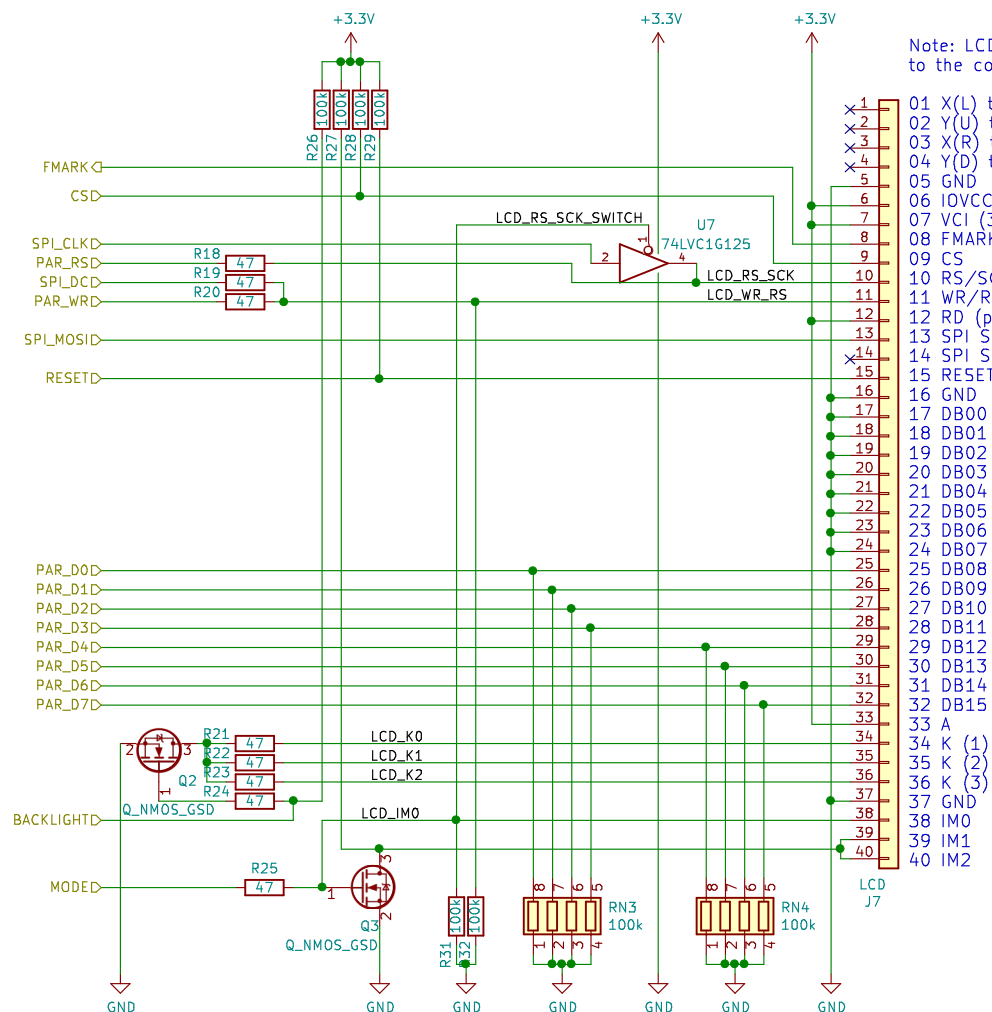


LCD
Type: Z240IT008
Controller: ILI9341
Size: 2.4 inch



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!

- 1 X(L) touch
- 2 Y(U) touch
- 3 X(R) touch
- 4 Y(D) touch
- 5 GND
- 6 IOVCC (3.3v)
- 7 VCI (3.3v)
- 8 FMARK (frame sync)
- 9 CS
- 10 RS/SCK (parallel: 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

BADGE.TEAM

Sheet: /LCD/

File: lcd.sch

Title: MCH2021 badge - LCD

Size: A4

Date: 2020-12-13

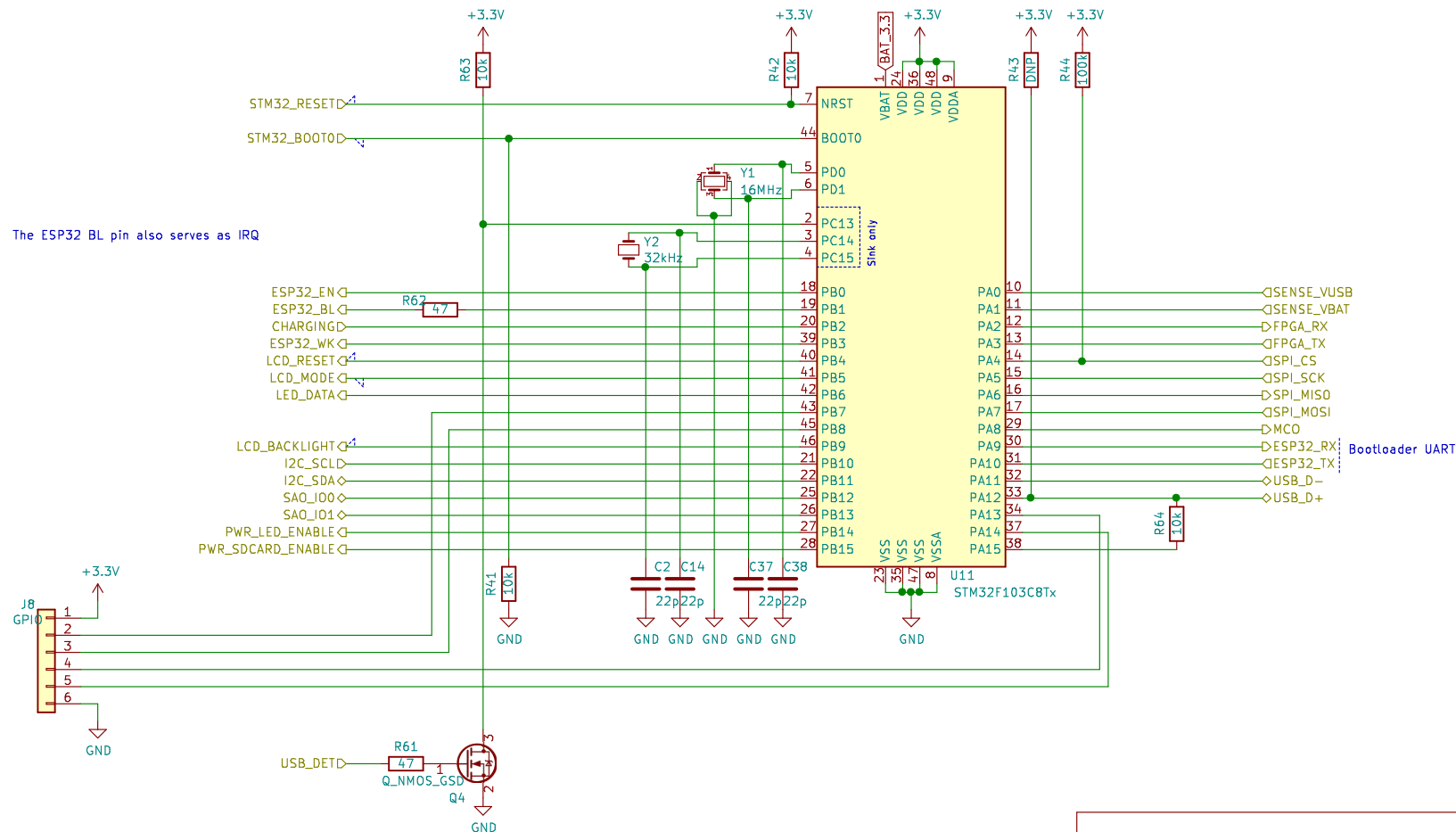
KiCad E.D.A. kicad 5.1.8

Rev: 2

Id: 2/9

STM32 microcontroller

The ESP32 BL pin also serves as IRQ



if using hardware time and the aproach of DMA > Timer Output
compare register you will need bridge pb15 and pb11 so we can
select or spi or tim

BADGE.TEAM

Sheet: /STM32/

File: stm32.sch

Title: MCH2021 badge – STM32 microcontroller

Size: A4

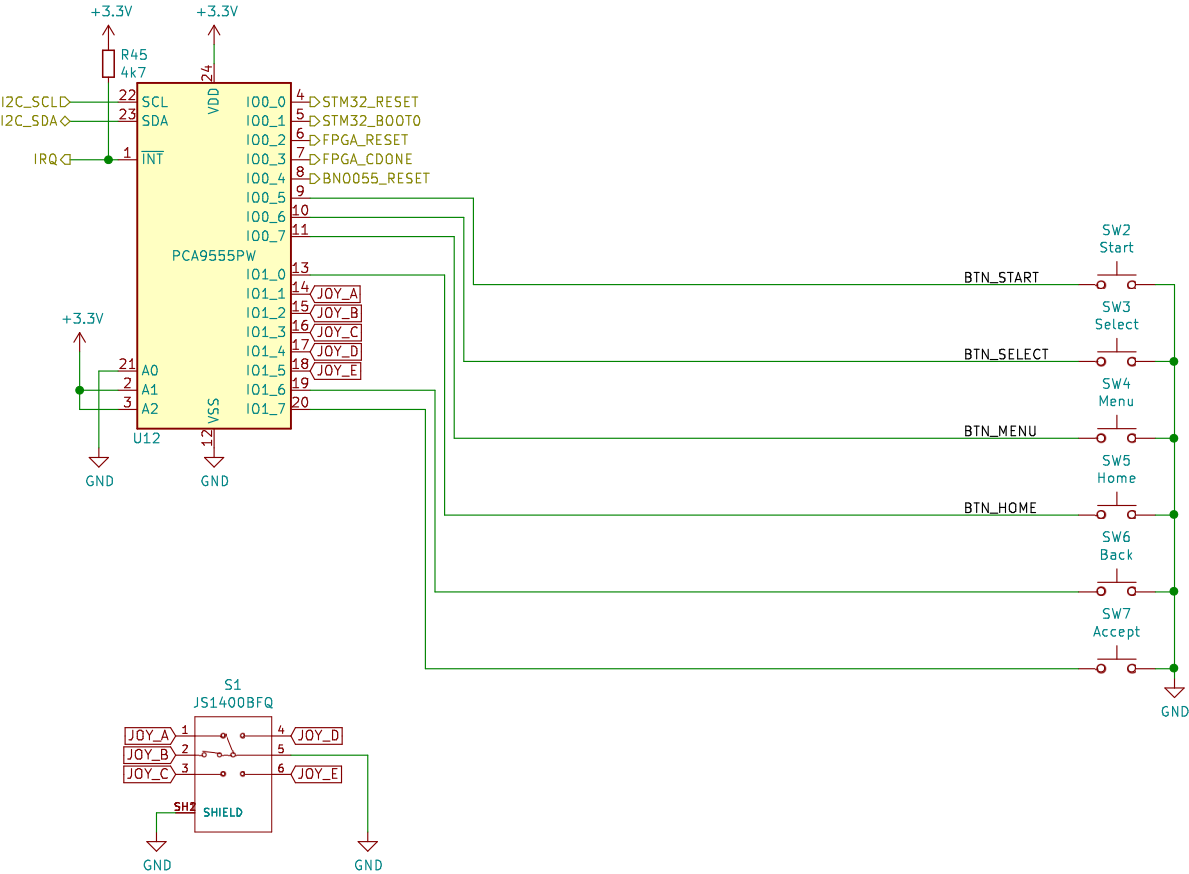
Date: 2020-12-13

Rev: 2

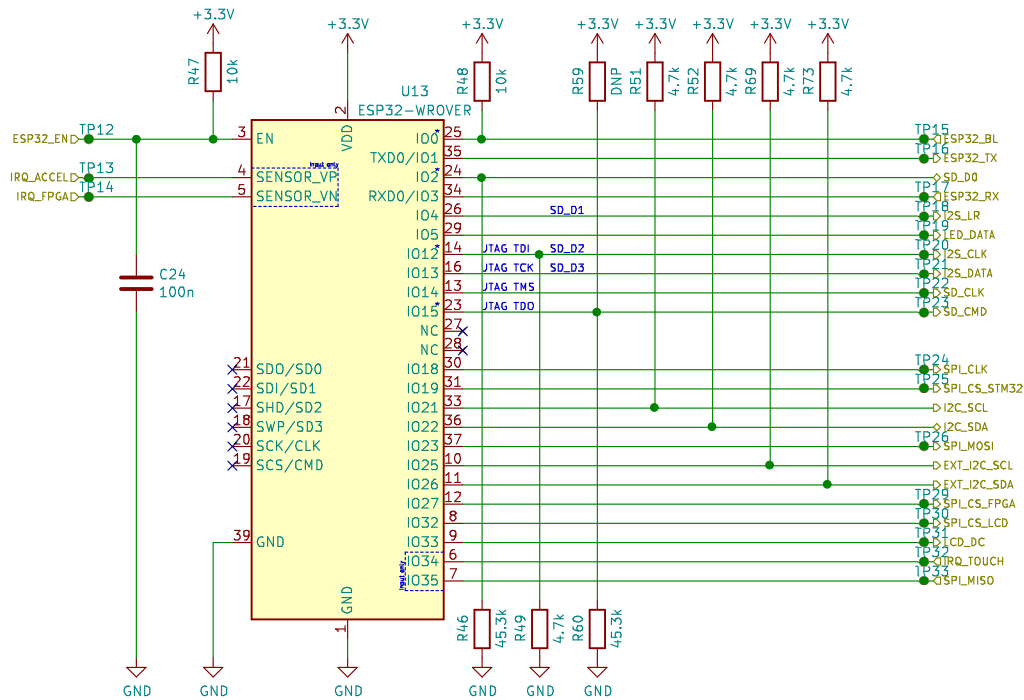
KiCad E.D.A. kicad 5.1.8

Id: 3/9

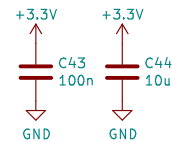
MPR121 touch button interface



ESP32 microcontroller



* 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



BADGE.TEAM

Sheet: /ESP32/
 File: esp32.sch

Title: MCH2021 badge – ESP32 microcontroller

Size: A4 Date: 2020-12-13

KiCad E.D.A. kicad 5.1.8

Rev: 2

Id: 6/9

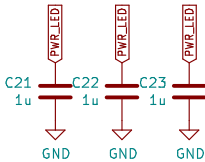
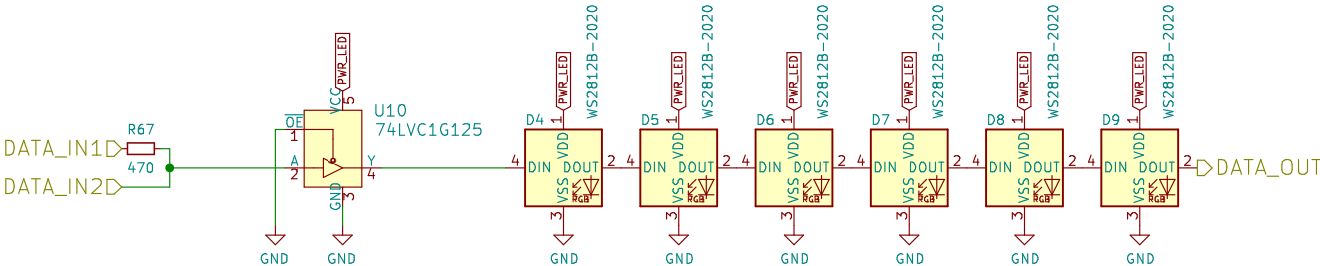
A



D

File: bosch.sch

WS2812B LEDs



BADGE.TEAM

Sheet: /LED/
File: led.sch

Title:

Size: A4
KiCad E.D.A. kicad 5.1.8

Date: 2020-12-13

Rev: 2

Id: 8/9

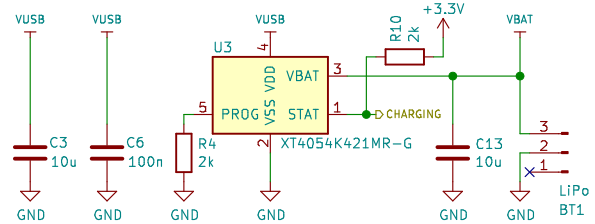
Battery & battery charger

The diagram illustrates a battery and battery charger circuit. The main components are:

- U3**: A USB-to-UART bridge chip with pins for **PROG**, **VSS**, **VDD**, and **STAT**.
- R4**: A 2k resistor connected between the **VUSB** input and the **VBAT** pin of U3.
- VBAT**: The battery, labeled **LiPo BT1**.
- R10**: A 2k resistor connected between the **VBAT** pin and the **+3.3V** output.
- C13**: A 10uF capacitor connected between the **+3.3V** output and **GND**.
- C3**: A 10uF capacitor connected between the **VUSB** input and **GND**.
- C6**: A 100nF capacitor connected between the **VSS** pin of U3 and **GND**.
- CHARGING**: An indicator connected to the **STAT** pin of U3.

The circuit is powered by a USB input (**VUSB**) and a battery (**VBAT**). The USB input is connected to the **PROG** pin of U3. The battery is connected to the **VBAT** pin of U3. The **STAT** pin of U3 is connected to the **CHARGING** indicator. The battery is also connected to a 3.3V regulator (R10) and a capacitor (C13). The battery is labeled **LiPo BT1**.

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

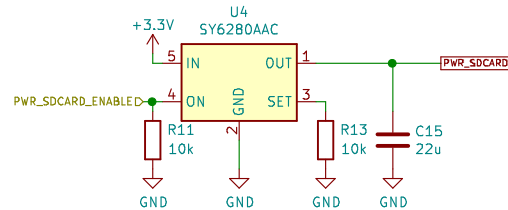


CHARGING is an open-drain output that gets pulled low when the charger is active (charging the battery)

Switched power: 3.3v for SDCARD

$I_{set} = 0.68A = 6800 / 10k\Omega$

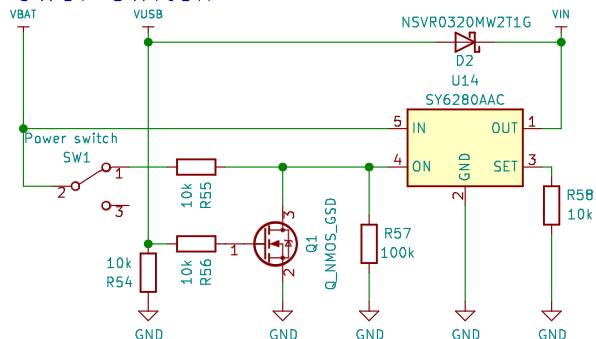
The diagram shows the SY6280AAC chip (U4) configured as a voltage-controlled switch. The input is +3.3V connected to pin 5 (IN). The output (OUT, pin 1) is connected to the SD card's power supply (PWR_SDCARD). The chip is controlled by the PWR_SDCARD_ENABLED signal (pin 4, ON) through a 10k resistor (R11) to ground. The SET pin (pin 3) is connected to ground through a 10k resistor (R13). A 22uF capacitor (C15) is connected between the output (pin 1) and ground to filter the output voltage.

$$I_{set} = 0.68A = 6800 / 10k\Omega$$


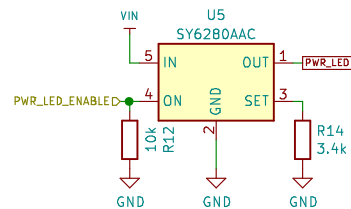
Note:
All control signals are hierarchical labels while all power rails are global

Power switch

The diagram illustrates a power switch circuit. It features a MOSFET (Q1) with its gate connected to the output of a logic inverter (U14, SY6280AAC). The inverter's input (IN, pin 5) is connected to the VBAT line through a 10k resistor (R54). The inverter's output (OUT, pin 1) is connected to the MOSFET's gate (pin 1) through a 10k resistor (R56). The MOSFET's source (pin 2) is connected to GND. The MOSFET's drain (pin 3) is connected to the VUSB line through a 10k resistor (R55). The VUSB line is also connected to the VIN pin of a diode (D2, NSVR0320MW2T1G) and to the SET pin (pin 3) of the inverter. The diode's cathode is connected to VBAT. The inverter's SET pin (pin 3) is also connected to GND through a 100k resistor (R57). A power switch (SW1) is connected between VBAT and the VUSB line. The MOSFET is labeled Q1 and its gate is labeled Q1NMOS_GSD.

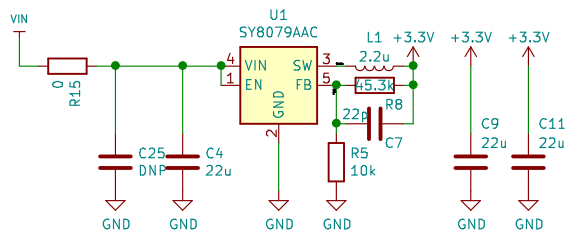


Switched power: Vin for LEDs

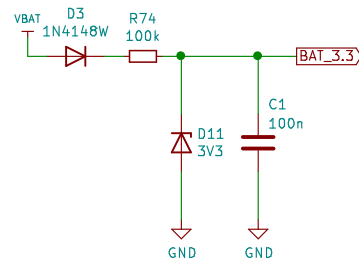
$$I_{set} = 2A = 6800 / 3.4k\Omega$$


3.3v voltage regulator

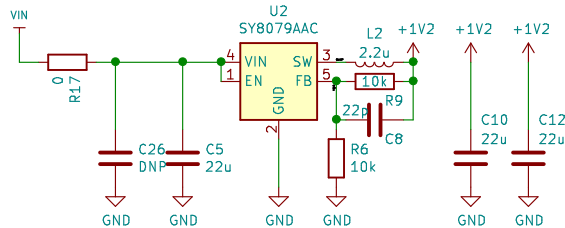
The diagram shows a 3.3V voltage regulator circuit. The input voltage V_{IN} is connected to the VIN pin (pin 4) of the SY8079AAC IC (U1) through a resistor R15 (0 Ω). The EN pin (pin 1) is connected to GND. The SW pin (pin 3) is connected to the +3.3V output. The FB pin (pin 5) is connected to the output through a feedback network consisting of a 45.3k resistor (R8) and a 22uF capacitor (C7). The output is also connected to a 22uF capacitor (C9) and a 10k resistor (R5) to GND. The output voltage is +3.3V. The input is connected to a 22uF capacitor (C25) and a 22uF capacitor (C4) to GND. The output is connected to a 22uF capacitor (C11) to GND.



3.3v voltage regulator for RTC backup

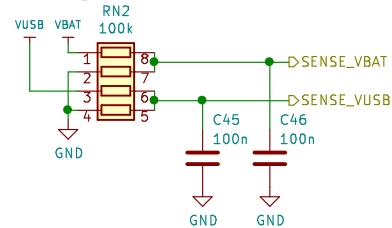


1.2v voltage regulator



Voltage sensing

The diagram illustrates a voltage sensing circuit. It features a resistor divider network (RN2, 100k) connected to the VUSB and VBAT inputs. The output of the divider is connected to the SENSE_VBAT and SENSE_VUSB pins. Two capacitors, C45 and C46, are connected to ground to filter the signals.



BADGE.TEAM		
Sheet: /POWER/		
File: power.sch		
Title: MCH2021 badge – Power management		
Size: A4	Date: 2020–12–13	Rev: 2
KiCad E.D.A. kicad 5.1.B		Id: 9/9

Id: 9/9