Microcontroller − ESP32−S3−WROOM

V_BAT_MEASURE — ▷V_BAT_MEASURE
BAT_CHRG_STATUS — ▷BAT_CHRG_STATUS
LED_BAT_R — ▷LED_BAT_R
LED_BAT_G — ▷LED_BAT_G

LED_STAT_R — ◁LED_STAT_R
LED_STAT_G — ▷LED_STAT_G

BTN_1◁ — BTN_1
BTN_2◁ — BTN_2
BTN_3◁ — BTN_3
BTN_4◁ — BTN_4

I2C_SCL ▷I2C_SCL
I2C_SDA ▷I2C_SDA
BNO055_INT ▷BNO055_INT
MPRLS_INT ▷MPRLS_INT

File: Microcontroller.kicad_sch

IMU

I2C_SDA — ▷I2C_SDA
I2C_SCL — ▷I2C_SCL

BNO55_INT — ▷BNO55_INT

File: IMU.kicad_sch

UI_Peripherals

LED_STAT_G — ▷LED_DEV_G
LED_STAT_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

I2C_SDA — ▷I2C_SDA
I2C_SCL — ▷I2C_SCL
MPRLS_INT — ▷MPRLS_INT

V_PWR_SWITCH — ▷V_PWR_SWITCH
V_IN — ▷V_IN

File: UI_Peripherals.kicad_sch

Battery_and_Power_Managment

V_PWR_SWITCH◁
V_IN◁
V_BATT_MEASURE◁ — V_BAT_MEASURE
BATT_CHARGING_STATUS◁ — BAT_CHRG_STATUS

File: untitled.kicad_sch

<beni@asterics−foundation.org>
Supervisor: Benjamin Aigner
Author: Vanessa Prankl
AsTeRICS Foundation
Sheet: /
File: HM_mainboard.kicad_sch
Title: HeadMouse Mainboard
Size: A4   Date: 2023−11−9   **Rev: 1**
KiCad E.D.A. kicad 7.0.8   Id: 1/5

Voltage Regulator

V_USB V_BATT
TP2
G Q1
D PMOS AS3401
S
R1 10k
D1
10BQ015
GND

V_PWR_SWITCH V_IN
Power Switch
(see page UI—peripherals)

C2
1.0uF
GND

600mA out
6V max in
U2
TC1262-33
1 VI VO 3
GND
2
TP5
GND

3.3V
C3
1.0uF
GND

Lithium—Polymer Battery Charger (1—cell)

V_BATT should be a single—
cell LiPo battery.

V_BATT
1
2
JST PH2P ST90
J1
C1
4.7uF
GND

U1
MCP73831-2
VDD
4
VBAT
V_BATT
3
TP4
BATT_CHARGING_STATUS
5 PROG VSS STAT 1
2
GND
R2 2k
GND

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

Charge current:
I_CHG = 1000 / R_PROG
R_PROG=2k : I_CHG=500mA

V_USB
C4
4.7uF
GND
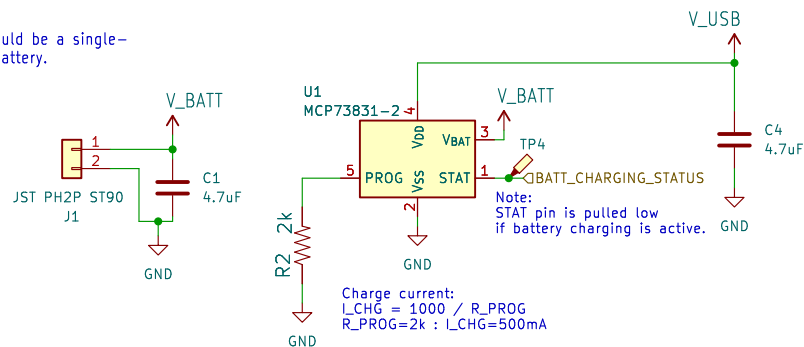
Battery Charge Level Measurement

V_BATT
R3 100k
V_BATT_MEASURE
R4 100k
GND
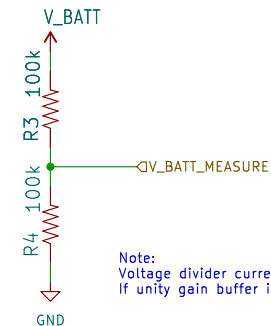
Note:
Voltage divider currently consumes 165 uA.
If unity gain buffer is used in addition, this can be reduced.

USB-C Plug for flashing and battery charging

J2
USB4105-GF-A

V_USB

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

VBUS A4
CC1   A5 — R5 — 5k1 — GND
CC2   B5 — R6 — 5k1
D-   A7
D-   B7
D+   A6
D+   B6

SHIELD   GND
SBU1 A8
SBU2 B8

S1   A1

GND

V_USB

Inductance for noise reduction
FL1
WE-CNSW 744232090

6 I/O   5 VDD   4 I/O
1 — 2 — USB_C_D-
4 — 3 — USB_C_D+

D2
WE-TVS-824015

1 I/O   2 GND   3 I/O

GND
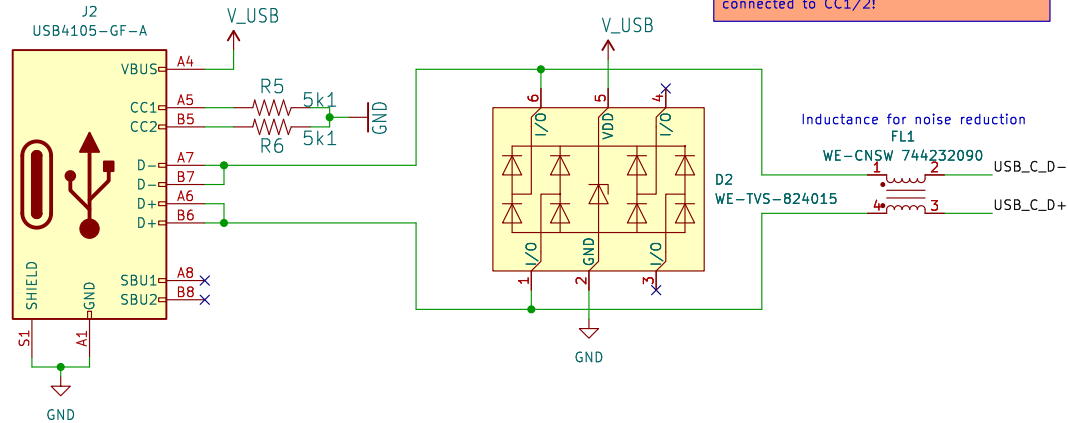
Microcontroller and Bluetooth Module

$C1 = C2 = 2 * (CL - Cstray) = 15\ pF$
$CL = 12.5\ pF$ ... Crystal load from datasheet
$Cstray = 5pF$ ... Approximation for pins of the chip and parasitics from the board

C5
15pF-1%

EN 3 — EN
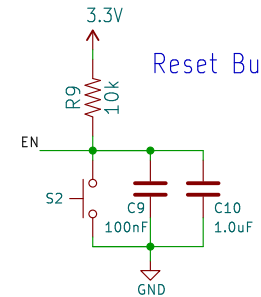
GND

Y1
32.768 kHz

C6
15pF-1%

3.3V   3.3V

C7   **C8**
22uF   **100nF**

GND

U3
ESP32-S3-WROOM-1

3V3 2

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

BTN_4D 32 MTCK/GPIO39/CLK_OUT3/SUBSPICS1
BTN_3D 33 MTDO/GPIO40/CLK_OUT2
BTN_2D 34 MTDI/GPIO41/CLK_OUT1
BTN_1D 35 MTMS/GPIO42

ESP32-S3-WROOM-1

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

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

GPIO0/BOOT 27 BOOT
GPIO1/TOUCH1/ADC1_CH0 39
GPIO2/TOUCH2/ADC1_CH1 38
GPIO3/TOUCH3/ADC1_CH2 15
GPIO4/TOUCH4/ADC1_CH3 4 V_BAT_MEASURE
GPIO5/TOUCH5/ADC1_CH4 5 BAT_CHRG_STATUS
GPIO6/TOUCH6/ADC1_CH5 6 LED_BAT_R
GPIO7/TOUCH7/ADC1_CH6 7 LED_BAT_G
GPIO8/TOUCH8/ADC1_CH7/SUBSPICS1 12
GPIO9/TOUCH9/ADC1_CH8/FSPIHD/SUBSPIHD 17 I2C_SCL
GPIO10/TOUCH10/ADC1_CH9/FSPICS0/FSPIIO4/SUBSPICS0 18 I2C_SDA
GPIO11/TOUCH11/ADC2_CH0/FSPID/FSPIIO5/SUBSPID 19
GPIO12/TOUCH12/ADC2_CH1/FSPICLK/FSPIIO6/SUBSPICLK 20
GPIO13/TOUCH13/ADC2_CH2/FSPIQ/FSPIIO7/SUBSPIQ 21 BNO055_INT
GPIO14/TOUCH14/ADC2_CH3/FSPIWP/FSPIDQS/SUBSPIWP 22 MPRLS_INT
GPIO17/U1TXD/ADC2_CH6 10 LED_STAT_R
GPIO18/U1RXD/ADC2_CH7/CLK_OUT3 11 LED_STAT_G
GPIO21 23
GPIO38/FSPIWP/SUBSPIWP 31
GPIO45 26
GPIO46 16

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

GPIO47/SPICLK_P/SUBSPICLK_P_DIFF 24
GPIO48/SPICLK_N/SUBSPICLK_N_DIFF 25

GND 1

GND

I2C-Pullup

I2C_SCLD — 4k7 R7 — 3.3V
I2C_SDAD — 1k8 R8

1k8 resistor at I2C-SDA line
because of I2C-timing issues
with BNO055.

Manual-Reset (internal)

Boot Button

BOOT

S1

GND

Reset Button

3.3V

EN

R9
10k

S2

C9   **C10**
100nF   **1.0uF**

GND

Button 1 (external)

J4
54-00174

1 1
3 3
5 5
4 4
2 2

GND
TVS_BTN_1
BTN_1
C11
100nF
GND
GND

Button 2 (external)

J6
54-00174

1 1
3 3
5 5
4 4
2 2

GND
TVS_BTN_2
BTN_2
C12
100nF
GND
GND

Button 3 (external)

J7
54-00174

1 1
3 3
5 5
4 4
2 2

GND
TVS_BTN_3
BTN_3
C13
100nF
GND
GND

Button 4 (BLE/config)

TVS_BTN_4
BTN_4
C14
100nF
SW1
GND
GND
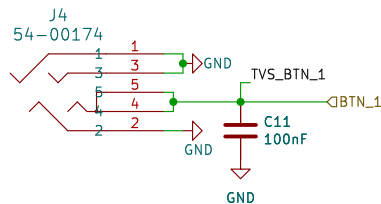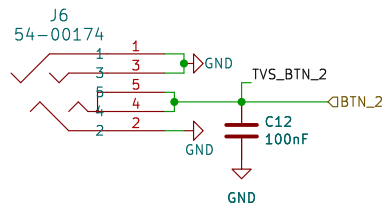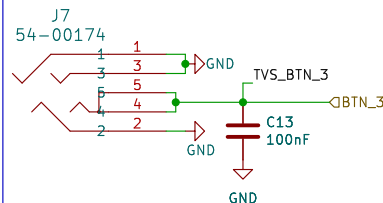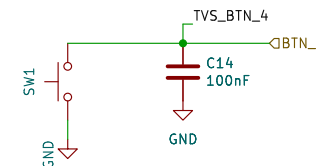
MPRLS (sip&puff sensor) connector

00915900551906

5 GND
4 3.3V
3 MPRLS_INT
2 I2C_SDA
1 I2C_SCL
J5

Power Switch

S3
450404015514

V_IND   1 | 1   MP2 | MP2
V_PWR_SWITCH 2 | 2   MP3 | MP3
           3 | 3   MP4 | MP4
             | MP1
GND   GND
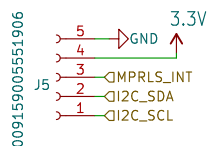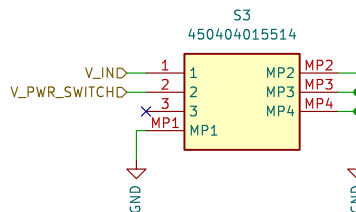
TVS Diodes for Button Jacks

3.3V
U4
WE-TVS-824015043

TVS_BTN_2 1 | 5 | 4 TVS_BTN_4
TVS_BTN_1 3 | | 6 TVS_BTN_3
             2
GND
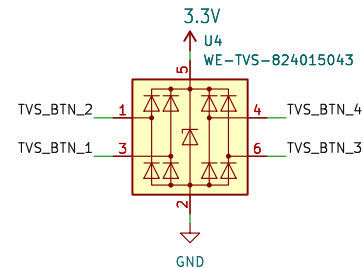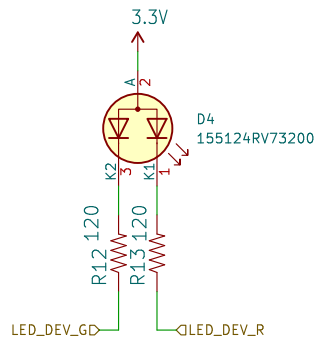
Mechanical

LOGO1 Logo_HM
LOGO2 Logo_KiCAD
LOGO3 Logo_CE
LOGO4 Logo_WEEE
H1 MountingHole
H2 MountingHole

Battery Status LED
(bi-color red-green)

3.3V
A 2
D3
155124RV73200
K2 3
K1 1
R10 120
R11 120
LED_BAT_G
LED_BAT_R
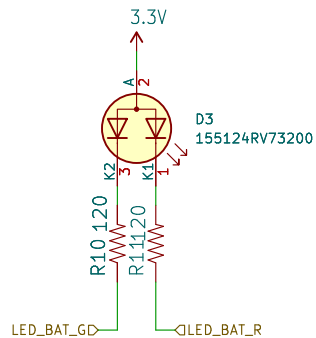
Device Status LED
(bi-color red-green)

3.3V
A 2
D4
155124RV73200
K2 3
K1 1
R12 120
R13 120
LED_DEV_G
LED_DEV_R

9-Axis IMU

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

U5
BNO055

Pin	Name
1	NC
2	GND
3	VDD
4	NBOOT_LOAD_PIN
5	PS1
6	PS0
7	SWDIO
8	SWCLK
9	CAP
10	BL_IND
11	NRESET
12	NC
13	NC
14	INT

Pin	Name
28	VDDIO
27	XIN32
26	XOUT32
25	GNDIO
24	NC
23	NC
22	NC
21	NC
20	COM0
19	COM1
18	COM2
17	COM3
16	Pin16
15	Pin15

C15 100nF
C16 1.0uF
C17 100nF

3.3V
GND

R14 10k
R15 10k

I2C_SDA
I2C_SCL

BNO055_INT