

Teensy 4.0 Interface to Tinkla Relay

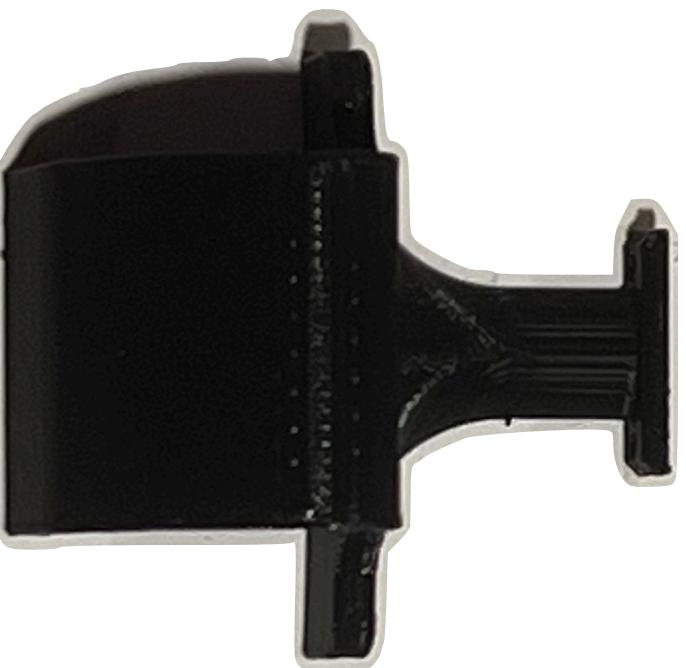
Using SSD1306 SIP Display and NeoPixel LEDs

Components

- Teensy 4.0 Board (no pins soldered)
- Adafruit Monochrome 128x68 Graphic Display
- Adafruit NeoPixel Ring 12 x 5050 w/ integrated driver
- 6ft USB-A to microUSB cable
- 7 screws 1mm x 9mm
- 2 screws 1mm x 5 mm
- 3D printed case and support

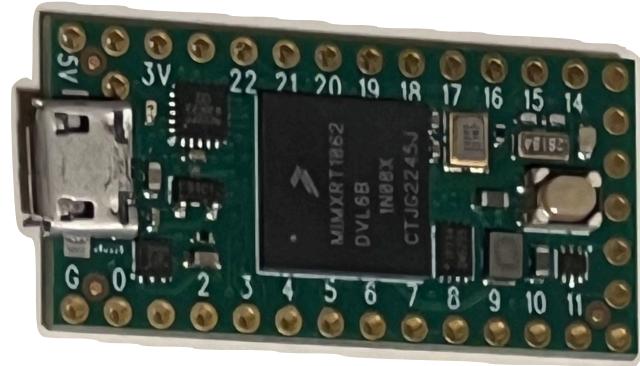
Print the 3D case

- Print the associated 3D files
- For testing only you can use PLA+ but if you want to keep this permanently in your car I suggest using a material that can withstand heat.
- You can pick the support for either a Model S/X or a Model 3/Y
- I suggest you print all the washers (both sizes) in case your screws are a little longer than 9mm



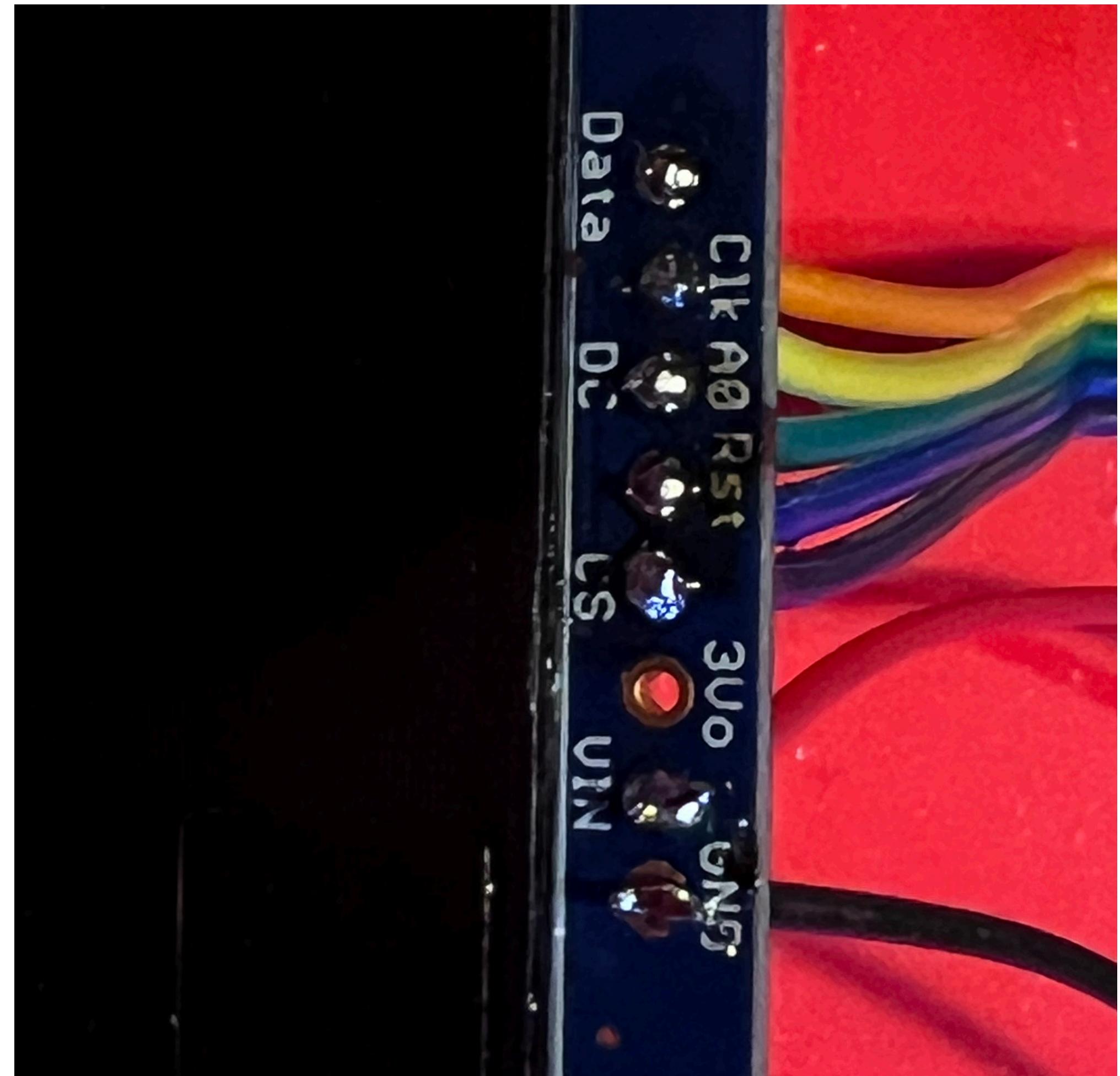
The electronic components

- Take a second to get accustomed to the electronic components
- Check all the pins that you will have to connect to
- Prepare your soldering area and turn on your soldering iron
- Locate cables and shrinking tubes, wire strippers, resin, etc.
- I strongly suggest using different color cables for each of the non-power connections (5 between the Teensy and the display and one between the Teensy and the LED ring)



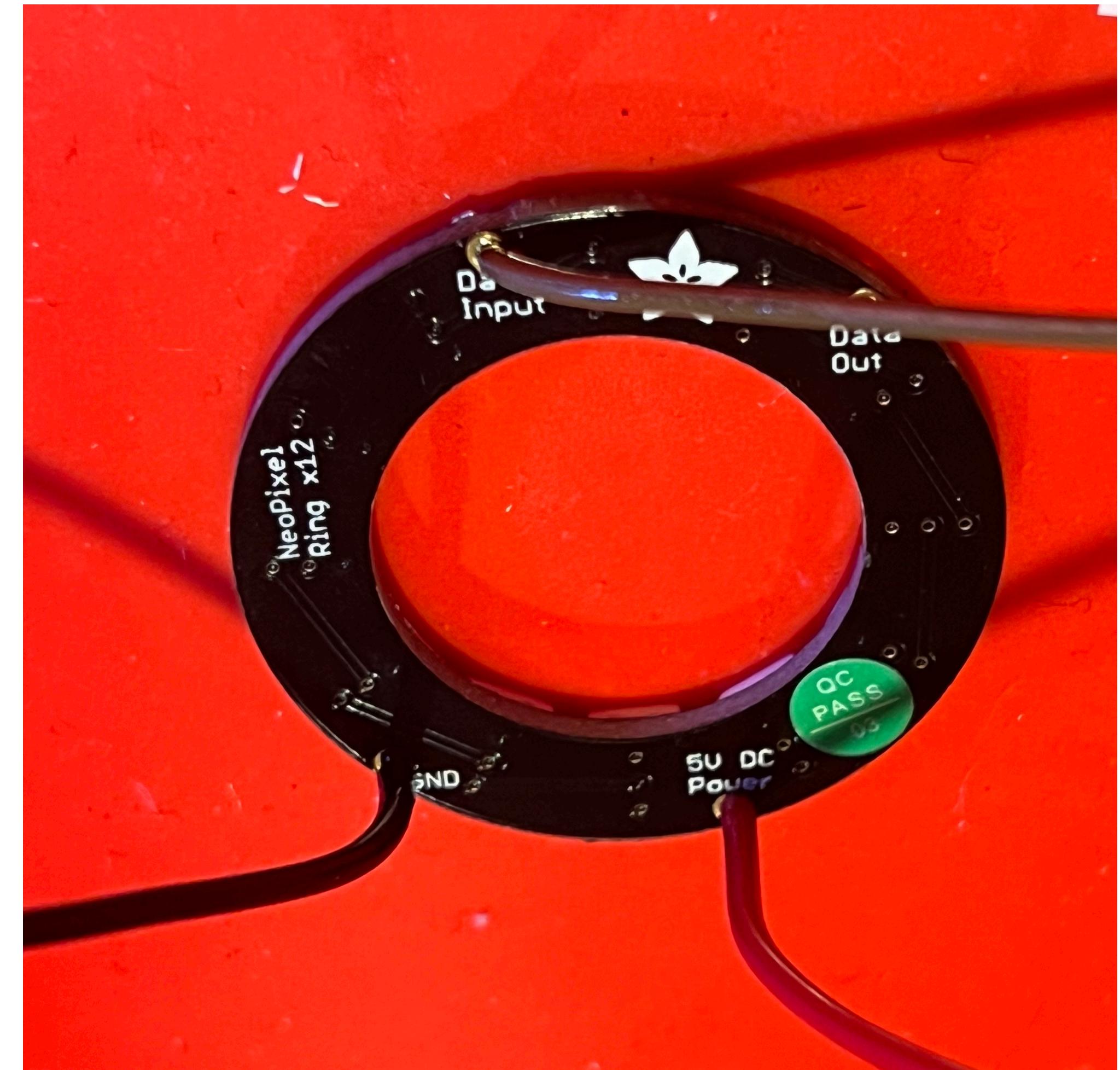
Solder the 7 wires to the Display

- You will have to connect wires to all but 3V_o pin.
- VIN and GND will provide 5V power to the display while the Data, DC, RST, CS and CLK will provide signals.



Solder the 3 wires to the LED Ring

- The LED ring requires power (5V DC Power and GND pins) as well as data (Data Input pin)
- Data Output pin will remain unused unless you want to add a second ring or LED strip

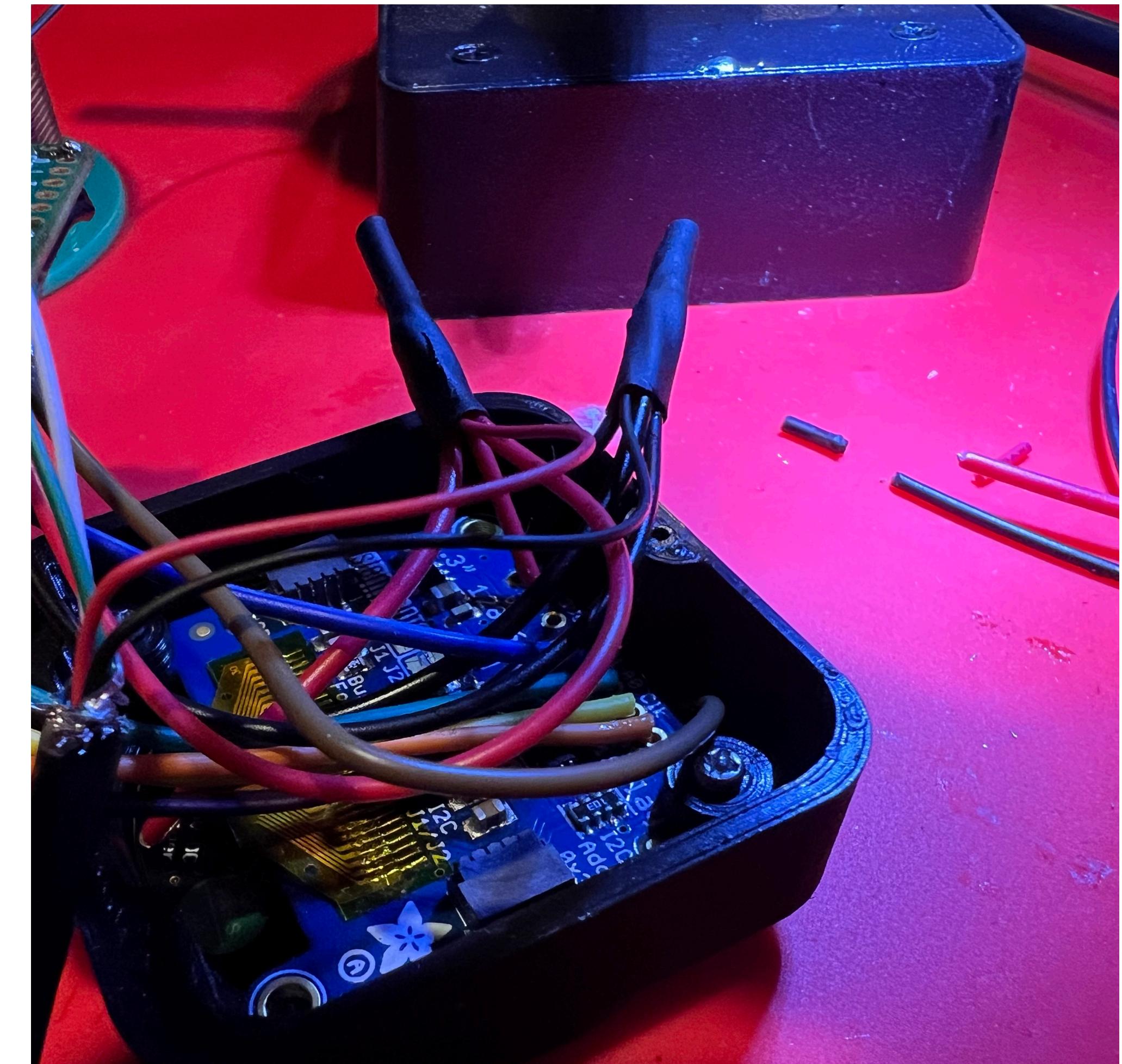


Solder the wires to the Teensy board

- Cut all the non-power wires to about 2". Too short and it will be a pain to solder them, too long and they will not have room in the box
- Solder the 6 signal wires (5 from display and one from LED ring) to the Teensy board:
 - Data Input from LED ring to Teensy Pin 6
 - CLK from Display to Teensy Pin 13
 - Data from Display to Teensy Pin 11
 - RES from Display to Teensy Pin 23
 - DC from Display to Teensy Pin 7
 - CS from Display to Teensy Pin 12
- Also solder 2 wires for power to the Teensy VIN and GND ports, we will deal with them shortly

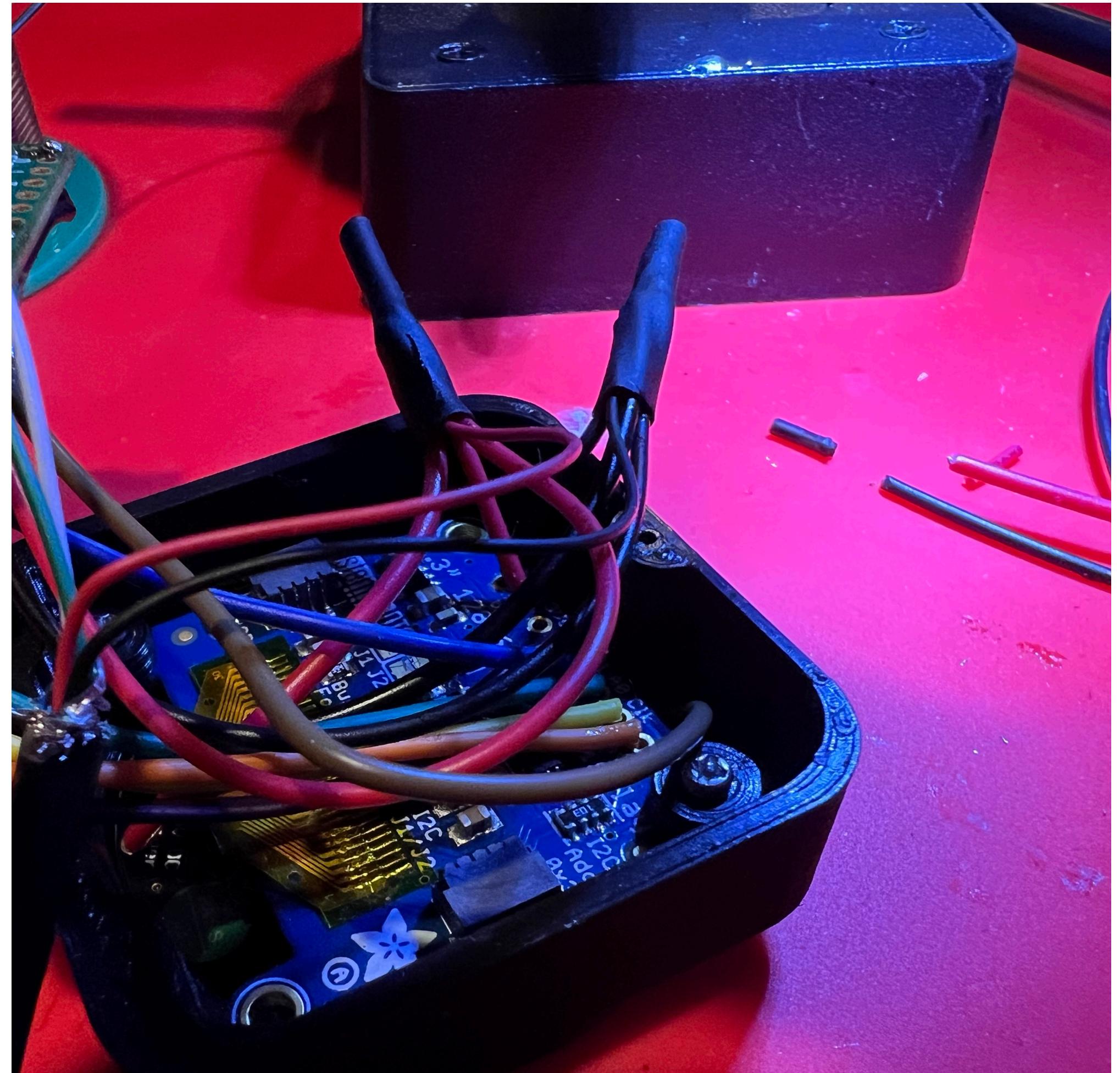
Assemble the lower part of the box

- Put the ring through the back of the box, and then using some hot glue connect it to the front cover.
- You don't need to worry about which LED is which as long as they show correctly through the cover slots.
- Best way is to bring the data on top of the display (opposite to the hole for the USB cable) and the power and ground through the bottom of the display.
- Place the display in its location and now use the washers and 4 screws to secure the screen to the case and the front cover (make sure your screw goes in the existing holes of the front cover)



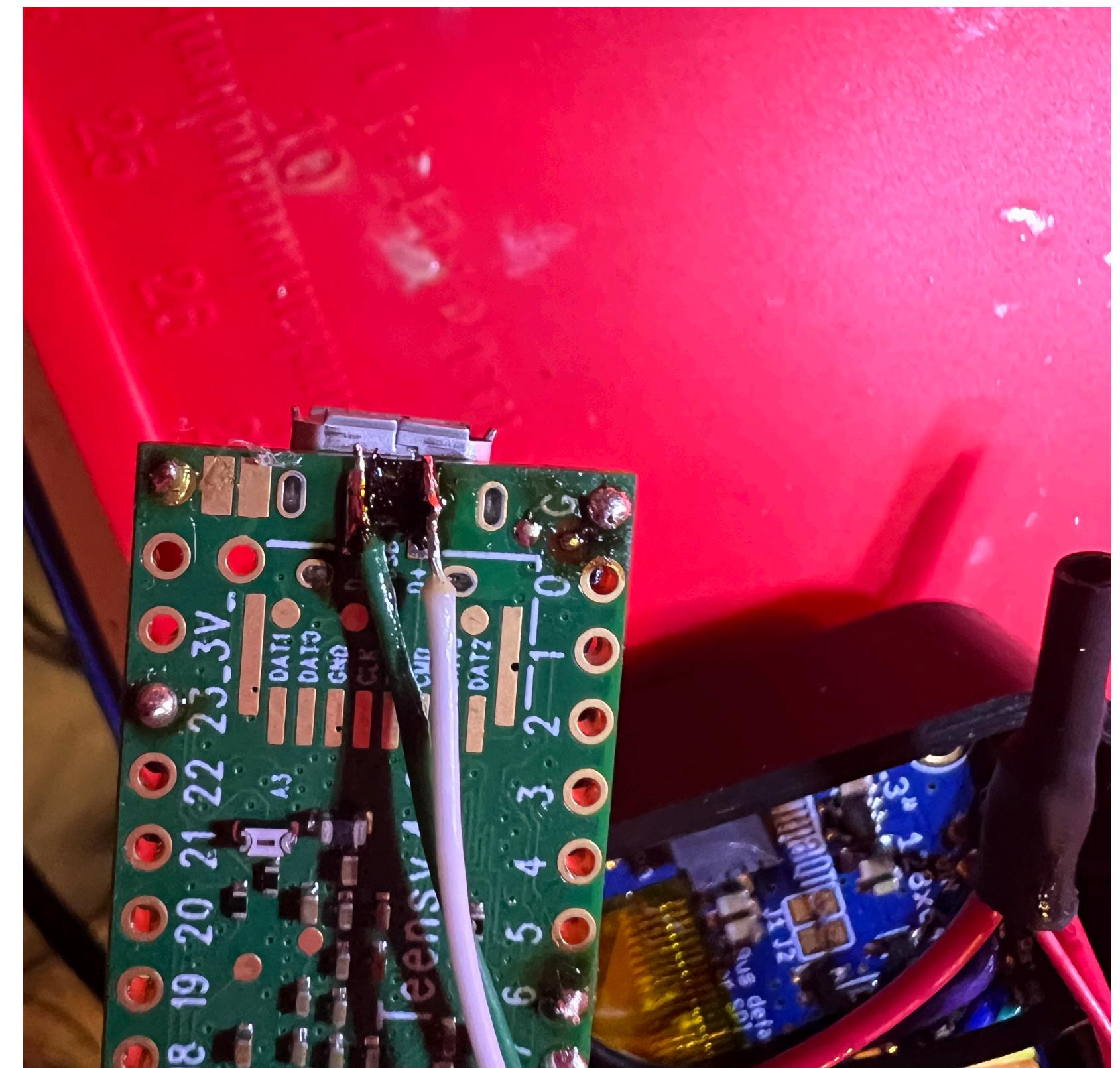
Power

- Cut the USB-A end of the USB cable but leave 2-3" because you might need to identify the colors correctly. Some of the china made cables do not obey color codes so while they all have black/red/green/white they might not be connected correctly.
- Double and triple check your 5V and GND before you burn your equipment!
- Cut the 5V from Teensy, Display and LED Ring such a way they end in the same place. Twist them together and solder them together with the 5V from USB. Repeat the same process for GND.
- Once done slide some shrinking tube over the ends and heat it up to ensure your power lines are well covered and we will not have sparks later.



Connect the USB Data Lines

- That's another tricky one but the good part is if you don't get it right the first time the board will survive and you can reverse them!
- So with 50/50 chance to be right, solder the green wire to the D+ post on the Teensy and the white wire for the D- post on the Teensy. Keep the box open for now and make sure you don't touch the Teensy to anything metallic.
- Flash the Teensy with the latest code from the repo and plug it in the Tinkla Relay. Watch the display show ERR and the LED Ring alternate colors with the 9 o'clock LED being permanently RED. If the red LED is in a different position, adjust the PIXEL_SHIFT constant by the # of locations.
- Now disconnect from the computer and connect to the Tinkla Relay. If the screen displays ERR and the LED ring flashes then you need to flip the two wires.



Protect the board and close the box

- Protect the board so it doesn't touches the circuit of the display. I chose to insert it inside a large shrinking tube (but did not shrink it so I can easily remove it).
- You can also loosely wrap it in some electrical tape. Make sure you don't press the programming button.
- Route the USB cable through the dedicated hole and close the lid with three 1x9 mm screws.
- Install the base using two 1x5 mm screws and you should be ready to use this in your car.

