

# Orion PCB node overview

## USB to UART Bridge



File: USB\_UART.kicad\_sch

## Power connectors



File: POWER\_CONNECTORS.kicad\_sch

## Node to node connectors



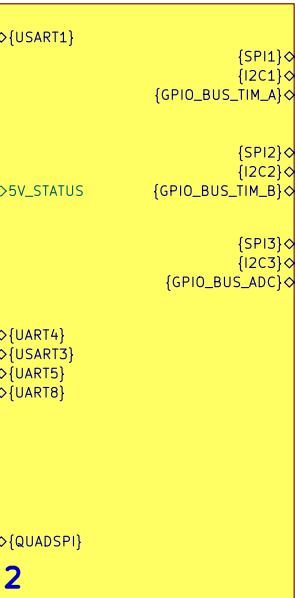
File: NODE\_CONNECTORS.kicad\_sch

## Flash memory



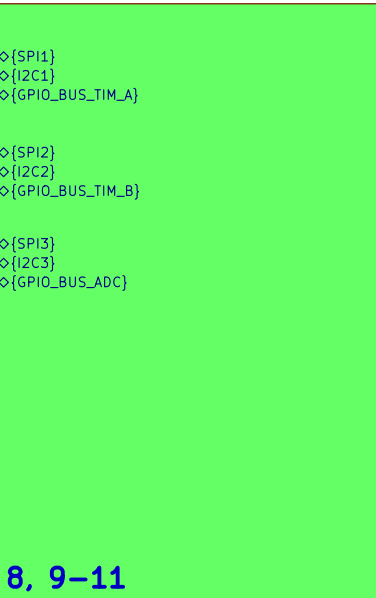
File: FLASH.kicad\_sch

## MCU



File: MCU.kicad\_sch

## Node to hats connections



File: NODE\_TO\_HATS.kicad\_sch

## Mechanical elements, testpoints, logos



File: MECHANICAL\_TP\_LOGO.kicad\_sch

Author: Vincent Nguyen

EPFL Xplore

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

Title: Orion PCB Node Overview

Size: A4

Date:

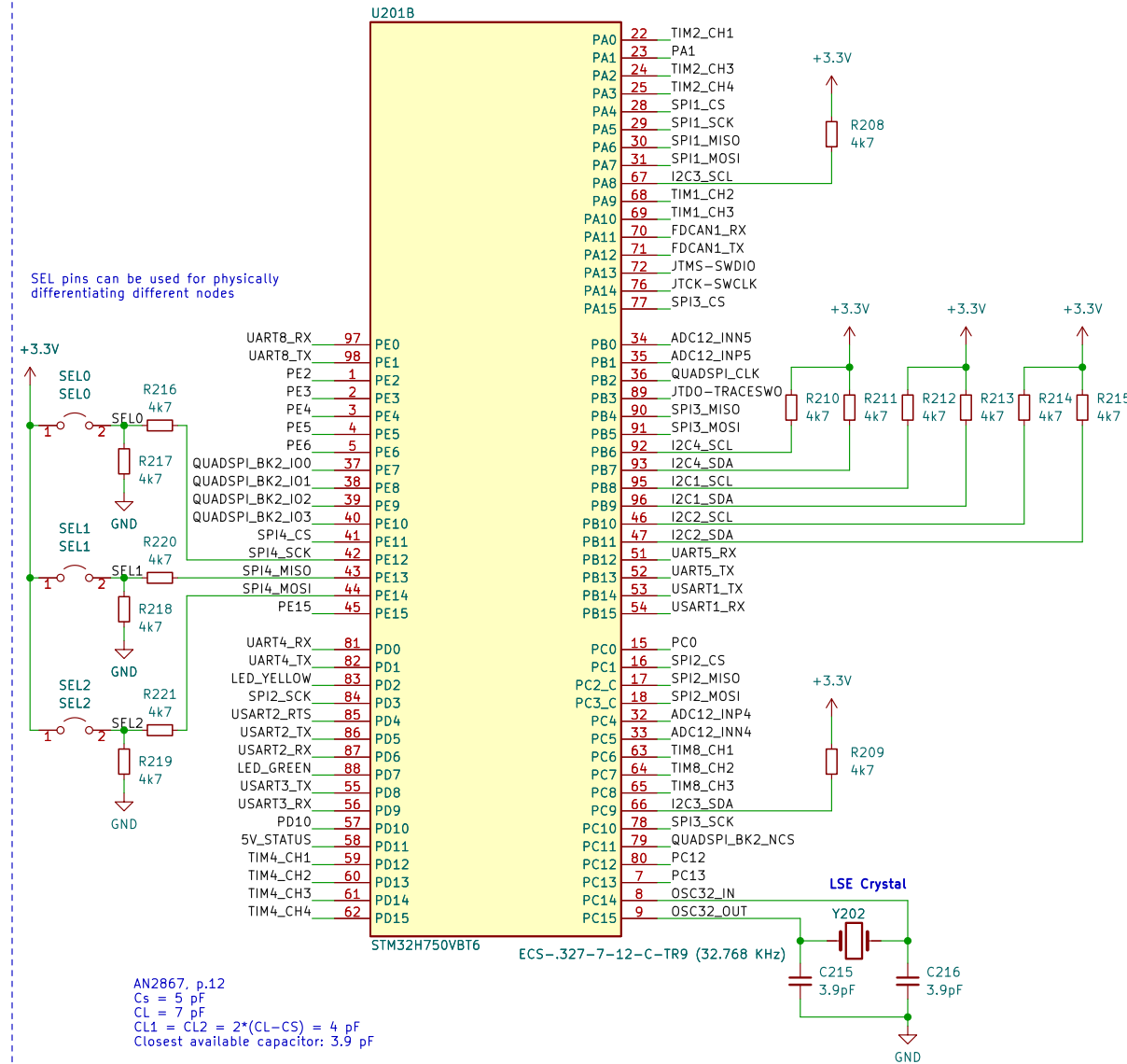
KiCad E.D.A. kicad (6.0.8)

Rev: 2

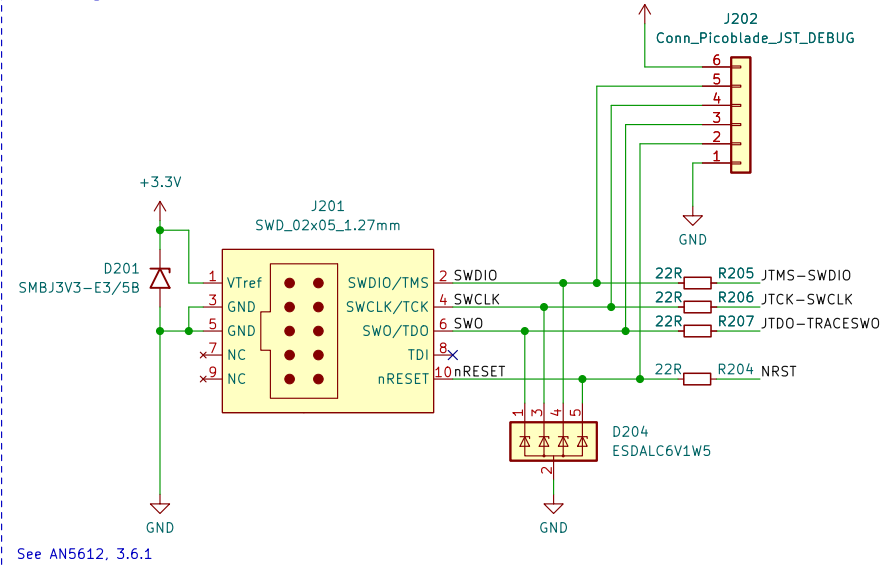
Id: 1/11

# MCU (STM32H750VBT6)

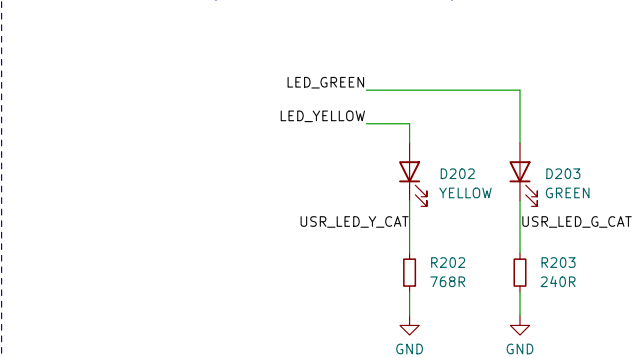
GPIO, UART, SPI, TIMERS, I2C, ADC



Debug



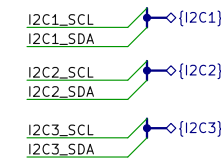
Status LEDs (user-controlled)



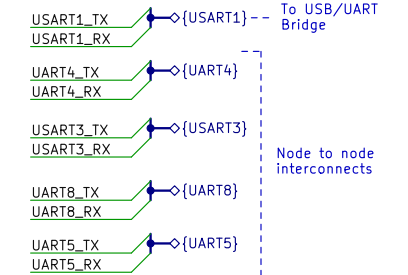
We aim for ~30% rel. lum. for green LED  
If = 5 mA  
Vf = 2.1 V  
R = (3.3 V - 2.1 V)/(5 mA) = 240 Ohm

Buses

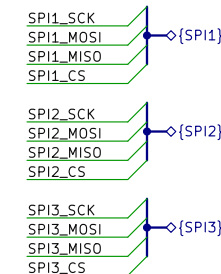
I2C



UART

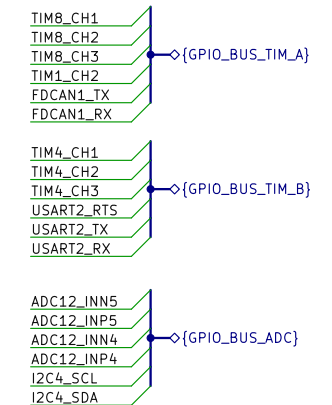


SPI

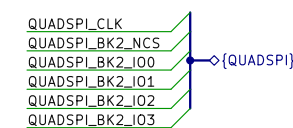


We only use one slave select pin per SPI bus. This means we are limited to one slave per SPI

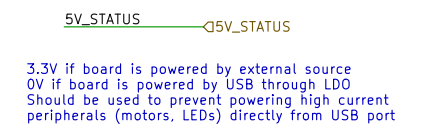
GPIO



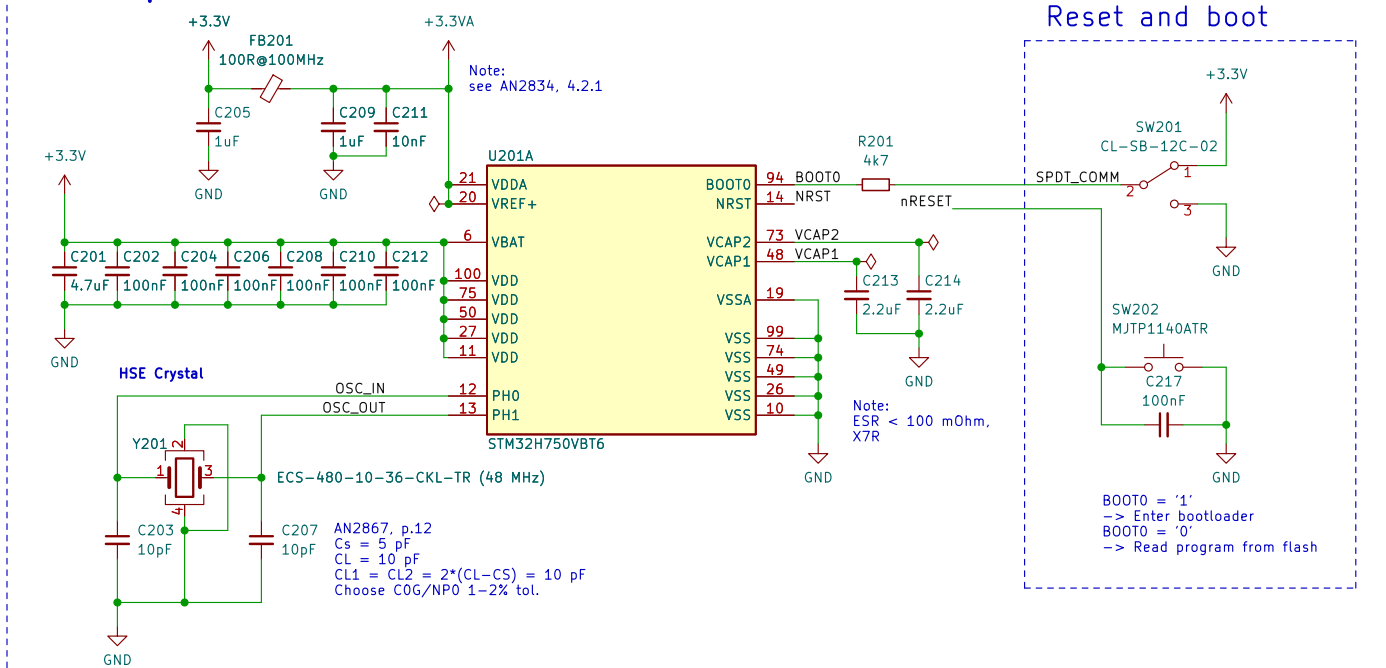
QUADSPI



5V power source status



Power inputs, reset, boot



Author: Vincent Nguyen

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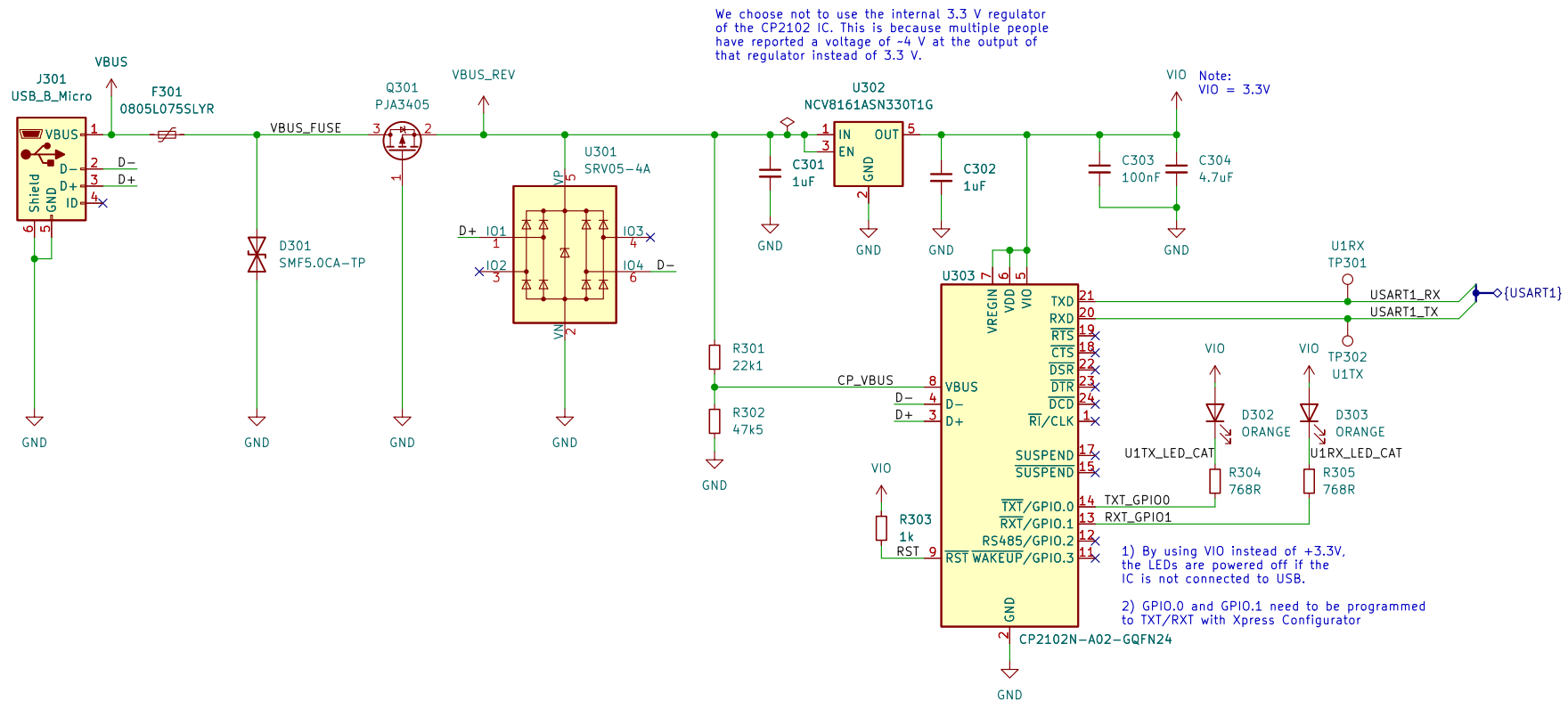
Sheet: /MCU/  
File: MCU.kicad\_sch

Title: MCU

Size: A3  
KiCad E.D.A. kicad (6.0.8)

Date:  
Id: 2/11  
Rev:

## USB to UART bridge



Author: Vincent Nguyen

EPFL Xplore

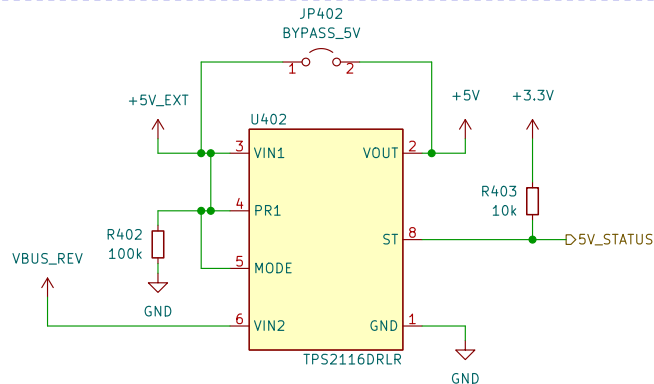
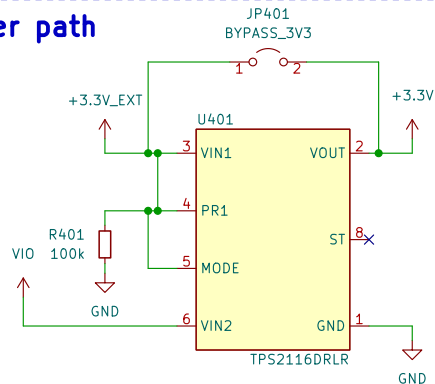
Sheet: /USB to UART Bridge/  
File: USB\_UART.kicad\_sch

**Title: USB to UART Bridge**

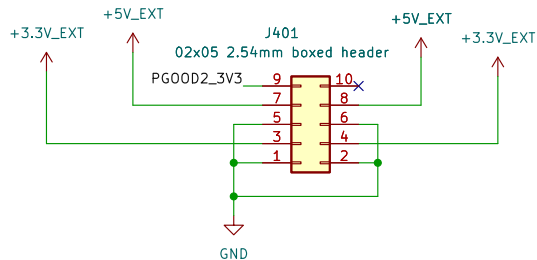
Size: A4	Date:
KiCad E.D.A. kicad (6.0.8)	

Rev:  
Id: 3/11

## Power path



## Switching converter connector



Author: Vincent Nguyen

**EPFL Xplore**

Sheet: /Power connectors/  
File: POWER\_CONNECTORS.kicad\_sch

**Title: External Connectors and Power Path**

Size: A5  
KiCad E.D.A. kicad (6.0.8)

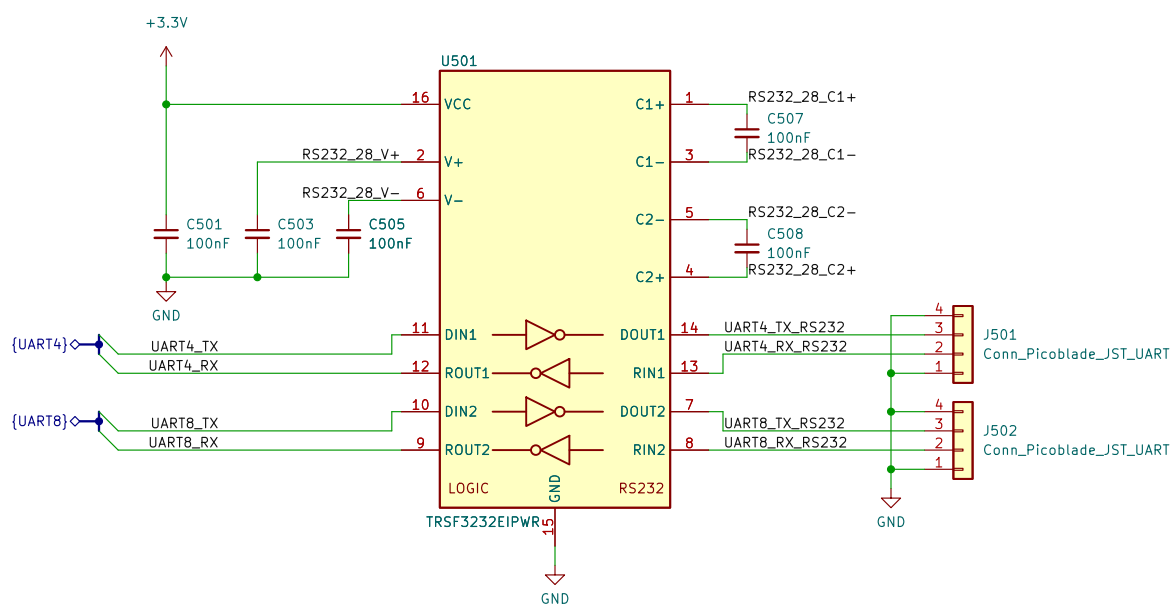
Date:

**Rev:**

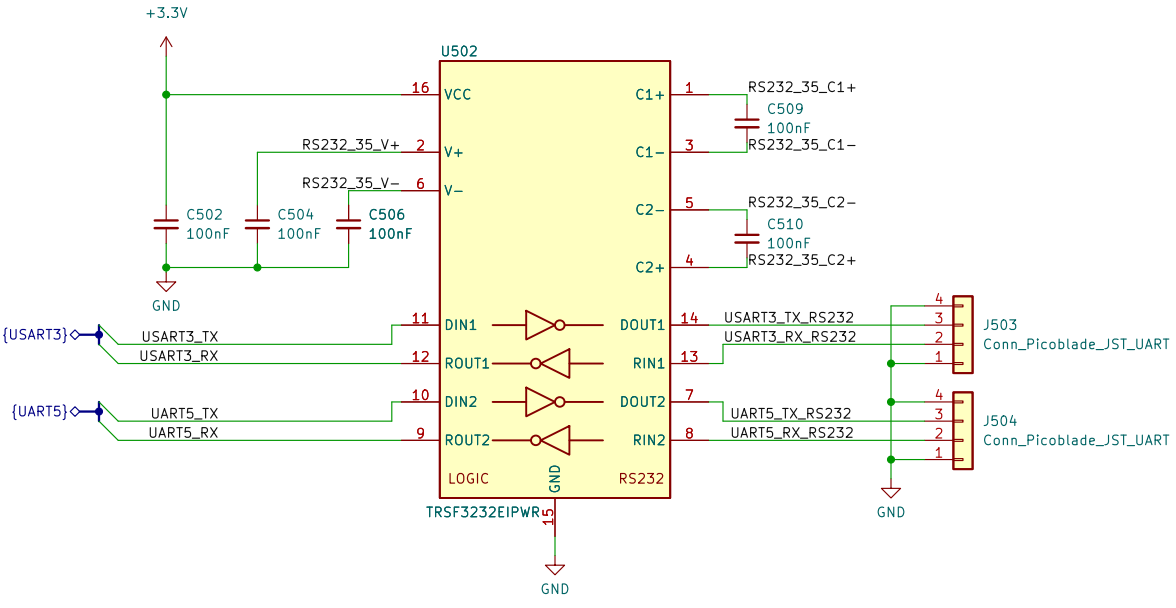
Id: 4/11

# RS232 Transceivers

USART2, USART8



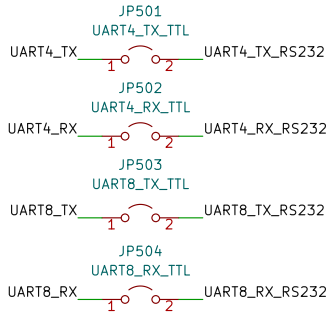
UART3, UART5



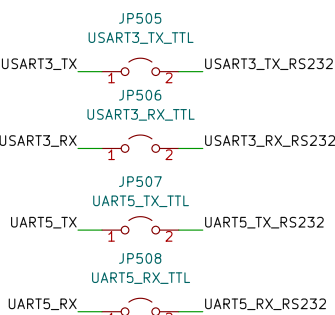
Maximum speed is 250 kb/s if using RS232 transceiver

# Jumpers

UART4, USART8



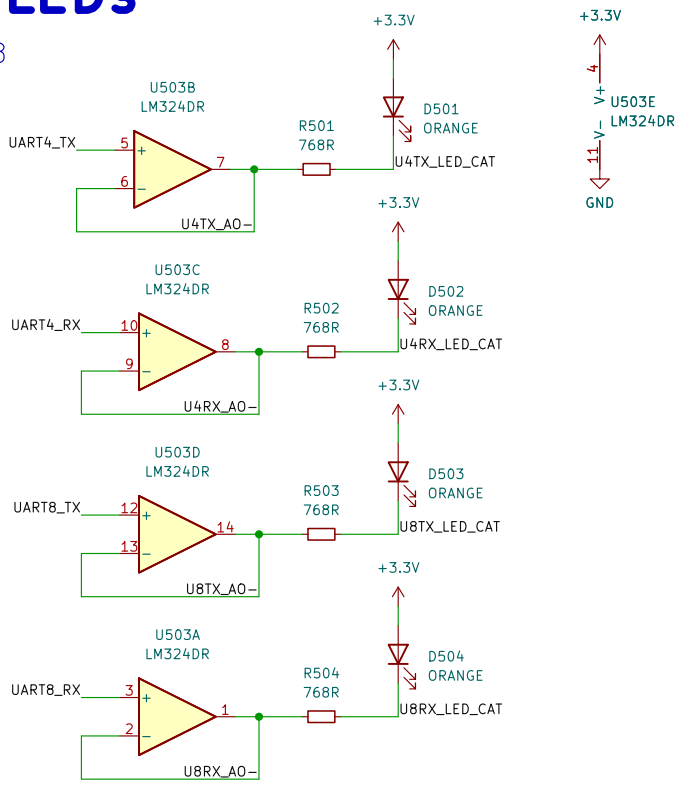
USART3, UART5



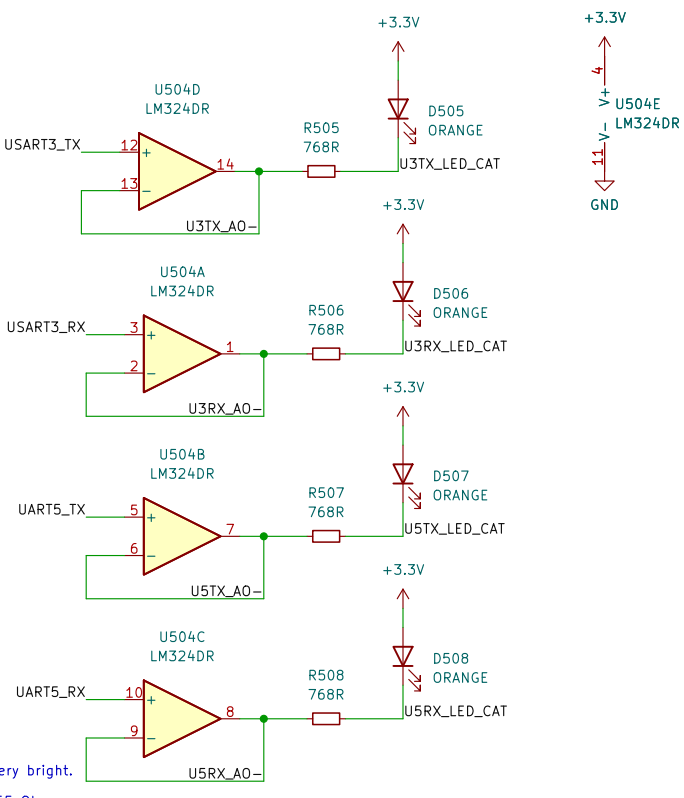
To use TTL voltage levels, short ALL of the jumpers for both nodes, for the corresponding UART buses.

# 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 -> 768 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

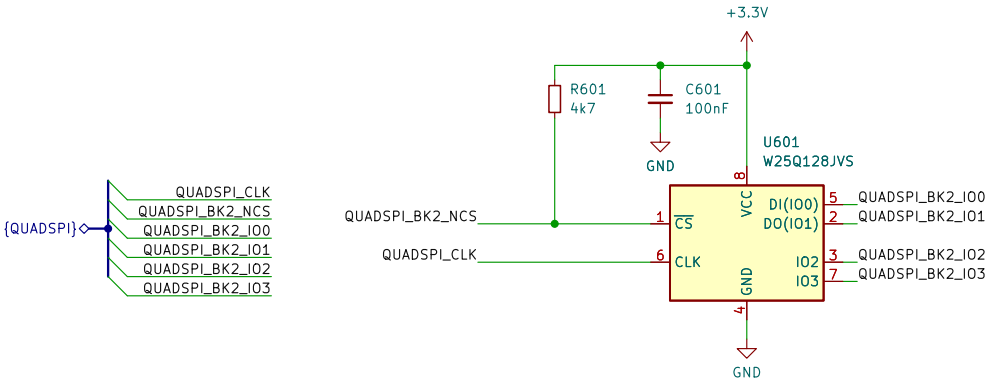
Date:

Rev:

KiCad E.D.A. kicad (6.0.8)

Id: 5/11

Quad-SPI external flash memory



Author: Vincent Nguyen

EPFL Xplore

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

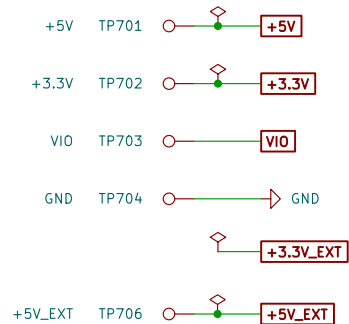
Title: External Flash Memory

Size: A5  
KiCad E.D.A. kicad (6.0.8)

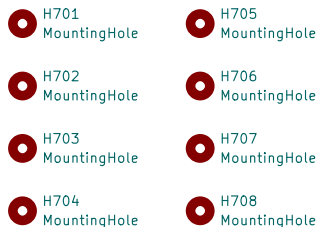
Date:

Rev:  
Id: 6/11

## Test points, power flags



## Mounting holes



## Logos



EPFL

maxon

APCO  
TECHNOLOGIES

ELCA

Author: Vincent Nguyen

**EPFL Xplore**

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

**Title: Mechanical Elements and Test Points**

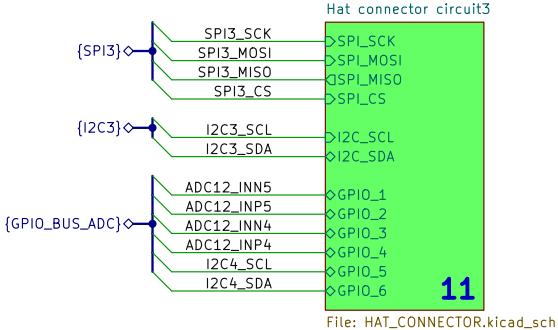
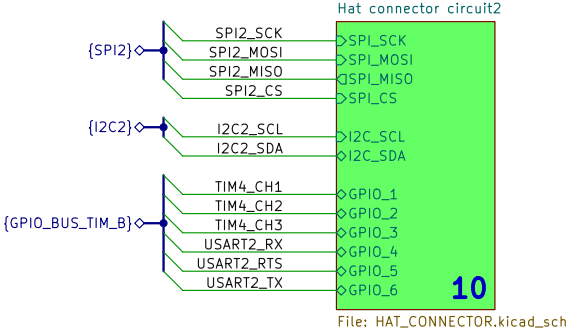
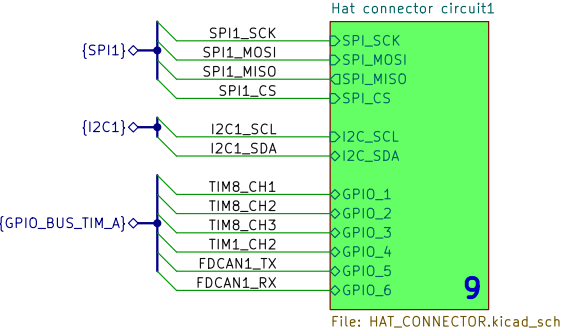
Size: A5  
KiCad E.D.A. kicad (6.0.8)

Date:

Rev:

Id: 7/11

# Node to Hat connectors



Author: Vincent Nguyen

EPFL Xplore

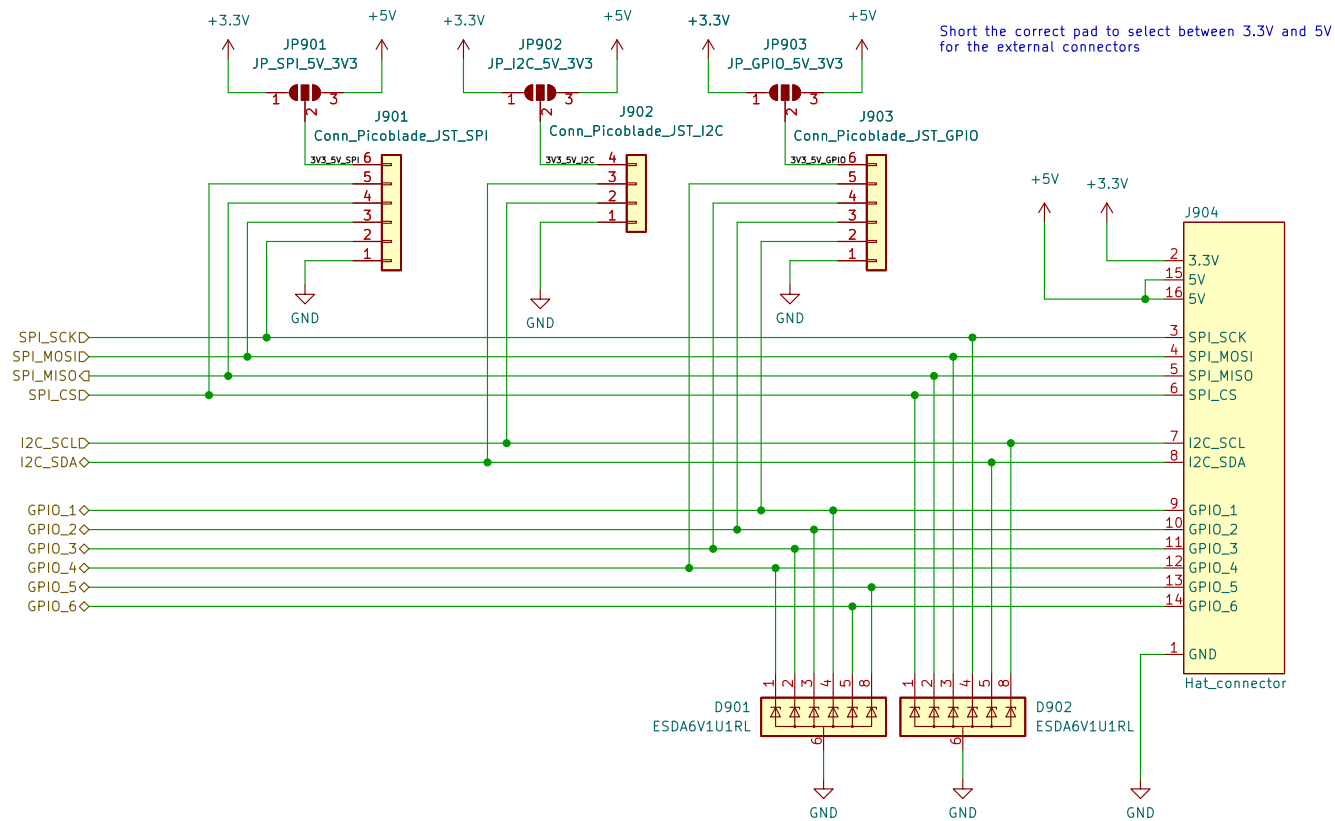
Sheet: /Node to hats connections/  
File: NODE\_TO\_HATS.kicad\_sch

Title: Hat Connectors and Delocalized Connectors

Size: A5	Date:	Rev:
KiCad E.D.A.	kicad (6.0.8)	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

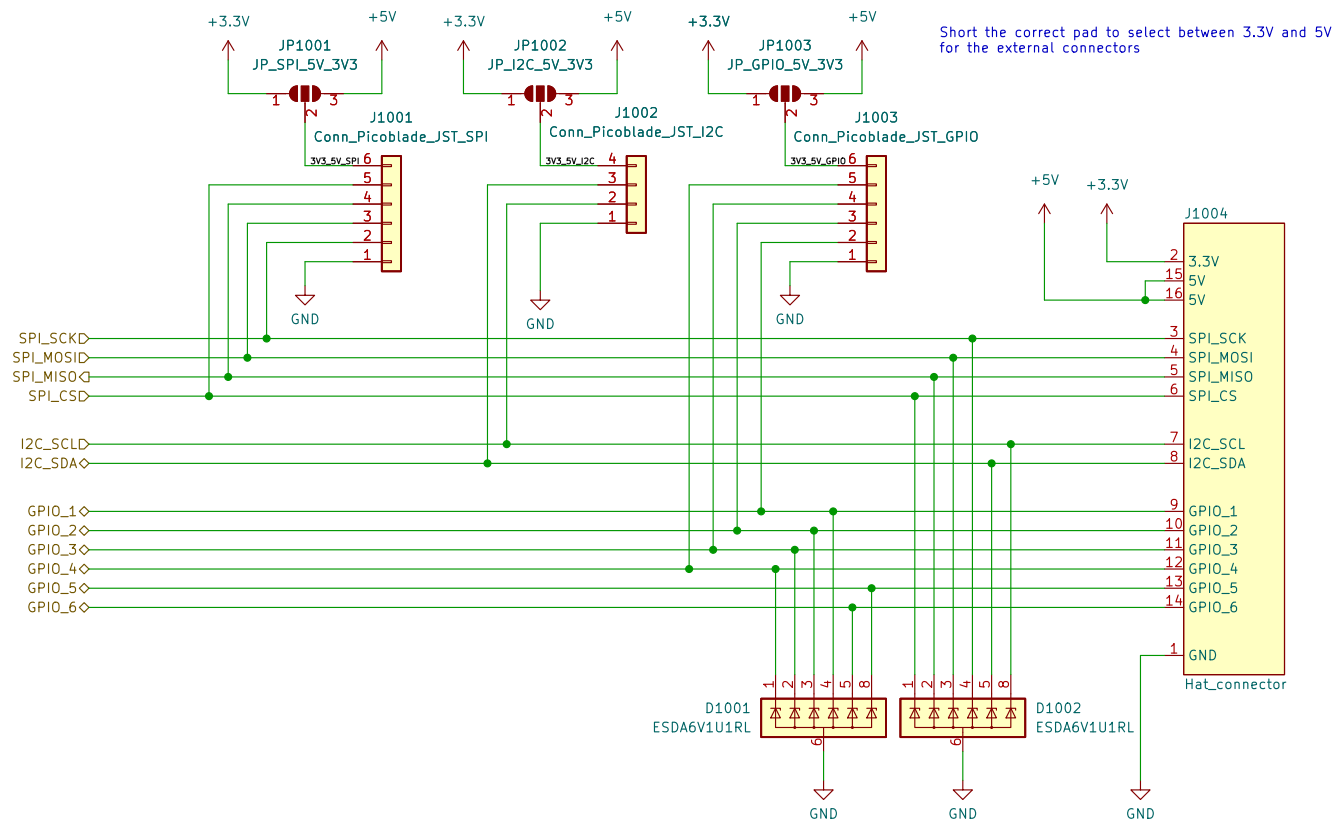
Size: A4  
KiCad E.D.A. kicad (6.0.8)

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

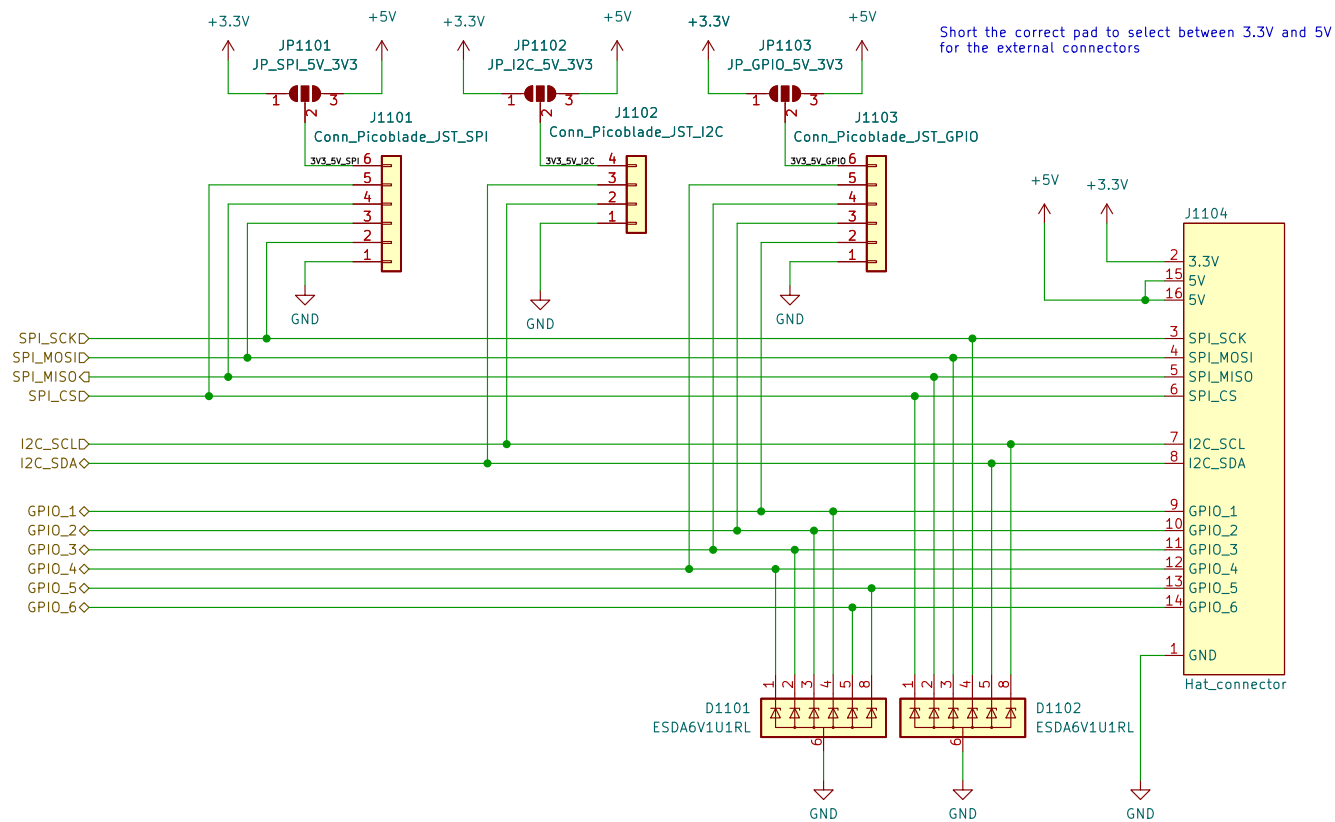
Date:

KiCad E.D.A. kicad (6.0.8)

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 (6.0.8)

Date:

Rev:

Id: 11/11