User's Manual

RZ/V2N Evaluation Board Kit (Secure type)

Hardware Manual

Renesas Electronics
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SAFETY MATTERS

Definitions of Symbols

A variety of symbols are used in this document and on this product, to prevent the damage to harm and the property to you and other people beforehand by correctly using this product.

This section, Safety Matters, presents these symbols and their meanings. It also presents safety notes to assure that this produce is used safely and correctly.

This product should only be used after fully understanding the material presented in this section.

⚠ WARNING	Warning items indicate things that, if not avoided, could lead to death or serious injury.
⚠ CAUTION	Caution items indicate things that, if not avoided, could lead injury or damage to the house and household goods, etc.

In addition to the above two symbols, the following are displayed at the same time as required.

[Important] These indicate the points which may cause a breakdown or malfunction of equipment by the incorrect setting when setting up this product.

△ indicates WARNING or CAUTION.

Example:  CAUTION AGAINST ELECTRIC SHOCK

⃠ indicates PROHIBITION.

Example:  DISASSEMBLY PROHIBITED

● indicates a COMPULSORY ACTION.

Example:  COMPULSORY ACTION

WARNING

Handling Related Warnings:

Always check the jumper and switch settings before connecting a power source. An incorrect jumper or switch setting can lead to internal heat generation, rupture, ignition, or damage to this evaluation board itself or any connected equipment.

If, during either the use or storage of this product, any abnormality in the product itself (including abnormal odors, heating, color changes, or changes to the shape of the product) are observed, disconnect the power supply immediately.
The incidence of such an abnormality may result in rupture, ignition, or performance deterioration. Therefore, do not use this product in such a situation.

Installation:

Do not install this product in a location that has a high humidity or where water or other fluids could get on it. This product may be damaged if water or other fluids can get on it.

Ambient Temperature:

The ambient temperature range for using this product is from 0°C to 60°C.

⚠ CAUTION

Handling:

This product must be handled carefully. Do not cause a strong impact by dropping it, letting it fall, etc.

Do not touch this product's component pins with bare hands. Doing so may discharge static electricity that damages the Internal circuits. Eliminate static electricity before touching this product.

When connecting or disconnecting cables to or from this product, hold the parts of the cable intended to be grasped (such as the plugs) and avoid putting stress on the cable. Do not pull this product etc. while it is connected with a communications interface cable. Doing so may cause the cable to be disconnected.

When connecting a cable to a connector, do not insert the plug in the reverse direction or upside down. Incorrect insertion may damage this product or connected equipment.

Always check the jumper and switch settings before connecting a power source. An incorrect jumper or switch setting can lead to damage to this product or connected equipment.

Do not handle this product with wet hands. Doing so can lead to failure of the product.

Transport methods:

When transporting this product, use the product's packing box and cushioning materials and ship it with precision equipment handling. If the products packing is insufficient, it may be damaged during shipping.
If it must be transported by some other method, pack it carefully as precision equipment.
When packing this product, always use the antistatic pouch included with this product.
If some other pouch is used, electrostatic discharge may damage the product.

Abnormal operation:

If operation of this product becomes abnormal due to interference from external noise etc., apply the following procedure.

1. Turn off the power.
2. Wait 10 or over seconds and then turn the power back on.

Disposal:

When disposing of this product, be sure to dispose it as industrial waste according to all applicable laws.

Table of Contents

1. Overview

This board is an evaluation kit for the Arm®-based high-end RZ/V2N MPU from Renesas Electronics (RZ/V2N Evaluation Board kit (Secure type), hereafter V2NEVK). This manual describes the hardware functions of the V2NEVK.

The V2NEVK consists of the RZ/V2N Evaluation Board (CPU board) and the RZ/V2H EVK Expansion Board (EXP board).

Board Name	Overview
RZ/V2N Evaluation Board (CPU board)	• The RZ/V2N is mounted. • Board on which the main functional components for the RZ/V2N are mounted.
RZ/V2H EVK Expansion Board (EXP board)	• Connected to J1, J2, and J4 on the RZ/V2N Evaluation Board. • This board has HDMI, audio, and Pmod interfaces.
eMMC Sub Board	• Connects to CN15 on the RZ/V2N Evaluation Board. • Usage is mutually exclusive with the microSD Sub Board equipped with a microSD slot.
microSD Sub Board	• Connects to CN15 on the RZ/V2N Evaluation Board. • Usage is mutually exclusive with the eMMC Sub Board equipped with eMMC.

The following documents have been prepared for the V2NEVK. Make sure to refer to the latest versions of these documents. For the development environment including software, contact a Renesas Electronics sales representative.

Document Type	Document Title	Document No.	Description
Hardware Manual	RZ/V2N Evaluation Board Kit (Secure type) Hardware Manual	This manual	Hardware specifications of the V2NEVK
User's Manual: Hardware	RZ/V2N Group User's Manual: Hardware	R01UH1071EJ****	RZ/V2N hardware specifications (pin assignments, memory maps, peripheral specifications, electrical characteristics, and timing charts) and descriptions of operation

1.1 Features

This V2NEVK includes the following features.

- LPDDR4X: 64 Gb × 1
- NOR flash: 512 Mb
- MIPI® CSI-2® connector: 2 ch.
- Gigabit Ethernet interface connector: 2 ch.
- USB3.2 Gen 2 Type-A: 1 ch.
- USB2.0 micro-AB: 1 ch.
- Micro SD card connector: 1 ch.
- eMMC: 64 GB
- PCIe® Slot (× 2 lanes): 1 ch.
- Debug serial interface USB micro-B: 1 ch.
- Debugger interface connector: 1 ch.
- HDMI® Type-A connector: 1 ch.
- Pmod™ interface connector: 4 ch.
- Audio MIC connector: 1 ch.
- Audio HP connector: 1 ch.
- Audio AUX connector: 1 ch.
- USB-PD Type-C (power supply): 1 ch.

1.2 Block Configuration

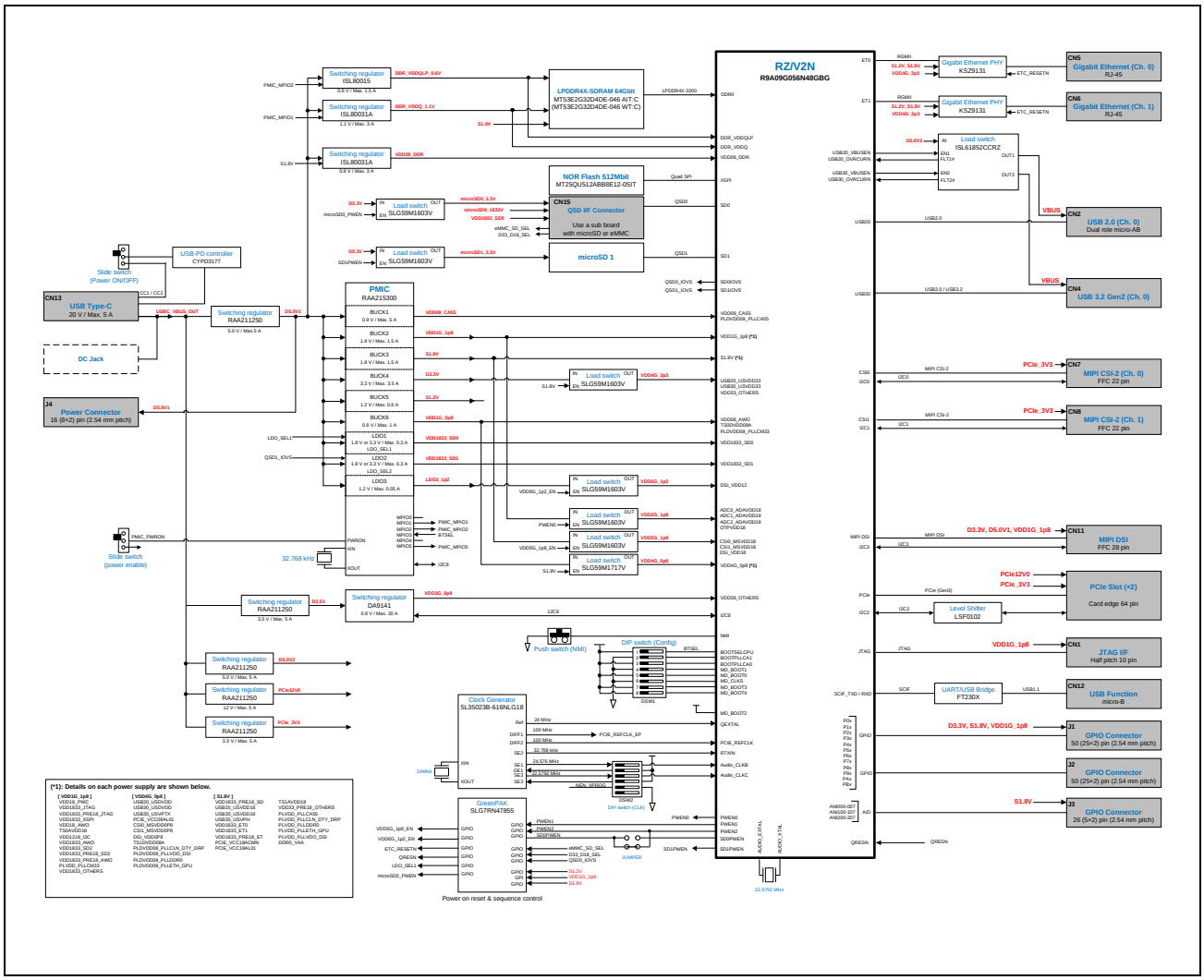


Figure 1.2-1 RZ/V2N Evaluation Board Block Diagram

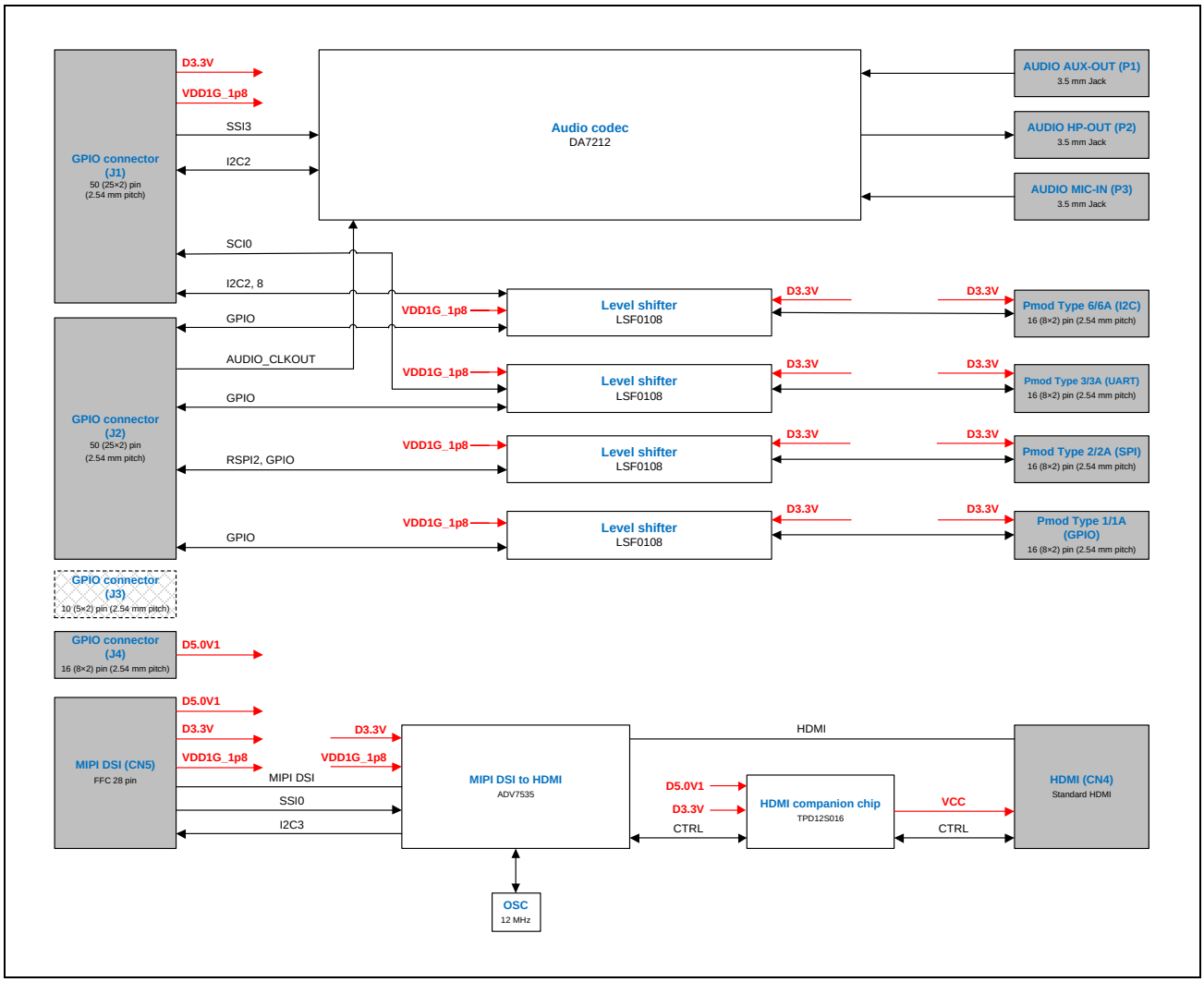


Figure 1.2-2 RZ/V2H EVK Expansion Board Block Diagram

1.3 Specifications

1.3.1 V2NEVK Specifications

Table 1.3-1 V2NEVK Specifications

Item	Specification		
MPU	R9A09G056N48GBG (RZ/V2N [GE3D, security, ISP])		
Board size	CPU board:	153 × 100 × 1.7 mm	
	EXP board:	153 × 100 × 1.7 mm	
	eMMC Sub Board:	24 × 18 × 1.6 mm	
	microSD Sub Board:	24 × 18 × 1.6 mm	
LPDDR4X	Micron MT53E2G32D4DE-046 AIT:C (MT53E2G32D4DE-046 WT:C) 64 Gb dual-rank		
NOR Flash	Micron MT25QU512ABB8E12		
eMMC	Micron MTFC64GBCAQTC-IT (MTFC64GAZAQHD)		
HDMI interface	Connector: Type-A (standard) MIPI® DSI® receiver with HDMI transmitter: ADV7535		
USB interface	Connector: USB3.2 Gen2 Type-A Connector: USB2.0 micro-AB		
Ethernet interface	Connector: RJ45 × 2 Ethernet PHY IC: KSZ9131RNXI		
Audio interface	Connector: 3.5 mm jack (MIC) Connector: 3.5 mm jack (HP) Connector: 3.5 mm jack (AUX-IN)		
SD Card interface	Connector: Micro SD card slot		
PCIe interface	Connector: PCIe Slot (× 2 lanes)		
MIPI CSI-2 interface	Connector: CF20221V0R0-NH × 2 ch.		
Pmod interface	Pmod Type 1A (GPIO) Pmod Type 2A (SPI) Pmod Type 3A (UART) Pmod Type 6A (I2C)		
Debug interface	Connector: USB Micro-B UART-USB bridge: FT230XS		
Debugger interface	Connector: 10 pins with 1.27 mm pitch		
LED	For power enable (PMIC_PWRON):	Green	
	For power supply (D5.0V1):	Green	
	For power supply (VDD1G_1p8):	Green	
	For power supply (S1.8V):	Green	
	For power supply (USBC_VBUS_OUT):	Green	
	For monitor:	Yellow × 2	
Switch	For mode setting:		8-bit DIP switch
	For audio clock select:		6-bit DIP switch
	For power ON/OFF:		Slide switch
	For PMIC ON/OFF:		Slide switch
	For NMI:		Push switch
	For MIPI CSI-2 Camera Interface voltage selection:		DIP switch
	For MIPI CSI-2 I2C Pull-Up ON/OFF:		4-bit DIP switch
Power supply	USB-PD Type-C (60 W or more)		

1.3.2 V2NEVK Power Supply Specifications

The exact power required for the V2NEVK depends on the application and peripheral devices. **Table 1.3-2** shows the power allocations.

This board is designed to be supplied by a USB power supply that complies with the USB Power Delivery standard of 60 W or more. Be sure to use a USB power supply of at least 60 W.

Table 1.3-2 Power Supply Allocation

Item	Power	Description
RZ/V2N	Max. 12 W	LSI maximum power consumption (in the worst conditions)
MIPI CSI-2	Max. 3 W	When connecting two camera modules
USB	Max. 7 W	USB2.0: 1 ch. USB3.2: 1 ch.
PCIe	Max. 25 W	2 lanes × 1 ch.
Others	Max. 6 W	LPDDR4X: 1 ch., GbE_PHY: 2 ch., SD/eMMC: 2 ch., SPI flash memory, etc.

1.3.3 V2NEVK Accessories

Table 1.3-3 V2NEVK Accessories

Item	Specification
Flexible flat cable (FFC)	Length: 64.2 mm, Width: 14.5 mm, 28 pins *Note*: Used to connect CN11 on the CPU board and CN5 on the EXP board
Heat-sink	40 × 40 × 20 mm
USB cable	Type-A – Micro-B Length: 1 m
Rubber feet	D = 8 mm, t = 2.79 mm, Qty: 4
Screw	M2 × 4 mm for fixing the sub board

1.3.4 Outer Appearance

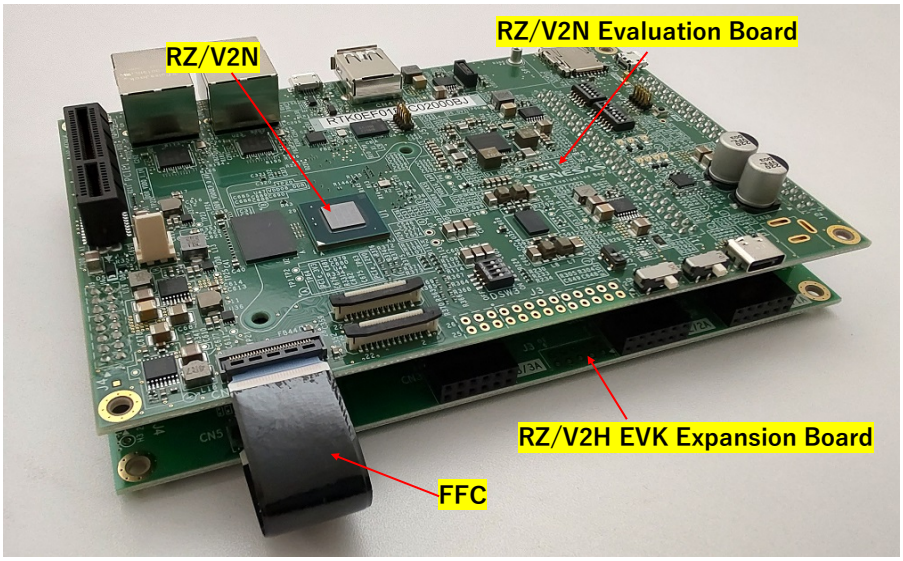


Figure 1.3-1 Outer Appearance of V2NEVK

1.3.5 List of Pin Functions

Table 1.3-4 lists pin functions used in V2NEVK.

Table 1.3-4 List of Pin Function Selection Used on the V2NEVK (1/3)

Pin Location	Pin Name	Pin Function	Description
AF5	P00	P00/LED	Switching LD5 via EXP board
AE5	P01	P01/LED	Switching LD6 via EXP board
AJ4	P02	P02	J1 connector on the CPU board
AJ5	P03	P03	J1 connector on the CPU board
AD6	P04	SSI3_SDATA	Audio codec (DA7212) on the EXP board
AE6	P05	P05	J1 connector on the CPU board
AD5	P06	SDA8	RAA215300 / DA9141 / 5L35023B / J1 connector on the CPU Board
AH4	P07	SCL8	RAA215300 / DA9141 / 5L35023B / J1 connector on the CPU Board
AF7	P10	AUDIO_CLKB	5L35023B / J1 connector on the CPU board DSW2(SW2) ON: Audio CLKB is supplied from 5L35023B OFF: Audio CLKB is not supplied from 5L35023B
AJ6	P11	AUDIO_CLKC	5L35023B / J1 connector on the CPU board DSW2(SW4) ON: Audio CLKC is supplied from 5L35023B OFF: Audio CLKC is not supplied from 5L35023B
AD7	P12	SSI3_SCK	Audio codec (DA7212) on the EXP board
AG6	P13	SSI3_WS	Audio codec (DA7212) on the EXP board
AF6	P14	P14	J1 connector on the CPU board
AH6	P15	SSI4_SDATA	Audio codec (DA7212) on the EXP board
AJ21	P20	SDA2	PCIe slot on the CPU Board and Pmod Type6/6A (I2C) Connector / DA7212 on the EXP Board
AH21	P21	SCL2	PCIe slot on the CPU Board and Pmod Type6/6A (I2C) Connector / DA7212 on the EXP Board
AH7	P30	SDA0	MIPI CSI-2 CH0 (CN7) / J1 connector on the CPU board
AJ7	P31	SCL0	MIPI CSI-2 CH0 (CN7) / J1 connector on the CPU board
AH9	P32	SDA1	MIPI CSI-2 CH1 (CN8) / J1 connector on the CPU board
AH10	P33	SCL1	MIPI CSI-2 CH1 (CN8) / J1 connector on the CPU board
AG8	P34	P34	J1 connector on the CPU board
AF9	P35	P35	J1 connector on the CPU board
AG7	P36	SDA3	MIPI DSI (CN11) / J1 connector on the CPU board
AH8	P37	SCL3	MIPI DSI (CN11) / J1 connector on the CPU board
AJ10	P40	SSI0_SCK	MIPI DSI (CN11) / J1 connector on the CPU board
AJ9	P41	SSI0_WS	MIPI DSI (CN11) / J1 connector on the CPU board
AD8	P42	SSI0_SDATA	MIPI DSI (CN11) / J1 connector on the CPU board
AE9	P43	P43	J1 connector on the CPU board
AJ8	P44	P44	J1 connector on the CPU board
AF8	P45	P45	J1 connector on the CPU board
AD9	P46	P46	J1 connector on the CPU board
AE8	P47	P47	J1 connector on the CPU board
AE10	P50	TXD0	Pmod Type3/3A (UART) Connector on the EXP board
AD10	P51	RXD0	Pmod Type3/3A (UART) Connector on the EXP board
AC11	P52	CTS0N	Pmod Type3/3A (UART) Connector on the EXP board

Table 1.3-4 List of Pin Function Selection Used on the V2NEVK (2/3)

Pin Location	Pin Name	Pin Function	Description
AD11	P53	RTS0N	Pmod Type3/3A (UART) Connector on the EXP board
AG10	P54	P54	Pmod Type6/6A (I2C) Connector on the EXP board
AG11	P55	P55	Pmod Type6/6A (I2C) Connector on the EXP board
AG12	P56	P56	J2 connector on the CPU board
AJ11	P57	P57	Pmod Type3/3A (UART) Connector on the EXP board
AH11	P60	P60	J2 connector on the CPU board
AF12	P61	P61	J2 connector on the CPU board
AD12	P62	P62	J2 connector on the CPU board
AH12	P63	P63	J2 connector on the CPU board
AF10	P64	P64/CAM0_RST#	MIPI CSI-2 CH0 (CN7) / J2 connector on the CPU board
AF11	P65	P65/CAM1_RST#	MIPI CSI-2 CH1 (CH8) / J2 connector on the CPU board
AE12	P66	P66	J2 connector on the CPU board
AC12	P67	P67	J2 connector on the CPU board
AD14	P70	P70/IRQ0	Pmod Type6/6A (I2C) Connector on the EXP board
AC14	P71	P71/IRQ1/HDMI_INT#	MIPI DSI (CN11) / J2 connector on the CPU board
AH13	P72	P72/IRQ4	Pmod Type6/6A (I2C) Connector on the EXP board
AJ14	P73	P73	Pmod Type3/3A (UART) Connector on the EXP board
AE14	P74	P74/IRQ8	Pmod Type2/2A (SPI) Connector on the EXP board
AE13	P75	P75	Pmod Type2/2A (SPI) Connector on the EXP board
AG14	P76	P76	Pmod Type3/3A (UART) Connector on the EXP board
AF14	P77	P77	Pmod Type3/3A (UART) Connector on the EXP board
AD13	P80	P80	Pmod Type1/1A (GPIO) Connector on the EXP board
AH14	P81	P81	Pmod Type1/1A (GPIO) Connector on the EXP board
AD15	P82	P82	Pmod Type1/1A (GPIO) Connector on the EXP board
AJ13	P83	P83	Pmod Type1/1A (GPIO) Connector on the EXP board
AC15	P84	P84	Pmod Type1/1A (GPIO) Connector on the EXP board
AF13	P85	P85	Pmod Type1/1A (GPIO) Connector on the EXP board
AC13	P86	P86	Pmod Type1/1A (GPIO) Connector on the EXP board
AJ12	P87	P87	Pmod Type1/1A (GPIO) Connector on the EXP board
AH17	P90	P90	Pmod Type6/6A (I2C) Connector on the EXP board
AE17	P91	P91	Pmod Type6/6A (I2C) Connector on the EXP board
AC16	P92	P92	J2 connector on the CPU board
AC17	P93	P93	J2 connector on the CPU board
AJ15	P94	SD1CD	SD1 card detect / J2 connector on the CPU board
AJ16	P95	USB20_VBUSEN	USB20 VBUS enable / J2 connector on the CPU board
AF17	P96	USB20_OVRCURN	USB20 overcurrent detect / J2 connector on the CPU board
AG16	P97	AUDIO_CLKOUT	Audio codec (DA7212) on the EXP board
AE16	PA0	SD0IOVS	SD0 IO voltage select / J2 connector on the CPU board
AD17	PA1	PA1/SD0PWEN	SD0 power enable (disconnected) / J2 connector on the CPU board
AF16	PA2	SD1IOVS	SD1 IO voltage select / J2 connector on the CPU board
AD16	PA3	SD1PWEN	SD1 power enable / J2 connector on the CPU board
AH16	PA4	PA4/SSLC3	Pmod Type2/2A (SPI) Connector on the EXP board
AH15	PA5	SD0CD	SD0 card detect / J2 connector on the CPU board
AG15	PA6	PA6/SSLC1	Pmod Type2/2A (SPI) Connector on the EXP board

Table 1.3-4 List of Pin Function Selection Used on the V2NEVK (3/3)

Pin Location	Pin Name	Pin Function	Description
AF15	PA7	PA7/SD1CD/SSLC0	SD1 card detect (disconnected) on the CPU board and Pmod Type2/2A (SPI) Connector on the EXP board
AE25	PB0	USB30_VBUSEN	USB30 VBUS enable / J2 connector on the CPU board
AG25	PB1	USB30_OVRCUR	USB30 overcurrent detect / J2 connector on the CPU board
AG26	PB2	PB2/CAM0&1_PWR#	MIPI CSI-2 CH0 (CN7) / MIPI CSI-2 CH1 (CN8) / J2 connector on the CPU board
AG27	PB3	MISOC	Pmod Type2/2A (SPI) Connector on the EXP board
AF25	PB4	MOSIC	Pmod Type2/2A (SPI) Connector on the EXP board
AF27	PB5	RSPCKC	Pmod Type2/2A (SPI) Connector on the EXP board

1.4 Usage Notes

1.4.1 Turning V2NEVK Power On/Off

- Take sufficient care with setting up switches on the V2NEVK. Incorrect settings may lead to damage to devices.
- The RZ/V2N has the power-on and power-off sequences. With the V2NEVK, be sure to follow the precautions below.

(1) When turning power on

Be sure to check that the power slide switches SW2 and SW3 are turned off before connecting the USB Type-C cable to the Type-C connector (CN13).
Connecting the USB Type-C cable to the Type-C connector while the power supply slide switches SW2 and SW3 are on is prohibited.

(2) When turning power off

Be sure to execute the power-off sequence*1 by software before turning the power supply slide switches SW2 and SW3 off. After the power-off sequence by software, turn these slide switches off and remove the USB Type-C cable from the Type-C connector (CN13). Removing the USB Type-C cable from the Type-C connector while the power supply slide switches SW2 and SW3 are on is prohibited. Doing so may lead to damage to devices.

Note 1. For power-off sequence, refer to the *RZ/V2N Group User's Manual: Hardware*.

1.4.2 Note on Use of Ethernet

The gigabit Ethernet interface connectors (CN5, CN6) must not be connected to a public line. Connection with a public line is not supported. Note that the MAC address is not set in this evaluation kit.

2. Operating Procedure

2.1 Assembly

The CPU board and the EXP board are connected by stacking with J1, J2 and J4. The MIPI DSI interface is connected with a dedicated FFC. For safety, attach the included rubber feet to the back of the EXP board.

Connect the FFC using the following procedure:

1. Open the FFC locking cover, align the FFC contacts to the bottom, and close the cover until it locks.
   The cover is fragile, so handle with care.

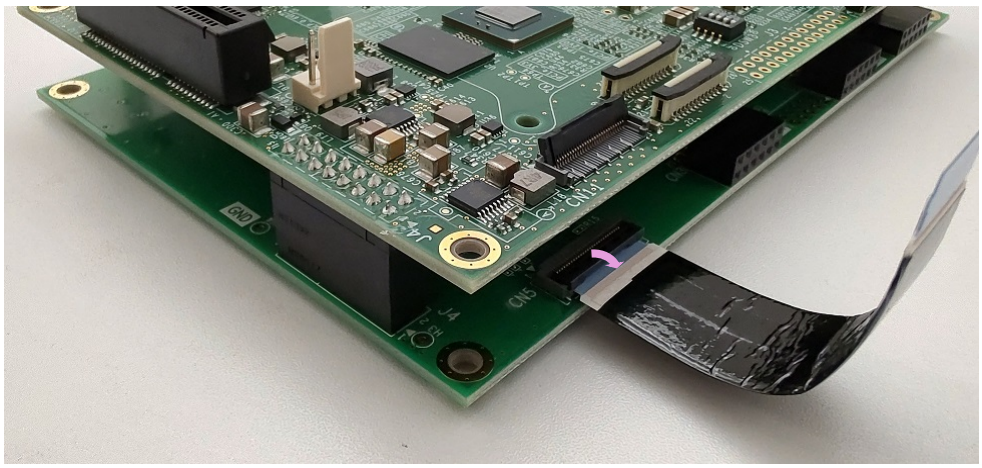


Figure 2.1-1 Connect FFC to RZ/V2H EVK Expansion Board

2. Connect the FFC to the CPU board.

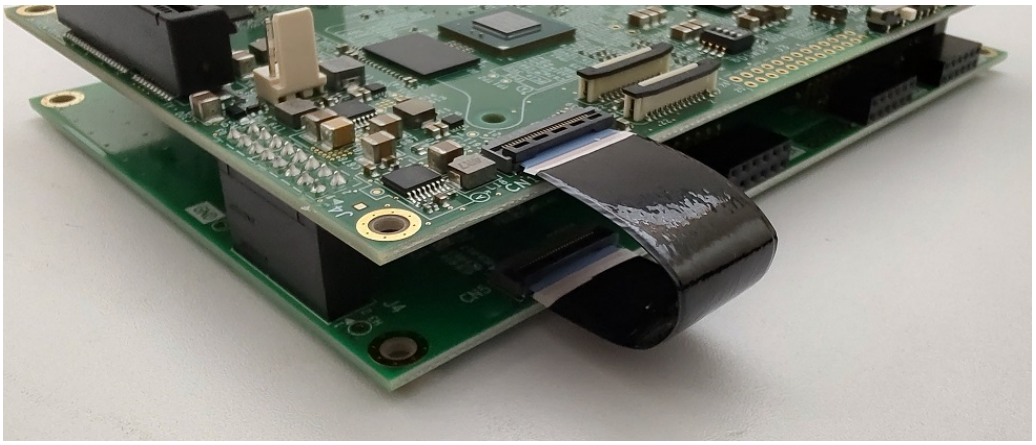


Figure 2.1-2 Connect FFC to RZ/V2N Evaluation Board

Install the microSD Sub Board or eMMC Sub Board using the following procedure:

1. Insert the sub board over the stacking connector of CN15. Pay attention to the direction.

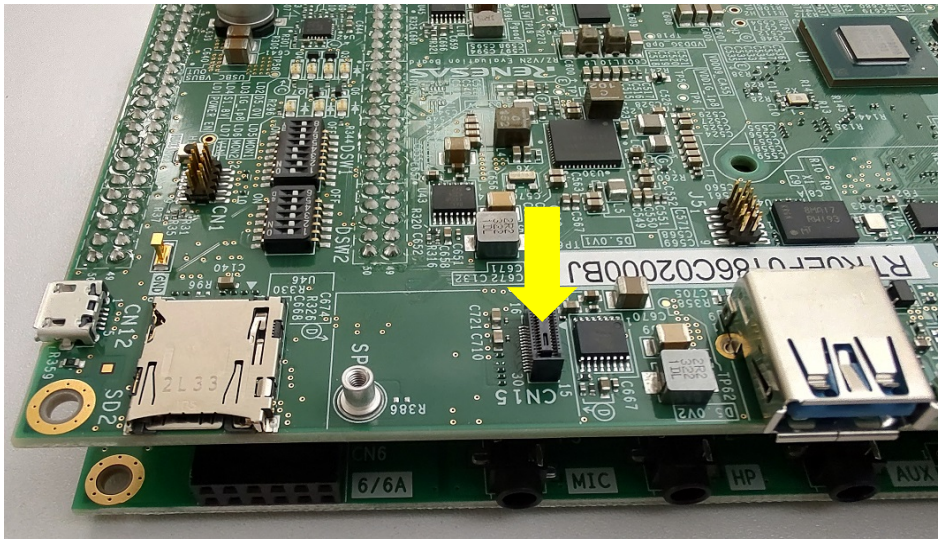


Figure 2.1-3 Connect Sub Board to RZ/V2N Evaluation Board

2. Use the included screw to fix.

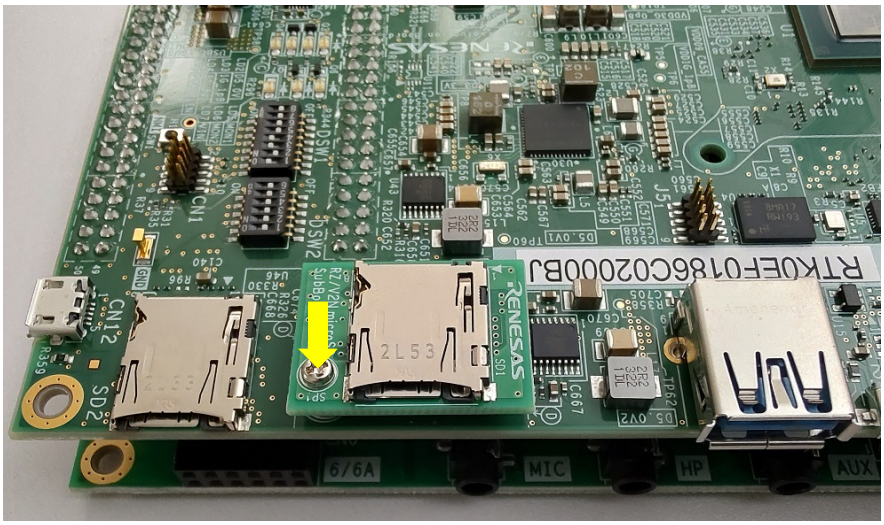


Figure 2.1-4 Use Screw to Fix Sub Board (the photo shows an installed microSD Sub Board)

2.2 Mode Setting

The table below lists the settings of the DIP switch (DSW1 on the RZ/V2N Evaluation Board) and its functions.

Table 2.2-1 DSW1 Connection Destinations and Functions

Switch No.	RZ/V2N Pin	Function
1	BOOTSELCPU	Select the cold boot CPU OFF: CM33, ON: CA55 (default)
2	BOOTPLLCA_1	Input the CA55 frequency at the CA55 cold boot
3	BOOTPLLCA_0	BOOTPLLCA[1:0] = [OFF:OFF]: 1.6 GHz = [OFF:ON]: 1.7 GHz (default) = [ON:OFF]: 1.1 GHz = [ON:ON]: 1.5 GHz
4	MD_BOOT1	Input the boot mode select signal
5	MD_BOOT0	MD_BOOT[1:0] = [OFF:OFF]: xSPI = [OFF:ON]: SCIF = [ON:OFF]: SD (default) = [ON:ON]: eMMC
6	MD_CLKS	OFF: SSCG ON (default), ON: SSCG OFF
7	MD_BOOT3	OFF: Normal mode (default), ON: Debug mode
8	MD_BOOT4	Fixed to OFF

The table below lists the settings of the DIP switch (DSW2 on the RZ/V2N Evaluation Board) and its functions.

Table 2.2-2 DSW2 Functions

Switch No.	Signal Name	Function
1	Audio_CLKB_OE	OFF: Disables Audio_CLKB output of 5L35023B (default) ON: Enables Audio_CLKB output of 5L35023B
2	Audio_CLKB	OFF: Audio_CLKB is not supplied (default) ON: Audio_CLKB is supplied with CLK
3	Audio_CLKC_OE	OFF: Disables Audio_CLKC output of 5L35023B (default) ON: Enables Audio_CLKC output of 5L35023B
4	Audio_CLKC	OFF: Audio_CLKC is not supplied (default) ON: Audio_CLKC is supplied with CLK
5	NEN_VPROG	OFF: Fixed to OFF ON: Setting ON is prohibited
6	—	—

The table below lists the settings of the DIP switch (JSW1 on the RZ/V2N Evaluation Board) and its functions.

Table 2.2-3 JSW1 Functions

Switch	Function
1-2	MIPI CSI-2 camera interface voltage: 1.8 V
2-3	MIPI CSI-2 camera interface voltage: 3.3 V (default)

Note: Set this switch according to the interface voltage of the camera module to be connected.

The table below lists the settings of the DIP switch (DSW3 on the RZ/V2N Evaluation Board) and its functions.

Table 2.2-4 DSW3 Functions

Switch No.	Signal Name	Function
1	I2C0_SCL	OFF: MIPI CSI-2 (ch. 0) SCL signal pull-up OFF ON: MIPI CSI-2 (ch. 0) SCL signal pull-up ON (default)
2	I2C0_SDA	OFF: MIPI CSI-2 (ch. 0) SDA signal pull-up OFF ON: MIPI CSI-2 (ch. 0) SDA signal pull-up ON (default)
3	I2C1_SCL	OFF: MIPI CSI-2 (ch. 1) SCL signal pull-up OFF ON: MIPI CSI-2 (ch. 1) SCL signal pull-up ON (default)
4	I2C1_SDA	OFF: MIPI CSI-2 (ch. 1) SDA signal pull-up OFF ON: MIPI CSI-2 (ch. 1) SDA signal pull-up ON (default)

Note: If these signals are pulled up in the connected camera modules, turn this switch OFF.

2.3 Power Supply

1. Set up the DIP switches before supplying power.
2. Before connecting the USB Type-C cable, check that the power slide switches SW2 and SW3 are turned off.
3. Connect the USB Type-C cable to CN13 on the RZ/V2N Evaluation Board.
4. When SW3 is turned on, LD2 and LD7 light up.
5. When SW2 is turned on, LD1, LD3, and LD4 light up and the RZ/V2N starts up.

Table 2.3-1 SW2/SW3 Functions

Switch No.	Function	Specifications
SW2	PMIC (RAA215300) ON/OFF	ON: Enables PMIC output OFF: Stops disabling of PMIC output
SW3	USB-PD ON/OFF	ON: Enables USB-PD power output OFF: Disables USB-PD power output

3. Layout

3.1 Parts Layout

Figure 3.1-1 and **Figure 3.1-2** show the parts layout diagrams of the RZ/V2N Evaluation Board, and **Figure 3.1-3** shows the parts layout diagram of the RZ/V2H EVK Expansion Board.

Figure 3.1-4 and **Figure 3.1-5** each show a diagram of the sub board.

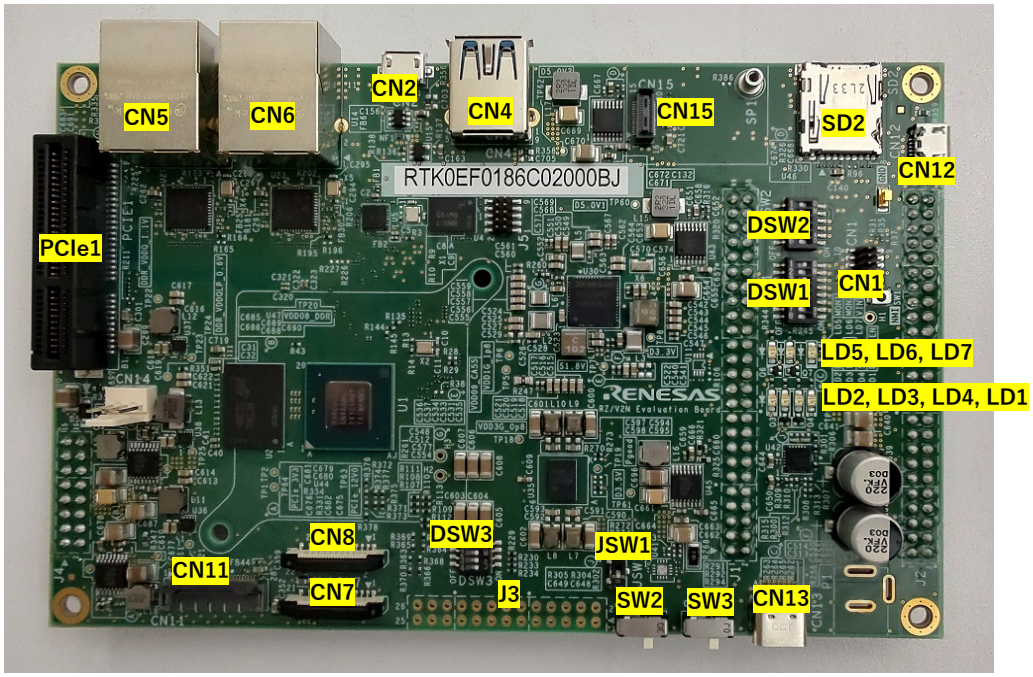


Figure 3.1-1 RZ/V2N Evaluation Board Parts Layout Diagram (Parts Side)

Figure 3.1-2 RZ/V2N Evaluation Board Layout Diagram (Solder Side)

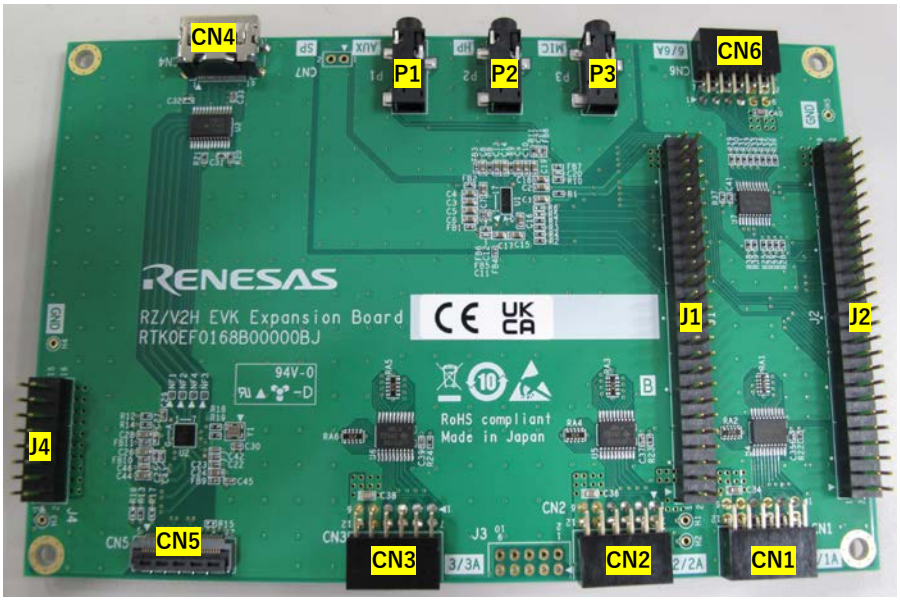


Figure 3.1-3 RZ/V2H EVK Expansion Board Parts Layout Diagram (Parts Side)

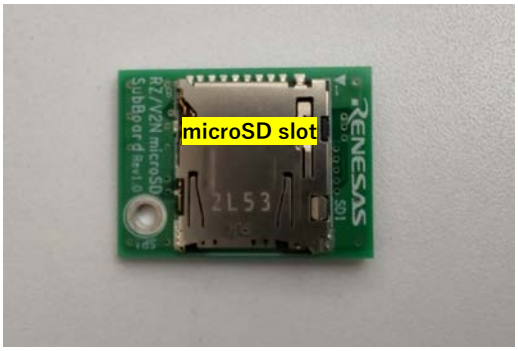


Figure 3.1-4 microSD Sub Board

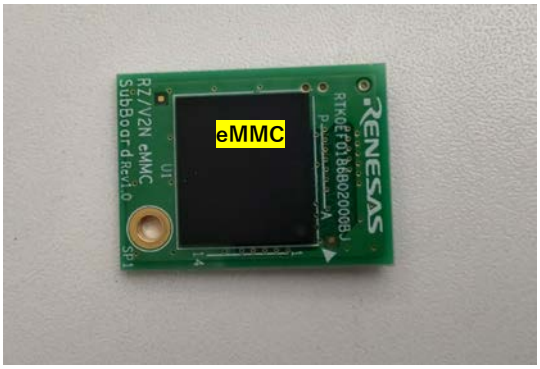


Figure 3.1-5 eMMC Sub Board

3.2 Lists of Main Parts

Table 3.2-1 and **Table 3.2-2** list the main parts of the RZ/V2N Evaluation Board and RZ/V2H EVK Expansion Board, respectively.

Table 3.2-1 RZ/V2N Evaluation Board Parts List

No.	Quantity	Part Symbol	Part Name	Manufacturer
1	1	U1	R9A09G056N48GBG (RZ/V2N)	Renesas Electronics
2	1	U5	5L35023B-616NLGI8	Renesas Electronics
3	1	U6	SLG7RN47855G	Renesas Electronics
4	1	U13	ISL61852CCRZ	Renesas Electronics
5	1	U30	RAA215300A2GNP#HA2	Renesas Electronics
6	4	U31, U32, U33, U34	SLG59M1603V	Renesas Electronics
7	1	U50	SLG59M1717V	Renesas Electronics
8	1	U35	DA9141-08F72*1	Renesas Electronics
9	2	U36, U37	ISL80031A	Renesas Electronics
10	1	U38	ISL80015	Renesas Electronics
11	5	U43, U44, U45, U46, U47	RAA211250GSP#HA0	Renesas Electronics

Note 1. This part can be replaced with DA9130-08RT1.

Table 3.2-2 RZ/V2H EVK Expansion Board Parts List

No.	Quantity	Part Symbol	Part Name	Manufacturer
1	1	U1	DA7212-01UM	Renesas Electronics

4. Interface Specifications

This section describes the interface specifications of the V2NEVK.

4.1 Reset

When resetting the V2NEVK, control it by using the power control switches (SW2, SW3) and software.

4.2 LED

The V2NEVK has seven LEDs. **Table 4.2-1** lists the colors and functions of these LEDs.

Table 4.2-1 RZ/V2H Secure Evaluation Board LEDs

LED	Color	Function/Usage
LD1	Green	PMIC_PWRON indicator
LD2	Green	Power D5.0V1 (5 V) indicator
LD3	Green	Power VDD1G_1p8 (1.8 V) indicator
LD4	Green	Power S1.8V (1.8 V) indicator
LD5	Yellow	Signal monitor
LD6	Yellow	Signal monitor
LD7	Green	Power USBC_VBUS_OUT (20 V) indicator

4.3 Switches

The V2NEVK has seven switches. **Table 4.3-1** lists the functions of the respective switches.

Table 4.3-1 RZ/V2N Secure Evaluation Board Switches

Switch	Shape	Usage
DSW1	DIP switch	Mode setting (see **Section 2.2, Mode Setting**)
DSW2	DIP switch	Mode setting (see **Section 2.2, Mode Setting**)
DSW3	DIP switch	Mode setting (see **Section 2.2, Mode Setting**)
JSW1	DIP switch	Mode setting (see **Section 2.2, Mode Setting**)
SW1	Push switch	NMI
SW2	Slide switch	Power switch (PMIC_RAA215300 ON/OFF)
SW3	Slide switch	Power switch (USBC VBUS OUT 20V ON/OFF)

4.4 Debug Serial Interface

The debugging port (micro USB Type-B connector (CN12)) is connected to the SCIF interface of the RZ/V2N via the USB-UART conversion IC. This port is for use in debugging.

4.5 Debugger Interface

Connect the ICE to the Arm JTAG connector (CN1). For the ICE having confirmed the connection, contact a Renesas Electronics sales representative.

Note: The emulator connector has 10 pins with 1.27-mm pitch.

Table 4.5-1 Arm JTAG Connector (CN1)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	+1.8 V (VDD1G_1p8)	2	RZ/V2N (TMS_SWDIO)
3	GND	4	RZ/V2N (TCK_SWCLK)
5	GND	6	RZ/V2N (TDO)
7	NC	8	RZ/V2N (TDI)
9	RZ/V2N (TRSTN)	10	RZ/V2N (QRESN)

4.6 MIPI CSI-2 Interface

The CPU board of the V2NEVK has four MIPI CSI-2 interfaces.

CAUTION

This interface is different from the Raspberry Pi camera interface. When connecting the Raspberry Pi camera module, carefully confirm each signal connection. Incorrect connections may damage the board or module.

Table 4.6-1 MIPI CSI-2 Connector (CN7)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	GND	12	RZ/V2N (CSI0_DATA2P)
2	RZ/V2N (CSI0_DATA0N)	13	GND
3	RZ/V2N (CSI0_DATA0P)	14	RZ/V2N (CSI0_DATA3N)
4	GND	15	RZ/V2N (CSI0_DATA3P)
5	RZ/V2N (CSI0_DATA1N)	16	GND
6	RZ/V2N (CSI0_DATA1P)	17	RZ/V2N (PB2)
7	GND	18	RZ/V2N (P64)
8	RZ/V2N (CSI0_CLKN)	19	GND
9	RZ/V2N (CSI0_CLKP)	20	RZ/V2N (I2C0_SCL)
10	GND	21	RZ/V2N (I2C0_SDA)
11	RZ/V2N (CSI0_DATA2N)	22	+3.3 V (PCIe_3V3)

Table 4.6-2 MIPI CSI-2 Connector (CN8)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	GND	12	RZ/V2N (CSI1_DATA2P)
2	RZ/V2N (CSI1_DATA0N)	13	GND
3	RZ/V2N (CSI1_DATA0P)	14	RZ/V2N (CSI1_DATA3N)
4	GND	15	RZ/V2N (CSI1_DATA3P)
5	RZ/V2N (CSI1_DATA1N)	16	GND
6	RZ/V2N (CSI1_DATA1P)	17	RZ/V2N (PB2)
7	GND	18	RZ/V2N (P65)
8	RZ/V2N (CSI1_CLKN)	19	GND
9	RZ/V2N (CSI1_CLKP)	20	RZ/V2N (I2C1_SCL)
10	GND	21	RZ/V2N (I2C1_SDA)
11	RZ/V2N (CSI1_DATA2N)	22	+3.3 V (PCIe_3V3)

4.7 MIPI DSI Interface

The V2NEVK has a MIPI DSI interface. This interface is connected from the RZ/V2N on the CPU board to CN11 and is connected to CN5 on the EXP board with a dedicated FFC. The EXP board converts MIPI DSI to an HDMI signal and outputs it to the CN4 HDMI connector.

Table 4.7-1 MIPI DSI Connector (CN11)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	RZ/V2N (P37)	16	RZ/V2N (DSI_DNDATA0)
2	RZ/V2N (P41)	17	RZ/V2N (DSI_DPDATA0)
3	RZ/V2N (P40)	18	GND
4	RZ/V2N (P42)	19	RZ/V2N (DSI_DNCLK)
5	RZ/V2N (P36)	20	RZ/V2N (DSI_DPCLK)
6	GND	21	GND
7	RZ/V2N (DSI_DNDATA3)	22	RZ/V2N (P71)
8	RZ/V2N (DSI_DPDATA3)	23	GND
9	GND	24	+1.8 V (VDD1G_1p8)
10	RZ/V2N (DSI_DNDATA2)	25	GND
11	RZ/V2N (DSI_DPDATA2)	26	+3.3 V (D3.3V)
12	GND	27	GND
13	RZ/V2N (DSI_DNDATA1)	28	+5.0 V
14	RZ/V2N (DSI_DPDATA1)	G1-5	GND
15	GND	F1-2	GND

4.8 USB Interface

The CPU board of the V2NEVK has the following USB connectors.

- USB3.2 Gen2 host interface
  The USB Type-A connector (CN4) is connected to the USB3.2 Gen2 interface of the RZ/V2N.
- USB2.0 DRD interface
  The USB micro-AB connector (CN2) is connected to the USB2.0 (ch. 0) interface of the RZ/V2N.

4.9 Ethernet Interface

The CPU board of the V2NEVK has two Ethernet interfaces. The RJ-45 connectors (CN5 and CN6) are connected to the Ethernet interface of the RZ/V2N via the Ethernet PHY IC. Connecting this interface to a public line is prohibited.

4.10 SD/eMMC Sub Board Connector

The CPU board of the V2NEVK is equipped with an SD/eMMC Sub Board connector (CN15). This connector is connected to the RZ/V2N SD interface (SD0). The included microSD Sub Board or eMMC Sub Board can be stacked and used as a boot device.

Table 4.10-1 SD/eMMC Sub Board Connector (CN15)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	+3.3 V (microSD0_3.3V)	16	+3.3 V (VDD1833_SD0)
2	+3.3 V (microSD0_3.3V)	17	GND
3	RZ/V2N (SD0DAT5)	18	GND
4	GND	19	RZ/V2N (SD0DAT0)
5	RZ/V2N (SD0DAT7)	20	GND
6	GND	21	RZ/V2N (SD0CLK)
7	RZ/V2N (SD0DAT1)	22	GND
8	GND	23	RZ/V2N (SD0CMD)
9	RZ/V2N (SD0DAT3)	24	GND
10	GND	25	RZ/V2N (SD0DAT4)
11	RZ/V2N (SD0DAT2)	26	GND
12	GND	27	RZ/V2N (SD0DAT6)
13	eMMC_SD_SEL	28	GND
14	D33_D18_SEL	29	RZ/V2N (SD0CD)
15	RZ/V2N (SD0RSTN)	30	GND

4.11 SD Card Connector

The CPU board of the V2NEVK has a micro SD card connector (SD2). SD2 is set as the SD interface (ch. 1) of the RZ/V2N.

4.12 PCIe Connector

The CPU board of the V2NEVK has a PCIe connector (PCIe1). This connector is connected to the PCIe interface of the RZ/V2N.

4.13 Pin Header

The CPU board of the V2NEVK has five pin headers. Their connection destinations are listed below.

Table 4.13-1 GPIO CN (J1) (Stacking Connection to EXP Board)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	+3.3 V (D3.3V)	2	GND
3	+1.8 V (VDD_1G_1p8)	4	GND
5	+1.8 V (S1.8V)	6	GND
7	RZ/V2N (P00)	8	P00_LED
9	RZ/V2N (P01)	10	P01_LED
11	RZ/V2N (P02)	12	RZ/V2N (P33)
13	RZ/V2N (P03)	14	RZ/V2N (P34)
15	RZ/V2N (P04)	16	RZ/V2N (P35)
17	RZ/V2N (P05)	18	RZ/V2N (P36)
19	RZ/V2N (P06)	20	RZ/V2N (P37)
21	RZ/V2N (P07)	22	RZ/V2N (P40)
23	RZ/V2N (P10)	24	RZ/V2N (P41)
25	RZ/V2N (P11)	26	RZ/V2N (P11)
27	RZ/V2N (P12)	28	RZ/V2N (P43)
29	RZ/V2N (P13)	30	RZ/V2N (P44)
31	RZ/V2N (P14)	32	RZ/V2N (P45)
33	RZ/V2N (P15)	34	RZ/V2N (P46)
35	RZ/V2N (P20)	36	RZ/V2N (P47)
37	RZ/V2N (P21)	38	RZ/V2N (P50)
39	RZ/V2N (P30)	40	RZ/V2N (P51)
41	RZ/V2N (P31)	42	RZ/V2N (P52)
43	RZ/V2N (P32)	44	RZ/V2N (P53)
45	RZ/V2N (QRESN)	46	RZ/V2N (P54)
47	PMIC_PWRON	48	RZ/V2N (P55)
49	GND	50	GND

Table 4.13-2 GPIO CN (J2) (Stacking Connection to EXP Board)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Destination
1	RZ/V2N (P56)	2	RZ/V2N (P86)
3	RZ/V2N (P57)	4	RZ/V2N (P87)
5	RZ/V2N (P60)	6	RZ/V2N (P90)
7	RZ/V2N (P61)	8	RZ/V2N (P91)
9	RZ/V2N (P62)	10	RZ/V2N (P92)
11	RZ/V2N (P63)	12	RZ/V2N (P93)
13	RZ/V2N (P64)	14	RZ/V2N (P94)
15	RZ/V2N (P65)	16	RZ/V2N (P95)
17	RZ/V2N (P66)	18	RZ/V2N (P96)
19	RZ/V2N (P67)	20	RZ/V2N (P97)
21	RZ/V2N (P70)	22	RZ/V2N (PA0)
23	RZ/V2N (P71)	24	RZ/V2N (PA1)
25	RZ/V2N (P72)	26	RZ/V2N (P72)
27	RZ/V2N (P73)	28	RZ/V2N (PA3)
29	RZ/V2N (P74)	30	RZ/V2N (PA4)
31	RZ/V2N (P75)	32	RZ/V2N (PA5)
33	RZ/V2N (P76)	34	RZ/V2N (PA6)
35	RZ/V2N (P77)	36	RZ/V2N (PA7)
37	RZ/V2N (P80)	38	RZ/V2N (PB0)
39	RZ/V2N (P81)	40	RZ/V2N (PB1)
41	RZ/V2N (P82)	42	RZ/V2N (PB2)
43	RZ/V2N (P83)	44	RZ/V2N (PB3)
45	RZ/V2N (P84)	46	RZ/V2N (PB4)
47	RZ/V2N (P85)	48	RZ/V2N (PB5)
49	GND	50	GND

Table 4.13-3 AD input CN (J3) [Not implemented]

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	+1.8 V (S1.8V)	2	GND
3	RZ/V2N (ANI000)	4	RZ/V2N (ANI004)
5	RZ/V2N (ANI001)	6	RZ/V2N (ANI005)
7	RZ/V2N (ANI002)	8	RZ/V2N (ANI006)
9	RZ/V2N (ANI003)	10	RZ/V2N (ANI007)
11	RZ/V2N (ANI100)	12	RZ/V2N (ANI104)
13	RZ/V2N (ANI101)	14	RZ/V2N (ANI105)
15	RZ/V2N (ANI102)	16	RZ/V2N (ANI106)
17	RZ/V2N (ANI103)	18	RZ/V2N (ANI107)
19	RZ/V2N (ANI200)	20	RZ/V2N (ANI204)
21	RZ/V2N (ANI201)	22	RZ/V2N (ANI205)
23	RZ/V2N (ANI202)	24	RZ/V2N (ANI206)
25	RZ/V2N (ANI203)	26	RZ/V2N (ANI207)

Table 4.13-4 Power CN (J4) (Stacking Connection to EXP Board)

Pin No.	V2NEVK Connection Destination	Pin No.	V2NEVK Connection Destination
1	+5.0 V	2	+5.0 V
3	+5.0 V	4	+5.0 V
5	+5.0 V	6	+5.0 V
7	+5.0 V	8	+5.0 V
9	GND	10	GND
11	GND	12	GND
13	GND	14	GND
15	GND	16	GND

4.14 12 V Connector

Can be connected to 12 V with CN14.

Table 4.14-1 12 V Connector (CN14)

Pin No.	Connection
1	NC
2	+12 V
3	GND

4.15 USB-PD Connector (Power only)

The V2NEVK operates with power supplied from USB-PD (CN13). The USB-PD controller is connected to CN13 and supplies 20 V (maximum 5 A) from the USB-PD power supply.

4.16 HDMI Interface

The EXP board of the V2NEVK has an HDMI interface. The HDMI Type-A connector (CN4) is connected to the RZ/V2N MIPI DSI interface via the DSI-HDMI conversion IC.

4.17 Audio Interface

The EXP board of the V2NEVK has three audio connectors. Three audio 3.5 mm jacks (P1: AUX, P2: HP, P3: MIC) are connected to the RZ/V2N SSI interface via the audio codec IC.

4.18 Pmod Connector

The EXP board of the V2NEVK has four Pmod connectors. The specifications are listed below.

Table 4.18-1 Pmod Type 1A GPIO (CN1)

Pin No.	Pmod Pin Spec.	V2NEVK Connection Destination
1	IO1	RZ/V2N (P80) via level shifter U4
2	IO2	RZ/V2N (P81) via level shifter U4
3	IO3	RZ/V2N (P82) via level shifter U4
4	IO4	RZ/V2N (P83) via level shifter U4
5	GND	GND
6	VCC	+3.3 V (D3.3V)
7	IO5	RZ/V2N (P84) via level shifter U4
8	IO6	RZ/V2N (P85) via level shifter U4
9	IO7	RZ/V2N (P86) via level shifter U4
10	IO8	RZ/V2N (P87) via level shifter U4
11	GND	GND
12	VCC	+3.3 V (D3.3V)

Table 4.18-2 Pmod Type 2A SPI (CN2)

Pin No.	Pmod Pin Spec.	V2NEVK Connection Destination
1	SSLA	RZ/V2N (PA7) via level shifter U5
2	MOSI	RZ/V2N (PB4) via level shifter U5
3	MISO	RZ/V2N (PB3) via level shifter U5
4	SCK	RZ/V2N (PB5) via level shifter U5
5	GND	GND
6	VCC	+3.3 V (D3.3V)
7	IO1	RZ/V2N (P74) via level shifter U5
8	IO2	RZ/V2N (P75) via level shifter U5
9	IO3	RZ/V2N (PA6) via level shifter U5
10	IO4	RZ/V2N (PA4) via level shifter U5
11	GND	GND
12	VCC	+3.3 V (D3.3V)

Table 4.18-3 Pmod Type 3A UART (CN3)

Pin No.	Pmod Pin Spec.	V2NEVK Connection Destination
1	CTS	RZ/V2N (P52) via level shifter U6
2	TXD	RZ/V2N (P50) via level shifter U6
3	RXD	RZ/V2N (P51) via level shifter U6
4	RTS	RZ/V2N (P53) via level shifter U6
5	GND	GND
6	VCC	+3.3 V (D3.3V)
7	IO1	RZ/V2N (P57) via level shifter U6
8	IO2	RZ/V2N (P73) via level shifter U6
9	IO3	RZ/V2N (P76) via level shifter U6
10	IO4	RZ/V2N (P77) via level shifter U6
11	GND	GND
12	VCC	+3.3 V (D3.3V)

Table 4.18-4 Pmod Type 6A I2C (CN6)

Pin No.	Pmod Pin Spec.	V2NEVK Connection Destination
1	IO1	RZ/V2N (P55) via level shifter U7
2	IO2	RZ/V2N (P54) via level shifter U7
3	SCL	RZ/V2N (P21) via level shifter U7
4	SDA	RZ/V2N (P20) via level shifter U7
5	GND	GND
6	VCC	+3.3 V (D3.3V)
7	IO3	RZ/V2N (P70) via level shifter U7
8	IO4	RZ/V2N (P72) via level shifter U7
9	IO5	RZ/V2N (P90) via level shifter U7
10	IO6	RZ/V2N (P91) via level shifter U7
11	GND	GND
12	VCC	+3.3 V (D3.3V)

5. Supplementary Note

5.1 Power Supply ICs of V2NEVK

In consideration of the evaluation usage, the power supply ICs of the V2NEVK are selected with a margin. The power supply ICs that suit the user circuit are recommended. For inquiries about power supply ICs, contact a Renesas Electronics sales representative.

5.2 Assembly of Heat-sink

- Remove the protective seal on the back of the heat-sink.
- Connect the heat-sink to the RZ/V2N Evaluation Board.

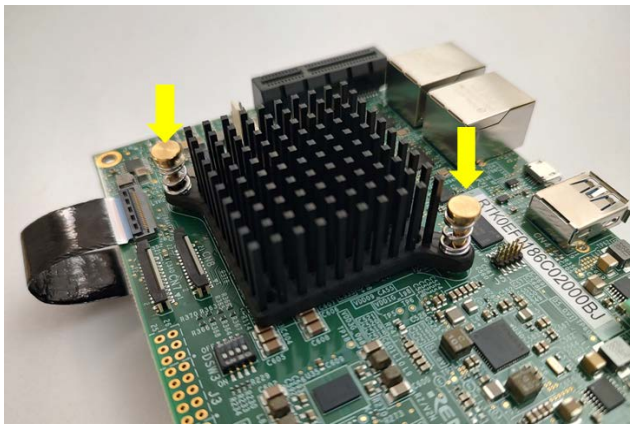
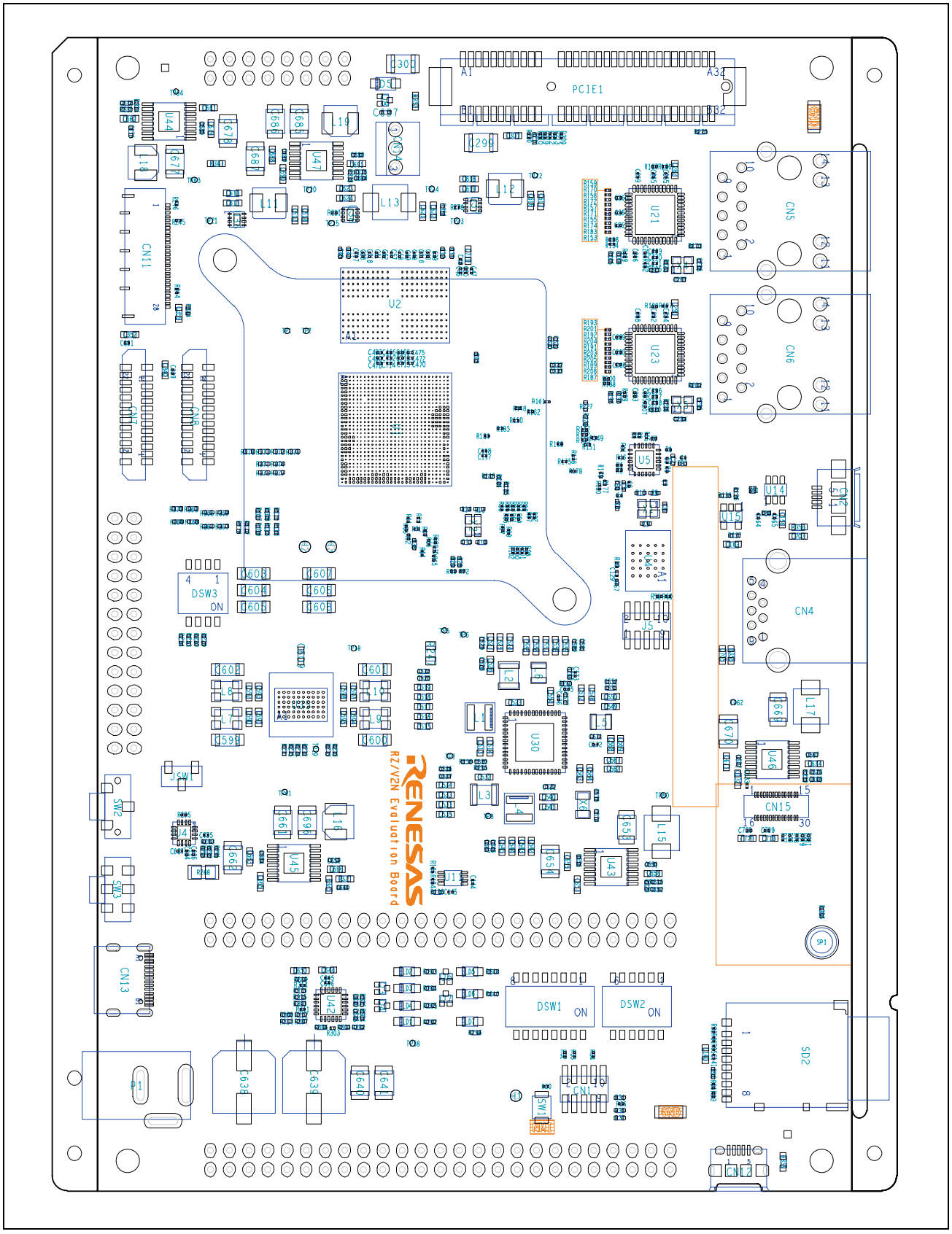
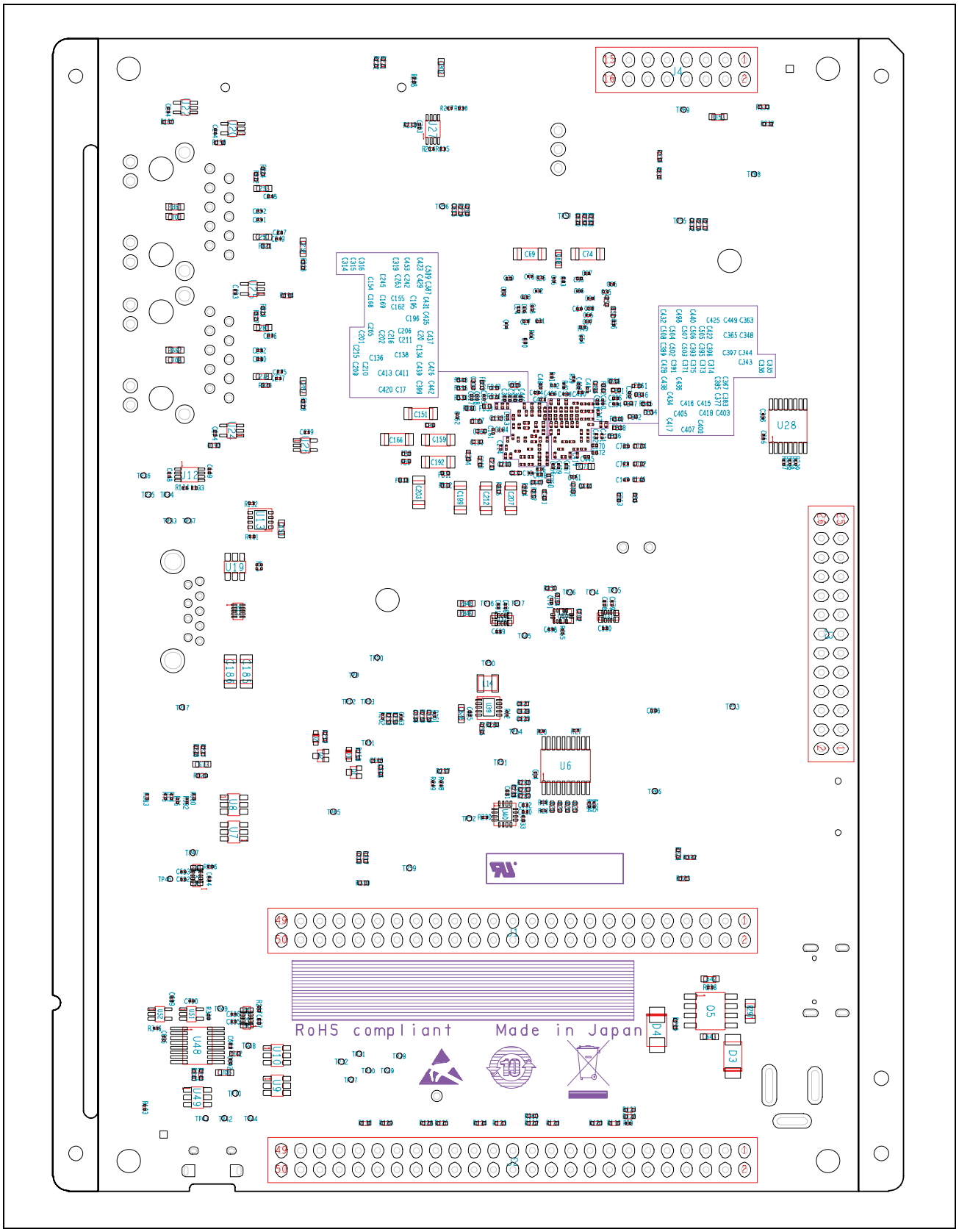


Figure 5.2-1 Connecting Heat-sink to RZ/V2N Evaluation Board

Appendix A CPU Board Parts Layout



Appendix A.1 Parts Layout (Top)



Appendix A.2 Parts Layout (Bottom)

REVISION HISTORY — RZ/V2N Evaluation Board Kit (Secure type) Hardware Manual

Rev.	Date	Description	
		Page	Summary
1.00	Nov 22, 2024	—	First edition issued
1.10	Feb 28, 2025	1. Overview	
		11	Figure 1.2-1 RZ/V2N Evaluation Board Block Diagram, modified (ISL97701IRZ and VDD1833_PRE18_SD1, deleted. DDR0_VAA, added. J3, modified.)
		13	Table 1.3-1 V2NEVK Specifications Item: The specification of eMMC, modified
		16 to 18	1.3.5 List of Pin Functions, added
		2. Operating Procedure	
		22	Table 2.2-1 DSW1 Connection Destinations and Functions The RZ/V2N pin for switch No. 2, 3, modified
		3. Layout	
		27	Table 3.2-1 RZ/V2N Evaluation Board Parts List Part Symbol: U39, deleted

RZ/V2N Evaluation Board Kit (Secure type)
Hardware Manual

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