Power

File: power.kicad_sch

User Input

File: user_input.kicad_sch

MCU

File: microcontroller.kicad_sch

Motor Driver

File: motor_driver.kicad_sch

Indicators

File: indicators.kicad_sch

Mounting points

4 x M3 for threaded inserts
1 x M2 for board support

M3 holes	M2 holes
H1 MountingHole	H5 MountingHole
H2 MountingHole	H6 MountingHole
H3 MountingHole	
H4 MountingHole	

Fiducials

- FID1 Fiducial
- FID2 Fiducial
- FID3 Fiducial

SJFOM

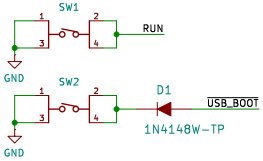
Sheet: /
File: StepUp.kicad_sch

Title: System diagram

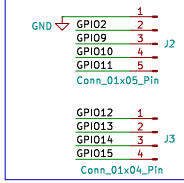
Size: A4	Date: 2025-02-22	**Rev: v0.3**
KiCad E.D.A. 9.0.0		Id: 1/6

MCU reset/prog buttons

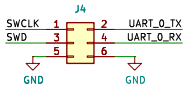
Run – resets MCU
USB_BOOT – hold this and toggle Run to enumerate as USB device for UF2 firmware upload
NOTE: Buttons are SMD and usually hidden from user



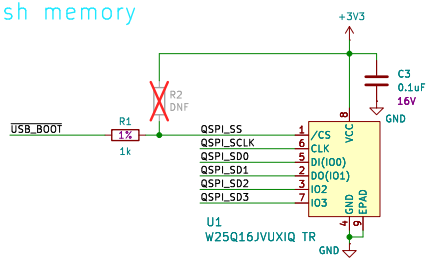
Spare I/O



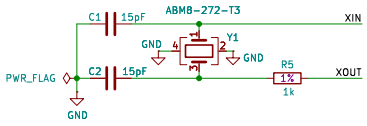
Debug header



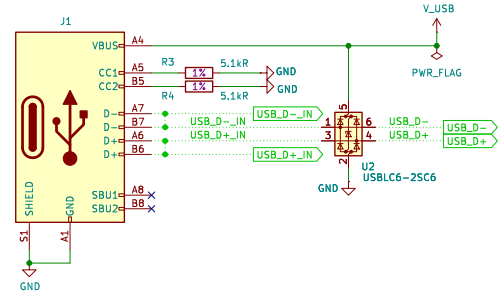
Flash memory

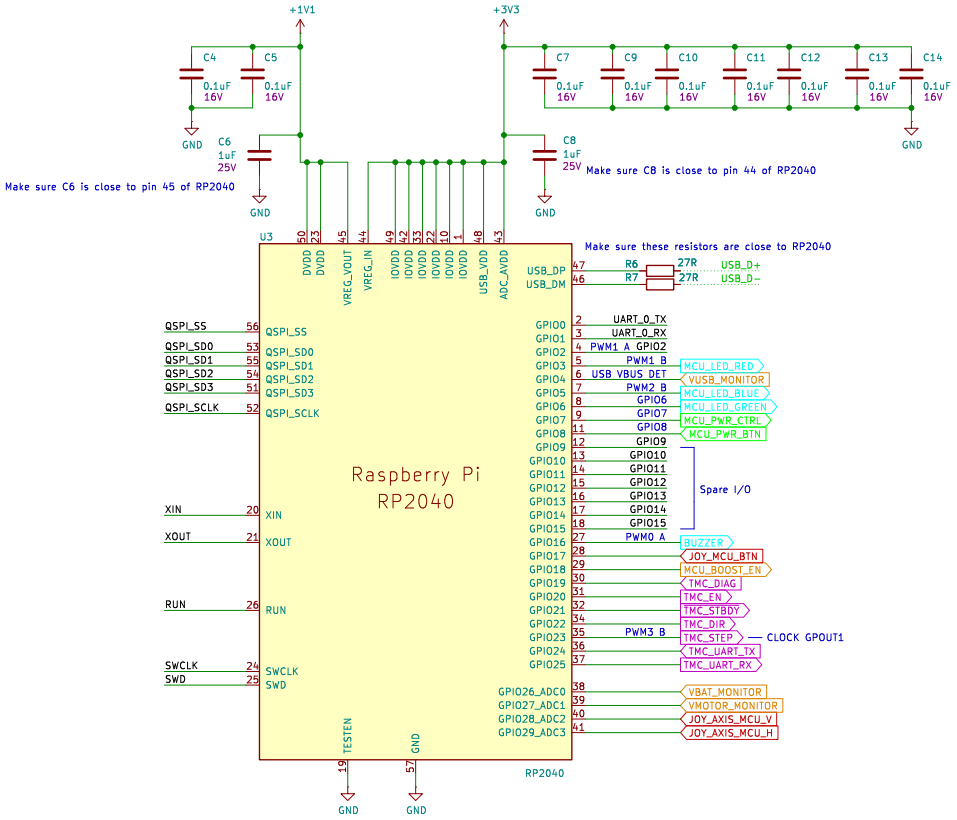


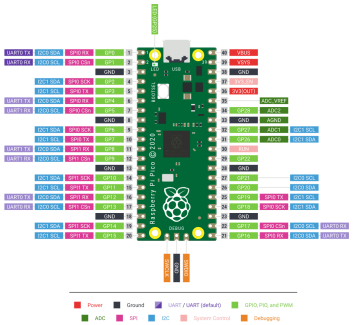
Crystal



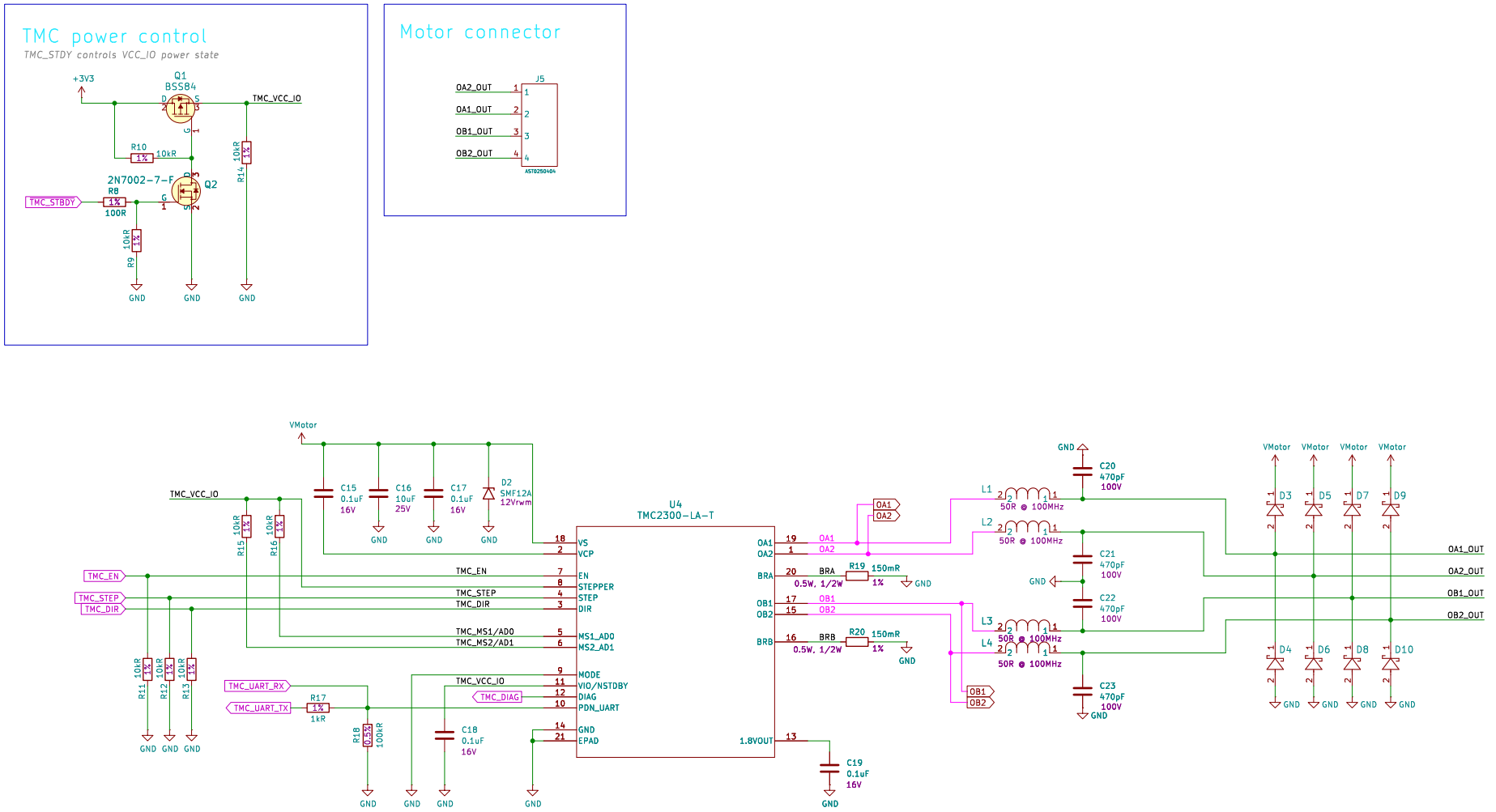
USB input







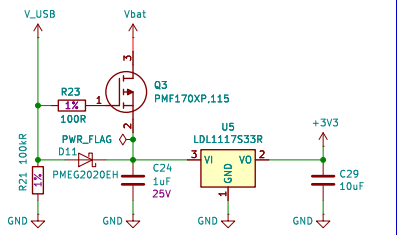
SJFOM		
Sheet: /MCU/		
File: microcontroller.kicad_sch		
Title: Microcontroller		
Size: A3	Date: 2025-02-22	**Rev: v0.3**
KiCad E.D.A. 9.0.0		Id: 2/6



SJFOM	
Sheet: /Motor Driver/	
File: motor_driver.kicad_sch	
Title: Motor Driver	
Size: A3	Date: 2025-02-22
KiCad E.D.A. 9.0.0	Id: 3/6
	Rev: v0.3

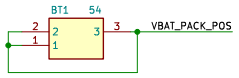
3v3 LDO

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

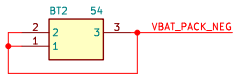


Battery connector

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



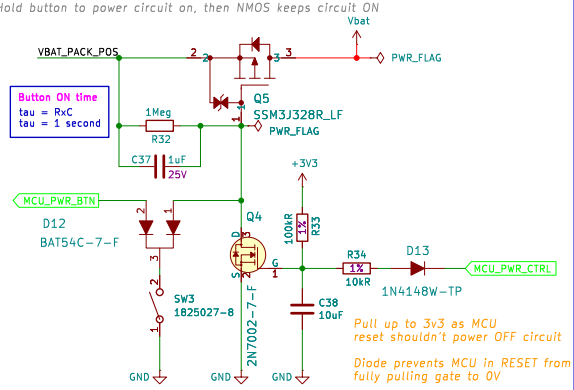
Battery connector with slots.
Adjust to suit batteries of length 65 –> 67mm



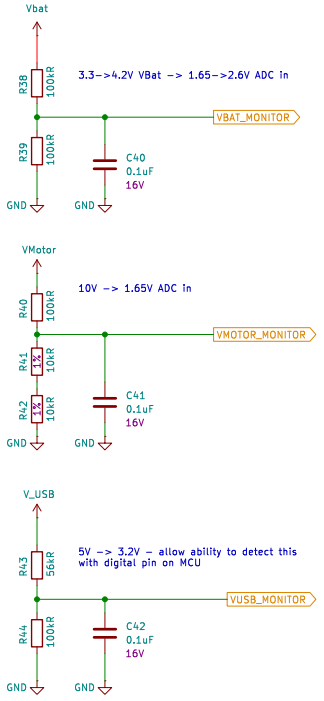
65mm battery: NO internal protection
67mm battery: WITH internal protection

Power switch

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

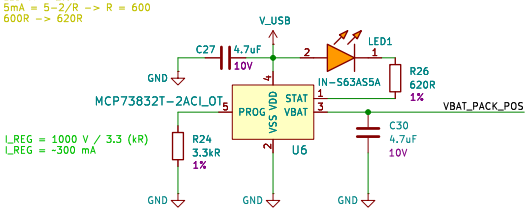


Voltage monitoring



Battery charge IC

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



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

Where:

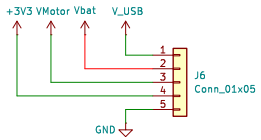
R_{PROG}	=	kOhms
I_{REG}	=	milliampere

Bypass battery protection

Enables working with batteries of non–standard voltage range

Voltage test pads

Common voltages

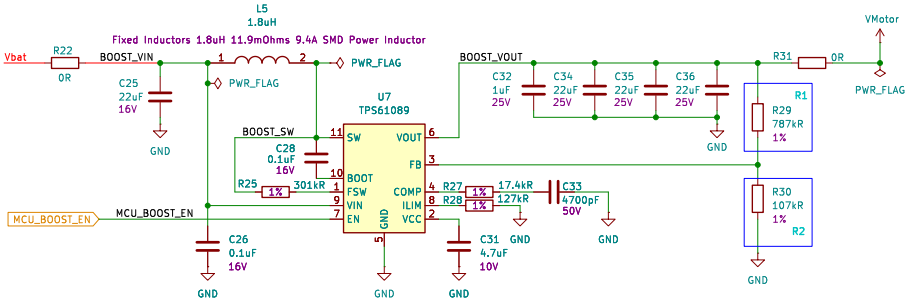


Step up boost converter

Boost from VBat –> 10V
OR jumper resistors can be removed for testing power consumption

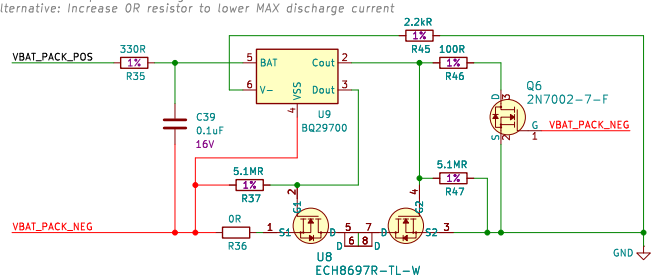
V_OUT
R1 = 787kR
R2 = 107kR
V_REF = 1.212V
V_OUT = 10.2V

$$R_1 = \frac{(V_{OUT} - V_{REF}) \times R_2}{V_{REF}}$$



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	Rev: v0.3
KiCad E.D.A. 9.0.0		Id: 4/6

Status LED's

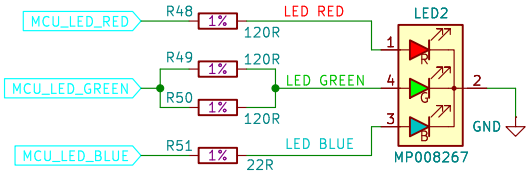
Status LEDs, RGB 3-in-1, through-hole, clear dome

LED resistor calculations (matching mcd values)

RED – 20mA = 600 mcd → 1mA = 30mcd
- 300mcd = 10mA
- Vf=2V (typ), 3.3-2V = 1.3V/10mA = 130R → 120R

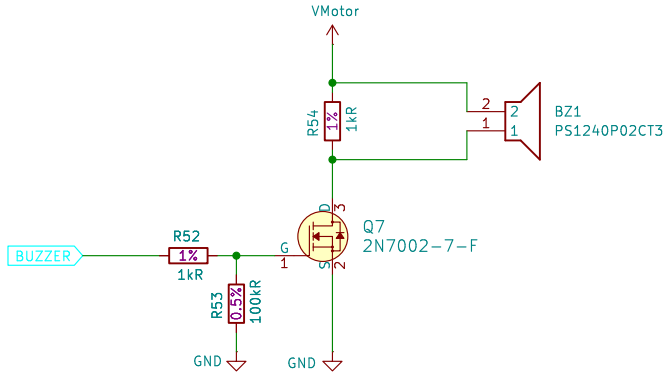
BLUE – 20mA = 300 mcd → 1mA = 15 mcd
- 300mcd = 20mA
- Vf=3V (typ), 3.3-3V = 0.3V/20mA = 15R → 22R

GREEN – 20mA = 1300 mcd → 1mA = 65 mcd
- 300mcd = 4.6mA
- Vf=3V (typ), 3.3-3V = 0.3V/4.6mA = 65R → 60R



Buzzer

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



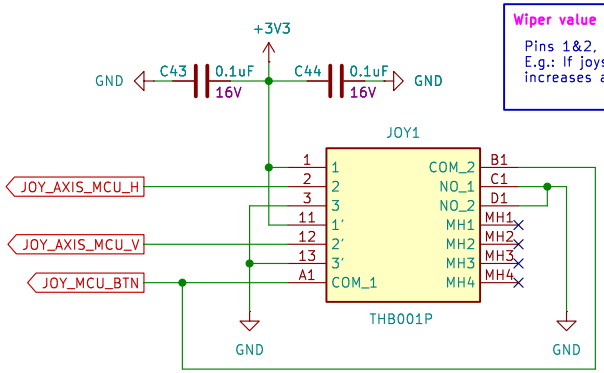
SJFOM

Sheet: /Indicators/
File: indicators.kicad_sch

Title: User Input

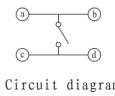
Size: A4	Date: 2025-02-22	**Rev: v0.3**
KiCad E.D.A. 9.0.0		Id: 5/6

Joystick

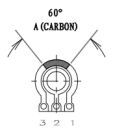


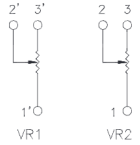
Wiper value

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 josytick moved to pin 1, decreases as moved to pin 3



Circuit diagram





SJFOM		
Sheet: /User Input/		
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Title: User Input		
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KiCad E.D.A. 9.0.0		Id: 6/6