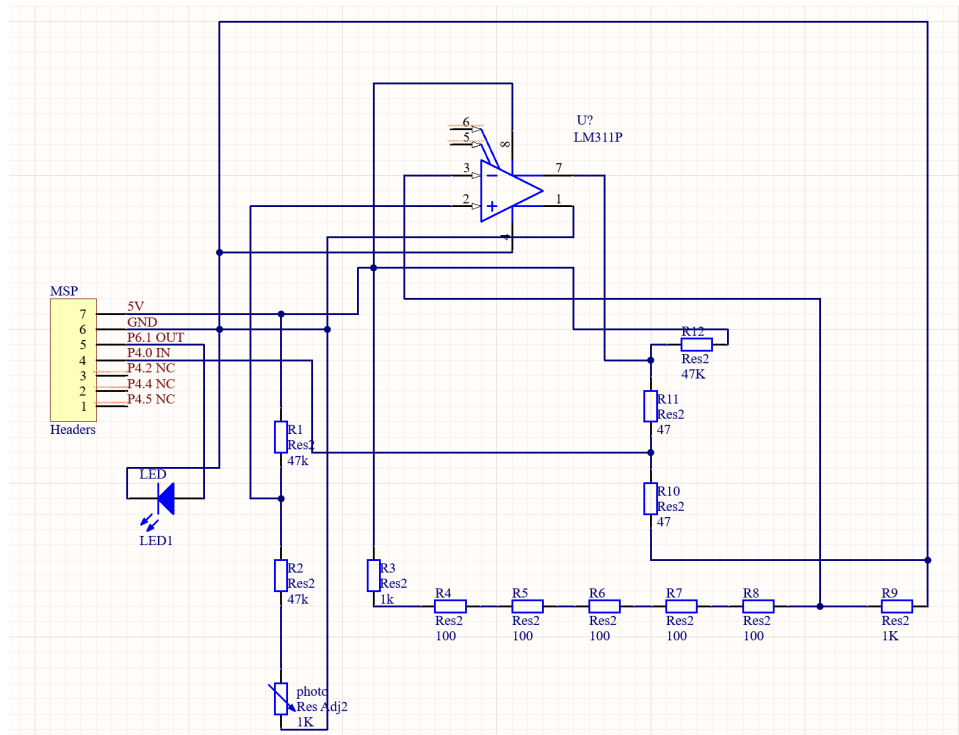# ECEN 2440 Final Project

Applications of Embedded Systems | Fall 2022
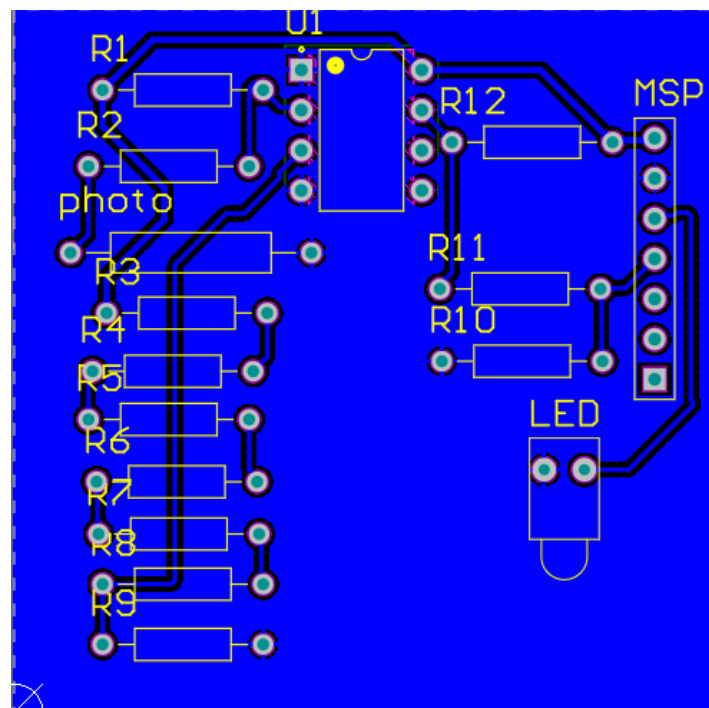
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Circuit Schematic

PCB Layout

Code Base

For the code, just plug it into the MSP. Attach the PCB to pins from 5V through 4.4. Cover the photoresistor and then uncover it. The LED should turn on and off. Alternatively, the system could be brought into a dark room and the LED will turn on.
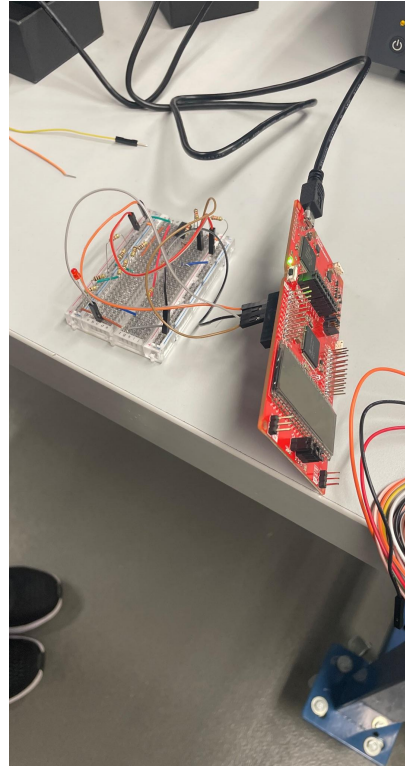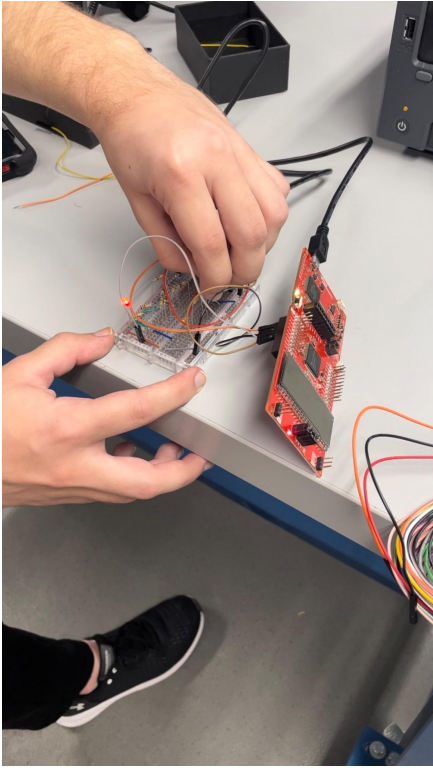
Design and Build

We first designed a rough circuit diagram showing how we wanted everything to be laid out. When designing the circuit for our PCB, we needed to break the circuit into 4 sections. The first was the threshold voltage from the photoresistor. We put the photoresistor in series with resistors to create a voltage divider so that when the photoresistor was covered, the output voltage would be above 2. When the photoresistor was not covered, the output voltage would be below 2. This was because of the second section of the circuit. The second section of the circuit is the threshold voltage for the comparator. We used another voltage divider to make the threshold a constant of 2 volts. The third section of the circuit is the output of the comparator. Since the output is a pullup and was too high for the MSP, we added one resistor to power, and then more in series to create a voltage divider so that the voltage into the MSP won't exceed 3 volts. Finally, separate from the comparator, we have an led that takes a digital signal from the MSP to turn on and off.

We used the Analog Discovery Kit to debug the circuit. We would test each of the aforementioned voltage dividers so that they would always give the expected output. This is important since some of the components had maximum power/voltage limits. Once we were done testing a single section, we would combine a section with another and then test that section. Finally, we would combine everything and test with the Analog Discovery. Since the circuit output would never exceed 3 volts, we knew that it was safe to connect to the MSP.

The design was then laid out on a PCB diagram where Lauren from the ITLL helped us create a design that could be printed and soldered. The components were then soldered onto the PCB. Finally, the functional PCB was connected to the MSP and the code uploaded.

Demo Pictures

Nightlight Demo Pictures