HDD Clock V3.0

This is the schematic for the Driver board of my HDD Persistence of Vision Clock V3.0

Main improvements of this driver board:

1. Powered fully from USB-C
2. APA102-2020 LEDs instead of WS2812B LEDs
   - The new LEDs are capable of 25x data speed.
   - the 2020 package takes up 60% less area allowing many more to be placed in the same space.
3. Integrated I2C PCB Temperature sensors.
4. Upgraded light mask and persistence of vision method.
   - This version uses several holes in the spinning light mask rather than 1 large slit. precise tracking of the holes and lighting of specific LEDs should allow for 'pixels' to be drawn around the spinning platter rather than just being able to draw a line from the center.
5. Potentiometer was replaced with an encoder.
   - It wasnt always clear to every user that there was an end to the travel of the potentiometer on V1 and V2. An encoder will remove this problem.
6. Right angle buttons replace the old buttons. Buttons reduced from 4 to 3.
   - Finding the old buttons was often difficult. Spacing the buttons out further and making them more visible should help this problem.
7. Wires have been removed from the assembly.
   - Connections between this driver board and the LED board are made with SMT spring-loaded PCB pins on the driver board and matching pin target on the LED board.

STM32F411

I2C_Devices

Power

Interface

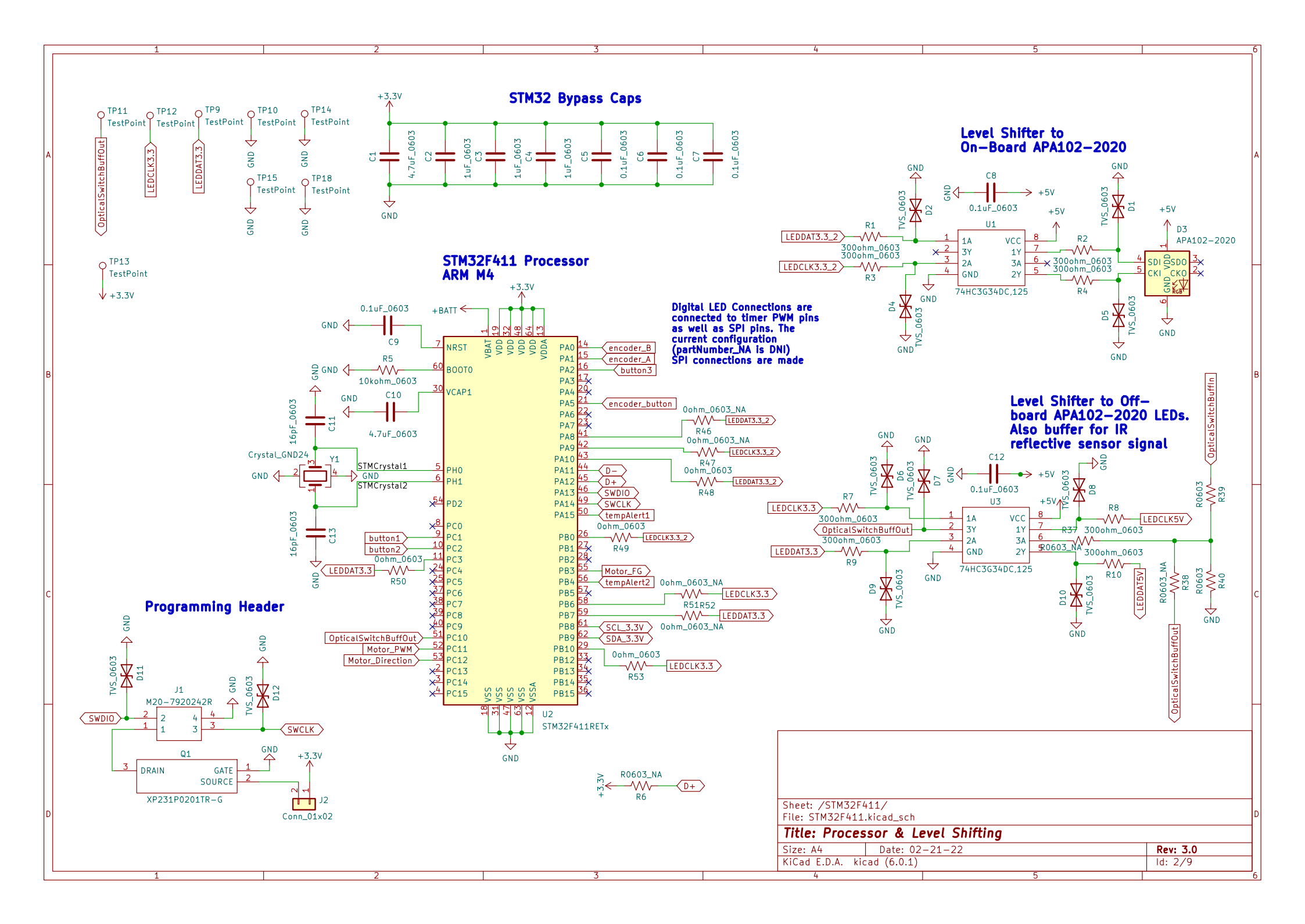
LED Board and Motor Connections

Mounting Holes

Sheet: /
File: HDD Clock V3.0_Driver Board.kicad_sch

Title: HDD Clock V3.0 Main Page

Size: A4	Date: 02-21-22	**Rev: 3.0**
KiCad E.D.A. kicad (6.0.1)		Id: 1/9



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Title: Processor & Level Shifting		
Size: A4	Date: 02-21-22	**Rev: 3.0**
KiCad E.D.A. kicad (6.0.1)		Id: 2/9

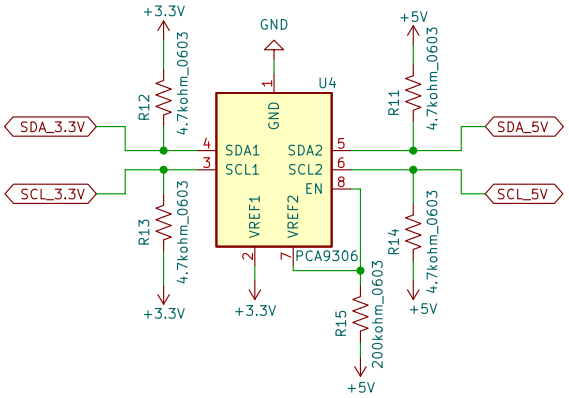
5V_I2C

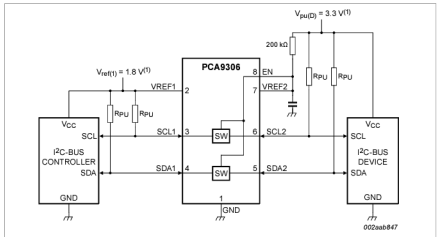
File: 5V_I2C.kicad_sch

3V3_I2C

File: 3V3_I2C.kicad_sch

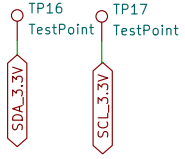
I2C Level Shifter





1. The applied voltages at $V_{ref(1)}$ and $V_{pu(D)}$ should be such that $V_{bias(ref)(2)}$ is at least 1 V higher than $V_{ref(1)}$ for best translator operation.

Figure 9. Typical application circuit (switch always enabled)



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Title: I2C Level Shifting

Size: A4	Date: 02-21-22	**Rev: 3.0**
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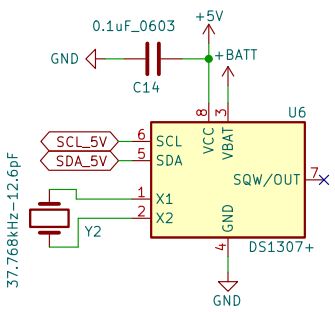
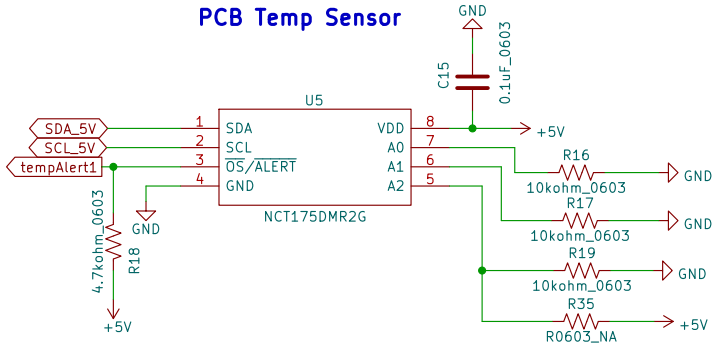
Real Time Clock

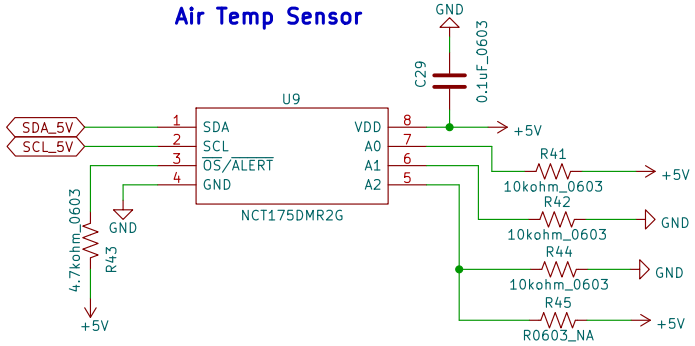


PCB Temp Sensor



address setting resistors

Air Temp Sensor



address setting resistors

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Title: +5V I2C		
Size: A4	Date: 02-21-22	**Rev: 3.0**
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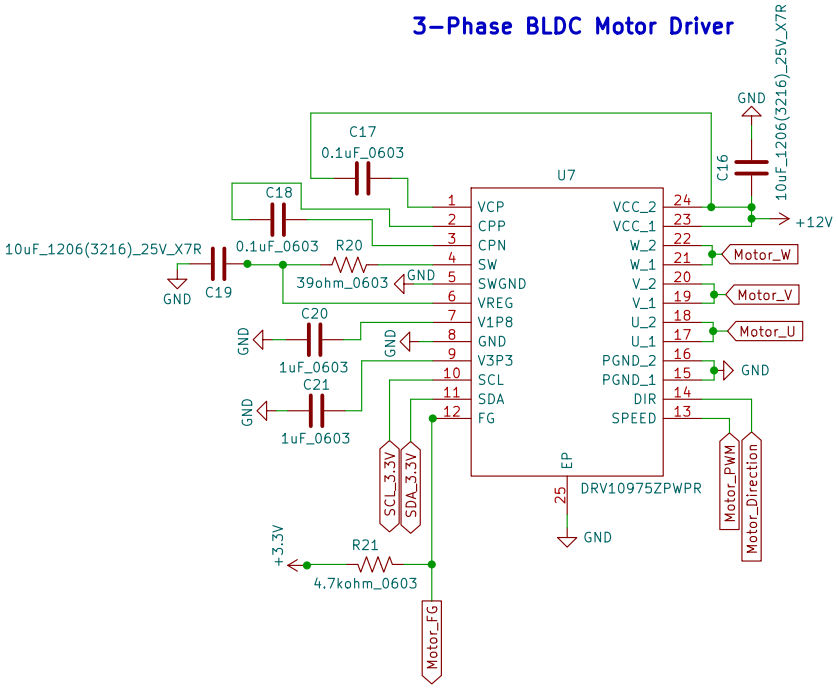
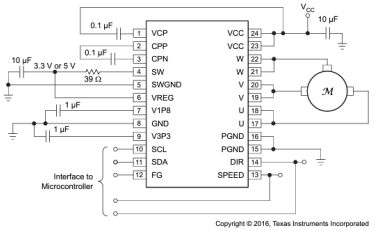
3-Phase BLDC Motor Driver



Application Schematic



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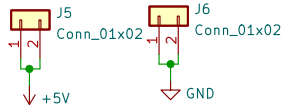
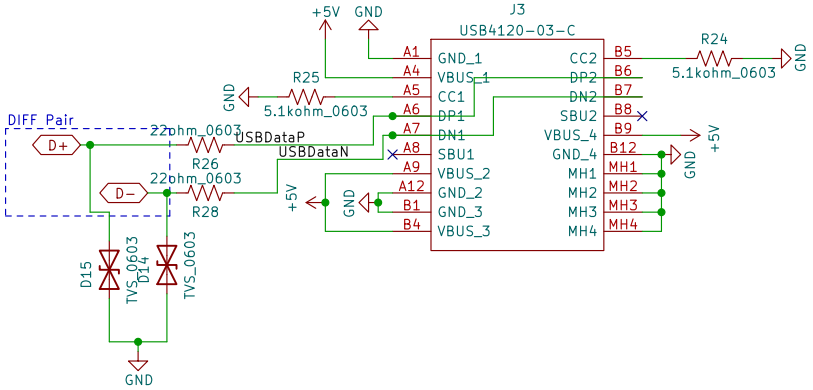
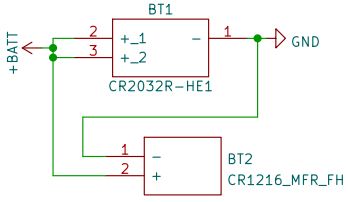
Backup Power Input



USB-C (USB 2.0)

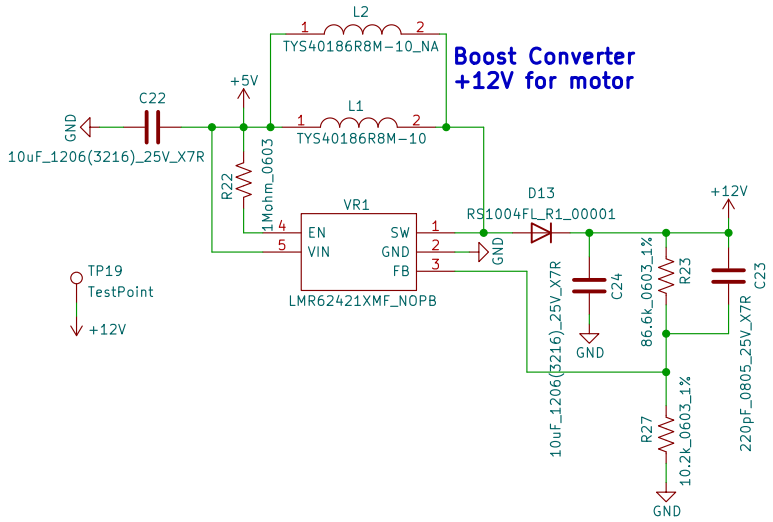


RTC Battery Backup

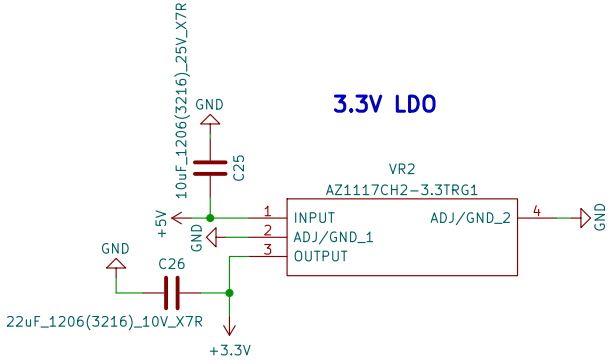


L2 is backup footprint in case L1 does not fit in the case

Boost Converter +12V for motor



3.3V LDO



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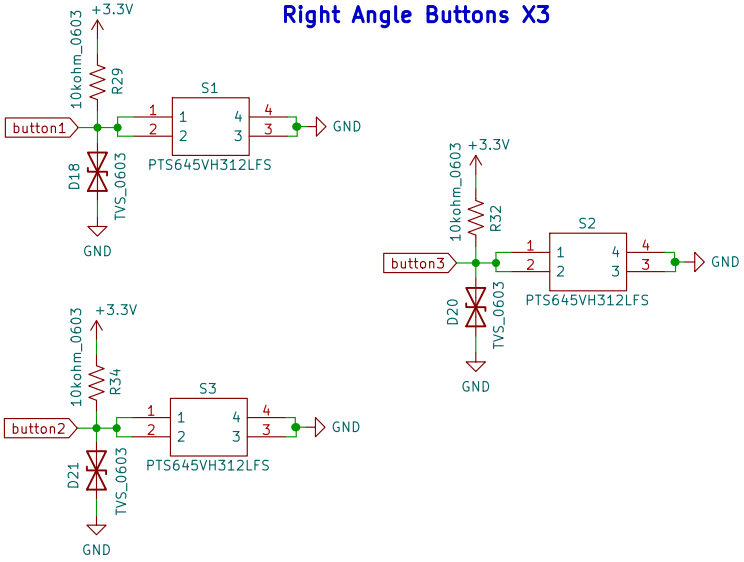
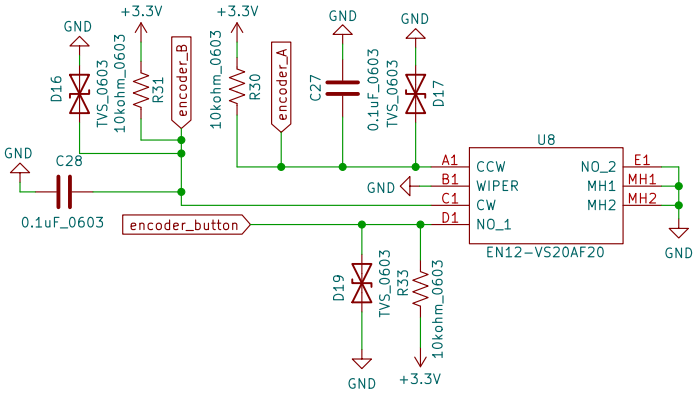
Right Angle Buttons X3



Right Angle Encoder
24 pulses/rotation



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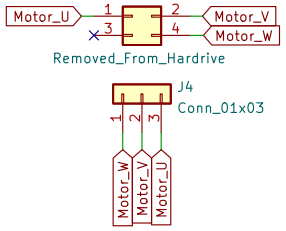
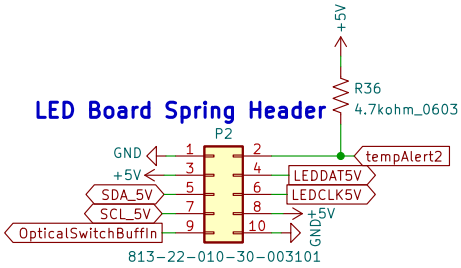
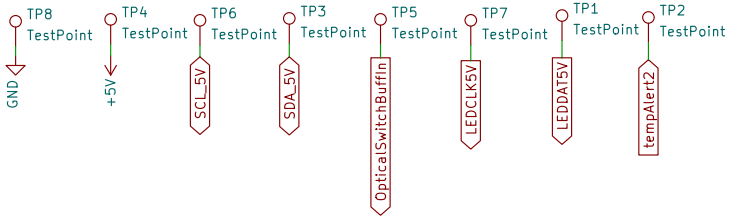
Motor Connections



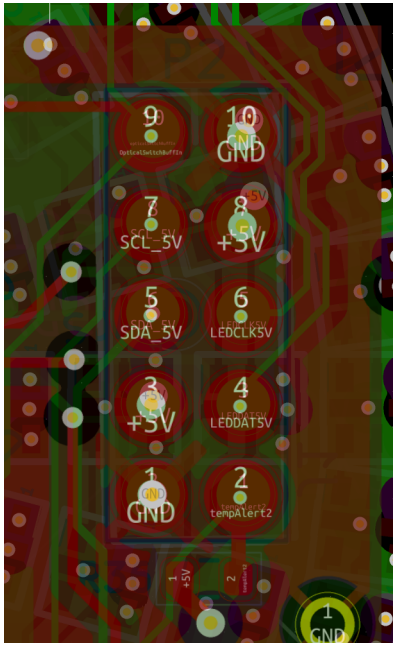
LED Board Spring Header



Test point for connection verification



Confirmed stackup connections



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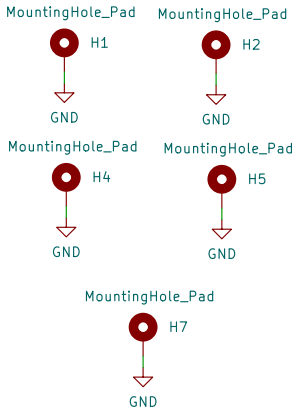
Screw Mounting Holes



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