Microcontroller – ESP32-S3-WROOM

Datei: Microcontroller.kicad_sch

V_BATT_MEASURE — GPIO_4
BATT_CHARGING_STATUS — GPIO_5
LED_BAT_R — GPIO_6
LED_BAT_G — GPIO_7
LED_DEV_R — GPIO_17
LED_DEV_G — GPIO_18
GPIO_8
GPIO_3
GPIO_46
I2C_SCL — GPIO_9
I2C_SDA — GPIO_10
LSM6DS_INT — GPIO_11
MC6470_INT — GPIO_12
BNO55_INT — GPIO_13
GPIO_14
GPIO_47
GPIO_21
GPIO_48
GPIO_45

GPIO_35
GPIO_36
GPIO_37
GPIO_38
BTN_4 — GPIO_39
BTN_3 — GPIO_40
BTN_2 — GPIO_41
BTN_1 — GPIO_42
GPIO_2
GPIO_1

Battery_and_Power_Managment

Datei: untitled.kicad_sch

V_PWR_SWITCH
V_IN
V_BATT_MEASURE
BATT_CHARGING_STATUS

BATT_CHARGING_STATUS
V_BATT_MEASURE
V_IN
V_PWR_SWITCH

Datei: untitled.kicad_sch

IMU

Datei: IMU.kicad_sch

I2C_SDA — I2C_SDA
I2C_SCL — I2C_SCL
LSM6DS_INT — LSM6DS_INT
MC6470_INT — MC6470_INT
BNO55_INT — BNO55_INT

UI_Peripherals

Datei: UI_Peripherals.kicad_sch

LED_DEV_G — LED_DEV_G
LED_DEV_R — LED_DEV_R
LED_BAT_G — LED_BAT_G
LED_BAT_R — LED_BAT_R
BTN_1 — BTN_1
BTN_2 — BTN_2
BTN_3 — BTN_3
BTN_4 — BTN_4
V_PWR_SWITCH — V_PWR_SWITCH
V_IN — V_IN

Voltage Regulator

TP1

GND R1 10k/1% V_USB

10BQ015 D1

G

S Q1 D V_BATT

PMOS AS3401

TP3 TP2

Power Switch
(see page UI-peripherals)

V_PWR_SWITCH V_IND

C2
1.0uF-25V-(+80/-20%)

GND

1 VI TC1262-33

GND 2 GND U2

TP5 600mA out
6V max in

VO 3 3.3V

C3 GND

1.0uF-25V-(+80/-20%) TP6

Lithium-Polymer Battery Charger (1-cell)

V_BATT should be a single-
cell LiPo battery.

JST PH2P ST90

J1

1 2

GND

C1 V_BATT

4.7uF GND

R2 2k

GND
R_PROG=2k : LCHG=500mA
LCHG = 1000 / R_PROG
Charge current:

U1
MCP73831-2

5 PROG VDD 4

2 VSS

STAT VBAT

1 3

TP4 V_BATT

BATT_CHARGING_STATUS

Note:
STAT pin is pulled low
if battery charging is active.

C4 GND

4.7uF V_USB
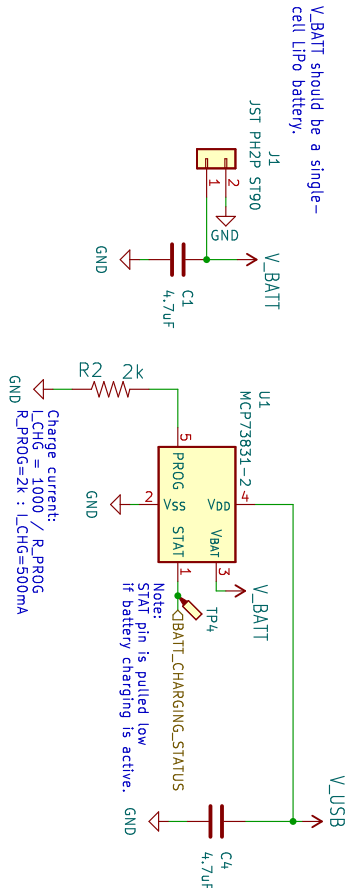
Battery Charge Level Measurement

GND R4 10k R3 10k V_BATT

V_BATT_MEASURE

Note:
Voltage divider currently consumes 165 uA.
If unity gain buffer is used in addition, this can be reduced.
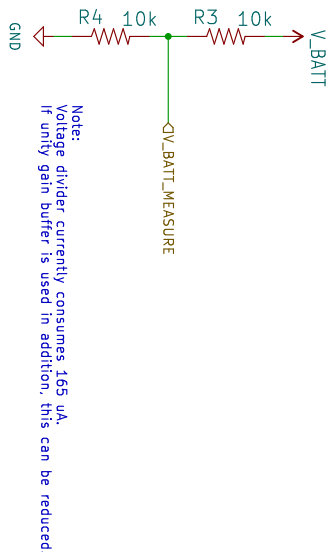
Sheet: /Battery_and_Power_Managment/
File: untitled.kicad_sch

Title: Battery and Power Management

Size: A4 | Date:
KiCad E.D.A. kicad 7.0.8

Rev: V1
Id: 2/5
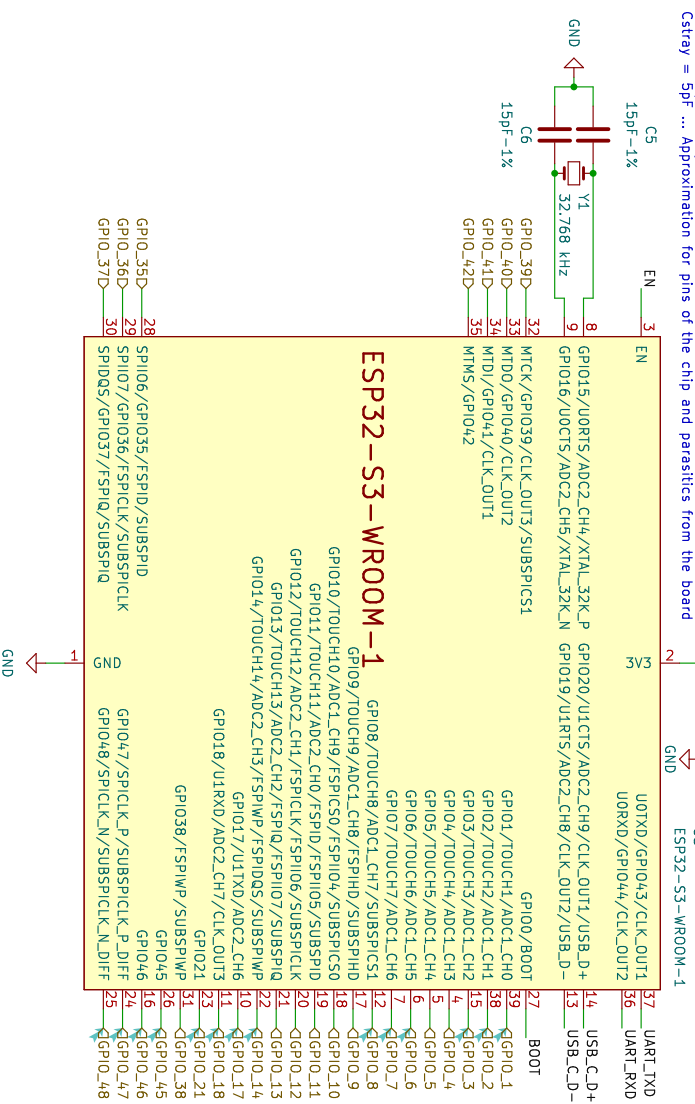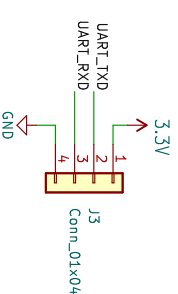
USB-C Plug for flashing and battery charging

J2
USB4105-GF-A

S1 SHIELD
A1 GND
GND

SBU1 — B8
SBU2 — X
D+ — B6
D- — B7
D- — A6
D+ — A7
CC2 — A5
CC1 — B5
VBUS — A4 → V_USB

R6 5k1
R5 5k1
GND

D2
WE-TVS-824015

1 I/O   I/O 6
2 GND   VDD 5 → V_USB
3 I/O   I/O 4 X
X

GND
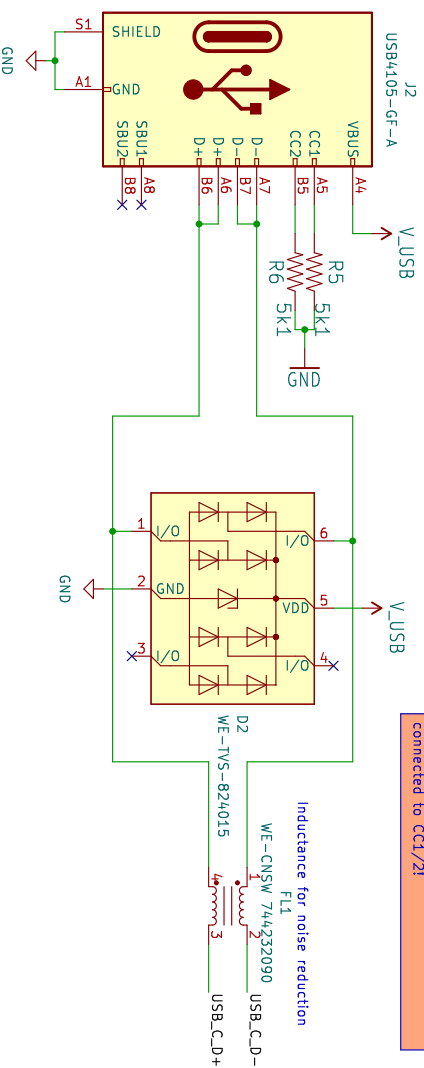
NOTE
USB-C suply max. 2,5 w (= 5V, 500 mA)
Otherwise PD-Controller needs to be
connected to CC1/2!

Inductance for noise reduction
WE-CNSW 744232090
F1.1

USB_C_D-
USB_C_D+

Microcontroller and Bluetooth Module

C1 = C2 = 2 * (CL − Cstray) = 15 pF
CL = 12,5 pF … Crystal load from datasheet
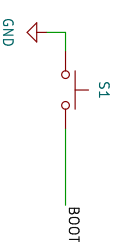Cstray = 5pF … Approximation for pins of the chip and parasitics from the board

GND

C6 15pF−1%
C5 15pF−1%
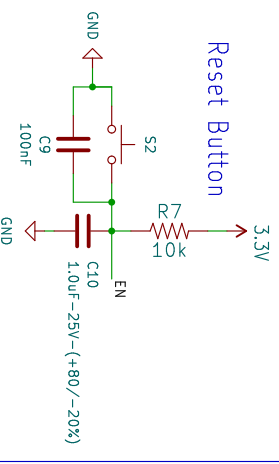
Y1 32.768 kHz

EN 3

ESP32−S3−WROOM−1
U3
ESP32−S3−WROOM−1

GPIO35 28
GPIO36 29
GPIO37 30

SPIIO6/GPIO35/FSPID/SUBSPID
SPIIO7/GPIO36/FSPICLK/SUBSPICLK
SPIDQS/GPIO37/FSPIQ/SUBSPIQ

GPIO39 32
GPIO40 33
GPIO41 34
GPIO42 35

MTCK/GPIO39/CLK_OUT3/SUBSPICS1
MTDO/GPIO40/CLK_OUT2
MTDI/GPIO41/CLK_OUT1
MTMS/GPIO42

GPIO15 8
GPIO16 9

GPIO15/U0RTS/ADC2_CH4/XTAL_32K_P
GPIO16/U0CTS/ADC2_CH5/XTAL_32K_N

EN 3
EN

3V3 2 → 3.3V

C7 22uF
3.3V
C8 100nF
GND

U0TXD/GPIO43/CLK_OUT1 37 UART_TXD
U0RXD/GPIO44/CLK_OUT2 36 UART_RXD

GPIO19/U1RTS/ADC2_CH8/CLK_OUT2/USB_D- 13 USB_C_D-
GPIO20/U1CTS/ADC2_CH9/CLK_OUT1/USB_D+ 14 USB_C_D+

GPIO0/BOOT 27 BOOT

GPIO1/TOUCH1/ADC1_CH0 39 GPIO_1
GPIO2/TOUCH2/ADC1_CH1 38 GPIO_2
GPIO3/TOUCH3/ADC1_CH2 15 GPIO_3
GPIO4/TOUCH4/ADC1_CH3 4 GPIO_4
GPIO5/TOUCH5/ADC1_CH4 5 GPIO_5
GPIO6/TOUCH6/ADC1_CH5 6 GPIO_6
GPIO7/TOUCH7/ADC1_CH6 7 GPIO_7
GPIO8/TOUCH8/ADC1_CH7/SUBSPICS1 12 GPIO_8
GPIO9/TOUCH9/ADC1_CH8/FSPIHD/SUBSPIHD 17 GPIO_9
GPIO10/TOUCH10/ADC1_CH9/FSPICS0/FSPIIO4/SUBSPICS0 18 GPIO_10
GPIO11/TOUCH11/ADC2_CH0/FSPID/FSPIIO5/SUBSPID 19 GPIO_11
GPIO12/TOUCH12/ADC2_CH1/FSPICLK/FSPIIO6/SUBSPICLK 20 GPIO_12
GPIO13/TOUCH13/ADC2_CH2/FSPIQ/FSPIIO7/SUBSPIQ 21 GPIO_13
GPIO14/TOUCH14/ADC2_CH3/FSPIWP/FSPIDQS/SUBSPIWP 22 GPIO_14
GPIO17/U1TXD/ADC2_CH6 10 GPIO_17
GPIO18/U1RXD/ADC2_CH7/CLK_OUT3 11 GPIO_18
GPIO21 23 GPIO_21
GPIO38/FSPIWP/SUBSPIWP 31 GPIO_38
GPIO45 26 GPIO_45
GPIO46 24 GPIO_46
GPIO47/SPICLK_P/SUBSPICLK_P_DIFF 16 GPIO_47
GPIO48/SPICLK_N/SUBSPICLK_N_DIFF 25 GPIO_48

GND 1 GND

UART Pin-Header

UART_TXD
UART_RXD
GND
3.3V

J3
Conn_01x04

Manual-Reset

Boot Button
S1
GND
BOOT

Reset Button
S2
GND
C9 100nF
R7 10k
3.3V
EN
C10
1.0uF−25V−(+80/−20%)
GND

Sheet: /Microcontroller − ESP32−S3−WROOM/
File: Microcontroller.kicad_sch
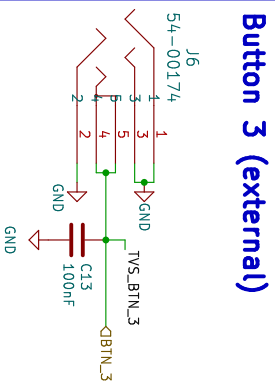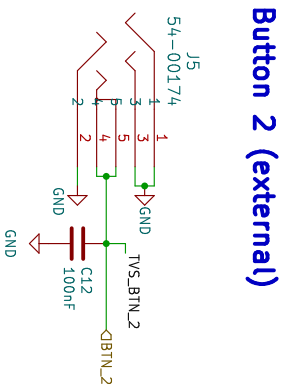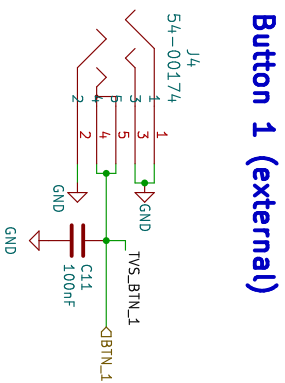
Title: Microcontroller and USB-C Connector

Size: A4   Date: Rev:
KiCad E.D.A. kicad 7.0.8   Id: 3/5
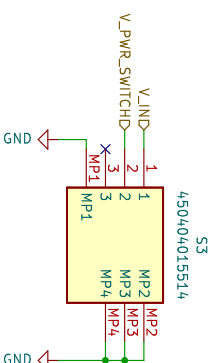
Button 1 (external)

J4
54-00174

GND
GND
GND

C11
100nF

TVS_BTN_1

BTN_1

Button 2 (external)

J5
54-00174

GND
GND
GND

C12
100nF

TVS_BTN_2

BTN_2

Button 3 (external)

J6
54-00174

GND
GND
GND

C13
100nF

TVS_BTN_3

BTN_3

Button 4 (external)

J7
54-00174

GND
GND
GND

C14
100nF

TVS_BTN_4

BTN_4
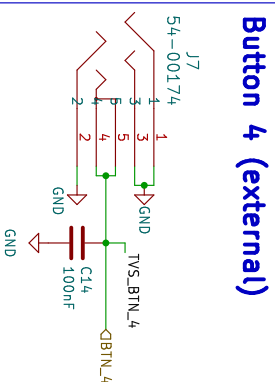
Battery Status LED
(bi-color red-green)

LED_BAT_GD
R8 120
K2
3

R9 120
K1
1

A
2
3.3V

D3
155124RV73200

LED_BAT_R
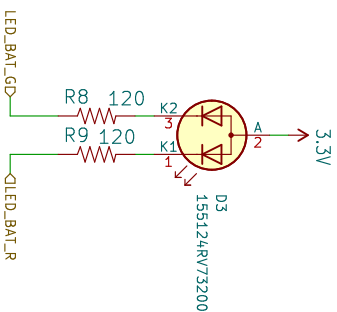
Device Status LED
(bi-color red-green)

LED_DEV_GD
R10 120
K2
3

R11 120
K1
1

A
2
3.3V

D4
155124RV73200

LED_DEV_R

Power Switch

V_IND
V_PWR_SWITCH

GND

MP1

1
2
3
MP1

S3
450404015514

MP2
MP3
MP4

MP2
MP3
MP4

GND

TVS Diodes for Button Jacks

TVS_BTN_2
TVS_BTN_1

3
1

GND
2

5

U4
WE-TVS-824015043
3.3V

6
4

TVS_BTN_3
TVS_BTN_4

6-Axis IMU

I2C slave addr.: 0b1101010 = 0x6a = 0d106

GND
LSM6DS_INTD

SDO/SA0
SDX
SCX
INT1

I2C_SCLD
I2C_SDAD

VDDIO
GND_1
GND_2

SDA
SCL
CS

SDO_AUX
OCS_AUX
INT2
VDD

3.3V
LSM6DSOXTR
AC1

U4

GND
C15
100nF

GND

3.3V
GND
C16
100nF
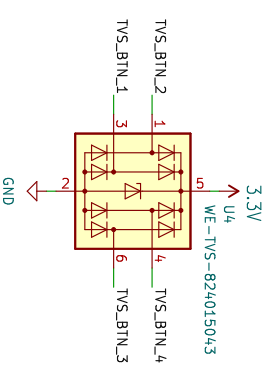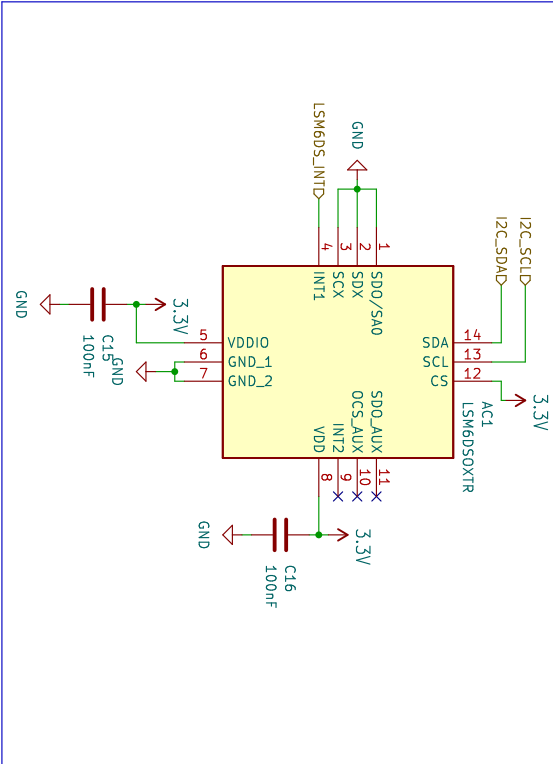
6-Axis IMU

I2C slave addr.: 0b1001100 = 0x4c = 0d76

I2C_SCLD
I2C_SDAD

GND

A5
PM
TM
SCL
SDA

GND
NC

INTA
INTM
VDDM
VDDIO

U5
MC6470

R12
10k

MC6470_INT

GND

C17
100nF
3.3V
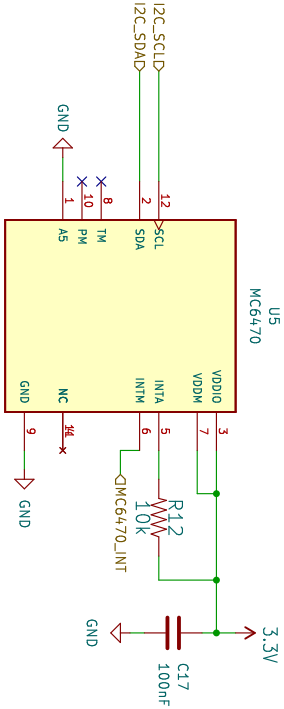
9-Axis IMU

I2C slave addr.: 0b101000 = 0x28 = 0d40

BNO55_INTD

NC
GND
VDD
NBOOT_LOAD_PIN
PS0
PS1
SWDIO
SWCLK
CAP
BL_IND
NRESET
NC
NC
INT

VDDIO
XIN32
XOUT32
GNDIO
NC
NC
NC
NC
COM3
COM2
COM1
COM0
Pin16
Pin15

U6
BNO055

C18
100nF
3.3V
GND

3.3V

R13
10k

R14
10k

3.3V

GND

C19
1.0uF-25V-(+80/-20%)

GND

GND

3.3V
C20
100nF
GND

TP7
1
2

GND

I2C_SDA
I2C_SCL