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Hitachi is now in mass production with a range of high performance microcontrollers offering the next generation of on-chip memory technology – Flash.

This provides all the benefits of OTP along with the ability to be electronically erased and reprogrammed in-circuit – at a competitive price.

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The use of on-board flash memory brings system designers many new benefits...

THESE INCLUDE:

HIGH PERFORMANCE

- *On-board flash provides high speed memory access.*
- *The use of on-board flash lowers the emitted radiation of a system.*

IN CIRCUIT REPROGRAMMABILITY

- *Easy software upgrades in the field..*
- *Bug fixes to be made at any time in the finished product.*
- *Software can be loaded at the end of production.*
- *System test software can be loaded before final application.*

PRODUCT CHANGES

- *Programmed devices can be erased and reprogrammed.*
- *Block programming allows parameters to be changed at any time.*

Hitachi's H8 Microcontroller Families

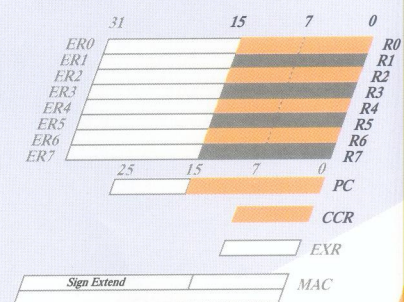
H8 Series

Hitachi's micro-controller families have been developed to provide for the efficient execution of code written in a high level language, particularly 'C'. The Hitachi H8 family of micro-controllers provides a range of upwardly code compatible 8/16 and 16/32 bit micro-controllers, with high levels of memory and peripheral integration.

The H8 family provides a wide range of devices with different functionality, from the low cost, low power, H8/300L family, aimed at consumer applications, through the H8/300 family, particularly suitable for automotive and industrial applications to the high performance H8/300H family. The H8/300H family finds many applications in mobile communications and motor control.

These devices all provide the highest levels of 8/16 and 16/32 bit performance available today, with instruction execution times in the order of 125ns. The H8S family, currently being introduced offers next generation performance with a 50ns instruction cycle time for applications where high performance and low current consumption are particularly important.

Hitachi currently have five H8 microcontrollers with on-board flash memory in mass production, with a number of new devices, including some in the SH RISC microcontroller family being introduced in 1997.



H8/300L

400ns cycle time
8-bit CPU
Sub-Clock(32KHz)
LCD Drive, Timers,
ADC, Serial

Object C
Compatib

Upwards Compatibility

H8S
 50ns cycle time
 16/32 CPU
 16MByte address space
 TCU, ADC, DMAC,
 SCI, WDT

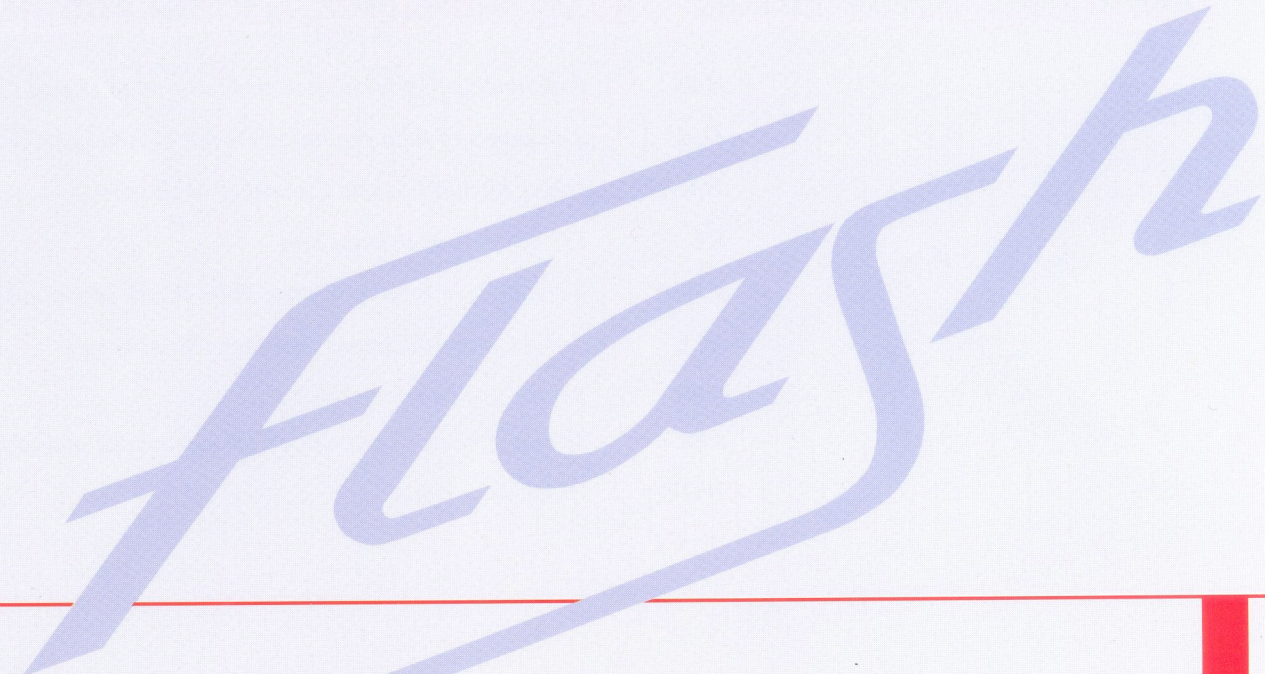
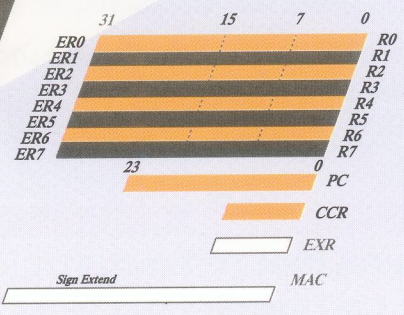
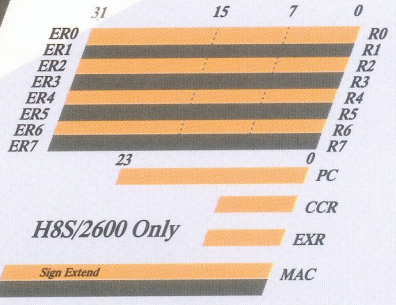
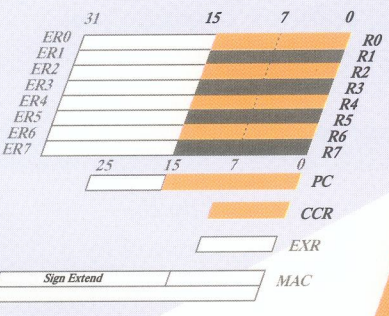
H8/300H
 125ns cycle time
 16/32 bit CPU
 16MByte address space
 ITU, TPC, DMAC
 ADC, SCI, WDT

Upwardly
 Compatible

H8S/2600 Only

H8/300
 125ns cycle time
 8-bit CPU
 64K address space
 FRT, ADC, SCI
 WDT

Upwardly
 Compatible



PROGRAMMING MODES

BOOT MODE

Device automatically programs itself using an on-board boot loader, via a serial port from a PC or other programming device. Ideal for in-circuit programming, software upgrades and bug fixes. Supported by Hitachi's flash programming utility.

USER MODE

Device programs itself using an application provided by the user, ideal for applications where the device is programmed by a host processor, i.e. PC keyboard controller, computer games, etc.

PROM MODE

Device is programmed using a programming socket and a standard programmer with the appropriate programming algorithm support e.g. Data I/O, Stag, MPQ, Elan, Dataman.

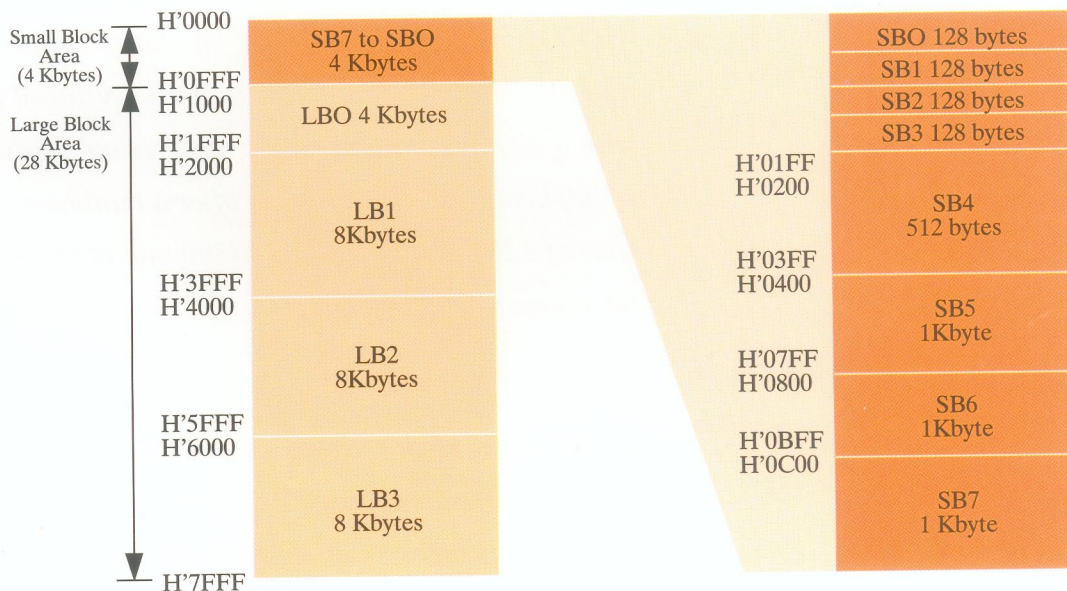
Device	CPU	RAM	Flash	Timers	Features	I/O
H8/3334Y	8-bit	1 Kbyte	32 Kbytes	3	A/D, D/A, PWM, I ² C, 2 x SCI, WDT	66
H8/3337Y	8-bit	2 Kbytes	60 Kbytes	3	A/D, D/A, PWM, I ² C, 2 x SCI, WDT	66
H8/3434	8-bit	1 Kbyte	32 Kbytes	3	A/D, D/A, PWM, I ² C, 2 x SCI, WDT	82
H8/3437	8-bit	2 Kbytes	60 Kbytes	3	A/D, D/A, PWM, I ² C, 2 x SCI, WDT	82
H8/3048	16-bit	4 Kbytes	128 Kbytes	5	A/D, D/A, TPC, DMAC, 2 x SCI, SIM, WDT	78

A/D	8 channels of 10-bit resolution Analogue to Digital Converter
D/A	2 channels of 8-bit resolution Digital to Analogue Converter
DMAC	Direct Memory Access Controller (4 channels)
I²C	I ² C Synchronous Serial Port
PWM	2 channels of 8-bit resolution Pulse Width Modulation Timer
SCI	Serial Communications Interface (Sync/Async)
SIM	SmartCard Interface Module
TPC	Timing Pattern Controller with 16 associated output pins
WDT	Watch Dog Timer

BLOCK PROGRAMMING

Hitachi's H8 F-ZTAT devices support a block based memory map, where the flash EPROM, is divided into a number of differently sized blocks. A typical memory map, in this case for the H8/3334Y, is shown below. Each of these blocks can be erased or programmed individually, giving the user a great deal of flexibility in their system architecture. Alternatively the whole device can be erased at the same time. In the example below, the four 128 byte blocks could be used for storing data tables or calibration information, while the other blocks could be used for code. This allows the calibration information, for example, to be updated without disturbing the program.

H8/3334Y F-ZTAT Memory Map



H8/300

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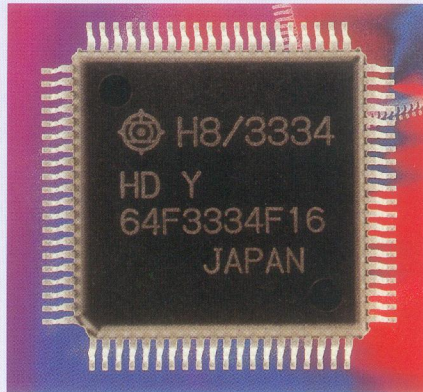
The H8/300 family combines a fast, powerful 8/16 bit CPU core with a comprehensive range of on-chip peripherals and memory options. The H8/300 family has been developed to provide designers with a high performance, high integration solution for a wide range of applications. These devices offer a minimum instruction cycle time of 125nS, making the H8/300 one of the fastest 8 bit microcontrollers available.

The H8/300 CPU is based around a general register architecture. Each register can be used for any purpose, holding either data or an address. Registers can be addressed as either sixteen 8-bit registers or eight 16-bit registers and each used as an accumulator, index register, address pointer or local storage.

Although the H8/300 series is based on an 8-bit CPU, its registers and memory can be accessed as 16 bit locations, in fact the internal data bus of the H8/300 is 16-bits wide, giving fast, 2 state word access to memory. Using H8/300 flash microcontrollers offers significant performance increases over solutions utilising external flash memory, and also greatly reduces the complications involved in passing the new European regulations on system EMC performance.

FEATURES:

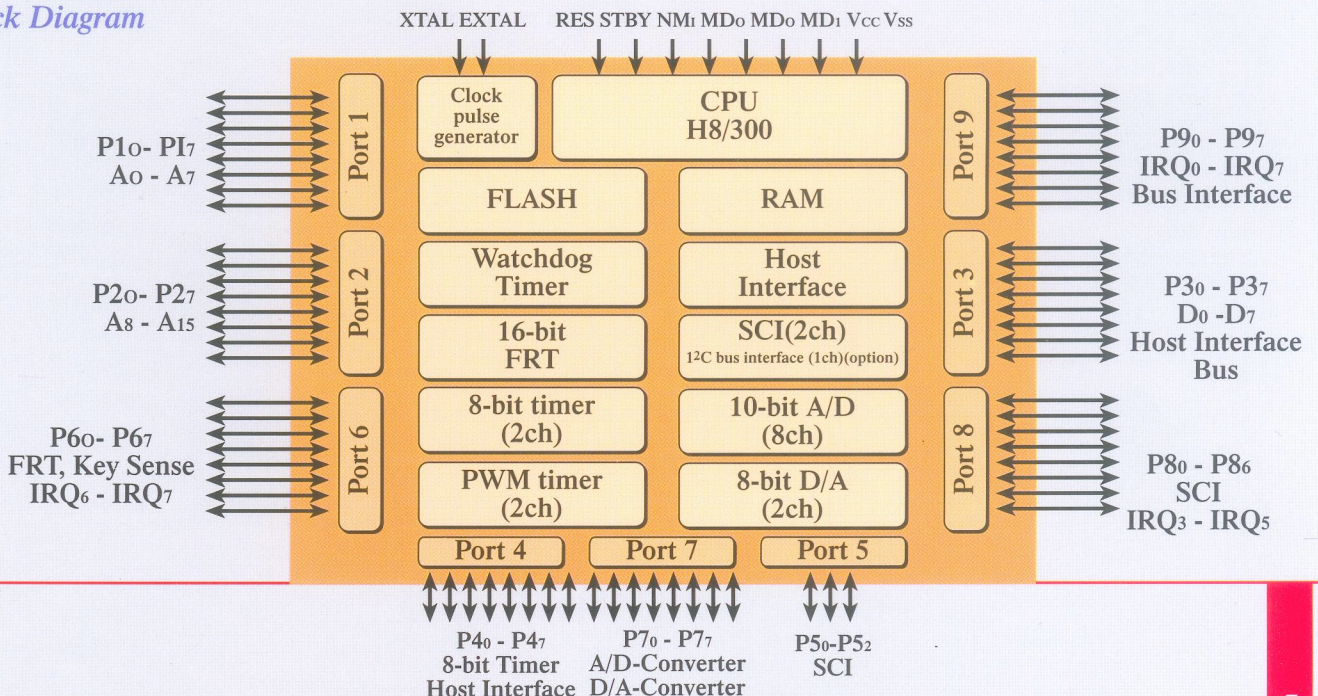
The H8/3337Y family are members of the next generation of 0.8um H8/300, with improvements in performance and functionality over more established H8/300 devices.



Two members of the H8/3337Y family offer on board flash memory, the 32Kbyte H8/3334Y and the 60Kbyte H8/3337Y, both devices are completely pin and function compatible with each other, and the OTP and mask ROM versions of these devices. The H8/3337 family is suitable for a range of high volume consumer applications, the on-board host interface, keyboard controller and optional I2C interface, along with its low power operation, make it ideal as a system controller in laptop computers and similar battery powered applications.

- H8/300 CPU Core
- 125nS instruction cycle time
- 32 Kbytes or 60 Kbytes of Flash memory
- 1 Kbyte or 2 KBytes RAM
- 16 bit counter / timer – 1 channel
- 8 bit counter / timer – 2 channels
- Watchdog / interval timer – 1 channel
- 8 bit PWM Timer – 2 channels
- 10 bit A/D converter – 8 channels
- 8 bit D/A converter – 2 channels
- Async / sync serial port – 2 channels
- Optional I²C interface
- Keyboard controller
- Host interface
- 60 Input / Output lines
- 6 input only lines
- 80 pin package

H8/3337Y Series Block Diagram

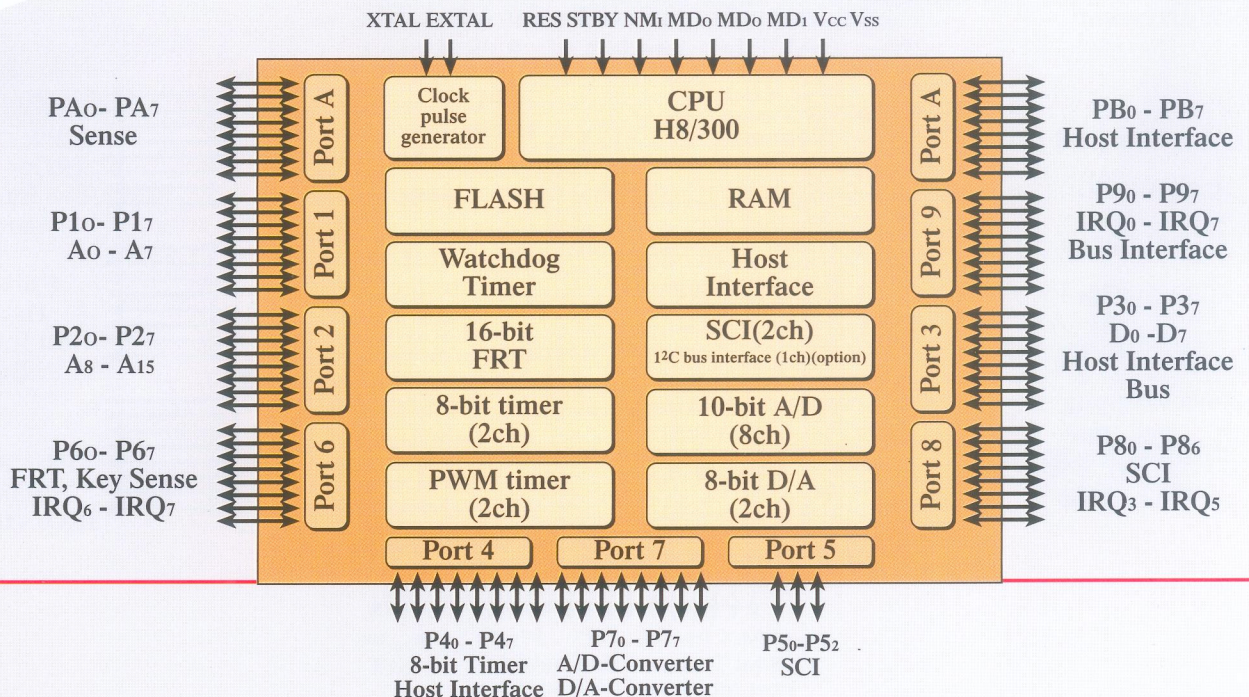


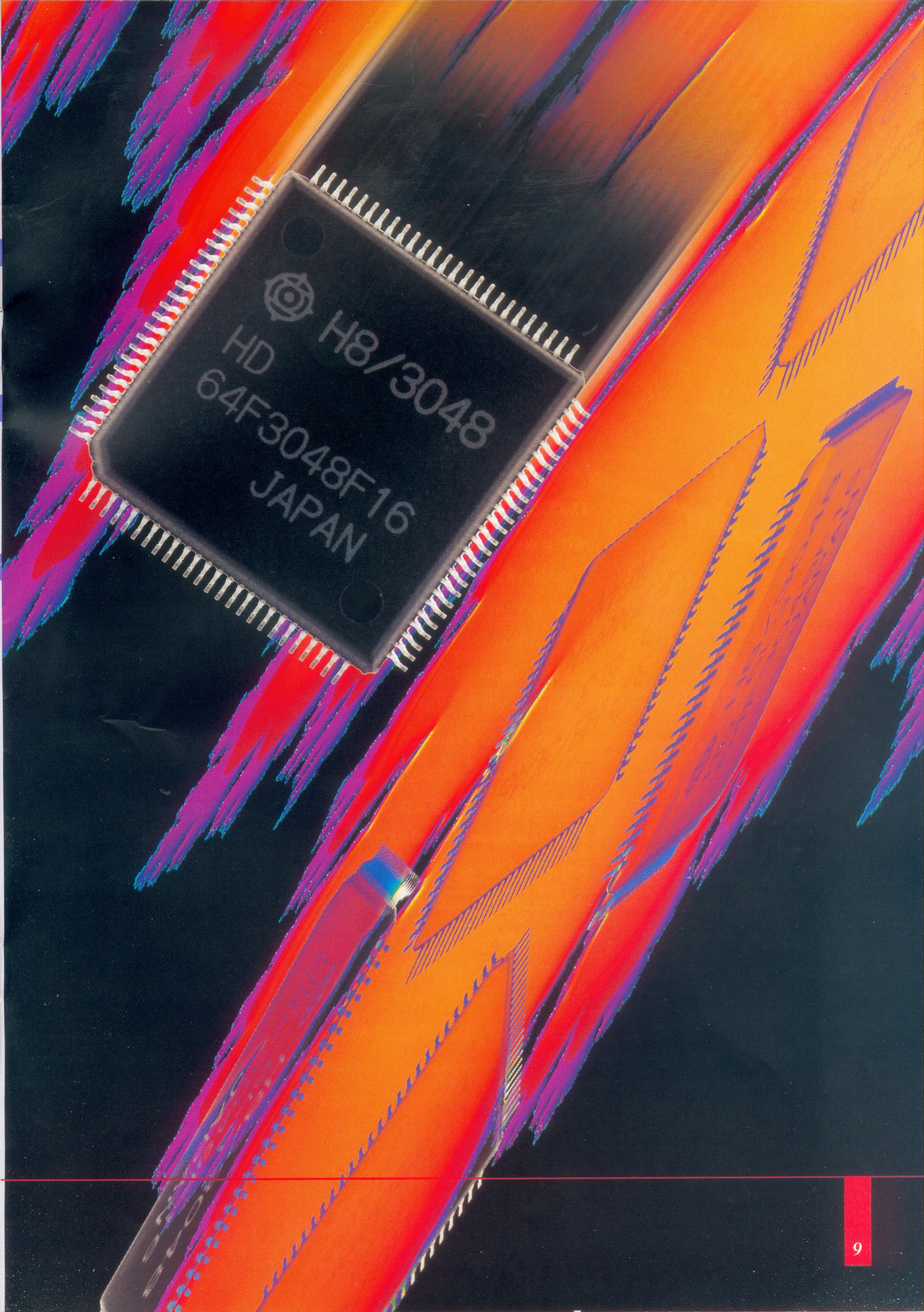
FEATURES:


The H8/3437 family have the largest pin count of any members of the H8/300 family. The H8/3437 family are members of the new, 0.8um generation of H8/300 and offer a higher level of performance and peripheral integration than more established devices. The H8/3437 offers 60 Kbytes of on-board flash memory and 2 Kbytes of RAM, while the H8/3434 offers 32 Kbytes of flash and 1 Kbyte of RAM. Both these devices are completely pin and function compatible with each other as well as the Mask ROM and OTP versions of the H8/3437 family.

- H8/300 CPU Core
- 125nS cycle instruction time
- 32 Kbytes or 60 Kbytes Flash memory
- 1 Kbyte or 2 Kbytes RAM
- 16 bit counter / timer – 1 channel
- 8 bit counter / timer – 2 channels
- Watchdog / interval timer – 1 channel
- 8 bit PWM Timer – 2 channels
- 10 bit A/D converter – 8 channels
- 8 bit D/A converter – 2 channels
- Async / sync serial port – 2 channels
- Optional I²C interface
- Keyboard controller
- Host interface
- 74 Input / Output lines
- 8 input only lines
- 100 pin package

H8/3437 Series Block Diagram





 H8/3048
HD
64F3048F16
JAPAN

H8/300H

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The H8/300H family combines a fast, powerful 16/32 bit CPU core with a comprehensive range of address space allowing devices with large blocks of on-board memory to be produced. This combination of features make Hitachi's 16-bit micro-controllers No. 1, both in Europe and world-wide.

The H8/300H CPU is ideal for executing software written in a high level language, such as C based as it is around a general register architecture. The registers can either be addressed as up to sixteen 8-bit registers, sixteen 16-bit registers or eight 32 bit registers) Each CPU register can be used as an accumulator, an index register, an address pointer or as local storage.

The H8/300H CPU is a 16-bit device, however with 32-bit internal data-paths and a 32-bit wide ALU it offers the ability to handle 32-bit data easily. This combined with a 125 nS instruction cycle time makes the H8/300H idea for many applications where high performance is a requirement.

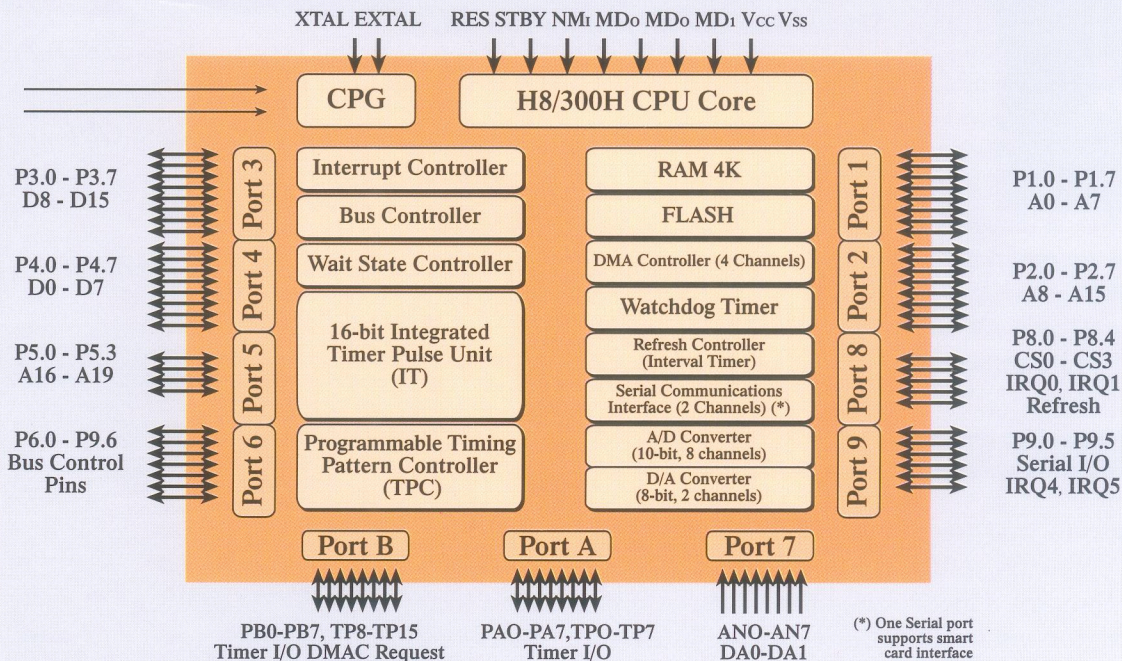


The H8/3048F is the largest device currently available in the H8 family, providing the highest level of single chip performance and integration. The H8/3048F offers a massive 128 Kbytes of on-chip Flash as well as 4 Kbytes of SRAM. The H8/3048F is also available in pin and function compatible OTP and mask ROM versions, with a variety of memory sizes. The H8/3048F is particularly useful in mobile and battery powered applications, as it has a variety of low power features including clock gearing and the ability to turn each peripheral off independently when not required. The H8/3048F also has an on-board smart-card interface, for applications such as mobile phone handsets.

FEATURES:

- H8/300H CPU core
- 125 nS instruction cycle time
- 128 Kbytes Flash memory
- 4 Kbytes RAM
- 16 bit counter / timer – 5 channels
- Watchdog / interval timer – 1 channel
- Timing Pattern Controller – 16 channels
- 10 bit A/D converter – 8 channels
- 8 bit D/A converter – 2 channels
- Async / sync serial port – 2 channels (1 with smart-card interface)
- DMAC – 4 channels
- Bus-controller with DRAM interface
- 78 I/O pins
- 100 pin QFP & TQFP packages

H8/3048 Series Block Diagram



Development Tools for

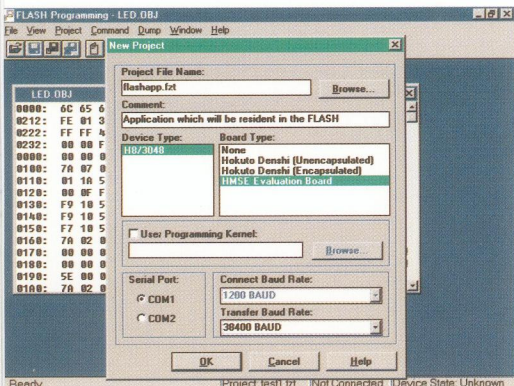
FLASH MICROCONTROLLERS

Hitachi Micro Systems Europe have developed a range of support tools to allow engineers to easily develop applications with Hitachi's range of flash microcontrollers. These include evaluation boards and emulators as well as a wide range of support software.

EVB3048F FLASH EVALUATION KIT

This kit includes:

- **H8/3048F Evaluation Board**
128Kbyte RAM & 64Kbyte ROM
Break-away flash programming board
Signals available on pins for user access
- **CD-ROM with Software and User Manuals (in PDF format)**
HDI-M (Hitachi Debugging Interface-Monitor) with Windows GUI
Easy to use Windows Flash Programming Utility
GNU H8/300 & H8/300H C compiler
CMON debugging monitor with HINT & GDB debugging interfaces
Demonstration versions of Hitachi's development tools
H8/300H & F-ZTAT Programming Tutorials
(with example C source files)



AVAILABLE
JUNE 1997

EVB3437F FLASH EVALUATION KIT

This kit includes:

- H8/3437F Evaluation Board
64 Kbyte SRAM
Break-away flash programming board
I/O signals available for user access
- CD-ROM with Software and User Manuals (in PDF format)

Special evaluation copies of IAR C compiler and C-Spy source level debugger

Easy to use Windows Flash Programming Utility

Demonstration versions of Hitachi's development tools

H8/300 and F-ZTAT programming tutorials

PCE LOW COST IN-CIRCUIT EMULATORS

The PCE8300 and PCE300H range of PC based emulators have been designed to offer engineers a high performance in-circuit emulator at an affordable price. The PCE is supported by CIDE (C Integrated Debugging Environment), a Windows based source level debugger. The PCE comes with a high speed parallel interface (8-bit ISA interface card requiring one PC half-card slot) from the PC to allow fast downloading of code and transfer of debug information. Each PCE provides non-intrusive, real-time emulation of the target H8 processor at full speed, with comprehensive breakpoint capabilities and a real-time trace buffer. Target probes are available separately for each device in the H8 family, allowing either emulator or an H8 device to be plugged into a socket on the target board.

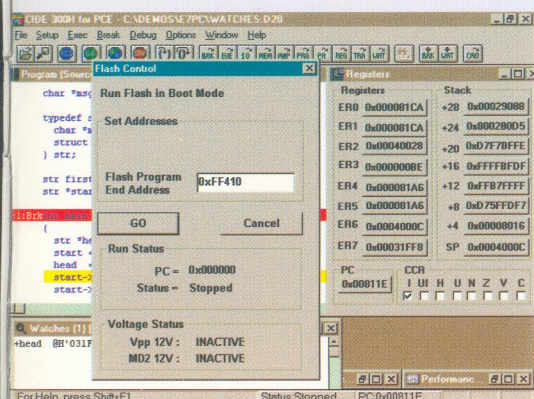
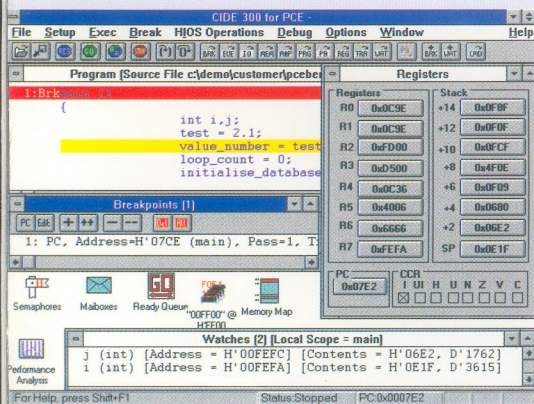
CIDE provides the user with full source level debug, including breakpoints, complex C-level watchpoints and the ability to see locals in scope as well as monitor and expand complex C structures. CIDE also displays C-level real-time trace as well as many other advanced debug facilities.

The PCE in-circuit emulators are available either on their own, or as part of an S5 kit, a bundled package of hardware and software, comprising of emulator, C compiler, assembler, linker and CIDE source level debugger. The S5 kit provides all the hardware and software required to start development with an H8 microcontroller.

FLASH PROGRAMMING UTILITY

Hitachi's flash programming utility provides an easy to use programming interface, running under Windows, that allows the user to download applications to any Hitachi flash based microcontroller from a PC.

This software allows the download in either boot mode, using a supplied bootloader, or in user program mode. Download data rate is software selectable over a wide range of speeds.



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