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Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Active
Core Processor	RXv2
Core Size	32-Bit Single-Core
Speed	80MHz
Connectivity	CANbus, I ² C, SCI, SPI
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	110
Program Memory Size	512KB (512K x 8)
Program Memory Type	FLASH
EEPROM Size	8K x 8
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 22x12b; D/A 2x8b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	144-LQFP
Supplier Device Package	144-LFQFP (20x20)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f524ueadfb-30

Table 1.2 Comparison of Functions for Different Packages

Module/Functions		RX24U Group	
		144 Pins	100 Pins
Memory	ROM	512 Kbytes	
	RAM	32 Kbytes	
	E2 Data Flash	8 Kbytes	
Interrupts	External interrupts	NMI, IRQ0 to IRQ7	
DTC	Data transfer controller (DTCa)	Available	
Timers	Multi-function timer pulse unit 3 (MTU3d)	9 channels	
	General PWM timer (GPTB)	4 channels	
	Port output enable 3 (POE3A)	POE0#, POE4#, POE8#, POE10#, POE11#, POE12#	
	8-bit timer (TMR)	2 channels × 4 units	
	Compare match timer (CMT)	2 channels × 2 units	
	Independent watchdog timer (IWDTa)	Available	
Communication functions	Serial communications interfaces (SCIg) [including simple I ² C and simple SPI]	6 channels (SCI1, 5, 6, 8, 9, 11)	4 channels (SCI1, 5, 6, 11)
	I ² C bus interface (RIICa)	1 channel	
	Serial peripheral interface (RSPIb)	1 channel	
	CAN module (RSCAN)	1 channel	
12-bit A/D converter (including high-precision channels) (S12ADF)		5 channels × 2 units, 12 channels × 1 unit (4 channels × 2 units, 12 channels × 1 unit)	5 channels × 2 units, 10 channels × 1 unit (4 channels × 2 units, 10 channels × 1 unit)
	3 channels simultaneous sampling function	3 channels/unit 1	
	Programmable gain amplifier	1 channel/unit 0, 3 channels/unit 1	
Comparator C (CMPC)		4 channels	
D/A converter (DAa)		2 channels	
CRC calculator (CRC)		Available	
Packages		144-pin LFQFP	100-pin LFQFP

Table 1.4 Pin Functions (3/4)

Classifications	Pin Name	I/O	Description
Serial communications interface (SCIg)	SMISO1, SMISO5, SMISO6, SMISO8, SMISO9, SMISO11	I/O	Input/output pins for slave transmit data.
	SMOSI1, SMOSI5, SMOSI6, SMOSI8, SMOSI9, SMOSI11	I/O	Input/output pins for master transmit data.
	SS1#, SS5#, SS6#, SS8#, SS9#, SS11#	Input	Chip-select input pins.
I ² C bus interface (RIIa)	SCL0	I/O	Input/output pin for I ² C bus interface clocks. Bus can be directly driven by the N-channel open drain output.
	SDA0	I/O	Input/output pin for I ² C bus interface data. Bus can be directly driven by the N-channel open drain output.
Serial peripheral interface (RSPIb)	RSPCKA	I/O	Input/output pin for the RSPI clock.
	MOSIA	I/O	Input/output pin for transmitting data from the RSPI master.
	MISOA	I/O	Input/output pin for transmitting data from the RSPI slave.
	SSLA0	I/O	Input/output pin to select the slave for the RSPI.
	SSLA1 to SSLA3	Output	Output pins to select the slave for the RSPI.
CAN module (RSCAN)	CRXD0	Input	Input pin
	CTXD0	Output	Output pin
12-bit A/D converter (S12ADF)	AN000 to AN003, AN016, AN100 to AN103, AN116, AN200 to AN211	Input	Input pins for the analog signals to be processed by the A/D converter.
	ADST0, ADST1, ADST2	Output	Output pins for A/D conversion status.
	ADTRG0#, ADTRG1#, ADTRG2#	Input	Input pins for the external trigger signals that start the A/D conversion.
	PGAVSS0	Input	AN000 PGA gain setting resistor reference ground pin: Connect to AVSS0 when the PGA is not used.
	PGAVSS1	Input	AN100 to 102 PGA gain setting resistor reference ground pin: Connect to AVSS1 when the PGA is not used.
8-bit D/A converter (DAa)	DA0, DA1	Output	Output pins for the analog signals to be processed by the D/A converter
Comparator C (CMPC)	COMP0 to COMP3	Output	Comparator detection result output pins.
	CMPC00 to CMPC03	Input	Analog input pins for CMPC0
	CMPC10 to CMPC13	Input	Analog input pins for CMPC1
	CMPC20 to CMPC23	Input	Analog input pins for CMPC2
	CMPC30 to CMPC33	Input	Analog input pins for CMPC3
Analog power supply	AVCC0	—	Analog power supply and reference power supply pin for 12-bit A/D converter unit 0. Connect the AVCC0 pin to AVCC1, or AVCC2 when 12-bit A/D converter unit 0 is not used.
	AVSS0	—	Analog ground and reference ground pin for 12-bit A/D converter unit 0. Connect the AVSS0 pin to AVSS1 or AVSS2 when 12-bit A/D converter unit 0 is not used.
	AVCC1	—	Analog power supply and reference power supply pin for 12-bit A/D converter unit 1. Connect the AVCC1 pin to AVCC0, or AVCC2 when 12-bit A/D converter unit 1 is not used.
	AVSS1	—	Analog ground and reference ground pin for 12-bit A/D converter unit 1. Connect the AVSS1 pin to AVSS0 or AVSS2 when 12-bit A/D converter unit 1 is not used.

1.5 Pin Assignments

Figure 1.3 and Figure 1.4 show the pin assignments. Table 1.5 and Table 1.6 show the lists of pins and pin functions.

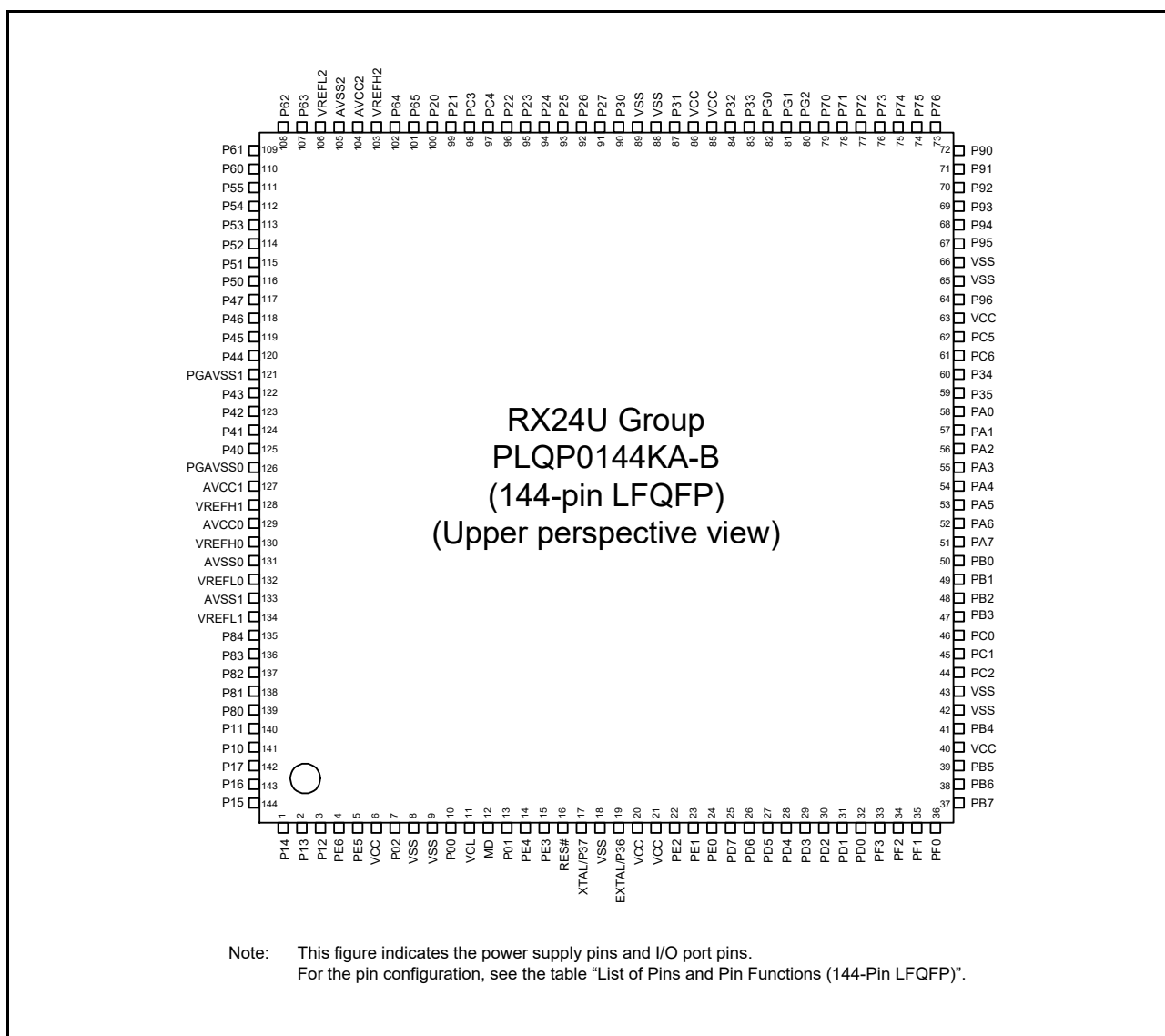


Figure 1.3 Pin Assignments of the 144-Pin LQFP

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

Pin No.	Power Supply, Clock, System Control	I/O Port	Timers (TMR, MTU3, POE, CAC, GPT)	Communications (SCI, RSPI, RIIC, RSCAN)	Others
1		P14	MTIOC4B, MTIOC4B#, GTIOC2A, GTIOC2A#		
2		P13	MTIOC4A, MTIOC4A#, GTIOC1A, GTIOC1A#		
3		P12	MTIOC3B, MTIOC3B#, GTIOC0A, GTIOC0A#		
4		PE6	POE10#		IRQ3
5		PE5			IRQ0
6	VCC				
7		P02	MTIOC9D, MTIOC9D#	CTS1#, RTS1#, SS1#	IRQ5, ADST0
8	VSS				
9	VSS				
10		P00			IRQ2, ADST1
11	VCL				
12	MD				FINED
13		P01	POE12#		IRQ4, ADST2
14		PE4	MTCLKC, MTCLKC#, POE10#		IRQ1
15		PE3	MTCLKD, MTCLKD#, POE11#		IRQ2
16	RES#				
17	XTAL	P37			
18	VSS				
19	EXTAL	P36			
20	VCC				
21	VCC				
22		PE2	POE10#		NMI
23		PE1	MTIOC9D, MTIOC9D#, TMO5	CTS5#, RTS5#, SS5#, SSLA3	
24		PE0	MTIOC9B, MTIOC9B#, TMC11, TMC15	RXD5, SMISO5, SSCL5, SSLA2	
25		PD7	MTIOC9A, MTIOC9A#, TMR11, TMR15, GTIOC3A, GTIOC3A#	TXD5, SMOSI5, SSDA5, SSLA1	
26		PD6	MTIOC9C, MTIOC9C#, TMO1, GTIOC3B, GTIOC3B#	CTS1#, RTS1#, SS1#, CTS11#, RTS11#, SS11#, SSLA0	IRQ5, ADST0
27		PD5	TMR10, TMR16, GTECLKA	RXD1, SMISO1, SSCL1, RXD11, SMISO11, SSCL11	IRQ3
28		PD4	TMC10, TMC16, GTECLKB	SCK1, SCK11	IRQ2
29		PD3	TMO0, GTECLKC	TXD1, SMOSI1, SSDA1, TXD11, SMOSI11, SSDA11	
30		PD2	TMC11, TMO4, GTIOC0A, GTIOC0A#	SCK5, MOSIA	
31		PD1	TMO2, GTIOC0B, GTIOC0B#	MISOA	
32		PD0	TMO6, GTIOC1A, GTIOC1A#	RSPCKA	
33		PF3	TMO7	CTS11#, RTS11#, SS11#, CRXD0	COMP0
34		PF2	TMO3	SCK11, CTXD0	COMP1
35		PF1	TMO5	RXD11, SMISO11, SSCL11	COMP2
36		PF0	TMO1	TXD11, SMOSI11, SSDA11	COMP3
37		PB7	GTIOC1B, GTIOC1B#	SCK5	
38		PB6	GTIOC2A, GTIOC2A#	RXD5, SMISO5, SSCL5	IRQ5
39		PB5	GTIOC2B, GTIOC2B#	TXD5, SMOSI5, SSDA5	
40	VCC				
41		PB4	POE8#, GTETRQ, GTECLKD	CTS5#, RTS5#, SS5#	IRQ3
42	VSS				
43	VSS				
44		PC2	ADSM0, GTADSM0	SCK8	
45		PC1	ADSM1, GTADSM1	TXD8, SMOSI8, SSDA8	
46		PC0		RXD8, SMISO8, SSCL8	COMP3
47		PB3	MTIOC0A, MTIOC0A#, CACREF	SCK6, RSPCKA	
48		PB2	MTIOC0B, MTIOC0B#, TMR10, ADSM0	TXD6, SMOSI6, SSDA6, SDA0	
49		PB1	MTIOC0C, MTIOC0C#, TMC10, ADSM1	RXD6, SMISO6, SSCL6, SCL0	

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

Pin No.	Power Supply, Clock, System Control	I/O Port	Timers (TMR, MTU3, POE, CAC, GPT)	Communications (SCI, RSPI, RIIC, RSCAN)	Others
50		PB0	MTIOC0D, MTIOC0D#, TMO0	TXD6, SMOSI6, SSDA6, MOSIA	ADTRG2#
51		PA7	TMO2, ADSM0		
52		PA6	TMO6, ADSM1		
53		PA5	MTIOC1A, MTIOC1A#, TMCi3	RXD6, SMISO6, SSCL6, MISOA	IRQ1, ADTRG1#
54		PA4	MTIOC1B, MTIOC1B#, TMCi7	SCK6, RSPCKA	ADTRG0#
55		PA3	MTIOC2A, MTIOC2A#, TMRi7, GTADSM0	SSLA0	
56		PA2	MTIOC2B, MTIOC2B#, TMO7, GTADSM1	CTS6#, RTS6#, SS6#, SSLA1	
57		PA1	MTIOC6A, MTIOC6A#, TMO4	SSLA2, CRXD0	ADTRG0#
58		PA0	MTIOC6C, MTIOC6C#, TMO2	SSLA3, CTXD0	
59		P35	TMO0, GTADSM0	CTS8#, RTS8#, SS8#	
60		P34	TMO4, GTADSM1	CTS9#, RTS9#, SS9#	
61		PC6	MTIOC1A, MTIOC1A#	RXD11, SMISO11, SSCL11	
62		PC5	MTIOC1B, MTIOC1B#	TXD11, SMOSI11, SSDA11	
63	VCC				
64		P96	POE4#	CTS8#, RTS8#, SS8#	IRQ4
65	VSS				
66	VSS				
67		P95	MTIOC6B, MTIOC6B#		
68		P94	MTIOC7A, MTIOC7A#		
69		P93	MTIOC7B, MTIOC7B#		
70		P92	MTIOC6D, MTIOC6D#		
71		P91	MTIOC7C, MTIOC7C#		
72		P90	MTIOC7D, MTIOC7D#		
73		P76	MTIOC4D, MTIOC4D#, GTIOC2B, GTIOC2B#		
74		P75	MTIOC4C, MTIOC4C#, GTIOC1B, GTIOC1B#		
75		P74	MTIOC3D, MTIOC3D#, GTIOC0B, GTIOC0B#		
76		P73	MTIOC4B, MTIOC4B#, GTIOC2A, GTIOC2A#		
77		P72	MTIOC4A, MTIOC4A#, GTIOC1A, GTIOC1A#		
78		P71	MTIOC3B, MTIOC3B#, GTIOC0A, GTIOC0A#		
79		P70	POE0#	CTS9#, RTS9#, SS9#	IRQ5
80		PG2	GTETRG	SCK9	COMP0
81		PG1		TXD9, SMOSI9, SSDA9	COMP1
82		PG0		RXD9, SMISO9, SSCL9	COMP2
83		P33	MTIOC3A, MTIOC3A#, MTCLKA, MTCLKA#, TMO0	SSLA3	
84		P32	MTIOC3C, MTIOC3C#, MTCLKB, MTCLKB#, TMO6	SSLA2	
85	VCC				
86	VCC				
87		P31	MTIOC0A, MTIOC0A#, MTCLKC, MTCLKC#, TMRi6	SSLA1	IRQ6
88	VSS				
89	VSS				
90		P30	MTIOC0B, MTIOC0B#, MTCLKD, MTCLKD#, TMCi6	SSLA0	IRQ7, COMP3
91		P27	MTIOC1A, MTIOC1A#		
92		P26	MTIOC9A, MTIOC9A#	CTS1#, RTS1#, SS1#	ADST0
93		P25	MTIOC9C, MTIOC9C#	SCK1	ADST1
94		P24	MTIC5U, MTIC5U#, TMCi2, TMO6	RSPCKA	COMP0, DA0
95		P23	MTIC5V, MTIC5V#, TMO2, CACREF	MOSIA	COMP1, DA1

Table 4.1 List of I/O Registers (Address Order) (11/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles	
						ICLK ≥ PCLK	
0008 73F9h	ICU	Interrupt Source Priority Register 249	IPR249	8	8	2 ICLK	
0008 73FAh	ICU	Interrupt Source Priority Register 250	IPR250	8	8	2 ICLK	
0008 7500h	ICU	IRQ Control Register 0	IRQCR0	8	8	2 ICLK	
0008 7501h	ICU	IRQ Control Register 1	IRQCR1	8	8	2 ICLK	
0008 7502h	ICU	IRQ Control Register 2	IRQCR2	8	8	2 ICLK	
0008 7503h	ICU	IRQ Control Register 3	IRQCR3	8	8	2 ICLK	
0008 7504h	ICU	IRQ Control Register 4	IRQCR4	8	8	2 ICLK	
0008 7505h	ICU	IRQ Control Register 5	IRQCR5	8	8	2 ICLK	
0008 7506h	ICU	IRQ Control Register 6	IRQCR6	8	8	2 ICLK	
0008 7507h	ICU	IRQ Control Register 7	IRQCR7	8	8	2 ICLK	
0008 7510h	ICU	IRQ Pin Digital Filter Enable Register 0	IRQFLTE0	8	8	2 ICLK	
0008 7514h	ICU	IRQ Pin Digital Filter Setting Register 0	IRQFLTC0	16	16	2 ICLK	
0008 7580h	ICU	Non-Maskable Interrupt Status Register	NMISR	8	8	2 ICLK	
0008 7581h	ICU	Non-Maskable Interrupt Enable Register	NMIER	8	8	2 ICLK	
0008 7582h	ICU	Non-Maskable Interrupt Status Clear Register	NMICLR	8	8	2 ICLK	
0008 7583h	ICU	NMI Pin Interrupt Control Register	NMICR	8	8	2 ICLK	
0008 7590h	ICU	NMI Pin Digital Filter Enable Register	NMIFLTE	8	8	2 ICLK	
0008 7594h	ICU	NMI Pin Digital Filter Setting Register	NMIFLTC	8	8	2 ICLK	
0008 8000h	CMT	Compare Match Timer Start Register 0	CMSTR0	16	16	2 or 3 PCLKB	
0008 8002h	CMT0	Compare Match Timer Control Register	CMCR	16	16	2 or 3 PCLKB	
0008 8004h	CMT0	Compare Match Counter	CMCNT	16	16	2 or 3 PCLKB	
0008 8006h	CMT0	Compare Match Constant Register	CMCOR	16	16	2 or 3 PCLKB	
0008 8008h	CMT1	Compare Match Timer Control Register	CMCR	16	16	2 or 3 PCLKB	
0008 800Ah	CMT1	Compare Match Counter	CMCNT	16	16	2 or 3 PCLKB	
0008 800Ch	CMT1	Compare Match Constant Register	CMCOR	16	16	2 or 3 PCLKB	
0008 8010h	CMT	Compare Match Timer Start Register 1	CMSTR1	16	16	2 or 3 PCLKB	
0008 8012h	CMT2	Compare Match Timer Control Register	CMCR	16	16	2 or 3 PCLKB	
0008 8014h	CMT2	Compare Match Counter	CMCNT	16	16	2 or 3 PCLKB	
0008 8016h	CMT2	Compare Match Constant Register	CMCOR	16	16	2 or 3 PCLKB	
0008 8018h	CMT3	Compare Match Timer Control Register	CMCR	16	16	2 or 3 PCLKB	
0008 801Ah	CMT3	Compare Match Counter	CMCNT	16	16	2 or 3 PCLKB	
0008 801Ch	CMT3	Compare Match Constant Register	CMCOR	16	16	2 or 3 PCLKB	
0008 8030h	IWDT	IWDT Refresh Register	IWDTRR	8	8	2 or 3 PCLKB	
0008 8032h	IWDT	IWDT Control Register	IWDTCR	16	16	2 or 3 PCLKB	
0008 8034h	IWDT	IWDT Status Register	IWDTSR	16	16	2 or 3 PCLKB	
0008 8036h	IWDT	IWDT Reset Control Register	IWDTRCR	8	8	2 or 3 PCLKB	
0008 8038h	IWDT	IWDT Count Stop Control Register	IWDTCSTPR	8	8	2 or 3 PCLKB	
0008 80C0h	DA	D/A Data Register 0	DADR0	16	16	2 or 3 PCLKB	
0008 80C2h	DA	D/A Data Register 1	DADR1	16	16	2 or 3 PCLKB	
0008 80C4h	DA	D/A Control Register	DACR	8	8	2 or 3 PCLKB	
0008 80C5h	DA	DADRm Format Select Register	DADPR	8	8	2 or 3 PCLKB	
0008 80C6h	DA	D/A A/D Synchronous Start Control Register	DAADSCR	8	8	2 or 3 PCLKB	
0008 8200h	TMR0	Timer Control Register	TCR	8	8	2 or 3 PCLKB	
0008 8201h	TMR1	Timer Control Register	TCR	8	8	2 or 3 PCLKB	
0008 8202h	TMR0	Timer Control/Status Register	TCSR	8	8	2 or 3 PCLKB	
0008 8203h	TMR1	Timer Control/Status Register	TCSR	8	8	2 or 3 PCLKB	
0008 8204h	TMR0	Time Constant Register A	TCORA	8	8	2 or 3 PCLKB	
0008 8205h	TMR1	Time Constant Register A	TCORA	8	8*1	2 or 3 PCLKB	
0008 8206h	TMR0	Time Constant Register B	TCORB	8	8	2 or 3 PCLKB	
0008 8207h	TMR1	Time Constant Register B	TCORB	8	8*1	2 or 3 PCLKB	
0008 8208h	TMR0	Timer Counter	TCNT	8	8	2 or 3 PCLKB	
0008 8209h	TMR1	Timer Counter	TCNT	8	8*1	2 or 3 PCLKB	

Table 4.1 List of I/O Registers (Address Order) (14/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles
						ICLK ≥ PCLK
0008 9086h	S12AD	A/D Data Duplication Register B	ADDBLDRB	16	16	2 or 3 PCLKB
0008 90D4h	S12AD	A/D Channel Select Register C0	ADANSC0	16	16	2 or 3 PCLKB
0008 90D6h	S12AD	A/D Channel Select Register C1	ADANSC1	16	16	2 or 3 PCLKB
0008 90D9h	S12AD	A/D Group C Trigger Select Register	ADGCTRGR	8	8	2 or 3 PCLKB
0008 90DDh	S12AD	A/D Sampling State Register L	ADSSTRL	8	8	2 or 3 PCLKB
0008 90E0h	S12AD	A/D Sampling State Register 0	ADSSTR0	8	8	2 or 3 PCLKB
0008 90E1h	S12AD	A/D Sampling State Register 1	ADSSTR1	8	8	2 or 3 PCLKB
0008 90E2h	S12AD	A/D Sampling State Register 2	ADSSTR2	8	8	2 or 3 PCLKB
0008 90E3h	S12AD	A/D Sampling State Register 3	ADSSTR3	8	8	2 or 3 PCLKB
0008 91A0h	S12AD	A/D Programmable Gain Amplifier Control Register	ADPGACR	16	16	2 or 3 PCLKB
0008 91A2h	S12AD	A/D Programmable Gain Amplifier Gain Setting Register 0	ADPGAGS0	16	16	2 or 3 PCLKB
0008 9200h	S12AD1	A/D Control Register	ADCSR	16	16	2 or 3 PCLKB
0008 9204h	S12AD1	A/D Channel Select Register A0	ADANSA0	16	16	2 or 3 PCLKB
0008 9206h	S12AD1	A/D Channel Select Register A1	ADANSA1	16	16	2 or 3 PCLKB
0008 9208h	S12AD1	A/D-Converted Value Addition/Average Function Channel Select Register 0	ADADS0	16	16	2 or 3 PCLKB
0008 920Ah	S12AD1	A/D-Converted Value Addition/Average Function Channel Select Register 1	ADADS1	16	16	2 or 3 PCLKB
0008 920Ch	S12AD1	A/D-Converted Value Addition/Average Count Select Register	ADADC	8	8	2 or 3 PCLKB
0008 920Eh	S12AD1	A/D Control Extended Register	ADCER	16	16	2 or 3 PCLKB
0008 9210h	S12AD1	A/D Conversion Start Trigger Select Register	ADSTRGR	16	16	2 or 3 PCLKB
0008 9214h	S12AD1	A/D Channel Select Register B0	ADANSB0	16	16	2 or 3 PCLKB
0008 9216h	S12AD1	A/D Channel Select Register B1	ADANSB1	16	16	2 or 3 PCLKB
0008 9218h	S12AD1	A/D Data Duplication Register	ADDBLDR	16	16	2 or 3 PCLKB
0008 921Eh	S12AD1	A/D Self-Diagnosis Data Register	ADRD	16	16	2 or 3 PCLKB
0008 9220h	S12AD1	A/D Data Register 0	ADDR0	16	16	2 or 3 PCLKB
0008 9222h	S12AD1	A/D Data Register 1	ADDR1	16	16	2 or 3 PCLKB
0008 9224h	S12AD1	A/D Data Register 2	ADDR2	16	16	2 or 3 PCLKB
0008 9226h	S12AD1	A/D Data Register 3	ADDR3	16	16	2 or 3 PCLKB
0008 9240h	S12AD1	A/D Data Register 16	ADDR16	16	16	2 or 3 PCLKB
0008 9266h	S12AD1	A/D Sample-and-hold Circuit Control Register	ADSHCR	16	16	2 or 3 PCLKB
0008 927Ah	S12AD1	A/D Disconnection Detection Control Register	ADDISCR	8	8	2 or 3 PCLKB
0008 9280h	S12AD1	A/D Group Scan Priority Control Register	ADGSPCR	16	16	2 or 3 PCLKB
0008 9284h	S12AD1	A/D Data Duplication Register A	ADDBLDRA	16	16	2 or 3 PCLKB
0008 9286h	S12AD1	A/D Data Duplication Register B	ADDBLDRB	16	16	2 or 3 PCLKB
0008 92D4h	S12AD1	A/D Channel Select Register C0	ADANSC0	16	16	2 or 3 PCLKB
0008 92D6h	S12AD1	A/D Channel Select Register C1	ADANSC1	16	16	2 or 3 PCLKB
0008 92D9h	S12AD1	A/D Group C Trigger Select Register	ADGCTRGR	8	8	2 or 3 PCLKB
0008 92DDh	S12AD1	A/D Sampling State Register L	ADSSTRL	8	8	2 or 3 PCLKB
0008 92E0h	S12AD1	A/D Sampling State Register 0	ADSSTR0	8	8	2 or 3 PCLKB
0008 92E1h	S12AD1	A/D Sampling State Register 1	ADSSTR1	8	8	2 or 3 PCLKB
0008 92E2h	S12AD1	A/D Sampling State Register 2	ADSSTR2	8	8	2 or 3 PCLKB
0008 92E3h	S12AD1	A/D Sampling State Register 3	ADSSTR3	8	8	2 or 3 PCLKB
0008 93A0h	S12AD1	A/D Programmable Gain Amplifier Control Register	ADPGACR	16	16	2 or 3 PCLKB
0008 93A2h	S12AD1	A/D Programmable Gain Amplifier Gain Setting Register 0	ADPGAGS0	16	16	2 or 3 PCLKB
0008 9400h	S12AD2	A/D Control Register	ADCSR	16	16	2 or 3 PCLKB
0008 9404h	S12AD2	A/D Channel Select Register A0	ADANSA0	16	16	2 or 3 PCLKB
0008 9408h	S12AD2	A/D-Converted Value Addition/Average Function Channel Select Register 0	ADADS0	16	16	2 or 3 PCLKB
0008 940Ch	S12AD2	A/D-Converted Value Addition/Average Count Select Register	ADADC	8	8	2 or 3 PCLKB
0008 940Eh	S12AD2	A/D Control Extended Register	ADCER	16	16	2 or 3 PCLKB
0008 9410h	S12AD2	A/D Conversion Start Trigger Select Register	ADSTRGR	16	16	2 or 3 PCLKB

Table 4.1 List of I/O Registers (Address Order) (16/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles
						ICLK ≥ PCLK
0008 A02Fh	SCI1	Transmit Data Register L	TDRL	8	8	2 or 3 PCLKB
0008 A030h	SCI1	Receive Data Register HL	RDRHL	16	16	4 or 5 PCLKB
0008 A030h	SCI1	Receive Data Register H	RDRH	8	8	2 or 3 PCLKB
0008 A031h	SCI1	Receive Data Register L	RDRL	8	8	2 or 3 PCLKB
0008 A032h	SCI1	Modulation Duty Register	MDDR	8	8	2 or 3 PCLKB
0008 A0A0h	SCI5	Serial Mode Register	SMR	8	8	2 or 3 PCLKB
0008 A0A1h	SCI5	Bit Rate Register	BRR	8	8	2 or 3 PCLKB
0008 A0A2h	SCI5	Serial Control Register	SCR	8	8	2 or 3 PCLKB
0008 A0A3h	SCI5	Transmit Data Register	TDR	8	8	2 or 3 PCLKB
0008 A0A4h	SCI5	Serial Status Register	SSR	8	8	2 or 3 PCLKB
0008 A0A5h	SCI5	Receive Data Register	RDR	8	8	2 or 3 PCLKB
0008 A0A6h	SMCI5	Smart Card Mode Register	SCMR	8	8	2 or 3 PCLKB
0008 A0A7h	SCI5	Serial Extended Mode Register	SEMR	8	8	2 or 3 PCLKB
0008 A0A8h	SCI5	Noise Filter Setting Register	SNFR	8	8	2 or 3 PCLKB
0008 A0A9h	SCI5	I ² C Mode Register 1	SIMR1	8	8	2 or 3 PCLKB
0008 A0AAh	SCI5	I ² C Mode Register 2	SIMR2	8	8	2 or 3 PCLKB
0008 A0ABh	SCI5	I ² C Mode Register 3	SIMR3	8	8	2 or 3 PCLKB
0008 A0ACh	SCI5	I ² C Status Register	SISR	8	8	2 or 3 PCLKB
0008 A0ADh	SCI5	SPI Mode Register	SPMR	8	8	2 or 3 PCLKB
0008 A0AEh	SCI5	Transmit Data Register HL	TDRHL	16	16	4 or 5 PCLKB
0008 A0AEh	SCI5	Transmit Data Register H	TDRH	8	8	2 or 3 PCLKB
0008 A0AFh	SCI5	Transmit Data Register L	TDRL	8	8	2 or 3 PCLKB
0008 A0B0h	SCI5	Receive Data Register HL	RDRHL	16	16	4 or 5 PCLKB
0008 A0B0h	SCI5	Receive Data Register H	RDRH	8	8	2 or 3 PCLKB
0008 A0B1h	SCI5	Receive Data Register L	RDRL	8	8	2 or 3 PCLKB
0008 A0B2h	SCI5	Modulation Duty Register	MDDR	8	8	2 or 3 PCLKB
0008 A0C0h	SCI6	Serial Mode Register	SMR	8	8	2 or 3 PCLKB
0008 A0C1h	SCI6	Bit Rate Register	BRR	8	8	2 or 3 PCLKB
0008 A0C2h	SCI6	Serial Control Register	SCR	8	8	2 or 3 PCLKB
0008 A0C3h	SCI6	Transmit Data Register	TDR	8	8	2 or 3 PCLKB
0008 A0C4h	SCI6	Serial Status Register	SSR	8	8	2 or 3 PCLKB
0008 A0C5h	SCI6	Receive Data Register	RDR	8	8	2 or 3 PCLKB
0008 A0C6h	SMCI6	Smart Card Mode Register	SCMR	8	8	2 or 3 PCLKB
0008 A0C7h	SCI6	Serial Extended Mode Register	SEMR	8	8	2 or 3 PCLKB
0008 A0C8h	SCI6	Noise Filter Setting Register	SNFR	8	8	2 or 3 PCLKB
0008 A0C9h	SCI6	I ² C Mode Register 1	SIMR1	8	8	2 or 3 PCLKB
0008 A0CAh	SCI6	I ² C Mode Register 2	SIMR2	8	8	2 or 3 PCLKB
0008 A0CBh	SCI6	I ² C Mode Register 3	SIMR3	8	8	2 or 3 PCLKB
0008 A0CCh	SCI6	I ² C Status Register	SISR	8	8	2 or 3 PCLKB
0008 A0CDh	SCI6	SPI Mode Register	SPMR	8	8	2 or 3 PCLKB
0008 A0CEh	SCI6	Transmit Data Register HL	TDRHL	16	16	4 or 5 PCLKB
0008 A0CEh	SCI6	Transmit Data Register H	TDRH	8	8	2 or 3 PCLKB
0008 A0CFh	SCI6	Transmit Data Register L	TDRL	8	8	2 or 3 PCLKB
0008 A0D0h	SCI6	Receive Data Register HL	RDRHL	16	16	4 or 5 PCLKB
0008 A0D0h	SCI6	Receive Data Register H	RDRH	8	8	2 or 3 PCLKB
0008 A0D1h	SCI6	Receive Data Register L	RDRL	8	8	2 or 3 PCLKB
0008 A0D2h	SCI6	Modulation Duty Register	MDDR	8	8	2 or 3 PCLKB
0008 A100h	SCI8	Serial Mode Register	SMR	8	8	2 or 3 PCLKB
0008 A101h	SCI8	Bit Rate Register	BRR	8	8	2 or 3 PCLKB
0008 A102h	SCI8	Serial Control Register	SCR	8	8	2 or 3 PCLKB
0008 A103h	SCI8	Transmit Data Register	TDR	8	8	2 or 3 PCLKB
0008 A104h	SCI8	Serial Status Register	SSR	8	8	2 or 3 PCLKB

Table 4.1 List of I/O Registers (Address Order) (27/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles
						ICLK ≥ PCLK
000A 841Ah	RSCAN	Receive Buffer Register 7CH	RMDF17	16	16	2 or 3 PCLKB
000A 841Ch	RSCAN	Receive Rule Entry Register 10BL	GAFLML10	16	16	2 or 3 PCLKB
000A 841Ch	RSCAN	Receive Buffer Register 7DL	RMDF27	16	16	2 or 3 PCLKB
000A 841Eh	RSCAN	Receive Rule Entry Register 10BH	GAFLMH10	16	16	2 or 3 PCLKB
000A 841Eh	RSCAN	Receive Buffer Register 7DH	RMDF37	16	16	2 or 3 PCLKB
000A 8420h	RSCAN	Receive Rule Entry Register 10CL	GAFLPL10	16	16	2 or 3 PCLKB
000A 8420h	RSCAN	Receive Buffer Register 8AL	RMIDL8	16	16	2 or 3 PCLKB
000A 8422h	RSCAN	Receive Rule Entry Register 10CH	GAFLPH10	16	16	2 or 3 PCLKB
000A 8422h	RSCAN	Receive Buffer Register 8AH	RMIDH8	16	16	2 or 3 PCLKB
000A 8424h	RSCAN	Receive Rule Entry Register 11AL	GAFLIDL11	16	16	2 or 3 PCLKB
000A 8424h	RSCAN	Receive Buffer Register 8BL	RMTS8	16	16	2 or 3 PCLKB
000A 8426h	RSCAN	Receive Rule Entry Register 11AH	GAFLIDH11	16	16	2 or 3 PCLKB
000A 8426h	RSCAN	Receive Buffer Register 8BH	RMPTR8	16	16	2 or 3 PCLKB
000A 8428h	RSCAN	Receive Rule Entry Register 11BL	GAFLML11	16	16	2 or 3 PCLKB
000A 8428h	RSCAN	Receive Buffer Register 8CL	RMDF08	16	16	2 or 3 PCLKB
000A 842Ah	RSCAN	Receive Rule Entry Register 11BH	GAFLMH11	16	16	2 or 3 PCLKB
000A 842Ah	RSCAN	Receive Buffer Register 8CH	RMDF18	16	16	2 or 3 PCLKB
000A 842Ch	RSCAN	Receive Rule Entry Register 11CL	GAFLPL11	16	16	2 or 3 PCLKB
000A 842Ch	RSCAN	Receive Buffer Register 8DL	RMDF28	16	16	2 or 3 PCLKB
000A 842Eh	RSCAN	Receive Rule Entry Register 11CH	GAFLPH11	16	16	2 or 3 PCLKB
000A 842Eh	RSCAN	Receive Buffer Register 8DH	RMDF38	16	16	2 or 3 PCLKB
000A 8430h	RSCAN	Receive Rule Entry Register 12AL	GAFLIDL12	16	16	2 or 3 PCLKB
000A 8430h	RSCAN	Receive Buffer Register 9AL	RMIDL9	16	16	2 or 3 PCLKB
000A 8432h	RSCAN	Receive Rule Entry Register 12AH	GAFLIDH12	16	16	2 or 3 PCLKB
000A 8432h	RSCAN	Receive Buffer Register 9AH	RMIDH9	16	16	2 or 3 PCLKB
000A 8434h	RSCAN	Receive Rule Entry Register 12BL	GAFLML12	16	16	2 or 3 PCLKB
000A 8434h	RSCAN	Receive Buffer Register 9BL	RMTS9	16	16	2 or 3 PCLKB
000A 8436h	RSCAN	Receive Rule Entry Register 12BH	GAFLMH12	16	16	2 or 3 PCLKB
000A 8436h	RSCAN	Receive Buffer Register 9BH	RMPTR9	16	16	2 or 3 PCLKB
000A 8438h	RSCAN	Receive Rule Entry Register 12CL	GAFLPL12	16	16	2 or 3 PCLKB
000A 8438h	RSCAN	Receive Buffer Register 9CL	RMDF09	16	16	2 or 3 PCLKB
000A 843Ah	RSCAN	Receive Rule Entry Register 12CH	GAFLPH12	16	16	2 or 3 PCLKB
000A 843Ah	RSCAN	Receive Buffer Register 9CH	RMDF19	16	16	2 or 3 PCLKB
000A 843Ch	RSCAN	Receive Rule Entry Register 13AL	GAFLIDL13	16	16	2 or 3 PCLKB
000A 843Ch	RSCAN	Receive Buffer Register 9DL	RMDF29	16	16	2 or 3 PCLKB
000A 843Eh	RSCAN	Receive Rule Entry Register 13AH	GAFLIDH13	16	16	2 or 3 PCLKB
000A 843Eh	RSCAN	Receive Buffer Register 9DH	RMDF39	16	16	2 or 3 PCLKB
000A 8440h	RSCAN	Receive Rule Entry Register 13BL	GAFLML13	16	16	2 or 3 PCLKB
000A 8440h	RSCAN	Receive Buffer Register 10AL	RMIDL10	16	16	2 or 3 PCLKB
000A 8442h	RSCAN	Receive Rule Entry Register 13BH	GAFLMH13	16	16	2 or 3 PCLKB
000A 8442h	RSCAN	Receive Buffer Register 10AH	RMIDH10	16	16	2 or 3 PCLKB
000A 8444h	RSCAN	Receive Rule Entry Register 13CL	GAFLPL13	16	16	2 or 3 PCLKB
000A 8444h	RSCAN	Receive Buffer Register 10BL	RMTS10	16	16	2 or 3 PCLKB
000A 8446h	RSCAN	Receive Rule Entry Register 13CH	GAFLPH13	16	16	2 or 3 PCLKB
000A 8446h	RSCAN	Receive Buffer Register 10BH	RMPTR10	16	16	2 or 3 PCLKB
000A 8448h	RSCAN	Receive Rule Entry Register 14AL	GAFLIDL14	16	16	2 or 3 PCLKB
000A 8448h	RSCAN	Receive Buffer Register 10CL	RMDF010	16	16	2 or 3 PCLKB
000A 844Ah	RSCAN	Receive Rule Entry Register 14AH	GAFLIDH14	16	16	2 or 3 PCLKB
000A 844Ah	RSCAN	Receive Buffer Register 10CH	RMDF110	16	16	2 or 3 PCLKB
000A 844Ch	RSCAN	Receive Rule Entry Register 14BL	GAFLML14	16	16	2 or 3 PCLKB
000A 844Ch	RSCAN	Receive Buffer Register 10DL	RMDF210	16	16	2 or 3 PCLKB
000A 844Eh	RSCAN	Receive Rule Entry Register 14BH	GAFLMH14	16	16	2 or 3 PCLKB

Table 4.1 List of I/O Registers (Address Order) (34/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles
						ICLK ≥ PCLK
000C 1A2Dh	MTU7	Timer Status Register	TSR	8	8	4 or 5 PCLKA
000C 1A30h	MTU	Timer Interrupt Skipping Set Register 1B	TITCR1B	8	8, 16	4 or 5 PCLKA
000C 1A31h	MTU	Timer Interrupt Skipping Counters 1B	TITCNT1B	8	8	4 or 5 PCLKA
000C 1A32h	MTU	Timer Buffer Transfer Set Register B	TBTERB	8	8	4 or 5 PCLKA
000C 1A34h	MTU	Timer Dead Time Enable Register B	TDERB	8	8	4 or 5 PCLKA
000C 1A36h	MTU	Timer Output Level Buffer Register B	TOLBRB	8	8	4 or 5 PCLKA
000C 1A38h	MTU6	Timer Buffer Operation Transfer Mode Register	TBTM	8	8, 16	4 or 5 PCLKA
000C 1A39h	MTU7	Timer Buffer Operation Transfer Mode Register	TBTM	8	8	4 or 5 PCLKA
000C 1A3Ah	MTU	Timer Interrupt Skipping Mode Register B	TITMRB	8	8	4 or 5 PCLKA
000C 1A3Bh	MTU	Timer Interrupt Skipping Set Register 2B	TITCR2B	8	8	4 or 5 PCLKA
000C 1A3Ch	MTU	Timer Interrupt Skipping Counters 2B	TITCNT2B	8	8	4 or 5 PCLKA
000C 1A40h	MTU7	Timer A/D Converter Start Request Control Register	TADCR	16	16	4 or 5 PCLKA
000C 1A44h	MTU7	Timer A/D Converter Start Request Cycle Set Register A	TADCORA	16	16, 32	4 or 5 PCLKA
000C 1A46h	MTU7	Timer A/D Converter Start Request Cycle Set Register B	TADCORB	16	16	4 or 5 PCLKA
000C 1A48h	MTU7	Timer A/D Converter Start Request Cycle Set Buffer Register A	TADCOBRA	16	16, 32	4 or 5 PCLKA
000C 1A4Ah	MTU7	Timer A/D Converter Start Request Cycle Set Buffer Register B	TADCOBRB	16	16	4 or 5 PCLKA
000C 1A4Ch	MTU6	Timer Control Register 2	TCR2	8	8	4 or 5 PCLKA
000C 1A4Dh	MTU7	Timer Control Register 2	TCR2	8	8	4 or 5 PCLKA
000C 1A50h	MTU6	Timer Synchronous Clear Register	TSYCR	8	8	4 or 5 PCLKA
000C 1A60h	MTU	Timer Waveform Control Register B	TWCRB	8	8	4 or 5 PCLKA
000C 1A70h	MTU	Timer Mode Register 2B	TMDR2B	8	8	4 or 5 PCLKA
000C 1A72h	MTU6	Timer General Register E	TGRE	16	16	4 or 5 PCLKA
000C 1A74h	MTU7	Timer General Register E	TGRE	16	16	4 or 5 PCLKA
000C 1A76h	MTU7	Timer General Register F	TGRF	16	16	4 or 5 PCLKA
000C 1A80h	MTU	Timer Start Register B	TSTRB	8	8, 16	4 or 5 PCLKA
000C 1A81h	MTU	Timer Synchronous Register B	TSYRB	8	8	4 or 5 PCLKA
000C 1A84h	MTU	Timer Read/Write Enable Register B	TRWERB	8	8	4 or 5 PCLKA
000C 1A93h	MTU6	Noise Filter Control Register 6	NFCR6	8	8	4 or 5 PCLKA
000C 1A94h	MTU7	Noise Filter Control Register 7	NFCR7	8	8	4 or 5 PCLKA
000C 1A95h	MTU5	Noise Filter Control Register 5	NFCR5	8	8	4 or 5 PCLKA
000C 1C80h	MTU5	Timer Counter U	TCNTU	16	16, 32	4 or 5 PCLKA
000C 1C82h	MTU5	Timer General Register U	TGRU	16	16	4 or 5 PCLKA
000C 1C84h	MTU5	Timer Control Register U	TCRU	8	8	4 or 5 PCLKA
000C 1C85h	MTU5	Timer Control Register 2U	TCR2U	8	8	4 or 5 PCLKA
000C 1C86h	MTU5	Timer I/O Control Register U	TIORU	8	8	4 or 5 PCLKA
000C 1C90h	MTU5	Timer Counter V	TCNTV	16	16, 32	4 or 5 PCLKA
000C 1C92h	MTU5	Timer General Register V	TGRV	16	16	4 or 5 PCLKA
000C 1C94h	MTU5	Timer Control Register V	TCRV	8	8	4 or 5 PCLKA
000C 1C95h	MTU5	Timer Control Register 2V	TCR2V	8	8	4 or 5 PCLKA
000C 1C96h	MTU5	Timer I/O Control Register V	TIORV	8	8	4 or 5 PCLKA
000C 1CA0h	MTU5	Timer Counter W	TCNTW	16	16, 32	4 or 5 PCLKA
000C 1CA2h	MTU5	Timer General Register W	TGRW	16	16	4 or 5 PCLKA
000C 1CA4h	MTU5	Timer Control Register W	TCRW	8	8	4 or 5 PCLKA
000C 1CA5h	MTU5	Timer Control Register 2W	TCR2W	8	8	4 or 5 PCLKA
000C 1CA6h	MTU5	Timer I/O Control Register W	TIORW	8	8	4 or 5 PCLKA
000C 1CB2h	MTU5	Timer Interrupt Enable Register	TIER	8	8	4 or 5 PCLKA
000C 1CB4h	MTU5	Timer Start Register	TSTR	8	8	4 or 5 PCLKA
000C 1CB6h	MTU5	Timer Compare Match Clear Register	TCNTCMPCLR	8	8	4 or 5 PCLKA
000C 1D30h	MTU	A/D Conversion Start Request Select Register 0	TADSTRGR0	8	8	4 or 5 PCLKA
000C 1D32h	MTU	A/D Conversion Start Request Select Register 1	TADSTRGR1	8	8	4 or 5 PCLKA
000C 2000h	GPT	General PWM Timer Software Start Register	GTSTR	16	8, 16, 32	4 or 5 PCLKA

Table 4.1 List of I/O Registers (Address Order) (38/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles
						ICLK ≥ PCLK
000C 2304h	GPT01	General PWM Timer Longword Compare Capture Register A	GTCCRALW	32	32	4 or 5 PCLKA
000C 2308h	GPT01	General PWM Timer Longword Compare Capture Register B	GTCCRBWLW	32	32	4 or 5 PCLKA
000C 230Ch	GPT01	General PWM Timer Longword Compare Capture Register C	GTCCRCLW	32	32	4 or 5 PCLKA
000C 2310h	GPT01	General PWM Timer Longword Compare Capture Register D	GTCCRDWLW	32	32	4 or 5 PCLKA
000C 2314h	GPT01	General PWM Timer Longword Compare Capture Register E	GTCCRELW	32	32	4 or 5 PCLKA
000C 2318h	GPT01	General PWM Timer Longword Compare Capture Register F	GTCCRFLW	32	32	4 or 5 PCLKA
000C 231Ch	GPT01	General PWM Timer Longword Period Setting Register	GTPRLW	32	32	4 or 5 PCLKA
000C 2320h	GPT01	General PWM Timer Longword Period Setting Buffer Register	GTPBRLW	32	32	4 or 5 PCLKA
000C 2324h	GPT01	General PWM Timer Longword Period Setting Double Buffer Register	GTPDBRLW	32	32	4 or 5 PCLKA
000C 2328h	GPT01	Longword A/D Converter Start Request Timing Register A	GTADTRALW	32	32	4 or 5 PCLKA
000C 232Ch	GPT01	Longword A/D Converter Start Request Timing Buffer Register A	GTADTBRLW	32	32	4 or 5 PCLKA
000C 2330h	GPT01	Longword A/D Converter Start Request Timing Double Buffer Register A	GTADTDBRALW	32	32	4 or 5 PCLKA
000C 2334h	GPT01	Longword A/D Converter Start Request Timing Register B	GTADTRBLW	32	32	4 or 5 PCLKA
000C 2338h	GPT01	Longword A/D Converter Start Request Timing Buffer Register B	GTADTBRLW	32	32	4 or 5 PCLKA
000C 233Ch	GPT01	Longword A/D Converter Start Request Timing Double Buffer Register B	GTADTDBRBLW	32	32	4 or 5 PCLKA
000C 2340h	GPT01	General PWM Timer Longword Dead Time Value Register U	GTDVULW	32	32	4 or 5 PCLKA
000C 2344h	GPT01	General PWM Timer Longword Dead Time Value Register D	GTDVDLW	32	32	4 or 5 PCLKA
000C 2348h	GPT01	General PWM Timer Longword Dead Time Buffer Register U	GTDBULW	32	32	4 or 5 PCLKA
000C 234Ch	GPT01	General PWM Timer Longword Dead Time Buffer Register D	GTDBDLW	32	32	4 or 5 PCLKA
000C 2380h	GPT23	General PWM Timer Longword Counter	GTCTLW	32	32	4 or 5 PCLKA
000C 2384h	GPT23	General PWM Timer Longword Compare Capture Register A	GTCCRALW	32	32	4 or 5 PCLKA
000C 2388h	GPT23	General PWM Timer Longword Compare Capture Register B	GTCCRBWLW	32	32	4 or 5 PCLKA
000C 238Ch	GPT23	General PWM Timer Longword Compare Capture Register C	GTCCRCLW	32	32	4 or 5 PCLKA
000C 2390h	GPT23	General PWM Timer Longword Compare Capture Register D	GTCCRDWLW	32	32	4 or 5 PCLKA
000C 2394h	GPT23	General PWM Timer Longword Compare Capture Register E	GTCCRELW	32	32	4 or 5 PCLKA
000C 2398h	GPT23	General PWM Timer Longword Compare Capture Register F	GTCCRFLW	32	32	4 or 5 PCLKA
000C 239Ch	GPT23	General PWM Timer Longword Period Setting Register	GTPRLW	32	32	4 or 5 PCLKA
000C 23A0h	GPT23	General PWM Timer Longword Period Setting Buffer Register	GTPBRLW	32	32	4 or 5 PCLKA
000C 23A4h	GPT23	General PWM Timer Longword Period Setting Double Buffer Register	GTPDBRLW	32	32	4 or 5 PCLKA
000C 23A8h	GPT23	Longword A/D Converter Start Request Timing Register A	GTADTRALW	32	32	4 or 5 PCLKA
000C 23ACh	GPT23	Longword A/D Converter Start Request Timing Buffer Register A	GTADTBRLW	32	32	4 or 5 PCLKA
000C 23B0h	GPT23	Longword A/D Converter Start Request Timing Double Buffer Register A	GTADTDBRALW	32	32	4 or 5 PCLKA
000C 23B4h	GPT23	Longword A/D Converter Start Request Timing Register B	GTADTRBLW	32	32	4 or 5 PCLKA
000C 23B8h	GPT23	Longword A/D Converter Start Request Timing Buffer Register B	GTADTBRLW	32	32	4 or 5 PCLKA
000C 23BCh	GPT23	Longword A/D Converter Start Request Timing Double Buffer Register B	GTADTDBRBLW	32	32	4 or 5 PCLKA
000C 23C0h	GPT23	General PWM Timer Longword Dead Time Value Register U	GTDVULW	32	32	4 or 5 PCLKA

Table 4.1 List of I/O Registers (Address Order) (40/40)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles
						ICLK ≥ PCLK
007F C354h	FLASHCON ST	Unique ID Register 1	UIDR1	32	32	2 or 3 FCLK
007F C358h	FLASHCON ST	Unique ID Register 2	UIDR2	32	32	2 or 3 FCLK
007F C35Ch	FLASHCON ST	Unique ID Register 3	UIDR3	32	32	2 or 3 FCLK
007F FFB2h	FLASH	Flash P/E Mode Entry Register	FENTRYR	16	16	2 or 3 FCLK

Note 1. Odd addresses cannot be accessed in 16-bit units. When accessing a register in 16-bit units, access the address of the TMR0, TMR2, TMR4, or TMR6 register. Table 23.5 lists register allocation for 16-bit access in the User's Manual: Hardware.

5.2.1 Normal I/O Pin Output Characteristics (1)

Figure 5.4 to Figure 5.7 show the characteristics when normal output is selected by the drive capacity control register.

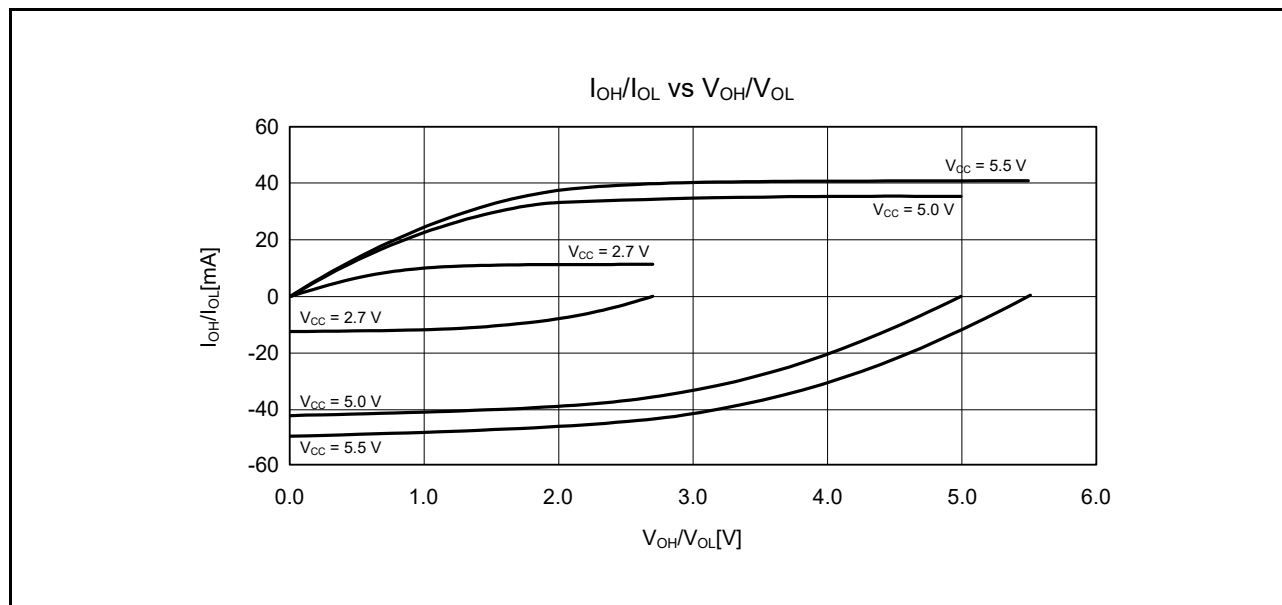


Figure 5.4 V_{OH}/V_{OL} and I_{OH}/I_{OL} Voltage Characteristics at $T_a = 25^\circ\text{C}$ When Normal Output is Selected (Reference Data)

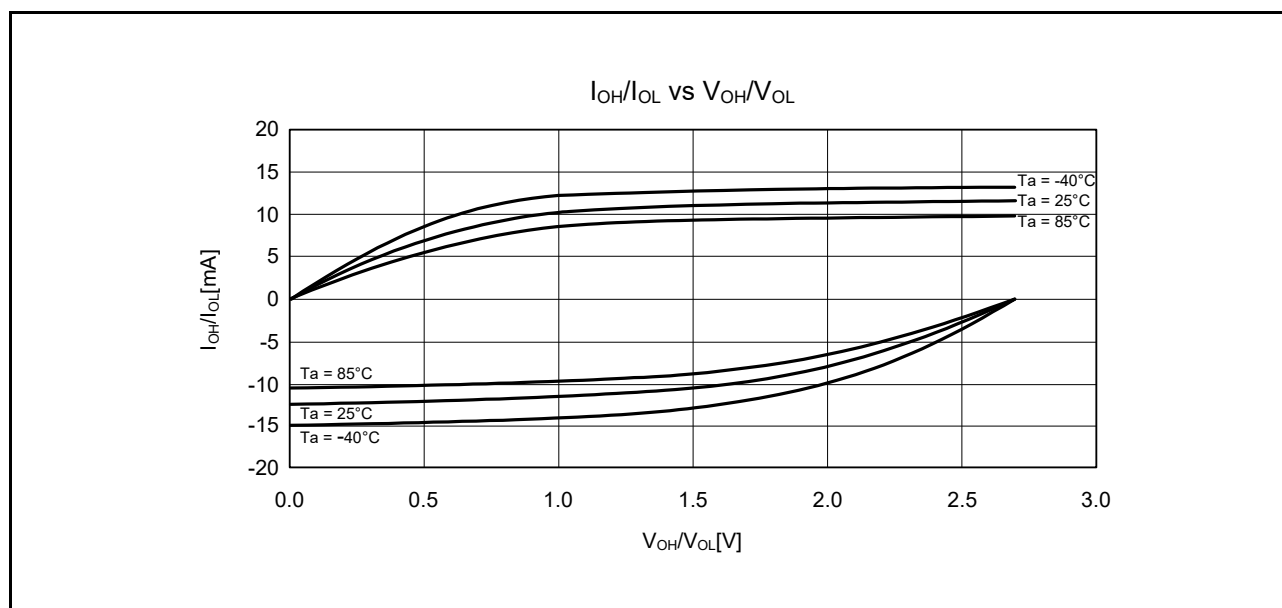


Figure 5.5 V_{OH}/V_{OL} and I_{OH}/I_{OL} Temperature Characteristics at $V_{CC} = 2.7\text{ V}$ when Normal Output is Selected (Reference Data)

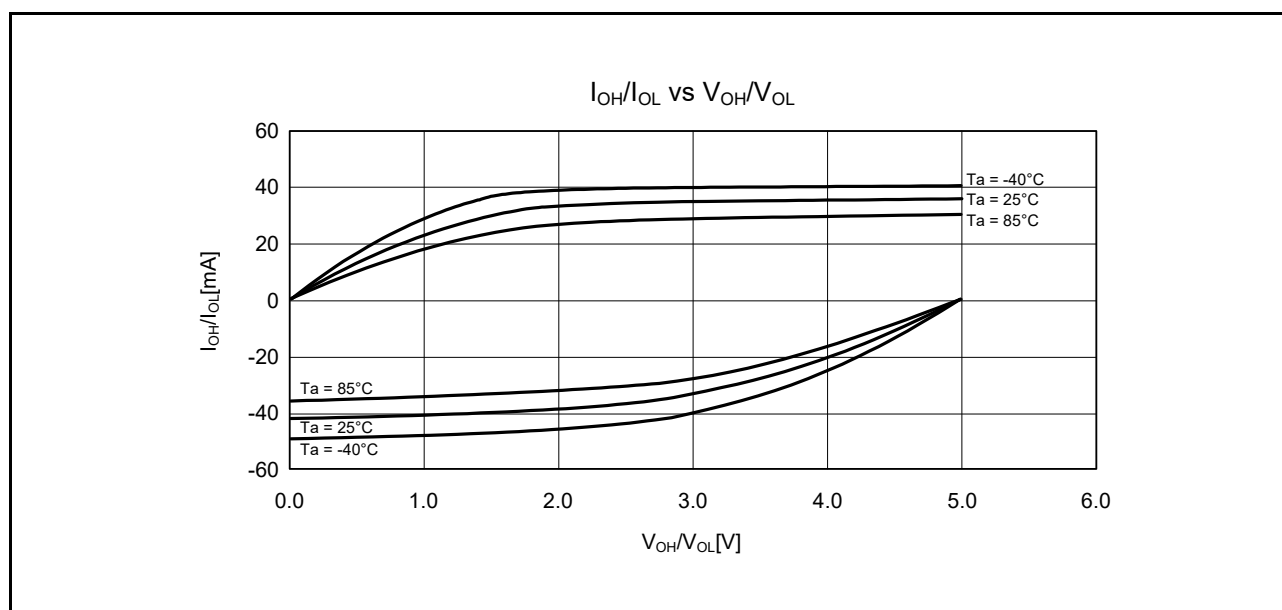


Figure 5.6 V_{OH}/V_{OL} and I_{OH}/I_{OL} Temperature Characteristics at $V_{CC} = 5.0$ V when Normal Output is Selected (Reference Data)

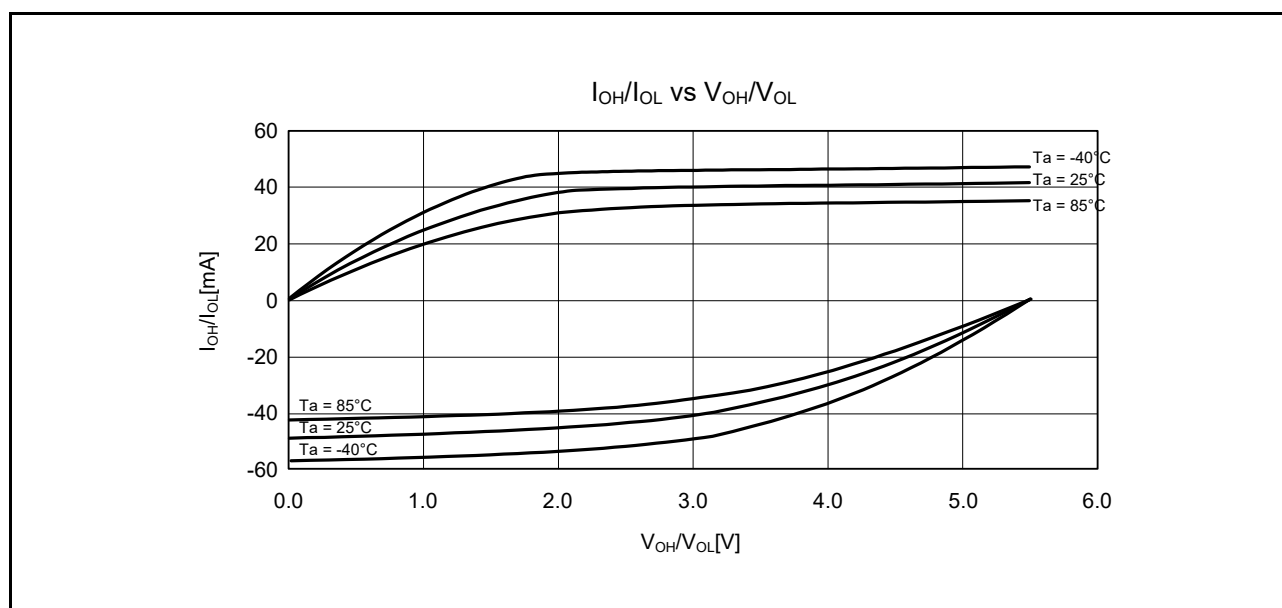


Figure 5.7 V_{OH}/V_{OL} and I_{OH}/I_{OL} Temperature Characteristics at $V_{CC} = 5.5$ V when Normal Output is Selected (Reference Data)

5.2.3 Standard I/O Pin Output Characteristics (3)

Figure 5.12 to Figure 5.15 show the output characteristics of the large current ports.

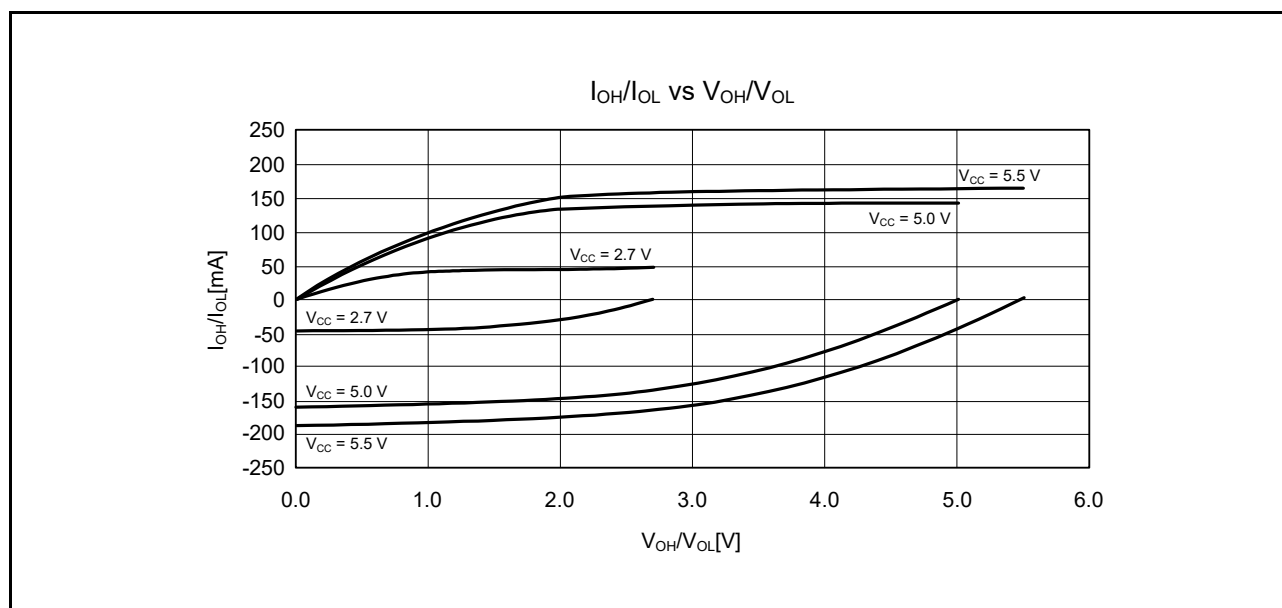


Figure 5.12 V_{OH}/V_{OL} and I_{OH}/I_{OL} Voltage Characteristics of Large Current Ports at $T_a = 25^\circ\text{C}$ (Reference Data)

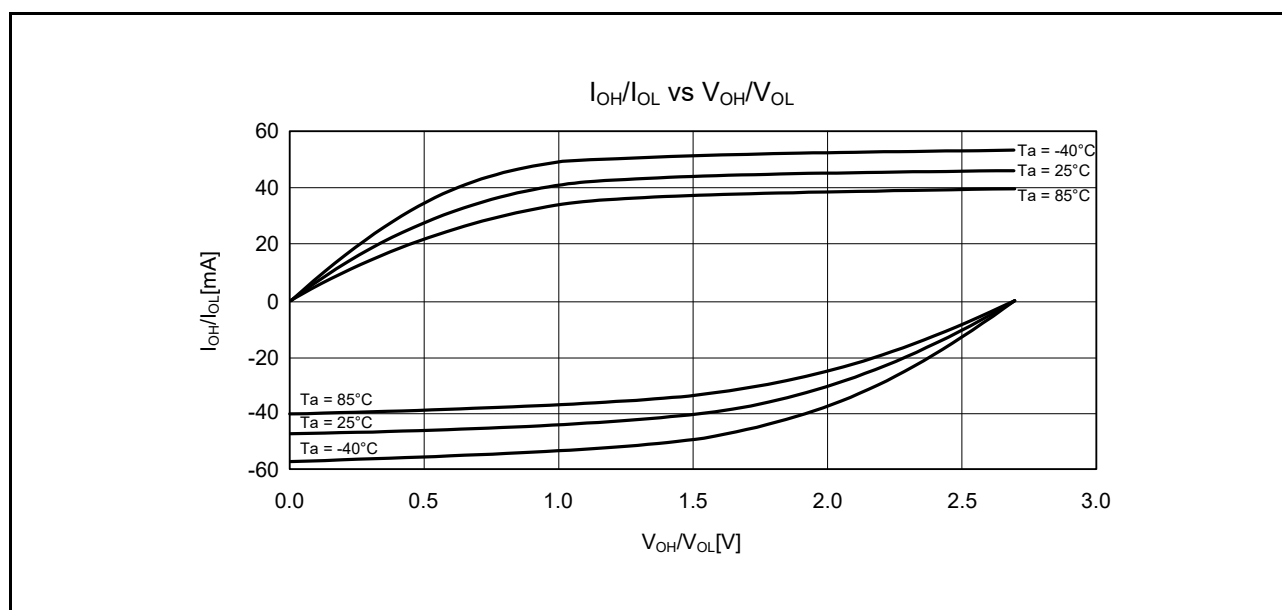


Figure 5.13 V_{OH}/V_{OL} and I_{OH}/I_{OL} Temperature Characteristics of Large Current Ports at $V_{CC} = 2.7\text{ V}$ (Reference Data)

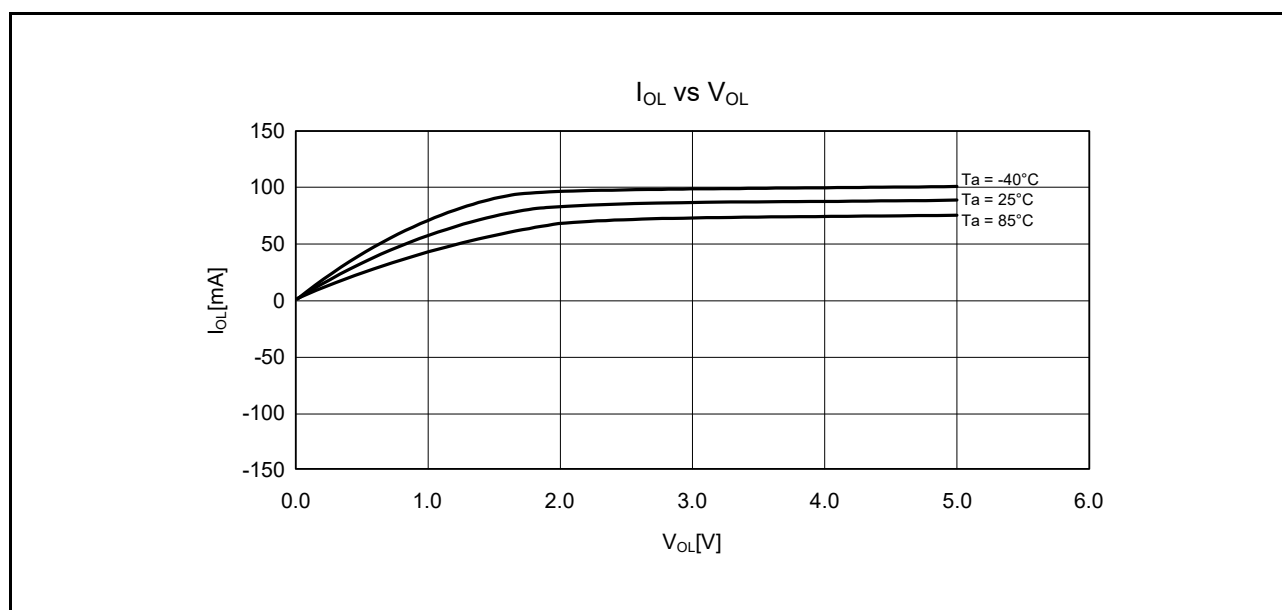


Figure 5.18 V_{OL} and I_{OL} Temperature Characteristics of RIIC Output Pin at $V_{CC} = 5.0$ V (Reference Data)

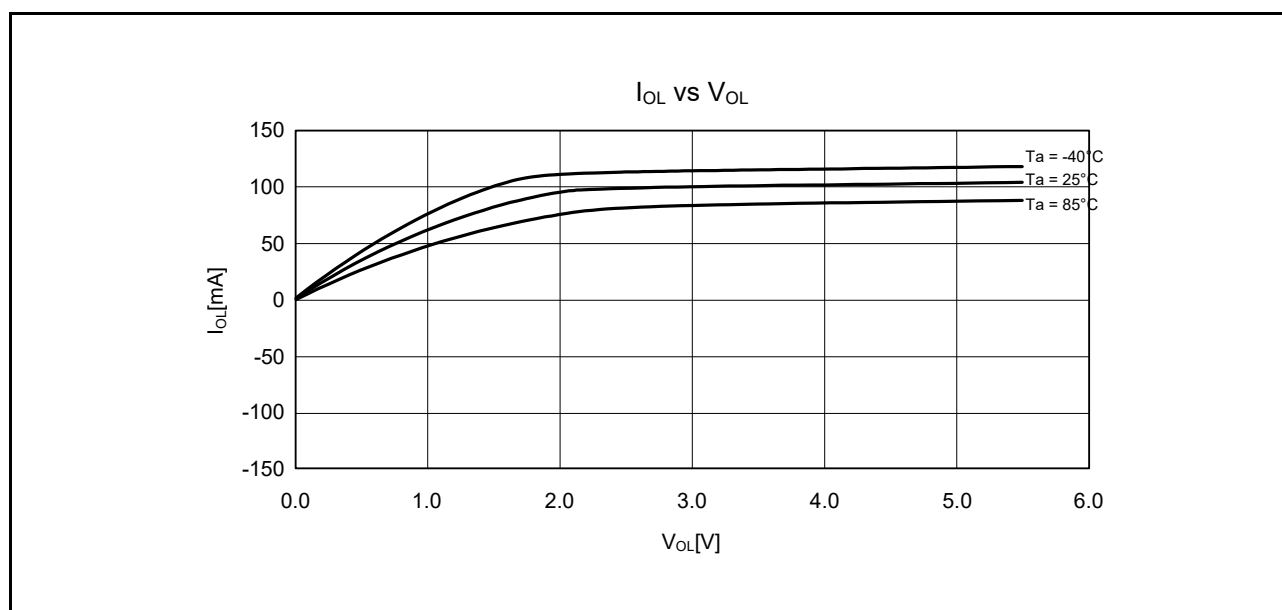


Figure 5.19 V_{OL} and I_{OL} Temperature Characteristics of RIIC Output Pin at $V_{CC} = 5.5$ V (Reference Data)

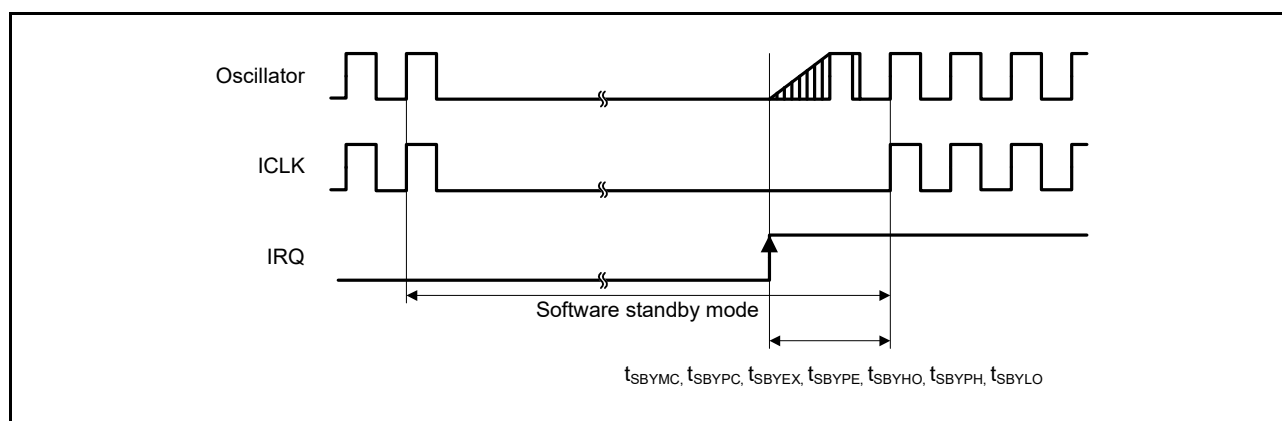


Figure 5.30 Software Standby Mode Recovery Timing

Table 5.20 Timing of Recovery from Low Power Consumption Modes (3)

Conditions: $V_{CC} = 2.7\text{ V to }5.5\text{ V}$, $AVCC0 = AVCC1 = AVCC2 = VREFH0 = VREFH1 = VREFH2 = V_{CC} \text{ to } 5.5\text{ V}$,
 $V_{SS} = AVSS0 = AVSS1 = AVSS2 = VREFL0 = VREFL1 = VREFL2 = 0\text{ V}$, $T_a = -40\text{ to }+85^\circ\text{C}$

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Recovery time from deep sleep mode*1	High-speed mode*2	$t_{DSL P}$	—	2	μs	Figure 5.31
	Middle-speed mode*3	$t_{DSL P}$	—	3	μs	

Note 1. Oscillators continue oscillating in deep sleep mode.

Note 2. When the frequencies of ICLK, FCLK, PCLKA, PCLKB, and PCLKD are 32 MHz.

Note 3. When the frequencies of ICLK, FCLK, PCLKA, PCLKB, and PCLKD are 12 MHz.

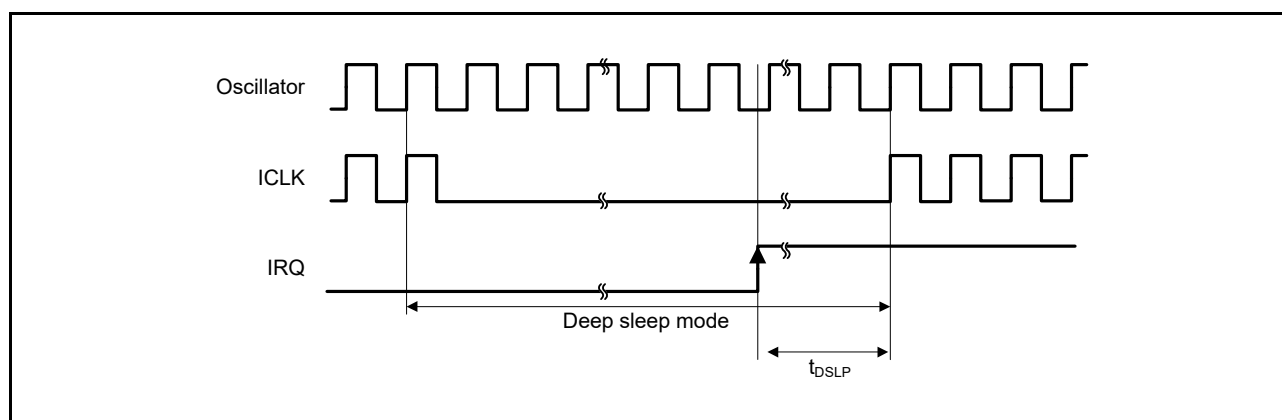


Figure 5.31 Deep Sleep Mode Recovery Timing

Table 5.21 Operating Mode Transition Time

Conditions: $V_{CC} = 2.7\text{ V to }5.5\text{ V}$, $AVCC0 = AVCC1 = AVCC2 = VREFH0 = VREFH1 = VREFH2 = V_{CC} \text{ to } 5.5\text{ V}$,
 $V_{SS} = AVSS0 = AVSS1 = AVSS2 = VREFL0 = VREFL1 = VREFL2 = 0\text{ V}$, $T_a = -40\text{ to }+85^\circ\text{C}$

Mode before Transition	Mode after Transition	ICLK Frequency	Transition Time			Unit
			Min.	Typ.	Max.	
High-speed operating mode	Middle-speed operating modes	8 MHz	—	10	—	μs
Middle-speed operating modes	High-speed operating mode	8 MHz	—	37.5	—	μs

Note: Values when the frequencies of PCLKA, PCLKB, PCLKD, and FCLK are not divided.

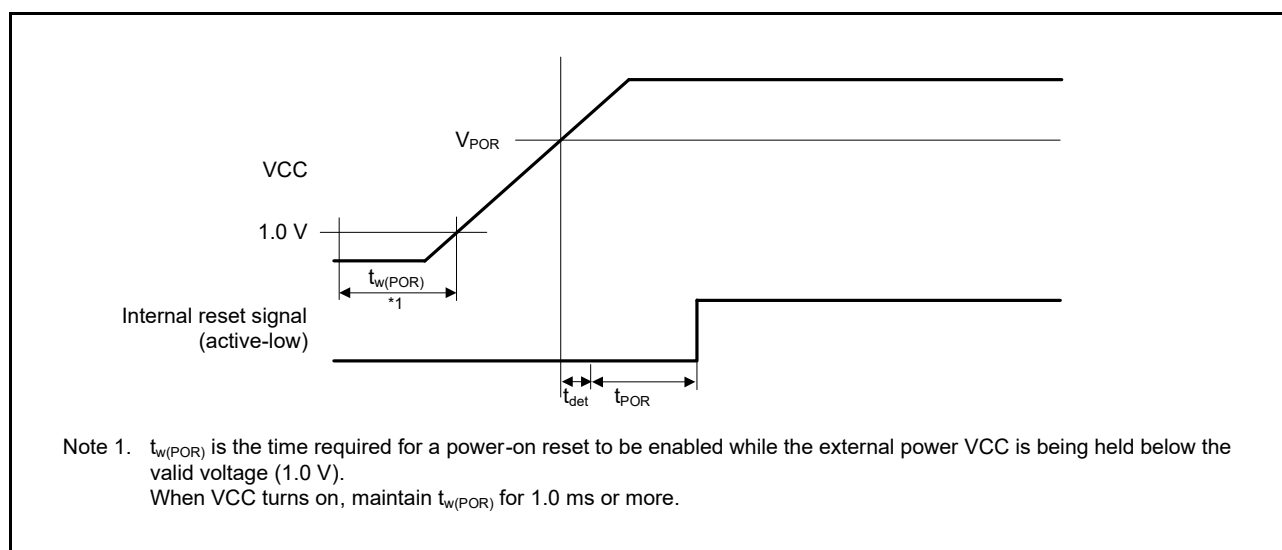
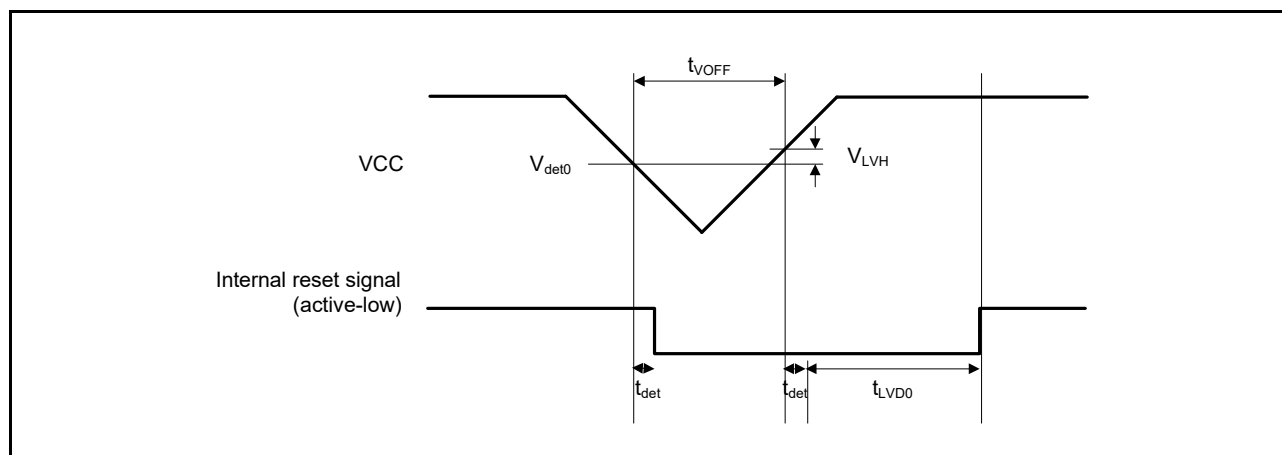


Figure 5.54 Power-On Reset Timing

Figure 5.55 Voltage Detection Circuit Timing (V_{det0})

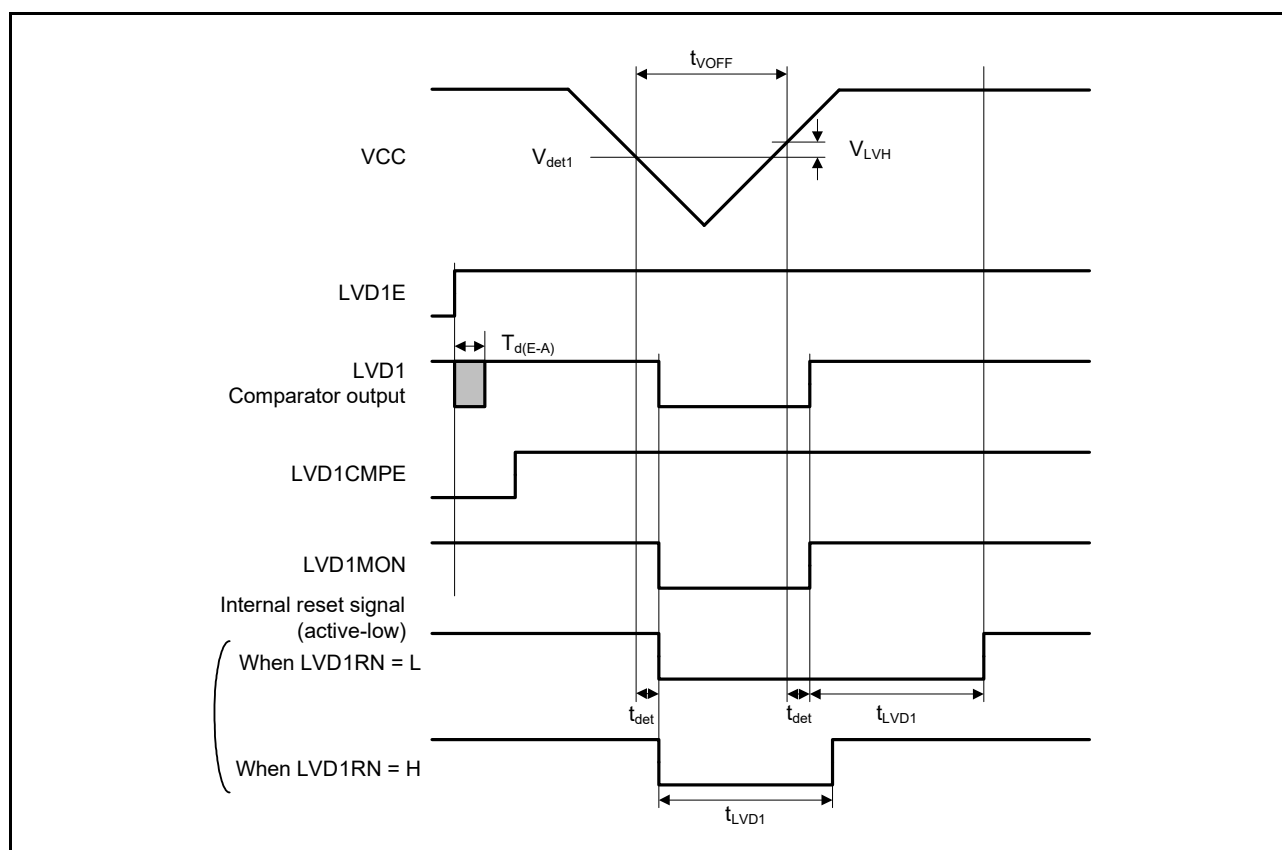


Figure 5.56 Voltage Detection Circuit Timing (V_{det1})

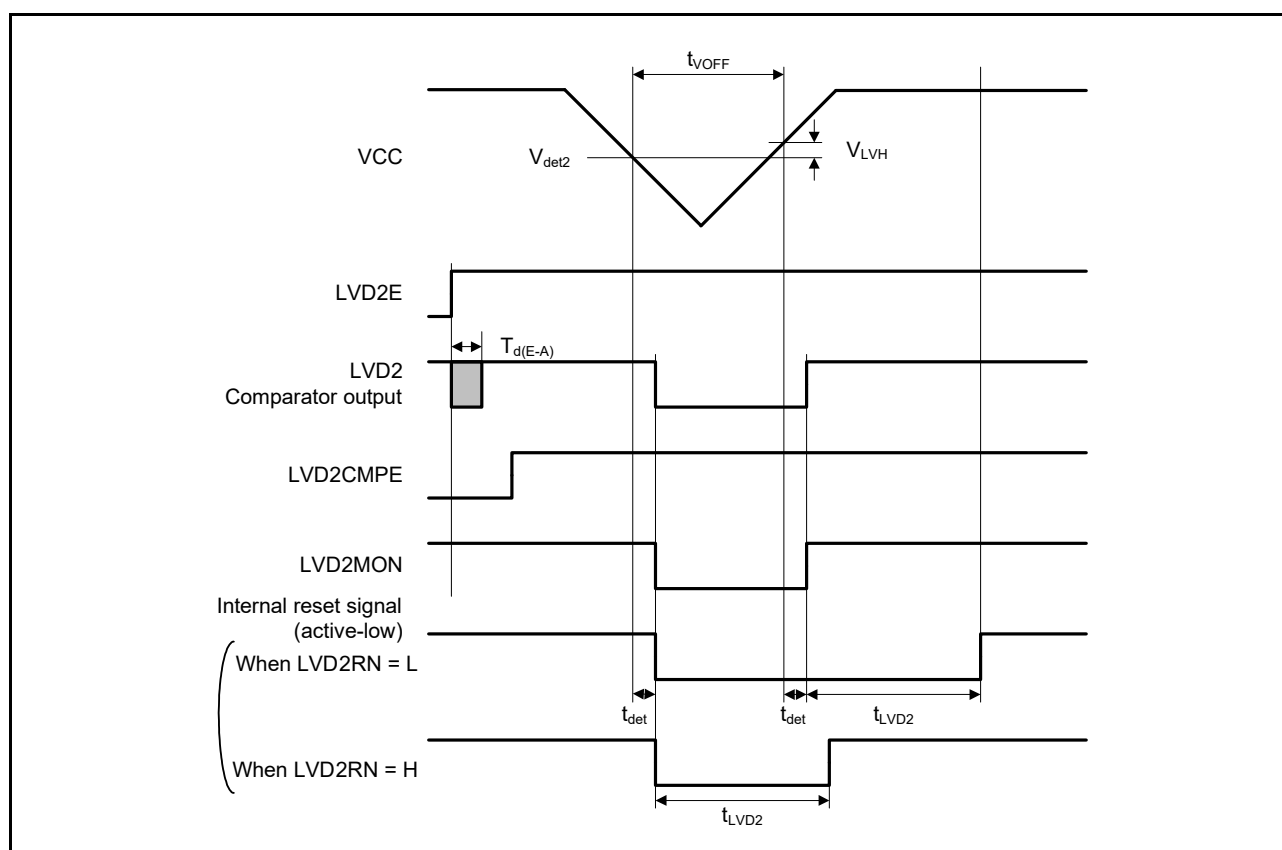


Figure 5.57 Voltage Detection Circuit Timing (V_{det2})

Table 5.42 ROM (Flash Memory for Code Storage) Characteristics (3): Middle-Speed Operating Mode

Conditions: $V_{CC} = 2.7\text{ V to }5.5\text{ V}$, $AVCC0 = AVCC1 = AVCC2 = VREFH0 = VREFH1 = VREFH2 = V_{CC}$ to 5.5 V ,
 $V_{SS} = AVSS0 = AVSS1 = AVSS2 = VREFL0 = VREFL1 = VREFL2 = 0\text{ V}$

Temperature range for the programming/erasure operation: $T_a = -40\text{ to }+85^\circ\text{C}$

Item		Symbol	FCLK = 1 MHz			FCLK = 8 MHz			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Programming time	8-byte	t_{P8}	—	152.0	1367.0	—	97.9	936.0	μs
Erasure time	2-Kbyte	t_{E2K}	—	8.8	279.7	—	5.9	220.8	ms
	512-Kbyte (when block erase command used)	t_{E512K}	—	928.0	19221.2	—	190.6	4107.3	ms
	512-Kbyte (when all- block erase command used)	t_{EA512K}	—	922.7	19015.0	—	185.4	3901.0	ms
Blank check time	8-byte	t_{BC8}	—	—	85.0	—	—	50.9	μs
	2-Kbyte	t_{BC2K}	—	—	1870.0	—	—	401.5	μs
Erase operation forcible stop time		t_{SED}	—	—	28.0	—	—	21.3	μs
Start-up area switching setting time		t_{SAS}	—	13.0	573.3	—	7.7	450.1	ms
Access window time		t_{AWS}	—	13.0	573.3	—	7.7	450.1	ms
ROM mode transition wait time 1		t_{DIS}	2.0	—	—	2.0	—	—	μs
ROM mode transition wait time 2		t_{MS}	3.0	—	—	3.0	—	—	μs

Note: Does not include the time until each operation of the flash memory is started after instructions are executed by software.

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 should be $\pm 3.5\%$.