Modular Mechanical Keyboard

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Abstract

The Modular Mechanical Keyboard (**MMKB**) seeks to suit a wide range of typing, layout, functional, and aesthetic preferences.

The modularity primarily comes from the side and top **magnetically-attached modules**, which extend the keyboard's functionality.

The modules range from a numpad, to navigation keys, function rows, to even a macropad.

Other features include multi-region layout support, **Bluetooth connectivity**, multiple USB-C ports, underglow lightning, a display, rotary knobs for volume, and much more.

Motivation

I had the strong desire to design a keyboard that had the flexibility and versatility to conform to and **serve as many people's preferences** as possible, **without sacrifice or compromise** on its functionality.

The solution to this was found simply by **giving the user the choice** to choose what they wanted their keyboard to do.

Before I made the MMKB, **there wasn't another keyboard like it currently on the market**, and knowing myself, I wasn't going to wait around for someone else to make it.

Methods and Materials

Hardware: The schematic and PCB was designed using KiCAD, and the PCB and case were both fabricated from JLCPCB. The primary tools for testing hardware were the oscilloscope and multimeter.

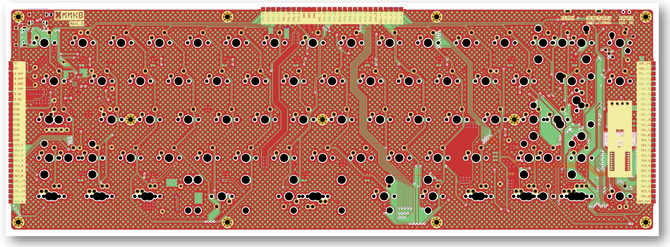


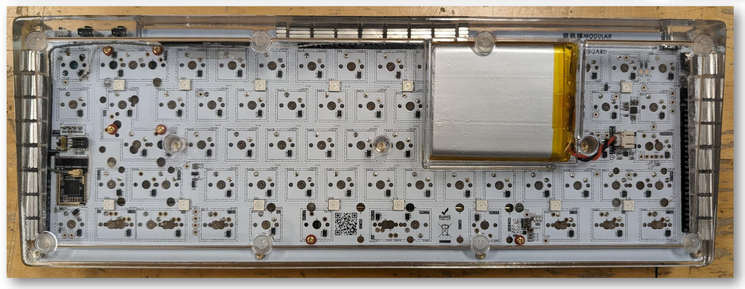
Fig 1. PCB design

Fig 2. Oscilloscope

Firmware: The firmware powering this project is called ZMK: it's open-source, free to use, and was configured for this project using VS Code and GitHub.

Results

The project was a **resounding success**: I was able to produce **3 separate fully featured and functional keyboards**, each with their own modules. The keyboards function both wired and wirelessly, have incredible battery life, and the modules attach satisfyingly and effortlessly.



Challenges

My project was particularly fortunate, as **I faced minimal setbacks** compared to others. However, the primary issues I encountered came from a simple initial hardware oversight, difficulty setting up the firmware, and reliability issues with the pins connecting the modules.

Conclusion

I'm incredibly proud and satisfied with how my project turned out, **it blew all my expectations out of the water**.

Virtually **every major feature I'd envisioned had been successfully implemented**, and I even had time achieve a few stretch goals.

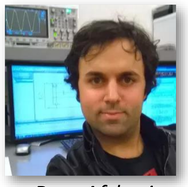
If I were to receive funding (i.e. a group buy, Kickstarter, Patreon), it's possible for me to make a (relatively) small run of these keyboards to be sold as a kit to enthusiasts.

Acknowledgments

Most useful resource for the hardware design, and basic firmware setup:
github.com/ebastler/zmk-designguide
zmk.dev/docs

Special thanks to **John Lund** for his invaluable help and insights, **Reza Afshari** for letting me use his office and equipment for countless hours, and to **Andrew Burns** for being my sounding board.

John Lund



Reza Afshari

Andrew Burns

WWU

Capstone Project

Electrical and Computer Engineering Program