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

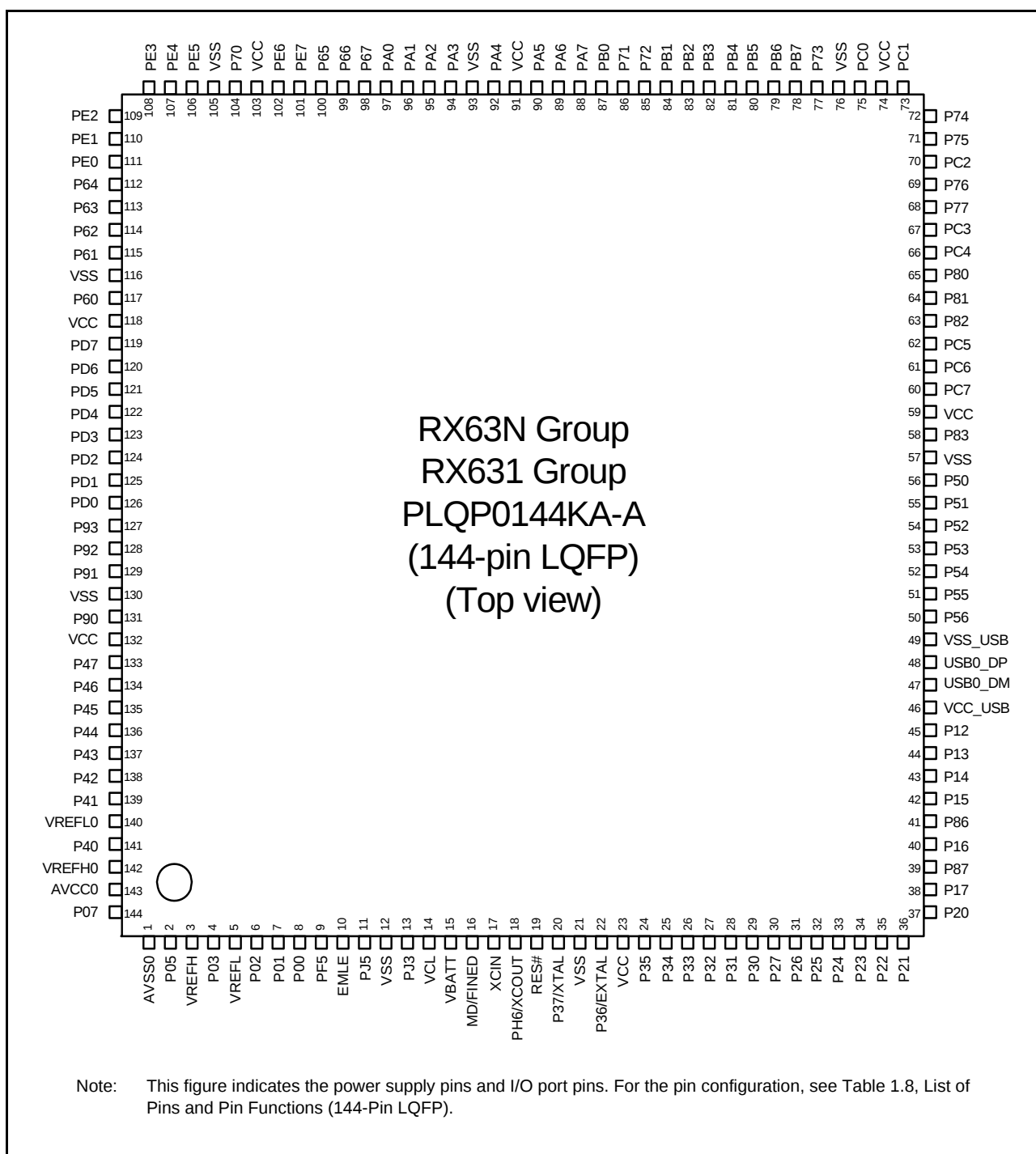
### Applications of "[Embedded - Microcontrollers](#)"

#### Details

|                            |                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status             | Not For New Designs                                                                                                                                                             |
| Core Processor             | RX                                                                                                                                                                              |
| Core Size                  | 32-Bit Single-Core                                                                                                                                                              |
| Speed                      | 100MHz                                                                                                                                                                          |
| Connectivity               | CANbus, I <sup>2</sup> C, LINbus, SCI, SPI, USB                                                                                                                                 |
| Peripherals                | DMA, LVD, POR, PWM, WDT                                                                                                                                                         |
| Number of I/O              | 30                                                                                                                                                                              |
| Program Memory Size        | 256KB (256K x 8)                                                                                                                                                                |
| Program Memory Type        | FLASH                                                                                                                                                                           |
| EEPROM Size                | 32K x 8                                                                                                                                                                         |
| RAM Size                   | 64K x 8                                                                                                                                                                         |
| Voltage - Supply (Vcc/Vdd) | 2.7V ~ 3.6V                                                                                                                                                                     |
| Data Converters            | A/D 8x12b                                                                                                                                                                       |
| Oscillator Type            | Internal                                                                                                                                                                        |
| Operating Temperature      | -40°C ~ 85°C (TA)                                                                                                                                                               |
| Mounting Type              | Surface Mount                                                                                                                                                                   |
| Package / Case             | 48-LQFP                                                                                                                                                                         |
| Supplier Device Package    | 48-LQFP (7x7)                                                                                                                                                                   |
| Purchase URL               | <a href="https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f5631mddfl-v0">https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f5631mddfl-v0</a> |

**Table 1.3 List of Products (6/8)**

| Group                | Part No.     | Package        | ROM Capacity | RAM Capacity | E2 Data Flash | Operating Frequency (Max.) | Operating Temp. Range |
|----------------------|--------------|----------------|--------------|--------------|---------------|----------------------------|-----------------------|
| RX631<br>(D version) | R5F56317CDFB | PLQP0144KA-A   | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56317DDFB | PLQP0144KA-A   | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631ECDLJ | PTLG0100JA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631EDDLJ | PTLG0100JA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631DCDLJ | PTLG0100JA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631DDDLJ | PTLG0100JA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631BCDLJ | PTLG0100JA-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631BDDLJ | PTLG0100JA-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631ACDLJ | PTLG0100JA-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631ADDLJ | PTLG0100JA-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56318CDLJ | PTLG0100JA-A   | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56318DDLJ | PTLG0100JA-A   | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56317CDLJ | PTLG0100JA-A   | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56317DDLJ | PTLG0100JA-A   | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56316CDLJ | PTLG0100JA-A   | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56316DDLJ | PTLG0100JA-A   | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631FHDFP | PLQP0100KB-A   | 2 Mbytes     | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631FDDFP | PLQP0100KB-A   | 2 Mbytes     | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631KHDFP | PLQP0100KB-A*1 | 2 Mbytes     | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631KDDFP | PLQP0100KB-A   | 2 Mbytes     | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631ECDFP | PLQP0100KB-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631EDDFP | PLQP0100KB-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631JHDFP | PLQP0100KB-A*1 | 1.5 Mbytes   | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631JDDFP | PLQP0100KB-A   | 1.5 Mbytes   | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631GHDFP | PLQP0100KB-A*1 | 1.5 Mbytes   | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631GDDFP | PLQP0100KB-A   | 1.5 Mbytes   | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631DCDFP | PLQP0100KB-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631DDDFP | PLQP0100KB-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631YHDFP | PLQP0100KB-A   | 1 Mbyte      | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631YDDFP | PLQP0100KB-A   | 1 Mbyte      | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631WHDFP | PLQP0100KB-A   | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631WDDFP | PLQP0100KB-A   | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631BCDFP | PLQP0100KB-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631BDDFP | PLQP0100KB-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631ACDFP | PLQP0100KB-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631ADDFP | PLQP0100KB-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56318CDFP | PLQP0100KB-A   | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56318DDFP | PLQP0100KB-A   | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56317CDFP | PLQP0100KB-A   | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56317DDFP | PLQP0100KB-A   | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56316CDFP | PLQP0100KB-A   | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F56316DDFP | PLQP0100KB-A   | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631PCDFM | PLQP0064KB-A   | 512 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631PDDFM | PLQP0064KB-A   | 512 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F5631NCDFM | PLQP0064KB-A   | 384 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |

**Figure 1.7 Pin Assignment (144-Pin LQFP)**

**Table 1.6 List of Pin and Pin Functions (176-Pin LQFP) (3/5)**

| Pin Number | Power Supply<br>Clock System<br>Control | I/O Port | Bus<br>EXDMAC<br>SDRAMC | Timer<br>(MTU, TPU, TMR, PPG,<br>RTC, POE)           | Communications<br>(ETHERC, SCIC, SCID,<br>RSPI, RIIC, CAN, IEB,<br>USB, and PDC) | Interrupt | S12AD,<br>AD, DA |
|------------|-----------------------------------------|----------|-------------------------|------------------------------------------------------|----------------------------------------------------------------------------------|-----------|------------------|
| 72         |                                         | P50      | WR0#/WR#                |                                                      | TXD2/SMOSI2/SSDA2/<br>SSLB1                                                      |           |                  |
| 73         | VSS                                     |          |                         |                                                      |                                                                                  |           |                  |
| 74         |                                         | P83      | EDACK1                  | MTIOC4C                                              | ET_CRS/RMII_CRS_DV/<br>CTS10#/RTS10#/SS10#                                       |           |                  |
| 75         | VCC                                     |          |                         |                                                      |                                                                                  |           |                  |
| 76         |                                         | PC7      | A23/CS0#                | MTIOC3A/MTCLKB/<br>TIOCB6/TMO2/PO31                  | ET_COL/TXD8/SMOSI8/<br>SSDA8/MISOA                                               | IRQ14     |                  |
| 77         |                                         | PC6      | A22/CS1#                | MTIOC3C/MTCLKA/<br>TIOCA6/TMCI2/PO30                 | ET_ETXD3/RXD8/<br>SMISO8/SSCL8/MOSIA                                             | IRQ13     |                  |
| 78         |                                         | PC5      | A21/CS2#/<br>WAIT#      | MTIOC3B/MTCLKD/<br>TIOCD6/TCLKF/TMRI2/<br>PO29       | ET_ETXD2/SCK8/<br>RSPCKA                                                         |           |                  |
| 79         |                                         | P82      | EDREQ1                  | MTIOC4A/PO28                                         | ET_ETXD1/RMII_TXD1/<br>TXD10/SMOSI10/SSDA10                                      |           |                  |
| 80         |                                         | P81      | EDACK0                  | MTIOC3D/PO27                                         | ET_ETXD0/RMII_TXD0/<br>RXD10/SMISO10/SSCL10                                      |           |                  |
| 81         |                                         | P80      | EDREQ0                  | MTIOC3B/PO26                                         | ET_TX_EN/<br>RMII_TXD_EN/SCK10                                                   |           |                  |
| 82         |                                         | PC4      | A20/CS3#                | MTIOC3D/MTCLKC/<br>TIOCC6/TCLKE/TMCI1/<br>PO25/POE0# | ET_TX_CLK/SCK5/<br>CTS8#/RTS8#/SS8#/<br>SSLA0                                    |           |                  |
| 83         |                                         | PC3      | A19                     | MTIOC4D/TCLKB/PO24                                   | ET_TX_ER/TXD5/<br>SMOSI5/SSDA5/IETXD                                             |           |                  |
| 84         |                                         | P77      | CS7#                    | PO23                                                 | ET_RX_ER/RMII_RX_ER/<br>TXD11/SMOSI11/SSDA11                                     |           |                  |
| 85         |                                         | P76      | CS6#                    | PO22                                                 | ET_RX_CLK/REF50CK/<br>RXD11/SMISO11/SSCL11                                       |           |                  |
| 86         |                                         | PC2      | A18                     | MTIOC4B/TCLKA/PO21                                   | ET_RX_DV/RXD5/<br>SMISO5/SSCL5/SSLA3/<br>IERXD                                   |           |                  |
| 87         |                                         | P75      | CS5#                    | PO20                                                 | ET_ERXD0/RMII_RXD0/<br>SCK11                                                     |           |                  |
| 88         |                                         | P74      | CS4#                    | PO19                                                 | ET_ERXD1/RMII_RXD1/<br>CTS11#/RTS11#/SS11#                                       |           |                  |
| 89         |                                         | PC1      | A17                     | MTIOC3A/TCLKD/PO18                                   | ET_ERXD2/SCK5/SSLA2/<br>SDA3                                                     | IRQ12     |                  |
| 90         | VCC                                     |          |                         |                                                      |                                                                                  |           |                  |
| 91         |                                         | PC0      | A16                     | MTIOC3C/TCLKC/PO17                                   | ET_ERXD3/CTS5#/<br>RTS5#/SS5#/SSLA1/<br>SCL3                                     | IRQ14     |                  |
| 92         | VSS                                     |          |                         |                                                      |                                                                                  |           |                  |
| 93         |                                         | P73      | CS3#                    | PO16                                                 | ET_WOL                                                                           |           |                  |
| 94         |                                         | PB7      | A15                     | MTIOC3B/TIOCB5/PO31                                  | ET_CRS/RMII_CRS_DV/<br>TXD9/SMOSI9/SSDA9                                         |           |                  |
| 95         |                                         | PB6      | A14                     | MTIOC3D/TIOCA5/PO30                                  | ET_ETXD1/RMII_TXD1/<br>RXD9/SMISO9/SSCL9                                         |           |                  |
| 96         |                                         | PB5      | A13                     | MTIOC2A/MTIOC1B/<br>TIOCB4/TMRI1/PO29/<br>POE1#      | ET_ETXD0/RMII_TXD0/<br>SCK9                                                      |           |                  |
| 97         |                                         | PB4      | A12                     | TIOCA4/PO28                                          | ET_TX_EN/<br>RMII_TXD_EN/CTS9#/<br>RTS9#/SS9#                                    |           |                  |
| 98         |                                         | PB3      | A11                     | MTIOC0A/MTIOC4A/<br>TIOCD3/TCLKD/TMO0/<br>PO27/POE3# | ET_RX_ER/RMII_RX_ER/<br>SCK4/SCK6                                                |           |                  |
| 99         |                                         | PB2      | A10                     | TIOCC3/TCLKC/PO26                                    | ET_RX_CLK/REF50CK/<br>CTS4#/RTS4#/CTS6#/<br>RTS6#/SS4#/SS6#                      |           |                  |

Table 1.7 List of Pins and Pin Functions (145-Pin TFLGA) (3/5)

| Pin No.<br>145-pin<br>TFLGA | Power Supply<br>Clock<br>System Control | I/O Port | Bus<br>EXDMAC<br>SDRAMC | Timers<br>(MTU, TPU, TMR, PPG,<br>RTC, POE)          | Communications<br>(ETHERC, SCId, SCId,<br>RSPI, RIIC, CAN, IEB,<br>USB, and PDC) | Interrupt | S12AD<br>AD<br>DA |
|-----------------------------|-----------------------------------------|----------|-------------------------|------------------------------------------------------|----------------------------------------------------------------------------------|-----------|-------------------|
| H12                         |                                         | PB0      | A8                      | MTIOC5W/TIOCA3/PO24                                  | RXD4/RXD6/SMISO4/<br>SMISO6/SSCL4/SSCL6/<br>RSPCKA/T_ERXD1/<br>RMII_RXD1         | IRQ12     |                   |
| H13                         |                                         | PA7      | A7                      | TIOCB2/PO23                                          | MISOA/ET_WOL                                                                     |           |                   |
| J1                          | TRST#                                   | P34      |                         | MTIOC0A/TMCI3/PO12/<br>POE2#                         | SCK6/SCK0/<br>USB0_DPRPD                                                         | IRQ4      |                   |
| J2                          |                                         | P33      |                         | MTIOC0D/TIOCD0/<br>TMRI3/PO11/POE3#                  | RXD6/RXD0/SMISO6/<br>SMISO0/SSCL6/SSCL0/<br>CRX0/PCKO                            | IRQ3-DS   |                   |
| J3                          |                                         | P32      |                         | MTIOC0C/TIOCC0/<br>TMO3/PO10/RTCOU7/<br>RTIC12       | TXD6/TXD0/SMOSI6/<br>SMOSI0/SSDA6/SSDA0/<br>CTX0/USB0_VBUSEN/<br>VSYNC           | IRQ2-DS   |                   |
| J4                          | TDI                                     | P30      |                         | MTIOC4B/TMRI3/PO8/<br>RTIC10/POE8#                   | RXD1/SMISO1/SSCL1/<br>MISOB/USB0_DRPD                                            | IRQ0-DS   |                   |
| J10                         |                                         | PB3      | A11                     | MTIOC0A/MTIOC4A/<br>TIOCD3/TCLKD/TMO0/<br>PO27/POE3# | SCK4/SCK6/ET_RX_ER/<br>RMII_RX_ER                                                |           |                   |
| J11                         |                                         | PB4      | A12                     | TIOCA4/PO28                                          | CTS9#/RTS9#/SS9#/<br>ET_TX_EN/RMII_TXD_EN                                        |           |                   |
| J12                         |                                         | PB2      | A10                     | TIOCC3/TCLKC/PO26                                    | CTS4#/RTS4#/CTS6#/<br>RTS6#/SS4#/SS6#/<br>ET_RX_CLK/REF50CK                      |           |                   |
| J13                         |                                         | PB1      | A9                      | MTIOC0C/MTIOC4C/<br>TIOCB3/TMCI0/PO25                | TXD4/TXD6/SMOSI4/<br>SMOSI6/SSDA4/SSDA6/<br>ET_ERXD0/RMII_RXD0                   | IRQ4-DS   |                   |
| K1                          | TCK/FINEC                               | P27      | CS7#                    | MTIOC2B/TMCI3/PO7                                    | SCK1/RSPCKB                                                                      |           |                   |
| K2                          | TDO                                     | P26      | CS6#                    | MTIOC2A/TMO1/PO6                                     | TXD1/CTS3#/RTS3#/<br>SMOSI1/SS3#/SSDA1/<br>MOSIB                                 |           |                   |
| K3                          | TMS                                     | P31      |                         | MTIOC4D/TMCI2/PO9/<br>RTIC11                         | CTS1#/RTS1#/SS1#/<br>SSLB0/USB0_DPUPE                                            | IRQ1-DS   |                   |
| K4                          |                                         | P15      |                         | MTIOC0B/MTCLKB/<br>TIOCB2/TCLKB/TMCI2/<br>PO13       | RXD1/SCK3/SMISO1/<br>SSCL1/CRX1-DS/PIXD0                                         | IRQ5      |                   |
| K5                          | TRDATA2                                 | P54      | ALE/EDACK0              | MTIOC4B/TMCI1                                        | CTS2#/RTS2#/SS2#/<br>CTX1/ET_LINKSTA                                             |           |                   |
| K6                          |                                         | P53*1    | BCLK                    |                                                      |                                                                                  |           |                   |
| K7                          |                                         | P51      | WR1#/BC1#/<br>WAIT#     |                                                      | SCK2/SSLB2                                                                       |           |                   |
| K8                          | VCC                                     |          |                         |                                                      |                                                                                  |           |                   |
| K9                          | TRDATA0                                 | P80      | EDREQ0                  | MTIOC3B/PO26                                         | SCK10/ET_TX_EN/<br>RMII_TXD_EN                                                   |           |                   |
| K10                         |                                         | P76      | CS6#                    | PO22                                                 | RXD11/SMISO11/SSCL11/<br>ET_RX_CLK/REF50CK                                       |           |                   |
| K11                         |                                         | PB7      | A15                     | MTIOC3B/TIOCB5/<br>PO31                              | TXD9/SMOSI9/SSDA9/<br>ET_CRS/RMII_CRS_DV                                         |           |                   |
| K12                         |                                         | PB6      | A14                     | MTIOC3D/TIOCA5/<br>PO30                              | RXD9/SMISO9/SSCL9/<br>ET_ETXD1/RMII_TXD1                                         |           |                   |
| K13                         |                                         | PB5      | A13                     | MTIOC2A/MTIOC1B/<br>TIOCB4/TMRI1/PO29/<br>POE1#      | SCK9/ET_ETXD0/<br>RMII_TXD0                                                      |           |                   |
| L1                          |                                         | P25      | CS5#/EDACK1             | MTIOC4C/MTCLKB/<br>TIOCA4/PO5                        | RXD3/SMISO3/SSCL3/<br>USB0_DPRPD/HSYNC                                           |           | ADTRG0#           |
| L2                          |                                         | P23      | EDACK0                  | MTIOC3D/MTCLKD/<br>TIOCD3/PO3                        | TXD3/CTS0#/RTS0#/<br>SMOSI3/SS0#/SSDA3/<br>USB0_DPUPE/PIXD7                      |           |                   |

**Table 1.10 List of Pins and Pin Functions (100-Pin LQFP) (2/4)**

| Pin No.<br>100-pin<br>LQFP | Power Supply<br>Clock<br>System Control | I/O Port | Bus<br>EXDMAC       | Timers<br>(MTU, TPU, TMR, PPG,<br>RTC, POE)          | Communications<br>(ETHERC, SCIC, SCID,<br>RSPI, RIIC, CAN, IEB,<br>USB) | Interrupt | S12AD<br>AD<br>DA |
|----------------------------|-----------------------------------------|----------|---------------------|------------------------------------------------------|-------------------------------------------------------------------------|-----------|-------------------|
| 31                         |                                         | P15      |                     | MTIOC0B/MTCLKB/<br>TIOCB2/TCLKB/TMC12/<br>PO13       | RXD1/SCK3/SMISO1/<br>SSCL1/CRX1-DS                                      | IRQ5      |                   |
| 32                         |                                         | P14      |                     | MTIOC3A/MTCLKA/<br>TIOCB5/TCLKA/TMR12/<br>PO15       | CTS1#/RTS1#/SS1#/<br>CTX1/USB0_DPUPE/<br>USB0_OVRCURA                   | IRQ4      |                   |
| 33                         |                                         | P13      |                     | MTIOC0B/TIOCA5/<br>TMO3/PO13                         | TXD2/SMOSI2/SSDA2/<br>SDA0[FM+]                                         | IRQ3      | ADTRG#            |
| 34                         |                                         | P12      |                     | TMC11                                                | RXD2/SMISO2/SSCL2/<br>SCL0[FM+]                                         | IRQ2      |                   |
| 35                         | VCC_USB                                 |          |                     |                                                      |                                                                         |           |                   |
| 36                         |                                         |          |                     |                                                      | USB0_DM                                                                 |           |                   |
| 37                         |                                         |          |                     |                                                      | USB0_DP                                                                 |           |                   |
| 38                         | VSS_USB                                 |          |                     |                                                      |                                                                         |           |                   |
| 39                         |                                         | P55      | WAIT#/<br>EDREQ0    | MTIOC4D/TMO3                                         | CRX1/ET_EXOUT                                                           | IRQ10     |                   |
| 40                         |                                         | P54      | ALE/EDACK0          | MTIOC4B/TMC11                                        | CTS2#/RTS2#/SS2#/<br>CTX1/ET_LINKSTA                                    |           |                   |
| 41                         |                                         | P53*2    | BCLK                |                                                      |                                                                         |           |                   |
| 42                         |                                         | P52      | RD#                 |                                                      | RXD2/SMISO2/SSCL2/<br>SSLB3                                             |           |                   |
| 43                         |                                         | P51      | WR1#/BC1#/<br>WAIT# |                                                      | SCK2/SSLB2                                                              |           |                   |
| 44                         |                                         | P50      | WR0#/WR#            |                                                      | TXD2/SMOSI2/SSDA2/<br>SSLB1                                             |           |                   |
| 45                         |                                         | PC7      | A23/CS0#            | MTIOC3A/MTCLKB/<br>TMO2/PO31                         | TXD8/SMOSI8/SSDA8/<br>MISOA/ET_COL                                      | IRQ14     |                   |
| 46                         |                                         | PC6      | A22/CS1#            | MTIOC3C/MTCLKA/<br>TMC12/PO30                        | RXD8/SMISO8/SSCL8/<br>MOSIA/ET_ETXD3                                    | IRQ13     |                   |
| 47                         |                                         | PC5      | A21/CS2#/<br>WAIT#  | MTIOC3B/MTCLKD/<br>TMR12/PO29                        | SCK8/RSPCKA/<br>ET_ETXD2                                                |           |                   |
| 48                         |                                         | PC4      | A20/CS3#            | MTIOC3D/MTCLKC/<br>TMC11/PO25/POE0#                  | SCK5/CTS8#/RTS8#/<br>SS8#/SSLA0/<br>ET_TX_CLK                           |           |                   |
| 49                         |                                         | PC3      | A19                 | MTIOC4D/TCLKB/<br>PO24                               | TXD5/SMOSI5/SSDA5/<br>IETXD/ET_TX_ER                                    |           |                   |
| 50                         |                                         | PC2      | A18                 | MTIOC4B/TCLKA/PO21                                   | RXD5/SMISO5/SSCL5/<br>SSLA3/IERXD/<br>ET_RX_DV                          |           |                   |
| 51                         |                                         | PC1      | A17                 | MTIOC3A/TCLKD/<br>PO18                               | SCK5/SSLA2/<br>ET_ERXD2                                                 | IRQ12     |                   |
| 52                         |                                         | PC0      | A16                 | MTIOC3C/TCLKC/<br>PO17                               | CTS5#/RTS5#/SS5#/<br>SSLA1/ET_ERXD3                                     | IRQ14     |                   |
| 53                         |                                         | PB7      | A15                 | MTIOC3B/TIOCB5/<br>PO31                              | TXD9/SMOSI9/SSDA9/<br>ET_CRS/<br>RMII_CRS_DV                            |           |                   |
| 54                         |                                         | PB6      | A14                 | MTIOC3D/TIOCA5/<br>PO30                              | RXD9/SMISO9/SSCL9/<br>ET_ETXD1/RMII_TXD1                                |           |                   |
| 55                         |                                         | PB5      | A13                 | MTIOC2A/MTIOC1B/<br>TIOCB4/TMR11/PO29/<br>POE1#      | SCK9/ET_ETXD0/<br>RMII_TXD0                                             |           |                   |
| 56                         |                                         | PB4      | A12                 | TIOCA4/PO28                                          | CTS9#/RTS9#/SS9#/<br>ET_TX_EN/<br>RMII_TXD_EN                           |           |                   |
| 57                         |                                         | PB3      | A11                 | MTIOC0A/MTIOC4A/<br>TIOCD3/TCLKD/TMO0/<br>PO27/POE3# | SCK6/ET_RX_ER/<br>RMII_RX_ER                                            |           |                   |
| 58                         |                                         | PB2      | A10                 | TIOCC3/TCLKC/PO26                                    | CTS6#/RTS6#/SS6#/<br>ET_RX_CLK/REF50CK                                  |           |                   |

**Table 1.12 List of Pins and Pin Functions (64-Pin LQFP) (3/3)**

| Pin Number<br>64-Pin LQFP | Power Supply<br>Clock<br>System Control | I/O Port | Timer<br>(MTU2a, TPUa, TMR, PPG,<br>RTCa, POE2a) | Timer<br>Communications<br>(SC1c, SC1d, RSPI, RIIC, CAN,<br>IEB, USB) | Interrupt | S12ADa, DAa |
|---------------------------|-----------------------------------------|----------|--------------------------------------------------|-----------------------------------------------------------------------|-----------|-------------|
| 61                        | VREFH0                                  |          |                                                  |                                                                       |           |             |
| 62                        | AVCC0                                   |          |                                                  |                                                                       |           |             |
| 63                        |                                         | P05      |                                                  |                                                                       | IRQ13     | DA1         |
| 64                        | AVSS0                                   |          |                                                  |                                                                       |           |             |

**Table 4.1 List of I/O Registers (Address Order) (2/50)**

| Address    | Module Symbol | Register Name                               | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|---------------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                             |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 201Ch | DMAC0         | DMA transfer enable register                | DMCNT           | 8              | 8           | 2                       | ICLK      | DMACA            |
| 0008 201Dh | DMAC0         | DMA software start register                 | DMREQ           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 201Eh | DMAC0         | DMA status register                         | DMSTS           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 201Fh | DMAC0         | DMA activation source flag control register | DMCSL           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 2040h | DMAC1         | DMA source address register                 | DMSAR           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 2044h | DMAC1         | DMA destination address register            | DMDAR           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 2048h | DMAC1         | DMA transfer count register                 | DMCRA           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 204Ch | DMAC1         | DMA block transfer count register           | DMCRB           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 2050h | DMAC1         | DMA transfer mode register                  | DMTMD           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 2053h | DMAC1         | DMA interrupt setting register              | DMINT           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 2054h | DMAC1         | DMA address mode register                   | DMAMD           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 205Ch | DMAC1         | DMA transfer enable register                | DMCNT           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 205Dh | DMAC1         | DMA software start register                 | DMREQ           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 205Eh | DMAC1         | DMA status register                         | DMSTS           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 205Fh | DMAC1         | DMA activation source flag control register | DMCSL           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 2080h | DMAC2         | DMA source address register                 | DMSAR           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 2084h | DMAC2         | DMA destination address register            | DMDAR           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 2088h | DMAC2         | DMA transfer count register                 | DMCRA           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 208Ch | DMAC2         | DMA block transfer count register           | DMCRB           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 2090h | DMAC2         | DMA transfer mode register                  | DMTMD           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 2093h | DMAC2         | DMA interrupt setting register              | DMINT           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 2094h | DMAC2         | DMA address mode register                   | DMAMD           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 209Ch | DMAC2         | DMA transfer enable register                | DMCNT           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 209Dh | DMAC2         | DMA software start register                 | DMREQ           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 209Eh | DMAC2         | DMA status register                         | DMSTS           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 209Fh | DMAC2         | DMA activation source flag control register | DMCSL           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 20C0h | DMAC3         | DMA source address register                 | DMSAR           | 32             | 32          | 2                       | ICLK      | EXDMACa          |
| 0008 20C4h | DMAC3         | DMA destination address register            | DMDAR           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 20C8h | DMAC3         | DMA transfer count register                 | DMCRA           | 32             | 32          | 2                       | ICLK      |                  |
| 0008 20CCh | DMAC3         | DMA block transfer count register           | DMCRB           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 20D0h | DMAC3         | DMA transfer mode register                  | DMTMD           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 20D3h | DMAC3         | DMA interrupt setting register              | DMINT           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 20D4h | DMAC3         | DMA address mode register                   | DMAMD           | 16             | 16          | 2                       | ICLK      |                  |
| 0008 20DCh | DMAC3         | DMA transfer enable register                | DMCNT           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 20DDh | DMAC3         | DMA software start register                 | DMREQ           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 20DEh | DMAC3         | DMA status register                         | DMSTS           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 20DFh | DMAC3         | DMA activation source flag control register | DMCSL           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 2200h | DMAC          | DMACA module activation register            | DMAST           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 2400h | DTC           | DTC control register                        | DTCCR           | 8              | 8           | 2                       | ICLK      | DTCa             |
| 0008 2404h | DTC           | DTC vector base register                    | DTCVBR          | 32             | 32          | 2                       | ICLK      |                  |
| 0008 2408h | DTC           | DTC address mode register                   | DTCADMOD        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 240Ch | DTC           | DTC module start register                   | DTCST           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 240Eh | DTC           | DTC status register                         | DTCSTS          | 16             | 16          | 2                       | ICLK      |                  |
| 0008 2800h | EXDMAC0       | EXDMA source address register               | EDMSAR          | 32             | 32          | 1, 2                    | BCLK      | EXDMACa          |
| 0008 2804h | EXDMAC0       | EXDMA destination address register          | EDMDAR          | 32             | 32          | 1, 2                    | BCLK      |                  |
| 0008 2808h | EXDMAC0       | EXDMA transfer count register               | EDMCRA          | 32             | 32          | 1, 2                    | BCLK      |                  |
| 0008 280Ch | EXDMAC0       | EXDMA block transfer count register         | EDMCRB          | 16             | 16          | 1, 2                    | BCLK      |                  |
| 0008 2810h | EXDMAC0       | EXDMA transfer mode register                | EDMTMD          | 16             | 16          | 1, 2                    | BCLK      |                  |
| 0008 2812h | EXDMAC0       | EXDMA output setting register               | EDMOMD          | 8              | 8           | 1, 2                    | BCLK      |                  |
| 0008 2813h | EXDMAC0       | EXDMA interrupt setting register            | EDMINT          | 8              | 8           | 1, 2                    | BCLK      |                  |
| 0008 2814h | EXDMAC0       | EXDMA address mode register                 | EDMAMD          | 32             | 32          | 1, 2                    | BCLK      |                  |

**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) (7/50)**

| Address    | Module Symbol | Register Name                  | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|--------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 7096h | ICU           | Interrupt request register 150 | IR150           | 8              | 8           | 2                       | ICLK      | ICUb             |
| 0008 7097h | ICU           | Interrupt request register 151 | IR151           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7098h | ICU           | Interrupt request register 152 | IR152           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7099h | ICU           | Interrupt request register 153 | IR153           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 709Ah | ICU           | Interrupt request register 154 | IR154           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 709Bh | ICU           | Interrupt request register 155 | IR155           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 709Ch | ICU           | Interrupt request register 156 | IR156           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 709Dh | ICU           | Interrupt request register 157 | IR157           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 709Eh | ICU           | Interrupt request register 158 | IR158           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 709Fh | ICU           | Interrupt request register 159 | IR159           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A0h | ICU           | Interrupt request register 160 | IR160           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A1h | ICU           | Interrupt request register 161 | IR161           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A2h | ICU           | Interrupt request register 162 | IR162           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A3h | ICU           | Interrupt request register 163 | IR163           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A4h | ICU           | Interrupt request register 164 | IR164           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A5h | ICU           | Interrupt request register 165 | IR165           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A6h | ICU           | Interrupt request register 166 | IR166           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70A7h | ICU           | Interrupt request register 167 | IR167           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70AAh | ICU           | Interrupt request register 170 | IR170           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70ABh | ICU           | Interrupt request register 171 | IR171           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70ACh | ICU           | Interrupt request register 172 | IR172           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70ADh | ICU           | Interrupt request register 173 | IR173           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70AEh | ICU           | Interrupt request register 174 | IR174           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70AFh | ICU           | Interrupt request register 175 | IR175           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B0h | ICU           | Interrupt request register 176 | IR176           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B1h | ICU           | Interrupt request register 177 | IR177           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B2h | ICU           | Interrupt request register 178 | IR178           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B3h | ICU           | Interrupt request register 179 | IR179           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B4h | ICU           | Interrupt request register 180 | IR180           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B5h | ICU           | Interrupt request register 181 | IR181           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B6h | ICU           | Interrupt request register 182 | IR182           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B7h | ICU           | Interrupt request register 183 | IR183           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B8h | ICU           | Interrupt request register 184 | IR184           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70B9h | ICU           | Interrupt request register 185 | IR185           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70BAh | ICU           | Interrupt request register 186 | IR186           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70BBh | ICU           | Interrupt request register 187 | IR187           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70BCh | ICU           | Interrupt request register 188 | IR188           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70BDh | ICU           | Interrupt request register 189 | IR189           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70BEh | ICU           | Interrupt request register 190 | IR190           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70BFh | ICU           | Interrupt request register 191 | IR191           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C0h | ICU           | Interrupt request register 192 | IR192           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C1h | ICU           | Interrupt request register 193 | IR193           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C2h | ICU           | Interrupt request register 194 | IR194           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C3h | ICU           | Interrupt request register 195 | IR195           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C4h | ICU           | Interrupt request register 196 | IR196           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C5h | ICU           | Interrupt request register 197 | IR197           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C6h | ICU           | Interrupt request register 198 | IR198           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C7h | ICU           | Interrupt request register 199 | IR199           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C8h | ICU           | Interrupt request register 200 | IR200           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70C9h | ICU           | Interrupt request register 201 | IR201           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70CAh | ICU           | Interrupt request register 202 | IR202           | 8              | 8           | 2                       | ICLK      |                  |

**Table 4.1 List of I/O Registers (Address Order) (8/50)**

| Address    | Module Symbol | Register Name                      | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                    |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 70CBh | ICU           | Interrupt request register 203     | IR203           | 8              | 8           | 2                       | ICLK      | ICUb             |
| 0008 70D6h | ICU           | Interrupt request register 214     | IR214           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70D7h | ICU           | Interrupt request register 215     | IR215           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70D8h | ICU           | Interrupt request register 216     | IR216           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70D9h | ICU           | Interrupt request register 217     | IR217           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70DAh | ICU           | Interrupt request register 218     | IR218           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70DBh | ICU           | Interrupt request register 219     | IR219           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70DCh | ICU           | Interrupt request register 220     | IR220           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70DDh | ICU           | Interrupt request register 221     | IR221           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70DEh | ICU           | Interrupt request register 222     | IR222           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70DFh | ICU           | Interrupt request register 223     | IR223           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E0h | ICU           | Interrupt request register 224     | IR224           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E1h | ICU           | Interrupt request register 225     | IR225           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E2h | ICU           | Interrupt request register 226     | IR226           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E3h | ICU           | Interrupt request register 227     | IR227           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E4h | ICU           | Interrupt request register 228     | IR228           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E5h | ICU           | Interrupt request register 229     | IR229           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E6h | ICU           | Interrupt request register 230     | IR230           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E7h | ICU           | Interrupt request register 231     | IR231           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E8h | ICU           | Interrupt request register 232     | IR232           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70E9h | ICU           | Interrupt request register 233     | IR233           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70EAh | ICU           | Interrupt request register 234     | IR234           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70EBh | ICU           | Interrupt request register 235     | IR235           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70ECh | ICU           | Interrupt request register 236     | IR236           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70EDh | ICU           | Interrupt request register 237     | IR237           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70EEh | ICU           | Interrupt request register 238     | IR238           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70EFh | ICU           | Interrupt request register 239     | IR239           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F0h | ICU           | Interrupt request register 240     | IR240           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F1h | ICU           | Interrupt request register 241     | IR241           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F2h | ICU           | Interrupt request register 242     | IR242           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F3h | ICU           | Interrupt request register 243     | IR243           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F4h | ICU           | Interrupt request register 244     | IR244           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F5h | ICU           | Interrupt request register 245     | IR245           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F6h | ICU           | Interrupt request register 246     | IR246           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F7h | ICU           | Interrupt request register 247     | IR247           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F8h | ICU           | Interrupt request register 248     | IR248           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70F9h | ICU           | Interrupt request register 249     | IR249           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70FAh | ICU           | Interrupt request register 250     | IR250           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70FBh | ICU           | Interrupt request register 251     | IR251           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70FCh | ICU           | Interrupt request register 252     | IR252           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 70FDh | ICU           | Interrupt request register 253     | IR253           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 711Bh | ICU           | DTC activation enable register 027 | DTCER027        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 711Ch | ICU           | DTC activation enable register 028 | DTCER028        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 711Dh | ICU           | DTC activation enable register 029 | DTCER029        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 711Eh | ICU           | DTC activation enable register 030 | DTCER030        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 711Fh | ICU           | DTC activation enable register 031 | DTCER031        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7121h | ICU           | DTC activation enable register 033 | DTCER033        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7122h | ICU           | DTC activation enable register 034 | DTCER034        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7124h | ICU           | DTC activation enable register 036 | DTCER036        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7125h | ICU           | DTC activation enable register 037 | DTCER037        | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7127h | ICU           | DTC activation enable register 039 | DTCER039        | 8              | 8           | 2                       | ICLK      |                  |

**Table 4.1 List of I/O Registers (Address Order) (13/50)**

| Address    | Module Symbol | Register Name                          | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|----------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                        |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 7394h | ICU           | Interrupt source priority register 148 | IPR148          | 8              | 8           | 2                       | ICLK      | ICUb             |
| 0008 7396h | ICU           | Interrupt source priority register 150 | IPR150          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7398h | ICU           | Interrupt source priority register 152 | IPR152          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 739Ch | ICU           | Interrupt source priority register 156 | IPR156          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73A0h | ICU           | Interrupt source priority register 160 | IPR160          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73A1h | ICU           | Interrupt source priority register 161 | IPR161          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73A4h | ICU           | Interrupt source priority register 164 | IPR164          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73A6h | ICU           | Interrupt source priority register 166 | IPR166          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73AAh | ICU           | Interrupt source priority register 170 | IPR170          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73ADh | ICU           | Interrupt source priority register 173 | IPR173          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73B0h | ICU           | Interrupt source priority register 176 | IPR176          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73B3h | ICU           | Interrupt source priority register 179 | IPR179          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73B6h | ICU           | Interrupt source priority register 182 | IPR182          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73B7h | ICU           | Interrupt source priority register 183 | IPR183          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73B8h | ICU           | Interrupt source priority register 184 | IPR184          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73B9h | ICU           | Interrupt source priority register 185 | IPR185          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73BAh | ICU           | Interrupt source priority register 186 | IPR186          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73BBh | ICU           | Interrupt source priority register 187 | IPR187          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73BCh | ICU           | Interrupt source priority register 188 | IPR188          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73BDh | ICU           | Interrupt source priority register 189 | IPR189          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73BEh | ICU           | Interrupt source priority register 190 | IPR190          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73BFh | ICU           | Interrupt source priority register 191 | IPR191          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C0h | ICU           | Interrupt source priority register 192 | IPR192          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C1h | ICU           | Interrupt source priority register 193 | IPR193          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C2h | ICU           | Interrupt source priority register 194 | IPR194          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C3h | ICU           | Interrupt source priority register 195 | IPR195          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C4h | ICU           | Interrupt source priority register 196 | IPR196          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C5h | ICU           | Interrupt source priority register 197 | IPR197          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C6h | ICU           | Interrupt source priority register 198 | IPR198          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C7h | ICU           | Interrupt source priority register 199 | IPR199          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C8h | ICU           | Interrupt source priority register 200 | IPR200          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73C9h | ICU           | Interrupt source priority register 201 | IPR201          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73CAh | ICU           | Interrupt source priority register 202 | IPR202          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73CBh | ICU           | Interrupt source priority register 203 | IPR203          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73CEh | ICU           | Interrupt source priority register 206 | IPR206          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73CFh | ICU           | Interrupt source priority register 207 | IPR207          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73D0h | ICU           | Interrupt source priority register 208 | IPR208          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73D6h | ICU           | Interrupt source priority register 214 | IPR214          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73D9h | ICU           | Interrupt source priority register 217 | IPR217          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73DCh | ICU           | Interrupt source priority register 220 | IPR220          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73DFh | ICU           | Interrupt source priority register 223 | IPR223          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73E2h | ICU           | Interrupt source priority register 226 | IPR226          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73E5h | ICU           | Interrupt source priority register 229 | IPR229          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73E8h | ICU           | Interrupt source priority register 232 | IPR232          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73EBh | ICU           | Interrupt source priority register 235 | IPR235          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73EEh | ICU           | Interrupt source priority register 238 | IPR238          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73F1h | ICU           | Interrupt source priority register 241 | IPR241          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73F4h | ICU           | Interrupt source priority register 244 | IPR244          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73F7h | ICU           | Interrupt source priority register 247 | IPR247          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73FAh | ICU           | Interrupt source priority register 250 | IPR250          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 73FDh | ICU           | Interrupt source priority register 253 | IPR253          | 8              | 8           | 2                       | ICLK      |                  |

**Table 4.1 List of I/O Registers (Address Order) (16/50)**

| Address    | Module Symbol | Register Name                   | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|---------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                 |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 814Ch | TPU3          | Timer general register C        | TGRC            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    | TPUa             |
| 0008 814Eh | TPU3          | Timer general register D        | TGRD            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8150h | TPU4          | Timer control register          | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8151h | TPU4          | Timer mode register             | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8152h | TPU4          | Timer I/O control register      | TIOR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8154h | TPU4          | Timer interrupt enable register | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8155h | TPU4          | Timer status register           | TSR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8156h | TPU4          | Timer counter                   | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8158h | TPU4          | Timer general register A        | TGRA            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 815Ah | TPU4          | Timer general register B        | TGRB            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8160h | TPU5          | Timer control register          | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8161h | TPU5          | Timer mode register             | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8162h | TPU5          | Timer I/O control register      | TIOR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8164h | TPU5          | Timer interrupt enable register | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8165h | TPU5          | Timer status register           | TSR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8166h | TPU5          | Timer counter                   | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8168h | TPU5          | Timer general register A        | TGRA            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 816Ah | TPU5          | Timer general register B        | TGRB            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8170h | TPUB          | Timer start register            | TSTR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8171h | TPUB          | Timer synchronous register      | TSYR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8178h | TPU6          | Noise filter control register   | NFCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8179h | TPU7          | Noise filter control register   | NFCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 817Ah | TPU8          | Noise filter control register   | NFCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 817Bh | TPU9          | Noise filter control register   | NFCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 817Ch | TPU10         | Noise filter control register   | NFCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 817Dh | TPU11         | Noise filter control register   | NFCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8180h | TPU6          | Timer control register          | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8181h | TPU6          | Timer mode register             | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8182h | TPU6          | Timer I/O control register H    | TIORH           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8183h | TPU6          | Timer I/O control register L    | TIORL           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8184h | TPU6          | Timer interrupt enable register | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8185h | TPU6          | Timer status register           | TSR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8186h | TPU6          | Timer counter                   | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8188h | TPU6          | Timer general register A        | TGRA            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 818Ah | TPU6          | Timer general register B        | TGRB            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 818Ch | TPU6          | Timer general register C        | TGRC            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 818Eh | TPU6          | Timer general register D        | TGRD            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8190h | TPU7          | Timer control register          | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8191h | TPU7          | Timer mode register             | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8192h | TPU7          | Timer I/O control register      | TIOR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8194h | TPU7          | Timer interrupt enable register | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8195h | TPU7          | Timer status register           | TSR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8196h | TPU7          | Timer counter                   | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8198h | TPU7          | Timer general register A        | TGRA            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 819Ah | TPU7          | Timer general register B        | TGRB            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 81A0h | TPU8          | Timer control register          | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 81A1h | TPU8          | Timer mode register             | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 81A2h | TPU8          | Timer I/O control register      | TIOR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 81A4h | TPU8          | Timer interrupt enable register | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 81A5h | TPU8          | Timer status register           | TSR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 81A6h | TPU8          | Timer counter                   | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |

**Table 4.1 List of I/O Registers (Address Order) (35/50)**

| Address    | Module Symbol | Register Name                      | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                    |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 C344h | ICU           | Group 1 interrupt enable register  | GEN01           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    | ICUb             |
| 0008 C348h | ICU           | Group 2 interrupt enable register  | GEN02           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C34Ch | ICU           | Group 3 interrupt enable register  | GEN03           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C350h | ICU           | Group 4 interrupt enable register  | GEN04           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C354h | ICU           | Group 5 interrupt enable register  | GEN05           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C358h | ICU           | Group 6 interrupt enable register  | GEN06           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C370h | ICU           | Group 12 interrupt enable register | GEN12           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C380h | ICU           | Group 0 interrupt clear register   | GCR00           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C384h | ICU           | Group 1 interrupt clear register   | GCR01           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C388h | ICU           | Group 2 interrupt clear register   | GCR02           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C38Ch | ICU           | Group 3 interrupt clear register   | GCR03           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C390h | ICU           | Group 4 interrupt clear register   | GCR04           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C394h | ICU           | Group 5 interrupt clear register   | GCR05           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C398h | ICU           | Group 6 interrupt clear register   | GCR06           | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C3C0h | ICU           | Unit select register               | SEL             | 32             | 32          | 1 to 2PCLKB             | 2 ICLK    |                  |
| 0008 C400h | RTC           | 64-Hz counter                      | R64CNT          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    | RTCa             |
| 0008 C402h | RTC           | Second counter                     | RSECCNT         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C404h | RTC           | Minute counter                     | RMINCNT         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C406h | RTC           | Hour counter                       | RHRCNT          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C408h | RTC           | Day-of-week counter                | RWKCNT          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C40Ah | RTC           | Date counter                       | RDAYCNT         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C40Ch | RTC           | Month counter                      | RMONCNT         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C40Eh | RTC           | Year counter                       | RYRCNT          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C410h | RTC           | Second alarm register              | RSECAR          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C412h | RTC           | Minute alarm register              | RMINAR          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C414h | RTC           | Hour alarm register                | RHRAR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C416h | RTC           | Day-of-week alarm register         | RWKAR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C418h | RTC           | Date alarm register                | RDAYAR          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C41Ah | RTC           | Month alarm register               | RMONAR          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C41Ch | RTC           | Year alarm register                | RYRAR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C41Eh | RTC           | Year alarm enable register         | RYRAREN         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C422h | RTC           | RTC control register 1             | RCR1            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C424h | RTC           | RTC control register 2             | RCR2            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C426h | RTC           | RTC control register 3             | RCR3            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C428h | RTC           | RTC control register 4             | RCR4            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C42Ah | RTC           | Frequency register H               | RFRH            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C42Ch | RTC           | Frequency register L               | RFRL            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C42Eh | RTC           | Time error adjustment register     | RADJ            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C440h | RTC           | Time capture control register 0    | RTCCR0          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C442h | RTC           | Time capture control register 1    | RTCCR1          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C444h | RTC           | Time capture control register 2    | RTCCR2          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C452h | RTC           | Second capture register 0          | RSECCP0         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 C454h | RTC           | Minute capture register 0          | RMINCP0         | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |

## 5. Electrical Characteristics

### 5.1 Absolute Maximum Ratings

**Table 5.1 Absolute Maximum Ratings**

Conditions:  $V_{SS} = AVSS0 = VREFL/VREFL0 = VSS\_USB = 0\text{ V}$

| Item                                                |           | Symbol       | Value             | Unit |
|-----------------------------------------------------|-----------|--------------|-------------------|------|
| Power supply voltage                                |           | VCC, VCC_USB | −0.3 to +4.6      | V    |
| $V_{BATT}$ power supply voltage                     |           | $V_{BATT}$   | −0.3 to +4.6      | V    |
| Input voltage (except for ports for 5 V tolerant*1) |           | $V_{in}$     | −0.3 to VCC + 0.3 | V    |
| Input voltage (ports for 5 V tolerant*1)            |           | $V_{in}$     | −0.3 to +5.8      | V    |
| Reference power supply voltage                      |           | VREFH        | −0.3 to VCC + 0.3 | V    |
| Analog power supply voltage                         |           | AVCC*2       | −0.3 to +4.6      | V    |
| Analog input voltage                                |           | $V_{AN}$     | −0.3 to VCC + 0.3 | V    |
| Operating temperature                               | D version | $T_{opr}$    | −40 to +85        | °C   |
|                                                     | G version |              | −40 to +105       | °C   |
| Storage temperature                                 |           | $T_{stg}$    | −55 to +125       | °C   |

Caution: Permanent damage to the LSI may result if absolute maximum ratings are exceeded.

Note 1. Ports 07, 12 to 17, 20, 21, 30 to 33, 67, and C0 to C3 are 5 V tolerant.

Note 2. Connect AVCC0 to VCC. When neither the A/D converter nor the D/A converter is in use, do not leave the AVCC0, VREFH/VREFH0, AVSS0, and VREFL/VREFL0 pins open. Connect the AVCC0 and VREFH/VREFH0 pins to VCC, and the AVSS0 and VREFL/VREFL0 pins to VSS, respectively.

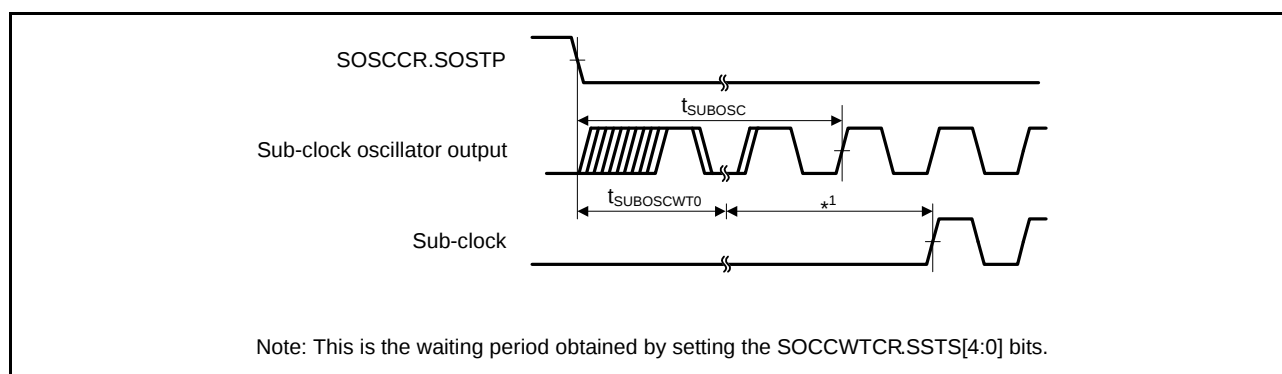


Figure 5.12 Sub-Clock Oscillation Start Timing

### 5.3.3 Timing of Recovery from Low Power Consumption Modes

**Table 5.14 Timing of Recovery from Low Power Consumption Modes**

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             | Test Conditions |
|----------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------|---------------------|------|------|------|------------------|-----------------|
| Recovery time after cancellation of software standby mode      | Crystal resonator connected to main clock oscillator                        | Main clock oscillator operating                 | t <sub>SBYMC</sub>  | 10   | —    | —    | ms               | Figure 5.13     |
|                                                                |                                                                             | Main clock oscillator and PLL circuit operating | t <sub>SBYPC</sub>  | 10   | —    | —    | ms               |                 |
|                                                                | External clock input to main clock oscillator                               | Main clock oscillator operating                 | t <sub>SBYEX</sub>  | 1    | —    | —    | ms               |                 |
|                                                                |                                                                             | Main clock oscillator and PLL circuit operating | t <sub>SBYPE</sub>  | 1    | —    | —    | ms               |                 |
|                                                                | Sub-clock oscillator operating                                              |                                                 | t <sub>SBYSC</sub>  | 2    | —    | —    | s                |                 |
|                                                                | High-speed on-chip oscillator operating                                     |                                                 | t <sub>SBYHO</sub>  | —    | —    | 2    | ms               |                 |
|                                                                | Low-speed on-chip oscillator or IWDG-dedicated on-chip oscillator operating |                                                 | t <sub>SBYLO</sub>  | —    | —    | 800  | μs               |                 |
| Recovery time after cancellation of deep software standby mode |                                                                             |                                                 | t <sub>DSBY</sub>   | —    | —    | 1.0  | ms               | Figure 5.14     |
| Wait time after cancellation of deep software standby mode     |                                                                             |                                                 | t <sub>DSBYWT</sub> | 45   | —    | 46   | t <sub>cyc</sub> |                 |

Note: The wait time varies depending on the state in which each oscillator was when the WAIT instruction was executed. The recovery time when multiple oscillators are operating is the same period as that when the oscillator which requires the longest time of all operating oscillators to recover is operating alone.

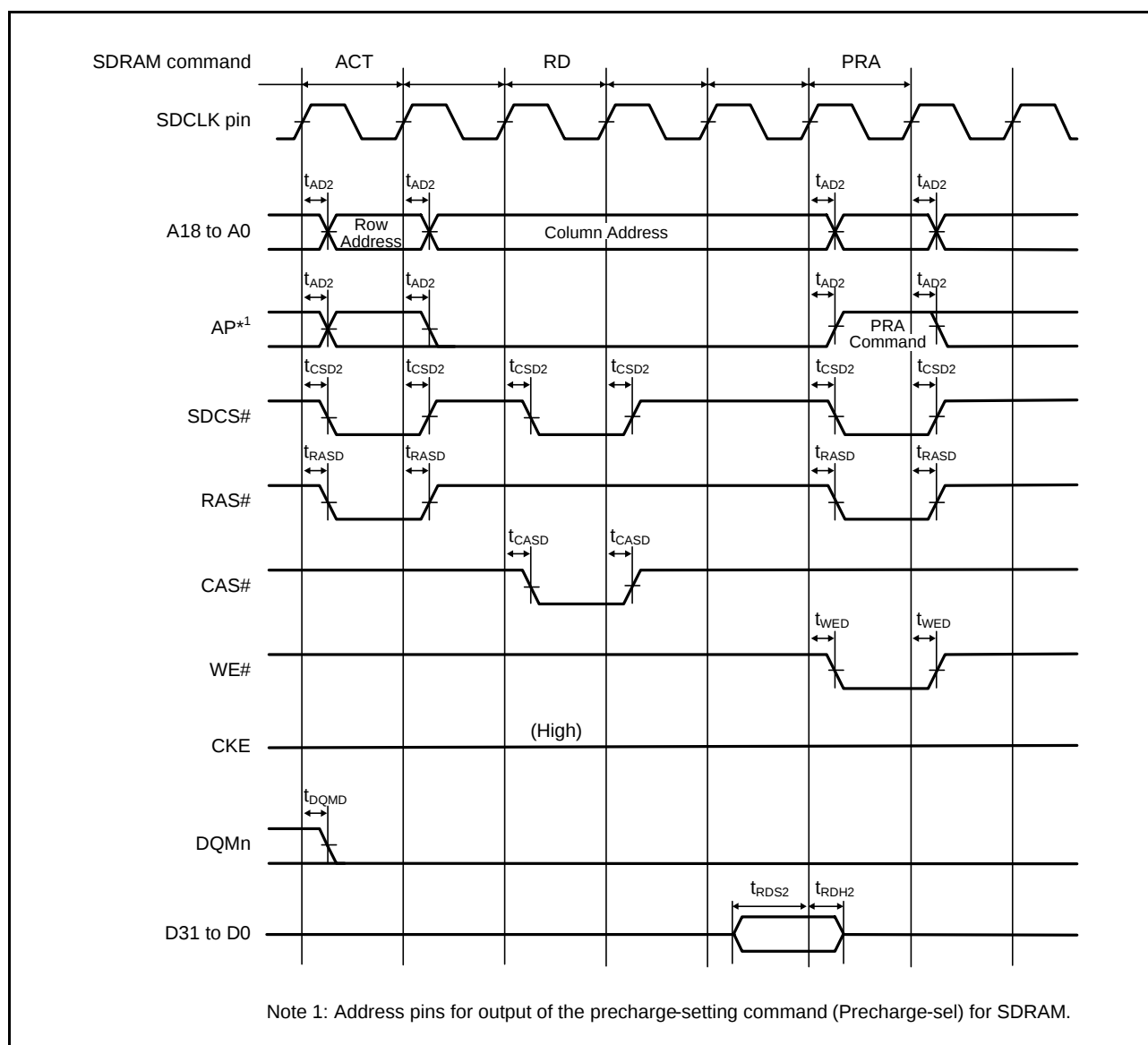
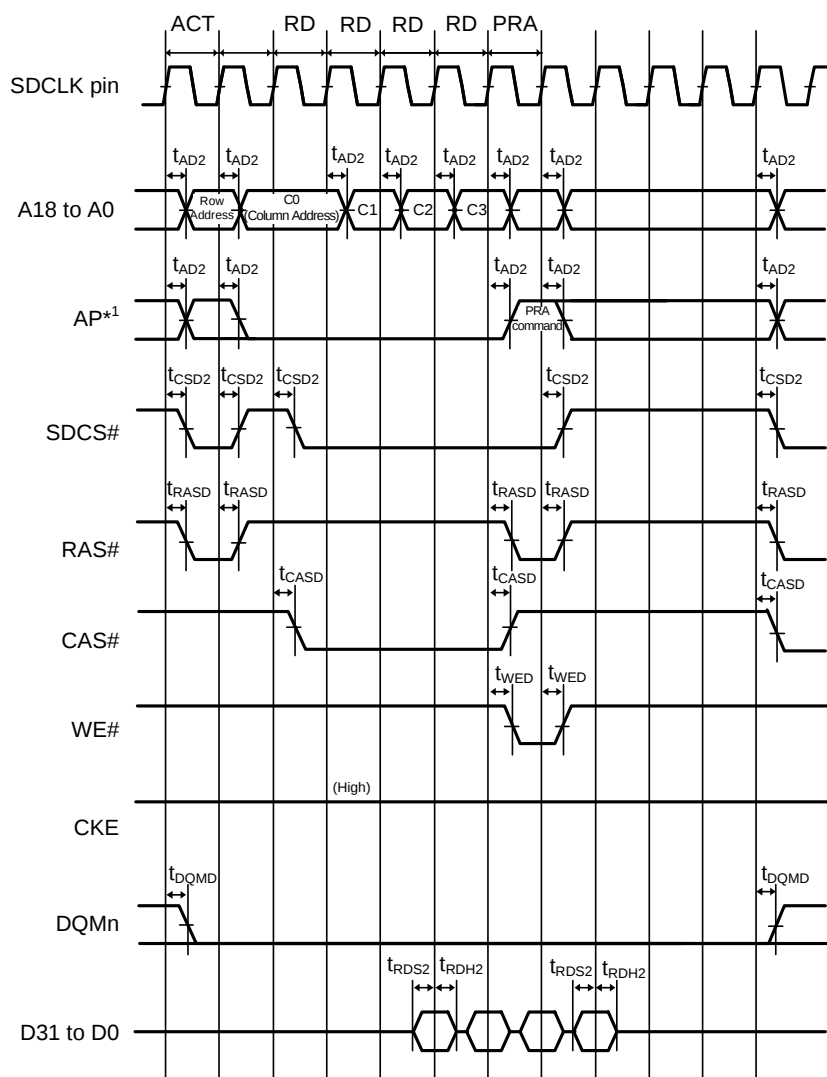


Figure 5.24 SDRAM Space Single Read Bus Timing



Note 1: Address pins for output of the precharge-setting command (Precharge-sel) for SDRAM.

Figure 5.26 SDRAM Space Multiple Read Bus Timing

**Table 5.23 Timing of On-Chip Peripheral Modules (5)**

Conditions: VCC = 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

 $T_a = T_{opr}$ 

High drive output is selected by the drive capacity control register.

| Item                                                |                                         | Symbol     | Min.*1,*2                        | Max.*                    | Unit | Test Conditions |
|-----------------------------------------------------|-----------------------------------------|------------|----------------------------------|--------------------------|------|-----------------|
| RIIC<br>(Standard-mode,<br>SMBus)<br>ICFER.FMPE = 0 | SCL input cycle time                    | $t_{SCL}$  | $6(12) \times t_{IICcyc} + 1300$ | —                        | ns   | Figure 5.47     |
|                                                     | SCL input high pulse width              | $t_{SCLH}$ | $3(6) \times t_{IICcyc} + 300$   | —                        | ns   |                 |
|                                                     | SCL input low pulse width               | $t_{SCLL}$ | $3(6) \times t_{IICcyc} + 300$   | —                        | ns   |                 |
|                                                     | SCL, SDA input rise time                | $t_{Sr}$   | —                                | 1000                     | ns   |                 |
|                                                     | SCL, SDA input fall time                | $t_{Sf}$   | —                                | 300                      | ns   |                 |
|                                                     | SCL, SDA input spike pulse removal time | $t_{SP}$   | 0                                | $1(4) \times t_{IICcyc}$ | ns   |                 |
|                                                     | SDA input bus free time                 | $t_{BUF}$  | $3(6) \times t_{IICcyc} + 300$   | —                        | ns   |                 |
|                                                     | Start condition input hold time         | $t_{STAH}$ | $t_{IICcyc} + 300$               | —                        | ns   |                 |
|                                                     | Restart condition input setup time      | $t_{STAS}$ | 1000                             | —                        | ns   |                 |
|                                                     | Stop condition input setup time         | $t_{STOS}$ | 1000                             | —                        | ns   |                 |
|                                                     | Data input setup time                   | $t_{SDAS}$ | $t_{IICcyc} + 50$                | —                        | ns   |                 |
|                                                     | Data input hold time                    | $t_{SDAH}$ | 0                                | —                        | ns   |                 |
|                                                     | SCL, SDA capacitive load                | $C_b$      | —                                | 400                      | pF   |                 |
| RIIC<br>(Fast-mode)                                 | SCL input cycle time                    | $t_{SCL}$  | $6(12) \times t_{IICcyc} + 600$  | —                        | ns   |                 |
|                                                     | SCL input high pulse width              | $t_{SCLH}$ | $3(6) \times t_{IICcyc} + 300$   | —                        | ns   |                 |
|                                                     | SCL input low pulse width               | $t_{SCLL}$ | $3(6) \times t_{IICcyc} + 300$   | —                        | ns   |                 |
|                                                     | SCL, SDA input rise time                | $t_{Sr}$   | $20 + 0.1C_b$                    | 300                      | ns   |                 |
|                                                     | SCL, SDA input fall time                | $t_{Sf}$   | $20 + 0.1C_b$                    | 300                      | ns   |                 |
|                                                     | SCL, SDA input spike pulse removal time | $t_{SP}$   | 0                                | $1(4) \times t_{IICcyc}$ | ns   |                 |
|                                                     | SDA input bus free time                 | $t_{BUF}$  | $3(6) \times t_{IICcyc} + 300$   | —                        | ns   |                 |
|                                                     | Start condition input hold time         | $t_{STAH}$ | $t_{IICcyc} + 300$               | —                        | ns   |                 |
|                                                     | Restart condition input setup time      | $t_{STAS}$ | 300                              | —                        | ns   |                 |
|                                                     | Stop condition input setup time         | $t_{STOS}$ | 300                              | —                        | ns   |                 |
|                                                     | Data input setup time                   | $t_{SDAS}$ | $t_{IICcyc} + 50$                | —                        | ns   |                 |
|                                                     | Data input hold time                    | $t_{SDAH}$ | 0                                | —                        | ns   |                 |
|                                                     | SCL, SDA capacitive load                | $C_b$      | —                                | 400                      | pF   |                 |

Note:  $t_{IICcyc}$ : RIIC internal reference clock (IIC $\phi$ ) Cycle

Note 1. The value within parentheses is applicable when the value of the ICMR3.NF[1:0] bits is 11b while the digital filter is enabled by the setting ICFER.NFE = 1.

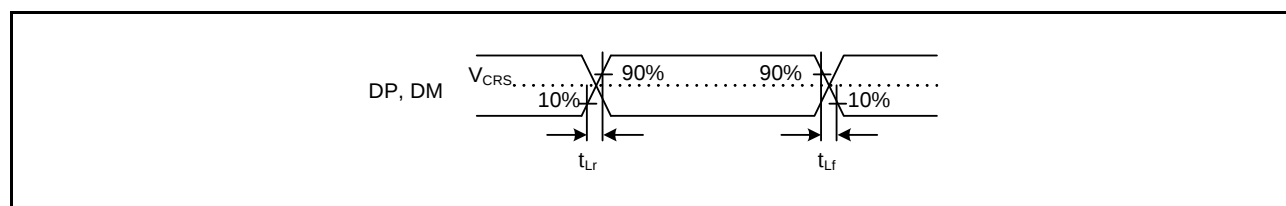
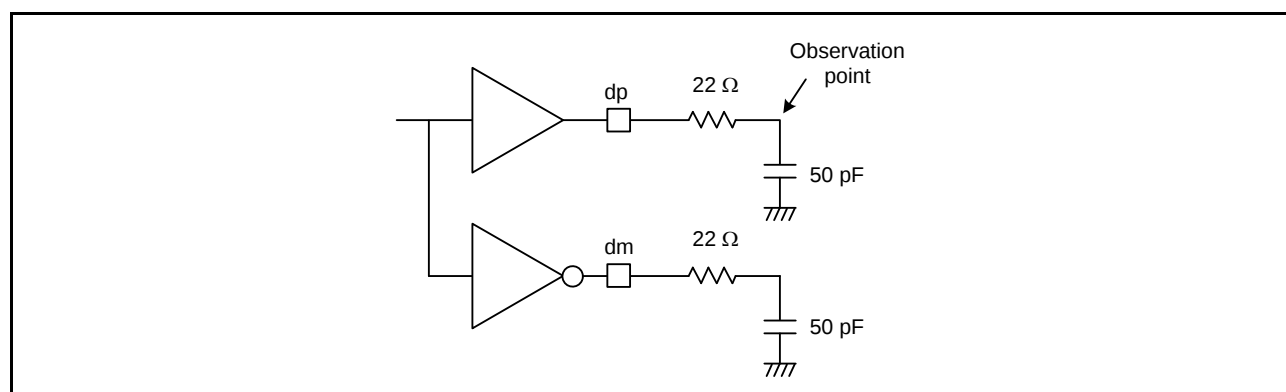
Note 2.  $C_b$  is the total capacitance of the bus lines.

## 5.4 USB Characteristics

**Table 5.27 On-Chip USB Full-Speed Characteristics (DP and DM Pin Characteristics)**Conditions:  $V_{CC} = AV_{CC0} = V_{REFH} = V_{CC\_USB} = 3.0$  to  $3.6$  V,  $V_{REFH0} = 3.0$  V to  $AV_{CC0}$  $V_{SS} = AV_{SS0} = V_{REFL}/V_{REFL0} = V_{SS\_USB} = 0$  V $PCLK = 24$  to  $50$  MHz $T_a = T_{opr}$ 

High drive output is selected by the drive capacity control register.

| Item                   |                                | Symbol            | Min. | Max.   | Unit     | Test Conditions            |             |
|------------------------|--------------------------------|-------------------|------|--------|----------|----------------------------|-------------|
| Input characteristics  | Input high level voltage       | $V_{IH}$          | 2.0  | —      | V        |                            |             |
|                        | Input low level voltage        | $V_{IL}$          | —    | 0.8    | V        |                            |             |
|                        | Differential input sensitivity | $V_{DI}$          | 0.2  | —      | V        | DP – DM                    |             |
|                        | Differential common mode range | $V_{CM}$          | 0.8  | 2.5    | V        |                            |             |
| Output characteristics | Output high level voltage      | $V_{OH}$          | 2.8  | 3.6    | V        | $I_{OH} = -200 \mu A$      |             |
|                        | Output low level voltage       | $V_{OL}$          | 0.0  | 0.3    | V        | $I_{OL} = 2$ mA            |             |
|                        | Cross-over voltage             | $V_{CRS}$         | 1.3  | 2.0    | V        |                            | Figure 5.61 |
|                        | Rise time                      | $t_{Lr}$          | 4    | 20     | ns       |                            |             |
|                        | Fall time                      | $t_{Lf}$          | 4    | 20     | ns       |                            |             |
|                        | Rise/fall time ratio           | $t_{Lr} / t_{Lf}$ | 90   | 111.11 | %        | $t_{Lr} / t_{Lf}$          |             |
|                        | Output resistance              | $Z_{DRV}$         | 28   | 44     | $\Omega$ | $R_s = 22 \Omega$ included |             |

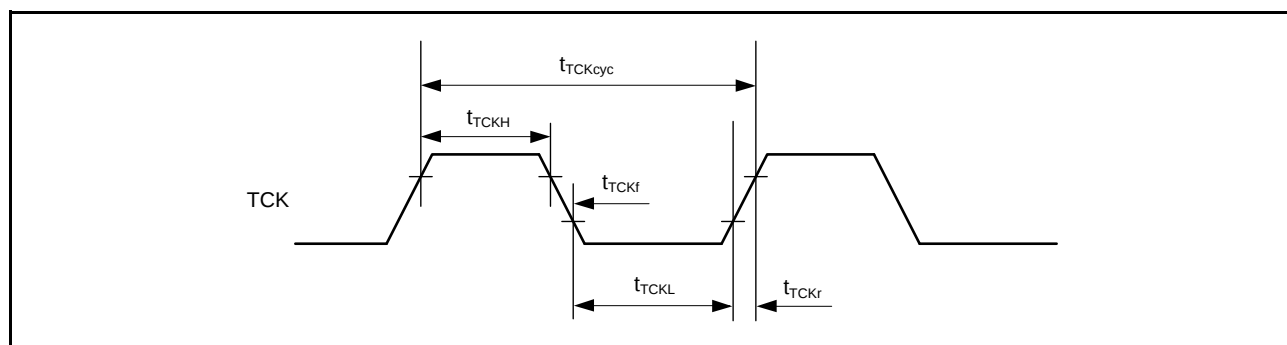
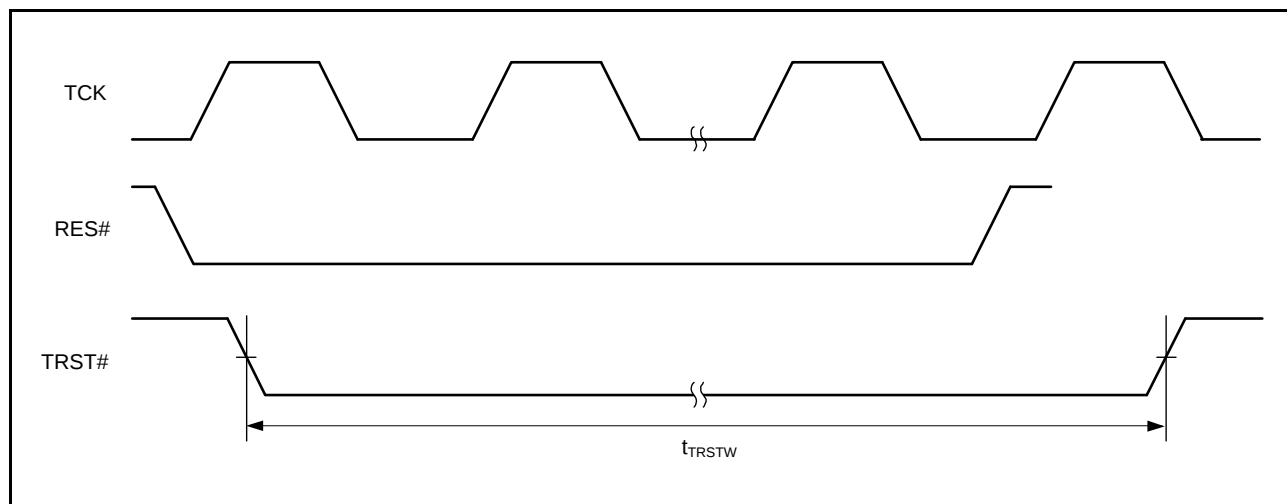
**Figure 5.61 DP and DM Output Timing (Full-Speed)****Figure 5.62 Test Circuit (Full-Speed)**

## 5.13 Boundary Scan

**Table 5.40** Boundary Scan

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

| Item                       | Symbol       | Min. | Typ. | Max. | Unit         | Test Conditions |
|----------------------------|--------------|------|------|------|--------------|-----------------|
| TCK clock cycle time       | $t_{TCKcyc}$ | 100  | —    | —    | ns           | Figure 5.70     |
| TCK clock high pulse width | $t_{TCKH}$   | 45   | —    | —    | ns           |                 |
| TCK clock low pulse width  | $t_{TCKL}$   | 45   | —    | —    | ns           |                 |
| TCK clock rise time        | $t_{TCKr}$   | —    | —    | 5    | ns           |                 |
| TCK clock fall time        | $t_{TCKf}$   | —    | —    | 5    | ns           |                 |
| TRST# pulse width          | $t_{TRSTW}$  | 20   | —    | —    | $t_{TCKcyc}$ | Figure 5.71     |
| TMS setup time             | $t_{TMSS}$   | 20   | —    | —    | ns           | Figure 5.72     |
| TMS hold time              | $t_{TMSH}$   | 20   | —    | —    | ns           |                 |
| TDI setup time             | $t_{TDIS}$   | 20   | —    | —    | ns           |                 |
| TDI hold time              | $t_{TDIH}$   | 20   | —    | —    | ns           |                 |
| TDO data delay time        | $t_{TDOD}$   | —    | —    | 40   | ns           |                 |

**Figure 5.70** Boundary Scan TCK Timing**Figure 5.71** Boundary Scan TRST# Timing