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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             | Discontinued at Digi-Key                                                                                                                                                        |
| Core Processor             | RX                                                                                                                                                                              |
| Core Size                  | 32-Bit Single-Core                                                                                                                                                              |
| Speed                      | 100MHz                                                                                                                                                                          |
| Connectivity               | CANbus, EBI/EMI, Ethernet, I <sup>2</sup> C, LINbus, SCI, SPI, USB                                                                                                              |
| Peripherals                | DMA, LVD, POR, PWM, WDT                                                                                                                                                         |
| Number of I/O              | 111                                                                                                                                                                             |
| Program Memory Size        | 1MB (1M 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             | 144-LQFP                                                                                                                                                                        |
| Supplier Device Package    | 144-LFQFP (20x20)                                                                                                                                                               |
| Purchase URL               | <a href="https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f563nbcdfb-v0">https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f563nbcdfb-v0</a> |

**Table 1.1 Outline of Specifications (3/6)**

| Classification | Module/Function   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I/O ports      | General I/O ports | <ul style="list-style-type: none"> <li>I/O ports for the 177-pin TFLGA, 176-pin LFBGA and 176-pin LQFP<br/>I/O pins: 133<br/>Input pins: 1<br/>Pull-up resistors: 133<br/>Open-drain outputs: 133<br/>5-V tolerance: 18</li> <li>I/O ports for the 145-pin TFLGA and 144-pin LQFP<br/>I/O pins: 111<br/>Input pins: 1<br/>Pull-up resistors: 111<br/>Open-drain outputs: 111<br/>5-V tolerance: 18</li> <li>I/O ports for the 100-pin TFLGA (in the planning stage) and 100-pin LQFP<br/>I/O pins: 78<br/>Input pins: 1<br/>Pull-up resistors: 78<br/>Open-drain outputs: 78<br/>5-V tolerance: 17</li> <li>I/O ports for the 64-pin TFLGA<br/>I/O pins: 39<br/>Input pin: 1<br/>Pull-up resistors: 39<br/>Open-drain outputs: 39<br/>5-V tolerance: 8</li> <li>I/O ports for the 64-pin LQFP<br/>I/O pins: 42<br/>Input pin: 1<br/>Pull-up resistors: 42<br/>Open-drain outputs: 42<br/>5-V tolerance: 8<br/>8-bit port switching function</li> <li>I/O ports for the 48-pin LQFP<br/>I/O pins: 30<br/>Input pin: 1<br/>Pull-up resistors: 30<br/>Open-drain outputs: 30<br/>5-V tolerance: 6<br/>8-bit port switching function</li> </ul> |

**Table 1.2 Comparison of Functions for Different Packages in the RX63N/RX631 Group**

| Functions                                           |                                   | RX63N Group                                                       |                                 |                  |                                                                   | RX631 Group                     |                      |                                  |                 |                                     |
|-----------------------------------------------------|-----------------------------------|-------------------------------------------------------------------|---------------------------------|------------------|-------------------------------------------------------------------|---------------------------------|----------------------|----------------------------------|-----------------|-------------------------------------|
| Package                                             |                                   | 177-pin<br>176-pin                                                | 145-pin<br>144-pin              | 100-pin          | 177-pin<br>176-pin                                                | 145-pin<br>144-pin              | 100-pin              | 64-pin<br>LQFP                   | 64-pin<br>TFLGA | 48-pin                              |
| External bus<br>width                               | External bus width                | 32 bits                                                           | 16 bits                         |                  | 32 bits                                                           | 16 bits                         |                      |                                  |                 | Not available                       |
|                                                     | SDRAM area controller             | Available                                                         |                                 | Not<br>available | Available                                                         |                                 |                      |                                  |                 | Not available                       |
| DMA                                                 | DMA controller                    | Ch. 0 to 3                                                        |                                 |                  |                                                                   | Ch. 0 to 3                      |                      |                                  |                 |                                     |
|                                                     | EXDMA controller                  | Ch. 0 and 1                                                       |                                 |                  | Ch. 0 and 1                                                       |                                 |                      | Not available                    |                 |                                     |
|                                                     | Data transfer controller          | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
| Timers                                              | 16-bit timer pulse unit           | Ch. 0 to 11                                                       | Ch. 0 to 5                      |                  | Ch. 0 to 11                                                       |                                 |                      | Ch. 0 to 5                       |                 |                                     |
|                                                     | Multi-function timer pulse unit 2 | Ch. 0 to 5                                                        |                                 |                  |                                                                   | Ch. 0 to 5                      |                      |                                  |                 |                                     |
|                                                     | Port output enable 2              | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
|                                                     | Programmable pulse generator      | Ch. 0 and 1                                                       |                                 |                  |                                                                   | Ch. 0 and 1                     |                      |                                  |                 |                                     |
|                                                     | 8-bit timers                      | Ch. 0 to 3                                                        |                                 |                  |                                                                   | Ch. 0 to 3                      |                      |                                  |                 |                                     |
|                                                     | Compare match timer               | Ch. 0 to 3                                                        |                                 |                  |                                                                   | Ch. 0 to 3                      |                      |                                  |                 |                                     |
|                                                     | Realtime clock                    | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 | Not<br>available                    |
|                                                     | Watchdog timer                    | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
|                                                     | Independent watchdog timer        | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
|                                                     | Communicatio<br>n function        | Ethernet controller                                               | Available                       |                  |                                                                   |                                 | Not available        |                                  |                 |                                     |
| DMA controller for Ethernet<br>controller           |                                   | Available                                                         |                                 |                  |                                                                   | Not available                   |                      |                                  |                 |                                     |
| USB 2.0 host/function module                        |                                   | Ch. 0 and<br>1                                                    | Ch.0                            |                  | Ch. 0 and<br>1                                                    |                                 | Ch.0                 | Ch. 0 and<br>1                   | Ch.0            |                                     |
| Serial communications<br>interfaces (SClc)          |                                   | Ch. 0 to 11                                                       | Ch. 0 to<br>3, 5, 6, 8<br>and 9 |                  | Ch. 0 to 11                                                       | Ch. 0 to<br>3, 5, 6, 8<br>and 9 | Ch. 1, 5, 6, 8 and 9 | Ch. 1, 5, 6,<br>and 8            |                 |                                     |
| Serial communications<br>interfaces (SCld)          |                                   | Ch. 12                                                            |                                 |                  |                                                                   | Ch. 12                          |                      |                                  |                 |                                     |
| I <sup>2</sup> C bus interfaces                     |                                   | Ch. 0 to 3                                                        | Ch.0 and<br>2                   |                  | Ch. 0 to 3                                                        | Ch.0 and<br>2                   | Ch.2                 |                                  |                 |                                     |
| IEBus                                               |                                   | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
| Serial peripheral interfaces                        |                                   | Ch.0 to 2                                                         | Ch. 0 and<br>1                  |                  | Ch.0 to 2                                                         | Ch. 0 and 1                     |                      |                                  |                 |                                     |
| CAN module                                          |                                   | For 1.5 M or more:<br>Ch. 0 to 2, For 1 M or<br>less: Ch. 0 and 1 | Ch. 0 and<br>1                  |                  | For 1.5 M or more:<br>Ch. 0 to 2, For 1 M or<br>less: Ch. 0 and 1 | Ch. 0<br>and 1                  | Ch.1                 |                                  |                 |                                     |
| Parallel data capture unit (PDC)                    |                                   | Not available                                                     |                                 |                  |                                                                   | Available                       |                      |                                  |                 | Not available                       |
| 12-bit A/D converter (channel)                      |                                   | AN000 to 020                                                      |                                 | AN000 to<br>013  | AN000 to 020                                                      |                                 | AN000 to<br>013      | AN000 to 004, 006,<br>008 to 013 |                 | AN000 to<br>002, 006,<br>009 to 012 |
| 10-bit A/D converter (channel)                      |                                   | AN0 to 7                                                          |                                 |                  |                                                                   | AN0 to 7                        |                      |                                  | Not available   |                                     |
| D/A converter                                       |                                   | Ch. 0 and 1                                                       |                                 | Ch.1             | Ch. 0 and 1                                                       |                                 | Ch.1                 | Ch.1                             |                 | Not<br>available                    |
| Temperature sensor                                  |                                   | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
| CRC calculator                                      |                                   | Available                                                         |                                 |                  |                                                                   | Available                       |                      |                                  |                 |                                     |
| Unique ID                                           |                                   | Available (only for the G version)                                |                                 |                  |                                                                   |                                 |                      |                                  |                 |                                     |
| Off-board programming (parallel programmer<br>mode) |                                   |                                                                   |                                 | Available        |                                                                   |                                 |                      | Not available                    |                 |                                     |
| Sub-clock oscillator (for low clock loads)          |                                   |                                                                   |                                 | Available        |                                                                   |                                 |                      | Not available                    |                 |                                     |
| Sub-clock oscillator (for standard clock loads)     |                                   |                                                                   |                                 | Available        |                                                                   |                                 |                      | Not<br>available                 |                 |                                     |
| Battery backup function                             |                                   |                                                                   |                                 | Available        |                                                                   |                                 |                      | Not<br>available                 |                 |                                     |
| I/O port switching function                         |                                   | Not available                                                     |                                 |                  |                                                                   | Not available                   |                      |                                  | Available       |                                     |

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 (4/6)**

| Classifications                        | Pin Name                                   | I/O    | Description                                                                                                                 |
|----------------------------------------|--------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------|
| Serial communications interface (SCId) | • Asynchronous mode/clock synchronous mode |        |                                                                                                                             |
|                                        | SCK12                                      | I/O    | Input/output pin for clock signals.                                                                                         |
|                                        | RXD12                                      | Input  | Input pin for data reception.                                                                                               |
|                                        | TXD12                                      | Output | Output pin for data transmission.                                                                                           |
|                                        | CTS12#                                     | Input  | Transmit/receive start control input pins                                                                                   |
|                                        | RTS12#                                     | Output | Transmit/receive start control output pins                                                                                  |
|                                        | • Simple I <sup>2</sup> C mode             |        |                                                                                                                             |
|                                        | SSCL12                                     | I/O    | Input/output pins for the I <sup>2</sup> C clock                                                                            |
|                                        | SSDA12                                     | I/O    | Input/output pins for the I <sup>2</sup> C data                                                                             |
|                                        | • Simple SPI mode                          |        |                                                                                                                             |
|                                        | SCK12                                      | I/O    | Input/output pins for the clock                                                                                             |
|                                        | SMISO12                                    | I/O    | Input/output pins for slave transmit data.                                                                                  |
|                                        | SMOSI12                                    | I/O    | Input/output pins for master transmit data.                                                                                 |
|                                        | SS12#                                      | Input  | Input pins for chip select signals                                                                                          |
|                                        | • Extended serial mode                     |        |                                                                                                                             |
|                                        | RXDX12                                     | Input  | Input pin for receive data                                                                                                  |
|                                        | TXDX12                                     | Output | Output pin for transmit data                                                                                                |
|                                        | SIOX12                                     | I/O    | Input/output pin for Transmit/receive data                                                                                  |
| I <sup>2</sup> C bus interface         | SCL0[FM+], SCL1 to SCL3                    | I/O    | Input/output pin for clocks. Bus can be directly driven by the N-channel open drain output.                                 |
|                                        | SDA0[FM+], SDA1 to SDA3                    | I/O    | Input/output pin for data. Bus can be directly driven by the N-channel open drain output.                                   |
| Ethernet controller                    | REF50CK                                    | Input  | 50-MHz reference clock. This pin inputs reference signals for transmission/reception timings in RMII mode.                  |
|                                        | RMII_CRS_DV                                | Input  | Indicates that there are carrier detection signals and valid receive data on RMII_RXD1 and RMII_RXD0 in RMII mode.          |
|                                        | RMII_TXD0, RMII_TXD1                       | Output | 2-bit transmit data in RMII mode.                                                                                           |
|                                        | RMII_RXD0, RMII_RXD1                       | Input  | 2-bit receive data in RMII mode.                                                                                            |
|                                        | RMII_TXD_EN                                | Output | Output pin for data transmit enable signals in RMII mode.                                                                   |
|                                        | RMII_RX_ER                                 | Input  | Indicates an error has occurred during reception of data in RMII mode.                                                      |
|                                        | ET_CRS                                     | Input  | Carrier detection/data reception enable pin.                                                                                |
|                                        | ET_RX_DV                                   | Input  | Indicates that there are valid receive data on ET_ERXD3 to ET_ERXD0.                                                        |
|                                        | ET_EXOUT                                   | Output | General-purpose external output pin.                                                                                        |
|                                        | ET_LINKSTA                                 | Input  | Inputs link status from the PHY-LSI.                                                                                        |
|                                        | ET_ETXD0 to ET_ETXD3                       | Output | 4 bits of MII transmit data.                                                                                                |
|                                        | ET_ERXD0 to ET_ERXD3                       | Input  | 4 bits of MII receive data.                                                                                                 |
|                                        | ET_TX_EN                                   | Output | Transmit enable pin. Indicates that transmit data is ready on ET_ETXD3 to ET_ETXD0.                                         |
|                                        | ET_TX_ER                                   | Output | Transmit error pin. Notifies the PHY_LSI of an error during transmission.                                                   |
|                                        | ET_RX_ER                                   | Input  | Receive error pin. Recognizes an error during reception.                                                                    |
|                                        | ET_TX_CLK                                  | Input  | Transmit clock pin. This pin inputs reference signals for output timings from ET_TX_EN, ET_ETXD3 to ET_ETXD0, and ET_TX_ER. |
|                                        | ET_RX_CLK                                  | Input  | Receive clock pin. This pin inputs reference signals for input timings to ET_RX_DV, ET_ERXD3 to ET_ERXD0, and ET_RX_ER.     |
|                                        | ET_COL                                     | Input  | Inputs collision detection signals.                                                                                         |
|                                        | ET_WOL                                     | Output | Receives Magic packets.                                                                                                     |
|                                        | ET_MDC                                     | Output | Outputs reference clock signals for information transfer via ET_MDIO.                                                       |

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

| Classifications     | Pin Name             | I/O   | Description                                                                                                                                                                                                                                  |
|---------------------|----------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analog power supply | AVCC0                | Input | Analog voltage supply pin for the 12-bit A/D converter. Connect this pin to VCC if the 12-bit A/D converter is not to be used.                                                                                                               |
|                     | AVSS0                | Input | Analog ground pin for the 12-bit A/D converter. Connect this pin to VSS if the 12-bit A/D converter is not to be used.                                                                                                                       |
|                     | VREFH0               | Input | Analog reference voltage supply pin for the 12-bit A/D converter. Connect this pin to VCC if the 12-bit A/D converter is not to be used.                                                                                                     |
|                     | VREFL0               | Input | Analog reference ground pin for the 12-bit A/D converter. Connect this pin to VSS if the 12-bit A/D converter is not to be used.                                                                                                             |
|                     | VREFH                | Input | Reference voltage input pin for the 10-bit A/D converter and D/A converter. This is used as the analog power supply for the respective modules. Connect this pin to VCC if neither the 10-bit A/D converter nor the D/A converter is in use. |
|                     | VREFL                | Input | Reference ground pin for the 10-bit A/D converter and D/A converter. This is used as the analog ground for the respective modules. Set this pin to the same potential as the VSS pin.                                                        |
| I/O ports           | P00 to P03, P05, P07 | I/O   | 6-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P10 to P17           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P20 to P27           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P30 to P37           | I/O   | 8-bit input/output pins. (P35 is an input pin)                                                                                                                                                                                               |
|                     | P40 to P47           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P50 to P57           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P60 to P67           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P70 to P77           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P80 to P87           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | P90 to P97           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PA0 to PA7           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PB0 to PB7           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PC0 to PC7           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PD0 to PD7           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PE0 to PE7           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PF0 to PF5           | I/O   | 6-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PG0 to PG7           | I/O   | 8-bit input/output pins.                                                                                                                                                                                                                     |
|                     | PJ3, PJ5             | I/O   | 2-bit input/output pins.                                                                                                                                                                                                                     |

**Table 1.5 List of Pin and Pin Functions (177-Pin TFLGA, 176-Pin LFBGA) (1/5)**

| Pin Number<br>177-Pin<br>TFLGA<br>176-Pin<br>LFBGA | Power Supply<br>Clock System<br>Control | I/O Port | Bus<br>EXDMAC<br>SDRAMC | Timer<br>(MTU, TPU, TMR, PPG,<br>RTC, POE) | Communications<br>(ETHERC, SCIC, SCID,<br>RSPI, RIIC, CAN, IEB,<br>USB, and PDC) | Interrupt | S12AD,<br>AD, DA |
|----------------------------------------------------|-----------------------------------------|----------|-------------------------|--------------------------------------------|----------------------------------------------------------------------------------|-----------|------------------|
| A1                                                 | AVSS0                                   |          |                         |                                            |                                                                                  |           |                  |
| A2                                                 | AVCC0                                   |          |                         |                                            |                                                                                  |           |                  |
| A3                                                 | VREFL0                                  |          |                         |                                            |                                                                                  |           |                  |
| A4                                                 |                                         | P42      |                         |                                            |                                                                                  | IRQ10-DS  | AN002            |
| A5                                                 |                                         | P46      |                         |                                            |                                                                                  | IRQ14-DS  | AN006            |
| A6                                                 | VCC                                     |          |                         |                                            |                                                                                  |           |                  |
| A7                                                 | VSS                                     |          |                         |                                            |                                                                                  |           |                  |
| A8                                                 |                                         | P94      | A20/D20                 |                                            |                                                                                  |           |                  |
| A9                                                 | VCC                                     |          |                         |                                            |                                                                                  |           |                  |
| A10                                                |                                         | P97      | A23/D23                 |                                            |                                                                                  |           |                  |
| A11                                                |                                         | PD6      | D6[A6/D6]               | MTIC5V/POE1#                               | SSLC2                                                                            | IRQ6      | AN6              |
| A12                                                |                                         | P60      | CS0#                    |                                            |                                                                                  |           |                  |
| A13                                                |                                         | P63      | CS3#/CAS#               |                                            |                                                                                  |           |                  |
| A14                                                |                                         | PE1      | D9[A9/D9]               | MTIOC4C/TIOCD9/PO18                        | TXD12/SMOSI12/<br>SSDA12/TXD12/<br>SIOX12/SSLB2/RSPCKB                           |           | ANEX1            |
| A15                                                |                                         | PE2      | D10[A10/D10]            | MTIOC4A/TIOCA9/PO23                        | RXD12/SMISO12/<br>SSCL12/RXD12/SSLB3/<br>MOSIB                                   | IRQ7-DS   | AN0              |
| B1                                                 |                                         | P05      |                         |                                            |                                                                                  | IRQ13     | DA1              |
| B2                                                 |                                         | P07      |                         |                                            |                                                                                  | IRQ15     | ADTRG0#          |
| B3                                                 |                                         | P40      |                         |                                            |                                                                                  | IRQ8-DS   | AN000            |
| B4                                                 |                                         | P41      |                         |                                            |                                                                                  | IRQ9-DS   | AN001            |
| B5                                                 |                                         | P47      |                         |                                            |                                                                                  | IRQ15-DS  | AN007            |
| B6                                                 |                                         | P91      | A17/D17                 |                                            | SCK7                                                                             |           | AN015            |
| B7                                                 |                                         | P92      | A18/D18                 |                                            | RXD7/SMISO7/SSCL7                                                                |           | AN016            |
| B8                                                 |                                         | PD1      | D1[A1/D1]               | MTIOC4B/TIOCB7/<br>TCLKG                   | MOSIC/CTX0                                                                       | IRQ1      | AN009            |
| B9                                                 |                                         | P96      | A22/D22                 |                                            |                                                                                  |           |                  |
| B10                                                |                                         | PD4      | D4[A4/D4]               | POE3#                                      | SSLC0                                                                            | IRQ4      | AN012            |
| B11                                                |                                         | PG1      | D25                     |                                            |                                                                                  |           |                  |
| B12                                                | VSS                                     |          |                         |                                            |                                                                                  |           |                  |
| B13                                                |                                         | P64      | CS4#/WE#                |                                            |                                                                                  |           |                  |
| B14                                                |                                         | PE0      | D8[A8/D8]               | TIOCC9                                     | SCK12/SSLB1                                                                      |           | ANEX0            |
| B15                                                |                                         | PE3      | D11[A11/D11]            | MTIOC4B/TIOCB9/PO26/<br>POE8#              | ET_ERXD3/CTS12#/<br>RTS12#/SS12#/MISOB                                           |           | AN1              |
| C1                                                 | VREFL                                   |          |                         |                                            |                                                                                  |           |                  |
| C2                                                 | VREFH                                   |          |                         |                                            |                                                                                  |           |                  |
| C3                                                 | VREFH0                                  |          |                         |                                            |                                                                                  |           |                  |
| C4                                                 |                                         | P43      |                         |                                            |                                                                                  | IRQ11-DS  | AN003            |
| C5                                                 |                                         | P45      |                         |                                            |                                                                                  | IRQ13-DS  | AN005            |
| C6                                                 |                                         | P90      | A16/D16                 |                                            | TXD7/SMOSI7/SSDA7                                                                |           | AN014            |
| C7                                                 |                                         | PD0      | D0[A0/D0]               | TIOCA7                                     |                                                                                  | IRQ0      | AN008            |
| C8                                                 |                                         | PD2      | D2[A2/D2]               | MTIOC4D/TIOCA8                             | MISOC/CRX0                                                                       | IRQ2      | AN010            |
| C9                                                 |                                         | PD3      | D3[A3/D3]               | TIOCB8/TCLKH/POE8#                         | RSPCKC                                                                           | IRQ3      | AN011            |
| C10                                                |                                         | PG0      | D24                     |                                            |                                                                                  |           |                  |
| C11                                                | VCC                                     |          |                         |                                            |                                                                                  |           |                  |
| C12                                                |                                         | P62      | CS2#/RAS#               |                                            |                                                                                  |           |                  |
| C13                                                |                                         | PE4      | D12[A12/D12]            | MTIOC4D/MTIOC1A/<br>TIOCA10/PO28           | ET_ERXD2/SSLB0                                                                   |           | AN2              |



**Table 1.8 List of Pins and Pin Functions (144-Pin LQFP) (3/5)**

| Pin No.<br>144-pin<br>LQFP | 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 |
|----------------------------|-----------------------------------------|----------|-------------------------|------------------------------------------------------|----------------------------------------------------------------------------------|-----------|-------------------|
| 64                         | TRDATA1                                 | P81      | EDACK0                  | MTIOC3D/PO27                                         | RXD10/SMISO10/<br>SSCL10/ET_ETXD0/<br>RMII_TXD0                                  |           |                   |
| 65                         | TRDATA0                                 | P80      | EDREQ0                  | MTIOC3B/PO26                                         | SCK10/ET_TX_EN/<br>RMII_TXD_EN                                                   |           |                   |
| 66                         |                                         | PC4      | A20/CS3#                | MTIOC3D/MTCLKC/<br>TIOCC6/TCLKE/<br>TMC11/PO25/POE0# | SCK5/CTS8#/RTS8#/<br>SS8#/SSLA0/<br>ET_TX_CLK                                    |           |                   |
| 67                         |                                         | PC3      | A19                     | MTIOC4D/TCLKB/<br>PO24                               | TXD5/SMOSI5/SSDA5/<br>IETXD/ET_TX_ER                                             |           |                   |
| 68                         |                                         | P77      | CS7#                    | PO23                                                 | TXD11/SMOSI11/<br>SSDA11/ET_RX_ER/<br>RMII_RX_ER                                 |           |                   |
| 69                         |                                         | P76      | CS6#                    | PO22                                                 | RXD11/SMISO11/<br>SSCL11/ET_RX_CLK/<br>REF50CK                                   |           |                   |
| 70                         |                                         | PC2      | A18                     | MTIOC4B/TCLKA/<br>PO21                               | RXD5/SMISO5/SSCL5/<br>SSLA3/IERXD/<br>ET_RX_DV                                   |           |                   |
| 71                         |                                         | P75      | CS5#                    | PO20                                                 | SCK11/ET_ERXD0/<br>RMII_RXD0                                                     |           |                   |
| 72                         |                                         | P74      | CS4#                    | PO19                                                 | CTS11#/RTS11#/<br>SS11#/ET_ERXD1/<br>RMII_RXD1                                   |           |                   |
| 73                         |                                         | PC1      | A17                     | MTIOC3A/TCLKD/<br>PO18                               | SCK5/SSLA2/SDA3/<br>ET_ERXD2                                                     | IRQ12     |                   |
| 74                         | VCC                                     |          |                         |                                                      |                                                                                  |           |                   |
| 75                         |                                         | PC0      | A16                     | MTIOC3C/TCLKC/<br>PO17                               | CTS5#/RTS5#/SS5#/<br>SSLA1/SCL3/<br>ET_ERXD3                                     | IRQ14     |                   |
| 76                         | VSS                                     |          |                         |                                                      |                                                                                  |           |                   |
| 77                         |                                         | P73      | CS3#                    | PO16                                                 | ET_WOL                                                                           |           |                   |
| 78                         |                                         | PB7      | A15                     | MTIOC3B/TIOCB5/<br>PO31                              | TXD9/SMOSI9/SSDA9/<br>ET_CRS/<br>RMII_CRS_DV                                     |           |                   |
| 79                         |                                         | PB6      | A14                     | MTIOC3D/TIOCA5/<br>PO30                              | RXD9/SMISO9/SSCL9/<br>ET_ETXD1/RMII_TXD1                                         |           |                   |
| 80                         |                                         | PB5      | A13                     | MTIOC2A/MTIOC1B/<br>TIOCB4/TMRI1/PO29/<br>POE1#      | SCK9/ET_ETXD0/<br>RMII_TXD0                                                      |           |                   |
| 81                         |                                         | PB4      | A12                     | TIOCA4/PO28                                          | CTS9#/RTS9#/SS9#/<br>ET_TX_EN/<br>RMII_TXD_EN                                    |           |                   |
| 82                         |                                         | PB3      | A11                     | MTIOC0A/MTIOC4A/<br>TIOCD3/TCLKD/TMO0/<br>PO27/POE3# | SCK4/SCK6/<br>ET_RX_ER/<br>RMII_RX_ER                                            |           |                   |
| 83                         |                                         | PB2      | A10                     | TIOCC3/TCLKC/PO26                                    | CTS4#/RTS4#/CTS6#/<br>RTS6#/SS4#/SS6#/<br>ET_RX_CLK/REF50CK                      |           |                   |
| 84                         |                                         | PB1      | A9                      | MTIOC0C/MTIOC4C/<br>TIOCB3/TMC10/PO25                | TXD4/TXD6/SMOSI4/<br>SMOSI6/SSDA4/<br>SSDA6/ET_ERXD0/<br>RMII_RXD0               | IRQ4-DS   |                   |
| 85                         |                                         | P72      | CS2#                    |                                                      | ET_MDC                                                                           |           |                   |
| 86                         |                                         | P71      | CS1#                    |                                                      | ET_MDIO                                                                          |           |                   |
| 87                         |                                         | PB0      | A8                      | MTIC5W/TIOCA3/<br>PO24                               | RXD4/RXD6/SMISO4/<br>SMISO6/SSCL4/<br>SSCL6/RSPCKA/<br>T_ERXD1/RMII_RXD1         | IRQ12     |                   |
| 88                         |                                         | PA7      | A7                      | TIOCB2/PO23                                          | MISOA/ET_WOL                                                                     |           |                   |

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

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

## 2.3 Register Associated with DSP Instructions

### (1) Accumulator (ACC)

The accumulator (ACC) is a 64-bit register used for DSP instructions. The accumulator is also used for the multiply and multiply-and-accumulate instructions; EMUL, EMULU, FMUL, MUL, and RMPA, in which case the prior value in the accumulator is modified by execution of the instruction.

Use the MVTACHI and MVTACLO instructions for writing to the accumulator. The MVTACHI and MVTACLO instructions write data to the higher-order 32 bits (bits 63 to 32) and the lower-order 32 bits (bits 31 to 0), respectively. Use the MVFACHI and MVFACMI instructions for reading data from the accumulator. The MVFACHI and MVFACMI instructions read data from the higher-order 32 bits (bits 63 to 32) and the middle 32 bits (bits 47 to 16), respectively.

## 3. Address Space

### 3.1 Address Space

This LSI has a 4-Gbyte address space, consisting of the range of addresses from 0000 0000h to FFFF FFFFh. That is, linear access to an address space of up to 4 Gbytes is possible, and this contains both program and data areas.

Figure 3.1 shows the memory maps in the respective operating modes. Accessible areas will differ according to the operating mode and states of control bits.

## 4.1 I/O Register Addresses (Address Order)

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

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

**Table 4.1 List of I/O Registers (Address Order) (12/50)**

| Address    | Module Symbol | Register Name                          | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|----------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                        |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 7322h | ICU           | Interrupt source priority register 034 | IPR034          | 8              | 8           | 2                       | ICLK      | ICUb             |
| 0008 7323h | ICU           | Interrupt source priority register 035 | IPR035          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7324h | ICU           | Interrupt source priority register 036 | IPR036          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7325h | ICU           | Interrupt source priority register 037 | IPR037          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7326h | ICU           | Interrupt source priority register 038 | IPR038          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7327h | ICU           | Interrupt source priority register 039 | IPR039          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 732Ah | ICU           | Interrupt source priority register 042 | IPR042          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 732Dh | ICU           | Interrupt source priority register 045 | IPR045          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7330h | ICU           | Interrupt source priority register 048 | IPR048          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7334h | ICU           | Interrupt source priority register 052 | IPR052          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7338h | ICU           | Interrupt source priority register 056 | IPR056          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 733Eh | ICU           | Interrupt source priority register 062 | IPR062          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7340h | ICU           | Interrupt source priority register 064 | IPR064          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7341h | ICU           | Interrupt source priority register 065 | IPR065          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7342h | ICU           | Interrupt source priority register 066 | IPR066          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7343h | ICU           | Interrupt source priority register 067 | IPR067          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7344h | ICU           | Interrupt source priority register 068 | IPR068          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7345h | ICU           | Interrupt source priority register 069 | IPR069          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7346h | ICU           | Interrupt source priority register 070 | IPR070          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7347h | ICU           | Interrupt source priority register 071 | IPR071          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7348h | ICU           | Interrupt source priority register 072 | IPR072          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7349h | ICU           | Interrupt source priority register 073 | IPR073          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 734Ah | ICU           | Interrupt source priority register 074 | IPR074          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 734Bh | ICU           | Interrupt source priority register 075 | IPR075          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 734Ch | ICU           | Interrupt source priority register 076 | IPR076          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 734Dh | ICU           | Interrupt source priority register 077 | IPR077          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 734Eh | ICU           | Interrupt source priority register 078 | IPR078          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 734Fh | ICU           | Interrupt source priority register 079 | IPR079          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 735Ah | ICU           | Interrupt source priority register 090 | IPR090          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 735Bh | ICU           | Interrupt source priority register 091 | IPR091          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 735Ch | ICU           | Interrupt source priority register 092 | IPR092          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 735Dh | ICU           | Interrupt source priority register 093 | IPR093          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7362h | ICU           | Interrupt source priority register 098 | IPR098          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7366h | ICU           | Interrupt source priority register 102 | IPR102          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 736Ah | ICU           | Interrupt source priority register 106 | IPR106          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 736Bh | ICU           | Interrupt source priority register 107 | IPR107          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 736Ch | ICU           | Interrupt source priority register 108 | IPR108          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 736Dh | ICU           | Interrupt source priority register 109 | IPR109          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 736Eh | ICU           | Interrupt source priority register 110 | IPR110          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 736Fh | ICU           | Interrupt source priority register 111 | IPR111          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7370h | ICU           | Interrupt source priority register 112 | IPR112          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7372h | ICU           | Interrupt source priority register 114 | IPR114          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 737Ah | ICU           | Interrupt source priority register 122 | IPR122          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 737Eh | ICU           | Interrupt source priority register 126 | IPR126          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7382h | ICU           | Interrupt source priority register 130 | IPR130          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7384h | ICU           | Interrupt source priority register 132 | IPR132          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7386h | ICU           | Interrupt source priority register 134 | IPR134          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 738Ah | ICU           | Interrupt source priority register 138 | IPR138          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 738Ch | ICU           | Interrupt source priority register 140 | IPR140          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 738Eh | ICU           | Interrupt source priority register 142 | IPR142          | 8              | 8           | 2                       | ICLK      |                  |
| 0008 7392h | ICU           | Interrupt source priority register 146 | IPR146          | 8              | 8           | 2                       | ICLK      |                  |

**Table 4.1 List of I/O Registers (Address Order) (21/50)**

| Address    | Module Symbol | Register Name                             | Register Symbol | Number of Bits | Access Size | Number of Access States |           | Related Function |
|------------|---------------|-------------------------------------------|-----------------|----------------|-------------|-------------------------|-----------|------------------|
|            |               |                                           |                 |                |             | ICLK≥PCLK               | ICLK<PCLK |                  |
| 0008 83BAh | RSPI1         | RSPI command register 5                   | SPCMD5          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    | RSPI             |
| 0008 83BCh | RSPI1         | RSPI command register 6                   | SPCMD6          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83BEh | RSPI1         | RSPI command register 7                   | SPCMD7          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C0h | RSPI2         | RSPI control register                     | SPCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C1h | RSPI2         | RSPI slave select polarity register       | SSLP            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C2h | RSPI2         | RSPI pin control register                 | SPPCR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C3h | RSPI2         | RSPI status register                      | SPSR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C4h | RSPI2         | RSPI data register                        | SPDR            | 32             | 16, 32      | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C8h | RSPI2         | RSPI sequence control register            | SPSCR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83C9h | RSPI2         | RSPI sequence status register             | SPSSR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83CAh | RSPI2         | RSPI bit rate register                    | SPBR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83CBh | RSPI2         | RSPI data control register                | SPDCR           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83CCh | RSPI2         | RSPI clock delay register                 | SPCKD           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83CDh | RSPI2         | RSPI slave select negation delay register | SSLND           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83CEh | RSPI2         | RSPI next-access delay register           | SPND            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83CFh | RSPI2         | RSPI control register 2                   | SPCR2           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83D0h | RSPI2         | RSPI command register 0                   | SPCMD0          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83D2h | RSPI2         | RSPI command register 1                   | SPCMD1          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83D4h | RSPI2         | RSPI command register 2                   | SPCMD2          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83D6h | RSPI2         | RSPI command register 3                   | SPCMD3          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83D8h | RSPI2         | RSPI command register 4                   | SPCMD4          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83DAh | RSPI2         | RSPI command register 5                   | SPCMD5          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83DCh | RSPI2         | RSPI command register 6                   | SPCMD6          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 83DEh | RSPI2         | RSPI command register 7                   | SPCMD7          | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8600h | MTU3          | Timer control register                    | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    | MTU2a            |
| 0008 8601h | MTU4          | Timer control register                    | TCR             | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8602h | MTU3          | Timer mode register                       | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8603h | MTU4          | Timer mode register                       | TMDR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8604h | MTU3          | Timer I/O control register H              | TIORH           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8605h | MTU3          | Timer I/O control register L              | TIORL           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8606h | MTU4          | Timer I/O control register H              | TIORH           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8607h | MTU4          | Timer I/O control register L              | TIORL           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8608h | MTU3          | Timer interrupt enable register           | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8609h | MTU4          | Timer interrupt enable register           | TIER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 860Ah | MTU           | Timer output master enable register       | TOER            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 860Dh | MTU           | Timer gate control register               | TGCR            | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 860Eh | MTU           | Timer output control register 1           | TOCR1           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 860Fh | MTU           | Timer output control register 2           | TOCR2           | 8              | 8           | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8610h | MTU3          | Timer counter                             | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8612h | MTU4          | Timer counter                             | TCNT            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8614h | MTU           | Timer cycle data register                 | TCDR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8616h | MTU           | Timer dead time data register             | TDDR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8618h | MTU3          | Timer general register A                  | TGRA            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 861Ah | MTU3          | Timer general register B                  | TGRB            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 861Ch | MTU4          | Timer general register A                  | TGRA            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 861Eh | MTU4          | Timer general register B                  | TGRB            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8620h | MTU           | Timer subcounter                          | TCNTS           | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8622h | MTU           | Timer cycle buffer register               | TCBR            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8624h | MTU3          | Timer general register C                  | TGRC            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8626h | MTU3          | Timer general register D                  | TGRD            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |
| 0008 8628h | MTU4          | Timer general register C                  | TGRC            | 16             | 16          | 2, 3 PCLKB              | 2 ICLK    |                  |

**Table 4.1 List of I/O Registers (Address Order) (39/50)**

| Address    | Module Symbol | Register Name                     | Register Symbol | Number of Bits | Access Size | Number of Access States |                                                                                                      | Related Function |
|------------|---------------|-----------------------------------|-----------------|----------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------|------------------|
|            |               |                                   |                 |                |             | ICLK $\geq$ PCLK        | ICLK<PCLK                                                                                            |                  |
| 000A 003Ah | USB0          | BEMP interrupt enable register    | BEMPENB         | 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 003Ch | USB0          | SOF output configuration register | SOFCFG          | 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 0040h | USB0          | Interrupt status register 0       | INTSTS0         | 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 0042h | USB0          | Interrupt status register 1       | INTSTS1         | 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 0046h | USB0          | BRDY interrupt status register    | BRDYSTS         | 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 0048h | USB0          | NRDY interrupt status register    | NRDYSTS         | 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 004Ah | USB0          | BEMP interrupt status register    | BEMPSTS         | 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 004Ch | USB0          | Frame number register             | FRMNUM          | 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 004Eh | USB0          | Device state changing register    | DVCHGR          | 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 0050h | USB0          | USB address register              | USBADDR         | 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) (44/50)**

| Address    | Module Symbol | Register Name                     | Register Symbol | Number of Bits | Access Size | Number of Access States |                                                                                                      | Related Function |
|------------|---------------|-----------------------------------|-----------------|----------------|-------------|-------------------------|------------------------------------------------------------------------------------------------------|------------------|
|            |               |                                   |                 |                |             | ICLK≥PCLK               | ICLK<PCLK                                                                                            |                  |
| 000A 0230h | USB1          | Interrupt enable register 0       | INTENB0         | 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 0236h | USB1          | BRDY interrupt enable register    | BRDYENB         | 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 0238h | USB1          | NRDY interrupt enable register    | NRDYENB         | 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 023Ah | USB1          | BEMP interrupt enable register    | BEMPENB         | 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 023Ch | USB1          | SOF output configuration register | SOFCFG          | 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 0240h | USB1          | Interrupt status register 0       | INTSTS0         | 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 0246h | USB1          | BRDY interrupt status register    | BRDYSTS         | 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 0248h | USB1          | NRDY interrupt status register    | NRDYSTS         | 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 024Ah | USB1          | BEMP interrupt status register    | BEMPSTS         | 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 024Ch | USB1          | Frame number register             | FRMNUM          | 16             | 16          | 9 PCLKB or more         | Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) <sup>*6</sup> |                  |

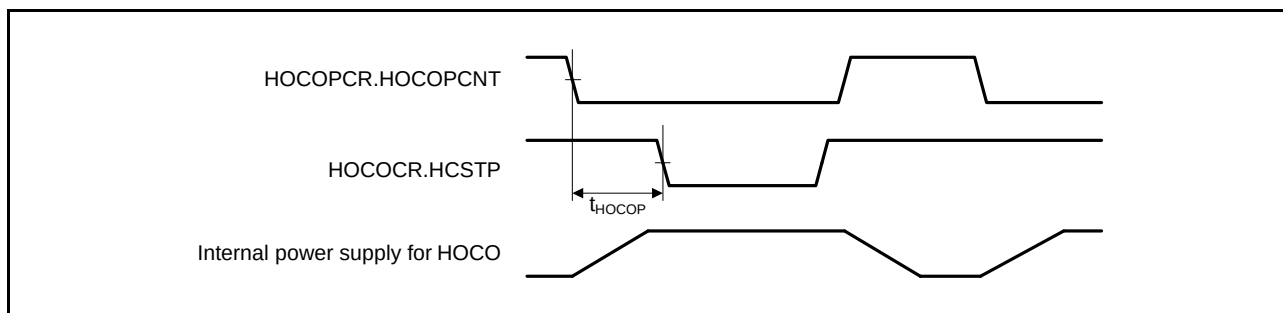


Figure 5.9 HOCO Power Supply Control Timing

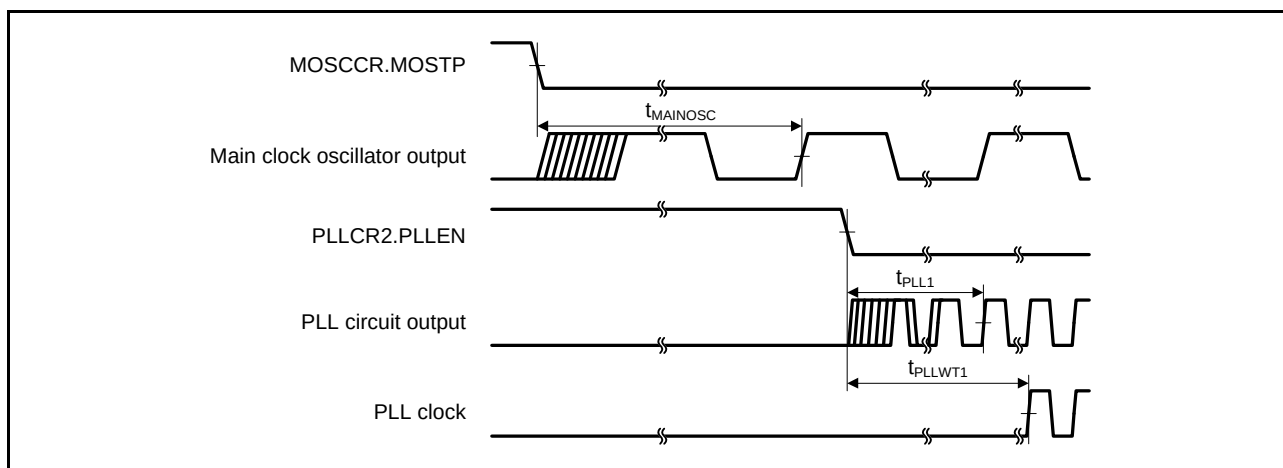


Figure 5.10 PLL Clock Oscillation Start Timing (PLL is Operated after Main Clock Oscillation Has Settled)

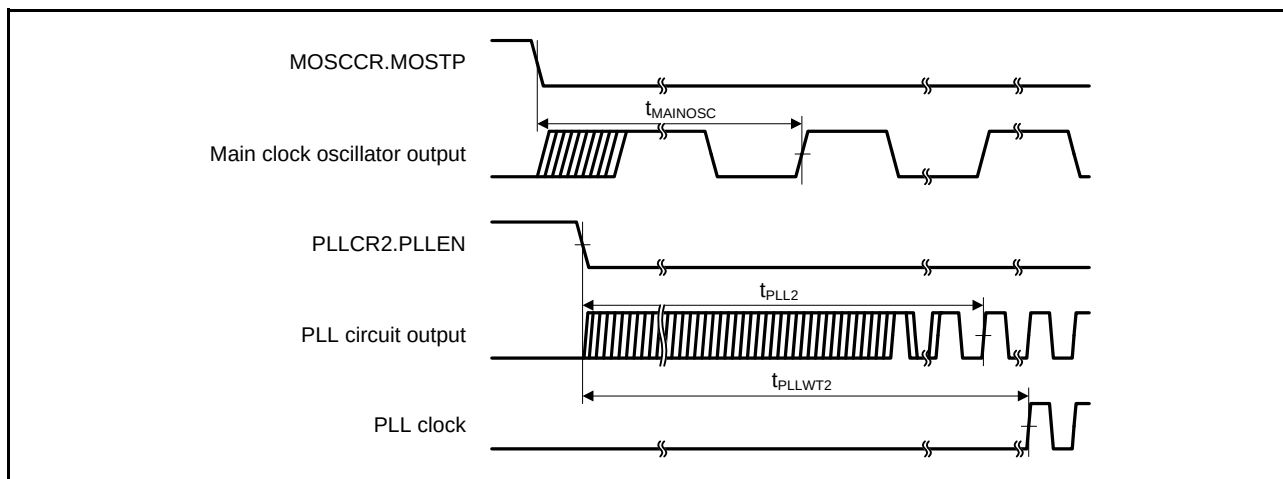
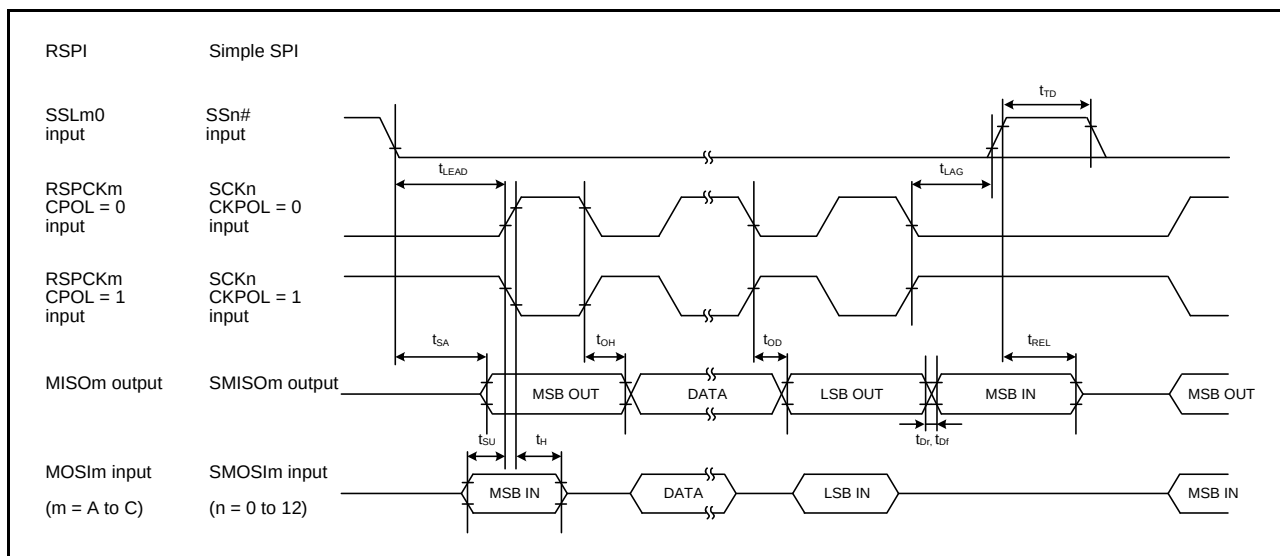
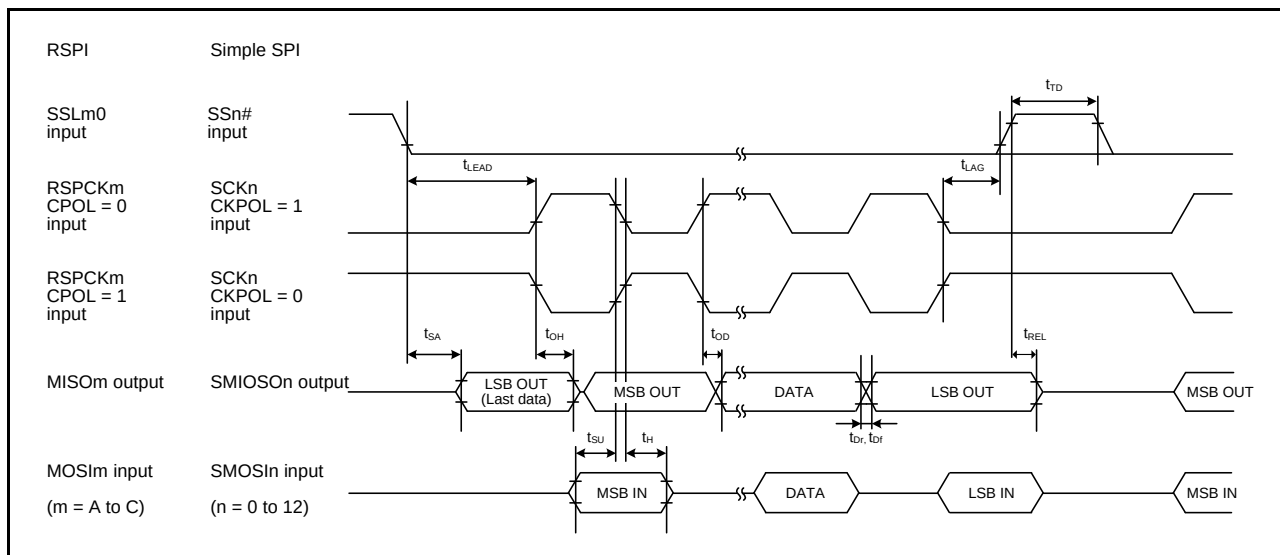


Figure 5.11 PLL Clock Oscillation Start Timing (PLL is Operated before Main Clock Oscillation Has Settled)



**Figure 5.45 RSPi Timing (Slave, CPHA = 0) and Simple SPI Timing (Slave, CKPH = 1)**



**Figure 5.46 RSPi Timing (Slave, CPHA = 1) and Simple SPI Timing (Slave, CKPH = 0)**

Appendix 1. Package Dimensions

Information on the latest version of the package dimensions or mountings has been displayed in “Packages” on Renesas Electronics Corporation website.

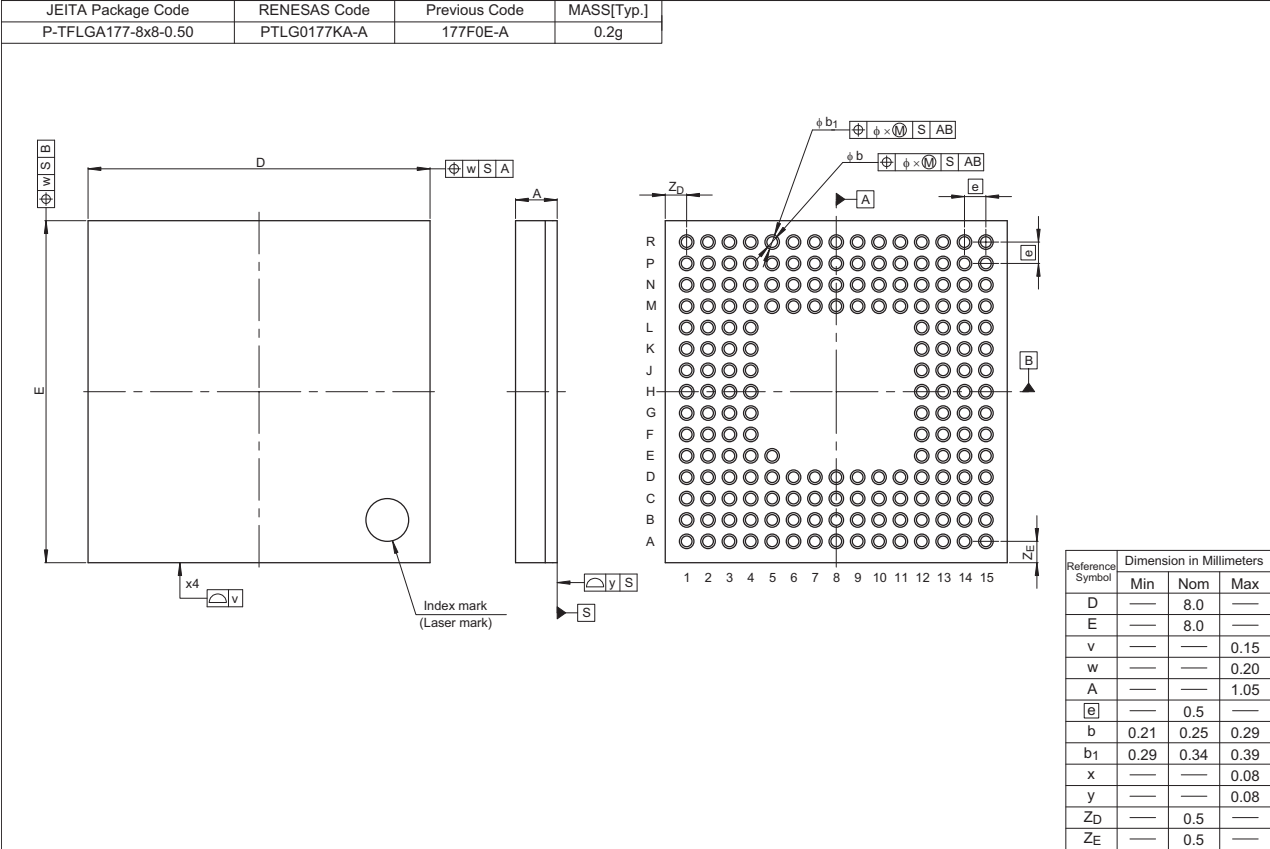


Figure A 177-pin TFLGA (PTLG0177KA-A)

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