Introduction

The LED6S (LED-on-Si) micro-array display is developed in Photonics Technology Center (PTC) and Nano-Fabrication Facilities (NFF) at HKUST.

Figure 1: The LED6S micro-array display

In this project, we aimed to design a driver circuit and program a microcontroller to control the LED6S display. The whole system is divided into three main parts: the LED6S driver board, the driver circuit board, and the microcontroller board.

Objectives:
- Improve matrix-driver circuits
- Optimize the circuit and programming
- Assemble the system and optimize

Methodology

Hardware

1. Design Phase

- Schematic Circuit
- Power Regulation Circuit
- Driver Circuit Board
- LED6S Demo Board

2. Implementation Phase

- Schematic Design
- PCB Layout Design
- PCB Assembly

3. Testing Phase

- Test procedures were conducted to ensure the circuit design and assembled board is well-functioned.

Software

Microcontroller programming

The whole program code structure includes 3 parts:
- a) LED6S library - a library that manages the display functions. Each array represents one matrix.
- b) Sample matrix - Defines the I/O pins of the MCU board.
- c) Display function - Defines the boolean array and controls the flow of signals.

Results

The 2 boards are assembled and combined together, the driver circuit board is designed in the same size as the MCU board and directly connected to the LED6S driver board. Therefore, the size of the system is highly reduced. The LED6S display is able to show any patterns in the boolean arrays with satisfied brightness.