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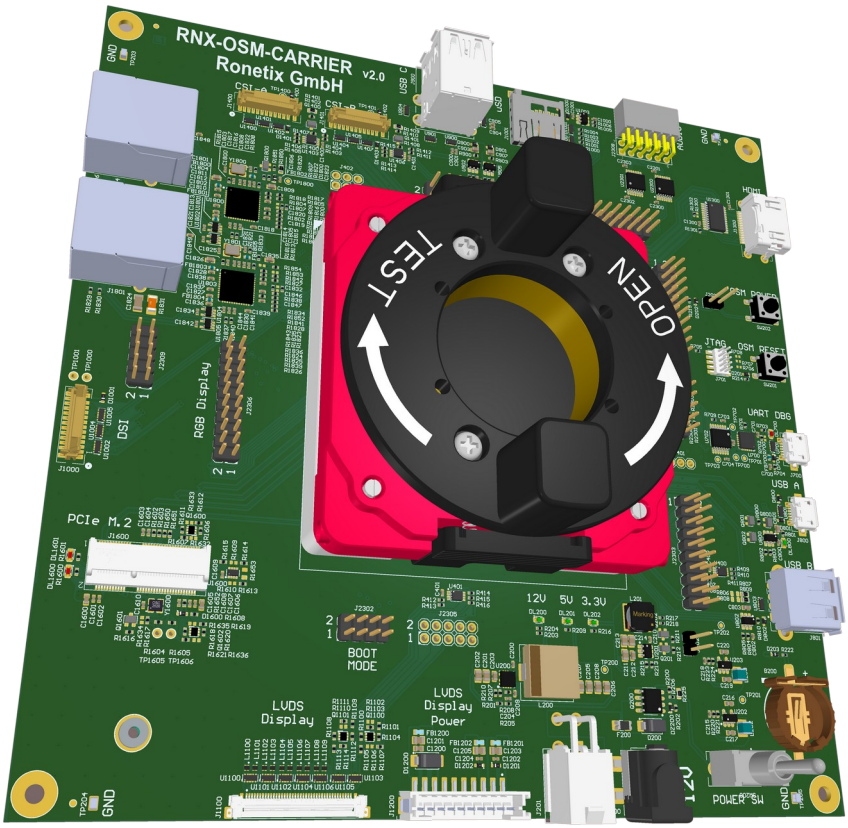
High-performance System on Module (SOM)

RNX-OSM-CARRIER

Carrier board for Open Standard Modules (OSM v1.2)

for development and mass production test

Board revision 2.0 – Datasheet, rev 1.0



OPEN STANDARD MODULE™

SGeT STANDARDIZATION GROUP FOR EMBEDDED TECHNOLOGIES

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1. Document Revision History

Revision	Date	Notes
1.0	05-Nov-2026	Initial release for board revision 2.0 (LGA662 socket)

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3. Overview

3.1 General Information

The **RNX-OSM-CARRIER** is a carrier board designed for **development and mass production test** of System-on-Modules in the **Open Standard Module (OSM) v1.2** form factor. Revision 2.0 carries an **LGA662 socket** (J400) that accepts OSM modules of **Size S, M and L**. The module is clamped by the rotating lid of the socket, so modules can be exchanged in seconds without soldering.

The board brings out all major OSM interfaces to standard connectors: two Gigabit Ethernet ports, four USB ports (two of them USB 3.0), M.2 Key E (PCIe), HDMI, dual-channel LVDS, MIPI-DSI, two MIPI-CSI camera inputs, parallel RGB, microSD, I²S on a PMOD connector, a USB debug UART, JTAG and pin headers for UART, SPI, I²C, PWM, CAN, ADC and GPIO.

For the **mass production test** of OSM modules, the module is inserted into the socket without soldering, and most module signals can be verified with simple loopback jumpers on the 2.54 mm pin headers (see chapter Mass Production Test).

> **Signal levels:** all OSM signals routed to pin headers are **1.8 V** unless the signal name has the suffix **_3V3** or the description states otherwise. Do not connect 3.3 V or 5 V logic directly to these pins.

3.1.1 Replacement of revision 1.x

Board revision 2.0 replaces revisions 1.0–1.2, which used four Hirose DF40C connectors and the RNX-OSM-ADAPTER board. Revision 1.x is no longer manufactured. The main changes are:

- four DF40C connectors and RNX-OSM-ADAPTER replaced by an LGA662 socket for OSM Size S/M/L
- USB-C changed from USB 3.0 OTG Type-C to USB 3.0 Host Type-A (stacked with USB-D)
- second 22-pin MIPI-CSI camera interface (CSI-B) added; the 15-pin camera connector removed
- LVDS connector changed to a 40-pin dual-channel connector with a separate 10-pin display power connector
- RGB display connector replaced by 2.54 mm pin headers
- audio codec WM8962 removed; a PMOD Type 7 (I²S) connector added instead, e.g. for the Digilent Pmod I2S2

- PMOD Type 2A/3A/6A connectors, the RS232 connectors and the on-board RTC removed; the module RTC is backed by a coin cell
- CAN and ADC brought out on a pin header as module-level signals (no CAN transceivers on the board)
- alternative 12 V input (Molex Mini-Fit) and a power switch added

3.1.2 Reference Documents

- SGET Open Standard Module (OSM) specification, v1.2
- Datasheet and hardware manual of the used OSM module
- RNX-OSM-CARRIER v2.0 schematic (Variant: Standard)
- PCI Express M.2 Specification (Key E)
- Digilent Pmod Interface Specification; Digilent Pmod I2S2 reference manual

3.1.3 Board Layout

The RNX-OSM-CARRIER physical dimensions are 170.0 x 170.0 mm. The board has four mounting holes of 3.2 mm diameter, one in each corner. The PCB is FR4, 1.6 mm, ENIG finish.

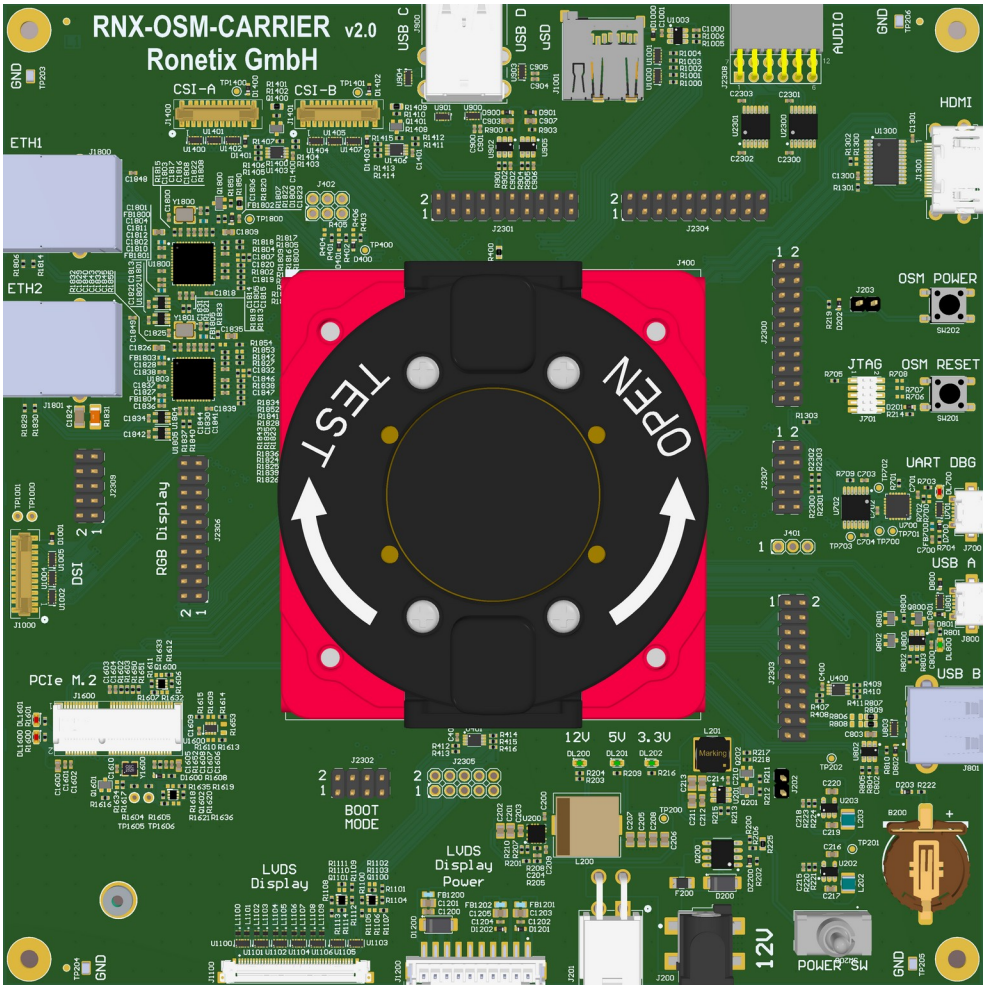


Figure 3.1: RNX-OSM-CARRIER v2.0, top view

3.2 Highlights

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

- LGA662 socket for OSM v1.2 modules, Size S, M and L
- 12 V power input: 2.1 mm DC jack or 4-pin Molex Mini-Fit; power switch
- 2x Ethernet 10/100/1000BaseT (KSZ9131RNX PHYs) – RJ45 with LEDs
- USB-A: USB 2.0 OTG, micro-AB
- USB-B: USB 2.0 Host, Type-A (alternatively routed to the M.2 connector)
- USB-C, USB-D: USB 3.0 Host, stacked dual Type-A
- USB debug interface (CP2105) for UART_CON and UART_A, micro-AB
- microSD card slot with card detect and switched card power
- M.2 Key E connector (PCIe x1, optional USB 2.0) for Wi-Fi/Bluetooth cards

- HDMI Type-A connector
- dual-channel LVDS display connector (40-pin) with backlight control and display power connector
- MIPI-DSI 4-lane, 22-pin FPC (Raspberry Pi CM4 pinout)
- 2x MIPI-CSI 4-lane, 22-pin FPC (Raspberry Pi CM4 pinout)
- parallel RGB display signals on pin headers
- PMOD Type 7 (I²S) connector, e.g. for Digilent Pmod I2S2 audio
- JTAG/SWD, 10-pin 1.27 mm
- pin headers with UART, SPI/QSPI, I²C, PWM, GPIO, CAN and ADC signals
- boot mode selection jumpers
- coin cell holder for the module RTC
- power and reset push buttons, status LEDs
- designed for development and mass production test: LGA662 socket for fast module exchange, loopback jumpers for the header signals

3.3 Block Diagram

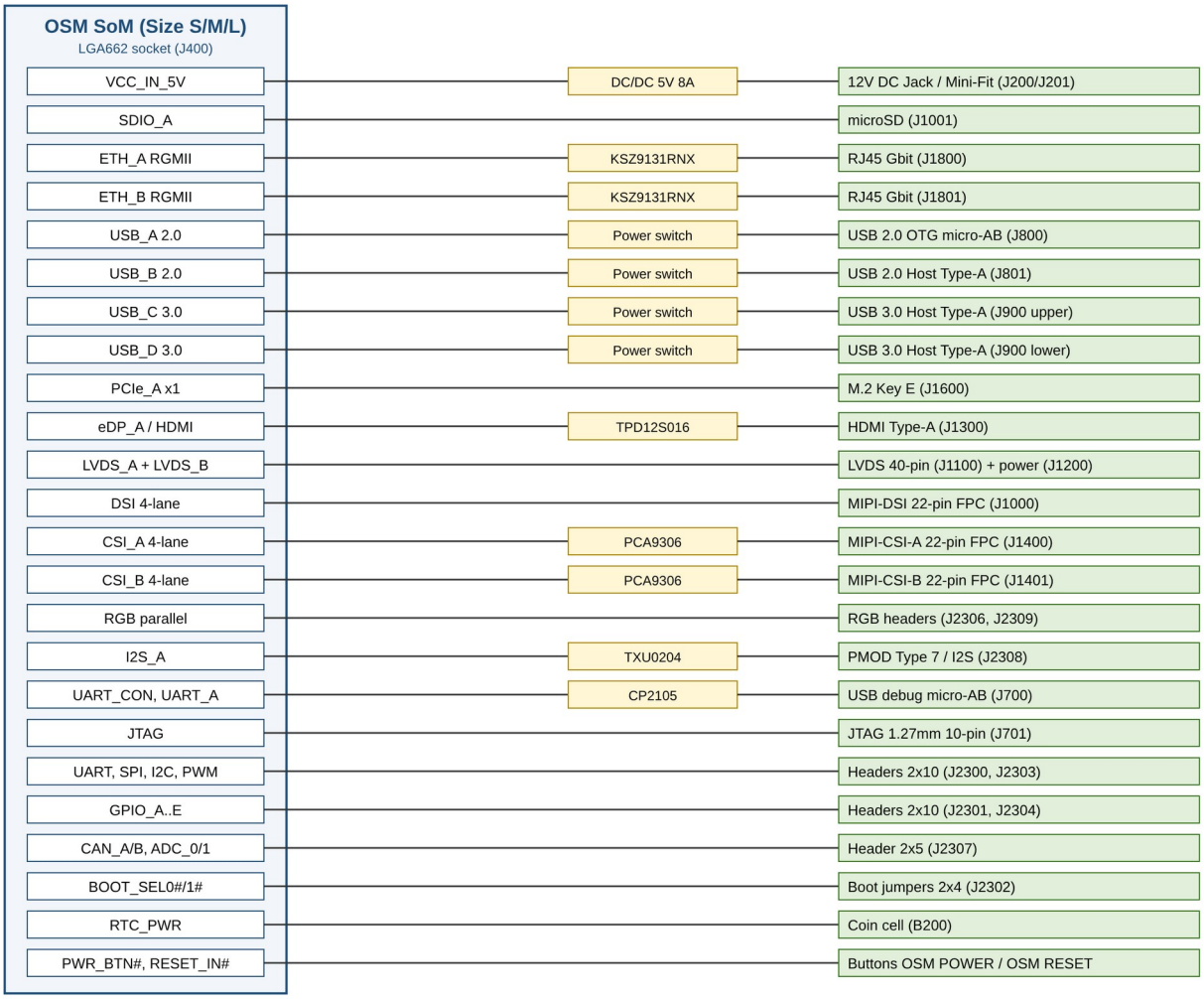


Figure 3.2: RNX-OSM-CARRIER v2.0 block diagram

3.4 RNX-OSM-CARRIER Connectors

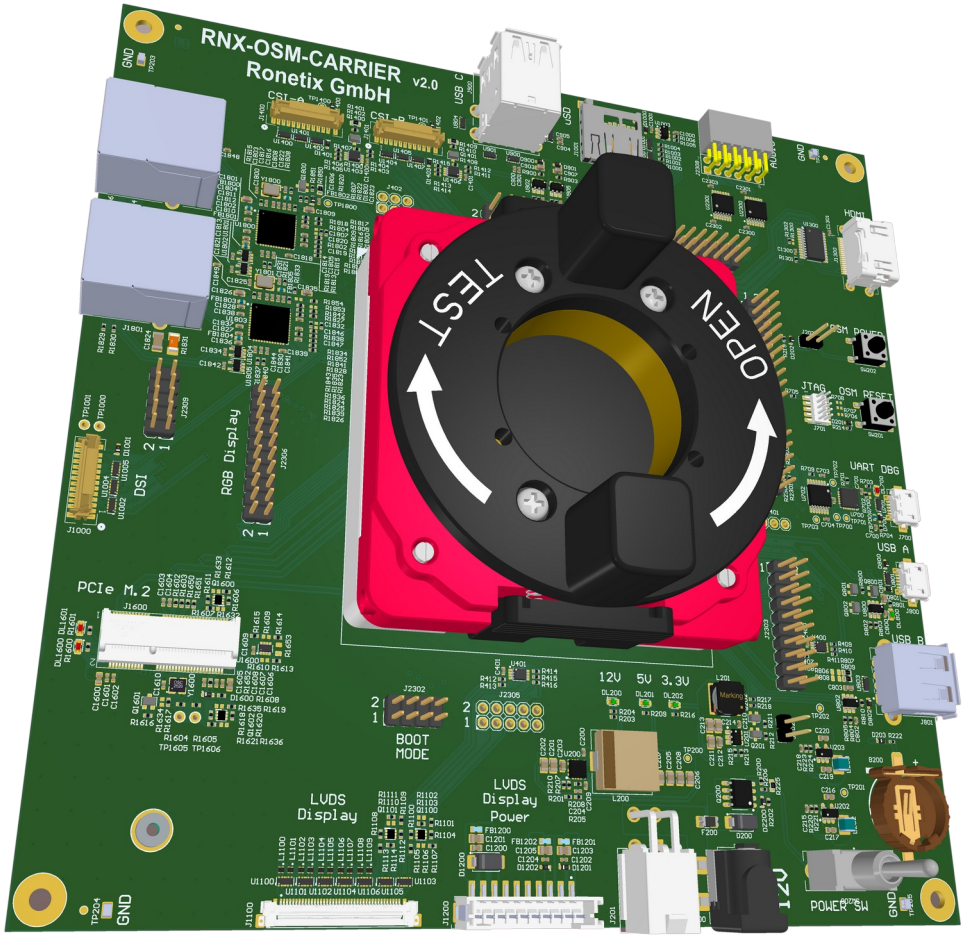


Figure 3.3: RNX-OSM-CARRIER v2.0, connectors and controls

Reference	Function	Type
J400	OSM module socket, Size S/M/L	LGA662 socket
J200	Power supply input 12 V	DC jack 2.1 mm, PJ002A-SMT
J201	Power supply input 12 V (alternative)	Molex Mini-Fit Jr. 4-pin, 874270402
SW200	Power switch	Toggle switch, 100SP1T1B4M2QE
SW201	OSM RESET button	Push button, PTS645
SW202	OSM POWER button	Push button, PTS645
J202	Force 3.3 V power ON	Header 1x2, 2.54 mm
J203	Force OSM power ON	Header 1x2, 2.54 mm
J700	USB debug UART (UART_CON, UART_A)	USB micro-AB
J701	JTAG / SWD	Header 2x5, 1.27 mm, SMD
J800	USB-A, OTG (2.0)	USB micro-AB
J801	USB-B, Host (2.0)	USB Type-A

Reference	Function	Type
J900	USB-C (upper), USB-D (lower), Host (3.0)	Stacked dual USB 3.0 Type-A, 0484060003
J1000	MIPI-DSI	22-pin FFC 0.5 mm, FH12-22S-0.5SVA
J1001	microSD	Würth 693071010811
J1100	LVDS display (dual channel)	40-pin, I-PEX 20455-040E-76
J1200	LVDS display power	10-pin JST PH, B10B-PH-SM4-TB
J1300	HDMI	HDMI Type-A, 10029449-111RLF
J1400	MIPI-CSI-A camera	22-pin FFC 0.5 mm, FH12-22S-0.5SVA
J1401	MIPI-CSI-B camera	22-pin FFC 0.5 mm, FH12-22S-0.5SVA
J1600	M.2 Key E (PCIe)	MDT420E01001
J1800	Ethernet A	RJ45 with magnetics and LEDs, HR911130A
J1801	Ethernet B	RJ45 with magnetics and LEDs, HR911130A
J2300	UART, PWM, I²C	Header 2x10, 2.54 mm
J2301	GPIO	Header 2x10, 2.54 mm
J2302	Boot mode select	Header 2x4, 2.54 mm
J2303	SPI / QSPI, I²C	Header 2x10, 2.54 mm
J2304	GPIO	Header 2x10, 2.54 mm
J2306	RGB display data	Header 2x10, 2.54 mm
J2307	CAN, ADC, VENDOR1	Header 2x5, 2.54 mm
J2308	PMOD Type 7 (I²S)	Header 2x6 right angle, SSW-106-02-T-D-RA
J2309	RGB display control	Header 2x5, 2.54 mm
B200	Coin cell for module RTC	Coin cell holder, S8411-45R

Footprints J401, J402 and J2305 are not populated in the standard assembly variant.

4. Interface description

4.1 OSM Module Socket

The OSM module is placed in the LGA662 socket J400. Open the socket by turning the lid towards **OPEN**, insert the module in the orientation shown by the socket marking, close the lid and turn it towards **TEST** until it locks. The socket supports OSM Size S, M and L modules. Always switch off the board power before inserting or removing a module.

4.2 Power supply

4.2.1 Power supply input

The RNX-OSM-CARRIER is powered by a **+12 V** power supply connected either to the 2.1 mm DC jack J200 (centre positive) or to the 4-pin Molex Mini-Fit connector J201 (mating housing 39-01-2040, crimp contacts 39-00-0039). The input is protected by an 8 A fuse, a reverse-polarity protection and a 15 V TVS diode. The power switch SW200 turns the board on and off.

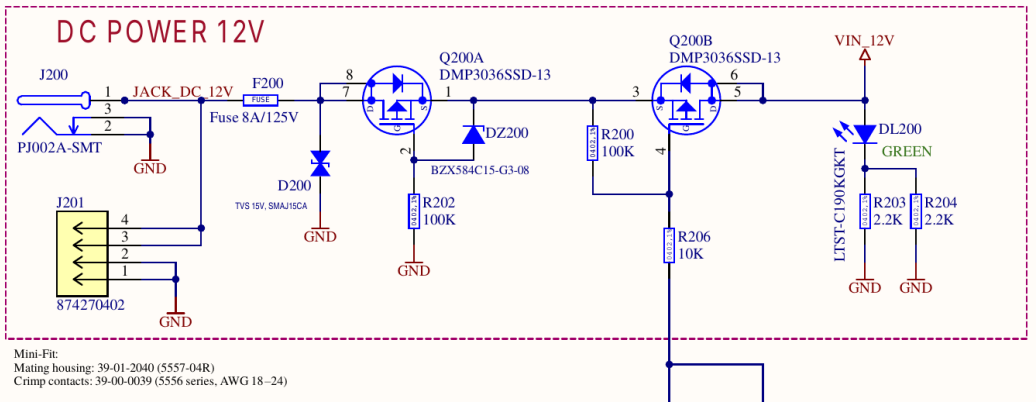


Figure 4.1: 12 V power input

4.2.2 On-board supplies

Rail	Voltage	Source	Description
VIN_12V	12 V	J200 / J201	Input supply; also provided to the LVDS display power connector J1200
VSYS_5V	5 V, 8 A	TPS56A37 buck converter from 12 V	Supply for the OSM module (VCC_IN_5V), USB VBUS, HDMI, LVDS display
VCC_3V3	3.3 V, 3 A	AP62301 buck converter from 12 V	Carrier peripherals; enabled by the module signal CARRIER_PWR_EN or by jumper J202
VCC_1V8	1.8 V, 2 A	TLV62569 from VCC_3V3	Carrier I/O voltage, level shifters, JTAG

Rail	Voltage	Source	Description
VCC_1V2	1.2 V, 2 A	TLV62569 from VCC_3V3	Ethernet PHYs

4.2.3 Power jumpers

Jumper	Function
J202	Closed: VCC_3V3 (and the rails derived from it) is switched on regardless of CARRIER_PWR_EN
J203	Closed: PWR_BTN# is held low permanently (Force Power ON). The module powers up as soon as power is applied, if supported by the module

4.3 Buttons

The RNX-OSM-CARRIER implements two push buttons:

Button	Silkscreen	Signal	Function
SW202	OSM POWER	PWR_BTN#	Power button input of the OSM module. The behaviour (power on, soft shutdown, forced off) is defined by the module
SW201	OSM RESET	SYS_RST# → RESET_IN#	System reset of the OSM module; also available on the JTAG connector

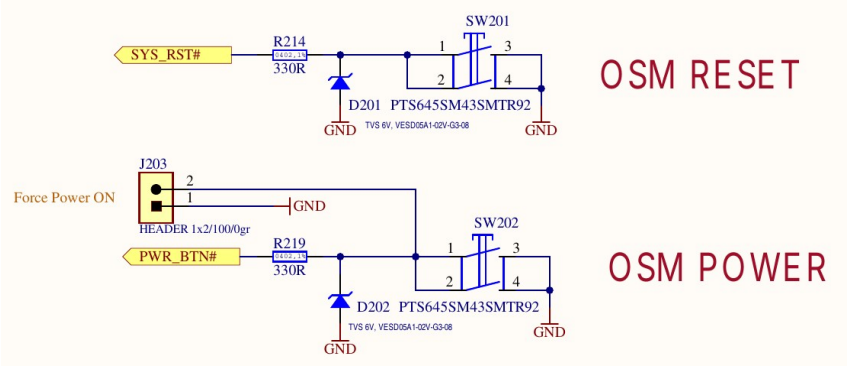


Figure 4.2: Buttons

4.4 Boot Mode

The boot mode of the module is selected with jumpers on J2302. A closed jumper connects the signal to GND (logic ‘0’); an open jumper leaves the signal pulled high by the module (logic ‘1’). The boot devices selected by BOOT_SEL0#/BOOT_SEL1# and the use of VENDOR2/VENDOR3 depend on the OSM module – refer to the module datasheet.

J2302 pins	Signal
1-2	BOOT_SEL0#
3-4	BOOT_SEL1#

J2302 pins	Signal
5-6	VENDOR2
7-8	VENDOR3

4.5 LEDs

LED	Color	Description
DL200	green	ON when 12 V input power is applied and SW200 is on
DL201	green	ON when VSYS_5V is available
DL202	green	ON when VCC_3V3 is available
DL700	red	ON when the USB debug bridge CP2105 is powered (USB cable connected to J700)
DL800	green	ON when VBUS on USB-A (J800) is present
DL1600	red	LED1# of the M.2 card
DL1601	red	LED2# of the M.2 card
J1800, J1801	left / right	Ethernet link (PHY LED2) / activity (PHY LED1)

4.6 Ethernet

Two Gigabit Ethernet ports are available on RJ45 connectors J1800 (Ethernet A) and J1801 (Ethernet B) with integrated magnetics and LEDs. Each port uses a Microchip **KSZ9131RNX** PHY connected via RGMII to the ETH_A and ETH_B interfaces of the module. Each PHY has its own MDIO bus.

Port	Connector	OSM interface	PHY address
Ethernet A	J1800	ETH_A (RGMII), ETH_A_MDIO/MDC	1
Ethernet B	J1801	ETH_B (RGMII), ETH_B_MDIO/MDC	2

The PHY I/O voltage is ETH_IOPWR supplied by the module (1.8–3.3 V). The PHY reset is generated on the carrier at power-up; optionally it can be driven by GPIO_A_0 (assembly option).

4.7 USB Interface

The RNX-OSM-CARRIER features two USB 2.0 ports and two USB 3.0 ports. Each port has its own VBUS power switch (AP22615) supplied from VSYS_5V and enabled by the corresponding USB_x_EN signal of the module. The current limit is 560 mA per port; an over-current condition is reported on USB_x_OC#. All data lines are ESD protected.

4.7.1 USB-A 2.0 OTG

The USB-A signals of the module are connected to the micro-AB connector J800. The ID pin is connected to USB_A_ID (host: connected to GND, device: open). USB_A_VBUS reports the VBUS voltage to the module; LED DL800 indicates VBUS.

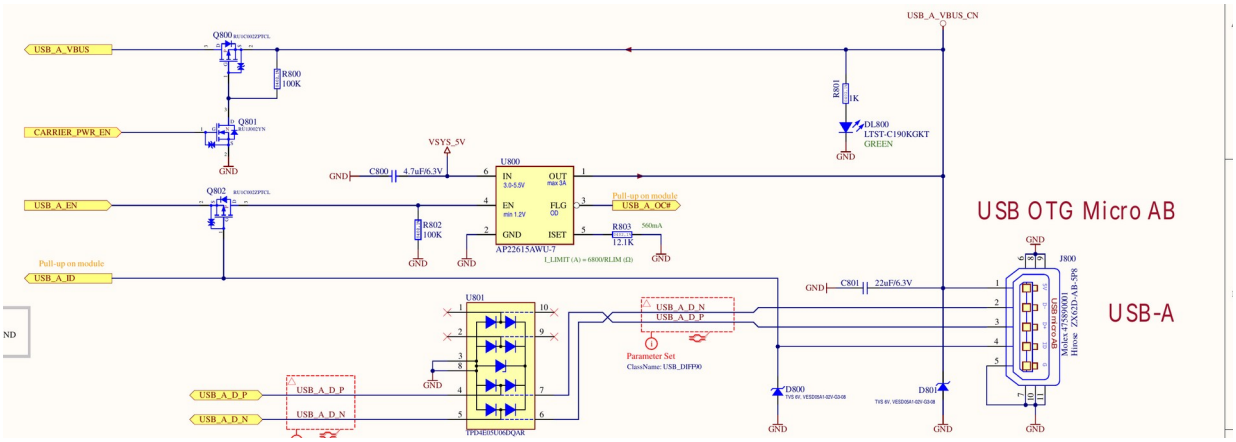


Figure 4.3: USB-A, OTG

4.7.2 USB-B 2.0 Host

The USB-B signals are connected to the Type-A connector J801 by default. As an assembly option (R806/R808 instead of R807/R809) USB-B can be routed to the M.2 connector J1600, e.g. for the Bluetooth part of a Wi-Fi/Bluetooth card.

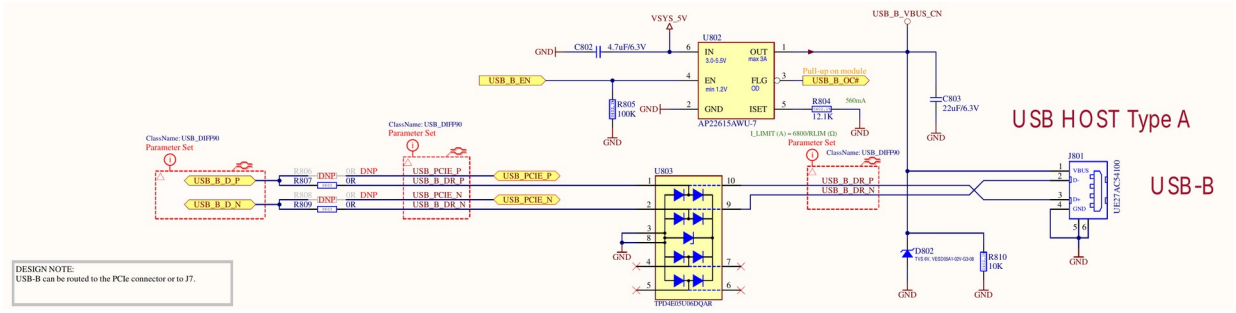


Figure 4.4: USB-B, Host

4.7.3 USB-C and USB-D, 3.0 Host

The USB-C and USB-D (USB 3.0 SuperSpeed + USB 2.0) signals are connected to the stacked dual Type-A connector J900: USB-C is the upper port, USB-D the lower port.

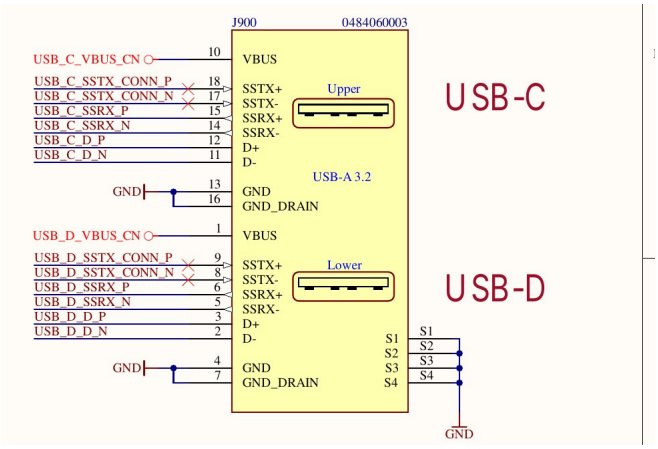


Figure 4.5: USB-C and USB-D connector

4.8 SD card

The RNX-OSM-CARRIER features a microSD card socket J1001 connected to the SDIO_A interface of the module. It can be used as boot device or storage. The card supply VCC_SD_3V3 is switched by SDIO_PWR_EN; the data lines are pulled up to SDIO_IOPWR provided by the module, so 1.8 V UHS modes are supported if the module supports them. Card detect (SDIO_CD#) is implemented; a write protect function is not available.

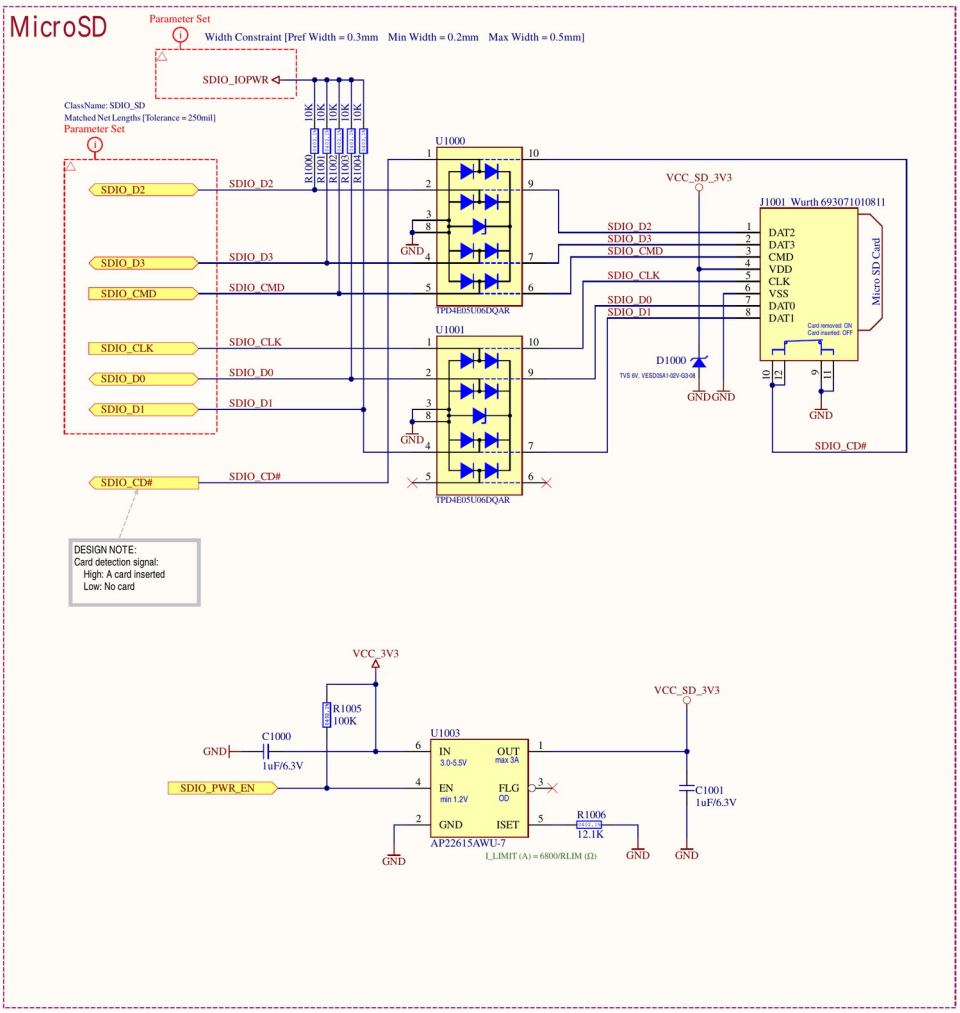


Figure 4.6: microSD card

4.9 LVDS Display

The 40-pin connector J1100 provides both LVDS channels of the module (LVDS_A and LVDS_B, 4 data lanes + clock each), so single- and dual-channel LVDS panels can be connected. All LVDS lanes have common-mode chokes and ESD protection. The panel control signals are level-shifted to 3.3 V:

J1100 signal	Source (default)	Alternative (assembly option)
DIS_BL_PWM_3V3	LVDS_BL_PWM	PWM0
DISP_nRESET_3V3	LVDS_VDD_EN	GPIO_A_1
DIS_BL_EN_3V3	LVDS_BL_EN	GPIO_A_2
LVDS_GPIO_3V3	GPIO_A_3	–
LVDS_I2C_CLK_3V3 / DAT_3V3	LVDS_I2C_CLK / LVDS_I2C_DAT	–

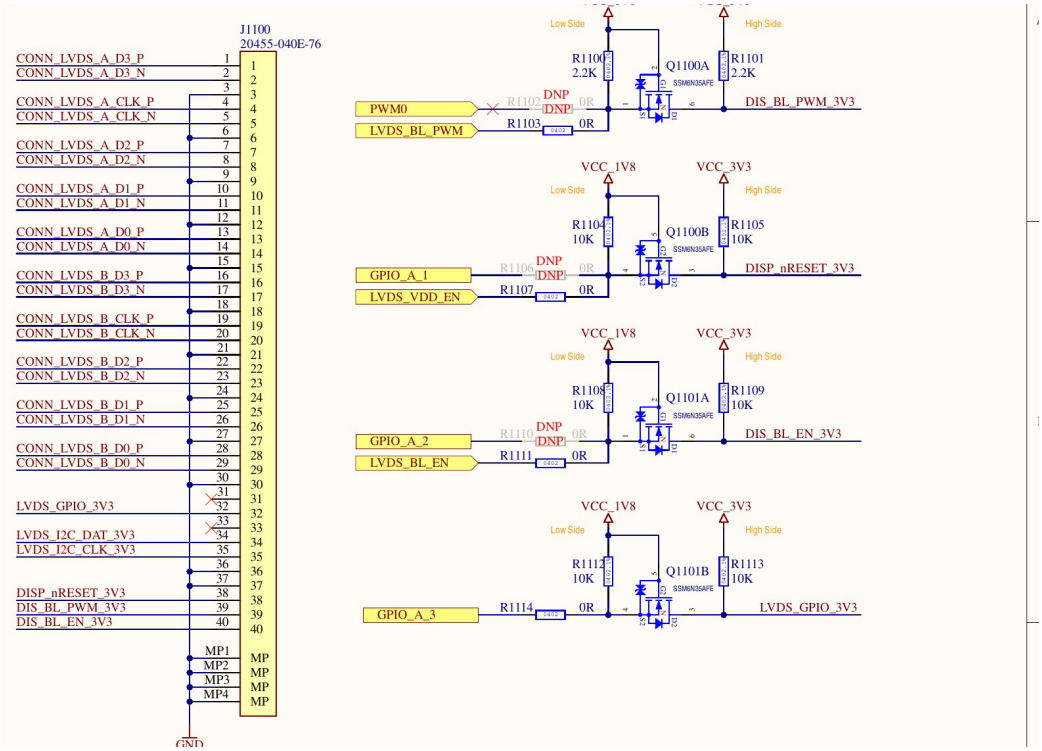


Figure 4.7: LVDS connector and backlight control

The display and backlight supplies are available on the 10-pin connector J1200:

J1200 pin	Signal
1, 10	LCD_VCC_12V (VIN_12V)
2, 9	LCD_VCC_5V0 (VSYS_5V)
3, 8	LCD_VCC_3V3 (VCC_3V3)
4, 5, 6, 7	GND

4.10 RGB Parallel Display

The parallel RGB signals of the module (18-bit RGB666 plus control) are available at 3.3 V on the pin headers J2306 and J2309. J2309 also provides VCC_3V3 and VCC_1V8 for an external display adapter.

J2306 pin	Signal	J2306 pin	Signal
1	RGB_R0	2	RGB_G4
3	RGB_R1	4	RGB_G5
5	RGB_R2	6	RGB_B0
7	RGB_R3	8	RGB_B1
9	RGB_R4	10	RGB_B2
11	RGB_R5	12	RGB_B3

J2306 pin	Signal	J2306 pin	Signal
13	RGB_G0	14	RGB_B4
15	RGB_G1	16	RGB_B5
17	RGB_G2	18	RGB_G3
19	GND	20	GND

J2309 pin	Signal	J2309 pin	Signal
1	RGB_RESET	2	RGB_CS
3	RGB_HSYNC	4	RGB_CLK
5	RGB_DISP	6	RGB_VSYNC
7	RGB_DE	8	GND
9	VCC_3V3	10	VCC_1V8

4.11 HDMI Display

The HDMI connector J1300 is driven by the eDP_A lanes of the module; the module must provide HDMI (TMDS) signalling on these pins. The DDC, CEC and hot-plug signals are level-shifted and ESD protected by a TPD12S016, which also supplies the 5 V for the HDMI connector.

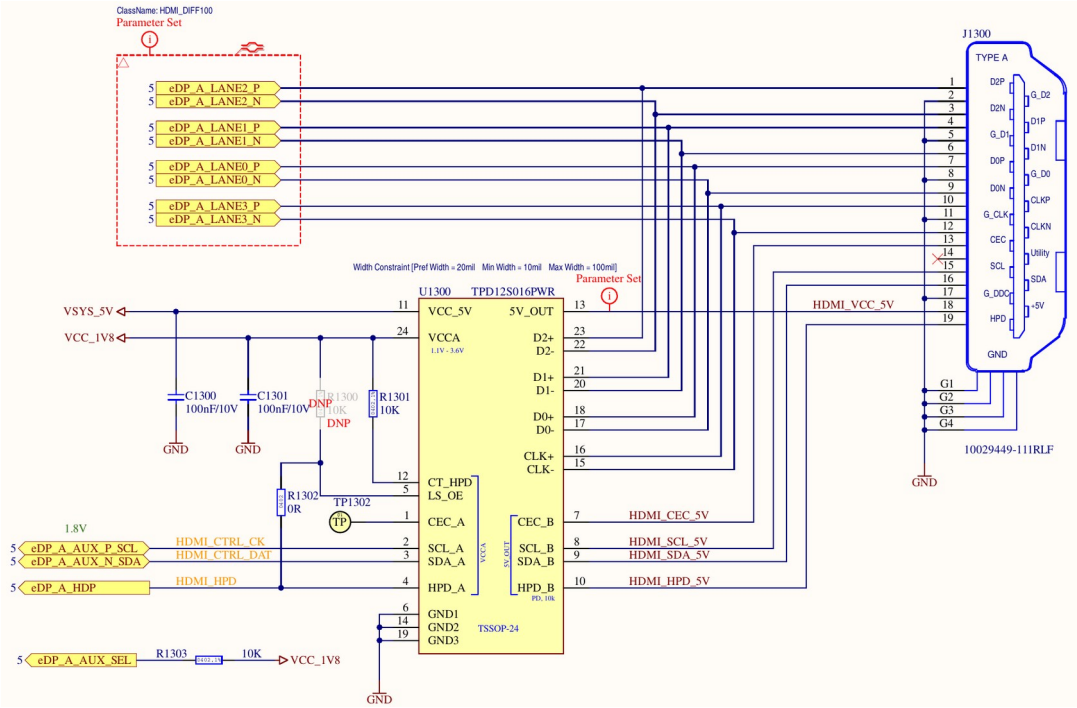


Figure 4.8: HDMI

4.12 MIPI DSI

The 4-lane MIPI-DSI interface of the module is connected to the 22-pin FFC connector J1000 (0.5 mm pitch). The pinout is compatible with the Raspberry Pi CM4 display connector. The connector also provides I²C (I2C_B, level-shifted to 3.3 V) and VCC_3V3.

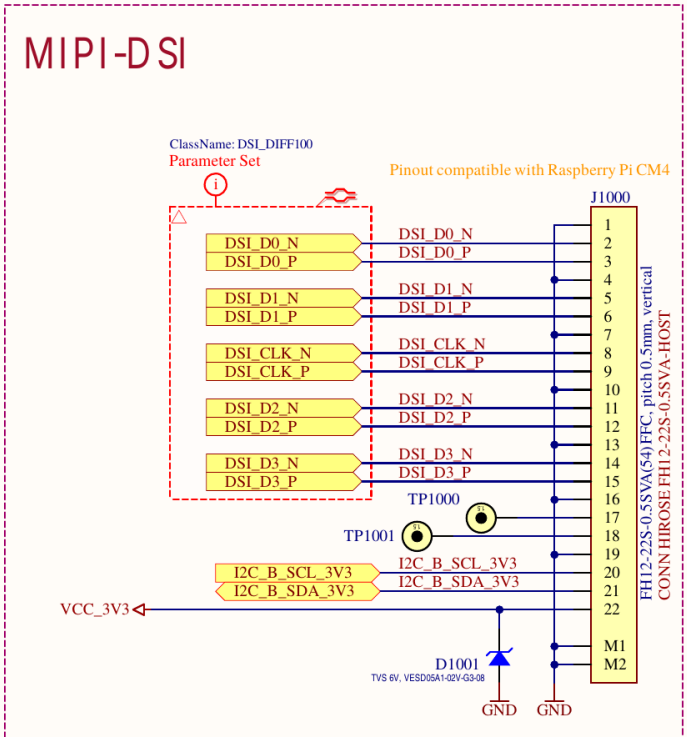


Figure 4.9: MIPI-DSI

4.13 Camera

The RNX-OSM-CARRIER supports two cameras with 4-lane MIPI-CSI-2 interfaces on the 22-pin FFC connectors J1400 (CSI-A) and J1401 (CSI-B). The pinout is compatible with the Raspberry Pi CM4 camera connectors; a tested reference camera is the IMX219-77 4-lane module. The camera I²C buses (CAM_A, CAM_B) are level-shifted to 3.3 V with PCA9306.

Connector	CSI	I²C	Camera power enable
J1400	CSI_A, 4 lanes	CAM_A_SCL/SDA	GPIO_C_6
J1401	CSI_B, 4 lanes	CAM_B_SCL/SDA	GPIO_C_2

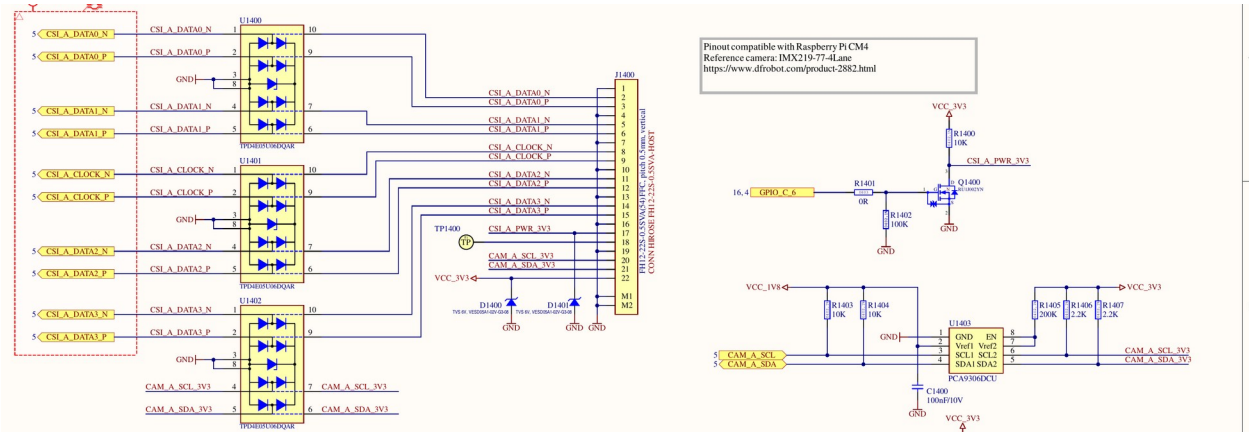


Figure 4.10: Camera MIPI-CSI-A (CSI-B identical)

4.14 USB debug UART

The RNX-OSM-CARRIER implements a dual USB-to-UART bridge (Silicon Labs **CP2105**) on the micro-AB connector J700. It is powered from the USB cable, so the console is available even when the board is switched off. The UART signals are level-shifted from 1.8 V to 3.3 V with a TXU0204.

CP2105 port	OSM UART
Standard (SCI)	UART_CON – console
Enhanced (ECI)	UART_A

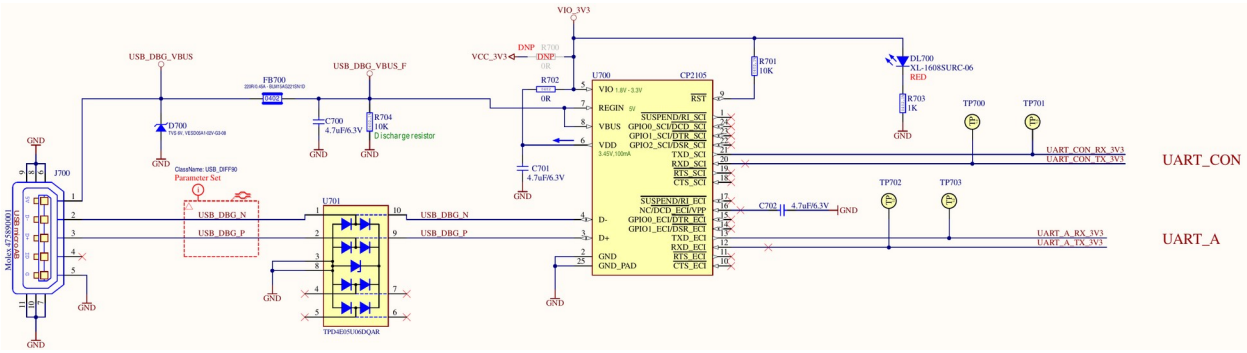


Figure 4.11: USB debug UART

4.15 GPIO and Peripheral Headers

The low-speed interfaces of the module are available on 2.54 mm pin headers. All signals are **1.8 V** except I2C_B_SCL_3V3/I2C_B_SDA_3V3 on J2300 (3.3 V).

4.15.1 J2300 – UART, PWM, I²C

Pin	Signal	Pin	Signal
1	UART_A_RX	2	UART_D_RX
3	UART_A_TX	4	UART_D_TX
5	UART_A_RTS	6	PWM0
7	UART_A_CTS	8	PWM1
9	UART_B_RX	10	PWM2
11	UART_B_TX	12	PWM3
13	UART_B_RTS	14	PWM4
15	UART_B_CTS	16	PWM5
17	UART_C_RX	18	I2C_B_SCL_3V3
19	UART_C_TX	20	I2C_B_SDA_3V3

4.15.2 J2303 – SPI / QSPI, I²C

Pin	Signal	Pin	Signal
1	SPI_A_SDI / QSPI_IO0	2	SPI_C_SDI
3	SPI_A_SDO / QSPI_IO1	4	SPI_C_SDO
5	SPI_A_WP / QSPI_IO2	6	SPI_C_CS0#
7	SPI_A_HOLD / QSPI_IO3	8	SPI_C_SCK
9	SPI_A_CS0#	10	I2C_A_SCL
11	SPI_A_SCK	12	I2C_A_SDA
13	SPI_B_SDI	14	I2C_B_SCL
15	SPI_B_SDO	16	I2C_B_SDA
17	SPI_B_CS0#	18	SPI_B_SCK
19	GND	20	GND

4.15.3 J2301, J2304 – GPIO

J2301 pin	Signal	J2301 pin	Signal
1	GPIO_A_0	2	GPIO_B_2
3	GPIO_A_1	4	GPIO_B_3
5	GPIO_A_2	6	GPIO_B_4
7	GPIO_A_3	8	GPIO_B_5
9	GPIO_A_4	10	GPIO_B_6
11	GPIO_A_5	12	GPIO_B_7
13	GPIO_A_6	14	GPIO_C_0
15	GPIO_A_7	16	GPIO_C_1
17	GPIO_B_0	18	GPIO_C_2
19	GPIO_B_1	20	GPIO_C_3

J2304 pin	Signal	J2304 pin	Signal
1	GPIO_C_4	2	GPIO_D_6
3	GPIO_C_5	4	GPIO_D_7
5	GPIO_C_6	6	GPIO_E_0
7	GPIO_C_7	8	GPIO_E_1
9	GPIO_D_0	10	GPIO_E_2
11	GPIO_D_1	12	GPIO_E_3
13	GPIO_D_2	14	GPIO_E_4
15	GPIO_D_3	16	GPIO_E_5
17	GPIO_D_4	18	GPIO_E_6
19	GPIO_D_5	20	GPIO_E_7

Some GPIOs have a carrier function: GPIO_A_0 – Ethernet PHY reset (optional), GPIO_A_1 – LVDS reset (optional), GPIO_A_2 – LVDS backlight enable (optional), GPIO_A_3 – LVDS GPIO, GPIO_C_2 – CSI-B camera power enable, GPIO_C_6 – CSI-A camera power enable.

4.16 CAN and ADC Interface

The CAN controller signals of the module (CAN_A, CAN_B) and the ADC inputs are available on header J2307. The CAN signals are 1.8 V logic level – an external CAN transceiver is required to connect to a CAN bus. For testing, the ADC inputs can be connected to on-board reference voltages derived from VCC_1V8 by placing jumpers 5-6 (ADC_0 = 0.9 V) and 7-8 (ADC_1 = 0.56 V).

Pin	Signal	Pin	Signal
1	CAN_A_TX	2	CAN_B_TX
3	CAN_A_RX	4	CAN_B_RX
5	0.9 V reference	6	ADC_0
7	0.56 V reference	8	ADC_1
9	GND	10	VENDOR1

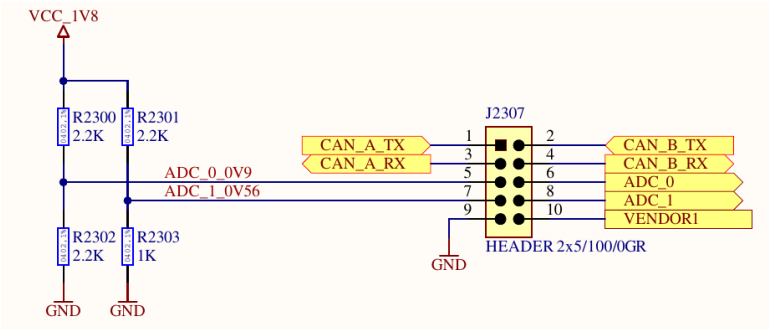


Figure 4.12: CAN and ADC header

4.17 RTC Backup Battery

The real-time clock is part of the OSM module. Its backup supply RTC_PWR is provided from the coin cell in holder B200 through a Schottky diode and a 1 kΩ resistor.

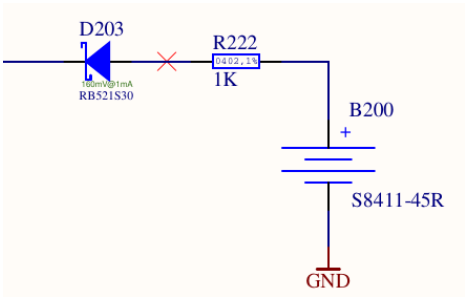


Figure 4.13: RTC backup battery

4.18 PCIe M.2

The RNX-OSM-CARRIER provides one M.2 Key E connector J1600, intended for Wi-Fi/Bluetooth cards. It is connected to the PCIe_A interface of the module (one lane, AC coupling capacitors on the TX lane, HCSL reference clock). The PCIe sideband signals (CLKREQ#, PERST#, WAKE#) and the SMBus are level-shifted between 1.8 V and the card I/O voltage. The card I/O voltage is selected automatically via VIO_CFG (1.8 V or 3.3 V sideband signals). The 32.768 kHz sleep clock SUSCLK is generated on the carrier. The card is supplied with VCC_3V3. USB 2.0 can be routed to the M.2 connector as an assembly option (see USB-B). The card LEDs are connected to DL1600 and DL1601.

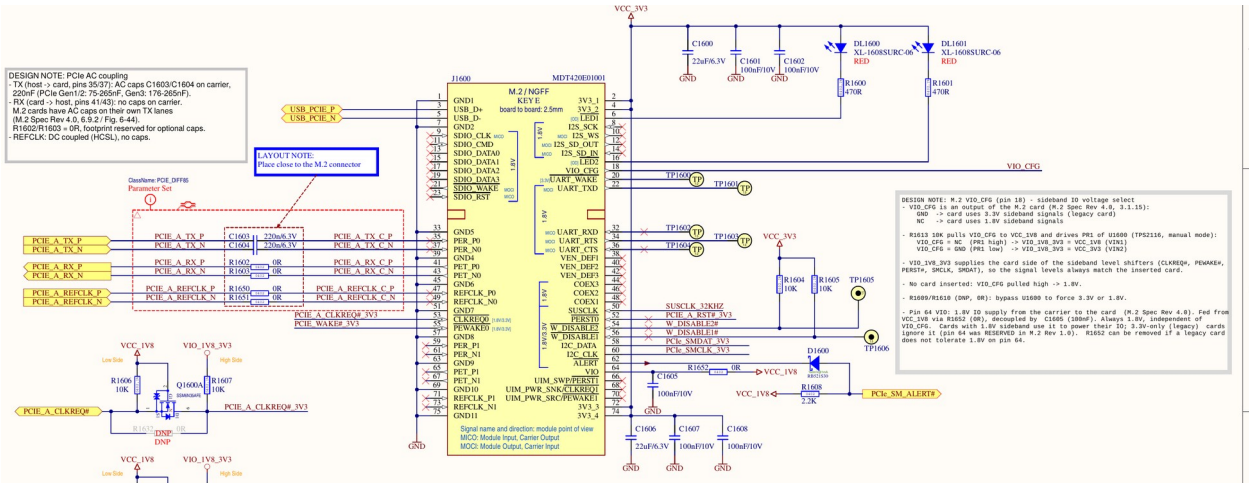


Figure 4.14: M.2 PCI Express, Key E

4.19 PMOD Interface

PMOD (peripheral module interface) is an open standard defined by Digilent for connecting peripheral modules to development boards. The RNX-OSM-CARRIER provides one 12-pin **PMOD Type 7 (I²S)** connector J2308, compatible with the Digilent **Pmod I2S2** stereo audio input/output module. The I2S_A signals of the module are level-shifted from 1.8 V to 3.3 V.

Pin	Signal	Pin	Signal
1	I2S_MCLK (DAC)	7	I2S_MCLK (ADC)
2	I2S_A_LRCLK (DAC)	8	I2S_A_LRCLK (ADC)
3	I2S_A_BITCLK (DAC)	9	I2S_A_BITCLK (ADC)
4	I2S_A_DATA_OUT	10	I2S_A_DATA_IN
5	GND	11	GND
6	VCC_3V3	12	VCC_3V3

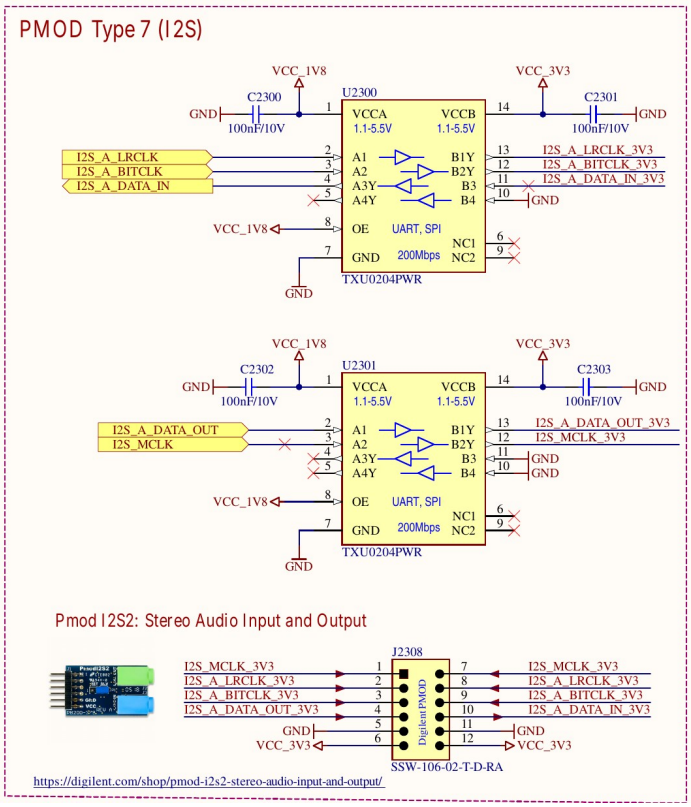


Figure 4.15: PMOD Type 7 (I²S)

4.20 JTAG

The RNX-OSM-CARRIER exposes the JTAG/SWD signals of the module through a standard 1.27 mm 10-pin connector J701 (Arm Cortex debug pinout). The signal level is 1.8 V; pin 1 (VCC) provides the reference voltage via 330 Ω. Pin 10 is connected to the system reset SYS_RST#.

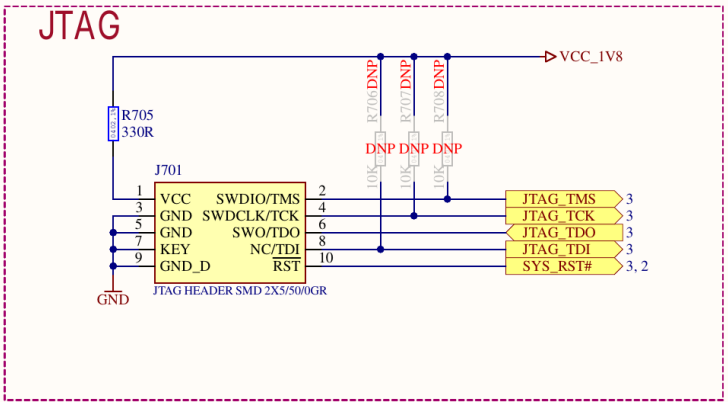


Figure 4.16: JTAG

4.21 Mass Production Test

The RNX-OSM-CARRIER is designed for development and mass production test. For the production test of OSM modules it offers:

- **fast module exchange** – the module is clamped in the LGA662 socket; no soldering and no adapter board are needed
- **loopback testing** – on the 2.54 mm headers the complementary signals (TX/RX, SDO/SDI, GPIO pairs) are placed on neighbouring pins of the same column, so they can be connected with standard jumpers. The test software drives one signal and reads it back on the other
- **console without board power** – the USB debug UART (J700) is powered from the USB cable, so the test log can be captured from power-up on
- **standard peripherals** – the high-speed interfaces are tested with standard devices: Ethernet cables or loopback plugs, USB memory sticks, microSD card, M.2 Wi-Fi card, HDMI/LVDS/DSI displays, MIPI-CSI cameras and a Pmod I2S2 audio module

The following loopback jumpers can be fitted. Jumpers connect two pins of the same column (e.g. pin 1 to pin 3).

Header	Jumper	Loopback
J2300	1 – 3	UART_A_RX ↔ UART_A_TX (R709 removed)
J2300	5 – 7	UART_A_RTS ↔ UART_A_CTS
J2300	9 – 11	UART_B_RX ↔ UART_B_TX
J2300	13 – 15	UART_B_RTS ↔ UART_B_CTS
J2300	17 – 19	UART_C_RX ↔ UART_C_TX
J2300	2 – 4	UART_D_RX ↔ UART_D_TX
J2303	1 – 3	SPI_A_SDI ↔ SPI_A_SDO
J2303	13 – 15	SPI_B_SDI ↔ SPI_B_SDO
J2303	2 – 4	SPI_C_SDI ↔ SPI_C_SDO

Header	Jumper	Loopback
J2301, J2304	1 – 3, 5 – 7, … 17 – 19 2 – 4, 6 – 8, … 18 – 20	GPIO pairs, e.g. GPIO_A_0 ↔ GPIO_A_1 (one GPIO as output, the other as input)
J2307	1 – 3	CAN_A_TX ↔ CAN_A_RX (CAN controller test)
J2307	2 – 4	CAN_B_TX ↔ CAN_B_RX (CAN controller test)
J2307	5 – 6	ADC_0 ← 0.9 V reference
J2307	7 – 8	ADC_1 ← 0.56 V reference

UART_A_RX is also driven by the USB debug bridge (CP2105 via level shifter U702). For the UART_A loopback test, remove the 0 Ω resistor R709 to disconnect the debug bridge from UART_A_RX; UART_A is then no longer available on the USB debug port. The PWM, I²C and RGB signals are outputs or open-drain buses and are verified with connected test devices instead of loopback jumpers.

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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