POWER_SUPPLY

File: POWER_SUPPLY.kicad_sch

MOTOR_CONTROL

File: MOTOR_CONTROL.kicad_sch

MCU

File: MCU.kicad_sch

CONNECTIVITY

File: CONNECTIVITY.kicad_sch

MECHANICS

File: MECHANICS.kicad_sch

GRAPHICS

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

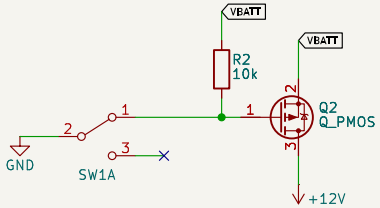
Sheet: /
File: SUMEC_MK_IV.kicad_sch

Title: SUMEC_MK_IV

Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 1/7

MAIN SWITCH

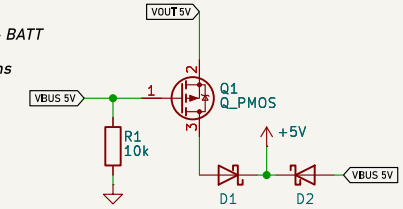
Rds On = 22.7 mOhms
Vds = 30 V
Vgs = - 20 V, + 16 V
Vgs th = 2.2 V



USB POWER SWITCH

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

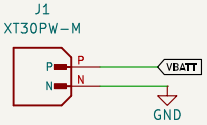
Rds On = 22.7 mOhms
Vds = 30 V
Vgs = - 20 V, + 16 V
Vgs th = 2.2 V



SWITCHING SIMULATION – FALSTAD

BATTERY

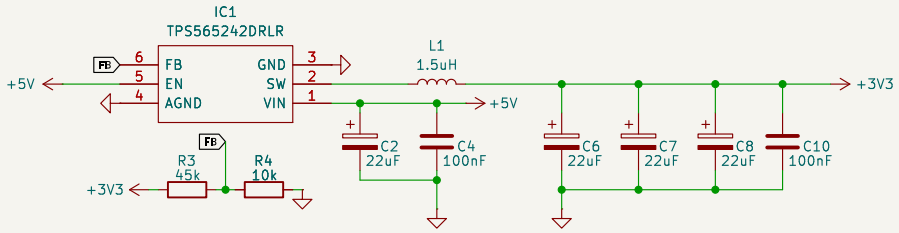
- *2S/3S LiPo*
- *3.7V Cell voltage (nominal voltage)*
- *4,2V Cell voltage (fully charged)*
- *400mAh (may vary)*



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

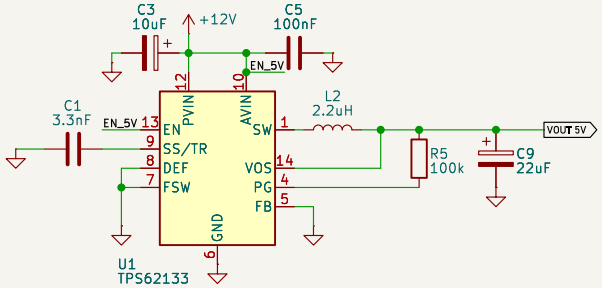


FeedBack voltage divider, usinf formula from datasheet
45.3 in reality? check before ordering.

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



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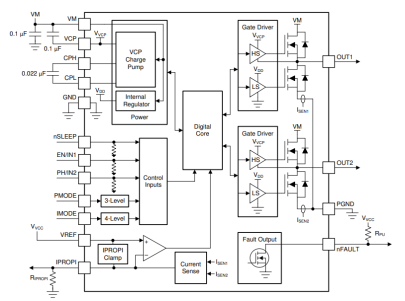
H-BRIDGE

DRV8874 - Motor driver, H-Bridge

Recommended Operating Conditions

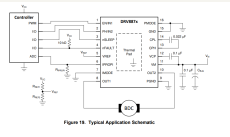
VM = 4.5V - 37V	*VM*
VIN = 0V - 5v	*I/PMODE, nSLEEP, EN/IN1, PH/IN2*
fPWM = 0Hz - 100kHz	*EN/IN1, PH/IN2*
Vref = 0V - 3.6V	*VREF*

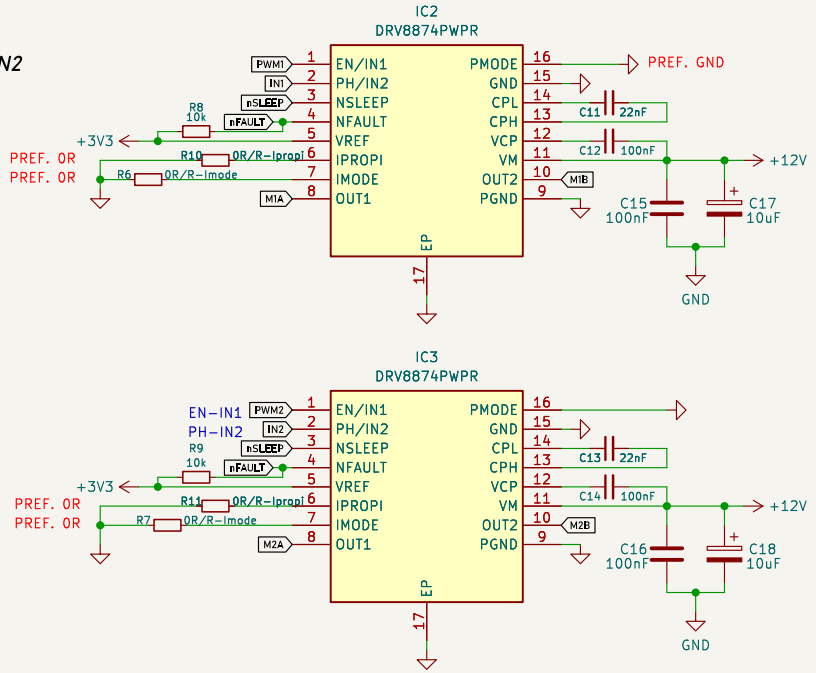
Block Diagram:



CONTROL MODES:

PMODE HIGH = PWM
PMODE LOW = PH/EN





ITRIP (A) x AIPROPI (µA/A) = VVREF (V) / RIPROPI (Ω)

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

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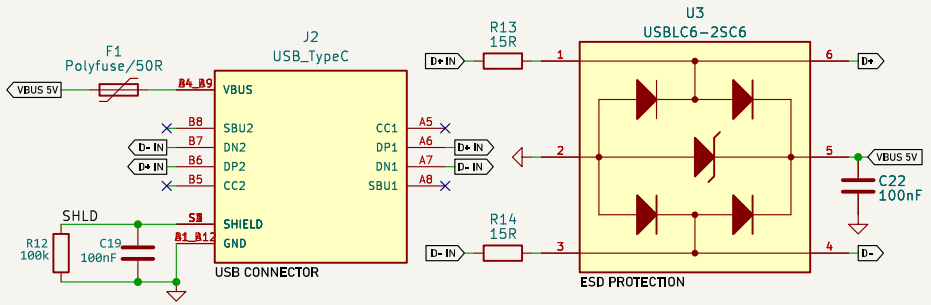
Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 3/7

USB

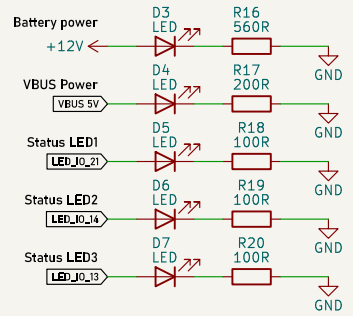
USB Type-C Connector

Data transfer USB connector connected to ESP32 using CDC method

GPIO	USB
20	D+ (green)
19	D- (white)
GND	GND (black)
VBUS	+5V (red)



LED SIGNALISATION



ESP32-S3-WROOM1-N4

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.

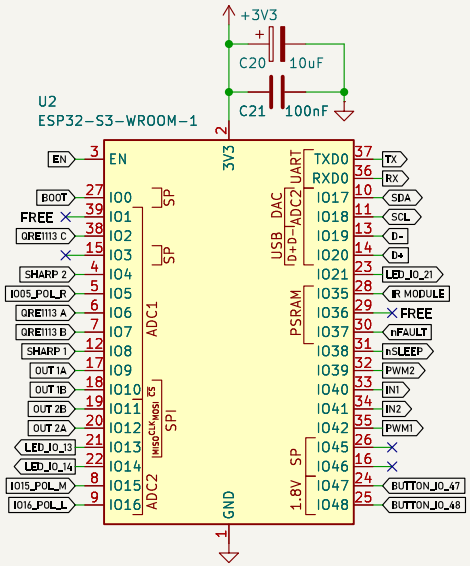
Default Configuration of Strapping Pins

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-S3 Datasheet



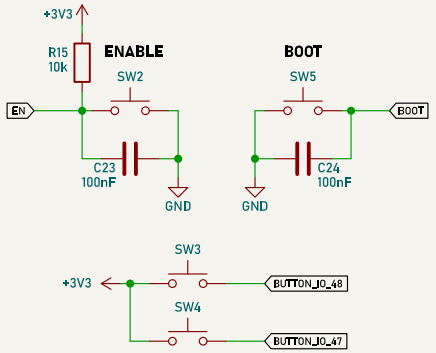
PUSH BUTTONS

Buttons for BOOT and ENABLE functions.

If the device does not support the auto download mode, you need to get into the download mode manually. To do so, press and hold the BOOT button and then press the RESET button once. After that release the BOOT button.

EN=RESET, BOOT=bootloader mode

Enable (EN) is the 3.3V regulator's enable pin. It's pulled up, so connect to ground to disable the 3.3V regulator. This means that you can use this pin connected to a pushbutton to restart your ESP32, for example.



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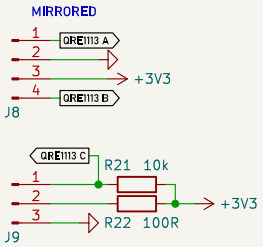
LINE SENSORS

Miniature Reflective
Object Sensor - QRE1113

IR reflectance sensor is comprised of two parts - an IR emitting LED and an IR sensitive phototransistor.

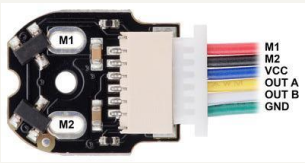
Analog output
A 100Ω resistor is placed in series with the LED to limit current. A 10kΩ resistor pulls the output pin high, but when the light from the LED is reflected back onto the phototransistor the output will begin to go lower.

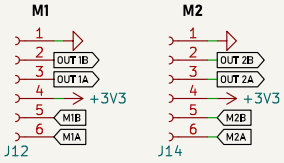
2 front sensors will be connected to the "QRE MiniBoard", rear sensor will be connected using the same connector.



MOTORS

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



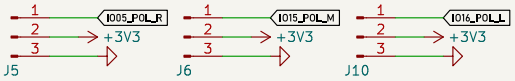


OBJECT DETECTING SENSORS

Pololu Distance Sensor with Pulse Width Output/Digital Output

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

Distance is chosen by configurating the jumpers with 0R resistors

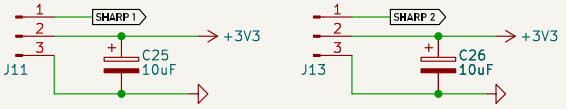


POLOLU SENSOR MANUAL

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

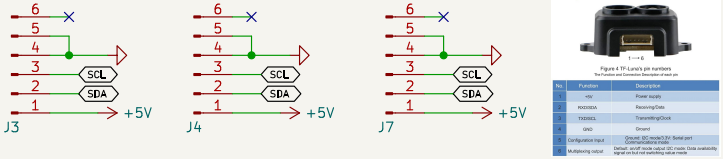


DISTANCE MEASURING

Time-of-Flight(ToF)
laser-ranging module - TF-Luna
COMMUNICATION PROTOCOL: I²C

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.

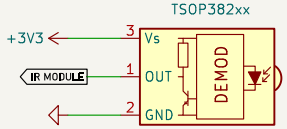
TF-LUNA MANUAL
(Better manual in -DOCS-)



IR MODULE

IR LED Reciver module

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



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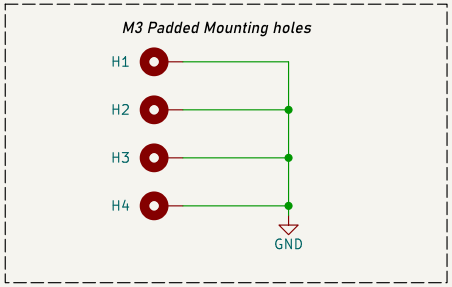
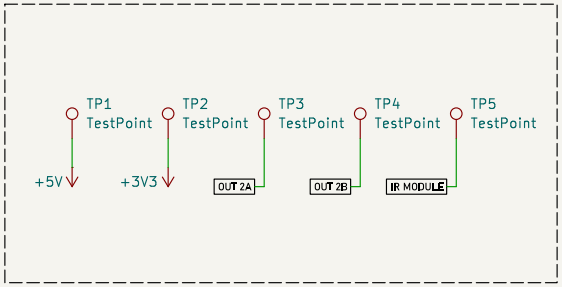
Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 6/7

MOUNTING HOLES



TESTING POINTS



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ART

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