University of Pittsburgh
Department of Electrical and Computer Engineering
ECE 1895: Junior Design Fundamentals
Dr. Samuel Dickerson

Design Project 1: 555 Timer Project Final Report

This document explains what needs to be included in your 555 timer final report.   This document should be comprehensive and include great detail about your design and design process.   Your report should include the follow sections:

Design Overview

In this section, you should provide a detailed description of your design.

- Start with a high-level description of your design and its purpose.
- Discuss the original design (at the block-diagram/schematic-level) that you referenced.
- Next, explain the modifications and improvements you made to the design.   If the modifications you ending up making to your design changed during the course this project, then make sure to include a writeup about those changes and how your design evolved. This document is not only a description of the technical aspects of your design, but it is also a digest of your design process.
- Explain the how the design is supposed to operate and the purpose of <u>each</u> component used in the design.
- Make sure to spend time explaining how the 555 timer chip is configured and used in your design (e.g. Astable, monostable, bistable, etc).
- Don't forget to cite your references and include images/schematics.

Design Verification

In this section, you should explain, in detail, all of the steps you took to verify your design before implementing it

- If you used SPICE to model your design, fully explain the process you went through to simulate your design.
    - Explain your simulation schematic(s).
    - In some instances, you may have had to come up with creative ways to model portions of your design in SPICE (e.g. non-electrical components, or components without readily available SPICE models), make sure to highlight those ocuurences

- Explain your simulation parameters (e.g. transient, DC, AC, duration etc) and why you decided setup the simulation in the way that you did
- Fully explain your simulation results, and include waveforms. Make sure that your waveforms are legible and identifiable (perhaps annotated) so that the reader can make sense of them
- Explain all of the test cases you ran in order to have confidence that you were ready to move on to design implementation
- If you used physical electronic/breadboarding to prototype your design, fully explain the process you went through to verify your design in that way
  - Explain which parts of your design you decided to verify and your rationale for prototyping those particular components
  - Make sure to include schematics of the portions that you verified and images of your experimental setup. The images of the setup should be annotated so that the reader can make connections between your experimental setup and the schematic
  - Include explanations of how any electronic test equipment used in prototyping and testing your design.
  - Describe all of the test cases you evaluated in order to make a final decision on your design and make sure to include your final results (e.g. oscilloscope images, tables of measurements, etc)

Design Implementation

In this section, you will explain your final PCB implementation

- Begin with a description of your PCB schematic.
  - Make sure to highlight descriptions of components that are specifically included for the purposes of realizing your design as a PCB
  - If there are any notable reasons you decided to use a particular component (e.g. , connectors, cost, availability, ease of use, etc) it would be appropriate to discuss those design decisions in this section
- Next, describe your PCB Layout
  - Provide an overview of your PCB layout and discuss its arrangement.
  - It would be appropriate to discuss the packaging used for each of your components in this section
  - If you employed any of the suggested PCB 'best practices' make sure to include a discussion of those practices in this section.
  - Also, in general, discuss your design process in coming up with the layout. Were there any particular challenges? How did verification of the PCB layout vs schematic go? Did the process of laying out the board drive you to make any changes? If you went through multiple iterations, discuss those here.

Design Manufacturing and Assembly

In this section, you should explain, in detail, all of the steps you took to assemble your design.

- Talk about your approach to soldering and assembling your design.
- Include the methods used
- Discuss any challenges encourtered when assembling or modifications made to the design for the purpose of testing

Design Testing

Write a summary of testing results from your initial prototype in this section.

- Explain your test plan, the procedures you use to test your design and the outcomes from those test.
- Include photos of the assembled prototype, and photos from any testing results
- If you had unsuccessful attempts, include write-ups of those attempts and how you remedied those issues.
- Make sure to document your debugging process and any challenges that came about.
- If your design is not fully functional, make sure to include write-ups on WHY it is not functioning
- Include references to videos (e.g. youtube or videos uploaded to CANVAS) showing your design functioning

Submission

Please upload the following files to Canvas

- A copy of your final report saved as a PDF document named **[USERNAME]_555_Report.pdf**
- You must include a video demonstration of your project in your report.
    - If you use YouTube to host your video, simply include a link to the demonstration in your report.
    - If your video is not hosted online, then upload the video file to Canvas alongside your report
- A zip file containing all your simulation files named **[USERNAME]_555_Simulation.zip**
- A zip file containing all of your Altium project files. Please only include the files associated with your most final schematics and layouts named **[USERNAME]_555_Altium.zip**
- A zip file containing your manufacturing files **[USERNAME]_GERBER_555.zip**