

KEY BENEFITS

- Measures water temperature, which allows efficient control of the heating element to conserve energy
- Enhances informational display functions such as a countdown to completion of the wash
- Provides an event control alarm
- Offers an in-home connection that sends dishwasher machine progress messages to other in-home devices
- Provides automatic machine startup when electricity is least expensive

OVERVIEW

Home appliance controls are changing from purely mechanical to fully electronic as microcontrollers are incorporated into the designs.

The migration in the industry from mechanical to electromechanical control, then to full electronic control has been ongoing for several years.

Today, microcontrollers provide the intelligence for every electronic solution. The primary reasons driving the adoption of electronics are reliability, cost, and improved energy efficiency.

Dishwashers are among the most recent additions to the White Goods product portfolio, with market penetration increasing rapidly over the last ten years. Because of this relatively recent introduction (compared to other appliances), a high percentage of dishwashers use electronic control.

Microcontrollers enable the electronic control that provides a range of dishwasher appliance features.

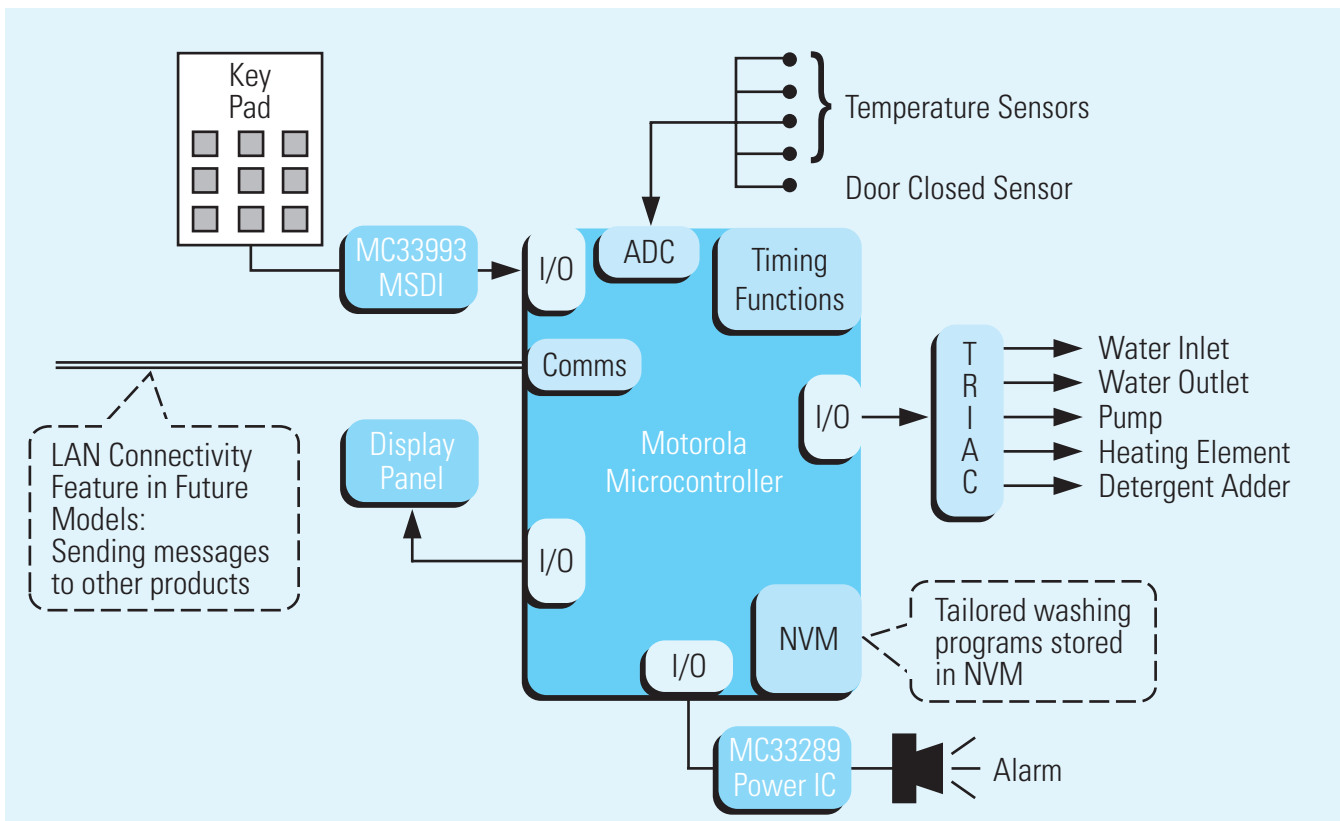


Figure 1. Typical Microprocessor Application Diagram

MOTOROLA ORDERING INFORMATION

Part Number	Product Highlights	Additional Information
MC68HC(9)08AZxx	ADC, SCI, SPI, CAN, EEPROM	www.motorola.com/semiconductors ^{NOTE}
MC68HC908MRxx	ADC, PWM, SCI, SPI	
MC68HC(9)08ABxx	ADC, SCI, SPI, EEPROM	
MC68HC(9)08GPxx	ADC, SCI, SPI	
MC68HC908GT16	ADC, SCI, SPI, ICG	
MC68HC908GRxx	ADC, SCI, SPI	
MC68HC(9)08JLxx	ADC	
MC68HC(9)08JKxx	ADC	
MC68HC908KXxx	ADC, SCI	
MC68HC908Qxx	Low pin count, low cost	
MC33289	Dual high side switch for inductive load - 40 Ω	www.motorola.com/semiconductors/analog
MC33993	Switch detection interface 22 inputs	

NOTE: Search on the listed part number.

DESIGN CHALLENGES

Cost

The appliance market is highly competitive and cost sensitive. Eliminating just a few cents from the cost of a solution can save thousands of dollars in this high-volume market.

Flexibility

A new model can be introduced every year, with products having a shorter life cycle. This means software problems must be eliminated quickly, which requires professional development tools and faster, more efficient development cycles.

Noise

Having a quiet appliance is a major goal of manufacturers. As consumers become busier, more appliances are likely to be operating simultaneously, possibly even during night hours when electricity is least expensive. Therefore, minimum levels of noise and vibration are desirable.

Legislation

Energy regulations and consumer demand for energy-efficient appliances are driving manufacturers to redesign their products to meet these expectations. Dishwashers are designed with two efficiency concerns, water and electricity.

Measurement Accuracy

Measuring temperatures in different interior zones of the dishwasher and the amount of water used for maximum efficiency is critical.

MOTOROLA SOLUTION

Motorola is the industry leader in Flash microcontrollers. Flash memory is a nonvolatile memory (NVM) technology that provides access to the following features:

- Faster programming and erase times of the Flash memory with reprogram capability
- In-application programming, which reduces time to market
- Improved write/erase and data retention performance for Flash
- Flexible block protection and security
- Flash emulation of EEPROM

Embedded Flash brings new flexibility to your designs:

- Provides end-of-line customization for regional variations in consumer demands
- Enables changing legislation to be satisfied with software-enabled intelligence
- Supports remote diagnostics and preventative maintenance
- Minimizes programming costs while increasing code flexibility with production line programming
- Reduces code obsolescence, which saves on scrapped product costs
- Improves time to market, which reduces lead times
- Standardizes platforms, which reduces product variability
- Eliminates sockets and rework with in-system programmable Flash
- Provides field upgrade capability while allowing remote reprogramming of the microcontroller
- Eliminates the need for external EEPROM with 10,000 write/erase cycles because Flash can emulate EEPROM

DEVELOPMENT TOOLS

Tool Type	Product Name	Vendor	Description
Software	CWHC08ASM	Metrowerks	CW ASM tools for HC08
Software	CWHC08	Metrowerks	CW full package for HC08
Software	CWHC08CC	Metrowerks	Stand-alone C/C++/cC++/EC++ compiler for HC08
Software	CWHC08MIG	Metrowerks	CW full package for HC08 migration
Hardware	68HC08 emulators, cables, and adapters	Motorola	Emulation modules, flex cables, and target head adapters in support of 68HC08 MCUs
Hardware	68HC08 programmers	Motorola	Programmer boards in support of 68HC08 MCUs
Development	MON08 Cyclone	Motorola	Provides all the capabilities of the MON08 Multilink plus the ability to function as a stand-alone programmer with push buttons and LED user interface
Development	MON08 Multilink	Motorola	Low-cost development tool for 68HC08 Flash MCUs
Development	In-Circuit Simulator (ICS) Kits	Motorola	Low-cost tools for developing and debugging target systems incorporating 68HC08 MCUs
Development	Modular Evaluation System (MMEVS) Kits	Motorola	Economical, two-board emulator for the 68HC(9)08 MCUs
Development	Modular Development System (MMDS) Kits	Motorola	Full-featured emulator system for developing embedded systems using 68HC(9)08 MCUs

For detailed information, refer to the “Microcontrollers” section of the Motorola document SG1011/D, *Software and Development Tools*.

RELATED INFORMATION

For inquiries about Motorola products, contact the Technical Information Center at 800-521-6247, or visit us online at www.motorola.com/semiconductors.

Document Number	Description
APDPAK/D	Analog ICs Integrated Solutions Pitch Pack
SG1002/D	Analog Product Selector Guide
8-16BITPAK/D	MCU 8- and 16-Bit Sales Binder
BR68HC08FAMAM/D	68HC08 Family: High Performance and Flexibility
CWDEVSTUDFACT/D	CodeWarrior™ Development Studio for 68HC08, Special Edition Brochure
FLYREMBEDFLASH/D	Embedded Flash: Changing the Technology World for the Better

NOTES

HOW TO REACH US:

USA/EUROPE/LOCATIONS NOT LISTED:

Motorola Literature Distribution
P.O. Box 5405
Denver, Colorado 80217
1-303-675-2140
1-800-441-2447

JAPAN:

Motorola Japan Ltd.
SPS, Technical Information Center
3-20-1, Minami-Azabu
Minato-ku
Tokyo 106-8573, Japan
81-3-3440-3569

ASIA/PACIFIC:

Motorola Semiconductors H.K. Ltd.
Silicon Harbour Centre
2 Dai King Street
Tai Po Industrial Estate
Tai Po, N.T. Hong Kong
852-26668334

TECHNICAL INFORMATION CENTER:

1-800-521-6274

HOME PAGE:

<http://www.motorola.com/semiconductors>



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals", must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and the Stylized M Logo are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

MOTOROLA and the Stylized M Logo are registered in the US Patent & Trademark Office. All other product or service names are the property of their respective owners.

© Motorola, Inc. 2002

SG2037/D, REV 1

December2002