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MC68HC908AP64A
MC68HC908AP32A
MC68HC908AP16A
MC68HC908AP8A

Data Sheet

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Microcontrollers

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Data Sheet

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The following revision history table summarizes changes contained in this document. For your convenience, the page number designators have been linked to the appropriate location.

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Revision History

Date	Revision Level	Description	Page Number(s)
October 2007	3	Clarified or updated information in Chapter 7 System Integration Module (SIM) . In Chapter 8 Monitor Mode (MON) , corrected and updated monitor mode entry details. In Chapter 9 Timer Interface Module (TIM) , updated functional details. In 15.7 I/O Registers , corrected COCO bit description. In 16.1 Introduction , added unused pin information. In Chapter 21 Break Module (BRK) , updated functional details. In 22.5 5V DC Electrical Characteristics , updated stop I _{DD} values.	—
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Chapter 1

General Description

1.1 Introduction

The MC68HC908AP64A is a member of the low-cost, high-performance M68HC08 Family of 8-bit microcontroller units (MCUs). All MCUs in the family use the enhanced M68HC08 central processor unit (CPU08) and are available with a variety of modules, memory sizes and types, and package types.

Table 1-1. Summary of Device Variations

Device	RAM Size (bytes)	FLASH Memory Size (bytes)
MC68HC908AP64A	2,048	62,368
MC68HC908AP32A	2,048	32,768
MC68HC908AP16A	1,024	16,384
MC68HC908AP8A	1,024	8,192

1.2 Features

Features of the MC68HC908AP64A include the following:

- High-performance M68HC08 architecture
- Fully upward-compatible object code with M6805, M146805, and M68HC05 Families
- Maximum internal bus frequency:
 - 8-MHz at 5V operating voltage
- Clock input options:
 - RC-oscillator
 - 1- to 8-MHz crystal-oscillator with 32MHz internal PLL
- User program FLASH memory with security⁽¹⁾ feature
 - 62,368 bytes for MC68HC908AP64A
 - 32,768 bytes for MC68HC908AP32A
 - 16,384 bytes for MC68HC908AP16A
 - 8,192 bytes for MC68HC908AP8A
- On-chip RAM
 - 2,048 bytes for MC68HC908AP64A and MC68HC908AP32A
 - 1,024 bytes for MC68HC908AP16A and MC68HC908AP8A
- Two 16-bit, 2-channel timer interface modules (TIM1 and TIM2) with selectable input capture, output compare, and PWM capability on each channel

1. No security feature is absolutely secure. However, Freescale's strategy is to make reading or copying the FLASH difficult for unauthorized users.

General Description

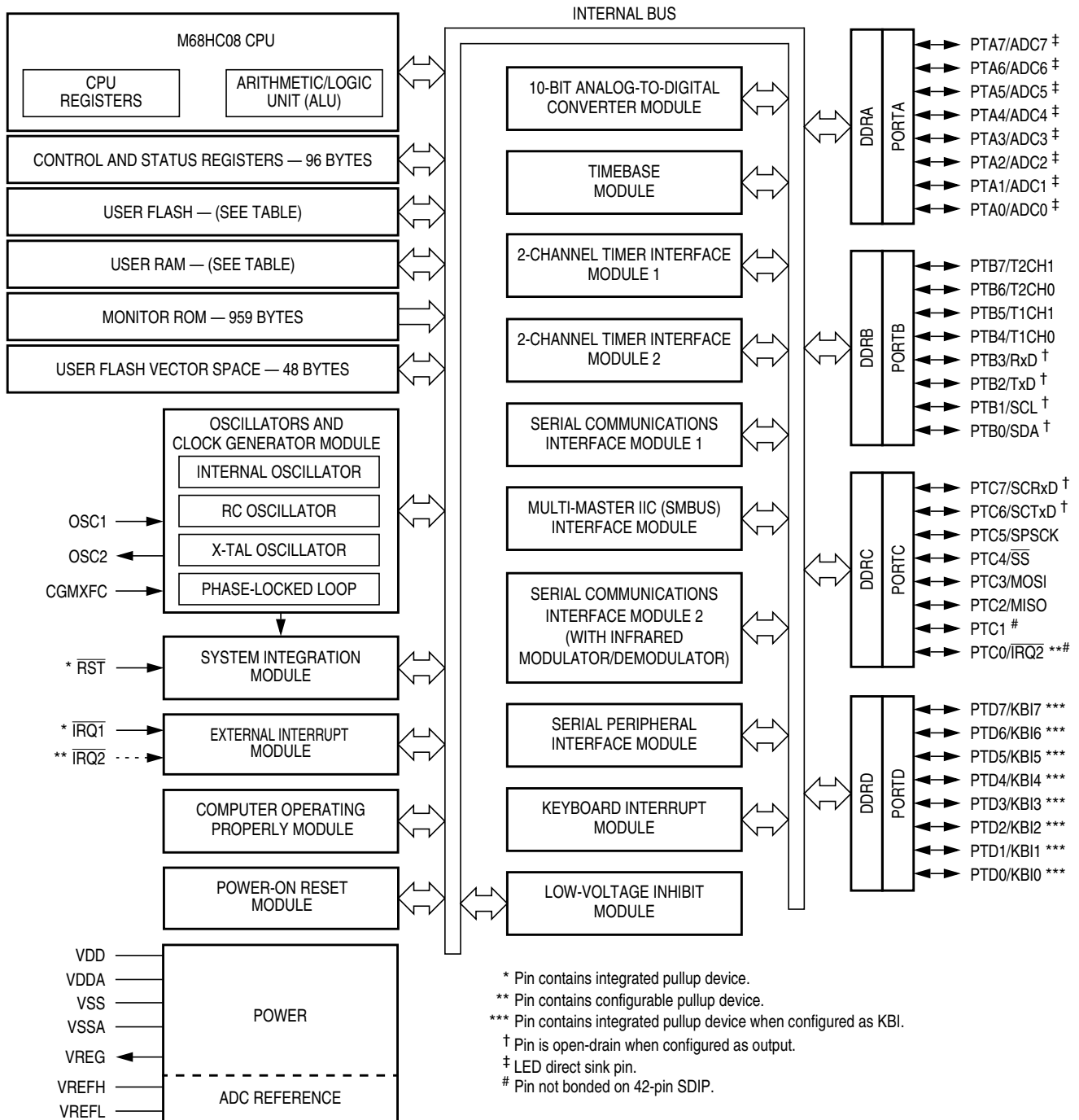
- Timebase module
- Serial communications interface module 1 (SCI)
- Serial communications interface module 2 (SCI) with infrared (IR) encoder/decoder
- Serial peripheral interface module (SPI)
- System management bus (SMBus), version 1.0/1.1 (multi-master IIC bus)
- 8-channel, 10-bit analog-to-digital converter (ADC)
- $\overline{\text{IRQ1}}$ external interrupt pin with integrated pullup
- $\overline{\text{IRQ2}}$ external interrupt pin with programmable pullup
- 8-bit keyboard wakeup port with integrated pullup
- 32 general-purpose input/output (I/O) pins:
 - 31 shared-function I/O pins
 - 8 LED drivers (sink)
 - 6 25mA open-drain I/O with pullup
- Low-power design (fully static with stop and wait modes)
- Master reset pin (with integrated pullup) and power-on reset
- System protection features
 - Optional computer operating properly (COP) reset, driven by internal RC oscillator
 - Low-voltage detection with optional reset or interrupt
 - Illegal opcode detection with reset
 - Illegal address detection with reset
- 48-pin low quad flat pack (LQFP), 44-pin quad flat pack (QFP), and 42-pin shrink dual-in-line package (SDIP)
- Specific features of the MC68HC908AP64A in 42-pin SDIP are:
 - 30 general-purpose I/Os only
 - External interrupt on $\overline{\text{IRQ1}}$ only

Features of the CPU08 include the following:

- Enhanced HC05 programming model
- Extensive loop control functions
- 16 addressing modes (eight more than the HC05)
- 16-bit Index register and stack pointer
- Memory-to-memory data transfers
- Fast 8 × 8 multiply instruction
- Fast 16/8 divide instruction
- Binary-coded decimal (BCD) instructions
- Optimization for controller applications
- Efficient C language support

1.3 MCU Block Diagram

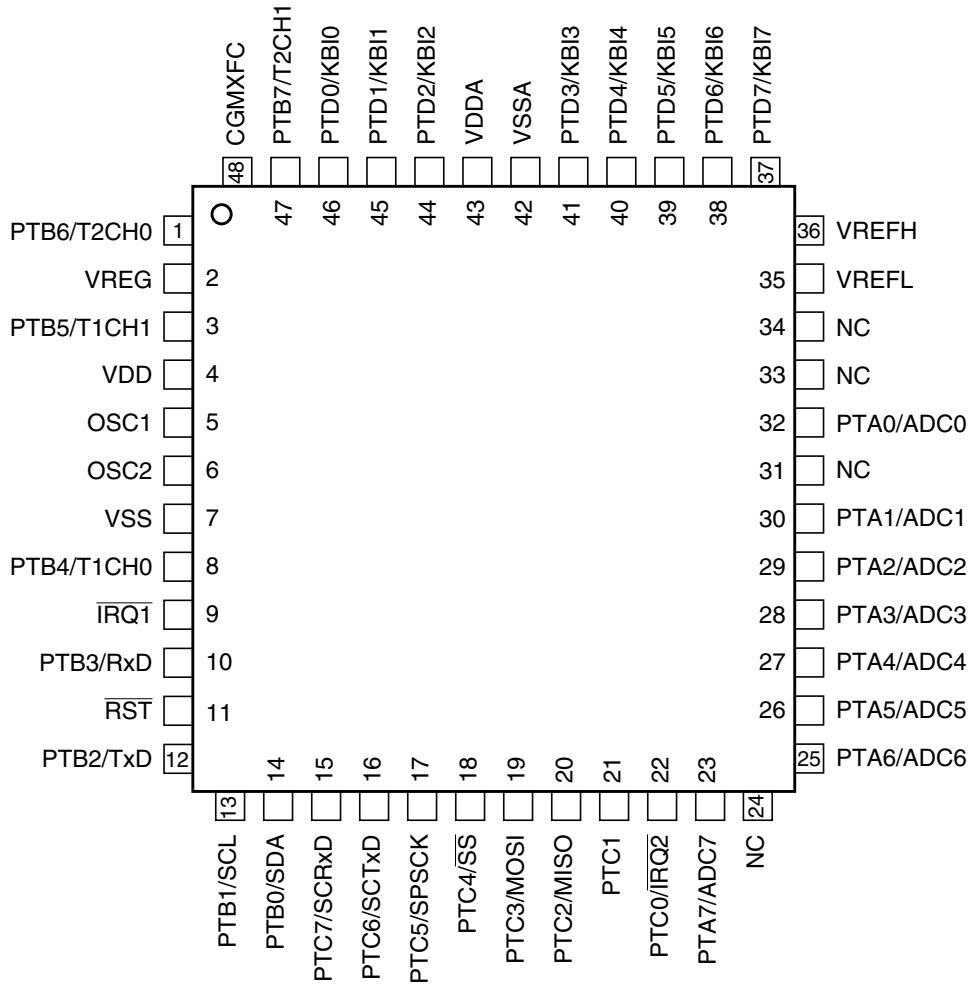
Figure 1-1 shows the structure of the MC68HC908AP64A.



DEVICE	USER RAM (bytes)	USER FLASH (bytes)
MC68HC908AP64A	2,048	62,368
MC68HC908AP32A	2,048	32,768
MC68HC908AP16A	1,024	16,384
MC68HC908AP8A	1,024	8,192

Figure 1-1. MC68HC908AP64A Block Diagram

1.4 Pin Assignment



NC: No connection

Figure 1-2. 48-Pin LQFP Pin Assignments

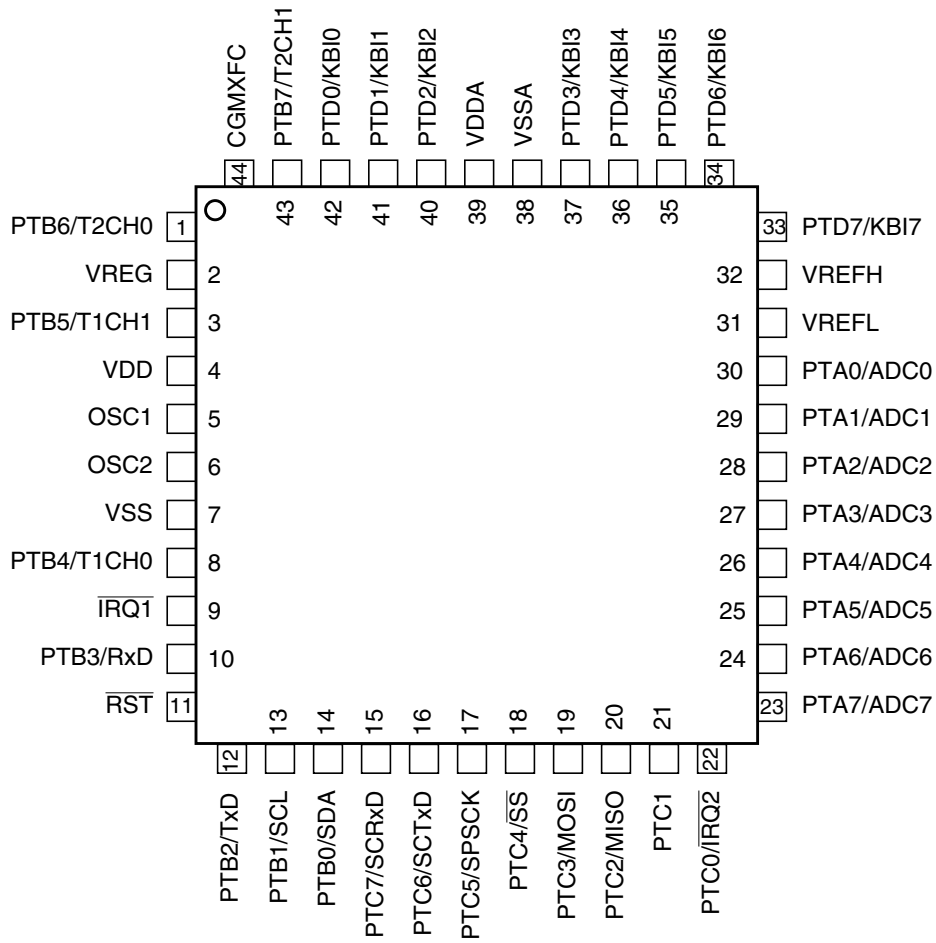
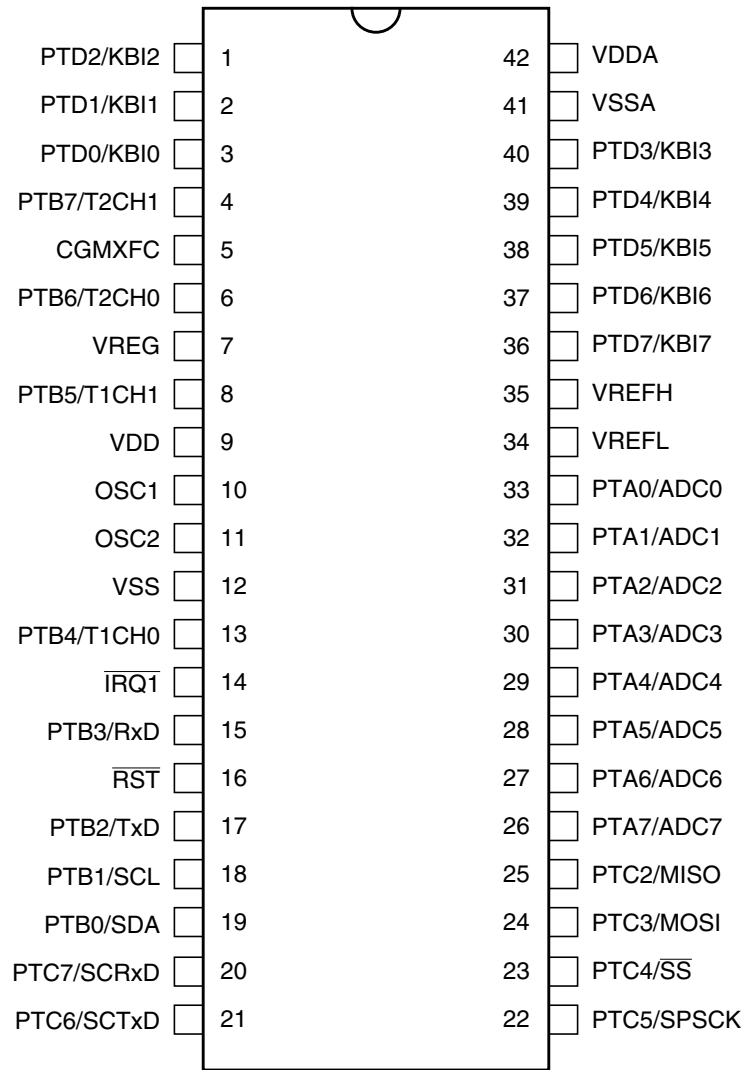


Figure 1-3. 44-Pin QFP Pin Assignments



Pins not available on 42-pin package	Internal connection
PTC0/ $\overline{\text{IRQ2}}$	Unconnected
PTC1	Unconnected

Figure 1-4. 42-Pin SDIP Pin Assignment

1.5 Pin Functions

Description of the pin functions are provided in [Table 1-2](#).

Table 1-2. Pin Functions

PIN NAME	PIN DESCRIPTION	IN/OUT	VOLTAGE LEVEL
V _{DD}	Power supply.	In	4.5 to 5.5
V _{SS}	Power supply ground.	Out	0V
V _{DDA}	Power supply for analog circuits.	In	V _{DD}
V _{SSA}	Power supply ground for analog circuits.	Out	V _{SS}
V _{REFH}	ADC input reference high.	In	V _{DDA}
V _{REFL}	ADC input reference low.	Out	V _{SSA}
V _{REG}	Internal (2.5V) regulator output. Require external capacitors for decoupling.	Out	2.5V ⁽¹⁾
$\overline{\text{RST}}$	Reset input, active low; with internal pullup and schmitt trigger input.	In	V _{DD}
$\overline{\text{IRQ1}}$	External IRQ1 pin; with internal pullup and schmitt trigger input.	In	V _{DD}
	Used for mode entry selection.	In	V _{DD} to V _{TST}
OSC1	Crystal or RC oscillator input.	In	V _{REG}
OSC2	Crystal OSC option: crystal oscillator output; inverted OSC1.	Out	V _{REG}
	RC OSC option: bus clock output.	Out	V _{REG}
	Internal OSC option: bus clock output.	Out	V _{REG}
CGMXFC	CGM external filter capacitor connection.	In/Out	Analog
PTA0/ADC0 : PTA7/ADC7	8-bit general purpose I/O port.	In/Out	V _{DD}
	Pins as ADC inputs, ADC0–ADC7.	In	V _{REFH}
	Each pin has high current sink for LED.	Out	V _{DD}