

EEE3088F Week 3: Design Proposal

Group Number:

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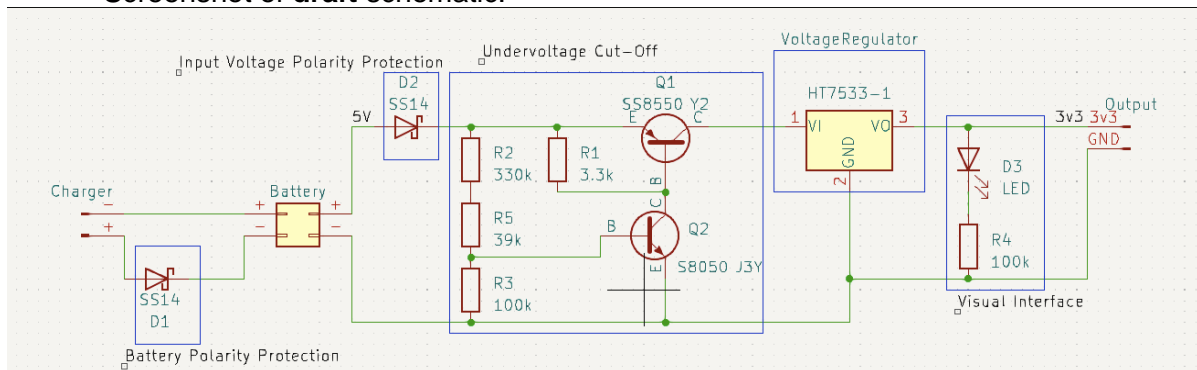
Q1 Power subsystem [30]

Q1.1 Specification [10]

- Must have polarity protection for charging the battery
- Must have polarity protection from the input voltage for the rest of the circuit
- Must accept input voltage of 5V via a battery or leads
- Must output a voltage of 3.3V
- Must have a LED output when output voltage of power subsystem is on
- Must have voltage cut-off when input voltage into the voltage divider is less than 3.3V

Q1.2 Draft Bill Of Materials (BOM) [10]

- https://github.com/zuhayr/EEE3088F_Proj/blob/82cb426b756778753f15d8b4452abae63c901c77/Power%20BOM.xlsx
- Total = \$0.2218 /PCB = \$1.109
- Screenshot of **draft** schematic:



Q1.3 Define this submodule's interface(s) [10]

This circuit interfaces with the outside world via visual stimulus, as when the circuit has power, an LED turns on. It also receives an input voltage from a 5V Lithium-Ion Battery. It Interfaces with every other circuit on the board via its output 3.3V as their input voltage/power supply.

Q2 Microcontroller interfacing [30]

Q2.1 Specification [10]

Q2.1.1 STM32

- 48 GPIO Pinouts
- Input load of maximum 5V.
- 16 to 64 Kbytes of Flash memory
- Two fast low-power analog comparators with programmable input and output
- Programmable voltage detector (PVD)
- 4 to 32 MHz crystal oscillator
-

Q2.1.2 EEPROM

- Low-voltage and standard-voltage operation
- VCC = 1.7V to 5.5V
- 2-wire serial interface
- Schmitt Trigger, filtered inputs for noise suppression
- Bidirectional data transfer protocol
- 400kHz (1.7V) and 1MHz (2.5V, 2.7V, 5.0V) compatibility
- Write Protect pin for hardware protection
- 64-byte page write mode
- Partial page writes allowed
- Self-timed write cycle (5ms max)
- Endurance: 1,000,000 write cycles
- Data retention: 40 years

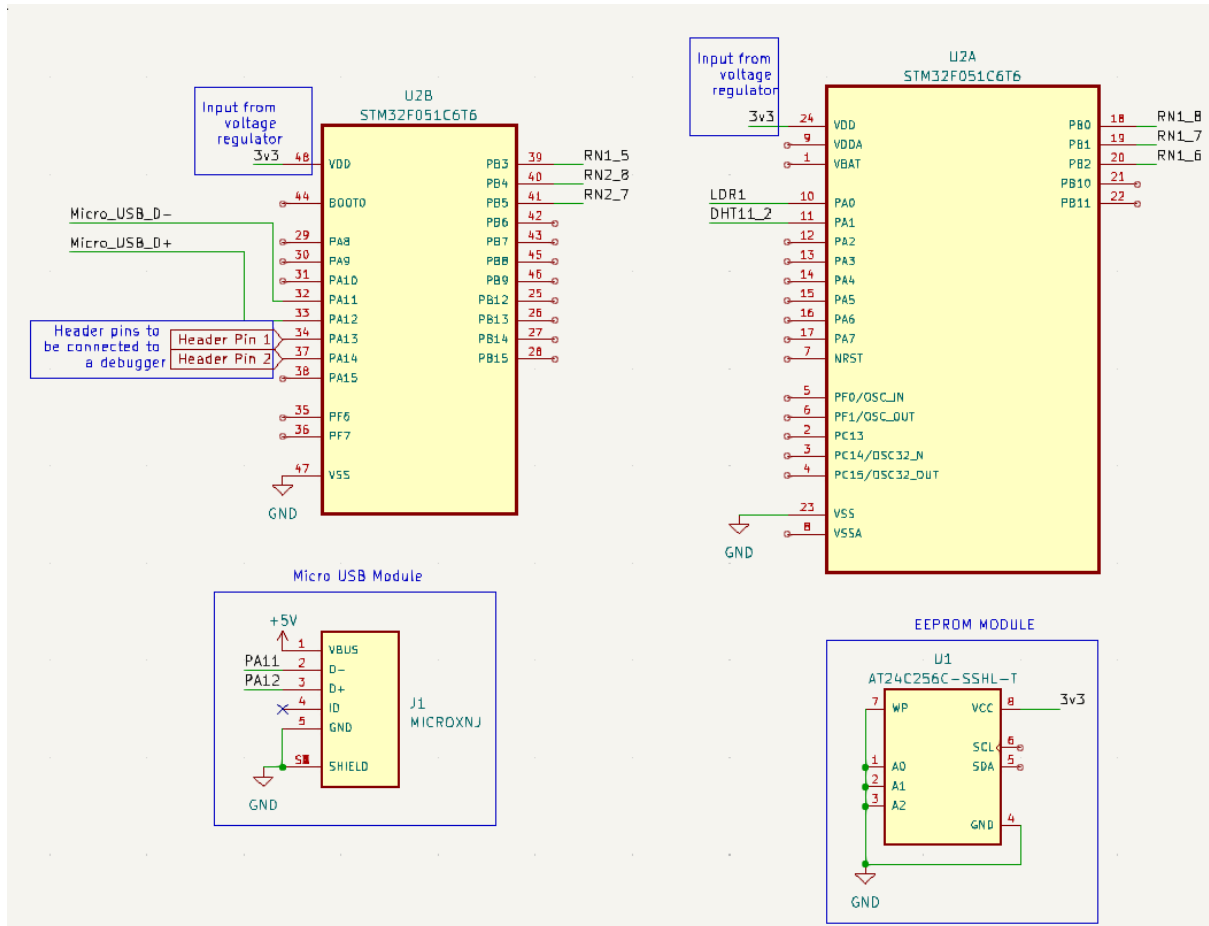
Q2.1.3 Micro USB

- Current rating: 1.8A
- Voltage Rating 30V DC
- Contact Resistance 50 milliohms Max
- Durability: 5000 Cycles

Q2.2 Draft Bill of Materials (BOM) [10]

Total for all 5 PCB: \$2,7525

https://github.com/zuhayri/EEE3088F_Proj/blob/188ade4d8734d7faf14aea685d022fabba73463e/BOM_uC.xlsx



Q2.3 Define this submodule's interface(s) [10]

This module interacts with both other main modules. It receives power from the Power module via the voltage regulator. It also receives data from the sensors as well as sending the data to the EEPROM. It uses a Micro USB port to allow the user to access the data. Its used to control the sensory module.

Q3 Sensing [40]

Q3.1 Specification [20]

Q3.1.1 Digital Sensor Specification [10]

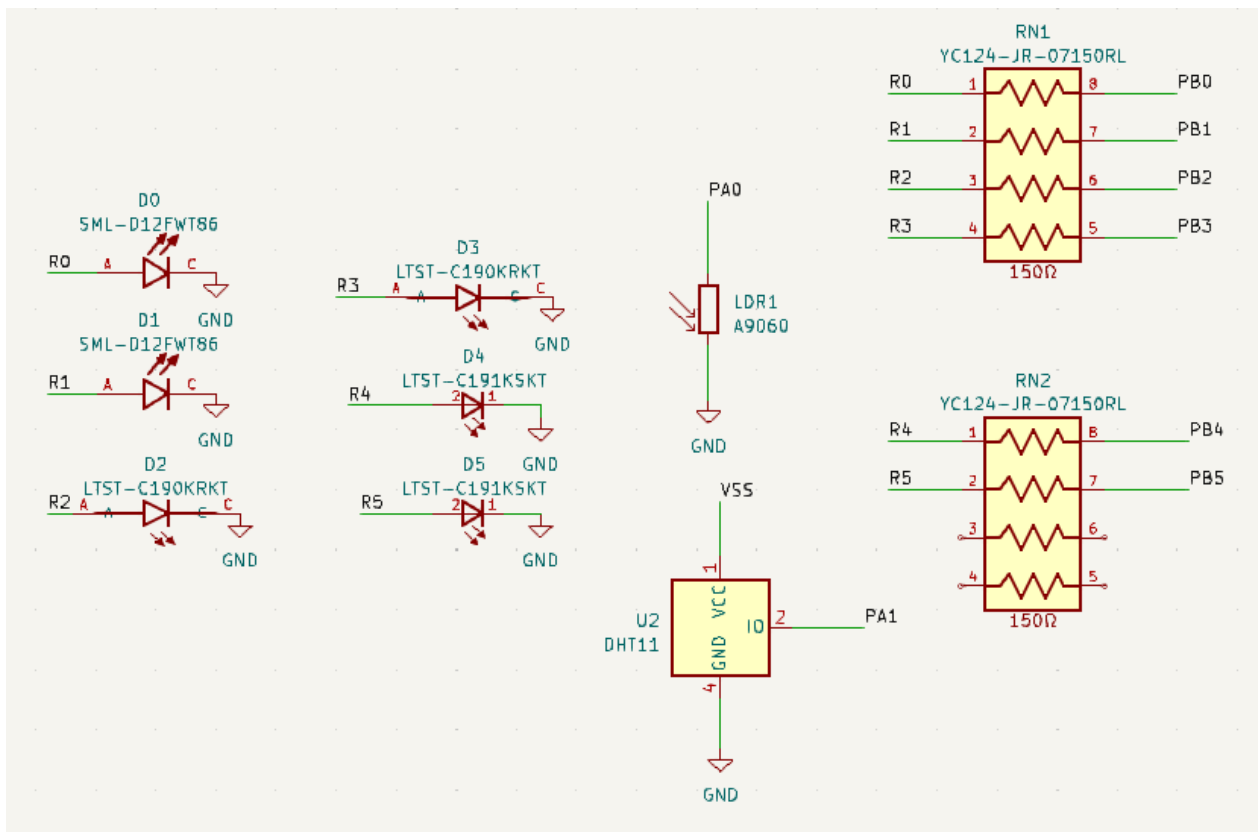
- **DHT11 Temperature and Humidity Sensor Specifications**
 - Operating voltage: 3.3V– 5.5V
 - Max current use during conversion: 0.3mA
 - Max current use during standby: 60 μ A
 - Sampling period: Secondary greater than 2 seconds
 - Simplified single bus communication
 - Humidity reading range: 20% to 90% with 5% accuracy
 - Humidity reading resolution: 16 bit
 - Temperature reading range: 0°C to 50°C with $\pm 2^\circ\text{C}$ accuracy
 - Temperature reading resolution: 16 bit
 - Maximum sampling rate: 1Hz
 - Dimensions: 15.5mm x 12mm x 5.5mm
 - 4 pins with 0.1" spacing

Q3.1.2 Analog Sensor Specification [10]

- **A906012 Photoconductive Cell – Specifications**
 - Miniature open frame package
 - Epoxy coated
 - Moisture resistant
 - Through hole connection
 - Spectral response similar to the human eye
 - Maximum operating voltage: 150 V
 - Maximum operating power: 90 mW
 - Operating temperature range: -30°C to 70°C
 - Spectral peak: 600 nm
 - Resistance when light is at 10 lux: 16 k Ω to 33k Ω
 - Resistance when it is dark: 0.3 M Ω
 - Gamma value at 100 lux to 10 lux: 0.7

Q3.2 Draft Bill Of Materials (BOM) [10]

- Link to Bill of Materials:
https://github.com/zuhayri/EEE3088F_Proj/blob/Documentation/Sensor_BOM.xlsx
- Total anticipated cost: \$ 1.7445
- Screenshot of draft schematic:



Q3.3 Define this submodule's interface(s) [10]

Q3.3.1 Digital Sensor Interface [5]

For the digital sensor, there will be 3 LEDs (1 green, 1 yellow, 1 red) that will serve as an interface for the user. The green LED will be used to indicate lower temperatures ranging from 0°C to 15°C. The yellow LED will be used to indicate approximately room temperatures, ranging from 16°C to 35°C. The red LED will be used to indicate temperatures higher than 35°C. As can be seen from the above schematic, each of the LEDs are connected to 150Ω resistors to limit the current entering the LED. LED D0 is the green LED and is connected to pin PB0. LED D2 is the red LED and is connected to pin PB2. Finally, LED D4 is the yellow LED and is connected to pin PB4. The red LED has a forward voltage ranging from 1.6V to 2.4V. The green LED has a forward voltage ranging from 1.9V to 2.2V. The yellow LED has a forward voltage ranging from 1.8V to 2.4V.

Q3.3.2 Analog Sensor Interface [5]

For the analog sensor, there will also be 3 LEDs (1 green, 1 yellow, 1 red) that will serve as an interface for the user. The green LED will be used to indicate lower light intensity levels ranging from 0 lux to 10 lux. The yellow LED will be used to indicate approximately moderate light intensity, ranging from 11 lux to approximately 100 lux. The red LED will be used to indicate light intensity levels higher than 100 lux. As can be seen from the above schematic, each of the LEDs are connected to 150Ω

resistors to limit the current entering the LED. LED D1 is the green LED and is connected to pin PB1. LED D3 is the red LED and is connected to pin PB3. Finally, LED D5 is the yellow LED and is connected to pin PB5. The red LED has a forward voltage ranging from 1.6V to 2.4V. The green LED has a forward voltage ranging from 1.9V to 2.2V. The yellow LED has a forward voltage ranging from 1.8V to 2.4V.