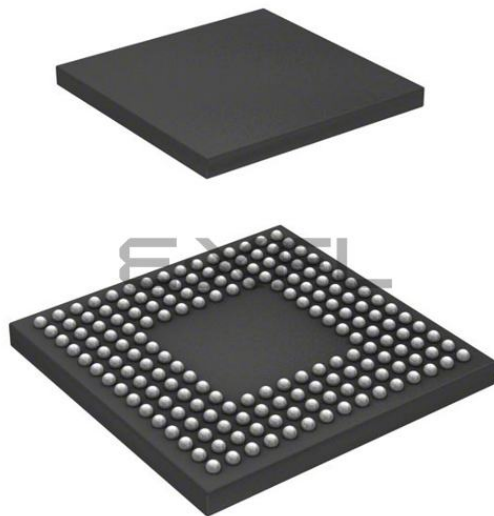




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Details

Product Status	Not For New Designs
Core Processor	RX
Core Size	32-Bit Single-Core
Speed	100MHz
Connectivity	CANbus, EBI/EMI, I ² C, LINbus, SCI, SPI, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	133
Program Memory Size	512KB (512K x 8)
Program Memory Type	FLASH
EEPROM Size	32K x 8
RAM Size	128K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 8x10b, 21x12b; D/A 2x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	176-LFBGA
Supplier Device Package	176-LFBGA (13x13)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f56318cdbg-u0

Table 1.1 Outline of Specifications (3/6)

Classification	Module/Function	Description
I/O ports	General I/O ports	- I/O ports for the 177-pin TFLGA, 176-pin LFBGA and 176-pin LQFP I/O pins: 133 Input pins: 1 Pull-up resistors: 133 Open-drain outputs: 133 5-V tolerance: 18 - I/O ports for the 145-pin TFLGA and 144-pin LQFP I/O pins: 111 Input pins: 1 Pull-up resistors: 111 Open-drain outputs: 111 5-V tolerance: 18 - I/O ports for the 100-pin TFLGA (in the planning stage) and 100-pin LQFP I/O pins: 78 Input pins: 1 Pull-up resistors: 78 Open-drain outputs: 78 5-V tolerance: 17 - I/O ports for the 64-pin TFLGA I/O pins: 39 Input pin: 1 Pull-up resistors: 39 Open-drain outputs: 39 5-V tolerance: 8 - I/O ports for the 64-pin LQFP I/O pins: 42 Input pin: 1 Pull-up resistors: 42 Open-drain outputs: 42 5-V tolerance: 8 8-bit port switching function - I/O ports for the 48-pin LQFP I/O pins: 30 Input pin: 1 Pull-up resistors: 30 Open-drain outputs: 30 5-V tolerance: 6 8-bit port switching function

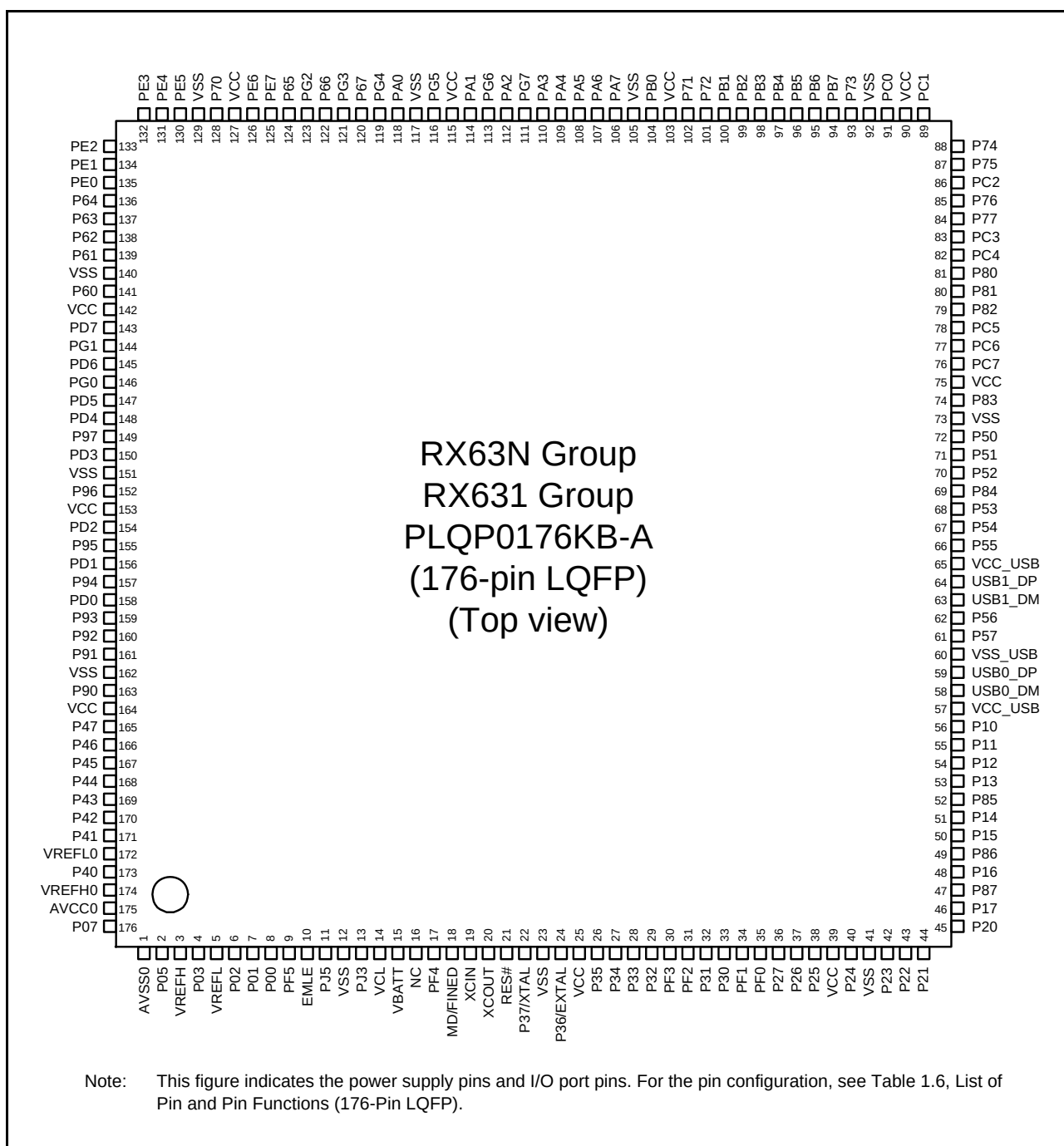
**Figure 1.5 Pin Assignment (176-Pin LQFP)**

Table 1.6 List of Pin and Pin Functions (176-Pin LQFP) (2/5)

Pin Number	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, TPU, TMR, PPG, RTC, POE)	Communications (ETHERC, SCIC, SCID, RSPI, RIIC, CAN, IEB, USB, and PDC)	Interrupt	S12AD, AD, DA
41	VSS						
42		P23	EDACK0	MTIOC3D/MTCLKD/ TIOCD3/PO3	TXD3/CTS0#/RTS0#/ SMOSI3/SS0#/SSDA3/ USB0_DPUPE/PIXD7		
43		P22	EDREQ0	MTIOC3B/MTCLKC/ TIOCC3/TMO0/PO2	SCK0/USB0_DRPD/ PIXD6		
44		P21		MTIOC1B/TIOCA3/ TMCI0/PO1	RXD0/SMISO0/SSCL0/ SCL1/USB0_EXICEN/ PIXD5	IRQ9	
45		P20		MTIOC1A/TIOCB3/ TMRI0/PO0	TXD0/SMOSI0/SSDA0/ SDA1/USB0_ID/PIXD4	IRQ8	
46		P17		MTIOC3A/MTIOC3B/ TIOCB0/TCLKD/TMO1/ PO15/POE8#	SCK1/TXD3/SMOSI3/ SSDA3/MISOA/SDA2-DS/ IETXD/USB1_VBUS/ PIXD3	IRQ7	ADTRG#
47		P87		TIOCA2	PIXD2		
48		P16		MTIOC3C/MTIOC3D/ TIOCB1/TCLKC/TMO2/ PO14/RTCOU	TXD1/RXD3/SMOSI1/ SMISO3/SSDA1/SSCL3/ MOSIA/SCL2-DS/IERXD/ USB0_VBUS/ USB0_VBUSEN/ USB0_OVRCURB	IRQ6	ADTRG0#
49		P86		TIOCA0	PIXD1		
50		P15		MTIOC0B/MTCLKB/ TIOCB2/TCLKB/TMCI2/ PO13	RXD1/SCK3/SMISO1/ SSCL1/CRX1-DS/ USB1_DPUPE/PIXD0	IRQ5	
51		P14		MTIOC3A/MTCLKA/ TIOCB5/TCLKA/TMRI2/ PO15	CTS1#/RTS1#/SS1#/ CTX1/USB0_DPUPE/ USB0_OVRCURA	IRQ4	
52		P85					
53		P13		MTIOC0B/TIOCA5/TMO3/ PO13	TXD2/SMOSI2/SSDA2/ SDA0[FM+]	IRQ3	ADTRG#
54		P12		MTIC5U/TMCI1	RXD2/SMISO2/SSCL2/ SCL0[FM+]	IRQ2	
55		P11		MTIC5V/TMCI3	SCK2	IRQ1	
56		P10		MTIC5W/TMRI3		IRQ0	
57	VCC_USB						
58					USB0_DM		
59					USB0_DP		
60	VSS_USB						
61		P57	WAIT#/WR3#/ BC3#/EDREQ1				
62		P56	WR2#/BC2#/ EDACK1	MTIOC3C/TIOCA1			
63					USB1_DM		
64					USB1_DP		
65	VCC_USB						
66		P55	WAIT#/ EDREQ0	MTIOC4D/TMO3	ET_EXOUT/CRX1	IRQ10	
67		P54	ALE/EDACK0	MTIOC4B/TMCI1	ET_LINKSTA/CTS2#/ RTS2#/SS2#/CTX1		
68		P53*1	BCLK				
69		P84					
70		P52	RD#		RXD2/SMISO2/SSCL2/ SSLB3		
71		P51	WR1#/BC1#/ WAIT#		SCK2/SSLB2		

Table 1.6 List of Pin and Pin Functions (176-Pin LQFP) (5/5)

Pin Number 176-Pin LQFP	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, TPU, TMR, PPG, RTC, POE)	Communications (ETHERC, SCId, SCId, RSPI, RIIC, CAN, IEB, USB, and PDC)	Interrupt	S12AD, AD, DA
136		P64	CS4#/WE#				
137		P63	CS3#/CAS#				
138		P62	CS2#/RAS#				
139		P61	CS1#/SDCS#				
140	VSS						
141		P60	CS0#				
142	VCC						
143		PD7	D7[A7/D7]	MTIC5U/POE0#	SSLC3	IRQ7	AN7
144		PG1	D25				
145		PD6	D6[A6/D6]	MTIC5V/POE1#	SSLC2	IRQ6	AN6
146		PG0	D24				
147		PD5	D5[A5/D5]	MTIC5W/POE2#	SSLC1	IRQ5	AN013
148		PD4	D4[A4/D4]	POE3#	SSLC0	IRQ4	AN012
149		P97	A23/D23				
150		PD3	D3[A3/D3]	TIOCB8/TCLKH/POE8#	RSPCKC	IRQ3	AN011
151	VSS						
152		P96	A22/D22				
153	VCC						
154		PD2	D2[A2/D2]	MTIOC4D/TIOCA8	MISOC/CRX0	IRQ2	AN010
155		P95	A21/D21				
156		PD1	D1[A1/D1]	MTIOC4B/TIOCB7/ TCLKG	MOSIC/CTX0	IRQ1	AN009
157		P94	A20/D20				
158		PD0	D0[A0/D0]	TIOCA7		IRQ0	AN008
159		P93	A19/D19		CTS7#/RTS7#/SS7#		AN017
160		P92	A18/D18		RXD7/SMISO7/SSCL7		AN016
161		P91	A17/D17		SCK7		AN015
162	VSS						
163		P90	A16/D16		TXD7/SMOSI7/SSDA7		AN014
164	VCC						
165		P47				IRQ15-DS	AN007
166		P46				IRQ14-DS	AN006
167		P45				IRQ13-DS	AN005
168		P44				IRQ12-DS	AN004
169		P43				IRQ11-DS	AN003
170		P42				IRQ10-DS	AN002
171		P41				IRQ9-DS	AN001
172	VREFL0						
173		P40				IRQ8-DS	AN000
174	VREFH0						
175	AVCC0						
176		P07				IRQ15	ADTRG0#

Note 1. The BCLK function is multiplexed with the I/O port function for pin P53, so the port function is not available if the external bus is enabled.

Note 2. Enabled only for the ROM capacity: 2 Mbytes/1.5 Mbytes

Table 1.9 List of Pins and Pin Functions (100-Pin TFLGA) (2/5)

Pin No. 100-pin TFLGA	Power Supply Clock System Control	I/O Port	Bus EXDMAC	Timers (MTU, TPU, TMR, PPG, RTC, POE)	Communications (ETHERC, SCIC, SCID, RSPI, RIIC, CAN, IEB, USB)	Interrupt	S12AD AD DA
D2	XCOUT						
D3	MD/FINED						
D4	VBATT						
D5		P45				IRQ13-DS	AN005
D6		P46				IRQ14-DS	AN006
D7		PE6	D14[A14/D14]		MOSIB	IRQ6	AN4
D8		PE7	D15[A15/D15]		MISOB	IRQ7	AN5
D9		PA1	A1	MTIOC0B/ MTCLKC/ TIOCBO/PO17	SCK5/SSLA2/ ET_WOL	IRQ11	
D10		PA0	A0/BC0#	MTIOC4A/ TIOCA0/PO16	SSLA1/ET_TX_EN/ RMII_TXD_EN		
E1	XTAL	P37					
E2	VSS						
E3	RES#						
E4	TRST#	P34		MTIOC0A/ TMC13/PO12/ POE2#	SCK6/SCK0/ USB0_DPRPD	IRQ4	
E5		P41				IRQ9-DS	AN001
E6		PA2	A2	PO18	RXD5/SMISO5/ SSCL5/SSLA3		
E7		PA6	A6	MTIC5V/ MTCLKB/ TIOCA2/ TMC13/PO22/ POE2#	CTS5#/RTS5#/ SS5#/MOSIA/ ET_EXOUT		
E8		PA4	A4	MTIC5U/ MTCLKA/ TIOCA1/ TMRI0/PO20	TXD5/SMOSI5/ SSDA5/SSLA0/ ET_MDC	IRQ5-DS	
E9		PA5	A5	TIOCBI/PO21	RSPCKA/ ET_LINKSTA		
E10		PA3	A3	MTIOC0D/ MTCLKD/ TIOCDO/ TCLKB/PO19	RXD5/SMISO5/ SSCL5/ET_MDIO	IRQ6-DS	
F1	EXTAL	P36					
F2	VCC						
F3		P35				NMI	
F4		P32		MTIOC0C/ TIOCC0/TMO3/ PO10/ RTCOUT/ RTCIC2	TXD6/TXD0/ SMOSI6/SMOSI0/ SSDA6/SSDA0/ CTX0*1/ USB0_VBUSEN	IRQ2-DS	
F5		P12		TMC11	RXD2/SMISO2/ SSCL2/SCL0[FM+]	IRQ2	
F6		PB3	A11	MTIOC0A/ MTIOC4A/ TIOCDO/ TCLKD/TMO0/ PO27/POE3#	SCK6/ET_RX_ER/ RMII_RX_ER		

Table 1.10 List of Pins and Pin Functions (100-Pin LQFP) (4/4)

Pin No. 100-pin LQFP	Power Supply Clock System Control	I/O Port	Bus EXDMAC	Timers (MTU, TPU, TMR, PPG, RTC, POE)	Communications (ETHERC, SC1c, SC1d, RSPI, RIIC, CAN, IEB, USB)	Interrupt	S12AD AD DA
94	VREFL0						
95		P40				IRQ8-DS	AN000
96	VREFH0						
97	AVCC0						
98		P07				IRQ15	ADTRG0#
99	AVSS0						
100		P05				IRQ13	DA1

Note 1. Enabled only for the ROM capacity of 768 Kbytes or more

Note 2. The BCLK function is multiplexed with the I/O port function for pin P53, so the port function is not available if the external bus is enabled.

4.1 I/O Register Addresses (Address Order)

Table 4.1 List of I/O Registers (Address Order) (1/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 0000h	SYSTEM	Mode monitor register	MDMONR	16	16	3 ICLK		Operating Modes
0008 0002h	SYSTEM	Mode status register	MDSR	16	16	3 ICLK		
0008 0006h	SYSTEM	System control register 0	SYSCR0	16	16	3 ICLK		
0008 0008h	SYSTEM	System control register 1	SYSCR1	16	16	3 ICLK		
0008 000Ch	SYSTEM	Standby control register	SBYCR	16	16	3 ICLK		Low Power Consumption
0008 0010h	SYSTEM	Module stop control register A	MSTPCRA	32	32	3 ICLK		
0008 0014h	SYSTEM	Module stop control register B	MSTPCRB	32	32	3 ICLK		
0008 0018h	SYSTEM	Module stop control register C	MSTPCRC	32	32	3 ICLK		
0008 001Ch	SYSTEM	Module stop control register D	MSTPCRD	32	32	3 ICLK		Clock Generation Circuit
0008 0020h	SYSTEM	System clock control register	SCKCR	32	32	3 ICLK		
0008 0024h	SYSTEM	System clock control register 2	SCKCR2	16	16	3 ICLK		
0008 0026h	SYSTEM	System clock control register 3	SCKCR3	16	16	3 ICLK		
0008 0028h	SYSTEM	PLL control register	PLLCR	16	16	3 ICLK		
0008 002Ah	SYSTEM	PLL control register 2	PLLCR2	8	8	3 ICLK		
0008 0030h	SYSTEM	External bus clock control register	BCKCR	8	8	3 ICLK		
0008 0032h	SYSTEM	Main clock oscillator control register	MOSCCR	8	8	3 ICLK		
0008 0033h	SYSTEM	Sub-clock oscillator control register	SOSCCR	8	8	3 ICLK		
0008 0034h	SYSTEM	Low-speed on-chip oscillator control register	LOCOCR	8	8	3 ICLK		
0008 0035h	SYSTEM	IWDT-dedicated on-chip oscillator control register	ILOCOCR	8	8	3 ICLK		
0008 0036h	SYSTEM	High-speed on-chip oscillator control register	HOCOCR	8	8	3 ICLK		
0008 0040h	SYSTEM	Oscillation stop detection control register	OSTDCR	8	8	3 ICLK		
0008 0041h	SYSTEM	Oscillation stop detection status register	OSTDSR	8	8	3 ICLK		
0008 00A0h	SYSTEM	Operating power control register	OPCCR	8	8	3 ICLK		Low Power Consumption
0008 00A1h	SYSTEM	Sleep mode return clock source switching register	RSTCKCR	8	8	3 ICLK		
0008 00A2h	SYSTEM	Main clock oscillator wait control register	MOSCWTCR	8	8	3 ICLK		
0008 00A3h	SYSTEM	Sub-clock oscillator wait control register	SOSCWTCR	8	8	3 ICLK		
0008 00A6h	SYSTEM	PLL wait control register	PLLWTCR	8	8	3 ICLK		Resets
0008 00C0h	SYSTEM	Reset status register 2	RSTS2	8	8	3 ICLK		
0008 00C2h	SYSTEM	Software reset register	SWRR	16	16	3 ICLK		LVDA
0008 00E0h	SYSTEM	Voltage monitoring 1 circuit control register 1	LVD1CR1	8	8	3 ICLK		
0008 00E1h	SYSTEM	Voltage monitoring 1 circuit status register	LVD1SR	8	8	3 ICLK		
0008 00E2h	SYSTEM	Voltage monitoring 2 circuit control register 1	LVD2CR1	8	8	3 ICLK		
0008 00E3h	SYSTEM	Voltage monitoring 2 circuit status register	LVD2SR	8	8	3 ICLK		Register Write Protection Function
0008 03FEh	SYSTEM	Protect register	PRCR	16	16	3 ICLK		
0008 1300h	BSC	Bus error status clear register	BERCLR	8	8	2 ICLK		Buses
0008 1304h	BSC	Bus error monitoring enable register	BEREN	8	8	2 ICLK		
0008 1308h	BSC	Bus error status register 1	BERSR1	8	8	2 ICLK		
0008 130Ah	BSC	Bus error status register 2	BERSR2	16	16	2 ICLK		
0008 1310h	BSC	Bus priority control register	BUSPRI	16	16	2 ICLK		
0008 2000h	DMAC0	DMA source address register	DMSAR	32	32	2 ICLK		DMACA
0008 2004h	DMAC0	DMA destination address register	DMDAR	32	32	2 ICLK		
0008 2008h	DMAC0	DMA transfer count register	DMCRA	32	32	2 ICLK		
0008 200Ch	DMAC0	DMA block transfer count register	DMCRB	16	16	2 ICLK		
0008 2010h	DMAC0	DMA transfer mode register	DMTMD	16	16	2 ICLK		
0008 2013h	DMAC0	DMA interrupt setting register	DMINT	8	8	2 ICLK		
0008 2014h	DMAC0	DMA address mode register	DMAMD	16	16	2 ICLK		
0008 2018h	DMAC0	DMA offset register	DMOFR	32	32	2 ICLK		

Table 4.1 List of I/O Registers (Address Order) (6/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 7047h	ICU	Interrupt request register 071	IR071	8	8	2	ICLK	ICUb
0008 7048h	ICU	Interrupt request register 072	IR072	8	8	2	ICLK	
0008 7049h	ICU	Interrupt request register 073	IR073	8	8	2	ICLK	
0008 704Ah	ICU	Interrupt request register 074	IR074	8	8	2	ICLK	
0008 704Bh	ICU	Interrupt request register 075	IR075	8	8	2	ICLK	
0008 704Ch	ICU	Interrupt request register 076	IR076	8	8	2	ICLK	
0008 704Dh	ICU	Interrupt request register 077	IR077	8	8	2	ICLK	
0008 704Eh	ICU	Interrupt request register 078	IR078	8	8	2	ICLK	
0008 704Fh	ICU	Interrupt request register 079	IR079	8	8	2	ICLK	
0008 705Ah	ICU	Interrupt request register 090	IR090	8	8	2	ICLK	
0008 705Bh	ICU	Interrupt request register 091	IR091	8	8	2	ICLK	
0008 705Ch	ICU	Interrupt request register 092	IR092	8	8	2	ICLK	
0008 705Dh	ICU	Interrupt request register 093	IR093	8	8	2	ICLK	
0008 7062h	ICU	Interrupt request register 098	IR098	8	8	2	ICLK	
0008 7066h	ICU	Interrupt request register 102	IR102	8	8	2	ICLK	
0008 706Ah	ICU	Interrupt request register 106	IR106	8	8	2	ICLK	
0008 706Bh	ICU	Interrupt request register 107	IR107	8	8	2	ICLK	
0008 706Ch	ICU	Interrupt request register 108	IR108	8	8	2	ICLK	
0008 706Dh	ICU	Interrupt request register 109	IR109	8	8	2	ICLK	
0008 706Eh	ICU	Interrupt request register 110	IR110	8	8	2	ICLK	
0008 706Fh	ICU	Interrupt request register 111	IR111	8	8	2	ICLK	
0008 7070h	ICU	Interrupt request register 112	IR112	8	8	2	ICLK	
0008 7072h	ICU	Interrupt request register 114	IR114	8	8	2	ICLK	
0008 707Ah	ICU	Interrupt request register 122	IR122	8	8	2	ICLK	
0008 707Bh	ICU	Interrupt request register 123	IR123	8	8	2	ICLK	
0008 707Ch	ICU	Interrupt request register 124	IR124	8	8	2	ICLK	
0008 707Dh	ICU	Interrupt request register 125	IR125	8	8	2	ICLK	
0008 707Eh	ICU	Interrupt request register 126	IR126	8	8	2	ICLK	
0008 707Fh	ICU	Interrupt request register 127	IR127	8	8	2	ICLK	
0008 7080h	ICU	Interrupt request register 128	IR128	8	8	2	ICLK	
0008 7081h	ICU	Interrupt request register 129	IR129	8	8	2	ICLK	
0008 7082h	ICU	Interrupt request register 130	IR130	8	8	2	ICLK	
0008 7083h	ICU	Interrupt request register 131	IR131	8	8	2	ICLK	
0008 7084h	ICU	Interrupt request register 132	IR132	8	8	2	ICLK	
0008 7085h	ICU	Interrupt request register 133	IR133	8	8	2	ICLK	
0008 7086h	ICU	Interrupt request register 134	IR134	8	8	2	ICLK	
0008 7087h	ICU	Interrupt request register 135	IR135	8	8	2	ICLK	
0008 7088h	ICU	Interrupt request register 136	IR136	8	8	2	ICLK	
0008 7089h	ICU	Interrupt request register 137	IR137	8	8	2	ICLK	
0008 708Ah	ICU	Interrupt request register 138	IR138	8	8	2	ICLK	
0008 708Bh	ICU	Interrupt request register 139	IR139	8	8	2	ICLK	
0008 708Ch	ICU	Interrupt request register 140	IR140	8	8	2	ICLK	
0008 708Dh	ICU	Interrupt request register 141	IR141	8	8	2	ICLK	
0008 708Eh	ICU	Interrupt request register 142	IR142	8	8	2	ICLK	
0008 708Fh	ICU	Interrupt request register 143	IR143	8	8	2	ICLK	
0008 7090h	ICU	Interrupt request register 144	IR144	8	8	2	ICLK	
0008 7091h	ICU	Interrupt request register 145	IR145	8	8	2	ICLK	
0008 7092h	ICU	Interrupt request register 146	IR146	8	8	2	ICLK	
0008 7093h	ICU	Interrupt request register 147	IR147	8	8	2	ICLK	
0008 7094h	ICU	Interrupt request register 148	IR148	8	8	2	ICLK	
0008 7095h	ICU	Interrupt request register 149	IR149	8	8	2	ICLK	

Table 4.1 List of I/O Registers (Address Order) (9/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 7128h	ICU	DTC activation enable register 040	DTCER040	8	8	2	ICLK	ICUb
0008 712Ah	ICU	DTC activation enable register 042	DTCER042	8	8	2	ICLK	
0008 712Bh	ICU	DTC activation enable register 043	DTCER043	8	8	2	ICLK	
0008 712Dh	ICU	DTC activation enable register 045	DTCER045	8	8	2	ICLK	
0008 712Eh	ICU	DTC activation enable register 046	DTCER046	8	8	2	ICLK	
0008 7140h	ICU	DTC activation enable register 064	DTCER064	8	8	2	ICLK	
0008 7141h	ICU	DTC activation enable register 065	DTCER065	8	8	2	ICLK	
0008 7142h	ICU	DTC activation enable register 066	DTCER066	8	8	2	ICLK	
0008 7143h	ICU	DTC activation enable register 067	DTCER067	8	8	2	ICLK	
0008 7144h	ICU	DTC activation enable register 068	DTCER068	8	8	2	ICLK	
0008 7145h	ICU	DTC activation enable register 069	DTCER069	8	8	2	ICLK	
0008 7146h	ICU	DTC activation enable register 070	DTCER070	8	8	2	ICLK	
0008 7147h	ICU	DTC activation enable register 071	DTCER071	8	8	2	ICLK	
0008 7148h	ICU	DTC activation enable register 072	DTCER072	8	8	2	ICLK	
0008 7149h	ICU	DTC activation enable register 073	DTCER073	8	8	2	ICLK	
0008 714Ah	ICU	DTC activation enable register 074	DTCER074	8	8	2	ICLK	
0008 714Bh	ICU	DTC activation enable register 075	DTCER075	8	8	2	ICLK	
0008 714Ch	ICU	DTC activation enable register 076	DTCER076	8	8	2	ICLK	
0008 714Dh	ICU	DTC activation enable register 077	DTCER077	8	8	2	ICLK	
0008 714Eh	ICU	DTC activation enable register 078	DTCER078	8	8	2	ICLK	
0008 714Fh	ICU	DTC activation enable register 079	DTCER079	8	8	2	ICLK	
0008 7162h	ICU	DTC activation enable register 098	DTCER098	8	8	2	ICLK	
0008 7166h	ICU	DTC activation enable register 102	DTCER102	8	8	2	ICLK	
0008 717Eh	ICU	DTC activation enable register 126	DTCER126	8	8	2	ICLK	
0008 717Fh	ICU	DTC activation enable register 127	DTCER127	8	8	2	ICLK	
0008 7180h	ICU	DTC activation enable register 128	DTCER128	8	8	2	ICLK	
0008 7181h	ICU	DTC activation enable register 129	DTCER129	8	8	2	ICLK	
0008 7182h	ICU	DTC activation enable register 130	DTCER130	8	8	2	ICLK	
0008 7183h	ICU	DTC activation enable register 131	DTCER131	8	8	2	ICLK	
0008 7184h	ICU	DTC activation enable register 132	DTCER132	8	8	2	ICLK	
0008 7185h	ICU	DTC activation enable register 133	DTCER133	8	8	2	ICLK	
0008 7186h	ICU	DTC activation enable register 134	DTCER134	8	8	2	ICLK	
0008 7187h	ICU	DTC activation enable register 135	DTCER135	8	8	2	ICLK	
0008 7188h	ICU	DTC activation enable register 136	DTCER136	8	8	2	ICLK	
0008 7189h	ICU	DTC activation enable register 137	DTCER137	8	8	2	ICLK	
0008 718Ah	ICU	DTC activation enable register 138	DTCER138	8	8	2	ICLK	
0008 718Bh	ICU	DTC activation enable register 139	DTCER139	8	8	2	ICLK	
0008 718Ch	ICU	DTC activation enable register 140	DTCER140	8	8	2	ICLK	
0008 718Dh	ICU	DTC activation enable register 141	DTCER141	8	8	2	ICLK	
0008 718Eh	ICU	DTC activation enable register 142	DTCER142	8	8	2	ICLK	
0008 718Fh	ICU	DTC activation enable register 143	DTCER143	8	8	2	ICLK	
0008 7190h	ICU	DTC activation enable register 144	DTCER144	8	8	2	ICLK	
0008 7191h	ICU	DTC activation enable register 145	DTCER145	8	8	2	ICLK	
0008 7194h	ICU	DTC activation enable register 148	DTCER148	8	8	2	ICLK	
0008 7195h	ICU	DTC activation enable register 149	DTCER149	8	8	2	ICLK	
0008 7196h	ICU	DTC activation enable register 150	DTCER150	8	8	2	ICLK	
0008 7197h	ICU	DTC activation enable register 151	DTCER151	8	8	2	ICLK	
0008 7198h	ICU	DTC activation enable register 152	DTCER152	8	8	2	ICLK	
0008 7199h	ICU	DTC activation enable register 153	DTCER153	8	8	2	ICLK	
0008 719Ah	ICU	DTC activation enable register 154	DTCER154	8	8	2	ICLK	
0008 719Bh	ICU	DTC activation enable register 155	DTCER155	8	8	2	ICLK	

Table 4.1 List of I/O Registers (Address Order) (10/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 719Ch	ICU	DTC activation enable register 156	DTCER156	8	8	2	ICLK	ICUb
0008 719Dh	ICU	DTC activation enable register 157	DTCER157	8	8	2	ICLK	
0008 719Eh	ICU	DTC activation enable register 158	DTCER158	8	8	2	ICLK	
0008 719Fh	ICU	DTC activation enable register 159	DTCER159	8	8	2	ICLK	
0008 71A0h	ICU	DTC activation enable register 160	DTCER160	8	8	2	ICLK	
0008 71A1h	ICU	DTC activation enable register 161	DTCER161	8	8	2	ICLK	
0008 71A2h	ICU	DTC activation enable register 162	DTCER162	8	8	2	ICLK	
0008 71A3h	ICU	DTC activation enable register 163	DTCER163	8	8	2	ICLK	
0008 71A4h	ICU	DTC activation enable register 164	DTCER164	8	8	2	ICLK	
0008 71A5h	ICU	DTC activation enable register 165	DTCER165	8	8	2	ICLK	
0008 71AAh	ICU	DTC activation enable register 170	DTCER170	8	8	2	ICLK	
0008 71ABh	ICU	DTC activation enable register 171	DTCER171	8	8	2	ICLK	
0008 71ADh	ICU	DTC activation enable register 173	DTCER173	8	8	2	ICLK	
0008 71AEh	ICU	DTC activation enable register 174	DTCER174	8	8	2	ICLK	
0008 71B0h	ICU	DTC activation enable register 176	DTCER176	8	8	2	ICLK	
0008 71B1h	ICU	DTC activation enable register 177	DTCER177	8	8	2	ICLK	
0008 71B3h	ICU	DTC activation enable register 179	DTCER179	8	8	2	ICLK	
0008 71B4h	ICU	DTC activation enable register 180	DTCER180	8	8	2	ICLK	
0008 71B7h	ICU	DTC activation enable register 183	DTCER183	8	8	2	ICLK	
0008 71B8h	ICU	DTC activation enable register 184	DTCER184	8	8	2	ICLK	
0008 71BBh	ICU	DTC activation enable register 187	DTCER187	8	8	2	ICLK	
0008 71BCh	ICU	DTC activation enable register 188	DTCER188	8	8	2	ICLK	
0008 71BFh	ICU	DTC activation enable register 191	DTCER191	8	8	2	ICLK	
0008 71C0h	ICU	DTC activation enable register 192	DTCER192	8	8	2	ICLK	
0008 71C3h	ICU	DTC activation enable register 195	DTCER195	8	8	2	ICLK	
0008 71C4h	ICU	DTC activation enable register 196	DTCER196	8	8	2	ICLK	
0008 71C6h	ICU	DTC activation enable register 198	DTCER198	8	8	2	ICLK	
0008 71C7h	ICU	DTC activation enable register 199	DTCER199	8	8	2	ICLK	
0008 71C8h	ICU	DTC activation enable register 200	DTCER200	8	8	2	ICLK	
0008 71C9h	ICU	DTC activation enable register 201	DTCER201	8	8	2	ICLK	
0008 71CAh	ICU	DTC activation enable register 202	DTCER202	8	8	2	ICLK	
0008 71CBh	ICU	DTC activation enable register 203	DTCER203	8	8	2	ICLK	
0008 71CEh	ICU	DTC activation enable register 206	DTCER206	8	8	2	ICLK	
0008 71CFh	ICU	DTC activation enable register 207	DTCER207	8	8	2	ICLK	
0008 71D0h	ICU	DTC activation enable register 208	DTCER208	8	8	2	ICLK	
0008 71D6h	ICU	DTC activation enable register 214	DTCER214	8	8	2	ICLK	
0008 71D7h	ICU	DTC activation enable register 215	DTCER215	8	8	2	ICLK	
0008 71D9h	ICU	DTC activation enable register 217	DTCER217	8	8	2	ICLK	
0008 71DAh	ICU	DTC activation enable register 218	DTCER218	8	8	2	ICLK	
0008 71DCh	ICU	DTC activation enable register 220	DTCER220	8	8	2	ICLK	
0008 71DDh	ICU	DTC activation enable register 221	DTCER221	8	8	2	ICLK	
0008 71DFh	ICU	DTC activation enable register 223	DTCER223	8	8	2	ICLK	
0008 71E0h	ICU	DTC activation enable register 224	DTCER224	8	8	2	ICLK	
0008 71E2h	ICU	DTC activation enable register 226	DTCER226	8	8	2	ICLK	
0008 71E3h	ICU	DTC activation enable register 227	DTCER227	8	8	2	ICLK	
0008 71E5h	ICU	DTC activation enable register 229	DTCER229	8	8	2	ICLK	
0008 71E6h	ICU	DTC activation enable register 230	DTCER230	8	8	2	ICLK	
0008 71E8h	ICU	DTC activation enable register 232	DTCER232	8	8	2	ICLK	
0008 71E9h	ICU	DTC activation enable register 233	DTCER233	8	8	2	ICLK	
0008 71EBh	ICU	DTC activation enable register 235	DTCER235	8	8	2	ICLK	
0008 71ECh	ICU	DTC activation enable register 236	DTCER236	8	8	2	ICLK	

Table 4.1 List of I/O Registers (Address Order) (32/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 C114h	MPC	USB0 control register	PFUSB0	8	8	2, 3 PCLKB	2 ICLK	MPC
0008 C115h	MPC	USB1 control register	PFUSB1	8	8	2, 3 PCLKB	2 ICLK	
0008 C11Fh	MPC	Write-protect register	PWPR	8	8	2, 3 PCLKB	2 ICLK	
0008 C120h	PORT	Port switching register B	PSRB	8	8	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C121h	PORT	Port switching register A	PSRA	8	8	2, 3 PCLKB	2 ICLK	
0008 C140h	MPC	P00 pin function control register	P00PFS	8	8	2, 3 PCLKB	2 ICLK	MPC
0008 C141h	MPC	P01 pin function control register	P01PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C142h	MPC	P02 pin function control register	P02PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C143h	MPC	P03 pin function control register	P03PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C145h	MPC	P05 pin function control register	P05PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C147h	MPC	P07 pin function control register	P07PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C148h	MPC	P10 pin function control register	P10PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C149h	MPC	P11 pin function control register	P11PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C14Ah	MPC	P12 pin function control register	P12PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C14Bh	MPC	P13 pin function control register	P13PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C14Ch	MPC	P14 pin function control register	P14PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C14Dh	MPC	P15 pin function control register	P15PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C14Eh	MPC	P16 pin function control register	P16PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C14Fh	MPC	P17 pin function control register	P17PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C150h	MPC	P20 pin function control register	P20PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C151h	MPC	P21 pin function control register	P21PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C152h	MPC	P22 pin function control register	P22PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C153h	MPC	P23 pin function control register	P23PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C154h	MPC	P24 pin function control register	P24PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C155h	MPC	P25 pin function control register	P25PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C156h	MPC	P26 pin function control register	P26PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C157h	MPC	P27 pin function control register	P27PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C158h	MPC	P30 pin function control register	P30PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C159h	MPC	P31 pin function control register	P31PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C15Ah	MPC	P32 pin function control register	P32PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C15Bh	MPC	P33 pin function control register	P33PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C15Ch	MPC	P34 pin function control register	P34PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C160h	MPC	P40 pin function control register	P40PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C161h	MPC	P41 pin function control register	P41PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C162h	MPC	P42 pin function control register	P42PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C163h	MPC	P43 pin function control register	P43PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C164h	MPC	P44 pin function control register	P44PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C165h	MPC	P45 pin function control register	P45PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C166h	MPC	P46 pin function control register	P46PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C167h	MPC	P47 pin function control register	P47PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C168h	MPC	P50 pin function control register	P50PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C169h	MPC	P51 pin function control register	P51PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C16Ah	MPC	P52 pin function control register	P52PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C16Ch	MPC	P54 pin function control register	P54PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C16Dh	MPC	P55 pin function control register	P55PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C16Eh	MPC	P56 pin function control register	P56PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C16Fh	MPC	P57 pin function control register	P57PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C170h	MPC	P60 pin function control register	P60PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C171h	MPC	P61 pin function control register	P61PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C176h	MPC	P66 pin function control register	P66PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C177h	MPC	P67 pin function control register	P67PFS	8	8	2, 3 PCLKB	2 ICLK	

Table 4.1 List of I/O Registers (Address Order) (34/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 C1B1h	MPC	PE1 pin function control register	PE1PFS	8	8	2, 3 PCLKB	2 ICLK	MPC
0008 C1B2h	MPC	PE2 pin function control register	PE2PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B3h	MPC	PE3 pin function control register	PE3PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B4h	MPC	PE4 pin function control register	PE4PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B5h	MPC	PE5 pin function control register	PE5PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B6h	MPC	PE6 pin function control register	PE6PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B7h	MPC	PE7 pin function control register	PE7PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B8h	MPC	PF0 pin function control register	PF0PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B9h	MPC	PF1 pin function control register	PF1PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1BAh	MPC	PF2 pin function control register	PF2PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1BDh	MPC	PF5 pin function control register	PF5PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1D3h	MPC	PJ3 pin function control register	PJ3PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C280h	SYSTEM	Deep standby control register	DPSBYCR	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C282h	SYSTEM	Deep standby interrupt enable register 0	DPSIER0	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C283h	SYSTEM	Deep standby interrupt enable register 1	DPSIER1	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C284h	SYSTEM	Deep standby interrupt enable register 2	DPSIER2	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C285h	SYSTEM	Deep standby interrupt enable register 3	DPSIER3	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C286h	SYSTEM	Deep standby interrupt flag register 0	DPSIFR0	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C287h	SYSTEM	Deep standby interrupt flag register 1	DPSIFR1	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C288h	SYSTEM	Deep standby interrupt flag register 2	DPSIFR2	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C289h	SYSTEM	Deep standby interrupt flag register 3	DPSIFR3	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C28Ah	SYSTEM	Deep standby interrupt edge register 0	DPSIEGR0	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C28Bh	SYSTEM	Deep standby interrupt edge register 1	DPSIEGR1	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C28Ch	SYSTEM	Deep standby interrupt edge register 2	DPSIEGR2	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C28Dh	SYSTEM	Deep standby interrupt edge register 3	DPSIEGR3	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C290h	SYSTEM	Reset status register 0	RSTSR0	8	8	4, 5 PCLKB	2, 3 ICLK	Resets
0008 C291h	SYSTEM	Reset status register 1	RSTSR1	8	8	4, 5 PCLKB	2, 3 ICLK	
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	
0008 C296h	FLASH	Flash write erase protection register	FWEPROR	8	8	4, 5 PCLKB	2, 3 ICLK	ROM
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	
0008 C29Ah	SYSTEM	Voltage monitoring 1 circuit control register 0	LVD1CR0	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C29Bh	SYSTEM	Voltage monitoring 2 circuit control register 0	LVD2CR0	8	8	4, 5 PCLKB	2, 3 ICLK	
0008 C2A0h to 0008 C2BFh	SYSTEM	Deep standby backup register 0 to 31	DPSBKR0 to 31	8	8	4, 5 PCLKB	2, 3 ICLK	Low Power Consumption
0008 C300h	ICU	Group 0 interrupt source register	GRP00	32	32	1 to 2PCLKB	2 ICLK	ICUb
0008 C304h	ICU	Group 1 interrupt source register	GRP01	32	32	1 to 2PCLKB	2 ICLK	
0008 C308h	ICU	Group 2 interrupt source register	GRP02	32	32	1 to 2PCLKB	2 ICLK	
0008 C30Ch	ICU	Group 3 interrupt source register	GRP03	32	32	1 to 2PCLKB	2 ICLK	
0008 C310h	ICU	Group 4 interrupt source register	GRP04	32	32	1 to 2PCLKB	2 ICLK	
0008 C314h	ICU	Group 5 interrupt source register	GRP05	32	32	1 to 2PCLKB	2 ICLK	
0008 C318h	ICU	Group 6 interrupt source register	GRP06	32	32	1 to 2PCLKB	2 ICLK	
0008 C330h	ICU	Group 12 interrupt source register	GRP12	32	32	1 to 2PCLKB	2 ICLK	
0008 C340h	ICU	Group 0 interrupt enable register	GEN00	32	32	1 to 2PCLKB	2 ICLK	

5.3 AC Characteristics

Table 5.8 Operation Frequency Value (High-Speed Operating Mode)

Conditions: $V_{CC} = AV_{CC0} = V_{REFH} = V_{CC_USB} = V_{BATT} = 2.7$ to 3.6 V, $V_{REFH0} = 2.7$ V to AV_{CC0} ,
 $V_{SS} = AV_{SS0} = V_{REFL}/V_{REFL0} = V_{SS_USB} = 0$ V, $T_a = T_{opr}$

Item			Symbol	Min.	Typ.	Max.	Unit
Operation frequency	System clock (ICLK)		f	—*1	—	100	MHz
	Peripheral module clock (PCLKA)			—*1	—	100	
	Peripheral module clock (PCLKB)			—*2	—	50	
	FlashIF clock (FCLK)			—*3	—	50	
	External bus clock (BCLK)	Packages with 177 to 144 pins		—	—	100	
		Packages with 100 pins or less		—	—	50	
	BCLK pin output	Packages with 177 to 144 pins		—	—	50	
		Packages with 100 pins or less		—	—	25	
	SDRAM clock (SDCLK)	Packages with 177 to 144 pins only		—	—	50	
	SDCLK pin output	Packages with 177 to 144 pins only		—	—	50	
	USB clock (UCLK)			—	—	48	
IEBUS clock (IECLK)		—	—	44.03			

Note 1. The ICLK and PCLKA frequencies must be the same and at least 12.5 MHz if the Ethernet controller is in use

Note 2. The PCLKB must run at a frequency of at least 24 MHz if the USB is in use.

Note 3. The FCLK must run at a frequency of at least 4 MHz when changing the ROM or E2 DataFlash memory contents.

Table 5.9 Operation Frequency Value (Low-Speed Operating Mode 1)

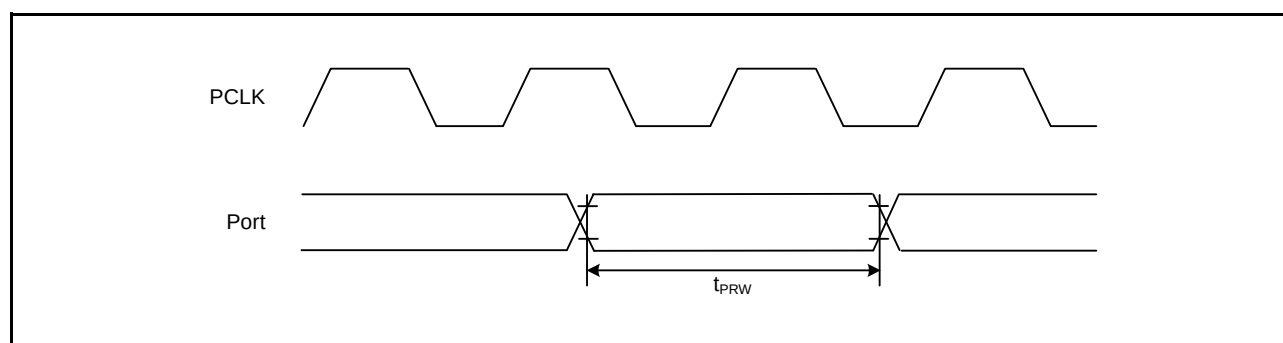
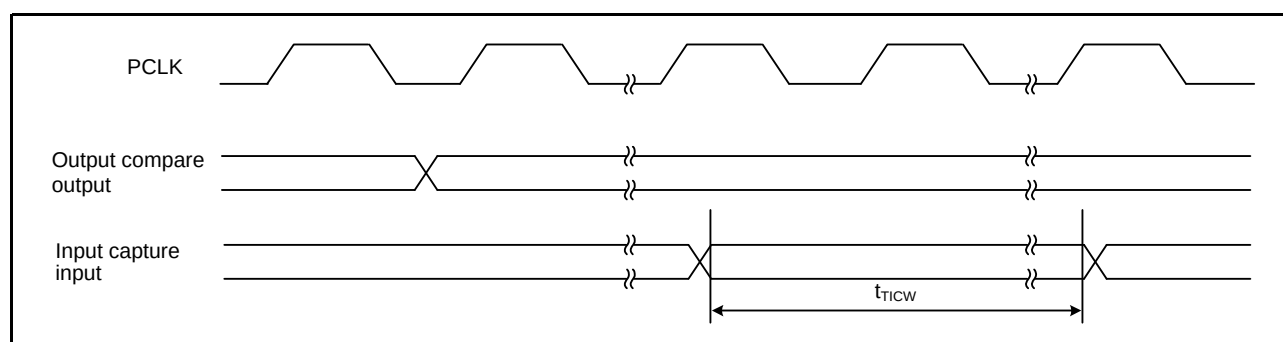
Conditions: $V_{CC} = AV_{CC0} = V_{REFH} = V_{CC_USB} = V_{BATT} = 2.7$ to 3.6 V, $V_{REFH0} = 2.7$ V to AV_{CC0} ,
 $V_{SS} = AV_{SS0} = V_{REFL}/V_{REFL0} = V_{SS_USB} = 0$ V, $T_a = T_{opr}$

Item			Symbol	Min.	Typ.	Max.	Unit
Operation frequency	System clock (ICLK)		f	—	—	1	MHz
	Peripheral module clock (PCLKA)			—	—	1	
	Peripheral module clock (PCLKB)			—	—	1	
	FlashIF clock (FCLK)			—	—	1	
	External bus clock (BCLK)	Packages with 177 to 144 pins		—	—	1	
		Packages with 100 pins or less		—	—	1	
	BCLK pin output	Packages with 177 to 144 pins		—	—	1	
		Packages with 100 pins or less		—	—	1	
	SDRAM clock (SDCLK)	Packages with 177 to 144 pins only		—	—	1	
	SDCLK pin output	Packages with 177 to 144 pins only		—	—	1	
	USB clock (UCLK)			—	—	1	
	IEBUS clock (IECLK)			—	—	1	

Table 5.26 Timing of On-Chip Peripheral Modules (8)

Conditions: VCC = AVCC0 = VREFH = VCC_USB = 2.7 to 3.6V, VREFH0 = 2.7V to AVCC0,
VSS = AVSS0 = VREFL/VREFL0 = VSS_USB = 0V, PIXCLK = 27MHz, T_a = T_{opr}

	Item	Symbol	min	typ	max	Unit	Test Conditions
PDC	VSXNC/HSXNC input setup time	t _{SYNCSXNCSETUP}	10	—	—	ns	Figure 5.58
	VSXNC/HSXNC input hold time	t _{SYNCSXNCHOLD}	5	—	—	ns	
	PIXD input setup time	t _{DATASXNCSETUP}	10	—	—	ns	
	PIXD input hold time	t _{DATASXNCHOLD}	5	—	—	ns	
	PIXCLK input cycle time	t _{PIXcyc}	37	—	1000	ns	Figure 5.59
	PIXCLK input pulse width high level	t _{PIXH}	10	—	—	ns	
	PIXCLK input pulse width low level	t _{PIXL}	10	—	—	ns	
	PCKO pin output cycle time	t _{PCKcyc}	40	—	1000	ns	Figure 5.60
	PCKO pin output high level pulse width	t _{PCKH}	13	—	—	ns	
	PCKO pin output low level pulse width	t _{PCKL}	13	—	—	ns	
	PCKO pin output rising time	t _{PCKr}	—	—	5	ns	
	PCKO pin output falling time	t _{PCKf}	—	—	5	ns	

**Figure 5.34 I/O Port Input Timing****Figure 5.35 MTU Input/Output Timing**

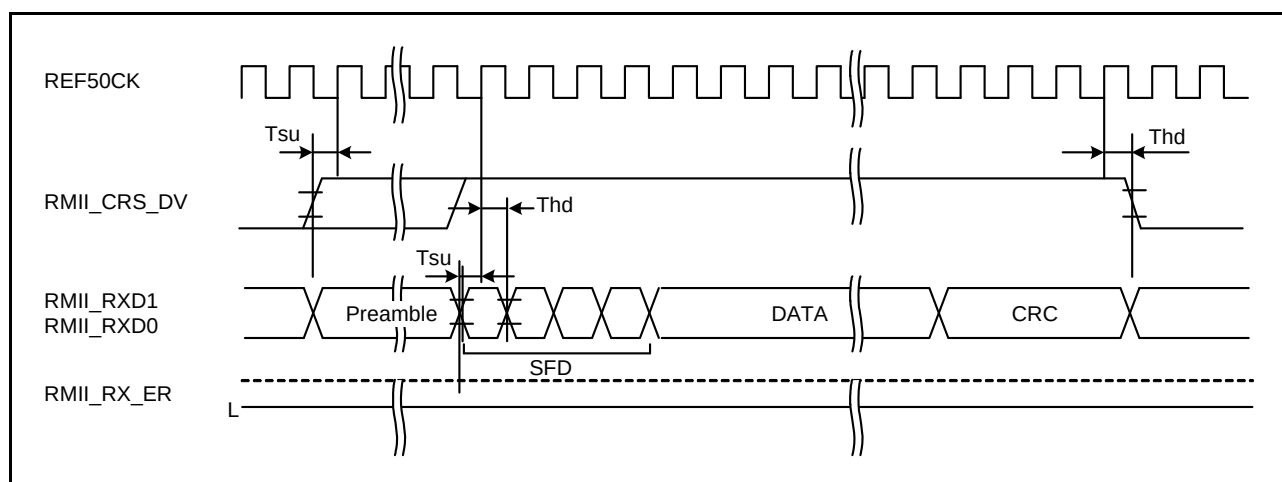


Figure 5.50 RMII Reception Timing (Normal Operation)

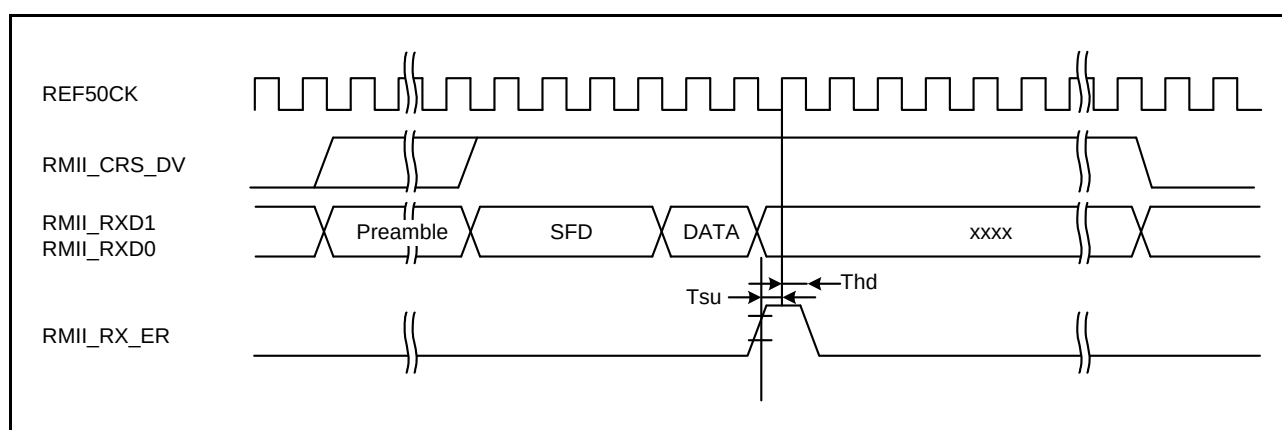


Figure 5.51 RMII Reception Timing (Error Occurrence)

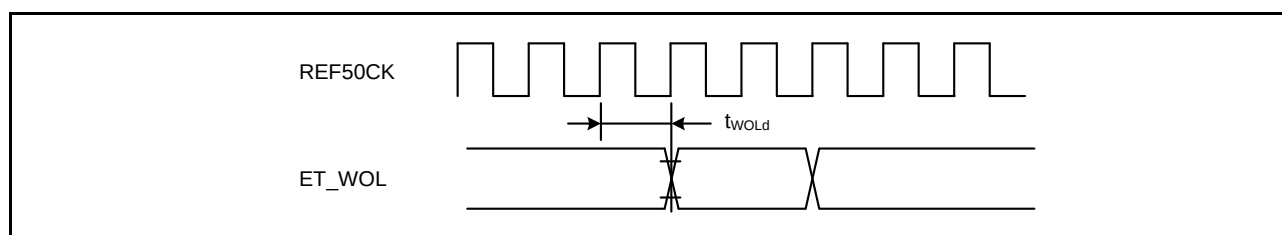


Figure 5.52 WOL Output Timing (RMII)

5.5 A/D Conversion Characteristics

Table 5.28 10-Bit A/D Conversion CharacteristicsConditions: $V_{CC} = AV_{CC0} = V_{REFH} = V_{CC_USB} = 2.7$ to 3.6 V, $V_{REFH0} = 2.7$ V to AV_{CC0} $V_{SS} = AV_{SS0} = V_{REFL}/V_{REFL0} = V_{SS_USB} = 0$ V $PCLK = 8$ to 50 MHz $T_a = T_{opr}$

Item			Min.	Typ.	Max.	Unit	Test Conditions
Resolution			—	—	10	Bit	
Conversion time*1 (Operation at PCLK = 50 MHz)	With 0.1-μF external capacitor	When the capacitor is charged enough*2	3.0 (2.5)*3	—	—	μs	Sampling in 125 states
	Without 0.1-μF external capacitor	Permissible signal source impedance (max.) = 1.0 kΩ, VCC ≥ 3.0 V	1.5 (1.0)*3	—	—		Sampling in 50 states
		Permissible signal source impedance (max.) = 1.0 kΩ, VCC ≥ 2.7 V	3.5 (3.0)*3	—	—		Sampling in 150 states
		Permissible signal source impedance (max.) = 5.0 kΩ, VCC ≥ 3.0 V	2.0 (1.5)*3	—	—		Sampling in 75 states
		Permissible signal source impedance (max.) = 5.0 kΩ, VCC ≥ 2.7 V	4.0 (3.5)*3	—	—		Sampling in 175 states
Analog input capacitance			—	—	6.0	pF	
Offset error			—	±1.5	±3.0	LSB	
Full-scale error			—	±1.5	±3.0	LSB	
Quantization error			—	±0.5	—	LSB	
Absolute accuracy			—	±1.5	±3.0	LSB	
DNL differential nonlinearity error			—	±0.5	±1.0	LSB	
INL integral nonlinearity error			—	±1.5	±3.0	LSB	

Note: The above specification values apply when there is no access to the external bus during A/D conversion. If access proceeds during A/D conversion, values may not fall within the above ranges.

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

Note 2. The scanning is not supported.

Note 3. The value in parentheses indicates the sampling time.

Table 5.29 12-Bit A/D Conversion CharacteristicsConditions: $V_{CC} = AVCC0 = VREFH = VCC_USB = 2.7$ to 3.6 V, $VREFH0 = 2.7$ V to $AVCC0$ $VSS = AVSS0 = VREFL/VREFL0 = VSS_USB = 0$ V $PCLK = 8$ to 50 MHz $T_a = T_{opr}$

Item			Min.	Typ.	Max.	Unit	Test Conditions
Resolution			—	—	12	Bit	
Conversion time*1 (Operation at PCLK = 50 MHz)	AN0 to AN7	Permissible signal source impedance (max.) = 1.0 kΩ	1.0 (0.4)*2	—	—	μs	Sampling in 20 states
	Other channels	Permissible signal source impedance (max.) = 1.0 kΩ, AVCC ≥ 3.0 V	2.0 (1.4)*2	—	—	μs	Sampling in 70 states
		Permissible signal source impedance (max.) = 1.0 kΩ, AVCC ≥ 2.7 V	5.6 (5.0)*2	—	—	μs	Sampling in 250 states
Analog input capacitance			—	—	30	pF	
Offset error			—	±2.0	±7.5	LSB	
Full-scale error			—	±2.0	±7.5	LSB	
Quantization error			—	±0.5	—	LSB	
Absolute accuracy			—	±2.5	±8.0	LSB	
DNL differential nonlinearity error			—	±2.0	±4.0	LSB	
INL integral nonlinearity error			—	±2.0	±4.0	LSB	

Note: The above specification values apply when there is no access to the external bus during A/D conversion. If access proceeds during A/D conversion, values may not fall within the above ranges.

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

Note 2. The value in parentheses indicates the sampling time.

Table 5.30 A/D Internal Reference Voltage CharacteristicsConditions: $V_{CC} = AVCC0 = VREFH = VCC_USB = 2.7$ to 3.6 V, $VREFH0 = 2.7$ V to $AVCC0$ $VSS = AVSS0 = VREFL/VREFL0 = VSS_USB = 0$ V $PCLK = 8$ to 50 MHz $T_a = T_{opr}$

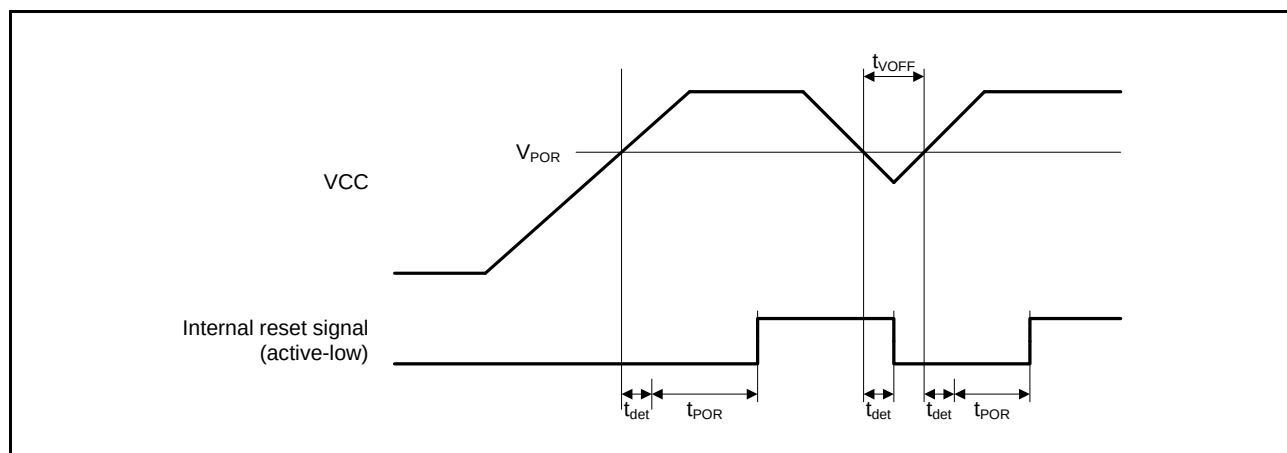
Item	Min.	Typ.	Max.	Unit	Test Conditions
A/D Internal reference voltage	1.45	1.50	1.55	V	

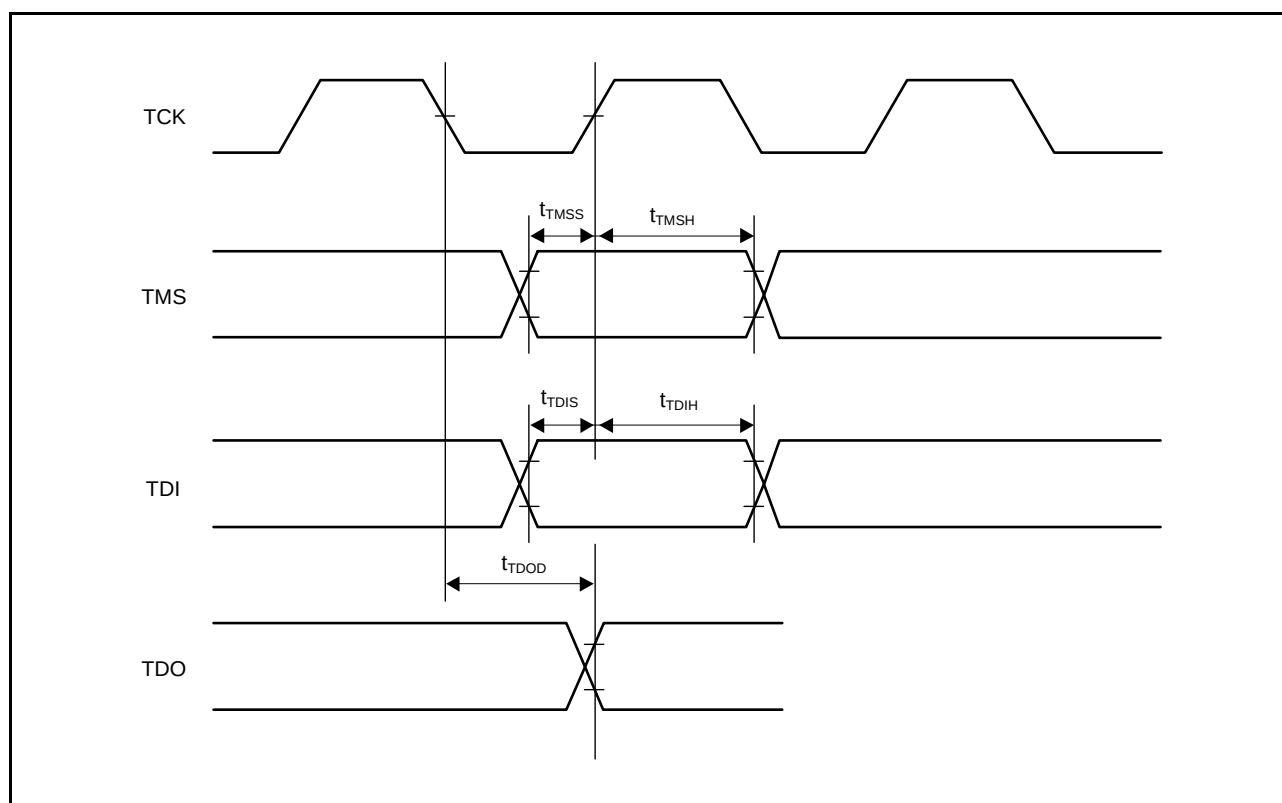
5.8 Power-on Reset Circuit and Voltage Detection Circuit Characteristics

Table 5.33 Power-on Reset Circuit and Voltage Detection Circuit CharacteristicsConditions: $V_{CC} = AV_{CC0} = V_{REFH} = V_{CC_USB} = V_{BATT} = 2.7$ to 3.6 V, $V_{REFH0} = 2.7$ V to AV_{CC0} $V_{SS} = AV_{SS0} = V_{REFL}/V_{REFL0} = V_{SS_USB} = 0$ V $T_a = T_{opr}$

Item			Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Voltage detection level	Power-on reset (POR)	Low power consumption function disabled	V _{POR}	2.5	2.6	2.7	V	Figure 5.63
		Low power consumption function enabled		2.0	2.35	2.7		
	Voltage detection circuit (LVD0)		V _{det0}	2.7	2.80	2.9		Figure 5.64
	Voltage detection circuit (LVD1)		V _{det1_A}	2.75	2.95	3.15		Figure 5.65
	Voltage detection circuit (LVD2)		V _{det2_A}	2.75	2.95	3.15		Figure 5.66
Internal reset time	Power-on reset time		t _{POR}	—	4.6	—	ms	Figure 5.63
	LVD0 reset time		t _{LVD0}	—	4.6	—		Figure 5.64
	LVD1 reset time		t _{LVD1}	—	0.9	—		Figure 5.65
	LVD2 reset time		t _{LVD2}	—	0.9	—		Figure 5.66
Minimum VCC down time			t _{VOFF}	200	—	—	μs	Figure 5.63 and Figure 5.64
Response delay time			t _{det}	—	—	200	μs	Figure 5.63 to Figure 5.66
LVD operation stabilization time (after LVD is enabled)			Td _(E-A)	—	—	3	μs	Figure 5.65 and Figure 5.66
Hysteresis width (LVD1 and LVD2)			V _{LVH}	—	80	—	mV	

Note: The minimum VCC down time indicates the time when VCC is below the minimum value of voltage detection levels V_{POR} , V_{det1} , and V_{det2} for the POR/ LVD.

**Figure 5.63 Power-on Reset Timing**

**Figure 5.72** Boundary Scan Input/Output Timing

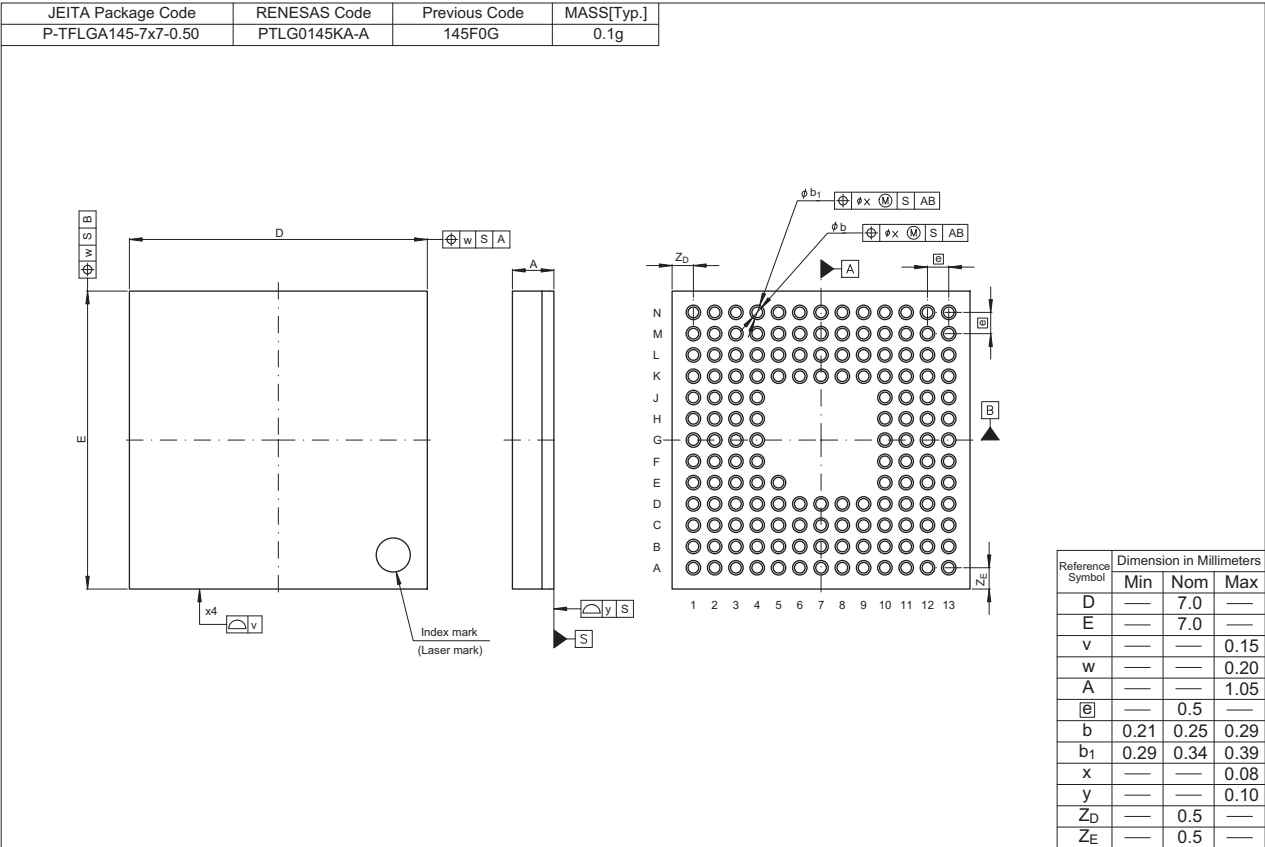


Figure D 145-pin TFLGA (PTLG0145KA-A)