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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	R8C
Core Size	16-Bit
Speed	20MHz
Connectivity	I ² C, LINbus, SIO, SSU, UART/USART
Peripherals	LCD, POR, PWM, Voltage Detect, WDT
Number of I/O	41
Program Memory Size	48KB (48K x 8)
Program Memory Type	FLASH
EEPROM Size	4K x 8
RAM Size	6K x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 5.5V
Data Converters	A/D 10x10b; D/A 2x8b
Oscillator Type	Internal
Operating Temperature	-20°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	52-LQFP
Supplier Device Package	52-LQFP (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f2l357cnfp-50

Table 1.5 Specifications (2)

Item	Function	Specification	
Timer	Timer RA	8 bits × 1 (with 8-bit prescaler) Timer mode (period timer), pulse output mode (output level inverted every period), event counter mode, pulse width measurement mode, pulse period measurement mode	
	Timer RB	8 bits × 1 (with 8-bit prescaler) Timer mode (period timer), programmable waveform generation mode (PWM output), programmable one-shot generation mode, programmable wait one-shot generation mode	
	Timer RC	16 bits × 1 (with 4 capture/compare registers) Timer mode (input capture function, output compare function), PWM mode (output: 3 pins), PWM2 mode (PWM output: 1 pin)	
	Timer RD	16 bits × 2 (with 4 capture/compare registers) Timer mode (input capture function, output compare function), PWM mode (output: 6 pins), reset synchronous PWM mode (three-phase waveform output: 6 pins, sawtooth wave modulation), complementary PWM mode (three-phase waveform output: 6 pins, triangular wave modulation), PWM3 mode (PWM output with fixed period: 2 pins)	
	Timer RE	8 bits × 1 Real-time clock mode (counting of seconds, minutes, hours, days of week), output compare mode	
	Timer RG	16 bits × 1 Phase-counting mode, timer mode (output compare function, input capture function), PWM mode (output: 1 pin)	
Serial Interface	UART0, UART1	Clock synchronous serial I/O/UART × 2 channels	
	UART2	Clock synchronous serial I/O/UART, I ² C mode (I ² C-bus), multiprocessor communication function	
Synchronous Serial Communication Unit (SSU)		1 (shared with I ² C-bus)	
I ² C bus		1 (shared with SSU)	
LIN Module		Hardware LIN: 1 channel (timer RA, UART0 used)	
A/D Converter	R8C/L35C Group	10-bit resolution × 10 channels, including sample and hold function, with sweep mode	
	R8C/L36C Group	10-bit resolution × 10 channels, including sample and hold function, with sweep mode	
	R8C/L38C Group	10-bit resolution × 16 channels, including sample and hold function, with sweep mode	
	R8C/L3AC Group	10-bit resolution × 20 channels, including sample and hold function, with sweep mode	
D/A Converter		8-bit resolution × 2 circuits	
Comparator B		2 circuits	
LCD Drive Control Circuit	R8C/L35C Group	Common output: Max. 4 pins Segment output: Max. 24 pins	Bias: 1/2, 1/3 Duty: static, 1/2, 1/3, 1/4
	R8C/L36C Group	Common output: Max. 8 pins Segment output: Max. 32 pins ⁽¹⁾	Bias: 1/2, 1/3, 1/4 Duty: static, 1/2, 1/3, 1/4, 1/8
	R8C/L38C Group	Common output: Max. 8 pins Segment output: Max. 48 pins ⁽¹⁾	
	R8C/L3AC Group	Common output: Max. 8 pins Segment output: Max. 56 pins ⁽¹⁾	
	Voltage multiplier and dedicated regulator integrated		

Note:

1. This applies when four pins are selected for common output.

1.2 Product Lists

Tables 1.7 to 1.10 list Product List for Each Group. Figures 1.1 to 1.4 show the Correspondence of Part No., with Memory Size and Package for Each Group.

Table 1.7 Product List for R8C/L35C Group

Current of Apr 2011

Part No.	Internal ROM Capacity		Internal RAM Capacity	Package Type	Remarks
	Program ROM	Data Flash			
R5F2L357CNFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0052JA-A	N Version
R5F2L358CNFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0052JA-A	
R5F2L35ACNFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0052JA-A	
R5F2L35CCNFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0052JA-A	
R5F2L357CDFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0052JA-A	D Version
R5F2L358CDFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0052JA-A	
R5F2L35ACDFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0052JA-A	
R5F2L35CCDFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0052JA-A	

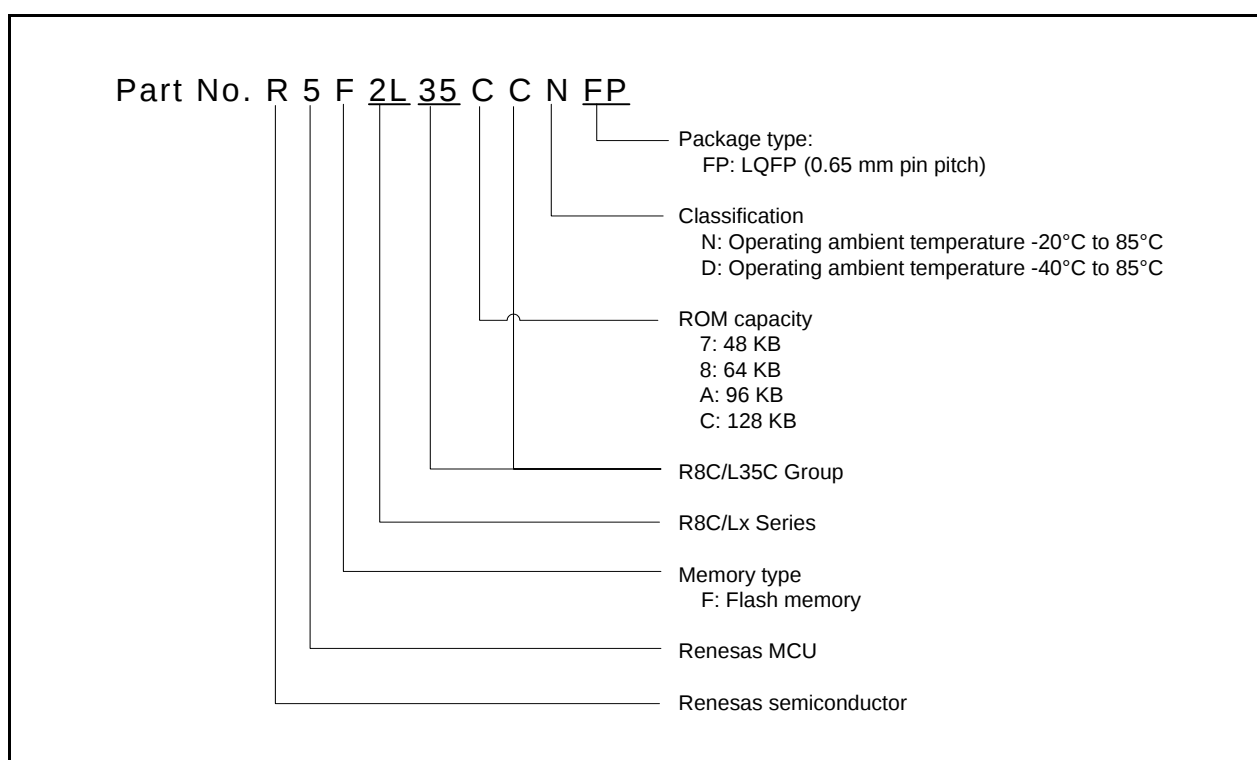


Figure 1.1 Correspondence of Part No., with Memory Size and Package of R8C/L35C Group

Table 1.8 Product List for R8C/L36C Group**Current of Apr 2011**

Part No.	Internal ROM Capacity		Internal RAM Capacity	Package Type	Remarks
	Program ROM	Data Flash			
R5F2L367CNFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0064KB-A	N Version
R5F2L367CNFA	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0064GA-A	
R5F2L368CNFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0064KB-A	
R5F2L368CNFA	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0064GA-A	
R5F2L36ACNFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064KB-A	
R5F2L36ACNFA	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064GA-A	
R5F2L36CCNFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064KB-A	
R5F2L36CCNFA	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064GA-A	
R5F2L367CDFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0064KB-A	D Version
R5F2L367CDFA	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0064GA-A	
R5F2L368CDFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0064KB-A	
R5F2L368CDFA	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0064GA-A	
R5F2L36ACDFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064KB-A	
R5F2L36ACDFA	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064GA-A	
R5F2L36CCDFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064KB-A	
R5F2L36CCDFA	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0064GA-A	

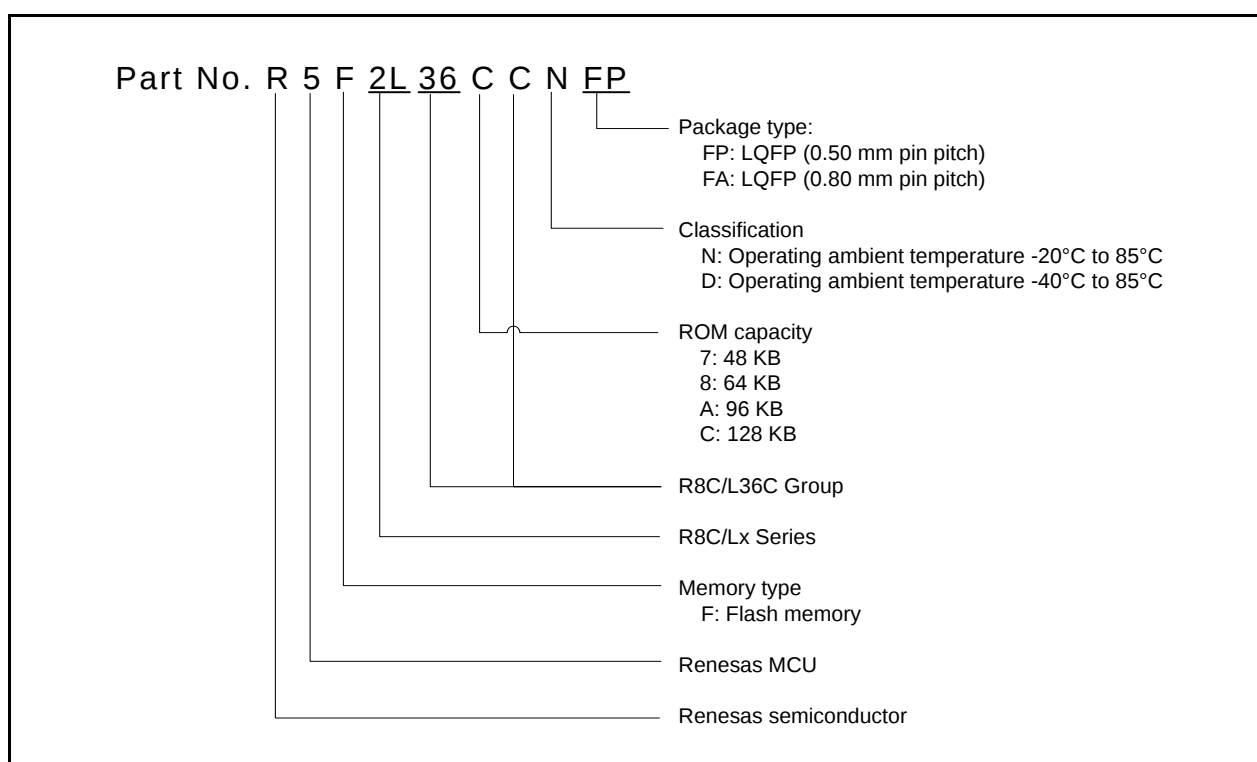
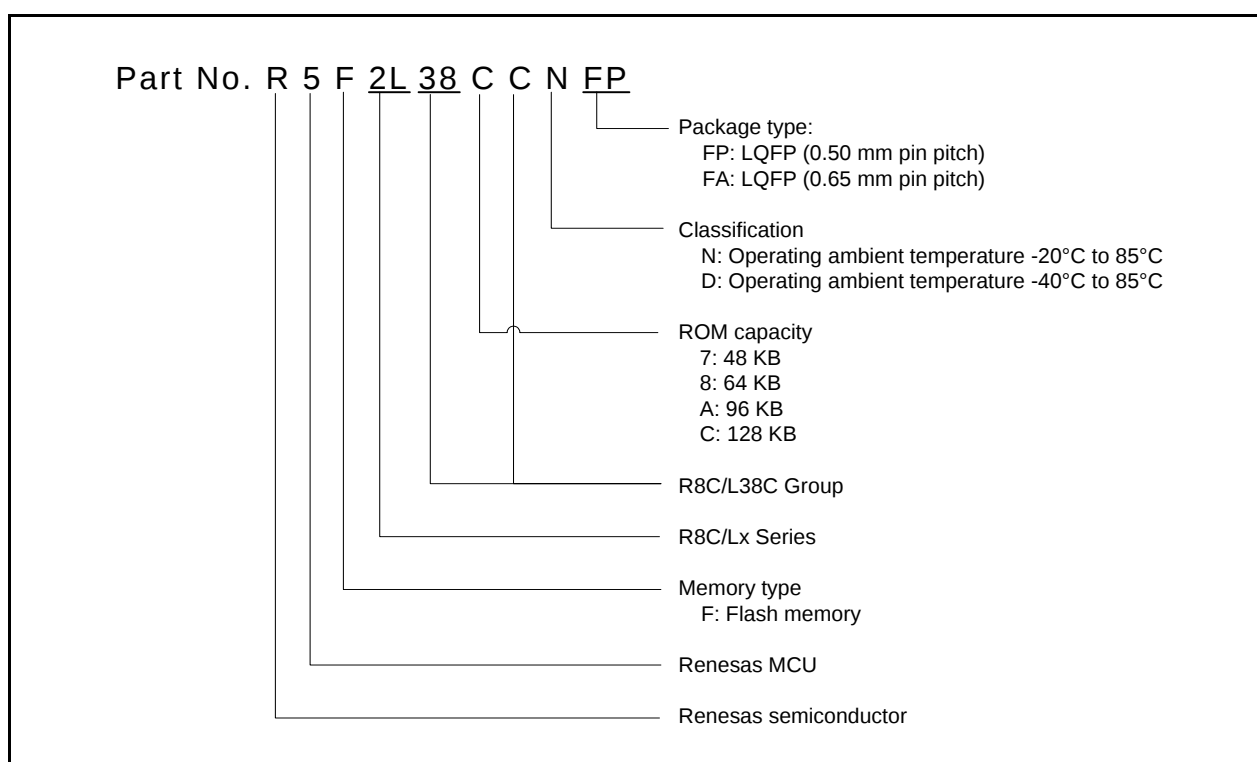
**Figure 1.2 Correspondence of Part No., with Memory Size and Package of R8C/L36C Group**

Table 1.9 Product List for R8C/L38C Group**Current of Apr 2011**

Part No.	Internal ROM Capacity		Internal RAM Capacity	Package Type	Remarks
	Program ROM	Data Flash			
R5F2L387CNFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0080KB-A	N Version
R5F2L387CNFA	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0080JA-A	
R5F2L388CNFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0080KB-A	
R5F2L388CNFA	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0080JA-A	
R5F2L38ACNFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080KB-A	
R5F2L38ACNFA	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080JA-A	
R5F2L38CCNFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080KB-A	
R5F2L38CCNFA	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080JA-A	
R5F2L387CDFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0080KB-A	D Version
R5F2L387CDFA	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0080JA-A	
R5F2L388CDFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0080KB-A	
R5F2L388CDFA	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0080JA-A	
R5F2L38ACDFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080KB-A	
R5F2L38ACDFA	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080JA-A	
R5F2L38CCDFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080KB-A	
R5F2L38CCDFA	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0080JA-A	

**Figure 1.3 Correspondence of Part No., with Memory Size and Package of R8C/L38C Group**

1.4 Pin Assignments

Figures 1.9 to 1.13 show Pin Assignments (Top View). Tables 1.11 to 1.13 list the Pin Name Information by Pin Number.

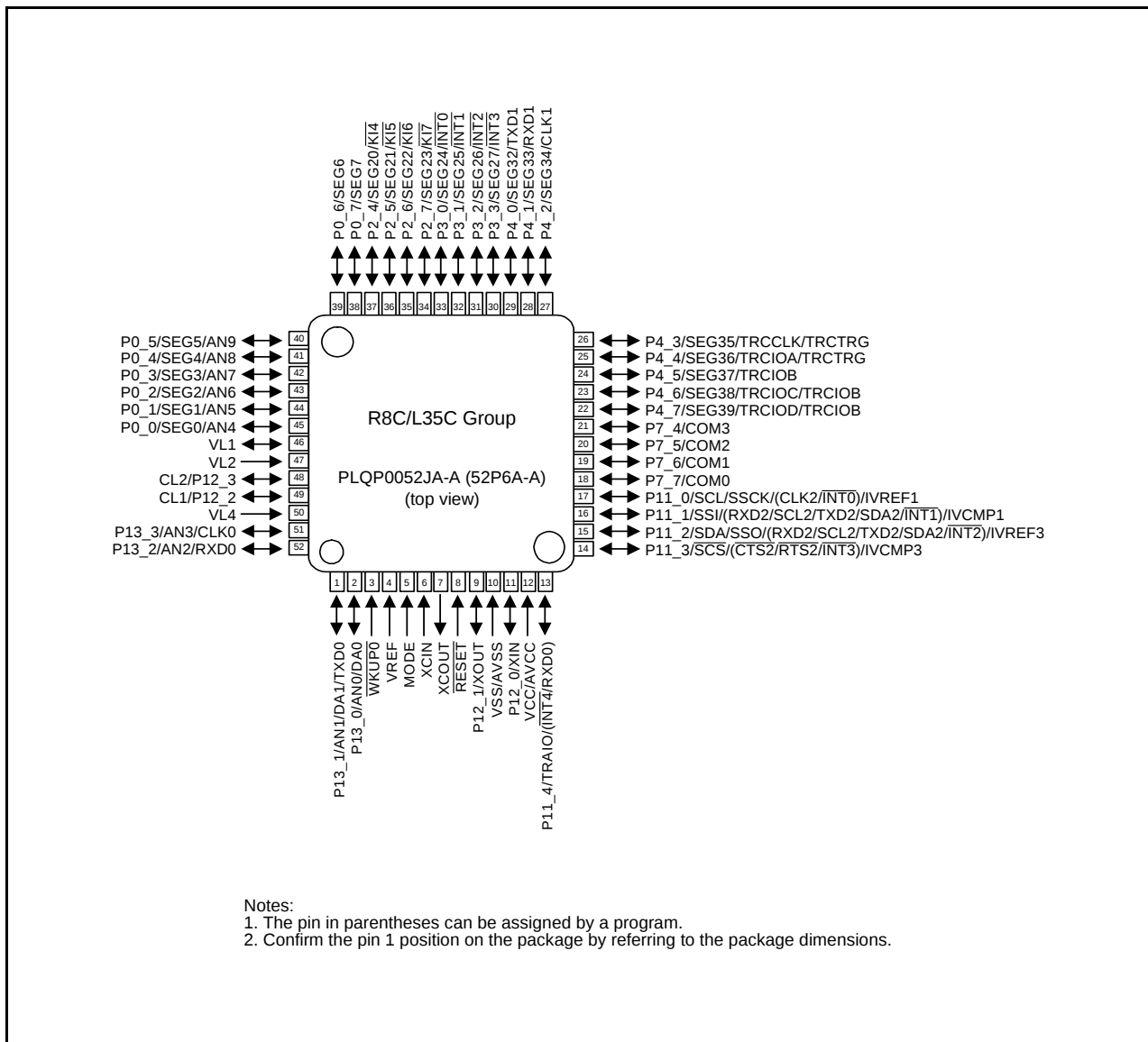


Figure 1.9 Pin Assignment (Top View) of PLQP0052JA-A Package

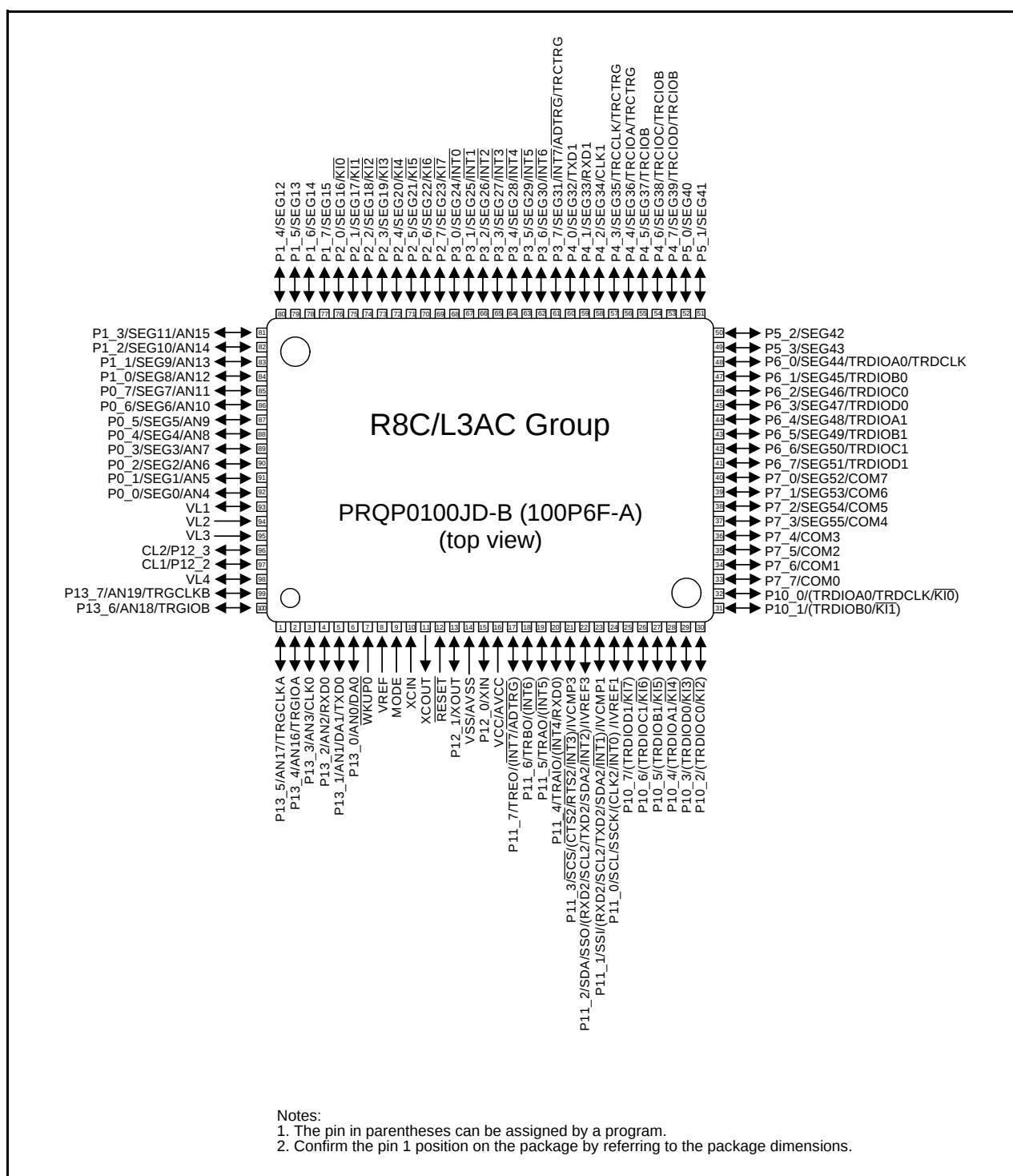


Figure 1.13 Pin Assignment (Top View) of PRQP0100JD-B Package

1.5 Pin Functions

Tables 1.14 and 1.15 list Pin Functions for R8C/L3AC Group.

Table 1.14 Pin Functions for R8C/L3AC Group (1)

Item	Pin Name	I/O Type	Description
Power supply input	VCC, VSS	–	Apply 1.8 V to 5.5 V to the VCC pin. Apply 0 V to the VSS pin.
Analog power supply input	AVCC, AVSS	–	Power supply for the A/D converter. Connect a capacitor between AVCC and AVSS.
Reset input	$\overline{\text{RESET}}$	I	Driving this pin low resets the MCU.
MODE	MODE	I	Connect this pin to VCC via a resistor.
Power-off mode exit input	$\overline{\text{WKUP0}}$	I	This pin is provided for input to exit the mode used in power-off mode. Connect to VSS when not using power-off mode.
XIN clock input	XIN	I	These pins are provided for XIN clock generation circuit I/O. Connect a ceramic oscillator or a crystal oscillator between pins XIN and XOUT. ⁽¹⁾ To use an external clock, input it to the XIN pin and leave the XOUT pin open.
XIN clock output	XOUT	O	
XCIN clock input	XCIN	I	These pins are provided for XCIN clock generation circuit I/O. Connect a crystal oscillator between pins XCIN and XCOU. ⁽¹⁾ To use an external clock, input it to the XCIN pin and leave the XCOU pin open.
XCIN clock output	XCOU	O	
$\overline{\text{INT}}$ interrupt input	$\overline{\text{INT0}}$ to $\overline{\text{INT7}}$	I	$\overline{\text{INT}}$ interrupt input pins.
Key input interrupt	$\overline{\text{KI0}}$ to $\overline{\text{KI7}}$	I	Key input interrupt input pins
Timer RA	TRAIO	I/O	Timer RA I/O pin
	TRA0	O	Timer RA output pin
Timer RB	TRBO	O	Timer RB output pin
Timer RC	TRCLK	I	External clock input pin
	TRCTRG	I	External trigger input pin
	TRCIOA, TRCIOB, TRCIO, TRCIOD	I/O	Timer RC I/O pins
Timer RD	TRDIOA0, TRDIOA1, TRDIOB0, TRDIOB1, TRDIOC0, TRDIOC1, TRDIOD0, TRDIOD1	I/O	Timer RD I/O pins
	TRDCLK	I	External clock input pin
Timer RE	TREO	O	Divided clock output pin
Timer RG	TRGCLKA, TRGCLKB	I	Timer RG input pins
	TRGIOA, TRGIOB	I/O	Timer RG I/O pins
Serial interface	CLK0, CLK1, CLK2	I/O	Transfer clock I/O pins
	RXD0, RXD1, RXD2	I	Serial data input pins
	TXD0, TXD1, TXD2	O	Serial data output pins
	$\overline{\text{CTS2}}$	I	Transmission control input pin
	$\overline{\text{RTS2}}$	O	Reception control output pin
	SCL2	I/O	I ² C mode clock I/O pin
	SDA2	I/O	I ² C mode data I/O pin

I: Input O: Output I/O: Input and output

Note:

1. Contact the oscillator manufacturer for oscillation characteristics.

Table 1.15 Pin Functions for R8C/L3AC Group (2)

Item	Pin Name	I/O Type	Description
I ² C bus	SCL	I/O	Clock I/O pin
	SDA	I/O	Data I/O pin
SSU	SSI	I/O	Data I/O pin
	$\overline{\text{SCS}}$	I/O	Chip-select signal I/O pin
	SSCK	I/O	Clock I/O pin
	SSO	I/O	Data I/O pin
Reference voltage input	VREF	I	Reference voltage input pin for the A/D converter and the D/A converter
A/D converter	AN0 to AN11	I	A/D converter analog input pins
	ADTRG	I	A/D external trigger input pin
D/A converter	DA0, DA1	O	D/A converter output pins
Comparator B	IVCMP1, IVCMP3	I	Comparator B analog voltage input pins
	IVREF1, IVREF3	I	Comparator B reference voltage input pins
I/O ports	P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0, P5_3, P6_0 to P6_7, P7_0 to P7_7, P10_0 to P10_7, P11_0 to P11_7, P12_0 to P12_3, P13_0 to P13_7	I/O	CMOS I/O ports. Each port has an I/O select direction register, allowing each pin in the port to be directed for input or output individually. Any port set to input can be set to use a pull-up resistor or not by a program. Ports P10_0 to P10_7 and P11_0 to P11_7 can be used as LED drive ports.
Segment output	SEG0 to SEG55	O	LCD segment output pins
Common output	COM0 to COM7	O	LCD common output pins
Voltage multiplier capacity connect pins	CL1, CL2	O	Connect pins for the LCD control voltage multiplier
LCD power supply	VL1	I/O	Apply the voltage: $0 \leq \text{VL1} \leq \text{VL2} \leq \text{VL3} \leq \text{VL4}$.
	VL2 to VL4	I	VL1 can be used as the reference potential input or output pin when setting the voltage multiplier.

I: Input O: Output I/O: Input and output

Note:

1. Contact the oscillator manufacturer for oscillation characteristics.

2.8.7 Interrupt Enable Flag (I)

The I flag enables maskable interrupts.

Interrupts are disabled when the I flag is set to 0, and are enabled when the I flag is set to 1. The I flag is set to 0 when an interrupt request is acknowledged.

2.8.8 Stack Pointer Select Flag (U)

ISP is selected when the U flag is set to 0; USP is selected when the U flag is set to 1.

The U flag is set to 0 when a hardware interrupt request is acknowledged or the INT instruction of software interrupt numbers 0 to 31 is executed.

2.8.9 Processor Interrupt Priority Level (IPL)

IPL is 3 bits wide and assigns processor interrupt priority levels from level 0 to level 7.

If a requested interrupt has higher priority than IPL, the interrupt is enabled.

2.8.10 Reserved Bit

If necessary, set to 0. When read, the content is undefined.

3. Memory

Figure 3.1 is a Memory Map of each group. Each group has a 1-Mbyte address space from addresses 00000h to FFFFFh. For example, a 48-Kbyte internal ROM area is allocated addresses 04000h to 0FFFFh.

The fixed interrupt vector table is allocated addresses 0FFDCh to 0FFFFh. The starting address of each interrupt routine is stored here.

The internal ROM (data flash) is allocated addresses 03000h to 03FFFh.

The internal RAM is allocated higher addresses, beginning with address 00400h. For example, a 6-Kbyte internal RAM area is allocated addresses 00400h to 01BFFh. The internal RAM is used not only for data storage but also as a stack area when a subroutine is called or when an interrupt request is acknowledged.

Special function registers (SFRs) are allocated addresses 00000h to 002FFh and 02C00h to 02FFFh. Peripheral function control registers are allocated here. All unallocated spaces within the SFRs are reserved and cannot be accessed by users.

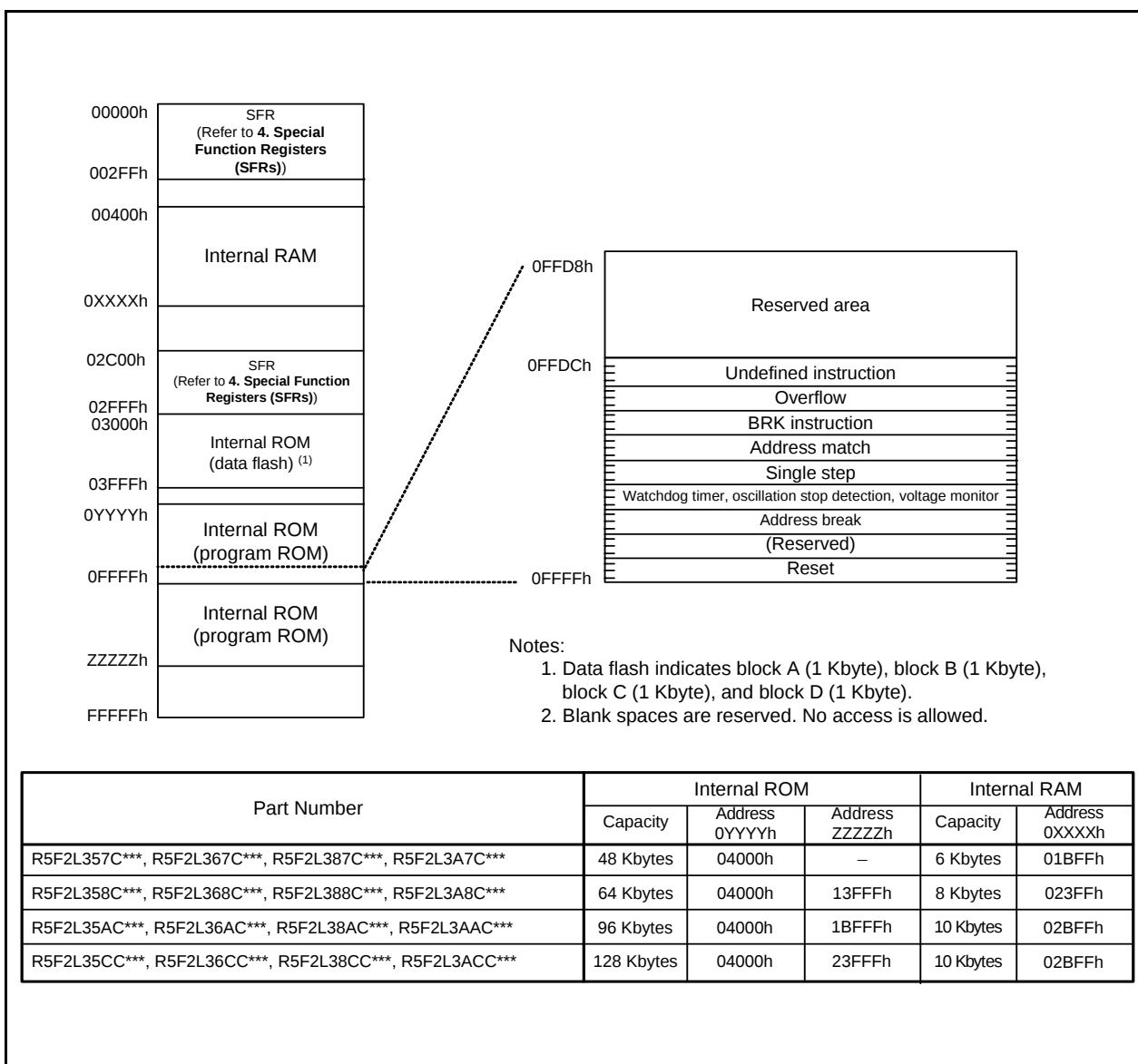


Figure 3.1 Memory Map

Table 4.4 SFR Information (4) ⁽¹⁾

Address	Register	Symbol	After Reset
00C0h	A/D Register 0	AD0	XXh
00C1h			000000XXb
00C2h	A/D Register 1	AD1	XXh
00C3h			000000XXb
00C4h	A/D Register 2	AD2	XXh
00C5h			000000XXb
00C6h	A/D Register 3	AD3	XXh
00C7h			000000XXb
00C8h	A/D Register 4	AD4	XXh
00C9h			000000XXb
00CAh	A/D Register 5	AD5	XXh
00CBh			000000XXb
00CCh	A/D Register 6	AD6	XXh
00CDh			000000XXb
00CEh	A/D Register 7	AD7	XXh
00CFh			000000XXb
00D0h			
00D1h			
00D2h			
00D3h			
00D4h	A/D Mode Register	ADMOD	00h
00D5h	A/D Input Select Register	ADINSEL	11000000b
00D6h	A/D Control Register 0	ADCON0	00h
00D7h	A/D Control Register 1	ADCON1	00h
00D8h	D/A 0 Register	DA0	00h
00D9h	D/A 1 Register	DA1	00h
00DAh			
00DBh			
00DCh	D/A Control Register	DACON	00h
00DDh			
00DEh			
00DFh			
00E0h	Port P0 Register	P0	XXh
00E1h	Port P1 Register	P1	XXh
00E2h	Port P0 Direction Register	PD0	00h
00E3h	Port P1 Direction Register	PD1	00h
00E4h	Port P2 Register	P2	XXh
00E5h	Port P3 Register	P3	XXh
00E6h	Port P2 Direction Register	PD2	00h
00E7h	Port P3 Direction Register	PD3	00h
00E8h	Port P4 Register	P4	XXh
00E9h	Port P5 Register	P5	XXh
00EAh	Port P4 Direction Register	PD4	00h
00EBh	Port P5 Direction Register	PD5	00h
00ECh	Port P6 Register	P6	XXh
00EDh	Port P7 Register	P7	XXh
00EEh	Port P6 Direction Register	PD6	00h
00EFh	Port P7 Direction Register	PD7	00h
00F0h			
00F1h			
00F2h			
00F3h			
00F4h	Port P10 Register	P10	XXh
00F5h	Port P11 Register	P11	XXh
00F6h	Port P10 Direction Register	PD10	00h
00F7h	Port P11 Direction Register	PD11	00h
00F8h	Port P12 Register	P12	XXh
00F9h	Port P13 Register	P13	XXh
00FAh	Port P12 Direction Register	PD12	00h
00FBh	Port P13 Direction Register	PD13	00h
00FCh			
00FDh			
00FEh			
00FFh			

X: Undefined

Note:

- Blank spaces are reserved. No access is allowed.

Table 4.6 SFR Information (6) ⁽¹⁾

Address	Register	Symbol	After Reset
0140h	Timer RD Control Register 0	TRDCR0	00h
0141h	Timer RD I/O Control Register A0	TRDIOA0	10001000b
0142h	Timer RD I/O Control Register C0	TRDIORC0	10001000b
0143h	Timer RD Status Register 0	TRDSR0	11100000b
0144h	Timer RD Interrupt Enable Register 0	TRDIER0	11100000b
0145h	Timer RD PWM Mode Output Level Control Register 0	TRDPOCR0	11111000b
0146h	Timer RD Counter 0	TRD0	00h
0147h			00h
0148h	Timer RD General Register A0	TRDGRA0	FFh
0149h			FFh
014Ah	Timer RD General Register B0	TRDGRB0	FFh
014Bh			FFh
014Ch	Timer RD General Register C0	TRDGRC0	FFh
014Dh			FFh
014Eh	Timer RD General Register D0	TRDGRD0	FFh
014Fh			FFh
0150h	Timer RD Control Register 1	TRDCR1	00h
0151h	Timer RD I/O Control Register A1	TRDIOA1	10001000b
0152h	Timer RD I/O Control Register C1	TRDIORC1	10001000b
0153h	Timer RD Status Register 1	TRDSR1	11100000b
0154h	Timer RD Interrupt Enable Register 1	TRDIER1	11100000b
0155h	Timer RD PWM Mode Output Level Control Register 1	TRDPOCR1	11111000b
0156h	Timer RD Counter 1	TRD1	00h
0157h			00h
0158h	Timer RD General Register A1	TRDGRA1	FFh
0159h			FFh
015Ah	Timer RD General Register B1	TRDGRB1	FFh
015Bh			FFh
015Ch	Timer RD General Register C1	TRDGRC1	FFh
015Dh			FFh
015Eh	Timer RD General Register D1	TRDGRD1	FFh
015Fh			FFh
0160h	UART1 Transmit/Receive Mode Register	U1MR	00h
0161h	UART1 Bit Rate Register	U1BRG	XXh
0162h	UART1 Transmit Buffer Register	U1TB	XXh
0163h			XXh
0164h	UART1 Transmit/Receive Control Register 0	U1C0	00001000b
0165h	UART1 Transmit/Receive Control Register 1	U1C1	00000010b
0166h	UART1 Receive Buffer Register	U1RB	XXh
0167h			XXh
0168h			
0169h			
016Ah			
016Bh			
016Ch			
016Dh			
016Eh			
016Fh			
0170h	Timer RG Mode Register	TRGMR	01000000b
0171h	Timer RG Count Control Register	TRGCNTC	00h
0172h	Timer RG Control Register	TRGCR	10000000b
0173h	Timer RG Interrupt Enable Register	TRGIER	11110000b
0174h	Timer RG Status Register	TRGSR	11100000b
0175h	Timer RG I/O Control Register	TRGIOR	00h
0176h	Timer RG Counter	TRG	00h
0177h			00h
0178h	Timer RG General Register A	TRGGRA	FFh
0179h			FFh
017Ah	Timer RG General Register B	TRGGRB	FFh
017Bh			FFh
017Ch	Timer RG General Register C	TRGGRC	FFh
017Dh			FFh
017Eh	Timer RG General Register D	TRGGRD	FFh
017Fh			FFh

X: Undefined

Note:

- Blank spaces are reserved. No access is allowed.

Table 4.10 SFR Information (10) ⁽¹⁾

Address	Register	Symbol	After Reset
0240h	LCD Display Data Register	LRA48L	XXh
0241h		LRA49L	XXh
0242h		LRA50L	XXh
0243h		LRA51L	XXh
0244h		LRA52L	XXh
0245h		LRA53L	XXh
0246h		LRA54L	XXh
0247h		LRA55L	XXh
0248h			
0249h			
024Ah			
024Bh			
024Ch			
024Dh			
024Eh			
024Fh			
0250h			
0251h			
0252h			
0253h			
0254h			
0255h			
0256h			
0257h			
0258h			
0259h			
025Ah			
025Bh			
025Ch			
025Dh			
025Eh			
025Fh			
0260h			
0261h			
0262h			
0263h			
0264h			
0265h			
0266h			
0267h			
0268h			
0269h			
026Ah			
026Bh			
026Ch			
026Dh			
026Eh			
026Fh			
0270h	LCD Display Control Data Register	LRA0H	XXh
0271h		LRA1H	XXh
0272h		LRA2H	XXh
0273h		LRA3H	XXh
0274h		LRA4H	XXh
0275h		LRA5H	XXh
0276h		LRA6H	XXh
0277h		LRA7H	XXh
0278h		LRA8H	XXh
0279h		LRA9H	XXh
027Ah		LRA10H	XXh
027Bh		LRA11H	XXh
027Ch		LRA12H	XXh
027Dh		LRA13H	XXh
027Eh		LRA14H	XXh
027Fh		LRA15H	XXh

X: Undefined

Note:

- Blank spaces are reserved. No access is allowed.

Table 4.16 SFR Information (16) ⁽¹⁾

Address	Register	Symbol	After Reset
2CF0h	DTC Control Data 22	DTCD22	XXh
2CF1h			XXh
2CF2h			XXh
2CF3h			XXh
2CF4h			XXh
2CF5h			XXh
2CF6h			XXh
2CF7h			XXh
2CF8h	DTC Control Data 23	DTCD23	XXh
2CF9h			XXh
2CFAh			XXh
2CFBh			XXh
2CFCh			XXh
2CFDh			XXh
2CFEh			XXh
2CFFh			XXh
2D00h			
:			
2FFFh			

X: Undefined

Note:

- Blank spaces are reserved. No access is allowed.

Table 4.17 ID Code Areas and Option Function Select Area

Address	Area Name	Symbol	After Reset
:			
FFDBh	Option Function Select Register 2	OFS2	(Note 1)
:			
FFDFh	ID1		(Note 2)
:			
FFE3h	ID2		(Note 2)
:			
FFEBh	ID3		(Note 2)
:			
FFEFh	ID4		(Note 2)
:			
FFF3h	ID5		(Note 2)
:			
FFF7h	ID6		(Note 2)
:			
FFFBh	ID7		(Note 2)
:			
FFFFh	Option Function Select Register	OFS	(Note 1)

Notes:

- The option function select area is allocated in the flash memory, not in the SFRs. Set appropriate values as ROM data by a program. Do not write additions to the option function select area. If the block including the option function select area is erased, the option function select area is set to FFh.
When blank products are shipped, the option function select area is set to FFh. It is set to the written value after written by the user.
When factory-programming products are shipped, the value of the option function select area is the value programmed by the user.
- The ID code areas are allocated in the flash memory, not in the SFRs. Set appropriate values as ROM data by a program. Do not write additions to the ID code areas. If the block including the ID code areas is erased, the ID code areas are set to FFh.
When blank products are shipped, the ID code areas are set to FFh. They are set to the written value after written by the user.
When factory-programming products are shipped, the value of the ID code areas is the value programmed by the user.

5.2 Recommended Operating Conditions

Table 5.2 Recommended Operating Conditions
(VCC = 1.8 to 5.5 V and Topr = -20 to 85°C (N version) / -40 to 85°C (D version), unless otherwise specified.)

Symbol	Parameter			Conditions	Standard			Unit	
					Min.	Typ.	Max.		
Vcc/AVcc	Supply voltage				1.8	—	5.5	V	
Vss/AVss	Supply voltage				—	0	—	V	
VIH	Input “H” voltage	Other than CMOS input			4.0 V ≤ Vcc ≤ 5.5 V	0.8 Vcc	—	Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0.8 Vcc	—	Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0.9 Vcc	—	Vcc	V
		CMOS input	Input level switching function (I/O port)	Input level selection : 0.35 Vcc	4.0 V ≤ Vcc ≤ 5.5 V	0.5 Vcc	—	Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0.55 Vcc	—	Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0.65 Vcc	—	Vcc	V
				Input level selection : 0.5 Vcc	4.0 V ≤ Vcc ≤ 5.5 V	0.65 Vcc	—	Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0.7 Vcc	—	Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0.8 Vcc	—	Vcc	V
				Input level selection : 0.7 Vcc	4.0 V ≤ Vcc ≤ 5.5 V	0.85 Vcc	—	Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0.85 Vcc	—	Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0.85 Vcc	—	Vcc	V
VIL	Input “L” voltage	Other than CMOS input			4.0 V ≤ Vcc ≤ 5.5 V	0	—	0.2 Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0	—	0.2 Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0	—	0.05 Vcc	V
		CMOS input	Input level switching function (I/O port)	Input level selection : 0.35 Vcc	4.0 V ≤ Vcc ≤ 5.5 V	0	—	0.2 Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0	—	0.2 Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0	—	0.2 Vcc	V
				Input level selection : 0.5 Vcc	4.0 V ≤ Vcc ≤ 5.5 V	0	—	0.4 Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0	—	0.3 Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0	—	0.2 Vcc	V
				Input level selection : 0.7 Vcc	4.0 V ≤ Vcc ≤ 5.5 V	0	—	0.55 Vcc	V
					2.7 V ≤ Vcc < 4.0 V	0	—	0.45 Vcc	V
					1.8 V ≤ Vcc < 2.7 V	0	—	0.35 Vcc	V
IOH(sum)	Peak sum output “H” current	Sum of all pins IOH(peak)				—	—	–160	mA
IOH(sum)	Average sum output “H” current	Sum of all pins IOH(aveg)				—	—	–80	mA
IOH(peak)	Peak output “H” current	Port P10, P11 (2)				—	—	–40	mA
		Other pins				—	—	–10	mA
IOH(aveg)	Average output “H” current (1)	Port P10, P11 (2)				—	—	–20	mA
		Other pins				—	—	–5	mA
IoL(sum)	Peak sum output “L” current	Sum of all pins IoL(peak)				—	—	160	mA
IoL(sum)	Average sum output “L” current	Sum of all pins IoL(aveg)				—	—	80	mA
IoL(peak)	Peak output “L” current	Port P10, P11 (2)				—	—	40	mA
		Other pins				—	—	10	mA
IoL(aveg)	Average output “L” current (1)	Port P10, P11 (2)				—	—	20	mA
		Other pins				—	—	5	mA
f(XIN)	XIN clock input ossillation frequency			2.7 V ≤ Vcc ≤ 5.5 V	—	—	20	MHz	
				1.8 V ≤ Vcc < 2.7 V	—	—	5	MHz	
f(XCIN)	XCIN clock input ossillation frequency			1.8 V ≤ Vcc ≤ 5.5 V	—	32.768	50	kHz	
fOCO40M	When used as the count source for timer RC, timer RD, or timer RG (3)			2.7 V ≤ Vcc ≤ 5.5 V	32	—	40	MHz	
fOCO-F	fOCO-F frequency			2.7 V ≤ Vcc ≤ 5.5 V	—	—	20	MHz	
				1.8 V ≤ Vcc < 2.7 V	—	—	5	MHz	
—	System clock frequency			2.7 V ≤ Vcc ≤ 5.5 V	—	—	20	MHz	
				1.8 V ≤ Vcc < 2.7 V	—	—	5	MHz	
f(BCLK)	CPU clock frequency			2.7 V ≤ Vcc ≤ 5.5 V	—	—	20	MHz	
				1.8 V ≤ Vcc < 2.7 V	—	—	5	MHz	

Notes:

1. The average output current indicates the average value of current measured during 100 ms.
2. This applies when the drive capacity of the output transistor is set to High by registers P10DRR and P11DRR. When the drive capacity is set to Low, the value of any other pin applies.
3. fOCO40M can be used as the count source for timer RC, timer RD, or timer RG in the range of VCC = 2.7 V to 5.5V.

Table 5.6 Flash Memory (Program ROM) Characteristics
(V_{CC} = 2.7 to 5.5 V and T_{opr} = 0 to 60°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Standard			Unit
			Min.	Typ.	Max.	
—	Program/erase endurance ⁽¹⁾		1,000 ⁽²⁾	—	—	times
—	Byte program time		—	80	500	μs
—	Block erase time		—	0.3	—	s
t _d (SR-SUS)	Time delay from suspend request until suspend		—	—	5 + CPU clock × 3 cycles	ms
—	Interval from erase start/restart until following suspend request		0	—	—	ms
—	Time from suspend until erase restart		—	—	30+CPU clock × 1 cycle	μs
t _d (CMDRST-READY)	Time from when command is forcibly terminated until reading is enabled		—	—	30+CPU clock × 1 cycle	μs
—	Program, erase voltage		2.7	—	5.5	V
—	Read voltage		1.8	—	5.5	V
—	Program, erase temperature		0	—	60	°C
—	Data hold time ⁽⁶⁾	Ambient temperature = 55°C	20	—	—	year

Notes:

1. Definition of programming/erasure endurance
 The programming and erasure endurance is defined on a per-block basis.
 If the programming and erasure endurance is n (n = 1,000), each block can be erased n times. For example, if 1,024 1-byte writes are performed to different addresses in block A, a 1 Kbyte block, and then the block is erased, the programming/erasure endurance still stands at one.
 However, the same address must not be programmed more than once per erase operation (overwriting prohibited).
2. Endurance to guarantee all electrical characteristics after program and erase. (1 to Min. value can be guaranteed).
3. In a system that executes multiple programming operations, the actual erasure count can be reduced by writing to sequential addresses in turn so that as much of the block as possible is used up before performing an erase operation. For example, when programming groups of 16 bytes, the effective number of rewrites can be minimized by programming up to 128 groups before erasing them all in one operation. It is also advisable to retain data on the erasure endurance of each block and limit the number of erase operations to a certain number.
4. If an error occurs during block erase, attempt to execute the clear status register command, then execute the block erase command at least three times until the erase error does not occur.
5. Customers desiring program/erase failure rate information should contact their Renesas technical support representative.
6. The data hold time includes time that the power supply is off or the clock is not supplied.

Table 5.15 LCD Drive Control Circuit Characteristics
(V_{CC} = 1.8 to 5.5 V, V_{SS} = 0 V, and T_{opr} = –20 to 85°C (N version) / –40 to 85°C (D version), unless otherwise specified.)

Symbol	Parameter	Condition	Standard			Unit
			Min.	Typ.	Max.	
VLCD	LCD power supply voltage	VLCD = VL4	2.2	—	5.5	V
VL3	VL3 voltage		VL2	—	VL4	V
VL2	VL2 voltage	R8C/L35C	VL1	—	VL4	V
		R8C/L36C, R8C/L38C, R8C/L3AC	VL1	—	VL3	V
VL1	VL1 voltage		1	—	VL2 (3)	V
—	VL1 internally-generated voltage accuracy (1)		Setting voltage –0.2	Setting voltage	Setting voltage +0.2	V
f(FR)	Frame frequency		50	—	180	Hz
ILCD	LCD drive control circuit current		—	(Note 2)	—	μA

Notes:

1. The voltage is selected with bits LVLS0 to LVLS3 in the LCR1 register.
2. Refer to **Table 5.18 DC Characteristics (2)**, **Table 5.20 DC Characteristics (4)**, and **Table 5.22 DC Characteristics (6)**.
3. The VL1 voltage should be VCC or below.

Table 5.16 Power-Off Mode Characteristics
(V_{CC} = 2.2 to 5.5 V, V_{SS} = 0 V, and T_{opr} = –20 to 85°C (N version) / –40 to 85°C (D version), unless otherwise specified.)

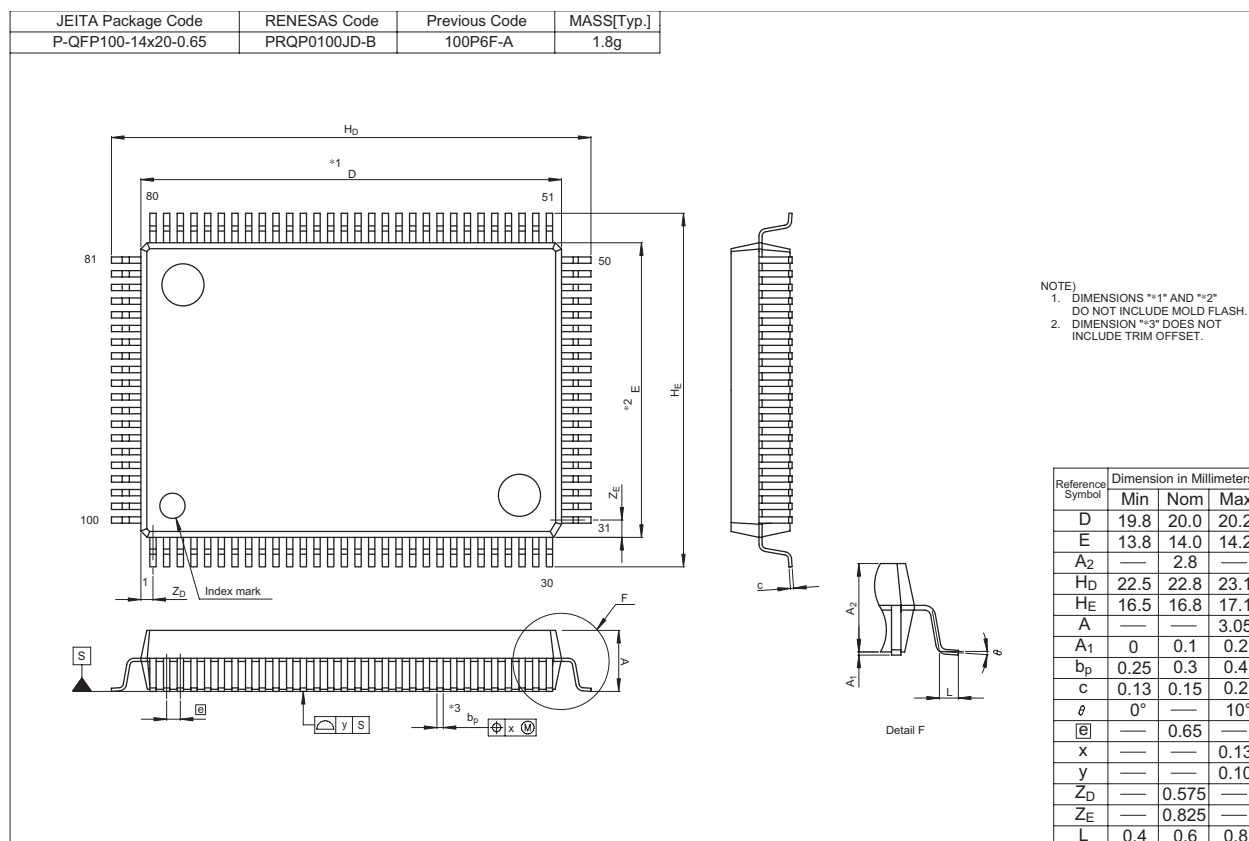
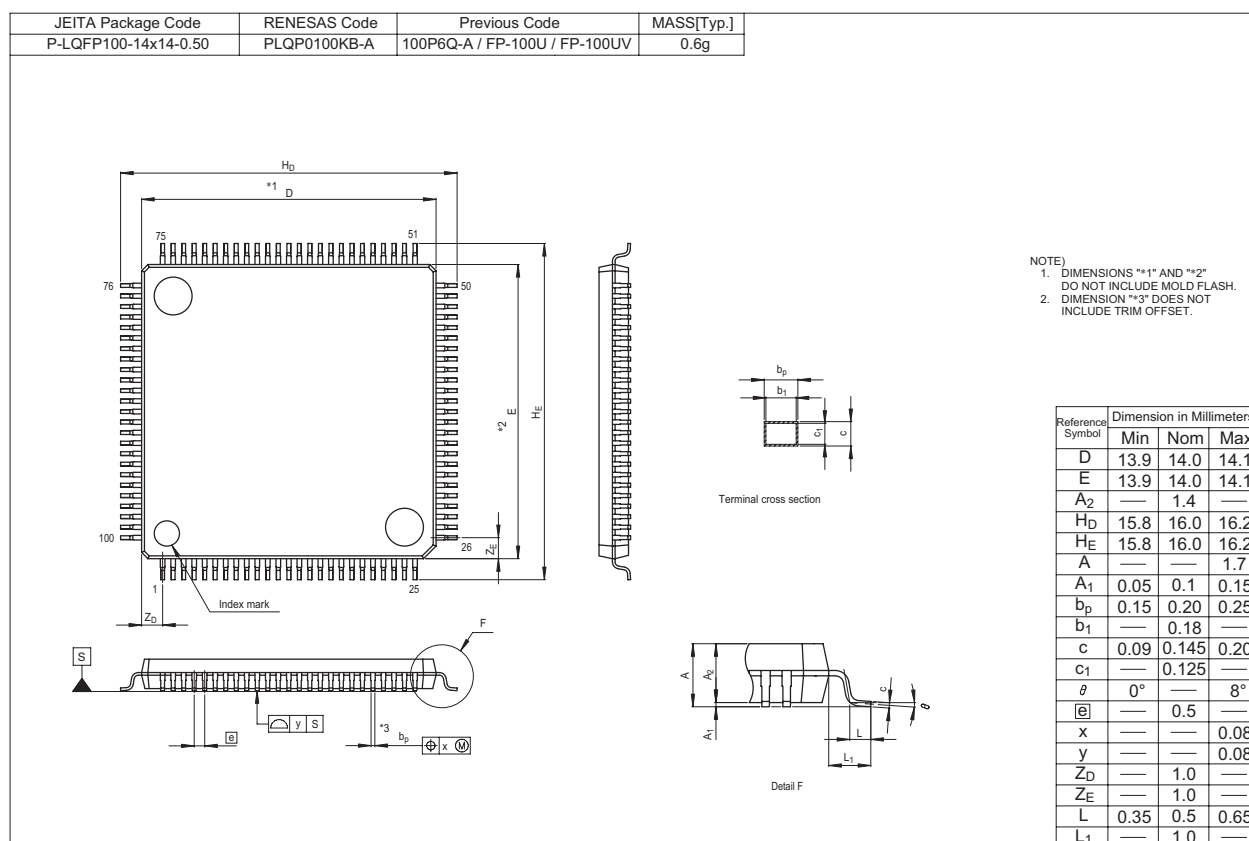
Symbol	Parameter	Condition	Standard			Unit
			Min.	Typ.	Max.	
—	Power-off mode operating supply voltage		2.2	—	5.5	V

Table 5.22 DC Characteristics (6) [$1.8\text{ V} \leq V_{CC} < 2.7\text{ V}$]
($T_{opr} = -20\text{ to }85^{\circ}\text{C}$ (N version) / $-40\text{ to }85^{\circ}\text{C}$ (D version), unless otherwise specified.)

Symbol	Parameter		Condition								Standard			Unit
			Oscillation Circuit		On-Chip Oscillator		CPU Clock	Low-Power-Consumption Setting	Other		Min.	Typ. (3)	Max.	
			XIN (2)	XCIN	High-Speed (fOCO-F)	Low-Speed								
Icc	Power supply current (1)	High-speed clock mode	5 MHz	Off	Off	125 kHz	No division	—			—	2.2	—	mA
			5 MHz	Off	Off	125 kHz	Divide-by-8	—			—	0.8	—	mA
		High-speed on-chip oscillator mode	Off	Off	5 MHz	125 kHz	No division	—			—	2.5	10	mA
			Off	Off	5 MHz	125 kHz	Divide-by-8	—			—	1.7	—	mA
			Off	Off	4 MHz	125 kHz	Divide-by-16	MSTIIC = 1 MSTTRD = 1 MSTTRC = 1 MSTTRG = 1			—	1	—	mA
		Low-speed on-chip oscillator mode	Off	Off	Off	125 kHz	Divide-by-8	FMR27 = 1 VCA20 = 0			—	90	300	μA
		Low-speed clock mode	Off	32 kHz	Off	Off	No division	FMR27 = 1 VCA20 = 0			—	90	400	μA
			Off	32 kHz	Off	Off	No division	FMSTP = 1 VCA20 = 0	Flash memory off Program operation on RAM			—	45	—
		Wait mode	Off	Off	Off	125 kHz	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1	While a WAIT instruction is executed Peripheral clock operation		—	15	90	μA
			Off	Off	Off	125 kHz	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1 CM02 = 1 CM01 = 1	While a WAIT instruction is executed Peripheral clock off		—	4	80	μA
			Off	32 kHz	Off	Off	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1 CM02 = 1 CM01 = 0	While a WAIT instruction is executed Peripheral clock off Timer RE operation in real-time clock mode	LCD drive control circuit (4) When external division resistors are used	—	4	—	μA
									LCD drive control circuit (5) When the internal voltage multiplier is used	—	11	—	μA	
		Stop mode	Off	32 kHz	Off	Off	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1 CM02 = 1 CM01 = 1	While a WAIT instruction is executed Peripheral clock off Timer RE operation in real-time clock mode		—	3.5	—	μA
			Off	Off	Off	Off	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 CM10 = 1	Topr = 25°C Peripheral clock off		—	2.0	5.0	μA
									Topr = 85°C Peripheral clock off		—	13	—	μA
			Power-off mode	Off	Off	Off	Off	—	—	Topr = 25°C		—	0.02	0.2
		Off		Off	Off	Off	—	—	Topr = 85°C		—	0.3	—	μA

Notes:

1. $V_{CC} = 1.8\text{ V}$ to 2.7 V , single chip mode, output pins are open, and other pins are Vss.
2. XIN is set to square wave input.
3. $V_{CC} = 2.2\text{ V}$
4. VLCD = V_{CC}, external division resistors are used for VL4 to VL1, 1/3 bias, 1/4 duty, f(FR) = 64 Hz, SEG0 to SEG55 are selected, and segment and common output pins are open. The standard value does not include the current that flows through external division resistors.
5. The internal voltage multiplier is used, bits LVLS3 to LVLS0 in the LCR1 register = 1011b, 1/3 bias, 1/4 duty, f(FR) = 64 Hz, SEG0 to SEG55 are selected, and segment and common output pins are open.



REVISION HISTORY	R8C/L35C Group, R8C/L36C Group, R8C/L38C Group, R8C/L3AC Group Datasheet
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Rev.	Date	Description	
		Page	Summary
0.10	Oct 30, 2009	—	First Edition issued
0.20	Apr 15, 2011	6 7 7 to 10 24 29 45 to 68	Table 1.6 Function deleted, Current consumption revised 1.2 “of R8C/Lx Series” → “for Each Group” Tables 1.7 to 1.10 revised Table 1.15 “Voltage detection circuit” deleted 4. Special Function Registers (SFRs) “The description offered in this chapter is based on the R8C/L3AC Group.” added 5. Electrical Characteristics added
1.00	Jun 25, 2010	— 1 7 to 10 45 55 69 to 72	“Preliminary” and “Under development” deleted 1.1 revised Tables 1.7 to 1.10 revised Tables 5.1 Note 2 added Table 5.15 Note 3 added Package Dimensions revised
1.01	Apr 15, 2011	2 3 6 11 to 14 20 to 22 23, 24 28 38 to 40 48 57, 59, 61	Table 1.1 revised Table 1.2 Note 2, Table 1.3 Note 1 revised Table 1.6 “Flash Memory” revised Figure 1.5 to Figure 1.8 revised Table 1.11 to Table 1.13 “Voltage Detection Circuit” deleted Table 1.14 and Table 1.15 title “for R8C/L3AC Group” added 3. “The internal ROM ... with address 0FFFFh.” deleted Table 4.10 to Table 4.12 “0248h to 026Fh”, “02A8h to 02BFh”, “02C0h to 02CFh” revised Table 5.3 “tCONV”, “tSAMP” revised Table 5.18, Table 5.20, Table 5.22 “High-Speed” → “High-Speed (fOCO-F)”

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