Source Independent Power Converter for Cell Phone Charging: Hardware Guide

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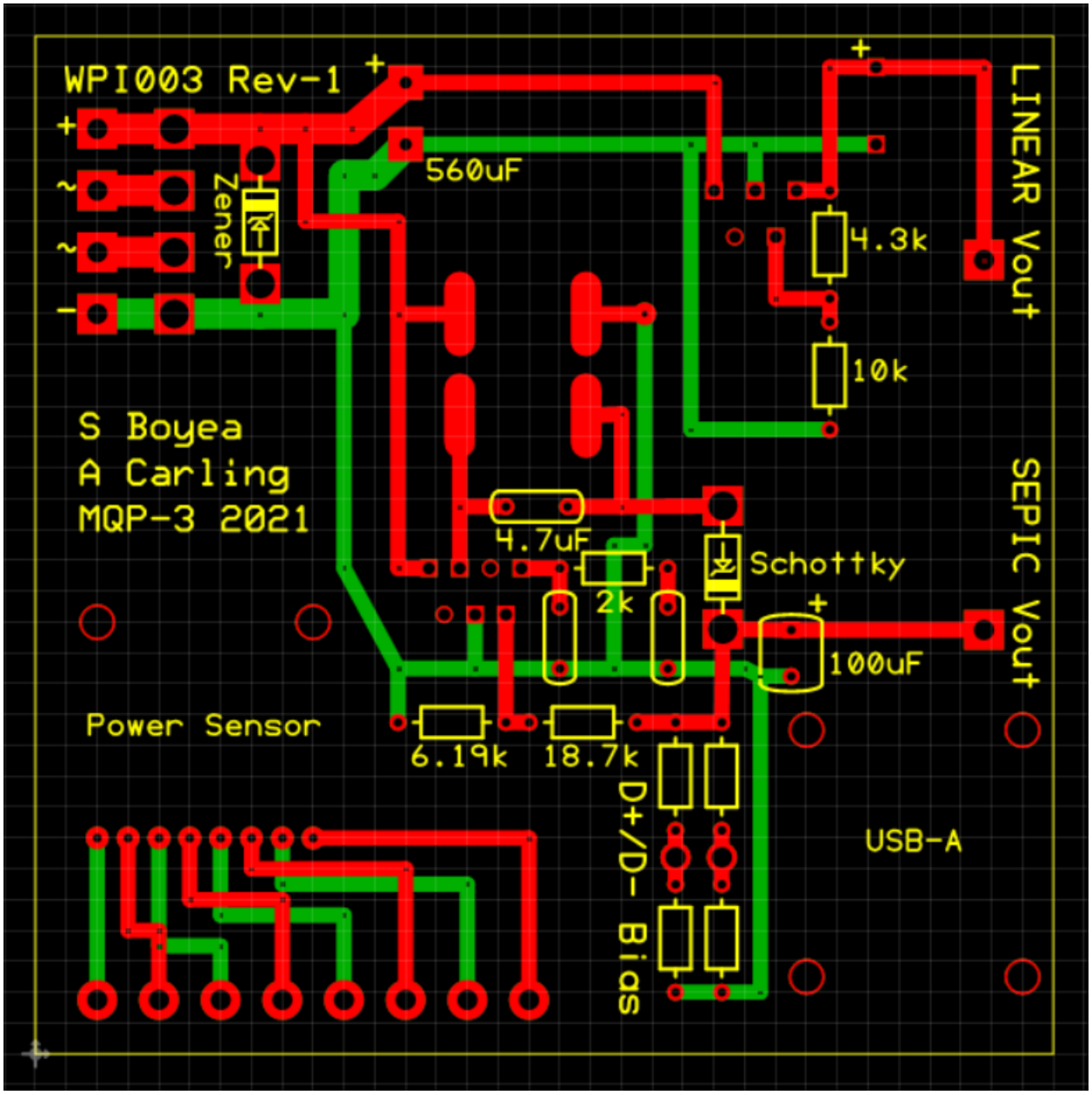

Figure 1: PCB Design Blank

1) The above figure illustrates the PCB that was designed for the stage 3 prototype. The attached gerber file contains all information required to print this custom PCB including trace dimensions, through hole connections, vias, and ground paths. The design uses a 2-layer PCB (layer 1 in red, layer 2 in green, top silkscreen in yellow)
2) This file was created using the program ExpressPCB but is compatible with all PCB printing machinery capable of reading gerber files.

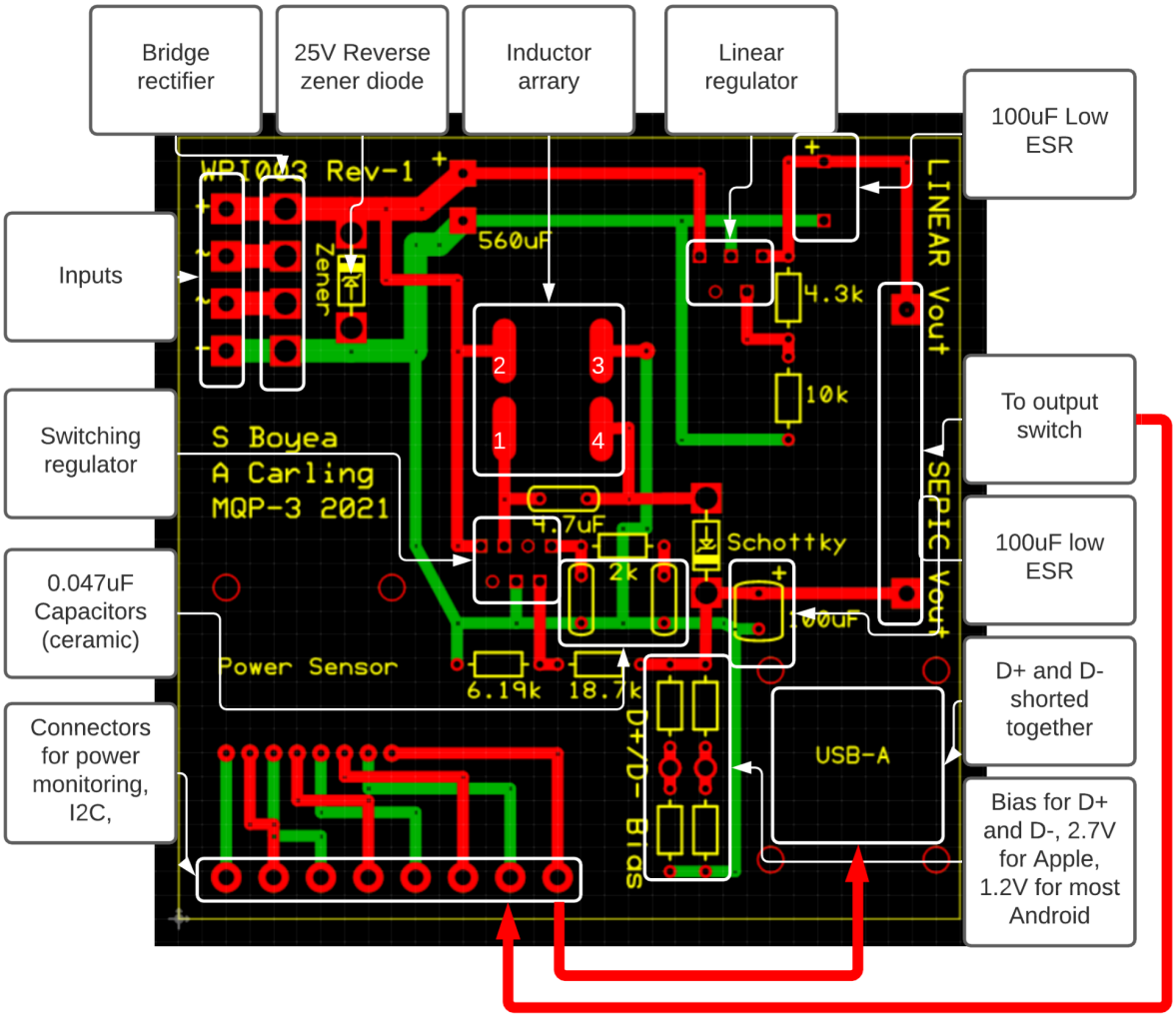

Figure 2: PCB Design Annotated

3) The above figure details the location of components on the custom PCB. Attached is a comprehensive parts list including all part numbers and relevant specifications.
4) In order to populate the PCB with the selected components, refer to Figure 2 for information regarding placement location and orientation. This is essential to achieve desired circuit performance.

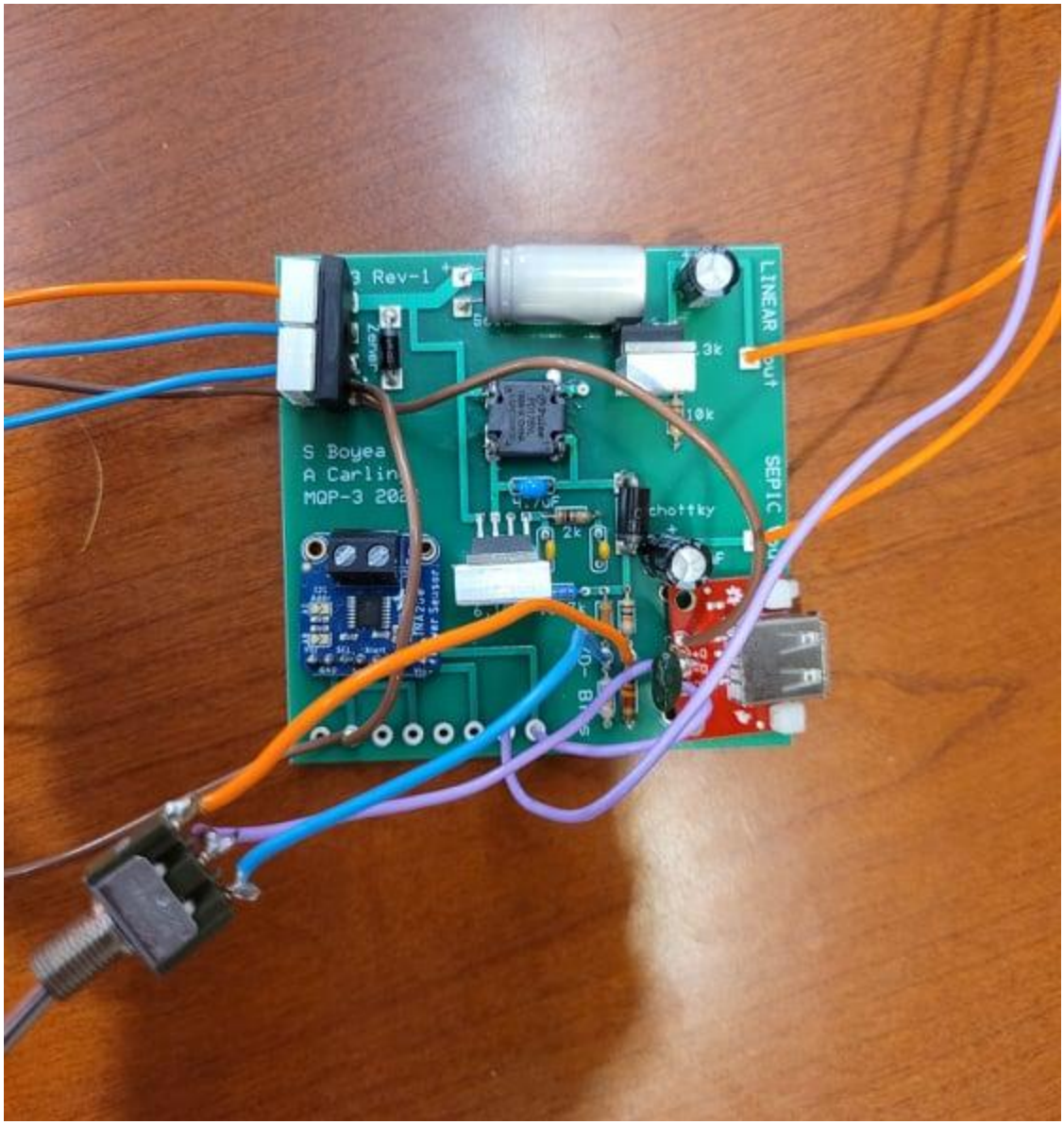

Figure 3: PCB Assembled, Missing Raspberry Pi Connections

5) Once assembled the populated PCB should look like the above figure. Take care to ensure proper grounding of the USB-A and power monitoring breakout boards. In the figure this is achieved through use of the brown jumper wires.
6) The design makes use of two switches. One to switch between the linear and switching regulator circuits and the other to switch between Apple and Android charging modes. Switch connection locations can be visualized in figures 2 and 3.

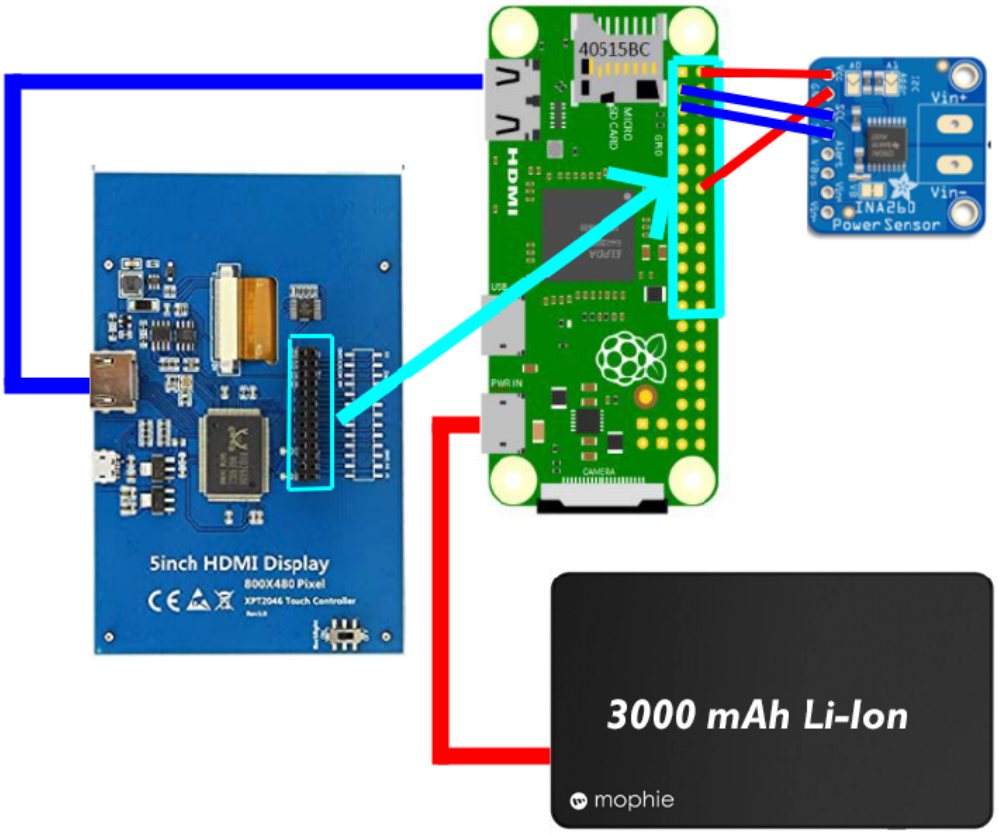

Figure 4: Power Sensor I2C Connections

7) The above figure details the power display hardware designed for this system.A microHDMI to HDMI cable is used to connect the 5” display to the Raspberry Pi Zero microcontroller. In addition, the connector on the back of the display carries power and touch data. Wires that connect the Raspberry Pi to the power sensor can be soldered directly to the Pi, or to the pads on the back of the display.
8) The Raspberry Pi Zero is connected to the 3000mAh portable Li-Ion battery pack via micro-USB to USB-A cable.
9) The power sensing module is connected to the Raspberry Pi Zero as shown in the figure above with the red connections representing the power path (5V and Ground) and the blue connections representing digital data connections (I2C.)