

RX65N/RX651 Group RX210 Group

R01AN4841EJ0100

Rev.1.00

Points of Difference Between RX651 Group and RX210 Group

Sep 21, 2018

Introduction

This application note is intended as a reference for confirming the points of difference between the overview of functions, the I/O registers, the pin functions of the RX651 Group and RX210 Group, and notes on migration.

Unless specifically otherwise noted, the information in this application note applies to the 144-/145-pin package version of the RX651 Group and the 144-/145-pin package (chip version B) version of the RX210 Group. To confirm details of differences in the specifications of the electrical characteristics, usage notes, and setting procedures, refer to the user's manuals of the products in question.

Target Devices

- RX651 Group (products with code flash memory capacity of 1 MB or less)
- RX210 Group

Note: Products with code flash memory capacity exceeding 1.5 MB are not included in the comparison.

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1. Comparison of Functions of RX651 Group and RX210 Group

A comparison of the functions of the RX651 Group and RX210 Group is provided below. For details of the functions, see section 2, Comparative Overview of Functions and section 5, Reference Documents.

Table 1.1 is a Comparison of Functions of RX651 and RX210.

Table 1.1 Comparison of Functions of RX651 and RX210

Function	RX210	RX651
CPU	△	
Operating modes	△	
Reset	○	
Option Setting Memory	△	
Voltage Detection Circuit (LVDA)	△	
Clock Generation Circuit	△	
Clock Accuracy Measurement Circuit (CAC)	△	
Low Power Consumption	△	
Battery Backup Function	×	○
Register Write Protection Function	△	
Exception Handling	△	
Interrupt Controller (ICUa): RX210, (ICUB): RX651	△	
Buses	△	
Memory Protection unit (MPU)	×	○
DMA Controller (DMACA): RX210, (DMACa): RX651	△	
EXDMA Controller (EXDMACa)	×	○
Data Transfer Controller (DTCa): RX210, (DTCb): RX651	△	
Event Link Controller (ELC)	△	
I/O Ports	△	
Multi Function Pin Controller (MPC)	△	
Multi-Function Timer Pulse Unit 2 (MTU2a)	○	×
Multi-Function Timer Pulse Unit 3 (MTU3a)	×	○
Port Output Enable 2 (POE2a)	○	×
Port Output Enable 3 (POE3a)	×	○
16-Bit Timer Pulse Unit (TPUa)	△	
Programmable Pulse Generator (PPG)	×	○
8-Bit Timer (TMR)	△	
Compare Match Timer (CMT)	○	
Compare Match Timer W (CMTW)	×	○
Real Time Clock (RTCb): RX210, (RTCd): RX651	△	
Watchdog Timer (WDTA)	△	
Independent Watchdog Timer (IWDTa)	△	
USB2.0 FSHost/Function Module (USBb)	×	○
Serial Communication Interface (SCIc, SCId): RX210	△	
Serial Communication Interface (SCIg, SCli, SCIh): RX651		
I²C-bus Interface (RIIC): RX210, (RIICa): RX651	△	
CAN Module (CAN)	×	○
Serial Peripheral Interface (RSPI): RX210, (RSPIc): RX651	△	
Quad Serial Peripheral Interface (QSPI)	×	○
CRC Calculator (CRC): RX210, (CRCA): RX651	△	
SD Host Interface (SDHI)	×	○
SD Slave Interface (SDSI)	×	○
Multi Media Card Interface (MMCIF)	×	○

Function	RX210	RX651
Parallel Data Capture Unit (PDC)	×	○
Boundary Scan	×	○
AESa	×	○
RNGa	×	○
12-bit A/D Converter (S12ADb): RX210, (S12ADFa): RX651	△	
D/A Converter (DA): RX210, 12-bit D/A Converter (R12DA): RX651	△	
Temperature Sensor (TMPSa): RX210, (TMPS): RX651	△	
Comparator A (CMPA)	○	×
Comparator B (CMPB)	○	×
Data Operation Circuit (DOC)	△	
RAM	△	
Standby RAM	×	○
Flash Memory (Code Flash)	△	
Flash Memory (E2 Data Flash)	○	×

Note: ○: Function implemented, ×: Function not implemented, △: Differences exist between implementation of function on RX210 and RX651.

2. Comparative Overview of Functions

2.1 CPU

Table 2.1 shows a Comparative Listing of CPU Specifications, and Table 2.2 shows a Comparative Listing of CPU Registers.

Table 2.1 Comparative Listing of CPU Specifications

Item	RX210	RX651
CPU	- Maximum operating frequency: 50 MHz 32-bit RX CPU - Minimum instruction execution time: One instruction per state (cycle of the system clock) - Address space: 4-Gbyte linear - Register set of the CPU General purpose: Sixteen 32-bit registers Control: Eight 32-bit registers Accumulator: One 64-bit register - Basic instructions: 73 - DSP instructions: 9 - Addressing modes: 10 - Data arrangement Instructions: Little endian Data: Selectable as little endian or big endian - On-chip 32-bit multiplier: 32 x 32 → 64 bits - On-chip divider: 32 / 32 → 32 bits - Barrel shifter: 32 bits	- Maximum operating frequency: 120 MHz 32-bit RX CPU (RXv2) - Minimum instruction execution time: One instruction per state (cycle of the system clock) - Address space: 4-Gbyte linear - Register set of the CPU General purpose: Sixteen 32-bit registers Control: Ten 32-bit registers Accumulator: Two 72-bit registers - Basic instructions: 75 Floating-point instructions: 11 - DSP instructions: 23 - Addressing modes: 11 - Data arrangement Instructions: Little endian Data: Selectable as little endian or big endian - On-chip 32-bit multiplier: 32 x 32 → 64 bits - On-chip divider: 32 / 32 → 32 bits - Barrel shifter: 32 bits Memory protection unit (MPU) Single precision (32-bit) floating point Data types and floating-point exceptions in conformance with the IEEE754 standard
FPU		

Table 2.2 Comparative Listing of CPU Registers

Register	Bit	RX210	RX651
FPSW	—	—	Floating-point Status Word
EXTB	—	—	Exception Table Register
ACC		ACC: 64-bits (DSP, multiply and multiply-and-accumulate)	ACC0: 72-bits (DSP, multiply and multiply-and-accumulate) ACC1: 72-bits (DSP)

2.2 Operating Modes

Table 2.3 shows a Comparative Listing of Operating Modes Specifications, and Table 2.4 shows a Comparative Listing of Operating Modes Registers.

Table 2.3 Comparative Listing of Operating Modes Specifications

Item	RX210	RX651
Operating modes specified by mode setting pins	Single-chip mode	Single-chip mode
	Boot mode	Boot mode (SCI interface)
	—	Boot mode (USB interface)
	User boot mode	—
Operating modes specified by register settings	—	Boot mode (FINE interface)
	Single-chip mode	Single-chip mode
	User boot mode	—
	On-chip ROM disabled extended mode	On-chip ROM disabled extended mode
	On-chip ROM enabled extended mode	On-chip ROM enabled extended mode

Table 2.4 Comparative Listing of Operating Modes Registers

Register	Bit	RX210	RX651
MDSR	—	Mode Status Register	—
SYSCR1	SBYRAME	—	Standby RAM Enable (b7)
		The Value after reset is different.	

2.3 Option-Setting Memory

Table 2.5 shows a Comparative Listing of Option-Setting Memory Registers.

Table 2.5 Comparative Listing of Option-Setting Memory Registers

Register	Bit	RX210	RX651
SPCC	—	—	Serial Programmer Command Control Register
OSIS	—	—	OCD/Serial Programmer ID Setting Register
OFS0	IWDTCKS[3:0]	IWDT Clock Frequency Division Ratio Select	IWDT- Dedicated Clock Frequency Division Ratio Select
	IWDRSTIRQS	IWDT Reset Interrupt Request Select	IWDT Reset Interrupt Request Select
		0: Non-maskable interrupt request is enabled	0: Non-maskable interrupt request or plain interrupt request is enabled
		1: Reset is enabled	1: Reset is enabled
	WDRSTIRQS	WDT Reset Interrupt Request Select	WDT Reset Interrupt Request Select
		0: Non-maskable interrupt request is enabled	0: Non-maskable interrupt request or plain interrupt request is enabled
OFS1	VDSEL[1:0]	1: Reset is enabled	1: Reset is enabled
		Voltage Detection 0 Level Select	Voltage Detection 0 Level Select
		b1 b0	b1 b0
		0 0: 3.80 V is selected	0 0: Reserved
		0 1: 2.80 V is selected	0 1: Selects 2.94V
		1 0: 1.90 V is selected	1 0: Selects 2.87V
		1 1: 1.72 V is selected	1 1: Selects 2.80V
MDEB	—	Endian Select Register B	—
MDES	—	Endian Select Register S	—
MDE	—	—	Endian Select Register
TMEF	—	—	TM Enable Flag Register
TMINF	—	—	TM Identification Data Register
FAW	—	—	Flash Access Window Setting Register
ROMCODE	—	—	ROM Code Protection Register
UB Code A	—	UB Code A	—
UB Code B	—	UB Code B	—

2.4 Voltage Detection Circuit

Table 2.6 shows a Comparative Listing of Voltage Detection Circuit Specifications, and Table 2.7 shows a Comparative Listing of Voltage Detection Circuit Registers.

Table 2.6 Comparative Listing of Voltage Detection Circuit Specifications

		RX210 (LVDAa)			RX651 (LVDA)		
Item		Voltage Monitoring 0	Voltage Monitoring 1	Voltage Monitoring 2	Voltage Monitoring 0	Voltage Monitoring 1	Voltage Monitoring 2
VCC monitoring	Monitored voltage	Vdet0	Vdet1	Vdet2	Vdet0	Vdet1	Vdet2
	Detected event	Voltage drops past Vdet0	Voltage rises or drops past Vdet1	Voltage rises or drops past Vdet2	Voltage drops past Vdet0	Voltage rises or drops past Vdet1	Voltage rises or drops past Vdet2
				Input voltages to VCC and the CMPA2 pin can be switched using the LVCMP2CR.EX VCCINP2 bit			
	Detection voltage	Voltage selectable from four levels using OFS1	Voltage selectable from 16 levels using LVDLVL.R.LVD1LVL[3:0] bits	Varies according to whether VCC or the CMPA2 pin is selected. Voltage selectable from 16 levels using LVDLVL.R.LVD2LVL[3:0] bits	Selectable from among three different levels by using OFS1.VDSEL [1:0] bits	Selectable from among three different levels by using LVDLVL.R.LVD1LVL[3:0] bits	Selectable from among three different levels by using LVDLVL.R.LVD2LVL[3:0] bits
	Monitor flag	—	LVD1SR.LVD1 MON flag: Monitors whether voltage is higher or lower than Vdet1	LVD2SR.LVD2 MON flag: Monitors whether voltage is higher or lower than Vdet2	—	LVD1SR.LVD1 MON flag: Monitors whether voltage is higher or lower than Vdet1	LVD2SR.LVD2 MON flag: Monitors whether voltage is higher or lower than Vdet2
			LVD1SR.LVD1 DET flag: Vdet1 passage detection	LVD2SR.LVD2 DET flag: Vdet2 passage detection		LVD1SR.LVD1 DET flag: Vdet1 passage detection	LVD2SR.LVD2 DET flag: Vdet2 passage detection
Process upon voltage detection	Reset	Voltage monitoring 0 reset	Voltage monitoring 1 reset	Voltage monitoring 2 reset	Voltage monitoring 0 reset	Voltage monitoring 1 reset	Voltage monitoring 2 reset
		Reset when Vdet0 > VCC CPU restart after specified time with VCC > Vdet0	Reset when Vdet1 > VCC CPU restart timing selectable: after specified time with VCC > Vdet1 or Vdet1 > VCC	Reset when Vdet2 > VCC CPU restart timing selectable: after specified time with VCC > Vdet2 or Vdet2 > VCC	Reset when Vdet0 > VCC CPU restart after specified time with VCC > Vdet0	Reset when Vdet1 > VCC CPU restart timing selectable: after specified time with VCC > Vdet1 or Vdet1 > VCC	Reset when Vdet2 > VCC CPU restart timing selectable: after specified time with VCC > Vdet2 or Vdet2 > VCC

		RX210 (LVDAa)			RX651 (LVDA)		
Item		Voltage Monitoring 0	Voltage Monitoring 1	Voltage Monitoring 2	Voltage Monitoring 0	Voltage Monitoring 1	Voltage Monitoring 2
Process upon voltage detection	Interrupt	—	Voltage monitoring 1 interrupt	Voltage monitoring 2 interrupt	—	Voltage monitoring 1 interrupt	Voltage monitoring 2 interrupt
			Non-maskable or maskable interrupt selectable	Non-maskable or maskable interrupt selectable		Non-maskable interrupt or maskable interrupt selectable	Non-maskable interrupt or maskable interrupt selectable
			Interrupt request issued when Vdet1 > VCC and VCC > Vdet1 or either	Interrupt request issued when Vdet2 > VCC and VCC > Vdet2 or either		Interrupt request issued when Vdet1 > VCC and VCC > Vdet1 or either	Interrupt request issued when Vdet2 > VCC and VCC > Vdet2 or either
Digital filter	Enable/disable switching	Digital filter function not available	Available	Available	Digital filter function not available	Available	Available
	Sampling time	—	1/n LOCO frequency x 2 (n: 1, 2, 4, 8)	1/n LOCO frequency x 2 (n: 1, 2, 4, 8)	—	1/n LOCO frequency x 2 (n: 2, 4, 8, 16)	1/n LOCO frequency x 2 (n: 2, 4, 8, 16)
Event link function		—	Available Vdet1 passage detection event output	Available Vdet2 passage detection event output	—	Available Output of event signals on detection of Vdet1 crossings	Available Output of event signals on detection of Vdet2 crossings

Table 2.7 Comparative Listing of Voltage Detection Circuit Registers

Register	Bit	RX210 (LVDA)	RX651 (LVDA)
LVD1CR1	—	Voltage Monitoring 1 Circuit/Comparator A1 Control Register 1	Voltage Monitoring 1 Circuit Control Register 1
	LVD1IDTSEL[1:0]	Voltage Monitoring 1/Comparator A1 Interrupt/ELC Event Generation Condition Select	Voltage Monitoring 1 Interrupt Generation Condition Select
	LVD1IRQSEL	Voltage Monitoring 1/Comparator A1 Interrupt Type Select	Voltage Monitoring 1 Interrupt Type Select
LVD1SR	—	Voltage Monitoring 1 Circuit/Comparator A1 Status Register	Voltage Monitoring 1 Circuit Status Register
	LVD1DET	Voltage Monitoring 1/Comparator A1 Voltage Change Detection Flag	Voltage Monitoring 1 Voltage Change Detection Flag
	LVD1MON	Voltage Monitoring 1/Comparator A1 Signal Monitor Flag	Voltage Monitoring 1 Signal Monitor Flag
LVD2CR1	—	Voltage Monitoring 2 Circuit/Comparator A2 Control Register 1	Voltage Monitoring 2 Circuit Control Register 1
	LVD2IDTSEL[1:0]	Voltage Monitoring 2/Comparator A2 Interrupt/ELC Event Generation Condition Select	Voltage Monitoring 2 Interrupt Generation Condition Select
	LVD2IRQSEL	Voltage Monitoring 2/Comparator A2 Interrupt Type Select	Voltage Monitoring 2 Interrupt Type Select

Register	Bit	RX210 (LVDA)	RX651 (LVDA)
LVD2SR	—	Voltage Monitoring 2 Circuit/ Comparator A2 Status Register	Voltage Monitoring 2 Circuit Status Register
	LVD2DET	Voltage Monitoring 2/ Comparator A2 Voltage Change Detection Flag	Voltage Monitoring 2 Voltage Change Detection Flag
	LVD2MON	Voltage Monitoring 2/ Comparator A2 Signal Monitor Flag	Voltage Monitoring 2 Signal Monitor Flag
LVCMPCR	—	Voltage Monitoring Circuit/ Comparator A Control Register	Voltage Monitoring Circuit Control Register
	EXVREFINP1	Comparator A1 Reference Voltage External Input Select (b0)	—
	EXVCCINP1	Comparator A1 Comparison Voltage External Input Select (b1)	—
	EXVREFINP2	Comparator A2 Reference Voltage External Input Select (b2)	—
	EXVCCINP2	Comparator A2 Comparison Voltage External Input Select (b3)	—
	LVD1E	Voltage Detection 1/ Comparator A1 Enable 0: Voltage detection 1/ comparator A1 circuit disabled 1: Voltage detection 1/ comparator A1 circuit enabled	Voltage Detection 1 Enable* ¹ 0: Voltage detection 1 circuit disabled 1: Voltage detection 1 circuit enabled
	LVD2E	Voltage Detection 2/ Comparator A2 Enable 0: Voltage detection 2/ comparator A2 circuit disabled 1: Voltage detection 2/ comparator A2 circuit enabled	Voltage Detection 2 Enable* ² 0: Voltage detection 2 circuit disabled 1: Voltage detection 2 circuit enabled

Register	Bit	RX210 (LVDA)	RX651 (LVDA)
LVDLVLR	LVD1LVL[3:0]	Voltage Detection 1 Level Select (Standard voltage during drop in voltage) b3 b0 0 0 0 0: 4.15 V 0 0 0 1: 4.00 V 0 0 1 0: 3.85 V 0 0 1 1: 3.70 V 0 1 0 0: 3.55 V 0 1 0 1: 3.40 V 0 1 1 0: 3.25 V 0 1 1 1: 3.10 V 1 0 0 0: 2.95 V 1 0 0 1: 2.80 V 1 0 1 0: 2.65 V 1 0 1 1: 2.50 V 1 1 0 0: 2.35 V 1 1 0 1: 2.20 V 1 1 1 0: 2.05 V 1 1 1 1: 1.90 V	Voltage Detection 1 Level Select (Standard voltage during drop in voltage) b3 b0 1 0 0 1: 2.99 V (Vdet1_1) 1 0 1 0: 2.92 V (Vdet1_2) 1 0 1 1: 2.85 V (Vdet1_3) Settings other than above are prohibited.
		The Value after reset is different.	
	LVD2LVL[3:0]	Voltage Detection 2 Level Select (Standard voltage during drop in voltage) (When LVCMPCR.EXVCCINP2 = 0 (VCC select)) b7 b4 0 0 0 0: 4.15 V 0 0 0 1: 4.00 V 0 0 1 0: 3.85 V 0 0 1 1: 3.70 V 0 1 0 0: 3.55 V 0 1 0 1: 3.40 V 0 1 1 0: 3.25 V 0 1 1 1: 3.10 V 1 0 0 0: 2.95 V 1 0 0 1: 2.80 V 1 0 1 0: 2.65 V 1 0 1 1: 2.50 V 1 1 0 0: 2.35 V 1 1 0 1: 2.20 V 1 1 1 0: 2.05 V 1 1 1 1: 1.90 V (When LVCMPCR.EXVCCINP2 = 1 (CMPA2 pin select)) b7 b4 0 0 0 1: 1.33 V Settings other than above are prohibited.	Voltage Detection 2 Level Select (Standard voltage during drop in voltage) b7 b4 1 0 0 1: 2.99 V (Vdet1_1) 1 0 1 0: 2.92 V (Vdet1_2) 1 0 1 1: 2.85 V (Vdet1_3) Settings other than above are prohibited.
		The Value after reset is different.	

Register	Bit	RX210 (LVDA)	RX651 (LVDA)
LVD1CR0	—	Voltage Monitoring 1 Circuit/ Comparator A1 Control Register 0	Voltage Monitoring 1 Circuit Control Register 0
	LVD1RIE	Voltage Monitoring 1/ Comparator A1 Interrupt/Reset Enable	Voltage Monitoring 1 Interrupt/Reset Enable
	LVD1DFDIS	Voltage Monitoring 1/ Comparator A1 Digital Filter Disable Mode Select	Voltage Monitoring 1 Digital Filter Disable Mode Select
	LVD1CMPE	Voltage Monitoring 1 Circuit/ Comparator A1 Comparison Result Output Enable	Voltage Monitoring 1 Circuit Comparison Result Output Enable
	LVD1FSAMP [1:0]	Sampling Clock Select b5 b4 0 0: LOCO divided by 1 0 1: LOCO divided by 2 1 0: LOCO divided by 4 1 1: LOCO divided by 8	Sampling Clock Select b5 b4 0 0: 1/2 LOCO frequency 0 1: 1/4 LOCO frequency 1 0: 1/8 LOCO frequency 1 1: 1/16 LOCO frequency
	LVD1RI	Voltage Monitoring 1 Circuit/ Comparator A1 Mode Select	Voltage Monitoring 1 Circuit Mode Select
	LVD1RN	Voltage Monitoring 1/ Comparator A1 Reset Negation Select	Voltage Monitoring 1 Reset Negate Select
LVD2CR0	—	Voltage Monitoring 2 Circuit/ Comparator A2 Control Register 0	Voltage Monitoring 2 Circuit Control Register 0
	LVD2RIE	Voltage Monitoring 2/ Comparator A2 Interrupt/Reset Enable	Voltage Monitoring 2 Interrupt/Reset Enable
	LVD2DFDIS	Voltage Monitoring 2/ Comparator A2 Digital Filter Disable Mode Select	Voltage Monitoring 2 Digital Filter Disable Mode Select
	LVD2CMPE	Voltage Monitoring 2 Circuit/ Comparator A2 Comparison Result Output Enable	Voltage Monitoring 2 Circuit Comparison Result Output Enable
	LVD2FSAMP [1:0]	Sampling Clock Select b5 b4 0 0: LOCO divided by 1 0 1: LOCO divided by 2 1 0: LOCO divided by 4 1 1: LOCO divided by 8	Sampling Clock Select b5 b4 0 0: 1/2 LOCO frequency 0 1: 1/4 LOCO frequency 1 0: 1/8 LOCO frequency 1 1: 1/16 LOCO frequency
	LVD2RI	Voltage Monitoring 2 Circuit/ Comparator A2 Mode Select	Voltage Monitoring 2 Circuit Mode Select
	LVD2RN	Voltage Monitoring 2/ Comparator A2 Reset Negation Select	Voltage Monitoring 2 Reset Negate Select

Note 1. The voltage of VCC = AVCC0 = AVCC1 when LVD1 is enabled must be set to at least 80 mV above the maximum value of the voltage detection 1 level selected by the LVDLVL.R.LVD1LVL[3:0] bits.

Note 2. The voltage of VCC = AVCC0 = AVCC1 when LVD2 is enabled must be set to at least 80 mV above the maximum value of the voltage detection 2 level selected by the LVDLVL.R.LVD2LVL[3:0] bits.

2.5 Clock Generation Circuit

Table 2.8 shows a Comparative Listing of Clock Generation Circuit Specifications, and Table 2.9 shows a Comparative Listing of Clock Generation Circuit Registers.

Table 2.8 Comparative Listing of Clock Generation Circuit Specifications

Item	RX210	RX651
Uses	- Generates the system clock (ICLK) to be supplied to the CPU, DMAC, DTC, ROM and RAM. - Generates the peripheral module clocks (PCLKB and PCLKD) to be supplied to peripheral modules. - The peripheral module clock used as the operating clock is PCLKD for S12AD and PCLKB for other modules. - Generates the FlashIF clock (FCLK) to be supplied to the FlashIF. - Generates the external bus clock (BCLK) to be supplied to the external bus. - Generates the CAC clock (CACCLK) to be supplied to the CAC - Generates the RTC-dedicated sub clock (RTCSCLK) to be supplied to the RTC. - Generates the IWDT-dedicated clock (IWDTCCLK) to be supplied to the IWDT.	- Generates the system clock (ICLK) to be supplied to the CPU, DMAC, DTC, code flash memory and RAM. - Generates the peripheral module clock (PCLKA) to be supplied to the ETHERC, EDMAC, RSPI, SCli, MTU3, and AES. - Generates the peripheral module clock (PCLKB) to be supplied to peripheral modules. - Generates the peripheral module clocks (for analog conversion) (PCLKC: unit 0; PCLKD: unit 1) to be supplied to S12AD. - Generates the flash-IF clock (FCLK) to be supplied to the flash interface. - Generates the external bus clock (BCLK) to be supplied to the external bus. - Generates the SDRAM clock (SDCLK) to be supplied to the SDRAM. - Generates the USB clock (UCLK) to be supplied to the USBb. - Generates the CAC clock (CACCLK) to be supplied to the CAC. - Generates the CAN clock (CANMCLK) to be supplied to the CAN. - Generates the RTC sub-clock (RTCSCLK) to be supplied to the RTC. - Generates the RTC main clock (RTCMCLK) to be supplied to the RTC. - Generates the IWDT-dedicated clock (IWDTCCLK) to be supplied to the IWDT. - Generates the JTAG clock (JTAGTCK) to be supplied to the JTAG.

Item	RX210	RX651
Operating frequency	• ICLK: 50MHz (max) • PCLKB: 32MHz (max) • PCLKD: 50MHz (max) • FCLK: 4 MHz to 32 MHz (for programming and erasing the ROM and E2 DataFlash) 32 MHz (max) (for reading from the E2 DataFlash) • BCLK: 25MHz (max) • BCLK pin output: 12.5 MHz (max) • CACCLK: Same as frequency of each oscillator • RTCSCCLK: 32.768kHz • WDTCLK: 125kHz	• ICLK: 120MHz (max) • PCLKA: 120MHz (max) • PCLKB: 60MHz (max) • PCLKC: 60MHz (max) • PCLKD: 60MHz (max) • FCLK: 4 MHz to 60 MHz (for programming and erasing the code flash memory) • BCLK: 120MHz (max) • BCLK pin output: 60 MHz (max) • SDCLK pin output: 60 MHz (max) • UCLK: 48MHz (max) • CACCLK: Same as the clock from respective oscillators • CANMCLK: 24MHz (max) • RTCSCCLK: 32.768kHz • RTCMCLK: 8MHz to 16MHz • IWDTCCLK: 120kHz • JTAGTCK: 10MHz (max)
Main clock oscillator	• Resonator frequency: 1 MHz to 20 MHz • External clock input frequency: 20 MHz (max) • Connectable resonator or additional circuit: ceramic resonator, crystal resonator • Connection pin: EXTAL, XTAL • Oscillation stop detection function: When an oscillation stop is detected with the main clock, the system clock source is switched to LOCO and MTU output can be forcedly driven to the high-impedance	• Resonator frequency: 8 MHz to 24 MHz • External clock input frequency: 24 MHz (max) • Connectable resonator or additional circuit: ceramic resonator, crystal resonator • Connection pin: EXTAL, XTAL • Oscillation stop detection function: When an oscillation stop is detected with the main clock, the system clock source is switched to LOCO, and MTU3 output can be forcedly driven to the high-impedance.
Sub-clock oscillator	• Resonator frequency: 32.768 kHz • Connectable resonator or additional circuit: crystal resonator • Connection pin: XCIN, XCOU	• Resonator frequency: 32.768 kHz • Connectable resonator or additional circuit: crystal resonator • Connection pin: XCIN, XCOU
PLL circuit	• Input clock source: Main clock • Input pulse frequency division ratio: Selectable from 1, 2, and 4 • Input frequency: 4 MHz to 12.5 MHz • Frequency multiplication ratio: Selectable from 8, 10, 12, 16, 20, 24, and 25 • VCO oscillation frequency: 50 MHz to 100 MHz	• Input clock source: Main clock, HOCO • Input pulse frequency division ratio: Selectable from 1, 2, and 3 • Input frequency: 8 MHz to 24 MHz • Frequency multiplication ratio: Selectable from 10 to 30 • Output clock frequency of the PLL frequency synthesizer: 120 MHz to 240 MHz
High-speed on-chip oscillator (HOCO)	• Oscillation frequency: 32 MHz/36.864 MHz/40 MHz/50 MHz • HOCO power supply control	• Selectable from 16 MHz, 18 MHz, and 20 MHz • HOCO power supply control

Item	RX210	RX651
Low-speed on-chip oscillator (LOCO)	Oscillation frequency: 125 kHz	Oscillation frequency: 240 kHz
IWDT-dedicated on-chip oscillator	Oscillation frequency: 125 kHz	Oscillation frequency: 120 kHz
JTAG external clock input (TCK)	—	Input clock frequency: 10 MHz (max)
Control of output on the BCLK pin	• BCLK clock output or high-level output is selectable • BCLK or BCLK/2 is selectable	• BCLK clock output or high output is selectable • BCLK or BCLK/2 is selectable
Control of output on the SDCLK pin	—	SDCLK clock output or high output is selectable
Event linking (output)	—	Detection of stopping of the main clock oscillator
Event linking (input)	—	Switching of the clock source to the low-speed on-chip oscillator

Table 2.9 Comparative Listing of Clock Generation Circuit Registers

Register	Bit	RX210	RX651
SCKCR	PCKC[3:0]	—	Peripheral Module Clock C (PCLKC) Select (b7-b4)
	PCKA[3:0]	—	Peripheral Module Clock A (PCLKA) Select (b15-b12)
	PSTOP0	—	SDCLK Pin Output Control
ROMWT	—	—	ROM Wait Cycle Setting Register
SCKCR2	—	—	System Clock Control Register 2
VRCR	—	Voltage Regulator Control Register	—
PLLCR	PLIDIV[1:0]	PLL Input Frequency Division Ratio Select b1 b0 0 0: ×1 0 1: ×1/2 1 0: ×1/4 1 1: Setting prohibited	PLL Input Frequency Division Ratio Select b1 b0 0 0: ×1 0 1: ×1/2 1 0: × 1/3 1 1: Setting prohibited
		PLLSRCSEL	PLL Clock Source Select (b4)

Register	Bit	RX210	RX651
PLLCR	STC[4:0] STC[5:0]	Frequency Multiplication Factor Select (b12-b8)	Frequency Multiplication Factor Select (b13-b8)
		b12 b8	b13 b8
		0 0 1 1 1: ×8	0 1 0 0 1 1: ×10.0
		0 1 0 0 1: ×10	0 1 0 1 0 0: ×10.5
		0 1 0 1 1: ×12	0 1 0 1 0 1: ×11.0
		0 1 1 1 1: ×16	0 1 0 1 1 0: ×11.5
		1 0 0 1 1: ×20	0 1 0 1 1 1: ×12.0
		1 0 1 1 1: ×24	0 1 1 0 0 0: ×12.5
		1 1 0 0 0: ×25	:
			1 1 1 0 0 1: ×29.0
HOCOCR2	HCFRQ[1:0]	Settings other than above are prohibited.	Settings other than above are prohibited
		The Value after reset is different.	
		HOCO Frequency Setting b1 b0	HOCO Frequency Setting b1 b0
		0 0: 32 MHz	0 0: 16 MHz
		0 1: 36.864 MHz	0 1: 18 MHz
		1 0: 40 MHz	1 0: 20 MHz
		1 1: 50 MHz	Settings other than above are prohibited.
OSCOVFSR	—	—	Oscillation Stabilization Flag Register
MOSCWTCR*1	MSTS[4:0]	Main Clock Oscillator Wait Time Select (b4-b0)	Main Clock Oscillator Wait Time Select (b7-b0)
		The Value after reset is different.	
SOSCWTCR*1	SSTS[4:0]	Sub-Clock Oscillator Wait Time Select (b4-b0)	Sub-Clock Oscillator Wait Time Select (b7-b0)
		The Value after reset is different.	
MOFCR	MOFXIN	—	Main Clock Oscillator Forced Oscillation (b0)
	MODRV[2:0]	Main Clock Oscillator Drive Capability Switch (b3-b1)	—
	MODRV2[1:0]	Main Clock Oscillator Drive Capability Switch 2	Main Clock Oscillator Driving Ability 2 Switching
		b5 b4	b5 b4
PLLPCR	—	0 1: 1 MHz to 8 MHz	0 0: 20.1 to 24 MHz
		1 0: 8.1 MHz to 15.9 MHz	0 1: 16.1 to 20 MHz
		1 1: 16 MHz to 20 MHz	1 0: 8.1 to 16 MHz
		Settings other than the above are prohibited.	1 1: 8 MHz
PLLPCR	—	The Value after reset is different.	
		PLL Power Control Register	—

Note 1. In the User's Manual: Hardware of the RX210 Group, MOSCWTCR and SOSCWTCR are described in section 11, Low Power Consumption.

2.6 Clock Frequency Accuracy Measurement Circuit

Table 2.10 shows a Comparative Listing of Clock Frequency Accuracy Measurement Circuit Specifications, and Table 2.11 shows a Comparative Listing of Clock Frequency Accuracy Measurement Circuit Registers.

Table 2.10 Comparative Listing of Clock Frequency Accuracy Measurement Circuit Specifications

Item	RX210 (CAC)	RX651 (CAC)
Clock frequency measurement	The frequency of the following clocks can be measured. • Clock output from main clock oscillator (main clock) • Clock output from sub-clock oscillator (sub-clock) • Clock output from high-speed on-chip oscillator (HOCO clock) • Clock output from low-speed on-chip oscillator (LOCO clock) • Clock output from IWDTC-dedicated on-chip oscillator (IWDTCCLK clock)	The frequency of the following clocks can be measured. • Main clock • Sub-clock • HOCO clock • LOCO clock • IWDTCCLK clock • Peripheral module clock B (PCLKB)
Measurement reference clocks	• External clock input to the CACREF pin • Main clock • Sub-clock • HOCO clock • LOCO clock • IWDTCCLK clock	• External clock input to the CACREF pin • Main clock • Sub-clock • HOCO clock • LOCO clock • IWDTCCLK clock • Peripheral module clock B (PCLKB)
Selectable function	Digital filter function	Digital filter function
Interrupt sources	• Measurement end interrupt • Frequency error interrupt • Overflow interrupt	• Measurement end interrupt • Frequency error interrupt • Overflow interrupt
Power consumption reduction function	Module stop state can be set.	Module stop state can be set

Table 2.11 Comparative Listing of Clock Frequency Accuracy Measurement Circuit Registers

Register	Bit	RX210	RX651
CACR1	FMCS[2:0]	Frequency Measurement Clock Select b3 b1 0 0 0: Output clock of main clock oscillator 0 0 1: Output clock of sub-clock oscillator 0 1 0: Output clock of high-speed on-chip oscillator 0 1 1: Output clock of low-speed on-chip oscillator 1 0 0: Output clock of IWDTC-dedicated on-chip oscillator Settings other than above are prohibited.	Measurement Target Clock Select b3 b1 0 0 0: Main clock 0 0 1: Sub-clock 0 1 0: HOCO clock 0 1 1: LOCO clock 1 0 0: IWDTCCLK clock 1 0 1: Peripheral module clock B (PCLKB) Settings other than above are prohibited.
CACR2	RSCS[2:0]	Reference Signal Generation Clock Select b3 b1 0 0 0: Output clock of main clock oscillator 0 0 1: Output clock of sub-clock oscillator 0 1 0: Output clock of high-speed on-chip oscillator 0 1 1: Output clock of low-speed on-chip oscillator 1 0 0: Output clock of IWDTC-dedicated on-chip oscillator	Measurement Reference Clock Select b3 b1 0 0 0: Main clock 0 0 1: Sub-clock 0 1 0: HOCO clock 0 1 1: LOCO clock 1 0 0: IWDTCCLK clock 1 0 1: Peripheral module clock B (PCLKB) Settings other than above are prohibited.
	RCDS [1:0]	Reference Signal Generation Clock Frequency Division Ratio Select	Measurement Reference Clock Frequency Division Ratio Select

2.7 Low Power Consumption

Table 2.12 shows a Comparative Listing of Low Power Consumption Specifications, and Table 2.13 shows a Comparative Listing of Low Power Consumption Registers.

Table 2.12 Comparative Listing of Low Power Consumption Specifications

Item	RX210	RX651
Reducing power consumption by switching clock signals	The frequency division ratio is settable independently for the system clock (ICLK), peripheral module clock (PCLKB), S12AD clock (PCLKD), external bus clock (BCLK), and Flash IF clock (FCLK).	The frequency division ratio is settable independently for the system clock (ICLK), peripheral module clock (PCLKA, PCLKB, PCLKC, PCLKD), external bus clock (BCLK), and flash interface clock (FCLK).
BCLK output control function	BCLK output or high-level output can be selected.	BCLK output or high-level output can be selected.
SDCLK output control function	—	SDCLK output or high-level output can be selected.
Module-stop function	Functions can be stopped independently for each peripheral module.	Functions can be stopped independently for each peripheral module.
Function for transition to low power consumption mode	Transition to a low power consumption mode in which the CPU, peripheral modules, or oscillators are stopped is enabled.	Transition to a low power consumption mode in which the CPU, peripheral modules, or oscillators are stopped is enabled.
Low power consumption modes	• Sleep mode • All-module clock stop mode • Software standby mode • Deep software standby mode	• Sleep mode • All-module clock stop mode • Software standby mode • Deep software standby mode
Function for lower operating power consumption	• Power consumption can be reduced in normal operation, sleep mode, and all-module clock stop mode by selecting an appropriate operating power consumption control mode according to the operating frequency and operating voltage. • Seven operating power control modes — High-speed operating mode — Middle-speed operating mode 1A — Middle-speed operating mode 1B — Middle-speed operating mode 2A — Middle-speed operating mode 2B — Low-speed operating mode 1 — Low-speed operating mode 2	• Power consumption can be reduced in normal operation, sleep mode, and all-module clock stop mode by selecting an appropriate operating power consumption control mode according to the operating frequency and operating voltage range. • Three operating power control modes — High-speed operating mode — Low-speed operating mode 1 — Low-speed operating mode 2 There is no difference in power consumption when the same conditions (frequency and voltage) are set in low-speed operating modes 1 and 2.

Table 2.13 Comparative Listing of Low Power Consumption Registers

Register	Bit	RX210	RX651
MSTPCRA	MSTPA0	—	Compare Match Timer W (Unit 1) Module Stop (b0)
	MSTPA1	—	Compare Match Timer W (Unit 0) Module Stop (b1)
	MSTPA9	Multifunction Timer Pulse Unit 3 Module Stop	Multifunction Timer Pulse Unit 3 Module Stop
		Target module: MTU (MTU0 to MTU5)	Target module: MTU3
	MSTPA10	—	Programmable Pulse Generator (Unit 1) Module Stop (b10)
	MSTPA11	—	Programmable Pulse Generator (Unit 0) Module Stop (b11)
	MSTPA13	16-Bit Timer Pulse Unit Module Stop	16-Bit Timer Pulse Unit 0 (Unit 0) Module Stop
	MSTPA16	—	12-bit A/D Converter (Unit 1) Module Stop (b16)
	MSTPA17	12-Bit A/D Converter Module Stop Target module: S12AD	12-bit A/D Converter (Unit 0) Module Stop Target module: S12AD unit 0
	MSTPA19	D/A Converter Module Stop	12-bit D/A Converter Module Stop
		Target module: D/A	Target module: 12-bit D/A
	MSTPA29	Module Stop A29	EXDMA Controller Module Stop Target module: EXDMAC
MSTPCRB	MSTPB0	—	CAN Module 0 Module Stop* (b0)
	MSTPB1	—	CAN Module 1 Module Stop* (b1)
	MSTPB4	Serial Communication Interface SCId Module Stop Target module: SCId (SCI12)	Serial Communication Interface SCIh Module Stop Target module: SCIh (SCI12)
	MSTPB6	DOC Module Stop	Data Operation Circuit Module Stop
	MSTPB9	ELC Module Stop	Event Link Controller Module Stop
	MSTPB10	Comparator B Module Stop (b10)	—
	MSTPB15	—	Ethernet Controller and Ethernet Controller DMA Controller (Channel 0) Modules Stop (b15)
	MSTPB16	—	Serial Peripheral Interface 1 Module Stop (b16)
	MSTPB19	—	Universal Serial Bus 2.0 FS Interface Module Stop* (b19)
	MSTPB22	—	Parallel Data Capture Unit Module Stop (b22)

Register	Bit	RX210	RX651
MSTPCRC	MSTPC1	RAM1 Module Stop (b1)	—
	MSTPC7	—	Standby RAM Module Stop (b7)
	MSTPC17	—	I ² C Bus Interface 2 Module Stop (b17)
	MSTPC22	—	Serial Peripheral Interface 2 Module Stop (b22)
	MSTPC23	—	Quad Serial Peripheral Interface Module Stop (b23)
MSTPCRD	—	—	Module Stop Control Register D
OPCCR	OPCM[2:0]	Operating Power Control Mode Select b2 b0 0 0 0: High-speed operating mode 0 1 0: Middle-speed operating mode 1A 0 1 1: Middle-speed operating mode 1B 1 0 0: Middle-speed operating mode 2A 1 0 1: Middle-speed operating mode 2B 1 1 0: Low-speed operating mode 1 1 1 1: Low-speed operating mode 2 Settings other than above are prohibited.	Operating Power Control Mode Select b2 b0 0 0 0: High-speed operating mode 1 1 0: Low-speed operating mode 1 1 1 1: Low-speed operating mode 2 Settings other than above are prohibited.
		The Value after reset is different.	
MOSCWTCR* ¹	MSTS[4:0]	Main Clock Oscillator Wait Time Select (b4-b0)	Main Clock Oscillator Wait Time Select (b7-b0)
	MSTS[7:0]	The Value after reset is different.	
SOSCWTCR* ¹	SSTS[4:0]	Sub-Clock Oscillator Wait Time Select (b4-b0)	Sub-Clock Oscillator Wait Time Select (b7-b0)
	SSTS[7:0]	The Value after reset is different.	
PLLWTCR	—	PLL Wait Control Register	—
HOCOWTCR2	—	HOCO Wait Control Register 2	—

Register	Bit	RX210	RX651
DPSBYCR	DEEPCUT1 DEEPCUT [1:0]	Deep Cut (b1) 0: LVD and POR can be operated at deep software standby mode. 1: LVD does not operate at deep software standby mode and POR operates in the low power consumption operation mode at deep software standby mode.	Deep Cut (b1-b0) b1 b0 0 0: Power is supplied to the standby RAM and USB resume detecting unit in deep software standby mode 0 1: Power is not supplied to the standby RAM and USB resume detecting unit in deep software standby mode 1 0: Setting prohibited 1 1: Power is not supplied to the standby RAM and USB resume detecting unit in deep software standby mode. In addition, LVD is stopped and the low power consumption function in a power-on reset circuit is enabled.
DPSIER1	—	—	Deep Standby Interrupt Enable Register 1
DPSIER2	DRIICDIE	SDA-DS Deep Standby Cancel Signal Enable	SDA2-DS Deep Standby Release Signal Enable
	DRIICCIE	SCL-DS Deep Standby Cancel Signal Enable	SCL2-DS Deep Standby Release Signal Enable
	DUSBIE	—	USB Suspend/Resume Deep Standby Release Signal Enable
DPSIER3	—	—	Deep Standby Interrupt Enable Register 3
DPSIFR1	—	—	Deep Standby Interrupt Flag Register 1
DPSIFR2	DRIICDIF	SDA-DS Deep Standby Cancel Flag	SDA2-DS Deep Standby Release Flag
	DRIICCIF	SCL-DS Deep Standby Cancel Flag	SCL2-DS Deep Standby Release Flag
	DUSBIF	—	USB Suspend/Resume Deep Standby Release Flag
DPSIFR3	—	—	Deep Standby Interrupt Flag Register 3
DPSIEGR1	—	—	Deep Standby Interrupt Edge Register 1
DPSIEGR2	DRIICDEG	SDA-DS Edge Select	SDA2-DS Edge Select
	DRIICCEG	SCL-DS Edge Select	SCL2-DS Edge Select
DPSIEGR3	—	—	Deep Standby Interrupt Edge Register 3
FHSSBYCR	—	Flash HOCO Software Standby Control Register	—

Note 1. In the User's Manual: Hardware of the RX651 Group, MOSCWTCR and SOSCWTCCR are described in section 9, Clock Generation Circuit

2.8 Register Write Protection Function

Table 2.14 shows a Comparative Listing of Register Write Protection Function Specifications, and Table 2.15 shows a Comparative Listing of Register Write Protection Function Registers.

Table 2.14 Comparative Listing of Register Write Protection Function Specifications

Item	RX210	RX651
PRC0 bit	Registers related to the clock generation circuit: SCKCR, SCKCR3, PLLCR, PLLCR2, BCKCR, MOSCCR, SOSCCR, LOCOCR, ILOCOCR, HOCOCCR, OSTDCR, OSTDSR, HOCOCCR2	Registers related to the clock generation circuit: SCKCR, SCKCR2, SCKCR3, PLLCR, PLLCR2, BCKCR, MOSCCR, SOSCCR, LOCOCR, ILOCOCR, HOCOCCR, HOCOCCR2, OSTDCR, OSTDSR
PRC1 bit	- Registers related to the operating modes: SYSCR0, SYSCR1 - Registers related to the low power consumption functions: SBYCR, MSTPCRA, MSTPCRB, MSTPCRC, OPCCR, RSTCKCR, MOSCWTCR*1, SOSCWTCR*1, PLLWTCR, DPSBYCR, DPSIER0, DPSIER2, DPSIFR0, DPSIFR2, DPSIEGR0, DPSIEGR2, FHSSBYCR, HOCOWTCR2 - Registers related to clock generation circuit: MOFCR, HOCOPCR, PLLPCR - Software reset register: SWRR	- Registers related to the operating modes: SYSCR0, SYSCR1 - Registers related to the low power consumption functions: SBYCR, MSTPCRA, MSTPCRB, MSTPCRC, MSTPCRD, OPCCR, RSTCKCR, DPSBYCR, DPSIER0, DPSIER1, DPSIER2, DPSIER3, DPSIFR0, DPSIFR1, DPSIFR2, DPSIFR3, DPSIEGR0, DPSIEGR1, DPSIEGR2, DPSIEGR3 - Registers related to clock generation circuit: MOSCWTCR*1, SOSCWTCR*1, MOFCR, HOCOPCR - Software reset register: SWRR
PRC2 bit	Register related to the VRCR	
PRC3 bit	Registers related to the LVD: LVCMPCR, LVDLVLR, LVD1CR0, LVD1CR1, LVD1SR, LVD2CR0, LVD2CR1, LVD2SR	Registers related to the LVD: LVCMPCR, LVDLVLR, LVD1CR0, LVD1CR1, LVD1SR, LVD2CR0, LVD2CR1, LVD2SR

Note 1. In the User's Manual: Hardware of RX651 Group, MOSCWTCR and SOSCWTCR are described in section 9.Clock Generation Circuit.

Table 2.15 Comparative Listing of Register Write Protection Function Registers

Register	Bit	RX210	RX651
PRCR	PRC2	Protect Bit 2 2 (b2)	—

2.9 Exception Handling

Table 2.16 shows a Comparative Listing of Vector, and Table 2.17 shows a Comparative Listing of Return from Exception Handling Routine.

Table 2.16 Comparative Listing of Vector

Exception (Event)		RX210	RX651
Undefined instruction exception		Fixed vector table	Exception vector table (EXTB)
Privileged instruction exception		Fixed vector table	Exception vector table (EXTB)
Access exception		—	Exception vector table (EXTB)
Floating-point exception		—	Exception vector table (EXTB)
Reset		Fixed vector table	Exception vector table (EXTB)
Non-maskable interrupt		Fixed vector table	Exception vector table (EXTB)
Interrupt	Fast interrupt	FINTV	FINTV
	Other than above	Relocatable vector table (INTB)	Interrupt vector table (INTB)
Unconditional trap		Relocatable vector table (INTB)	Interrupt vector table (INTB)

Table 2.17 Comparative Listing of Return from Exception Handling Routine

Exception		RX210	RX651
Undefined instruction exception		RTE	RTE
Privileged instruction exception		RTE	RTE
Access exception		—	RTE
Floating-point exception		—	RTE
Reset		Return is impossible	Return is impossible
Non-maskable interrupt		Return is impossible	Prohibited
Interrupt	Fast interrupt	RTFI	RTFI
	Other than above	RTE	RTE
Unconditional trap		RTE	RTE

2.10 Interrupt Controller

Table 2.18 shows a Comparative Listing of Interrupt Controller Specifications, and Table 2.19 shows a Comparative Listing of Interrupt Controller Registers.

Table 2.18 Comparative Listing of Interrupt Controller Specifications

Item		RX210 (ICUb)	RX651 (ICUB)
Interrupt	Peripheral function interrupts	• Interrupts from peripheral modules • Interrupt detection: Edge detection/level detection Edge detection or level detection is fixed for each source of connected peripheral modules.	• Interrupts from peripheral modules • Interrupt detection: Edge detection/level detection (detection method is fixed for each interrupt source) • Group interrupt: Multiple interrupt sources are grouped together and treated as an interrupt source. — Group BE0 interrupt: Interrupt sources of peripheral modules that use PCLKB as the operating clock (edge detection) — Group BL0/BL1/BL2 interrupt: Interrupt sources of peripheral modules that use PCLKB as the operating clock (level detection) — Group AL0/AL1 interrupt: Interrupt sources of peripheral modules that use PCLKA as the operating clock (level detection) • Software configurable interrupt B: Any of the interrupt sources for peripheral modules that use PCLKB as the operating clock can be assigned to interrupt vector numbers 128 to 207. • Software configurable interrupt A: Any of the interrupt sources for peripheral modules that use PCLKA as the operating clock can be assigned to interrupt vector numbers 208 to 255.

Item		RX210 (ICUb)	RX651 (ICUB)
Interrupt	External pin interrupts	- Interrupts from pins IRQ0 to IRQ7 - Number of sources: 8 - Interrupt detection: Low level/falling edge/rising edge/rising and falling edges One of these detection methods can be set for each source. - Digital filter function: Supported	- Interrupt by the input signal to the IRQi pin (i = 0 to 15) - Number of sources: 16 - Interrupt detection method: Detection of low level, falling edge, rising edge, rising and falling edges One of these detection methods can be set for each source. - Digital filter can be used to remove noise.
	Software interrupt	- Interrupt generated by writing to a register - One interrupt source	- Interrupt request can be generated by writing to a register. - Two interrupt sources
	Event link Interrupt	The ELSR18I or ELSR19I interrupt is generated by an ELC event	—
	Interrupt priority level	Specified by registers.	Priority level can be set with interrupt source priority register r (IPRr) (r = 000 to 255).
	Fast interrupt function	Faster interrupt processing of the CPU can be set only for a single interrupt source.	CPU interrupt response time can be reduced. This function can be used for only one interrupt source.
	DTC and DMAC control	The DTC and DMAC can be activated by interrupt sources.	Interrupt sources can be used to start the DTC and DMAC.
	EXDMAC control	—	- Interrupt selected by software configurable interrupt B source select register 144 or software configurable interrupt A source select register 208 can be used to start EXDMAC0. - Interrupt selected by software configurable interrupt B source select register 145 or software configurable interrupt A source select register 209 can be used to start EXDMAC1.
Non-maskable interrupts	NMI pin interrupt	- Interrupt from the NMI pin - Interrupt detection: Falling edge/rising edge - Digital filter function: Supported	- Interrupt by the input signal to the NMI pin - Interrupt detection: Falling edge/rising edge - Digital filter can be used to remove noise.
	Oscillation stop detection interrupt	Interrupt on detection of oscillation having stopped	This interrupt occurs when the main clock oscillator stop is detected.
	WDT underflow/refresh error	Interrupt on an underflow of the down counter or occurrence of a refresh error	This interrupt occurs when the watchdog timer (WDT) underflows or a refresh error occurs.
	IWDT underflow/refresh error	Interrupt on an underflow of the down counter or occurrence of a refresh error	This interrupt occurs when the independent watchdog timer (IWDT) underflows or a refresh error occurs.

Item		RX210 (ICUb)	RX651 (ICUB)
Non-maskable interrupts	Voltage monitoring interrupt	- Voltage monitoring interrupt of voltage monitoring circuit 1 (LVD1) - Voltage monitoring interrupt of voltage monitoring circuit 2 (LVD2)	- Interrupt from voltage detection circuit 1 (LVD1) - Interrupt from voltage detection circuit 2 (LVD2)
	RAM error interrupt	—	This interrupt occurs when a parity check error is detected in the RAM.
Return from low power consumption state	Sleep mode	Return is initiated by non-maskable interrupts or any other interrupt source.	Exit sleep mode by any interrupt source.
	All-module clock stop mode	Return is initiated by non-maskable interrupts, IRQ0 to IRQ7 interrupts, WDT interrupts, TMR interrupts, or RTC alarm/periodic interrupts.	Exit all-module clock stop mode by the NMI pin interrupt, external pin interrupt, or peripheral interrupt (voltage monitoring 1, voltage monitoring 2, oscillation stop detection interrupt, USB resume, RTC alarm, RTC period, IWDG, software configurable interrupt 146 to 157).
	Software standby mode	Return is initiated by non-maskable interrupts, IRQ0 to IRQ7 interrupts, or RTC alarm/periodic interrupts.	Exit all-module clock stop mode by the NMI pin interrupt, external pin interrupt, or peripheral interrupt (voltage monitoring 1, voltage monitoring 2, USB resume, RTC alarm, RTC period, IWDG).
	Deep software standby mode	—	Exit all-module clock stop mode by the NMI pin interrupt, specific external pin interrupt, or peripheral interrupt (voltage monitoring 1, voltage monitoring 2, USB resume, RTC alarm, RTC period).

Table 2.19 Comparative Listing of Interrupt Controller Registers

Register	Bit	RX210 (ICUb)	RX651 (ICUB)
IRn	—	Interrupt Request Register n (n = interrupt vector number)	Interrupt Request Register n (n = 016 to 255)
IPRn IPRr	—	Interrupt Source Priority Register n (n = 000 to 250)	Interrupt Source Priority Register r (r = 000 to 255)
SWINT2R	—	—	Software Interrupt 2 Generation Register
DTCERn	—	DTC Activation Enable Register n (n = interrupt vector number)	DTC Transfer Request Enable Register n (n = 026 to 255)
	DTCE	DTC Activation Enable 0: DTC Activation is disabled 1: DTC Activation is enabled	DTC Transfer Request Enable 0: The corresponding interrupt source is not selected as the DTC trigger. 1: The corresponding interrupt source is selected as the DTC trigger.
DMRSRm	—	DMAC Activation Request Select Register m (m = DMAC channel number)	DMAC trigger Select Register m (m = DMAC channel number)
	DMRS[7:0] —	DMAC Activation Source Select These bits specify the vector number for the DMAC activation request.	— These bits set the interrupt vector number of the interrupt source as the DMAC trigger.
IRQCRi	—	IRQ Control Register i (i = 0 to 7)	IRQ Control Register i (i = 0 to 15)
IRQLTE1	—	—	IRQ Pin Digital Filter Enable Register 1
IRQFLTC1	—	—	IRQ Pin Digital Filter Setting Register 1
NMISR	RAMST	—	RAM Error Interrupt Status Flag (b6)
NMIER	RAMEN	—	RAM Error Interrupt Enable (b6)
GRPBE0	—	—	Group BE0 Interrupt Request Register
GRPBL0/1/2	—	—	Group BL0/BL1/BL2 Interrupt Request Register
GRPAL0/1	—	—	Group AL0/AL1 Interrupt Request Register
GENBE0	—	—	Group BE0 Interrupt Request Enable Register
GENBL0/1/2	—	—	Group BL0/BL1/BL2 Interrupt Request Enable Register
GENAL0/1	—	—	Group AL0/AL1 Interrupt Request Enable Register
GCRBE0	—	—	Group BE0 Interrupt Clear Register
PIBRk	—	—	Software Configurable Interrupt B Request Register k (k = 0h to Ah)
PIARk	—	—	Software Configurable Interrupt A Request Register k (k = 0h to 5h, Bh)
SLIBXRn	—	—	Software Configurable Interrupt B Source Select Register Xn (n = 128 to 143)

Register	Bit	RX210 (ICUb)	RX651 (ICUB)
SLIBRn	—	—	Software Configurable Interrupt B Source Select Register n (n = 144 to 207)
SLIARn	—	—	Software Configurable Interrupt A Source Select Register n (n = 208 to 255)
SELEXDR	—	—	EXDMAC Trigger Select Register
SLIPRCR	—	—	Software Configurable Interrupt Source Select Register Write Protect Register

2.11 Buses

Table 2.20 shows a Comparative Listing of Bus Specifications, Table 2.21 shows a Comparative Listing of External Bus Specifications, and Table 2.22 shows a Comparative Listing of Bus Registers.

Table 2.20 Comparative Listing of Bus Specifications

Bus Type		RX210	RX651
CPU bus	Instruction bus	- Connected to the CPU (for instructions) - Connected to on-chip memory (RAM, ROM) - Operates in synchronization with the system clock (ICLK)	- Connected to the CPU (for instructions) - Connected to on-chip memory (RAM, code flash memory) - Operates in synchronization with the system clock (ICLK)
	Operand bus	- Connected to the CPU (for operands) - Connected to on-chip memory (RAM, ROM) - Operates in synchronization with the system clock (ICLK)	- Connected to the CPU (for operands) - Connected to on-chip memory (RAM, code flash memory) - Operates in synchronization with the system clock (ICLK)
Memory bus	Memory bus 1	Connected to RAM	Connected to RAM
	Memory bus 2	Connected to ROM	Connected to code flash memory
Internal main bus	Internal main bus 1	- Connected to the CPU - Operates in synchronization with the system clock (ICLK)	- Connected to the CPU - Operates in synchronization with the system clock (ICLK)
	Internal main bus 2	- Connected to the DMAC, DTC - Connected to on-chip memory (RAM, ROM) - Operates in synchronization with the system clock (ICLK)	- Connected to the DMAC, DTC, and SDSI - Connected to on-chip memory (RAM, code flash memory) - Operates in synchronization with the system clock (ICLK)
Internal peripheral bus	Internal peripheral bus 1	- Connected to peripheral modules (DTC, DMAC, interrupt controller, and bus error monitoring section) - Operates in synchronization with the system clock (ICLK)	- Connected to peripheral modules (DTC, DMAC, EXDMAC, interrupt controller, and bus error monitoring section) - Operates in synchronization with the system clock (ICLK) (EXDMAC operates in synchronization with the BCLK)
	Internal peripheral bus 2	- Connected to peripheral modules (modules other than those connected to internal peripheral bus 1) - Operates in synchronization with the peripheral-module clock (PCLKB and PCLKD)	- Connected to peripheral modules (modules other than those connected to internal peripheral buses 1, 3, 4, and 5) - Operates in synchronization with the peripheral-module clock (PCLKB)
	Internal peripheral bus 3	—	Connected to peripheral modules (USBb, PDC, and standby RAM) Operates in synchronization with the peripheral-module clock (PCLKB)

Bus Type		RX210	RX651
Internal peripheral bus	Internal peripheral bus 4	—	- Connected to peripheral modules (MTU3, SCLi, RSPI, and AES) - Operates in synchronization with the peripheral-module clock (PCLKA)
	Internal peripheral bus 5	—	Reserved area
	Internal peripheral bus 6	- Connected to ROM (P/E) and E2 DataFlash memory - Operates in synchronization with the Flash IF clock (FCLK)	- Connected to code flash (in P/E) - Operates in synchronization with the FlashIF clock (FCLK)
External bus	CS area	- Connected to the external devices - Operates in synchronization with the external-bus clock (BCLK)	- Connected to the external devices - Operates in synchronization with the external-bus clock (BCLK)
	SDRAM area	—	- Connected to the SDRAM - Operates in synchronization with the SDRAM clock (SDCLK)

Table 2.21 Comparative Listing of External Bus Specifications

Item	RX210	RX651
External address space	- An external address space is divided into four CS areas (CS0 to CS3) for management. - Chip select signals can be output for each area. - Bus width can be set for each area. - Separate bus: An 8 or 16-bit bus space is selectable. - Address/data multiplexed bus: An 8 or 16-bit bus space is selectable. - An endian mode can be specified for each area.	- An external address space is divided into eight CS areas (CS0 to CS7) and the SDRAM area (SDCS) for management. - Chip select signals can be output for each area. - Bus width can be set for each area. - Separate bus: An 8 or 16-bit bus space is selectable. - Address/data multiplexed bus: An 8 or 16-bit bus space is selectable. - An endian mode can be specified for each area.
CS area controller	- Recovery cycles can be inserted. - Read recovery: Up to 15 cycles - Write recovery: Up to 15 cycles - Cycle wait function: Wait for up to 31 cycles (page access: up to 7 cycles) - Wait control can be used to set up the following. - Timing of assertion and negation for chip-select signals (CS0# to CS3#) - The timing of assertion of the read signal (RD#) and write signals (WR#, WR0#, WR1#) - The timing with which data output starts and ends - Write access mode: Single write strobe mode/byte strobe mode - Separate bus or address/data multiplexed bus can be set for each area.	- Recovery cycles can be inserted. - Read recovery: Up to 15 cycles - Write recovery: Up to 15 cycles - Cycle wait function: Wait for up to 31 cycles (page access: up to 7 cycles) - Wait control can be used to set up the following. - Timing of assertion and negation for chip-select signals (CS0# to CS7#) - The timing of assertion of the read signal (RD#) and write signals (WR0#/WR#, and WR1# to WR1#) - The timing with which data output starts and ends - Write access mode: Single write strobe mode/byte strobe mode - Separate bus or address/data multiplexed bus can be set for each area.
SDRAM area controller	—	Multiplexing output of row address/column address (8, 9, 10, or 11 bits) Self-refresh and auto-Refresh selectable CAS latency can be specified from one to three cycles
Write buffer function	When write data from the bus master has been written to the write buffer, write access by the bus master is completed.	When write data from the bus master has been written to the write buffer, write access by the bus master is completed.
Frequency	The CS area controller (CSC) operates in synchronization with the external-bus clock (BCLK)*1.	- The CS area controller (CSC) operates in synchronization with the external-bus clock (BCLK)*1. The SDRAM area controller (SDRAMC) operates in synchronization with the SDRAM clock (SDCLK).

Note 1. The BCLK and the SDCLK should be operated with the same frequency when the SDRAM is in use.

Table 2.22 Comparative Listing of Bus Registers

Register	Bit	RX210	RX651
CSnCR	—	CSn Control Register (n = 0 to 3)	CSn Control Register (n = 0 to 7)
	EMODE	Endian Mode	Endian Mode
		0: Endian of area n is the same as the endian of operating mode. 1: Endian of area n is not the endian of operating mode. (n = 0 to 3)	0: Endian of area n is the same as the endian of operating mode. 1: Endian of area n is not the endian of operating mode. (n = 0 to 7)
	MPXEN	Address/Data Multiplexed I/O Interface Select	Address/Data Multiplexed I/O Interface Select
		0: Separate bus interface is selected for area n. 1: Address/data multiplexed I/O interface is selected for area n. (n = 0 to 3)	0: Separate bus interface is selected for area n. 1: Address/data multiplexed I/O interface is selected for area n. (n = 0 to 7)
CSnREC	—	CSn Recovery Cycle Register (n = 0 to 3)	CSn Recovery Cycle Register (n = 0 to 7)
CSnMOD	—	CSn Mode Register (n = 0 to 3)	CSn Mode Register (n = 0 to 7)
CSnWCR1	—	CSn Wait Control Register 1 (n = 0 to 3)	CSn Wait Control Register 1 (n = 0 to 7)
CSnWCR2	—	CSn Wait Control Register 2 (n = 0 to 3)	CSn Wait Control Register 2 (n = 0 to 7)
SDCCR	—	—	SDC Control Register
SDCMOD	—	—	SDC Mode Register
SDAMOD	—	—	SDRAM Access Mode Register
SDSELF	—	—	SDRAM Self-Refresh Control Register
SDRFCR	—	—	SDRAM Refresh Control Register
SDRFEN	—	—	SDRAM Auto-Refresh Control Register
SDICR	—	—	SDRAM Initialization Sequence Control Register
SDIR	—	—	SDRAM Initialization Register
SDADR	—	—	SDRAM Address Register
SDTR	—	—	SDRAM Timing Register
SDMOD	—	—	SDRAM Mode Register
SDSR	—	—	SDRAM Status Register
BERSR1	MST[2:0]	Bus Master Code	Bus Master Code
		b6 b4 0 0 0: CPU 0 0 1: Reserved 0 1 0: Reserved 0 1 1: DTC/DMAC 1 0 0: Reserved 1 0 1: Reserved 1 1 0: Reserved 1 1 1: Reserved	b6 b4 0 0 0: CPU 0 0 1: Reserved 0 1 0: Reserved 0 1 1: DTC/DMAC 1 0 0: Reserved 1 0 1: Reserved 1 1 0: SDSI 1 1 1: EXDMAC

Register	Bit	RX210	RX651
BUSPRI	BPGb[1:0]	Internal Peripheral Bus 2 Priority Control	Internal Peripheral Bus 2 and 3 Priority Control
	BPHB[1:0]		Internal Peripheral Bus 4 Priority Control (b9-b8)

2.12 DMA Controller

Table 2.23 shows a Comparative Listing of DMA Controller Specifications, and Table 2.24 shows a Comparative Listing of DMA Controller Registers.

Table 2.23 Comparative Listing of DMA Controller Specifications

Item		RX210 (DMACA)	RX651 (DMACaA)
Number of channels		4 (DMACm (m = 0 to 3))	8 (DMACm (m = 0 to 7))
Transfer space		512 Mbytes (0000 0000h to 0FFF FFFFh and F000 0000h to FFFF FFFFh excluding reserved areas)	512 Mbytes (0000 0000h to 0FFF FFFFh and F000 0000h to FFFF FFFFh excluding reserved areas)
Maximum transfer volume		1M data (Maximum number of transfers in block transfer mode: 1,024 data × 1,024 blocks)	64 Mbytes (Maximum number of transfers in block transfer mode: 1,024 data × 65,536 blocks)
DMA request source		Activation source selectable for each channel • Software trigger • Interrupt requests from peripheral modules or trigger input to external interrupt input pins	Request source selectable for each channel • Software trigger • Interrupt requests from peripheral modules or trigger input to external interrupt input pins
Channel priority		Channel 0 > Channel 1 > Channel 2 > Channel 3 (Channel 0: Highest)	Channel 0 > Channel 1 > Channel 2 > Channel 3... > Channel 7 (Channel 0: Highest)
Transfer data	Single data	Bit length: 8, 16, 32 bits	Bit length: 8, 16, 32 bits
	Block size	Number of data: 1 to 1,024	Number of data: 1 to 1,024
Transfer mode	Normal transfer mode	• One data transfer by one DMA transfer request • Free running mode (setting in which total number of data transfers is not specified) settable	• One data transfer by one DMA transfer request • Free running mode (setting in which total number of data transfers is not specified) settable
	Repeat transfer mode	• One data transfer by one DMA transfer request • Program returns to the transfer start address on completion of the repeat size of data transfer specified for the transfer source or destination. • Maximum settable repeat size: 1,024	• One data transfer by one DMA transfer request • Program returns to the transfer start address on completion of the repeat size of data transfer specified for the transfer source or destination. • Maximum settable repeat size: 1,024
	Block transfer mode	• One block data transfer by one DMA transfer request • Maximum settable block size: 1,024 data	• One block data transfer by one DMA transfer request • Maximum settable block size: 1,024 data

Item		RX210 (DMACA)	RX651 (DMACAa)
Selective functions	Extended repeat area function	- Function in which data can be transferred by repeating the address values in the specified range with the upper bit values in the transfer address register fixed - Area of 2 bytes to 128 Mbytes separately settable as extended repeat area for transfer source and destination	- Function in which data can be transferred by repeating the address values in the specified range with the upper bit values in the transfer address register fixed - Area of 2 bytes to 128 Mbytes separately settable as extended repeat area for transfer source and destination
Interrupt request	Transfer end interrupt	Generated on completion of transferring data volume specified by the transfer counter.	Generated on completion of transferring data volume specified by the transfer counter.
	Transfer escape end interrupt	Generated when the repeat size of data transfer is completed or the extended repeat area overflows.	Generated when the repeat size of data transfer is completed or the extended repeat area overflows.
Event link function		Event link request is generated after one data transfer (for block, after one block transfer).	An event link request is generated after each data transfer (for block transfer, after each block is transferred).
Power consumption reduction function		Module stop state can be set.	Module-stop state can be set.

Table 2.24 Comparative Listing of DMA Controller Registers

Register	Bit	RX210 (DMACA)	RX651 (DMACAa)
DMCRB	—	DMA Block Transfer Count Register (b9-b0)	DMA Block Transfer Count Register (b15-b0)
		001h to 3FFh (1 to 1023) 000h (1024)	0001h to FFFFh (1 to 65535) 0000h (65536)
DMIST	—	—	DMAC74 Interrupt Status Monitor Register

2.13 Data Transfer Controller

Table 2.25 shows a Comparative Listing of Data Transfer Controller Specifications, and Table 2.26 shows a Comparative Listing of Data Transfer Controller Registers.

Table 2.25 Comparative Listing of Data Transfer Controller Specifications

Item	RX210 (DTCa)	RX651 (DTCb)
Number of channels	Channel transfer corresponding to the interrupt source is possible (transferred by DTC activation request from the ICU).	The same number as all interrupt sources that can start the DTC transfer
Transfer mode	- Normal transfer mode — A single activation leads to a single data transfer. - Repeat transfer mode — A single activation leads to a single data transfer. — The transfer address is returned to the transfer start address after the number of data transfers corresponding to “repeat size”. — The maximum repeat size is 256. - Block transfer mode — A single activation leads to the transfer of a single block. — The maximum block size is 256 data.	- Normal transfer mode — A single transfer request leads to a single data transfer. - Repeat transfer mode — A single transfer request leads to a single data transfer. — The transfer address is returned to the transfer start address after the number of data transfers corresponding to “repeat size”. — The maximum number of repeat transfers is 256, and the maximum data transfer size is 256 × 32 bits, 1024 bytes. - Block transfer mode — A single transfer request leads to the transfer of a single block. — The maximum block size is 256 × 32 bits = 1024 byte
Chain transfer	- Data of multiple channels can be transferred on a single activation source (chain transfer). - Either “executed when the counter is 0” or “always executed” can be selected for chain transfer.	- Multiple types of data transfers can sequentially be executed in response to a single request. - Either “performed only when the transfer counter becomes 0” or “every time” can be selected.
Sequence transfer	—	A series of complicated transfers can be registered as a sequence. Any sequence can be selected by the transfer data and executed. - Only one trigger source can be set at a time. - Up to 256 sequences for a single trigger source - The data that is initially transferred in response to a transfer request determines a sequence - The whole sequence can be executed on a single request, or be suspended in the middle of the sequence and resumed on the next transfer request (division of sequence).

Item	RX210 (DTCa)	RX651 (DTCb)
Transfer space	- In short-address mode: 16 Mbytes (Areas from 0000 0000h to 007F FFFFh and FF80 0000h to FFFF FFFFh excepting reserved areas) - In full-address mode: 4 Gbytes (Area from 0000 0000h to FFFF FFFFh excepting reserved areas)	- In short-address mode: 16 Mbytes (Areas from 0000 0000h to 007F FFFFh and FF80 0000h to FFFF FFFFh except reserved areas) - In full-address mode: 4 Gbytes (Area from 0000 0000h to FFFF FFFFh except reserved areas)
Data transfer units	- Length of a single data: 8, 16, or 32 bits - Number of data for a single block: 1 to 256 data	- Single data: 1 byte (8 bits), 1 word (16 bits), 1 longword (32 bits) - Single block size: 1 to 256 data
CPU interrupt source	- An interrupt request can be generated to the CPU on a DTC activation interrupt. - An interrupt request can be generated to the CPU after a single data transfer. - An interrupt request can be generated to the CPU after data transfer of specified volume.	- An interrupt request can be generated to the CPU on a request source for a data transfer. - An interrupt request can be generated to the CPU after a single data transfer. - An interrupt request can be generated to the CPU after data transfer of specified volume
Event link function	Event link request is generated after one data transfer (for block, after one block transfer).	An event link request is generated after one data transfer (for block, after one block transfer).
Read skip	Transfer data read skip can be specified.	Reading of the transfer information can be skipped when the same transfer is repeated.
Write-back skip	When "fixed" is selected for transfer source address and/or transfer destination address, writeback skip execution is provided.	Write-back of the transferred data that is not updated can be skipped when the address of the transfer source or destination is fixed.
Write-back disable	—	Allows disabling the write-back of transfer information.
Displacement addition	—	The displacement value can be added to the transfer source address (for each transfer information)
Lower power consumption function	Module stop state can be specified	Module stop state can be specified

Table 2.26 Comparative Listing of Data Transfer Controller Registers

Register	Bit	RX210 (DTCa)	RX651 (DTCb)
MRA	WBDIS	—	Write-back Disable (b0)
MRB	SQEND	—	Sequence Transfer End (b0)
	INDX	—	Index Table Reference (b1)
MRC	—	—	DTC Mode Register C
DTCVBR	—	DTC Vector Base Address	DTC Vector Base Register
		Lower 12 bits: These bits are read as 0. The write value should be 0.	Lower 10 bits: These bits are read as 0. The write value should be 0.
		Upper 4bits: The upper 4 bits (b31 to b28) are ignored, and the address of this register is extended by the value specified by b27.	Upper 4bits: The upper 4 bits (b31 to b28) are ignored, and the address of this register is extended by the value specified by b27
		It can be set in the range of 0000 0000h to 07FF F000h and F800 0000h to FFFF F000h in 4-Kbyte units	It can be set in the range of 0000 0000h to 07FF FC 00h and F800 0000h to FFFF FC 00h in 1-Kbyte units.
DTCIBR	—	—	DTC Index Table Base Register
DTCOR	—	—	DTC Operation Register
DTCSQE	—	—	DTC Sequence Transfer Enable Register
DTCDISP	—	—	DTC Address Displacement Register

2.14 Event Link Controller

Table 2.27 shows a Comparative Listing of Event Link Controller Specifications, and Table 2.28 shows a Comparative Listing of Event Link Controller Registers.

Table 2.27 Comparative Listing of Event Link Controller Specifications

Item	RX210 (ELC)	RX651 (ELC)
Event link	59 types of event signals can be directly connected to modules. - The operation of timer modules can be selected when an event is input to the timer module. - Event link operation is possible for ports B and E. - Single-port*1: An event link can be set for a specified 1-bit in a port. - Port group*1: An event link can be set for a group of specified bits within an 8-bit port.	82 types of event signals can be directly connected to modules. - The operation of timer modules can be selected when an event is input to the timer module. - Event link operation is possible for port B and port E. - Single port*1: An event link can be set for a single bit specified in a port. - Port group*1: An event link can be set for a group of single bits specified within eight I/O ports.
Low power consumption function	Module stop state can be specified	Module stop state can be specified

Table 2.28 Comparative Listing of Event Link Controller Registers

Register	Bit	RX210 (ELC)	RX651 (ELC)
ELSRn	—	Event Link Setting Register n (n = 1 to 4, 7, 10, 12, 15, 16, 18 to 29)	Event Link Setting Register n (n = 0, 3, 4, 7, 10 to 13, 15, 16, 18 to 28, 33, 35 to 38, 45)
	ELS[7:0]	Event Link Select b7 b0 00000000: Event link function is disabled. 00000001 to 01101001: Set the number for the event signal to be linked. Settings other than above are prohibited.	Event Link Select 00h: Event output to the corresponding peripheral module is disabled. 01h to BDh: Set the number for the event signal to be linked. Settings other than above are prohibited
ELOPA	MTU0MD[1:0]	—	MTU0 Operation Select (b1-b0)
	MTU1MD[1:0]	MTU1 Operation Select (b3-b2)	—
	MTU2MD[1:0]	MTU2 Operation Select (b5-b4)	—
ELOPD	TMR1MD[1:0]	—	TMR1 Operation Select (b3-b2)
	TMR3MD[1:0]	—	TMR3 Operation Select (b7-b6)
ELOPF	—	—	Event Link Option Setting Register F
ELOPH	—	—	Event Link Option Setting Register H

2.15 I/O Ports

Table 2.29 shows a Comparative Listing of I/O Ports Specifications, and Table 2.30 shows a Comparative Listing of I/O Port Registers.

Table 2.29 Comparative Listing of I/O Ports Specifications

Port	RX210		RX651	
	145 or 144Pins	100pins	145 or 144Pins	100pins
PORT0	P00 to P03, P05, P07	P03, P05, P07	P00 to P03, P05, P07	P05, P07
PORT1	P12 to P17	P12 to P17	P12 to P17	P12 to P17
PORT2	P20 to P27	P20 to P27	P20 to P27	P20 to P27
PORT3	P30 to P37	P30 to P37	P30 to P37	P30 to P37
PORT4	P40 to P47	P40 to P47	P40 to P47	P40 to P47
PORT5	P50 to P56	P50 to P55	P50 to P56	P50 to P55
PORT6	P60 to P67	None	P60 to P67	None
PORT7	P70 to P77	None	P70 to P77	None
PORT8	P80 to P83, P86, P87	None	P80 to P83, P86, P87	None
PORT9	P90 to P93	None	P90 to P93	None
PORTA	PA0 to PA7	PA0 to PA7	PA0 to PA7	PA0 to PA7
PORTB	PB0 to PB7	PB0 to PB7	PB0 to PB7	PB0 to PB7
PORTC	PC0 to PC7	PC0 to PC7	PC0 to PC7	PC0 to PC7
PORTD	PD0 to PD7	PD0 to PD7	PD0 to PD7	PD0 to PD7
PORTE	PE0 to PE7	PE0 to PE7	PE0 to PE7	PE0 to PE7
PORTF	PF5	None	PF5	None
PORTH	PH0 to PH3	PH0 to PH3	None	None
PORTJ	PJ1, PJ3, PJ5	PJ1, PJ3	PJ3, PJ5	PJ3
PORTK	PK2 to PK5	None	None	None
PORTL	PL0, PL1	None	None	None
Total	123	85	112	79

Table 2.30 Comparative Listing of I/O Port Registers

Register	Bit	RX210	RX651
PDR	—	Port Direction Register Pmn I/O Select n = 0 to 7 m = 0 to 9, A to F, H, J, K, L	Port Direction Register Pmn I/O Select n = 0 to 7 m = 0 to 9, A to F, J
PODR	—	Port Output Data Register Pmn Output Data Store n = 0 to 7 m = 0 to 9, A to F, H, J, K, L	Port Output Data Register Pmn Output Data Store n = 0 to 7 m = 0 to 9, A to F, J
PIDR	—	Port Input Data Register Pmn n = 0 to 7 m = 0 to 9, A to F, H, J, K, L	Port Input Register Pmn n = 0 to 7 m = 0 to 9, A to F, J
PMR	—	Port Mode Register Pmn Pin Mode Control n = 0 to 7 m = 9 to 0, A to F, H, J, K, L	Port Mode Register Pmn Pin Mode Control n = 0 to 7 m = 9 to 0, A to F, J
ODR0	—	Open Drain Control Register 0 m = 0 to 3, 5 to 9, A to C, E, K	Open Drain Control Register 0 m = 0, 1, 2, 3, 4 , 5, 6, 7, 8, 9, A, B, C, D , E, J
	Pm1 Output Type Select	Pm1 Output Type Select - P01, P21, P31, P51, P61, P81, P91, PA1, PB1, PC1 - b2 0: CMOS Output 1: N channel Open drain - b3: This bit is read as 0. The write value should be 0. - PE1 - b3 b2 0 0: CMOS Output 0 1: N channel Open drain 1 0: P channel Open drain 1 1: Hi-Z	- In case of except Port E1 Odd-bit Even-bit x 0: CMOS Output x 1: N channel Open drain (b1, b3, b5, b7: Reserved) - In case of Port PE1 b3 b2 0 0: CMOS Output 0 1: N channel Open drain 1 0: P channel Open drain 1 1: Setting prohibit
ODR1	—	Open Drain Control Register 1 m = 1, 2, 3, 7, A to C, E, K	Open Drain Control Register 1 m = 0 , 1, 2, 3, 4, 5, 6 , 7, 8, A to F, J
PCR	—	Pull-Up Resistor Control Register m = 0 to 9, A to F, H, J to L	Pull-Up Resistor Control Register m = 0 to 9, A to F, J
DSCR	—	Drive Capacity Control Register m = 0, 1, 2, 3, 5, 6, 7, 8 , 9, A to E, H, J, K	Drive Capacity Control Register m = 0, 2, 5, 9, A to E
DSCR2	—	—	Drive Capacity Control Register 2

2.16 Multi-Function Pin Controller

Table 2.31 shows a Comparative Listing of Multi-Function Pin Controller Registers.

Table 2.31 Comparative Listing of Multi-Function Pin Controller Registers

Register	Bit	RX210 (MPC)	RX651 (MPC)
PmnPFS	—	Refer to the user's manual for descriptions of the pin function control registers.	
PFCSE	CS0E	CS0 Enable of PC7	CS0 Enable
	CS1E	CS1 Enable of PC6	CS1 Enable
	CS2E	CS2 Enable of P26	CS2 Enable
	CS3E	CS3 Enable of P27	CS3 Enable
	CS4E	CS0 Enable of P24	CS4 Enable
	CS5E	CS1 Enable of P25	CS5 Enable
	CS6E	CS2 Enable of PC5	CS6 Enable
	CS7E	CS3 Enable of PC4	CS7 Enable
PFCSS0	—	—	CS Output Pin Select Register 0
PFCSS1	—	—	CS Output Pin Select Register 1
PFBCR0	ADRHMS	—	A16 to A23 Output Enable (b1)
	ADRHMS2	—	A16 to A23 Output Enable 2 (b2)
	BCLKO	—	BCLK Forced Output (b3)
PFBCR1	MDSDE	—	SDRAM Pin Enable (b4)
	DQM1E	—	DQM1 Enable (b6)
	SDCLKE	—	SDCLK Enable (b7)

2.17 16-Bit Timer Pulse Unit

Table 2.32 shows a Comparative Listing of 16-Bit Timer Pulse Unit Specifications, and Table 2.33 shows a Comparative Listing of Multi-Function Pin Controller Registers.

Table 2.32 Comparative Listing of 16-Bit Timer Pulse Unit Specifications

Item	RX210 (TPUa)	RX651 (TPUa)
Pulse input/output	Maximum 16	Maximum 16
Count clock	Seven or eight types are provided for each channel	Seven or eight types are provided for each channel
Settable operations	- Waveform output at compare match - Input capture function (noise filters can be set) - Counter clear operation - Simultaneous writing to multiple timer counters (TCNT) - Simultaneous clearing by compare match and input capture - Synchronous input/output for registers by counter synchronous operation - Maximum of 15-phase PWM output by combination with synchronous operation - Cascaded operation	- Waveform output at compare match - Input capture function (noise filters can be set) - Counter clear operation - Simultaneous writing to multiple timer counters (TCNT) - Simultaneous clearing by compare match and input capture - Synchronous input/output for registers by counter synchronous operation - Maximum of 15-phase PWM output by combination with synchronous operation - Cascaded operation
TPU0, TPU3	Buffer operation can be set	Buffer operation can be set
TPU1, TPU2, TPU4, TPU5	Phase counting mode can be set	Phase counting mode can be set
Interrupt source	26 sources	26 sources
Buffer operation	Automatic transfer of register data	Automatic transfer of register data
Generation of trigger	—	Programmable pulse generator (PPG) output trigger can be generated
	Conversion start trigger for the A/D converter can be generated.	Conversion start trigger for the A/D converter can be generated.
Event linking (output)	—	Six types of event signal can be output to the ELC. - Compare match A (TPU0 to TPU3) - Compare match B (TPU0 to TPU3) - Compare match C (TPU0, TPU3) - Compare match D (TPU0, TPU3) - Overflow (TPU0 to TPU3) - Underflow (TPU1, TPU2)
Event linking (input)	—	Any of the three operations in response to event input is possible. - Starting counts (TPU0 to TPU3) - Restarting counts (TPU0 to TPU3) - Input capture operation (TPU0 to TPU3)
Low power consumption function	Module stop state can be set for each unit.	Module stop state can be set

Table 2.33 Comparative Listing of Multi-Function Pin Controller Registers

Register	Bit	RX210	RX651
TIER	TTGE	A/D Conversion Start Request Enable	A/D Conversion Start Request Enable* ¹

Note 1. Bit 7 in TIER of TPU5 is reserved. This bit is read as 0. The write value should be 0.

2.18 8-Bit Timer

Table 2.34 shows a Comparative Listing of 8-Bit Timer Specifications, and Table 2.35 shows a Comparative Listing of 8-Bit Timer Registers.

Table 2.34 Comparative Listing of 8-Bit Timer Specifications

Item	RX210 (TMR)	RX651 (TMR)
Count clocks	- Frequency divided clock: PCLK/1, PCLK/2, PCLK/8, PCLK/32, PCLK/64, PCLK/1024, PCLK/8192 - External clock	- Frequency divided clock: PCLK/1, PCLK/2, PCLK/8, PCLK/32, PCLK/64, PCLK/1024, PCLK/8192 - External clock
Number of channels	(8 bits x 2 channels) x 2 units	(8 bits x 2 channels) x 2 units
Compare match	8-bit mode (compare match A, compare match B) 16-bit mode (compare match A, compare match B)	8-bit mode (compare match A, compare match B) 16-bit mode (compare match A, compare match B)
Counter clear	Selected by compare match A or B, or an external reset signal.	Selected by compare match A or B, or an external reset signal.
Timer output	Output pulses with a desired duty cycle or PWM output	Output pulses with a desired duty cycle or PWM output
Cascading of two channels	16-bit count mode 16-bit timer using TMR0 for the upper 8 bits and TMR1 for the lower 8 bits (TMR2 for the upper 8 bits and TMR3 for the lower 8 bits) - Compare match count mode TMR1 can be used to count TMR0 compare matches (TMR3 can be used to count TMR2 compare matches).	16-bit count mode 16-bit timer using TMR0 for the upper 8 bits and TMR1 for the lower 8 bits (TMR2 for the upper 8 bits and TMR3 for the lower 8 bits) - Compare match count mode TMR1 can be used to count TMR0 compare matches (TMR3 can be used to count TMR2 compare matches).
Interrupt sources	Compare match A, compare match B, and overflow	Compare match A, compare match B, and overflow
Event link function (output)	Compare match A, compare match B, and overflow (TMR0, TMR2)	Compare match A, compare match B, and overflow (TMR0 to TMR3)
Event link function (input)	(1) Count start operation (TMR0, TMR2) (2) Event counter operation (TMR0, TMR2) (3) Count restart operation (TMR0, TMR2)	One of the following three operations proceeds in response to an event reception: (1) Counting start operation (TMR0 to TMR3) (2) Event counting operation (TMR0 to TMR3) (3) Counting restart operation (TMR0 to TMR3)
DTC activation	DTC can be activated by compare match A interrupts or compare match B interrupts.	DTC can be activated by compare match A interrupts or compare match B interrupts.
A/D conversion start trigger of the A/D converter	—	Compare match A of TMR0 or TMR2
Capable of generating baud rate clock for SCI	Generates baud rate clock for SCI.	Generation of baud rate clock for SCI

Item	RX210 (TMR)	RX651 (TMR)
Low power consumption function	Each unit can be placed in a module stop state	Each unit can be placed in a module stop state

Table 2.35 Comparative Listing of 8-Bit Timer Registers

Register	Bit	RX210 (TMR)	RX651 (TMR)
TCSR	ADTE	—	A/D Trigger Enable (b4)

2.19 Realtime Clock

Table 2.36 shows a Comparative Listing of Realtime Clock Specifications, and Table 2.37 shows a Comparative Listing of Realtime Clock Registers.

Table 2.36 Comparative Listing of Realtime Clock Specifications

Item	RX210 (RTCb)	RX651 (RTCd)
Count modes	Calendar count mode	Calendar count mode/ binary count mode
Count source	Sub-clock (XCIN)	Sub-clock (XCIN) or main clock (EXTAL)
Clock and calendar functions	• Calendar count mode — Year, month, date, day of the week, hours, minutes, and seconds are counted and represented in BCD — Selection of 12- or 24-hour mode — 30-second adjustment (30 seconds or less are rounded down to 00 second, and 30 seconds or more are rounded up to one minute) — Automatic leap year adjustment — Start/stop function — Indicates the state of 1, 2, 4, 8, 16, 32, or 64-Hz in binary — Time error adjustment function — Output a 1-Hz clock	• Calendar count mode — Year, month, date, day-of-week, hour, minute, second are counted, BCD display — 12 hours/24 hours mode switching function — 30 seconds adjustment function (a number less than 30 is rounded down to 00 seconds, and 30 seconds or more are rounded up to one minute) — Automatic adjustment function for leap years • Binary count mode — Count seconds in 32 bits, binary display • Common to both modes — Start/stop function — The sub-second digit is displayed in binary units (1 Hz, 2 Hz, 4 Hz, 8 Hz, 16 Hz, 32 Hz, or 64 Hz). — Clock error correction function — Clock (1 Hz/64 Hz) output

Item	RX210 (RTCb)	RX651 (RTCd)
Interrupt	- Alarm interrupt (ALM) Year, month, date, day of the week, hours, minutes, and seconds can be selected as conditions for the alarm interrupt - Periodic interrupt (PRD) 2 seconds, 1 second, 1/2 second, 1/4 second, 1/8 second, 1/16 second, 1/32 second, 1/64 second, or 1/256 second can be selected as an interrupt period. - Carry interrupt (CUP) Indicates occurrence of a carry to the seconds counter or a carry to the 64-Hz counter during reading of the 64-Hz counter - Recovery from software standby mode or deep software standby mode can be performed by an alarm interrupt or periodic interrupt	- Alarm interrupt (ALM) As an alarm interrupt condition, selectable which of the below is compared with: - Calendar count mode: Year, month, date, day-of-week, hour, minute, or second can be selected - Binary count mode: Each bit of the 32-bit binary counter - Periodic interrupt (PRD) 2 seconds, 1 second, 1/2 second, 1/4 second, 1/8 second, 1/16 second, 1/32 second, 1/64 second, 1/128 second, or 1/256 second can be selected as an interrupt period. - Carry interrupt (CUP) An interrupt is generated at either of the following timings: - When a carry from the 64-Hz counter to the second counter is generated. - When the 64-Hz counter is changed and the R64CNT register is read at the same time. - Recovery from software standby mode or deep software standby mode can be performed by an alarm interrupt or periodic interrupt
Time-capture function	- Times when any of three event signals are input can be captured - The month, date, hour, minute, and second are captured for each event	- Times can be captured when the edge of the time capture event input pin is detected. - For every event input, month, date, hour, minute, and second are captured or 32-bit binary counter value is captured.
Event link function	Periodic event output	Periodic event output

Table 2.37 Comparative Listing of Realtime Clock Registers

Register	Bit	RX210 (RTCb)	RX651 (RTCd)
BCNT0*1	—	—	Binary Counter 0
BCNT1*1	—	—	Binary Counter 1
BCNT2*1	—	—	Binary Counter 2
BCNT3*1	—	—	Binary Counter 3
RSECCNT	SEC1[3:0]	Ones Place of Seconds	1-Second Count
	SEC10[2:0]	Tens Place of Seconds	10-Second Count
RMINCNT	MIN1[3:0]	Ones Place of Minutes	1-Minute Count
	MIN10[2:0]	Tens Place of Minutes	10-Minute Count
RHRCNT	HR1[3:0]	Ones Place of Hours	1-Hour Count
	HR10[1:0]	Tens Place of Hours	10-Hour Count
RDAYCNT	DATE1[3:0]	Ones Place of Days	1-Day Count
	DATE10[1:0]	Tens Place of Days	10-Day Count
RMONCNT	MON1[3:0]	Ones Place of Months	1-Month Count
	MON10	Tens Place of Months	10-Month Count

Register	Bit	RX210 (RTCb)	RX651 (RTCd)
RYRCNT	YR1[3:0]	Ones Place of Years	1-Year Count
	YR10[3:0]	Tens Place of Years	10-Year Count
BCNT0AR* ¹	—	—	Binary Counter 0 Alarm Register
BCNT1AR* ¹	—	—	Binary Counter 1 Alarm Register
BCNT2AR* ¹	—	—	Binary Counter 2 Alarm Register
BCNT3AR* ¹	—	—	Binary Counter 3 Alarm Register
BCNT0AER* ¹	—	—	Binary Counter 0 Alarm Enable Register
BCNT1AER* ¹	—	—	Binary Counter 1 Alarm Enable Register
BCNT2AER* ¹	—	—	Binary Counter 2 Alarm Enable Register
BCNT3AER* ¹	—	—	Binary Counter 3 Alarm Enable Register
RCR1	RTCOS	—	RTCCOUT Output Select (b3)
RCR2	CNTMD	—	Count Mode Select (b7)
RCR4	—	—	RTC Control Register 4
RFRH/L	—	—	Frequency Register H/L
RSECCPy	SEC1[3:0]	Ones Place of Seconds Captured	1-Second Capture
	SEC10[2:0]	Tens Place of Seconds Captured	10-Second Capture
RMINCPy	MIN1[3:0]	Ones Place of Minutes Captured	1-Minute Capture
	MIN10[2:0]	Tens Place of Minutes Captured	10-Minute Capture
RHRCPy	HR1[3:0]	Ones Place of Hours Captured	1-Hour Capture
	HR10[1:0]	Tens Place of Hours Captured	10-Hour Capture
RDAYCPy	DATE1[3:0]	Ones Place of Days Captured	1-Day Capture
	DATE10[1:0]	Tens Place of Days Captured	10-Day Capture
RMONCPy	MON1[3:0]	Ones Place of Months Captured	1-Month Capture
	MON10	Tens Place of Months Captured	10-Month Capture
BCNT0CPy* ¹	—	—	BCNT0 Capture Register y (y = 0 to 2)
BCNT1CPy* ¹	—	—	BCNT1 Capture Register y (y = 0 to 2)
BCNT2CPy* ¹	—	—	BCNT2 Capture Register y (y = 0 to 2)
BCNT3CPy* ¹	—	—	BCNT3 Capture Register y (y = 0 to 2)

Note 1. In binary count mode

2.20 Watchdog Timer

Table 2.38 shows a Comparative Listing of Watchdog Timer Specifications, and Table 2.39 shows a Comparative Listing of Watchdog Timer Registers.

Table 2.38 Comparative Listing of Watchdog Timer Specifications

Item	RX210 (WDTA)	RX651 (WDTA)
Count source	Peripheral clock (PCLK)	Peripheral module clock (PCLK)
Clock division ratio	Divide by 4, 64, 128, 512, 2,048, or 8,192	Divide by 4, 64, 128, 512, 2,048, or 8,192
Counter operation	Counting down using a 14-bit down-counter	Counting down using a 14-bit down-counter
Conditions for starting the counter	- Counting automatically starts after a reset (auto-start mode) - Counting is started by refreshing the WDTRR register (writing 00h and then FFh) (register start mode)	- Auto-start mode: Counting automatically starts after a reset or after an underflow or refresh error occurs - Register start mode: Counting is started by refresh operation (writing to the WDTRR register)
Conditions for stopping the counter	- Reset generated by the RES# pin (the down-counter and registers return to their initial values) - A counter underflows or a refresh error is generated. Count restarts (Auto-start mode: Count restarts automatically after a reset or non-maskable interrupt request is issued. Register start mode: Count restarts after refreshing the counter)	- Reset (the down-counter and other registers return to their initial values) - A counter underflows or a refresh error is generated
Window function	Window start and end positions can be specified (refresh-permitted and refresh-prohibited periods)	Window start and end positions can be specified (refresh-permitted and refresh-prohibited periods)
Watchdog timer Reset sources	- Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)	- Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)
Interrupt sources	- A non-maskable interrupt (WUNI) is generated by an underflow of the down-counter - Refreshing outside the refresh-permitted period (refresh error)	Non-maskable interrupt/ interrupt sources - Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)
Reading the counter value	The down-counter value can be read by the WDTSR register.	The down-counter value can be read by the WDTSR register.

Table 2.39 Comparative Listing of Watchdog Timer Registers

Register	Bit	RX210 (WDTA)	RX651 (WDTA)
WDTRCR	RSTIRQS	Reset Interrupt Request Selection	Reset Interrupt Request Selection
		0: Non-maskable interrupt request output is enabled	0: Non-maskable interrupt request or interrupt request output is enabled
		1: Reset output is enabled	1: Reset output is enabled

2.21 Independent Watchdog Timer

Table 2.40 shows a Comparative Listing of Independent Watchdog Timer Specifications, and Table 2.41 shows a Comparative Listing of Independent Watchdog Timer Registers.

Table 2.40 Comparative Listing of Independent Watchdog Timer Specifications

Item	RX210 (IWDTA)	RX651 (IWDTa)
Count source	IWDT-dedicated clock (IWDTCLK)	IWDT-dedicated clock (IWDTCLK)
Clock divide ratio	Division by 1, 16, 32, 64, 128, or 256	Division by 1, 16, 32, 64, 128, or 256
Counter operation	Counting down using a 14-bit down-counter	Counting down using a 14-bit down-counter
Conditions for starting the counter	- Counting automatically starts after a reset (auto-start mode) - Counting is started by refreshing the IWDTRR register (writing 00h and then FFh) (register start mode)	- Counting automatically starts after a reset (auto-start mode) - Counting is started by refreshing the IWDTRR register (writing 00h and then FFh) (register start mode)
Conditions for stopping the counter	- Reset (the down-counter and other registers return to their initial values) - A counter underflows or a refresh error is generated Count restarts automatically in auto-start mode after a reset or output for non-maskable interrupt request/ interrupt request, or by refreshing the counter in register start Mode	- Reset (the down-counter and other registers return to their initial values) - A counter underflows or a refresh error is generated Counting restarts (In auto-start mode, counting automatically restarts after a reset or after a nonmaskable interrupt request/ interrupt request is output. In register start mode, counting restarts after refreshing.)
Window function	Window start and end positions can be specified (refresh-permitted and refresh-prohibited periods)	Window start and end positions can be specified (refresh-permitted and refresh-prohibited periods)
Reset output sources	- Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)	- Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)
interrupt sources	Non-maskable interrupt - A non-maskable interrupt (WUNI) is generated by an underflow of the down-counter - When refreshing is done outside the refresh-permitted period (refresh error)	Non-maskable interrupt/ interrupt sources - Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)
Reading the counter value	The down-counter value can be read by the IWDTSR register.	The down-counter value can be read by the IWDTSR register.
Event link function (output)	- Down-counter underflows - Refreshing outside the refresh-permitted period (refresh error)	- Down-counter underflow event output - Refresh error event output
Output signal (internal signal)	- Reset output - Interrupt request output - Sleep mode count stop control output	- Reset output - Interrupt request output - Sleep mode count stop control output

Item	RX210 (IWDTA)	RX651 (IWDTa)
Auto-start mode (controlled by option function select register 0 (OFS0))	- Selecting the clock frequency division ratio after a reset (OFS0.IWDTCCKS[3:0] bits) - Selecting the time-out period of the watchdog timer (OFS0.IWDTTOPS[1:0] bits) - Selecting the window start position in the watchdog timer (OFS0.IWDTRPSS[1:0] bits) - Selecting the window end position in the watchdog timer (OFS0.IWDTRPES[1:0] bits) - Selecting the reset output or interrupt request output (OFS0.IWDTRSTIRQS bit) - Selecting the down-count stop function at transition to sleep mode, software standby mode, deep software standby mode, or all-module clock stop mode (OFS0.IWDTSCLCSTP bit)	- Selecting the clock frequency divide ratio after a reset (OFS0.IWDTCCKS[3:0] bits) - Selecting the timeout period of the independent watchdog timer (OFS0.IWDTTOPS[1:0] bits) - Selecting the window start position in the independent watchdog timer (OFS0.IWDTRPSS[1:0] bits) - Selecting the window end position in the independent watchdog timer (OFS0.IWDTRPES[1:0] bits) - Selecting the reset output or interrupt request output (OFS0.IWDTRSTIRQS bit) - Selecting the down-count stop function at transition to sleep mode, software standby mode, deep software standby mode, or all-module clock stop mode (OFS0.IWDTSCLCSTP bit)
Register start mode (controlled by the IWDTCR registers)	- Selecting the clock frequency division ratio after refreshing (IWDTCR.CKS[3:0] bits) - Selecting the time-out period of the watchdog timer (IWDTCR.TOPS[1:0] bits) - Selecting the window start position in the watchdog timer (IWDTCR.RPSS[1:0] bits) - Selecting the window end position in the watchdog timer (IWDTCR.RPES[1:0] bits) - Selecting the reset output or interrupt request output (IWDTCR.RSTIRQS bit) - Selecting the down-count stop function at transition to sleep mode, software standby mode, deep software standby mode, or all-module clock stop mode (IWDTCSTPR.SLCSTP bit)	- Selecting the clock frequency divide ratio after refreshing (IWDTCR.CKS[3:0] bits) - Selecting the timeout period of the independent watchdog timer (IWDTCR.TOPS[1:0] bits) - Selecting the window start position in the independent watchdog timer (IWDTCR.RPSS[1:0] bits) - Selecting the window end position in the independent watchdog timer (IWDTCR.RPES[1:0] bits) - Selecting the reset output or interrupt request output (IWDTCR.RSTIRQS bit) - Selecting the down-count stop function at transition to sleep mode, software standby mode, deep software standby mode, or all-module clock stop mode (IWDTCSTPR.SLCSTP bit)

Table 2.41 Comparative Listing of Independent Watchdog Timer Registers

Register	Bit	RX210 (IWDTCR)	RX651 (IWDTCa)
IWDTRCR	RSTIRQS	Reset Interrupt Request Selection	Reset Interrupt Request Select
		0: Non-maskable interrupt request output is enabled. 1: Reset output is enabled.	0: Non-maskable interrupt request or interrupt request output is enabled. 1: Reset output is enabled.

2.22 Serial Communications Interface

The RX210 Group has 13 independent serial communications interface channels (SCIc: 12 channels, SCId: 1 channel).

The RX651 Group has 13 independent serial communications interface channels (SCIg: 10 channels, SCIf: 2 channels, SCIfh: 1 channel).

Table 2.42 shows a Comparative Listing of SCIc and SCIg Specifications, Table 2.43 shows a Comparative Listing of SCId and SCIf Specifications, Table 2.44 shows a Comparative Listing of SCId and SCIfh Specifications, Table 2.45 shows a Comparative Listing of Serial Communications Interface Channels Specifications, and Table 2.46 shows a Comparative Listing of Serial Communications Interface Registers.

Table 2.42 Comparative Listing of SCIc and SCIg Specifications

Item		RX210 (SCIc)	RX651 (SCIg)
Number of channels		12 channels	10 channels
Serial communications modes		- Asynchronous operation - Clock synchronous operation - Smart card interface - Simple I²C bus - Simple SPI bus	- Asynchronous operation - Clock synchronous operation - Smart card interface - Simple I²C bus - Simple SPI bus
Transfer speed		Bit rate specifiable with on-chip baud rate generator.	Bit rate specifiable with on-chip baud rate generator.
Full-duplex communications		- Transmitter: Enables continuous transmission by double-buffering. - Receiver: Enables continuous reception by double-buffering.	- Transmitter: Enables continuous transmission by double-buffering. - Receiver: Enables continuous reception by double-buffering.
Data transfer		Selectable as LSB-first or MSB-first transfer*1	Selectable as LSB-first or MSB-first transfer*1
Interrupt sources		Transmit-end, transmit-data-empty, receive-data-full, and receive error Completion of generation of a start condition, restart condition, or stop condition (for simple I ² C mode)	Transmit-end, transmit-data-empty, receive-data-full, and receive error Completion of generation of a start condition, restart condition, or stop condition (for simple I ² C mode)
Power consumption reduction function		Module stop state can be set for each channel.	Module stop state can be set for each channel.
Asynchronous mode	Data length	7 or 8 bits	7, 8, or 9 bits
	Transmission stop bit	1 or 2 bits	1 or 2 bits
	Parity	Even, odd, or none	Even, odd, or none
	Receive error detection	Parity, overrun, and framing errors	Parity, overrun, and framing errors
	Hardware flow control	CTSn and RTSn pins can be used in transfer control.	CTSn and RTSn pins can be used in transfer control.
	Start-bit detection	Low is detected	Low level or falling edge is selectable.
	Break detection	Break can be detected by reading RXDn pin level directly in case of a framing error	When a framing error occurs, a break can be detected by reading the RXDn pin level directly

Item		RX210 (SCIc)	RX651 (SCIg)
Asynchronous mode	Clock source	- Selectable from internal or external clock - Enables transfer rate clock input from TMR (SCI5 and SCI6)	- An internal or external clock can be selected. - Transfer rate clock input from the TMR can be used. (SCI5, SCI6)
	Double-speed mode	—	Baud rate generator double-speed mode is selectable.
	Multi-processor communications function	Serial communication among multiple processors	Serial communication among multiple processors
	Noise cancellation	The signal paths from input on the RXDn pins incorporate digital noise filters.	The signal paths from input on the RXDn pins incorporate digital noise filters.
Clock synchronous mode	Data length	8 bits	8 bits
	Receive error detection	Overrun errors	Overrun errors
	Hardware flow control	CTSn and RTSn pins can be used in transfer control.	CTSn and RTSn pins can be used in transfer control.
Smart card interface mode	Error processing	An error signal can be automatically transmitted on detection of a parity error during reception	An error signal can be automatically transmitted on detection of a parity error during reception
		Data can be automatically re-transmitted on receiving an error signal during transmission	Data can be automatically re-transmitted on receiving an error signal during transmission
	Data type	Both direct convention and inverse convention are supported.	Both direct convention and inverse convention are supported.
Simple I ² C mode	Transfer format	I ² C bus format (MSB-first transfer only)	I ² C bus format (MSB-first transfer only)
	Operating mode	Master (single-master operation only)	Master (single-master operation only)
	Transfer rate	Up to 384 kbps	Fast mode is supported.
	Noise cancellation	The signal paths from input on the SSCLn and SSDAn pins incorporate digital noise filters, and the interval for noise cancellation is adjustable.	The signal paths from input on the SSCLn and SSDAn pins incorporate digital noise filters, and the interval for noise cancellation is adjustable.
Simple SPI bus	Data length	8 bits	8 bits
	Detection of errors	Overrun errors	Overrun errors
	SS input pin function	Applying the high level to the SS# pin can cause the output pins to enter the highimpedance state.	Applying the high level to the SS# pin can cause the output pins to enter the highimpedance state.
	Clock settings	Four kinds of settings for clock phase and clock sense are selectable.	Four kinds of settings for clock phase and clock sense are selectable.
Bit rate modulation function		—	Correction of outputs from the on-chip baud rate generator can reduce errors.

Item	RX210 (SCIc)	RX651 (SCIg)
Event link function	Error (receive error or error signal detection) event output	Error (receive error or error signal detection) event output
	Receive data full event output	Receive data full event output
	Transmit data empty event output	Transmit data empty event output
	Transmit end event output	Transmit end event output

Note 1. In simple I²C mode, only MSB-first is available

Table 2.43 Comparative Listing of SC1c and SC1i Specifications

Item		RX210 (SC1c)	RX651 (SC1i)
Number of channels		12 channels	2 channels
Serial communications modes		- Asynchronous operation - Clock synchronous operation - Smart card interface - Simple I2C bus - Simple SPI bus	- Asynchronous operation - Clock synchronous operation - Smart card interface - Simple I2C bus - Simple SPI bus
Transfer speed		Bit rate specifiable with on-chip baud rate generator.	Bit rate specifiable with on-chip baud rate generator.
Full-duplex communications		- Transmitter: Enables continuous transmission by double-buffering. - Receiver: Enables continuous reception by double-buffering.	- Transmitter: Enables continuous transmission by double-buffering. - Receiver: Enables continuous reception by double-buffering.
Data transfer		Selectable as LSB-first or MSB-first transfer*1	Selectable as LSB-first or MSB-first transfer*1
Interrupt sources		Transmit-end, transmit-data-empty, receive-data-full, and receive error Completion of generation of a start condition, restart condition, or stop condition (for simple I2C mode)	Transmit end, transmit data empty, receive data full, receive error, receive data ready, and data match Completion of generation of a start condition, restart condition, or stop condition (for simple I2C mode)
Power consumption reduction function		Module stop state can be set for each channel	Module stop state can be set for each channel
Asynchronous mode	Data length	7 or 8 bits	7, 8, or 9 bits
	Transmission stop bit	1 or 2 bits	1 or 2 bits
	Parity	Even, odd, or none	Even, odd, or none
	Receive error detection	Parity, overrun, and framing errors	Parity, overrun, and framing errors
	Hardware flow control	CTSn and RTSn pins can be used in transfer control.	CTSn and RTSn pins can be used in transfer control.
	Transmit/receive FIFO	—	16-stage FIFOs for transmit and receive buffers
	Data match detection	—	Compares receive data and comparison data, and generates interrupt when they are matched
	Start-bit detection	Low is detected	Low level or falling edge is selectable.
	Break detection	Break can be detected by reading RXDn pin level directly in case of a framing error	When a framing error occurs, a break can be detected by reading the RXDn pin level directly
	Clock source	- Selectable from internal or external clock - Enables transfer rate clock input from TMR (SCI5 and SCI6)	An internal or external clock can be selected.
Double-speed mode		—	Baud rate generator double-speed mode is selectable.

Item		RX210 (SC1c)	RX651 (SC1i)
Asynchronous mode	Multi-processor communications function	Serial communication among multiple processors	Serial communication among multiple processors
	Noise cancellation	The signal paths from input on the RXDn pins incorporate digital noise filters.	The signal paths from input on the RXDn pins incorporate digital noise filters.
Clock synchronous mode	Data length	8 bits	8 bits
	Receive error detection	Overrun errors	Overrun errors
	Hardware flow control	CTSn and RTSn pins can be used in transfer control.	CTSn and RTSn pins can be used in transfer control.
	Transmit/receive FIFO	—	16-stage FIFOs for transmit and receive buffers
Smart card interface mode	Error processing	An error signal can be automatically transmitted on detection of a parity error during reception	An error signal can be automatically transmitted on detection of a parity error during reception
		Data can be automatically re-transmitted on receiving an error signal during transmission	Data can be automatically re-transmitted on receiving an error signal during transmission
	Data type	Both direct convention and inverse convention are supported.	Both direct convention and inverse convention are supported.
Simple I ² C mode	Transfer format	I ² C bus format (MSB-first transfer only)	I ² C bus format (MSB-first transfer only)
	Operating mode	Master (single-master operation only)	Master (single-master operation only)
	Transfer rate	Up to 384 kbps	Fast mode is supported
	Noise cancellation	The signal paths from input on the SSCLn and SSDAn pins incorporate digital noise filters, and the interval for noise cancellation is adjustable.	The signal paths from input on the SSCLn and SSDAn pins incorporate digital noise filters, and the interval for noise cancellation is adjustable
Simple SPI bus	Data length	8 bits	8 bits
	Detection of errors	Overrun errors	Overrun errors
	SS input pin function	Applying the high level to the SS# pin can cause the output pins to enter the high-impedance state.	Applying the high level to the SS# pin can cause the output pins to enter the high-impedance state.
	Clock settings	Four kinds of settings for clock phase and clock sense are selectable.	Four kinds of settings for clock phase and clock sense are selectable.
Bit rate modulation function		—	Correction of outputs from the on-chip baud rate generator can reduce errors.

Note 1. In simple I²C mode, only MSB-first is available

Table 2.44 Comparative Listing of SCId and SC1h Specifications

Item		RX210 (SCId)	RX651 (SC1h)
Number of channels		1 channel	1 channel
Serial communications modes		- Asynchronous operation - Clock synchronous operation - Smart card interface - Simple I2C bus - Simple SPI bus	- Asynchronous operation - Clock synchronous operation - Smart card interface - Simple I2C bus - Simple SPI bus
Transfer speed		Bit rate specifiable with on-chip baud rate generator.	Bit rate specifiable with on-chip baud rate generator.
Full-duplex communications		- Transmitter: Enables continuous transmission by double-buffering. - Receiver: Enables continuous reception by double-buffering.	- Transmitter: Enables continuous transmission by double-buffering. - Receiver: Enables continuous reception by double-buffering.
Data transfer		Selectable as LSB-first or MSB-first transfer*1	Selectable as LSB-first or MSB-first transfer*1
Interrupt sources		Transmit-end, transmit-data-empty, receive-data-full, and receive error Completion of generation of a start condition, restart condition, or stop condition (for simple I2C mode)	Transmit-end, transmit-data-empty, receive-data-full, and receive error Completion of generation of a start condition, restart condition, or stop condition (for simple I2C mode)
Power consumption reduction function		Module stop state can be set.	Module stop state can be set.
Asynchronous mode	Data length	7 or 8 bits	7, 8, or 9 bits
	Transmission stop bit	1 or 2 bits	1 or 2 bits
	Parity	Even, odd, or none	Even, odd, or none
	Receive error detection	Parity, overrun, and framing errors	Parity, overrun, and framing errors
	Hardware flow control	CTSn and RTSn pins can be used in transfer control.	CTSn and RTSn pins can be used in transfer control.
	Start-bit detection	Low is detected	Low level or falling edge is selectable.
	Break detection	Break can be detected by reading RXDn pin level directly in case of a framing error	Break can be detected by reading RXDn pin level directly in case of a framing error
	Clock source	- Selectable from internal or external clock - Enables transfer rate clock input from TMR (SCI5 and SCI6)	- Selectable from internal or external clock - Enables transfer rate clock input from TMR (SCI5 and SCI6)
	Double-speed mode	—	Baud rate generator double-speed mode is selectable.
	Multi-processor communications function	Serial communication among multiple processors	Serial communication among multiple processors
Noise cancellation		The signal paths from input on the RXDn pins incorporate digital noise filters.	The signal paths from input on the RXDn pins incorporate digital noise filters.

Item		RX210 (SCId)	RX651 (SCIdh)
Clock synchronous mode	Data length	8 bits	8 bits
	Receive error detection	Overrun errors	Overrun errors
	Hardware flow control	CTSn and RTSn pins can be used in transfer control.	CTSn and RTSn pins can be used in transfer control.
Smart card interface mode	Error processing	An error signal can be automatically transmitted on detection of a parity error during reception	An error signal can be automatically transmitted on detection of a parity error during reception
		Data can be automatically re-transmitted on receiving an error signal during transmission	Data can be automatically re-transmitted on receiving an error signal during transmission
	Data type	Both direct convention and inverse convention are supported.	Both direct convention and inverse convention are supported.
Simple I ² C mode	Transfer format	I ² C bus format (MSB-first transfer only)	I ² C bus format (MSB-first transfer only)
	Operating mode	Master (single-master operation only)	Master (single-master operation only)
	Transfer rate	Up to 384 kbps	Fast mode is supported
	Noise cancellation	The signal paths from input on the SSCLn and SSDAn pins incorporate digital noise filters, and the interval for noise cancellation is adjustable.	The signal paths from input on the SSCLn and SSDAn pins incorporate digital noise filters, and the interval for noise cancellation is adjustable.
Simple SPI bus	Data length	8 bits	8 bits
	Detection of errors	Overrun errors	Overrun errors
	SS input pin function	Applying the high level to the SS# pin can cause the output pins to enter the high-impedance state.	Applying the high level to the SS# pin can cause the output pins to enter the high-impedance state.
	Clock settings	Four kinds of settings for clock phase and clock sense are selectable.	Four kinds of settings for clock phase and clock sense are selectable.
Extended serial mode	Start Frame transmission	- Output of a low level as the Break Field over a specified width and generation of interrupts on completion - Detection of bus collisions and the generation of interrupts on detection	- Output of a low level as the Break Field over a specified width and generation of interrupts on completion - Detection of bus collisions and the generation of interrupts on detection

Item		RX210 (SCId)	RX651 (SCIh)
Extended serial mode	Start Frame reception	- Detection of the Break Field low width and generation of an interrupt on detection - Comparison of Control Fields 0 and 1 and generation of an interrupt when the two match - Two kinds of data for comparison (primary and secondary) can be set in Control Field 1. - A priority interrupt bit can be set in Control Field 1. - Handling of Start Frames that do not include a Break Field - Handling of Start Frames that do not include a Control Field - Function for measuring bit rates	- Detection of the Break Field low width and generation of an interrupt on detection - Comparison of Control Fields 0 and 1 and generation of an interrupt when the two match - Two kinds of data for comparison (primary and secondary) can be set in Control Field 1. - A priority interrupt bit can be set in Control Field 1. - Handling of Start Frames that do not include a Break Field - Handling of Start Frames that do not include a Control Field - Function for measuring bit rates
Extended serial mode	I/O control function	- Selectable polarity for TXDX12 and RXDX12 signals - Selection of a digital filter for RXDX12 - Half-duplex operation employing RXDX12 and TXDX12 signals multiplexed on the same pin - Selectable timing for the sampling of data received through RXDX12 - Signals received on RXDX12 can be passed through to SCId when the extended serial mode control section is off.	- Selectable polarity for TXDX12 and RXDX12 signals - Selection of a digital filter for RXDX12 - Half-duplex operation employing RXDX12 and TXDX12 signals multiplexed on the same pin - Selectable timing for the sampling of data received through RXDX12 - Signals received on RXDX12 can be passed through to SCId when the extended serial mode control section is off.
	Timer function	Usable as a reloading timer	Usable as a reloading timer
	Bit rate modulation function	—	Correction of outputs from the on-chip baud rate generator can reduce errors.

Note 1. In simple I²C mode, only MSB-first is available

Table 2.45 Comparative Listing of Serial Communications Interface Channels Specifications

Item	RX210 (SCId)	RX651 (SCIg, SCId, SCId)
Asynchronous mode	SCI0 to SCI12	SCI0 to SCI12
Clock synchronous mode	SCI0 to SCI12	SCI0 to SCI12
Smart card interface mode	SCI0 to SCI12	SCI0 to SCI12
Simple I ² C mode	SCI0 to SCI12	SCI0 to SCI12
Simple SPI mode	SCI0 to SCI12	SCI0 to SCI12
Extended serial mode	SCI12	SCI12
TMR clock input	SCI5, SCI6, SCI12	SCI5, SCI6, SCI12
Event link function	SCI5	SCI5
FIFO mode	—	SCI10, SCI11

Table 2.46 Comparative Listing of Serial Communications Interface Registers

Register	Bit	RX210 (SC1c, SC1d)	RX651 (SC1g, SC1i, SC1h)
RDRH	—	—	Receive Data Register H
RDRL	—	—	Receive Data Register L
RDRHL	—	—	Receive Data Register HL
FRDR	—	—	Receive FIFO Data Register
TDRH	—	—	Transmit Data Register H
TDRL	—	—	Transmit Data Register L
TDRHL	—	—	Transmit Data Register HL
FTDR	—	—	Transmit FIFO Data Register
SMR	CHR	Character Length (Valid only in asynchronous mode)	Character Length (Valid only in asynchronous mode) Selects in combination with the SCMR.CHR1 bit. CHR1 CHR 0 0: Transmit/receive in 9-bit data length 0 1: Transmit/receive in 9-bit data length 1 0: Transmit/receive in 8-bit data length (initial value) 1 1: Transmit/receive in 7-bit data length
		0: Selects 8 bits as the data length 1: Selects 7 bits as the data length	
	CM	Communications Mode 0: Asynchronous mode 1: Clock synchronous mode	Communications Mode 0: Asynchronous mode or simple I²C mode 1: Clock synchronous mode or simple SPI mode
SSR	RDRF	—	Receive Data Full Flag (b6)
	TDRE	—	Transmit Data Empty Flag (b7)
SSRFIFO	—	—	Serial Status Register
SCMR	CHR1	—	Character Length 1 (b4)
BBR	—	Bit Rate Register In the Asynchronous mode and the Multiprocessor communication mode, the set value and the bitrate depends on SEMR.ABCS bit setting. For more related information, refer to the user's manual.	Bit Rate Register In the Asynchronous mode and the Multiprocessor communication mode, the set value and the bitrate depends on SEMR.BGDM and SEMR.ABCS bit setting. For more related information, refer to the user's manual. In case of SCI10 & SCI11, when SMR.CM = "1" (Clock synchronous mode or simple SPI mode), FCR.FM = "1" (FIFO mode) and SMR.CKS[1:0] = "00b", do not write the value of "00h" to BBR Register
MDDR	—	—	Modulation Duty Register
SEMR	BRME	—	Bit Rate Modulation Enable (b2)
	BGDM	—	Baud Rate Generator Double-Speed Mode Select (b6)
	RXDESEL	—	Asynchronous Start Bit Edge Detection Select (b7)
FCR	—	—	FIFO Control Register
FDR	—	—	FIFO Data Count Register

Register	Bit	RX210 (SCId, SCId)	RX651 (SCIg, SCId, SCId)
LSR	—	—	Line Status Register
CDR	—	—	Comparison Data Register
DCCR	—	—	Data Comparison Control Register
SPTR	—	—	Serial Port Register
CR2	BCCS [1:0]	Bus Collision Detection Clock Select	Bus Collision Detection Clock Select
			When SEMR.BGDM = 0 or SEMR.BGDM = 1 and SMR.CKS[1:0] = a value other than 00b
		b5 b4	b5 b4
		0 0: SCI base clock	0 0: SCI base clock
		0 1: SCI base clock frequency divided by 2	0 1: SCI base clock frequency divided by 2
		1 0: SCI base clock frequency divided by 4	1 0: SCI base clock frequency divided by 4
		1 1: Setting prohibited	1 1: Setting prohibited
			When SEMR.BGDM = 1 and SMR.CKS[1:0] = 00b
			b5 b4
			0 0: SCI base clock frequency divided by 2
			0 1: SCI base clock frequency divided by 4
			1 0: Setting prohibited
			1 1: Setting prohibited

2.23 I²C-bus Interface

Table 2.47 shows a Comparative Listing of I²C-bus Interface Specifications, and Table 2.48 shows a Comparative Listing of I²C-bus Interface Registers.

Table 2.47 Comparative Listing of I²C-bus Interface Specifications

Item	RX210 (RIIC)	RX651 (RIICa)
Number of channels	1 channel	2 channels
Communication format	- I²C bus format or SMBus format - Master mode or slave mode selectable - Automatic securing of the various setup times, hold times, and bus-free times for the transfer rate	- I²C bus format or SMBus format - Master mode or slave mode selectable - Automatic securing of the various setup times, hold times, and bus-free times for the transfer rate
Transfer speed	Up to 400kbps	Fast-mode Plus is supported (up to 1 Mbps)
SCL clock	For master operation, the duty cycle of the SCL clock is selectable in the range from 4% to 96%.	For master operation, the duty cycle of the SCL clock is selectable in the range from 4% to 96%.
Issuing and detection conditions	Start, restart, and stop conditions are generated automatically. Start conditions (including restart conditions) and stop conditions are detectable.	Start, restart, and stop conditions are generated automatically. Start conditions (including restart conditions) and stop conditions are detectable.
Slave addresses	- Up to three different slave addresses can be set. 7-bit and 10-bit address formats are supported (along with the use of both at once). - General call addresses, device ID addresses, and SMBus host addresses are detectable.	- Up to three different slave addresses can be set. 7-bit and 10-bit address formats are supported (along with the use of both at once). - General call addresses, device ID addresses, and SMBus host addresses are detectable.
Acknowledgement	- For transmission, the acknowledge bit is automatically loaded. - Transfer of the next data for transmission can be automatically suspended on detection of a not-acknowledge bit. - For reception, the acknowledge bit is automatically transmitted. - If a wait between the eighth and ninth clock cycles has been selected, software control of the value in the acknowledge field in response to the received value is possible.	- For transmission, the acknowledge bit is automatically loaded. - Transfer of the next data for transmission can be automatically suspended on detection of a not-acknowledge bit. - For reception, the acknowledge bit is automatically transmitted. - If a wait between the eighth and ninth clock cycles has been selected, software control of the value in the acknowledge field in response to the received value is possible.
Wait function	In reception, the following periods of waiting can be obtained by holding the SCL clock at the low level: - Waiting between the eighth and ninth clock cycles - Waiting between the ninth clock cycle and the first clock cycle of the next transfer	In reception, the following periods of waiting can be obtained by holding the SCL clock at the low level: - Waiting between the eighth and ninth clock cycles - Waiting between the ninth clock cycle and the first clock cycle of the next transfer

Item	RX210 (RIIC)	RX651 (RIICa)
SDA output delay function	Timing of the output of transmitted data, including the acknowledge bit, can be delayed.	Timing of the output of transmitted data, including the acknowledge bit, can be delayed.
Arbitration	- For multi-master operation - Operation to synchronize the SCL clock in cases of conflict with the SCL signal from another master is possible. - When issuing the start condition would create conflict on the bus, loss of arbitration is detected by testing for non-matching between the internal signal for the SDA line and the level on the SDA line. - In master operation, loss of arbitration is detected by testing for non-matching between the signal on the SDA line and the internal signal for the SDA line. - Loss of arbitration due to detection of the start condition while the bus is busy is detectable (to prevent the issuing of double start conditions). - Loss of arbitration in transfer of a not-acknowledge bit due to the internal signal for the SDA line and the level on the SDA line not matching is detectable. - Loss of arbitration due to non-matching of internal and line levels for data is detectable in slave transmission.	- For multi-master operation - Operation to synchronize the SCL clock in cases of conflict with the SCL signal from another master is possible. - When issuing the start condition would create conflict on the bus, loss of arbitration is detected by testing for non-matching between the internal signal for the SDA line and the level on the SDA line. - In master operation, loss of arbitration is detected by testing for non-matching between the signal on the SDA line and the internal signal for the SDA line. - Loss of arbitration due to detection of the start condition while the bus is busy is detectable (to prevent the issuing of double start conditions). - Loss of arbitration in transfer of a not-acknowledge bit due to the internal signal for the SDA line and the level on the SDA line not matching is detectable. - Loss of arbitration due to non-matching of internal and line levels for data is detectable in slave transmission.
Timeout detection function	The internal timeout function is capable of detecting long-interval stop of the SCL clock.	The internal timeout function is capable of detecting long-interval stop of the SCL clock.
Noise canceler	The interface incorporates digital noise filters for both the SCL and SDA signals, and the width for noise cancellation by the filters is adjustable by software.	The interface incorporates digital noise filters for both the SCL and SDA signals, and the width for noise cancellation by the filters is adjustable by software.
Interrupt sources	Four sources - Error in transfer or occurrence of events Detection of arbitration, NACK, timeout, a start condition including a restart condition, or a stop condition - Receive data full (including matching with a slave address) - Transmit data empty (including matching with a slave address) - Transmit end	Four sources - Error in transfer or occurrence of events Detection of arbitration, NACK, timeout, a start condition including a restart condition, or a stop condition - Receive data full (including matching with a slave address) - Transmit data empty (including matching with a slave address) - Transmit end
Low power consumption function	Module stop state can be set.	Module stop state can be set.

Item	RX210 (RIIC)	RX651 (RIICa)
RIIC operating modes	Four modes Master transmit mode, master receive mode, slave transmit mode, and slave receive mode	Four modes Master transmit mode, master receive mode, slave transmit mode, and slave receive mode
Event link function	Four sources (RIIC): • Error in transfer or occurrence of events Detection of arbitration, NACK, timeout, a start condition including a restart condition, or a stop condition • Receive data full (including matching with a slave address) • Transmit data empty (including matching with a slave address) • Transmit end	Four sources (RIIC0): • Error in transfer or occurrence of events Detection of arbitration, NACK, timeout, a start condition including a restart condition, or a stop condition • Receive data full (including matching with a slave address) • Transmit data empty (including matching with a slave address) • Transmit end

Table 2.48 Comparative Listing of I²C-bus Interface Registers

Register	Bit	RX210 (RIIC)	RX651 (RIICa)
ICMR2	TMWE	Timeout internal counter write enable bit (b3)	—
ICFER	FMPE	—	Fast-Mode Plus Enable (b7)
TMOCNT	—	Timeout internal counter	—

2.24 Serial Peripheral Interface

Table 2.49 shows a Comparative Listing of Serial Peripheral Interface Specifications, and Table 2.50 shows a Comparative Listing of Serial Peripheral Interface Registers.

Table 2.49 Comparative Listing of Serial Peripheral Interface Specifications

Item	RX210 (RSPI)	RX651 (RSPIC)
Number of channels	1 channel	3 channels
RSPI transfer functions	• Use of MOSI (master out/slave in), MISO (master in/slave out), SSL (slave select), and RSPCK (RSPI clock) signals allows serial communications through SPI operation (four-wire method) or clock synchronous operation (three-wire method). • Transmit-only operation is available. • Capable of serial communications in master/slave mode • Switching of the polarity of the serial transfer clock • Switching of the phase of the serial transfer clock	• Use of MOSI (master out/slave in), MISO (master in/slave out), SSL (slave select), and RSPCK (RSPI clock) signals allows serial communications through SPI operation (4-wire method) or clock synchronous operation (3-wire method). • Transmit-only operation is available. • Communication mode: Full-duplex or transmit-only can be selected • Switching of the polarity of RSPCK • Switching of the phase of RSPCK
Data format	• MSB first/LSB first selectable • Transfer bit length is selectable as 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 24, or 32 bits. • 128-bit transmit/receive buffers • Up to four frames can be transferred in one round of transmission/reception (each frame consisting of up to 32 bits)	• MSB first/LSB first selectable • Transfer bit length is selectable as 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 24, or 32 bits. • 128-bit transmit/receive buffers • Up to four frames can be transferred in one round of transmission/reception (each frame consisting of up to 32 bits) • Byte swapping of transmit and receive data is selectable
Bit rate	• In master mode, the on-chip baud rate generator generates RSPCK by frequency-dividing PCLK (the maximum divisor is 4096). • In slave mode, the externally input clock is used as the serial clock (the maximum frequency is that of PCLK divided by 8). Width at high level: 4 cycles of PCLK; width at low level: 4 cycles of PCLK	• In master mode, the on-chip baud rate generator generates RSPCK by frequency-dividing PCLK (the division ratio ranges from divided by 2 to divided by 4096). • In slave mode, the minimum PCLK clock divided by 4 can be input as RSPCK (the maximum frequency of RSPCK is that of PCLK divided by 4). Width at high level: 2 cycles of PCLK; width at low level: 2 cycles of PCLK.
Buffer configuration	• Double buffer configuration for the transmit/receive buffers	• Double buffer configuration for the transmit/receive buffers. • 128 bits for the transmit/receive buffers.
Error detection	• Mode fault error detection • Overrun error detection • Parity error detection	• Mode fault error detection • Overrun error detection^{*1} • Parity error detection • Underrun error detection

Item	RX210 (RSPI)	RX651 (RSPIc)
SSL control function	- Four SSL signals (SSLA0 to SSLA3) for each channel - In single-master mode, SSLA0 to SSLA3 signals are output. - In multi-master mode: SSLA0 signal for input, and SSLA1 to SSLA3 signals for either output or unused. - In slave mode: SSLA0 signal for input, and SSLA1 to SSLA3 signals for unused. - Controllable delay from SSL output assertion to RSPCK operation (RSPCK delay) Range: 1 to 8 RSPCK cycles (set in RSPCK-cycle units) - Controllable delay from RSPCK stop to SSL output negation (SSL negation delay) Range: 1 to 8 RSPCK cycles (set in RSPCK-cycle units) - Controllable wait for next-access SSL output assertion (next-access delay) Range: 1 to 8 RSPCK cycles (set in RSPCK-cycle units) - Function for changing SSL polarity	- Four SSL pins (SSLn0 to SSLn3) for each channel - In single-master mode, SSLn0 to SSLn3 pins are output. - In multi-master mode: SSLn0 pin for input, and SSLn1 to SSLn3 pins for either output or unused. - In slave mode: SSLn0 pin for input, and SSLn1 to SSLn3 pins for unused. - Controllable delay from SSL output assertion to RSPCK operation (RSPCK delay) Range: 1 to 8 RSPCK cycles (set in RSPCK-cycle units) - Controllable delay from RSPCK stop to SSL output negation (SSL negation delay) Range: 1 to 8 RSPCK cycles (set in RSPCK-cycle units) - Controllable wait for next-access SSL output assertion (next-access delay) Range: 1 to 8 RSPCK cycles (set in RSPCK-cycle units) - Function for changing SSL polarity
Control in master transfer	- A transfer of up to eight commands can be executed sequentially in looped execution. - For each command, the following can be set: SSL signal value, bit rate, RSPCK polarity/phase, transfer data length, MSB/LSB-first, burst, RSPCK delay, SSL negation delay, and next-access delay - A transfer can be initiated by writing to the transmit buffer. - MOSI signal value specifiable in SSL negation	- A transfer of up to eight commands can be executed sequentially in looped execution. - For each command, the following can be set: SSL signal value, bit rate, RSPCK polarity/phase, transfer data length, MSB/LSB first, burst, RSPCK delay, SSL negation delay, and next-access delay - A transfer can be initiated by writing to the transmit buffer. - MOSI signal value specifiable in SSL negation RSPCK auto-stop function
Interrupt sources	Maskable interrupt sources - RSPI receive interrupt (receive buffer full) - RSPI transmit interrupt (transmit buffer empty) - RSPI error interrupt (mode fault, overrun, parity error) - RSPI idle interrupt (RSPI idle)	Interrupt sources - Receive buffer full interrupt - Transmit buffer empty interrupt - RSPI error interrupt (mode fault, overrun, underrun, or parity error) - RSPI idle interrupt (RSPI idle)

Item	RX210 (RSPI)	RX651 (RSPIc)
Event link function (output)	The following five types of events can be output to the event link controller. • Reception-buffer full event output • Transmission-buffer empty event output • Mode fault, overrun, or parity error event output • RSPI idle event output • Transmission-completed event output	The following events can be output to the event link controller. (RSPI0) • Receive buffer full signal • Transmit buffer empty signal • Mode fault, overrun, underrun, or parity error signal • RSPI idle signal • Transmission-completed signal
Other functions	• Function for switching between CMOS output and open-drain output • Function for initializing the RSPI • Loopback mode	• Function for switching between CMOS output and open-drain output • Function for initializing the RSPI • Loopback mode
Low power consumption function	Module stop state can be set.	Module stop state can be set.

Note 1. In master reception and when the RSPCK auto-stop function is enabled, an overrun error does not occur because the transfer clock is stopped at the timing of overrun error detection.

Table 2.50 Comparative Listing of Serial Peripheral Interface Registers

Register	Bit	RX210 (RSPI)	RX651 (RSPIc)
SPSR	UDRF	—	Underrun Error Flag (b4)
	SPTEF	—	Transmit Buffer Empty Flag (b5)
	SPRF	—	Receive Buffer Full Flag (b7)
SPDR	—	RSPI Data Register	RSPI Data Register
		Available access size • Long word access (SPDCR.SPLW = 1) • Word access (SPDCR.SPLW = 0)	Available access size • Long word access (SPDCR.SPLW = 1, SPBYTE = 0) • Word access (SPDCR.SPLW = 0, SPBYTE = 0) • Byte access (SPDCR.SPBYT = 1)
SPDCR	SPBYT	—	RSPI Byte Access Specification (b6)
SPDCR2	—	—	RSPI Data Control Register 2
SPCR2	SCKASE	—	RSPCK Auto-Stop Function Enable (b4)

2.25 CRC Calculator

Table 2.51 shows a Comparative Listing of CRC Calculator Specifications, and Table 2.52 shows a Comparative Listing of CRC Calculator Registers.

Table 2.51 Comparative Listing of CRC Calculator Specifications

Item	RX210 (CRC)	RX651 (CRCA)	
Data size	8 bits	8 bits	32 bits
Data for CRC calculation	CRC code generated for any desired data in 8n-bit units (where n is a whole number)	CRC codes are generated for any desired data in 8n-bit units (where n is a whole number)	CRC codes are generated for any desired data in 32n-bit units (where n is a whole number)
CRC processor unit	Operation executed on eight bits in parallel	8-bit parallel processing	32-bit parallel processing
CRC generating polynomial	One of three generating polynomials selectable • 8-bit CRC — $X^8 + X^2 + X + 1$ • 16-bit CRC — $X^{16} + X^{15} + X^2 + 1$ — $X^{16} + X^{12} + X^5 + 1$	One of five generating polynomials selectable: • 8-bit CRC — $X^8 + X^2 + X + 1$ • 16-bit CRC — $X^{16} + X^{15} + X^2 + 1$ — $X^{16} + X^{12} + X^5 + 1$	One of five generating polynomials selectable: • 32-bit CRC — $X^{32} + X^{26} + X^{22} + X^{16} + X^{12} + X^{11} + X^{10} + X^8 + X^7 + X^5 + X^4 + X^2 + X + 1$ — $X^{32} + X^{28} + X^{27} + X^{26} + X^{25} + X^{23} + X^{22} + X^{20} + X^{19} + X^{18} + X^{14} + X^{13} + X^{11} + X^{10} + X^9 + X^8 + X^6 + 1$
CRC calculation switching	CRC code generation for LSB-first or MSB-first communication selectable	The order of the bits produced by CRC calculation can be switched for LSB first or MSB first communication	
Data size	Module stop state can be set.	Module stop state can be set.	

Table 2.52 Comparative Listing of CRC Calculator Registers

Register	Bit	RX210 (CRC)	RX651 (CRCA)
CRCCR	GPS[1:0] GPS[2:0]	CRC Generating Polynomial Switching (b1-b0) b1 b0 0 0: No calculation is executed. 0 1: $X^8 + X^2 + X + 1$ 1 0: $X^{16} + X^{15} + X^2 + 1$ 1 1: $X^{16} + X^{12} + X^5 + 1$	CRC Generating Polynomial Switching (b2-b0) b2 b0 0 0 0: No calculation is executed. 0 0 1: 8-bit CRC ($X^8 + X^2 + X + 1$) 0 1 0: 16-bit CRC ($X^{16} + X^{15} + X^2 + 1$) 0 1 1: 16-bit CRC ($X^{16} + X^{12} + X^5 + 1$) 1 0 0: 32-bit CRC ($X^{32} + X^{26} + X^{23} + X^{22} + X^{16} + X^{12} + X^{11} + X^{10} + X^8 + X^7 + X^5 + X^4 + X^2 + X + 1$) 1 0 1: 32-bit CRC ($X^{32} + X^{28} + X^{27} + X^{26} + X^{25} + X^{23} + X^{22} + X^{20} + X^{19} + X^{18} + X^{14} + X^{13} + X^{11} + X^{10} + X^9 + X^8 + X^6 + 1$) 1 1 0: No calculation is executed. 1 1 1: No calculation is executed.
	LMS	CRC Calculation Switching (b2)	CRC Calculation Switching (b6)
CRCDIR	—	CRC Data Input Register (8-bits) Available Access size • Byte access	CRC Data Input Register (32-bits) Available Access size • Long word access (When 32-bit CRC is selected) • Byte access (When 16-bit or 8-bit CRC is selected)
CRCDOR	—	CRC Data Output Register (16-bits) Available Access size • Word access When an 8-bit CRC is in use, the valid CRC code is obtained in the lower-order byte (b7 to b0).	CRC Data Output Register (32-bits) Available Access size • Long word access (When 32-bit CRC is selected) • Word access (When 16-bit CRC is selected) • Byte access (When 8-bit CRC is selected)

2.26 12-Bit A/D Converter

Table 2.53 shows a Comparative Listing of 12-Bit A/D Converter Specifications, and Table 2.54 shows a Comparative Listing of 12-Bit A/D Converter Registers.

Table 2.53 Comparative Listing of 12-Bit A/D Converter Specifications

Item	RX210 (S12ADb)	RX651 (S12ADFa)
Number of units	1 unit	2 unit (S12AD, S12AD1)
Input channels	Up to 16 channels	8 channels for S12AD 21 channels for S12AD1 + 1 extension
Extended analog function	Temperature sensor output, internal reference voltage	Temperature sensor output, internal reference voltage
A/D conversion method	Successive approximation method	Successive approximation method
Resolution	12 bits	12 bits
Conversion time	1.0μs per channel	0.48 μs per channel (12-bit conversion mode) 0.45 μs per channel (10-bit conversion mode) 0.42 μs per channel (8-bit conversion mode)
	(when A/D conversion clock ADCLK = 50 MHz)	(A/D conversion clock: when ADCLK operates at 60 MHz)
A/D conversion clock	Peripheral module clock PCLK and A/D conversion clock ADCLK can be set so that the frequency division ratio should be one of the following. PCLK to ADCLK frequency division ratio = 1:1, 1:2, 1:4, 1:8, 2:1, 4:1 ADCLK is set using the clock generation circuit	Peripheral module clock PCLK* ¹ and A/D conversion clock ADCLK* ¹ can be set so that the frequency ratio should be one of the following. PCLK to ADCLK frequency ratio = 1:1, 2:1, 4:1, 8:1 ADCLK is set using the clock generation circuit

Item	RX210 (S12ADb)	RX651 (S12ADFa)
Data register	- For analog input: 16 data registers - For duplication of A/D conversion data in double trigger mode: One data register - For temperature sensor: One data register - For internal reference voltage: One data register - The A/D conversion result is stored in 12-bit A/D data registers. - In addition mode, A/D conversion results are added and stored in A/D data registers as 14-bit data. - Duplication of A/D conversion data - A/D conversion data of one selected analog input channel is stored into A/D data register y when conversion is started by the first trigger and into the duplication register when started by the second trigger. Duplication is available only in double trigger mode in single scan mode or group scan mode.	29 registers for analog input (eight for S12AD and 21 for S12AD1), 1 for A/D-converted data duplication in double trigger mode per unit, and 2 for A/D-converted data duplication during extended operation in double trigger mode per unit. - One register for temperature sensor (S12AD1) - One register for internal reference (S12AD1) - One register for self-diagnosis per unit - The results of A/D conversion are stored in 12-bit A/D data registers. 8-, 10-, and 12-bit accuracy output for the results of A/D conversion - The value obtained by adding up A/D-converted results is stored as a value in the number of bit for conversion accuracy + 2 bits/4 bits in the A/D data registers in A/D-converted value addition mode. - Double trigger mode (selectable in single scan and group scan modes): The first piece of A/D-converted analog-input data on one selected channel is stored in the data register for the channel, and the second piece is stored in the duplication register. - Extended operation in double trigger mode (available for specific triggers): A/D-converted analog-input data on one selected channel is stored in the duplication register that is prepared for each type of trigger.

Item	RX210 (S12ADb)	RX651 (S12ADFa)
Operating modes	• Single scan mode: — A/D conversion is performed for only once on the analog inputs of up to 16 arbitrarily selected channels. — A/D conversion is performed only once on the temperature sensor output. — A/D conversion is performed only once on the internal reference voltage. • Continuous scan mode: — A/D conversion is performed repeatedly on the analog inputs of up to 16 arbitrarily selected channels.	• Single scan mode: — A/D conversion is performed only once on the analog inputs arbitrarily selected. — A/D conversion is performed only once on the temperature sensor output (S12AD1). — A/D conversion is performed only once on the internal reference voltage (S12AD1). — A/D conversion is performed only once on the extended analog input (S12AD1). • Continuous scan mode: — A/D conversion is performed repeatedly on the analog input, temperature sensor output (S12AD1), and internal reference voltage (S12AD1) of the arbitrarily selected channel. — A/D conversion is performed repeatedly on the extended analog input (S12AD1).

Item	RX210 (S12ADb)	RX651 (S12ADFa)
Operating modes	- Group scan mode: - Up to 16 channels of analog inputs are divided into group A and group B and A/D conversion is performed only once on all the selected channels on a group basis. The scan start conditions of group A and group B can be independently selected, thus allowing A/D conversion of group A and group B to be started independently	- Group scan mode: - Two (groups A and B) or three (groups A, B, and C) can be selected as the number of the groups to be used. Only the combination of groups A and B can be selected when the number of the groups is two. - Analog inputs, temperature sensor output (S12AD1), and internal reference voltage (S12AD1) that are arbitrarily selected are divided into two groups (group A and B) or three groups (group A, B, and C), and A/D conversion of the analog input selected on a group basis is performed only once. - The conditions for scanning start of groups A, B, and C (synchronous trigger) can be independently selected, thus allowing A/D conversion of each group to be started independently. - Group scan mode (when group priority control selected): - If a priority-group trigger is input during scanning of the low-priority group, scan of the low-priority group is stopped and scan of the priority group is started. The priority order is group A (highest) > group B > group C (lowest). - Whether or not to restart scanning of the low-priority group after processing for the high-priority group completes, is selectable. Rescan can also be set to start either from the beginning of the selected channel or the channel on which A/D conversion is not completed.

Item	RX210 (S12ADb)	RX651 (S12ADFa)
Conditions for A/D conversion start	• Software trigger • Synchronous trigger Trigger by MTU, ELC, or temperature sensor • Asynchronous trigger A/D conversion can be triggered from the ADTRG0# pin	• Software trigger • Synchronous trigger Trigger by the multi-function timer pulse unit (MTU), 8-bit timer (TMR), 16-bit timer pulse unit (TPU), or event link controller (ELC). • Asynchronous trigger A/D conversion can be triggered by the external trigger ADTRG0# (S12AD) or ADTRG1# (S12AD1) pin (independently for two units).
Functions	• Sample-and-hold function • Channel-dedicated sample-and-hold function ($0.25\text{ V} \leq \text{analog voltage input} \leq \text{AVCC0} - 0.25\text{ V}$) • Variable sampling state count • Self-diagnosis of 12-bit A/D converter • A/D-converted value addition mode • Analog input disconnection detection assist • Double trigger mode (duplication of A/D conversion data)	• Channel-dedicated sample-and-hold function (three channels for S12AD only) • Variable sampling state count (settable for each channel) • Self-diagnosis of 12-bit A/D converter • Selectable A/D-converted value addition mode or average mode • Analog input disconnection detection assist function (discharge function/precharge function) • Double trigger mode (duplication of A/D conversion data) • 12-/10-/8-bit conversion switching • Automatic clear function of A/D data registers • Extended analog input • Comparison function (windows A and B)

Item	RX210 (S12ADb)	RX651 (S12ADFa)
Interrupt sources	- In the modes except double trigger mode and group scan mode, A/D scan end interrupt (S12ADI0) request can be generated on completion of single scan. - In double trigger mode, A/D scan end interrupt (S12ADI0) request can be generated on completion of double scan. - In group scan mode, A/D scan end interrupt (S12ADI0) request can be generated on completion of group A scan, whereas A/D scan end interrupt specially for group B (GBADI) request can be generated on completion of group B scan. - In group scan mode with double trigger mode, A/D scan end interrupt (S12ADI0) request can be generated on completion of double scan of group A, whereas A/D scan end interrupt specially for group B (GBADI) request can be generated on completion of group B scan. S12ADI0 or GBADI interrupt can activate DMA controller (DMAC) or data transfer controller (DTC).	- In the modes except double trigger mode and group scan mode, a scan end interrupt request (S12ADI or S12ADI1) can be generated on completion of single scan. (independently for two units). - In double trigger mode, a scan end interrupt request (S12ADI or S12ADI1) can be generated on completion of double scan. (independently for two units). - In group scan mode, a scan end interrupt request (S12ADI or S12ADI1) can be generated on completion of group A scan, whereas a scan end interrupt request (GBADI or GBADI1) for group B can be generated on completion of group B scan, and a group C scan end interrupt request (GCADI or GCADI1) can be generated on completion of group C scan. When double trigger mode is selected in group scan mode, an A/D scan end interrupt request (S12ADI or S12ADI1) can be generated on completion of double scan of group A, and the corresponding scan end interrupt request (GBADI/GCADI or GBADI1/GCADI1) can be generated on completion of group B and group C scan. A compare interrupt request (S12CMPAI, S12CMPAI1, S12CMPBI, or S12CMPBI1) can be generated upon a match with the comparison condition for the digital compare function. - The S12ADI/S12ADI1, GBADI/GBADI1, and GCADI/GCADI1 interrupts can activate the DMA controller (DMAC) and data transfer controller (DTC).
Event link	- An ELC event can be generated on completion of scans except for group B scan in group scan mode. - A/D conversion can be started by the trigger from ELC.	- An ELC event is generated upon completion of all scans - Able to start scanning by a trigger from the ELC
Low power consumption function	Module stop state can be specified	Module stop state can be specified

Table 2.54 Comparative Listing of 12-Bit A/D Converter Registers

Register	Bit	RX210 (S12AD)	RX651 (S12ADFa)
ADDRy	—	A/D Data Registers y (y = 0 to 15)	A/D Data Registers y (y = 0 to 20) (y = 0 to 7: S12AD, y = 0 to 20: S12AD1)
ADDBLDR	AD[11:0] —	—	—
ADDBLDRA	—	—	A/D data duplication register A
ADDBLDRB	—	—	A/D data duplication register B
ADTSDR	AD[11:0] —	—	—
ADOCDR	AD[11:0] —	—	—
ADRD	AD[11:0] —	— 12-bit A/D-converted value ADCER.ADRFMT = 0 (Setting for right-alignment) (b11-b0) ADCER.ADRFMT = 1 (Setting for left-alignment) (b15-b4)	— 12-bit A/D-converted value ADCER.ADRFMT = 0 (Setting for right-alignment) (b11-b0) ADCER.ADRFMT = 1 (Setting for left-alignment) (b15-b4) 10-bit A/D-converted value ADCER.ADRFMT = 0 (Setting for right-alignment) (b9-b0) ADCER.ADRFMT = 1 (Setting for left-alignment) (b15-b6) 8-bit A/D-converted value ADCER.ADRFMT = 0 (Setting for right-alignment) (b7-b0) ADCER.ADRFMT = 1 (Setting for left-alignment) (b15-b8)
	DIAGST[1:0] —	Self-Diagnosis Status	Self-Diagnosis Status
ADCSR	GBADIE	Group B Scan End Interrupt Enable 0: Disables GBADI interrupt generation upon group B scan completion. 1: Enables GBADI interrupt generation upon group B scan completion.	Group B Scan End Interrupt Enable 0: Disables interrupt generation upon group B scan completion. 1: Enables interrupt generation upon group B scan completion.
	ADIE	Scan End Interrupt Enable 0: Disables S12ADI0 interrupt generation upon scan completion. 1: Enables S12ADI0 interrupt generation upon scan completion.	Scan End Interrupt Enable 0: Disables interrupt generation upon scan completion. 1: Enables interrupt generation upon scan completion.

Register	Bit	RX210 (S12AD)	RX651 (S12ADFa)
ADANSA	—	A/D Channel Select Register A	A/D Channel Select Register A0
ADANSA0	ANSA[15:0] ANSAn (n = 000 to 007)	A/D Conversion Channels Select (b15-b0) 0: AN000 to AN015 are not subjected to conversion. 1: AN000 to AN015 are subjected to scan conversion.	A/D Conversion Channel Select (b7-b0) 0: AN000 to AN007 are not subjected to conversion. 1: AN000 to AN007 are subjected to conversion.
ADANSA1	—	—	A/D Channel Select Register A1
ADANSB	—	A/D Channel Select Register B	A/D Channel Select Register B0
ADANSB0	ANSB[15:0] ANSBn (n = 000 to 007)	A/D Conversion Channels Select (b15-b0) 0: AN000 to AN015 are not subjected to conversion. 1: AN000 to AN015 are subjected to scan conversion.	A/D Conversion Channel Select (b7-b0) 0: AN000 to AN007 are not subjected to conversion. 1: AN000 to AN007 are subjected to conversion.
ADANSB1	—	—	A/D Channel Select Register B1
ADANSC0	—	—	A/D Channel Select Register C0
ADANSC1	—	—	A/D Channel Select Register C1
ADADS	—	A/D-Converted Value Addition Mode Select Register	A/D-Converted Value Addition/ Average Function Select Register 0
ADADS0	ADS[15:0] ADSn (n = 000 to 007)	A/D-Converted Value Addition Channel Select 0: A/D-converted value addition mode for AN000 to AN015 is not selected. 1: A/D-converted value addition mode for AN000 to AN015 is selected.	A/D-Converted Value Addition/ Average Channel Select 0: A/D-converted value addition/average mode for AN000 to AN007 is not selected. 1: A/D-converted value addition/average mode for AN000 to AN007 is selected.
ADADS1	—	—	A/D-Converted Value Addition/ Average Function Select Register 1
ADADC	—	A/D-Converted Value Addition Count Select Register	A/D-Converted Value Addition/ Average Count Select Register
	ADC[1:0] ADC[2:0]	Addition Count Select (b1-b0) b1 b0 0 0: 1-time conversion (no addition; same as normal conversion) 0 1: 2-time conversion (addition once) 1 0: 3-time conversion (addition twice) 1 1: 4-time conversion (addition three times)	Addition Count Select (b2-b0) b2 b0 0 0 0: 1-time conversion (no addition; same as normal conversion) 0 0 1: 2-time conversion (addition once) 0 1 0: 3-time conversion (addition twice)*1 0 1 1: 4-time conversion (addition three times) 1 0 1: 16-time conversion (addition 15 times)*1 Settings other than above are prohibited.

Register	Bit	RX210 (S12AD)	RX651 (S12ADFa)
ADADC	AVEE	—	Average Mode Enable (b7)
ADCER	ADPRC[1:0]	—	A/D Conversion Resolution Setting (b2-b1)
	ACE	Automatic Clearing Enable	A/D Data Register Automatic Clearing Enable
ADSTRGR	TRSB[3:0]	A/D Conversion Start Trigger Select for Group B (b3-b0)	A/D Conversion Start Trigger Select for Group B (b5-b0)
	TRSA[3:0]	A/D Conversion Start Trigger Select (b11-b8)	A/D Conversion Start Trigger Select (b13-b8)
ADEXICR	TSSAD	—	Temperature Sensor Output A/D Converted Value Addition/Averaging Mode Select (b0)
	TSS TSSA	Temperature Sensor Output A/D Conversion Select	Temperature Sensor Output A/D Conversion Select
		0: A/D conversion of temperature sensor output is not performed 1: A/D conversion of temperature sensor output is performed	Conversion for group A in single scan mode, sequence scan mode, and group scan mode
	OCS OCSA	Internal Reference Voltage A/D Conversion Select	Internal Reference Voltage A/D Conversion Select
	TSSB	—	Temperature Sensor Output A/D Conversion Select (b10)
	OCSB	—	Internal Reference Voltage A/D Conversion Select (b11)
	EXSEL[1:0]	—	Extended Analog Input Select (b14-b13)
	EXCEN	—	Extended Analog Output Control (b15)
ADGCEXCR	—	—	A/D Group C Extended Input Control Register
ADGCTRGR	—	—	A/D Group C Trigger Select Register
ADSSTRn	—	A/D Sampling State Register n (n = 0 to 7, L, T, O)	A/D Sampling State Register n (n = 0 to 15, L, T, O)
	SST[7:0]	Sampling Time Setting	Sampling Time Setting
	—	The set value for sampling time should be 12 or more states and 255 or less states.	
ADSHMSR	—	—	A/D Sample-and-Hold Operating Mode Select Register
ADGSPCR	—	—	A/D Group Scan Priority Control Register
ADCMPCR	—	—	A/D Comparison Function Control Register
ADCMPANSR0	—	—	A/D Comparison Function Window A Channel Select Register 0
ADCMPANSR1	—	—	A/D Comparison Function Window A Channel Select Register 1

Register	Bit	RX210 (S12AD)	RX651 (S12ADFa)
ADCMPANSER	—	—	A/D Comparison Function Window A Extended Input Select Register
ADCMPLR0	—	—	A/D Comparison Function Window A Comparison Condition Setting Register 0
ADCMPLR1	—	—	A/D Comparison Function Window A Comparison Condition Setting Register 1
ADCMPLER	—	—	A/D Comparison Function Window A Extended Input Comparison Condition Setting Register
ADCMPDR0	—	—	A/D Comparison Function Window A Lower Level Setting Register
ADCMPDR1	—	—	A/D Comparison Function Window A Upper Level Setting Register
ADCMPSR0	—	—	A/D Comparison Function Window A Channel Status Register 0
ADCMPSR1	—	—	A/D Comparison Function Window A Channel Status Register 1
ADCMPSER	—	—	A/D Comparison Function Window A Extended Input Channel Status Register
ADWINMON	—	—	A/D Comparison Function Window A/B Status Monitoring Register
ADCMPBNSR	—	—	A/D Comparison Function Window B Channel Select Register
ADWINLLB	—	—	A/D Comparison Function Window B Lower Level Setting Register
ADWINULB	—	—	A/D Comparison Function Window B Upper Level Setting Register
ADCMPBSR	—	—	A/D Comparison Function Window B Channel Status Register
ADSAM	—	—	A/D Conversion Time Setting Register
ADSAMPR	—	—	A/D Conversion Time Setting Protection Release Register

2.27 D/A Converter

Table 2.55 shows a Comparative Listing of D/A Converter Specifications, and Table 2.56 shows a Comparative Listing of D/A Converter Registers.

Table 2.55 Comparative Listing of D/A Converter Specifications

Item	RX210 (DA)	RX651 (R12DA)
Resolution	10 bits	12 bits
Output channel	2 channels	2 channels
Countermeasure against mutual interference between analog modules	—	Measure against interference between D/A and A/D conversion: D/A converted data update timing is controlled by the 12-bit A/D converter synchronous D/A conversion enable input signal from the 12-bit A/D converter (unit 1). Therefore, the degradation of A/D conversion accuracy due to interference is reduced by controlling the timing in which the 12-bit D/A converter inrush current occurs, with the enable signal.
Low power consumption function	Module stop state can be set.	Module stop state can be set.
Event link function (input)	DA0 conversion can be started when an event signal is input.	DA0 conversion can be started when an event signal is input.
Output buffer amplifier control function	—	Buffered output (gain = 1) or unbuffered can be selected.

Table 2.56 Comparative Listing of D/A Converter Registers

Register	Bit	RX210 (DA)	RX651 (R12DA)
DADRM	—	D/A Data Register m (DADRM) (m = 0, 1) 10-bit data can be relocated by setting the DPSEL bit in DADPR.	D/A Data Register m (DADRM) (m = 0, 1) 12-bit data can be relocated by setting the DADPR.DPSEL bit.
DAADSCR	—	—	D/A A/D Synchronous Start Control Register
DAADUSR	—	—	D/A A/D Synchronous Unit Select Register
DAAMPCR	—	—	D/A Output Amplifier Control Register
DAASWCR	—	—	D/A Output Amplifier Stabilization Wait Control Register

2.28 Temperature Sensor

Table 2.57 shows a Comparative Listing of Temperature Sensor Specification, and Table 2.58 shows a Comparative Listing of Temperature Sensor Registers.

Table 2.57 Comparative Listing of Temperature Sensor Specification

Item	RX210 (TEMPSa)	RX651 (TEMPS)
Temperature sensor voltage output	Temperature sensor outputs a voltage to the 12-bit A/D converter via a programmable gain amplifier (PGA).	Temperature sensor outputs a voltage to the 12-bit A/D converter unit 1.
Low-power consumption function	Module stop state can be set.	Module stop state can be set.
Temperature Sensor Calibration Data	—	Reference data measured for each chip at factory shipment is stored.

Table 2.58 Comparative Listing of Temperature Sensor Registers

Register	Bit	RX210 (TEMPSa)	RX651 (TEMPS)
TSCR	PGAGAIN [1:0]	PGA Gain Select (b1-b0)	—
	TSOE	—	Temperature Sensor Output Enable (b4)
	PGAEN	PGA Enable (b6)	—
TSCDR	—	—	Temperature Sensor Calibration Data Register

2.29 Data Operation Circuit

Table 2.59 shows a Comparative Listing of Temperature Sensor Registers Comparative Listing of Data Operation Circuit Specification.

Table 2.59 Comparative Listing of Data Operation Circuit Specification

Item	RX210 (DOC)	RX651 (DOC)
Data operation function	16-bit data comparison, addition, and subtraction	16-bit data comparison, addition, and subtraction
Lower power consumption function	Module stop state can be set.	Module stop state can be set.
Interrupts	- The condition selected by the DOCR.DCSEL bit being met - The result of data addition being greater than FFFFh - The result of data subtraction being less than 0000h	- The compared values either match or mismatch - The result of data addition is greater than FFFFh - The result of data subtraction is less than 0000h
Event link function (output)	—	- The compared values either match or mismatch - The result of data addition is greater than FFFFh - The result of data subtraction is less than 0000h

2.30 RAM

Table 2.60 shows a Comparative Listing of RAM Specifications, and Table 2.61 shows a Comparative Listing of RAM Registers.

Table 2.60 Comparative Listing of RAM Specifications

Item	RX210	RX651 (Without ECC Error Correction)
RAM capacity	96KB RAM0: 64KB, RAM1: 32KB 64KB RAM0: 64KB 32KB RAM0: 32KB 20KB RAM0: 20KB 16KB RAM0: 16KB 12KB RAM0: 12KB	256 KB RAM0: 256 KB
RAM address	- RAM Capacity 96KB RAM0: 0000 0000h to 0000 FFFFh RAM1: 0001 0000h to 0001 7FFFh - RAM Capacity 64KB RAM0: 0000 0000h to 0000 FFFFh RAM1: None - RAM Capacity 32KB RAM0: 0000 0000h to 0000 7FFFh RAM1: None - RAM Capacity 20KB RAM0: 0000 0000h to 0000 4FFFh RAM1: None - RAM Capacity 16KB RAM0: 0000 0000h to 0000 3FFFh RAM1: None - RAM Capacity 12KB RAM0: 0000 0000h to 0000 2FFFh RAM1: None	RAM0: 0000 0000h to 0003 FFFFh
Access	- Single-cycle access is possible for both reading and writing. - On-chip RAM can be enabled or disabled	- Single-cycle access is possible for both reading and writing.*1 - Enabling or disabling of the RAM is selectable.
Data retention function	Not available in deep software standby mode.	Not available in deep software standby mode (Data in Standby RAM can be retained)
Low power consumption function	The module-stop state is independently selectable for RAM0 and RAM1.	The module-stop state is selectable.
Error checking function	—	- Detection of 1-bit errors - A non-maskable interrupt or interrupt is generated in response to an error.

Note 1. When accessing across the 8-byte boundary, the number of cycles is doubled.

Table 2.61 Comparative Listing of RAM Registers

Register	Bit	RX210	RX651
RAMMODE	—	—	RAM Operating Mode Control Register
RAMSTS	—	—	RAM Error Status Register
RAMECAD	—	—	RAM Error Address Capture Register
RAMPRCR	—	—	RAM Protection Register

2.31 Flash Memory (Code Flash)

Table 2.62 shows a Comparative Listing of Flash Memory (Code Flash) Specifications, and Table 2.63 shows a Comparative Listing of Flash Memory Registers.

Table 2.62 Comparative Listing of Flash Memory (Code Flash) Specifications

Item	RX210	RX651
Memory space	- User area: 1 Mbyte max. - User boot area: 16 Kbytes	User area: 1 Mbyte max.
ROM cache	—	- Capacity: 256 Bytes - Mapping method: 8-way set associative - Replace method: LRU method - Line size: 16 bytes
Read cycle	A read operation takes one cycle of ICLK	When the cache is hit: One cycle When the cache is missed: One cycle if $ICLK \leq 50 \text{ MHz}$ Two cycles if $50 \text{ MHz} < ICLK \leq 100 \text{ MHz}$ Three cycles if $ICLK > 100 \text{ MHz}$
Value after erase	FFh	FFh
Programming/erasing method	- The chip incorporates a dedicated sequencer (FCU) for programming of the ROM. - Programming and erasing the ROM are handled by issuing commands to the FCU. - FFFF FFFFh is read from the erased ROM in 32 bits.	- The chip incorporates a dedicated sequencer (FCU) for programming and erasure of the flash memory. - Programming and erasing the code flash memory is handled by the FACL commands specified in the FACL command issuing area (007E 0000h) - Programming/erasure through transfer by a dedicated flash-memory programmer via a serial interface (serial programming) - Programming/erasure of flash memory by a user program (self-programming)
Security function	Protects against illicit tampering with or reading out of data in flash memory	Protects against illicit tampering with or reading out of data in flash memory
Protection function	- Software Protection: The ROM programming/erasure is prohibited by the settings of the control registers or user area lock bit. - Command-Locked State P/E The FCU detects malfunctions caused by FCU command issuance errors and prohibited access occurrences, and an FCU command is prohibited from being received.	Protects against erroneous programming of the flash memory
Trusted Memory (TM) function	—	Protects against illicit reading of blocks 8 and 9 in the code flash memory

Item	RX210	RX651
Background Operation (BGO)	• Execution of program code from the ROM is possible while the E2 DataFlash memory is being programmed or erased. • The CPU is able to execute program code from areas other than the ROM or E2 DataFlash while the ROM is being programmed or erased.	—
Suspension and resumption	• The CPU is able to execute program code from the ROM during suspension of programming or erasure. • Programming and erasure of the ROM can be restarted (resumed) after suspension.	• The CPU is able to execute program code from the Code Flash during suspension of programming or erasure. • Programming and erasure of the Code Flash can be restarted (resumed) after suspension.
Units of programming and erasure	• Units of programming for the user area or user boot area: 2, 8, or 128 bytes • Units of erasure for the user area: In block units • Units of erasure for the user boot area: 16 Kbytes	• Units of programming for the user area: 128 bytes • Units of erasure for the user area: Block units
Other functions	—	Interrupts can be accepted during self-programming (When interrupt and exception vector addresses are set other than code flash memory.)
	—	The startup area of the code flash memory is selectable from blocks 0 and 1.

Item	RX210	RX651
On-board programming	- Reprogramming in boot mode - The clock synchronous serial interface (SCI1) is used. - The bit rate is automatically adjusted. - The user boot area is also programmable - Reprogramming in user boot mode - The user-specific boot program can be programmed. - Reprogramming using the ROM reprogramming routine in the user program - ROM is reprogrammable without resetting the system.	- Programming/erasure in boot mode (for the SCI interface) - The asynchronous serial interface (SCI1) is used. - The transfer rate is adjusted automatically. - Programming/erasure in boot mode (for the USB interface) - USBb is used - Dedicated hardware is not required, so direct connection to a PC is possible. - Programming/erasure in boot mode (for the FINE interface) - FINE is used. - Programming/erasure by a routine for code flash memory programming within the user program - This allows code flash memory programming without resetting the system
Programming and Erasure by Dedicated Parallel Programmer	A PROM programmer can be used to program the user area and user boot area .	A flash programmer can be used to program or erase the user area.
Unique ID	—	16-byte ID code provided for each MCU

Table 2.63 Comparative Listing of Flash Memory Registers

Register	Bit	RX210	RX651
FWEPROR	—	Flash Write Erase Protection Register	Flash P/E Protect Register
	FLWE[1:0]	Flash Programming/Erasure	Flash Programming and Erasure Enable
FMODR	—	Flash Mode Register	—
FASTAT	DFLWPE	E2 DataFlash Programming/Erasure Protection Violation (b0)	—
	DFLRPE	E2 DataFlash Read Protection Violation (b1)	—
	DFLAE	E2 DataFlash Access Violation (b3)	—
	ROMAE	ROM Access Violation (b7)	—
	CFAE	—	Code Flash Memory Access Violation Flag (b7)

Register	Bit	RX210	RX651
FAEINT	DFLWPEIE	E2 DataFlash Programming/Erase Protection Violation Interrupt Enable (b0)	—
	DFLRPEIE	E2 DataFlash Read Protection Violation Interrupt Enable (b1)	—
	DFLAEIE	E2 DataFlash Access Violation Interrupt Enable (b3)	—
	ROMAEIE	ROM Access Violation Interrupt Enable (b7)	—
	CFAEIE	—	Code Flash Memory Access Violation Interrupt Enable (b7)
FSADDR	—	—	FACI Command Start Address Register
FCURAME	—	FCU RAM Enable Register	—
FSTATR0	—	Flash Status Register 0	—
FSTATR1	—	Flash Status Register 1	—
FSTATR	—	—	Flash Status Register
FENTRYR	FENTRY0	ROM P/E Mode Entry 0 (b0)	—
	FENTRYC	—	Code Flash Memory P/E Mode Entry (b0)
	FENTRY1	ROM P/E Mode Entry 1 (b1)	—
	FENTRYD	E2 DataFlash P/E Mode Entry (b7)	—
	FEKEY[7:0] KEY[7:0]	Key Code (b15-b8)	Key Code (b15-8)
FPROTR	—	Flash Protection Register	—
FRESETR	—	Flash Reset Register	—
FCMDR	—	FCU Command Register	FACI Command Register
FSUINTR	—	—	Flash Sequencer Set-Up Initialization Register
FAWMON	—	—	Flash Access Window Monitor Register
FCPSR	—	FCU Processing Switching Register	Flash Sequencer Processing Switching Register
	ESUSPMD	Programming/Erase Suspend Mode 0: Suspension priority mode 1: Programming/erase priority mode	Erase Suspend Mode 0: Suspension priority mode 1: Erase priority mode
FPESTAT	—	Flash P/E Status Register	—
FPCKAR	—	—	Flash Sequencer Processing Clock Notification Register
FSUACR	—	—	Start-Up Area Control Register
PCKAR	—	Peripheral Clock Notification Register	—
ROMCE	—	—	ROM Cache Enable Register
ROMCIV	—	—	ROM Cache Invalidate Register
UIDRn	—	—	Unique ID Register n (n = 0 to 3)

3. Comparison of Pin Functions

A comparison of the pin functions, power supply, clock, system control pins is provided below.

Blue character : Items that exist only in either group.

Red character : Items that exist in both group, but they have differences.

Black character : Items that are same specification.

3.1 144pin Package

Table 3.1 shows a Comparative Listing of Pin Functions (144pin Package).

Table 3.1 Comparative Listing of Pin Functions (144pin Package)

144pin LFQFP	RX210	RX651
1	AVSS0	AVSS0
2	P05/DA1	P05/ IRQ13 /DA1
3	VREFH	AVCC1
4	P03/DA0	P03/ IRQ11 /DA0
5	VREFL	AVSS1
6	P02/TMC11/SCK6	P02/TMC11/SCK6/ IRQ10 /AN120
7	P01/TMC10/RXD6/SMISO6/SSCL6	P01/TMC10/RXD6/SMISO6/SSCL6/ IRQ9 /AN119
8	P00/TMRI0/TXD6/SMOSI6/SSDA6	P00/TMRI0/TXD6/SMOSI6/SSDA6/ IRQ8 /AN118
9	PF5/IRQ4	PF5/IRQ4
10	NC	EMLE
11	PJ5	PJ5/ POE8 / CTS2 / RTS2 / SS2
12	VSS	VSS
13	PJ3/MTIOC3C/CTS6#/RTS6#/SS6#/CTS0#/RTS0#/SS0#	PJ3/ EDACK1 /MTIOC3C/CTS6#/RTS6#/CTS0#/RTS0#/SS6#/SS0#
14	VCL	VCL
15	PJ1 /MTIOC3A	VBATT
16	MD/FINED	MD/FINED
17	XCIN	XCIN
18	XCOUT	XCOUT
19	RES#	RES#
20	XTAL/P37	XTAL/P37
21	VSS	VSS
22	EXTAL/P36	EXTAL/P36
23	VCC	VCC
24	P35/NMI	UPSEL /P35/NMI
25	P34/MTIOC0A/TMC13/ POE2 /SCK6/SCK0/IRQ4	TRST /P34/MTIOC0A/TMC13/ PO12 / POE10 /SCK6/SCK0/IRQ4
26	P33/MTIOC0D/TMRI3/ POE3 /TIOC0D/RXD6/SMISO6/SSCL6/RXD0/SMISO0/SSCL0/IRQ3-DS	P33/ EDREQ1 /MTIOC0D/TIOC0D/TMRI3/ PO11 / POE4 / POE11 /RXD6/RXD0/SMISO6/SMISO0/SSCL6/SSCL0/ CRX0 / PCK0 /IRQ3-DS
27	P32/MTIOC0C/TMO3/TIOCC0/TXD6/SMOSI6/SSDA6/TXD0/SMOSI0/SSDA0/IRQ2-DS/RTICOUT/RTICIC2	P32/MTIOC0C/TIOCC0/TMO3/ PO10 /RTICOUT/RTICIC2/ POE0 / POE10 /TXD6/TXD0/SMOSI6/SMOSI0/SSDA6/SSDA0/ CTX0 / USB0_VBUSEN /VSYNC/IRQ2-DS

144pin LFQFP	RX210	RX651
28	P31/MTIOC4D/TMCI2/CTS1#/RTS1#/SS1#/IRQ1-DS/RTCIC1	TMS /P31/MTIOC4D/TMCI2/ PO9 /RTCIC1/CTS1#/RTS1#/SS1#/ SSLB0-A /IRQ1-DS
29	P30/MTIOC4B/TMRI3/POE8#/RXD1/SMISO1/SSCL1/IRQ0-DS/RTCIC0	TDI /P30/MTIOC4B/TMRI3/ PO8 /RTCIC0/POE8#/RXD1/SMISO1/SSCL1/ MISOB-A /IRQ0-DS
30	P27/ CS3 /MTIOC2B/TMCI3/SCK1	TCK /P27/ CS7 /MTIOC2B/TMCI3/ PO7 /SCK1/ RSPCKB-A
31	P26/ CS2 /MTIOC2A/TMO1/TXD1/SMOSI1/SSDA1/CTS3#/RTS3#/SS3#	TDO /P26/ CS6 /MTIOC2A/TMO1/ PO6 /TXD1/CTS3#/RTS3#/SMOSI1/SS3#/ SSDA1/MOSIB-A
32	P25/ CS1 /MTIOC4C/MTCLKB/TIOCA4/RXD3/SMISO3/SSCL3/ADTRG0#	P25/ CS5 / EDACK1 /MTIOC4C/MTCLKB/TIOCA4/ PO5 /RXD3/SMISO3/SSCL3/ HSYNC /ADTRG0#
33	P24/ CS0 /MTIOC4A/MTCLKA/TMRI1/TIOCB4/SCK3	P24/ CS4 / EDREQ1 /MTIOC4A/MTCLKA/TIOCB4/TMRI1/ PO4 /SCK3/ USB0_VBUSEN/PIXCLK
34	P23/MTIOC3D/MTCLKD/TIOCD3/CTS0#/RTS0#/SS0#/TXD3/SMOSI3/SSDA3	P23/ EDACK0 /MTIOC3D/MTCLKD/TIOCD3/ PO3 /TXD3/CTS0#/RTS0#/SMOSI3/SS0#/ SSDA3/PIXD7
35	P22/MTIOC3B/MTCLKC/TMO0/TIOCC3/SCK0	P22/ EDREQ0 /MTIOC3B/MTCLKC/TIOCC3/TMO0/ PO2 /SCK0/ USB0_OVRCURB/PIXD6
36	P21/MTIOC1B/TMCI0/TIOCA3/RXD0/SMISO0/SSCL0	P21/MTIOC1B/ MTIOC4A /TIOCA3/TMCI0/ PO1 /RXD0/SMISO0/SSCL0/ USB0_EXICEN/PIXD5/IRQ9
37	P20/MTIOC1A/TMRI0/TIOCB3/TXD0/SMOSI0/SSDA0	P20/MTIOC1A/TIOCB3/TMRI0/ PO0 /TXD0/SMOSI0/SSDA0/ USB0_ID/PIXD4/IRQ8
38	P17/MTIOC3A/MTIOC3B/TMO1/POE8#/TIOCB0/TCLKD/SCK1/ MISOA/SDA-DS /TXD3/SMOSI3/SSDA3/IRQ7	P17/MTIOC3A/MTIOC3B/ MTIOC4B /TIOCB0/TCLKD/TMO1/ PO15 /POE8#/SCK1/TXD3/SMOSI3/SSDA3/ SDA2-DS/PIXD3/IRQ7/ADTRG1#
39	P87/TIOCA2	P87/ MTIOC4C /TIOCA2/ TXD10/SMOSI10/SSDA10/PIXD2
40	P16/MTIOC3C/MTIOC3D/TMO2/TIOCB1/TCLKC/TXD1/SMOSI1/SSDA1/ MOSIA/SCL-DS /RXD3/SMISO3/SSCL3/IRQ6/RTCOU/ADTRG0#	P16/MTIOC3C/MTIOC3D/TIOCB1/TCLKC/TMO2/ PO14 /RTCOU/TXD1/RXD3/SMOSI1/SMISO3/SSDA1/SSCL3/ SCL2-DS/USB0_VBUS/USB0_VBUSEN/USB0_OVRCURB/IRQ6/ADTRG0#
41	P86/TIOCA0	P86/ MTIOC4D /TIOCA0/ RXD10/SMISO10/SSCL10/PIXD1
42	P15/MTIOC0B/MTCLKB/TMCI2/TIOCB2/TCLKB/RXD1/SMISO1/SSCL1/SCK3/IRQ5	P15/MTIOC0B/MTCLKB/TIOCB2/TCLKB/TMCI2/ PO13 /RXD1/SCK3/SMISO1/SSCL1/ CRX1-DS/PIXD0/IRQ5
43	P14/MTIOC3A/MTCLKA/TMRI2/TIOCB5/TCLKA/CTS1#/RTS1#/SS1#/IRQ4	P14/MTIOC3A/MTCLKA/TIOCB5/TCLKA/TMRI2/ PO15 /CTS1#/RTS1#/SS1#/ CTX1/USB0_OVRCURA/IRQ4
44	P13/MTIOC0B/TMO3/TIOCA5/ SDA /TXD2/SMOSI2/SSDA2/IRQ3	P13/MTIOC0B/TIOCA5/TMO3/ PO13 /TXD2/SMOSI2/SSDA2/ SDA0[FM+] /IRQ3/ ADTRG1#
45	P12/TMCI1/ SCL /RXD2/SMISO2/SSCL2/IRQ2	P12/TMCI1/RXD2/SMISO2/SSCL2/ SCL0[FM+] /IRQ2
46	PH3/TMCI0	VCC_USB
47	PH2/TMRI0/IRQ1	USB0_DM
48	PH1/TMO0/IRQ0	USB0_DP
49	PH0/CACREF	VSS_USB

144pin LFQFP	RX210	RX651
50	P56/MTIOC3C/TIOCA1	P56/ EDACK1 /MTIOC3C/TIOCA1
51	P55/WAIT#/MTIOC4D/TMO3	TRDATA3 /P55/WAIT#/ EDREQ0 /MTIOC4D/TMO3/ CRX1 /IRQ10
52	P54/ALE/MTIOC4B/TMC11/CTS2#/RTS2#/SS2#	TRDATA2 /P54/ALE/ EDACK0 /MTIOC4B/TMC11/CTS2#/RTS2#/SS2#/ CTX1
53	BCLK/P53	BCLK/P53
54	P52/RD#/RXD2/SMISO2/SSCL2	P52/RD#/RXD2/SMISO2/SSCL2/ SSLB3-A
55	P51/WR1#/BC1#/WAIT#/SCK2	P51/WR1#/BC1#/WAIT#/ SSLB2-A /SCK2
56	P50/WR0#/WR#/TXD2/SMOSI2/SSDA2	P50/WR0#/WR#/TXD2/SMOSI2/SSDA2/ SSLB1-A
57	VSS	VSS
58	P83/MTIOC4C/CTS10#/ RTS10#	TRCLK /P83/ EDACK1 /MTIOC4C/CTS10#/ SS10# / SCK10
59	VCC	VCC
60	PC7/A23/CS0#/MTIOC3A/TMO2/MTCLKB/TXD8/SMOSI8/SSDA8/MISOA/CACREF	UB /PC7/A23/CS0#/MTIOC3A/MTCLKB/TMO2/ TOC0 / PO31 /CACREF/TXD8/SMOSI8/SSDA8/MISOA-A/ TXD10 / SMOSI10 / SSDA10 / MMC_C_D7-A /IRQ14
61	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMC12/RXD8/SMISO8/SSCL8/MOSIA	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMC12/ TI_C0 / PO30 /RXD8/SMISO8/SSCL8/MOSIA-A/ RXD10 / SMISO10 / SSCL10 / MMC_D6-A /IRQ13
62	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/TMRI2/SCK8/RSPCKA	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/TMRI2/ PO29 /SCK8/RSPCKA-A/ SCK10 / MMC_D5-A
63	P82/MTIOC4A/TXD10/SMOSI10/SSDA10	TRSYNC /P82/ EDREQ1 /MTIOC4A/ PO28 /TXD10/SMOSI10/SSDA10/ MMC_D4-A
64	P81/MTIOC3D/RXD10/SMISO10/SSCL10	TRDATA1 /P81/ EDACK0 /MTIOC3D/ PO27 /RXD10/SMISO10/SSCL10/ MMC_D3-A / SDHI_C_D-A / QIO3-A
65	P80/MTIOC3B/SCK10	TRDATA0 /P80/ EDREQ0 /MTIOC3B/ PO26 /SCK10/ RTS10# / MMC_D2-A / SDHI_WP-A / QIO2-A
66	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMC11/POE0#/SCK5/CTS8#/RTS8#/SS8#/SSLA0	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMC11/ PO25 /POE0#/SCK5/CTS8#/RTS8#/SS8#/ SSLA0-A / CTS10# / RTS10# / SS10# / MMC_D1-A / SDHI_D1-A / SDSI_D1-A / QIO1-A / QMI-A
67	PC3/A19/MTIOC4D/TCLKB/TXD5/SMOSI5/SSDA5	PC3/A19/MTIOC4D/TCLKB/ PO24 /TXD5/SMOSI5/SSDA5/ MMC_D0-A / SDHI_D0-A / SDSI_D0-A / QIO0-A / QMO-A
68	P77/TXD11/SMOSI11/SSDA11	TRDATA7 /P77/ CS7# / PO23 /TXD11/SMOSI11/SSDA11/ MMC_CLK-A / SDHI_CLK-A / SDSI_CLK-A / QSPCLK-A
69	P76/RXD11/SMISO11/SSCL11	TRDATA6 /P76/ CS6# / PO22 /RXD11/SMISO11/SSCL11/ MMC_CMD-A / SDHI_CMD-A / SDSI_CMD-A / QSSL-A
70	PC2/A18/MTIOC4B/TCLKA/RXD5/SMISO5/SSCL5/SSLA3	PC2/A18/MTIOC4B/TCLKA/ PO21 /RXD5/SMISO5/SSCL5/SSLA3-A/ MMC_CD-A / SDHI_D3-A / SDSI_D3-A
71	P75/SCK11	TRSYNC1 /P75/ CS5# / PO20 /SCK11/ RTS11# / MMC_RES#-A / SDHI_D2-A / SDSI_D2-A
72	P74/CTS11#/ RTS11# /SS11#	TRDATA5 /P74/ A20 / CS4# / PO19 /CTS11#/SS11#

144pin LFQFP	RX210	RX651
73	PC1/A17/MTIOC3A/TCLKD/SCK5/SSLA2	PC1/A17/MTIOC3A/TCLKD/ PO18 /SCK5/SSLA2-A/ IRQ12
74	PL1	VCC
75	PC0/A16/MTIOC3C/TCLKC/CTS5#/RTS5#/SS5#/SSLA1	PC0/A16/MTIOC3C/TCLKC/ PO17 /CTS5#/RTS5#/SS5#/SSLA1-A/ IRQ14
76	PL0	VSS
77	P73	TRDATA4/P73/CS3#/PO16
78	PB7/A15/MTIOC3B/TIOCB5/TXD9/SMOSI9/SSDA9	PB7/A15/MTIOC3B/TIOCB5/ PO31 /TXD9/SMOSI9/SSDA9/ TXD11/SMOSI11/SSDA11/SDS_I_D1-B
79	PB6/A14/MTIOC3D/TIOCA5/RXD9/SMISO9/SSCL9	PB6/A14/MTIOC3D/TIOCA5/ PO30 /RXD9/SMISO9/SSCL9/ RXD11/SMISO11/SSCL11/SDS_I_D0-B
80	PB5/A13/MTIOC2A/MTIOC1B/TMRI1/ POE1# /TIOCB4/SCK9	PB5/A13/MTIOC2A/MTIOC1B/TIOCB4/TMRI1/ PO29/POE4# /SCK9/ SCK11/SDSI_CLK-B
81	PB4/A12/TIOCA4/CTS9#/RTS9#/SS9#	PB4/A12/TIOCA4/ PO28 /CTS9#/RTS9#/SS9#/ CTS11#/RTS11#/SS11#/SDSI_CMD-B
82	PB3/A11/MTIOC0A/MTIOC4A/TMO0/ POE3# /TIOCD3/TCLKD/SCK4/SCK6	PB3/A11/MTIOC0A/MTIOC4A/TIOCD3/TCLKD/TMO0/ PO27/POE11# /SCK4/SCK6/ SDSI_D3-B
83	PB2/A10/TIOCC3/TCLKC/CTS4#/RTS4#/SS4#/CTS6#/RTS6#/SS6#	PB2/A10/TIOCC3/TCLKC/ PO26 /CTS4#/RTS4#/CTS6#/RTS6#/SS4#/SS6#/ SDSI_D2-B
84	PB1/A9/MTIOC0C/MTIOC4C/TMCI0/TIOCB3/TXD4/SMOSI4/SSDA4/TXD6/SMOSI6/SSDA6/IRQ4-DS	PB1/A9/MTIOC0C/MTIOC4C/TIOCB3/TMCI0/ PO25 /TXD4/TXD6/SMOSI4/SMOSI6/SSDA4/SSDA6/IRQ4-DS
85	P72	P72/ A19/CS2#
86	P71	P71/ A18/CS1#
87	PB0/A8/MTIC5W/TIOCA3/RXD4/SMISO4/SSCL4/RXD6/SMISO6/SSCL6/ RSPCKA	PB0/A8/MTIC5W/TIOCA3/ PO24 /RXD4/RXD6/SMISO4/SMISO6/SSCL4/SSCL6/ IRQ12
88	PA7/A7/TIOCB2/MISOA	PA7/A7/TIOCB2/ PO23 /MISOA-B
89	PA6/A6/MTIC5V/MTCLKB/TMCI3/ POE2# /TIOCA2/CTS5#/RTS5#/SS5#/MOSIA	PA6/A6/MTIC5V/MTCLKB/TIOCA2/TMCI3/ PO22/POE10# /CTS5#/RTS5#/SS5#/MOSIA-B
90	PA5/A5/TIOCB1/RSPCKA	PA5/A5/ MTIOC6B /TIOCB1/ PO21 /RSPCKA-B
91	VCC	VCC
92	PA4/A4/MTIC5U/MTCLKA/TMRI0/TIOCA1/TXD5/SMOSI5/SSDA5/SSLA0/IRQ5-DS/ CVREFB1	PA4/A4/MTIC5U/MTCLKA/TIOCA1/TMRI0/ PO20 /TXD5/SMOSI5/SSDA5/SSLA0-B/IRQ5-DS
93	VSS	VSS
94	PA3/A3/MTIOC0D/MTCLKD/TIOCD0/TCLKB/RXD5/SMISO5/SSCL5/IRQ6-DS/ CMPB1	PA3/A3/MTIOC0D/MTCLKD/TIOCD0/TCLKB/ PO19 /RXD5/SMISO5/SSCL5/IRQ6-DS
95	PA2/A2/RXD5/SMISO5/SSCL5/SSLA3	PA2/A2/ MTIOC7A/PO18 /RXD5/SMISO5/SSCL5/SSLA3-B
96	PA1/A1/MTIOC0B/MTCLKC/TIOCB0/SCK5/SSLA2/ CVREFA	PA1/A1/MTIOC0B/MTCLKC/ MTIOC7B /TIOCB0/ PO17 /SCK5/SSLA2-B/ IRQ11
97	PA0/A0/BC0#/MTIOC4A/TIOCA0/SSLA1/CACREF	PA0/A0/BC0#/MTIOC4A/ MTIOC6D /TIOCA0/CACREF/ PO16 /SSLA1-B
98	P67	P67/ CS7#/DQM1/MTIOC7C/IRQ15
99	P66	P66/ CS6#/DQM0/MTIOC7D
100	P65	P65/ CS5#/CKE
101	PE7/D15[A15/D15]/IRQ7/ AN015	PE7/D15[A15/D15]/ MTIOC6A/TOC1/MISOB-B/MMC_RES#-B/SDHI_WP-B/IRQ7/AN105

144pin LFQFP	RX210	RX651
102	PE6/D14[A14/D14]/CTS4#/RTS4#/SS4#/IRQ6/ AN014	PE6/D14[A14/D14]/MTIOC6C/TIC1/MOSIB-B/MMC_CD-B/SDHI_CD-B/IRQ6/ AN104
103	PK5/TXD4/SMOSI4/SSDA4	VCC
104	P70/ SCK4	SDCLK/P70
105	PK4/RXD4/SMISO4/SSCL4	VSS
106	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/IRQ5/ AN013	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/ RSPCKB-B/IRQ5/AN103
107	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/ AN012/CMPA2	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/ PO28/SSLB0-B/AN102
108	PE3/D11[A11/D11]/MTIOC4B/POE8#/CTS12#/RTS12#/SS12#/ AN011/CMPA1	PE3/D11[A11/D11]/MTIOC4B/ PO26/POE8#/TOC3/CTS12#/RTS12#/SS12#/MMC_D7-B/AN101
109	PE2/D10[A10/D10]/MTIOC4A/RXD12/RXD12/SMISO12/SSCL12/IRQ7-DS/ AN010/CVREFB0	PE2/D10[A10/D10]/MTIOC4A/ PO23/TIC3/RXD12/SMISO12/SSCL12/RXD12/SSLB3-B/MC_D6-B/IRQ7-DS/AN100
110	PE1/D9[A9/D9]/MTIOC4C/TXD12/TXD12/SIOX12/SMOSI12/SSDA12/ AN009/CMPB0	PE1/D9[A9/D9]/MTIOC4C/ MTIOC3B/PO18/TXD12/SMOSI12/SSDA12/TXD12/SIOX12/SSLB2-B/MMC_D5-B/ANEX1
111	PE0/D8[A8/D8]/SCK12/ AN008	PE0/D8[A8/D8]/MTIOC3D/SCK12/ SSLB1-B/MMC_D4-B/ANEX0
112	P64	P64/ CS4#/WE#
113	P63	P63/ CS3#/CAS#
114	P62	P62/ CS2#/RAS#
115	P61/ CTS9#/RTS9#/SS9#	P61/ CS1#/SDCS#
116	PK3/RXD9/SMISO9/SSCL9	VSS
117	P60/ SCK9	P60/ CS0#
118	PK2/TXD9/SMOSI9/SSDA9	VCC
119	PD7/D7[A7/D7]/MTIC5U/POE0#/IRQ7	PD7/D7[A7/D7]/MTIC5U/POE0#/ SSLC3/MMC_D1-B/SDHI_D1-B/QIO1-B/QMI-B/IRQ7/AN107
120	PD6/D6[A6/D6]/MTIC5V/ POE1#/IRQ6	PD6/D6[A6/D6]/MTIC5V/ MTIOC8A/POE4#/SSLC2/MMC_D0-B/SDHI_D0-B/QIO0-B/QMOB/IRQ6/AN106
121	PD5/D5[A5/D5]/MTIC5W/ POE2#/IRQ5	PD5/D5[A5/D5]/MTIC5W/ MTIOC8C/POE10#/SSLC1/MMC_CLK-B/SDHI_CLK-B/QSPCLK-B/IRQ5/AN113
122	PD4/D4[A4/D4]/ POE3#/IRQ4	PD4/D4[A4/D4]/ MTIOC8B/POE11#/SSLC0/MMC_CMD-B/SDHI_CMD-B/QSSL-B/IRQ4/AN112
123	PD3/D3[A3/D3]/POE8#/IRQ3	PD3/D3[A3/D3]/ MTIOC8D/POE8#/TOC2/RSPCKC/MMC_D3-B/SDHI_D3-B/QIO3-B/IRQ3/AN111
124	PD2/D2[A2/D2]/MTIOC4D/IRQ2	PD2/D2[A2/D2]/MTIOC4D/ TIC2/CRX0/MISO C/MMC_D2-B/SDHI_D2-B/QIO2-B/IRQ2/AN110
125	PD1/D1[A1/D1]/MTIOC4B/IRQ1	PD1/D1[A1/D1]/MTIOC4B/ POE0#/CTX0/MOSIC/IRQ1/AN109
126	PD0/D0[A0/D0]/IRQ0	PD0/D0[A0/D0]/ POE4#/IRQ0/AN108
127	P93/CTS7#/RTS7#/SS7#	P93/ A19/POE0#/CTS7#/RTS7#/SS7#/AN117
128	P92/RXD7/SMISO7/SSCL7	P92/ A18/POE4#/RXD7/SMISO7/SSCL7/AN116
129	P91/SCK7	P91/ A17/SCK7/AN115

144pin LFQFP	RX210	RX651
130	VSS	VSS
131	P90/TXD7/SMOSI7/SSDA7	P90/ A16 /TXD7/SMOSI7/SSDA7/ AN114
132	VCC	VCC
133	P47/AN007	P47/ IRQ15-DS /AN007
134	P46/AN006	P46/ IRQ14-DS /AN006
135	P45/AN005	P45/ IRQ13-DS /AN005
136	P44/AN004	P44/ IRQ12-DS /AN004
137	P43/AN003	P43/ IRQ11-DS /AN003
138	P42/AN002	P42/ IRQ10-DS /AN002
139	P41/AN001	P41/ IRQ9-DS /AN001
140	VREFL0	VREFL0
141	P40/AN000	P40/ IRQ8-DS /AN000
142	VREFH0	VREFH0
143	AVCC0	AVCC0
144	P07/ADTRG0#	P07/ IRQ15 /ADTRG0#

3.2 145pin Package

Table 3.2 shows a Comparative Listing of Pin Functions (145pin Package).

Table 3.2 Comparative Listing of Pin Functions (145pin Package)

145pin TFLGA	RX210	RX651
A1	AVSS0	AVSS0
A2	P07/ADTRG0#	P07/IRQ15/ADTRG0#
A3	P40/AN000	P40/IRQ8-DS/AN000
A4	P42/AN002	P42/IRQ10-DS/AN002
A5	P45/AN005	P45/IRQ13-DS/AN005
A6	P90/TXD7/SMOSI7/SSDA7	P90/A16/TXD7/SMOSI7/SSDA7/AN114
A7	P92/RXD7/SMISO7/SSCL7	P92/A18/POE4#/RXD7/SMISO7/SSCL7/AN116
A8	PD2/D2[A2/D2]/MTIOC4D/IRQ2	PD2/D2[A2/D2]/MTIOC4D/TIC2/CRX0/MISO C/MMC_D2-B/SDHI_D2-B/QIO2-B/IRQ2/AN110
A9	PD6/D6[A6/D6]/MTIC5V/POE1#/IRQ6	PD6/D6[A6/D6]/MTIC5V/MTIOC8A/POE4#/SLC2/MMC_D0-B/SDHI_D0-B/QIO0-B/QMO-B/IRQ6/AN106
A10	PK3/RXD9/SMISO9/SSCL9	VSS
A11	P62	P62/CS2#/RAS#
A12	PE1/D9[A9/D9]/MTIOC4C/TXD12/TXDX12/SIOX12/SMOSI12/SSDA12/AN009/CMPB0	PE1/D9[A9/D9]/MTIOC4C/MTIOC3B/PO18/TXD12/SMOSI12/SSDA12/TXDX12/SIOX12/SLB2-B/MMC_D5-B/ANEX1
A13	PE3/D11[A11/D11]/MTIOC4B/POE8#/CTS12#/RTS12#/SS12#/AN011/CMPA1	PE3/D11[A11/D11]/MTIOC4B/PO26/POE8#/TOC3/CTS12#/RTS12#/SS12#/MMC_D7-B/AN101
B1	VREFH	AVCC1
B2	AVCC0	AVCC0
B3	P05/DA1	P05/IRQ13/DA1
B4	VREFL0	VREFL0
B5	P43/AN003	P43/IRQ11-DS/AN003
B6	P47/AN007	P47/IRQ15-DS/AN007
B7	P91/SCK7	P91/A17/SCK7/AN115
B8	PD0/D0[A0/D0]/IRQ0	PD0/D0[A0/D0]/POE4#/IRQ0/AN108
B9	PD4/D4[A4/D4]/POE3#/IRQ4	PD4/D4[A4/D4]/MTIOC8B/POE11#/SSLC0/MMC_CMD-B/SDHI_CMD-B/QSSL-B/IRQ4/AN112
B10	PK2/TXD9/SMOSI9/SSDA9	VCC
B11	P61/CTS9#/RTS9#/SS9#	P61/CS1#/SDCS#
B12	PE2/D10[A10/D10]/MTIOC4A/RXD12/RXDX12/SMISO12/SSCL12/IRQ7-DS/AN010/CVRE FB0	PE2/D10[A10/D10]/MTIOC4A/PO23/TIC3/RXD12/SMISO12/SSCL12/RXDX12/SSLB3-B/MMC_D6-B/IRQ7-DS/AN100
B13	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/AN012/CMPA2	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/PO28/SSLB0-B/AN102
C1	VREFL	AVSS1
C2	P02/TMC11/SCK6	P02/TMC11/SCK6/IRQ10/AN120
C3	VREFH0	VREFH0
C4	P41/AN001	P41/IRQ9-DS/AN001
C5	P46/AN006	P46/IRQ14-DS/AN006
C6	VSS	VSS

145pin TFLGA	RX210	RX651
C7	PD1/D1[A1/D1]/MTIOC4B/IRQ1	PD1/D1[A1/D1]/MTIOC4B/POE0#/CTX0/MO SIC/IRQ1/AN109
C8	PD3/D3[A3/D3]/POE8#/IRQ3	PD3/D3[A3/D3]/MTIOC8D/POE8#/TOC2/RS PCKC/MMC_D3-B/SDHI_D3-B/QIO3-B/IRQ3/ AN111
C9	PD7/D7[A7/D7]/MTIC5U/POE0#/IRQ7	PD7/D7[A7/D7]/MTIC5U/POE0#/SSLC3/MM C_D1-B/SDHI_D1-B/QIO1-B/QMI-B/IRQ7/AN 107
C10	P63	P63/CS3#/CAS#
C11	PE0/D8[A8/D8]/SCK12/AN008	PE0/D8[A8/D8]/MTIOC3D/SCK12/SSLB1-B/ MMC_D4-B/ANEX0
C12	P70/SCK4	P70/SDCLK
C13	PK4/RXD4/SMISO4/SSCL4	VSS
D1	P00/TMRI0/TXD6/SMOSI6/SSDA6	P00/TMRI0/TXD6/SMOSI6/SSDA6/IRQ8/AN1 18
D2	PF5/IRQ4	PF5/IRQ4
D3	P03/DA0	P03/IRQ11/DA0
D4	P01/TMCi0/RXD6/SMISO6/SSCL6	P01/TMCi0/RXD6/SMISO6/SSCL6/IRQ9/AN1 19
D5	VCC	VCC
D6	P93/CTS7#/RTS7#/SS7#	P93/A19/POE0#/CTS7#/RTS7#/SS7#/AN117
D7	PD5/D5[A5/D5]/MTIC5W/POE2#/IRQ5	PD5/D5[A5/D5]/MTIC5W/MTIOC8C/POE10#/ SSLC1/MMC_CLK-B/SDHI_CLK-B/QSPCLK- B/IRQ5/AN113
D8	P60/SCK9	P60/CS0#
D9	P64	P64/CS4#/WE#
D10	PE7/D15[A15/D15]/IRQ7/AN015	PE7/D15[A15/D15]/MTIOC6A/TOC1/MISOB- B/MMC_RES#-B/SDHI_WP-B/IRQ7/AN105
D11	PK5/TXD4/SMOSI4/SSDA4	VCC
D12	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/IRQ 5/AN013	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/RSP CKB-B/IRQ5/AN103
D13	PE6/D14[A14/D14]/CTS4#/RTS4#/SS4#/IRQ 6/AN014	PE6/D14[A14/D14]/MTIOC6C/TIC1/MOSIB-B /MMC_CD-B/SDHI_CD-B/IRQ6/AN104
E1	VSS	VSS
E2	VCL	VCL
E3	PJ5	PJ5/POE8#/CTS2#/RTS2#/SS2#
E4	NC	EMLE
E5	P44/AN004	P44/IRQ12-DS/AN004
E10	PA0/A0/BC0#/MTIOC4A/TIOCA0/SSLA1/CA CREF	PA0/A0/BC0#/MTIOC4A/MTIOC6D/TIOCA0/ CACREF/PO16/SSLA1-B
E11	P66	P66/CS6#/DQM0/MTIOC7D
E12	P65	P65/CS5#/CKE
E13	P67	P67/CS7#/DQM1/MTIOC7C/IRQ15
F1	XCIN	XCIN
F2	XCOUT	XCOUT
F3	PJ3/MTIOC3C/CTS6#/RTS6#/SS6#/CTS0#/ RTS0#/SS0#	PJ3/EDACK1/MTIOC3C/CTS6#/RTS6#/CTS 0#/RTS0#/SS6#/SS0#
F4	PJ1/MTIOC3A	VBATT
F10	PA3/A3/MTIOC0D/MTCLKD/TIOCD0/TCLKB/ RXD5/SMISO5/SSCL5/IRQ6-DS/CMPB1	PA3/A3/MTIOC0D/MTCLKD/TIOCD0/TCLKB/ PO19/RXD5/SMISO5/SSCL5/IRQ6-DS
F11	VSS	VSS

145pin TFLGA	RX210	RX651
F12	PA1/A1/MTIOC0B/MTCLKC/TIOCB0/SCK5/SLA2/ CVREFA	PA1/A1/MTIOC0B/MTCLKC/ MTIOC7B /TIOCB0/ PO17 /SCK5/SSLA2-B/ IRQ11
F13	PA2/A2/RXD5/SMISO5/SSCL5/SSLA3	PA2/A2/ MTIOC7A / PO18 /RXD5/SMISO5/SSCL5/SSLA3-B
G1	XTAL/P37	XTAL/P37
G2	RES#	RES#
G3	MD/FINED	MD/FINED
G4	NC	BSCANP
G10	PA5/A5/TIOCB1/RSPCKA	PA5/A5/ MTIOC6B /TIOCB1/ PO21 /RSPCKA-B
G11	PA6/A6/MTIC5V/MTCLKB/TMCI3/ POE2# /TIOCA2/CTS5#/RTS5#/SS5#/MOSIA	PA6/A6/MTIC5V/MTCLKB/TIOCA2/TMCI3/ PO22 / POE10# /CTS5#/RTS5#/SS5#/MOSIA-B
G12	VCC	VCC
G13	PA4/A4/MTIC5U/MTCLKA/TMRI0/TIOCA1/TXD5/SMOSI5/SSDA5/SSLA0/IRQ5-DS/ CVREFB1	PA4/A4/MTIC5U/MTCLKA/TMRI0/ PO20 /TXD5/SMOSI5/SSDA5/SSLA0-B/IRQ5-DS
H1	EXTAL/P36	EXTAL/P36
H2	VCC	VCC
H3	VSS	VSS
H4	P35/NMI	UPSEL /P35/NMI
H10	P72	P72/ A19 / CS2#
H11	P71	P71/ A18 / CS1#
H12	PB0/A8/MTIC5W/TIOCA3/RXD4/SMISO4/SSCL4/RXD6/SMISO6/SSCL6/ RSPCKA	PB0/A8/MTIC5W/TIOCA3/ PO24 /RXD4/RXD6/SMISO4/SMISO6/SSCL4/SSCL6/ IRQ12
H13	PA7/A7/TIOCB2/MISOA	PA7/A7/TIOCB2/ PO23 /MISOA-B
J1	P34/MTIOC0A/TMCI3/ POE2# /SCK6/SCK0/IRQ4	TRST# /P34/MTIOC0A/TMCI3/ PO12 / POE10# /SCK6/SCK0/IRQ4
J2	P33/MTIOC0D/TMRI3/ POE3# /TIOCD0/RXD6/SMISO6/SSCL6/RXD0/SMISO0/SSCL0/IRQ3-DS	P33/ EDREQ1 /MTIOC0D/TIOCD0/TMRI3/ PO11 / POE4# / POE11# /RXD6/RXD0/SMISO6/SMISO0/SSCL6/SSCL0/ CRX0 / PCKO /IRQ3-DS
J3	P32/MTIOC0C/TMO3/TIOCC0/TXD6/SMOSI6/SSDA6/TXD0/SMOSI0/SSDA0/IRQ2-DS/RTICOUT/RTICIC2	P32/MTIOC0C/TIOCC0/TMO3/ PO10 /RTICOUT/RTICIC2/ POE0# / POE10# /TXD6/TXD0/SMOSI6/SMOSI0/SSDA6/SSDA0/ CTX0 / USB0_VBUS / VSYNC /IRQ2-DS
J4	P30/MTIOC4B/TMRI3/ POE8# /RXD1/SMISO1/SSCL1/IRQ0-DS/RTICIC0	TDI /P30/MTIOC4B/TMRI3/ PO8 /RTICIC0/ POE8# /RXD1/SMISO1/SSCL1/ MISOB-A /IRQ0-DS
J10	PB3/A11/MTIOC0A/MTIOC4A/TMO0/ POE3# /TIOCD3/TCLKD/SCK4/SCK6	PB3/A11/MTIOC0A/MTIOC4A/TIOCD3/TCLKD/TMO0/ PO27 / POE11# /SCK4/SCK6/ SDSI_D3-B
J11	PB4/A12/TIOCA4/CTS9#/RTS9#/SS9#	PB4/A12/TIOCA4/ PO28 /CTS9#/RTS9#/SS9#/ CTS11# / RTS11# / SS11# / SDSI_CMD-B
J12	PB2/A10/TIOCC3/TCLKC/CTS4#/RTS4#/SS4#/CTS6#/RTS6#/SS6#	PB2/A10/TIOCC3/TCLKC/ PO26 /CTS4#/RTS4#/CTS6#/RTS6#/SS4#/SS6#/ SDSI_D2-B
J13	PB1/A9/MTIOC0C/MTIOC4C/TMCI0/TIOCB3/TXD4/SMOSI4/SSDA4/TXD6/SMOSI6/SSDA6/IRQ4-DS	PB1/A9/MTIOC0C/MTIOC4C/TIOCB3/TMCI0/ PO25 /TXD4/TXD6/SMOSI4/SMOSI6/SSDA4/SSDA6/IRQ4-DS
K1	P27/ CS3# /MTIOC2B/TMCI3/SCK1	TCK /P27/ CS7# /MTIOC2B/TMCI3/ PO7 /SCK1/ RSPCKB-A
K2	P26/ CS2# /MTIOC2A/TMO1/TXD1/SMOSI1/SSDA1/CTS3#/RTS3#/SS3#	TDO /P26/ CS6# /MTIOC2A/TMO1/ PO6 /TXD1/CTS3#/RTS3#/SMOSI1/SS3#/SSDA1/ MOSIB-A

145pin TFLGA	RX210	RX651
K3	P31/MTIOC4D/TMC12/CTS1#/RTS1#/SS1#/IRQ1-DS/RTCIC1	TMS/P31/MTIOC4D/TMC12/PO9/RTCIC1/CTS1#/RTS1#/SS1#/SSLB0-A/IRQ1-DS
K4	P15/MTIOC0B/MTCLKB/TMC12/TIOCB2/TCLKB/TMC12/PO13/RXD1/SMISO1/SSCL1/SCK3/IRQ5	P15/MTIOC0B/MTCLKB/TIOCB2/TCLKB/TMC12/PO13/RXD1/SCK3/SMISO1/SSCL1/CRX1-DS/PIXD0/IRQ5
K5	P54/ALE/MTIOC4B/TMC11/CTS2#/RTS2#/SS2#	TRDATA2/P54/ALE/EDACK0/MTIOC4B/TMC11/CTS2#/RTS2#/SS2#/CTX1
K6	BCLK/P53	P53/BCLK
K7	P51/WR1#/BC1#/WAIT#/SCK2	P51/WR1#/BC1#/WAIT#/SCK2/SSLB2-A
K8	VCC	VCC
K9	P80/MTIOC3B/SCK10	TRDATA0/P80/EDREQ0/MTIOC3B/PO26/SCK10/RTS10#/MMC_D2-A/SDHI_WP-A/QIO2-A
K10	P76/RXD11/SMISO11/SSCL11	TRDATA6/P76/CS6#/PO22/RXD11/SMISO11/SSCL11/MMC_CMD-A/SDHI_CMD-A/SDSI_CMD-A/QSSL-A
K11	PB7/A15/MTIOC3B/TIOCB5/TXD9/SMOSI9/SSDA9	PB7/A15/MTIOC3B/TIOCB5/PO31/TXD9/SMOSI9/SSDA9/TXD11/SMOSI11/SSDA11/SDSI_D1-B
K12	PB6/A14/MTIOC3D/TIOCA5/RXD9/SMISO9/SSCL9	PB6/A14/MTIOC3D/TIOCA5/PO30/RXD9/SMISO9/SSCL9/RXD11/SMISO11/SSCL11/SDSI_D0-B
K13	PB5/A13/MTIOC2A/MTIOC1B/TMRI1/POE1#/TIOCB4/SCK9	PB5/A13/MTIOC2A/MTIOC1B/TIOCB4/TMRI1/PO29/POE4#/SCK9/SCK11/SDSI_CLK-B
L1	P25/CS1#/MTIOC4C/MTCLKB/TIOCA4/RXD3/SMISO3/SSCL3/ADTRG0#	P25/CS5#/EDACK1/MTIOC4C/MTCLKB/TIOCA4/PO5/RXD3/SMISO3/SSCL3/HSYNC/ADTRG0#
L2	P23/MTIOC3D/MTCLKD/TIOCD3/CTS0#/RTS0#/SS0#/TXD3/SMOSI3/SSDA3	P23/EDACK0/MTIOC3D/MTCLKD/TIOCD3/PO3/TXD3/CTS0#/RTS0#/SMOSI3/SS0#/SSDA3/PIXD7
L3	P16/MTIOC3C/MTIOC3D/TMO2/TIOCB1/TCLKC/TXD1/SMOSI1/SSDA1/MOSIA/SCL-DS/RXD3/SMISO3/SSCL3/IRQ6/RTCOUT/ADTRG0#	P16/MTIOC3C/MTIOC3D/TIOCB1/TCLKC/TMO2/PO14/RTCOUT/TXD1/RXD3/SMOSI1/SMISO3/SSDA1/SSCL3/SCL2-DS/USB0_VBUS/USB0_VBUSEN/USB0_OVRCURB/IRQ6/ADTRG0#
L4	P24/CS0#/MTIOC4A/MTCLKA/TMRI1/TIOCB4/SCK3	P24/CS4#/EDREQ1/MTIOC4A/MTCLKA/TIOCB4/TMRI1/PO4/SCK3/USB0_VBUSEN/PIXCLK
L5	P13/MTIOC0B/TMO3/TIOCA5/SDA/TXD2/SMOSI2/SSDA2/IRQ3	P13/MTIOC0B/TIOCA5/TMO3/PO13/TXD2/SMOSI2/SSDA2/SDA0[FM+]/IRQ3/ADTRG1#
L6	P56/MTIOC3C/TIOCA1	P56/EDACK1/MTIOC3C/TIOCA1
L7	P52/RD#/RXD2/SMISO2/SSCL2	P52/RD#/RXD2/SMISO2/SSCL2/SSLB3-A
L8	P83/MTIOC4C/CTS10#/RTS10#	TRCLK/P83/EDACK1/MTIOC4C/CTS10#/SS10#/SCK10
L9	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/TMRI2/SCK8/RSPCKA	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/TMRI2/PO29/SCK8/RSPCKA-A/SCK10/MMC_D5-A
L10	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMC11/POE0#/SCK5/CTS8#/RTS8#/SS8#/SSLA0	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMC11/PO25/POE0#/SCK5/CTS8#/RTS8#/SS8#/SSLA0-A/CTS10#/RTS10#/SS10#/MMC_D1-A/SDHI_D1-A/SDSI_D1-A/QIO1-A/QMI-A

145pin TFLGA	RX210	RX651
L11	PC2/A18/MTIOC4B/TCLKA/RXD5/SMISO5/SSCL5/SSLA3	PC2/A18/MTIOC4B/TCLKA/ PO21 /RXD5/SMISO5/SSCL5/SSLA3-A/ MMC_CD-A / SDHI_D3-A / SDSI_D3-A
L12	P73	TRDATA4/P73/CS3#/PO16
L13	PL0	VSS
M1	P22/MTIOC3B/MTCLKC/TMO0/TIOCC3/SCK0	P22/ EDREQ0 /MTIOC3B/MTCLKC/TIOCC3/TMO0/ PO2 /SCK0/ USB0_OVRCURB / PIXD6
M2	P17/MTIOC3A/MTIOC3B/TMO1/POE8#/TIOCB0/TCLKD/SCK1/ MISOA / SDA-DS /TXD3/SMOSI3/SSDA3/IRQ7	P17/MTIOC3A/MTIOC3B/ MTIOC4B /TIOCB0/TCLKD/TMO1/ PO15 /POE8#/SCK1/TXD3/SMOSI3/SSDA3/ SDA2-DS / PIXD3 /IRQ7/ ADTRG1#
M3	P86/TIOCA0	P86/ MTIOC4D /TIOCA0/ RXD10 / SMISO10 / SSCL10 / PIXD1
M4	P12/TMC11/ SCL /RXD2/SMISO2/SSCL2/IRQ2	P12/TMC11/RXD2/SMISO2/SSCL2/ SCL0 [FM+]/IRQ2
M5	PH3/TMCIO	VCC_USB
M6	PH0/CACREF	VSS_USB
M7	P50/WR0#/WR#/TXD2/SMOSI2/SSDA2	P50/WR0#/WR#/TXD2/SMOSI2/SSDA2/ SSLB1-A
M8	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMC12/RXD8/SMISO8/SSCL8/MOSIA	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMC12/ TIC0 / PO30 /RXD8/SMISO8/SSCL8/MOSIA-A/ RXD10 / SMISO10 / SSCL10 / MMC_D6-A /IRQ13
M9	P81/MTIOC3D/RXD10/SMISO10/SSCL10	TRDATA1 /P81/ EDACK0 /MTIOC3D/ PO27 /RXD10/SMISO10/SSCL10/ MMC_D3-A / SDHI_CD-A / QIO3-A
M10	P77/TXD11/SMOSI11/SSDA11	TRDATA7 /P77/ CS7# / PO23 /TXD11/SMOSI11/SSDA11/ MMC_CLK-A / SDHI_CLK-A / SDSI_CLK-A / QSPCLK-A
M11	PC0/A16/MTIOC3C/TCLKC/CTS5#/RTS5#/SS5#/SSLA1	PC0/A16/MTIOC3C/TCLKC/ PO17 /CTS5#/RTS5#/SS5#/SSLA1-A/ IRQ14
M12	PC1/A17/MTIOC3A/TCLKD/SCK5/SSLA2	PC1/A17/MTIOC3A/TCLKD/ PO18 /SCK5/SSLA2-A/ IRQ12
M13	PL1	VCC
N1	P21/MTIOC1B/TMCIO/TIOCA3/RXD0/SMISO0/SSCL0	P21/MTIOC1B/ MTIOC4A /TIOCA3/TMCIO/ PO1 /RXD0/SMISO0/SSCL0/ USB0_EXICEN / PIXD5 /IRQ9
N2	P20/MTIOC1A/TMRI0/TIOCB3/TXD0/SMOSI0/SSDA0	P20/MTIOC1A/TIOCB3/TMRI0/ PO0 /TXD0/SMOSI0/SSDA0/ USB0_ID / PIXD4 /IRQ8
N3	P87/TIOCA2	P87/ MTIOC4C /TIOCA2/ TXD10 / SMOSI10 / SSDA10 / PIXD2
N4	P14/MTIOC3A/MTCLKA/TMRI2/TIOCB5/TCLKA/CTS1#/RTS1#/SS1#/IRQ4	P14/MTIOC3A/MTCLKA/TIOCB5/TCLKA/TMRI2/ PO15 /CTS1#/RTS1#/SS1#/ CTX1 / USB0_OVRCURA /IRQ4
N5	PH2/TMRI0/IRQ1	USB0_DM
N6	PH1/TMO0/IRQ0	USB0_DP
N7	P55/WAIT#/MTIOC4D/TMO3	TRDATA3 /P55/WAIT#/ EDREQ0 /MTIOC4D/TMO3/ CRX1 /IRQ10
N8	VSS	VSS
N9	PC7/A23/CS0#/MTIOC3A/TMO2/MTCLKB/TXD8/SMOSI8/SSDA8/MISOA/CACREF	UB /PC7/A23/CS0#/MTIOC3A/MTCLKB/TMO2/ TOC0 / PO31 /CACREF/TXD8/SMOSI8/SSDA8/MISOA-A/ TXD10 / SMOSI10 / SSDA10 / MMC_D7-A /IRQ14

145pin TFLGA	RX210	RX651
N10	P82/MTIOC4A/TXD10/SMOSI10/SSDA10	TRSYNC/P82/EDREQ1/MTIOC4A/PO28/TXD10/SMOSI10/SSDA10/MMC_D4-A
N11	PC3/A19/MTIOC4D/TCLKB/TXD5/SMOSI5/SSDA5	PC3/A19/MTIOC4D/TCLKB/PO24/TXD5/SMOSI5/SSDA5/MMC_D0-A/SDHI_D0-A/SDSI_D0-A/QIO0-A/QMO-A
N12	P75/SCK11	TRSYNC1/P75/CS5#/PO20/SCK11/RTS11#/MMC_RES#-A/SDHI_D2-A/SDSI_D2-A
N13	P74/CTS11#/RTS11#/SS11#	TRDATA5/P74/A20/CS4#/PO19/CTS11#/SS11#

3.3 100pin Package (QFP)

Table 3.4 shows a Comparative Listing of Pin Functions (100pin Package (TFLGA)).

Table 3.3 Comparative Listing of Pin Functions (100pin Package (QFP))

100pin	RX210 (LFQFP)	RX651 (LQFP)
1	VREFH	AVCC1
2	P03/DA0	EMLE
3	VREFL	AVSS1
4	PJ3/MTIOC3C/CTS6#/RTS6#/SS6#	PJ3/EDACK1/MTIOC3C/CTS6#/RTS6#/CTS0#/RTS0#/SS6#/SS0#
5	VCL	VCL
6	PJ1/MTIOC3A	VBATT
7	MD/FINED	MD/FINED
8	XCIN	XCIN
9	XCOUT	XCOUT
10	RES#	RES#
11	XTAL/P37	P37/XTAL
12	VSS	VSS
13	EXTAL/P36	P36/EXTAL
14	VCC	VCC
15	P35/NMI	P35/UPSEL/NMI
16	P34/MTIOC0A/TMCI3/POE2#/SCK6/IRQ4	P34/TRST#/MTIOC0A/TMCI3/PO12/POE10#/SCK6/SCK0/IRQ4
17	P33/MTIOC0D/TMRI3/POE3#/RXD6/SMISO6/SSCL6/IRQ3-DS	P33/EDREQ1/MTIOC0D/TIOC0D/TMRI3/PO11/POE4#/POE11#/RXD6/RXD0/SMISO6/SMISO0/SSCL6/SSCL0/CRX0/IRQ3-DS
18	P32/MTIOC0C/TMO3/TXD6/SMOSI6/SSDA6/IRQ2-DS/RTCCOUT/RTCIC2	P32/MTIOC0C/TIOCC0/TMO3/PO10/RTCCOUT/RTCIC2/POE0#/POE10#/TXD6/TXD0/SMOSI6/SMOSI0/SSDA6/SSDA0/CTX0/USB0_VBUS/IRQ2-DS
19	P31/MTIOC4D/TMCI2/CTS1#/RTS1#/SS1#/IRQ1-DS/RTCIC1	P31/TMS/MTIOC4D/TMCI2/PO9/RTCIC1/CTS1#/RTS1#/SS1#/SSLB0-A/IRQ1-DS
20	P30/MTIOC4B/TMRI3/POE8#/RXD1/SMISO1/SSCL1/IRQ0-DS/RTCIC0	P30/TDI/MTIOC4B/TMRI3/PO8/RTCIC0/POE8#/RXD1/SMISO1/SSCL1/MISOB-A/IRQ0-DS
21	P27/CS3#/MTIOC2B/TMCI3/SCK1	P27/TCK/CS7#/MTIOC2B/TMCI3/PO7/SCK1/RSPCKB-A
22	P26/CS2#/MTIOC2A/TMO1/TXD1/SMOSI1/SSDA1	P26/TDO/CS6#/MTIOC2A/TMO1/PO6/TXD1/CTS3#/RTS3#/SMOSI1/SS3#/SSDA1/MOSIB-A
23	P25/CS1#/MTIOC4C/MTCLKB/ADTRG0#	P25/CS5#/EDACK1/MTIOC4C/MTCLKB/TIOCA4/PO5/RXD3/SMISO3/SSCL3/ADTRG0#
24	P24/CS0#/MTIOC4A/MTCLKA/TMRI1	P24/CS4#/EDREQ1/MTIOC4A/MTCLKA/TIOCB4/TMRI1/PO4/SCK3/USB0_VBUS
25	P23/MTIOC3D/MTCLKD/CTS0#/RTS0#/SS0#	P23/EDACK0/MTIOC3D/MTCLKD/TIOC0D3/PO3/TXD3/CTS0#/RTS0#/SMOSI3/SS0#/SSDA3
26	P22/MTIOC3B/MTCLKC/TMO0/SCK0	P22/EDREQ0/MTIOC3B/MTCLKC/TIOCC3/TMO0/PO2/SCK0/USB0_OVRCURB
27	P21/MTIOC1B/TMCI0/RXD0/SMISO0/SSCL0	P21/MTIOC1B/MTIOC4A/TIOCA3/TMCI0/PO1/RXD0/SMISO0/SSCL0/USB0_EXICEN/IRQ9

100pin	RX210 (LFQFP)	RX651 (LQFP)
28	P20/MTIOC1A/TMRI0/TXD0/SMOSI0/SSDA0	P20/MTIOC1A/ TIOCB3 /TMRI0/ PO0 /TXD0/S MOSI0/SSDA0/ USB0_ID / IRQ8
29	P17/MTIOC3A/MTIOC3B/TMO1/POE8#/SCK 1/ MISOA / SDA-DS /IRQ7	P17/MTIOC3A/MTIOC3B/ MTIOC4B / TIOCB0 / TCLKD /TMO1/ PO15 /POE8#/SCK1/ TXD3 /SM OSI3 / SSDA3 / SDA2-DS /IRQ7/ ADTRG1 #
30	P16/MTIOC3C/MTIOC3D/TMO2/TXD1/SMO SI1/SSDA1/ MOSIA / SCL-DS /IRQ6/RTCOUT/ ADTRG0#	P16/MTIOC3C/MTIOC3D/ TIOCB1 / TCLKC /T MO2/ PO14 /RTCOUT/TXD1/ RXD3 /SMOSI1/ S MISO3 / SSDA1 / SSCL3 / SCL2-DS / USB0_VBU S / USB0_VBUSEN / USB0_OVRCURB /IRQ6/A DTRG0#
31	P15/MTIOC0B/MTCLKB/TMC12/RXD1/SMIS O1/SSCL1/IRQ5	P15/MTIOC0B/MTCLKB/ TIOCB2 / TCLKB /TM CI2/ PO13 /RXD1/ SCK3 /SMISO1/SSCL1/ CRX 1-DS /IRQ5
32	P14/MTIOC3A/MTCLKA/TMRI2/CTS1#/RTS1 #/SS1#/IRQ4	P14/MTIOC3A/MTCLKA/ TIOCB5 /TCLKA/TM RI2/ PO15 /CTS1#/RTS1#/SS1#/ CTX1 / USB0_ OVRCURA /IRQ4
33	P13/MTIOC0B/TMO3/ SDA /IRQ3	P13/MTIOC0B/ TIOCA5 /TMO3/ PO13 / TXD2 / S MOSI2 / SSDA2 / SDA0 [FM+]/IRQ3/ ADTRG1 #
34	P12/TMC11/ SCL /IRQ2	P12/TMC11/ RXD2 /SMISO2/SSCL2/ SCL0 [FM +]/IRQ2
35	PH3 /TMC10	VCC_USB
36	PH2 /TMRI0/IRQ1	USB0_DM
37	PH1 /TMO0/IRQ0	USB0_DP
38	PH0 /CACREF	VSS_USB
39	P55/WAIT#/MTIOC4D/TMO3	P55/WAIT#/ EDREQ0 /MTIOC4D/TMO3/ CRX1 /IRQ10
40	P54/ALE/MTIOC4B/TMC11	P54/ALE/ EDACK0 /MTIOC4B/TMC11/ CTS2 #/ RTS2 #/ SS2 #/ CTX1
41	BCLK/P53	P53/BCLK
42	P52/RD#	P52/RD#/ RXD2 /SMISO2/SSCL2/SSLB3-A
43	P51/WR1#/BC1#/WAIT#	P51/WR1#/BC1#/WAIT#/ SCK2 /SSLB2-A
44	P50/WR0#/WR#	P50/WR0#/WR#/ TXD2 /SMOSI2/SSDA2/SSL B1-A
45	PC7/A23/CS0#/MTIOC3A/TMO2/MTCLKB/T XD8/SMOSI8/SSDA8/MISOA/CACREF	PC7/ UB /A23/CS0#/MTIOC3A/MTCLKB/TMO 2/ TOC0 / PO31 /CACREF/TXD8/SMOSI8/SSD A8/MISOA-A/ TXD10 /SMOSI10/SSDA10/IRQ 14
46	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMC12/R XD8/SMISO8/SSCL8/MOSIA	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMC12/ TI C0 / PO30 /RXD8/SMISO8/SSCL8/MOSIA-A/ R XD10 /SMISO10/SSCL10/IRQ13
47	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/T MRI2/SCK8/RSPCKA	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/T MRI2/ PO29 /SCK8/RSPCKA-A/ SCK10
48	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMC11/P OE0#/SCK5/CTS8#/RTS8#/SS8#/SSLA0	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMC11/ P O25 /POE0#/SCK5/CTS8#/RTS8#/SS8#/SSL A0-A/ CTS10 #/ RTS10 #/ SS10 #
49	PC3/A19/MTIOC4D/TXD5/SMOSI5/SSDA5	PC3/A19/MTIOC4D/ TCLKB / PO24 /TXD5/SM OSI5/SSDA5
50	PC2/A18/MTIOC4B/RXD5/SMISO5/SSCL5/S SLA3	PC2/A18/MTIOC4B/ TCLKA / PO21 /RXD5/SMI SO5/SSCL5/SSLA3-A
51	PC1/A17/MTIOC3A/SCK5/SSLA2	PC1/A17/MTIOC3A/ TCLKD / PO18 /SCK5/SSL A2-A/ IRQ12
52	PC0/A16/MTIOC3C/CTS5#/RTS5#/SS5#/SS LA1	PC0/A16/MTIOC3C/ TCLKC / PO17 /CTS5#/RT S5#/SS5#/SSLA1-A/ IRQ14

100pin	RX210 (LFQFP)	RX651 (LQFP)
53	PB7/A15/MTIOC3B/TXD9/SMOSI9/SSDA9	PB7/A15/MTIOC3B/ TIOCB5/PO31 /TXD9/SMOSI9/SSDA9/ TXD11/SMOSI11/SSDA11/SDSI_D1-B
54	PB6/A14/MTIOC3D/RXD9/SMISO9/SSCL9	PB6/A14/MTIOC3D/ TIOCA5/PO30 /RXD9/SMISO9/SSCL9/ RXD11/SMISO11/SSCL11/SDSI_D0-B
55	PB5/A13/MTIOC2A/MTIOC1B/TMRI1/ POE1# /SCK9	PB5/A13/MTIOC2A/MTIOC1B/ TIOCB4 /TMRI1/ PO29/POE4# /SCK9/ SCK11/SDSI_CLK-B
56	PB4/A12/CTS9#/RTS9#/SS9#	PB4/A12/ TIOCA4/PO28 /CTS9#/RTS9#/SS9#/ CTS11#/RTS11#/SS11#/SDSI_CMD-B
57	PB3/A11/MTIOC0A/MTIOC4A/TMO0/ POE3# /SCK6	PB3/A11/MTIOC0A/MTIOC4A/ TIOC0D3/TCLKD/TMO0/PO27/POE11# /SCK6/ SDSI_D3-B
58	PB2/A10/CTS6#/RTS6#/SS6#	PB2/A10/ TIOCC3/TCLKC/PO26 /CTS6#/RTS6#/SS6#/ SDSI_D2-B
59	PB1/A9/MTIOC0C/MTIOC4C/TMCI0/TXD6/SMOSI6/SSDA6/IRQ4-DS	PB1/A9/MTIOC0C/MTIOC4C/ TIOCB3 /TMCI0/ PO25 /TXD6/SMOSI6/SSDA6/IRQ4-DS
60	VCC	VCC
61	PB0/A8/MTIC5W/RXD6/SMISO6/SSCL6/ RS PCKA	PB0/A8/MTIC5W/ TIOCA3/PO24 /RXD6/SMISO6/SSCL6/ IRQ12
62	VSS	VSS
63	PA7/A7/MISOA	PA7/A7/ TIOCB2/PO23 /MISOA-B
64	PA6/A6/MTIC5V/MTCLKB/TMCI3/ POE2# /CTS5#/RTS5#/SS5#/MOSIA	PA6/A6/MTIC5V/MTCLKB/ TIOCA2 /TMCI3/ PO22/POE10# /CTS5#/RTS5#/SS5#/MOSIA-B
65	PA5/A5/RSPCKA	PA5/A5/ MTIOC6B/TIOCB1/PO21 /RSPCKA-B
66	PA4/A4/MTIC5U/MTCLKA/TMRI0/TXD5/SMOSI5/SSDA5/SSLA0/IRQ5-DS/ CVREFB1	PA4/A4/MTIC5U/MTCLKA/ TIOCA1 /TMRI0/ PO20 /TXD5/SMOSI5/SSDA5/SSLA0-B/IRQ5-DS
67	PA3/A3/MTIOC0D/MTCLKD/RXD5/SMISO5/SSCL5/IRQ6-DS/ CMPB1	PA3/A3/MTIOC0D/MTCLKD/ TIOC0D3/TCLKB/PO19 /RXD5/SMISO5/SSCL5/IRQ6-DS
68	PA2/A2/RXD5/SMISO5/SSCL5/SSLA3	PA2/A2/ MTIOC7A/PO18 /RXD5/SMISO5/SSCL5/SSLA3-B
69	PA1/A1/MTIOC0B/MTCLKC/SCK5/SSLA2/ CVREFA	PA1/A1/MTIOC0B/MTCLKC/ MTIOC7B/TIOCB0/PO17 /SCK5/SSLA2-B/ IRQ11
70	PA0/A0/BC0#/MTIOC4A/SSLA1/CACREF	PA0/A0/BC0#/MTIOC4A/ MTIOC6D/TIOCA0 /CACREF/ PO16 /SSLA1-B
71	PE7/D15[A15/D15]/IRQ7/ AN015	PE7/D15[A15/D15]/ MTIOC6A/TOC1/MISOB-B/MMC_RES#-B/SDHI_WP-B /IRQ7/ AN105
72	PE6/D14[A14/D14]/IRQ6/ AN014	PE6/D14[A14/D14]/ MTIOC6C/TIC1/MOSIB-B/MMC_CD-B/SDHI_CD-B /IRQ6/ AN104
73	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/IRQ5/ AN013	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/ RSPCKB-B /IRQ5/ AN103
74	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/ AN012 / CMPA2	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/ PO28/SSLB0-B /AN102
75	PE3/D11[A11/D11]/MTIOC4B/POE8#/CTS12#/RTS12#/SS12#/ AN011 / CMPA1	PE3/D11[A11/D11]/MTIOC4B/ PO26 /POE8#/ TOC3 /CTS12#/RTS12#/SS12#/ MMC_D7-B/AN101
76	PE2/D10[A10/D10]/MTIOC4A/RXD12/RXD12/SMISO12/SSCL12/IRQ7-DS/ AN010 / CVREFB0	PE2/D10[A10/D10]/MTIOC4A/ PO23/TIC3 /RXD12/SMISO12/SSCL12/RXD12/ SSLB3-B/MMC_D6-B /IRQ7-DS/ AN100
77	PE1/D9[A9/D9]/MTIOC4C/TXD12/TXD12/SIOX12/SMOSI12/SSDA12/ AN009 / CMPB0	PE1/D9[A9/D9]/MTIOC4C/ MTIOC3B/PO18 /TXD12/SMOSI12/SSDA12/TXD12/SIOX12/ SSLB2-B/MMC_D5-B/ANEX1
78	PE0/D8[A8/D8]/SCK12/ AN008	PE0/D8[A8/D8]/ MTIOC3D /SCK12/ SSLB1-B/MMC_D4-B/ANEX0

100pin	RX210 (LFQFP)	RX651 (LQFP)
79	PD7/D7[A7/D7]/MTIC5U/POE0#/IRQ7	PD7/D7[A7/D7]/MTIC5U/POE0#/ SSLC3/MMC_D1-B/SDHI_D1-B/QIO1-B/QMI-B/IRQ7/AN107
80	PD6/D6[A6/D6]/MTIC5V/ POE1# /IRQ6	PD6/D6[A6/D6]/MTIC5V/ MTIOC8A/POE4# / SSLC2/MMC_D0-B/SDHI_D0-B/QIO0-B/QMO-B/IRQ6/AN106
81	PD5/D5[A5/D5]/MTIC5W/ POE2# /IRQ5	PD5/D5[A5/D5]/MTIC5W/ MTIOC8C/POE10# / SSLC1/MMC_CLK-B/SDHI_CLK-B/QSPCLK-B/IRQ5/AN113
82	PD4/D4[A4/D4]/ POE3# /IRQ4	PD4/D4[A4/D4]/ MTIOC8B/POE11# / SSLC0/MMC_CMD-B/SDHI_CMD-B/QSSL-B/IRQ4/AN112
83	PD3/D3[A3/D3]/POE8#/IRQ3	PD3/D3[A3/D3]/ MTIOC8D/POE8# / TOC2/RSPCKC/MMC_D3-B/SDHI_D3-B/QIO3-B/IRQ3/AN111
84	PD2/D2[A2/D2]/MTIOC4D/IRQ2	PD2/D2[A2/D2]/MTIOC4D/ TIC2/CRX0/MISOC/MMC_D2-B/SDHI_D2-B/QIO2-B/IRQ2/AN110
85	PD1/D1[A1/D1]/MTIOC4B/IRQ1	PD1/D1[A1/D1]/MTIOC4B/ POE0# / CTX0/MOSIC/IRQ1/AN109
86	PD0/D0[A0/D0]/IRQ0	PD0/D0[A0/D0]/ POE4# /IRQ0/ AN108
87	P47/AN007	P47/ IRQ15-DS /AN007
88	P46/AN006	P46/ IRQ14-DS /AN006
89	P45/AN005	P45/ IRQ13-DS /AN005
90	P44/AN004	P44/ IRQ12-DS /AN004
91	P43/AN003	P43/ IRQ11-DS /AN003
92	P42/AN002	P42/ IRQ10-DS /AN002
93	P41/AN001	P41/ IRQ9-DS /AN001
94	VREFL0	VREFL0
95	P40/AN000	P40/ IRQ8-DS /AN000
96	VREFH0	VREFH0
97	AVCC0	AVCC0
98	P07/ADTRG0#	P07/ IRQ15 /ADTRG0#
99	AVSS0	AVSS0
100	P05/DA1	P05/ IRQ13 /DA1

3.4 100pin Package (TFLGA)

Table 3.4 shows a Comparative Listing of Pin Functions (100pin Package (TFLGA)).

Table 3.4 Comparative Listing of Pin Functions (100pin Package (TFLGA))

100pin TFLGA	RX210	RX651
A1	P05/DA1	P05/ IRQ13 /DA1
A2	VREFH	AVCC1
A3	P07/ADTRG0#	P07/ IRQ15 /ADTRG0#
A4	VREFL0	VREFL0
A5	P43/AN003	P43/ IRQ11-DS /AN003
A6	PD0/D0[A0/D0]/IRQ0	PD0/D0[A0/D0]/ POE4# /IRQ0/ AN108
A7	PD4/D4[A4/D4]/ POE3# /IRQ4	PD4/D4[A4/D4]/ MTIOC8B / POE11# / SSLC0/MC_CMD-B /SDHI_CMD-B/QSSL-B/IRQ4/ AN112
A8	PE0/D8[A8/D8]/SCK12/ AN008	PE0/D8[A8/D8]/ MTIOC3D /SCK12/ SSLB1-B/MMC_D4-B /ANEX0
A9	PE1/D9[A9/D9]/MTIOC4C/TXD12/TXDX12/SIOX12/SMOSI12/SSDA12/ AN009 / CMPB0	PE1/D9[A9/D9]/MTIOC4C/ MTIOC3B / PO18 /TXD12/SMOSI12/SSDA12/TXDX12/SIOX12/ SLB2-B/MMC_D5-B /ANEX1
A10	PE2/D10[A10/D10]/MTIOC4A/RXD12/RXDX12/SMISO12/SSCL12/IRQ7-DS/ AN010 / CVREFB0	PE2/D10[A10/D10]/MTIOC4A/ PO23 / TIC3 /RXD12/SMISO12/SSCL12/RXDX12/ SSLB3-B/MC_D6-B /IRQ7-DS/ AN100
A11	P03 /DA0	EMLE
A12	AVSS0	AVSS0
A13	AVCC0	AVCC0
B1	P40/AN000	P40/ IRQ8-DS /AN000
B2	P44/AN004	P44/ IRQ12-DS /AN004
B3	PD1/D1[A1/D1]/MTIOC4B/IRQ1	PD1/D1[A1/D1]/MTIOC4B/ POE0# /CTX0/MOSIC/IRQ1/ AN109
B4	PD3/D3[A3/D3]/POE8#/IRQ3	PD3/D3[A3/D3]/ MTIOC8D /POE8#/TOC2/RSPCKC/MMC_D3-B/SDHI_D3-B/QIO3-B/IRQ3/ AN111
B5	PD6/D6[A6/D6]/MTIC5V/ POE1# /IRQ6	PD6/D6[A6/D6]/MTIC5V/ MTIOC8A / POE4# / SLC2/MMC_D0-B /SDHI_D0-B/QIO0-B/QMOB/IRQ6/ AN106
B6	PD7/D7[A7/D7]/MTIC5U/POE0#/IRQ7	PD7/D7[A7/D7]/MTIC5U/POE0#/ SSLC3/MMC_D1-B /SDHI_D1-B/QIO1/QMI-B/IRQ7/ AN107
B7	PE3/D11[A11/D11]/MTIOC4B/POE8#/CTS12#/RTS12#/SS12#/ AN011 / CMPA1	PE3/D11[A11/D11]/MTIOC4B/ PO26 /POE8#/TOC3/CTS12#/RTS12#/SS12#/ MMC_D7-B / AN101
B8	VCL	VCL
B9	VREFL	AVSS1
B10	PJ3/MTIOC3C/CTS6#/RTS6#/SS6#	PJ3/ EDACK1 /MTIOC3C/CTS6#/RTS6#/ CTS0# /RTS0#/SS6#/ SS0#
B11	VREFH0	VREFH0
B12	P42/AN002	P42/ IRQ10-DS /AN002
B13	P47/AN007	P47/ IRQ15-DS /AN007
C1	PD2/D2[A2/D2]/MTIOC4D/IRQ2	PD2/D2[A2/D2]/MTIOC4D/ TIC2 /CRX0/MISOC/MMC_D2-B/SDHI_D2-B/QIO2-B/IRQ2/ AN110

100pin TFLGA	RX210	RX651
C2	PD5/D5[A5/D5]/MTIC5W/ POE2# /IRQ5	PD5/D5[A5/D5]/MTIC5W/ MTIOC8C/POE10# / SSLC1/MMC_CLK-B/SDHI_CLK-B/QSPCLK- B/IRQ5/AN113
C3	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/IRQ 5/AN013	PE5/D13[A13/D13]/MTIOC4C/MTIOC2B/ RSP CKB-B/IRQ5/AN103
C4	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/ AN0 12/CMPA2	PE4/D12[A12/D12]/MTIOC4D/MTIOC1A/ PO2 8/SSLB0-B/AN102
C5	XCIN	XCIN
C6	XCOUT	XCOUT
C7	MD/FINED	MD/FINED
C8	PJ1/MTIOC3A	VBATT
C9	P45/AN005	P45/ IRQ13-DS /AN005
C10	P46/AN006	P46/ IRQ14-DS /AN006
C11	PE6/D14[A14/D14]/IRQ6/ AN014	PE6/D14[A14/D14]/ MTIOC6C/TIC1/MOSIB-B /MMC_CD-B/SDHI_CD-B/IRQ6/AN104
C12	PE7/D15[A15/D15]/IRQ7/ AN015	PE7/D15[A15/D15]/ MTIOC6A/TOC1/MISOB- B/MMC_RES#-B/SDHI_WP-B/IRQ7/AN105
C13	PA1/A1/MTIOC0B/MTCLKC/SCK5/SSLA2/ C VREFA	PA1/A1/MTIOC0B/MTCLKC/ MTIOC7B/TIOC B0/PO17/SCK5/SSLA2-B/IRQ11
D1	PA0/A0/BC0#/MTIOC4A/SSLA1/CACREF	PA0/A0/BC0#/MTIOC4A/ MTIOC6D/TIOCA0/ CACREF/PO16/SSLA1-B
D2	XTAL/P37	XTAL/P37
D3	VSS	VSS
D4	RES#	RES#
D5	P34/MTIOC0A/TMCI3/ POE2# /SCK6/IRQ4	TRST# /P34/MTIOC0A/TMCI3/ PO12/POE10# /SCK6/SCK0/IRQ4
D6	P41/AN001	P41/ IRQ9-DS /AN001
D7	PA2/A2/RXD5/SMISO5/SSCL5/SSLA3	PA2/A2/ MTIOC7A/PO18 /RXD5/SMISO5/SSC L5/SSLA3-B
D8	PA6/A6/MTIC5V/MTCLKB/TMCI3/ POE2# /CT S5#/RTS5#/SS5#/MOSIA	PA6/A6/MTIC5V/MTCLKB/ TIOCA2/TMCI3/P O22/POE10# /CTS5#/RTS5#/SS5#/MOSIA-B
D9	PA4/A4/MTIC5U/MTCLKA/TMRI0/TXD5/SM OSI5/SSDA5/SSLA0/IRQ5-DS/ CVREFB1	PA4/A4/MTIC5U/MTCLKA/ TIOCA1/TMRI0/P O20/TXD5/SMOSI5/SSDA5/SSLA0-B/IRQ5- DS
D10	PA5/A5/RSPCKA	PA5/A5/ MTIOC6B/TIOCB1/PO21 /RSPCKA-B
D11	PA3/A3/MTIOC0D/MTCLKD/RXD5/SMISO5/ SSCL5/IRQ6-DS/ CMPB1	PA3/A3/MTIOC0D/MTCLKD/ TIOCD0/TCLKB/ PO19/RXD5/SMISO5/SSCL5/IRQ6-DS
D12	EXTAL/P36	EXTAL/P36
D13	VCC	VCC
E1	P35/NMI	UPSEL /P35/NMI
E2	P32/MTIOC0C/TMO3/TXD6/SMOSI6/SSDA6/ IRQ2-DS/RTICOUT/RTICIC2	P32/MTIOC0C/ TIOCC0/TMO3/PO10 /RTICOU T/RTICIC2/ POE0# / POE10# /TXD6/TXD0/SMO SI6/ SMOSI0/SSDA6/SSDA0/CTX0/USB0_VB USEN/IRQ2-DS
E3	P12/TMCI1/ SCL /IRQ2	P12/TMCI1/ RXD2/SMISO2/SSCL2/SCL0 [FM +]/IRQ2
E4	PB3/A11/MTIOC0A/MTIOC4A/TMO0/ POE3# / SCK6	PB3/A11/MTIOC0A/MTIOC4A/ TIOCD3/TCLK D/TMO0/PO27/POE11# /SCK6/ SDSI_D3-B
E5	PB2/A10/CTS6#/RTS6#/SS6#	PB2/A10/ TIOCC3/TCLKC/PO26 /CTS6#/RTS 6#SS6#/ SDSI_D2-B
E10	PB0/A8/MTIC5W/RXD6/SMISO6/SSCL6/ RS PCKA	PB0/A8/MTIC5W/ TIOCA3/PO24 /RXD6/SMIS O6/SSCL6/ IRQ12

100pin TFLGA	RX210	RX651
E11	PA7/A7/MISOA	PA7/A7/ TIOCB2/PO23 /MISOA-B
E12	VSS	VSS
E13	P33/MTIOC0D/TMRI3/ POE3# /RXD6/SMISO6/SSCL6/IRQ3-DS	P33/ EDREQ1 /MTIOC0D/ TIOCDO /TMRI3/ PO11/POE4#/POE11# /RXD6/ RXD0 /SMISO6/ S MISO0 /SSCL6/ SSCL0/CRX0 /IRQ3-DS
F1	P31/MTIOC4D/TMCI2/CTS1#/RTS1#/SS1#/IRQ1-DS/RTCIC1	TMS /P31/MTIOC4D/TMCI2/ PO9 /RTCIC1/CTS1#/RTS1#/SS1#/ SSLB0-A /IRQ1-DS
F2	P30/MTIOC4B/TMRI3/POE8#/RXD1/SMISO1/SSCL1/IRQ0-DS/RTCIC0	TDI /P30/MTIOC4B/TMRI3/ PO8 /RTCIC0/POE8#/RXD1/SMISO1/SSCL1/ MISOB-A /IRQ0-DS
F3	P27/ CS3# /MTIOC2B/TMCI3/SCK1	TCK /P27/ CS7# /MTIOC2B/TMCI3/ PO7 /SCK1/ RSPCKB-A
F4	BCLK/P53	P53/BCLK
F10	P52/RD#	P52/RD#/ RXD2/SMISO2/SSCL2/SSLB3-A
F11	PB5/A13/MTIOC2A/MTIOC1B/TMRI1/ POE1# /SCK9	PB5/A13/MTIOC2A/MTIOC1B/ TIOCB4 /TMRI1/ PO29/POE4# /SCK9/ SCK11/SDSI_CLK-B
F12	PB4/A12/CTS9#/RTS9#/SS9#	PB4/A12/ TIOCA4/PO28 /CTS9#/RTS9#/SS9#/ CTS11#/RTS11#/SS11#/SDSI_CMD-B
F13	PB1/A9/MTIOC0C/MTIOC4C/TMCI0/TXD6/SMOSI6/SSDA6/IRQ4-DS	PB1/A9/MTIOC0C/MTIOC4C/ TIOCB3 /TMCI0/ PO25 /TXD6/SMOSI6/SSDA6/IRQ4-DS
G1	VCC	VCC
G2	P26/ CS2# /MTIOC2A/TMO1/TXD1/SMOSI1/SSDA1	TDO /P26/ CS6# /MTIOC2A/TMO1/ PO6 /TXD1/ CTS3#/RTS3# /SMOSI1/ SS3# /SSDA1/ MOSIB-A
G3	P25/ CS1# /MTIOC4C/MTCLKB/ADTRG0#	P25/ CS5# / EDACK1 /MTIOC4C/MTCLKB/ TIOCA4/PO5/RXD3/SMISO3/SSCL3 /ADTRG0#
G4	P16/MTIOC3C/MTIOC3D/TMO2/TXD1/SMOSI1/SSDA1/MOSIA/ SCL-DS /IRQ6/RTCOUT/ADTRG0#	P16/MTIOC3C/MTIOC3D/ TIOCB1/TCLKC /TMO2/ PO14 /RTCOUT/TXD1/ RXD3/SMOSI1/S MISO3/SSDA1/SSCL3/SCL2-DS/USB0_VBUS/USB0_VBUSEN/USB0_OVRCURB /IRQ6/ADTRG0#
G10	P15/MTIOC0B/MTCLKB/TMCI2/RXD1/SMISO1/SSCL1/IRQ5	P15/MTIOC0B/MTCLKB/ TIOCB2/TCLKB /TMCI2/ PO13 /RXD1/ SCK3 /SMISO1/SSCL1/ CRX1-DS /IRQ5
G11	P55/WAIT#/MTIOC4D/TMO3	P55/WAIT#/ EDREQ0 /MTIOC4D/TMO3/ CRX1/IRQ10
G12	P54/ALE/MTIOC4B/TMCI1	P54/ALE/ EDACK0 /MTIOC4B/TMCI1/ CTS2#/RTS2#/SS2#/CTX1
G13	PC7/A23/CS0#/MTIOC3A/TMO2/MTCLKB/TXD8/SMOSI8/SSDA8/MISOA/CACREF	UB /PC7/A23/CS0#/MTIOC3A/MTCLKB/TMO2/ TOC0/PO31 /CACREF/TXD8/SMOSI8/SSDA8/MISOA-A/ TXD10/SMOSI10/SSDA10/IRQ14
H1	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMCI2/RXD8/SMISO8/SSCL8/MOSIA	PC6/A22/CS1#/MTIOC3C/MTCLKA/TMCI2/ TI C0/PO30 /RXD8/SMISO8/SSCL8/MOSIA-A/ R XD10/SMISO10/SSCL10/IRQ13
H2	PB6/A14/MTIOC3D/RXD9/SMISO9/SSCL9	PB6/A14/MTIOC3D/ TIOCA5/PO30 /RXD9/SMISO9/SSCL9/ SMISO11/SSCL11/SDSI_D0-B
H3	PB7/A15/MTIOC3B/TXD9/SMOSI9/SSDA9	PB7/A15/MTIOC3B/ TIOCB5/PO31 /TXD9/SMOSI9/SSDA9/ TXD11/SMOSI11/SSDA11/SDSI_D1-B
H4	P24/ CS0# /MTIOC4A/MTCLKA/TMRI1	P24/ CS4# / EDREQ1 /MTIOC4A/MTCLKA/ TIOCB4 /TMRI1/ PO4/SCK3/USB0_VBUSEN

100pin TFLGA	RX210	RX651
H10	P21/MTIOC1B/TMCI0/RXD0/SMISO0/SSCL0	P21/MTIOC1B/MTIOC4A/TIOCA3/TMCI0/PO1/RXD0/SMISO0/SSCL0/USB0_EXICEN/IRQ9
H11	P17/MTIOC3A/MTIOC3B/TMO1/POE8#/SCK1/MISOA/SDA-DS/IRQ7	P17/MTIOC3A/MTIOC3B/MTIOC4B/TIOCB0/TCLKD/TMO1/PO15/POE8#/SCK1/TXD3/SMOSI3/SSDA3/SDA2-DS/IRQ7/ADTRG1#
H12	P13/MTIOC0B/TMO3/SDA/IRQ3	P13/MTIOC0B/TIOCA5/TMO3/PO13/TXD2/SMOSI2/SSDA2/SDA0[FM+]/IRQ3/ADTRG1#
H13	PH0/CACREF	VSS_USB
J1	PH3/TMCI0	VCC_USB
J2	P50/WR0#/WR#	P50/WR0#/WR#/TXD2/SMOSI2/SSDA2/SSLB1-A
J3	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMCI1/POE0#/SCK5/CTS8#/RTS8#/SS8#/SSLA0	PC4/A20/CS3#/MTIOC3D/MTCLKC/TMCI1/PO25/POE0#/SCK5/CTS8#/RTS8#/SS8#/SSLA0-A/CTS10#/RTS10#/SS10#
J4	PC0/A16/MTIOC3C/CTS5#/RTS5#/SS5#/SSLA1	PC0/A16/MTIOC3C/TCLKC/PO17/CTS5#/RTS5#/SS5#/SSLA1-A/IRQ14
J10	PC1/A17/MTIOC3A/SCK5/SSLA2	PC1/A17/MTIOC3A/TCLKD/PO18/SCK5/SSLA2-A/IRQ12
J11	P23/MTIOC3D/MTCLKD/CTS0#/RTS0#/SS0#	P23/EDACK0/MTIOC3D/MTCLKD/TIOCD3/PO3/TXD3/CTS0#/RTS0#/SMOSI3/SS0#/SSDA3
J12	P22/MTIOC3B/MTCLKC/TMO0/SCK0	P22/EDREQ0/MTIOC3B/MTCLKC/TIOCC3/TMO0/PO2/SCK0/USB0_OVRCURB
J13	P20/MTIOC1A/TMRI0/TXD0/SMOSI0/SSDA0	P20/MTIOC1A/TIOCB3/TMRI0/PO0/TXD0/SMOSI0/SSDA0/USB0_ID/IRQ8
K1	P14/MTIOC3A/MTCLKA/TMRI2/CTS1#/RTS1#/SS1#/IRQ4	P14/MTIOC3A/MTCLKA/TIOCB5/TCLKA/TMRI2/PO15/CTS1#/RTS1#/SS1#/CTX1/USB0_OVRCURA/IRQ4
K2	PH2/TMRI0/IRQ1	USB0_DM
K3	PH1/TMO0/IRQ0	USB0_DP
K4	P51/WR1#/BC1#/WAIT#	P51/WR1#/BC1#/WAIT#/SCK2/SSLB2-A
K5	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/TMRI2/SCK8/RSPCKA	PC5/A21/CS2#/WAIT#/MTIOC3B/MTCLKD/TMRI2/PO29/SCK8/RSPCKA-A/SCK10
K6	PC3/A19/MTIOC4D/TXD5/SMOSI5/SSDA5	PC3/A19/MTIOC4D/TCLKB/PO24/TXD5/SMOSI5/SSDA5
K7	PC2/A18/MTIOC4B/RXD5/SMISO5/SSCL5/SSLA3	PC2/A18/MTIOC4B/TCLKA/PO21/RXD5/SMISO5/SSCL5/SSLA3-A
K8	P05/DA1	P05/IRQ13/DA1
K9	VREFH	AVCC1
K10	P07/ADTRG0#	P07/IRQ15/ADTRG0#

4. Notes on Migration

There are some notes about difference between RX210 Group and RX651 Group.

Description about the Hardware, there is on the < Chapter 4.1 Notes on Pin Design >.

Description about the Software, there is on the <Chapter 4.2 Notes on Function Setting>.

4.1 Notes on Pin Design

4.1.1 Operating Modes

The Operating mode has difference between RX210 Group and RX651 Group.

On the RX651 Group, the chip starts up in boot mode (FINE interface) when the MD pin is set to the low level at the time of release from the reset state and then is then switched to the high level within 20 to 100 msec.

Table 4.1 Comparative Listing of Operating Modes

RX210			RX651		
MD1	PC7	Operating modes	MD	UB	Operating modes
0	0	Boot mode	0	0	Boot mode (SCI Interface)
0	1	User boot mode	0	1	Boot mode (USB Interface)
—	—	—	0->1	0	Boot mode (FINE Interface)
1	—	Single chip mode	1	—	Single chip mode

4.1.2 VCL Pin (External Capacitor)

Connect a smoothing capacitor rated at 0.22 μ F to the VCL pin of the RX651 Group for stabilization of the internal power supply.

4.1.3 VBATT Pin

On the RX651 Group, when the voltage at the VCC pin is dropped, power can be supplied to the realtime clock (RTC) and sub-clock oscillator from the dedicated battery backup power pin (VBATT pin).

Connect the VBATT pin to the VCC pin when do not use the battery backup function or do not use Sub-clock oscillator with realtime-clock (RTC).

4.1.4 Main Clock Oscillator

When connecting an oscillator to EXTAL pin and XTAL pin of RX651 Group, frequency should be in a range of 8 MHz to 24 MHz

On the RX651 Group, EXTAL pin and XTAL pin can not be used as General I/O ports.

4.2 Notes on Function Settings

4.2.1 Notes on Using Power-On Reset and PLL Circuit Together

On the RX651 Group, when using a power-on reset and the PLL circuit together, set the LVD1CR1.LVD1IDTSEL[1:0] bits or LVD2CR1.LVD2IDTSEL[1:0] bits to 01b, and select the voltage monitoring interrupt to be generated when a drop ($V_{cc} < V_{det}$) is detected.

In addition, at the beginning of the interrupt handling routine, set the SCKCR3.CKSEL[2:0] bits to a value other than 100b to select a clock source other than the PLL circuit, then set the PLLCR2.PLEN bit to 1 to stop the PLL circuit.

4.2.2 Data for Programming Reserved Areas and Reserved Bits in the Option-Setting Memory

On the RX651 Group, when reserved areas and reserved bits in the option-setting memory are within the scope of programming, write 1 as the value for all bits of reserved areas and all reserved bits. Normal operation cannot be guaranteed if 0 is written to such bits.

4.2.3 Point for Caution when Shifting from Low-Speed Operating Mode to Software Standby Mode

On the RX651 Group, on return from software standby, the chip enters high-speed operating mode. Even if a WAIT instruction is executed in low-speed operating mode, if generation of the return interrupt precedes completion of the transition to software standby and processing for the transition is canceled, the chip does not return to the mode before execution of the WAIT instruction. If this creates a problem, set the OPCCR.OPCM[2:0] bits to 000b during processing of the return interrupt.

4.2.4 Interrupt Requests in Software Standby Mode

On the RX651 Group, when an interrupt request occurs in software standby mode but the interrupt source is not set as a source for exiting software standby mode, the request is held in the ICU. The request is handled after exiting by another interrupt source.

Note that the interrupt request for the external pin interrupt is not held.

4.2.5 Setting Value of the Port Direction Register (PDR) for each Packages

In the RX651 Group, the initialization of the reserved bits of the Port Direction Register (PDR), refer to the User's Manual <Chapter 22.4 Initialization of the Port Direction Register>

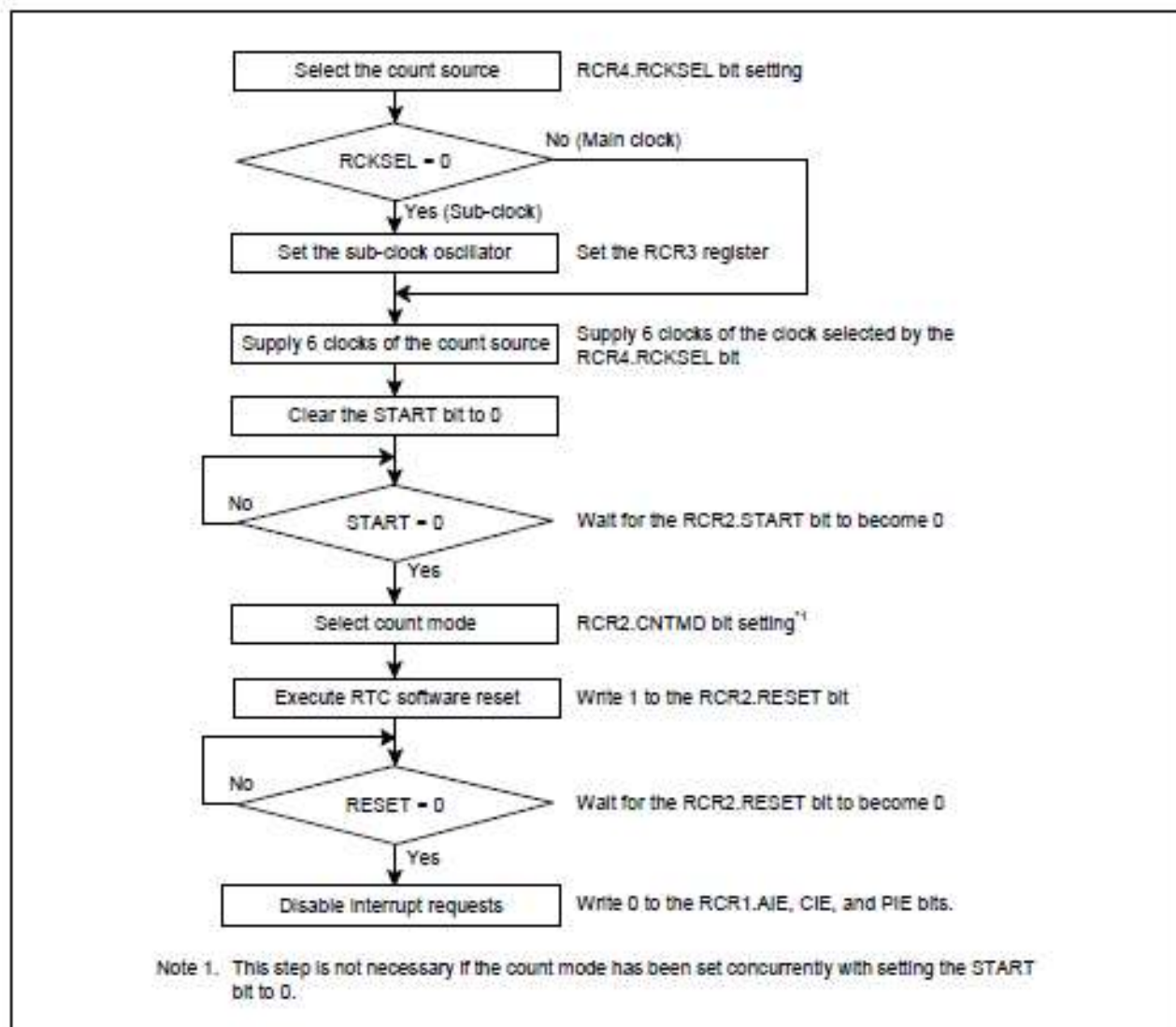
4.2.6 Initialization Procedure When the Realtime Clock is Not to be Used

On the RX651 Group, registers in the RTC are not initialized by a reset. Accordingly, depending on the initial state, the generation of an unintentional interrupt request or operation of the counter may lead to increased power consumption.

For products that do not require a realtime clock, initialize the registers.

Alternatively, when the sub-clock is not used as the system clock or realtime clock, the counter can be stopped by writing 0 (sub-clock oscillator is selected) to the RCR4.RCKSEL bit and stopping the sub-clock.

When making the setting to stop the sub-clock, write 0 to the RCR3.RTCEN bit and write 1 to the SOSCCR.SOSTP bit.



4.2.7 Note on Transmit Enable Bit (TE Bit)

On the RX651 Group, when setting the SCR.TE bit to 0 (serial transmission is disabled) while the pin function is “TXDn”, output of the pin becomes high impedance.

Prevent the TXDn line from becoming high impedance by any of the following ways:

- (1) Connect a pull-up resistor to the TXDn line.
- (2) Change the pin function to “general-purpose I/O port, output” before setting the SCR.TE bit to 0.

Set the SCR.TE bit to 1 before changing the pin function to “TXDn”.

4.2.8 Note on Stopping Reception When Using the RTS Function in Asynchronous Mode

On the RX651 Group, one clock cycle of PCLK is required for the time from setting the SCR.RE bit to 0 to stopping the RTS signal generator in asynchronous mode.

When reading the RDR (or RDRL) register after setting the SCR.RE bit to 0, confirm that the RE bit has been set to 0 before reading the RDR (or RDRL) register to prevent these two processes from being performed consecutively.

4.2.9 S12AD A/D Conversion Restarting Timing and Termination Timing

It takes a maximum of six ADCLK cycles (in case of RX210 four cycles) for the idle analog unit of the 12-bit A/D converter to be restarted by setting the ADCSR.ADST bit to 1. It takes a maximum of two ADCLK cycles for the operating analog unit of the 12-bit A/D converter to be terminated by setting the ADCSR.ADST bit to 0.

4.2.10 S12AD 12Pin Setting When Using the 12-bit A/D Converter

When using the 12-bit A/D converter unit 0, do not use the P40 to P47, P03, P05, and P07 pins as output pins. We also recommend not using the P00 to P02, P90 to P93, PD0 to PD7, and PE0 to PE7 pins as output pins. If any of the P00 to P02, P90 to P93, PD0 to PD7, and PE0 to PE7 pins is used for an output pin, perform A/D conversion several times, eliminate the maximum and minimum values, and obtain the average of the other results.

When using the 12-bit A/D conversion unit 1, we recommend not using the P00 to P02, P90 to P93, PD0 to PD7, and PE0 to PE7 pins as output pins. If any of the P00 to P02, P90 to P93, PD0 to PD7, and PE0 to PE7 pins is used for an output pins, perform A/D conversion several times, eliminate the maximum and minimum values, and obtain the average of the other results.

4.2.11 S12AD Caution When Using an External Bus

On the RX651 Group, A/D conversion at the same time as access to an external bus may produce poor results.

In this case, use a software approach, such as performing A/D conversion several times, then obtaining the average after excluding the highest and lowest values.

4.2.12 Note on Usage When Measure against Interference between D/A and A/D Conversion is Enabled

On the RX651 Group, when the DAADSCR.DAADST bit is 1 (measure against interference between D/A and A/D conversion is enabled), do not place the 12-bit A/D converter (unit 1) in the module stop state. It may halt D/A conversion in addition to A/D conversion.

4.2.13 D/A Note on Event Link Operation

On the RX651 Group, when the event link function is used, do not use output buffer amplifier.

4.2.14 Initial Setting Procedure when the Output Buffer Amplifier is Used

On the RX651 Group, when using the output buffer amplifier, enable the amplifier output in the following procedure. An example for channel 0 is described below.

- (1) Confirm that the DACR.DAE and DACR.DAE0 bits are 0.
- (2) Write 0000h to the DACR0 register.
- (3) Set the DAA.SWCR.DAASW0 bit to 1.
- (4) Set the DAA.SWCR.DAAMP0 bit to 1.
- (5) Set the DACR.DAE or DACR.DAOE0 bit to 1. The output buffer amplifier starts the operation.
- (6) Wait for at least 3 μ s and then set the DAAWCR.DAASW0 bit to 0.
- (7) Write a value to be converted in the DADR0 register.

While the output buffer amplifier is operating, setting the DACR.DAE and DACR.DAOE bits to 0 disables the output buffer amplifier. Repeat the procedure from (1) to (7) to use the output buffer amplifier again.

4.2.15 Supplementary Explanation on RAM Self-Test

On the RX651 Group, when a value is written to RAM and then execute a read access to the same address, the value may be read from the buffer, not from the RAM.

Perform the following operation to ensure that a value will be read from RAM.

To read RAM data at an address of 4-aligned bytes (*) after writing a value to the RAM address of the same 4-aligned bytes:

Write a value to any other RAM address which is out of the 4-aligned bytes, and then execute a read access to the RAM address where you want to read.

4.2.16 Setting Number of Flash Memory Access Wait States

On the RX651 Group it is necessary to specify the number of access wait states to be used when accessing the flash memory, based on the system clock (ICLK) frequency of the microcontroller. This setting is made to the ROMWT register.

Table 4.2 shows The Number of Flash Memory Access Wait States.

Table 4.2 The Number of Flash Memory Access Wait States

Item	ICLK ≤ 50 MHz	50 MHz < ICLK ≤ 100 MHz	100 MHz < ICLK
Wait states	0 to 2	1 or 2	2

4.2.17 Transferring Firmware to the FCU RAM

On the RX210 Group, FCU commands could only be used if the FCU RAM holds the firmware for the FCU. However, this is not necessary on the RX651 Group.

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4.2.18 Command of Flash Memory Usage

On the RX210 Group, the Flash memory can be programmed or erased by issuing FCU commands to FCU.

On the RX651 Group, the Flash memory can be programmed or erased by setting the FACL commands specified in the FACL command issuing area and by controlling the FCU.

Table 4.3 shows The Specification Comparison Between FCU Commands and FACL Commands

Table 4.3 The Specification Comparison Between FCU Commands and FACL Commands

Item	FCU Commands (RX210)	FACL commands (RX651)
Command issuing area	Address for programming/erasure (00E0 0000h to 00FF FFFFh)	FACL command issuing area (007E 0000h)
Available commands	• P/E normal mode transition • Status read mode transition • Lock bit read mode transition • Peripheral clock notification • Programming • Block erase • P/E suspend • P/E resume • Status register clear • Lock bit read 2 • Lock bit programming • Blank checking	• Program • Block erase • P/E suspend • P/E resume • Status clear • Forced stop • Configuration setting

4.2.19 Note of ID Code Protection

On the RX210 Group, when the control code is 52h and the ID code is 50h, 72h, 6Fh, 74h, 65h, 63h, 74h, FFh, ..., FFh (from the ID code 1 field), there is no determination of matching and the ID code is always considered to be non-matching. Accordingly, reading, programming, and erasure from the host are prohibited.

On the RX65N Group, when the On-Chip Debugger is connected, the ID Code is authenticated regardless of the setting of SPCC.SPE. For details of ID code authentication operation please refer to RENESAS TECHNICAL UPDATE (TN-RX*-A166A/E)

5. Reference Documents

User's Manual: Hardware

RX210 Group User's Manual: Hardware Rev.1.50 (R01UH0037EJ0150)

(The latest version can be downloaded from the Renesas Electronics website.)

RX65N Group, RX651 Group User's Manual: Hardware Rev.1.00 (R01UH0590EJ0100)

(The latest version can be downloaded from the Renesas Electronics website.)

RX65N Group, RX651 Group Flash Memory User's Manual: Hardware Interface Rev.1.00 (R01UH0602EJ0100)

(The latest version can be downloaded from the Renesas Electronics website.)

Technical Update/Technical News

(The latest version can be downloaded from the Renesas Electronics website.)

Related Technical Updates

This module reflects the content of the following technical updates.

- TN-RX*-A164A/E
- TN-RX*-A165A/E
- TN-RX*-A166A/E
- TN-RX*-A173A/E
- TN-RX*-A176A/E

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Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep. 21, 2018	—	First edition issued

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. 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

Access to reserved addresses is prohibited.

- The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has 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. Moreover, 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.

5. Differences between Products

Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

- The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the 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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(Rev.4.0-1 November 2017)



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