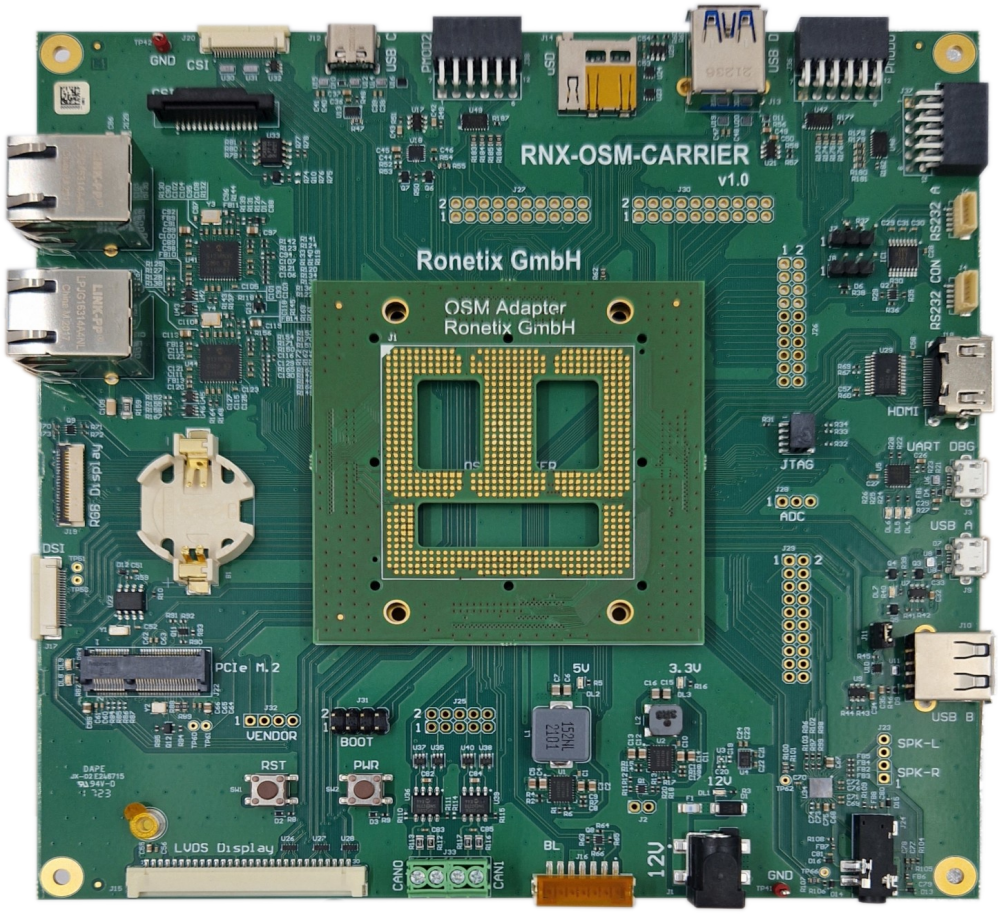
RONETIX

High-performance System on Module (SOM)

RNX-OSM-CARRIER

Base board for Open Standard Modules

Datasheet, rev 1.0



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1. Document Revision History

Revision	Date	Notes
1.0	06-July-2023	Initial release

2. Table of Contents

Table of Contents

1. Document Revision History....3
2. Table of Contents....3
3. Overview....5
3.1 General Information....5
3.1.1 Reference Documents....5
3.1.2 Board Layout....5
3.2 Highlights....6
3.3 Block Diagram....7
3.4 RNX-OSM-CARRIER Connectors....8
4. Interface description....10
4.1 Power supply....10
4.1.1 Power supply input....10
4.1.2 Power out headers....10
4.2 Buttons....11
4.2.1 PWR_BTN# button....11
4.2.2 RST button....11
4.2.3 Boot Mode....12
4.3 LEDs....12
4.4 Ethernet....12
4.5 USB Interface....13
4.5.1 USB-A 2.0 OTG....13
4.5.2 USB-B 2.0 Host....13
4.5.3 USB-C, 3.0, Type-C....14
4.5.4 USB-D, 3.0, Host....14
4.6 SD card....15
4.7 LVDS Display....16

4.8 RGB Parallel Display....16
4.9 HDMI Display....17
4.10 MIPI DSI....18
4.11 Audio....19
4.12 Camera....20
4.13 USB debug UART....21
4.14 GPIO....21
4.15 RTC Clock....22
4.16 PCIe M.2....22
4.17 CAN Interface....23
4.18 PMOD Interface....23
4.19 JTAG....24
5. Warranty Terms....25

3. Overview

3.1 General Information

The **RNX-OSM-CARRIER** base board is designed to explore the functionality and performance of SoMs in Open Standard Module formfactor. The board is equipped with four 100pin Hirose DF40C conectors, on top of which the adapter board **RNX-OSM-ADAPTER** is mounted.

The **RNX-OSM-ADAPTER** allows easy replacement and soldering of various OSM modules.

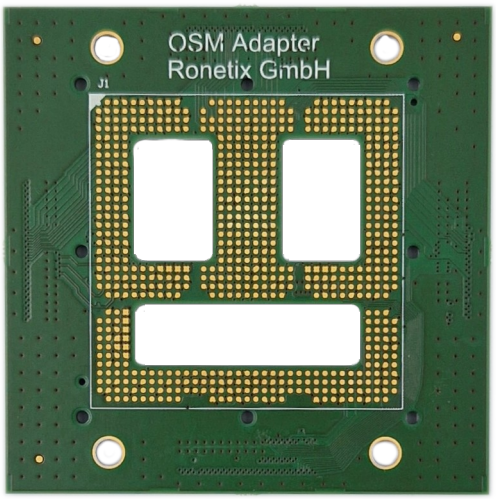


Figure 3.1: OSM-ADAPTER top side

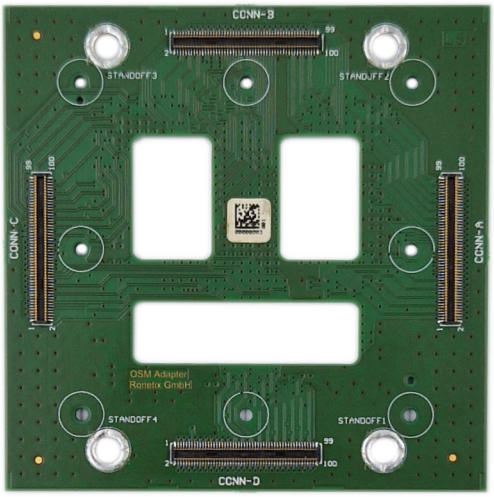


Figure 3.2: OSM-ADAPTER bottom side

3.1.1 Board Layout

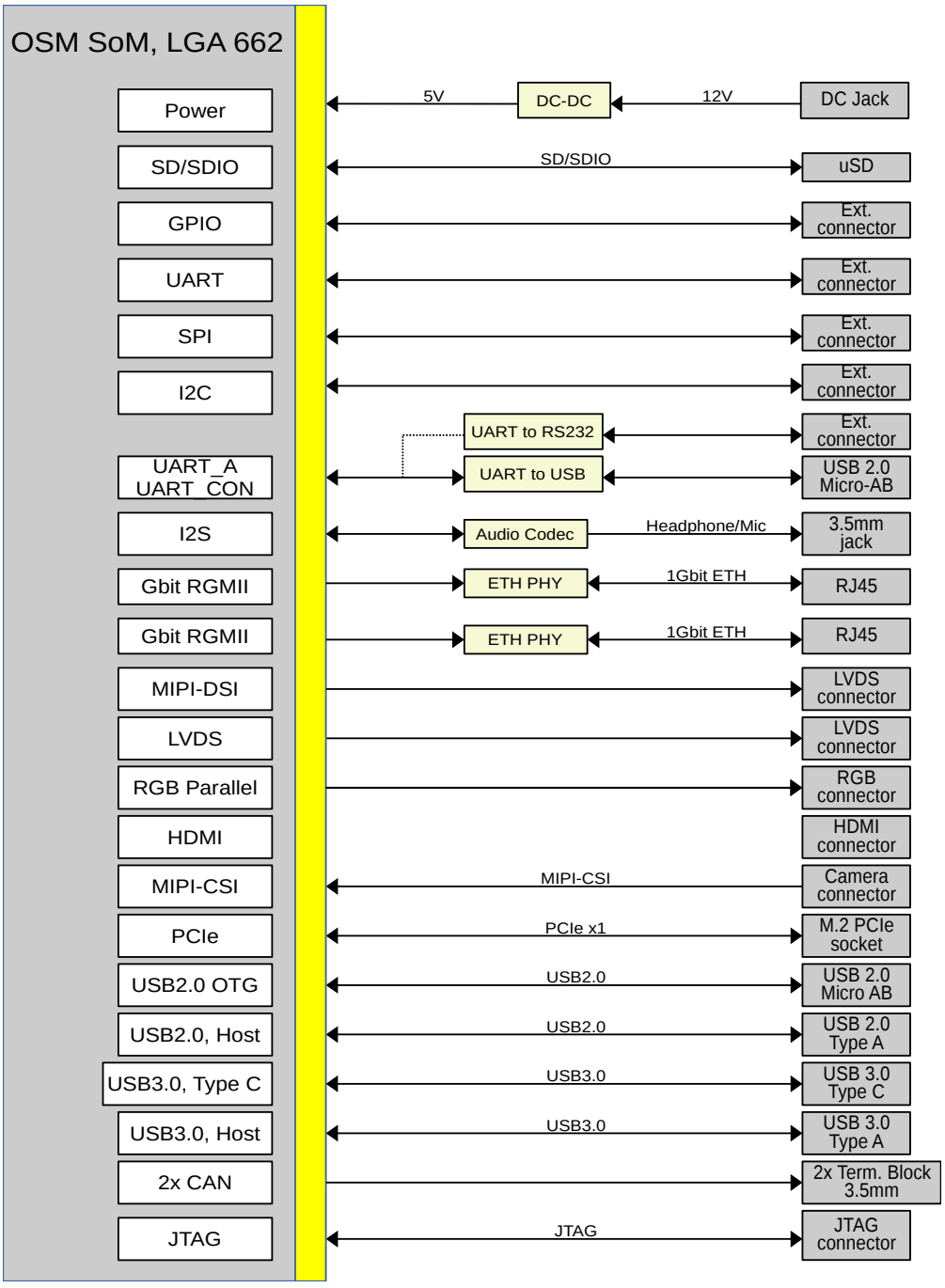
The RNX-OSM-CARRIER physical dimensions are 170.0 x 190.0 mm.

3.2 Highlights

The RNX-OSM-CARRIER board provides the following features and interfaces:

- four 100pin Hirose DF040 connectors for mounting of RNX-OSM-ADAPTER
- 2x Ethernet 10/100/1000BaseT – RJ45
- USB-A: USB2.0 OTG, micro AB
- USB-B: USB2.0 Host, Type A
- USB-C: USB3.0, Type C
- USB-D: USB3.0, Host, Type A
- USB debug UART_A and UART_CON, micro AB
- micro-SD card slot
- M.2 PCIe Connector
- MIPI-DSI connector
- MIPI-CSI connector
- LVDS Display interface
- HDMI connectors
- RGB Parallel Display connector
- Audio
  - 3.5mm jack for Headphones and Microphone
  - 1W Speakers
- GPIO headers
- 2x CAN Interface connectors
- 3x PMOD connectors

3.3 Block Diagram



3.4 RNX-OSM-CARRIER Connectors

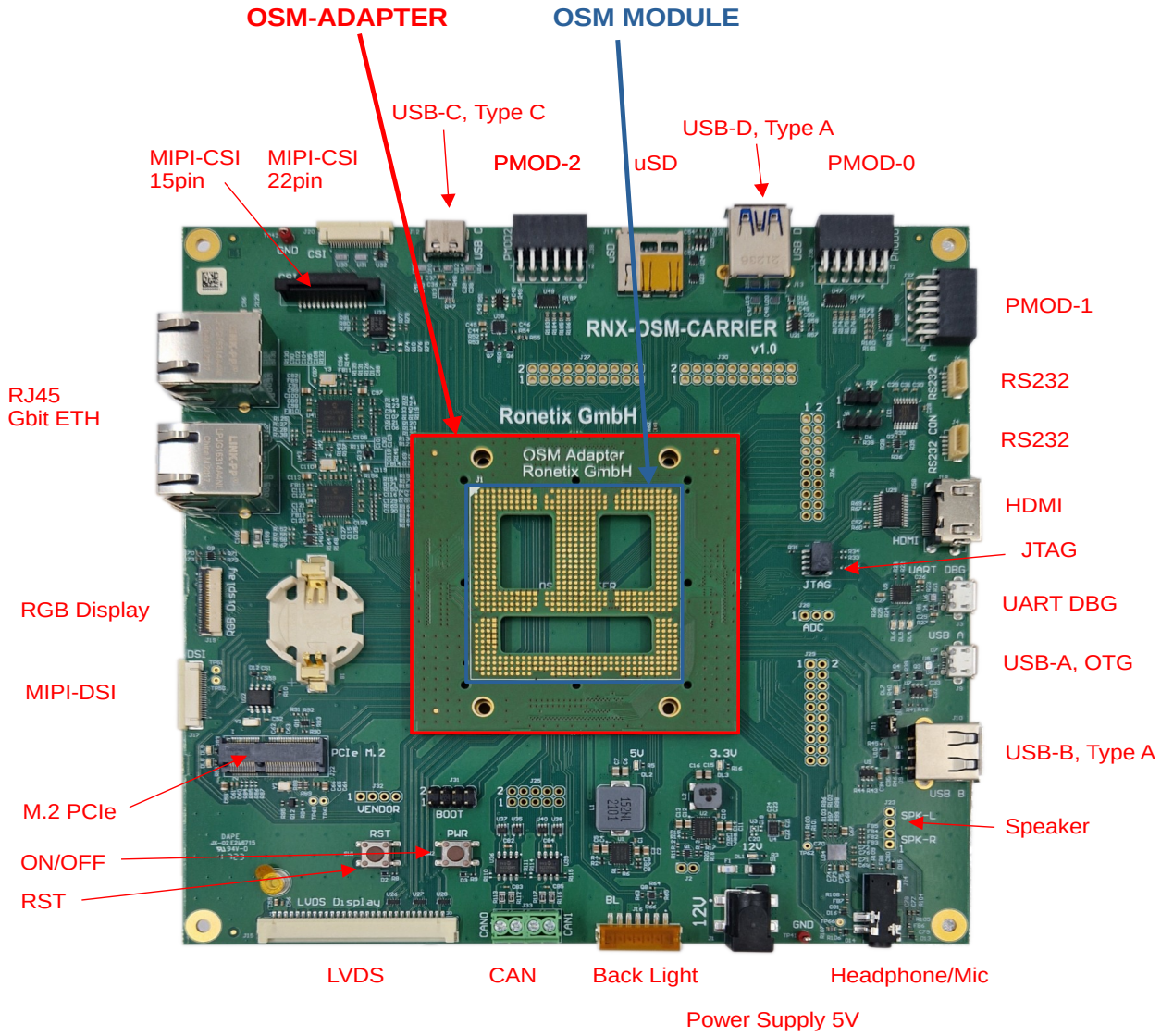


Figure 3.3:

Reference	Function	Type
CONN-A CONN-B CONN-C CONN-D	OSM-ADAPTER connector	Hirose DF40C-100DS-0.4V(51)
J1	Power Supply	DC Jack, 2.1mm
J2	Force ON 1.8V and 3.3V	Header 2x1, 2.54mm
J3	USB Debug UART	USB Micro-AB

Reference	Function	Type
J4	RS232 UART Console	BM05B-SRSS-TB
J5	JTAG	HEADER SMD 2X5/50/0GR
J6	RS232 UART-A	BM05B-SRSS-TB
J7	1-2: UART Console to USB DBG 2-3: UART Console to RS232 conn	Header 3x1, 2.54mm
J8	1-2: UART-A to USB DBG 2-3: UART-A to RS232 connector	Header 3x1, 2.54mm
J9	USB-A OTG (2.0)	USB 2.0 Micro AB
J10	USB-B Host (2.0)	USB Type-A
J11	Close: USB-B routed to BT module M2 PCIe connector Open: USB-B routed to USB Host Type A connector	Header 2x1, 2.54mm
J12	USB-C, OTG (3.0)	USB Type C
J13	USB-D, Host (3.0)	USB Type A, 3.0
J14	Micro SD	Micro SD
J15	LVDS	30pin, DF14-30P-1.25H
J16	Display back light	7-pin, B7B-PH-SM4-TB
J17	MIPI-DSI	FFC, TE-2-1734592-2
J18	HDMI Display	10029449-111RLF
J19	RGB Display	FH23-45S-0.3SHAW(05)
J20	MIPI-CSI	22-pin, TE-2-1734592-2
J21	MIPI-CSI	15-pin, TE-1-1734248-5
J22	M.2 PCIe	MDT420E01001
J23	Speakers	Header 2x2, 2.54mm
J24	Headphones & Microphone	SJ-43515RS-SMT
J25	Power supplies	Header 5x2, 2.54mm
J26, J27, J29, J30	GPIOs	Header 10x2, 2.54mm
J28	ADC-0 and ADC-1	Header 3x1, 2.54mm
J31	Boot mode select	Header 4x2, 2.54mm
J32	OSM vendor defined	Header 4x1, 2.54mm

Reference	Function	Type
J33	2x CAN Interface	PT1.5/4-3.5-H
J34	Ethernet 1	RJ45
J35	Ethernet 2	RJ45
J36	PMOD-0, Type 2A, SPI	SSW-106-02-T-D-RA
J37	PMOD-1, Type 3A, UART	SSW-106-02-T-D-RA
J38	PMOD-2, 6A, I2C	SSW-106-02-T-D-RA

4. Interface description

4.1 Power supply

4.1.1 Power supply input

RNX-OSM-CARRIER is powered by a +12V power supply connected through a 2.1mm barrel jack.

4.1.2 Power out headers

- **J25**, 5x2 2.54mm header provides supplies generated on the base board.

J25, PIN	Label	Voltage	Description
1	VIN_12V	12V	Power supply input
3	VSYS_5V	5V	Power supply provided to SoM
5	VCC_3V3	3.3V	Generated from 12V through 3A DC-DC converter
7	VCC_1V8	1.8V	Generated from 3.3V through 0.3A lienar converter
9	V_BAT		Connected to OSM V_BAT signal
2,4,6,8,10	GND		

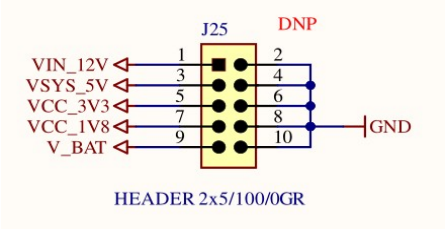


Figure 4.1: Power out connector

4.2 Buttons

RNX-OSM-CARRIER implements two buttons.

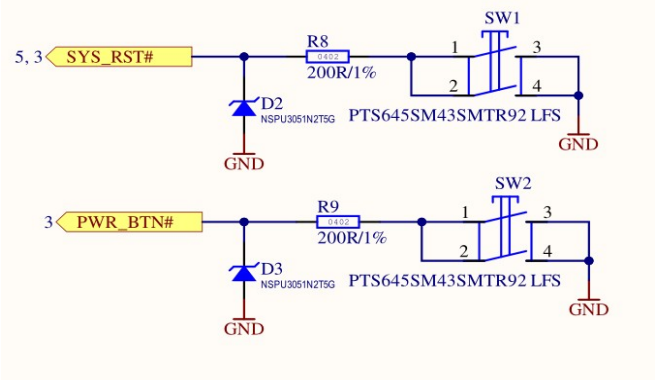


Figure 4.2: Buttons

4.2.1 PWR_BTN# button

The PWR_BT# button provides following functionality:

- Long press (> 5 sec.) - hardware shutdown without possibility for software wake-up
- Short press (< 5 sec.) - software shutdown
- Short press in OFF state – restart

4.2.2 RST button

The RST button performs a system reset.

It is connected to PMIC_RST signal on PMIC PCA9541 located on the SoM.

4.2.3 Boot Mode

J31 sets the boot mode of the CPU (‘1’ means jumper closed):

CPU pins: #BOOT_MODE[3:0]	BOOT CORE	BOOT DEVICE	COMMENT
0000	Cortex-A55	From internal fuses	
0001	Cortex-A55	Serial Downloader	USB1/2
0010	Cortex-A55	USDHC1 8-bit eMMC 5.1	with SFDP (JESD-216) discoverable
0011	Cortex-A55	USDHC2 4-bit SD3.0	parameters
0100	Cortex-A55	FlexSPI Serial NOR	
0101	Cortex-A55	FlexSPI Serial NAND 2K page	
0110	Cortex-A55	Infinite Loop	
0111	Cortex-A55	Test Mode	
1000	Cortex-M33	From internal fuses	
1001	Cortex-M33	Serial Downloader	USB1
1010	Cortex-M33	USDHC1 8-bit eMMC 5.1	with SFDP (JESD-216) discoverable
1011	Cortex-M33	USDHC2 4-bit SD3.0	parameters
1100	Cortex-M33	FlexSPI Serial NOR	
1101	Cortex-M33	FlexSPI Serial NAND 2K page	
1110	Cortex-M33	Infinite Loop	
1111	Cortex-M33	Test Mode	

Figure 4.3: Boot mode

4.3 LEDs

LED	Color	Description
DL1	green	ON when input 12V DC power is provided
DL2	red	ON when VSYS_5V is available
DL3	red	ON when VCC_3V3 is available
DL4	green	GPIO0 on USB debug bridge CP2105
DL5	red	GPIO1 on USB debug bridge CP2105
DL6	red	ON when USB debug bridge CP2105 is powered
DL7	green	ON when VBUS on USB-A is available
DL8	red	Connected to LED1 on M.2 PCIe
DL9	red	Connected to LED2 on M.2 PCIe

4.4 Ethernet

Two Gigabit Ethernet port are available: RJ45 connector J34 and J35 with integrated magnetics and LEDs.

4.5 USB Interface

The RNX-OSM-CARRIER features two USB2.0 ports and two USB3.0 ports.

4.5.1 USB-A 2.0 OTG

The USB-A signals from OSM Module are connected to J9.

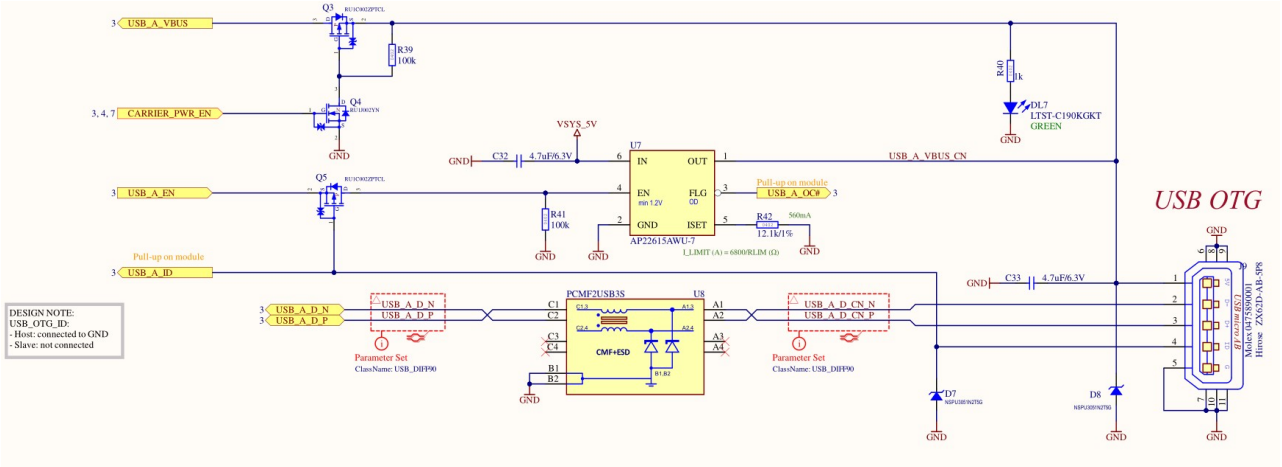


Figure 4.4: USB-A

4.5.2 USB-B 2.0 Host

The USB-B signals from OSM Module can be multiplexed to J10 or to the M.2 PCIe connector.

J11	Multiplex mode
close	Close - USB-B routed to BT module M.2 PCIe connector
open	Open – USB-B routed to USB Host Type A connector

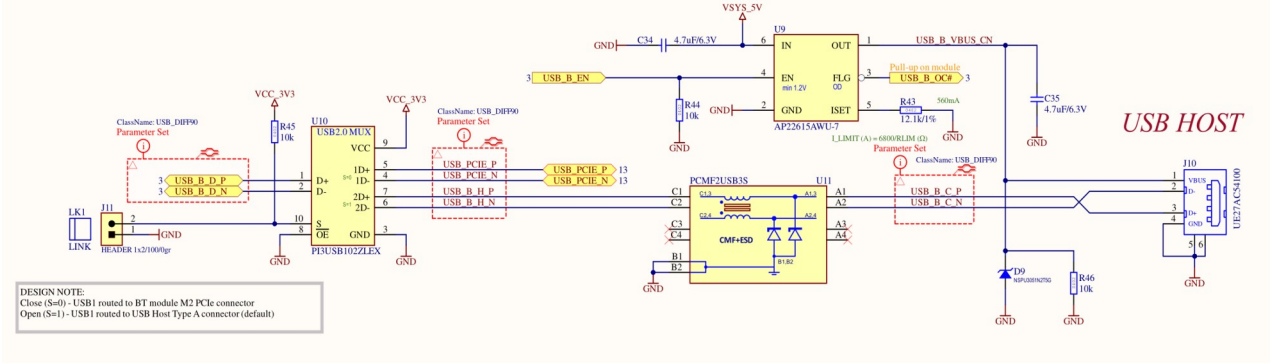


Figure 4.5: USB-B multiplexing

4.5.3 USB-C, 3.0, Type-C

The USB-C signals from OSM Module are connected to J12.

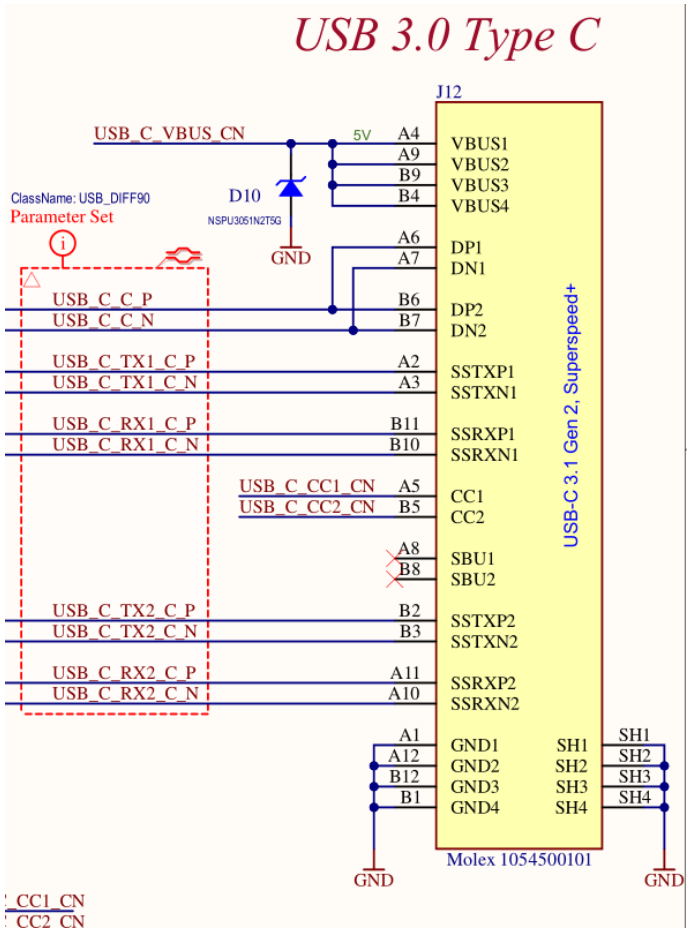


Figure 4.6: USB-C, Type C

4.5.4 USB-D, 3.0, Host

The USB-D signals from OSM Module are connected to J13, Host Type A connector.

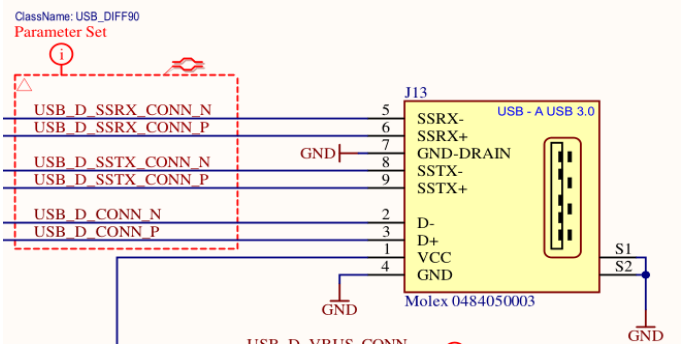


Figure 4.7: USB-D, Host, Type A

4.6 SD card

The RNX-OSM-CARRIER board features a uSD card socket which can be used as boot device or storage. Please note that the hardware supported card detect function is implemented and hardware write protect feature is not available.

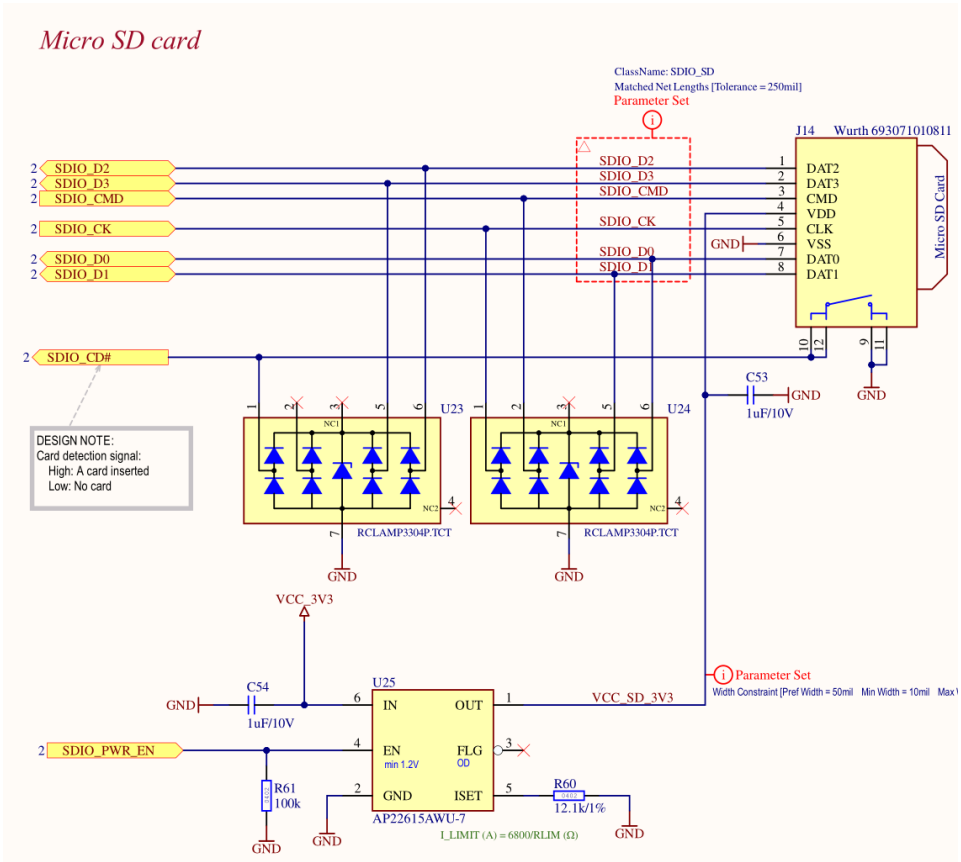


Figure 4.8: uSD card

4.7 LVDS Display

The RNX-OSM-CARRIER board exposes a 4 data lane LVDS interface driven by the LVDS signals from the OSM Module. The interface is exposed to a 30 pin connector for connecting G101ICE-L01, 10.1", 1280x800 LVDS LCD display.

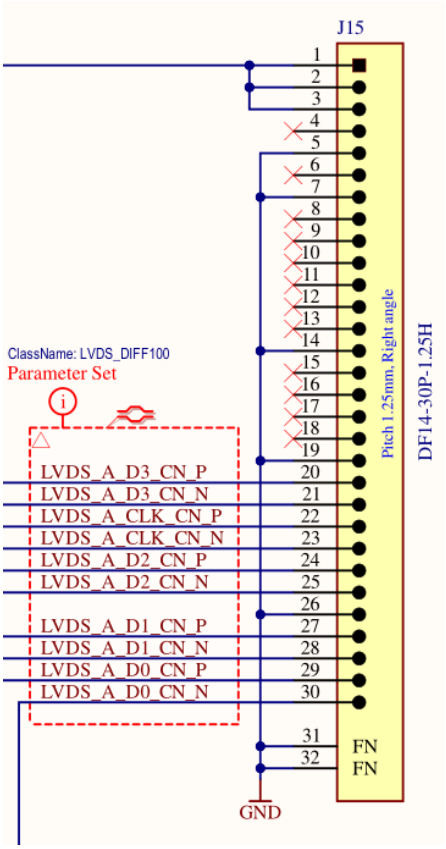


Figure 4.9: LVDS

4.8 RGB Parallel Display

The RGB signals from the OSM Module are connected to J19.

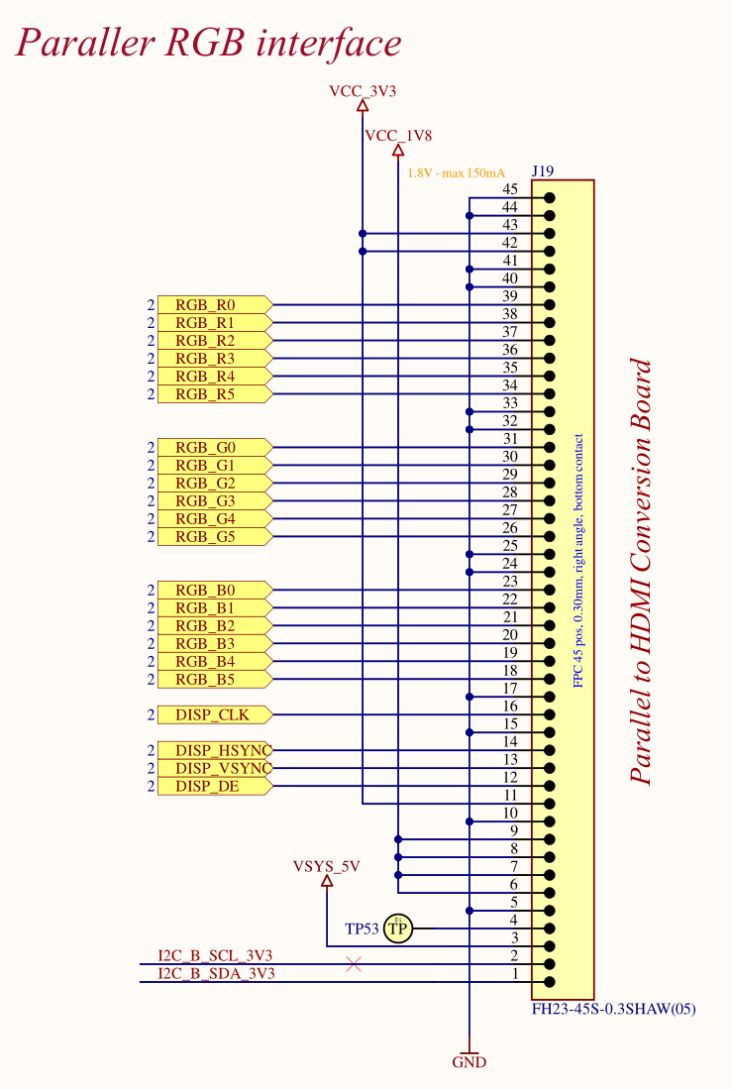


Figure 4.10: RGB Display

4.9 HDMI Display

The RGB signals from the OSM Module are connected to J18.

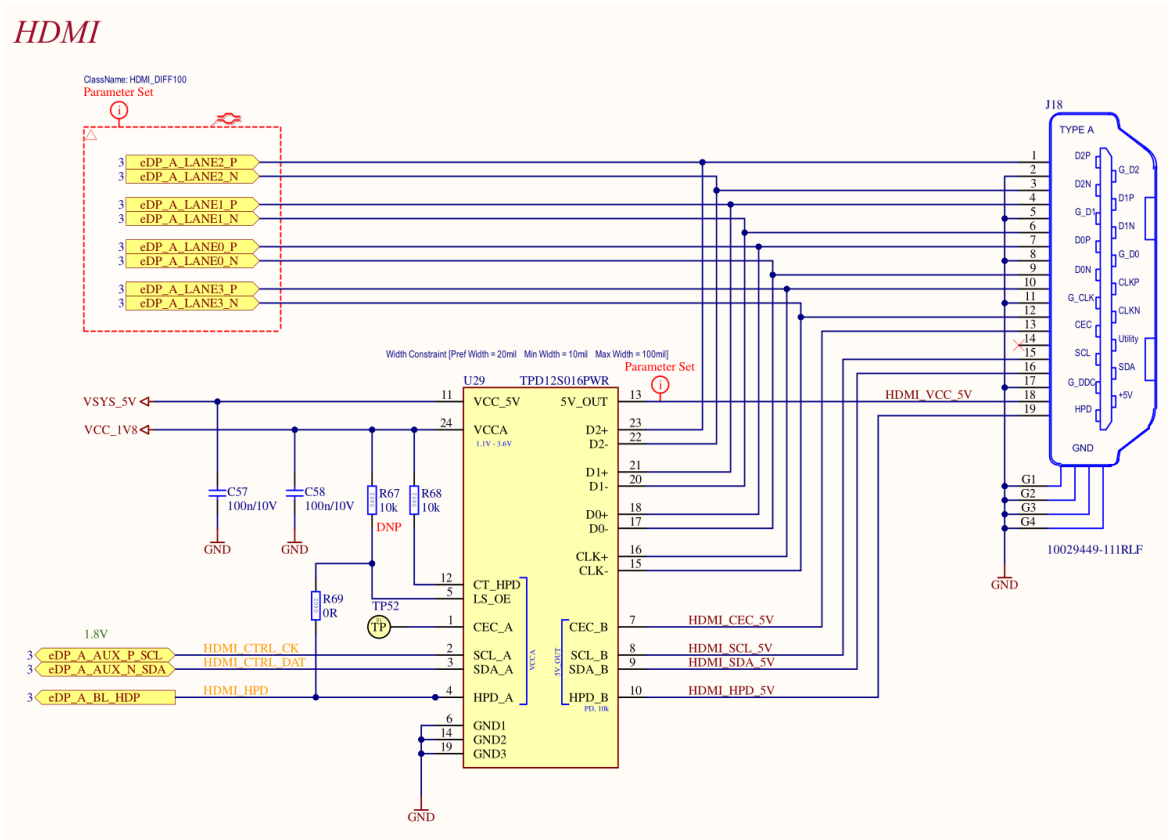


Figure 4.11: HDMI Display

4.10 MIPI DSI

The MIPI-DSI signals from the OSM Module are connected to J17.

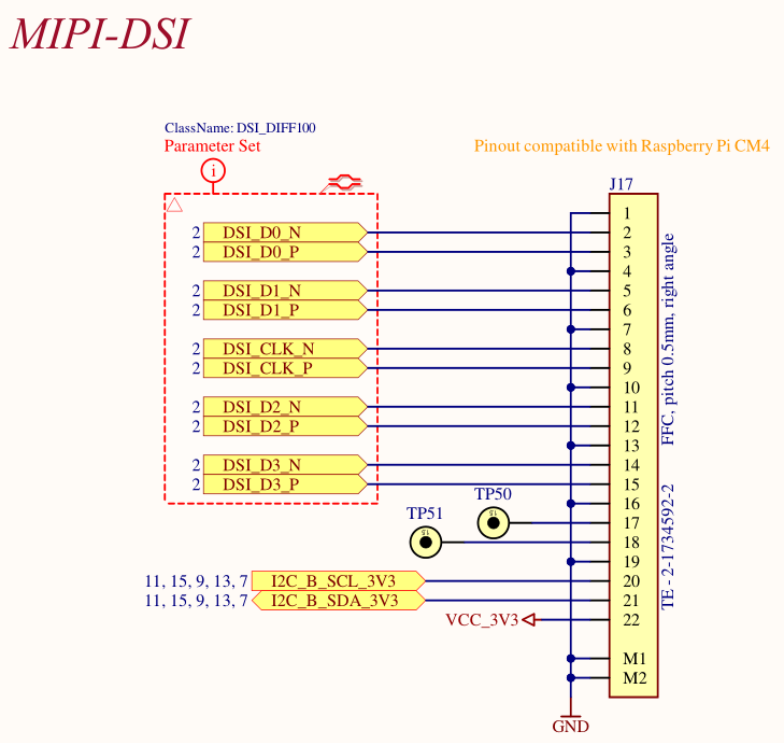


Figure 4.12: MIPI-DSI

4.11 Audio

RNX-OSM-CARRIER implements an audio codec WM8962. The WM8962 is a low power stereo codec featuring Class D speaker drivers to provide 1W per channel into 8Ω loads. External component requirements are drastically reduced as no separate microphone, speaker or headphone amplifiers are required. Advanced on-chip digital signal processing performs automatic level control for the microphone or line input. Stereo 24-bit Delta Sigma converters are used with low power oversampling digital interpolation and decimation filters and a flexible digital audio interface. The main clock can be input directly or generated internally by an onboard PLL, supporting most commonly used clocking schemes.

The WM8962 supports the following features:

- Stereo class D speaker driver, 1W per channel
- On-chip headphone driver 40mW output power into 16Ω
- Microphone interface

- Pop and click suppression
- DAC SNR 98 dB (’A’ weighted), THD -84 dB at 48 kHz, 3.3V
- ADC SNR 95 dB (’A’ weighted),THD -82 dB at 48 kHz, 3.3V
- Programmable ALC / limiter and noise gate

The RNX-OSM-CARRIER board features one 3.5mm jack for Headphones and Microphone and one Header 4x1, 2.54mm pitch for speakers.

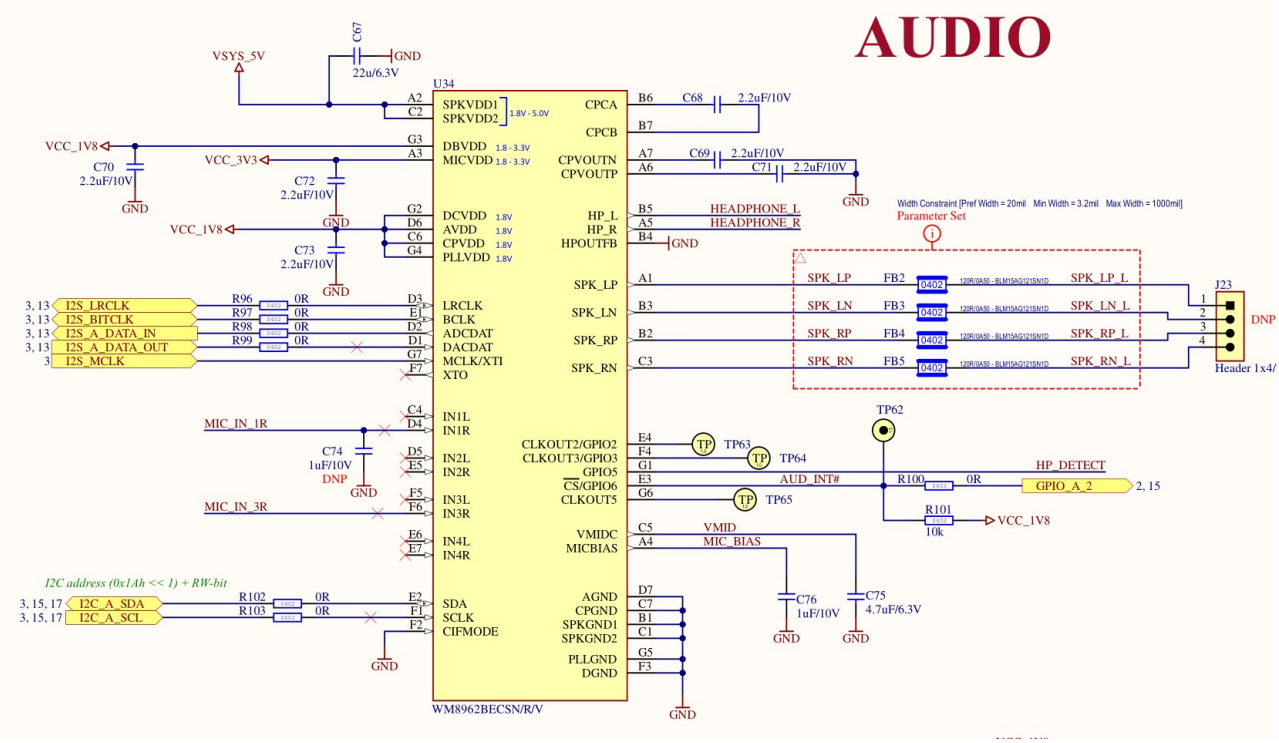


Figure 4.13: Audio

4.12 Camera

The RNX-OSM-CARRIER supports one camera sensor input using a 15-pin (J21) or 22-pin (J20) FPC connector. The 15-pin connector is suitable for PCAM 5C, 5 MP MIPI camera module with OV5640 sensor. The 22-pin connector is compatible with Raspberry Pi CM4.

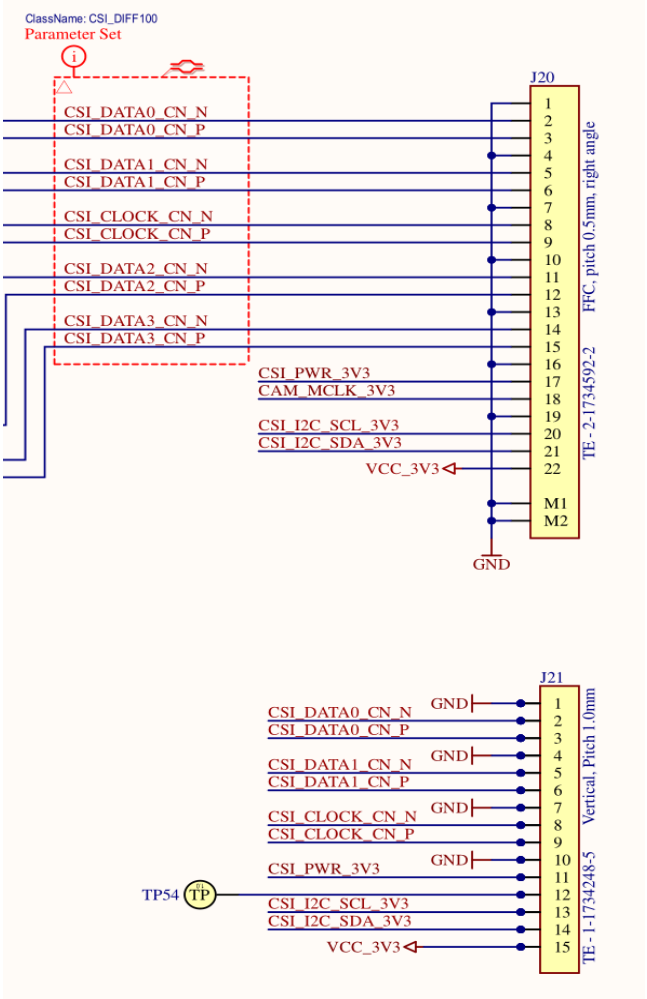


Figure 4.14: Camera

4.13 USB debug UART

RNX-OSM-CARRIER implements a USB to UART bridge (CP2105) which can be used to interface with the UART-CON and UART-A of the OSM Module.

4.14 GPIO

Various GPIOs are available on standard headers:

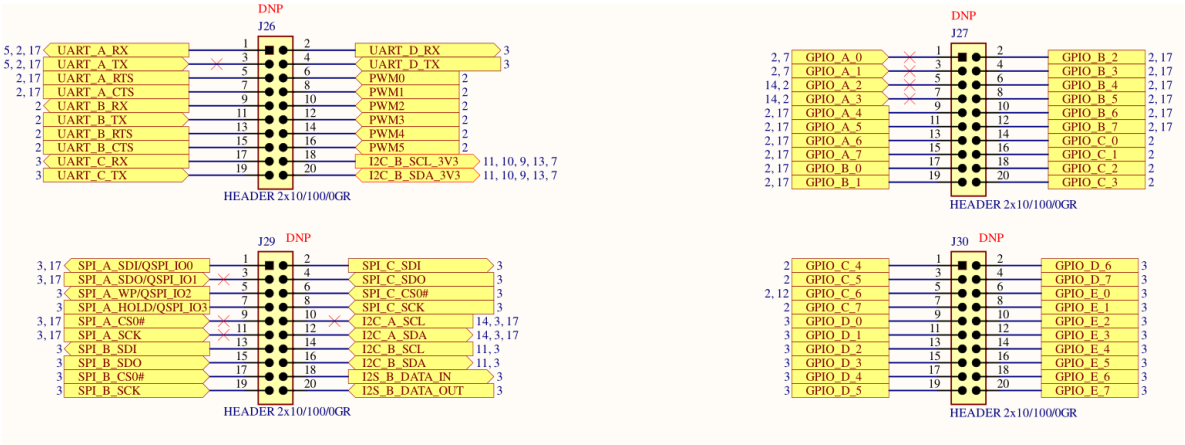


Figure 4.15: GPIO

4.15 RTC Clock

RNX-OSM-CARRIER implements a I2C RTC Clock (Renesas ISL1208IB8Z) connected to I2C-B. An external 3.0V battery is required – B1.

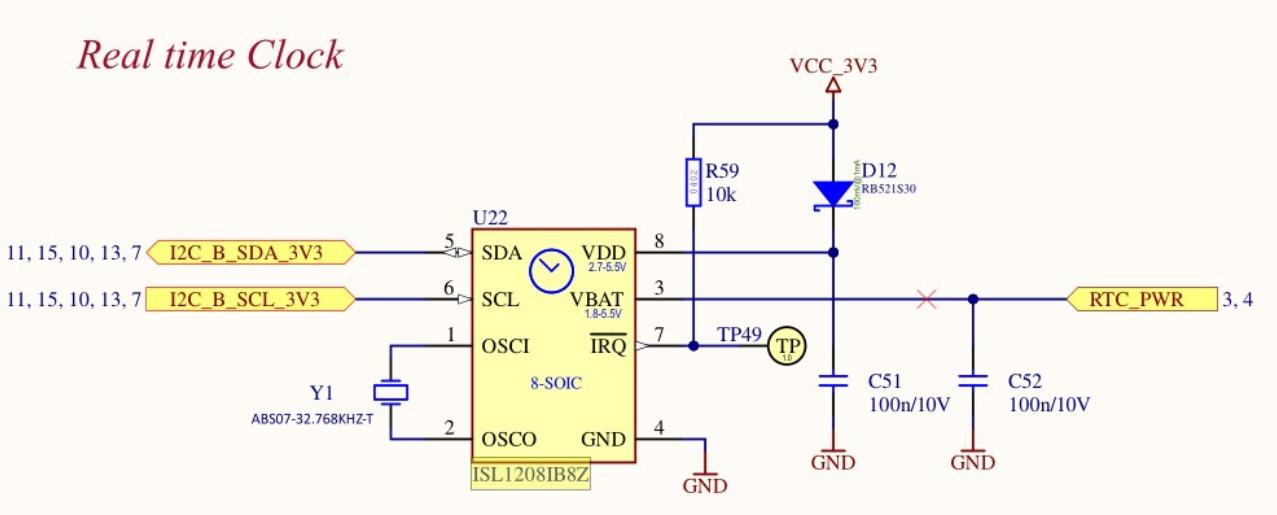


Figure 4.16: RTC clock

4.16 PCIe M.2

The RNX-OSM-CARRIER exposes one M.2 connector - J22. This port can be used for Wi-Fi/ Bluetooth cards or some 3G/4G cards.

4.17 CAN Interface

RNX-OSM-CARRIER implements two CAN bus interfaces derived from CAN0 and CAN1 of the OSM Module.

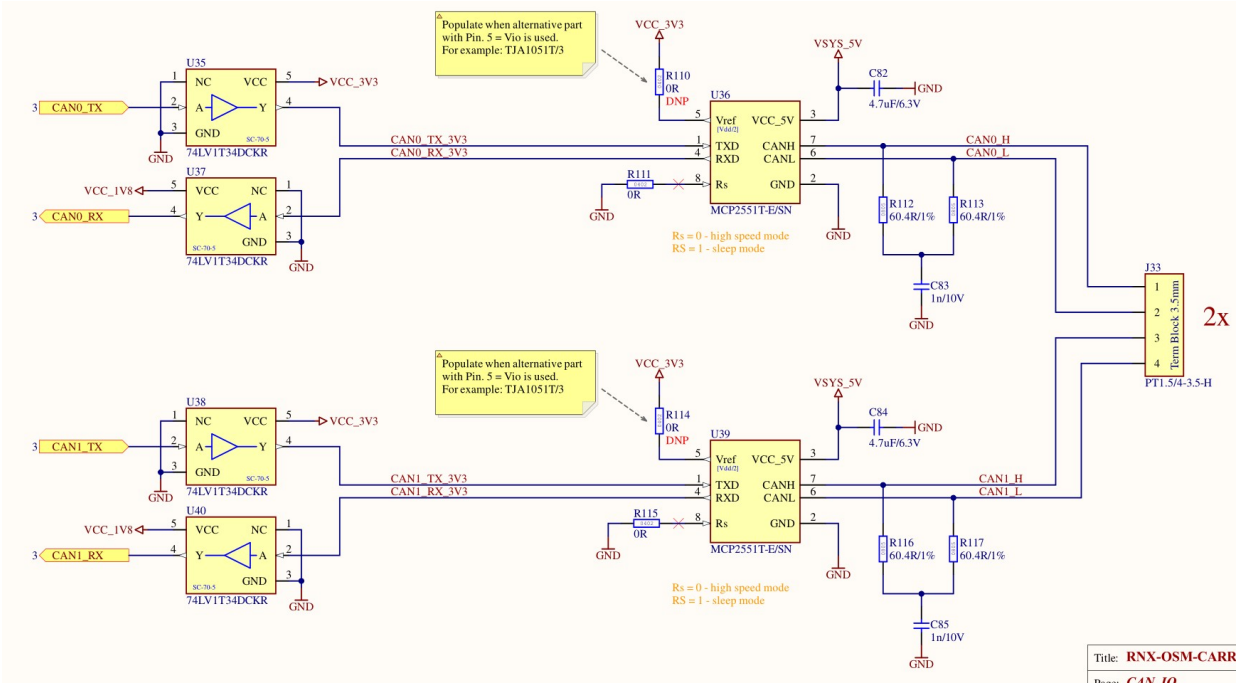


Figure 4.17: CAN interface

4.18 PMOD Interface

PMOD interface (peripheral module interface) is an open standard defined by Digilent for connecting peripheral modules to microcontroller development boards.

RNX-OSM-CARRIER provides three PMOD connectors:

- PMOD-0, Type-2A, SPI
- PMOD-1, Type-3A, UART
- PMOD-2, Type-6A, I2C

The PMOD signals are derived from the OSM module through level shifters.

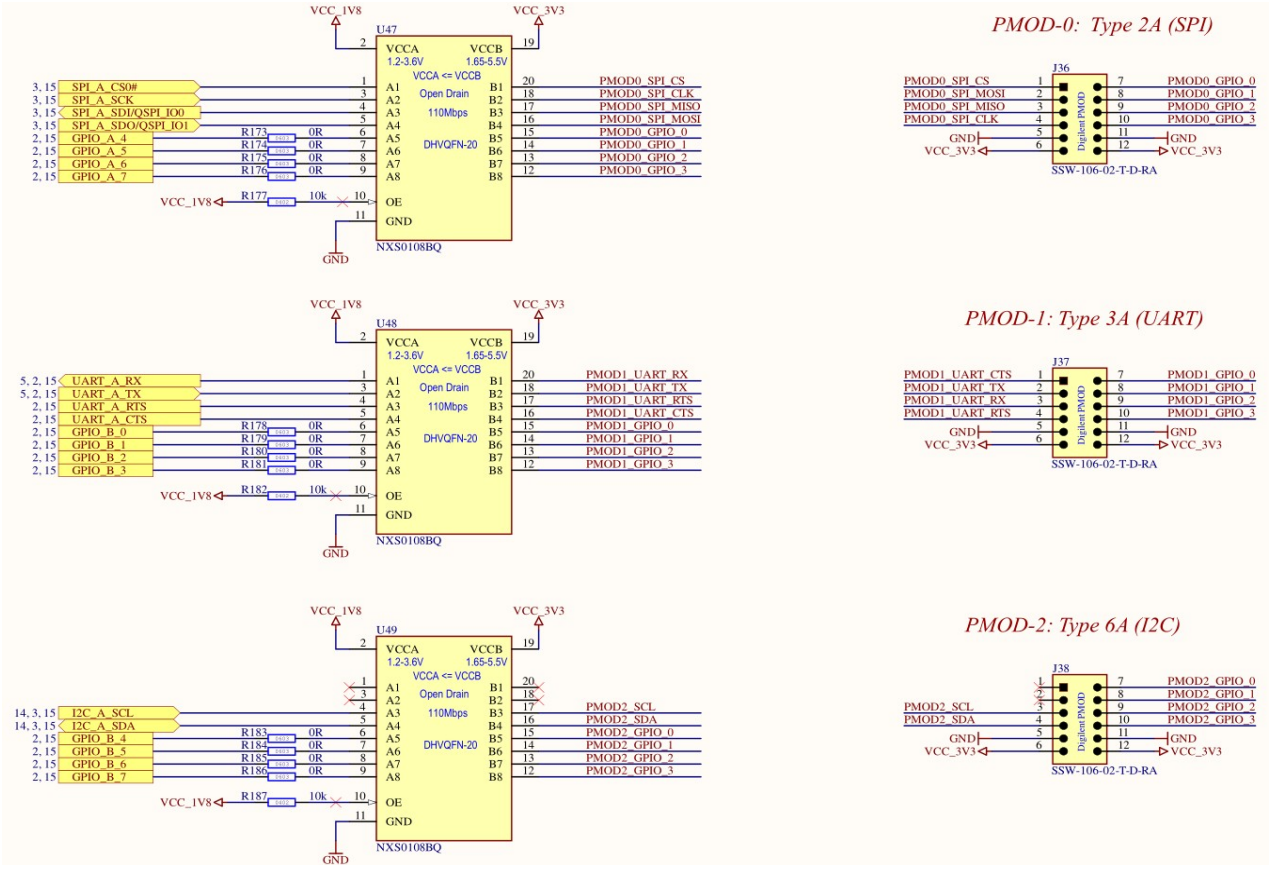


Figure 4.18: PMOD interface

4.19 JTAG

The RNX-OSM-CARRIER exposes the CPU JTAG signals through a standard 1.27mm 10 pin connector – J5.

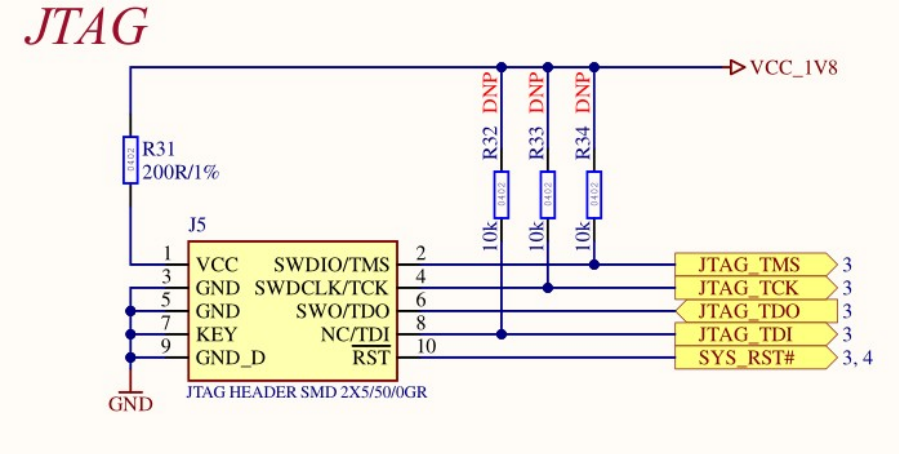


Figure 4.19: JTAG

5. Warranty Terms

Ronetix guarantees hardware products against defects in workmanship and material for a period of one (1) year from the date of shipment. Your sole remedy and Ronetix's sole liability shall be for Ronetix, at its sole discretion, to either repair or replace the defective hardware product at no charge or to refund the purchase price. Shipment costs in both directions are the responsibility of the customer. This warranty is void if the hardware product has been altered or damaged by accident, misuse or abuse.

Disclaimer of Warranty

THIS WARRANTY IS MADE IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESSED, OR IMPLIED, OF MERCHANT-ABILITY, FITNESS FOR A SPECIFIC PURPOSE, NON-INFRINGEMENT OR THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION, EXCEPT THE WARRANTY EXPRESSLY STATED HEREIN. THE REMEDIES SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDIES OF ANY PURCHASER WITH RESPECT TO ANY DEFECTIVE PRODUCT.

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THAT THE RONETIX CPU MODULE, HARDWARE AND SOFTWARE, WAS THOROUGHLY TESTED AND HAS MET THE CUSTOMER'S REQUIREMENTS AND SPECIFICATIONS.