SHPI.zero

Functional schematic / population overview

Functional net names and modular circuit groups

Populated circuit at the front / non-populated options at the back

Raspberry Pi Zero / DPI interface

Sheet 02 | 25 components

Display / charge pumps / supply

Sheet 03 | 26 components

Supply / current measurement / backlight

Sheet 04 | 16 components

ATmega32U4 / clock / reset / ISP

Sheet 05 | 26 components

RS485 / fan / sensor heater

Sheet 06 | 20 components

SPI level shifter / radio modules

Sheet 07 | 7 components

USB hub / connections

Sheet 08 | 10 components

I2C expansion / ADC / DAC / RTC

Sheet 09 | 5 components

I2C level / climate / air quality / light

Sheet 10 | 23 components

Motion / temperature / thermal imaging

Sheet 11 | 17 components

Analog gas sensors / NTC

Sheet 12 | 10 components

USB audio / HS100B

Sheet 13 | 19 components

Audio power amplifier / microphone / FM

Sheet 14 | 20 components

CC2531 / 2.4 GHz radio / programming

Sheet 15 | 31 components

Optical sensor / MAX30105

Sheet 16 | 3 components

DNP / Display / RGB and timing filters

Sheet 17 | 22 components

DNP / Supply / current measurement / backlight

Sheet 18 | 2 components

DNP / SPI level shifter / radio modules

Sheet 19 | 3 components

DNP / I2C expansion / ADC / DAC / RTC

Sheet 20 | 16 components

DNP / I2C level shifter / climate / air quality / light

Sheet 21 | 5 components

DNP / Motion / temperature / thermal imaging

Sheet 22 | 7 components

DNP / Analog gas sensors / NTC

Sheet 23 | 2 components

DNP / Audio power amplifier / microphone / FM

Sheet 24 | 3 components

DNP / CC2531 / 2.4 GHz radio / programming

Sheet 25 | 4 components

DNP / Optical sensor / MAX30105

Sheet 26 | 5 components

Identical global net names connect the functional sheets.

Non-populated options are marked with DNP and a cross.

SHPI

Sheet: /
File: SHPI-zero.kicad_sch

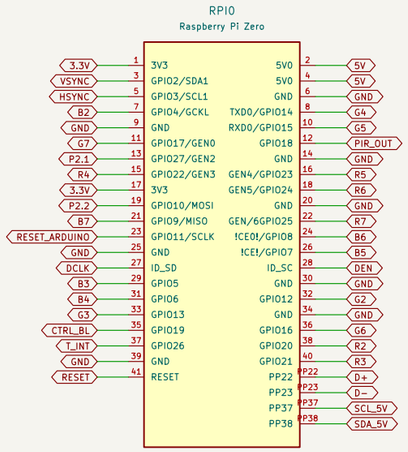
Title: SHPI.zero / Function overview

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 1/26

Raspberry Pi Zero / DPI interface

Raspberry Pi module, DPI color signals, timing and control interfaces.

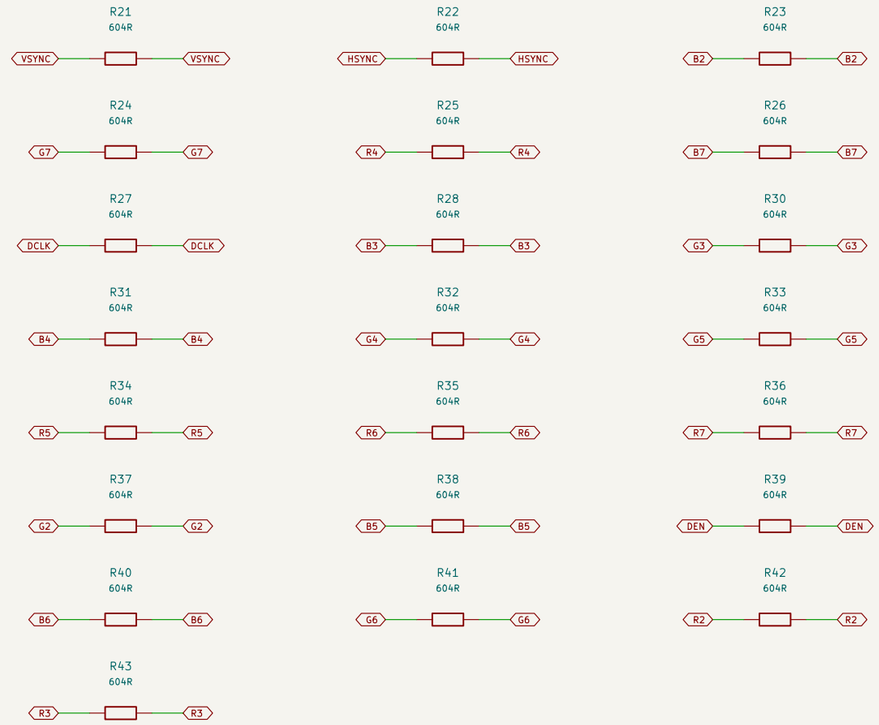
Raspberry Pi Zero



Touch interrupt / display reset



DPI termination components



SHPI.zero | Functional schematic

SHPI

Sheet: /Raspberry Pi Zero / DPI interface/
File: 01_Raspberry_Pi.kicad_sch

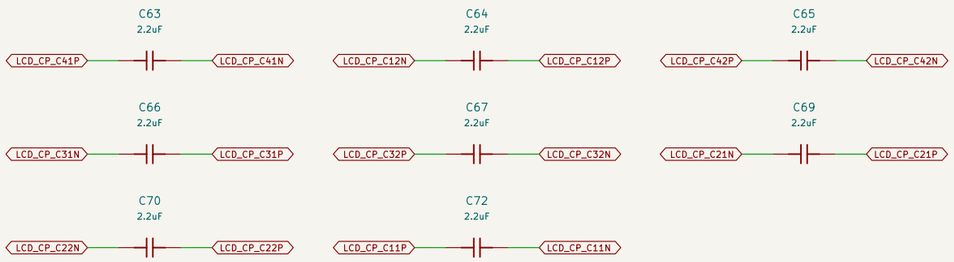
Title: SHPI.zero / Raspberry Pi

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 2/26

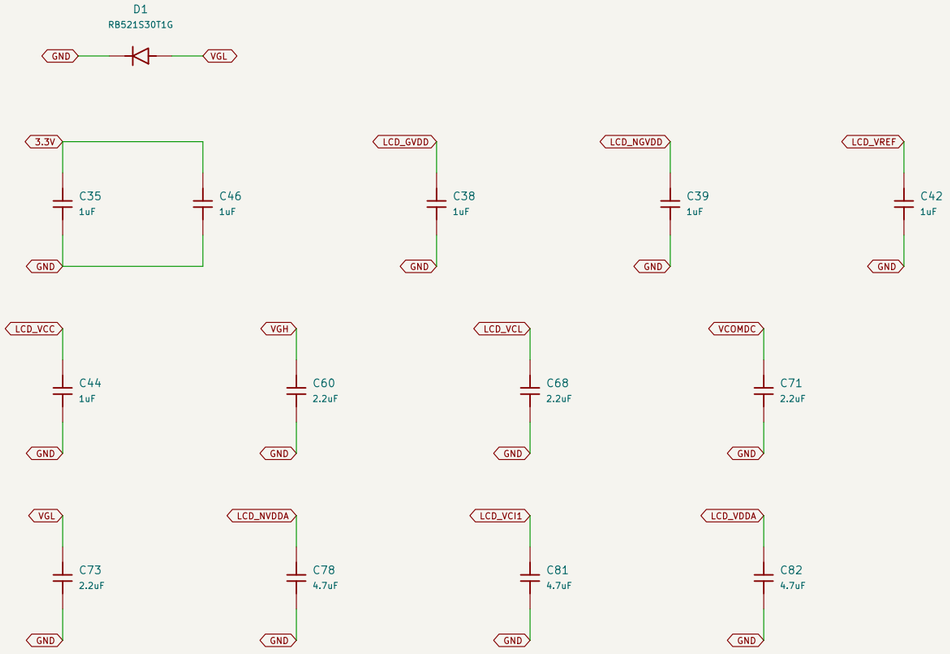
Display / charge pumps / supply

Display and touch connector, pump capacitors and local supply nodes.

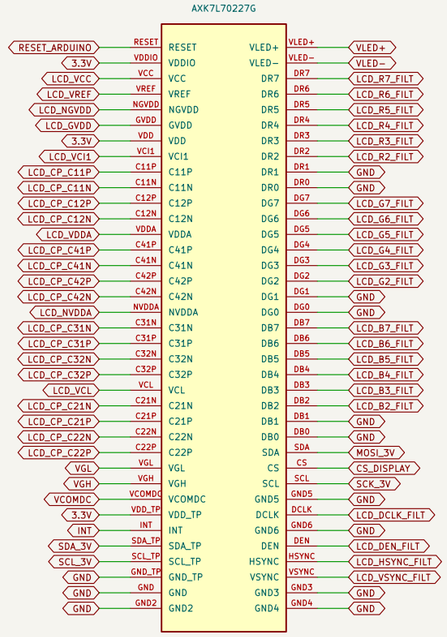
Display charge pumps



Display supplies



WB210 display/touch connection



Display ground contacts



SHPI.zero | Functional schematic

SHPI

Sheet: /Display / charge pumps / supply/
File: 02_Display_Connector.kicad_sch

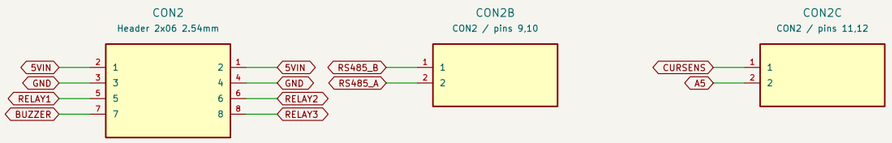
Title: SHPI.zero / Display Connector

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 3/26

Supply / current measurement / backlight

Supply input, current measurement, protection and LED backlight.

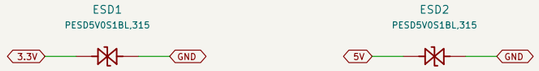
CON2 / 2x06 supply and control



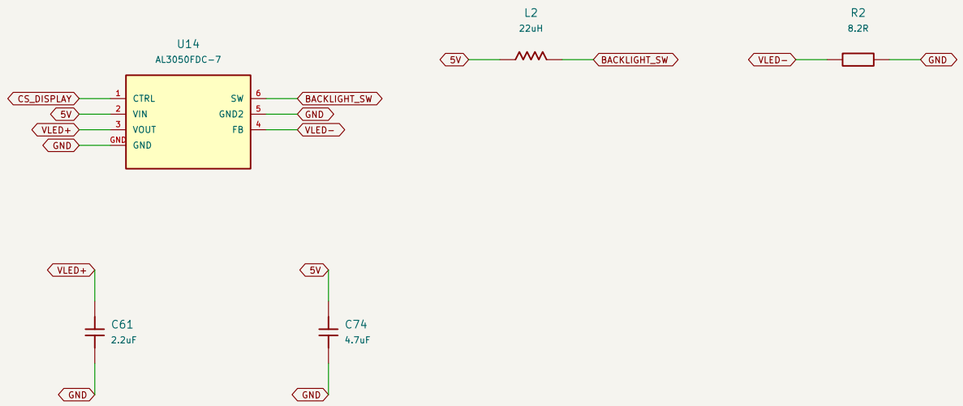
INA219 current measurement



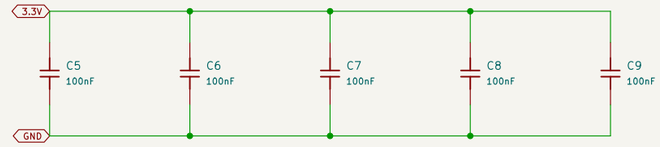
Supply protection



AL3050 backlight driver



Common 3.3 V decoupling



SHPI.zero | Functional schematic

SHPI

Sheet: /Supply / current measurement / backlight/
File: 04_Power_Backlight.kicad_sch

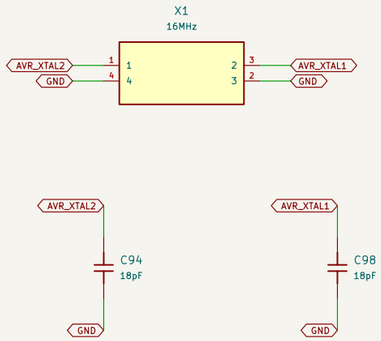
Title: SHPI.zero / Power Backlight

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 4/26

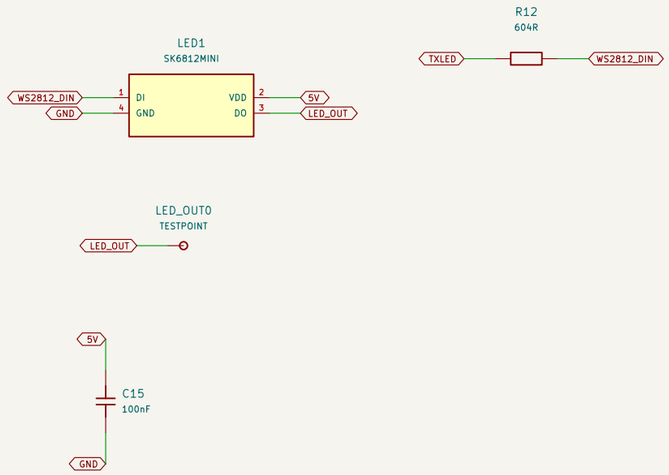
ATmega32U4 / clock / reset / ISP

AVR main controller with supply, crystal, programming connector and USB termination.

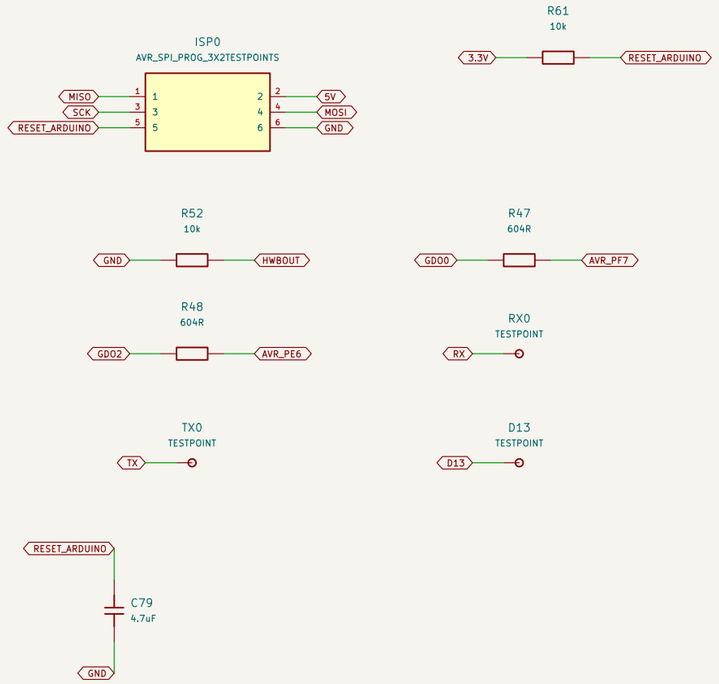
AVR clock



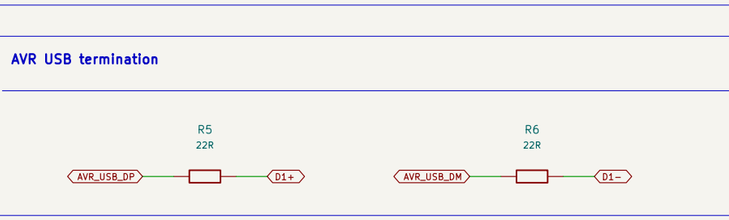
WS2812 status / expansion



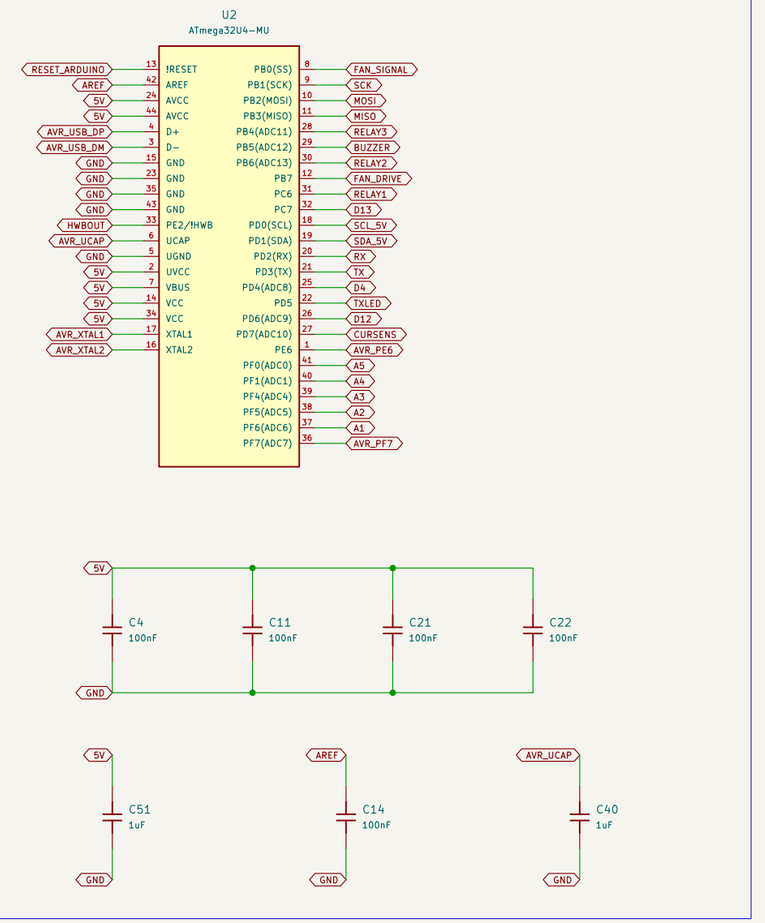
Reset / HWB / ISP



AVR USB termination



ATmega32U4



SHPI.zero | Functional schematic

SHPI

Sheet: /ATmega32U4 / clock / reset / ISP/
File: 05_ATmega32U4.kicad_sch

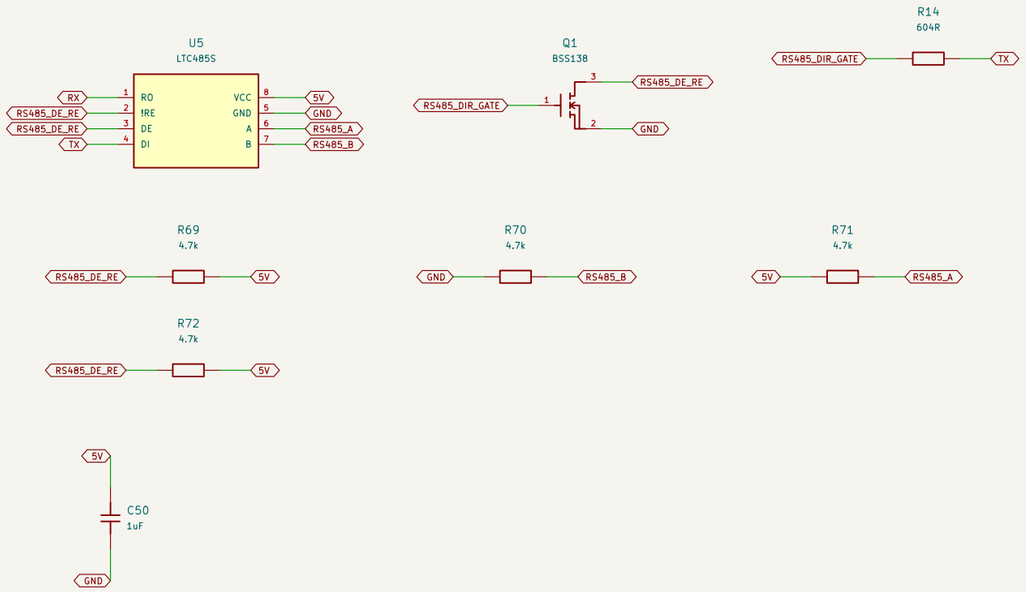
Title: SHPI.zero / ATmega32U4

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 5/26

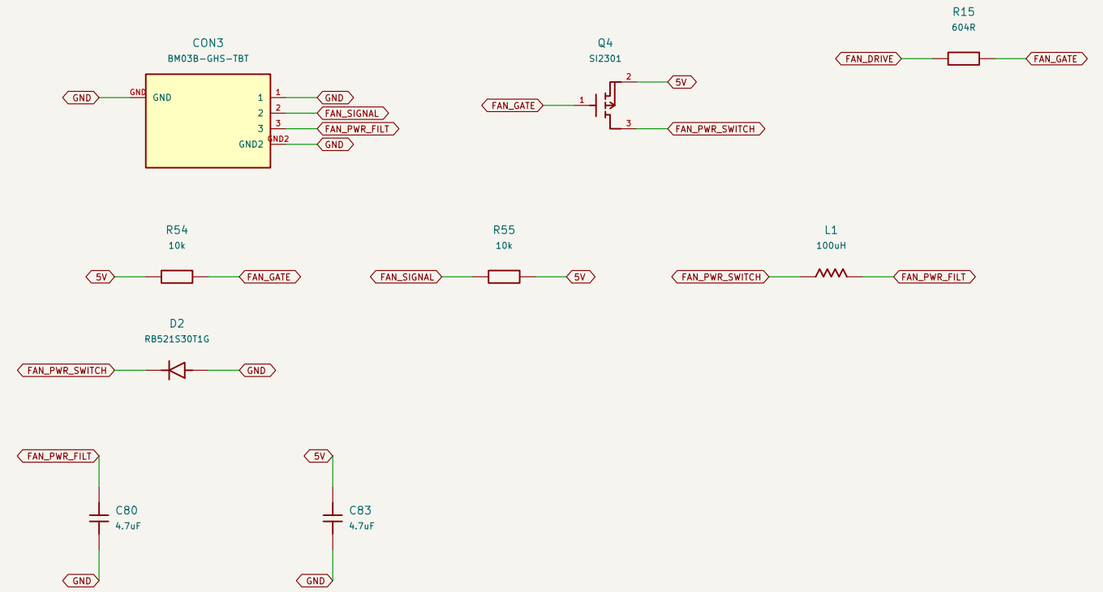
RS485 / fan / sensor heater

RS485 transceiver, direction control and two switched power outputs.

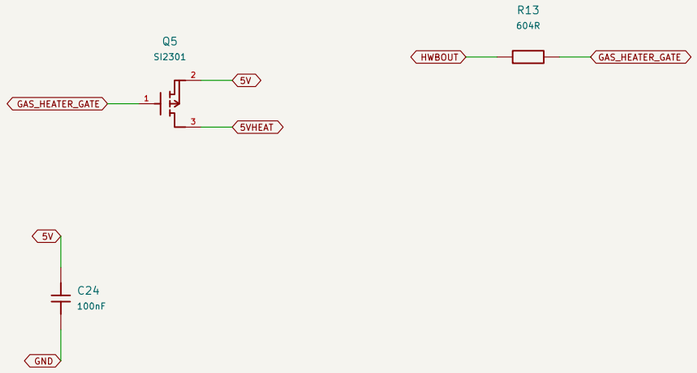
RS485 transceiver / direction



Fan output



Gas sensor heater



SHPI.zero | Functional schematic

SHPI

Sheet: /RS485 / fan / sensor heater/
File: 06_Outputs_RS485.kicad_sch

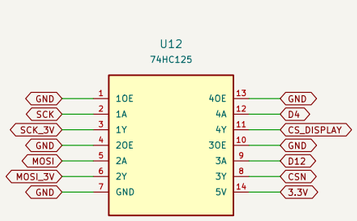
Title: SHPI.zero / Outputs RS485

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 6/26

SPI level shifter / radio modules

SPI level shifter and two separate radio module options.

SPI level shifter

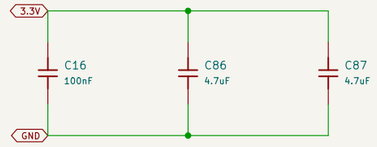








CC1101 module



SHPI.zero | Functional schematic

SHPI

Sheet: /SPI level shifter / radio modules/
File: 07_Radio_SPI.kicad_sch

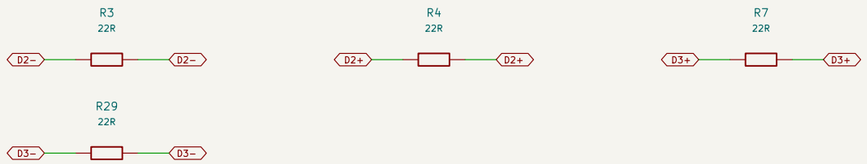
Title: SHPI.zero / Radio SPI

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 7/26

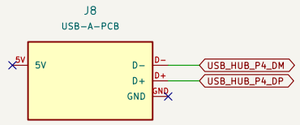
USB hub / connections

HS8836 USB hub with supply, reference branch and four downstream data ports.

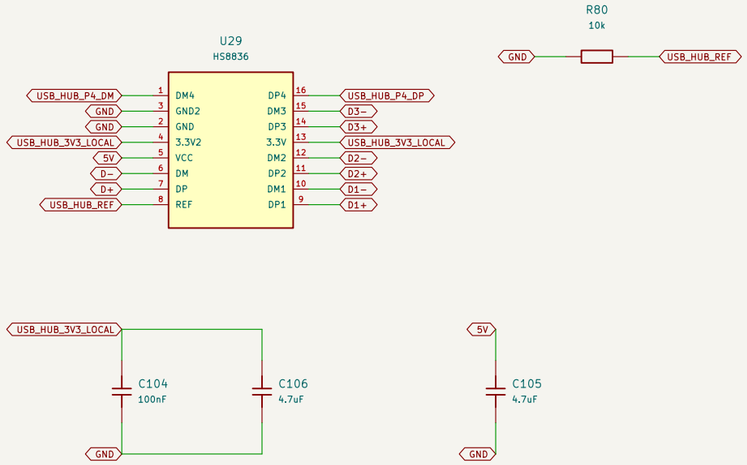
USB data branches



USB PCB contacts



HS8836 USB hub



SHPI.zero | Functional schematic

SHPI

Sheet: /USB hub / connections/
File: 08_USB_Hub.kicad_sch

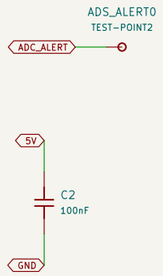
Title: SHPI.zero / USB Hub

Size: A3	Date: 2026−11−07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 8/26

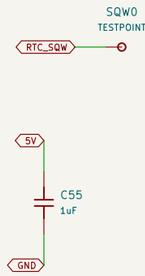
I2C expansion / ADC / DAC / RTC

Port expander, analog-to-digital converter, digital-to-analog converter and real-time clock.

ADS1015 ADC



DS1307 RTC



MCP4725 DAC



SHPI.zero | Functional schematic

SHPI

Sheet: /I2C expansion / ADC / DAC / RTC/
File: 09_I2C_Expansion.kicad_sch

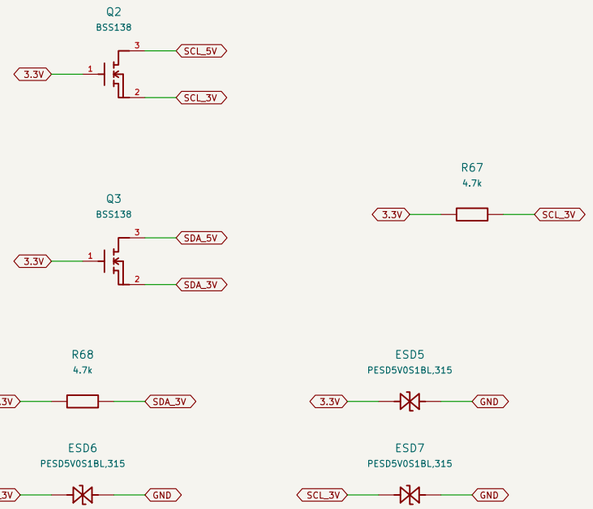
Title: SHPI.zero / I2C Expansion

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 9/26

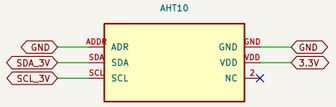
I2C level / climate / air quality / light

Level shifter, digital environmental and light sensors and common reset.

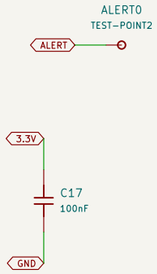
I2C 5V / 3.3V / protection



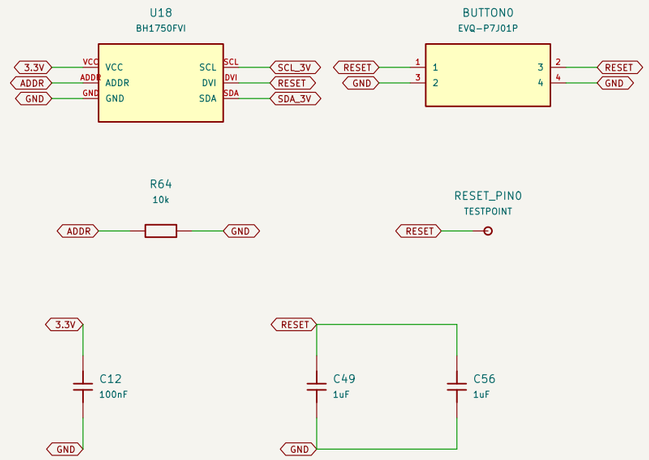
AHT10 humidity / temperature



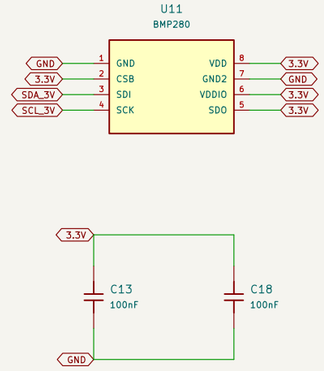
SHT3x humidity / temperature



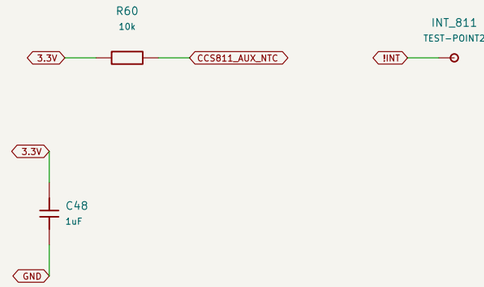
BH175x / system reset



BMP/BME280 / BME680 options



CCS811 / compensation



SHPI.zero | Functional schematic

SHPI

Sheet: /I2C level / climate / air quality / light/
File: 10_I2C_Climate.kicad_sch

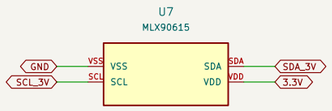
Title: SHPI.zero / I2C Climate

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 10/26

Motion / temperature / thermal imaging

PIR evaluation, contactless temperature measurement, thermal imaging sensor and IMU.

MLX90615 temperature





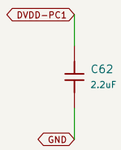
AMG8833 thermal imaging

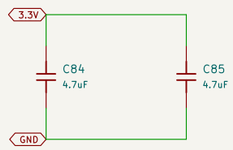




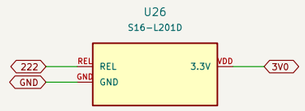








PIR / S16-L201D





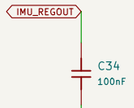






MPU-9250 IMU





SHPI.zero | Functional schematic
SHPI

Sheet: /Motion / temperature / thermal imaging/
File: 11_Motion_Thermal.kicad_sch

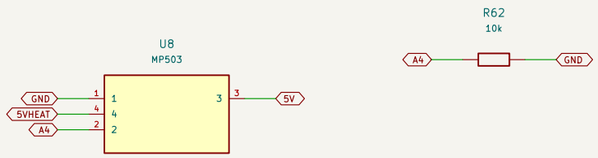
Title: SHPI.zero / Motion Thermal

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 11/26

Analog gas sensors / NTC

Analog gas sensors, heater paths and temperature/current input.

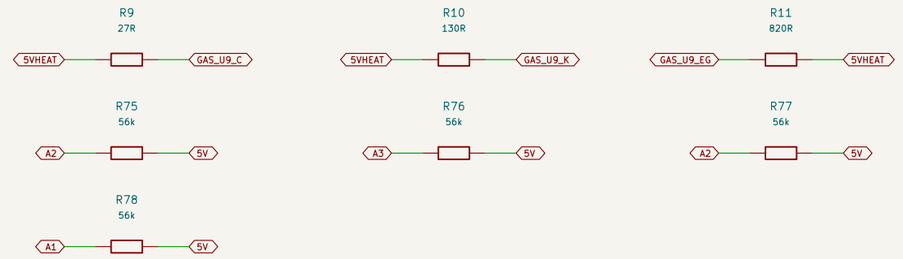
MP503 gas sensor / heater



NTC / current input



MICS sensor / heating resistors



SHPI.zero | Functional schematic

SHPI

Sheet: /Analog gas sensors / NTC/
File: 12_Gas_Analog.kicad_sch

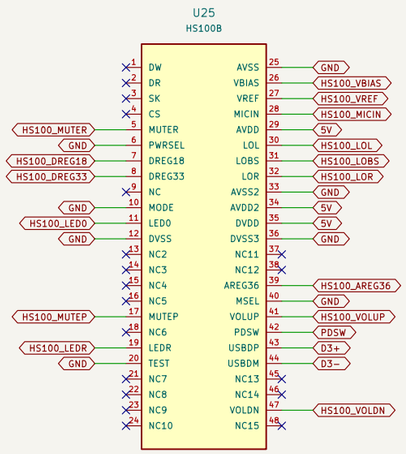
Title: SHPI.zero / Gas Analog

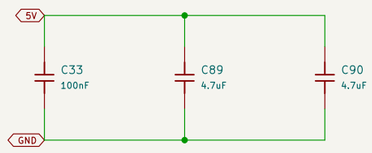
Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 12/26

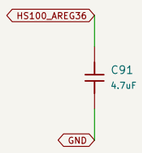
USB audio / HS100B

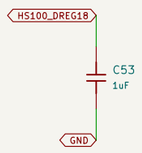
USB audio codec with supply, control test pads and output coupling.

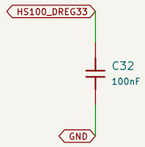
HS100B / USB

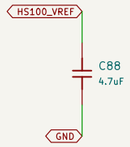




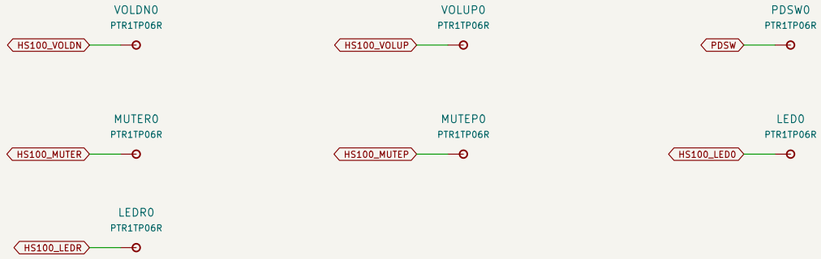




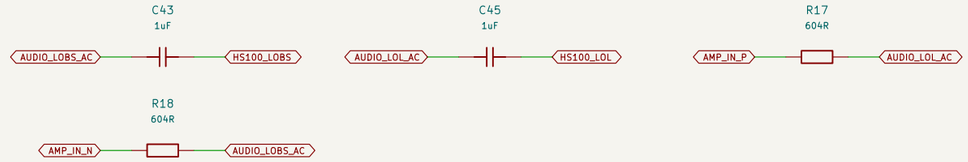




Control/status pads



Audio output coupling



SHPI.zero | Functional schematic

SHPI

Sheet: /USB audio / HS100B/
File: 13_USB_Audio_Codec.kicad_sch

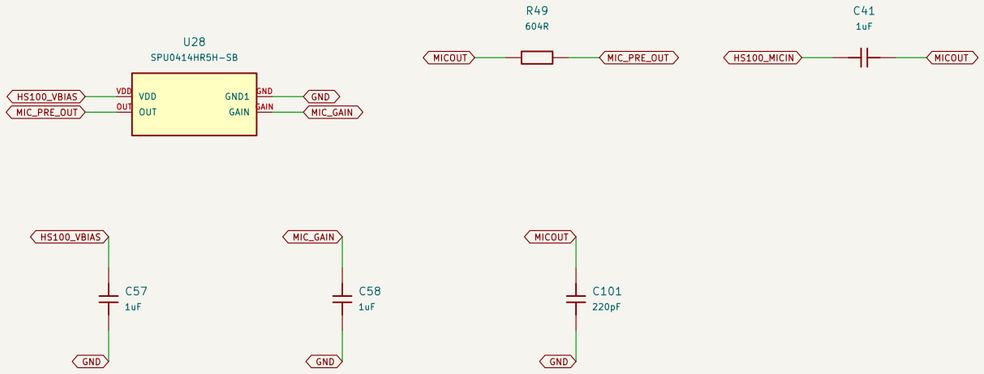
Title: SHPI.zero / USB Audio Codec

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 13/26

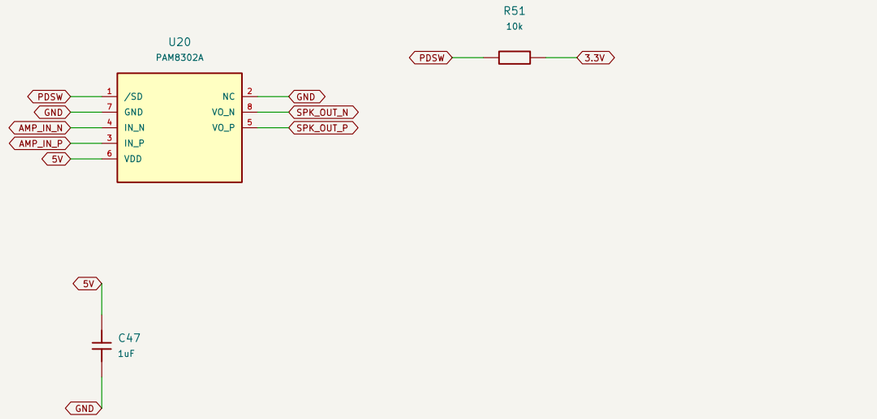
Audio power amplifier / microphone / FM

Speaker amplifier, active microphone and FM transmitter with clock and output circuitry.

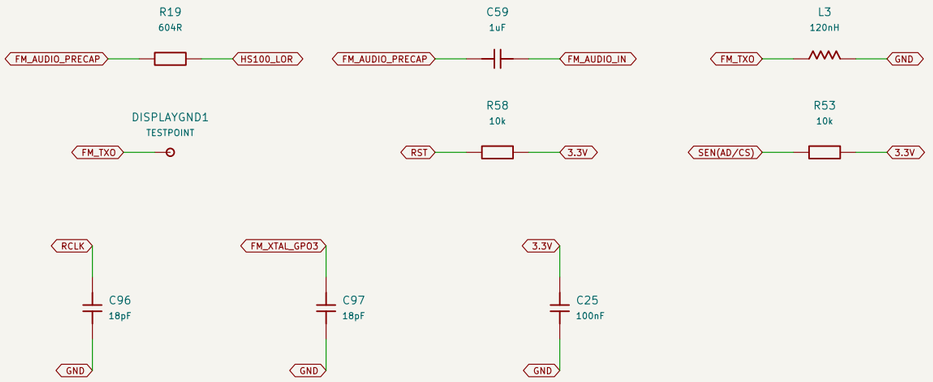
Active microphone



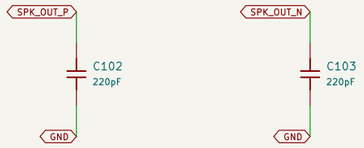
PAM8302A output stage



Si471x FM transmitter



Speaker / output filter



SHPI.zero | Functional schematic

SHPI

Sheet: /Audio power amplifier / microphone / FM/
File: 14_Audio_Analog.kicad_sch

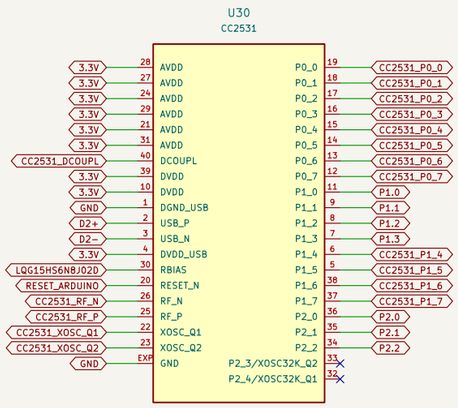
Title: SHPI.zero / Audio Analog

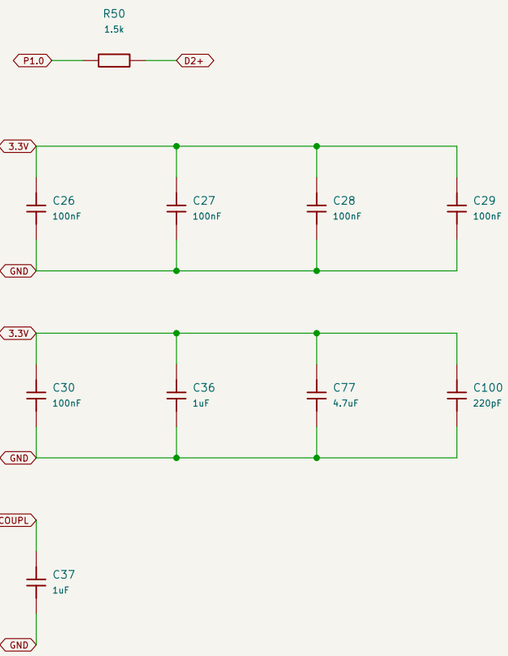
Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 14/26

CC2531 / 2.4 GHz radio / programming

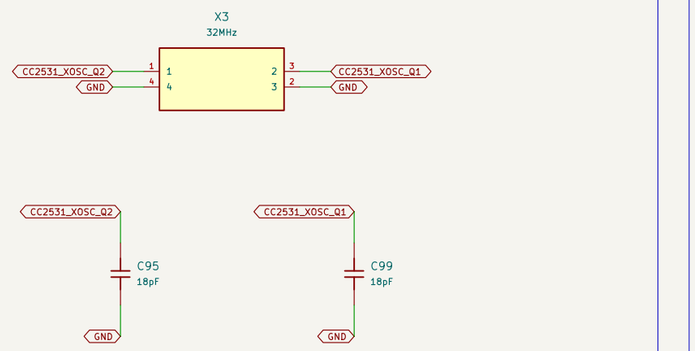
CC2531 radio controller with USB, clock, matching network and GPIO/programming interfaces.

CC2531 supply / USB

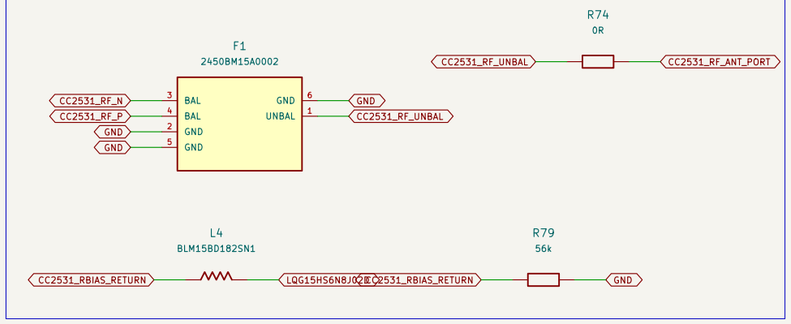




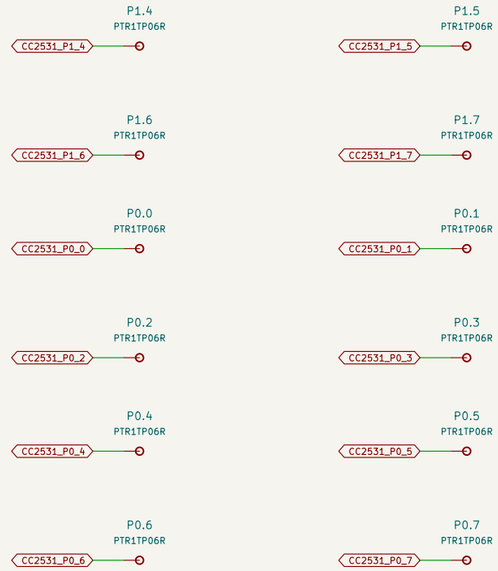
CC2531 / 32 MHz clock



CC2531 RF / bias / antenna



CC2531 GPIO test pads



CC2531 status LED



SHPI.zero | Functional schematic

SHPI

Sheet: /CC2531 / 2.4 GHz radio / programming/
File: 15_CC2531.kicad_sch

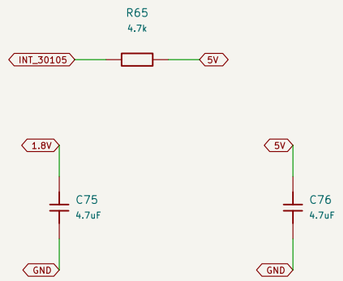
Title: SHPI.zero / CC2531

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 15/26

Optical sensor / MAX30105

MAX30105 with separate supply planes, interrupt and LED driver test contacts.

MAX30105 sensor



SHPI.zero | Functional schematic

SHPI

Sheet: /Optical sensor / MAX30105/
File: 16_Optical_Sensor.kicad_sch

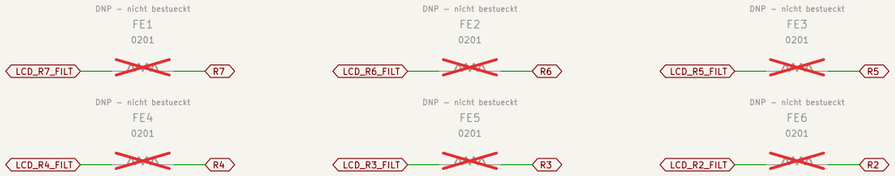
Title: SHPI.zero / Optical Sensor

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 16/26

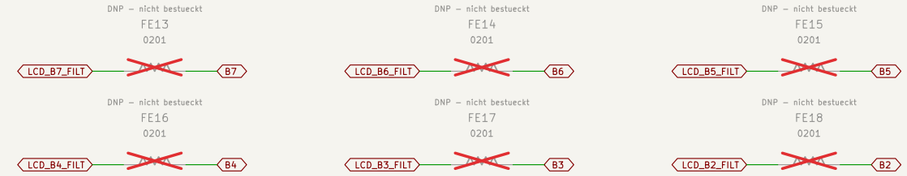
DNP / Options: Display / RGB and timing filters

DNP = not populated (option).

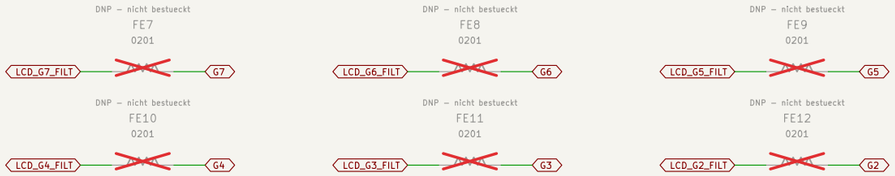
Red bus R2–R7



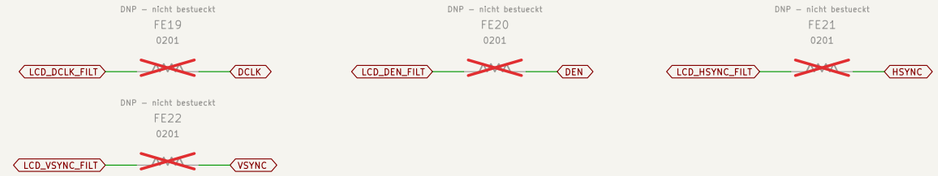
Blue bus B2–B7



Green bus G2–G7



DPI timing



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: Display / RGB and timing filters/
File: DNP_03_Display_Filter.kicad_sch

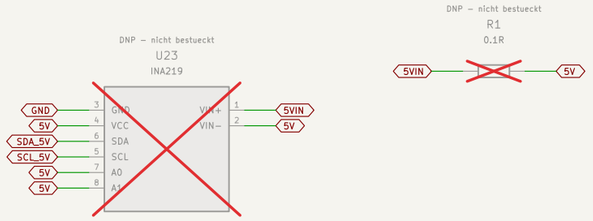
Title: SHPI.zero / DNP: Display Filter

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 17/26

DNP / Options: Supply / current measurement / backlight

DNP = not populated (option).

INA219 current measurement



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: Supply / current measurement / backlight/
File: DNP_04_Power_Backlight.kicad_sch

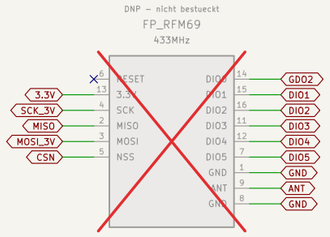
Title: SHPI.zero / DNP: Power Backlight

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 18/26

DNP / Options: SPI level shifter / radio modules

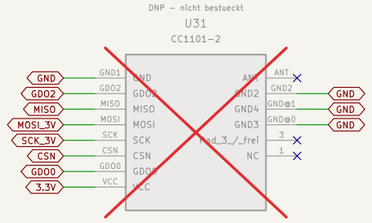
DNP = not populated (option).

RFM69 option





CC1101 module



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: SPI level shifter / radio modules/
File: DNP_07_Radio_SPI.kicad_sch

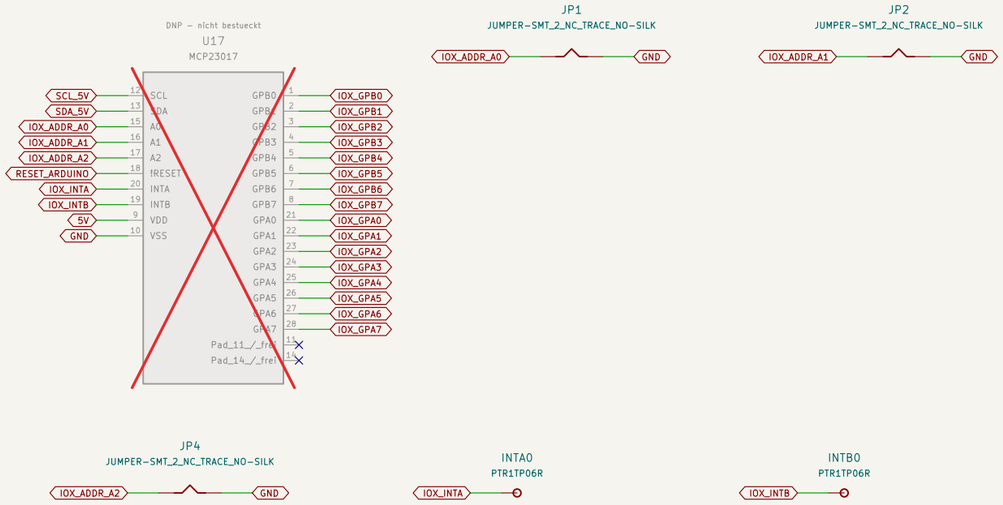
Title: SHPI.zero / DNP: Radio SPI

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 19/26

DNP / Options: I2C expansion / ADC / DAC / RTC

DNP = not populated (option).

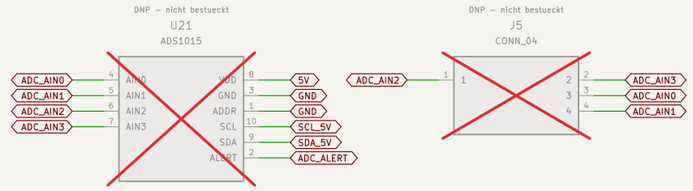
MCP23017 GPIO expander



GPIO connectors J1–J4



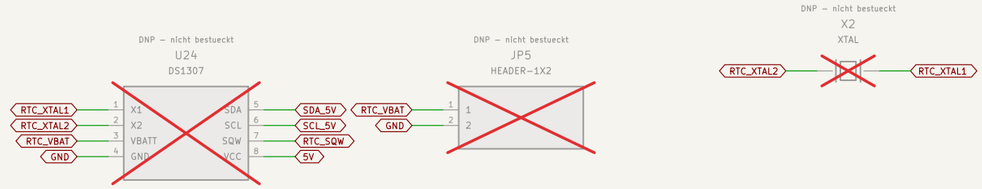
ADS1015 ADC



MCP4725 DAC



DS1307 RTC



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: I2C expansion / ADC / DAC / RTC/
File: DNP_09_I2C_Expansion.kicad_sch

Title: SHPI.zero / DNP: I2C Expansion

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 20/26

DNP / Options: I2C level shifter / climate / air quality / light

DNP = not populated (option).

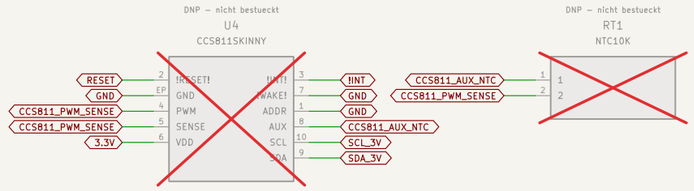
BMP/BME280 / BME680 options



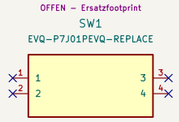
SHT3x humidity / temperature



CCS811 / compensation



Additional push button area



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: I2C level shifter / climate / air quality / light/
File: DNP_10_I2C_Climate.kicad_sch

Title: SHPI.zero / DNP: I2C Climate

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 21/26

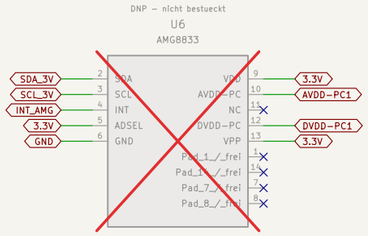
DNP / Options: Motion / temperature / thermal imaging

DNP = not populated (option).

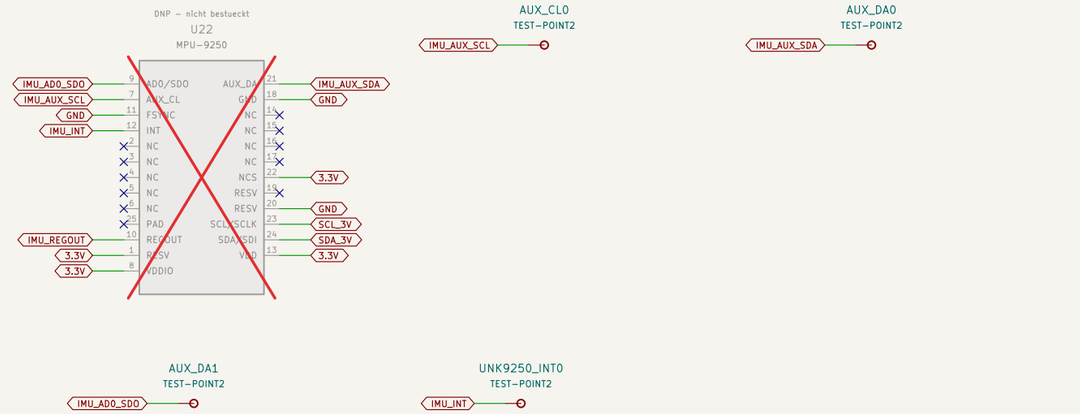
MLX90615 temperature



AMG8833 thermal imaging



MPU–9250 IMU



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: Motion / temperature / thermal imaging/
File: DNP_11_Motion_Thermal.kicad_sch

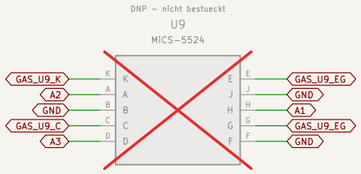
Title: SHPI.zero / DNP: Motion Thermal

Size: A3	Date: 2026–11–07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 22/26

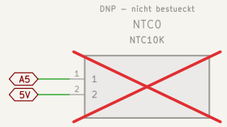
DNP / Options: Analog gas sensors / NTC

DNP = not populated (option).

MICS sensor / heating resistors



NTC / current input



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: Analog gas sensors / NTC/
File: DNP_12_Gas_Analog.kicad_sch

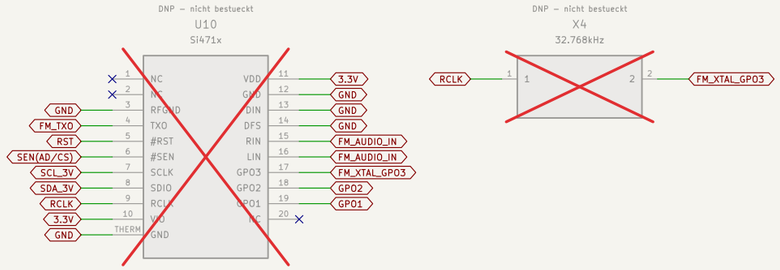
Title: SHPI.zero / DNP: Gas Analog

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 23/26

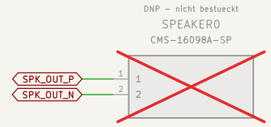
DNP / Options: Audio power amplifier / microphone / FM

DNP = not populated (option).

Si471x FM transmitter



Speaker / output filter



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: Audio power amplifier / microphone / FM/
File: DNP_14_Audio_Analog.kicad_sch

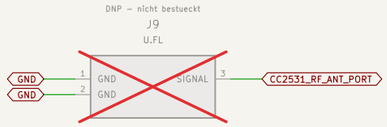
Title: SHPI.zero / DNP: Audio Analog

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 24/26

DNP / Options: CC2531 / 2.4 GHz radio / programming

DNP = not populated (option).

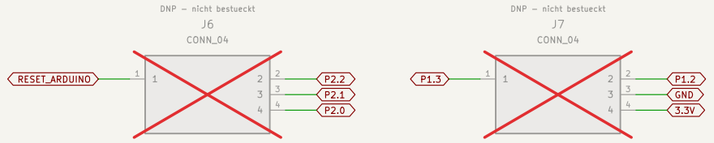
CC2531 RF / bias / antenna



CC2531 status LED



CC2531 programming/GPIO connector



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: CC2531 / 2.4 GHz radio / programming/
File: DNP_15_CC2531.kicad_sch

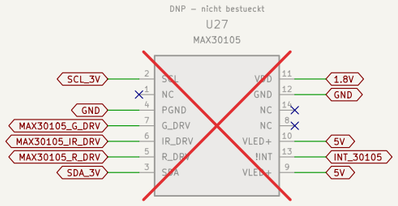
Title: SHPI.zero / DNP: CC2531

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 25/26

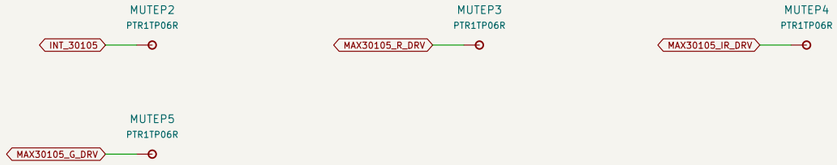
DNP / Options: Optical sensor / MAX30105

DNP = not populated (option).

MAX30105 sensor



LED driver / interrupt test pads



SHPI.zero | Functional schematic

SHPI

Sheet: /DNP / Options: Optical sensor / MAX30105/
File: DNP_16_Optical_Sensor.kicad_sch

Title: SHPI.zero / DNP: Optical Sensor

Size: A3	Date: 2026-11-07	**Rev: R1**
KiCad E.D.A. 10.0.6		Id: 26/26