Milestone 1 – Idea presentation
9/11 Wed

If you have formed your group, put your name on the ELMS->People->Group->Semester-long Project

Documentation Due 9/15 Sun

Everyone | Groups

+ Group

Search Groups or People

Semester-long project 1 Semester-long project	4 students	
Semester-long project 2 Semester-long project	3 students	
Semester-long project 3 Semester-long project	4 students	
Semester-long project 4 Semester-long project	4 students	
Semester-long project 5 Semester-long project	4 students	
Semester-long project 6 Semester-long project	4 students	
Semester-long project 7 Semester-long project	3 students	
Semester-long project 8 Semester-long project	1 student	
Semester-long project 9 Semester-long project	0 students	
Semester-long project 10 Semester-long project	0 students	

5 min presentation + 3 min Q& A

2 Options:

a) Haven’t decided on the idea:

Present 3 of your best ideas and explain to us with sketches

b) Know what to do:

Present your final idea – what are the functions, challenges and potential solutions

5 min presentation + 3 min Q& A

Submit a google doc with:

a) Problem Statement & Idea
b) System Block Diagram
c) Input/Sensing+Output/Actuation
d) Challenges + Potential Solutions
e) Bill of Materials(BOM)

Braille Label Bot

Huaishu


label.m
PROFESSIONAL HAIRCARE
Honey & Oat Shampoo/750 ml
Lightweight repair for dry, dehydrated hair.
www.labelm.com
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PROFESSIONAL HAIRCARE
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SHOPPERS DRUG MART
PROTEA PHARMACY INC.
210 WALLACE AVE. N. LISTOWEL, ON N4W 1K9 CANADA
Store # 1007
Phone: 519-291-15
Rx#9373889 Ref:0
R.PH. H. VALLIS
EASTDALE PUBLIC SCHOOL
TAKE 1 TABLET TWICE DAILY
TAKE WITH FOOD
MEDICINE
50 TAB
27 May 2017
SHOPPERS DRUG MART
PROTEA PHARMACY INC.
210 WALLACE AVE. N. LISTOWEL, ON N4W 1K9
Store # 1007
Phone: 519-2
9373892 Ref:0
R.PH. H. VAL
TDALE PUBLIC SCHOOL
KE 1 TEASPOONFUL (5M
3 TIMES DAILY FOR 7 DAYS
SHAKE WE
AND KEEP IN REFRIGERATOR
EDICINE
5 ML
27 May 2017


CONFERENCE RO

Perkins SMART Brailler

$ 2K+

6 Dot Braille Label Maker

$ 775

Reizen Braille Labeler

$ 40+
But fully manual
Hard to use

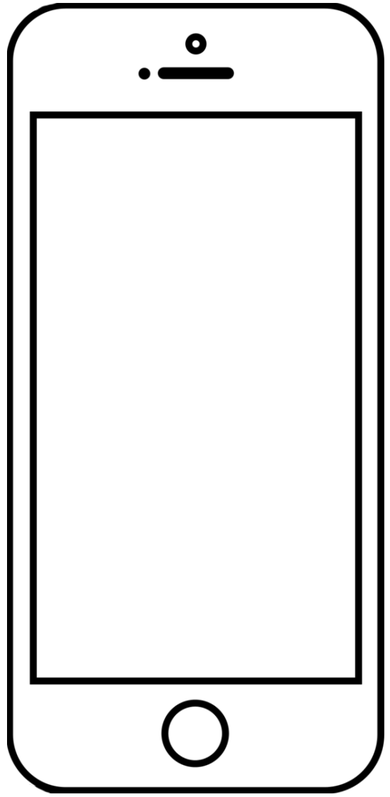
The idea

Low-cost, portable braille label bot that can be used by everyone

Can be used both
Indoor and outdoor

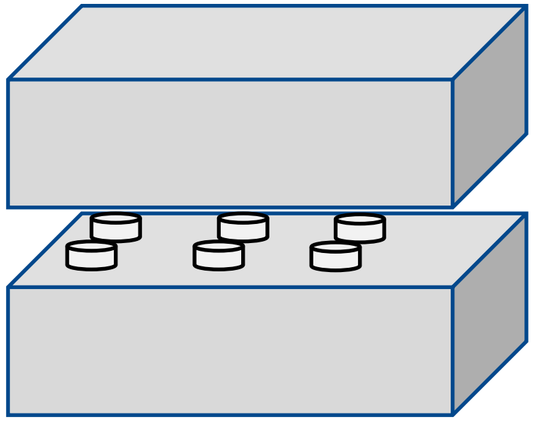
We can create braille
label for them

How



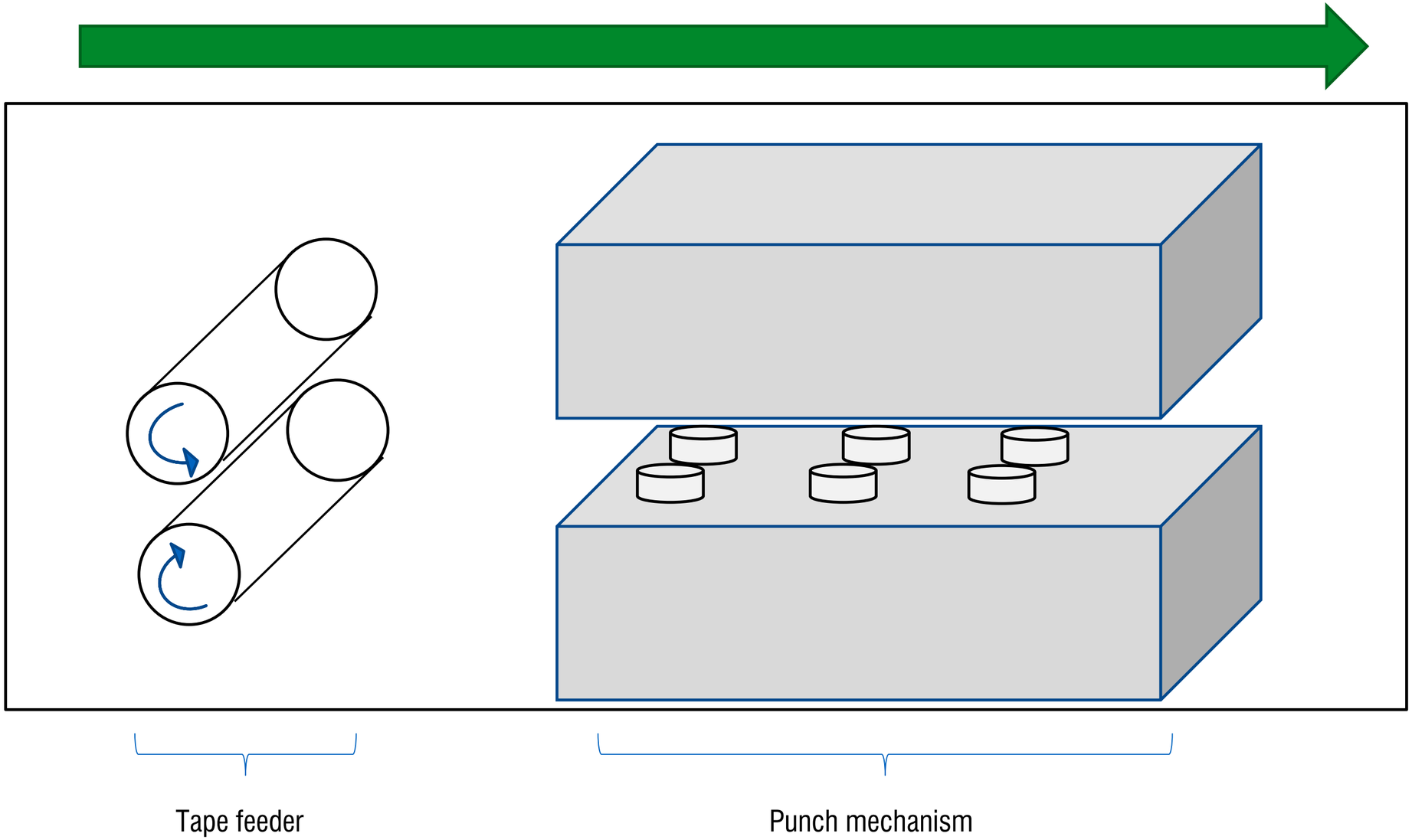
input platform
Either voice or type

+

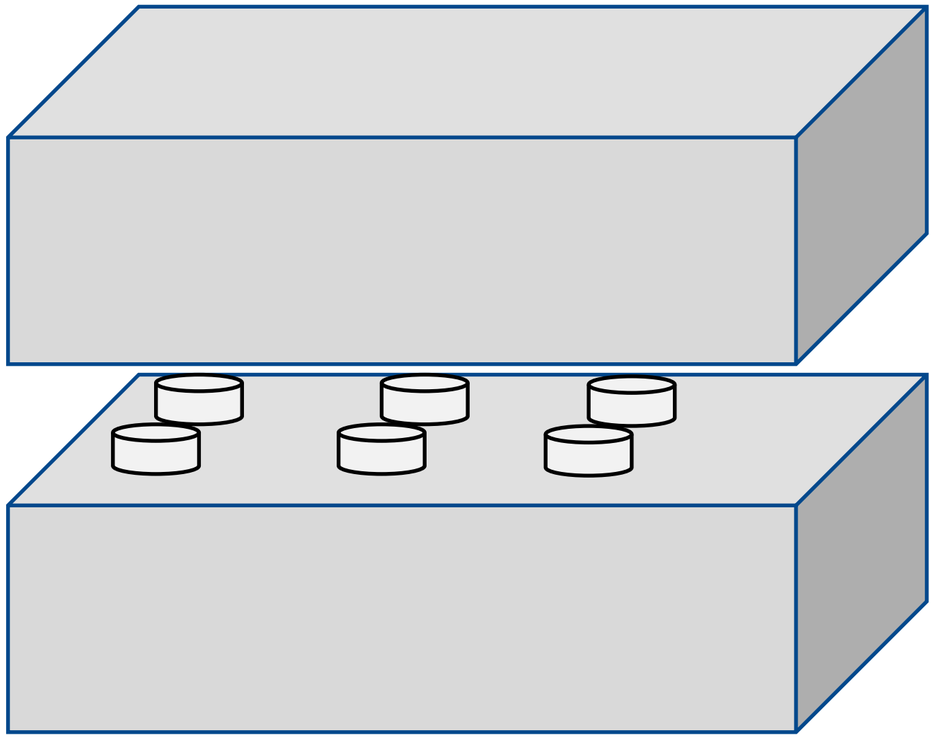


custom build machine
6 pin controlled with Arduino
punch holes to tape

How



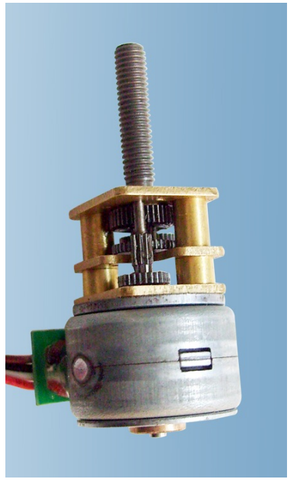
Main challenge



1. Limited physical space, dots need to be close to each other – how to arrange motors to control each of the 6 pins

2. Need large force to create hole or embossing

Potential solutions



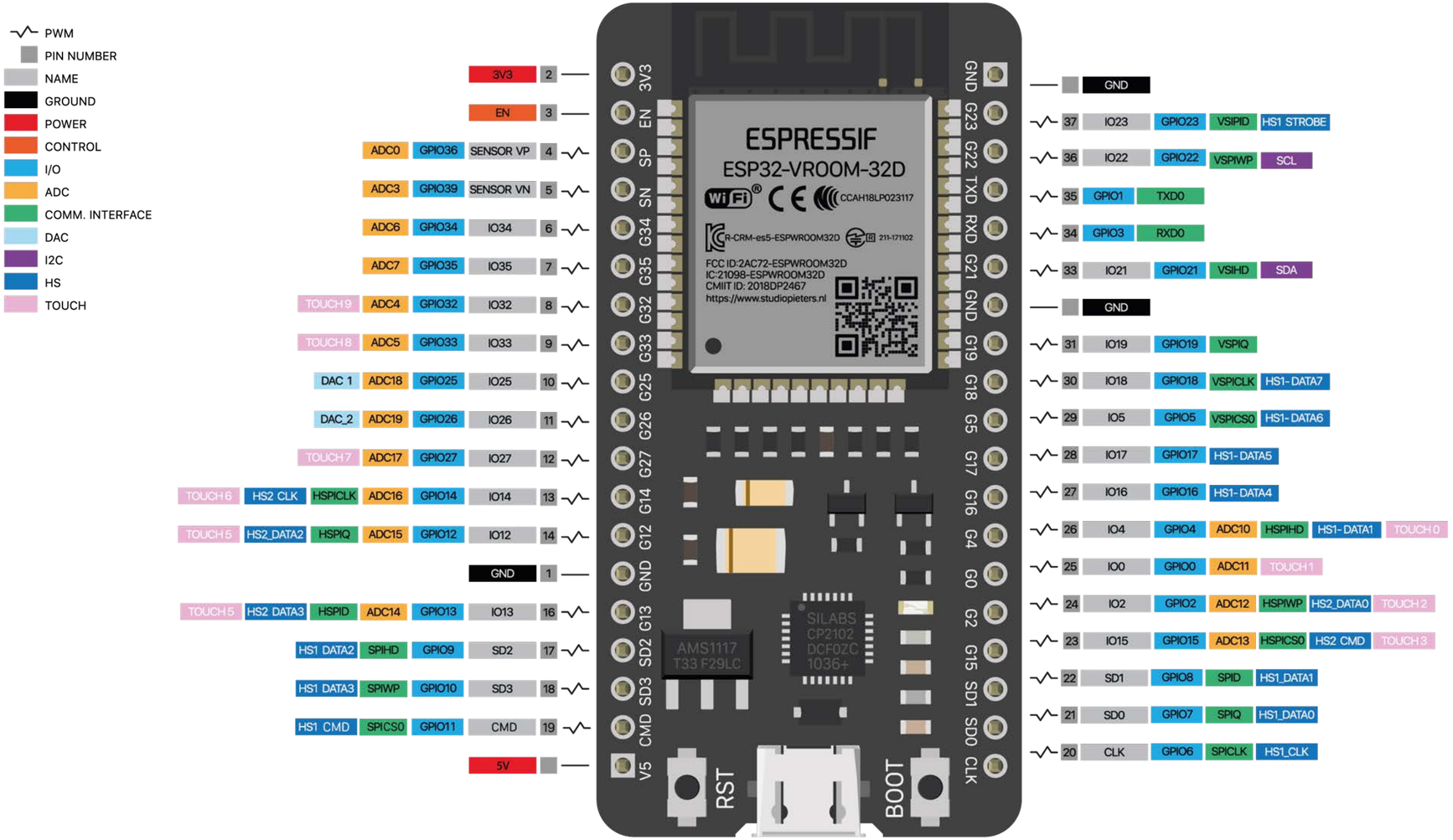
Plan for the next milestone

1. Figure out the motor to create embossing
2. Create one working prototype that can create 2 dots at a close distance

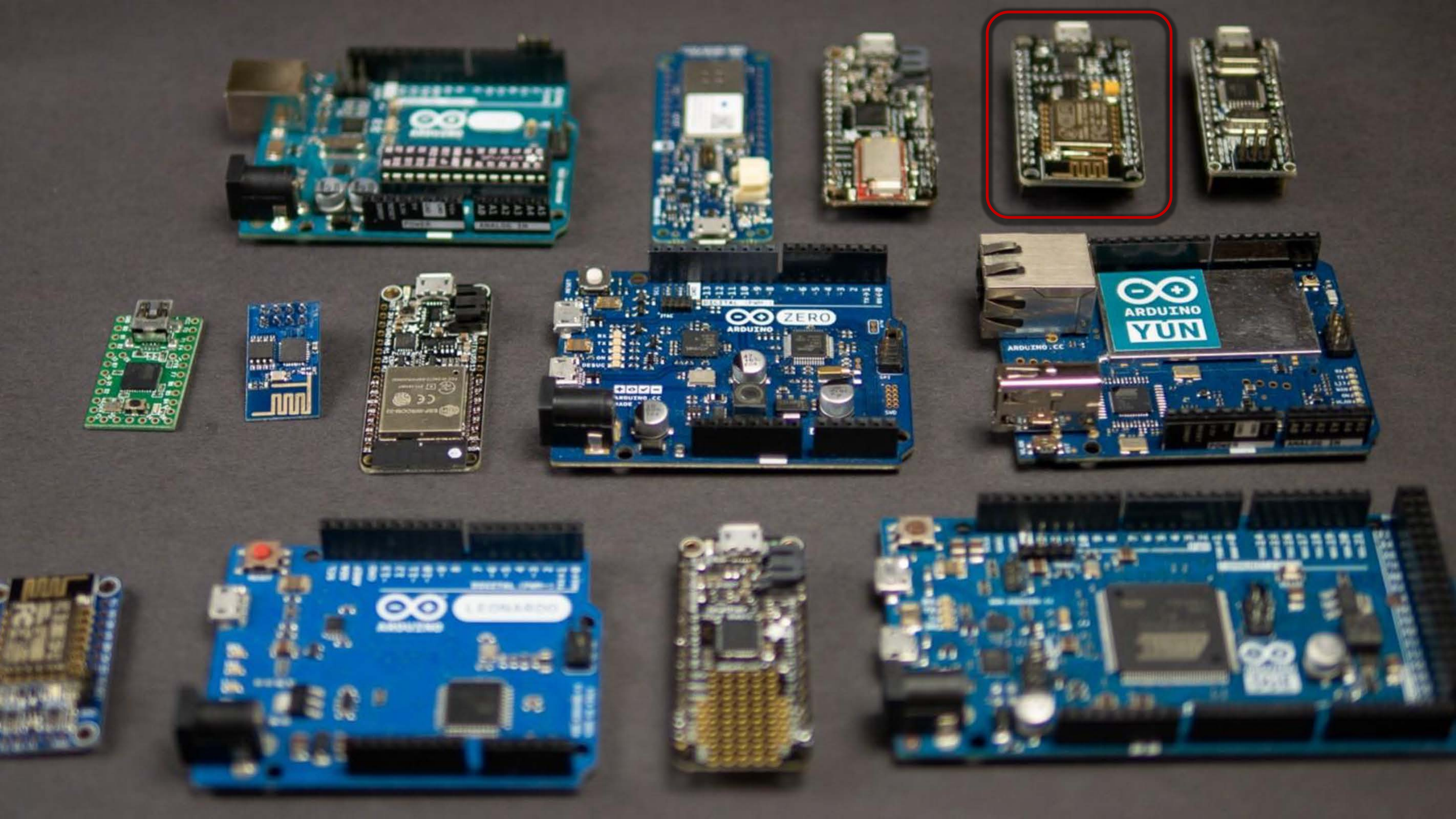
Questions?

DigitalOutput

Huaishu Peng | UMD CS | Fall 2024



https://www.studiopieters.nl/esp32-pinout/


ZERO
ARDUINO
YUN
ARDUINO.CC

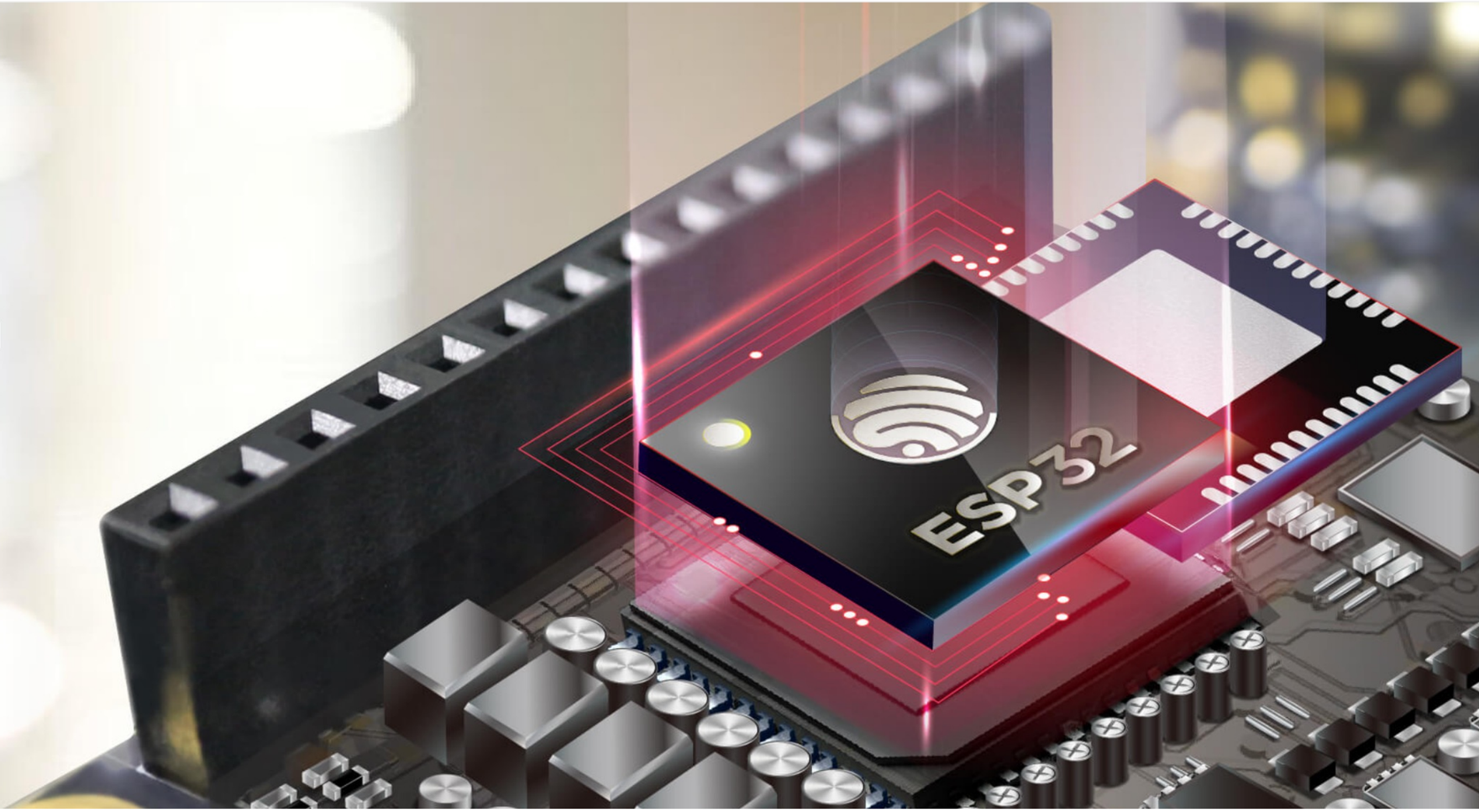
What is Arduino?

ESP32 (38Pin version)

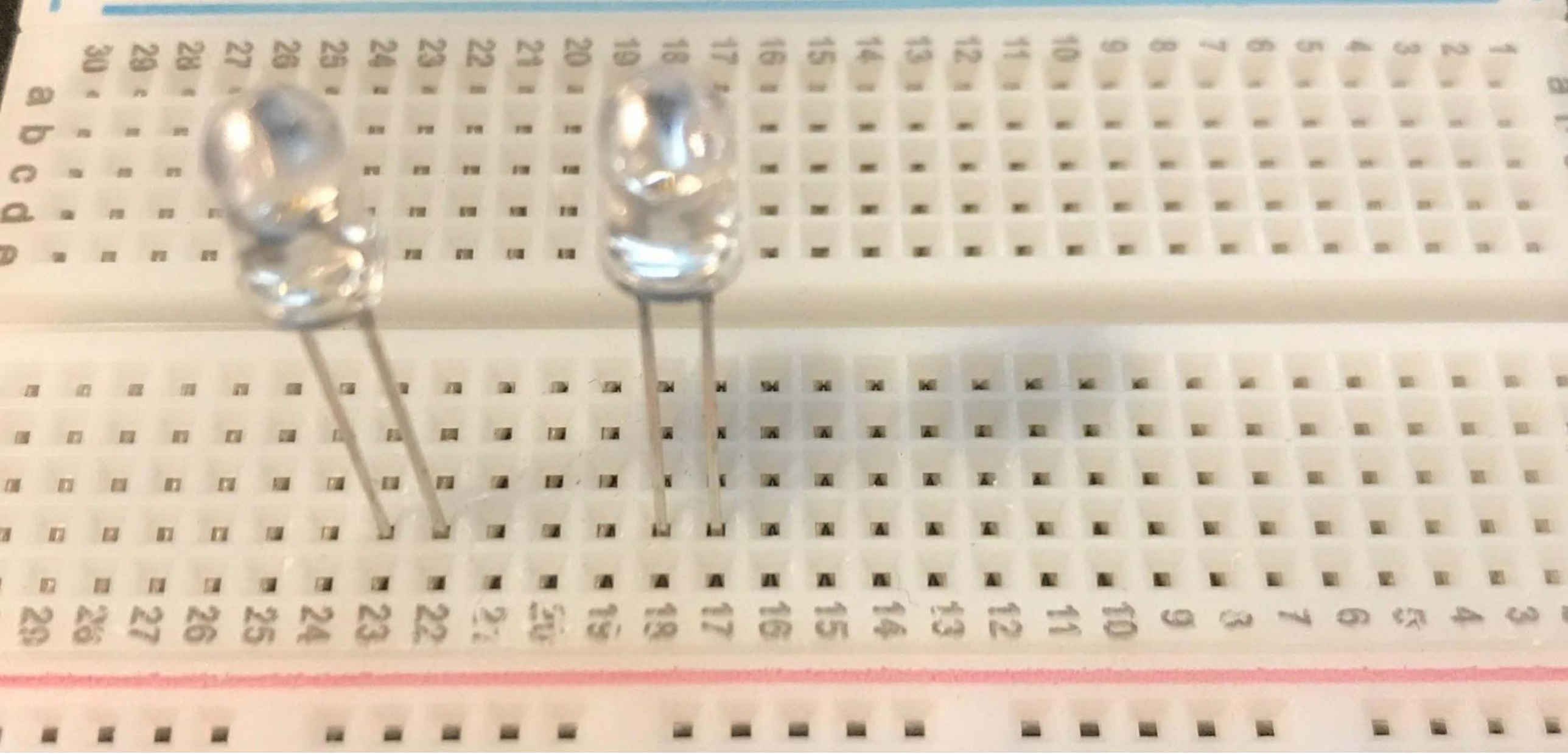
18 Analog-to-Digital Converter (ADC) channels
3 SPI interfaces
3 UART interfaces
2 I2C interfaces
16 PWM output channels
2 Digital-to-Analog Converters (DAC)
2 I2S interfaces
10 Capacitive sensing GPIO’s
Bluetooth
WIFI

ESP32

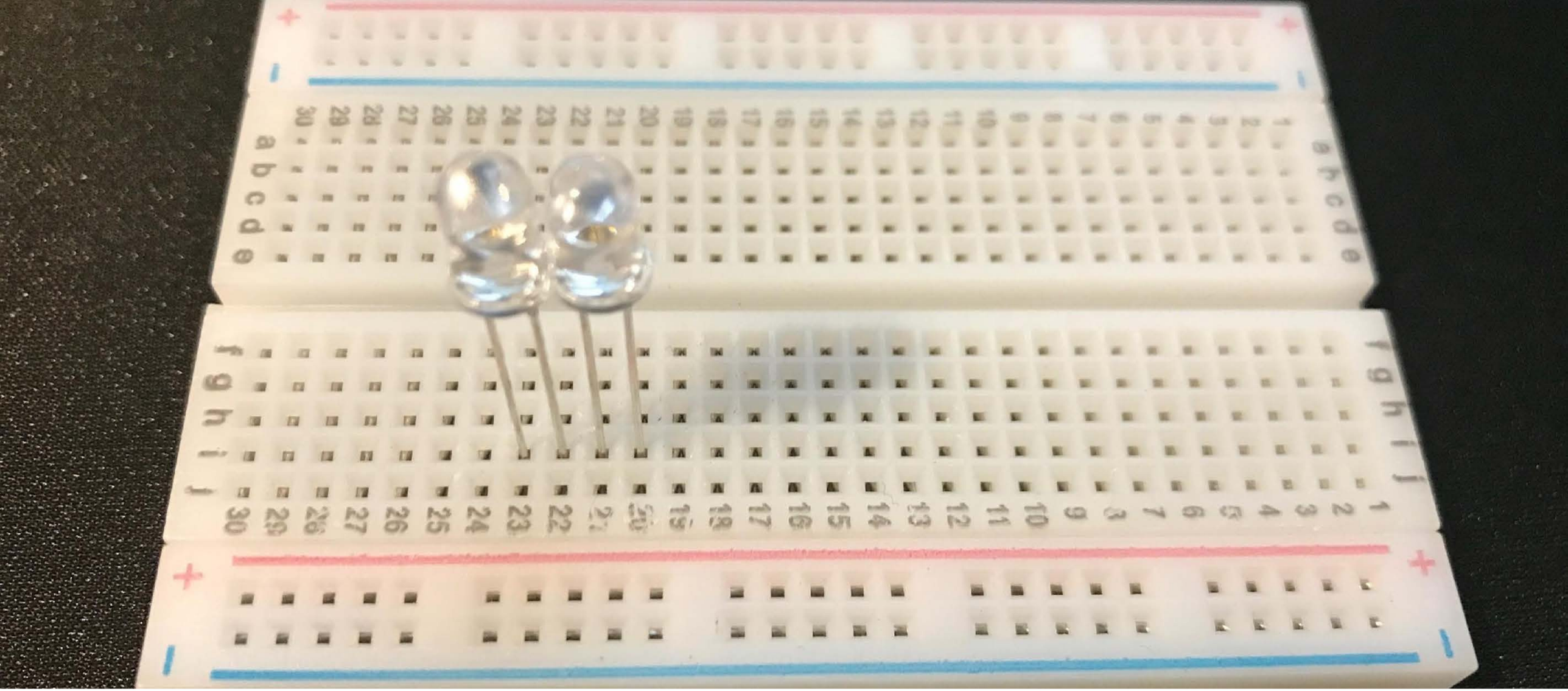
A feature-rich MCU with integrated Wi-Fi and Bluetooth connectivity for a wide-range of applications



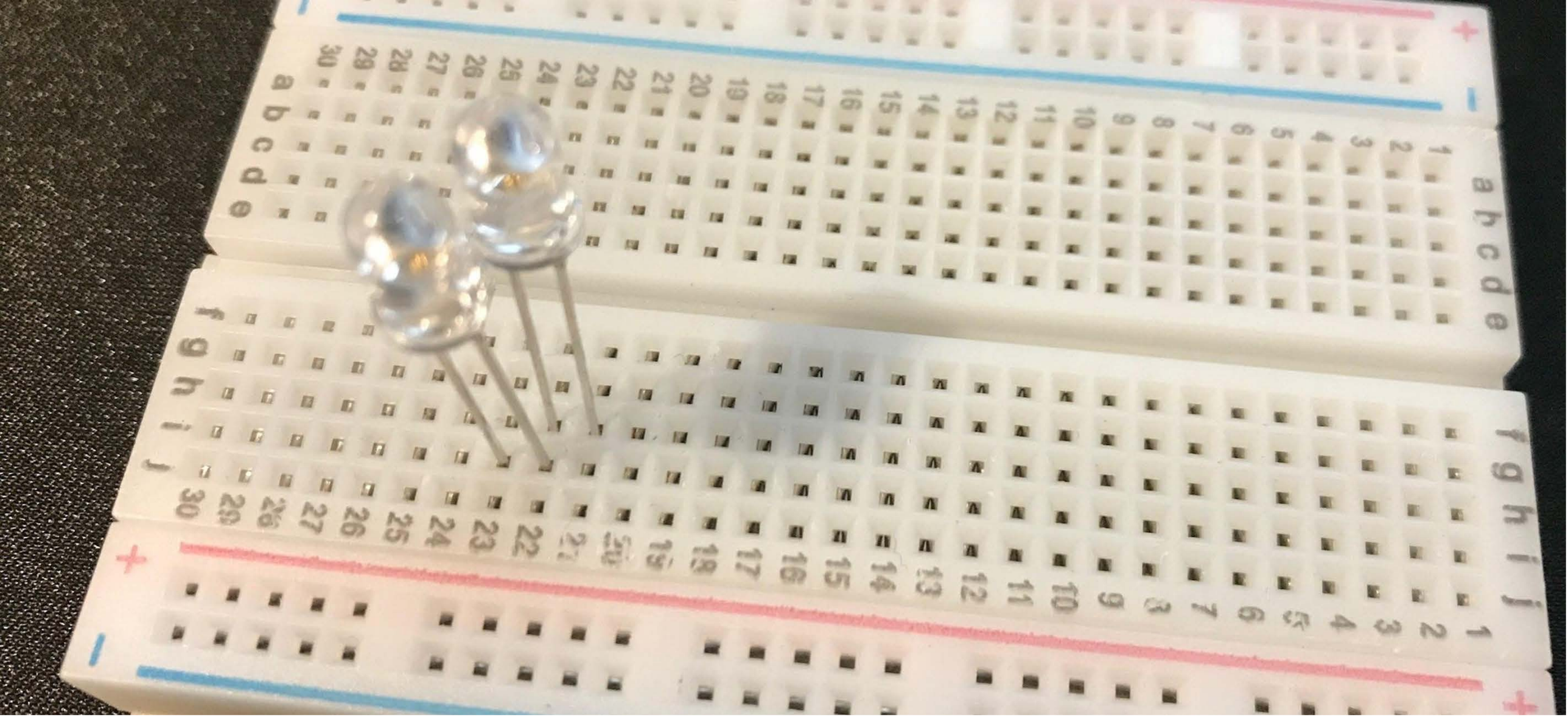
Datasheet: https://www.espressif.com/sites/default/files/documentation/esp32-wroom-32e_esp32-wroom-32ue_datasheet_en.pdf



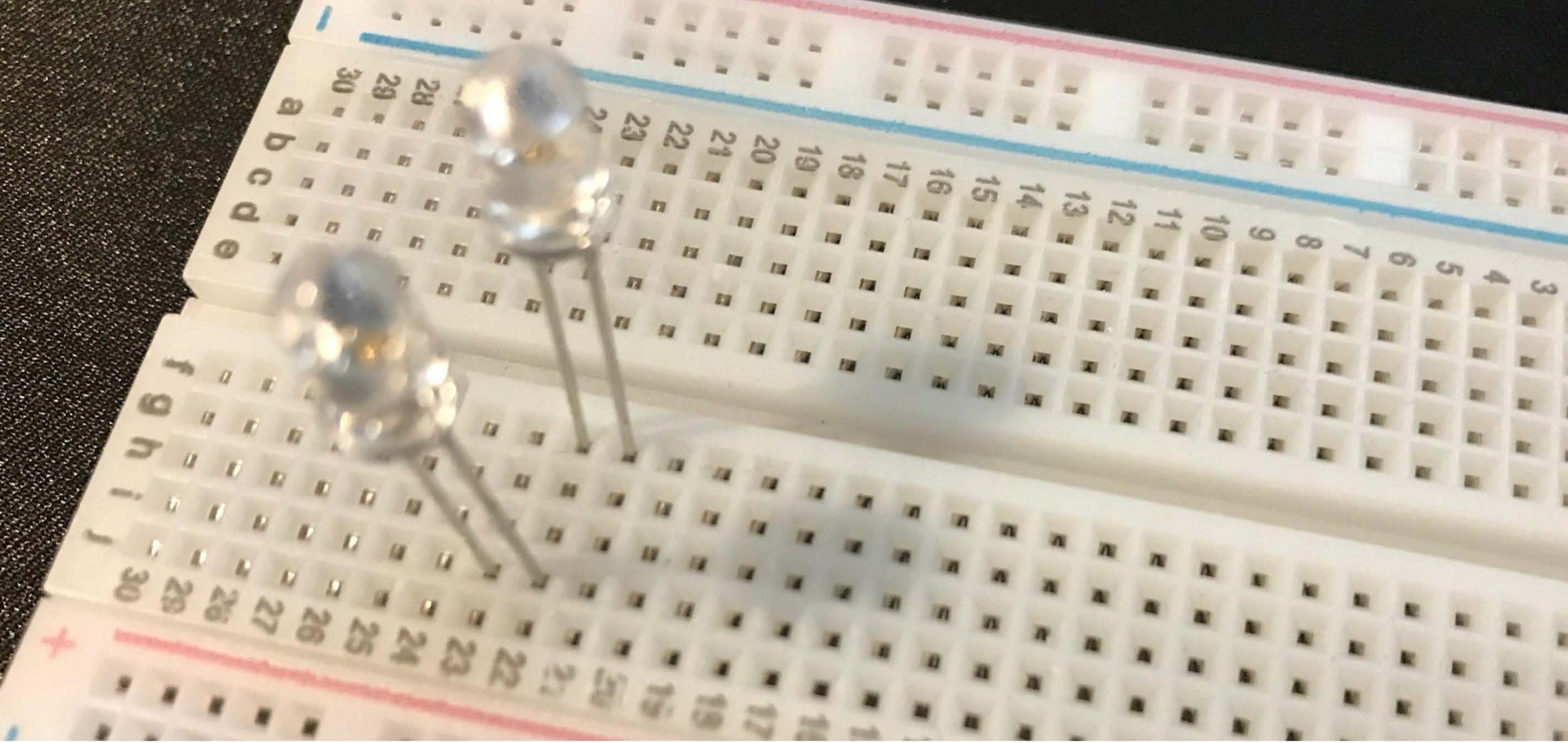
are the LEDs connected with each other?



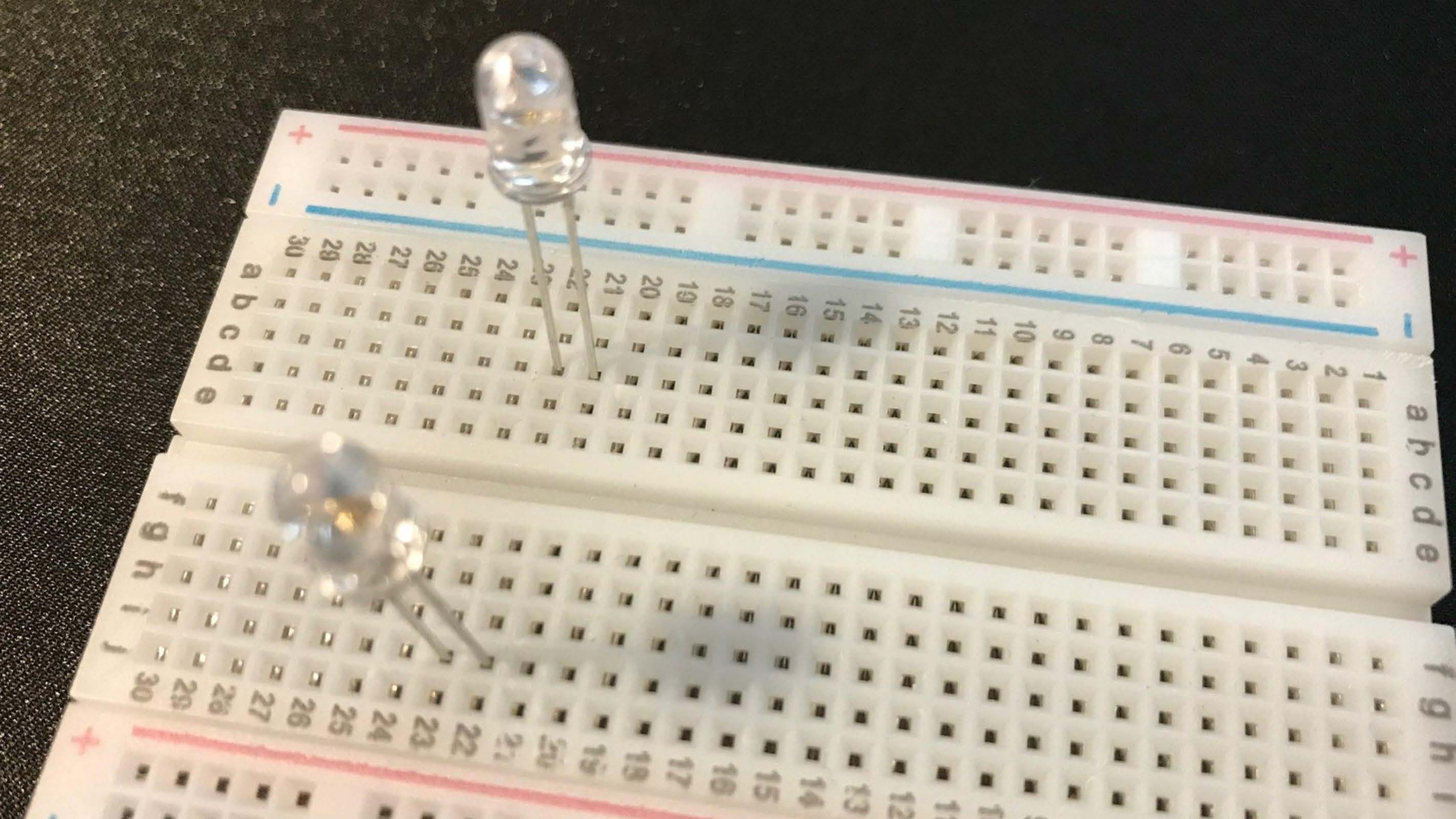
Now?

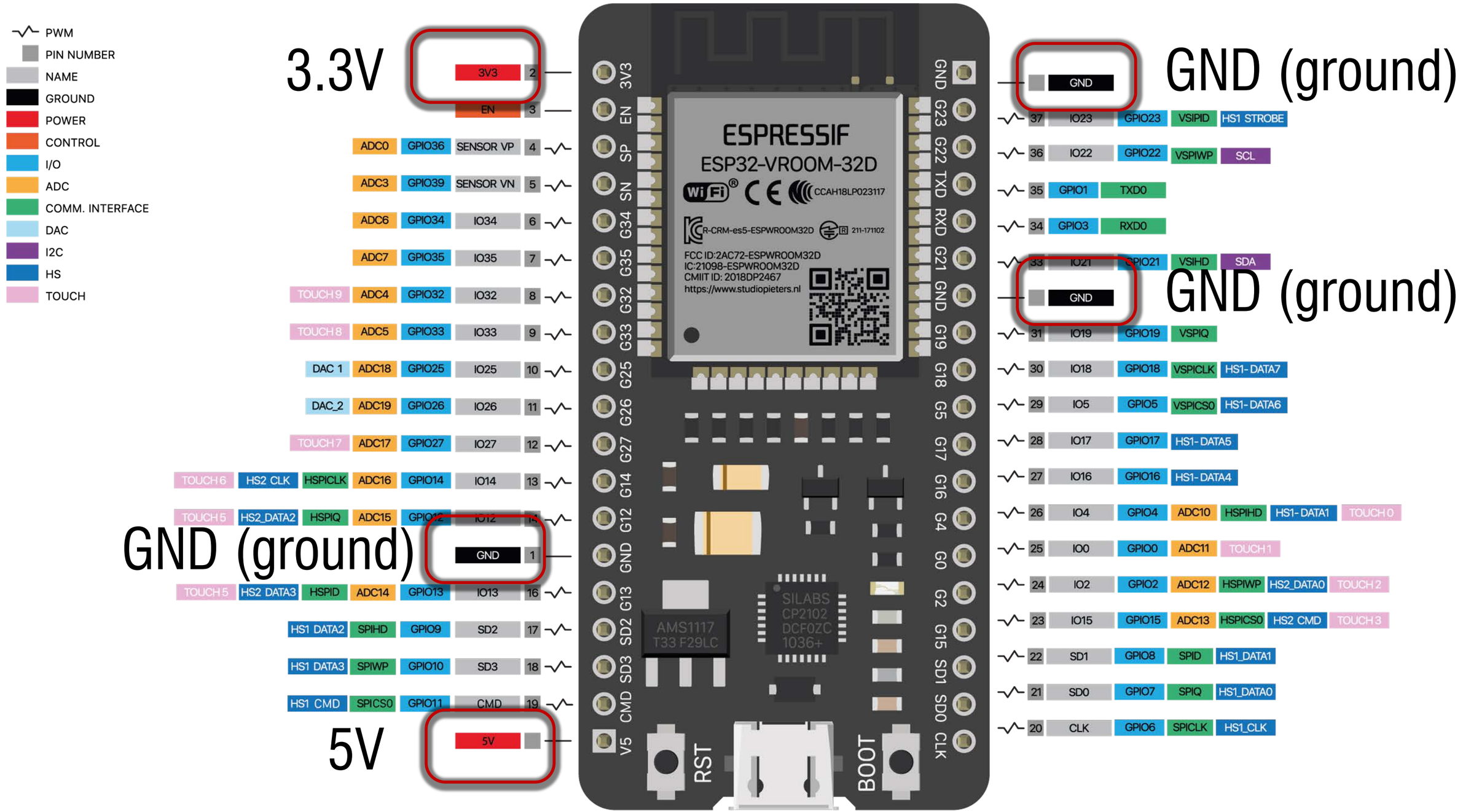


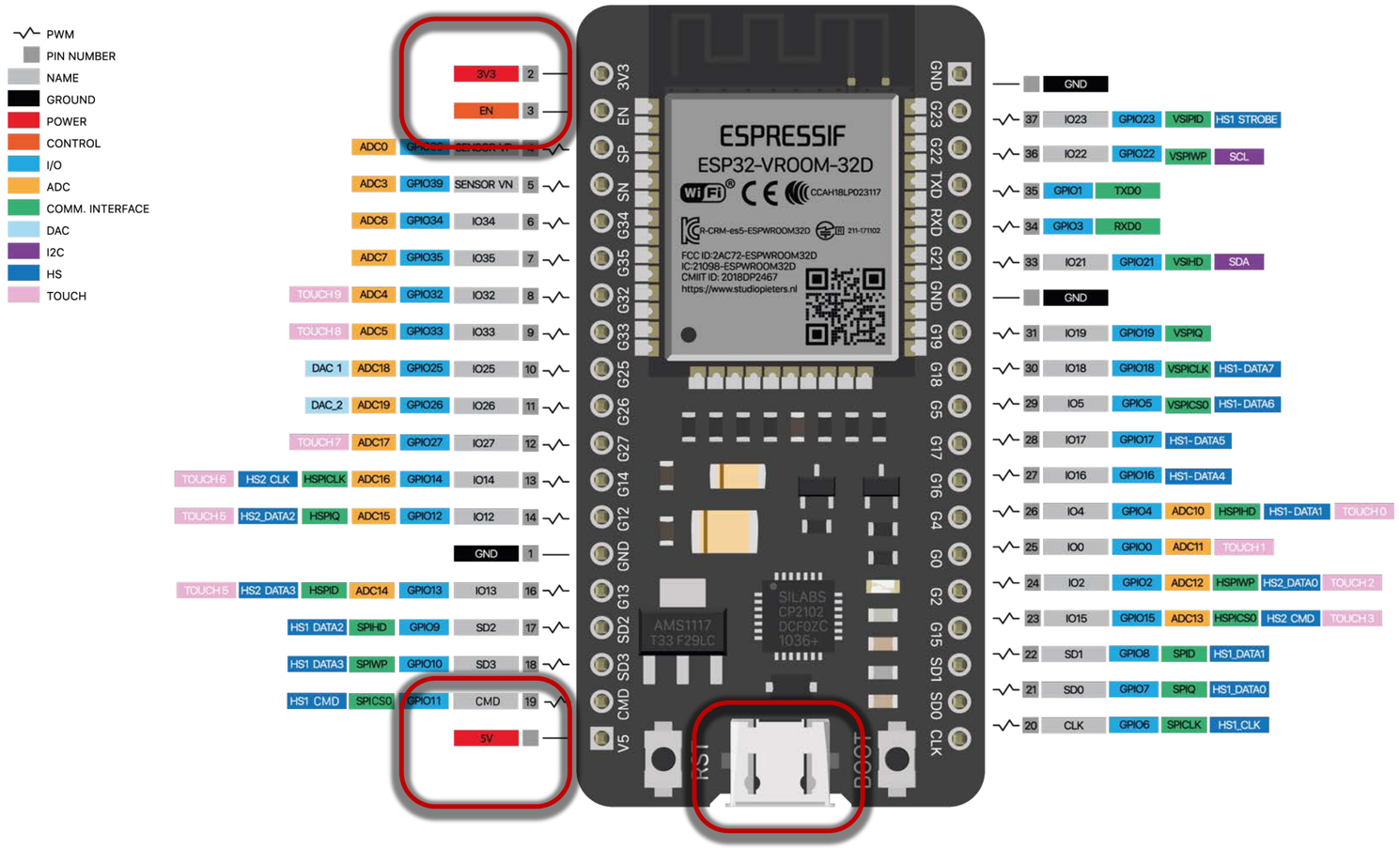
Now?



Now?




PWM
PIN NUMBER
NAME
GROUND
POWER
CONTROL
I/O
ADC
COMM. INTERFACE
DAC
I2C
HS
TOUCH
3.3V
GND (ground)
GND (ground)
5V
3V3 2
EN 3
ADC0 GPIO36 SENSOR VP 4
ADC3 GPIO39 SENSOR VN 5
ADC6 GPIO34 IO34 6
ADC7 GPIO35 IO35 7
TOUCH 9 ADC4 GPIO32 IO32 8
TOUCH 8 ADC5 GPIO33 IO33 9
DAC 1 ADC18 GPIO25 IO25 10
DAC_2 ADC19 GPIO26 IO26 11
TOUCH 7 ADC17 GPIO27 IO27 12
TOUCH 6 HS2 CLK HSPICLK ADC16 GPIO14 IO14 13
TOUCH 5 HS2_DATA2 HSPIQ ADC15 GPIO12 IO12 14
GND 1
TOUCH 5 HS2 DATA3 HSPID ADC14 GPIO13 IO13 16
HS1 DATA2 SPIHD GPIO9 SD2 17
HS1 DATA3 SPIWP GPIO10 SD3 18
HS1 CMD SPICS0 GPIO11 CMD 19
5V
3V3 EN SP SN G34 G35 G32 G33 G25 G26 G27 G14 G12 GND G13 SD2 SD3 CMD V5
ESPRESSIF
ESP32-VROOM-32D
CCAH18LP023117
R-CRM-es5-ESPWROOM32D
211-171102
FCC ID:2AC72-ESPWROOM32D
IC:21098-ESPWROOM32D
CMIIT ID: 2018DP2467
https://www.studiopieters.nl
AMS1117
T33 F29LC
SILABS
CP2102
DCF0ZC
1036+
RST
BOOT
GND G23 G22 TXD RXD G21 GND G19 G18 G5 G17 G16 G4 G0 G2 G15 SD1 SD0 CLK
GND
37 IO23 GPIO23 VSIPID HS1 STROBE
36 IO22 GPIO22 VSPIWP SCL
35 GPIO1 TXD0
34 GPIO3 RXD0
33 IO21 GPIO21 VSIHD SDA
GND
31 IO19 GPIO19 VSPIQ
30 IO18 GPIO18 VSPICLK HS1- DATA7
29 IO5 GPIO5 VSPICS0 HS1- DATA6
28 IO17 GPIO17 HS1- DATA5
27 IO16 GPIO16 HS1- DATA4
26 IO4 GPIO4 ADC10 HSPIHD HS1- DATA1 TOUCH 0
25 IO0 GPIO0 ADC11 TOUCH 1
24 IO2 GPIO2 ADC12 HSPIWP HS2_DATA0 TOUCH 2
23 IO15 GPIO15 ADC13 HSPICS0 HS2 CMD TOUCH 3
22 SD1 GPIO8 SPID HS1_DATA1
21 SD0 GPIO7 SPIQ HS1_DATA0
20 CLK GPIO6 SPICLK HS1_CLK



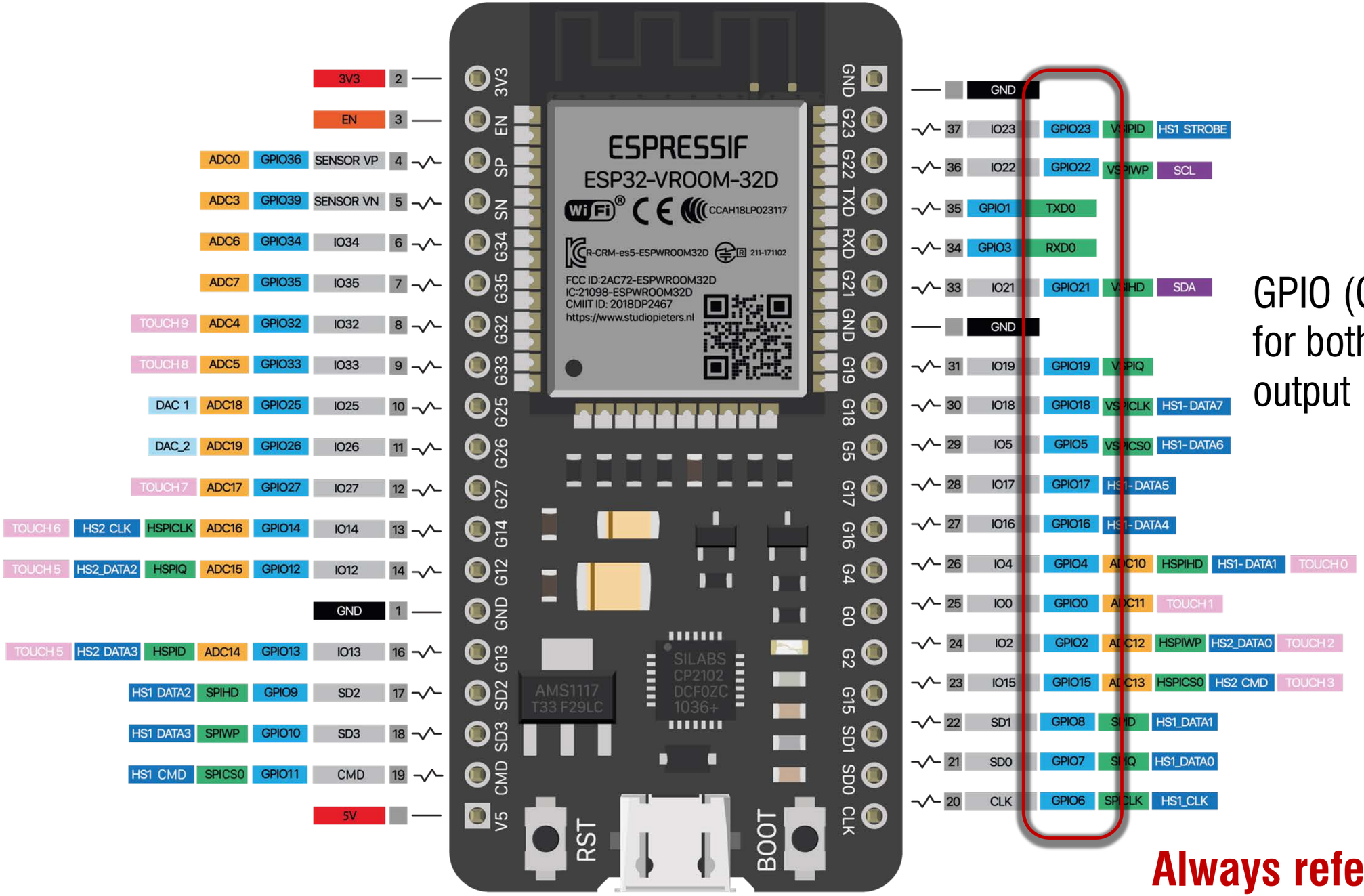
3 options to power up ESP32.

1. Directly via micro-USB port.

2. Unregulated power to GND and 5V pins (Between 5 to 12 v)

3. Regulated power to GND and 3.3V pins (ONLY 3.3v!)

Always only power the microcontroller with one option



GPIO (General Purpose IO) for both digital input and output

Always refer to the pin layout

Arduino Framework Basics

Untitled (Workspace)

EXPLORER

UNTITLED (WORKSPACE)
- TEST PIO
- NodeMCU
- TestCode
- DigitalIO
  - .pio
  - .vscode
  - include
  - lib
  - src
    - main.cpp
  - test
  - .gitignore
  - platformio.ini

OUTLINE
- myFunction(int, int) declaration
- setup()
- loop()
- myFunction(int, int)

TIMELINE

main.cpp TestCode • src | main.cpp DigitalIO • src

DigitalIO > src > main.cpp > ...

```cpp
#include <Arduino.h>

// put function declarations here:
int myFunction(int, int);

void setup() {
  // put your setup code here, to run once:
  int result = myFunction(2, 3);
}

void loop() {
  // put your main code here, to run repeatedly:
}

// put function definitions here:
int myFunction(int x, int y) {
  return x + y;
}
```

PROBLEMS | OUTPUT | DEBUG CONSOLE | TERMINAL | PORTS

zsh - TestCode

```
huaishu@INFO TestCode %
```

0 0 0 | Default (DigitalIO) | Auto | Ln 1, Col 1 | Spaces: 2 | UTF-8 | LF | C++ | PlatformIO

Digital Output – Blink an LED

Digital Output

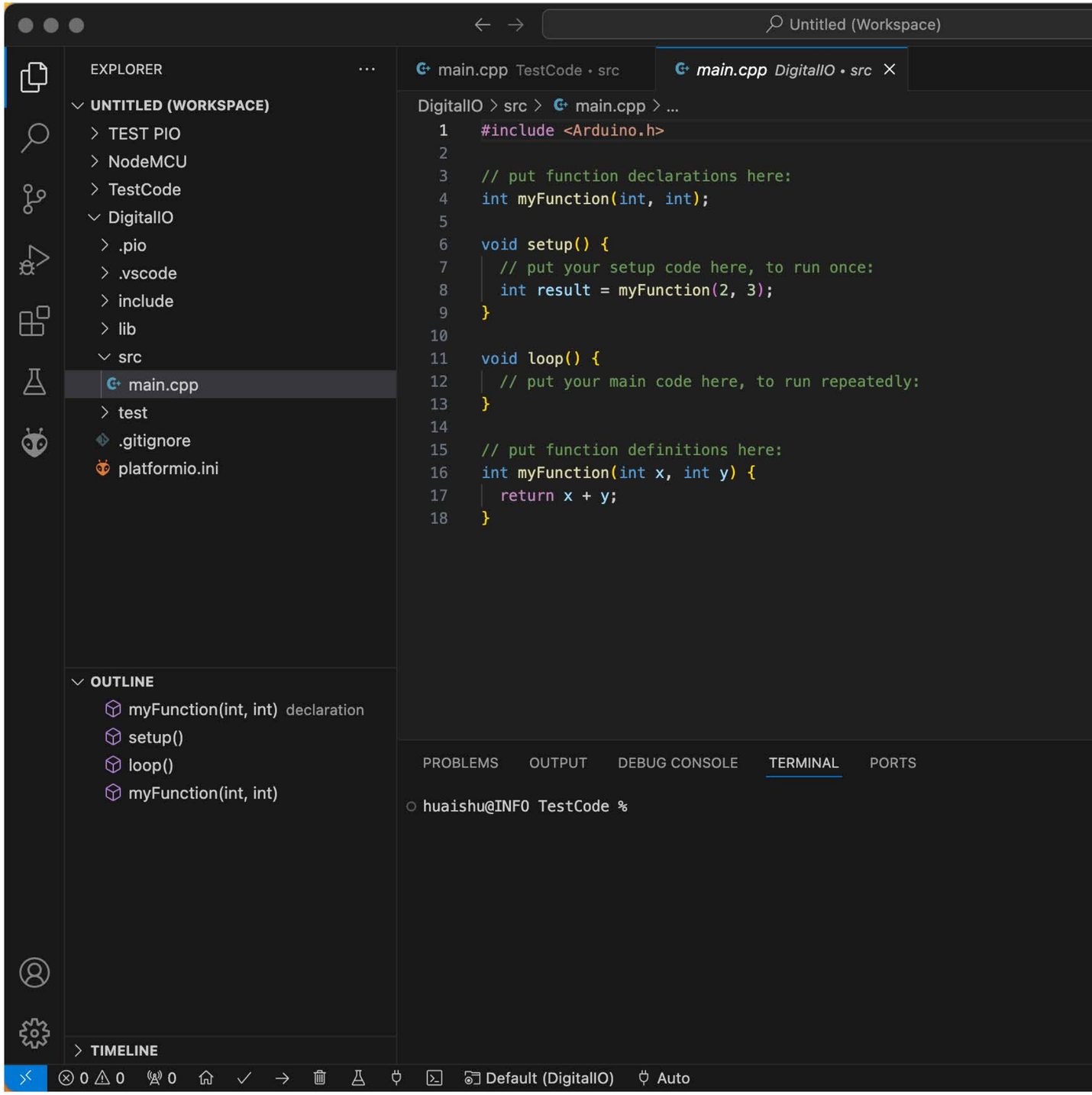
Set the logic value of a pin
– **LOW** (0V) or **HIGH** (3.3V)

Arduino functions
– **pinMode(pin, OUTPUT)** to set the pin direction

*Often in the **setup()** function*

– **digitalWrite(pin, value)** to write the current value of a pin

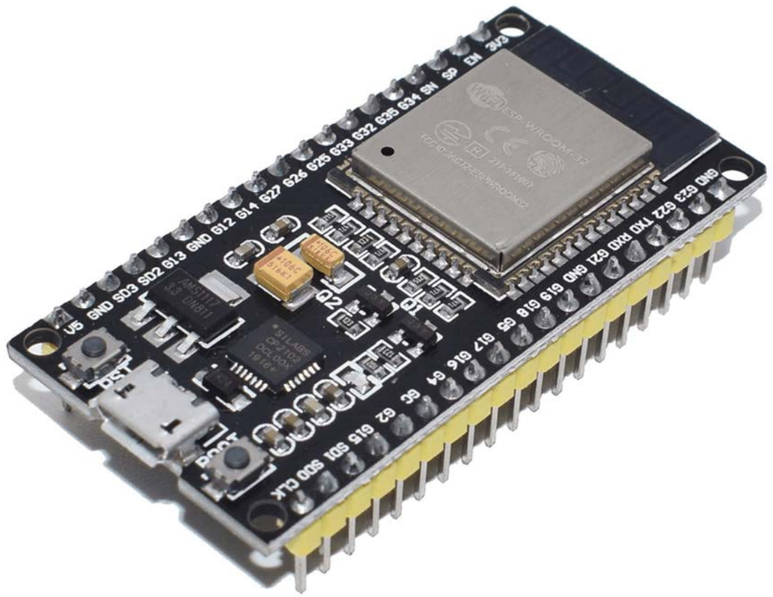
Limitations
– Only 0 or 3.3 V with limited current;



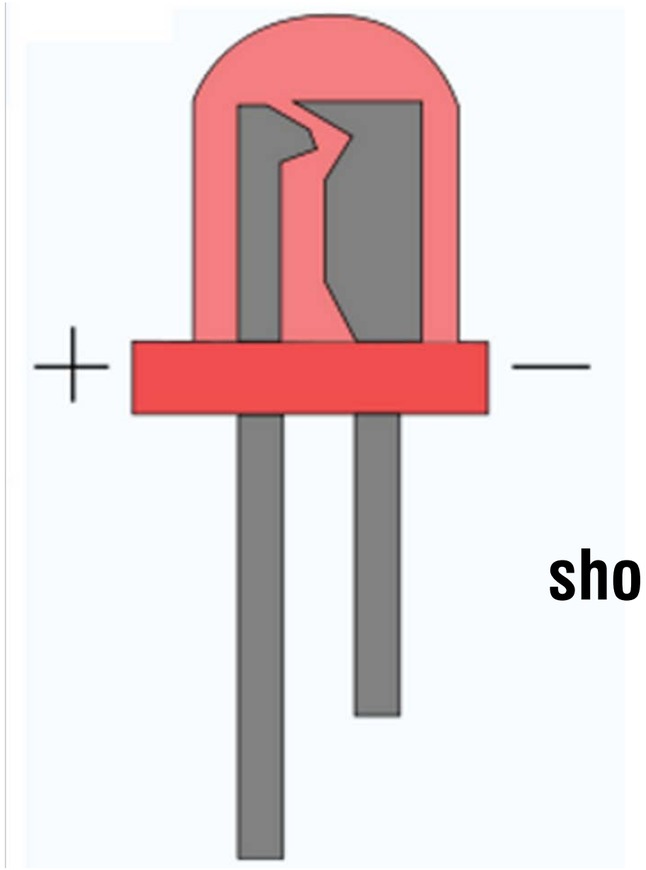
Blink the built-in LED

```
#include <Arduino.h>

// constants definition
const int ledPin = 2; // Default LED is connected to GPIO 2
// The setup() method runs once, when the sketch starts
void setup() {
  // initialize the digital pin as an output:
  pinMode(ledPin, OUTPUT);
}
// the loop() method runs over and over again,
// as long as the Arduino has power
void loop()
{
  digitalWrite(ledPin, HIGH); // set the LED on
  delay(5000); // wait for 5 second
  digitalWrite(ledPin, LOW); // set the LED off
  delay(5000); // wait for 5 second
}
```



Practice: Light up an RED Led



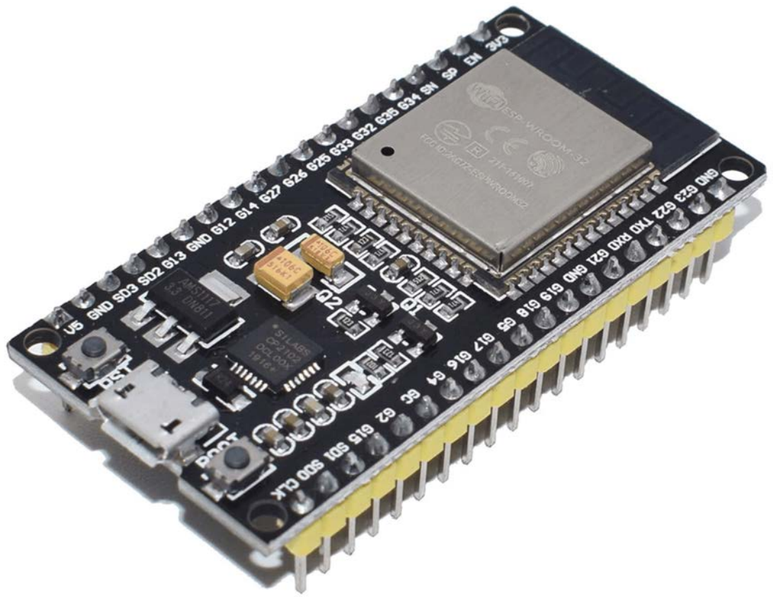
long leg

short leg

Blink an external LED

```
#include <Arduino.h>

// constants definition
const int ledPin = 23; // Default LED is connected to GPIO 23
// The setup() method runs once, when the sketch starts
void setup() {
  // initialize the digital pin as an output:
  pinMode(ledPin, OUTPUT);
}
// the loop() method runs over and over again,
// as long as the Arduino has power
void loop()
{
  digitalWrite(ledPin, HIGH); // set the LED on
  delay(5000); // wait for 5 second
  digitalWrite(ledPin, LOW); // set the LED off
  delay(5000); // wait for 5 second
}
```



Serial Communication – talk to PC

Serial Communication

Setup
– **Serial.begin(<baud_speed>)**//9600

Receiving information
– Test is data is available
Serial.available()
– Read one byte
Serial.read()

Sending information
– Raw data transfer
Serial.write(val) or Serial.write(buf, len)

Other commands -> https://www.arduino.cc/reference/en

– Formatted output
Serial.print (x,{BIN,OCT,DEC,HEX})
– Read formatted data
Serial.parseFloat()
Serial.parseInt()

Echo program

```
// setup performs initializations
void setup()
{
  // initialize the serial port setting its speed to 9600 Baud:
  Serial.begin(9600);
}
// the loop() method runs over and over again,
// as long as the Arduino has power
void loop() {

if (Serial.available() > 0) {
   // Read the incoming byte
   char incomingByte = Serial.read();

   Serial.print("You entered: ");
   Serial.println(incomingByte);
  }
}
```

Assignment

Morse code

– Input:

3451 from the Serial Terminal Monitor

– Output:

Blink the LED accordingly

International Morse code

For this assignment:

A **dot** is **100ms** long

A **dash** is equal to **3 dots**

A space between **parts** of the same letter is equal to **one dot**

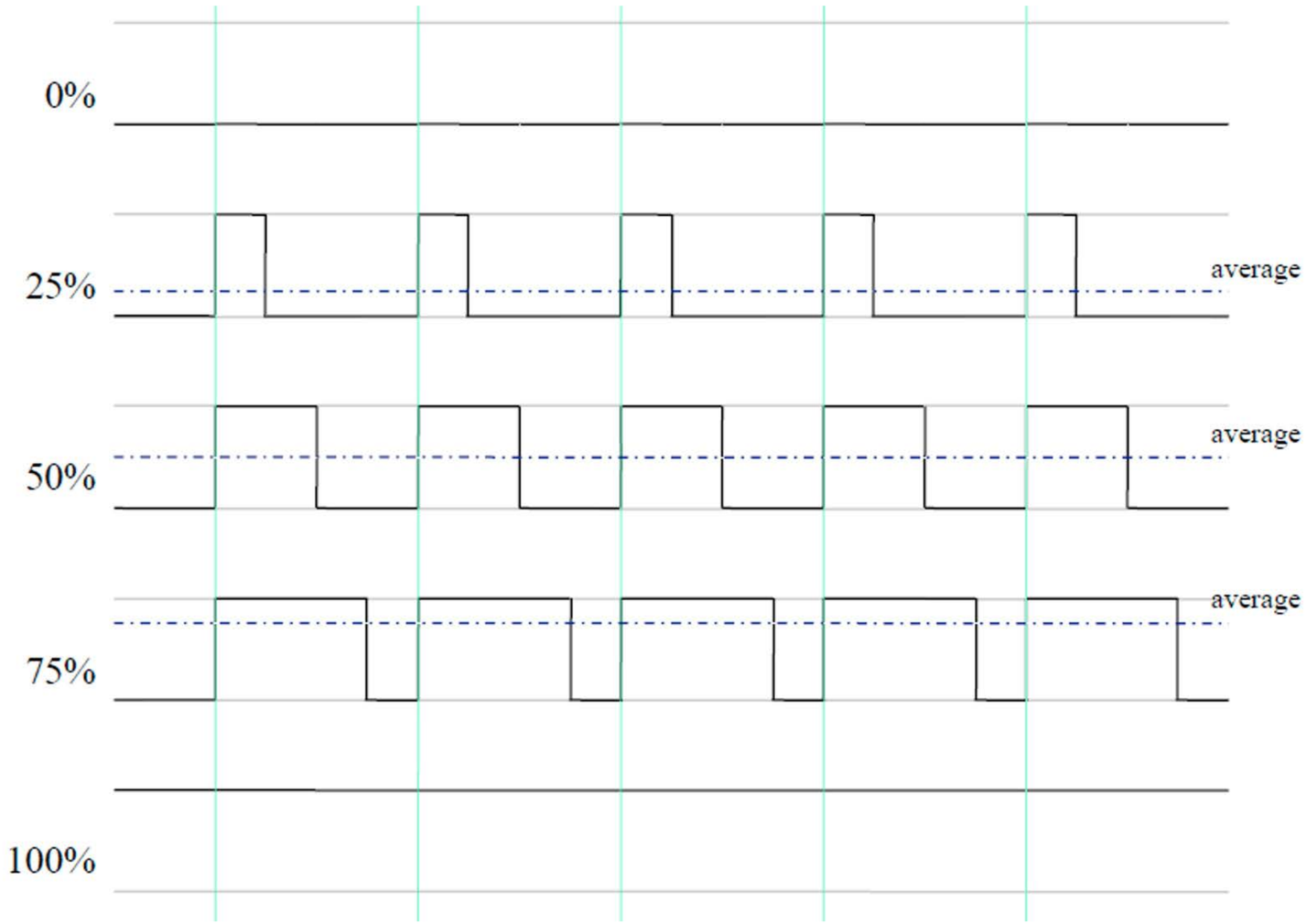
The space between two **letters** is equal to **three dots**

Submission:

Unlisted youtube video link for the blinking LED

Upload the Arduino code

Pulse Width Modulation (PWM)



analogWrite() is on a scale of 0 - 255

Now modify your program to

blink the LED with 100% light intensity when type ‘1’ from the PC

turn it off when type ‘0’

light up with 50% light intensity when type ‘2’