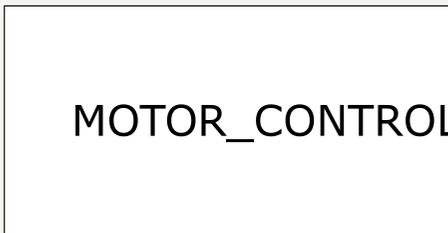
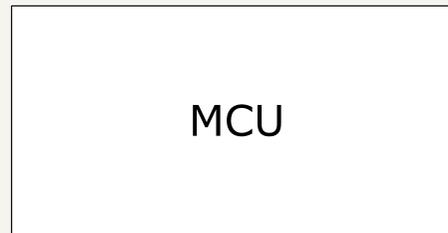




File: POWER\_SUPPLY.kicad\_sch



File: MOTOR\_CONTROL.kicad\_sch



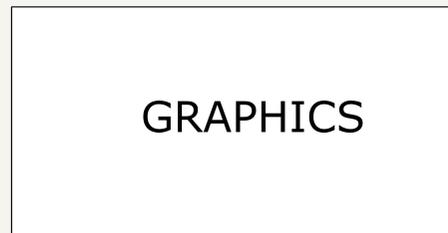
File: MCU.kicad\_sch



File: CONNECTIVITY.kicad\_sch



File: MECHANICS.kicad\_sch



File: GRAPHICS.kicad\_sch

SUMEC MK IV aka SMD-V3 board  
Made by bismarx-v1  
CONTACT: Savva Popov, savva.popov.sp@gmail.com, +420 605 570 366  
Made in Prague, Czech Republic  
**SPS NA PROSEKU**

Sheet: /  
File: SUMEC\_MK\_IV.kicad\_sch

**Title: SUMEC\_MK\_IV**

Size: A4 Date: 2024-08-05

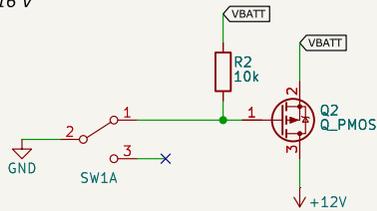
KiCad E.D.A. 9.0.0

**Rev: v3.0.9**

Id: 1/7

# MAIN SWITCH

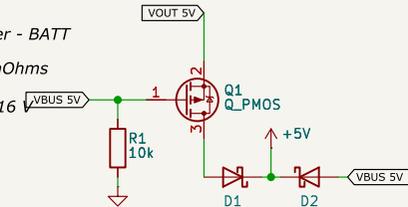
$R_{ds\ On} = 22.7\ m\Omega$   
 $V_{ds} = 30\ V$   
 $V_{gs} = -20\ V, +16\ V$   
 $V_{gs\ th} = 2.2\ V$



# USB POWER SWITCH

Power switching between  
 5V VBUS - USB  
 and  
 5V Buck converter - BATT

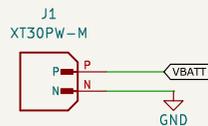
$R_{ds\ On} = 22.7\ m\Omega$   
 $V_{ds} = 30\ V$   
 $V_{gs} = -20\ V, +16\ V$   
 $V_{gs\ th} = 2.2\ V$



SWITCHING SIMULATION - FALSTAD

# BATTERY

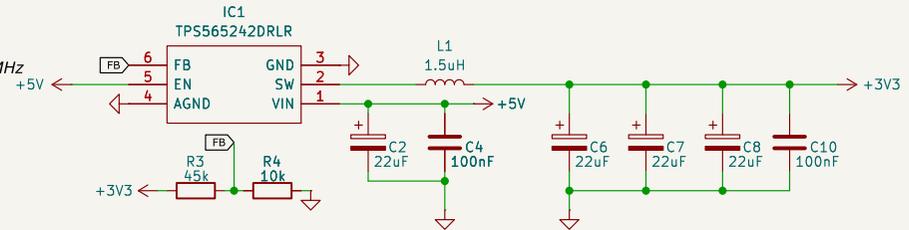
- 2S/3S LiPo
- 3.7V Cell voltage (nominal voltage)
- 4.2V Cell voltage (fully charged)
- 400mAh (may vary)



# STEPDOWN CONVERTER 3.3V

TPS62133 Step down converter  
 Input: 3-17V  
 Output: 5V  
 Current output: 3A  
 Switching freq.: 2.5MHz

Inductor  
 Inductance: 2.2uH  
 Max. current: 4.7A

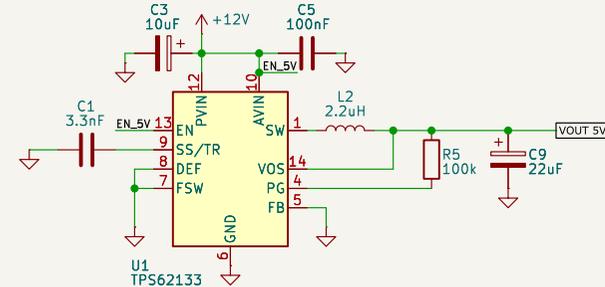


FeedBack voltage divider, usinf formula from datasheet  
 45.3 in reality? check before ordering.

# STEPDOWN CONVERTER 5V

TPS62133 Step down converter  
 Input: 3-17V  
 Output: 5V  
 Current output: 3A  
 Switching freq.: 2.5MHz

Inductor  
 Inductance: 2.2uH  
 Max. current: 3.8A



SUMEC MK IV aka SMD-V3 board  
 Made by bismarx-v1  
 CONTACT: Savva Popov, savva.popov.sp@gmail.com, +420 605 570 366  
 Made in Prague, Czech Republic

**SPS NA PROSEKU**

Sheet: /POWER\_SUPPLY/  
 File: POWER\_SUPPLY.kicad\_sch

**Title: SUMEC\_MK\_IV**

Size: A4 Date: 2024-08-05

KiCad E.D.A. 9.0.0

**Rev: v3.0.9**

Id: 2/7

# H-BRIDGE

DRV8874 - Motor driver, H-Bridge

Recommended Operating Conditions

VM = 4.5V - 37V VM

VIN = 0V - 5V

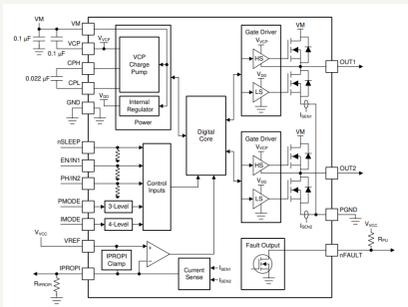
I/PMODE, nSLEEP, EN/IN1, PH/IN2

fPWM = 0Hz - 100kHz EN/IN1, PH/IN2

Vref = 0V - 3.6V

VREF

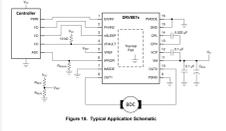
Block Diagram:



CONTROL MODES:

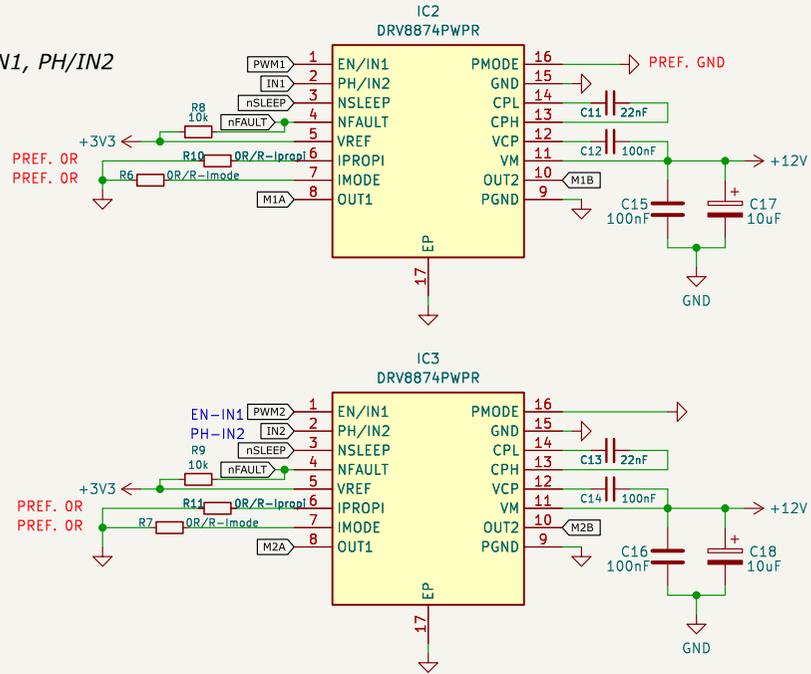
PMODE HIGH = PWM

PMODE LOW = PH/EN



$$ITRIP (A) \times AIPROPI (\mu A/A) = VVREF (V) / RIPROPI (\Omega)$$

The internal current regulation can be disabled by tying IPROPI to GND and setting the VREF pin voltage greater than GND



SUMEC MK IV aka SMD-V3 board

Made by bismarx-v1

CONTACT: Savva Popov, savva.popov.sp@gmail.com, +420 605 570 366

Made in Prague, Czech Republic

**SPS NA PROSEKU**

Sheet: /MOTOR\_CONTROL/

File: MOTOR\_CONTROL.kicad\_sch

**Title: SUMEC\_MK\_IV**

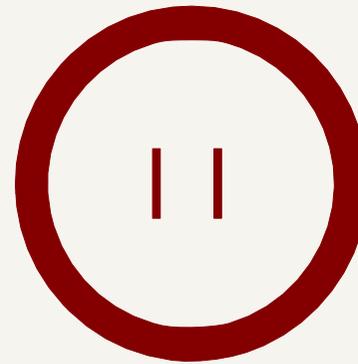
Size: A4

Date: 2024-08-05

Rev: v3.0.9

KiCad E.D.A. 9.0.0

Id: 3/7



# ESP32

MINISU

## ESP32 - S3 - WROOM1

GPIO0 has an internal pullup resistor, so if it is left unconnected then it will pull high.

GPIO0, GPIO45, and GPIO46 are connected to the chip's internal weak pull-up/pull-down resistors at chip reset. These resistors determine the default bit values of the strapping pins. Also, these resistors determine the bit values if the strapping pins are connected to an external high-impedance circuit.

Default Configuration of Strapping Pins

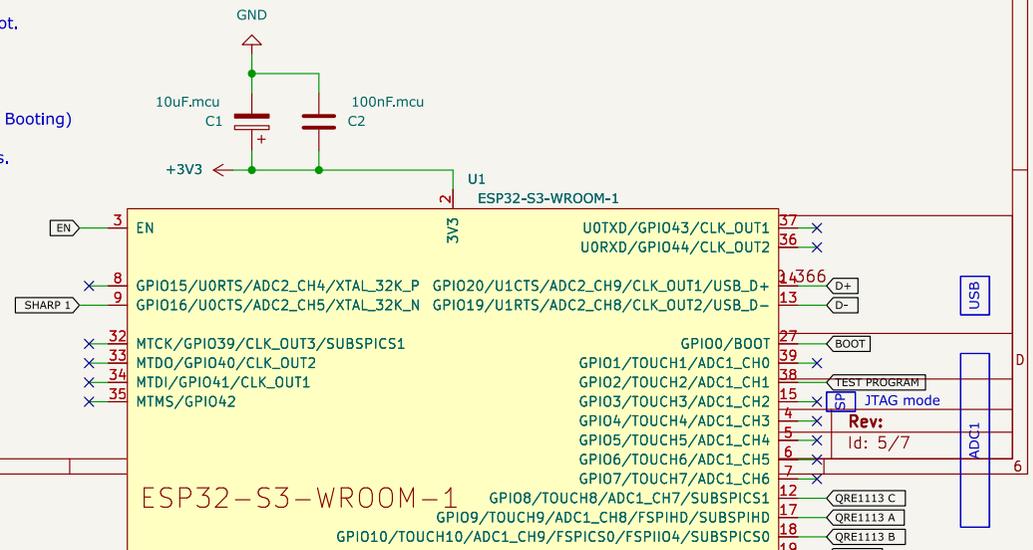
Strapping Pin	Default Configuration	Bit Value
GPIO0	Pull-up	1
GPIO3	Floating	-
GPIO45	Pull-down	0
GPIO46	Pull-down	0

Typically these can be used, but you need to make sure they are not in the wrong state during boot.

- gpio.0 Boot Mode. Weak pullup during reset. (Boot Mode 0=Boot from Flash, 1=Download)
- gpio.3 JTAG Mode. Weak pull down during reset. (JTAG Config)
- gpio.45 SPI voltage. Weak pull down during reset. (SPI Voltage 0=3.3v 1=1.8v)
- gpio.46 Boot mode. Weak pull down during reset. (Enabling/Disabling ROM Messages Print During Booting)

ESP32: Only pins that support both input & output have integrated pull-up and pull-down resistors. Input-only GPIOs 34-39 do not.

## ESP32-S3 Datasheet

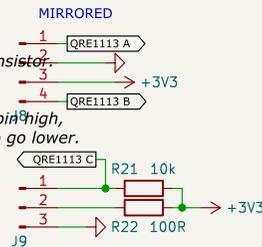


# LINE SENSORS

Miniature Reflective Object Sensor - QRE1113

IR reflectance sensor is comprised of two parts - an IR emitting LED and an IR sensitive phototransistor.  
Analog output  
A 100Ω resistor is placed in series with the LED to limit current. A 10kΩ resistor pulls the output pin high, but when the light from the LED is reflected back onto the phototransistor the output will begin to go lower.

2 front sensors will be connected to the "QRE MiniBoard", rear sensor will be connected using the same connector.



# OBJECT DETECTING SENSORS

Pololu Distance Sensor with Pulse Width Output/Digital Output

Small lidar based sensor can report presence/distance of objects up to (TOTAL MAX 200cm-Digital, 300cm - PWM)

Distance is chosen by configuring the jumpers with 0R resistors

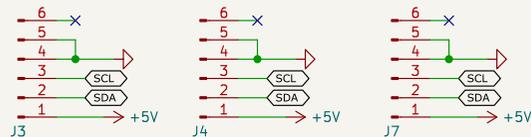


[POLOLU SENSOR MANUAL](#)

# DISTANCE MEASURING

Time-of-Flight(ToF) laser-ranging module - TF-Luna COMMUNICATION PROTOCOL: I<sup>2</sup>C

When pin 5 is connected to ground, TF-Luna enters I2C mode, then its pin 2 is used as SDA data and pin 3 is the SCL clock sending data.

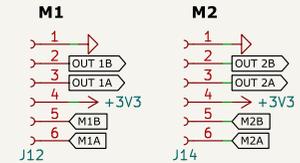
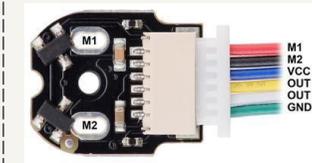


[TF-LUNA MANUAL](#)  
( Better manual in -DOC5- )



# MOTORS

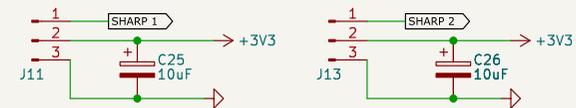
6-PIN JST SH-Style male connector  
VCC 2.7 V to 18 V encoder operating voltage



# SIDE SENSORS

Digital distance sensor - Sharp GP2Y0D810Z0F

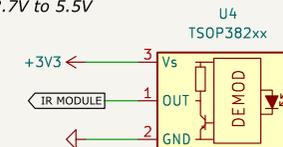
Sensor detects objects between 2 cm and 10 cm  
Low when detecting an object, high otherwise.  
Operating voltage 2.7V - 6.2V



# IR MODULE

IR LED Reciver module

Operating voltage: 2.7V to 5.5V  
Frequency: 38kHz



SUMEC MK IV aka SMD-V3 board  
Made by bismarx-v1  
CONTACT: Savva Popov, savva.popov.sp@gmail.com, +420 605 570 366  
Made in Prague, Czech Republic

**SPS NA PROSEKU**

Sheet: /CONNECTIVITY/  
File: CONNECTIVITY.kicad\_sch

**Title: SUMEC\_MK\_IV**

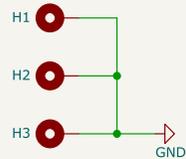
Size: A4 Date: 2024-08-05  
KiCad E.D.A. 9.0.0

**Rev: v3.0.9**  
Id: 6/7

## MOUNTING HOLES

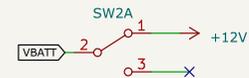
Mounting holes M3

Mounting holes that are screwed to the threaded holes on the chassis.



## MAIN SWITCH

Main switch is at the top of the robot for ease of access



## TEST BUTTON

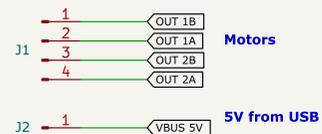
Tactile switch (button)

Used for starting test code program

LED is used as indicator of starting the said program  
- (subject to change depending on different usage of LED, for example; multiple flashing for trouble-shooting or indicating)



## CONNECTORS



SUMEC MK III aka SMD-V2 board

Made by bismarx-v1

CONTACT: Savva Popov, savva.popov.sp@gmail.com, +420 605 570 366

Made in Prague, Czech Republic

**SPŠ NA PROSEKU**

Sheet: /MECHANICS/

File: MECHANICS.kicad\_sch

**Title: SUMEC\_MK\_III**

Size: A4

Date:

KiCad E.D.A. 9.0.0

**Rev:**

Id: 7/7

# ART



SUMEC MK IV aka SMD-V3 board  
Made by bismarx-v1  
CONTACT: Savva Popov, savva.popov.sp@gmail.com, +420 605 570 366  
Made in Prague, Czech Republic

## SPS NA PROSEKU

Sheet: /GRAPHICS/  
File: GRAPHICS.kicad\_sch

## Title: SUMEC\_MK\_IV

Size: A4 Date: 2024-08-05

KiCad E.D.A. 9.0.0

Rev: v3.0.9  
Id: 8/7