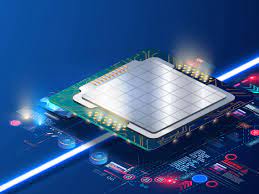
ECE 4514 REPORT

HW6: VGA Display Module



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I have neither given nor received unauthorized assistance on this assignment.

# Overview of the Design

The goal of the project is to design a VGA display program. The top file consists of three modules, the PLL module to generate VGA clock at a specific frequency, the vga\_controller to generate the VGA-related signals, and the pattern generator to decode the pixels to the colors.

The PLL is IP-based design. The VGA-related signals will be controlled by two counters: hcount and vcount, for visible area, back porch, sync pulse, and front porch. The pattern generator is about assigning a set of 24-bit values to the RGB sections.

# Functional Verification

For testing, I just give an initial reset and check the outputs of the VGA signals and values, mainly focusing on the hsync\_n, vsync\_n, sync\_n, and blank\_n signals.

图片包含 应用程序

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图示

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One main problem I met is that I didn’t use the async\_reset at the beginning. In this case, the submodules cannot be initiated by the reset\_n signal, therefore no output was generated. It was then solved by applying asynchronous reset\_n to the sequential blocks.

# Frame Frequency Exploration

The vga\_frequency is different from the system clock. Take a refresh frequency of 60Hz for example, the pointer needs to refresh the whole frame 60 times per second.

Assume the number of pixel per frame is 800 by 640, which is 5.12x10^5. Then the number of pixels per second is 60 x 5.12 x 10^5 = 3 x 10^7.

Since the pointer need to change one pixel per vga\_clock, the number of vga\_clk per second is 3 x 10^7. In other word, the frequency of vga\_clk is around 3 x 10^7 Hz, which is 30 MHz.

In this design, I test two different frequencies: 25.175MHz, 30MHz, 10MHz

The case with 25.175MHz and 30 MHz can show functional results on the monitor, as shown in the last section. The case with 10 MHz cannot show any pixel on the monitor.

# RTL Schematic of the top module

图示

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# VGA Display

I shift the displayed color between red and blue at an adjustable speed. The vga\_clock and the vcount are used to generate a flag bit, which is used to decide the number of frames between each shift.

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