**EEE3088F Week 3: Design Proposal**

**Group Number**:

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Q1 Power subsystem [30]

Q1.1 Specification [10]

**Specifications:**

* 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]

**Draft Bill of Materials**

<https://github.com/zuhayrl/EEE3088F_Proj/blob/82cb426b756778753f15d8b4452abae63c901c77/Power%20BOM.xlsx>

Total = $0.2218 /PCB = $1.109

* Screenshot of your **draft** schematic here

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

**Submodule Interface:**

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]

Using both the requirements you defined last week and the information provided in this week’s lab lecture, define a comprehensive set of specifications for this submodule. A reminder again that while requirements are abstract and conceptual like a rough feature request, specifications are specific technical facts that a system needs to have and are therefore testable. Eg: *The submodule must be able to receive 10-24V and deliver up to 3W at 5V via a USB3.0 A male connector. //Just an example, not a specification for your submodule*

Additionally, there are 3 ‘users’ who will use these specifications, keep them in mind as your define these:

1. You will use these specifications to design your submodule and later test the resulting subsystem.

2. Your colleagues will assume each submodule meets the specifications laid out here and will design their submodules assuming they can expect this submodule to perform as specified.

3. A future engineer who you may well never get to speak to will be given these design documents when tasked with maintaining or updating your design and they will refer to these to understand how the submodule was initially specified to perform.

Specifications can be bulleted or in a table.

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

Using KiCAD, create a **draft** schematic for this submodule. Complete a draft BOM for this submodule and publish it in the shared gitlab repository as a spreadsheet. In this pdf enter:

● Link to spreadsheet in gitlab

● Total anticipated cost

● Screenshot of your **draft** schematic here

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

This submodule will interact with at least the other submodules in the system, and possibly the outside world. Define each interface this submodule has. These interfaces could be

electrical, mechanical, radio, and/or visual/audible/tactile (eg LEDs/a buzzer/a button). Your definition should cover pinouts, dimensions, electrical characteristics, and meanings behind any visual/audible/buttons signals.

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 µA
  + 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 ±2°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 kΩ to 33kΩ
  + Resistance when it is dark: 0.3 MΩ
  + 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/zuhayrl/EEE3088F_Proj/blob/Documentation/Sensor_BOM.xlsx>

* Total anticipated cost: $ 1.7445
* Screenshot of draft schematic:

Diagram, schematic

Description automatically generated

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.