Conversion Bridge of Sony SubLvds to MIPI CSI-2

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Objective

Create a circuit board design to convert Sony Sublvds output data into MIPI CSI-2 protocol

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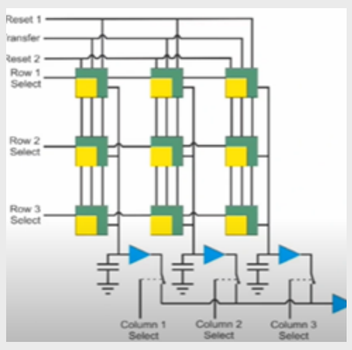
Initial steps

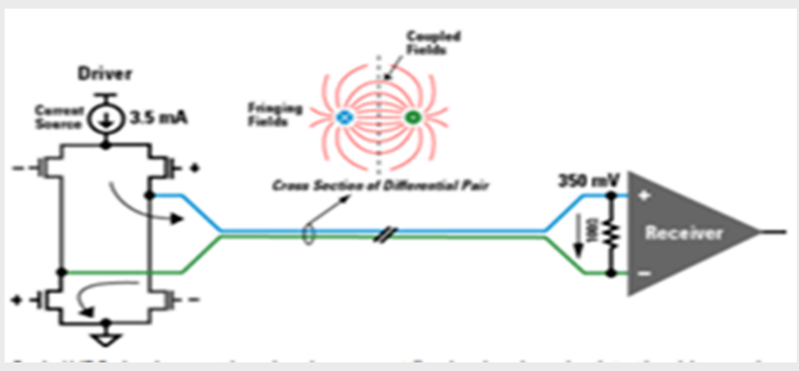
·CMOS Image sensor

a) Uses Mosfets to convert accumulated charge across photodiode into a voltage signal which can be used
b) The voltage signal which corresponds to each pixel is called row by row
c) There are two main types: Rolling shutter global shutter



SybLvds

a) Tight electromagnetic coupling between the wires, which reduces the generation of EM noise
b) Reduces the vulnerability to EM noise
c) Differential Voltage

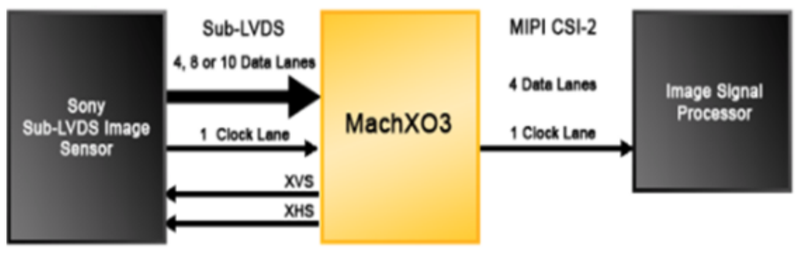


03

Available Technology

·Few options available in choosing the proper fpga to complete the task. Some of them included the Trion T120 from Efinix, MachXO2, MachXO3, and Crosslink from Lattice Semiconductors.

·The MachXO2 was selected mainly because of the number of resources and documentation provided by the company, along with a reference design that can be used to simulate the conversion between the two protocols



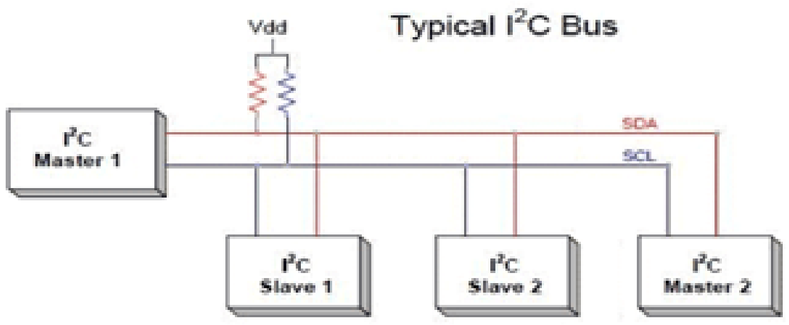
04

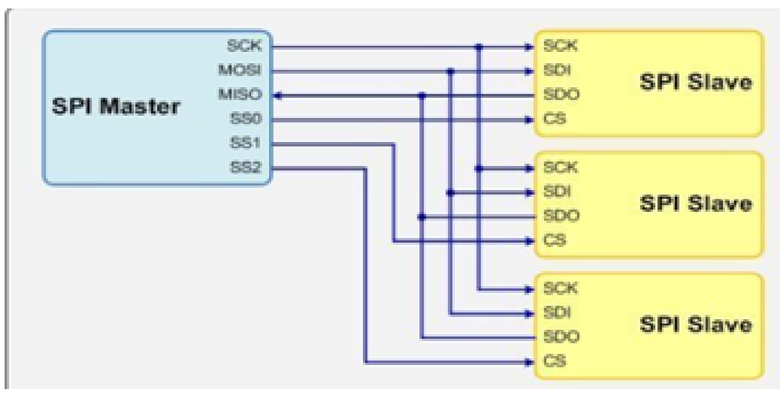
Peripheral Components

·Some other components were needed in addition to the fpga such as: an oscillator, a clock buffer, an SPI to I2C, and voltage level translators

·Learned the difference between SPI and I2C protocols, their advantages, and disadvantages

·Created schematics and footprints for resistors and capacitors on Altium which were to be used for the peripheral components, the Sony image sensor and the fpga.

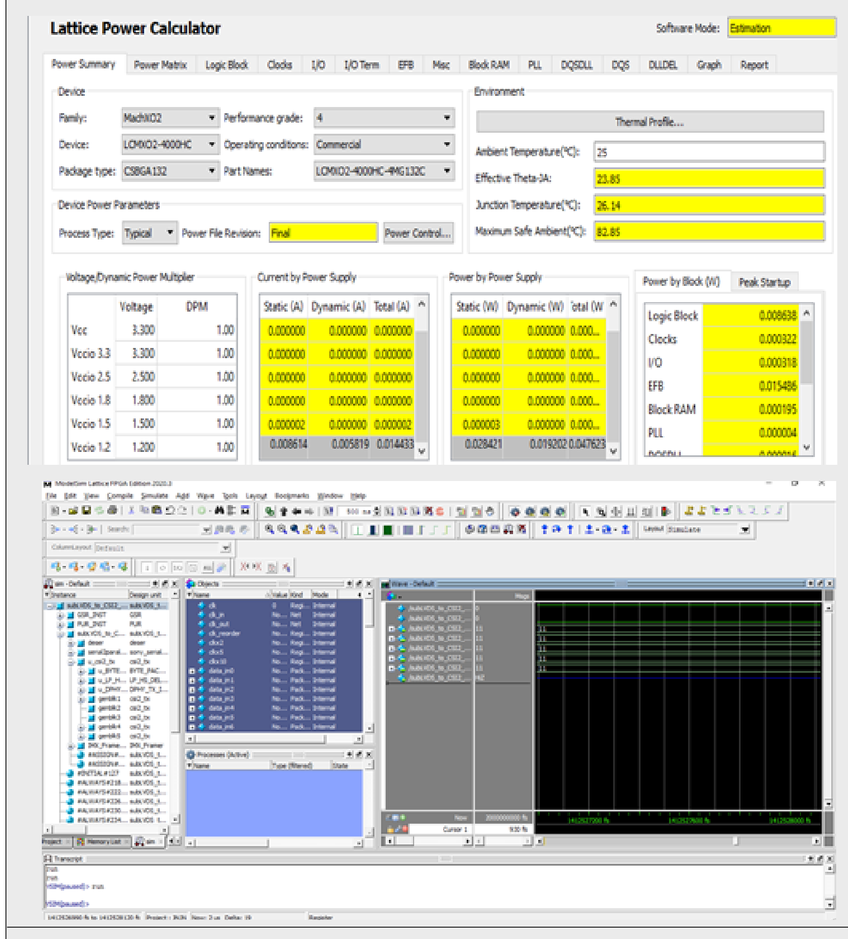




05

Implementation

- The MachXO2 is programmed by using the Lattice Diamond software
- The software has timing analysis and power analysis which could be used
- I initially ran into a few problems
- The first problem was a licensing issue which took some time to be resolved
- The second issue was regarding the reference design which was provided by Lattice
- The code had multiple errors which Lattice needed to be contacted before they were resolved
- A documentation was also provided which was supposed to outline how to the diamond software should be used to run simulations for the reference design provided. This was however no the case
- Power analysis was able to provide an estimation regarding the power consumption for the given mode of operation



References (Images)

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