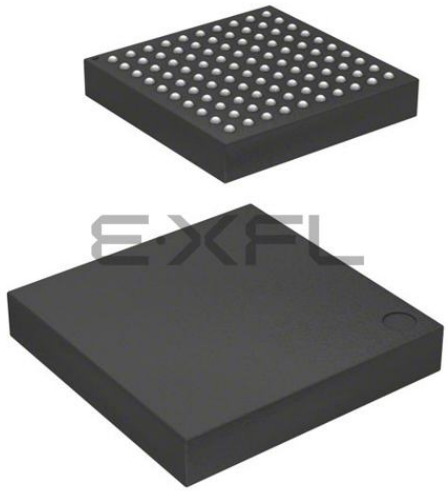

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	RXv2
Core Size	32-Bit Single-Core
Speed	120MHz
Connectivity	CANbus, EBI/EMI, Ethernet, I²C, LINbus, MMC/SD, SCI, SPI, SSI, UART/USART, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	78
Program Memory Size	3MB (3M x 8)
Program Memory Type	FLASH
EEPROM Size	64K x 8
RAM Size	552K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 22x12b; D/A 1x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	100-TFLGA
Supplier Device Package	100-TFLGA (7x7)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f564mjhdlj-21

Table 1.2 Comparison of Functions for Different Packages (2/2)

Functions	RX64M Group		
Package	**177 Pins, 176 Pins**	**145 Pins, 144 Pins**	**100 Pins**
DES	Available		
SHA	Available		
RNG	Available		
Event link controller	Available		

Table 1.4 Pin Functions (4/8)

Classifications	Pin Name	I/O	Description
Serial communications interface (SCIg)	• Asynchronous mode/clock synchronous mode		
	SCK0 to SCK7	I/O	Input/output pins for the clock
	RXD0 to RXD7	Input	Input pins for received data
	TXD0 to TXD7	Output	Output pins for transmitted data
	CTS0# to CTS7#	Input	Input pins for controlling the start of transmission and reception
	RTS0# to RTS7#	Output	Output pins for controlling the start of transmission and reception
	• Simple I^2C mode		
	SSCL0 to SSCL7	I/O	Input/output pins for the I^2C clock
	SSDA0 to SSDA7	I/O	Input/output pins for the I^2C data
	• Simple SPI mode		
	SCK0 to SCK7	I/O	Input/output pins for the clock
	SMISO0 to SMISO7	I/O	Input/output pins for slave transmission of data
	SMOSI0 to SMOSI7	I/O	Input/output pins for master transmission of data
	SS0# to SS7#	Input	Chip-select input pins
Serial communications interface (SCIh)	• Asynchronous mode/clock synchronous mode		
	SCK12	I/O	Input/output pin for the clock
	RXD12	Input	Input pin for received data
	TXD12	Output	Output pin for transmitted data
	CTS12#	Input	Input pin for controlling the start of transmission and reception
	RTS12#	Output	Output pin for controlling the start of transmission and reception
	• Simple I^2C mode		
	SSCL12	I/O	Input/output pin for the I^2C clock
	SSDA12	I/O	Input/output pin for the I^2C data
	• Simple SPI mode		
	SCK12	I/O	Input/output pin for the clock
	SMISO12	I/O	Input/output pin for slave transmission of data
	SMOSI12	I/O	Input/output pin for master transmission of data
	SS12#	Input	Chip-select input pin
	• Extended serial mode		
	RXDX12	Input	Input pin for received data
	TXDX12	Output	Output pin for transmitted data
	SIOX12	I/O	Input/output pin for received or transmitted data
Serial communications interface with FIFO (SCIFA)	SCK8 to SCK11	I/O	Input/output pins for the clock
	RXD8 to RXD11	Input	Input pins for received data
	TXD8 to TXD11	Output	Output pins for transmitted data
	CTS8# to CTS11#	Input	Input pins for controlling the start of transmission and reception
	RTS8# to RTS11#	Output	Output pins for controlling the start of transmission and reception
I^2C bus interface	SCL0[FM+], SCL2	I/O	Input/output pins for clocks. Bus can be directly driven by the N-channel open drain
	SDA0[FM+], SDA2	I/O	Input/output pins for data. Bus can be directly driven by the N-channel open drain

Table 1.4 Pin Functions (7/8)

Classifications	Pin Name	I/O	Description
MMC host interface	MMC_CLK-A/ MMC_CLK-B	Output	MMC clock pin
	MMC_CMD-A/ MMC_CMD-B	I/O	Command/response pin
	MMC_D7-A/MMC_D7-B to MMC_D0-A/MMC_D0-B	I/O	Transmit data/receive data
	MMC_CD-A/MMC_CD-B	Input	Card detection pin
	MMC_RES#-A/MMC_RES#-B	Output	MMC reset output pin
SD host interface	SDHI_CLK-A/SDHI_CLK-B	Output	SD clock output pin
	SDHI_CMD-A/SDHI_CMD-B	I/O	SD command output, response input signal pin
	SDHI_D3-A/SDHI_D3-B to SDHI_D0-A/SDHI_D0-B	I/O	SD data bus pins
	SDHI_CD-A/SDHI_CD-B	Input	SD card detection pin
	SDHI_WP-A/SDHI_WP-B	Input	SD write-protect signal
Parallel data capture unit	PIXCLK	Input	Image transfer clock pin
	VSYNC	Input	Vertical synchronization signal pin
	HSYNC	Input	Horizontal synchronization signal pin
	PIXD0 to PIXD7	Input	8-bit image data pins
	PCKO	Output	Output pin for dot clock
Realtime clock	RTCOUT	Output	Output pin for 1-Hz/64-Hz clock
	RTCIC0 to RTCIC2	Input	Time capture event input pins
12-bit A/D converter	AN000 to AN007, AN100 to AN120	Input	Input pins for the analog signals to be processed by the A/D converter
	ADTRG0#, ADTRG1#	Input	Input pins for the external trigger signals that start the A/D conversion
	ANEX0	Output	Extended analog output pin
	ANEX1	Input	Extended analog input pin
12-bit D/A converter	DA0, DA1	Output	Output pins for the analog signals to be processed by the D/A converter
Analog power supply	AVCC0	Input	Analog voltage supply pin for the 12-bit A/D converter (unit 0). Connect this pin to a branch from the VCC power supply.
	AVSS0	Input	Analog ground pin for the 12-bit A/D converter (unit 0). Connect this pin to a branch from the VSS ground power supply.
	VREFH0	Input	Analog reference voltage supply pin for the 12-bit A/D converter (unit 0). Connect this pin to VCC if the 12-bit A/D converter is not to be used.
	VREFL0	Input	Analog reference ground pin for the 12-bit A/D converter (unit 0). Connect this pin to VSS if the 12-bit A/D converter is not to be used.
	AVCC1	Input	Analog voltage supply and reference voltage supply pin for the 12-bit A/D converter (unit 1) and D/A converter. This pin also supplies the analog voltage to the temperature sensor. Connect this pin to a branch from the VCC power supply.
	AVSS1	Input	Analog voltage supply and reference voltage supply pin for the 12-bit A/D converter (unit 1) and D/A converter. This pin also supplies the analog ground voltage to the temperature sensor. Connect this pin to a branch from the VSS ground power supply.

RX64M Group
PTLG0100JA-A (100-Pin TFLGA)
(Upper Perspective View)

	A	B	C	D	E	F	G	H	J	K	
10	PE2	PE3	PE4	PA0	PA3	VSS	VCC	PB7	PC1	PC2	10
9	PE1	PD7	PE5	PA1	PA5	PA7	PB1	PB6	PC0	PC3	9
8	PE0	PD6	PD5	PE7	PA4	PB0	PB4	PC6	PC4	PC5	8
7	PD4	PD3	PD2	PE6	PA6	PB2	PB5	PC7	P50	P51	7
6	PD0	PD1	P47	P46	PA2	PB3	P52	P54	VCC_ USB	USB0_ DP	6
5	P43	P44	P42	P45	P41	P12	P53	P55	VSS_ USB	USB0_ DM	5
4	VREFL0	P40	VREFH0	VBATT	P34	P32	P27	P15	P13	P14	4
3	P07	AVCC0	PJ3	MD/ FINED	RES#	P35	P30	P16	P17	P20	3
2	AVCC1	AVSS0	AVSS1	XCOUT	VSS	VCC	P31	P25	P21	P22	2
1	P05	EMLE	VCL	XCIN	XTAL	EXTAL	P33	P26	P24	P23	1
	A	B	C	D	E	F	G	H	J	K	

Note: This figure indicates the power supply pins and I/O port pins. For the pin configuration, see Table 1.9, List of Pin and Pin Functions (100-Pin TFLGA).

Figure 1.8 Pin Assignment (100-Pin TFLGA)

Table 1.6 List of Pin and Pin Functions (176-Pin LFQFP) (6/7)

Pin Number 176-Pin LFQFP	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, GPT, TPU, TMR, PPG, RTC, CMTW, POE, CAC)	Communication (ETHERC, SCIg, SCIh, RSPI, RIIC, CAN, USB, SSI)	Memory Interface Camera Interface (QSPI, SDHI, MMCIF, PDC)	Interrupt	S12ADC, R12DA
143		PD7	D7[A7/D7]	MTIC5U/POE0#		MMC_D1-B/ SDHI_D1-B/ QIO1-B/QMI-B	IRQ7	AN107
144		PG1	D25		ET1_RX_ER/ RMII1_RX_ER			
145		PD6	D6[A6/D6]	MTIC5V/MTIOC8A/ POE4#		MMC_D0-B/ SDHI_D0-B/ QIO0-B/ QMO-B	IRQ6	AN106
146		PG0	D24		ET1_RX_CLK/ REF50CK1			
147		PD5	D5[A5/D5]	MTIC5W/MTIOC8C/ POE10#		MMC_CLK-B/ SDHI_CLK-B/ QSPCLK-B	IRQ5	AN113
148		PD4	D4[A4/D4]	MTIOC8B/POE11#		MMC_CMD-B/ SDHI_CMD-B/ QSSL-B	IRQ4	AN112
149		P97	A23/D23		ET1_ERXD3			
150		PD3	D3[A3/D3]	MTIOC8D/ GTIOC0A-E/POE8#/ TOC2		MMC_D3-B/ SDHI_D3-B/ QIO3-B	IRQ3	AN111
151	VSS							
152		P96	A22/D22		ET1_ERXD2			
153	VCC							
154		PD2	D2[A2/D2]	MTIOC4D/ GTIOC0B-E/TIC2	CRX0	MMC_D2-B/ SDHI_D2-B/ QIO2_B	IRQ2	AN110
155		P95	A21/D21		ET1_ERXD1/ RMII1_RXD1			
156		PD1	D1[A1/D1]	MTIOC4B/ GTIOC1A-E/POE0#	CTX0		IRQ1	AN109
157		P94	A20/D20		ET1_ERXD0/ RMII1_RXD0			
158		PD0	D0[A0/D0]	GTIOC1B-E/POE4#			IRQ0	AN108
159		P93	A19/D19	POE0#	ET1_LINKSTA/CTS7#/ RTS7#/SS7#			AN117
160		P92	A18/D18	POE4#	ET1_CRS/ RMII1_CRS_DV/ RXD7/SMISO7/SSCL7			AN116
161		P91	A17/D17		ET1_COL/SCK7			AN115
162	VSS							
163		P90	A16/D16		ET1_RX_DV/ TXD7/SMOSI7/SSDA7			AN114
164	VCC							
165		P47					IRQ15-DS	AN007
166		P46					IRQ14-DS	AN006
167		P45					IRQ13-DS	AN005
168		P44					IRQ12-DS	AN004
169		P43					IRQ11-DS	AN003
170		P42					IRQ10-DS	AN002
171		P41					IRQ9-DS	AN001
172	VREFL0							

Table 1.6 List of Pin and Pin Functions (176-Pin LFQFP) (7/7)

Pin Number 176-Pin LFQFP	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, GPT, TPU, TMR, PPG, RTC, CMTW, POE, CAC)	Communication (ETHERC, SCIg, SCIh, RSPI, RIIC, CAN, USB, SSI)	Memory Interface Camera Interface (QSPI, SDHI, MMCIF, PDC)	Interrupt	S12ADC, R12DA
173		P40					IRQ8-DS	AN000
174	VREFH0							
175	AVCC0							
176		P07					IRQ15	ADTRG0#

Note 1. The BCLK function is multiplexed with the I/O port function for pin P53, so the port function is not available if the external bus is enabled.

Table 1.7 List of Pin and Pin Functions (145-Pin TFLGA) (4/5)

Pin Number 145-Pin TFLGA	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, GPT, TPU, TMR, PPG, RTC, CMTW, POE, CAC)	Communication (ETHERC, SCIg, SCIh, RSPI, RIIC, CAN, USB, SSI)	Memory Interface Camera Interface (QSPI, SDHI, MMCIF, PDC)	Interrupt	S12ADC, R12DA
K5	TRDATA2	P54	ALE/EDACK0	MTIOC4B/TMCI1	CTS2#/RTS2#/SS2#/ CTX1/ET0_LINKSTA			
K6		P53*1	BCLK					
K7		P51	WR1#/BC1#/ WAIT#		SCK2			
K8	VCC							
K9	TRDATA0	P80	EDREQ0	MTIOC3B/PO26	SCK10/RTS10#/ ET0_TX_EN/ RMII0_TXD_EN	MMC_D2-A/ SDHI_WP-A/ QIO2-A		
K10		P76	CS6#	PO22	RXD11/ET0_RX_CLK/ REF50CK0	MMC_CMD-A/ SDHI_CMD-A/ QSSL-A		
K11		PB7	A15	MTIOC3B/TIOCB5/ PO31	TXD9/ET0_CRS/ RMII0_CRS_DV			
K12		PB6	A14	MTIOC3D/TIOCA5/ PO30	RXD9/ET0_ETXD1/ RMII0_TXD1			
K13		PB5	A13	MTIOC2A/MTIOC1B/ TIOCB4/TMRI1/PO29/ POE4#	SCK9/RTS9#/ ET0_ETXD0/ RMII0_TXD0			
L1		P25	CS5#/ EDACK1	MTIOC4C/MTCLKB/ TIOCA4/PO5	RXD3/SMISO3/ SSCL3/SSIDATA1	HSYNC		ADTRG0#
L2		P23	EDACK0	MTIOC3D/MTCLKD/ GTIOC0A-B/TIOCD3/ PO3	TXD3/CTS0#/RTS0#/ SMOSI3/SS0#/ SSDA3/SSISCK0	PIXD7		
L3		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	CS4#/ EDREQ1	MTIOC4A/MTCLKA/ TIOCB4/TMRI1/PO4	SCK3/ USB0_VBUSEN/ SSISCK1	PIXCLK		
L5		P13		MTIOC0B/TIOCA5/ TMO3/PO13	TXD2/SMOSI2/ SSDA2/SDA0[FM+]		IRQ3	ADTRG1#
L6		P56	EDACK1	MTIOC3C/TIOCA1				
L7		P52	RD#		RXD2/SMISO2/SSCL2			
L8	TRCLK	P83	EDACK1	MTIOC4C/ GTIOC0A-D	CTS10#/ET0_CRS/ RMII0_CRS_DV/ SCK10			
L9		PC5	A21/CS2#/ WAIT#	MTIOC3B/MTCLKD/ GTIOC1A-D/TMRI2/ PO29	SCK8/RSPCKA-A/ RTS8#/ET0_ETXD2	MMC_D5-A		
L10		PC4	A20/CS3#	MTIOC3D/MTCLKC/ GTETRG-D/TMCI1/ PO25/POE0#	SCK5/CTS8#/ SSLA0-A/ ET0_TX_CLK	MMC_D1-A/ SDHI_D1-A/ QIO1-A/QMI-A		
L11		PC2	A18	MTIOC4B/ GTIOC2B-D/TCLKA/ PO21	RXD5/SMISO5/ SSCL5/SSLA3-A/ ET0_RX_DV	MMC_CD-A/ SDHI_D3-A		
L12		P73	CS3#	PO16	ET0_WOL			
L13	VSS							
M1		P22	EDREQ0	MTIOC3B/MTCLKC/ GTIOC1A-B/TIOCC3/ TMO0/PO2	SCK0/ USB0_OVRCURB/ AUDIO_MCLK	PIXD6		
M2		P17		MTIOC3A/MTIOC3B/ MTIOC4B/ GTIOC0B-B/TIOCB0/ TCLKD/TMO1/PO15/ POE8#	SCK1/TXD3/SMOSI3/ SSDA3/SDA2-DS/ SSITXD0	PIXD3	IRQ7	ADTRG1#
M3		P86		MTIOC4D/ GTIOC2B-B/TIOCA0	RXD10	PIXD1		

2.1 General-Purpose Registers (R0 to R15)

This CPU has sixteen 32-bit general-purpose registers (R0 to R15). R0 to R15 can be used as data registers or address registers.
R0, a general-purpose register, also functions as the stack pointer (SP).
The stack pointer is switched to operate as the interrupt stack pointer (ISP) or user stack pointer (USP) by the value of the stack pointer select bit (U) in the processor status word (PSW).

2.2 Control Registers

(1) Interrupt Stack Pointer (ISP) / User Stack Pointer (USP)

The stack pointer (SP) can be either of two types, the interrupt stack pointer (ISP) or the user stack pointer (USP). Whether the stack pointer operates as the ISP or USP depends on the value of the stack pointer select bit (U) in the processor status word (PSW).

(2) Exception Table Register (EXTB)

The exception table register (EXTB) specifies the address where the exception vector table starts.

(3) Interrupt Table Register (INTB)

The interrupt table register (INTB) specifies the address where the interrupt vector table starts.

(4) Program Counter (PC)

The program counter (PC) indicates the address of the instruction being executed.

(5) Processor Status Word (PSW)

The processor status word (PSW) indicates the results of instruction execution or the state of the CPU.

(6) Backup PC (BPC)

The backup PC (BPC) is provided to speed up response to interrupts.
After a fast interrupt has been generated, the contents of the program counter (PC) are saved in the BPC register.

(7) Backup PSW (BPSW)

The backup PSW (BPSW) is provided to speed up response to interrupts.
After a fast interrupt has been generated, the contents of the processor status word (PSW) are saved in the BPSW. The allocation of bits in the BPSW corresponds to that in the PSW.

(8) Fast Interrupt Vector Register (FINTV)

The fast interrupt vector register (FINTV) is provided to speed up response to interrupts.
The FINTV register specifies a branch destination address when a fast interrupt has been generated.

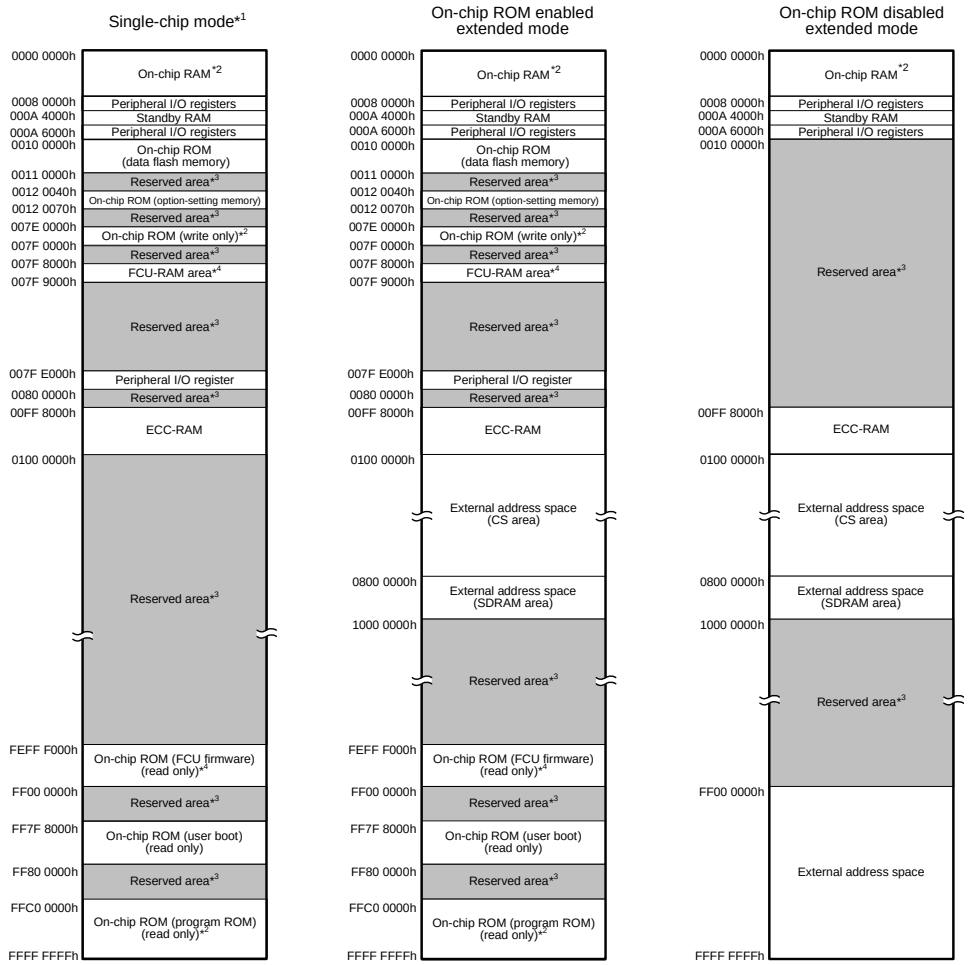
(9) Floating-Point Status Word (FPSW)

The floating-point status word (FPSW) indicates the results of floating-point operations.
When an exception handling enable bit (Ej) enables the exception handling (Ej = 1), the exception cause can be identified by checking the corresponding Cj flag in the exception handling routine. If the exception handling is masked (Ej = 0), the occurrence of exception can be checked by reading the Fj flag at the end of a series of processing. Once the Fj flag has been set to 1, this value is retained until it is cleared to 0 by software (j = X, U, Z, O, or V).

3. Address Space

3.1 Address Space

This MCU has a 4-Gbyte address space, consisting of the range of addresses from 0000 0000h to FFFF FFFFh. That is, linear access to an address space of up to 4 Gbytes is possible, and this contains both program and data areas.
Figure 3.1 shows the memory maps in the respective operating modes. Accessible areas will differ according to the operating mode and states of control bits.



Note 1. The address space in boot mode and user boot mode/USB boot mode is the same as the address space in single-chip mode.
Note 2. The capacity of ROM/RAM differs depending on the products.

Code Flash Memory Capacity	Address	Data Flash Memory Capacity	Address	RAM Capacity	Address
4 Mbytes	FFC0 0000h to FFFF FFFFh	64 Kbytes	0010 0000h to 0010 FFFFh	512 Kbytes	0000 0000h to 0007 FFFFh
3 Mbytes	FFD0 0000h to FFFF FFFFh				
2.5 Mbytes	FFD8 0000h to FFFF FFFFh				
2 Mbytes	FFE0 0000h to FFFF FFFFh				

Note 3. Reserved areas should not be accessed.
Note 4. The FCU-RAM and the on-chip ROM (FCU firmware) are reserved in products that do not include the FCU-RAM. For details on the FCU, see section 63, Flash Memory, in the RX64M Group User's Manual: Hardware.

Figure 3.1 Memory Map in Each Operating Mode

Table 4.1 List of I/O Registers (Address Order) (8 / 67)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0008 652Ch	MPU	Data-Hit Region Register	MHITD	32	32	1 ICLK		MPU
0008 7010h to 0008 70FFh	ICU	Interrupt Request Registers 016 to 255	IR016 to 255	8	8	2 ICLK		ICUA
0008 711Ah to 0008 71FFh	ICU	DTC Transfer Request Enable Registers 026 to 255	DTCER026 to DTCER255	8	8	2 ICLK		ICUA
0008 7202h to 0008 721Fh	ICU	Interrupt Request Enable Registers 02 to 1F	IER02 to IER1F	8	8	2 ICLK		ICUA
0008 72E0h	ICU	Software Interrupt Generation Register	SWINTR	8	8	2 ICLK		ICUA
0008 72E1h	ICU	Software Interrupt 2 Generation Register	SWINT2R	8	8	2 ICLK		ICUA
0008 72F0h	ICU	Fast Interrupt Set Register	FIR	16	16	2 ICLK		ICUA
0008 7300h to 0008 73FFh	ICU	Interrupt Source Priority Registers 000 to 255	IPR000 to IPR255	8	8	2 ICLK		ICUA
0008 7400h	ICU	DMAC Trigger Select Register 0	DMRSR0	8	8	2 ICLK		ICUA
0008 7404h	ICU	DMAC Trigger Select Register 1	DMRSR1	8	8	2 ICLK		ICUA
0008 7408h	ICU	DMAC Trigger Select Register 2	DMRSR2	8	8	2 ICLK		ICUA
0008 740Ch	ICU	DMAC Trigger Select Register 3	DMRSR3	8	8	2 ICLK		ICUA
0008 7410h	ICU	DMAC Trigger Select Register 4	DMRSR4	8	8	2 ICLK		ICUA
0008 7414h	ICU	DMAC Trigger Select Register 5	DMRSR5	8	8	2 ICLK		ICUA
0008 7418h	ICU	DMAC Trigger Select Register 6	DMRSR6	8	8	2 ICLK		ICUA
0008 741Ch	ICU	DMAC Trigger Select Register 7	DMRSR7	8	8	2 ICLK		ICUA
0008 7500h to 0008 750Fh	ICU	IRQ Control Registers 0 to 15	IRQCR0 to 15	8	8	2 ICLK		ICUA
0008 7520h	ICU	IRQ Pin Digital Filter Enable Register 0	IRQFLTE0	8	8	2 ICLK		ICUA
0008 7521h	ICU	IRQ Pin Digital Filter Enable Register 1	IRQFLTE1	8	8	2 ICLK		ICUA
0008 7528h	ICU	IRQ Pin Digital Filter Setting Register 0	IRQFLTC0	16	16	2 ICLK		ICUA
0008 752Ah	ICU	IRQ Pin Digital Filter Setting Register 1	IRQFLTC1	16	16	2 ICLK		ICUA
0008 7580h	ICU	Non-Maskable Interrupt Status Register	NMISR	8	8	2 ICLK		ICUA
0008 7581h	ICU	Non-Maskable Interrupt Enable Register	NMIER	8	8	2 ICLK		ICUA
0008 7582h	ICU	Non-Maskable Interrupt Status Clear Register	NMICLR	8	8	2 ICLK		ICUA
0008 7583h	ICU	NMI Pin Interrupt Control Register	NMICR	8	8	2 ICLK		ICUA
0008 7590h	ICU	NMI Pin Digital Filter Enable Register	NMIFLTE	8	8	2 ICLK		ICUA
0008 7594h	ICU	NMI Pin Digital Filter Setting Register	NMIFLTC	8	8	2 ICLK		ICUA
0008 7600h	ICU	Group BE0 Interrupt Request Register	GRPBE0	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7630h	ICU	Group BL0 Interrupt Request Register	GRPBL0	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7634h	ICU	Group BL1 Interrupt Request Register	GRPBL1	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7640h	ICU	Group BE0 Interrupt Request Enable Register	GENBE0	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7670h	ICU	Group BL0 Interrupt Request Enable Register	GENBL0	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7674h	ICU	Group BL1 Interrupt Request Enable Register	GENBL1	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7680h	ICU	Group BE0 Interrupt Clear Register	GCRBE0	32	32	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7700h	ICU	Software Configurable Interrupt B Request Register 0	PIBR0	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7701h	ICU	Software Configurable Interrupt B Request Register 1	PIBR1	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7702h	ICU	Software Configurable Interrupt B Request Register 2	PIBR2	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7703h	ICU	Software Configurable Interrupt B Request Register 3	PIBR3	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7704h	ICU	Software Configurable Interrupt B Request Register 4	PIBR4	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7705h	ICU	Software Configurable Interrupt B Request Register 5	PIBR5	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA
0008 7706h	ICU	Software Configurable Interrupt B Request Register 6	PIBR6	8	8	2 ICLK to 1 PCLKB	2 ICLK	ICUA

Table 4.1 List of I/O Registers (Address Order) (31 / 67)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0008 C02Dh	PORTD	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C02Eh	PORTE	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C02Fh	PORTF	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C030h	PORTG	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C032h	PORTJ	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C040h	PORT0	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C041h	PORT1	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C042h	PORT2	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C043h	PORT3	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C044h	PORT4	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C045h	PORT5	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C046h	PORT6	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C047h	PORT7	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C048h	PORT8	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C049h	PORT9	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C04Ah	PORTA	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C04Bh	PORTB	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C04Ch	PORTC	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C04Dh	PORTD	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C04Eh	PORTE	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C04Fh	PORTF	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C050h	PORTG	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C052h	PORTJ	Port Input Register	PIDR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C060h	PORT0	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C061h	PORT1	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C062h	PORT2	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C063h	PORT3	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C064h	PORT4	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C065h	PORT5	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C066h	PORT6	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C067h	PORT7	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports

Table 4.1 List of I/O Registers (Address Order) (43 / 67)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
000A 0050h	USB0	USB Address Register	USBADDR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0054h	USB0	USB Request Type Register	USBREQ	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0056h	USB0	USB Request Value Register	USBVAL	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0058h	USB0	USB Request Index Register	USBINDX	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 005Ah	USB0	USB Request Length Register	USBLENG	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 005Ch	USB0	DCP Configuration Register	DCPCFG	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 005Eh	USB0	DCP Maximum Packet Size Register	DCPMAXP	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0060h	USB0	DCP Control Register	DCPCTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0064h	USB0	Pipe Window Select Register	PIPESEL	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0068h	USB0	Pipe Configuration Register	PIPECFG	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 006Ch	USB0	Pipe Maximum Packet Size Register	PIPEMAXP	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 006Eh	USB0	Pipe Cycle Control Register	PIPEPERI	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0070h	USB0	PIPE1 Control Register	PIPE1CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0072h	USB0	PIPE2 Control Register	PIPE2CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0074h	USB0	PIPE3 Control Register	PIPE3CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0076h	USB0	PIPE4 Control Register	PIPE4CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0078h	USB0	PIPE5 Control Register	PIPE5CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 007Ah	USB0	PIPE6 Control Register	PIPE6CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 007Ch	USB0	PIPE7 Control Register	PIPE7CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 007Eh	USB0	PIPE8 Control Register	PIPE8CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0080h	USB0	PIPE9 Control Register	PIPE9CTR	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0090h	USB0	Pipe1 Transaction Counter Enable Register	PIPE1TRE	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0092h	USB0	Pipe1 Transaction Counter Register	PIPE1TRN	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0094h	USB0	Pipe2 Transaction Counter Enable Register	PIPE2TRE	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0096h	USB0	Pipe2 Transaction Counter Register	PIPE2TRN	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb
000A 0098h	USB0	Pipe3 Transaction Counter Enable Register	PIPE3TRE	16	16	9 PCLKB or more	Frequency with 1 + 9 × (frequency ratio of ICLK/PCLKB)*5	USBb

Table 4.1 List of I/O Registers (Address Order) (67 / 67)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
000D 0548h	USBA	Host L1 Control Register 1	HL1CTRL1	16	16	(3 + BUSWAIT) PCLKA or more	Rounded up to the nearest integer greater than 1 + (3 + BUSWAIT) × (frequency ratio of ICLK/PCLKB)*5	USBA
000D 054Ah	USBA	Host L1 Control Register 2	HL1CTRL2	16	16	(3 + BUSWAIT) PCLKA or more	Rounded up to the nearest integer greater than 1 + (3 + BUSWAIT) × (frequency ratio of ICLK/PCLKB)*5	USBA
000D 0560h	USBA	Deep Standby USB Transceiver Control/Pin Monitor Register	DPUSR0R	32	32	(3 + BUSWAIT) PCLKA or more	Rounded up to the nearest integer greater than 1 + (3 + BUSWAIT) × (frequency ratio of ICLK/PCLKB)*5	USBA
000D 0564h	USBA	Deep Standby USB Suspend/Resume Interrupt Register	DPUSR1R	32	32	(3 + BUSWAIT) PCLKA or more	Rounded up to the nearest integer greater than 1 + (3 + BUSWAIT) × (frequency ratio of ICLK/PCLKB)*5	USBA

Note 1. When the same output trigger is specified for pulse output groups 2 and 3 by the PPG0.PCR setting, the PPG0.NDRH address is 0008 81ECh. When different output triggers are specified, the PPG0.NDRH addresses for pulse output groups 2 and 3 are 0008 81EEh and 0008 81ECh, respectively.

Note 2. When the same output trigger is specified for pulse output groups 0 and 1 by the PPG0.PCR setting, the PPG0.NDRL address is 0008 81EDh. When different output triggers are specified, the PPG0.NDRL addresses for pulse output groups 0 and 1 are 0008 81EFh and 0008 81EDh, respectively.

Note 3. When the same output trigger is specified for pulse output groups 6 and 7 by the PPG1.PCR setting, the PPG1.NDRH address is 0008 81FCh. When different output triggers are specified, the PPG1.NDRH addresses for pulse output groups 6 and 7 are 0008 81FEh and 0008 81FCh, respectively.

Note 4. When the same output trigger is specified for pulse output groups 4 and 5 by the PPG1.PCR setting, the PPG1.NDRL address is 0008 81FDh. When different output triggers are specified, the PPG1.NDRL addresses for pulse output groups 4 and 5 are 0008 81FFh and 0008 81FDh, respectively.

Note 5. When the register is accessed while the USB is operating, a delay may be generated in accessing.

Note 6. The address must end with 0h, 4h, 8h, or Ch when access is made in 32-bit units. The address must end with 0h, 2h, 4h, 6h, 8h, Ah, Ch, or Eh when access is made in 16-bit units.

5.3 AC Characteristics

Table 5.7 Operating Frequency (High-Speed Operating Mode)

Conditions: VCC = AVCC0 = AVCC1 = VCC_USB = V_{BATT} = 2.7 to 3.6 V, 2.7 ≤ VREFH0 ≤ AVCC0,
VCC_USBA = AVCC_USBA = 3.0 to 3.6 V,
VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = VSS1_USBA = VSS2_USBA = PVSS_USBA = AVSS_USBA = 0 V,
$T_a = T_{opr}$

Item			Symbol	Min.	Typ.	Max.	Unit
Operating frequency	System clock (ICLK)		f	—	—	120	MHz
	Peripheral module clock (PCLKA)			—	—	120	
	Peripheral module clock (PCLKB)			—	—	60	
	Peripheral module clock (PCLKC)			—	—	60	
	Peripheral module clock (PCLKD)			—	—	60	
	Flash-IF clock (FCLK)			—*1	—	60	
	External bus clock (BCLK)	Packages with 177 to 144 pins only		—	—	120	
		Package with 100 pins only		—	—	60	
	BCLK pin output	Packages with 177 to 144 pins only		—	—	60	
		Package with 100 pins only		—	—	30	
	SDRAM clock (SDCLK)	Packages with 177 to 144 pins only		—	—	60	
	SDCLK pin output	Packages with 177 to 144 pins only		—	—	60	

Note 1. The FCLK must run at a frequency of at least 4 MHz when changing the flash memory contents.

Table 5.8 Operating Frequency (Low-Speed Operating Mode 1)

Conditions: VCC = AVCC0 = AVCC1 = VCC_USB = V_{BATT} = 2.7 to 3.6 V, 2.7 ≤ VREFH0 ≤ AVCC0,
VCC_USBA = AVCC_USBA = 3.0 to 3.6 V,
VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = VSS1_USBA = VSS2_USBA = PVSS_USBA = AVSS_USBA = 0 V,
$T_a = T_{opr}$

Item			Symbol	Min.	Typ.	Max.	Unit
Operating frequency	System clock (ICLK)		f	—	—	1	MHz
	Peripheral module clock (PCLKA)			—	—	1	
	Peripheral module clock (PCLKB)			—	—	1	
	Peripheral module clock (PCLKC)*1			—	—	1	
	Peripheral module clock (PCLKD)*1			—	—	1	
	Flash-IF clock (FCLK)			—	—	1	
	External bus clock (BCLK)	Packages with 177 to 144 pins only		—	—	1	
		Package with 100 pins only		—	—	1	
	BCLK pin output	Packages with 177 to 144 pins only		—	—	1	
		Package with 100 pins only		—	—	1	
	SDRAM clock (SDCLK)	Packages with 177 to 144 pins only		—	—	1	
	SDCLK pin output	Packages with 177 to 144 pins only		—	—	1	

Note 1. When the 12-bit A/D converter is used, the frequency must be set to at least 1 MHz.

5.3.5 Bus Timing

Table 5.21 Bus Timing

Conditions: VCC = AVCC0 = AVCC1 = VCC_USB = V_{BATT} = 2.7 to 3.6 V, 2.7 ≤ VREFH0 ≤ AVCC0,
VCC_USBA = AVCC_USBA = 3.0 to 3.6 V,
VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = VSS1_USBA = VSS2_USBA = PVSS_USBA = AVSS_USBA = 0 V,
ICLK = PCLKA = 8 to 120 MHz, PCLKB = BCLK = SDCLK = 8 to 60 MHz, $T_a = T_{opr}$
Output load conditions: V_{OH} = VCC × 0.5, V_{OL} = VCC × 0.5, C = 30 pF
High-drive output is selected by the driving ability control register.

Item	Symbol	Min.	Max.	Unit	Test Conditions
Address delay time	t_{AD}	—	12.5	ns	Figure 5.16 to Figure 5.21
Byte control delay time	t_{BCD}	—	12.5	ns	
CS# delay time	t_{CSD}	—	12.5	ns	
ALE delay time	t_{ALED}	—	12.5	ns	
RD# delay time	t_{RSD}	—	12.5	ns	
Read data setup time	t_{RDS}	12.5	—	ns	
Read data hold time	t_{RDH}	0	—	ns	
WR# delay time	t_{WRD}	—	12.5	ns	
Write data delay time	t_{WDD}	—	12.5	ns	
Write data hold time	t_{WDH}	0	—	ns	
WAIT# setup time	t_{WTS}	12.5	—	ns	Figure 5.22
WAIT# hold time	t_{WTH}	0	—	ns	
Address delay time 2 (SDRAM)	t_{AD2}	1	12.5	ns	Figure 5.23
CS# delay time 2 (SDRAM)	t_{CSD2}	1	12.5	ns	
DQM delay time (SDRAM)	t_{DQMD}	1	12.5	ns	
CKE delay time (SDRAM)	t_{CKED}	1	12.5	ns	
Read data setup time 2 (SDRAM)	t_{RDS2}	10	—	ns	
Read data hold time 2 (SDRAM)	t_{RDH2}	0	—	ns	
Write data delay time 2 (SDRAM)	t_{WDD2}	—	12.5	ns	
Write data hold time 2 (SDRAM)	t_{WDH2}	1	—	ns	
WE# delay time (SDRAM)	t_{WED}	1	12.5	ns	
RAS# delay time (SDRAM)	t_{RASD}	1	12.5	ns	
CAS# delay time (SDRAM)	t_{CASD}	1	12.5	ns	

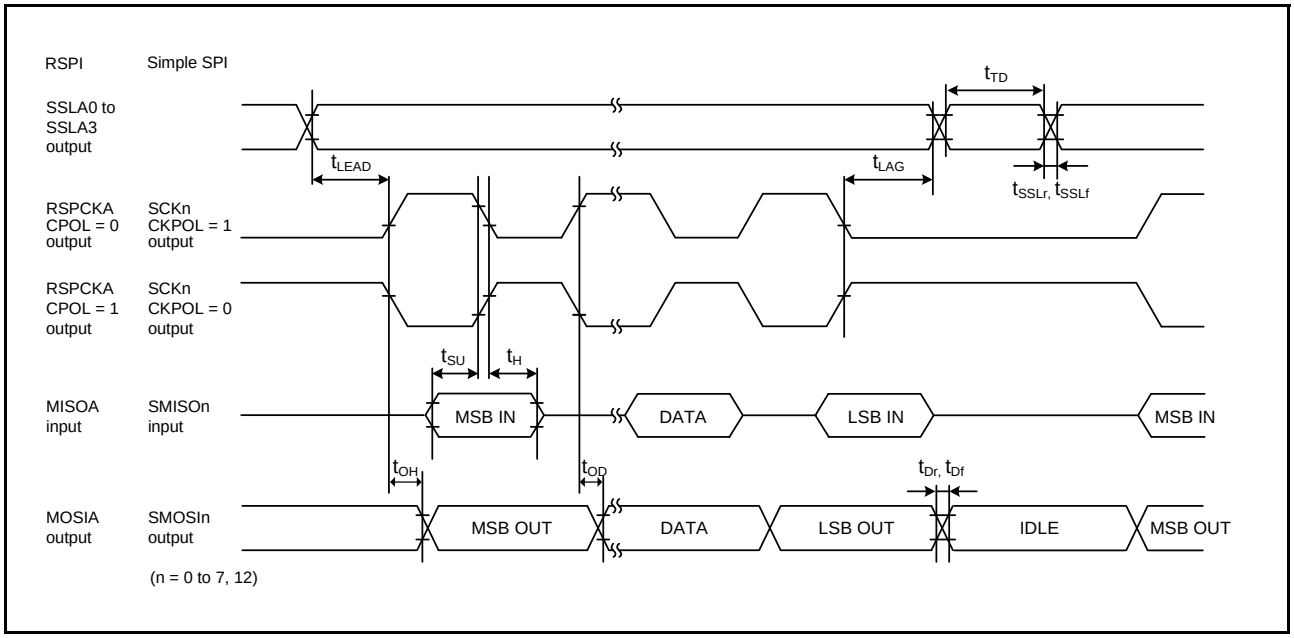


Figure 5.49 RSPI Timing (Master, CPHA = 1) (Bit Rate: PCLKB Division Ratio Set to a Value Other Than 1/2) and Simple SPI Timing (Master, CKPH = 0)

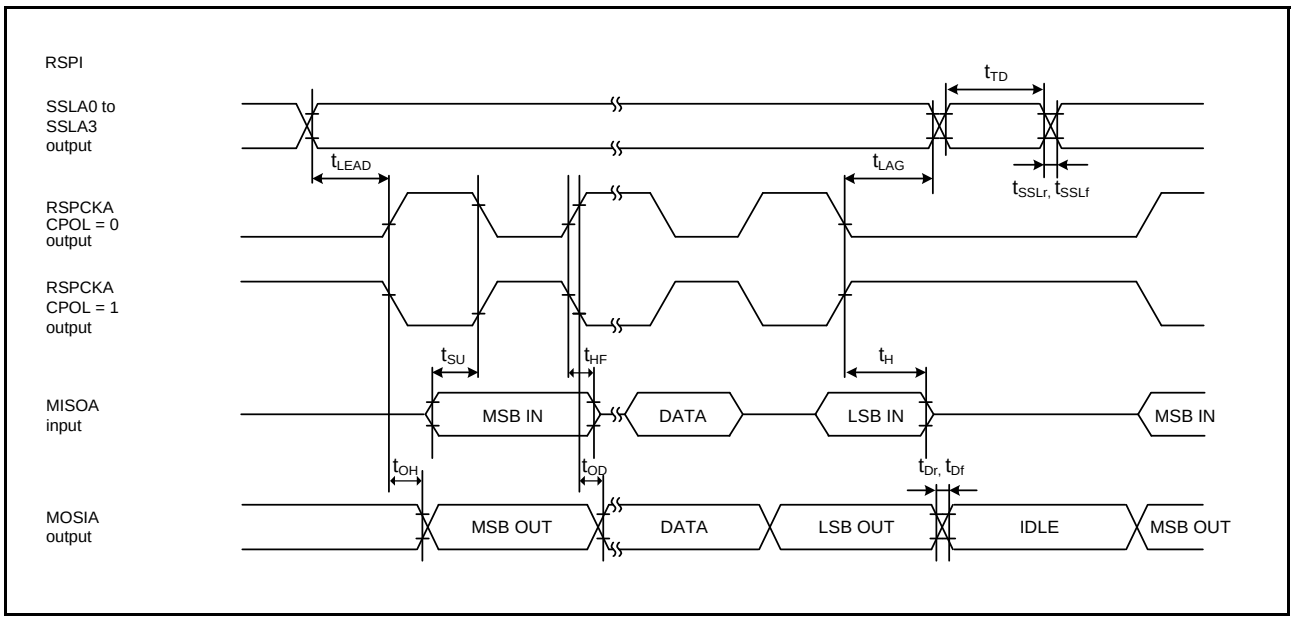
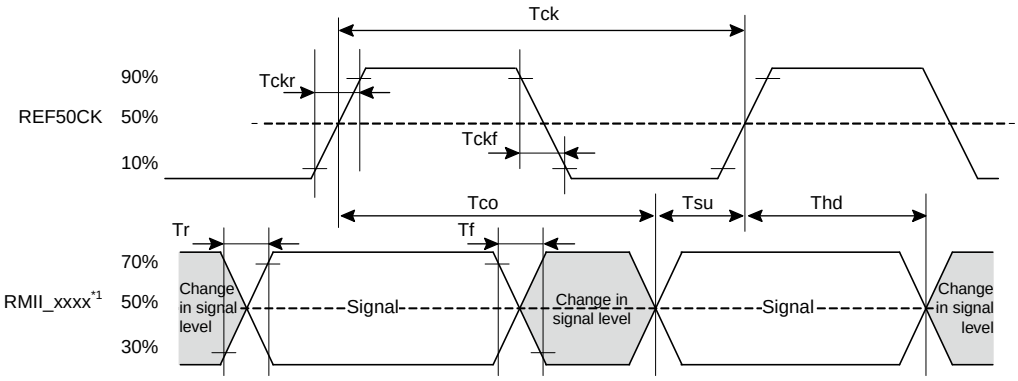


Figure 5.50 RSPI Timing (Master, CPHA = 1) (Bit Rate: PCLKB Division Ratio Set to 1/2)



Note 1. RMII_TXD_EN, RMII_TXD1, RMII_TXD0, RMII_CRS_DV, RMII_RXD1, RMII_RXD0, RMII_RX_ER

Figure 5.62 Timing with the REF50CK and RMII Signals

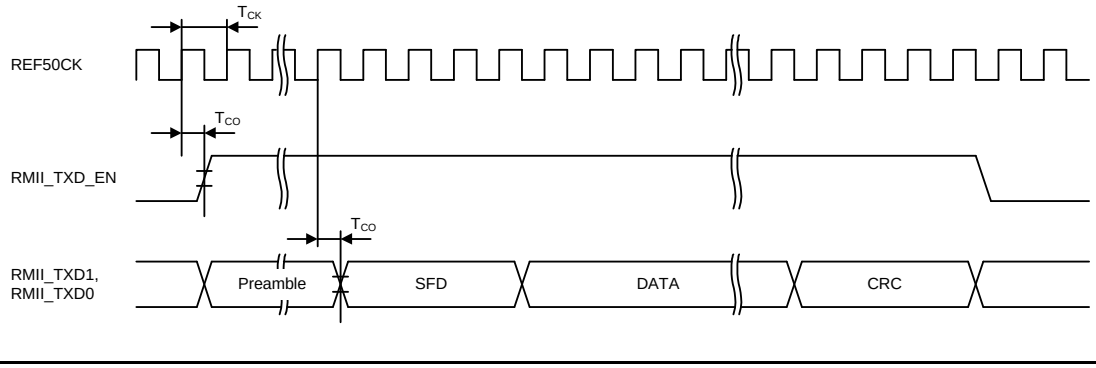


Figure 5.63 RMII Transmission Timing

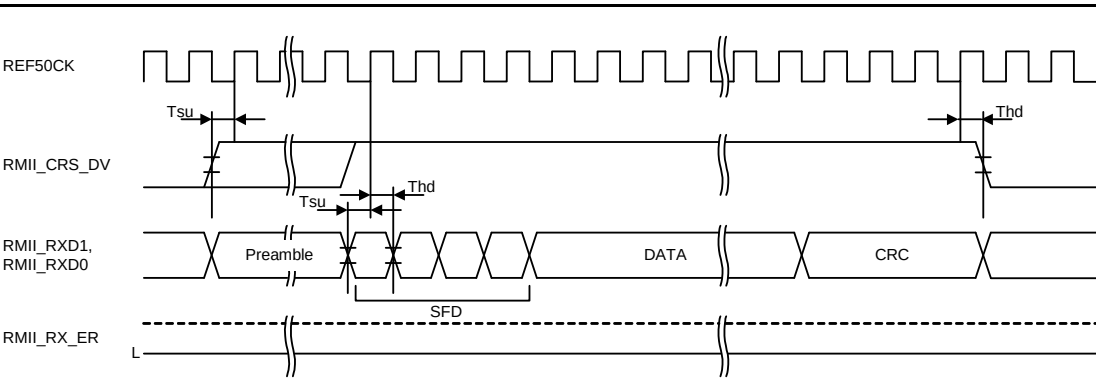


Figure 5.64 RMII Reception Timing (Normal Operation)

Table 5.46 12-Bit A/D (Unit 1) Conversion Characteristics

Conditions: VCC = AVCC0 = AVCC1 = VCC_USB = V_{BATT} = 2.7 to 3.6 V, 2.7 ≤ VREFH0 ≤ AVCC0,
VCC_USBA = AVCC_USBA = 3.0 to 3.6 V,
VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = VSS1_USBA = VSS2_USBA = PVSS_USBA = AVSS_USBA = 0 V,
PCLKB = PCLKD = 1 MHz to 60 MHz, $T_a = T_{opr}$

Item		Min.	Typ.	Max.	Unit	Test Conditions
Resolution		8	—	12	Bit	
Conversion time*1 (Operation at PCLK = 60 MHz)	Permissible signal source impedance (max.) = 1.0 kΩ	0.88 (0.667) *2	—	—	µs	Sampling in 40 states
Analog input capacitance		—	—	30	pF	
Offset error		—	±2.0	±3.5	LSB	
Full-scale error		—	±2.0	±3.5	LSB	
Quantization error		—	±0.5	—	LSB	
Absolute accuracy		—	±4.0	±6.0	LSB	
DNL differential nonlinearity error		—	±1.5	±2.5	LSB	
INL integral nonlinearity error		—	±2.0	±3.5	LSB	

Note: The above specification values apply when there is no access to the external bus during A/D conversion. If access proceeds during A/D conversion, values may not fall within the above ranges.
Note 1. The conversion time includes the sampling time and the comparison time. As the test conditions, the number of sampling states is indicated.
Note 2. The value in parentheses indicates the sampling time.

Table 5.47 A/D Internal Reference Voltage Characteristics

Conditions: VCC = AVCC0 = AVCC1 = VCC_USB = V_{BATT} = 2.7 to 3.6 V, 2.7 ≤ VREFH0 ≤ AVCC0,
VCC_USBA = AVCC_USBA = 3.0 to 3.6 V,
VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = VSS1_USBA = VSS2_USBA = PVSS_USBA = AVSS_USBA = 0 V,
PCLKB = PCLKD = 60 MHz, $T_a = T_{opr}$

Item	Min.	Typ.	Max.	Unit	Test Conditions
A/D internal reference voltage	1.20	1.25	1.30	V	

5.8 Power-on Reset Circuit and Voltage Detection Circuit Characteristics

Table 5.50 Power-on Reset Circuit and Voltage Detection Circuit Characteristics

Conditions: VCC = AVCC0 = AVCC1 = VCC_USB = V_{BATT} = 2.7 to 3.6 V, 2.7 ≤ VREFH0 ≤ AVCC0,
VCC_USBA = AVCC_USBA = 3.0 to 3.6 V,
VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = VSS1_USBA = VSS2_USBA = PVSS_USBA = AVSS_USBA = 0 V,
$T_a = T_{opr}$

Item			Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Voltage detection level	Power-on reset (POR)	Low power consumption function disabled*1	V_{POR}	2.5	2.6	2.7	V	Figure 5.79
		Low power consumption function enabled*2		2.0	2.35	2.7		
	Voltage detection circuit (LVD0)		V_{det0_1}	2.84	2.94	3.04		Figure 5.80
			V_{det0_2}	2.77	2.87	2.97		
			V_{det0_3}	2.70	2.80	2.90		
	Voltage detection circuit (LVD1)		V_{det1_1}	2.89	2.99	3.09		Figure 5.81
			V_{det1_2}	2.82	2.92	3.02		
			V_{det1_3}	2.75	2.85	2.95		
	Voltage detection circuit (LVD2)		V_{det2_1}	2.89	2.99	3.09		Figure 5.82
			V_{det2_2}	2.82	2.92	3.02		
			V_{det2_3}	2.75	2.85	2.95		
Internal reset time	Power-on reset time		t_{POR}	—	4.6	—	ms	Figure 5.79
	LVD0 reset time		t_{LVD0}	—	0.70	—		Figure 5.80
	LVD1 reset time		t_{LVD1}	—	0.57	—		Figure 5.81
	LVD2 reset time		t_{LVD2}	—	0.57	—		Figure 5.82
Minimum VCC down time			t_{VOFF}	200	—	—	μs	Figure 5.79, Figure 5.80
Response delay time			t_{det}	—	—	200	μs	Figure 5.79 to Figure 5.82
LVD operation stabilization time (after LVD is enabled)*3			$T_{d(E-A)}$	—	—	10	μs	Figure 5.81, Figure 5.82
Hysteresis width (LVD1 and LVD2)			V_{LVH}	—	80	—	mV	

Note: The minimum VCC down time indicates the time when VCC is below the minimum value of voltage detection levels V_{POR}, V_{det1}, and V_{det2} for the POR/ LVD.

Note 1. The low power consumption function is disabled and DEEPCUT[1:0] = 00b or 01b.

Note 2. The low power consumption function is enabled and DEEPCUT[1:0] = 11b.

Note 3. 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 ($V_{det1\_1, 2, 3}$) selected by the LVDLVLR.LVD1LVL[3:0] bits.
Similarly, 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 ($V_{det2\_1, 2, 3}$) selected by the LVDLVLR.LVD2LVL[3:0] bits.

REVISION HISTORY	RX64M Group Datasheet

Rev.	Date	Description	
		Page	Summary
0.90	Feb 28, 2014	—	First edition, issued
1.00	Jul 31, 2014	Summary	
		1	■ Data transfer, changed
		1. Overview	
		—	FINEC (Pin), deleted
		2	Table 1.1 Outline of Specifications (1/9), changed
		3	Table 1.1 Outline of Specifications (2/9), changed
		6	Table 1.1 Outline of Specifications (5/9), changed
		7	Table 1.1 Outline of Specifications (6/9), changed
		8	Table 1.1 Outline of Specifications (7/9), changed
		9	Table 1.1 Outline of Specifications (8/9), changed
		10	Table 1.1 Outline of Specifications (9/9), changed
		16	Figure 1.1 How to Read the Product Part Number, changed
		19	Table 1.4 Pin Functions (2/8), changed
		20	Table 1.4 Pin Functions (3/8), changed
		25	Table 1.4 Pin Functions (8/8), note added
		2. CPU, added	
		3. Address Space, added	
		4. I/O Registers, added	
		5. Electrical Characteristics, added	
		Appendix 1. Package Dimensions, added	

Classifications

- Items with Technical Update document number: Changes according to the corresponding issued Technical Update
- Items without Technical Update document number: Minor changes that do not require Technical Update to be issued

Rev.	Date	Description		Classification
		Page	Summary	
1.10	Oct 24, 2016	All	Terms unified: GPTa → GPTA LQFP → LFQFP	
		Features		
		1	AES key lengths, changed	TN-RX*-A122A/E
		1. Overview		
		2	Table 1.1 Outline of Specifications (1/9), changed	TN-RX*-A127A/E
		5	Table 1.1 Outline of Specifications (4/9), changed	
		10	Table 1.1 Outline of Specifications (9/9), changed	TN-RX*-A122A/E
		28	Figure 1.5 Pin Assignment (176-Pin LFQFP), changed	
		48	Table 1.7 List of Pin and Pin Functions (145-Pin TFLGA) (2/5), changed	
		49	Table 1.7 List of Pin and Pin Functions (145-Pin TFLGA) (3/5), changed	
		52	Table 1.8 List of Pin and Pin Functions (144-Pin LFQFP) (1/5), changed	
		55	Table 1.8 List of Pin and Pin Functions (144-Pin LFQFP) (4/5), changed	
		58	Table 1.9 List of Pin and Pin Functions (100-Pin TFLGA) (2/4), changed	
		59	Table 1.9 List of Pin and Pin Functions (100-Pin TFLGA) (3/4), changed	
		63	Table 1.10 List of Pin and Pin Functions (100-Pin LFQFP) (3/4), changed	
		4. I/O Registers		
		71	(4) Notes on Sleep Mode and Mode Transitions, added	
		73	Table 4.1 List of I/O Registers (Address Order) (2 / 67) 0008 1200h, 0008 1201h, 0008 1204h, 0008 1208h, added	TN-RX*-A127A/E