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# Addendum for New QFN Package Migration

This addendum provides the changes to the 98A case outline numbers for products covered in this book. Case outlines were changed because of the migration from gold wire to copper wire in some packages. See the table below for the old (gold wire) package versus the new (copper wire) package.

To view the new drawing, go to [Freescale.com](http://Freescale.com) and search on the new 98A package number for your device.

For more information about QFN package use, see EB806: *Electrical Connection Recommendations for the Exposed Pad on QFN and DFN Packages*.

Part Number	Package Description	Original (gold wire) package document number	Current (copper wire) package document number
MC68HC908JW32	48 QFN	98ARH99048A	98ASA00466D
MC9S08AC16			
MC9S908AC60			
MC9S08AC128			
MC9S08AW60			
MC9S08GB60A			
MC9S08GT16A			
MC9S08JM16			
MC9S08JM60			
MC9S08LL16			
MC9S08QE128			
MC9S08QE32			
MC9S08RG60			
MCF51CN128			
MC9RS08LA8	48 QFN	98ARL10606D	98ASA00466D
MC9S08GT16A	32 QFN	98ARH99035A	98ASA00473D
MC9S908QE32	32 QFN	98ARE10566D	98ASA00473D
MC9S908QE8	32 QFN	98ASA00071D	98ASA00736D
MC9S08JS16	24 QFN	98ARL10608D	98ASA00734D
MC9S08QB8			
MC9S08QG8	24 QFN	98ARL10605D	98ASA00474D
MC9S08SH8	24 QFN	98ARE10714D	98ASA00474D
MC9RS08KB12	24 QFN	98ASA00087D	98ASA00602D
MC9S08QG8	16 QFN	98ARE10614D	98ASA00671D
MC9RS08KB12	8 DFN	98ARL10557D	98ASA00672D
MC9S08QG8			
MC9RS08KA2	6 DFN	98ARL10602D	98ASA00735D

# MC9S08SH8 Datasheet

This is the MC9S08SH8 datasheet set consisting of the following files:

- MC9S08SH8 Datasheet Addendum, Rev 1
- MC9S08SH8 Datasheet, Rev 3

# MC9S08SH8 Datasheet Addendum

This addendum describes corrections or updates to the *MC9S08SH8 Datasheet*, file named as MC9S08SH8. Please check our website at <http://www.freescale.com/>, for the latest updates.

The current version available of the *MC9S08SH8 Datasheet* is Revision 3.0.

## Table of Contents

1	Addendum for Revision 3.0. ....	2
2	Revision History .....	2

# 1 Addendum for Revision 3.0

**Table 1. MC9S08SH8 Rev 3.0 Addendum**

Location	Description
Section "Control Timing" for Appendix A "Electrical Characteristics"	In "Control Timing" table, changed minimum value of "Internal low power oscillator period" parameter from 800 $\mu$ s to 700 $\mu$ s. This value is under 5V VDD, -40 °C to 125 °C temperature range condition.

# 2 Revision History

Table 2 provides a revision history for this document.

**Table 2. Revision History Table**

Rev. Number	Substantive Changes	Date of Release
1.0	Initial release. Changed minimum value of "Internal low power oscillator period" parameter from 800 $\mu$ s to 700 $\mu$ s, in "Control Timing" table.	05/2012



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**MC9S08SH8**

**MC9S08SH4**

Data Sheet

***HCS08***  
***Microcontrollers***

MC9S08SH8  
Rev. 3  
6/2008

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# MC9S08SH8 Features

## 8-Bit HCS08 Central Processor Unit (CPU)

- 40-MHz HCS08 CPU (central processor unit)
- HC08 instruction set with added BGND instruction
- Support for up to 32 interrupt/reset sources

## On-Chip Memory

- FLASH read/program/erase over full operating voltage and temperature
- Random-access memory (RAM)

## Power-Saving Modes

- Two very low power stop modes
- Reduced power wait mode
- Very low power real time interrupt for use in run, wait, and stop

## Clock Source Options

- Oscillator (XOSC) — Loop-control Pierce oscillator; Crystal or ceramic resonator range of 31.25 kHz to 38.4 kHz or 1 MHz to 16 MHz
- Internal Clock Source (ICS) — Internal clock source module containing a frequency-locked loop (FLL) controlled by internal or external reference; precision trimming of internal reference allows 0.2% resolution and 2% deviation over temperature and voltage; supports bus frequencies from 2 MHz to 20 MHz.

## System Protection

- Watchdog computer operating properly (COP) reset with opti/n to run from dedicated 1-kHz internal clock source or bus clock
- Low-voltage detection with reset or interrupt; selectable trip points
- Illegal opcode detection with reset
- Illegal address detection with reset
- FLASH block protect

## Development Support

- Single-wire background debug interface
- Breakpoint capability to allow single breakpoint setting during in-circuit debugging (pluss two more breakpoints in on-chip debug module)
- On-chip, in-circuit emulation (ICE) debug module containing two comparators and nine trigger modes. Eight deep FIFO for storing change-of-flow address and event-only data. Debug module supports both tag and force breakpoints.

## Peripherals

- **ADC** — 12-channel, 10-bit resolution, 2.5  $\mu$ s conversion time, automatic compare function, temperature sensor, internal bandgap reference channel; runs in stop3
- **ACMP** — Analog comparator with selectable interrupt on rising, falling, or either edge of comparator output; compare option to fixed internal bandgap reference voltage; output can be optionally routed to TPM module; runs in stop3
- **SCI** — Full duplex non-return to zero (NRZ); LIN master extended break generation; LIN slave extended break detection; wake up on active edge
- **SPI** — Full-duplex or single-wire bidirectional; Double-buffered transmit and receive; Master or Slave mode; MSB-first or LSB-first shifting
- **IIC** — Up to 100 kbps with maximum bus loading; Multi-master operation; Programmable slave address; Interrupt driven byte-by-byte data transfer; supports broadcast mode and 10-bit addressing
- **MTIM** — 8-bit modulo counter with 8-bit prescaler and overflow interrupt
- **TPMx** — Two 2-channel timer pwm modules (TPM1, TPM2); Selectable input capture, output compare, or buffered edge- or center-aligned PWM on each channel
- **RTC** — (Real-time counter) 8-bit modulus counter with binary or decimal based prescaler; External clock source for precise time base, time-of-day, calendar or task scheduling functions; Free running on-chip low power oscillator (1 kHz) for cyclic wake-up without external components, runs in all MCU modes

## Input/Output

- 17 general purpose I/O pins (GPIOs) and 1 output-only pin
- 8 interrupt pins with selectable polarity
- Ganged output option for PTB[5:2] and PTC[3:0]; allows single write to change state of multiple pins
- Hysteresis and configurable pull up device on all input pins; Configurable slew rate and drive strength on all output pins.

## Package Options

- 24-QFN, 20-TSSOP, 20-SOIC, 20-PDIP, 16-TSSOP, 8-SOIC



# MC9S08SH8 Data Sheet

Covers MC9S08SH8  
MC9S08SH4

MC9S08SH8  
Rev. 3  
6/2008

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## Revision History

To provide the most up-to-date information, the revision of our documents on the World Wide Web will be the most current. Your printed copy may be an earlier revision. To verify you have the latest information available, refer to:

<http://freescale.com/>

The following revision history table summarizes changes contained in this document.

Revision Number	Revision Date	Description of Changes
0.01	3/08/2006	Initial review copy
1	11/2007	Updated Electricals and incorporated revisions from Project sync issues: 2394, 2600, 2601, and 2764.
2	3/2008	Corrected SPI module to be version 3. Incorporated fixes for Project Sync issues: 2394, 2600, 2601, 2764, 3237, and 3279; as well as, ADC Temperature Sensor issues 3331 and 3335. Adjusted Features page leading and fixed minor grammatical errors. Added 20-SOIC package option for the C temp only. Corrected package drawing number for 24-QFN.
3	6/2008	Added ICS over Temperature graph to Electricals. Resolved final TBDs.

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## List of Chapters

<b>Chapter 1</b>	<b>Device Overview .....</b>	<b>19</b>
<b>Chapter 2</b>	<b>Pins and Connections .....</b>	<b>23</b>
<b>Chapter 3</b>	<b>Modes of Operation .....</b>	<b>31</b>
<b>Chapter 4</b>	<b>Memory .....</b>	<b>37</b>
<b>Chapter 5</b>	<b>Resets, Interrupts, and General System Control.....</b>	<b>59</b>
<b>Chapter 6</b>	<b>Parallel Input/Output Control.....</b>	<b>75</b>
<b>Chapter 7</b>	<b>Central Processor Unit (S08CPUV2) .....</b>	<b>93</b>
<b>Chapter 8</b>	<b>Analog Comparator 5-V (S08ACMPV2).....</b>	<b>113</b>
<b>Chapter 9</b>	<b>Analog-to-Digital Converter (S08ADCV1).....</b>	<b>121</b>
<b>Chapter 10</b>	<b>Internal Clock Source (S08ICSV2).....</b>	<b>149</b>
<b>Chapter 11</b>	<b>Inter-Integrated Circuit (S08IICV2) .....</b>	<b>163</b>
<b>Chapter 12</b>	<b>Modulo Timer (S08MTIMV1).....</b>	<b>183</b>
<b>Chapter 13</b>	<b>Real-Time Counter (S08RTCV1) .....</b>	<b>193</b>
<b>Chapter 14</b>	<b>Serial Communications Interface (S08SCIV4).....</b>	<b>203</b>
<b>Chapter 15</b>	<b>Serial Peripheral Interface (S08SPIV3) .....</b>	<b>223</b>
<b>Chapter 16</b>	<b>Timer Pulse-Width Modulator (S08TPMV3).....</b>	<b>239</b>
<b>Chapter 17</b>	<b>Development Support .....</b>	<b>267</b>
<b>Appendix A</b>	<b>Electrical Characteristics .....</b>	<b>289</b>
<b>Appendix B</b>	<b>Ordering Information and Mechanical Drawings.....</b>	<b>319</b>





# Contents

Section Number	Title	Page
<b>Chapter 1</b>		
<b>Device Overview</b>		
1.1	Devices in the MC9S08SH8 Series .....	19
1.2	MCU Block Diagram .....	20
1.3	System Clock Distribution .....	22
<b>Chapter 2</b>		
<b>Pins and Connections</b>		
2.1	Device Pin Assignment .....	23
2.2	Recommended System Connections .....	24
2.2.1	Power .....	25
2.2.2	Oscillator (XOSC) .....	26
2.2.3	RESET .....	26
2.2.4	Background / Mode Select (BKGD/MS) .....	27
2.2.5	General-Purpose I/O and Peripheral Ports .....	27
<b>Chapter 3</b>		
<b>Modes of Operation</b>		
3.1	Introduction .....	31
3.2	Features .....	31
3.3	Run Mode .....	31
3.4	Active Background Mode .....	31
3.5	Wait Mode .....	32
3.6	Stop Modes .....	32
3.6.1	Stop3 Mode .....	33
3.6.2	Stop2 Mode .....	34
3.6.3	On-Chip Peripheral Modules in Stop Modes .....	34
<b>Chapter 4</b>		
<b>Memory</b>		
4.1	MC9S08SH8 Memory Map .....	37
4.2	Reset and Interrupt Vector Assignments .....	38
4.3	Register Addresses and Bit Assignments .....	39
4.4	RAM .....	46
4.5	FLASH .....	46
4.5.1	Features .....	47
4.5.2	Program and Erase Times .....	47

Section Number	Title	Page
4.5.3	Program and Erase Command Execution .....	48
4.5.4	Burst Program Execution .....	49
4.5.5	Access Errors .....	51
4.5.6	FLASH Block Protection .....	51
4.5.7	Vector Redirection .....	52
4.6	Security .....	52
4.7	FLASH Registers and Control Bits .....	53
4.7.1	FLASH Clock Divider Register (FCDIV) .....	54
4.7.2	FLASH Options Register (FOPT and NVOPT) .....	55
4.7.3	FLASH Configuration Register (FCNFG) .....	56
4.7.4	FLASH Protection Register (FPROT and NVPROT) .....	56
4.7.5	FLASH Status Register (FSTAT) .....	57
4.7.6	FLASH Command Register (FCMD) .....	58

## Chapter 5 Resets, Interrupts, and General System Control

5.1	Introduction .....	59
5.2	Features .....	59
5.3	MCU Reset .....	59
5.4	Computer Operating Properly (COP) Watchdog .....	60
5.5	Interrupts .....	61
5.5.1	Interrupt Stack Frame .....	62
5.5.2	External Interrupt Request Pin (IRQ) .....	63
5.5.3	Interrupt Vectors, Sources, and Local Masks .....	63
5.6	Low-Voltage Detect (LVD) System .....	65
5.6.1	Power-On Reset Operation .....	65
5.6.2	Low-Voltage Detection (LVD) Reset Operation .....	65
5.6.3	Low-Voltage Warning (LVW) Interrupt Operation .....	65
5.7	Reset, Interrupt, and System Control Registers and Control Bits .....	65
5.7.1	Interrupt Pin Request Status and Control Register (IRQSC) .....	66
5.7.2	System Reset Status Register (SRS) .....	67
5.7.3	System Background Debug Force Reset Register (SBDFR) .....	68
5.7.4	System Options Register 1 (SOPT1) .....	69
5.7.5	System Options Register 2 (SOPT2) .....	70
5.7.6	System Device Identification Register (SDIDH, SDIDL) .....	71
5.7.7	System Power Management Status and Control 1 Register (SPMSC1) .....	72
5.7.8	System Power Management Status and Control 2 Register (SPMSC2) .....	73

## Chapter 6 Parallel Input/Output Control

6.1	Port Data and Data Direction .....	75
6.2	Pull-up, Slew Rate, and Drive Strength .....	76

Section Number	Title	Page
6.3	Ganged Output .....	77
6.4	Pin Interrupts .....	78
6.4.1	Edge Only Sensitivity .....	78
6.4.2	Edge and Level Sensitivity .....	78
6.4.3	Pull-up/Pull-down Resistors .....	79
6.4.4	Pin Interrupt Initialization .....	79
6.5	Pin Behavior in Stop Modes .....	79
6.6	Parallel I/O and Pin Control Registers .....	79
6.6.1	Port A Registers .....	80
6.6.2	Port B Registers .....	85
6.6.3	Port C Registers .....	89

## Chapter 7 Central Processor Unit (S08CPUV2)

7.1	Introduction .....	93
7.1.1	Features .....	93
7.2	Programmer's Model and CPU Registers .....	94
7.2.1	Accumulator (A) .....	94
7.2.2	Index Register (H:X) .....	94
7.2.3	Stack Pointer (SP) .....	95
7.2.4	Program Counter (PC) .....	95
7.2.5	Condition Code Register (CCR) .....	95
7.3	Addressing Modes .....	97
7.3.1	Inherent Addressing Mode (INH) .....	97
7.3.2	Relative Addressing Mode (REL) .....	97
7.3.3	Immediate Addressing Mode (IMM) .....	97
7.3.4	Direct Addressing Mode (DIR) .....	97
7.3.5	Extended Addressing Mode (EXT) .....	98
7.3.6	Indexed Addressing Mode .....	98
7.4	Special Operations .....	99
7.4.1	Reset Sequence .....	99
7.4.2	Interrupt Sequence .....	99
7.4.3	Wait Mode Operation .....	100
7.4.4	Stop Mode Operation .....	100
7.4.5	BGND Instruction .....	101
7.5	HCS08 Instruction Set Summary .....	102

## Chapter 8 Analog Comparator 5-V (S08ACMPV2)

8.1	Introduction .....	113
8.1.1	ACMP Configuration Information .....	113
8.1.2	ACMP in Stop3 Mode .....	113

Section Number	Title	Page
8.1.3	ACMP/TPM Configuration Information .....	113
8.1.4	Features .....	115
8.1.5	Modes of Operation .....	115
8.1.6	Block Diagram .....	115
8.2	External Signal Description .....	117
8.3	Memory Map .....	117
8.3.1	Register Descriptions .....	117
8.4	Functional Description .....	119

## Chapter 9 Analog-to-Digital Converter (S08ADCV1)

9.1	Introduction .....	121
9.1.1	Channel Assignments .....	121
9.1.2	Alternate Clock .....	122
9.1.3	Hardware Trigger .....	122
9.1.4	Temperature Sensor .....	122
9.1.5	Features .....	125
9.1.6	Block Diagram .....	125
9.2	External Signal Description .....	126
9.2.1	Analog Power ( $V_{DDAD}$ ) .....	127
9.2.2	Analog Ground ( $V_{SSAD}$ ) .....	127
9.2.3	Voltage Reference High ( $V_{REFH}$ ) .....	127
9.2.4	Voltage Reference Low ( $V_{REFL}$ ) .....	127
9.2.5	Analog Channel Inputs ( $ADx$ ) .....	127
9.3	Register Definition .....	127
9.3.1	Status and Control Register 1 (ADCSC1) .....	127
9.3.2	Status and Control Register 2 (ADCSC2) .....	129
9.3.3	Data Result High Register (ADCRH) .....	130
9.3.4	Data Result Low Register (ADCRL) .....	130
9.3.5	Compare Value High Register (ADCCVH) .....	131
9.3.6	Compare Value Low Register (ADCCVL) .....	131
9.3.7	Configuration Register (ADCCFG) .....	131
9.3.8	Pin Control 1 Register (APCTL1) .....	133
9.3.9	Pin Control 2 Register (APCTL2) .....	134
9.3.10	Pin Control 3 Register (APCTL3) .....	135
9.4	Functional Description .....	136
9.4.1	Clock Select and Divide Control .....	136
9.4.2	Input Select and Pin Control .....	137
9.4.3	Hardware Trigger .....	137
9.4.4	Conversion Control .....	137
9.4.5	Automatic Compare Function .....	140
9.4.6	MCU Wait Mode Operation .....	140

Section Number	Title	Page
9.4.7	MCU Stop3 Mode Operation .....	140
9.4.8	MCU Stop1 and Stop2 Mode Operation .....	141
9.5	Initialization Information .....	141
9.5.1	ADC Module Initialization Example .....	141
9.6	Application Information .....	143
9.6.1	External Pins and Routing .....	143
9.6.2	Sources of Error .....	145

## Chapter 10 Internal Clock Source (S08ICSV2)

10.1	Introduction .....	149
10.1.1	Module Configuration .....	149
10.1.2	Features .....	151
10.1.3	Block Diagram .....	151
10.1.4	Modes of Operation .....	152
10.2	External Signal Description .....	153
10.3	Register Definition .....	153
10.3.1	ICS Control Register 1 (ICSC1) .....	154
10.3.2	ICS Control Register 2 (ICSC2) .....	155
10.3.3	ICS Trim Register (ICSTRM) .....	156
10.3.4	ICS Status and Control (ICSSC) .....	156
10.4	Functional Description .....	157
10.4.1	Operational Modes .....	157
10.4.2	Mode Switching .....	159
10.4.3	Bus Frequency Divider .....	160
10.4.4	Low Power Bit Usage .....	160
10.4.5	Internal Reference Clock .....	160
10.4.6	Optional External Reference Clock .....	160
10.4.7	Fixed Frequency Clock .....	161

## Chapter 11 Inter-Integrated Circuit (S08IICV2)

11.1	Introduction .....	163
11.1.1	Module Configuration .....	163
11.1.2	Features .....	165
11.1.3	Modes of Operation .....	165
11.1.4	Block Diagram .....	166
11.2	External Signal Description .....	166
11.2.1	SCL — Serial Clock Line .....	166
11.2.2	SDA — Serial Data Line .....	166
11.3	Register Definition .....	166
11.3.1	IIC Address Register (IICA) .....	167



Section Number	Title	Page
11.3.2	IIC Frequency Divider Register (IICF) .....	167
11.3.3	IIC Control Register (IICC1) .....	170
11.3.4	IIC Status Register (IICS) .....	171
11.3.5	IIC Data I/O Register (IICD) .....	172
11.3.6	IIC Control Register 2 (IICC2) .....	172
11.4	Functional Description .....	173
11.4.1	IIC Protocol .....	173
11.4.2	10-bit Address .....	177
11.4.3	General Call Address .....	178
11.5	Resets .....	178
11.6	Interrupts .....	178
11.6.1	Byte Transfer Interrupt .....	178
11.6.2	Address Detect Interrupt .....	178
11.6.3	Arbitration Lost Interrupt .....	178
11.7	Initialization/Application Information .....	180

## Chapter 12 Modulo Timer (S08MTIMV1)

12.1	Introduction .....	183
12.1.1	MTIM Configuration Information .....	183
12.1.2	Features .....	185
12.1.3	Modes of Operation .....	185
12.1.4	Block Diagram .....	186
12.2	External Signal Description .....	186
12.3	Register Definition .....	187
12.3.1	MTIM Status and Control Register (MTIMSC) .....	188
12.3.2	MTIM Clock Configuration Register (MTIMCLK) .....	189
12.3.3	MTIM Counter Register (MTIMCNT) .....	190
12.3.4	MTIM Modulo Register (MTIMMOD) .....	190
12.4	Functional Description .....	191
12.4.1	MTIM Operation Example .....	192

## Chapter 13 Real-Time Counter (S08RTCV1)

13.1	Introduction .....	193
13.1.1	Features .....	195
13.1.2	Modes of Operation .....	195
13.1.3	Block Diagram .....	196
13.2	External Signal Description .....	196
13.3	Register Definition .....	196
13.3.1	RTC Status and Control Register (RTCSC) .....	197
13.3.2	RTC Counter Register (RTCCNT) .....	198

Section Number	Title	Page
13.3.3	RTC Modulo Register (RTCMOD) .....	198
13.4	Functional Description .....	198
13.4.1	RTC Operation Example .....	199
13.5	Initialization/Application Information .....	200

## Chapter 14 Serial Communications Interface (S08SCIV4)

14.1	Introduction .....	203
14.1.1	Features .....	205
14.1.2	Modes of Operation .....	205
14.1.3	Block Diagram .....	206
14.2	Register Definition .....	208
14.2.1	SCI Baud Rate Registers (SCIxBDH, SCIxBDL) .....	208
14.2.2	SCI Control Register 1 (SCIxC1) .....	209
14.2.3	SCI Control Register 2 (SCIxC2) .....	210
14.2.4	SCI Status Register 1 (SCIxS1) .....	211
14.2.5	SCI Status Register 2 (SCIxS2) .....	213
14.2.6	SCI Control Register 3 (SCIxC3) .....	214
14.2.7	SCI Data Register (SCIxD) .....	215
14.3	Functional Description .....	215
14.3.1	Baud Rate Generation .....	215
14.3.2	Transmitter Functional Description .....	216
14.3.3	Receiver Functional Description .....	217
14.3.4	Interrupts and Status Flags .....	219
14.3.5	Additional SCI Functions .....	220

## Chapter 15 Serial Peripheral Interface (S08SPIV3)

15.1	Introduction .....	223
15.1.1	Features .....	225
15.1.2	Block Diagrams .....	225
15.1.3	SPI Baud Rate Generation .....	227
15.2	External Signal Description .....	228
15.2.1	SPSCK — SPI Serial Clock .....	228
15.2.2	MOSI — Master Data Out, Slave Data In .....	228
15.2.3	MISO — Master Data In, Slave Data Out .....	228
15.2.4	$\overline{SS}$ — Slave Select .....	228
15.3	Modes of Operation .....	229
15.3.1	SPI in Stop Modes .....	229
15.4	Register Definition .....	229
15.4.1	SPI Control Register 1 (SPIC1) .....	229
15.4.2	SPI Control Register 2 (SPIC2) .....	230

Section Number	Title	Page
15.4.3	SPI Baud Rate Register (SPIBR) .....	231
15.4.4	SPI Status Register (SPIS) .....	232
15.4.5	SPI Data Register (SPID) .....	233
15.5	Functional Description .....	234
15.5.1	SPI Clock Formats .....	234
15.5.2	SPI Interrupts .....	237
15.5.3	Mode Fault Detection .....	237

## Chapter 16 Timer Pulse-Width Modulator (S08TPMV3)

16.1	Introduction .....	239
16.1.1	ACMP/TPM Configuration Information .....	239
16.1.2	TPM Configuration Information .....	239
16.1.3	Features .....	241
16.1.4	Modes of Operation .....	241
16.1.5	Block Diagram .....	242
16.2	Signal Description .....	244
16.2.1	Detailed Signal Descriptions .....	244
16.3	Register Definition .....	248
16.3.1	TPM Status and Control Register (TPMxSC) .....	248
16.3.2	TPM-Counter Registers (TPMxCNTH:TPMxCNTL) .....	249
16.3.3	TPM Counter Modulo Registers (TPMxMODH:TPMxMODL) .....	250
16.3.4	TPM Channel n Status and Control Register (TPMxCnSC) .....	251
16.3.5	TPM Channel Value Registers (TPMxCnVH:TPMxCnVL) .....	253
16.4	Functional Description .....	254
16.4.1	Counter .....	255
16.4.2	Channel Mode Selection .....	256
16.5	Reset Overview .....	260
16.5.1	General .....	260
16.5.2	Description of Reset Operation .....	260
16.6	Interrupts .....	260
16.6.1	General .....	260
16.6.2	Description of Interrupt Operation .....	260
16.7	The Differences from TPM v2 to TPM v3 .....	262

## Chapter 17 Development Support

17.1	Introduction .....	267
17.1.1	Forcing Active Background .....	267
17.1.2	Features .....	268
17.2	Background Debug Controller (BDC) .....	268
17.2.1	BKGD Pin Description .....	269

Section Number	Title	Page
17.2.2	Communication Details .....	270
17.2.3	BDC Commands .....	274
17.2.4	BDC Hardware Breakpoint .....	276
17.3	On-Chip Debug System (DBG) .....	277
17.3.1	Comparators A and B .....	277
17.3.2	Bus Capture Information and FIFO Operation .....	277
17.3.3	Change-of-Flow Information .....	278
17.3.4	Tag vs. Force Breakpoints and Triggers .....	278
17.3.5	Trigger Modes .....	279
17.3.6	Hardware Breakpoints .....	281
17.4	Register Definition .....	281
17.4.1	BDC Registers and Control Bits .....	281
17.4.2	System Background Debug Force Reset Register (SBDFR) .....	283
17.4.3	DBG Registers and Control Bits .....	284

## Appendix A Electrical Characteristics

A.1	Introduction .....	289
A.2	Parameter Classification .....	289
A.3	Absolute Maximum Ratings .....	289
A.4	Thermal Characteristics .....	291
A.5	ESD Protection and Latch-Up Immunity .....	293
A.6	DC Characteristics .....	294
A.7	Supply Current Characteristics .....	298
A.8	External Oscillator (XOSC) Characteristics .....	301
A.9	Internal Clock Source (ICS) Characteristics .....	303
A.10	Analog Comparator (ACMP) Electricals .....	305
A.11	ADC Characteristics .....	306
A.12	AC Characteristics .....	309
	A.12.1 Control Timing .....	309
	A.12.2 TPM/MTIM Module Timing .....	311
	A.12.3 SPI .....	312
A.13	FLASH Specifications .....	315
A.14	EMC Performance .....	316
	A.14.1 Radiated Emissions .....	316
	A.14.2 Conducted Transient Susceptibility .....	316

## Appendix B Ordering Information and Mechanical Drawings

B.1	Ordering Information .....	319
	B.1.1 Device Numbering Scheme .....	319
B.2	Mechanical Drawings .....	320



# Chapter 1

## Device Overview

The MC9S08SH8 members of the low-cost, high-performance HCS08 Family of 8-bit microcontroller units (MCUs). All MCUs in the family use the enhanced HCS08 core and are available with a variety of modules, memory sizes, memory types, and package types.

### 1.1 Devices in the MC9S08SH8 Series

Table 1-1 summarizes the feature set available in the MC9S08SH8 series of MCUs.

**Table 1-1. MC9S08SH8 Features by MCU and Package**

Feature	9S08SH8				9S08SH4			
FLASH size (bytes)	8192				4096			
RAM size (bytes)	512				256			
Pin quantity	24	20	16	8	24	20	16	8
ACMP	yes							
ADC channels	12	12	8	4	12	12	8	4
DBG	yes							
ICS	yes	yes	yes	yes <sup>1</sup>	yes	yes	yes	yes <sup>1</sup>
IIC	yes							
MTIM	yes							
Pin Interrupts	8	8	8	4	8	8	8	4
Pin I/O <sup>2</sup>	17	17	13	5	17	17	13	5
RTC	yes							
SCI	yes	yes	yes	no	yes	yes	yes	no
SPI	yes	yes	yes	no	yes	yes	yes	no
TPM1 channels	2	2	2	1	2	2	2	1
TPM2 channels	2	2	2	1	2	2	2	1
XOSC	yes	yes	yes	no	yes	yes	yes	no

<sup>1</sup> FBE and FEE modes are not available in 8-pin packages.

<sup>2</sup> Port I/O count does not include the output-only PTA4/ACMPO/BKGD/MS.