HITACHI

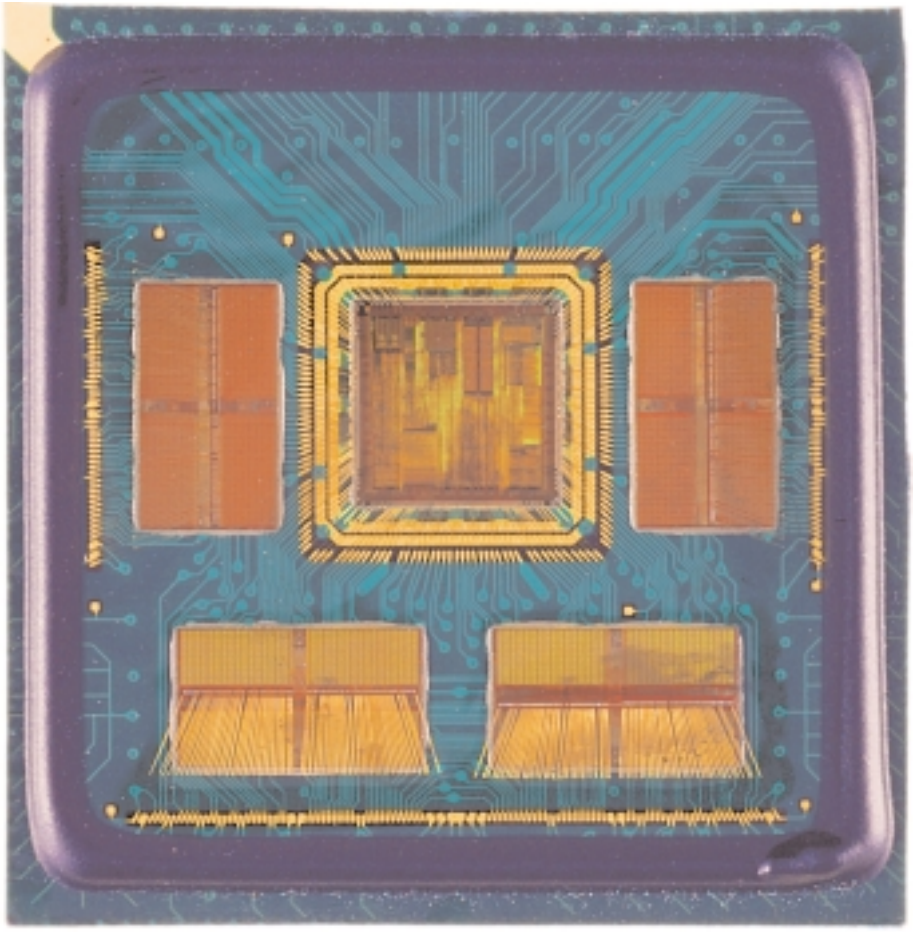
Semiconductor

SuperH® RISC Processor Based Multi-Chip Modules

Introduction

Devices in the Hitachi SuperH MCM (multi-chip module) product family are based on popular SuperH RISC and RISC/DSP microprocessors. These standard system-on-substrate products combine 200-MHz SH-4, or 133-MHz SH3-DSP or 133-MHz SH-3 processors with 32 MB or 16 MB of synchronous DRAM (SDRAM). They solve a range of key design problems—and do so cost effectively—because they leverage Hitachi's system design expertise, advanced packaging technologies, and high-quality/high-volume manufacturing and testing processes.

SuperH MCMs allow system manufacturers to simplify and improve the design of high-speed, high-performance embedded systems, while also reducing the product development cycle for a faster time to market. Applications include small digital cameras and other portable consumer products such as wireless devices, as well as factory automation systems and industrial and office equipment.



Features and Benefits

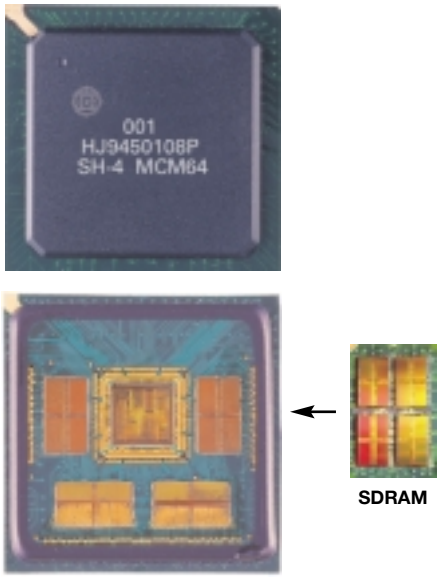
- High performance—Up to 200 MHz processor core speed and 100 MHz on-substrate bus speed, combined with tight coupling between the processor and memory, ensure the highest possible throughput.
- Small footprint—The 13x19-mm and 31x31-mm BGA packages use less space (up to 90% less board area than designs with MPU and SDRAM chips), decrease main printed-circuit board complexity and reduce pc-board cost (for example: 50% fewer layers are possible).
- Reduced bus capacitance and resistance—Low R and C help reduce power dissipation.
- Lower inductance—the low pin inductance of the MCM BGA packages, due to the short length of the solder balls, decreases voltage spikes.
- Reduced electromagnetic interference (EMI)—The MCM's tightly coupled processor and memory generate less EMI than designs with separate processor and memory chips on a pc board.
- Low power—Power-efficient SuperH processors help extend battery life in portable applications.
- Standard parts—Off-the-shelf, fully proven and tested SuperH MCMs allow shorter system design/debug cycles without the development-time or NRE issues of SOC (system-on-chip) custom products.
- Process technology optimization—Unlike SOC solutions, MCMs assemble mixed geometry or technology devices on the same substrate, for performance and cost optimization.
- Single device implementation—By combining processors and memory, SuperH MCMs reduce system component counts for more reliable products.
- Upward code-compatible processors—The SH-3, SH3-DSP and SH-4 series processors in the SuperH MCMs ease the development of system upgrades and higher-performance designs.
- Ensured availability of small-capacity SDRAM—Hitachi will supply MCMs with small-capacity SDRAM well into the future, even if other suppliers stop making such SDRAMs, to avoid premature obsolescence of customers' designs.
- Broad range of support tools—Extensive SuperH hardware and software support tools (low-cost evaluation and development kits, in-circuit emulators, high-performance C compilers, real-time operating systems, and more) facilitate rapid, efficient embedded system design.

SuperH® RISC engine

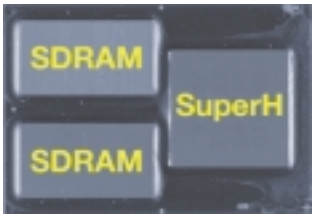
Different Configurations of MCM

Discrete device implementation

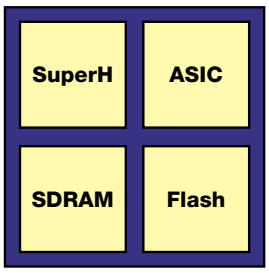
BGA 353-pin series



BGA 273-pin series



Custom MCM (example)



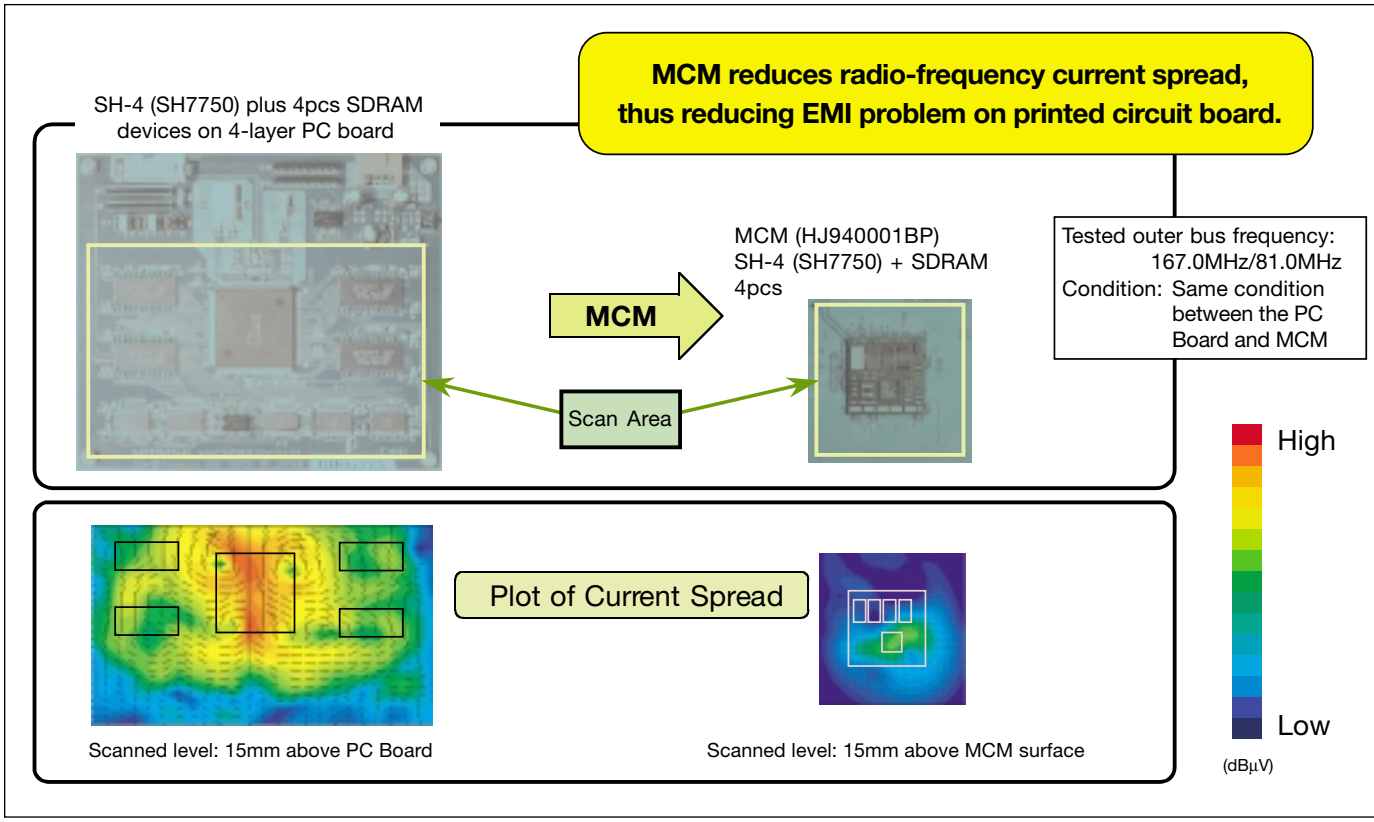
Match MCM to Application

The eight standard SuperH MCMs cover many key embedded system applications. Our basic recommendations are as follows:

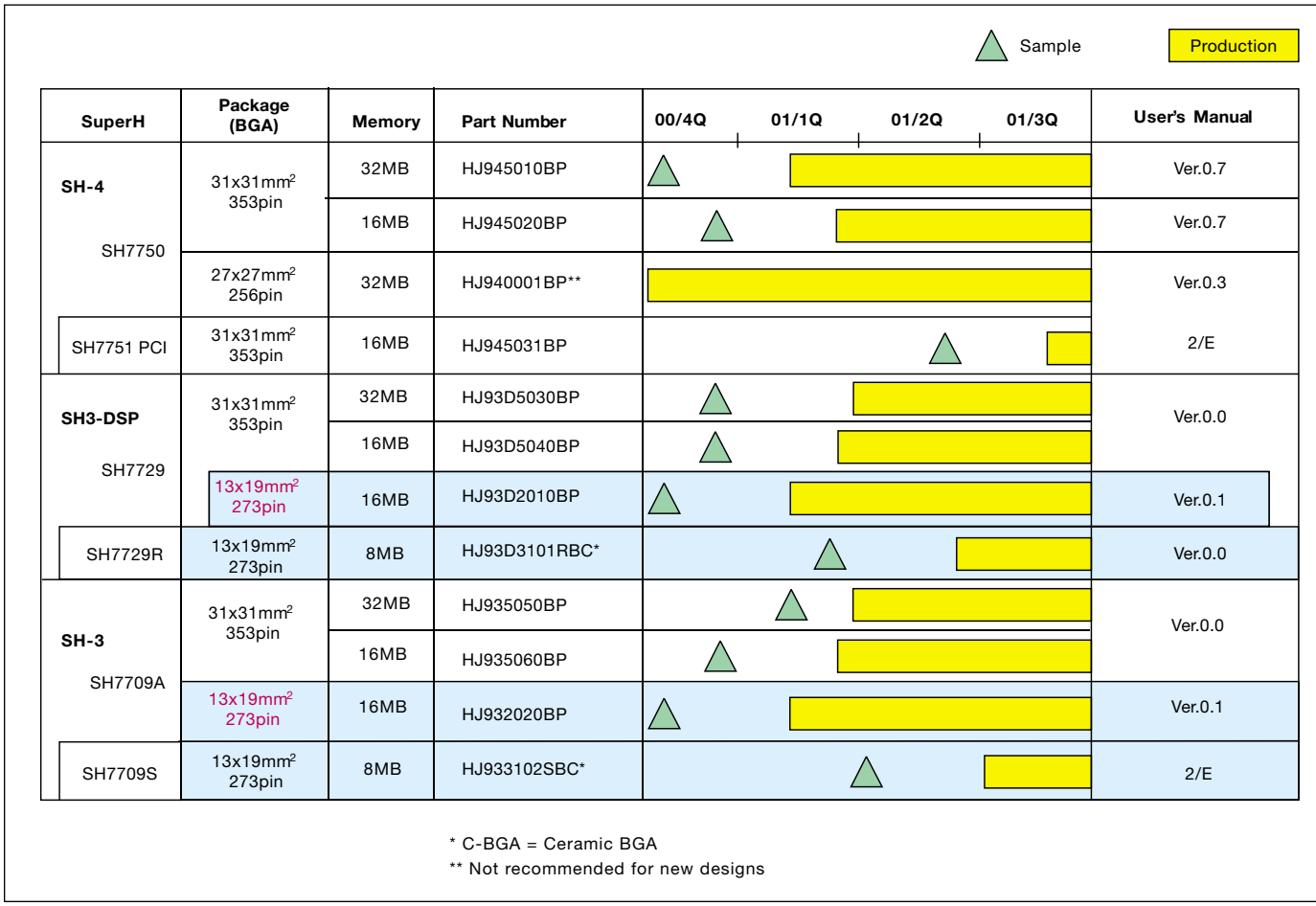
- Devices in the HJ94 series are ideal for high-speed image processing systems. These are the highest-performance SuperH MCMs. They have a 200-MHz SH-4 (SH7750) RISC microprocessor connected to either a 32-MB or 16-MB SDRAM (four or two 64-Mbit chips) with a 100-MHz bus.
- Devices in the HJ93D series are great choices for multimedia devices with a built-in browser or network products such as routers that provide a built-in VoIP function. Such applications take advantage of the high-speed voice and image data compression/expansion processing capabilities of the 133-MHz SH7729 RISC/DSP processor, which has an SH3-DSP CPU core with a built-in DSP unit.
- Devices in the HJ93 series are well suited for portable information terminals such as handheld PCs. They incorporate a 133-MHz SH7709A RISC microprocessor (SH-3 CPU core) that delivers good performance with low power consumption.

Hitachi plans to expand the SuperH MCM product line with versions that offer increased functionality and value. We will work with customers to develop special MCMs that provide optimized functions and performance. Such customized MCMs will offer much shorter development times and much lower engineering costs than comparable SOC implementations.

Test Results of Radio-Frequency Current



MCM Roadmap



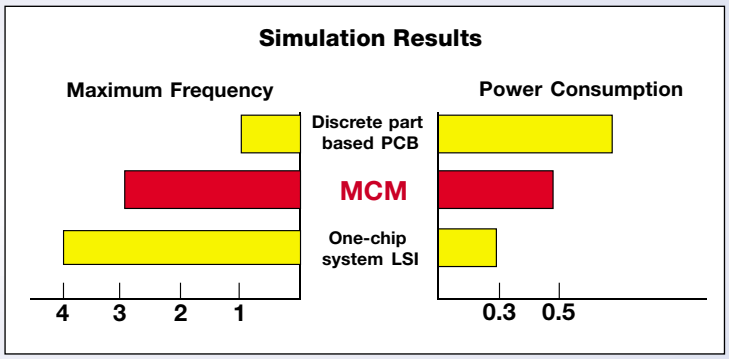
SuperH	Package (BGA)	Memory	Part Number	User's Manual
SH-4 SH7750	31x31mm² 353pin	32MB	HJ945010BP	Ver.0.7
		16MB	HJ945020BP	Ver.0.7
	27x27mm² 256pin	32MB	HJ940001BP**	Ver.0.3
SH7751 PCI	31x31mm² 353pin	16MB	HJ945031BP	2/E
SH3-DSP SH7729	31x31mm² 353pin	32MB	HJ93D5030BP	Ver.0.0
		16MB	HJ93D5040BP	
	13x19mm² 273pin	16MB	HJ93D2010BP	Ver.0.1
SH7729R	13x19mm² 273pin	8MB	HJ93D3101RBC*	Ver.0.0
SH-3 SH7709A	31x31mm² 353pin	32MB	HJ935050BP	Ver.0.0
		16MB	HJ935060BP	
	13x19mm² 273pin	16MB	HJ932020BP	Ver.0.1
SH7709S	13x19mm² 273pin	8MB	HJ933102SBC*	2/E

* C-BGA = Ceramic BGA
** Not recommended for new designs

Performance and Power Consumption Comparison

Maximum frequency and power dissipations among MCM, system LSI and discrete part based PCB using HSPICE simulation

Condition	
Process:	0.18 mm
Temperature:	27C
Supply Voltage:	Core 1.8V; I/O 3.3V
Discrete part based PCB:	120mm x75mm
MCM size:	27mm x 27mm
System LSI size:	8mm x 8mm



Ordering Information

Processor	MPU Model	Memory (MB)	MCM Product Number	Package	No. of Solder Balls
SH-3	SH7709A	16	HJ932020BP	13X19	273
SH-3	SH7709A	32	HJ935050BP	31X31	353
SH-3	SH7709A	16	HJ935060BP	31X31	353
SH-3 DSP	SH7729	16	HJ93D2010BP	13X19	273
SH-3 DSP	SH7729	32	HJ93D5030BP	31X31	353
SH-3 DSP	SH7729	8 Exclusive SDRAM	HJ93D31XXBP	13X19	TBD
SH-3 DSP	SH7729	16	HJ93D5040BP	31X31	353
SH-4	SH7750	32	HJ945010BP	31X31	353
SH-4	SH7750	16	HJ945020BP	31X31	353

Budgetary Pricing – Availability

Samples of the SuperH MCMs are available now. For pricing, please call your local Hitachi sales office.

Contacts

http://www.hitachi.com/semiconductor

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Insight Electronics . . . . . .(800) 677-7716
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