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

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

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

#### Details

|                            |                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status             | Not For New Designs                                                                                                                                                             |
| Core Processor             | RX                                                                                                                                                                              |
| Core Size                  | 32-Bit Single-Core                                                                                                                                                              |
| Speed                      | 100MHz                                                                                                                                                                          |
| Connectivity               | CANbus, EBI/EMI, I <sup>2</sup> C, LINbus, SCI, SPI, USB                                                                                                                        |
| Peripherals                | DMA, LVD, POR, PWM, WDT                                                                                                                                                         |
| Number of I/O              | 133                                                                                                                                                                             |
| Program Memory Size        | 768KB (768K x 8)                                                                                                                                                                |
| Program Memory Type        | FLASH                                                                                                                                                                           |
| EEPROM Size                | 32K x 8                                                                                                                                                                         |
| RAM Size                   | 128K x 8                                                                                                                                                                        |
| Voltage - Supply (Vcc/Vdd) | 2.7V ~ 3.6V                                                                                                                                                                     |
| Data Converters            | A/D 8x10b, 21x12b; D/A 2x10b                                                                                                                                                    |
| Oscillator Type            | Internal                                                                                                                                                                        |
| Operating Temperature      | -40°C ~ 85°C (TA)                                                                                                                                                               |
| Mounting Type              | Surface Mount                                                                                                                                                                   |
| Package / Case             | 176-LQFP                                                                                                                                                                        |
| Supplier Device Package    | 176-LFQFP (24x24)                                                                                                                                                               |
| Purchase URL               | <a href="https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f5631acdfc-v0">https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f5631acdfc-v0</a> |

## 1.2 List of Products

Table 1.3 is a list of products, and Figure 1.1 shows how to read the product part no.

**Table 1.3 List of Products (1/8)**

| Group                | Part No.     | Package        | ROM Capacity | RAM Capacity | E2 Data Flash | Operating Frequency (Max.) | Operating Temp. Range |
|----------------------|--------------|----------------|--------------|--------------|---------------|----------------------------|-----------------------|
| RX63N<br>(D version) | R5F563NECDLC | PTLG0177KA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NEDDLC | PTLG0177KA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDCDLC | PTLG0177KA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDDDL  | PTLG0177KA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NBCDLC | PTLG0177KA-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NBDDL  | PTLG0177KA-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NACDLC | PTLG0177KA-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NADDLC | PTLG0177KA-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NECDBG | PLBG0176GA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NEDDBG | PLBG0176GA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDCDBG | PLBG0176GA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDDDBG | PLBG0176GA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NBCDBG | PLBG0176GA-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NBDDBG | PLBG0176GA-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NACDBG | PLBG0176GA-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NADDBG | PLBG0176GA-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NFHDFC | PLQP0176KB-A   | 2 Mbytes     | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NFDDFC | PLQP0176KB-A   | 2 Mbytes     | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NKHDFC | PLQP0176KB-A*1 | 2 Mbytes     | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NKDDFC | PLQP0176KB-A   | 2 Mbytes     | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NECDFC | PLQP0176KB-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NEDDFC | PLQP0176KB-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NJHDFC | PLQP0176KB-A*1 | 1.5 Mbytes   | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NJDDFC | PLQP0176KB-A*1 | 1.5 Mbytes   | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NGHDFC | PLQP0176KB-A*1 | 1.5 Mbytes   | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NGDDFC | PLQP0176KB-A*1 | 1.5 Mbytes   | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDCDFC | PLQP0176KB-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDDDFC | PLQP0176KB-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NYHDFC | PLQP0176KB-A   | 1 Mbyte      | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NYDDFC | PLQP0176KB-A   | 1 Mbyte      | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NWHDFC | PLQP0176KB-A   | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NWDDFC | PLQP0176KB-A   | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NWGDFC | PLQP0176KB-A   | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NWCDFC | PLQP0176KB-A   | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NBCDFC | PLQP0176KB-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NBDDFC | PLQP0176KB-A   | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NACDFC | PLQP0176KB-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NADDFC | PLQP0176KB-A   | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NECDLK | PTLG0145KA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NEDDLK | PTLG0145KA-A   | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |
|                      | R5F563NDCDLK | PTLG0145KA-A   | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +85°C          |

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          |

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

| Group                      | Part No.     | Package      | ROM Capacity | RAM Capacity | E2 Data Flash | Operating Frequency (Max.) | Operating Temp. Range |
|----------------------------|--------------|--------------|--------------|--------------|---------------|----------------------------|-----------------------|
| RX631<br>(G version)<br>*2 | R5F5631GDGFB | PLQP0144KA-A | 1.5 Mbytes   | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631DDGFB | PLQP0144KA-A | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631YDGFB | PLQP0144KA-A | 1 Mbyte      | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631WDGFB | PLQP0144KA-A | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631BDGFB | PLQP0144KA-A | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631ADGFB | PLQP0144KA-A | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56318SGFB | PLQP0144KA-A | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56318DGFB | PLQP0144KA-A | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56317SGFB | PLQP0144KA-A | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56317DGFB | PLQP0144KA-A | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56316SGFB | PLQP0144KA-A | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56316DGFB | PLQP0144KA-A | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631FDGFP | PLQP0100KB-A | 2 Mbytes     | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631KDGFP | PLQP0100KB-A | 2 Mbytes     | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631EDGFP | PLQP0100KB-A | 2 Mbytes     | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631JDGFP | PLQP0100KB-A | 1.5 Mbytes   | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631GDGFP | PLQP0100KB-A | 1.5 Mbytes   | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631DDGFP | PLQP0100KB-A | 1.5 Mbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631YDGFP | PLQP0100KB-A | 1 Mbyte      | 256 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631WDGFP | PLQP0100KB-A | 1 Mbyte      | 192 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631BDGFP | PLQP0100KB-A | 1 Mbyte      | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631ADGFP | PLQP0100KB-A | 768 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56318DGFP | PLQP0100KB-A | 512 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56317DGFP | PLQP0100KB-A | 384 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F56316DGFP | PLQP0100KB-A | 256 Kbytes   | 128 Kbytes   | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631PDGFM | PLQP0064KB-A | 512 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631NDGFM | PLQP0064KB-A | 384 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631MDGFM | PLQP0064KB-A | 256 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631PDGFL | PLQP0048KB-A | 512 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631NDGFL | PLQP0048KB-A | 384 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |
|                            | R5F5631MDGFL | PLQP0048KB-A | 256 Kbytes   | 64 Kbytes    | 32 Kbytes     | 100 MHz                    | -40 to +105°C         |

Note 1. In the planning stage

Note 2. The specifications of the temperature sensor calibration and unique ID for G-version products differ from those for other products. For details, see section 45.2.2, Temperature Sensor Calibration Data Registers (TSCDRH, TSCDRL), section 45.3, Using the Temperature Sensor, and section 47.2.22, Unique ID Registers n (UIDRn) (n = 0 to 15) in the User's manual: Hardware.

**Table 1.4 Pin Functions (2/6)**

| Classifications                   | Pin Name                             | I/O    | Description                                                                                                                                                                                        |
|-----------------------------------|--------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bus control                       | RD#                                  | Output | Strobe signal which indicates that reading from the external bus interface space is in progress.                                                                                                   |
|                                   | WR#                                  | Output | Strobe signal which indicates that writing to the external bus interface space is in progress, in 1-write strobe mode.                                                                             |
|                                   | WR0# to WR3#                         | Output | Strobe signals which indicate that either group of data bus pins (D7 to D0, D15 to D8, D23 to D16, and D31 to D24) is valid in writing to the external bus interface space, in byte strobe mode.   |
|                                   | BC0# to BC3#                         | Output | Strobe signals which indicate that either group of data bus pins (D7 to D0, D15 to D8, D23 to D16, and D31 to D24) is valid in access to the external bus interface space, in 1-write strobe mode. |
|                                   | ALE                                  | Output | Address latch signal when address/data multiplexed bus is selected.                                                                                                                                |
|                                   | CKE                                  | Output | Output pin for SDRAM clock enable signals.                                                                                                                                                         |
|                                   | SDCS#                                | Output | Output pin for SDRAM chip select signals.                                                                                                                                                          |
|                                   | RAS#                                 | Output | Output pin for SDRAM row address strobe signals.                                                                                                                                                   |
|                                   | CAS#                                 | Output | Output pin for SDRAM column address strobe signals.                                                                                                                                                |
|                                   | WE#                                  | Output | Output pin for SDRAM write enable signals.                                                                                                                                                         |
|                                   | DQM0 to DQM3                         | Output | Output pins for SDRAM I/O data mask enable signals.                                                                                                                                                |
|                                   | CS0# to CS7#                         | Output | Select signals for CS area.                                                                                                                                                                        |
|                                   | WAIT#                                | Input  | Input pins for wait request signals in access to the external space.                                                                                                                               |
| EXDMA controller                  | EDREQ0, EDREQ1                       |        | Input pins for external DMA transfer requests.                                                                                                                                                     |
|                                   | EDACK0, EDACK1                       |        | Output pins for single address transfer acknowledge signals.                                                                                                                                       |
| Interrupt                         | NMI                                  | Input  | Non-maskable interrupt request signal.                                                                                                                                                             |
|                                   | IRQ0 to IRQ15                        | Input  | Maskable interrupt request signals.                                                                                                                                                                |
| Multi-function timer pulse unit 2 | MTIOC0A, MTIOC0B<br>MTIOC0C, MTIOC0D | I/O    | The TGRA0 to TGRD0 input capture input/output compare output/PWM output pins.                                                                                                                      |
|                                   | MTIOC1A, MTIOC1B                     | I/O    | The TGRA1 and TGRB1 input capture input/output compare output/PWM output pins.                                                                                                                     |
|                                   | MTIOC2A, MTIOC2B                     | I/O    | The TGRA2 and TGRB2 input capture input/output compare output/PWM output pins.                                                                                                                     |
|                                   | MTIOC3A, MTIOC3B<br>MTIOC3C, MTIOC3D | I/O    | The TGRA3 to TGRD3 input capture input/output compare output/PWM output pins.                                                                                                                      |
|                                   | MTIOC4A, MTIOC4B<br>MTIOC4C, MTIOC4D | I/O    | The TGRA4 to TGRD4 input capture input/output compare output/PWM output pins.                                                                                                                      |
|                                   | MTIC5U, MTIC5V<br>MTIC5W             | Input  | The TGRU5, TGRV5, and TGRW5 input capture input/dead time compensation input pins.                                                                                                                 |
|                                   | MTCLKA, MTCLKB<br>MTCLKC, MTCLKD     | Input  | Input pins for external clock signals.                                                                                                                                                             |
| Port output enable 2              | POE0# to POE3#<br>POE8#              | Input  | Input pins for request signals to place the MTU large-current pins in the high impedance state.                                                                                                    |

**Table 1.7 List of Pins and Pin Functions (145-Pin TFLGA) (1/5)**

| Pin No. | 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, SC1c, SC1d,<br>RSPI, RIIC, CAN, IEB,<br>USB, and PDC) | Interrupt | S12AD<br>AD<br>DA |
|---------|-----------------------------------------|----------|-------------------------|---------------------------------------------|----------------------------------------------------------------------------------|-----------|-------------------|
| A1      | AVSS0                                   |          |                         |                                             |                                                                                  |           |                   |
| A2      |                                         | P07      |                         |                                             |                                                                                  | IRQ15     | ADTRG0#           |
| A3      |                                         | P40      |                         |                                             |                                                                                  | IRQ8-DS   | AN000             |
| A4      |                                         | P42      |                         |                                             |                                                                                  | IRQ10-DS  | AN002             |
| A5      |                                         | P45      |                         |                                             |                                                                                  | IRQ13-DS  | AN005             |
| A6      |                                         | P90      | A16                     |                                             | TXD7/SMOSI7/SSDA7                                                                |           | AN014             |
| A7      |                                         | P92      | A18                     |                                             | RXD7/SMISO7/SSCL7                                                                |           | AN016             |
| A8      |                                         | PD2      | D2[A2/D2]               | MTIOC4D/TIOCA8                              | MISOC/CRX0                                                                       | IRQ2      | AN010             |
| A9      |                                         | PD6      | D6[A6/D6]               | MTIC5V/POE1#                                | SSLC2                                                                            | IRQ6      | AN6               |
| A10     | VSS                                     |          |                         |                                             |                                                                                  |           |                   |
| A11     |                                         | P62      | CS2#/RAS#               |                                             |                                                                                  |           |                   |
| A12     |                                         | PE1      | D9[A9/D9]               | MTIOC4C/TIOCD9/<br>PO18                     | TXD12/SMOSI12/SSDA12/<br>TXDX12/SIOX12/SSLB2/<br>RSPCKB                          |           | ANEX1             |
| A13     |                                         | PE3      | D11[A11/D11]            | MTIOC4B/TIOCB9/<br>PO26/POE8#               | CTS12#/RTS12#/SS12#/<br>MISOB/ET_ERXD3                                           |           | AN1               |
| B1      | VREFH                                   |          |                         |                                             |                                                                                  |           |                   |
| B2      | AVCC0                                   |          |                         |                                             |                                                                                  |           |                   |
| B3      |                                         | P05      |                         |                                             |                                                                                  | IRQ13     | DA1               |
| B4      | VREFL0                                  |          |                         |                                             |                                                                                  |           |                   |
| B5      |                                         | P43      |                         |                                             |                                                                                  | IRQ11-DS  | AN003             |
| B6      |                                         | P47      |                         |                                             |                                                                                  | IRQ15-DS  | AN007             |
| B7      |                                         | P91      | A17                     |                                             | SCK7                                                                             |           | AN015             |
| B8      |                                         | PD0      | D0[A0/D0]               | TIOCA7                                      |                                                                                  | IRQ0      | AN008             |
| B9      |                                         | PD4      | D4[A4/D4]               | POE3#                                       | SSLC0                                                                            | IRQ4      | AN012             |
| B10     | VCC                                     |          |                         |                                             |                                                                                  |           |                   |
| B11     |                                         | P61      | CS1#/SDCS#              |                                             |                                                                                  |           |                   |
| B12     |                                         | PE2      | D10[A10/D10]            | MTIOC4A/TIOCA9/<br>PO23                     | RXD12/SMISO12/SSCL12/<br>RXDX12/SSLB3/MOSIB                                      | IRQ7-DS   | AN0               |
| B13     |                                         | PE4      | D12[A12/D12]            | MTIOC4D/MTIOC1A/<br>TIOCA10/PO28            | SSLB0/ET_ERXD2                                                                   |           | AN2               |
| C1      | VREFL                                   |          |                         |                                             |                                                                                  |           |                   |
| C2      |                                         | P02      |                         | TMC11                                       | SCK6                                                                             | IRQ10     | AN020             |
| C3      | VREFH0                                  |          |                         |                                             |                                                                                  |           |                   |
| C4      |                                         | P41      |                         |                                             |                                                                                  | IRQ9-DS   | AN001             |
| C5      |                                         | P46      |                         |                                             |                                                                                  | IRQ14-DS  | AN006             |
| C6      | VSS                                     |          |                         |                                             |                                                                                  |           |                   |
| C7      |                                         | PD1      | D1[A1/D1]               | MTIOC4B/TIOCB7/<br>TCLKG                    | MOSIC/CTX0                                                                       | IRQ1      | AN009             |
| C8      |                                         | PD3      | D3[A3/D3]               | TIOCB8/TCLKH/POE8#                          | RSPCKC                                                                           | IRQ3      | AN011             |
| C9      |                                         | PD7      | D7[A7/D7]               | MTIC5U/POE0#                                | SSLC3                                                                            | IRQ7      | AN7               |
| C10     |                                         | P63      | CS3#/CAS#               |                                             |                                                                                  |           |                   |
| C11     |                                         | PE0      | D8[A8/D8]               | TIOCC9                                      | SCK12/SSLB1                                                                      |           | ANEX0             |
| C12     | SDCLK                                   | P70      |                         |                                             |                                                                                  |           |                   |
| C13     | VSS                                     |          |                         |                                             |                                                                                  |           |                   |
| D1      |                                         | P00      |                         | TMRI0                                       | TXD6/SMOSI6/SSDA6                                                                | IRQ8      | AN018             |
| D2      |                                         | PF5      |                         |                                             |                                                                                  | IRQ4      |                   |
| D3      |                                         | P03      |                         |                                             |                                                                                  | IRQ11     | DA0               |
| D4      |                                         | P01      |                         | TMC10                                       | RXD6/SMISO6/SSCL6                                                                | IRQ9      | AN019             |

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

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



**Table 1.9 List of Pins and Pin Functions (100-Pin TFLGA) (4/5)**

| Pin No.<br>100-pin<br>TFLGA | Power Supply<br>Clock<br>System<br>Control | I/O Port | Bus<br>EXDMAC    | Timers<br>(MTU, TPU,<br>TMR, PPG,<br>RTC, POE)               | Communications<br>(ETHERC, SCIC,<br>SCID, RSPI, RIIC,<br>CAN, IEB, USB) | Interrupt | S12AD<br>AD<br>DA |
|-----------------------------|--------------------------------------------|----------|------------------|--------------------------------------------------------------|-------------------------------------------------------------------------|-----------|-------------------|
| H4                          |                                            | P15      |                  | MTIOC0B/<br>MTCLKB/<br>TIOCB2/<br>TCLKB/TMCI2/<br>PO13       | RXD1/SCK3/<br>SMISO1/SSCL1/<br>CRX1-DS                                  | IRQ5      |                   |
| H5                          |                                            | P55      | WAIT#/<br>EDREQ0 | MTIOC4D/<br>TMO3                                             | CRX1/ET_EXOUT                                                           | IRQ10     |                   |
| H6                          |                                            | P54      | ALE/EDACK0       | MTIOC4B/<br>TMCI1                                            | CTS2#/RTS2#/<br>SS2#/CTX1/<br>ET_LINKSTA                                |           |                   |
| H7                          |                                            | PC7      | A23/CS0#         | MTIOC3A/<br>MTCLKB/<br>TMO2/PO31                             | TXD8/SMOSI8/<br>SSDA8/MISOA/<br>ET_COL                                  | IRQ14     |                   |
| H8                          |                                            | PC6      | A22/CS1#         | MTIOC3C/<br>MTCLKA/<br>TMCI2/PO30                            | RXD8/SMISO8/<br>SSCL8/MOSIA/<br>ET_ETXD3                                | IRQ13     |                   |
| H9                          |                                            | PB6      | A14              | MTIOC3D/<br>TIOCA5/PO30                                      | RXD9/SMISO9/<br>SSCL9/ET_ETXD1/<br>RMII_TXD1                            |           |                   |
| H10                         |                                            | PB7      | A15              | MTIOC3B/<br>TIOCB5/PO31                                      | TXD9/SMOSI9/<br>SSDA9/ET_CRS/<br>RMII_CRS_DV                            |           |                   |
| J1                          |                                            | P24      | CS4#/<br>EDREQ1  | MTIOC4A/<br>MTCLKA/<br>TIOCB4/<br>TMRI1/PO4                  | SCK3/<br>USB0_VBUSEN                                                    |           |                   |
| J2                          |                                            | P21      |                  | MTIOC1B/<br>TIOCA3/<br>TMCI0/PO1                             | RXD0/SMISO0/<br>SSCL0/<br>USB0_EXICEN                                   | IRQ9      |                   |
| J3                          |                                            | P17      |                  | MTIOC3A/<br>MTIOC3B/<br>TIOCB0/<br>TCLKD/TMO1/<br>PO15/POE8# | SCK1/TXD3/<br>SMOSI3/SSDA3/<br>MISOA/SDA2-DS/<br>IETXD                  | IRQ7      | ADTRG#            |
| J4                          |                                            | P13      |                  | MTIOC0B/<br>TIOCA5/TMO3/<br>PO13                             | TXD2/SMOSI2/<br>SSDA2/SDA0[FM+]                                         | IRQ3      | ADTRG#            |
| J5                          | VSS_USB                                    |          |                  |                                                              |                                                                         |           |                   |
| J6                          | VCC_USB                                    |          |                  |                                                              |                                                                         |           |                   |
| J7                          |                                            | P50      | WR0#/WR#         |                                                              | TXD2/SMOSI2/<br>SSDA2/SSLB1                                             |           |                   |
| J8                          |                                            | PC4      | A20/CS3#         | MTIOC3D/<br>MTCLKC/<br>TMCI1/PO25/<br>POE0#                  | SCK5/CTS8#/<br>RTS8#/SS8#/<br>SSLA0/ET_TX_CLK                           |           |                   |
| J9                          |                                            | PC0      | A16              | MTIOC3C/<br>TCLKC/PO17                                       | CTS5#/RTS5#/<br>SS5#/SSLA1/<br>ET_ERXD3                                 | IRQ14     |                   |
| J10                         |                                            | PC1      | A17              | MTIOC3A/<br>TCLKD/PO18                                       | SCK5/SSLA2/<br>ET_ERXD2                                                 | IRQ12     |                   |
| K1                          |                                            | P23      | EDACK0           | MTIOC3D/<br>MTCLKD/<br>TIOCD3/PO3                            | TXD3/CTS0#/<br>RTS0#/SMOSI3/<br>SS0#/SSDA3/<br>USB0_DPUPE               |           |                   |



**Table 4.1 List of I/O Registers (Address Order) (5/50)**

| Address    | Module Symbol | Register Name                                 | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|-----------------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                               |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 650Ch | MPU           | Memory-protection error status register       | MPESTS          | 32             | 32          | 1                       | ICLK      | MPU              |
| 0008 6514h | MPU           | Data memory-protection error address register | MPDEA           | 32             | 32          | 1                       | ICLK      |                  |
| 0008 6520h | MPU           | Region search address register                | MPSA            | 32             | 32          | 1                       | ICLK      |                  |
| 0008 6524h | MPU           | Region search operation register              | MPOPS           | 16             | 16          | 1                       | ICLK      |                  |
| 0008 6526h | MPU           | Region invalidation operation register        | MPOPI           | 16             | 16          | 1                       | ICLK      |                  |
| 0008 6528h | MPU           | Instruction-hit region register               | MHITI           | 32             | 32          | 1                       | ICLK      |                  |
| 0008 652Ch | MPU           | Data-hit region register                      | MHITD           | 32             | 32          | 1                       | ICLK      |                  |
| 0008 7010h | ICU           | Interrupt request register 016                | IR016           | 8              | 8           | 2                       | ICLK      | ICUb             |
| 0008 7015h | ICU           | Interrupt request register 021                | IR021           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7017h | ICU           | Interrupt request register 023                | IR023           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 701Bh | ICU           | Interrupt request register 027                | IR027           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 701Ch | ICU           | Interrupt request register 028                | IR028           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 701Dh | ICU           | Interrupt request register 029                | IR029           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 701Eh | ICU           | Interrupt request register 030                | IR030           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 701Fh | ICU           | Interrupt request register 031                | IR031           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7020h | ICU           | Interrupt request register 032                | IR032           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7021h | ICU           | Interrupt request register 033                | IR033           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7022h | ICU           | Interrupt request register 034                | IR034           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7023h | ICU           | Interrupt request register 035                | IR035           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7024h | ICU           | Interrupt request register 036                | IR036           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7025h | ICU           | Interrupt request register 037                | IR037           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7026h | ICU           | Interrupt request register 038                | IR038           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7027h | ICU           | Interrupt request register 039                | IR039           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7028h | ICU           | Interrupt request register 040                | IR040           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7029h | ICU           | Interrupt request register 041                | IR041           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 702Ah | ICU           | Interrupt request register 042                | IR042           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 702Bh | ICU           | Interrupt request register 043                | IR043           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 702Ch | ICU           | Interrupt request register 044                | IR044           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 702Dh | ICU           | Interrupt request register 045                | IR045           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 702Eh | ICU           | Interrupt request register 046                | IR046           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 702Fh | ICU           | Interrupt request register 047                | IR047           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7030h | ICU           | Interrupt request register 048                | IR048           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7031h | ICU           | Interrupt request register 049                | IR049           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7032h | ICU           | Interrupt request register 050                | IR050           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7033h | ICU           | Interrupt request register 051                | IR051           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7034h | ICU           | Interrupt request register 052                | IR052           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7035h | ICU           | Interrupt request register 053                | IR053           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7036h | ICU           | Interrupt request register 054                | IR054           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7037h | ICU           | Interrupt request register 055                | IR055           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7038h | ICU           | Interrupt request register 056                | IR056           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7039h | ICU           | Interrupt request register 057                | IR057           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 703Ah | ICU           | Interrupt request register 058                | IR058           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 703Bh | ICU           | Interrupt request register 059                | IR059           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 703Eh | ICU           | Interrupt request register 062                | IR062           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7040h | ICU           | Interrupt request register 064                | IR064           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7041h | ICU           | Interrupt request register 065                | IR065           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7042h | ICU           | Interrupt request register 066                | IR066           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7043h | ICU           | Interrupt request register 067                | IR067           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7044h | ICU           | Interrupt request register 068                | IR068           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7045h | ICU           | Interrupt request register 069                | IR069           | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7046h | ICU           | Interrupt request register 070                | IR070           | 8              | 8           | 2                       | ICLK      |                  |

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

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

**Table 4.1 List of I/O Registers (Address Order) (14/50)**

| Address    | Module Symbol | Register Name                                | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |      |
|------------|---------------|----------------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|------|
|            |               |                                              |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |      |
| 0008 7400h | ICU           | DMAC activation request select register 0    | DMRSR0          | 8              | 8           | 2 ICLK                  |           | ICUb             |      |
| 0008 7404h | ICU           | DMAC activation request select register 1    | DMRSR1          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7408h | ICU           | DMAC activation request select register 2    | DMRSR2          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 740Ch | ICU           | DMAC activation request select register 3    | DMRSR3          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7500h | ICU           | IRQ control register 0                       | IRQCR0          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7501h | ICU           | IRQ control register 1                       | IRQCR1          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7502h | ICU           | IRQ control register 2                       | IRQCR2          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7503h | ICU           | IRQ control register 3                       | IRQCR3          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7504h | ICU           | IRQ control register 4                       | IRQCR4          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7505h | ICU           | IRQ control register 5                       | IRQCR5          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7506h | ICU           | IRQ control register 6                       | IRQCR6          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7507h | ICU           | IRQ control register 7                       | IRQCR7          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7508h | ICU           | IRQ control register 8                       | IRQCR8          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7509h | ICU           | IRQ control register 9                       | IRQCR9          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 750Ah | ICU           | IRQ control register 10                      | IRQCR10         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 750Bh | ICU           | IRQ control register 11                      | IRQCR11         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 750Ch | ICU           | IRQ control register 12                      | IRQCR12         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 750Dh | ICU           | IRQ control register 13                      | IRQCR13         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 750Eh | ICU           | IRQ control register 14                      | IRQCR14         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 750Fh | ICU           | IRQ control register 15                      | IRQCR15         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7510h | ICU           | IRQ pin digital filter enable register 0     | IRQFLTE0        | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7511h | ICU           | IRQ pin digital filter enable register 1     | IRQFLTE1        | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7514h | ICU           | IRQ pin digital filter setting register 0    | IRQFLTC0        | 16             | 16          | 2 ICLK                  |           |                  |      |
| 0008 7516h | ICU           | IRQ pin digital filter setting register 1    | IRQFLTC1        | 16             | 16          | 2 ICLK                  |           |                  |      |
| 0008 7580h | ICU           | Non-maskable interrupt status register       | NMISR           | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7581h | ICU           | Non-maskable interrupt enable register       | NMIER           | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7582h | ICU           | Non-maskable interrupt status clear register | NMICLR          | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7583h | ICU           | NMI pin interrupt control register           | NMICR           | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7590h | ICU           | NMI pin digital filter enable register       | NMIFLTE         | 8              | 8           | 2 ICLK                  |           |                  |      |
| 0008 7594h | ICU           | NMI pin digital filter setting register      | NMIFLTC         | 16             | 16          | 2 ICLK                  |           |                  |      |
| 0008 8000h | CMT           | Compare match timer start register 0         | CMSTR0          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    | CMT              |      |
| 0008 8002h | CMT0          | Compare match timer control register         | CMCR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8004h | CMT0          | Compare match timer counter                  | CMCNT           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8006h | CMT0          | Compare match timer constant register        | CMCOR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8008h | CMT1          | Compare match timer control register         | CMCR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 800Ah | CMT1          | Compare match timer counter                  | CMCNT           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 800Ch | CMT1          | Compare match timer constant register        | CMCOR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8010h | CMT           | Compare match timer start register 1         | CMSTR1          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8012h | CMT2          | Compare match timer control register         | CMCR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8014h | CMT2          | Compare match timer counter                  | CMCNT           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8016h | CMT2          | Compare match timer constant register        | CMCOR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8018h | CMT3          | Compare match timer control register         | CMCR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 801Ah | CMT3          | Compare match timer counter                  | CMCNT           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 801Ch | CMT3          | Compare match timer constant register        | CMCOR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8020h | WDT           | WDT refresh register                         | WDTRR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  | WDTA |
| 0008 8022h | WDT           | WDT control register                         | WDTCR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8024h | WDT           | WDT status register                          | WDTSR           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8026h | WDT           | WDT reset control register                   | WDTRCR          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8030h | IWDT          | IWDT refresh register                        | IWDTRR          | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8032h | IWDT          | IWDT control register                        | IWDTCR          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |
| 0008 8034h | IWDT          | IWDT status register                         | IWDTSR          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |      |

**Table 4.1 List of I/O Registers (Address Order) (40/50)**

| Address    | Module Symbol | Register Name                     | Register Symbol | Number of Bits | Access Size | Number of Access States |                                                                                                      | Related Function |
|------------|---------------|-----------------------------------|-----------------|----------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------|------------------|
|            |               |                                   |                 |                |             | ICLK≥PCLK               | ICLK<PCLK                                                                                            |                  |
| 000A 0054h | USB0          | USB request type register         | USBREQ          | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0056h | USB0          | USB request value register        | USBVAL          | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0058h | USB0          | USB request index register        | USBINDX         | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 005Ah | USB0          | USB request length register       | USBLENG         | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 005Ch | USB0          | DCP configuration register        | DCPCFG          | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 005Eh | USB0          | DCP maximum packet size register  | DCPMAXP         | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0060h | USB0          | DCP control register              | DCPCTR          | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0064h | USB0          | Pipe window select register       | PIPESEL         | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> | USBa             |
| 000A 0068h | USB0          | Pipe configuration register       | PIPECFG         | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 006Ch | USB0          | Pipe maximum packet size register | PIPEMAXP        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |

**Table 4.1 List of I/O Registers (Address Order) (46/50)**

| Address    | Module Symbol | Register Name                     | Register Symbol | Number of Bits | Access Size | Number of Access States |                                                                                                      | Related Function |
|------------|---------------|-----------------------------------|-----------------|----------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------|------------------|
|            |               |                                   |                 |                |             | ICLK≥PCLK               | ICLK<PCLK                                                                                            |                  |
| 000A 0268h | USB1          | Pipe configuration register       | PIPECFG         | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 026Ch | USB1          | Pipe maximum packet size register | PEMAXP          | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 026Eh | USB1          | Pipe cycle control register       | PIPEPERI        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0270h | USB1          | Pipe 1 control register           | PIPE1CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> | USBa             |
| 000A 0272h | USB1          | Pipe 2 control register           | PIPE2CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0274h | USB1          | Pipe 3 control register           | PIPE3CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0276h | USB1          | Pipe 4 control register           | PIPE4CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 0278h | USB1          | Pipe 5 control register           | PIPE5CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 027Ah | USB1          | Pipe 6 control register           | PIPE6CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |
| 000A 027Ch | USB1          | Pipe 7 control register           | PIPE7CTR        | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |

- Note 1. Supply current values are with all output pins unloaded and all input pull-up MOSs in the off state.
- Note 2. Measured with clocks supplied to the peripheral functions. This does not include the BGO operation.
- Note 3.  $I_{CC}$  depends on  $f$  (ICLK) as follows. (ICLK:PCLK:BCLK:BCLK pin = 8:4:4:2)  
 $I_{CC}$  Max. =  $0.87 \times f + 13$  (max. operation in high-speed operating mode)  
 $I_{CC}$  Typ. =  $0.35 \times f + 5$  (normal operation in high-speed operating mode)  
 $I_{CC}$  Typ. =  $1.0 \times f + 3$  (low-speed operating mode 1)  
 $I_{CC}$  Max. =  $0.53 \times f + 12$  (sleep mode)
- Note 4. This does not include the BGO operation.
- Note 5. This is the increase for programming or erasure of the ROM or flash memory for data storage during program execution.
- Note 6. Supply of the clock signal to peripherals is stopped in this state. This does not include the BGO operation.
- Note 7. The reference power supply current is included in the power supply current value for 10-bit A/D conversion and D/A conversion.
- Note 8. When  $V_{BATT}$  is used
- Note 9. The current values for 10-bit A/D converter and 10-bit D/A converter are included in the current from the VREFH pin.
- Note 10. The values are the sum of  $I_{AVCC0}$  and  $I_{VREFH}$ .

**Table 5.6 DC Characteristics (4)**

Conditions:  $V_{CC} = AVCC0 = VREFH = VCC\_USB = 2.7$  to  $3.6$  V,  $VREFH0 = 2.7$  V to  $AVCC0$ ,  
 $VSS = AVSS0 = VREFL/VREFL0 = VSS\_USB = 0$  V,  $T_a = T_{opr}$

| Item                                  | Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---------------------------------------|--------|------|------|------|------|-----------------|
| Permissible total power consumption*1 | $P_d$  | —    | —    | 380  | mW   | *2              |

Note 1. This is the total power consumption of the chip as a whole (including the power consumed by the output buffers).

Note 2. Contact a Renesas sales office or agent regarding further details of the conditions of measurement.

**Table 5.7 Permissible Output Currents**

Conditions:  $V_{CC} = AVCC0 = VREFH = VCC\_USB = 2.7$  to  $3.6$  V,  $VREFH0 = 2.7$  V to  $AVCC0$ ,  
 $VSS = AVSS0 = VREFL/VREFL0 = VSS\_USB = 0$  V,  $T_a = T_{opr}$

| Item                                                       |                          |              | Symbol          | Min. | Typ. | Max. | Unit |
|------------------------------------------------------------|--------------------------|--------------|-----------------|------|------|------|------|
| Permissible output low current<br>(average value per pin)  | All output pins*1        | Normal drive | $I_{OL}$        | —    | —    | 2.0  | mA   |
|                                                            | All output pins*2        | High drive   | $I_{OL}$        |      |      | 3.8  | mA   |
| Permissible output low current<br>(max. value per pin)     | All output pins*1        | Normal drive | $I_{OL}$        | —    | —    | 4.0  | mA   |
|                                                            | All output pins*2        | High drive   | $I_{OL}$        |      |      | 7.6  | mA   |
| Permissible output low current (total)                     | Total of all output pins |              | $\Sigma I_{OL}$ | —    | —    | 80   | mA   |
| Permissible output high current<br>(average value per pin) | All output pins*1        | Normal drive | $I_{OH}$        | —    | —    | −2.0 | mA   |
|                                                            | USB_DPUPE pin*2          | High drive   | $I_{OH}$        | —    | —    | −3.8 | mA   |
| Permissible output high current<br>(max. value per pin)    | All output pins*1        | Normal drive | $I_{OH}$        | —    | —    | −4.0 | mA   |
|                                                            | All output pins*2        | High drive   | $I_{OH}$        | —    | —    | −7.6 | mA   |
| Permissible output high current (total)                    | Total of all output pins |              | $\Sigma I_{OH}$ | —    | —    | −80  | mA   |

Caution: To protect the LSI's reliability, the output current values should not exceed the values in this table.

Note 1. This is the value when normal driving ability is set with a pin for which normal driving ability is selectable.

Note 2. This is the value when high driving ability is set with a pin for which normal driving ability is selectable or the value of the pin to which high driving ability is fixed.



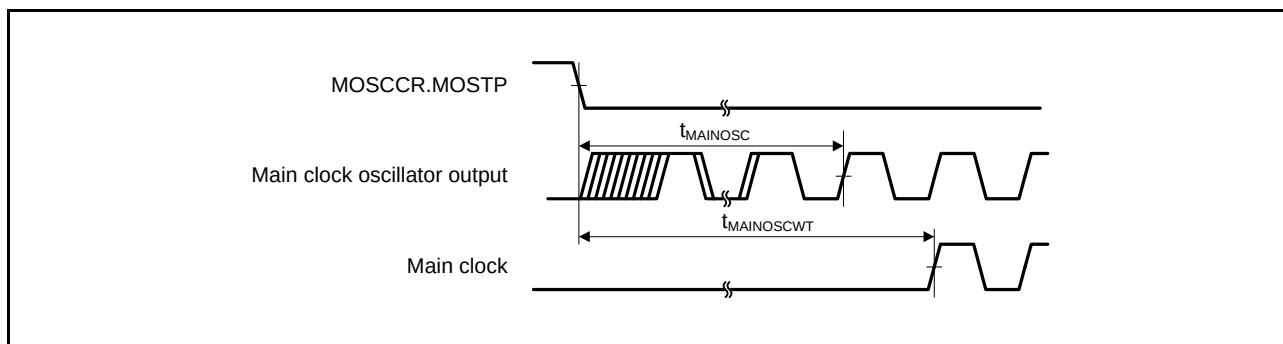


Figure 5.5 Main Clock Oscillation Start Timing

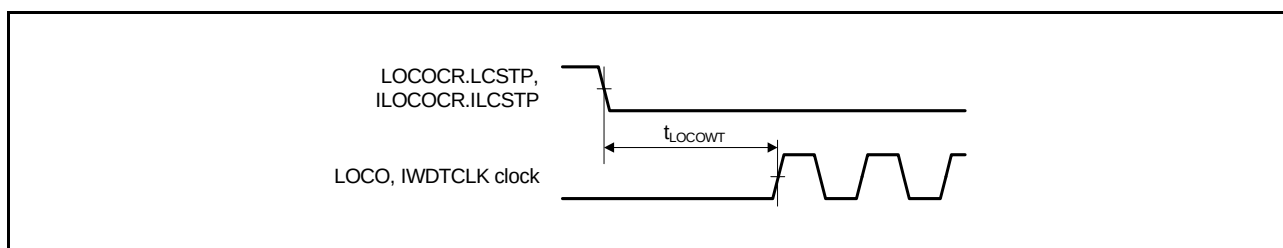


Figure 5.6 LOCO, IWDTCCLK Oscillation Start Timing

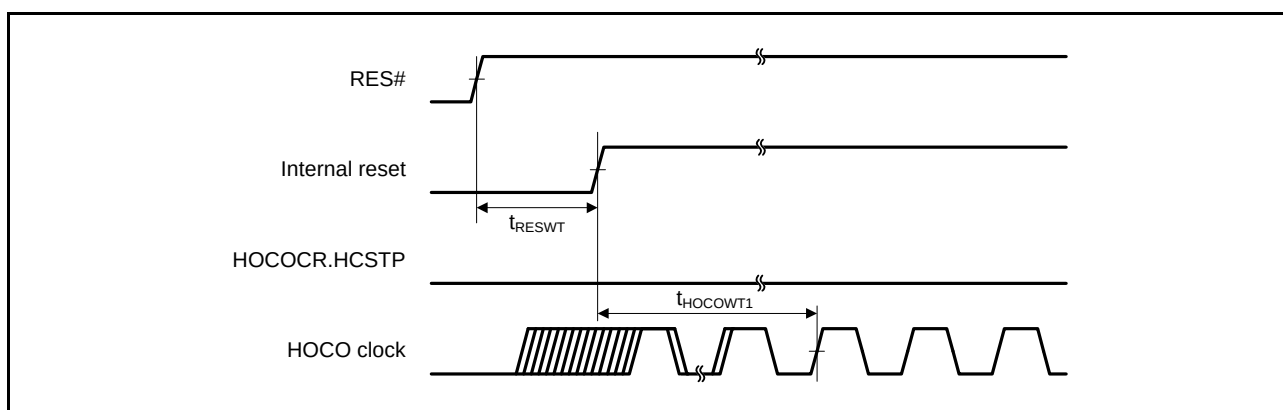


Figure 5.7 HOCO Oscillation Start Timing (After Reset is Canceled by Setting the OFS1.HOCOEN Bit to 0)

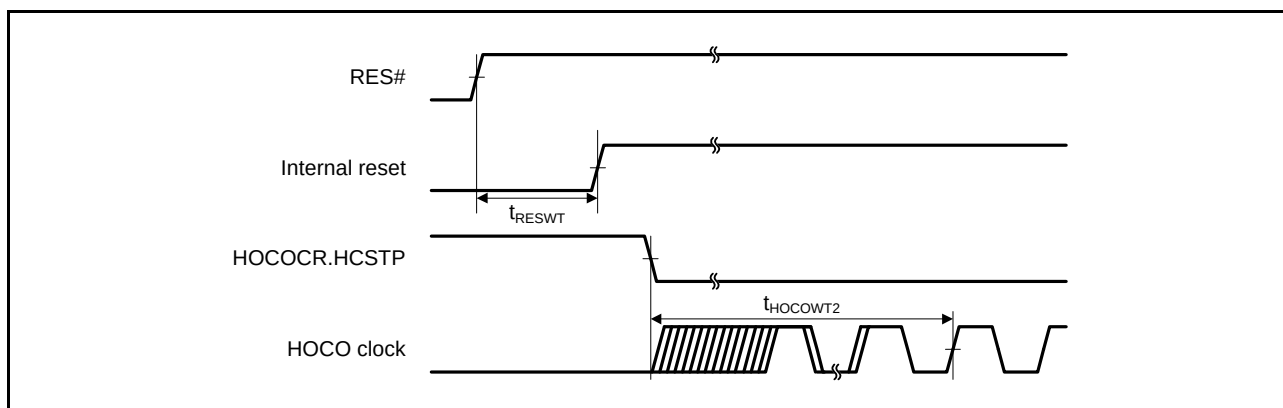


Figure 5.8 HOCO Clock Oscillation Start Timing (Oscillation is Started by Setting the HOCOEN.HCSTP Bit)

**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.

## 5.5 A/D Conversion Characteristics

**Table 5.28 10-Bit A/D Conversion Characteristics**Conditions:  $V_{CC} = AV_{CC0} = V_{REFH} = V_{CC\_USB} = 2.7$  to  $3.6$  V,  $V_{REFH0} = 2.7$  V to  $AV_{CC0}$  $V_{SS} = AV_{SS0} = V_{REFL}/V_{REFL0} = V_{SS\_USB} = 0$  V

PCLK = 8 to 50 MHz

 $T_a = T_{opr}$ 

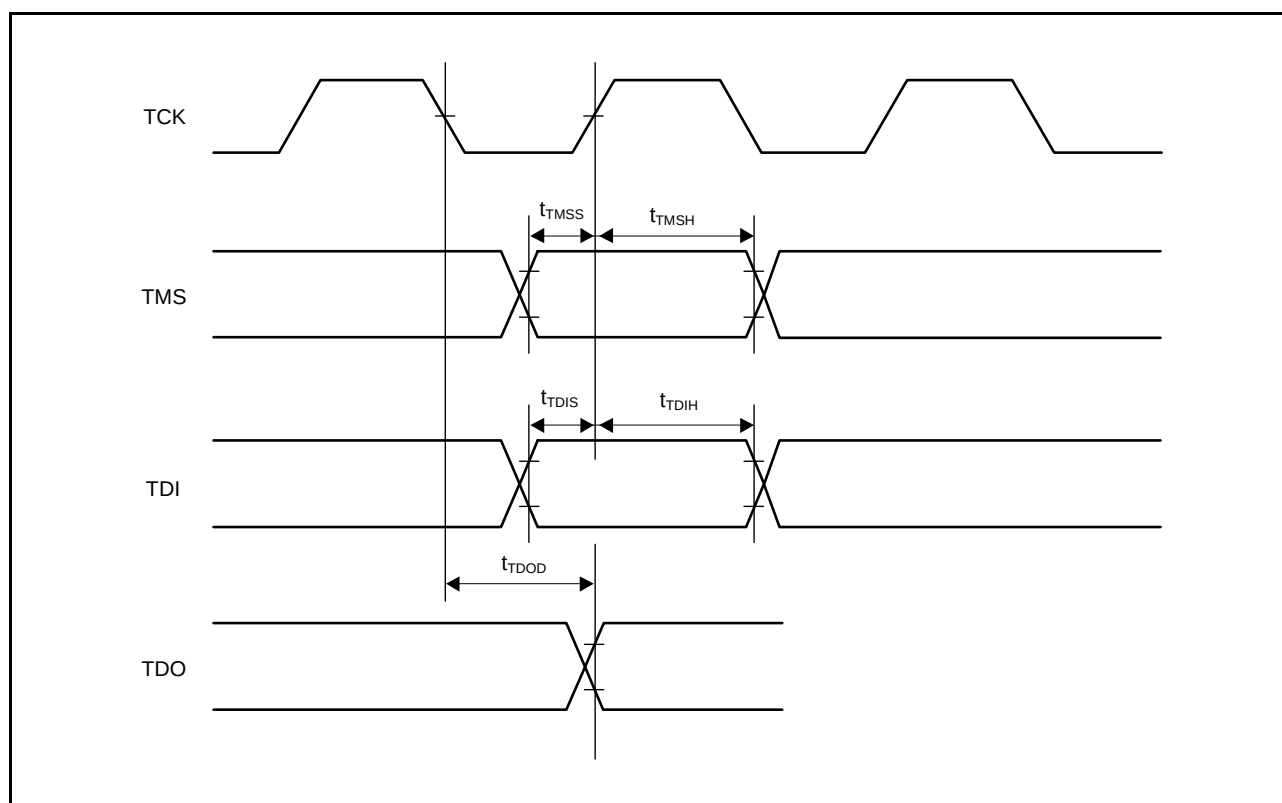
| Item                                              |                                   |                                                                  | Min.        | Typ. | Max. | Unit | Test Conditions        |
|---------------------------------------------------|-----------------------------------|----------------------------------------------------------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

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

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

Note 2. The scanning is not supported.

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

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

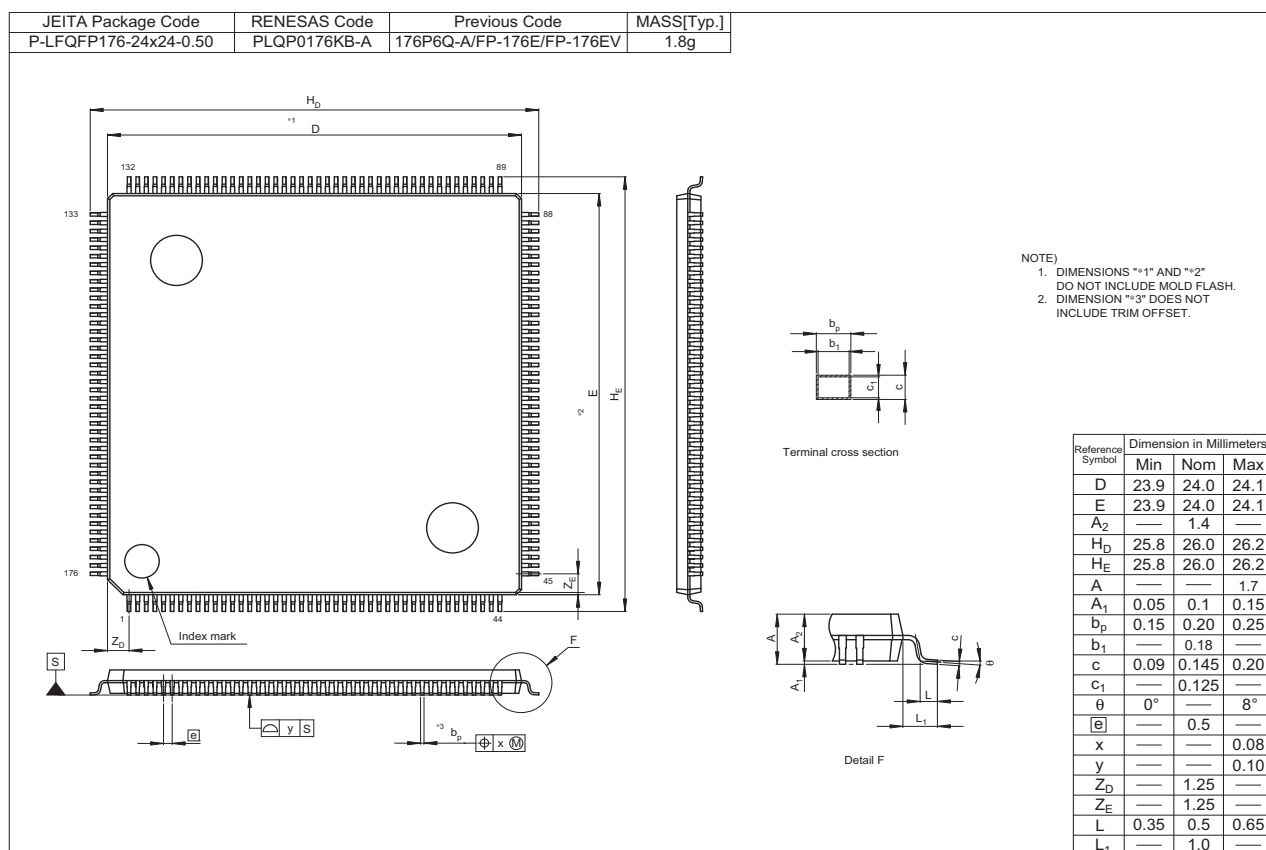


Figure C 176-pin LQFP (PLQP0176KB-A)

| Rev. | Date         | Description                    |                                                                                                                                                                 |
|------|--------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |              | Page                           | Summary                                                                                                                                                         |
| 1.60 | Mar 13. 2013 | Feature                        |                                                                                                                                                                 |
|      |              | 1                              | Changed                                                                                                                                                         |
|      |              | 1. Overview                    |                                                                                                                                                                 |
|      |              | 2 to 7                         | Table 1.1 Outline of Specifications: changed, note added                                                                                                        |
|      |              | 8                              | Table 1.2 Comparison of Functions for Different Packages in the RX63N/RX631 Group, changed                                                                      |
|      |              | 9 to 15                        | Table 1.3 List of Products, changed                                                                                                                             |
|      |              | 16                             | Figure 1.1 How to Read the Product Part No., changed                                                                                                            |
|      |              | 17                             | Figure 1.2 Block Diagram, changed                                                                                                                               |
|      |              | 24 to 32                       | Figure 1.3 to Figure 1.11 Pin Assignment: note, added                                                                                                           |
|      |              | 53 to 57                       | Table 1.9 List of Pins and Pin Functions (100-Pin TFLGA), added                                                                                                 |
|      |              | 62 to 64                       | Table 1.11 List of Pins and Pin Functions (64-Pin LQFP), added                                                                                                  |
|      |              | 65, 66                         | Table 1.12 List of Pins and Pin Functions (48-Pin LQFP), added                                                                                                  |
|      |              | 3. Address Space               |                                                                                                                                                                 |
|      |              | 71                             | Figure 3.1 Memory Map in Each Operating Mode, changed                                                                                                           |
|      |              | 4. I/O Registers               |                                                                                                                                                                 |
|      |              | 75 to 120                      | Table 4.1 List of I/O Registers (Address Order), changed                                                                                                        |
|      |              | 5. Electrical Characteristics  |                                                                                                                                                                 |
|      |              | All                            | Characteristics and timing conditions in the tables, changed                                                                                                    |
|      |              | 124, 125                       | Table 5.4 DC Characteristics (3), changed                                                                                                                       |
|      |              | 126                            | Table 5.5 DC Characteristics (4), changed                                                                                                                       |
|      |              | 127                            | 5.3 AC Characteristics, changed                                                                                                                                 |
|      |              | 130, 131                       | Table 5.11, Clock Timing (Except for Sub-Clock Related): Condition and the table, changed, note, added                                                          |
|      |              | 132                            | Table 5.12 Clock Timing (Sub-Clock Related): Condition and the table, changed, note, added                                                                      |
|      |              | 176                            | Table 5.33 Battery Backup Function Characteristics: Condition, changed                                                                                          |
|      |              | Appendix 1. Package Dimensions |                                                                                                                                                                 |
|      |              | 189                            | Figure H 64-pin LQFP (PLQP0064KB-A), added                                                                                                                      |
|      |              | 190                            | Figure I 48-pin LQFP (PLQP0048KB-A), added                                                                                                                      |
| 1.70 | Oct 08. 2013 | Features                       |                                                                                                                                                                 |
|      |              | 1                              | changed                                                                                                                                                         |
|      |              | 1. Overview                    |                                                                                                                                                                 |
|      |              | 2 to 7                         | Table 1.1 Outline of Specifications, General I/O ports, Packages, changed, Parallel data capture unit (PDC), added.                                             |
|      |              | 8                              | Table 1.2 Comparison of Functions for Different Packages in the RX63N/RX631 Group, 64-pin LQFP, changed, 64-pin TFLGA, Parallel data capture unit (PDC), added. |
|      |              | 9 to 16                        | Table 1.3 List of Products, changed.                                                                                                                            |
|      |              | 17                             | Figure 1.1 How to Read the Product Part No., changed                                                                                                            |
|      |              | 18                             | Figure 1.2 Block Diagram, changed                                                                                                                               |
|      |              | 19 to 24                       | Table 1.4 Pin Functions, changed, Parallel data capture unit (PDC), added                                                                                       |
|      |              | 32                             | Figure 1.10 Pin Assignment (64-Pin TFLGA), added                                                                                                                |
|      |              | 35 to 40                       | Table 1.5 List of Pin and Pin Functions (177-Pin TFLGA, 176-Pin LFBGA), changed                                                                                 |
|      |              | 41 to 45                       | Table 1.6 List of Pin and Pin Functions (176-Pin LQFP), changed                                                                                                 |
|      |              | 46 to 50                       | Table 1.7 List of Pins and Pin Functions (145-Pin TFLGA), changed                                                                                               |
|      |              | 51 to 55                       | Table 1.8 List of Pins and Pin Functions (144-Pin LQFP), changed                                                                                                |
|      |              | 65 to 66                       | Table 1.11 List of Pins and Pin Functions (64-Pin TFLGA), added                                                                                                 |
|      |              | 3. Address Space               |                                                                                                                                                                 |
|      |              | 76                             | Figure 3.1 Memory Map in Each Operating Mode, changed                                                                                                           |
|      |              | 4. I/O Registers               |                                                                                                                                                                 |
|      |              | 79                             | (4) Restrictions in Relation to RMPA and String-Manipulation Instructions, added                                                                                |