

# Automotive powertrain 32-bit microcontroller



## SH725xx

### RS44C

The SH725xx (SH-2A) is a high performance, highly integrated, high quality and cost-effective single chip 32-bit RISC microcontroller for automotive applications, in particular for powertrain. The SH725xx delivers best-in-class performance with up to 200MHz operation, on-chip memory integration (up to 4MB Flash, 256kB SRAM, 256kB DataFlash (EEPROM emulation)) and optimised code size, with advanced peripherals.

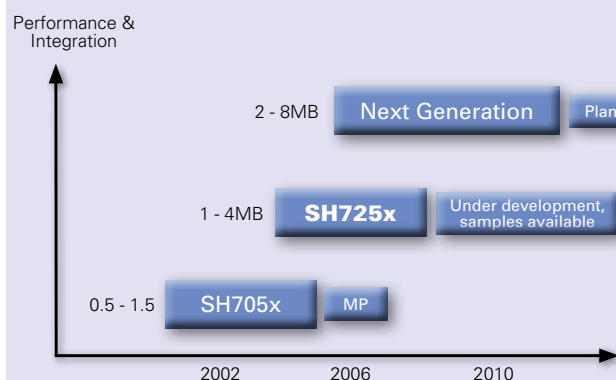
### Applications

- Engine Management
- Transmission Management
- Electronic Valve Control
- Adaptive Cruise Control
- High performance automotive systems with embedded Flash

### Key features

- High performance, superscalar 32-bit RISC controller
- Single/double precision Floating Point Unit
- High integration (up to 4MB Flash, 256kB SRAM, 256kB DataFlash (EEPROM emulation))
- Flash, SRAM and DataFlash (EEPROM emulation) with ECC
- High quality and reliability
- High-functionality peripherals (RCAN, ADC, etc.)
- Advanced Timer Unit (ATU-III) for up to eight cylinder engine and complex operations
- Comprehensive on-chip debugging features

### Renesas 32-bit powertrain roadmap



## RS44C features

### CPU

- 480 MIPS Dhrystone @ 200MHz
- SH-2A core
- 32-bit RISC superscalar architecture
- Harvard bus architecture
- High code density due to 16-bit instructions basis
- 16 x 32-bit general purpose registers
- 32 x 32 + 64 bits MAC for DSP-algorithms
- 5 stage pipeline

### Floating Point Unit

- Single precision mode (IEEE-1394 compliant)
- 16 x 32-bit dedicated floating point registers
- Double precision mode (IEEE-1394 compliant)
- 8 x 64-bit dedicated floating point registers
- Square root function
- Configurable NaN/Infinity handling

### On-chip memory

- Up to 4MB Flash, three-cycle random access @ 200Mhz, single cycle access if cache hits
- Up to 256kB SRAM
- Up to 256kB DataFlash with EEPROM emulation
- All memories have ECC
- 235 interrupt vectors, 16 priority levels

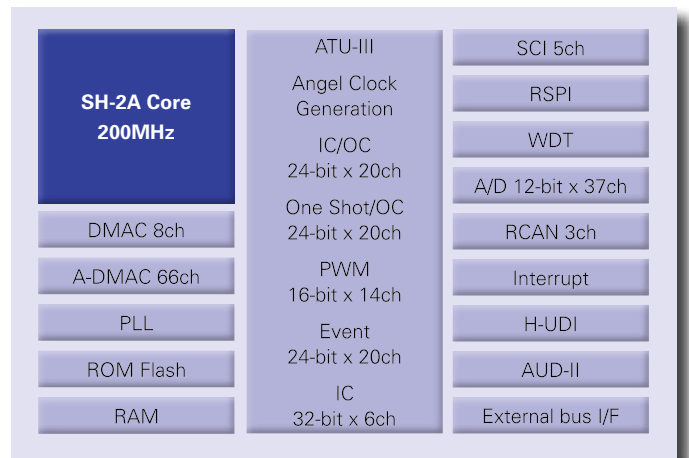
### DMA-controller

- 8 channel: general purpose with 4GByte address range
- burst mode, normal cycle-steal mode and intermittent cycle-steal mode
- Peripheral units can trigger DMA directly, without interrupt or CPU
- 66 channel: automotive purpose, fixed assigned to peripheral units

### On-chip peripherals

- Advanced Timer Unit-III with up to 122 pulses up to 8 cylinder
  - Angle Clock Generation, PWM, Input Capture, Output Compare
- RCAN-Interface (Bosch V2.0B compliant)
  - Up to 3 channels
  - 32 message buffers / channel
  - message priority system
- Watchdog Timer (WDT)
- Phase Lock Loop (PLL)
- On-chip back-up clock oscillator
- Up to 5 Serial Communication Interfaces (SCI)
  - synchronous and asynchronous

- Bus State Controller (BSC)
  - 4 chip selects, 16-bit data bus support (max)
- AD-Converter
  - Up to 2 independent Sample and Hold (up to 40ch + 9ch)
  - 1.25  $\mu$ s / conversion
- Up to 200 General Purpose I/O
  - 32 channel, 3 x Sample & Hold (12,12,8)
- General purpose I/O 149



### On-chip debug and calibration interface

- JTAG, High-Performance User Debug Interface (H-UDI) for high speed download
- Advanced User Debugger (AUD-II) for non-intrusive calibration and trace output
- User Break Controller for hardware breakpoints

### Temperature and packages

- Ta -40°C ... +125°C
- BGA-272, BGA-417, QFP-176

### Development tools & support

#### Hardware debugging tools

- Renesas E10A-USB
- Lauterbach Supertrace
- Renesas SDK72513

#### C, C++ compiler

- Renesas C/C++, GNU C/C++, Green Hills C/C++

#### 3rd party support

OSEK: Vector Informatik, ETAS  
CAN Driver: Vector Informatik  
Flash Bootloader: Vector Informatik  
Automatic Code Generation: dSpace (Targetlink)  
Calibration Support: ETAS (ETK, INCA)

