

Battery & battery charger

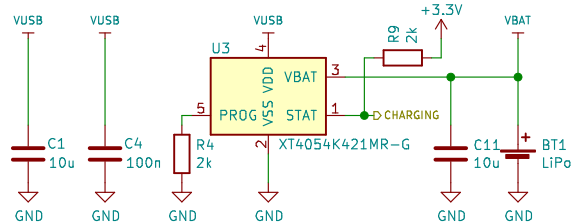
The diagram illustrates a battery charging circuit. A yellow IC labeled U3 (PROG V55 VDD STAT) is the central component. It has several pins connected to various components:

- Pin 1:** Labeled "CHARGING", it is connected to a green LED.
- Pin 2:** Labeled "XT4054K421MR-G", it is connected to GND.
- Pin 3:** Labeled "VBAT", it is connected to a node that branches to a 3.3V output and the positive terminal of a battery (BT1 LiPo).
- Pin 4:** Labeled "VUSB", it is connected to a 3.3V input.
- Pin 5:** Labeled "V55 VDD", it is connected to a node that branches to a 3.3V output and the positive terminal of a battery (BT1 LiPo).

Other components and connections include:

- Capacitors:** C1 (10uF) and C4 (100nF) are connected to the VUSB inputs. C11 (10uF) is connected to the 3.3V output.
- Resistors:** R4 (2k) is connected between pin 5 and GND. R9 (2k) is connected between the 3.3V output and the VBAT pin.
- Batteries:** Two BT1 LiPo batteries are shown, one connected to the 3.3V output and the other connected to the VBAT pin.

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

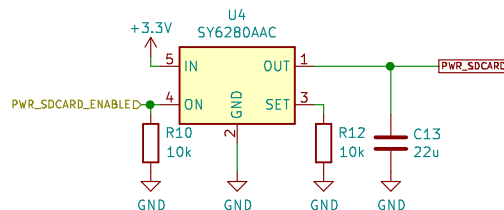


CHARGING is an open-drain output that gets pulled low when the charger is active (charging the battery)

Switched power: 3.3v for SDCARD

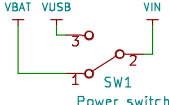
$I_{set} = 0.68A = 6800 / 10k\Omega m$

The diagram shows a MOSFET (U4, SY6280AAC) used as a switch for a 3.3V power supply. The MOSFET's gate (pin 4, ON) is controlled by the PWR_SDCARD_ENABLED signal through a 10kΩ resistor (R10). The drain (pin 5, IN) is connected to a 3.3V source. The source (pin 2, GND) is connected to ground. The MOSFET's output (pin 1, OUT) is connected to the SDCARD's PWR_SDCARD pin through a 10kΩ resistor (R12). A 22μF capacitor (C13) is connected between the output and ground to filter the supply.

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


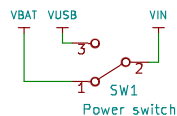
Note:
All control signals are hierarchical labels while all power rails are global

Power switch



The diagram shows a power switch labeled 'SW1' and 'Power switch'. It has three terminals: 1, 2, and 3. Terminal 1 is connected to VBAT. Terminal 2 is connected to VIN. Terminal 3 is connected to VUSB. The switch is shown in a state where it can connect the battery (VBAT) to the VIN line, bypassing the USB (VUSB) connection.

The power switch never really turns the badge off. Instead it lets you choose to bypass the battery when powering the badge from USB. This increases charging speed and turns the badge off completely when USB is not connected



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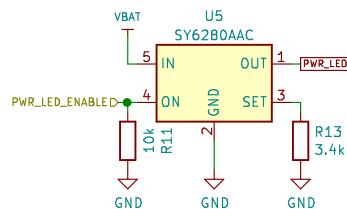
Switched power: Vin for LEDs

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

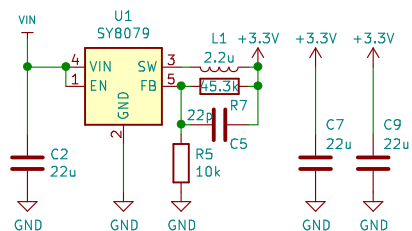
The diagram shows the internal circuit of a switched power supply for LEDs. It features the SY6280AAC IC, which is a 5-pin component. The pins are connected as follows:

- Pin 5 (IN):** Connected to VBAT.
- Pin 4 (ON):** Connected to PWR_LED_ENABLED through a 10k resistor (R11) to GND.
- Pin 2 (GND):** Connected to GND.
- Pin 3 (SET):** Connected to GND through a 3.4k resistor (R13).
- Pin 1 (OUT):** Connected to PWR_LED.

The IC is labeled U5 and SY6280AAC. The output PWR_LED is connected to the LED load.

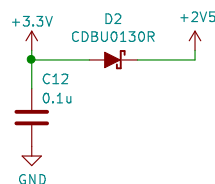
$$I_{set} = 2A = 6800 / 3.4k\Omega m$$


3.3v voltage regulator

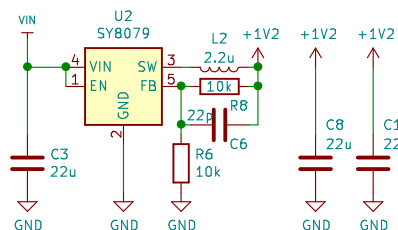


2.5v voltage regulator

The diagram shows a circuit for a 2.5V voltage regulator. A 3.3V input is connected to a green node. A capacitor, labeled C12 with a value of 0.1u, is connected between this green node and ground (GND). A diode, labeled D2 with a value of CDBU0130R, is connected in series between the green node and a +2V5 output. The diode's cathode is connected to the green node, and its anode is connected to the +2V5 output.

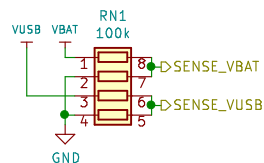


1.2v voltage regulator



Voltage sensing

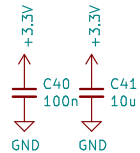
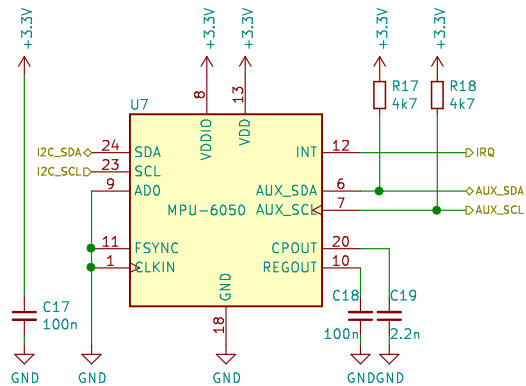
The diagram shows a voltage divider circuit for sensing VUSB and VBAT. A 100k resistor (RN1) is connected between VUSB and VBAT. The resistor has four taps. Tap 1 (pin 8) is connected to VBAT. Tap 2 (pin 7) is connected to VUSB. Tap 3 (pin 6) is connected to a green dot, which is then connected to SENSE_VUSB. Tap 4 (pin 5) is connected to GND. The bottom tap (pin 4) is also connected to GND.



BADGE.TEAM		
Sheet: /POWER/ File: power.sch		
Title: MCH2021 badge – Power management		
Size: A4	Date: 2020-08-08	Rev: 1
KiCad E.D.A. kicad 5.1.6		Id: 2/9

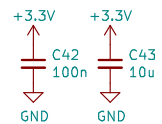
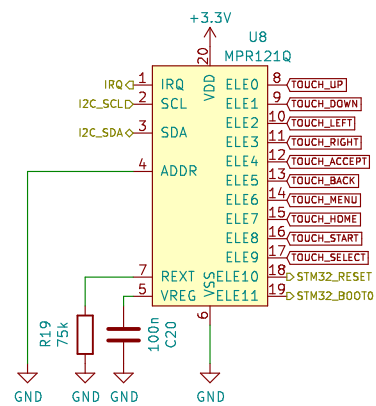
Id: 2/9

MPU6050 accelerometer and gyroscope



Sheet: /ACCELEROMETER/		File: accelerometer.sch	
Size: A4		Date:	
KiCad E.D.A. kicad 5.1.6		Rev: Id: 3/9	

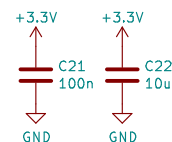
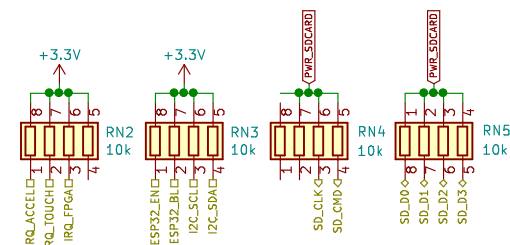
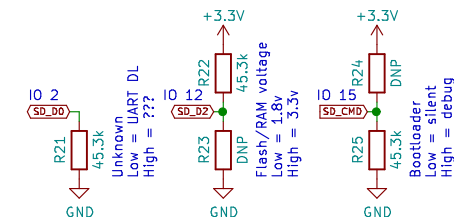
MPR121 touch button interface



Sheet: /TOUCH/		
File: touch.sch		
Title:		
Size: A4	Date:	Rev:
KiCad E.D.A. kicad 5.1.6	Id: 4/9	

ESP32 bootstapping pins

- Pull-up resistors for
 - I2C bus
 - IRQ signals
 - Download mode (IO0)
 - SDIO bus

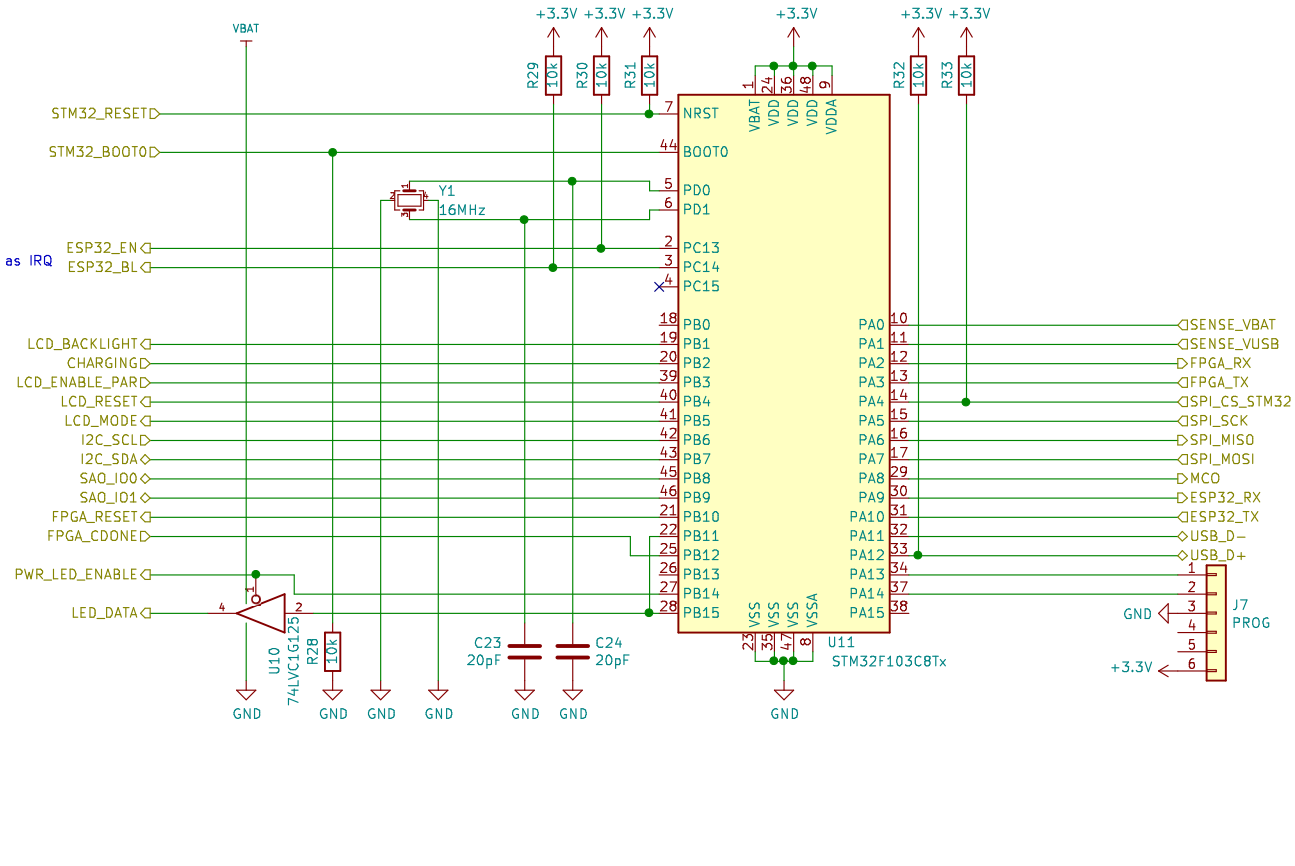


Title: MCH2021 badge – ESP32 microcontroller

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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

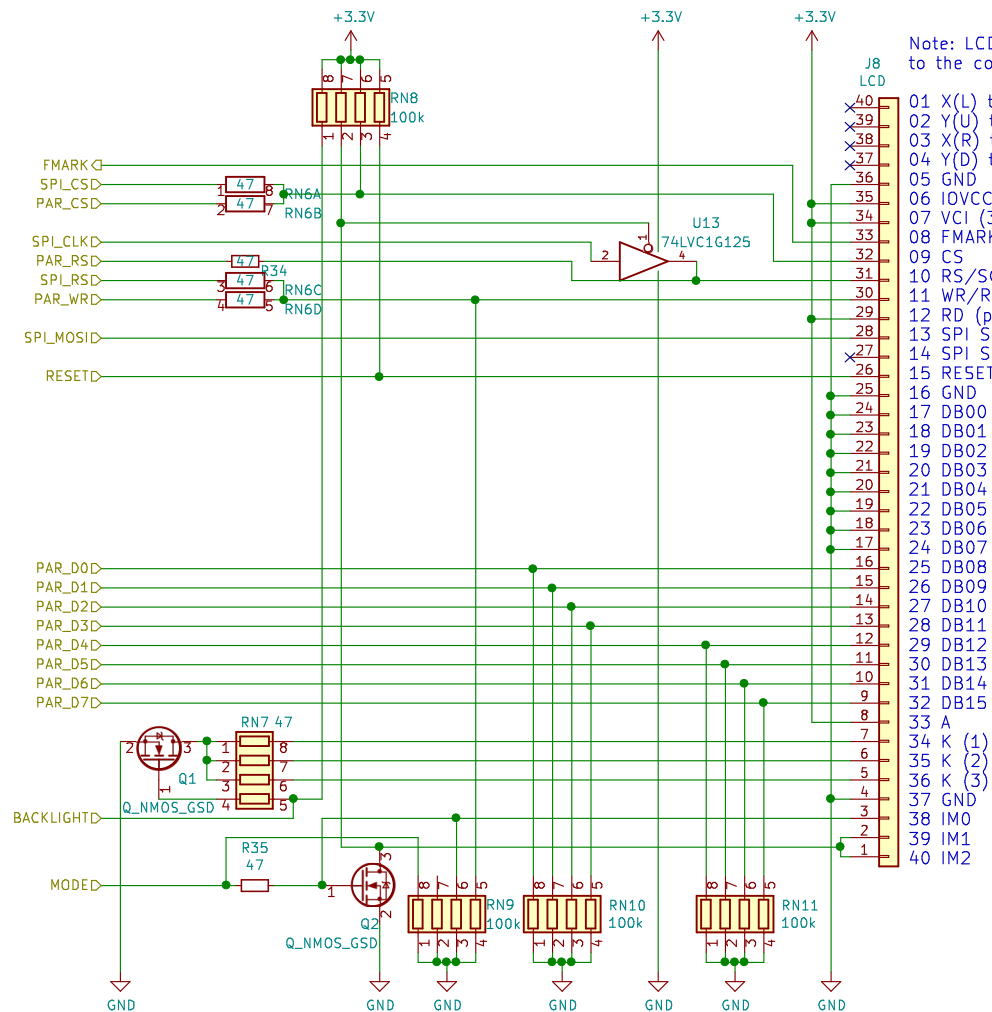
Date: 2020-08-08

Rev: 1

KiCad E.D.A. kicad 5.1.6

Id: 6/9

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

BADGE.TEAM

Sheet: /LCD/

File: lcd.sch

Title: MCH2021 badge - LCD

Size: A4

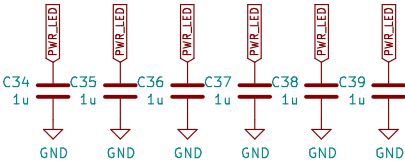
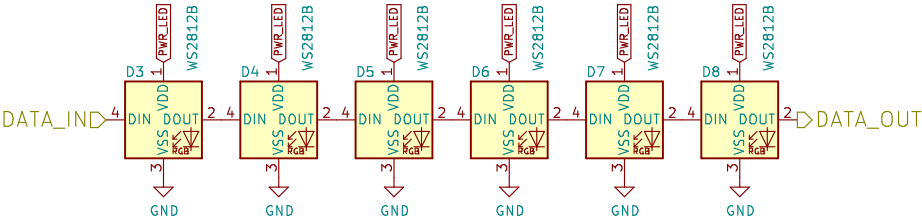
Date: 2020-08-09

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Rev: 1

Id: 7/9

WS2812B LEDs



Sheet: /LED/		
File: led.sch		
Title:		
Size: A4	Date:	Rev:
KiCad E.D.A. kicad 5.1.6		Id: 8/9

