

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 which segregate duties between dome or main body related motors and sensors (Feather 32u4 Proto M0 or 32u4 Basic Proto | Feather 32u4 RF Series AND Feather ESP32 HUZZAH Series processors).

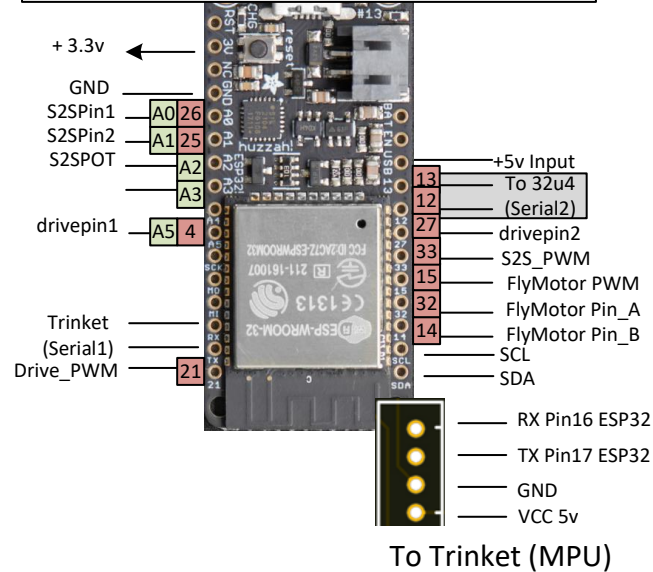
NOTE: There are 5 options given depending upon secondary 32u4 and which MP3 trigger you wish to use

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.

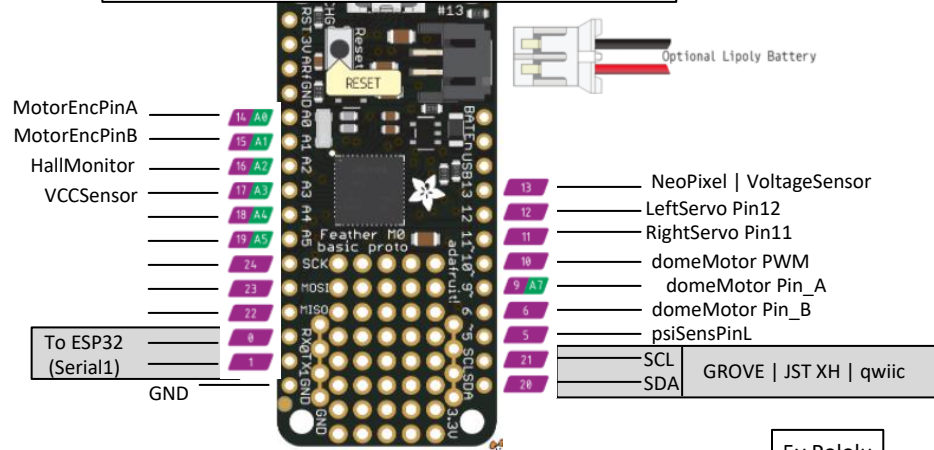
3. **Dome board** – this communicates via ESP32NOW to the Main Board and controls LEDs in the dome only. Future adaption of motion sensor and distance sensors.

OPTION 1: 32u4 PROTO M0 and i2C MP3 Trigger

Adafruit ESP32 HUZZAH32 Feather (MAIN)

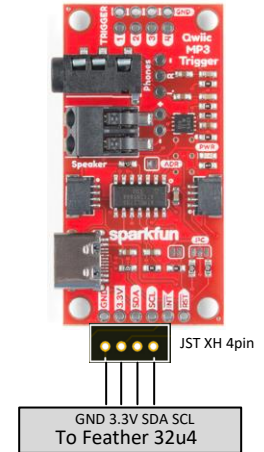


Adafruit Feather 32u4 M0 Proto (SECONDARY)



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

Sparkfun QWIIC MP3 TRIGGER



5v Pololu



Bat on 32u4, Trinket and ESP32 And Outputs

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

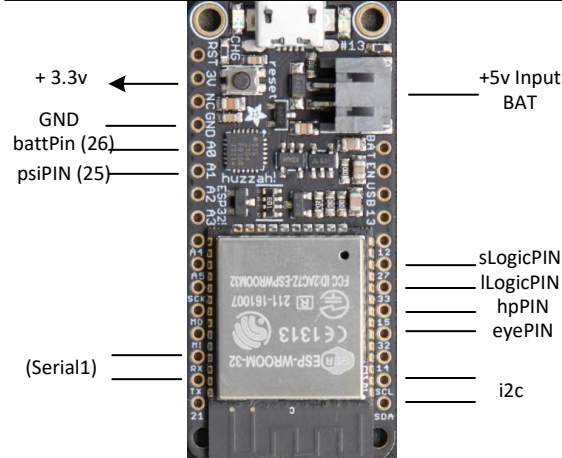
6v/9v Pololu



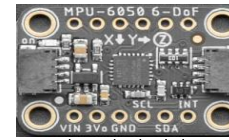
To Left/Right Servo and Output

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

Adafruit ESP32 HUZZAH32 Feather (DOME)



MPU6050



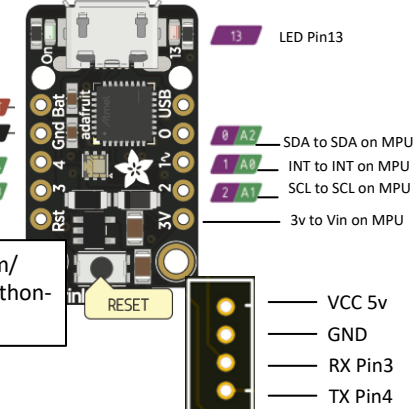
5v
GND
SCL
SDA
INT

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

i2C
5v
GND
ESP32 (Serial1) TX
RX

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

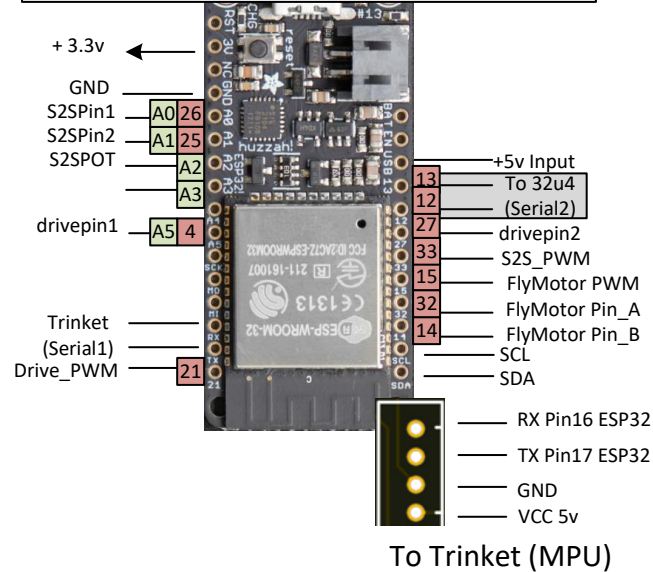
Adafruit Trinket M0



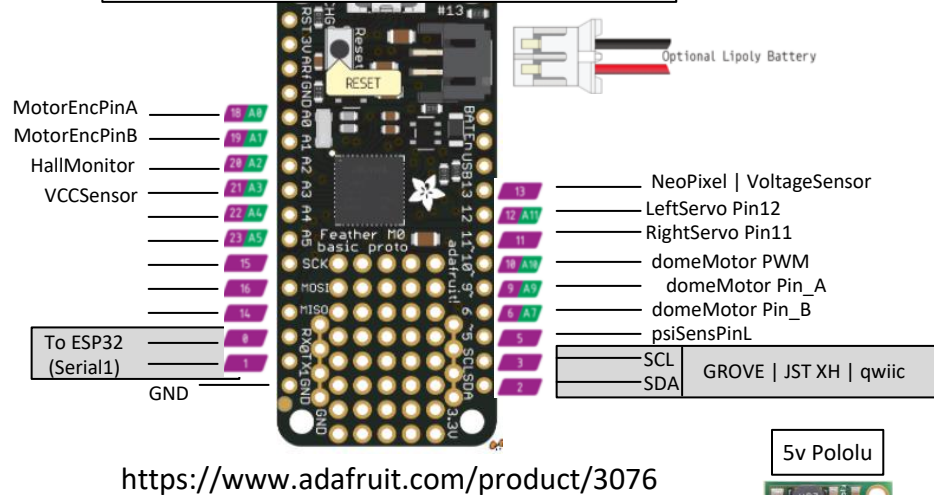
To ESP32 (MAIN)

OPTION 2: 32u4 Basic Proto and i2C MP3 Trigger

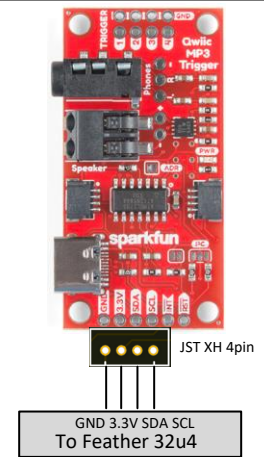
Adafruit ESP32 HUZZAH32 Feather
(MAIN)



Adafruit Feather 32u4 Basic Proto
(SECONDARY)



Sparkfun QWIIC MP3 TRIGGER

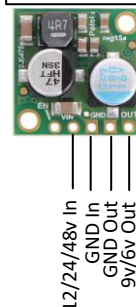


5v Pololu



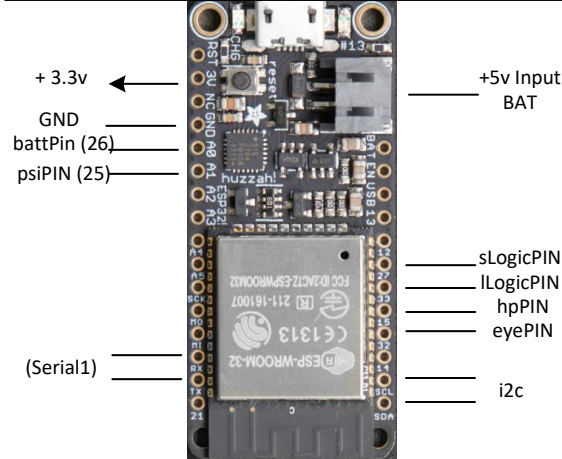
Bat on 32u4, Trinket and ESP32 And Outputs

6v/9v Pololu

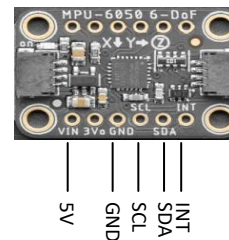


To Left/Right Servo and Output

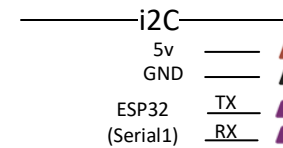
Adafruit ESP32 HUZZAH32 Feather
(DOME)



MPU6050

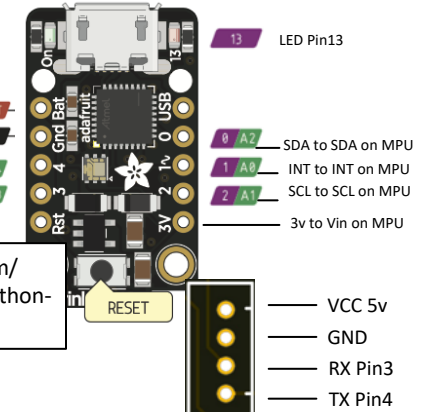


<https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts>



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

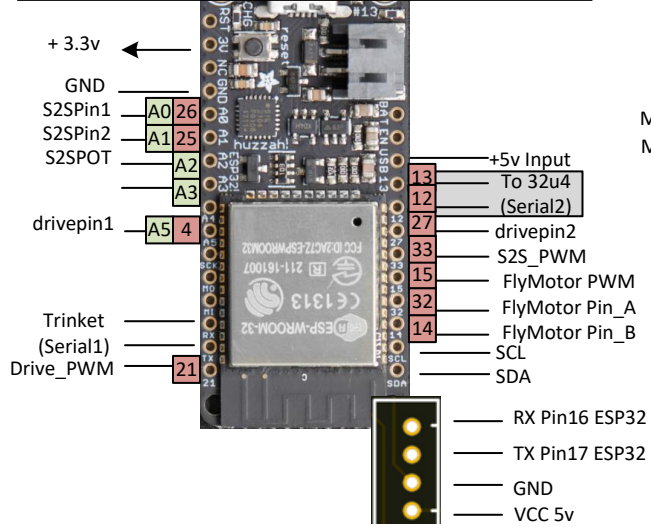
Adafruit Trinket M0



To ESP32 (MAIN)

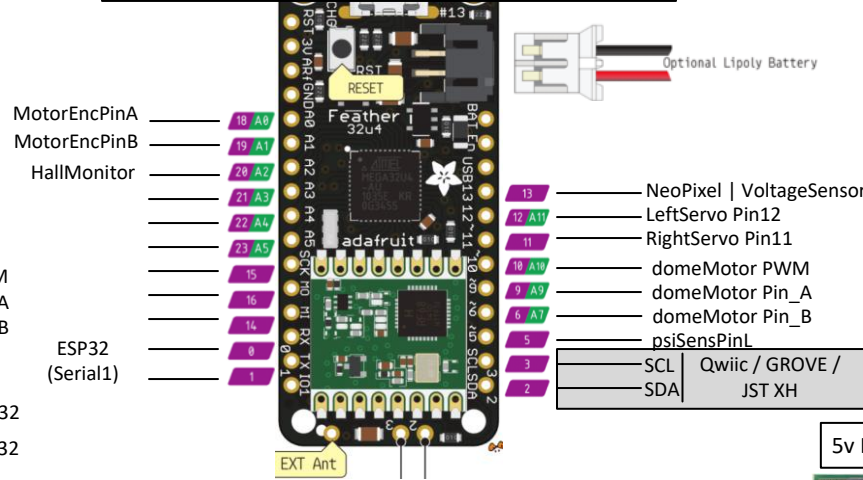
OPTION 3: 32u4 RF and i2C MP3 Trigger

Adafruit ESP32 HUZZAH32 Feather (MAIN)



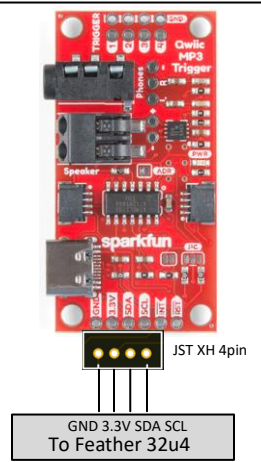
To Trinket (MPU)

Adafruit Feather 32u4 RF Series (BB8 Secondary)

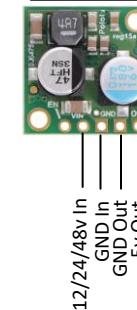


<https://www.adafruit.com/product/3076>

Sparkfun QWIIC MP3 TRIGGER

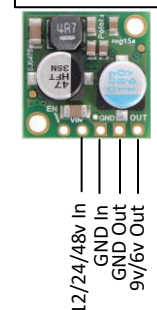


5v Pololu



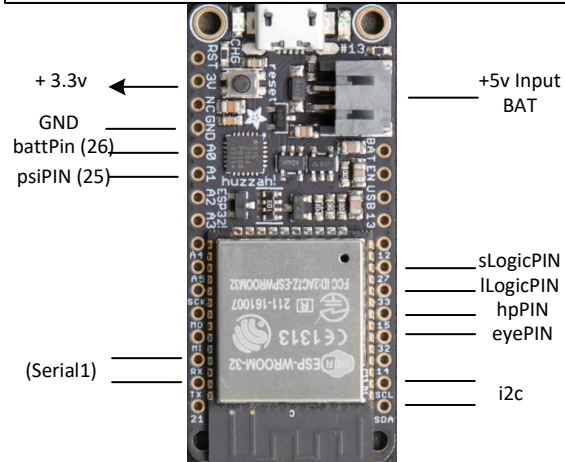
Bat on 32u4, Trinket and ESP32 And Outputs

6v/9v Pololu

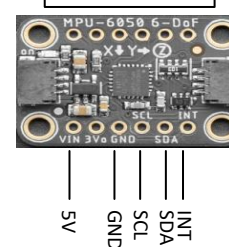


To Left/Right Servo and Output

Adafruit ESP32 HUZZAH32 Feather (DOME)

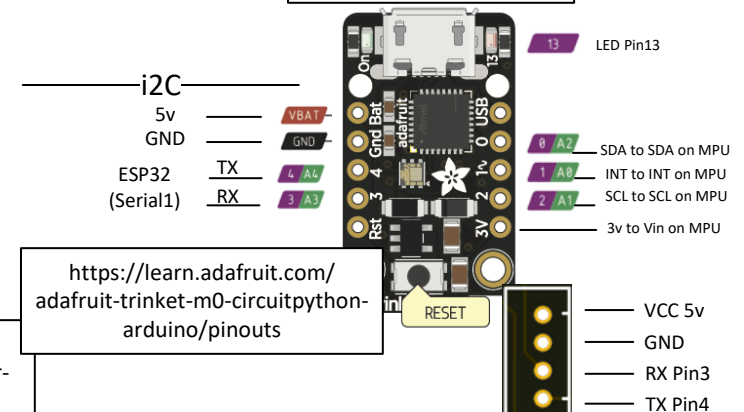


MPU6050



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

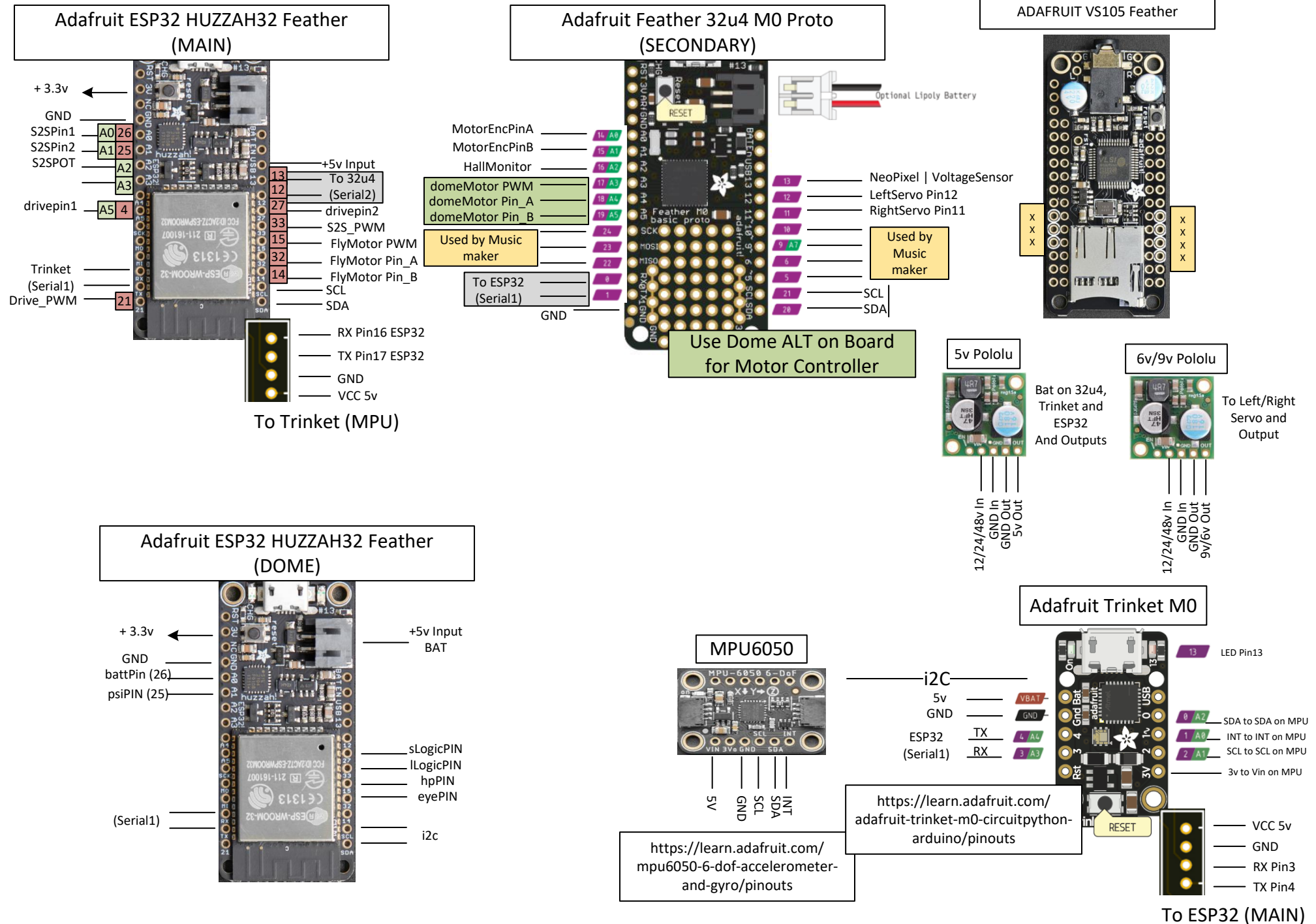
Adafruit Trinket M0



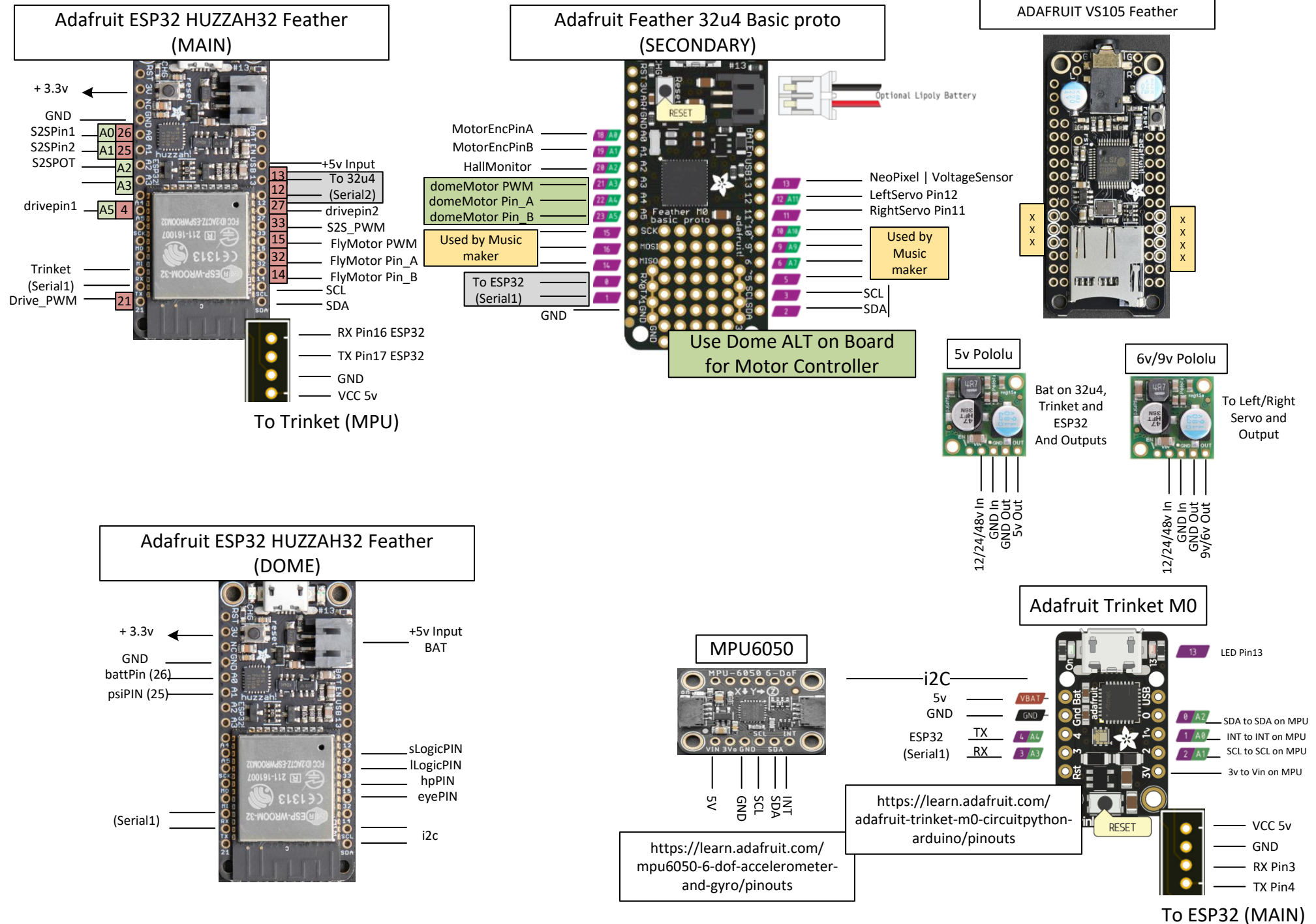
To ESP32 (MAIN)

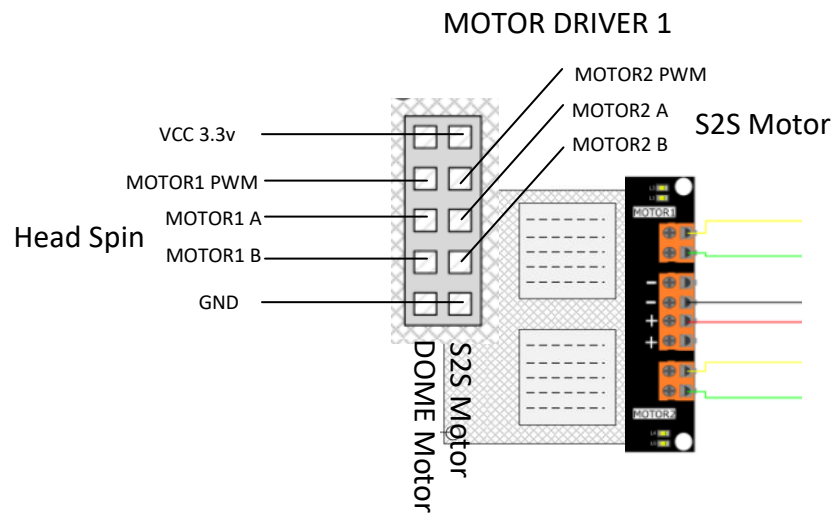
<https://learn.adafruit.com/adafruit-trinket-m0-circuitpython-arduino/pinouts>

OPTION 4: 32u4 PROTO M0 and ADAFRUIT MUSIC MAKER FEATHERWING



OPTION 5: 32u4 Basic Proto and ADAFRUIT MUSIC MAKER FEATHERWING





DOME Motor

32u4

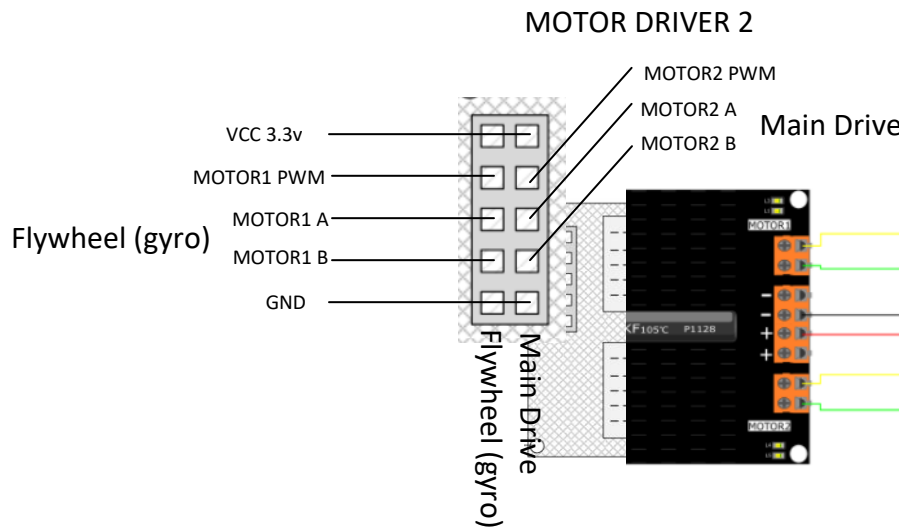
```
#define domeMotor_pwm 21
#define domeMotor_pin_A 22
#define domeMotor_pin_B 23
ALT w/ MUSIC MAKER FEATHERWING
#define domeMotor_pwm A3
#define domeMotor_pin_A A4
#define domeMotor_pin_B A5
```

VCC 12/24v

ESP32

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

S2S Motor



Flywheel (gyro)

ESP32

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

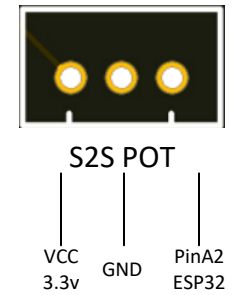
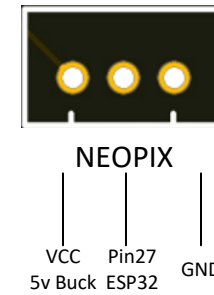
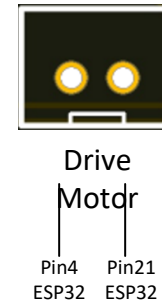
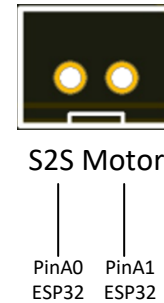
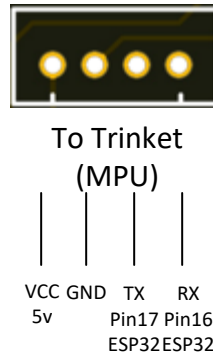
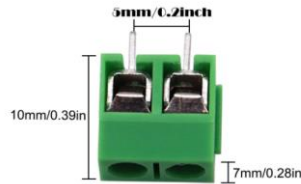
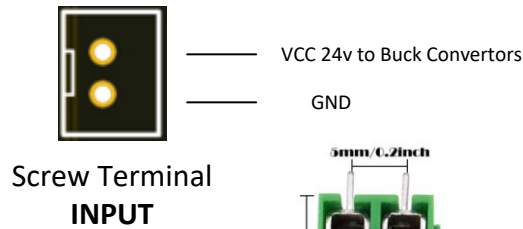
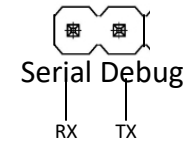
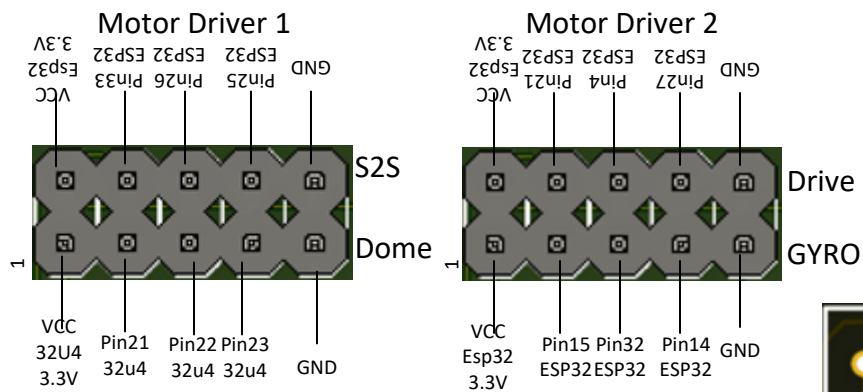
VCC 12/24v

ESP32

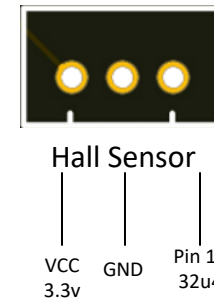
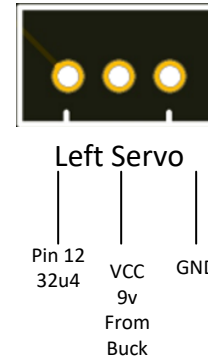
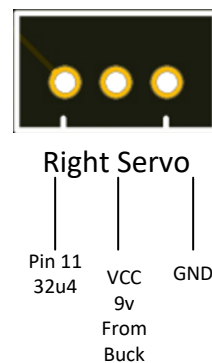
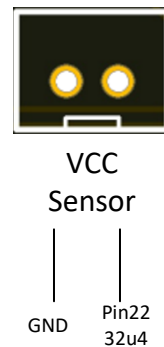
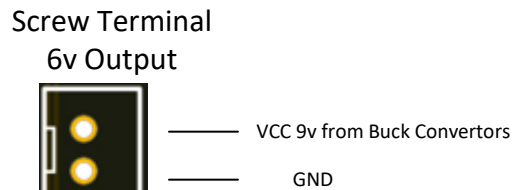
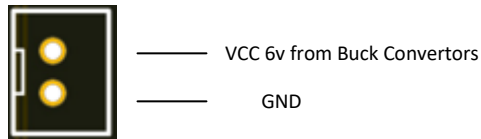
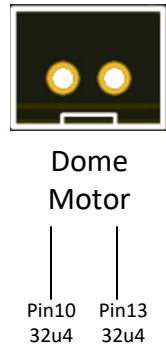
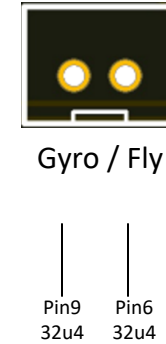
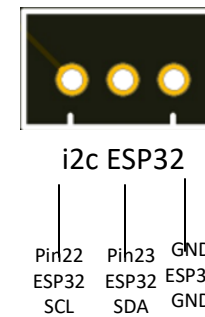
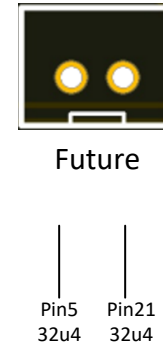
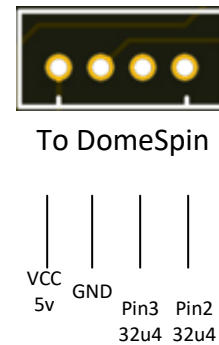
```
#define Drive_pwm 21 // SCL 22 and SDA 23
#define Drive_pin_1 4
#define Drive_pin_2 27
```



Main Drive

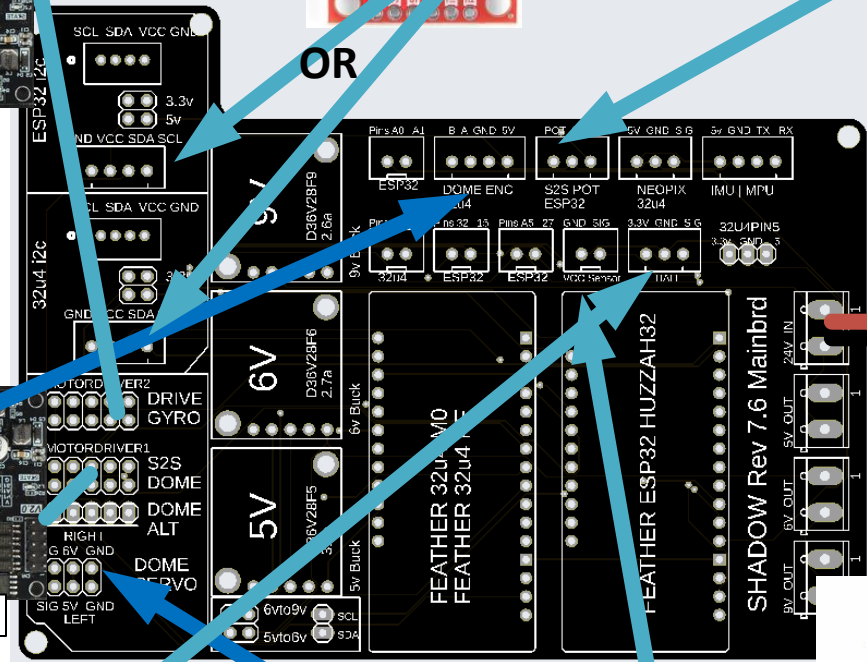
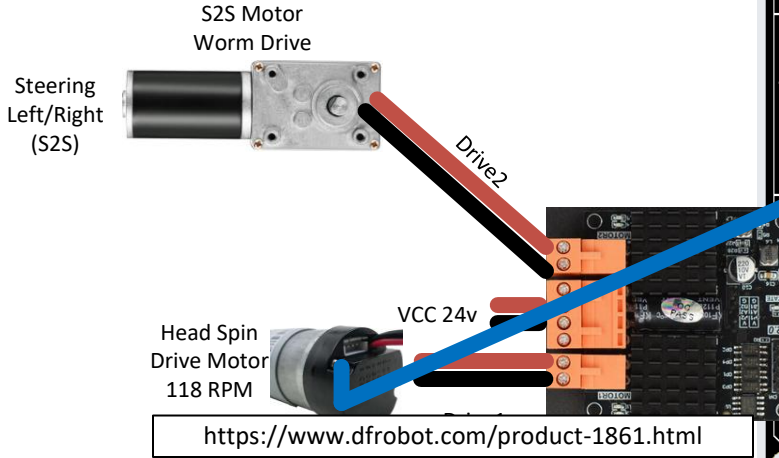
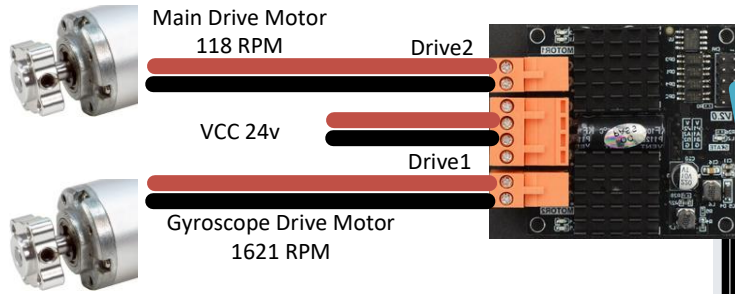


JST-XH 2.54mm



https://www.amazon.com/s?k=2+Pin+26+3+Pin+5mm%2F0.2inch+Pitch+PCB+Mount&i=industrial&ref=nb_sb_noss

Mp3 Trigger
qwiic / JST XH or
GROVE

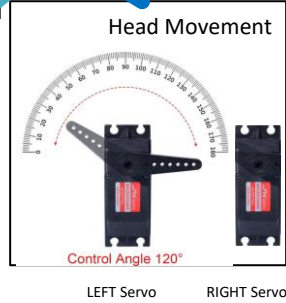
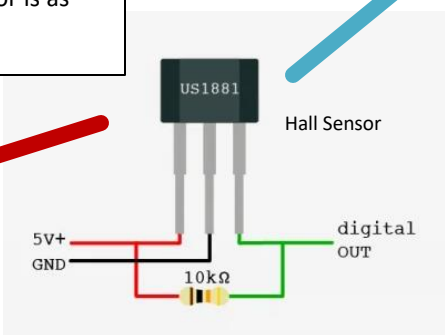
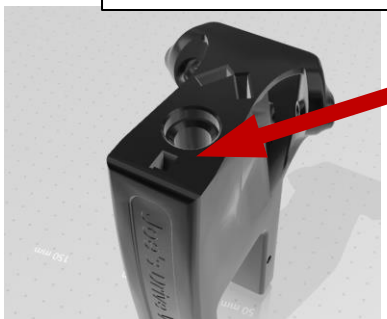


Remote Switch



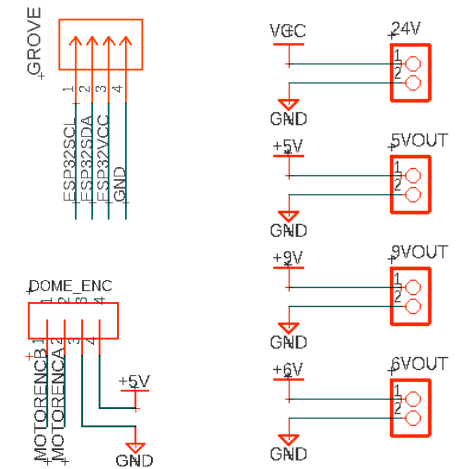
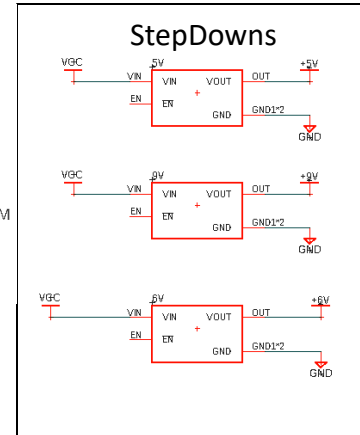
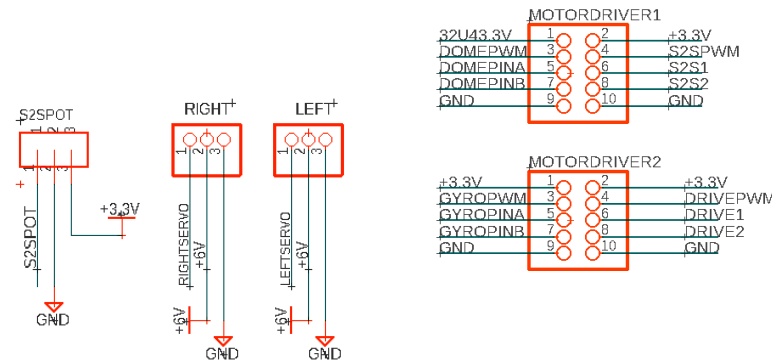
70*86*250mm
24V 24Ah li-ion

Hall effect sensors have three pins:
VCC(5V), GND, and Vout(Signal). The
pinout of a Hall effect sensor is as
shown below:

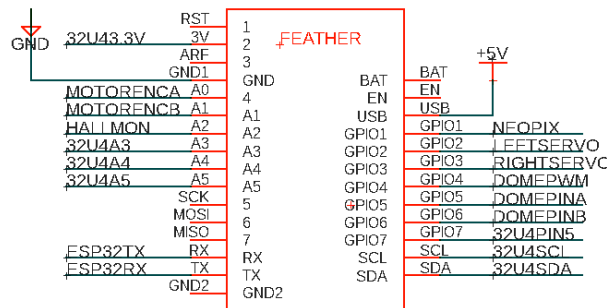


Head Movement

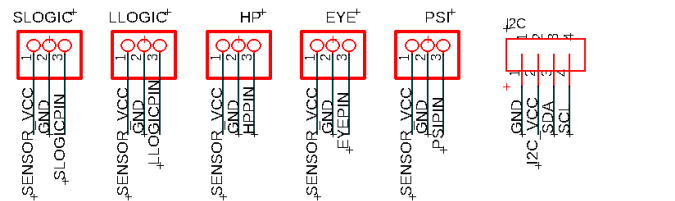
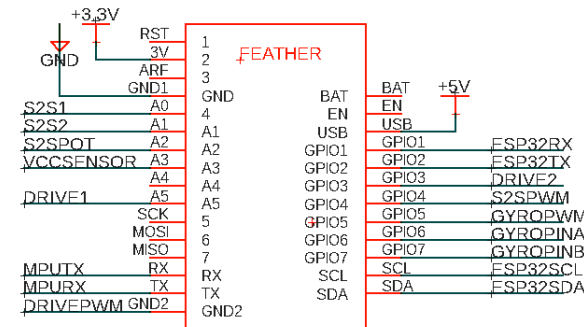
MAIN BOARD 7.1/7.5



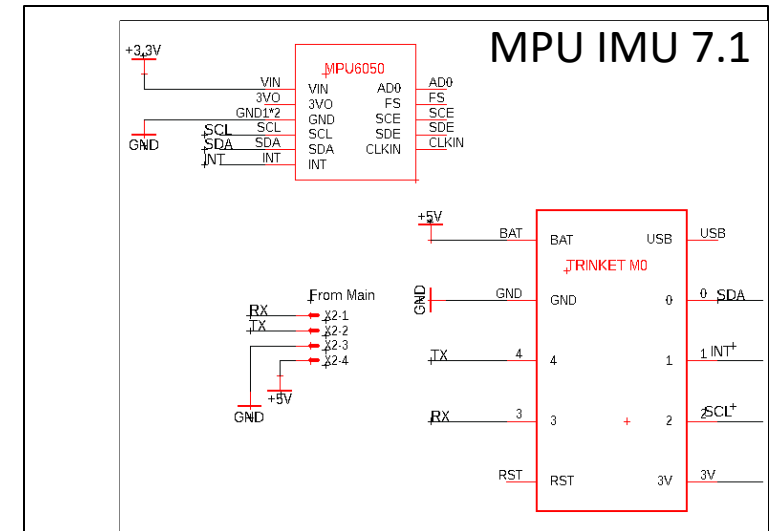
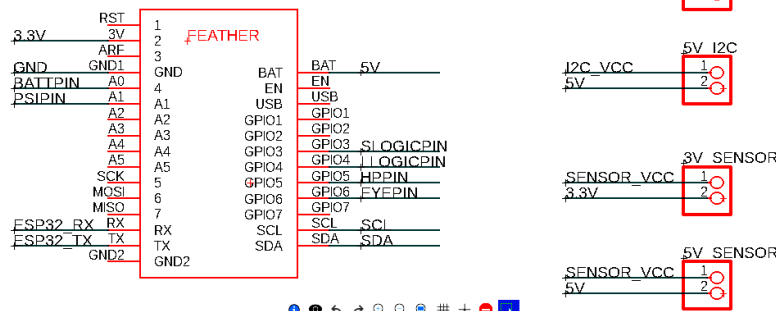
32u4 Proto M0 Proto / Rf series



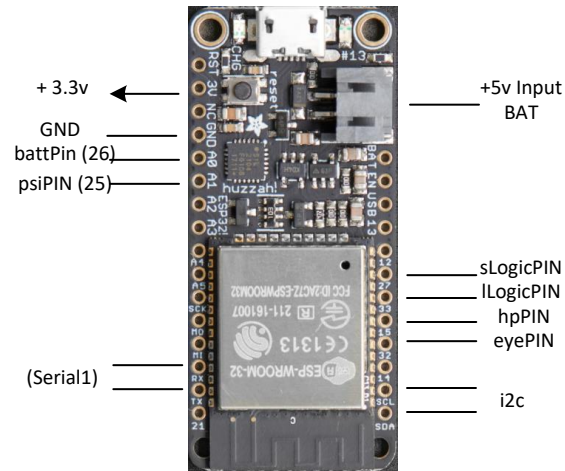
ESP32 HUZAZH32



HOME ESP32 7.1



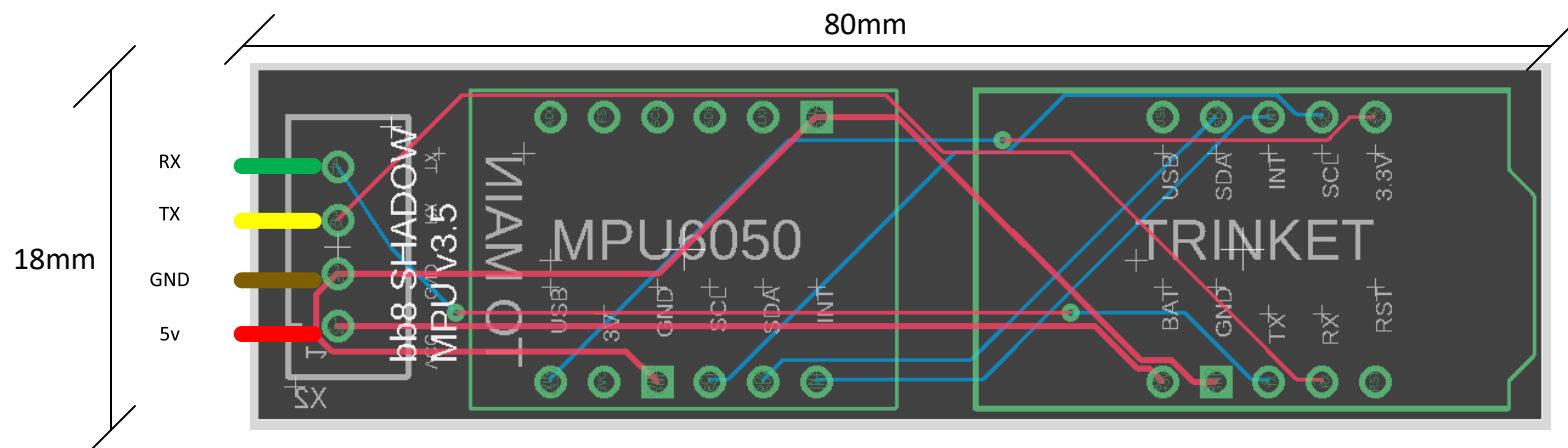
Adafruit ESP32 HUZZAH Feather (BB8 Dome)



sLogicPIN
sLOGIC
3 lights



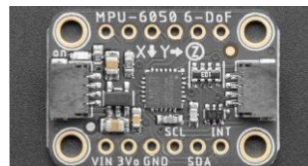
IMU BOARD with TRINKET as CPU



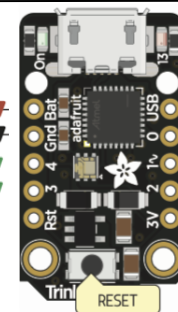
<https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts>

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

MPU6050



Adafruit Trinket M0



5v

GND

ESP32 (Serial1)

TX

RX

i2C



To ESP32

VCC

GND

5v

RX

TX

Pin3pin4

SDA to SDA on MPU

INT to INT on MPU

SCL to SCL on MPU

3v to Vin on MPU

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

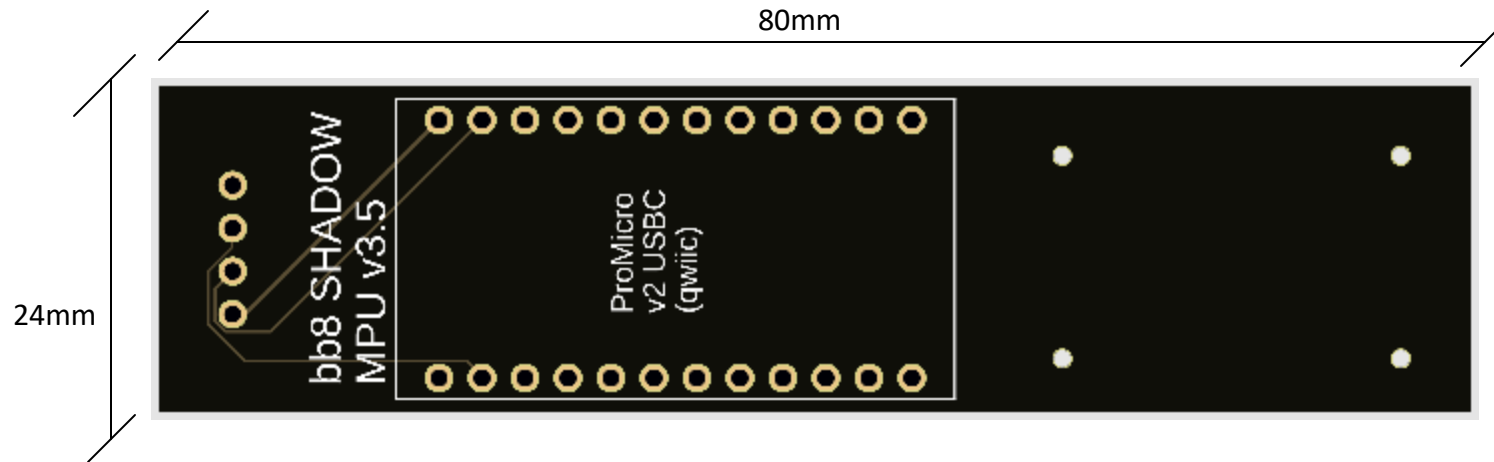
Unique ID: 1618

Min Value: -34.91

Max Value: 34.91

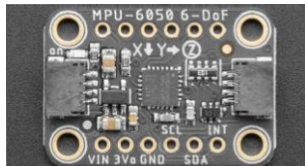
Resolution: 0.00

IMU BOARD with ProMicro as CPU



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

MPU6050



3V GND SCL SDA INT

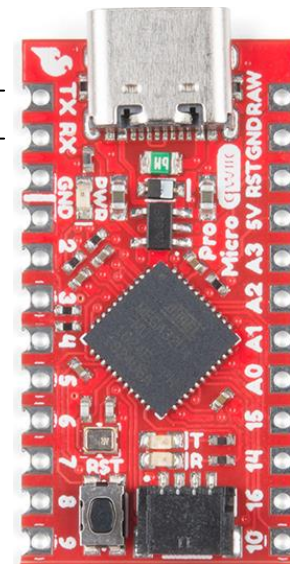
—i2C via qwiic—



To ESP32
VCC GND RX TX
5v Pin3 pin4

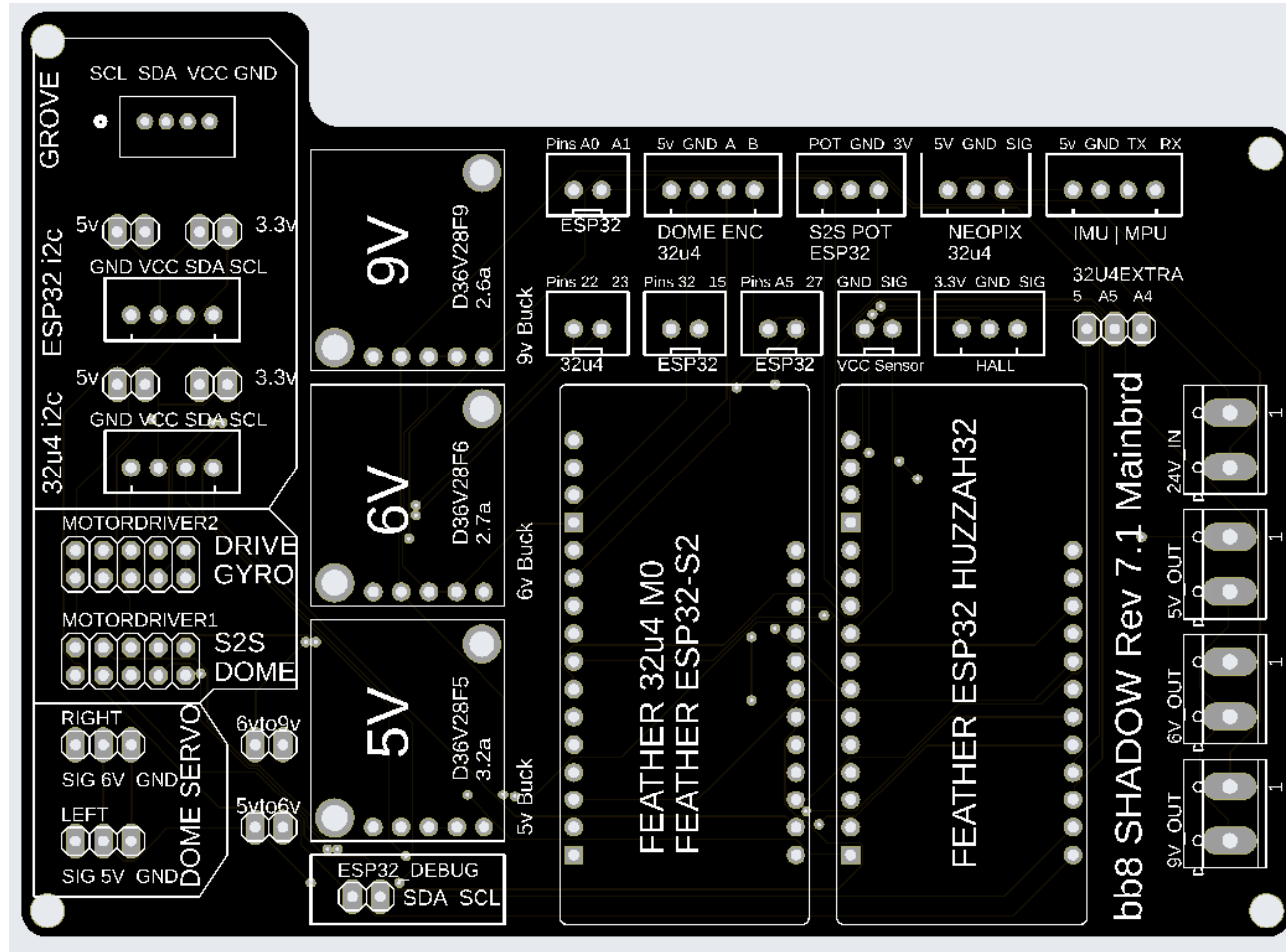
TX
RX

5V
GND



i2C via
qwiic

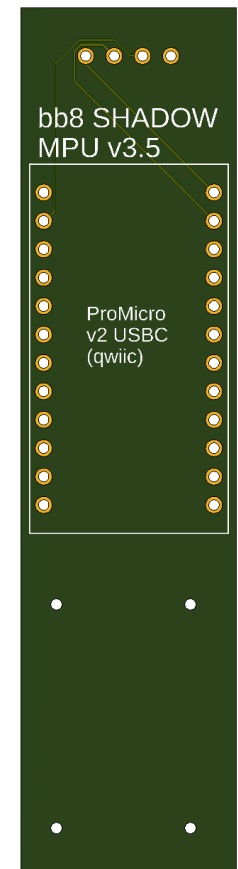
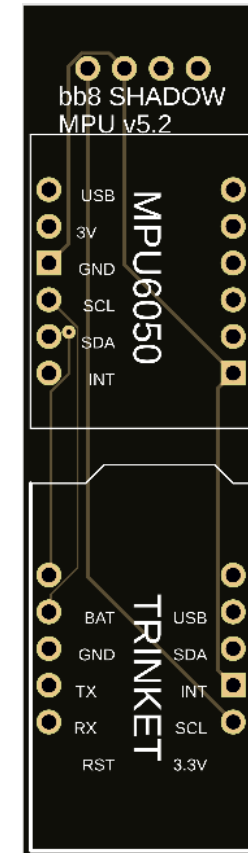
MAIN BOARD Revision 7.1



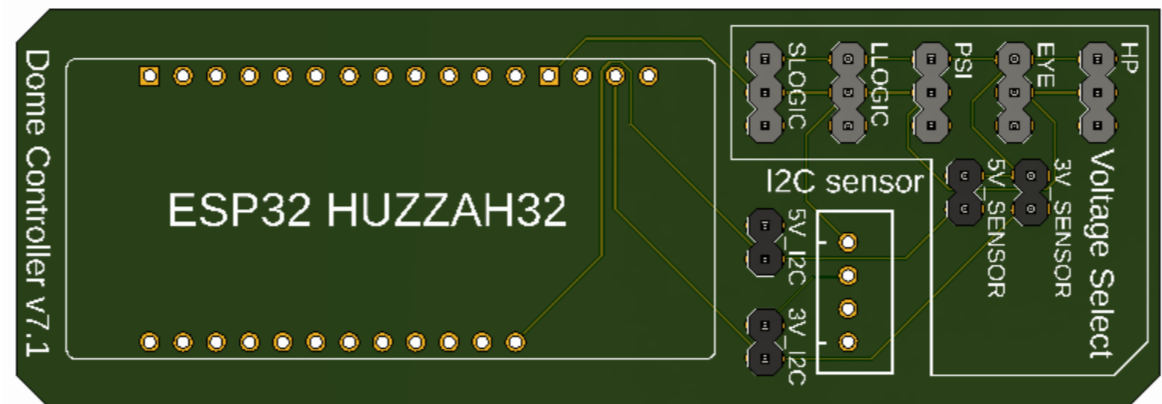
Main Board

Important Changes:

- Focused on i2c with grove and jst-xh connectors for the ESP32

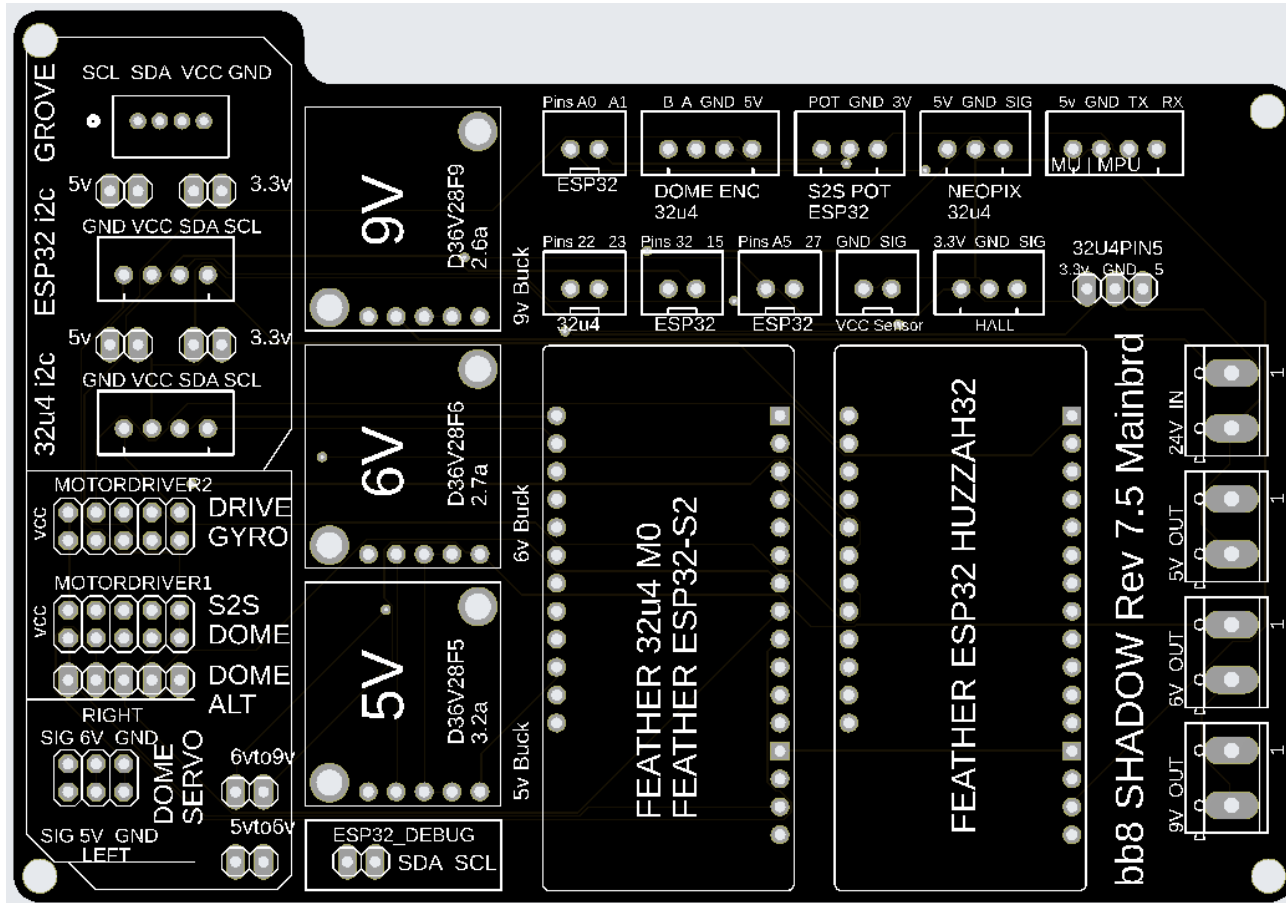


IMU/MPU Board(s)



Dome Board

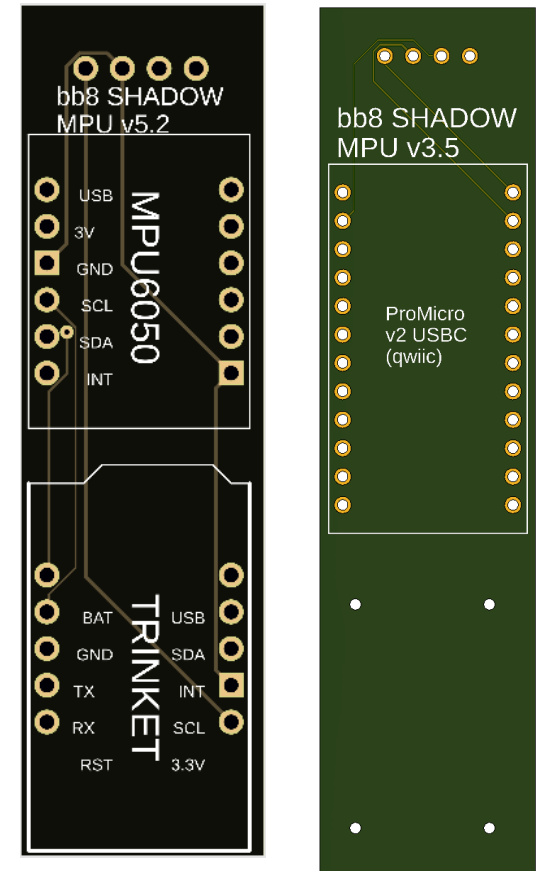
MAIN BOARD Revision 7.5



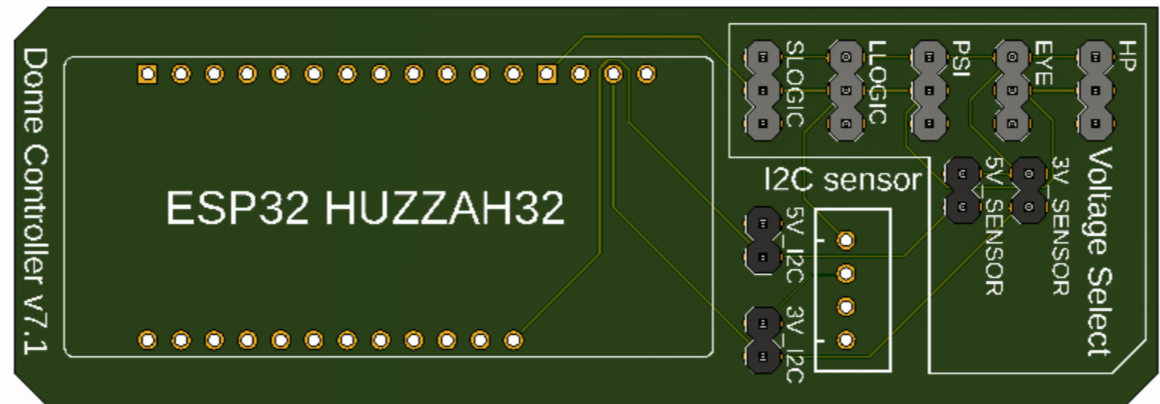
Main Board

Important Changes:

- Reversed position of the 2 Feathers to allow clearance for the Serial ports
- Added ALT position for Dome Motor to allow for Featherwing (MP3) on secondary feather.
- Changed the Dome Servos to 2x3 pin header for easier soldering and space saving.

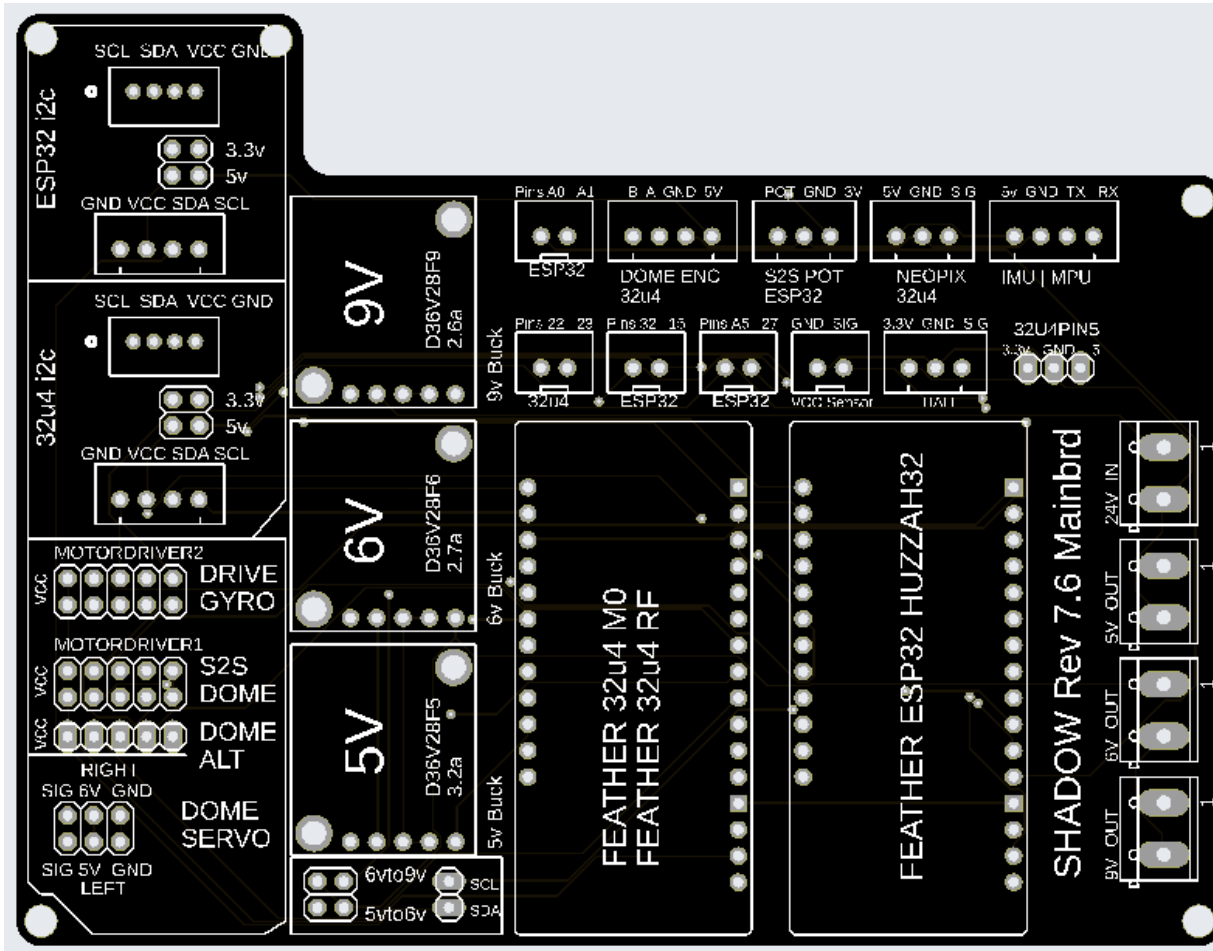


IMU/MPU Board(s)



Dome Board

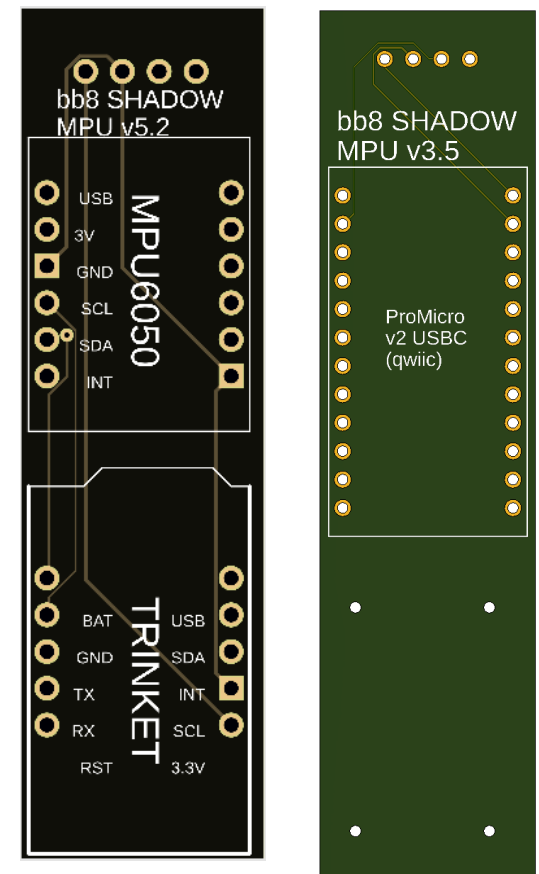
MAIN BOARD Revision 7.6



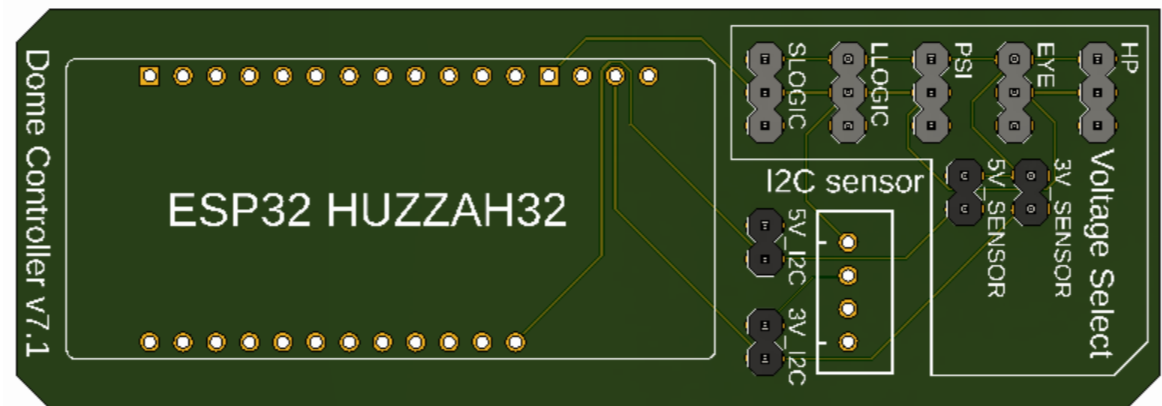
Main Board

Important Changes:

- Added 2nd GROVE for 32u4 supported MP3
- Added 2x2pin headers to ease soldering for:
 - I2c VCCs
 - BUCK VCCs



IMU/MPU Board(s)



Dome Board