

### Mounting points

M3 for threaded inserts  
M2 for board support

#### M3 holes

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

#### M2 holes

- H5 MountingHole
- H6 MountingHole

### Fiducials

- FID1 Fiducial
- FID2 Fiducial
- FID3 Fiducial
- FID4 Fiducial
- FID5 Fiducial
- FID6 Fiducial

#### SJFOM

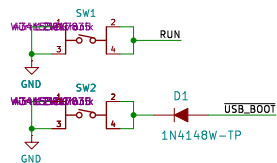
Sheet: /  
File: StepUp.kicad\_sch

#### Title: System diagram

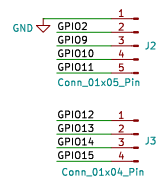
Size: A4	Date: 2025-02-22	Rev: v0.3
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## MCU reset/prog buttons

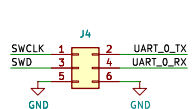
Run – resets MCU  
USB\_BOOT – hold this and toggle Run to enumerate as USB device for UF2 firmware upload  
NOTE: Buttons are SMD and usually hidden from user



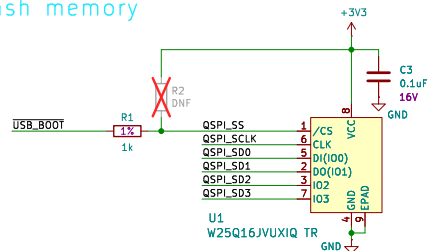
## Spare I/O



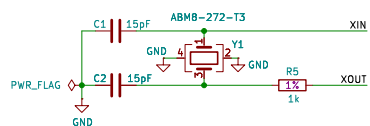
## Debug header



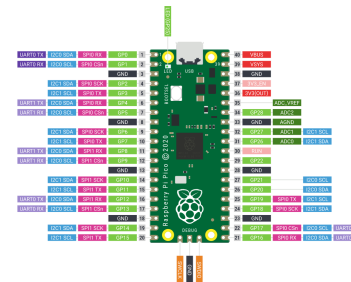
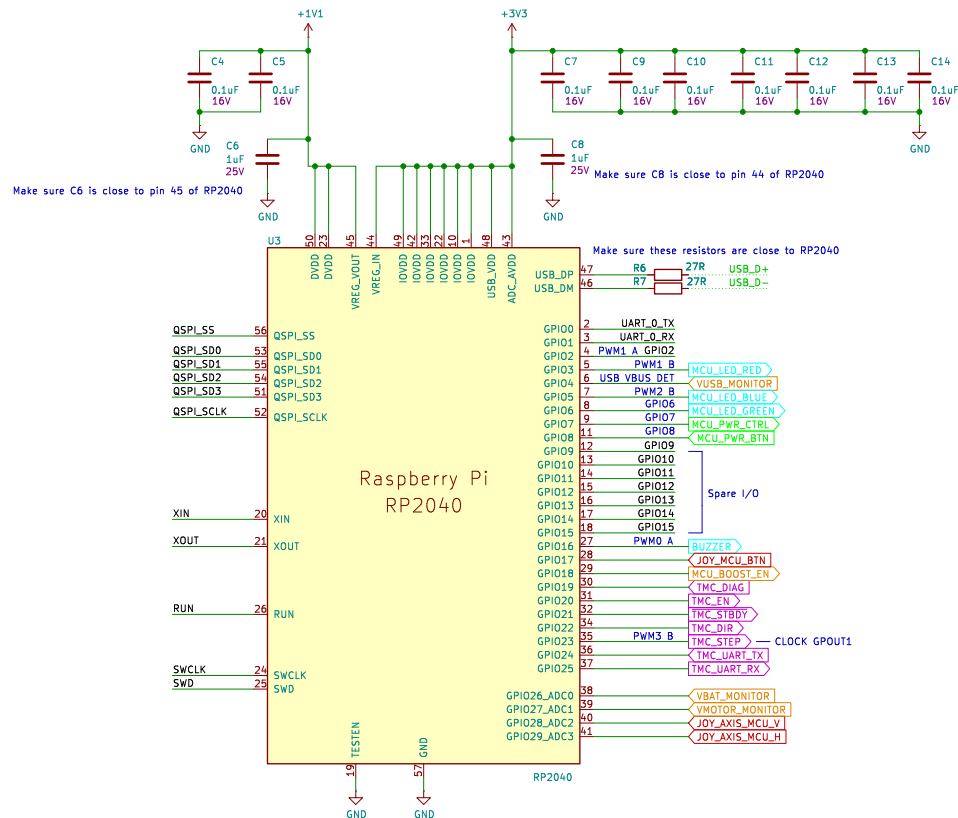
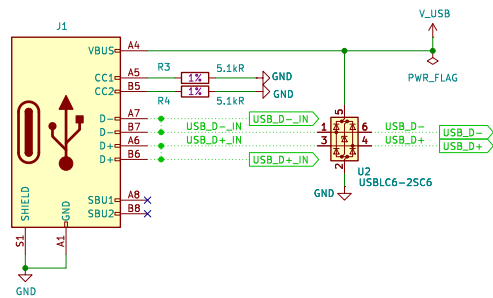
## Flash memory



## Crystal



## USB input



SJFOM

Sheet: /MCU/

File: microcontroller.kicad\_sch

Title: Microcontroller

Size: A3

Date: 2025-02-22

Rev: v0.3

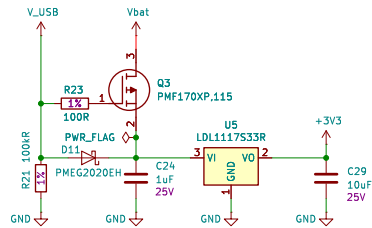
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Id: 2/6



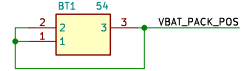
## 3v3 LDO

Default: 3v3 powered by Vbat  
USB inserted: 3v3 powered by Vusb



## Battery connector

2 battery clip connectors  
Option:  
BT2 component has slots to accommodate:  
- battery of length ~65mm, no internal protection  
OR  
- battery of length ~67mm, with internal protection

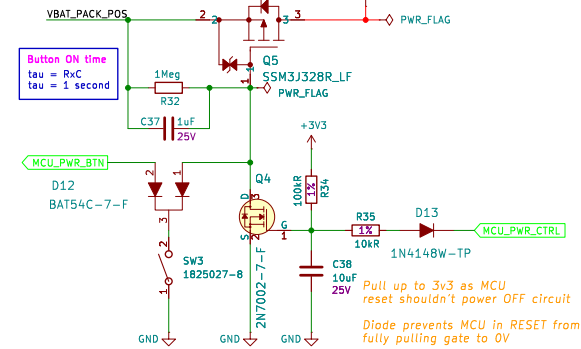


Battery connector with slots.  
Adjust to suit batteries of length 65 -> 67mm

65mm battery: NO internal protection  
67mm battery: WITH internal protection

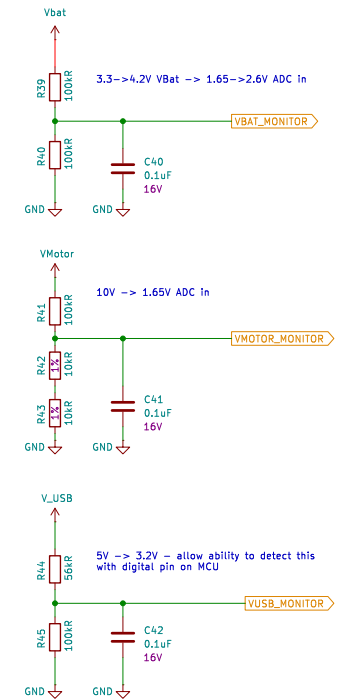
## Power switch

Hold button to power circuit on, then NMOS keeps circuit ON



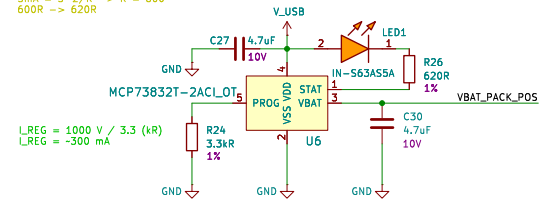
Pull up to 3v3 as MCU  
reset shouldn't power OFF circuit  
Diode prevents MCU in RESET from  
fully pulling gate to 0V

## Voltage monitoring



## Battery charge IC

LED Vf = 2.0V  
5mA = 5-2/R -> R = 600  
600R -> 620R



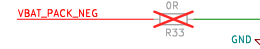
$$I_{REG} = \frac{1000V}{R_{PROG}}$$

Where:

R<sub>PROG</sub> = kOhms  
I<sub>REG</sub> = milliampere

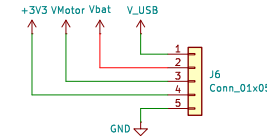
## Bypass battery protection

Enables working with batteries of non-standard voltage range



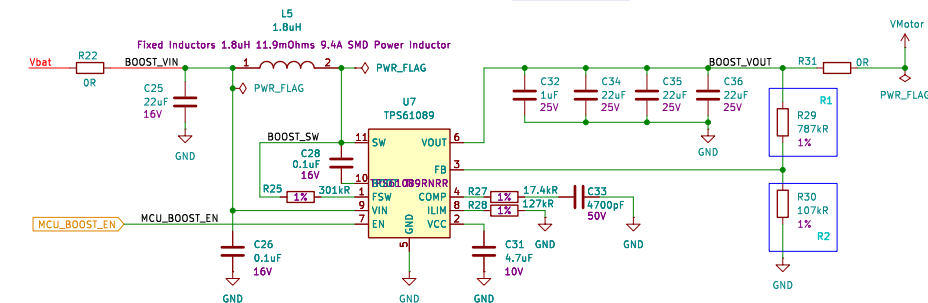
## Voltage test pads

Common voltages



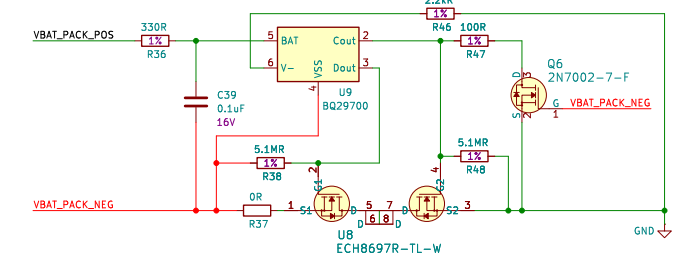
## Step up boost converter

Boost from Vbat -> 10V  
OR jumper resistors can be removed for testing power consumption



## Battery Protection circuit

Default: ~4.3Amp MAX discharge current  
Alternative: Increase OR resistor to lower MAX discharge current



SJFOM

Sheet: /Power/  
File: power.kicad\_sch

Title: Power

Size: A3 Date: 2025-02-22  
KiCad E.D.A. 9.0.0

Rev: v0.3  
Id: 4/6

## Status LED's

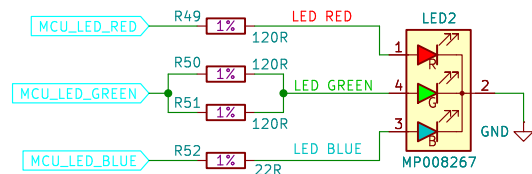
Status LEDs, RGB 3-in-1, through-hole, clear dome

### LED resistor calculations (matching mcd values)

RED - 20mA = 600 mcd  $\rightarrow$  1mA = 30mcd  
 - 300mcd = 10mA  
 - Vf=2V (typ). 3.3-2V = 1.3V/10mA = 130R  $\rightarrow$  120R

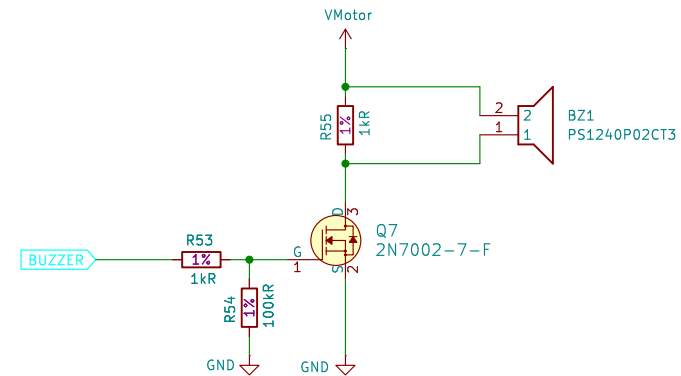
BLUE - 20mA = 300 mcd  $\rightarrow$  1mA = 15 mcd  
 - 300mcd = 20mA  
 - Vf=3V (typ). 3.3-3V = 0.3V/20mA = 15R  $\rightarrow$  22R

GREEN - 20mA = 1300 mcd  $\rightarrow$  1mA = 65 mcd  
 - 300mcd = 4.6mA  
 - Vf=3V (typ). 3.3-3V = 0.3V/4.6mA = 65R  $\rightarrow$  60R



## Buzzer

To indicate device states,  $f = 4\text{kHz}$   
~10V from the boost converter also used for the buzzer



SJFOM

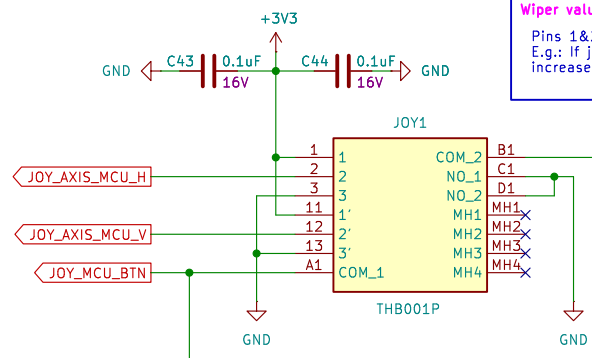
Sheet: /Indicators/  
File: indicators.kicad\_sch

**Title: User Input**

Size: A4	Date: 2025-02-22
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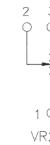
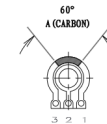
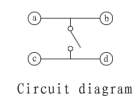
Rev: v0.3  
Id: 5/6

## Joystick



### Wiper value

Pins 1&2, resistance goes down as wiper moved in that direction  
E.g.: If joystick has pin 1 = 3v3 and pin 3 = GND, pin 2 voltage increases as joystick moved to pin 1, decreases as moved to pin 3



### SJFOM

Sheet: /User Input/  
File: user\_input.kicad\_sch

### Title: User Input

Size: A4 Date: 2025-02-22  
KiCad E.D.A. 9.0.0

Rev: v0.3  
Id: 6/6