

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. 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.
2. 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 before using it in a particular application. You may not use any 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 for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an 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. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “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”: Aircraft; 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 malfunctions 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 malfunction 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.

38D5 Group, 38D2 Group

Difference between 38D5 Group and 38D2 Group

1. Function comparison between 38D5 Group and 38D2 Group

Table 1.1 Function Comparison Between 38D5 Group and 38D2 Group

	38D5 Group	38D2 Group
	QzROM/FLASH	QzROM/FLASH
Number of pins	80 pins	<u>64 pins</u>
Part number	M38D58G8FP/HP, M38D58G8-XXXFP/HP M38D59GCFP/HP, M38D59GC-XXXFP/HP M38D59GFFP/HP, M38D59GF-XXXFP/HP M38D59FFFP/HP	M38D24G4FP/HP, M38D24G4-XXXFP/HP M38D24G6FP/HP, M38D24G6-XXXFP/HP M38D28G8FP/HP, M38D28G8-XXXFP/HP M38D29GCFP/HP, M38D29GC-XXXFP/HP M38D29GFFP/HP, M38D29GF-XXXFP/HP M38D29FFFP/HP
Package	PLQP0080KB-A (Old part no. 80P6Q-A) : 80-pin LQFP(0.5mm pin-pitch) PRQP0080GB-A (Old part no. 80P6N-A) : 80-pin QFP(0.8mm pin-pitch)	PLQP0064KB-A (Old part no. 64P6Q-A): 64-pin LQFP(0.5mm pin-pitch) PLQP0064GA-A (Old part no. 64P6U-A): 64-pin LQFP(0.8mm pin-pitch)
ROM type: ROM/RAM Size	QzROM: 32K/1536, 48K/2048, 60K/2048 FLASH: 60K/2048	QzROM: 16K/640, 24K/640, 32K/1536, 48K/2048, 60K/2048 FLASH: 60K/2048
Interrupt source	17 sources	<u>18 sources (Refer to P6 for details)</u>
Serial interface	8 bits x 2 lines Serial I/O 1: UART or Clock synchronous Serial I/O 2: Clock synchronous	8 bits x 2 lines Serial I/O 1, Serial I/O 2 : UART or Clock <u>synchronous</u>
Maximum number of pixels of LCD drive control	256 pixels (8 com x 32 seg)	<u>96 pixels (4 com x 24 seg)</u>
Duty ratio of LCD drive control	1(Static), 2, 3, 4, 8	<u>2, 3, 4</u>
LCD multiplier circuit	Available	<u>N/A</u>
Dividing resistor for LCD power	N/A	<u>Available (Refer to P7 for details)</u>
LCD drive timing selection bit	N/A	<u>Available</u>
Clock output control	Timer 2 output/System clock ϕ /XCIN frequency signal	<u>Timer 2 output/System clock ϕ</u>
Maximum oscillation frequency	16MHz (Note 1)	
Reserved ROM area (ROM code protect address)	FFDB ₁₆	

Notes: 1. $12.5\text{MHz} < f(\text{XIN}) \leq 16\text{MHz}$ is not available in frequency/2 mode in 38D5 group and 38D2 group .

2. Refer to each group's datasheet for absolute maximum ratings, electric characteristics, and recommended operating conditions.

2. Pin configurations of 38D5 Group and 38D2 Group (Top View)

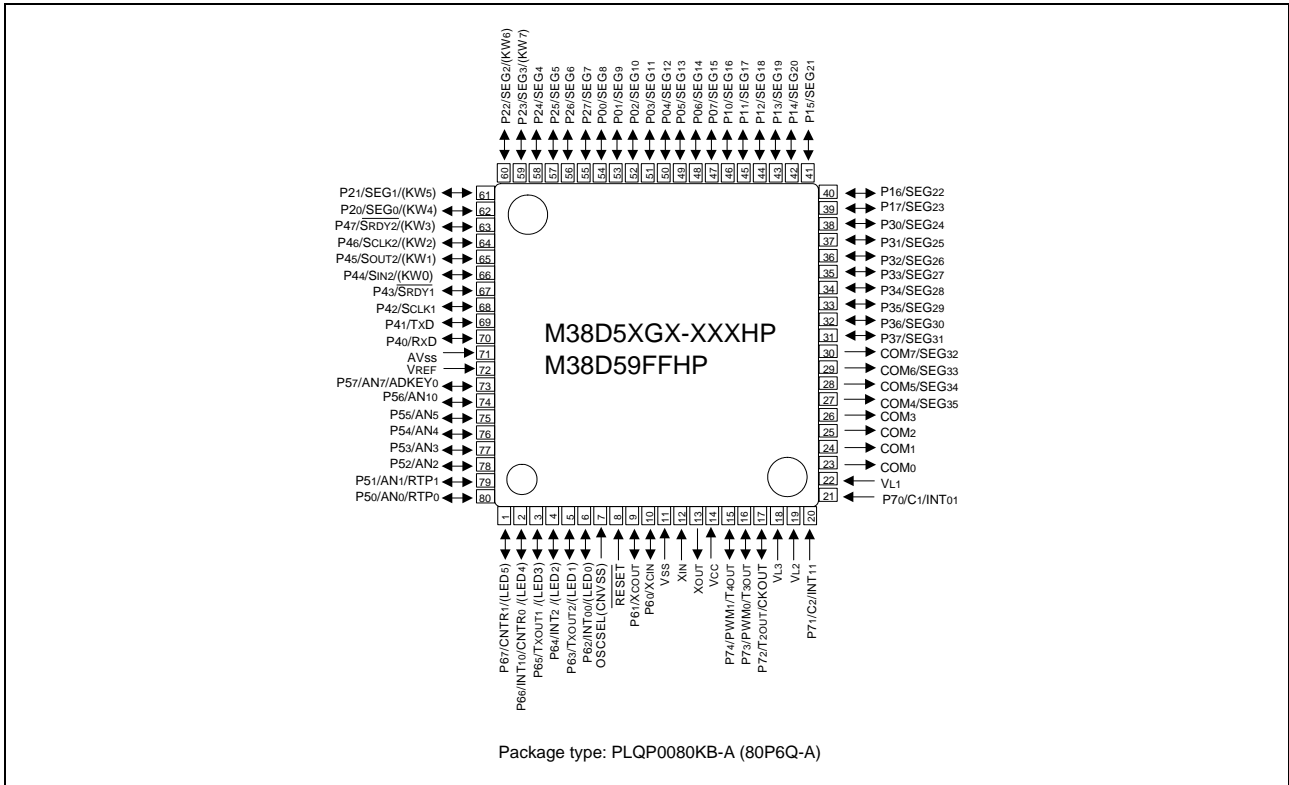


Figure 2.1 Pin Configurations of 38D5 Group

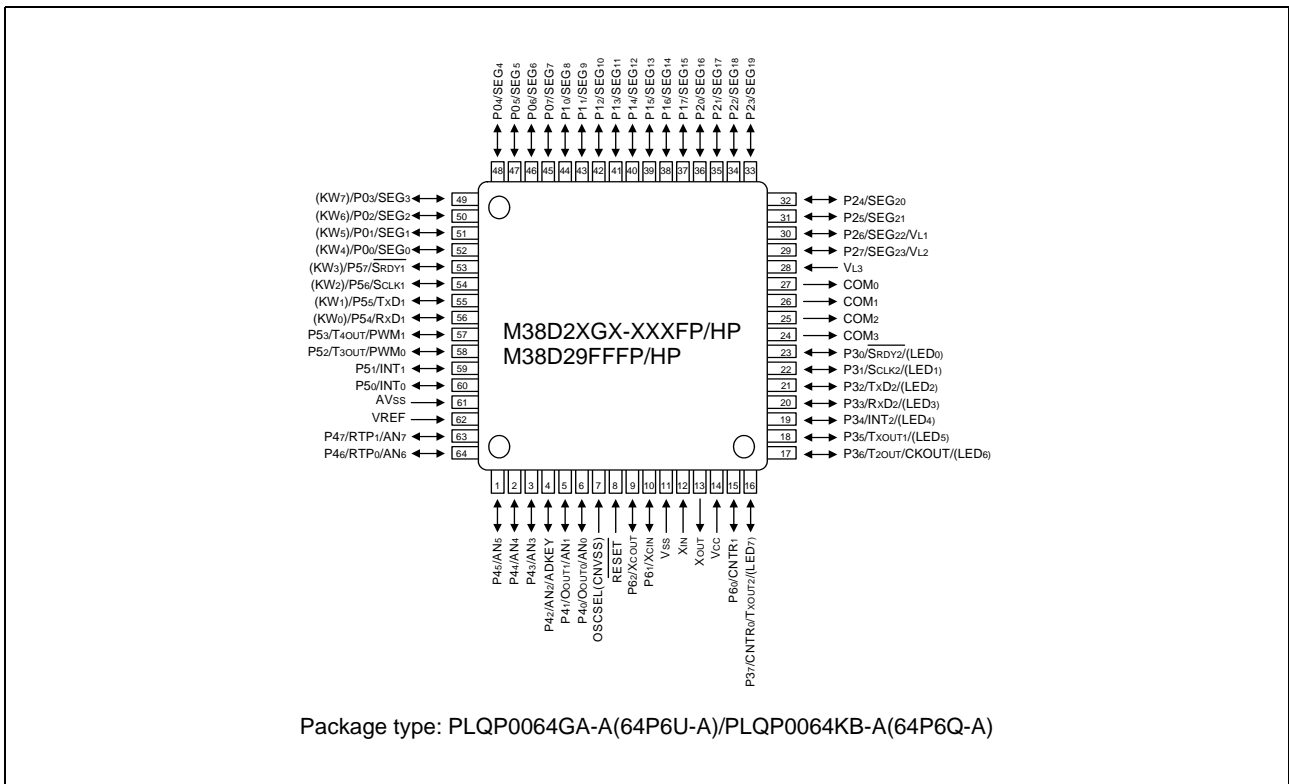


Figure 2.2 Pin Configurations of 38D2 Group

3. SFR comparison between 38D5 Group and 38D2 Group

Table 3.1 SFR Comparison Between 38D5 Group and 38D2 Group (1)

	38D5 Group	38D2 Group
0000 ¹⁶	Port P0(P0)	Port P0(P0)
0001 ¹⁶	Port P0 direction register (P0D)	Port P0 direction register (P0D)
0002 ¹⁶	Port P1(P1)	Port P1(P1)
0003 ¹⁶	Port P1 direction register (P1D)	Port P1 direction register (P1D)
0004 ¹⁶	Port P2 (P2)	Port P2(P2)
0005 ¹⁶	Port P2 direction register (P2D)	Port P2 direction register (P2D)
0006 ¹⁶	Port P3(P3)	Port P3(P3)
0007 ¹⁶	Port P3 direction register (P3D)	Port P3 direction register (P3D)
0008 ¹⁶	Port P4(P4)	Port P4(P4)
0009 ¹⁶	Port P4 direction register (P4D)	Port P4 direction register (P4D)
000A ¹⁶	Port P5(P5)	Port P5(P5)
000B ¹⁶	Port P5 direction register (P5D)	Port P5 direction register (P5D)
000C ¹⁶	Port P6(P6)	Port P6(P6)
000D ¹⁶	Port P6 direction register (P6D)	Port P6 direction register (P6D)
000E ¹⁶	Port P7(P7)	
000F ¹⁶	Port P7 direction register (P7D)	
0010 ¹⁶		Oscillation output control register 1 (OSCOU1)
0011 ¹⁶	CPU mode register 2(CPUM2)	CPU mode register 2 (CPUM2)
0012 ¹⁶	RRF register (RRFR)	RRF register (RRFR)
0013 ¹⁶	LCD mode register 1 (LM1)	LCD mode register (LM)
0014 ¹⁶	LCD mode register 2 (LM2)	LCD power control register (VLCON)
0015 ¹⁶	A/D control register (ADCON)	AD control register (ADCON)
0016 ¹⁶	A/D conversion register (low-order) (ADL)	AD conversion register (low-order) (ADL)
0017 ¹⁶	A/D conversion register (high-order) (ADH)	AD conversion register (high-order) (ADH)
0018 ¹⁶	Buffer register 1(TB1RB1)	Transmit/Receive buffer register 1 (TB1RB1)
0019 ¹⁶	Serial I/O1 status register (SIO1STS)	Serial I/O1 status register (SIO1STS)
001A ¹⁶	Serial I/O1 control register (SIO1CON)	Serial I/O1 control register (SIO1CON)
001B ¹⁶	UART control register (UARTCON)	UART control register (UARTCON)
001C ¹⁶	Baud rate generator (BRG)	Baud rate generator 1 (BRG1)
001D ¹⁶	Serial I/O2 control register (SIO2CON)	Transmit/Receive buffer register 2(TB2RB2)
001E ¹⁶	Reserved area (Do not access)	Serial I/O2 status register (SIO2STS)
001F ¹⁶	Serial I/O register (SIO2)	Serial I/O2 control register (SIO2CON)

Note: Do not access memory in free space of SFR.

- : SFR is different. (Different address)
- : Register contents are different. (Same register name)
- : Register name is different. (Same register contents)

Table 3.2 SFR Comparison Between 38D5 Group and 38D2 Group (2)

	38D5 Group	38D2 Group
0020 ¹⁶	Timer 1 (T1)	Timer 1 (T1)
0021 ¹⁶	Timer 2 (T2)	Timer 2 (T2)
0022 ¹⁶	Timer 3 (T3)	Timer 3 (T3)
0023 ¹⁶	Timer 4 (T4)	Timer 4 (T4)
0024 ¹⁶	PWM01 register (PWM01)	PWM01 register (PWM01)
0025 ¹⁶	Timer 12 mode register (T12M)	Timer 12 mode register (T12M)
0026 ¹⁶	Timer 34 mode register (T34M)	Timer 34 mode register (T34M)
0027 ¹⁶	Timer 1234 mode register (T1234M)	Timer 1234 mode register (T1234M)
0028 ¹⁶	Timer 1234 frequency division selection register (PRE1234)	Timer 1234 frequency division selection register (PRE1234)
0029 ¹⁶	Watchdog timer control register (WDTCON)	Watchdog timer control register (WDTCON)
002A ¹⁶	Timer X (low-order) (TXL)	Timer X (low-order) (TXL)
002B ¹⁶	Timer X (high-order) (TXH)	Timer X (high-order) (TXH)
002C ¹⁶	Timer X (expansion) (TXEX)	Timer X (expansion) (TXEX)
002D ¹⁶	Timer X mode register (TXM)	Timer X mode register (TXM)
002E ¹⁶	Timer X control register 1 (TXCON1)	Timer X control register 1 (TXCON1)
002F ¹⁶	Timer X control register 2 (TXCON2)	Timer X control register 2 (TXCON2)
0030 ¹⁶	Compare register 1 (low-order) (COMP1L)	Compare register 1 (low-order) (COMP1L)
0031 ¹⁶	Compare register 1 (high-order) (COMP1H)	Compare register 1 (high-order) (COMP1H)
0032 ¹⁶	Compare register 2 (low-order) (COMP2L)	Compare register 2 (low-order) (COMP2L)
0033 ¹⁶	Compare register 2 (high-order) (COMP2H)	Compare register 2 (high-order) (COMP2H)
0034 ¹⁶	Compare register 3 (low-order) (COMP3L)	Compare register 3 (low-order) (COMP3L)
0035 ¹⁶	Compare register 3 (high-order) (COMP3H)	Compare register 3 (high-order) (COMP3H)
0036 ¹⁶	Timer Y (low-order) (TYL)	Timer Y (low-order) (TYL)
0037 ¹⁶	Timer Y (high-order) (TYH)	Timer Y (high-order) (TYH)
0038 ¹⁶	Timer Y mode register (TYM)	Timer Y mode register (TYM)
0039 ¹⁶	Timer Y control register (TYCON)	Timer Y control register (TYCON)
003A ¹⁶	Interrupt edge selection register (INTEDGE)	Interrupt edge selection register (INTEDGE)
003B ¹⁶	CPU mode register (CPUM)	CPU mode register (CPUM)
003C ¹⁶	Interrupt request register 1 (IREQ1)	Interrupt request register 1 (IREQ1)
003D ¹⁶	Interrupt request register 2 (IREQ2)	Interrupt request register 2 (IREQ2)
003E ¹⁶	Interrupt control register 1 (ICON1)	Interrupt control register 1 (ICON1)
003F ¹⁶	Interrupt control register 2 (ICON2)	Interrupt control register 2 (ICON2)

Note: Do not access memory in free space of SFR.

- : SFR is different. (Different address)
- : Register contents are different. (Same register name)
- : Register name is different. (Same register contents)

Table 3.3 SFR Comparison Between 38D5 Group and 38D2 Group (3)

	38D5 Group	38D2 Group
0FF0 ¹⁶	PULL register 1 (PULL1)	PULL register (PULL)
0FF1 ¹⁶	PULL register 2 (PULL2)	UART2 control register (UART2CON)
0FF2 ¹⁶	PULL register 3 (PULL3)	Baud rate generator2(BRG2)
0FF3 ¹⁶	Clock output control register (CKOUT)	Clock output control register (CKOUT)
0FF4 ¹⁶	Segment output disable register 0(SEG0)	Segment output disable register 0(SEG0)
0FF5 ¹⁶	Segment output disable register 1(SEG1)	Segment output disable register 1(SEG1)
0FF6 ¹⁶	Segment output disable register 2(SEG2)	Segment output disable register 2(SEG2)
0FF7 ¹⁶	Key input control register (KIC)	Key input control register (KIC)
0FF8 ¹⁶	ROM correction address 1 (high-order)	ROM correction address 1 (high-order)
0FF9 ¹⁶	ROM correction address 1 (low-order)	ROM correction address 1 (low-order)
0FFA ¹⁶	ROM correction address 2 (high-order)	ROM correction address 2 (high-order)
0FFB ¹⁶	ROM correction address 2 (low-order)	ROM correction address 2 (low-order)
0FFC ¹⁶	ROM correction enable register	ROM correction enable register
0FFD ¹⁶	Reserved area (Do not access)	Reserved area (Do not access)
0FFE ¹⁶		Reserved area (Do not access)
0FFF ¹⁶		Reserved area (Do not access)

Note: Do not access memory in free space of SFR.

: SFR is different. (Different address)

: Register contents are different. (Same register name)

: Register name is different. (Same register contents)

Do not access free space and reserved area on the SFR memory map.

4. Interrupt vector comparison between 38D5 group and 38D2 group

Table 4.1 Interrupt Vector Comparison Between 38D5 Group and 38D2 Group

: Difference between 38D5 Group and 38D2 Group

Vector address		Priority	38D5 Group Interrupt Source	38D2 Group Interrupt Source
high-order	low-order			
FFFD16	FFFC16	1	Reset	Reset
FFFB16	FFFA16	2	INT0 (INT00 or INT01)	INT0
FFF916	FFF816	3	INT1 (INT10 or INT11)	INT1
FFF716	FFF616	4	INT2	INT2 / Key input (Key-on wake up)
FFF516	FFF416	5	Key input (Key-on wake up)	CNTR ₀
FFF316	FFF216	6	Timer X	Timer X
FFF116	FFF016	7	Timer 1	Timer 1
FFEF16	FFEE16	8	Timer 2	Timer 2
FFED16	FFEC16	9	Timer 3	Timer 3
FFEB16	FFEA16	10	Timer 4	Timer 4
FFE916	FFE816	11	Serial I/O1 reception	Serial I/O1 reception
FFE716	FFE616	12	Serial I/O1 transmission	Serial I/O1 transmission
FFE516	FFE416	13	Serial I/O2	Serial I/O2 reception
FFE316	FFE216	14	CNTR ₀	Serial I/O2 transmission
FFE116	FFE016	15	Timer Y / CNTR ₁	Timer Y / CNTR ₁
FFDF16	FFDE16	16	A/D conversion	A/D conversion
FFDD16	FFDC16	17	BRK instruction	BRK instruction

5. LCD drive control circuit of 38D2 group

The LCD power circuit of 38D2 Group has an internal LCD power dividing resistor which can be disconnected by software. The user can select connecting or disconnecting this internal resistor at the LCD power control register.

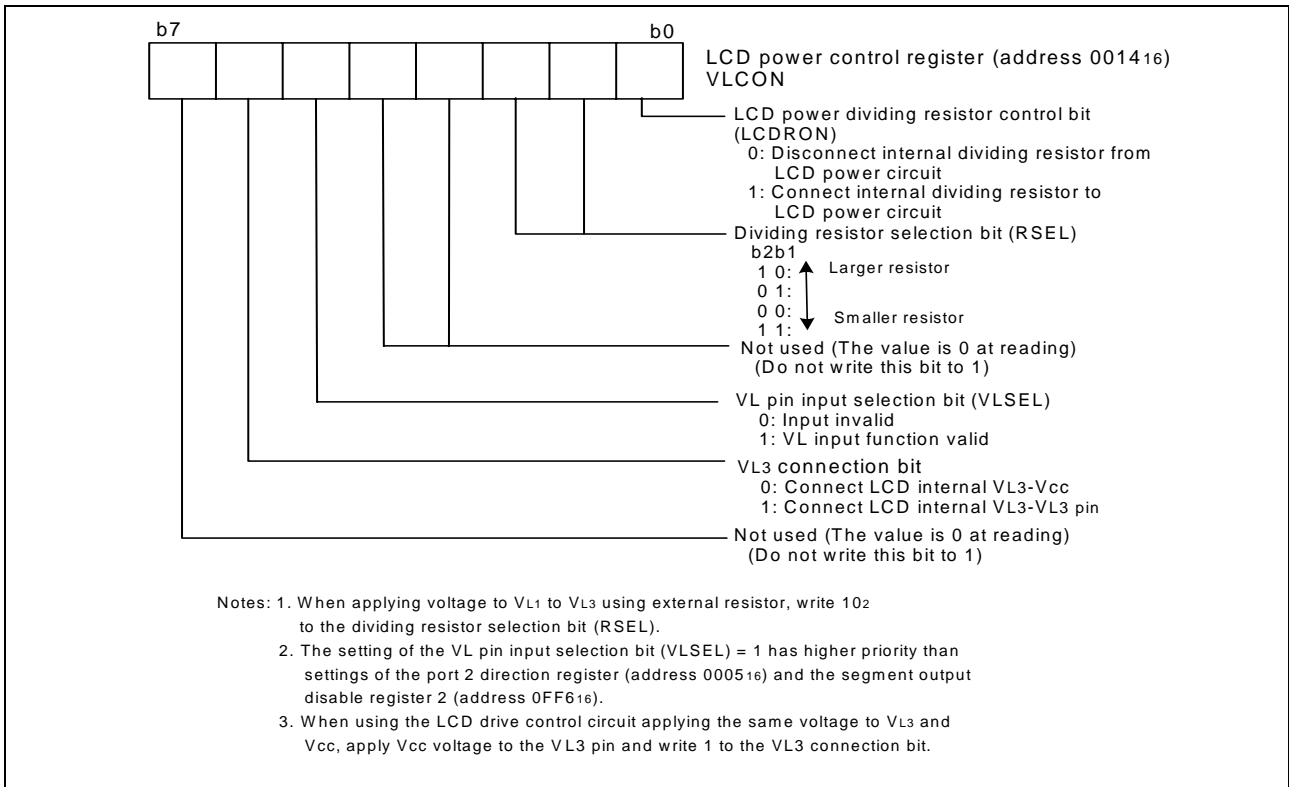


Figure 5.1 Structure of LCD power control register

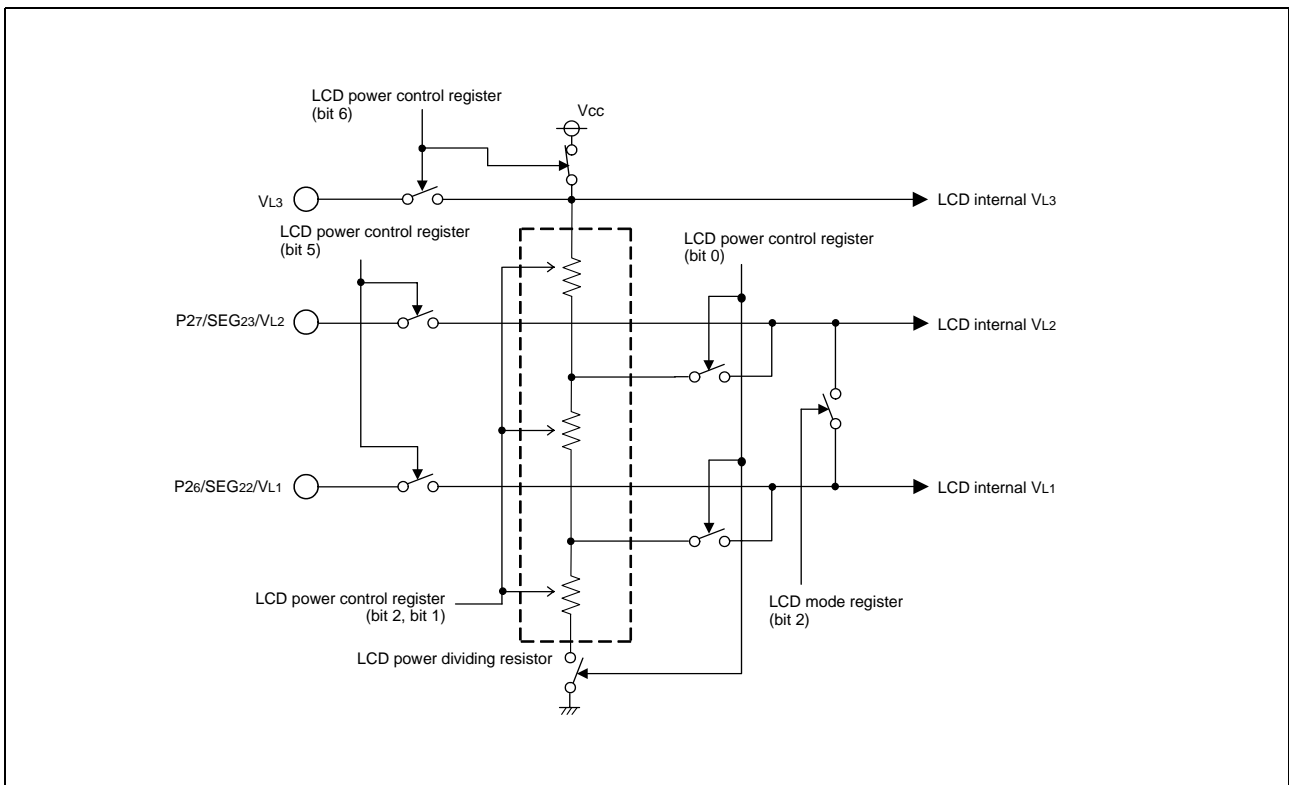


Figure 5.2 VL block diagram

6. Notes

The 38D5 Group and 38D2 Group have different oscillation circuit constants of XIN-XOUT, XCIN-XCOUT. Therefore, contact an oscillator manufacture 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 range of voltage and temperature is wide. Considering the wiring pattern of the feed-back resistor, the dumping resistor, and the load capacity in advance is recommended 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 every individual product before starting mass production.

7. Reference

Datasheet

38D5 Group Datasheet

38D2 Group Datasheet

Download the latest version from the Renesas Technology website.

Technical News/Technical Update

Download the latest information from the Renesas Technology website.

Website and Support

Renesas Technology website
<http://www.renesas.com>

Inquiries
<http://www.renesas.com/inquiry>
csc@renesas.com

REVISION HISTORY	38D5 Group, 38D2 Group Difference between 38D5 Group and 38D2 Group
------------------	--

Rev.	Date	Description	
		Page	Summary
1.00	Feb 16, 2007	-	First Edition issued

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein. The information described here may contain technical inaccuracies or typographical errors. Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors. Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination. Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.