The Solution consists of 3 PCB boards

1. **Main Board** – this regulates power from a single 48v - 12v battery to 5v, 6v or 9v outputs, it has all the necessary connectors to quickly wire to DFRobot H Bridge motor controllers and all required sensors. It utilizes 2 CPUs (Feather 32u4 Proto M0 | Feather 32u4 RF Series AND Feather ESP32 HUZZAH Series processors).

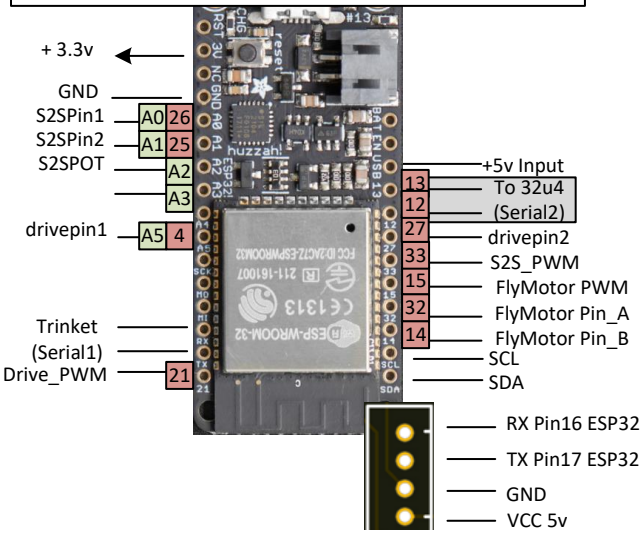
NOTE: There are 3 options given depending upon secondary 32u4 and which MP3 trigger you wish to use

2. **IMU/MPU Board** – this connects via Serial and consists of dedicated CPU (trinket m0) as well as MPU6050 series that regulates Pitch, Tilt and yaw movement on the system.

3. **Dome board** – this communicates via ESP32NOW to the Main Board and controls LEDs in the dome only. Future adaption of motion sensor and distance sensors.

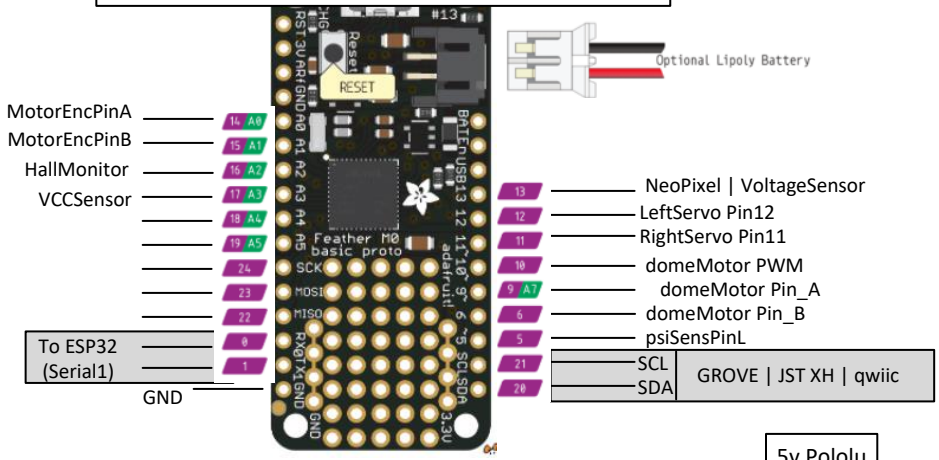
OPTION 1: 32u4 PROTO M0 and i2C MP3 Trigger

Adafruit ESP32 HUZZAH32 Feather (MAIN)



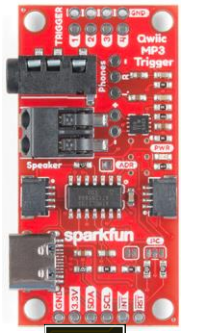
To Trinket (MPU)

Adafruit Feather 32u4 M0 Proto (SECONDARY)



https://www.adafruit.com/product/3076

Sparkfun QWIIC MP3 TRIGGER



GND 3.3V SDA SCL
To Feather 32u4

5v Pololu

Bat on 32u4, Trinket and ESP32 And Outputs

12/24/48v In
GND In
GND Out
5v Out

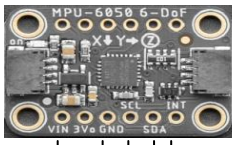
6v/9v Pololu

To Left/Right Servo and Output

12/24/48v In
GND In
GND Out
9v/6v Out

Adafruit ESP32 HUZZAH32 Feather (DOME)

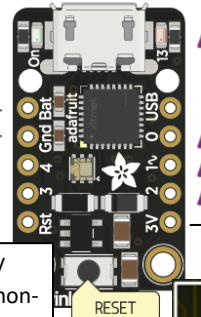
MPU6050



5v
GND
SCL
SDA
INT

https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts

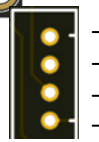
Adafruit Trinket M0



i2C
5v
GND
ESP32 (Serial1)
TX
RX

LED Pin13
SDA to SDA on MPU
INT to INT on MPU
SCL to SCL on MPU
3v to Vin on MPU

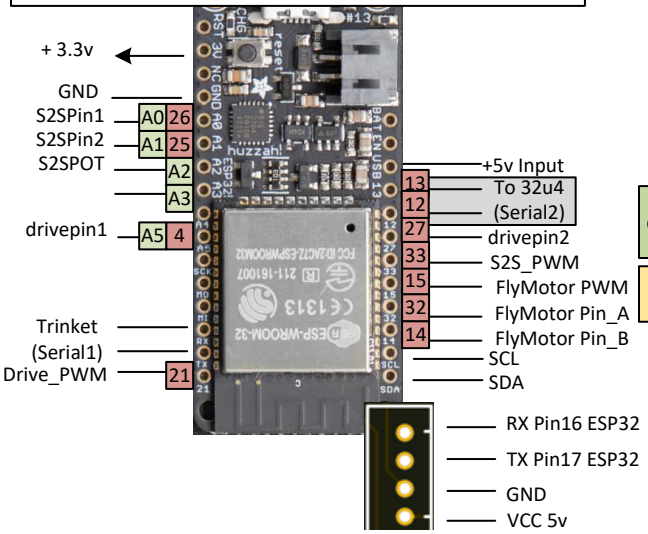
https://learn.adafruit.com/adafruit-trinket-m0-circuitpython-arduino/pinouts



To ESP32 (MAIN)

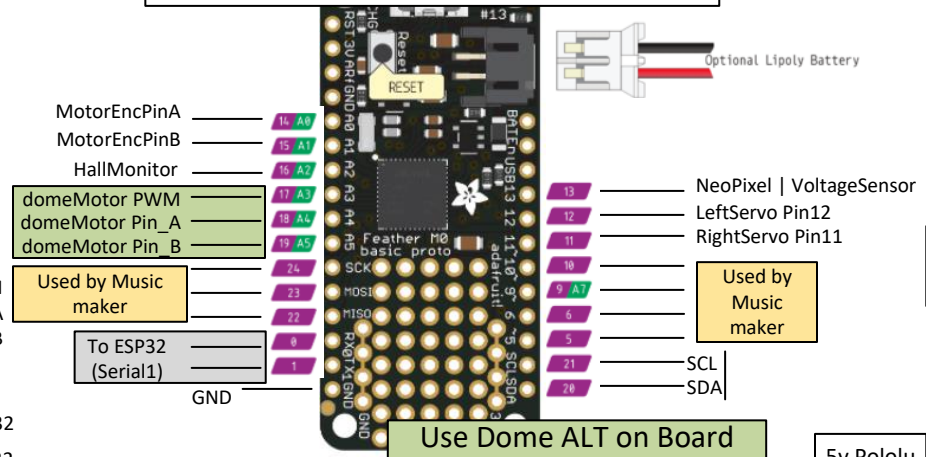
OPTION 2: 32u4 PROTO M0 and ADAFRUIT MUSIC MAKER FEATHERWING

Adafruit ESP32 HUZZAH32 Feather (MAIN)



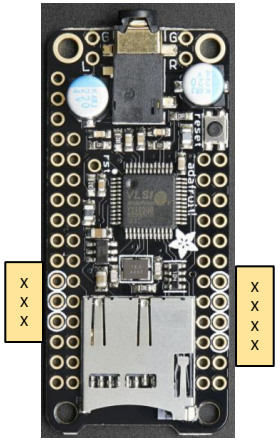
To Trinket (MPU)

Adafruit Feather 32u4 M0 Proto (SECONDARY)



Use Dome ALT on Board for Motor Controller

ADAFRUIT VS105 Feather



5v Pololu

Bat on 32u4, Trinket and ESP32 And Outputs

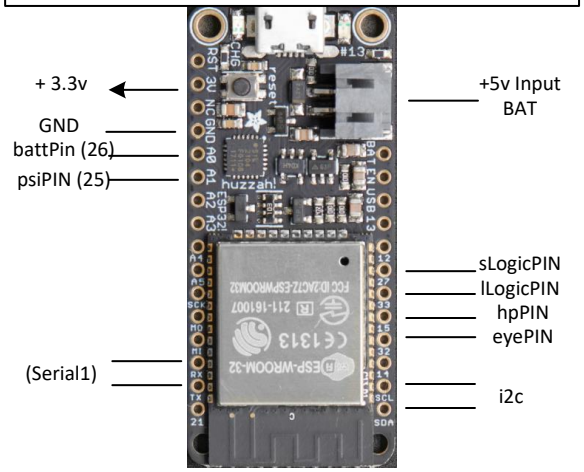
12/24/48v In
GND In
GND Out
5v Out

6v/9v Pololu

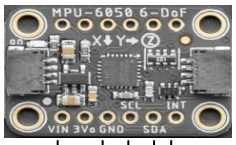
To Left/Right Servo and Output

12/24/48v In
GND In
GND Out
9v/6v Out

Adafruit ESP32 HUZZAH32 Feather (DOME)

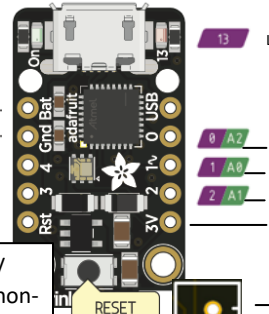


MPU6050

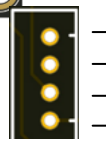


https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts

Adafruit Trinket M0



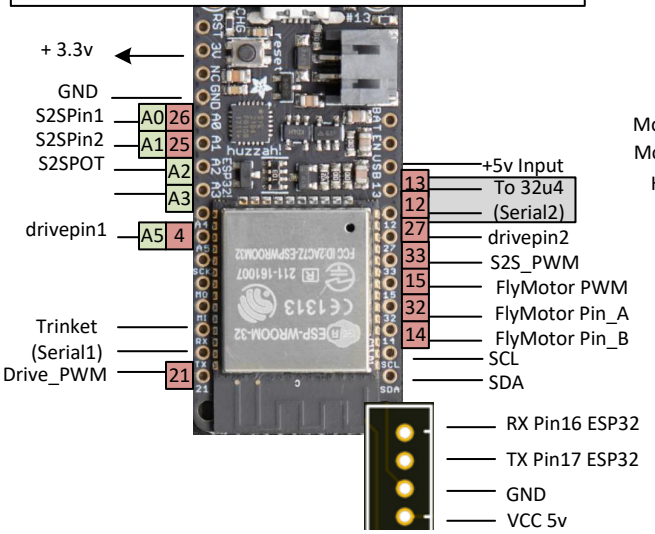
https://learn.adafruit.com/adafruit-trinket-m0-circuitpython-arduino/pinouts



To ESP32 (MAIN)

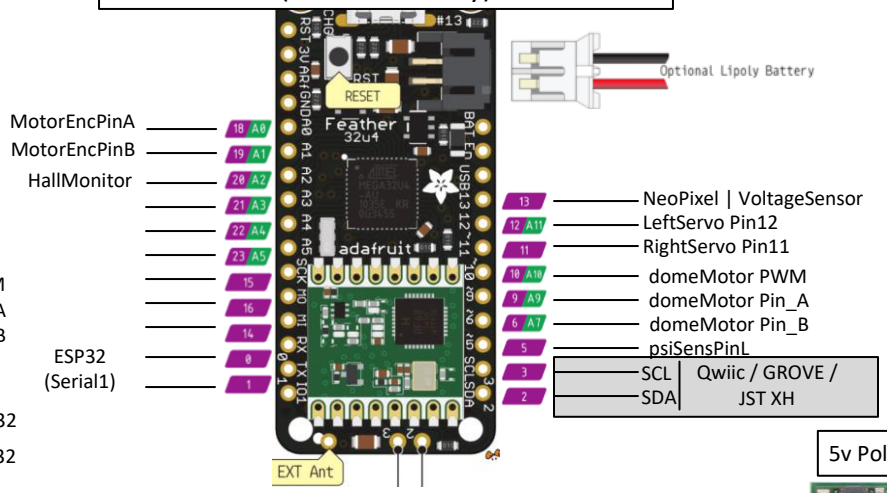
OPTION 3: 32u4 RF and i2C MP3 Trigger

Adafruit ESP32 HUZZAH32 Feather (MAIN)



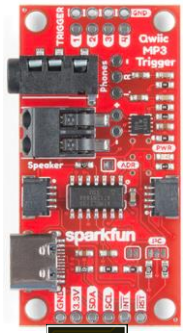
To Trinket (MPU)

Adafruit Feather 32u4 RF Series (BB8 Secondary)

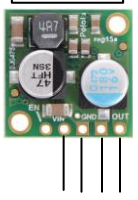


https://www.adafruit.com/product/3076

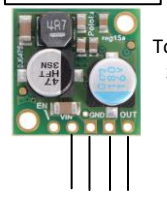
Sparkfun QWIIC MP3 TRIGGER



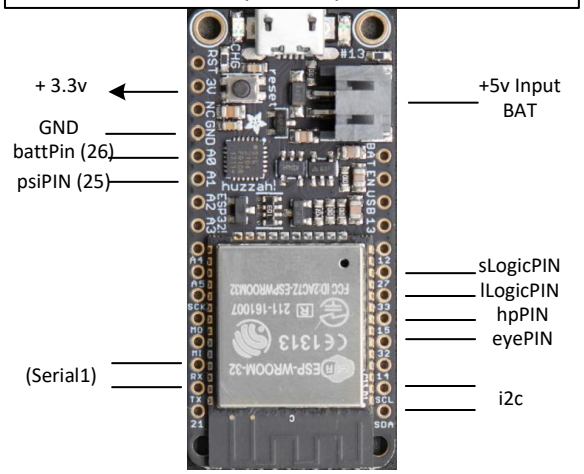
5v Pololu



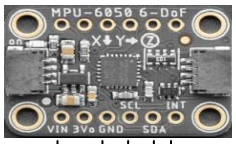
6v/9v Pololu



Adafruit ESP32 HUZZAH32 Feather (DOME)

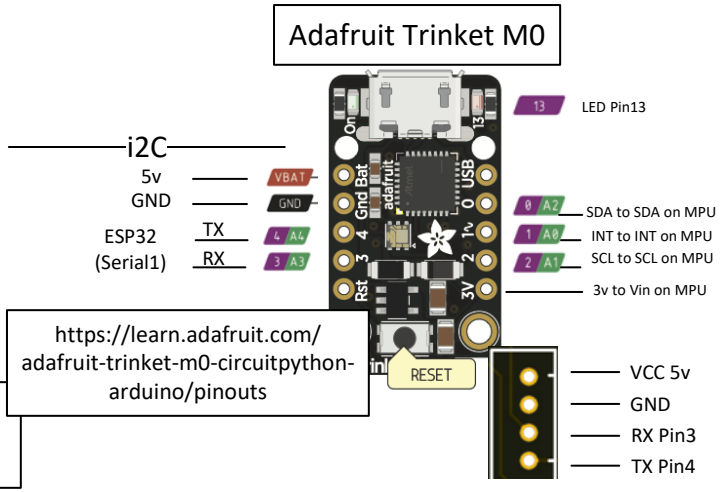


MPU6050



https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts

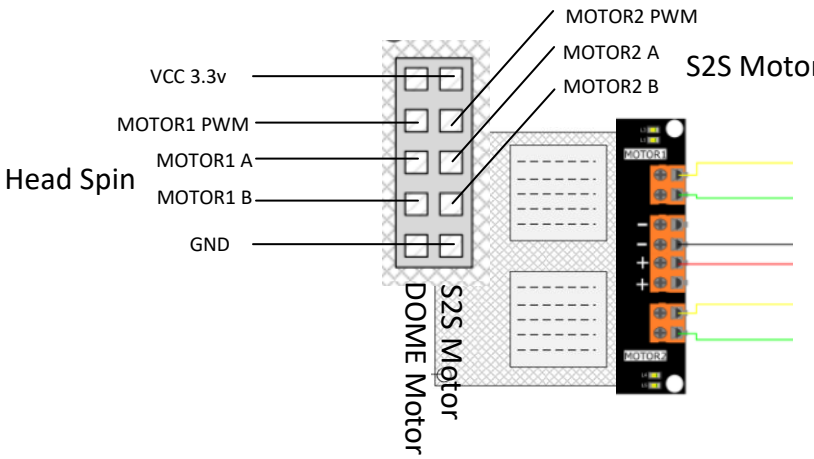
Adafruit Trinket M0



https://learn.adafruit.com/adafruit-trinket-m0-circuitpython-arduino/pinouts

To ESP32 (MAIN)

MOTOR DRIVER 1



DOME Motor

32u4

```
#define domeMotor_pwm 21
#define domeMotor_pin_A 22
#define domeMotor_pin_B 23
ALT w/ MUSIC MAKER FEATHERWING
#define domeMotor_pwm  A3
#define domeMotor_pin_A A4
#define domeMotor_pin_B A5
```

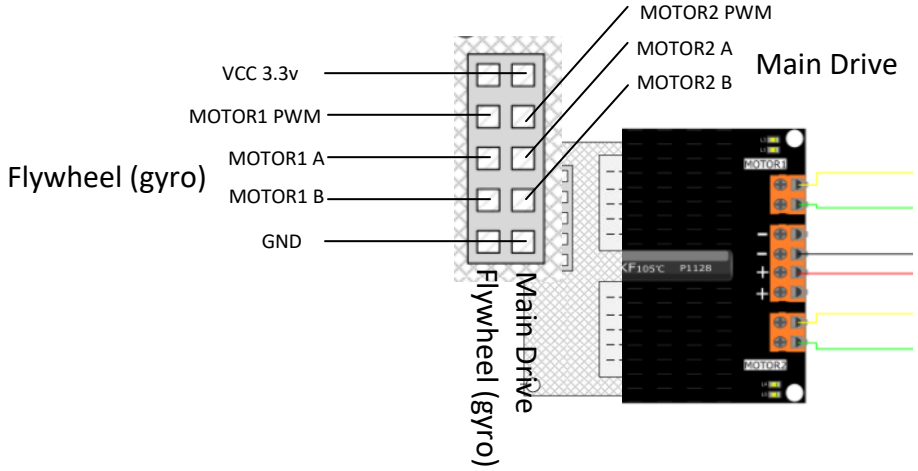
VCC 12/24v

S2S Motor

ESP32

```
#define S2S_pwm 33  // SCL 22 and SDA 23
#define S2S_pin_1 26 //A0
#define S2S_pin_2 25 //A1
```

MOTOR DRIVER 2



Flywheel (gyro)

ESP32

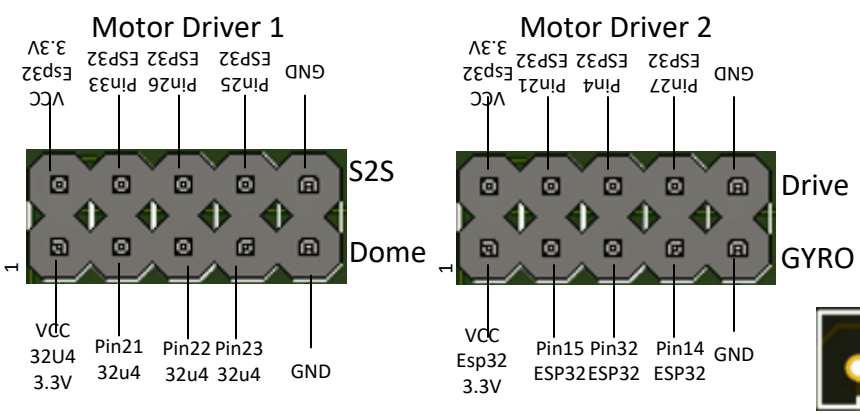
```
#define flyWheelMotor_pwm 15
#define flyWheelMotor_pin_A 32
#define flyWheelMotor_pin_B 14
```

VCC 12/24v

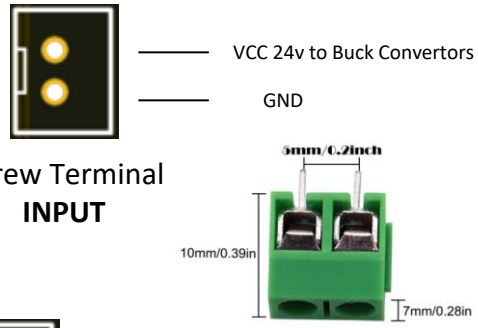
Main Drive

ESP32

```
#define Drive_pwm 21  // SCL 22 and SDA 23
#define Drive_pin_1 4
#define Drive_pin_2 27
```


Motor Driver 1
VCC Esp32 3.3V
Pin33 ESP32
Pin26 ESP32
Pin25 ESP32
GND
S2S
Dome
1
VCC 32U4 3.3V
Pin21 32u4
Pin22 32u4
Pin23 32u4
GND
Motor Driver 2
VCC Esp32 3.3V
Pin21 ESP32
Pin4 ESP32
Pin27 ESP32
GND
Drive
GYRO
1
VCC Esp32 3.3V
Pin15 ESP32
Pin32 ESP32
Pin14 ESP32
GND


Serial Debug
RX
TX


VCC 24v to Buck Convertors
GND
Screw Terminal
INPUT
5mm/0.2inch
10mm/0.39in
7mm/0.28in


To Trinket (MPU)
VCC 5v
GND
TX Pin17 ESP32
RX Pin16 ESP32

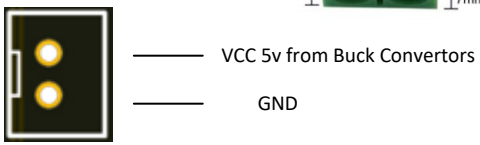

S2S Motor
PinA0 ESP32
PinA1 ESP32

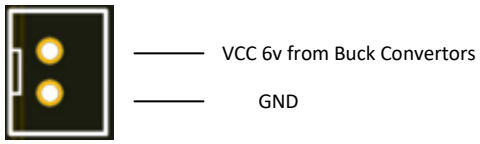

Drive Motor
Pin4 ESP32
Pin21 ESP32

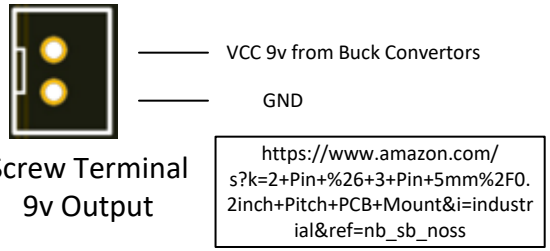

NEOPIX
VCC 5v Buck
Pin27 ESP32
GND


S2S POT
VCC 3.3v
GND
PinA2 ESP32


JST-XH 2.54mm


VCC 5v from Buck Convertors
GND
Screw Terminal
5v Output


VCC 6v from Buck Convertors
GND
Screw Terminal
6v Output


VCC 9v from Buck Convertors
GND
Screw Terminal
9v Output
https://www.amazon.com/s?k=2+Pin+%26+3+Pin+5mm%2F0.2inch+Pitch+PCB+Mount&i=industrial&ref=nb_sb_noss


To DomeSpin
VCC 5v
GND
Pin3 32u4
Pin2 32u4


Future
Pin5 32u4
Pin21 32u4


i2c ESP32
Pin22 ESP32 SCL
Pin23 ESP32 SDA
GND ESP32 GND


Gyro / Fly
Pin9 32u4
Pin6 32u4


Dome Motor
Pin10 32u4
Pin13 32u4

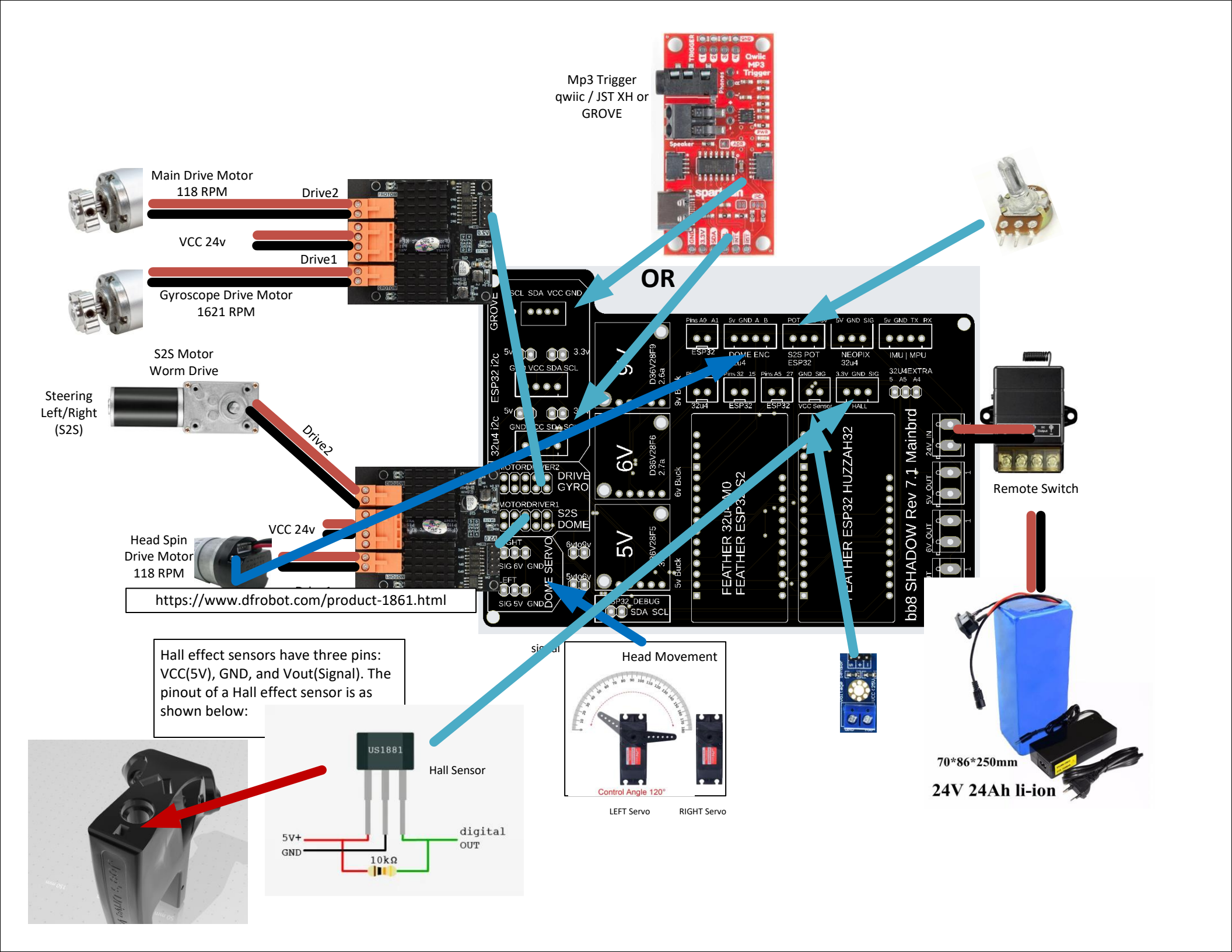

VCC Sensor
GND
Pin22 32u4


Right Servo
Pin 11 32u4
VCC 9v From Buck
GND

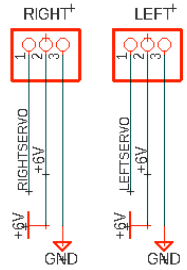

Left Servo
Pin 12 32u4
VCC 9v From Buck
GND

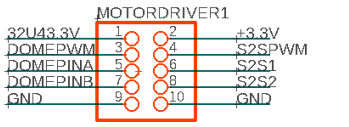

PSI Sensor
Pin18 32u4
Pin20 32u4

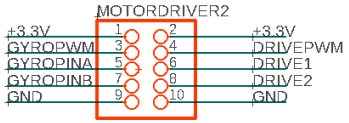

Hall Sensor
VCC 3.3v
GND
Pin 19 32u4

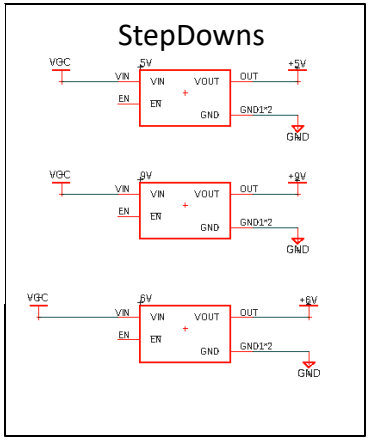

Mp3 Trigger
qwiic / JST XH or
GROVE
Main Drive Motor
118 RPM
Drive2
VCC 24v
Drive1
Gyroscope Drive Motor
1621 RPM
OR
S2S Motor
Worm Drive
Steering
Left/Right
(S2S)
Drive2
VCC 24v
Head Spin
Drive Motor
118 RPM
https://www.dfrobot.com/product-1861.html
Remote Switch
bb8 SHADOW Rev 7.1 Mainbrd
FEATHER ESP32 HUZZAH32
Hall effect sensors have three pins: VCC(5V), GND, and Vout(Signal). The pinout of a Hall effect sensor is as shown below:
US1881
Hall Sensor
5V+
GND
10kΩ
digital
OUT
Head Movement
Control Angle 120°
LEFT Servo
RIGHT Servo
70*86*250mm
24V 24Ah li-ion

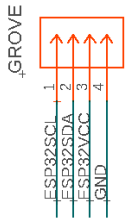
MAIN BOARD 7.1/7.5

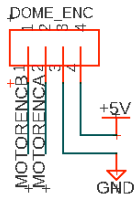


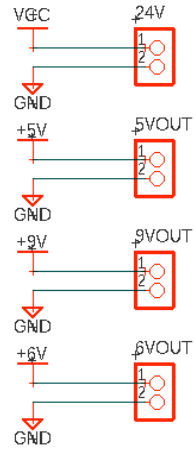




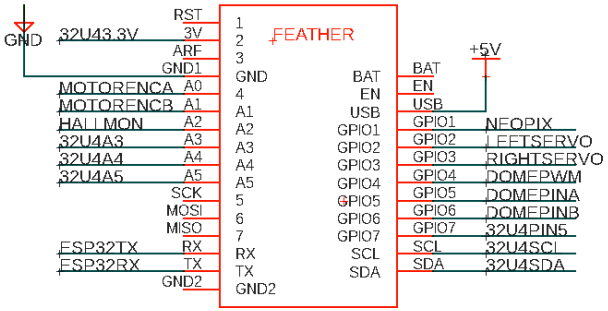




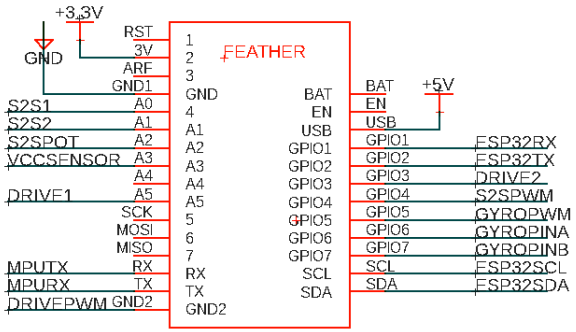


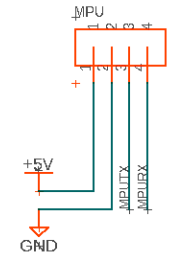


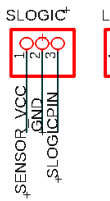
32u4 Proto M0 Proto / Rf series

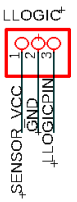


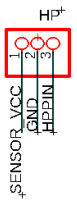
ESP32 HUZZAH32

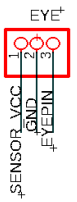


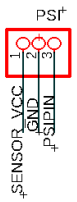


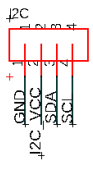




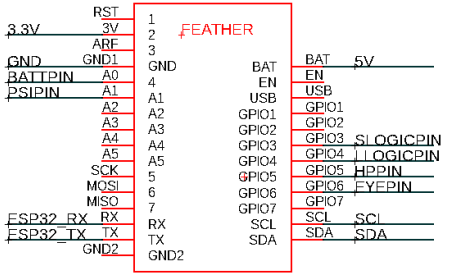


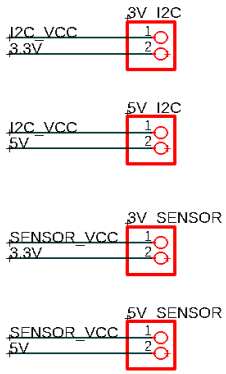




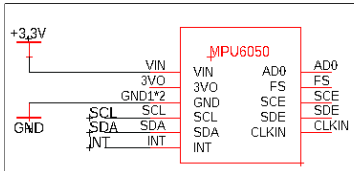


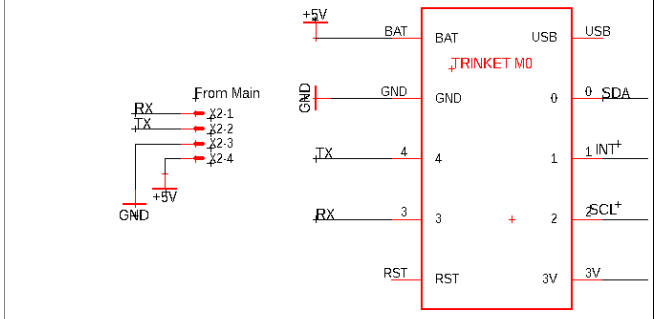
DOME ESP32 7.1



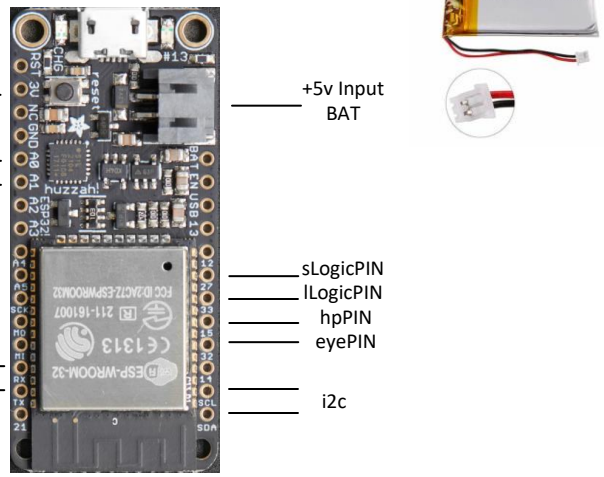


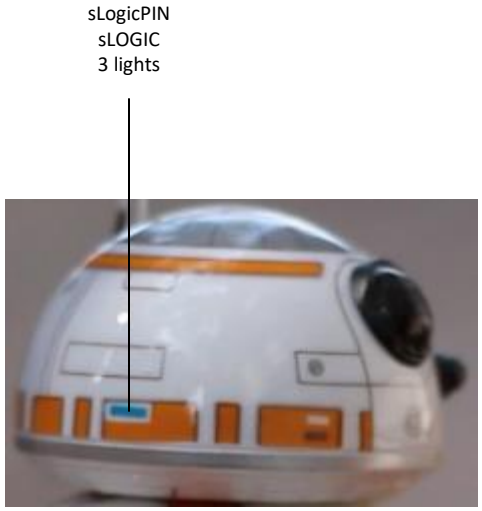
MPU IMU 7.1



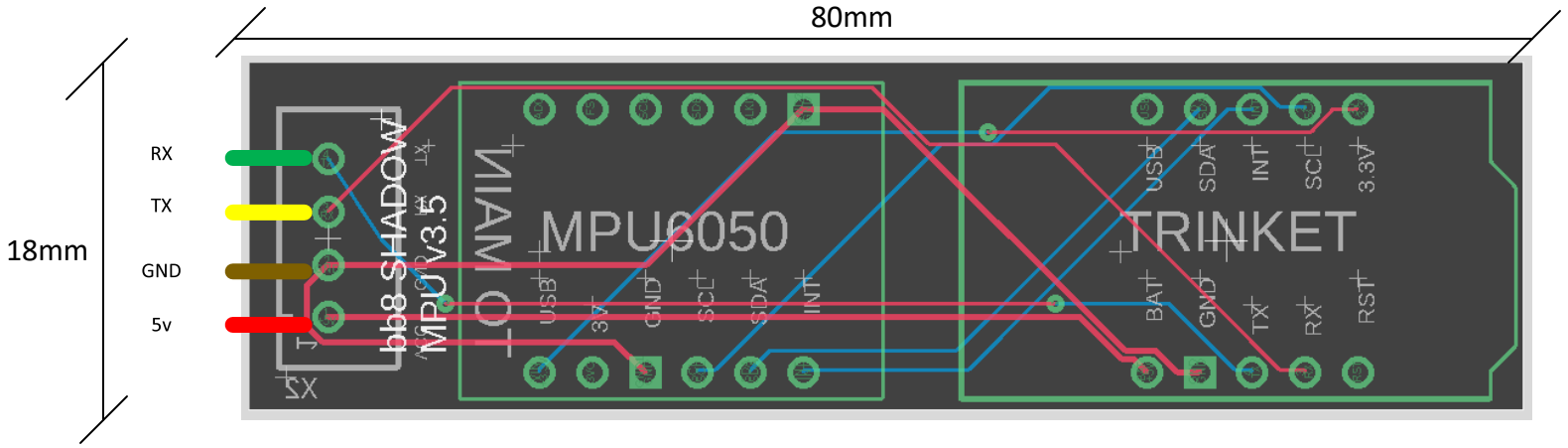


Adafruit ESP32 HUZZAH Feather (BB8 Dome)





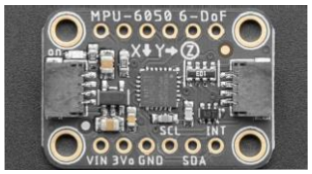
IMU BOARD with TRINKET as CPU



https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts

https://learn.adafruit.com/adafruit-trinket-m0-circuitpython-arduino/pinouts

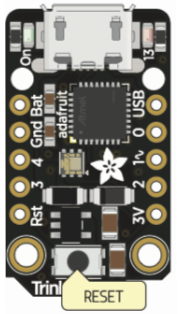
MPU6050



3V GND SCL SDA INT

i2C

Adafruit Trinket M0



5v
GND
ESP32 (Serial1) TX RX

SDA to SDA on MPU
INT to INT on MPU
SCL to SCL on MPU
3v to Vin on MPU

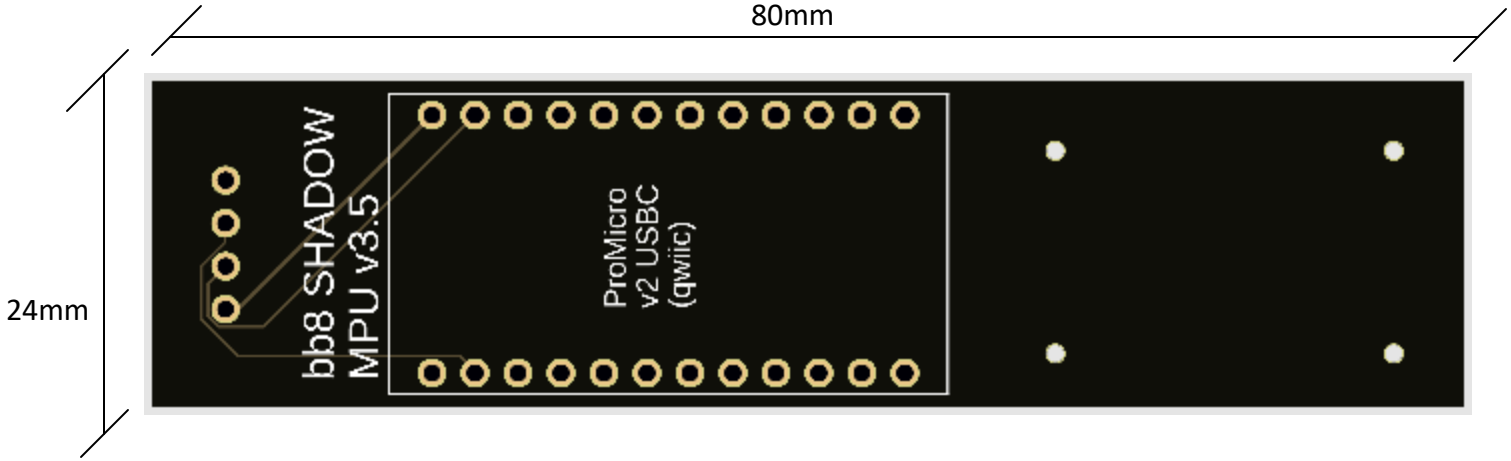
To ESP32

VCC 5v GND RX Pin3 TX pin4

Sensor: MPU6050_A
Type: Acceleration (m/s2)
Driver Ver: 1
Unique ID: 1617
Min Value: -156.91
Max Value: 156.91
Resolution: 0.06

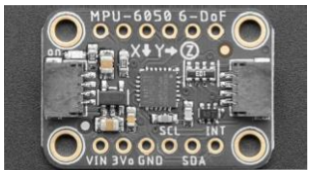
Sensor: MPU6050_G
Type: Gyroscopic (rad/s)
Driver Ver: 1
Unique ID: 1618
Min Value: -34.91
Max Value: 34.91
Resolution: 0.00

IMU BOARD with ProMicro as CPU



https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts

MPU6050



3V GND SCL SDA INT

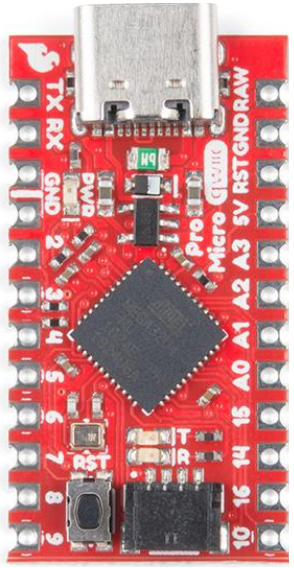
—i2C via qwiic—

To ESP32

VCC 5v GND RX Pin3 TX pin4

TX

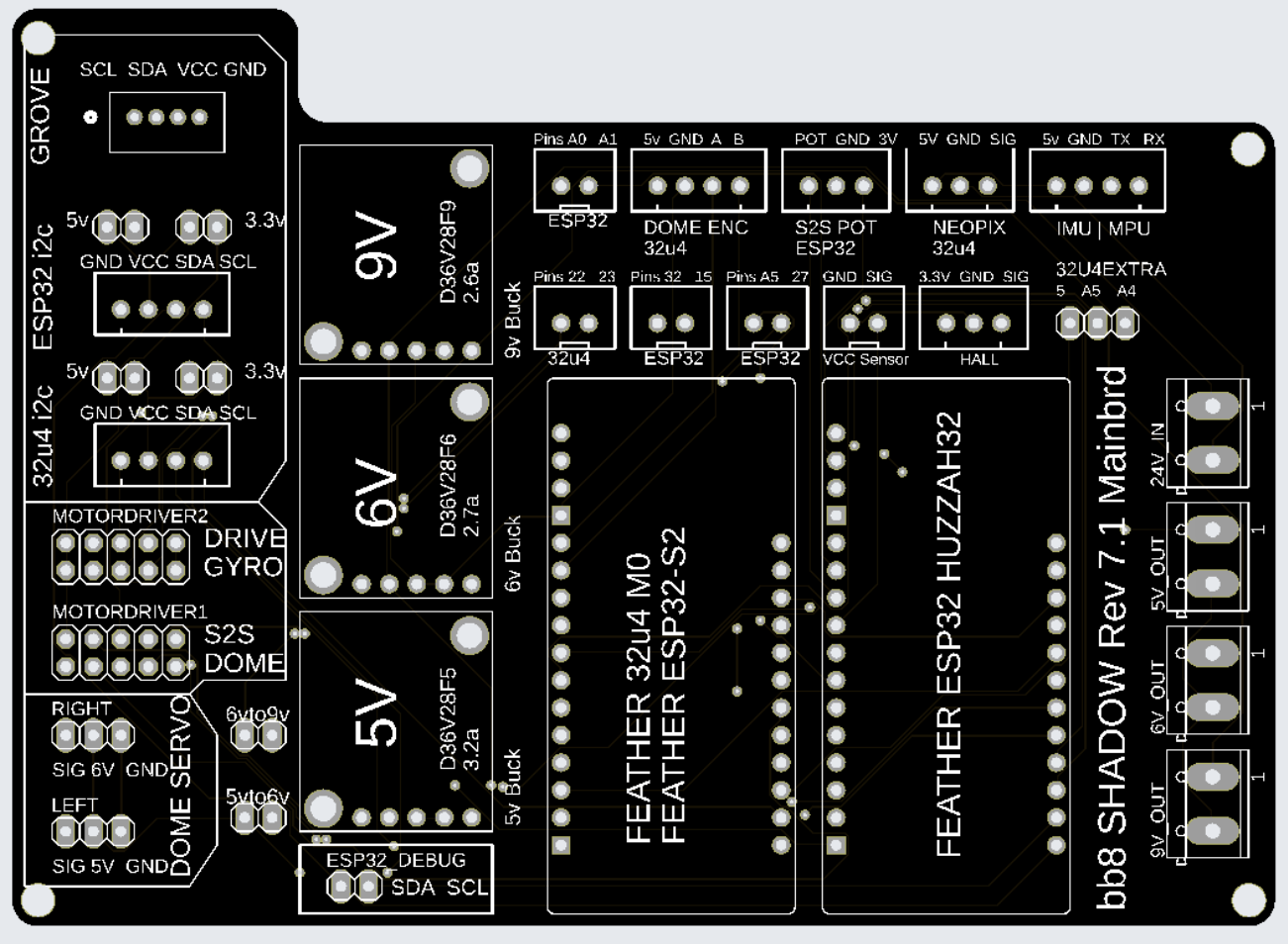
RX



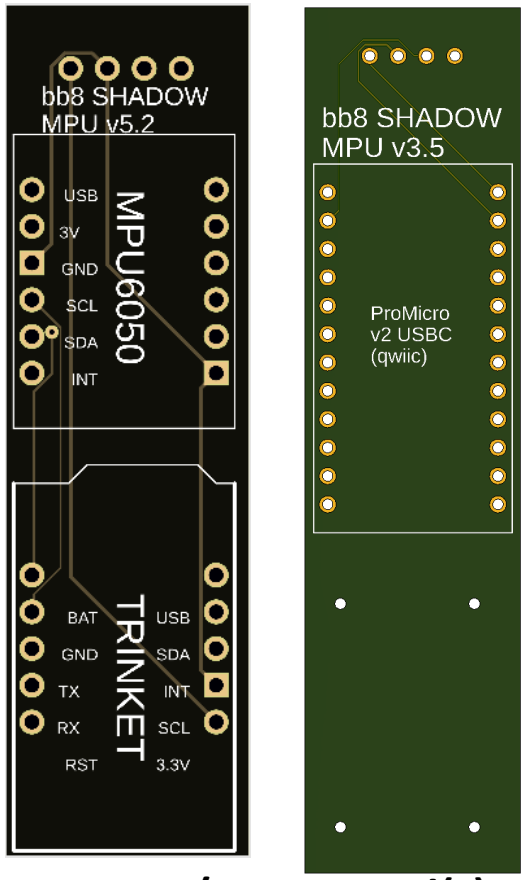
5V

GND

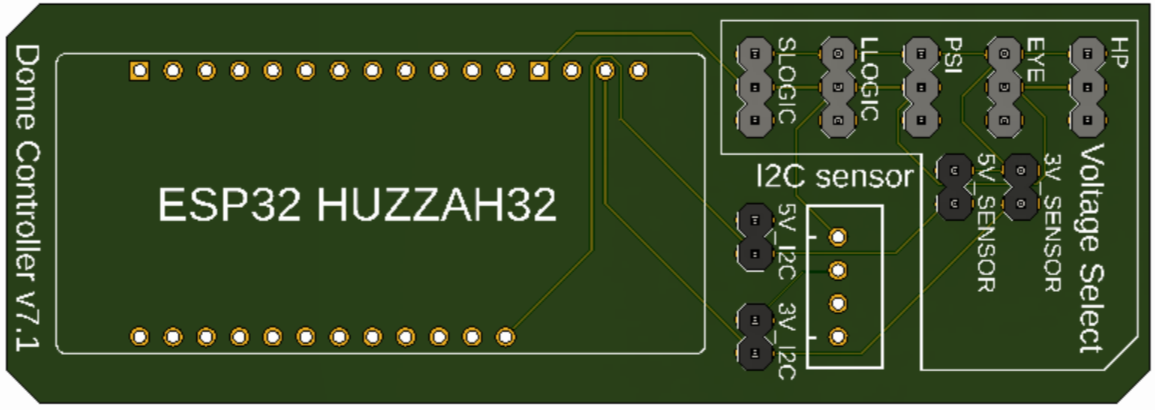
i2C via qwiic



Main Board



IMU/MPU Board(s)



Dome Board