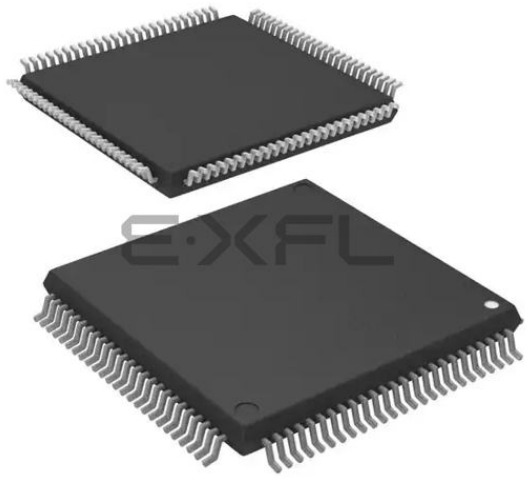
Renesas Electronics America Inc - R5F563TCADFP#V0 Datasheet



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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	384KB (384K x 8)
Program Memory Type	FLASH
EEPROM Size	32K x 8
RAM Size	32K 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/r5f563tcadfp-v0

Table 1.1 Outline of Specifications (6/7)

Classification Module/Function	Description
12-bit A/D converter (S12ADB) [64- and 48-pin versions]	• 12 bits (8 channels x 1 unit) • 12-bit resolution • Conversion time 1.0 µs per channel (S12ADB clock: PCLKD (A/D conversion clock: ADCLK) = 50 MHz • Operating modes Scan mode (single scan mode / continuous scan mode / group scan mode) Group A priority control (group scan mode only) • Sample-and-hold function A common sample-and-hold circuit for units is included Separate sample-and-hold circuits are also included (three channels per unit) • Self-diagnosis function Three analog input voltages (VREFL0, VREFH0 × 1/2, VREFH0) can be generated internally by the self-diagnosis function. • Double trigger mode (double the results of A/D conversion) • Three ways to start A/D conversion Conversion can be started by software, a conversion start trigger from a timer (MTU3 or GPT), or an external trigger signal. • Window comparators (three channels per unit)
10-bit A/D converter (ADA)	10 bits (20 channels × 1 unit) • 10-bit resolution • Conversion time 0.5 µs per channel (A/D conversion clock ADCLK = 100 MHz) • Two operating modes Single mode, scan mode • Scan mode Single-cycle scan mode Continuous scan mode • Sample-and-hold function A common sample-and-hold circuit for units is included • Three ways to start A/D conversion Conversion can be started by software, a conversion start trigger from a timer (MTU3 or GPT), or an external trigger signal. • 8-bit precision output 2-bit right shifting for output of conversion results is selectable. • Self-diagnostic function The self-diagnostic function internally generates three analog input voltages (AVSS, VREF x 1/2, VREF)
D/A converter (DAa)	• 2 channels • 10-bit resolution • Output voltage: 0 V to VREF
CRC calculator (CRC)	• CRC code generation for arbitrary amounts of data in 8-bit units • Select any of three generating polynomials: $X^8 + X^2 + X + 1$, $X^{16} + X^{15} + X^2 + 1$, or $X^{16} + X^{12} + X^5 + 1$. • Generation of CRC codes for use with LSB-first or MSB-first communications is selectable
Data operating circuit (DOC)	• Comparison, addition, and subtraction of 16-bit data
Digital power supply controller (DPC)	• Control parameters calculation unit of the digital switch-mode power supply systems. • Adopt robust control algorithm with high control stability • Results of measurement by the 10-bit A/D converter can be used in calculating the control parameters.
Operating frequency	Up to 100 MHz
Power supply voltage [144-, 120-, 112- and 100-pin versions]	• 3-V product VCC = PLLVCC = VCC_USB = 2.7 to 3.6 V AVCC0 = AVCC = VREF = 3.0 to 3.6 V, or 4.0 to 5.5 V VREFH0 = 3.0 to AVCC0, or 4.0 to AVCC0 • 5-V product VCC = PLLVCC = 4.0 to 5.5 V VCC_USB = 3.0 to 3.6 V AVCC0 = AVCC = VREF = 4.0 to 5.5 V VREFH0 = 4.0 to AVCC0
Power supply voltage [64- and 48-pin versions]	VCC = 2.7 to 3.6 V, AVCC0 = 3.0 to 3.6 V, VREFH0 = 3.0 V to AVCC0

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/ PLLVCC 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 1.3 List of Products (4/4)

Group	Part No.	Order Part No.	Package	On-chip ROM Capacity	On-chip RAM Capacity	Option	Operating Voltage	Operating Temperature
RX63T	R5F563TBAGFA	R5F563TBAGFA#V1	PLQP0120KA-A	256 Kbytes	24 Kbytes	CAN module included	VCC/ PLLVCC 4.0 to 5.5V VCC_USB 3.0 to 3.6V AVCC/ AVCC0 4.0 to 5.5V	-40 to +105°C (G Version)*1
	R5F563TBAGFH	R5F563TBAGFH#V1	PLQP0112JA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBAGFP	R5F563TBAGFP#V1	PLQP0100KB-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TEBGFB	R5F563TEBGFB#V1	PLQP0144KA-A	512 Kbytes	48 Kbytes	CAN module included	VCC/ PLLVCC/ VCC_USB 2.7 to 3.6V AVCC/ AVCC0 3.0 to 3.6V or 4.0 to 5.5V	
	R5F563TEBGFA	R5F563TEBGFA#V1	PLQP0120KA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEBGFH	R5F563TEBGFH#V1	PLQP0112JA-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TEBGFP	R5F563TEBGFP#V1	PLQP0100KB-A	512 Kbytes	48 Kbytes	CAN module included		
	R5F563TCBGFB	R5F563TCBGFB#V1	PLQP0144KA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCBGFA	R5F563TCBGFA#V1	PLQP0120KA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCBGFH	R5F563TCBGFH#V1	PLQP0112JA-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TCBGFP	R5F563TCBGFP#V1	PLQP0100KB-A	384 Kbytes	32 Kbytes	CAN module included		
	R5F563TBBGFB	R5F563TBBGFB#V1	PLQP0144KA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBBGFA	R5F563TBBGFA#V1	PLQP0120KA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBBGFH	R5F563TBBGFH#V1	PLQP0112JA-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563TBBGFP	R5F563TBBGFP#V1	PLQP0100KB-A	256 Kbytes	24 Kbytes	CAN module included		
	R5F563T6EGFM	R5F563T6EGFM#V0	PLQP0064KB-A	64 Kbytes	8 Kbytes	CAN module not included	VCC/ PLLVCC 2.7 to 3.6V AVCC0 3.0 to 3.6V	
	R5F563T5EGFM	R5F563T5EGFM#V0	PLQP0064KB-A	48 Kbytes	8 Kbytes	CAN module not included		
	R5F563T4EGFM	R5F563T4EGFM#V0	PLQP0064KB-A	32 Kbytes	8 Kbytes	CAN module not included		
	R5F563T6EGFL	R5F563T6EGFL#V0	PLQP0048KB-A	64 Kbytes	8 Kbytes	CAN module not included		
	R5F563T5EGFL	R5F563T5EGFL#V0	PLQP0048KB-A	48 Kbytes	8 Kbytes	CAN module not included		
	R5F563T4EGFL	R5F563T4EGFL#V0	PLQP0048KB-A	32 Kbytes	8 Kbytes	CAN module not included		

Note: • Orderable part numbers are current as of when this manual was published. Please make sure to refer to the relevant product page on the Renesas website for the latest part numbers.

Note: • The products with the product ID code 1 (ex. R5F563TEADFB#V1) are the revised version to the specification constraints of technical update TX-RX*-A84A / E described.

Note 1. Please contact Renesas Electronics sales office for derating of operation under Ta = +85°C to +105°C. Derating is the systematic reduction of load for the sake of improved reliability.

Table 1.5 List of Pins and Pin Functions (144-Pin LQFP) (1/4)

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
1	VCC_USB						
2		PE5	BCLK		USB0_VBUS	IRQ0	
3	EMLE						
4	TRSYNC	P03			RXD2/SMISO2/SSCL2	IRQ7	
5	TRDATA3	P02			TXD2/SMOSI2/SSDA2		
6	VSS						
7		P01	RD#		CTS0#/RTS0#/SS0#/ USB0_DRPD		
8	VCL						
9		P00	CS1#	CACREF			
10	MD/FINED						
11		PE4	A10	POE10#/MTCLKC		IRQ1	
12		PE3	A11	POE11#/MTCLKD		IRQ2-DS	
13	TRDATA2	P14			SCK2		
14	VCC						
15		P13			CTS2#/RTS2#/SS2#/ USB0_VBUSEN		
16	RES#						
17	XTAL						
18	VSS						
19	EXTAL						
20	VCC						
21		PE2		POE10#		NMI	
22		PE1	WR0#/WR#		CTS12#/RTS12#/ SS12#/SSLA3/SSLB3/ USB0_OVRCURA		
23		PE0	WR1#/BC1#/ WAIT#		SSLA2/SSLB2/CRX1/ USB0_OVRCURB	IRQ7	
24		PD7		GTIOC0A	CTS0#/RTS0#/SS0#/ SSLA1/SSLB1/CTX1		
25		PD6		GTIOC0B	SSLA0/SSLB0		
26		PD5		GTIOC1A	RXD1/SMISO1/SSCL1	IRQ6	
27	VSS						
28		PD4		GTIOC1B	SCK1		
29		PD3		GTIOC2A	TXD1/SMOSI1/SSDA1		
30		PD2	CS2#	GTIOC2B	MOSIA/MOSIB/ USB0_ID		
31		PD1	CS0#	GTIOC3A	MISOA/MISOB/ USB0_EXICEN		
32		PD0	A12	GTIOC3B	RSPCKA/RSPCKB		
33		PF4	CS3#				
34		PF3			TXD1/SMOSI1/SSDA1		
35		PF2	CS1#		RXD1/SMISO1/SSCL1	IRQ5	
36	TRST#	PF1					
37	TMS	PF0					
38		PB7	A19		SCK12		

Table 1.5 List of Pins and Pin Functions (144-Pin LQFP) (2/4)

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
39		PB6	A18		RXD12/SMISO12/ SSCL12/RXDX12/ CRX1	IRQ2	
40		PB5	A17		TXD12/SMOSI12/ SSDA12/TXDX12/ SIOX12/ CTX1		
41	PLLVCC						
42		PB4	A16	POE8#/ GTETRG0		IRQ3-DS	
43	PLLVSS						
44	TDI				RXD1*1		
45	TCK/FINEC						
46	TDO				TXD1*1		
47		PB3	A15	MTIOC0A/CACREF	SCK0		
48		PB2		MTIOC0B	TXD0/SMOSI0/ SSDA0/SDA0		
49		PB1		MTIOC0C	RXD0/SMISO0/ SSCL0/SCL0	IRQ4	
50		PB0	A14	MTIOC0D	MOSIA/MOSIB		
51	TRDATA1	PA6	CS3#		CTS3#/RTS3#/SS3#		
52		PA5		MTIOC1A	RXD0/SMISO0/ SSCL0/ MISOA/MISOB		ADTRG1#
53		PA4		MTIOC1B	TXD0/SMOSI0/ SSDA0/SMOSI0/ RSPCKA/RSPCKB		ADTRG0#
54		PA3		MTIOC2A	SCK0/SSLA0/SSLB0		
55		PA2		MTIOC2B	RXD2/SMISO2/ SSCL2/ SSLA1/SSLB1		
56		PA1		MTIOC6A	TXD2/SMOSI2/ SSDA2/SMOSI2/ SSLA2/SSLB2		
57		PA0		MTIOC6C	SCK2/SSLA3/SSLB3		
58	TRDATA0	P35			TXD3/SMOSI3/SSDA3		
59	TRCLK	P34		GTETRG1	RXD3/SMISO3/SSCL3	IRQ3	
60	VCC						
61		P96	A13	POE4#	RXD1/SMISO1/SSCL1	IRQ4-DS	
62		PG6	CS2#		SCK1		
63	VSS						
64		P95		MTIOC6B/GTIOC4A	TXD1/SMOSI1/SSDA1		
65		P94		MTIOC7A/GTIOC5A	CTS1#/RTS1#/SS1#		
66		P93		MTIOC7B/GTIOC6A	CTS2#/RTS2#/SS2#		
67		P92		MTIOC6D/GTIOC4B			
68		P91		MTIOC7C/GTIOC5B			
69		P90		MTIOC7D/GTIOC6B			
70		PG5		POE12#	SCK3		ADTRG#
71		PG4		GTIOC6B	RXD3/SMISO3/SSCL3	IRQ6	

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/TXDX12/ SIOX12		
133	VSS						
134		P80	A9	MTIC5W	RXD12/SMISO12/ SSCL12/RXDX12	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) (3/4)

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
75	VSS						
76		P30	D10/[A10/D10]	MTIOC0B/MTCLKD	SCK0/SSLA0/SSLB0		
77		P26	CS0#		TXD1/SMOSI1/SSDA1/SDA1		
78		P25	CS1#		SCK1/SCL1		
79		P24	D11/[A11/D11]		CTS0#/RTS0#/SS0#/RSPCKA/RSPCKB	IRQ4	
80		P23	D12/[A12/D12]	CACREF	TXD0/SMOSI0/SSDA0/MOSIA/MOSIB/CTX1		
81		P22	D13/[A13/D13]		RXD0/SMISO0/SSCL0/MISOA/MISOB/CRX1		ADTRG#
82		P21	D14/[A14/D14]	MTCLKA		IRQ6-DS	ADTRG1#
83		P20	D15/[A15/D15]	MTCLKB		IRQ7-DS	ADTRG0#
84		P65	A0/BC0#				AN5
85		P64	A1				AN4
86	AVCC						
87	VREF						
88	AVSS						
89		P63	A2				AN3
90		P62	A3				AN2
91		P61	A4				AN1
92		P60	A5				AN0
93		P55					AN11/DA1
94		P54					AN10/DA0
95		P53	A6				AN9
96		P52	A7				AN8
97		P51					AN7
98		P50					AN6
99		P47					AN103/CVREFH
100		P46					AN102
101		P45					AN101
102		P44					AN100
103		P43					AN003/CVREFL
104		P42					AN002
105		P41					AN001
106		P40					AN000
107	AVCC0						
108	VREFH0						
109	VREFL0						
110	AVSS0						

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) (27/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
0008 C1A3h	MPC	PC3 Pin Function Control Register	PC3PFS	8	8	2, 3 PCLKB	2 ICLK	MPC	Not present in versions with 120, 112, 100, 64, or 48 pins.
0008 C1A4h	MPC	PC4 Pin Function Control Register	PC4PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64, or 48 pins.
0008 C1A5h	MPC	PC5 Pin Function Control Register	PC5PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 120, 112, 100, 64, or 48 pins.
0008 C1A8h	MPC	PD0 Pin Function Control Register	PD0PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1A9h	MPC	PD1 Pin Function Control Register	PD1PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1AAh	MPC	PD2 Pin Function Control Register	PD2PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1ABh	MPC	PD3 Pin Function Control Register	PD3PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C1ACh	MPC	PD4 Pin Function Control Register	PD4PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C1ADh	MPC	PD5 Pin Function Control Register	PD5PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C1AEh	MPC	PD6 Pin Function Control Register	PD6PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C1AFh	MPC	PD7 Pin Function Control Register	PD7PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C1B0h	MPC	PE0 Pin Function Control Register	PE0PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1B1h	MPC	PE1 Pin Function Control Register	PE1PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1B2h	MPC	PE2 Pin Function Control Register	PE2PFS	8	8	2, 3 PCLKB	2 ICLK		
0008 C1B3h	MPC	PE3 Pin Function Control Register	PE3PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1B4h	MPC	PE4 Pin Function Control Register	PE4PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1B5h	MPC	PE5 Pin Function Control Register	PE5PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 64 or 48 pins.
0008 C1BAh	MPC	PF2 Pin Function Control Register	PF2PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1BBh	MPC	PF3 Pin Function Control Register	PF3PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C0h	MPC	PG0 Pin Function Control Register	PG0PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C1h	MPC	PG1 Pin Function Control Register	PG1PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C2h	MPC	PG2 Pin Function Control Register	PG2PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C3h	MPC	PG3 Pin Function Control Register	PG3PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C4h	MPC	PG4 Pin Function Control Register	PG4PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C5h	MPC	PG5 Pin Function Control Register	PG5PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 100, 64, or 48 pins.
0008 C1C6h	MPC	PG6 Pin Function Control Register	PG6PFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
0008 C1D0h	MPC	USB0_DPUPE Pin Function Control Register	UDPUPEPFS	8	8	2, 3 PCLKB	2 ICLK		Not present in versions with 112, 100, 64, or 48 pins.
0008 C280h	SYSTEM	Deep Standby Control Register	DPSBYCR	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption	
0008 C282h	SYSTEM	Deep Standby Interrupt Enable Register 0	DPSIER0	8	8	4, 5 PCLKB	2, 3 ICLK		
0008 C284h	SYSTEM	Deep Standby Interrupt Enable Register 2	DPSIER2	8	8	4, 5 PCLKB	2, 3 ICLK		
0008 C286h	SYSTEM	Deep Standby Interrupt Flag Register 0	DPSIFR0	8	8	4, 5 PCLKB	2, 3 ICLK		
0008 C288h	SYSTEM	Deep Standby Interrupt Flag Register 2	DPSIFR2	8	8	4, 5 PCLKB	2, 3 ICLK		
0008 C28Ah	SYSTEM	Deep Standby Interrupt Edge Register 0	DPSIEGR0	8	8	4, 5 PCLKB	2, 3 ICLK		
0008 C28Ch	SYSTEM	Deep Standby Interrupt Edge Register 2	DPSIEGR2	8	8	4, 5 PCLKB	2, 3 ICLK		
0008 C290h	SYSTEM	Reset Status Register 0	RSTSR0	8	8	4, 5 PCLKB	2, 3 ICLK	Resets	
0008 C291h	SYSTEM	Reset Status Register 1	RSTSR1	8	8	4, 5 PCLKB	2, 3 ICLK		

Table 4.1 List of I/O Registers (Address Order) (36/48)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Module Name	Remarks
						ICLK ≥ PCLK	ICLK < PCLK		
000C 1A28h	MTU7	Timer General Register C	TGRC	16	16, 32	4, 5 PCLKA	2, 3 ICLK	MTU3	
000C 1A2Ah	MTU7	Timer General Register D	TGRD	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A2Ch	MTU6	Timer Status Register	TSR	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A2Dh	MTU7	Timer Status Register	TSR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A30h	MTU	Timer Interrupt Skipping Set Register 1B	TITCR1B	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A31h	MTU	Timer Interrupt Skipping Counters 1B	TITCNT1B	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A32h	MTU	Timer Buffer Transfer Set Register B	TBTERB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A34h	MTU	Timer Dead Time Enable Register B	TDERB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A36h	MTU	Timer Output Level Buffer Register B	TOLBRB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A38h	MTU6	Timer Buffer Operation Transfer Mode Register	TBTM	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A39h	MTU7	Timer Buffer Operation Transfer Mode Register	TBTM	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A3Ah	MTU	Timer Interrupt Skipping Mode Register B	TITMRB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A3Bh	MTU	Timer Interrupt Skipping Set Register 2B	TITCR2B	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A3Ch	MTU	Timer Interrupt Skipping Counters 2B	TITCNT2B	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A40h	MTU7	Timer A/D Converter Start Request Control Register	TADCR	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A44h	MTU7	Timer A/D Converter Start Request Cycle Set Register A	TADCORA	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A46h	MTU7	Timer A/D Converter Start Request Cycle Set Register B	TADCORB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A48h	MTU7	Timer A/D Converter Start Request Cycle Set Buffer Register A	TADCOBRA	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1A4Ah	MTU7	Timer A/D Converter Start Request Cycle Set Buffer Register B	TADCOBRB	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A50h	MTU	Timer Synchronous Clear Register	TSYCR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A60h	MTU	Timer Waveform Control Register B	TWCRB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A70h	MTU	Timer Mode Register 2B	TMDR2B	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A72h	MTU6	Timer General Register E	TGRE	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A74h	MTU7	Timer General Register E	TGRE	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A76h	MTU7	Timer General Register F	TGRF	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1A80h	MTU	Timer Start Register B	TSTRB	8	8, 16	4, 5 PCLKA	2, 3 ICLK		
000C 1A81h	MTU	Timer Synchronous Register B	TSYRB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1A84h	MTU	Timer Read/Write Enable Register B	TRWERB	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1C80h	MTU5	Timer Counter U	TCNTU	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1C82h	MTU5	Timer General Register U	TGRU	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1C84h	MTU5	Timer Control Register U	TCRU	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1C86h	MTU5	Timer I/O Control Register U	TIORU	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1C90h	MTU5	Timer Counter V	TCNTV	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1C92h	MTU5	Timer General Register V	TGRV	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1C94h	MTU5	Timer Control Register V	TCRV	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1C96h	MTU5	Timer I/O Control Register V	TIORV	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1CA0h	MTU5	Timer Counter W	TCNTW	16	16, 32	4, 5 PCLKA	2, 3 ICLK		
000C 1CA2h	MTU5	Timer General Register W	TGRW	16	16	4, 5 PCLKA	2, 3 ICLK		
000C 1CA4h	MTU5	Timer Control Register W	TCRW	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1CA6h	MTU5	Timer I/O Control Register W	TIORW	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1CB0h	MTU5	Timer Status Register	TSR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1CB2h	MTU5	Timer Interrupt Enable Register	TIER	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1CB4h	MTU5	Timer Start Register	TSTR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 1CB6h	MTU5	Timer Compare Match Clear Register	TCNTCMPCLR	8	8	4, 5 PCLKA	2, 3 ICLK		
000C 2000h	GPT	General PWM Timer Software Start Register	GTSTR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK	GPT	
000C 2004h	GPT	General PWM Timer Hardware Source Start Control Register	GTHSCR	16	8, 16, 32	2 to 5 PCLKA	2, 3 ICLK		

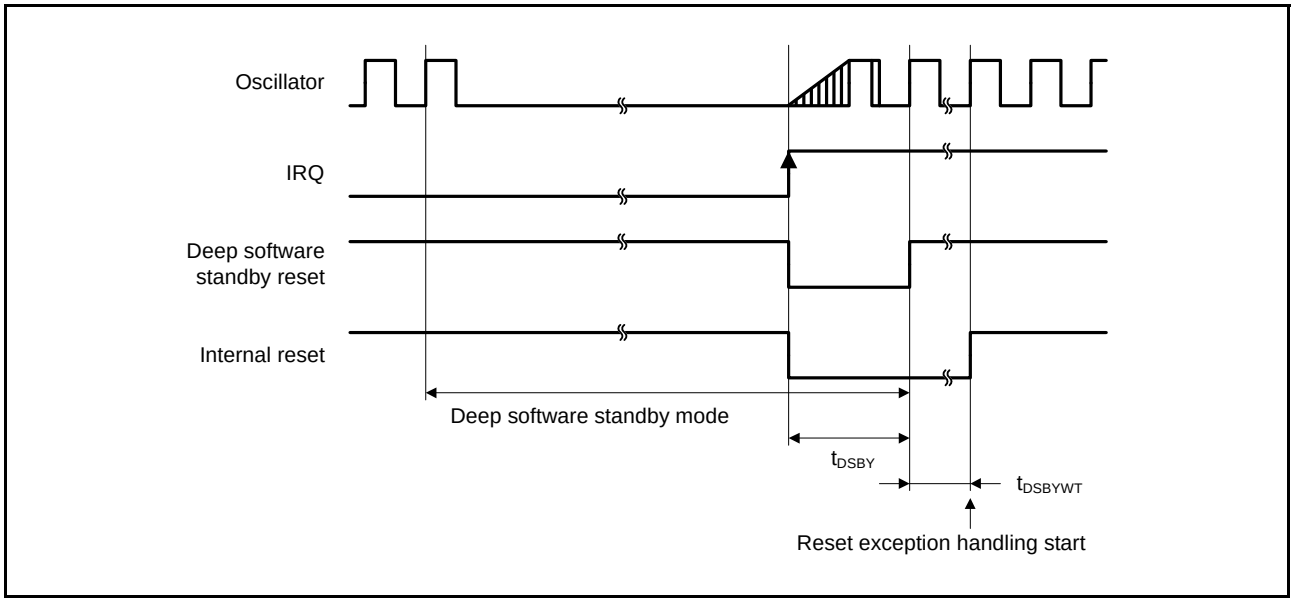


Figure 5.10 Deep Software Standby Mode Cancellation Timing

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

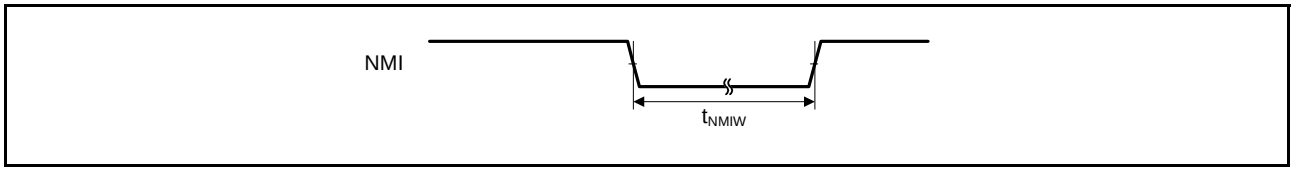


Figure 5.11 NMI Interrupt Input Timing

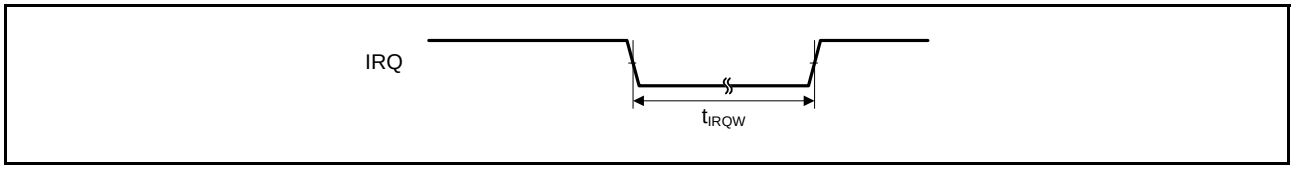


Figure 5.12 IRQ Interrupt Input Timing

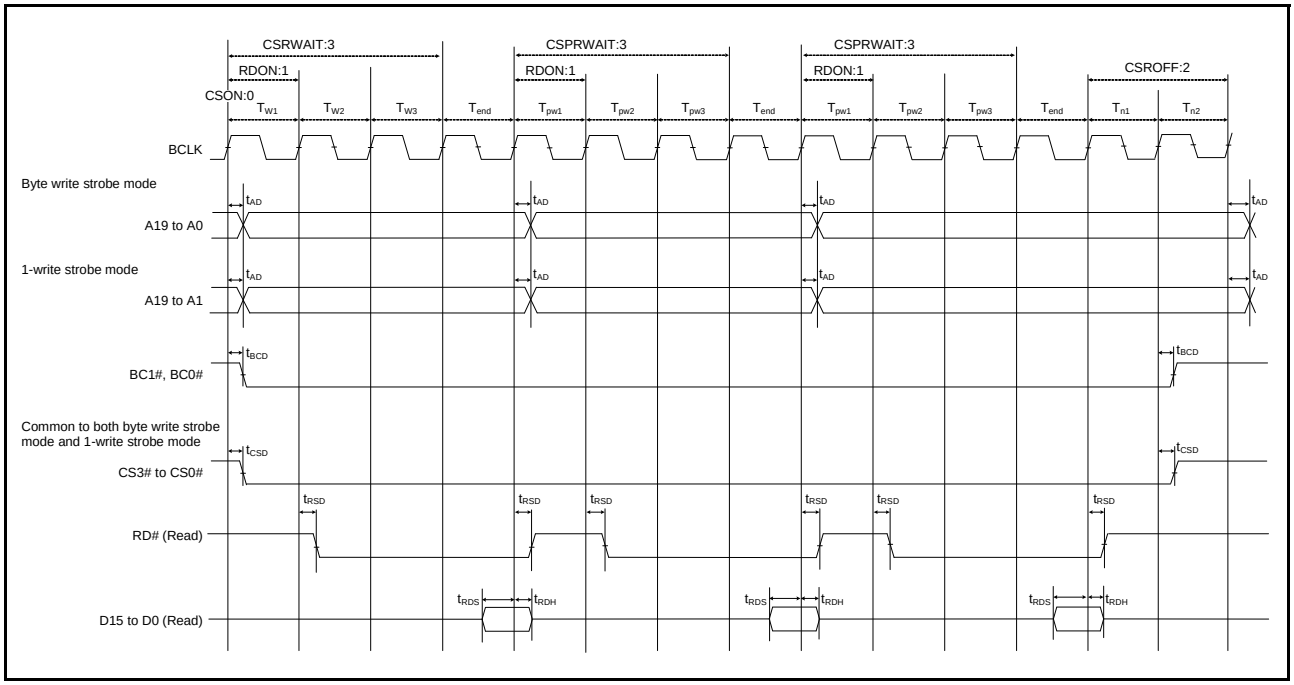
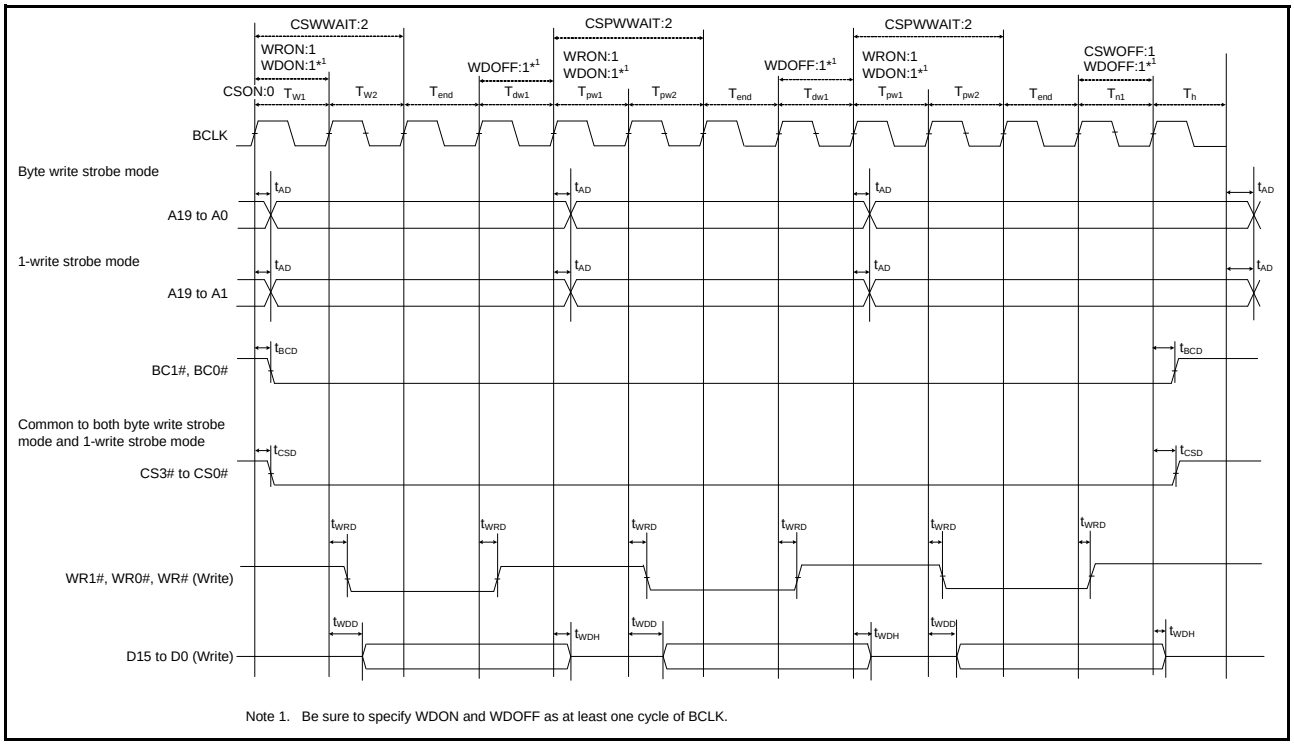


Figure 5.15 External Bus Timing/Page Read Cycle (Bus Clock Synchronized)



Note 1. Be sure to specify WDON and WDOFF as at least one cycle of BCLK.

Figure 5.16 External Bus Timing/Page Write Cycle (Bus Clock Synchronized)

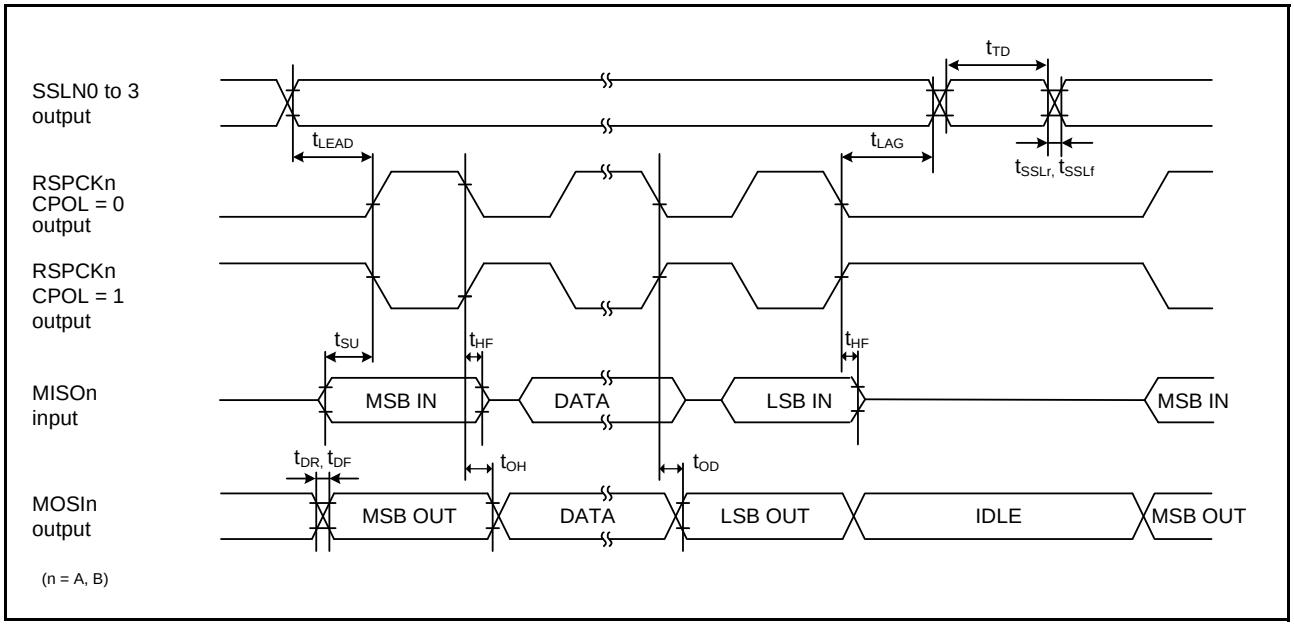


Figure 5.31 RSPI Timing (Master, CPHA = 1) (Bit Rate: PCLKB Division Ratio Set to 1/2)

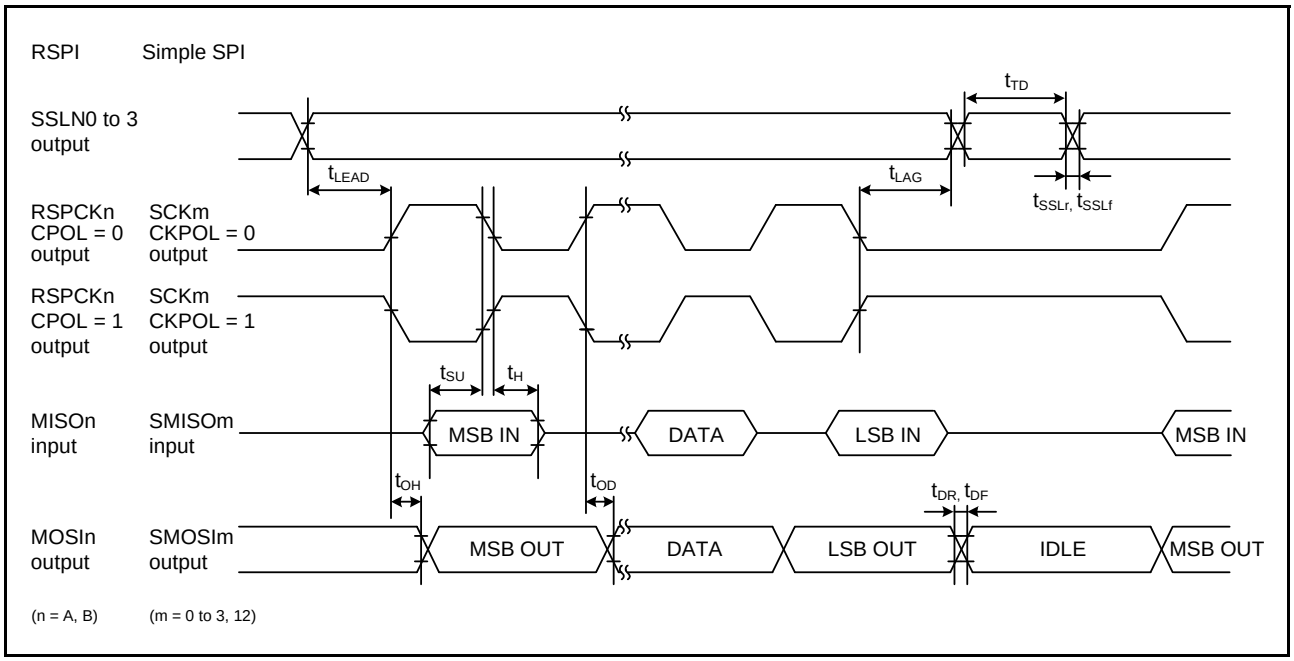


Figure 5.32 RSPI Timing (Master, CPHA = 1) (Bit Rate: PCLKB Division Ratio Set to a Value Other Than 1/2) and Simple SPI Timing (Master, CKPH = 0)

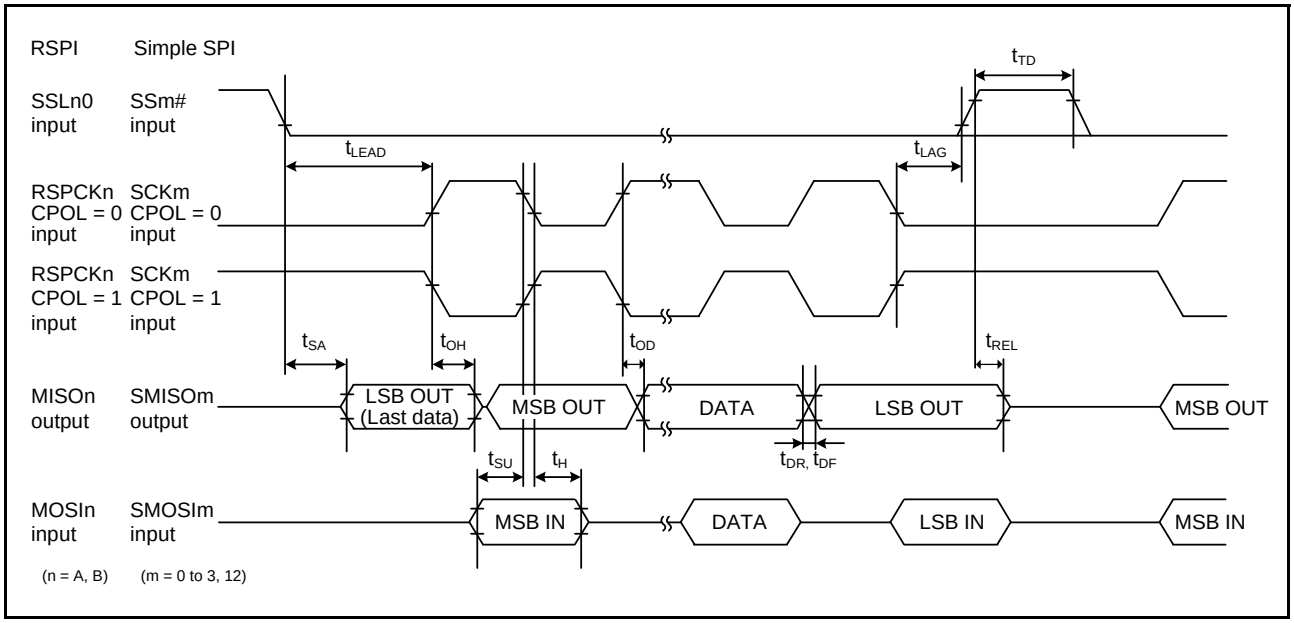


Figure 5.35 RSPI Timing (Slave, CPHA = 1) and Simple SPI Timing (Slave, CKPH = 0)

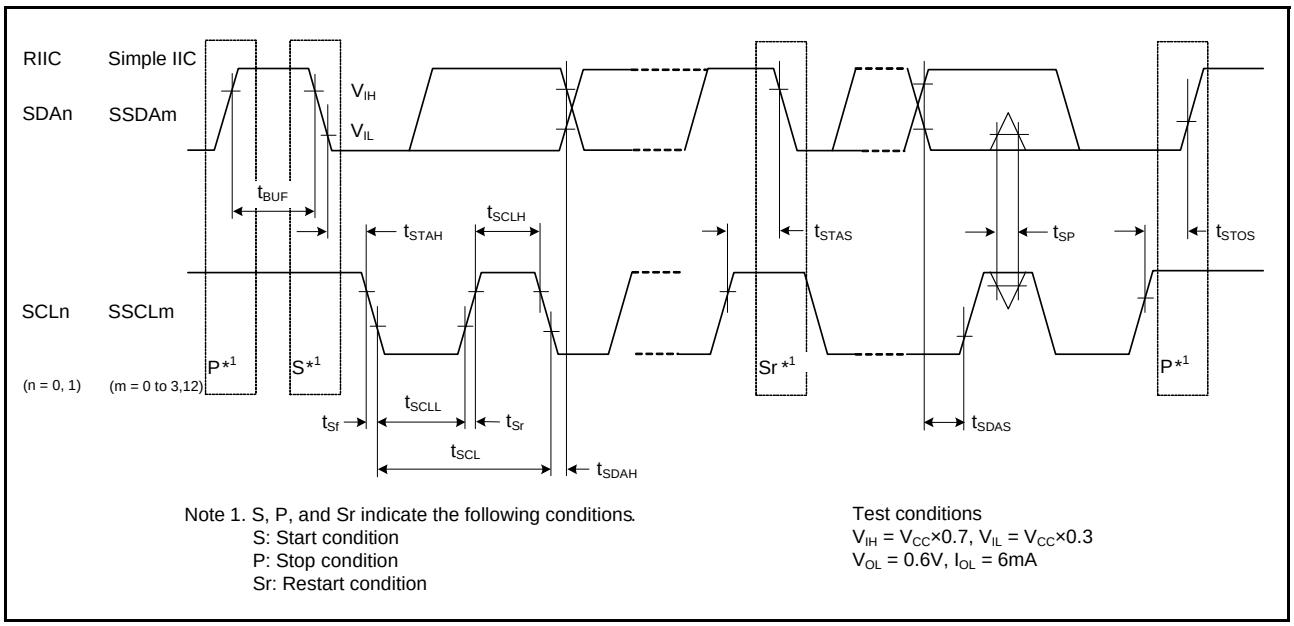


Figure 5.36 RIIC Bus Interface Input/Output Timing and Simple IIC Bus Interface Input/Output Timing

Table 5.20 10-Bit A/D Conversion 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

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

Item			Min.	Typ.	Max.	Unit	Test Conditions
Resolution			10	10	10	Bit	
Conversion time*1 (Operation at ADCLK = 50 MHz)	Without 0.1-µF external capacitor Permissible signal source impedance (max.) = 1 kΩ	AN0 to AN7	0.8	—	—	µs	Sampling in 15 states
		Other channels	1.0	—	—	µs	Sampling in 25 states
Analog input capacitance			—	—	6	pF	
Integral nonlinearity error			—	—	±2.0	LSB	
Offset error			—	—	±2.0	LSB	
Full-scale error			—	—	±3.0	LSB	
Quantization error			—	±0.5	—	LSB	
Absolute accuracy			—	—	±4.0	LSB	

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

5.8 Oscillation Stop Detection Circuit Characteristics

Table 5.28 Oscillation Stop Detection Circuit 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	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Detection time	t_{dr}	—	—	1.0	ms	Figure 5.43

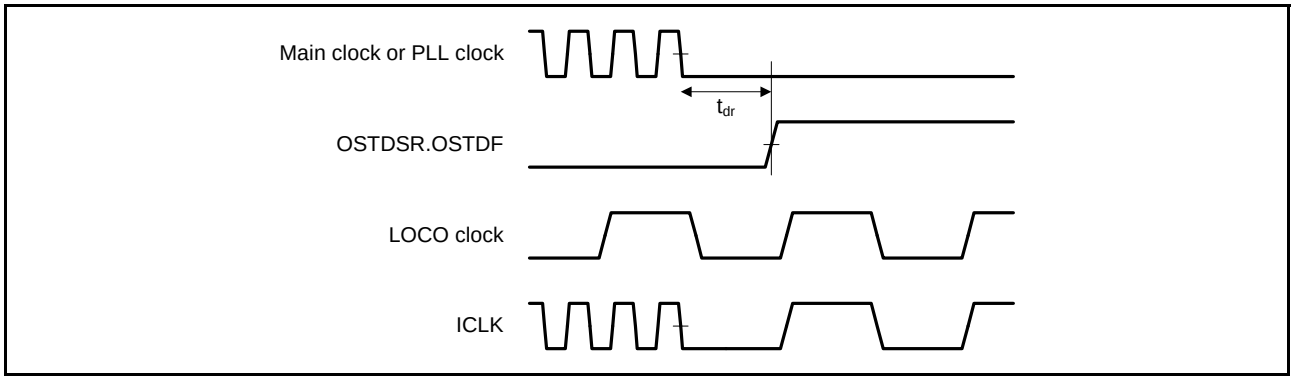
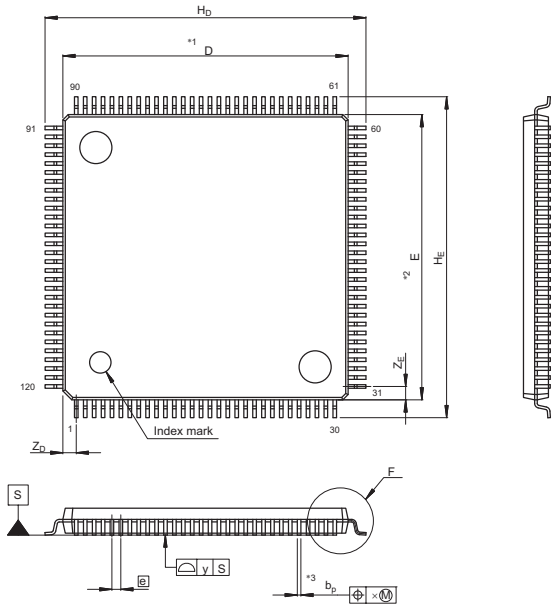
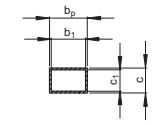


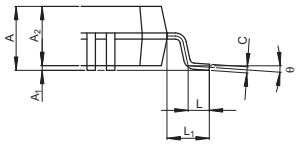
Figure 5.43 Oscillation Stop Detection Timing

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-LQFP120-16x16-0.50	PLQP0120KA-A	—	0.9g





Terminal cross section



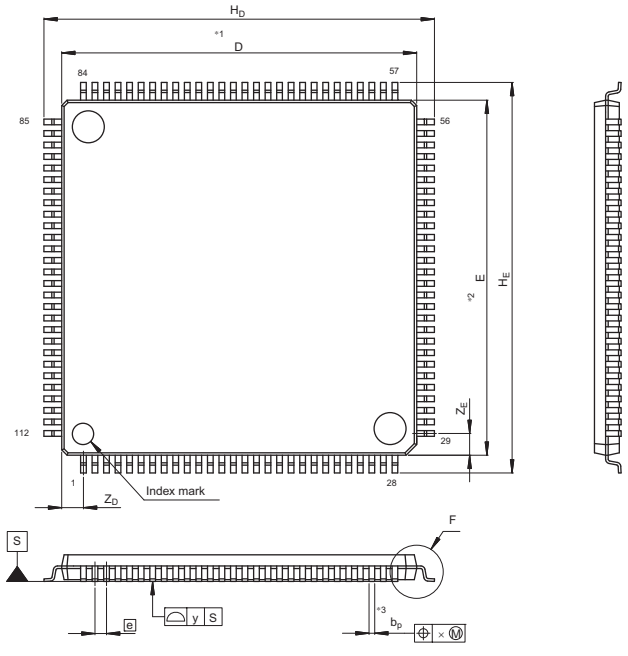
Detail F

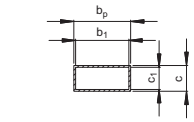
NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	15.9	16.0	16.1
E	15.9	16.0	16.1
A_2	—	1.4	—
H_D	17.8	18.0	18.2
H_E	17.8	18.0	18.2
A	—	—	1.7
A_1	0.05	0.1	0.15
b_p	0.17	0.22	0.27
b_1	—	0.20	—
c	0.09	0.145	0.20
c_1	—	0.125	—
θ	0°	—	8°
e	—	0.5	—
x	—	—	0.08
y	—	—	0.08
Z_D	—	0.75	—
Z_E	—	0.75	—
L	0.35	0.5	0.65
L_1	—	1.0	—

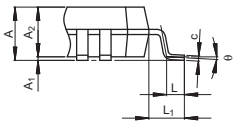
Figure B 120-Pin LQFP (PLQP0120KA-A)

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-LQFP112-20x20-0.65	PLQP0112JA-A	FP-112E/FP-112EV	1.2g





Terminal cross section



Detail F

NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	19.9	20.0	20.1
E	19.9	20.0	20.1
A_2	—	1.4	—
H_D	21.8	22.0	22.2
H_E	21.8	22.0	22.2
A	—	—	1.7
A_1	0.05	0.1	0.15
b_p	0.27	0.32	0.37
b_1	—	0.30	—
c	0.09	0.145	0.20
c_1	—	0.125	—
θ	0°	—	8°
e	—	0.65	—
x	—	—	0.13
y	—	—	0.10
Z_D	—	1.225	—
Z_E	—	1.225	—
L	0.35	0.5	0.65
L_1	—	1.0	—

Figure C 112-Pin LQFP (PLQP0112JA-A)