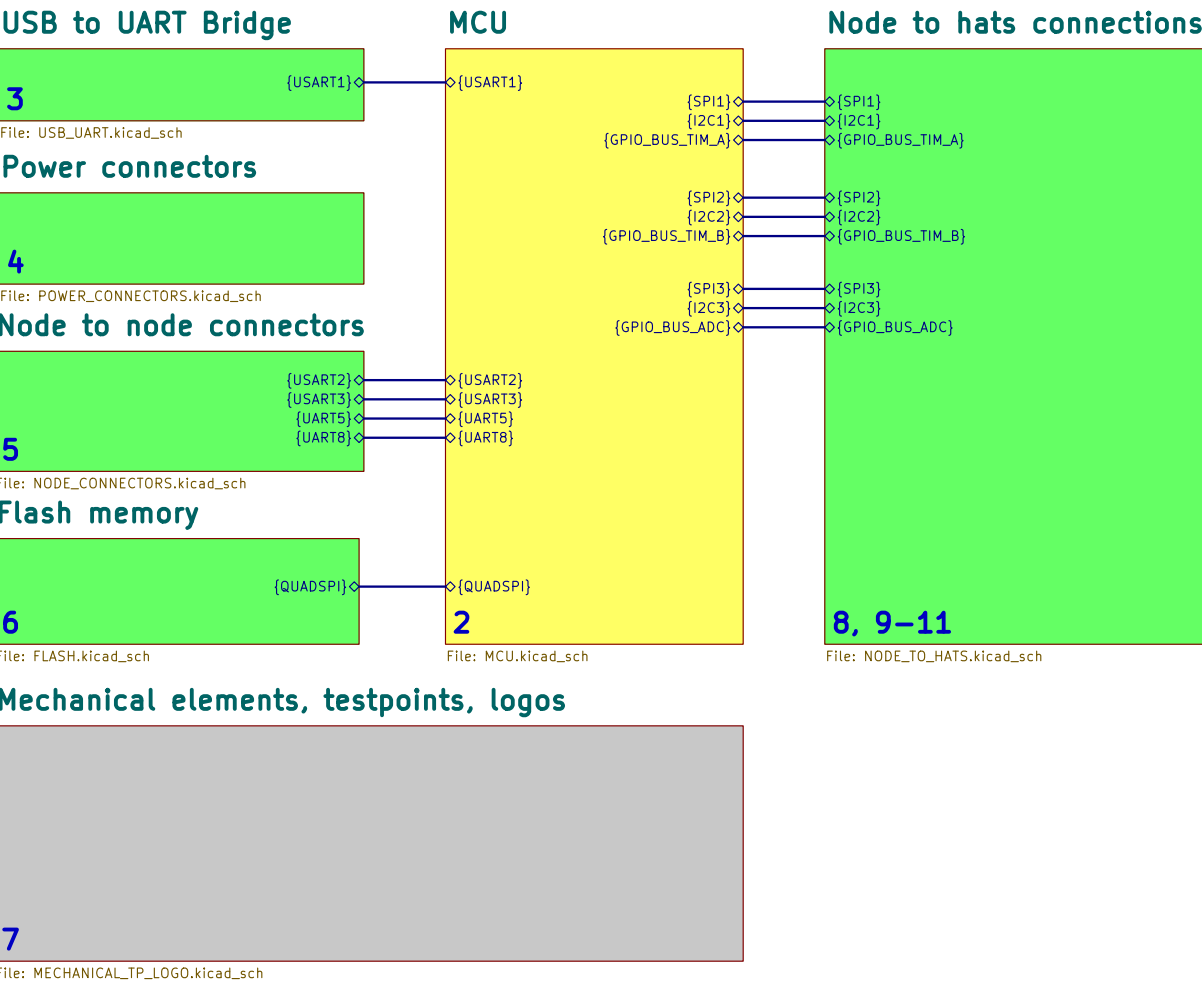


# Orion PCB node overview



Author: Vincent Nguyen

EPFL Xplore

Sheet: /  
File: orion\_pcb.kicad\_sch

Title: Orion PCB Node Overview

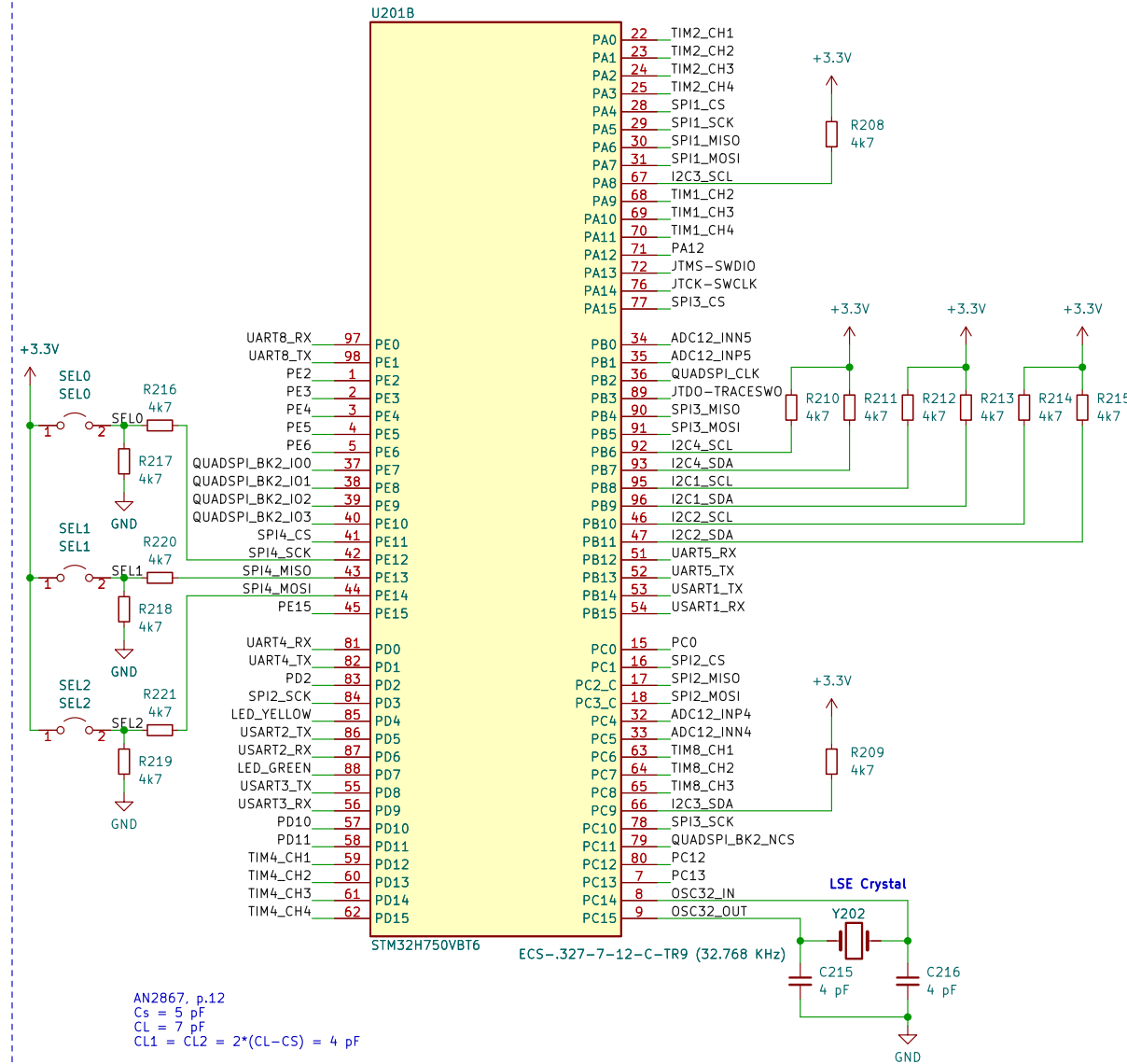
Size: A4  
KiCad E.D.A. kicad (6.0.7)

Date:

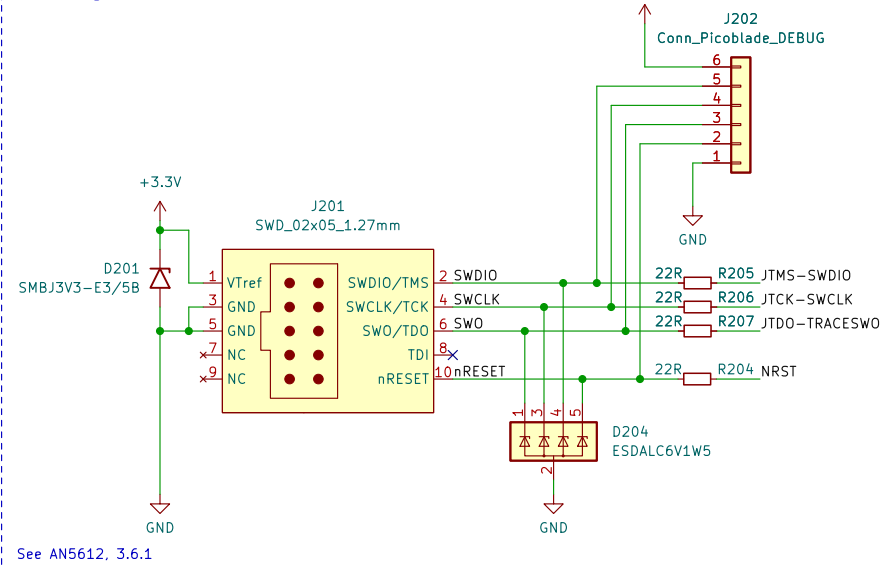
Rev:  
Id: 1/11

# MCU (STM32H750VBT6)

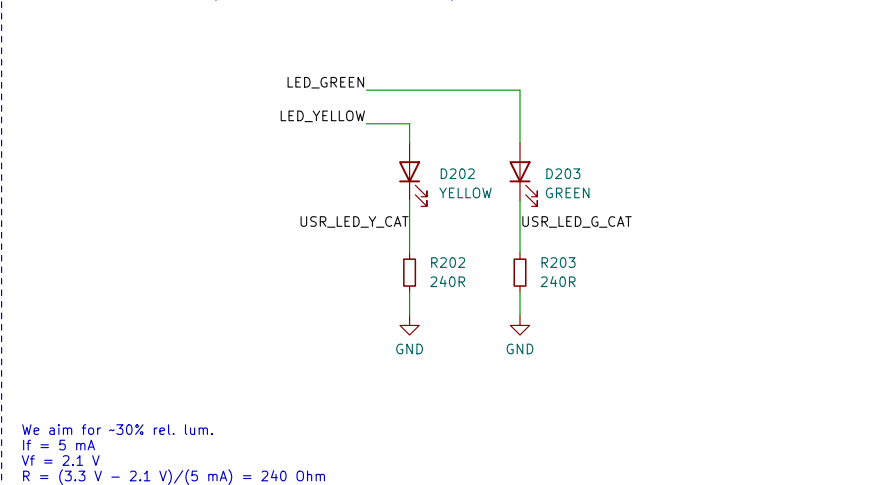
GPIO, UART, SPI, TIMERS, I2C, ADC



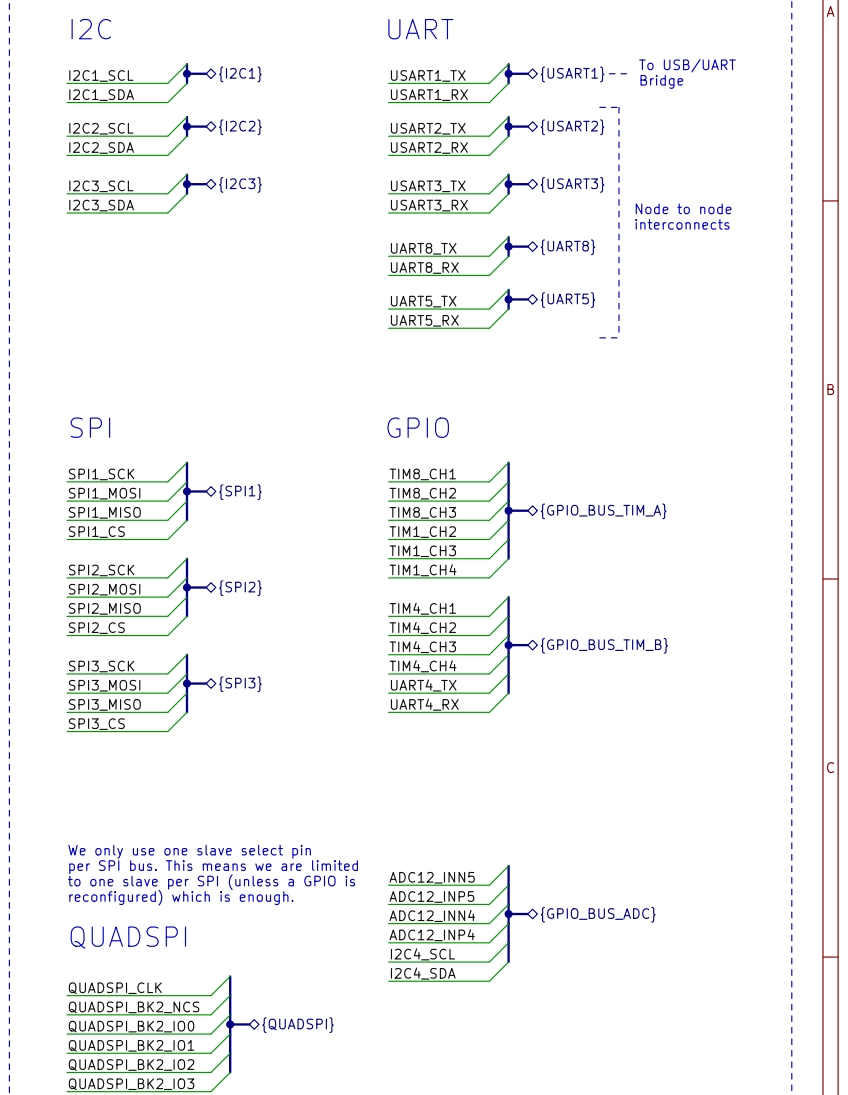
## Debug



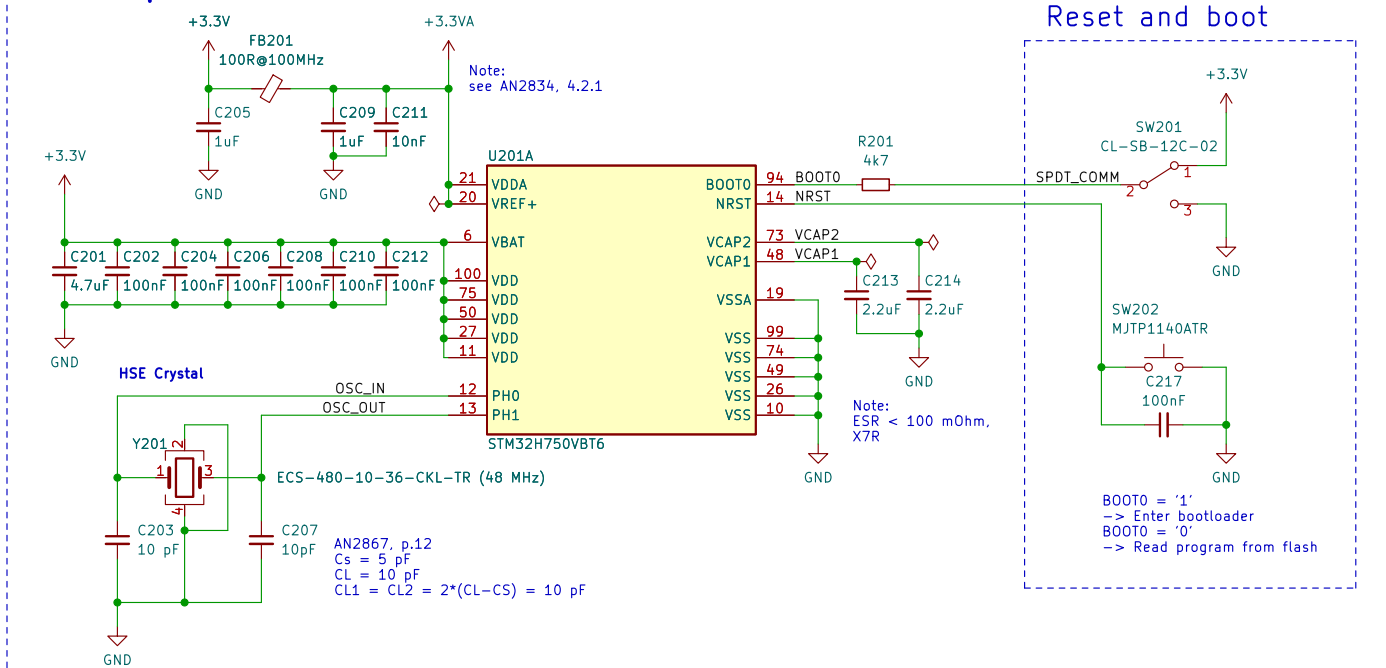
## Status LEDs (user-controlled)



## Buses



## Power inputs, reset, boot



Author: Vincent Nguyen

EPFL Xplore

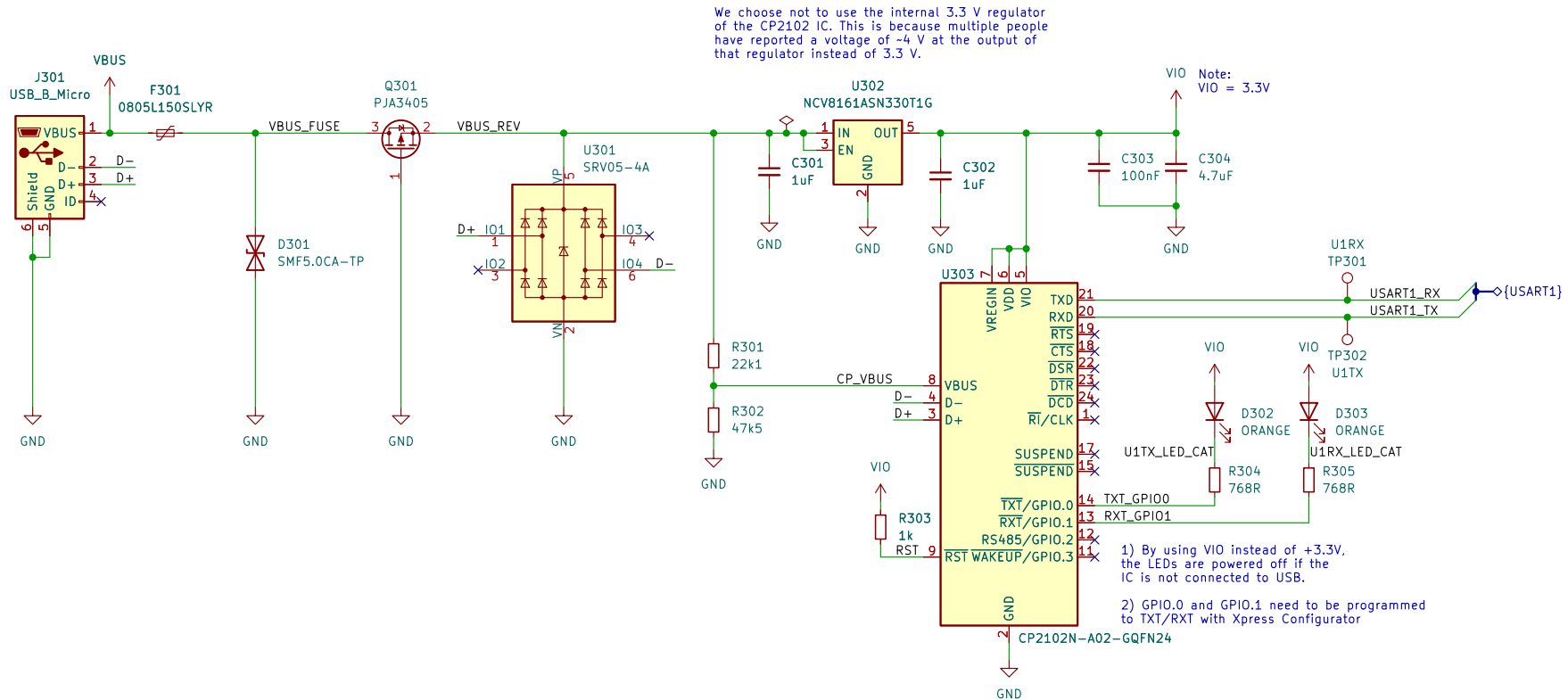
Sheet: /MCU/  
File: MCU.kicad\_sch

Title: MCU

Size: A3  
KiCad E.D.A. kicad (6.0.7)

Rev:  
Id: 2/11

# USB to UART bridge



Author: Vincent Nguyen

EPFL Xplore

Sheet: /USB to UART Bridge/  
File: USB\_UART.kicad\_sch

**Title: USB to UART Bridge**

Size: A4

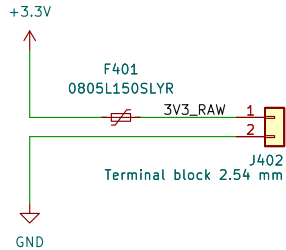
Date:

KiCad E.D.A. kicad (6.0.7)

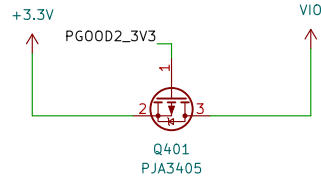
Rev:

Id: 3/11

## Raw power input



## Power path



Diode forward voltage  $V_{DS} = 1.2 \text{ V}$  ( $V_{SD} = -1.2 \text{ V}$ )

1) External power is not connected ( $PG00D2 = 0 \text{ V}$ )

1a) USB is connected ( $V_{IO} = 3.3 \text{ V}$ )

Initially:

$V_S = V_{IO} - V_{DS} = 3.3 \text{ V} - 1.2 \text{ V} = 2.1 \text{ V}$

$V_{GS} = V_G - V_S = 0 \text{ V} - 2.1 \text{ V} = -2.1 \text{ V} \leq V_{GS(th)} \rightarrow \text{CLOSED}$

Then:

$\text{CLOSED} \rightarrow V_S = V_D = V_{IO} = 3.3 \text{ V}$

$V_{GS} = V_G - V_S = 0 \text{ V} - 3.3 \text{ V} < V_{GS(th)} \rightarrow \text{stays CLOSED}$

1b) USB is disconnected ( $V_{IO} = 0 \text{ V}$ )

No voltages, everything is at 0 V

2) External power is connected ( $PG00D2 = 5 \text{ V}$ ,  $V_S = 3.3 \text{ V}$ )

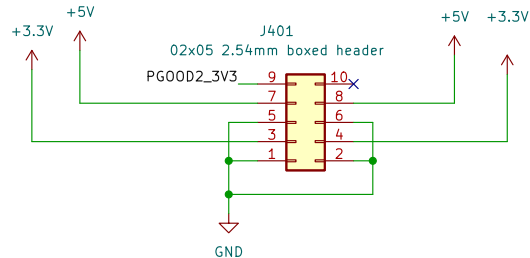
2a) USB is connected ( $V_{IO} = 3.3 \text{ V}$ )

$V_{GS} = V_G - V_S = 5 \text{ V} - 3.3 \text{ V} = 1.7 \text{ V} > V_{GS(th)} \rightarrow \text{OPEN}$

2b) USB is disconnected ( $V_{IO} = 0 \text{ V}$ )

$V_{GS} = V_G - V_S = 5 \text{ V} - 3.3 \text{ V} = 1.7 \text{ V} > V_{GS(th)} \rightarrow \text{OPEN}$

## Voltage regulator connector



Author: Vincent Nguyen

**EPFL Xplore**

Sheet: /Power connectors/

File: POWER\_CONNECTORS.kicad\_sch

**Title: External Connectors and Power Path**

Size: A5

Date:

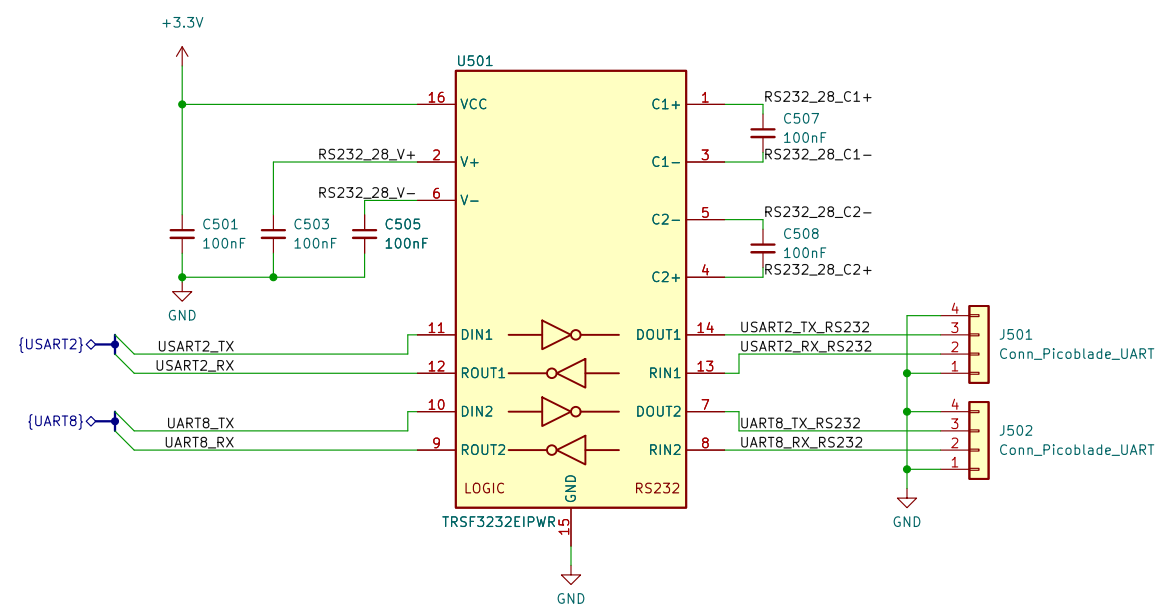
KiCad E.D.A. kicad (6.0.7)

**Rev:**

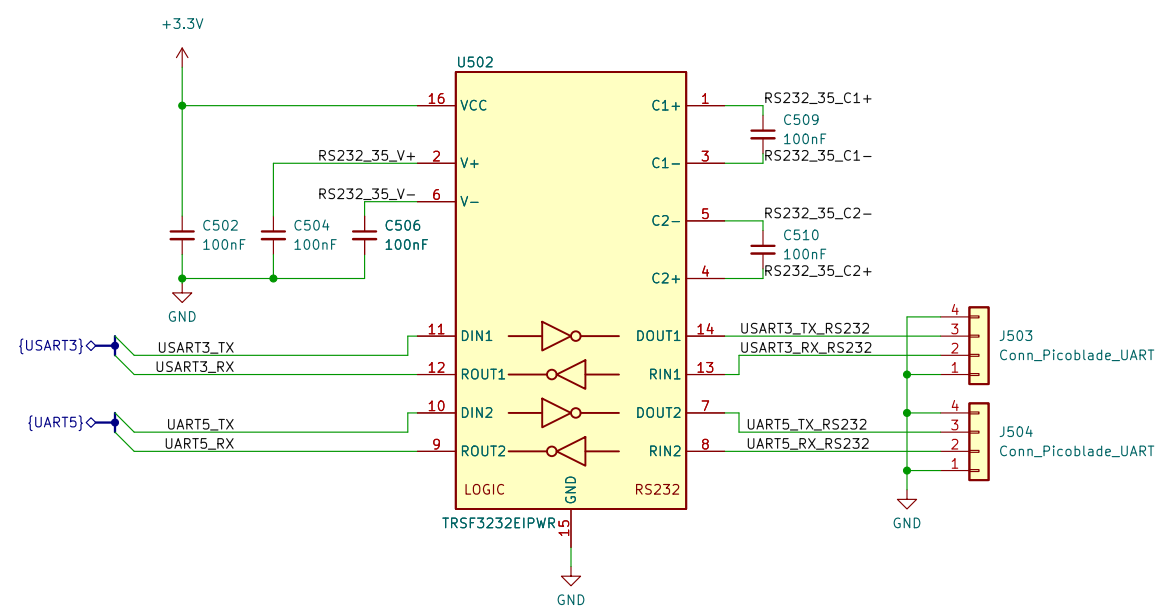
Id: 4/11

# RS232 Transceivers

USART2, USART8



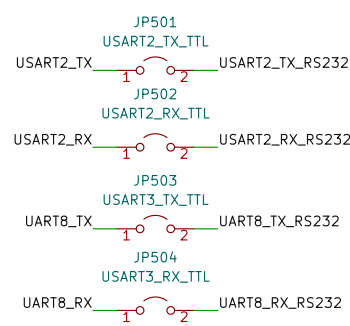
UART3, UART5



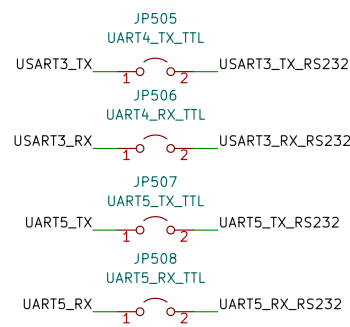
Maximum speed is 250 kb/s if using RS232 transceiver

# Jumpers

USART2, USART8



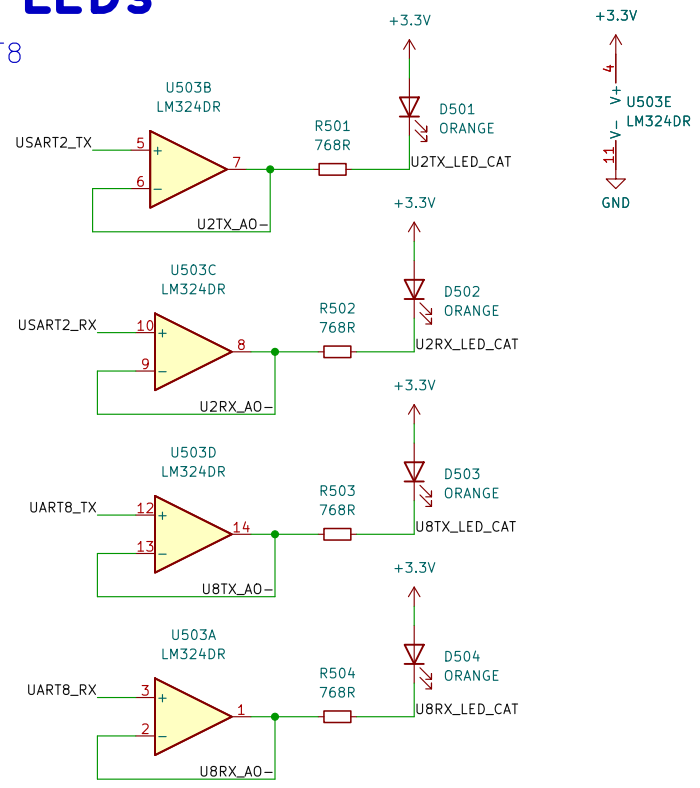
UART3, UART5



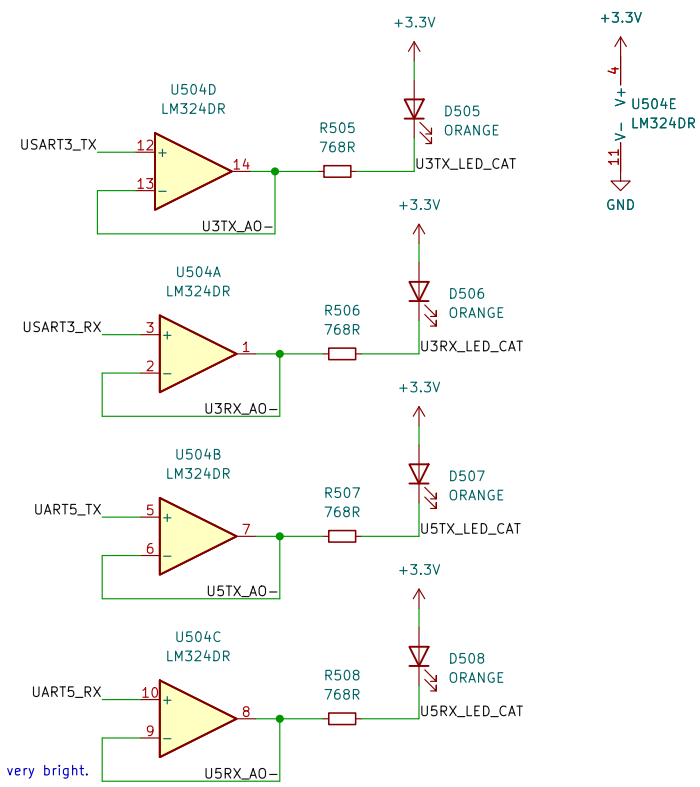
To use TTL voltage levels, short ALL of the jumpers for both nodes, for the corresponding UART buses.

# Activity LEDs

USART2, USART8



UART3, UART5



Activity LEDs don't need to be very bright.  
We choose  $I_f = 1.7 \text{ mA}$   
 $R = (3.3 \text{ V} - 2 \text{ V}) / (2 \text{ mA}) = 765 \text{ Ohm}$   
Closest standard resistor  $\rightarrow 768 \text{ Ohm}$

Author: Vincent Nguyen

EPFL Xplore

Sheet: /Node to node connectors/  
File: NODE\_CONNECTORS.kicad\_sch

Title: RS232 UART Node to Node Connectors

Size: A3

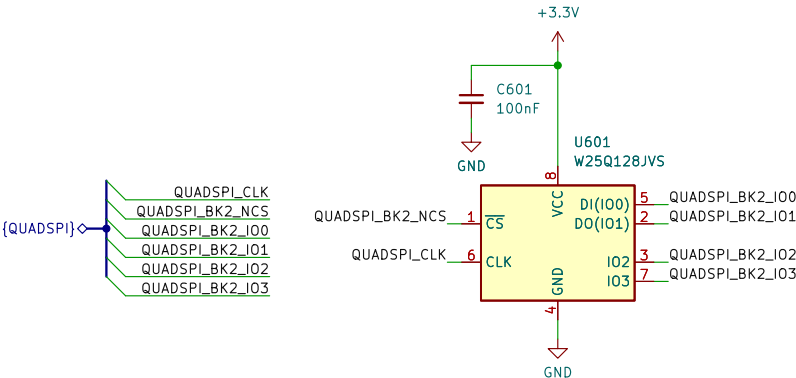
Date:

Rev:

KiCad E.D.A. kicad (6.0.7)

Id: 5/11

Quad-SPI external flash memory



Author: Vincent Nguyen

EPFL Xplore

Sheet: /Flash memory/  
File: FLASH.kicad\_sch

Title: External Flash Memory

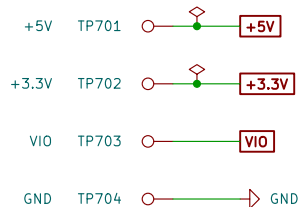
Size: A5  
KiCad E.D.A. kicad (6.0.7)

Date:

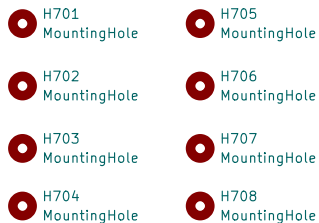
Rev:

Id: 6/11

## Test points



## Mounting holes



## Logos



Author: Vincent Nguyen

### EPFL Xplore

Sheet: /Mechanical elements, testpoints, logos/  
File: MECHANICAL\_TP\_LOGO.kicad\_sch

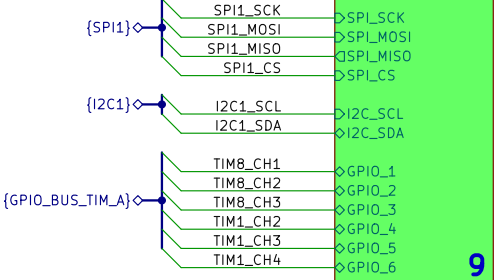
### Title: Mechanical Elements and Test Points

Size: A5  
KiCad E.D.A. kicad (6.0.7)

Date:

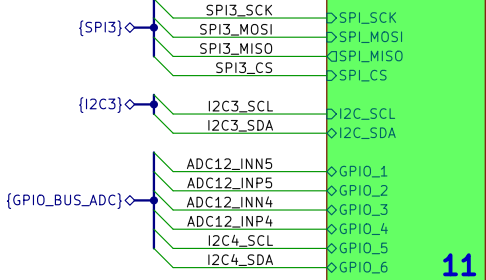
Rev:  
Id: 7/11

Node to Hat connectors



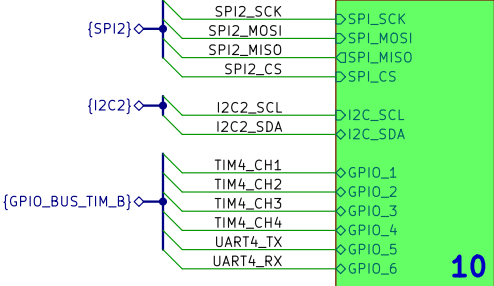
File: HAT\_CONNECTOR.kicad\_sch

Hat connector circuit3



File: HAT\_CONNECTOR.kicad\_sch

Hat connector circuit2



File: HAT\_CONNECTOR.kicad\_sch

Author: Vincent Nguyen

EPFL Xplore

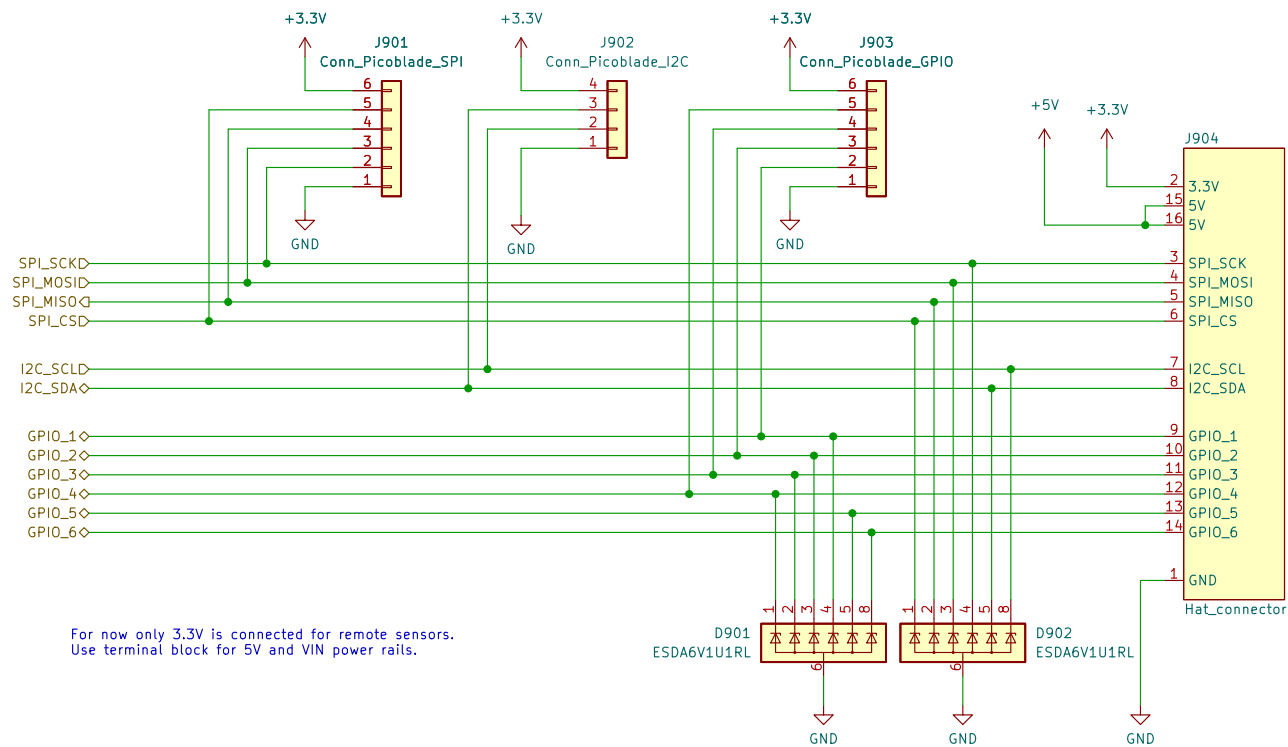
Sheet: /Node to hats connections/  
File: NODE\_TO\_HATS.kicad\_sch

Title: Hat Connectors and Delocalized Connectors

Size: A5	Date:	Rev:
KiCad E.D.A.	kicad (6.0.7)	Id: 8/11



# Hat connector



Author: Vincent Nguyen

EPFL Xplore

Sheet: /Node to hats connections/Hat connector circuit1/  
File: HAT\_CONNECTOR.kicad\_sch

Title: Hat Connector

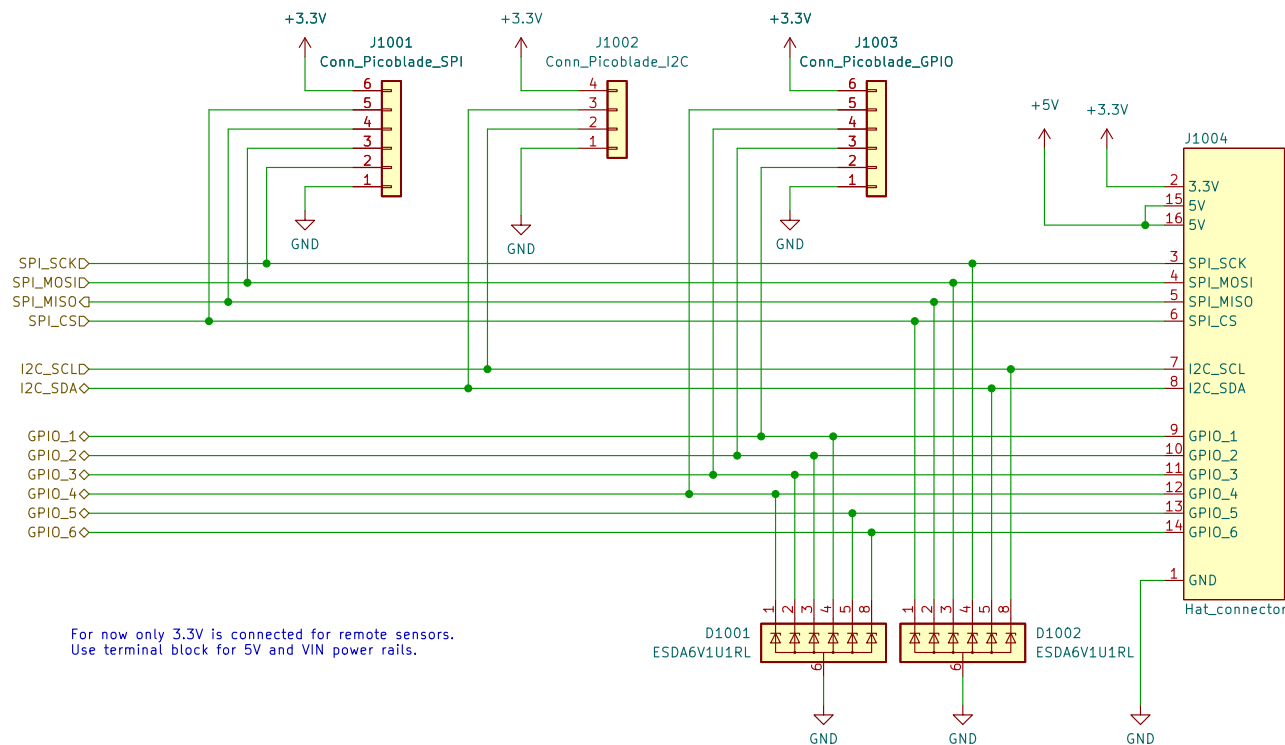
Size: A4  
KiCad E.D.A. kicad (6.0.7)

Date:

Rev:

Id: 9/11

# Hat connector



Author: Vincent Nguyen

EPFL Xplore

Sheet: /Node to hats connections/Hat connector circuit2/  
File: HAT\_CONNECTOR.kicad\_sch

Title: Hat Connector

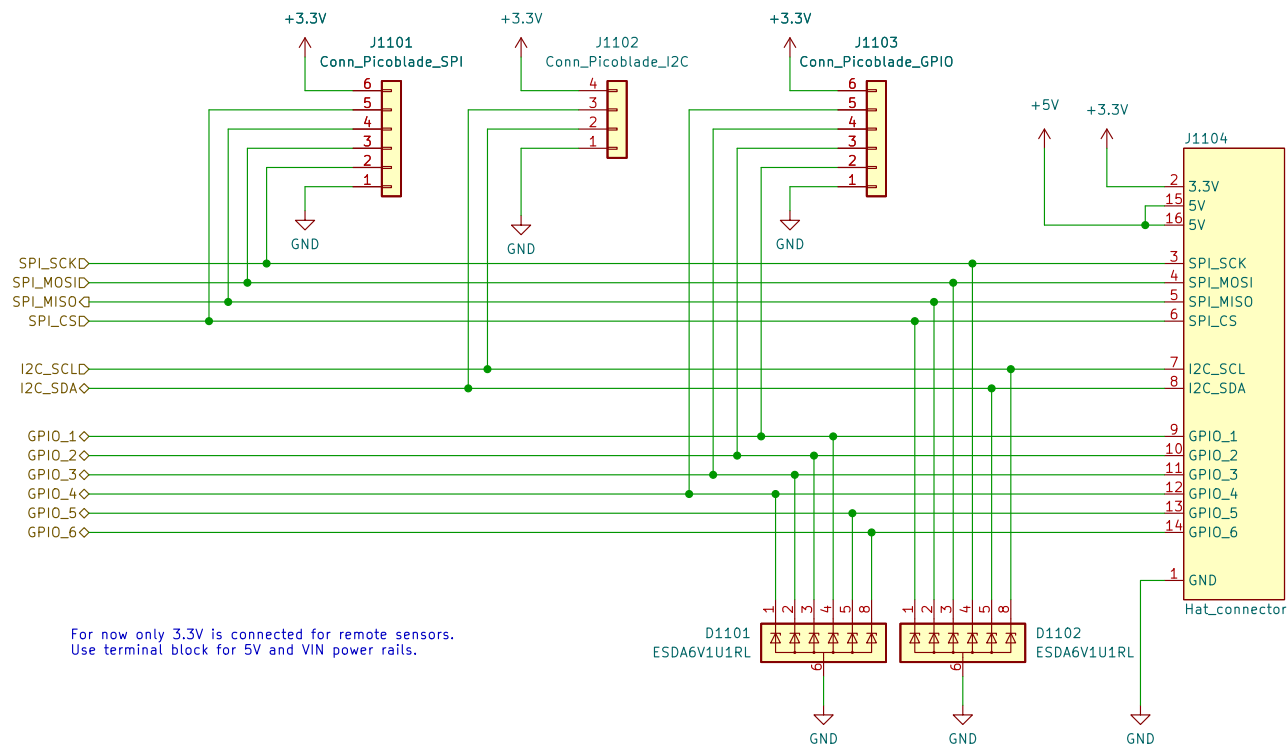
Size: A4  
KiCad E.D.A. kicad (6.0.7)

Date:

Rev:

Id: 10/11

# Hat connector



Author: Vincent Nguyen

EPFL Xplore

Sheet: /Node to hats connections/Hat connector circuit3/  
File: HAT\_CONNECTOR.kicad\_sch

Title: Hat Connector

Size: A4  
KiCad E.D.A. kicad (6.0.7)

Date:

Rev:

Id: 11/11