**SH-4 SuperH™ RISC Processor**

**SH7750 and SH7751**

**Product Brief**

**Description**

The SH775x (SH-4) series is a high-performance, highly integrated, cost-effective, 2-way superscalar 32-bit RISC microprocessor for embedded applications. The SH775x series delivers best-in-class performance, on-chip integration and code size, with excellent low power consumption, support tools and chipsets from Hitachi and third party vendors, as well as a migration path to higher performance and lower power consumption. This complete package makes the SH775x series the optimal choice for use in data processing, communications, industrial, transportation and high-end consumer applications.

The SH775x series’ superscalar architecture and 3D graphics capability (arithmetic accelerator) combines a 100MHz and 64-bit external bus to deliver 800MB/s data throughput for workstation-class performance at an affordable price. Several operating systems and middleware applications run on the processors, with more in development.

**Design Win**

- Navigation systems/Radio
- Handheld PC, Pocket PC
- Video game consoles
- Set-top-boxes
- Cable modems, Residential Gateway
- Digital TV, WebTV
- Internet terminals
- VoIP, IPhone
- Highend Screenphone, WebPhone
- Low-cost routers, switches

**Hardware Features**

- **General**
  - SH7750S / SH7751
  - 200 MHz (360 MIPS)
  - First 1000MIPS/Watt processor
  - PCI, FPU, 3D graphic engine...
- **CPU**
  - 32-bit RISC 2 ways superscaler architecture
  - 16-bit fixed instruction length for high code density (save up to 40% memory footprint)
  - Upward code compatibility with SH-1, SH-2, SH-3 series
  - 16 -32-bit general purpose registers
  - 32 -32 + 64 ->64 bits multiply-accumulate unit for special functions such as MPEG4
  - MMU, TLB for virtual memory management
  - 5 stage pipeline
- **Floating-point Unit**
  - Single and double precision
  - 3D Vector graphic Engine (128-bit vector registers)
  - Hardware 4x4 matrix-calculations for multimedia accelerator (MPEG4, M32)
- **Specialised Math Circuits**
  - Floating Point Unit
  - 128-bit Graphic Calculation
  - 3D Matrix Operations
- **Cache**
  - Instruction 8KB
  - Data 16KB
- **Bus Unit**
  - Glueless Interface to SDRAM, DRAM, SRAM, ROM & Flash
- **PCI Bus Controller**
  - 33/66 MHz 4ch DMA Controller
- **Memory Management Unit**
  - 32/16/8-bit data bus
- **Peripheral Functions**
  - DM A Controller
  - Power Management
  - Interrupt Controller
  - Timers
  - Real-time Clock
  - User Break
  - GPIO
- **Serial Interfaces**
  - Smart Card
  - 16550 UART
  - Synch/Asynch

**SH-4 CPU**

- Two-way Superscaler RISC
- 300 MIPS @ 167 MHz
- Integer Unit 32-bit
- Floating Point Unit 32-bit

**Memory Management Unit**

- Full Linux & Windows®CE Support
- 1K/4K/64K/1Mb Page Sizes
- Unified TLB
- 64 Entry
- Micro TLB
- 4 Entry

**Peripheral Functions**

- DM A Controller
- Power Management
- Interrupt Controller
- Timers
- Real-time Clock
- User Break
- GPIO

**Memory**

- On-chip cache, 8KB instruction and 16KB data
- Write back or write through, selectable by page
- Low voltage cache to reduce power consumption
- Glueless interface for SDRAM, SRAM, Flash, ROM
- 8, 16, 32 or 64-bit data bus support
- 100MHz 2 external bus

**PCI Bus**

- 32-bit PCI bus controller (Rev 2.1)
- 33MHz (4 channels) / 66MHz (1 channel)
- Host/slave support
- On-chip PCI arbiter
- Dedicated 4-channel PCI DMA Controller
- On-chip FIFOs for fast data transfer
- Configurable as 32 I/O pins

**On-chip peripherals**

- DM A Controller, 4 channels
- Timers, 3 channels -32-bits
- Watchdog timer
- Real-time clock
- PCM CIA control logic (2 channels)
- 2 Serial Communication Interfaces (SCI, SCIF)
  - Synchronous and A-synchronous mode
  - SCI: UART, ACIA, Smart Card interface
  - SCIF: 16550 UART (16-Bytes FIFOs)
- Interrupt Controller
- On-chip clock oscillator (with PLL)

**General purpose I/O, 16 lines**

**Low power management**

- Sleep and standby mode
- Peripheral turn off capability

**Integrated Debug Interface**

- JTAG, H-UDI for High speed download
- User break controller
- Real Time debug capability

* SH 7751 only
**SH 4 Comparison table / Ordering information**

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<th>SH 7751R</th>
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<td>32b/2-way</td>
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<td>SH7750SV</td>
<td>133/240MIPS</td>
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</table>

**Chipset solution**

- **MP Plan**
  - Higher Performances Cache x 2, 2-way associative WS now, MP B/2002
  - NEXT GENERATION
    - SH776x
    - Application Specific
    - SH7751 : 32bit SDRAM + PCI
    - SH7750 : 64bit SDRAM

**Networking**

- **V3 Semiconductor**: PCI Controller
- **Conexant**: MDP Modem
- **SMSC**: Ethernet controller

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