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# H8/3802, H8/38004, H8/38002S, H8/38104 Group Hardware Manual

Renesas 8-Bit Single-Chip Microcomputer  
H8 Family / H8/300L Super Low Power Series

H8/3802 Group	H8/3802	H8/38002S Group	H8/38002S
	H8/3801		H8/38001S
	H8/3800		H8/38000S
H8/38004 Group	H8/38004	H8/38104 Group	H8/38104
	H8/38003		H8/38103
	H8/38002		H8/38102
	H8/38001		H8/38101
	H8/38000		H8/38100

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# 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 may occur due to the false recognition of the pin state as an input signal. 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 type number, confirm that the change will not lead to problems.

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

# Configuration of This Manual

This manual comprises the following items:

1. General Precautions in the Handling of MPU/MCU Products
2. Configuration of This Manual
3. Preface
4. Contents
5. Overview
6. Description of Functional Modules
  - CPU and System-Control Modules
  - On-Chip Peripheral Modules

The configuration of the functional description of each module differs according to the module. However, the generic style includes the following items:

- i) Feature
- ii) Input/Output Pin
- iii) Register Description
- iv) Operation
- v) Usage Note

When designing an application system that includes this LSI, take notes into account. Each section includes notes in relation to the descriptions given, and usage notes are given, as required, as the final part of each section.

7. List of Registers
8. Electrical Characteristics
9. Appendix
10. Main Revisions for This Edition (only for revised versions)

The list of revisions is a summary of points that have been revised or added to earlier versions. This does not include all of the revised contents. For details, see the actual locations in this manual.

11. Index

# Preface

The H8/3802 Group, H8/38004 Group, and H8/38104 Group are single-chip microcomputers made up of the high-speed H8/300L CPU employing Renesas technology's original architecture as their cores, and the peripheral functions required to configure a system. The H8/300L CPU has an instruction set that is compatible with the H8/300 CPU. Below is a table listing the product specifications for each group.

Item		H8/3802 Group		H8/38004 Group		H8/38002S Group	H8/38104 Group	
		ZTAT	Mask ROM	Flash ROM	Mask ROM	Mask ROM	Flash ROM	Mask ROM
Memory	ROM	16 k	8 k to 16 k	16 k/32 k	32 k	8 k to 16 k	16 k/32 k	8 k to 32 k
	RAM	1 k	512 or 1 k	1 k	1 k	512 k	1 k	512 or 1 k
Operating voltage and operating frequency	4.5 to 5.5 V	16 MHz	16 MHz	—	16 MHz	—	20 MHz	20 MHz
	2.7 to 5.5 V	10 MHz	10 MHz	—	16 MHz	—	20 MHz	20 MHz
	1.8 to 5.5 V	4 MHz	4 MHz	—	—	—	—	—
	2.7 to 3.6 V	—	—	10 MHz	—	10 MHz	—	—
	1.8 to 3.6 V	—	—	4 MHz (2.2 V or more)	—	4 MHz	—	—
I/O ports	Input	9	9	9	9	9	9	9
	Output	6	6	6	5	6	5	5
	I/O	39	39	39	39	39	39	39
Timers	Clock (timer A)	1	1	1	1	1	1	1
	Compare (timer F)	1	1	1	1	1	1	1
	AEC	1	1	1	1	1	1	1
	WDT			1		1		
	WDT (discrete)				1		1	1
SCI	UART/Clock frequency	1 ch	1 ch	1 ch	1 ch	1 ch	1 ch	1 ch
A-D (resolution × input channels)		10 bit × 4 ch	10 bit × 4 ch	10 bit × 4 ch	10 bit × 4 ch	10 bit × 4 ch	10 bit × 4 ch	10 bit × 4 ch
LCD	seg	25	25	25	25	25	25	25
	com	4	4	4	4	4	4	4
External interrupt (internal wakeup)		11(8)	11(8)	11(8)	11(8)	11(8)	11(8)	11(8)
POR (power-on reset)		—	—	—	—	—	1	1
LVD		—	—	—	—	—	1	1



Item	H8/3802 Group		H8/38004 Group		H8/38002S Group	H8/38104 Group	
	ZTAT	Mask ROM	Flash ROM	Mask ROM	Mask ROM	Flash ROM	Mask ROM
Package	FP-64A	FP-64A	FP-64A	FP-64A	FP-64A	FP-64A	FP-64A
	FP-64E	FP-64E	FP-64E	FP-64E	FP-64K*	FP-64E	FP-64E
			TNP-64B	TNP-64B	TNP-64B		
	DP-64S	DP-64S					
		die	die				
Operating temperature	Standard specifications: -20 to 75°C, WTR: -40 to 85°C						

Note: \* Under development.

**Target Users:** This manual was written for users who will be using the H8/3802 Group, H8/38004 Group, H8/38002S Group, and H8/38104 Group in the design of application systems. Target users are expected to understand the fundamentals of electrical circuits, logical circuits, and microcomputers.

**Objective:** This manual was written to explain the hardware functions and electrical characteristics of the H8/3802 Group, H8/38004 Group, H8/38002S Group, and H8/38104 Group to the target users.  
Refer to the H8/300L Series Software Manual for a detailed description of the instruction set.

Notes on reading this manual:

- In order to understand the overall functions of the chip  
Read the manual according to the contents. This manual can be roughly categorized into parts on the CPU, system control functions, peripheral functions and electrical characteristics.
- In order to understand the details of the CPU's functions  
Read the H8/300L Series Software Manual.
- In order to understand the details of a register when its name is known  
Read the index that is the final part of the manual to find the page number of the entry on the register. The addresses, bits, and initial values of the registers are summarized in section 14, List of Registers.

**Example:** Bit order: The MSB is on the left and the LSB is on the right.

Notes:

The following limitations apply to H8/38004, H8/38002, H8/38104, and H8/38102 programming and debugging when the on-chip emulator is used.

1. Pin P95 is not available because it is used exclusively by the on-chip emulator.
2. Pins P33, P34, and P35 are unavailable for use. In order to use these pins additional hardware must be mounted on the user board.

3. The address range H'7000 to H'7FFF is used by the on-chip emulator and is unavailable to the user.
4. The address range H'F780 to H'FB7F must not be accessed under any circumstances.
5. When the on-chip emulator is being used, pin P95 is I/O, pins P33 and P34 are input, and pin P35 is output.
6. When using the on-chip emulator, pins OSC1 and OSC2 should be connected to an oscillator, or an external clock should be supplied to pin OSC1, even if the on-chip oscillator of the H8/38104 Group is selected.

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H8/3802 Group, H8/38004 Group, H8/38002S Group, H8/38104 Group Manuals:

<b>Document Title</b>	<b>Document No.</b>
H8/3802 Group, H8/38004 Group, H8/38002S Group, H8/38104 Group Hardware Manual	This manual
H8/300L Series Software Manual	REJ09B0214

User's Manuals for Development Tools:

<b>Document Title</b>	<b>Document No.</b>
H8S, H8/300 Series C/C++ Compiler, Assembler, Optimizing Linkage Editor User's Manual	REJ10B2039
H8S, H8/300 Series Simulator/Debugger User's Manual	REJ10B0211
High-performance Embedded Workshop User's Manual	REJ10J2037

Application Notes:

<b>Document Title</b>	<b>Document No.</b>
H8S, H8/300 Series C/C++ Compiler Package Application Note	REJ05B0464

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# Contents

Section 1	Overview .....	1
1.1	Features .....	1
1.2	Internal Block Diagram.....	4
1.3	Pin Arrangement .....	7
1.4	Pin Functions .....	19
Section 2	CPU .....	23
2.1	Features .....	23
2.2	Address Space and Memory Map .....	24
2.3	Register Configuration .....	33
2.3.1	General Registers .....	34
2.3.2	Program Counter (PC) .....	34
2.3.3	Condition Code Register (CCR) .....	35
2.3.4	Initial Register Values.....	36
2.4	Data Formats .....	36
2.4.1	General Register Data Formats .....	36
2.4.2	Memory Data Formats .....	38
2.5	Instruction Set .....	39
2.5.1	Data Transfer Instructions.....	41
2.5.2	Arithmetic Operations Instructions .....	43
2.5.3	Logic Operations Instructions .....	44
2.5.4	Shift Instructions.....	44
2.5.5	Bit Manipulation Instructions .....	46
2.5.6	Branch Instructions .....	49
2.5.7	System Control Instructions.....	51
2.5.8	Block Data Transfer Instructions .....	52
2.6	Addressing Modes and Effective Address .....	53
2.6.1	Addressing Modes .....	53
2.6.2	Effective Address Calculation.....	56
2.7	Basic Bus Cycle .....	60
2.7.1	Access to On-Chip Memory (RAM, ROM).....	60
2.7.2	On-Chip Peripheral Modules .....	61
2.8	CPU States .....	63
2.9	Usage Notes .....	64
2.9.1	Notes on Data Access to Empty Areas .....	64
2.9.2	Access to Internal I/O Registers.....	64
2.9.3	EEMOV Instruction.....	65
2.9.4	Bit Manipulation Instructions .....	65

Section 3	Exception Handling .....	73
3.1	Exception Sources and Vector Address .....	75
3.2	Register Descriptions .....	77
3.2.1	Interrupt Edge Select Register (IEGR) .....	77
3.2.2	Interrupt Enable Register 1 (IENR1) .....	78
3.2.3	Interrupt Enable Register 2 (IENR2) .....	79
3.2.4	Interrupt Request Register 1 (IRR1) .....	80
3.2.5	Interrupt Request Register 2 (IRR2) .....	81
3.2.6	Wakeup Interrupt Request Register (IWPR).....	82
3.2.7	Wakeup Edge Select Register (WEGR).....	83
3.3	Reset Exception Handling.....	83
3.4	Interrupt Exception Handling.....	84
3.4.1	External Interrupts .....	84
3.4.2	Internal Interrupts .....	85
3.4.3	Interrupt Handling Sequence .....	86
3.4.4	Interrupt Response Time.....	87
3.5	Usage Notes .....	89
3.5.1	Interrupts after Reset.....	89
3.5.2	Notes on Stack Area Use .....	89
3.5.3	Interrupt Request Flag Clearing Method.....	89
3.5.4	Notes on Rewriting Port Mode Registers.....	90
Section 4	Clock Pulse Generators .....	93
4.1	Features .....	93
4.2	Register Description.....	95
4.3	System Clock Generator .....	96
4.3.1	Connecting Crystal Resonator .....	96
4.3.2	Connecting Ceramic Resonator .....	98
4.3.3	External Clock Input Method.....	99
4.3.4	On-Chip Oscillator Selection Method (H8/38104 Group Only).....	99
4.4	Subclock Generator.....	100
4.4.1	Connecting 32.768-kHz/38.4-kHz Crystal Resonator.....	101
4.4.2	Pin Connection when Not Using Subclock.....	102
4.4.3	External Clock Input.....	102
4.5	Prescalers .....	103
4.5.1	Prescaler S .....	103
4.5.2	Prescaler W .....	103
4.6	Usage Notes .....	103
4.6.1	Note on Resonators.....	103
4.6.2	Notes on Board Design .....	105
4.6.3	Definition of Oscillation Stabilization Standby Time.....	106

4.6.4	Notes on Use of Resonator.....	108
4.6.5	Notes on H8/38104 Group.....	109
<b>Section 5 Power-Down Modes .....</b>		<b>111</b>
5.1	Register Descriptions .....	112
5.1.1	System Control Register 1 (SYSCR1) .....	112
5.1.2	System Control Register 2 (SYSCR2) .....	115
5.1.3	Clock Halt Registers 1 and 2 (CKSTPR1 and CKSTPR2) .....	116
5.2	Mode Transitions and States of LSI.....	118
5.2.1	Sleep Mode .....	122
5.2.2	Standby Mode .....	123
5.2.3	Watch Mode.....	123
5.2.4	Subsleep Mode.....	124
5.2.5	Subactive Mode .....	124
5.2.6	Active (Medium-Speed) Mode .....	125
5.3	Direct Transition .....	126
5.3.1	Direct Transition from Active (High-Speed) Mode to Active (Medium-Speed) Mode.....	127
5.3.2	Direct Transition from Active (Medium-Speed) Mode to Active (High-Speed) Mode .....	128
5.3.3	Direct Transition from Subactive Mode to Active (High-Speed) Mode.....	128
5.3.4	Direct Transition from Subactive Mode to Active (Medium-Speed) Mode .....	129
5.3.5	Notes on External Input Signal Changes before/after Direct Transition.....	129
5.4	Module Standby Function .....	130
5.5	Usage Notes .....	130
5.5.1	Standby Mode Transition and Pin States .....	130
5.5.2	Notes on External Input Signal Changes before/after Standby Mode.....	130
5.5.3	Contention Between Module Standby and Interrupts .....	132
<b>Section 6 ROM .....</b>		<b>133</b>
6.1	Block Diagram .....	133
6.2	H8/3802 PROM Mode .....	134
6.2.1	Setting to PROM Mode.....	134
6.2.2	Socket Adapter Pin Arrangement and Memory Map.....	134
6.3	H8/3802 Programming.....	137
6.3.1	Writing and Verifying.....	137
6.3.2	Programming Precautions .....	141
6.4	Reliability of Programmed Data .....	142
6.5	Overview of Flash Memory .....	143
6.5.1	Features.....	143
6.5.2	Block Diagram.....	144

6.5.3	Block Configuration .....	145
6.6	Register Descriptions .....	146
6.6.1	Flash Memory Control Register 1 (FLMCR1).....	147
6.6.2	Flash Memory Control Register 2 (FLMCR2).....	148
6.6.3	Erase Block Register (EBR) .....	148
6.6.4	Flash Memory Power Control Register (FLPWCR).....	149
6.6.5	Flash Memory Enable Register (FENR).....	149
6.7	On-Board Programming Modes.....	150
6.7.1	Boot Mode .....	150
6.7.2	Programming/Erasing in User Program Mode.....	153
6.7.3	Notes on On-Board Programming .....	154
6.8	Flash Memory Programming/Erasing .....	155
6.8.1	Program/Program-Verify .....	155
6.8.2	Erase/Erase-Verify .....	159
6.8.3	Interrupt Handling when Programming/Erasing Flash Memory.....	159
6.9	Program/Erase Protection .....	161
6.9.1	Hardware Protection .....	161
6.9.2	Software Protection.....	161
6.9.3	Error Protection.....	161
6.10	Programmer Mode .....	162
6.10.1	Socket Adapter.....	162
6.10.2	Programmer Mode Commands .....	162
6.10.3	Memory Read Mode .....	166
6.10.4	Auto-Program Mode .....	169
6.10.5	Auto-Erase Mode.....	171
6.10.6	Status Read Mode .....	172
6.10.7	Status Polling .....	174
6.10.8	Programmer Mode Transition Time .....	175
6.10.9	Notes on Memory Programming.....	175
6.11	Power-Down States for Flash Memory.....	176
 Section 7 RAM .....		 177
7.1	Block Diagram.....	178
 Section 8 I/O Ports.....		 179
8.1	Port 3.....	181
8.1.1	Port Data Register 3 (PDR3).....	182
8.1.2	Port Control Register 3 (PCR3) .....	182
8.1.3	Port Pull-Up Control Register 3 (PUCR3).....	183
8.1.4	Port Mode Register 3 (PMR3) .....	184
8.1.5	Port Mode Register 2 (PMR2) .....	185

8.1.6	Pin Functions .....	186
8.1.7	Input Pull-Up MOS.....	187
8.2	Port 4.....	188
8.2.1	Port Data Register 4 (PDR4).....	188
8.2.2	Port Control Register 4 (PCR4) .....	189
8.2.3	Serial Port Control Register (SPCR).....	189
8.2.4	Pin Functions .....	191
8.3	Port 5.....	192
8.3.1	Port Data Register 5 (PDR5).....	193
8.3.2	Port Control Register 5 (PCR5) .....	193
8.3.3	Port Pull-Up Control Register 5 (PUCR5).....	194
8.3.4	Port Mode Register 5 (PMR5) .....	194
8.3.5	Pin Functions .....	195
8.3.6	Input Pull-Up MOS.....	196
8.4	Port 6.....	196
8.4.1	Port Data Register 6 (PDR6).....	197
8.4.2	Port Control Register 6 (PCR6) .....	197
8.4.3	Port Pull-Up Control Register 6 (PUCR6).....	198
8.4.4	Pin Functions .....	198
8.4.5	Input Pull-Up MOS.....	199
8.5	Port 7.....	200
8.5.1	Port Data Register 7 (PDR7).....	200
8.5.2	Port Control Register 7 (PCR7) .....	201
8.5.3	Pin Functions .....	201
8.6	Port 8.....	202
8.6.1	Port Data Register 8 (PDR8).....	203
8.6.2	Port Control Register 8 (PCR8) .....	203
8.6.3	Pin Functions .....	204
8.7	Port 9.....	204
8.7.1	Port Data Register 9 (PDR9).....	205
8.7.2	Port Mode Register 9 (PMR9) .....	206
8.7.3	Pin Functions .....	206
8.8	Port A.....	207
8.8.1	Port Data Register A (PDRA).....	208
8.8.2	Port Control Register A (PCRA).....	208
8.8.3	Pin Functions .....	209
8.9	Port B.....	210
8.9.1	Port Data Register B (PDRB) .....	211
8.9.2	Port Mode Register B (PMRB).....	211
8.9.3	Pin Functions .....	212
8.10	Usage Notes .....	213



8.10.1	How to Handle Unused Pin.....	213
<b>Section 9 Timers.....</b>		
9.1	Overview.....	215
9.2	Timer A.....	217
9.2.1	Features.....	217
9.2.2	Register Descriptions.....	218
9.2.3	Operation.....	220
9.2.4	Timer A Operating States.....	220
9.3	Timer F.....	221
9.3.1	Features.....	221
9.3.2	Input/Output Pins.....	223
9.3.3	Register Descriptions.....	223
9.3.4	CPU Interface.....	227
9.3.5	Operation.....	229
9.3.6	Timer F Operating States.....	232
9.3.7	Usage Notes.....	232
9.4	Asynchronous Event Counter (AEC).....	236
9.4.1	Features.....	236
9.4.2	Input/Output Pins.....	238
9.4.3	Register Descriptions.....	238
9.4.4	Operation.....	245
9.4.5	Operating States of Asynchronous Event Counter.....	250
9.4.6	Usage Notes.....	250
9.5	Watchdog Timer.....	252
9.5.1	Features.....	252
9.5.2	Register Descriptions.....	253
9.5.3	Operation.....	256
9.5.4	Operating States of Watchdog Timer.....	258
<b>Section 10 Serial Communication Interface 3 (SCI3).....</b>		
10.1	Features.....	259
10.2	Input/Output Pins.....	261
10.3	Register Descriptions.....	261
10.3.1	Receive Shift Register (RSR).....	261
10.3.2	Receive Data Register (RDR).....	262
10.3.3	Transmit Shift Register (TSR).....	262
10.3.4	Transmit Data Register (TDR).....	262
10.3.5	Serial Mode Register (SMR).....	263
10.3.6	Serial Control Register 3 (SCR3).....	266
10.3.7	Serial Status Register (SSR).....	268

10.3.8	Bit Rate Register (BRR) .....	271
10.3.9	Serial Port Control Register (SPCR).....	276
10.4	Operation in Asynchronous Mode .....	277
10.4.1	Clock .....	278
10.4.2	SCI3 Initialization .....	282
10.4.3	Data Transmission .....	283
10.4.4	Serial Data Reception.....	285
10.5	Operation in Clocked Synchronous Mode .....	289
10.5.1	Clock .....	289
10.5.2	SCI3 Initialization .....	289
10.5.3	Serial Data Transmission .....	290
10.5.4	Serial Data Reception (Clocked Synchronous Mode).....	293
10.5.5	Simultaneous Serial Data Transmission and Reception.....	295
10.6	Interrupts .....	297
10.7	Usage Notes .....	299
10.7.1	Break Detection and Processing.....	299
10.7.2	Mark State and Break Sending.....	299
10.7.3	Receive Error Flags and Transmit Operations (Clocked Synchronous Mode Only).....	300
10.7.4	Receive Data Sampling Timing and Reception Margin in Asynchronous Mode .....	300
10.7.5	Note on Switching SCK32 Function.....	301
10.7.6	Relation between Writing to TDR and Bit TDRE .....	302
10.7.7	Relation between RDR Reading and bit RDRF .....	302
10.7.8	Transmit and Receive Operations when Making State Transition.....	303
10.7.9	Setting in Subactive or Subsleep Mode .....	303
10.7.10	Oscillator Use with Serial Communication Interface 3 in Asynchronous Mode (H8/38104 Group Only) .....	303
<b>Section 11</b>	<b>10-Bit PWM.....</b>	<b>305</b>
11.1	Features .....	305
11.2	Input/Output Pins .....	307
11.3	Register Descriptions .....	308
11.3.1	PWM Control Register (PWCR).....	308
11.3.2	PWM Data Registers U and L (PWDRU, PWDRL).....	310
11.4	Operation.....	311
11.4.1	Operation .....	311
11.4.2	PWM Operating States.....	312
<b>Section 12</b>	<b>A/D Converter.....</b>	<b>313</b>
12.1	Features .....	313

12.2	Input/Output Pins .....	315
12.3	Register Descriptions .....	315
12.3.1	A/D Result Registers H and L (ADRRH and ADDRRL).....	315
12.3.2	A/D Mode Register (AMR) .....	316
12.3.3	A/D Start Register (ADSR) .....	317
12.4	Operation .....	317
12.4.1	A/D Conversion .....	317
12.4.2	Operating States of A/D Converter .....	318
12.5	Example of Use.....	318
12.6	A/D Conversion Accuracy Definitions .....	321
12.7	Usage Notes .....	323
12.7.1	Permissible Signal Source Impedance .....	323
12.7.2	Influences on Absolute Accuracy .....	323
12.7.3	Additional Usage Notes .....	324
<b>Section 13 LCD Controller/Driver .....</b>		<b>325</b>
13.1	Features.....	325
13.2	Input/Output Pins .....	328
13.3	Register Descriptions .....	329
13.3.1	LCD Port Control Register (LPCR).....	329
13.3.2	LCD Control Register (LCR).....	332
13.3.3	LCD Control Register 2 (LCR2).....	334
13.4	Operation .....	335
13.4.1	Settings up to LCD Display .....	335
13.4.2	Relationship between LCD RAM and Display .....	337
13.4.3	Operation in Power-Down Modes .....	342
13.4.4	Boosting LCD Drive Power Supply.....	343
<b>Section 14 Power-On Reset and Low-Voltage Detection Circuits (H8/38104 Group Only) .....</b>		<b>345</b>
14.1	Features.....	345
14.2	Register Descriptions .....	347
14.2.1	Low-Voltage Detection Control Register (LVDCR) .....	347
14.2.2	Low-Voltage Detection Status Register (LVDSR) .....	349
14.2.3	Low-Voltage Detection Counter (LVDCNT) .....	350
14.3	Operation .....	350
14.3.1	Power-On Reset Circuit .....	350
14.3.2	Low-Voltage Detection Circuit.....	351
<b>Section 15 Power Supply Circuit (H8/38104 Group Only).....</b>		<b>359</b>
15.1	When Using Internal Power Supply Step-Down Circuit.....	359

15.2	When Not Using Internal Power Supply Step-Down Circuit.....	360
Section 16	List of Registers .....	361
16.1	Register Addresses (Address Order).....	362
16.2	Register Bits.....	366
16.3	Register States in Each Operating Mode.....	369
Section 17	Electrical Characteristics .....	373
17.1	Absolute Maximum Ratings of H8/3802 Group (ZTAT Version, Mask ROM Version).....	373
17.2	Electrical Characteristics of H8/3802 Group (ZTAT Version, Mask ROM Version).....	374
17.2.1	Power Supply Voltage and Operating Ranges .....	374
17.2.2	DC Characteristics .....	377
17.2.3	AC Characteristics .....	384
17.2.4	A/D Converter Characteristics .....	387
17.2.5	LCD Characteristics .....	389
17.3	Absolute Maximum Ratings of H8/38004 Group (F-ZTAT Version, Mask ROM Version), H8/38002S Group (Mask ROM Version).....	390
17.4	Electrical Characteristics of H8/38004 Group (F-ZTAT Version, Mask ROM Version), H8/38002S Group (Mask ROM Version).....	391
17.4.1	Power Supply Voltage and Operating Ranges .....	391
17.4.2	DC Characteristics .....	395
17.4.3	AC Characteristics .....	403
17.4.4	A/D Converter Characteristics .....	408
17.4.5	LCD Characteristics.....	410
17.4.6	Flash Memory Characteristics .....	411
17.4.7	Power Supply Characteristics .....	413
17.5	Absolute Maximum Ratings of H8/38104 Group (F-ZTAT Version, Mask ROM Version).....	414
17.6	Electrical Characteristics of H8/38104 Group (F-ZTAT Version, Mask ROM Version).....	415
17.6.1	Power Supply Voltage and Operating Ranges .....	415
17.6.2	DC Characteristics .....	419
17.6.3	AC Characteristics .....	428
17.6.4	A/D Converter Characteristics .....	430
17.6.5	LCD Characteristics.....	431
17.6.6	Flash Memory Characteristics .....	432
17.6.7	Power Supply Voltage Detection Circuit Characteristics .....	434
17.6.8	Power-On Reset Circuit Characteristics.....	437
17.6.9	Watchdog Timer Characteristics.....	438
17.6.10	Power Supply Characteristics .....	438

17.7	Operation Timing.....	439
17.8	Output Load Condition .....	440
17.9	Resonator Equivalent Circuit.....	441
17.10	Usage Note.....	442
Appendix A Instruction Set.....		443
A.1	Instruction List.....	443
A.2	Operation Code Map.....	454
A.3	Number of Execution States .....	456
Appendix B I/O Port Block Diagrams.....		463
B.1	Port 3 Block Diagrams.....	463
B.2	Port 4 Block Diagrams.....	467
B.3	Port 5 Block Diagram .....	471
B.4	Port 6 Block Diagram .....	472
B.5	Port 7 Block Diagram .....	473
B.6	Port 8 Block Diagram .....	474
B.7	Port 9 Block Diagrams.....	475
B.8	Port A Block Diagram.....	477
B.9	Port B Block Diagrams .....	478
Appendix C Port States in Each Operating State .....		481
Appendix D Product Code Lineup .....		482
Appendix E Package Dimensions .....		488
Appendix F Chip Form Specifications .....		493
Appendix G Bonding Pad Form .....		495
Appendix H Chip Tray Specifications .....		496
Main Revisions for This Edition .....		499
Index .....		509

# Figures

## Section 1 Overview

Figure 1.1	Internal Block Diagram of H8/3802 Group .....	4
Figure 1.2	Internal Block Diagram of H8/38004 and H8/38002S Group.....	5
Figure 1.3	Internal Block Diagram of H8/38104 Group .....	6
Figure 1.4	Pin Arrangement of H8/3802, H8/38004 and H8/38002S Group (FP-64A, FP-64E, FP-64K, TNP-64B) .....	7
Figure 1.5	Pin Arrangement of H8/3802 Group (DP-64S).....	8
Figure 1.6	Pin Arrangement of H8/38104 Group (FP-64A, FP-64E).....	9
Figure 1.7	Pad Arrangement of HCD6433802, HCD6433801, and HCD6433800 (Top View).....	10
Figure 1.8	Pad Arrangement of HCD64338004, HCD64338003, HCD64338002, HCD64338001, and HCD64338000 (Top View).....	13
Figure 1.9	Pad Arrangement of HCD64F38004 and HCD64F38002 (Top View).....	16

## Section 2 CPU

Figure 2.1(1)	H8/3802 Memory Map.....	24
Figure 2.1(2)	H8/3801 Memory Map.....	25
Figure 2.1(3)	H8/3800 Memory Map.....	26
Figure 2.1(4)	H8/38004, H8/38104 Memory Map.....	27
Figure 2.1(5)	H8/38003, H8/38103 Memory Map.....	28
Figure 2.1(6)	H8/38002, H8/38102 Memory Map.....	29
Figure 2.1(7)	H8/38002S Memory Map .....	30
Figure 2.1(8)	H8/38001, H8/38001S, H8/38101 Memory Map.....	31
Figure 2.1(9)	H8/38000, H8/38000S, H8/38100 Memory Map.....	32
Figure 2.2	CPU Registers .....	33
Figure 2.3	Stack Pointer .....	34
Figure 2.4	General Register Data Formats .....	37
Figure 2.5	Memory Data Formats .....	38
Figure 2.6	Instruction Formats of Data Transfer Instructions .....	42
Figure 2.7	Instruction Formats of Arithmetic, Logic, and Shift Instructions .....	45
Figure 2.8	Instruction Formats of Bit Manipulation Instructions.....	48
Figure 2.9	Instruction Formats of Branch Instructions.....	50
Figure 2.10	Instruction Formats of System Control Instructions .....	52
Figure 2.11	Instruction Format of Block Data Transfer Instructions .....	53
Figure 2.12	On-Chip Memory Access Cycle .....	60
Figure 2.13	On-Chip Peripheral Module Access Cycle (2-State Access) .....	61
Figure 2.14	On-Chip Peripheral Module Access Cycle (3-State Access) .....	62
Figure 2.15	CPU Operation States .....	63
Figure 2.16	State Transitions.....	64

Figure 2.17	Example of Timer Configuration with Two Registers Allocated to Same Address .....	66
-------------	---	----

### Section 3 Exception Handling

Figure 3.1	Reset Sequence .....	85
Figure 3.2	Stack Status after Exception Handling.....	87
Figure 3.3	Interrupt Sequence .....	88
Figure 3.4	Port Mode Register Setting and Interrupt Request Flag Clearing Procedure.....	92

### Section 4 Clock Pulse Generators

Figure 4.1	Block Diagram of Clock Pulse Generators (H8/3802, H8/38004, H8/38002S Group).....	93
Figure 4.2	Block Diagram of Clock Pulse Generators (H8/38104 Group).....	94
Figure 4.3	Block Diagram of System Clock Generator.....	96
Figure 4.4(1)	Typical Connection to Crystal Resonator (H8/3802 Group).....	96
Figure 4.4(2)	Typical Connection to Crystal Resonator (H8/38004, H8/38002S, H8/38104 Group).....	97
Figure 4.5	Equivalent Circuit of Crystal Resonator .....	97
Figure 4.6(1)	Typical Connection to Ceramic Resonator (H8/3802 Group).....	98
Figure 4.6(2)	Typical Connection to Ceramic Resonator (H8/38004, H8/38002S, H8/38104 Group).....	98
Figure 4.7	Example of External Clock Input.....	99
Figure 4.8	Block Diagram of Subclock Generator .....	100
Figure 4.9	Typical Connection to 32.768-kHz/38.4-kHz Crystal Resonator .....	101
Figure 4.10	Equivalent Circuit of 32.768-kHz/38.4-kHz Crystal Resonator .....	101
Figure 4.11	Pin Connection when Not Using Subclock.....	102
Figure 4.12	Pin Connection when Inputting External Clock.....	102
Figure 4.13	Example of Crystal and Ceramic Resonator Arrangement .....	104
Figure 4.14	Negative Resistor Measurement and Proposed Changes in Circuit .....	105
Figure 4.15	Example of Incorrect Board Design.....	105
Figure 4.16	Oscillation Stabilization Standby Time .....	107

### Section 5 Power-Down Modes

Figure 5.1	Mode Transition Diagram.....	119
Figure 5.2	Standby Mode Transition and Pin States .....	130
Figure 5.3	External Input Signal Capture when Signal Changes before/after Standby Mode or Watch Mode .....	131

### Section 6 ROM

Figure 6.1	Block Diagram of ROM (H8/3802) .....	133
Figure 6.2	Socket Adapter Pin Correspondence (with HN27C101).....	135

Figure 6.3	H8/3802 Memory Map in PROM Mode.....	136
Figure 6.4	High-Speed, High-Reliability Programming Flowchart.....	138
Figure 6.5	PROM Write/Verify Timing.....	141
Figure 6.6	Recommended Screening Procedure.....	142
Figure 6.7	Block Diagram of Flash Memory .....	144
Figure 6.8(1)	Block Configuration of 32-kbyte Flash Memory .....	145
Figure 6.8(2)	Block Configuration of 16-kbyte Flash Memory .....	146
Figure 6.9	Programming/Erasing Flowchart Example in User Program Mode.....	154
Figure 6.10	Program/Program-Verify Flowchart .....	157
Figure 6.11	Erase/Erase-Verify Flowchart.....	160
Figure 6.12(1)	Socket Adapter Pin Correspondence Diagram (H8/38004F, H8/38002F).....	164
Figure 6.12(2)	Socket Adapter Pin Correspondence Diagram (H8/38104F, H8/38102F).....	165
Figure 6.13	Timing Waveforms for Memory Read after Command Write.....	167
Figure 6.14	Timing Waveforms in Transition from Memory Read Mode to Another Mode .....	168
Figure 6.15	Timing Waveforms in $\overline{CE}$ and $\overline{OE}$ Enable State Read.....	168
Figure 6.16	Timing Waveforms in $\overline{CE}$ and $\overline{OE}$ Clock System Read.....	169
Figure 6.17	Timing Waveforms in Auto-Program Mode.....	170
Figure 6.18	Timing Waveforms in Auto-Erase Mode.....	172
Figure 6.19	Timing Waveforms in Status Read Mode.....	173
Figure 6.20	Oscillation Stabilization Time, Boot Program Transfer Time, and Power-Down Sequence .....	175

## Section 7 RAM

Figure 7.1	Block Diagram of RAM (H8/3802).....	178
------------	-------------------------------------	-----

## Section 8 I/O Ports

Figure 8.1	Port 3 Pin Configuration .....	181
Figure 8.2	Port 4 Pin Configuration .....	188
Figure 8.3	Input/Output Data Inversion Function .....	189
Figure 8.4	Port 5 Pin Configuration .....	192
Figure 8.5	Port 6 Pin Configuration .....	196
Figure 8.6	Port 7 Pin Configuration .....	200
Figure 8.7	Port 8 Pin Configuration .....	202
Figure 8.8	Port 9 Pin Configuration .....	204
Figure 8.9	Port A Pin Configuration .....	207
Figure 8.10	Port B Pin Configuration.....	210

## Section 9 Timers

Figure 9.1	Block Diagram of Timer A .....	218
Figure 9.2	Block Diagram of Timer F.....	222



Figure 9.3	Write Access to TCF (CPU → TCF) .....	228
Figure 9.4	Read Access to TCF (TCF → CPU) .....	229
Figure 9.5	TMOFH/TMOFL Output Timing .....	231
Figure 9.6	Clear Interrupt Request Flag when Interrupt Source Generation Signal Is Valid.....	235
Figure 9.7	Block Diagram of Asynchronous Event Counter.....	237
Figure 9.8	Example of Software Processing when Using ECH and ECL as 16-Bit Event Counter.....	246
Figure 9.9	Example of Software Processing when Using ECH and ECL as 8-Bit Event Counters .....	247
Figure 9.10	Event Counter Operation Waveform .....	248
Figure 9.11	Example of Clock Control Operation .....	249
Figure 9.12(1)	Block Diagram of Watchdog Timer (H8/38004, H8/38002S Group).....	252
Figure 9.12(2)	Block Diagram of Watchdog Timer (H8/38104 Group).....	253
Figure 9.13	Example of Watchdog Timer Operation .....	257

### **Section 10 Serial Communication Interface 3 (SCI3)**

Figure 10.1	Block Diagram of SCI3 .....	260
Figure 10.2	Data Format in Asynchronous Communication.....	277
Figure 10.3	Relationship between Output Clock and Transfer Data Phase (Asynchronous Mode) (Example with 8-Bit Data, Parity, Two Stop Bits).....	278
Figure 10.4	Sample SCI3 Initialization Flowchart.....	282
Figure 10.5	Example SCI3 Operation in Transmission in Asynchronous Mode (8-Bit Data, Parity, One Stop Bit).....	283
Figure 10.6	Sample Serial Transmission Flowchart (Asynchronous Mode).....	284
Figure 10.7	Example SCI3 Operation in Reception in Asynchronous Mode (8-Bit Data, Parity, One Stop Bit).....	286
Figure 10.8	Sample Serial Data Reception Flowchart (Asynchronous Mode) (1) .....	287
Figure 10.8	Sample Serial Data Reception Flowchart (Asynchronous Mode) (2) .....	288
Figure 10.9	Data Format in Clocked Synchronous Communication.....	289
Figure 10.10	Example of SCI3 Operation in Transmission in Clocked Synchronous Mode ...	291
Figure 10.11	Sample Serial Transmission Flowchart (Clocked Synchronous Mode).....	292
Figure 10.12	Example of SCI3 Reception Operation in Clocked Synchronous Mode.....	293
Figure 10.13	Sample Serial Reception Flowchart (Clocked Synchronous Mode) .....	294
Figure 10.14	Sample Flowchart of Simultaneous Serial Transmit and Receive Operations (Clocked Synchronous Mode) .....	296
Figure 10.15(a)	RDRF Setting and RXI Interrupt .....	298
Figure 10.15(b)	TDRE Setting and TXI Interrupt .....	299
Figure 10.15(c)	TEND Setting and TEI Interrupt.....	299
Figure 10.16	Receive Data Sampling Timing in Asynchronous Mode.....	301
Figure 10.17	Relation between RDR Read Timing and Data .....	302

## Section 11 10-Bit PWM

Figure 11.1(1) Block Diagram of 10-Bit PWM (H8/3802 Group, H8/38004 Group, H8/38002S Group).....	306
Figure 11.1(2) Block Diagram of 10-Bit PWM (H8/38104 Group) .....	307
Figure 11.2 Waveform Output by 10-Bit PWM.....	312

## Section 12 A/D Converter

Figure 12.1 Block Diagram of A/D Converter .....	314
Figure 12.2 Example of A/D Conversion Operation .....	319
Figure 12.3 Flowchart of Procedure for Using A/D Converter (Polling by Software).....	320
Figure 12.4 Flowchart of Procedure for Using A/D Converter (Interrupts Used).....	320
Figure 12.5 A/D Conversion Accuracy Definitions (1).....	322
Figure 12.6 A/D Conversion Accuracy Definitions (2).....	322
Figure 12.7 Example of Analog Input Circuit .....	323

## Section 13 LCD Controller/Driver

Figure 13.1(1) Block Diagram of LCD Controller/Driver (H8/3802 Group, H8/38004 Group, H8/38002S Group).....	326
Figure 13.1(2) Block Diagram of LCD Controller/Driver (H8/38104 Group) .....	327
Figure 13.2 Handling of LCD Drive Power Supply when Using 1/2 Duty .....	335
Figure 13.3 LCD RAM Map (1/4 Duty).....	337
Figure 13.4 LCD RAM Map (1/3 Duty).....	338
Figure 13.5 LCD RAM Map (1/2 Duty).....	338
Figure 13.6 LCD RAM Map (Static Mode) .....	339
Figure 13.7 Output Waveforms for Each Duty Cycle (A Waveform).....	340
Figure 13.8 Output Waveforms for Each Duty Cycle (B Waveform).....	341
Figure 13.9 Connection of External Split-Resistance.....	343

## Section 14 Power-On Reset and Low-Voltage Detection Circuits (H8/38104 Group Only)

Figure 14.1 Block Diagram of Power-On Reset Circuit and Low-Voltage Detection Circuit .....	346
Figure 14.2 Operational Timing of Power-On Reset Circuit.....	351
Figure 14.3 Operational Timing of LVDR Circuit.....	352
Figure 14.4 Operational Timing of LVDI Circuit .....	353
Figure 14.5 Operational Timing of Low-Voltage Detection Interrupt Circuit (Using Pins Vref, extD, and extU) .....	354
Figure 14.6 LVD Function Usage Example Employing Pins Vref, extD, and extU .....	355
Figure 14.7 Timing for Operation/Release of Low-Voltage Detection Circuit.....	357

## Section 15 Power Supply Circuit (H8/38104 Group Only)

Figure 15.1 Power Supply Connection when Internal Step-Down Circuit Is Used.....	359
--	-----