HITACHI
Inspire the Next

SuperH™
System Solutions

The brains . . .

. . . of the machine

Shaping intelligence

HITACHI SEMICONDUCTOR

Hitachi Board Level Solution for Internet Applications

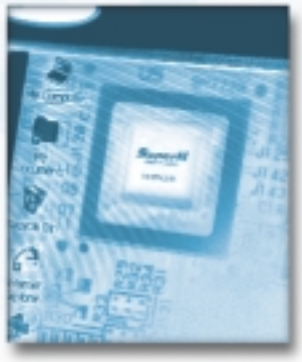
- Single chip solution
- Combined RISC/DSP processor for multimedia applications
- Complete hardware reference design
- Complete software stacks for Linux and Windows® CE
- Optimised middleware for multimedia
- Low cost, high performance

Internet Application products come in many different form-factors such as PDAs, Web/Email Phones, ePOS Terminals and even as part of the latest White Goods. Generally though, each application differs little in terms of the hardware and software needs as the on-going convergence of technologies evolves.

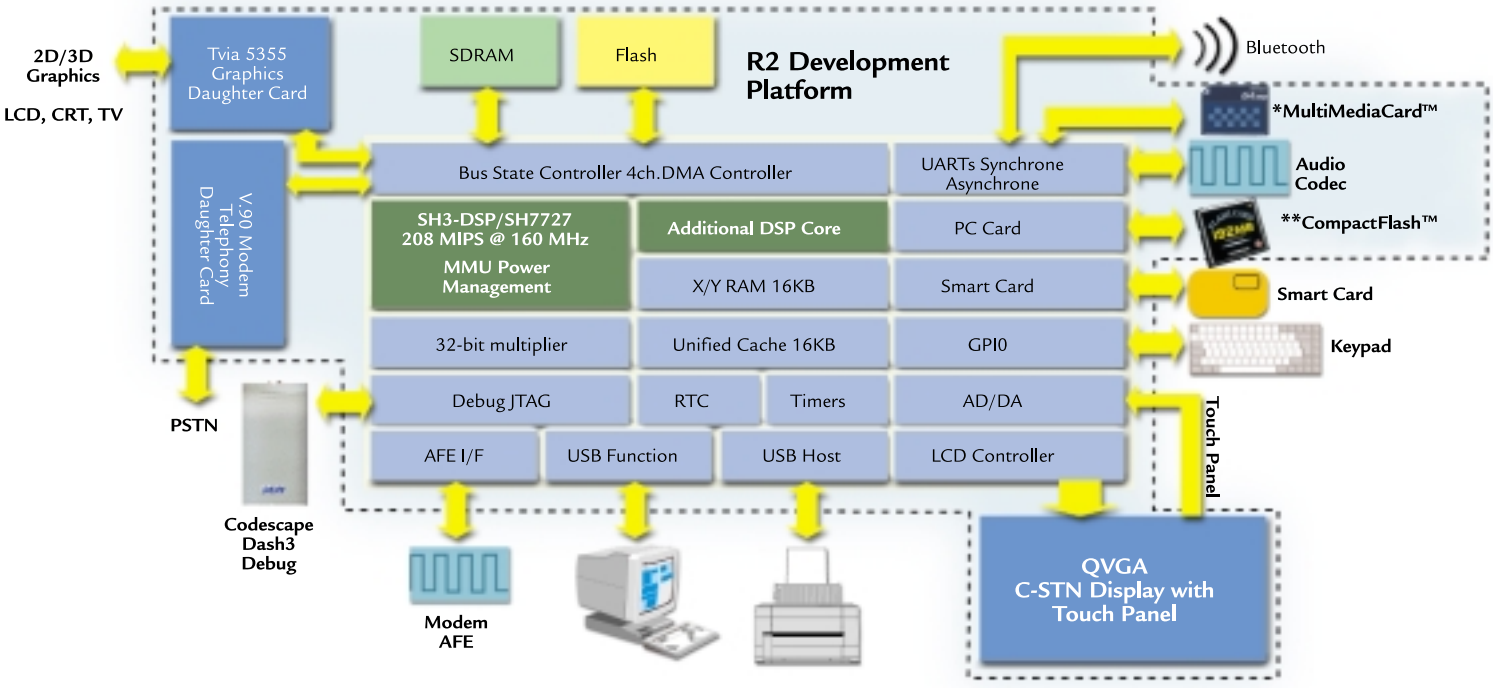
At Hitachi, our focus is not just on bringing leading edge silicon solutions to our customers but bringing complete system solutions that give OEMs both a hardware and software reference platform with which to develop new products.

No more is this evident than in our R2 platform for the SH7727. This platform incorporates a hardware reference design, that includes the SH7727 silicon, with its highly integrated peripheral mix, a QVGA Touch Panel Display and a compelling suite of software for both Lineo's Embeddix Linux and Microsoft's Windows® CE Operating Systems[1]. Further to this, a diverse range of middleware components is available through both Hitachi and its partners. For example, for multimedia applications, Hitachi can offer optimised software engines, that take advantage of our SH3-DSP architecture, for both MP3 and MPEG4 decoding.

Similar solutions are available for SH3 and SH4. Visit our Web site for more application examples at *www.hitachi-eu.com/brains.*



[1] *Other leading Operating Systems are supported through our standard Solution Engine range of development boards.*



** MultiMediaCard™ is a trademark of Infiren Technology AG*

*** CompactFlash™ is a trademark of SanDisk Corporation and is licensed royalty-free to the CFA (CompactFlash™ Association)*

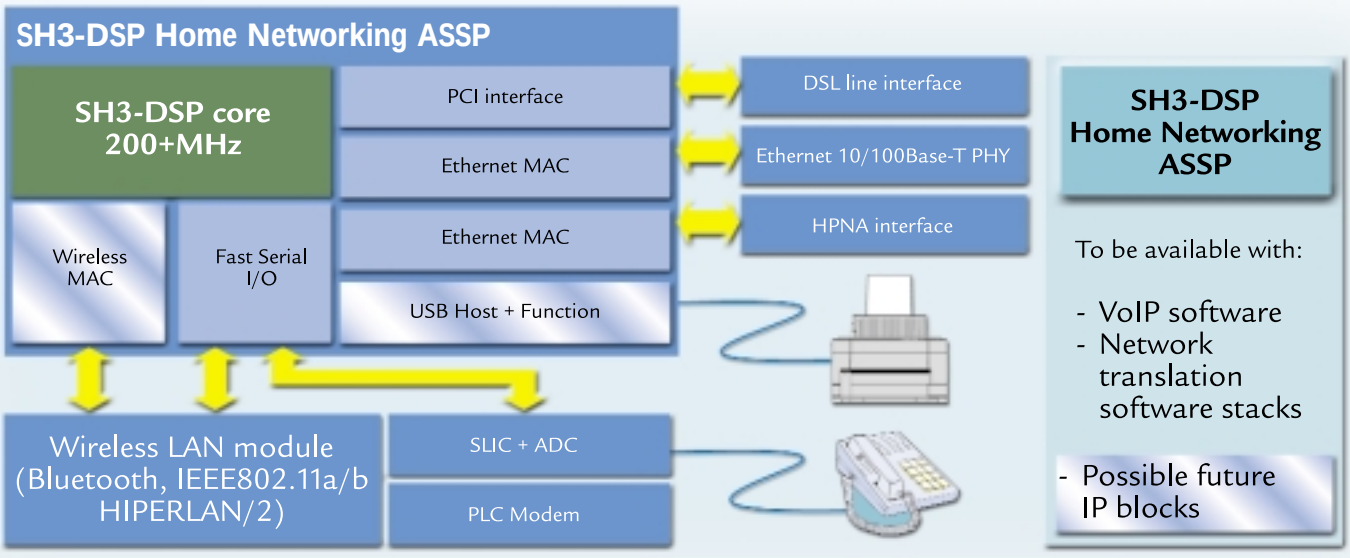
Advanced Silicon IP for the Home Networking Market

- Embedded processors with USB, Ethernet and PCI on-chip
- Combined RISC/DSP solutions for low cost, high performance
- ASSP, SoC and ASIC solutions
- Advanced middleware support for voice, audio and video
- New technology solutions for Bluetooth, WirelessLAN and Powerline Communications (PLC)

The emerging Home Network market is an area where Hitachi is poised to take a leading role. Service providers and Gateway manufactures alike are demanding higher levels of integration and leading edge technologies from their silicon provider to give them an advantage in what is already becoming a highly competitive market space. Hitachi is one such supplier that can deliver on both these counts.

With an extensive in-house IP portfolio for both hardware and middleware, Hitachi already offers high performance, low power and low cost Application Specific Standard Products (ASSPs). Further to this, Hitachi can also provide leading edge ASIC solutions based on our SuperH RISC and combined RISC/DSP processor cores *(see back page for example hardware and middleware components available from Hitachi).*

When looking to the future, it is clear that the Home will employ many different communications media; some wired, some wireless, some requiring low data rates and some requiring full audio/video transmission. To fulfil some of these needs, Hitachi is investing in technologies such as WirelessLAN and Powerline Communications (PLC) with some customers already deploying equipment using our technology.



Hitachi Software Options for Mobile Multimedia

- Optimised Hitachi MP3 codec
- Optimised Hitachi MPEG4 codec
- JavaVM™ (kJava and pJava) from our partner software vendors
- Complete software stacks for Linux and Windows® CE
- Windows® Media Technology

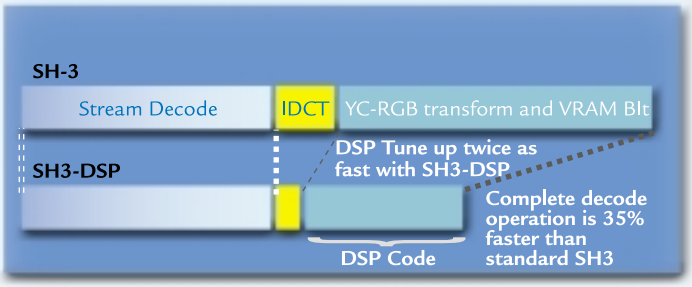
When considering the software components required to realise an engaging mobile multimedia product, the following can be considered to be core elements.

- Browser, e-mail, PIM
- Music player (MP3)
- Video player (MPEG4)
- Java

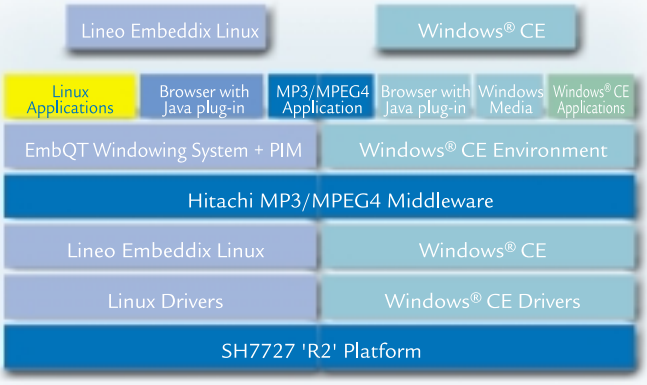
Of these elements, the functionality of a Web browser, e-mail client or Personal Information Manager (PIM) is relatively easy to implement - given a high level operating system such as Linux or Windows® CE. However, difficulty can arise with the integration of other middleware blocks that are more closely optimised for the CPU.

At Hitachi we have developed the SH3-DSP core which delivers high levels of performance at low power. Utilising the DSP instructions, MP3 and MPEG4 decoding tasks run at a speed approximately 65% of that of a standard RISC architecture. This performance increase can be directly translated into lower power consumption in mobile applications. However, Hitachi not only offers its own proprietary codecs but also support for Microsoft's Windows® Media Technology to give OEMs a highly optimised system solution based around the SuperH architecture.

For Mobile Multimedia applications, Java is also a key technology - needed for applications such as e-commerce and the distribution of games. Here again, the trade-off between price, power and performance is a vital balance. As such, Hitachi works with many Java vendors to ensure that our customers have the widest array of options open to them -just visit our Web site at *superh.hitachi-eu.com* for further details on all of Hitachi's software and middleware partners.



MPEG4 Decode



Mobile Software Stacks

New SH4R Multimedia Processors for Automotive

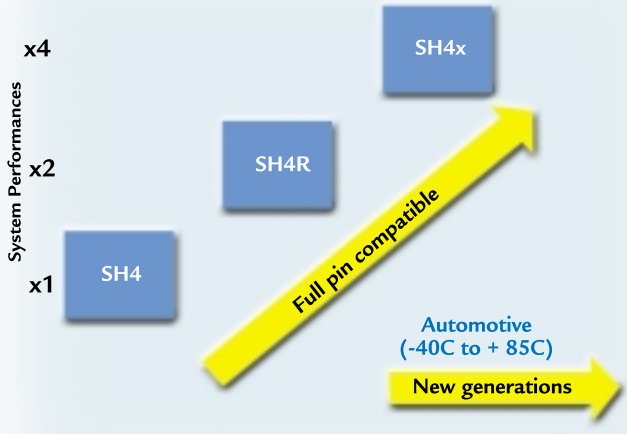
- New SH4R CPU core
- Higher frequency
- Optimised Caches and DMA
- Pin compatible with SH7750 and SH7751 (SH4-PCI)
- No redesign required
- Software compatible

As Car Information Systems (CIS) become more prevalent in vehicles today, the range of functionality also varies considerably from standard navigation up to full web browsing capability with audio/video players and speech recognition. This requires OEMs to create scalable platforms in a bid to reduce software development costs, facilitate smoother qualification and reduce time-to-market.

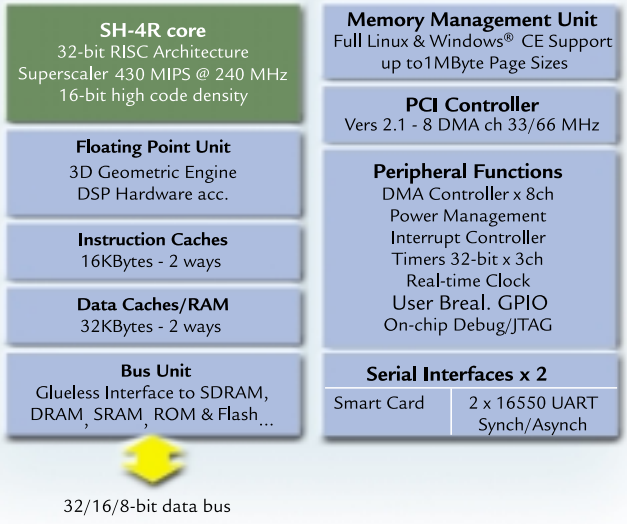
The SH4 processor has now become the de-facto standard in the CIS market. As such, Hitachi developed the new SH4R core with this market area particularly in mind. Both the SH7750R and SH7751R (SH4-PCI) are qualified for extended temperature range, provide impressive performance upgrades and are pin compatible to the first generation products. This means that changing to SH4R is really the simplest way to boost your system performance without adding any additional costs associated with redesign or architecture changes.

The SH4R core uses a high yield 0.18µm technology process. The new cache architecture (2-way set associative) has been doubled in size, considerably reducing cache misses and significantly increasing the real time capabilities of the operating system. Also the new core has been qualified to Automotive temperature and quality specifications for operation up to 240MHz internally and 120MHz for SDRAM access. The number of DMA channels has also been doubled to 8 channels to facilitate media streaming transfers.

These enhancements are the latest in the SH4 roadmap to hit mass production status, but the roadmap doesn't stop there. Hitachi is already developing higher speed versions and a dedicated SH4-ASSP for telematics and car information systems.



SH4 Roadmap



SH4-PCI (SH7751R)

Hitachi Partners for Industrial Control

- Systems Integrators
- OS and Middleware vendors
- Development Boards
- Design houses
- Tool vendors
- Off-the-shelf embedded modules

Whatever the system requirement, Hitachi has a partner company that can offer the best complimentary resource to our high performance silicon and software system solutions. No more is this evident than for Industrial applications where Hitachi has a selection of solution partners for every aspect of system design.

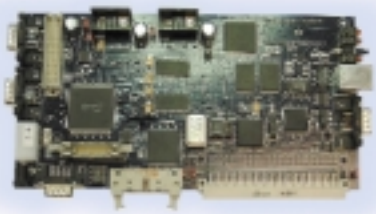
At the lowest levels of design, such as On-Chip Debugging, as well as offering in-house solutions, Hitachi has partnerships with vendors such as ATI, Imagination Technologies, Green Hills Software, Lauterbach and WindRiver. These companies offer a depth coverage for all our SuperH processors.

When it comes to Operating System partners, the SuperH architecture, through it's long history, has the widest range of support on the market with vendors including ATI, Green Hills Software, Lineo, LynuxWorks, Microsoft, Microware, Montavista, NexGen Software, QNX and WindRiver to name but a few.

Further up the software chain, Hitachi compliments its own Middleware offerings with products from partner companies that have expertise in areas such as Communications, Java and Networking stacks and services.

For Industrial applications that require the quickest time-to-market with the lowest risk, Hitachi has also teamed up with a number of Design Houses and Systems Integrators, some of which offer 'off-the-shelf' solutions and even manufacturing services. For ready-to-go solutions look no further than the ESG Platform, the Garz & Fricke 'Sydney', the Hitex 'HiCO.SH4' or the NMI 'µEngine' products; all of which offer excellent solutions for high-end SuperH designs.

Whether your need is for latest compiler software or a complete reference design our system partners offer excellent alternatives and extensions to the already extensive portfolio of Hitachi products. Just visit superh.hitachi-eu.com for more details.



ESG Platform

Garz & Fricke 'Sydney'

Hitex 'HiCO.SH4'

NMI 'uEngine'

Hitachi Technology Developments for Consumer Products

- SH2-DSP for MP3 players
- SH3 and SH3-DSP for Mobile Appliances
- SH4 for Gaming Machines and STBs
- SH5 for DigitalTV

With the rapid convergence of technologies has come the need for processor solutions with even more power and integration than ever before.

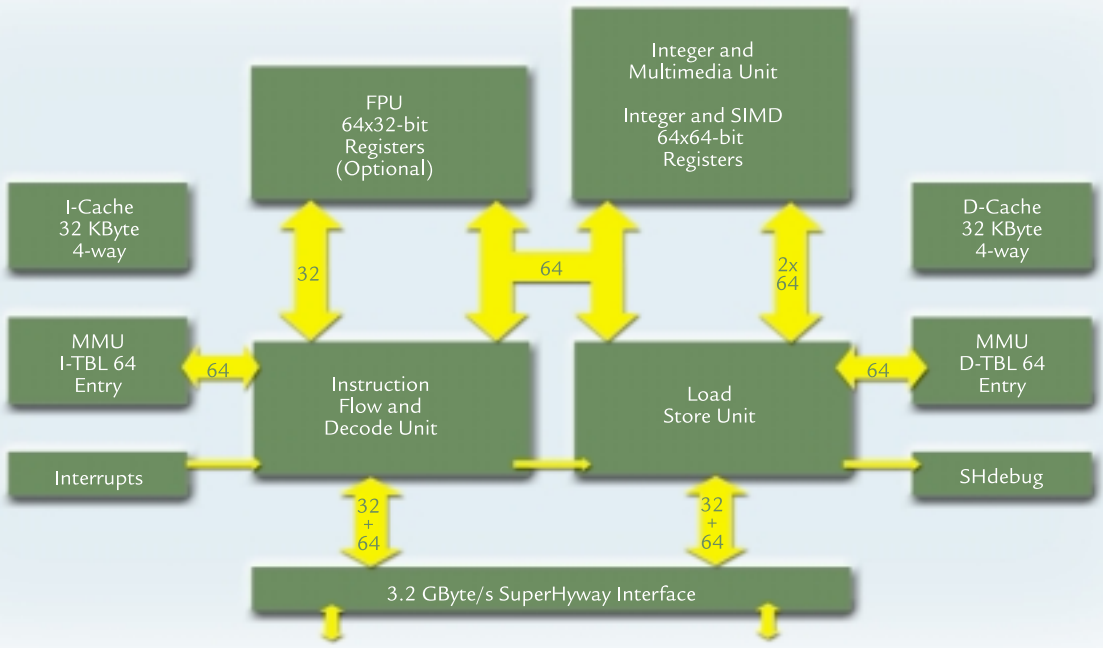
Many products today need to process multimedia, display images, play audio, be connected and in many cases be mobile. Along with these increasing needs comes the demand for lower power, a limiting factor in all mobile applications. Further still, for Consumer products, comes the question of cost.

With a long heritage in 32-bit Consumer products such as PDAs, Gaming Machines, Digital Cameras and STBs, Hitachi continues to create leading edge products that give the best MIPS/Watt and MIPS/Euro ratios.

The latest to endorse this philosophy are Hitachi's SH5 products that use the new SH5 core from SuperH Inc..

This architecture employs a 64bit SIMD core, a 7-stage pipeline and full FPU and DSP acceleration. With 714MIPS (Dhrystone 1.1) available the core is usable in two, real-time interchangable, modes: 32-bit SHcompact mode for SH4 compatible operation and 64-bit SHmedia mode where the full power of the SH5 architecture is realised.

This raw processing performance is also complimented by the latest power-down features and a core structure that facilitates high performance, low power SoC design; the perfect mix for tomorrows Consumer products.

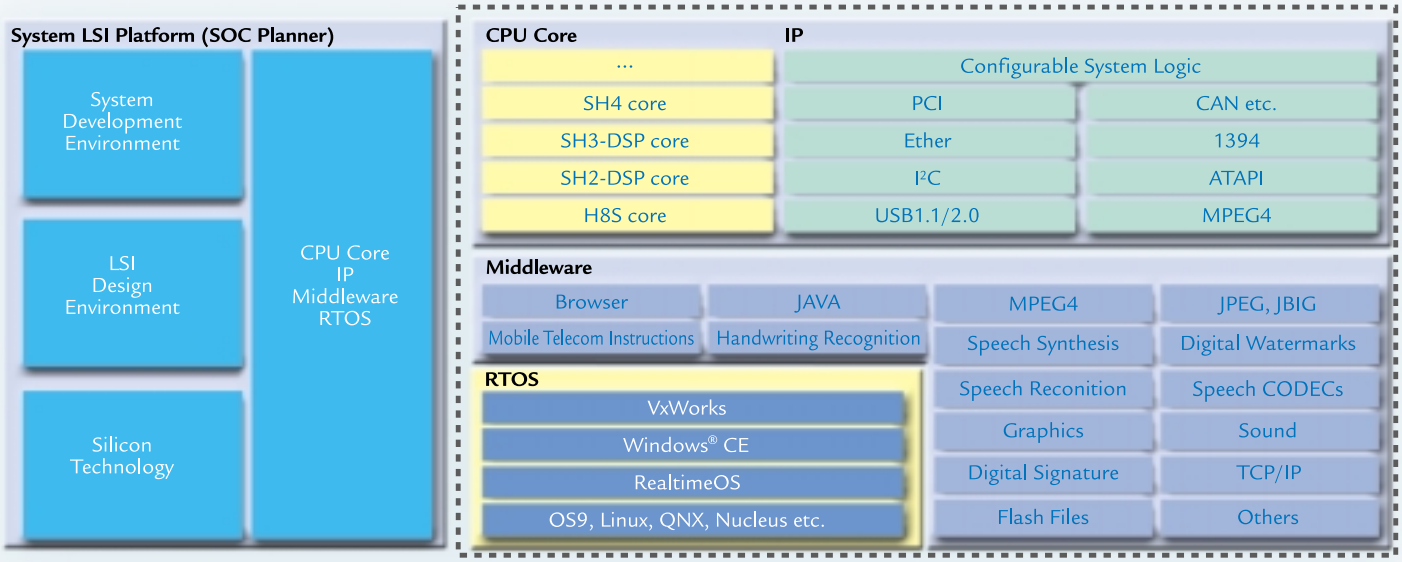


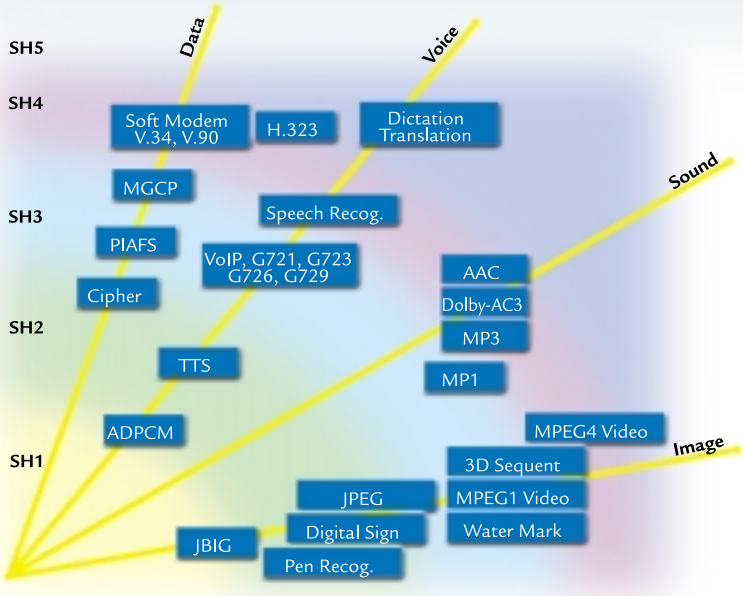
SH5 Core from SuperH Inc.

Hitachi System Solutions

Designing complex solutions goes beyond the plugging together of IP blocks. An environment is needed to allow the mix and match of various IP, design methodologies and prototyping tools that enable hardware/software and that allows the evaluation of real-time system performance.

Against this backdrop, Hitachi has developed the integrated SOCplanner for custom system LSI design. SOCplanner is an integrated design platform that provides a coherent design and development infrastructure, together with enhanced EDA tools and reusable cores and IPs. It includes the latest hardware technologies and middleware, offering shorter development times and earlier market entry for System LSIs and user systems. The platform is capable of offering system-on-chip solutions that include fast and dependable LSI design through to user system development.





CPU Cores, IP, OS and Middleware; SOCplanner provides many valuable modules, such as SuperH or H8S CPU cores, analogue modules and memory, as well as standard IPs including USB, IEEE1394, Ethernet, JPEG and MPEG. A SuperH/H8S common standard bus (allowing flexible system configuration to suit a wide variety of applications and allowing the user to employ them on silicon as pre-verified IP) can then interconnect these modules.
In addition, a comprehensive line-up of Hitachi's middleware is available. By integrating the modules into upper system software layers (OS, Plug-Ins, User Applications...) it provides you with the foundation of an optimal system solution that uses the least amount of MIPS.

EUROPEAN HEADQUARTERS

Hitachi Europe Ltd.
Whitebrook Park, Lower Cookham Road, Maidenhead, Berkshire SL6 8YA United Kingdom
Tel: +44-1628 585000 Fax: +44-1628 585160 Email: web.ecg@hitachi-eu.com

(Please visit our website for contact details of our Hitachi Sales Offices in EMEA)
www.hitachi-eu.com/semiconductors/

HITACHI
Inspire the Next

February 2002 Printed in Europe **19-069**