

Controllable Liquid Crystal Tint

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5CB Liquid Adjustable Crystal Systems



5LACS

Abstract

The Liquid Crystal Window (LCW) is a window that electrically modulates window tint to user specifications. These windows allow the user to create a smarter more customized environment.

Problem & Need

Windows that were previously difficult to reach, such as sunroofs, panoramic windows, and other inaccessible windows can now be controlled with ease. These windows can be utilized where more traditional methods, such as blinds and shutters are not practical to install and maintain. Similar window companies fall short on displaying the true capabilities and customizable experience possible with liquid controlled windows.



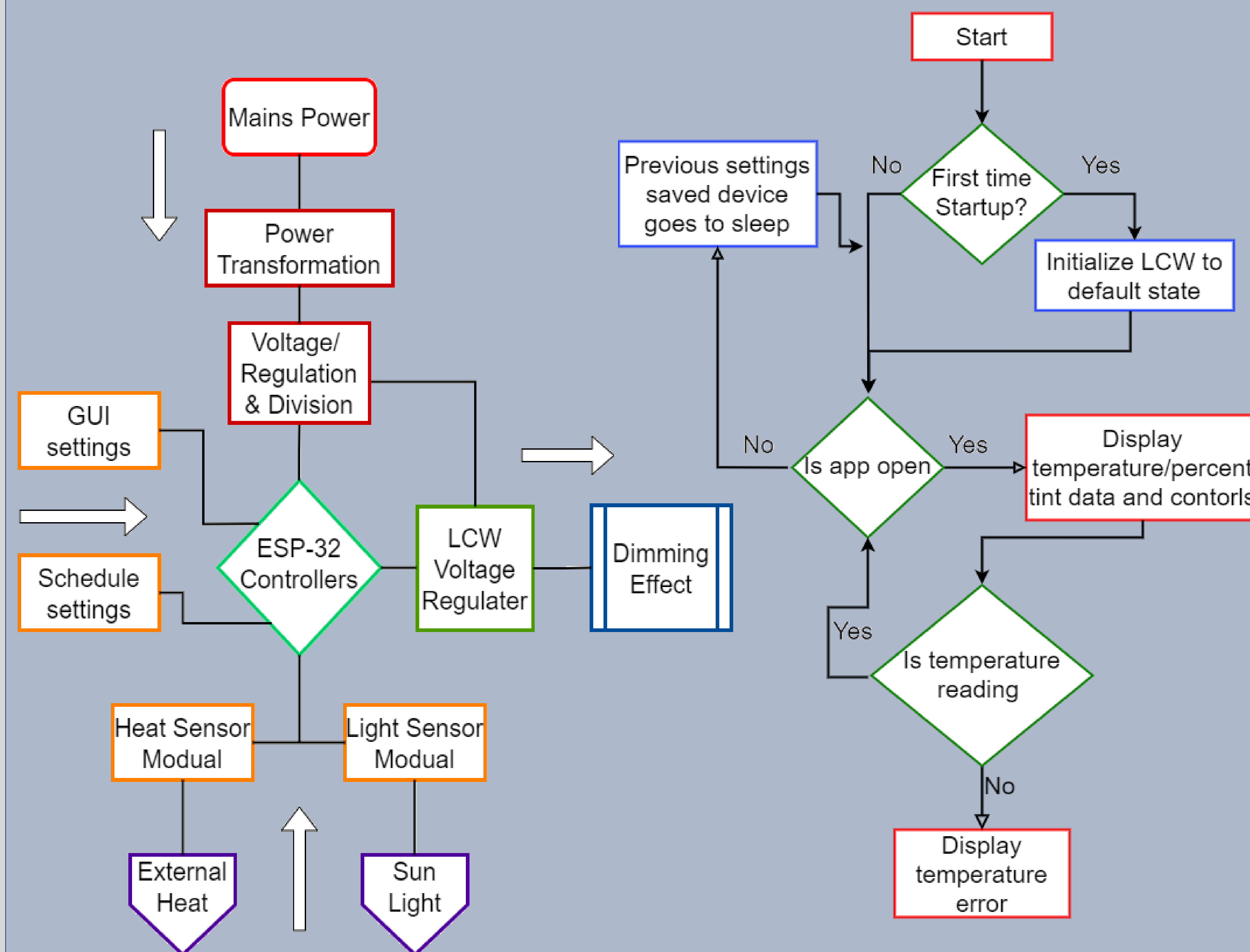
Design Concept

On start up the window is fully tinted, from there the user can adjust the GUI to the desired opaqueness. The GUIs menu has the option to adjust itself according to sensors, set scheduled dimness, or manual adjustment. Once an option has been selected the GUI will put the microcontroller into a low power state.

Implementation

Our design reflects similar technology found in other liquid crystal displays. We utilize layering of glass, ITO, and liquid crystal to create a window with electrical tinting properties. A key component of our design is our user interface and controls capabilities. The device can be automated via sensors within the window, as well as controlled by the user to manually adjust the tint to their preference.

Block Diagram



Functional Block Diagram

Software Block Diagram

Components

GUI: I2C controlled TFT LCD

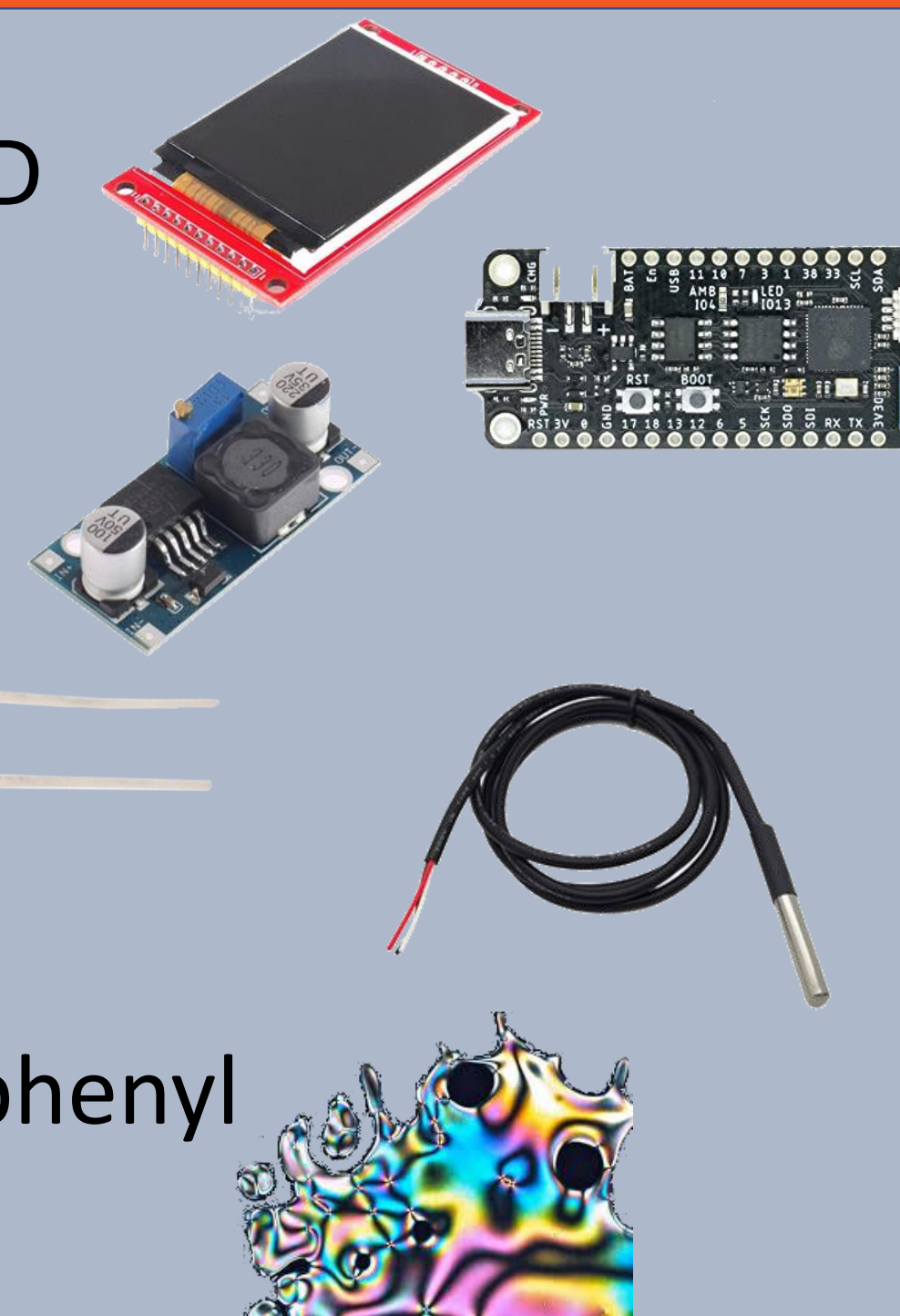
Microcontroller: ESP32-S2

Buck Converter: LM2596

Light sensor module

Heat sensor: DS18V20

5CB - 4-Cyano-4'-pentylbiphenyl



Summary

There are a variety of tasks that can be done to further improve upon this project. These tasks include: improving and scaling the window manufacturing process, a phone app, a more advanced user interface, and more options for customizability. We really want to improve the overall user experience and interaction with the windows. Further expansion can also be done by exploring applications in automobiles.

Glossary

LCW - Liquid crystal window, the window using liquid crystal technology to be electronically dimmed and controlled.

5CB - 4-Cyano-4'-pentylbiphenyl; the liquid crystal chemical compound used to create the LCW.
Buck Converter - DC-To-DC power converter that is used to reduce the voltage to a usable level.

Acknowledgement

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