

Welcome to E-XFL.COM

### 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 "<u>Embedded -</u> <u>Microcontrollers</u>"

### Details

Product Status	Active
Core Processor	R8C
Core Size	16-Bit
Speed	20MHz
Connectivity	I <sup>2</sup> C, LINbus, SIO, SSU, UART/USART
Peripherals	LCD, POR, PWM, Voltage Detect, WDT
Number of I/O	52
Program Memory Size	128KB (128K x 8)
Program Memory Type	FLASH
EEPROM Size	4K x 8
RAM Size	10K 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	64-LQFP
Supplier Device Package	64-LQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f2l36ccnfa-31

Email: info@E-XFL.COM

Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong

# 1.1.2 Differences between Groups

Table 1.1 lists the Differences between Groups, Table 1.2 lists the Programmable I/O Ports Provided for Each Group, and Table 1.3 lists the LCD Display Function Pins Provided for Each Group. Figures 1.9 to 1.13 show the Pin Assignment for Each Group, and Tables 1.7 to 1.10 list Product Information.

The explanations in the chapters which follow apply to the R8C/L3AC Group only. Note the differences shown below.

Item	Function	R8C/L35C Group	R8C/L36C Group	R8C/L38C Group	R8C/L3AC Group
I/O Ports	Programmable I/O ports	41 pins	52 pins	68 pins	88 pins
	High current drive ports	5 pins	8 pins	8 pins	16 pins
Interrupts	INT interrupt pins	5 pins	8 pins	8 pins	8 pins
	Key input interrupt pins	4 pins	4 pins	8 pins	8 pins
Timer RA	Timer RA output pin	None	1 pin	1 pin	1 pin
Timer RB	Timer RB output pin	None	1 pin	1 pin	1 pin
Timer RD	Timer RD I/O pin	None	None	8 pins	8 pins
Timer RE	Timer RE output pin	None	1 pin	1 pin	1 pin
Timer RG	Timer RG I/O pin	None	None	None	2 pins
	Timer RG output pin	None	None	None	2 pins
A/D Converter	Analog input pin	10 pins	10 pins	16 pins	20 pins
LCD Drive Control Circuit	LCD power supply	3 pins (VL1, VL2, VL4)	4 pins (VL1 to VL4)	4 pins (VL1 to VL4)	4 pins (VL1 to VL4)
	Common output pins	Max. 4 pins	Max. 8 pins	Max. 8 pins	Max. 8 pins
	Segment output pins	Max. 24 pins	Max. 32 pins	Max. 48 pins	Max. 56 pins
Packages		52-pin LQFP	64-pin LQFP	80-pin LQFP	100-pin LQFP/ 100-pin QFP

## Table 1.1 Differences between Groups

Note:

1. I/O ports are shared with I/O functions, such as interrupts or timers.

Refer to Tables 1.11 to 1.13, Pin Name Information by Pin Number, for details.



Programmable		R	/38. Notal	′L35 ∙⊿1		Grou	ib			R	8C/	L36		Grou	ip s			R	8C/	L38 · 68		rou	ip s			R T	8C/	L3AC Group				
I/O Dort			otai		"0		13				otai	. 52		' P'''	3				otai	. 00	1/0	Pill	3				otai	. 00		Pill	3	
1/O Polt	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
P0	~	~	~	~	~	~	~	~	~	~	$\checkmark$	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
P1	Ι	-	Ι	-	-	-	-	I	-	I	-	Ι	Ι	-	I	Ι	-	Ι	-	Ι	~	~	~	~	~	~	$\checkmark$	~	~	~	~	~
P2	~	~	~	~	-	-	-	1	~	~	~	~	Ι	-	Ι	Ι	~	~	~	~	~	~	~	~	~	~	$\checkmark$	~	~	~	~	~
P3	Ι	-	Ι	-	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
P4	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	$\checkmark$	~	~	~	~	~
P5	Ι	-	Ι	-	-	-	-	1	-	1	-	Ι	Ι	-	1	Ι	-	Ι	-	Ι	Ι	Ι	Ι	-	-	-	-	I	~	~	~	~
P6	Ι	-	Ι	-	-	-	-	1	-	1	-	Ι	Ι	-	1	Ι	~	~	~	~	~	~	~	~	~	~	$\checkmark$	~	~	~	~	~
P7	~	~	~	~	-	-	-	1	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
P10	Ι	-	Ι	-	-	-	-	1	-	1	-	Ι	Ι	-	1	Ι	-	Ι	-	Ι	Ι	Ι	Ι	-	~	~	$\checkmark$	~	~	~	~	~
P11	Ι	-	Ι	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
P12	I	-	I	-	$\checkmark$	~	~	~	-	1	-	I	~	~	~	~	-	I	-	1	~	~	~	~	-	-	-	Ι	~	$\checkmark$	~	$\checkmark$
P13	-	-	-	-	$\checkmark$	~	~	~	-	1	-	I	~	~	~	~	-	I	-	1	~	~	~	~	~	~	$\checkmark$	~	~	$\checkmark$	~	$\checkmark$

### Table 1.2 Programmable I/O Ports Provided for Each Group

Notes:

1. The symbol " $\checkmark$ " indicates a programmable I/O port.

2. The symbol "-" indicates the settings should be made as follows:

- Set 1 to the corresponding bits in the PDi (i = 1 to 3, 5 to 7, and 10 to 13) register.

- Set 0 to the corresponding bits in the Pi (i = 1 to 3, 5 to 7, and 10 to 13) register.

- Set 0 to the corresponding bits in the P10DRR or P11DRR register.

## Table 1.3 LCD Display Function Pins Provided for Each Group

						•	•														-											
Shared			L3	5C	Gro	up					L3	6C	Gro	up					L3	8C	Gro	up					L3	AC	Gro	up		
I/O Port		Com	nmo	n oı	itpu	t: Ma	ax. 4	1	(	Corr	ommon output: Max. 8					Common output: Max. 8						3	Common output: Max. 8									
1/0 T 0/1	9	Segr	nen	t ou	tput	Ma	x. 2	4	S	Segr	gment output: Max. 32				S	Segment output: Max. 48					Segment output: Max. 56											
P0	SEG 7	SEG 6	SEG 5	SEG 4	SEG 3	SEG 2	SEG 1	SEG 0	SEG 7	SEG 6	SEG 5	SEG 4	SEG 3	SEG 2	SEG 1	SEG 0	SEG 7	SEG 6	SEG 5	SEG 4	SEG 3	SEG 2	SEG 1	SEG 0	SEG 7	SEG 6	SEG 5	SEG 4	SEG 3	SEG 2	SEG 1	SEG 0
P1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SEG 11	SEG 10	SEG 9	SEG 8	SEG 15	SEG 14	SEG 13	SEG 12	SEG 11	SEG 10	SEG 9	SEG 8
P2	SEG 23	SEG 22	SEG 21	SEG 20	-	-	-	-	SEG 23	SEG 22	SEG 21	SEG 20	-	-	-	-	SEG 23	SEG 22	SEG 21	SEG 20	SEG 19	SEG 18	SEG 17	SEG 16	SEG 23	SEG 22	SEG 21	SEG 20	SEG 19	SEG 18	SEG 17	SEG 16
P3	-	-	I	I	SEG 27	SEG 26	SEG 25	SEG 24	SEG 31	SEG 30	SEG 29	SEG 28	SEG 27	SEG 26	SEG 25	SEG 24	SEG 31	SEG 30	SEG 29	SEG 28	SEG 27	SEG 26	SEG 25	SEG 24	SEG 31	SEG 30	SEG 29	SEG 28	SEG 27	SEG 26	SEG 25	SEG 24
P4	SEG 39	SEG 38	SEG 37	SEG 36	SEG 35	SEG 34	SEG 33	SEG 32	SEG 39	SEG 38	SEG 37	SEG 36	SEG 35	SEG 34	SEG 33	SEG 32	SEG 39	SEG 38	SEG 37	SEG 36	SEG 35	SEG 34	SEG 33	SEG 32	SEG 39	SEG 38	SEG 37	SEG 36	SEG 35	SEG 34	SEG 33	SEG 32
P5	-	-	I	I	-	-	I	I	-	I	-	-	I	I	I	I	I	I	-	I	I	I	-	-	I	-	-	-	SEG 43	SEG 42	SEG 41	SEG 40
P6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SEG 51	SEG 50	SEG 49	SEG 48	SEG 47	SEG 46	SEG 45	SEG 44	SEG 51	SEG 50	SEG 49	SEG 48	SEG 47	SEG 46	SEG 45	SEG 44
P7	COM 0	COM 1	COM 2	COM 3	-	-	I	I	COM 0	COM 1	COM 2	COM 3	SEG 55	SEG 54	SEG 53	SEG 52	COM 0	COM 1	COM 2	COM 3	SEG 55	SEG 54	SEG 53	SEG 52	COM 0	COM 1	COM 2	COM 3	SEG 55	SEG 54	SEG 53	SEG 52
P12	-	-	-	-	CL2	CL1	-	-	-	-	-	-	CL2	CL1	-	-	-	-	-	-	CL2	CL1	-	1	-	-	-	-	CL2	CL1	-	-
-				V	L1							VI	_1							VI	_1							VI	∟1			
-				V	L2							VI	_2							VI	_2							VI	L2			
				-	-					VL3				VL3						VL3												
-				V	L4							VI	_4							VI	_4							VI	L4			

Notes:

1. The symbol "-" indicates there is no LCD display function. Set the corresponding bits in registers LSE1 to LSE3, LSE5 to LSE7 to 0 for these pins.

2. SEG52 to SEG55 can be used as COM7 to COM4.

The R8C/L35C Group does not have pins SEG52 to SEG55, so 1/8 duty cannot be selected.

3. The R8C/L35C Group does not have the VL3 pin, so 1/4 bias cannot be selected. When the internal voltage multiplier is used, 1/2 bias cannot also be selected.



Current of Apr 2011

Part No	Internal RC	M Capacity	Internal RAM	Package Type	Remarks
i arriver	Program ROM	Data Flash	Capacity	r donago rypo	riomanio
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



1. Overview
-------------

# Current of Apr 2011

Part No	Internal RC	M Capacity	Internal RAM	Package Type	Remarks
i art No.	Program ROM	Data Flash	Capacity	T dekage Type	Remarks
R5F2L3A7CNFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0100KB-A	N Version
R5F2L3A7CNFA	48 Kbytes	1 Kbyte × 4	6 Kbytes	PRQP0100JD-B	
R5F2L3A8CNFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0100KB-A	
R5F2L3A8CNFA	64 Kbytes	1 Kbyte × 4	8 Kbytes	PRQP0100JD-B	
R5F2L3AACNFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0100KB-A	
R5F2L3AACNFA	96 Kbytes	1 Kbyte × 4	10 Kbytes	PRQP0100JD-B	
R5F2L3ACCNFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0100KB-A	
R5F2L3ACCNFA	128 Kbytes	1 Kbyte × 4	10 Kbytes	PRQP0100JD-B	
R5F2L3A7CDFP	48 Kbytes	1 Kbyte × 4	6 Kbytes	PLQP0100KB-A	D Version
R5F2L3A7CDFA	48 Kbytes	1 Kbyte × 4	6 Kbytes	PRQP0100JD-B	
R5F2L3A8CDFP	64 Kbytes	1 Kbyte × 4	8 Kbytes	PLQP0100KB-A	
R5F2L3A8CDFA	64 Kbytes	1 Kbyte × 4	8 Kbytes	PRQP0100JD-B	
R5F2L3AACDFP	96 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0100KB-A	
R5F2L3AACDFA	96 Kbytes	1 Kbyte × 4	10 Kbytes	PRQP0100JD-B	
R5F2L3ACCDFP	128 Kbytes	1 Kbyte × 4	10 Kbytes	PLQP0100KB-A	
R5F2L3ACCDFA	128 Kbytes	1 Kbyte × 4	10 Kbytes	PRQP0100JD-B	



Figure 1.4 Correspondence of Part No., with Memory Size and Package of R8C/L3AC Group

# 1.3 Block Diagrams

Figure 1.5 shows a Block Diagram of R8C/L35C Group. Figure 1.6 shows a Block Diagram of R8C/L36C Group. Figure 1.7 shows a Block Diagram of R8C/L38C Group. Figure 1.8 shows a Block Diagram of R8C/L3AC Group.



RENESAS







Pin Number						I/O Pin Functions for Peripheral Modules										
1340	1380	1360	1350	Control	Port			Serial		120	A/D Converter,	LCD drive				
(Note 2)	L300	L300	L330	Pin	1 011	Interrupt	Timer	Interface	SSU	huc	D/A Converter,	control				
(11010 2)								Interface		Dus	Comparator B	circuit				
1 [3]	80	61	51		P13_3			CLK0			AN3					
2 [4]	1	62	52		P13_2			RXD0			AN2					
3 [5]	2	63	1		P13_1			TXD0			AN1/DA1					
4 [6]	3	64	2		P13 0						AN0/DA0					
- [-]	-	4	-													
5[7]	4	1	3	WKUP0												
6 [8]	5	2	4	VREF												
7 [9]	6	3	5	MODE												
8 [10]	7	4	6	XCIN												
9 [11]	8	5	7	XCOUT												
10 [12]	9	6	8	RESET												
11 [13]	10	7	9	XOUT	P12_1											
12 [14]	11	8	10	VSS/ AVSS												
13 [15]	12	9	11	XIN	P12_0											
14 [16]	10	10	10	VCC/												
14 [16]	13	10	12	AVCC												
15 [17]	14	11			P11_7	(INT7)	TREO				(ADTRG)					
16 [18]	15	12			P11_6	(INT6)	TRBO									
17 [19]	16	13			P11_5	(INT5)	TRAO									
18 [20]	17	14	13		P11_4	(INT4)	TRAIO	(RXD0)								
19 [21]	18	15	14		P11_3	(INT3)		(CTS2/RTS2)	SCS		IVCMP3					
20 [22]	19	16	15		P11_2	(INT2)		(RXD2/SCL2/ TXD2/SDA2)	SSO	SDA	IVREF3					
21 [23]	20	17	16		P11_1	(INT1)		(RXD2/SCL2/ TXD2/SDA2)	SSI		IVCMP1					
22 [24]	21	18	17		P11_0	(INT0)		(CLK2)	SSCK	SCL	IVREF1					
23 [25]					P10_7	( <del>KI7</del> )	(TRDIOD1)									
24 [26]					P10_6	( <del>Kl6</del> )	(TRDIOC1)									
25 [27]					P10_5	( <del>KI5</del> )	(TRDIOB1)									
26 [28]					P10_4	(KI4)	(TRDIOA1)									
27 [29]					P10_3	(KI3)	(TRDIOD0)									
28 [30]					P10_2	(KI2)	(TRDIOC0)									
29 [31]					P10_1	(KI1)	(TRDIOB0)									
30 [32]					P10_0	( <del>KI0</del> )	(TRDIOA0/ TRDCLK)									
31 [33]	22	19	18		P7_7							COM0				
32 [34]	23	20	19		P7_6							COM1				
33 [35]	24	21	20		P7 5							COM2				
34 [36]	25	22	21		P7 4							COM3				
0.[00]												SEG55/				
35 [37]	26	23			P7_3							COM4				
36 [38]	27	24			P7_2							COM5				
37 [39]	28	25			P7_1							SEG53/ COM6				
38 [40]	29	26			P7_0							SEG52/				
20 [44]	20				 											
39 [41]	30				י_סיי							SEGST				

Pin Name Information by Pin Number (1) Table 1.11

Notes:

The pin in parentheses can be assigned by a program.
 The number in brackets indicates the pin number for the 100P6F package.

Item	Pin Name	I/O Type	Description
I <sup>2</sup> C bus	SCL	I/O	Clock I/O pin
	SDA	I/O	Data I/O pin
SSU	SSI	I/O	Data I/O pin
	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	0	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	0	LCD segment output pins
Common output	COM0 to COM7	0	LCD common output pins
Voltage multiplier capacity connect pins	CL1, CL2	0	Connect pins for the LCD control voltage multiplier
LCD power supply	VL1	I/O	Apply the voltage: $0 \le VL1 \le VL2 \le VL3 \le VL4$ .
	VL2 to VL4	I	VL1 can be used as the reference potential input or output pin when setting the voltage multiplier.

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

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

Note:

1. Contact the oscillator manufacturer for oscillation characteristics.



Address	Register	Symbol	After Reset
00C0h	A/D Register 0	AD0	XXh
00C1h	-		000000XXb
00025	A/D Register 1		YYh
000211	A/D INEYIOLEI I	AUT	000000226
00C3n		1.5.0	dXXUUUUUU
00C4h	A/D Register 2	AD2	XXh
00C5h			000000XXb
00C6h	A/D Register 3	AD3	XXh
00C7h		-	000000XXb
000011	A/D Pagistor 4		YYh
000001	AUD INEYIOLEI 4	AU4	
00C9h			dxx00000xxb
00CAh	A/D Register 5	AD5	XXh
00CBh			000000XXb
00CCh	A/D Register 6	AD6	XXh
00CDh		-	000000XXb
00055	A/D Pogistor 7	AD7	YVh
OUCEII	A/D INEYIOLEI /	AUT	
UUCEN			DVVUUUUU
00D0h			
00D1h			
00D2h			
00D3h			
00D4b	A/D Mode Register		00b
			1100000h
00050		ADINGEL	000000
00D6h	A/D Control Register 0	ADCON0	UUh
00D7h	A/D Control Register 1	ADCON1	00h
00D8h	D/A 0 Register	DA0	00h
00D9h	D/A 1 Register	DA1	00h
00046			
UUDBN		BA GON!	0.01
00DCh	D/A Control Register	DACON	UUh
00DDh			
00DEh			
00DFh			
00E0b	Port P0 Register	P0	XXh
00E1h	Port D1 Ponistor	D1	YYh
		F I	
UUE2h	Port PU Direction Register	PD0	UUN
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
	Port D4 Pagister	1 00 D4	VVh
		F4	
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
00EDb	Port P7 Register	P7	XXh
	Port D6 Direction Poristor	PD6	00b
			001
UUEFh	Port P7 Direction Register	רטו	UUN
00F0h			
00F1h			
00F2h			
00E3h			
00F4b	Port P10 Register	P10	XXh
001411	Dert D11 Derister	D11	
00F5N		P11	AAII
00F6h	Port P10 Direction Register	10טין	UUh
00F7h	Port P11 Direction Register	PD11	00h
00F8h	Port P12 Register	P12	XXh
00F9h	Port P13 Register	P13	XXh
00F4b	Port P12 Direction Register	PD12	00b
	Port D12 Direction Register		00h
UUFBN	POIL P IS DIJECTION REGISTER	PU13	UUN
00FCh			
00FDh			
00FEh			
00FFh			
001111			

SFR Information (4)<sup>(1)</sup> Table 4.4

X: Undefined Note: 1. Blank spaces are reserved. No access is allowed.



Address	Register	Symbol	After Reset
02C0h			
02C1h			
02C2h			
02C3h			
02C4h			
02C5h			
02C6h			
02C7h			
02C8h			
02C9h			
02CAh			
02CBh			
02CCh			
02CDh			
02CEh			
02CFh			
02D0h			
02D1h			
02D2h			
02D3h			
02D4h			
02D5h			
02D6h			
02D90			
02DAII 02DBh			
02DBh			
02DCh			
02DEh			
02DEh			
02E0h			
02E1h			
02E2h			
02E3h			
02E4h			
02E5h			
02E6h			
02E7h			
02E8h			
02E9h			
02EAh			
02EBh			
02ECh			
02EDh			
02EEh			
02EFh			
02F0h			
02F1h			
02F2h			
02F3h			
02F4h			
02F5h			
02590			
021-411			
021.011			
02FDh			
02FEh			
021 L11		L	
VZ1111			

X: Undefined Note: 1. Blank spaces are reserved. No access is allowed.









# Table 5.8Voltage Detection 0 Circuit Characteristics<br/>(Vcc = 1.8 to 5.5 V and Topr = -20 to 85°C (N version) / -40 to 85°C (D version), unless<br/>otherwise specified.)

Sumbol	Perometer	Condition		Linit		
Symbol	Falanielei	Condition	Min.	Тур.	Max.	Unit
Vdet0	Voltage detection level Vdet0_0 <sup>(1)</sup>		1.80	1.90	2.05	V
	Voltage detection level Vdet0_1 (1)		2.15	2.35	2.50	V
	Voltage detection level Vdet0_2 <sup>(1)</sup>		2.70	2.85	3.05	V
	Voltage detection level Vdet0_3 <sup>(1)</sup>		3.55	3.80	4.05	V
—	Voltage detection 0 circuit response time (3)	At the falling of Vcc from 5 V to (Vdet0_0 - 0.1) V	—	6	150	μS
—	Voltage detection circuit self power consumption	VCA25 = 1, Vcc = 5.0 V	_	1.5	_	μΑ
td(E-A)	Waiting time until voltage detection circuit operation starts <sup>(2)</sup>		_	_	100	μS

Notes:

1. Select the voltage detection level with bits VDSEL0 and VDSEL1 in the OFS register.

2. Necessary time until the voltage detection circuit operates when setting to 1 again after setting the VCA25 bit in the VCA2 register to 0.

3. Time until the voltage monitor 0 reset is generated after the voltage passes Vdet0.

### Table 5.9 Voltage Detection 1 Circuit Characteristics

(Vcc = 1.8 to 5.5 V and Topr = $-20$ to $85^{\circ}$ C (N version) / $-40$ to $85^{\circ}$ C (D version), unle	SS
otherwise specified.)	

Symbol	Paramotor	Condition		Standard	Lloit	
Symbol	Falanielei	Condition	Min.	Тур.	Max.	Offic
Vdet1	Voltage detection level Vdet1_0 <sup>(1)</sup>	At the falling of Vcc	2.00	2.20	2.40	V
	Voltage detection level Vdet1_1 <sup>(1)</sup>	At the falling of Vcc	2.15	2.35	2.55	V
	Voltage detection level Vdet1_2 <sup>(1)</sup>	At the falling of Vcc	2.30	2.50	2.70	V
	Voltage detection level Vdet1_3 <sup>(1)</sup>	At the falling of Vcc	2.45	2.65	2.85	V
	Voltage detection level Vdet1_4 (1)	At the falling of Vcc	2.60	2.80	3.00	V
	Voltage detection level Vdet1_5 <sup>(1)</sup>	At the falling of Vcc	2.75	2.95	3.15	V
	Voltage detection level Vdet1_6 <sup>(1)</sup>	At the falling of Vcc	2.85	3.10	3.40	V
	Voltage detection level Vdet1_7 <sup>(1)</sup>	At the falling of Vcc	3.00	3.25	3.55	V
	Voltage detection level Vdet1_8 <sup>(1)</sup>	At the falling of Vcc	3.15	3.40	3.70	V
	Voltage detection level Vdet1_9 <sup>(1)</sup>	At the falling of Vcc	3.30	3.55	3.85	V
	Voltage detection level Vdet1_A (1)	At the falling of Vcc	3.45	3.70	4.00	V
	Voltage detection level Vdet1_B (1)	At the falling of Vcc	3.60	3.85	4.15	V
	Voltage detection level Vdet1_C (1)	At the falling of Vcc	3.75	4.00	4.30	V
	Voltage detection level Vdet1_D (1)	At the falling of Vcc	3.90	4.15	4.45	V
	Voltage detection level Vdet1_E (1)	At the falling of Vcc	4.05	4.30	4.60	V
	Voltage detection level Vdet1_F (1)	At the falling of Vcc	4.20	4.45	4.75	V
_	Hysteresis width at the rising of Vcc in voltage detection 1 circuit	Vdet1_0 to Vdet1_5 selected	—	0.07	_	V
		Vdet1_6 to Vdet1_F selected	—	0.10	_	V
—	Voltage detection 1 circuit response time (2)	At the falling of Vcc from 5 V to (Vdet1_0 – 0.1) V	—	60	150	μS
—	Voltage detection circuit self power consumption	VCA26 = 1, Vcc = 5.0 V	—	1.7	—	μA
td(E-A)	Waiting time until voltage detection circuit operation starts <sup>(3)</sup>			_	100	μS

Notes:

1. Select the voltage detection level with bits VD1S0 to VD1S3 in the VD1LS register.

2. Time until the voltage monitor 1 interrupt request is generated after the voltage passes Vdet1.

3. Necessary time until the voltage detection circuit operates when setting to 1 again after setting the VCA26 bit in the VCA2 register to 0.

Symbol	Pa	ramator	Condition Standard				Unit	
		Tamelei	Condition	Min.	Тур.	Max.	Onit	
Vон	Output "H" voltage Port P10, P11 (1)		Iон = -5 mA	Vcc - 0.5	_	Vcc	V	
		Other pins	Iон = -1 mA	Vcc - 0.5	—	Vcc	V	
		XOUT	Іон = –200 μА	1.0	_	_	V	
Vol	Output "L" voltage	Port P10, P11 <sup>(1)</sup>	IOL = 5 mA	—	_	0.5	V	
		Other pins	IOL = 1 mA	—	—	0.5	V	
		XOUT	ΙΟL = 200 μΑ	—	_	0.5	V	
VT+-VT-	Hysteresis INT0, INT1, INT2, INT3, INT4, INT5, INT6, INT7, KI0, KI1, KI2, KI3, KI4, KI5, KI6, KI7, TRAIO, TRCIOA, TRCIOB, TRCIOA, TRCIOB, TRCIOC, TRDIOD0, TRDIOA0, TRDIOB0, TRDIOC1, TRDIOD1, TRDIOC1, TRDIOD1, TRDIOC1, TRDIOD1, TRCTRG, TRCCLK, TRGIOA, TRGIOB, ADTRG, RXD0, RXD1, RXD2, CLK0, CLK1, CLK2, SSI, SCL, SDA, SSO			0.05	0.4	_	V	
1	1	RESET, WKUPU		0.1	0.8		v	
IIH	Input "H" current		VI = 3.0 V, VCC = 3.0 V		_	5.0	μA	
IIL	Input "L" current		VI = 0 V, VCC = 3.0 V	-		-5.0	μA	
RPULLUP	Pull-up resistance		VI = 0 V, Vcc = 3.0 V	30	100	170	kΩ	
Rfxin	Feedback resistance	XIN		_	0.3		MΩ	
Rfxcin	Feedback resistance	XCIN			14		MΩ	
VRAM	RAM hold voltage	•	During stop mode	1.8	—	—	V	

# Table 5.19DC Characteristics (3) $[2.7 V \le Vcc < 4.0 V]$ <br/>(Topr = -20 to 85°C (N version) / -40 to 85°C (D version), unless otherwise specified.)

Note:

1. 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.



Cumbal	Do	romotor	Condition	S	Linit			
Symbol	Pa	Irameter	Condition	Min.	Тур.	Max.	Unit	
Vон	Output "H" voltage	Port P10, P11 (1)	Юн = -2 mA	Vcc - 0.5	—	Vcc	V	
		Other pins	Iон = -1 mA	Vcc - 0.5	_	Vcc	V	
	XOUT		Юн = -200 μА	1.0	_	—	V	
Vol	Output "L" voltage	Port P10, P11 (1)	IOL = 2 mA	—	—	0.5	V	
		Other pins	IOL = 1 mA	—	_	0.5	V	
		XOUT	IOL = 200 μA	_	_	0.5	V	
VT+-VT-	Hysteresis	INTO, INT1, INT2, INT3, INT4, INT5, INT6, INT7, KI0, KI1, KI2, KI3, KI4, KI5, KI6, KI7, TRAIO, TRCIOA, TRCIOB, TRCIOA, TRCIOB, TRDIOA0, TRDIOB0, TRDIOC0, TRDIOB0, TRDIOC1, TRDIOD1, TRDIOC1, TRDIOD1, TRCTRG, TRCCLK, TRGCLKA, TRGCLKB, TRGIOA, TRGIOB, ADTRG, RXD0, RXD1, RXD2, CLK0, CLK1, CLK2, SSI, SCL, SDA, SSO		0.05	0.4		V	
		RESET, WKUP0		0.1	0.8	_	V	
Іін	Input "H" current		VI = 1.8 V, Vcc = 1.8 V		—	4.0	μA	
lı∟	Input "L" current		VI = 0 V, Vcc = 1.8 V	—		-4.0	μA	
Rpullup	Pull-up resistance		VI = 0 V, Vcc = 1.8 V	60	160	420	kΩ	
RfXIN	Feedback resistance	XIN		_	0.3		MΩ	
RfxCIN	Feedback resistance	XCIN		_	14	—	MΩ	
Vram	RAM hold voltage		During stop mode	1.8	_	—	V	

# Table 5.21DC Characteristics (5) [1.8 V $\leq$ Vcc < 2.7 V]<br/>(Topr = -20 to 85°C (N version) / -40 to 85°C (D version), unless otherwise specified.)

Note:

1. 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.



								Condition			S	tanda	rd	
Symbol	mbol Parameter		Osci Cir	llation cuit	On-C Oscilla	hip ator	CPU	Low-Power- Consumption	(	Dther	Min.	Typ.	Max.	Unit
			(2)	XCIN	(fOCO-F)	Speed	CIUCK	Setting				(3)		
lcc	Power supply	High- speed	5 MHz	Off	Off	125 kHz	No division	_			-	2.2		mA
	current (1)	clock mode	5 MHz	Off	Off	125 kHz	Divide- bv-8	—			—	0.8	—	mA
		High-	Off	Off	5 MHz	125 kHz	No	—			-	2.5	10	mA
		on-chip	Off	Off	5 MHz	125	Divide-	—			—	1.7	_	mA
		mode	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	Off	32 kHz	Off	Off	No division	FMR27 = 1 VCA20 = 0			—	90	400	μA
		clock mode	Off	32 kHz	Off	Off	No division	FMSTP = 1 VCA20 = 0	Flash memory off Program operation of	on RAM	—	45	—	μA
		Wait mode	Off	Off	Off	125 kHz	_	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1	While a WAIT instru Peripheral clock ope	ction is executed eration		15	90	μΑ
			Off	Off	Off	125 kHz	_	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1 CM02 = 1 CM01 = 1	While a WAIT instru Peripheral clock off	ction is executed	-	4	80	μA
			Off	32 kHz	Off	Off	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA25 = 1	While a WAIT instruction is executed Peripheral clock off	LCD drive control circuit <sup>(4)</sup> When external division resistors are used	_	4		μA
								CM02 = 1 CM01 = 0	Timer RE operation in real-time clock mode	LCD drive control circuit <sup>(5)</sup> When the internal voltage multiplier is used	—	11		μA
			Off	32 kHz	Off	Off	_	VCA27 = 0 VCA26 = 0 VCA25 = 0 VCA20 = 1 CM02 = 1 CM01 = 1	While a WAIT instru Peripheral clock off Timer RE operation	ction is executed in real-time clock mode	_	3.5		μΑ
		Stop mode	Off	Off	Off	Off	-	VCA27 = 0 VCA26 = 0 VCA25 = 0 CM10 = 1	Topr = 25°C Peripheral clock off		—	2.0	5.0	μA
			Off	Off	Off	Off	—	VCA27 = 0 VCA26 = 0 VCA25 = 0 CM10 = 1	Topr = 85°C Peripheral clock off		_	13	_	μA
		Power-	Off	Off	Off	Off	- 1	_	Topr = 25°C		-	0.02	0.2	μA
		off mode	Off	Off	Off	Off	—	—	Topr = 85°C		- 1	0.3	—	μA

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

Notes:

Vcc = 1.8 V to 2.7 V, single chip mode, output pins are open, and other pins are Vss. 1.

2. XIN is set to square wave input.

3. Vcc = 2.2 V

4. VLCD = Vcc, 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. 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

5. are selected, and segment and common output pins are open.

















R8C/L35C Group, R8C/L36C Group, R8C/L38C Group, R8C/L3AC Group Datasheet

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

All trademarks and registered trademarks are the property of their respective owners.

#### Notice

- All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
- Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
- 3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
- 4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
- 5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
- 6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
- 7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application categorized as "Specific" written consent of Renesas Electronics should be for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The recommended where you have failed to obtain the prior written consent of Renesas Electronics and the prior written consent of Renesas Electronics as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product for any application application as exploration categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product for which there are supported to a not application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics.
- "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools
- personal electronic equipment; and industrial robots.
  "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically
  designed for life support.
- "Specific": Alicraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
- 8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
- 9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and mafunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and mafunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
- 10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
- 11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
- 12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.
- (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries
- (Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

Refer to "http://www.renesas.com/" for the latest and detailed information



### SALES OFFICES

### **Renesas Electronics Corporation**

http://www.renesas.com

Renesas Electronics America Inc. 2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A. Tel: +1-408-588-4000, Fax: +1-408-588-6130 Renesas Electronics Canada Limited 1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada Tel: +1-905-898-5441, Fax: +1-905-898-3220 Renesas Electronics Europe Limited Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K Tel: +44-1628-585-100, Fax: +44-1628-585-900 Renesas Electronics Europe GmbH Arcadiastrasse 10, 40472 Düsseldorf, Germany Tel: +49-211-65030, Fax: +44-1628-585-900 Renesas Electronics Corpo GmbH Arcadiastrasse 10, 40472 Düsseldorf, Germany Tel: +49-211-65030, Fax: +44-1628-585-900 Renesas Electronics (Shanghai) Co., Ltd. 7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China Tel: +480-12453-1155, Tax: +480-2485-7679 Renesas Electronics (Shanghai) Co., Ltd. Unit 204, 205, A221 Center, No.1223 Lujiazul Ring Rd., Pudong District, Shanghai 200120, China Tel: +482-13-877-1818, Fax: +480-2487-7859 Renesas Electronics Hong Kong Limited Unit 1001.1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong Tel: +482-2486-9318, Fax: +4852-2486-9022/9044 Renesas Electronics Taiwan Co., Ltd. 7F, No. 363 Fu Shing North Road Taipel, Taiwan Tel: +486-2-4175-9800, Fax: +4882-24875-970 Renesas Electronics Magayor BC. Ltd. 1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632 Tel: +656-2175-9900, Fax: +4892-24875-9910 Renesas Electronics Kong A. Hod. 1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632 Tel: +656-2175-9900, Fax: +4892-24875-9910 Renesas Electronics Kong Co., Ltd. 11F, Samik Lavied' or Billog, 720-2 Veoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea Tel: +60-37755-9390, Fax: +480-2-4855-9101