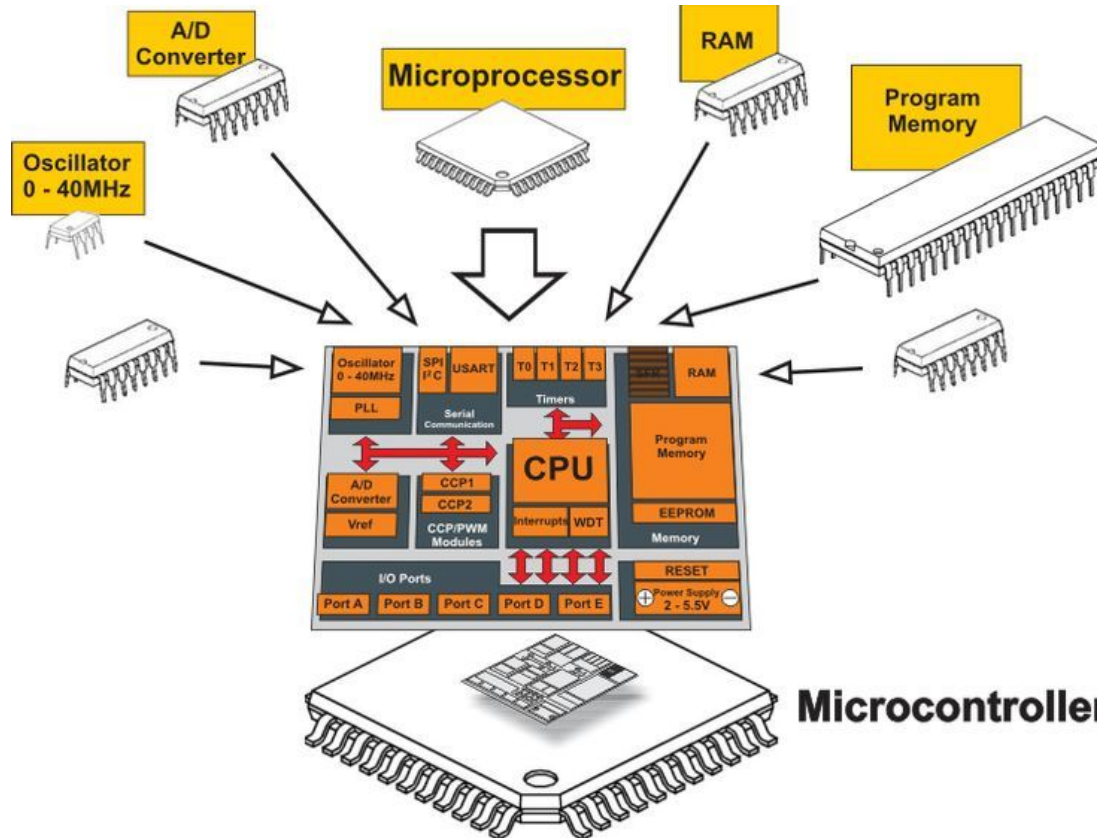
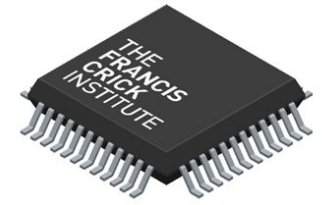


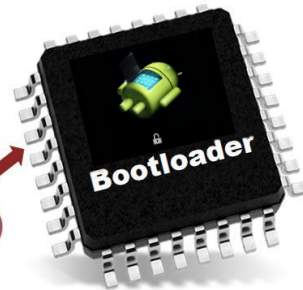
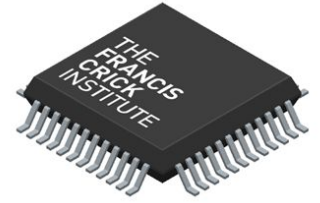
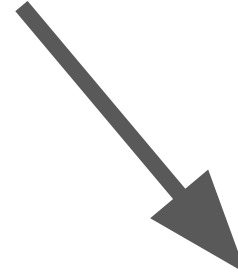
Microcontrollers (2022)

Session 1

Microprocessor vs Microcontroller



How to program a microcontroller



How to program a microcontroller

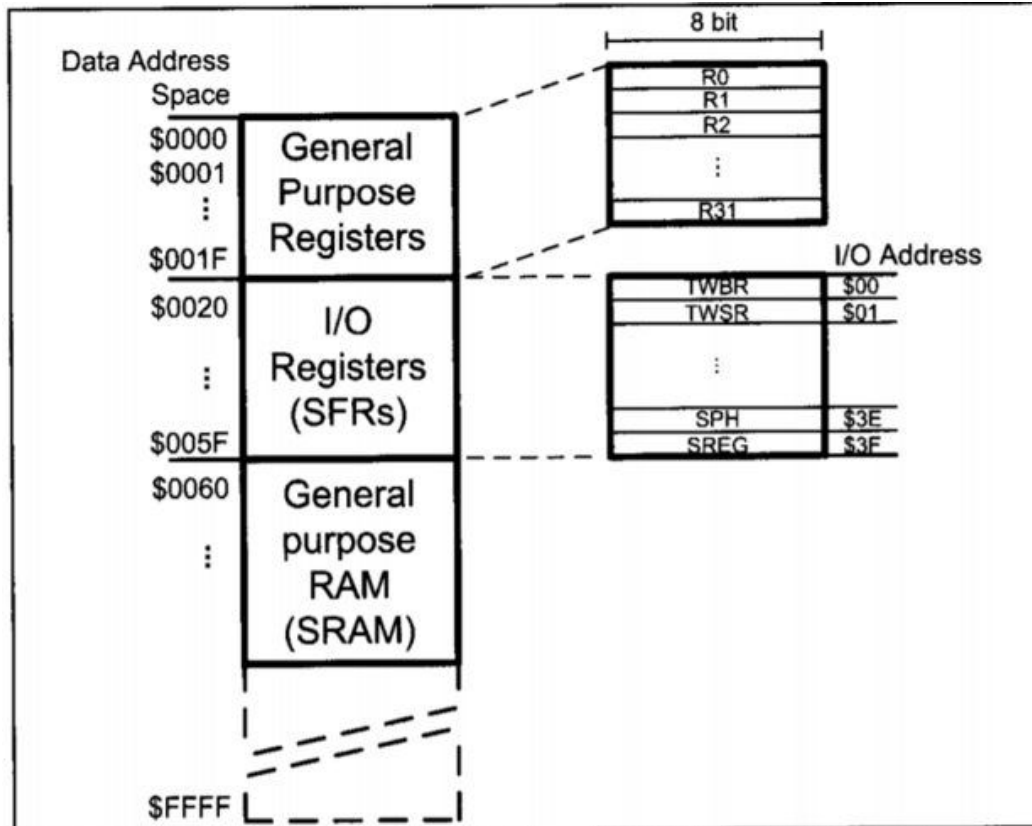
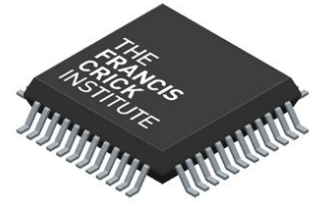
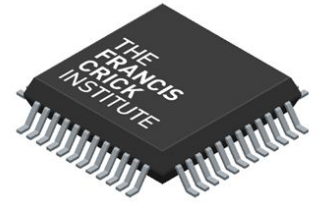


Figure 2-3. The Data Memory for AVR with No Extended I/O Memory

What is Arduino?

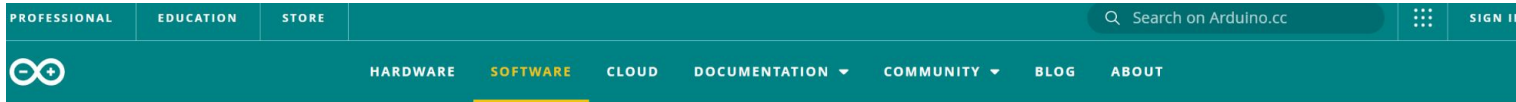
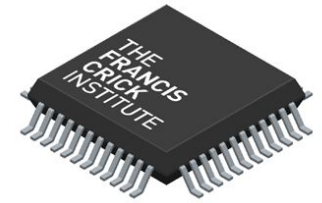


```
sketch_dec07a | Arduino 1.8.3
File Edit Sketch Tools Help

void setup() {
  // put your setup code here, to run once:
}

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

Download the Arduino IDE



Downloads



Arduino IDE 1.8.19

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

Refer to the [Getting Started](#) page for Installation instructions.

SOURCE CODE

Active development of the Arduino software is [hosted by GitHub](#). See the instructions for [building the code](#). Latest release source code archives are available [here](#). The archives are PGP-signed so they can be verified using [this](#) gpg key.

DOWNLOAD OPTIONS

Windows Win 7 and newer

Windows ZIP file

Windows app Win 8.1 or 10



Linux 32 bits

Linux 64 bits

Linux ARM 32 bits

Linux ARM 64 bits

Mac OS X 10.10 or newer

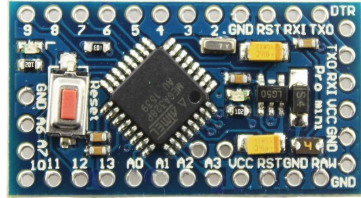
[Release Notes](#)

[Checksums \(sha512\)](#)

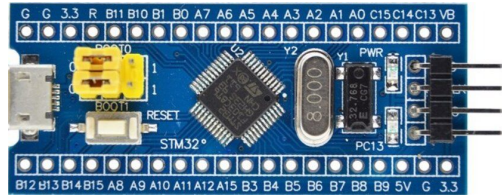
Microcontroller Architectures



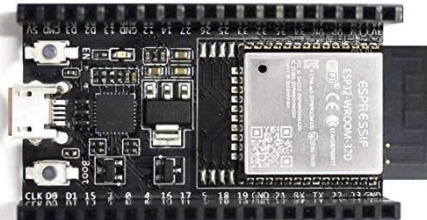
Teensy (ARM)



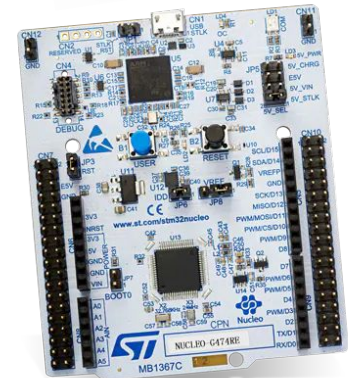
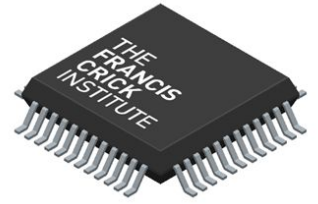
Arduino (Atmel)



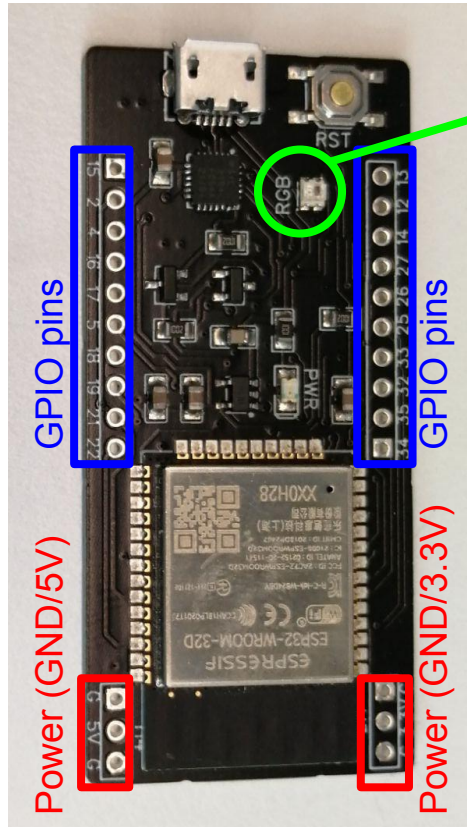
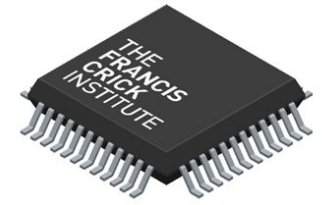
STM32 (ARM)



ESP32 (RISC)



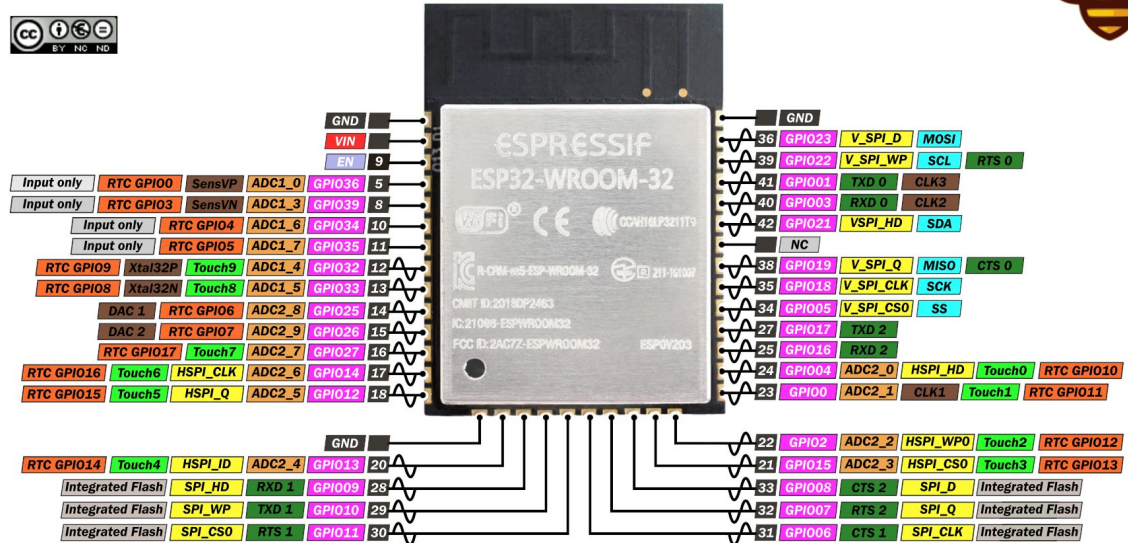
Our devBoard pinout (ESP32-Wroom-32)



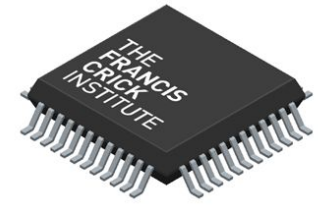
RGB LED connected to GPIO 13

ESP32-wroom-32 PINOUT

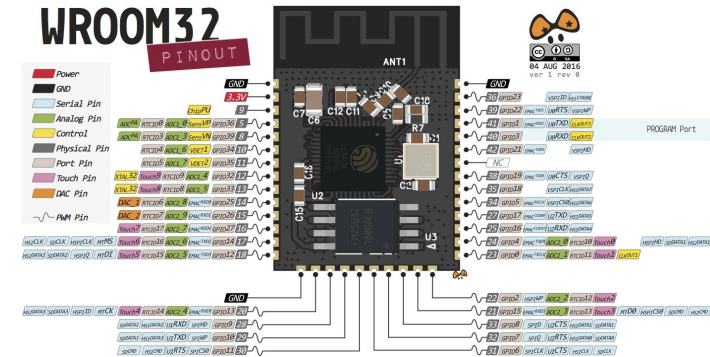
www.mischianti.org (CC) BY-NC-ND



Our devBoard pinout (ESP32-Wroom-32)

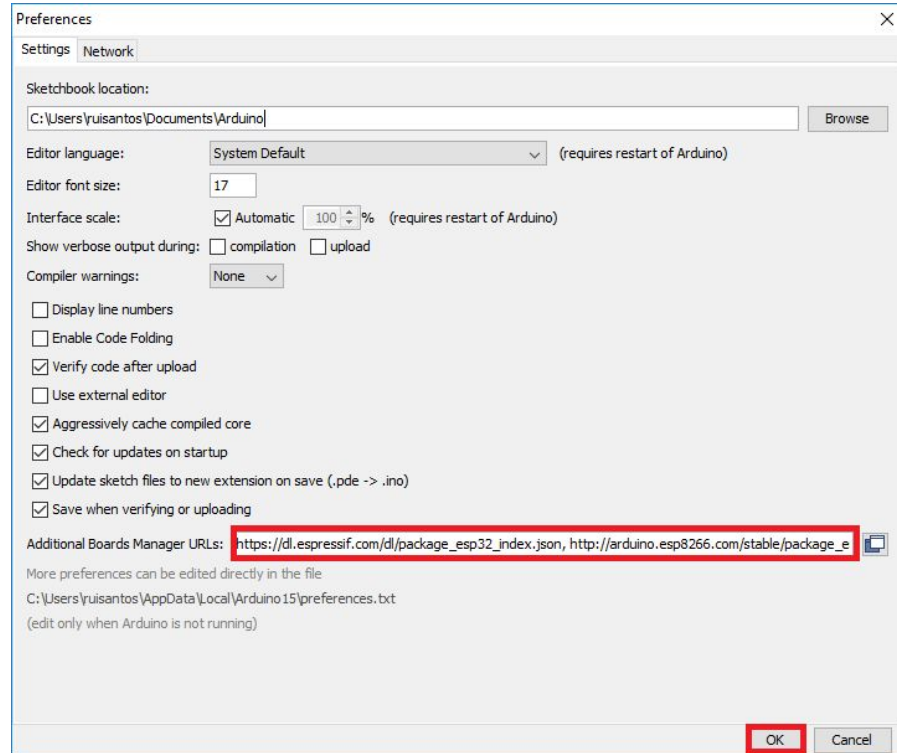
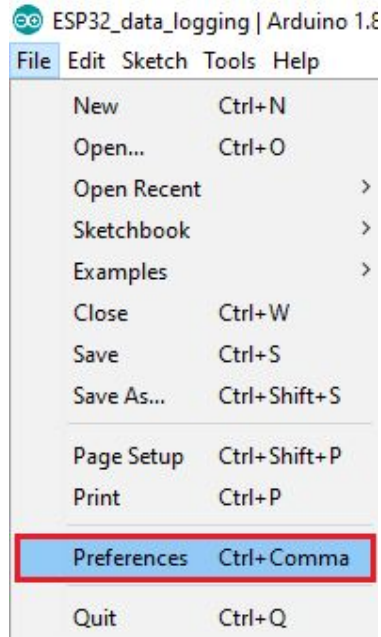
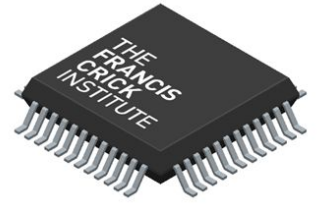


- Two Cores!
- 18 Analog-to-Digital Converter (ADC) channels (GPIO 5,8,10-18 & 20-24)
- 3 SPI interfaces
- 3 UART interfaces
- 2 I2C interfaces
- 16 PWM output channels
- 2 Digital-to-Analog Converters (DAC) (GPIO 14 & 15)
- 2 I2S interfaces
- 10 Capacitive sensing GPIOs (GPIO 12,13 & 16-18 & 20-24)
- **GPIO 5,14 and 15** output PWM signal at boot
- **GPIO 35-39** Input only



*Plus a little thing called WiFi...
...and Bluetooth... plus two little things...

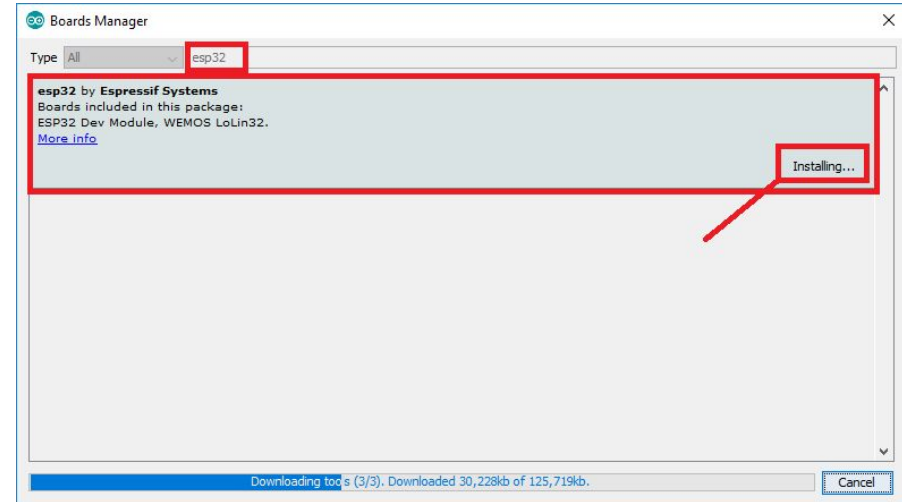
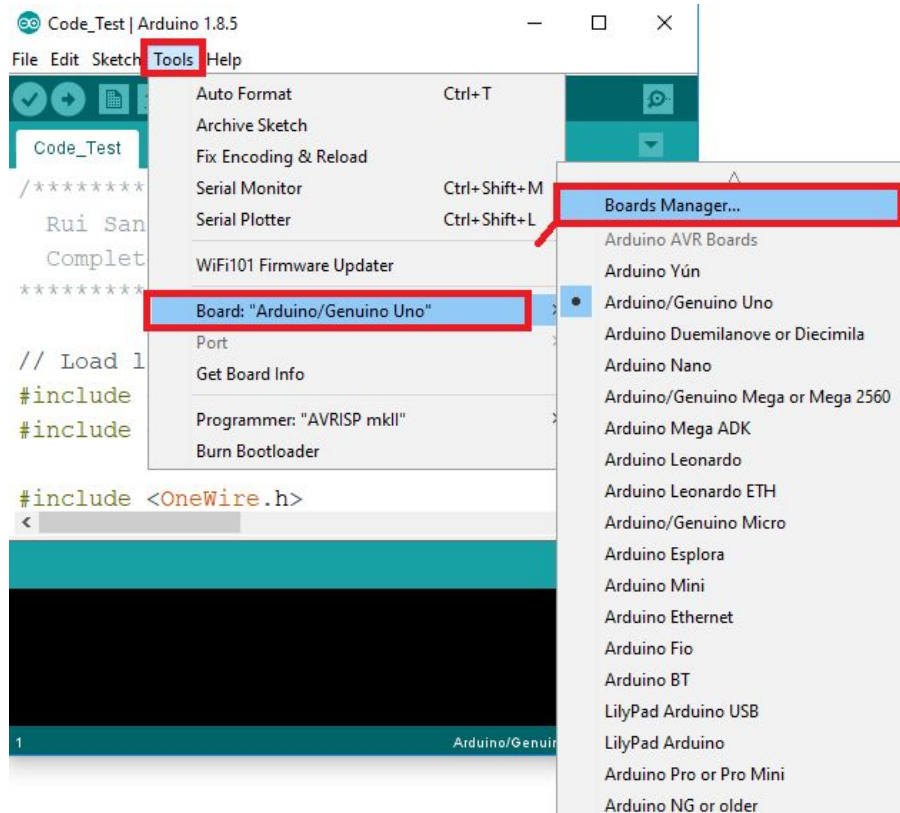
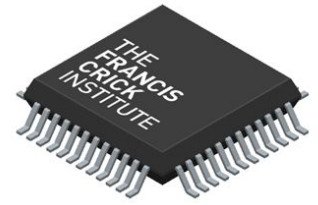
Download the ESP32 package for the Arduino IDE



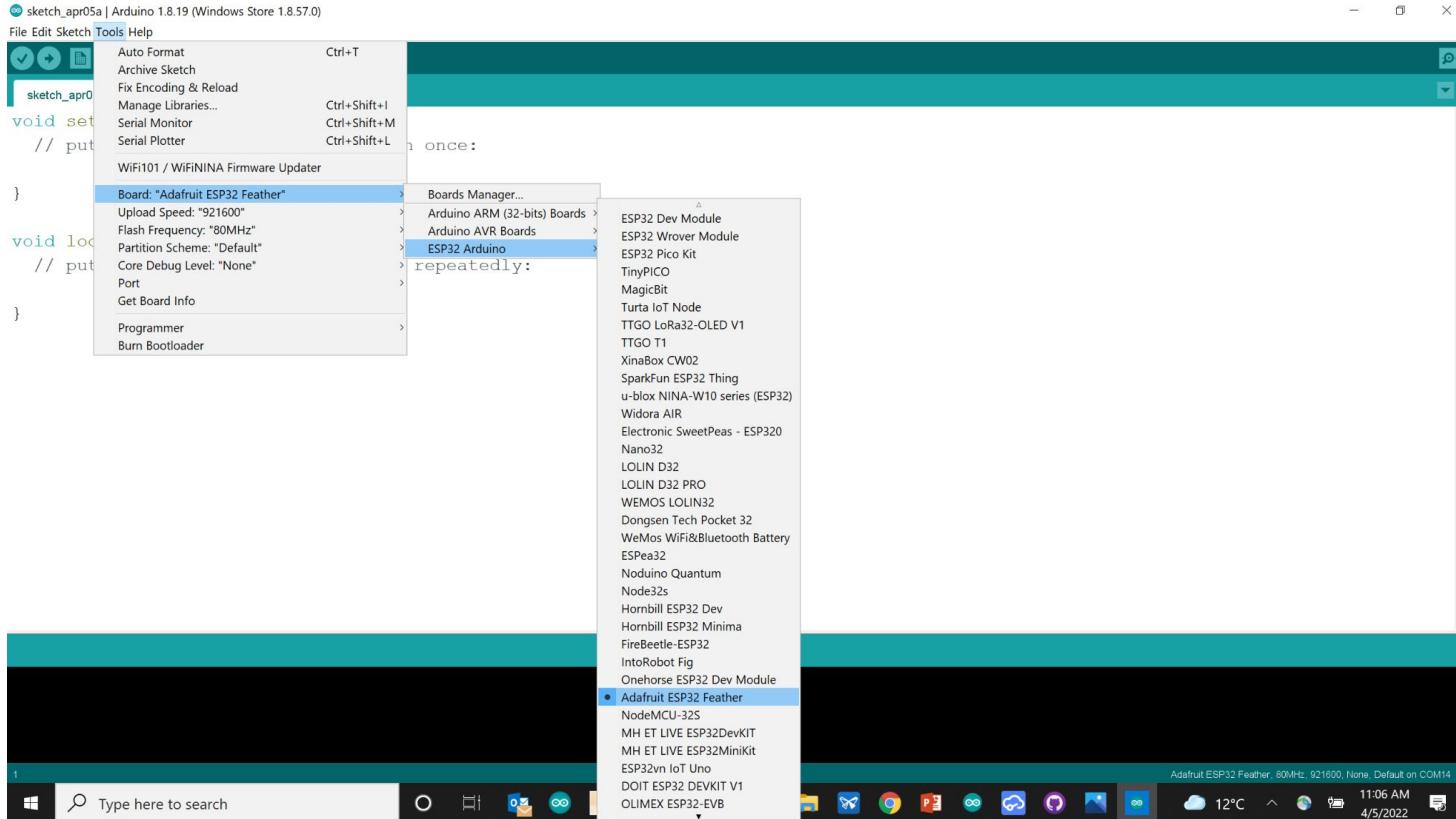
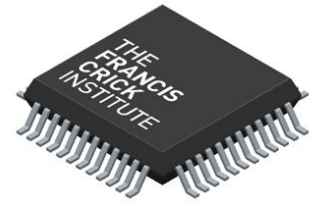
https://dl.espressif.com/dl/package_esp32_index.json

<https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/>

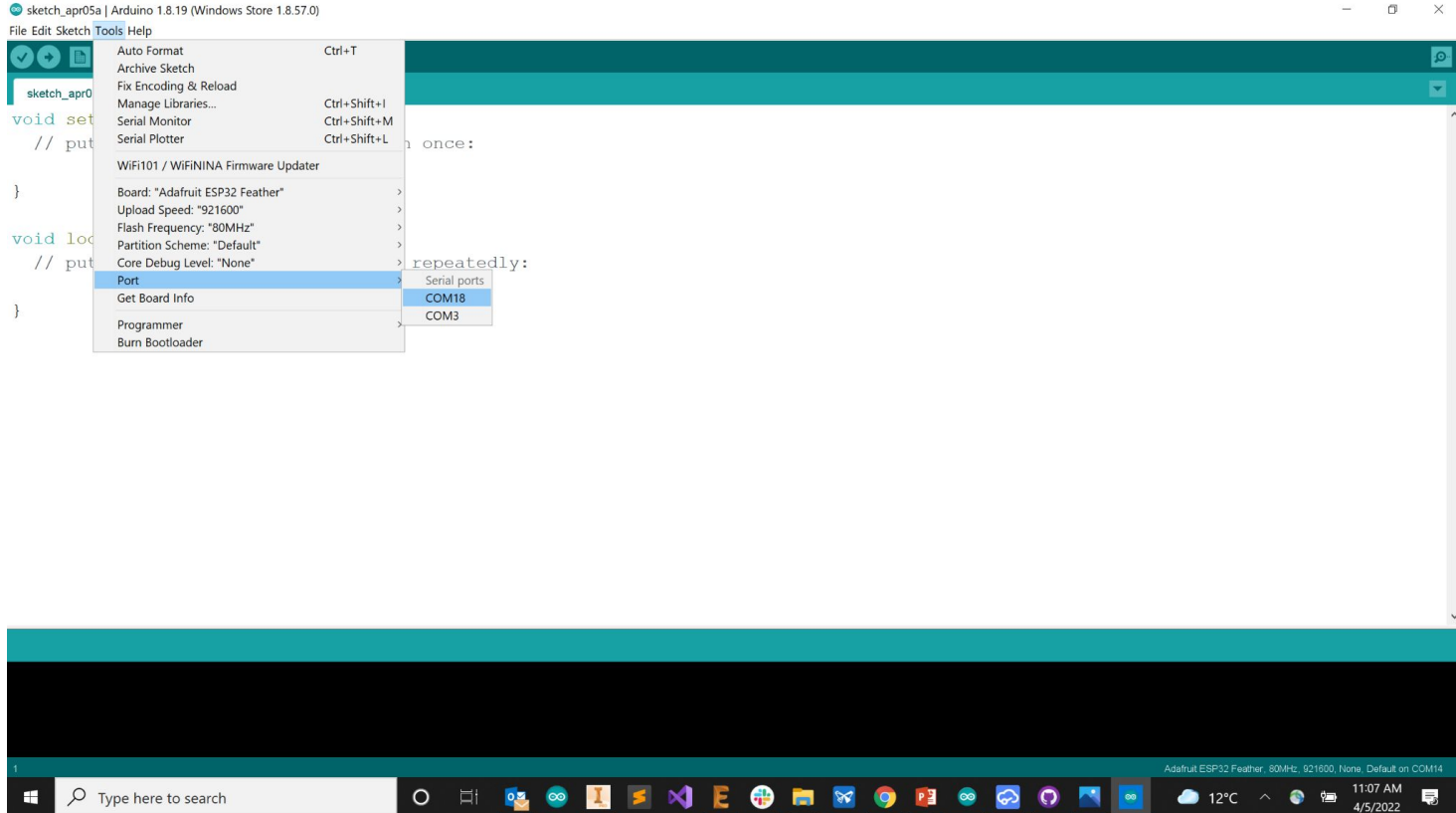
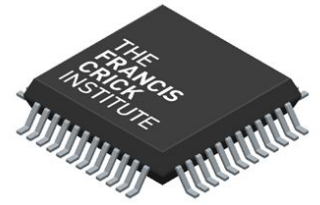
Download the ESP32 package for the Arduino IDE



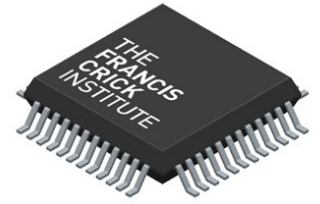
Selecting or board to upload the sketch



Selecting the COM port



Downloading the first sketches from the course GitHub repository



<> Code Issues Pull requests Actions Projects Wiki Security Insights Settings

main 1 branch 0 tags Go to file Add file Code


XaviCanoFerrer Update README.md 2d92b0e now 6 commits

- Microcontrollers gif 3 minutes ago
- README.md Update README.md now

README.md

Electronics-Course-Material

Examples and course material



About

Examples and course material

- Readme
- 0 stars
- 3 watching
- 0 forks

Releases

No releases published
[Create a new release](#)

Packages

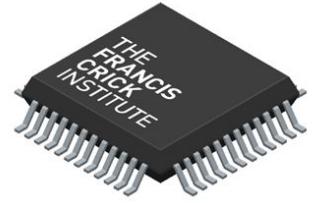
No packages published
[Publish your first package](#)

Languages

C++ 100.0%

<https://github.com/FrancisCrickInstitute/Electronics-Course-Material>

Arduino Sketch typical structure



#include libraries

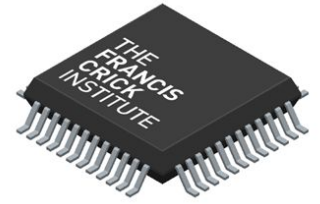
Declare Objects

Global variables

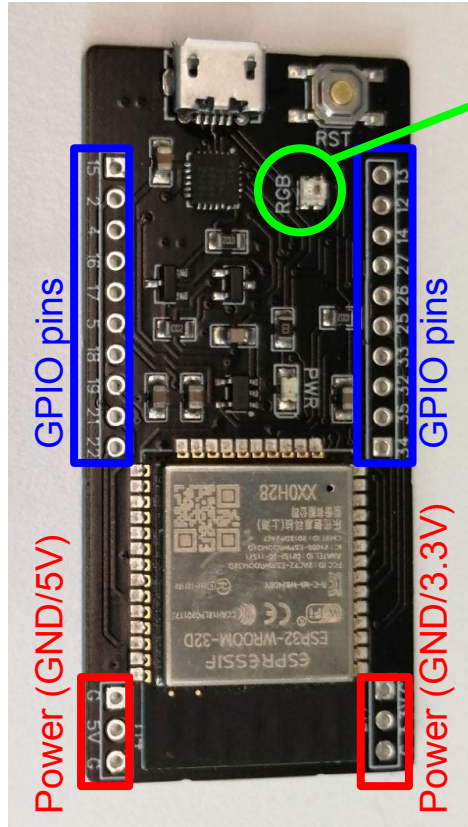
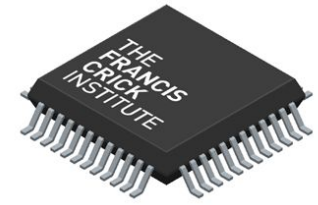
setup() function (It is executed one time)

loop() function (It loops indefinitely)

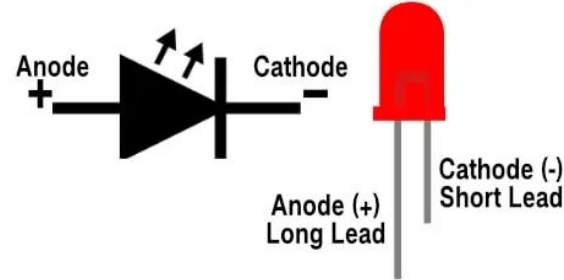
The “Hello World” of hardware



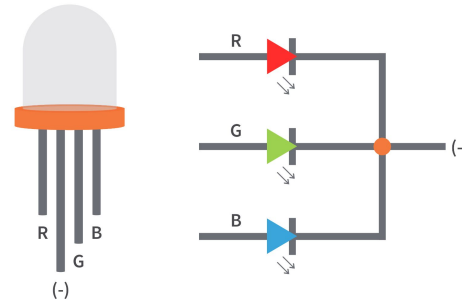
The “Hello World” of our hardware



RGB LED connected to GPIO 13

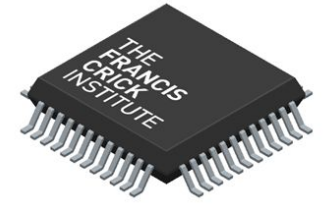


LED (Light Emitting Diode)

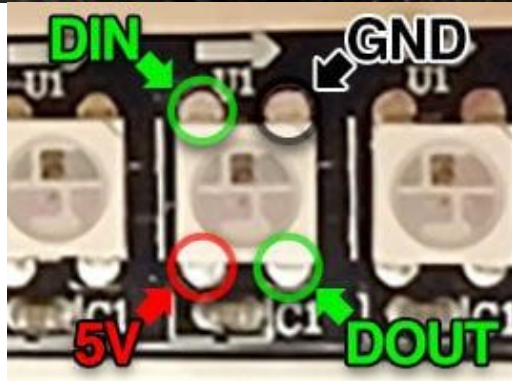
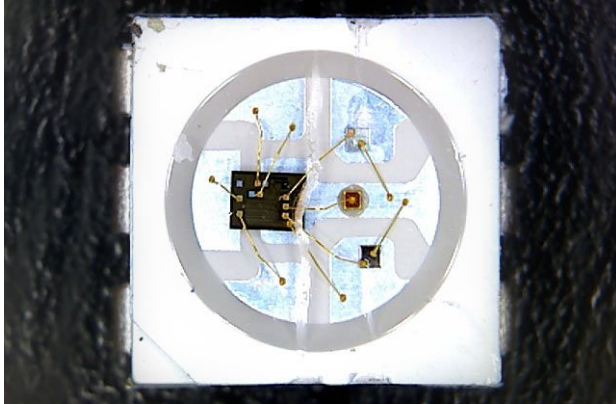


RGB LED composed by the three LED's

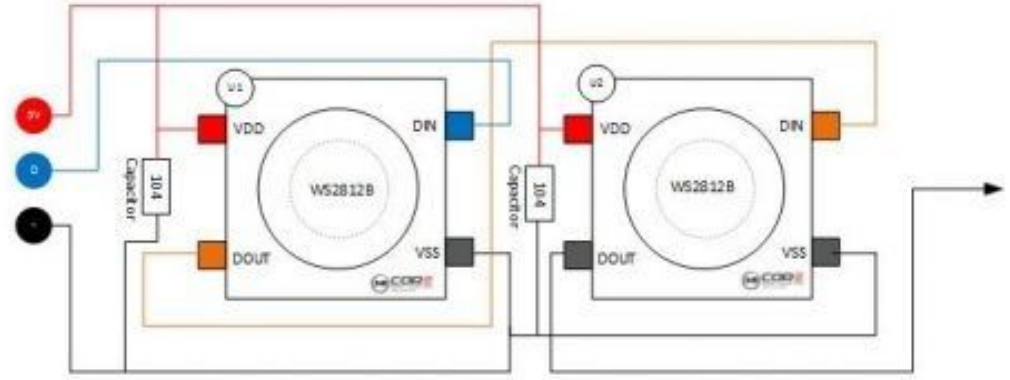
The “Hello World” of our hardware



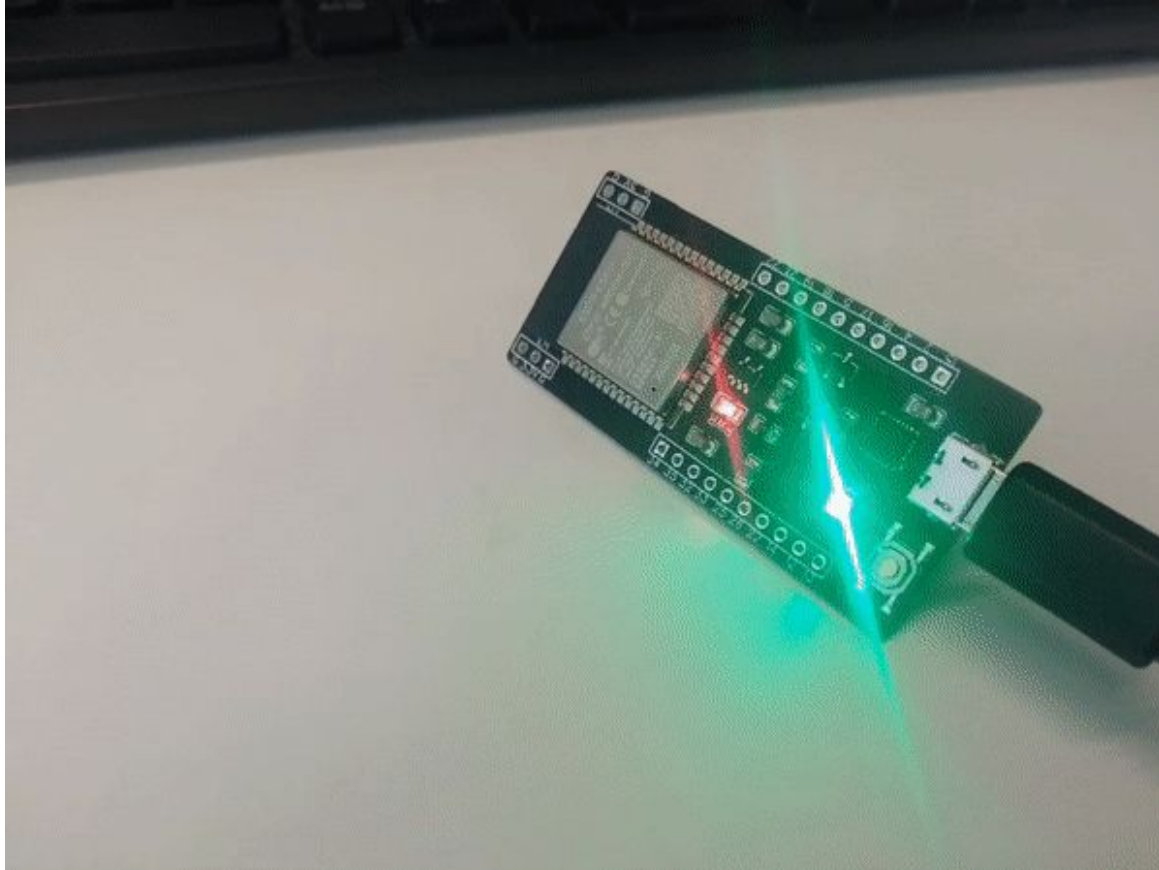
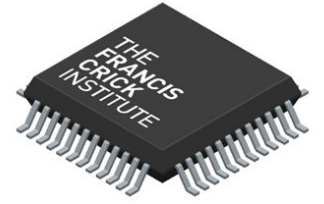
Addressable RGB LED



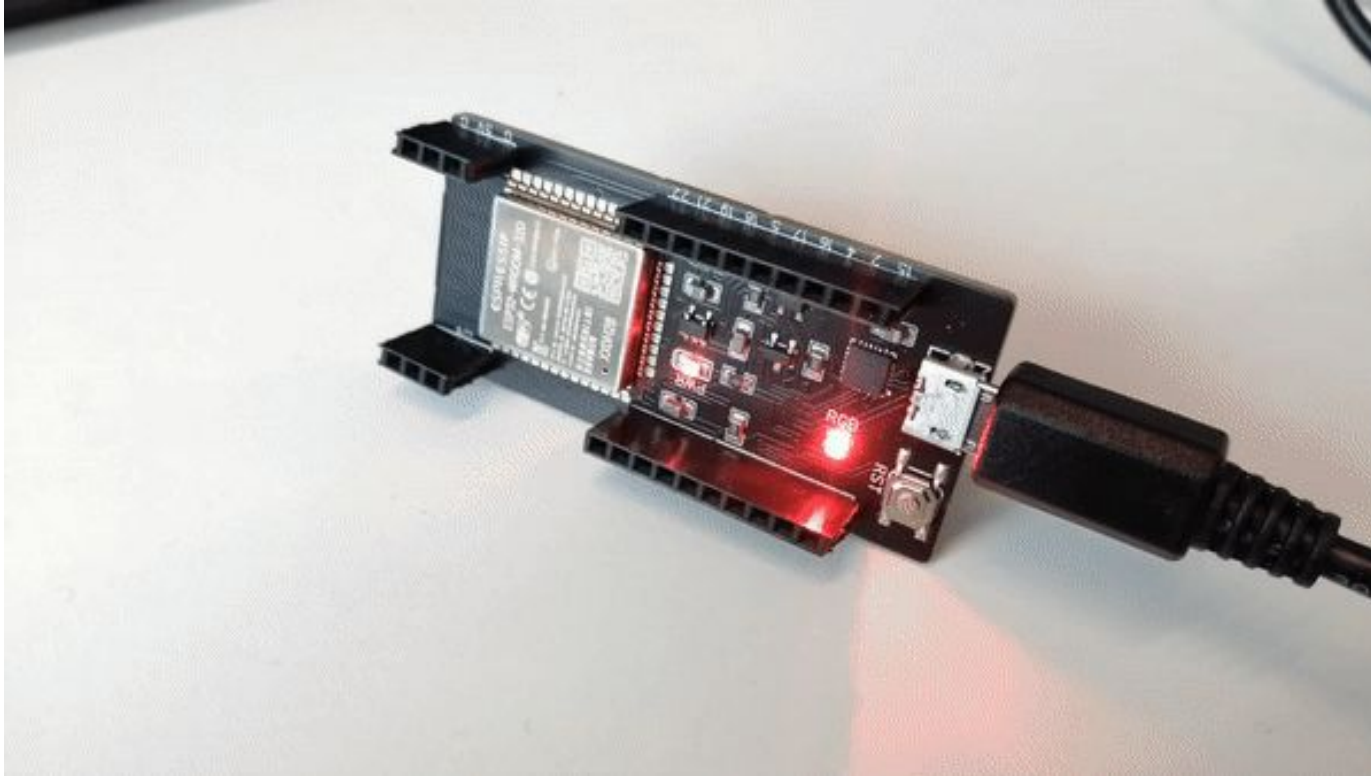
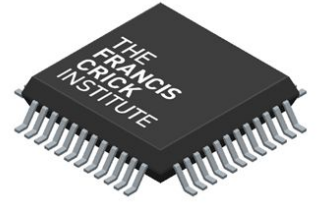
WS2812 LED CHAIN



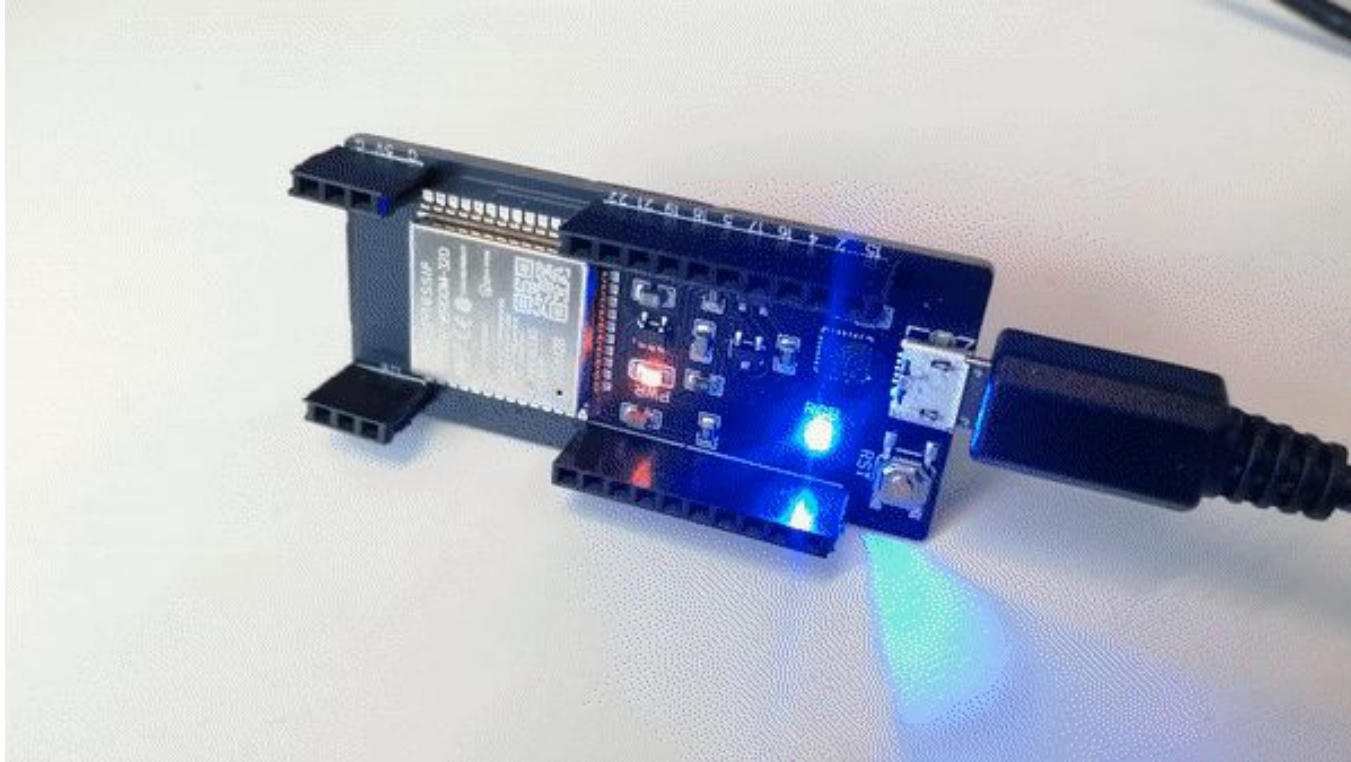
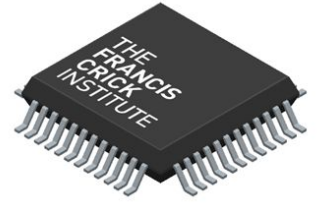
The “Hello World” of our hardware



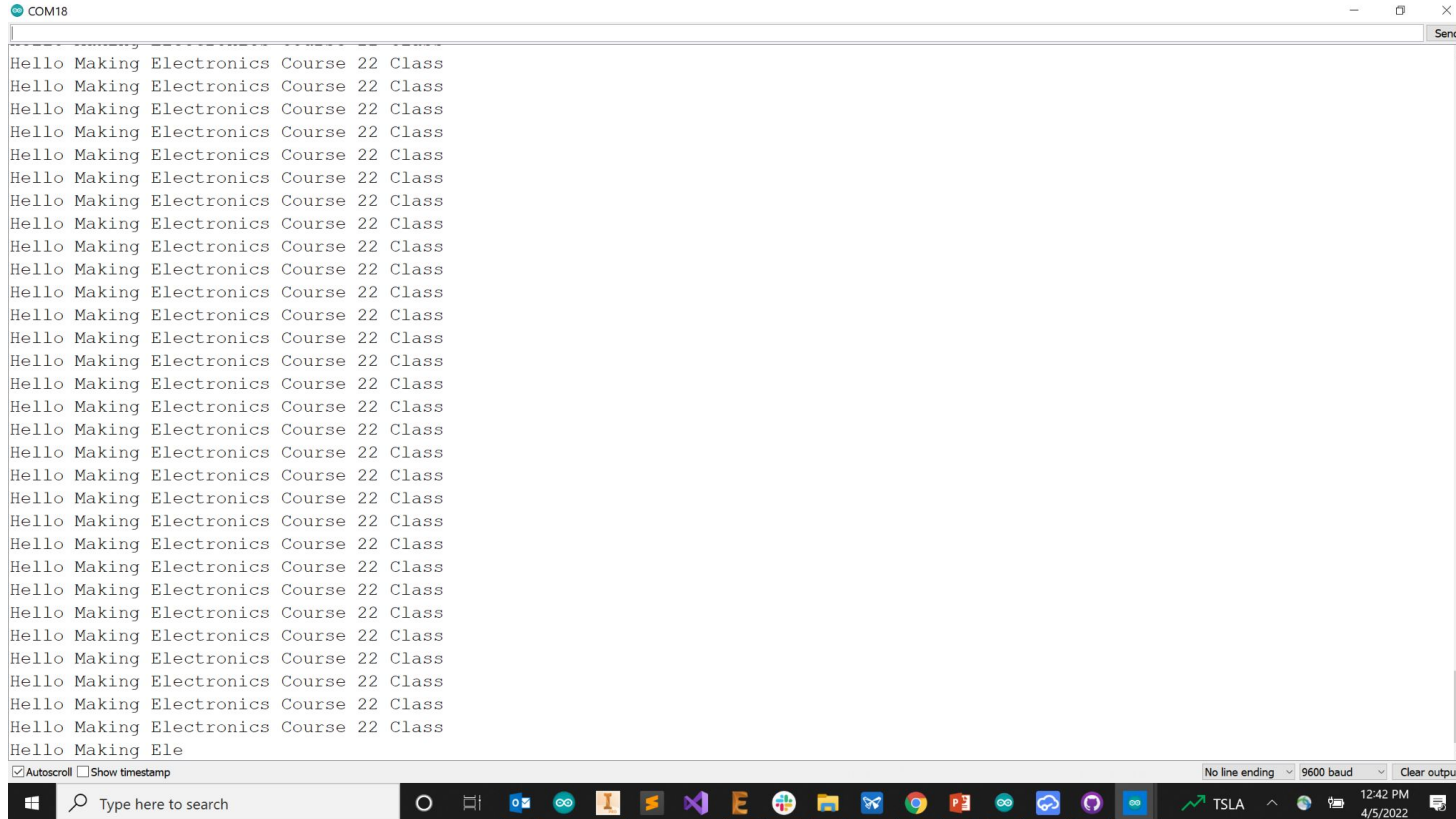
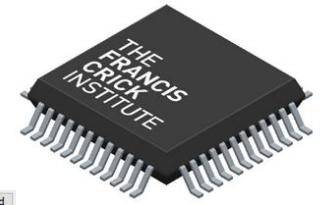
Now let's give it a heartbeat!



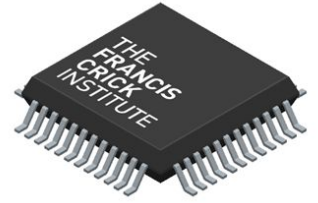
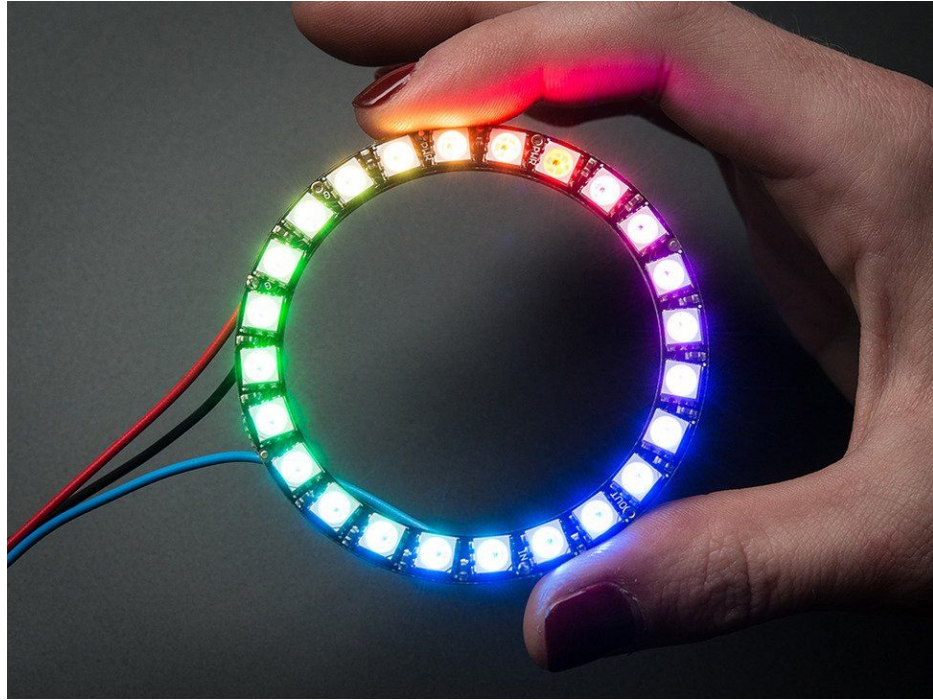
How can we make alternating colours?



The Serial port



Take it up to 11



<https://github.com/jasoncoon/esp32-fastled-ble>