ZTF Design Document

<Title>

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<Date>

# Overview

This section is used to provide an overview of the design which will be presented in this document. The overview describes the requirements, the function(s) of the hardware section, the necessary digital interfaces, and the power and voltages required for the hardware.

# Block Diagram

This section includes one or more block diagrams of the hardware. One block diagram can show the placement of the hardware function in the single board controller system. The other block diagram can show a quick overview of the hardware.

# Unit Block Schematic

This section will show a schematic of a unit cell of the hardware design with all components and their values included. This schematic will be accompanied by a file on the twiki which contains a netlist of the design which will allow the collaborators to import the schematic into their own schematic capture program.

# Design Description

The section will generally be the bulk of the document. This is where the design will be described and how the circuit works. This description will include the circuit topology and the reasoning used to arrive at the current design. How the design fulfills the requirements of the single board controller should also be discussed. These requirements can include voltage range(s), voltage resolution, driving currents and load analysis, and switching speeds. Any tradeoffs needed to arrive at the design should be described. Any calculations needed to describe the circuit functions should be included in this section.

# Noise Analysis

This section will flow directly from the design description and show the noise sources of the circuit. Each of the noise sources should be described and included in a final output noise calculation. How the noise source ultimately affects the CCD video signal should also be described.

The PSRR should also be addressed in this section. How will the noise on the power supply contribute to the output noise of the circuit? This will place a limit on the amount of noise in the chassis power supply. Also, how power supply noise is mitigated through bypass capacitors should be addressed in this section. This discussion should be continued in the power supply section of the design document.

# Digital Interface

Many circuits within the single board controller will be under digital control. This section will describe the digital interface(s) of the circuit. The digital interface description should include a cross reference to the FPGA design document or the USB communication document for a more detailed description of the digital interface. A description of the software used to control the circuit should also be included in this section. A cross reference to the software documentation should also be made to alert the reader to the necessary command line code which is necessary to provide full control of the circuit.

# Required Voltages and Power Consumption

This section will describe the required voltages for the circuit. This information will be aggregated to support the design of the power board for the chassis. For this reason, this section is critical to the system design. In addition to the required voltages, the required power consumption should also be described. Again, this will aid in the design of the chassis power board and what power supplies will be necessary for the chassis design.

# Heat Transfer and Thermal Analysis

This section flows directly from the power consumption section. Calculations will be included detailing the rise in temperature for the circuit’s components. This flows from junction to case and case to ambient resistances and power consumption. This thermal analysis will also discuss how the heat is drawn away from the circuit by conduction, convection, and radiative processes. An acceptable temperature rise will be demonstrated by a calculation of the heating and power consumption.

# Layout Discussion

How the heat is drawn away from the circuit will be addressed in the layout discussion. The layout discussion will also address the grounding of the circuit and the ground planes involved in the circuit’s layout. This section will be developed as the design approaches the final creation of the circuit board.