

Simone Tollardo

Sheet: /  
File: LAITS-HW.kicad\_sch

**Title: LAITS (Light Analysis lot porTable Spectrometer)**

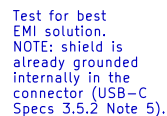
Size: A4      Date: 2022-08-12

KiCad E.D.A.      kicad 6.0.7-1.fc36

**Rev: 1.0.3**

Id: 1/6

J201  
USB\_C\_Receptacle\_USB2.0



The diagram illustrates the connection between a CP2102N chip (U201) and a CP2102N-Axx-xQFN28 chip. The CP2102N chip is shown with its pins and connections. The CP2102N-Axx-xQFN28 chip is shown with its pins and connections. The diagram includes a +3V3 power supply, capacitors C205 (4.7u), C206 (4.7u), and C207 (100n), and resistors R209 (510R) and R210 (510R). LEDs TX\_LED (D203) and RX\_LED (D204) are connected to the TXD and RXD pins respectively. The RXD pin is also connected to a +3V3 supply through a resistor.

**CP2102N Pin Connections:**

- RST: 9
- VREGIN: 7
- VDD: 6
- TXD: 26
- RXD: 25
- RTS: 24
- CTS: 23
- DSR: 27
- DTR: 28
- DCD: 1
- RI/CLK: 2
- SUSPEND: 12
- SUSPEND: 11
- TXT/GPIO.0: 18
- RXT/GPIO.1: 19
- RS485/GPIO.2: 17
- WAKEUP/GPIO.3: 16
- GPIO.4: 22
- GPIO.5: 21
- GPIO.6: 20
- CHREN: 13
- CHRO: 15
- CHR1: 14

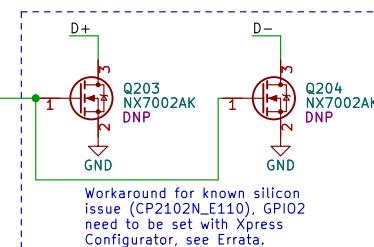
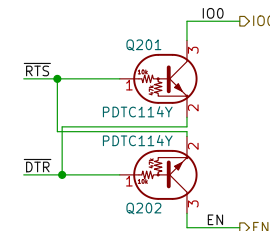
**CP2102N-Axx-xQFN28 Pin Connections:**

- RXD: 26
- TXD: 25
- RTS: 24
- CTS: 23
- DTR: 28
- DCD: 1
- RI/CLK: 2
- SUSPEND: 12
- SUSPEND: 11
- TXT/GPIO.0: 18
- RXT/GPIO.1: 19
- RS485/GPIO.2: 17
- WAKEUP/GPIO.3: 16
- GPIO.4: 22
- GPIO.5: 21
- GPIO.6: 20
- CHREN: 13
- CHRO: 15
- CHR1: 14

**Other Components:**

- +3V3: Power supply
- C205: 4.7uF capacitor
- C206: 4.7uF capacitor
- C207: 100nF capacitor
- R209: 510R resistor
- R210: 510R resistor
- D203: TX\_LED
- D204: RX\_LED

## Bootloader Mode from USB



Workaround for known silicon issue (CP2102N\_E110), GPIO2 need to be set with Xpress Configurator, see Errata.



Sheet: /USB/  
File: USB.kicad\_sch

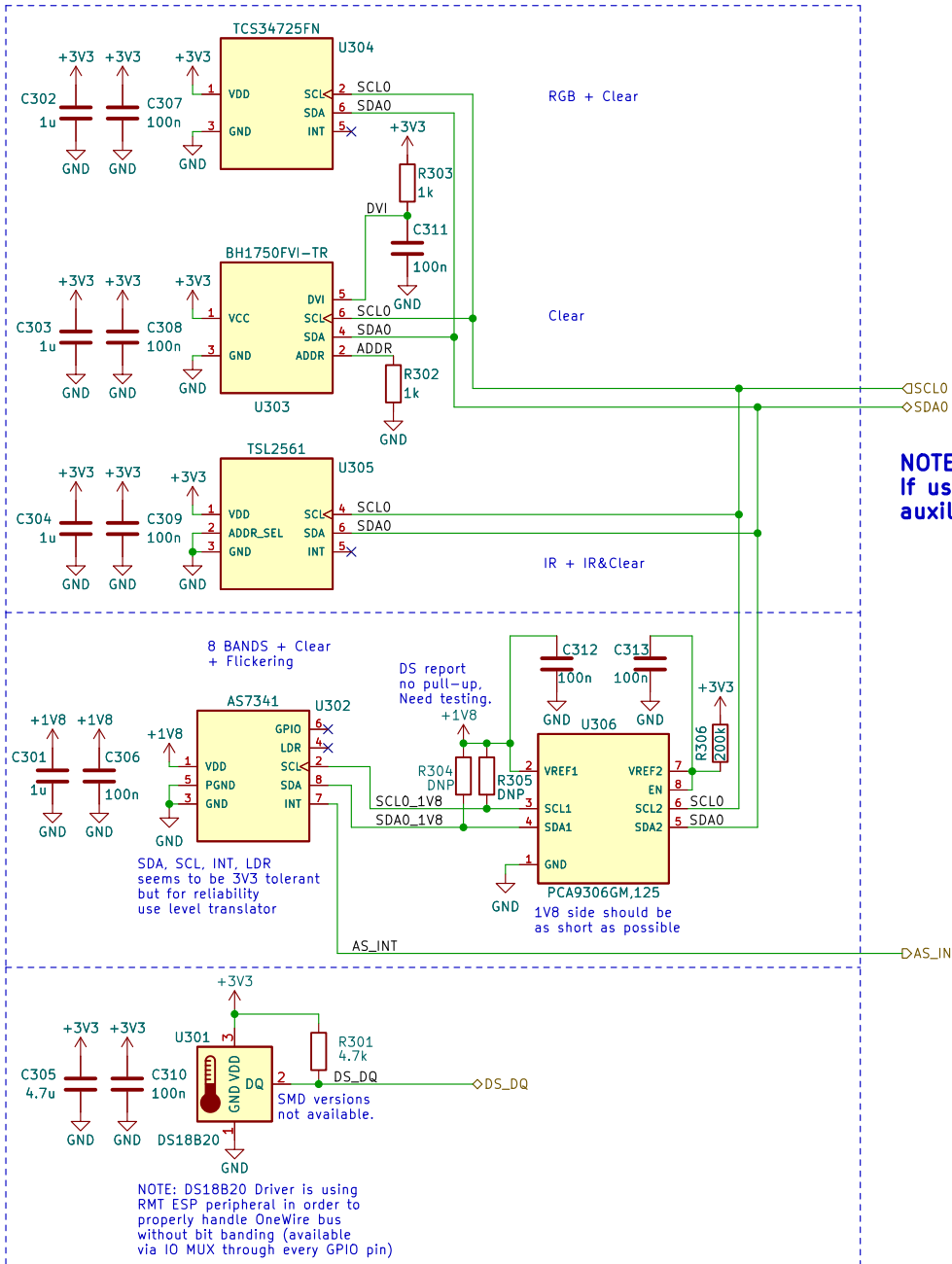
Size: A4	Date:
----------	-------

KiCad E.D.A.	kiCad 6.0.7-1.fc36
--------------	--------------------

KiCad E.D.A.	kiCad 6.0.7-1.fc36
--------------	--------------------

Id: 2/6

# SENSORS



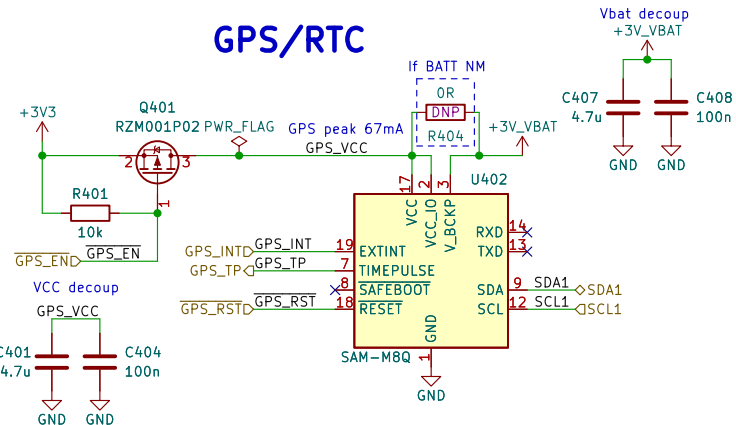
Simone Tollardo

Sheet: /Sensors/  
 File: Sensors.kicad\_sch

**Title: Sensors**

Size: A4 Date: 2022-08-12  
 KiCad E.D.A. kicad 6.0.7-1.fc36

**Rev: 1.0.3**  
 Id: 3/6



2032 Cell

BT401

+3V\_VBAT

GND

BATT on GPS for hot start,  
BATT on RTC for time

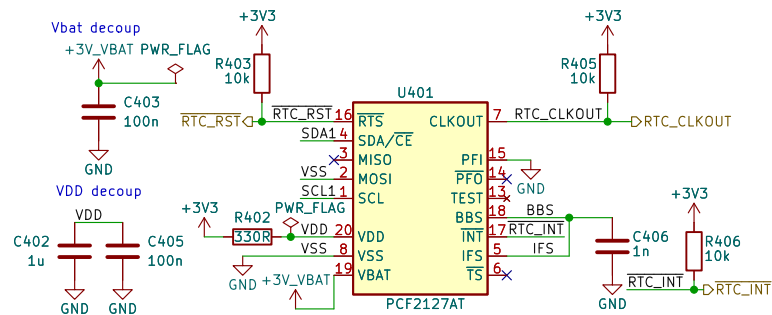
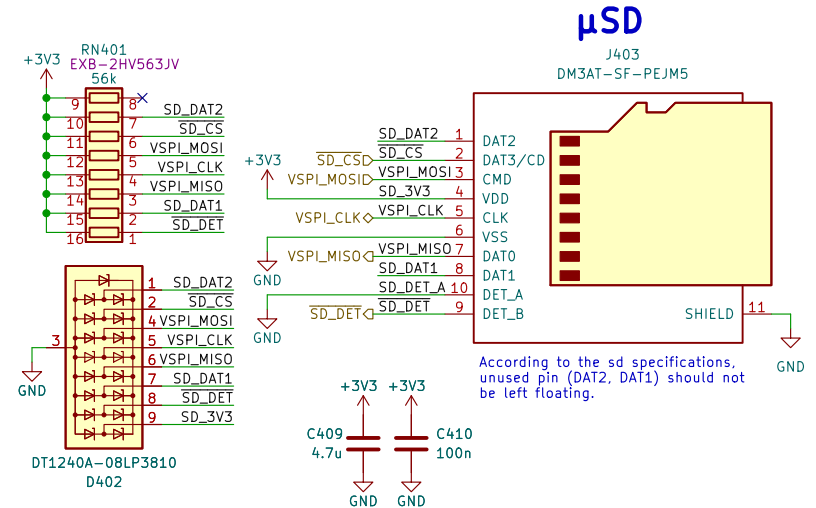


Diagram showing the pin configuration for the J401 EXP connector:

- Pin 4: +3V3
- Pin 3: SCL0
- Pin 2: SDA0
- Pin 1: GND



6.4V min ~ 8.4V max  
VSYS

D403  
LED RGB 5mm Horiz.  
WP154A4SEJ3VBDZGC/CA

R409 330R  
Q403  
PTCT114Y  
GND  
 $V_f = 2.2-2.8V @ 20mA$

R410 220R  
Q404  
PTCT114Y  
GND  
 $V_f = 3.3-4.1V @ 20mA$

R411 220R  
Q405  
PTCT114Y  
GND  
 $V_f = 3.3-4.0V @ 20mA$



Sheet: /AUX + Peripherals/  
File: Aux\_peripherals.kicad\_sch

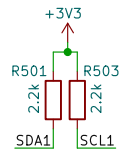
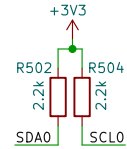
**Title: AUX + Peripherals**

KiCad E.D.A.	kiCad 6.0.7-1.fc36
--------------	--------------------

KiCad E.D.A.	kiCad 6.0.7-1.fc36
--------------	--------------------

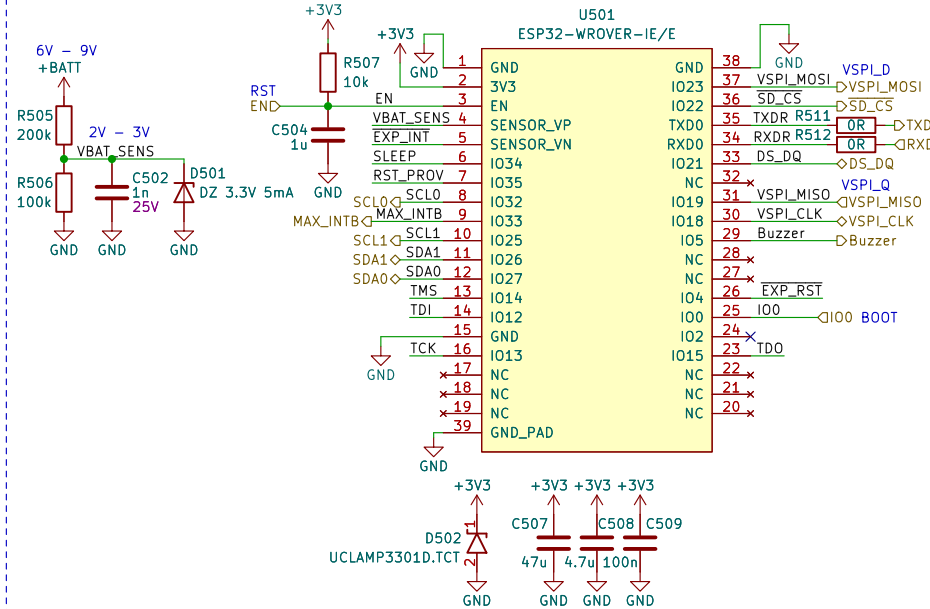
Id: 4/6

## I2C Pull-up



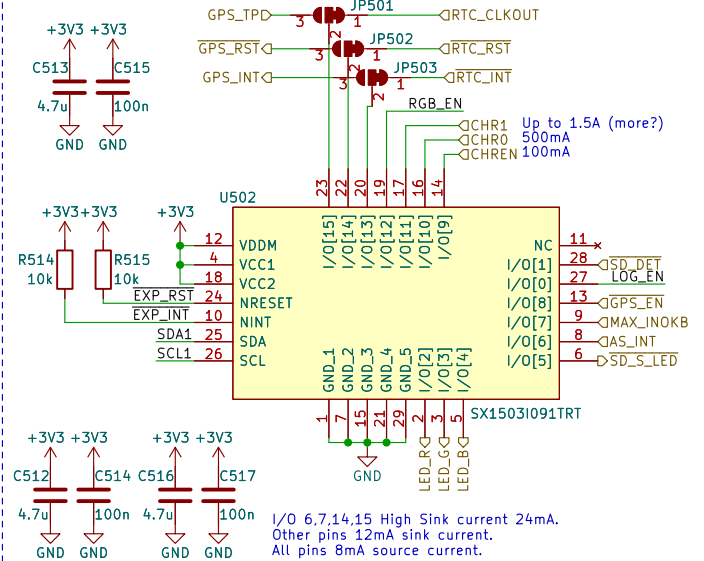
Depending on the I2C bus speed, these values may be adjusted.  
100KHz=4.7K  
400KHz=2.2K  
In every case this need some testing.

## ESP

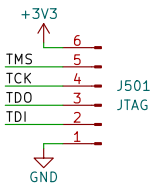


## GPIO Expander

Solder Jumpers Pos.  
1-2 if RTC mounted,  
3-2 if GPS mounted.

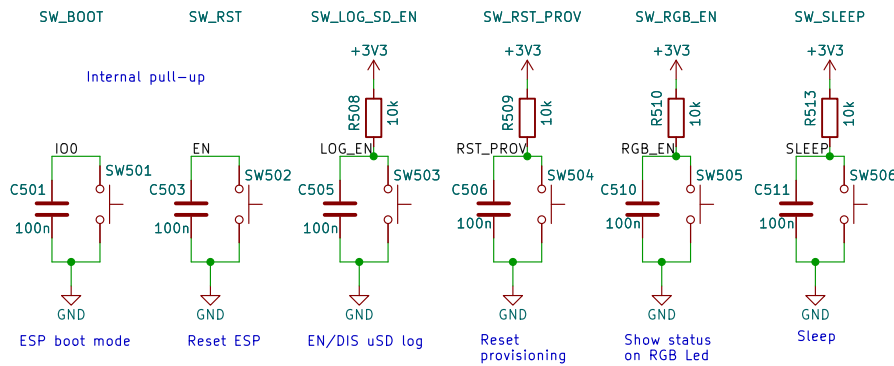


## JTAG

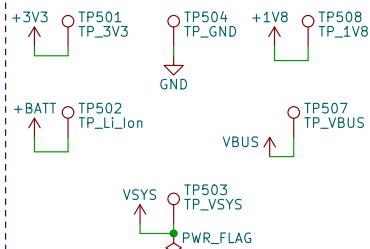


Since MTDI and MTDO are bootstrapping pins, wait for reset before using JTAG interface.

## BUTTONS



## Testpoints



ESP Bootstrapping pins:  
MTDI (GPIO12) -> need to be kept low at startup: 0=LDO 3V3, 1=LDO 1V8

MTDO (GPIO15) -> 1=U0TXD Active 0=U0TXD Silent

BOOT (GPIO0) -> 1=SPI, 0=Bootloader

GPIO2 -> 0 for Bootloader mode

GPIO5 (Pull-up at startup) SDIO timing  
Since we are not using SDIO interface we can freely use GPIO5.

GPIO34-35-36-37-38-39 Input only

RTC PINS can receive interrupt and wake up ESP from deep-sleep.

NINT, RGB, CHRG, RST PROV, MAX\_INTB.

SPI and UART direct I/O via I/O MUX while I2C and other low speed stuff can be mapped anywhere through GPIO Matrix.

SPI, GPIO16, GPIO17 used by internal FLASH and PSRAM. HSPi mapped on same pins of JTAG VSPI is free.

SPIQ=MOSI  
SPIQ=MISO  
SPICLK=SPICLK  
SPIHD=Hold  
SPIWP=Write Protect

WP & HD pin not used in SPI 1 bit mode

# LA TS

Simone Tollardo

Sheet: /ESP/  
File: ESP.kicad\_sch

Title: ESP

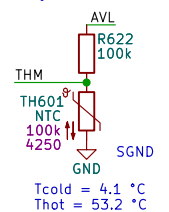
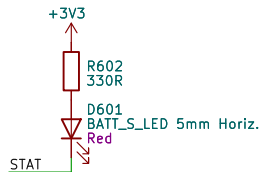
Size: A4 Date: 2022-08-12

KiCad E.D.A. kicad 6.0.7-1.fc36

Rev: 1.0.3

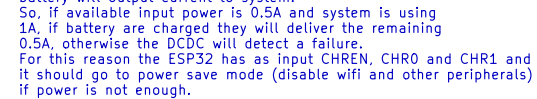
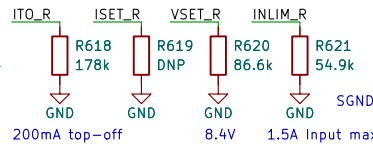
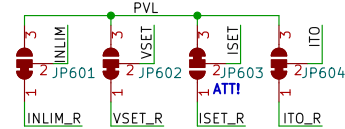
Id: 5/6

- With a valid external power source at CHGIN:
  - The external power source is the primary source of energy.
  - The battery is the secondary source of energy.
  - Energy delivery to SYS has the highest priority.
  - Any remaining energy from the power source that is not required by the system is available to the battery charger.
- With no valid external power source at CHGIN:
  - The battery is the primary source of energy.
  - When OTG mode is enabled, energy delivery to SYS has the highest priority.
  - Any remaining energy from the battery that is not required by the system is available to power the CHGIN.



According to the DS of CP2102N, implementing USB BC 1.2, 1.5A is the TOTAL MAX CURRENT drawn from USB 5V rail.

There are also some proprietary protocols (e.g. Apple, Samsung and Blackberry chargers) that allows to draw more than 1.5A without USB C PD, but they are not implemented on CP2102N.



Needed only if AS7341 used.

$$\begin{aligned} PD_{\max} &= (T_{j\max} - T_a) / R_{\theta JA} = \\ &= (125 - 20) / 158 = 0.66 \text{ W} \\ PD &= V_{in}(I_{gnd} + I_{out}) + I_{out}(V_{in} - V_{out}) = \\ &= 3.3(0) + 300\text{m}(3.3 - 1.8) = 0.45 \text{ W} \end{aligned}$$

Id: 6/6