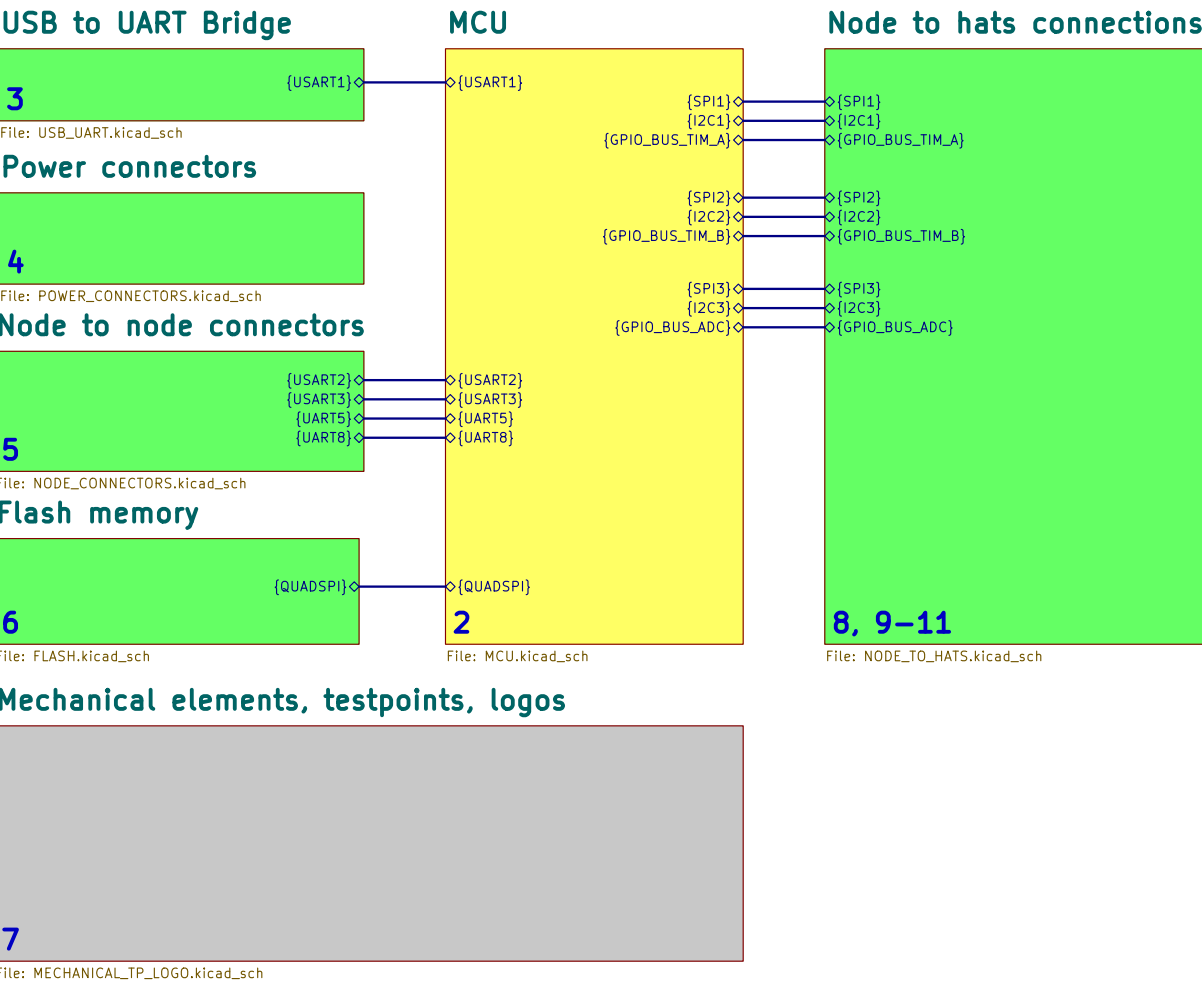


Orion PCB node overview



Author: Vincent Nguyen

EPFL Xplore

Sheet: /
File: orion_pcb.kicad_sch

Title: Orion PCB Node Overview

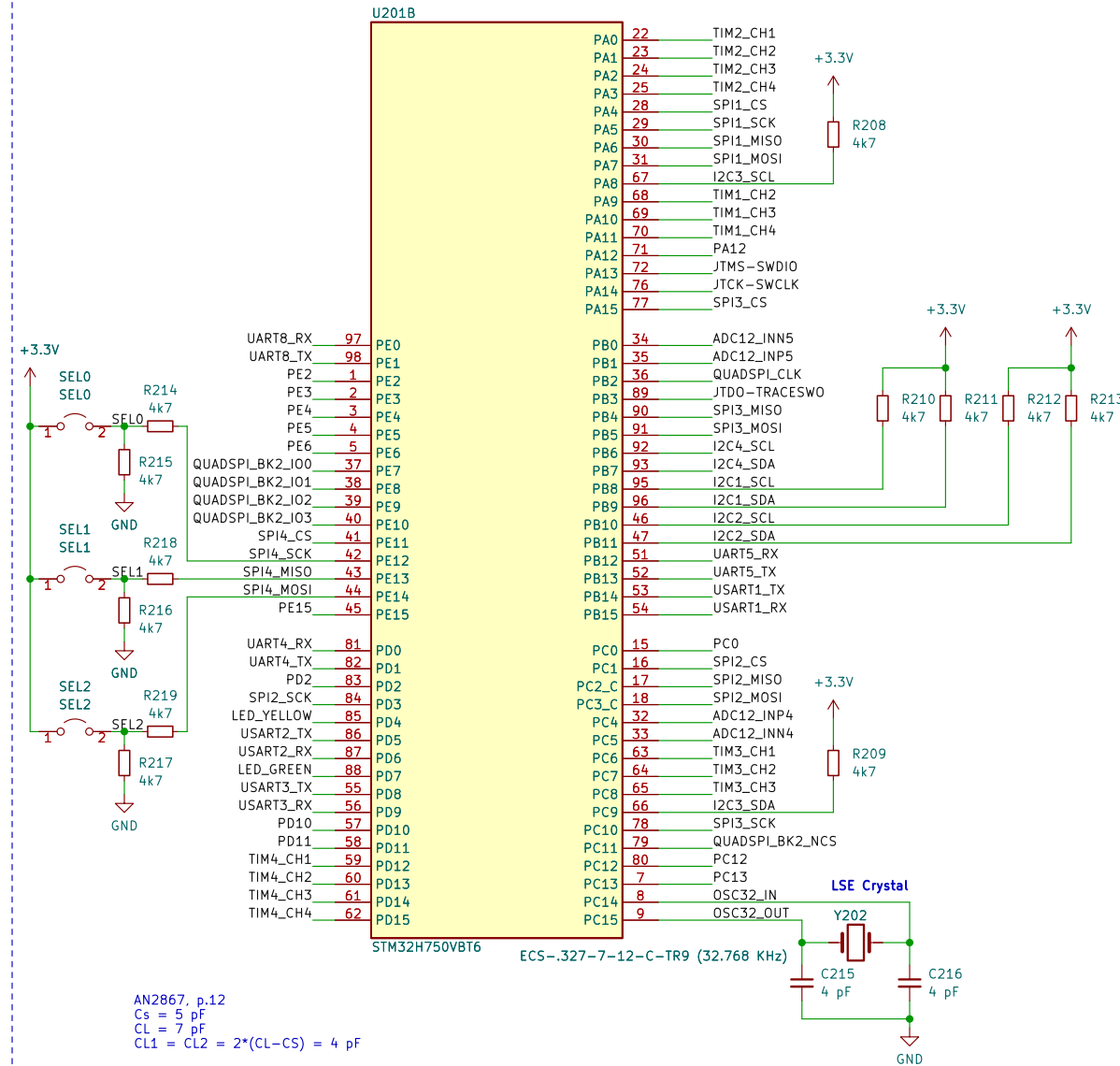
Size: A4
KiCad E.D.A. kicad (6.0.7)

Date:

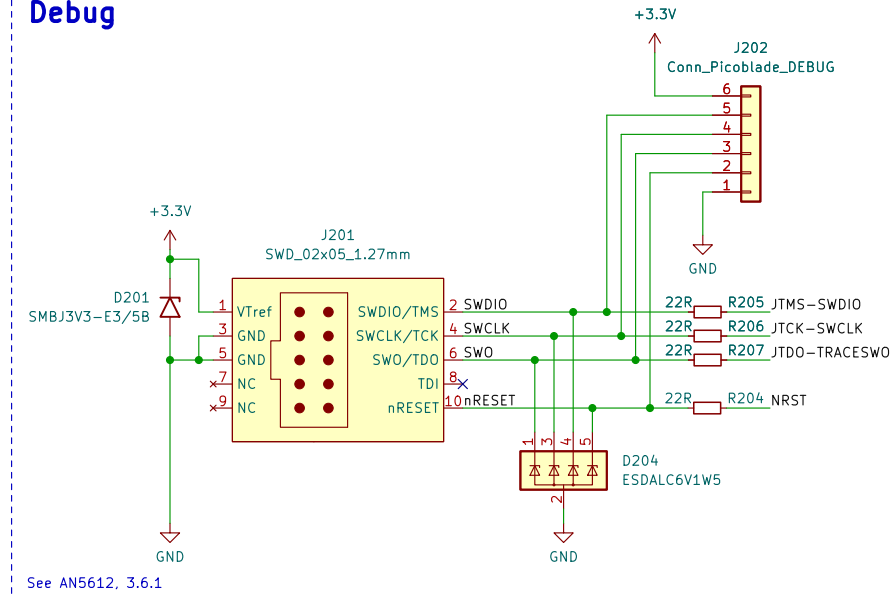
Rev:
Id: 1/11

MCU (STM32H750VBT6)

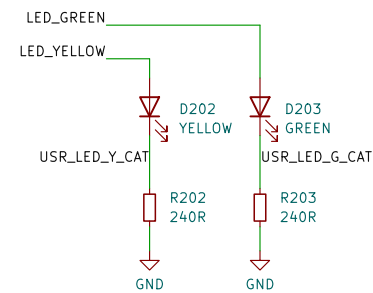
GPIO, UART, SPI, TIMERS, I2C, ADC



Debug



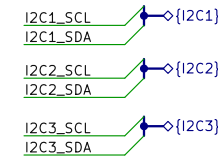
Status LEDs (user-controlled)



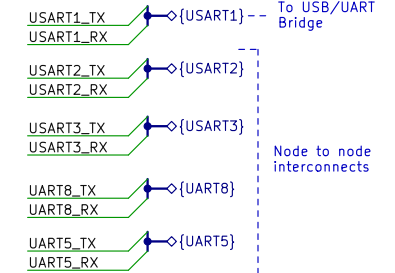
We aim for ~30% rel. lum.
If = 5 mA
Vf = 2.1 V
R = (3.3 V - 2.1 V)/(5 mA) = 240 Ohm

Buses

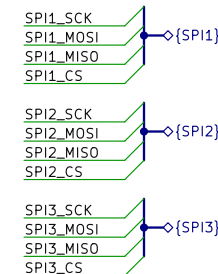
I2C



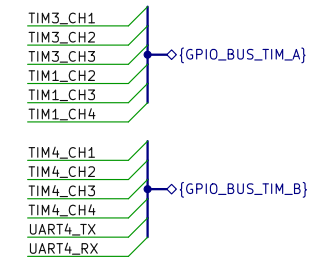
UART



SPI

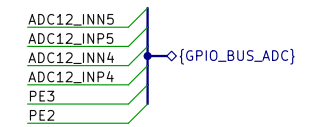
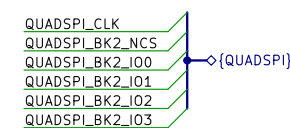


GPIO

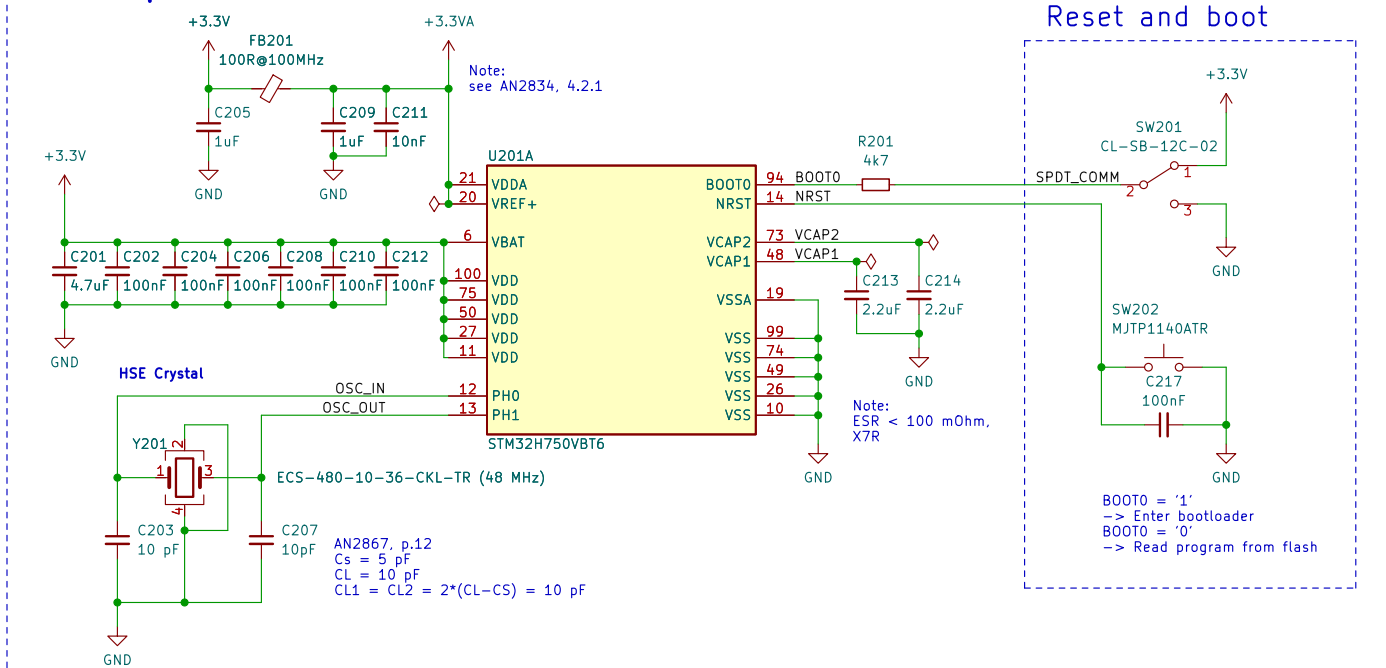


We only use one slave select pin per SPI bus. This means we are limited to one slave per SPI (unless a GPIO is reconfigured) which is enough.

QUADSPI



Power inputs, reset, boot



Author: Vincent Nguyen

EPFL Xplore

Sheet: /MCU/
File: MCU.kicad_sch

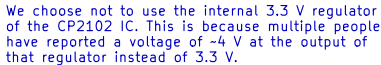
Title: MCU

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

Date:
Id: 2/11

Maybe consider a single push reset/boot circuit

D

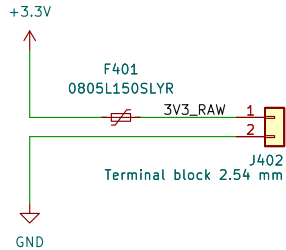


Note:
 $V_{IO} = 3.3V$

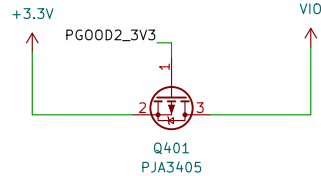
- 1) By using VIO instead of +3.3V, the LEDs are powered off if the IC is not connected to USB.
- 2) GPIO.0 and GPIO.1 need to be programmed to TX/RX with Xpress Configurator

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 ($PG00D2 = 5 \text{ V}$, $V_S = 3.3 \text{ V}$)

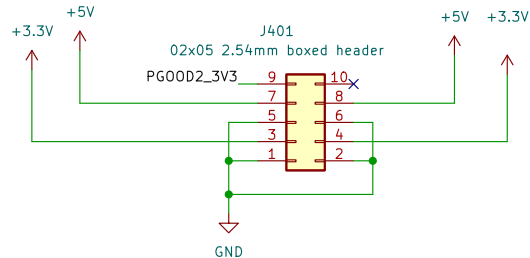
2a) USB is connected ($V_{IO} = 3.3 \text{ V}$)

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

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)

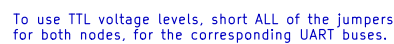
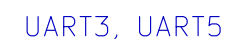
Rev:

Id: 4/11

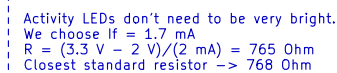
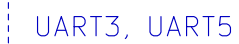
USART2, USART8



USART2, USART8

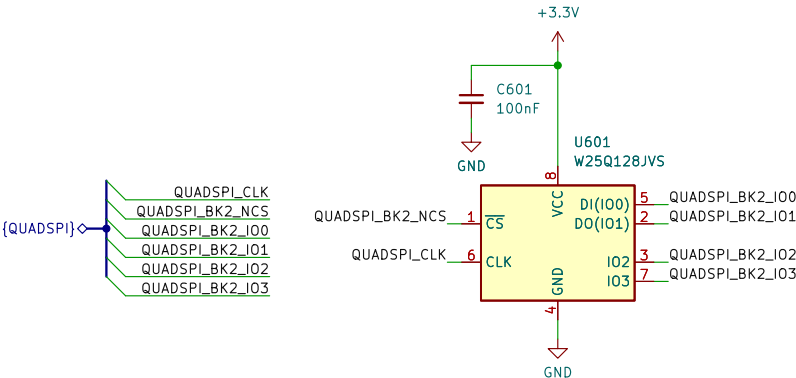


USART2, USART8



Id: 5/11

Quad-SPI external flash memory



Author: Vincent Nguyen

EPFL Xplore

Sheet: /Flash memory/
File: FLASH.kicad_sch

Title: External Flash Memory

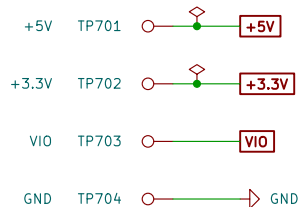
Size: A5
KiCad E.D.A. kicad (6.0.7)

Date:

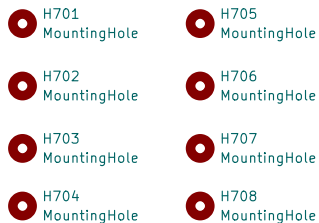
Rev:

Id: 6/11

Test points



Mounting holes



Logos



Author: Vincent Nguyen

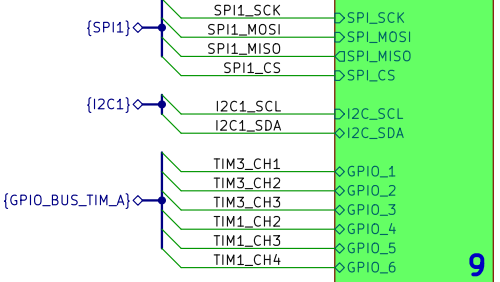
EPFL Xplore

Sheet: /Mechanical elements, testpoints, logos/
File: MECHANICAL_TP_LOGO.kicad_sch

Title: Mechanical Elements and Test Points

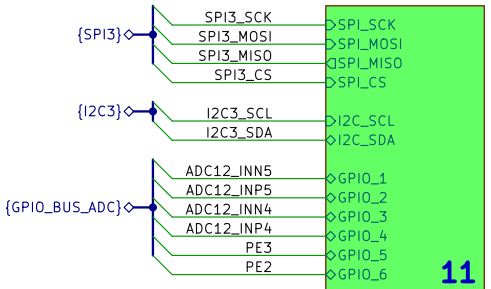
Size: A5	Date:	Rev:
KiCad E.D.A. kicad (6.0.7)		Id: 7/11

Node to Hat connectors



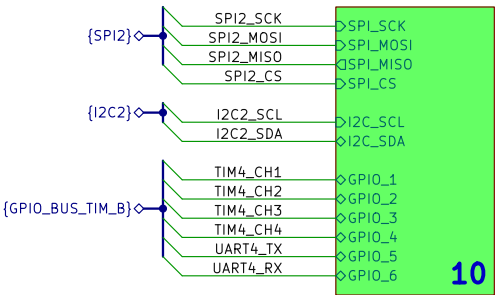
File: HAT_CONNECTOR.kicad_sch

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

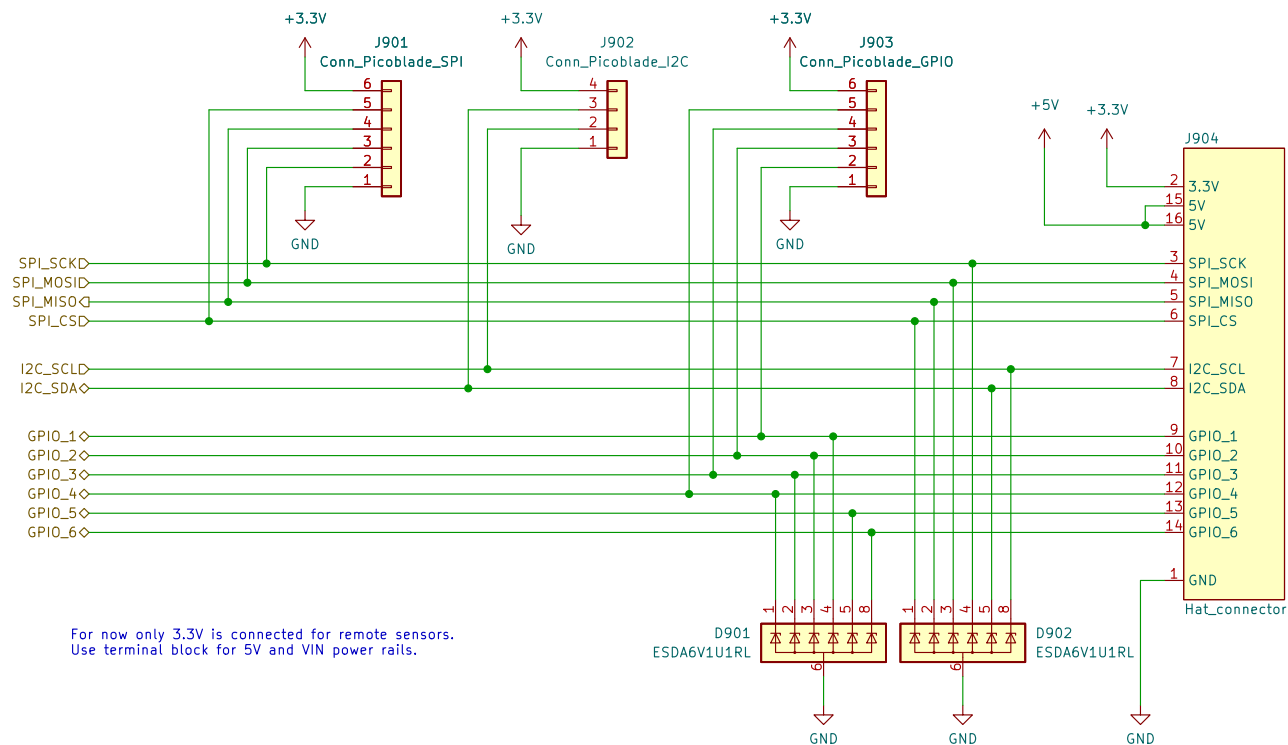
Title: Hat Connectors and Delocalized Connectors

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

Date:

Rev:
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

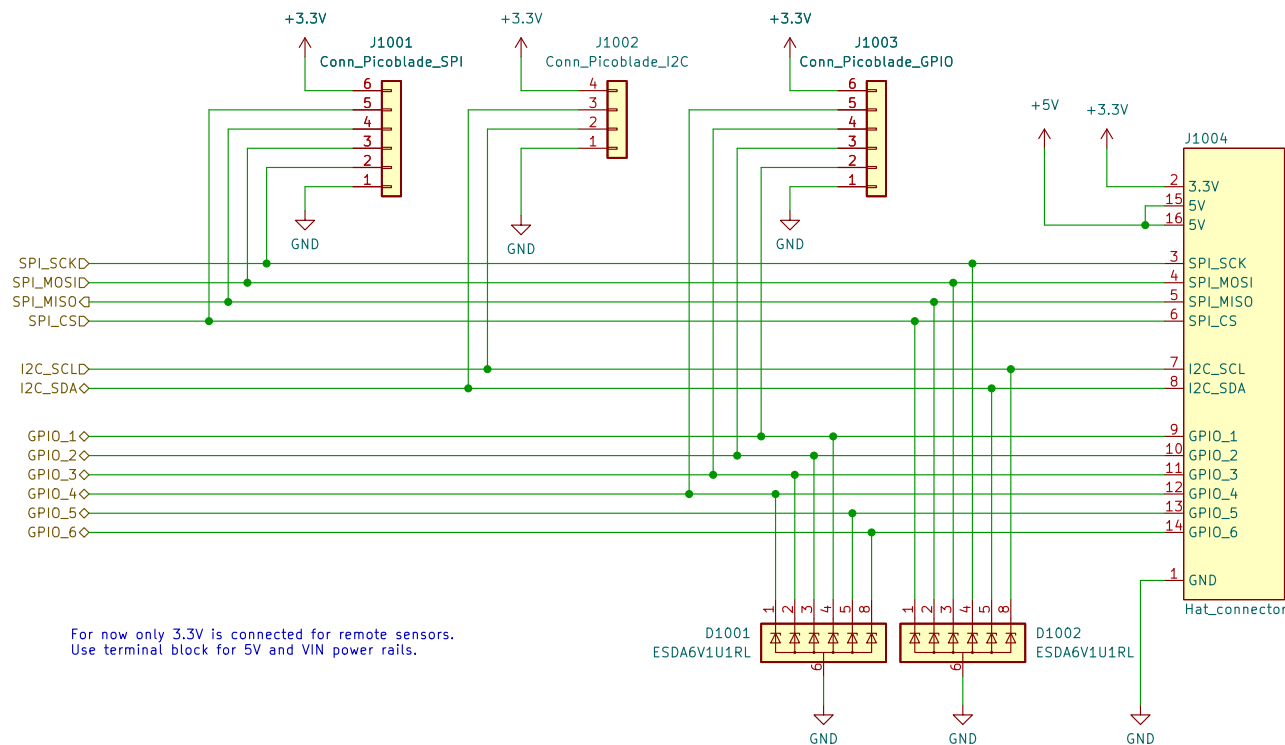
Size: A4
KiCad E.D.A. kicad (6.0.7)

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

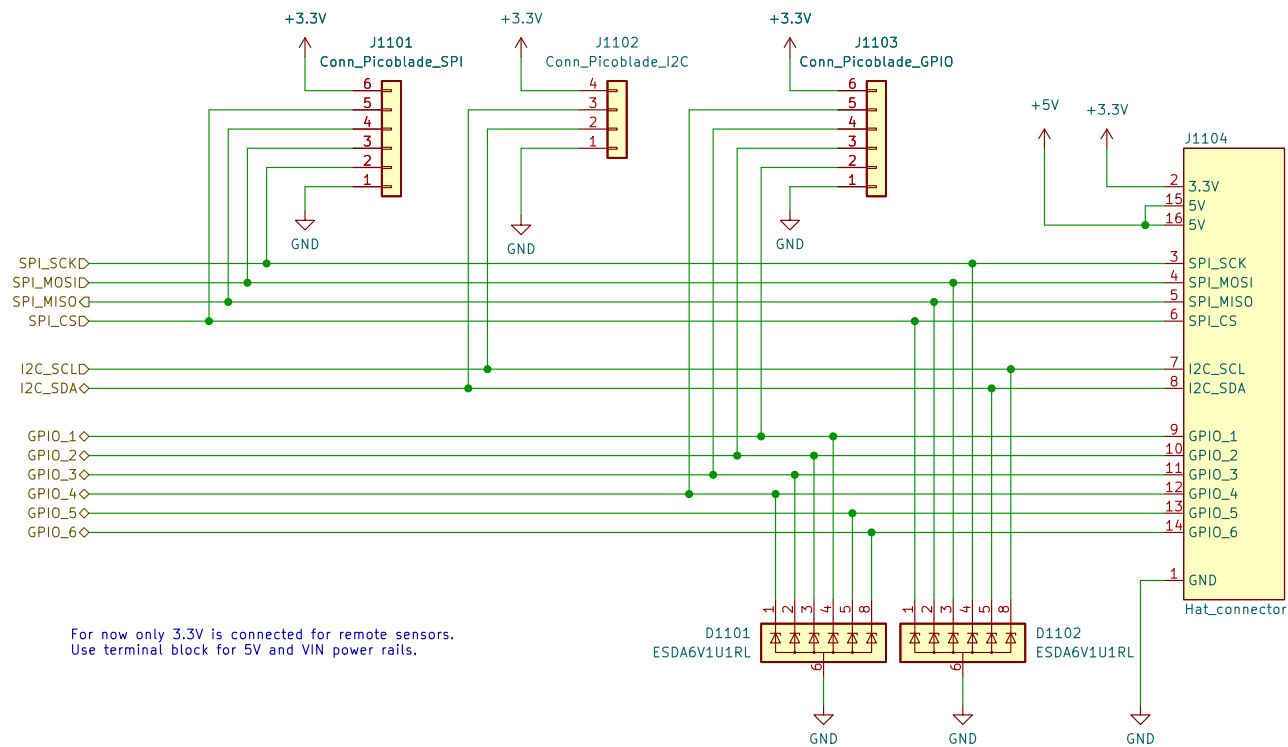
Size: A4
KiCad E.D.A. kicad (6.0.7)

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