POWER_SUPPLY

File: POWER_SUPPLY.kicad_sch

MOTOR_CONTROL

File: MOTOR_CONTROL.kicad_sch

SENSORS

File: SENSORS.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 aka MenMenson
CONTACT: Savva Popov, menmenson09@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

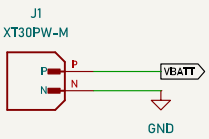
Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 1/8

XT-30M

XT-30 Connector

Battery connection
Connector with 2mm bullet contacts
for currents up to 30 A.
Gold-plated contacts
Non-interchangeable polarity.

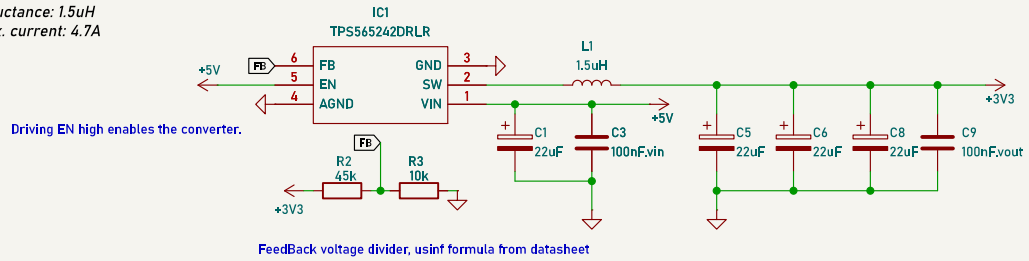
Battery specs:
- 2S/3S LiPo
- 3.7V Cell voltage (nominal voltage)
- 4,2V Cell voltage (fully charged)
- 400mAh (may vary)



STEPDOWN CONVERTER 3.3V

USE LDO OR BUCK FOR 3V3

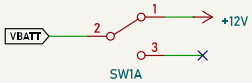
Inductor
Inductance: 1.5uH
Max. current: 4.7A



MAIN SWITCH

Main PCB slide switch
Goldplated 5A
Silverplated 2A, 5A

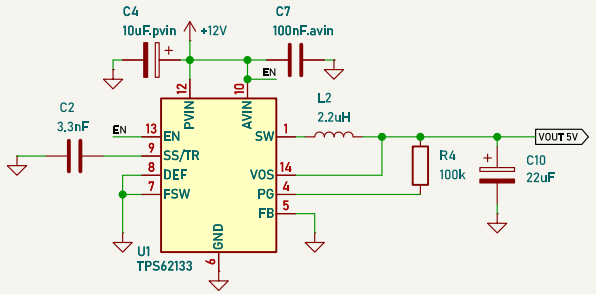
500SSP1S1M2REA - goldplated 5A
500SSP1S1M2QEA - silverplated 2A, 5A



STEPDOWN CONVERTER 5V

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

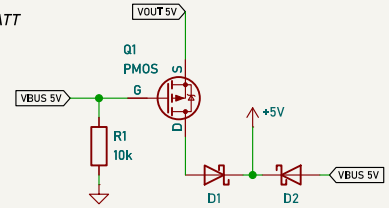
Inductor
Inductance: 2.2uH
Max. current:



USB POWER SWITCH

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

LOW Vf - DIODE
LOW Rds - PMOS



SWITCHING SIMULATION - FALSTAD

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GUILTY UNTIL PROVEN INNOCENT

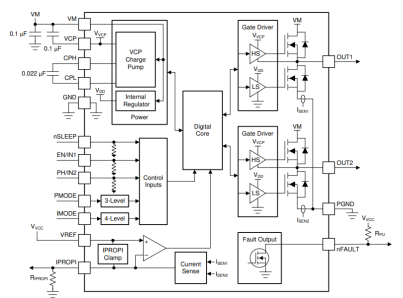
H-BRIDGE

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:

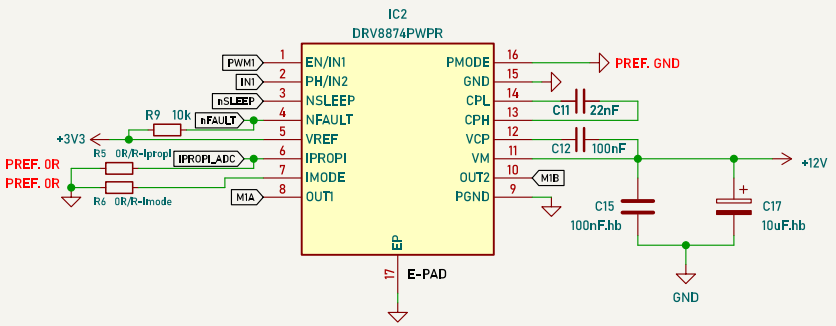


CONTROL MODES:

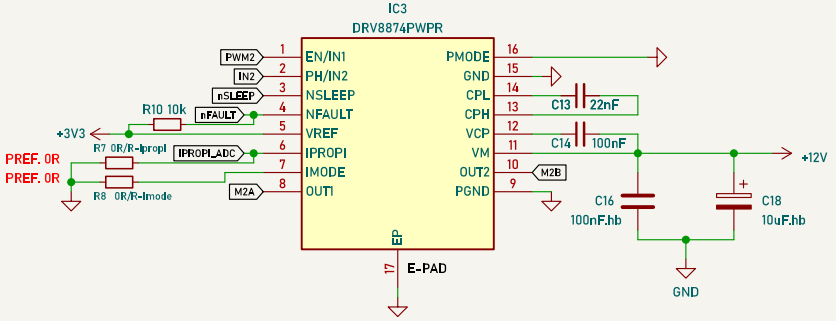
PMODE HIGH ▪ PWM

PMODE LOW ▪ PH/EN

THERE WERE 2 OR RESISTORS, ONE FOR VCC THE OTHER IS FOR GND, PURPOSE: CHOICE BETWEEEN GND AND VCC FOR TWO MODES



Should Current sensing and nFault be together? Both drivers using the same nFault etc.
nFault=Fault indicator output.



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

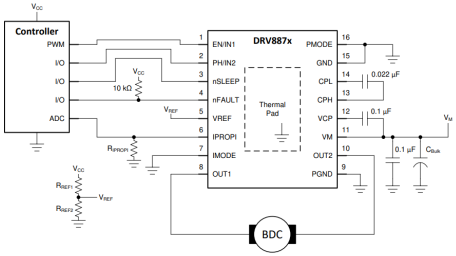


Figure 19. Typical Application Schematic

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Title: SUMEC_MK_IV

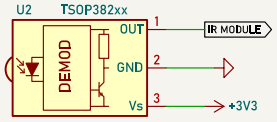
Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 3/8

IR MODULE

IR LED Reciver module

Operating voltage: 2.7V to 5.5V
Frequency: 38kHz
High immunity against ambient light.
For more than 1 input use - Hexadecimal code

Used as a main program starter



LINE SENSORS

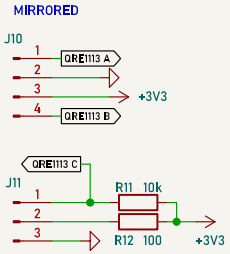
Miniature Reflective
Object Sensor - QRE1113

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.

qre signal visualisation? (update it on the qre miniboard itself)



DISTANCE MEASURING

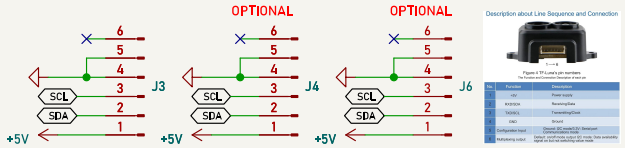
Time-of-Flight(ToF)
laser-ranging module - TF-Luna
COMMUNICATION PROTOCOL: I²C

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.

Addresses are saved using Natani's wonderful and magical code.

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

I2C signal visualisation? like etherent another pin configuration?



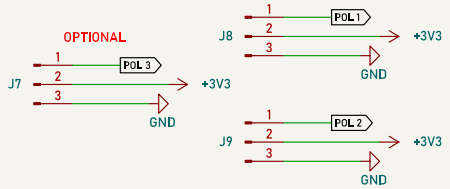
OBJECT DETECTING SENSORS

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)

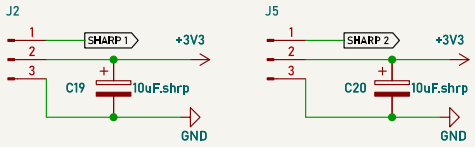
Distance is chosen by configurating the jumpers with 0R resistors

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.
Frequency - 390 Hz
Operating voltage 2.7V - 6.2V



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KiCad E.D.A. 8.0.4		Id: 4/8

ESP32-S3-WROOM1-N4

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

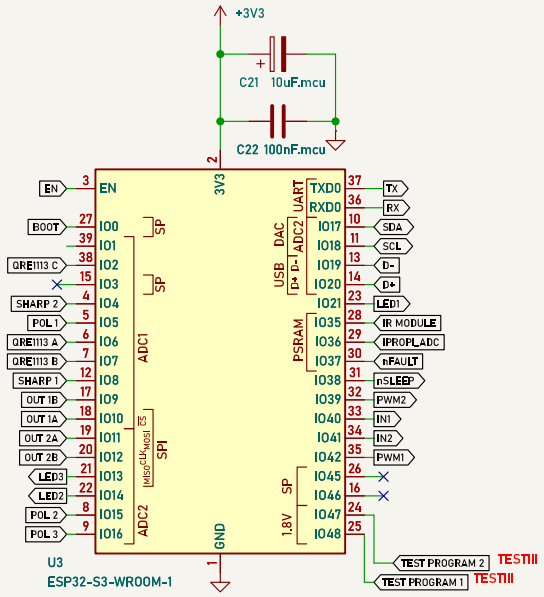
GPIO0, GPIO45, and GPIO46 are connected to the chip's internal weak pull-up/pull-down resistors at chip reset. These resistors determine the default bit values of the strapping pins. Also, these resistors determine the bit values if the strapping pins are connected to an external high-impedance circuit.

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.

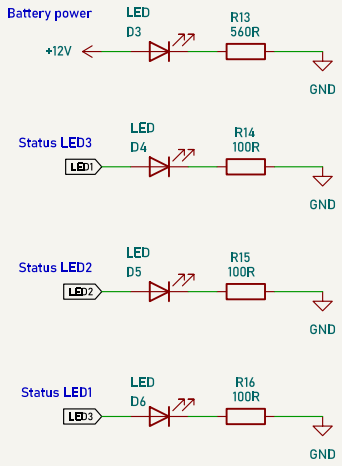
gpio.0 Boot Mode. Weak pullup during reset. (Boot Mode 0=Boot from Flash, 1=Download)
gpio.3 JTAG Mode. Weak pull down during reset. (JTAG Config)
gpio.45 SPI voltage. Weak pull down during reset. (SPI Voltage 0=3.3v 1=1.8v)
gpio.46 Boot mode. Weak pull down during reset. (Enabling/Disabling ROM Messages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



ESP32-S3 Datasheet

working voltage for pins 47 and 48 is 1.8 (test it)
Check pins with datasheet, ADC, SP, USB etc
Check encoder connection
UART connection?

LED SIGNALISATION



GPIO9: FSPIHD (not sure what it stands for)

GPIO10: FSPICS0 (chip select)

GPIO11: FSPID (dual SPI)

GPIO12: FSPICLK (clock)

GPIO13: FSPIQ (quad SPI)

GPIO14: FSPIWP ("write protect")

FSPID is MOSI, FSPIQ is MISO, FSPICS0 is chip select, FSPICLK is the clock.

FSPI Bus Signal	SPI3 Bus Signal	Function
FSPICLK	SPI3_CLK	Input and output clock in master/slave mode
FSPICS0	SPI3_CS0	Input and output CS signal in master/slave mode
FSPICS1 ~ 5	SPI3_CS1 ~ 2	Output CS signal in master mode
FSPID	SPI3_D	MOSI/SIO0 (serial data input and output, bit0)
FSPIQ	SPI3_Q	MISO/SIO1 (serial data input and output, bit1)
FSPIWP	SPI3_WP	SIO2 (serial data input and output, bit2)
FSPIHD	SPI3_HD	SIO3 (serial data input and output, bit3)
FSPIIO4 ~ 7	—	SIO4 ~ 7 (serial data input and output, bit4 ~ 7)
FSPIDQS	—	Output data mask signal in master mode

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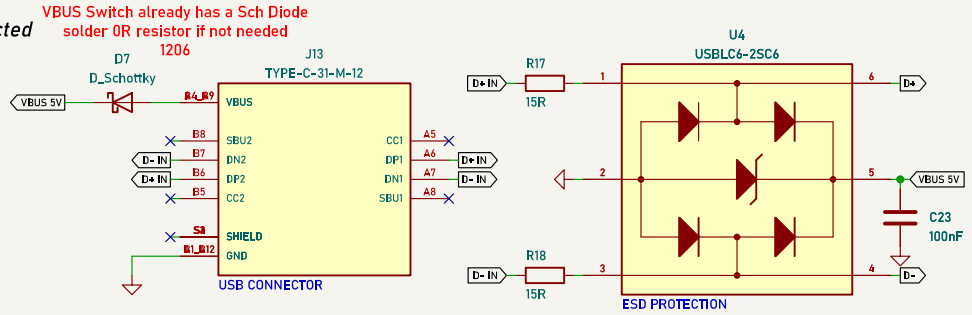
Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 5/8

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)



UART

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Sheet: /CONNECTIVITY/ File: CONNECTIVITY.kicad_sch		
Title: SUMEC_MK_IV		
Size: A4	Date: 2024-08-05	**Rev: v3.0.9**
KiCad E.D.A. 8.0.4		Id: 6/8

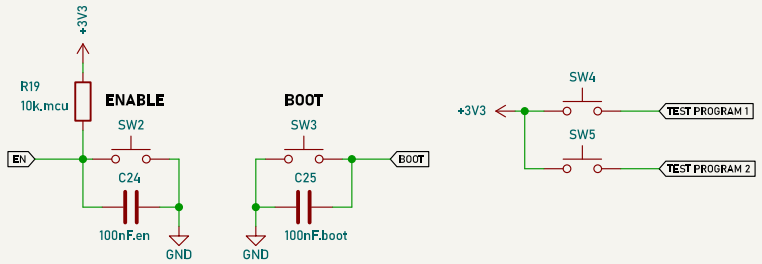
PUSH BUTTONS

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

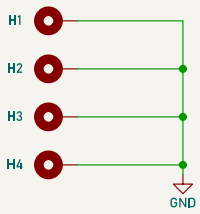
Enable (EN) is the 3.3V regulator's enable pin. It's pulled up, so connect to ground to disable the 3.3V regulator. This means that you can use this pin connected to a pushbutton to restart your ESP32, for example.

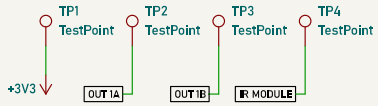


MOUNTING HOLES / TEST POINTS

M3 Padded Mounting holes

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



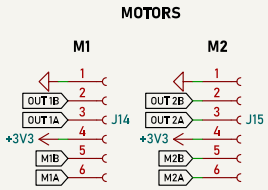


put it at the edge of a PCB for oscilloscope connecotrs

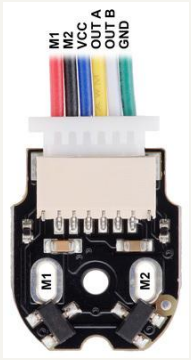
CONNECTORS

6-pin JST SH-style male connector / encoder motors

Pin	Cable color	Function
1	Red	motor power M1 ("+" terminal)
2	Black	motor power M2 (other terminal)
3	Blue	encoder Vcc (2.7 V to 18 V)
4	Yellow	encoder channel A output
5	White	encoder channel B output
6	Green	encoder GND



CHECK IF THE MIRRORING IS NECESSARY CHECK CHECK CHECK



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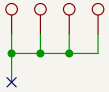
ART



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