PythonTEX Examples

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Revision History

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1 Introduction

1.1 Purpose

The ErgoDUE is a split ortholinear mechanical keyboard with USB-C 3.1 data hub functionality. The design is based on the open-source ErgoDOX project, which can be found at `https://www.ergodox.io/`. The intention of the ErgoDUE project is to refresh the electronic design of the keyboard and add USB-C hub functionality while maintaining the same form factor. The mechanical design of the original ErgoDOX is largely unchanged.

1.2 Product Scope

1.3 References

2 Requirements

2.1 Safety

2.2 Keyboard

2.2.1 Keyswitches

2.2.2 LED Lighting

2.3 Power

2.4 Microcontroller

2.5 USB Hub

To minimize complexity, the USB hub will initially only be able to sink 3 A at 5 V from the USB host, but the system may expand to include better USB PD support at a later time.

1. The ErgoDue design shall be adapted from the open-source ErgoDox design.

    1.1. Electrical Design

        1.1.1. Keyboard

        1.1.2. USB Hub

2.5.1 USB Controller

2.5.2 Upstream Port

2.5.3 Downstream Ports

3 Architecture

The software and electronics rearchitecture consists of several changes. The main change is the addition of three USB-C ports per half of the keyboard. with both halves connected, the keyboard also has 5 additional low power USB-C ports for data transfer or charging. The changes can be summarized as follows. First, the microcontroller is changed to the RP2040. The RP2040 is more powerful than the ATTINY-series microcontroller used in the original, and is now readily available in large and small quantities. The RP2040 offers many attractive features, such as multiple independent serial interface controllers as well as the highest clock speed available for the price. The RP2040 interfaces with an external USB hub controller that handles the USB data protocol, and with each external USB-C port. In addition to the USB hub function, the RP2040 is also responsible for managing the keyswitches and LED backlighting for the keyboard. The microcontroller lacks the required number of GPIO pins, so an I2C GPIO expander is used to poll the keyswitch circuits. The colored LEDs are controlled using dedicated I2C LED matrix driver ICs for each color LED.

3.1 Interface

3.2 Keyboard

3.3 USB Hub

3.4 Power Tree

4 Circuit Design

4.1 Power

4.2 Keyboard

4.2.1 Keyswitches

4.2.2 LED Lighting

4.3 Microcontroller

4.4 USB Hub

4.4.1 USB Controller

4.4.2 Upstream Port

4.4.3 Downstream Ports

5 PCB Design

6 Verification