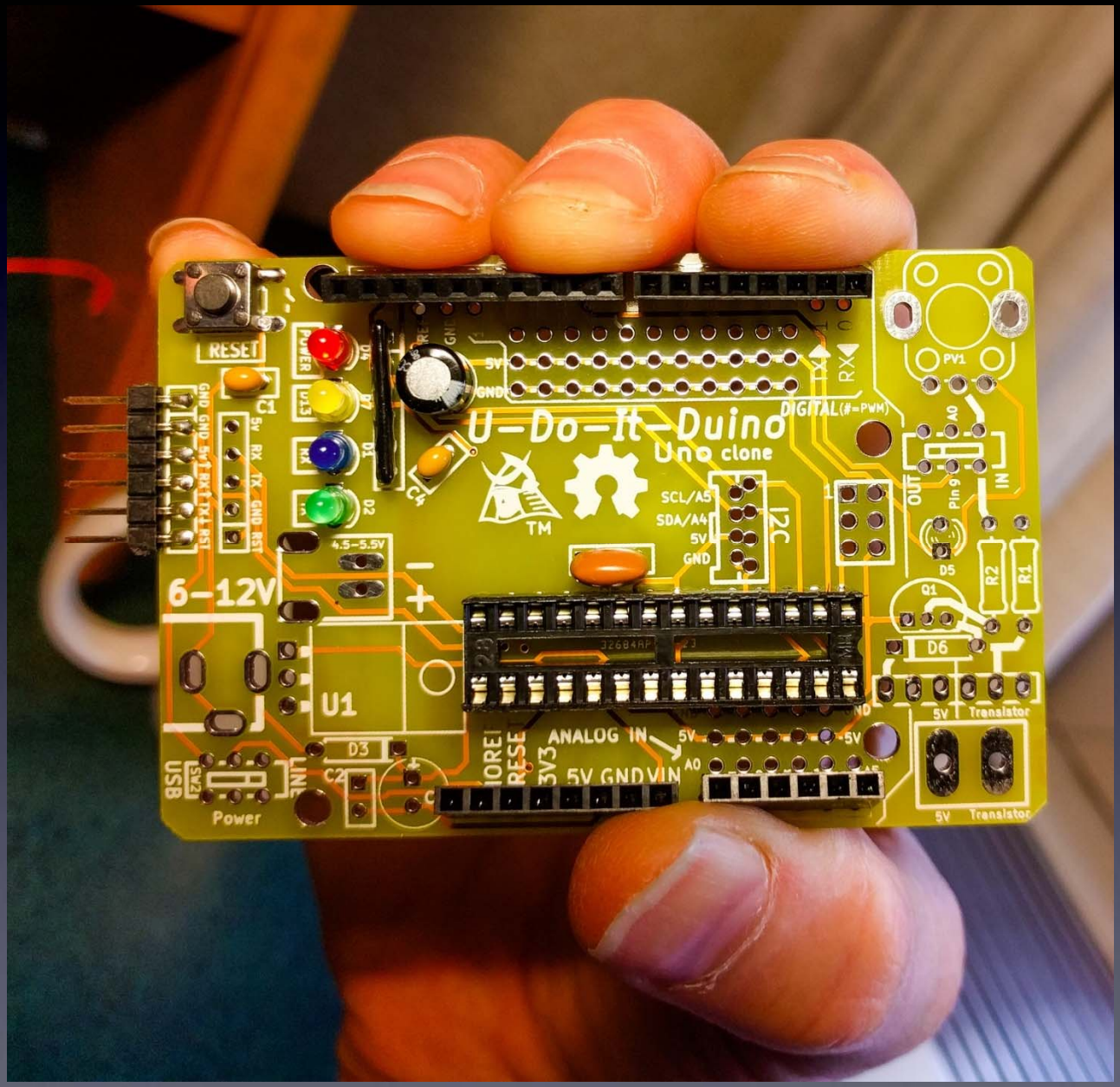
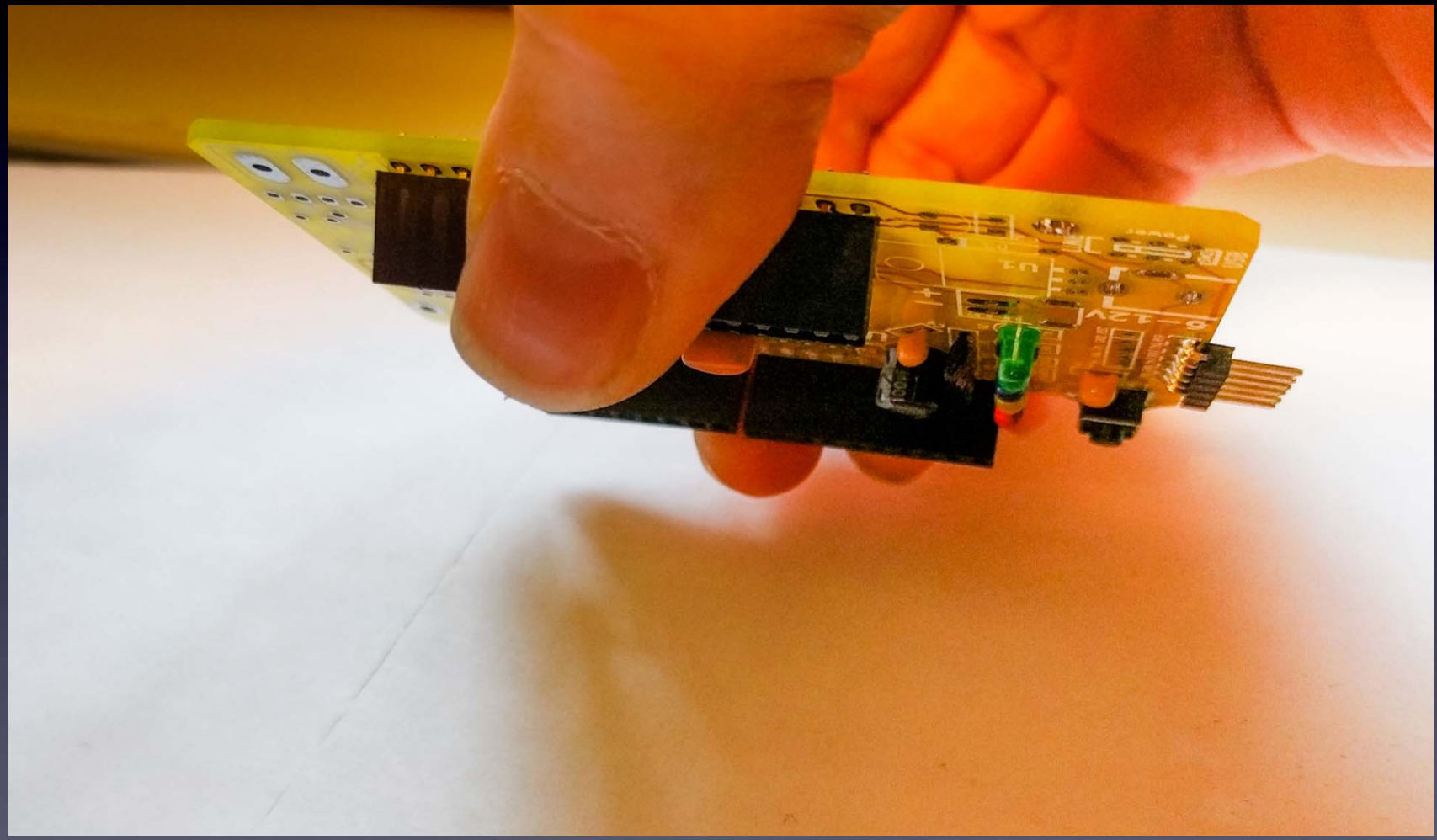
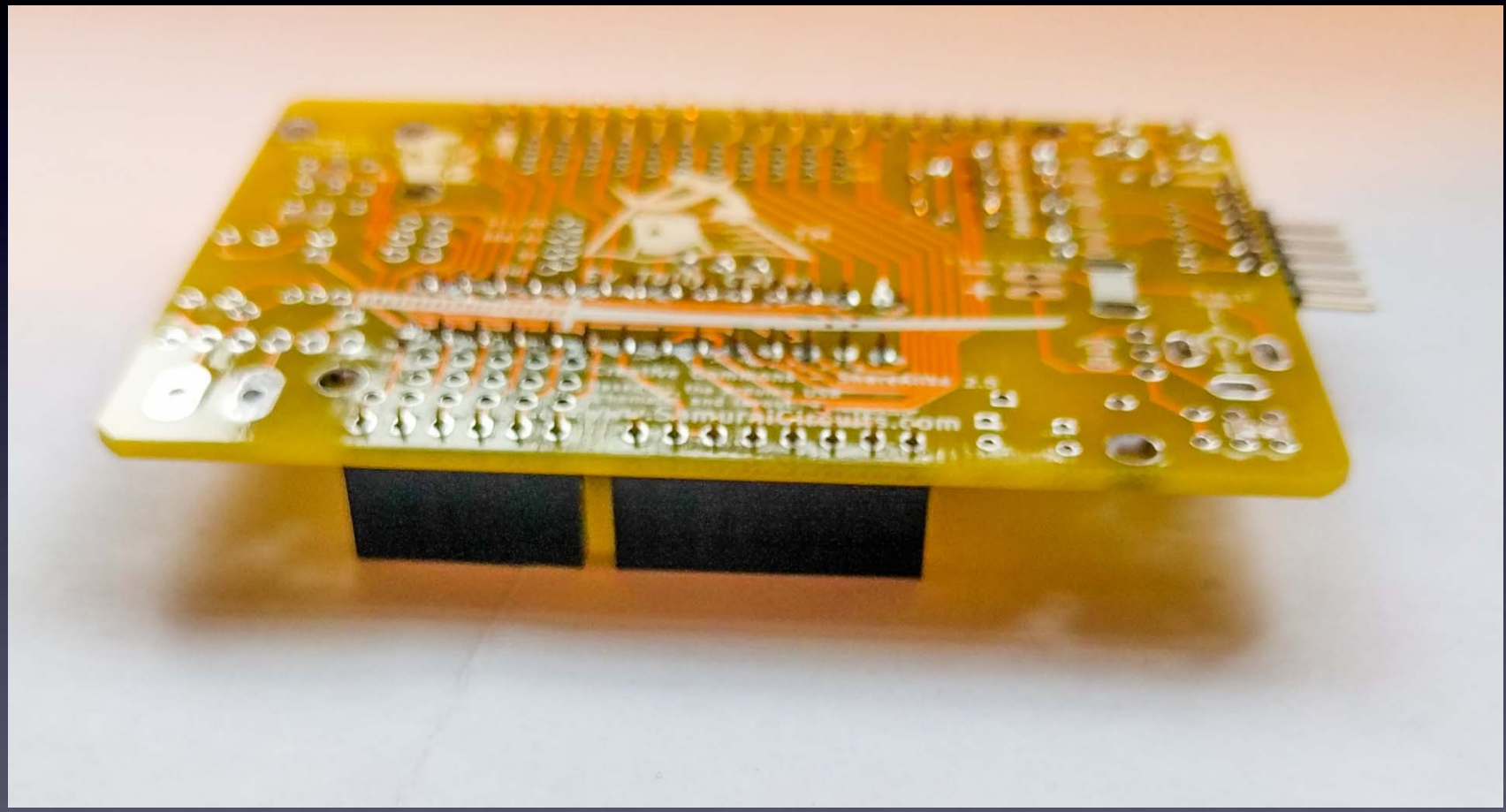
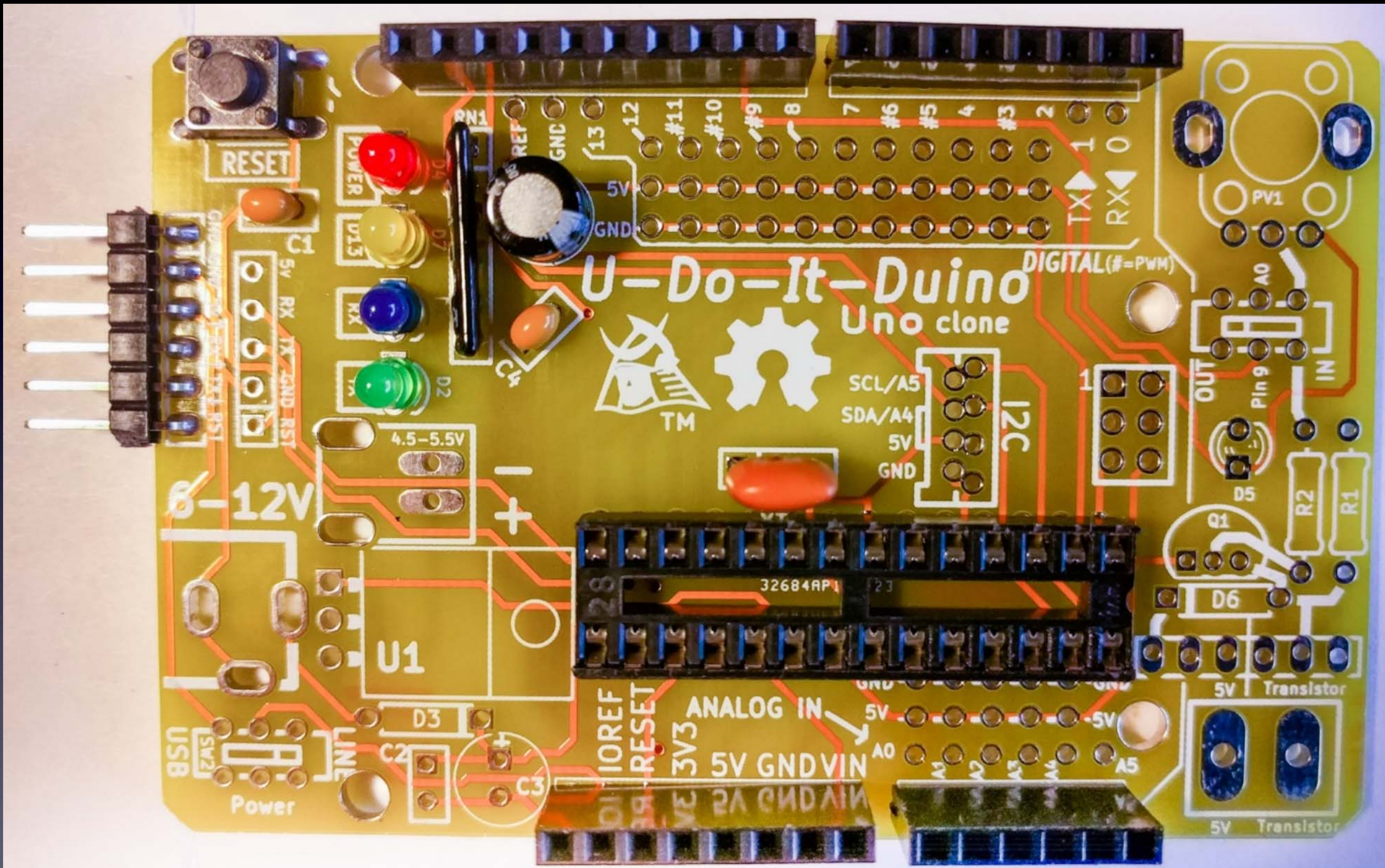

U-Do-It-Duino
Uno clone
RESET
POWER
6-12V
U1
ANALOG IN
DIGITAL(#=PWM)
I2C
SCL/A5
SDA/A4
5V
GND
Power
Translator

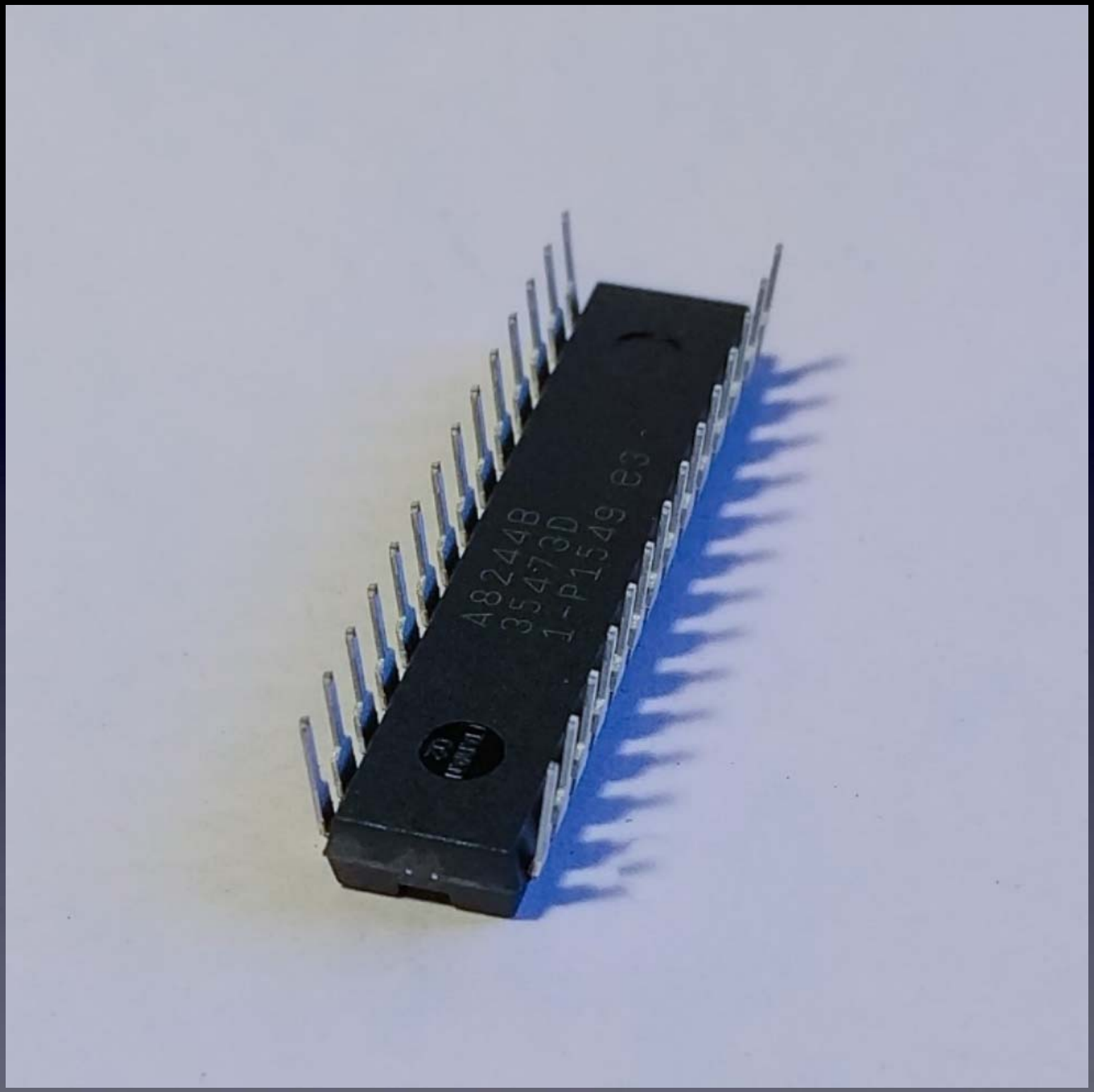
Headers

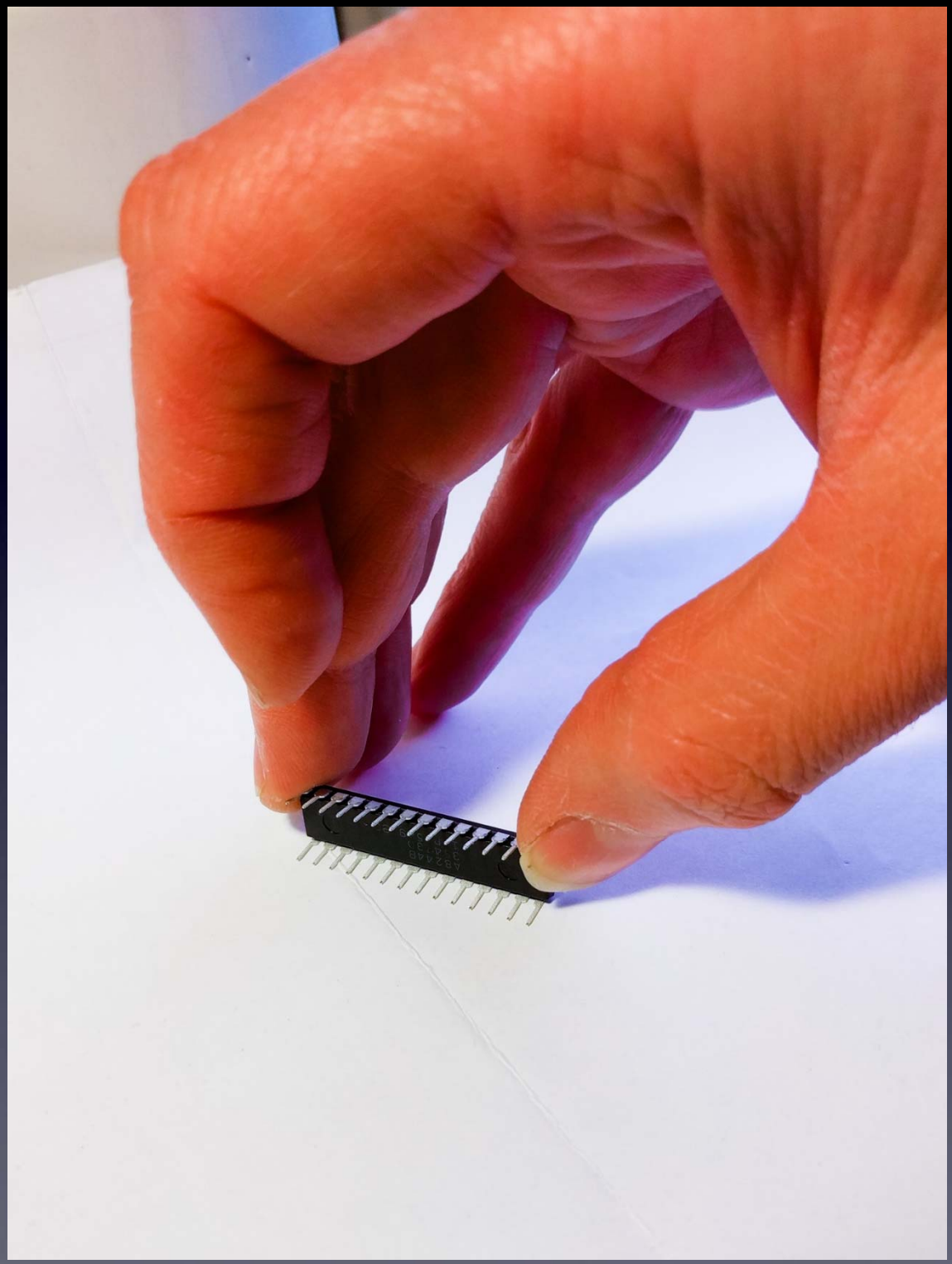


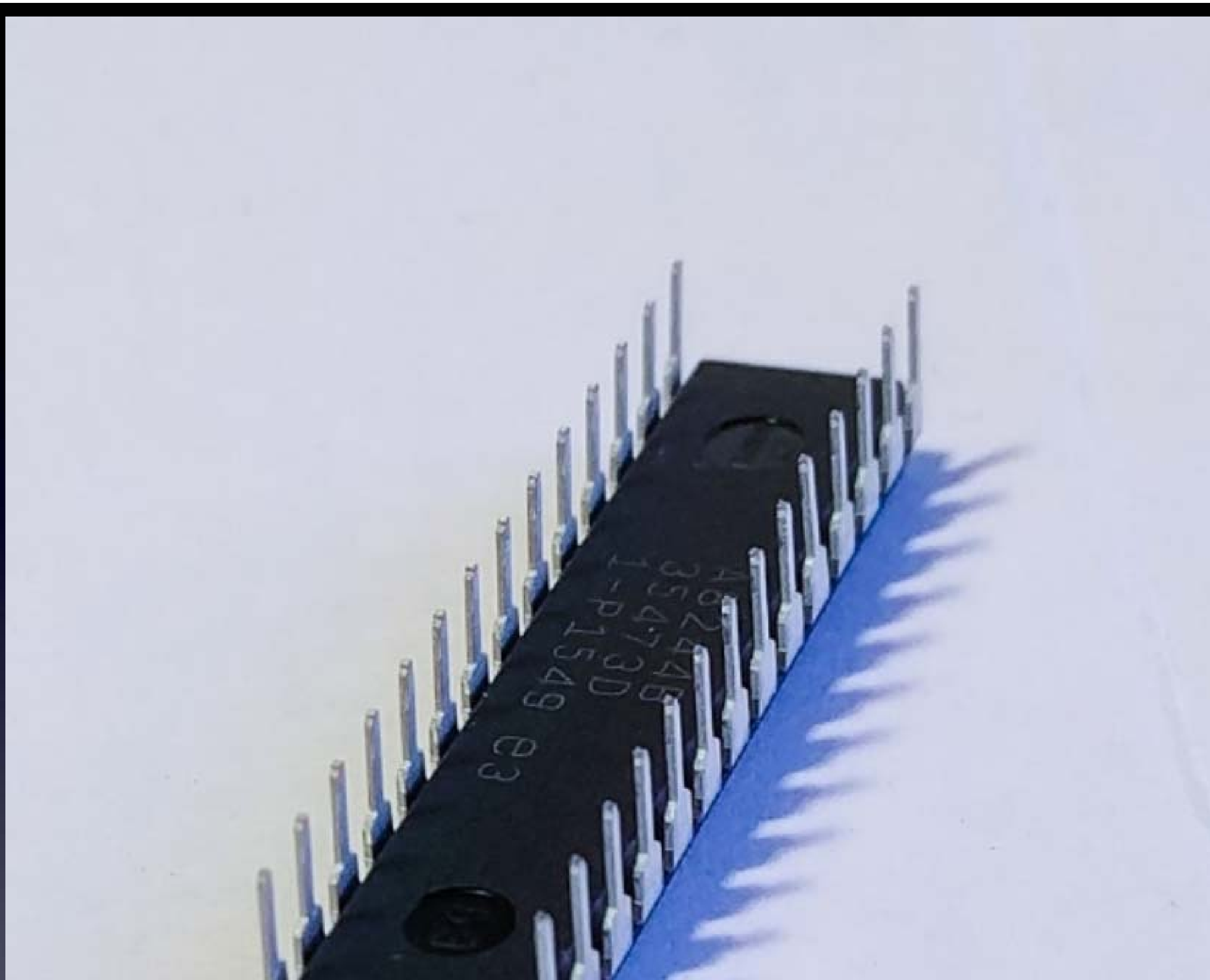
Headers

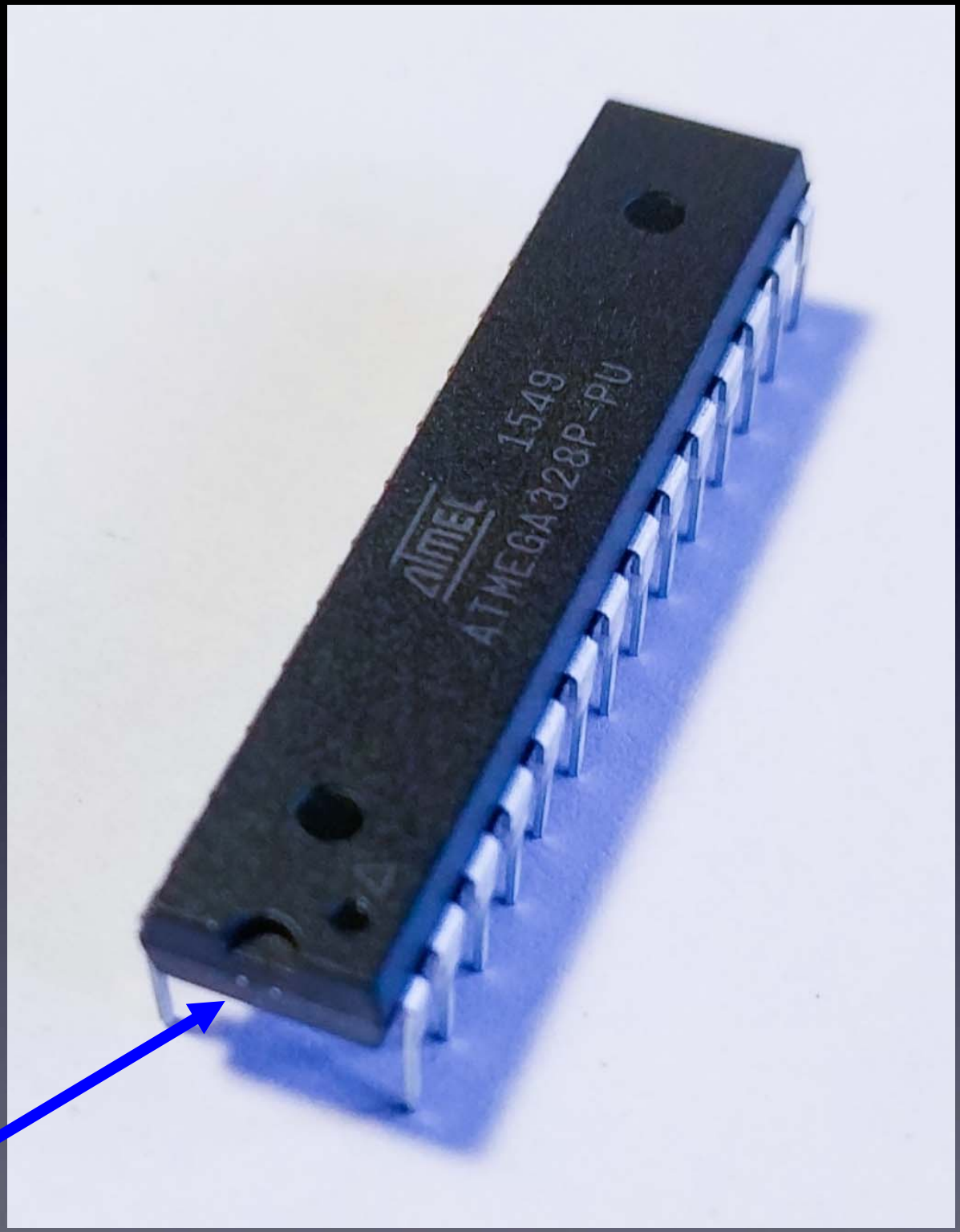


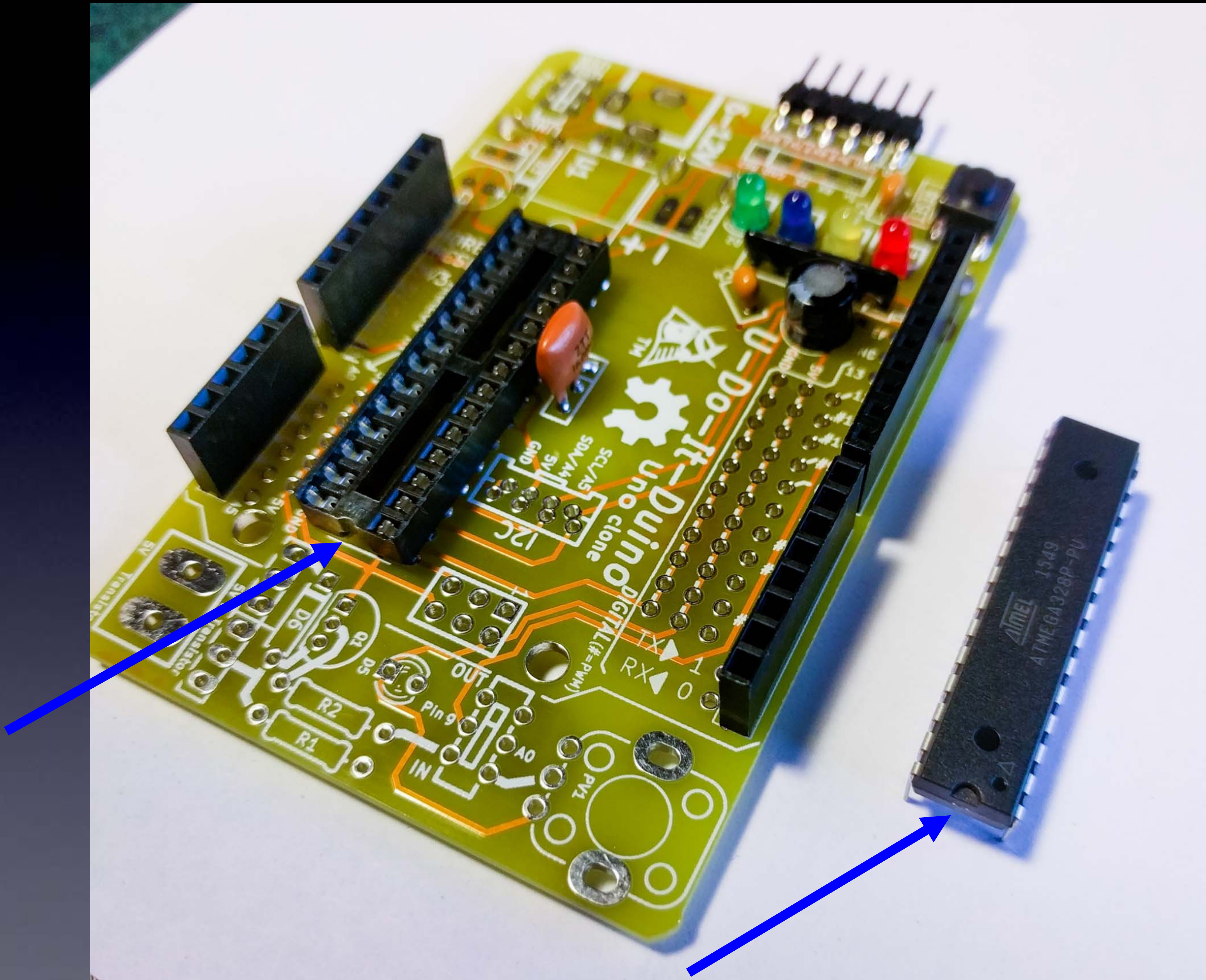

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
RESET
POWER
C1
C4
4.5-5.5V
6-12V
U1
D3
C2
C3
USB
SW2
Power
LINE
IOREF
RESET
3V3
5V GND VIN
ANALOG IN
SCL/A5
SDA/A4
5V
GND
I2C
TM
PV1
A0
OUT
Pin 9
IN
D5
R2
R1
Q1
D6
5V
Transistor
32684AP1
28
TX
RX
GND
5V
A5


A82448
3547 3D
1-P1549 E3

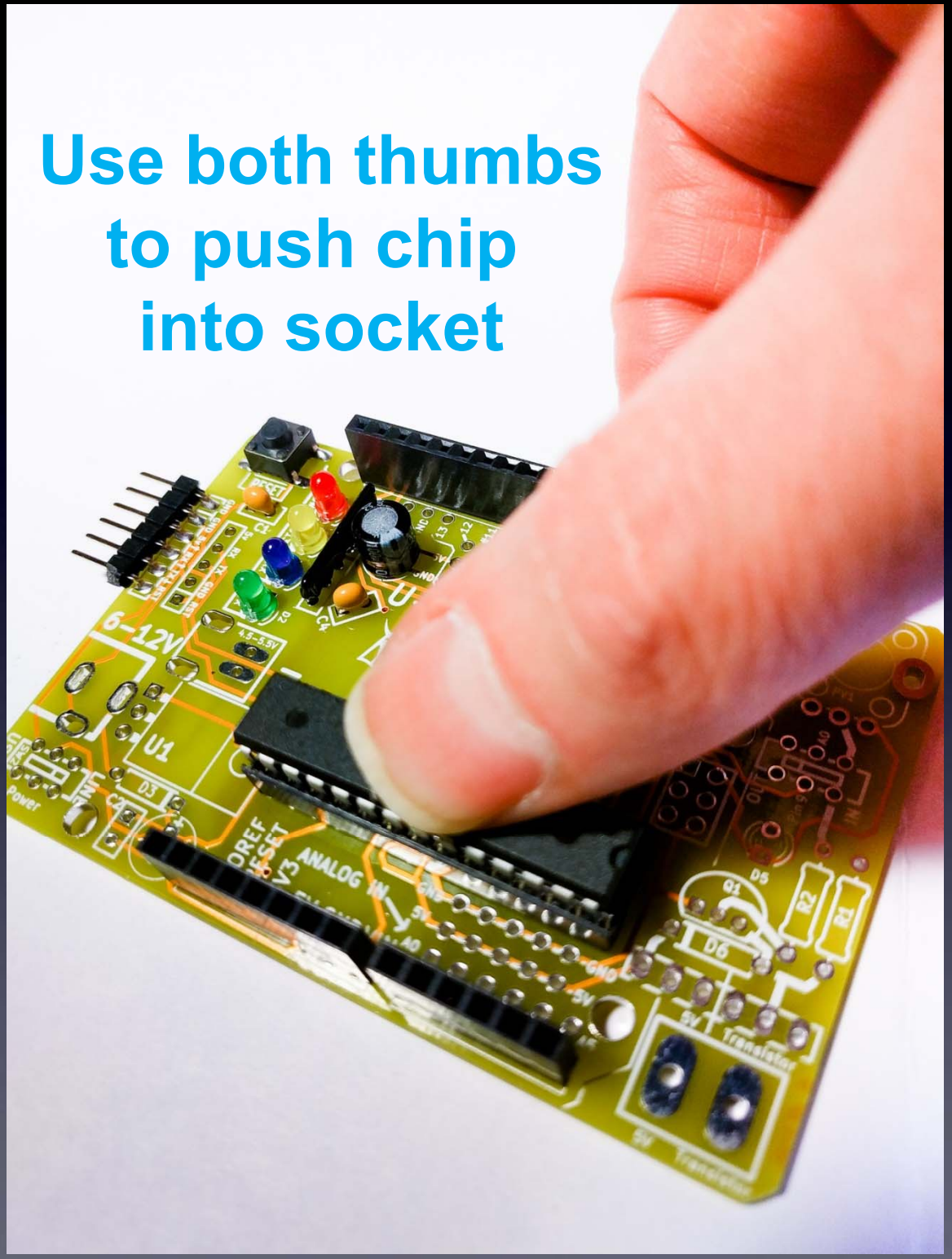


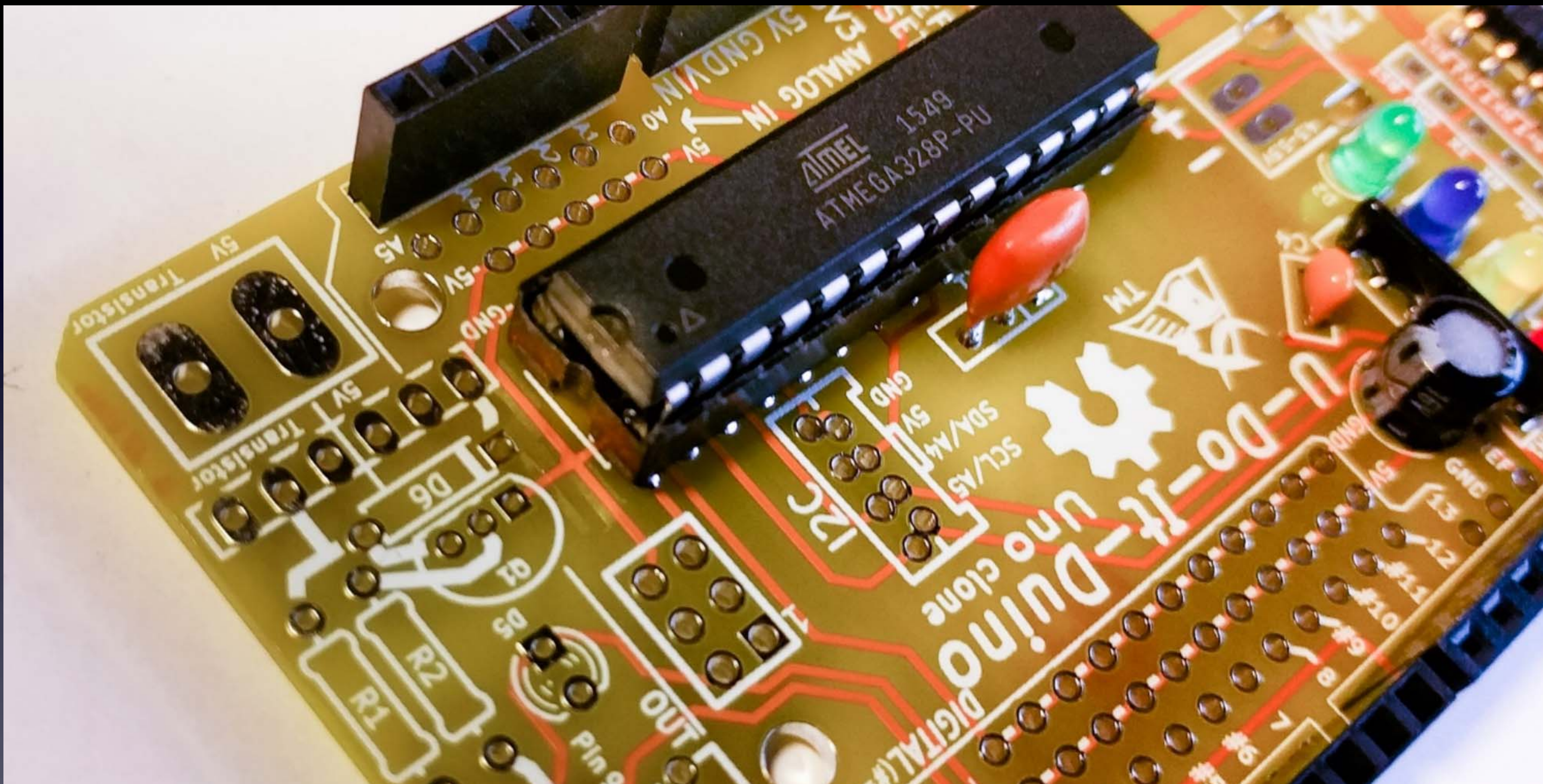

35473D
1-P1549 e3


ATMEL
ATMEGA328P-PU
1549

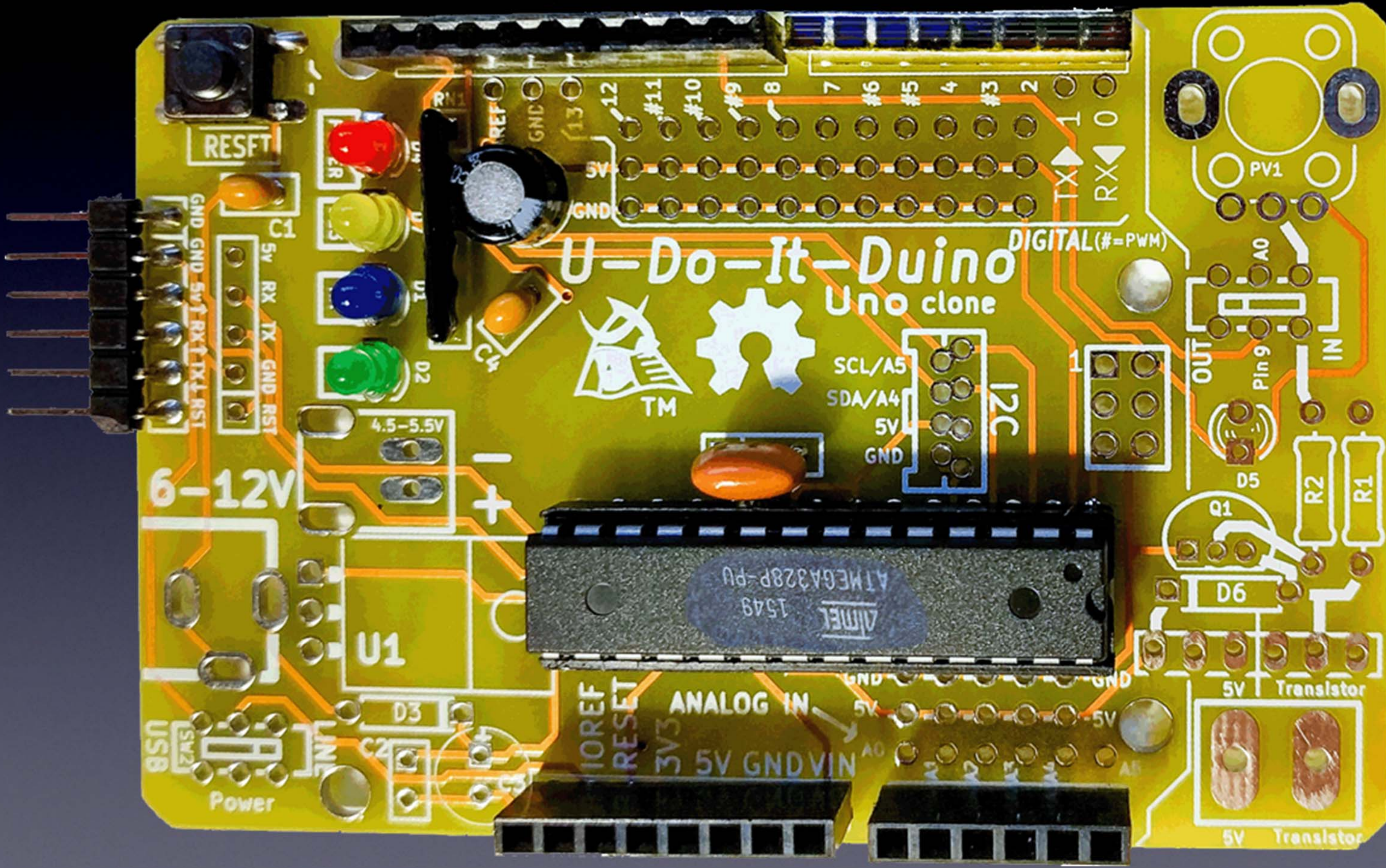

U-Do-It-Duino
Uno clone
DIGITAL(#=PWM)
I2C
GND
5V
SDA/A4
SCL/A5
TX
RX
R1
R2
D5
D6
Q1
PV1
IN
OUT
Pin9
A0
ATMEL
1549
ATMEGA328P-PU

Use both thumbs to push chip into socket

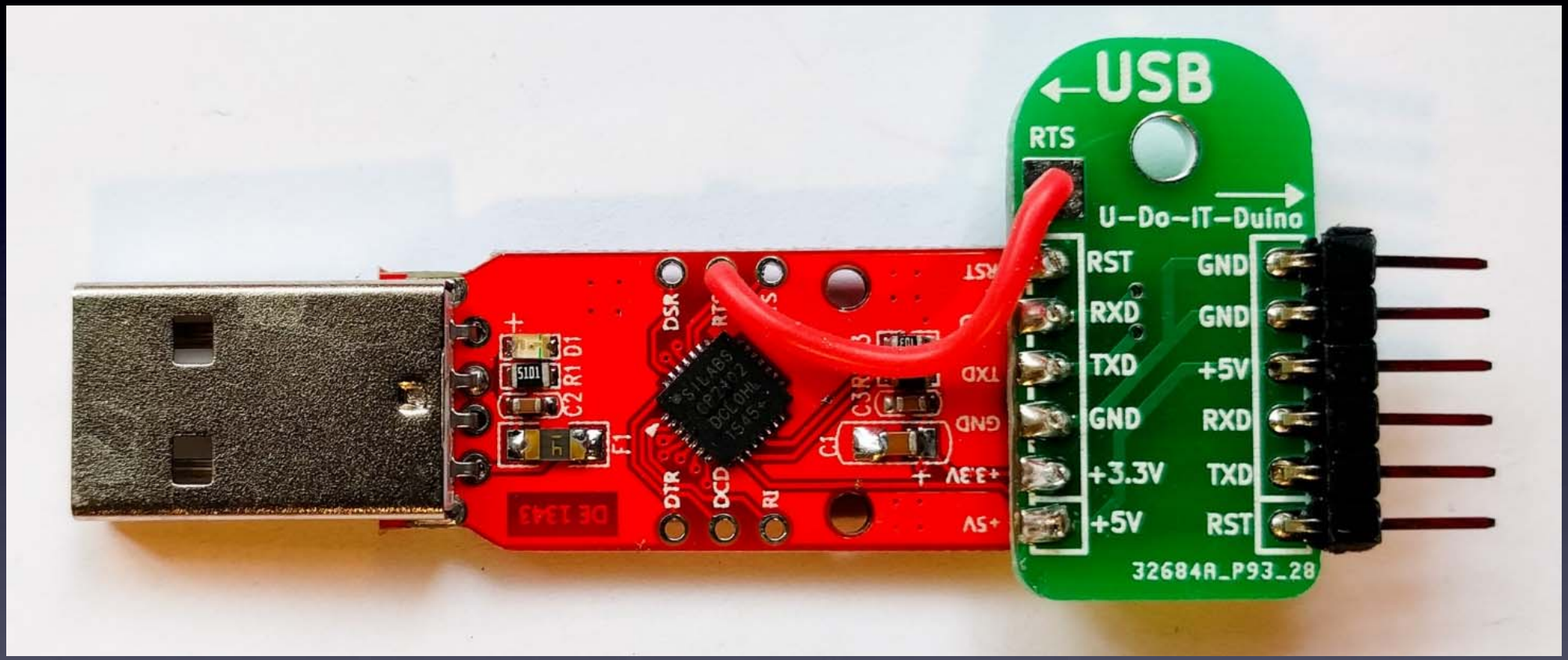



1549
ATMEGA328P-PU
ANALOG IN
Transistor
I2C
GND
5V
SDA/A4
SCL/A5
Uno clone
R1
R2
D5
D6
Q1
OUT
TM

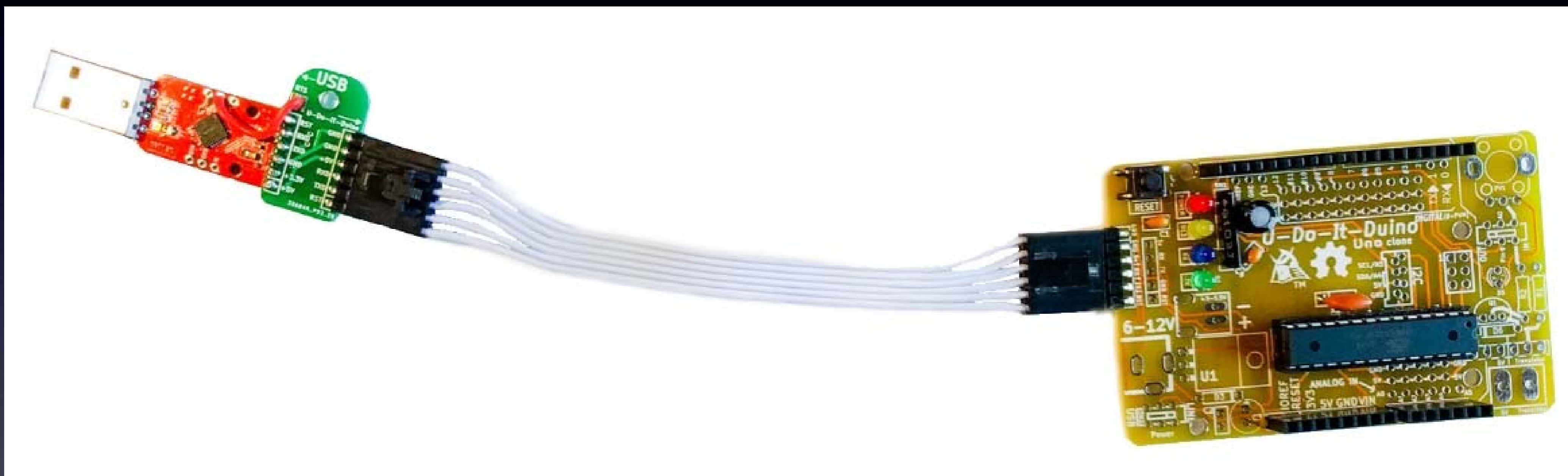
We’re done!


U-Do-It-Duino
Uno clone
RESET
DIGITAL(#=PWM)
ANALOG IN
6-12V
4.5-5.5V
SCL/A5
SDA/A4
5V
GND
I2C
U1
D3
D5
D6
Q1
R1
R2
PV1
Power
TM
5V
Translstor

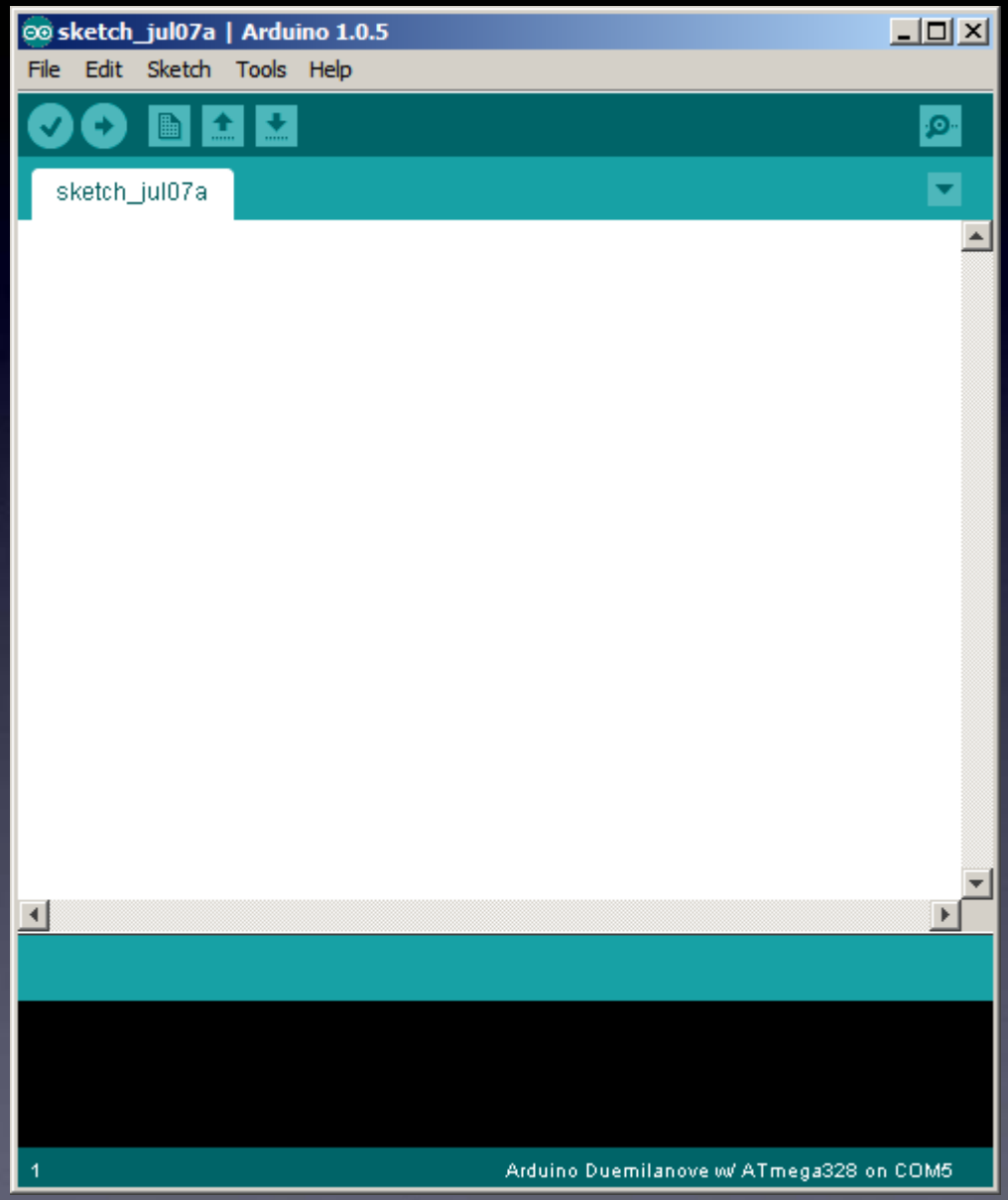
Now we can
connect parts to our Arduino,
and program it!


←USB
RTS
U-Do-IT-Duino
RST
RXD
TXD
GND
+3.3V
+5V
GND
GND
+5V
RXD
TXD
RST
32684A_P93_28
DSR
DTR
DCD
RI
F1
C1
C2
C3
R1
D1
TXD
GND
+3.3V
+5V

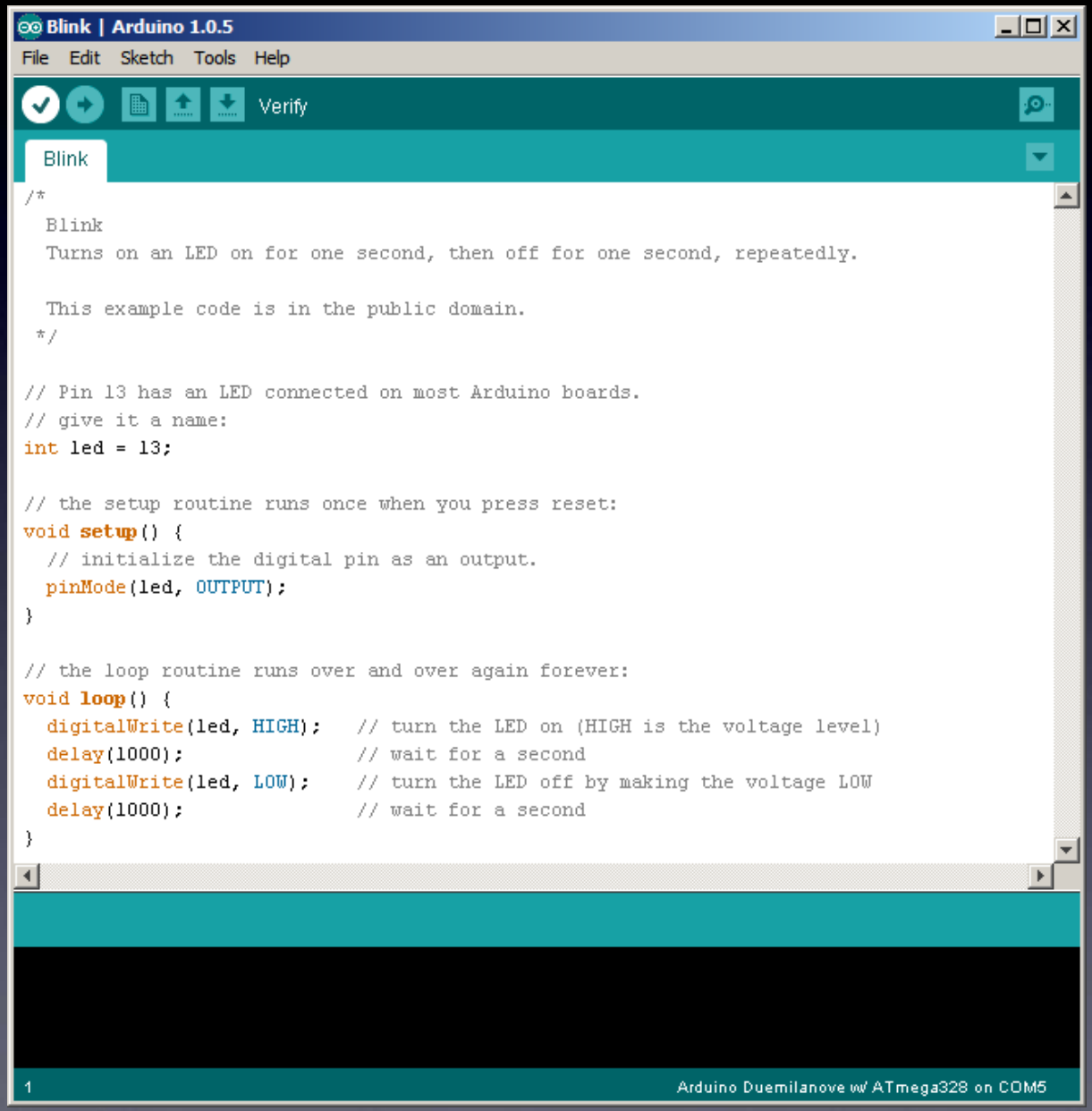

USB
RTS
U-Do-IT-Duino
RST
RXD
TXD
GND
+3.3V
+5V
GND
GND
+5V
RXD
TXD
RST
32684A_P93_28
DSR
DTR
DCD
RI
SILABS
GND
+3.3V
+5V


USB
U-Do-It-Duino
Uno clone
RESET
6-12V
U1
ANALOG IN
IOREF
RESET
3V3
5V GND VIN
Power

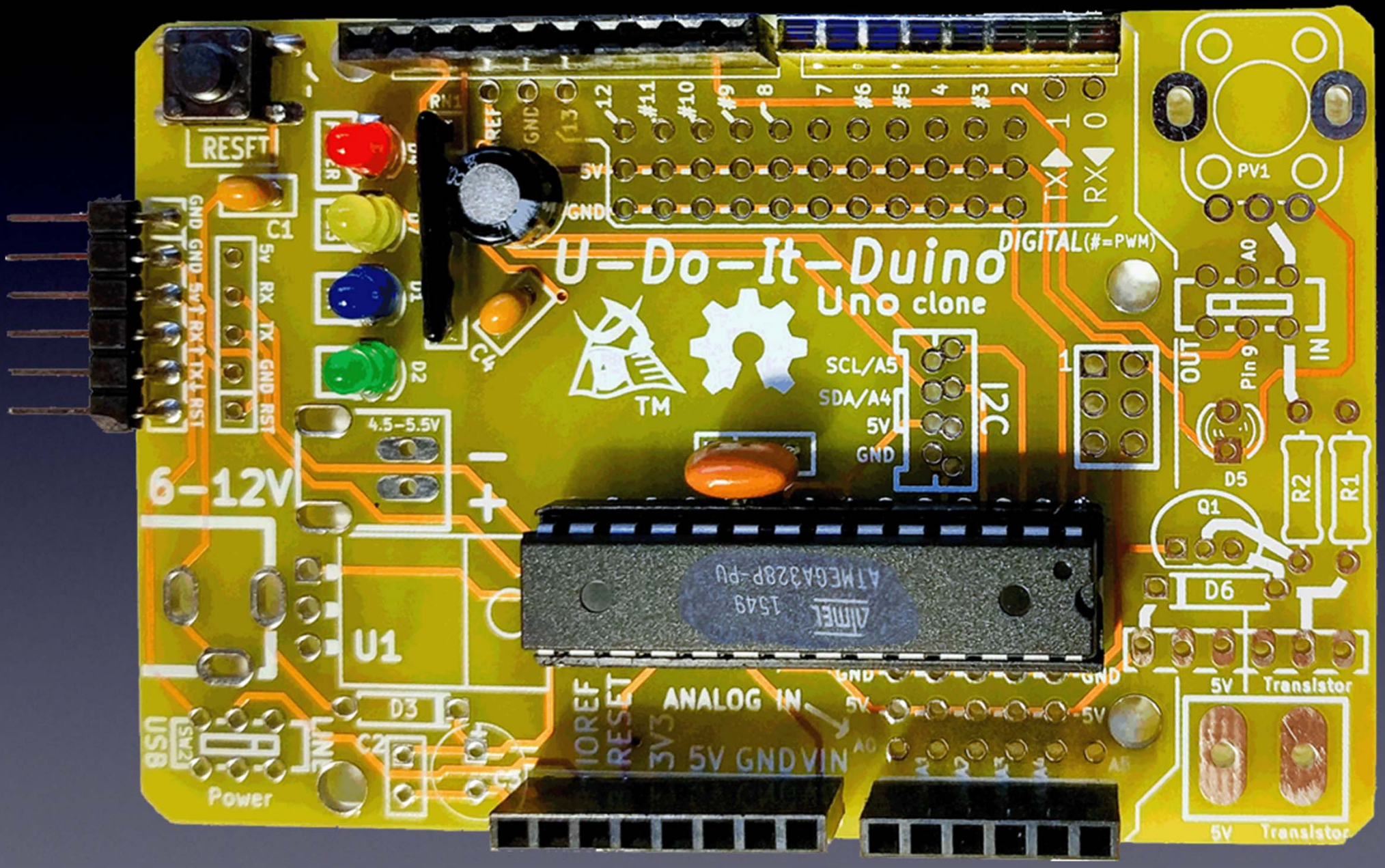
How to Set Up and Use the Arduino Software



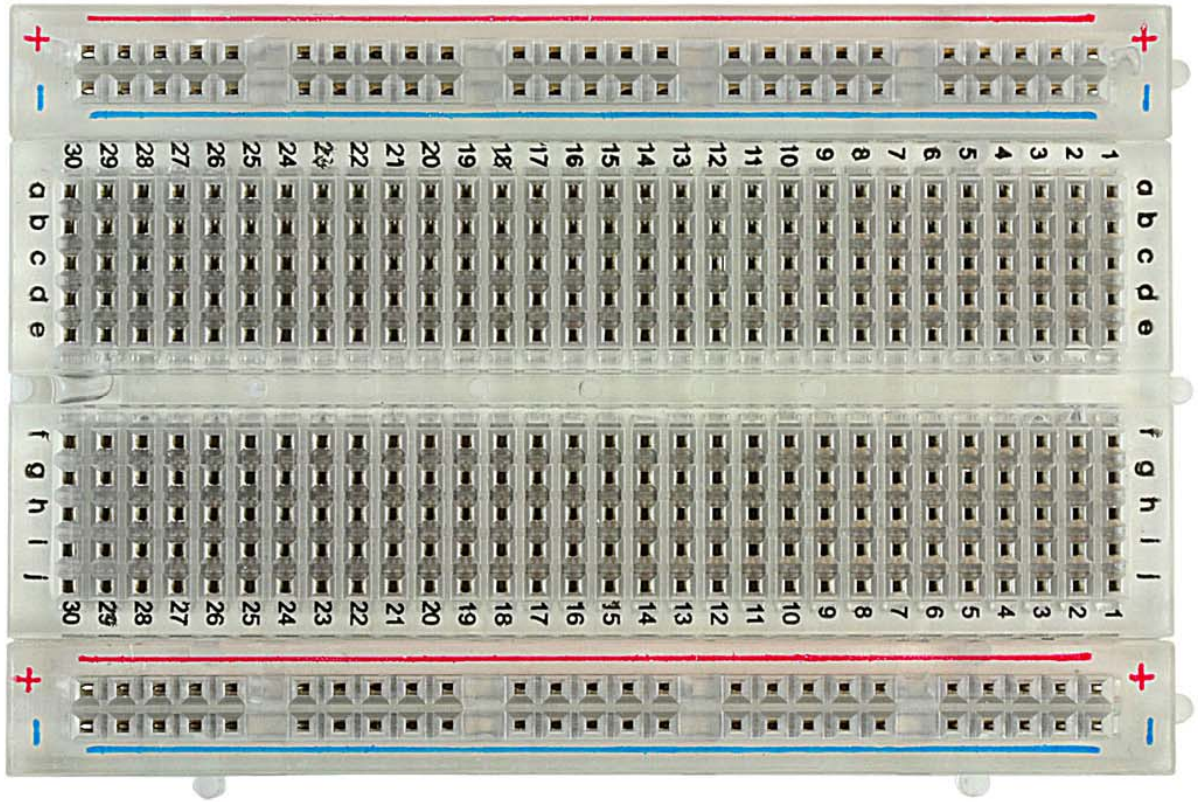
How to Hack Arduino Programs (“Sketches”)



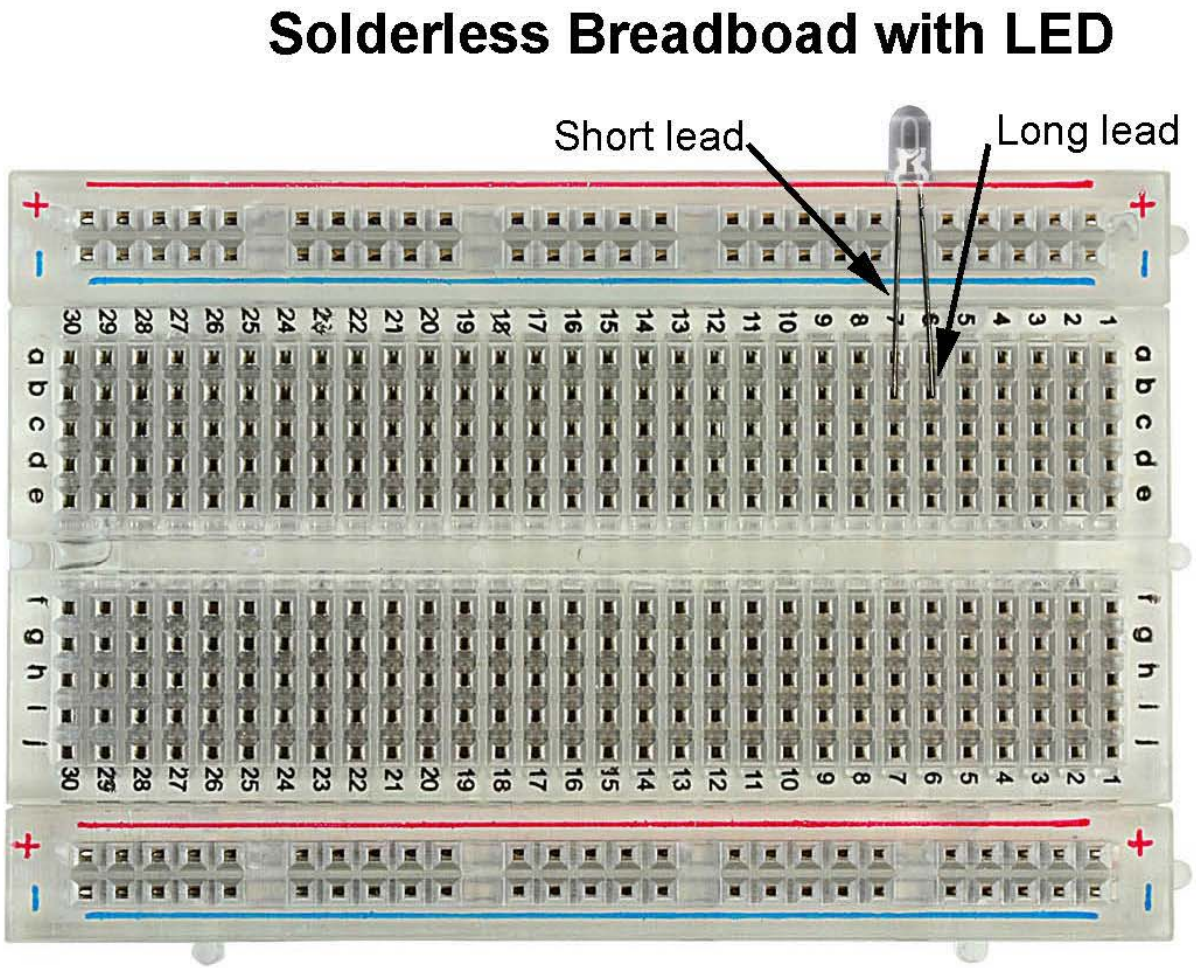
How to Hack Arduino Programs (“Sketches”)



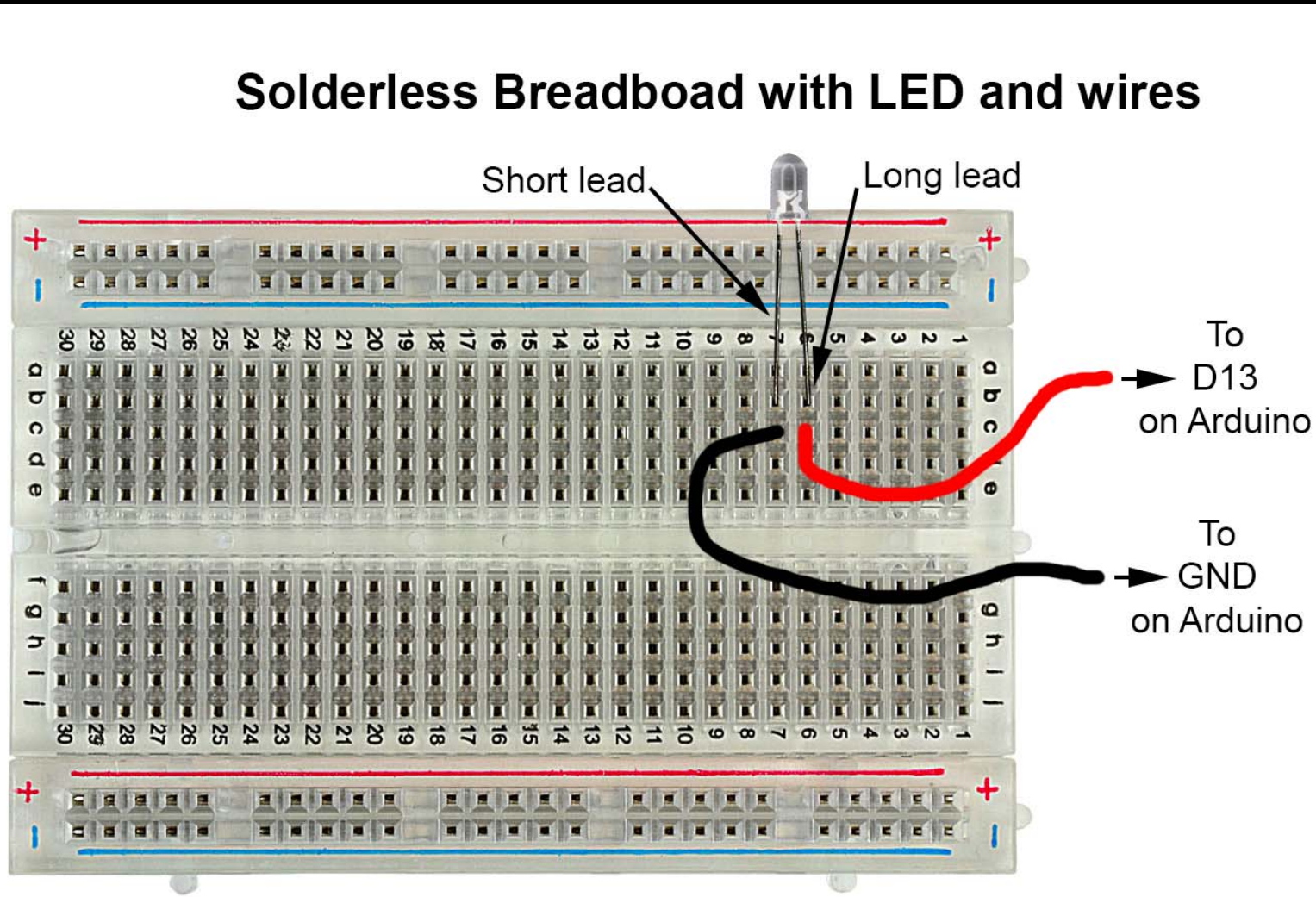
How to Use Solderless Breadboards



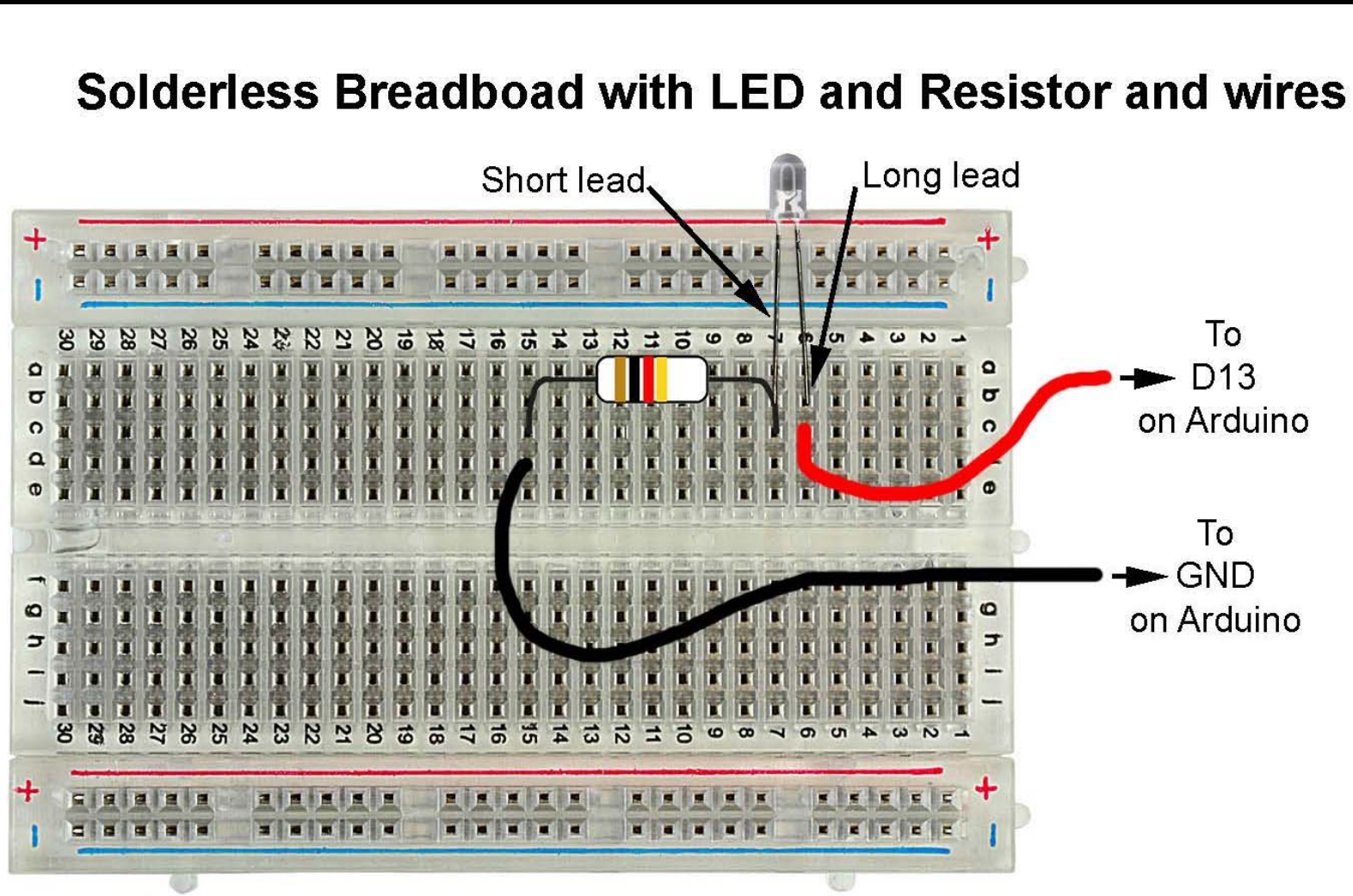
How to Use Solderless Breadboards



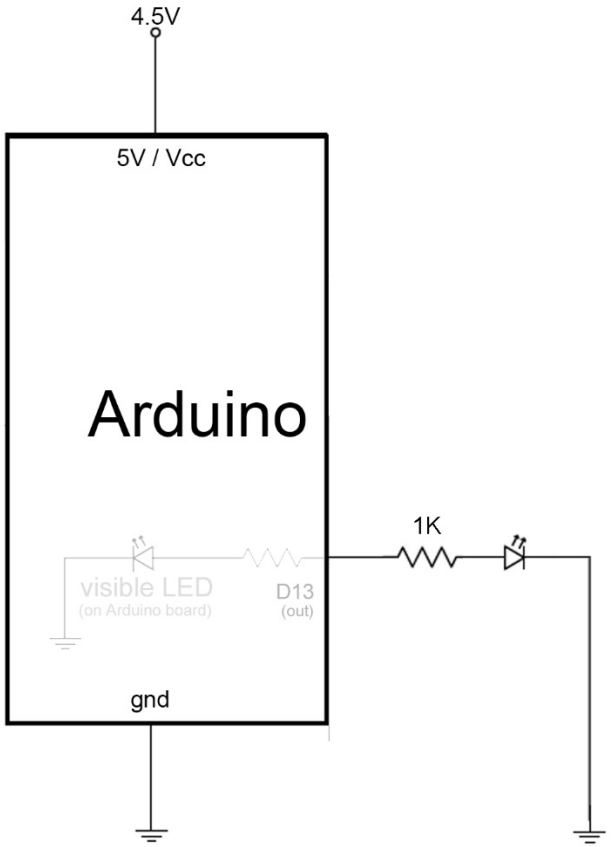
How to Use Solderless Breadboards



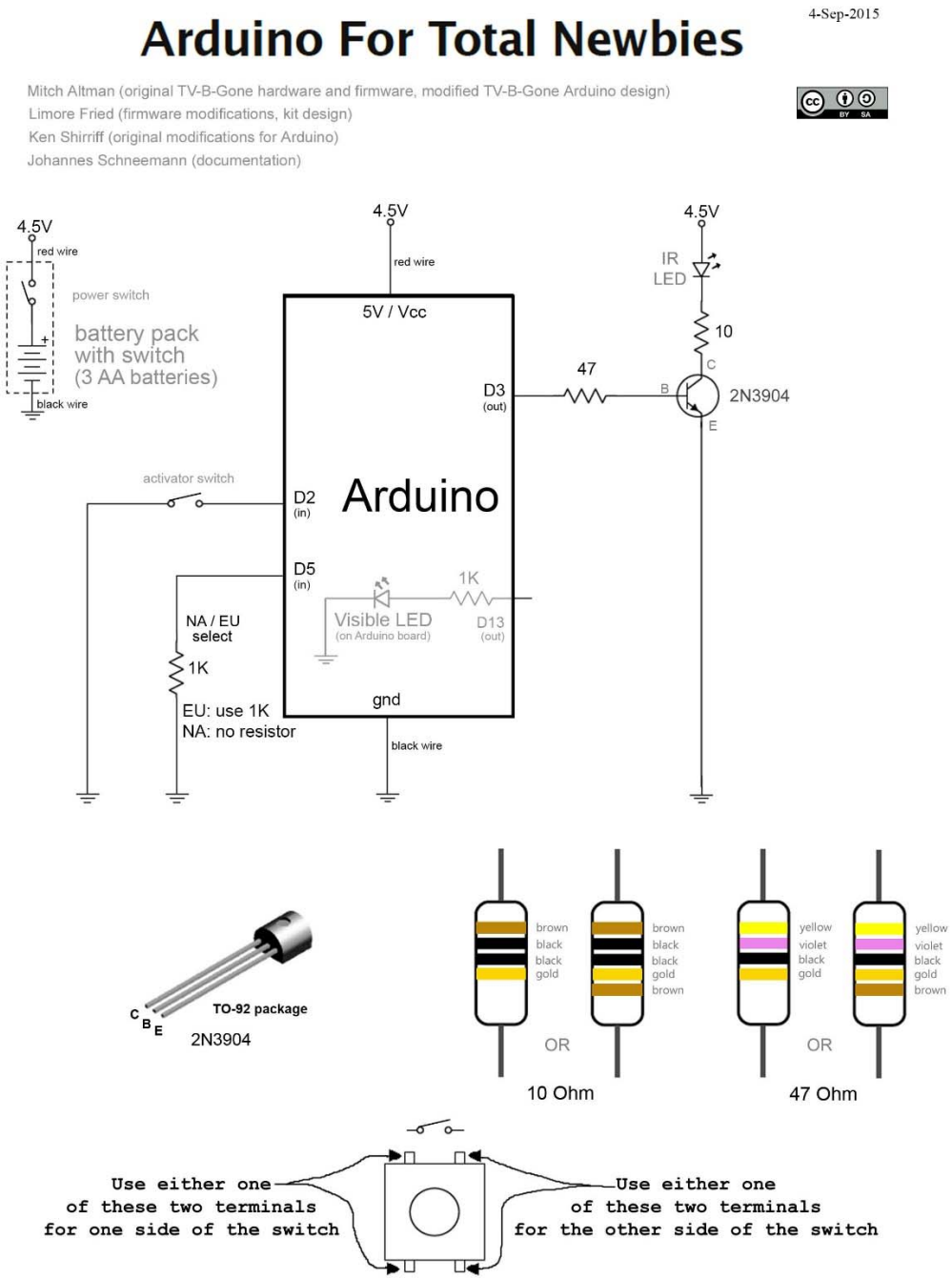
How to Use Solderless Breadboards



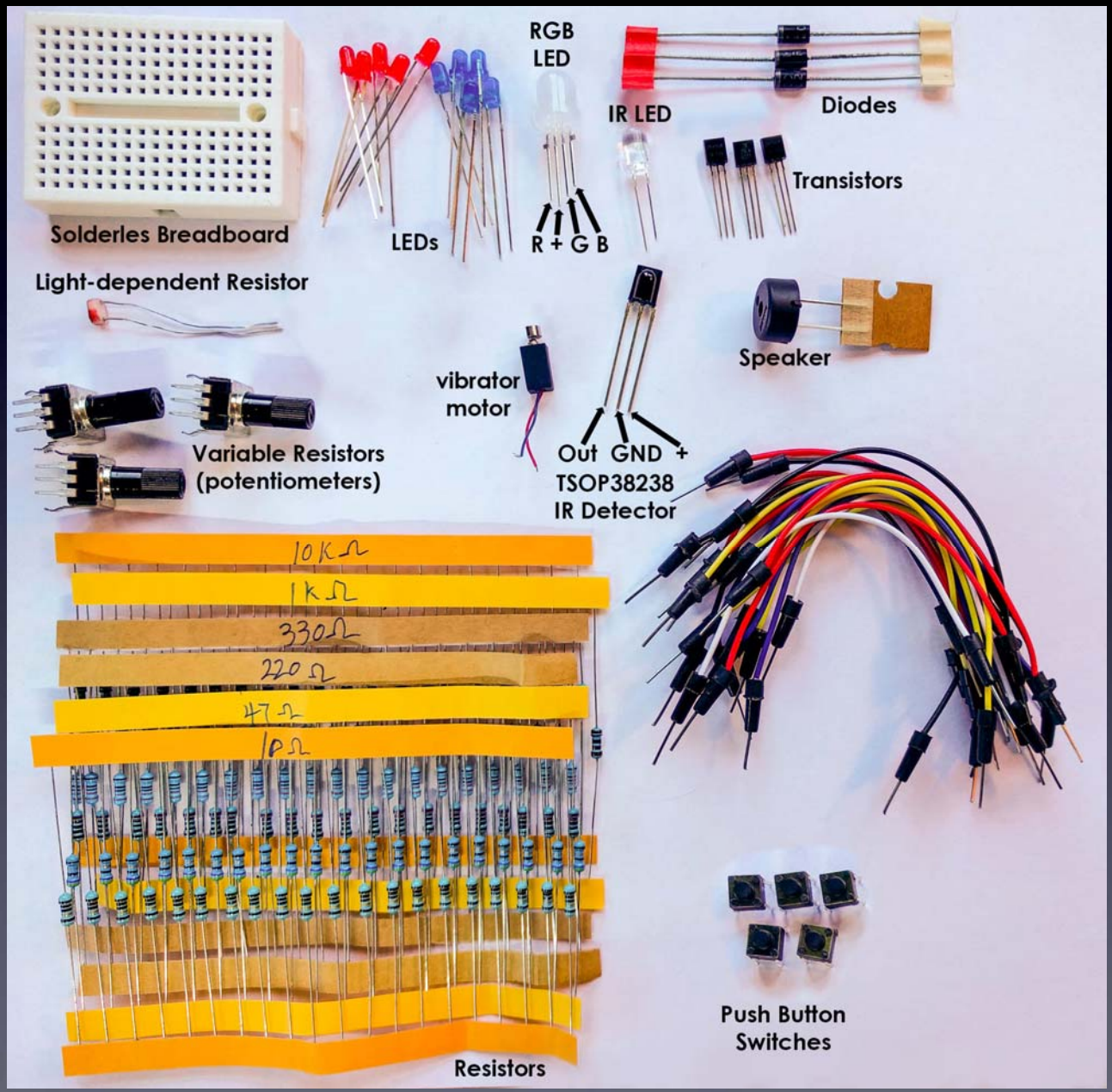
How to Read a Schematic



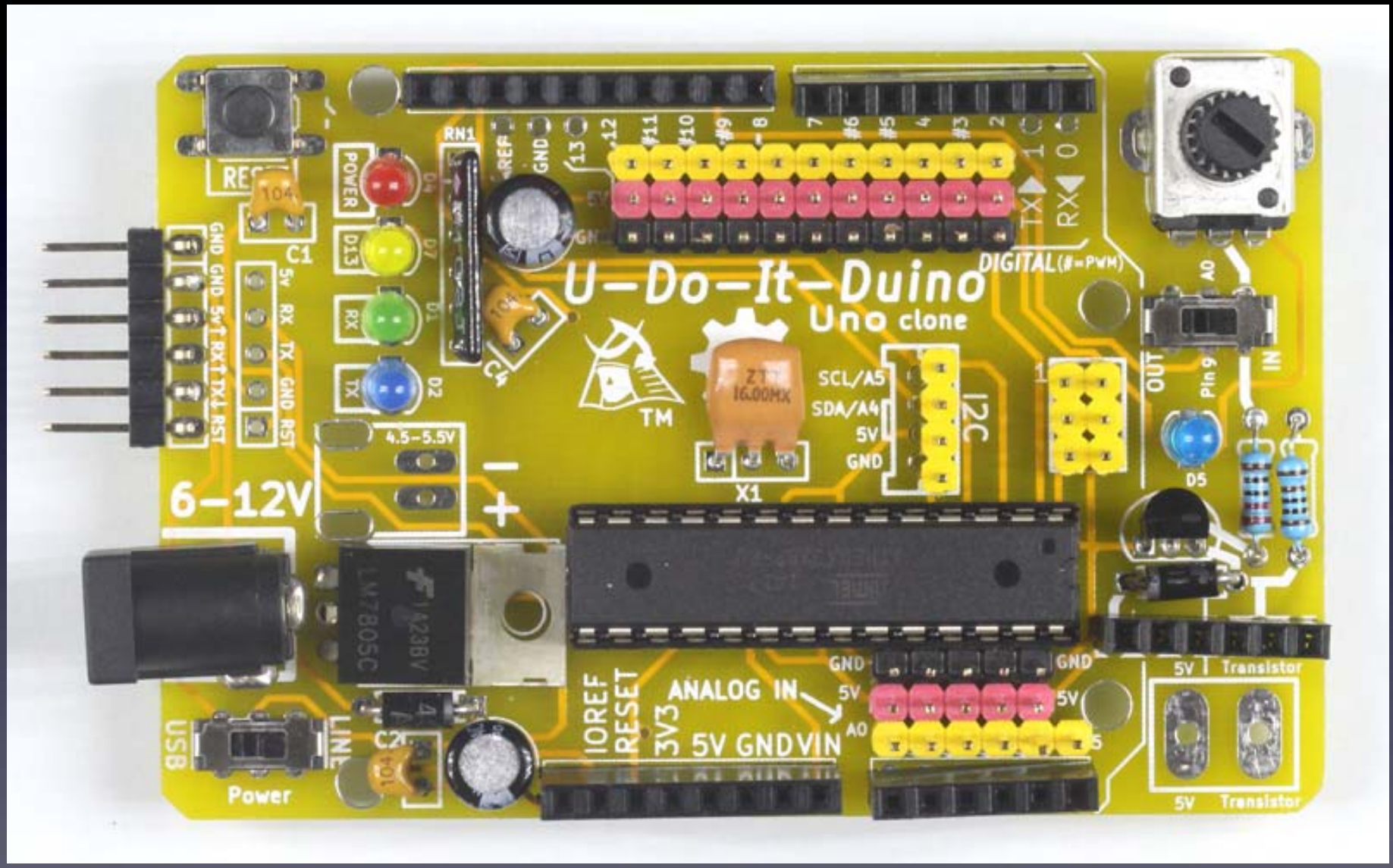
How to Read a Schematic



Parts Pack Contents



If you want to:



http://www.samuraicircuits.com/MediaWiki/index.php?title=U-Do-It-Duino

Please Remember:

to

Wash your hands