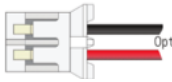
The Solution consists of 3 PCB boards

1. Main Board – this regulates power from a single 24v or higher 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.

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.

Adafruit Feather 32u4 RF Series (BB8 Secondary)



MotorEncPinA
MotorEncPinB
HallMonitor
ESP32 (Serial1)

NeoPixel | VoltageSensor
LeftServo Pin12
RightServo Pin11
domeMotor PWM
domeMotor Pin_A
domeMotor Pin_B
psiSensPinL
SCL
SDA
qwiic

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

DomeMotor PinA
FlyMotor PinA

Serial

Adafruit ESP32 HUZZAH32 Feather (BB8 Main)

+ 3.3v
GND
S2SPin1
S2SPin2
S2SPOT
VCCSensor
drivepin1
Trinket (Serial1)
Drive_PWM

+5v Input
32u4
(Serial2)
drivepin2
S2S_PWM
FlyMotor PWM
FlyMotor Pin_A
FlyMotor Pin_B
SCL
SDA

To Trinket (MPU)

VCC 5v
GND
TX Pin17 ESP32
RX Pin16 ESP32

Serial

5v Pololu

12/24v In
GND In
GND Out
5v Out
Bat on 32u4, Trinket and ESP32 And Outputs

9v/6v Pololu

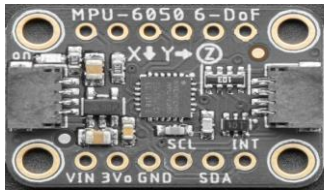
12/24v In
GND In
GND Out
9v / 6v Out
To Left/Right Servo and Output

Adafruit ESP32 HUZZAH32 Feather (BB8 Dome)

+ 3.3v
GND
battPin (26)
psiPIN (25)
(Serial1)

+5v Input
BAT
sLogicPIN
lLogicPIN
hpPIN
eyePIN
i2c

MPU6050



i2c

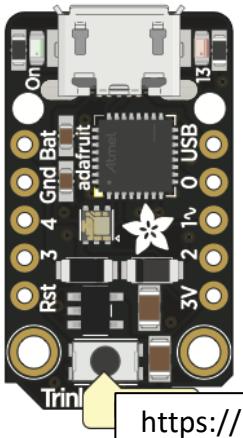
5V GND SCL SDA INT

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

To ESP32

TX pin4
RX Pin3
GND
VCC 5v

Adafruit Trinket M0



5v
GND
ESP32 (Serial1)
TX
RX

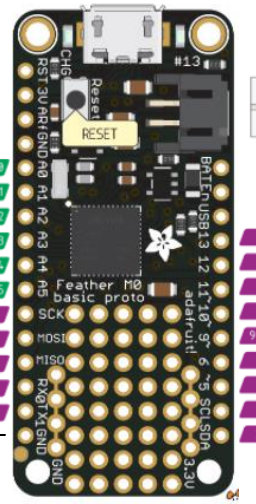
VBAT
GND
4 A4
3 A3

13
0 A2
1 A0
2 A1

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

Adafruit Feather 32u4 M0 Proto (BB8 Secondary)



MotorEncPinA
MotorEncPinB
HallMonitor
ESP32 (Serial1)
GND

NeoPixel | VoltageSensor
LeftServo Pin12
RightServo Pin11
domeMotor PWM
domeMotor Pin_A
domeMotor Pin_B
psiSensPinL
SCL
SDA
GROVE

DomeMotor PinA
FlyMotor PinA

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

Serial

Adafruit ESP32 HUZZAH32 Feather (BB8 Main)

+ 3.3v
GND
S2SPin1
S2SPin2
S2SPOT
VCCSensor
drivepin1
Trinket (Serial1)
Drive_PWM

+5v Input
32u4
(Serial2)
drivepin2
S2S_PWM
FlyMotor PWM
FlyMotor Pin_A
FlyMotor Pin_B
SCL
SDA

To Trinket (MPU)

VCC 5v | GND | TX Pin17 ESP32 | RX Pin16 ESP32

Serial

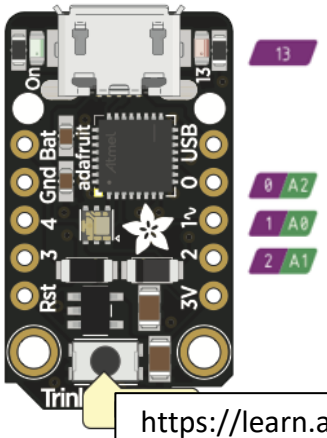
5v Pololu

12/24v In
GND In
GND Out
5v Out
Bat on 32u4, Trinket and ESP32 And Outputs

9v/6v Pololu

12/24v In
GND In
GND Out
9v / 6v Out
To Left/Right Servo and Output

Adafruit Trinket M0



5v
GND
ESP32 (Serial1)
TX
RX

VBAT
GND
4 A4
3 A3

13
0 A2
1 A0
2 A1

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

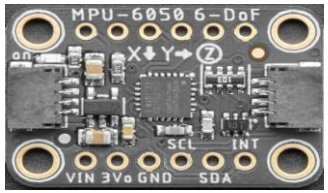
https://learn.adafruit.com/adafruit-trinket-m0-circuitpython-arduino/pinouts

Adafruit ESP32 HUZZAH32 Feather (BB8 Dome)

+ 3.3v
GND
battPin (26)
psiPIN (25)
(Serial1)

+5v Input
BAT
sLogicPIN
lLogicPIN
hpPIN
eyePIN
i2c

MPU6050



i2C

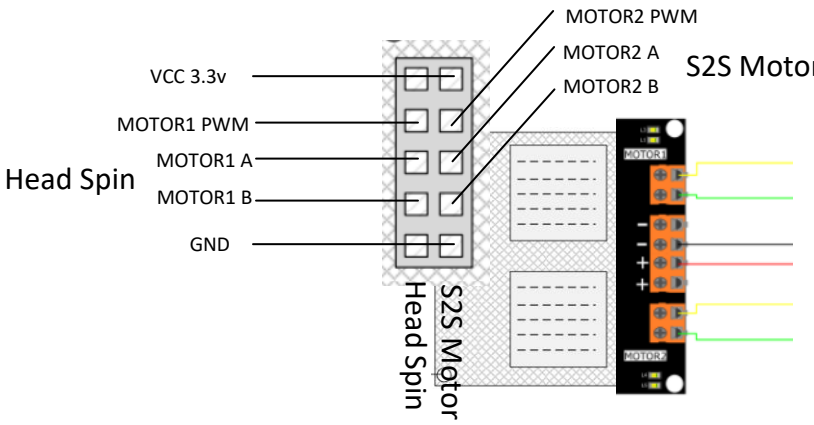
5V | GND | SCL | SDA | INT

To ESP32

TX pin4 | RX Pin3 | GND | VCC 5v

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

MOTOR DRIVER 1



Head Spin

32u4

```
#define domeMotor_pwm 21
#define domeMotor_pin_A 22
#define domeMotor_pin_B 23
```

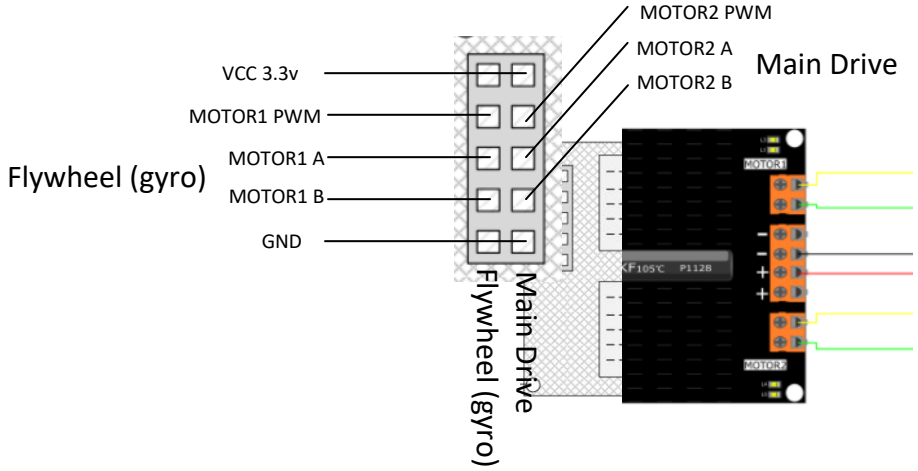
VCC 12/24v

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

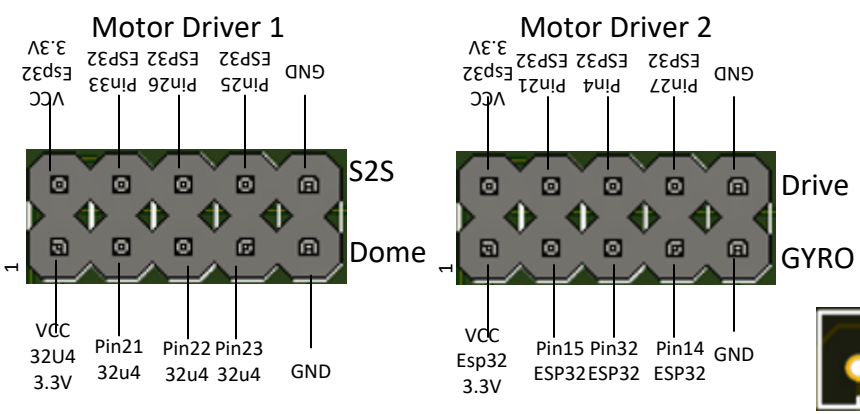
```
#define flyWheelMotor_pwm 15
#define flyWheelMotor_pin_A 32
#define flyWheelMotor_pin_B 14
```

VCC 12/24v

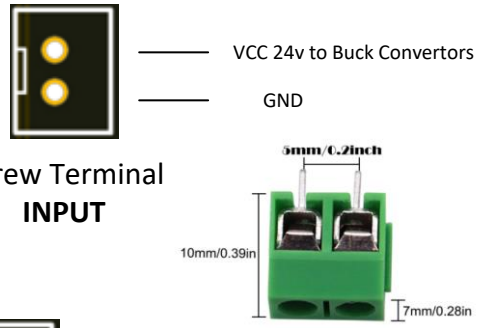
Main Drive

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

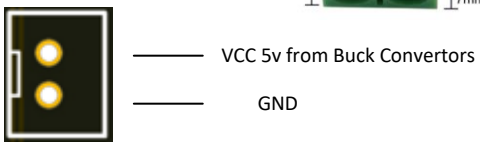

S2S Motor
PinA0 ESP32
PinA1 ESP32

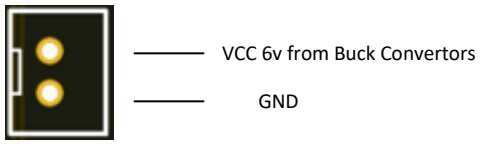

Drive Motor
Pin4 ESP32
Pin21 ESP32

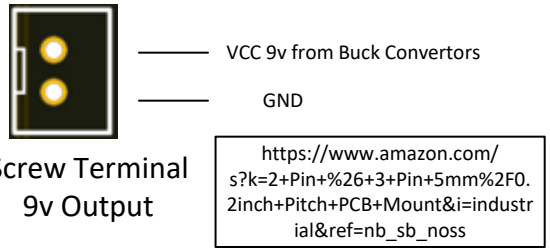

NEOPIX
VCC 5v Buck
Pin27 ESP32
GND


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

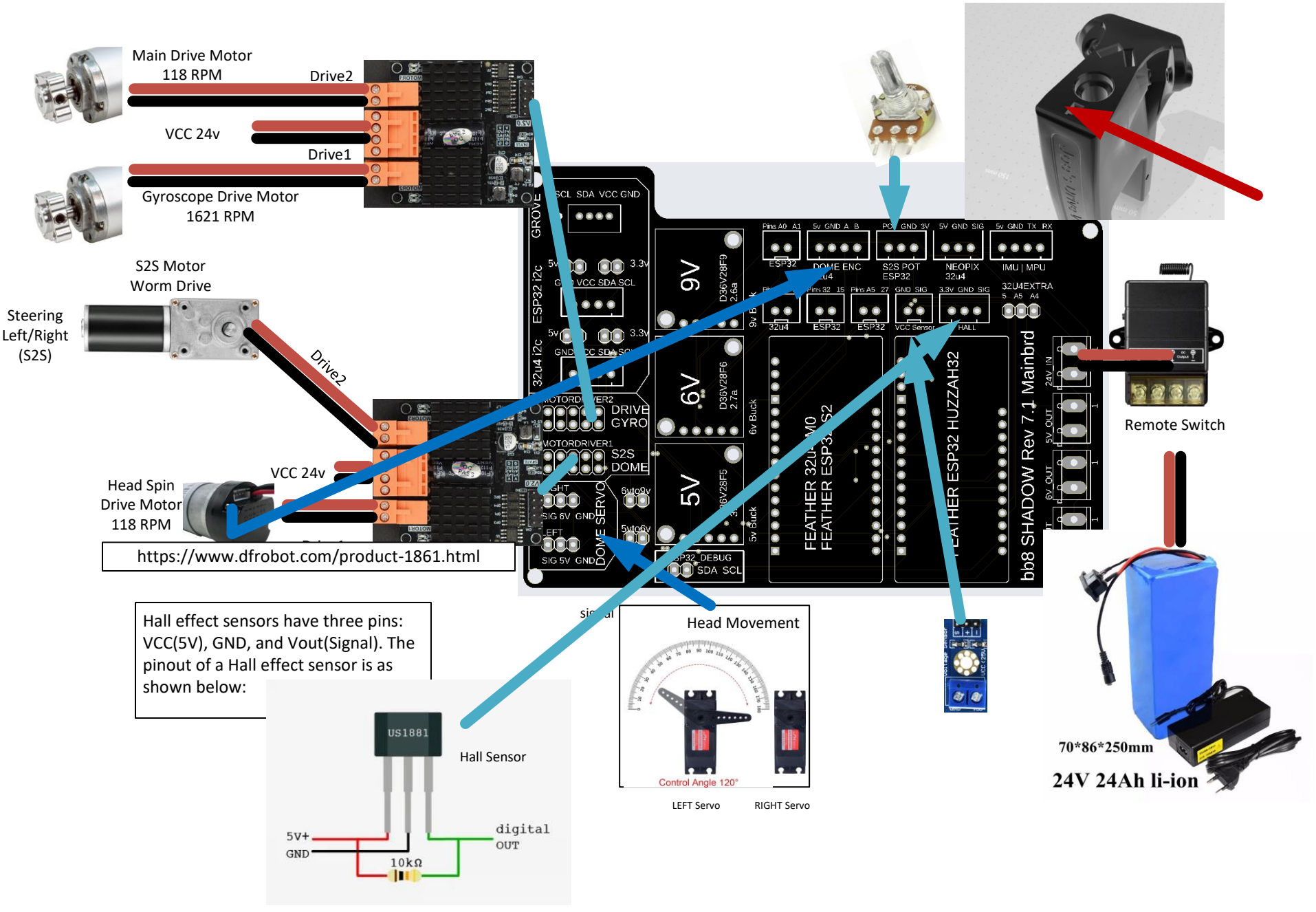

VCC Sensor
GND
Pin22 32u4


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

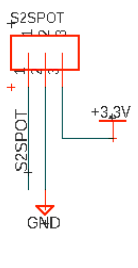

Left Servo
Pin 12 32u4
VCC 9v From Buck
GND

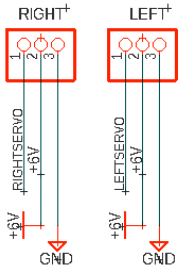

PSI Sensor
Pin18 32u4
Pin20 32u4

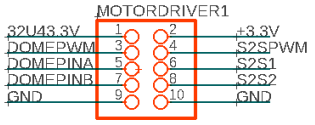

Hall Sensor
VCC 3.3v
GND
Pin 19 32u4

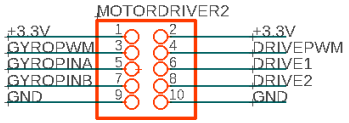

Main Drive Motor
118 RPM
Drive2
VCC 24v
Drive1
Gyroscope Drive Motor
1621 RPM
S2S Motor
Worm Drive
Steering
Left/Right
(S2S)
Drive2
VCC 24v
Head Spin
Drive Motor
118 RPM
https://www.dfrobot.com/product-1861.html
bb8 SHADOW Rev 7.1 Mainbrd
FEATHER ESP32 HUZZAH32
Remote Switch
70*86*250mm
24V 24Ah li-ion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

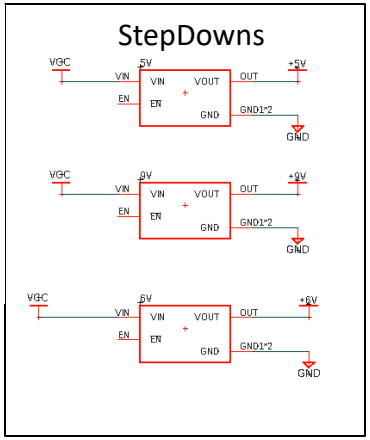
MAIN BOARD 7.1

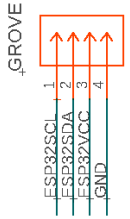


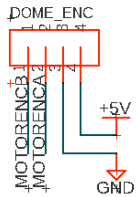


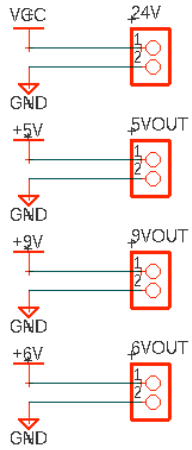




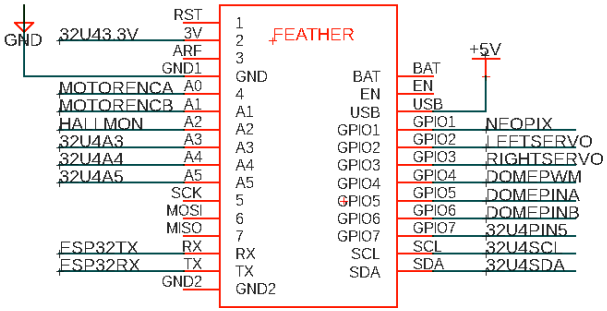




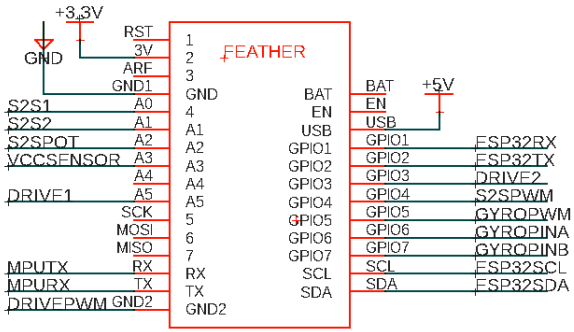


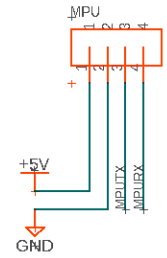


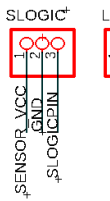
32u4 Proto M0 Proto / Rf series

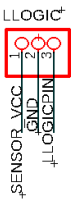


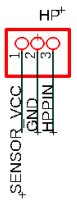
ESP32 HUZZAH32

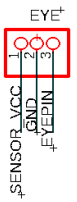


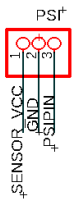


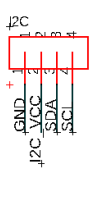




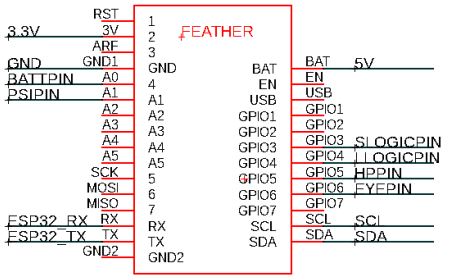


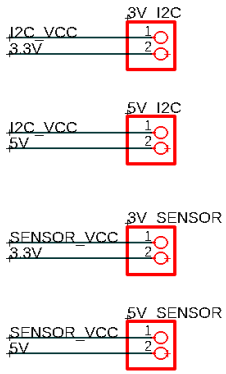




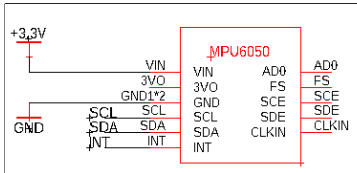


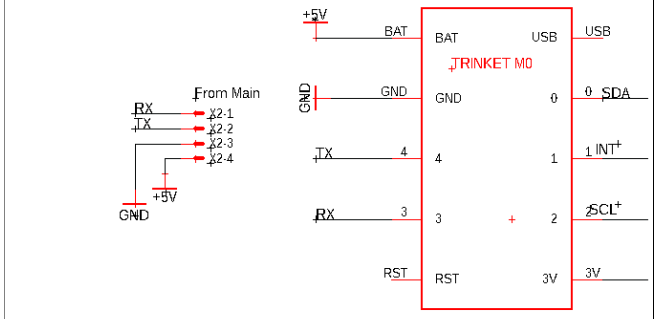
DOME ESP32 7.1



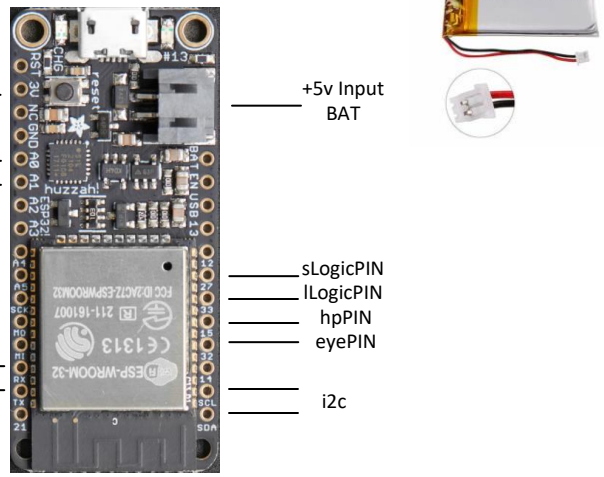


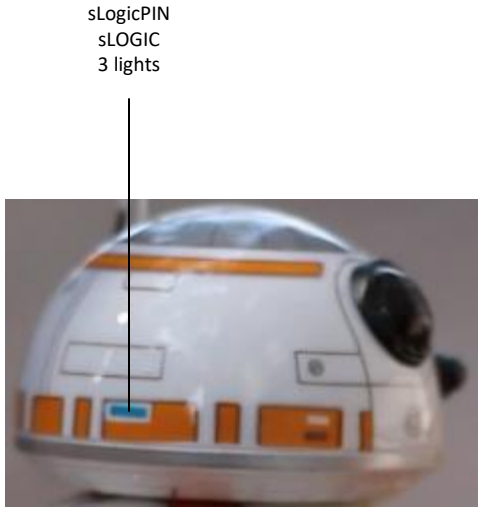
MPU IMU 7.1

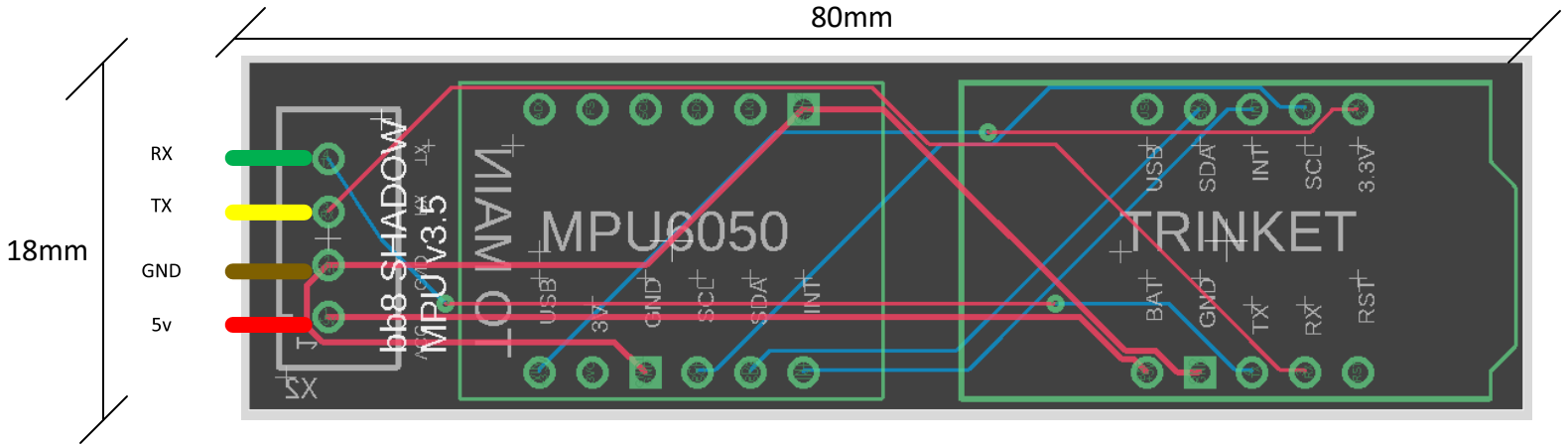




Adafruit ESP32 HUZZAH Feather (BB8 Dome)



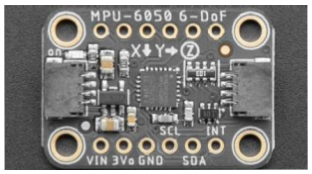




https://learn.adafruit.com/mpu6050-6-dof-accelerometer-and-gyro/pinouts

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

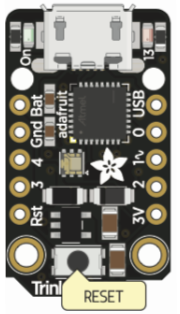
MPU6050



3V GND SCL SDA INT

i2C

Adafruit Trinket M0



5v
GND
ESP32 (Serial1) TX RX

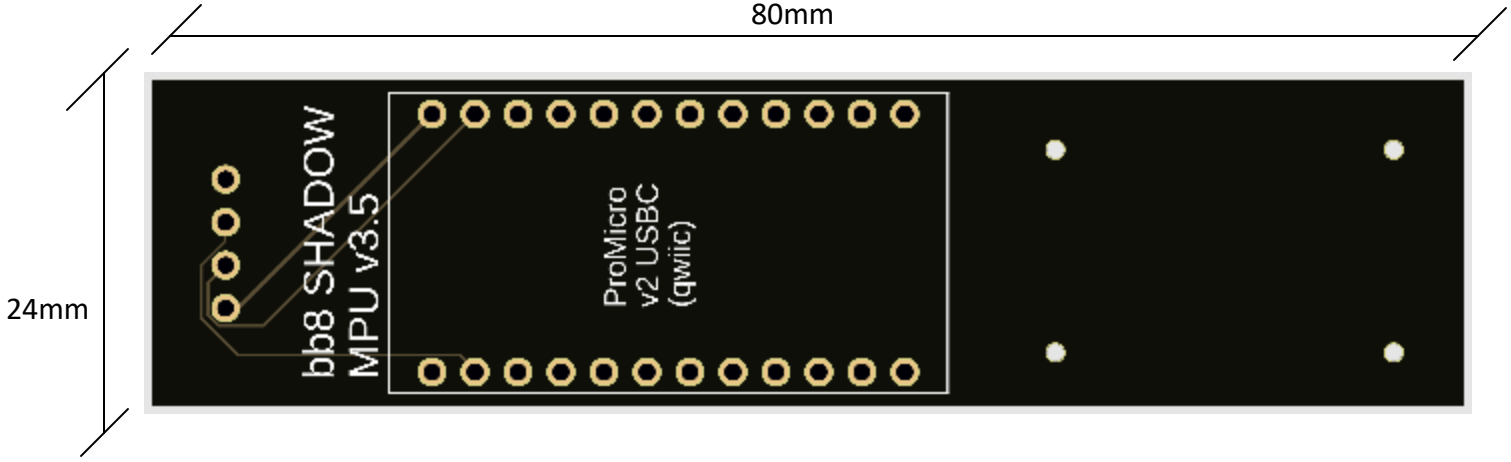
SDA to SDA on MPU
INT to INT on MPU
SCL to SCL on MPU
3v to Vin on MPU

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



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

MPU6050

3V GND SCL SDA INT

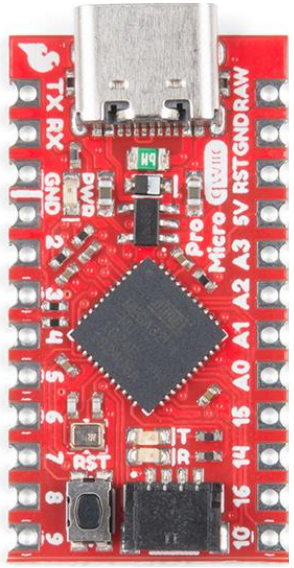
—i2C via qwiic—

To ESP32

VCC 5v GND RX Pin3 TX pin4

TX

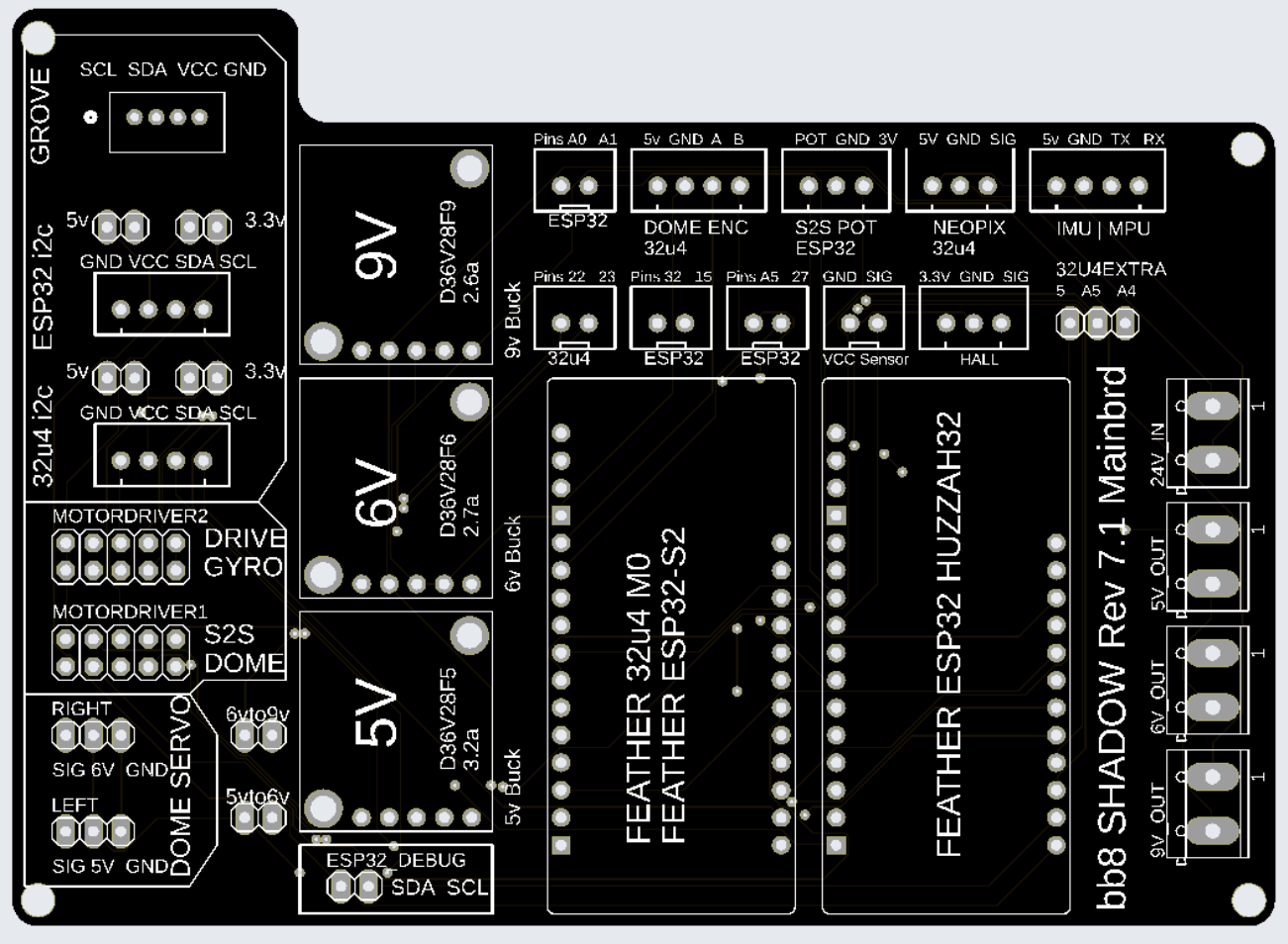
RX



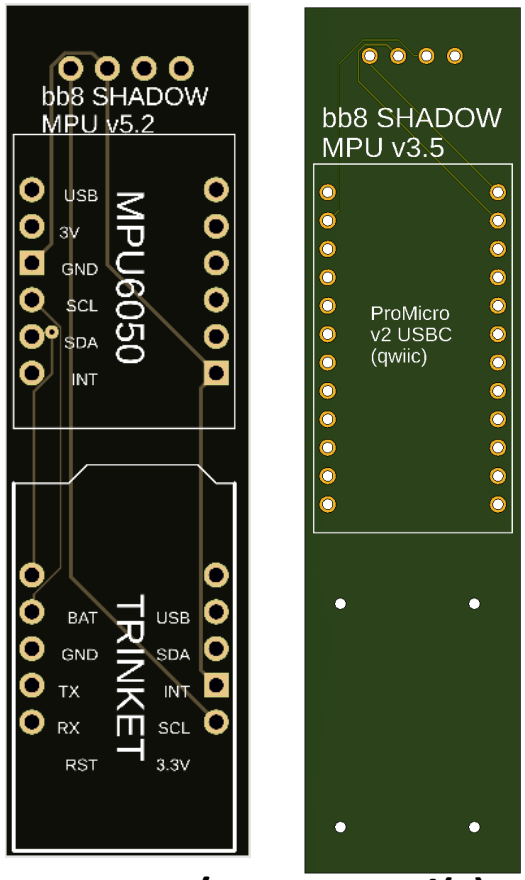
5V

GND

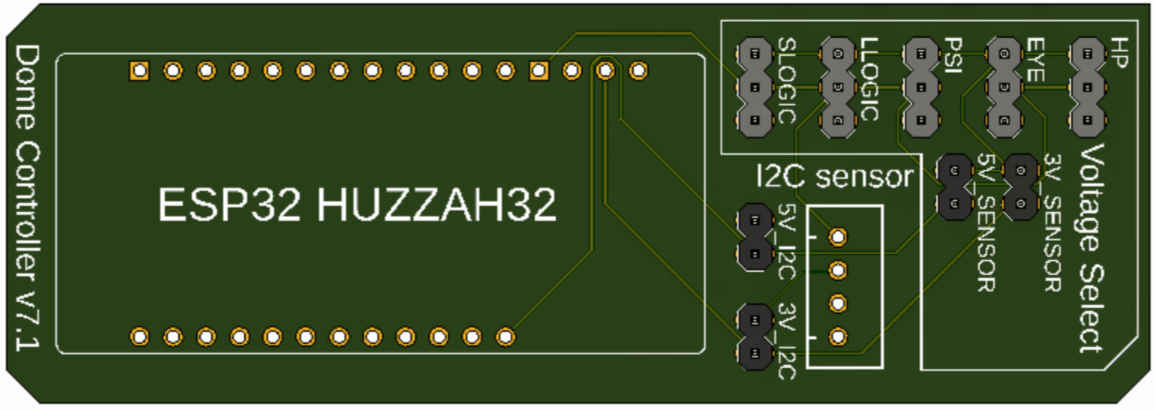
i2C via qwiic



Main Board



IMU/MPU Board(s)



Dome Board