

1. This assembly has multi-layer ceramic capacitors (MLCC). MLCCs can be damaged with heat. Heat shall be controlled while soldering to prevent damage To MLCC Capacitors.
2. Use Kapton tape to secure components highlighted RED prior to placing parts on the opposite side of the PCB and prior to second reflow. See page 4 for second reflow instructions.
 1. These components are spring-pin connectors and have critical placement. Ensure these components are placed directly in the center of their footprint prior to first reflow.
3. Components highlighted PURPLE are resistors directing the optical sensor signal either into the buffer or directly into the MCU. The current configuration has the optical sensor signal fed directly into the processor. Install:
 1. R7 – 0 ohm 0603 – Resistor to signal in resistor divider
 2. R15 – DNI (Do not Install) – Resistor to ground in resistor divider
 3. R16 – 0 ohm 0603 – Buffer Bypass Resistor
 4. R11 – DNI – Resistor Feeding Into Buffer (opposite side of PCB)

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| Project: | | |
| HDD Clock V4.0 Driver Board PCB Assembly | | |
| Pg. Description: | | |
| Bottom Side SMT Polarity and Component Notes | | |
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4. Now that the bottom side of the PCB has been assembled we need to suspend the bottom components while applying solder paste and placing components.

The Driver Board Solder Paste Stencil Jig can be used for both applying solder paste to the top side of the PCB as well as a holder while components are being placed.

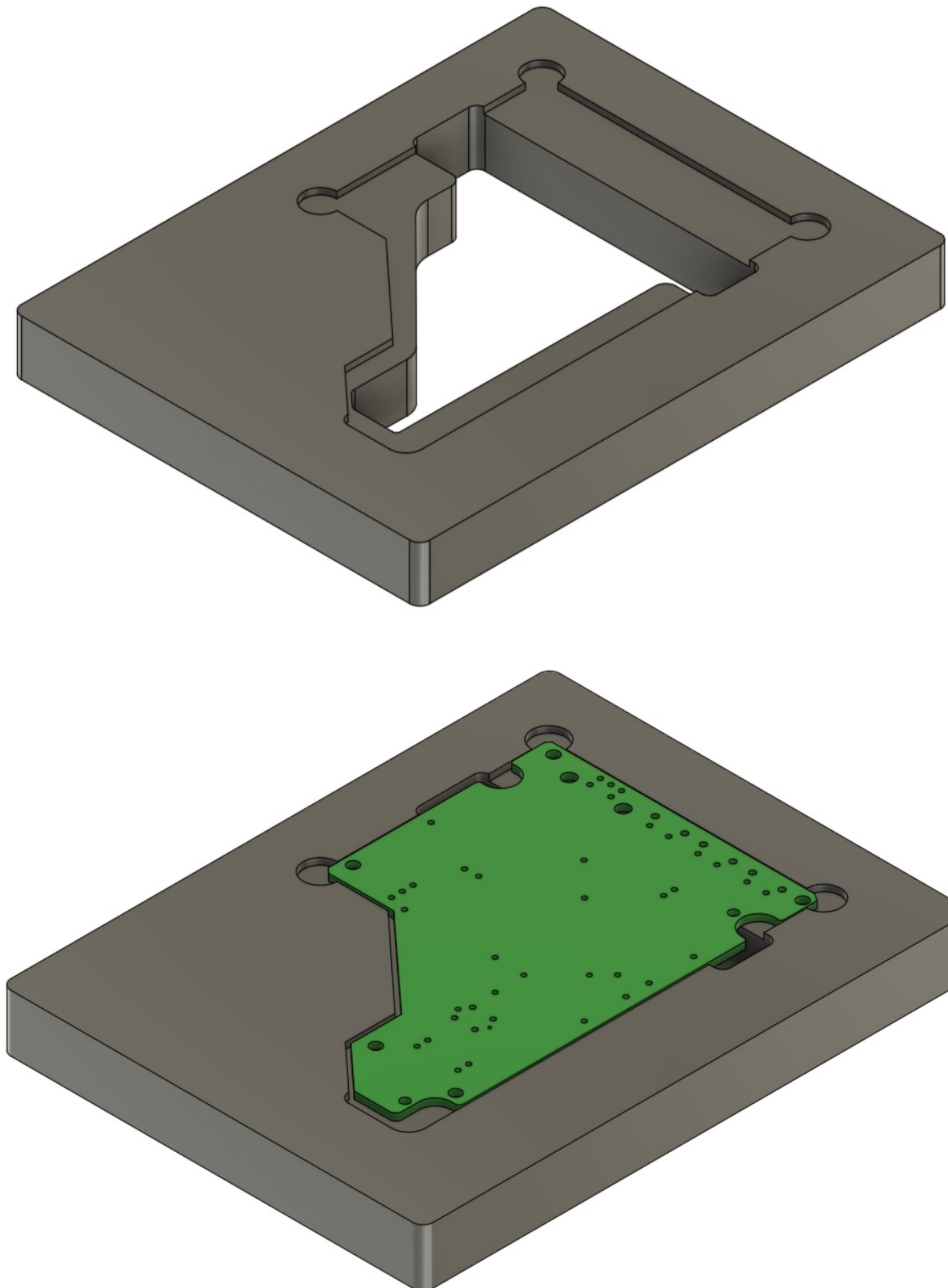
Print settings for this jig:

1. Layer height of 0.25mm to ensure the PCB pocket is 1.5mm deep (PCB is 1.6mm).
2. Enable ironing to ensure a smooth top surface
3. 10-15% infill should be sufficient

When using this jig ensure that it is not exposed to heat past the glass transition point of the plastic used. PLA has a glass transition point of ~60C.

Steps to use this jig:

1. Using double sided tape, secure the jig to the top of a stable surface.
2. Carefully place the Driver Board PCB, placed parts down, into the paste jig.
3. Align the stencil to the jig and secure it using tape. The jig is about the same size as the ordered solder stencil.
4. Using an appropriate tool, apply solder paste to the PCB.
5. Carefully remove the PCB from the jig using tweezers or leave it for parts placement.



Project:

HDD Clock V4.0 Driver Board PCB Assembly

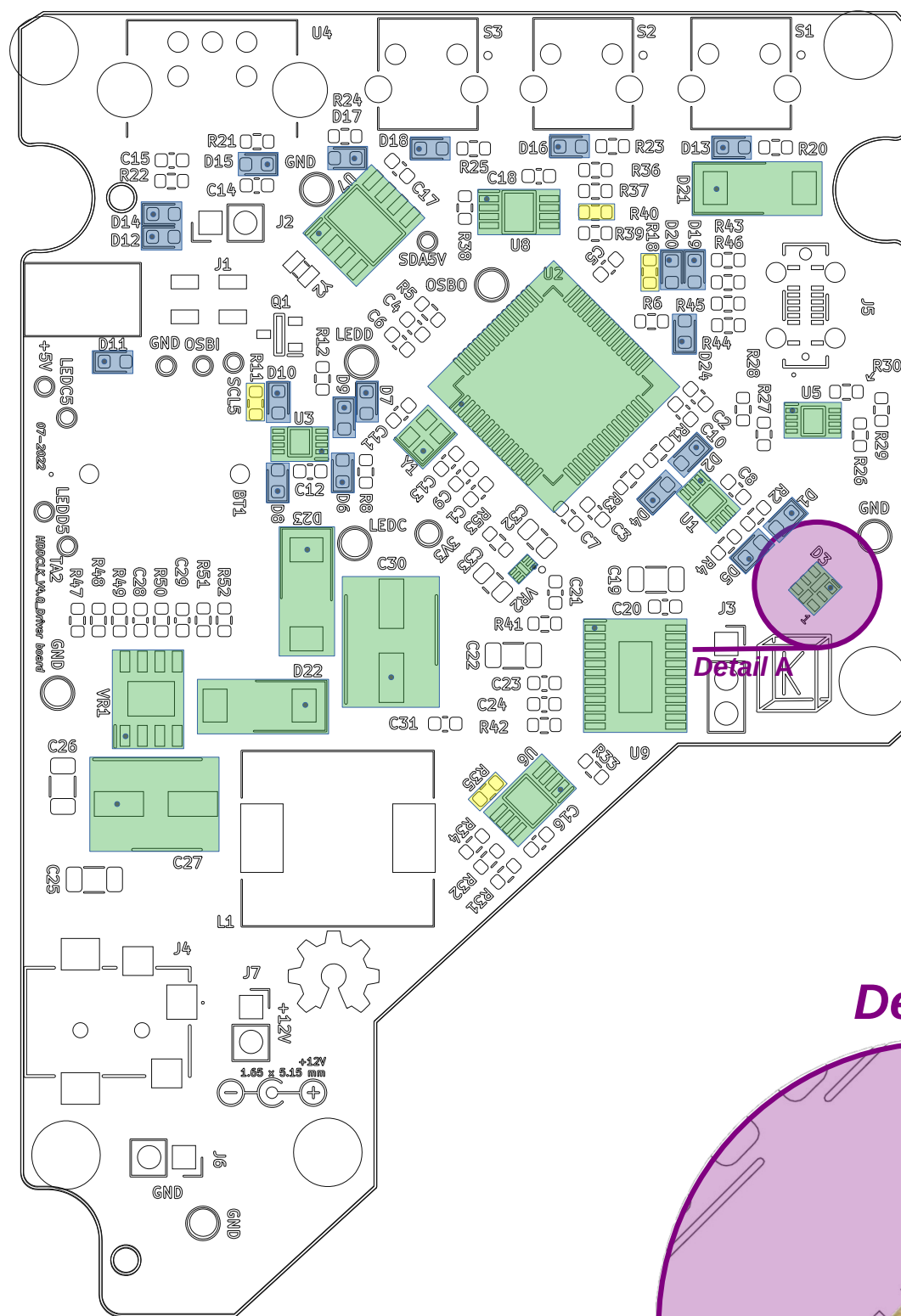
Pg. Description:

Top Side Solder Paste Jig

Author: Kadin Whiting

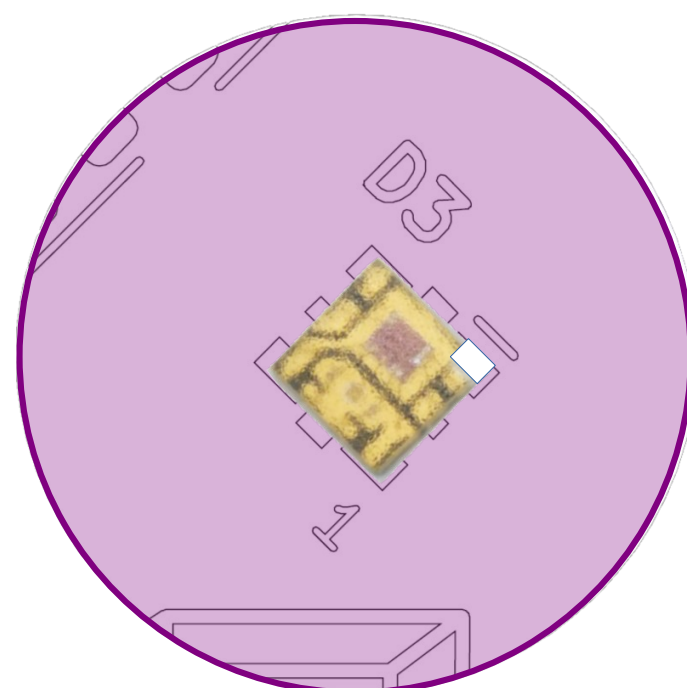
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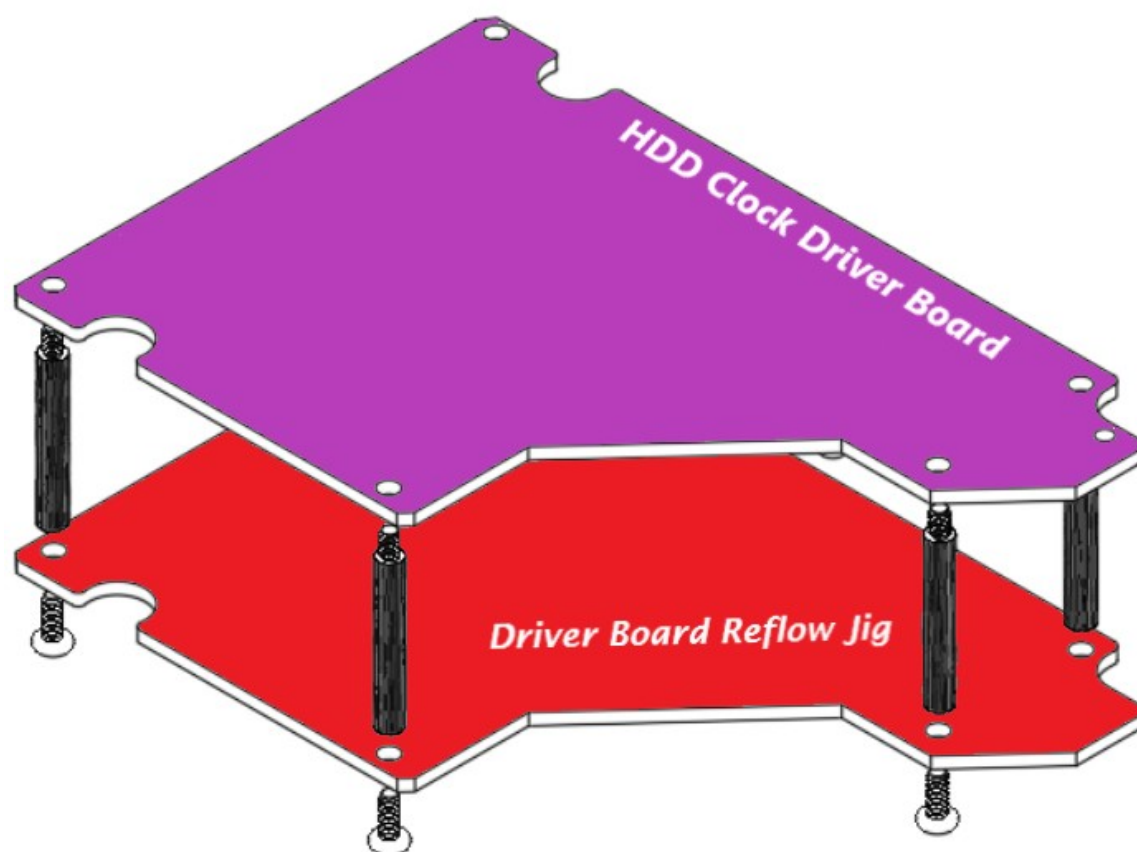


5. Components highlighted GREEN have polarity. Inspect these components prior to reflow. Pin 1 is indicated with a black dot.
 1. Components highlighted BLUE are TVS diodes. The part number in the BOM does NOT have polarity. If a different TVS diode is used then polarity inspection may be needed on these components. A black dot has been placed on the cathode side of the footprint.
6. Components highlighted YELLOW are not installed.
7. See Detail A for the polarity of APA102-2020, D3. See the datasheet for additional package information.
 1. Lessons from V3.0 – These LEDs are prone to shorts due to tight pitch. Take care to apply solder paste cleanly and place the LED well without much additional post-adjusting.
8. This side of the board will require the Driver Board Reflow Jig PCB to suspend the PCB during second reflow. See page 4 for instructions.
 1. These steps are necessary for reflow in a toaster oven. The solder jig raises the PCB so the bottom parts do not make contact with the the oven rack. Disregard this note if not using a toaster reflow oven.

Detail A

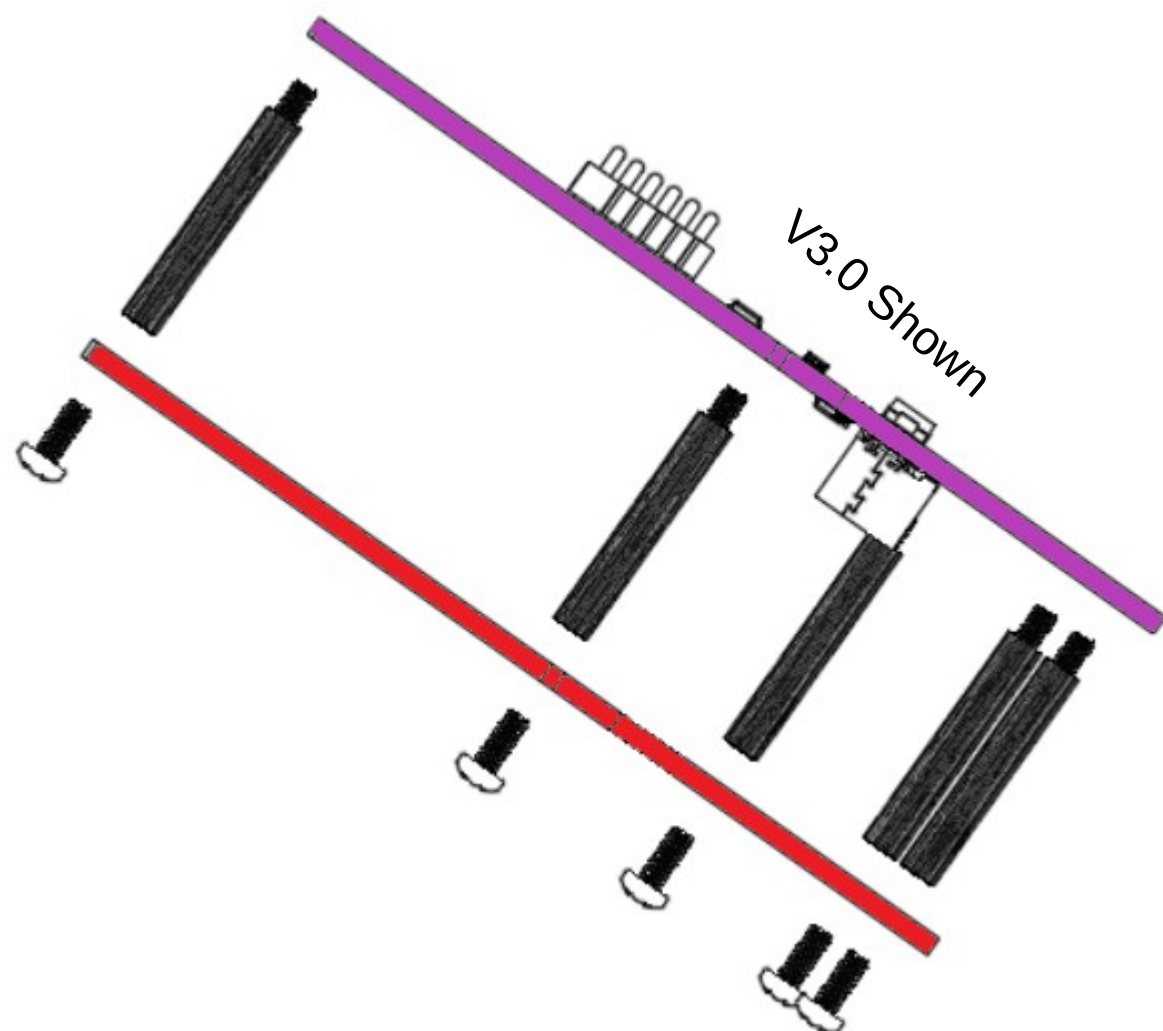


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| HDD Clock V4.0 Driver Board PCB Assembly | | |
| Pg. Description: | | |
| Top Side SMT Polarity and Component Notes | | |
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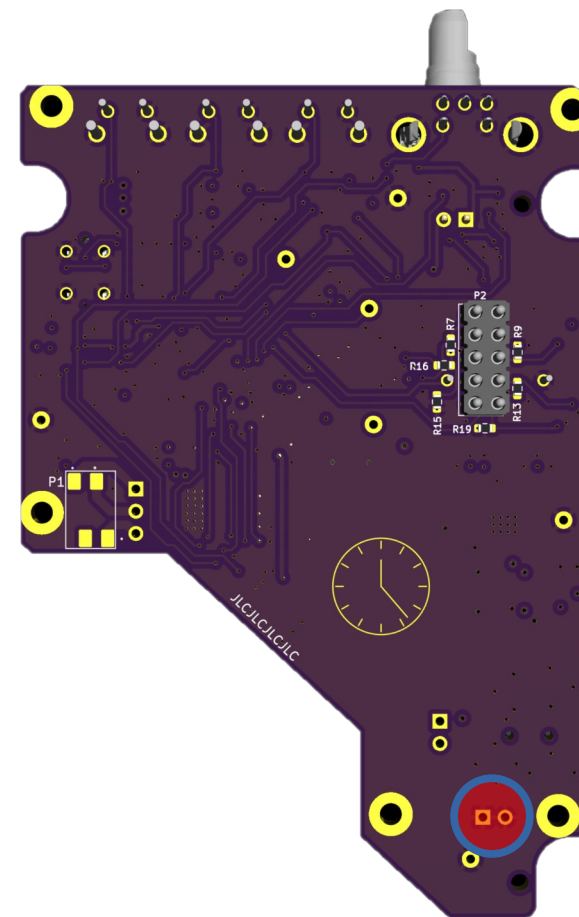
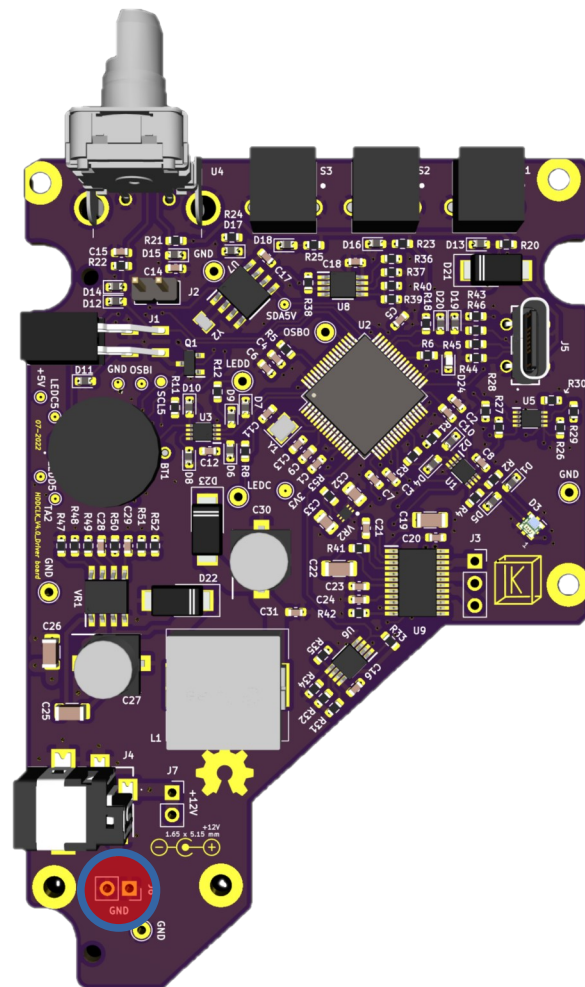
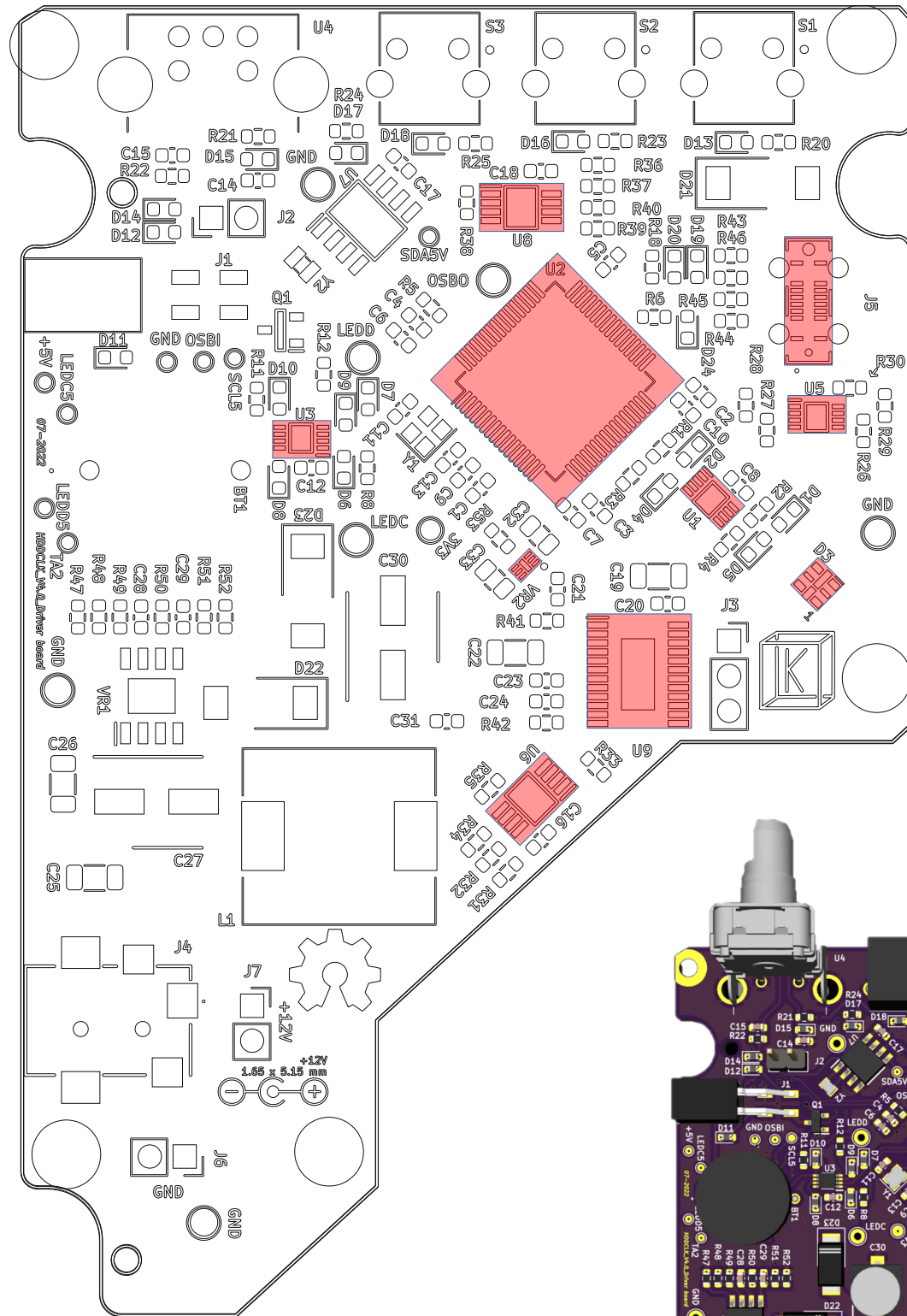
9. The HDD Clock V4.0 Driver Board PCB has components on both sides of the PCB that require a reflow soldering process. The reflow oven I have does not suspend the PCBs by the board edge. This makes reflowing 2 sides of a PCB difficult due to the parts on the bottom side. The Driver Board Reflow Jig PCB has been designed to suspend the PCB during second reflow. The following instructions outline how to use is jig.

1. Assemble, hand-tight, m2 screws and standoffs to each hole of the Driver Board Reflow Jig. Standoffs need to be at least 10mm long. Reference images to the left show, at scale, 20mm standoffs and 5mm screws. 10mm standoffs recommended.
2. Carefully place the HDD Clock Driver Board PCB onto the standoffs previously mounted to the Driver Board Reflow Jig.
 1. Do not use nuts to secure the HDD Clock Driver Board to the standoffs.
3. See page 5 for critical pre-second reflow component inspections and reflow instructions.

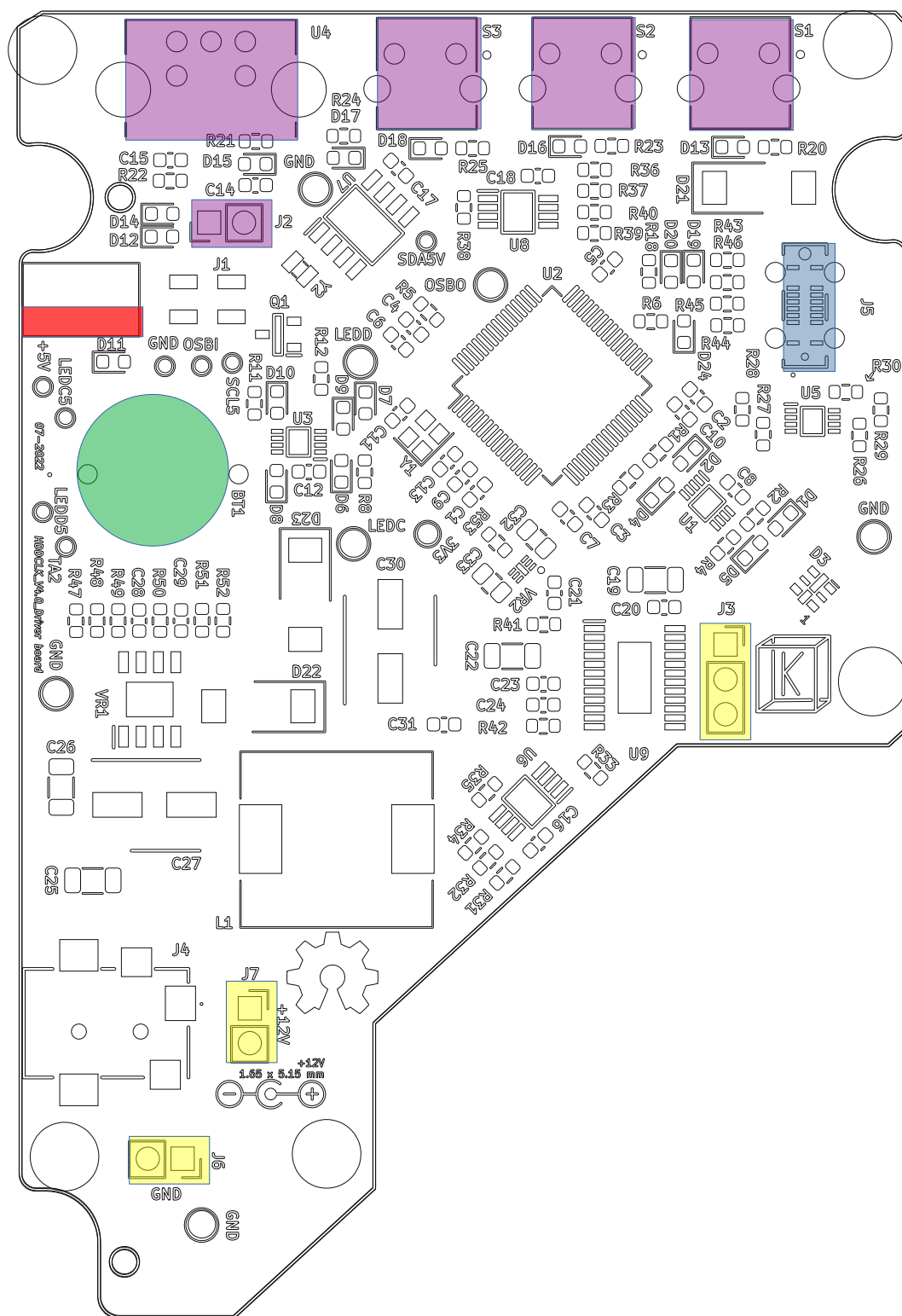


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| Project: | | |
| HDD Clock V4.0 Driver Board PCB Assembly | | |
| Pg. Description: | | |
| Driver Board Reflow Jig Instructions | | |
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10. Refer to page 3 for polarity inspection. Components highlighted RED have critical placement. Inspect these parts closely prior to reflow.
11. Reflow the assembly for the second time using the following instructions:
 1. See the reference image below for the recommended through-hole location to place the reflow oven thermocouple. Secure the thermocouple with Kapton tape ensuring the thermocouple is making contact with the copper of the PCB.
 2. Place the assembly on the middle of the reflow oven rack and carefully slide the rack into the oven taking care not to disturb any components.
 3. Reflow the PCB using the oven profile for the chosen solder paste.

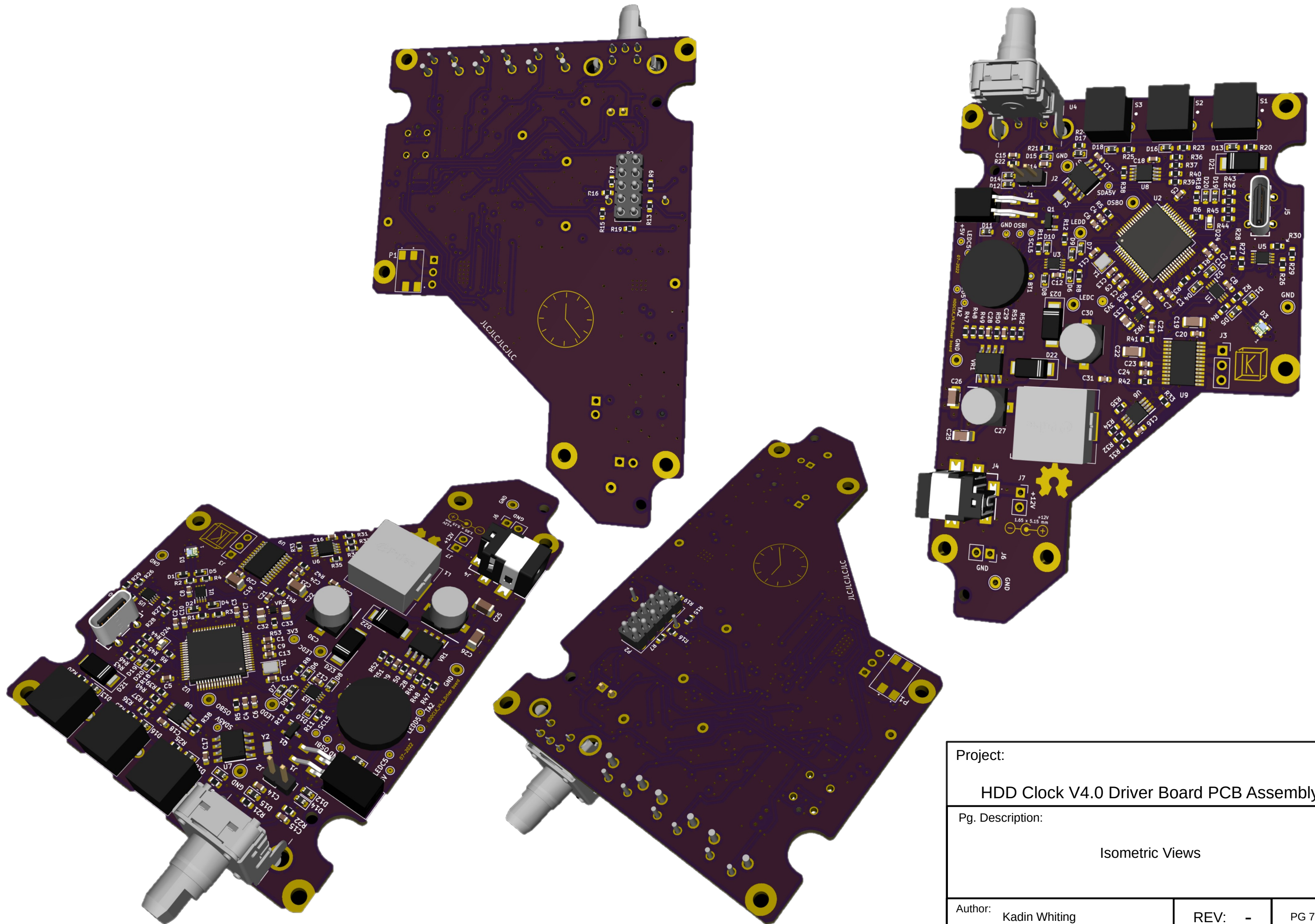


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| Project: | | |
| HDD Clock V4.0 Driver Board PCB Assembly | | |
| Pg. Description: | | |
| Second Reflow Instructions | | |
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12. Assemble Through-hole components highlighted PURPLE. Check component lead length to ensure leads will not make contact with the HDD case. Trim component leads if needed. Reflow a solder joint if it is trimmed to ensure the solder joint integrity is not damaged.
13. Components highlighted YELLOW are not assembled.
14. Check for Minimum Electrical Clearance (MEC) between the battery (BT1), highlighted GREEN, and surrounding test points. If MEC is violated, use Kapton Tape to isolate the test points and the battery. Ensure the alignment test has been completed prior to covering the test points.
15. USB-C (J5) has through-hole solder locations. J5 is highlighted BLUE
16. Connector J1 is the programming connector for the STM32 Microcontroller. Using a silver sharpie, mark pin 1 (+3.3v) on the body of the connector. This is the top of the connector where the RED line is shown.

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| Project: | | |
| HDD Clock V4.0 Driver Board PCB Assembly | | |
| Pg. Description: | | |
| Through-Hole Assembly | | |
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Project:

HDD Clock V4.0 Driver Board PCB Assembly

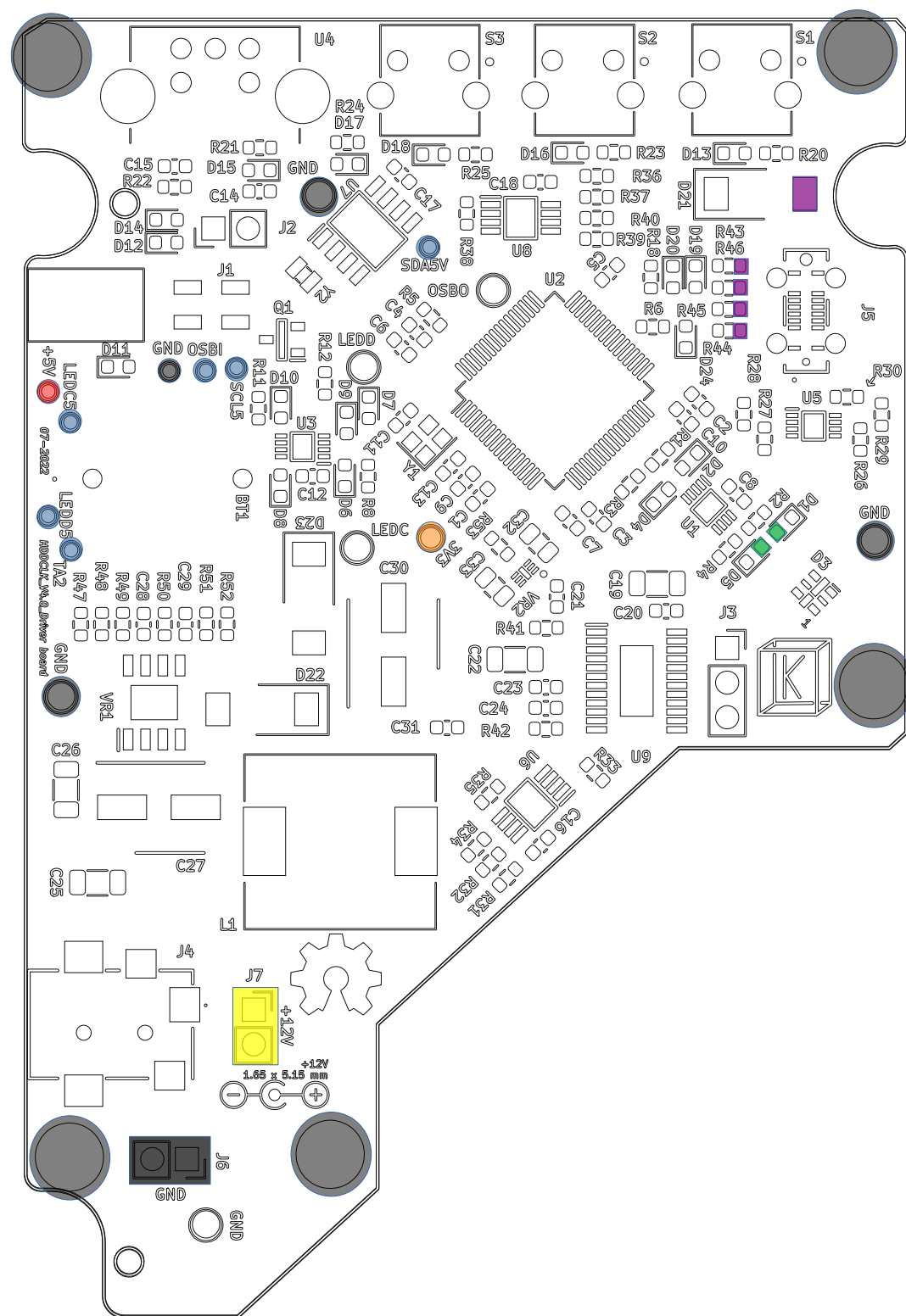
Pg. Description:

Isometric Views

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17. Using a Digital Multi-Meter (DMM) ,check for power shorts:

1. 12V – YELLOW ●
2. 5V – RED ●
3. 3.3V – ORANGE ●
4. GND – BLACK ●

18. Using a DMM, check for USB-C Shorts

1. D+ – PURPLE ●
2. D- – PURPLE ●
3. CC1 – PURPLE ●
4. CC2 – PURPLE ●
5. GND – BLACK ●
6. 5V (USB) - PURPLE ●

19. Using a DMM, check for LED Shorts

1. LEDD – GREEN ●
2. LEDC – GREEN ●
3. 5V – RED ●
4. GND – BLACK ●

20. Using a DMM, check for spring connector shorts

1. SDA5V – BLUE ●
2. SCL5V – BLUE ●
3. LEDD5 – BLUE ●
4. LEDC5 – BLUE ●
5. TA2 – BLUE ●
6. OSBI - BLUE ●
7. 5V – RED ●
8. GND – BLACK ●

21. After it has been confirmed there are no shorts, apply power to the Driver Board. Using a DMM, check the voltages at the following test points:

1. 12V – YELLOW ●
2. 5V – RED ●
3. 3.3V - ORANGE ●

Project:

HDD Clock V4.0 Driver Board PCB Assembly

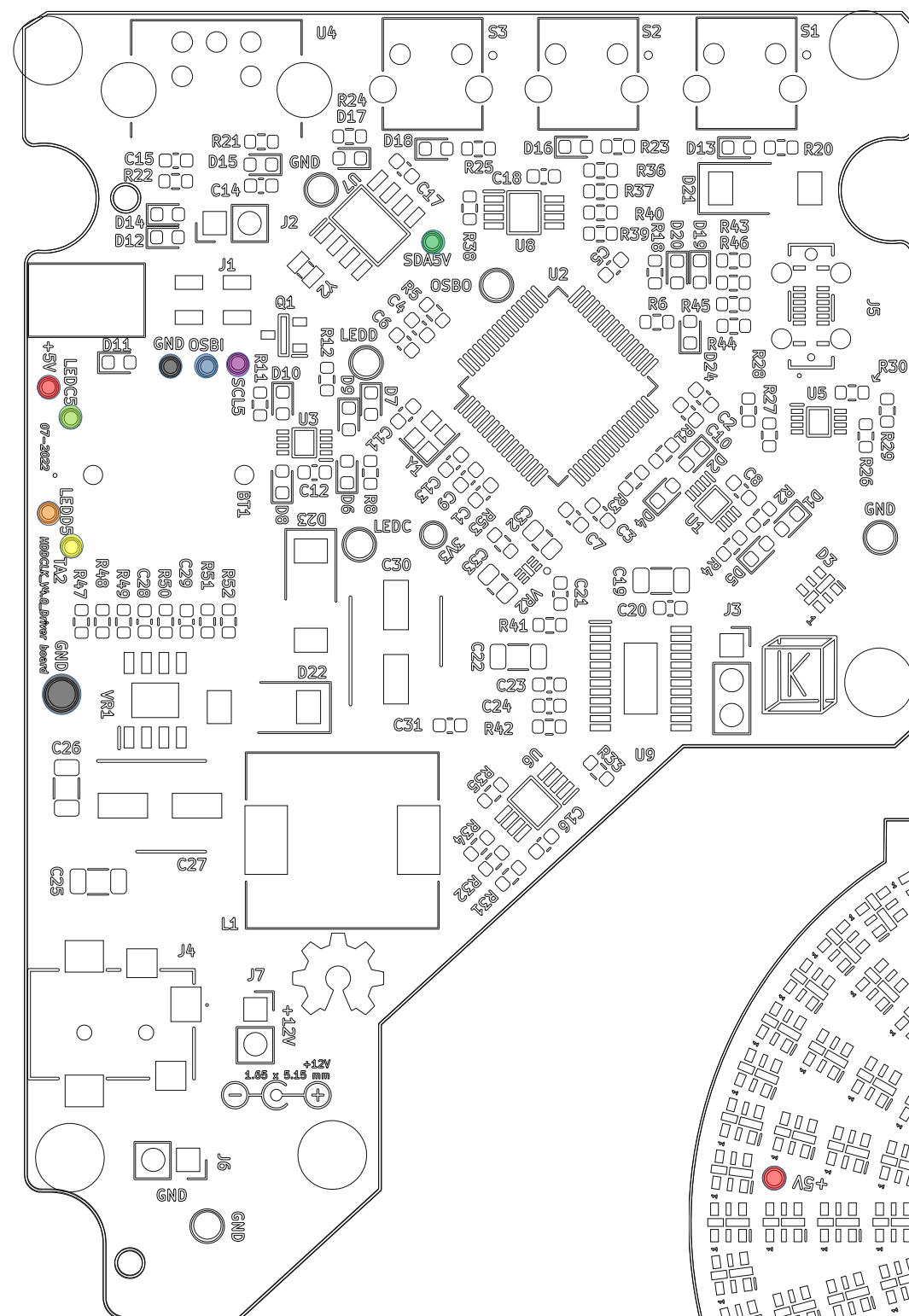
Pg. Description:

Check for Shorts

Author: Kadin Whiting

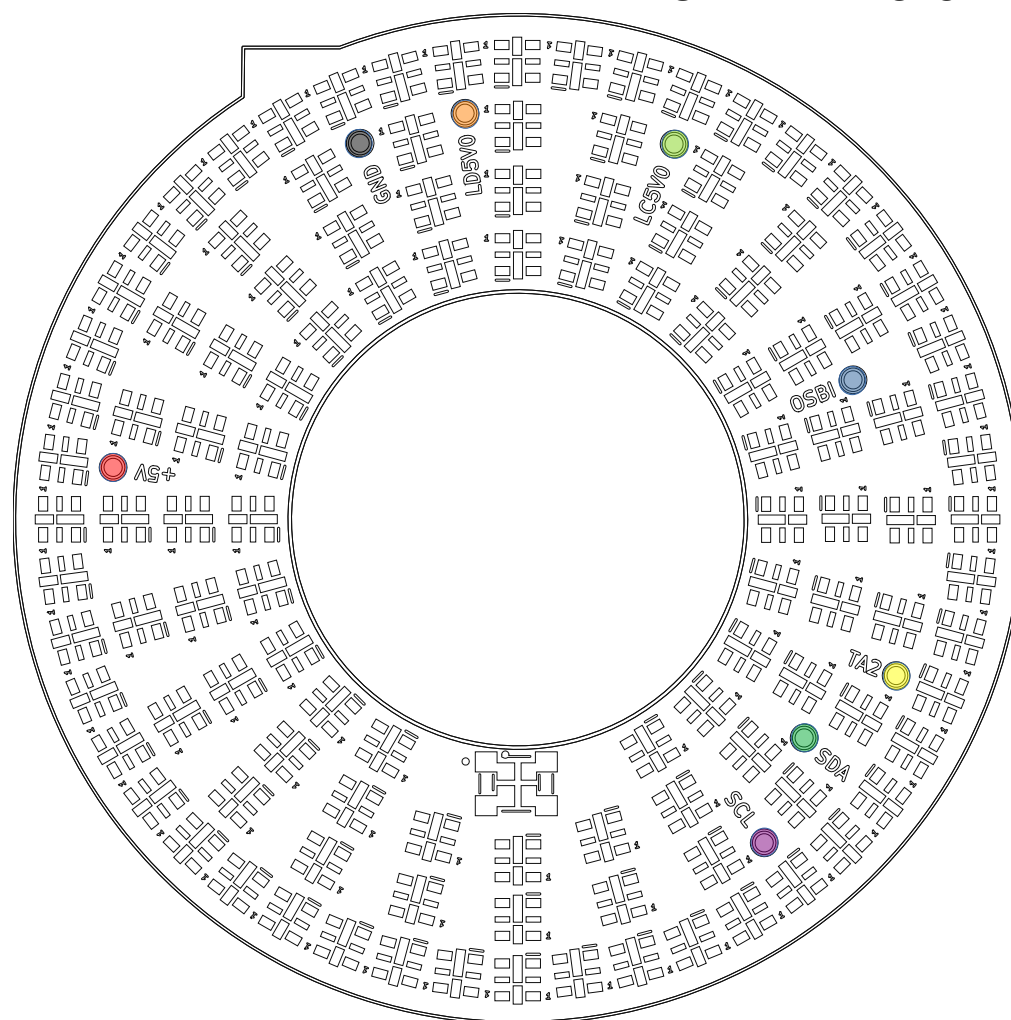
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22. After the board has been checked for shorts and has had each circuit validated as good, mount both the LED board and the Driver Board into the HDD case. The spring pins of the Driver Board should make contact with the pads on the back of the LED Board through the hole that is cut through the HDD case. Using a digital multi-meter, check for continuity and isolation between the following test points. This is a check to ensure the spring connector pins are making contact with the correct pads and no shorts have been introduced.

1. +5V – Red ●
2. GND – Black ●
3. OSBI – Blue ●
4. SDA5V – Green ●
5. SCL5V – Purple ●
6. LEDD5 – Orange ●
7. LEDC5 – Lime ●
8. TA2 – Yellow ●



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| Project: | | |
| HDD Clock V4.0 Driver Board PCB Assembly | | |
| Pg. Description: | | |
| Check Spring Connector Alignment | | |
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