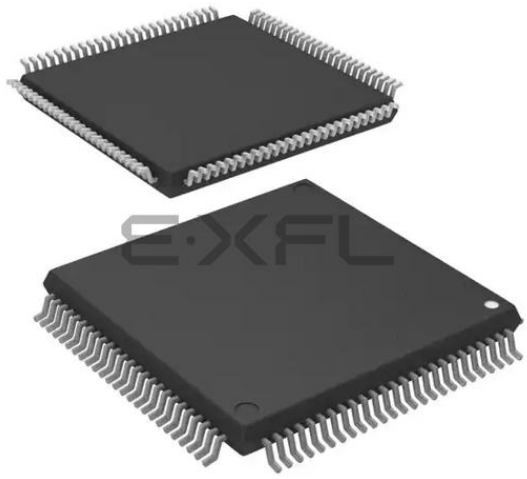
Renesas Electronics America Inc - R5F563TBADFP#V1 Datasheet



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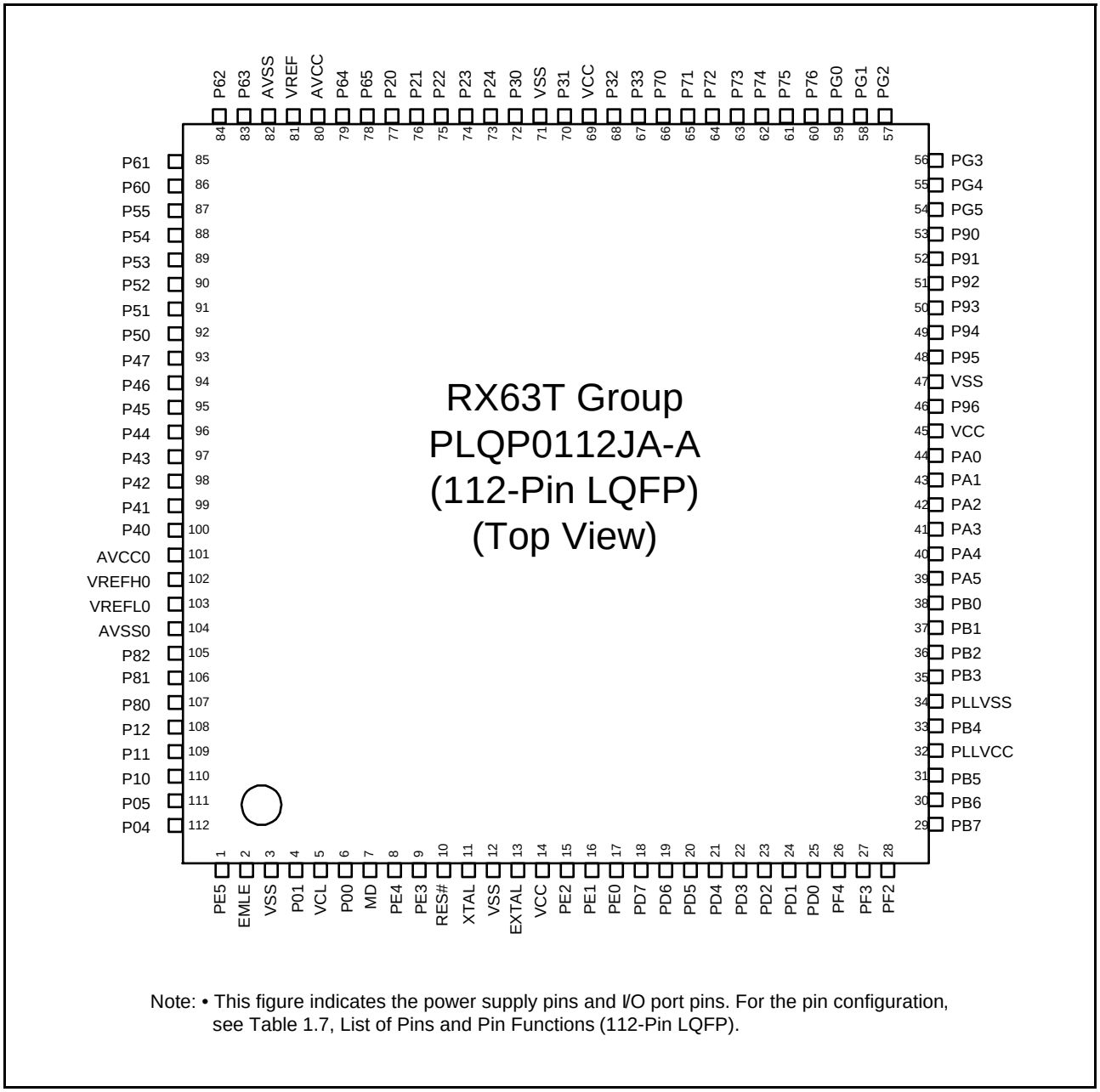
Applications of "Embedded - Microcontrollers"

Details	
Product Status	Not For New Designs
Core Processor	RX
Core Size	32-Bit Single-Core
Speed	100MHz
Connectivity	CANbus, EBI/EMI, I²C, LINbus, SCI, SPI, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	57
Program Memory Size	256KB (256K x 8)
Program Memory Type	FLASH
EEPROM Size	32K x 8
RAM Size	24K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
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	100-LQFP
Supplier Device Package	100-LFQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f563tbadfp-v1

Table 1.4 Pin Functions (3/5)

Classifications	Pin Name	I/O	Description
Serial communications interface (SCIc)	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^2C mode		
	SSCL0, SSCL1, SSCL2, SSCL3	I/O	Input/output pins for the I^2C clock
	SSDA0, SSDA1, SSDA2, SSDA3	I/O	Input/output pins for the I^2C 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 (SCId)	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^2C mode		
	SSCL12	I/O	Input/output pins for the I^2C clock
	SSDA12	I/O	Input/output pins for the I^2C 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		
	RXDX12	Input	Input pin for receive data
	TXDX12	Output	Output pin for transmit data
	SIOX12	I/O	Input/output pin for transfer data
I^2C 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.



Note: • This figure indicates the power supply pins and I/O port pins. For the pin configuration, see Table 1.7, List of Pins and Pin Functions (112-Pin LQFP).

Figure 1.5 Pin Assignment (112-Pin LQFP)

- Longword-size I/O registers

```
MOV.L  #SFR_ADDR, R1
MOV.L  #SFR_DATA, [R1]
CMP    [R1].L, R1
;; Next process
```

If multiple registers are written to and a subsequent instruction should be executed after the write operations are entirely completed, only read the I/O register that was last written to and execute the operation using the value; it is not necessary to read or execute operation for all the registers that were written to.

(3) Number of Access Cycles to I/O Registers

For the number of I/O register access cycles, refer to Table 4.1, List of I/O Registers (Address Order).
The number of access cycles to I/O registers is obtained by following equation.*1

Number of access cycles to I/O registers = Number of bus cycles for internal main bus 1 +
Number of divided clock synchronization cycles +
Number of bus cycles for internal peripheral bus 1 to 6

The number of bus cycles of internal peripheral bus 1 to 6 differs according to the register to be accessed.
When peripheral functions connected to internal peripheral bus 2 to 6 are accessed, the number of divided clock synchronization cycles is added.
The number of divided clock synchronization cycles differs depending on the frequency ratio between ICLK and PCLK (or FCLK, BCLK) or bus access timing.
In the peripheral function unit, when the frequency ratio of ICLK is equal to or greater than that of PCLK (or FCLK), the sum of the number of bus cycles for internal main bus 1 and the number of the divided clock synchronization cycles will be one cycle of PCLK (or FCLK) at a maximum. Therefore, one PCLK (or FCLK) has been added to the number of access states shown in Table 4.1.
When the frequency ratio of ICLK is lower than that of PCLK (or FCLK), the subsequent bus access is started from the ICLK cycle following the completion of the access to the peripheral functions. Therefore, the access cycles are described on an ICLK basis.
In the external bus control unit, the sum of the number of bus cycles for internal main bus 1 and the number of divided clock synchronization cycles will be one cycle of BCLK at a maximum. Therefore, one BCLK is added to the number of access cycles shown in Table 4.1.

Note 1. This applies to the number of cycles when the access from the CPU does not conflict with the instruction fetching to the external memory or bus access from the different bus master (DMAC or DTC).

(4) Note on Sleep Mode and Mode Transition

During sleep mode or a mode transition, do not write to the system control related registers (indicated by 'SYSTEM' in the Module Symbol column in Table 4.1, List of I/O Registers (Address Order)).

Table 4.1 List of I/O Registers (Address Order) (3/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 3024h	BSC	CS2 Wait Control Register 1	CS2WCR1	32	32	1, 2 BCLK		Buses	Not present in versions with 64 or 48 pins.
0008 3028h	BSC	CS2 Wait Control Register 2	CS2WCR2	32	32	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3032h	BSC	CS3 Mode Register	CS3MOD	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3034h	BSC	CS3 Wait Control Register 1	CS3WCR1	32	32	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3038h	BSC	CS3 Wait Control Register 2	CS3WCR2	32	32	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3802h	BSC	CS0 Control Register	CS0CR	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 380Ah	BSC	CS0 Recovery Cycle Register	CS0REC	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3812h	BSC	CS1 Control Register	CS1CR	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 381Ah	BSC	CS1 Recovery Cycle Register	CS1REC	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3822h	BSC	CS2 Control Register	CS2CR	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 382Ah	BSC	CS2 Recovery Cycle Register	CS2REC	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3832h	BSC	CS3 Control Register	CS3CR	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 383Ah	BSC	CS3 Recovery Cycle Register	CS3REC	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 3880h	BSC	CS Recovery Cycle Insertion Enable Register	CSRECEN	16	16	1, 2 BCLK			Not present in versions with 64 or 48 pins.
0008 6400h	MPU	Region-0 Start Page Number Register	RSPAGE0	32	32	1 ICLK		MPU	
0008 6404h	MPU	Region-0 End Page Number Register	REPAGE0	32	32	1 ICLK			
0008 6408h	MPU	Region-1 Start Page Number Register	RSPAGE1	32	32	1 ICLK			
0008 640Ch	MPU	Region-1 End Page Number Register	REPAGE1	32	32	1 ICLK			
0008 6410h	MPU	Region-2 Start Page Number Register	RSPAGE2	32	32	1 ICLK			
0008 6414h	MPU	Region-2 End Page Number Register	REPAGE2	32	32	1 ICLK			
0008 6418h	MPU	Region-3 Start Page Number Register	RSPAGE3	32	32	1 ICLK			
0008 641Ch	MPU	Region-3 End Page Number Register	REPAGE3	32	32	1 ICLK			
0008 6420h	MPU	Region-4 Start Page Number Register	RSPAGE4	32	32	1 ICLK			
0008 6424h	MPU	Region-4 End Page Number Register	REPAGE4	32	32	1 ICLK			
0008 6428h	MPU	Region-5 Start Page Number Register	RSPAGE5	32	32	1 ICLK			
0008 642Ch	MPU	Region-5 End Page Number Register	REPAGE5	32	32	1 ICLK			
0008 6430h	MPU	Region-6 Start Page Number Register	RSPAGE6	32	32	1 ICLK			
0008 6434h	MPU	Region-6 End Page Number Register	REPAGE6	32	32	1 ICLK			
0008 6438h	MPU	Region-7 Start Page Number Register	RSPAGE7	32	32	1 ICLK			
0008 643Ch	MPU	Region-7 End Page Number Register	REPAGE7	32	32	1 ICLK			
0008 6500h	MPU	Memory-Protection Enable Register	MPEN	32	32	1 ICLK			
0008 6504h	MPU	Background Access Control Register	MPBAC	32	32	1 ICLK			
0008 6508h	MPU	Memory-Protection Error Status-Clearing Register	MPECLR	32	32	1 ICLK			
0008 650Ch	MPU	Memory-Protection Error Status Register	MPESTS	32	32	1 ICLK			
0008 6514h	MPU	Data Memory-Protection Error Address Register	MPDEA	32	32	1 ICLK			
0008 6520h	MPU	Region Search Address Register	MPSA	32	32	1 ICLK			
0008 6524h	MPU	Region Search Operation Register	MPOPS	16	16	1 ICLK			
0008 6526h	MPU	Region Invalidation Operation Register	MPOPI	16	16	1 ICLK			
0008 6528h	MPU	Instruction-Hit Region Register	MHITI	32	32	1 ICLK			
0008 652Ch	MPU	Data-Hit Region Register	MHITD	32	32	1 ICLK			

Table 4.1 List of I/O Registers (Address Order) (4/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 7010h	ICU	Interrupt Request Register 016	IR016	8	8	2 ICLK		ICUb	
0008 7015h	ICU	Interrupt Request Register 021	IR021	8	8	2 ICLK			
0008 7017h	ICU	Interrupt Request Register 023	IR023	8	8	2 ICLK			
0008 701Bh	ICU	Interrupt Request Register 027	IR027	8	8	2 ICLK			
0008 701Ch	ICU	Interrupt Request Register 028	IR028	8	8	2 ICLK			
0008 701Dh	ICU	Interrupt Request Register 029	IR029	8	8	2 ICLK			
0008 701Eh	ICU	Interrupt Request Register 030	IR030	8	8	2 ICLK			
0008 701Fh	ICU	Interrupt Request Register 031	IR031	8	8	2 ICLK			
0008 7021h	ICU	Interrupt Request Register 033	IR033	8	8	2 ICLK			Not present in versions with 112, 100, 64 or 48 pins.
0008 7022h	ICU	Interrupt Request Register 034	IR034	8	8	2 ICLK			Not present in versions with 112, 100, 64 or 48 pins.
0008 7023h	ICU	Interrupt Request Register 035	IR035	8	8	2 ICLK			Not present in versions with 112, 100, 64 or 48 pins.
0008 7024h	ICU	Interrupt Request Register 036	IR036	8	8	2 ICLK			
0008 7025h	ICU	Interrupt Request Register 037	IR037	8	8	2 ICLK			
0008 7026h	ICU	Interrupt Request Register 038	IR038	8	8	2 ICLK			
0008 7027h	ICU	Interrupt Request Register 039	IR039	8	8	2 ICLK			
0008 7028h	ICU	Interrupt Request Register 040	IR040	8	8	2 ICLK			
0008 7029h	ICU	Interrupt Request Register 041	IR041	8	8	2 ICLK			
0008 702Ah	ICU	Interrupt Request Register 042	IR042	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 702Bh	ICU	Interrupt Request Register 043	IR043	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 702Ch	ICU	Interrupt Request Register 044	IR044	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 702Dh	ICU	Interrupt Request Register 045	IR045	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 702Eh	ICU	Interrupt Request Register 046	IR046	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 702Fh	ICU	Interrupt Request Register 047	IR047	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7030h	ICU	Interrupt Request Register 048	IR048	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7031h	ICU	Interrupt Request Register 049	IR049	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7032h	ICU	Interrupt Request Register 050	IR050	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7033h	ICU	Interrupt Request Register 051	IR051	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7034h	ICU	Interrupt Request Register 052	IR052	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7035h	ICU	Interrupt Request Register 053	IR053	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7036h	ICU	Interrupt Request Register 054	IR054	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7037h	ICU	Interrupt Request Register 055	IR055	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7038h	ICU	Interrupt Request Register 056	IR056	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 7039h	ICU	Interrupt Request Register 057	IR057	8	8	2 ICLK			
0008 703Ah	ICU	Interrupt Request Register 058	IR058	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 703Bh	ICU	Interrupt Request Register 059	IR059	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 703Ch	ICU	Interrupt Request Register 060	IR060	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 703Dh	ICU	Interrupt Request Register 061	IR061	8	8	2 ICLK			Not present in versions with 64 or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (6/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 7098h	ICU	Interrupt Request Register 152	IR152	8	8	2 ICLK		ICUb	
0008 7099h	ICU	Interrupt Request Register 153	IR153	8	8	2 ICLK			
0008 709Ah	ICU	Interrupt Request Register 154	IR154	8	8	2 ICLK			
0008 709Bh	ICU	Interrupt Request Register 155	IR155	8	8	2 ICLK			
0008 709Ch	ICU	Interrupt Request Register 156	IR156	8	8	2 ICLK			
0008 709Dh	ICU	Interrupt Request Register 157	IR157	8	8	2 ICLK			
0008 709Eh	ICU	Interrupt Request Register 158	IR158	8	8	2 ICLK			
0008 70A1h	ICU	Interrupt Request Register 161	IR161	8	8	2 ICLK			
0008 70A2h	ICU	Interrupt Request Register 162	IR162	8	8	2 ICLK			
0008 70A3h	ICU	Interrupt Request Register 163	IR163	8	8	2 ICLK			
0008 70A4h	ICU	Interrupt Request Register 164	IR164	8	8	2 ICLK			
0008 70A5h	ICU	Interrupt Request Register 165	IR165	8	8	2 ICLK			
0008 70A6h	ICU	Interrupt Request Register 166	IR166	8	8	2 ICLK			
0008 70A7h	ICU	Interrupt Request Register 167	IR167	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70A8h	ICU	Interrupt Request Register 168	IR168	8	8	2 ICLK			
0008 70A9h	ICU	Interrupt Request Register 169	IR169	8	8	2 ICLK			
0008 70AAh	ICU	Interrupt Request Register 170	IR170	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70ABh	ICU	Interrupt Request Register 171	IR171	8	8	2 ICLK			
0008 70ACh	ICU	Interrupt Request Register 172	IR172	8	8	2 ICLK			
0008 70ADh	ICU	Interrupt Request Register 173	IR173	8	8	2 ICLK			
0008 70AEh	ICU	Interrupt Request Register 174	IR174	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70AFh	ICU	Interrupt Request Register 175	IR175	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B0h	ICU	Interrupt Request Register 176	IR176	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B1h	ICU	Interrupt Request Register 177	IR177	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B2h	ICU	Interrupt Request Register 178	IR178	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B3h	ICU	Interrupt Request Register 179	IR179	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B4h	ICU	Interrupt Request Register 180	IR180	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B5h	ICU	Interrupt Request Register 181	IR181	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B6h	ICU	Interrupt Request Register 182	IR182	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B7h	ICU	Interrupt Request Register 183	IR183	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B8h	ICU	Interrupt Request Register 184	IR184	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70B9h	ICU	Interrupt Request Register 185	IR185	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70BAh	ICU	Interrupt Request Register 186	IR186	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70BBh	ICU	Interrupt Request Register 187	IR187	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70BCh	ICU	Interrupt Request Register 188	IR188	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70BDh	ICU	Interrupt Request Register 189	IR189	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 70BEh	ICU	Interrupt Request Register 190	IR190	8	8	2 ICLK			Not present in versions with 112, 100, 64 or 48 pins.
0008 70BFh	ICU	Interrupt Request Register 191	IR191	8	8	2 ICLK			Not present in versions with 112, 100, 64 or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (9/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 717Fh	ICU	DTC Activation Enable Register 127	DTCER127	8	8	2 ICLK		ICUb	
0008 7180h	ICU	DTC Activation Enable Register 128	DTCER128	8	8	2 ICLK			
0008 7181h	ICU	DTC Activation Enable Register 129	DTCER129	8	8	2 ICLK			
0008 7185h	ICU	DTC Activation Enable Register 133	DTCER133	8	8	2 ICLK			
0008 7186h	ICU	DTC Activation Enable Register 134	DTCER134	8	8	2 ICLK			
0008 7189h	ICU	DTC Activation Enable Register 137	DTCER137	8	8	2 ICLK			
0008 718Ah	ICU	DTC Activation Enable Register 138	DTCER138	8	8	2 ICLK			
0008 718Dh	ICU	DTC Activation Enable Register 141	DTCER141	8	8	2 ICLK			
0008 718Eh	ICU	DTC Activation Enable Register 142	DTCER142	8	8	2 ICLK			
0008 718Fh	ICU	DTC Activation Enable Register 143	DTCER143	8	8	2 ICLK			
0008 7190h	ICU	DTC Activation Enable Register 144	DTCER144	8	8	2 ICLK			
0008 7192h	ICU	DTC Activation Enable Register 146	DTCER146	8	8	2 ICLK			
0008 7193h	ICU	DTC Activation Enable Register 147	DTCER147	8	8	2 ICLK			
0008 7194h	ICU	DTC Activation Enable Register 148	DTCER148	8	8	2 ICLK			
0008 7195h	ICU	DTC Activation Enable Register 149	DTCER149	8	8	2 ICLK			
0008 7196h	ICU	DTC Activation Enable Register 150	DTCER150	8	8	2 ICLK			
0008 7197h	ICU	DTC Activation Enable Register 151	DTCER151	8	8	2 ICLK			
0008 7198h	ICU	DTC Activation Enable Register 152	DTCER152	8	8	2 ICLK			
0008 7199h	ICU	DTC Activation Enable Register 153	DTCER153	8	8	2 ICLK			
0008 719Ah	ICU	DTC Activation Enable Register 154	DTCER154	8	8	2 ICLK			
0008 719Bh	ICU	DTC Activation Enable Register 155	DTCER155	8	8	2 ICLK			
0008 719Ch	ICU	DTC Activation Enable Register 156	DTCER156	8	8	2 ICLK			
0008 719Dh	ICU	DTC Activation Enable Register 157	DTCER157	8	8	2 ICLK			
0008 71A1h	ICU	DTC Activation Enable Register 161	DTCER161	8	8	2 ICLK			
0008 71A2h	ICU	DTC Activation Enable Register 162	DTCER162	8	8	2 ICLK			
0008 71A3h	ICU	DTC Activation Enable Register 163	DTCER163	8	8	2 ICLK			
0008 71A4h	ICU	DTC Activation Enable Register 164	DTCER164	8	8	2 ICLK			
0008 71A5h	ICU	DTC Activation Enable Register 165	DTCER165	8	8	2 ICLK			
0008 71ABh	ICU	DTC Activation Enable Register 171	DTCER171	8	8	2 ICLK			
0008 71ACh	ICU	DTC Activation Enable Register 172	DTCER172	8	8	2 ICLK			
0008 71ADh	ICU	DTC Activation Enable Register 173	DTCER173	8	8	2 ICLK			
0008 71AEh	ICU	DTC Activation Enable Register 174	DTCER174	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71AFh	ICU	DTC Activation Enable Register 175	DTCER175	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B0h	ICU	DTC Activation Enable Register 176	DTCER176	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B1h	ICU	DTC Activation Enable Register 177	DTCER177	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B2h	ICU	DTC Activation Enable Register 178	DTCER178	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B3h	ICU	DTC Activation Enable Register 179	DTCER179	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B4h	ICU	DTC Activation Enable Register 180	DTCER180	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B5h	ICU	DTC Activation Enable Register 181	DTCER181	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B6h	ICU	DTC Activation Enable Register 182	DTCER182	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B7h	ICU	DTC Activation Enable Register 183	DTCER183	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B8h	ICU	DTC Activation Enable Register 184	DTCER184	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71B9h	ICU	DTC Activation Enable Register 185	DTCER185	8	8	2 ICLK			Not present in versions with 64 or 48 pins.
0008 71BAh	ICU	DTC Activation Enable Register 186	DTCER186	8	8	2 ICLK			Not present in versions with 64 or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (21/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 A047h	SCI2	Serial Extended Mode Register	SEMR	8	8	2, 3 PCLKB	2 ICLK	SCIc, SCId	Not present in versions with 64 or 48 pins.
0008 A048h	SCI2	Noise Filter Setting Register	SNFR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 A049h	SCI2	I²C Mode Register 1	SIMR1	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 A04Ah	SCI2	I²C Mode Register 2	SIMR2	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 A04Bh	SCI2	I²C Mode Register 3	SIMR3	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 A04Ch	SCI2	I²C Status Register	SISR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 A04Dh	SCI2	SPI Mode Register	SPMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 A060h	SCI3	Serial Mode Register	SMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A061h	SCI3	Bit Rate Register	BRR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A062h	SCI3	Serial Control Register	SCR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A063h	SCI3	Transmit Data Register	TDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A064h	SCI3	Serial Status Register	SSR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A065h	SCI3	Receive Data Register	RDR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A066h	SCI3	Smart Card Mode Register	SCMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A067h	SCI3	Serial Extended Mode Register	SEMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A068h	SCI3	Noise Filter Setting Register	SNFR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A069h	SCI3	I²C Mode Register 1	SIMR1	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A06Ah	SCI3	I²C Mode Register 2	SIMR2	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A06Bh	SCI3	I²C Mode Register 3	SIMR3	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A06Ch	SCI3	I²C Status Register	SISR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 A06Dh	SCI3	SPI Mode Register	SPMR	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 B000h	CAC	CAC Control Register 0	CACR0	8	8	2, 3 PCLKB	2 ICLK	CAC	
0008 B001h	CAC	CAC Control Register 1	CACR1	8	8	2, 3 PCLKB	2 ICLK		
0008 B002h	CAC	CAC Control Register 2)	CACR2	8	8	2, 3 PCLKB	2 ICLK		
0008 B003h	CAC	CAC Interrupt Control Register	CAICR	8	8	2, 3 PCLKB	2 ICLK		
0008 B004h	CAC	CAC Status Register	CASTR	8	8	2, 3 PCLKB	2 ICLK		
0008 B006h	CAC	CAC Upper-Limit Value Setting Register	CAULVR	16	16	2, 3 PCLKB	2 ICLK		
0008 B008h	CAC	CAC Lower-Limit Value Setting Register	CALLVR	16	16	2, 3 PCLKB	2 ICLK		
0008 B00Ah	CAC	CAC Counter Buffer Register	CACNTBR	16	16	2, 3 PCLKB	2 ICLK		
0008 B080h	DOC	DOC Control Register	DOCR	8	8	2, 3 PCLKB	2 ICLK	DOC	
0008 B082h	DOC	DOC Data Input Register	DODIR	16	16	2, 3 PCLKB	2 ICLK		
0008 B084h	DOC	DOC Data Setting Register	DODSR	16	16	2, 3 PCLKB	2 ICLK		
0008 B300h	SCI12	Serial Mode Register	SMR	8	8	2, 3 PCLKB	2 ICLK	SCIc, SCId	
0008 B301h	SCI12	Bit Rate Register	BRR	8	8	2, 3 PCLKB	2 ICLK		
0008 B302h	SCI12	Serial Control Register	SCR	8	8	2, 3 PCLKB	2 ICLK		
0008 B303h	SCI12	Transmit Data Register	TDR	8	8	2, 3 PCLKB	2 ICLK		
0008 B304h	SCI12	Serial Status Register	SSR	8	8	2, 3 PCLKB	2 ICLK		
0008 B305h	SCI12	Receive Data Register	RDR	8	8	2, 3 PCLKB	2 ICLK		
0008 B306h	SCI12	Smart Card Mode Register	SCMR	8	8	2, 3 PCLKB	2 ICLK		
0008 B307h	SCI12	Serial Extended Mode Register	SEMR	8	8	2, 3 PCLKB	2 ICLK		

Table 4.1 List of I/O Registers (Address Order) (26/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 C174h	MPC	P64 Pin Function Control Register	P64PFS	8	8	2, 3 PCLKB	2 ICLK	MPC	Not present in versions with 64 or 48 pins.
0008 C175h	MPC	P65 Pin Function Control Register	P65PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C178h	MPC	P70 Pin Function Control Register	P70PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C179h	MPC	P71 Pin Function Control Register	P71PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C17Ah	MPC	P72 Pin Function Control Register	P72PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C17Bh	MPC	P73 Pin Function Control Register	P73PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C17Ch	MPC	P74 Pin Function Control Register	P74PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C17Dh	MPC	P75 Pin Function Control Register	P75PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C17Eh	MPC	P76 Pin Function Control Register	P76PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C180h	MPC	P80 Pin Function Control Register	P80PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C181h	MPC	P81 Pin Function Control Register	P81PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C182h	MPC	P82 Pin Function Control Register	P82PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C188h	MPC	P90 Pin Function Control Register	P90PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C189h	MPC	P91 Pin Function Control Register	P91PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C18Ah	MPC	P92 Pin Function Control Register	P92PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C18Bh	MPC	P93 Pin Function Control Register	P93PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C18Ch	MPC	P94 Pin Function Control Register	P94PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C18Dh	MPC	P95 Pin Function Control Register	P95PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C18Eh	MPC	P96 Pin Function Control Register	P96PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C190h	MPC	PA0 Pin Function Control Register	PA0PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C191h	MPC	PA1 Pin Function Control Register	PA1PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C192h	MPC	PA2 Pin Function Control Register	PA2PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C193h	MPC	PA3 Pin Function Control Register	PA3PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C194h	MPC	PA4 Pin Function Control Register	PA4PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C195h	MPC	PA5 Pin Function Control Register	PA5PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C196h	MPC	PA6 Pin Function Control Register	PA6PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64 or 48 pins.
0008 C198h	MPC	PB0 Pin Function Control Register	PB0PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C199h	MPC	PB1 Pin Function Control Register	PB1PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C19Ah	MPC	PB2 Pin Function Control Register	PB2PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C19Bh	MPC	PB3 Pin Function Control Register	PB3PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C19Ch	MPC	PB4 Pin Function Control Register	PB4PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C19Dh	MPC	PB5 Pin Function Control Register	PB5PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C19Eh	MPC	PB6 Pin Function Control Register	PB6PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C19Fh	MPC	PB7 Pin Function Control Register	PB7PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 48 pins.
0008 C1A0h	MPC	PC0 Pin Function Control Register	PC0PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64, or 48 pins.
0008 C1A1h	MPC	PC1 Pin Function Control Register	PC1PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64, or 48 pins.
0008 C1A2h	MPC	PC2 Pin Function Control Register	PC2PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64, or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (32/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
000A 006Ch	USB0	Pipe Maximum Packet Size Register	PIPEMAXP	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1	USBa	Not present in versions with 112, 100, 64, or 48 pins.
000A 006Eh	USB0	Pipe Cycle Control Register	PIPEPERI	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0070h	USB0	PIPE1 Control Register	PIPE1CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0072h	USB0	PIPE2 Control Register	PIPE2CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0074h	USB0	PIPE3 Control Register	PIPE3CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0076h	USB0	PIPE4 Control Register	PIPE4CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0078h	USB0	PIPE5 Control Register	PIPE5CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 007Ah	USB0	PIPE6 Control Register	PIPE6CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 007Ch	USB0	PIPE7 Control Register	PIPE7CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 007Eh	USB0	PIPE8 Control Register	PIPE8CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0080h	USB0	PIPE9 Control Register	PIPE9CTR	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.
000A 0090h	USB0	PIPE1 Transaction Counter Enable Register	PIPE1TRE	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/(frequency ratio of ICLK/PCLKB)*1		Not present in versions with 112, 100, 64, or 48 pins.

Table 4.1 List of I/O Registers (Address Order) (35/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
000C 1308h	MTU0	Timer General Register A	TGRA	16	16, 32	4, 5 PCLKA	2, 3 ICLK	MTU3	
000C 130Ah	MTU0	Timer General Register B	TGRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 130Ch	MTU0	Timer General Register C	TGRC	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 130Eh	MTU0	Timer General Register D	TGRD	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1320h	MTU0	Timer General Register E	TGRE	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1322h	MTU0	Timer General Register F	TGRF	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1324h	MTU0	Timer Interrupt Enable Register 2	TIER2	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1325h	MTU0	Timer Status Register 2	TSR2	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1326h	MTU0	Timer Buffer Operation Transfer Mode Register	TBTM	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1380h	MTU1	Timer Control Register	TCR	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1381h	MTU1	Timer Mode Register 1	TMDR1	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1382h	MTU1	Timer I/O Control Register	TIOR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1384h	MTU1	Timer Interrupt Enable Register	TIER	8	8, 16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1385h	MTU1	Timer Status Register	TSR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1386h	MTU1	Timer Counter	TCNT	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1388h	MTU1	Timer General Register A	TGRA	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 138Ah	MTU1	Timer General Register B	TGRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1390h	MTU1	Timer Input Capture Control Register	TICCR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1400h	MTU2	Timer Control Register	TCR	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1401h	MTU2	Timer Mode Register 1	TMDR1	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1402h	MTU2	Timer I/O Control Register	TIOR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1404h	MTU2	Timer Interrupt Enable Register	TIER	8	8, 16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1405h	MTU2	Timer Status Register	TSR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1406h	MTU2	Timer Counter	TCNT	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1408h	MTU2	Timer General Register A	TGRA	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 140Ah	MTU2	Timer General Register B	TGRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A00h	MTU6	Timer Control Register	TCR	8	8, 16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A01h	MTU7	Timer Control Register	TCR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A02h	MTU6	Timer Mode Register 1	TMDR1	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A03h	MTU7	Timer Mode Register 1	TMDR1	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A04h	MTU6	Timer I/O Control Register H	TIORH	8	8, 16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A05h	MTU6	Timer I/O Control Register L	TIORL	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A06h	MTU7	Timer I/O Control Register H	TIORH	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A07h	MTU7	Timer I/O Control Register L	TIORL	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A08h	MTU6	Timer Interrupt Enable Register	TIER	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A09h	MTU7	Timer Interrupt Enable Register	TIER	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A0Ah	MTU	Timer Output Master Enable Register B	TOERB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A0Eh	MTU	Timer Output Control Register 1B	TOCR1B	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A0Fh	MTU	Timer Output Control Register 2B	TOCR2B	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A10h	MTU6	Timer Counter	TCNT	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A12h	MTU7	Timer Counter	TCNT	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A14h	MTU	Timer Cycle Data Register B	TCDRB	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A16h	MTU	Timer Dead Time Data Register B	TDDRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A18h	MTU6	Timer General Register A	TGRA	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A1Ah	MTU6	Timer General Register B	TGRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A1Ch	MTU7	Timer General Register A	TGRA	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A1Eh	MTU7	Timer General Register B	TGRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A20h	MTU	Timer Subcounter B	TCNTSB	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A22h	MTU	Timer Cycle Buffer Register B	TCBRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A24h	MTU6	Timer General Register C	TGRC	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A26h	MTU6	Timer General Register D	TGRD	16	16	4, 5 PCLKA	2, 3 ICLK		

Table 4.1 List of I/O Registers (Address Order) (39/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
000C 21A6h	GPT1	A/D Converter Start Request Timing Buffer Register A	GTADTBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK	GPT	
000C 21A8h	GPT1	A/D Converter Start Request Timing Double-Buffer Register A	GTADTDBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21ACh	GPT1	A/D Converter Start Request Timing Register B	GTADTRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21AEh	GPT1	A/D Converter Start Request Timing Buffer Register B	GTADTBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21B0h	GPT1	A/D Converter Start Request Timing Double-Buffer Register B	GTADTDBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21B4h	GPT1	General PWM Timer Output Negate Control Register	GTONCR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21B6h	GPT1	General PWM Timer Dead Time Control Register	GTDTCR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21B8h	GPT1	General PWM Timer Dead Time Value Register U	GTDVU	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21BAh	GPT1	General PWM Timer Dead Time Value Register D	GTDVD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21BCh	GPT1	General PWM Timer Dead Time Buffer Register U	GTDBU	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21BEh	GPT1	General PWM Timer Dead Time Buffer Register D	GTDBD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21C0h	GPT1	General PWM Timer Output Protection Function Status Register	GTSOS	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 21C2h	GPT1	General PWM Timer Output Protection Function Temporary Release Register	GTSOTR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2200h	GPT2	General PWM Timer I/O Control Register	GTIOR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2202h	GPT2	General PWM Timer Interrupt Output Setting Register	GTINTAD	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2204h	GPT2	General PWM Timer Control Register	GTCR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2206h	GPT2	General PWM Timer Buffer Enable Register	GTBER	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2208h	GPT2	General PWM Timer Count Direction Register	GTUDC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 220Ah	GPT2	General PWM Timer Interrupt and A/D Converter Start Request Skipping Setting Register	GTITC	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 220Ch	GPT2	General PWM Timer Status Register	GTST	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 220Eh	GPT2	General PWM Timer Counter	GTCNT	16	16	2 to 5 PCLKA	2, 3 ICLK		
000C 2210h	GPT2	General PWM Timer Compare Capture Register A	GTCCRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2212h	GPT2	General PWM Timer Compare Capture Register B	GTCCRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2214h	GPT2	General PWM Timer Compare Capture Register C	GTCCRC	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2216h	GPT2	General PWM Timer Compare Capture Register D	GTCCRD	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2218h	GPT2	General PWM Timer Compare Capture Register E	GTCCRE	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 221Ah	GPT2	General PWM Timer Compare Capture Register F	GTCCRF	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 221Ch	GPT2	General PWM Timer Cycle Setting Register	GTPR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 221Eh	GPT2	General PWM Timer Cycle Setting Buffer Register	GTPBR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2220h	GPT2	General PWM Timer Cycle Setting Double-Buffer Register	GTPDBR	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2224h	GPT2	A/D Converter Start Request Timing Register A	GTADTRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2226h	GPT2	A/D Converter Start Request Timing Buffer Register A	GTADTBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 2228h	GPT2	A/D Converter Start Request Timing Double-Buffer Register A	GTADTDBRA	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 222Ch	GPT2	A/D Converter Start Request Timing Register B	GTADTRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		
000C 222Eh	GPT2	A/D Converter Start Request Timing Buffer Register B	GTADTBRB	16	16, 32	2 to 5 PCLKA	2, 3 ICLK		

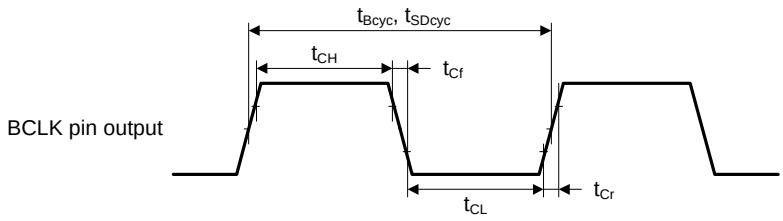
Table 4.1 List of I/O Registers (Address Order) (44/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ 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.

Note 4. This is calculated from the formula below, where n is the number of cycles set by the PLLWTCR.PSTS[4:0] bits.

$$t_{PLLWT1} = t_{PLL1} + \frac{n + 131072}{f_{PLL}}$$

$$t_{PLLWT2} = t_{PLL2} + \frac{n + 131072}{f_{PLL}} = t_{MAINOSC} + t_{PLL1} + \frac{n + 131072}{f_{PLL}}$$



Test conditions: VOH = VCC × 0.7, VOL = VCC × 0.3, IOH = –1.0 mA, IOL = 1.0 mA, C = 30 pF

Figure 5.3 BCLK Pin Output Timing

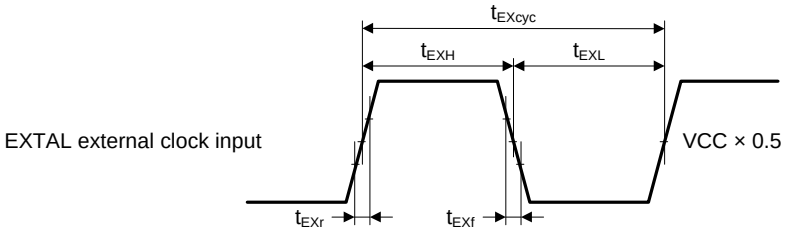


Figure 5.4 EXTAL External Clock Input Timing

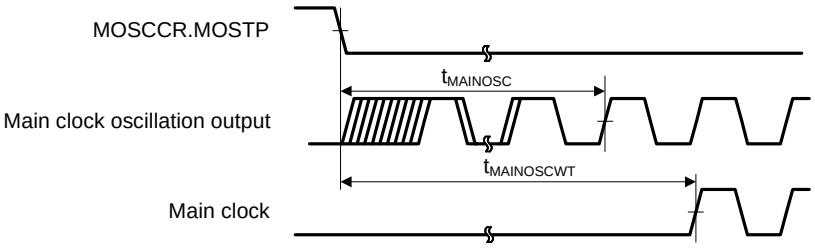


Figure 5.5 Main Clock Oscillation Start Timing

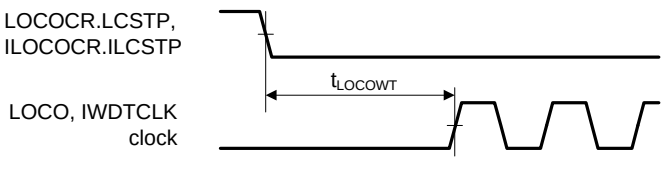


Figure 5.6 LOCO, IWDTCLK Clock Oscillation Start Timing

5.3.4 Control Signal Timing

Table 5.11 Control Signal Timing

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

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

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
NMI pulse width	t_{NMIW}	200	—	—	ns	t_c(PCLK) × 2 ≤ 200 ns, Figure 5.11
		t_c(PCLK) × 2	—	—	ns	t_c(PCLK) > 200 ns, Figure 5.11
IRQ pulse width	t_{IRQW}	200	—	—	ns	t_c(PCLK) ≤ 200 ns, Figure 5.12
		t_c(PCLK) × 2	—	—	ns	t_c(PCLK) > 200 ns, Figure 5.12

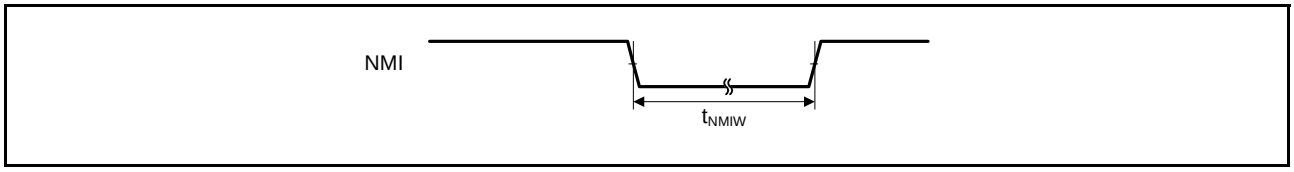


Figure 5.11 NMI Interrupt Input Timing

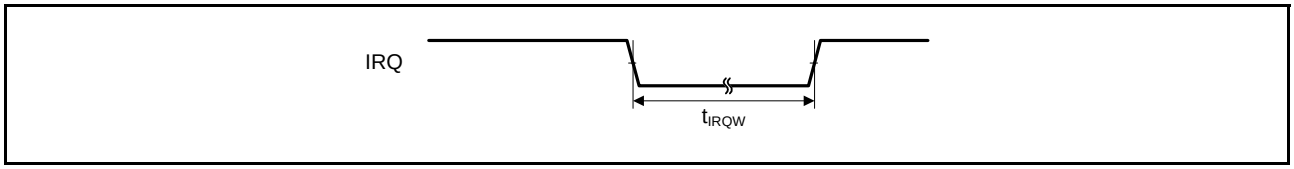


Figure 5.12 IRQ Interrupt Input Timing

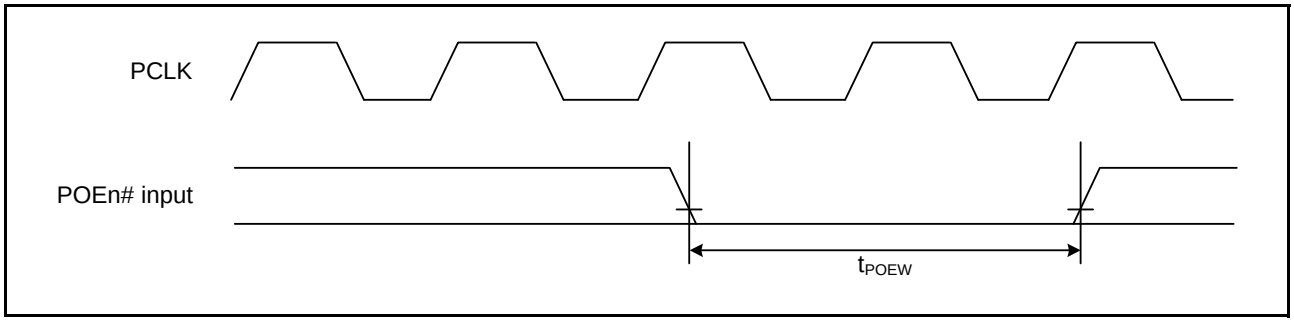


Figure 5.25 POE3# Input Timing

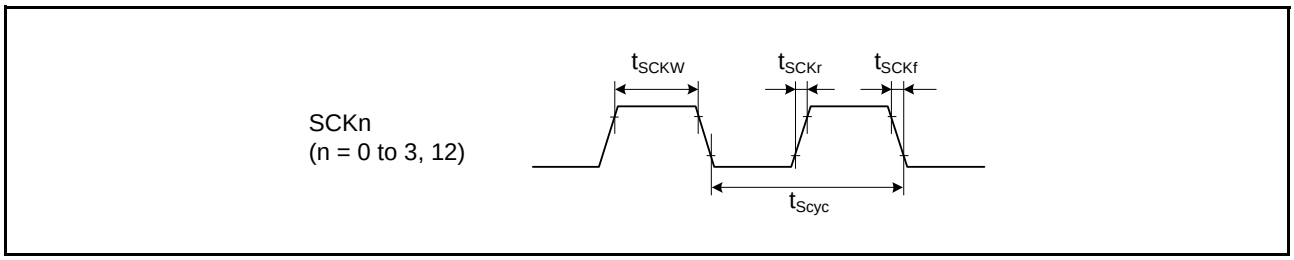


Figure 5.26 SCK Clock Input Timing

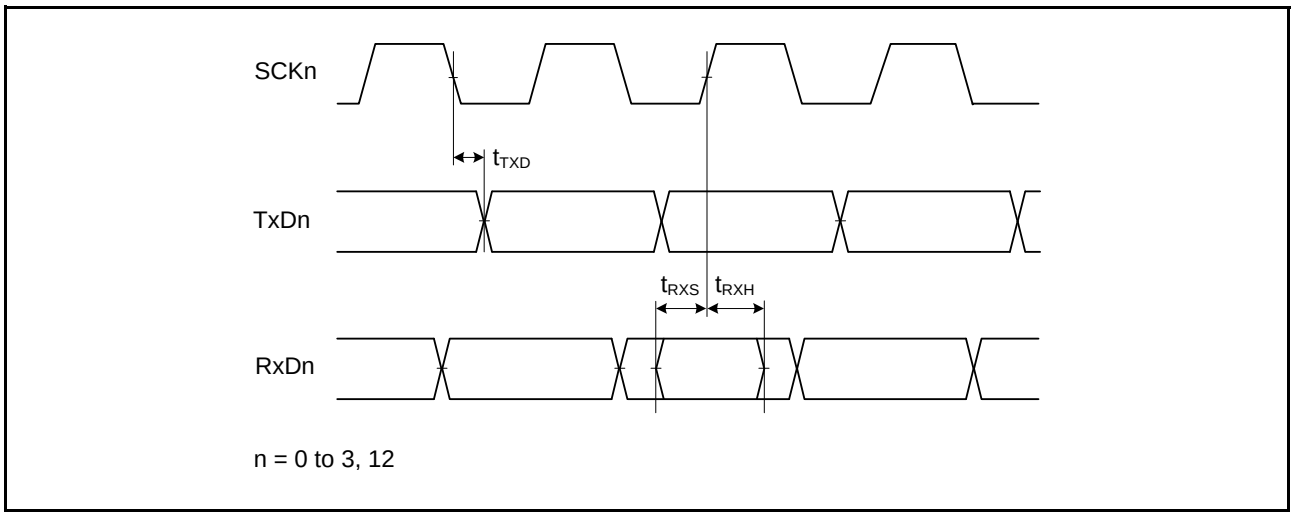


Figure 5.27 SCI Input/Output Timing: Clock Synchronous Mode

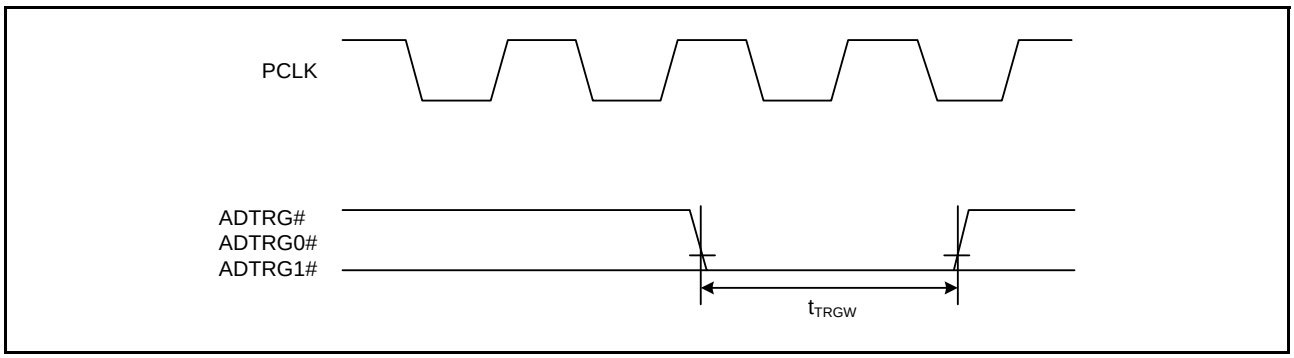


Figure 5.28 AD Converter External Trigger Input Timing

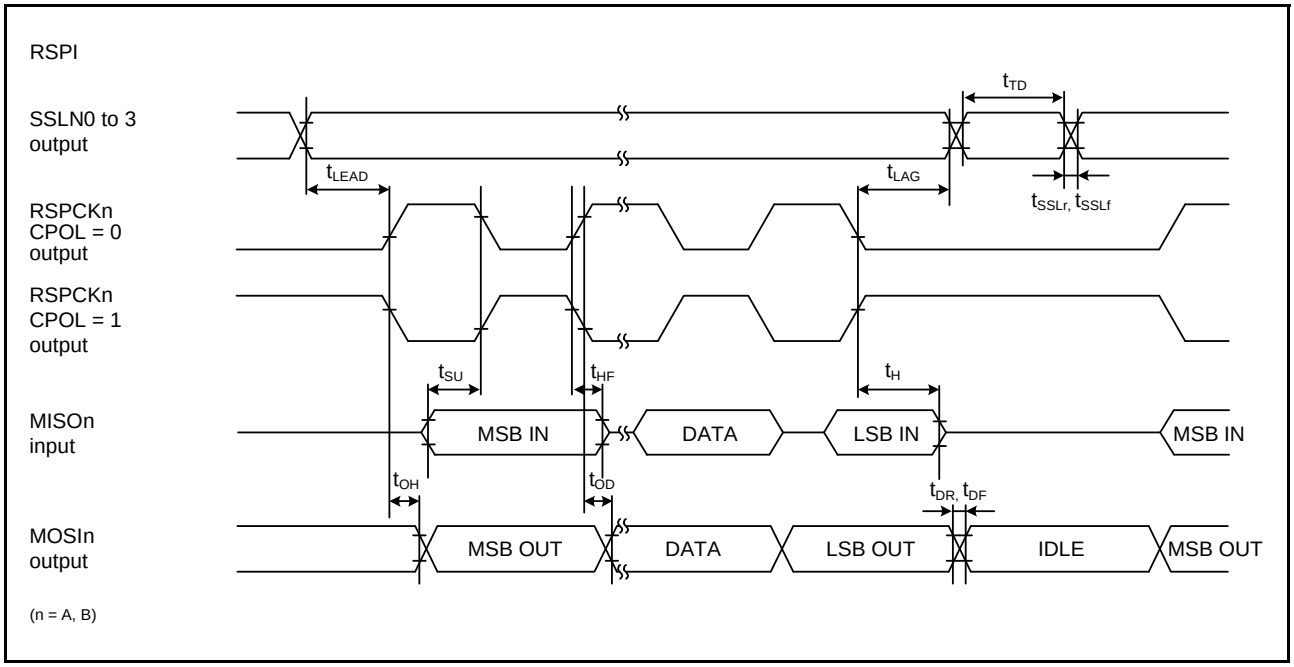


Figure 5.33 RSPI Timing (Master, CPHA = 1) (Bit Rate: PCLKB Division Ratio Set to 1/2)

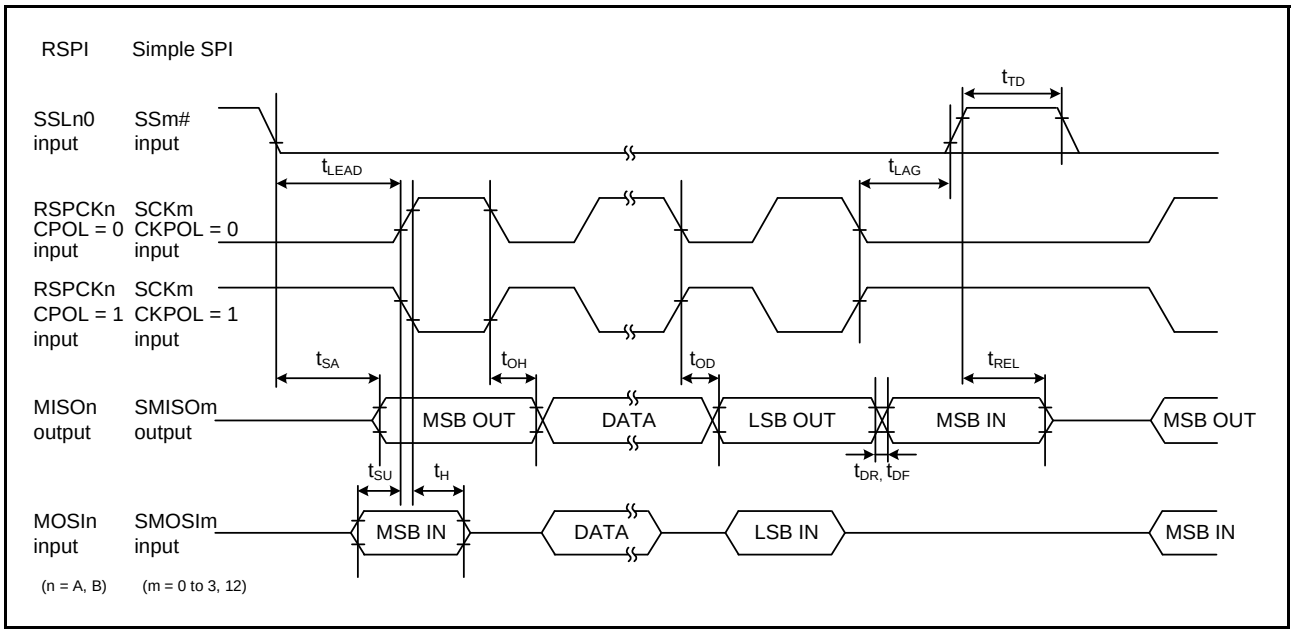


Figure 5.34 RSPI Timing (Slave, CPHA = 0) and Simple SPI Timing (Slave, CKPH = 1)

5.6 D/A Conversion Characteristics

Table 5.25 D/A Conversion Characteristics

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 = 0V
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

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

Item	Min.	Typ.	Max.	Unit	Test Conditions
Resolution	10	10	10	Bit	
Conversion time	—	—	3.0	µs	20-pF capacitive load
Absolute accuracy	—	±2.0	±4.0	LSB	2-MΩ resistive load
	—	—	±3.0	LSB	4-MΩ resistive load
	—	—	±2.0	LSB	10-MΩ resistive load
RO output resistance	—	3.6	—	kΩ	

Table 5.27 Power-on Reset Circuit and Voltage Detection Circuit Characteristics (2)

Condition: 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
$T_a = T_{opr}$

Item		Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Voltage detection level	Power-on reset (POR)	V_{POR}	3.6	3.8	4.0	V	Figure 5.41
	Voltage detection circuit (LVD0)	V_{DET0}	4.0	4.2	4.4		Figure 5.42
	Voltage detection circuit (LVD1)*1	V_{DET1_8}	4.59	4.77	4.95		Figure 5.43
		V_{DET1_9}	4.05	4.23	4.41		
		V_{DET1_A}	4.32	4.50	4.68		
	Voltage detection circuit (LVD2)*2	V_{DET2_8}	4.59	4.77	4.95		Figure 5.44
		V_{DET2_9}	4.05	4.23	4.41		
		V_{DET2_A}	4.32	4.50	4.68		
Internal reset time	Power-on reset (POR)	t_{POR}		9.7		ms	Figure 5.41
	Voltage detection circuit (LVD0)	t_{LVD0}		9.7			Figure 5.42
	Voltage detection circuit (LVD1)	t_{LVD1}		0.9			Figure 5.43
	Voltage detection circuit (LVD2)	t_{LVD2}		0.9			Figure 5.44
Minimum VCC down time*3		t_{VOFF}	200	—	—	µs	Figure 5.41 to Figure 5.44
Response delay time		t_{DET}			200	µs	
LVD operation stabilization time (after LVD is enabled)		$Td_{(E-A)}$			3	µs	Figure 5.41 to Figure 5.44
Hysteresis width (LVD1 and LVD2)		V_{LVH}		80		mV	

Note 1. # in symbol $V_{DET1\_\#}$ indicates the value of the LVDLVLR.LVD1LVL[3:0] bits.
Note 2. # in symbol $V_{DET2\_\#}$ indicates the value of the LVDLVLR.LVD2LVL[3:0] bits.
Note 3. 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.

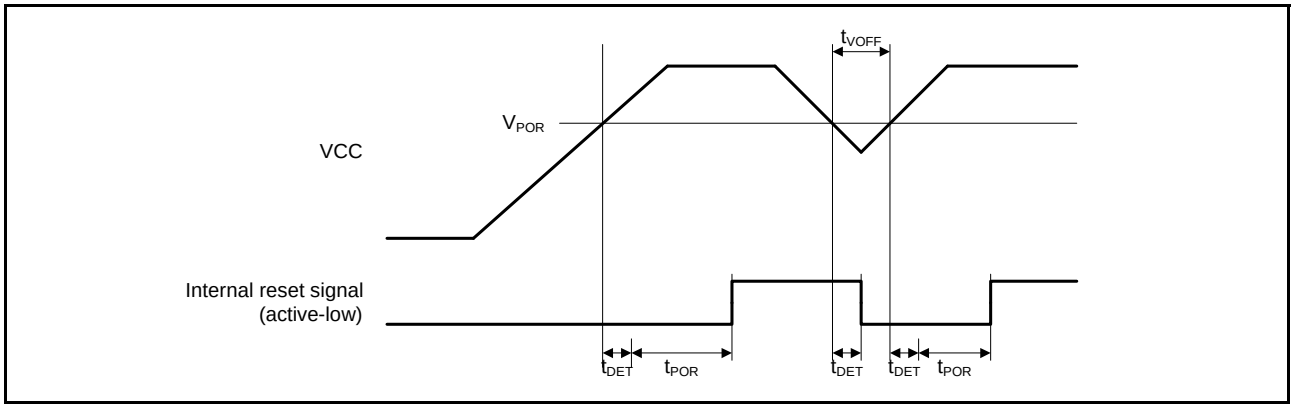


Figure 5.39 Power-on Reset Timing

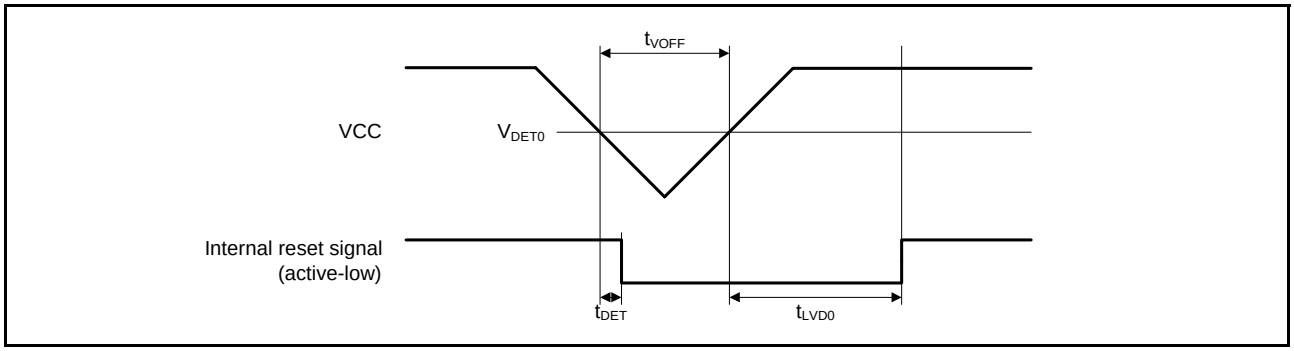


Figure 5.40 Voltage Detection Circuit Timing (V_{DET0})

Rev.	Date	Description	
		Page	Summary
2.10	Sep 26, 2013	36 to 39	Table 1.7 List of Pins and Pin Functions (112-Pin LQFP), changed
		40 to 42	Table 1.8 List of Pins and Pin Functions (100-Pin LQFP), changed
		43 to 45	Table 1.9 List of Pins and Pin Functions (64-Pin LQFP), changed
		46 to 47	Table 1.10 List of Pins and Pin Functions (48-Pin LQFP), changed
		4. I/O Registers	
		56 to 103	Table 4.1 List of I/O Registers (Address Order), changed
		5. Electrical Characteristics [144-, 120-, 112- and 100-Pin Versions]	
		104	Table 5.1 Absolute Maximum Ratings, changed
		107	Table 5.4 DC Characteristics (3), Note 7, deleted
		108	Table 5.6 Permissible Power Consumption, added
		128	5.3.7 Timing of PWM Delay Generation Circuit, added
		128	Table 42.21 Timing of the PWM Delay Generation Circuit, added
		132	Figure 5.32 RSPI Timing (Master, CPHA = 1) (Bit Rate: PCLKB Division Ratio Set to a Value Other Than 1/2) and Simple SPI Timing (Master, CKPH = 1), changed
		133	Figure 5.34 RSPI Timing (Slave, CPHA = 0) and Simple SPI Timing (Slave, CKPH = 0), changed
		134	Figure 5.35 RSPI Timing (Slave, CPHA = 1) and Simple SPI Timing (Slave, CKPH = 1), changed
		6. Electrical Characteristics [64- and 48-Pin Versions]	
		149	Table 6.1 Absolute Maximum Ratings, changed
		151	Table 6.3 DC Characteristics (2), Note 3, changed
		152	Table 6.5 Permissible Power Consumption, added