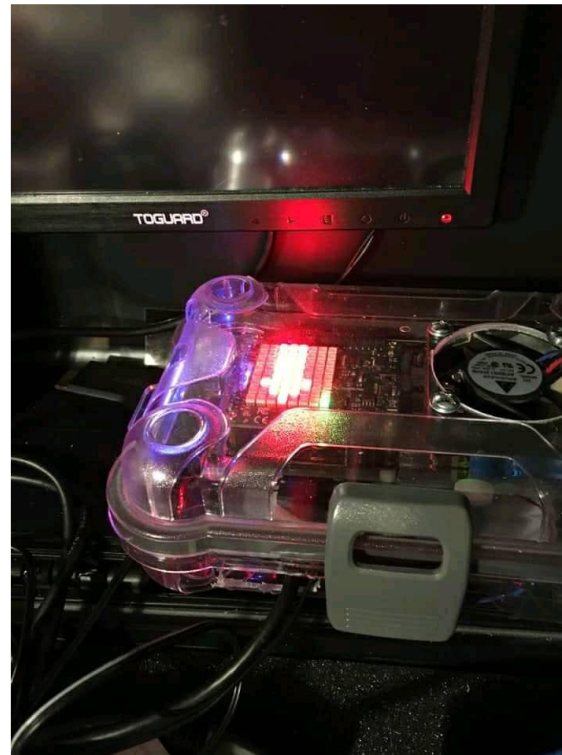
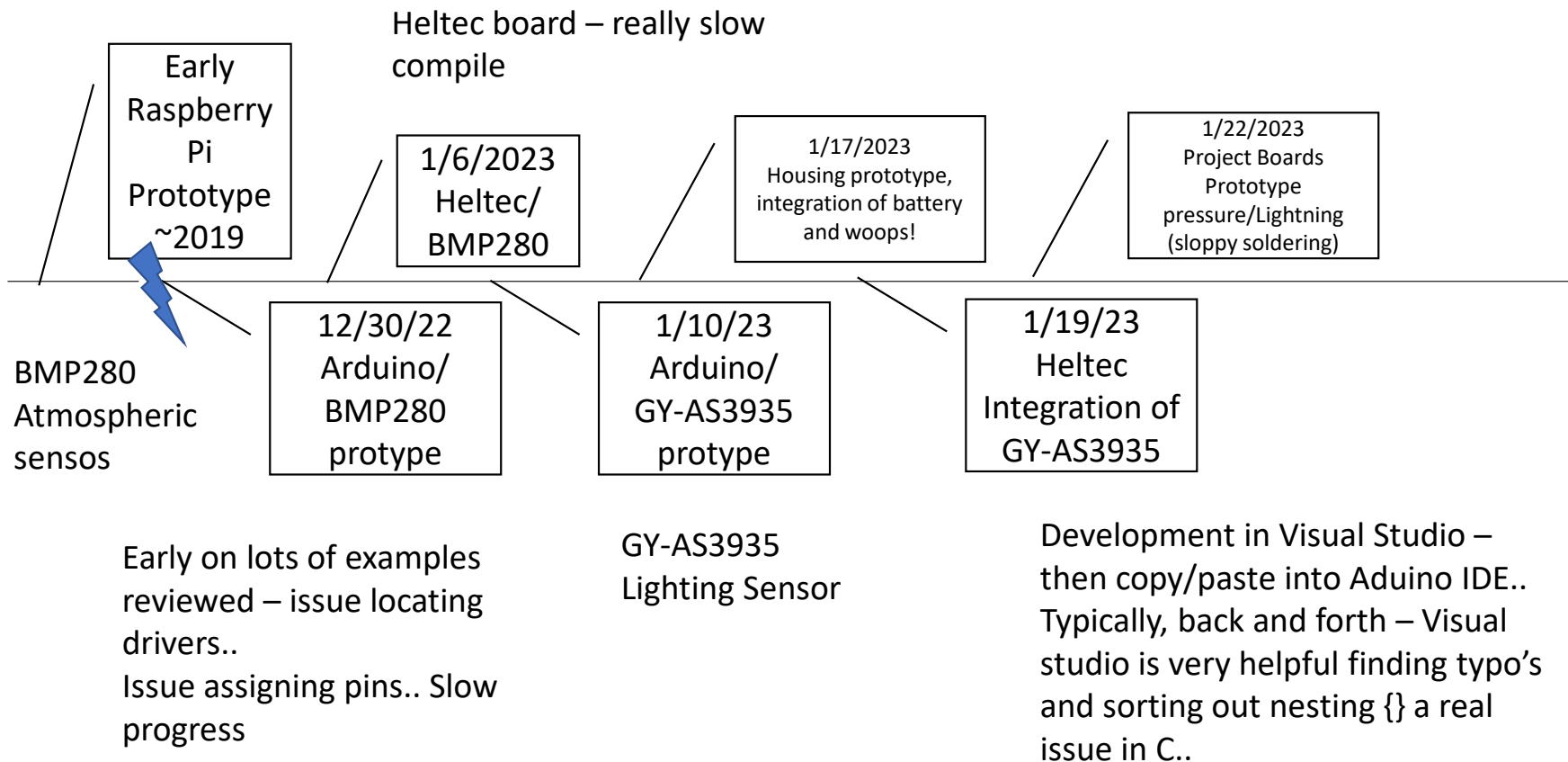


Mobilization of Digital Weather Rock

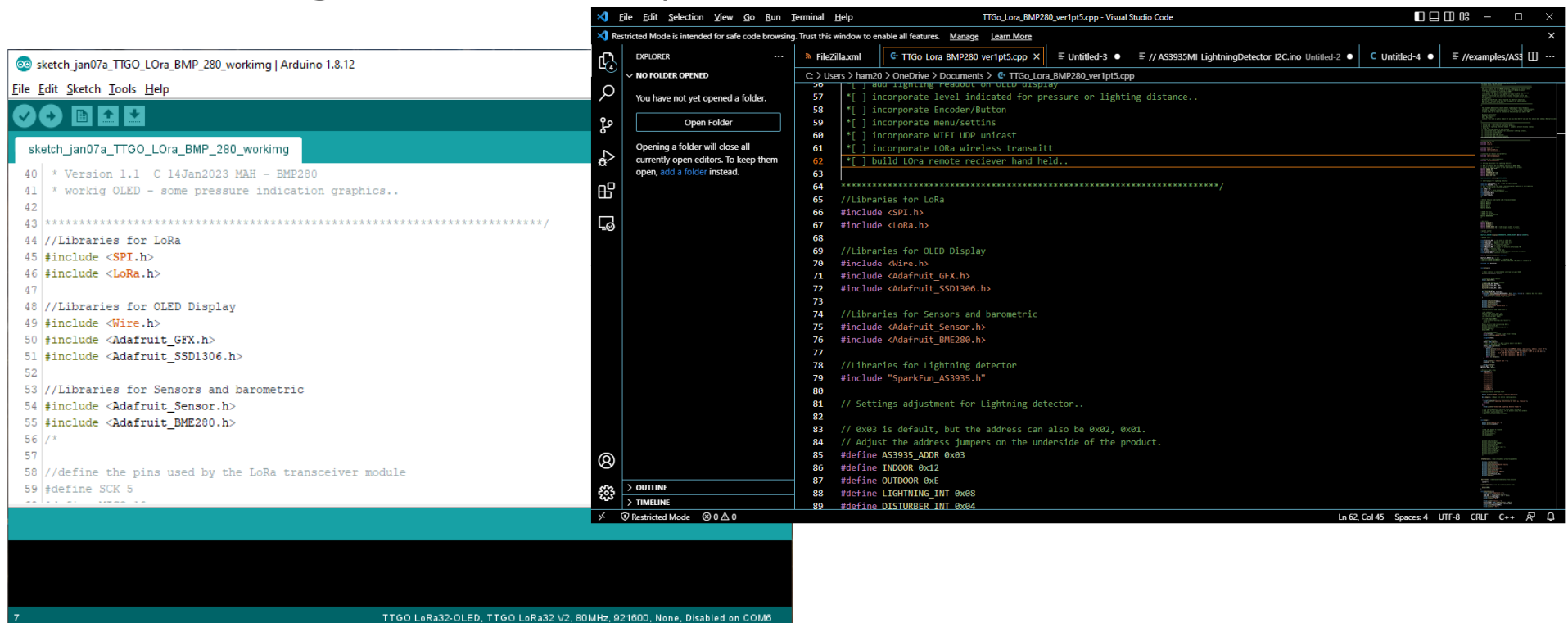
- Early Prototype Raspberry Pi (2022 version)
 - Written in Python and Node Red
 - Powered by 12 volt DC
 - Screen/Keyboard/Mouse Interface
 - Full Raspian OS (installed in Ham Radio Go kit)
 - BMP280 on board atmospheric sensor (temperature/humidity impacted by proximity to pi)
- Porting approach to Embedded Processors – Arduino line
 - Stand alone
 - Hand Held



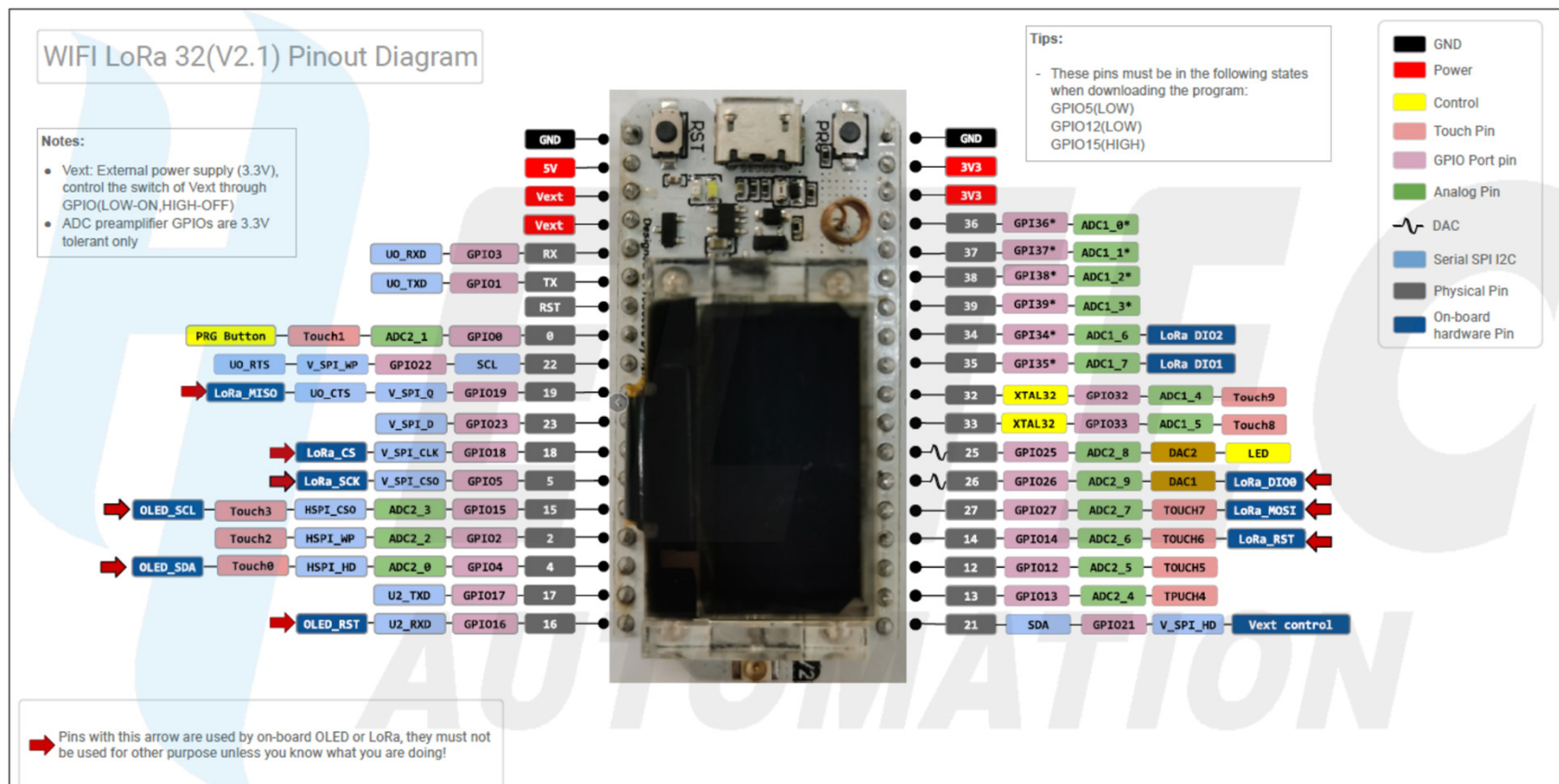
Early Development Timeline:



Development Environment Visual Studio/Arduino IDE – code including comments is ~500 lines long at mid stage of development

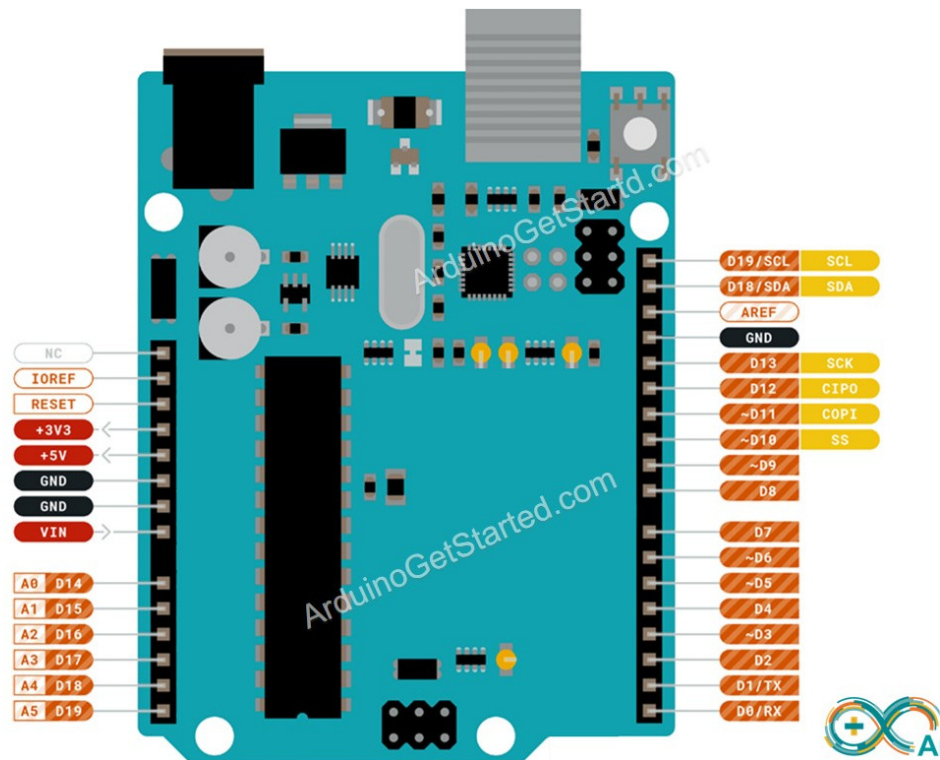


Marketing: 915MHz ESP32 LoRa 0.96 OLED Development Board WiFi SX1276 Module + LoRa Antenna for Arduino LoraWan IOT Internet of Thing (V2 used – V3 available)



Reality: Early Prototype on Arduino Uno

Prototyped interfaces in
simple Arduino Uno -
Development in Visual
Studio – then copy/paste
into Arduino IDE..
Validation of drivers etc.
Uno also compiles 10 times
faster. (seconds versus
minutes)



Lightning and pressure detectors integration with LoRa 0.96 OLED EP32 wifi board

- Modification and loading of special libraries *.h
- Integration/calibration of lightning detection libraries with OLED board
- Board prototype
- Build
 - Battery integration
 - Lack of on/off switch
 - Non standard battery header pins (Male/female cable pairs sourced)
 - housing
 - recharging
- Field use

HiLetgo BME280 3.3V Atmospheric Pressure Sensor GY-BME280-3.3 Temperature Humidity Sensor Module for Arduino

Description:

- BME280 is a Temperature, Humidity & Pressure Sensor breakout board.
- The board has selectable I2C address jumper (solder link GS2), I2C pull-up resistors, 7 pin header 2.54mm, and two mounting holes 3.5mm.
- Default setting of the board; single power rail Vdd=Vdd_IO (solder link GS1), pull-ups resistors (R2, R3) 10k, protocol selector resistor 0ohm (R1), decoupling capacitors 0.1uF on both power supply pins Vdd & Vdd_IO.
- If you connect board to both power rails VDD_IO 1.8V and VDD 3.3V be sure to remove the power rail jumper GS1!

BME280 Features:

- - Package 2.5 mm x 2.5 mm x 0.93 mm metal lid LGA
- - Digital interface I2C (up to 3.4 MHz) and SPI (3 and 4 wire, up to 10 MHz)
- - Supply voltage VDD main supply voltage range: 1.71 V to 3.6 V
- VDDIO interface voltage range: 1.2 V to 3.6 V
- - Current consumption 1.8 uA @ 1 Hz humidity and temperature
- 2.8 uA @ 1 Hz pressure and temperature
- 3.6 uA @ 1 Hz humidity, pressure and temperature
- 0.1 uA in sleep mode
- - Operating range -40...+85 C, 0...100 % rel. humidity, 300...1100 hPa-
- Humidity sensor and pressure sensor can be independently enabled/disabled
- This precision sensor is the best low-cost, precision sensing solution for measuring barometric pressure with ± 1 hPa absolute accuracy, and temperature with $\pm 1.0^\circ\text{C}$ accuracy. Because pressure changes with altitude, and the pressure measurements are so good, you can also use it as an altimeter with ± 1 meter accuracy.
- The BME280 is the next-generation of sensors, and is the upgrade to the BMP085/BMP180/BMP183 - with a low altitude noise of 0.25m and the same fast conversion time. It has the same specifications, but can use either I2C or SPI.

Package included:

- 1* BME280 Atmospheric Pressure Sensor Temperature Humidity Sensor Breakout

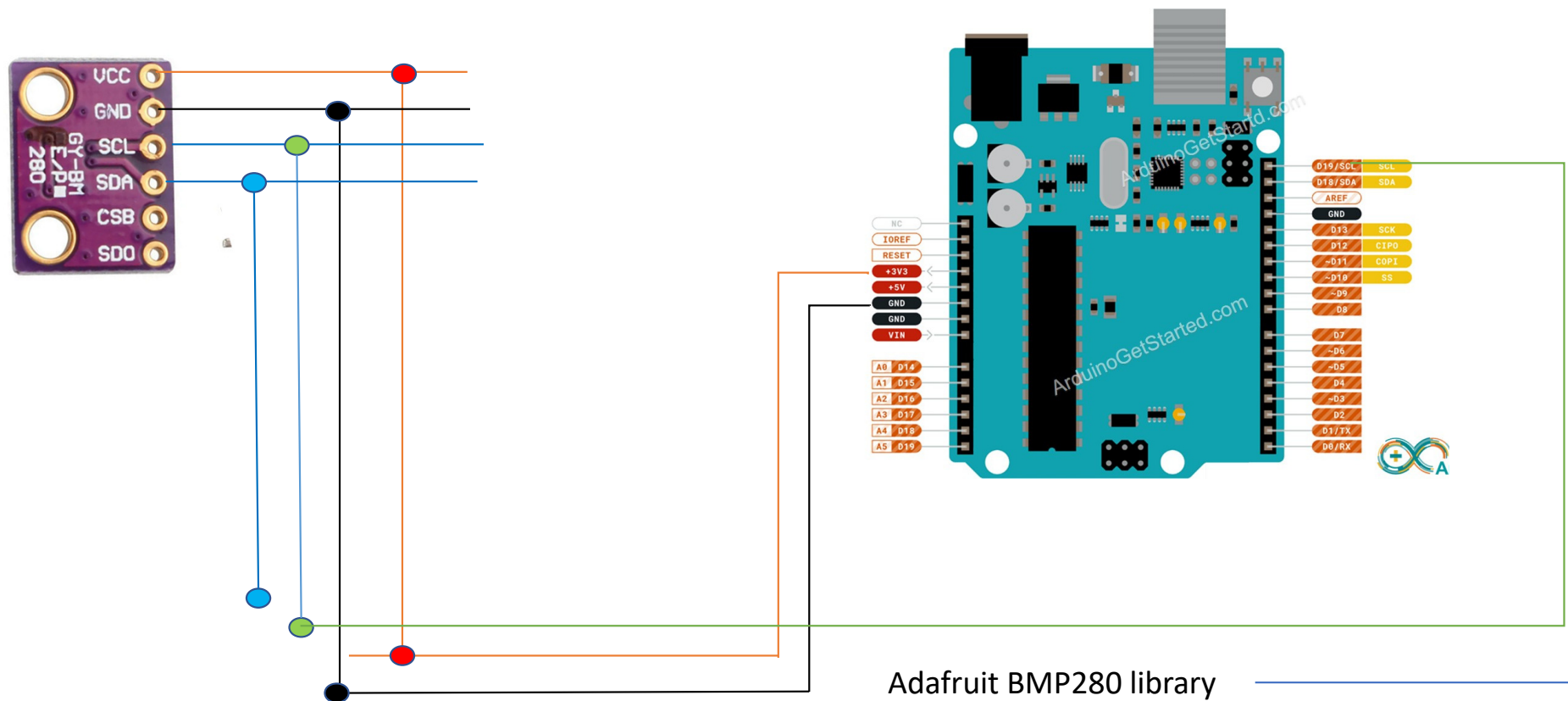
HiLetgo BME280 3.3V Atmospheric Pressure Sensor GY-BME280-3.3 Temperature Humidity Sensor Module for Arduino



← 1.71 V to 3.6 V
← DC Ground

When connecting via i2c, do you only have to connect vcc, gnd, scl and sda? assuming you want to use the default 0x76 i2c address.
Close attention to SCL and SDA pin assignment in software to get this to work..

Pressure circuit - SPI Demonstrator

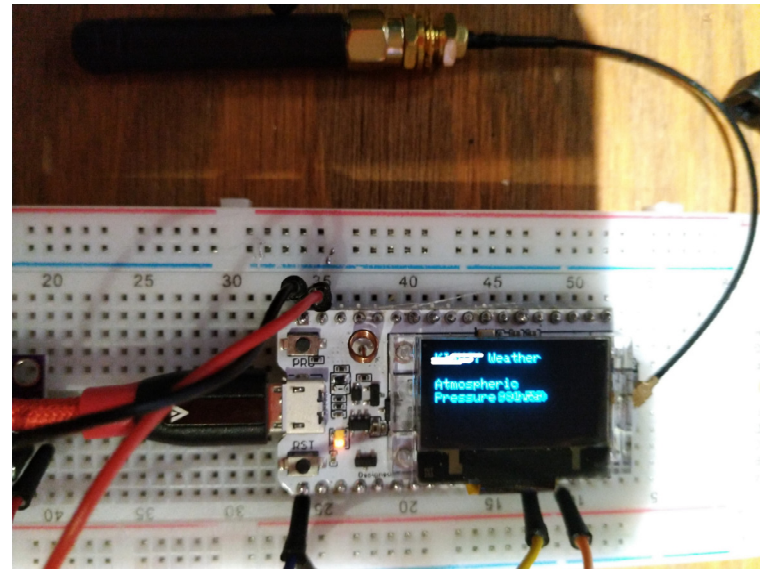


Prototyping – Barometric code and display

Working Heltek board with BMP280

Tedius improvement in display of pressure
and animating an ASCII gauge at the bottom
of the screen –

Ordered an Iphone 13 carry case from
Amazon to be used as a housing.

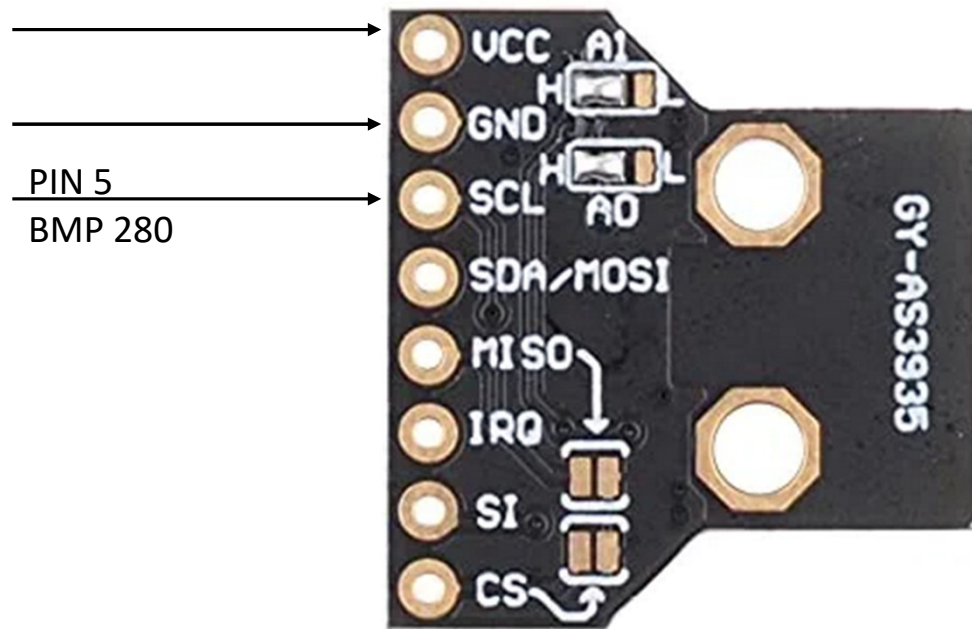


GY-AS3935 Lighting Sensor Module SPI I2C MA5532-AE

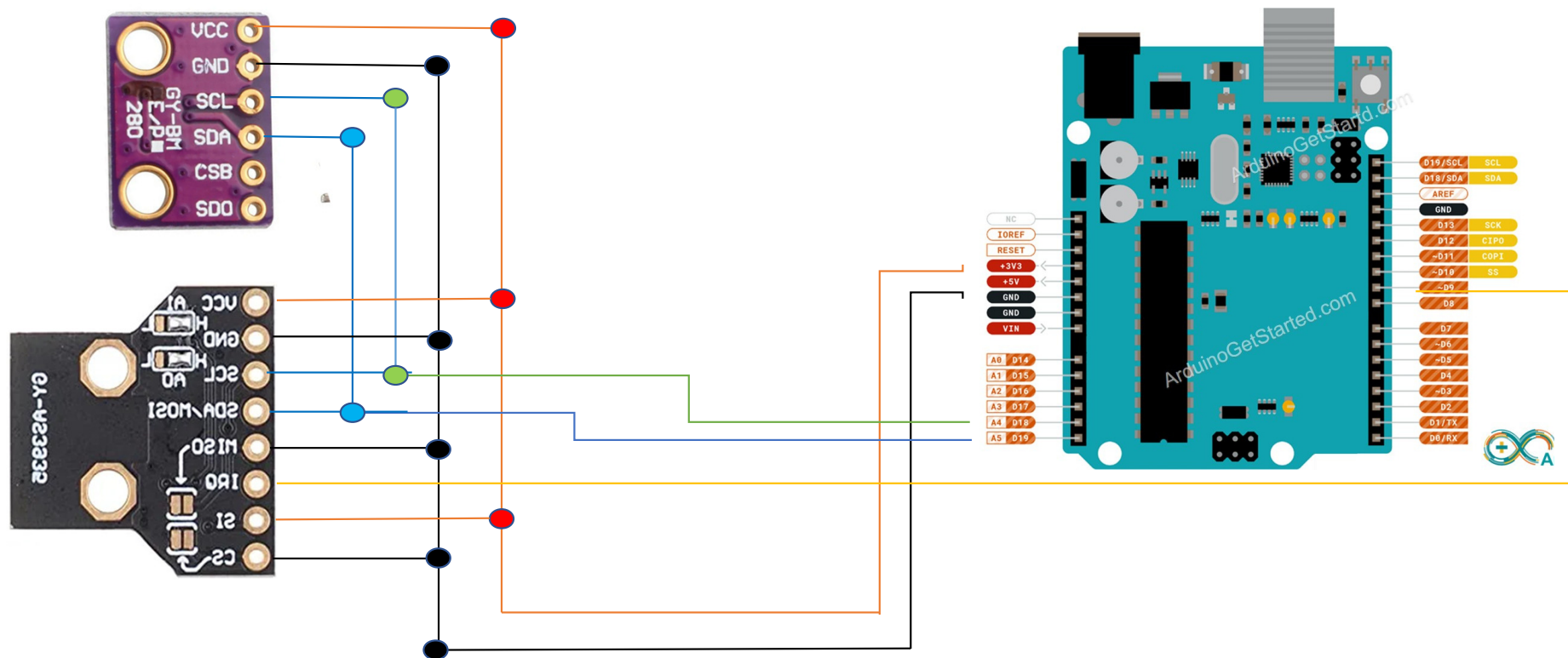
- I2C
 - I²C An I²C slave interface is implemented for read/write access to the internal registers and to send direct commands.
 - To enable the I²C as interface, the Select Interface pin has to be set to the positive voltage supply (SI=VDD).
 - The I2CL is the clock bus, while the I2CD is the data bus.
 - An external pull-up resistor on the I2CL pin is needed.
 - The device addresses for the AS3935 in read or write mode are defined by: 0-0-0-0-0-a1-a0-0: write mode device address (DW) 0-0-0-0-0-a1-a0-1: read mode device address (DR) Where a0 and a1 are defined by the pins 5 (ADD0) and 6 (ADD1).

GY-AS3935 Lighting Sensor Module SPI I2C MA5532-AE

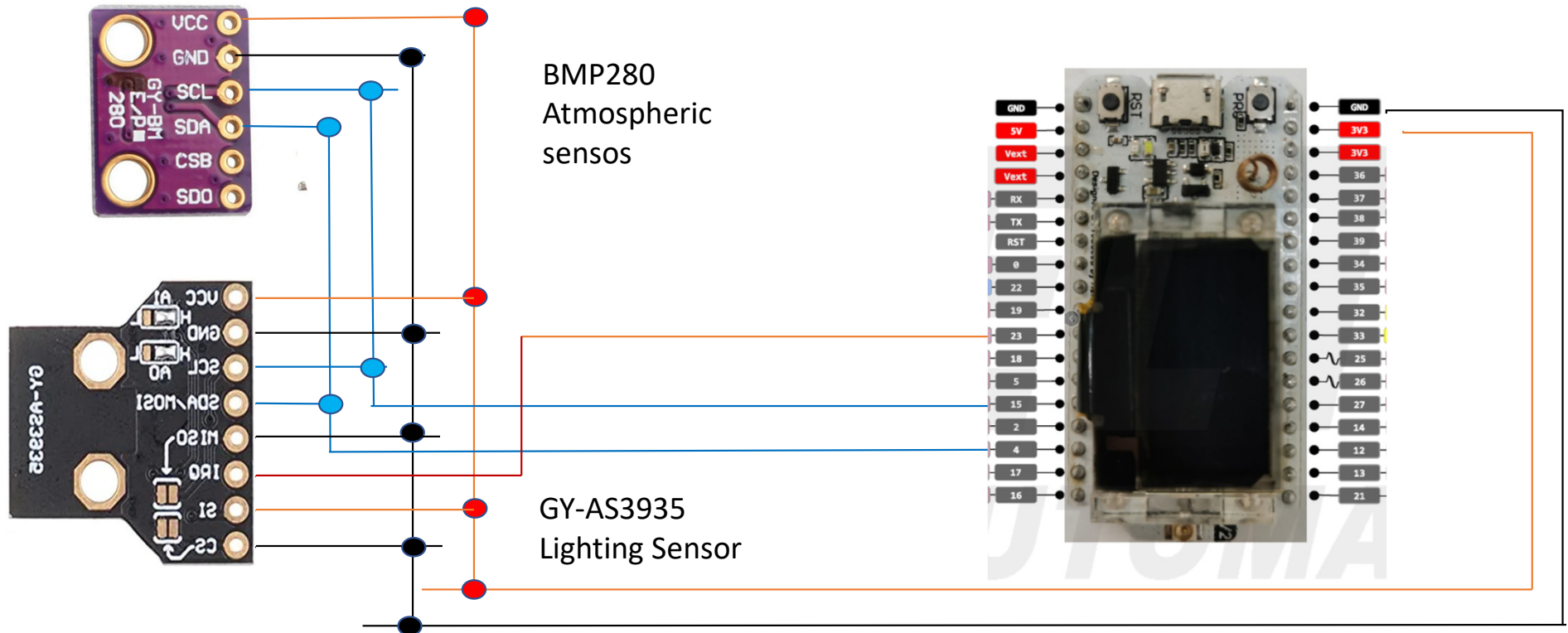
2.4V - 5.5V
DC Ground



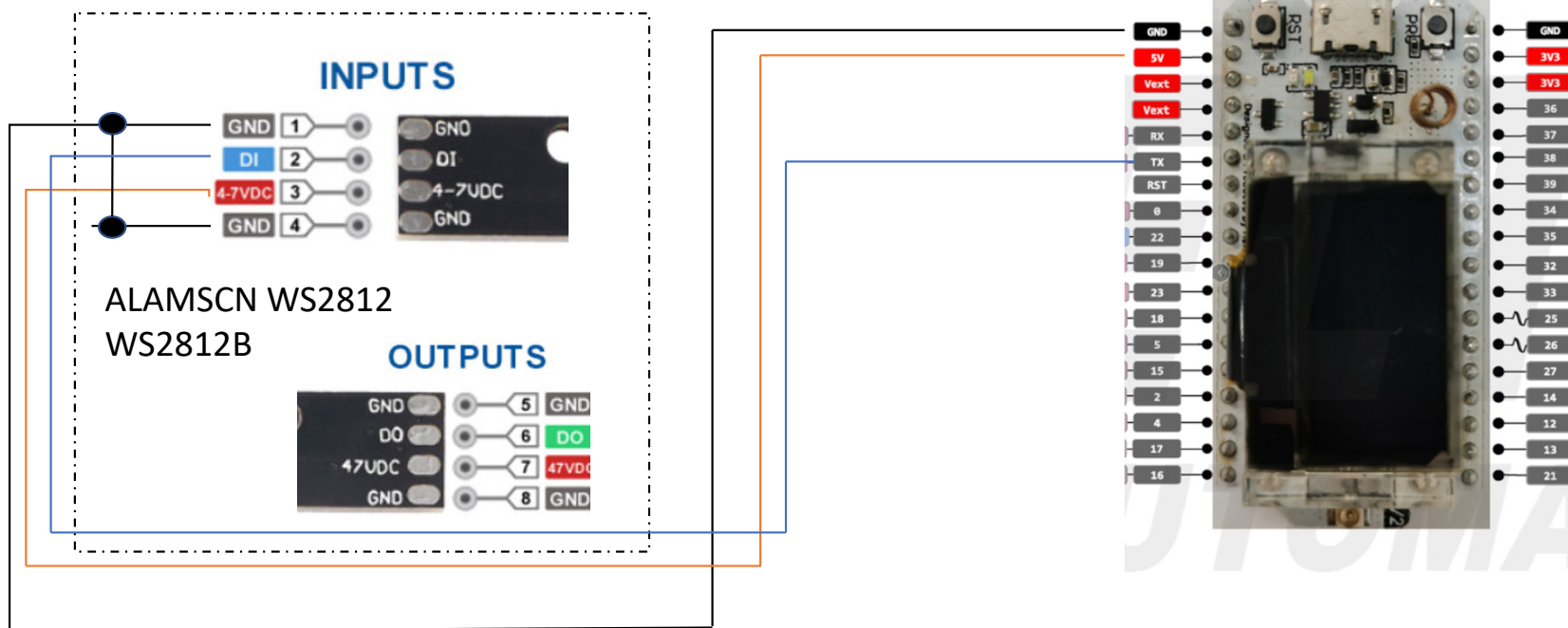
Basic circuit - SMOP (Small Matter of Programming)



Advanced circuit - SMOP (Small Matter of Programming)



Indication level circuit -ALAMSCN WS2812 WS2812B 5050 RGB 8 Bit 8 LEDs Strip Light Driver Board 8 Channel Built-in Full Color-Driven Board Rainbow LED



MakerFocus 3.7V 3000mAh Lithium Rechargeable Battery 1S 1C Lipo Battery

- with Protection Board Insulated Rubber Tape and Micro JST 1.25 Plug for Arduino Nodemcu ESP32 Development Board
- Purchased eBoot 20 Pairs 1.25 mm JST 2 Pin Micro Electrical Male and Female Connector Plug with 10 cm Wire Cable (to place in line with switch)
- Maintained ON/OFF switch



Specification:

Standard Voltage: 3.7V

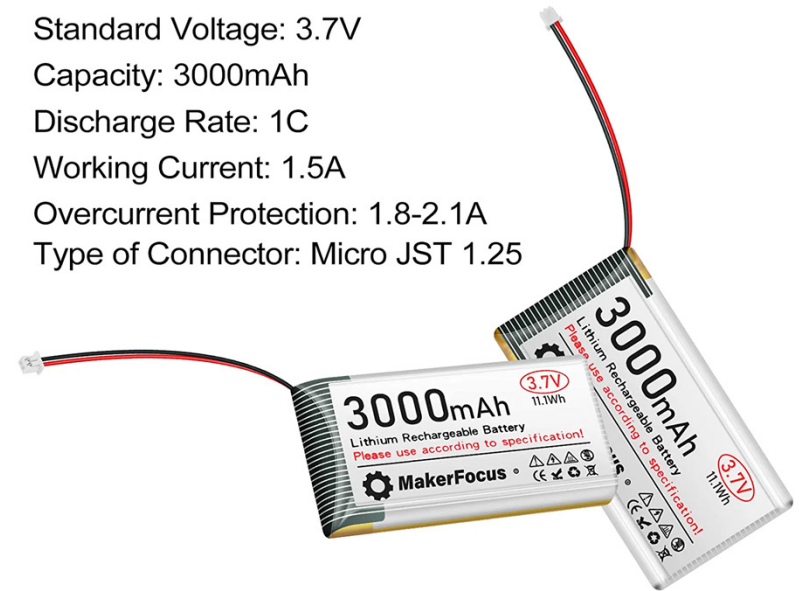
Capacity: 3000mAh

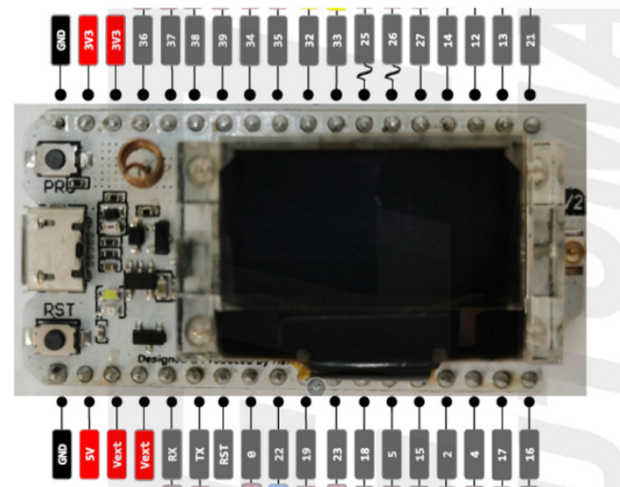
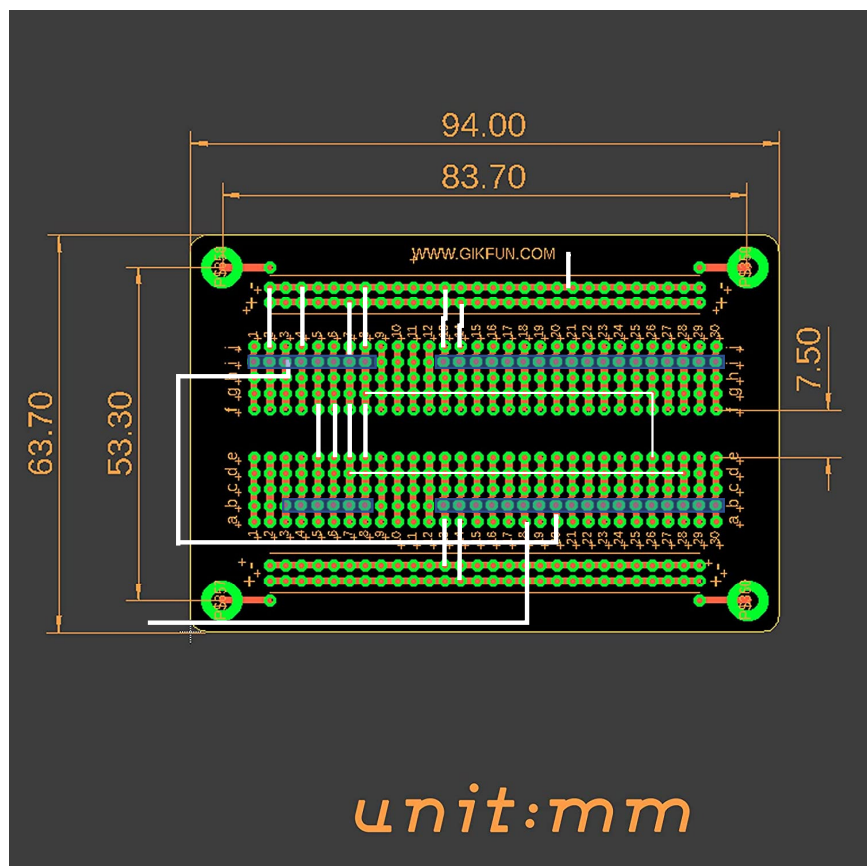
Discharge Rate: 1C

Working Current: 1.5A

Overcurrent Protection: 1.8-2.1A

Type of Connector: Micro JST 1.25





Programming Issues

- Lightning detector requires calls that are not standard...
- Example for the Lora board includes :
 - Wire.h (standard call to allow communication to OLED)
- Punted back to basic Arduino board – once working will migrate back to full feature board. Compiler is twitchy....
 1. Get basic 1wire diagnostic programing going and confirm board addresses - Libraries

```
//Libraries for LoRa
#include <SPI.h>
#include <LoRa.h>

//Libraries for OLED Display
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

//Libraries for Sensors and barometric
#include <Adafruit_Sensor.h>
#include <Adafruit_BME280.h>
```

Unique programming and library call syntax – could not have done it without programming examples – mixed Heltec and Adafruit example codes..