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.

R8C/L3AC Group

LCD Drive Control Circuit (External Division Resistor, Blink Function)

1. Abstract

This document describes the setting method and an application example of the LCD drive control circuit (when using external division resistor, blink function) for the R8C/L3AC Group.

2. Introduction

The application example described in this document applies to the following MCU:

- MCU: R8C/L3AC Group

The sample program in this application note can be used with other R8C Family MCUs which have the same special function registers (SFRs) as the above group. Check the manual for any modifications to functions. Careful evaluation is recommended before using the sample program described in this application note.

3. Application Example

3.1 LCD Display

Outline: Use the LCD drive control circuit to display the LCD.
Specifications:

- Use segment pins SEG0 to SEG23 and common pins COM0 to COM3.
- Duty = 1/4, bias value = 1/3
- Frame frequency = 76 Hz

$$f(FR) = \frac{f(LCDCK) \times duty}{2}$$

$$f(LCDCK) = \frac{\text{LCD clock source frequency}}{n \times \text{division ratio}}$$

Notes:
n = 32 when f32 is selected
n = 4 when fC–LCD is selected

LCD clock source frequency = f32 = (high-speed on-chip oscillator divided by 2) / 32

n = 32

Division ratio = divide by 32

- Use the external division resistors.
- Data display control interval = f(FR) x 32 counts = 0.42 seconds
- Enable LCD display control and display LCD blink.
- Display as R8C/LX.

Figure 3.1 shows a Segment Layout. Figure 3.2 shows a Circuit Example When Using External Division Resistor. Figure 3.3 shows the LCD Display Data Register Settings.

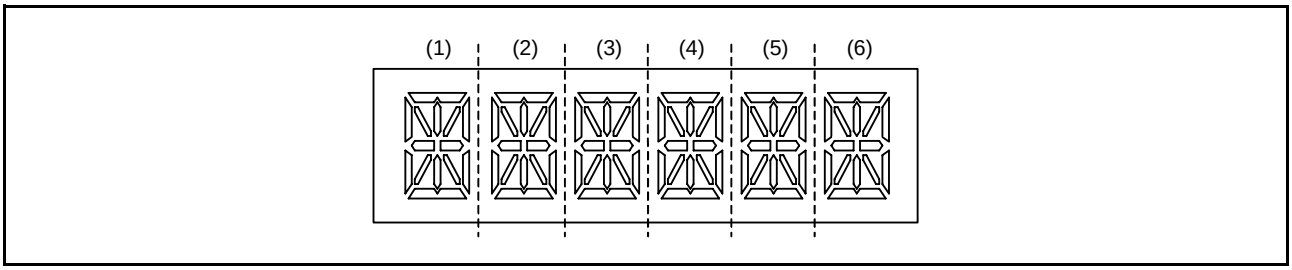
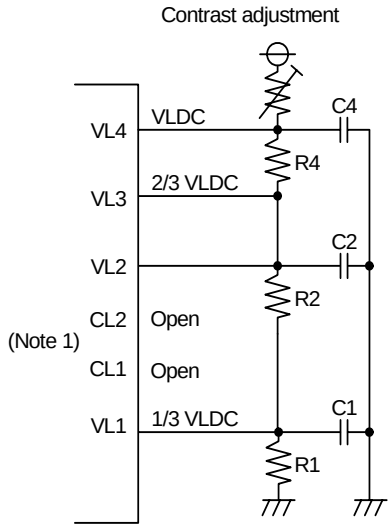


Figure 3.1 Segment Layout



Note:
1. Pins CL1 and CL2 can be used as I/O ports.

Figure 3.2 Circuit Example When Using External Division Resistor

Address \ Bit		7	6	5	4	3	2	1	0	Digit
		COM7	COM6	COM5	COM4	COM3	COM2	COM1	COM0	
0210h	LRA0L	These bits are not used in this application note (they can be used as RAM).				d	c	b	a	→(1)
0211h	LRA1L					h	g	f	e	→(1)
0212h	LRA2L					k	j		i	→(1)
0213h	LRA3L					n	m		l	→(1)
0214h	LRA4L					d	c	b	a	→(2)
0215h	LRA5L					h	g	f	e	→(2)
0216h	LRA6L					k	j		i	→(2)
0217h	LRA7L					n	m		l	→(2)
0218h	LRA8L					d	c	b	a	→(3)
0219h	LRA9L					h	g	f	e	→(3)
021Ah	LRA10L					k	j		i	→(3)
021Bh	LRA11L					n	m		l	→(3)
021Ch	LRA12L					d	c	b	a	→(4)
021Dh	LRA13L					h	g	f	e	→(4)
021Eh	LRA14L					k	j		i	→(4)
021Fh	LRA15L					n	m		l	→(4)
0220h	LRA16L					d	c	b	a	→(5)
0221h	LRA17L					h	g	f	e	→(5)
0222h	LRA18L					k	j		i	→(5)
0223h	LRA19L					n	m		l	→(5)
0224h	LRA20L					d	c	b	a	→(6)
0225h	LRA21L					h	g	f	e	→(6)
0226h	LRA22L					k	j		i	→(6)
0227h	LRA23L					n	m		l	→(6)

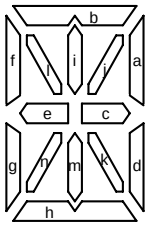


Figure 3.3 LCD Display Data Register Settings

3.2 Memory

Table 3.1 Memory

Memory	Size	Remarks
ROM	271 bytes	In the rej05b1164_src.c module
RAM	0 bytes	In the rej05b1164_src.c module
Maximum user stack	10 bytes	
Maximum interrupt stack	0 bytes	

Memory size varies depending on the C compiler version and compile options.
The above applies to the following conditions:
• C compiler: M16C/60, 30, 20, 10, and Tiny, and R8C/Tiny Series Compiler V.5.45 Release 00
• Compile option: -c -finfo -dir “$(CONFIGDIR)” -R8CE

4. Software Outline

This section shows the setting procedures and values to set the example described in section 3. Application Example. Refer to the latest R8C/L3AC Group Hardware Manual for details on individual registers.

The × in the register's Setting Value represents bits not used in this application, blank spaces represent bits that do not change, and the hyphen represents reserved bits or bits that have nothing assigned.

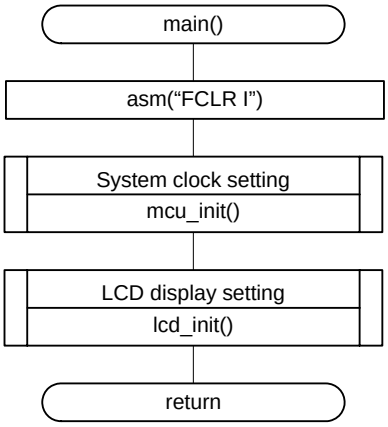
4.1 Function Tables

Declaration	void mcu_init(void)		
Outline	System clock setting		
Argument	Argument name		Meaning
	None		—
Variable (global)	Variable name		Contents
	None		—
Returned value	Type	Value	Meaning
	None	—	—
Function	Set the system clock (high-speed on-chip oscillator).		

Declaration	void lcd_init(void)		
Outline	LCD display setting		
Argument	Argument name		Meaning
	None		—
Variable (global)	Variable name		Contents
	None		—
Returned value	Type	Value	Meaning
	None	—	—
Function	Set registers associated with the LCD.		

4.2 Main Function

- Flowchart



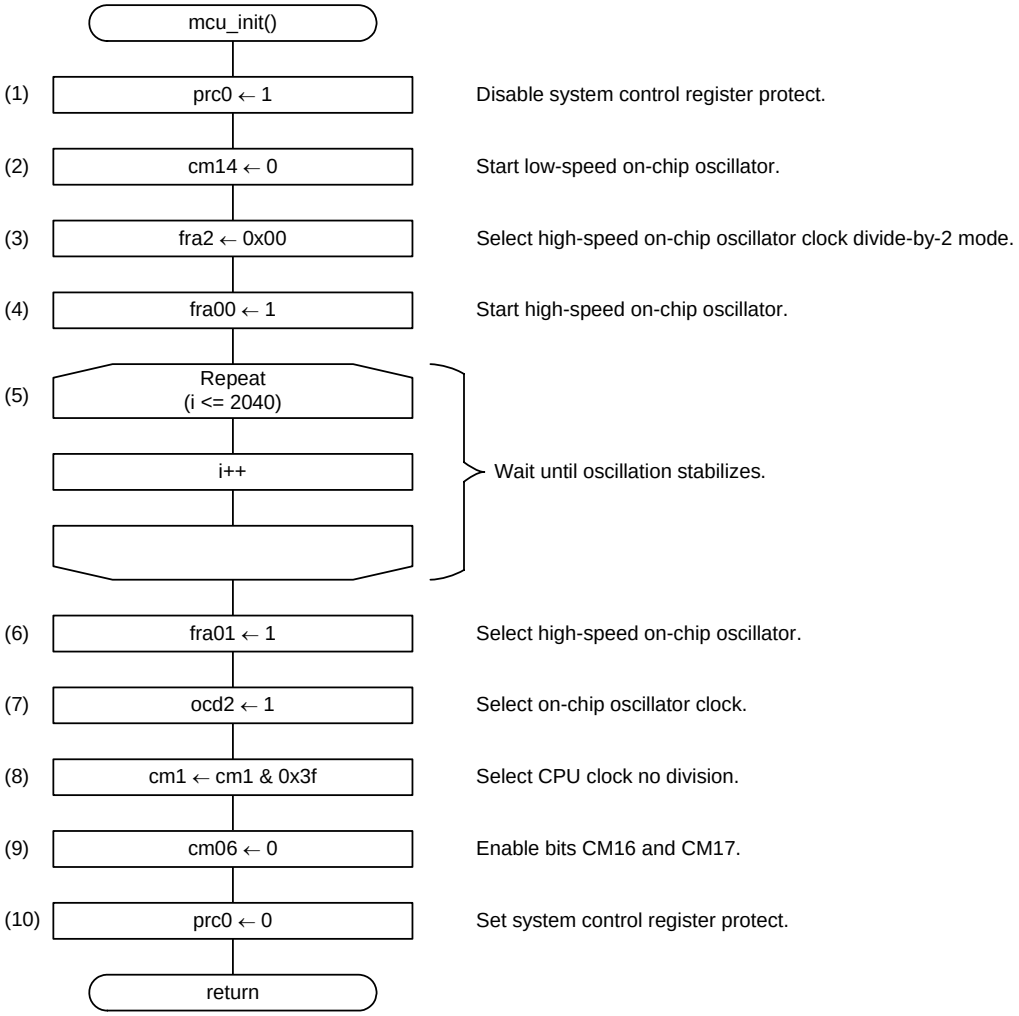
Disable interrupts.

System clock set (high-speed on-chip oscillator set)

LCD display set

4.3 System Clock Setting

• Flowchart



• Register Settings

(1) Enable writing to registers CM0, CM1, CM3, OCD, FRA0, FRA1, FRA2, and FRA3.

Protect Register (PRCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—	×	—	×	1

Bit	Symbol	Bit Name	Function	R/W
b0	PRC0	Protect bit 0	Enables writing to registers CM0, CM1, CM3, OCD, FRA0, FRA1, FRA2, and FRA3. 1: Write enabled	R/W

(2) Oscillate the low-speed on-chip oscillator.

System Clock Control Register 1 (CM1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value			—	0	×	×	×	×

Bit	Symbol	Bit Name	Function	R/W
b4	CM14	Low-speed on-chip oscillator oscillation stop bit	0: Low-speed on-chip oscillator on	R/W

(3) Set the division ratio for the high-speed on-chip oscillator.

High-Speed On-Chip Oscillator Control Register 2 (FRA2)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	—	—	—	—	0	0	0

Bit	Symbol	Bit Name	Function	R/W
b0	FRA20	High-speed on-chip oscillator frequency switch bit	Division ratio selection These bits select the division ratio for the high-speed on-chip oscillator clock. b2 b1 b0 0 0 0: Divide-by-2 mode	R/W
b1	FRA21			R/W
b2	FRA22			R/W

(4) Oscillate the high-speed on-chip oscillator.

High-Speed On-Chip Oscillator Control Register 0 (FRA0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	—	—	—	×	—		1

Bit	Symbol	Bit Name	Function	R/W
b0	FRA00	High-speed on-chip oscillator enable bit	1: High-speed on-chip oscillator on	R/W

(5) Wait until oscillation stabilizes.

(6) Select the high-speed on-chip oscillator.

High-Speed On-Chip Oscillator Control Register 0 (FRA0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	—	—	—	×	—	1	

Bit	Symbol	Bit Name	Function	R/W
b1	FRA01	High-speed on-chip oscillator select bit	1: High-speed on-chip oscillator on	R/W

(7) Select the on-chip oscillator clock as the system clock.

Oscillation Stop Detection Register (OCD)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	—	—	—	×	1	×	×

Bit	Symbol	Bit Name	Function	R/W
b2	OCD2	On-chip oscillator clock select bit	1: On-chip oscillator clock selected	R/W

(8) Set CPU clock division select bit 1.

System Clock Control Register 1 (CM1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	0	0	—		×	×	×	×

Bit	Symbol	Bit Name	Function	R/W
b6	CM16	CPU clock division select bit 1	b7 b6 0 0: No division mode	R/W
b7	CM17			R/W

(9) Set CPU clock division select bit 0.

System Clock Control Register 0 (CM0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	×	0	×	×	×	×	×	—

Bit	Symbol	Bit Name	Function	R/W
b6	CM06	CPU clock division select bit 0	0: Bits CM16 and CM17 in CM1 register enabled	R/W

(10) Disable writing to registers CM0, CM1, CM3, OCD, FRA0, FRA1, FRA2, and FRA3.

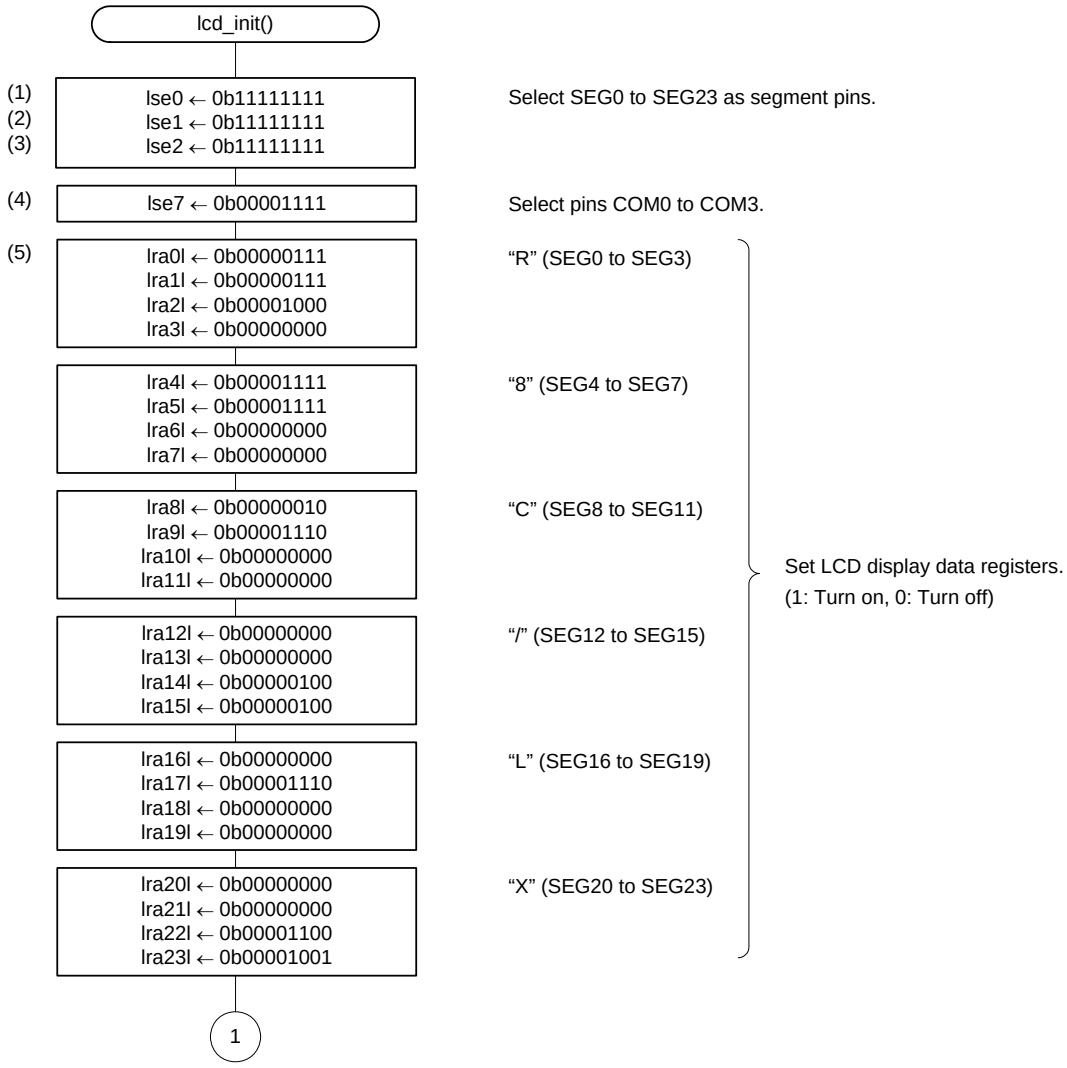
Protect Register (PRCR)

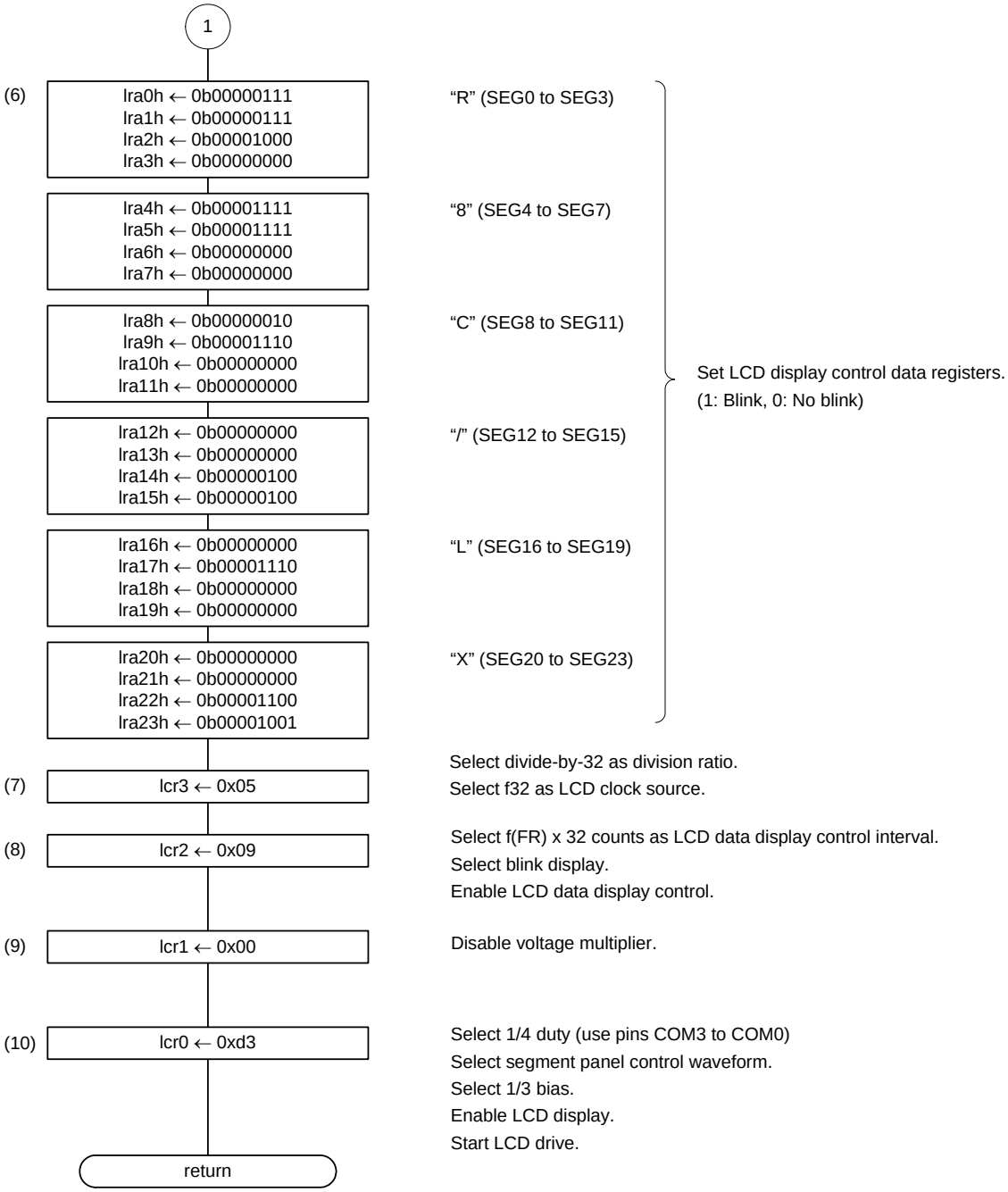
Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	—	—	—	×	—	×	0

Bit	Symbol	Bit Name	Function	R/W
b0	PRC0	Protect bit 0	Enables writing to registers CM0, CM1, CM3, OCD, FRA0, FRA1, FRA2, and FRA3. 0: Write disabled	R/W

4.4 LCD Display Setting

- Flowchart




1
(6)
lra0h ← 0b00000111
lra1h ← 0b00000111
lra2h ← 0b00001000
lra3h ← 0b00000000
"R" (SEG0 to SEG3)
lra4h ← 0b00001111
lra5h ← 0b00001111
lra6h ← 0b00000000
lra7h ← 0b00000000
"8" (SEG4 to SEG7)
lra8h ← 0b00000010
lra9h ← 0b00001110
lra10h ← 0b00000000
lra11h ← 0b00000000
"C" (SEG8 to SEG11)
lra12h ← 0b00000000
lra13h ← 0b00000000
lra14h ← 0b00000100
lra15h ← 0b00000100
"/" (SEG12 to SEG15)
lra16h ← 0b00000000
lra17h ← 0b00001110
lra18h ← 0b00000000
lra19h ← 0b00000000
"L" (SEG16 to SEG19)
lra20h ← 0b00000000
lra21h ← 0b00000000
lra22h ← 0b00001100
lra23h ← 0b00001001
"X" (SEG20 to SEG23)
Set LCD display control data registers.
(1: Blink, 0: No blink)
(7)
lcr3 ← 0x05
Select divide-by-32 as division ratio.
Select f32 as LCD clock source.
(8)
lcr2 ← 0x09
Select f(FR) x 32 counts as LCD data display control interval.
Select blink display.
Enable LCD data display control.
(9)
lcr1 ← 0x00
Disable voltage multiplier.
(10)
lcr0 ← 0xd3
Select 1/4 duty (use pins COM3 to COM0)
Select segment panel control waveform.
Select 1/3 bias.
Enable LCD display.
Start LCD drive.
return

• Register Settings

(1) Set port P0 as a segment pin.

LCD Port Select Register 0 (LSE0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	1	1	1	1	1	1	1	1

Bit	Symbol	Bit Name	Function	R/W
b0	LSE00	LCD port select bit 0	1: SEG0	R/W
b1	LSE01	LCD port select bit 1	1: SEG1	R/W
b2	LSE02	LCD port select bit 2	1: SEG2	R/W
b3	LSE03	LCD port select bit 3	1: SEG3	R/W
b4	LSE04	LCD port select bit 4	1: SEG4	R/W
b5	LSE05	LCD port select bit 5	1: SEG5	R/W
b6	LSE06	LCD port select bit 6	1: SEG6	R/W
b7	LSE07	LCD port select bit 7	1: SEG7	R/W

(2) Set port P1 as a segment pin.

LCD Port Select Register 1 (LSE1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	1	1	1	1	1	1	1	1

Bit	Symbol	Bit Name	Function	R/W
b0	LSE08	LCD port select bit 8	1: SEG8	R/W
b1	LSE09	LCD port select bit 9	1: SEG9	R/W
b2	LSE10	LCD port select bit 10	1: SEG10	R/W
b3	LSE11	LCD port select bit 11	1: SEG11	R/W
b4	LSE12	LCD port select bit 12	1: SEG12	R/W
b5	LSE13	LCD port select bit 13	1: SEG13	R/W
b6	LSE14	LCD port select bit 14	1: SEG14	R/W
b7	LSE15	LCD port select bit 15	1: SEG15	R/W

(3) Set port P2 as a segment pin.

LCD Port Select Register 2 (LSE2)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	1	1	1	1	1	1	1	1

Bit	Symbol	Bit Name	Function	R/W
b0	LSE16	LCD port select bit 16	1: SEG16	R/W
b1	LSE17	LCD port select bit 17	1: SEG17	R/W
b2	LSE18	LCD port select bit 18	1: SEG18	R/W
b3	LSE19	LCD port select bit 19	1: SEG19	R/W
b4	LSE20	LCD port select bit 20	1: SEG20	R/W
b5	LSE21	LCD port select bit 21	1: SEG21	R/W
b6	LSE22	LCD port select bit 22	1: SEG22	R/W
b7	LSE23	LCD port select bit 23	1: SEG23	R/W

(4) Set ports P7_4 to P7_7 as COM pins.

LCD Port Select Register 7 (LSE7)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	—	—	0	1	1	1	1

Bit	Symbol	Bit Name	Function	R/W
b0	LSE56	LCD port select bit 56	1: COM3	R/W
b1	LSE57	LCD port select bit 57	1: COM2	R/W
b2	LSE58	LCD port select bit 58	1: COM1	R/W
b3	LSE59	LCD port select bit 59	1: COM0	R/W
b4	LSE60	LCD port select bit 60	1: Ports P12_2 and P12_3	R/W

(5) Set the LCD display data register.

When 1 is written to a bit in the LCD display data register (LRAL), the corresponding segment of the LCD panel is turned on, when a bit is set to 0, the corresponding segment is turned off.

Symbol	Address	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
		COM7	COM6	COM5	COM4	COM3	COM2	COM1	COM0
LRA0L	0210h	SEG0							
LRA1L	0211h	SEG1							
LRA2L	0212h	SEG2							
LRA3L	0213h	SEG3							
LRA4L	0214h	SEG4							
LRA5L	0215h	SEG5							
LRA6L	0216h	SEG6							
LRA7L	0217h	SEG7							
LRA8L	0218h	SEG8							
LRA9L	0219h	SEG9							
LRA10L	021Ah	SEG10							
LRA11L	021Bh	SEG11							
LRA12L	021Ch	SEG12							
LRA13L	021Dh	SEG13							
LRA14L	021Eh	SEG14							
LRA15L	021Fh	SEG15							
LRA16L	0220h	SEG16							
LRA17L	0221h	SEG17							
LRA18L	0222h	SEG18							
LRA19L	0223h	SEG19							
LRA20L	0224h	SEG20							
LRA21L	0225h	SEG21							
LRA22L	0226h	SEG22							
LRA23L	0227h	SEG23							

(6) Set the LCD display control data register.

When 1 is written to a bit in the LCD display control data register (LRAH), the corresponding segment of the LCD is blinked for the interval selected by bits LDFR0 to LDFR2.

Symbol	Address	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
		COM7	COM6	COM5	COM4	COM3	COM2	COM1	COM0
LRA0H	0270h	SEG0							
LRA1H	0271h	SEG1							
LRA2H	0272h	SEG2							
LRA3H	0273h	SEG3							
LRA4H	0274h	SEG4							
LRA5H	0275h	SEG5							
LRA6H	0276h	SEG6							
LRA7H	0277h	SEG7							
LRA8H	0278h	SEG8							
LRA9H	0279h	SEG9							
LRA10H	027Ah	SEG10							
LRA11H	027Bh	SEG11							
LRA12H	027Ch	SEG12							
LRA13H	027Dh	SEG13							
LRA14H	027Eh	SEG14							
LRA15H	027Fh	SEG15							
LRA16H	0280h	SEG16							
LRA17H	0281h	SEG17							
LRA18H	0282h	SEG18							
LRA19H	0283h	SEG19							
LRA20H	0284h	SEG20							
LRA21H	0285h	SEG21							
LRA22H	0286h	SEG22							
LRA23H	0287h	SEG23							

(7) Set the division ratio and LCD clock source.

LCD Clock Control Register (LCR3)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	0	0	—	—	—	1	0	1

Bit	Symbol	Bit Name	Function	R/W
b0	LPSC0	Division ratio select bit	b2 b1 b0 1 0 1: Divide-by-32	R/W
b1	LPSC1			R/W
b2	LPSC2			R/W
b6	LCKS0	LCD clock source select bit	b7 b6 0 0: f32	R/W
b7	LCKS1			R/W

(8) Select the LCD data display control interval, enable the data display control, and select the display control mode.

LCD Display Control Register (LCR2)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	—	0	0	0	1	0	0	1

Bit	Symbol	Bit Name	Function	R/W
b0	LDFR0	LCD data display control interval select bit 1 (counts the frame frequency)	b2 b1 b0 0 0 1: Display control interval = f(FR) Other than LDTY2 to LDTY0 = 010b (other than 1/3 duty): × 32 counts	R/W
b1	LDFR1			R/W
b2	LDFR2			R/W
b3	LDSPC	LCD data display control enable bit	1: Data display control enabled	R/W
b4	LRVRS	LCD display control mode select bit	0: On/off display	R/W
b5	LDFR20	LCD data display control interval select bit 2 (synchronized with timer RE)	b6 b5 0 0 : Settings of bits LDER0 to LDER2 enabled	R/W
b6	LDFR21			R/W

(9) Select the voltage multiplier wait time and voltage multiplier reference voltage source, and enable the voltage multiplier.

LCD Bias Control Register (LCR1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	1	0	0	0	×	×	×	×

Bit	Symbol	Bit Name	Function	R/W
b4	LVWT0	Voltage multiplier wait time select bit	b5 b4 0 0 : Wait time = f(FR) Other than LDTY2 to LDTY0 = 010b (other than 1/3 duty): × 64 counts	R/W
b5	LVWT1			R/W
b6	LVURS	Voltage multiplier reference voltage source select bit	0: VL1 externally-input voltage	R/W
b7	LVUPE	Voltage multiplier enable bit	1: Voltage multiplier enabled	R/W

(10) Select the duty, waveform control, and bias. Turn on the LCD display and start the LCD drive.

LCD Control Register (LCR0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting value	1	1	0	1	0	0	1	1

Bit	Symbol	Bit Name	Function	R/W
b0	LDTY0	Duty select Bit	b2 b1 b0 0 1 1: 1/4 duty (COM0 to COM3 used)	R/W
b1	LDTY1			R/W
b2	LDTY2			R/W
b3	LWAV	LCD waveform control select bit	0: Segment panel control waveform	R/W
b4	LBAS0	Bias select bit	b5 b4 0 1: 1/3 bias	R/W
b5	LBAS1			R/W
b6	LDSPE	LCD display enable bit	1: LCD on	R/W
b7	LSTAT	LCD drive start bit	1: Drive starts	R/W

5. Sample Program

A sample program can be downloaded from the Renesas Technology website.
To download, click “Application Notes” in the left-hand side menu of the R8C Family page.

6. Reference Documents

Hardware Manual
R8C/L3AC Group Hardware Manual Rev.0.10
The latest version can be downloaded from the Renesas Technology website.

Technical Update/Technical News
The latest information can be downloaded 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	R8C/L3AC Group LCD Drive Control Circuit (External Division Resistor, Blink Function)

Rev.	Date	Description	
		Page	Summary
1.00	Feb 26, 2010	–	First Edition issued

Notes regarding these materials

1. This document is provided for reference purposes only so that Renesas customers may select the appropriate Renesas products for their use. Renesas neither makes warranties or representations with respect to the accuracy or completeness of the information contained in this document nor grants any license to any intellectual property rights or any other rights of Renesas or any third party with respect to the information in this document.
2. Renesas shall have no liability for damages or infringement of any intellectual property or other rights arising out of the use of any information in this document, including, but not limited to, product data, diagrams, charts, programs, algorithms, and application circuit examples.
3. You should not use the products or the technology described in this document for the purpose of military applications such as the development of weapons of mass destruction or for the purpose of any other military use. When exporting the products or technology described herein, you should follow the applicable export control laws and regulations, and procedures required by such laws and regulations.
4. All information included in this document such as product data, diagrams, charts, programs, algorithms, and application circuit examples, 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 products listed in this document, please confirm the latest product information with a Renesas sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas such as that disclosed through our website. (http://www.renesas.com)
5. Renesas has used reasonable care in compiling the information included in this document, but Renesas assumes no liability whatsoever for any damages incurred as a result of errors or omissions in the information included in this document.
6. When using or otherwise relying on the information in this document, you should evaluate the information in light of the total system before deciding about the applicability of such information to the intended application. Renesas makes no representations, warranties or guaranties regarding the suitability of its products for any particular application and specifically disclaims any liability arising out of the application and use of the information in this document or Renesas products.
7. With the exception of products specified by Renesas as suitable for automobile applications, Renesas products are not designed, manufactured or tested for applications or otherwise in systems the failure or malfunction of which may cause a direct threat to human life or create a risk of human injury or which require especially high quality and reliability such as safety systems, or equipment or systems for transportation and traffic, healthcare, combustion control, aerospace and aeronautics, nuclear power, or undersea communication transmission. If you are considering the use of our products for such purposes, please contact a Renesas sales office beforehand. Renesas shall have no liability for damages arising out of the uses set forth above.
8. Notwithstanding the preceding paragraph, you should not use Renesas products for the purposes listed below:
   (1) artificial life support devices or systems
   (2) surgical implantations
   (3) healthcare intervention (e.g., excision, administration of medication, etc.)
   (4) any other purposes that pose a direct threat to human life
   Renesas shall have no liability for damages arising out of the uses set forth in the above and purchasers who elect to use Renesas products in any of the foregoing applications shall indemnify and hold harmless Renesas Technology Corp., its affiliated companies and their officers, directors, and employees against any and all damages arising out of such applications.
9. You should use the products described herein within the range specified by Renesas, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas shall have no liability for malfunctions or damages arising out of the use of Renesas products beyond such specified ranges.
10. Although Renesas endeavors to improve the quality and reliability of its products, IC products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas 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 applicable measures. Among others, since the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
11. In case Renesas products listed in this document are detached from the products to which the Renesas products are attached or affixed, the risk of accident such as swallowing by infants and small children is very high. You should implement safety measures so that Renesas products may not be easily detached from your products. Renesas shall have no liability for damages arising out of such detachment.
12. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written approval from Renesas.
13. Please contact a Renesas sales office if you have any questions regarding the information contained in this document, Renesas semiconductor products, or if you have any other inquiries.