Hitachi Releases SH7760 SuperH™ Microprocessor for In-Vehicle Information Products Supporting Telematics, Integrating SH-4 CPU Core and Variety of Interfaces in a Single Chip

⎯ Offering compact implementation of sophisticated, high-performance telematics products and industrial equipment, and short development times ⎯

Tokyo, October 21, 2002— Hitachi, Ltd. (TSE: 6501) today announced the SH7760 high-performance processor for use in in-vehicle information systems such as next-generation telematics[1] products and industrial equipment such as POS terminals, integrating a SuperH™[2] family top-end SH-4 RISC CPU core together with a variety of interfaces such as voice, sound, in-vehicle LAN and memory card interfaces, in a single chip. Sample shipments will begin in January 2003 in Japan.

The SH7760 incorporates an improved version of the SH-4 core, featuring enhancements such as a doubled cache memory capacity, plus a variety of on-chip interfaces and peripheral functions including voice and in-vehicle LAN support. These features make it possible to implement in-vehicle systems such as next-generation high-functionality, high-performance telematics products, while the provision of on-chip modules such as an LCD controller and USB interface make the SH7760 ideal for use in POS terminals and similar industrial products and a variety of consumer products. Instruction compatibility with current SH-4 products enables existing programs and middleware to be used, while the development platform under preparation allows user system development to be completed in a short timeframe.

Car navigation systems displaying route information have for some time been the most common type of in-vehicle information equipment, but recent developments include the advent of services offering a safety-monitoring "Emergency Call System"[3] that transmits vehicle information, such as the airbag activation, by wireless from inside the vehicle and reports problems, as well as services providing simple route guidance and information on gas stations, restaurants, and similar facilities, in real time. Major expansion is forecast in the field of telematics, in which the in-vehicle and the out-of-vehicle are connected through the Internet, etc., by means of a wireless terminal such as a mobile phone, and traffic, safety, entertainment, and other kinds of information are received from outside the vehicle, while vehicle information, including vehicle conditions, or service center inquiries are transmitted outside the vehicle, enabling services similar to those available at home to be provided in an automobile.

A telematics system requires a variety of functions, such as display of simple route guidance and various other kinds of information received from outside the vehicle, capture via an in-vehicle LAN and processing of various kinds of vehicle information, such as car speed and airbag activation, and connection to and control of a wireless terminal for transmission outside the vehicle. In addition, such systems are expected to expand into the provision of features that take account of safety features when operating equipment, with voice-operated hands-free functions, for example, in which technologies such as noise and echo cancellation, speech recognition, and speech synthesis will be of major importance. To meet the needs of next-generation telematics systems, therefore, there is a strong demand for high-performance, high-functionality devices that are capable of implementing a variety of functions and technologies, and will enable systems to be made small enough to fit into the limited installation space inside a vehicle.

To meet this market need, Hitachi has developed the SH7760 high-performance processor, integrating a SuperH family top-end SH-4 CPU core, widely used in car navigation systems, together with a variety of interfaces and peripheral functions necessary for telematics systems, all in a single chip.

Features of the SH7760 are summarized below.

< Features >

1. High processing performance of 360 MIPS and 1.4 GFLOPS, together with an improved SH-4 CPU core with doubled cache memory capacity, for high-performance systems

    The SH7760 incorporates a SuperH family top-end SH-4 CPU core offering high performance of 360 MIPS and 1.4 GFLOPS at a 200 MHz operating frequency. This CPU core is an improved version that features twice the memory capacity (16 Kbytes for instructions and 32 Kbytes for data) and uses two-way set-associative operation, speeding up program processing and enabling high-performance end-products to be developed. The new CPU core is instruction compatible with the existing version, enabling the use of existing programs and middleware of various kinds, such as voice and sound processing middleware.

2. Variety of on-chip interfaces for compact, high-performance systems at lower cost through the use of fewer external parts

    As voice and audio data interfaces essential for hands-free functions, the SH7760 includes an audio CODEC interface and a serial sound interface for audio LSI connection.   Also provided are an HCAN2*[4] interface offering CAN*[5] industry standard in-vehicle LAN compatibility, a USB host interface for connecting a mobile phone or similar device, plus a variety of interfaces for various kinds of information, from voice and sound to control information, including a memory card interface for map data capture and so on. These features enable a variety of telematics system or industrial equipment applications to be handled by a single chip, and make it possible to reduce the number of different parts previously required to implement various functions, and thus to reduce the size and cost of the end-product.

3. On-chip LCD controller with a display capacity of up to 640×480 dots, facilitating configuration of a display system and enabling simple car navigation functions to be implemented with a single chip

    The SH7760 has an on-chip LCD controller supporting a liquid crystal display screen of up to 640×480 dots when displaying 256 colors. A display system can easily be configured simply by connecting LCD module, and the powerful processing capability of the SH-4 enables single-chip implementation of simple car navigation functions such as basic turn-by-turn*[6] route guidance and information display.

4. On-chip data transfer buffers and FIFO bridges for smooth, non-intermittent transfer processing

    A number of modules, such as the I^2C bus interface, incorporate a data transfer buffer. When transmission and reception of various kinds of data occur simultaneously on the internal bus, the data processing for each can be executed smoothly. In addition, DMAC includes a bridge that provides a dedicated FIFO (First In First Out) buffer for the LCD controller, USB interface, audio CODEC interface, and serial sound interface, for which smooth data transfer is especially important. This enables smooth data transfer and processing, and prevents such problems as sound intermittence due to interruption of data transfer.

The package used is a small 256-pin BGA.

A development platform provided with USB and other interfaces is prepared as a development tool, use of which will simplify the development of user software.

Hitachi will continue to develop products offering still higher performance and enhanced peripheral functions to meet the increasingly sophisticated demands of telematics systems.

Notes: 1.   Telematics: A term coined from a combination of "telecommunications" and "informatics", referring to next-generation information provision services for automobiles, etc.

2.   SuperH is a trademark of Hitachi, Ltd.

3.   Emergency Call System: A system that detects operation of a button or airbag activation and transmits this information to a service center, together with vehicle position information, to report the occurrence of a breakdown or accident and request assistance.

4.   HCAN2: Hitachi Controller Area Network 2. A CAN supporting the Bosch CAN Ver. 2.0B active specification, featuring FULL CAN support and a 32-message buffer.

5.   CAN: Controller Area Network. A network specification for use in vehicles, proposed by Robert Bosch GmbH of Germany.

6.   Turn-by-turn: A kind of navigation function in which the route of a vehicle is indicated by an arrow.

< Typical Applications >

- In-vehicle information terminals (telematics devices, low-end navigation systems, etc.)

- Industrial equipment (POS terminals, etc.)

< Prices in Japan >(For Reference)

Product Code	Package	Unit Price for 10,000-Unit Lot (Yen)
SH7760 (HD6417760BP200D)	256-pin BGA	3,900

< Specifications >

Item	Specifications
Product code	SH7760 (HD6417760BP200D)
Operation temperature range	-40 to +85°C
Power supply voltage	Core: 1.5 V, I/O: 3.3 V
Operating frequency	200 MHz (max.)
Processing performance	360 MIPS, 1.4 GFLOPS (at 200 MHz operation)
CPU core	SH-4 core
CPU instructions	91 types (16-bit fixed-length instructions)
Cache memory	16-Kbyte instruction / 32-Kbyte data separation, two-way set-associative, write-through/copy-back selectable
External memory	Bus state controller supports SRAM, synchronous DRAM, and burst ROM
Data bus width	External 8/16/32 bits selectable
On-chip peripheral functions	Interrupt controller (INTC)
	Direct memory access controller (DMAC) $\times$ 8 channels
	Clock pulse generator (CPG): with multiplication PLL
	Watchdog timer (WDT)
	User break controller (UBC)
	Timer unit (TMU) $\times$ 3 channels
	Compare match timer (CMT) $\times$ 4 channels
	LCD controller (LCDC)
	Smart card interface module (SIM)
	10-bit resolution A/D converter $\times$ 4 channels
	Advanced user debugger (AUD)
	Hitachi user debug interface (H-UDI)
Interfaces	Serial communication interface with FIFO (SCIF) $\times$ 3 channels
	I^2C bus interface $\times$ 2 channels
	Serial sound interface (SSI) $\times$ 2 channels
	Hitachi Audio CODEC interface (HAC) $\times$ 2 channels
	USB host interface
	Hitachi controller area network 2 (HCAN2) $\times$ 2 channels
	Hitachi serial peripheral interface (HSPI)
	MultiMediaCard™ interface (MMCIF)
	Multifunction interface (MFI)
Power-down modes	Sleep mode
	Deep sleep mode
	Software standby mode
	Hardware standby mode
	Module standby mode
Package	256-pin BGA (21 mm $\times$ 21 mm, 1.0 mm pitch)

* MultiMediaCard is a trademark of Infineon Technologies AG, Germany, and is licensed to MMCA (MultiMediaCard Association). Hitachi is an MMCA Board Member.