R8C/L3AA, R8C/L3AC, and R8C/L3AM Groups
Differences between R8C/L3AA, R8C/L3AC, and R8C/L3AM Groups

1. Abstract

This document is reference material for identifying differences between the R8C/L3xA Group, R8C/L3xC Group, and R8C/L3xM Group.

2. Introduction

This document applies to the following microcomputers (MCUs):

- MCUs: R8C/L3AA Group, R8C/L3AC Group, R8C/L3AM Group
    R8C/L38A Group, R8C/L38C Group, R8C/L38M Group
    R8C/L36A Group, R8C/L36C Group, R8C/L36M Group
    R8C/L35A Group, R8C/L35C Group, R8C/L35M Group

For differences between the R8C/L3xA Group, R8C/L3xC Group, and R8C/L3xM Group, refer to hardware user's manuals of each group.

The R8C/L3xB Group has the same functions and specifications as the R8C/L3xA Group. However, the R8C/L3xB Group does not include the data flash.

For more details and electrical characteristics, refer to hardware user's manuals and technical updates.

3. Differences between Groups

3.1 Function and Specification Differences

Table 3.1 to Table 3.3 list differences in the functions and specifications. For more details and electrical characteristics, refer to the documents listed in 5. Reference Documents.

Table 3.1   Function and Specification Differences (1)

	Item	R8C/L3xA Group	R8C/L3xC Group	R8C/L3xM Group
Reset	Power-on reset	Not included	Included	
	Voltage monitor 0 reset	Not included	Included	
Voltage Detection Circuit		Not included	Included	
High-Speed On-Chip Oscillator		Not included [1]	Included [2]	
Power Control	Power-off mode	• Power-off 1 (timer RE enabled) included • Exit source: WKUP1 included [3]	• Power-off 1 (timer RE enabled) not included • Exit source: WKUP1 not included	• Power-off 1 (timer RE enabled) included • Exit source: WKUP1 not included
	• Select 10b for bits CM37 and CM36	Not available	Available	Not available
	• Enter stop mode while bits CM37 and CM36 are 00b in high-speed on-chip oscillator mode	—	Available	Not available
	• Select 11b for bits CM37 and CM36 in low-speed clock mode.	Available		Not available
Interrupts		• Number of interrupt sources: 36 • External interrupt inputs: 16 (INT x 8 and key input x 8)	• Number of interrupt sources: 40 • External interrupt inputs: 16 (INT x 8 and key input x 8)	• Number of interrupt sources: 44 • External interrupt inputs: 16 (INT x 8 and key input x 8)
Data Transfer Controller (DTC)		Activation sources: 36	Activation sources: 38	
Timer RG	Count source	f2 cannot be selected.	f2 can be selected.	

Notes:
1. Since the R8C/L3xA Group does not include the high-speed on-chip oscillator function, it cannot be selected as the peripheral function count source.
2. Electrical characteristics differ for these groups. Refer to the hardware user's manual of each group.
3. This applies to the R8C/L38A and R8C/L3AA Groups.

Table 3.2   Function and Specification Differences (2)

Item		R8C/L3xA Group	R8C/L3xC Group	R8C/L3xM Group
A/D Converter	Channels [1]	10		12
	Conversion rate per pin (ϕAD = fAD)	Minimum: 43 ϕAD cycles	Minimum: 44 ϕAD cycles	
	Sampling time	15 ϕAD (ϕAD = 20 MHz: 0.75 μs)	16 ϕAD (ϕAD = 20 MHz: 0.8 μs)	
	A/D conversion execution time	Open-circuit detection disabled: 40 ϕAD cycles Open-circuit detection enabled: 42 ϕAD cycles	Open-circuit detection disabled: 40 ϕAD cycles + 1 to 3 fAD cycles Open-circuit detection enabled: 42 ϕAD cycles + 1 to 3 fAD cycles	
Comparator A		Not included		Included
LCD Drive Control	Count source	f4 cannot be selected.	f4 can be selected.	
	VL1 internally-generated voltage accuracy	Min.: Setting voltage -0.4 V Max.: Setting voltage +0.4 V	Min.: Setting voltage -0.2 V Max.: Setting voltage +0.2 V	
Flash Memory	Program operation (programming to the flash memory) for the suspend function while auto-erasure is suspended	Not available	Available	
	Interval from erase start/restart until following suspend request	Min.: 33 ms	Min.: 0 ms	
	Suspend interval necessary for auto-erasure to be completed	Min.: 33 ms	Min.: 0 ms	

Note:
1.   Differences between the R8C/L35x Group and R8C/L36x Group.

Table 3.3   Function and Specification Differences (3)

Item	R8C/L3xA Group	R8C/L3xC Group	R8C/L3xM Group
Current Consumption	• Typ. 7 mA (VCC = 5.0 V, f(XIN) = 20 MHz) • Typ. 3.6 mA (VCC = 3.0 V, f(XIN) = 10 MHz) • Typ. 3.5 μA (VCC = 3.0 V, wait mode (f(XCIN) = 32 kHz)) • Typ. 2 μA (VCC = 3.0 V, stop mode) • Typ. 1 μA (VCC = 3.0 V, power-off mode, timer RE enabled) • Typ. 0.02 μA (VCC = 3.0 V, power-off mode, timer RE disabled)	• Typ. 7 mA (VCC = 5.0 V, f(XIN) = 20 MHz) • Typ. 3.6 mA (VCC = 3.0 V, f(XIN) = 10 MHz) • Typ. 3.5 μA (VCC = 3.0 V, wait mode (f(XCIN) = 32 kHz)) • Typ. 2 μA (VCC = 3.0 V, stop mode) • Typ. 0.02 μA (VCC = 3.0 V, power-off mode)	•Typ. 7 mA (VCC = 5.0 V, f(XIN) = 20 MHz) • Typ. 3.6 mA (VCC = 3.0 V, f(XIN) = 10 MHz) • Typ. 3.5 μA (VCC = 3.0 V, wait mode (f(XCIN) = 32 kHz)) • Typ. 2 μA (VCC = 3.0 V, stop mode) • Typ. 1.4 μA (VCC = 3.0 V, power-off mode, timer RE enabled) • Typ. 0.02 μA (VCC = 3.0 V, power-off mode, timer RE disabled)

3.2   Pin Function Differences

Table 3.4 to Table 3.6 list differences in the I/O ports assigned to the peripheral function pins. For more details, refer to the documents listed in 5. Reference Documents.

Table 3.4   Pin Function Differences of R8C/L3AA, R8C/L3AC, and R8C/L3AM Groups

Peripheral Function Pin	Assigned I/O Port		
	R8C/L3AA Group	R8C/L3AC Group	R8C/L3AM Group
WKUP1	P13_0	—	
LVCOUT1	—		P11_0
LVCOUT2	—		P11_1
LVCMP1	—		P13_2
LVCMP2	—		P13_3
LVREF	—		P13_1

The symbol "—" indicates there is no pin for the peripheral function.

Table 3.5   Pin Function Differences of R8C/L38A, R8C/L38C, and L38M Groups

Peripheral Function Pin	Assigned I/O Port		
	R8C/L38A Group	R8C/L38C Group	R8C/L38M Group
WKUP1	P13_0	—	
LVCOUT1	—		P11_0
LVCOUT2	—		P11_1
LVCMP1	—		P13_2
LVCMP2	—		P13_3
LVREF	—		P13_1
SEG16	—	P2_0	

The symbol "—" indicates there is no pin for the peripheral function.

Table 3.6   Pin Function Differences of R8C/L35A, R8C/L36A, R8C/L35C, R8C/L36C, R8C/L35M, and R8C/L36M Groups

Peripheral Function Pin	Assigned I/O Port		
	R8C/L35A, R8C/L36A Groups	R8C/L35C, R8C/L36C Groups	R8C/L35M, R8C/L36M Groups
AN10	—		P0_6
AN11	—		P0_7
LVCOUT1	—		P11_0
LVCOUT2	—		P11_1
LVCMP1	—		P13_2
LVCMP2	—		P13_3
LVREF	—		P13_1
SEG6	—	P0_6	
SEG7	—	P0_7	

The symbol "—" indicates there is no pin for the peripheral function.

3.3   SFR Differences

Table 3.7 lists differences in the SFRs. For more details, refer to the documents listed in 5. Reference Documents.

Table 3.7   Differences in SFRs

R8C/L3xA Group	R8C/L3xC Group	R8C/L3xM Group	Differences to R8C/L3xA Group [1]	
			R8C/L3xC Group	R8C/L3xM Group
CM3	CM3	CM3	Function(s) changed in bits 6 and 7	
—	FRA0		Register added	
—	FRA1		Register added	
—	FRA2		Register added	
—	FRA3		Register added	
—	FRA4		Register added	
—	FRA5		Register added	
—	FRA6		Register added	
—	FRA7		Register added	
—	CMPA		Register added	
—	VCAC		Register added	
—	VCA1		Register added	
VCA2	VCA2	VCA2	Bits 5 to 7 added	Bits 1 to 7 added
—	VD1LS		Register added	
—	VW0C		Register added	
—	VW1C		Register added	
—	VW2C		Register added	
—	VCMP1IC		Register added	
—	VCMP2IC		Register added	
POMCR0	POMCR0	POMCR0	• Function(s) deleted in bit 0 • Bits 1, 3, and 6 deleted	Bits 1 and 3 deleted
PRCR	PRCR		Function(s) added to bit 0	
DTCEN2	DTCEN2	DTCEN2	Function(s) added to bits 4 and 5	Function(s) added to bits 4 and 5
TRAMR	TRAMR		Function(s) changed in bits 4 to 6	
TRCCR1	TRCCR1		Function(s) changed in bits 4 to 6	
TRDCR0	TRDCR0		Function(s) changed in bits 0 to 2	
TRDCR1	TRDCR1		Function(s) changed in bits 0 to 2	
TRGCR	TRGCR		Function(s) changed in bits 0 to 2	
ADMOD	ADMOD		Bit 2 added	
LCR2	LCR2		Function(s) changed in bits 0 to 2	
LCR3	LCR3		Function(s) added to bits 6 and 7	
LSE0	LSE0		Function(s) added to bits 6 and 7 [2]	
LSE2	LSE2		Function(s) added to bit 0 [3]	

The symbol "—" indicates there is no SFR.

Notes:
1. There is no difference with the R8C/L3xA Group in blank spaces.
2. This applies to the R8C/L35x Group and R8C/L36x Group.
3. This applies to the R8C/L38x Group.

Table 3.8   Differences in the Option Function Select Area [1]

R8C/L3xA Group	R8C/L3xC Group	R8C/L3xM Group	Remarks
OFS	OFS		Functions added to bits 4 to 6

Note:
1. The option function select area is allocated in the flash memory, not in the SFRs.

3.4   Interrupt Vector Differences

Table 3.9 lists differences in the fixed vector table and Table 3.10 lists differences in the relocatable vector table. For more details, refer to the documents listed in 5. Reference Documents.

Table 3.9   Differences in the Fixed Vector Table

Vector Addresses Addresses (L) to (H)	Interrupt Source of R8C/L3xA Group	Interrupt Source of R8C/L3xC Group	Interrupt Source of R8C/L3xM Group
0FFF0h to 0FFF3h	Watchdog timer Oscillation stop detection	Watchdog timer Oscillation stop detection Voltage monitor 1 Voltage monitor 2	Watchdog timer Oscillation stop detection Voltage monitor 1/comparator A1 Voltage monitor 2/comparator A2

Table 3.10   Differences in the Relocatable Vector Table

Software Interrupt Number	Interrupt Source of R8C/L3xA Group	Interrupt Source of R8C/L3xC Group	Interrupt Source of R8C/L3xM Group
50	—	Voltage monitor 1	Voltage monitor 1/comparator A1
51	—	Voltage monitor 2	Voltage monitor 1/comparator A2

Table 3.11 lists differences in the relocatable vector table of the L3Ax, L38x, L36x, and L35x Groups.

Table 3.11   Differences in the Relocatable Vector Table for R8C/L3Ax, L38x, L36x, and L35x Groups

Software Interrupt Number	Interrupt Source of R8C/L3AA Group R8C/L3AC Group R8C/L3AM Group	Interrupt Source of R8C/L38A Group R8C/L38C Group R8C/L38M Group	Interrupt Source of R8C/L36A Group R8C/L36C Group R8C/L36M Group	Interrupt Source of R8C/L35A Group R8C/L35C Group R8C/L35M Group
3	$\overline{INT7}$			Reserved
4	$\overline{INT6}$			Reserved
5	$\overline{INT5}$			Reserved

4. Notes

Each product has different oscillation circuit constants of XIN-XOUT, XCIN-XCOUT. Therefore, contact an oscillator manufacturer when selecting an oscillator and oscillation circuit constants so that a stable operation clock can be obtained on the user system and conditions for mass-production. Be careful especially when the voltage and temperature range is wide. The wiring pattern of the feedback resistor, damping resistor, and the load capacity should be considered in advance when designing a circuit.

In addition, although compatibility in characteristics is fully considered when designing each device, actual values such as operating margin, A/D conversion accuracy, noise immunity, noise radiation may be different within the range of electrical characteristics due to different manufacturing processes. Therefore, perform sufficient system evaluations for each individual product before starting mass production.

5.   Reference Documents

R8C/L3AA Group User's Manual: Hardware   Rev.1.00
R8C/L3AC Group User's Manual: Hardware   Rev.1.00
R8C/L3AM Group User's Manual: Hardware   Rev.0.10
The latest versions can be downloaded from the Renesas Electronics website.

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6.   Website and Support

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Revision History	R8C/L3AA, R8C/L3AC, and R8C/L3AM Groups Differences between R8C/L3AA, R8C/L3AC, and R8C/L3AM Groups

Rev.	Date	Description	
		Page	Summary
1.00	June 24, 2010	—	First edition issued
2.00	Mar. 1, 2011	—	Document number changed (old number: REJ05B1377)
		Full page	Differences of R8C/L3AM Group added
		1	Chapter 2, some sentences added
		2	Table 3.1 power control added and note 2 added
		3	Table 3.2 differences of A/D converter sampling time and A/D conversion execution time added
		5	Table 3.6 WKUP1 deleted from peripheral function pin
		6	Table 3.7 remarks of registers VCA2, POMCR0, and ADMOD changed LCR2 register added
		7	Table 3.11 added

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins

   Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.

   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.

   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to one with a different part number, confirm that the change will not lead to problems.

   — The characteristics of MPU/MCU in the same group but having different part numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different part numbers, implement a system-evaluation test for each of the products.

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