AN EVOLUTION OF CUBESAT SUBSYSTEM DESIGN METHODS FOR...

by

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Electrical Engineering

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ACKNOWLEDGEMENTS

I would like acknowledge .... Acknowledgments must be double spaced and is limited to one page.

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ABSTRACT

The abstract must be single spaced and no more than 350 words, indent first line five spaces. The abstract must contain the following elements: (1) statement of the problem, (2) procedure or methods, (3) results, and (4) conclusions. Mathematical formulas, abbreviations, diagrams, and other illustrative materials should not be included. It should be written to be understood by a person who does not have expertise in the field.

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INTRODUCTION

Welcome to the Montana State University electronic Thesis/Dissertation (ETD) LaTeX template. In this chapter various sections, subsections, and subsubsections are created and filled with random text). In Ch. **??** methods to write equations and how to include figures and tables are explored. Conclusions are drawn in Ch. 7.

Section

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Subsection With a Very Very Very Very Very Very Very Very Very Very Very Long Title

For long subsection titles use the command `\longsubsection{#1}{#2}`, where #1 is the first line of the long title, and #2 is the second line of the long title. You can also pass an optional argument to this command that puts a shorter title in the table of contents as shown by the subsection below.

Another Subsection With a Very Very Very Very Very Very Very Very Very Very Very Long Title

The are **not** similar commands for sections and subsubsections as these are not specified in the MSU style guide.

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BACKGROUND

CubeSats are a growing industry and are becoming increasingly more capable and affordable space mission options. Off-the-shelf components can be used to develop complex missions....

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DESIGN STUDY - SOLAR CELL EXPERIMENT

This subsystem design was part of the FIREBIRD-II mission, and was an electronic load used to measure the performance of a spacecraft's solar cells on orbit. By working with an industry partner, the SSEL was able to utilize cutting edge solar cell technology in exchange for providing the customer with low-cost flight heritage and useful environmental data. This chapter will focus on the design method used to fulfill the requirements as defined by the collaboration between the SSEL team and the customer. After discussing the subsystem requirements, the concept design can take shape, followed by the analyses and calculations performed to verify circuit functionality.

At this time, the SSEL relied on the Mentor Graphics PADS Suite for electrical computer aided design (ECAD), and integrated SPICE simulation was not a feature that was readily available. Therefore, simulations of the critical circuits and subcircuits was performed using LTSpice developed by Linear Technology. Then, a full schematic was captured in PADS for creating the PCB layout files and bill-of-materials needed for fabrication and assembly of the subsystem.

Requirements and Conceptual Design

Circuit Simulations and Calculations

PCB Layout and Mechanical Design

Calibration and Results

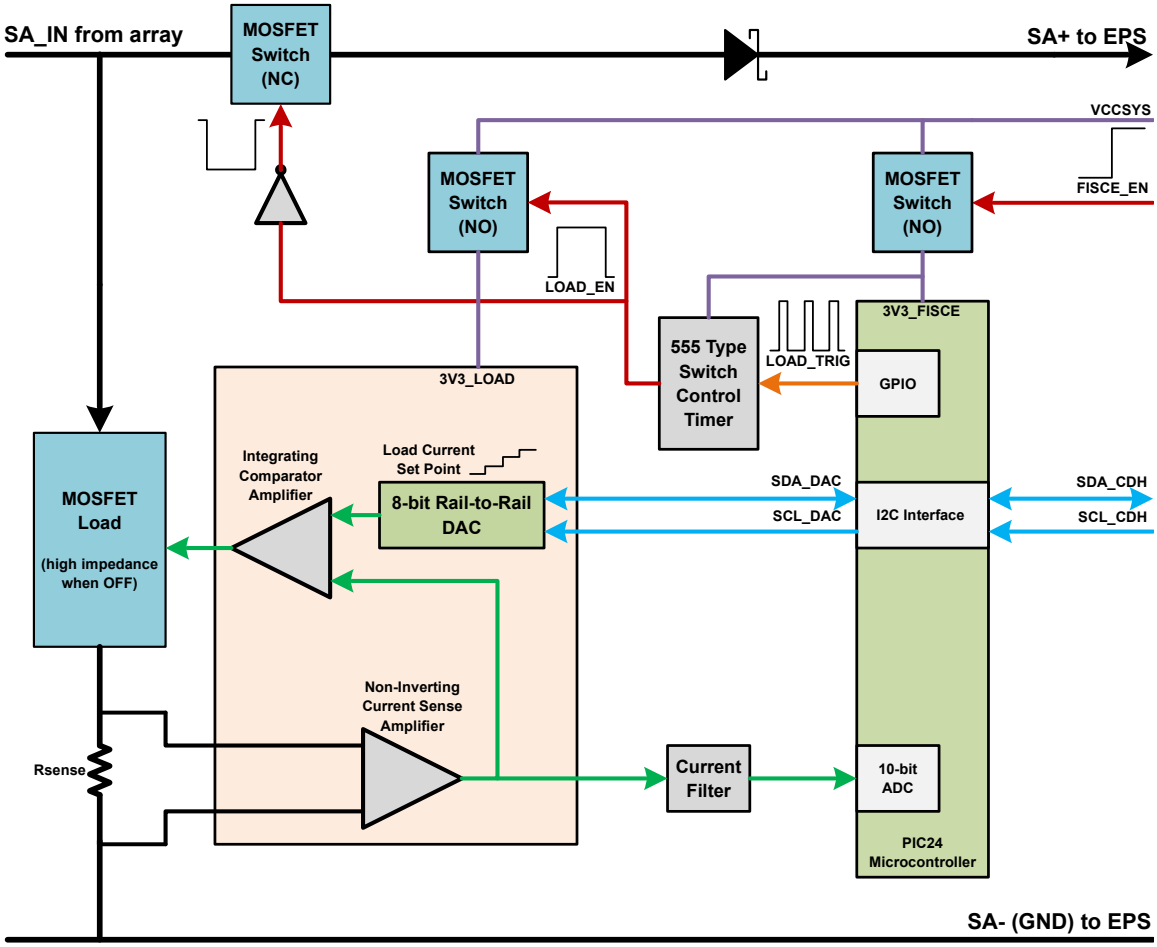

Figure 3.1: This block diagram represents the components of the FISCE load circuit and their functions.

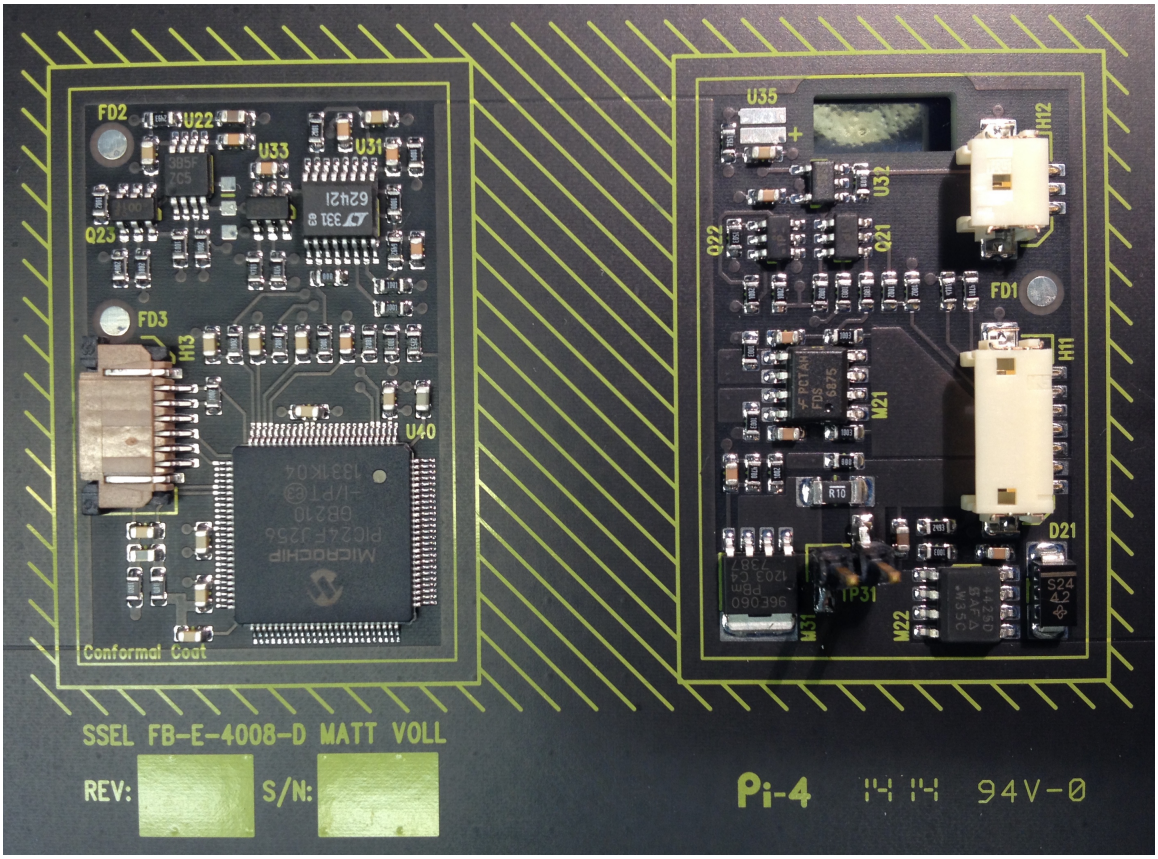

Figure 3.2: The assembled FISCE load circuit on the backside of the solar panel substrate.

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DESIGN STUDY - ELECTRICAL POWER SUBSYSTEM

This subsystem was designed to facilitate the expanded mission capabilities of the IT-SPINS mission. Building on the success of the electrical power subsystem (EPS) designed for the FIREBIRD-II mission, an updated version of the Phoenix EPS was conceptualized in the Spring of 2016.

Requirements and Conceptual Design

Circuit Simulations and Calculations

PCB Layout and Mechanical Design

Lessons Learned and Future Work

DESIGN STUDY - ELECTRICAL GROUND SUPPORT EQUIPMENT

This is the VOID EGSE design example.

Requirements and Conceptual Design

Circuit Simulations and Calculations

PCB Layout and Mechanical Design

Lessons Learned and Future Work

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FUTURE METHODS

Investigating the possible methods for future use.

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CONCLUSION

LaTeX produces documents that look great, automatically handles references and citations, and easily incorporates figures and tables. This is not a guide to LaTeX but rather an introduction to the MSU style. If you want more information about LaTeX many introductory guides can be found online.

REFERENCES CITED

APPENDICES

APPENDIX A

EXAMPLE CODE

```
% MATLAB code to say 'hello world'
disp('Hello world')
```

APPENDIX B

EXAMPLE SCHEMATIC

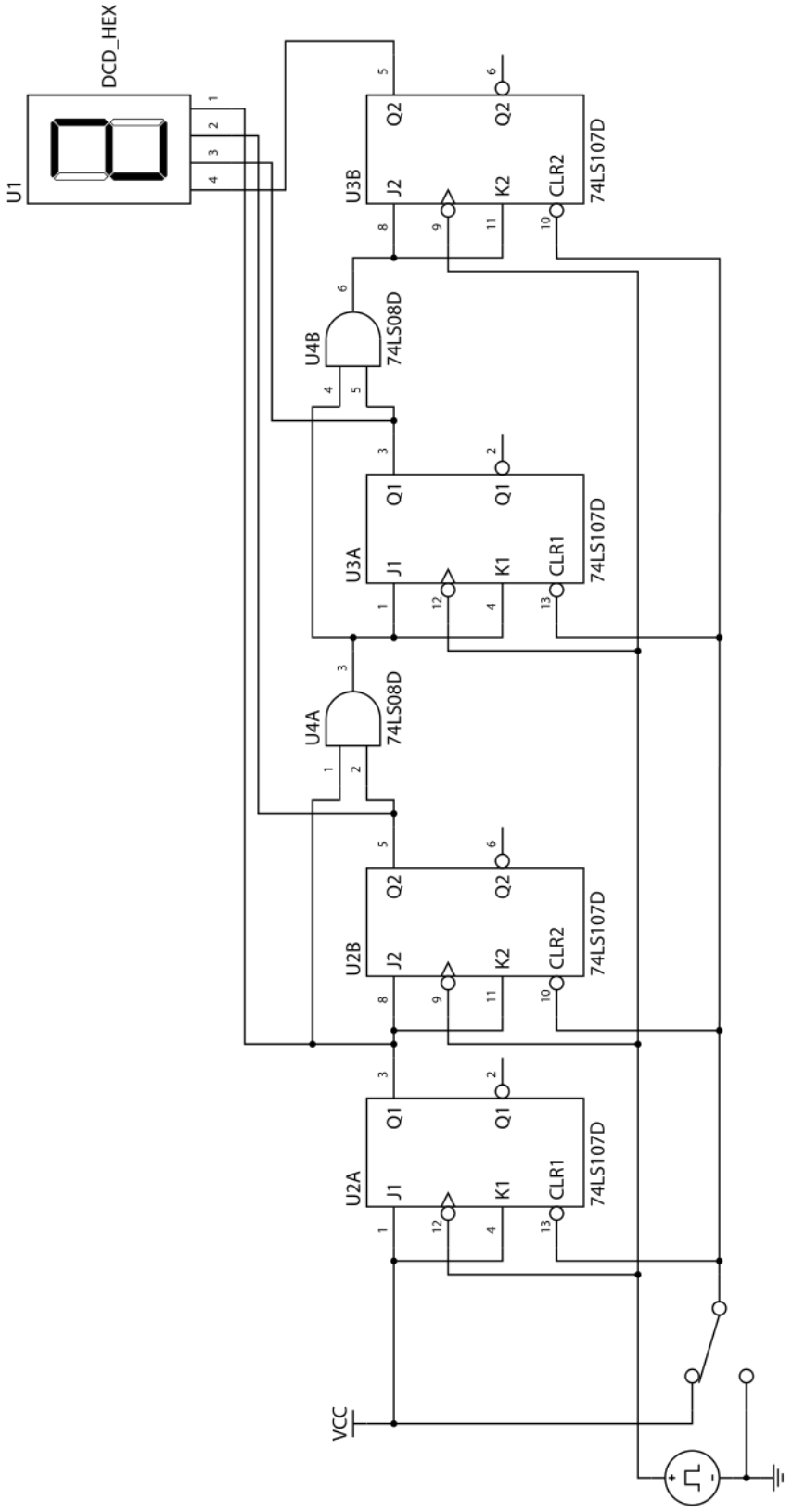

Figure B.1: Large schematic on landscape page