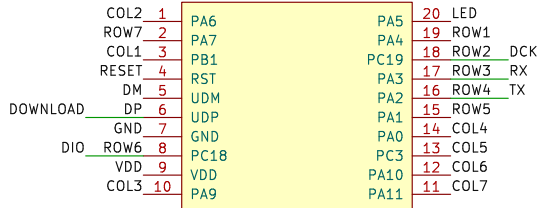


Per the CH32X035 datasheet, PA7 can not be output.

U1  
CH32X033F8P6



The keyboard has 48 keys laid out in a 4-row-12-column grid.  
It uses fewer GPIO pins to have a 7x7 matrix (14 pins) than to use a 4x12 (16 pins) matrix.

The mapping is top-to-bottom, left-to-right. This retains "column X <= Y".

To find the key number:  
switch number = keyboard column \* number of rows + keyboard row.  
To find the logical column, 'row':  
(switch number / 7, switch number % 7)

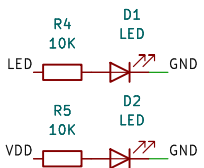
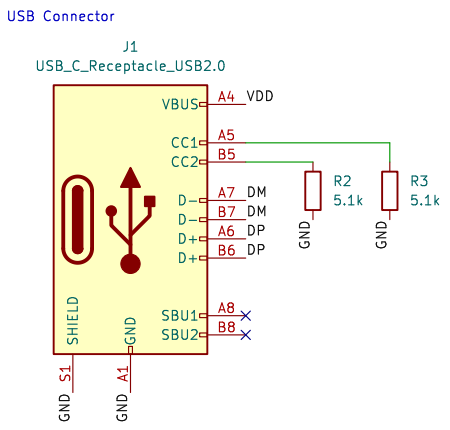
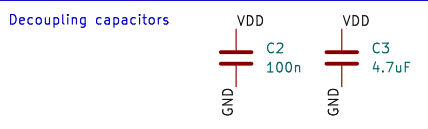
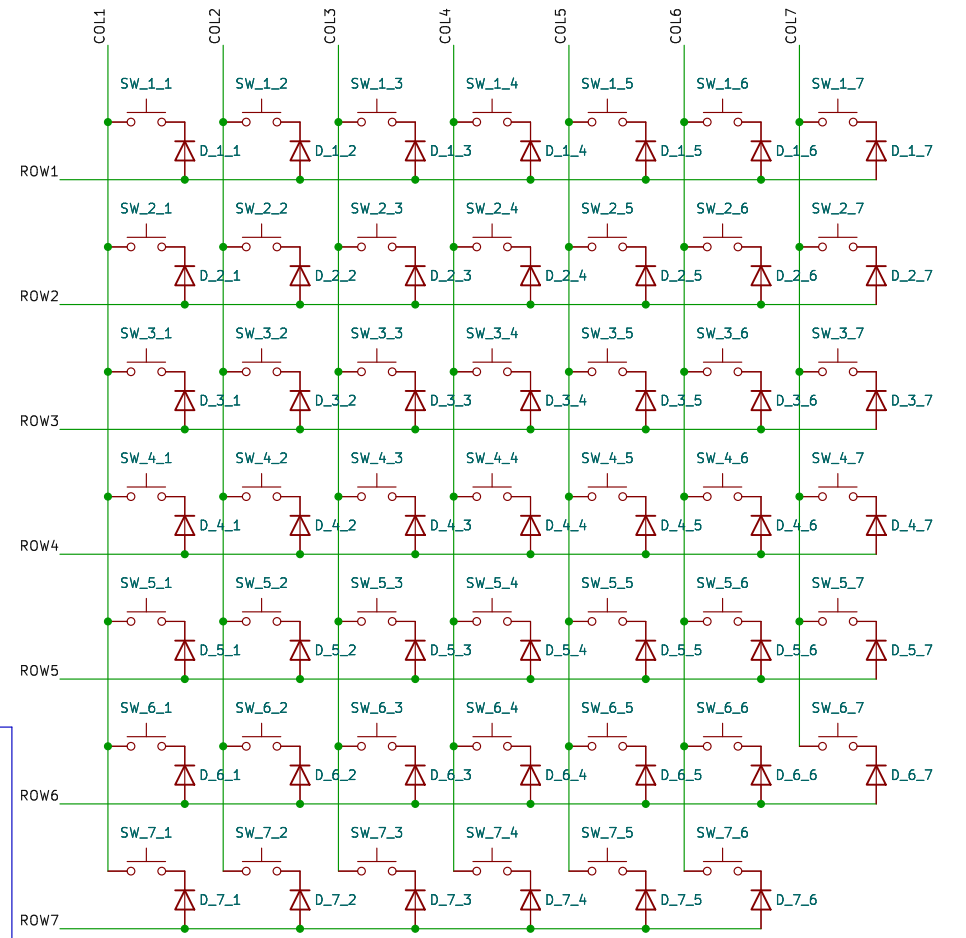
**IMPORTANT: Take care with diode direction!**

For CH32X035:  
- Only PA0-PA15 and PC16-PC17 support pull down input. (ref. CH32X035 datasheet, section 1.4.19).  
- PA7 cannot be used as an output. (ref. notes to Table 2-1).

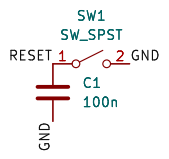
For "cathode(-) faces row", current flows from column to row, matrix scanning is done by either:  
- write col high (+), and read from pull-down rows (-).  
- write row low (-), and read from pull-up cols (+).

For "cathode(-) faces col", current flows from row to column, matrix scanning is done by either:  
- write row high (+), and read from pull-down cols (-).  
- write col low (-), and read from pull-up cols (+).

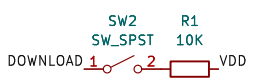
**Take care the diode direction agrees with matrix scanning requirements for writing to the pin / pulling down.**



Reset Switch  
ref. Figure 3-3 Typical circuit of CH32X datasheet.



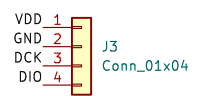
Download switch.  
Short while plugging in USB to enter ISP flashing mode. e.g. with wchisp.



UART  
For simple printf debugging with UART2. ("ROW4"/SW\_4\_x switches can't be used while using UART2).



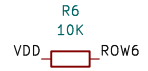
WCH Link interface  
(CH32X033 only compatible with WCH-LinkE or WCH-LinkW) Using DIO/DCK prevents use of ROW2/ROW6.



Hardware, Mounting Holes  
For M2 screws.  
Same mounting holes as JJ40.

- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- H4 MountingHole
- H5 MountingHole

External Pull-up Resistor  
When testing rev2025.1, I observed if a SW\_6\_C key was pressed quickly followed by a physically adjacent SW\_2\_C key, then all SW\_6\_C keys scanned as pressed.  
Using a 10K pull up resistor on Row6 resolved the issue.



Project: <https://github.com/rgoulter/keyboard-labs>  
Simple 4x12 ortholinear keyboard using CH32X MCU.  
48-key on 7x7 digital matrix.

**Richard Goulter (rgoulter)**  
Sheet: /  
File: keyboard-ch32x-48.kicad\_sch

**Title: CH32X-48**

Size: A4	Date: 2025-01-16	Rev: rev2025.3
KiCad E.D.A. 8.0.2		Id: 1/1