

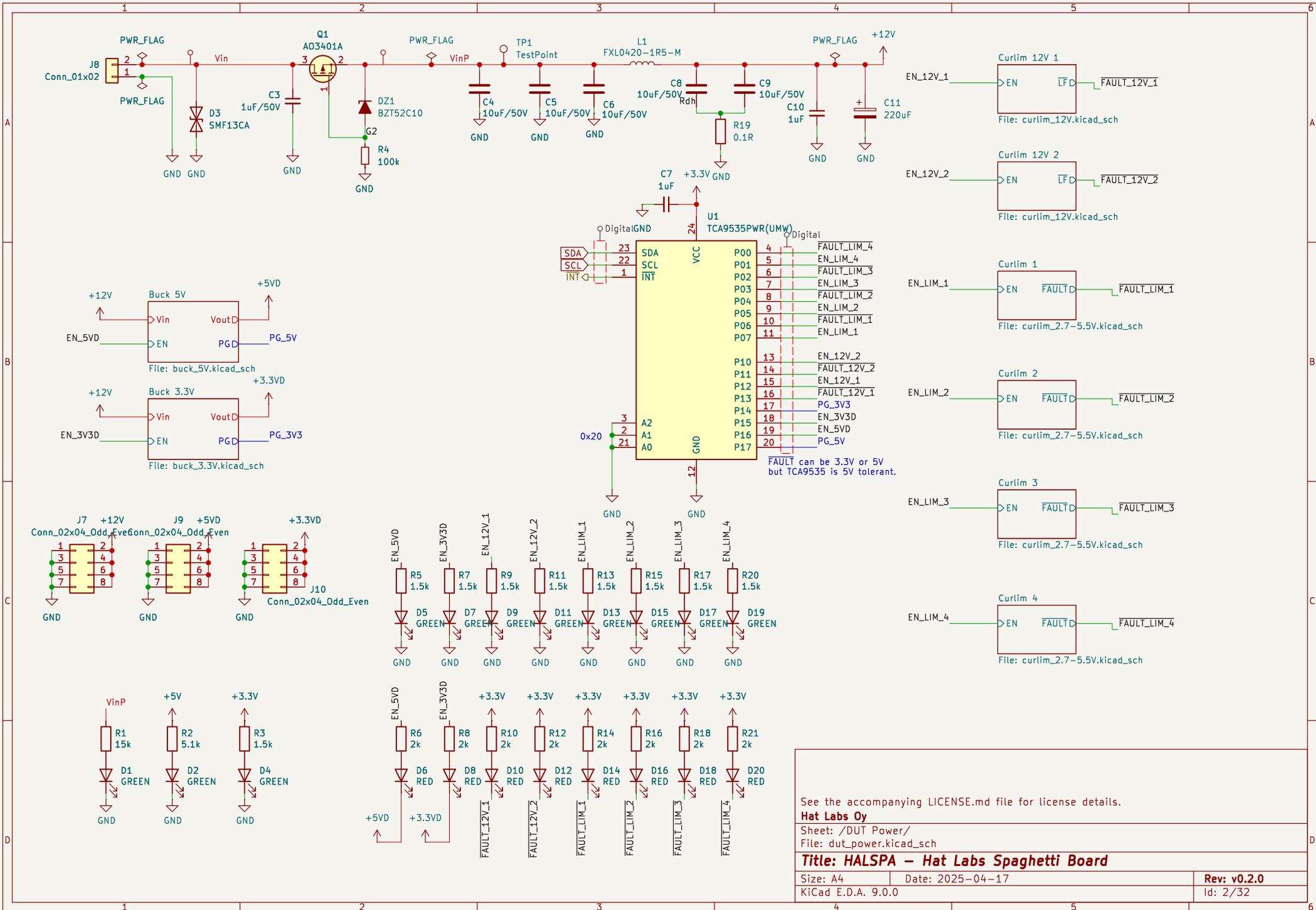
See the accompanying LICENSE.md file for license details.

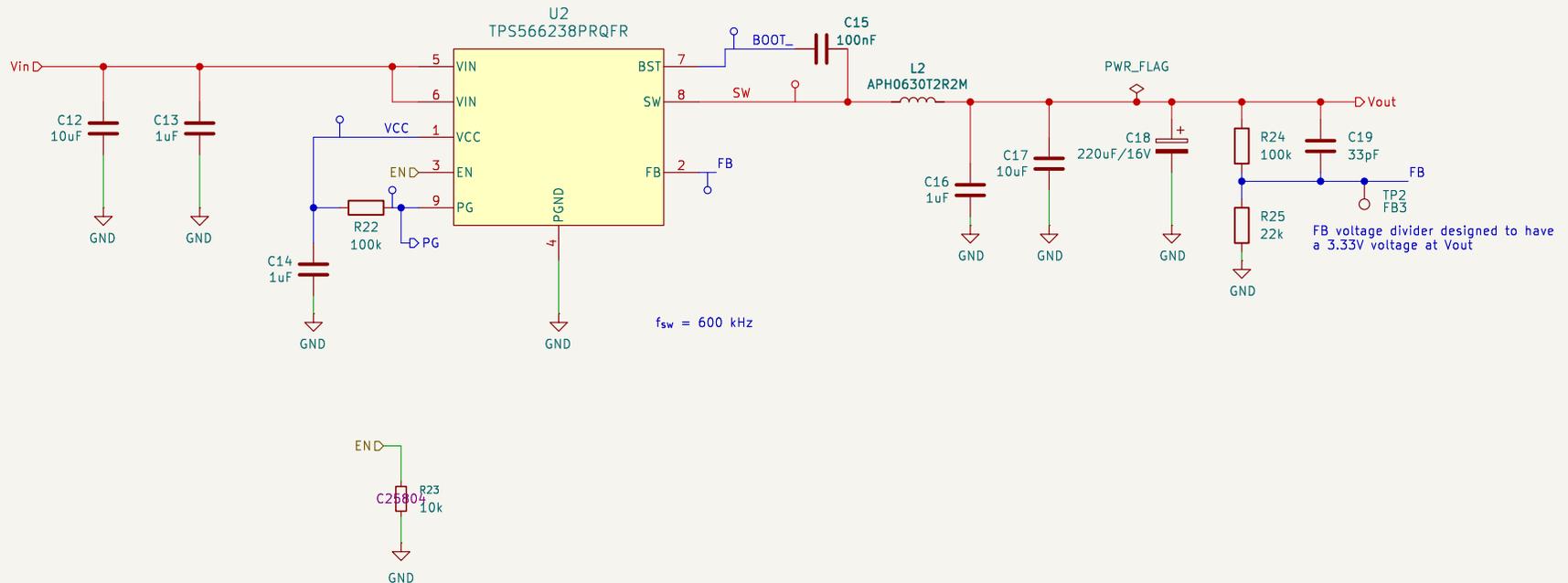
**Hat Labs Oy**

Sheet: /  
File: HALSPA.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 1/32





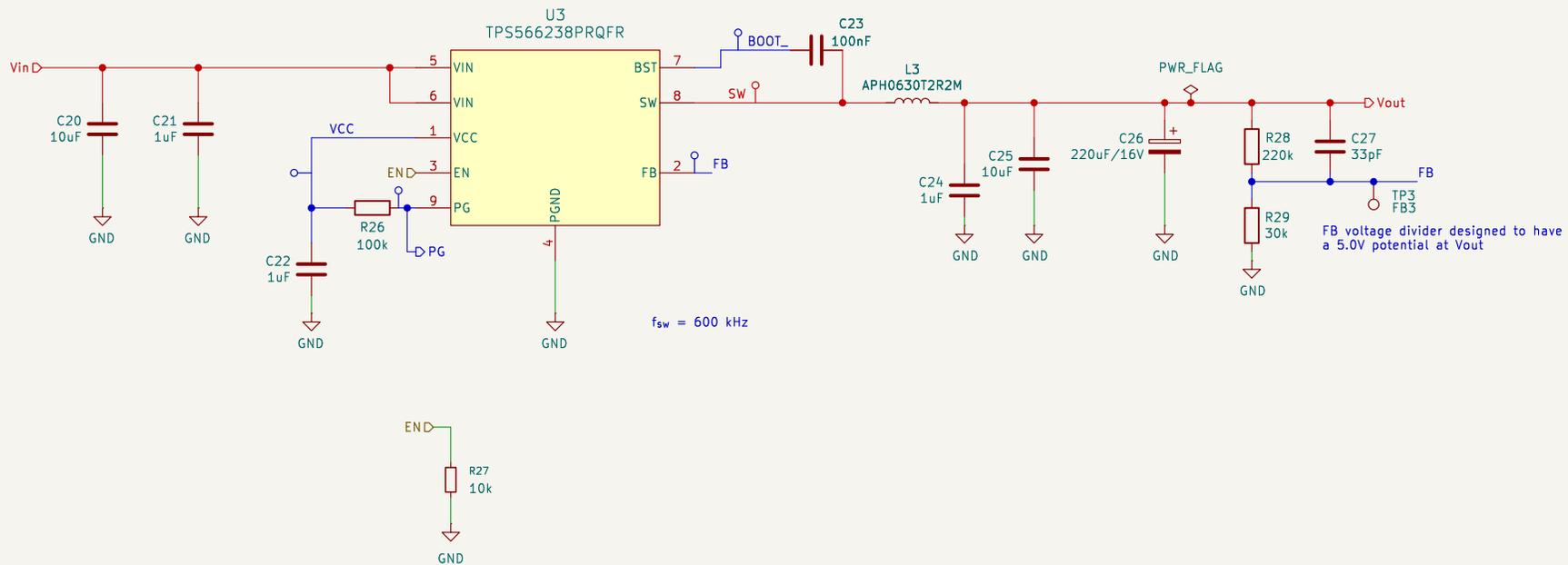
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 To view a copy of this license, visit  
 See the accompanying LICENSE.md file for license details.

**Hat Labs Oy**

Sheet: /DUT Power/Buck 3.3V/  
 File: buck\_3.3V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 3/32



FB voltage divider designed to have a 5.0V potential at Vout

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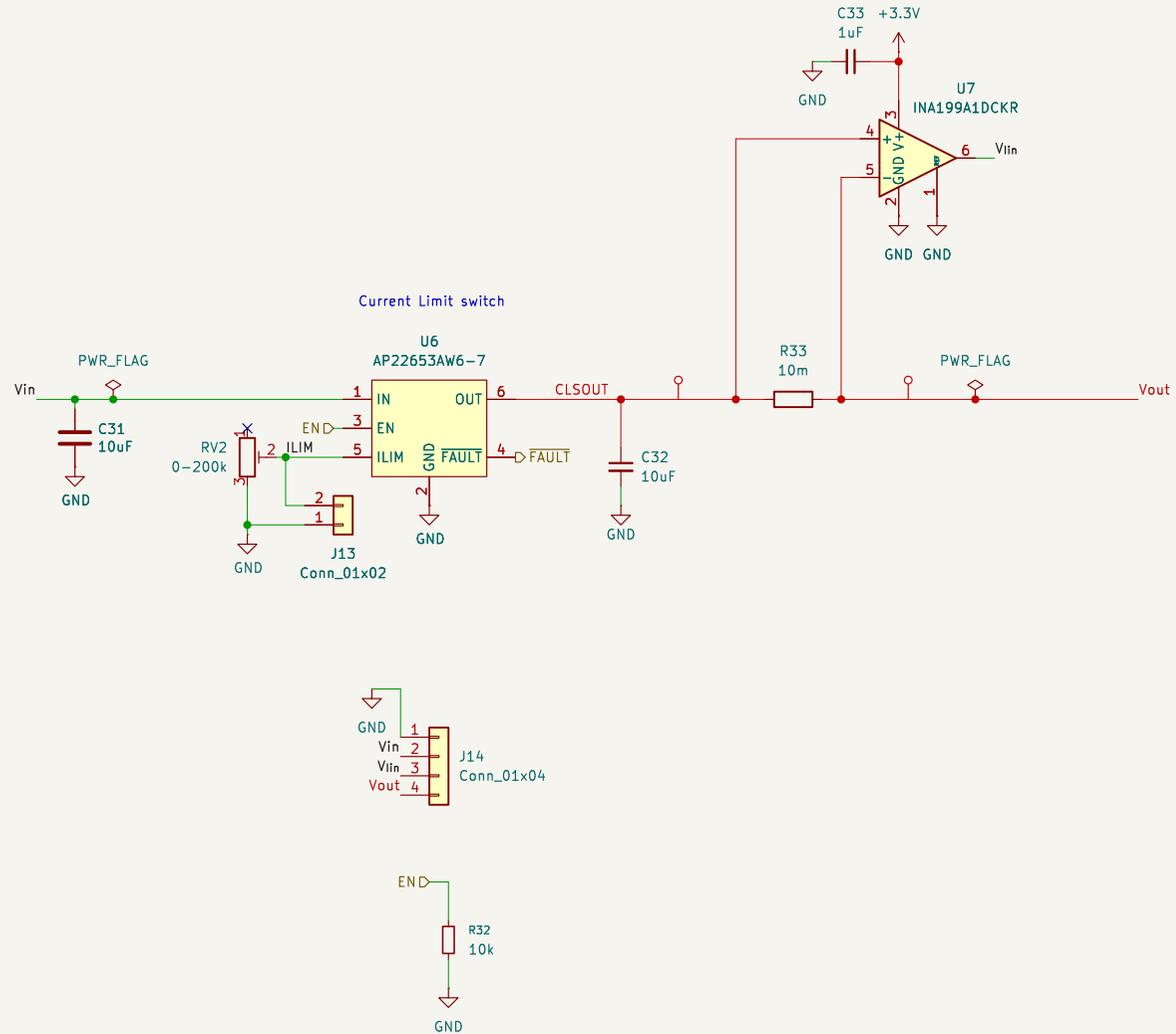
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Sheet: /DUT Power/Buck 5V/  
 File: buck\_5V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 4/32





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**Hat Labs Oy**

Sheet: /DUT Power/Curlim 2/  
File: curlim\_2.7-5.5V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

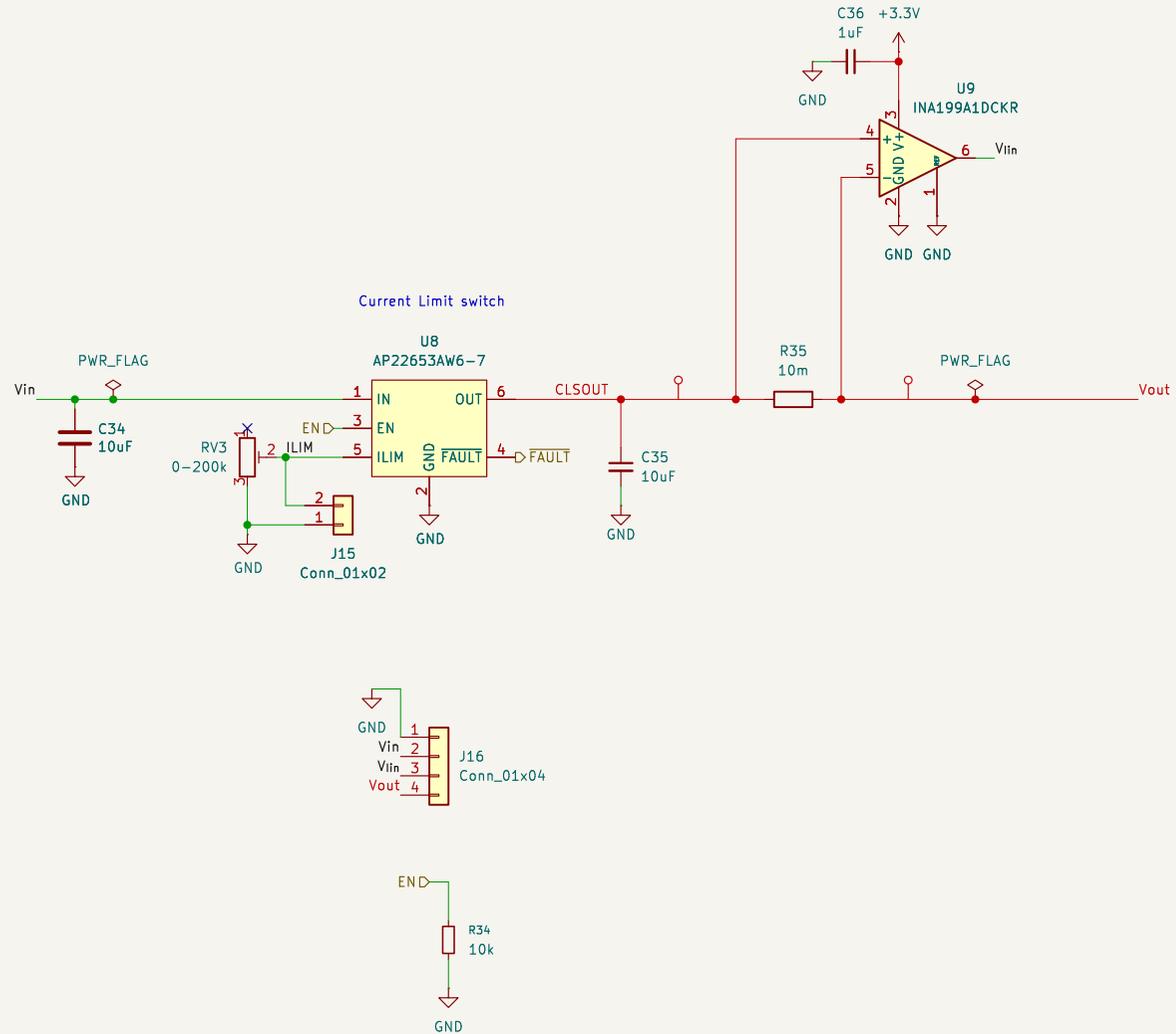
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 6/32



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**Hat Labs Oy**

Sheet: /DUT Power/Curlim 3/  
 File: curlim\_2.7-5.5V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

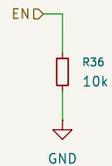
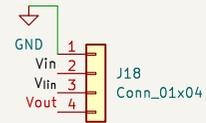
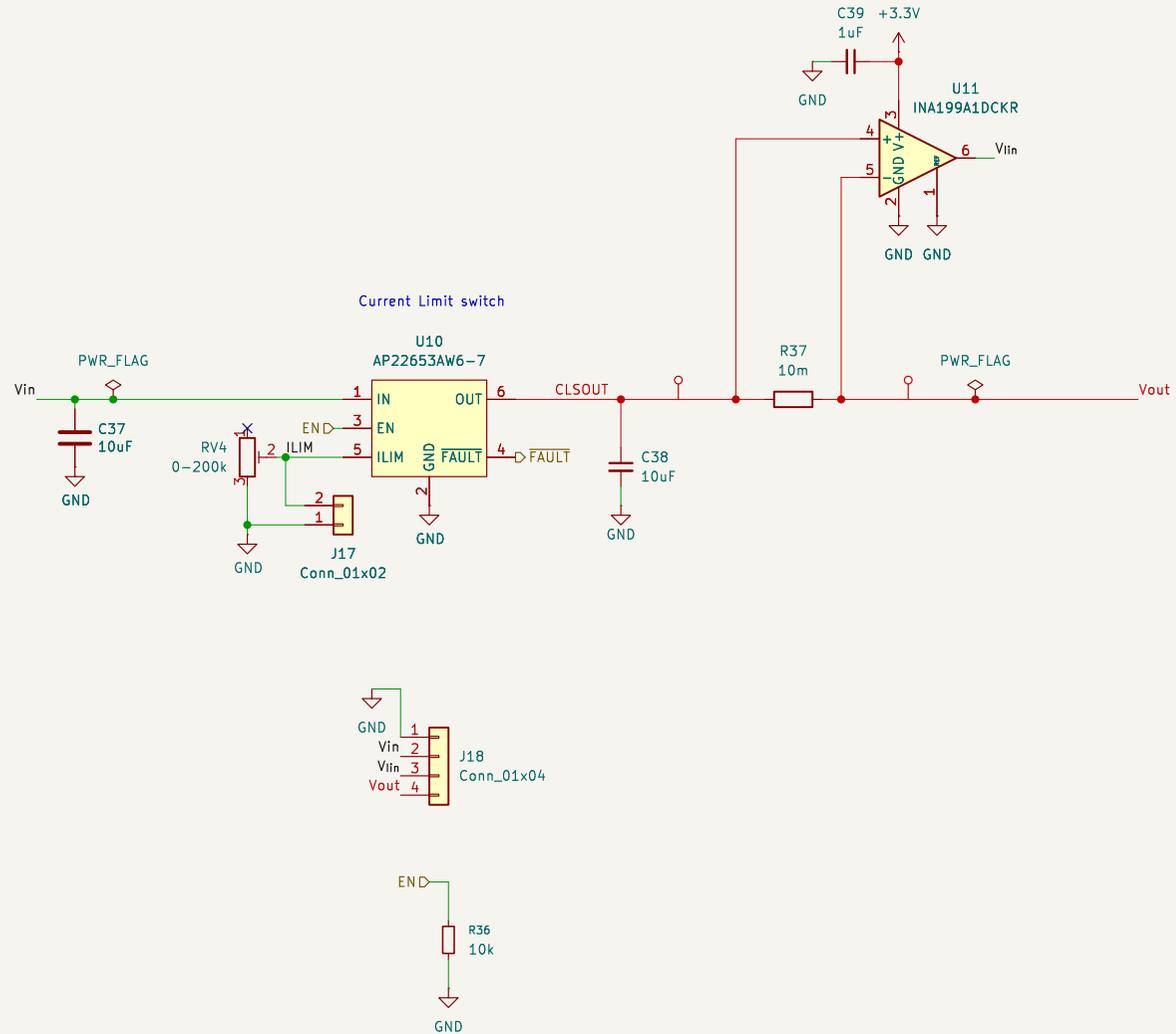
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 7/32



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**Hat Labs Oy**

Sheet: /DUT Power/Curlim 4/  
File: curlim\_2.7-5.5V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4

Date: 2025-04-17

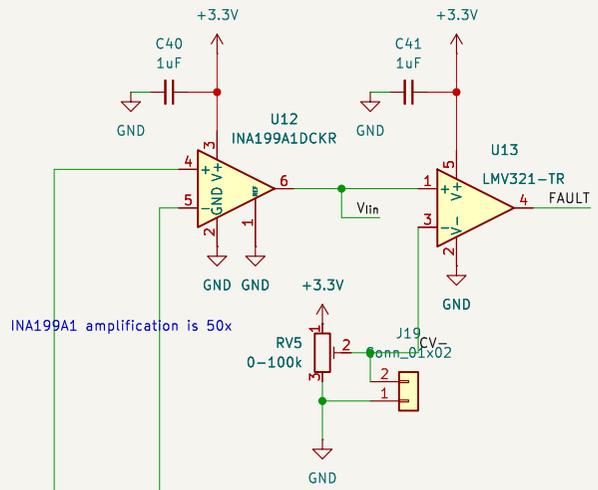
Rev: v0.2.0

KiCad E.D.A. 9.0.0

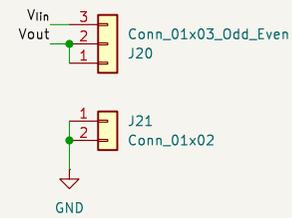
Id: 8/32

Current measurement and fault triggering

FAULT is set high if current through shunt rises above threshold set by voltage divider

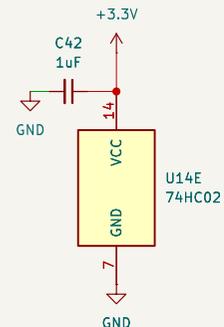
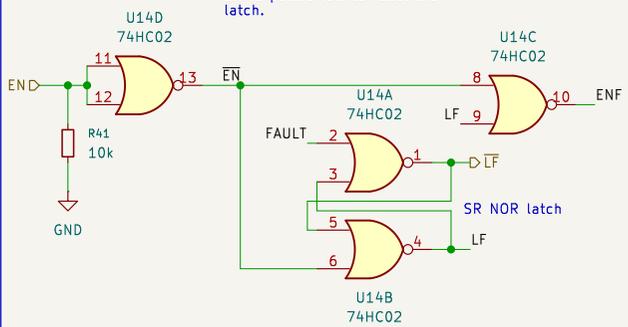


INA199A1 amplification is 50x

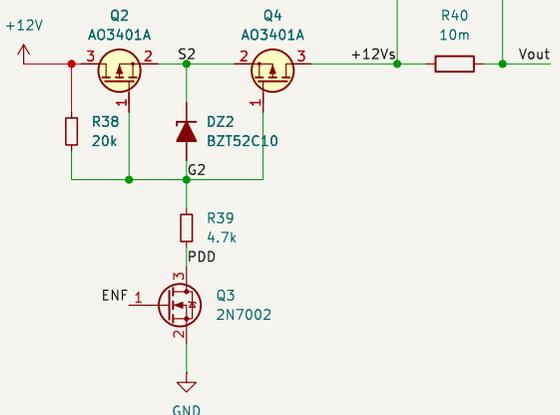


Fault latching circuit

ENF follows EN except if FAULT is raised; then ENF remains low until EN is pulled low to reset the latch.



Load switch



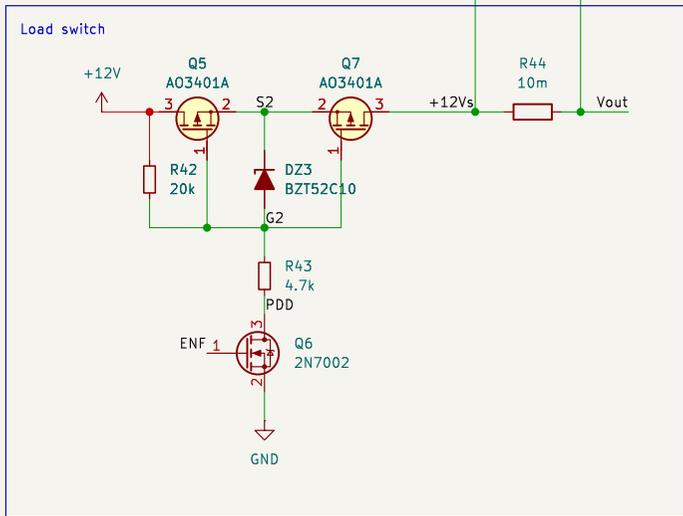
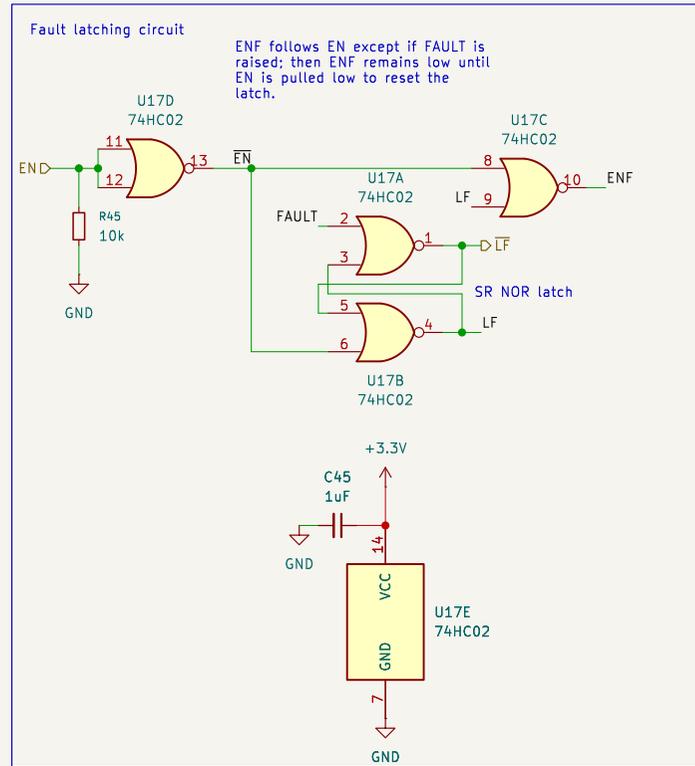
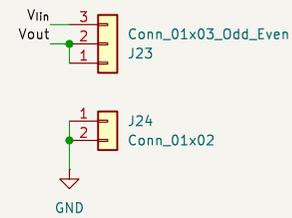
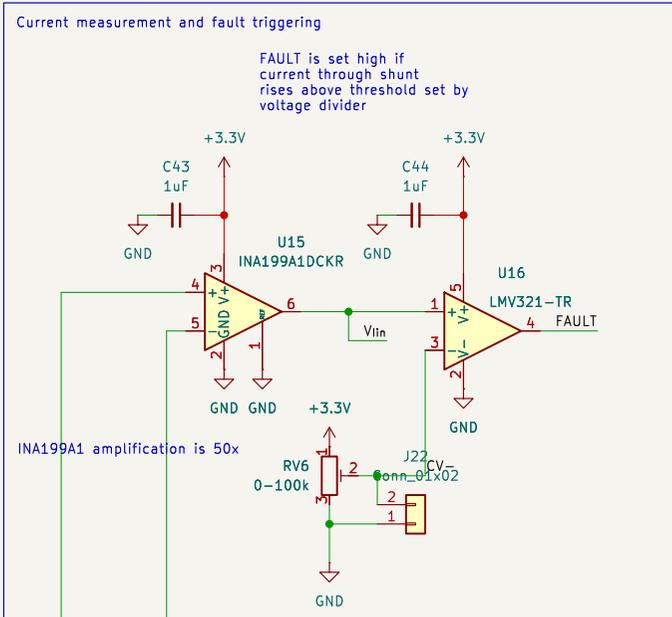
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Hat Labs Oy

Sheet: /DUT Power/Curlim 12V 1/  
File: curlim\_12V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 9/32



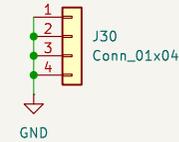
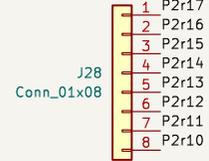
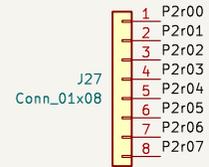
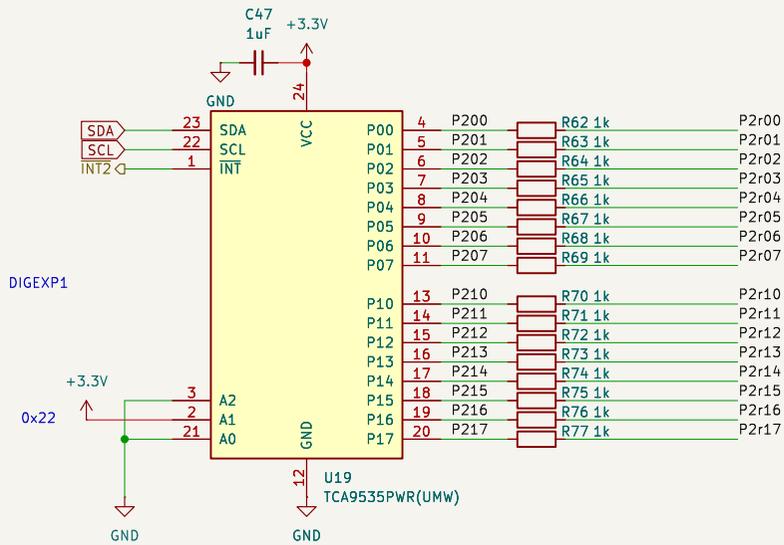
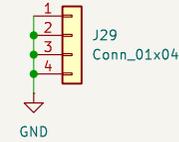
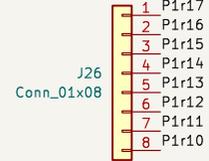
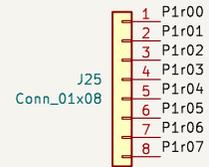
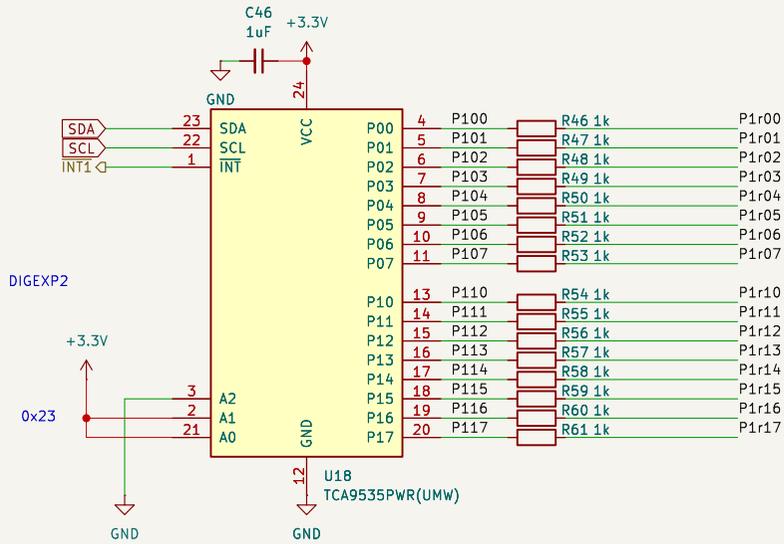
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**Hat Labs Oy**

Sheet: /DUT Power/Curlim 12V 2/  
File: curlim\_12V.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 10/32



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**Hat Labs Oy**

Sheet: /Digital IO/

File: digio.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

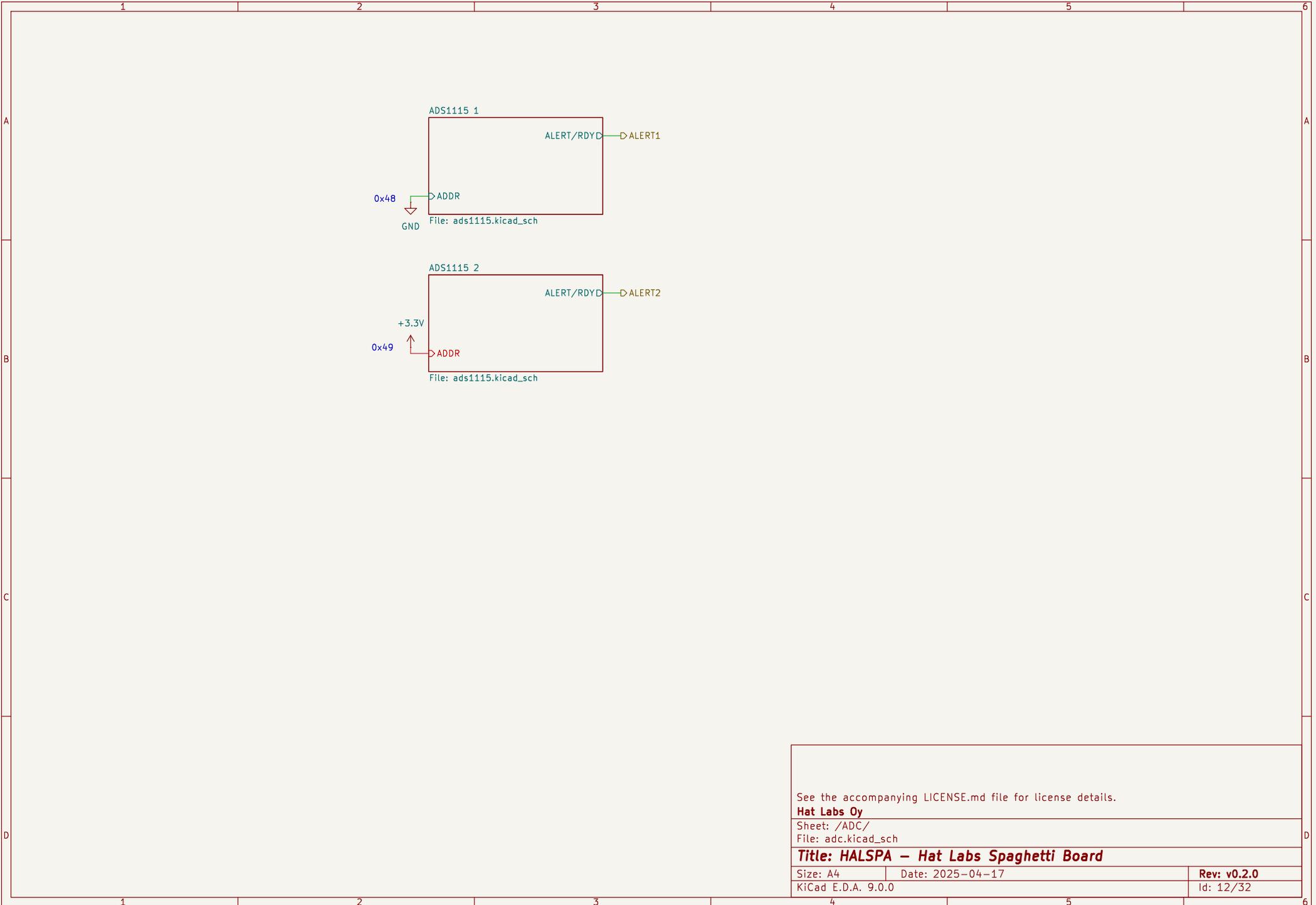
Size: A4

Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 11/32



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**Hat Labs Oy**

Sheet: /ADC/

File: adc.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

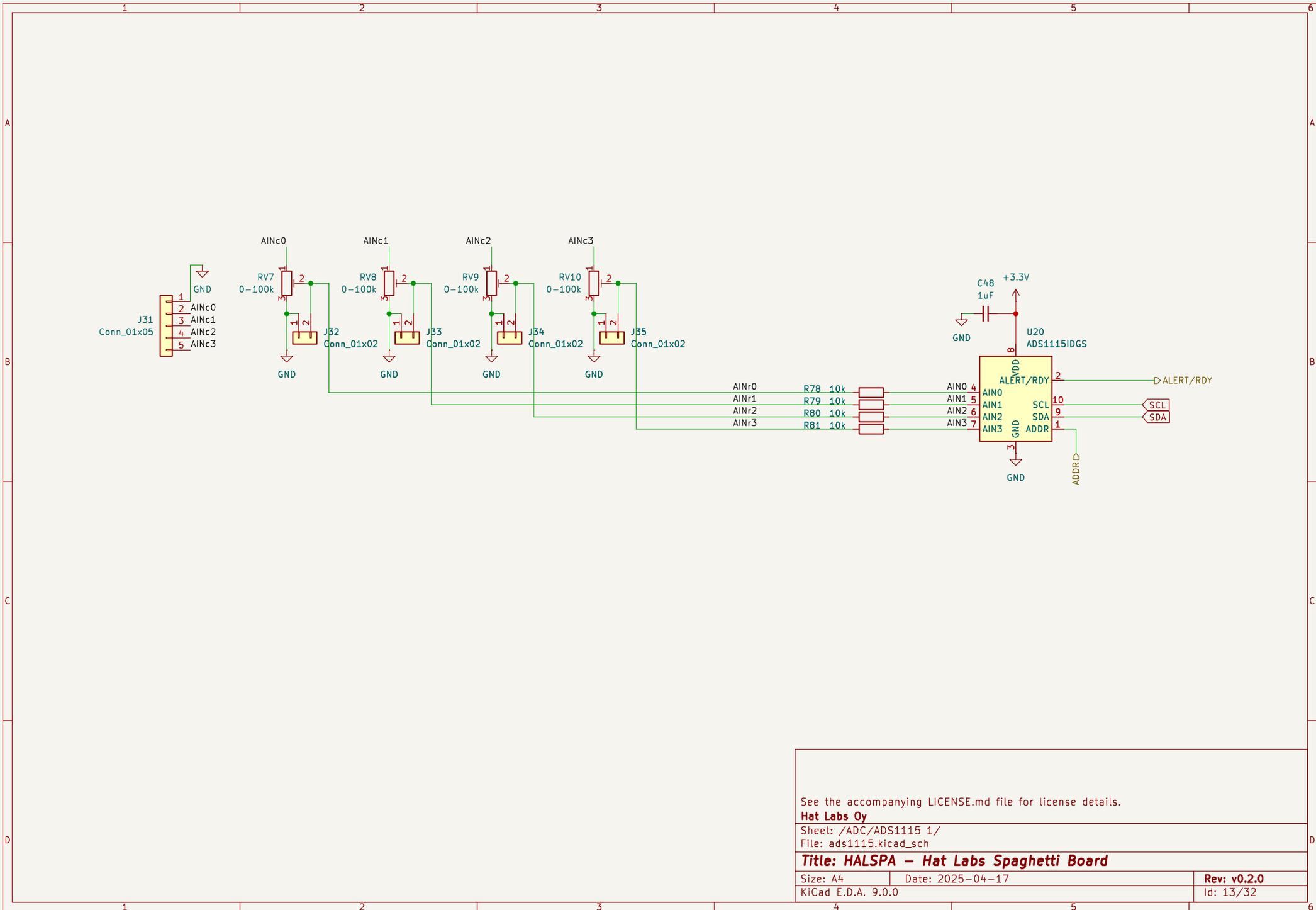
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 12/32



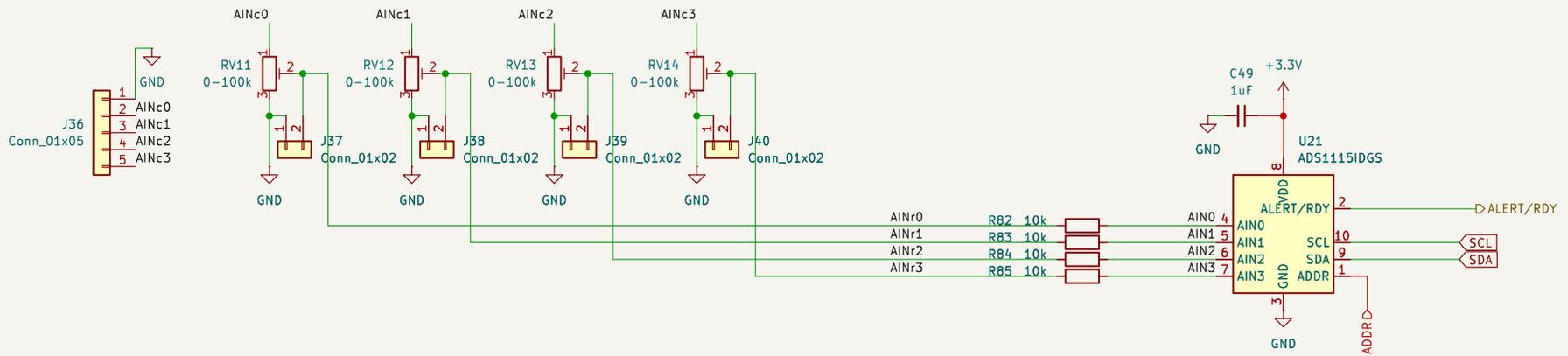
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**Hat Labs Oy**

Sheet: /ADC/ADS1115 1/  
 File: ads1115.kicad\_sch

**Title: HALSPA - Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 13/32



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**Hat Labs Oy**

Sheet: /ADC/ADS1115 2/

File: ads1115.kicad\_sch

**Title: HALSPA - Hat Labs Spaghetti Board**

Size: A4

Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 14/32

1

2

3

4

5

6

A

A

INA199 1



File: ina199.kicad\_sch

INA199 2



File: ina199.kicad\_sch

INA199 3



File: ina199.kicad\_sch

INA199 4



File: ina199.kicad\_sch

B

B

C

C

D

D

1

2

3

4

5

6

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**Hat Labs Oy**

Sheet: /Current Sense/

File: current\_sense.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

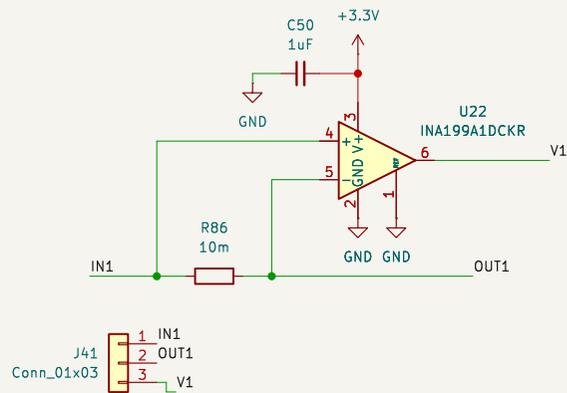
Size: A4

Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 15/32



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**Hat Labs Oy**

Sheet: /Current Sense/INA199 1/

File: ina199.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

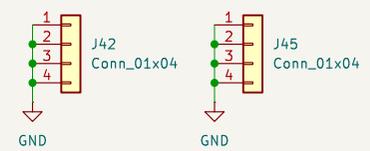
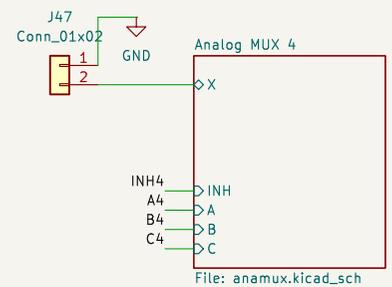
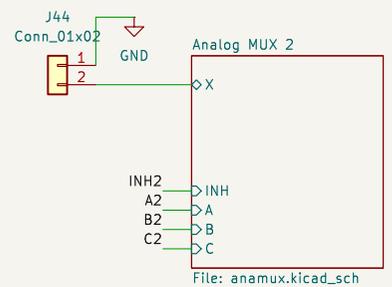
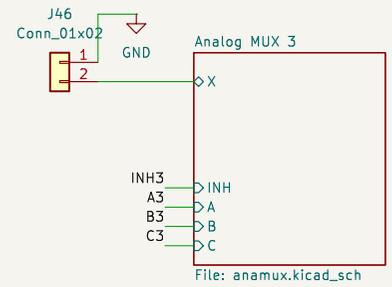
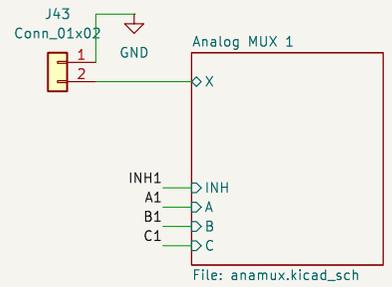
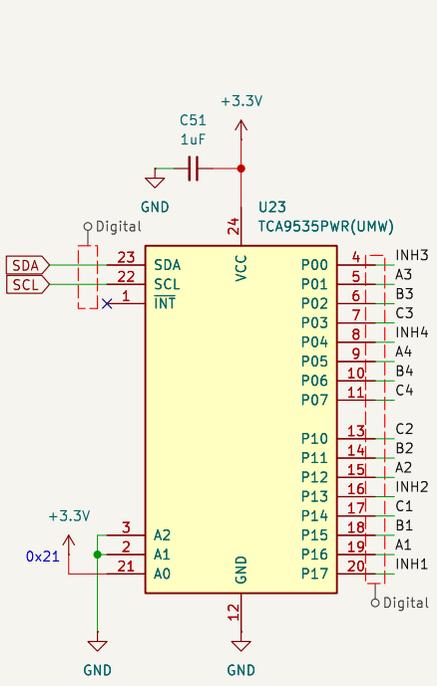
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 16/32



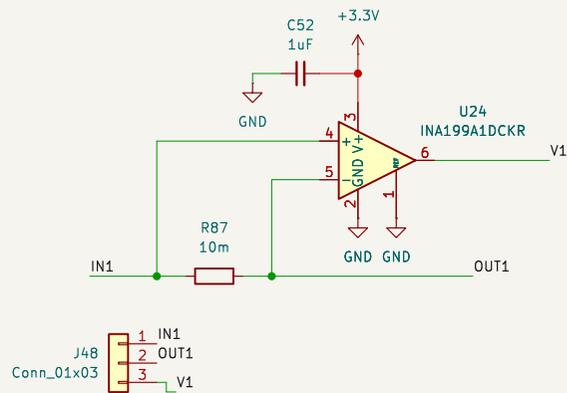
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**Hat Labs Oy**

Sheet: /Analog IO/  
File: anaio.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 16/32



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**Hat Labs Oy**

Sheet: /Current Sense/INA199 2/

File: ina199.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

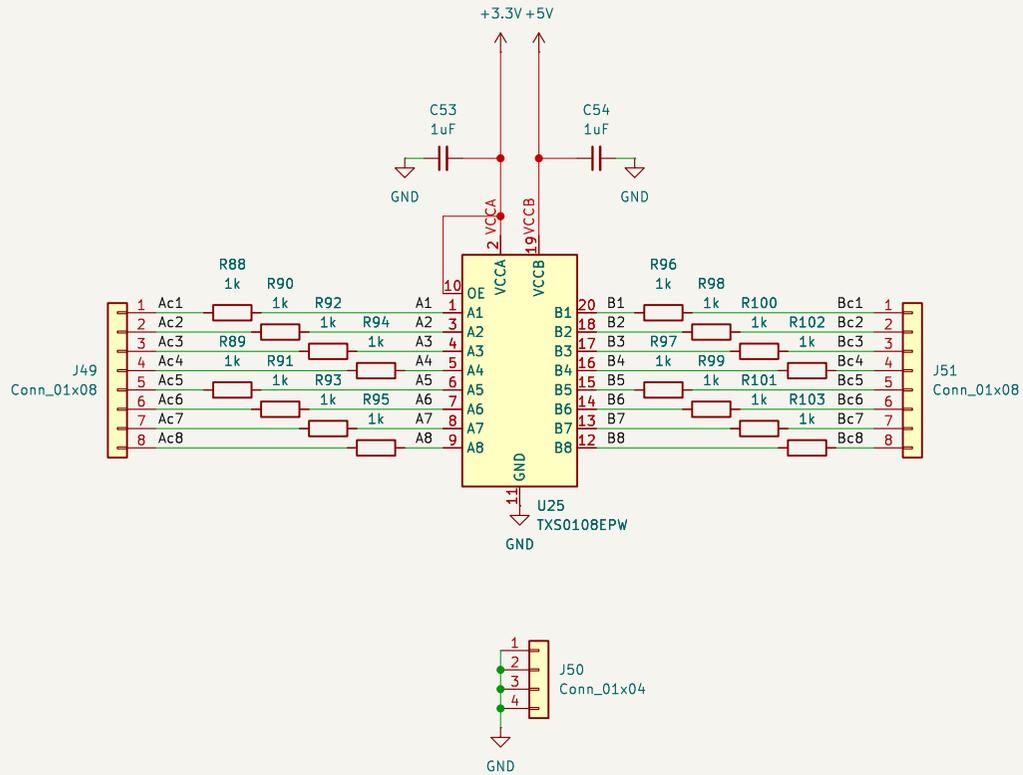
Size: A4

Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 17/32



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**Hat Labs Oy**

Sheet: /Level Shifting/

File: level\_shifting.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

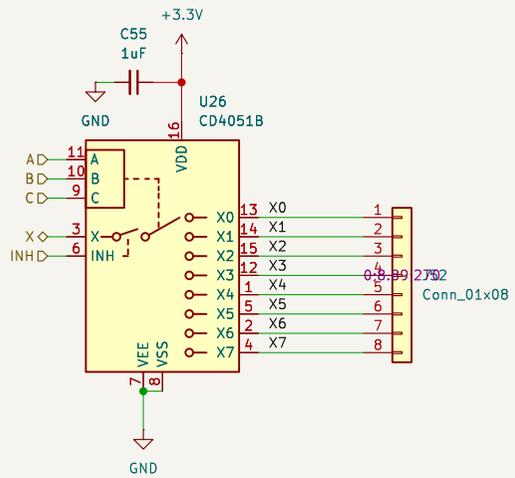
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 17/32



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**Hat Labs Oy**

Sheet: /Analog IO/Analog MUX 1/

File: anamux.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

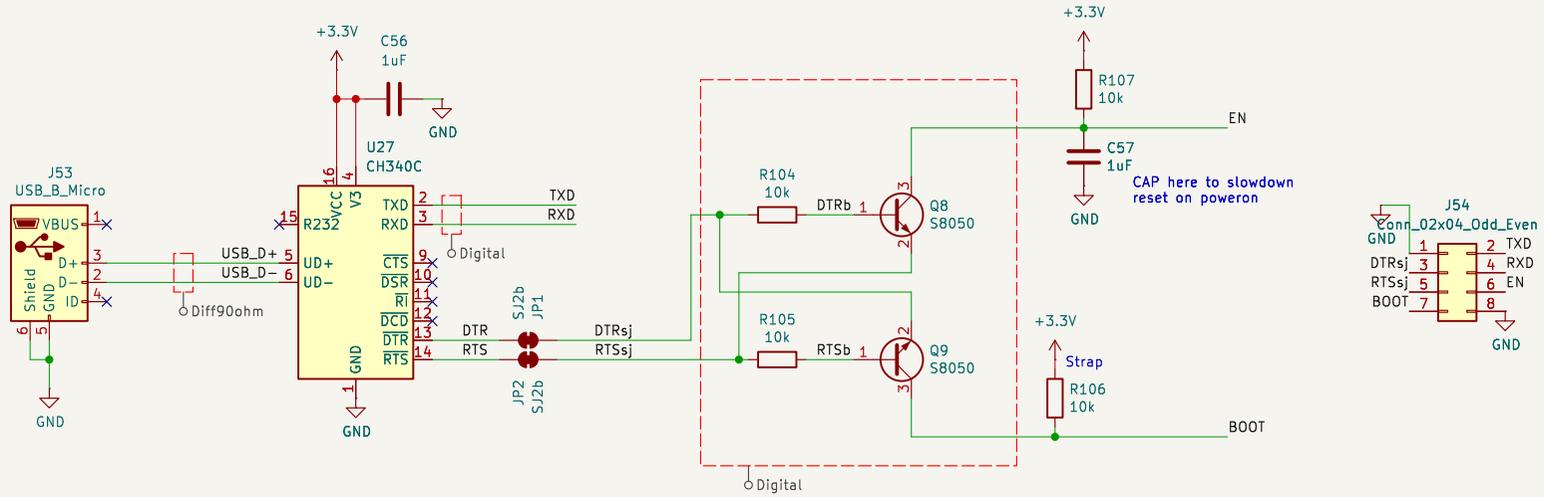
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 17/32



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**Hat Labs Oy**

Sheet: /USB serial interface/

File: usb\_serial.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

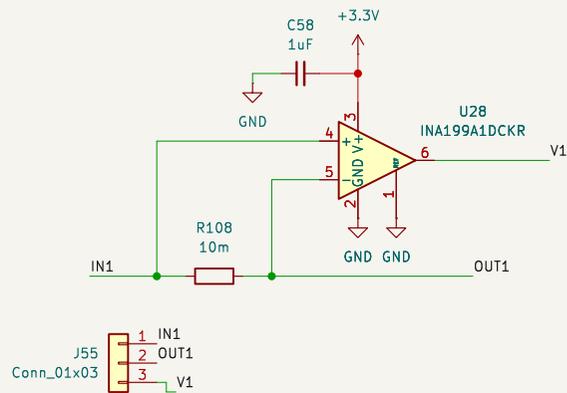
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 18/32



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**Hat Labs Oy**

Sheet: /Current Sense/INA199 3/

File: ina199.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

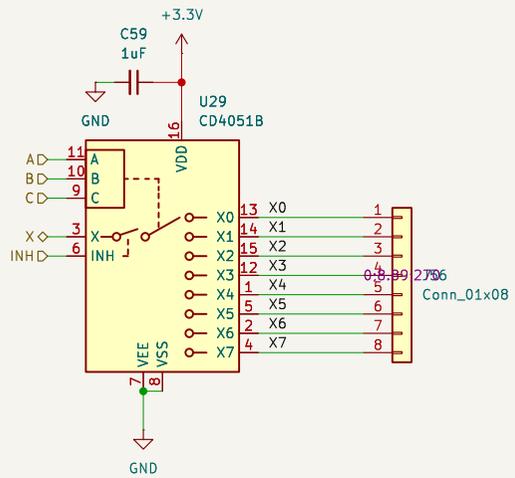
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 18/32



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**Hat Labs Oy**

Sheet: /Analog IO/Analog MUX 2/

File: anamux.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

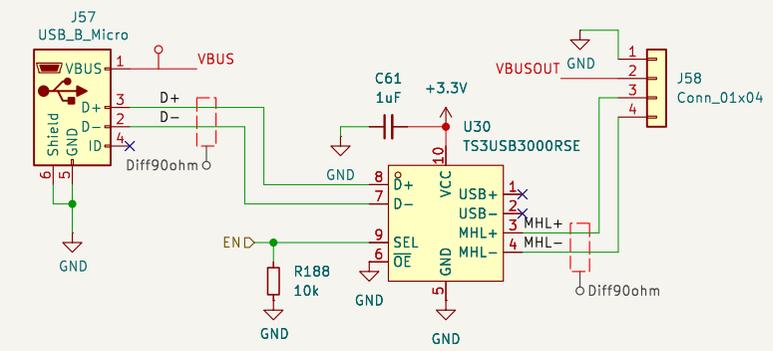
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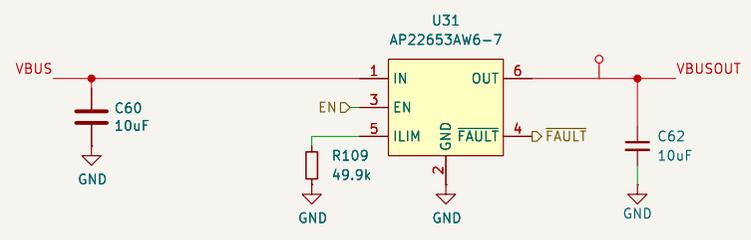
Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 18/32



Current Limit switch



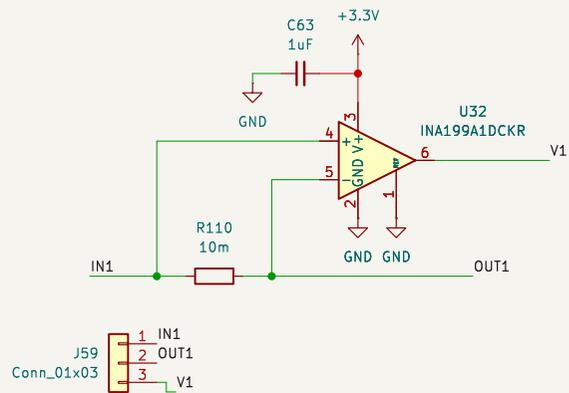
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**Hat Labs Oy**

Sheet: /USB connector/  
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**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 19/32



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**Hat Labs Oy**

Sheet: /Current Sense/INA199 4/

File: ina199.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

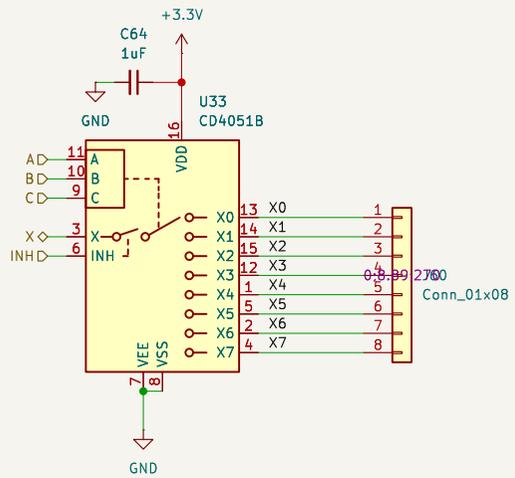
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 19/32



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**Hat Labs Oy**

Sheet: /Analog IO/Analog MUX 3/

File: anamux.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

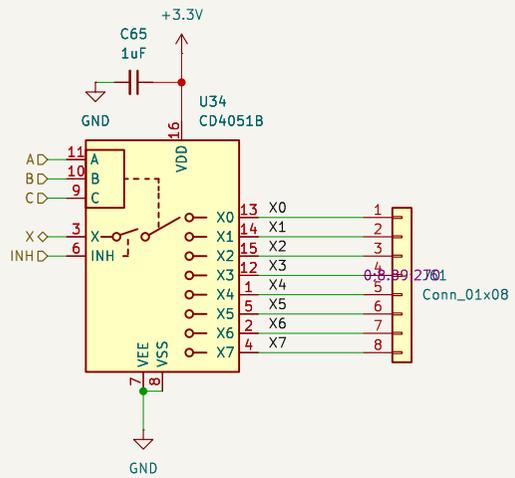
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 19/32



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**Hat Labs Oy**

Sheet: /Analog IO/Analog MUX 4/

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**Title: HALSPA – Hat Labs Spaghetti Board**

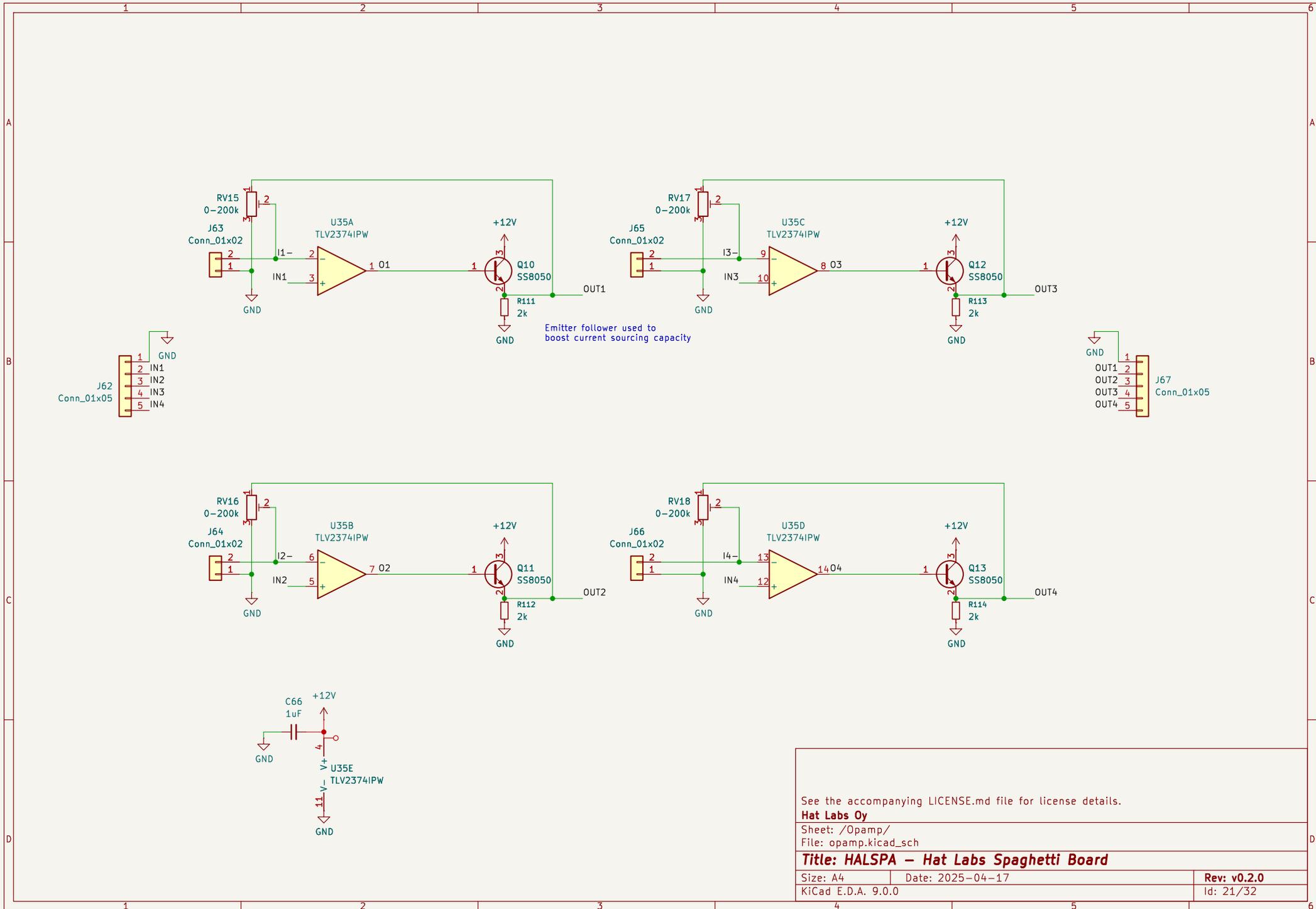
Size: A4

Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 20/32



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**Hat Labs Oy**

Sheet: /Opamp/

File: opamp.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

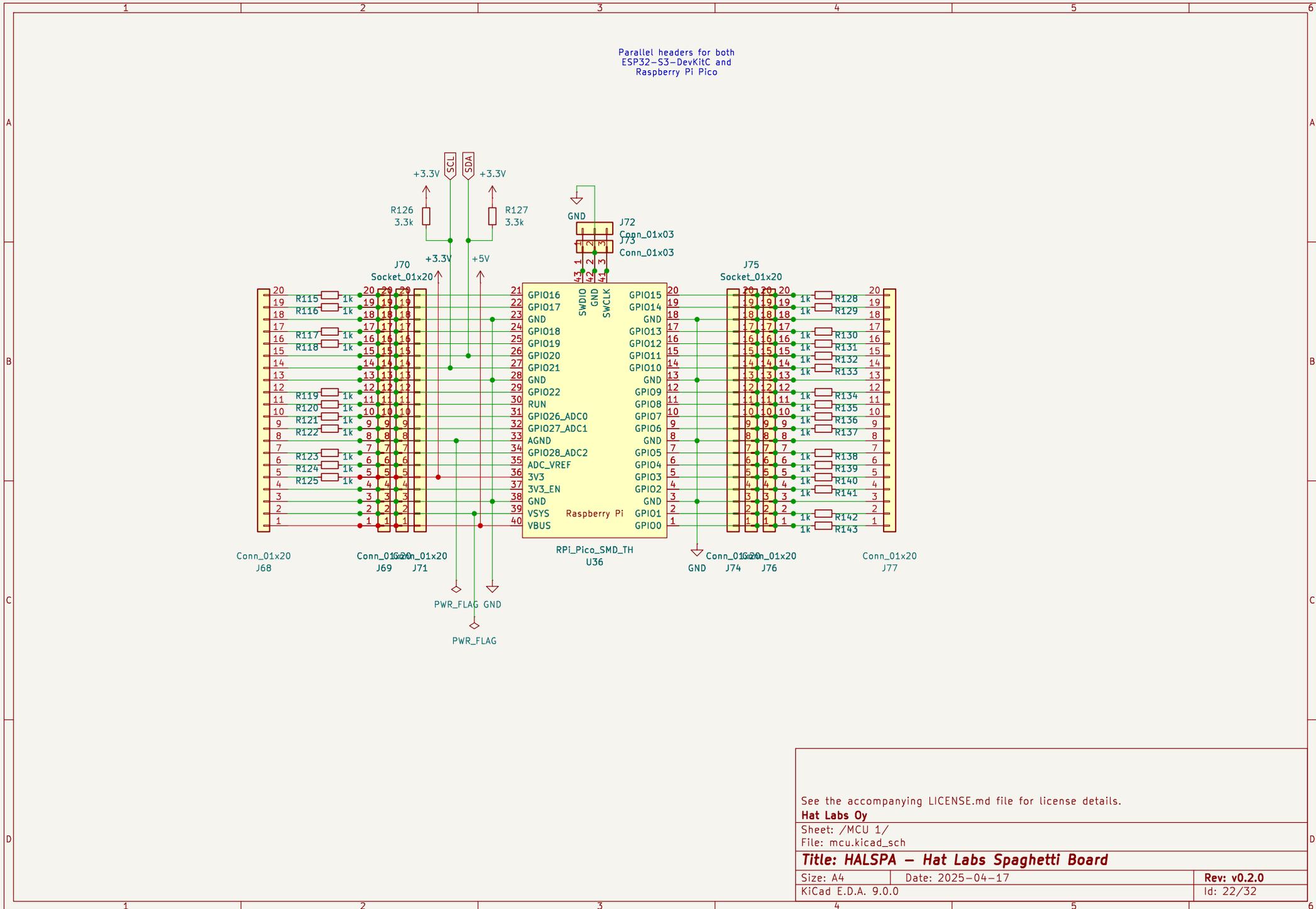
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 21/32



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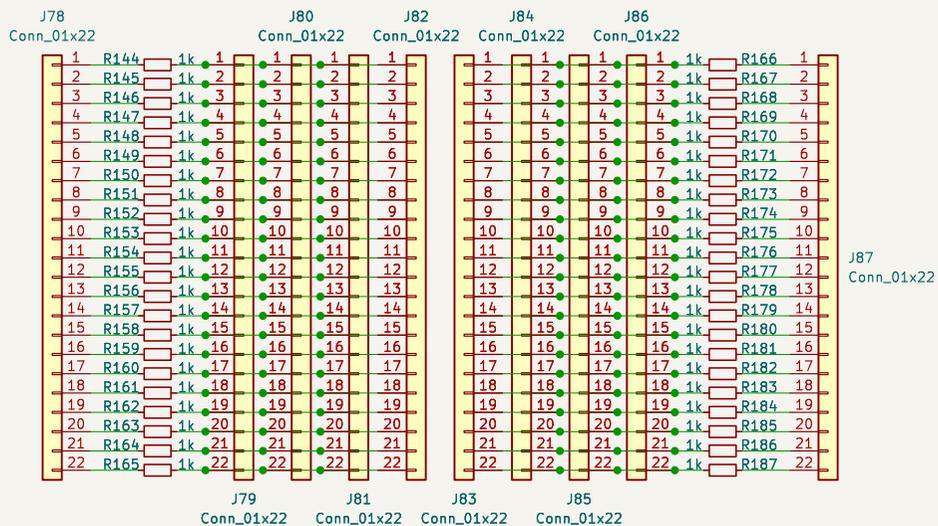
**Hat Labs Oy**

Sheet: /MCU 1/  
 File: mcu.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4	Date: 2025-04-17	Rev: v0.2.0
KiCad E.D.A. 9.0.0		Id: 22/32

Parallel headers for both  
ESP32-S3-DevKitC and  
Raspberry Pi Pico



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**Hat Labs Oy**

Sheet: /MCU 2/

File: mcu2.kicad\_sch

**Title: HALSPA – Hat Labs Spaghetti Board**

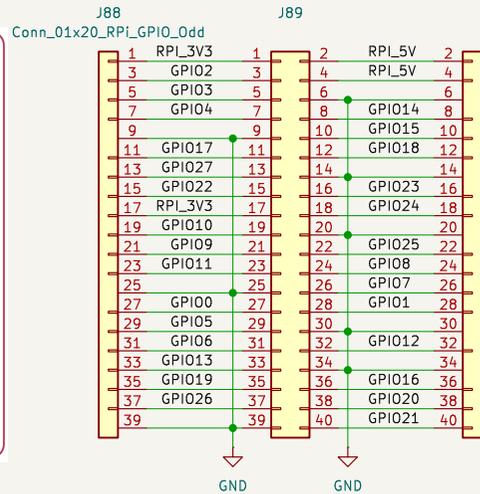
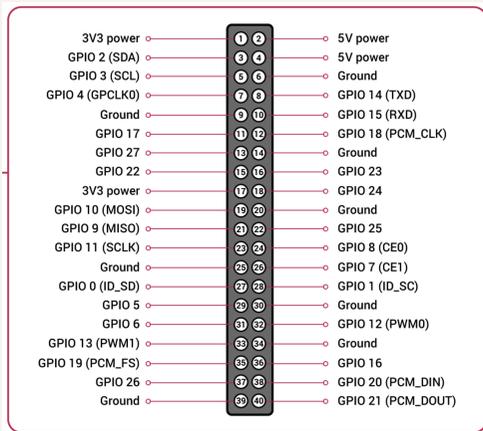
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Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 23/32



J90  
Conn\_01x20\_RPI\_GPIO\_Even

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**Hat Labs Oy**

Sheet: /Raspberry Pi GPIO/  
File: raspi-gpio.kicad\_sch

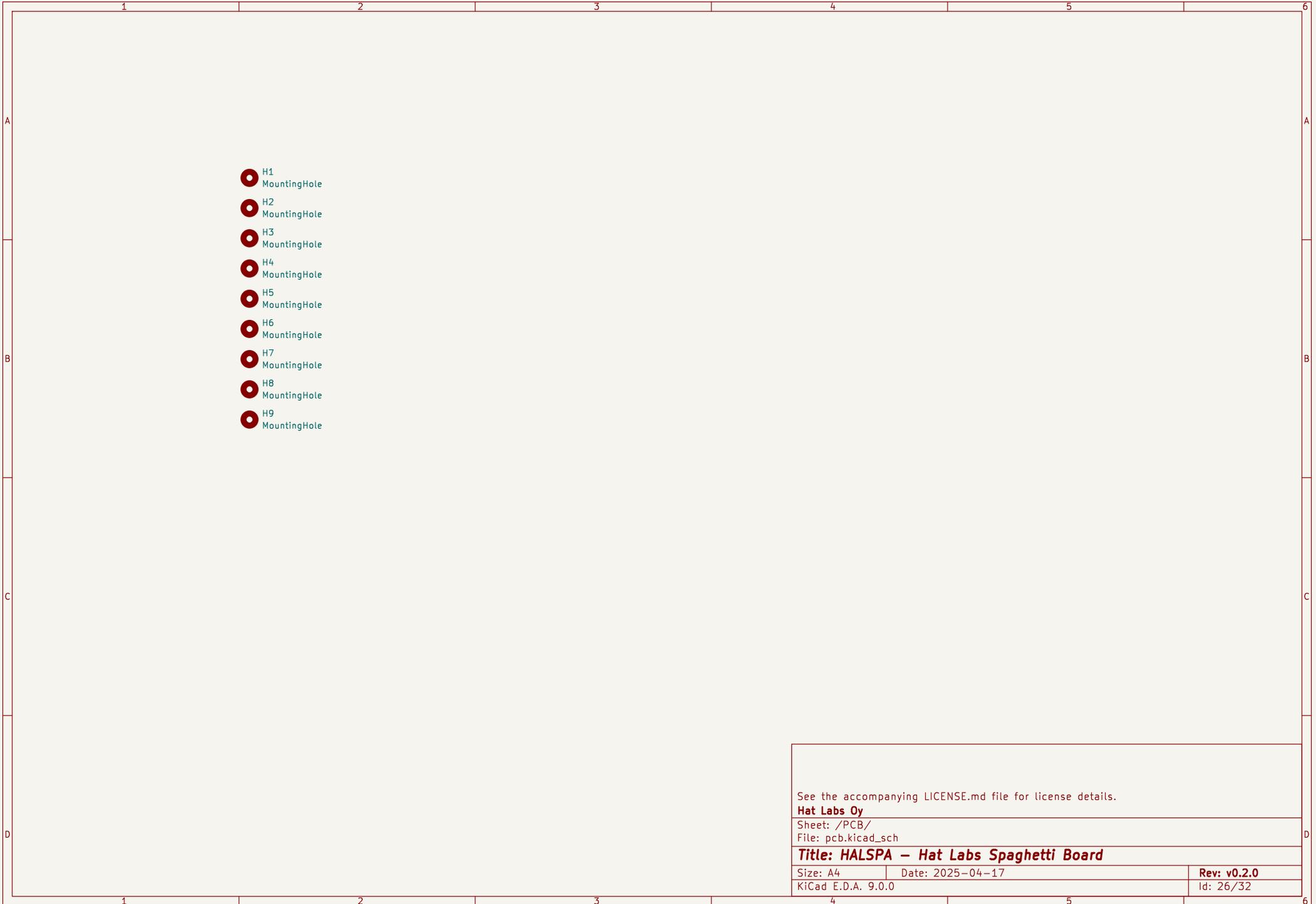
**Title: HALSPA – Hat Labs Spaghetti Board**

Size: A4 Date: 2025-04-17

Rev: v0.2.0

KiCad E.D.A. 9.0.0

Id: 24/32



- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- H4 MountingHole
- H5 MountingHole
- H6 MountingHole
- H7 MountingHole
- H8 MountingHole
- H9 MountingHole

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<b>Hat Labs Oy</b>			
Sheet: /PCB/			
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<b>Title: HALSPA – Hat Labs Spaghetti Board</b>			
Size: A4	Date: 2025-04-17		Rev: v0.2.0
KiCad E.D.A. 9.0.0			Id: 26/32