

RZ/G2L, RZ/V2L SMARC Module Board

User's Manual: Hardware

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

RTK9744L23C01000BE
RTK9754L23C01000BE

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- Arm® Cortex®-M33

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General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

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.

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1. Overview

1.1 Overview

To begin with, only RZ/G2L SMARC Module Board will be explained here.

The difference between RZ/G2L SMARC Module Board (RTK9744L23C01000BE) and RZ/V2L SMARC Module Board (RTK9754L23C01000BE) is that RTK9754L23C01000BE uses Renesas Electronics microprocessor RZ/V2L “R9A07G054L23GBG”, which is pin-compatible with RZ/G2L. In other words, they are functionally the same.

This document describes the specification of RTK9744L23C01000BE to evaluate the functions and performance of the Renesas Electronics microprocessor RZ/G2L “R9A07G044L23GBG” and evaluate application software programs.

The RTK9744L23C01000BE complies with the SMARC v2.1 and has following features.

- It is mounted with the following external memories.
 - DDR4 SDRAM: 2GB × 1pc
 - QSPI flash memory: 512Mb × 1pc
 - eMMC memory: 64GB × 1pc
- The microSD card slot is implemented and used as an eSD for boot.
- It is implemented a 5-output clock generator “5P35023”.
- It is implemented a PMIC “RAA215300” as power supply circuit.
- The Ethernet PHY is implemented as standard and can send/receive data at 10/100/1000Mbps.
- Terminals not used on this board are connected to the 314-pin 0.5-mm pitch connector, which can be used in conjunction with a Carrier Board. It also allows for the development of the Carrier Board that meet the needs of development.
- The 10-pin pin header for ARM Cortex Debug is implemented for connection to debug interface.
- The 10-pin pin header is implemented for connection to ADC interface.

1.2 Configuration

Figure 1.1 shows an example of system configuration using RTK9744L23C01000BE.

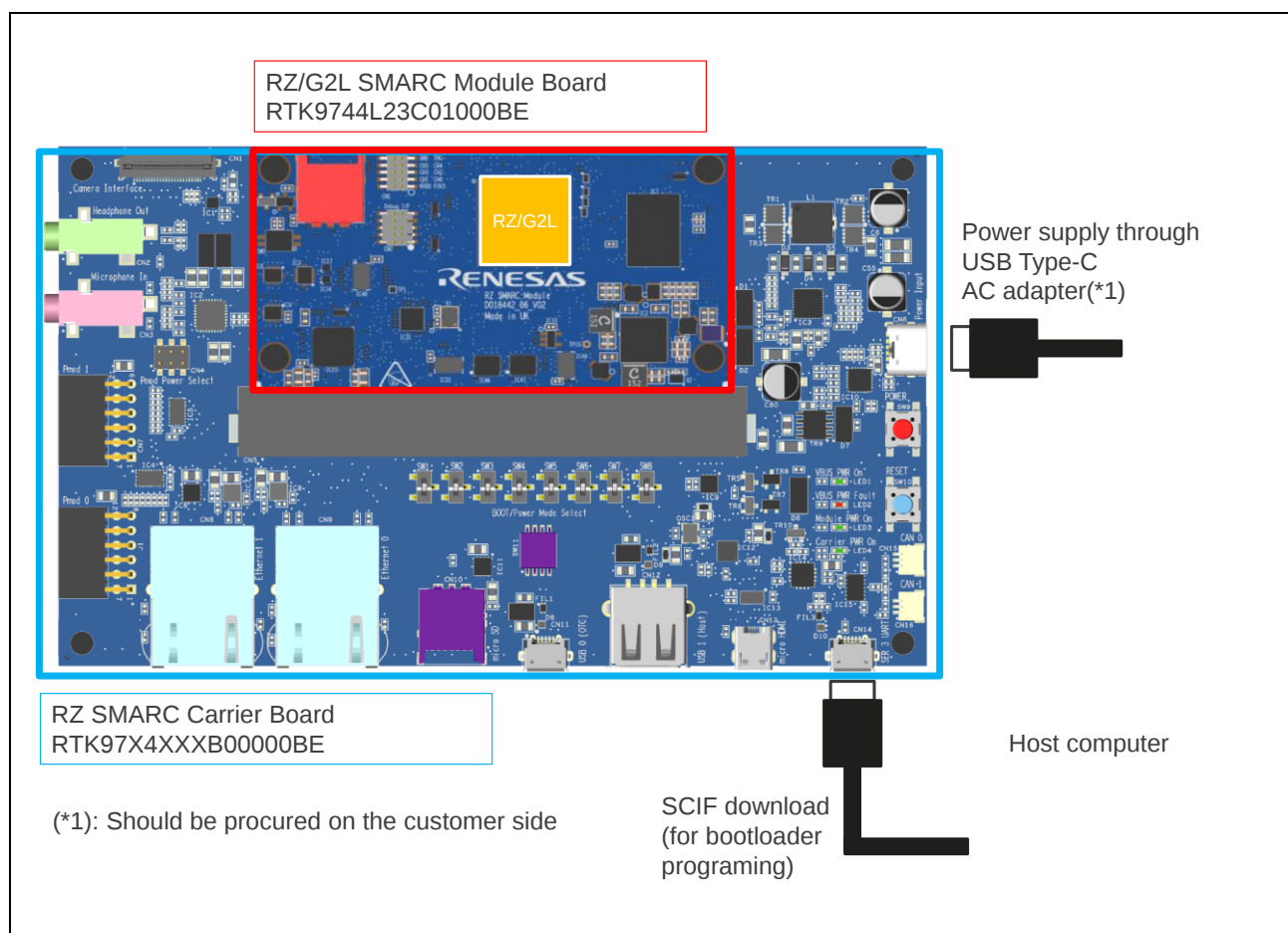


Figure 1.1 Example of System Configuration Using RTK9744L23C01000BE

1.3 Features

Table 1.1 shows the features of the RTK9744L23C01000BE.

Table 1.1 Features of the RTK9744L23C01000BE

Item	Details
CPU	RZ/G2L Input (Xin) clock: 24MHz Arm Cortex-A55 clock: 1.2GHz Arm Cortex-M33 clock: 200MHz AXI-bus clock: 200MHz APB-bus clock: 100MHz Internal memory Instruction cache: 32KB Data cache: 32KB Power voltage: 1.1V, I/O: 3.3V 456-Pin PBGA 0.5-mm pitch
Memory	QSPI flash memory: 512Mbit * 1pc DDR4 SDRAM: 2GB * 1pc eMMC memory: 64GB * 1pc
Clock IC	Clock generator: 1pc
Ethernet IC	Ethernet PHY: 2pcs
Connector	microSD card slot (4 bits): 1pc 10-pin pin header for JTAG: 1pc 10-pin pin header for ADC: 1pc SMARC edge connector (314 pins): 1pc
Switch	System setting DIP switch: 2 bits
Circuit board specifications	Dimensions: 82 mm * 50 mm Mount: Double-sided mounting (6 layers)

1.4 Physical View

Figure 1.2 and Figure 1.3 show the top and bottom views of the RTK9744L23C01000BE.

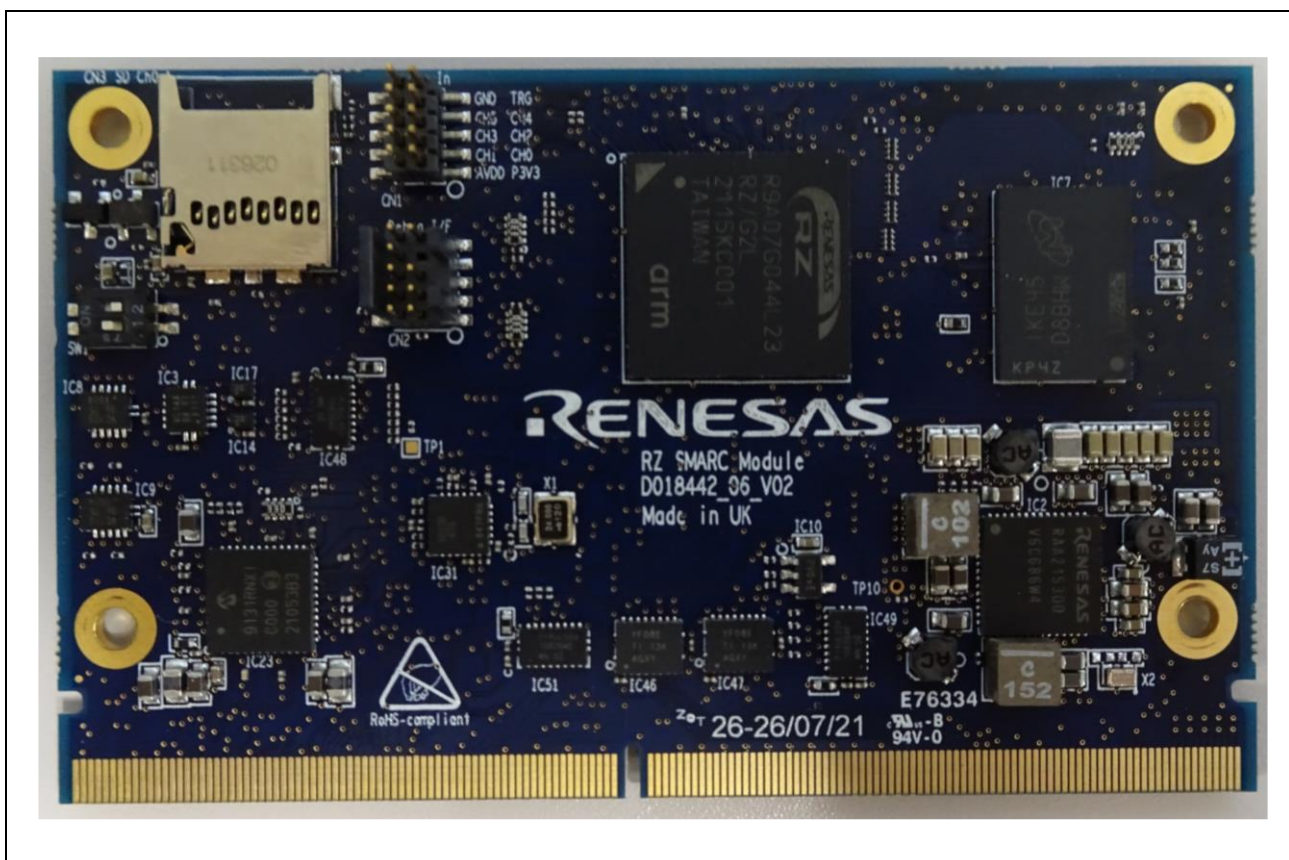


Figure 1.2 Top View of the RTK9744L23C01000BE



Figure 1.3 Bottom View of the RTK9744L23C01000BE

1.5 Block Diagram

Figure 1.4 shows the block diagram of the RTK9744L23C01000BE.

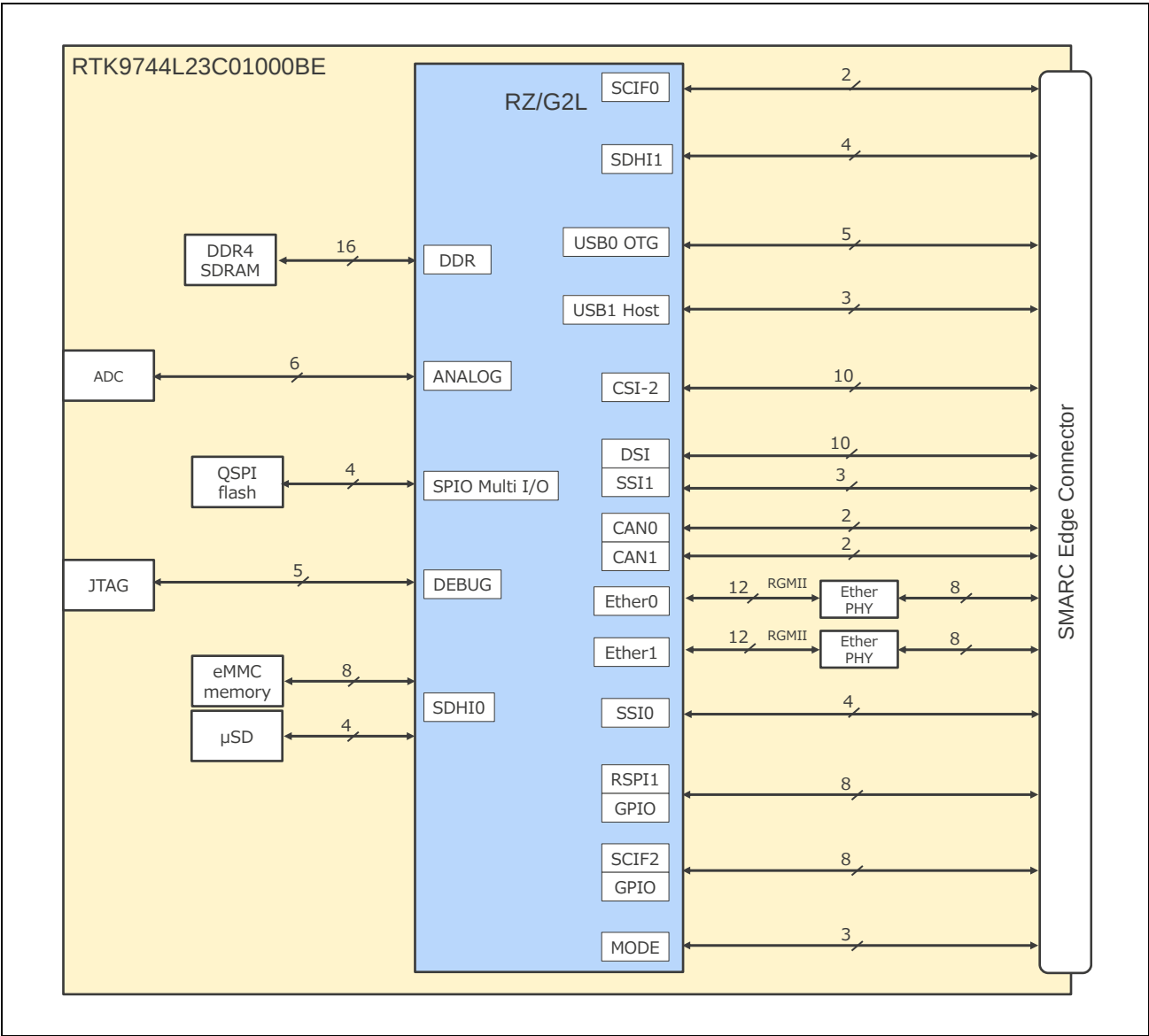


Figure 1.4 Block Diagram of the RTK9744L23C01000BE

1.6 Component Layout

Figure 1.5 and **Figure 1.6** show the layout of main components of the RTK9744L23C01000BE.

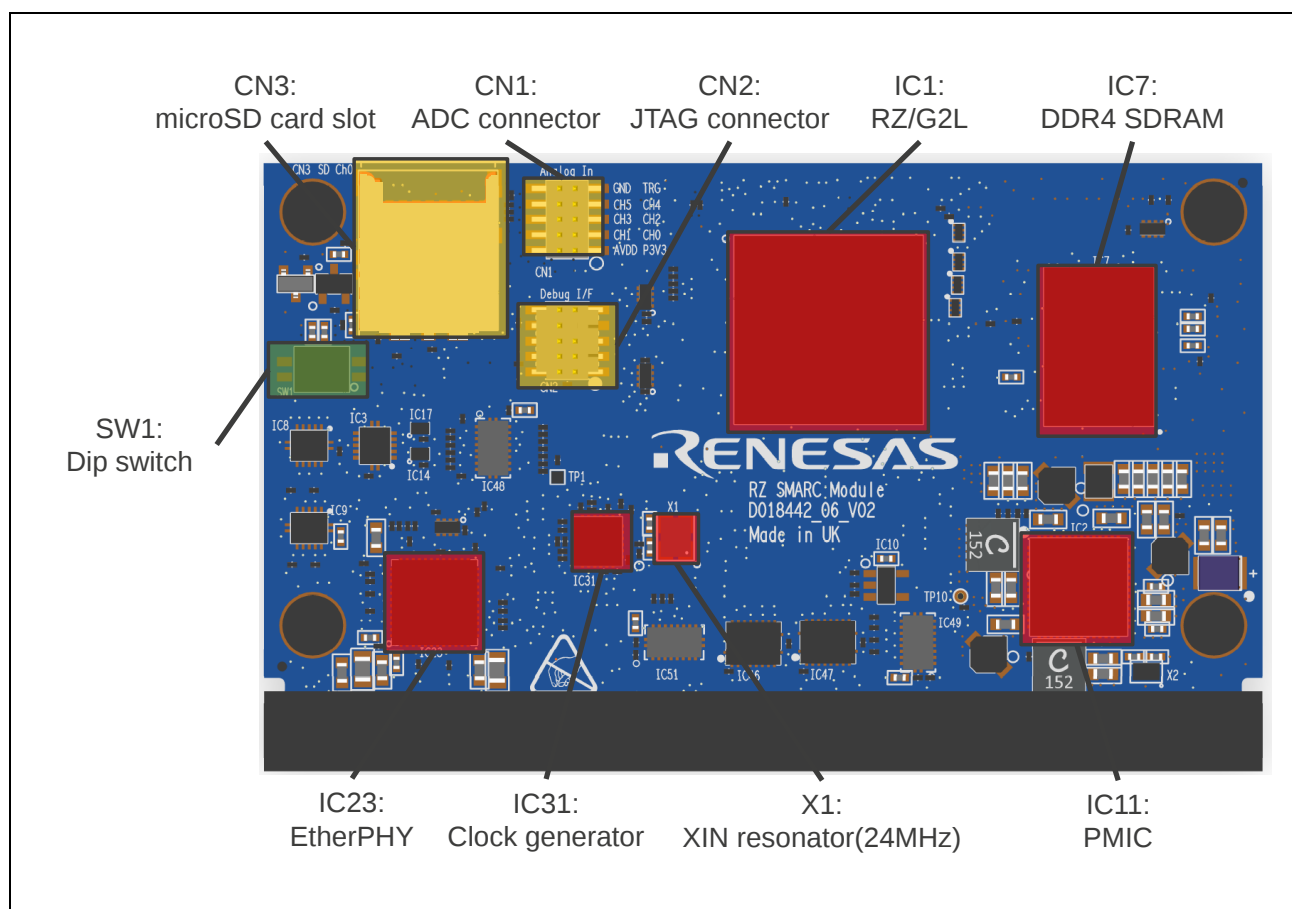


Figure 1.5 Layout of Components of the RTK9744L23C01000BE (Top View)

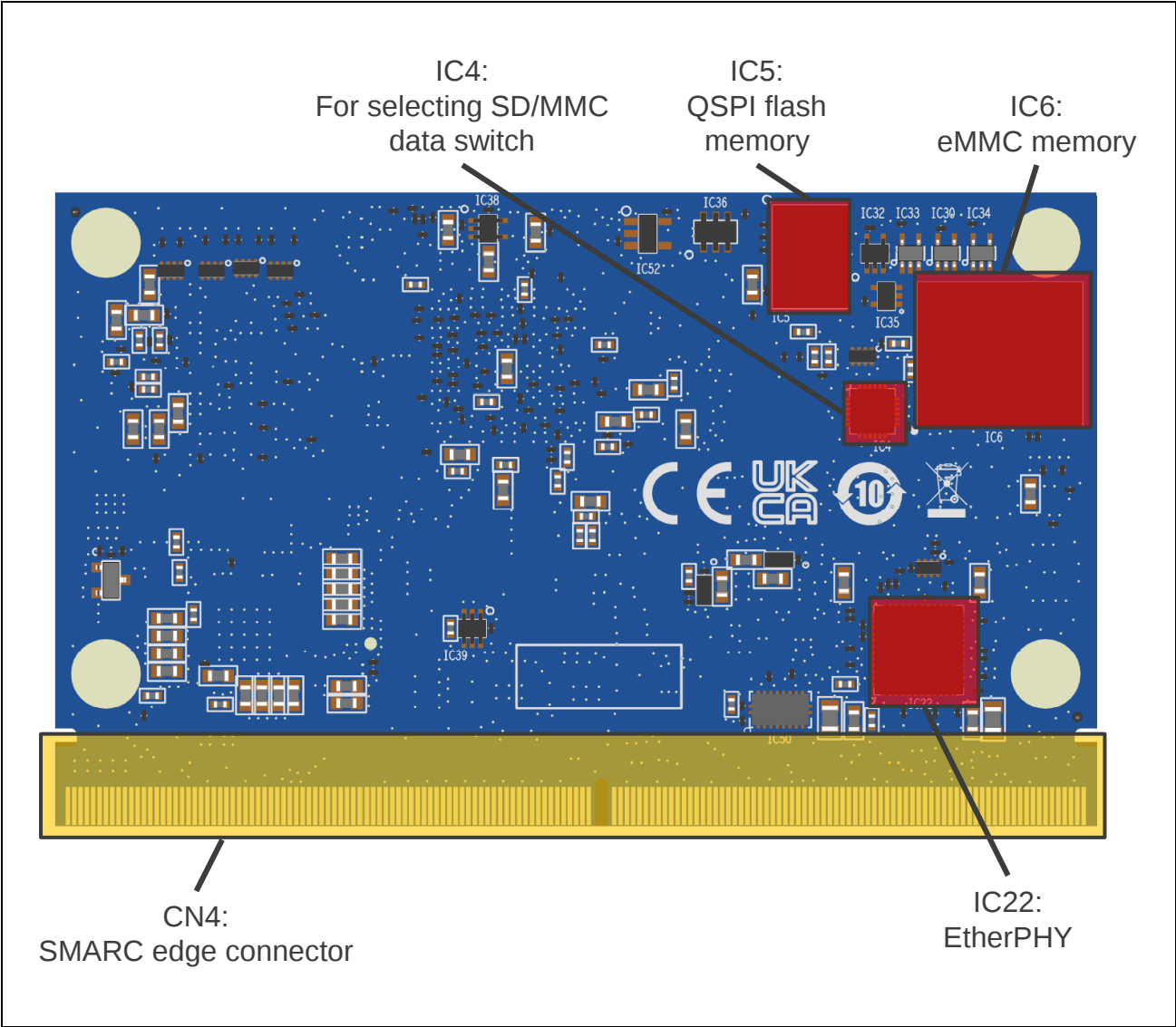


Figure 1.6 Layout of Components of the RTK9744L23C01000BE (Bottom View)

Table 1.2 and **Table 1.3** list main components mounted on the RTK9744L23C01000BE.

Table 1.2 Main Components on the RTK9744L23C01000BE (1) IC

Component Number	Component Name	Type (Manufacturer)
IC1	MPU	R9A07G044L23GBG (Renesas Electronics)
IC2	PMIC	RAA215300A2GNP#HA0 (Renesas Electronics)
IC4	Data switch IC	MAX4996LETG+ (MAXIM)
IC5	QSPI flash memory	MT25QU512ABB8E12-0SIT (Micron)
IC6	eMMC memory	MTFC64GASAQHD-IT (Micron)
IC7	DDR4 SDRAM	MT40A1G16KD-062E:E (Micron)
IC22	Ethernet PHY	KSZ9131RNXC (Microchip)
IC23	Ethernet PHY	KSZ9131RNXC (Microchip)
IC31	Clock generator	5P35023B-629NLGI (Renesas Electronics)
X1	Crystal resonator for XIN	FL2400022 (Diodes Inc)

Table 1.3 Main Components on the RTK9744L23C01000BE (2) Connector

Components Number	Component Name	Type (Manufacturer)
CN1	ADC connector (10pin)	FTSH-105-01-L-DV (Samtec)
CN2	JTAG connector (10pin)	FTSH-105-01-F-DV-007-K (Samtec)
CN3	microSD card slot	504077-1891 (Molex)
CN4	SMARC edge connector (314pin)	

1.7 Absolute Maximum Ratings

Table 1.4 lists absolute maximum ratings of the RTK9744L23C01000BE.

Table 1.4 Absolute Maximum Ratings of the RTK9744L23C01000BE

Symbol	Item	Rated Value	Note
VDD_IN	power voltage	5.25V	Reference: Vss
—	Maximum power consumption	3A	Includes continuous RZ SMARC Series Carrier Board current consumption
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.

1.8 Operating Condition

Table 1.5 lists operating conditions of the RTK9744L23C01000BE.

Table 1.5 Operating Conditions of the RTK9744L23C01000BE

Symbol	Item	Rated Value	Note
VDD_IN	Power voltage	3.0V to 5.25V	Reference: Smarc v2.1 specification
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 RTK9744L23C01000BE.

Table 2.1 Function Modules of the RTK9744L23C01000BE

Section	Function	Description
2.2	MPU	RZ/G2L Input (Xin) clock: 24MHz Arm Cortex-A55 clock: 1.2GHz Arm Cortex-M33 clock: 200MHz AXI-bus clock: 200MHz APB-bus clock: 100MHz
2.3	Memory	QSPI flash memory: 512Mbit * 1pc DDR4 SDRAM: 2GB * 1pc eMMC memory: 64GB * 1pc
2.4	Gigabit Ethernet Interface	Connection between the Ethernet controller (E-MAC) and LAN connector via Ethernet PHY
2.5	ADC Interface	Connection between ADC module and connector
2.6	Clock Configuration	System clock configuration
2.7	Reset Control	Reset control for RZ/G2L mounted on the RTK9744L23C01000BE.
2.8	Power Supply Configuration	System power supply configuration of the RTK9744L23C01000BE and RTK97X4XXB00000BE
2.9	PMIC	Connection between RZ/G2L and PMIC
2.10	Debug Interface	Connection between Debug Interface and connector
2.11	SD/MMC Host Interface	Connection between SD/MMC Host Interface (SDHI) channel 0 and microSD card slot
—	Operating specification	Connectors and switches Details are described in Chapter 3

2.2 MPU

2.2.1 Overview of RZ/G2L

RTK9744L23C01000BE contains a 64-bit microprocessor RZ/G2L that runs in synchronization with the CPU clock (max.1.2 GHz).

2.2.2 List of Pin Functions

Table 2.2 lists pin functions used in RTK9744L23C01000BE.

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (1/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
G12	ABG_AVDD18	ABG_AVDD18	1.8V, Samsung Adaptive Body Bias Generator 1.8V Analog Power Supply	—	—
B11	ABG_NCP_OUT	ABG_NCP_OUT	Connected to VSS via 1uF bypass-capacitor	—	—
E22	ADC_AVDD18	ADC_AVDD18	1.8V	—	—
A28	ADC_CH0	ADC_CH0	Pin header CN1 for ADC input	—	—
B27	ADC_CH1	ADC_CH1	Pin header CN1 for ADC input	—	—
B28	ADC_CH2	ADC_CH2	Pin header CN1 for ADC input	—	—
A27	ADC_CH3	ADC_CH3	Pin header CN1 for ADC input	—	—
C26	ADC_CH4	ADC_CH4	Pin header CN1 for ADC input	—	—
B26	ADC_CH5	ADC_CH5	Pin header CN1 for ADC input	—	—
A26	ADC_CH6	ADC_CH6	Unused	—	—
B25	ADC_CH7	ADC_CH7	Unused	—	—
E12	AUDIO_CLK1	AUDIO_CLK1	Connected to DIFF1 pin of 5P35023B used as CD sampling rate 44.1KHz refclock 11.2896MHz	S38	AUDIO_MCK
B8	AUDIO_CLK2	AUDIO_CLK2	Connected to DIFF2 pin of 5P35023B used as DVD sampling rate 48.0KHz refclock 12.2880MHz	—	—
AB23	BSCANP	BSCANP	Initial setting: 0 (Pull down), should be controllable by resistor.	—	—
AB24	CPUHOLD	CPUHOLD	Initial setting: 0 (Pull down), should be controllable by resistor.	—	—
AG12	CSI_CLKN	CSI_CLKN	Carrier Board Connector Connected to 24pin FFC connector	P4	CSI1_CLK-
AG13	CSI_CLKP	CSI_CLKP	Carrier Board Connector Connected to 24pin FFC connector	P3	CSI1_CLK+
AH13	CSI_DATA0_N	CSI_DATA0_N	Carrier Board Connector Connected to 24pin FFC connector	P8	CSI1_RX0-

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (2/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
AJ13	CSI_DATA0_P	CSI_DATA0_P	Carrier Board Connector Connected to 24pin FFC connector	P7	CSI1_RX0+
AH12	CSI_DATA1_N	CSI_DATA1_N	Carrier Board Connector Connected to 24pin FFC connector	P11	CSI1_RX1-
AJ12	CSI_DATA1_P	CSI_DATA1_P	Carrier Board Connector Connected to 24pin FFC connector	P10	CSI1_RX1+
AH14	CSI_DATA2_N	CSI_DATA2_N	Carrier Board Connector Connected to 24pin FFC connector	P14	CSI1_RX2-
AJ14	CSI_DATA2_P	CSI_DATA2_P	Carrier Board Connector Connected to 24pin FFC connector	P13	CSI1_RX2+
AH11	CSI_DATA3_N	CSI_DATA3_N	Carrier Board Connector Connected to 24pin FFC connector	P17	CSI1_RX3-
AJ11	CSI_DATA3_P	CSI_DATA3_P	Carrier Board Connector Connected to 24pin FFC connector	P16	CSI1_RX3+
AD12	CSI_VDD18	CSI_VDD18	1.8V	—	—
AD13	CSI_VDD18	CSI_VDD18	1.8V	—	—
G29	DDR_ADDR0	DDR_ADDR0	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
M27	DDR_ADDR1	DDR_ADDR1	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
R29	DDR_ADDR10	DDR_ADDR10	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
K28	DDR_ADDR11	DDR_ADDR11	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
P29	DDR_ADDR12	DDR_ADDR12	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
E29	DDR_ADDR13	DDR_ADDR13	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
H29	DDR_ADDR14	DDR_ADDR14	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
G27	DDR_ADDR15	DDR_ADDR15	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
F28	DDR_ADDR2	DDR_ADDR2	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
F29	DDR_ADDR3	DDR_ADDR3	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
L29	DDR_ADDR4	DDR_ADDR4	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
D29	DDR_ADDR5	DDR_ADDR5	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
L28	DDR_ADDR6	DDR_ADDR6	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
C28	DDR_ADDR7	DDR_ADDR7	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
H28	DDR_ADDR8	DDR_ADDR8	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (3/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
E28	DDR_ADDR9	DDR_ADDR9	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
H27	DDR_BA0	DDR_BA0	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
M28	DDR_BA1	DDR_BA1	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
G28	DDR_BA2	DDR_BA2	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
C29	DDR_CALIBRATION	DDR_CALIBRATION	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
K29	DDR_CAS_N	DDR_CAS_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
N28	DDR_CKE	DDR_CKE	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
T28	DDR_CLK_N	DDR_CLK_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
T29	DDR_CLK_P	DDR_CLK_P	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
P28	DDR_CS0_N	DDR_CS0_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
M29	DDR_CS1_N	DDR_CS1_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
W29	DDR_DM0	DDR_DM0	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AC29	DDR_DM1	DDR_DM1	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
V28	DDR_DQ0	DDR_DQ0	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AB29	DDR_DQ1	DDR_DQ1	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AC28	DDR_DQ10	DDR_DQ10	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AE29	DDR_DQ11	DDR_DQ11	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AH29	DDR_DQ12	DDR_DQ12	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AE28	DDR_DQ13	DDR_DQ13	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AF29	DDR_DQ14	DDR_DQ14	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AG29	DDR_DQ15	DDR_DQ15	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
U28	DDR_DQ2	DDR_DQ2	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AB28	DDR_DQ3	DDR_DQ3	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
V27	DDR_DQ4	DDR_DQ4	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
W28	DDR_DQ5	DDR_DQ5	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
U27	DDR_DQ6	DDR_DQ6	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (4/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
V29	DDR_DQ7	DDR_DQ7	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AF28	DDR_DQ8	DDR_DQ8	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AD29	DDR_DQ9	DDR_DQ9	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
Y28	DDR_DQS0_N	DDR_DQS0_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AA29	DDR_DQS0_P	DDR_DQS0_P	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AC27	DDR_DQS1_N	DDR_DQS1_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AC26	DDR_DQS1_P	DDR_DQS1_P	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
N29	DDR_ODT0	DDR_ODT0	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
N27	DDR_ODT1	DDR_ODT1	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
J29	DDR_RAS_N	DDR_RAS_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
B29	DDR_RESET_N	DDR_RESET_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
H25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
M25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
N25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
U25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
V25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
AA25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
AB25	DDR_VDDQ	DDR_VDDQ	1.2V	—	—
J28	DDR_WE_N	DDR_WE_N	DDR4 SDRAM (MT40A1G16KD-062E:E)	—	—
AE18	DEBUGEN	DEBUGEN	DIP_SW (SW1)	—	—
AG18	DSI_CLKN	DSI_CLKN	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S135	DSI0_CLK-
AG17	DSI_CLKP	DSI_CLKP	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S134	DSI0_CLK+
AJ16	DSI_DATA0_N	DSI_DATA0_N	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S126	DSI0_D0-
AH16	DSI_DATA0_P	DSI_DATA0_P	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S125	DSI0_D0+
AJ17	DSI_DATA1_N	DSI_DATA1_N	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S129	DSI0_D1-

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (5/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
AH17	DSI_DATA1_P	DSI_DATA1_P	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S128	DSI0_D1+
AJ15	DSI_DATA2_N	DSI_DATA2_N	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S132	DSI0_D2-
AH15	DSI_DATA2_P	DSI_DATA2_P	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S131	DSI0_D2+
AJ18	DSI_DATA3_N	DSI_DATA3_N	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S138	DSI0_D3-
AH18	DSI_DATA3_P	DSI_DATA3_P	Carrier Board Connector Connected MIPI-DSI to HDMI bridge device	S137	DSI0_D3+
AC17	DSI_VDD18	DSI_VDD18	1.8V	—	—
AC18	DSI_VDD18	DSI_VDD18	1.8V	—	—
N6	ETHER0_PVDD	ETHER0_PVDD	1.8V	—	—
U7	ETHER1_PVDD	ETHER1_PVDD	1.8V	—	—
AG2	EXTAL	EXTAL	24MHz input (Connected to REF pin of 5P35023 for system clock)	—	—
V7	JTAG_PVDD	JTAG_PVDD	1.8V	—	—
E8	MD_BOOT0	MD_BOOT0	Input BOOT_SEL0#, BOOT_SEL1#, BOOT_SEL2# logic states	P123, P124, P125	BOOT_SEL 0#,1#,2#
E7	MD_BOOT1	MD_BOOT1	Input BOOT_SEL0#, BOOT_SEL1#, BOOT_SEL2# logic states	P123, P124, P125	BOOT_SEL 0#,1#,2#
G7	MD_BOOT2	MD_BOOT2	Input BOOT_SEL0#, BOOT_SEL1#, BOOT_SEL2# logic states	P123, P124, P125	BOOT_SEL 0#,1#,2#
D23	MD_CLKS	MD_CLKS	Initial setting: 1 (Pull Up), should be controllable by resistor.	—	—
E23	MD_OSCDRV0	MD_OSCDRV0	Initial setting: 0 (Pull Down), should be controllable by resistor.	—	—
D27	MD_OSCDRV1	MD_OSCDRV1	Initial setting: 0 (Pull Down), should be controllable by resistor.	—	—
AJ2	NMI	NMI	Input Interrupt signal from PWR_BTN#	—	—
G17	OTP_VDD18	OTP_VDD18	1.8V	—	—
A11	P0_0/IRQ0/SCI0_RX D/GTIOC0A/MTIOC0 A/SCIF3_TXD	P0_0	Unused	—	—
B12	P0_1/IRQ1/SCI0_TX D/GTIOC0B/MTIOC0 B/SCIF3_RXD	IRQ1	Unused	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (6/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
C13	P1_0/IRQ2/SCI0_SC K/GTIOC1A/MTIOC0 C/SCIF3_SCK	IRQ2	Connected to Ethernet0 PHY (KSZ9131RNXC), used as IRQ2	—	—
A12	P1_1/IRQ3/SCI0_CT S_N_RTS_N/GTIOC1 B/MTIOC0D	IRQ3	Connected to Ethernet1 PHY (KSZ9131RNXC), used as IRQ3	—	—
AJ22	P10_0/DISP_DATA6/ CAN_CLK/MTIOC6A/ GTETRGA	P10_0	Unused	—	—
AH22	P10_1/DISP_DATA7/ CAN0_TX/MTIOC6B/ GTETRGB	CAN0_TX	Carrier Board Connector Connected to CAN0 connector (*1)	P143	CAN0_TX
AG22	P11_0/DISP_DATA8/ CAN0_RX/MTIOC6C/ GTETRGC	CAN0_RX	Carrier Board Connector Connected to CAN0 connector (*1)	P144	CAN0_RX
AF22	P11_1/DISP_DATA9/ CAN0_TX_DATARAT E_EN/MTIOC6D/GTE TRGD	P11_1	Unused	—	—
AE22	P12_0/DISP_DATA10 /CAN0_RX_DATARA TE_EN/POE0_N/GTI OC7A	P12_0	Unused	—	—
AE23	P12_1/DISP_DATA11 /CAN1_TX/POE4_N/ GTIOC7B	CAN1_TX	Carrier Board Connector Connected to CAN1 connector (*1)	P145	CAN1_TX
AF23	P13_0/DISP_DATA12 /CAN1_RX/POE8_N/I RQ0	CAN1_RX	Carrier Board Connector Connected to CAN1 connector (*1)	P146	CAN1_RX
AG23	P13_1/DISP_DATA13 /CAN1_TX_DATARA TE_EN/POE10_N/IR Q1	P13_1	Unused	—	—
AG26	P13_2/DISP_DATA14 /CAN1_RX_DATARA TE_EN/IRQ7/IRQ2	P13_2	Unused	—	—
AF27	P14_0/DISP_DATA15 /SSI1_BCK/SD1_CD/ MTCLKA	P14_0	Unused	—	—
AJ23	P14_1/DISP_DATA16 /SSI1_RCK/SD1_WP/ MTCLKB	P14_1	Unused	—	—
AH23	P15_0/DISP_DATA17 /SSI1_TXD/GTIOC4A/ MTCLKC	P15_0	Unused	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (7/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
AJ24	P15_1/DISP_DATA18 /SSI1_RXD/GTIOC4B /MTCLKD	P15_1	Unused	—	—
AH24	P16_0/DISP_DATA19 /SCIF2_TXD/GTIOC5 A/IRQ3	P16_0	Connected to PMIC, used as MPIO4 function	—	—
AJ25	P16_1/DISP_DATA20 /SCIF2_RXD/GTIOC5 B/IRQ4	P16_1	Connected as PMIC, used as MPIO3 function	—	—
AH25	P17_0/DISP_DATA21 /SCIF2_SCK/GTIOC6 A/IRQ5	P17_0	Unused	—	—
AJ26	P17_1/DISP_DATA22 /SCIF2_CTS/GTIOC6 B/IRQ6	P17_1	Unused	—	—
AH26	P17_2/DISP_DATA23 /SCIF2_RTS/IRQ7	P17_2	Unused	—	—
C2	P18_0/SD0_CD /GTIOC0A/RIIC3_SD A/MTIOC2A	RIIC3_SDA	Connected to PMIC Carrier Board Connector, Connected to PMOD1, Audio Codec	S49	I2C_GP_D AT
D3	P18_1/SD0_WP /GTIOC0B/RIIC3_SCL/MTIOC2B	RIIC3_SCL	Connected to PMIC Carrier Board Connector, Connected to PMOD1, Audio Codec	S48	I2C_GP_C K
B1	P19_0/SD1_CD/GTIOC3A/MTIOC1A/RIIC2_SDA	SD1_CD	Carrier Board Connector, Connected to SDIO_CD# (for SD1)	P35	SDIO_CD#
B2	P19_1/SD1_WP/GTIOC3B/MTIOC1B/RIIC2_SCL	P19_1	Unused	P33	SDIO_WP
B13	P2_0/IRQ4/ADC_TRG/GTIOC2A/MTIOC1A/SCIF4_TXD	P2_0	Carrier Board Connector, Used as CAM1_PWR#	P109	GPIO1
A13	P2_1/IRQ5/GTIOC2B/MTIOC1B/SCIF4_RXD	IRQ5	Carrier Board Connector, Used as IRQ5 for HDMI INT	P110	GPIO2
N1	P20_0/ET0_TXC_TX_CLK/RSP10_CK/CAN0_CLK	ET0_TXC_TX_CLK	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
N2	P20_1/ET0_TX_CTL_TX_EN/RSP10_MOSI/CAN0_TX	ET0_TX_CTL_TX_EN	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
M1	P20_2/ET0_TXD0/RSP10_MISO/CAN0_RX	ET0_TXD0	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
M2	P21_0/ET0_TXD1/RSP10_SSL/CAN0_TX_DATARATE_EN	ET0_TXD1	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (8/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
L1	P21_1/ET0_TXD2/CAN0_RX_Datarate_EN	ET0_TXD2	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
L2	P22_0/ET0_TXD3/SSI0_BCK/CAN1_TX/MTCLKA	ET0_TXD3	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
M3	P22_1/ET0_TX_ERR/SSI0_RCK/CAN1_RX/MTCLKB	ET0_TX_ERR	Unused	—	—
N4	P23_0/ET0_TX_COL/SSI0_TXD/CAN1_TX_Datarate_EN/MTCLKC	ET0_TX_COL	Unused	—	—
M4	P23_1/ET0_TX_CRS/SSI0_RXD/CAN1_RX_Datarate_EN/MTCLKD	ET0_TX_CRS	Unused	—	—
P2	P24_0/ET0_RXC_RX_CLK/SSI1_BCK/POE0_N	ET0_RXC_RX_CLK	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
P1	P24_1/ET0_RX_CTL_RX_DV/SSI1_RCK/POE4_N	ET0_RX_CTL_RX_DV	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
R2	P25_0/ET0_RXD0/SSI1_TXD/POE8_N	ET0_RXD0	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
R1	P25_1/ET0_RXD1/SSI1_RXD/POE10_N	ET0_RXD1	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
T2	P26_0/ET0_RXD2/RSPI1_CK/MTIOC8A	ET0_RXD2	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
T1	P26_1/ET0_RXD3/RSPI1_MOSI/MTIOC8B	ET0_RXD3	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
N3	P27_0/ET0_RX_ERR/RSPI1_MISO/MTIOC8C	ET0_RX_ERR	Unused	—	—
U2	P27_1/ET0_MDC/RSPI1_SSL/MTIOC8D	ET0_MDC	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
U1	P28_0/ET0_MDIO	ET0_MDIO	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
R3	P28_1/ET0_LINKSTA	ET0_LINKSTA	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
AB2	P29_0/ET1_TXC_TX_CLK/CAM_PCLK/USB1_VBUSEN/SSI2_BCK	ET1_TXC_TX_CLK	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—
Y1	P29_1/ET1_TX_CTL_TX_EN/CAM_HREF/USB1_OVRCUR/SSI2_RCK	ET1_TX_CTL_TX_EN	Connected to Ethernet0 PHY (KSZ9131RNXC)	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (9/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
A14	P3_0/IRQ6/RIIC2_SD A/GTIOC3A/MTIOC2 A/SCIF4_SCK	P3_0/IRQ6	Unused	P108	—
B14	P3_1/IRQ7/RIIC2_SC L/GTIOC3B/MTIOC2B /CAM_FIELD	P3_1/IRQ7	Connected to PMOD1, used as IRQ7	P118	GPIO10
AB1	P30_0/ET1_TXD0/CA M_VSYNC/SSI2_DAT A	ET1_TXD0	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AA2	P30_1/ET1_TXD1/CA M_DATA15	ET1_TXD1	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AA1	P31_0/ET1_TXD2/CA M_DATA0/SCI1_RXD /SSI3_BCK	ET1_TXD2	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
Y2	P31_1/ET1_TXD3/CA M_DATA1/SCI1_TXD/ SSI3_RCK	ET1_TXD3	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
U3	P32_0/ET1_TX_ERR/ CAM_DATA2/SCI1_S CK/MTIOC3A/SSI3_T XD	ET1_TX_ERR	Unused	—	—
V4	P32_1/ET1_TX_COL/ CAM_DATA3/SCI1_C TS_N_RTS_N/MTIOC 3B/SSI3_RXD	ET1_TX_COL	Unused	—	—
U4	P33_0/ET1_TX_CRS/ CAM_DATA4/GTIOC 2A/SCIF2_TXD/GTIO C0A	ET1_TX_CRS	Unused	—	—
AC1	P33_1/ET1_RXC_RX _CLK/CAM_DATA5/G TIOC2B/SCIF2_RXD/ GTIOC0B	ET1_RXC_RX_CLK	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AC2	P34_0/ET1_RX_CTL _RX_DV/CAM_DATA 6/GTIOC3A/MTIOC0A /GTIOC1A	ET1_RX_CTL_RX_D V	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AC3	P34_1/ET1_RXD0/CA M_DATA7/GTIOC3B/ MTIOC0B/GTIOC1B	ET1_RXD0	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AC4	P35_0/ET1_RXD1/CA M_DATA8/SSI0_BCK/ MTIOC0C/GTIOC2A	ET1_RXD1	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AB4	P35_1/ET1_RXD2/CA M_DATA9/SSI0_RCK /MTIOC0D/GTIOC2B	ET1_RXD2	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
AB3	P36_0/ET1_RXD3/CA M_DATA10/SSI0_TX D/MTIOC3C/GTETR G A	ET1_RXD3	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (10/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
V3	P36_1/ET1_RX_ERR/ CAM_DATA11/SSIO_ RXD/MTIOC3D/GTET RGB	ET1_RX_ERR	Unused	—	—
W2	P37_0/ET1_MDC/CA M_DATA12/SCIF2_S CK/GTETRGC	ET1_MDC	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
W1	P37_1/ET1_MDIO/CA M_DATA13/SCIF2_C TS/GTETRGD	ET1_MDIO	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
V2	P37_2/ET1_LINKSTA /CAM_DATA14/SCIF2 _RTS	ET1_LINKSTA	Connected to Ethernet1 PHY (KSZ9131RNXC)	—	—
A15	P38_0/SCIF0_TXD/G TETRGA/CAN_CLK/ MTIOC4A/USB1_VBU SEN	SCIF0_TXD	Carrier Board Connector Used as SCIF0_TXD (Serial Download Mode with UART to USB for Debug)	P140	SER3_TX
B15	P38_1/SCIF0_RXD/G TETRGB/CAN0_TX/M TIOC4B/USB1_OVRC UR	SCIF0_RXD	Carrier Board Connector Used as SCIF0_RXD (Serial Download Mode with UART to USB for Debug)	P141	SER3_RX
A16	P39_0/SCIF0_SCK/G TETRGC/CAN0_RX/ MTIOC4C	P39_0	For selecting SD0_PVDD 1.8V/3.3V	—	—
C15	P39_1/SCIF0_CTS/G TETRGD/CAN0_TX_ DATARATE_EN/MTI OC4D	P39_1	For selecting SD1_PVDD 1.8V/3.3V	—	—
B16	P39_2/SCIF0_RTS/C AN0_RX_DATARATE _EN	P39_2	Carrier Board Connector Used as “SD1_PWR_ON” GPIO to control SD1 card body 3.3V power on/off	P37	SDIO_PW R_EN
AJ5	P4_0/USB0_VBUSEN /SCIF2_TXD/MTIOC7 A/ADC_TRG	USB0_VBUSEN	Carrier Board Connector Include gate USB0_VBUSEN state	P62	USB0_EN_ OC#
AH6	P4_1/SCIF2_RXD/MT IOC7B	P4_1	Connected to CB12 pin of MAX4996L	P108	—
C17	P40_0/SCIF1_TXD/G TIOC6A/CAN1_TX/M TIC5U/SCIO_RXD	SCIF1_TXD	Unused	P134	SER1_TX
B17	P40_1/SCIF1_RXD/G TIOC6B/CAN1_RX/M TIC5V/SCIO_TXD	SCIF1_RXD	Unused	P135	SER1_RX
A17	P40_2/SCIF1_SCK/C AN1_TX_DATARATE _EN/MTIC5W/SCIO_S CK	P40_2	Carrier Board Connector Used as CAM1_RST#	P111	GPIO3

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (11/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
E17	P41_0/SCIF1_CTS/GTIOC7A/CAN1_RX_D ATARATE_EN/GTIO C3A/SCI0_CTS_N_R TS_N	P41_0	Carrier Board Connector Connected to PMOD0	P114	GPIO6
A18	P41_1/SCIF1_RTS/GTIOC7B/GTIOC3B	P41_1	Unused	P113	—
AG4	P42_0/USB1_VBUSE N/RSP12_CK/CAN_C LK/SCIF2_TXD/MTIO C7A	USB1_VBUSEN	Carrier Board Connector Include gate USB1_VBUSEN state	P67	USB1_EN_ OC#
AE7	P42_1/USB1_OVRCU R/RSP12_MOSI/CAN0 _TX/SCIF2_RXD/MTI OC7B	USB1_OVRCUR	Carrier Board Connector Include gate USB1_OVRCUR state	P67	USB1_EN_ OC#
AJ3	P42_2/ADC_TRG/RS PI2_MISO/CAN0_RX/ SCIF2_SCK/MTIOC7 C	P42_2/ADC_TRG selectable with header-pin	Carrier Board Connector Connected to PMOD1	P116	GPIO8
AH3	P42_3/RIIC2_SDA/R SPI2_SSL/CAN0_TX_ DATARATE_EN/SCIF 2_CTS/MTIOC7D	P42_3	Carrier Board Connector Connected to PMOD1	P117	GPIO9
AC5	P42_4/RIIC2_SCL/CA M_FIELD/CAN0_RX_ DATARATE_EN/SCIF 2_RTS	P42_4	Carrier Board Connector Connected to PMOD1	S142	GPIO12
B18	P43_0/RSP10_CK/GTIO C4A/GTIOC6A/IRQ 4/MTIOC8A	P43_0/IRQ4	Carrier Board Connector Connected to PMOD0	P112	GPIO4
D17	P43_1/RSP10_MOSI/ GTIOC4B/GTIOC6B/I RQ5/MTIOC8B	P43_1	Carrier Board Connector Connected to PMOD0	P115	GPIO7
E18	P43_2/RSP10_MISO/ GTIOC5A/IRQ6/MTIO C8C	P43_2	Carrier Board Connector Connected to PMOD0	P113	GPIO5
C18	P43_3/RSP10_SSL/G TIOC5B/IRQ7/MTIOC 8D	RSP10_SSL	Unused	—	—
A19	P44_0/RSP11_CK/SSI 1_BCK/CAN1_TX/MTI OC3A/GTIOC6A	RSP11_CK	Carrier Board Connector Connected to PMOD0	P56	SPI1_Clock
F17	P44_1/RSP11_MOSI/ SSI1_RCK/CAN1_RX /MTIOC3B/GTIOC6B	RSP11_MISO	Carrier Board Connector Connected to PMOD0	P57	SPI1_DIN

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (12/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
D18	P44_2/RSPI1_MISO/SSI1_TXD/CAN1_TX_DATARATE_EN/MTI OC3C/GTIOC7A	RSPI1_MOSI	Carrier Board Connector Connected to PMOD0	P58	SPI1_DO
B19	P44_3/RSPI1_SSL/SI1_RXD/CAN1_RX_DATARATE_EN/MTI OC3D/GTIOC7B	RSPI1_SSL	Carrier Board Connector Connected to PMOD0	P54	SPI1_CS0#
A8	P45_0/SSIO_BCK/PO E0_N/SCI1_RXD	SSIO_BCK	Carrier Board Connector Connected to Audio Codec	S42	I2S0_CK
D12	P45_1/SSIO_RCK/PO E4_N/SCI1_TXD	SSIO_RCK	Carrier Board Connector Connected to Audio Codec	S39	I2S0_LRCK
A9	P45_2/SSIO_TXD/PO E8_N/SCI1_SCK	SSIO_TXD	Carrier Board Connector Connected to Audio Codec	S40	I2S0_SDO UT
B9	P45_3/SSIO_RXD/PO E10_N/SCI1_CTS_N_RTS_N	SSIO_RXD	Carrier Board Connector Connected to Audio Codec	S41	I2S0_SDIN
B10	P46_0/SSI1_BCK/GT ETRGA/CAN1_TX/RII C2_SDA	SSI1_BCK	Carrier Board Connector Connected to MIPI DSI to HDMI bridge device	S53	I2S2_CK
A10	P46_1/SSI1_RCK/GT ETRGB/CAN1_RX/RII C2_SCL	SSI1_RCK	Carrier Board Connector Connected to MIPI DSI to HDMI bridge device	S50	I2S2_LRCK
C12	P46_2/SSI1_TXD/GT ETRGC/CAN1_TX_D ATARATE_EN/RIIC3_SDA	SSI1_TXD	Carrier Board Connector Connected to MIPI DSI to HDMI bridge device	S51	I2S2_SDO UT
D13	P46_3/SSI1_RXD/GT ETRGD/CAN1_RX_D ATARATE_EN/RIIC3_SCL	SSI1_RXD	Unused	—	—
B20	P47_0/SCI0_RXD/SD 0_CD/IRQ0/SSI1_BCK/RSPI0_CK	P47_0	Unused	—	—
A20	P47_1/SCI0_TXD/SD 0_WP/IRQ1/SSI1_RC K/RSPI0_MOSI	P47_1	Unused	—	—
A21	P47_2/SCI0_SCK/SD 1_CD/IRQ2/SSI1_TX D/RSPI0_MISO	P47_2	Carrier Board Connector Connected to PMOD1	S123	GPIO13
B21	P47_3/SCI0_CTS_N_RTS_N/SD1_WP/IRQ 3/SSI1_RXD/RSPI0_SSL	P47_3	Unused	P118	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (13/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
B22	P48_0/SCIF2_TXD/R SPI1_CK/RIIC2_SDA/ MTCLKA	SCIF2_TXD	Carrier Board Connector Connected to PMOD1	P129	SER0_TX
A23	P48_1/SCIF2_RXD/R SPI1_MOSI/RIIC2_S CL/MTCLKB	SCIF2_RXD	Carrier Board Connector Connected to PMOD1	P130	SER0_RX
A22	P48_2/SCIF2_SCK/R SPI1_MISO/RIIC3_S DA/MTCLKC	P48_2	Unused	—	—
C22	P48_3/SCIF2_CTS/R SPI1_SSL/RIIC3_SCL /MTCLKD	SCIF2_CTS	Carrier Board Connector Connected to PMOD1	P132	SER0_CTS #
B23	P48_4/SCIF2_RTS/A DC_TRG	SCIF2_RTS	Carrier Board Connector Connected to PMOD1	P131	SER0_RTS #
AJ4	P5_0/USB0_OVRCU R/SCIF2_SCK/MTIOC 7C/SSI2_BCK	USB0_OVRCUR	Carrier Board Connector, include gate USB0_OVRCUR state	P62	USB0_EN_ OC#
AH4	P5_1/USB0_OTG_ID/ SCIF2_CTS/MTIOC7 D/SSI2_RCK	USB0_OTG_ID	Carrier Board Connector USB_OTG_ID state	P64	USB0_OT G_ID
AH5	P5_2/USB0_OTG_EX ICEN/SCIF2_RTS/SSI 2_DATA	P5_2	Carrier Board Connector Connected to PMOD1	P119	GPIO11
AJ27	P6_0/DISP_CLK/SSI0 _BCK/USB0_VBUSE N/MTIOC1A	P6_0	Unused	—	—
AH27	P6_1/DISP_HSYNC/S SI0_RCK/MTIOC1B	P6_1	Unused	—	—
AJ28	P7_0/DISP_VSYNC/S SI0_TXD/USB0_OVR CUR/MTIC5U	P7_0	Unused	—	—
AH28	P7_1/DISP_DE/SSI0 RXD/USB0_OTG_ID/ MTIC5V	P7_1	Unused	—	—
AJ19	P7_2/DISP_DATA0/U SB0_OTG_EXICEN/ MTIC5W	P7_2	Unused	—	—
AH19	P8_0/DISP_DATA1/U SB1_VBUSEN/RSPI2 _CK/RIIC3_SCL	P8_0	Unused	—	—
AJ20	P8_1/DISP_DATA2/U SB1_OVRCUR/RSPI2 _MOSI/RIIC3_SDA	P8_1	Unused	—	—
AH20	P8_2/DISP_DATA3/R SPI2_MISO	P8_2	Unused	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (14/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
AJ21	P9_0/DISP_DATA4/A DC_TRG/RSPi2_SSL /MTIOC2A	P9_0	Pin header CN1 for ADC, used as ADC_TRG	—	—
AH21	P9_1/DISP_DATA5/M TIOC2B	P9_1	Unused	—	—
N7	PLL1_AVDD18	PLL1_AVDD18	1.8V	—	—
W9	PLL23_AVDD18	PLL23_AVDD18	1.8V	—	—
V5	PLL23_DVDD11	PLL23_DVDD11	1.1V	—	—
U23	PLL4_AVDD18	PLL4_AVDD18	1.8V	—	—
AA15	PLL5_DVDD11	PLL5_DVDD11	1.1V	—	—
G13	PLL6_AVDD18	PLL6_AVDD18	1.8V	—	—
AF3	PRST_N	PRST_N	Connected to PMIC, used as MPIO0 function	—	—
AC7	PVDD_1	PVDD_1	3.3V	—	—
AC12	PVDD_1	PVDD_1	3.3V	—	—
AC22	PVDD_1	PVDD_1	3.3V	—	—
AC23	PVDD_1	PVDD_1	3.3V	—	—
H7	PVDD_2	PVDD_2	3.3V	—	—
E13	PVDD_2	PVDD_2	3.3V	—	—
G18	PVDD_2	PVDD_2	3.3V	—	—
G23	PVDD_2	PVDD_2	3.3V	—	—
B6	QSPI_INT_N	QSPI_INT_N	Unused	—	—
A5	QSPI_RESET_N	QSPI_RESET_N	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—
B5	QSPI_WP_N	QSPI_WP_N	Unused	—	—
A3	QSPI0_IO0	QSPI0_IO0	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—
B3	QSPI0_IO1	QSPI0_IO1	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—
A4	QSPI0_IO2	QSPI0_IO2	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—
B4	QSPI0_IO3	QSPI0_IO3	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (15/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
C4	QSPI0_SPCLK	QSPI0_SPCLK	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—
A2	QSPI0_SSL	QSPI0_SSL	QSPI Flash Memory (MT25QU512ABB8E12-0SIT)	—	—
C7	QSPI1_IO0	QSPI1_IO0	Unused	—	—
D7	QSPI1_IO1	QSPI1_IO1	Unused	—	—
A6	QSPI1_IO2	QSPI1_IO2	Unused	—	—
D8	QSPI1_IO3	QSPI1_IO3	Unused	—	—
B7	QSPI1_SPCLK	QSPI1_SPCLK	Unused	—	—
C8	QSPI1_SSL	QSPI1_SSL	Unused	—	—
B24	RIIC0_SCL	RIIC0_SCL	Carrier Board Connector Used as RIIC0 to connect MIPI CSI Camera module	S1	I2C_CAM1_CK
A25	RIIC0_SDA	RIIC0_SDA	Carrier Board Connector Used as RIIC0 to connect MIPI CSI Camera module	S2	I2C_CAM1_DAT
C23	RIIC1_SCL	RIIC1_SCL	Carrier Board Connector Used as RIIC1 to connect MPI DSI to HDMI bridge device	S139	I2C_LCD_CK
A24	RIIC1_SDA	RIIC1_SDA	Carrier Board Connector Used as RIIC1 to connect MPI DSI to HDMI bridge device	S140	I2C_LCD_DAT
F1	SD0_CLK	SD0_CLK	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
F2	SD0_CMD	SD0_CMD	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
G2	SD0_DATA0	SD0_DATA0	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
H4	SD0_DATA1	SD0_DATA1	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
G3	SD0_DATA2	SD0_DATA2	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
G4	SD0_DATA3	SD0_DATA3	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
E1	SD0_DATA4	SD0_DATA4	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
D1	SD0_DATA5	SD0_DATA5	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
E2	SD0_DATA6	SD0_DATA6	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
D2	SD0_DATA7	SD0_DATA7	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
H5	SD0_PVDD	SD0_PVDD	Connected to VOUT pin of ISL80505IRAJZ (1.8V/3.3V)	—	—
C1	SD0_RST_N	SD0_RST_N	eMMC Memory (MTFC64GASAQHD-IT) (for SD0)	—	—
H3	SD1_CLK	SD1_CLK	Carrier Board Connector Connected to SDIO_CK (for SD1)	P36	SDIO_CK

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (16/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
J2	SD1_CMD	SD1_CMD	Carrier Board Connector, Connected to SDIO_CMD (for SD1)	P34	SDIO_CMD
H1	SD1_DATA0	SD1_DATA0	Carrier Board Connector, Connected to SDIO_D0 (for SD1)	P39	SDIO_D0
H2	SD1_DATA1	SD1_DATA1	Carrier Board Connector, Connected to SDIO_D1 (for SD1)	P40	SDIO_D1
K2	SD1_DATA2	SD1_DATA2	Carrier Board Connector, Connected to SDIO_D2 (for SD1)	P41	SDIO_D2
J1	SD1_DATA3	SD1_DATA3	Carrier Board Connector, Connected to SDIO_D3 (for SD1)	P42	SDIO_D3
K2	SD1_DATA2	SD1_DATA2	Carrier Board Connector, Connected to SDIO_D2 (for SD1)	P41	SDIO_D2
J1	SD1_DATA3	SD1_DATA3	Carrier Board Connector, Connected to SDIO_D3 (for SD1)	P42	SDIO_D3
M6	SD1_PVDD	SD1_PVDD	Connected to VOUT pin of ISL80505IRAJZ (1.8V/3.3V)	—	—
F8	SPI_PVDD	SPI_PVDD	1.8V	—	—
AE1	TCK_SWDCCLK	TCK_SWDCCLK	Connected to JTAG connector (CN2)	—	—
AF1	TDI	TDI	Connected to JTAG connector (CN2)	—	—
AE2	TDO_SWO	TDO_SWO	Connected to JTAG connector (CN2)	—	—
AD18	TESTMD	TESTMD	Initial setting: 0 (Pull Down Resistor), should be controllable by resistor.	—	—
AD2	TMS_SWDIO	TMS_SWDIO	Connected to JTAG connector (CN2)	—	—
AF2	TRST_N	TRST_N	Connected to JTAG connector (CN2)	—	—
AB7	TS_AVDD18	TS_AVDD18	1.8V	—	—
AG8	USB_AVDD18	USB_AVDD18	1.8V	—	—
AG7	USB_RREF	USB_RREF	Connected 1.8ohm to GND	—	—
AF7	USB_VDD18	USB_VDD18	1.8V	—	—
AF8	USB_VDD18	USB_VDD18	1.8V	—	—
AD8	USB_VDD33	USB_VDD33	3.3V	—	—
AE8	USB_VDD33	USB_VDD33	3.3V	—	—
AJ6	USB_VSS	USB_VSS	GND	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (17/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
AH7	USB_VSS	USB_VSS	GND	—	—
AC8	USB_VSS	USB_VSS	GND	—	—
AJ9	USB_VSS	USB_VSS	GND	—	—
AJ8	USB0_DM	USB0_DM	Carrier Board Connector Connected to USB0- (for USB0)	P61	USB0-
AH9	USB0_DP	USB0_DP	Carrier Board Connector Connected to USB0+ (for USB0)	P60	USB0+
AH10	USB0_VBUSIN	USB0_VBUSIN	Carrier Board Connector Connected to USB0_VBUS_DET (for USB0)	P63	USB0_VBUS_DET
AJ7	USB1_DM	USB1_DM	Carrier Board Connector Connected to USB1- (for USB1)	P66	USB1-
AH8	USB1_DP	USB1_DP	Carrier Board Connector Connected to USB1- (for USB1)	P65	USB1+
J9	VDD	VDD	1.1V	—	—
L9	VDD	VDD	1.1V	—	—
N9	VDD	VDD	1.1V	—	—
R9	VDD	VDD	1.1V	—	—
U9	VDD	VDD	1.1V	—	—
AA9	VDD	VDD	1.1V	—	—
K10	VDD	VDD	1.1V	—	—
M10	VDD	VDD	1.1V	—	—
P10	VDD	VDD	1.1V	—	—
T10	VDD	VDD	1.1V	—	—
V10	VDD	VDD	1.1V	—	—
Y10	VDD	VDD	1.1V	—	—
J11	VDD	VDD	1.1V	—	—
AA11	VDD	VDD	1.1V	—	—
K12	VDD	VDD	1.1V	—	—
Y12	VDD	VDD	1.1V	—	—
J13	VDD	VDD	1.1V	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (18/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
AA13	VDD	VDD	1.1V	—	—
K14	VDD	VDD	1.1V	—	—
Y14	VDD	VDD	1.1V	—	—
J15	VDD	VDD	1.1V	—	—
K16	VDD	VDD	1.1V	—	—
Y16	VDD	VDD	1.1V	—	—
J17	VDD	VDD	1.1V	—	—
AA17	VDD	VDD	1.1V	—	—
K18	VDD	VDD	1.1V	—	—
Y18	VDD	VDD	1.1V	—	—
J19	VDD	VDD	1.1V	—	—
AA19	VDD	VDD	1.1V	—	—
K20	VDD	VDD	1.1V	—	—
M20	VDD	VDD	1.1V	—	—
P20	VDD	VDD	1.1V	—	—
T20	VDD	VDD	1.1V	—	—
V20	VDD	VDD	1.1V	—	—
Y20	VDD	VDD	1.1V	—	—
J21	VDD	VDD	1.1V	—	—
L21	VDD	VDD	1.1V	—	—
N21	VDD	VDD	1.1V	—	—
R21	VDD	VDD	1.1V	—	—
U21	VDD	VDD	1.1V	—	—
W21	VDD	VDD	1.1V	—	—
AA21	VDD	VDD	1.1V	—	—
A1	VSS	VSS	GND	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (19/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
G1	VSS	VSS	GND	—	—
K1	VSS	VSS	GND	—	—
V1	VSS	VSS	GND	—	—
AD1	VSS	VSS	GND	—	—
AJ1	VSS	VSS	GND	—	—
AH2	VSS	VSS	GND	—	—
G5	VSS	VSS	GND	—	—
M5	VSS	VSS	GND	—	—
N5	VSS	VSS	GND	—	—
U5	VSS	VSS	GND	—	—
AB5	VSS	VSS	GND	—	—
H6	VSS	VSS	GND	—	—
U6	VSS	VSS	GND	—	—
V6	VSS	VSS	GND	—	—
AB6	VSS	VSS	GND	—	—
A7	VSS	VSS	GND	—	—
M7	VSS	VSS	GND	—	—
G8	VSS	VSS	GND	—	—
AJ10	VSS	VSS	GND	—	—
L11	VSS	VSS	GND	—	—
N11	VSS	VSS	GND	—	—
R11	VSS	VSS	GND	—	—
U11	VSS	VSS	GND	—	—
W11	VSS	VSS	GND	—	—
F12	VSS	VSS	GND	—	—
M12	VSS	VSS	GND	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (20/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
P12	VSS	VSS	GND	—	—
T12	VSS	VSS	GND	—	—
V12	VSS	VSS	GND	—	—
AE12	VSS	VSS	GND	—	—
AF12	VSS	VSS	GND	—	—
F13	VSS	VSS	GND	—	—
L13	VSS	VSS	GND	—	—
N13	VSS	VSS	GND	—	—
R13	VSS	VSS	GND	—	—
U13	VSS	VSS	GND	—	—
W13	VSS	VSS	GND	—	—
AE13	VSS	VSS	GND	—	—
AF13	VSS	VSS	GND	—	—
M14	VSS	VSS	GND	—	—
P14	VSS	VSS	GND	—	—
T14	VSS	VSS	GND	—	—
V14	VSS	VSS	GND	—	—
L15	VSS	VSS	GND	—	—
N15	VSS	VSS	GND	—	—
R15	VSS	VSS	GND	—	—
U15	VSS	VSS	GND	—	—
W15	VSS	VSS	GND	—	—
AG15	VSS	VSS	GND	—	—
M16	VSS	VSS	GND	—	—
P16	VSS	VSS	GND	—	—
T16	VSS	VSS	GND	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (21/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
V16	VSS	VSS	GND	—	—
L17	VSS	VSS	GND	—	—
N17	VSS	VSS	GND	—	—
R17	VSS	VSS	GND	—	—
U17	VSS	VSS	GND	—	—
W17	VSS	VSS	GND	—	—
AD17	VSS	VSS	GND	—	—
AE17	VSS	VSS	GND	—	—
AF17	VSS	VSS	GND	—	—
F18	VSS	VSS	GND	—	—
M18	VSS	VSS	GND	—	—
P18	VSS	VSS	GND	—	—
T18	VSS	VSS	GND	—	—
V18	VSS	VSS	GND	—	—
AF18	VSS	VSS	GND	—	—
L19	VSS	VSS	GND	—	—
N19	VSS	VSS	GND	—	—
R19	VSS	VSS	GND	—	—
U19	VSS	VSS	GND	—	—
W19	VSS	VSS	GND	—	—
F22	VSS	VSS	GND	—	—
G22	VSS	VSS	GND	—	—
AD22	VSS	VSS	GND	—	—
V23	VSS	VSS	GND	—	—
H24	VSS	VSS	GND	—	—
U24	VSS	VSS	GND	—	—

Table 2.2 List of Pin Function Selection Used on the RTK9744L23C01000BE (22/22)

Pin Location	Pin Name	Pin Function	Description	SMARC Pin No.	SMARC Pin Name
V24	VSS	VSS	GND	—	—
G25	VSS	VSS	GND	—	—
AC25	VSS	VSS	GND	—	—
G26	VSS	VSS	GND	—	—
H26	VSS	VSS	GND	—	—
M26	VSS	VSS	GND	—	—
N26	VSS	VSS	GND	—	—
U26	VSS	VSS	GND	—	—
V26	VSS	VSS	GND	—	—
AB27	VSS	VSS	GND	—	—
D28	VSS	VSS	GND	—	—
R28	VSS	VSS	GND	—	—
AA28	VSS	VSS	GND	—	—
AD28	VSS	VSS	GND	—	—
AG28	VSS	VSS	GND	—	—
A29	VSS	VSS	GND	—	—
U29	VSS	VSS	GND	—	—
Y29	VSS	VSS	GND	—	—
AJ29	VSS	VSS	GND	—	—
D22	WDTOVF_PERROUT	WDTOVF_PERROUT	Connected to the logic IC for using MPIO5 function of PMIC	—	—
AH1	XIN	XIN	GND	—	—
AG1	XOUT	XOUT	Open	—	—

Note 1. When used in combination with the RZ SMARC Series Carrier Board (P/N: RTR97X4XXB00000BE), CAN0 and CAN1 interface cannot be used because a CAN transceiver is not fitted on the RTK97X4XXB00000BE.

2.3 Memory

QSPI flash memory and DDR4 SDRAM are mounted in RTK9744L23C01000BE as external memories.

Please refer to the following for details

2.3.1 QSPI Flash Memory

Figure 2.1 shows a block diagram of the Serial Flash Memory interface.

The QSPI flash memory is controlled by the SPI multi-I/O bus controller (SPIBSC) that is with built-in to the RZ/G2L. This memory supports both single data rate (SDR) and double data rate (DDR) transfers at 66MHz and 50MHz clock frequency.

NOTE

The pull-up resistor on the clock line "RZ_QSPI0_SPCLK" is optional.

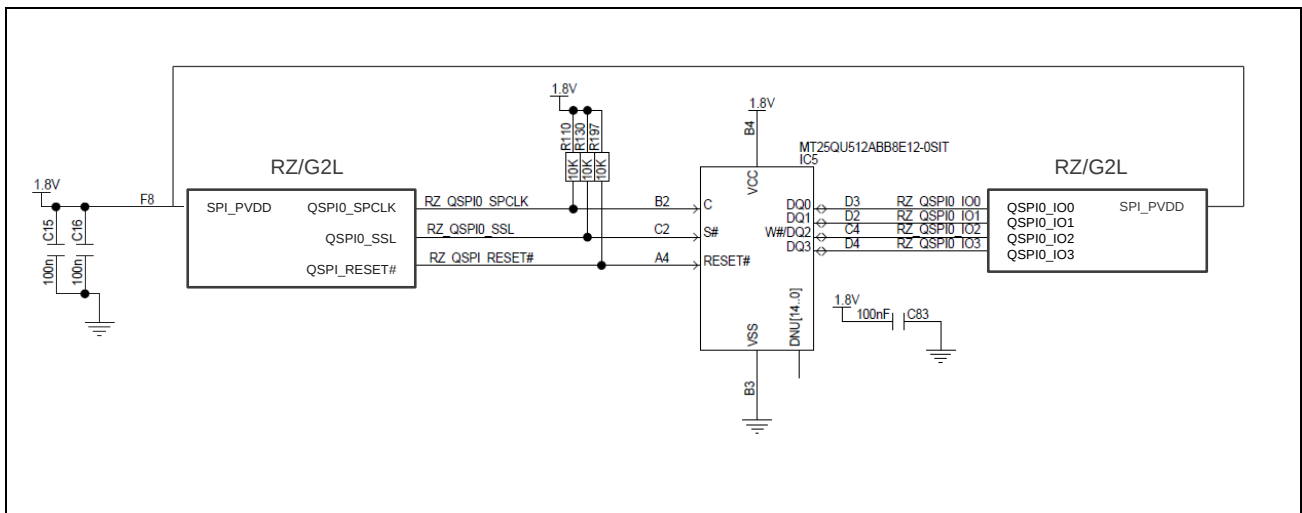


Figure 2.1 Block Diagram of Serial Flash Memory I/F

2.3.2 DDR4 SDRAM

Figure 2.2 shows a block diagram of the DDR4 SDRAM interface.

The DDR4 SDRAM is controlled by the DDD3L/DDR4 SDRAM Memory Controller (MEMC) that is with built-in to the RZ/G2L. This interface supports up to DDR4-1600 SDRAM, a data bus width of 16-bit and inline ECC.

This interface complies with JEDEC STANDARD JESD79-4C.

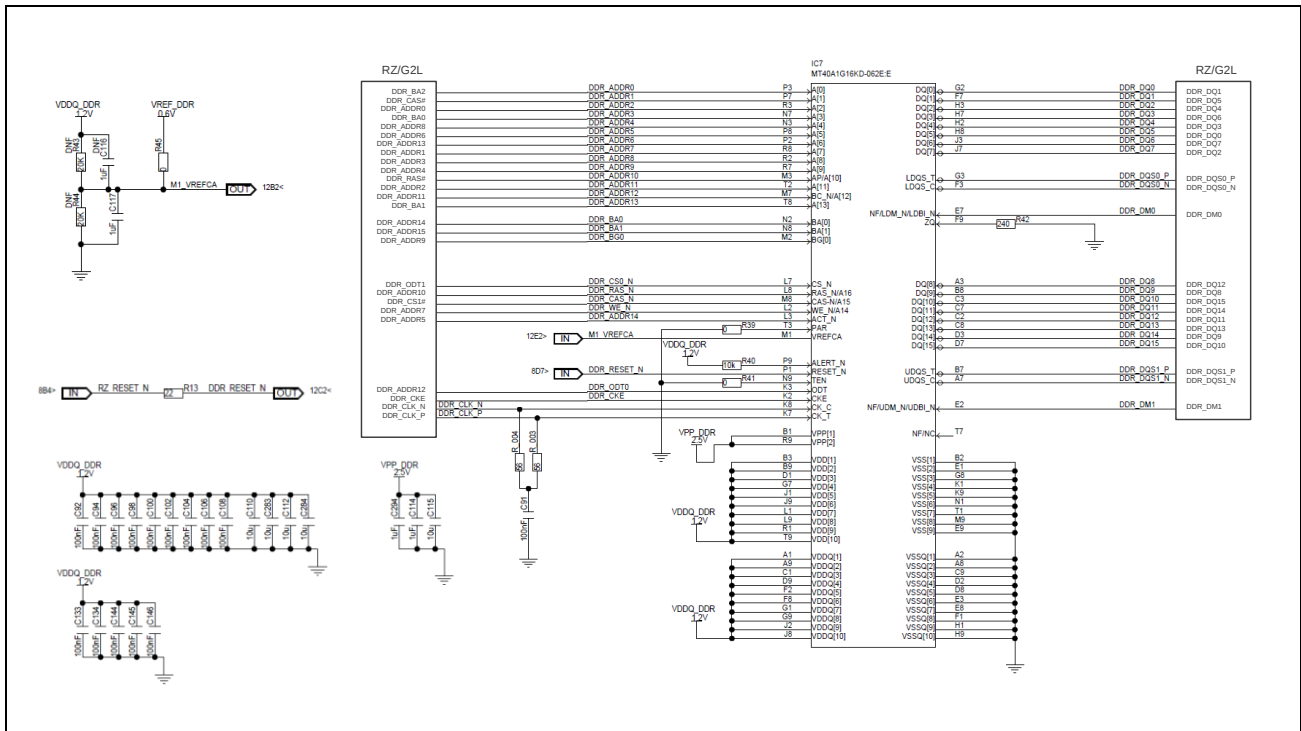


Figure 2.2 Block Diagram of DDR4 SDRAM

2.4 Gigabit Ethernet Interface

Figure 2.3 and **Figure 2.4** show a block diagram of Gigabit Ethernet0 and Ethernet1 interface.

The Gigabit Ethernet Interface is controlled by the Ethernet controller (E-MAC) that conforms to the definition of the MAC (Media Access Control) layer that is built-in to the RZ/G2L. The Ethernet clock is sourced from a clock generator connected to the Ethernet PHY.

This interface complies with IEEE802.3 PHY RGMII.

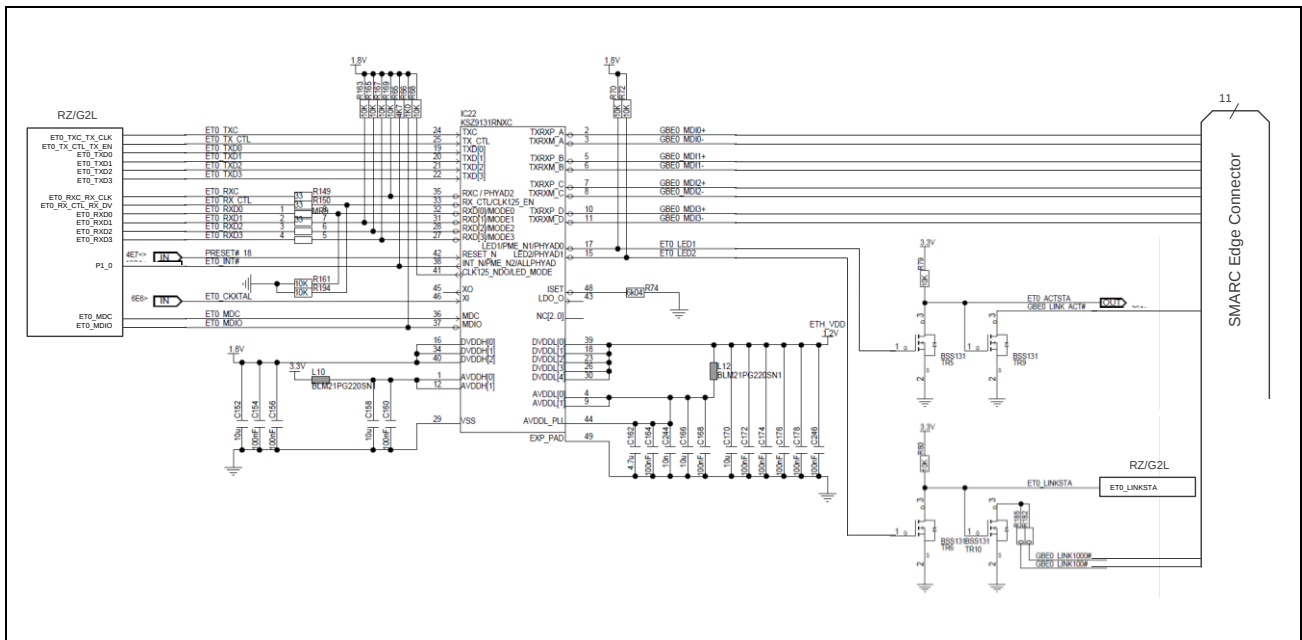


Figure 2.3 Block Diagram of Gigabit Ethernet0 I/F

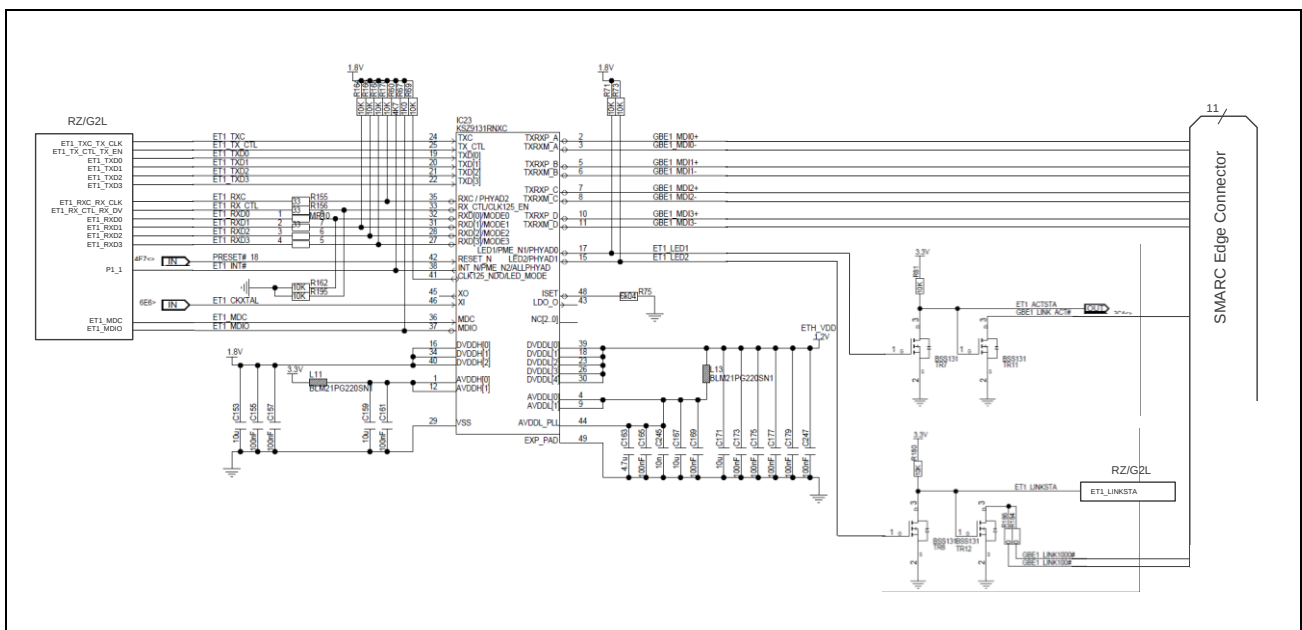


Figure 2.4 Block Diagram of Gigabit Ethernet1 I/F

2.5 ADC Interface

Figure 2.5 shows a block diagram of the ADC interface.

RTK9744L23C01000BE is implemented the 10-pin pin header for connection to the ADC interface. Six input channels can be used.

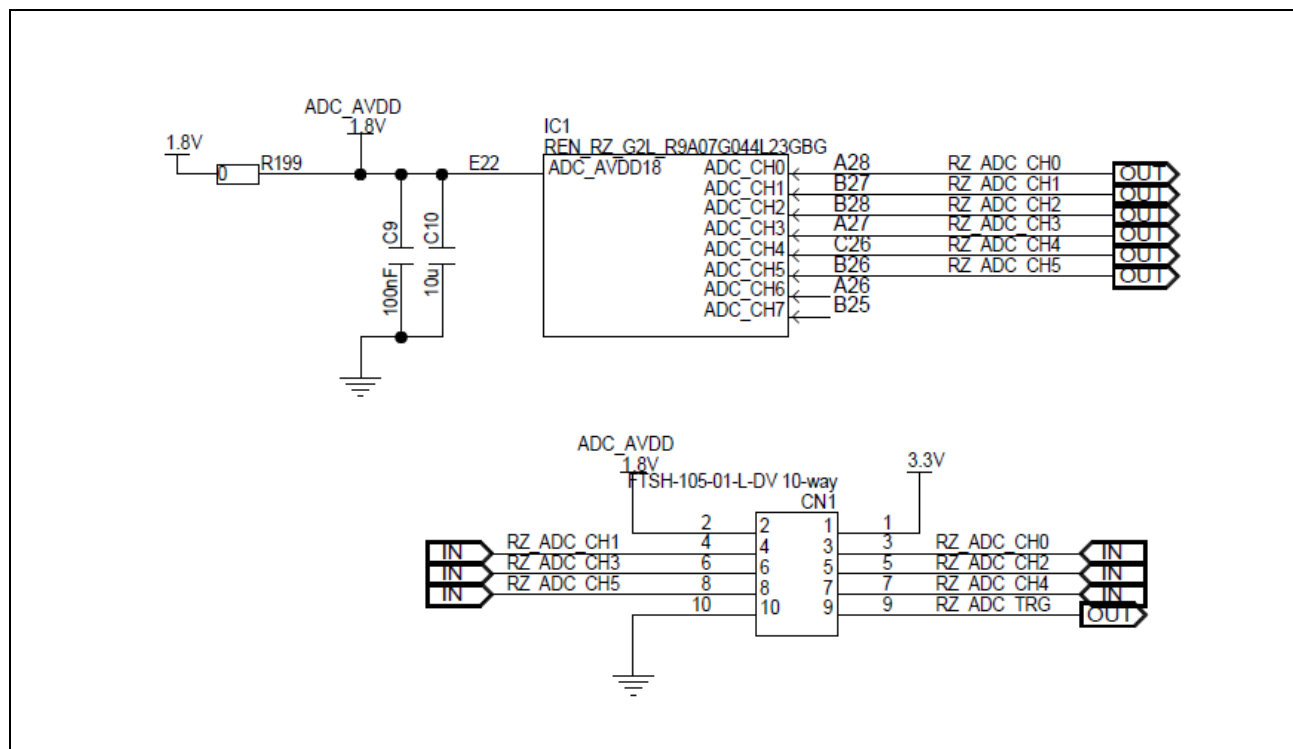


Figure 2.5 Block Diagram of ADC I/F

2.6 Clock Configuration

Figure 2.6 shows a block diagram of the Clock configuration.

NOTE

MIPI-DSI Interface supports operation up to Full HD, 60fps mode.

SD Interface supports UHS-I mode of 50MB/s (SDR50) and 104MB/s (SDR104).

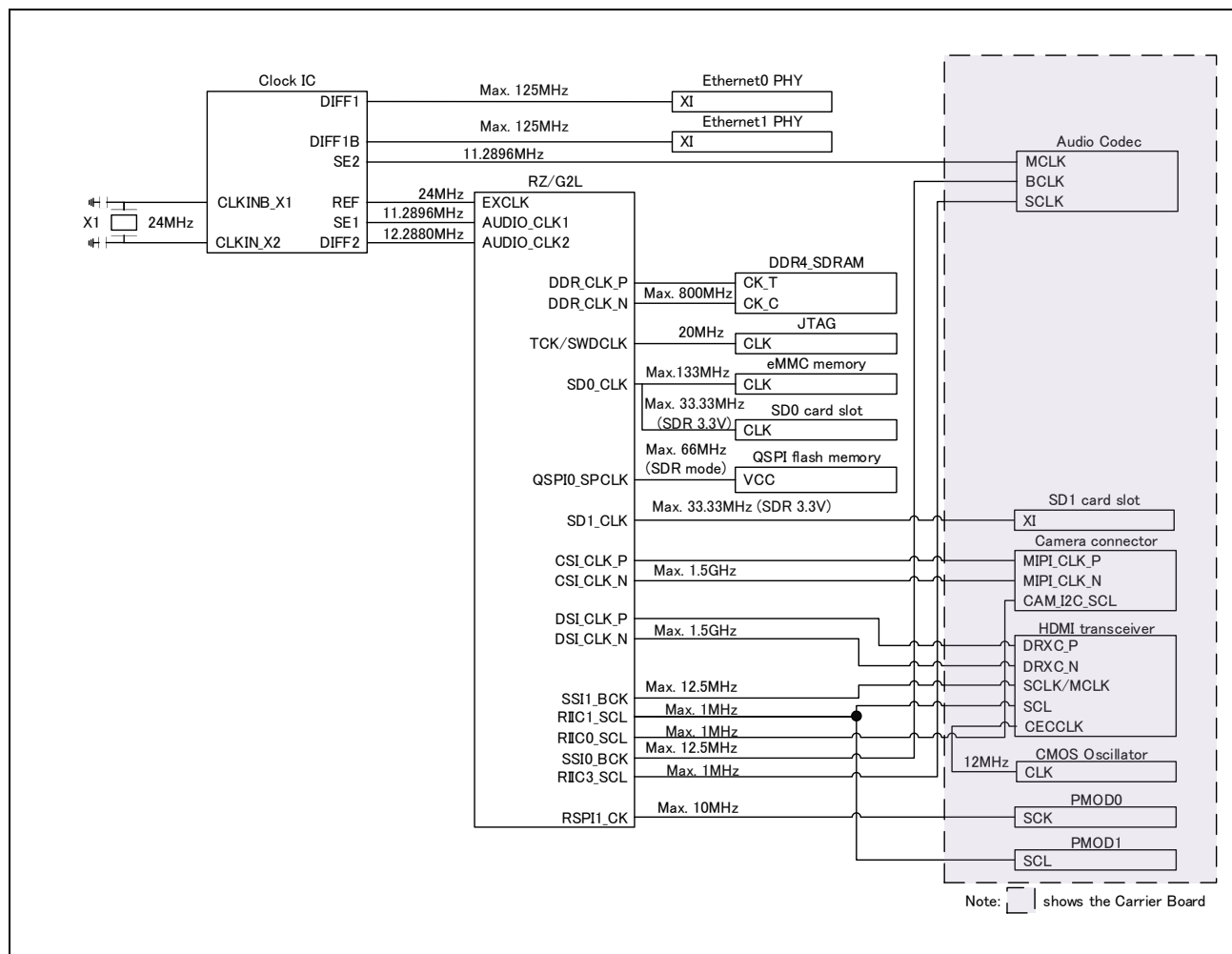


Figure 2.6 Block Diagram of Clock Configuration

2.7 Reset Control

Figure 2.7 shows block diagrams of a reset control for RTK9744L23S01000BE (Evaluation board Kit for RZ/G2L MPU).

For the RTK9744L23C01000BE, the interfaces of DDR4 SDRAM, QSPI flash memory, eMMC memory, Ethernet and Debug are controlled by reset signal from the PMIC.

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

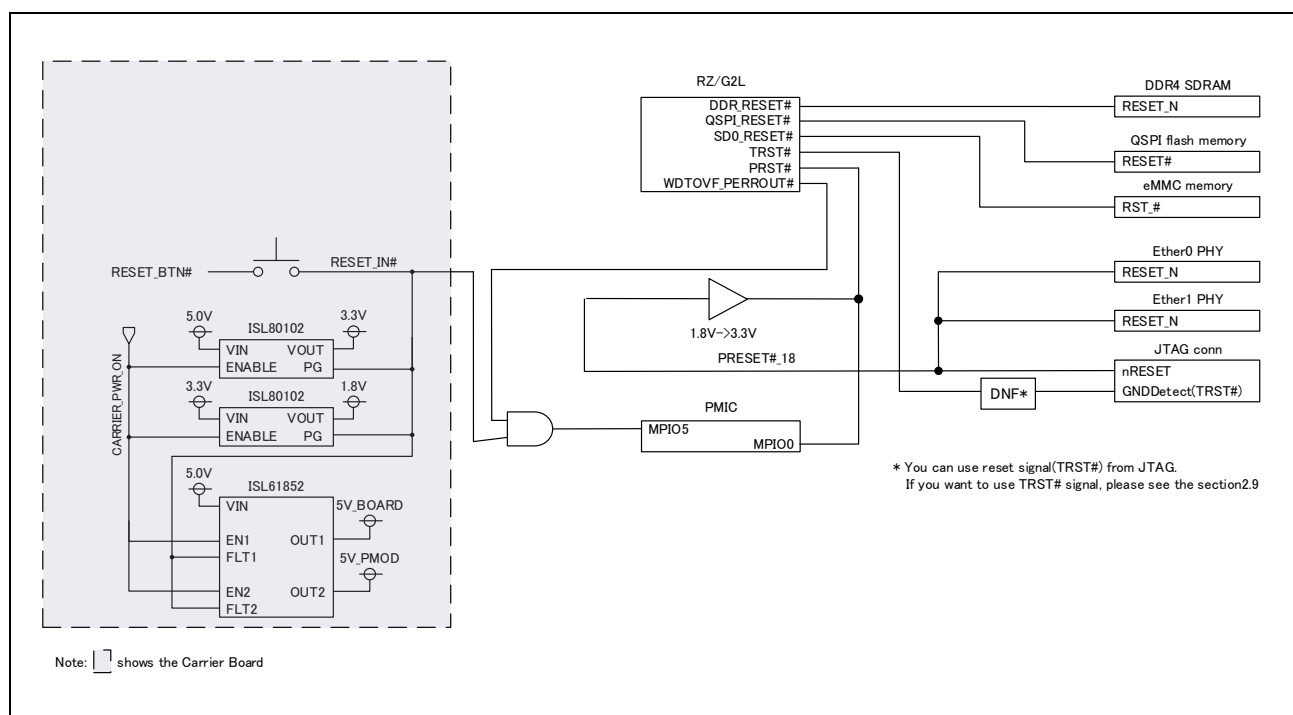


Figure 2.7 Block Diagram of Reset Control

2.8 Power Supply Configuration

Figure 2.8 shows a block diagram of power configuration for RTK9744L23S01000BE (Evaluation board Kit for RZ/G2L MPU).

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

The default setting for controlling the input voltage level is 5V (max 3A input) with SW11-4 is turned on. When the switch is turned off, the input voltage is 9V (max 3A input). Only when RTK9744L23S01000BE is connected to external devices that requires a lot of power and is expected to run out of power, the SW 11-4 is turned off.

The 5V power supply is supplied to the PMIC installed in RTK9744L23C01000BE, and the PMIC generates the power supply voltage for each interface.

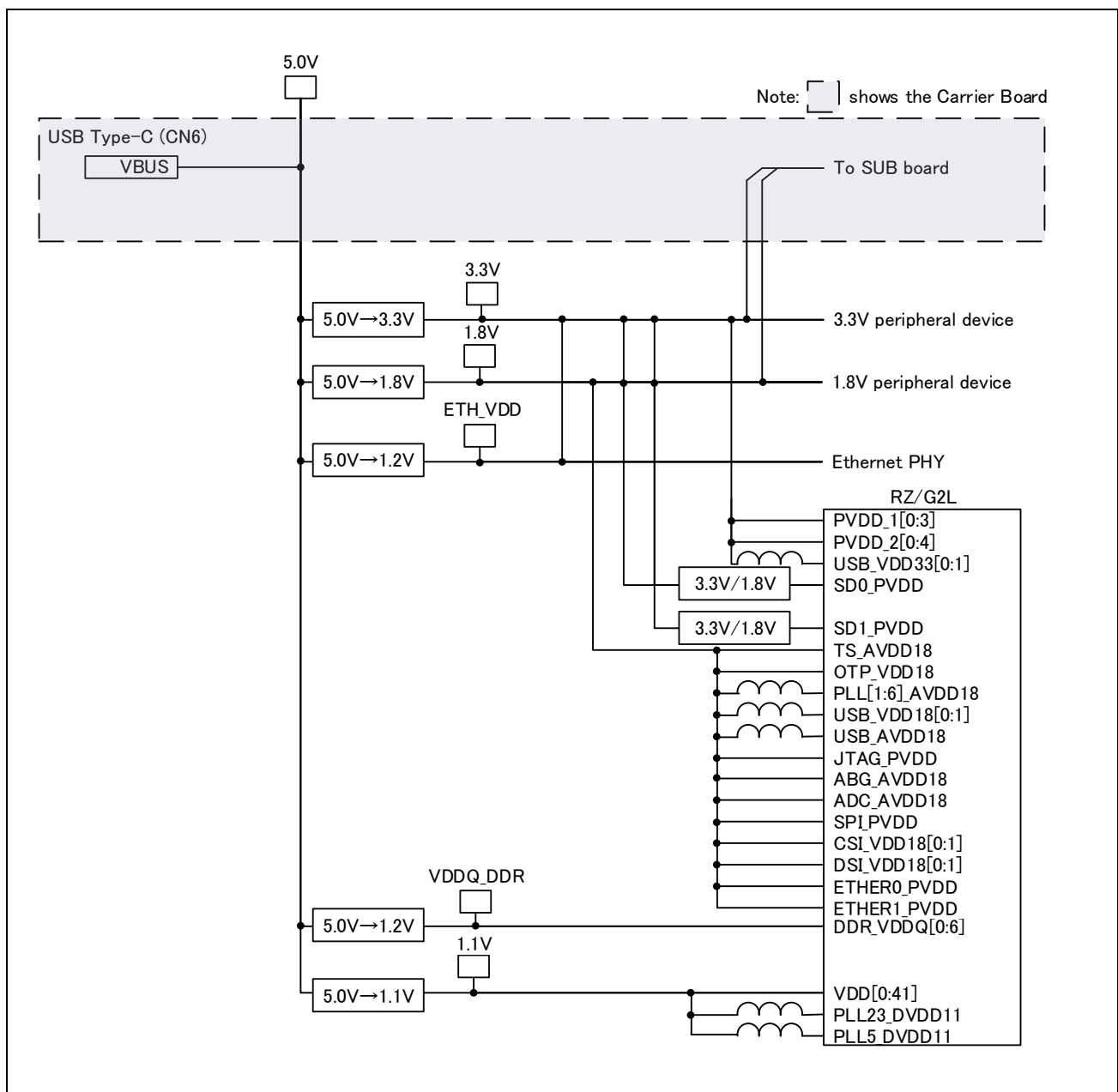


Figure 2.8 Block Diagram of Power Configuration

[illegible]

Figure 2.9 Block Diagrams of Power Regulation

2.9 PMIC

Figure 2.10 shows the RZ/G2L pin assignment for PMIC.

LDO1 and LDO2 output voltage value are fixed by P39_0 and P39_1.

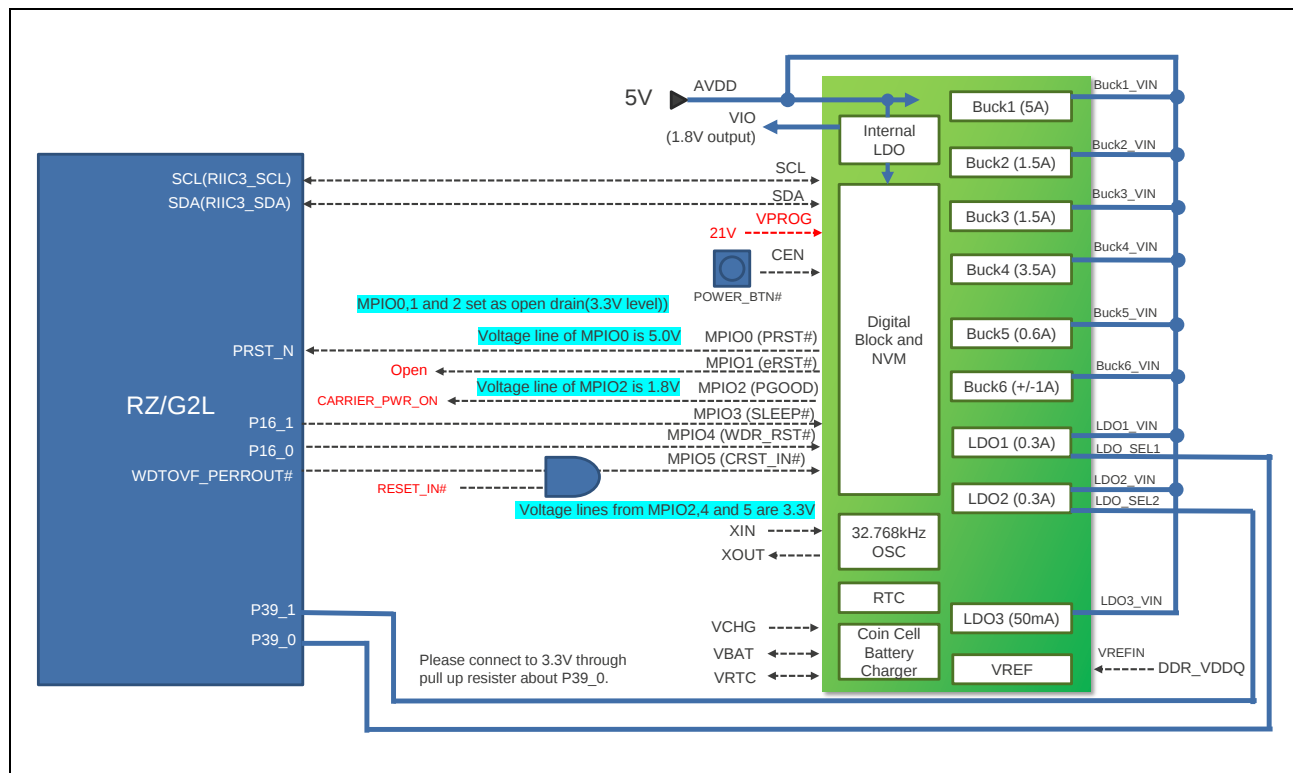


Figure 2.10 Block Diagram around PMIC

2.10 Debug Interface

Figure 2.11 shows a block diagram of debug interface.

This interface supports JTAG and SWD and has debug support for Cortex-A55 and Cortex-M33.

The default operation for the debug interface uses pin 9 as a ground detect, although with resistor (R20) fitting options, it is possible to use this to independently drive the JTAG_TRST#.

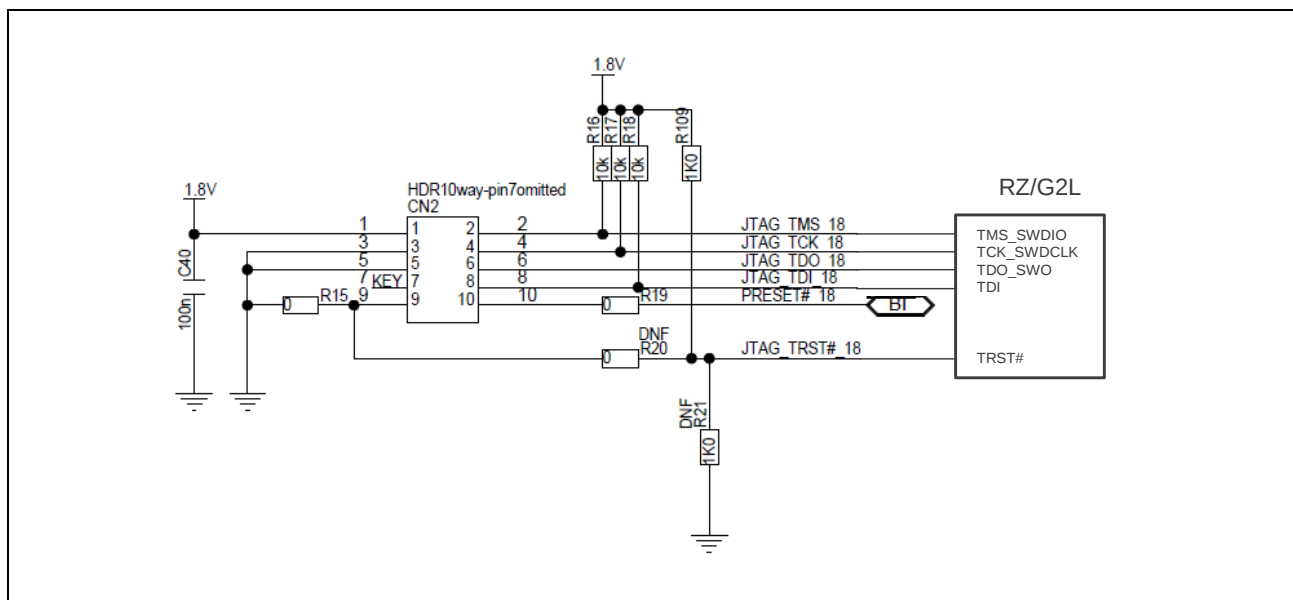


Figure 2.11 Block Diagram of Debug I/F

2.11 SD/MMC Host Interface

2.11.1 eMMC Memory

Figure 2.12 shows a block diagram of the MMC interface.

The eMMC memory is connected to channel0 of SD/MMC interface that is with built-in to the RZ/G2L. This memory is used in conjunction with SD card.

The eMMC memory may be used when

- the SW_SD0_DEV_SEL is enabled (SW1-2: Selection SD/MMC is OFF).

This interface complies with the JEDEC standard version 4.51 and supports HS200 mode.

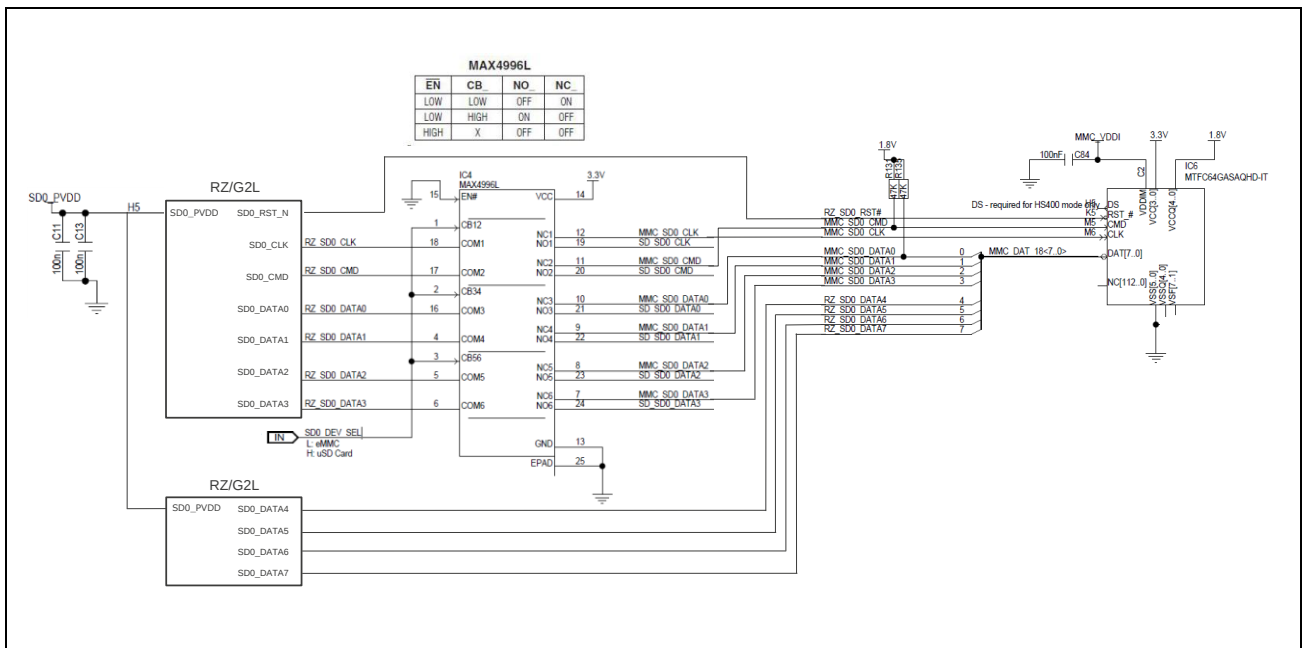


Figure 2.12 Block Diagram of eMMC I/F

2.11.2 SD Card

Figure 2.13 shows a block diagram of the SD0 interface.

The microSD card is connected to channel0 of SD/MMC interface that is with built-in to the RZ/G2L. This memory is used in conjunction with eMMC memory.

The microSD card may be used when

- the microSD is the selected boot mode (SW11-1: ON, SW11-2: ON, SW11-3: OFF)
- the SW_SD0_DEV_SEL is disabled (SW1-2: Selection SD/MMC is ON) and eMMC memory is not the selected boot mode (SW11-1: ON, SW11-2: OFF, SW11-3: OFF).

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

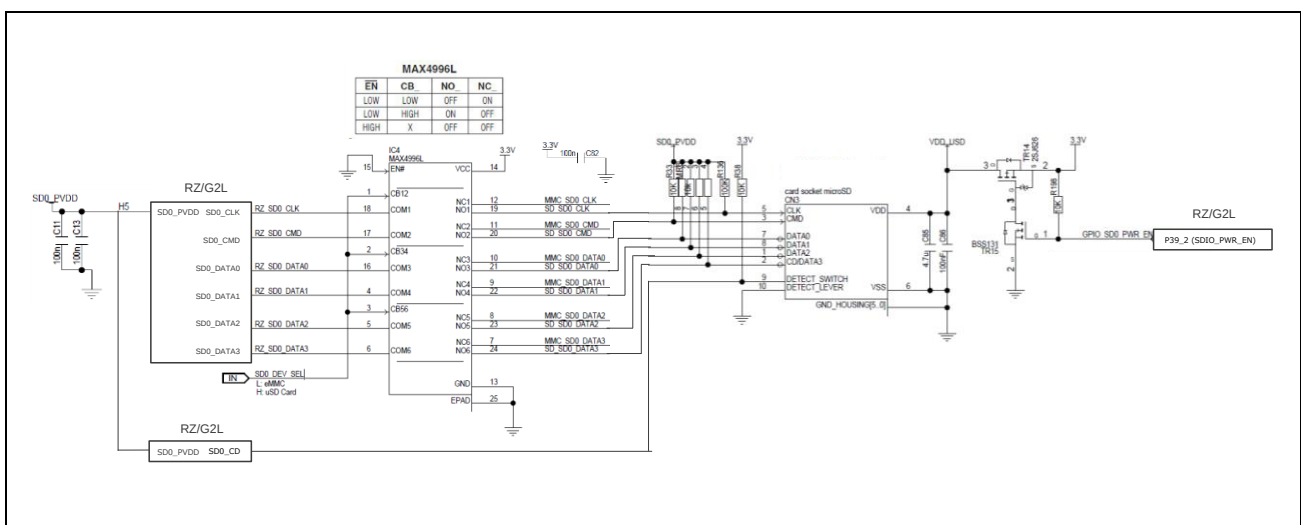


Figure 2.13 Block Diagram of SD0 I/F

3. Operation Specifications

3.1 Overview of Connectors

Figure 3.1 Illustrates the layout of connectors of the RTK9744L23C01000BE.

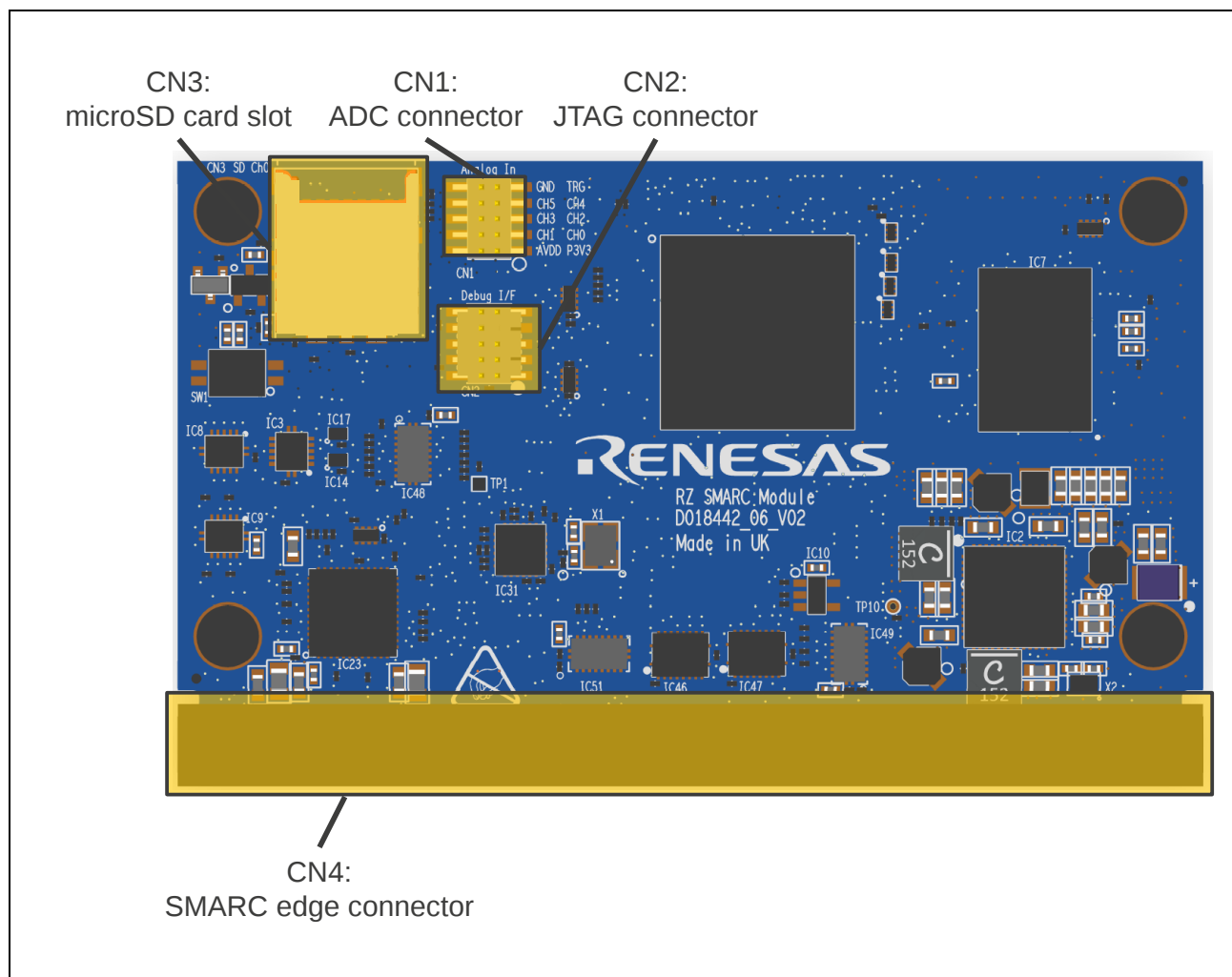


Figure 3.1 Layout of connectors of the RTK9744L23C01000BE (Top side)

3.1.1 ADC Connector (CN1)

RTK9744L23C01000BE contains a connector of ADC interface (CN1).

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

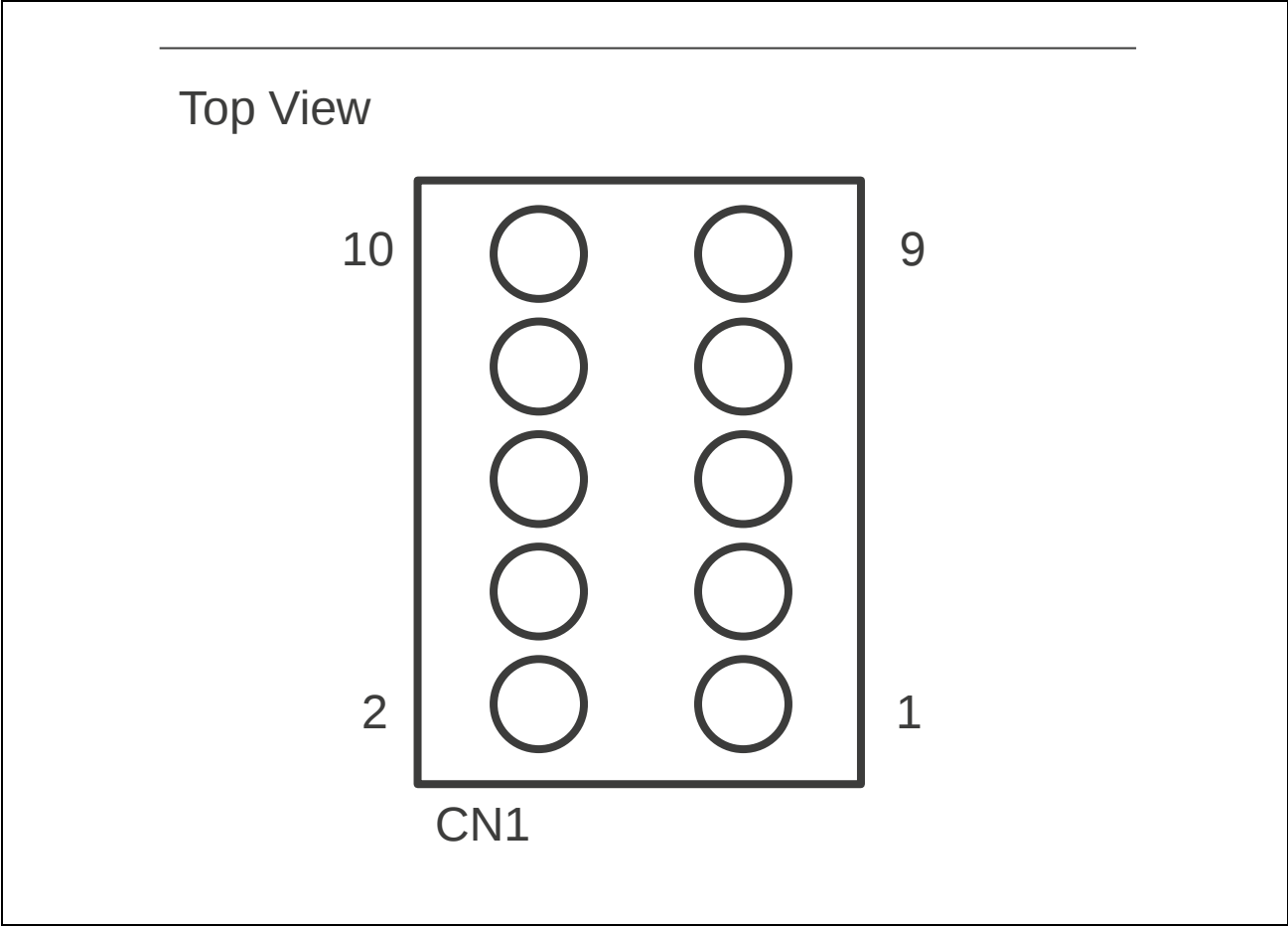


Figure 3.2 ADC Connector (CN1) Pin Layout Diagram

Table 3.1 ADC Connector (CN1) Pin Layout Table

Pin	Signal Name
1	PVDD
2	ADC_AVDD18
3	ADC_CH0
4	ADC_CH1
5	ADC_CH2
6	ADC_CH3
7	ADC_CH4
8	ADC_CH5
9	ADC_TRG
10	VSS

3.1.2 JTAG Connector (CN2)

RTK9744L23C01000BE contains a connector of debug interface (CN2).

Figure 3.3 illustrates the layout of connector pins. Table 3.2 shows the assignment of connector pins.

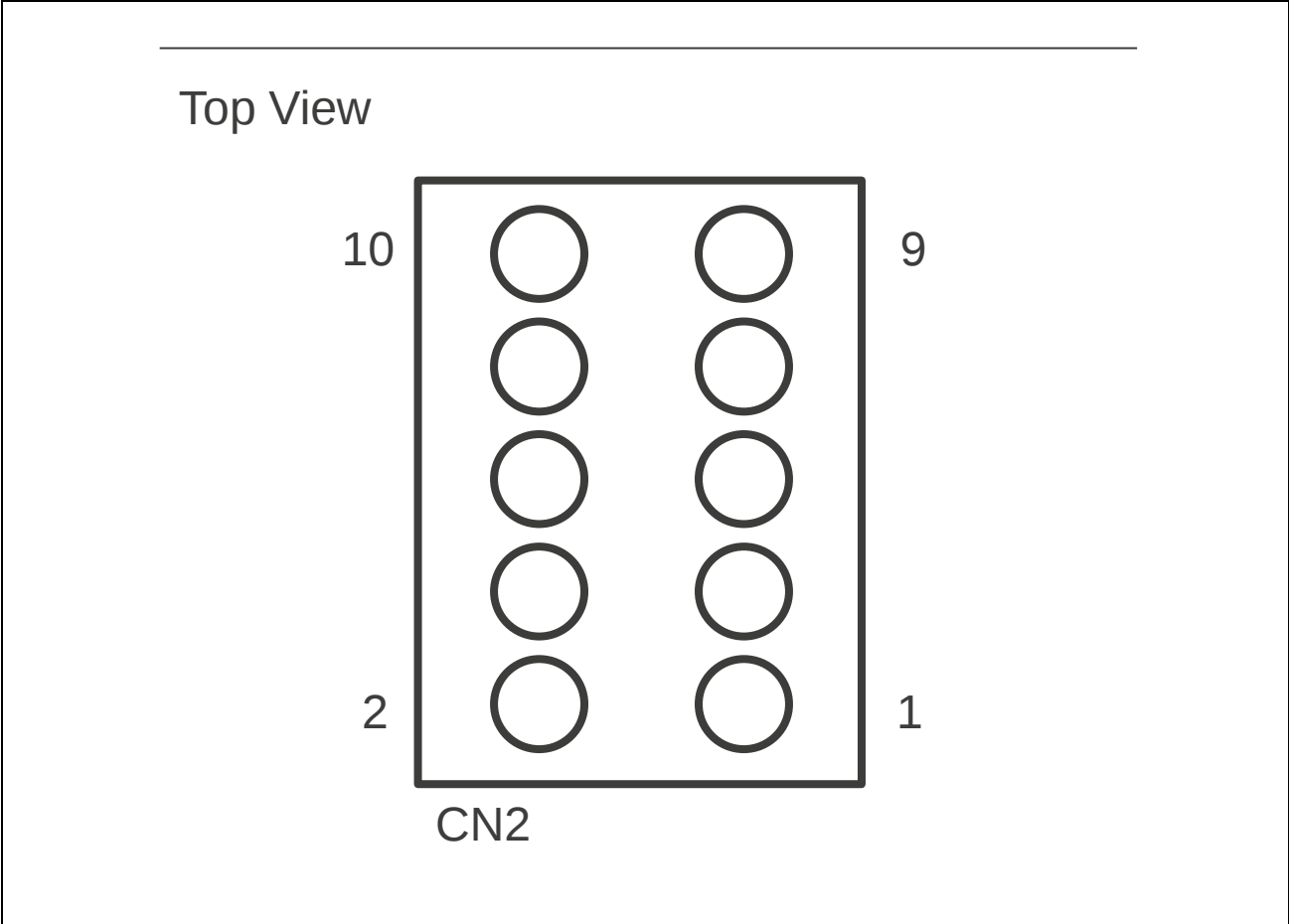


Figure 3.3 JTAG Connector (CN2) Pin Layout Diagram

Table 3.2 JTAG Connector (CN2) Pin Layout Table

Pin	Signal Name
1	PVDD18
2	TMS/SWDIO
3	VSS
4	TCK/SWDCLK
5	VSS
6	TDO
7	—
8	TDI
9	VSS
10	TRST#

3.1.3 **MicroSD Card Slot (CN3)**

RTK9744L23C01000BE contains a microSD card slot (CN3).

Figure 3.4 illustrates the layout of microSD card slot pins. **Table 3.3** shows the assignment of microSD card slot pins.

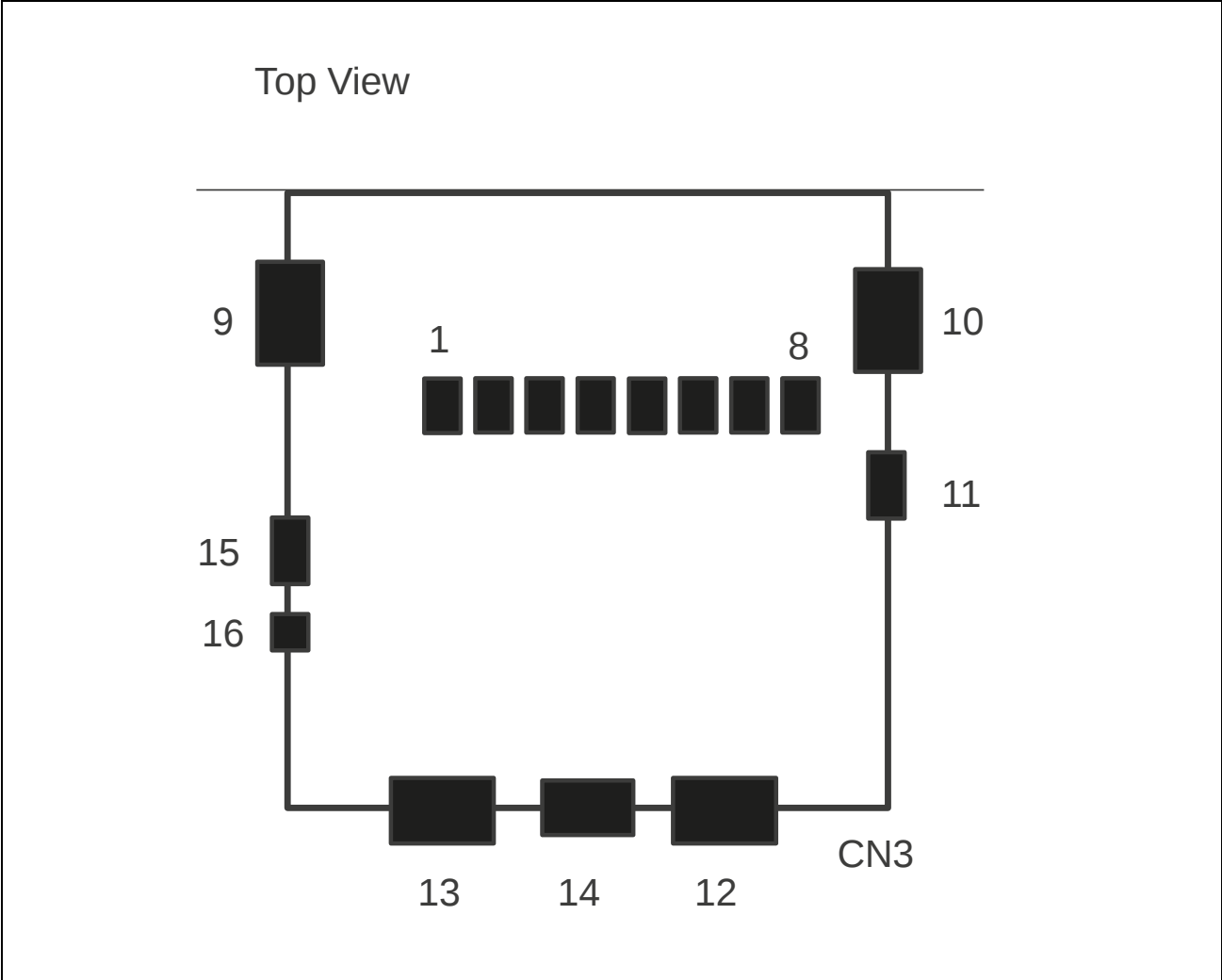


Figure 3.4 microSD Card Slot (CN3) Pin Layout Diagram

Table 3.3 microSD Card Slot (CN3) Pin Layout Table

Pin	Signal Name
1	SD0_DATA2
2	CD/SD0_DATA3
3	SD0_CMD
4	SD0_PVDD
5	SD0_CLK
6	VSS
7	SD0_DATA0
8	SD0_DATA1
9	DETECT_SWITCH
10	DETECT_LEVER

3.1.4 SMARC edge Connector (CN4)

RTK9744L23C01000BE can be connected to an external expansion board through the Carrier board connecting connector (CN4).

Figure 3.5 illustrates the layout of Carrier board connecting connector pins. For the assignment of Carrier board connecting connector pins, please refer to the section4 “MODULE PIN-OUT MAP” of the document “SMARC module 2.1 Specification (sget.org)”.

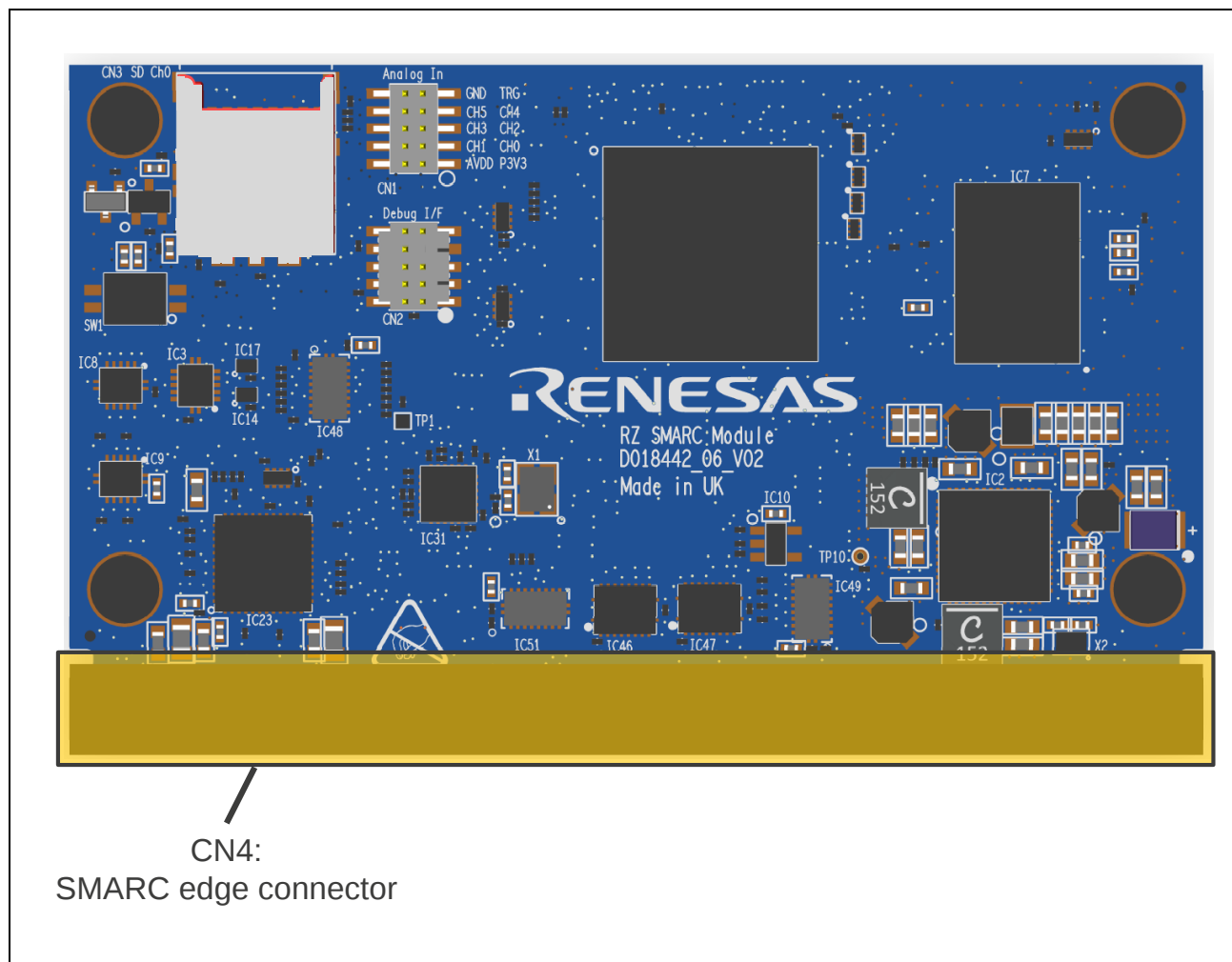


Figure 3.5 Layout of Carrier Board Connecting Pins

3.2 Layout of Operation Components

Figure 3.6 illustrates the layout of operation components of the RTK9744L23C01000BE.

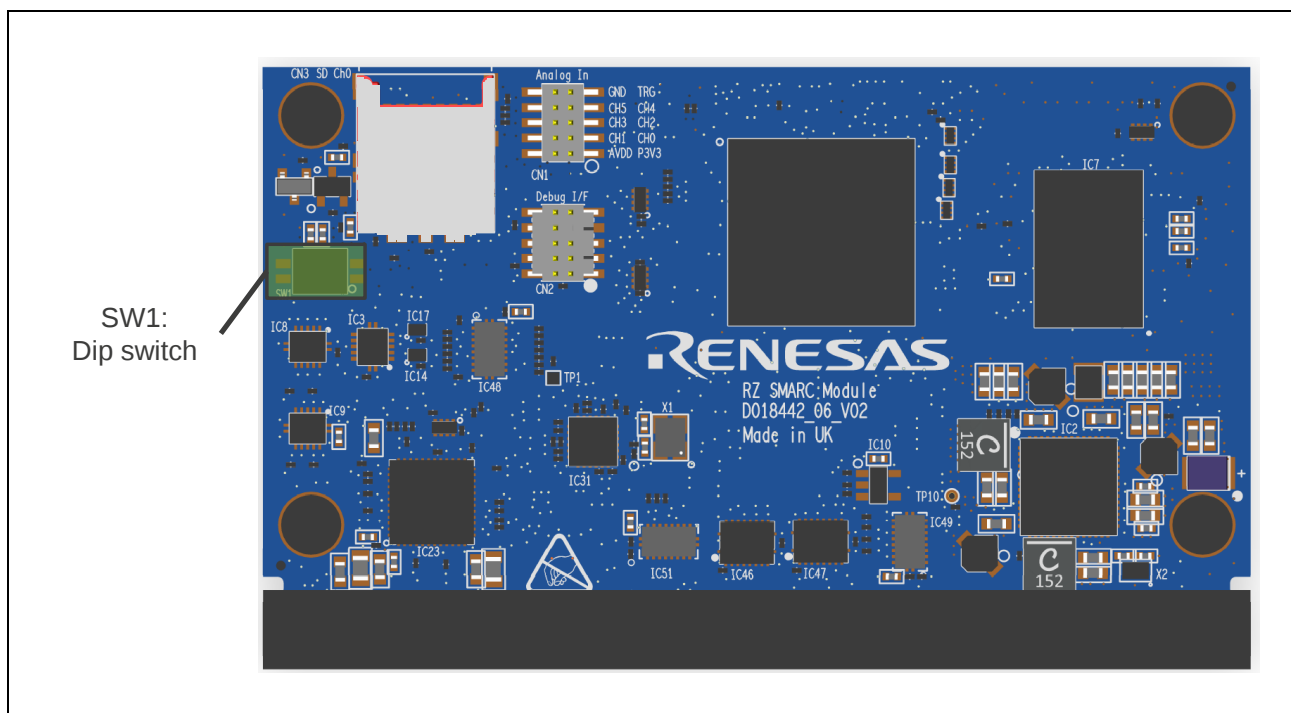


Figure 3.6 Layout of Operation Components of the RTK9744L23C01000BE

3.2.1 Functions of Switches and Mode Terminals

RTK9744L23C01000BE contains one switch.

Table 3.4 lists mounted switches. Figure 3.7 shows a block diagram of the System Setting interface.

Table 3.4 Switches Mounted on RTK9744L23C01000BE

No.	Function	Note
SW1	System setting DIP switch	For details, see Table 3.5

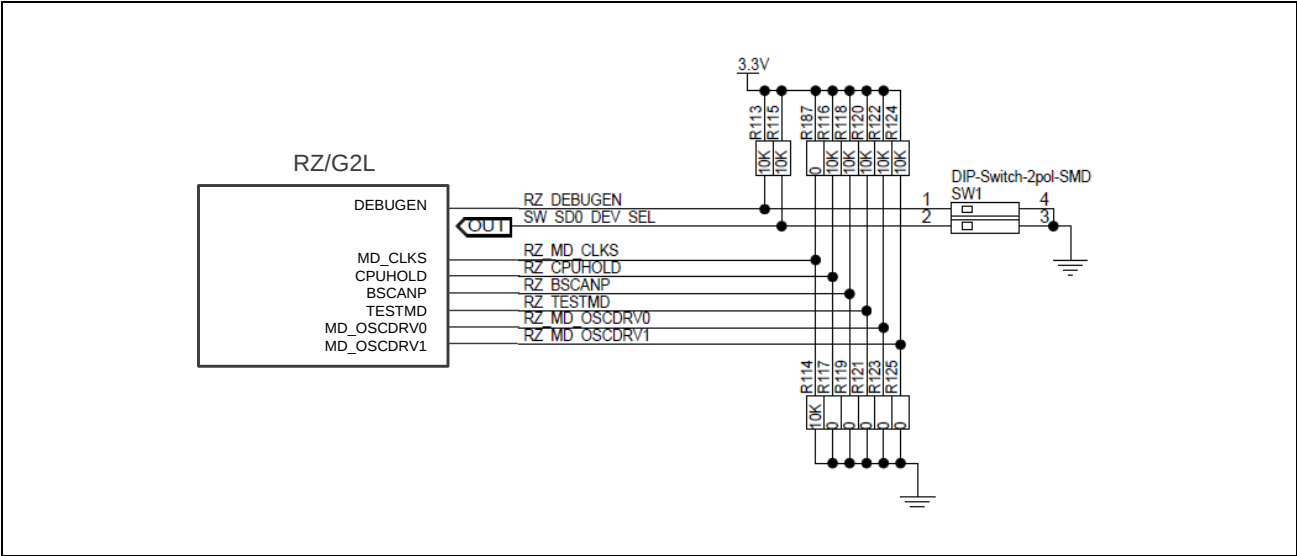


Figure 3.7 Block Diagram of System Setting I/F

Table 3.5 provides functions of the DIP switch and **Figure 3.8** indicates a default terminal state.

Table 3.5 Functions of System Setting DIP Switch (SW1)

No.	Setting	Function
SW1-1 DEBUGEN	OFF DEBUGEN="H"	Debugging with debuggers for ARM
	ON DEBUGEN="L"	Normal operation
SW1-2 Selection SD/MMC	OFF Selection="H"	Select the eMMC memory
	ON Selection="L"	Select the SD card

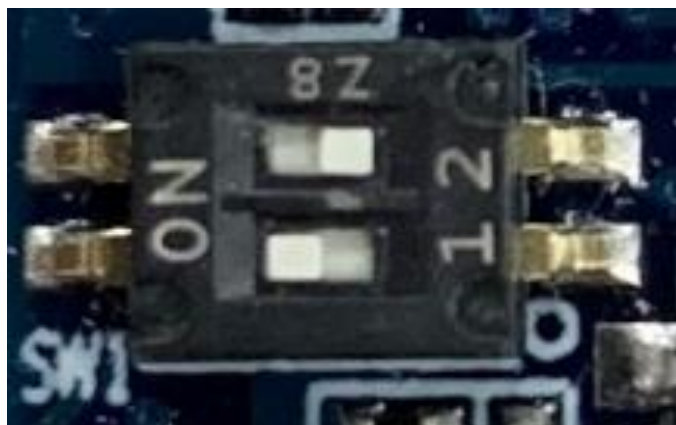


Figure 3.8 Default Setting of System Setting DIP Switch (SW1)

Table 3.6 provides functions of mode terminals.

Table 3.6 Functions of System Setting

No.	Setting	Function
MD_CLKS	0 MD_CLKS="H"	SSCG ON
	1 MD_CLKS="L"	SSCG OFF
BSCANP	0 BSCANP="H"	Select the eMMC memory
	1 BSCANP="L"	Select the SD card
MD_OSCDRV0	0 MD_OSCDRV0="H"	Not supported
	1 MD_OSCDRV0="L"	
MD_OSCDRV1	0 MD_OSCDRV1="H"	Not supported
	1 MD_OSCDRV1="L"	

4. Appendix

4.1 Type Name and Features of Each Board

This section describes the the type name and feature of each board here.

The SMARC Module Board is as follows. This picture is of the RTK9744L23C01000BE.



Figure 4.1 Top View of the SMARC Module Board

Please refer to the chapter 2 “Functional Specifications” onwards for the actual functions of the board.

Board Name	Type Name	MPU
RZ/G2L SMARC Module Board	RTK9744L23C01000BE	RZ/G2L (R9A07G044L23GBG)

The RZ SMARC Series Carrier Board is as follows. This picture is of the RTK97X4XXXB00000BE.



Figure 4.2 Top View of the RZ SMARC Series Carrier Board

Board Name	Type Name
RZ SMARC Series Carrier Board	RTK97X4XXXB00000BE

The Evaluation board Kit is as follows. This board consists of the SMARC Module Board and the RZ SMARC Series Carrier Board via a 314-pin 0.5-mm pitch connector. This picture is of the RTK9744L23S01000BE.

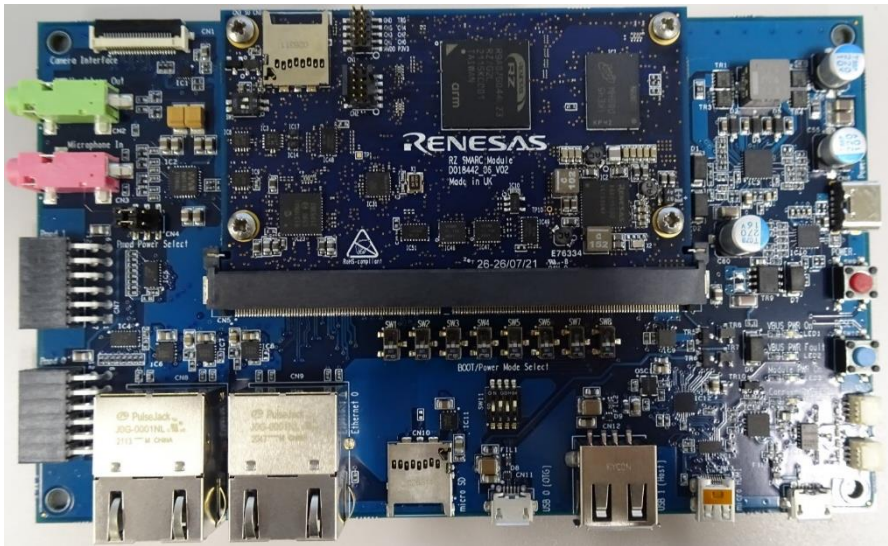


Figure 4.3 Top View of the Evaluation board Kit

The Evaluation board Kits are similarly designed to use a common board layout and to be pin-compatible.

Board Name	Type Name	MPU
Evaluation board Kit for RZ/G2L MPU	RTK9744L23S01000BE	RZ/G2L (R9A07G044L23GBG)

4.2 How to Identify Each SMARC Module Board

The differences between each SMARC Module Board are as follows. This picture is of the RTK9744L23C01000BE.

Table 4.1 Comparison of the RTK9744L23C01000BE and the RTK9754L23C01000BE

Type Name	RTK9744L23C01000BE	RTK9754L23C01000BE
IC1	RZ/G2L (R9A07G044L23GBG)	RZ/V2L (R9A07G054L23GBG)

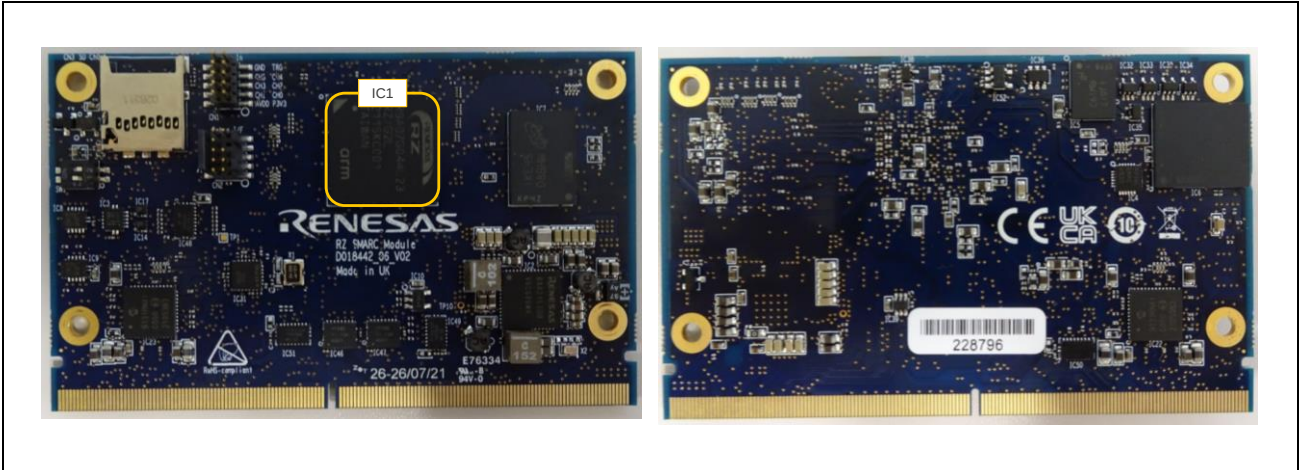


Figure 4.4 Comparison of Each SMARC Module Board

4.3 How to replace the SMARC Module Board

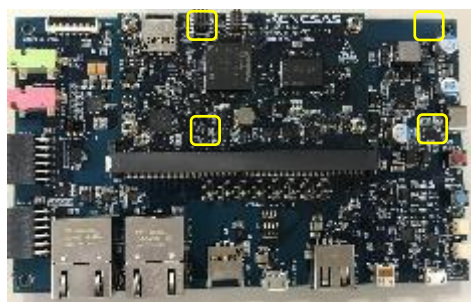
Please be careful when replacing the board as follows.

1. Remove the four screws.

NOTE

The screw thread is a special shape, so be careful not to crush the screw thread.

Please recommend to prepare a torx screwdriver which is a "T6" head size.



Specially shaped screw threads

Figure 4.5 How to remove the screws

2. Remove the screw and the SMARC Module Board will stand up at an angle. Slide it out.

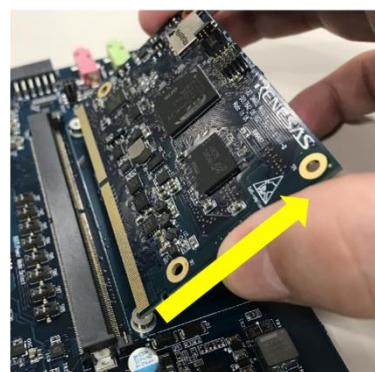


Figure 4.6 How to remove the SMARC Module Board

3. Insert the replacement the SMARC Module Board diagonally, then roll the board parallel to the RZ SMARC Series Carrier Board and fix it with screws.

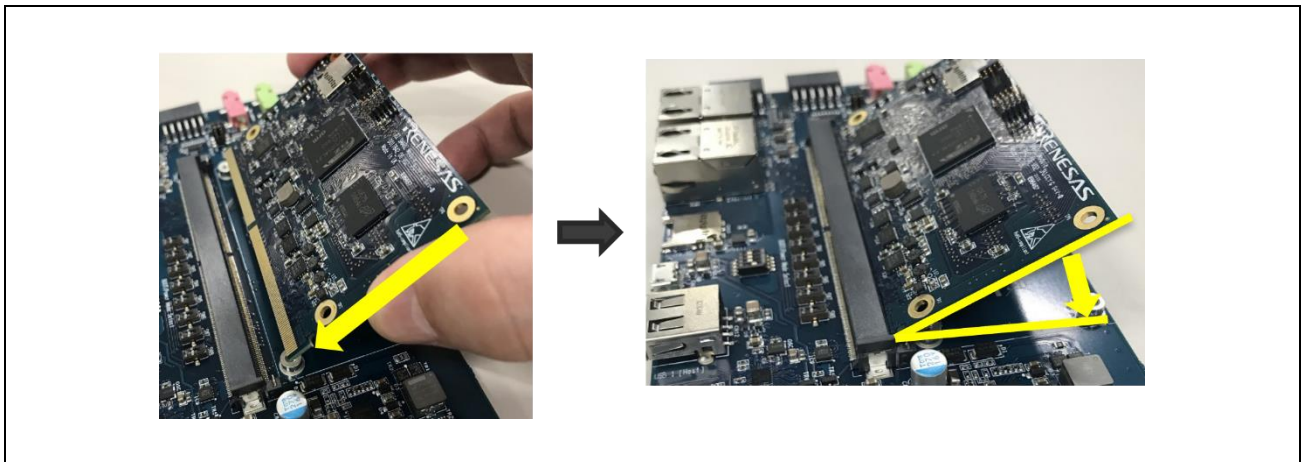


Figure 4.7 How to install the SMARC Module Board

REVISION HISTORY	RZ Family / RZ/G, RZ/V Series RZ/G2L, RZ/V2L SMARC Module Board
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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/G2L SMARC Module Board RTK9744L23C01000BE" to "RZ/G2L, RZ/V2L SMARC Module Board". It is changed the description from "RZ Family / RZ/G Series" to "RZ Family / RZ/G, RZ/V Series". It is added the description "RTK9754L23C01000BE".
		7	For Title, it is changed the description from "RZ Family / RZ/G Series RZ/G2L SMARC Module Board RTK9744L23C01000BE" to "RZ Family / RZ/G, RZ/V Series RZ/G2L, RZ/V2L SMARC Module Board". For section "Overview", it is added the description "To begin with, only RTK9744L23C01000BE will be explained here. The difference between RTK9744L23C01000BE and RTK9754L23C01000BE is that RTK9754L23C01000BE uses Renesas Electronics microprocessor RZ/V2L "R9A07G054L23GBG", which is pin-compatible with RZ/G2L. In other words, they are functionally the same".
		60	For Revision History, it is changed the description from "RZ Family / RZ/G Series RZ/G2L SMARC Module Board RTK9744L23C01000BE" to "RZ Family / RZ/G, RZ/V Series RZ/G2L, RZ/V2L SMARC Module Board".
		62	For back cover, it is changed the description from "RZ Family / RZ/G Series" to "RZ Family / RZ/G, RZ/V Series".
1.02	Apr 26, 2022	8, 11 to 14, 52 to 57	For each figure, the figure style has been improved.
		10	For section title, it is changed the description from "Outside View" to "Physical View". Figure 1.2 is modified.
		15	For Table 1.2 and Table 1.3, the Recommend Optional Parts is removed.
		40, 42, 49 to 51	For each interface, the description is added.
		41	For DDR4 SDRAM, the description is added. For Figure 2.2, the pin swap is modified.
		60 to 64	Section 4 Appendix is added.
1.10	Dec 09, 2022	23, 39	Restrictions on use are added. When used in combination with the RZ SMARC Series Carrier Board (P/N: RTR97X4XXXB00000BE), CAN0 and CAN1 interface cannot be used because a CAN transceiver is not fitted on the RTK97X4XXXB00000BE.

RZ Family / RZ/G, RZ/V Series User's Manual: Hardware

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 Rev.1.10 Dec 09, 2022

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RZ Family / RZ/G, RZ/V Series

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