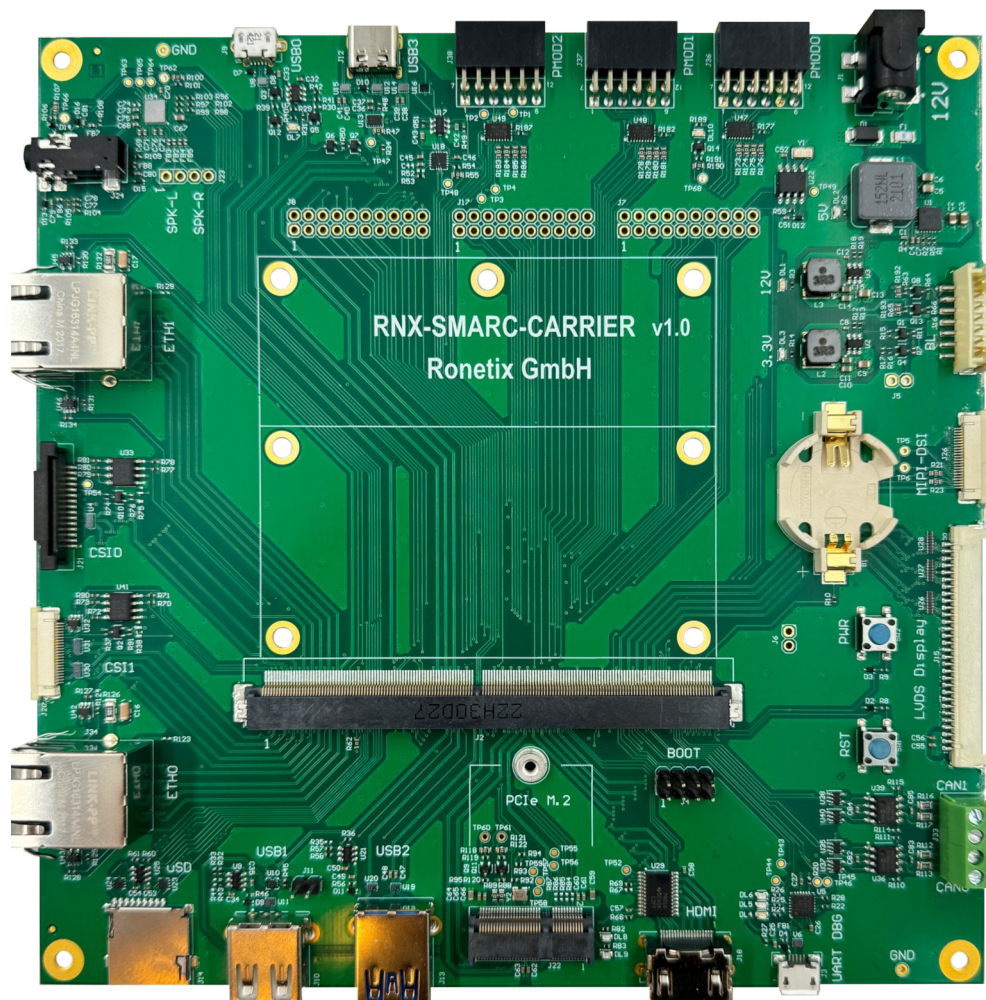


RNX-SMARC-CARRIER

Base board for SMARC Modules

Datasheet, rev 1.0



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1. Document Revision History

Revision	Date	Notes
1.0	05-Feb-2024	Initial release

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3. Overview

3.1 General Information

The **RNX-SMARC-CARRIER** base board is designed for evaluating the functionality and performance of SoMs in Smart Mobility ARChitecture SMARC form-factor.

RNX-SMARC-CARRIER supports all SMARC v2.1 modules.

3.1.1 Board Layout

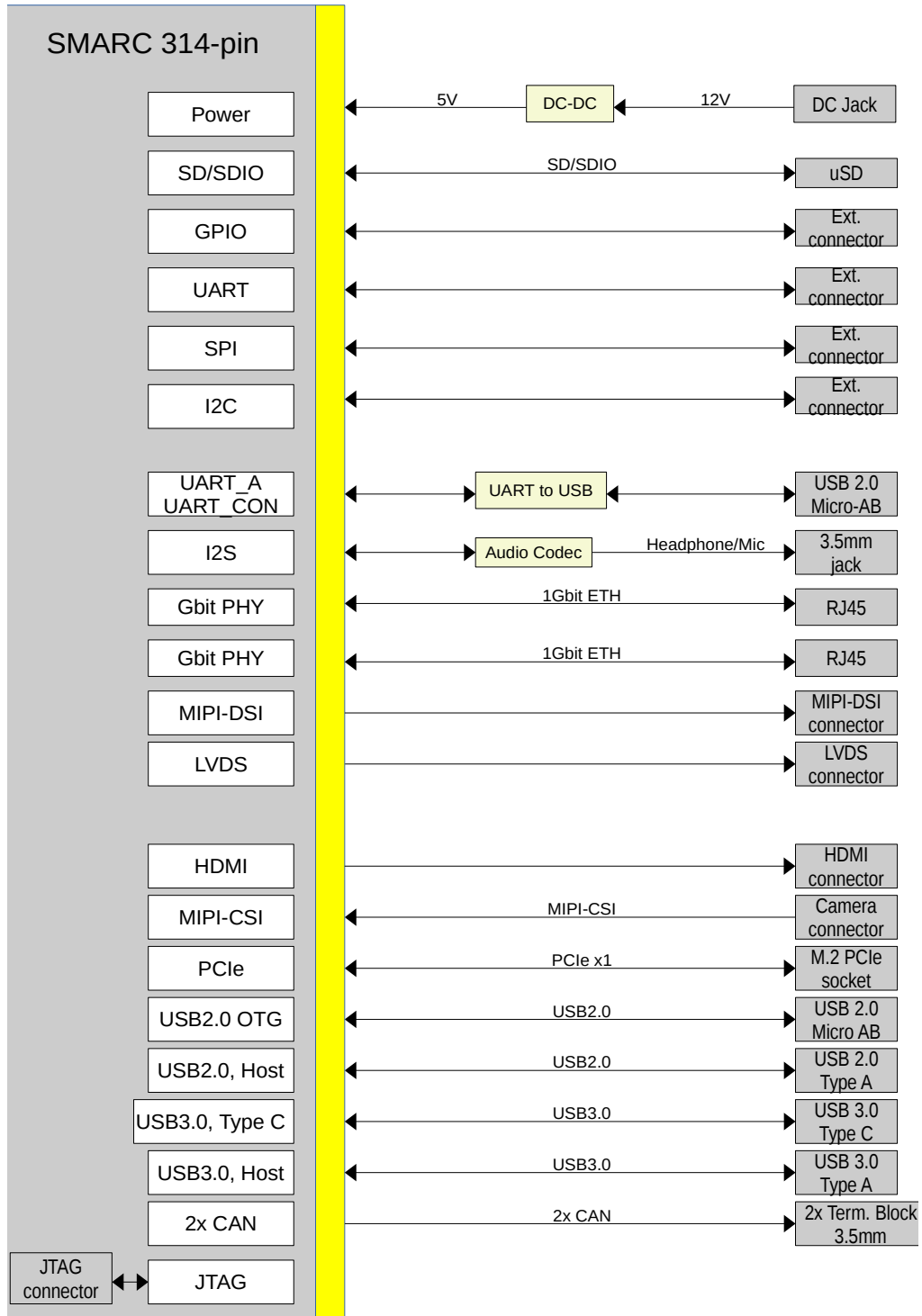
The RNX-SMARC-CARRIER physical dimensions are 170.0 x 170.0 mm.

3.2 Highlights

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

- MXM 3.0 314-pin connector for mounting of SMARC modules
- 2x Ethernet 10/100/1000BaseT – RJ45
- USB-0: USB2.0 OTG, micro AB
- USB-1: USB2.0 Host, Type A
- USB-2: USB3.0, Host, Type A
- USB-3: USB3.0, Type C
- USB debug UART, micro AB
- micro-SD card slot
- M.2 PCIe Connector
- MIPI-DSI connector
- 2x MIPI-CSI connector
- LVDS Display interface
- HDMI 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-SMARC-CARRIER Connectors

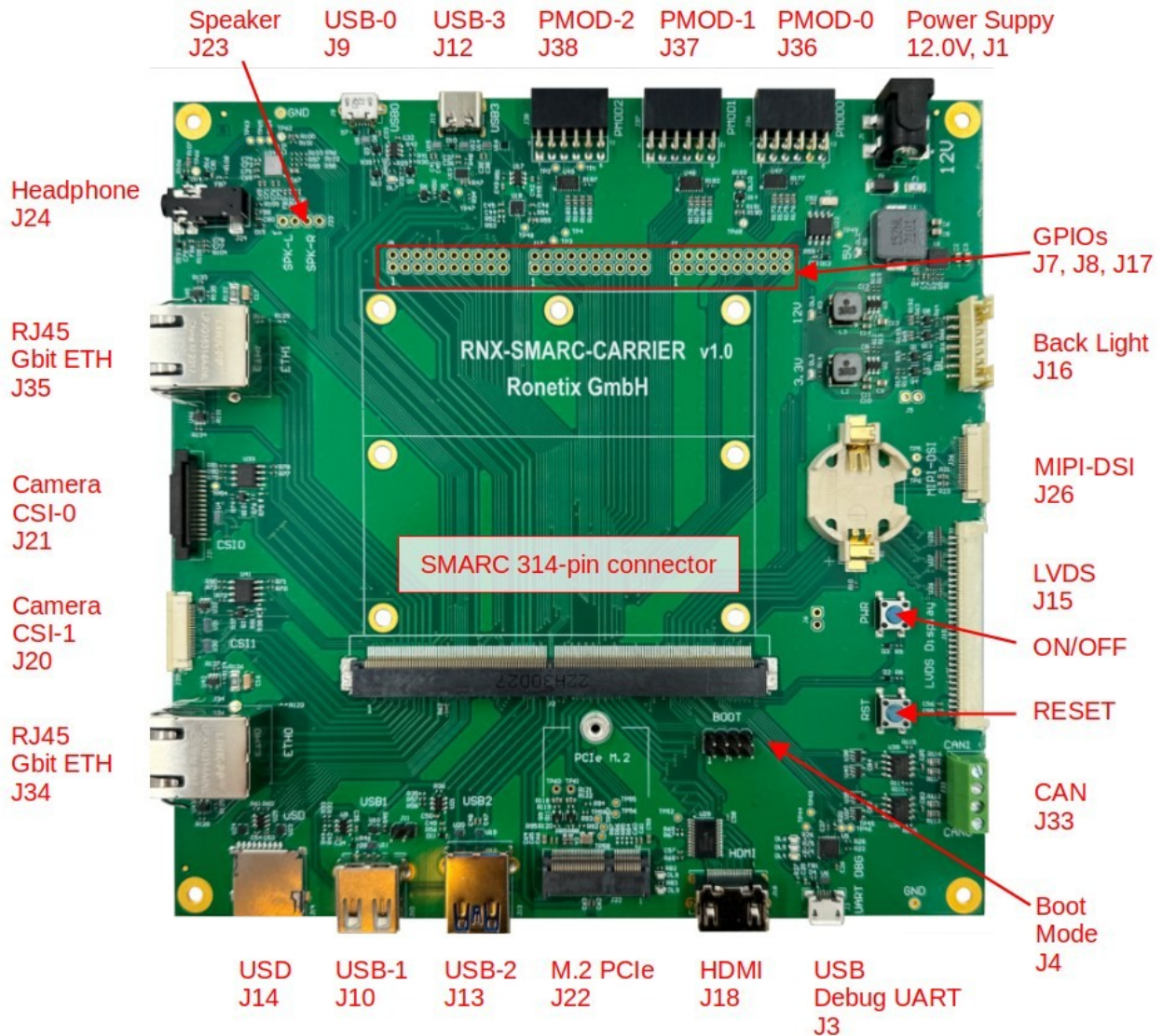


Figure 3.1: RNX-SMARC-CARRIER connectors

Reference	Function	Type
J2	SMARC module connector	Aces 91781-31408-001
J1	Power Supply	DC Jack, 2.1mm
J3	USB Debug UART	USB Micro-AB
J4	Boot mode select	Header 4x2, 2.54mm
J5	Force ON 1.8V and 3.3V	Header 1x2, 2.54mm
J6	Force Power Button	Header 1x2, 2.54mm

Reference	Function	Type
J7	GPIOs	Header 2x10, 2.54mm
J8	GPIOs	Header 2x10, 2.54mm
J9	USB-0 OTG (2.0)	USB 2.0 Micro AB
J10	USB-1 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 1x2, 2.54mm
J12	USB-3, OTG (3.0)	USB Type C
J13	USB-2, 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	GPIOs	Header 2x10, 2.54mm
J18	HDMI Display	10029449-111RLF
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
J26	MIPI-DSI	FFC, TE-2-1734592-2
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-SMARC-CARRIER is powered by a +12V power supply connected through a 2.1mm barrel jack.



4.1.2 Power out headers

- J7, 2x10 2.54mm header provides supplies generated on the base board.

J25, PIN	Label	Voltage	
1	VIN_12V	12V	
3	VSYS_5V	5V	
5	VCC_3V3	3.3V	
7	VCC_1V8	1.8V	
2,4,6,8	GND		

4.2 Buttons

RNX-SMARC-CARRIER implements two buttons.

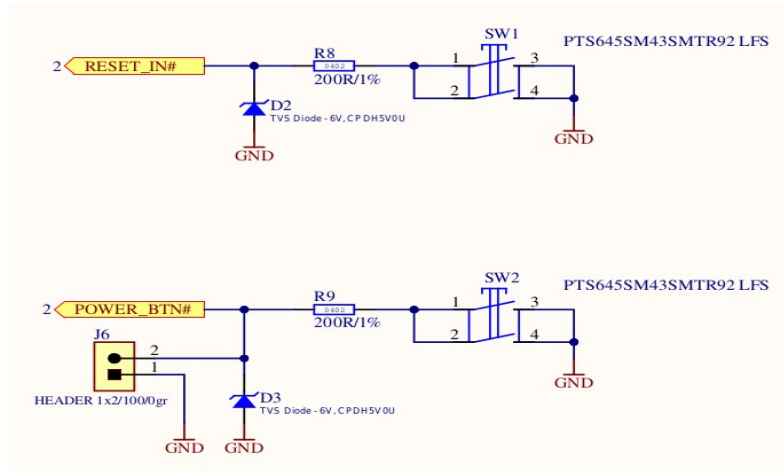


Figure 4.1: Buttons

4.2.1 PWR_BTN# button

The PWR_BTN# 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

J4 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	USB1/2 with SFDP (JESD-216) discoverable parameters	
0001	Cortex-A55	Serial Downloader		
0010	Cortex-A55	USDHC1 8-bit eMMC 5.1		
0011	Cortex-A55	USDHC2 4-bit SD3.0		
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		USB1 with SFDP (JESD-216) discoverable parameters
1001	Cortex-M33	Serial Downloader		
1010	Cortex-M33	USDHC1 8-bit eMMC 5.1		
1011	Cortex-M33	USDHC2 4-bit SD3.0		
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 4.2: 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-0 is available
DL8	red	Connected to LED1 on M.2 PCIe
DL9	red	Connected to LED2 on M.2 PCIe
DL10	red	Heartbeat, GPIO-6

4.4 Ethernet

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

4.5 USB Interface

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

4.5.1 USB-0 OTG 2.0

The USB-0 signals from SMARC module are connected to J9.

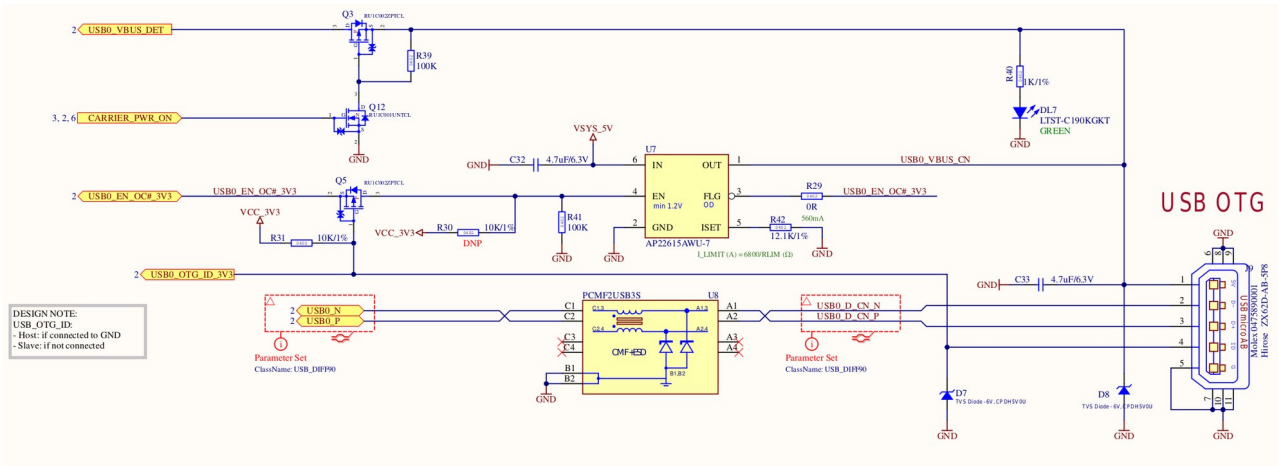


Figure 4.3: USB-0

4.5.2 USB-1 Host 2.0

The USB-1 signals from SMARC 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

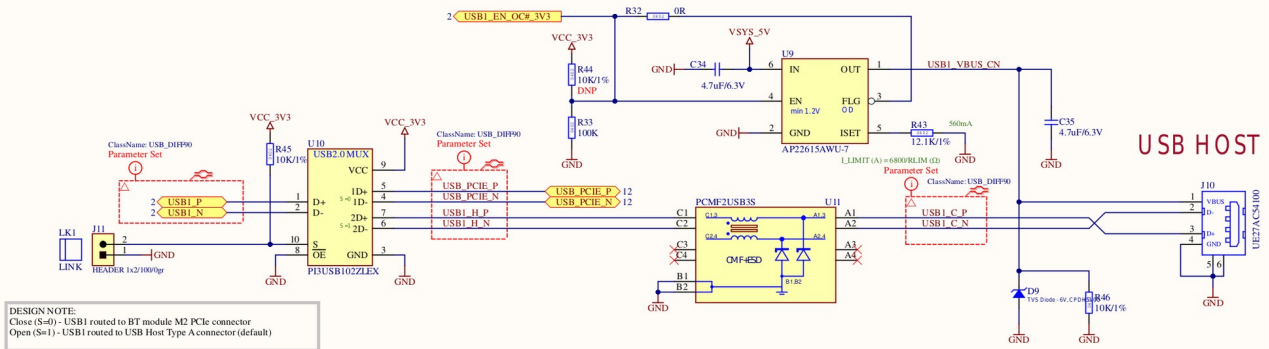


Figure 4.4: USB-1 multiplexing

4.5.3 USB-2, Host 3.0

The USB-2 signals from SMARC Module are connected to J13, Host Type A connector.

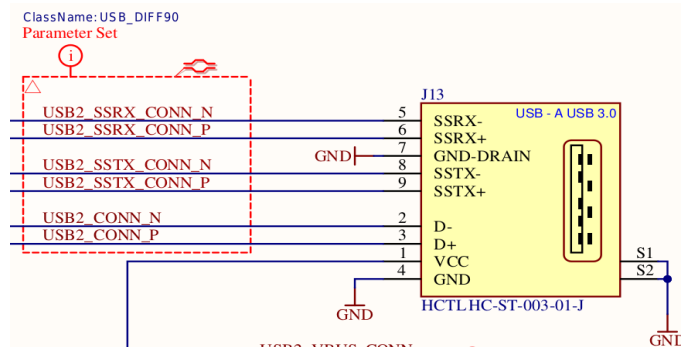


Figure 4.5: USB-2, Host, Type A

4.5.4 USB-3, Type-C 3.0

The USB-3 signals from SMARC Module are connected to J12.

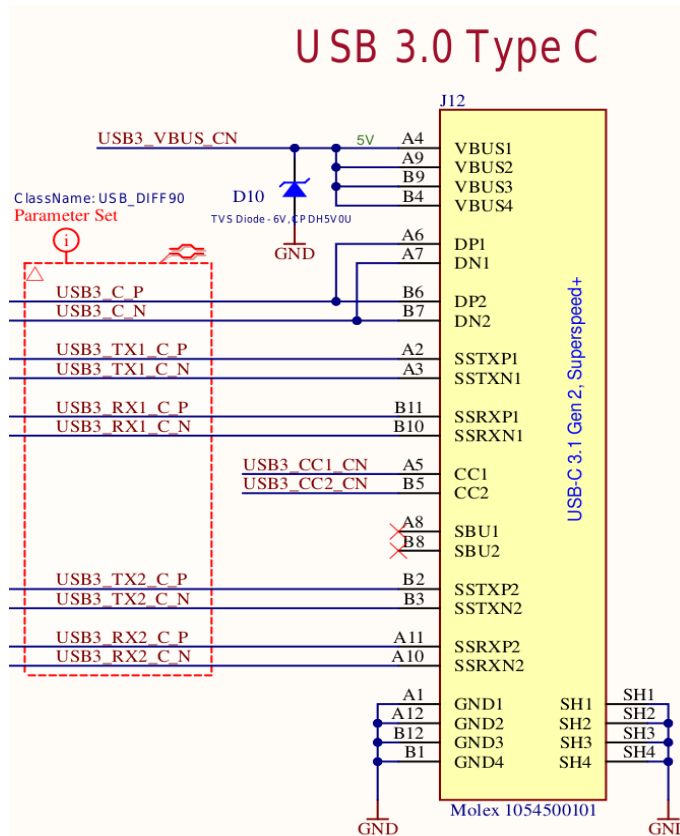


Figure 4.6: USB-3, Type C

4.6 SD card

The RNX-SMARC-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.

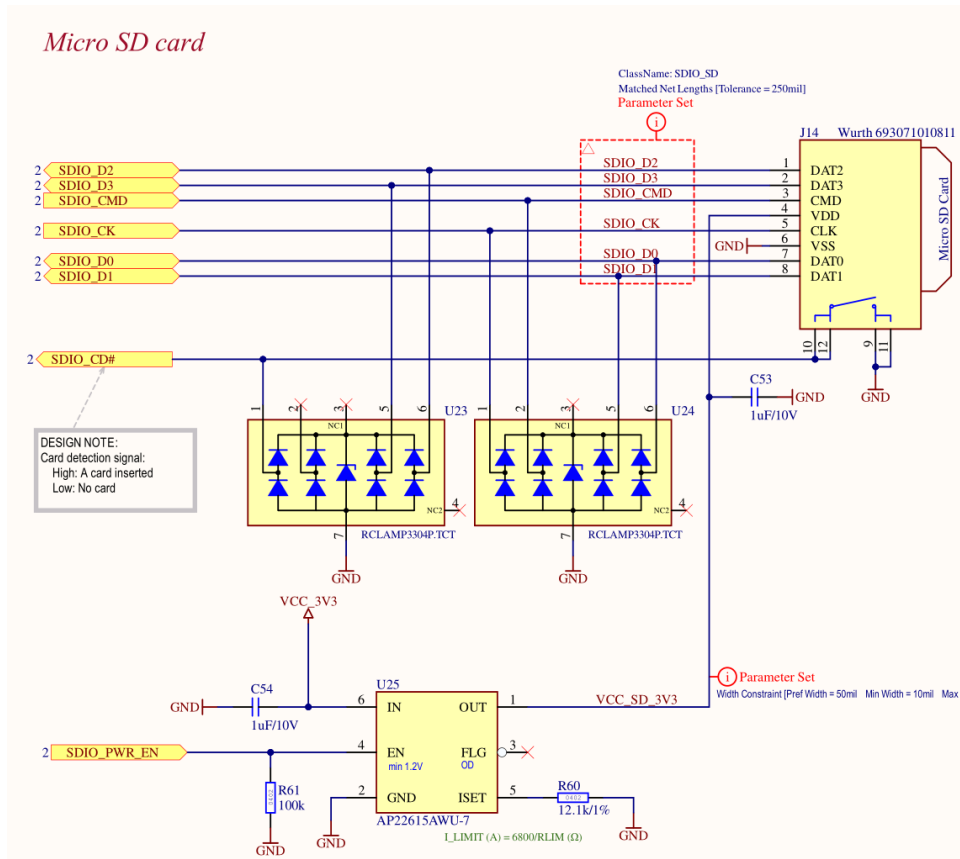


Figure 4.7: uSD card

4.7 Display Interfaces

According to the SMARC specification, the LVDS and MIPI-DSI signals share same pins and are connected to J16 and J26.

3.4.4 LVDS / eDP / MIPI DSI Pin Sharing

Pin #	LVDS Signal Name	MIPI DSI Signal Name
S125	LVDS0_0+	DSI0_D0+
S126	LVDS0_0-	DSI0_D0-
S128	LVDS0_1+	DSI0_D1+
S129	LVDS0_1-	DSI0_D1-
S131	LVDS0_2+	DSI0_D2+
S132	LVDS0_2-	DSI0_D2-
S137	LVDS0_3+	DSI0_D3+
S138	LVDS0_3-	DSI0_D3-
S134	LVDS0_CK+	DSI0_CLK+
S135	LVDS0_CK-	DSI0_CLK-
S133	LCD0_VDD_EN	LCD0_VDD_EN
S127	LCD0_BKLT_EN	LCD0_BKLT_EN
S141	LCD0_BKLT_PWM	LCD0_BKLT_PWM
S144	-	DSI0_TE

Figure 4.8: SMARC LVDS, MIPI-DSI pin sharing

4.7.1 LVDS Display

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

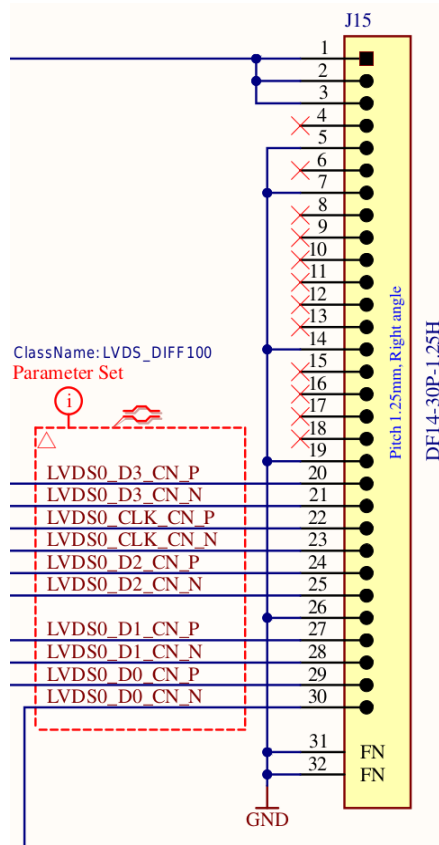


Figure 4.9: LVDS

4.7.2 MIPI DSI

The MIPI-DSI signals are connected to J26.

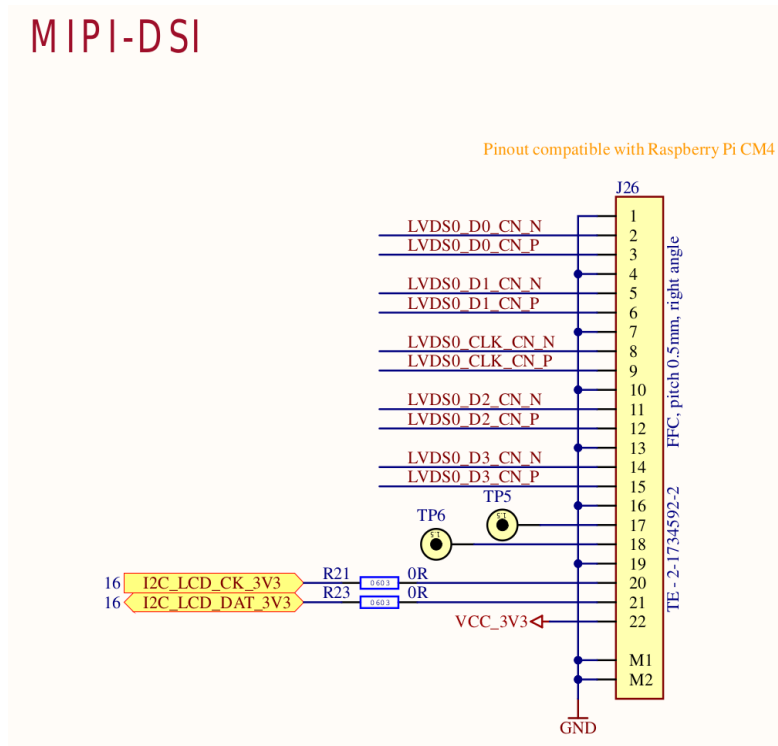


Figure 4.10: MIPI-DSI

4.8 HDMI Display

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

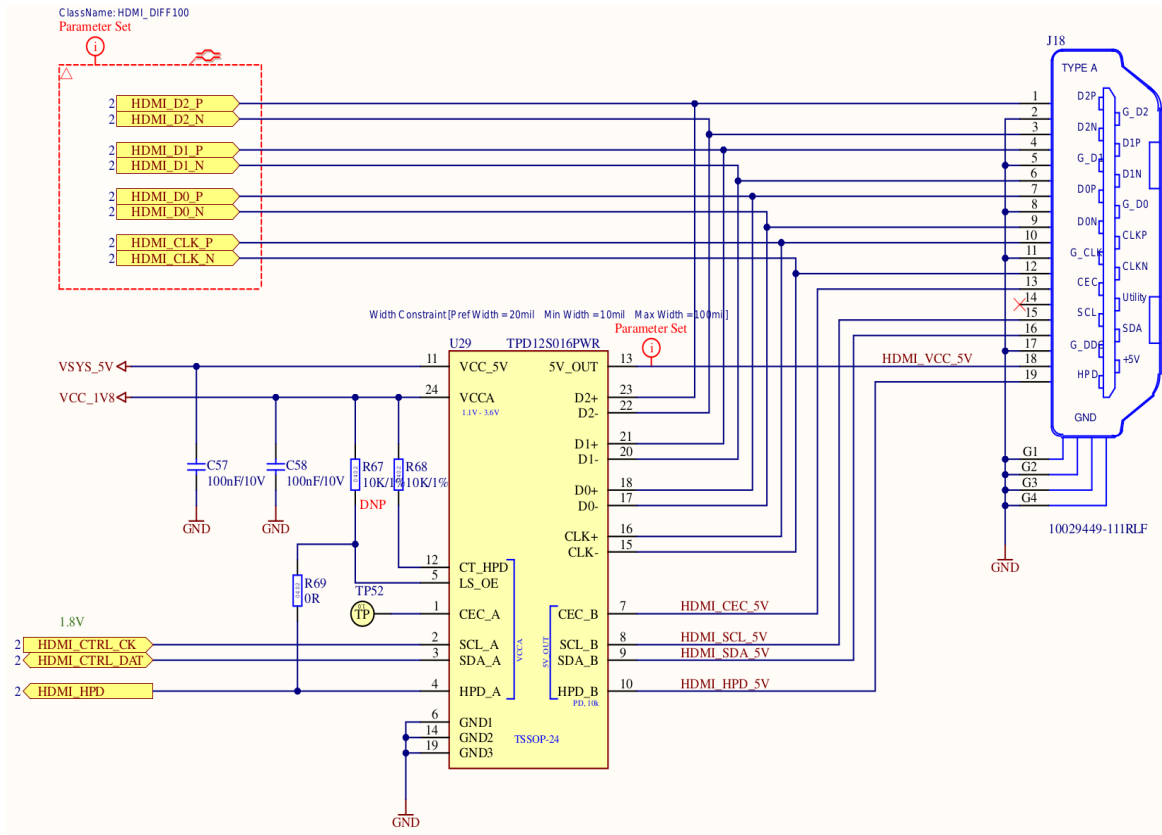


Figure 4.11: HDMI Display

4.9 Audio

RNX-SMARC-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 over-sampling 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-SMARC-CARRIER board features one 3.5mm jack for Headphones and Microphone and one Header 1x4, 2.54mm pitch for speakers.

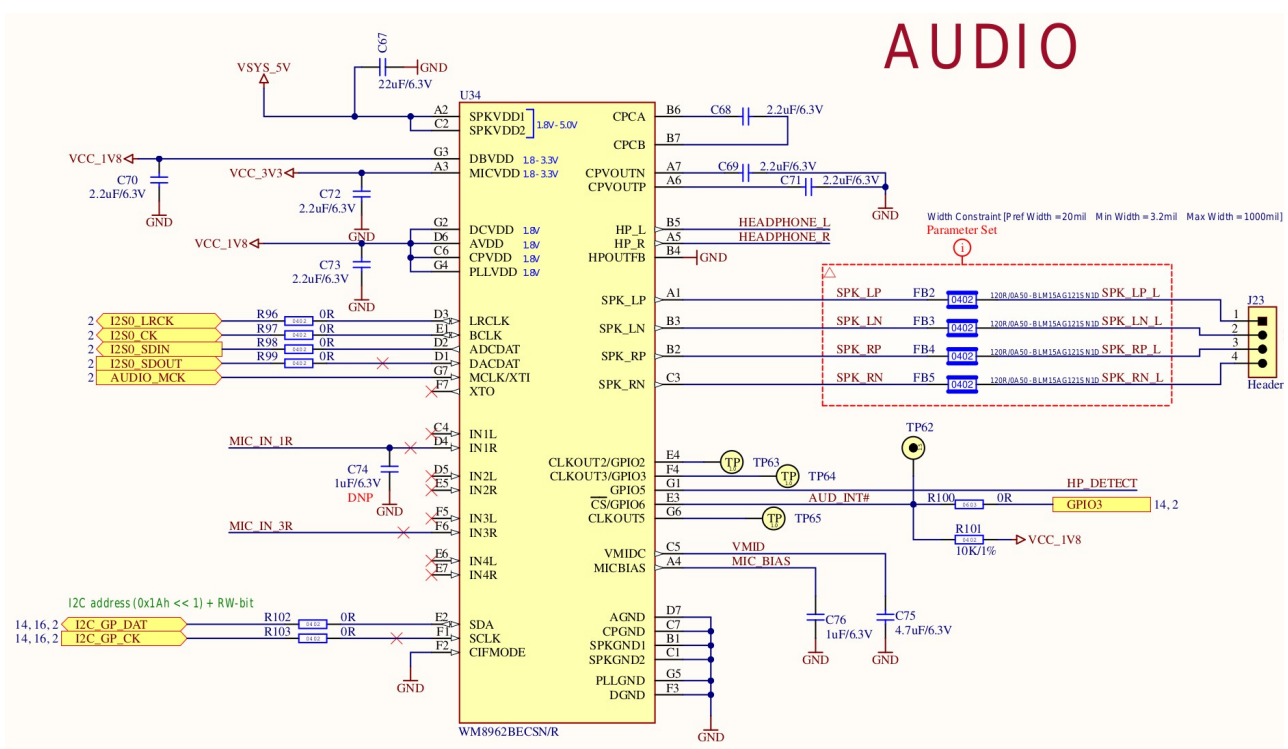


Figure 4.12: Audio

4.10 Camera

The RNX-SMARC-CARRIER supports two camera sensor inputs using a 22-pin (J20) and 15-pin (J21) 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.

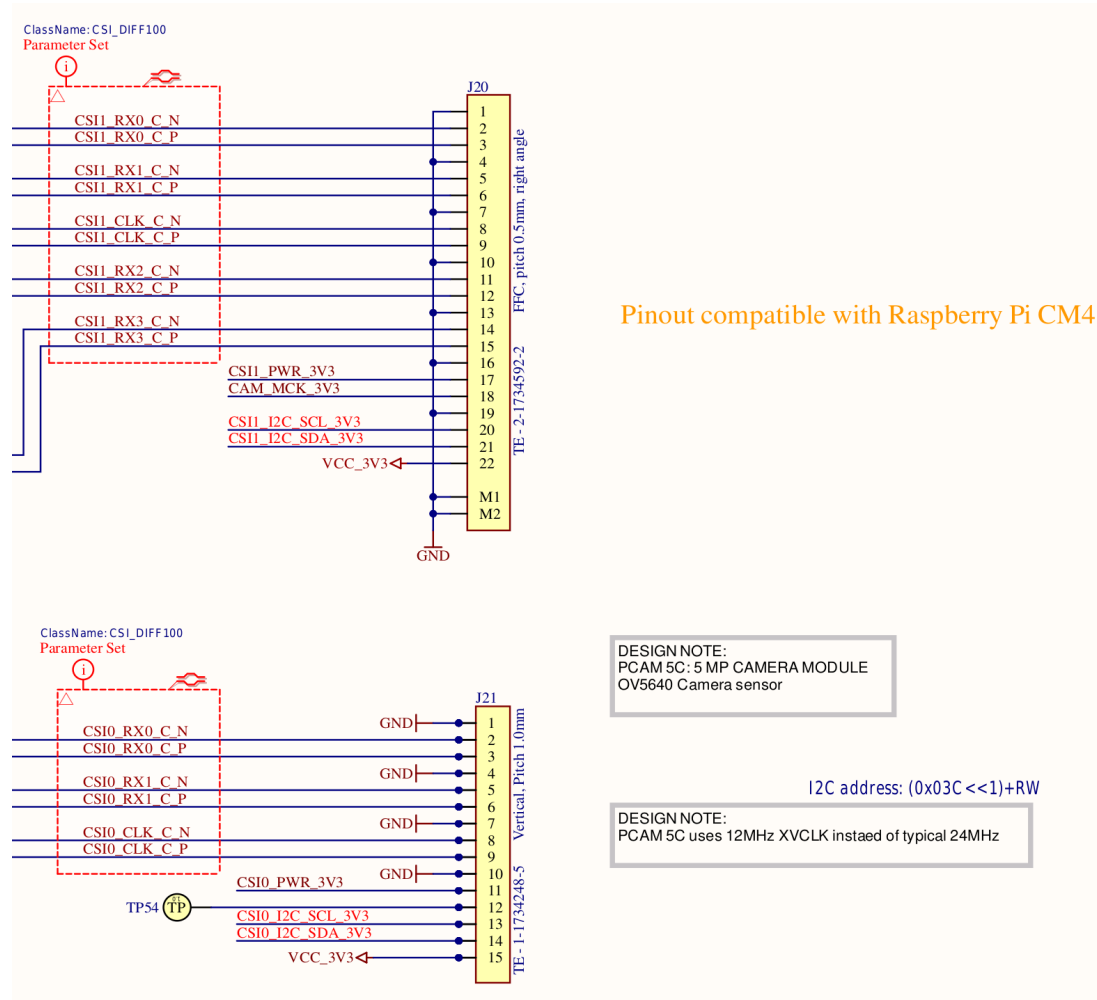


Figure 4.13: Camera interfaces

4.11 USB debug UART

RNX-SMARC-CARRIER implements a USB to UART bridge (CP2105) which can be used to interface with the SER0 and SER1 of the SMARC Module.

4.12 GPIO

Various GPIOs are available on standard headers:

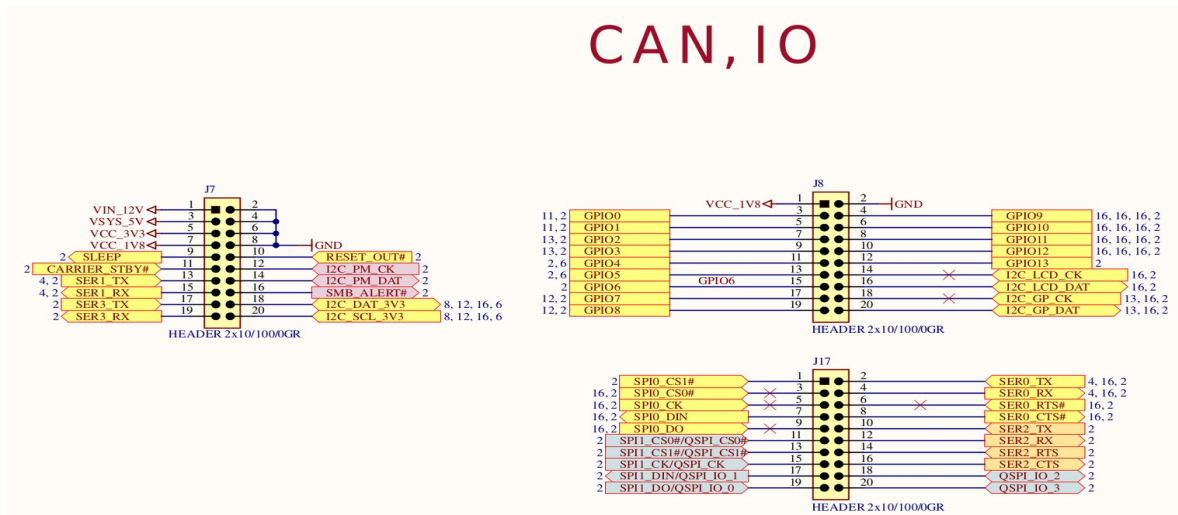


Figure 4.14: GPIO

4.13 RTC Clock

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

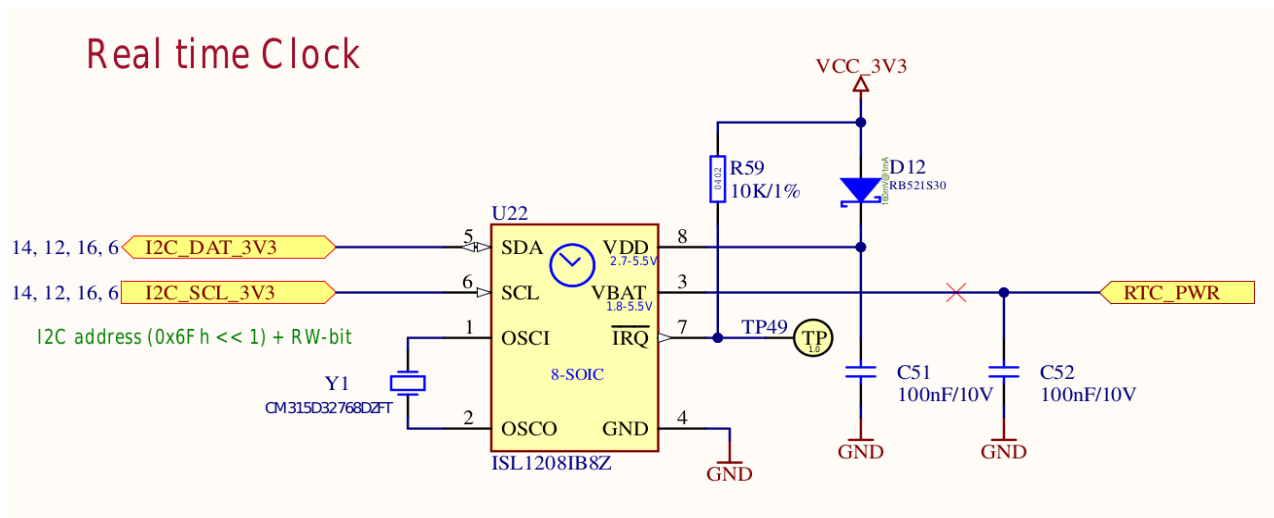


Figure 4.15: RTC clock

4.14 PCIe M.2

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

4.15 CAN Interface

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

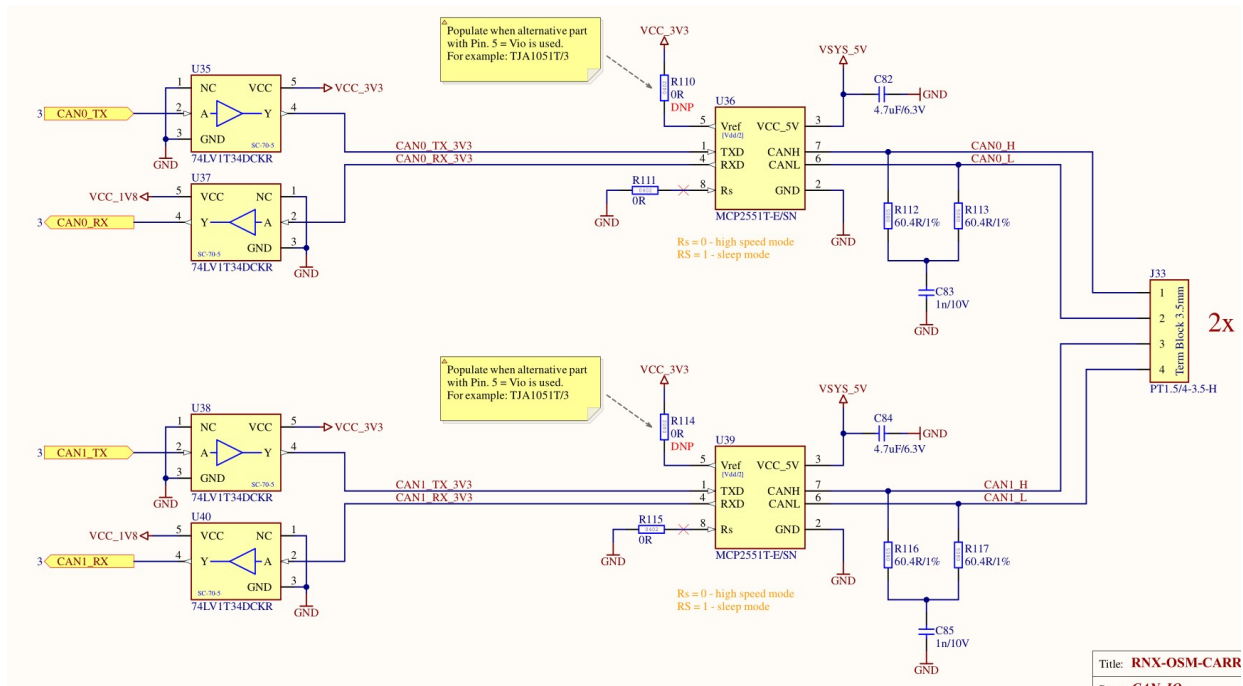


Figure 4.16: CAN interface

4.16 PMOD Interface

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

RNX-SMARC-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 SMARC module through level shifters.

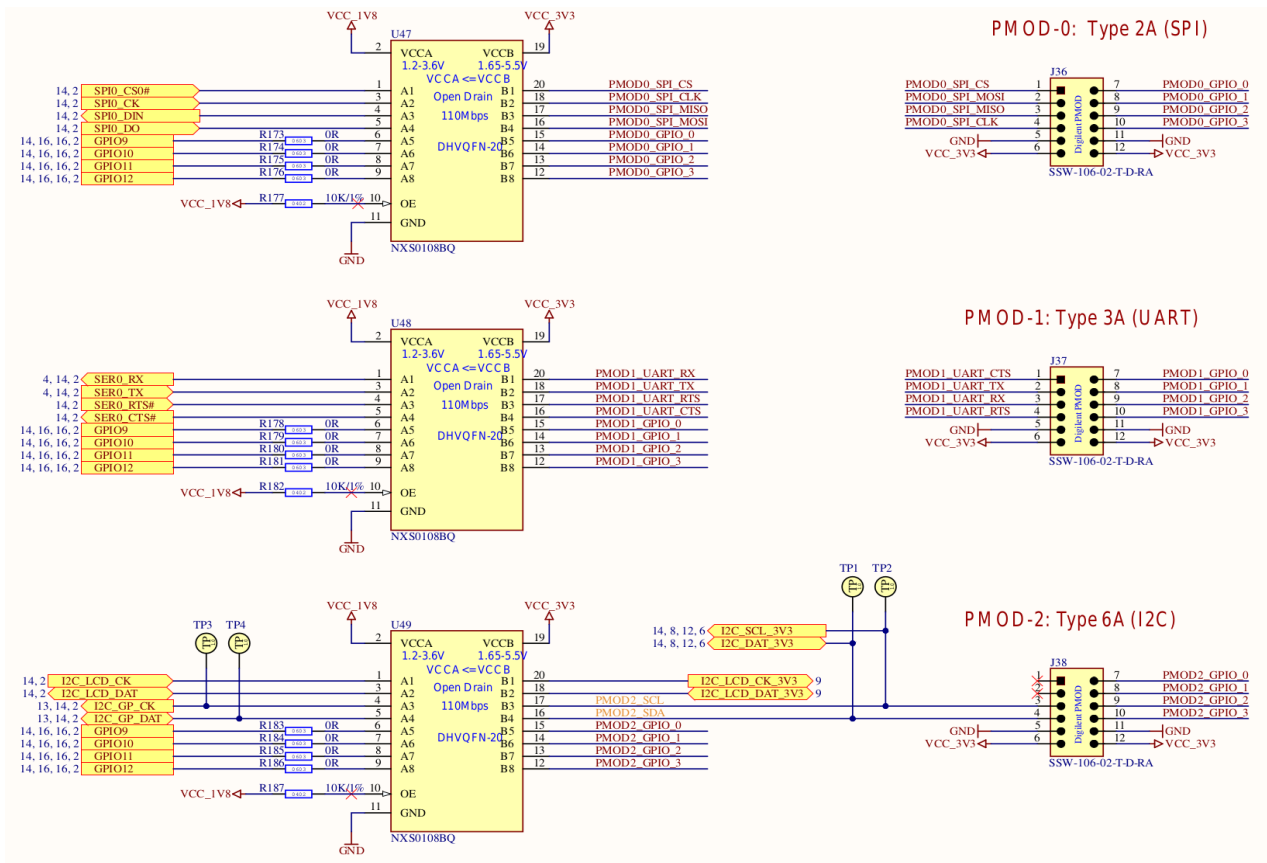


Figure 4.17: PMOD interface

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.

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