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"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

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Details

Product Status	Not For New Designs
Core Processor	RX
Core Size	32-Bit Single-Core
Speed	100MHz
Connectivity	CANbus, EBI/EMI, I ² C, LINbus, SCI, SPI, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	72
Program Memory Size	384KB (384K x 8)
Program Memory Type	FLASH
EEPROM Size	32K x 8
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 12x10b, 8x12b; D/A 2x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	120-LQFP
Supplier Device Package	120-LQFP (16x16)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f563tcbdfa-v1

Table 1.2 Comparison of Functions for Different Packages

Functions			RX63T Group						
Package			144 Pins	120 Pins	112 Pins	100 Pins	64 Pins	48 Pins	
External bus			16 bits				—		
External address space			1 Mbyte × 4 areas				—		
DMA	DMA controller (DMACA)		Ch. 0 to 3						
	Data transfer controller (DTCa)		Supported						
Interrupt controller (ICUb)	NMI pin		Supported						
	IRQ pin		Supported (x 8)				Supported (x 6)		
Timers	Multi-function timer pulse unit 3 (MTU3)* ¹		Ch. 0 to 7						
	General PWM timer (GPT)* ¹	Generation of delays in PWM, not supported	Ch. 0 to 7				Ch. 0 to 3		
		Generation of delays in PWM, supported	Ch. 0 to 3				—		
	Port output enable 3 (POE3)		Supported (POE pins × 6)			Supported (POE pins × 5)	Supported (POE pins × 4)		
	Compare match timer (CMT)		Ch. 0 to 3						
	Watchdog timer (WDTA)		Supported						
	Independent watchdog timer (IWDTa)		Supported						
	Communication function	USB2.0 host/function module (USBa)		Ch. 0		—			
Serial communications interfaces (SClc)		Ch. 0 to 3			Ch. 0 to 2	Ch. 0, 1			
Serial communications interfaces (SCld)		Ch. 12							
I ² C bus interfaces (RIIC)		Ch. 0, 1		Ch. 0					
Serial peripheral interfaces (RSPI)		Ch. 0, 1				Ch. 0			
CAN module (CAN) (as an optional function)* ¹		Ch. 0				—			
12-bit A/D converter (S12ADB)			4 channels × 2 units				8 channels × 1 unit (AN000 to 007)	8 channels × 1 unit (AN000 to 004, 007)	
			Three-channel simultaneous sampling function		2 units			1 unit	
			Programmable gain amplifier		3 channels × 2 units			—	
			Window comparator		3 channels × 2 units			3 channels × 1 unit	
10-bit A/D converter (ADA)			20 channels	12 channels			—		
D/A converter (DAa)			Ch. 0, 1				—		
Clock Frequency Accuracy Measurement Circuit			Supported						
Digital power supply controller (DPC)* ²			Supported				Not supported		

Note 1. For the MTU3 and GPT, the number of pins will differ with the package. See the list of pins and pin functions for details.

In addition, the CAN module is an optional function. For details, see Table 1.3.

Note 2. Not provided for the product ID code O.

1.2 List of Products

Table 1.3 is a list of products, and Figure 1.1 shows how to read the product part number.

Table 1.3 List of Products (1/4)

Group	Part No.	Order Part No.	Package	On-chip ROM Capacity	On-chip RAM Capacity	Option	Operating Voltage	Operating Temperature
RX63T	R5F563TEADFB	R5F563TEADFB#V0	PLQP0144KA-A	512 Kbytes	48 Kbytes	CAN module included	VCC/ PLLVC 4.0 to 5.5V VCC_USB 3.0 to 3.6V AVCC/ AVCC0 4.0 to 5.5V	-40 to +85°C (D Version)
	R5F563TEADFB	R5F563TEADFB#V1	PLQP0144KA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEADFA	R5F563TEADFA#V0	PLQP0120KA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEADFA	R5F563TEADFA#V1	PLQP0120KA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEADFH	R5F563TEADFH#V0	PLQP0112JA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEADFH	R5F563TEADFH#V1	PLQP0112JA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEADFP	R5F563TEADFP#V0	PLQP0100KB-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEADFP	R5F563TEADFP#V1	PLQP0100KB-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TCADFB	R5F563TCADFB#V0	PLQP0144KA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFB	R5F563TCADFB#V1	PLQP0144KA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFA	R5F563TCADFA#V0	PLQP0120KA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFA	R5F563TCADFA#V1	PLQP0120KA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFH	R5F563TCADFH#V0	PLQP0112JA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFH	R5F563TCADFH#V1	PLQP0112JA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFP	R5F563TCADFP#V0	PLQP0100KB-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCADFP	R5F563TCADFP#V1	PLQP0100KB-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TBADFB	R5F563TBADFB#V0	PLQP0144KA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFB	R5F563TBADFB#V1	PLQP0144KA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFA	R5F563TBADFA#V0	PLQP0120KA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFA	R5F563TBADFA#V1	PLQP0120KA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFH	R5F563TBADFH#V0	PLQP0112JA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFH	R5F563TBADFH#V1	PLQP0112JA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFP	R5F563TBADFP#V0	PLQP0100KB-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBADFP	R5F563TBADFP#V1	PLQP0100KB-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TEDDFB	R5F563TEDDFB#V0	PLQP0144KA-A	512 Kbytes	48 Kbytes	CAN module not included		
	R5F563TEDDFA	R5F563TEDDFA#V0	PLQP0120KA-A	512 Kbytes	48 Kbytes	CAN module not included		
	R5F563TEDDFH	R5F563TEDDFH#V0	PLQP0112JA-A	512 Kbytes	48 Kbytes	CAN module not included		
	R5F563TEDDFP	R5F563TEDDFP#V0	PLQP0100KB-A	512 Kbytes	48 Kbytes	CAN module not included		

Table 1.4 Pin Functions (3/5)

Classifications	Pin Name	I/O	Description
Serial communications interface (SC1c)	Asynchronous mode/clock synchronous mode		
	SCK0, SCK1, SCK2, SCK3	I/O	Input/output pins for clock signals.
	RXD0, RXD1, RXD2, RXD3	Input	Input pins for data reception.
	TXD0, TXD1, TXD2, TXD3	Output	Output pins for data transmission.
	CTS0#, CTS1#, CTS2#, CTS3#	Input	Transmit/receive start control input pins
	RTS0#, RTS1#, RTS2#, RTS3#	Output	Transmit/receive start control output pins
	Simple I ² C mode		
	SSCL0, SSCL1, SSCL2, SSCL3	I/O	Input/output pins for the I ² C clock
	SSDA0, SSDA1, SSDA2, SSDA3	I/O	Input/output pins for the I ² C data
	Simple SPI mode		
	SCK0, SCK1, SCK2, SCK3	I/O	Input/output pins for the clock
	SMISO0, SMISO1, SMISO2, SMISO3	I/O	Input/output pins for slave transmit data.
	SMOSI0, SMOSI1, SMOSI2, SMOSI3	I/O	Input/output pins for master transmit data.
	SS0#, SS1#, SS2#, SS3#	Input	Input pins for chip select signals
Serial communications interface (SC1d)	Asynchronous mode/clock synchronous mode		
	SCK12	I/O	Input/output pin for clock signals.
	RXD12	Input	Input pin for data reception.
	TXD12	Output	Output pin for data transmission.
	CTS12#	Input	Transmit/receive start control input pins
	RTS12#	Output	Transmit/receive start control output pins
	Simple I ² C mode		
	SSCL12	I/O	Input/output pins for the I ² C clock
	SSDA12	I/O	Input/output pins for the I ² C data
	Simple SPI mode		
	SCK12	I/O	Input/output pins for the clock
	SMISO12	I/O	Input/output pins for slave transmit data.
	SMOSI12	I/O	Input/output pins for master transmit data.
	SS12#	Input	Input pins for chip select signals
	Extended serial mode		
	RDX12	Input	Input pin for receive data
	TXDX12	Output	Output pin for transmit data
	SIOX12	I/O	Input/output pin for transfer data
I ² C bus interface	SCL, SCL0, SCL1	I/O	Clock input/output pin. N-channel open drain can directly drive buses.
	SDA, SDA0, SDA1	I/O	Data input/output pin. N-channel open drain can directly drive buses.

Table 1.4 Pin Functions (5/5)

Classifications	Pin Name	I/O	Description
I/O ports	P00 to P05	I/O	6-bit input/output pins
	P10 to P14	I/O	5-bit input/output pins
	P20 to P26	I/O	7-bit input/output pins
	P30 to P35	I/O	6-bit input/output pins
	P40 to P47	Input	8-bit input pins
	P50 to P57	Input	8-bit input pins
	P60 to P65	Input	6-bit input pins
	P70 to P76	I/O	7-bit input/output pins
	P80 to P82	I/O	3-bit input/output pins
	P90 to P96	I/O	7-bit input/output pins
	PA0 to PA6	I/O	7-bit input/output pins
	PB0 to PB7	I/O	8-bit input/output pins
	PC0 to PC5	Input	6-bit input pins
	PD0 to PD7	I/O	8-bit input/output pins
	PE0, PE1, PE3 to PE5	I/O	6-bit input/output pins
	PE2	Input	1-bit input pin
	PF0 to PF4	I/O	5-bit input/output pins
	PG0 to PG6	I/O	7-bit input/output pins

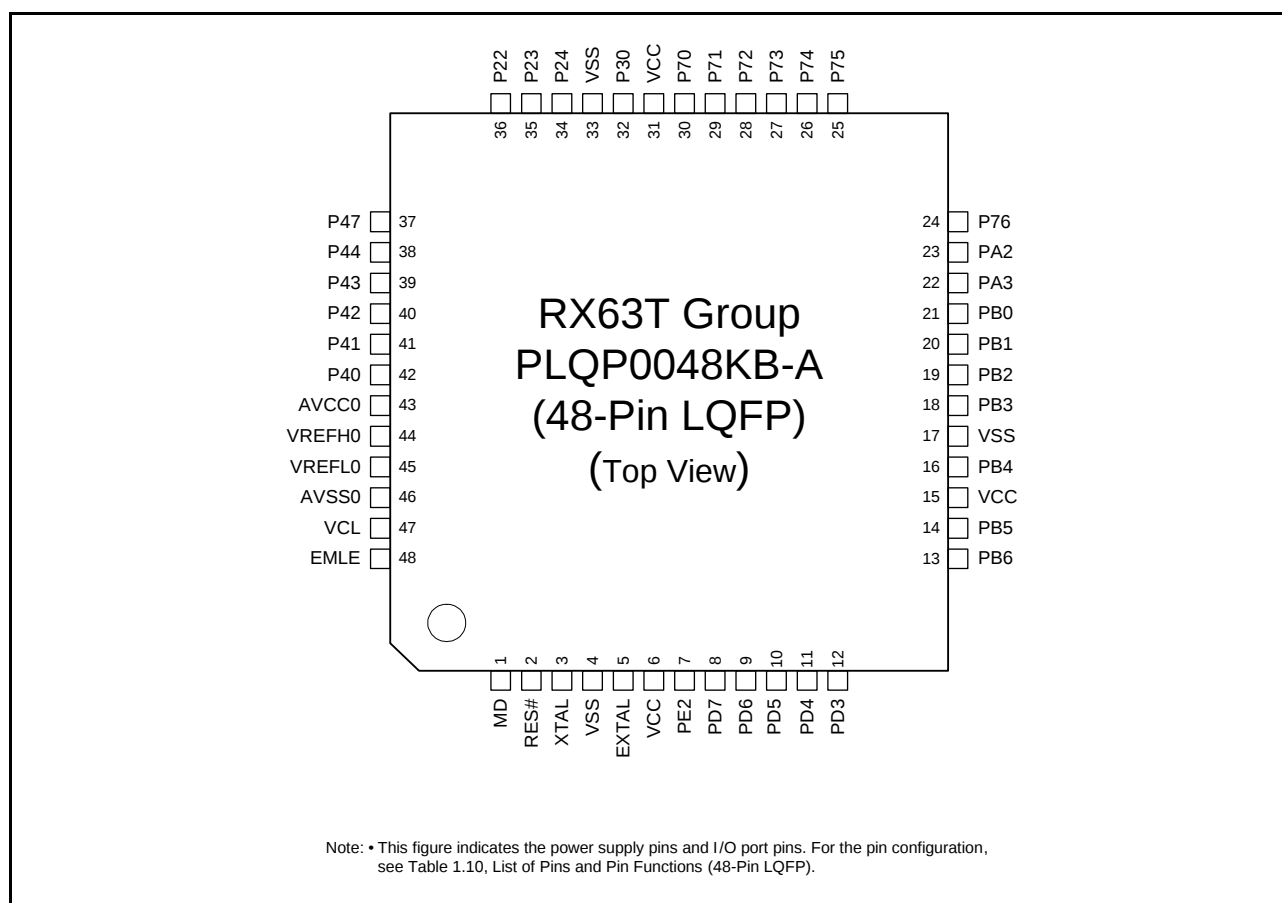


Figure 1.8 Pin Assignment (48-Pin LQFP)

Table 1.5 List of Pins and Pin Functions (144-Pin LQFP) (4/4)

Pin Number 144-Pin LQFP	Power Supply Clock System Control	I/O Port	Bus	Timer (MTU3, GPT, POE3, CAC)	Communications (SCIc, SCId, RSPI, RIIC, CAN, USB)	Interrupt	S12ADB, AD, DA
110		P60	A5				AN0
111		P57					AN13
112		P56					AN12
113		P55					AN11/DA1
114		P54					AN10/ DA0
115		P53	A6				AN9
116		P52	A7				AN8
117		P51					AN7
118		P50					AN6
119		P47					AN103/ CVREFH
120		P46					AN102
121		P45					AN101
122		P44					AN100
123		P43					AN003/ CVREFL
124		P42					AN002
125		P41					AN001
126		P40					AN000
127	AVCC0						
128	VREFH0						
129	VREFL0						
130	AVSS0						
131		P82	WAIT#	MTIC5U	SCK12	IRQ3	
132		P81	A8	MTIC5V	TXD12/SMOSI12/ SSDA12/TXD12/ SIOX12		
133	VSS						
134		P80	A9	MTIC5W	RXD12/SMISO12/ SSCL12/RXD12	IRQ5	
135		P12	CS3#		USB0_DPRPD		
136		P11	ALE	MTCLKC		IRQ1-DS	
137		P10		MTCLKD		IRQ0-DS	
138		P05	CS2#/WAIT#				
139	VCC						
140		P04					
141					USB0_DPUPE		
142	VSS_USB						
143					USB0_DM		
144					USB0_DP		

Note 1. Available for use as SCI pin only in boot mode.

Table 1.6 List of Pins and Pin Functions (120-Pin LQFP) (1/4)

Pin Number 120-Pin LQFP	Power Supply Clock System Control	I/O Port	Bus	Timer (MTU3, GPT, POE3, CAC)	Communications (SCIC, SCID, RSPI, RIIC, CAN, USB)	Interrupt	S12ADB, AD, DA
1	VCC_USB						
2		PE5	BCLK		USB0_VBUS	IRQ0	
3	EMLE						
4	VSS						
5		P01	RD#		CTS0#/RTS0#/SS0#/ USB0_DRPD		
6	VCL						
7		P00	CS1#	CACREF			
8	MD/FINED						
9		PE4	A10	POE10#/MTCLKC		IRQ1	
10		PE3	A11	POE11#/MTCLKD		IRQ2-DS	
11		P13			CTS2#/RTS2#/SS2#/ USB0_VBUSEN		
12	RES#						
13	XTAL						
14	VSS						
15	EXTAL						
16	VCC						
17		PE2		POE10#		NMI	
18		PE1	WR0#/WR#		CTS12#/RTS12#/ SS12#/SSLA3/SSLB3/ USB0_OVRCURA		
19		PE0	WR1#/BC1#/ WAIT#		SSLA2/SSLB2/CRX1/ USB0_OVRCURB	IRQ7	
20	TRST#	PD7		GTIOC0A	CTS0#/RTS0#/SS0#/ SSLA1/SSLB1/CTX1		
21	TMS	PD6		GTIOC0B	SSLA0/SSLB0		
22	TDI	PD5		GTIOC1A	RXD1/SMISO1/SSCL1	IRQ6	
23	TCK/FINEC	PD4		GTIOC1B	SCK1		
24	TDO	PD3		GTIOC2A	TXD1/SMOSI1/SSDA1		
25		PD2	CS2#	GTIOC2B	MOSIA/MOSIB/ USB0_ID		
26		PD1	CS0#	GTIOC3A	MISOA/MISOB/ USB0_EXICEN		
27		PD0	A12	GTIOC3B	RSPCKA/RSPCKB		
28		PF3			TXD1/SMOSI1/SSDA1		
29		PF2	CS1#		RXD1/SMISO1/SSCL1	IRQ5	
30		PF1					
31		PF0					
32		PB7	A19		SCK12		
33		PB6	A18		RXD12/SMISO12/ SSCL12/RXD12/ CRX1	IRQ2	
34		PB5	A17		TXD12/SMOSI12/ SSDA12/TXD12/ SIOX12/CTX1		
35	PLLVC						
36		PB4	A16	POE8#/GTETRGO		IRQ3-DS	

Table 1.7 List of Pins and Pin Functions (112-Pin LQFP) (2/4)

Pin Number 112-Pin LQFP	Power Supply Clock System Control	I/O Port	Bus	Timer (MTU3, GPT, POE3, CAC)	Communications (SCIC, SCID, RSPI, RIIC, CAN)	Interrupt	S12ADB, AD, DA
38		PB0	A14	MTIOC0D	MOSIA/MOSIB		
39		PA5		MTIOC1A	RXD0/SMISO0/ SSCL0/ MISOA/MISOB		ADTRG1#
40		PA4		MTIOC1B	TXD0/SMOSI0/ SSDA0/RSPCKA/ RSPCKB		ADTRG0#
41		PA3		MTIOC2A	SCK0/SSLA0/SSLB0		
42		PA2		MTIOC2B	RXD2/SMISO2/ SSCL2/ SSLA1/SSLB1		
43		PA1		MTIOC6A	TXD2/SMOSI2/ SSDA2/SSLA2/SSLB2		
44		PA0		MTIOC6C	SCK2/SSLA3/SSLB3		
45	VCC						
46		P96	A13	POE4#	RXD1/SMISO1/SSCL1	IRQ4-DS	
47	VSS						
48		P95		MTIOC6B/ GTIOC4A	TXD1/SMOSI1/SSDA1		
49		P94		MTIOC7A/ GTIOC5A	CTS1#/RTS1#/SS1#		
50		P93		MTIOC7B/ GTIOC6A	CTS2#/RTS2#/SS2#		
51		P92		MTIOC6D/GTIOC4B			
52		P91		MTIOC7C/GTIOC5B			
53		P90		MTIOC7D/GTIOC6B			
54	TRCLK	PG5		POE12#	SCK3		ADTRG#
55	TRDATA3	PG4		GTIOC6B	RXD3/SMISO3/SSCL3	IRQ6	
56	TRDATA2	PG3		GTIOC6A	TXD3/SMOSI3/SSDA3		
57	TRDATA1	PG2			SCK2	IRQ2	
58	TRDATA0	PG1		GTIOC7B	RXD2/SMISO2/SSCL2	IRQ1	
59	TRSYNC	PG0		GTIOC7A	TXD2/SMOSI2/SSDA2	IRQ0	
60		P76	D0/[A0/D0]	MTIOC4D/GTIOC2B			
61		P75	D1/[A1/D1]	MTIOC4C/GTIOC1B			
62		P74	D2/[A2/D2]	MTIOC3D/GTIOC0B			
63		P73	D3/[A3/D3]	MTIOC4B/GTIOC2A			
64		P72	D4/[A4/D4]	MTIOC4A/GTIOC1A			
65		P71	D5/[A5/D5]	MTIOC3B/GTIOC0A			
66		P70	D6/[A6/D6]	POE0#	CTS1#/RTS1#/SS1#	IRQ5-DS	
67		P33	D7/[A7/D7]	MTIOC3A/MTCLKA	SSLA3/SSLB3		
68		P32	D8/[A8/D8]	MTIOC3C/MTCLKB	SSLA2/SSLB2		
69	VCC						
70		P31	D9/[A9/D9]	MTIOC0A/MTCLKC	SSLA1/SSLB1		
71	VSS						
72		P30	D10/[A10/ D10]	MTIOC0B/MTCLKD	SCK0/SSLA0/SSLB0		
73		P24	D11/[A11/D11]		CTS0#/RTS0#/SS0#/ RSPCKA/RSPCKB	IRQ4	

Table 4.1 List of I/O Registers (Address Order) (16/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 8330h	RIIC1	I ² C Bus Bit Rate Low-Level Register	ICBRL	8	8	2, 3 PCLKB	2 ICLK	RIIC	Not present in versions with 112, 100, 64, or 48 pins.
0008 8331h	RIIC1	I ² C Bus Bit Rate High-Level Register	ICBRH	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
0008 8332h	RIIC1	I ² C Bus Transmit Data Register	ICDRT	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
0008 8333h	RIIC1	I ² C Bus Receive Data Register	ICDRR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
0008 8380h	RSPI0	RSPI Control Register	SPCR	8	8	2, 3 PCLKB	2 ICLK	RSPI	
0008 8381h	RSPI0	RSPI Slave Select Polarity Register	SSLP	8	8	2, 3 PCLKB	2 ICLK		
0008 8382h	RSPI0	RSPI Pin Control Register	SPPCR	8	8	2, 3 PCLKB	2 ICLK		
0008 8383h	RSPI0	RSPI Status Register	SPSR	8	8	2, 3 PCLKB	2 ICLK		
0008 8384h	RSPI0	RSPI Data Register	SPDR	32	16, 32	2, 3 PCLKB	2 ICLK		
0008 8388h	RSPI0	RSPI Sequence Control Register	SPSCR	8	8	2, 3 PCLKB	2 ICLK		
0008 8389h	RSPI0	RSPI Sequence Status Register	SPSSR	8	8	2, 3 PCLKB	2 ICLK		
0008 838Ah	RSPI0	RSPI Bit Rate Register	SPBR	8	8	2, 3 PCLKB	2 ICLK		
0008 838Bh	RSPI0	RSPI Data Control Register	SPDCR	8	8	2, 3 PCLKB	2 ICLK		
0008 838Ch	RSPI0	RSPI Clock Delay Register	SPCKD	8	8	2, 3 PCLKB	2 ICLK		
0008 838Dh	RSPI0	RSPI Slave Select Negation Delay Register	SSLND	8	8	2, 3 PCLKB	2 ICLK		
0008 838Eh	RSPI0	RSPI Next-Access Delay Register	SPND	8	8	2, 3 PCLKB	2 ICLK		
0008 838Fh	RSPI0	RSPI Control Register 2	SPCR2	8	8	2, 3 PCLKB	2 ICLK		
0008 8390h	RSPI0	RSPI Command Register 0	SPCMD0	16	16	2, 3 PCLKB	2 ICLK		
0008 8392h	RSPI0	RSPI Command Register 1	SPCMD1	16	16	2, 3 PCLKB	2 ICLK		
0008 8394h	RSPI0	RSPI Command Register 2	SPCMD2	16	16	2, 3 PCLKB	2 ICLK		
0008 8396h	RSPI0	RSPI Command Register 3	SPCMD3	16	16	2, 3 PCLKB	2 ICLK		
0008 8398h	RSPI0	RSPI Command Register 4	SPCMD4	16	16	2, 3 PCLKB	2 ICLK		
0008 839Ah	RSPI0	RSPI Command Register 5	SPCMD5	16	16	2, 3 PCLKB	2 ICLK		
0008 839Ch	RSPI0	RSPI Command Register 6	SPCMD6	16	16	2, 3 PCLKB	2 ICLK		
0008 839Eh	RSPI0	RSPI Command Register 7	SPCMD7	16	16	2, 3 PCLKB	2 ICLK		
0008 83A0h	RSPI1	RSPI Control Register	SPCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83A1h	RSPI1	RSPI Slave Select Polarity Register	SSLP	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83A2h	RSPI1	RSPI Pin Control Register	SPPCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83A3h	RSPI1	RSPI Status Register	SPSR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83A4h	RSPI1	RSPI Data Register	SPDR	32	16, 32	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83A8h	RSPI1	RSPI Sequence Control Register	SPSCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83A9h	RSPI1	RSPI Sequence Status Register	SPSSR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83AAh	RSPI1	RSPI Bit Rate Register	SPBR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83ABh	RSPI1	RSPI Data Control Register	SPDCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83ACh	RSPI1	RSPI Clock Delay Register	SPCKD	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83ADh	RSPI1	RSPI Slave Select Negation Delay Register	SSLND	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83AEh	RSPI1	RSPI Next-Access Delay Register	SPND	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83AFh	RSPI1	RSPI Control Register 2	SPCR2	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 83B0h	RSPI1	RSPI Command Register 0	SPCMD0	16	16	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (23/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK $\geq$ PCLK	ICLK $<$ PCLK		
0008 C02Ah	PORTA	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK	I/O Ports	
0008 C02Bh	PORTB	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK		
0008 C02Dh	PORTD	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK		
0008 C02Eh	PORTE	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C02Fh	PORTF	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C030h	PORTG	Port Output Data Register	PODR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C040h	PORT0	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C041h	PORT1	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C042h	PORT2	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C043h	PORT3	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C044h	PORT4	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C045h	PORT5	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C046h	PORT6	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C047h	PORT7	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C048h	PORT8	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C049h	PORT9	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C04Ah	PORTA	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C04Bh	PORTB	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C04Ch	PORTC	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64, or 48 pins.
0008 C04Dh	PORTD	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C04Eh	PORTE	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		
0008 C04Fh	PORTF	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C050h	PORTG	Port Input Data Register	PIDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C060h	PORT0	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C061h	PORT1	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C062h	PORT2	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C063h	PORT3	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C067h	PORT7	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C068h	PORT8	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C069h	PORT9	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C06Ah	PORTA	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C06Bh	PORTB	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C06Dh	PORTD	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C06Eh	PORTE	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		
0008 C06Fh	PORTF	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C070h	PORTG	Port Mode Register	PMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C080h	PORT0	Open Drain Control Register 0	ODR0	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64 or 48 pins.
0008 C084h	PORT2	Open Drain Control Register 0	ODR0	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C085h	PORT2	Open Drain Control Register 1	ODR1	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 112 or 100 pins.

Table 4.1 List of I/O Registers (Address Order) (29/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0009 1840h	CAN1	Control Register	CTLR	16	8, 16	2, 3 PCLKB	2 ICLK	CAN	Not present in versions with 64 or 48 pins.
0009 1842h	CAN1	Status Register	STR	16	8, 16	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1844h	CAN1	Bit Configuration Register	BCR	32	8, 16, 32	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1848h	CAN1	Receive FIFO Control Register	RFCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1849h	CAN1	Receive FIFO Pointer Control Register	RFPCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 184Ah	CAN1	Transmit FIFO Control Register	TFCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 184Bh	CAN1	Transmit FIFO Pointer Control Register	TFPCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 184Ch	CAN1	Error Interrupt Enable Register	EIER	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 184Dh	CAN1	Error Interrupt Factor Judge Register	EIFR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 184Eh	CAN1	Receive Error Count Register	RECR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 184Fh	CAN1	Transmit Error Count Register	TECR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1850h	CAN1	Error Code Store Register	ECSR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1851h	CAN1	Channel Search Support Register	CSSR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1852h	CAN1	Mailbox Search Status Register	MSSR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1853h	CAN1	Mailbox Search Mode Register	MSMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1854h	CAN1	Time Stamp Register	TSR	16	8, 16	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1856h	CAN1	Acceptance Filter Support Register	AFSR	16	8, 16	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0009 1858h	CAN1	Test Control Register	TCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
000A 0000h	USB0	System Configuration Control Register	SYSCFG	16	16	3, 4 PCLKB	2, 3 ICLK	USBa	Not present in versions with 112, 100, 64, or 48 pins.
000A 0004h	USB0	System Configuration Status Register 0	SYSSTS0	16	16	9 PCLKB or more			Not present in versions with 112, 100, 64, or 48 pins.
000A 0008h	USB0	Device State Control Register 0	DVSTCTR0	16	16	9 PCLKB or more			Not present in versions with 112, 100, 64, or 48 pins.
000A 0014h	USB0	CFIFO Port Register	CFIFO	16	8, 16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 0018h	USB0	D0FIFO Port Register	D0FIFO	16	8, 16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 001Ch	USB0	D1FIFO Port Register	D1FIFO	16	8, 16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 0020h	USB0	CFIFO Port Select Register	CFIFOSEL	16	16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 0022h	USB0	CFIFO Port Control Register	CFIFOCTR	16	16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 0028h	USB0	D0FIFO Port Select Register	D0FIFOSEL	16	16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 002Ah	USB0	D0FIFO Port Control Register	D0FIFOCTR	16	16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
000A 002Ch	USB0	D1FIFO Port Select Register	D1FIFOSEL	16	16	3, 4 PCLKB	2, 3 ICLK		Not present in versions with 112, 100, 64, or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (37/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
000C 2006h	GPT	General PWM Timer Hardware Source Clear Control Register	GTHCCR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK	GPT	
000C 2008h	GPT	General PWM Timer Hardware Start Source Select Register	GTHSSR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 200Ah	GPT	General PWM Timer Hardware Stop/Clear Source Select Register	GTHPSR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 200Ch	GPT	General PWM Timer Write-Protection Register	GTWP	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 200Eh	GPT	General PWM Timer Sync Register	GTSYNC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2010h	GPT	General PWM Timer External Trigger Input Interrupt Register	GTETINT	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2014h	GPT	General PWM Timer Buffer Operation Disable Register	GTBDR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2018h	GPT	General PWM Timer Start Write-Protection Register	GTSWP	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2080h	GPT	LOCO Count Control Register	LCCR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2082h	GPT	LOCO Count Status Register	LCST	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2084h	GPT	LOCO Count Value Register	LCNT	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2086h	GPT	LOCO Count Result Average Register	LCNTA	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2088h	GPT	LOCO Count Result Register 0	LCNT00	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 208Ah	GPT	LOCO Count Result Register 1	LCNT01	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 208Ch	GPT	LOCO Count Result Register 2	LCNT02	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 208Eh	GPT	LOCO Count Result Register 3	LCNT03	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2090h	GPT	LOCO Count Result Register 4	LCNT04	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2092h	GPT	LOCO Count Result Register 5	LCNT05	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2094h	GPT	LOCO Count Result Register 6	LCNT06	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2096h	GPT	LOCO Count Result Register 7	LCNT07	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2098h	GPT	LOCO Count Result Register 8	LCNT08	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 209Ah	GPT	LOCO Count Result Register 9	LCNT09	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 209Ch	GPT	LOCO Count Result Register 10	LCNT10	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 209Eh	GPT	LOCO Count Result Register 11	LCNT11	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 20A0h	GPT	LOCO Count Result Register 12	LCNT12	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 20A2h	GPT	LOCO Count Result Register 13	LCNT13	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 20A4h	GPT	LOCO Count Result Register 14	LCNT14	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 20A6h	GPT	LOCO Count Result Register 15	LCNT15	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 20A8h	GPT	LOCO Count Upper Permissible Deviation Register	LCNTDU	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 20AAh	GPT	LOCO Count Lower Permissible Deviation Register	LCNTDL	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2100h	GPT0	General PWM Timer I/O Control Register	GTIOR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2102h	GPT0	General PWM Timer Interrupt Output Setting Register	GTINTAD	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2104h	GPT0	General PWM Timer Control Register	GTCR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2106h	GPT0	General PWM Timer Buffer Enable Register	GTBER	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2108h	GPT0	General PWM Timer Count Direction Register	GTUDC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 210Ah	GPT0	General PWM Timer Interrupt, A/D Converter Start Request Skipping Setting Register	GTITC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 210Ch	GPT0	General PWM Timer Status Register	GTST	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 210Eh	GPT0	General PWM Timer Counter	GTCNT	16	16	2 to 5 PCLKA	2, 3 ICLK		
000C 2110h	GPT0	General PWM Timer Compare Capture Register A	GTCCRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2112h	GPT0	General PWM Timer Compare Capture Register B	GTCCRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2114h	GPT0	General PWM Timer Compare Capture Register C	GTCCRC	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2116h	GPT0	General PWM Timer Compare Capture Register D	GTCCRD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2118h	GPT0	General PWM Timer Compare Capture Register E	GTCCRE	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		

Table 4.1 List of I/O Registers (Address Order) (44/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK $\geq$ PCLK	ICLK $<$ PCLK		
000C 299Eh	GPT5	General PWM Timer Cycle Setting Buffer Register	GTPBR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK	GPT	Not present in versions with 64 or 48 pins.
000C 29A0h	GPT5	General PWM Timer Cycle Setting Double-Buffer Register	GTPDBR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29A4h	GPT5	A/D Converter Start Request Timing Register A	GTADTRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29A6h	GPT5	A/D Converter Start Request Timing Buffer Register A	GTADTBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29A8h	GPT5	A/D Converter Start Request Timing Double-Buffer Register A	GTADTDBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29ACh	GPT5	A/D Converter Start Request Timing Register B	GTADTRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29AEh	GPT5	A/D Converter Start Request Timing Buffer Register B	GTADTBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29B0h	GPT5	A/D Converter Start Request Timing Double-Buffer Register B	GTADTDBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29B4h	GPT5	General PWM Timer Output Negate Control Register	GTONCR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29B6h	GPT5	General PWM Timer Dead Time Control Register	GTDTCR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29B8h	GPT5	General PWM Timer Dead Time Value Register U	GTDVU	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29BAh	GPT5	General PWM Timer Dead Time Value Register D	GTDVD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29BCh	GPT5	General PWM Timer Dead Time Buffer Register U	GTDBU	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29BEh	GPT5	General PWM Timer Dead Time Buffer Register D	GTDBD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29C0h	GPT5	General PWM Timer Output Protection Function Status Register	GTSOS	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 29C2h	GPT5	General PWM Timer Output Protection Function Temporary Release Register	GTSOTR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A00h	GPT6	General PWM Timer I/O Control Register	GTIOR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A02h	GPT6	General PWM Timer Interrupt Output Setting Register	GTINTAD	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A04h	GPT6	General PWM Timer Control Register	GTCR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A06h	GPT6	General PWM Timer Buffer Enable Register	GTBER	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A08h	GPT6	General PWM Timer Count Direction Register	GTUDC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A0Ah	GPT6	General PWM Timer Interrupt, A/D Converter Start Request Skipping Setting Register	GTITC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A0Ch	GPT6	General PWM Timer Status Register	GTST	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A0Eh	GPT6	General PWM Timer Counter	GTCNT	16	16	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A10h	GPT6	General PWM Timer Compare Capture Register A	GTCCRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A12h	GPT6	General PWM Timer Compare Capture Register B	GTCCRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A14h	GPT6	General PWM Timer Compare Capture Register C	GTCCRC	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A16h	GPT6	General PWM Timer Compare Capture Register D	GTCCRD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A18h	GPT6	General PWM Timer Compare Capture Register E	GTCCRE	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A1Ah	GPT6	General PWM Timer Compare Capture Register F	GTCCRF	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A1Ch	GPT6	General PWM Timer Cycle Setting Register	GTPR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A1Eh	GPT6	General PWM Timer Cycle Setting Buffer Register	GTPBR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2A20h	GPT6	General PWM Timer Cycle Setting Double-Buffer Register	GTPDBR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (46/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK $\geq$ PCLK	ICLK $<$ PCLK		
000C 2AA8h	GPT7	A/D Converter Start Request Timing Double-Buffer Register A	GTADTDBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK	GPT	Not present in versions with 64 or 48 pins.
000C 2AACh	GPT7	A/D Converter Start Request Timing Register B	GTADTRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AAEh	GPT7	A/D Converter Start Request Timing Buffer Register B	GTADTBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AB0h	GPT7	A/D Converter Start Request Timing Double-Buffer Register B	GTADTDBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AB4h	GPT7	General PWM Timer Output Negate Control Register	GTONCR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AB6h	GPT7	General PWM Timer Dead Time Control Register	GTDTCR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AB8h	GPT7	General PWM Timer Dead Time Value Register U	GTDVU	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2ABAh	GPT7	General PWM Timer Dead Time Value Register D	GTDVD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2ABCh	GPT7	General PWM Timer Dead Time Buffer Register U	GTDBU	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2ABEh	GPT7	General PWM Timer Dead Time Buffer Register D	GTDBD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AC0h	GPT7	General PWM Timer Output Protection Function Status Register	GTSOS	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C 2AC2h	GPT7	General PWM Timer Output Protection Function Temporary Release Register	GTSOTR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3002h	DPC	Software Start Setting Register 0	SOFTSTART 0	16	16	3 to 5 PCLKA	2, 3 ICLK	DPC	Not present in versions with 64 or 48 pins.
000C3006h	DPC	Software Start Setting Register 1	SOFTSTART 1	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C300Ah	DPC	Software Start Setting Register 2	SOFTSTART 2	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C300Eh	DPC	Software Start Setting Register 3	SOFTSTART 3	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3012h	DPC	Reference Value Setting Register 0	VOTARGET 0	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3016h	DPC	Reference Value Setting Register 1	VOTARGET 1	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C301Ah	DPC	Reference Value Setting Register 2	VOTARGET 2	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C301Eh	DPC	Reference Value Setting Register 3	VOTARGET 3	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3022h	DPC	Reference Value Select Register	REFSEL	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3026h	DPC	PWM Channel Setting Register	CHLSEL	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C302Ah	DPC	Control Enable Setting Register	ENABLE	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C302Eh	DPC	Control Calculation Parameter Setting Register KP0	PARAMKP0	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3032h	DPC	Control Calculation Parameter Setting Register KI0	PARAMKI0	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3036h	DPC	Control Calculation Parameter Setting Register KQ0	PARAMKQ0	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C303Ah	DPC	Control Calculation Parameter Setting Register KF0	PARAMKF0	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C303Eh	DPC	Control Calculation Parameter Setting Register KP1	PARAMKP1	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3042h	DPC	Control Calculation Parameter Setting Register KI1	PARAMKI1	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3046h	DPC	Control Calculation Parameter Setting Register KQ1	PARAMKQ1	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C304Ah	DPC	Control Calculation Parameter Setting Register KF1	PARAMKF1	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C304Eh	DPC	Control Calculation Parameter Setting Register KP2	PARAMKP2	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.
000C3052h	DPC	Control Calculation Parameter Setting Register KI2	PARAMKI2	16	16	3 to 5 PCLKA	2, 3 ICLK		Not present in versions with 64 or 48 pins.

Table 5.3 DC Characteristics (2)

Note: Common standard values for conditions not given in the table are listed as "Condition 1" to "Condition 3" below.

Condition 1: VCC = PLLVCC = VCC_USB = 2.7 to 3.6 V, VSS = PLLVSS = VSS_USB = AVSS0 = AVSS = VREFL0 = 0 V
AVCC0 = AVCC = VREF = 3.0 to 3.6 V, VREFH0 = 3.0 V to AVCC0

Condition 2: VCC = PLLVCC = VCC_USB = 2.7 to 3.6 V, VSS = PLLVSS = VSS_USB = AVSS0 = AVSS = VREFL0 = 0 V
AVCC0 = AVCC = VREF = 4.0 to 5.5 V, VREFH0 = 4.0 V to AVCC0

Condition 3: VCC = PLLVCC = 4.0 to 5.5 V, VCC_USB = 3.0 to 3.6 V, VSS = PLLVSS = VSS_USB = AVSS0 = AVSS = VREFL0 = 0 V
AVCC0 = AVCC = VREF = 4.0 to 5.5 V, VREFH0 = 4.0 V to AVCC0

The following relation applies when the USB is in use under condition 1 or condition 2: Vcc = PLLVcc = Vcc_USB = 3.0 to 3.6 V.

T_a = T_{opr}. T_a is common to conditions 1 to 3.

Item		Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Output high voltage	All output pins (except for P52, P53, P60 to P65, P71 to P76, P90 to P95, and USB0_DPUPE)	V _{OH}	VCC – 0.5	—	—	V	I _{OH} = –1 mA
	P52, P53, and P60 to P65		AVCC – 0.5	—	—		I _{OH} = –1 mA
	USB0_DPUPE		VCC_USB – 0.5				I _{OH} = –1 mA
	P71 to P76, and P90 to P95		VCC – 1.0	—	—		I _{OH} = –5 mA
Output low voltage	All output pins (except for P71 to P76, P90 to P95, and RIIC pins)	V _{OL}	—	—	0.5	V	I _{OL} = 1.0 mA
	P71 to P76, and P90 to P95		—	—	1.1		I _{OL} = 15 mA
	RIIC pins		—	—	0.4		I _{OL} = 3 mA
			—	—	0.6		I _{OL} = 6 mA
Input leakage current	RES#, MD pin, EMLE, Port 4, Ports P50, P51, P54 to P57, and Port C	I _{in}	—	—	1.0	μA	V _{in} = 0 V, V _{in} = VCC
Three-state leakage current (off state)	Port 0, Port 1, Ports P20 to P24, Port 3, Ports P52, P53, Ports 6 to A, Ports PB0, PB3 to PB7, and Ports D to G	I _{TSI}	—	—	1.0	μA	V _{in} = 0 V, V _{in} = VCC
	Ports P25, P26, PB1, and PB2		—	—	5.0		
Input capacitance	All output pins (except for P25, P26, PB1, and PB2)	C _{in}	—	—	15	pF	V _{in} = 0 V, f = 1 MHz, T _a = 25 °C
	Ports P25, P26, PB1, and PB2		—	—	30		

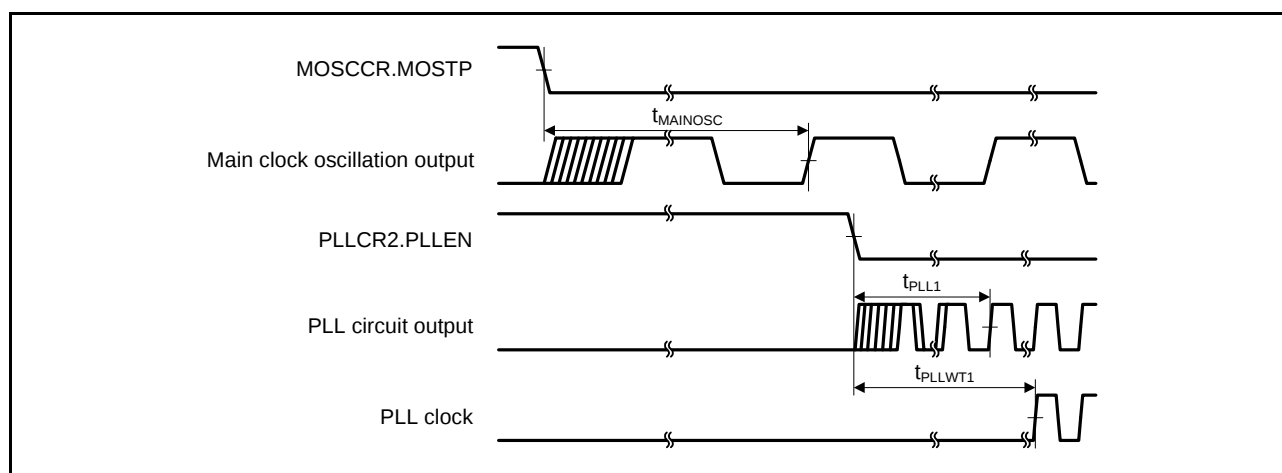


Figure 5.7 PLL Clock Oscillation Start Timing (PLL is Operated after Main Clock Oscillation Has Settled)

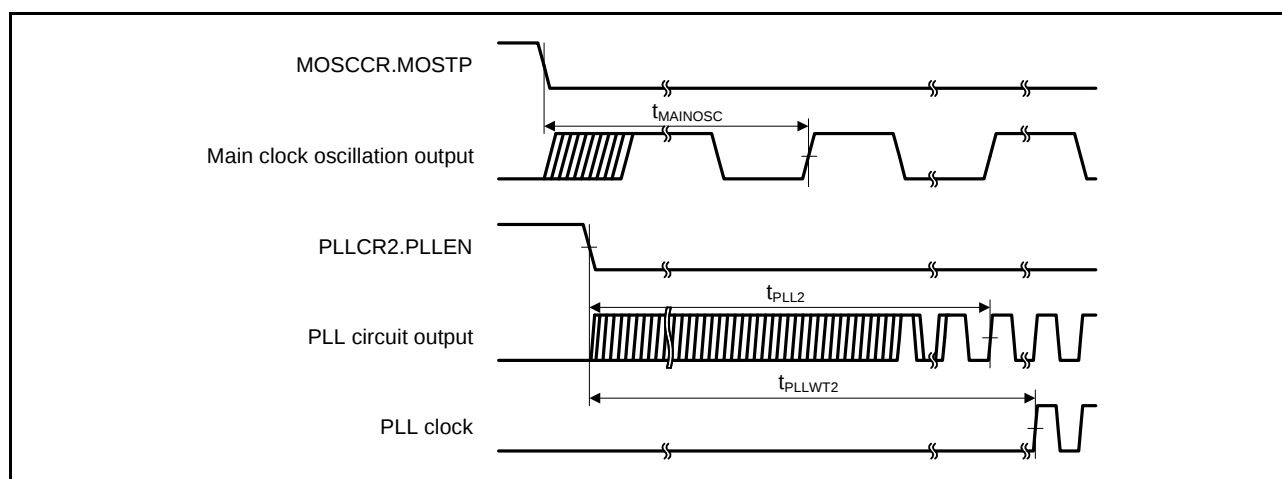
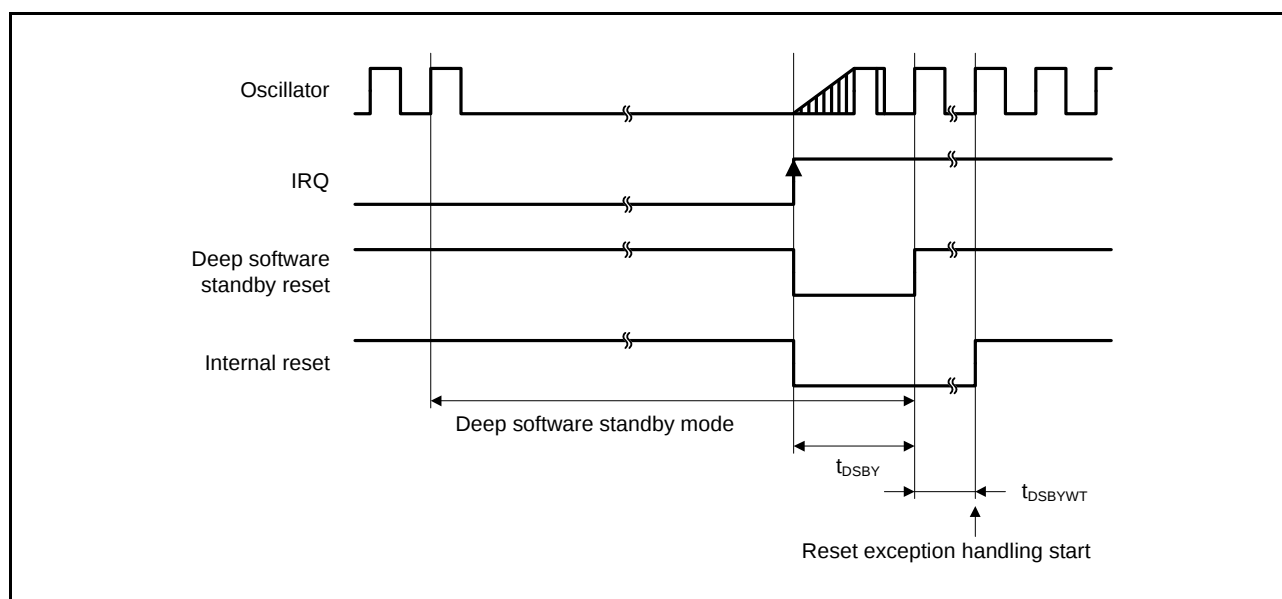


Figure 5.8 PLL Clock Oscillation Start Timing (PLL is Operated before Main Clock Oscillation Has Settled)

**Figure 5.10 Deep Software Standby Mode Cancellation Timing**

6.3.2 Reset Timing

Table 6.8 Reset Timing

Conditions: $V_{CC} = 2.7$ to 3.6 V, $V_{SS} = AV_{SS0} = V_{REFL0} = 0$ V,
 $AV_{CC0} = 3.0$ to 3.6 V, $V_{REFH0} = 3.0$ V to AV_{CC0} ,
 $T_a = T_{opr}$

Item		Symbol	Min	Typ	Max.	Unit	Test Conditions
RES# pulse width	Power-on	t_{RESWP}	2	—	—	ms	Figure 6.6
	Deep software standby mode	t_{RESWD}	1	—	—	ms	Figure 6.7
	Software standby mode	t_{RESWS}	1	—	—	ms	
	Other than above (except for programming or erasure of the ROM or E2 DataFlash memory or blank checking of the E2 DataFlash memory)	t_{RESW}	200	—	—	μ s	
Wait time after RES# cancellation		t_{RESWT}	59	—	60	t_{cyc}	
Internal reset time (independent watchdog timer reset, watchdog timer reset, software reset)		t_{RESW2}	112	—	120	t_{cyc}	

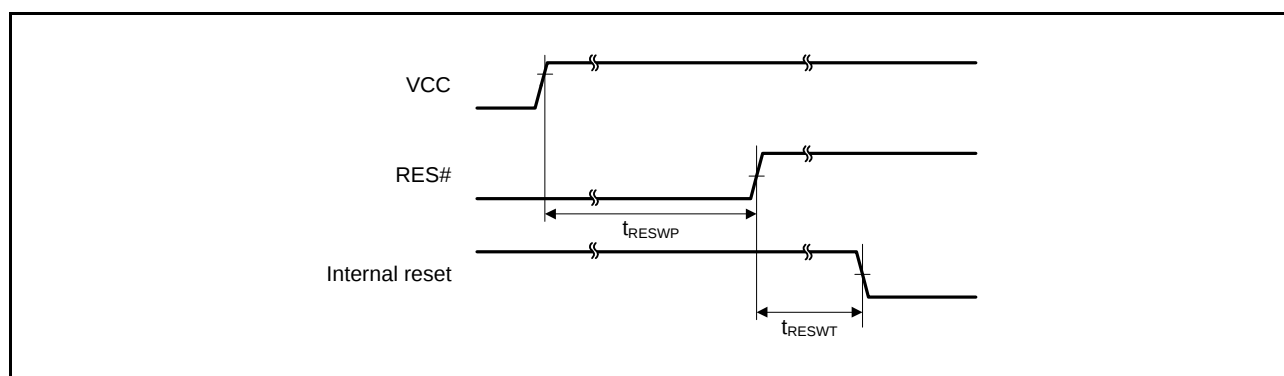
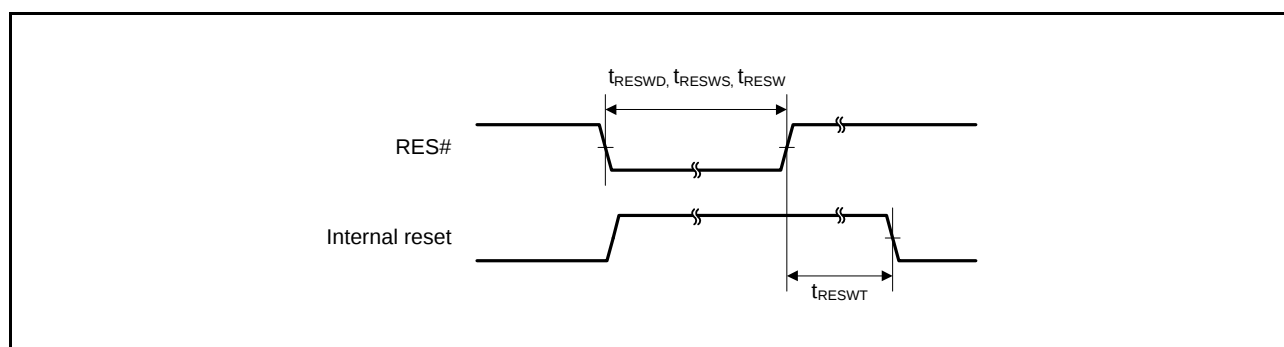

Figure 6.6 Reset Input Timing at Power-On

Figure 6.7 Reset Input Timing

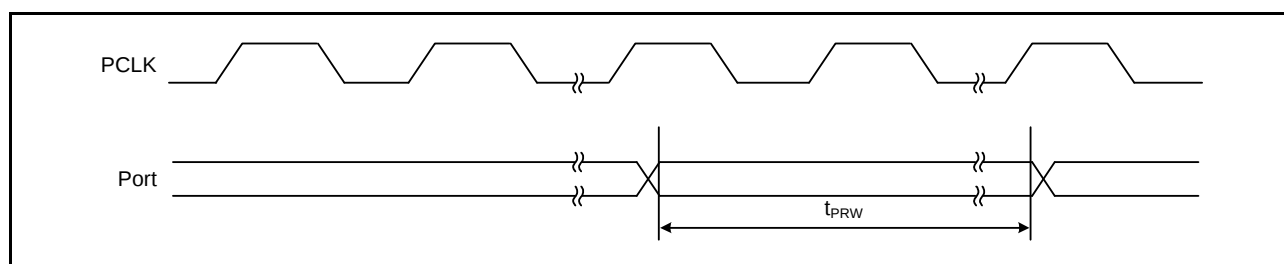
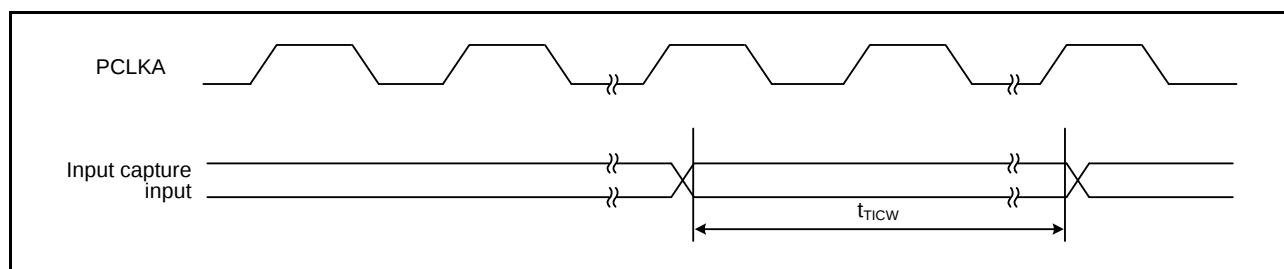
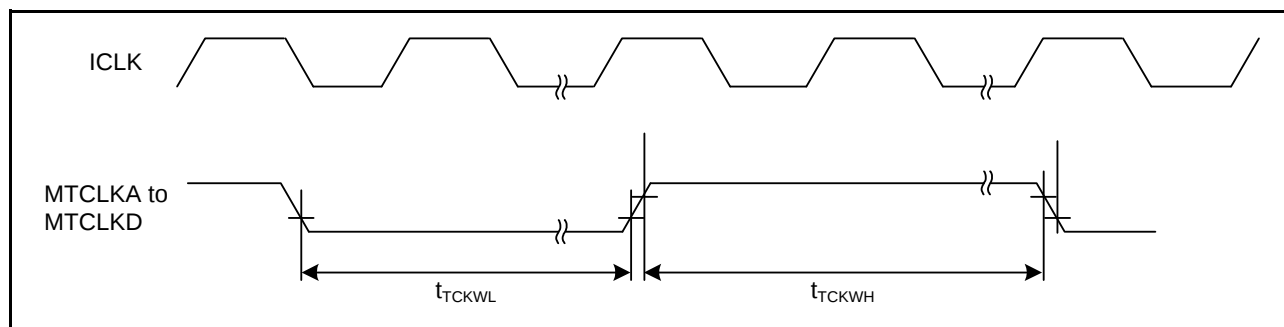
Table 6.15 Timing of On-Chip Peripheral Modules (5)

Conditions: $V_{CC} = 2.7$ to 3.6 V, $V_{SS} = AVSS0 = VREFL0 = 0$ V,
 $AVCC0 = 3.0$ to 3.6 V, $VREFH0 = 3.0$ V to $AVCC0$,
 $T_a = T_{opr}$

	Item	Symbol	Min.*1, *2	Max.	Unit	Test Conditions
Simple IIC (Standard-mode)	SCL, SDA input rise time	t_{Sr}	—	1000	ns	Figure 6.25
	SCL, SDA input fall time	t_{Sf}	—	300	ns	
	SCL, SDA input spike pulse removal time	t_{SP}	0	$4 \times t_{IICcyc}$	ns	
	Data input setup time	t_{SDAS}	250	—	ns	
	Data input hold time	t_{SDAH}	0	—	ns	
	SCL, SDA capacitive load	C_b	—	400	pF	
Simple IIC (Fast-mode)	SCL, SDA input rise time	t_{Sr}	$20 + 0.1C_b$	300	ns	
	SCL, SDA input fall time	t_{Sf}	$20 + 0.1C_b$	300	ns	
	SCL, SDA input spike pulse removal time	t_{SP}	0	$4 \times t_{IICcyc}$	ns	
	Data input setup time	t_{SDAS}	100	—	ns	
	Data input hold time	t_{SDAH}	0	—	ns	
	SCL, SDA capacitive load	C_b	—	400	pF	

Note 1. The value in parentheses is used when ICMR3.NF[1:0] are set to 11b while a digital filter is enabled with ICFER.NFE = 1.

Note 2. C_b indicates the total capacity of the bus line.

**Figure 6.12 I/O port Input Timing****Figure 6.13 MTU3 Input/Output Timing****Figure 6.14 MTU3 Clock Input Timing**

6.4 A/D Conversion Characteristics

Table 6.16 12-Bit A/D Conversion Characteristics

Conditions: $V_{CC} = 2.7$ to 3.6 V, $V_{SS} = AV_{SS0} = V_{REFL0} = 0$ V,
 $AV_{CC0} = 3.0$ to 3.6 V, $V_{REFH0} = 3.0$ V to AV_{CC0} ,
 $T_a = T_{opr}$

Item		min	typ	max	Unit	Test Conditions
Resolution		12	12	12	Bit	
Conversion time *1 (ADCLK = 50 MHz)	When the sample-and-hold circuit is in use per pin	1.6	—	—	μs	Sampling by the sample-and-hold circuit in 30 states. Sampling by the A/D converter in 20 states.
	When the sample-and-hold circuit is not in use per pin	1.0	—	—	μs	Sampling by the A/D converter in 20 states.
Analog input capacitance		—	—	6	pF	
Integral nonlinearity error		—	—	±4.0	LSB	
Offset error		—	—	±7.5	LSB	
Full-scale error		—	—	±7.5	LSB	
Quantization error		—	±0.5	—	LSB	
Absolute accuracy	Sample and hold circuit in use	—	—	±8.0	LSB	$AV_{in} = 0.25$ to $AV_{REFH} - 0.25$
	Sample and hold circuit not in use	—	—	±8.0	LSB	$AV_{in} = AV_{REFL}$ to AV_{REFH}
Permissible signal source impedance		—	—	3.0	kΩ	

Note 1. The conversion time includes the sampling time and the comparison time. As the test conditions, the number of sampling states is indicated.

Table 6.17 Comparator Characteristics

Conditions: $V_{CC} = 2.7$ to 3.6 V, $V_{SS} = AV_{SS0} = V_{REFL0} = 0$ V,
 $AV_{CC0} = 3.0$ to 3.6 V, $V_{REFH0} = 3.0$ V to AV_{CC0} ,
 $T_a = T_{opr}$

Item	Symbol	Min	Typ	Max.	Unit	Test Conditions
Analog input capacitance	Cin	—	—	6	pF	
REFH pin offset voltage	Voff	—	—	5	mV	
REFL pin offset voltage		—	—	5	mV	
REFH input voltage range	Vin	1.7	—	$AV_{cc} - 0.3$	V	
REFL input voltage range		0.3	—	$AV_{cc} - 1.7$	V	
REFH reply time	tCR	—	—	0.5	μs	
REFL reply time	tCF	—	—	0.5	μs	