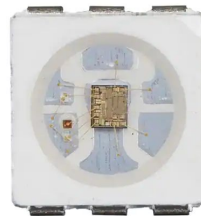


# 2023 Onsite Embedded Fun

Brought to you by the letters T and Z

# Hardware overview

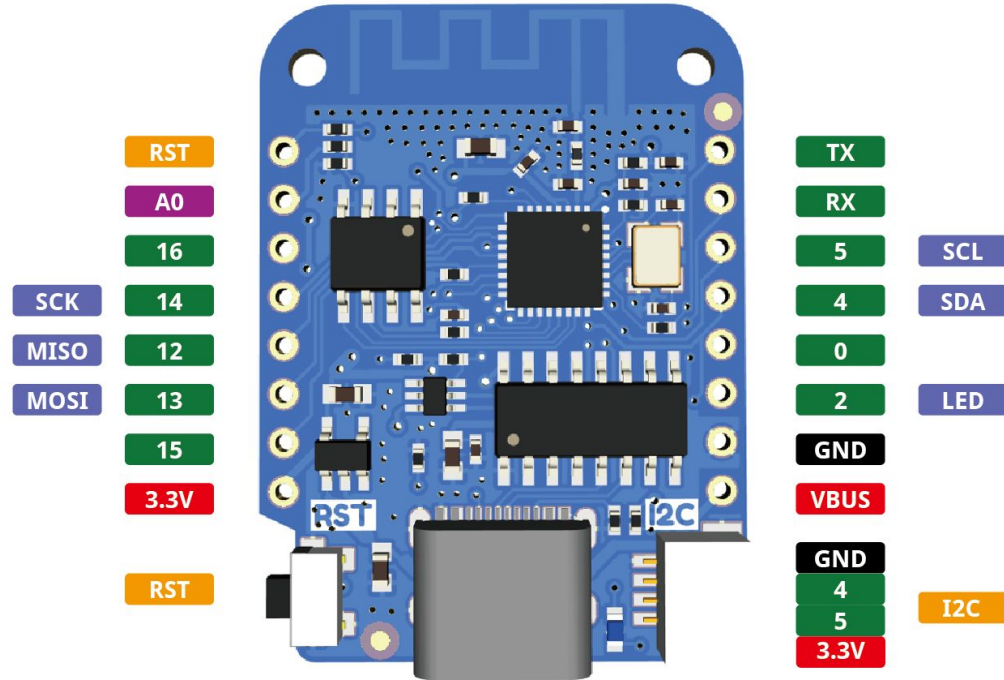


## Two circuit boards

- Generic wemos d1 mini esp8266 development board
  - The esp8266 is a well known wifi capable processor with lots of open source support
  - The d1 mini has an esp8266 module on it with built in antenna
  - This pcb is available on aliexpress.com, Amazon etc.
  - Makes working with the esp8266 easy by adding USB and pin breakout (3.3v io)
  - Cost about \$2 inc shipping
  - You get what you pay for, isn't 100% reliable, may need to try some things more than once to get them to work
- Custom minim m led board
  - Custom led board for this event
  - Has 36 WS2812B leds in a chain
  - Has a small level converter to convert the esp8266 3.3v io into 5v io for the WS2812B

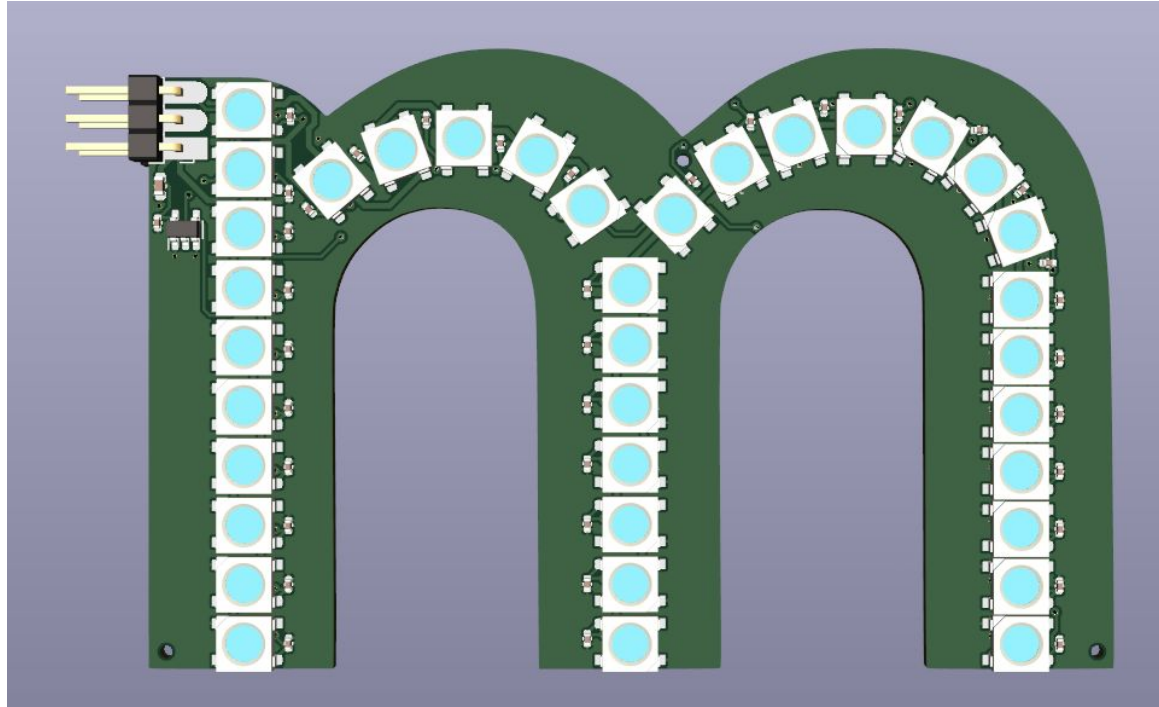
# Wemos d1 mini details

We'll be using it with the arduino development environment. This is the pinout you'll need. The led board is connected to VBUS/GND/2. This image shows a USB C connector, we have the micro usb version (was cheaper)



# LED Board details

Connector has 3 pins, GND/5V/DATA. Can plug directly into the wemos d1 mini or, with soldering, use wires to link them. The LED sequence numbering is on the back. There are 36 WS2812B leds in a single chain.

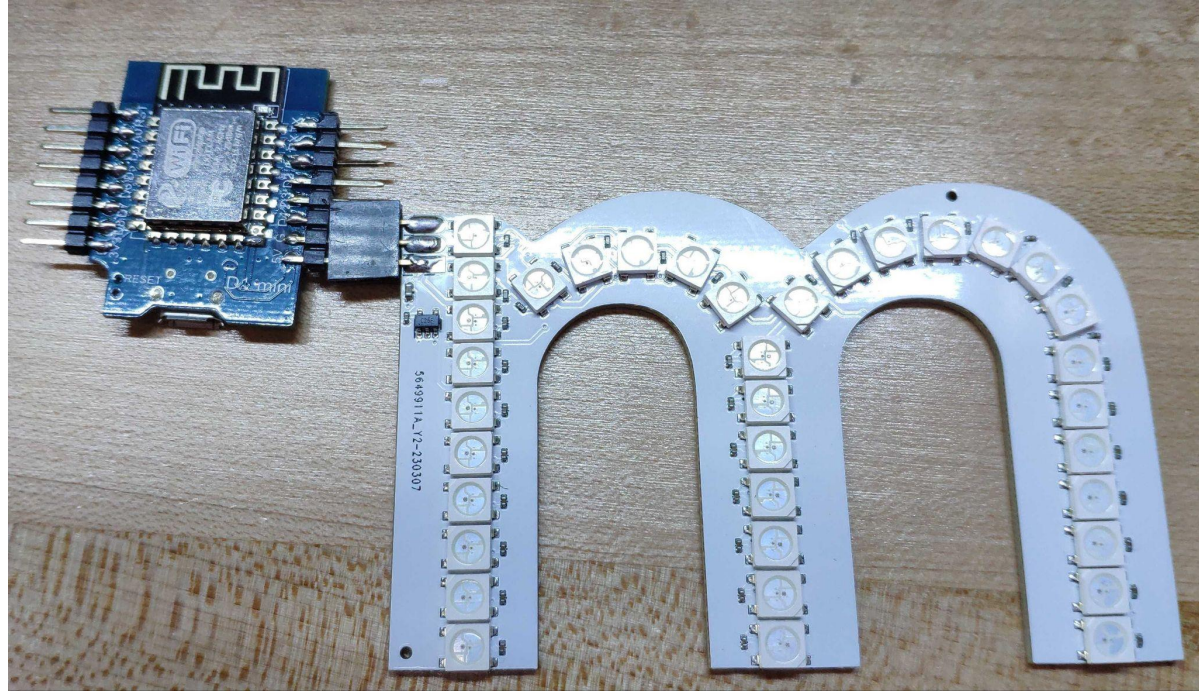


# Plugging the boards together

Connect the boards as shown. Note the USB connector on the d1 mini needs to face down.

Plug in a usb cable for a demo of the board.

The demo is called Pride2015 from the fastled library (more later on this).



# A fork in the road?

- The rest of this session is self driven
- There are two paths to choose between, coding and non-coding
- We encourage everyone to at least try the coding path before the non-coding
- The coding path starts on the next slide
- The non-coding path starts on slide 12



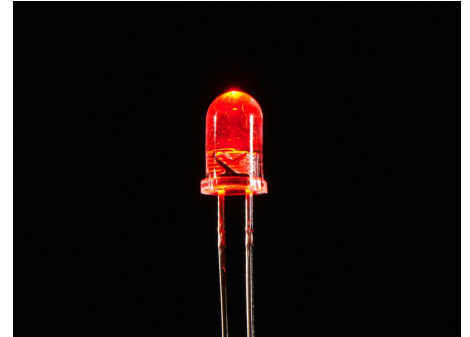
# Coding path - getting started

1. Follow the instructions at <https://support.arduino.cc/hc/en-us/articles/360019833020-Download-and-install-Arduino-IDE> to install the latest version of the arduino ide on your computer
2. Add support for the esp8266 processor to the arduino ide by following the instructions at <https://github.com/esp8266/Arduino#installing-with-boards-manager>



# Coding path - blink an LED

1. Connect the board to your computer
2. Start the Arduino IDE
3. Load the blink example (File menu -> Examples -> 01.Basics -> Blink)
4. Select the wemos d1 mini (Tools menu -> Board -> ESP8266 Boards -> LOLIN (WEMOS) d1 mini (clone))
5. Select the correct serial port (Tools Menu -> Port -> ? )  
(ask for help if needed)
6. Download and run (Sketch menu -> Upload)
7. LED on the d1 mini should blink





# Coding path - add the fastled library and test

In the arduino ide

1. Sketch Menu -> Include Library -> Manage Libraries
2. Type fastled in the search box and click install (any version will do, use the latest)
3. Click Close
4. File Menu -> Examples -> (scroll right down to) Fastled -> Pride2015
5. Change DATA\_PIN to 2 (default is 3) (ignore CLOCK\_PIN)
6. Change NUM\_LEDS to 36 (default is 200)
7. Change the LED\_TYPE to WS2812B (default is WS2811)
8. Sketch menu -> Upload

(you should see the example we started with)



# Coding path - task

## Make your own LED animation



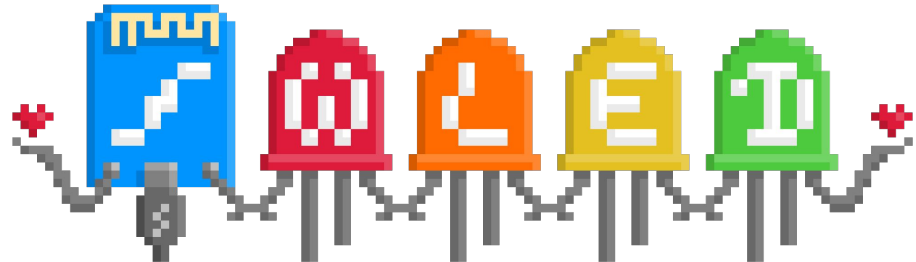
- Arduino is c++ (with the complexity hidden)
- There are other fastled examples to try (fastled blink is a good place to start)
- My lame attempt can be found at <https://github.com/Tom-Keddie/2023-onsite-badge/tree/main/software>
- Fastled documentation can be found at [http://fastled.io/docs/3.1/md\\_readme.html](http://fastled.io/docs/3.1/md_readme.html)
- Some ideas
  - create a static image and play with FastLED.setBrightness to make it pulsate
  - play with colours (see [https://fastled.io/docs/3.1/struct\\_c\\_r\\_g\\_b.html](https://fastled.io/docs/3.1/struct_c_r_g_b.html) )
  - play with different delay() values for animation speed

Coding path - placeholder

THIS PAGE  
INTENTIONALLY  
LEFT BLANK

# Noncoding path - fun with open source

- There are a huge number of open source applications written for the esp8266 and the ws281\* leds
- We're going to install one of them, WLED and use it to control the leds

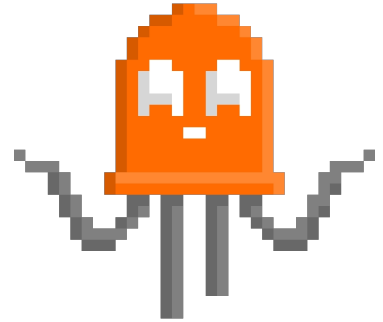




## Noncoding path - WLED intro

- wled is a complex piece of software that I'm not going to cover in great detail. In summary it's a wifi based led controller
- It will try to connect to a given ssid, if it fails it will create an ssid to connect to (we will use the latter, please don't connect the device to the minim wifi network)
- The esp8266 is a decent chip but it has its detractors. It works but it's not a great idea to use it on your main wifi network (don't you all have a spare 7600 laying around?)

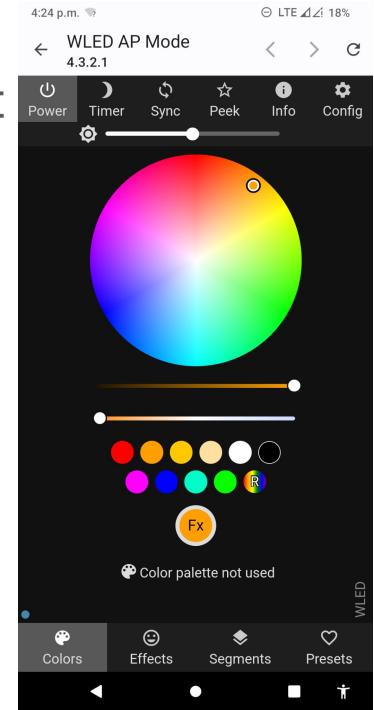
# Noncoding path - WLED installation



- wled binaries can be found at [https://drive.google.com/drive/folders/1\\_zPJ4FdvBNfqKUvcs376SYANr\\_zlo-9j?usp=sharing](https://drive.google.com/drive/folders/1_zPJ4FdvBNfqKUvcs376SYANr_zlo-9j?usp=sharing)
- Your wemos d1 mini has a number on the back. Download the wled binary to your computer that matches that number
- ***Make sure you have exited the arduino ide***
- For windows and mac follow the instructions at <https://kno.wled.ge/basics/install-wled-flasher/>
- For linux (assumed expert) follow the instructions titled “Flashing method 2: esptool” at <https://kno.wled.ge/basics/install-binary/>

# Noncoding path - WLED usage

- Using your phone or laptop open the wifi settings and connect to the esp8266 using the ssid named the same as the binary you downloaded
- Password is the same as the ssid
- Connecting to a colleagues ssid and messing with them is within the “rules”
- Play with the gui, there is a lot in there
- There is also a WLED app but I don't think it offers much more than the browser



# Noncoding path - going further

There is a wide variety of open source software for the esp8266 some other examples are

- Tasmota <https://tasmota.github.io/docs/>
- Esphome <https://esphome.io/>
- Nodemcu [https://www.nodemcu.com/index\\_en.html](https://www.nodemcu.com/index_en.html)
- Circuitpython  
<https://learn.adafruit.com/welcome-to-circuitpython/circuitpython-for-esp8266>



# Closing notes

There are WS2812 leds available in lots of configurations. Including strips, circles, squares. They're cheap and fun.

