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What is "Embedded - Microcontrollers"?

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

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Not For New Designs
Core Processor	RXv2
Core Size	32-Bit Single-Core
Speed	54MHz
Connectivity	I²C, IrDA, SCI, SD/SDIO, SPI, SSI, USB OTG
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	43
Program Memory Size	256KB (256K x 8)
Program Memory Type	FLASH
EEPROM Size	8K x 8
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 5.5V
Data Converters	A/D 12x12b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	64-WFQFN Exposed Pad
Supplier Device Package	64-HWQFN (9x9)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f52316cdnd-u0

Table 1.2 Comparison of Functions for Different Packages

Module/Functions		RX230 Group			RX231 Group		
		100 Pins	64 Pins	48 Pins	100 Pins	64 Pins	48 Pins
External bus	External bus	16 bit	Not supported		16 bit	Not supported	
Interrupts	External interrupts	NMI, IRQ0 to IRQ7	NMI, IRQ0, IRQ1, IRQ4 to IRQ7	NMI, IRQ0, IRQ1, IRQ4 to IRQ7	NMI, IRQ0 to IRQ7	NMI, IRQ0, IRQ1, IRQ4 to IRQ7	NMI, IRQ0, IRQ1, IRQ4 to IRQ7
DMA	DMA controller	4 channels (DMAC0 to DMAC3)			4 channels (DMAC0 to DMAC3)		
	Data transfer controller	Available			Available		
Timers	16-bit timer pulse unit	6 channels (TPU0 to TPU5)			6 channels (TPU0 to TPU5)		
	Multi-function timer pulse unit 2	6 channels (MTU0 to MTU5)			6 channels (MTU0 to MTU5)		
	Port output enable 2	POE0# to POE3#, POE8#			POE0# to POE3#, POE8#		
	8-bit timer	2 channels× 2 units			2 channels× 2 units		
	Compare match timer	2 channels× 2 units			2 channels× 2 units		
	Low power timer	1 channel			1 channel		
	Realtime clock	Available		Not supported	Available		Not supported
	Watchdog timer	Available			Available		
	Independent watchdog timer	Available			Available		
Communication functions	Serial communications interfaces (SCIg)	6 channels (SCI0, 1, 5, 6, 8, 9)	5 channels (SCI1, 5, 6, 8, 9)	4 channels (SCI1, 5, 6, 8)	6 channels (SCI0, 1, 5, 6, 8, 9)	5 channels (SCI1, 5, 6, 8, 9)	4 channels (SCI1, 5, 6, 8)
	IrDA interface	1 channel (SCI5)			1 channel (SCI5)		
	Serial communications interfaces (SCIh)	1 channel (SCI12)			1 channel (SCI12)		
	I²C bus interface	1 channel			1 channel		
	CAN module	Not supported			1 channel*1		
	Serial peripheral interface	1 channel			1 channel		
	USB 2.0 host/function module	Not supported			1 channel		
	Serial sound interface	1 channel			1 channel		
	SD Host Interface	Not supported			1 channel*1		Not supported
Capacitive touch sensing unit		24 channels	10 channels	6 channels	24 channels	10 channels	6 channels
12-bit A/D converter (including high-precision channels)		24 channels (8 channels)	12 channels (6 channels)	8 channels (4 channels)	24 channels (8 channels)	12 channels (6 channels)	8 channels (4 channels)
Temperature sensor		Available			Available		
D/A converter		2 channels		Not supported	2 channels		Not supported
CRC calculator		Available			Available		
Event link controller		Available			Available		
Comparator B		4 channels			4 channels		
Packages		100-pin TFLGA 100-pin LFQFP	64-pin WFLGA 64-pin HWQFN 64-pin LFQFP	48-pin HWQFN 48-pin LFQFP	100-pin TFLGA 100-pin LFQFP	64-pin WFLGA 64-pin HWQFN 64-pin LFQFP	48-pin HWQFN 48-pin LFQFP

Note 1. Only for chip version B

Table 1.4 List of Products: G Version (T_a = –40 to +105°C) (1/2)

Group	Part No.	Order Part No.	Package	ROM Capacity	RAM Capacity	E2 DataFlash	Operating Frequency	Security Function	SDHI	CAN	Operating Temperature
RX231	R5F52318AGFP	R5F52318AGFP#30	PLQP0100KB-B	512 Kbytes	64 Kbytes	8 Kbytes	54 MHz	Not available	Not available	Available	–40 to +105°C
	R5F52318BGFP	R5F52318BGFP#30						Available	Available	Available	
	R5F52318AGND	R5F52318AGND#U0	PWQN0064KC-A					Not available	Not available	Available	
	R5F52318BGND	R5F52318BGND#U0						Available	Available	Available	
	R5F52318AGFM	R5F52318AGFM#30	PLQP0064KB-C					Not available	Not available	Available	
	R5F52318BGFM	R5F52318BGFM#30						Available	Available	Available	
	R5F52318AGNE	R5F52318AGNE#U0	PWQN0048KB-A					Not available	Not available	Available	
	R5F52318BGNE	R5F52318BGNE#U0						Available	Not available	Available	
	R5F52318AGFL	R5F52318AGFL#30	PLQP0048KB-B					Not available	Not available	Available	
	R5F52318BGFL	R5F52318BGFL#30						Available	Not available	Available	
	R5F52317AGFP	R5F52317AGFP#30	PLQP0100KB-B	384 Kbytes				Not available	Not available	Available	
	R5F52317BGFP	R5F52317BGFP#30						Available	Available	Available	
	R5F52317AGND	R5F52317AGND#U0	PWQN0064KC-A					Not available	Not available	Available	
	R5F52317BGND	R5F52317BGND#U0						Available	Available	Available	
	R5F52317AGFM	R5F52317AGFM#30	PLQP0064KB-C					Not available	Not available	Available	
	R5F52317BGFM	R5F52317BGFM#30						Available	Available	Available	
	R5F52317AGNE	R5F52317AGNE#U0	PWQN0048KB-A					Not available	Not available	Available	
	R5F52317BGNE	R5F52317BGNE#U0						Available	Not available	Available	
	R5F52317AGFL	R5F52317AGFL#30	PLQP0048KB-B					Not available	Not available	Available	
	R5F52317BGFL	R5F52317BGFL#30						Available	Not available	Available	
	R5F52316AGFP	R5F52316AGFP#30	PLQP0100KB-B	256 Kbytes	32 Kbytes			Not available	Not available	Available	
	R5F52316CGFP	R5F52316CGFP#30						Not available	Not available	Not available	
	R5F52316AGND	R5F52316AGND#U0	PWQN0064KC-A					Not available	Not available	Available	
	R5F52316CGND	R5F52316CGND#U0						Not available	Not available	Not available	
	R5F52316AGFM	R5F52316AGFM#30	PLQP0064KB-C					Not available	Not available	Available	
	R5F52316CGFM	R5F52316CGFM#30						Not available	Not available	Not available	
	R5F52316AGNE	R5F52316AGNE#U0	PWQN0048KB-A					Not available	Not available	Available	
	R5F52316CGNE	R5F52316CGNE#U0						Not available	Not available	Not available	
	R5F52316AGFL	R5F52316AGFL#30	PLQP0048KB-B					Not available	Not available	Available	
	R5F52316CGFL	R5F52316CGFL#30						Not available	Not available	Not available	
	R5F52315AGFP	R5F52315AGFP#30	PLQP0100KB-B	128 Kbytes				Not available	Not available	Available	
	R5F52315CGFP	R5F52315CGFP#30						Not available	Not available	Not available	
	R5F52315AGND	R5F52315AGND#U0	PWQN0064KC-A					Not available	Not available	Available	
	R5F52315CGND	R5F52315CGND#U0						Not available	Not available	Not available	
	R5F52315AGFM	R5F52315AGFM#30	PLQP0064KB-C					Not available	Not available	Available	
	R5F52315CGFM	R5F52315CGFM#30						Not available	Not available	Not available	
	R5F52315AGNE	R5F52315AGNE#U0	PWQN0048KB-A					Not available	Not available	Available	
	R5F52315CGNE	R5F52315CGNE#U0						Not available	Not available	Not available	

Table 1.4 List of Products: G Version (T_a = –40 to +105°C) (2/2)

Group	Part No.	Order Part No.	Package	ROM Capacity	RAM Capacity	E2 DataFlash	Operating Frequency	Security Function	SDHI	CAN	Operating Temperature
RX231	R5F52315AGFL	R5F52315AGFL#30	PLQP0048KB-B	128 Kbytes	32 Kbytes	8 Kbytes	54 MHz	Not available	Not available	Available	–40 to +105°C
	R5F52315CGFL	R5F52315CGFL#30						Not available	Not available	Not available	
RX230	R5F52306AGFP	R5F52306AGFP#30	PLQP0100KB-B	256 Kbytes	32 Kbytes	8 Kbytes	54 MHz	Not available	Not available	Not available	–40 to +105°C
	R5F52306AGND	R5F52306AGND#U0	PWQN0064KC-A					Not available	Not available	Not available	
	R5F52306AGFM	R5F52306AGFM#30	PLQP0064KB-C					Not available	Not available	Not available	
	R5F52306AGNE	R5F52306AGNE#U0	PWQN0048KB-A					Not available	Not available	Not available	
	R5F52306AGFL	R5F52306AGFL#30	PLQP0048KB-B					Not available	Not available	Not available	
	R5F52305AGFP	R5F52305AGFP#30	PLQP0100KB-B	128 Kbytes				Not available	Not available	Not available	
	R5F52305AGND	R5F52305AGND#U0	PWQN0064KC-A					Not available	Not available	Not available	
	R5F52305AGFM	R5F52305AGFM#30	PLQP0064KB-C					Not available	Not available	Not available	
	R5F52305AGNE	R5F52305AGNE#U0	PWQN0048KB-A					Not available	Not available	Not available	
	R5F52305AGFL	R5F52305AGFL#30	PLQP0048KB-B					Not available	Not available	Not available	

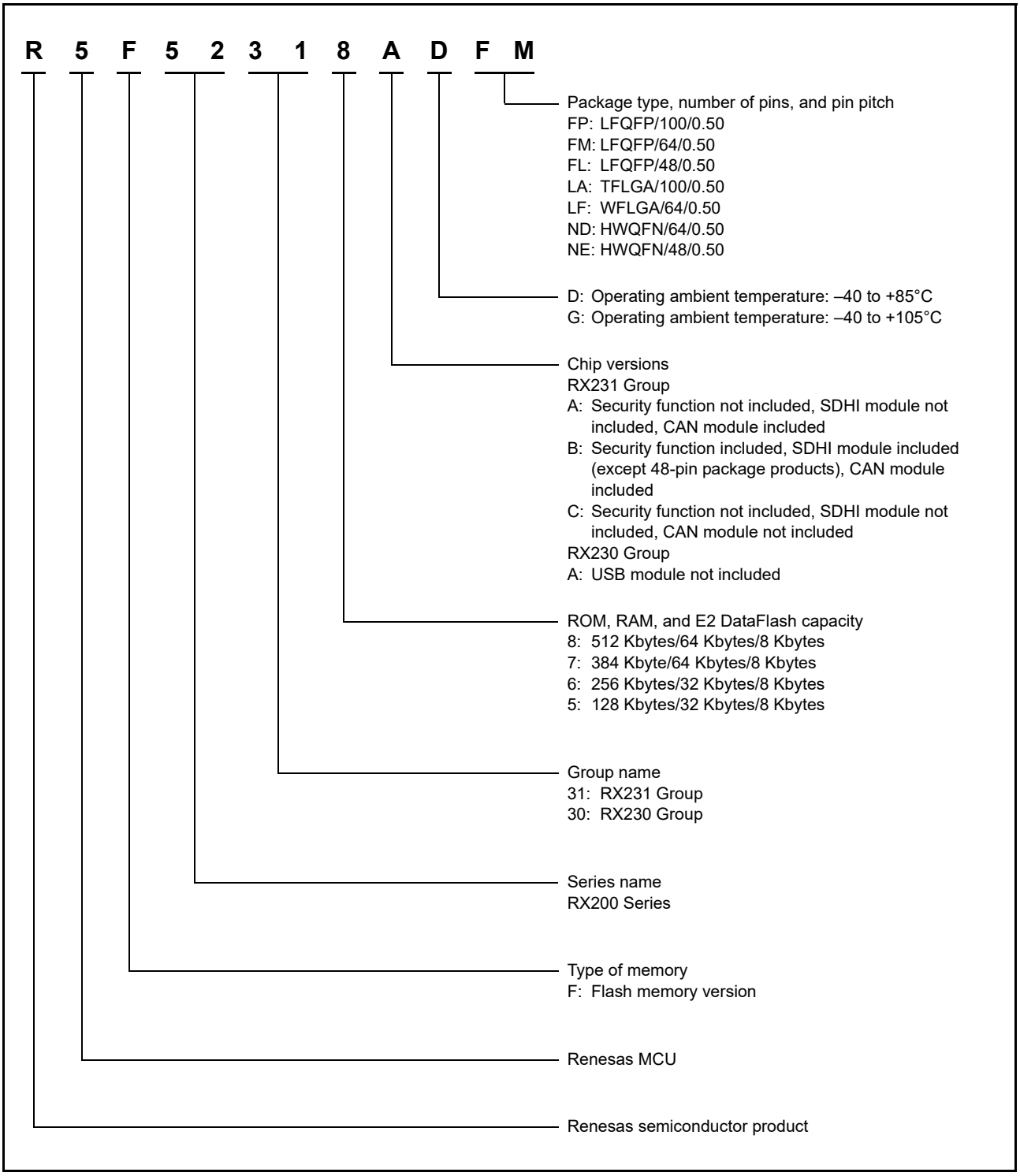


Figure 1.1 How to Read the Product Part Number

Table 1.5 Pin Functions (2/4)

Classifications	Pin Name	I/O	Description
16-bit timer pulse unit	TIOCA0, TIOCB0 TIOCC0, TIOCD0	I/O	The TGRA0 to TGRD0 input capture input/output compare output/PWM output pins.
	TIOCA1, TIOCB1	I/O	The TGRA1 and TGRB1 input capture input/output compare output/PWM output pins.
	TIOCA2, TIOCB2	I/O	The TGRA2 and TGRB2 input capture input/output compare output/PWM output pins.
	TIOCA3, TIOCB3 TIOCC3, TIOCD3	I/O	The TGRA3 to TGRD3 input capture input/output compare output/PWM output pins.
	TIOCA4, TIOCB4	I/O	The TGRA4 and TGRB4 input capture input/output compare output/PWM output pins.
	TIOCA5, TIOCB5	I/O	The TGRA5 and TGRB5 input capture input/output compare output/PWM output pins.
	TCLKA, TCLKB TCLKC, TCLKD	Input	Input pins for external clock signals.
Multi-function timer pulse unit 2	MTIOC0A, MTIOC0B MTIOC0C, MTIOC0D	I/O	The TGRA0 to TGRD0 input capture input/output compare output/PWM output pins.
	MTIOC1A, MTIOC1B	I/O	The TGRA1 and TGRB1 input capture input/output compare output/PWM output pins.
	MTIOC2A, MTIOC2B	I/O	The TGRA2 and TGRB2 input capture input/output compare output/PWM output pins.
	MTIOC3A, MTIOC3B MTIOC3C, MTIOC3D	I/O	The TGRA3 to TGRD3 input capture input/output compare output/PWM output pins.
	MTIOC4A, MTIOC4B MTIOC4C, MTIOC4D	I/O	The TGRA4 to TGRD4 input capture input/output compare output/PWM output pins.
	MTIC5U, MTIC5V, MTIC5W	Input	The TGRU5, TGRV5, and TGRW5 input capture input/external pulse input pins.
	MTCLKA, MTCLKB, MTCLKC, MTCLKD	Input	Input pins for the external clock.
Port output enable 2	POE0# to POE3#, POE8#	Input	Input pins for request signals to place the MTU pins in the high impedance state.
Realtime clock	RTCOUT	Output	Output pin for the 1-Hz/64-Hz clock.
	RTCIC0 to RTCIC2	Input	Time capture event input pins.
8-bit timer	TMO0 to TMO3	Output	Compare match output pins.
	TMCI0 to TMCI3	Input	Input pins for the external clock to be input to the counter.
	TMRI0 to TMRI3	Input	Counter reset input pins.
Serial communications interface (SCIg)	• Asynchronous mode/clock synchronous mode		
	SCK0, SCK1, SCK5, SCK6, SCK8, SCK9	I/O	Input/output pins for the clock.
	RXD0, RXD1, RXD5, RXD6, RXD8, RXD9	Input	Input pins for received data.
	TXD0, TXD1, TXD5, TXD6, TXD8, TXD9	Output	Output pins for transmitted data.
	CTS0#, CTS1#, CTS5#, CTS6#, CTS8#, CTS9#	Input	Input pins for controlling the start of transmission and reception.
	RTS0#, RTS1#, RTS5#, RTS6#, RTS8#, RTS9#	Output	Output pins for controlling the start of transmission and reception.
	• Simple I^2C mode		
	SSCL0, SSCL1, SSCL5, SSCL6, SSCL8, SSCL9	I/O	Input/output pins for the I^2C clock.
	SSDA0, SSDA1, SSDA5, SSDA6, SSDA8, SSDA9	I/O	Input/output pins for the I^2C data.

Table 1.6 List of Pins and Pin Functions (100-Pin TFLGA) (3/3)

Pin No.	Power Supply, Clock, System Control	I/O Port	External Bus	Timers (MTU, TPU, TMR, RTC, CMT, POE, CAC)	Communications (SCI, RSPI, RIIC, RSCAN, USB, SSI)	Memory Interface (SDHI)	Touch sensing	Others
J6	VCC_USB*1	PH3*1		TMCI0*1				
J7		P50	WR0#/WR#				TS20	
J8		PC4	A20/CS3#	MTIOC3D/MTCLKC/TMCI1/ POE0#	SCK5/CTS8#/RTS8#/ SS8#/SSLA0	SDHI_D1	TSCAP	
J9		PC0	A16	MTIOC3C/TCLKC	CTS5#/RTS5#/SS5#/ SSLA1		TS35	
J10		PC1	A17	MTIOC3A/TCLKD	SCK5/SSLA2		TS33	
K1		P23		MTIOC3D/MTCLKD/ TIOCD3	CTS0#/RTS0#/SS0#/ SSISCK0		TS6	
K2		P22		MTIOC3B/MTCLKC/TMO0/ TIOCC3	SCK0/ USB0_OVRCURB/ AUDIO_MCLK		TS7	
K3		P20		MTIOC1A/TMRI0/TIOCB3	TXD0/SMOSI0/SSDA0/ USB0_ID/SSIRXD0		TS9	
K4		P14		MTIOC3A/MTCLKA/TMRI2/ TIOCB5/TCLKA	CTS1#/RTS1#/SS1#/ CTXD0/USB0_OVRCURA		TS13	IRQ4/ CVREFB2
K5		PH2*1		TMRI0*1	USB0_DM*1			IRQ1*1
K6		PH1*1		TMO0*1	USB0_DP*1			IRQ0*1
K7		P51	WR1#/BC1#/ WAIT#				TS19	
K8		PC5	A21/CS2#/ WAIT#	MTIOC3B/MTCLKD/TMRI2	SCK8/RSPCKA		TS23	
K9		PC3	A19	MTIOC4D/TCLKB	TXD5/SMOSI5/SSDA5/ IRTXD5	SDHI_D0	TS27	
K10		PC2	A18	MTIOC4B/TCLKA	RXD5/SMISO5/SSCL5/ SSLA3/ IRRXD5	SDHI_D3	TS30	

Note 1. RX230: PH0/CACREF, PH1/IRQ0/TMO0, PH2/IRQ1/TMRI0, PH3/TMCI0
RX231: VSS_USB, USB0_DP, USB0_DM, VCC_USB

Table 1.9 List of Pins and Pin Functions (64-Pin LFQFP/HWQFN) (1/2)

Pin No.	Power Supply, Clock, System Control	I/O Port	Timers (MTU, TPU, TMR, RTC, CMT, POE, CAC)	Communications (SCI, RSPI, RIIC, RSCAN, USB, SSI)	Memory Interface (SDHI)	Touch sensing	Others
1		P03					DA0
2	VCL						
3	MD						FINED
4	XCIN						
5	XCOUT						
6	RES#						
7	XTAL	P37					
8	VSS						
9	EXTAL	P36					
10	VCC						
11	UPSEL	P35					NMI
12	VBATT						
13		P31	MTIOC4D/TMCI2/RTCIC1	CTS1#/RTS1#/SS1#/SSISCK0			IRQ1
14		P30	MTIOC4B/TMRI3/POE8#/RTCIC0	RXD1/SMISO1/SSCL1/ AUDIO_MCLK			IRQ0/CMPOB3
15		P27	MTIOC2B/TMCI3	SCK1/SSIWS0		TS2	CVREFB3
16		P26	MTIOC2A/TMO1	TXD1/SMOSI1/SSDA1/ USB0_VBUSEN/SSIRXD0		TS3	CMPB3
17		P17	MTIOC3A/MTIOC3B/TMO1/ POE8#/TIOCB0/TCLKD	SCK1/MISOA/SDA/SSITXD0			IRQ7/ CMPOB2
18		P16	MTIOC3C/MTIOC3D/TMO2/ TIOCB1/TCLKC/RTCOUT	TXD1/SMOSI1/SSDA1/MOSIA/ SCL/USB0_VBUS/ USB0_VBUSEN/ USB0_OVRCURB			IRQ6/ADTRG0#
19		P15	MTIOC0B/MTCLKB/TMCI2/ TIOCB2/TCLKB	RXD1/SMISO1/SSCL1/CRXD0		TS12	IRQ5/CMPB2
20		P14	MTIOC3A/MTCLKA/TMRI2/ TIOCB5/TCLKA	CTS1#/RTS1#/SS1#/CTXD0/ USB0_OVRCURA		TS13	IRQ4/CVREFB2
21	VCC_USB*1	PH3*1	TMCI0*1				
22		PH2*1	TMRI0*1	USB0_DM*1			IRQ1*1
23		PH1*1	TMO0*1	USB0_DP*1			IRQ0*1
24	VSS_USB*1	PH0*1					CACREF*1
25		P55	MTIOC4D/TMO3	CRXD0		TS15	
26		P54	MTIOC4B/TMCI1	CTXD0		TS16	
27	UB	PC7	MTIOC3A/MTCLKB/TMO2	TXD8/SMOSI8/SSDA8/MISOA			CACREF
28		PC6	MTIOC3C/MTCLKA/TMCI2	RXD8/SMISO8/SSCL8/MOSIA/ USB0_EXICEN		TS22	
29		PC5	MTIOC3B/MTCLKD/TMRI2	SCK8/RSPCKA/USB0_ID		TS23	
30		PC4	MTIOC3D/MTCLKC/TMCI1/ POE0#	SCK5/CTS8#/RTS8#/SS8#/ SSLA0	SDHI_D1	TSCAP	
31		PC3	MTIOC4D/TCLKB	TXD5/SMOSI5/SSDA5/ IRTXD5	SDHI_D0	TS27	
32		PC2	MTIOC4B/TCLKA	RXD5/SMISO5/SSCL5/SSLA3/ IRRXD5	SDHI_D3	TS30	
33		PB7/PC1	MTIOC3B/TIOCB5	TXD9/SMOSI9/SSDA9	SDHI_D2		
34		PB6/PC0	MTIOC3D/TIOCA5	RXD9/SMISO9/SSCL9	SDHI_D1		
35		PB5	MTIOC2A/MTIOC1B/TMRI1/ POE1#/TIOCB4	SCK9/USB0_VBUS	SDHI_CD		
36		PB3	MTIOC0A/MTIOC4A/TMO0/ POE3#/TIOCD3/TCLKD	SCK6	SDHI_WP		
37		PB1	MTIOC0C/MTIOC4C/TMCI0/ TIOCB3	TXD6/SMOSI6/SSDA6	SDHI_CLK		IRQ4/ CMPOB1
38	VCC						
39		PB0	MTIC5W/TIOCA3	RXD6/SMISO6/SSCL6/RSPCKA	SDHI_CMD		
40	VSS						
41		PA6	MTIC5V/MTCLKB/TMCI3/POE2#/ TIOCA2	CTS5#/RTS5#/SS5#/MOSIA/ SSIWS0			

Table 4.1 List of I/O Registers (Address Order) (3/33)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	ICLK <PCLK
0008 240Ch	DTC	DTC Module Start Register	DTCST	8	8	2 ICLK	
0008 240Eh	DTC	DTC Status Register	DTCSTS	16	16	2 ICLK	
0008 3002h	BSC	CS0 Mode Register	CS0MOD	16	16	1 or 2 BCLK	
0008 3004h	BSC	CS0 Wait Control Register 1	CS0WCR1	32	32	1 or 2 BCLK	
0008 3008h	BSC	CS0 Wait Control Register 2	CS0WCR2	32	32	1 or 2 BCLK	
0008 3012h	BSC	CS1 Mode Register	CS1MOD	16	16	1 or 2 BCLK	
0008 3014h	BSC	CS1 Wait Control Register 1	CS1WCR1	32	32	1 or 2 BCLK	
0008 3018h	BSC	CS1 Wait Control Register 2	CS1WCR2	32	32	1 or 2 BCLK	
0008 3022h	BSC	CS2 Mode Register	CS2MOD	16	16	1 or 2 BCLK	
0008 3024h	BSC	CS2 Wait Control Register 1	CS2WCR1	32	32	1 or 2 BCLK	
0008 3028h	BSC	CS2 Wait Control Register 2	CS2WCR2	32	32	1 or 2 BCLK	
0008 3032h	BSC	CS3 Mode Register	CS3MOD	16	16	1 or 2 BCLK	
0008 3034h	BSC	CS3 Wait Control Register 1	CS3WCR1	32	32	1 or 2 BCLK	
0008 3038h	BSC	CS3 Wait Control Register 2	CS3WCR2	32	32	1 or 2 BCLK	
0008 3802h	BSC	CS0 Control Register	CS0CR	16	16	1 or 2 BCLK	
0008 380Ah	BSC	CS0 Recovery Cycle Register	CS0REC	16	16	1 or 2 BCLK	
0008 3812h	BSC	CS1 Control Register	CS1CR	16	16	1 or 2 BCLK	
0008 381Ah	BSC	CS1 Recovery Cycle Register	CS1REC	16	16	1 or 2 BCLK	
0008 3822h	BSC	CS2 Control Register	CS2CR	16	16	1 or 2 BCLK	
0008 382Ah	BSC	CS2 Recovery Cycle Register	CS2REC	16	16	1 or 2 BCLK	
0008 3832h	BSC	CS3 Control Register	CS3CR	16	16	1 or 2 BCLK	
0008 383Ah	BSC	CS3 Recovery Cycle Register	CS3REC	16	16	1 or 2 BCLK	
0008 3880h	BSC	CS Recovery Cycle Insertion Enable Register	CSRECEN	16	16	1 or 2 BCLK	
0008 6400h	MPU	Region-0 Start Page Number Register	RSPAGE0	32	32	1 ICLK	
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	
0008 7010h to 0008 70FFh	ICU	Interrupt Request Register 016 to Interrupt Request Register 255	IR016 to IR255	8	8	2 ICLK	

Table 4.1 List of I/O Registers (Address Order) (9/33)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	ICLK <PCLK
0008 90AAh	S12AD	A/D Compare Function Window B Upper-Side Level Setting Register	ADWINULB	16	16	2 or 3 PCLKB	2 ICLK
0008 90ACh	S12AD	A/D Compare Function Window B Channel Status Register	ADCMPBSR	8	8	2 or 3 PCLKB	2 ICLK
0008 90B0h	S12AD	A/D Data Storage Buffer Register 0	ADBUF0	16	16	2 or 3 PCLKB	2 ICLK
0008 90B2h	S12AD	A/D Data Storage Buffer Register 1	ADBUF1	16	16	2 or 3 PCLKB	2 ICLK
0008 90B4h	S12AD	A/D Data Storage Buffer Register 2	ADBUF2	16	16	2 or 3 PCLKB	2 ICLK
0008 90B6h	S12AD	A/D Data Storage Buffer Register 3	ADBUF3	16	16	2 or 3 PCLKB	2 ICLK
0008 90B8h	S12AD	A/D Data Storage Buffer Register 4	ADBUF4	16	16	2 or 3 PCLKB	2 ICLK
0008 90BAh	S12AD	A/D Data Storage Buffer Register 5	ADBUF5	16	16	2 or 3 PCLKB	2 ICLK
0008 90BCh	S12AD	A/D Data Storage Buffer Register 6	ADBUF6	16	16	2 or 3 PCLKB	2 ICLK
0008 90BEh	S12AD	A/D Data Storage Buffer Register 7	ADBUF7	16	16	2 or 3 PCLKB	2 ICLK
0008 90C0h	S12AD	A/D Data Storage Buffer Register 8	ADBUF8	16	16	2 or 3 PCLKB	2 ICLK
0008 90C2h	S12AD	A/D Data Storage Buffer Register 9	ADBUF9	16	16	2 or 3 PCLKB	2 ICLK
0008 90C4h	S12AD	A/D Data Storage Buffer Register 10	ADBUF10	16	16	2 or 3 PCLKB	2 ICLK
0008 90C6h	S12AD	A/D Data Storage Buffer Register 11	ADBUF11	16	16	2 or 3 PCLKB	2 ICLK
0008 90C8h	S12AD	A/D Data Storage Buffer Register 12	ADBUF12	16	16	2 or 3 PCLKB	2 ICLK
0008 90CAh	S12AD	A/D Data Storage Buffer Register 13	ADBUF13	16	16	2 or 3 PCLKB	2 ICLK
0008 90CCh	S12AD	A/D Data Storage Buffer Register 14	ADBUF14	16	16	2 or 3 PCLKB	2 ICLK
0008 90CEh	S12AD	A/D Data Storage Buffer Register 15	ADBUF15	16	16	2 or 3 PCLKB	2 ICLK
0008 90D0h	S12AD	A/D Data Storage Buffer Enable Register	ADBUFEN	8	8	2 or 3 PCLKB	2 ICLK
0008 90D2h	S12AD	A/D Data Storage Buffer Pointer Register	ADBUFPTR	8	8	2 or 3 PCLKB	2 ICLK
0008 90DDh	S12AD	A/D Sampling State Register L	ADSSTRL	8	8	2 or 3 PCLKB	2 ICLK
0008 90DEh	S12AD	A/D Sampling State Register T	ADSSTRT	8	8	2 or 3 PCLKB	2 ICLK
0008 90DFh	S12AD	A/D Sampling State Register O	ADSSTRO	8	8	2 or 3 PCLKB	2 ICLK
0008 90E0h	S12AD	A/D Sampling State Register 0	ADSSTR0	8	8	2 or 3 PCLKB	2 ICLK
0008 90E1h	S12AD	A/D Sampling State Register 1	ADSSTR1	8	8	2 or 3 PCLKB	2 ICLK
0008 90E2h	S12AD	A/D Sampling State Register 2	ADSSTR2	8	8	2 or 3 PCLKB	2 ICLK
0008 90E3h	S12AD	A/D Sampling State Register 3	ADSSTR3	8	8	2 or 3 PCLKB	2 ICLK
0008 90E4h	S12AD	A/D Sampling State Register 4	ADSSTR4	8	8	2 or 3 PCLKB	2 ICLK
0008 90E5h	S12AD	A/D Sampling State Register 5	ADSSTR5	8	8	2 or 3 PCLKB	2 ICLK
0008 90E6h	S12AD	A/D Sampling State Register 6	ADSSTR6	8	8	2 or 3 PCLKB	2 ICLK
0008 90E7h	S12AD	A/D Sampling State Register 7	ADSSTR7	8	8	2 or 3 PCLKB	2 ICLK
0008 A000h	SCI0	Serial Mode Register	SMR	8	8	2 or 3 PCLKB	2 ICLK
0008 A001h	SCI0	Bit Rate Register	BRR	8	8	2 or 3 PCLKB	2 ICLK
0008 A002h	SCI0	Serial Control Register	SCR	8	8	2 or 3 PCLKB	2 ICLK
0008 A003h	SCI0	Transmit Data Register	TDR	8	8	2 or 3 PCLKB	2 ICLK
0008 A004h	SCI0	Serial Status Register	SSR	8	8	2 or 3 PCLKB	2 ICLK
0008 A005h	SCI0	Receive Data Register	RDR	8	8	2 or 3 PCLKB	2 ICLK
0008 A006h	SCI0	Smart Card Mode Register	SCMR	8	8	2 or 3 PCLKB	2 ICLK
0008 A007h	SCI0	Serial Extended Mode Register	SEMR	8	8	2 or 3 PCLKB	2 ICLK
0008 A008h	SCI0	Noise Filter Setting Register	SNFR	8	8	2 or 3 PCLKB	2 ICLK
0008 A009h	SCI0	I^2C Mode Register 1	SIMR1	8	8	2 or 3 PCLKB	2 ICLK
0008 A00Ah	SCI0	I^2C Mode Register 2	SIMR2	8	8	2 or 3 PCLKB	2 ICLK
0008 A00Bh	SCI0	I^2C Mode Register 3	SIMR3	8	8	2 or 3 PCLKB	2 ICLK
0008 A00Ch	SCI0	I^2C Status Register	SISR	8	8	2 or 3 PCLKB	2 ICLK
0008 A00Dh	SCI0	SPI Mode Register	SPMR	8	8	2 or 3 PCLKB	2 ICLK
0008 A00Eh	SCI0	Transmit Data Register HL	TDRHL	16	16	4 or 5 PCLKB	2 ICLK
0008 A00Eh	SCI0	Transmit Data Register H	TDRH	8	8	2 or 3 PCLKB	2 ICLK
0008 A00Fh	SCI0	Transmit Data Register L	TDRL	8	8	2 or 3 PCLKB	2 ICLK
0008 A010h	SCI0	Receive Data Register HL	RDRHL	16	16	4 or 5 PCLKB	2 ICLK
0008 A010h	SCI0	Receive Data Register H	RDRH	8	8	2 or 3 PCLKB	2 ICLK
0008 A011h	SCI0	Receive Data Register L	RDRL	8	8	2 or 3 PCLKB	2 ICLK

Table 4.1 List of I/O Registers (Address Order) (16/33)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	ICLK <PCLK
0008 C023h	PORT3	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C024h	PORT4	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C025h	PORT5	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C02Ah	PORTA	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C02Bh	PORTB	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C02Ch	PORTC	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C02Dh	PORTD	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C02Eh	PORTE	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C031h	PORTH	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C032h	PORTJ	Port Output Data Register	PODR	8	8	2 or 3 PCLKB	2 ICLK
0008 C040h	PORT0	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C041h	PORT1	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C042h	PORT2	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C043h	PORT3	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C044h	PORT4	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C045h	PORT5	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C04Ah	PORTA	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C04Bh	PORTB	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C04Ch	PORTC	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C04Dh	PORTD	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C04Eh	PORTE	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C051h	PORTH	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C052h	PORTJ	Port Input Data Register	PIDR	8	8	3 or 4 PCLKB	3 ICLK
0008 C060h	PORT0	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C061h	PORT1	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C062h	PORT2	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C063h	PORT3	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C064h	PORT4	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C065h	PORT5	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C06Ah	PORTA	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C06Bh	PORTB	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C06Ch	PORTC	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C06Dh	PORTD	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C06Eh	PORTE	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C071h	PORTH	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C072h	PORTJ	Port Mode Register	PMR	8	8	2 or 3 PCLKB	2 ICLK
0008 C082h	PORT1	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C083h	PORT1	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C084h	PORT2	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C085h	PORT2	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C086h	PORT3	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C087h	PORT3	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C08Ah	PORT5	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C08Bh	PORT5	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C094h	PORTA	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C095h	PORTA	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C096h	PORTB	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C097h	PORTB	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C098h	PORTC	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C099h	PORTC	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C09Ch	PORTE	Open Drain Control Register 0	ODR0	8	8, 16	2 or 3 PCLKB	2 ICLK
0008 C09Dh	PORTE	Open Drain Control Register 1	ODR1	8	8, 16	2 or 3 PCLKB	2 ICLK

Table 4.1 List of I/O Registers (Address Order) (19/33)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	ICLK <PCLK
0008 C1B3h	MPC	PE3 Pin Function Control Register	PE3PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1B4h	MPC	PE4 Pin Function Control Register	PE4PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1B5h	MPC	PE5 Pin Function Control Register	PE5PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1B6h	MPC	PE6 Pin Function Control Register	PE6PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1B7h	MPC	PE7 Pin Function Control Register	PE7PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1C8h	MPC	PH0 Pin Function Control Register	PH0PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1C9h	MPC	PH1 Pin Function Control Register	PH1PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1CAh	MPC	PH2 Pin Function Control Register	PH2PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1CBh	MPC	PH3 Pin Function Control Register	PH3PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C1D3h	MPC	PJ3 Pin Function Control Register	PJ3PFS	8	8	2 or 3 PCLKB	2 ICLK
0008 C290h	SYSTEM	Reset Status Register 0	RSTSR0	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C291h	SYSTEM	Reset Status Register 1	RSTSR1	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C293h	SYSTEM	Main Clock Oscillator Forced Oscillation Control Register	MOFCR	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C297h	SYSTEM	Voltage Monitoring Circuit Control Register	LVCMPCR	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C298h	SYSTEM	Voltage Detection Level Select Register	LVDLVLR	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C29Ah	SYSTEM	Voltage Monitoring 1 Circuit Control Register 0	LVD1CR0	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C29Bh	SYSTEM	Voltage Monitoring 2 Circuit Control Register 0	LVD2CR0	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C29Dh	SYSTEM	VBATT Control Register	VBATTCR	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C29Eh	SYSTEM	VBATT Status Register	VBATTSR	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C29Fh	SYSTEM	VBATT Pin Voltage Drop Detection Interrupt Control Register	VBTLVDICR	8	8	4 or 5 PCLKB	2 or 3 ICLK
0008 C400h	RTC	64-Hz Counter	R64CNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C402h	RTC	Second Counter	RSECCNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C402h	RTC	Binary Counter 0	BCNT0	8	8	2 or 3 PCLKB	2 ICLK
0008 C404h	RTC	Minute Counter	RMINCNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C404h	RTC	Binary Counter 1	BCNT1	8	8	2 or 3 PCLKB	2 ICLK
0008 C406h	RTC	Hour Counter	RHRCNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C406h	RTC	Binary Counter 2	BCNT2	8	8	2 or 3 PCLKB	2 ICLK
0008 C408h	RTC	Day-of-Week Counter	RWKCNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C408h	RTC	Binary Counter 3	BCNT3	8	8	2 or 3 PCLKB	2 ICLK
0008 C40Ah	RTC	Date Counter	RDAYCNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C40Ch	RTC	Month Counter	RMONCNT	8	8	2 or 3 PCLKB	2 ICLK
0008 C40Eh	RTC	Year Counter	RYRCNT	16	16	2 or 3 PCLKB	2 ICLK
0008 C410h	RTC	Second Alarm Register	RSECAR	8	8	2 or 3 PCLKB	2 ICLK
0008 C410h	RTC	Binary Counter 0 Alarm Register	BCNT0AR	8	8	2 or 3 PCLKB	2 ICLK
0008 C412h	RTC	Minute Alarm Register	RMINAR	8	8	2 or 3 PCLKB	2 ICLK
0008 C412h	RTC	Binary Counter 1 Alarm Register	BCNT1AR	8	8	2 or 3 PCLKB	2 ICLK
0008 C414h	RTC	Hour Alarm Register	RHRAR	8	8	2 or 3 PCLKB	2 ICLK
0008 C414h	RTC	Binary Counter 2 Alarm Register	BCNT2AR	8	8	2 or 3 PCLKB	2 ICLK
0008 C416h	RTC	Day-of-Week Alarm Register	RWKAR	8	8	2 or 3 PCLKB	2 ICLK
0008 C416h	RTC	Binary Counter 3 Alarm Register	BCNT3AR	8	8	2 or 3 PCLKB	2 ICLK
0008 C418h	RTC	Date Alarm Register	RDAYAR	8	8	2 or 3 PCLKB	2 ICLK
0008 C418h	RTC	Binary Counter 0 Alarm Enable Register	BCNT0AER	8	8	2 or 3 PCLKB	2 ICLK
0008 C41Ah	RTC	Month Alarm Register	RMONAR	8	8	2 or 3 PCLKB	2 ICLK
0008 C41Ah	RTC	Binary Counter 1 Alarm Enable Register	BCNT1AER	8	8	2 or 3 PCLKB	2 ICLK
0008 C41Ch	RTC	Year Alarm Register	RYRAR	16	16	2 or 3 PCLKB	2 ICLK
0008 C41Ch	RTC	Binary Counter 2 Alarm Enable Register	BCNT2AER	16	16	2 or 3 PCLKB	2 ICLK
0008 C41Eh	RTC	Year Alarm Enable Register	RYRAREN	8	8	2 or 3 PCLKB	2 ICLK
0008 C41Eh	RTC	Binary Counter 3 Alarm Enable Register	BCNT3AER	8	8	2 or 3 PCLKB	2 ICLK
0008 C422h	RTC	RTC Control Register 1	RCR1	8	8	2 or 3 PCLKB	2 ICLK
0008 C424h	RTC	RTC Control Register 2	RCR2	8	8	2 or 3 PCLKB	2 ICLK
0008 C426h	RTC	RTC Control Register 3	RCR3	8	8	2 or 3 PCLKB	2 ICLK

Table 4.1 List of I/O Registers (Address Order) (27/33)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	ICLK <PCLK
000A 8412h	RSCAN	Receive Rule Entry Register 9BH	GAFLMH9	16	16	2 or 3 PCLKB	2 ICLK
000A 8412h	RSCAN	Receive Buffer Register 7AH	RMIDH7	16	16	2 or 3 PCLKB	2 ICLK
000A 8414h	RSCAN	Receive Rule Entry Register 9CL	GAFLPL9	16	16	2 or 3 PCLKB	2 ICLK
000A 8414h	RSCAN	Receive Buffer Register 7BL	RMTS7	16	16	2 or 3 PCLKB	2 ICLK
000A 8416h	RSCAN	Receive Rule Entry Register 9CH	GAFLPH9	16	16	2 or 3 PCLKB	2 ICLK
000A 8416h	RSCAN	Receive Buffer Register 7BH	RMPTR7	16	16	2 or 3 PCLKB	2 ICLK
000A 8418h	RSCAN	Receive Rule Entry Register 10AL	GAFLIDL10	16	16	2 or 3 PCLKB	2 ICLK
000A 8418h	RSCAN	Receive Buffer Register 7CL	RMDF07	16	16	2 or 3 PCLKB	2 ICLK
000A 841Ah	RSCAN	Receive Rule Entry Register 10AH	GAFLIDH10	16	16	2 or 3 PCLKB	2 ICLK
000A 841Ah	RSCAN	Receive Buffer Register 7CH	RMDF17	16	16	2 or 3 PCLKB	2 ICLK
000A 841Ch	RSCAN	Receive Rule Entry Register 10BL	GAFLML10	16	16	2 or 3 PCLKB	2 ICLK
000A 841Ch	RSCAN	Receive Buffer Register 7DL	RMDF27	16	16	2 or 3 PCLKB	2 ICLK
000A 841Eh	RSCAN	Receive Rule Entry Register 10BH	GAFLMH10	16	16	2 or 3 PCLKB	2 ICLK
000A 841Eh	RSCAN	Receive Buffer Register 7DH	RMDF37	16	16	2 or 3 PCLKB	2 ICLK
000A 8420h	RSCAN	Receive Rule Entry Register 10CL	GAFLPL10	16	16	2 or 3 PCLKB	2 ICLK
000A 8420h	RSCAN	Receive Buffer Register 8AL	RMIDL8	16	16	2 or 3 PCLKB	2 ICLK
000A 8422h	RSCAN	Receive Rule Entry Register 10CH	GAFLPH10	16	16	2 or 3 PCLKB	2 ICLK
000A 8422h	RSCAN	Receive Buffer Register 8AH	RMIDH8	16	16	2 or 3 PCLKB	2 ICLK
000A 8424h	RSCAN	Receive Rule Entry Register 11AL	GAFLIDL11	16	16	2 or 3 PCLKB	2 ICLK
000A 8424h	RSCAN	Receive Buffer Register 8BL	RMTS8	16	16	2 or 3 PCLKB	2 ICLK
000A 8426h	RSCAN	Receive Rule Entry Register 11AH	GAFLIDH11	16	16	2 or 3 PCLKB	2 ICLK
000A 8426h	RSCAN	Receive Buffer Register 8BH	RMPTR8	16	16	2 or 3 PCLKB	2 ICLK
000A 8428h	RSCAN	Receive Rule Entry Register 11BL	GAFLML11	16	16	2 or 3 PCLKB	2 ICLK
000A 8428h	RSCAN	Receive Buffer Register 8CL	RMDF08	16	16	2 or 3 PCLKB	2 ICLK
000A 842Ah	RSCAN	Receive Rule Entry Register 11BH	GAFLMH11	16	16	2 or 3 PCLKB	2 ICLK
000A 842Ah	RSCAN	Receive Buffer Register 8CH	RMDF18	16	16	2 or 3 PCLKB	2 ICLK
000A 842Ch	RSCAN	Receive Rule Entry Register 11CL	GAFLPL11	16	16	2 or 3 PCLKB	2 ICLK
000A 842Ch	RSCAN	Receive Buffer Register 8DL	RMDF28	16	16	2 or 3 PCLKB	2 ICLK
000A 842Eh	RSCAN	Receive Rule Entry Register 11CH	GAFLPH11	16	16	2 or 3 PCLKB	2 ICLK
000A 842Eh	RSCAN	Receive Buffer Register 8DH	RMDF38	16	16	2 or 3 PCLKB	2 ICLK
000A 8430h	RSCAN	Receive Rule Entry Register 12AL	GAFLIDL12	16	16	2 or 3 PCLKB	2 ICLK
000A 8430h	RSCAN	Receive Buffer Register 9AL	RMIDL9	16	16	2 or 3 PCLKB	2 ICLK
000A 8432h	RSCAN	Receive Rule Entry Register 12AH	GAFLIDH12	16	16	2 or 3 PCLKB	2 ICLK
000A 8432h	RSCAN	Receive Buffer Register 9AH	RMIDH9	16	16	2 or 3 PCLKB	2 ICLK
000A 8434h	RSCAN	Receive Rule Entry Register 12BL	GAFLML12	16	16	2 or 3 PCLKB	2 ICLK
000A 8434h	RSCAN	Receive Buffer Register 9BL	RMTS9	16	16	2 or 3 PCLKB	2 ICLK
000A 8436h	RSCAN	Receive Rule Entry Register 12BH	GAFLMH12	16	16	2 or 3 PCLKB	2 ICLK
000A 8436h	RSCAN	Receive Buffer Register 9BH	RMPTR9	16	16	2 or 3 PCLKB	2 ICLK
000A 8438h	RSCAN	Receive Rule Entry Register 12CL	GAFLPL12	16	16	2 or 3 PCLKB	2 ICLK
000A 8438h	RSCAN	Receive Buffer Register 9CL	RMDF09	16	16	2 or 3 PCLKB	2 ICLK
000A 843Ah	RSCAN	Receive Rule Entry Register 12CH	GAFLPH12	16	16	2 or 3 PCLKB	2 ICLK
000A 843Ah	RSCAN	Receive Buffer Register 9CH	RMDF19	16	16	2 or 3 PCLKB	2 ICLK
000A 843Ch	RSCAN	Receive Rule Entry Register 13AL	GAFLIDL13	16	16	2 or 3 PCLKB	2 ICLK
000A 843Ch	RSCAN	Receive Buffer Register 9DL	RMDF29	16	16	2 or 3 PCLKB	2 ICLK
000A 843Eh	RSCAN	Receive Rule Entry Register 13AH	GAFLIDH13	16	16	2 or 3 PCLKB	2 ICLK
000A 843Eh	RSCAN	Receive Buffer Register 9DH	RMDF39	16	16	2 or 3 PCLKB	2 ICLK
000A 8440h	RSCAN	Receive Rule Entry Register 13BL	GAFLML13	16	16	2 or 3 PCLKB	2 ICLK
000A 8440h	RSCAN	Receive Buffer Register 10AL	RMIDL10	16	16	2 or 3 PCLKB	2 ICLK
000A 8442h	RSCAN	Receive Rule Entry Register 13BH	GAFLMH13	16	16	2 or 3 PCLKB	2 ICLK
000A 8442h	RSCAN	Receive Buffer Register 10AH	RMIDH10	16	16	2 or 3 PCLKB	2 ICLK
000A 8444h	RSCAN	Receive Rule Entry Register 13CL	GAFLPL13	16	16	2 or 3 PCLKB	2 ICLK
000A 8444h	RSCAN	Receive Buffer Register 10BL	RMTS10	16	16	2 or 3 PCLKB	2 ICLK

Table 4.1 List of I/O Registers (Address Order) (30/33)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	ICLK <PCLK
000A 85EAh	RSCAN0	Transmit/Receive FIFO Access Register 0CH	CFDF10	16	16	2 or 3 PCLKB	2 ICLK
000A 85EAh	RSCAN	RAM Test Register 53	RPGACC53	16	16	2 or 3 PCLKB	2 ICLK
000A 85ECh	RSCAN0	Transmit/Receive FIFO Access Register 0DL	CFDF20	16	16	2 or 3 PCLKB	2 ICLK
000A 85ECh	RSCAN	RAM Test Register 54	RPGACC54	16	16	2 or 3 PCLKB	2 ICLK
000A 85EEh	RSCAN0	Transmit/Receive FIFO Access Register 0DH	CFDF30	16	16	2 or 3 PCLKB	2 ICLK
000A 85EEh	RSCAN	RAM Test Register 55	RPGACC55	16	16	2 or 3 PCLKB	2 ICLK
000A 85F0h to 000A 85FEh	RSCAN	RAM Test Register 56 to RAM Test Register 63	RPGACC56 to RPGACC63	16	16	2 or 3 PCLKB	2 ICLK
000A 8600h	RSCAN0	Transmit Buffer Register 0AL	TMIDL0	16	16	2 or 3 PCLKB	2 ICLK
000A 8600h	RSCAN	RAM Test Register 64	RPGACC64	16	16	2 or 3 PCLKB	2 ICLK
000A 8602h	RSCAN0	Transmit Buffer Register 0AH	TMIDH0	16	16	2 or 3 PCLKB	2 ICLK
000A 8602h	RSCAN	RAM Test Register 65	RPGACC65	16	16	2 or 3 PCLKB	2 ICLK
000A 8604h	RSCAN	RAM Test Register 66	RPGACC66	16	16	2 or 3 PCLKB	2 ICLK
000A 8606h	RSCAN0	Transmit Buffer Register 0BH	TMPTR0	16	16	2 or 3 PCLKB	2 ICLK
000A 8606h	RSCAN	RAM Test Register 67	RPGACC67	16	16	2 or 3 PCLKB	2 ICLK
000A 8608h	RSCAN0	Transmit Buffer Register 0CL	TMDF00	16	16	2 or 3 PCLKB	2 ICLK
000A 8608h	RSCAN	RAM Test Register 68	RPGACC68	16	16	2 or 3 PCLKB	2 ICLK
000A 860Ah	RSCAN0	Transmit Buffer Register 0CH	TMDF10	16	16	2 or 3 PCLKB	2 ICLK
000A 860Ah	RSCAN	RAM Test Register 69	RPGACC69	16	16	2 or 3 PCLKB	2 ICLK
000A 860Ch	RSCAN0	Transmit Buffer Register 0DL	TMDF20	16	16	2 or 3 PCLKB	2 ICLK
000A 860Ch	RSCAN	RAM Test Register 70	RPGACC70	16	16	2 or 3 PCLKB	2 ICLK
000A 860Eh	RSCAN0	Transmit Buffer Register 0DH	TMDF30	16	16	2 or 3 PCLKB	2 ICLK
000A 860Eh	RSCAN	RAM Test Register 71	RPGACC71	16	16	2 or 3 PCLKB	2 ICLK
000A 8610h	RSCAN0	Transmit Buffer Register 1AL	TMIDL1	16	16	2 or 3 PCLKB	2 ICLK
000A 8610h	RSCAN	RAM Test Register 72	RPGACC72	16	16	2 or 3 PCLKB	2 ICLK
000A 8612h	RSCAN0	Transmit Buffer Register 1AH	TMIDH1	16	16	2 or 3 PCLKB	2 ICLK
000A 8612h	RSCAN	RAM Test Register 73	RPGACC73	16	16	2 or 3 PCLKB	2 ICLK
000A 8614h	RSCAN	RAM Test Register 74	RPGACC74	16	16	2 or 3 PCLKB	2 ICLK
000A 8616h	RSCAN0	Transmit Buffer Register 1BH	TMPTR1	16	16	2 or 3 PCLKB	2 ICLK
000A 8616h	RSCAN	RAM Test Register 75	RPGACC75	16	16	2 or 3 PCLKB	2 ICLK
000A 8618h	RSCAN0	Transmit Buffer Register 1CL	TMDF01	16	16	2 or 3 PCLKB	2 ICLK
000A 8618h	RSCAN	RAM Test Register 76	RPGACC76	16	16	2 or 3 PCLKB	2 ICLK
000A 861Ah	RSCAN0	Transmit Buffer Register 1CH	TMDF11	16	16	2 or 3 PCLKB	2 ICLK
000A 861Ah	RSCAN	RAM Test Register 77	RPGACC77	16	16	2 or 3 PCLKB	2 ICLK
000A 861Ch	RSCAN0	Transmit Buffer Register 1DL	TMDF21	16	16	2 or 3 PCLKB	2 ICLK
000A 861Ch	RSCAN	RAM Test Register 78	RPGACC78	16	16	2 or 3 PCLKB	2 ICLK
000A 861Eh	RSCAN0	Transmit Buffer Register 1DH	TMDF31	16	16	2 or 3 PCLKB	2 ICLK
000A 861Eh	RSCAN	RAM Test Register 79	RPGACC79	16	16	2 or 3 PCLKB	2 ICLK
000A 8620h	RSCAN0	Transmit Buffer Register 2AL	TMIDL2	16	16	2 or 3 PCLKB	2 ICLK
000A 8620h	RSCAN	RAM Test Register 80	RPGACC80	16	16	2 or 3 PCLKB	2 ICLK
000A 8622h	RSCAN0	Transmit Buffer Register 2AH	TMIDH2	16	16	2 or 3 PCLKB	2 ICLK
000A 8622h	RSCAN	RAM Test Register 81	RPGACC81	16	16	2 or 3 PCLKB	2 ICLK
000A 8624h	RSCAN	RAM Test Register 82	RPGACC82	16	16	2 or 3 PCLKB	2 ICLK
000A 8626h	RSCAN0	Transmit Buffer Register 2BH	TMPTR2	16	16	2 or 3 PCLKB	2 ICLK
000A 8626h	RSCAN	RAM Test Register 83	RPGACC83	16	16	2 or 3 PCLKB	2 ICLK
000A 8628h	RSCAN0	Transmit Buffer Register 2CL	TMDF02	16	16	2 or 3 PCLKB	2 ICLK
000A 8628h	RSCAN	RAM Test Register 84	RPGACC84	16	16	2 or 3 PCLKB	2 ICLK
000A 862Ah	RSCAN0	Transmit Buffer Register 2CH	TMDF12	16	16	2 or 3 PCLKB	2 ICLK
000A 862Ah	RSCAN	RAM Test Register 85	RPGACC85	16	16	2 or 3 PCLKB	2 ICLK
000A 862Ch	RSCAN0	Transmit Buffer Register 2DL	TMDF22	16	16	2 or 3 PCLKB	2 ICLK
000A 862Ch	RSCAN	RAM Test Register 86	RPGACC86	16	16	2 or 3 PCLKB	2 ICLK
000A 862Eh	RSCAN0	Transmit Buffer Register 2DH	TMDF32	16	16	2 or 3 PCLKB	2 ICLK

5.2 DC Characteristics

Table 5.3 DC Characteristics (1)

Conditions: 2.7 V ≤ VCC = VCC_USB ≤ 5.5 V, 2.7 V ≤ AVCC0 ≤ 5.5 V, VSS = AVSS0 = VSS_USB = 0 V, T_a = –40 to +105°C

Item			Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Schmitt trigger input voltage	RIIC input pin (except for SMBus, 5 V tolerant)		V_{IH}	VCC × 0.7	—	5.8	V	
	Ports 12, 13, 16, 17, port B5 (5 V tolerant)			VCC × 0.8	—	5.8		
	Ports 14 to 15, ports 20 to 27, ports 33 to 37, ports 50 to 55, ports A0 to A7, ports B0 to B4, B6, B7 ports C0 to C7, ports D0 to D7, ports E0 to E7, port J3, Ports 30 to 32 (when time capture event input is not selected), RES#			VCC × 0.8	—	VCC + 0.3		
	Ports 03, 05, 07, ports 40 to 47			AVCC0 × 0.8	—	AVCC0 + 0.3		
	Ports 30 to 32 (when time capture event input is selected)	When VCC is supplied		VCC × 0.8	—	VCC + 0.3		
		When VBATT is supplied		VBATT × 0.8	—	VBATT + 0.3		
	Ports 03, 05, 07, ports 40 to 47		V_{IL}	–0.3	—	AVCC0 × 0.2		
	RIIC input pin (except for SMBus)			–0.3	—	VCC × 0.3		
	Other than RIIC input pin or ports 30 to 32			–0.3	—	VCC × 0.2		
	Ports 30 to 32 (when time capture event input is selected)	When VCC is supplied		–0.3	—	VCC × 0.3		
		When VBATT is supplied		–0.3	—	VBATT × 0.3		
	Ports 03, 05, 07, ports 40 to 47		ΔV_T	AVCC0 × 0.1	—	—		
	RIIC input pin (except for SMBus)			VCC × 0.05	—	—		
	Ports 12, 13, 16, 17, Port B5			VCC × 0.05	—	—		
	Other than RIIC input pin			VCC × 0.1	—	—		
Input level voltage (except for Schmitt trigger input pins)	MD		V_{IH}	VCC × 0.9	—	VCC + 0.3	V	
	EXTAL (external clock input)			VCC × 0.8	—	VCC + 0.3		
	RIIC input pin (SMBus)			2.1	—	VCC + 0.3		
	MD		V_{IL}	–0.3	—	VCC × 0.1		
	EXTAL (external clock input)			–0.3	—	VCC × 0.2		
	RIIC input pin (SMBus)			–0.3	—	0.8		

5.2.2 Normal I/O Pin Output Characteristics (2)

Figure 5.13 to Figure 5.17 show the characteristics when high-drive output is selected by the drive capacity control register.

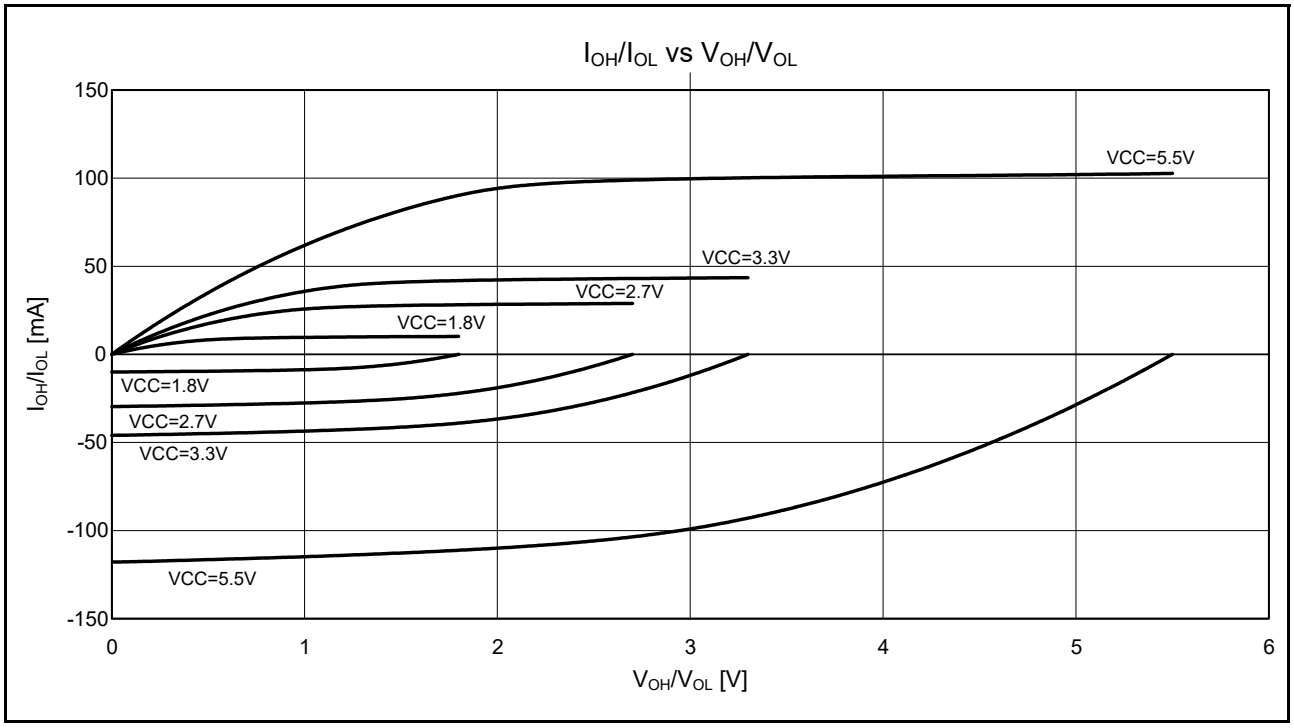


Figure 5.13 V_{OH}/V_{OL} and I_{OH}/I_{OL} Voltage Characteristics at T_a = 25°C When High-Drive Output is Selected (Reference Data)

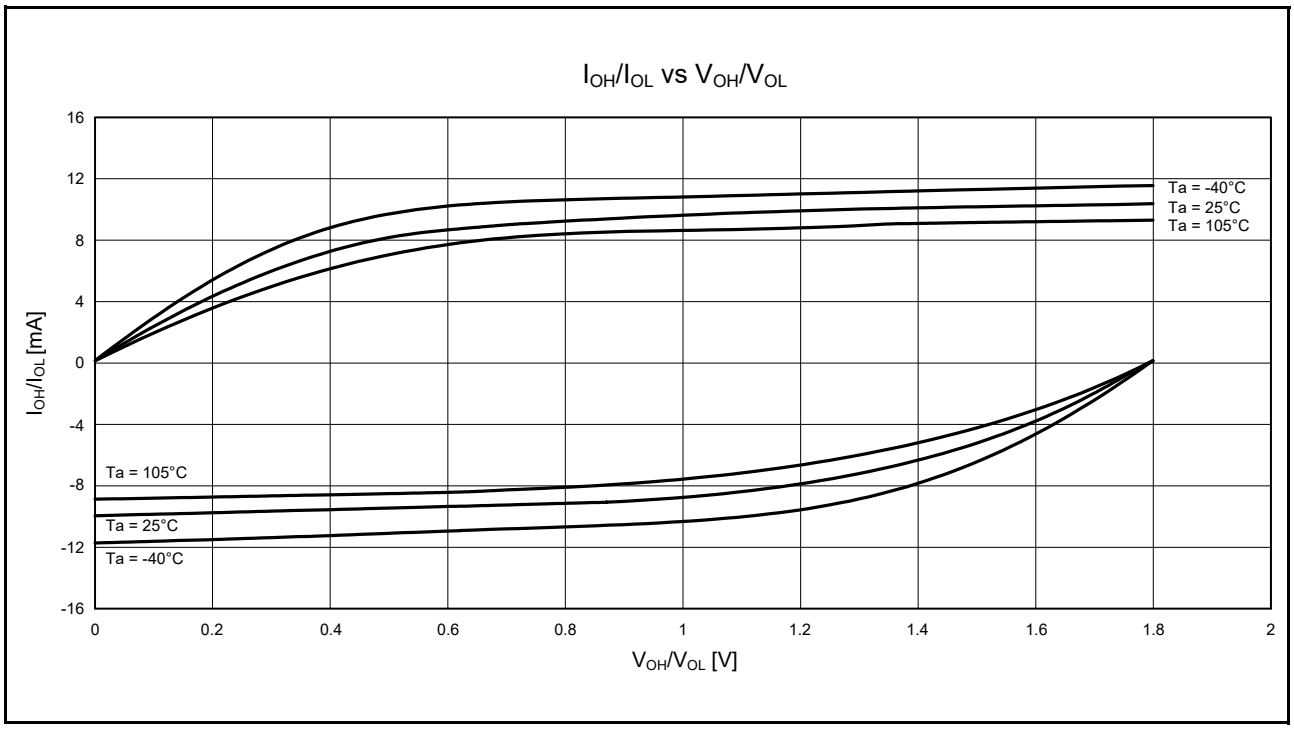


Figure 5.14 V_{OH}/V_{OL} and I_{OH}/I_{OL} Temperature Characteristics at VCC = 1.8 V When High-Drive Output is Selected (Reference Data)

Table 5.40 Timing of On-Chip Peripheral Modules (3)

Conditions: 1.8 V ≤ VCC = VCC_USB = AVCC0 ≤ 5.5 V, VSS = AVSS0 = VSS_USB = 0 V, T_a = –40 to +105°C

Item			Symbol	Min.	Max.	Unit*1	Test Conditions
Simple SPI	SCK clock cycle output (master)		t_{SPcyc}	4	65536	t_{Pcyc}	Figure 5.54
	SCK clock cycle input (slave)			6	65536	t_{Pcyc}	
	SCK clock high pulse width		t_{SPCKWH}	0.4	0.6	t_{SPcyc}	
	SCK clock low pulse width		t_{SPCKWL}	0.4	0.6	t_{SPcyc}	
	SCK clock rise/fall time		t_{SPCKr}, t_{SPCKf}	—	20	ns	
	Data input setup time (master)	2.7 V or above	t_{SU}	65	—	ns	Figure 5.55, Figure 5.56
		1.8 V or above		95	—		
	Data input setup time (slave)			40	—		
	Data input hold time		t_H	40	—	ns	
	SSL input setup time		t_{LEAD}	3	—	t_{SPcyc}	
	SSL input hold time		t_{LAG}	3	—	t_{SPcyc}	
	Data output delay time (master)		t_{OD}	—	40	ns	
	Data output delay time (slave)	2.7 V or above		—	65		
		1.8 V or above		—	100		
	Data output hold time (master)	2.7 V or above	t_{OH}	–10	—	ns	
		1.8 V or above		–20	—		
	Data output hold time (slave)			–10	—		
	Data rise/fall time		t_{Dr}, t_{Df}	—	20	ns	
	SSL input rise/fall time		t_{SSLr}, t_{SSLf}	—	20	ns	
	Slave access time		t_{SA}	—	6	t_{Pcyc}	Figure 5.57, Figure 5.58
	Slave output release time		t_{REL}	—	6	t_{Pcyc}	

Note 1. t_{Pcyc}: PCLK cycle

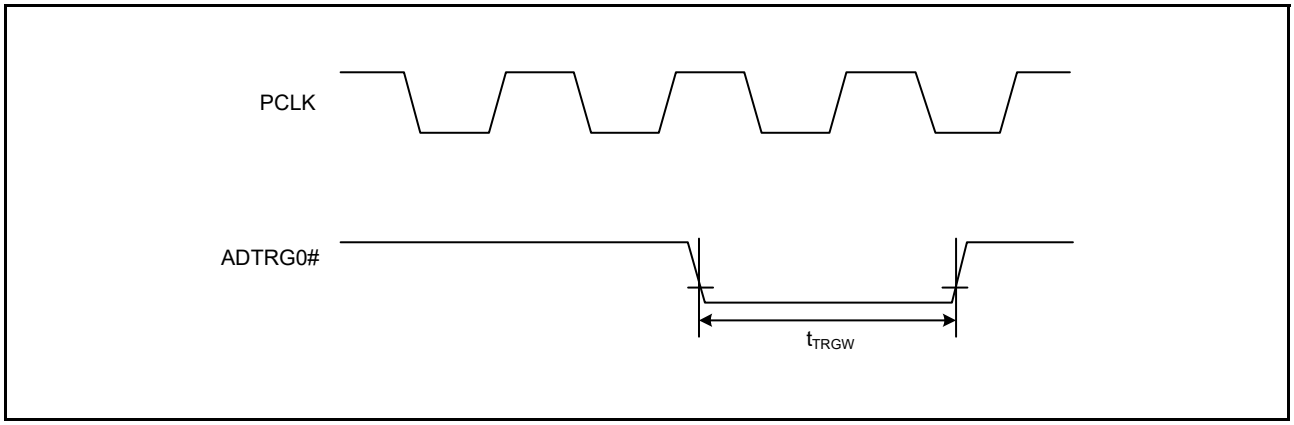


Figure 5.52 A/D Converter External Trigger Input Timing

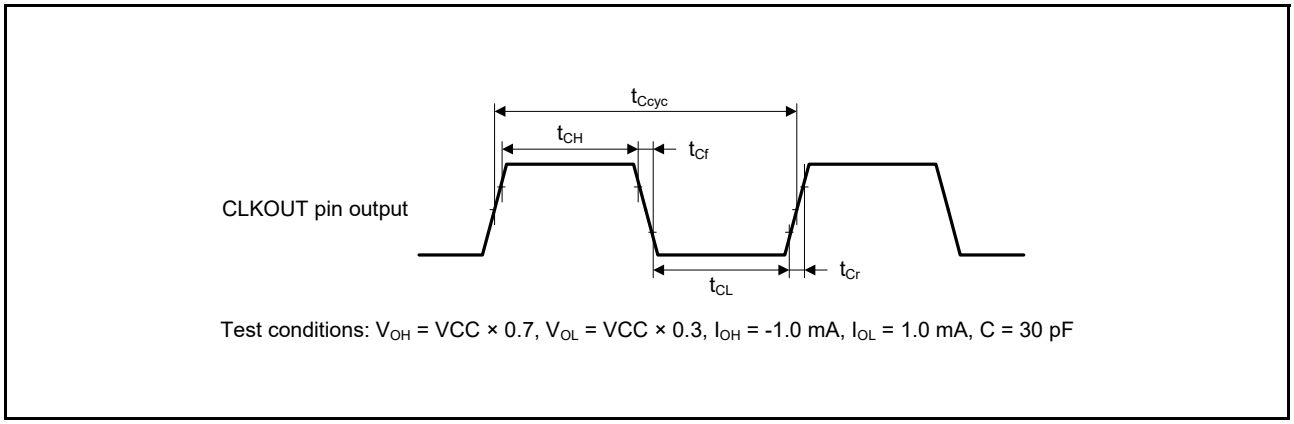


Figure 5.53 CLKOUT Output Timing

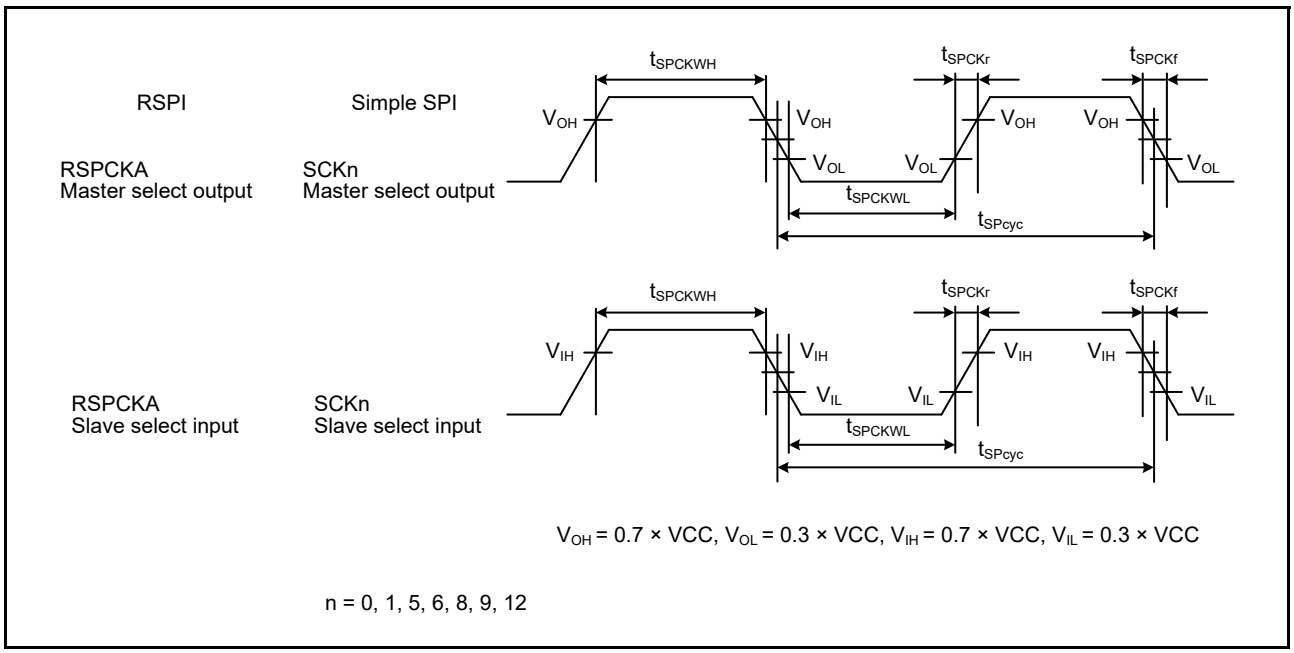


Figure 5.54 RSPI Clock Timing and Simple SPI Clock Timing

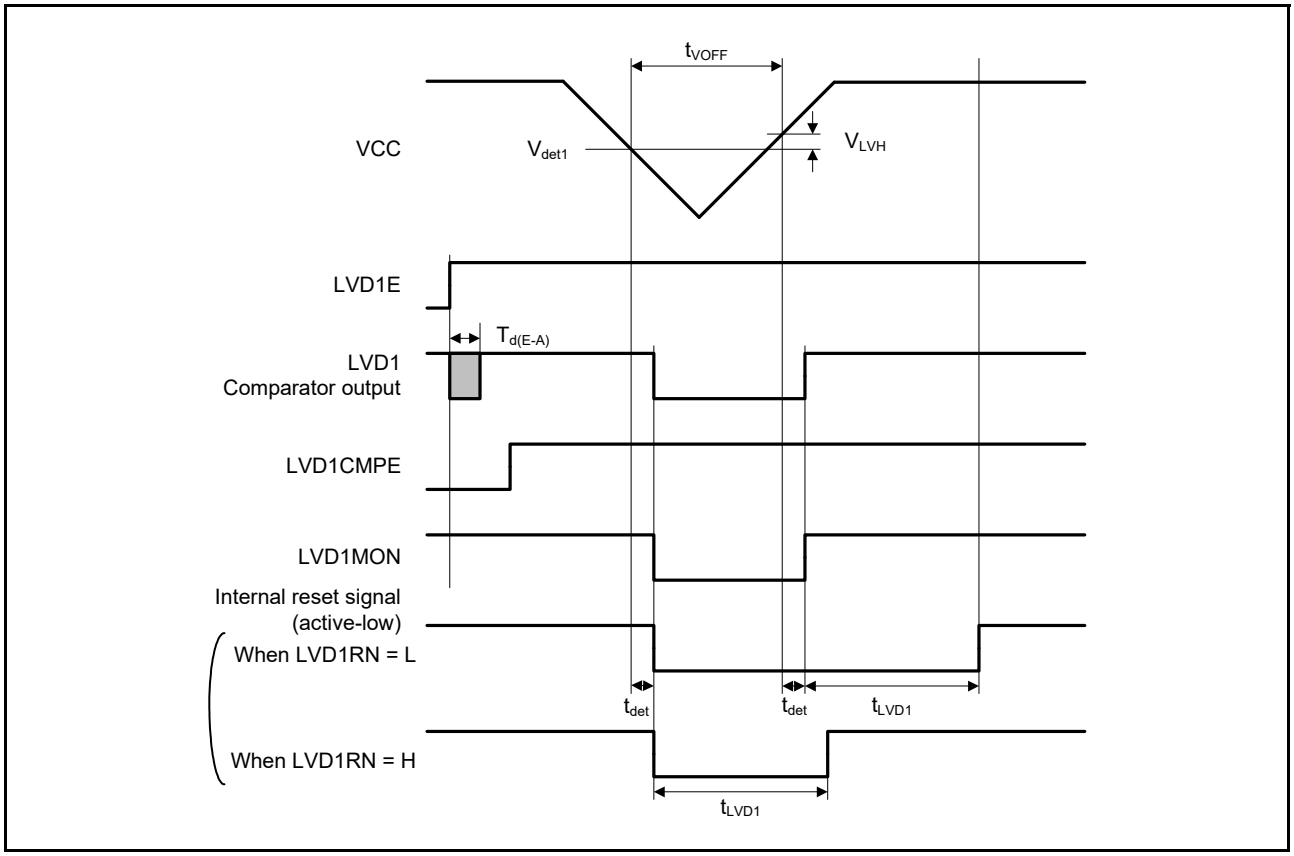


Figure 5.76 Voltage Detection Circuit Timing (V_{det1})

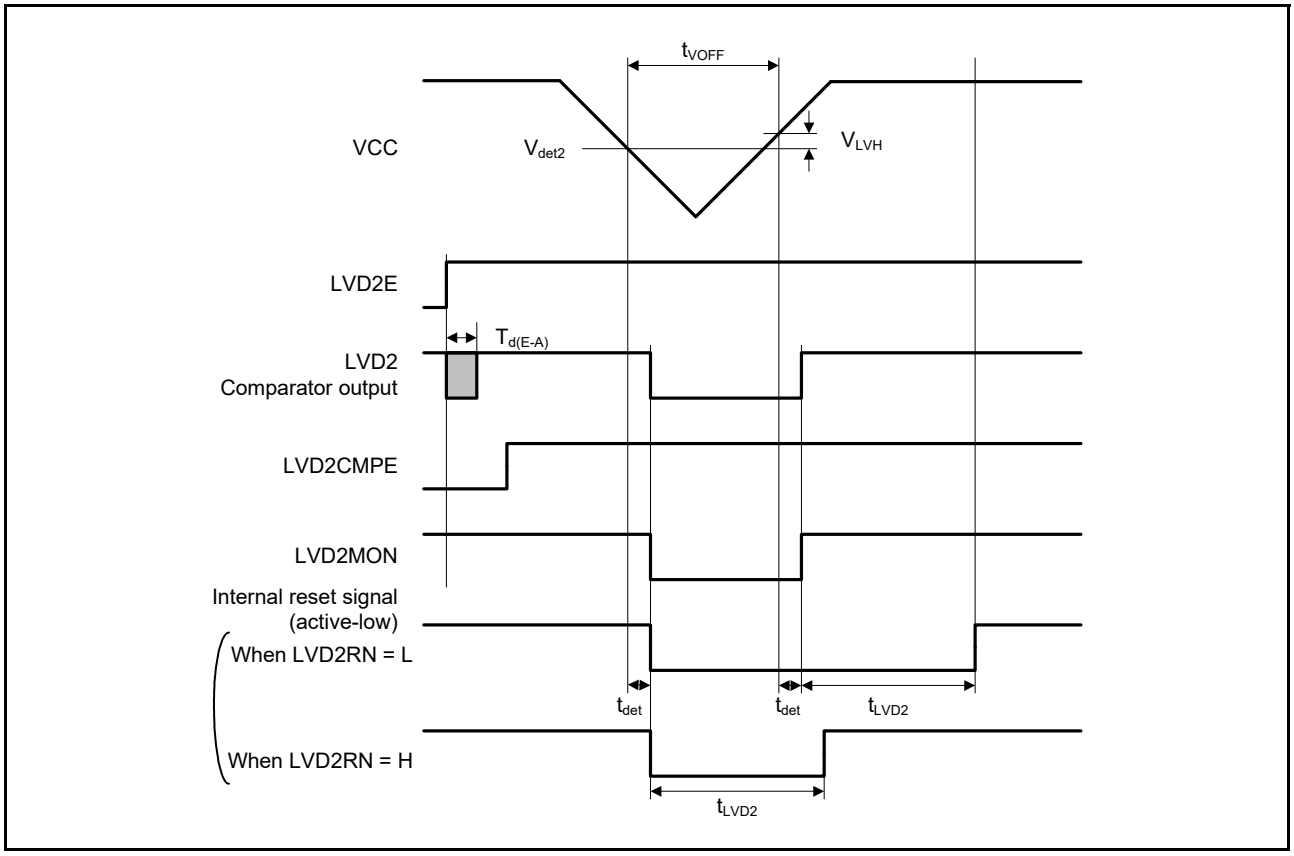


Figure 5.77 Voltage Detection Circuit Timing (V_{det2})

5.14 E2 DataFlash Characteristics (Flash Memory for Data Storage)

Table 5.65 E2 DataFlash Characteristics (1)

Item		Symbol	Min.	Typ.	Max.	Unit	Conditions
Reprogramming/erasure cycle*1		N_{DPEC}	100000	1000000	—	Times	
Data hold time	After 10000 times of N_{DPEC}	t_{DDRP}	20*2, *3	—	—	Year	T_a = +85°C
	After 100000 times of N_{DPEC}		5*2, *3	—	—	Year	
	After 1000000 times of N_{DPEC}		—	1*2, *3	—	Year	T_a = +25°C

Note 1. The reprogram/erase cycle is the number of erasing for each block. When the reprogram/erase cycle is n times (n = 100000), erasing can be performed n times for each block. For instance, when 1-byte programming is performed 1000 times for different addresses in a 1-Kbyte block and then the entire block is erased, the reprogram/erase cycle is counted as one. However, programming the same address for several times as one erasing is not enabled (overwriting is prohibited).
Note 2. Characteristic when the flash memory programmer is used and the self-programming library is provided from Renesas Electronics.
Note 3. These results are obtained from reliability testing.

Table 5.66 E2 DataFlash Characteristics (2) : high-speed operating mode

Conditions: 2.7 V ≤ VCC = VCC_USB = AVCC0 ≤ 5.5 V, VSS = AVSS0 = VSS_USB = 0 V

Temperature range for the programming/erasure operation: T_a = –40 to +105°C

Item		Symbol	FCLK = 1 MHz			FCLK = 32 MHz			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Programming time	1 byte	t_{DP1}	—	95.0	797	—	40.8	376	µs
Erasure time	1 Kbyte	t_{DE1K}	—	19.5	498	—	6.2	230	ms
	8 Kbyte	t_{DE8K}	—	119.8	2556	—	12.9	368	ms
Blank check time	1 byte	t_{DBC1}	—	—	55.00	—	—	16.1	µs
	1 Kbyte	t_{DBC1K}	—	—	0.72	—	—	0.50	ms
Erase operation forced stop time		t_{DSED}	—	—	16.0	—	—	10.7	µs
DataFlash STOP recovery time		t_{DSTOP}	5.0	—	—	5.0	—	—	µs

Note: The time until each operation of the flash memory is started after instructions are executed by software is not included.
Note: The lower-limit frequency of FCLK is 1 MHz during programming or erasing of the flash memory. When using FCLK at below 4 MHz, the frequency can be set to 1 MHz, 2 MHz, or 3 MHz. A non-integer frequency such as 1.5 MHz cannot be set.
Note: The frequency accuracy of FCLK must be within ±3.5%.

Table 5.67 E2 DataFlash Characteristics (3) : middle-speed operating mode

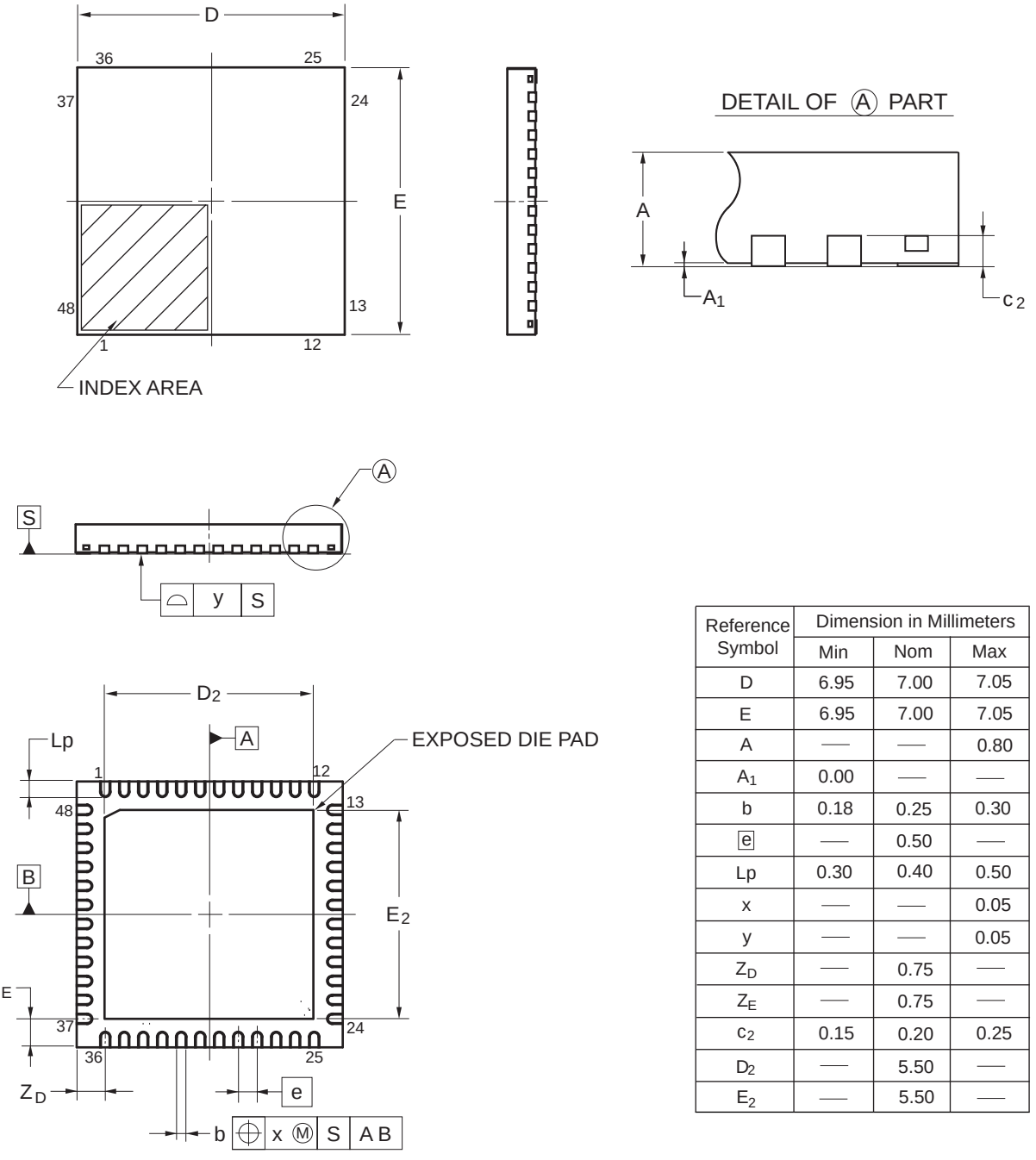
Conditions: 1.8 V ≤ VCC0 = VCC_USB = AVCC0 ≤ 5.5 V, VSS = AVSS0 = VSS_USB = 0 V

Temperature range for the programming/erasure operation: T_a = –40 to +85°C

Item		Symbol	FCLK = 1 MHz			FCLK = 8 MHz			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Programming time	1 byte	t_{DP1}	—	135	1197	—	86.5	823	µs
Erasure time	1 Kbyte	t_{DE1K}	—	19.6	501	—	8.0	265	ms
	8 Kbyte	t_{DE8K}	—	120	2558		27.7	669	ms
Blank check time	1 byte	t_{DBC1}	—	—	85.0	—	—	50.9	µs
	1 Kbyte	t_{DBC1K}	—	—	0.72	—	—	1.45	ms
Erase operation forced stop time		t_{DSED}	—	—	28.0	—	—	21.3	µs
DataFlash STOP recovery time		t_{DSTOP}	0.72	—	—	0.72	—	—	µs

Note: The time until each operation of the flash memory is started after instructions are executed by software is not included.
Note: The lower-limit frequency of FCLK is 1 MHz during programming or erasing of the flash memory. When using FCLK at below 4 MHz, the frequency can be set to 1 MHz, 2 MHz, or 3 MHz. A non-integer frequency such as 1.5 MHz cannot be set.
Note: The frequency accuracy of FCLK must be within ±3.5%.

JEITA Package code	RENESAS code	Previous code	MASS(TYP.)[g]
P-HWQFN48-7x7-0.50	PWQN0048KB-A	48PJN-A P48K8-50-5B4-7	0.13



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	6.95	7.00	7.05
E	6.95	7.00	7.05
A	—	—	0.80
A_1	0.00	—	—
b	0.18	0.25	0.30
e	—	0.50	—
Lp	0.30	0.40	0.50
x	—	—	0.05
y	—	—	0.05
Z_D	—	0.75	—
Z_E	—	0.75	—
c_2	0.15	0.20	0.25
D_2	—	5.50	—
E_2	—	5.50	—

Figure F 48 -Pin HWQFN (PWQN0048KB-A)