User's Manual

RZ SMARC Series Carrier Board

User's Manual: Hardware

Renesas Microprocessor
RZ Family / RZ/G, RZ/V, RZ/A Series

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The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on
   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins
   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses
   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products
   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Table of Contents

1. Overview

1.1 Purpose

The RZ SMARC Series Carrier Board (hereafter referred to as "RZ SMARC Carrier") is a platform designed in accordance with the SMARC 2.1 specification, providing a carrier for Renesas RZ SMARC Module Boards.

Basically, the RZ SMARC Carrier is connected to the Renesas RZ/G2L SMARC Module Board (hereafter referred to as "RZ/G2L SMARC Module")*1 and used as the RZ/G2L SMARC Evaluation Board (hereafter referred to as "RZ/G2L EVKIT").

This guide is based on a combination of the RZ SMARC Carrier and the RZ/G2L SMARC Module.

It includes system setup and configuration, and also provides detailed information on the overall design and use of the RZ SMARC Carrier from a hardware system perspective.

Details of the Renesas RZ SMARC Module Boards can be found in the User's Manuals for the RZ/G2L, RZ/V2L, RZ/G2LC, RZ/G2UL, RZ/A3UL and RZ/Five SMARC Module Boards.

The RZ SMARC Carrier has the following features.

- The FFC/FPC connector is mounted as standard for connection to a high-speed serial interface for camera modules.
- The microHDMI connector, connected via a MIPI-DSI-to-HDMI transmitter, is provided as standard for connection to a high-speed serial interface for digital video modules.
- The USB Type-microAB receptacle (ch0: USB 2.0 host/function) and the USB Type-A receptacle (ch1: USB 2.0 host) are provided as standard for connection to USB 2.0 interfaces.
- The RJ45 connector is mounted as standard for software development and evaluation using Ethernet.
- The audio codec is mounted as standard for advance development of an audio system. The audio input/output jack is implemented for connection to an audio interface.
- The CAN connector is implemented for connection to a CAN-FD interface*2.
- The USB Type-microAB receptacles are implemented for connection to asynchronous serial port interfaces.
- The microSD card slot and two sockets for PMOD are implemented as an interface for peripheral functions.
- For power supply, it is mounted a USB Type-C receptacle that supports the USB PD standard.

Note 1. Other target module boards that can be connected to the RZ SMARC Carrier are listed below:
Renesas RZ/G2LC SMARC Module Board (hereafter referred to as "RZ/G2LC SMARC Module")
Renesas RZ/V2L SMARC Module Board (hereafter referred to as "RZ/V2L SMARC Module")
Renesas RZ/G2UL SMARC Module Board (hereafter referred to as "RZ/G2UL SMARC Module")
Renesas RZ/A3UL SMARC Module Board (hereafter referred to as "RZ/A3UL SMARC Module")
Renesas RZ/Five SMARC Module Board (hereafter referred to as "RZ/Five SMARC Module")

Note 2. The CAN connector is implemented, but the CAN-FD interface cannot be used because a CAN transceiver is not fitted.
The following Carrier boards are equipped with a CAN transceiver, and the CAN-FD interface is already available:
S.LOT# on the outer box label: 000251812 or later
S.LOT# label on the Carrier board: 251812 or later

1.2 Configuration

Figure 1.1 shows an example of system configuration using the RZ SMARC Carrier. In this example, the RZ/G2L SMARC Module is used as the Module Board.

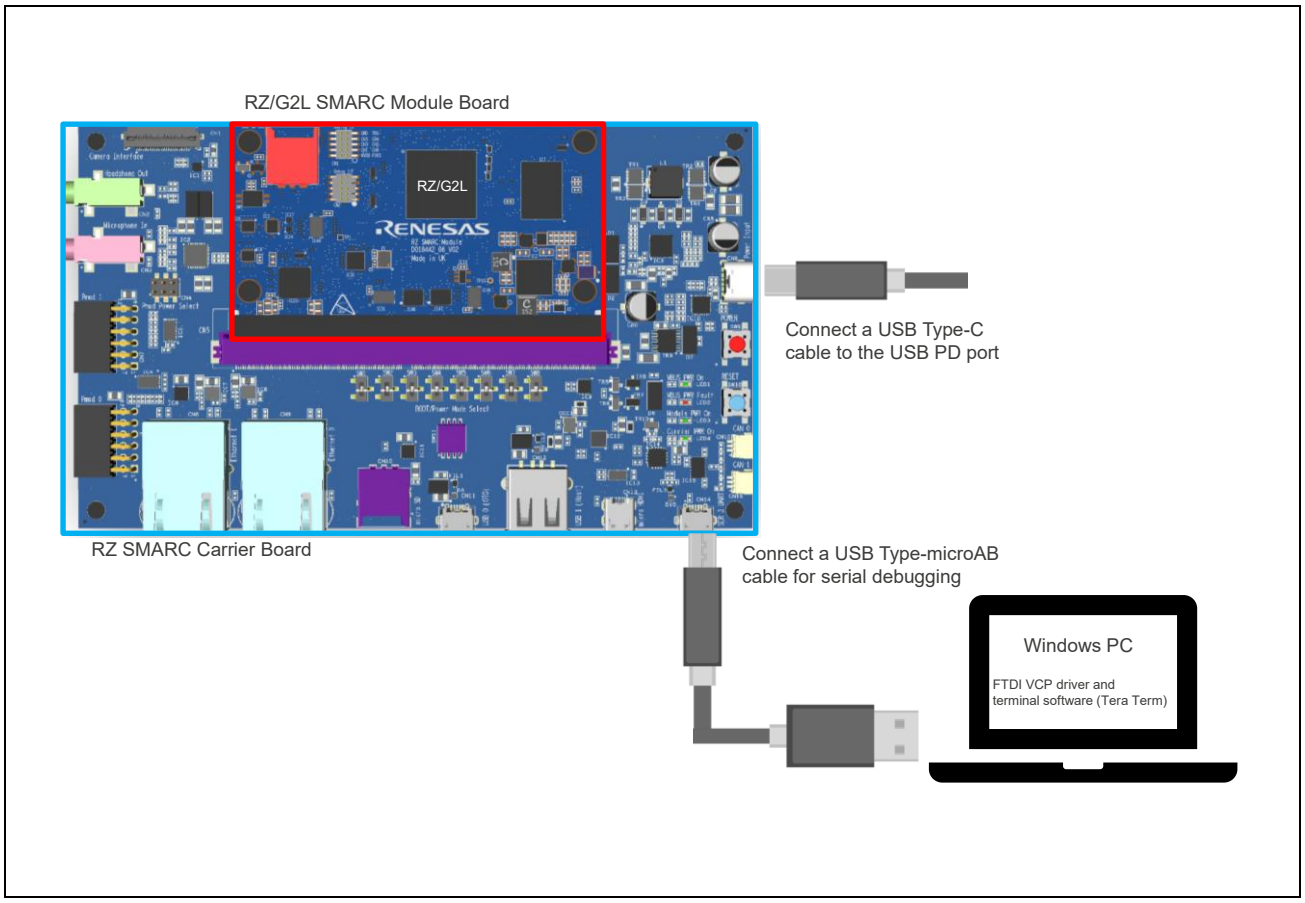


Figure 1.1 Example of System Configuration

1.3 Features

Table 1.1 shows the features of the RZ SMARC Carrier.

Table 1.1 Features

Item	Details
USB2.0 interface	Connector: Type-microAB Connector: Type-A
Ethernet interface	Connector: RJ45 × 2
Debug interface	Connector: USB Micro-AB UART-USB bridge: FT230XQ
Power supply	USB-PD Type-C (15W or 27W)
SD interface	Connector: microSD card slot
Audio interface	Audio codec: WM8978 Connector: 3.5 mm jack (MIC) Connector: 3.5 mm jack (HP)
Camera interface	Connector: 5051102491-SD
Display interface	Connector: microHDMI MIPI-DSI-to-HDMI transmitter: ADV7535
CAN-FD interface	Connector: SM03B-SRSS-TB × 2 CAN transceiver: TCAN1046-Q1*1
PMOD interface	PMOD Type-2A (SPI) PMOD Type-3A/6A (UART/I2C)
SMARC edge interface	Connector: • D017832_06_V04: JAE MM70-314B1-2-R300*2 • D017832_06_V05: FOXCONN AS0B826-S55B-7H*2
Switch	For power on/off: Push-button switch (Red) For hardware reset: Push-button switch (Blue) For mode setting and VBUS power selection: 4-bit DIP switch For PMOD Type-3A and Type-6A selection: 1-bit DIP switch x6 For PMOD abd CAN selection: 1-bit DIP switch × 2
LED	For VBUS power on: Green For VBUS power fault: Red For SOM power on: Green For Carrier power on: Green
Circuit board specifications	Dimensions: 150 mm (W) × 90 mm (L) × 1.4 mm (H) Mount: Single-sided mounting (6 layers)

Note 1. The CAN connector is implemented; however, the CAN-FD interface cannot be used because a CAN transceiver is not fitted. The following Carrier boards are equipped with a CAN transceiver, and the CAN-FD interface is already available:
S.LOT# on the outer box label: 000251812 or later
S.LOT# label on the Carrier board: 251812 or later

Note 2. The board version is printed on the board silkscreen, as shown in Figure 1.2.

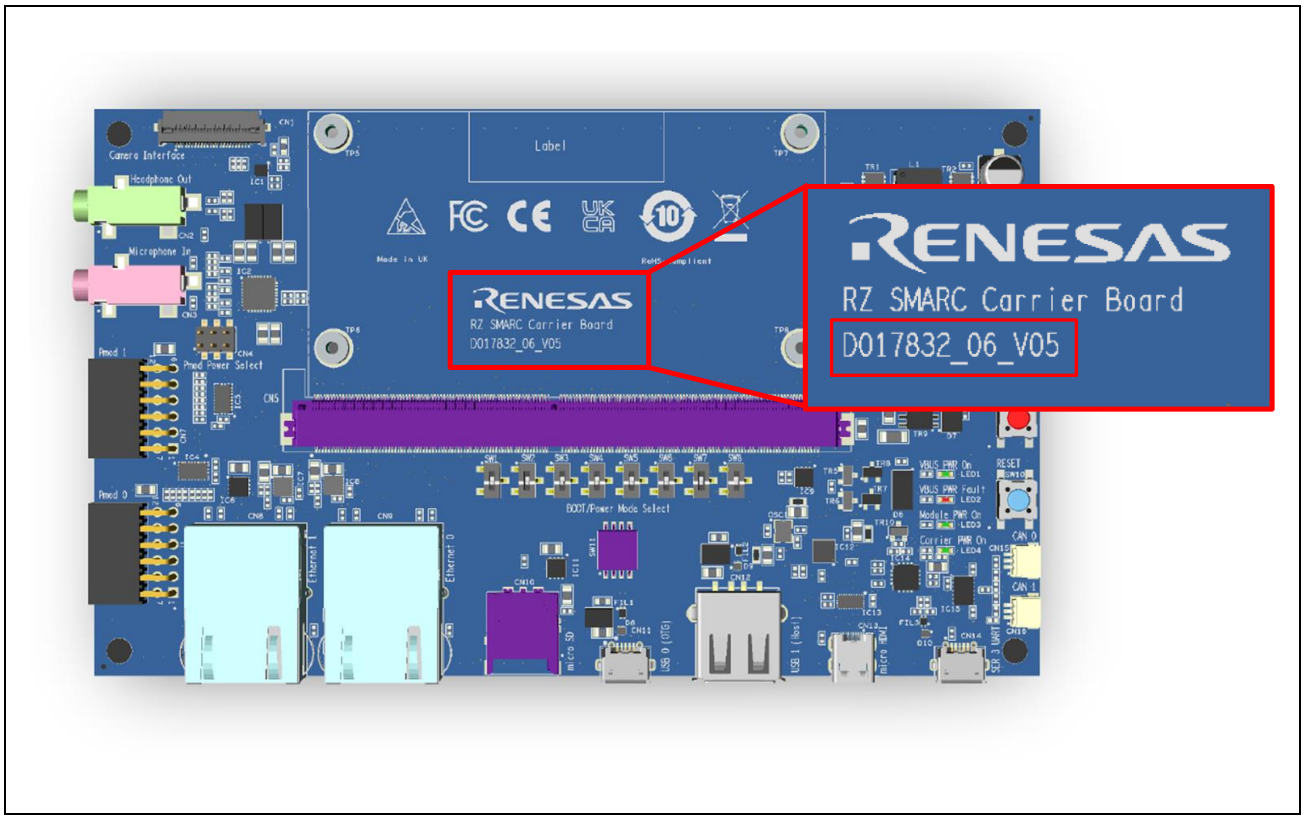


Figure 1.2 Checking the Board Version

1.4 Block Diagram

Figure 1.3 shows the block diagram of the RZ SMARC Carrier.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

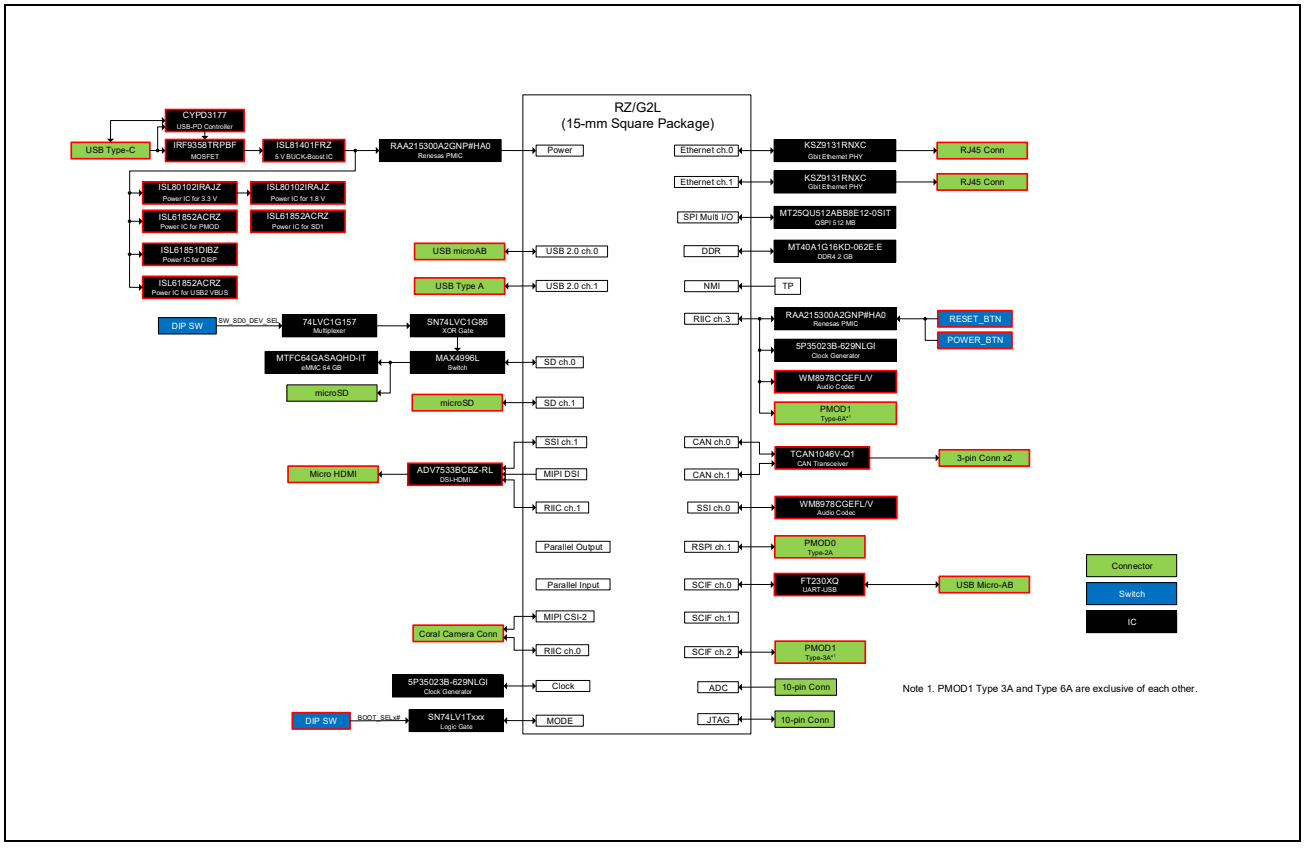


Figure 1.3 Block Diagram

1.5 Component Layout

Figure 1.4 and **Figure 1.5** show the component layout on the top and bottom sides of the RZ SMARC Carrier.

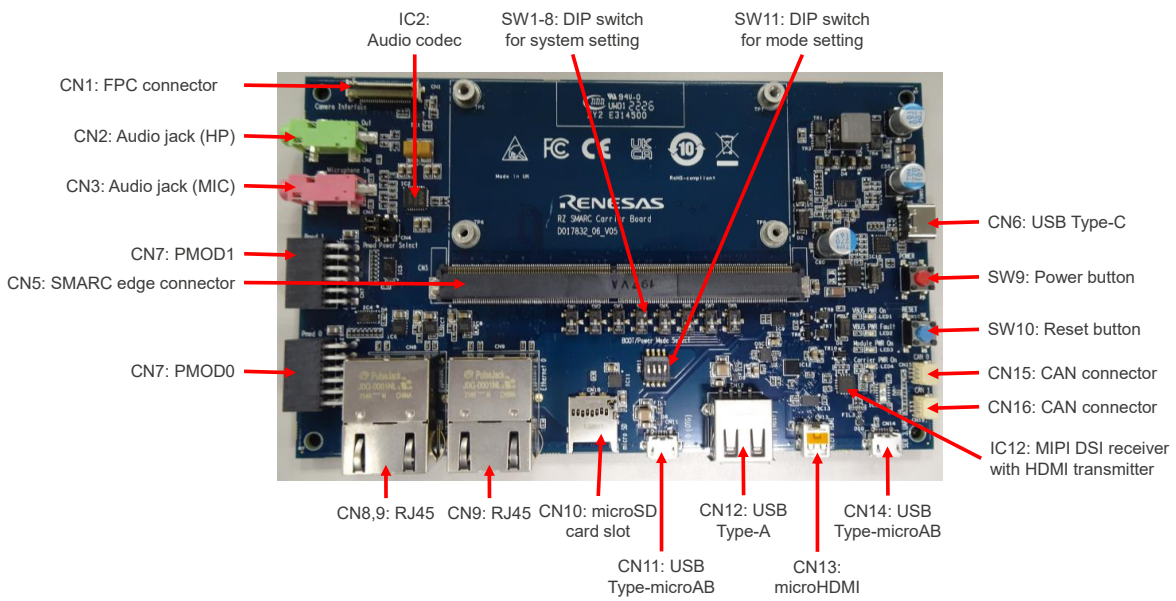


Figure 1.4 Component Layout (Top View)

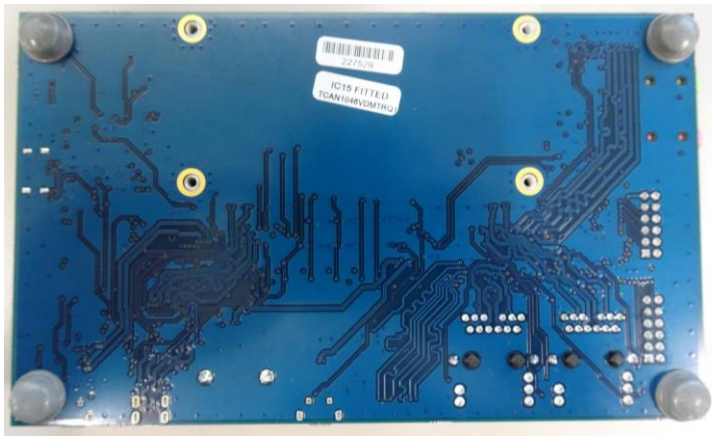


Figure 1.5 Component Layout (Bottom View)

1.6 Absolute Maximum Ratings

Table 1.2 lists absolute maximum ratings of the RZ SMARC Carrier.

Table 1.2 Absolute Maximum Ratings

Symbol	Item	Rated Value	Note
USBC_VBUS_IN	Power voltage	15 V	Reference: USB Type-C Port Controller (CYPD3177) Specification on the RZ SMARC Carrier
—	Maximum power consumption	3 A	Includes continuous RZ/G2L Module Board current consumptions
Topr	Operating ambient temperature*1	0°C to 50°C	Do not expose to condensation or corrosive gases
Tstg	Storage temperature*1	-10°C to 60°C	Do not expose to condensation or corrosive gases

Note 1. Ambient temperature is the air temperature at a position as close to the board as possible.

1.7 Operating Conditions

Table 1.3 lists operating conditions of the RZ SMARC Carrier.

Table 1.3 Operating Conditions

Symbol	Item	Rated Value	Note
USBC_VBUS_IN	Power voltage	5 V to 15 V	Reference: Vss
Topr	Operating ambient temperature*1	0°C to 40°C	Do not expose to condensation or corrosive gases

Note 1. Ambient temperature is the air temperature at a position as close to the board as possible.

2. Functional Specifications

2.1 Overview of Functions

Table 2.1 lists function modules of the RZ SMARC Carrier.

Table 2.1 Function Modules of the RZ SMARC Carrier

Section	Function	Description
2.2	**MPU**	Devices pin functions used in the RZ SMARC Carrier
2.3	**USB2.0 Interface**	Connection between the USB2.0 host/function module and USB Type-microAB, Type-A connector
2.4	**Gigabit Ethernet Interface**	Connection between the Ethernet controller (E-MAC) and LAN connector via Ethernet PHY
2.5	**Serial Debug** Interface	Connection between the Serial Communications Interface with FIFO (SCIFA) and USB Type-microAB connector
2.6	**Clock Configuration**	System clock configuration
2.7	**Reset Control**	Reset control for the Module board and devices installed on RZ SMARC Carrier.
2.8	**Power Supply Configuration**	System power supply configuration of the Module board and RZ SMARC Carrier
2.9	**SD1 Interface**	Connection between the SD/MMC Host Interface (SDHI) channel 1 and microSD card slot
2.10	**Audio Interface**	Connection for the Serial Sound Interface (SSIF-2) via Audio Codec (WM8978)
2.11	**Camera Interface**	Connection between the Camera Data Receiving Unit (CRU) and camera connector
2.12	**Display Interface**	Connection between devices and microHDMI connector via the MIPI-DSI-to-HDMI transmitter
2.13	**CAN-FD Interface**	Connection between the CAN-FD interface (RS-CANFD) and CAN connector
2.14	**PMOD Interface**	Connection between General Purpose Input Output interface (GPIO) and PMOD connector
—	Operating specification	Connectors, switches and LEDs Details are described in Chapter 3

2.2 MPU

Please refer to the function list (section 4.1) in the user's manual of each module board.

2.3 USB2.0 Interface

2.3.1 USB0 (Host-Function)

Figure 2.1 shows a block diagram of the USB0 (Host-Function) interface.

The RZ SMARC Carrier incorporates a VBUS supply circuit, a protection diode, and a USB Type-microAB receptacle.

This interface complies with the USB standard version 2.0 and supports the USB On-The-Go function.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

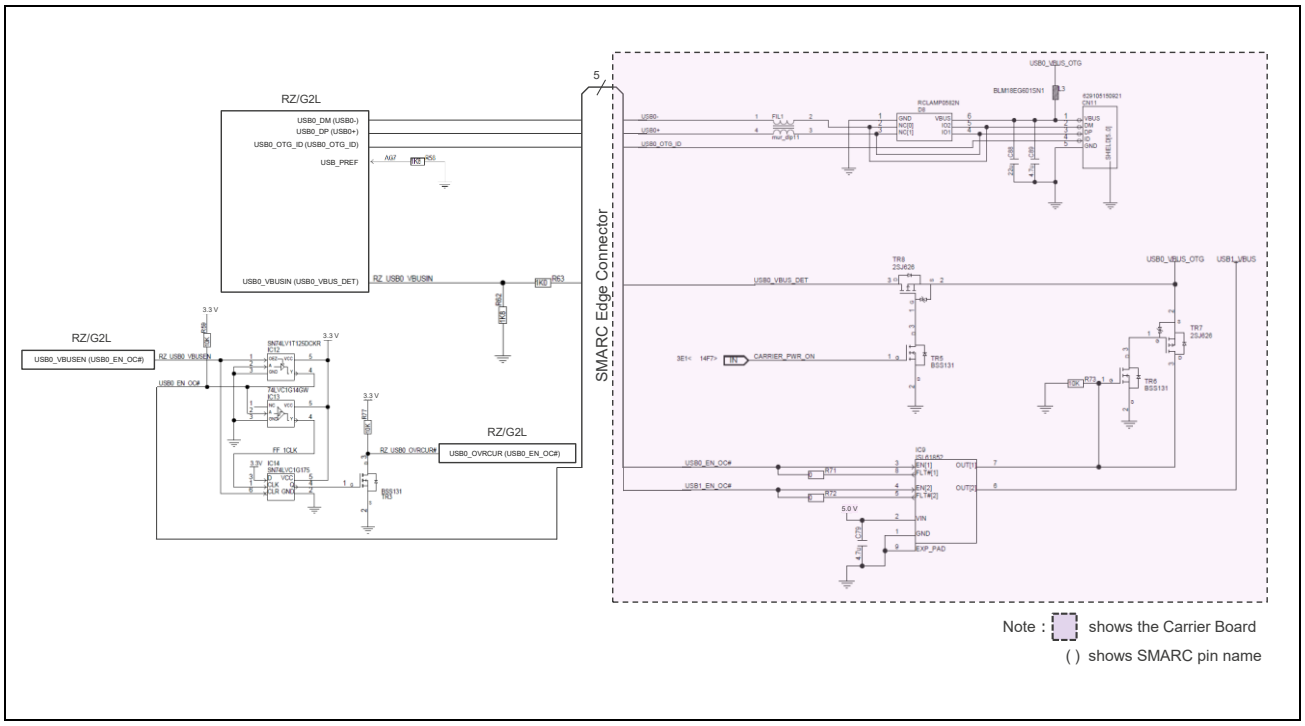


Figure 2.1 Block Diagram of USB0 (Host-Function) I/F

2.3.2 USB1 (Host)

Figure 2.2 shows a block diagram of the USB1 (Host) interface.

The RZ SMARC Carrier incorporates a VBUS supply circuit, a protection diode, and a USB Type-A receptacle.

This interface complies with the USB standard version 2.0.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

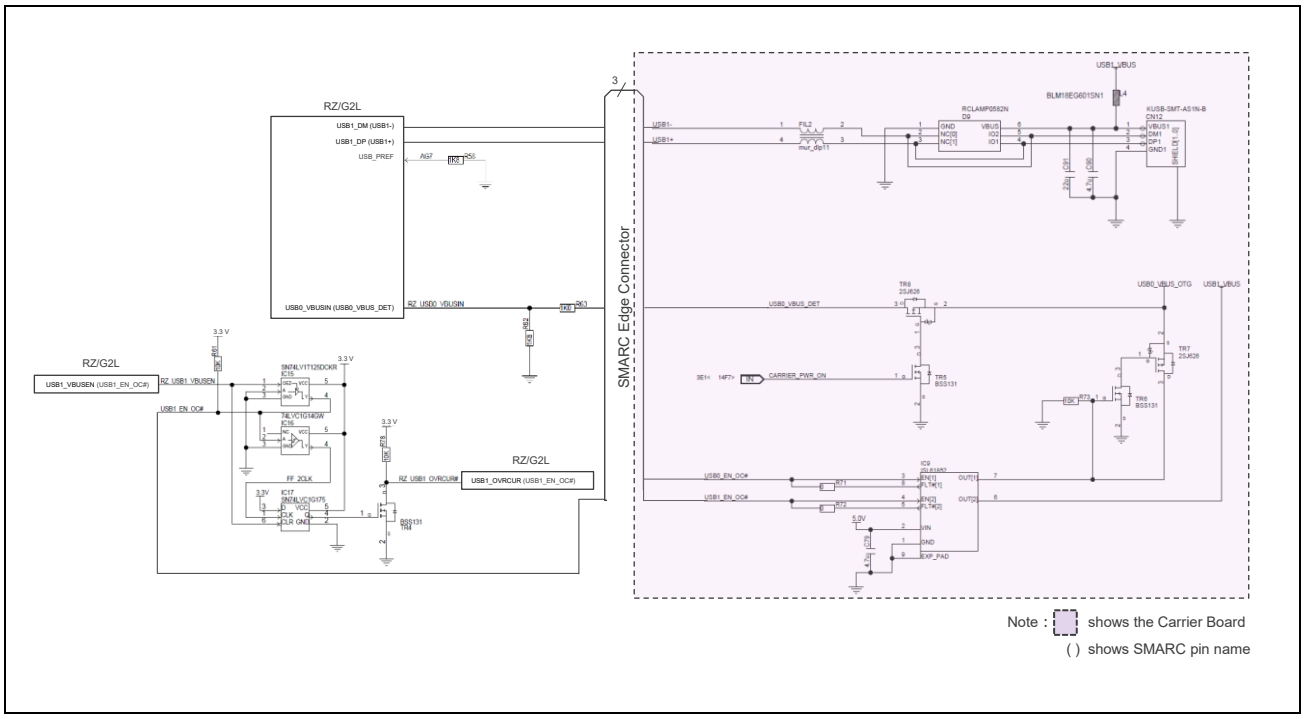


Figure 2.2 Block Diagram of USB1 (Host) I/F

2.4 Gigabit Ethernet Interface

Figure 2.3 and **Figure 2.4** show the block diagrams of the Gigabit Ethernet 0 and Gigabit Ethernet 1 interfaces.

The RZ SMARC Carrier incorporates an RJ45 connector for connection to the Ethernet interface.

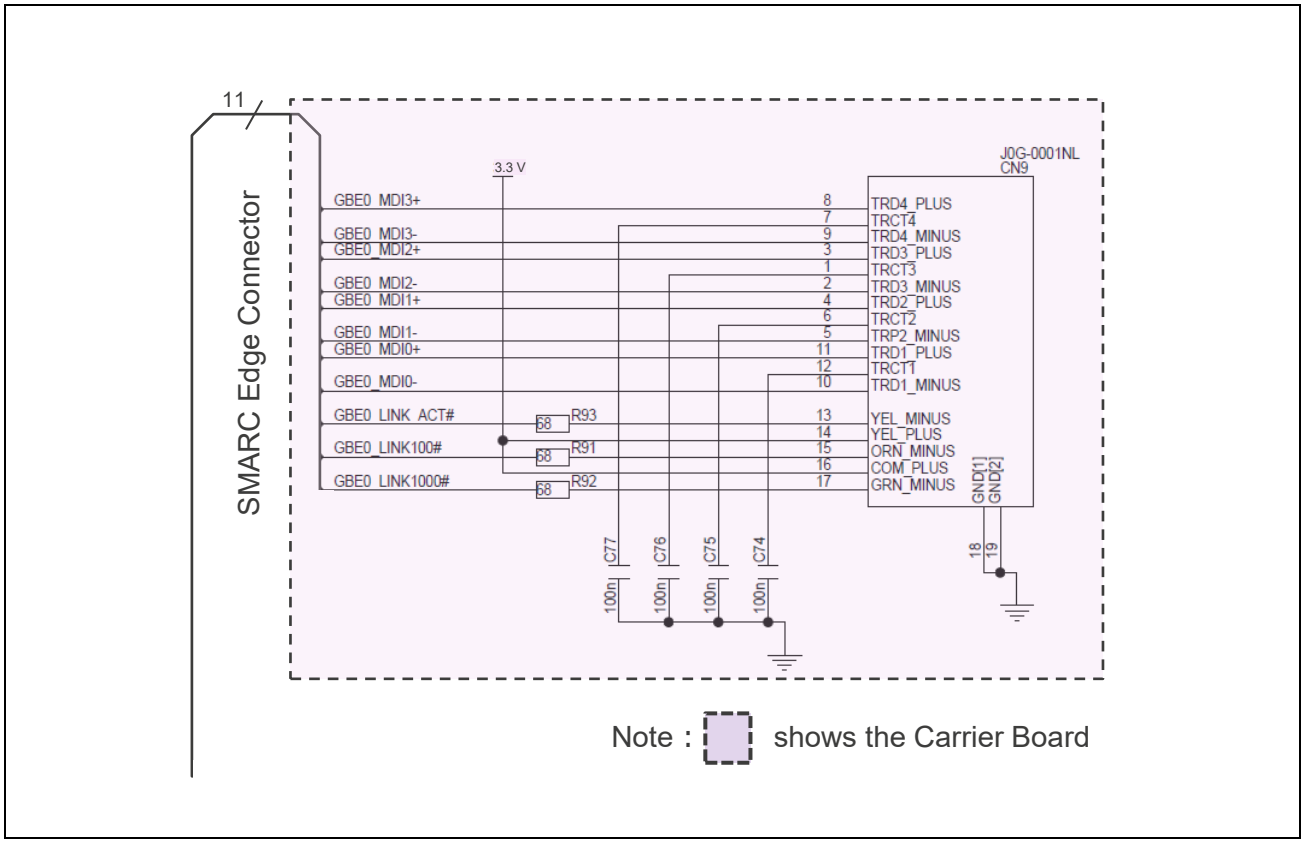


Figure 2.3 Block Diagram of Gigabit Ethernet 0 I/F

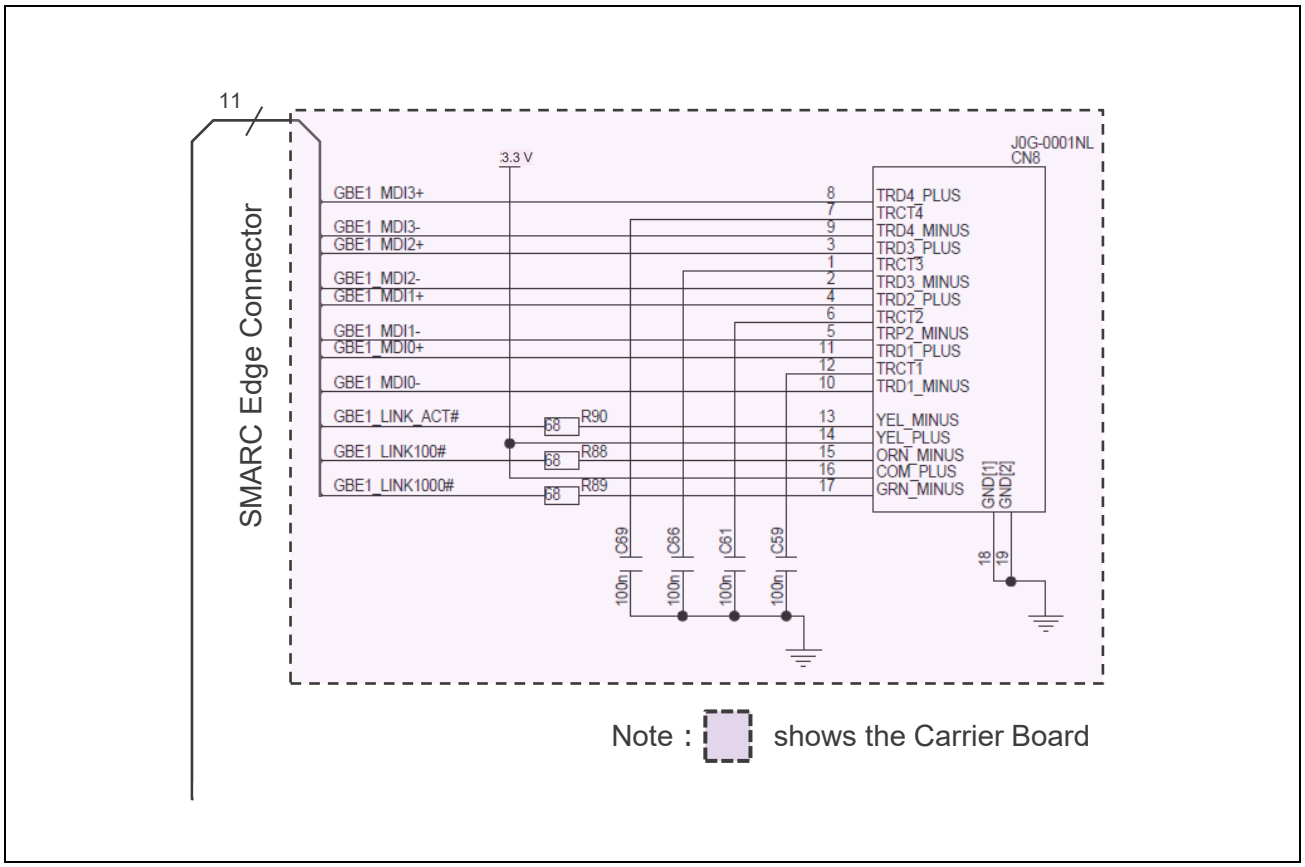


Figure 2.4 Block Diagram of Gigabit Ethernet 1 I/F

2.5 Serial Debug Interface

Figure 2.5 shows a block diagram of the serial debug interface.

The RZ SMARC Carrier is connected to the USB Type-microAB receptacle through a USB serial conversion IC.

To perform serial communication between the USB connector of the host computer and the USB Type-microAB receptacle (CN14) on the RZ SMARC Carrier, the driver for a serial conversion IC must be installed on the host computer.

Download and install the INF file on the host computer from the following URL: Virtual COM Port Drivers

In this example, the RZ/G2L SMARC Module is used as the Module Board.

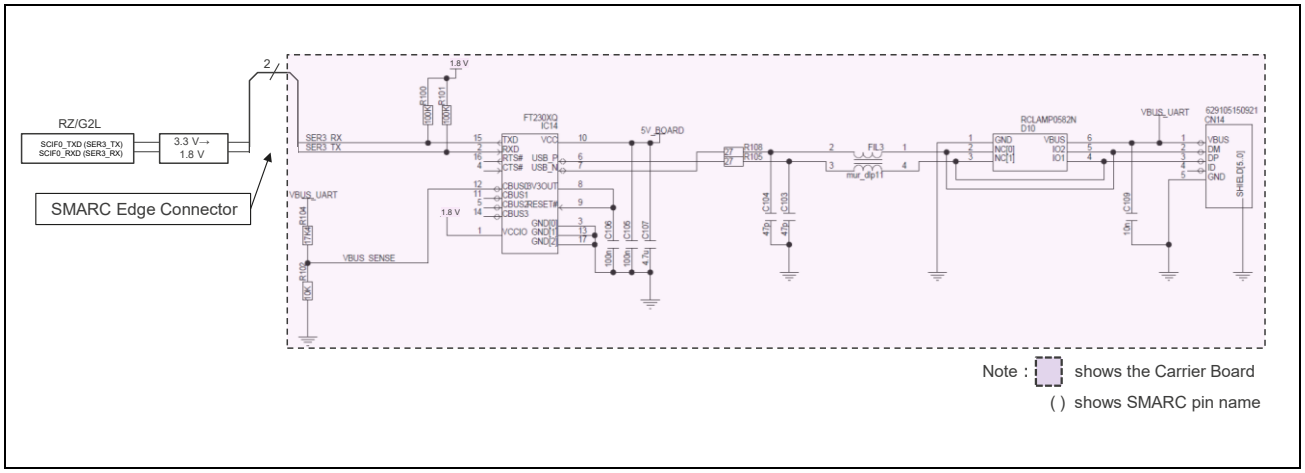


Figure 2.5 Block Diagram of Serial Debug I/F

2.6 Clock Configuration

Figure 2.6 shows a block diagram of the clock configuration for the RZ/G2L EVK.

The clock generator (part number 5P35023B-629NLGI) provides the clock required for the RZ/G2L and peripheral interfaces.

The 5P35023B is a Renesas VersaClock® 3S programmable clock generator that supports 6 unique frequency outputs. The 5P35023B-629NLGI uses a 24-MHz crystal as the reference input and provides one 24-MHz reference clock output for the RZ/G2L, two 11.2896-MHz LVCMOS clock outputs for the RZ/G2L and audio codec, two 25-MHz LVCMOS clock output for one Ethernet PHYs, and one 12.2880-MHz LVCMOS clock output for the RZ/G2L.

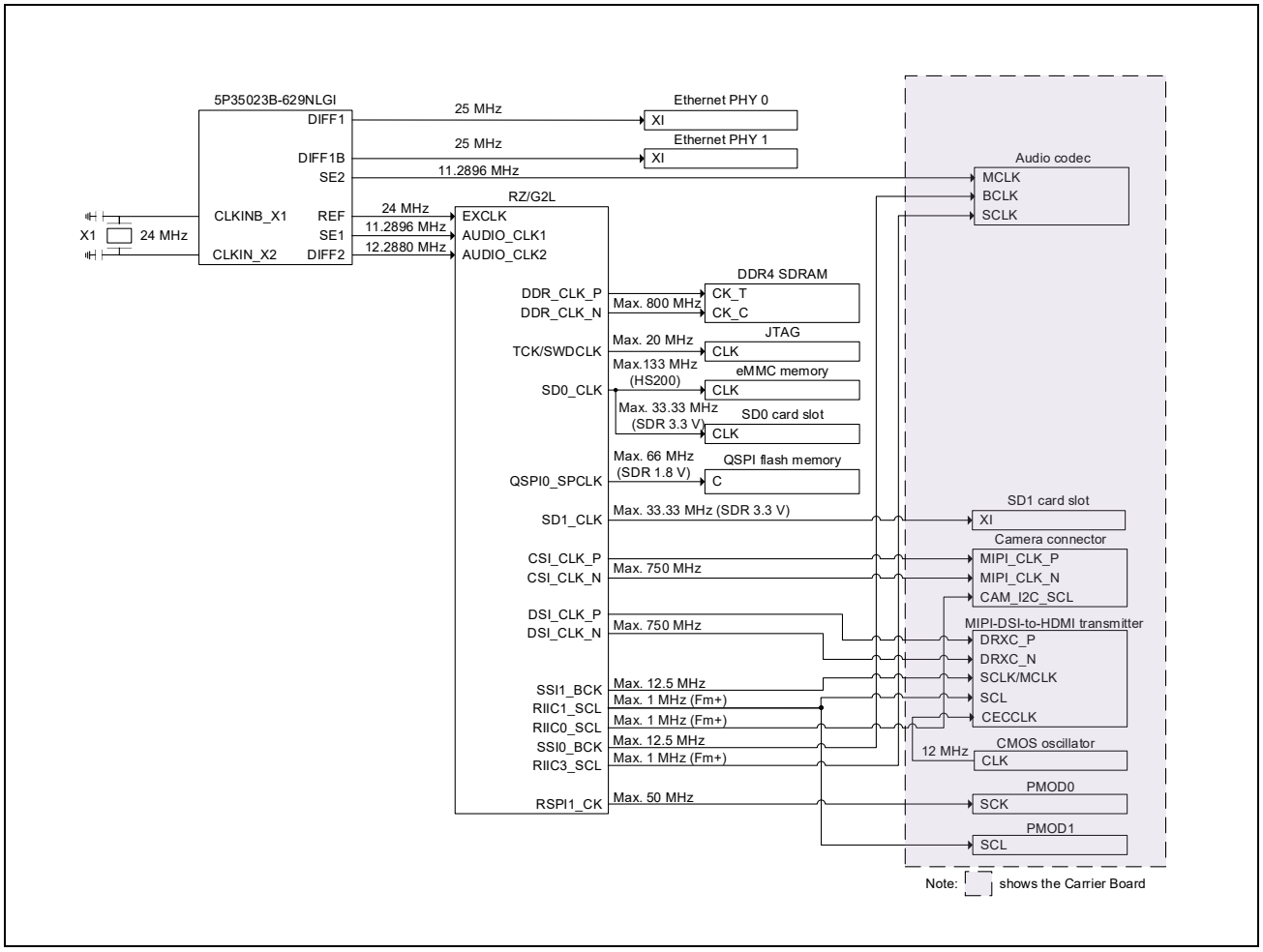


Figure 2.6 Block Diagram of Clock Configuration

2.7 Reset Control

Figure 2.7 shows a block diagram of the reset control for the RZ/G2L EVKIT.

For the RZ SMARC Carrier, reset control for the PMOD and camera interfaces is handled by reset signals generated by the PMIC.

There are two types of system resets: a power-on reset and a hardware reset triggered by the push-button switch.

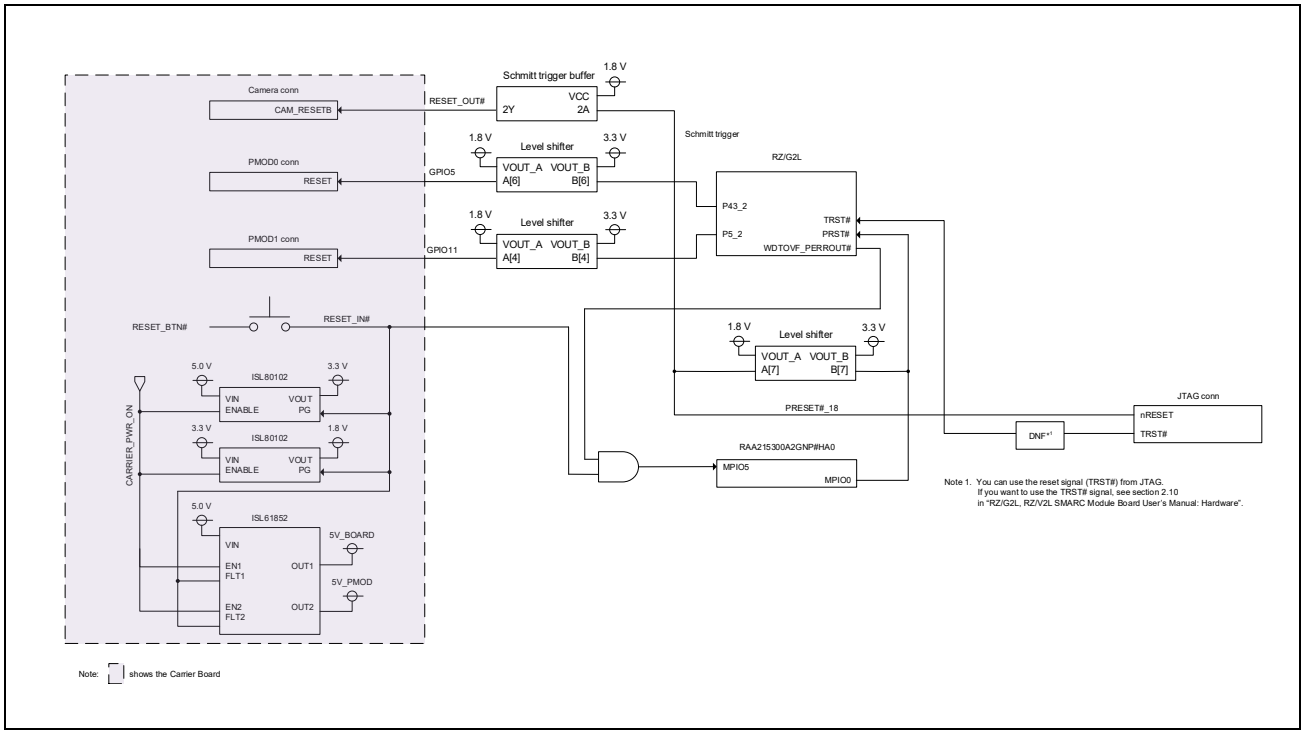


Figure 2.7 Block Diagram of Reset Control

2.8 Power Supply Configuration

Figure 2.8 shows a block diagram of the power configuration for the RZ EVKIT.

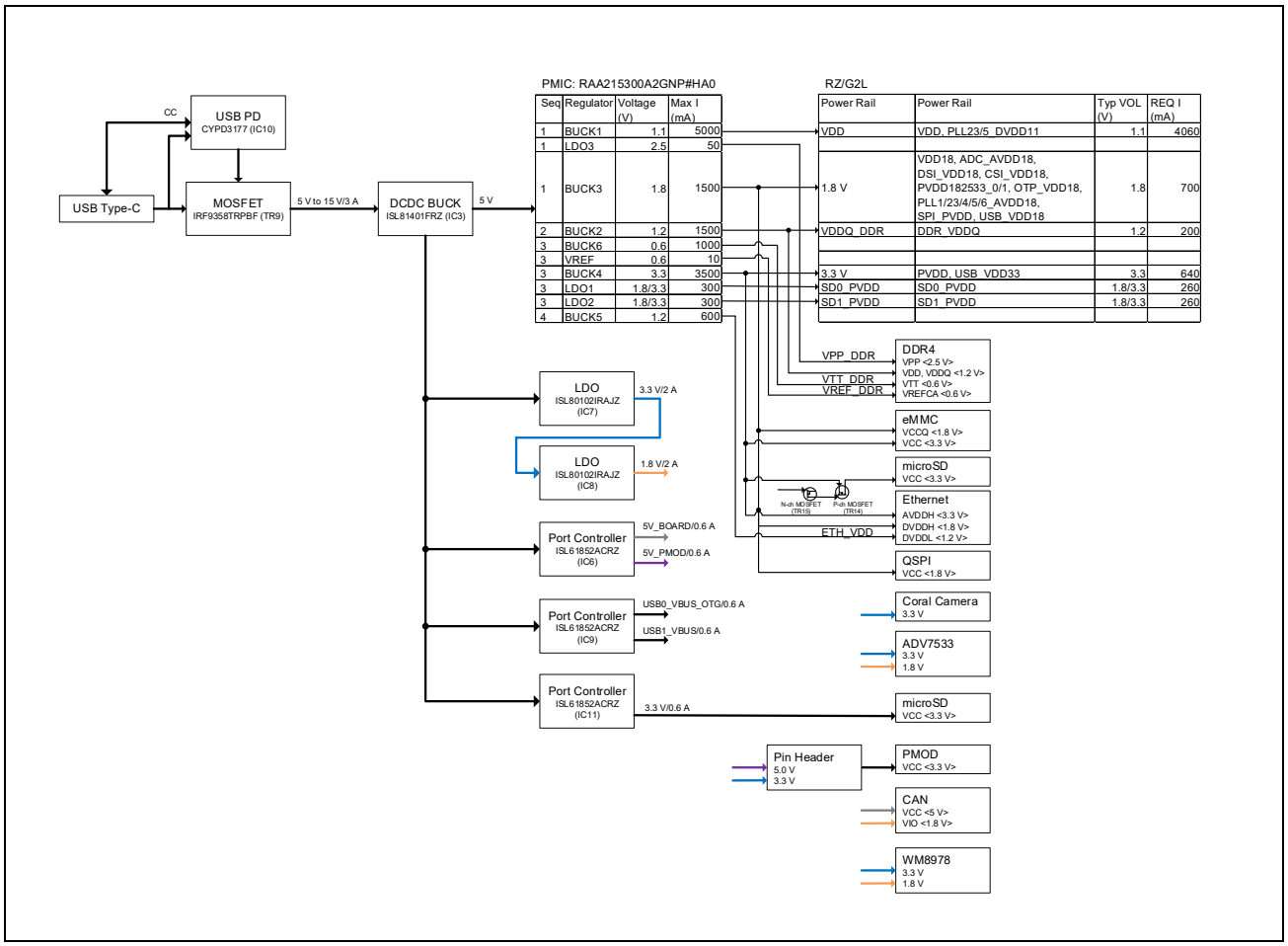
This board has a USB Type-C receptacle for power input with USB Power Delivery. The input voltage of VBUS can be selected between 5 V and 9 V.

The default setting for controlling the input voltage level is 5 V (max. 3 A input) when SW11-4 is switched on. When SW11-4 is switched off, the input voltage is set to 9 V (max. 3 A input). SW11-4 should be turned off only when the RZ/G2L EVKIT is connected to external devices that require a large amount of power, as there is otherwise a risk of insufficient power supply.

The 5 V power supply is supplied to the PMIC mounted on the RZ/G2L SMARC Module, and the PMIC generates the power supply voltage for each interface.

SW9 of RZ SMARC Carrier is a button switch, and the PMIC uses RAA215300A2GNP#HA0, which requires a long press on SW9 for power on/off.

If you want to use an on/off switch type instead of a long press type for power on/off, you need to change SW9 to an on/off switch type and to select “RAA215300A2GNP#HA1”, which is an on/off switch type.



Seq	Regulator	Voltage (V)	Max I (mA)
1	BUCK1	1.1	5000
1	LDO3	2.5	50
1	BUCK3	1.8	1500
2	BUCK2	1.2	1500
3	BUCK6	0.6	1000
3	VREF	0.6	10
3	BUCK4	3.3	3500
3	LDO1	1.8/3.3	300
3	LDO2	1.8/3.3	300
4	BUCK5	1.2	600

Power Rail	Power Rail	Typ VOL (V)	REQ I (mA)
VDD	VDD, PLL23/5_DVDD11	1.1	4060
1.8 V	VDD18, ADC_AVDD18, DSI_VDD18, CSI_VDD18, PVDD182533_0/1, OTP_VDD18, PLL1/23/4/5/6_AVDD18, SPI_PVDD, USB_VDD18	1.8	700
VDDQ_DDR	DDR_VDDQ	1.2	200
3.3 V	PVDD, USB_VDD33	3.3	640
SD0_PVDD	SD0_PVDD	1.8/3.3	260
SD1_PVDD	SD1_PVDD	1.8/3.3	260

Figure 2.8 Block Diagram of Power Configuration

2.9 SD1 Interface

Figure 2.9 shows a block diagram of the SD1 interface.

The RZ SMARC Carrier incorporates a microSD card slot, and is connected to channel 1 of the SD interface of the RZ/G2L.

This interface complies with the memory card standard version 3.0 and supports the UHS-I mode of 50MB/s (SDR50) and 104MB/s (SDR104).

In this example, the RZ/G2L SMARC Module is used as the Module Board.

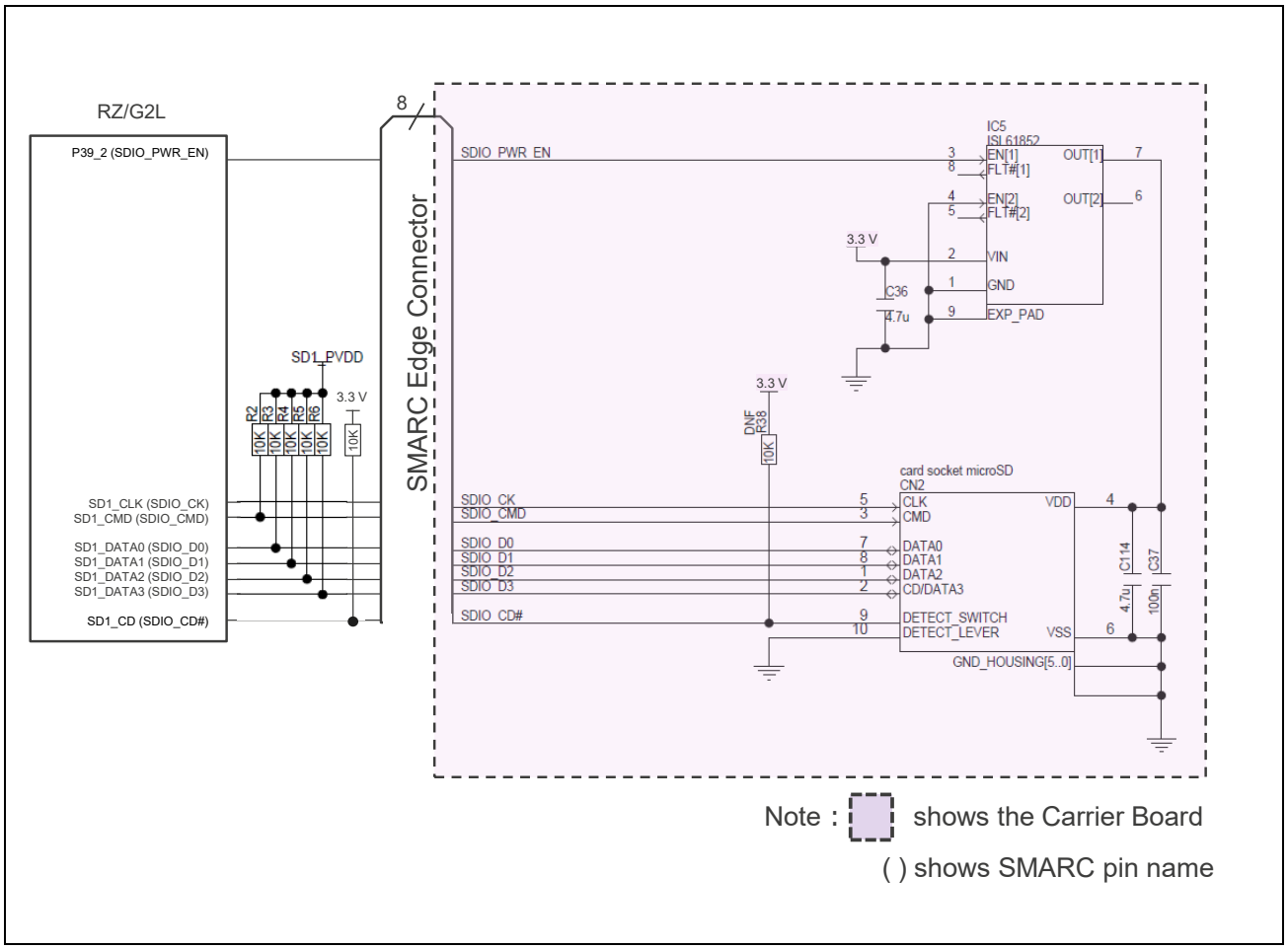


Figure 2.9 Block Diagram of SD1 I/F

2.10 Audio Interface

Figure 2.10 shows a block diagram of the audio interface.

The RZ SMARC Carrier is connected a connector through the audio codec. This interface supports I2S/monaural formats.

The audio data input/output is controlled with the serial sound interface (SSIF-2) with built-in RZ/G2L.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

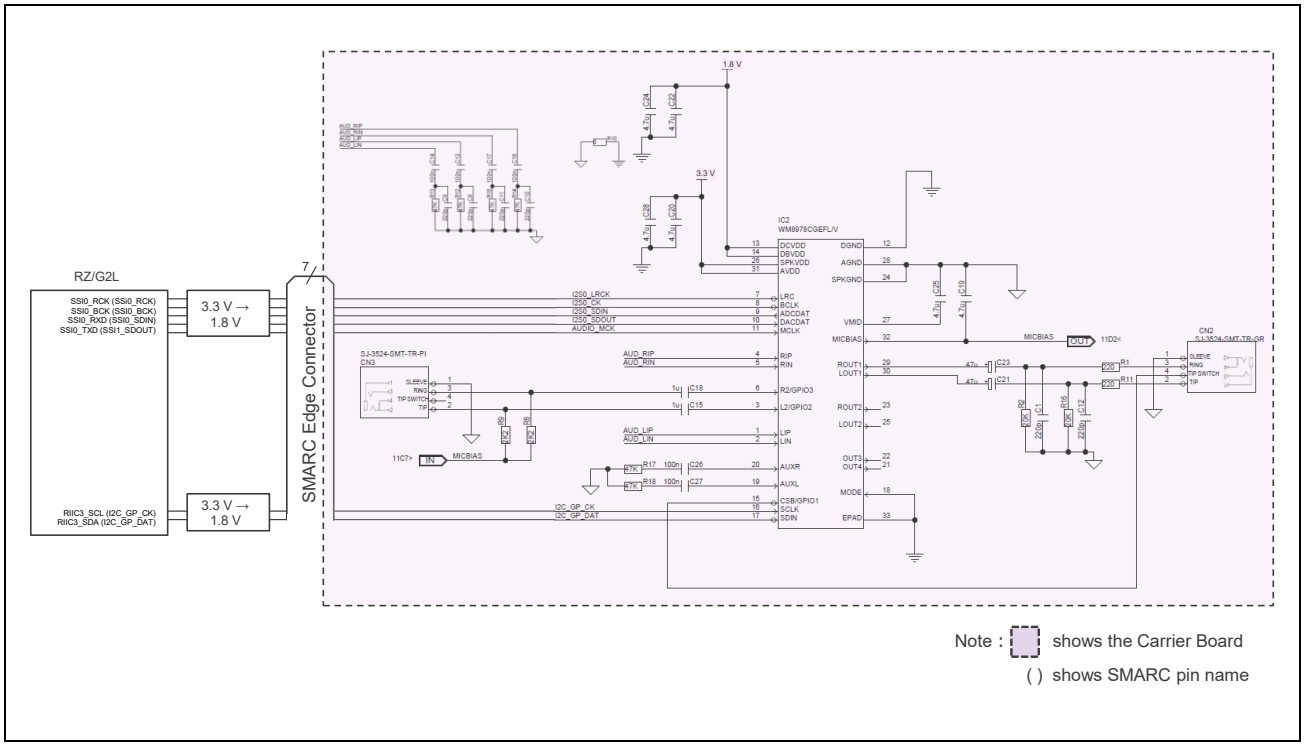


Figure 2.10 Bloc Diagram around Audio I/F

2.11 Camera Interface

Figure 2.11 shows a block diagram of the Camera interface.

The RZ SMARC Carrier incorporates a FFC/FPC connector for connection to the MIPI CSI-2. This interface supports a maximum resolution 5MP/30fps.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

When using the Camera interface, please be sure to connect camera modules when the power is off. Reset release is not done properly when the power is switched on.

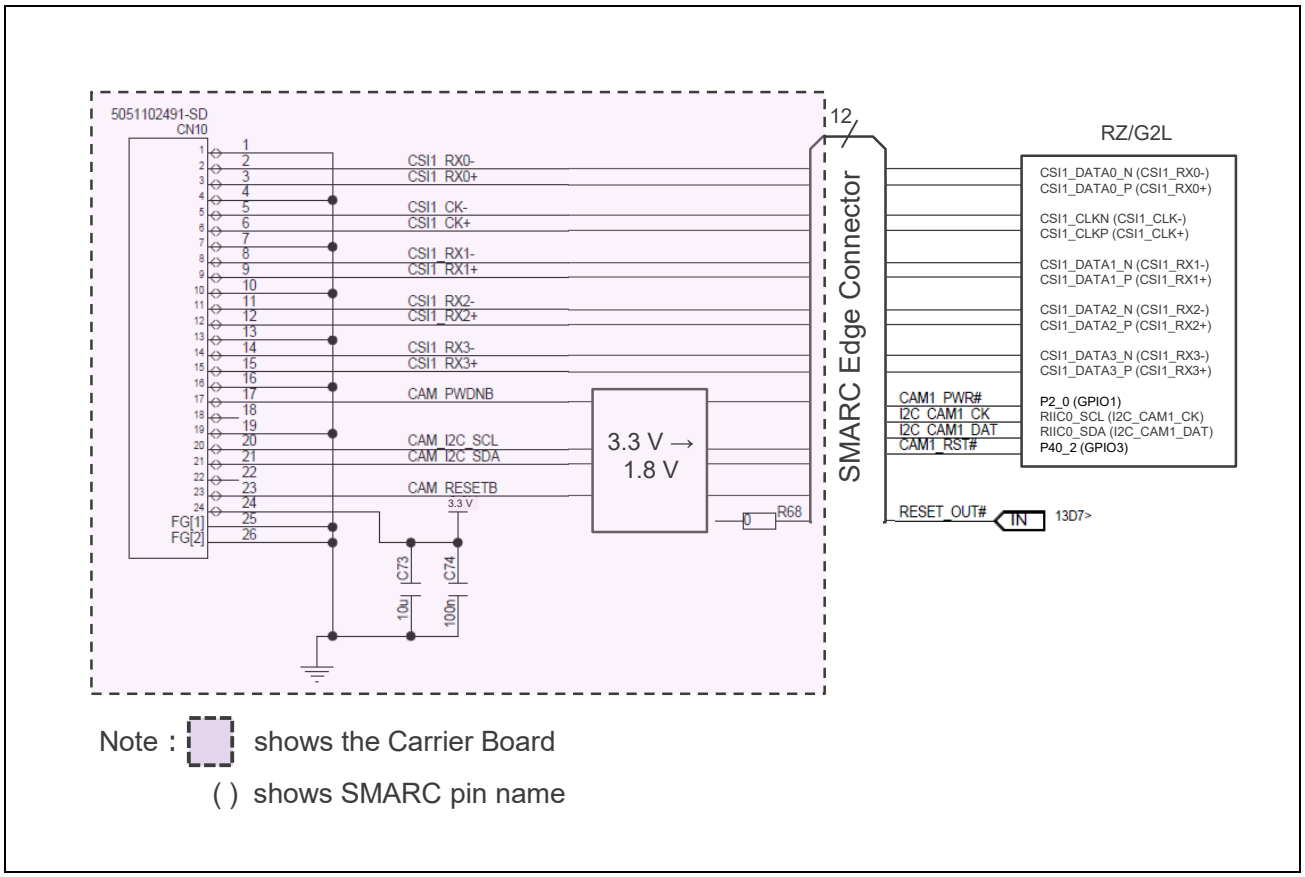


Figure 2.11 Block Diagram of Camera I/F

2.12 Display Interface

Figure 2.12 shows a block diagram of the Display interface.

The RZ SMARC Carrier is connected a microHDMI connector through the MIPI-DSI-to-HDMI transmitter. This interface supports Full HD and 60fps.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

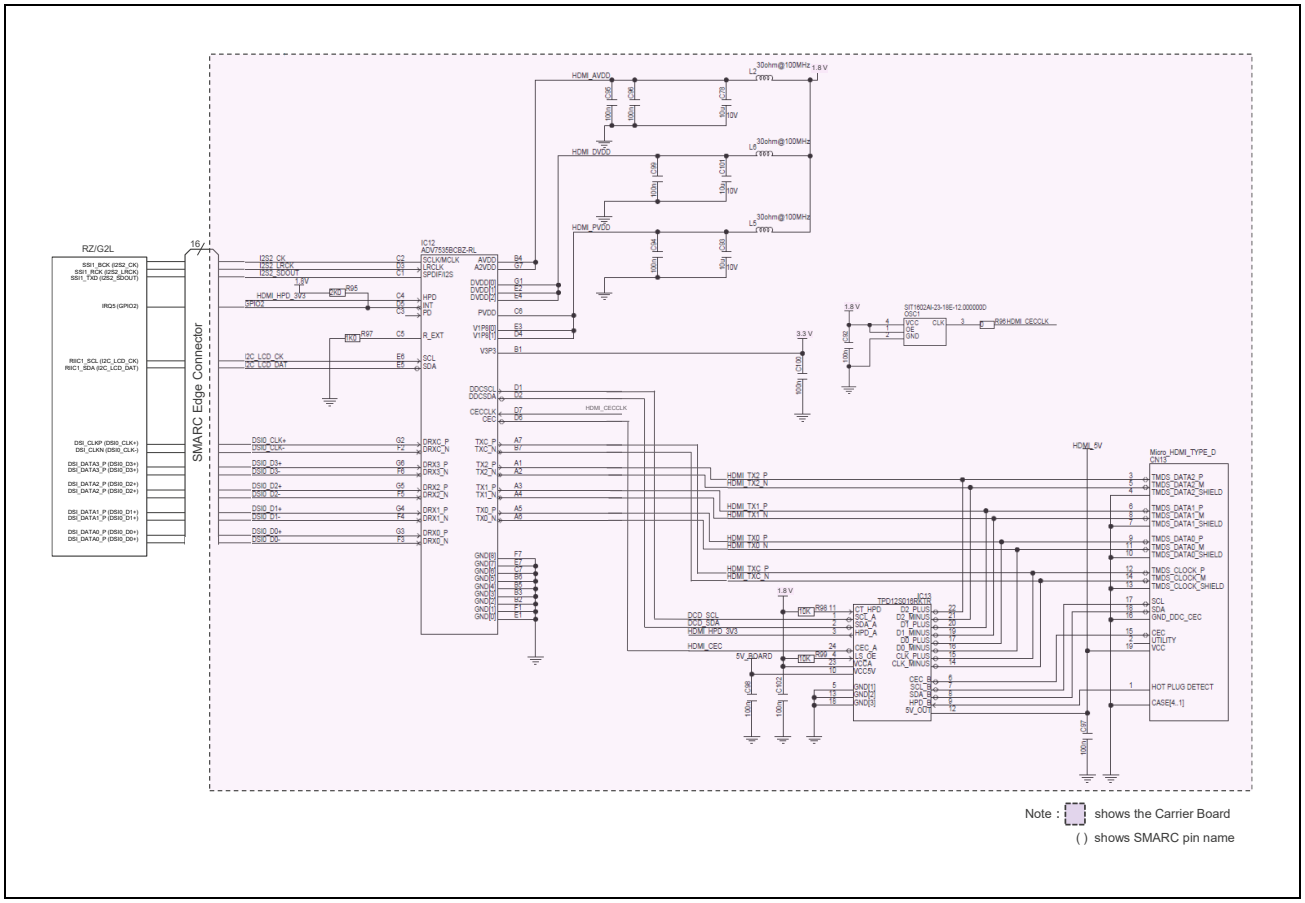


Figure 2.12 Block Diagram of Display I/F

2.13 CAN-FD Interface

Figure 2.13 shows a block diagram of the CAN-FD interface.

The RZ SMARC Carrier is connected the CAN0 and CAN1 connectors through the CAN0 and CAN1 transceivers. This interface complies with ISO 11898-1:2003, and the CAN-FD interface complies with ISO 11898-1 (CD 2014).

In this example, the RZ/G2L SMARC Module is used as the Module Board.

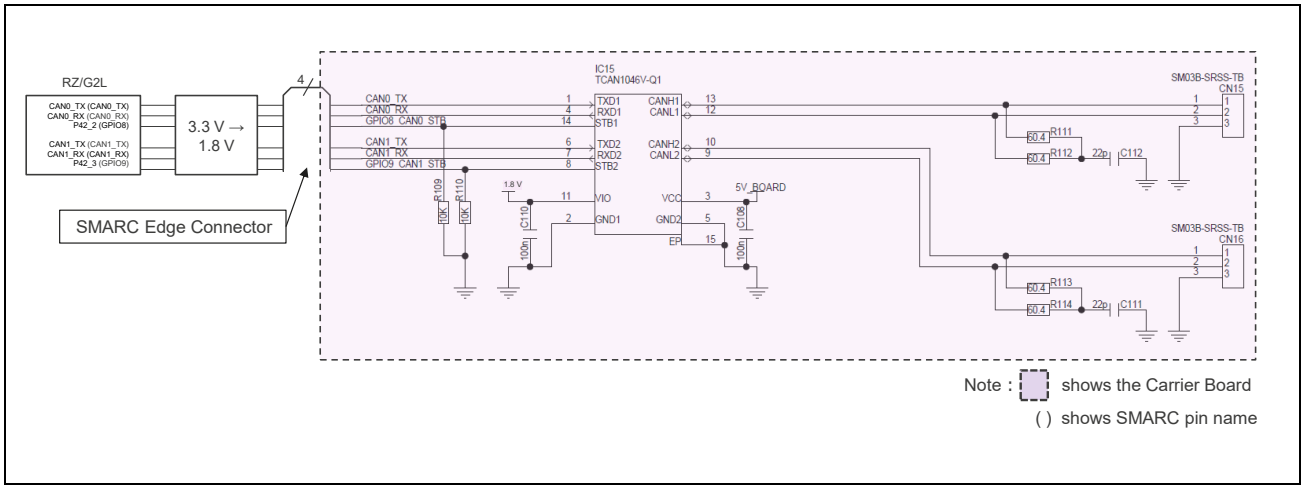


Figure 2.13 Block Diagram of CAN-FD I/F

2.14 PMOD Interface

Figure 2.14 shows a block diagram of the PMOD0 interface.

The RZ SMARC Carrier incorporates a Type-2A PMOD module. The Type-2A interface provides a SPI interface plus additional control signals. There is also a 5 V power source option.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

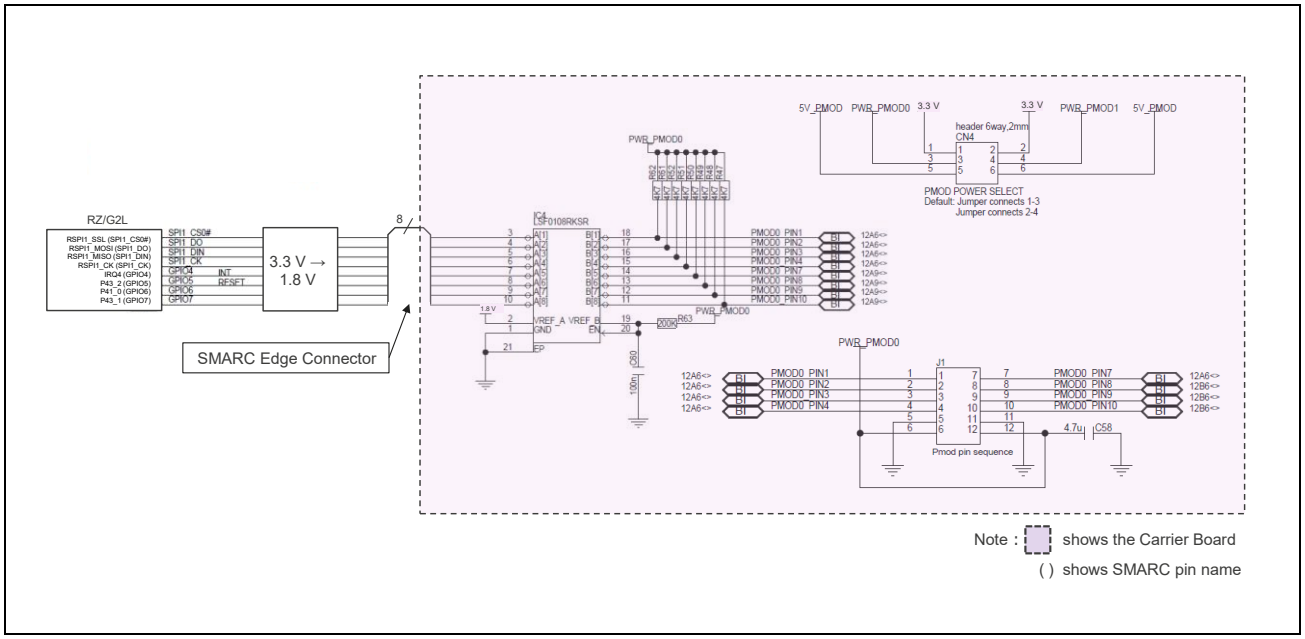


Figure 2.14 Block Diagram of PMOD0 I/F

Figure 2.15 shows a block diagram of the PMOD1 interface.

The RZ SMARC Carrier incorporates a Type-3A&Type-6A PMOD module. The Type-3A interface provides a UART interface with optional hardware flow control plus additional control signals. The Type-6A interface provides an I2C interface. There is also a 5 V power source option.

In this example, the RZ/G2L SMARC Module is used as the Module Board.

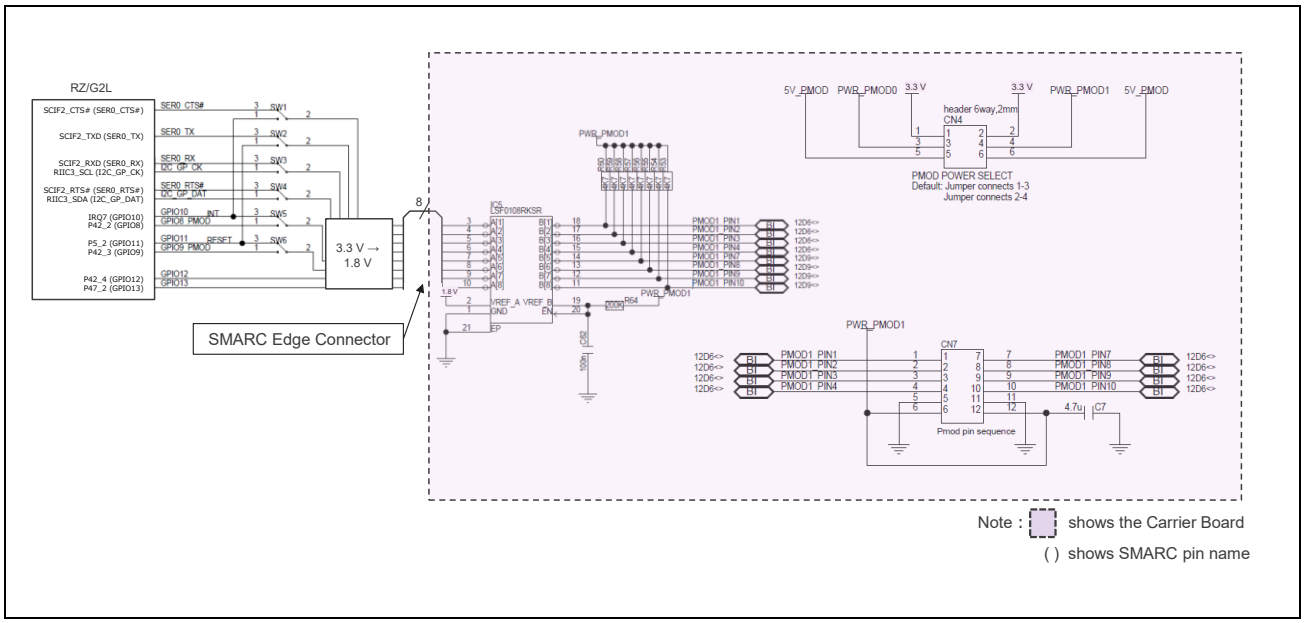


Figure 2.15 Block Diagram of PMOD1 I/F

3. Operation Specifications

3.1 Overview of Connectors

Figure 3.1 illustrates the layout of connectors of the RZ SMARC Carrier.

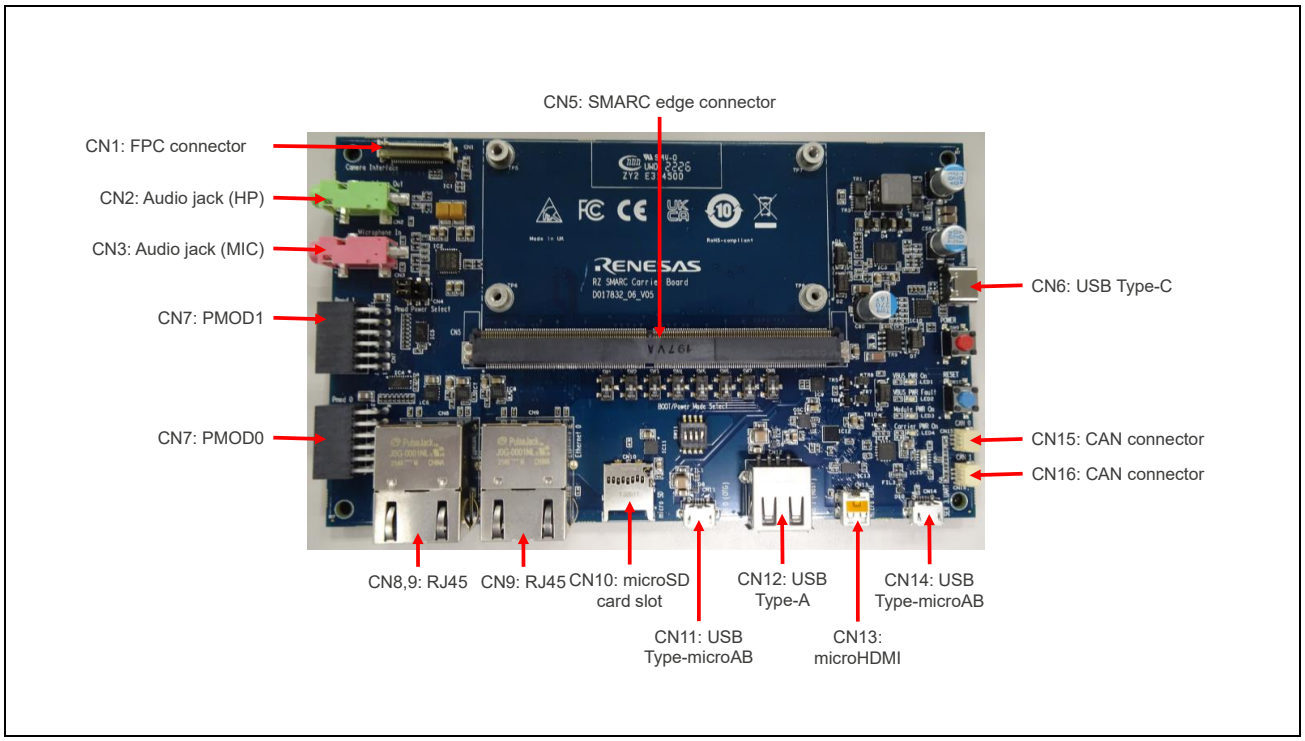


Figure 3.1 Layout of Connectors (Top Side)

3.1.1 MIPI CSI-2 Camera Connector

The RZ SMARC Carrier contains a camera connector (CN1).

Figure 3.2 illustrates the layout of the camera connector pins. **Table 3.1** shows the assignment of camera connector pins.

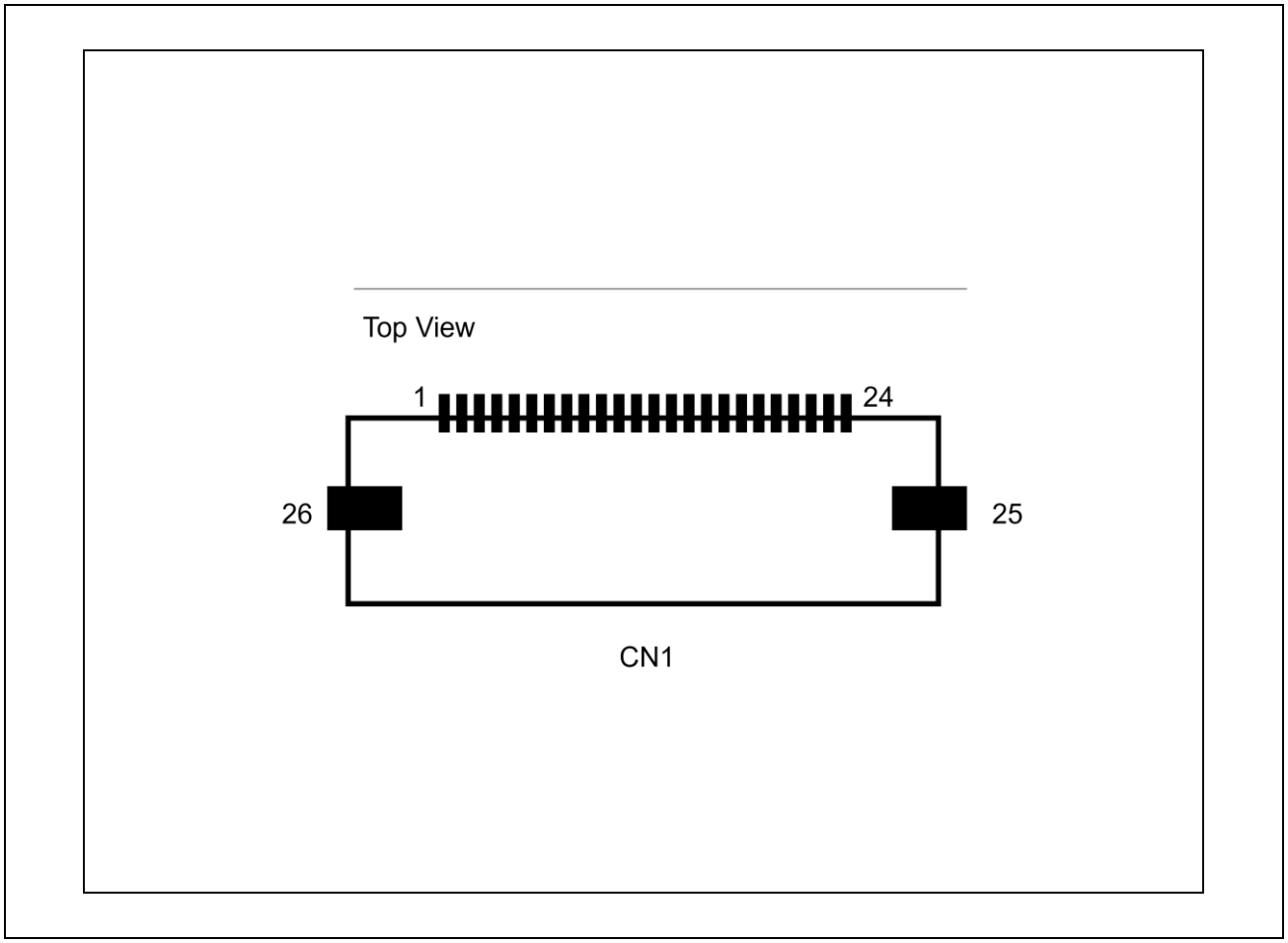


Figure 3.2 Camera Connector (CN1) Pin Layout Diagram

Table 3.1 Camera Connector (CN1) Pin Layout Table

Pin	Signal Name
1	GND
2	CSI1_RX0-
3	CSI1_RX0+
4	GND
5	CSI1_CK-
6	CSI1_CK+
7	GND
8	CSI1_RX1-
9	CSI1_RX1+
10	GND
11	CSI1_RX2-
12	CSI1_RX2+
13	GND
14	CSI1_RX3-
15	CSI1_RX3+
16	GND
17	CAM_PWDNB
18	—
19	GND
20	CAM_I2C_SCL
21	CAM_I2C_SDA
22	—
23	CAM_RESETB
24	3.3 V
25	GND
26	GND

3.1.2 Audio Jack Microphone

The RZ SMARC Carrier contains an audio jack for microphones (CN2).

Figure 3.3 illustrates the layout of the audio jack pins. **Table 3.2** shows the assignment of the audio output jack pins.

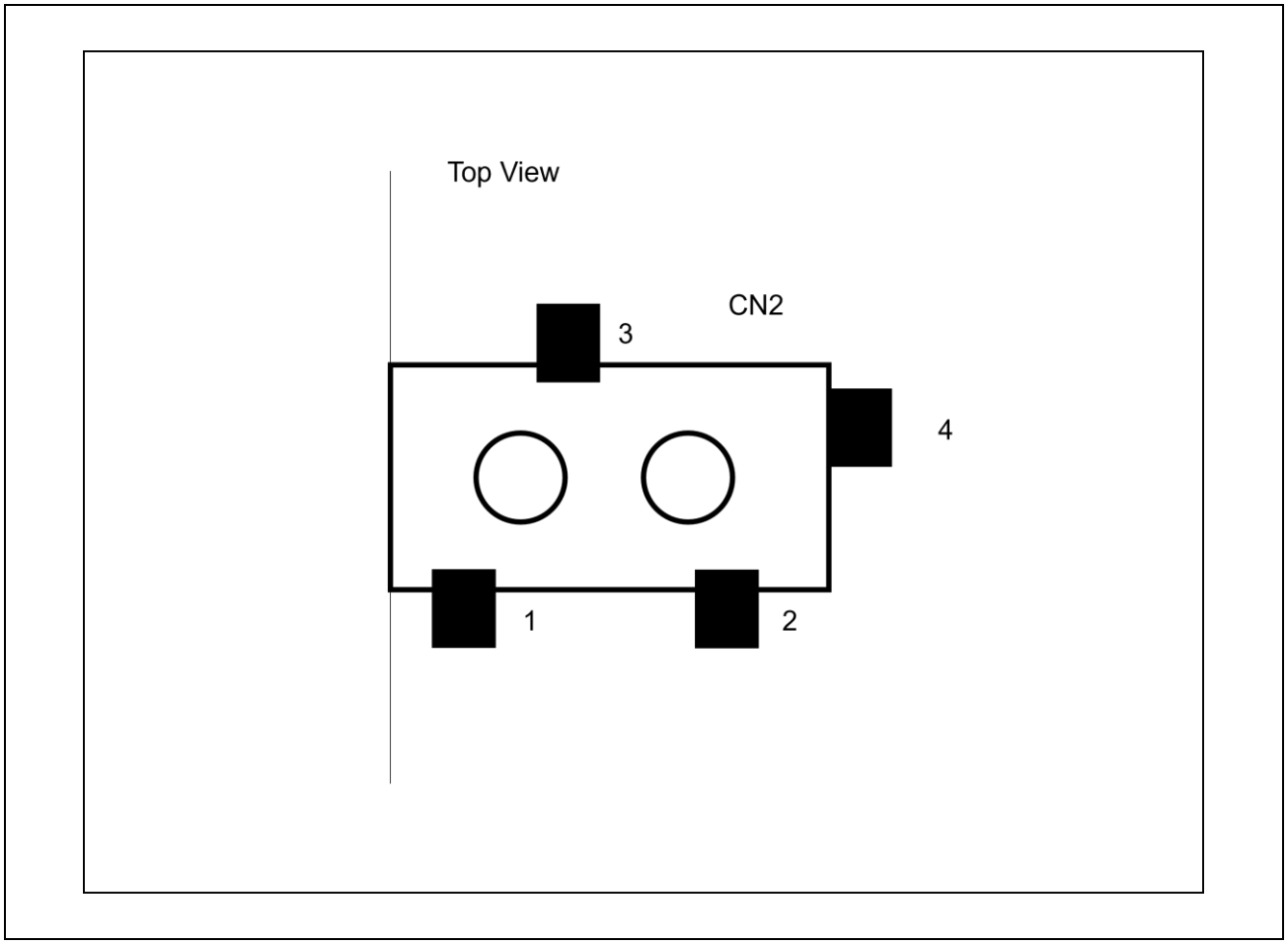


Figure 3.3 Audio Output Jack (CN2) Layout Diagram

Table 3.2 Audio Output Jack (CN2) Layout Table

Pin	Signal Name
1	GND
2	LOUT (Audio Codec Lch analog output pin)
3	ROUT (Audio Codec Rch analog output pin)
4	CSB/GPIO (3-Wire Control Interface Chip Select)

3.1.3 Audio Jack Headphone

The RZ SMARC Carrier contains an audio jack for headphones (CN3).

Figure 3.4 illustrates the layout of the audio jack pins. **Table 3.3** shows the assignment of the audio input jack pins. Pins 3 and 4 are also connected to the MICBIAS terminal.

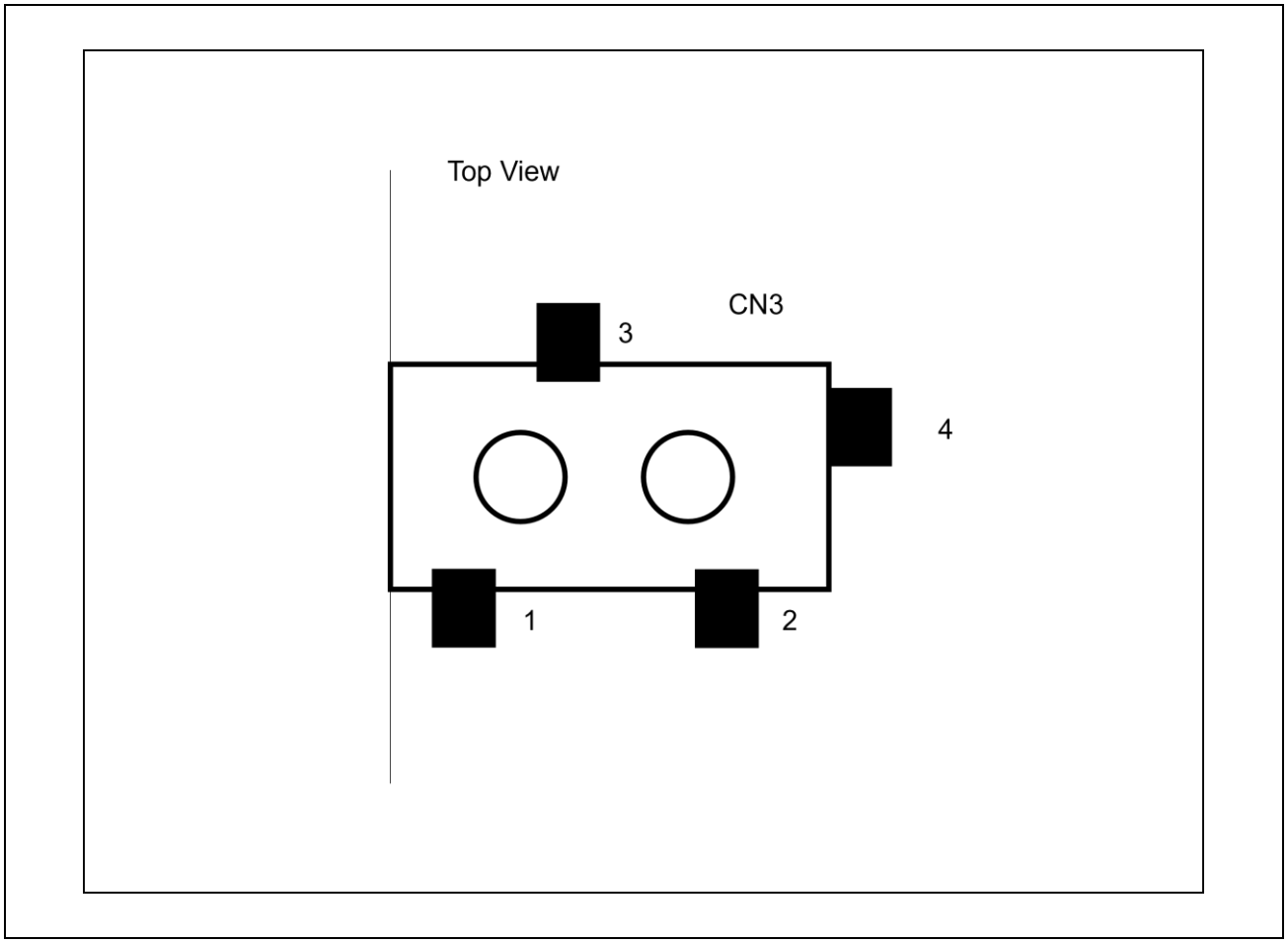


Figure 3.4 Layout of Audio Input Jack (CN3) Layout Diagram

Table 3.3 Audio Input Jack (CN3) Layout Table

Pin	Signal Name
1	GND
2	L2 (Audio Codec Lch analog input pin)
3	R2 (Audio Codec Rch analog input pin)
4	—

3.1.4 USB Type-C Receptacle

The RZ SMARC Carrier contains a USB Type-C receptacle (CN6).

Figure 3.5 illustrates the layout of the USB Type-C receptacle pins. **Table 3.4** shows the assignment of the USB Type-C receptacle pins.

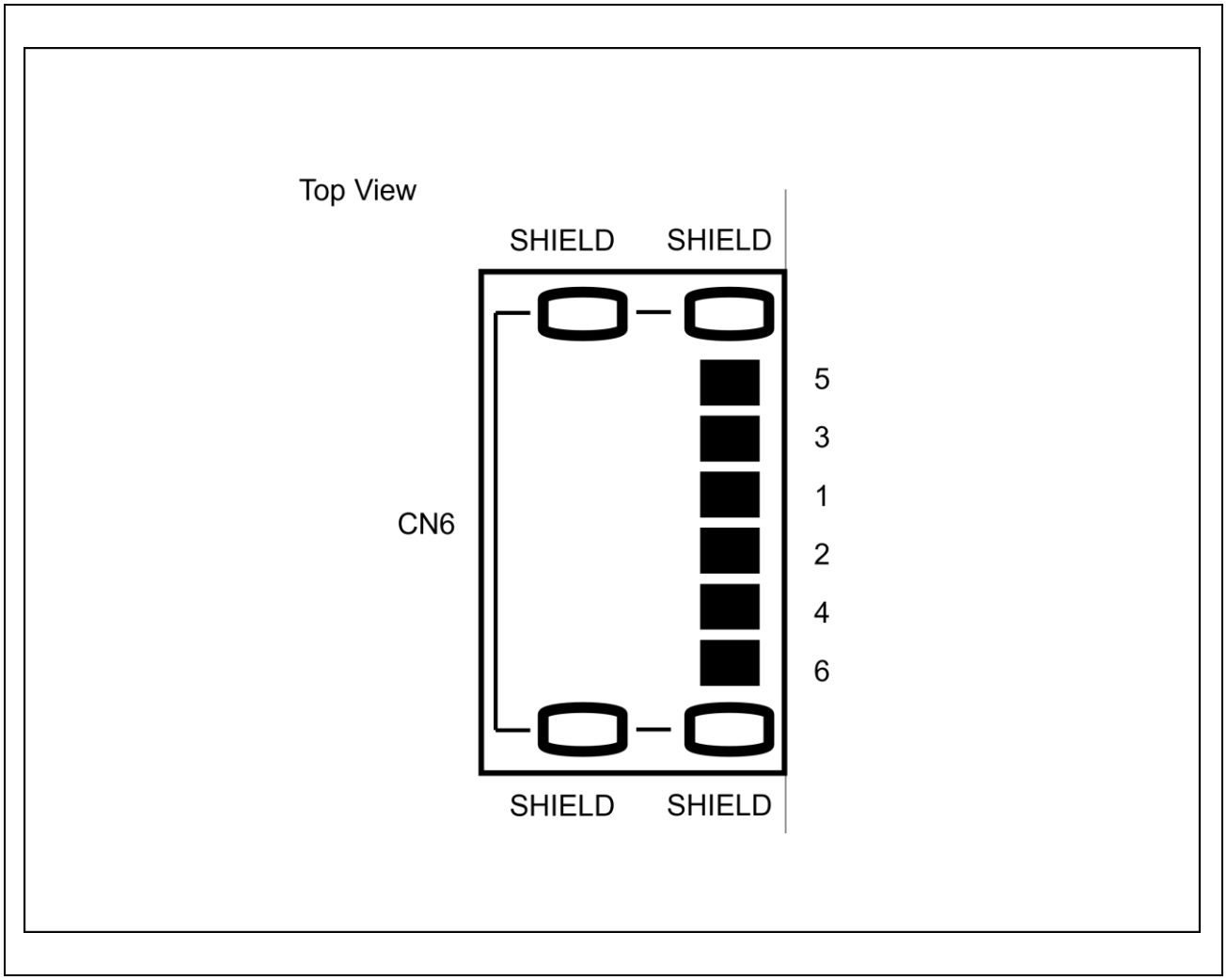


Figure 3.5 USB Type-C Receptacle (CN6) Pin Layout Diagram

Table 3.4 USB Type-C Receptacle (CN6) Pin Layout Table

Pin	Signal Name
1	CC1
2	CC2
3	VBUS
4	VBUS
5	GND
6	GND

3.1.5 PMOD Connector

The RZ SMARC Carrier contains PMOD0 and PMOD1 connectors (J1 and CN7).

Figure 3.6 illustrates the layout of the PMOD0 and PMOD1 connector pins. **Table 3.5** shows the assignment of the PMOD0 connector pins.

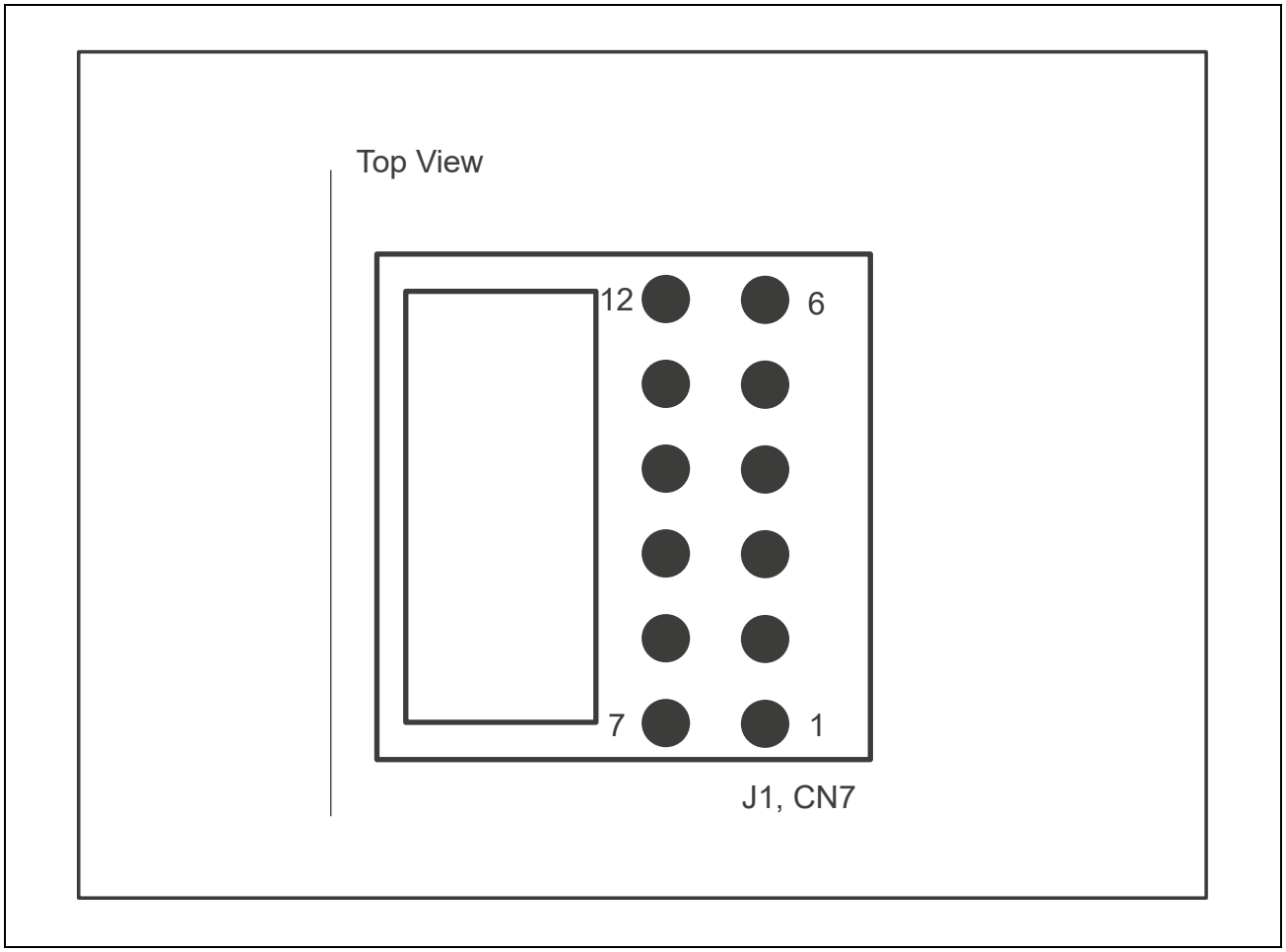


Figure 3.6 PMOD0/1 Connector (J1, CN7) Pin Layout Diagram

Table 3.5 PMOD0 Connector (J1) Pin Layout Table

Pin	Signal Name
1	SPI_CS0#
2	SPI1_DO
3	SPI1_DIN
4	SPI1_CK
5	GND
6	PWR_PMOD0
7	INT
8	RESET
9	GPIO
10	GPIO
11	GND
12	PWR_PMOD0

Table 3.6 shows the assignment of the PMOD1 connector pins.

Table 3.6 PMOD1 Connector (CN7) Pin Layout Table

Pin	Signal Name
1	SER_CTS#/INT
2	SER0_TX/RESET
3	SER0_RX/I2C_GP_CK
4	SER0_RTS#/I2C_GP_DATA
5	GND
6	PWR_PMOD1
7	GPIO10
8	INT/GPIO
9	RESET/GPIO
10	GPIO
11	GND
12	PWR_PMOD1

3.1.6 LAN Connector

The RZ SMARC Carrier contains LAN0 and LAN1 connectors (CN8 and CN9).

Figure 3.7 illustrates the layout of the LAN0 and LAN1 connector pins. **Table 3.7** shows the assignment of the LAN0 connector pins.

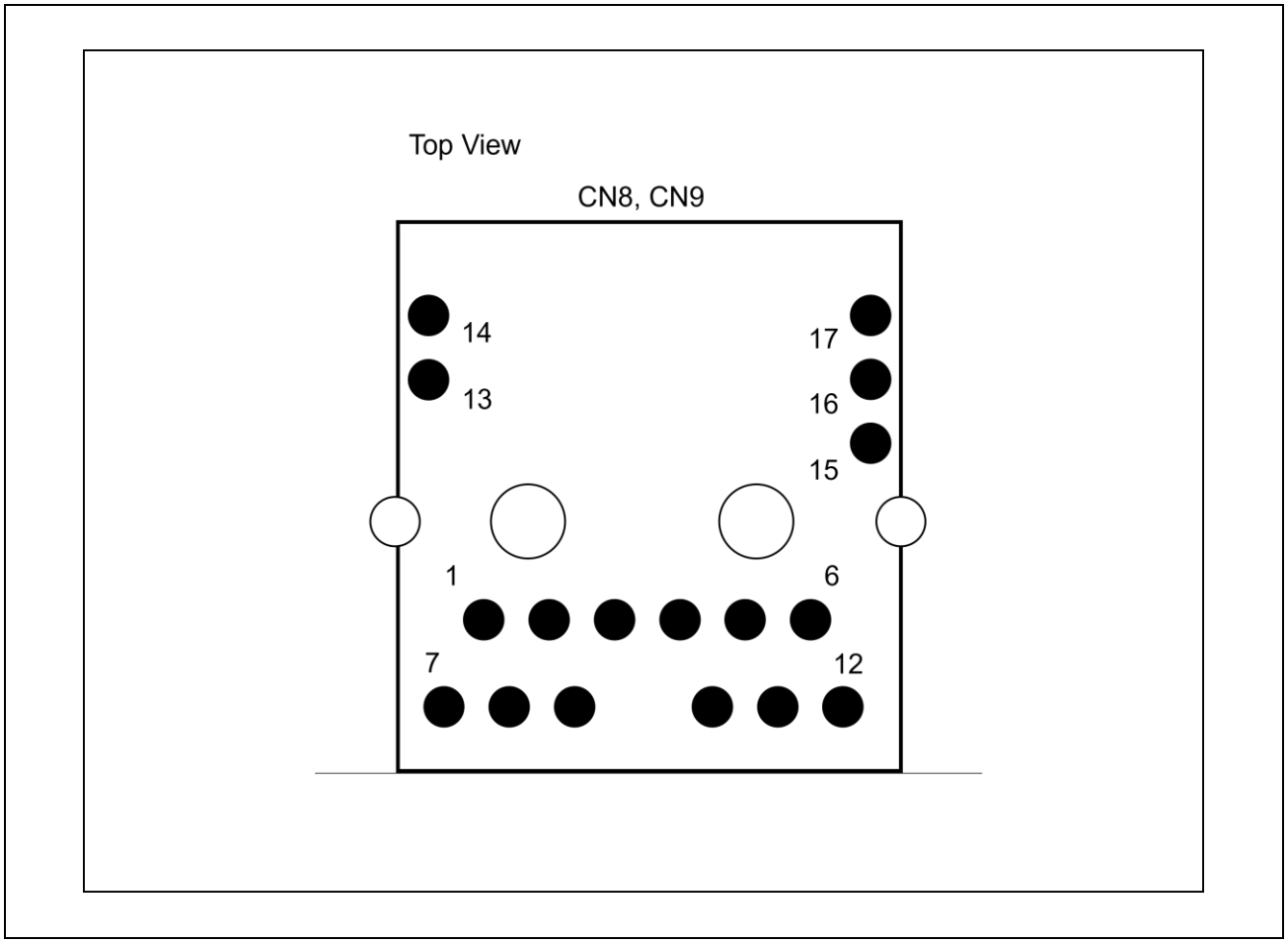


Figure 3.7 LAN0/1 Connector (CN8, CN9) Pin Layout Diagram

Table 3.7 LAN0 Connector (CN8) Pin Layout Table

Pin	Signal Name
1	GND
2	GBE0_MDI2-
3	GBE0_MDI2+
4	GBE0_MDI1-
5	GBE0_MDI1+
6	GND
7	GND
8	GBE0_MDI3-
9	GBE0_MDI3+
10	GBE0_MDI0-
11	GBE0_MDI0+
12	GND
13	GBE0_LINK_ACT#
14	3.3 V
15	GBE0_LINK_100#
16	3.3 V
17	GBE0_LINK_1000#

Table 3.8 shows the assignment of the LAN1 connector pins.

Table 3.8 LAN1 Connector (CN9) Pin Layout Table

Pin	Signal Name
1	GND
2	GBE1_MDI2-
3	GBE1_MDI2+
4	GBE1_MDI1-
5	GBE1_MDI1+
6	GND
7	GND
8	GBE1_MDI2-
9	GBE1_MDI2+
10	GBE1_MDI2-
11	GBE1_MDI2+
12	GND
13	GBE1_LINK_ACT#
14	3.3 V
15	GBE1_LINK_100#
16	3.3 V
17	GBE1_LINK_1000#

3.1.7 microSD Card Slot

The RZ SMARC Carrier contains a microSD card slot (CN10).

Figure 3.8 illustrates the layout of the microSD card slot pins. **Table 3.9** shows the assignment of the microSD card slot pins.

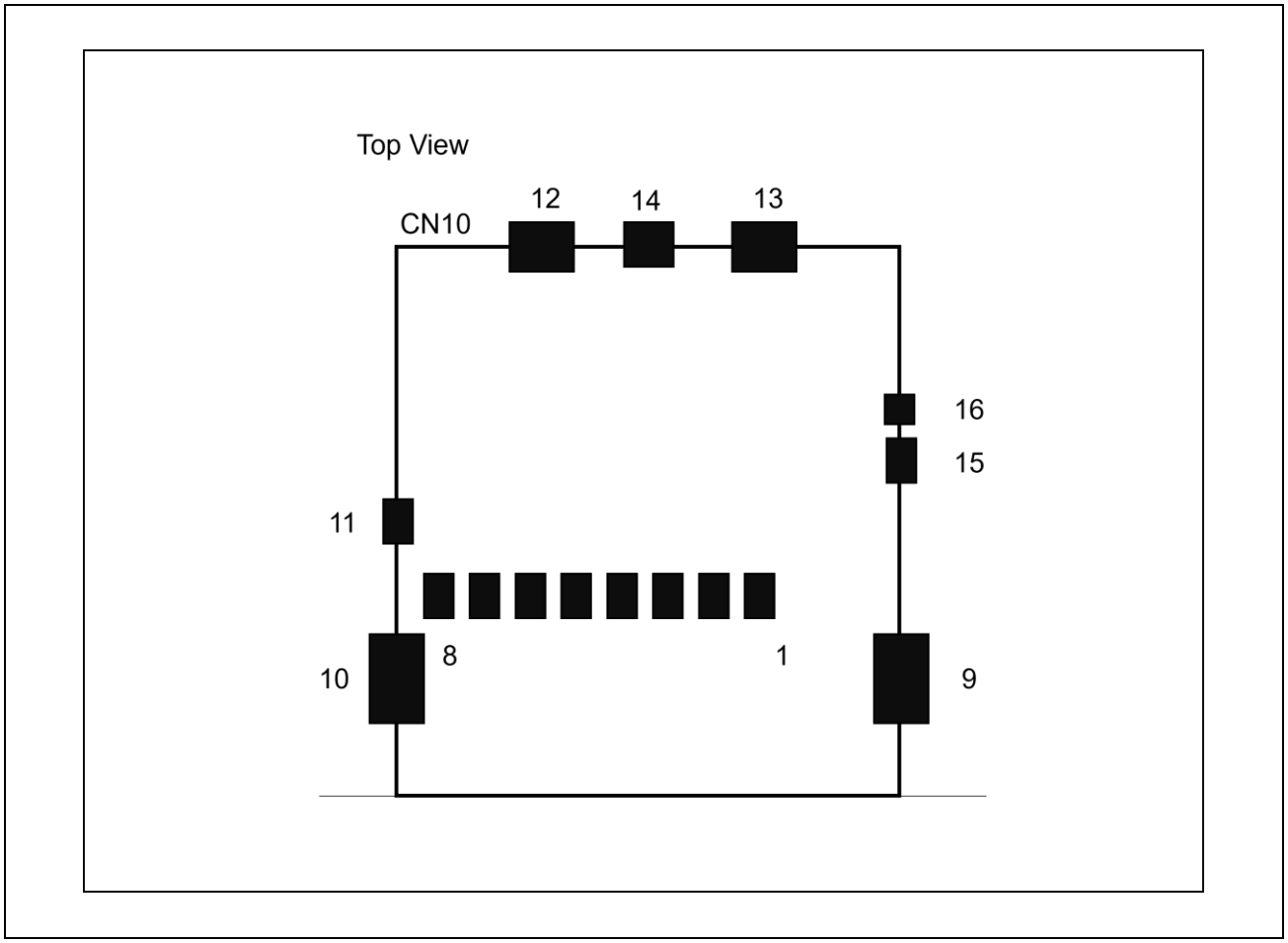


Figure 3.8 microSD Card Slot (CN10) Pin Layout Diagram

Table 3.9 microSD Card Slot (CN10) Pin Layout Table

Pin	Signal Name
1	SDIO_D2
2	SDIO_D3
3	SDIO_CMD
4	SD0_PVDD
5	SDIO_CK
6	GND
7	SDIO_D0
8	SDIO_D1
9	SDIO_CD#
10	GND
11	GND
12	GND
13	GND
14	GND
15	GND
16	GND

3.1.8 USB Type-microAB Receptacle

The RZ SMARC Carrier contains a USB Type-microAB receptacles (CN11 and CN14).

Figure 3.9 illustrates the layout of the USB Type-microAB receptacle pins. **Table 3.10** shows the assignment of the USB Type-microAB receptacle pins.

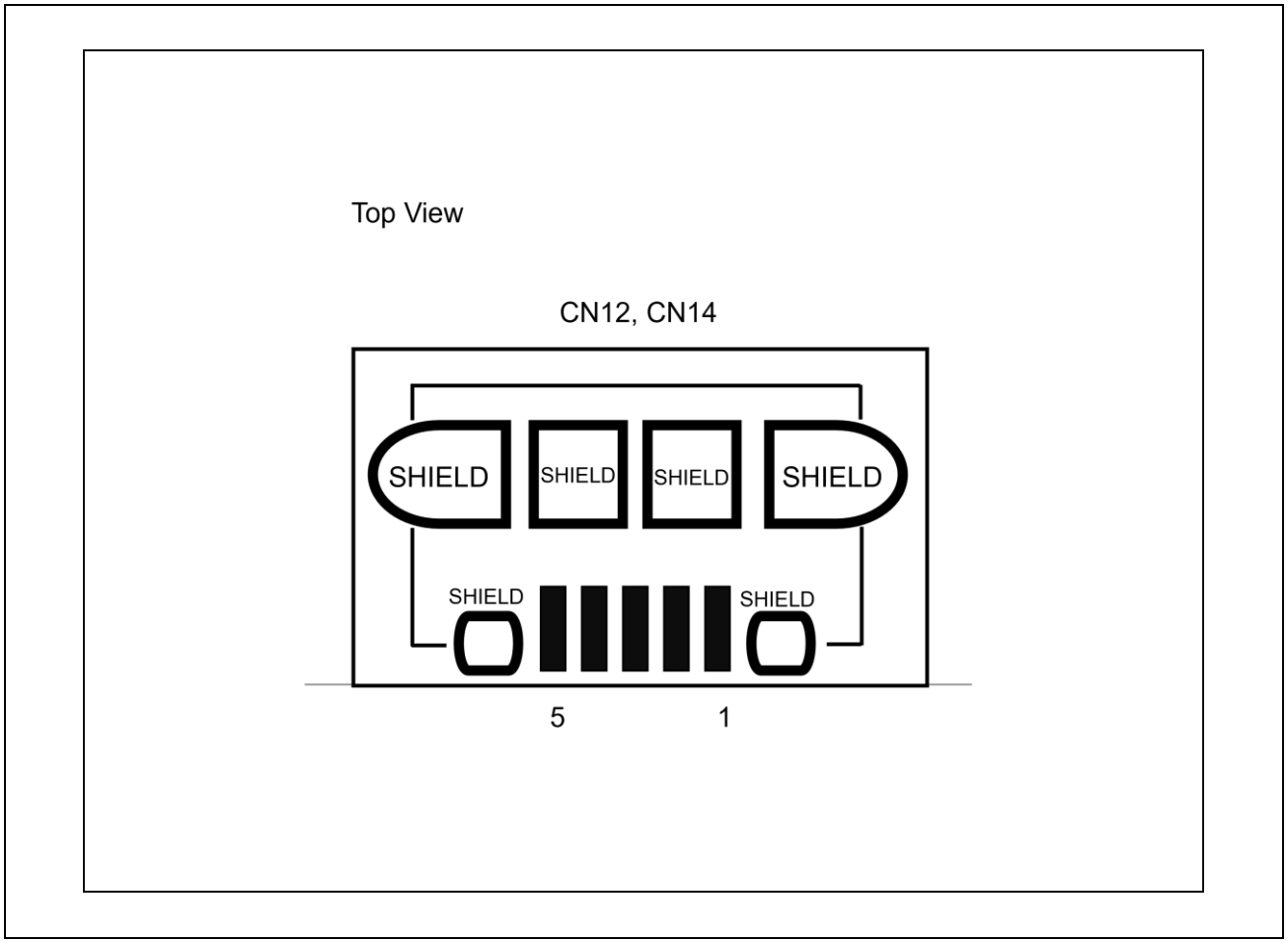


Figure 3.9 USB Type-microAB Receptacle (CN12, CN14) Pin Layout Diagram

Table 3.10 USB Type-microAB Receptacle (CN11) Pin Layout Table

Pin	Signal Name
1	VBUS
2	USB0-
3	USB0+
4	USB0_OTG_ID
5	GND

Table 3.11 shows the assignment of the USB Type-microAB receptacle pins.

Table 3.11 USB Type-microAB Receptacle (CN14) Pin Layout Table

Pin	Signal Name
1	VBUS
2	SER3_RX
3	SER3_TX
4	—
5	GND

3.1.9 USB Type-A Receptacle

The RZ SMARC Carrier contains a USB Type-A receptacle (CN12).

Figure 3.10 illustrates the layout of the USB Type-A receptacle pins. **Table 3.12** shows the assignment of the USB Type-A receptacle pins.

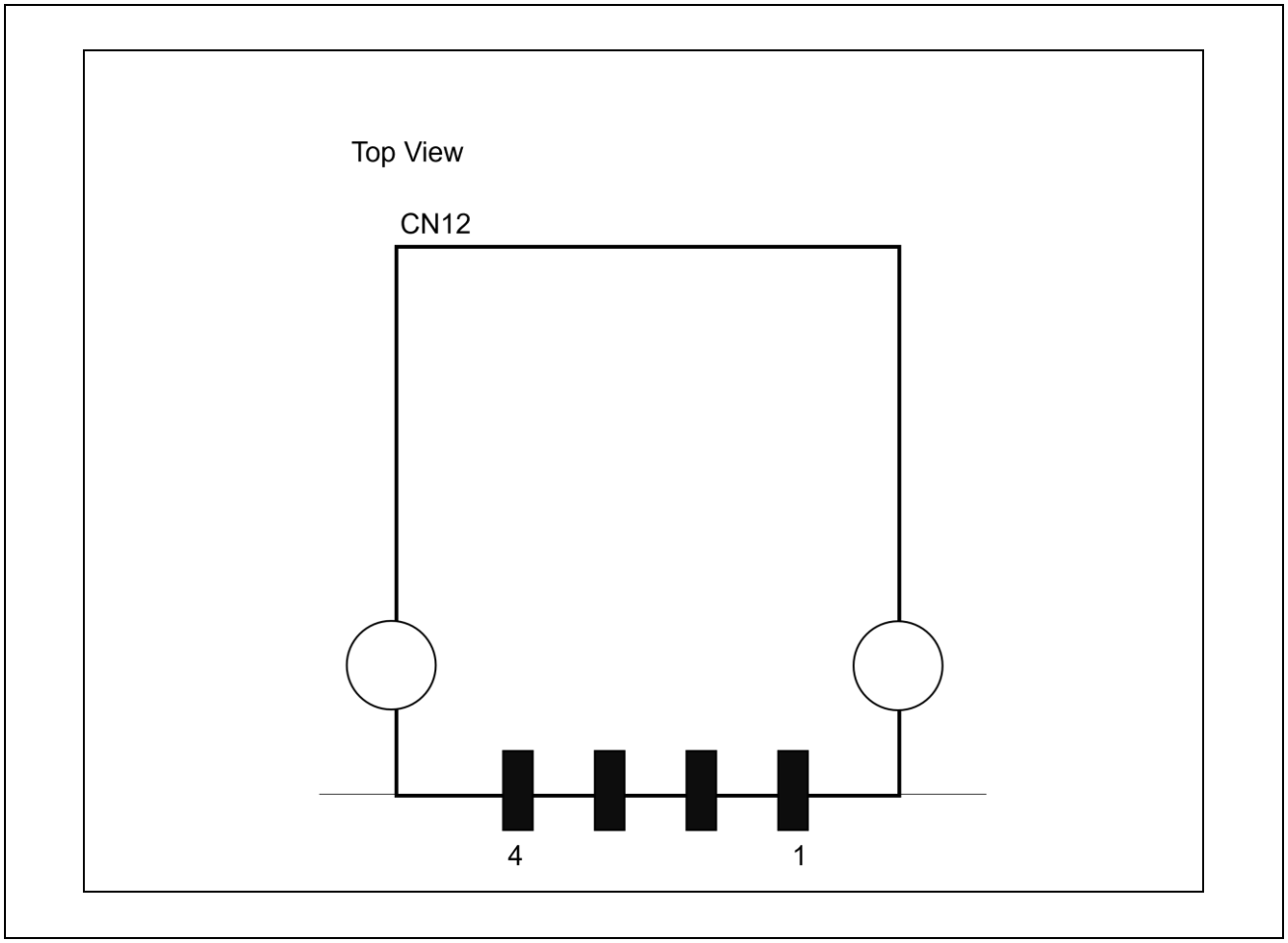


Figure 3.10 USB Type-A Receptacle (CN12) Pin Layout Diagram

Table 3.12 USB Type-A Receptacle (CN12) Pin Layout Table

Pin	Signal Name
1	VBUS
2	USB1-
3	USB1+
4	GND

3.1.10 MicroHDMI Connector

The RZ SMARC Carrier contains a microHDMI connector (CN13).

Figure 3.11 illustrates the layout of the microHDMI connector pins. **Table 3.13** shows the assignment of the microHDMI connector pins.

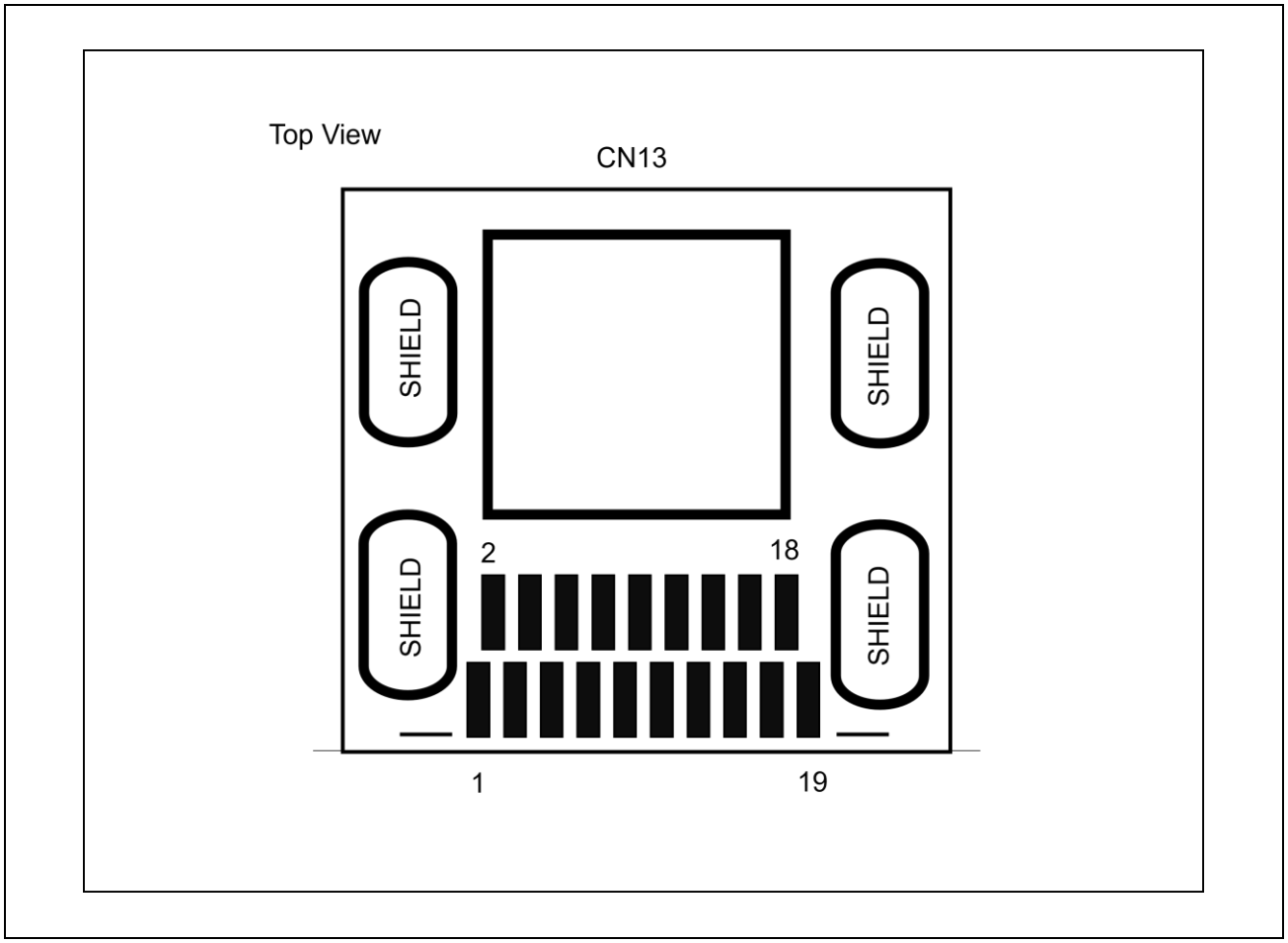


Figure 3.11 microHDMI Connector (CN13) Pin Layout Diagram

Table 3.13 microHDMI Connector (CN13) Pin Layout Table

Pin	Signal Name
1	HDMI_HPD_3V3
2	—
3	HDMI_TX2_P(DSI0_D2+)
4	HDMI_TX2_N(DSI0_D2-)
5	GND
6	HDMI_TX1_P(DSI0_D1+)
7	GND
8	HDMI_TX1_N(DSI0_D1-)
9	HDMI_TX0_P(DSI0_D0+)
10	GND
11	HDMI_TX0_N(DSI0_D0-)
12	HDMI_TXC_P(DSI0_CLK+)
13	GND
14	HDMI_TXC_N(DSI0_CLK-)
15	HDMI_CEC
16	GND
17	DCD_SCL(I2C_LCD_CK)
18	DCD_SDA(I2C_LCD_DAT)
19	HDMI_5V

3.1.11 CAN Connector

The RZ SMARC Carrier contains CAN0 and CAN1 connectors (CN15 and CN16).

Figure 3.12 illustrates the layout of the CAN0 and CAN1 connector pins. **Table 3.14** shows the assignment of the CAN0 connector pins.

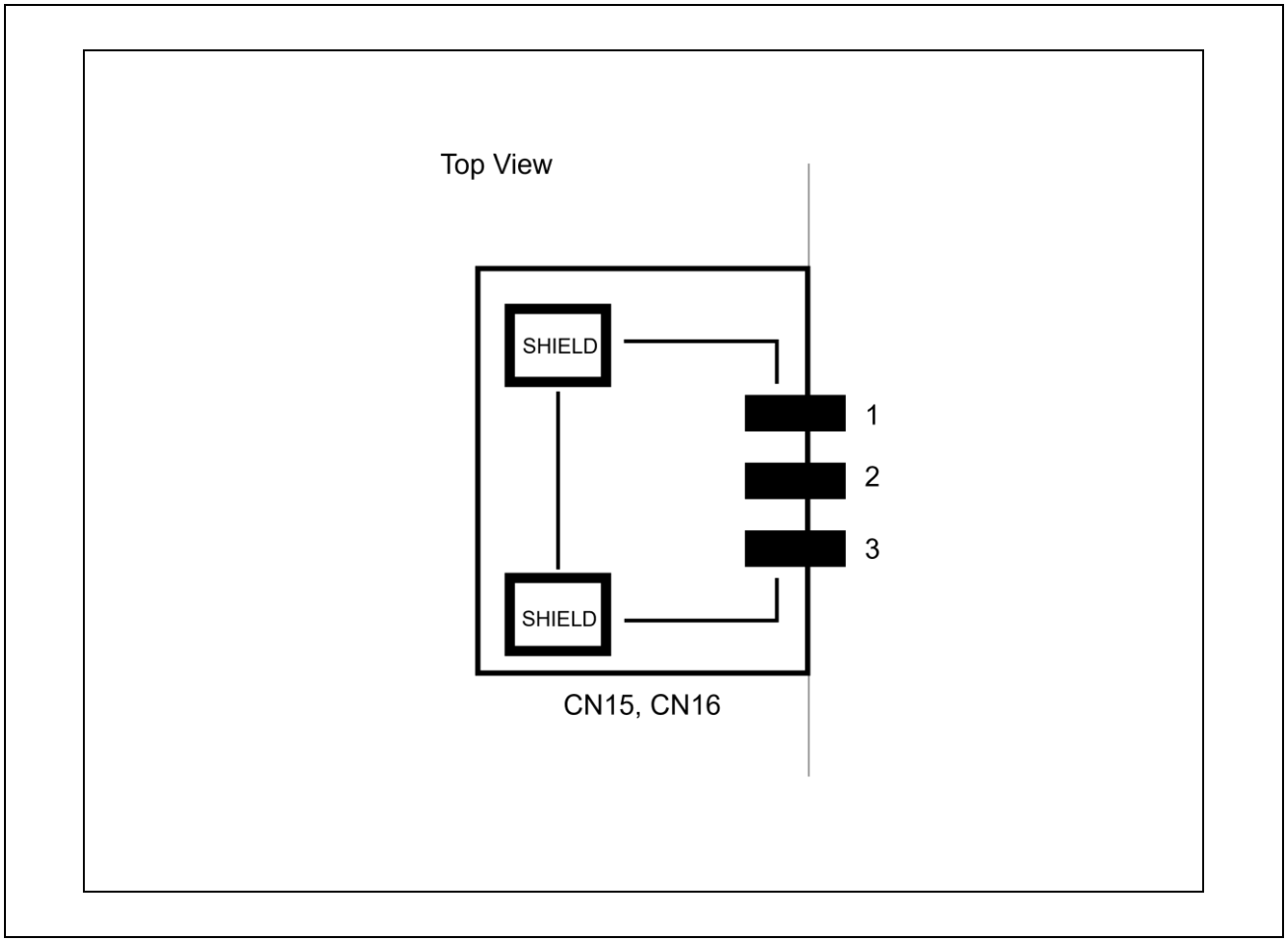


Figure 3.12 CAN0/1 Connector (CN15, CN16) Pin Layout Diagram

Table 3.14 CAN0 Connector (CN15) Pin Layout Table

Pin	Signal Name
1	CAN0_TX
2	CAN0_RX
3	GND

Table 3.15 shows the assignment of the CAN1 connector pins.

Table 3.15 CAN1 Connector (CN16) Pin Layout Table

Pin	Signal Name
1	CAN1_TX
2	CAN1_RX
3	GND

3.1.12 SMARC Edge Connector

The RZ SMARC Carrier can be connected to an external expansion board through the Module board connecting connector (CN5).

Figure 3.13 illustrates the layout of the Carrier board connecting connector pins.

For the assignment of the Carrier board connecting connector pins, refer to section 4 “MODULE PIN-OUT MAP” of the document “SMARC module 2.1 Specification”.

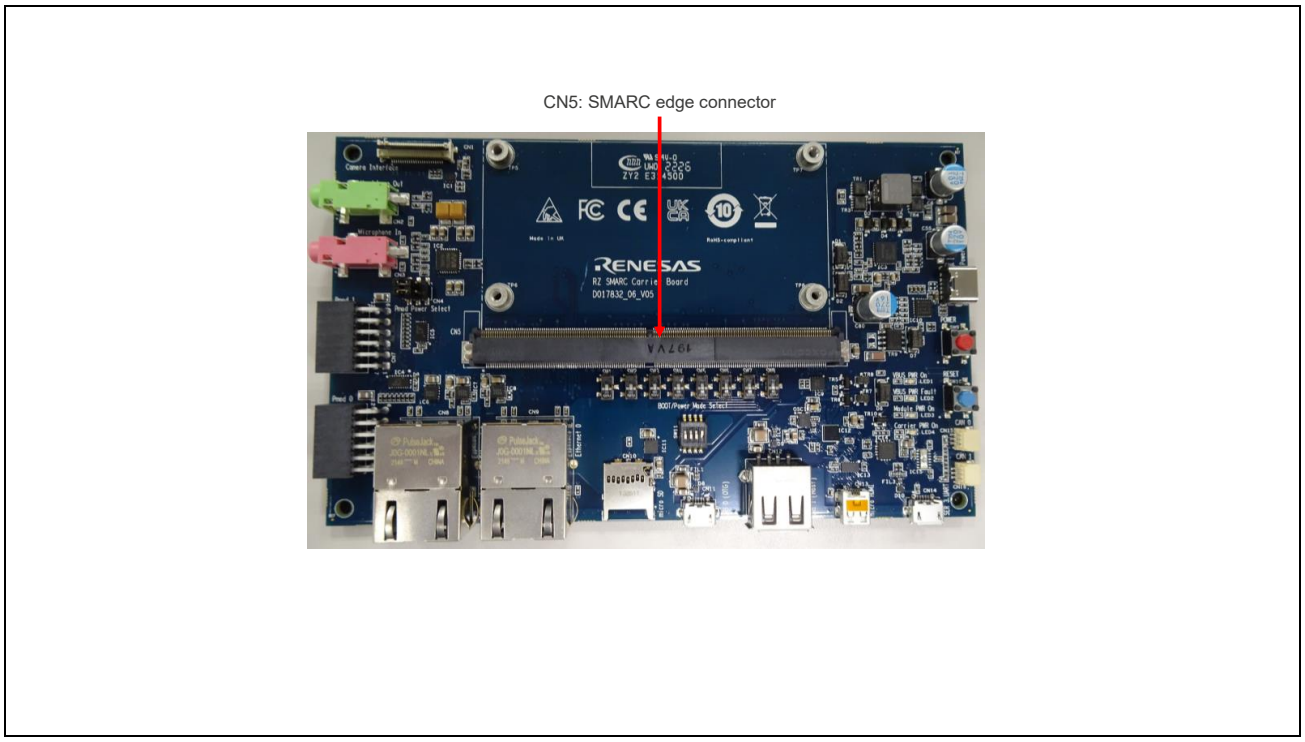


Figure 3.13 Layout of Carrier Board Connecting Pins

3.2 Operation Components

Figure 3.14 illustrates the switch settings at the time of shipment.

Figure 3.14 Switch Settings at Shipment

3.2.1 Configuration by Switches and Mode Terminals

The RZ SMARC Carrier contains eleven switches.

Table 3.16 lists the mounted switches. **Table 3.17** lists the functions of the DIP switches. The default settings are highlighted.

Table 3.16 Switches Mounted on the RZ SMARC Carrier

No.	Function	Note
SW1	System setting DIP switch	For details, see **Table 3.17**
SW2		
SW3		
SW4		
SW5		
SW6		
SW7		
SW8		
SW9	Power button switch	
SW10	Reset button switch	Refer to **section 2.7** for details.
SW11	Boot Mode setting DIP switch	For details, see **Table 3.18**

Table 3.17 Functions of System Setting DIP Switch (SW1 to SW8)

No.	Setting		Function
SW1	OFF	SCIF2_CTS# = “H”	Used as Type-3A
	ON	P3_1 = “L”	Used as Type-6A
SW2	OFF	SCIF2_TX = “H”	Used as Type-3A
	ON	P5_2 = “L”	Used as Type-6A
SW3	OFF	SCIF2_RX = “H”	Used as Type-3A
	ON	RIIC3_SCL = “L”	Used as Type-6A
SW4	OFF	SCIF2_RTS = “H”	Used as Type-3A
	ON	RIIC3_SDA = “L”	Used as Type-6A
SW5	OFF	P3_1 = “H”	Used as Type-3A
	ON	P42_2 = “L”	Used as Type-6A
SW6	OFF	P5_2 = “H”	Used as Type-3A
	ON	P42_3 = “L”	Used as Type-6A
SW7	OFF	P42_2 = “H”	Used as CAN0
	ON	P42_2 = “L”	Used as PMOD1
SW8	OFF	P42_3 = “H”	Used as CAN0
	ON	P42_3 = “L”	Used as PMOD1

Figure 3.15 shows a block diagram of the system setting interface. **Table 3.18** lists the functions of the mode terminals.

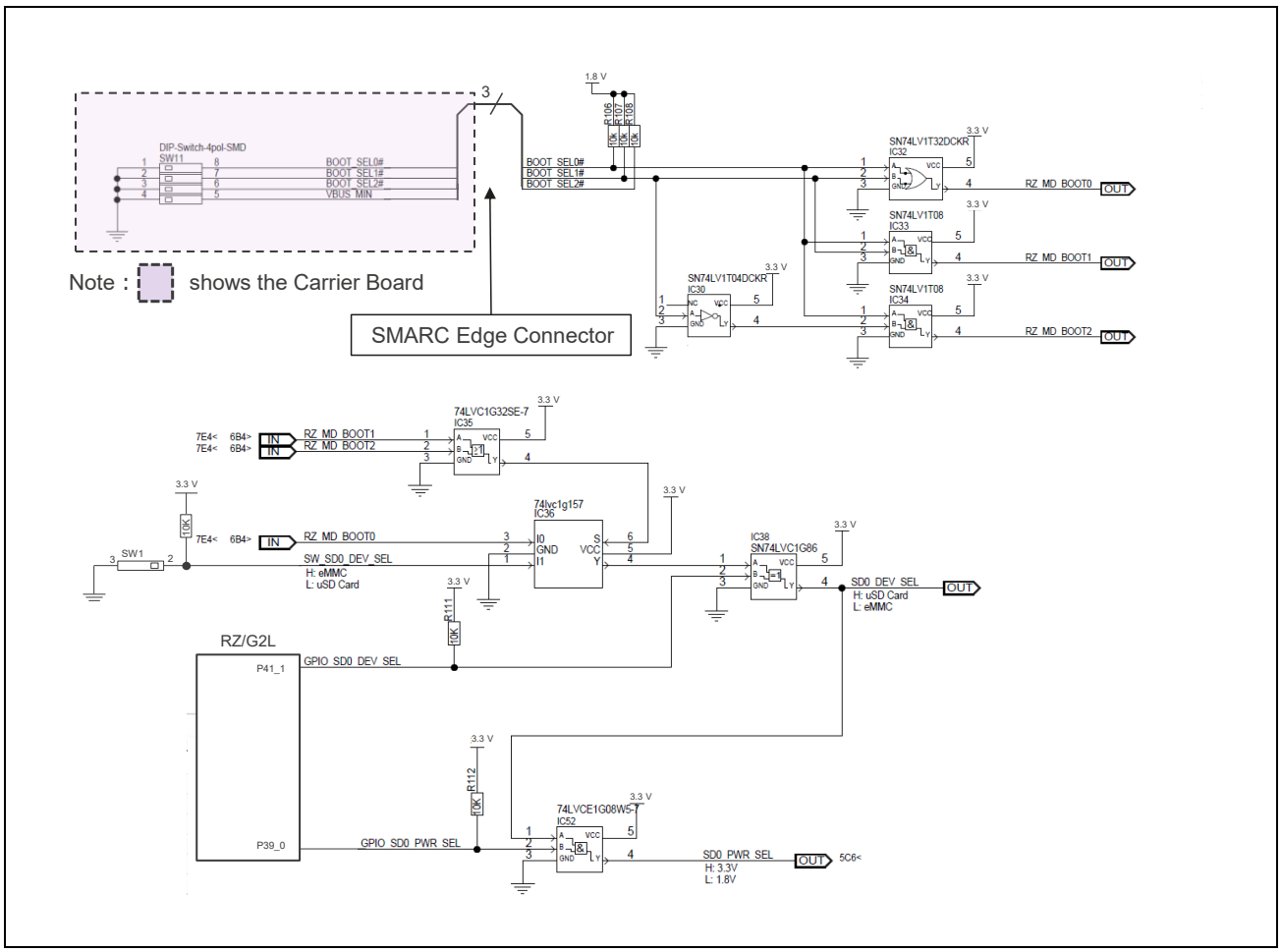


Figure 3.15 Block Diagram of System Setting I/F

Table 3.18 Functions of System Setting

No.			Setting			Function	Setting			Function	
Carrier "BOOT_SELn#" (SW11)*1			RZ_MD_BOOTn				Module (SW1-2) SW_SD0_DEV_SEL*2	P41_1 (external pull-up) GPIO_SD0_DEV_SEL	P39_0 (external pull-up) GPIO_SD0_PWR_SEL	Device connected to SD0 (P0_0 Read Only) SD0_DEV_SEL*3	SD0_PVDD (SD0_PWR_SEL)*4
2# (SW11-3)	1# (SW11-2)	0# (SW11-1)	2	1	0	Boot Mode					
Off	On	On	0	0	0	eSD*5 (start up 3.3V)	x	1	1	uSD Card	3.3 V
Off	Off	On	0	0	1	1.8-V eMMC*5	x	1	x	eMMC	1.8 V
Off	Off	Off	0	1	1	1.8-V Single/Quad	Off	1	x	eMMC	1.8 V
Off	Off	Off	0	1	1	1.8-V Single/Quad	On	1	1	uSD Card	3.3 V
Off	On	Off	1	0	1	SCIF download*5	Off	1	x	eMMC	1.8 V
Off	On	Off	1	0	1	SCIF download*5	On	1	1	uSD Card	3.3 V

Note: "x" indicates that the setting does not depend on the DIP SW setting.

Note 1. For the "BOOT_SEL0#", "BOOT_SEL1#", and "BOOT_SEL2#" signals, "On" means 0 (= "H"), and "Off" means 1 (= "L").

Note 2. For the "SW_SD0_DEV_SEL" signal, "On" means connection to the microSD card (= "H"), and "Off" means connection to the eMMC memory (= "L").

Note 3. For the "SD0_DEV_SEL" signal, "On" means connection to the eMMC memory (= "H"), and "Off" means connection to the microSD card (= "L").

Note 4. For the "SD0_PWR_SEL" signal, "On" means a 1.8 V supply (= "H"), and "Off" means a 3.3 V supply (= "L").

Note 5. The RZ/A3UL EVKIT does not support eSD, eMMC, or SCIF download modes as boot modes.

3.2.2 Functions of LEDs

The RZ SMARC Carrier contains four LEDs.

Figure 3.16 illustrates the layout of the LEDs. **Table 3.19** lists the mounted LEDs.

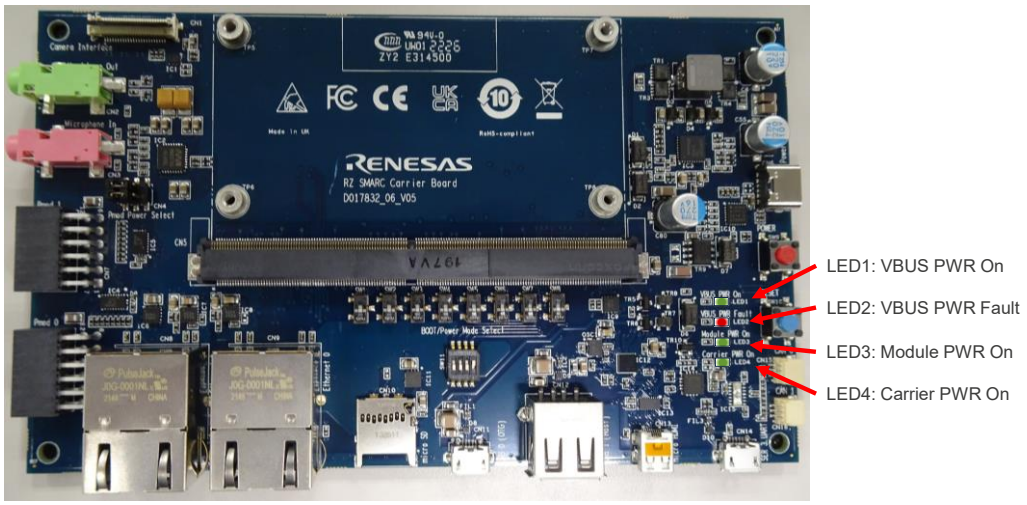


Figure 3.16 Layout of LEDs Mounted on the RZ SMARC Carrier

Table 3.19 LEDs Mounted on the RZ SMARC Carrier

No.	Color	Function
LED1	Green	VBUS Power On (Lit while 5 V is supplied)
LED2	Green	VBUS Power Fault
LED3	Green	Module Power On (Lit while 5 V is supplied)
LED4	Green	Carrier Power On (Lit while SW9 is pressed)

4. Appendix

4.1 Interfaces Supported on Each EVKIT

See the Excel file for a list of supported interfaces.
(Double-click the icon on the right to open the file.)

5. Certifications

The RZ SMARC Series Carrier Board comprising the RZ/G2L, RZ/V2L, RZ/G2LC, RZ/G2UL, RZ/A3UL, and RZ/Five EVKITs meets the following certification/standards. See page 3 of this user's manual for the disclaimer and precautions.

5.1 EMC/EMI Standards

- FCC Notice (Class A)

  This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

  [NOTE] — This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/television technician for help.

- Innovation, Science and Economic Development Canada ICES-003 Compliance:
  CAN ICES-3 (A)/NMB-3(A)

- CE Class A (EMC)

  This product is herewith confirmed to comply with the requirements set out in the Council Directives on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility Directive 2014/30/EU.

  [Warning] — This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.

- UKCA Class A (EMC)

  This product is in conformity with the following relevant UK Statutory Instrument(s) (and its amendments): 2016 No. 1091 Electromagnetic Compatibility Regulations 2016.

  [Warning] — This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.

5.2 Material Selection, Waste, Recycling and Disposal Standards

- EU RoHS
- WEEE Directive (2012/19/EU) & The Waste Electrical and Electronic Equipment Regulations 2013

For customers in the UK & European Union the WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the UK and European Union.

This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner.

Renesas Electronics Europe GmbH can take back end of life equipment. Register for this service at:
https://www.renesas.com/en/support/regional-customer-support/weee

5.3 Safety Standards

- UL 94V-0

REVISION HISTORY	RZ SMARC Series Carrier Board User's Manual: Hardware

Rev.	Date	Description	
		Page	Summary
1.00	Sep. 27, 2021	—	First edition issued
1.01	Oct. 07, 2021	1	For front cover, it is changed the description from "RZ SMARC Series Carrier Board RTK97X4XXXB00000BE" to "RZ SMARC Series Carrier Board". It is changed from "RZ Family / RZ/G Series" to "RZ Family / RZ/G, RZ/V Series"
		7	For Tytle, it is changed the description from "RZ Family / RZ/G Series RZ SMARC Series Carrier Board RTK97X4XXXB00000BE" to "RZ Family / RZ/G, RZ/V Series RZ SMARC Series Carrier Board".
		8	For section "Configuration", it is added the description "RTK9754L23C01000BE(RZ/V2L SMARC Module Board)".
		17	For section "MPU", it is added the description "Please refer to the function list (section 2.2.2) in the user's manual of each module board". For section "Overview of RZ/G2L", it is removed the description. For section "List of RZ/G2L functions", it is removed the description.
		58	For Revision History, it is changed the description from "RZ Family / RZ/G Series RZ SMARC Series Carrier Board RTK97X4XXXB00000BE" to "RZ Family / RZ/G, RZ/V Series RZ SMARC Series Carrier Board".
		60	For back cover, it is changed the description from "RZ Family / RZ/G Series" to "RZ Family / RZ/G, RZ/V Series".
1.02	Feb. 15, 2022	8	The RTK9743U11C01000BE (RZ/G2UL SMARC Module Board) is added.
1.03	Mar. 7, 2022	8	The RTK9743F01C01000BE (RZ/Five SMARC Module Board) is added.
1.04	Apr. 26, 2022	8	The RTK9763U02C01000BE (RZ/A3UL SMARC Module Board QSPI Edition) is added. The RTK9763U02C01001BE (RZ/A3UL SMARC Module Board Octal Edition) is added. For Figure1.1, it is changed from "RZ/V2L SMARC Module Board" to "RZ/G2L SMARC Module Board".
1.10	Dec. 13, 2022	7, 9, 10, 13, 15, 17, 31, 34, 51	CAN-FD interface is not supported because a CAN transceiver is not fitted.
		29	For section "Camera Interface", it is added a note on the use of camera modules.
		40	For section "PMOD0/1 Connector (J1, CN7)", Figure 3.6 is modified.
1.20	Mar. 22, 2024	17, 31	For section 2.13 "CAN-FD Interface", CAN-FD Interface is supported.
		24	For section 2.7 "Reset Control", figure is modified.
		25	For section 2.8 "Power Supply Configuration", figure is modied.
		32, 33	For section 2.14 "PMOD Interface", figure is modified.
1.21	Mar. 27, 2024	24	For section 2.7 "Reset Control", figure is modified.
1.22	May 31, 2024	24, 25	The description is changed from "Evauation board Kit for RZ/G2L MPU" to "RZ/G2L SMARC Evaluation board Kit".
		25, 26	For section 2.8 "Power Supply Configuration", Figure 2.8 is modified. The following description is added. SW9 of RTK97X4XXXB00000BE is a button switch, and the PMIC uses RAA215300A2GNP#HA0, which requires a long press on SW9 for power on/off. If you want to use an on/off switch type instead of a long press type for power on/off, you need to change SW9 to an on/off switch type and to select "RAA215300A2GNP#HA1", which is an on/off switch type.
		52	For section 3.1.11 "Not available", it is changed to "CAN0/1 Connector (CN15, CN16)". The CAN-FD interface is supported.
		57	For section 3.2.1 "Functions of Switches and Mode Terminals", Table 3.18 is modified.
1.23	Mar. 12, 2025	9	For section 1.3 "Features", Table 1.1 is modified.
		10, 13, 36, 54, 55, 59	Since the version of the board was changed from D017832_06_V04 to D017832_06_V05, Figure 1.2, Figure 1.5, Figure 3.1, Figure 3.13, Figure 3.14, and Figure 3.16 are modified.

Rev.	Date	Description	
		Page	Summary
1.23	Mar. 12, 2025	15, 16	For section 1.6 “Layout Components”, Table 1.2 and Table 1.3 are modified and Figure 1.7 is added since the SMARC edge connector was changed with the board version change.
1.30	Nov. 25, 2025	60, 61	4. “Certifications”, added.
2.00	May 27, 2026	7	For section 1.1 “Purpose”, updated the description. Added information on Renesas SMARC Modules that can be connected to the RZ SMARC Carrier.
		9	For section 1.3 “Features”, updated the table. Added information on how to distinguish each RZ SMARC Carrier.
		49	For section 3.2 “Operation Components”, updated the figure. Added information on the default DIP switch settings at the time of shipment.
		52	For section 3.2.1 “Configuration by Switches and Mode Terminals”, added information to the table regarding boot modes supported by the RZ/A3UL EVKIT.
		54	4 “Appendix”, added information on interfaces supported by each EVKIT.

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