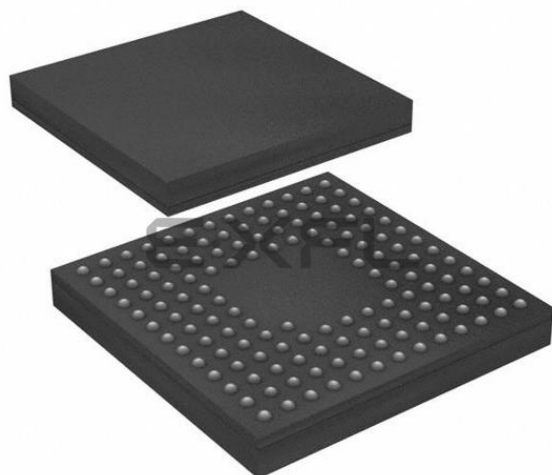




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What is "[Embedded - Microcontrollers](#)"?

"[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	Active
Core Processor	RXv2
Core Size	32-Bit Single-Core
Speed	120MHz
Connectivity	CANbus, EBI/EMI, Ethernet, I ² C, LINbus, MMC/SD, QSPI, SCI, SPI, UART/USART, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	111
Program Memory Size	768KB (768K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	256K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 29x12b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	145-TFLGA
Supplier Device Package	145-TFLGA (7x7)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f56517bdlk-20

1. Overview

1.1 Outline of Specifications

Table 1.1 lists the specifications in outline, and Table 1.2 give a comparison of the functions of products in different packages.

Table 1.1 is an outline of maximum specifications, and the peripheral modules and the number of channels of the modules differ depending on the number of pins on the package and the capacity of the code flash memory. For details, see Table 1.2, Code Flash Memory Capacity and Comparison of Functions for Different Packages.

Table 1.1 Outline of Specifications (1/9)

Classification	Module/Function	Description
CPU	CPU	- Maximum operating frequency: 120 MHz 32-bit RX CPU (RXv2) - Minimum instruction execution time: One instruction per state (cycle of the system clock) - Address space: 4-Gbyte linear - Register set of the CPU - General purpose: Sixteen 32-bit registers - Control: Ten 32-bit registers - Accumulator: Two 72-bit registers - Basic instructions: 75 - Floating-point instructions: 11 - DSP instructions: 23 - Addressing modes: 11 - Data arrangement - Instructions: Little endian - Data: Selectable as little endian or big endian - On-chip 32-bit multiplier: $32 \times 32 \rightarrow 64$ bits - On-chip divider: $32 / 32 \rightarrow 32$ bits - Barrel shifter: 32 bits
	FPU	- Single precision (32-bit) floating point - Data types and floating-point exceptions in conformance with the IEEE754 standard
Memory	Code flash memory	- Capacity: 512 Kbytes/768 Kbytes/1 Mbyte/1.5 Mbytes/2 Mbytes $50 \text{ MHz} \leq$ No-wait cycle access $100 \text{ MHz} \leq$ 1-wait cycle access $100 \text{ MHz} \geq$ 2-wait cycle access - Instructions hitting the ROM cache or operand = 120 MHz: No-wait access - On-board programming: Four types - Off-board programming (parallel programmer mode) - Instructions are executable only for the program stored in the TM target area by using the Trusted Memory (TM) function and protection against data reading is realized. - A dual-bank structure allows programming during reading or exchanging the start-up areas
	Data flash memory	- Capacity: 32 Kbytes - Programming/erasing: 100,000 times
	RAM	- Capacity: 256 Kbytes (Products with 1 Mbyte of code flash memory or less) - RAM: 256 Kbytes - Capacity: 640 Kbytes (Products with at least 1.5 Mbytes of code flash memory) - RAM: 256 Kbytes - Expansion RAM: 384 Kbytes 120 MHz, no-wait access
	Standby RAM	- Capacity: 8 Kbytes - Operation synchronized with PCLKB: Up to 60 MHz, two-cycle access

Table 1.1 Outline of Specifications (6/9)

Classification	Module/Function	Description
Communication function	Serial communications interfaces (SCIg, SCIlh, SCLi)	13 channels (SCIg: 10 channels + SCIlh: 1 channel + SCLi: 2 channels) - SCIg, SCIlh, SCLi Serial communications modes: Asynchronous, clock synchronous, and smart-card interface Multi-processor function On-chip baud rate generator allows selection of the desired bit rate Choice of LSB-first or MSB-first transfer Start-bit detection: Level or edge detection is selectable. Simple I²C Simple SPI 9-bit transfer mode Bit rate modulation Double-speed mode - SCIg, SCIlh Average transfer rate clock can be input from TMR timers for SCIl5, SCIl6, and SCIl12 Event linking by the ELC (only on channel 5) - SCIlh Supports the serial communications protocol, which contains the start frame and information frame Supports the LIN format - SCLi Data can be transmitted or received in sequence by the 16-byte FIFO buffers of the transmission and reception unit
	I ² C bus interface (RIICa)	3 channels (only channel 0 can be used in fast-mode plus) Communication formats I²C bus format/SMBus format Supports the multi-master Max. transfer rate: 1 Mbps (channel 0) - Event linking by the ELC
	CAN module (CAN)	2 channels - Compliance with the ISO11898-1 specification (standard frame and extended frame) 32 mailboxes per channel
	Serial peripheral interface (RSPIC)	3 channels RSPIC transfer facility Using the MOSI (master out, slave in), MISO (master in, slave out), SSL (slave select), and RSPCK (RSPIC clock) signals enables serial transfer through SPI operation (four lines) or clock-synchronous operation (three lines) Capable of handling serial transfer as a master or slave - Data formats Switching between MSB first and LSB first The number of bits in each transfer can be changed to any number of bits from 8 to 16, or to 20, 24, or 32 bits. 128-bit buffers for transmission and reception Up to four frames can be transmitted or received in a single transfer operation (with each frame having up to 32 bits) Transit/receive data can be swapped in byte units - Buffered structure Double buffers for both transmission and reception - RSPCK can be stopped with the receive buffer full for master reception. - Event linking by the ELC
	Quad serial peripheral interface (QSPI)	1 channel - Connectable with serial flash memory equipped with multiple input and output lines (i.e. for single, dual, or quad operation) - Programmable bit length and selectable active sense and phase of the clock signal - Sequential execution of transfer - LSB or MSB first is selectable

Table 1.1 Outline of Specifications (9/9)

Classification	Module/Function	Description
Safety	Clock frequency accuracy measurement circuit (CAC)	Monitors the clock output from the main clock oscillator, sub-clock oscillator, low- and high-speed on-chip oscillators, the PLL frequency synthesizer, IWDG-dedicated on-chip oscillator, and PCLKB, and generates interrupts when the setting range is exceeded.
	Data operation circuit (DOC)	The function to compare, add, or subtract 16-bit data
Encryption function	AESa*2	- Key lengths: 128, 192, and 256 bits - Support for CFB, OFB, and CMAC operating modes - Speed of calculations: 128-bit key length in 22 cycles 192-bit key length in 26 cycles 256-bit key length in 30 cycles - Compliant with FIPS PUB 197
	True random number generator (RNG)*2	- Length of random numbers: 16 bits - Generation of random-number-generated interrupts after a number is generated - Random number generation time: 1.9 ms (typ)
	Trusted Secure IP (TSIP)*2	- Security algorithm - Common key encryption: AES (compliant with NIST FIPS PUB 197), 3DES, ARC4 - Non-common key encryption: RSA - Other features - TRNG (true-random number generator) - Hash value generation: SHA1, SHA224, SHA256, GHASH - Support of unique ID
Operating frequency		Up to 120 MHz
Power supply voltage		VCC = AVCC0 = AVCC1 = VCC_USB = 2.7 to 3.6 V, $2.7 \leq V_{REFH0} \leq AVCC0$, V _{BATT} = 2.0 to 3.6 V
Operating temperature		D-version: -40 to +85°C G-version: -40 to +105°C
Package		177-pin TFLGA (PTLG0177KA-A) 176-pin LFBGA (PLBG0176GA-A) 176-pin LFQFP (PLQP0176KB-A) 145-pin TFLGA (PTLG0145KA-A) 144-pin LFQFP (PLQP0144KA-B) 100-pin TFLGA (PTLG0100JA-A) 100-pin LFQFP (PLQP0100KB-B)
On-chip debugging system		- E1 emulator (JTAG and FINE interfaces) - E20 emulator (JTAG interface)

Note 1. Magic Packet™ is a registered trademark of Advanced Micro Devices, Inc.

Note 2. The product part number differs according to whether or not the MCU includes the encryption function.

Note 3. The product part number differs according to whether or not the MCU includes an SDHI (SD host interface)/SDSI (SD slave interface) (products with 1 Mbyte of code flash memory or less).

Note 4. When the realtime clock is not used, initialize the registers in the time clock according to description in section 31.6.7, Initialization Procedure When the Realtime Clock is Not to be Used in the User's Manual: Hardware.

Table 1.3 List of Products (5/8)

Group	Part No.	Package	Code Flash Memory Capacity (byte(s))	RAM Capacity (byte(s))	Data Flash Memory Capacity (byte(s))	Operating Frequency (Max.)	Encryption Module	SDHI/SDSI	Dual bank	Operating temperature (°C)
RX651 (D version)	R5F5651EDDFC	PLQP0176KB-A	2 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651EHDFC	PLQP0176KB-A	2 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651CDDFC	PLQP0176KB-A	1.5 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651CHDFC	PLQP0176KB-A	1.5 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651EDDFB	PLQP0144KA-B	2 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651EHDFB	PLQP0144KA-B	2 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651CDDFB	PLQP0144KA-B	1.5 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651CHDFB	PLQP0144KA-B	1.5 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F56519ADFB	PLQP0144KA-B	1 M	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56519BDFB	PLQP0144KA-B	1 M	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56519EDFB	PLQP0144KA-B	1 M	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56519FDFB	PLQP0144KA-B	1 M	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F56517ADFB	PLQP0144KA-B	768 K	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56517BDFB	PLQP0144KA-B	768 K	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56517EDFB	PLQP0144KA-B	768 K	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56517FDFB	PLQP0144KA-B	768 K	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F56514ADFB	PLQP0144KA-B	512 K	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56514BDFB	PLQP0144KA-B	512 K	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56514EDFB	PLQP0144KA-B	512 K	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56514FDFB	PLQP0144KA-B	512 K	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F5651EDDFP	PLQP0100KB-B	2 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651EHDFP	PLQP0100KB-B	2 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651CDDFP	PLQP0100KB-B	1.5 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651CHDFP	PLQP0100KB-B	1.5 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F56519ADFP	PLQP0100KB-B	1 M	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56519BDFP	PLQP0100KB-B	1 M	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56519EDFP	PLQP0100KB-B	1 M	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56519FDFP	PLQP0100KB-B	1 M	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F56517ADFP	PLQP0100KB-B	768 K	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56517BDFP	PLQP0100KB-B	768 K	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85

Table 1.3 List of Products (6/8)

Group	Part No.	Package	Code Flash Memory Capacity (byte(s))	RAM Capacity (byte(s))	Data Flash Memory Capacity (byte(s))	Operating Frequency (Max.)	Encryption Module	SDHI/SDSI	Dual bank	Operating temperature (°C)
RX651 (D version)	R5F56517EDFP	PLQP0100KB-B	768 K	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56517FDFP	PLQP0100KB-B	768 K	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F56514ADFP	PLQP0100KB-B	512 K	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56514BDFP	PLQP0100KB-B	512 K	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56514EDFP	PLQP0100KB-B	512 K	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56514FDFP	PLQP0100KB-B	512 K	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F5651EDDBG	PLBG0176GA-A	2 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651EHDBG	PLBG0176GA-A	2 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651CDBG	PLBG0176GA-A	1.5 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651CHDBG	PLBG0176GA-A	1.5 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651EDDLC	PTLG0177KA-A	2 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651EHDLC	PTLG0177KA-A	2 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651CDDL	PTLG0177KA-A	1.5 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651CHDLC	PTLG0177KA-A	1.5 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651EDDLK	PTLG0145KA-A	2 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651EHDLC	PTLG0145KA-A	2 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F5651CDDLK	PTLG0145KA-A	1.5 M	640 K	32 K	120 MHz	Not available	Available	Available	−40 to +85
	R5F5651CHDLK	PTLG0145KA-A	1.5 M	640 K	32 K	120 MHz	Available	Available	Available	−40 to +85
	R5F56519ADLK	PTLG0145KA-A	1 M	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56519BDLK	PTLG0145KA-A	1 M	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56519EDLK	PTLG0145KA-A	1 M	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56519FDLK	PTLG0145KA-A	1 M	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F56517ADLK	PTLG0145KA-A	768 K	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56517BDLK	PTLG0145KA-A	768 K	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56517EDLK	PTLG0145KA-A	768 K	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56517FDLK	PTLG0145KA-A	768 K	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85
	R5F56514ADLK	PTLG0145KA-A	512 K	256 K	Not included	120 MHz	Not available	Not available	Not available	−40 to +85
	R5F56514BDLK	PTLG0145KA-A	512 K	256 K	Not included	120 MHz	Not available	Available	Not available	−40 to +85
	R5F56514EDLK	PTLG0145KA-A	512 K	256 K	Not included	120 MHz	Available	Not available	Not available	−40 to +85
	R5F56514FDLK	PTLG0145KA-A	512 K	256 K	Not included	120 MHz	Available	Available	Not available	−40 to +85

Table 1.6 List of Pin and Pin Functions (176-Pin LFQFP) (4/8)

Pin Number	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, TPU, TMR, PPG, RTC, CMTW, POE, CAC)	Communication (ETHERC, SCI, RSPI, RIIC, CAN, USB)	Memory Interface Camera Interface (QSPI, SDHI, SDSDI, MMCIF, PDC)	GLCDC	Interrupt	A/D D/A
74		P83	EDACK1	MTIOC4C	ET0_CRS/ RMII0_CRS_DV/ SCK10/SS10#/ CTS10#		LCD_DA TA8-A		
75	VCC								
76	UB	PC7	A23/CS0#	MTIOC3A/ MTCLKB/ TMO2/PO31/ TOC0/ CACREF	ET0_COL/TXD8/ SMOSI8/SSDA8/ SMOSI10/ SSDA10/TXD10/ MISOA-A	MMC_D7-A	LCD_DA TA9-A	IRQ14	
77		PC6	D2[A2/D2]/ A22/CS1#	MTIOC3C/ MTCLKA/ TMCI2/PO30/ TIC0	ET0_ETXD3/ RXD8/SMISO8/ SSCL8/ SMISO10/ SSCL10/RXD10/ MOSIA-A	MMC_D6-A	LCD_DA TA10-A	IRQ13	
78		PC5	D3[A3/D3]/ A21/CS2#/ WAIT#	MTIOC3B/ MTCLKD/ TMRI2/PO29	ET0_ETXD2/ SCK8/SCK10/ RSPCKA-A	MMC_D5-A	LCD_DA TA11-A		
79		P82	EDREQ1	MTIOC4A/ PO28	ET0_ETXD1/ RMII0_TXD1/ SMOSI10/ SSDA10/TXD10	MMC_D4-A	LCD_DA TA12-A		
80		P81	EDACK0	MTIOC3D/ PO27	ET0_ETXD0/ RMII0_TXD0/ SMISO10/ SSCL10/RXD10	QIO3-A/SDHI_CD/ MMC_D3-A	LCD_DA TA13-A		
81		P80	EDREQ0	MTIOC3B/ PO26	ET0_TX_EN/ RMII0_TXD_EN/ SCK10/RTS10#	QIO2-A/SDHI_WP/ MMC_D2-A	LCD_DA TA14-A		
82		PC4	A20/CS3#	MTIOC3D/ MTCLKC/ TMCI1/PO25/ POE0#	ET0_TX_CLK/ SCK5/CTS8#/ RTS8#/SS8#/ SS10#/CTS10#/ RTS10#/SSLA0-A	QMI-A/QIO1-A/ SDHI_D1-A/ SDSI_D1-A/ MMC_D1-A	LCD_DA TA15-A		
83		PC3	A19	MTIOC4D/ TCLKB/PO24	ET0_TX_ER/ TXD5/SMOSI5/ SSDA5	QMO-A/QIO0-A/ SDHI_D0-A/ SDSI_D0-A/ MMC_D0-A	LCD_DA TA16-A		
84		P77	CS7#	PO23	ET0_RX_ER/ RMII0_RX_ER/ SMOSI11/ SSDA11/TXD11	QSPCLK-A/ SDHI_CLK-A/ SDSI_CLK-A/ MMC_CLK-A	LCD_DA TA17-A		
85		P76	CS6#	PO22	ET0_RX_CLK/ REF50CK0/ SMISO11/ SSCL11/RXD11	QSSL-A/ SDHI_CMD-A/ SDSI_CMD-A/ MMC_CMD-A	LCD_DA TA18-A		
86		PC2	A18	MTIOC4B/ TCLKA/PO21	ET0_RX_DV/ RXD5/SMISO5/ SSCL5/SSLA3-A	SDHI_D3-A/ SDSI_D3-A/ MMC_CD-A	LCD_DA TA19-A		
87		P75	CS5#	PO20	ET0_ERXD0/ RMII0_RXD0/ SCK11/RTS11#	SDHI_D2-A/ SDSI_D2-A/ MMC_RES#-A	LCD_DA TA20-A		
88		P74	A20/CS4#	PO19	ET0_ERXD1/ RMII0_RXD1/ SS11#/CTS11#		LCD_DA TA21-A		
89		PC1	A17	MTIOC3A/ TCLKD/PO18	ET0_ERXD2/ SCK5/SSLA2-A		LCD_DA TA22-A	IRQ12	
90	VCC								
91		PC0	A16	MTIOC3C/ TCLKC/PO17	ET0_ERXD3/ CTS5#/RTS5#/ SS5#/SSLA1-A			IRQ14	

Table 1.7 List of Pin and Pin Functions (145-Pin TFLGA) (4/7)

Pin Number				Timer (MTU, TPU, TMR, PPG, RTC, CMTW, POE, CAC)	Communication (ETHERC, SCI, RSPI, RIIC, CAN, USB)	Memory Interface Camera Interface (QSPI, SDHI, SDI, MMCIF, PDC)	GLCDC	Interrupt	A/D D/A
145-Pin TFLGA	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC						
H12		PB0	A8	MTIC5W/ TIOCA3/PO24	ET0_ERXD1/ RMII0_RXD1/ RXD4/SMISO4/ SSCL4/RXD6/ SMISO6/SSCL6		LCD_DA TA0-B*1	IRQ12	
H13		PA7	A7	TIOCB2/PO23	ET0_WOL/ MISOA-B		LCD_DA TA1-B*1		
J1	TRST#	P34		MTIOC0A/ TMC13/PO12/ POE10#	ET0_LINKSTA/ SCK6/SCK0			IRQ4	
J2		P33	EDREQ1	MTIOC0D/ TIOCD0/ TMRI3/PO11/ POE4#/ POE11#	RXD6/SMISO6/ SSCL6/RXD0/ SMISO0/SSCL0/ CRX0	PCKO		IRQ3-DS	
J3		P32		MTIOC0C/ TIOCC0/ TMO3/PO10/ RTCIC2/ RTCCOUT/ POE0#/ POE10#	TXD6/SMOSI6/ SSDA6/TXD0/ SMOSI0/SSDA0/ CTX0/ USB0_VBUSEN	VSYNC		IRQ2-DS	
J4	TDI	P30		MTIOC4B/ TMRI3/PO8/ RTCIC0/ POE8#	RXD1/SMISO1/ SSCL1/MISOB-A			IRQ0-DS	
J10		PB3	A11	MTIOC0A/ MTIOC4A/ TIOCD3/ TCLKD/TMO0/ PO27/POE11#	ET0_RX_ER/ RMII0_RX_ER/ SCK4/SCK6	SDSI_D3-B	LCD_TC ON1-B*1		
J11		PB4	A12	TIOCA4/PO28	ET0_TX_EN/ RMII0_TXD_EN/ CTS9#/RTS9#/ SS9#/SS11#/ CTS11#/RTS11#	SDSI_CMD-B	LCD_TC ON0-B*1		
J12		PB2	A10	TIOCC3/ TCLKC/PO26	ET0_RX_CLK/ REF50CK0/ CTS4#/RTS4#/ SS4#/CTS6#/ RTS6#/SS6#	SDSI_D2-B	LCD_TC ON2-B*1		
J13		PB1	A9	MTIOC0C/ MTIOC4C/ TIOCB3/ TMC10/PO25	ET0_ERXD0/ RMII0_RXD0/ TXD4/SMOSI4/ SSDA4/TXD6/ SMOSI6/SSDA6		LCD_TC ON3-B*1	IRQ4-DS	
K1	TCK	P27	CS7#	MTIOC2B/ TMC13/PO7	SCK1/RSPCKB-A				
K2	TDO	P26	CS6#	MTIOC2A/ TMO1/PO6	TXD1/SMOSI1/ SSDA1/CTS3#/ RTS3#/SS3#/ MOSIB-A				
K3	TMS	P31		MTIOC4D/ TMC12/PO9/ RTCIC1	CTS1#/RTS1#/ SS1#/SSLB0-A			IRQ1-DS	
K4		P15		MTIOC0B/ MTCLKB/ TIOCB2/ TCLKB/TMC12/ PO13	RXD1/SMISO1/ SSCL1/SCK3/ CRX1-DS	PIXD0		IRQ5	
K5	TRDATA2	P54	ALE/ D1[A1/D1]*1/ EDACK0	MTIOC4B/ TMC11	ET0_LINKSTA/ CTS2#/RTS2#/ SS2#/CTX1				
K6		P53*2	BCLK						

Table 1.10 List of Pin and Pin Functions (100-Pin LFQFP) (4/5)

Pin Number	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, TPU, TMR, PPG, RTC, CMTW, POE, CAC)	Communication (ETHERC, SCI, RSPI, RIIC, CAN, USB)	Memory Interface Camera Interface (QSPI, SDHI, SDSI, MMCIF, PDC)	GLCDC	Interrupt	A/D D/A
60	VCC								
61		PB0	A8	MTIC5W/ TIOCA3/PO24	ET0_ERXD1/ RMII0_RXD1/ RXD6/SMISO6/ SSCL6		LCD_DA TA0-B*1	IRQ12	
62	VSS								
63		PA7	A7	TIOCB2/PO23	ET0_WOL/ MISOA-B		LCD_DA TA1-B*1		
64		PA6	A6	MTIC5V/ MTCLKB/ TIOCA2/ TMCI3/PO22/ POE10#	ET0_EXOUT/ CTS5#/RTS5#/ SS5#/MOSIA-B		LCD_DA TA2-B*1		
65		PA5	A5	MTIOC6B/ TIOCB1/PO21	ET0_LINKSTA/ RSPCKA-B		LCD_DA TA3-B*1		
66		PA4	A4	MTIC5U/ MTCLKA/ TIOCA1/ TMRI0/PO20	ET0_MDC/TXD5/ SMOSI5/SSDA5/ SSLA0-B		LCD_DA TA4-B*1	IRQ5-DS	
67		PA3	A3	MTIOC0D/ MTCLKD/ TIOCDO/ TCLKB/PO19	ET0_MDIO/ RXD5/SMISO5/ SSCL5		LCD_DA TA5-B*1	IRQ6-DS	
68		PA2	A2	MTIOC7A/ PO18	RXD5/SMISO5/ SSCL5/SSLA3-B		LCD_DA TA6-B*1		
69		PA1	A1	MTIOC0B/ MTCLKC/ MTIOC7B/ TIOCB0/PO17	ET0_WOL/ SCK5/SSLA2-B		LCD_DA TA7-B*1	IRQ11	
70		PA0	BC0#/A0	MTIOC4A/ MTIOC6D/ TIOCA0/PO16/ CACREF	ET0_TX_EN/ RMII0_TXD_EN/ SSLA1-B		LCD_DA TA8-B*1		
71		PE7	D15[A15/ D15]/D7[A7/ D7]*1	MTIOC6A/ TOC1	MISOB-B	SDHI_WP/ MMC_RES#-B	LCD_DA TA9-B*1	IRQ7	AN105
72		PE6	D14[A14/ D14]/D6[A6/ D6]*1	MTIOC6C/TIC1	MOSIB-B	SDHI_CD/ MMC_CD-B	LCD_DA TA10-B*1	IRQ6	AN104
73		PE5	D13[A13/ D13]/D5[A5/ D5]*1	MTIOC4C/ MTIOC2B	ET0_RX_CLK/ REF50CK0/ RSPCKB-B		LCD_DA TA11-B*1	IRQ5	AN103
74		PE4	D12[A12/ D12]/D4[A4/ D4]*1	MTIOC4D/ MTIOC1A/ PO28	ET0_ERXD2/ SSLB0-B		LCD_DA TA12-B*1		AN102
75		PE3	D11[A11/ D11]/D3[A3/ D3]*1	MTIOC4B/ PO26/TOC3/ POE8#	ET0_ERXD3/ CTS12#/ RTS12#/SS12#	MMC_D7-B	LCD_DA TA13-B*1		AN101
76		PE2	D10[A10/ D10]/D2[A2/ D2]*1	MTIOC4A/ PO23/TIC3	RXD12/ SMISO12/ SSCL12/ RXDX12/SSLB3- B	MMC_D6-B	LCD_DA TA14-B*1	IRQ7-DS	AN100
77		PE1	D9[A9/D9]/ D1[A1/D1]*1	MTIOC4C/ MTIOC3B/ PO18	TXD12/ SMOSI12/ SSDA12/ TXDX12/ SIOX12/SSLB2- B	MMC_D5-B	LCD_DA TA15-B*1		ANEX1
78		PE0	D8[A8/D8]/ D0[A0/D0]*1	MTIOC3D	SCK12/SSLB1-B	MMC_D4-B	LCD_DA TA16-B*1		ANEX0

Table 4.1 List of I/O Registers (Address Order) (19 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0008 9080h	S12AD	A/D Group Scan Priority Control Register	ADGSPCR	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9084h	S12AD	A/D Data Duplication Register A	ADDBLDRA	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9086h	S12AD	A/D Data Duplication Register B	ADDBLDRB	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 908Ch	S12AD	A/D Comparison Function Window A/B Status Monitoring Register	ADWINMON	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9090h	S12AD	A/D Comparison Function Control Register	ADCMPCR	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9094h	S12AD	A/D Comparison Function Window A Channel Select Register 0	ADCMPSNR0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9098h	S12AD	A/D Comparison Function Window A Comparison Condition Setting Register 0	ADCMPLR0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 909Ch	S12AD	A/D Comparison Function Window A Lower Level Setting Register	ADCMPDR0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 909Eh	S12AD	A/D Comparison Function Window A Upper Level Setting Register	ADCMPDR1	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90A0h	S12AD	A/D Comparison Function Window A Channel Status Register 0	ADCMPSR0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90A6h	S12AD	A/D Comparison Function Window B Channel Select Register	ADCMPBNSR	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90A8h	S12AD	A/D Comparison Function Window B Lower Level Setting Register	ADWINLLB	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90AAh	S12AD	A/D Comparison Function Window B Upper Level Setting Register	ADWINULB	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90ACh	S12AD	A/D Comparison Function Window B Channel Status Register	ADCMPBSR	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90D4h	S12AD	A/D Channel Select Register C0	ADANSC0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90D9h	S12AD	A/D Group C Trigger Select Register	ADGCTRGR	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E0h	S12AD	A/D Sampling State Register 0	ADSSTR0	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E1h	S12AD	A/D Sampling State Register 1	ADSSTR1	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E2h	S12AD	A/D Sampling State Register 2	ADSSTR2	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E3h	S12AD	A/D Sampling State Register 3	ADSSTR3	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E4h	S12AD	A/D Sampling State Register 4	ADSSTR4	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E5h	S12AD	A/D Sampling State Register 5	ADSSTR5	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E6h	S12AD	A/D Sampling State Register 6	ADSSTR6	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 90E7h	S12AD	A/D Sampling State Register 7	ADSSTR7	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9100h	S12AD1	A/D Control Register	ADCSR	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9104h	S12AD1	A/D Channel Select Register A0	ADANSA0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9106h	S12AD1	A/D Channel Select Register A1	ADANSA1	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 9108h	S12AD1	A/D-Converted Value Addition/Average Function Channel Select Register 0	ADADS0	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 910Ah	S12AD1	A/D-Converted Value Addition/Average Function Channel Select Register 1	ADADS1	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 910Ch	S12AD1	A/D-Converted Value Addition/Average Count Select Register	ADADC	8	8	2, 3 PCLKB	2 ICLK	S12AD Fa
0008 910Eh	S12AD1	A/D Control Extended Register	ADCER	16	16	2, 3 PCLKB	2 ICLK	S12AD Fa

Table 4.1 List of I/O Registers (Address Order) (23 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK $\geq$ PCLK	ICLK < PCLK	
0008 A002h	SCI0	Serial Control Register	SCR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A003h	SCI0	Transmit Data Register	TDR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A004h	SCI0	Serial Status Register	SSR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A005h	SCI0	Receive Data Register	RDR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A006h	SMCI0	Smart Card Mode Register	SCMR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A007h	SCI0	Serial Extended Mode Register	SEMR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A008h	SCI0	Noise Filter Setting Register	SNFR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A009h	SCI0	I ² C Mode Register 1	SIMR1	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Ah	SCI0	I ² C Mode Register 2	SIMR2	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Bh	SCI0	I ² C Mode Register 3	SIMR3	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Ch	SCI0	I ² C Status Register	SISR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Dh	SCI0	SPI Mode Register	SPMR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Eh	SCI0	Transmit Data Register H	TDRH	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Fh	SCI0	Transmit Data Register L	TDRL	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A00Eh	SCI0	Transmit Data Register HL	TDRHL	16	16	4, 5 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A010h	SCI0	Receive Data Register H	RDRH	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A011h	SCI0	Receive Data Register L	RDRL	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A010h	SCI0	Receive Data Register HL	RDRHL	16	16	4, 5 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A012h	SCI0	Modulation Duty Register	MDDR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A020h	SCI1	Serial Mode Register	SMR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A021h	SCI1	Bit Rate Register	BRR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A022h	SCI1	Serial Control Register	SCR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli
0008 A023h	SCI1	Transmit Data Register	TDR	8	8	2, 3 PCLKB	2 ICLK	SClg, SClh, Scli

Table 4.1 List of I/O Registers (Address Order) (28 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0008 A0ACh	SCI5	I ² C Status Register	SISR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0ADh	SCI5	SPI Mode Register	SPMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0AEh	SCI5	Transmit Data Register H	TDRH	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0AFh	SCI5	Transmit Data Register L	TDRL	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0AEh	SCI5	Transmit Data Register HL	TDRHL	16	16	4, 5 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0B0h	SCI5	Receive Data Register H	RDRH	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0B1h	SCI5	Receive Data Register L	RDRL	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0B0h	SCI5	Receive Data Register HL	RDRHL	16	16	4, 5 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0B2h	SCI5	Modulation Duty Register	MDDR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C0h	SCI6	Serial Mode Register	SMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C1h	SCI6	Bit Rate Register	BRR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C2h	SCI6	Serial Control Register	SCR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C3h	SCI6	Transmit Data Register	TDR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C4h	SCI6	Serial Status Register	SSR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C5h	SCI6	Receive Data Register	RDR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C6h	SMCI6	Smart Card Mode Register	SCMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C7h	SCI6	Serial Extended Mode Register	SEMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C8h	SCI6	Noise Filter Setting Register	SNFR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0C9h	SCI6	I ² C Mode Register 1	SIMR1	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0CAh	SCI6	I ² C Mode Register 2	SIMR2	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0CBh	SCI6	I ² C Mode Register 3	SIMR3	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0CCh	SCI6	I ² C Status Register	SISR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli
0008 A0CDh	SCI6	SPI Mode Register	SPMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SClh, SCli

Table 4.1 List of I/O Registers (Address Order) (29 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0008 A0CEh	SCI6	Transmit Data Register H	TDRH	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0CFh	SCI6	Transmit Data Register L	TDRL	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0CEh	SCI6	Transmit Data Register HL	TDRHL	16	16	4, 5 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0D0h	SCI6	Receive Data Register H	RDRH	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0D1h	SCI6	Receive Data Register L	RDRL	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0D0h	SCI6	Receive Data Register HL	RDRHL	16	16	4, 5 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0D2h	SCI6	Modulation Duty Register	MDDR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E0h	SCI7	Serial Mode Register	SMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E1h	SCI7	Bit Rate Register	BRR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E2h	SCI7	Serial Control Register	SCR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E3h	SCI7	Transmit Data Register	TDR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E4h	SCI7	Serial Status Register	SSR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E5h	SCI7	Receive Data Register	RDR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E6h	SMCI7	Smart Card Mode Register	SCMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E7h	SCI7	Serial Extended Mode Register	SEMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E8h	SCI7	Noise Filter Setting Register	SNFR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0E9h	SCI7	I ² C Mode Register 1	SIMR1	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0EAh	SCI7	I ² C Mode Register 2	SIMR2	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0EBh	SCI7	I ² C Mode Register 3	SIMR3	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0ECh	SCI7	I ² C Status Register	SISR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0EDh	SCI7	SPI Mode Register	SPMR	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0EEh	SCI7	Transmit Data Register H	TDRH	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i
0008 A0EFh	SCI7	Transmit Data Register L	TDRL	8	8	2, 3 PCLKB	2 ICLK	SCIg, SC1h, SC1i

Table 4.1 List of I/O Registers (Address Order) (42 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0008 C282h	SYSTEM	Deep Standby Interrupt Enable Register 0	DPSIER0	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C283h	SYSTEM	Deep Standby Interrupt Enable Register 1	DPSIER1	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C284h	SYSTEM	Deep Standby Interrupt Enable Register 2	DPSIER2	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C285h	SYSTEM	Deep Standby Interrupt Enable Register 3	DPSIER3	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C286h	SYSTEM	Deep Standby Interrupt Flag Register 0	DPSIFR0	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C287h	SYSTEM	Deep Standby Interrupt Flag Register 1	DPSIFR1	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C288h	SYSTEM	Deep Standby Interrupt Flag Register 2	DPSIFR2	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C289h	SYSTEM	Deep Standby Interrupt Flag Register 3	DPSIFR3	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C28Ah	SYSTEM	Deep Standby Interrupt Edge Register 0	DPSIEGR0	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C28Bh	SYSTEM	Deep Standby Interrupt Edge Register 1	DPSIEGR1	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C28Ch	SYSTEM	Deep Standby Interrupt Edge Register 2	DPSIEGR2	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C28Dh	SYSTEM	Deep Standby Interrupt Edge Register 3	DPSIEGR3	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
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	Resets
0008 C293h	SYSTEM	Main Clock Oscillator Forced Oscillation Control Register	MOFCR	8	8	4, 5 PCLKB	2, 3 ICLK	Clock Generation Circuit
0008 C294h	SYSTEM	High-Speed On-Chip Oscillator Power Supply Control Register	HOCOPCR	8	8	4, 5 PCLKB	2, 3 ICLK	Clock Generation Circuit
0008 C296h	FLASH	Flash P/E Protect Register	FWEPROR	8	8	2 ICLK		Flash
0008 C297h	SYSTEM	Voltage Monitoring Circuit Control Register	LVCMPCR	8	8	4, 5 PCLKB	2, 3 ICLK	LVDA
0008 C298h	SYSTEM	Voltage Detection Level Select Register	LVDLVL	8	8	4, 5 PCLKB	2, 3 ICLK	LVDA
0008 C29Ah	SYSTEM	Voltage Monitoring 1 Circuit Control Register 0	LVD1CR0	8	8	4, 5 PCLKB	2, 3 ICLK	LVDA
0008 C29Bh	SYSTEM	Voltage Monitoring 2 Circuit Control Register 0	LVD2CR0	8	8	4, 5 PCLKB	2, 3 ICLK	LVDA

Table 4.1 List of I/O Registers (Address Order) (46 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
0009 4204h	CMTW0	Timer Control Register	CMWCR	16	16	2, 3 PCLKB	2 ICLK	CMTW
0009 4208h	CMTW0	Timer I/O Control Register	CMWIOR	16	16	2, 3 PCLKB	2 ICLK	CMTW
0009 4210h	CMTW0	Timer Counter	CMWCNT	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4214h	CMTW0	Compare Match Constant Register	CMWCOR	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4218h	CMTW0	Input Capture Register 0	CMWICR0	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 421Ch	CMTW0	Input Capture Register 1	CMWICR1	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4220h	CMTW0	Output Compare Register 0	CMWOCR0	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4224h	CMTW0	Output Compare Register 1	CMWOCR1	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4280h	CMTW1	Timer Start Register	CMWSTR	16	16	2, 3 PCLKB	2 ICLK	CMTW
0009 4284h	CMTW1	Timer Control Register	CMWCR	16	16	2, 3 PCLKB	2 ICLK	CMTW
0009 4288h	CMTW1	Timer I/O Control Register	CMWIOR	16	16	2, 3 PCLKB	2 ICLK	CMTW
0009 4290h	CMTW1	Timer Counter	CMWCNT	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4294h	CMTW1	Compare Match Constant Register	CMWCOR	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 4298h	CMTW1	Input Capture Register 0	CMWICR0	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 429Ch	CMTW1	Input Capture Register 1	CMWICR1	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 42A0h	CMTW1	Output Compare Register 0	CMWOCR0	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 42A4h	CMTW1	Output Compare Register 1	CMWOCR1	32	32	2, 3 PCLKB	2 ICLK	CMTW
0009 5000h	SDSI	FN1 Access Control Register	FN1ACCR	32	32	10, 11 PCLKB	2 to 6 ICLK	SDSI
0009 5004h	SDSI	Interrupt Enable Control Register 1	INTENCR1	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5005h	SDSI	Interrupt Status Register 1	INTSR1	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5006h	SDSI	SD Command Control Register	SDCMDCR	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5007h	SDSI	SD Command Access Address 0 Register	SDCADD0R	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5008h	SDSI	SD Command Access Address 1 Register	SDCADD1R	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5009h	SDSI	SD Command Access Address 2 Register	SDCADD2R	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 500Ah	SDSI	SDSI Control Register 1	SDSICR1	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 500Bh	SDSI	DMA Control Register 1	DMACR1	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 500Ch	SDSI	Block Counter	BLKCNT	16	16	8, 9 PCLKB	2 to 5 ICLK	SDSI
0009 500Eh	SDSI	Byte Counter	BYTCNT	16	16	8, 9 PCLKB	2 to 5 ICLK	SDSI
0009 5010h	SDSI	DMA Transfer Address Register	DMATRADDR	32	32	10, 11 PCLKB	2 to 6 ICLK	SDSI
0009 5100h	SDSI	SDSI Control Register 2	SDSICR2	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5104h	SDSI	SDSI Control Register 3	SDSICR3	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5108h	SDSI	Interrupt Enable Control Register 2	INTENCR2	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 510Ch	SDSI	Interrupt Status Register 2	INTSR2	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5110h	SDSI	DMA Control Register 2	DMACR2	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5200h to 0009 526Bh	SDSI	CIS Data Register 0 to 26	CISDATAR0 to 26	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5270h	SDSI	FBR Setting Register 1	FBR1	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5274h	SDSI	FBR Setting Register 2	FBR2	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5278h	SDSI	FBR Setting Register 3	FBR3	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 527Ch	SDSI	FBR Setting Register 4	FBR4	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5280h	SDSI	FBR Setting Register 5	FBR5	32	32	2, 3 PCLKB	2 ICLK	SDSI
0009 5800h to 0009 58FFh	SDSI	FN1 Data Register 10 to 163	FN1DATAR10 to 163	8, 32	32	10, 11 PCLKB	2 to 6 ICLK	SDSI
0009 5900h to 0009 59FFh	SDSI	FN1 Data Register 20 to 263	FN1DATAR20 to 263	8, 32	32	10, 11 PCLKB	2 to 6 ICLK	SDSI
0009 5A00h to 0009 5AFFh	SDSI	FN1 Data Register 30 to 363	FN1DATAR30 to 363	8, 32	32	10, 11 PCLKB	2 to 6 ICLK	SDSI
0009 5B00h	SDSI	FN1 Interrupt Vector Register	FN1INTVECR	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5B01h	SDSI	FN1 Interrupt Clear Register	FN1INTCLR	8	8	7, 8 PCLKB	2 to 5 ICLK	SDSI
0009 5C00h to 0009 5FFFh	SDSI	FN1 Data Register 50 to 5255	FN1DATAR50 to 5255	8, 32	32	7, 8 PCLKB	2 to 5 ICLK	SDSI

Table 4.1 List of I/O Registers (Address Order) (53 / 61)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access Cycles		Related Function
						ICLK ≥ PCLK	ICLK < PCLK	
000C 1405h	MTU2	Timer Status Register	TSR	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1406h	MTU2	Timer Counter	TCNT	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1408h	MTU2	Timer General Register A	TGRA	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 140Ah	MTU2	Timer General Register B	TGRB	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 140Ch	MTU2	Timer Control Register 2	TCR2	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1600h	MTU8	Timer Control Register	TCR	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1601h	MTU8	Timer Mode Register 1	TMDR1	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1602h	MTU8	Timer I/O Control Register H	TIORH	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1603h	MTU8	Timer I/O Control Register L	TIORL	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1604h	MTU8	Timer Interrupt Enable Register	TIER	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1606h	MTU8	Timer Control Register 2	TCR2	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1608h	MTU8	Timer Counter	TCNT	32	32	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 160Ch	MTU8	Timer General Register A	TGRA	32	32	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1610h	MTU8	Timer General Register B	TGRB	32	32	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1614h	MTU8	Timer General Register C	TGRC	32	32	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1618h	MTU8	Timer General Register D	TGRD	32	32	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A00h	MTU6	Timer Control Register	TCR	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A01h	MTU7	Timer Control Register	TCR	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A02h	MTU6	Timer Mode Register 1	TMDR1	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A03h	MTU7	Timer Mode Register 1	TMDR1	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A04h	MTU6	Timer I/O Control Register H	TIORH	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A05h	MTU6	Timer I/O Control Register L	TIORL	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A06h	MTU7	Timer I/O Control Register H	TIORH	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A07h	MTU7	Timer I/O Control Register L	TIORL	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A08h	MTU6	Timer Interrupt Enable Register	TIER	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A09h	MTU7	Timer Interrupt Enable Register	TIER	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A0Ah	MTU	Timer Output Master Enable Register B	TOERB	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A0Eh	MTU	Timer Output Control Register 1B	TOCR1B	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A0Fh	MTU	Timer Output Control Register 2B	TOCR2B	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A10h	MTU6	Timer Counter	TCNT	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A12h	MTU7	Timer Counter	TCNT	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A14h	MTU	Timer Cycle Data Register B	TCDRB	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A16h	MTU	Timer Dead Time Data Register B	TDDRb	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A18h	MTU6	Timer General Register A	TGRA	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A1Ah	MTU6	Timer General Register B	TGRB	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A1Ch	MTU7	Timer General Register A	TGRA	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A1Eh	MTU7	Timer General Register B	TGRB	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A20h	MTU	Timer Subcounter B	TCNTSB	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A22h	MTU	Timer Cycle Buffer Register B	TCBRB	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A24h	MTU6	Timer General Register C	TGRC	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A26h	MTU6	Timer General Register D	TGRD	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A28h	MTU7	Timer General Register C	TGRC	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A2Ah	MTU7	Timer General Register D	TGRD	16	16	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A2Ch	MTU6	Timer Status Register	TSR	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A2Dh	MTU7	Timer Status Register	TSR	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A30h	MTU	Timer Interrupt Skipping Set Register 1B	TITCR1B	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A31h	MTU	Timer Interrupt Skipping Counter 1B	TITCNT1B	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A32h	MTU	Timer Buffer Transfer Set Register B	TBTBRB	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A34h	MTU	Timer Dead Time Enable Register B	TDERB	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a
000C 1A36h	MTU	Timer Output Level Buffer Register B	TOLBRB	8	8	4, 5 PCLKA	1, 2 ICLK	MTU3a

Table 5.4 DC Characteristics (2)

Conditions: $V_{CC} = AVCC0 = AVCC1 = V_{CC_USB} = V_{BATT} = 2.7$ to 3.6 V, 2.7 V $\leq V_{REFH0} \leq AVCC0$,
 $V_{SS} = AVSS0 = AVSS1 = V_{REFL0} = V_{SS_USB} = 0$ V,
 $T_a = T_{opr}$

Item		Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Output high voltage	All output pins	V _{OH}	VCC – 0.5	—	—	V	I _{OH} = –1 mA
Output low voltage	All output pins (except for RIIC pins and ETHERC output pin)	V _{OL}	—	—	0.5	V	I _{OL} = 1.0 mA
	RIIC output pin		—	—	0.4		I _{OL} = 3.0 mA
			—	—	0.6		I _{OL} = 6.0 mA
	RIIC output pin (only P12 and P13 in channel 0)	V _{OL}	—	—	0.4	V	I _{OL} = 15.0 mA (ICFER.FMPE = 1)
			—	0.4	—		I _{OL} = 20.0 mA (ICFER.FMPE = 1)
	ETHERC output pin	V _{OL}	—	—	0.4	V	I _{OL} = 1.0 mA
Input leakage current	RES#, MD pin, EMLE*1, BSCANP*1, NMI	I _{in}	—	—	1.0	μA	V _{in} = 0 V V _{in} = VCC
Three-state leakage current (off state)	Other than ports for 5 V tolerant	I _{TSI}	—	—	1.0	μA	V _{in} = 0 V V _{in} = VCC
	Ports for 5 V tolerant		—	—	5.0		V _{in} = 0 V V _{in} = 5.5 V
Input pull-up MOS current	Other than P35	I _p	–300	—	–10	μA	VCC = 2.7 to 3.6 V V _{in} = 0 V
Input pull-down MOS current	EMLE, BSCANP	I _p	10	—	300	μA	V _{in} = VCC
Input capacitance	All input pins (except for ports 03, 05, 12, 13, 16, 17, 20, 21, EMLE, BSCANP, USB0_DP, and USB0_DM)	C _{in}	—	—	8	pF	V _{bias} = 0 V V _{amp} = 20 mV f = 1 MHz T _a = 25°C
	Ports 03, 05, 12, 13, 16, 17, 20, 21, EMLE, BSCANP, USB0_DP, and USB0_DM		—	—	16		

Note 1. The input leakage current value at the EMLE and BSCANP pins are only when $V_{in} = 0$ V.

Table 5.5 DC Characteristics (3) (Products with 1 Mbyte of code flash memory or less)Conditions: $V_{CC} = AVCC0 = AVCC1 = VCC_USB = 2.7$ to 3.6 V, 2.7 V $\leq VREFH0 \leq AVCC0$, $VSS = AVSS0 = AVSS1 = VREFL0 = VSS_USB = 0$ V, $T_a = T_{opr}$

Item			Symbol	D version		G version		Unit	Test Conditions		
				Typ.	Max.	Typ.	Max.				
Supply current*1	High-speed operating mode	Max.*2		I _{CC} *3	—	40	—	45	mA	ICLK = 120 MHz PCLKA = 120 MHz PCLKB = 60 MHz PCLKC = 60 MHz PCLKD = 60 MHz FCLK = 60 MHz BCLK = 120 MHz BCLK pin = 60 MHz	
		Normal	Peripheral function clock signal supplied*4		22	—	22	—			
			Peripheral function clock signal stopped*4		12	—	12	—			
		Core Mark	Peripheral function clock signal stopped*4		15	—	15	—			
		Sleep mode: The clock signal to peripheral modules is supplied*4			16	24	16	28			
		All-module-clock-stop mode (reference value)			8	15	8	19			
		Low-speed operating mode 1: Supply of the clock signal to peripheral modules is stopped*4			1.1	—	1.1	—			All clocks 1 MHz
		Low-speed operating mode 2: Supply of the clock signal to peripheral modules is stopped*4			1.1	—	1.1	—			All clocks 32.768 kHz
		Software standby mode			1.6	6.4	1.6	9.8			
	Deep software standby mode	Power supplied to standby RAM and USB resume detecting unit (USB0 only)		15.5	61	15.5	85	μA			
		Power not supplied to standby RAM and USB resume detecting unit (USB0 only)	Power-on reset circuit and low-power consumption function disabled*5	11.5	38	11.5	48				
			Power-on reset circuit and low-power consumption function enabled*6		4.9	29	4.9		39		
			Increased by RTC operation	When a low C _L crystal is in use	1	—	1		—		
		When a standard C _L crystal is in use		2	—	2	—				
		RTC operating while VCC is off (with the battery backup function, only the RTC and sub-clock oscillator operate)	When a crystal oscillator for low clock loads is in use		0.9	—	0.9		—	V _{BATT} = 2.0 V, VCC = 0 V	
					1.6	—	1.6		—	V _{BATT} = 3.3 V, VCC = 0 V	
			When a crystal oscillator for standard clock loads is in use		1.7	—	1.7		—	V _{BATT} = 2.0 V, VCC = 0 V	
					3.3	—	3.3		—	V _{BATT} = 3.3 V, VCC = 0 V	
		Inrush current on returning from deep software standby mode	Inrush current*7	I _{RUSH}	—	70	—		70	mA	
			Energy of inrush current*7	E _{RUSH}	—	1.0	—		1.0		

Note 1. Supply current values are with all output pins unloaded and all input pull-up MOSs in the off state.

Note 2. Supply of the clock signal to peripheral modules is stopped in this state.

Note 3. I_{CC} depends on f (ICLK) as follows. (ICLK/PCLKA:PCLKB/PCLKC/PCLKD:BCLK:BCLK pin = 10:5:10:5 when EXTAL = 12 MHz)

[D version]

 I_{CC} Max. = $0.31 \times f + 6.5$ (max. operation in high-speed operating mode) I_{CC} Typ. = $0.16 \times f + 2.8$ (ICLK 1 MHz max) (normal operation in high-speed operating mode) I_{CC} Typ. = $0.4 \times f + 1.1$ (low-speed operating mode 1) I_{CC} Max. = $0.15 \times f + 6.5$ (sleep mode)

[G version]

 I_{CC} Max. = $0.33 \times f + 9$ (max. operation in high-speed operating mode) I_{CC} Typ. = $0.16 \times f + 2.8$ (ICLK 1 MHz max) (normal operation in high-speed operating mode) I_{CC} Typ. = $0.4 \times f + 1.1$ (low-speed operating mode 1) I_{CC} Max. = $0.21 \times f + 9$ (sleep mode)

Note 4. Whether supply of the clock signal to peripheral modules continues or is stopped only depends on the state determined by the settings of the bits in module stop control registers A to D.

The setting for the peripheral module clock stopped state is FCLK = BCLK = PCLKA = PCLKB = PCLKC = PCLKD = BCLK pin = 3.75 MHz (division by 64).

Note 5. The low power consumption function is disabled and DEEPCUT[1:0] = 01b.

Table 5.41 ETHERC Timing

Conditions: $V_{CC} = AVCC0 = AVCC1 = V_{CC_USB} = V_{BATT} = 2.7$ to 3.6 V, 2.7 V $\leq V_{REFH0} \leq AVCC0$,
 $V_{SS} = AVSS0 = AVSS1 = V_{REFL0} = V_{SS_USB} = 0$ V,
 $PCLKA = 8$ to 120 MHz, $PCLKB = 8$ to 60 MHz, $T_a = T_{opr}$,
Output load conditions: $V_{OH} = V_{CC} \times 0.5$, $V_{OL} = V_{CC} \times 0.5$, $C = 30$ pF,
High-drive output is selected by the driving ability control register.

	Item	Symbol	Min.	Max.	Unit	Test Conditions
ETHERC (RMII)	REF50CK cycle time	T_{ck}	20	—	ns	Figure 5.56 to Figure 5.58
	REF50CK frequency Typ. 50 MHz	—	—	50 + 100 ppm	MHz	
	REF50CK duty	—	35	65	%	
	REF50CK rise/fall time	$T_{ckr/ckf}$	0.5	3.5	ns	
	RMII0_xxx*1 output delay time	T_{co}	2.5	15.0	ns	
	RMII0_xxx*2 setup time	T_{su}	3	—	ns	
	RMII0_xxx*2 hold time	T_{hd}	1	—	ns	
	RMII0_xxx*1, *2 rise/fall time	T_r/T_f	0.5	5	ns	
	ET0_WOL output delay time	t_{WOLd}	1	23.5	ns	Figure 5.60
ETHERC (MII)	ET0_TX_CLK cycle time	t_{Tcyc}	40	—	ns	—
	ET0_TX_EN output delay time	t_{TENd}	1	20	ns	Figure 5.61
	ET0_ETXD0 to ET0_ETXD3 output delay time	t_{MTDd}	1	20	ns	
	ET0_CRS setup time	t_{CRSs}	10	—	ns	
	ET0_CRS hold time	t_{CRSh}	10	—	ns	
	ET0_COL setup time	t_{COLs}	10	—	ns	Figure 5.62
	ET0_COL hold time	t_{COLh}	10	—	ns	
	ET0_RX_CLK cycle time	t_{TRcyc}	40	—	ns	—
	ET0_RX_DV setup time	t_{RDVs}	10	—	ns	Figure 5.63
	ET0_RX_DV hold time	t_{RDVh}	10	—	ns	
	ET0_ERXD0 to ET0_ERXD3 setup time	t_{MRDs}	10	—	ns	
	ET0_ERXD0 to ET0_ERXD3 hold time	t_{MRDh}	10	—	ns	
	ET0_RX_ER setup time	t_{RERs}	10	—	ns	Figure 5.64
	ET0_RX_ER hold time	t_{RERh}	10	—	ns	
	ET0_WOL output delay time	t_{WOLd}	1	23.5	ns	Figure 5.65

Note 1. RMII0_TXD_EN, RMII0_TXD1, RMII0_TXD0

Note 2. RMII0_CRS_DV, RMII0_RXD1, RMII0_RXD0, RMII0_RX_ER

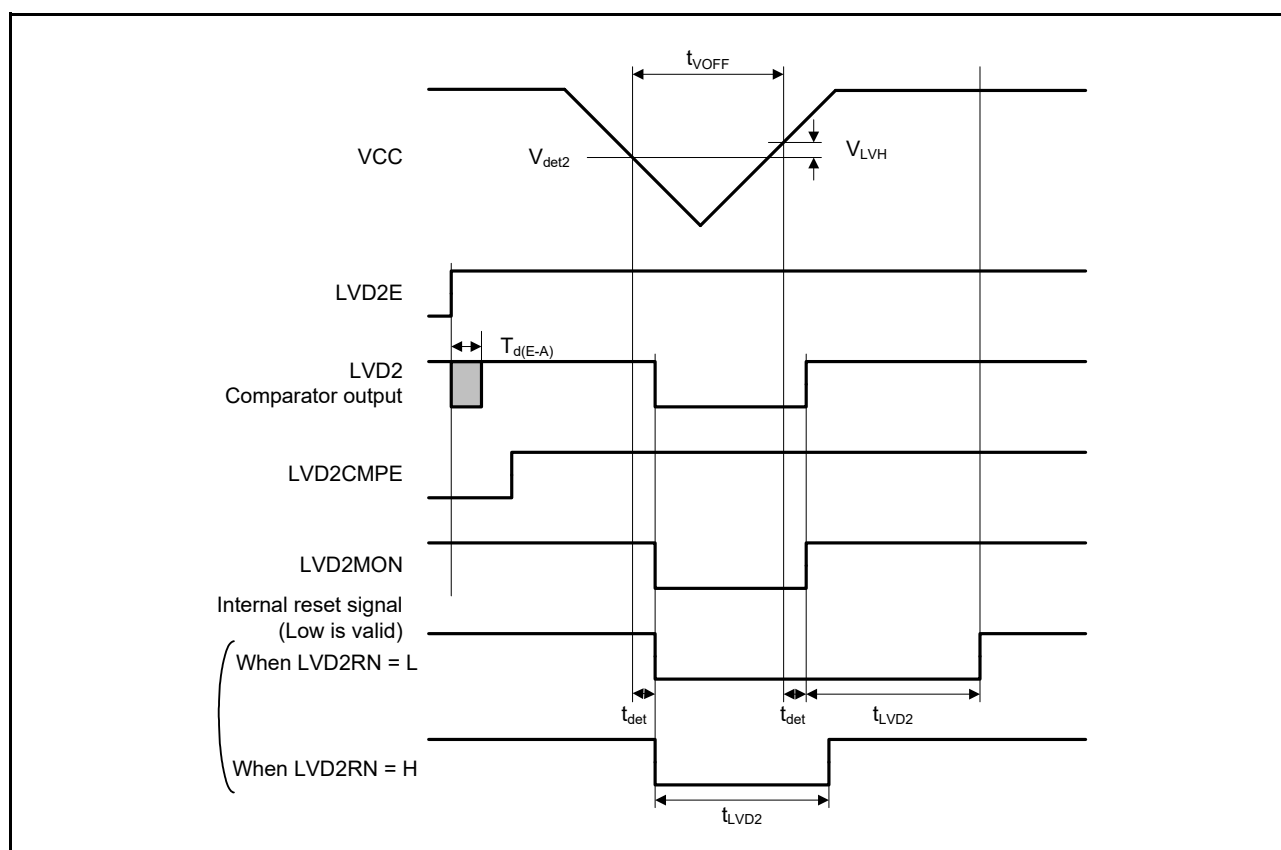


Figure 5.79 Voltage Detection Circuit Timing (V_{det2})

5.11 Flash Memory Characteristics

Table 5.54 Code Flash Memory Characteristics

Conditions: $V_{CC} = AVCC0 = AVCC1 = V_{CC_USB} = V_{BATT} = 2.7$ to 3.6 V, 2.7 V $\leq V_{REFH0} \leq AVCC0$,
 $V_{SS} = AVSS0 = AVSS1 = V_{REFL0} = V_{SS_USB} = 0$ V,
 Temperature range for programming/erasure: $T_a = T_{opr}$

Item		Symbol	FCLK = 4 MHz			FCLK = 15 MHz			20 MHz ≤ FCLK ≤ 60 MHz			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Programming time N _{PEC} ≤ 100 times	128 bytes	t _{P128}	—	0.75	13.2	—	0.38	6.6	—	0.34	6	ms
	8 Kbytes	t _{P8K}	—	49	176	—	25	88	—	22	80	ms
	32 Kbytes	t _{P32K}	—	194	704	—	97	352	—	88	320	ms
Programming time N _{PEC} > 100 times	128 bytes	t _{P128}	—	0.91	15.8	—	0.46	8	—	0.41	7.2	ms
	8 Kbytes	t _{P8K}	—	60	212	—	30	106	—	27	96	ms
	32 Kbytes	t _{P32K}	—	234	848	—	117	424	—	106	384	ms
Erasure time N _{PEC} ≤ 100 times	8 Kbytes	t _{E8K}	—	78	216	—	48	132	—	43	120	ms
	32 Kbytes	t _{E32K}	—	283	864	—	173	528	—	157	480	ms
Erasure time N _{PEC} > 100 times	8 Kbytes	t _{E8K}	—	94	260	—	58	158	—	52	144	ms
	32 Kbytes	t _{E32K}	—	341	1040	—	208	632	—	189	576	ms
Reprogramming/erasure cycle* ¹		N _{PEC}	10000 * ²	—	—	10000 * ²	—	—	10000 * ²	—	—	Times
Suspend delay time during programming		t _{SPD}	—	—	264	—	—	132	—	—	120	μs
First suspend delay time during erasing (in suspend priority mode)		t _{SESD1}	—	—	216	—	—	132	—	—	120	μs
Second suspend delay time during erasure (in suspend priority mode)		t _{SESD2}	—	—	1.7	—	—	1.7	—	—	1.7	ms
Suspend delay time during erasure (in erasure priority mode)		t _{SEED}	—	—	1.7	—	—	1.7	—	—	1.7	ms
Forced stop command		t _{FD}	—	—	32	—	—	22	—	—	20	μs
Data hold time* ³		t _{DRP}	10	—	—	10	—	—	10	—	—	Year

Note 1. Definition of reprogram/erase cycle:

The reprogram/erase cycle is the number of erasing for each block. When the reprogram/erase cycle is n times ($n = 1000$), erasing can be performed n times for each block. For instance, when 128-byte programming is performed 64 times for different addresses in 8-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. This is the minimum number of times to guarantee all the characteristics after reprogramming (guaranteed range is from 1 to the value of the minimum value).

Note 3. This shows the characteristics when reprogramming is performed within the specified range, including the minimum value.