

Color Digital Sign Board using Altium Designer

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ABSTRACT

Digital signage is ultimately less costly and more efficient than print, while delivering greater message control and a more engaged audience. LED display, as the board size is getting larger, the time needed for data transfer between LED dot matrix arrays is also very important using display technology, video technology, multimedia technology, network technology, computer technique and automatic control technology to display various information factors. In this paper, first using of Altium Designer, is a PCB design software. Designers provide consistent and standardized project file, create the right parts for design and then made of PCB board is proposed. As the main functional unit, the proposed method uses the PSoC analog coprocessor, octal transparent D-type latches and high speed CMOS Decoder/De-multiplexer are deployed. In addition, DC to DC power converter and a power MOSFET transistor are used.

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I. INTRODUCTION

The primary goal of this paper is to develop a human live. This will provide a modular solution for displaying the scrolling text and numbers from storing files, but they are easy to change another text and numbers for user desires. There are three separate components. But these components are altogether combined to one work. Three components are first is Altium Design, second is PCB design and then Programmable System-on-chip PSoC.

Altium Designer is a PCB design software, an electronic design automation software package is a category of software tools for designing electronic systems for printed circuit board, FPGA is an integrated circuit designed to be configured by a customer or a designer after manufacturing and embedded software design written to control machines or devices that are not typically thought of as computers, and associated library and release management automation.

Altium Design is using project file, they are like a container for project. There are many different things will need for even a basic project, such as: PCB Footprint libraries, Schematic libraries, Schematic documents, PCB Documents, Scripts, CAM file, Setting, Generated reports, Generated files, Version control feature, Net labels and Net class etc. [1]

My Altium design has six copper layer in PCB. There are important 6 copper layers in Garbar files. They are Two outer layers: Top Layer (GTL) and bottom Layer (GBL), Two inner Signal Layers: G1 (Vertical), Signal Layer G2 (Horizontal), Power Plane GP2(VCC) and Ground plane GP1(GND).

The remainder of this paper is organized as follows. Section 2 Theory of LED dot matrix and PCB Design Flow. Section 3 Describes the hardware description for the system. Section 4 Implementation of the proposed system. Final section concludes the paper.

II. THEORY OF LED DOT MATRIX DISPLAY

In a dot matrix display, multiple LEDs are wired together in rows and columns. This is done to minimize the number of pins required to drive them. For example, a 8x4 matrix of LEDs would need 32 I/O pins. By wiring all the anodes together in rows (R1 through R7), and cathodes in columns (C1 through C3). Each LED is addressed by its row and column number shown in figure 2.1 below.

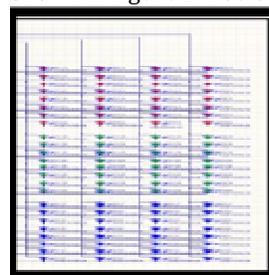
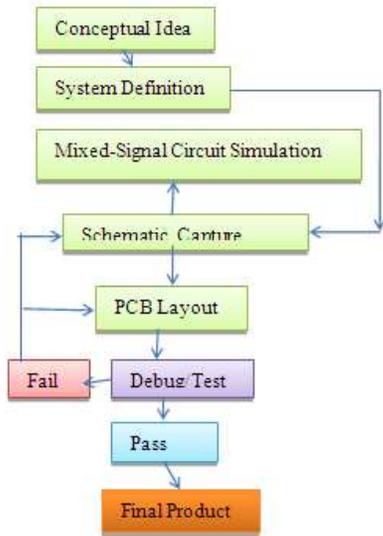


Figure 2.1 RGB led in Altium design.

A dot matrix display is a display device used to display information on machines, clocks, railway departure indicators and many other devices requiring a simple display device of limited resolution. The display consists of a matrix of lights or mechanical indicators arranged in a

rectangular configuration such that by switching on or off selected lights, text or graphics can be displayed. A dot matrix controller converts instructions from a processor into signals which turns on or off lights in the matrix so that the required display is produced.[2]

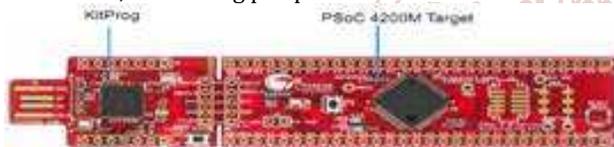
PCB Design Flow



III. HARDWARE DESCRIPTION FOR THE SYSTEM

A. Programmable System-on-Chip-PSoC

The PSoC is a combination of a microcontroller with digital programmable logic, high-performance analog-to-digital conversion, and timing peripherals.



B. Full Color RGB LED

RGB LED is a two-lead semiconductor light source. It is a P-N junction diode.



C. Octal Transparent D-type Latch



Latches are the basic elements for storing information.

D. 3 to 8- line Decoder



Decoder is an advanced high speed CMOS decoder.

E. Power Trench MOSFET



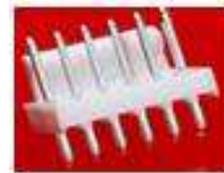
A power MOSFET is a specific type of metal oxide semiconductor field-effect transistor.

F. Inductor



A passive two-terminal electrical component that stores electrical energy in a magnetic field.

G. Connector



This connector is mated with either printed circuit board (PCB) connectors or connectors terminated with 22 to 30 AWG wire.[4]

IV. IMPLEMENTATION OF THE PROPOSED SYSTEM

A. PCB design support for Altium

In Altium designer using the Miscellaneous Devices. In library to select it. This library has symbols for all the available simulation-ready.

Libraries = collection of components

Additional Libraries accessible via a search path and subfolders . And then draw the some components design using of their footprint with library in the Altium software shown in figure 4.1A,4.2A ,4.3A and 4.4A.

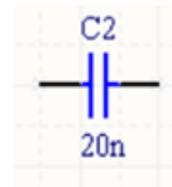


Figure4.1A Capacitor and their footprint

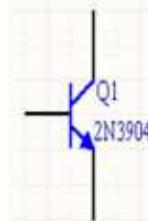


Figure 4.2A Transistor and Their footprint

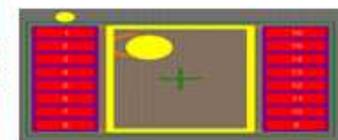
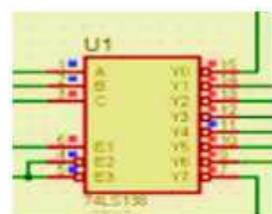


Figure 4.3A Decoder and their footprint

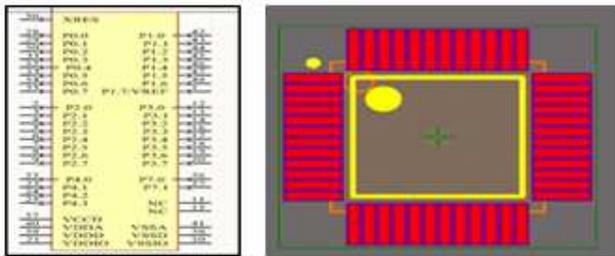


Figure 4.4A Cypress and their footprint

In schematic, using a designing toolbar and draw the require design shown in some figure 4.5A and 4.6A .

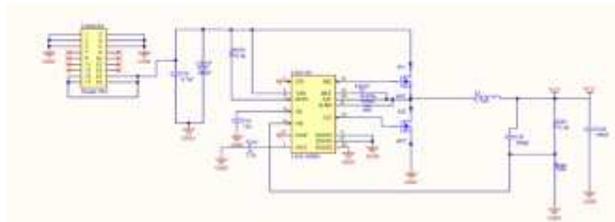


Figure 4.5A schematic entry and simulation

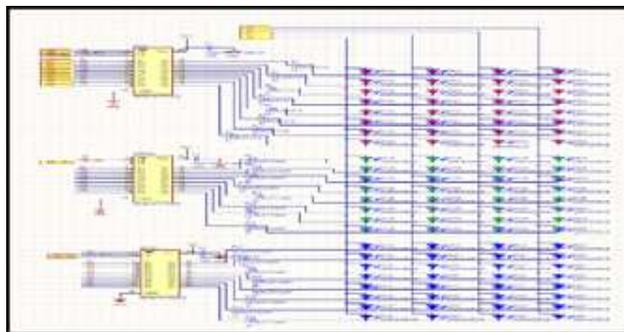


Figure 4.6A schematic entry and simulation

After importing, find the added parts inside the pink area and connected to VCC, GND, GTL, GBL, G1 and G2 design has six copper layer in PCB shown in figure 4.7A.

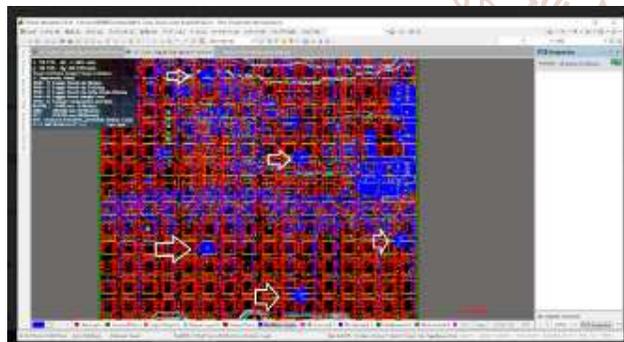


Figure 4.7A schematic of copper layer in PCB

B. Made of PCB Board in Real Time

Looking at many options in the field of LED arrays, use a set of dot matrices consisting of 16 rows of 16 Led's, and columns of 16 LED's, each with red, green, and blue (RGB) capabilities. This brought the need for decoders, latches, cypress and more devices are assemble in circuit design shown in figure 4.1B, 4.2B and 4.3B .

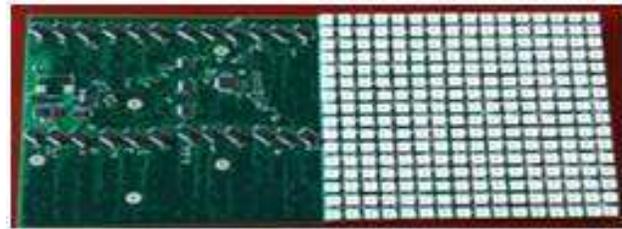


Figure 4.1B. Assembled PCB of color digital sign board



Figure 4.2B In front of PCB board connected with power supply.



Figure 4.3B In back of PCB board connected with power supply.

CONCLUSION

This system keep to high speed data transfer, more simple access than serial interface and easy to understand. PSoC4 Cyp-cy8c424x has many pins, thus it is easy to extension of many devices. This display board can be controlled by a PC or USB and used any text, graphic, or multimedia information and secondary monitor to video and television display. This system's advantage is could be easily implemented with the software that is included in the hardware. Also, it is the most power efficient options that uses a 24 Volt supply, and runs 0.4 Amps maximum. This works out to be only 220 Watts maximum power for an entire array of square feet LED board.

References

- [1] www.wikipedia.org
- [2] Design & Simulation of Moving Message Display using Microcontroller[DIU]
- [3] Altium1-schematics &simulations-2017
- [4] www.ti.com