F_Interface_AL v0.06 presentation

Here is an update of the project with improved hardware and software.

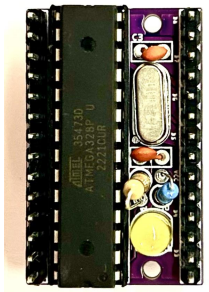
On the hardware side, you now have the choice between various versions depending on your needs. They vary in terms of sizes and inputs/output capabilities. They though all use the same base schematic to establish the link with the Fanatec base.

A presentation of the range is available below. The main hardware platform which is described if the original one beeing the FULL_NANO version.

- A smallest form factor PCB based on an **ATMEGA328P** microcontroller just to unlock the force feedback for advanced users : ATMEGA328P_NO_HEADER
- A smallest form factor PCB based on an **ATMEGA328P** microcontroller just to unlock the force feedback + a few buttons for advanced user : ATMEGA328P_WITH_HEADER
- A small form factor PCB based on an **arduino nano** just to unlock the force feedback : NANO_NO_HEADER
- A small form factor PCB based on an **arduino nano** just to unlock the force feedback + a few buttons : NANO_WITH_HEADER
- A small form factor PCB based on an **arduino PRO MICRO** just to unlock the force feedback + a few buttons : PROMICRO_WITH_HEADER
- A podium hub form factor PCB based on an **arduino nano** with full features (buttons, rotary encoder, rotary switches) : FULL_NANO
- A podium hub form factor PCB based on an **arduino PRO MICRO** with full features (buttons, rotary encoder, rotary switches) : FULL_PROMICRO
- A button box wich is not intended to work with a Fanatec wheel base but which is very close in terms of I/Os.

The whole family

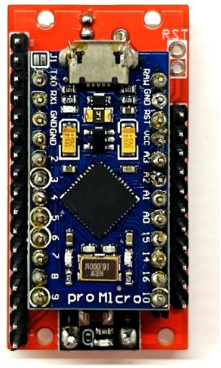
ATMEGA328P_
NO_HEADER



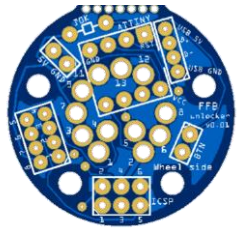
ATMEGA328P_
WITH_HEADER

NANO_NO
_HEADER

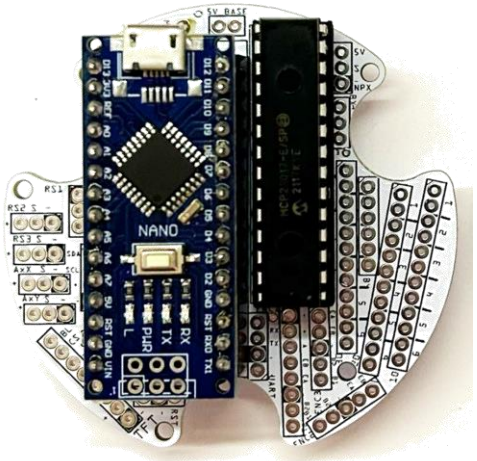
NANO_WITH_
HEADER



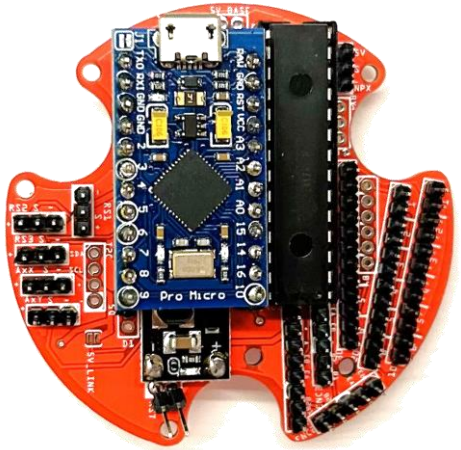
PROMICRO_WITH_
HEADER



ATTINY_NO_HEADER

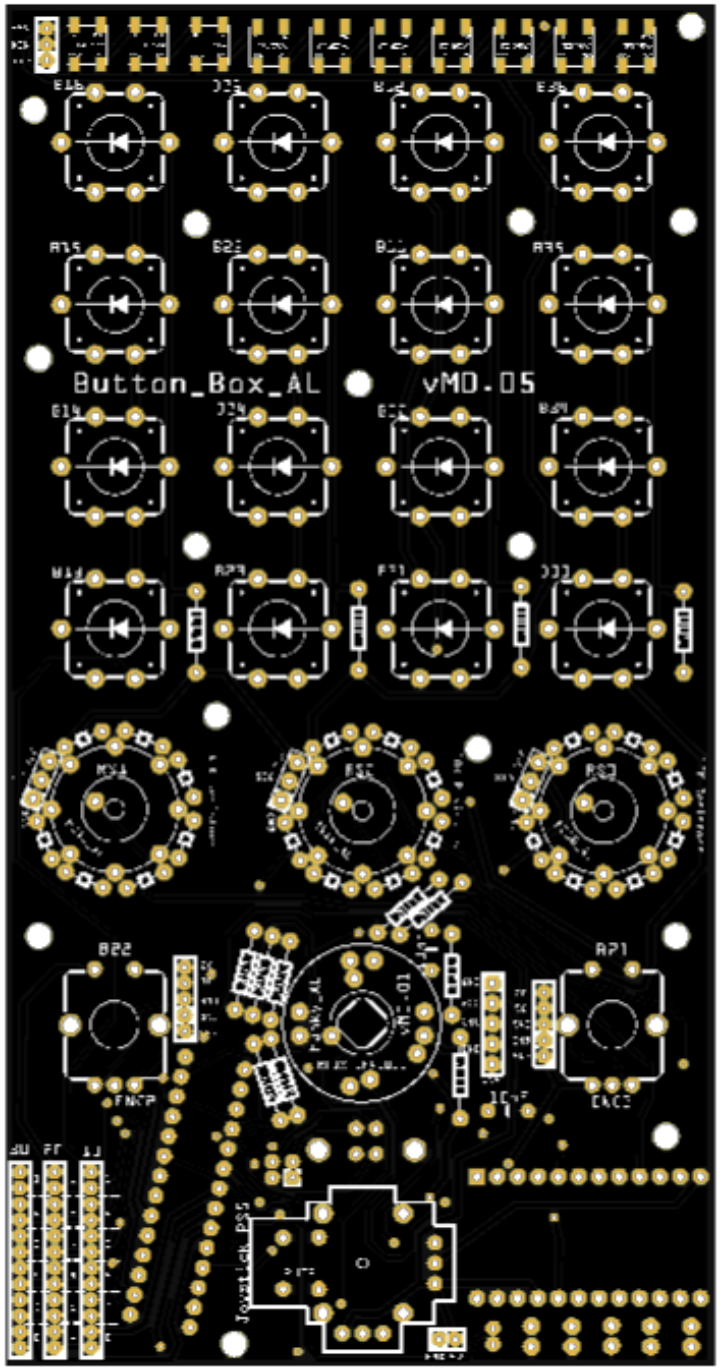


FULL_NANO



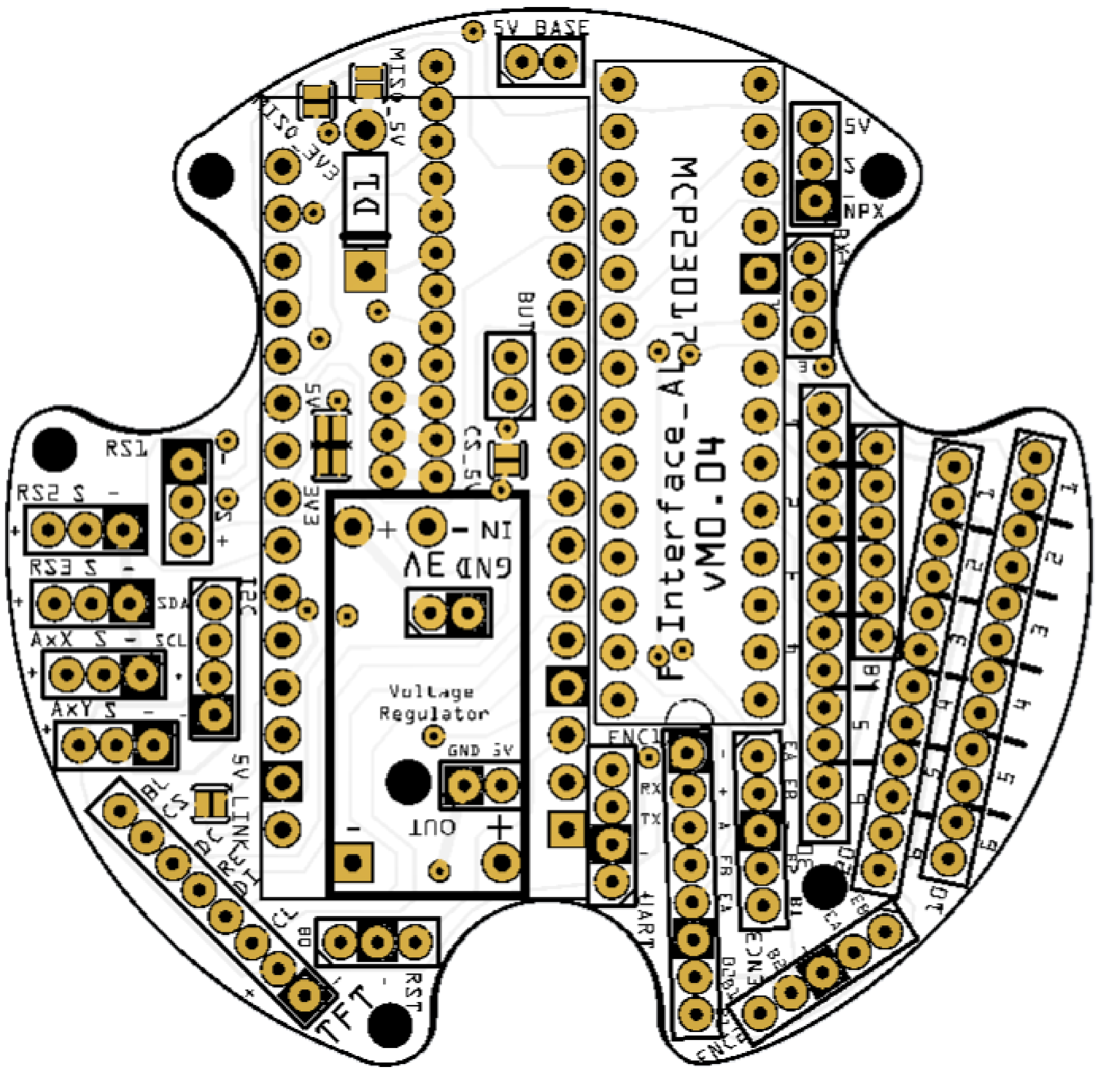
FULL_PROMICRO

PROMICRO_
BUTTONBOX

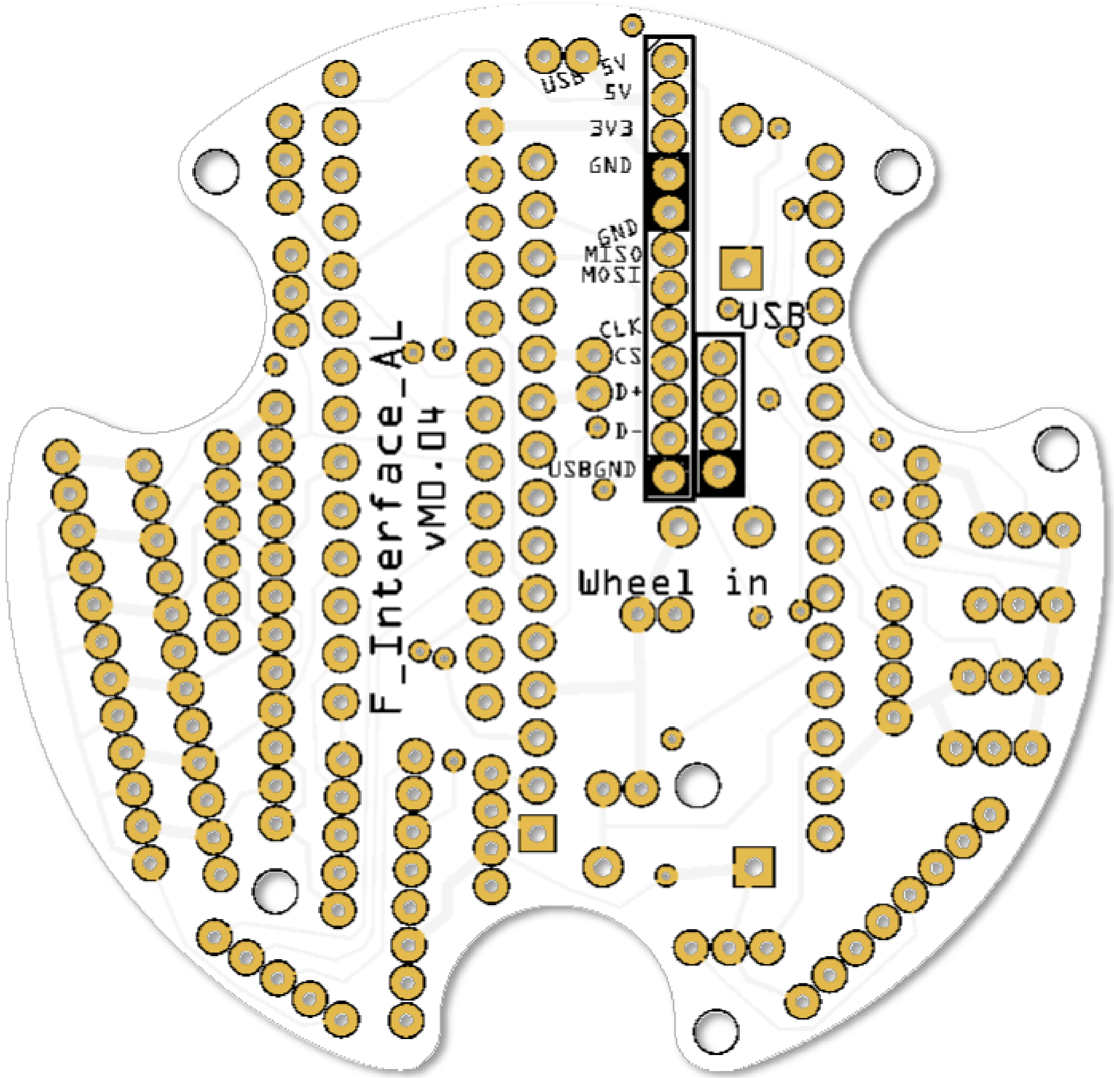


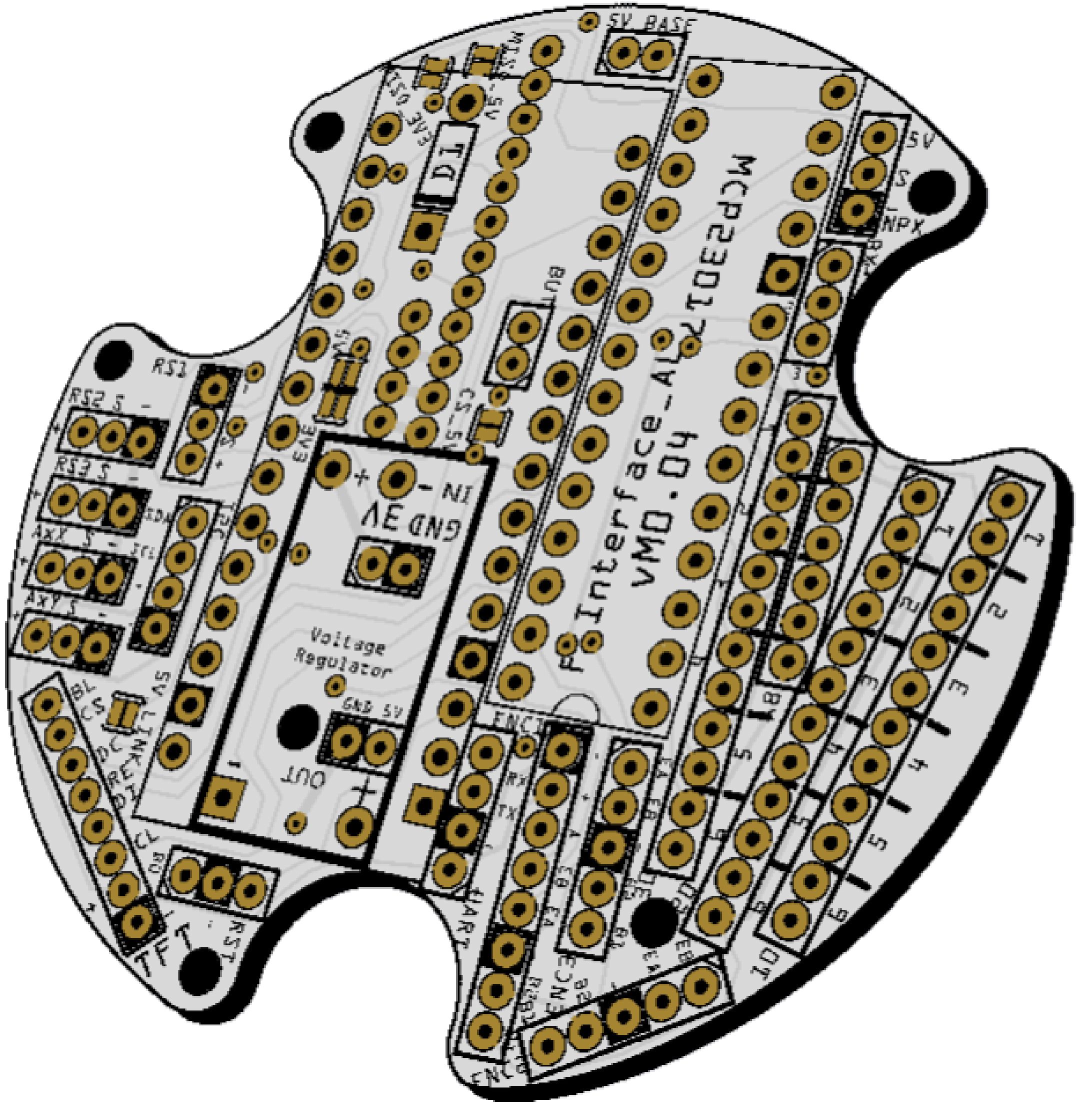
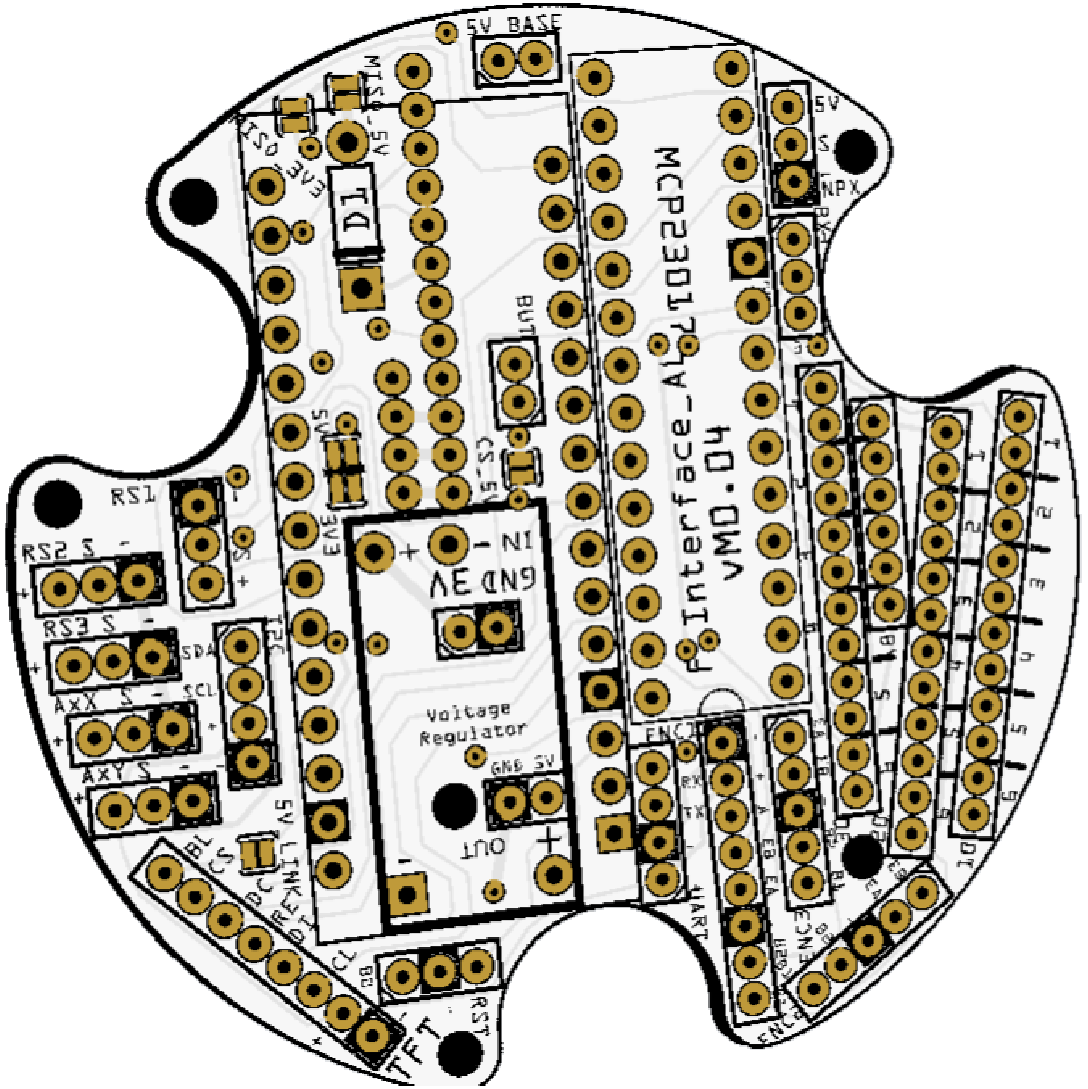
	ATTINY_NO_HEADER	ATMEGA328P_NO_HEADER	ATMEGA328P_WITH_HEADER	NANO_NO_HEADER	NANO_WITH_HEADER	PROMICRO_WITH_HEADER	FULL_NANO	FULL_PROMICRO	PROMICRO_BUTTON BOX
Base MCU platform	ATTINY85	ATMEGA328P	ATEMGA328P	Arduino Nano	Arduino Nano	Arduino PRO MICRO	Arduino Nano	Arduino PRO MICRO	Arduino PRO MICRO
Size (mm)		17,2 x 36,6	23,4 x 36,6	18,9 x 48,4	25,5 x 48,4	25,5 x 48,4	59,1 x 59,1	59,1 x 59,1	89x171
Operating voltage	3,3V	3,3V	3,3V	5V	5V	5V	5V	5V	5V
Max buttons	0	0	13	0	17	14	21	21	26
Max encoder	0	0	0	0	0	0	3	3	3
Max rotary switches	0	0	3	0	3	3	3	3	3
Max analog axes	0	0	2	0	2	2	2	2	0
LCD screen	NO	NO	NO	NO	NO	NO	YES	YES	NO
RGB LEDs	NO	NO	YES	NO	YES	YES	YES	YES	YES
7 segments	NO	NO	NO	NO	NO	NO	YES	YES	NO
Funky switch	NO	NO	NO	NO	NO	NO	YES	YES	YES

Front


5V BASE
MCP23017
F_Interface_AL
vM0.04
D1
Voltage
Regulator
GND 3V
IN -
OUT
+
RS1
RS2 S -
RS3 S -
AxX S -
AxY S -
SDA
SCL
I2C
5V
S
NPX
BUT
ENC1
ENC2
ENC3
RX
TX
UART
TFT
RST
BL
CS
DC
RE
DI
CL
EA
EB

Rear


USB 5V
5V
3V3
GND
GND
MISO
MOSI
CLK
CS
D+
D-
USBGND
USB
F_Interface_AL
vM0.04
Wheel in


5V BASE
MCP23017
Interface_A
vM0.04
D1
Voltage Regulator
GND 5V
OUT
IN
GND 3V
RS1
RS2 S
RS3 S
AxX S
AxY S
BUT
NPX
ENC1
UART
TFT
RST

5V BASE
MCP23017
Interface_A
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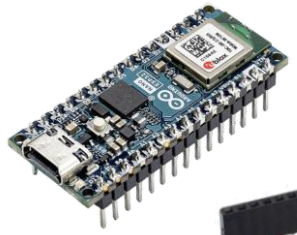
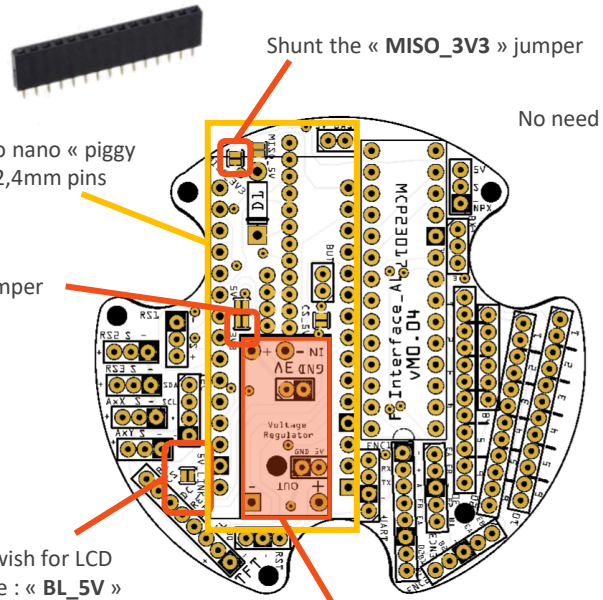
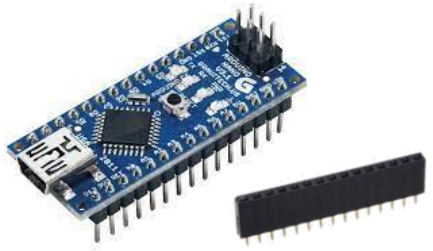
D1
Voltage Regulator
GND 5V
OUT
IN
GND 3V
RS1
RS2 S
RS3 S
AxX S
AxY S
SDA
SCL
BUT
NPX
ENC1
UART
TFT
RST

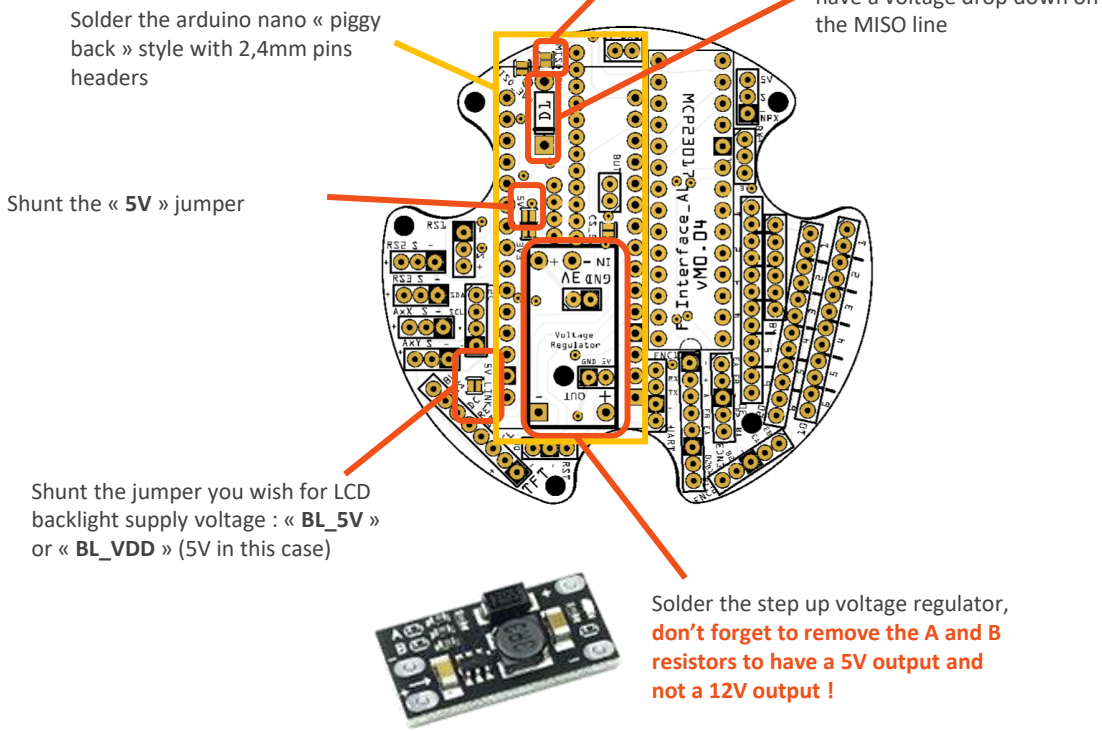
Arduino nano ESP32
3,3V voltage operation





Arduino nano ATMEGA328p – 5V voltage operation





Data flow

Inputs management

PC

Fanatec Driver

USB

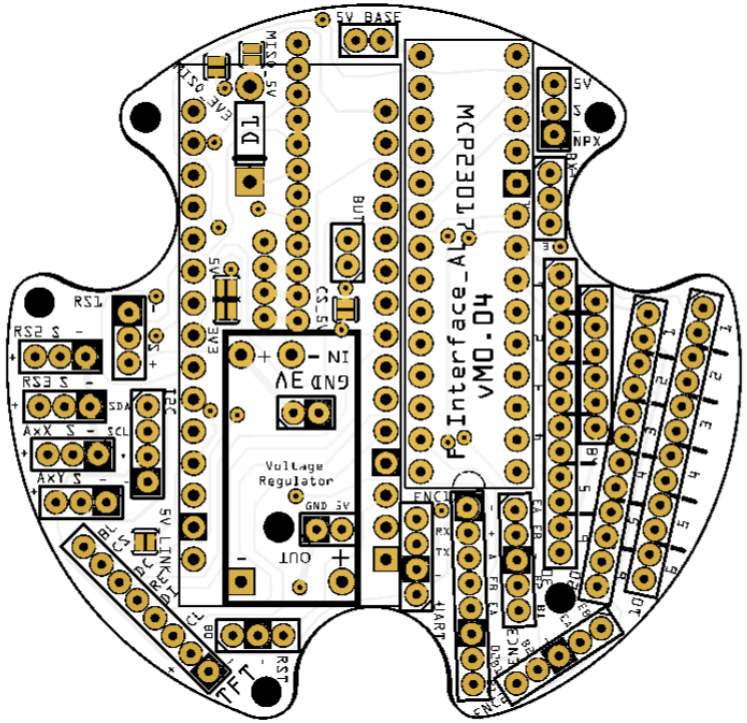
Fanatec base & QR pins

Can handle :
- 24 buttons
- 2 Analog axis
- 9 LEDs handled by Fanalab
- 3x 7 segments display
- 2 vibration motors (not managed here)

Fanatec SPI protocol

Fanatec custom USB protocol

Used to plug button modules and extra inputs



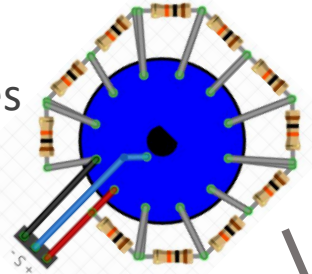
Displays management

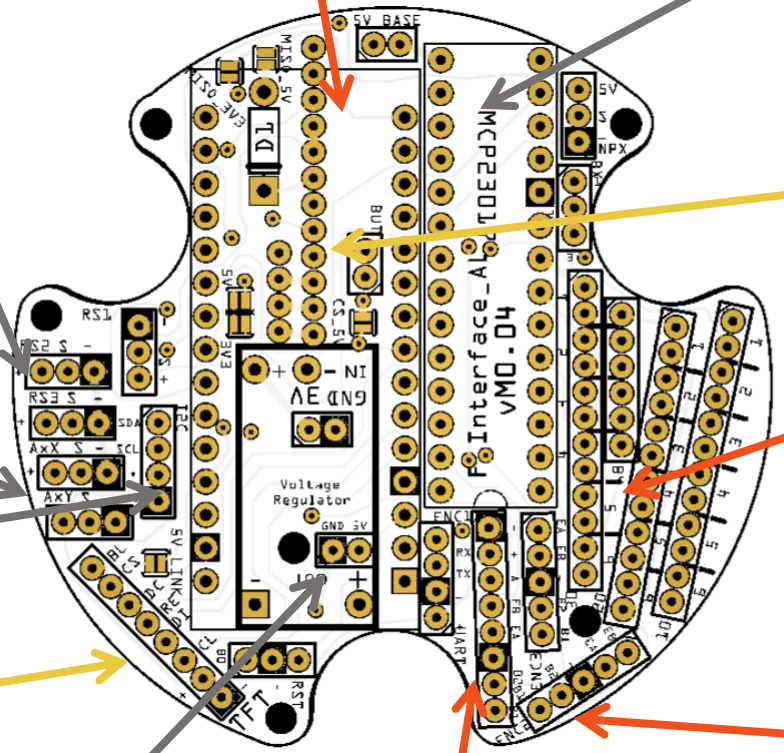
Global interfacing view

Arduino nano
or Arduino
nano ESP32

MCP23017
I/O expander
DIP-28

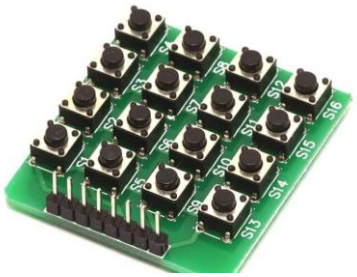
Up to 4 rotary switches





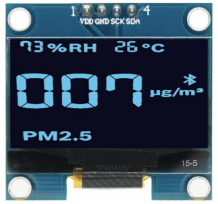
Fanatec QR input

2 analog axis



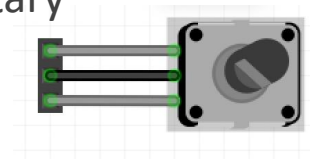
Button matrix
for up to 21
buttons

TM1637
Or OLED
display or I2C

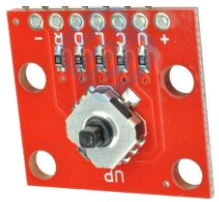


TFT LCD

Up to 3 rotary
encoders



Stepup voltage regulator.
Required for arduino nano
only



DPAD or Funky
switch

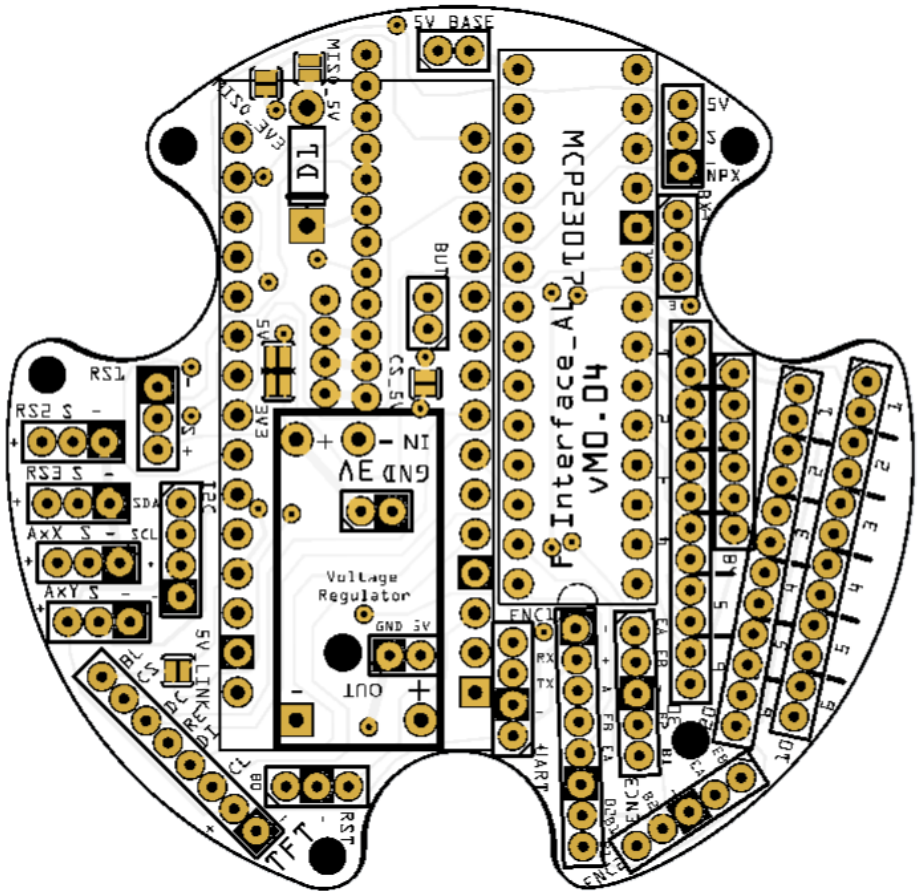
BOM

- 1 arduino nano (Approx. 3€)
- 1 PCB (Approx. 5-7€ if ordered by 5 on JLCPCB)
- 1 MCP23017 16IO extender - (Approx. 3€)
- 1 step up voltage regulator – 0,5€
- Some 2mm pitch, straight or elbowed pin arrays to hook up your buttons, switches,… - 0,5€
- 1x 10k Ohms pullup resistor – 200mil – 0,1€
- 1x 1N4001 Diod – 0,1 €

Total build cost estimated for the control board 12-13€

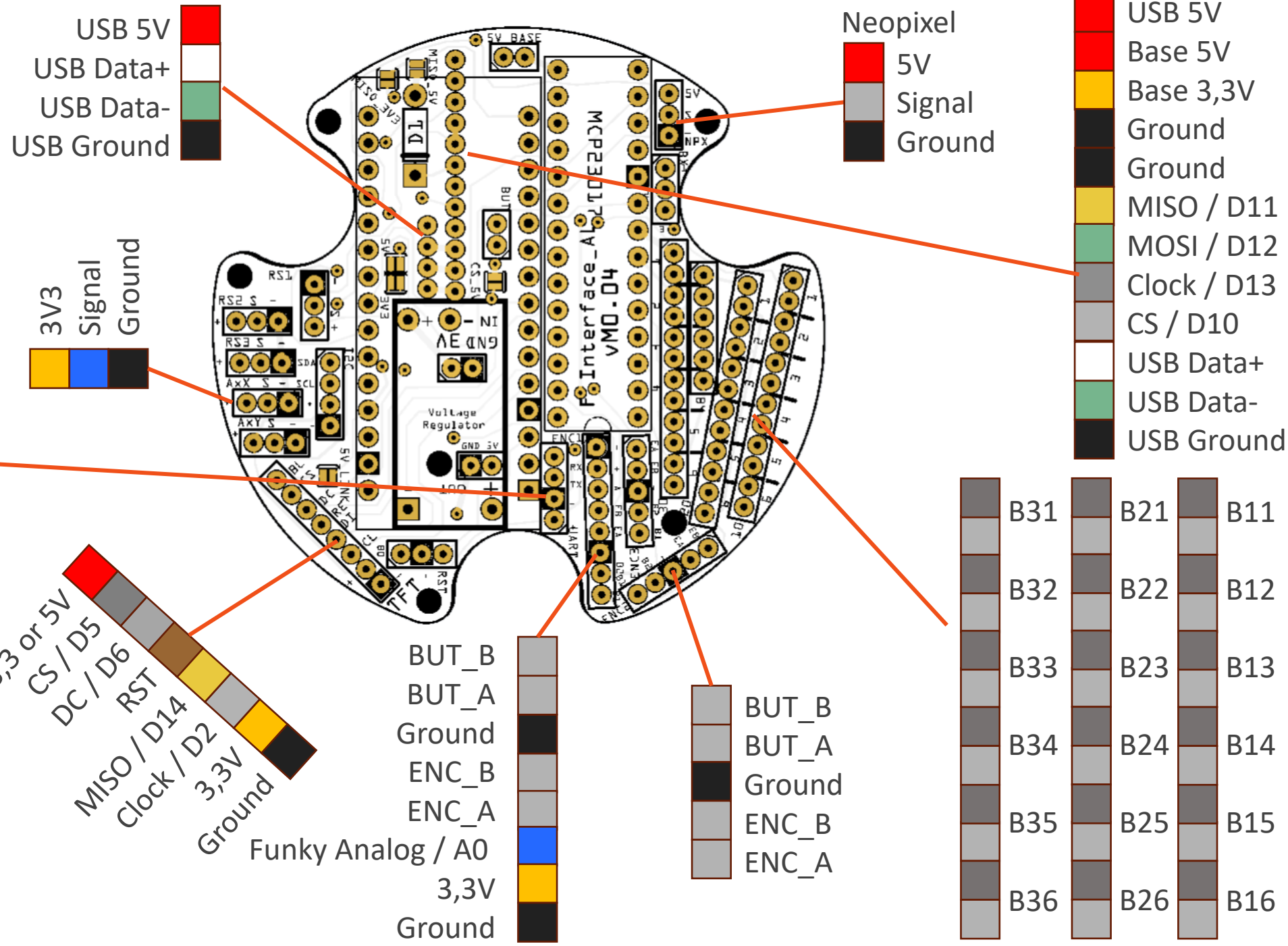
- + Depending on you build, some buttons, encoder, rotary switches,…

Dimensions



59 mm diameter

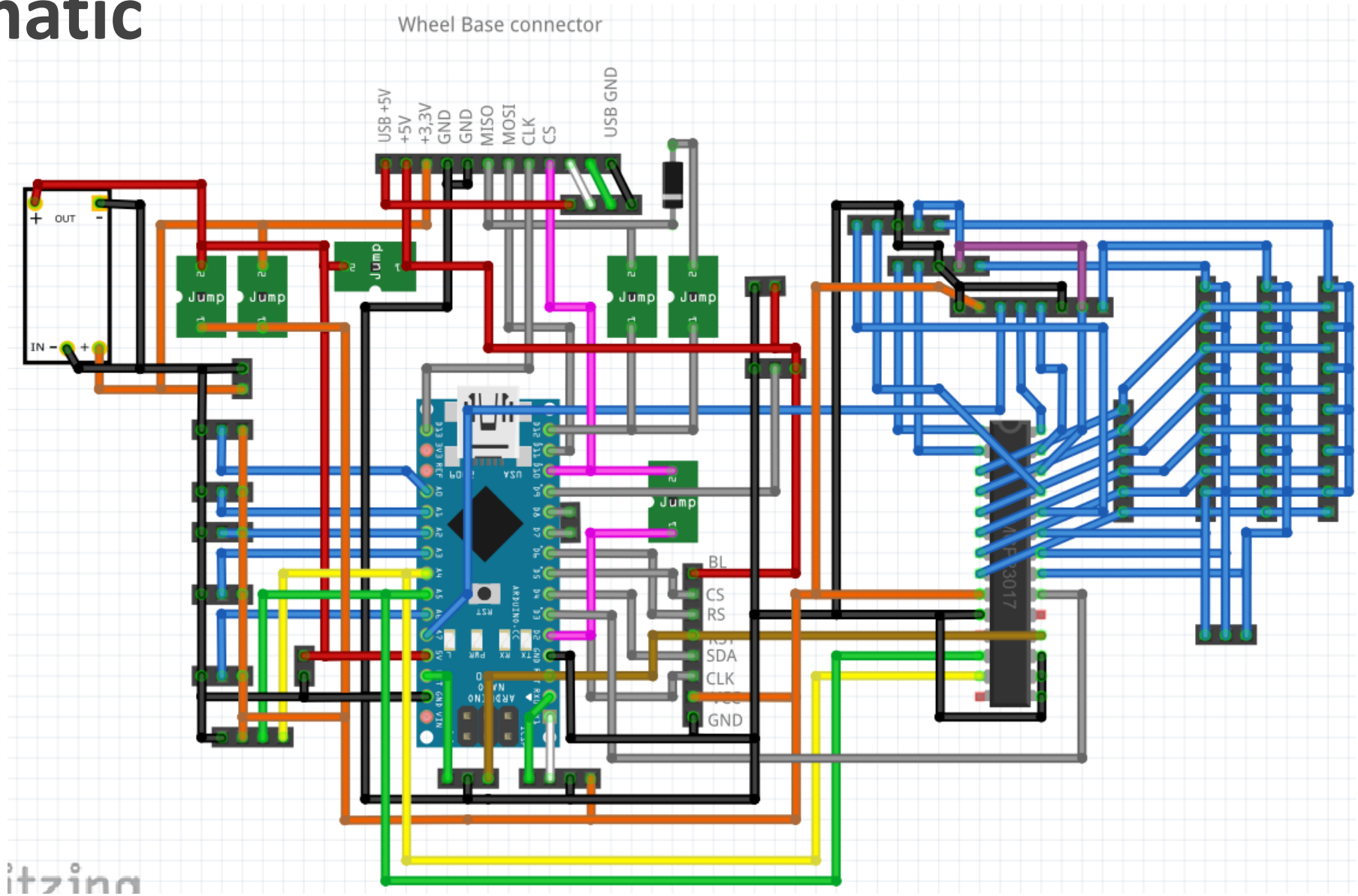
Pinout


USB 5V
USB Data+
USB Data-
USB Ground
Neopixel
5V
Signal
Ground
USB 5V
Base 5V
Base 3,3V
Ground
Ground
MISO / D11
MOSI / D12
Clock / D13
CS / D10
USB Data+
USB Data-
USB Ground
3V3
Signal
Ground
RX / D0
TX / D1
Ground
3,3V
LCD BL 3,3 or 5V
CS / D5
DC / D6
RST
MISO / D14
Clock / D2
3,3V
Ground
BUT_B
BUT_A
Ground
ENC_B
ENC_A
Funky Analog / A0
3,3V
Ground
BUT_B
BUT_A
Ground
ENC_B
ENC_A
B31
B32
B33
B34
B35
B36
B21
B22
B23
B24
B25
B26
B11
B12
B13
B14
B15
B16

General schematic

General schematic will help you understand the PCB wiring and link with the code.

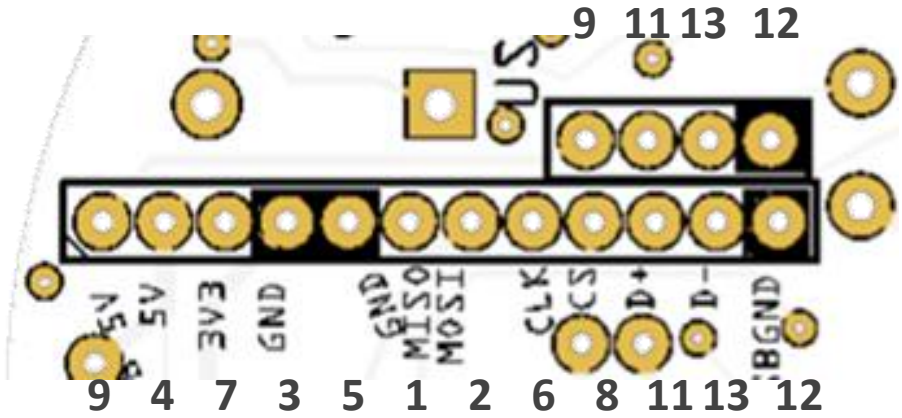
It can be found in the Fritzing file



Wheel input

This connector is used to plug the base ribbon. It respects the pinout standard described by Darknao :

1.MISO
2.MOSI
3.GND
4.5v
5.GND
6.SCK
7.3v3
8.CS
9.USB charge 5v*
10.DataPort1*
11.USB charge GND*
12.DataPort2*



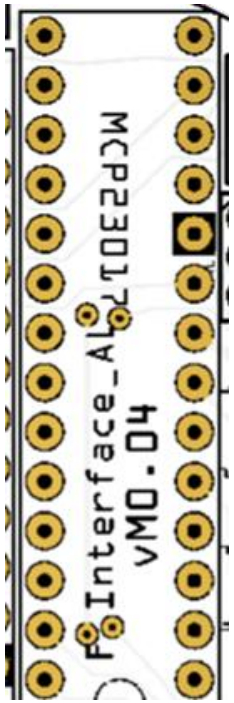
Credit :
https://github.com/darknao/btClubSportWheel

MCP 23017 16 IO extender

A classic component when it comes to extend the Arduino GPIOs.

Brings 16 more Ios to the project, mostly used to handle the button matrix and the rotary encoders.

Communicates via I2C with the arduino.

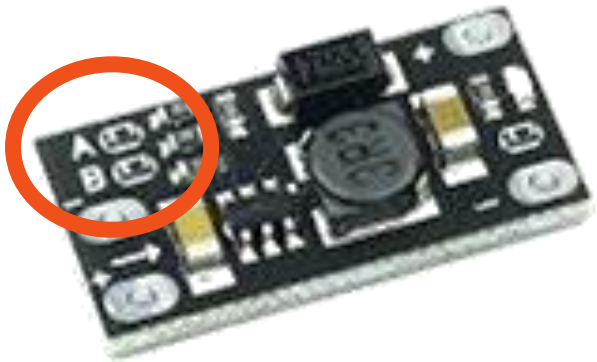


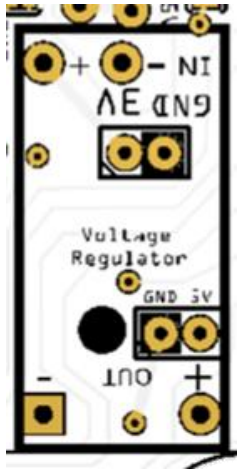
Step up voltage regulator

Classic omponent from Aliexpress

BE CAREFUL, it comes delivered with a 12V output.

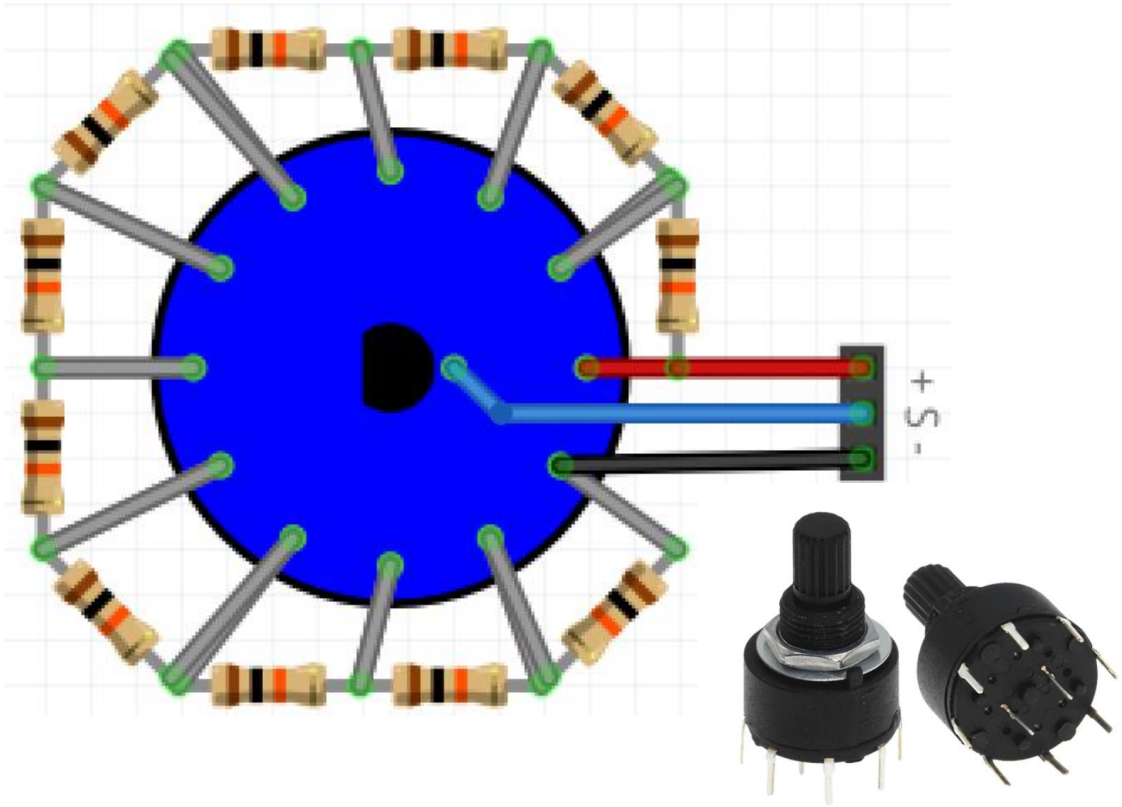
You need to desolder the 2 A and B resistors to have a 5V output

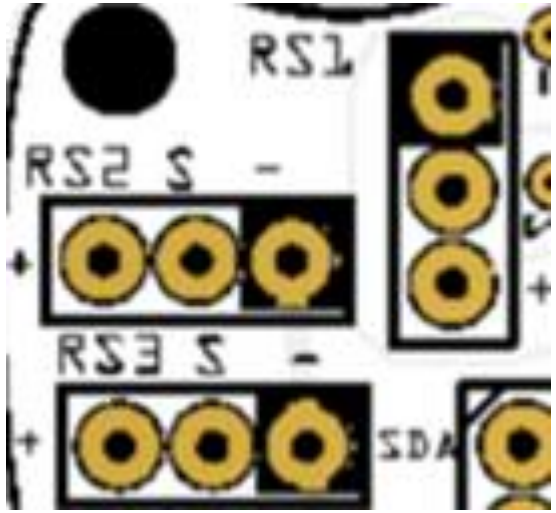




Rotary switch

You can use any rotary switch. You just need to solder 10K resistors between each connector according to the below presented schematic. RS16 – 1pole 8 throws from Aliexpress is a good option – approw 1,5€





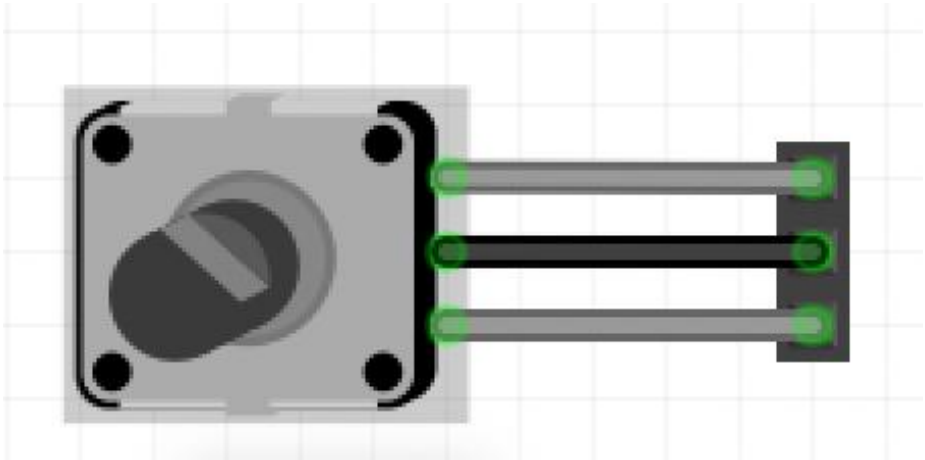
Ground
Signal
3V3

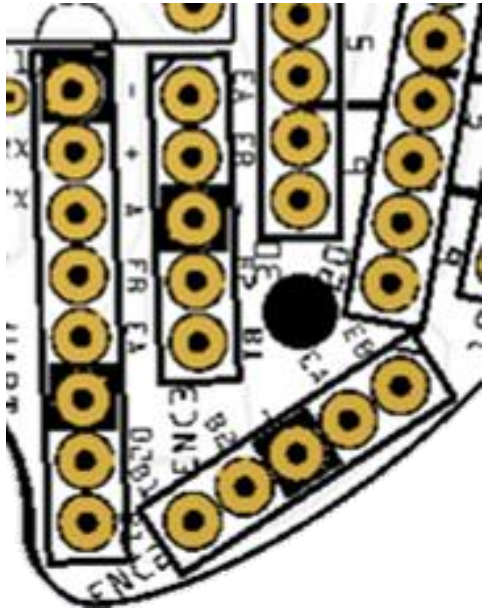
If your project requires it, you can use the analog axis X and Y to add 2 extra rotary encoders.

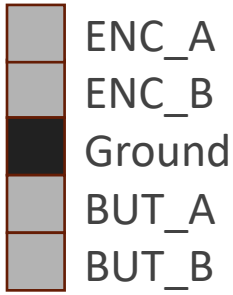
Encoder

You can hook up to 3 rotary encoders on the PCB.

Thei buttons are affected to B17, B27 and 237 of the button matrix



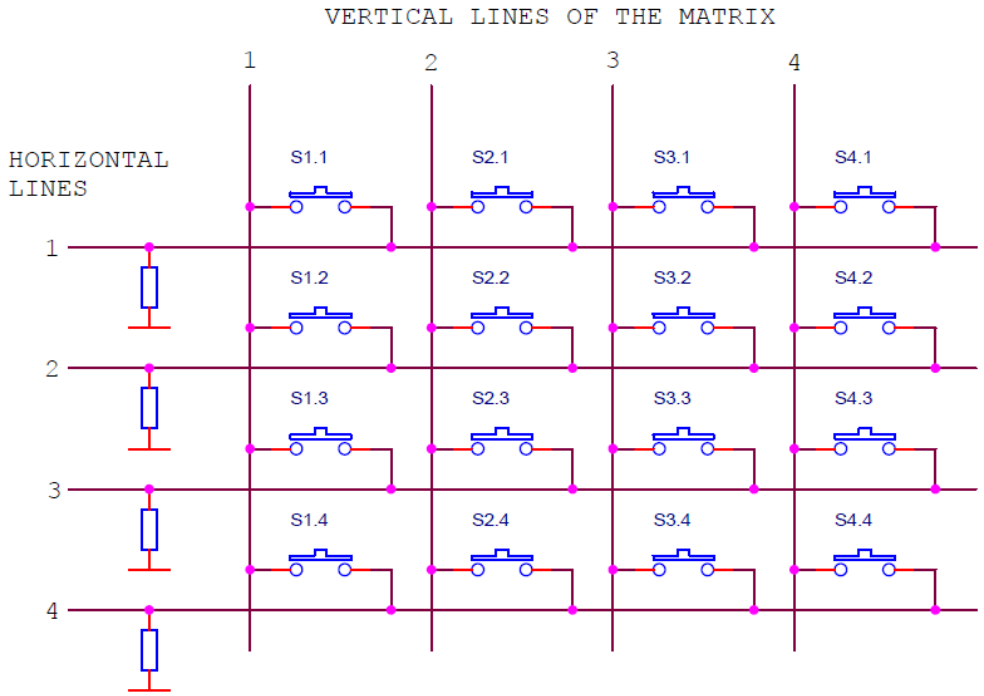


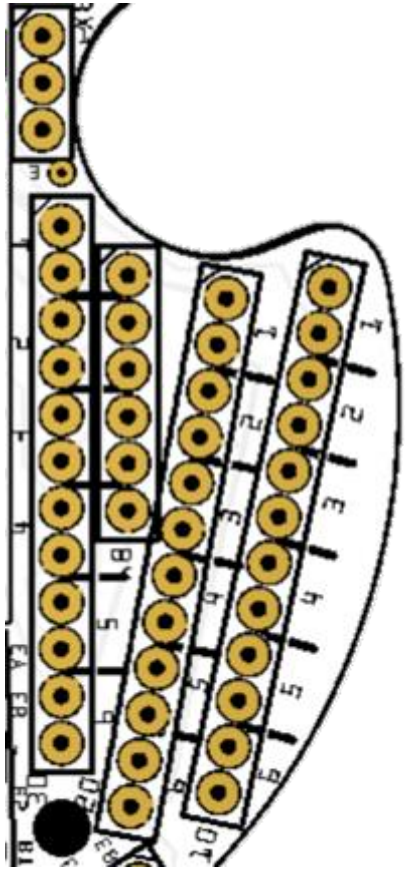


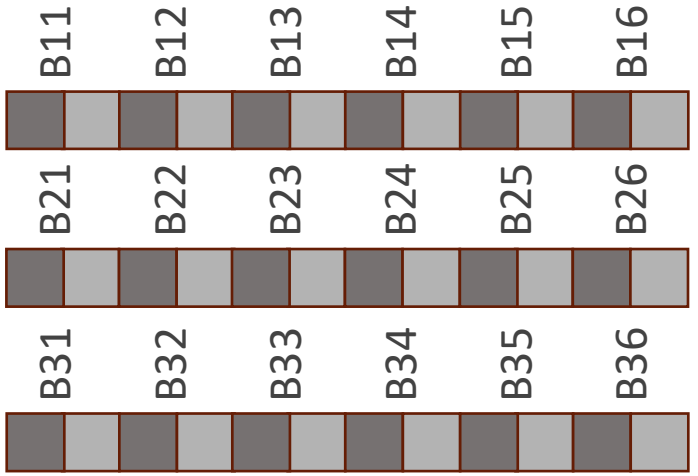
Button matrix

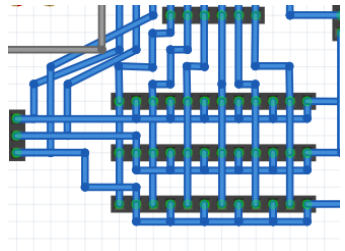
The button matrix is 3 rows x 7 colums bringing a max of 21 buttons.

You can plus each button individually on each pins from B11 to B37 or you can wire you matrix outside of the PCB usin the BX and BY connectors.



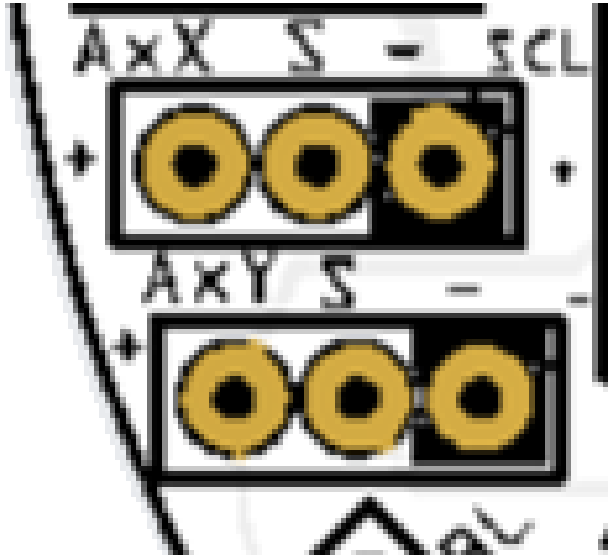






Joystick / Analog Axis

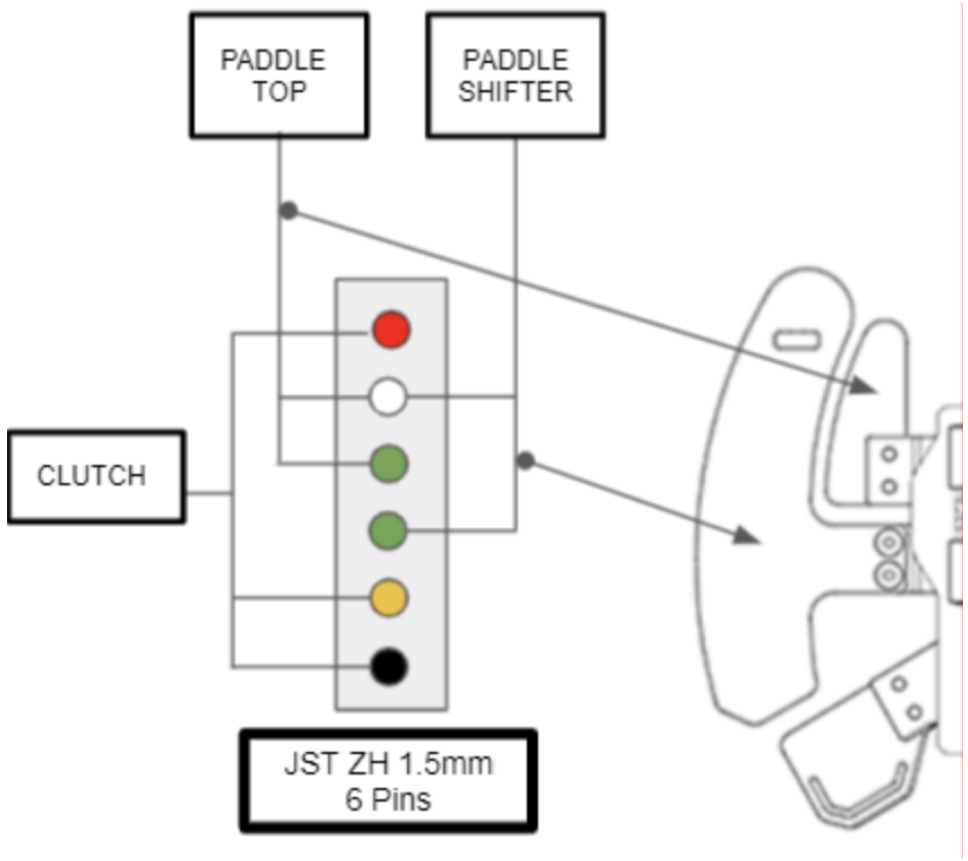
You can plug a joystick module to the board by linking it to the 2 analog axis and 1 button.



3V3
Signal
Ground

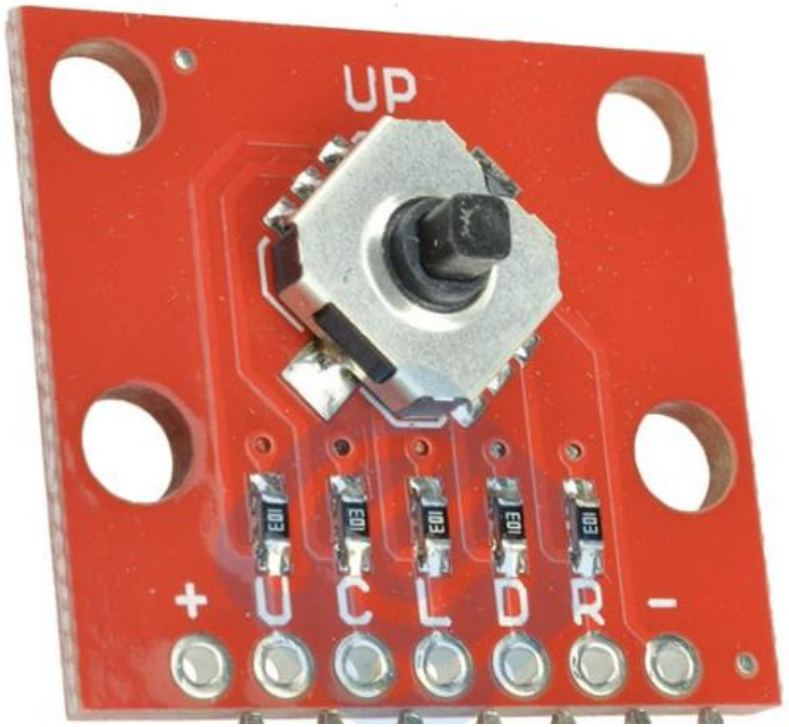
APM

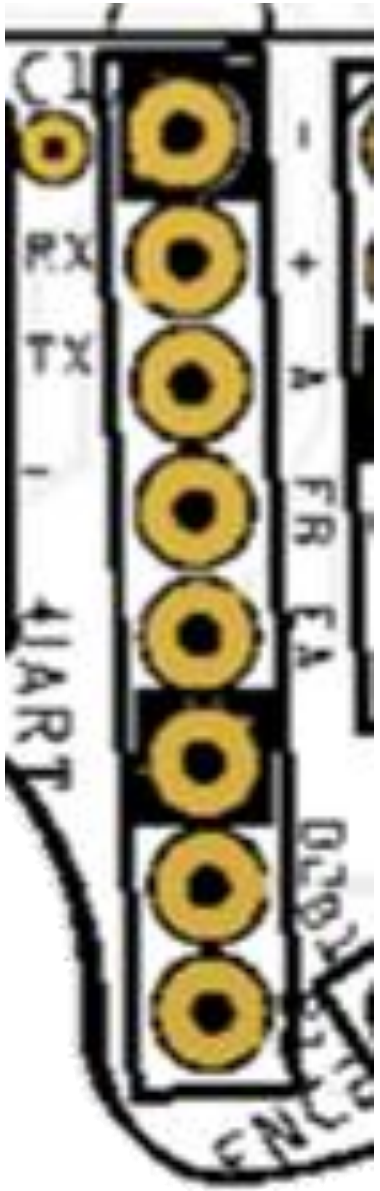
You can plug Advance paddle modules to the board
by combining a selection of buttons and axis



DPAD

You can plug a DPAD module in 2 ways :
- via the funky/dpad analog input
- via 5 buttons from the button matrix



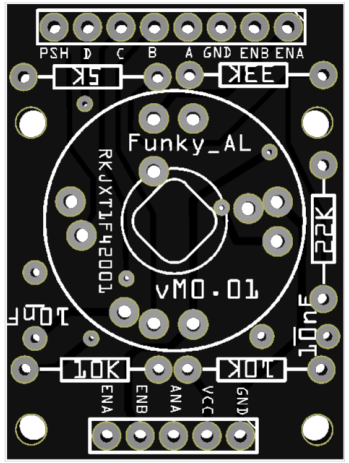


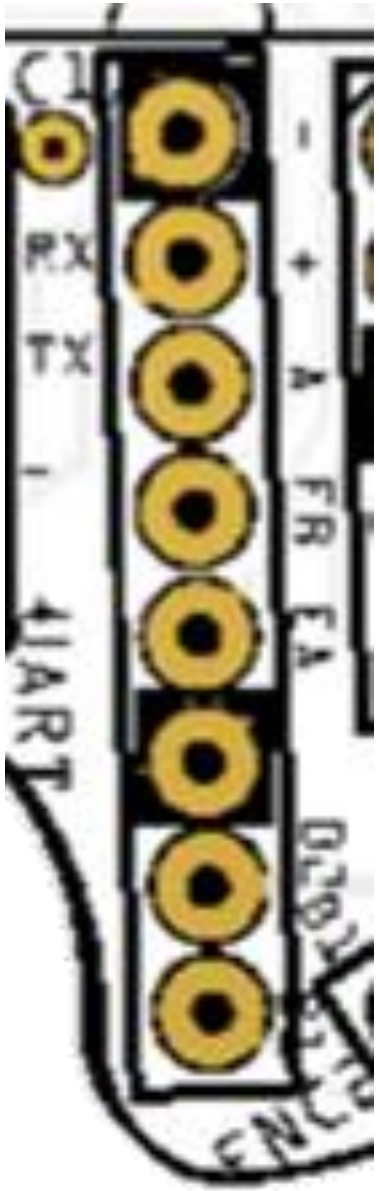
- Ground
- 3,3V
- Funky Analog / A0
- ENC_A
- ENC_B
- Ground
- BUT_A
- BUT_B

Funky switch

You can plug a funky switch module

To help you with the wiring and connection of this funky switch, I have a breakout PCB :



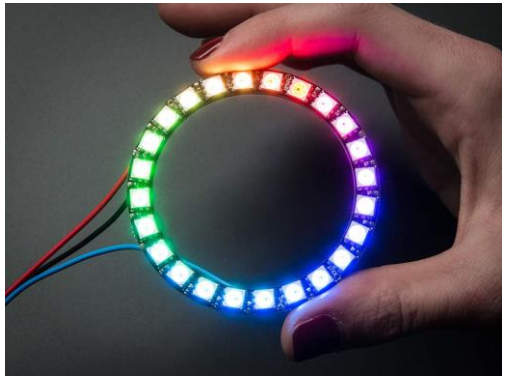


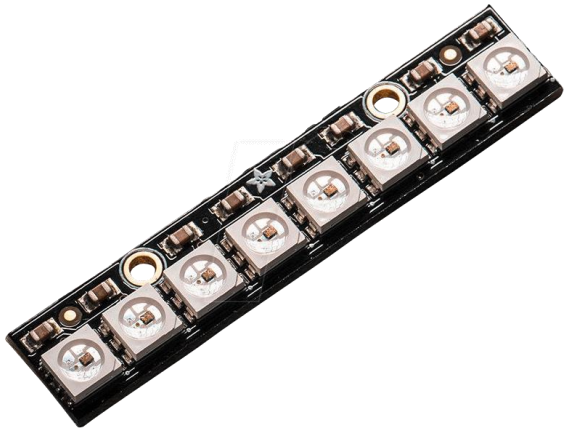
- Ground
- 3,3V
- Funky Analog / A0
- ENC_A
- ENC_B
- Ground
- BUT_A
- BUT_B

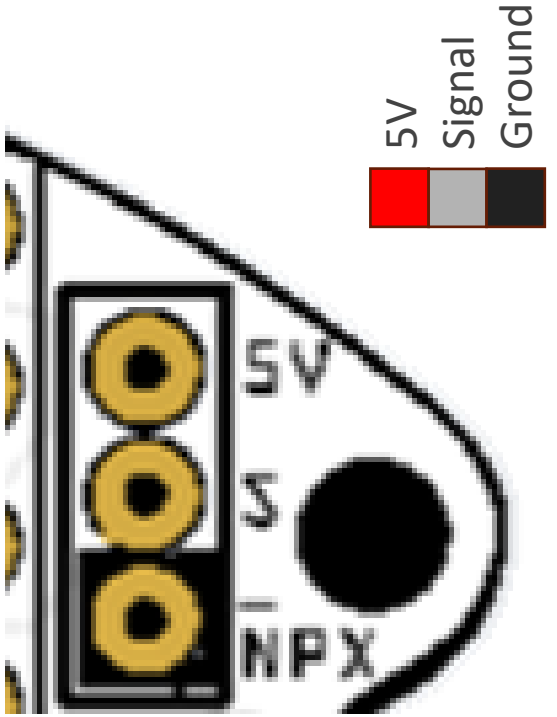
Neopixels / LEDs

You can hook up any type of Neopixels WS2812b to the board with the 3 wire connector.

Even if the data line is rated for 5v, it has been tested OK for a 3,3V data line input. You may will have the 1st pixel non functionnal as decribed here

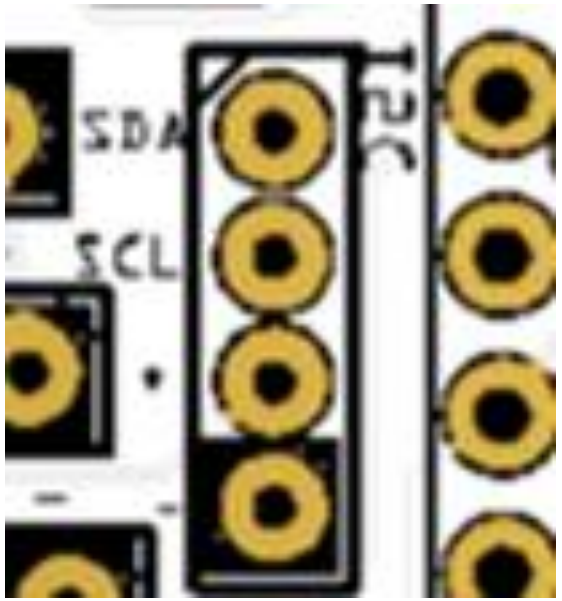






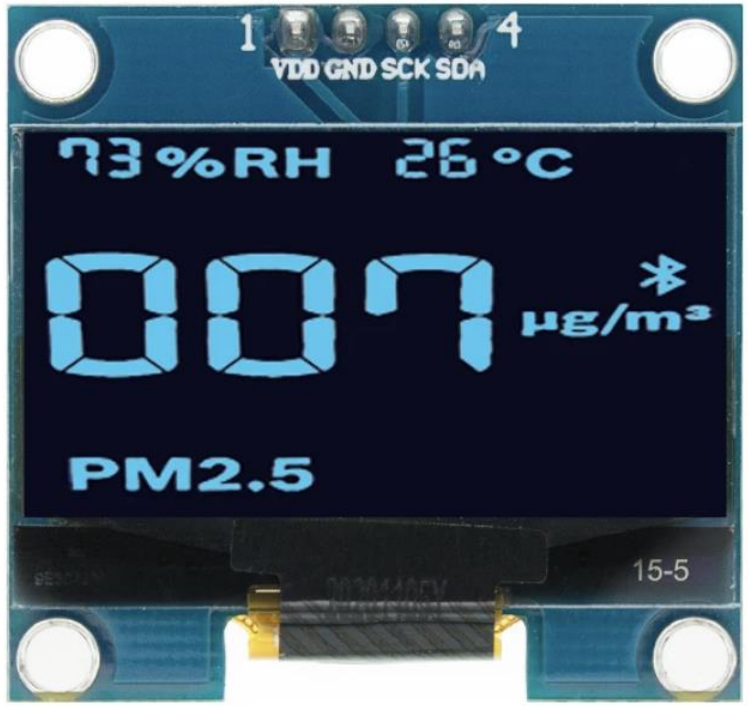
TM1637

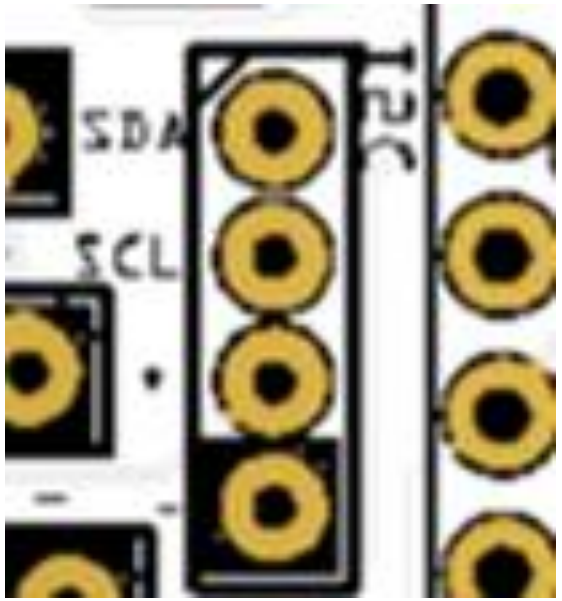
You can hook up a 7 segments display based on TM1637 driver. Nothing special here to connect it



OLED display

You can hook up an OLED display. Nothing special here to connect it

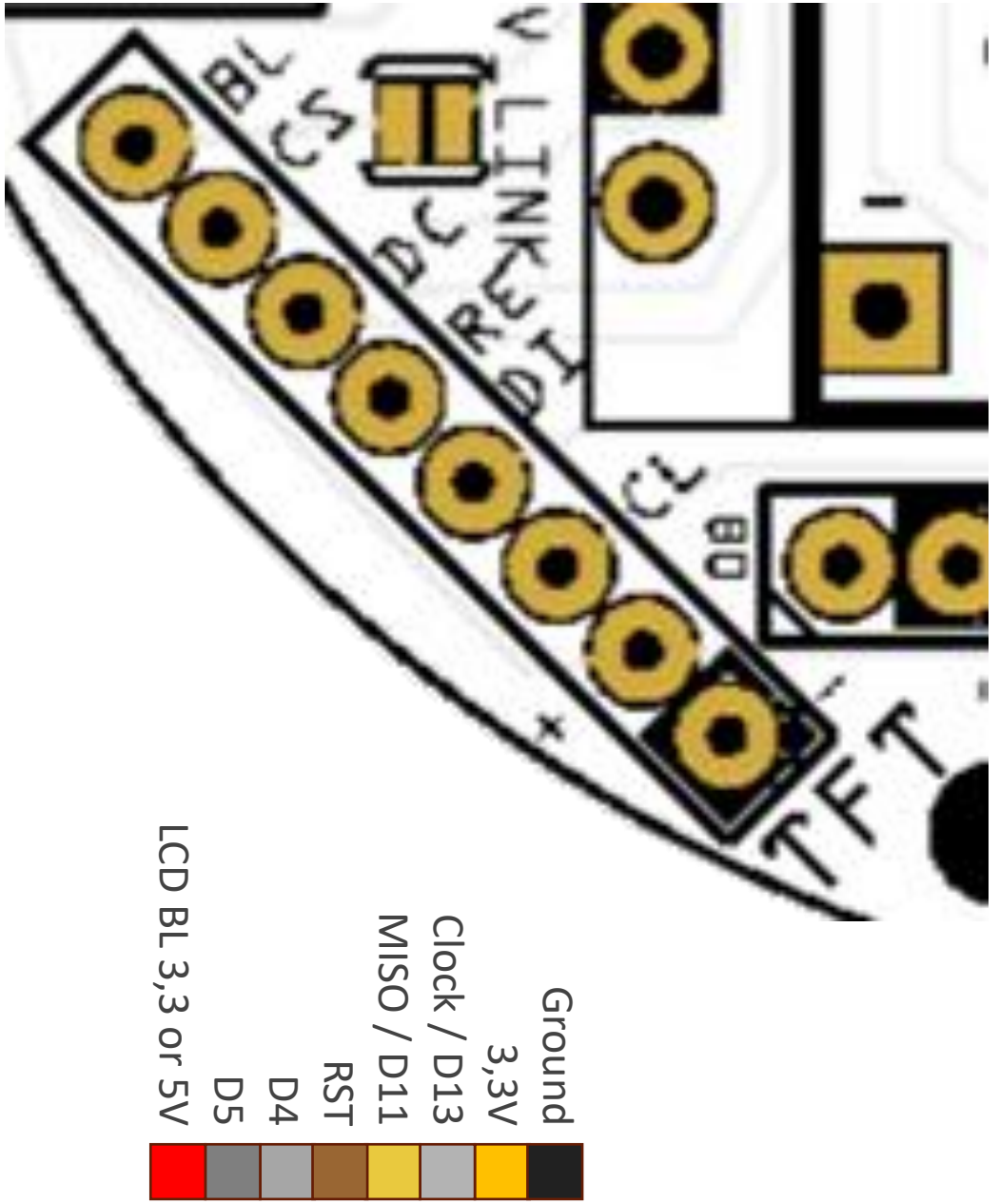




TFT LCD

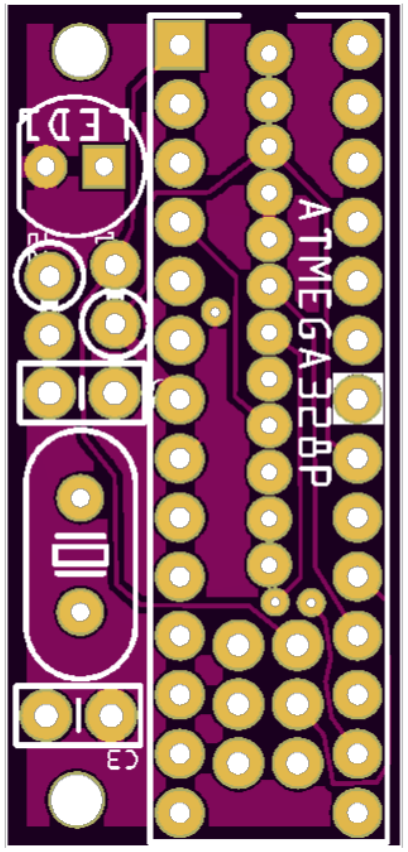
You can hook up an TFT LCD display to the board. ESP32 can drive ST7735, ILI93XX, ILI94XX families of LCD drivers.

There is a wide variety of sizes and resolutions available for 5-15€

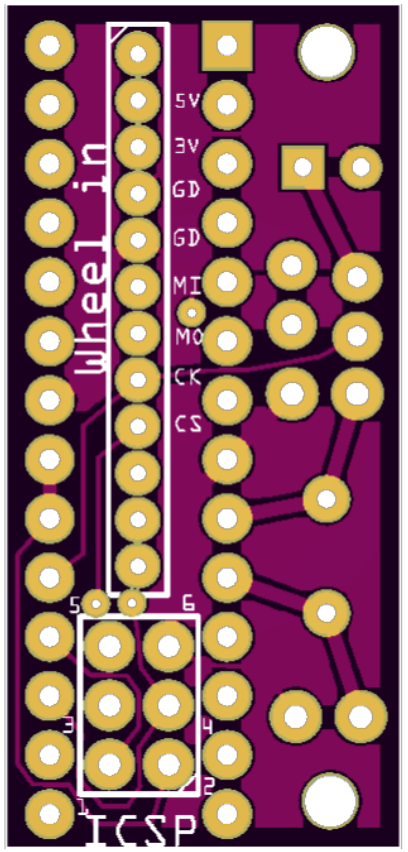


F_Interface - ATMEGA328P_NO_HEADER

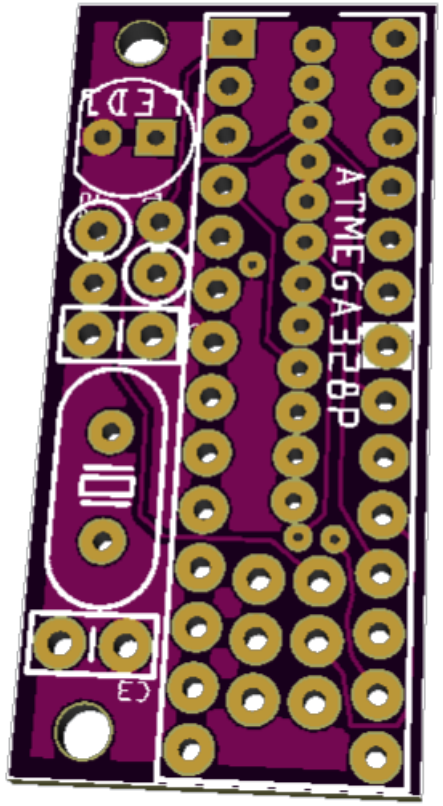
Front



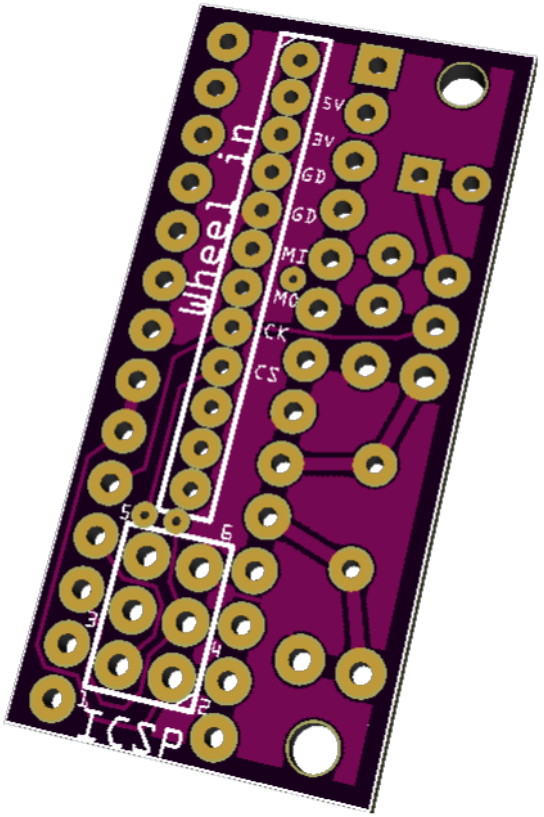
Back



3D Front

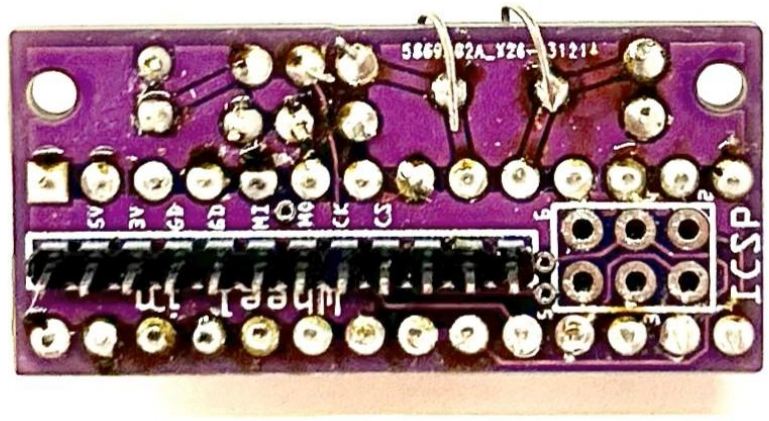


3D Back

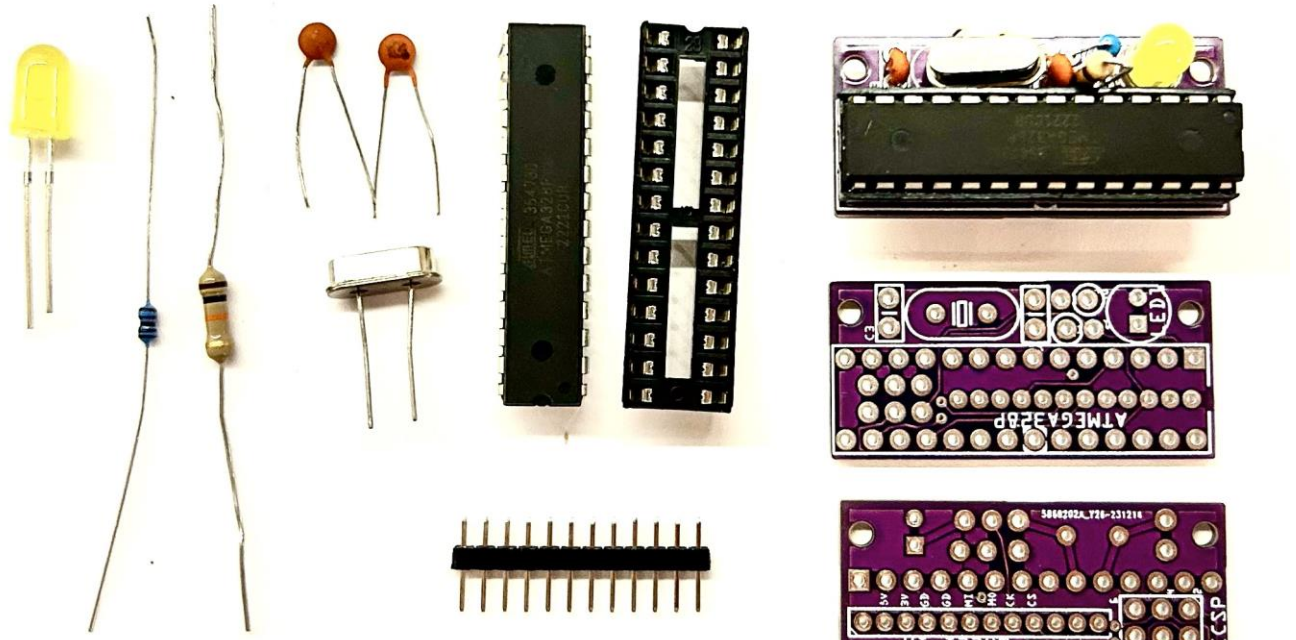


F_Interface - ATMEGA328P_NO_HEADER

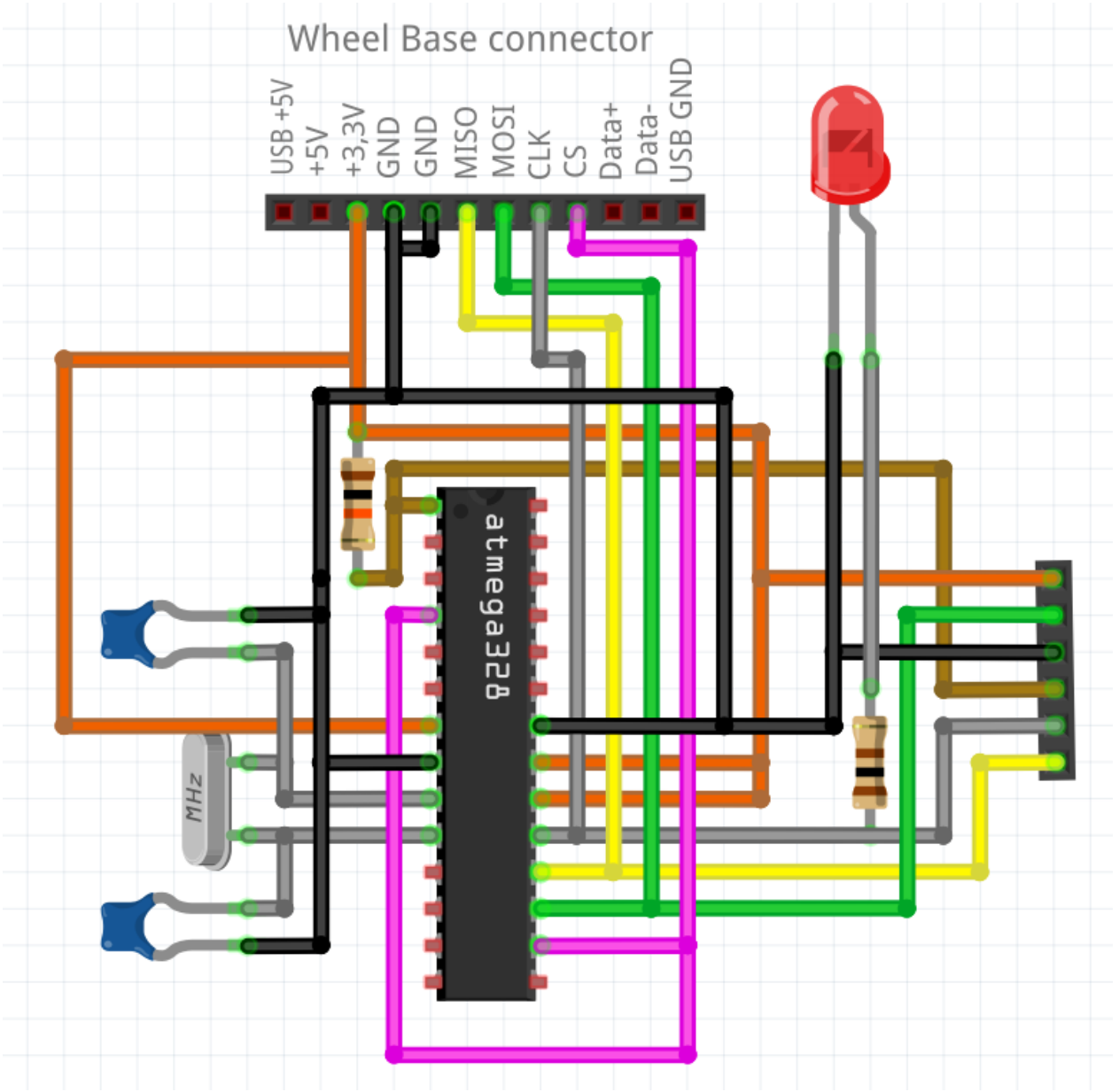
Picture



BOM

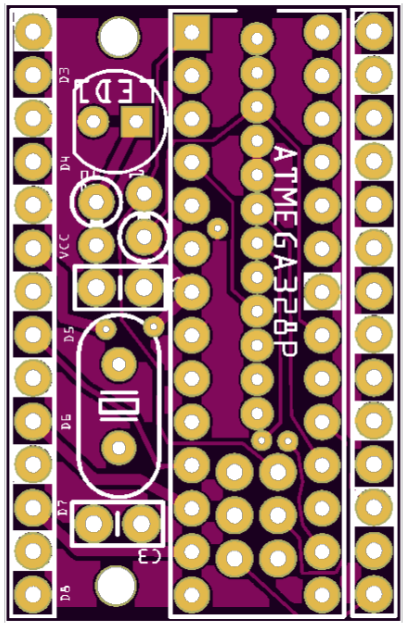


F_Interface - ATMEGA328P_NO_HEADER

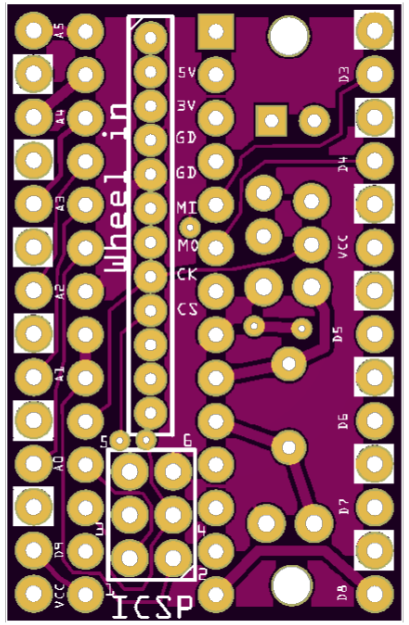


F_Interface – ATMEGA328P_WITH_HEADER

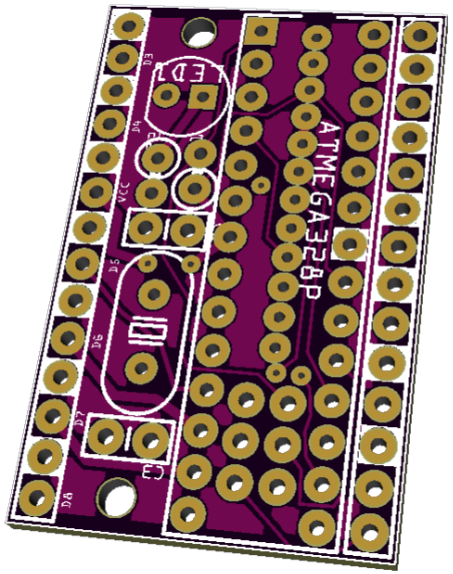
Front



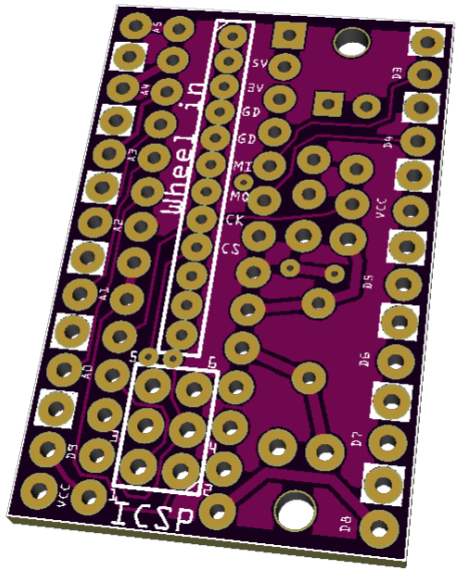
Back



3D Front

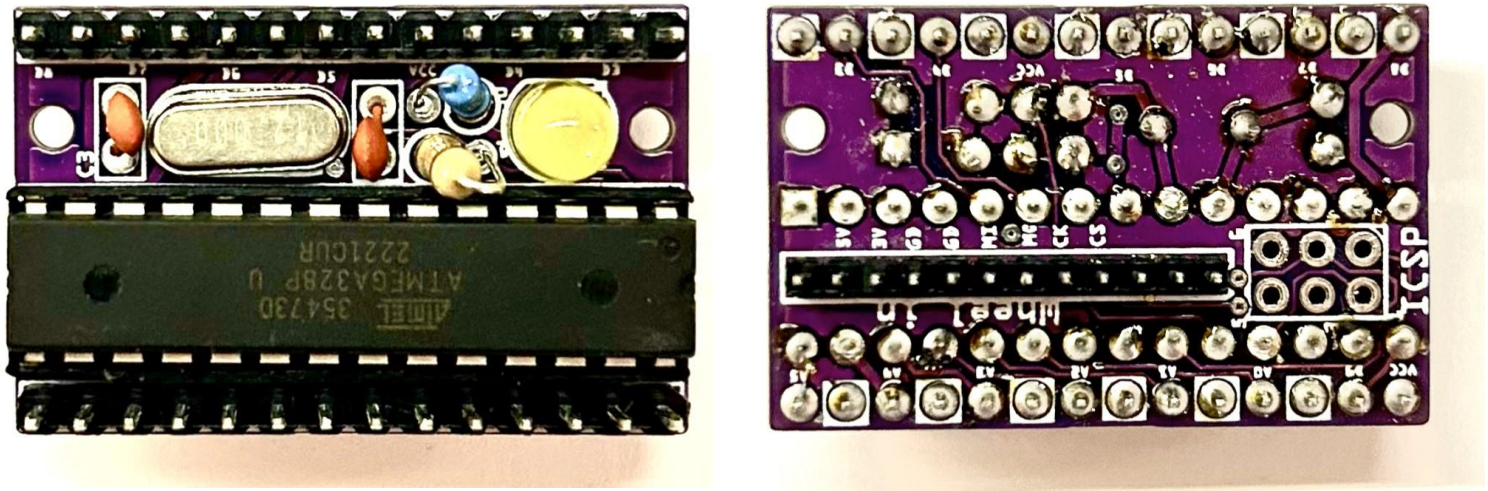


3D Back

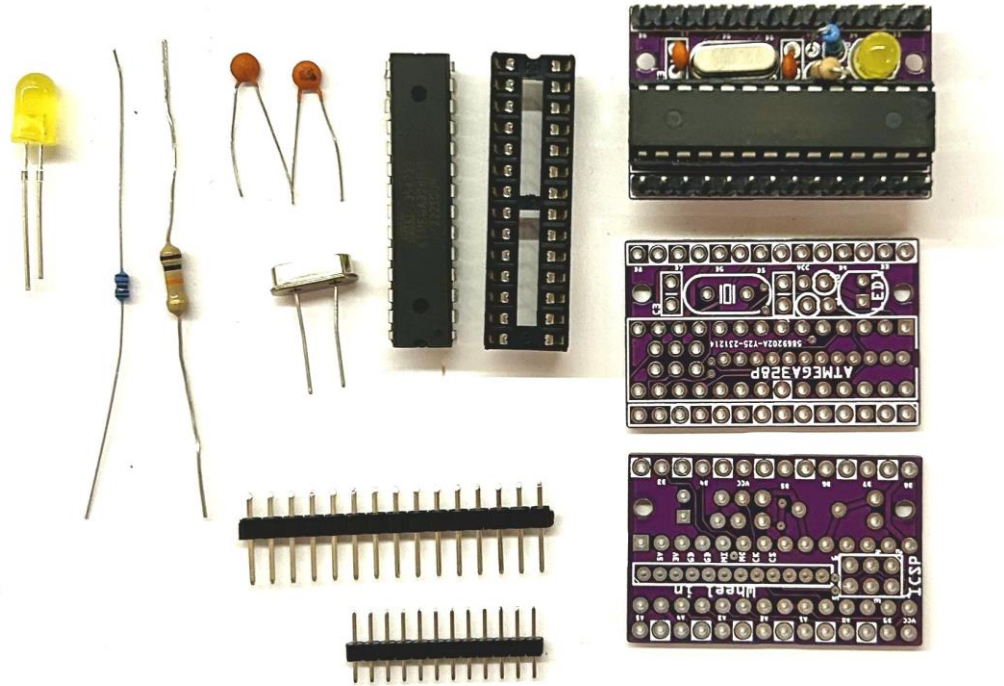


F_Interface – ATMEGA328P_WITH_HEADER

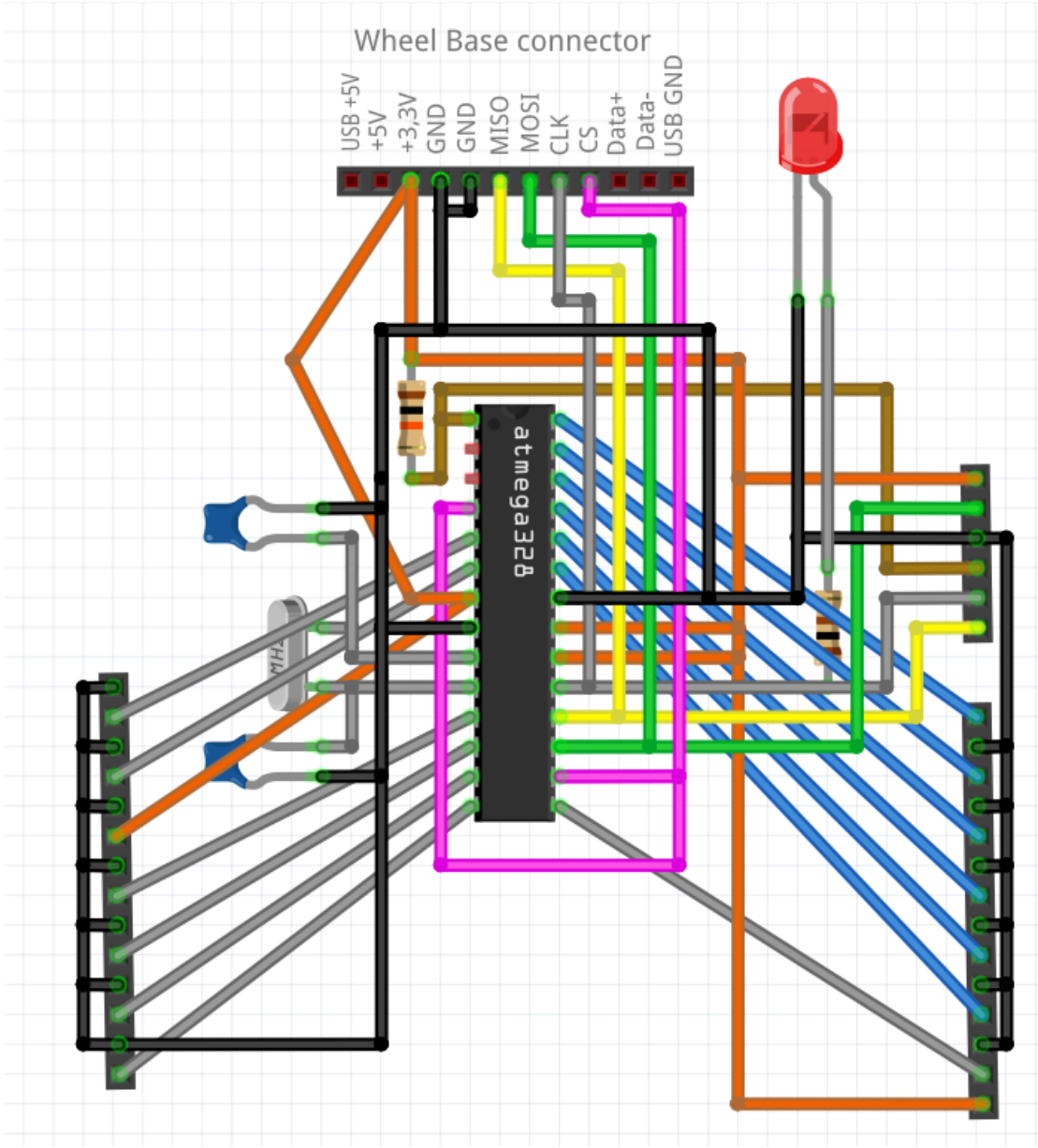
Picture



BOM

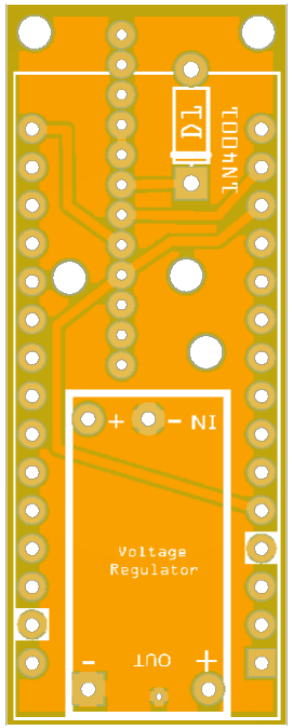


F_Interface – ATMEGA328P_WITH_HEADER

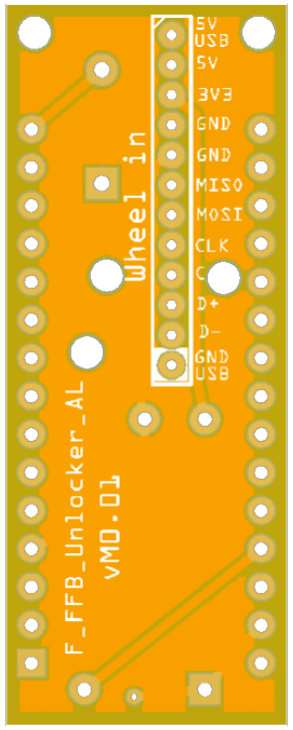


F_Interface - NANO_NO_HEADER

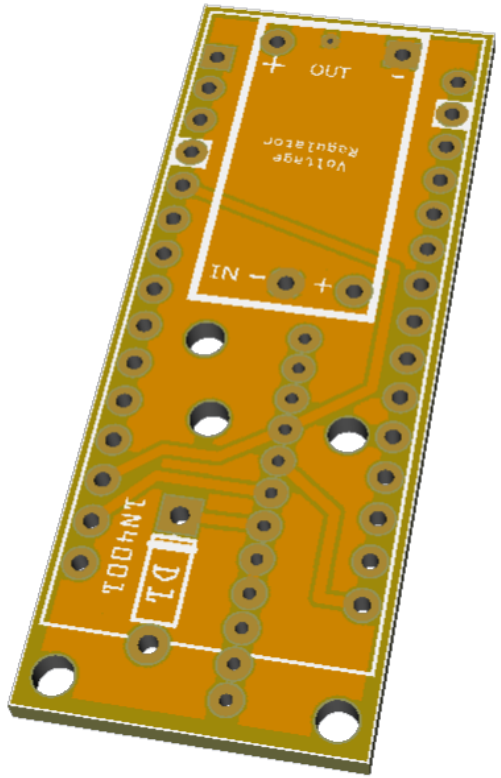
Front



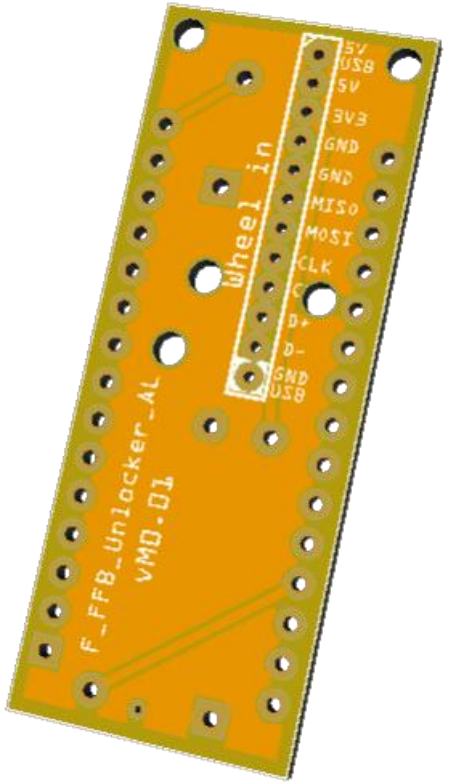
Back



3D Front

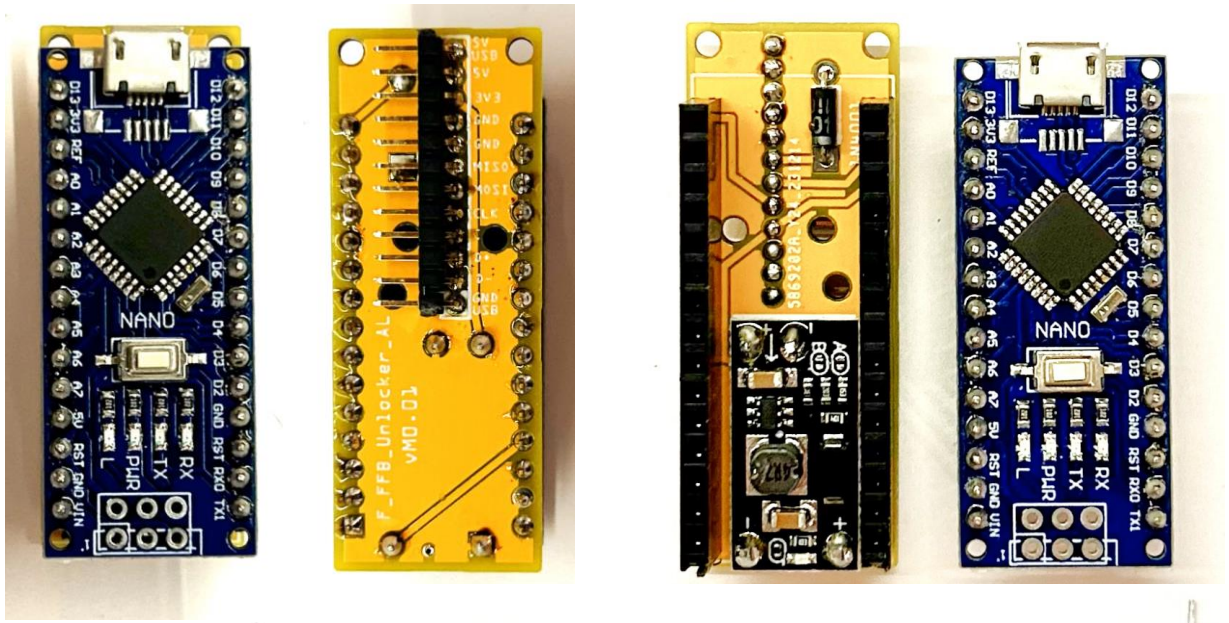


3D Back

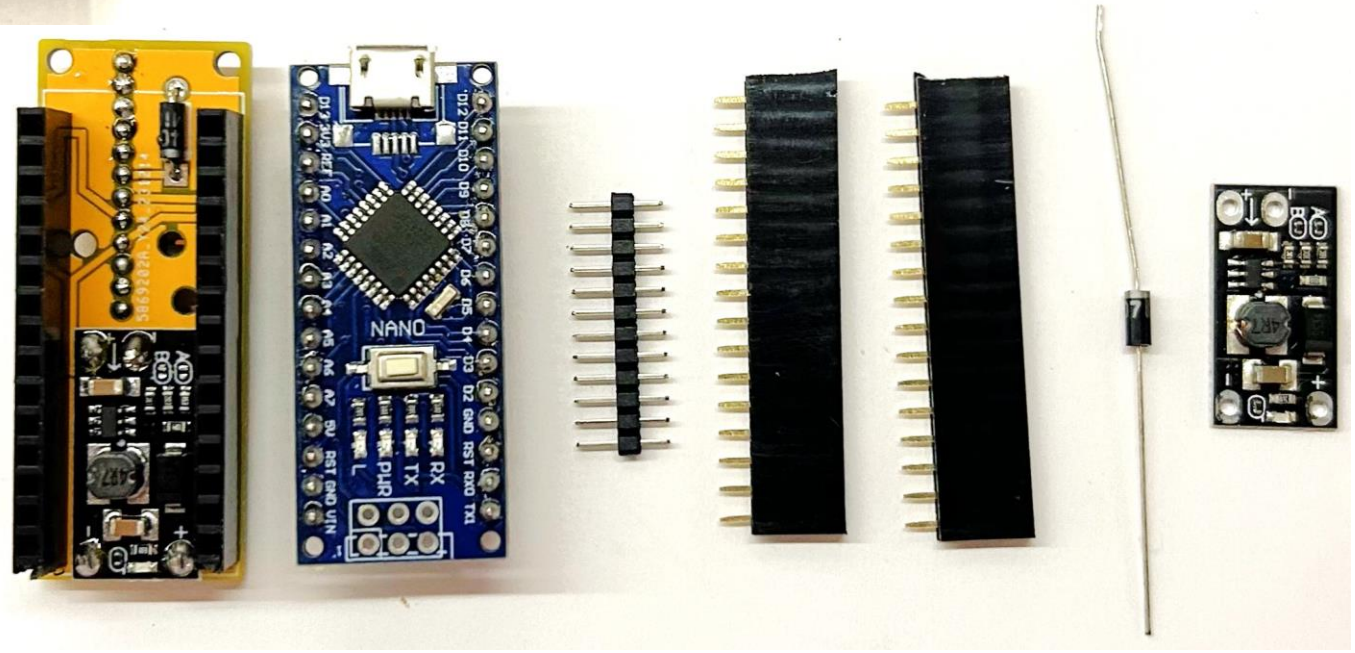


F_Interface - NANO_NO_HEADER

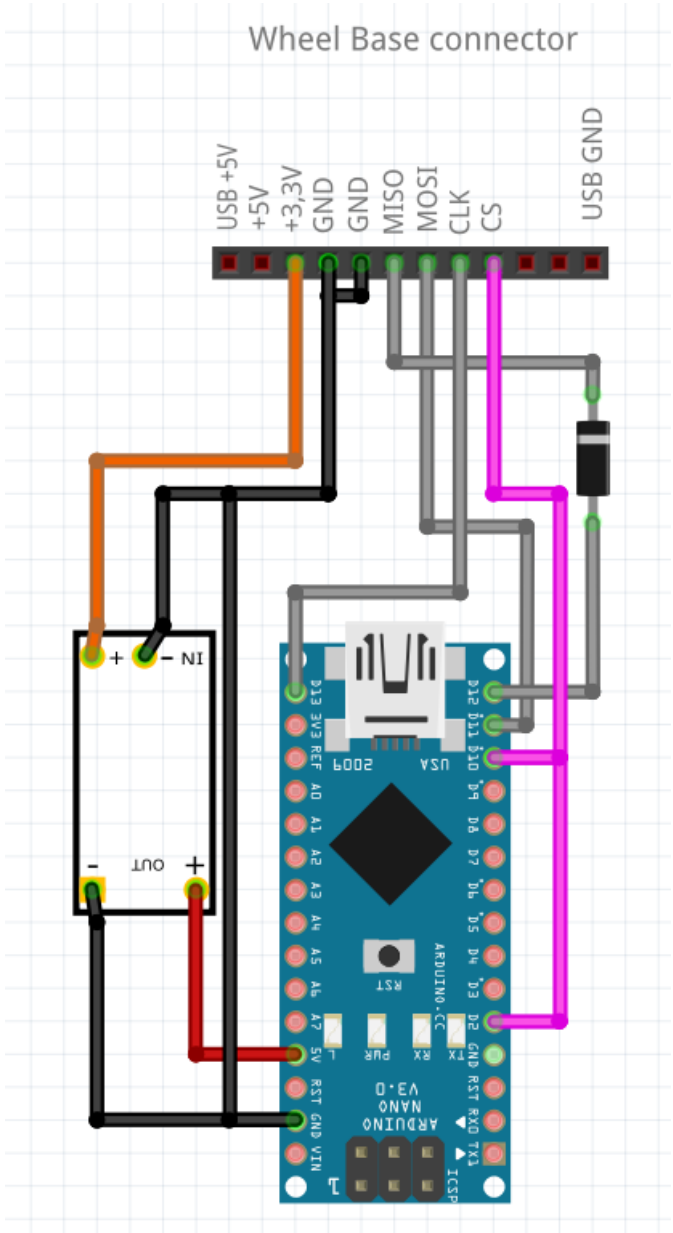
Picture



BOM

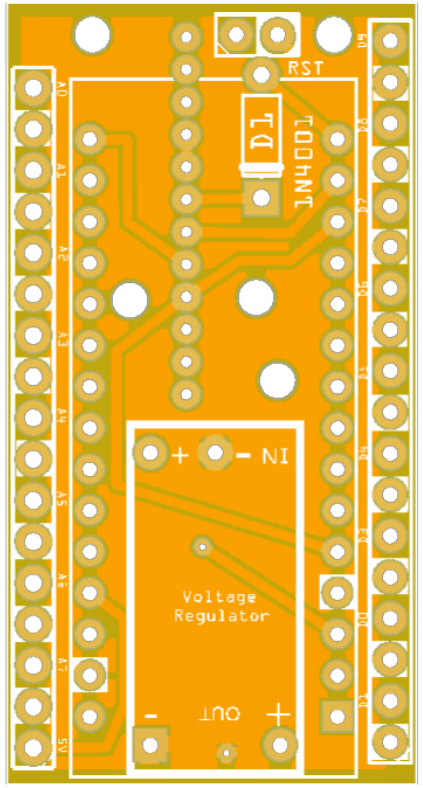


F_Interface - NANO_NO_HEADER



F_Interface - NANO_WITH_HEADER

Front



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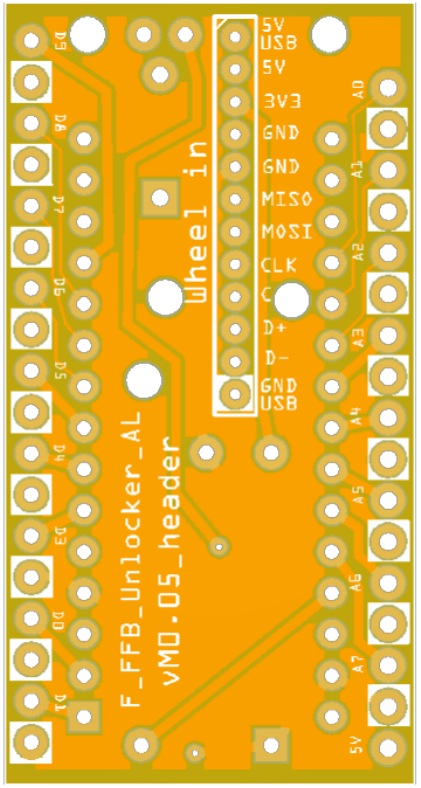
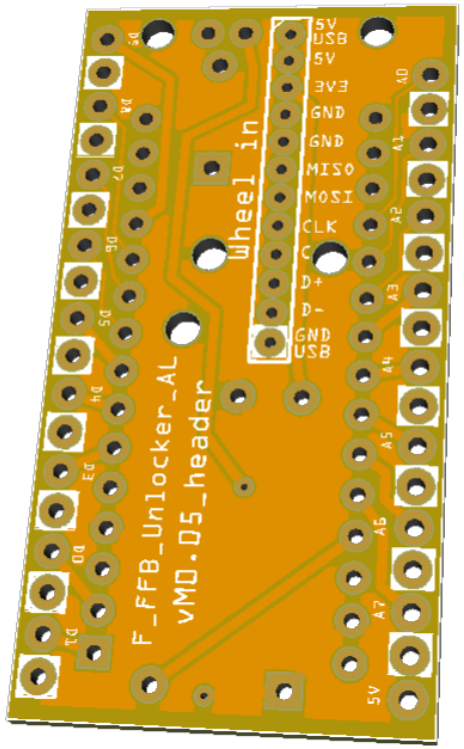
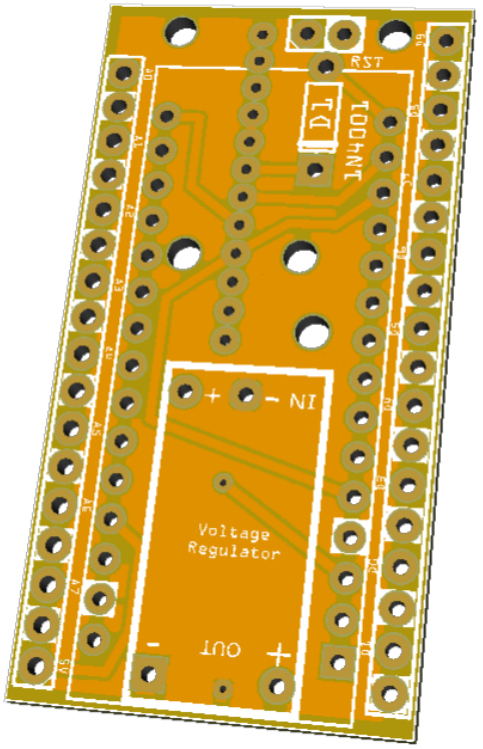


3D Front



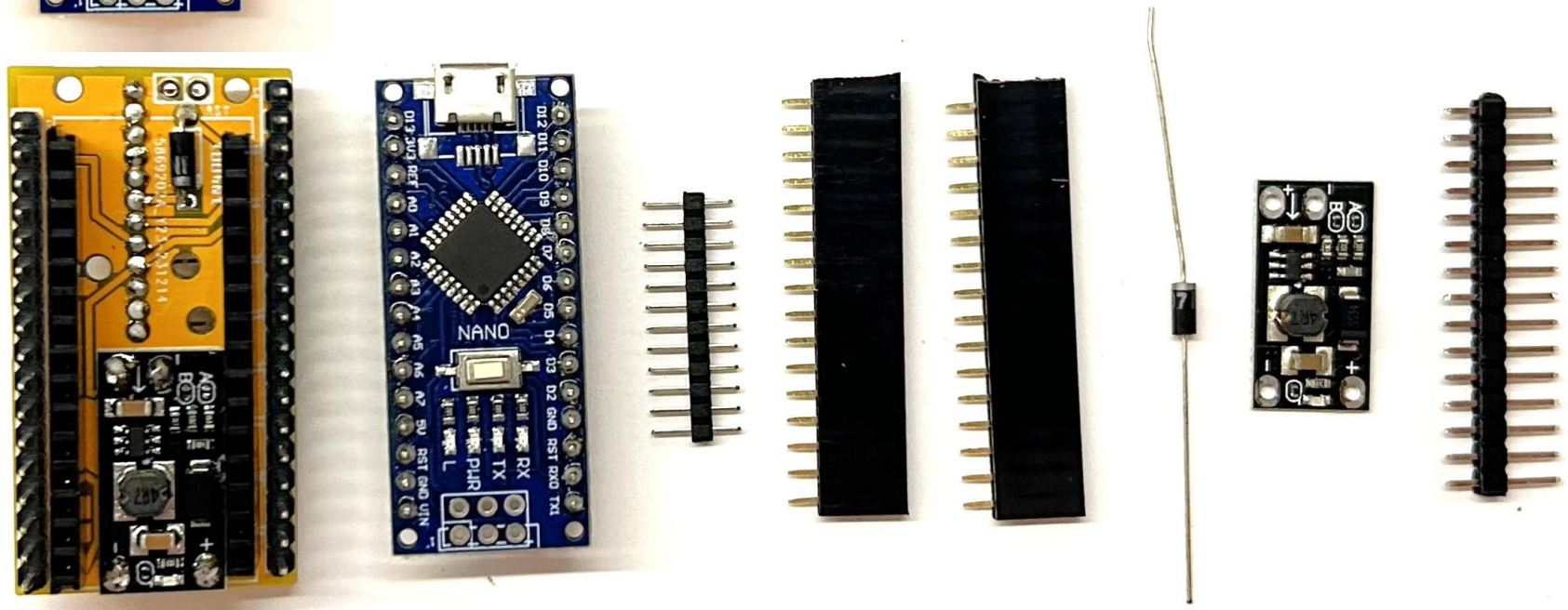
3D Back



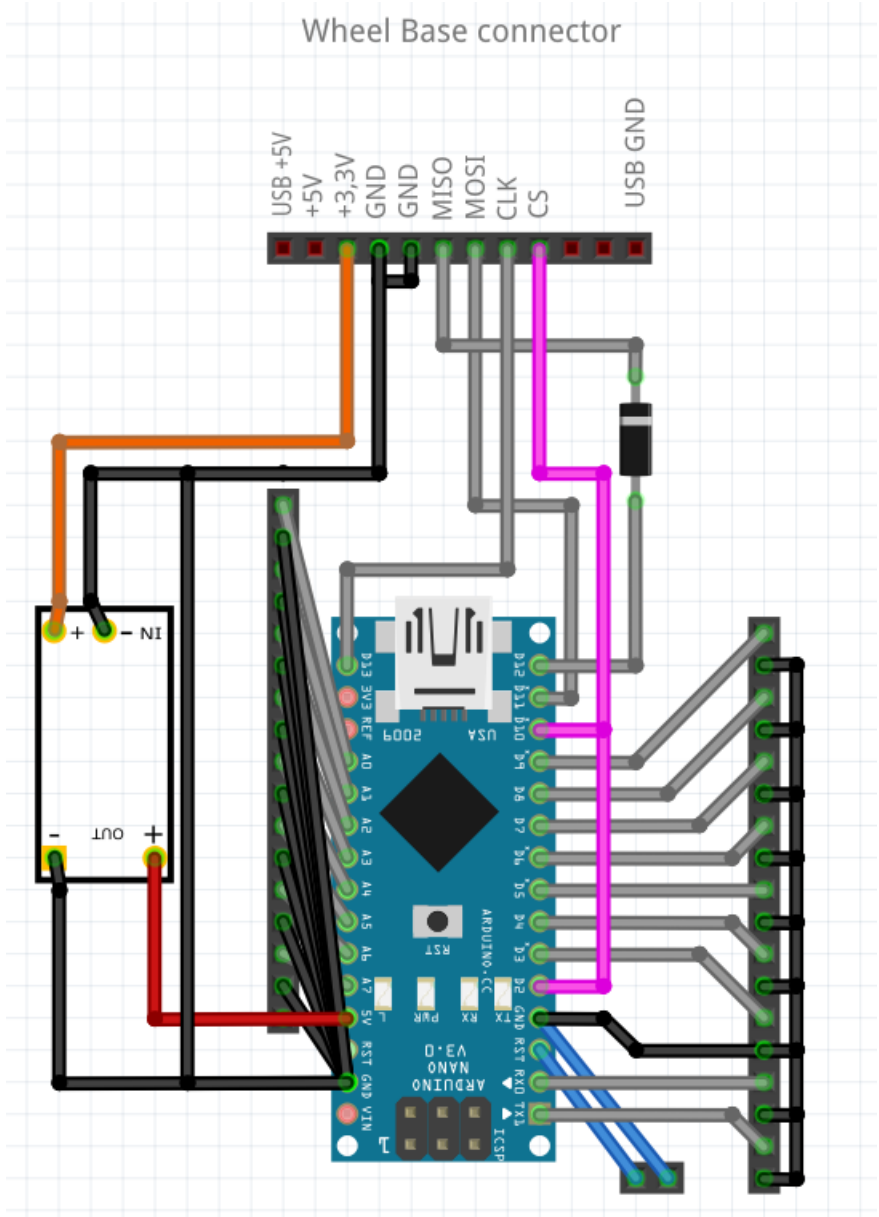
F_Interface - NANO_WITH_HEADER

Picture

BOM

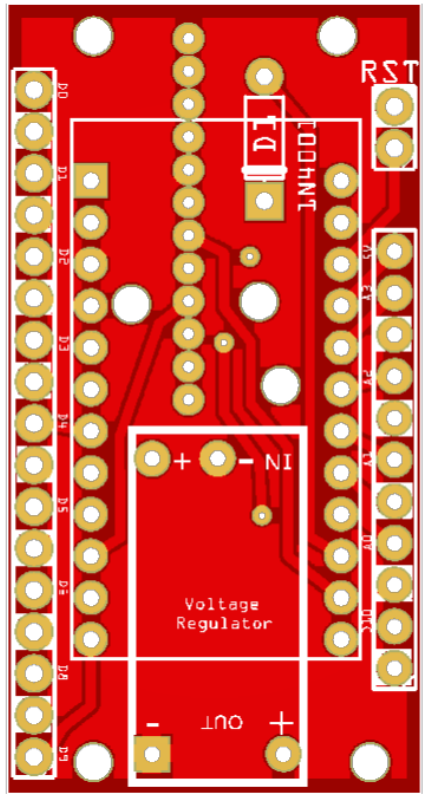


F_Interface - NANO_WITH_HEADER

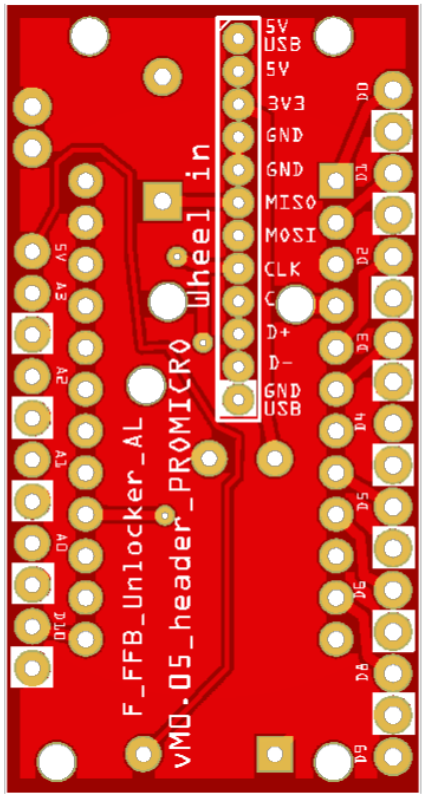


F_Interface - MICRO_WITH_HEADER

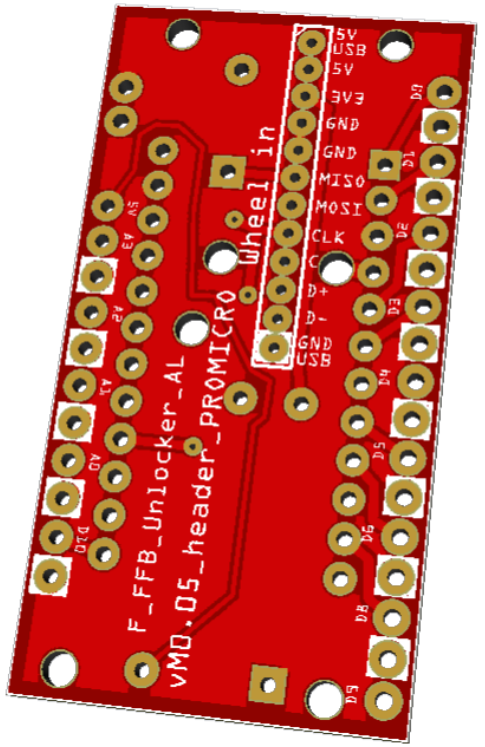
Front



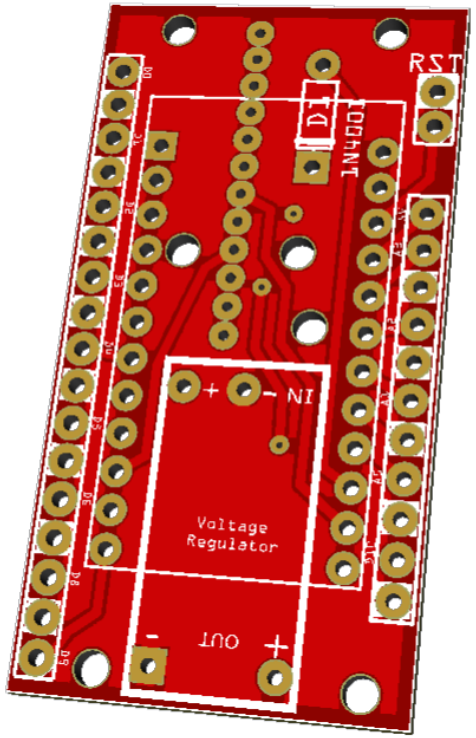
Back



3D Front

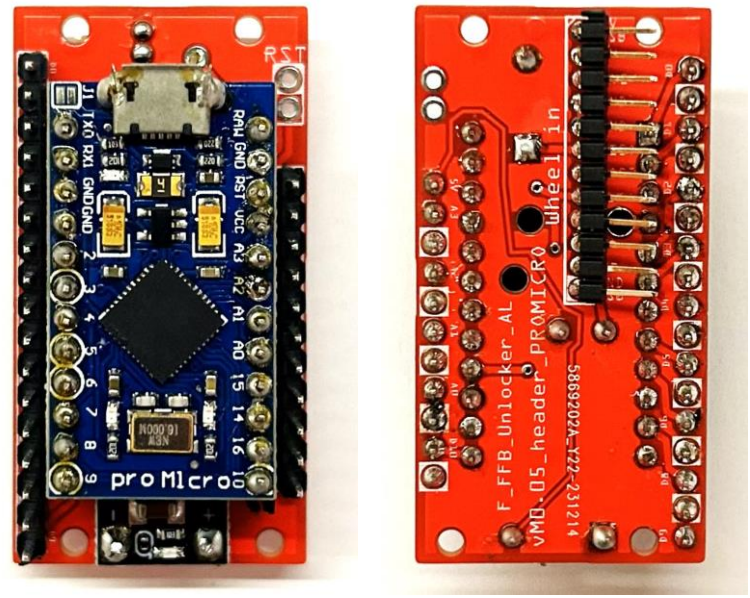


3D Back



F_Interface - MICRO_WITH_HEADER

Picture



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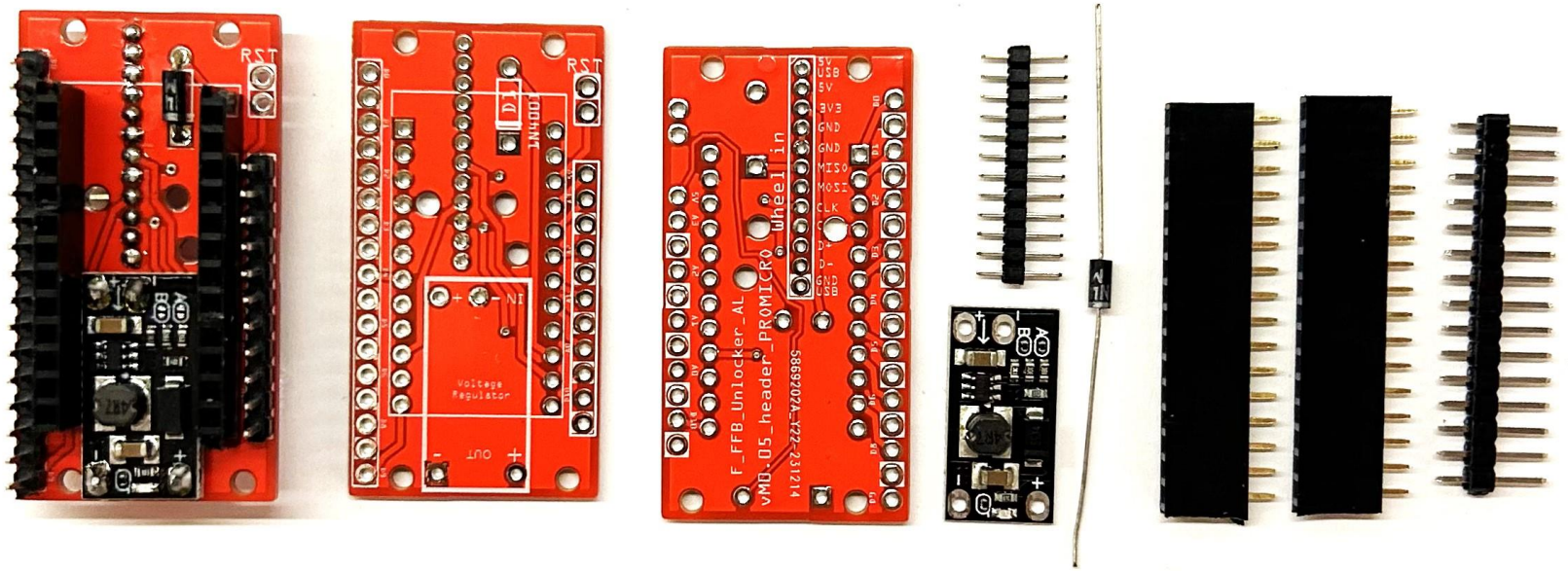
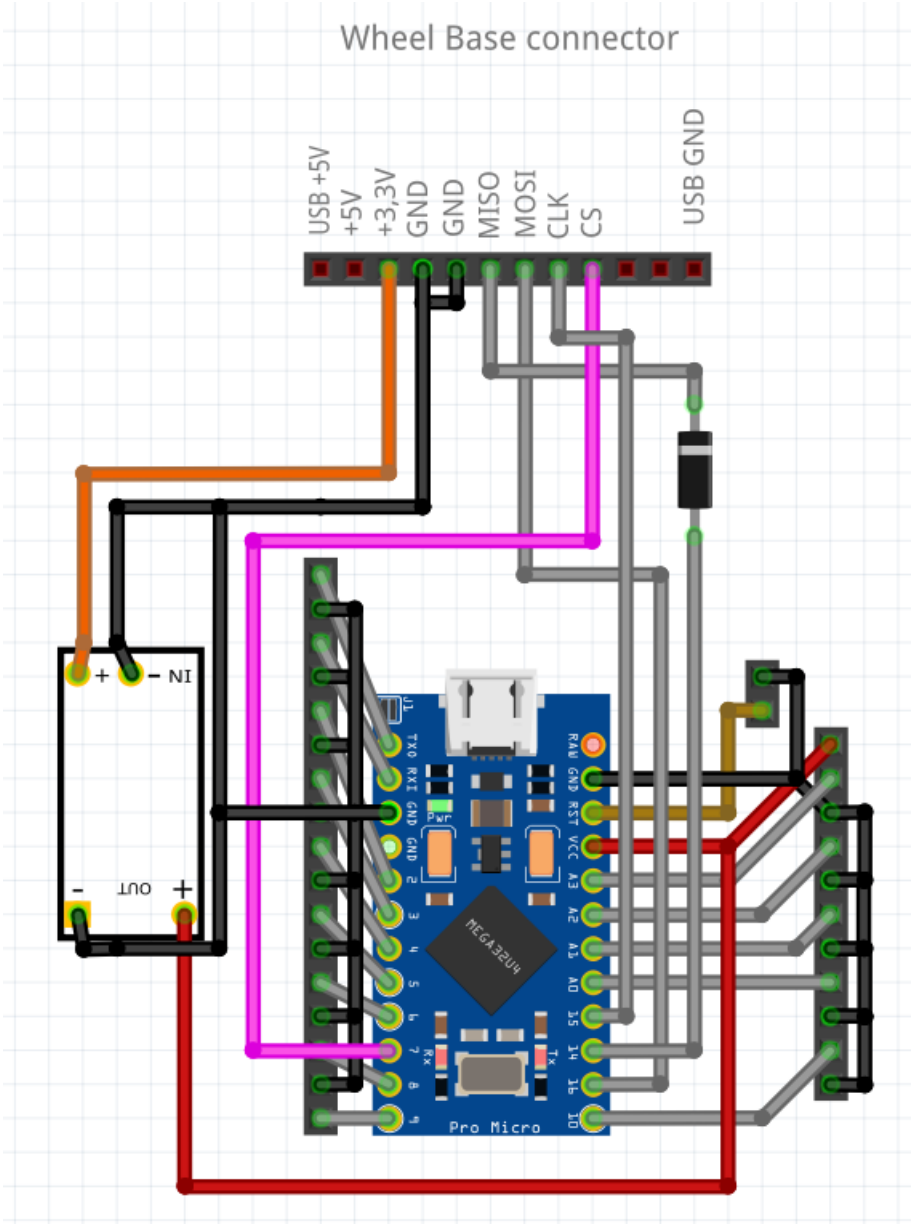
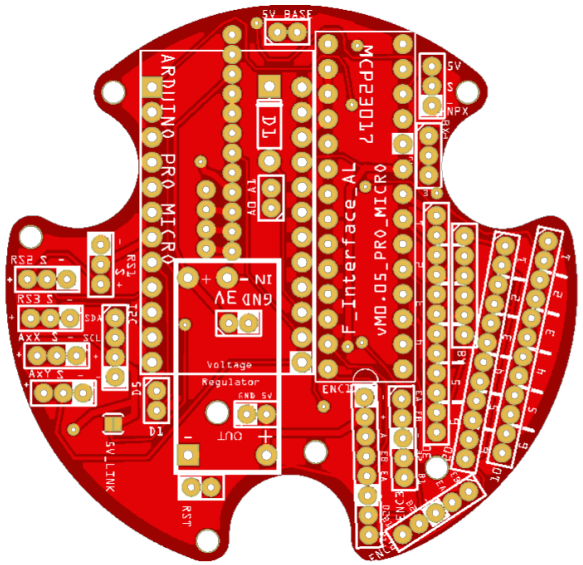


F_Interface - MICRO_WITH_HEADER

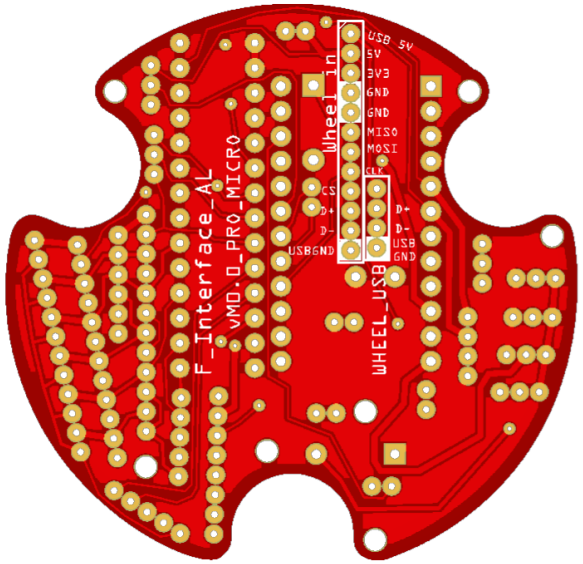


F_Interface – FULL_MICRO

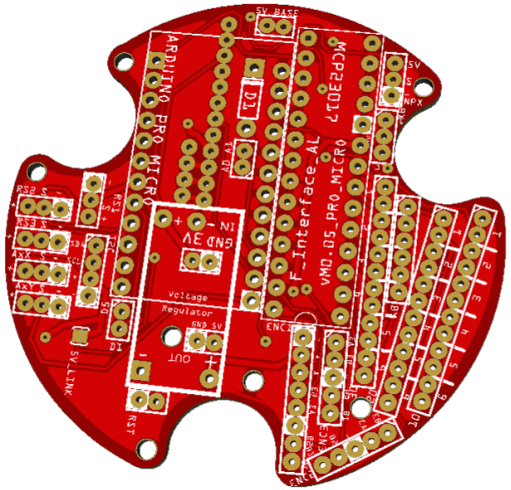
Front



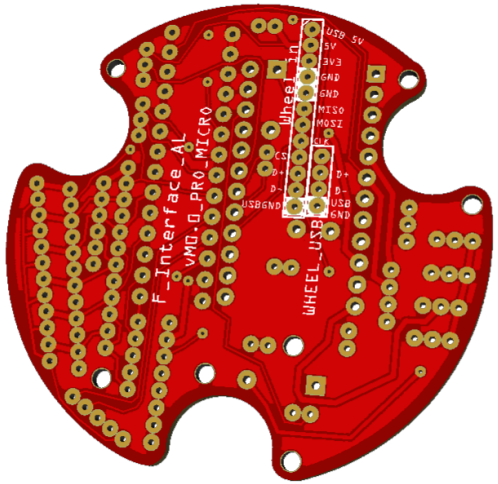
Back



3D Front

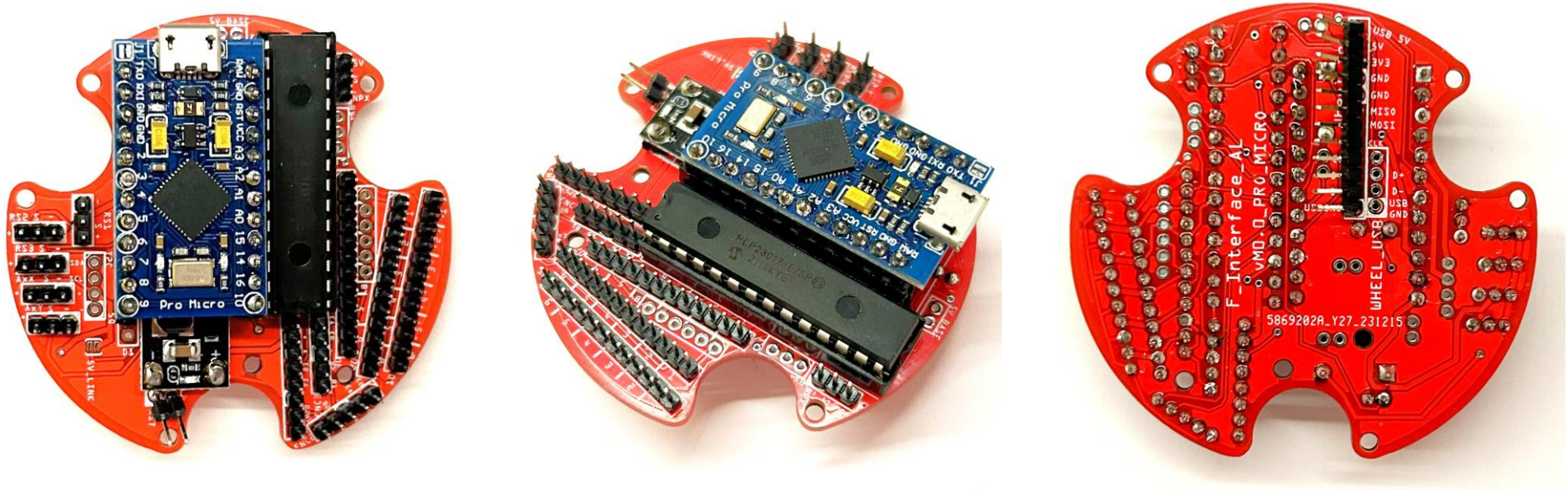


3D Back

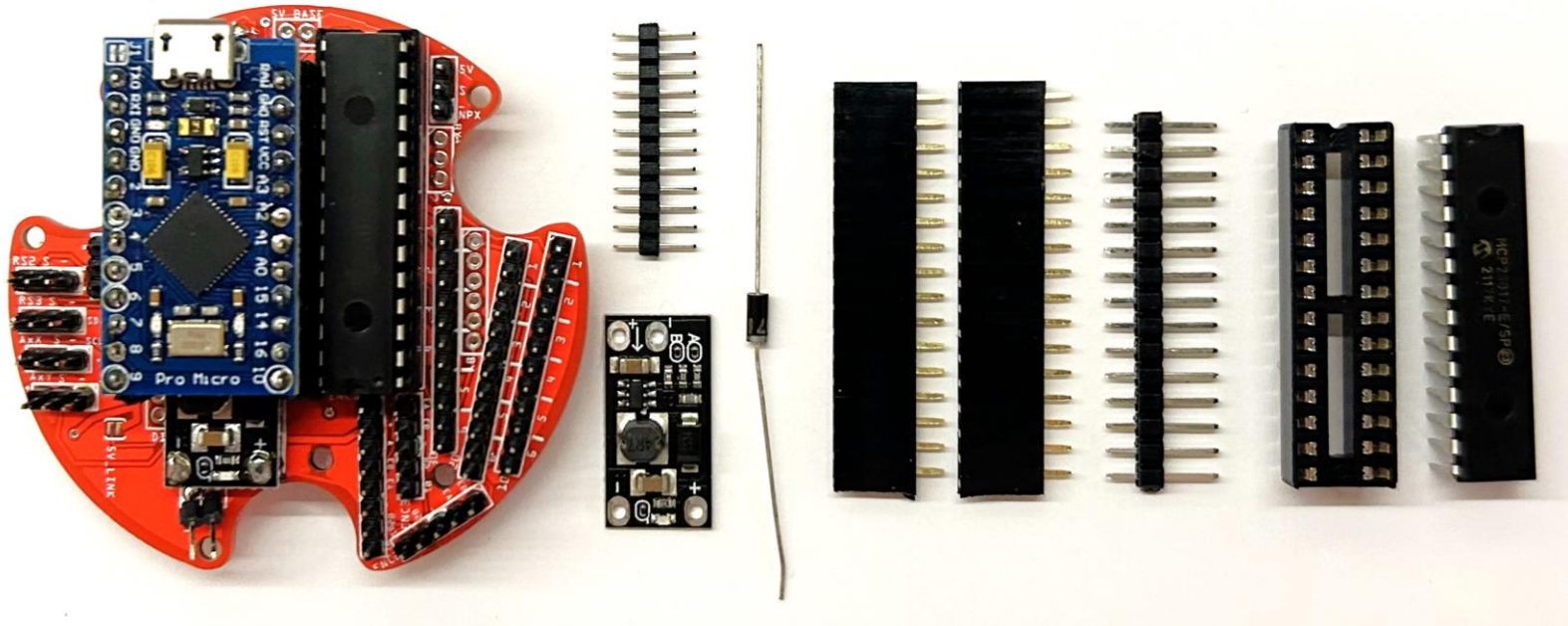


F_Interface – FULL_MICRO

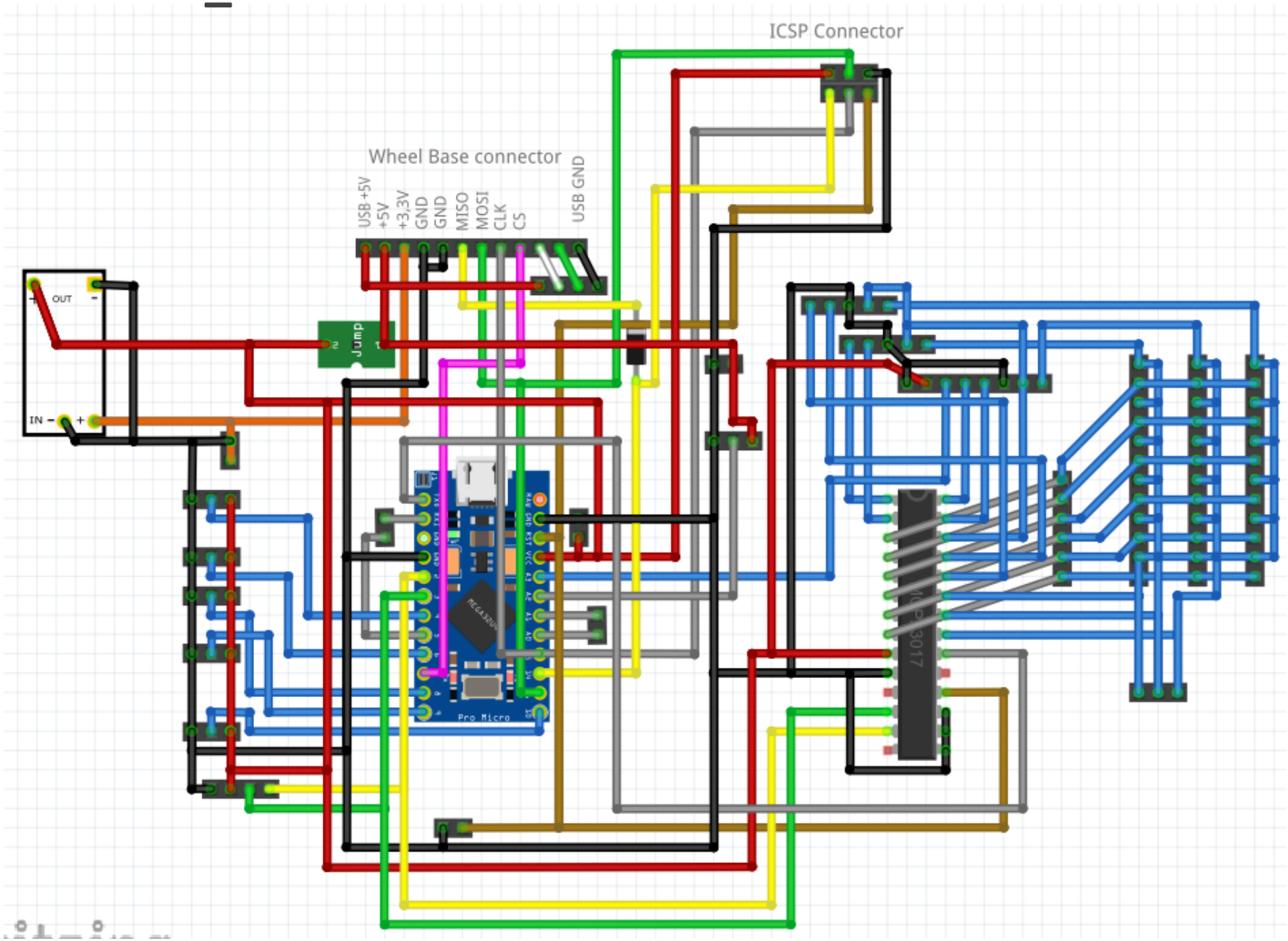
Picture



BOM

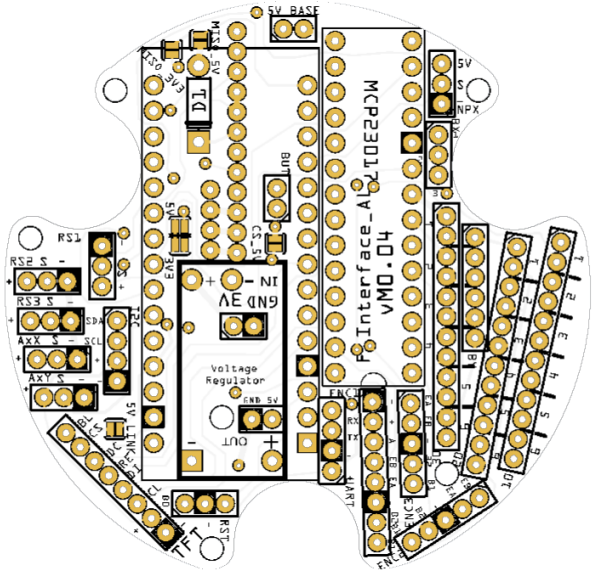


F_Interface – FULL_MICRO

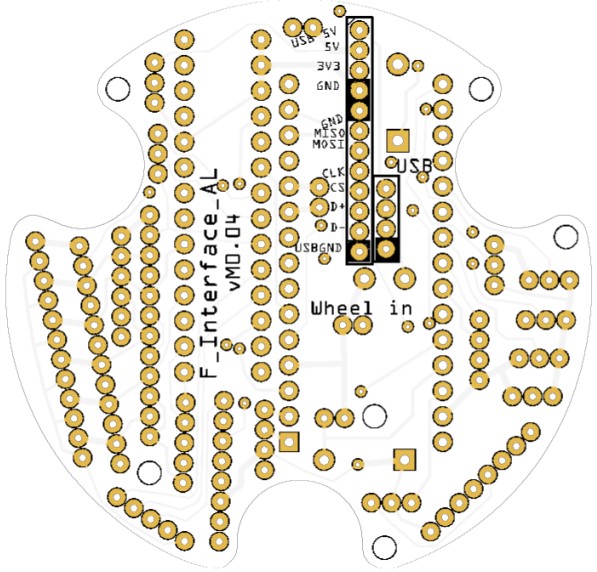


F_Interface – FULL_NANO

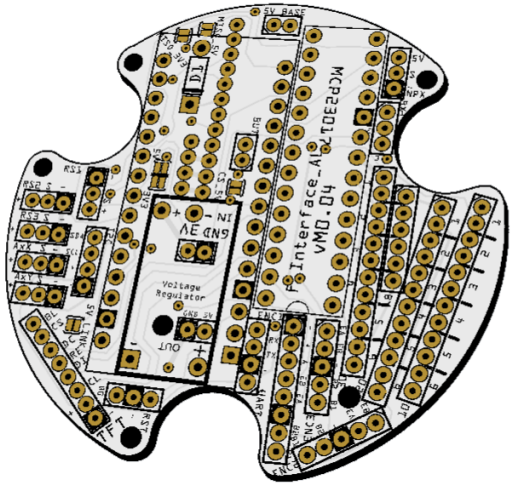
Front



Back



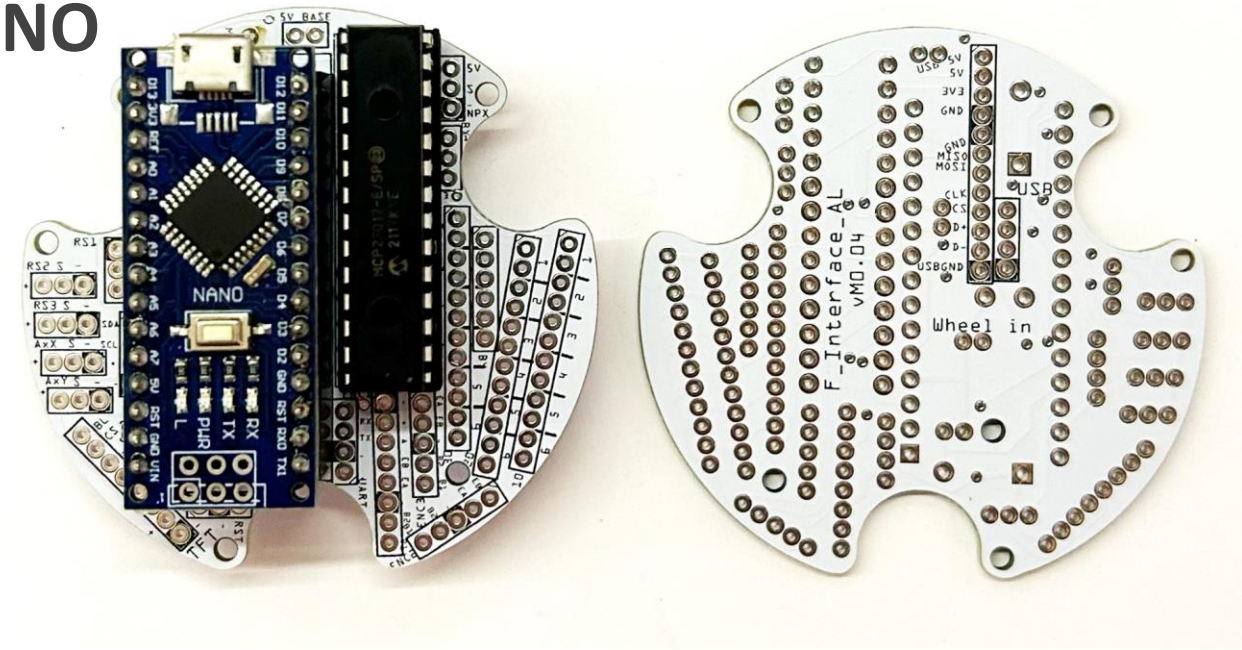
3D Front



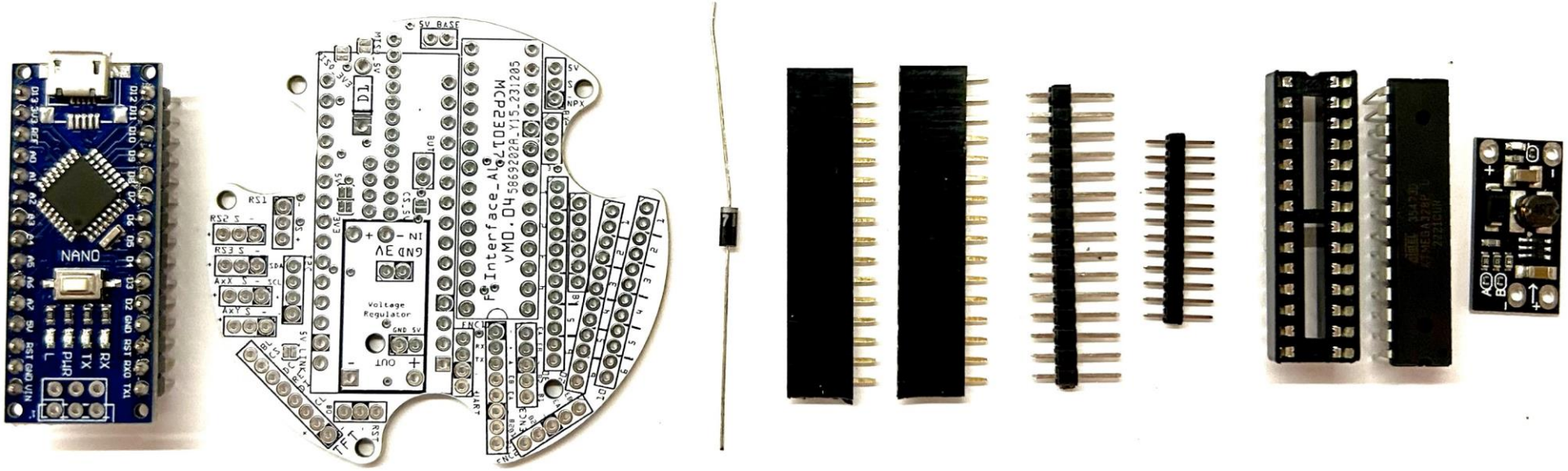
3D Back

F_Interface – FULL_NANO

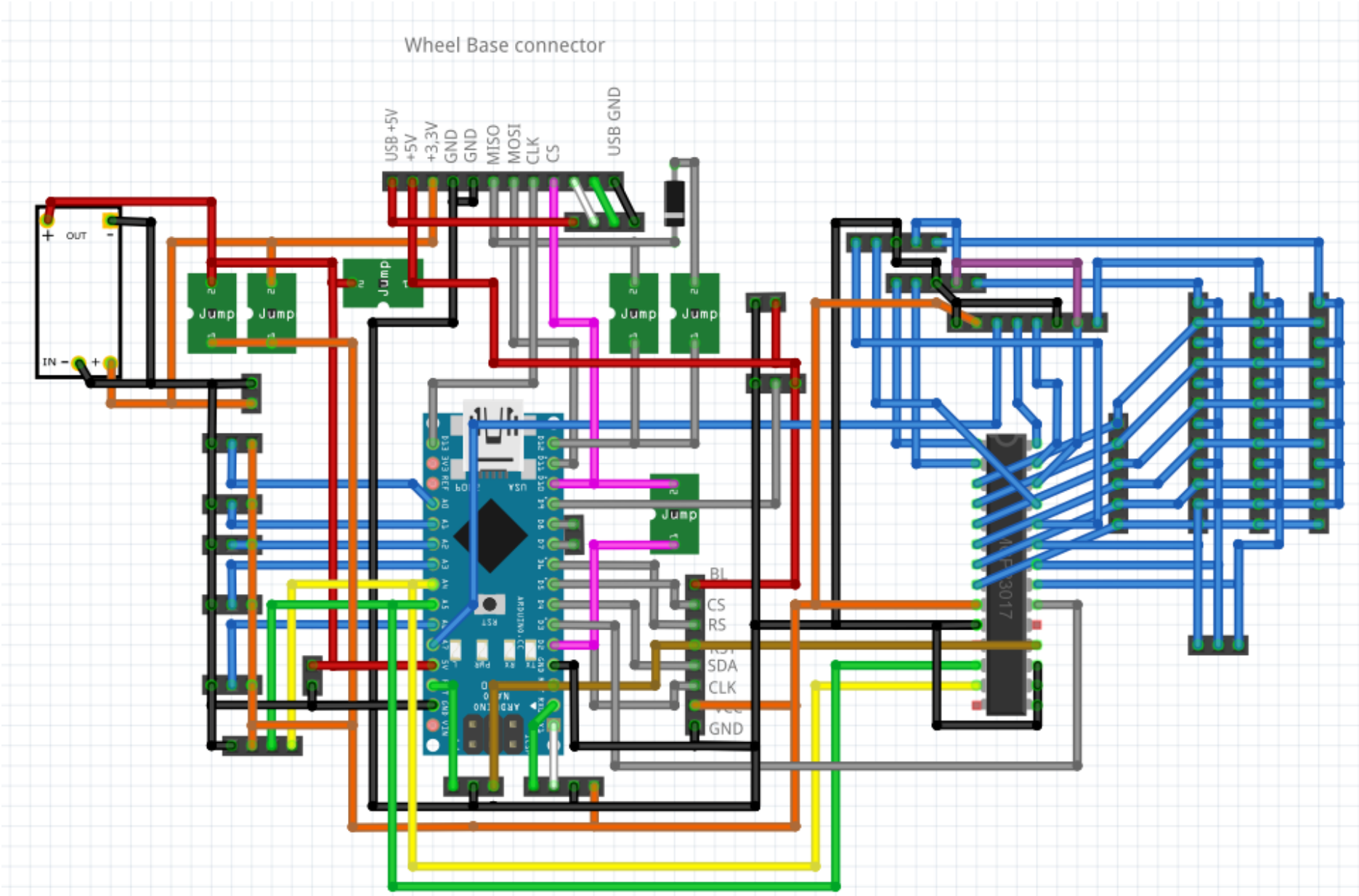
Picture



BOM

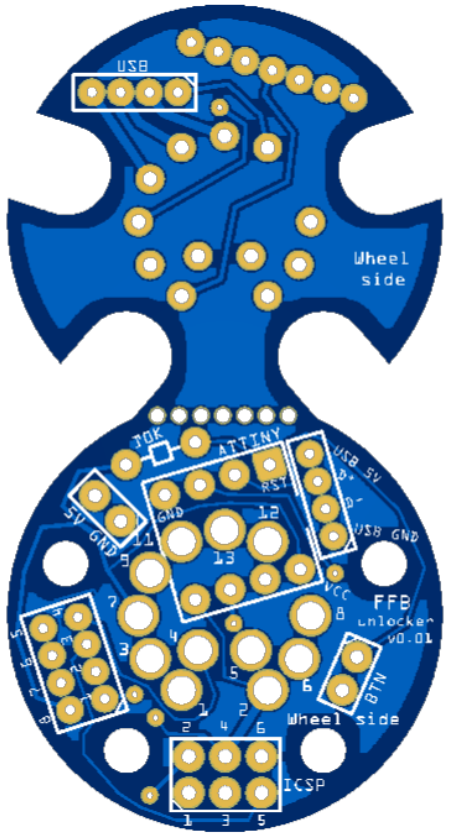


F_Interface – FULL_NANO

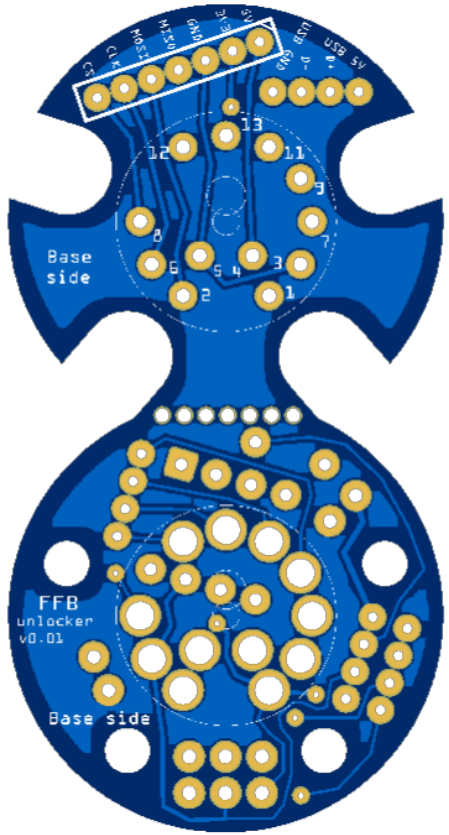


F_Interface – ATTINY85_NO_HEADER

Front



Back



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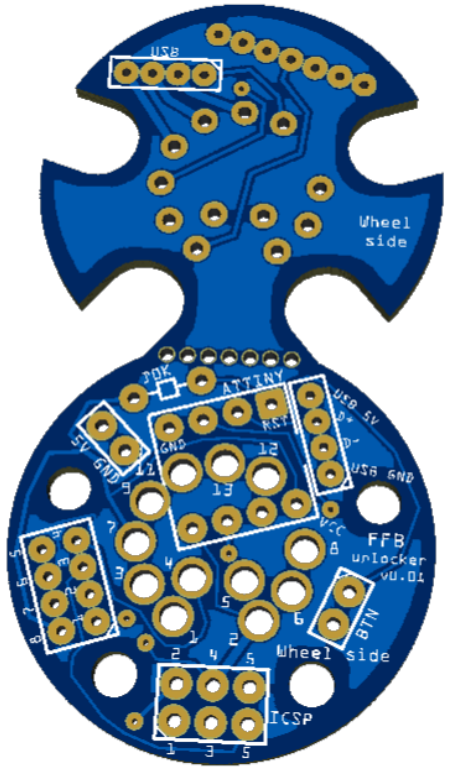

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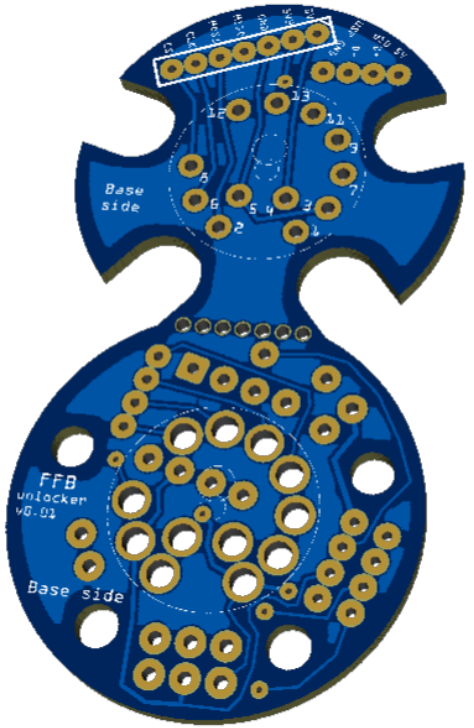
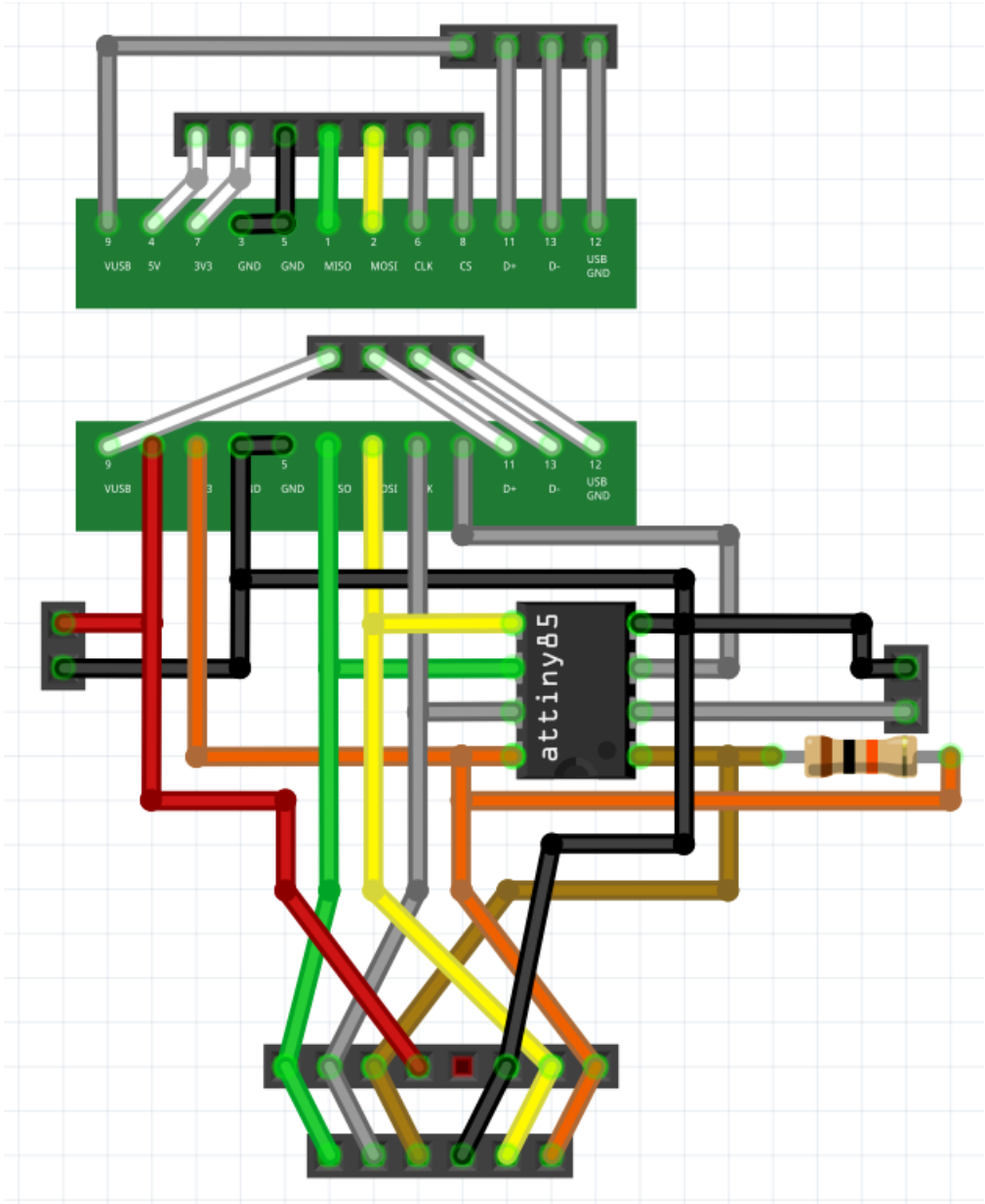
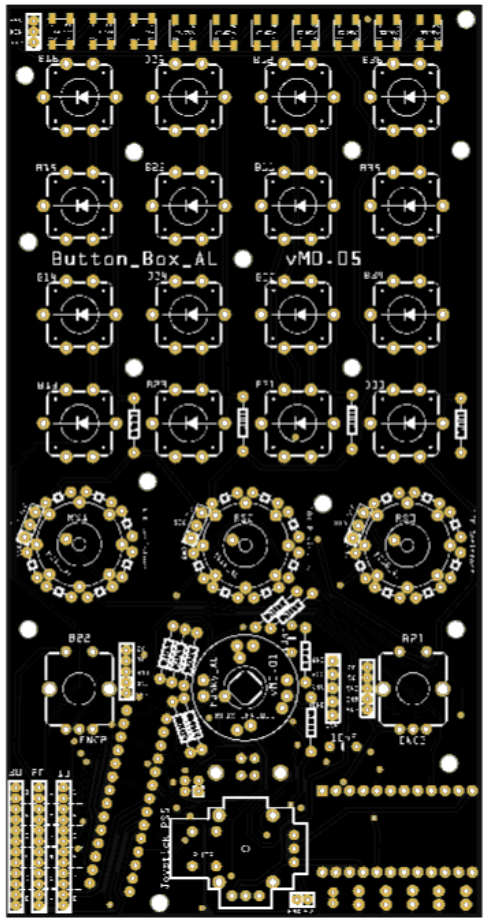


F_Interface – ATTINY85_NO_HEADER



F_Interface – BUTTON_BOX

Front



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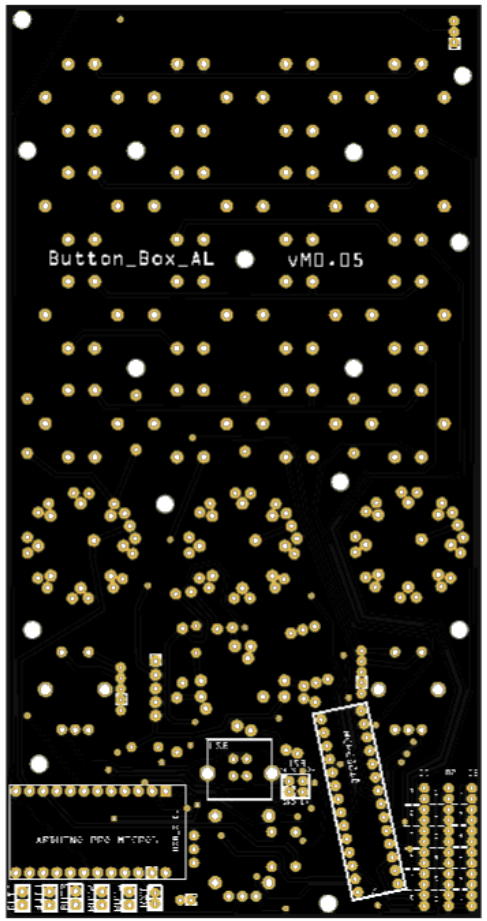
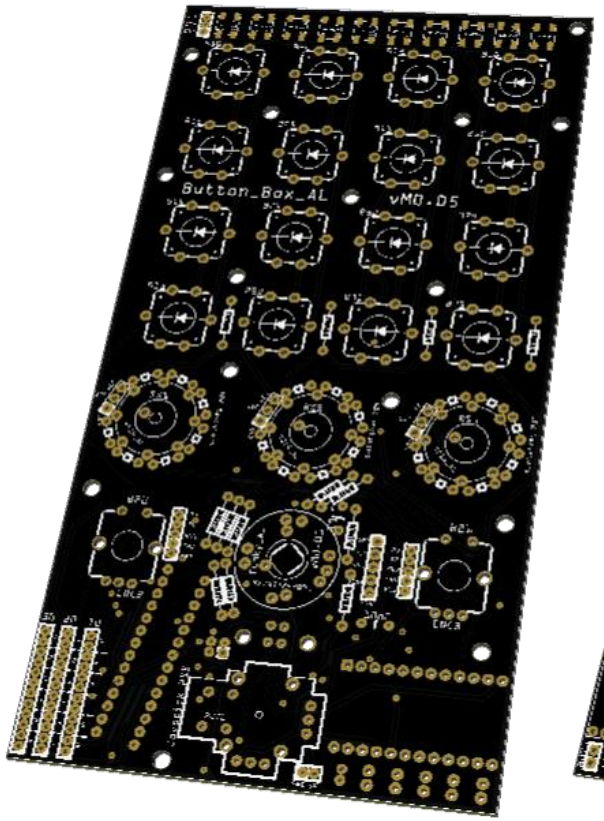


3D Front



3D Back

F_Interface – BUTTON_BOX