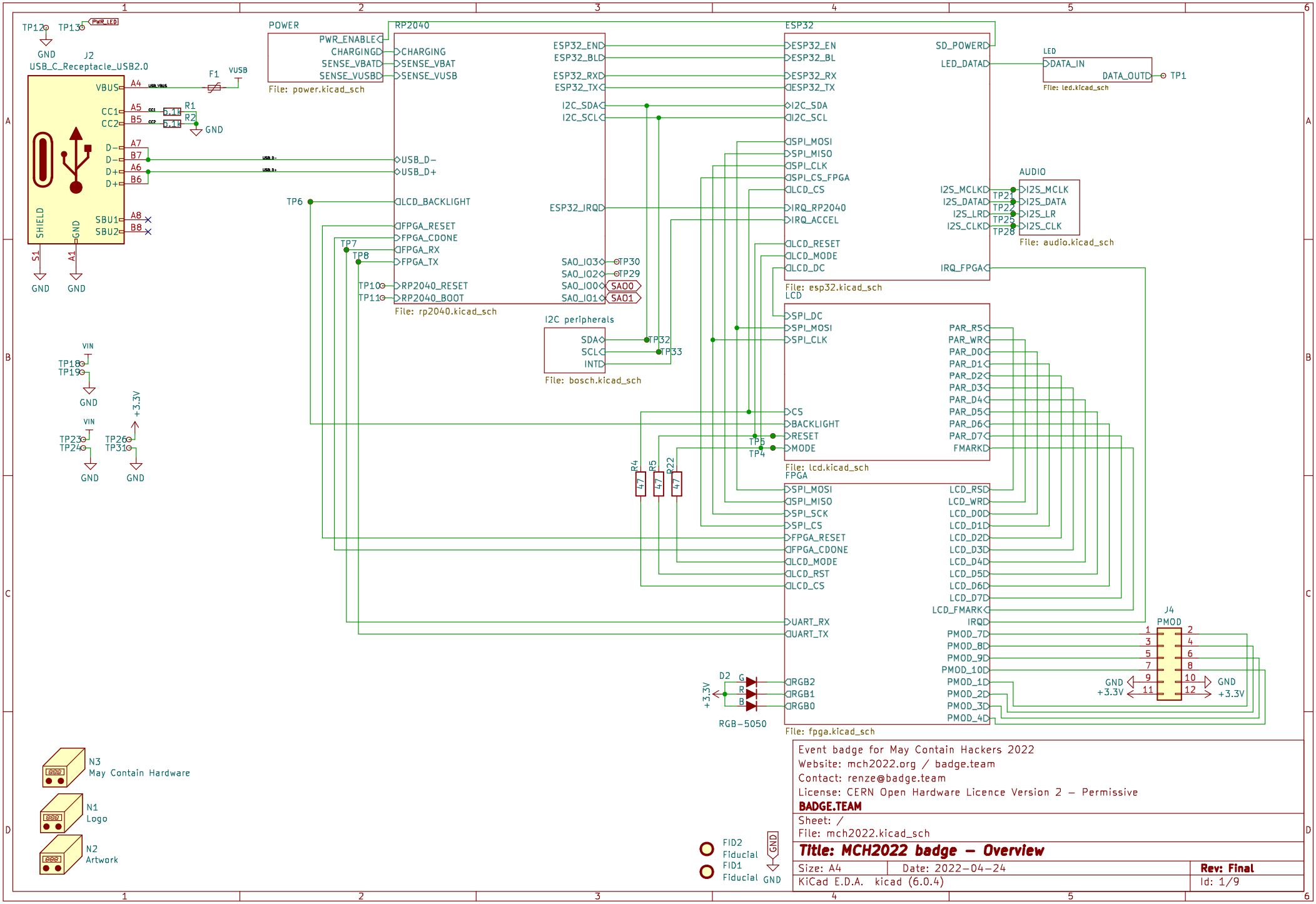
TP12
TP13
PWR_LED
GND
J2
USB_C_Receptacle_USB2.0
VBUS
CC1
CC2
D-
D-
D+
D+
SHIELD
GND
SBU1
SBU2
A4
A5
B5
A7
B7
A6
B6
A8
B8
S1
A1
F1
VUSB
R1
R2
5.1k
5.1k
GND
POWER
PWR_ENABLE
CHARGING
SENSE_VBAT
SENSE_VUSB
File: power.kicad_sch
RP2040
CHARGING
SENSE_VBAT
SENSE_VUSB
USB_D-
USB_D+
LCD_BACKLIGHT
FPGA_RESET
FPGA_CDONE
FPGA_RX
FPGA_TX
RP2040_RESET
RP2040_BOOT
TP6
TP7
TP8
TP10
TP11
File: rp2040.kicad_sch
ESP32_END
ESP32_BLD
ESP32_RXD
ESP32_TX
I2C_SDA
I2C_SCL
ESP32_IRQD
SA0_IO3
SA0_IO2
SA0_IO0
SA0_IO1
TP30
TP29
SA00
SA01
I2C peripherals
SDA
SCL
INT
TP32
TP33
File: bosch.kicad_sch
ESP32
ESP32_EN
ESP32_BL
ESP32_RX
ESP32_TX
I2C_SDA
I2C_SCL
SPI_MOSI
SPI_MISO
SPI_CLK
SPI_CS_FPGA
LCD_CS
IRQ_RP2040
IRQ_ACCEL
LCD_RESET
LCD_MODE
LCD_DC
SD_POWERD
LED_DATAD
IRQ_FPGA
File: esp32.kicad_sch
LED
DATA_IN
DATA_OUTD
TP1
File: led.kicad_sch
AUDIO
I2S_MCLKD
I2S_DATAD
I2S_LRD
I2S_CLKD
TP21
TP22
TP25
TP28
I2S_MCLK
I2S_DATA
I2S_LR
I2S_CLK
File: audio.kicad_sch
LCD
SPI_DC
SPI_MOSI
SPI_CLK
CS
BACKLIGHT
RESET
MODE
TP5
TP4
PAR_R5
PAR_WR
PAR_D0
PAR_D1
PAR_D2
PAR_D3
PAR_D4
PAR_D5
PAR_D6
PAR_D7
FMARKD
File: lcd.kicad_sch
FPGA
SPI_MOSI
SPI_MISO
SPI_SCK
SPI_CS
FPGA_RESET
FPGA_CDONE
LCD_MODE
LCD_RST
LCD_CS
UART_RX
UART_TX
LCD_R5D
LCD_WRD
LCD_D0D
LCD_D1D
LCD_D2D
LCD_D3D
LCD_D4D
LCD_D5D
LCD_D6D
LCD_D7D
LCD_FMARKD
IRQD
PMOD_7D
PMOD_8D
PMOD_9D
PMOD_10D
PMOD_1D
PMOD_2D
PMOD_3D
PMOD_4D
RGB2
RGB1
RGB0
File: fpga.kicad_sch
R4
R5
R22
47
47
47
D2
RGB-5050
J4
PMOD
VIN
TP18
TP19
TP23
TP24
TP26
TP31
+3.3V
N3
May Contain Hardware
N1
Logo
N2
Artwork
FID2
Fiducial
FID1
Fiducial
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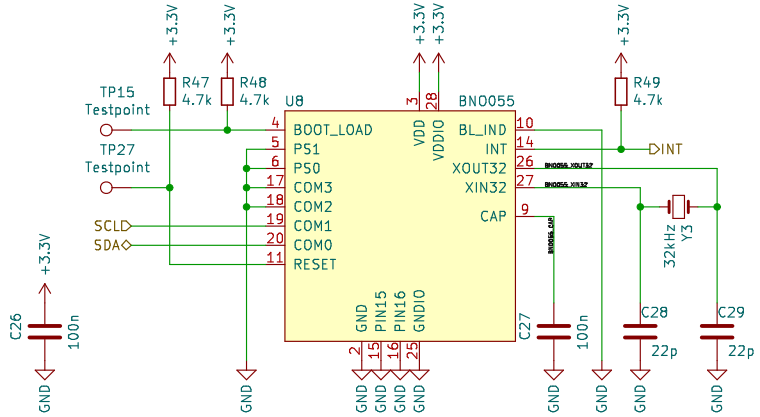
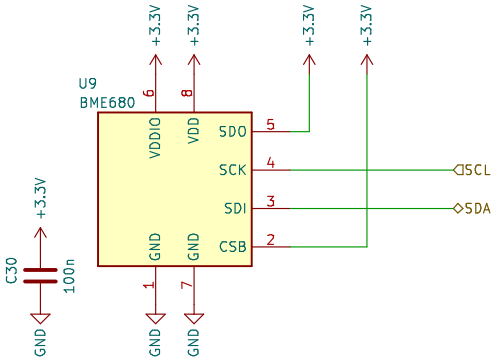
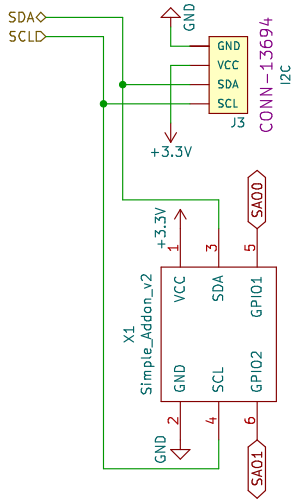
File: mch2022.kicad_sch
Title: MCH2022 badge – Overview
Size: A4
Date: 2022-04-24
Rev: Final
KiCad E.D.A. kicad (6.0.4)
Id: 1/9

I2C peripherals

- BOSCH BNO055
- BOSCH BME680
- SAO expansion header
- Qwiic expansion header







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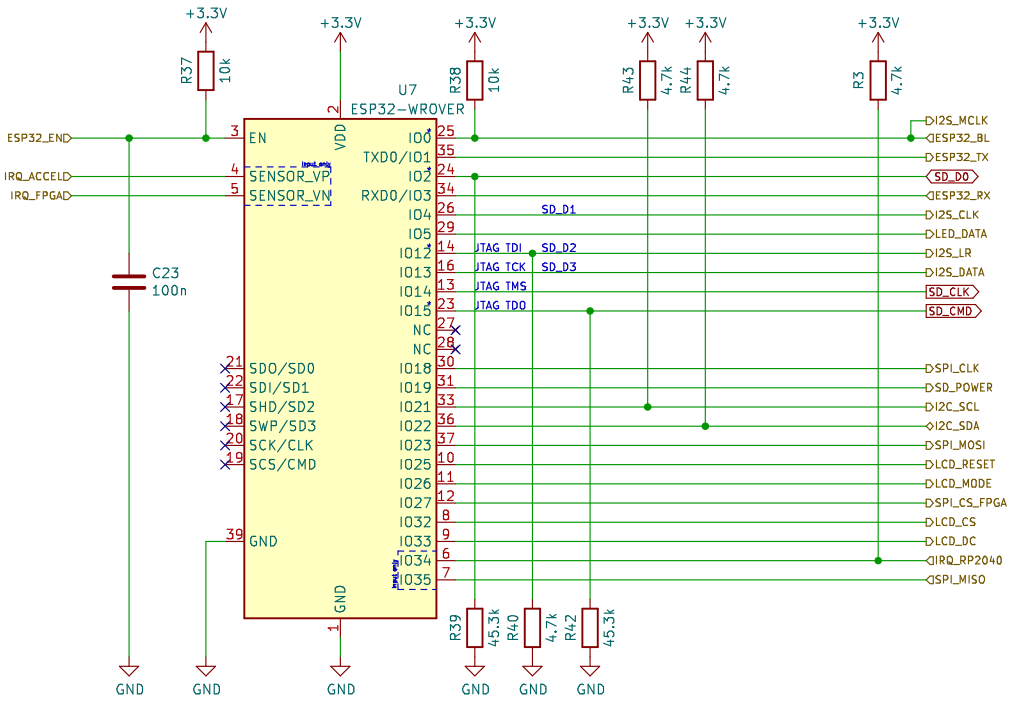
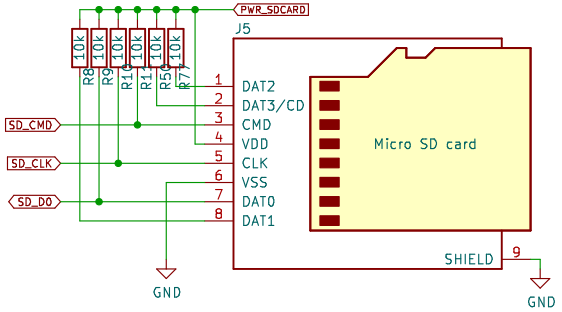
Sheet: /I2C peripherals/
File: bosch.kicad_sch

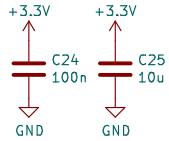
Title: MCH2022 badge – BOSCH

Size: A4	Date: 2022-04-24	**Rev: Final**
KiCad E.D.A. kicad (6.0.4)		Id: 2/9

ESP32 microcontroller, SD card and audio output







* Bootstrapping pins
IO 0:Low for UART DL mode, pull high for normal boot
IO 2: Pull down to select UART DL mode when GPIO 0 is LOW
IO 12: Selects internal flash/ram voltage. Pull-up for 1.8v, pull-down for 3.3v
IO 15: Pull down for silent bootloader

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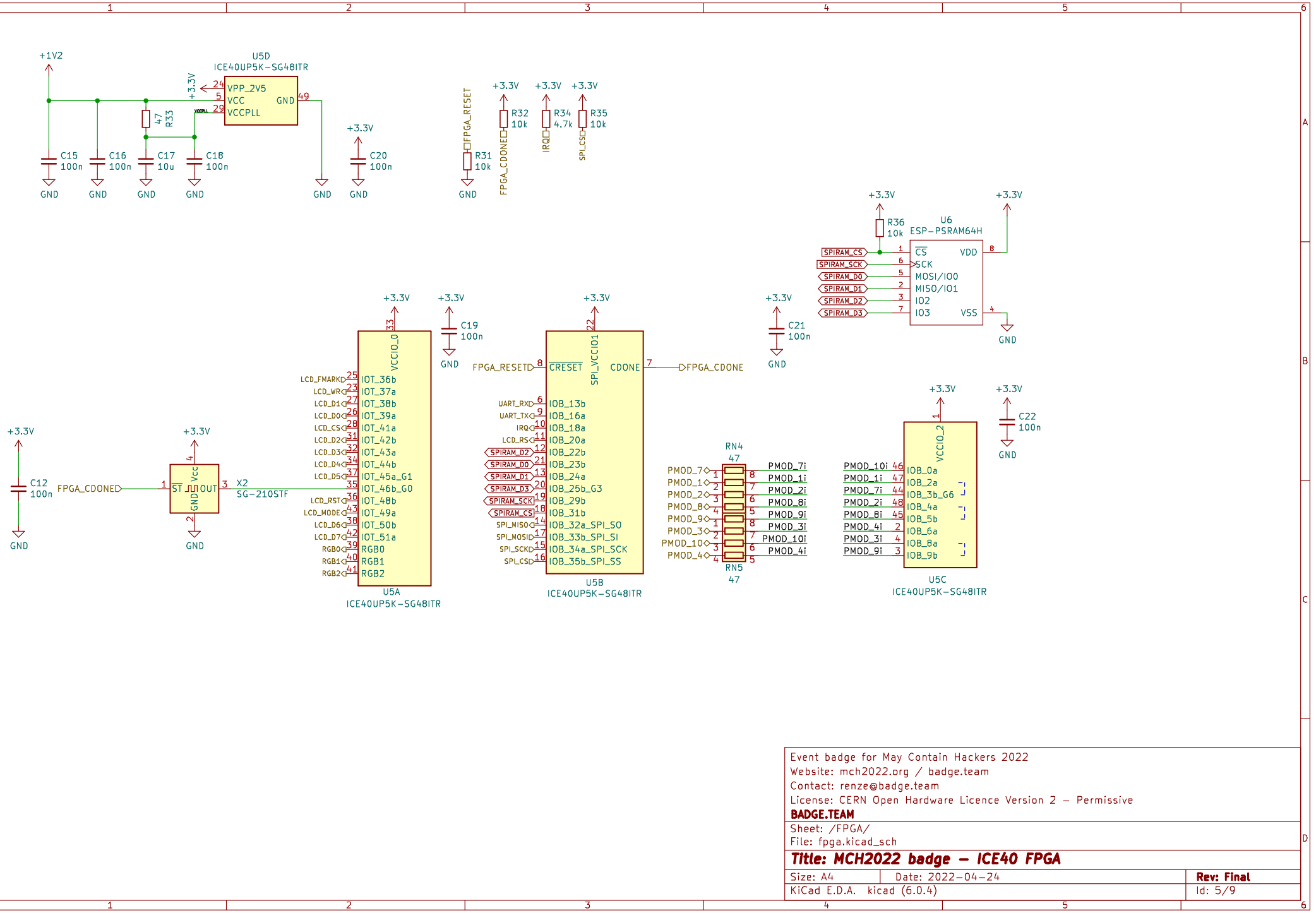
Sheet: /ESP32/
File: esp32.kicad_sch

Title: MCH2022 badge – ESP32 microcontroller

Size: A4	Date: 2022-04-24	**Rev: Final**
KiCad E.D.A. kicad (6.0.4)		Id: 4/9



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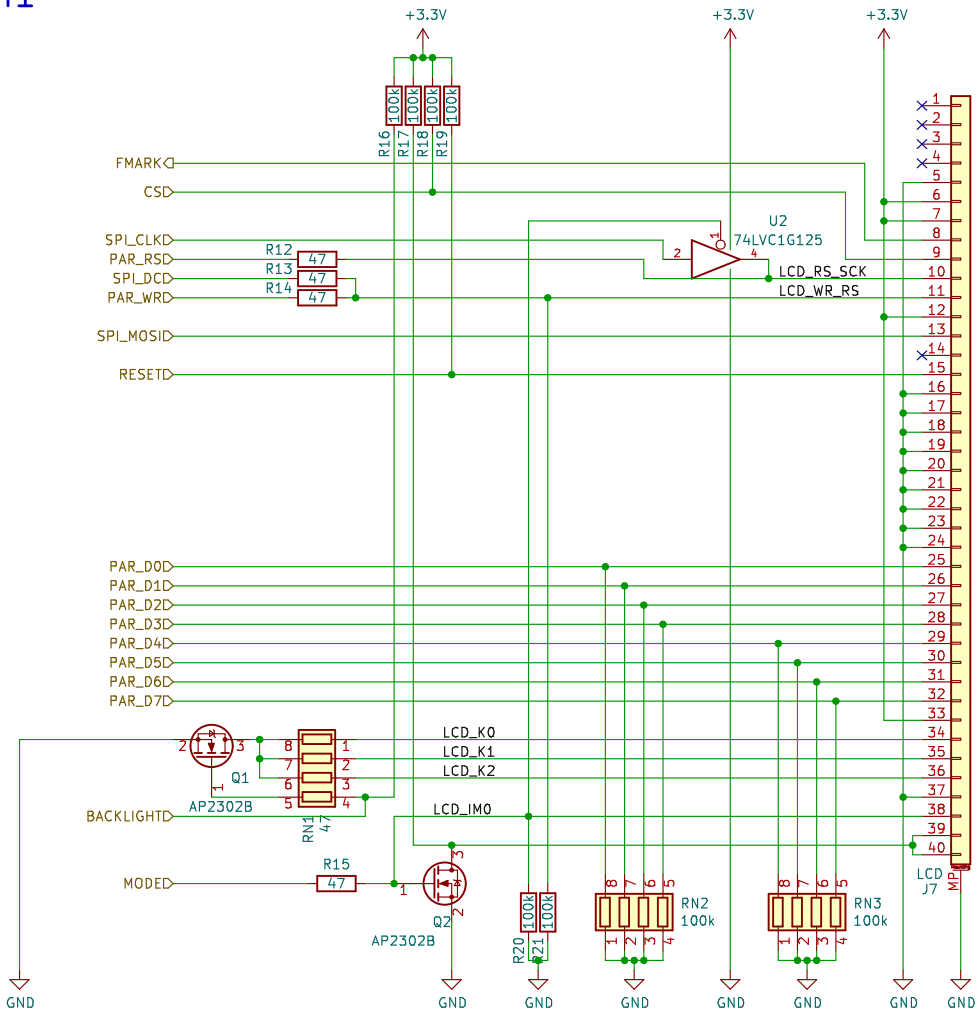
Sheet: /FPGA/
File: fpga.kicad_sch

Title: MCH2022 badge – ICE40 FPGA

Size: A4	Date: 2022-04-24	**Rev: Final**
KiCad E.D.A. kicad (6.0.4)		Id: 5/9

LCD
Type: Z240IT008
Controller: ILI9341
Size: 2.4 inch



Note: LCD pin numbering on the flatflex cable is reversed compared to the connector so pin 40 here is pin 1 on the LCD itself!

01 X(L) touch
02 Y(U) touch
03 X(R) touch
04 Y(D) touch
05 GND
06 IOVCC (3.3v)
07 VCI (3.3v)
08 FMARK (frame sync)
09 CS
10 RS/SCK (paralle; register select, SPI: clock)
11 WR/RS (parallel: write at rising edge, SPI: register select)
12 RD (parallel: read at rising edge)
13 SPI SDI (if not used: pull up/down)
14 SPI SDO
15 RESET
16 GND
17 DB00
18 DB01
19 DB02
20 DB03
21 DB04
22 DB05
23 DB06
24 DB07
25 DB08
26 DB09
27 DB10
28 DB11
29 DB12
30 DB13
31 DB14
32 DB15
33 A
34 K (1)
35 K (2)
36 K (3)
37 GND
38 IM0
39 IM1
40 IM2

SPI: IM0 = 0, IM1 = 1, IM2 = 1
PAR: IM0 = 1, IM1 = 0, IM2 = 0

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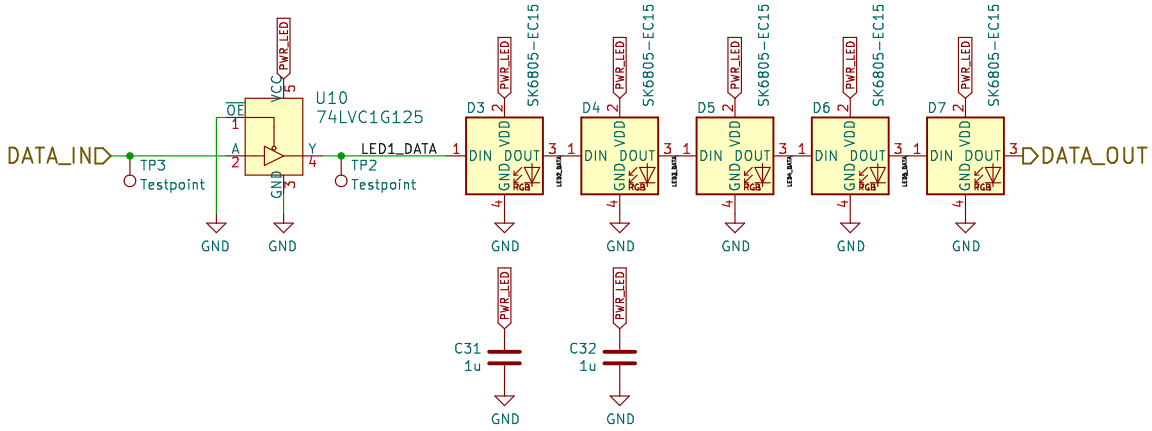
Sheet: /LCD/
File: lcd.kicad_sch

Title: MCH2022 badge – LCD

Size: A4	Date: 2022-04-24	**Rev: Final**
KiCad E.D.A. kicad (6.0.4)		Id: 6/9

WS2812B LEDs



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Sheet: /LED/
File: led.kicad_sch

Title:

Size: A4	Date: 2022-04-24	**Rev: Final**
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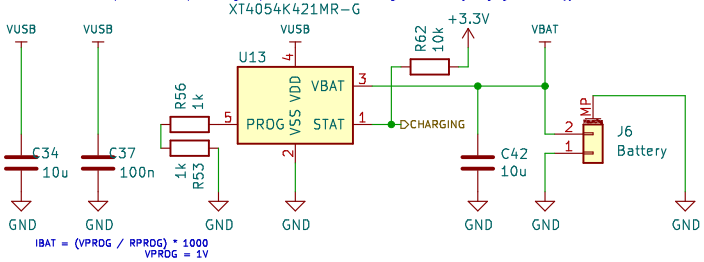
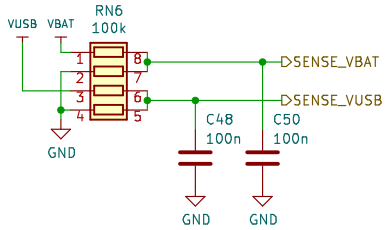
Battery & battery charger

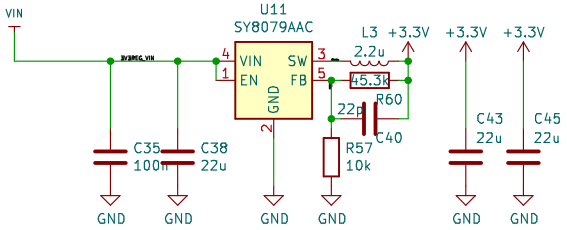
CHARGING is an open-drain output that gets pulled low when the charger is active (charging the battery)



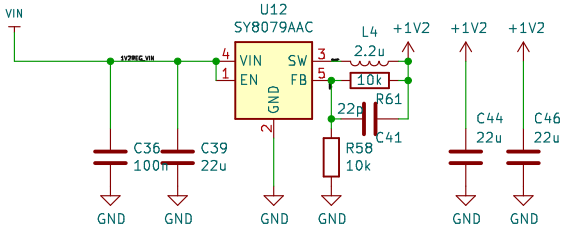
Voltage sensing



3.3v voltage regulator

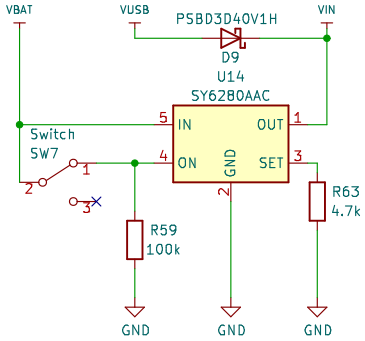


1.2v voltage regulator



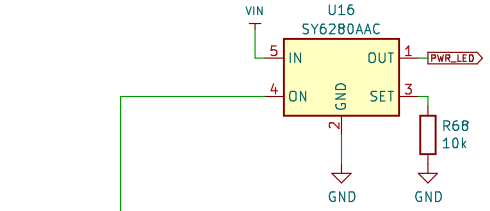
Power switch

Iset = 1.44A = 6800 / 4700



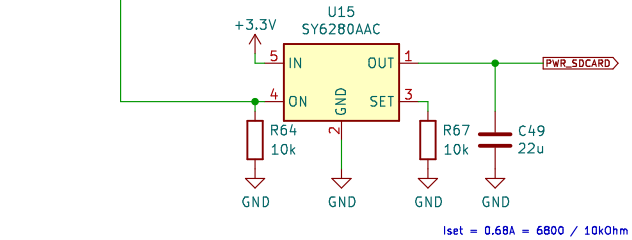
Switched power: Vin for LEDs

Iset = 0.68A = 6800 / 10kOhm



Switched power: 3.3v for SDCARD

Iset = 0.68A = 6800 / 10kOhm



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Sheet: /POWER/
File: power.kicad_sch

Title: MCH2022 badge – Power management

Size: A4	Date: 2022-04-24	**Rev: Final**
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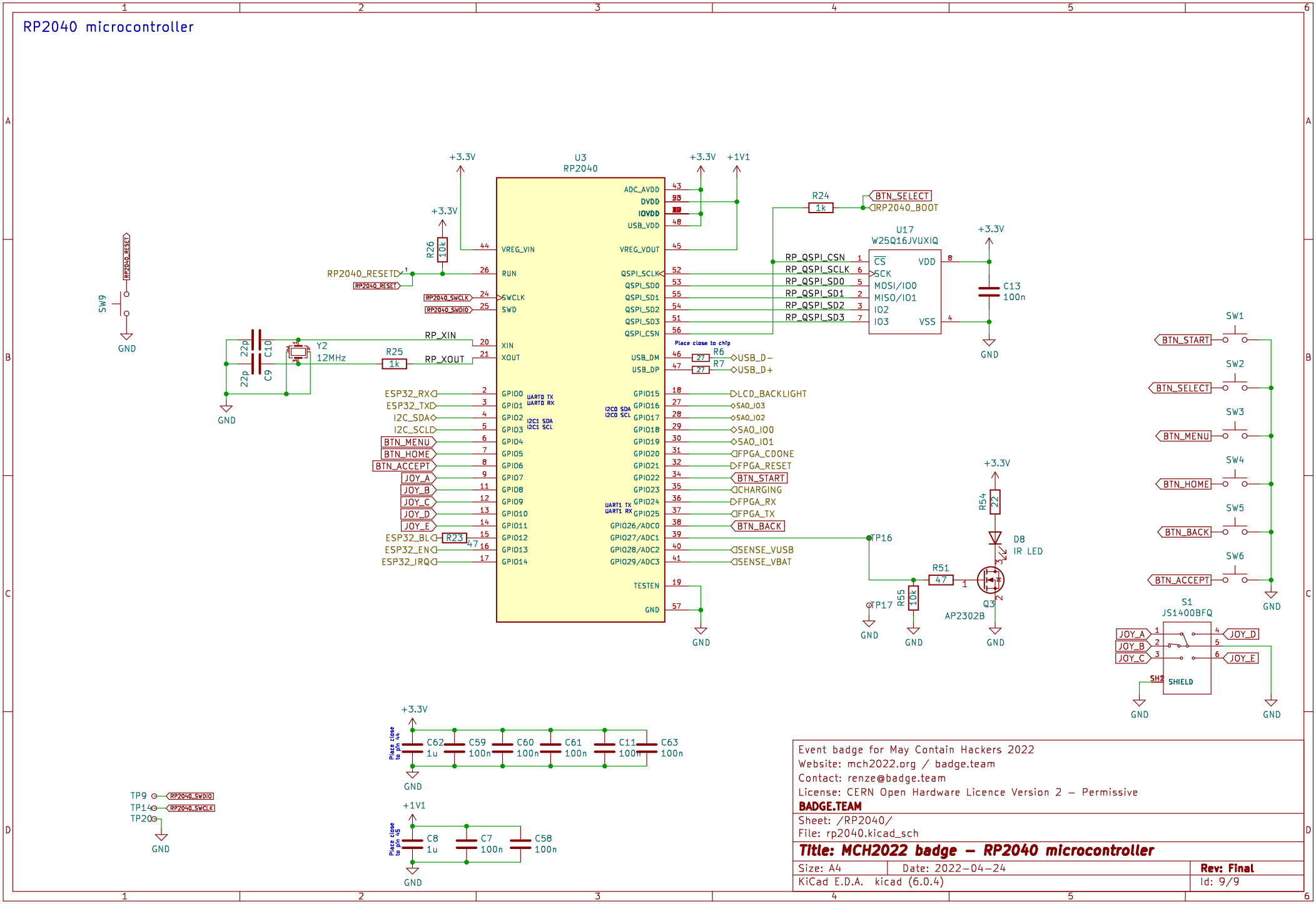
RP2040 microcontroller
U3
RP2040
+3.3V
+1V1
GND
SW9
RP2040_RESET
R26
10k
RP2040_RESET
RP2040_SWCLK
RP2040_SWDIO
Y2
12MHz
22p
C10
C9
R25
1k
RP_XIN
RP_XOUT
ESP32_RX
ESP32_TX
I2C_SDA
I2C_SCL
BTN_MENU
BTN_HOME
BTN_ACCEPT
JOY_A
JOY_B
JOY_C
JOY_D
JOY_E
ESP32_BL
ESP32_EN
ESP32_IRQ
R23
47
ADC_AVDD
DVDD
IOVDD
USB_VDD
VREG_VIN
VREG_VOUT
RUN
SWCLK
SWD
QSPI_SCLK
QSPI_SD0
QSPI_SD1
QSPI_SD2
QSPI_SD3
QSPI_CSN
XIN
XOUT
USB_DM
USB_DP
GPIO0
GPIO1
GPIO2
GPIO3
GPIO4
GPIO5
GPIO6
GPIO7
GPIO8
GPIO9
GPIO10
GPIO11
GPIO12
GPIO13
GPIO14
GPIO15
GPIO16
GPIO17
GPIO18
GPIO19
GPIO20
GPIO21
GPIO22
GPIO23
GPIO24
GPIO25
GPIO26/ADC0
GPIO27/ADC1
GPIO28/ADC2
GPIO29/ADC3
TESTEN
GND
Place close to chip
R6
R7
27
USB_D-
USB_D+
LCD_BACKLIGHT
SAO_IO3
SAO_IO2
SAO_IO0
SAO_IO1
FPGA_CDONE
FPGA_RESET
BTN_START
CHARGING
FPGA_RX
FPGA_TX
BTN_BACK
SENSE_VUSB
SENSE_VBAT
R24
1k
BTN_SELECT
RP2040_BOOT
U17
W25Q16JVUXIQ
RP_QSPI_CSN
RP_QSPI_SCLK
RP_QSPI_SD0
RP_QSPI_SD1
RP_QSPI_SD2
RP_QSPI_SD3
C13
100n
TP16
TP17
R55
10k
R51
47
R54
22
D8
IR LED
Q3
AP2302B
SW1
SW2
SW3
SW4
SW5
SW6
BTN_START
BTN_SELECT
BTN_MENU
BTN_HOME
BTN_BACK
BTN_ACCEPT
S1
JS1400BFQ
SHIELD
C62
1u
C59
100n
C60
100n
C61
100n
C11
100n
C63
100n
Place close to pin 44
C8
1u
C7
100n
C58
100n
Place close to pin 45
TP9
TP14
TP20
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File: rp2040.kicad_sch
Title: MCH2022 badge – RP2040 microcontroller
Size: A4
Date: 2022-04-24
Rev: Final
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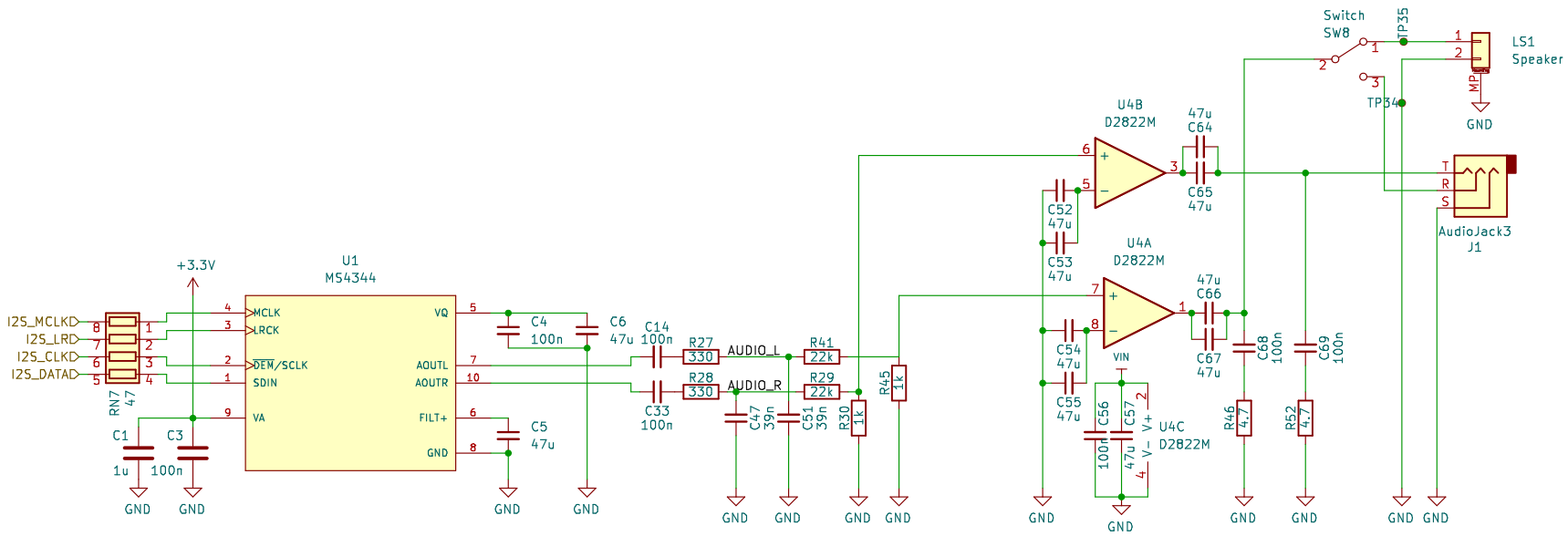

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Sheet: /AUDIO/
File: audio.kicad_sch

Title:

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