

Vacuum Cleaners

Overview

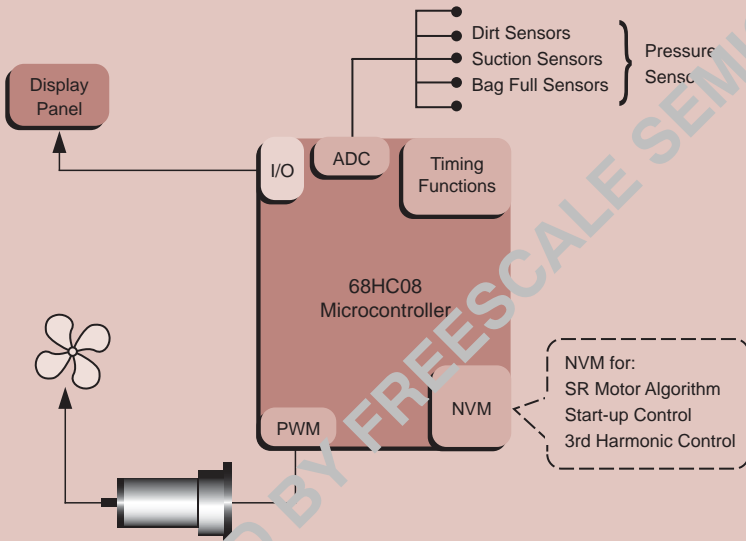
Electronic control is becoming increasingly popular for use in vacuum cleaners, with microcontrollers being used alongside sensors to provide a variety of features to the appliance.

A Smart Kitchen survey carried out by MORI found that more than half of the consumers surveyed would prefer that technology made home life simpler rather than provide more information at work. Enter the robotic vacuum cleaner, one more chore we can take off the list!

Key Benefits

- > Provides constant power suction control coupled with lower energy costs
- > Offers self-testing for improved maintenance and cleaning efficiency
- > Monitors cleaning surfaces and obstacles and automatically adjusts equipment

VACUUM CLEANER BLOCK DIAGRAM



Freescale Ordering Information

Part Number	Product Highlights	Additional Information
68HC908SR12	Microcontrollers	www.freescale.com ^{Note}
M68HC05 Family	8-bit microcontrollers	
M68HC08 Family	8-bit microcontrollers	
M68HC12 Family	16-bit microcontrollers	
MC14600	Low-power CMOS alarm with horn driver	
MPX5050	Integrated pressure sensor	
MPXM2010	Compensated pressure sensor	
MPXM2053	Compensated pressure sensor	
RD68HC08VAC	Vacuum cleaner reference design	

Note: Search by listed part number.

Features

- > Remote control of main motor and nozzle brush motor (wireless (IR) or wired)
- > Controlling the main motor (soft start and speed to conserve power)
- > Sense if bag is full
- > Sense the pressure at the nozzle
- > Sense if the output filter is full
- > Indicator lamps (LEDs)
- > Remote control function
- > Controlling the nozzle motor (on/off only)

Benefits

- > Offering more features for users
- > Choice between different motor control algorithms
- > Improved motor control function
- > Easy-to-meet new harmonics and voltage flicker legislation requirement
- > Open up use of new sensor technology
- > Open up use of SR motor types to provide faster fan speed and increased suction

Design Challenges

Cost

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

Legislation

Energy regulations and consumer demand for efficient appliances are forcing manufacturers to redesign their products to meet expectations.

Regional Variation

The white goods market is dominated by global companies who are trying to minimize development costs by introducing common platforms with the capability to be used around the world. These platforms must be flexible enough to accommodate regional variations such as preferences for upright versus cylinder vacuum cleaners.

Freescale's Semiconductor Solution

Vacuum Cleaner Pressure Sensing

What if your vacuum cleaner had a sock detector and instead of blocking the tube, it would automatically let the sock go? An analog differential pressure sensor between the dust bag and the micro filter brings, coupled with a microcontroller, new features such as:

- > Recognition of surface type and detection if tube is blocked
- > Self test to verify if dust bag/filters/ tube are properly inserted
- > Early maintenance signs
- > Real time dust bag filling and micro filter cleanliness information
- > Power control to keep a constant suction while addressing consumer energy saving
- > Simplifies vacuums by removing the potentiometer

Pressure switches, the pressure valve and the potentiometer can be removed to provide manufacturing advantages such as less mounting, automatic mounting, or smaller PCB, thus keeping the cost to a minimum. The MPXM2010 and MPXM2053 devices are silicon piezoresistive pressure sensors providing highly accurate and linear voltage output directly proportional to the applied pressure.

- > Temperature compensated over 0°C to +85°C
 - > Unique silicon shear stress strain gauge
 - > Easy to use tape and reel
- The MPX5050 series piezoresistive transducer is a state-of-the-art monolithic silicon pressure sensor designed for a wide range of applications, but is particularly suited to those employing a microcontroller or microprocessor with A/D inputs.
- > 2.5% maximum error over 0°C to 85°C
 - > Ideally suited for microprocessor microcontroller-based systems
 - > Temperature compensated over -40°C to +125°C

Freescale Semiconductor Solution (continued)

Alarm IC

The MC14600 Alarm IC is designed to simplify the process of interfacing an alarm level voltage condition to a piezoelectric horn and/or LED.

- > High impedance, FET input comparator
- > Alarm detect threshold easily established with two resistors
- > Integrated oscillator and piezoelectric horn driver

Flash Microcontrollers

Freescale Semiconductor is the Flash microcontrollers industry leader. Flash memory is a non-volatile memory (NVM) technology that provides new design flexibility and the following features:

- > In-application programming, which reduces time to market
- > Improved write / erase and data retention performance for Flash (allowing the user to define their own preferred programs)

- > Faster programming and erase times of the Flash memory
- > Flexible block protection and security
- > Flash emulation of EEPROM
- > Reduced code obsolescence/scrapped product
- > Provides end-of-line customization for regional variations in consumer demands
- > Standardized platforms which reduces product variability

Development Tools^{Note}

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	Freescale Semiconductor	Emulation Modules, Flex Cables, and Target Head Adapters in Support of 68HC08 MCUs
Hardware	68HC08 Programmers	Freescale Semiconductor	Programmer Boards in Support of 68HC08 MCUs
Development	MON08 Cyclone	Freescale Semiconductor	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	Freescale Semiconductor	Low-Cost Development Tool for 68HC08 Flash MCUs
Development	In-Circuit Simulator (ICS) Kits	Freescale Semiconductor	Low-Cost Tools for Developing and Debugging Target Systems Incorporating 68HC08 MCUs
Development	Modular Evaluation System (MMEVS) Kits	Freescale Semiconductor	Economical, Two-Board Emulator for the 68HC(9)08 MCUs
Development	Modular Development System (MMDS) Kits	Freescale Semiconductor	Full-Featured Emulator System for Developing Embedded Systems Using 68HC(9)08 MCUs

Note: For detailed information, refer to the "Microcontrollers" section of SG1011, *Software and Development Tools*.

Related Documentation

Document Number	Description
AN1050	Designing for Electromagnetic Compatibility (EMC) with HCMOS Microcontrollers
AN1263	Designing for Electromagnetic Compatibility with Single-Chip Microcontrollers
AN1843	Vacuum Cleaner Reference Platform
AN2183	Using Flash as EEPROM on the MC68HC908GP32
AN2183SW	Software for AN2183 Zipped
AN-HK-32	In-Circuit Programming of Flash Memory in the MC68HC908GP32
AN-HK-33	In-Circuit Programming of Flash Memory in the MC68HC908JL3
BR1822	Embedded Flash MCU Overview
FLYR30	MPXM Series Pressure Sensors
MC68HC908SR12	68HC908SR12, 68HC08SR12 Technical Data
SG2000CR	Application Selector Guide Index and Cross-Reference

Notes

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