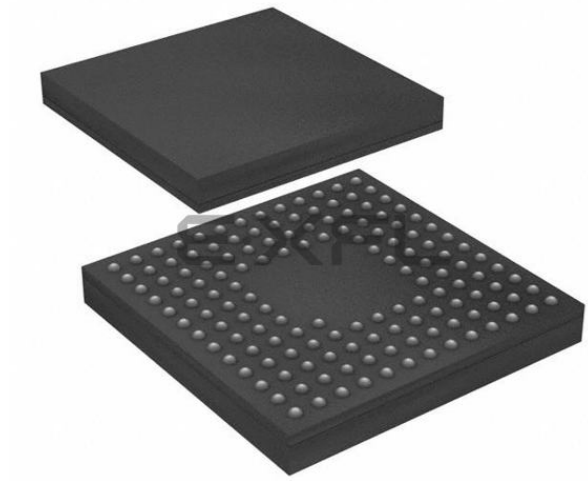
# Renesas Electronics America Inc - R5F563NBCDLK#U0 Datasheet



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

## Applications of "Embedded - Microcontrollers"

| Details | |
|---|---|
| Product Status | Not For New Designs |
| Core Processor | RX |
| Core Size | 32-Bit Single-Core |
| Speed | 100MHz |
| Connectivity | CANbus, EBI/EMI, Ethernet, I²C, 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 | 145-TFLGA |
| Supplier Device Package | 145-TFLGA (7x7) |
| Purchase URL | https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f563nbcdlk-u0 |

**Table 1.1 Outline of Specifications (2/6)**

| Classification | Module/Function | Description |
|---|---|---|
| Low power consumption | Low power consumption facilities | • Module stop function<br>• Four low power consumption modes<br>Sleep mode, all-module clock stop mode, software standby mode, and deep software standby mode<br>• Battery backup function |
| Interrupt | Interrupt controller (ICUb) | • Peripheral function interrupts: 187 sources<br>• External interrupts: 16 (pins IRQ0 to IRQ15)<br>• Software interrupts: One source<br>• Non-maskable interrupts: 6 sources<br>• Sixteen levels specifiable for the order of priority |
| External bus extension | | • The external address space can be divided into nine areas (CS0 to CS7, SDCS), each with independent control of access settings.<br>Capacity of each area: 16 Mbytes (CS0 to CS7), 128 Mbytes (SDCS)<br>A chip-select signal (CS0# to CS7#, SDCS#) can be output for each area.<br>Each area is specifiable as an 8-, 16-, or 32-bit bus space.<br>The data arrangement in each area is selectable as little or big endian (only for data).<br>• SDRAM interface connectable<br>• Bus format: Separate bus, multiplex bus<br>• Wait control<br>• Write buffer facility |
| DMA | DMA controller (DMAC) | • 4 channels<br>• Three transfer modes: Normal transfer, repeat transfer, and block transfer<br>• Activation sources: Software trigger, external interrupts, and interrupt requests from peripheral functions |
| | EXDMA controller (EXDMACa) | • 2 channels<br>• Four transfer modes: Normal transfer, repeat transfer, block transfer, and cluster transfer<br>• Single-address transfer enabled with the EDAKn signal<br>• Capable of direct data transfer to TFT LCD panels<br>• Activation sources: Software trigger, external DMA requests (EDREQn), and interrupt requests from peripheral functions |
| | Data transfer controller (DTCa) | • Three transfer modes: Normal transfer, repeat transfer, and block transfer<br>• Activation sources: External interrupts and interrupt requests from peripheral functions |

**Table 1.1 Outline of Specifications (4/6)**

| Classification | Module/Function | Description |
|---|---|---|
| Timers | 16-bit timer pulse unit (TPUa) | • (16 bits x 6 channels) x 2 unit<br>• Maximum of 16 pulse-input/output possible<br>• Select from among seven or eight counter-input clock signals for each channel<br>• Input capture/output compare function<br>• Output of PWM waveforms in up to 15 phases in PWM mode<br>• Buffered operation and phase-counting mode (two phase encoder input) depending on the channel<br>• Support for cascade-connected operation (32 bits x 2 channels)<br>• PPG output trigger can be generated<br>• Capable of generating conversion start triggers for the A/D converters<br>• Signals from the input capture pins are input via a digital filter<br>• Clock frequency measuring method |
| | Multi-function timer pulse unit 2 (MTU2a) | • (16 bits x 6 channels) x 1 unit<br>• Time bases for the 6 × 16-bit timer channels can be provided via up to sixteen pulse-input/output lines and three pulse-input lines<br>• Select from among eight counter-input clock signals for each channel (PCLK/1, PCLK/4, PCLK/16, PCLK/64, MTCLKA, MTCLKB, MTCLKC, MTCLKD) other than channel 5, for which only four signals are available.<br>• Input capture function<br>• 21 output compare/input capture registers<br>• Complementary PWM output mode<br>• Reset synchronous PWM mode<br>• Phase-counting mode<br>• Generation of triggers for A/D converter conversion<br>• Digital filter<br>• Signals from the input capture pins are input via a digital filter<br>• PPG output trigger can be generated<br>• Clock frequency measuring function |
| | Frequency measuring method (MCK) | The MTU or unit 0 TPU module can be used to monitor the main clock, subclock, HOCO clock, LOCO clock, and PLL clock for abnormal frequencies. |
| | Port output enable 2 (POE2a) | Controls the high-impedance state of the MTU's waveform output pins |
| | Programmable pulse generator (PPG) | • (4 bits x 4 groups) x 2 units<br>• Pulse output with the MTU2 or TPU output as a trigger<br>• Maximum of 32 pulse-output possible |
| | 8-bit timers (TMR) | • (8 bits x 2 channels) x 2 units<br>• Select from among seven internal clock signals (PCLK/1, PCLK/2, PCLK/8, PCLK/32, PCLK/64, PCLK/1024, PCLK/8192) and one external clock signal<br>• Capable of output of pulse trains with desired duty cycles or of PWM signals<br>• The 2 channels of each unit can be cascaded to create a 16-bit timer<br>• Generation of triggers for A/D converter conversion<br>• Capable of generating baud-rate clocks for SCI5, SCI6, and SCI12 |
| | Compare match timer (CMT) | • (16 bits x 2 channels) x 2 units<br>• Select from among four internal clock signals (PCLK/8, PCLK/32, PCLK/128, PCLK/512) |
| | Realtime clock (RTCa) | • Clock sources: Main clock, subclock<br>• Clock and calendar functions<br>Interrupt sources: Alarm interrupt, periodic interrupt, and carry interrupt<br>• Battery backup operation<br>• Time-capture facility for three values |
| | Watchdog timer (WDTA) | • 14 bits x 1 channel<br>• Select from among 6 counter-input clock signals (PCLK/4, PCLK/64, PCLK/128, PCLK/512, PCLK/2048, PCLK/8192) |
| | Independent watchdog timer (IWDTa) | • 14 bits x 1 channel<br>• Counter-input clock: IWDT-dedicated on-chip oscillator<br>• Dedicated clock/1, dedicated clock/16, dedicated clock/32, dedicated clock/64, dedicated clock/128, dedicated clock/256 |

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

| Functions | | RX63N Group | | | RX631 Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Package | | 177-pin 176-pin | 145-pin 144-pin | 100-pin | 177-pin 176-pin | 145-pin 144-pin | 100-pin | 64-pin LQFP | 64-pin TFLGA | 48-pin |
| External bus width | External bus width | 32 bits | 16 bits | | 32 bits | 16 bits | | Not available | | |
| | SDRAM area controller | Available | | Not 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 available |
| | Watchdog timer | Available | | | Available | | | | | |
| | Independent watchdog timer | Available | | | Available | | | | | |
| Communication function | Ethernet controller | Available | | | Not available | | | | | |
| | DMA controller for Ethernet controller | Available | | | Not available | | | | | |
| | USB 2.0 host/function module | Ch. 0 and 1 | | Ch.0 | Ch. 0 and 1 | | Ch.0 | | Ch. 0 and 1 | Ch.0 |
| | Serial communications interfaces (SCIc) | Ch. 0 to 11 | | Ch. 0 to 3, 5, 6, 8 and 9 | Ch. 0 to 11 | | Ch. 0 to 3, 5, 6, 8 and 9 | Ch. 1, 5, 6, 8 and 9 | | Ch. 1, 5, 6, and 8 |
| | Serial communications interfaces (SCId) | Ch. 12 | | | Ch. 12 | | | | | |
| | $I^2C$ bus interfaces | Ch. 0 to 3 | | Ch.0 and 2 | Ch. 0 to 3 | | Ch.0 and 2 | Ch.2 | | |
| | IEBus | Available | | | Available | | | | | |
| | Serial peripheral interfaces | Ch.0 to 2 | | Ch. 0 and 1 | Ch.0 to 2 | | | Ch. 0 and 1 | | |
| | CAN module | For 1.5 M or more: Ch. 0 to 2, For 1 M or less: Ch. 0 and 1 | | Ch. 0 and 1 | For 1.5 M or more: Ch. 0 to 2, For 1 M or less: Ch. 0 and 1 | | Ch. 0 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 013 | AN000 to 020 | | AN000 to 013 | AN000 to 004, 006, 008 to 013 | | AN000 to 002, 006, 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 available |
| Temperature sensor | | Available | | | Available | | | | | |
| CRC calculator | | Available | | | Available | | | | | |
| Unique ID | | Available (only for the G version) | | | | | | | | |
| Off-board programming (parallel programmer mode) | | Available | | | | | | Not available | | |
| Sub-clock oscillator (for low clock loads) | | Available | | | | | | Not available | | |
| Sub-clock oscillator (for standard clock loads) | | Available | | | | | | | | Not available |
| Battery backup function | | Available | | | | | | | | Not available |
| I/O port switching function | | Not available | | | Not available | | | Available | | |

**Table 1.3 List of Products (2/8)**

| Group | Part No. | Package | ROM Capacity | RAM Capacity | E2 Data Flash | Operating Frequency (Max.) | Operating Temp. Range |
|---|---|---|---|---|---|---|---|
| RX63N (D version) | R5F563NDDDLK | PTLG0145KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NBCDLK | PTLG0145KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NBDDLK | PTLG0145KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NACDLK | PTLG0145KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NADDLK | PTLG0145KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NFHDFB | PLQP0144KA-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NFDDFB | PLQP0144KA-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NKHDFB | PLQP0144KA-A*1 | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NKDDFB | PLQP0144KA-A | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NECDFB | PLQP0144KA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NEDDFB | PLQP0144KA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NJHDFB | PLQP0144KA-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NJDDFB | PLQP0144KA-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NGHDFB | PLQP0144KA-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NGDDFB | PLQP0144KA-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NDCDFB | PLQP0144KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NDDDFB | PLQP0144KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NYHDFB | PLQP0144KA-A | 1 Mbyte | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NYDDFB | PLQP0144KA-A | 1 Mbyte | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NWHDFB | PLQP0144KA-A | 1 Mbyte | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NWDDFB | PLQP0144KA-A | 1 Mbyte | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NBCDFB | PLQP0144KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NBDDFB | PLQP0144KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NACDFB | PLQP0144KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NADDFB | PLQP0144KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NECDLJ | PTLG0100JA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NEDDLJ | PTLG0100JA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NDCDLJ | PTLG0100JA-A*1 | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NDDDLJ | PTLG0100JA-A*1 | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NBCDLJ | PTLG0100JA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NBDDLJ | PTLG0100JA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NACDLJ | PTLG0100JA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NADDLJ | PTLG0100JA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NFHDFP | PLQP0100KB-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NFDDFP | PLQP0100KB-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NKHDFP | PLQP0100KB-A*1 | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NKDDFP | PLQP0100KB-A | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NECDFP | PLQP0100KB-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NEDDFP | PLQP0100KB-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NJHDFP | PLQP0100KB-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NJDDFP | PLQP0100KB-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NGHDFP | PLQP0100KB-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NGDDFP | PLQP0100KB-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NDCDFP | PLQP0100KB-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F563NDDDFP | PLQP0100KB-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |

**Table 1.3 List of Products (4/8)**

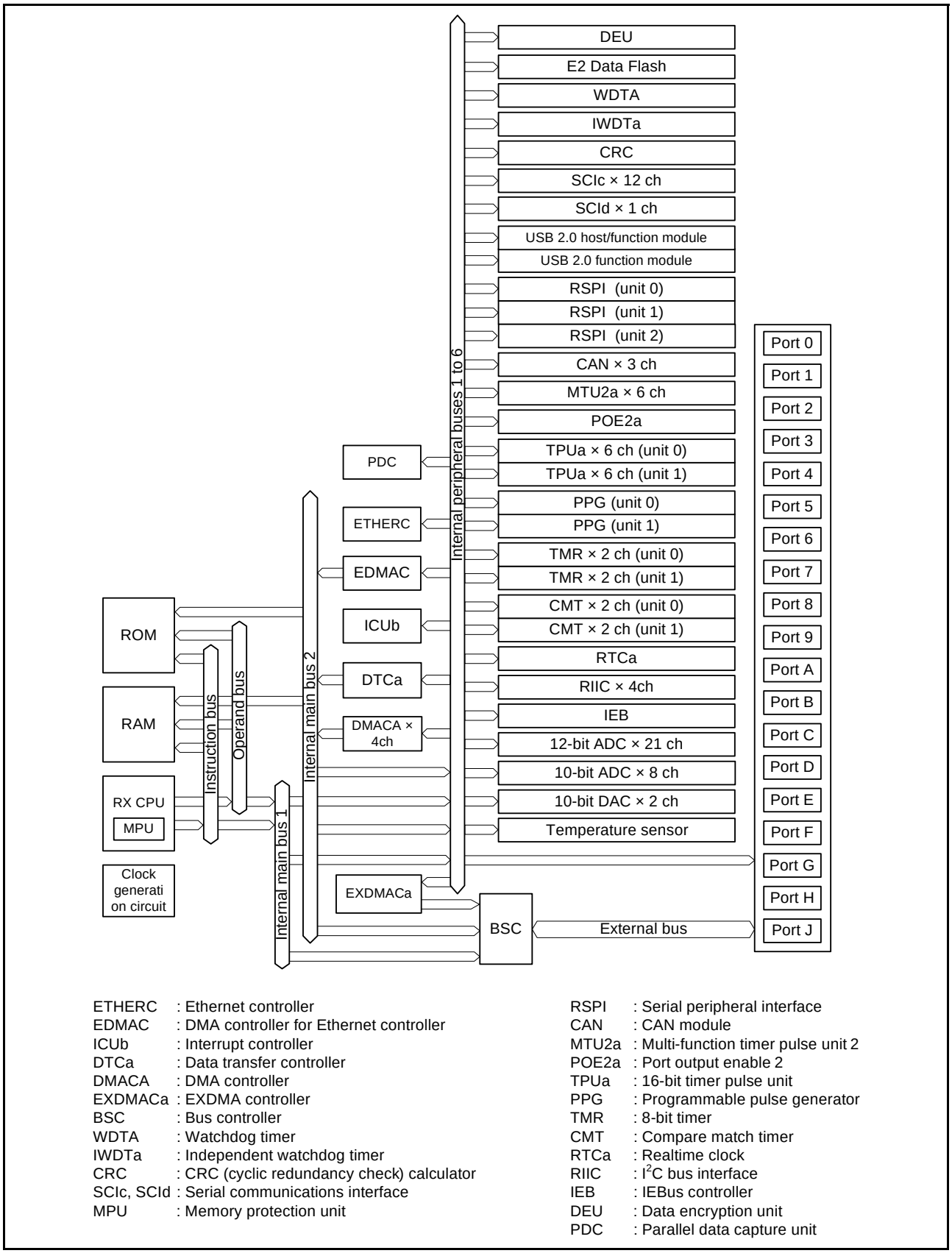
| Group | Part No. | Package | ROM Capacity | RAM Capacity | E2 Data Flash | Operating Frequency (Max.) | Operating Temp. Range |
|---|---|---|---|---|---|---|---|
| RX631 (D version) | R5F5631DCDLC | PTLG0177KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DDDLC | PTLG0177KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BDDLC | PTLG0177KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BCDLC | PTLG0177KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ACDLC | PTLG0177KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ADDLC | PTLG0177KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318CDLC | PTLG0177KA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318DDLC | PTLG0177KA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317CDLC | PTLG0177KA-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317DDLC | PTLG0177KA-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316CDLC | PTLG0177KA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316DDLC | PTLG0177KA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ECDBG | PLBG0176GA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631EDDBG | PLBG0176GA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DCDBG | PLBG0176GA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DDDBG | PLBG0176GA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BCDBG | PLBG0176GA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BDDBG | PLBG0176GA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ACDBG | PLBG0176GA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ADDBG | PLBG0176GA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318CDBG | PLBG0176GA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318DDBG | PLBG0176GA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317CDBG | PLBG0176GA-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317DDBG | PLBG0176GA-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316CDBG | PLBG0176GA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316DDBG | PLBG0176GA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631FHDFC | PLQP0176KB-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631FDDFC | PLQP0176KB-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631KHDFC | PLQP0176KB-A*1 | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631KDDFC | PLQP0176KB-A | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ECDFC | PLQP0176KB-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631EDDFC | PLQP0176KB-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631JHDFC | PLQP0176KB-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631JDDFC | PLQP0176KB-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631GHDFC | PLQP0176KB-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631GDDFC | PLQP0176KB-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DCDFC | PLQP0176KB-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DDDFC | PLQP0176KB-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631YHDFC | PLQP0176KB-A | 1 Mbyte | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631YDDFC | PLQP0176KB-A | 1 Mbyte | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631WHDFC | PLQP0176KB-A | 1 Mbyte | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631WDDFC | PLQP0176KB-A | 1 Mbyte | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BCDFC | PLQP0176KB-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BDDFC | PLQP0176KB-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ACDFC | PLQP0176KB-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |

**Table 1.3 List of Products (5/8)**

| Group | Part No. | Package | ROM Capacity | RAM Capacity | E2 Data Flash | Operating Frequency (Max.) | Operating Temp. Range |
|---|---|---|---|---|---|---|---|
| RX631 (D version) | R5F5631ADDFC | PLQP0176KB-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318CDFC | PLQP0176KB-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318DDFC | PLQP0176KB-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317CDFC | PLQP0176KB-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317DDFC | PLQP0176KB-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316CDFC | PLQP0176KB-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316DDFC | PLQP0176KB-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ECDLK | PTLG0145KA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631EDDLK | PTLG0145KA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DCDLK | PTLG0145KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DDDLK | PTLG0145KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BCDLK | PTLG0145KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BDDLK | PTLG0145KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ACDLK | PTLG0145KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ADDLK | PTLG0145KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318CDLK | PTLG0145KA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318DDLK | PTLG0145KA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317CDLK | PTLG0145KA-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56317DDLK | PTLG0145KA-A | 384 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316CDLK | PTLG0145KA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316DDLK | PTLG0145KA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631FHDFB | PLQP0144KA-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631FDDFB | PLQP0144KA-A | 2 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631KHDFB | PLQP0144KA-A*1 | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631KDDFB | PLQP0144KA-A | 2 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ECDFB | PLQP0144KA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631EDDFB | PLQP0144KA-A | 2 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631JHDFB | PLQP0144KA-A*1 | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631JDDFB | PLQP0144KA-A | 1.5 Mbytes | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631GHDFB | PLQP0144KA-A*1 | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631GDDFB | PLQP0144KA-A | 1.5 Mbytes | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DCDFB | PLQP0144KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631DDDFB | PLQP0144KA-A | 1.5 Mbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631YHDFB | PLQP0144KA-A | 1 Mbyte | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631YDDFB | PLQP0144KA-A | 1 Mbyte | 256 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631WHDFB | PLQP0144KA-A | 1 Mbyte | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631WDDFB | PLQP0144KA-A | 1 Mbyte | 192 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BCDFB | PLQP0144KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631BDDFB | PLQP0144KA-A | 1 Mbyte | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ACDFB | PLQP0144KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F5631ADDFB | PLQP0144KA-A | 768 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318CDFB | PLQP0144KA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56318DDFB | PLQP0144KA-A | 512 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316CDFB | PLQP0144KA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |
| | R5F56316DDFB | PLQP0144KA-A | 256 Kbytes | 128 Kbytes | 32 Kbytes | 100 MHz | -40 to +85°C |

## 1.3 Block Diagram

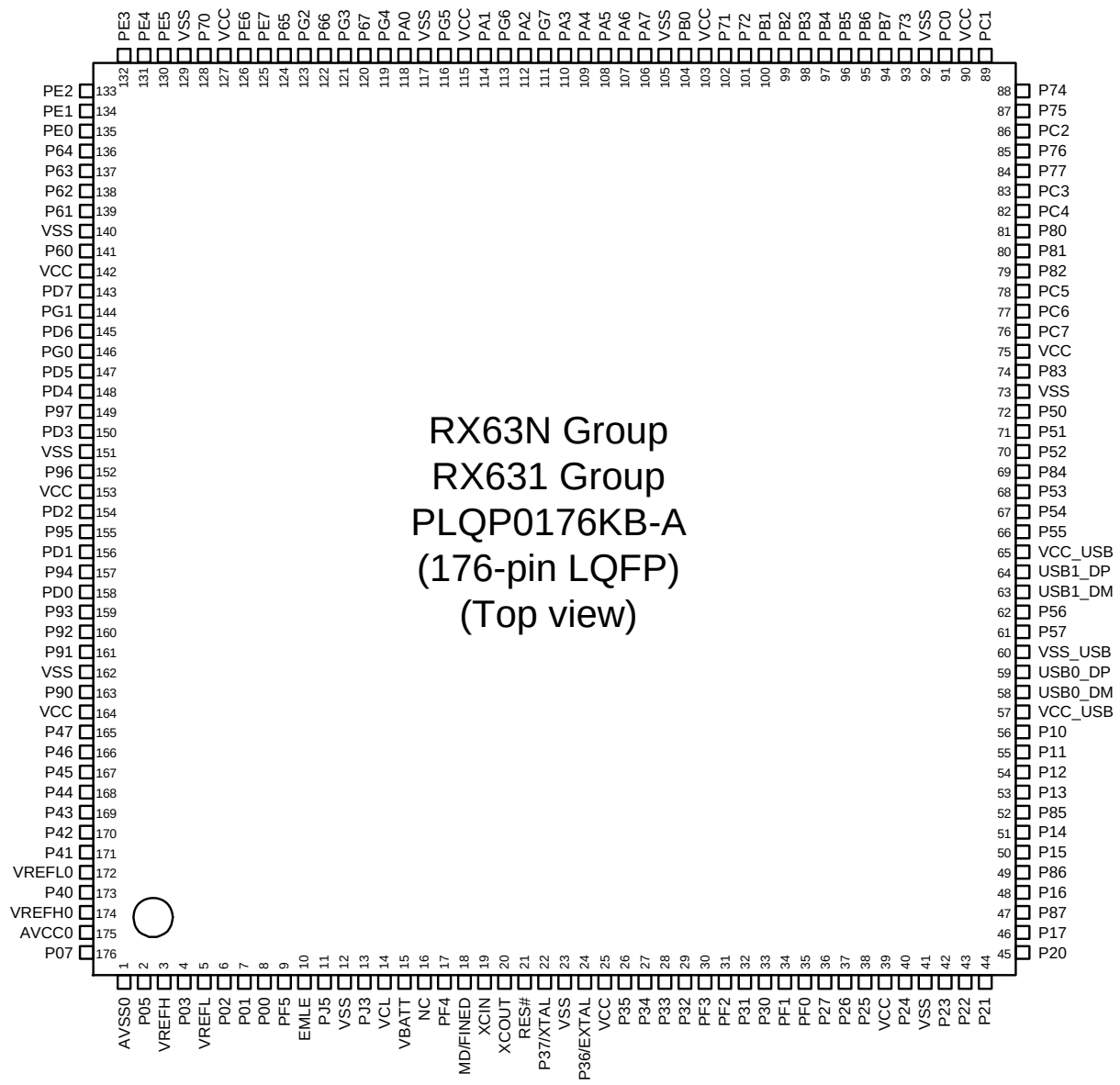
Figure 1.2 shows a block diagram.




ETHERC : Ethernet controller
EDMAC : DMA controller for Ethernet controller
ICUb : Interrupt controller
DTCa : Data transfer controller
DMACA : DMA controller
EXDMACa : EXDMA controller
BSC : Bus controller
WDTA : Watchdog timer
IWDTa : Independent watchdog timer
CRC : CRC (cyclic redundancy check) calculator
SCIc, SCId : Serial communications interface
MPU : Memory protection unit

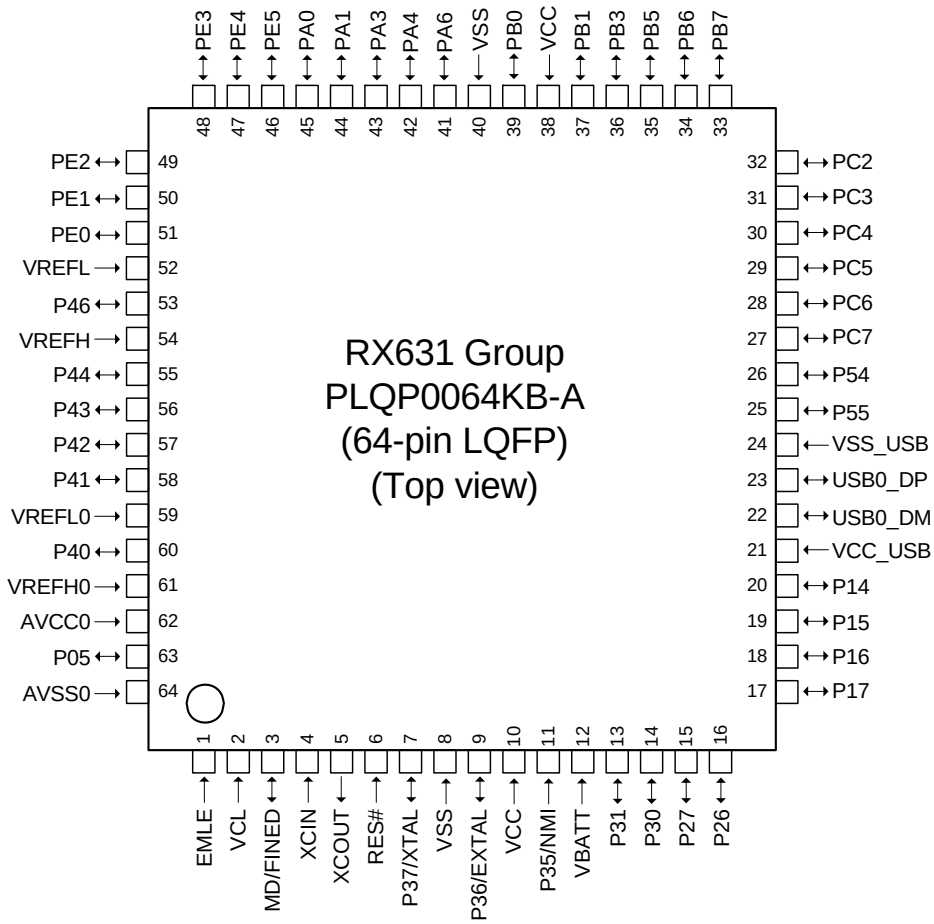
RSPI : Serial peripheral interface
CAN : CAN module
MTU2a : Multi-function timer pulse unit 2
POE2a : Port output enable 2
TPUa : 16-bit timer pulse unit
PPG : Programmable pulse generator
TMR : 8-bit timer
CMT : Compare match timer
RTCa : Realtime clock
RIIC : $I^2C$ bus interface
IEB : IEBus controller
DEU : Data encryption unit
PDC : Parallel data capture unit

**Figure 1.2 Block Diagram**




Note: This figure indicates the power supply pins and I/O port pins. For the pin configuration, see Table 1.6, List of Pin and Pin Functions (176-Pin LQFP).

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




Note: This figure indicates the power supply pins and I/O port pins. For the pin configuration, see Table 1.12, List of Pins and Pin Functions (64-Pin LQFP).

**Figure 1.11 Pin Assignment (64-Pin LQFP)**

**Table 1.9 List of Pins and Pin Functions (100-Pin TFLGA) (1/5)**

| Pin No. 100-pin TFLGA | Power Supply Clock System Control | I/O Port | Bus EXDMAC | Timers (MTU, TPU, TMR, PPG, RTC, POE) | Communications (ETHERC, SCIc, SCId, RSPI, RIIC, CAN, IEB, USB) | Interrupt | S12AD AD DA |
|---|---|---|---|---|---|---|---|
| A1 | | P05 | | | | IRQ13 | DA1 |
| A2 | VREFH | | | | | | |
| A3 | | P07 | | | | IRQ15 | ADTRG0# |
| A4 | VREFL0 | | | | | | |
| A5 | | P43 | | | | IRQ11-DS | AN003 |
| A6 | | PD0 | D0[A0/D0] | | | IRQ0 | AN008 |
| A7 | | PD4 | D4[A4/D4] | POE3# | | IRQ4 | AN012 |
| A8 | | PE0 | D8[A8/D8] | | SCK12/SSLB1 | | ANEX0 |
| A9 | | PE1 | D9[A9/D9] | MTIOC4C/ PO18 | TXD12/SMOSI12/ SSDA12/TXDX12/ SIOX12/SSLB2/ RSPCKB | | ANEX1 |
| A10 | | PE2 | D10[A10/D10] | MTIOC4A/ PO23 | RXD12/SMISO12/ SSCL12/RXDX12/ SSLB3/MOSIB | IRQ7-DS | AN0 |
| B1 | EMLE | | | | | | |
| B2 | AVSS0 | | | | | | |
| B3 | AVCC0 | | | | | | |
| B4 | | P40 | | | | IRQ8-DS | AN000 |
| B5 | | P44 | | | | IRQ12-DS | AN004 |
| B6 | | PD1 | D1[A1/D1] | MTIOC4B | CTX0*1 | IRQ1 | AN009 |
| B7 | | PD3 | D3[A3/D3] | POE8# | | IRQ3 | AN011 |
| B8 | | PD6 | D6[A6/D6] | MTIC5V/ POE1# | | IRQ6 | AN6 |
| B9 | | PD7 | D7[A7/D7] | MTIC5U/ POE0# | | IRQ7 | AN7 |
| B10 | | PE3 | D11[A11/D11] | MTIOC4B/ PO26/POE8# | CTS12#/RTS12#/ SS12#/MISOB/ ET_ERXD3 | | AN1 |
| C1 | VCL | | | | | | |
| C2 | VREFL | | | | | | |
| C3 | | PJ3 | | MTIOC3C | CTS6#/RTS6#/ CTS0#/RTS0#/ SS6#/SS0# | | |
| C4 | VREFH0 | | | | | | |
| C5 | | P42 | | | | IRQ10-DS | AN002 |
| C6 | | P47 | | | | IRQ15-DS | AN007 |
| C7 | | PD2 | D2[A2/D2] | MTIOC4D | CRX0*1 | IRQ2 | AN010 |
| C8 | | PD5 | D5[A5/D5] | MTIC5W/ POE2# | | IRQ5 | AN013 |
| C9 | | PE5 | D13[A13/D13] | MTIOC4C/ MTIOC2B | RSPCKB/ ET_RX_CLK/ REF50CK | IRQ5 | AN3 |
| C10 | | PE4 | D12[A12/D12] | MTIOC4D/ MTIOC1A/ PO28 | SSLB0/ET_ERXD2 | | AN2 |
| D1 | XCIN | | | | | | |

**Table 1.12 List of Pins and Pin Functions (64-Pin LQFP) (2/3)**

| Pin Number 64-Pin LQFP | Power Supply Clock System Control | I/O Port | Timer (MTU2a, TPUa, TMR, PPG, RTCa, POE2a) | Timer Communications (SCIc, SCId, RSPI, RIIC, CAN, IEB, USB) | Interrupt | S12ADa, DAa |
|---|---|---|---|---|---|---|
| 32 | | PC2 | MTIOC4B/TCLKA/ PO21 | RXD5/SMISO5/SSCL5/ SSLA3/IERXD | | |
| 33 | | PB7/ PC1 | MTIOC3B/TIOCB5/ PO31 | TXD9/SMOSI9/SSDA9 | | |
| 34 | | PB6/ PC0 | MTIOC3D/TIOCA5/ PO30 | RXD9/SMISO9/SSCL9 | | |
| 35 | | PB5 | MTIOC2A/MTIOC1B/ TIOCB4/TMRI1/PO29/ POE1# | SCK9 | | |
| 36 | | PB3 | MTIOC0A/MTIOC4A/ TIOCD3/TCLKD/TMO0/ PO27/POE3# | SCK6 | | |
| 37 | | PB1 | MTIOC0C/MTIOC4C/ TIOCB3/TMCI0/PO25 | TXD6/SMOSI6/SSDA6 | IRQ4-DS | |
| 38 | VCC | | | | | |
| 39 | | PB0 | MTIC5W/TIOCA3/PO24 | RXD6/SMISO6/SSCL6/ RSPCKA | IRQ12 | |
| 40 | VSS | | | | | |
| 41 | | PA6 | MTIC5V/MTCLKB/ TIOCA2/TMCI3/PO22/ POE2# | CTS5#/RTS5#/SS5#/ MOSIA | | |
| 42 | | PA4 | MTIC5U/MTCLKA/ TIOCA1/TMRI0/PO20 | TXD5/SMOSI5/SSDA5/ SSLA0 | IRQ5-DS | |
| 43 | | PA3 | MTIOC0D/MTCLKD/ TIOCD0/TCLKB/PO19 | RXD5/SMISO5/SSCL5 | IRQ6-DS | |
| 44 | | PA1 | MTIOC0B/MTCLKC/ TIOCB0/PO17 | SCK5/SSLA2/SCL2 | IRQ11 | |
| 45 | | PA0 | MTIOC4A/TIOCA0/ PO16 | SSLA1 | | |
| 46 | | PE5 | MTIOC4C/MTIOC2B | RSPCKB | IRQ5 | AN013 |
| 47 | | PE4 | MTIOC4D/MTIOC1A/ PO28 | SSLB0 | | AN012 |
| 48 | | PE3 | MTIOC4B/PO26/POE8# | CTS12#/RTS12#/ SS12#/MISOB | | AN011 |
| 49 | | PE2 | MTIOC4A/PO23 | RXD12/SMISO12/ SSCL12/RXDX12/ SSLB3/MOSIB | IRQ7-DS | AN010 |
| 50 | | PE1 | MTIOC4C/PO18 | TXD12/SMOSI12/SSDA12/ TXDX12/SIOX12/SSLB2/ RSPCKB | | AN009 |
| 51 | | PE0 | | SCK12/SSLB1 | | AN008 |
| 52 | VREFL | | | | | |
| 53 | | P46 | | | IRQ14-DS | AN006 |
| 54 | VREFH | | | | | |
| 55 | | P44 | | | IRQ12-DS | AN004 |
| 56 | | P43 | | | IRQ11-DS | AN003 |
| 57 | | P42 | | | IRQ10-DS | AN002 |
| 58 | | P41 | | | IRQ9-DS | AN001 |
| 59 | VREFL0 | | | | | |
| 60 | | P40 | | | IRQ8-DS | AN000 |

**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) (13/50)**

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

**Table 4.1 List of I/O Registers (Address Order) (26/50)**

| Address | Module Symbol | Register Name | Register Symbol | Number of Bits | Access Size | Number of Access States | | Related Function |
|---|---|---|---|---|---|---|---|---|
| | | | | | | ICLK≥PCLK | ICLK<PCLK | |
| 0008 A0A6h | SCI5 | Smart card mode register | SCMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | SCIc, SCId |
| 0008 A0A7h | SCI5 | Serial extended mode register | SEMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0A8h | SCI5 | Noise filter setting register | SNFR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0A9h | SCI5 | $I^2C$ mode register 1 | SIMR1 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0AAh | SCI5 | $I^2C$ mode register 2 | SIMR2 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0ABh | SCI5 | $I^2C$ mode register 3 | SIMR3 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0ACh | SCI5 | $I^2C$ status register | SISR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0ADh | SCI5 | SPI mode register | SPMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C0h | SCI6 | Serial mode register | SMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C1h | SCI6 | Bit rate register | BRR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C2h | SCI6 | Serial control register | SCR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C3h | SCI6 | Transmit data register | TDR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C4h | SCI6 | Serial status register | SSR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C5h | SCI6 | Receive data register | RDR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C6h | SCI6 | Smart card mode register | SCMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C7h | SCI6 | Serial extended mode register | SEMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C8h | SCI6 | Noise filter setting register | SNFR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0C9h | SCI6 | $I^2C$ mode register 1 | SIMR1 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0CAh | SCI6 | $I^2C$ mode register 2 | SIMR2 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0CBh | SCI6 | $I^2C$ mode register 3 | SIMR3 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0CCh | SCI6 | $I^2C$ status register | SISR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0CDh | SCI6 | SPI mode register | SPMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E0h | SCI7 | Serial mode register | SMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E1h | SCI7 | Bit rate register | BRR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E2h | SCI7 | Serial control register | SCR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E3h | SCI7 | Transmit data register | TDR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E4h | SCI7 | Serial status register | SSR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E5h | SCI7 | Receive data register | RDR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E6h | SCI7 | Smart card mode register | SCMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E7h | SCI7 | Serial extended mode register | SEMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E8h | SCI7 | Noise filter setting register | SNFR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0E9h | SCI7 | $I^2C$ mode register 1 | SIMR1 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0EAh | SCI7 | $I^2C$ mode register 2 | SIMR2 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0EBh | SCI7 | $I^2C$ mode register 3 | SIMR3 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0ECh | SCI7 | $I^2C$ status register | SISR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A0EDh | SCI7 | SPI mode register | SPMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A100h | SCI8 | Serial mode register | SMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A101h | SCI8 | Bit rate register | BRR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A102h | SCI8 | Serial control register | SCR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A103h | SCI8 | Transmit data register | TDR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A104h | SCI8 | Serial status register | SSR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A105h | SCI8 | Receive data register | RDR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A106h | SCI8 | Smart card mode register | SCMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A107h | SCI8 | Serial extended mode register | SEMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A108h | SCI8 | Noise filter setting register | SNFR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A109h | SCI8 | $I^2C$ mode register 1 | SIMR1 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A10Ah | SCI8 | $I^2C$ mode register 2 | SIMR2 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A10Bh | SCI8 | $I^2C$ mode register 3 | SIMR3 | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A10Ch | SCI8 | $I^2C$ status register | SISR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A10Dh | SCI8 | SPI mode register | SPMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |
| 0008 A120h | SCI9 | Serial mode register | SMR | 8 | 8 | 2, 3 PCLKB | 2 ICLK | |

### Table 5.6 DC Characteristics (4)

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

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

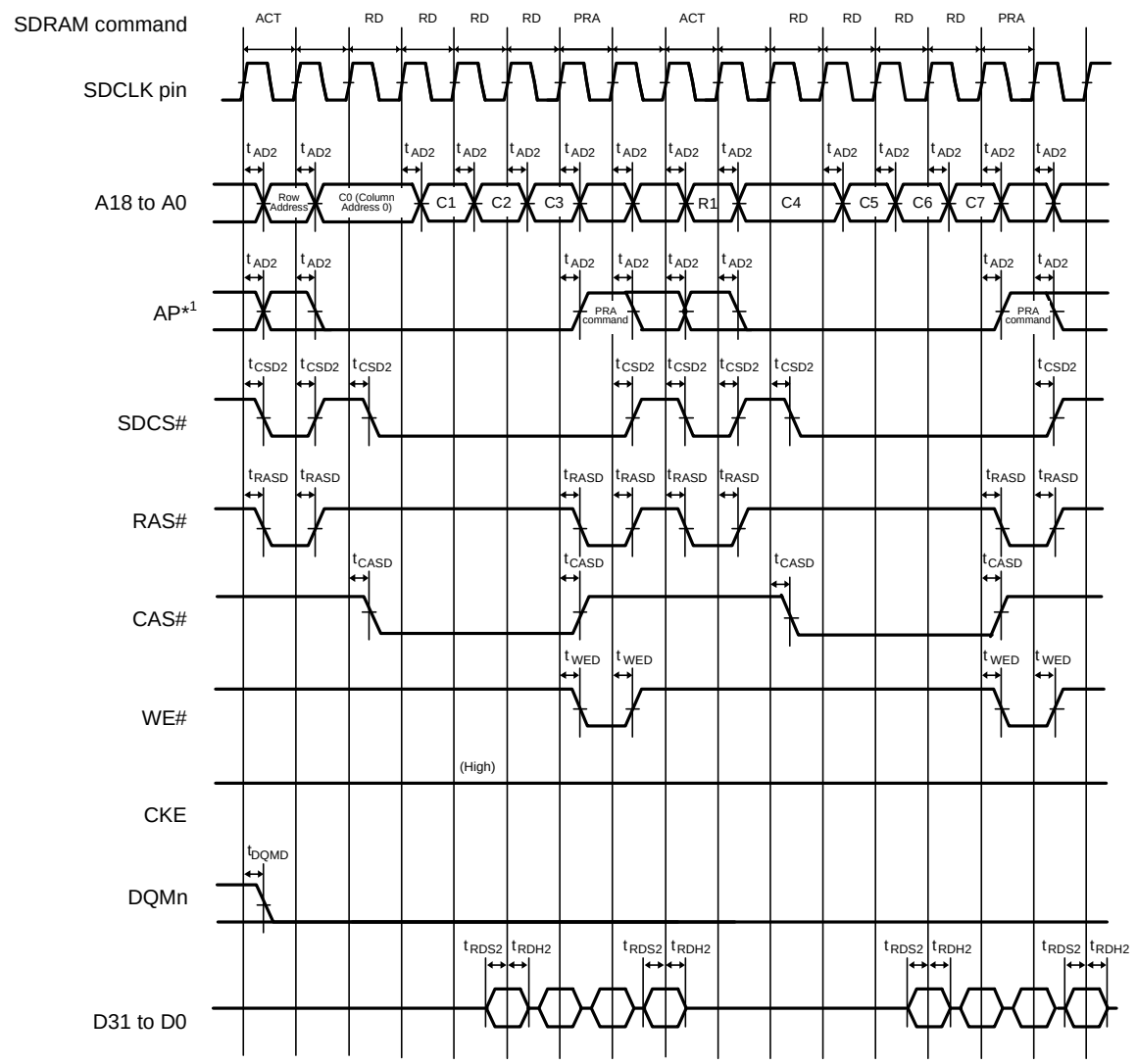
Note 1. This is the total power consumption of the chip as a whole (including the power consumed by the output buffers).
Note 2. Contact a Renesas sales office or agent regarding further details of the conditions of measurement.

### Table 5.7 Permissible Output Currents

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

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

Caution: To protect the LSI's reliability, the output current values should not exceed the values in this table.
Note 1. This is the value when normal driving ability is set with a pin for which normal driving ability is selectable.
Note 2. This is the value when high driving ability is set with a pin for which normal driving ability is selectable or the value of the pin to which high driving ability is fixed.




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

**Figure 5.28 SDRAM Space Multiple Read Line Stride Bus Timing**

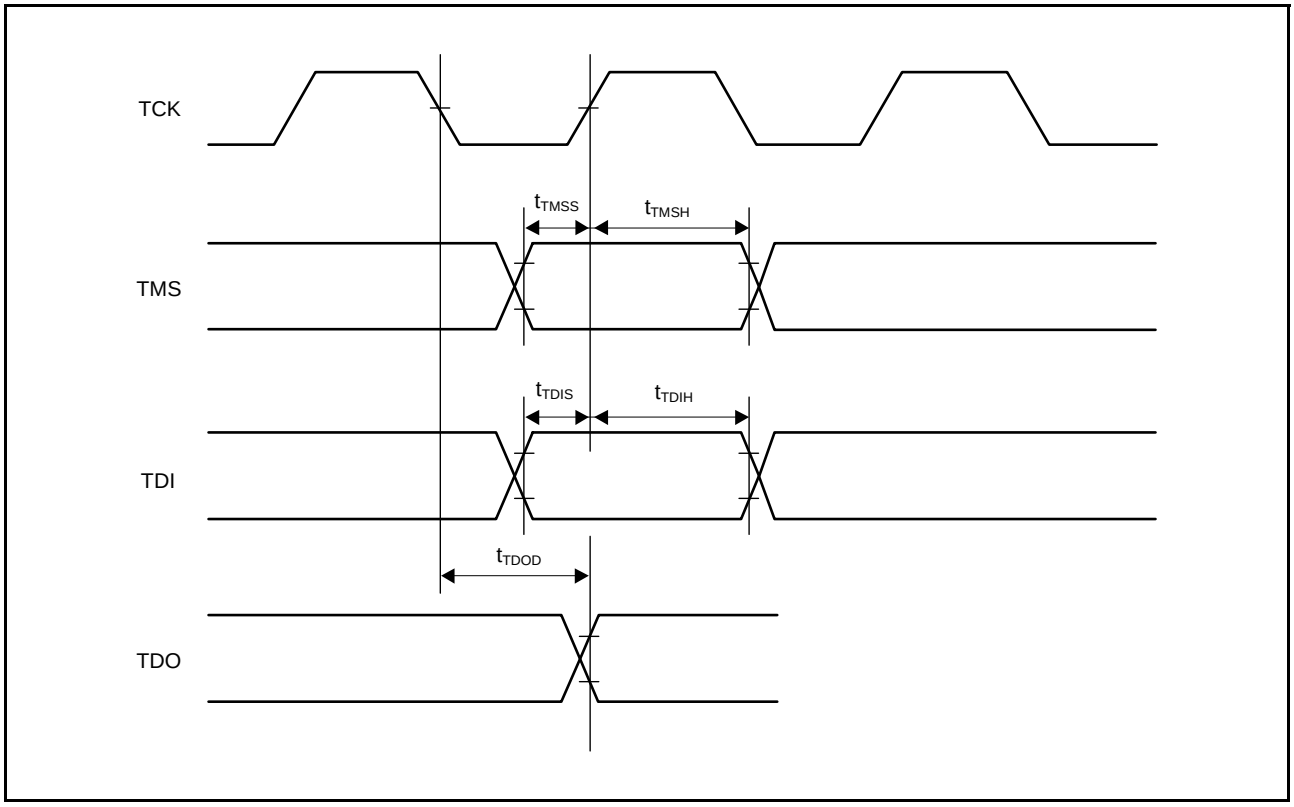
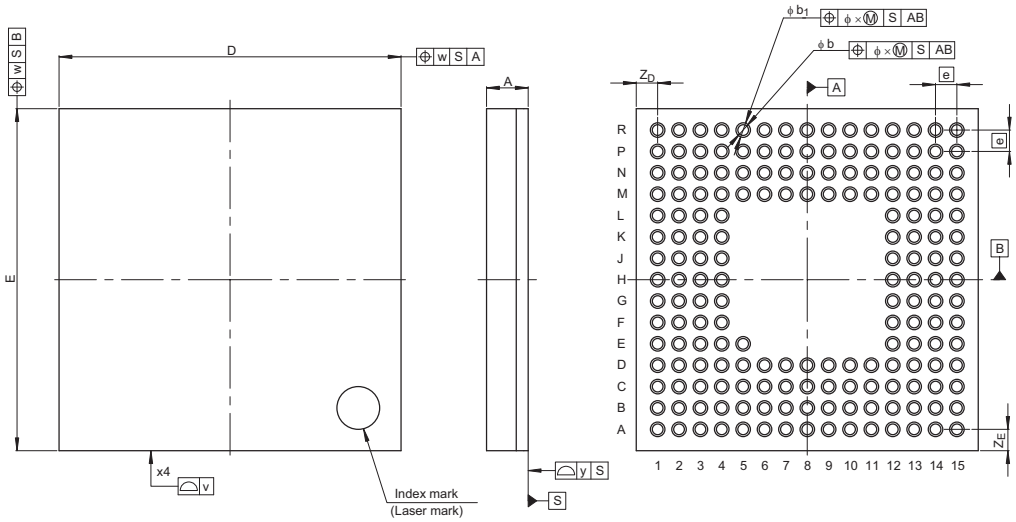



**Figure 5.72 Boundary Scan Input/Output Timing**

# 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.

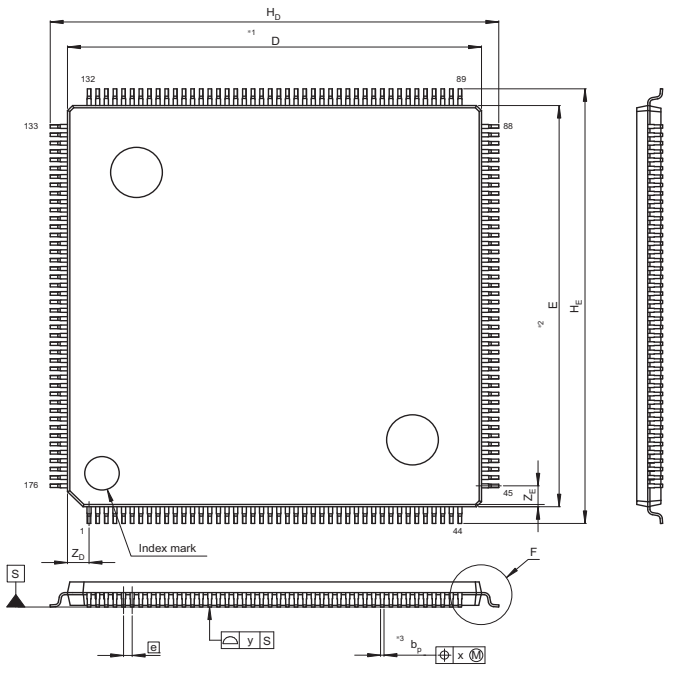
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-TFLGA177-8x8-0.50 | PTLG0177KA-A | 177F0E-A | 0.2g |

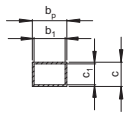


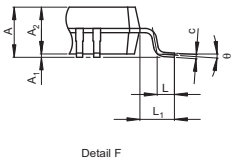

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | — | 8.0 | — |
| E | — | 8.0 | — |
| v | — | — | 0.15 |
| w | — | — | 0.20 |
| A | — | — | 1.05 |
| e | — | 0.5 | — |
| b | 0.21 | 0.25 | 0.29 |
| $b_1$ | 0.29 | 0.34 | 0.39 |
| x | — | — | 0.08 |
| y | — | — | 0.08 |
| $Z_D$ | — | 0.5 | — |
| $Z_E$ | — | 0.5 | — |

Figure A 177-pin TFLGA (PTLG0177KA-A)

| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-LFQFP176-24x24-0.50 | PLQP0176KB-A | 176P6Q-A/FP-176E/FP-176EV | 1.8g |




NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | 23.9 | 24.0 | 24.1 |
| E | 23.9 | 24.0 | 24.1 |
| $A_2$ | — | 1.4 | — |
| $H_D$ | 25.8 | 26.0 | 26.2 |
| $H_E$ | 25.8 | 26.0 | 26.2 |
| A | — | — | 1.7 |
| $A_1$ | 0.05 | 0.1 | 0.15 |
| $b_p$ | 0.15 | 0.20 | 0.25 |
| $b_1$ | — | 0.18 | — |
| c | 0.09 | 0.145 | 0.20 |
| $c_1$ | — | 0.125 | — |
| θ | 0° | — | 8° |
| e | — | 0.5 | — |
| x | — | — | 0.08 |
| y | — | — | 0.10 |
| $Z_D$ | — | 1.25 | — |
| $Z_E$ | — | 1.25 | — |
| L | 0.35 | 0.5 | 0.65 |
| $L_1$ | — | 1.0 | — |

Figure C 176-pin LQFP (PLQP0176KB-A)

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.60 | Mar 13. 2013 | Feature | |
| | | 1 | Changed |
| | | 1. Overview | |
| | | 2 to 7 | Table 1.1 Outline of Specifications: changed, note added |
| | | 8 | Table1.2 Comparison of Functions for Different Packages in the RX63N/RX631 Group, changed |
| | | 9 to 15 | Table 1.3 List of Products, changed |
| | | 16 | Figure 1.1 How to Read the Product Part No., changed |
| | | 17 | Figure 1.2 Block Diagram, changed |
| | | 24 to 32 | Figure 1.3 to Figure 1.11 Pin Assignment: note, added |
| | | 53 to 57 | Table 1.9 List of Pins and Pin Functions (100-Pin TFLGA), added |
| | | 62 to 64 | Table 1.11 List of Pins and Pin Functions (64-Pin LQFP), added |
| | | 65, 66 | Table 1.12 List of Pins and Pin Functions (48-Pin LQFP), added |
| | | 3. Address Space | |
| | | 71 | Figure 3.1 Memory Map in Each Operating Mode, changed |
| | | 4. I/O Registers | |
| | | 75 to 120 | Table 4.1 List of I/O Registers (Address Order), changed |
| | | 5. Electrical Characteristics | |
| | | All | Characteristics and timing conditions in the tables, changed |
| | | 124, 125 | Table 5.4 DC Characteristics (3), changed |
| | | 126 | Table 5.5 DC Characteristics (4), changed |
| | | 127 | 5.3 AC Characteristics, changed |
| | | 130, 131 | Table 5.11, Clock Timing (Except for Sub-Clock Related): Condition and the table, changed, note, added |
| | | 132 | Table 5.12 Clock Timing (Sub-Clock Related): Condition and the table, changed, note, added |
| | | 176 | Table 5.33 Battery Backup Function Characteristics: Condition, changed |
| | | Appendix 1.Package Dimensions | |
| | | 189 | Figure H 64-pin LQFP (PLQP0064KB-A), added |
| | | 190 | Figure I 48-pin LQFP (PLQP0048KB-A), added |
| 1.70 | Oct 08. 2013 | Features | |
| | | 1 | changed |
| | | 1. Overview | |
| | | 2 to 7 | Table 1.1 Outline of Specifications, General I/O ports, Packages, changed, Parallel data capture unit (PDC), added. |
| | | 8 | Table 1.2 Comparison of Functions for Different Packages in the RX63N/RX631 Group, 64-pin LQFP, changed, 64-pin TFLGA, Parallel data capture unit (PDC), added. |
| | | 9 to 16 | Table 1.3 List of Products, changed. |
| | | 17 | Figure 1.1 How to Read the Product Part No., changed |
| | | 18 | Figure 1.2 Block Diagram, changed |
| | | 19 to 24 | Table 1.4 Pin Functions,changed, Parallel data capture unit (PDC), added |
| | | 32 | Figure 1.10 Pin Assignment (64-Pin TFLGA), added |
| | | 35 to 40 | Table 1.5 List of Pin and Pin Functions (177-Pin TFLGA, 176-Pin LFBGA), changed |
| | | 41 to 45 | Table 1.6 List of Pin and Pin Functions (176-Pin LQFP), changed |
| | | 46 to 50 | Table 1.7 List of Pins and Pin Functions (145-Pin TFLGA), changed |
| | | 51 to 55 | Table 1.8 List of Pins and Pin Functions (144-Pin LQFP), changed |
| | | 65 to 66 | Table 1.11 List of Pins and Pin Functions (64-Pin TFLGA), added |
| | | 3. Address Space | |
| | | 76 | Figure 3.1 Memory Map in Each Operating Mode, changed |
| | | 4. I/O Registers | |
| | | 79 | (4) Restrictions in Relation to RMPA and String-Manipulation Instructions, added |