



AT91SAM7 32-Bit ARM-Based Microcontrollers

Core: [ARM7TDMI](#)



The AT91SAM7 family of Flash microcontrollers are based on the 32-bit ARM7TDMI RISC processor. The entry-level AT91SAM7S features from 32 KB to 512 KB of embedded high-speed Flash with sector lock capabilities and a security bit, and from 8 KB to 128 KB of SRAM. The integrated

proprietary SAM-BA Boot Assistant enables in-system programming of the embedded Flash.

Its extensive peripheral set includes a USB 2.0 Full Speed Device Port, USARTs, SPI, SSC, TWI, and an 8-channel 10-bit A/D converter. Its Peripheral DMA Controller channels eliminate processor bottlenecks during peripheral-to-memory transfers. Its System Controller manages interrupts, clocks, power, time, debug, and reset, significantly reducing the external chip count and minimizing power consumption.

The maximum clock frequency is 55 MHz, in industrial temperature range and under the worst case conditions. Typical core supply is 1.8V, I/Os are supplied at 1.8V or 3.3V and are 5V tolerant. An integrated Voltage Regulator permits single supply at 3.3V.

AT91SAM7L series features innovative power reduction techniques for both active and standby modes. In active mode, the power consumption is optimized via a programmable operating voltage, operating frequency, and peripheral clock activity, and the use of DMA instead of the CPU for data transfers. The SAM7L consumes 0.5 mA/MHz typical in

active mode when executing code out of its Flash memory. The power consumption in the different standby modes is controlled via power switches, scalable voltage regulators, and the use of sampling techniques on Voltage Monitors, Power On Reset, and Brown Out Detector instead of continuous measurement. In power down mode, the AT91SAM7L consumes only a typical 100 nA.

AT91SAM7SE family expands on the AT91SAMS family with external memory bus. The External Bus Interface (EBI) supports SDRAM and static memories including CompactFlash and ECC-enabled NAND Flash. Making it particularly suited to applications requiring high performance, USB connectivity, and extended on- and off-chip memory.

AT91SAM7X family adds integrated Ethernet, USB, and CAN interface. Its extensive peripheral set includes a USB 2.0 Full Speed Device Port, Ethernet MAC 10/100 base T, CAN 2.0A and 2.0B compliant Controller, USARTs, SPI, SSC, TWI, and an 8-channel 10-bit A/D converter. Its Peripheral DMA Controller channels eliminate processor bottlenecks during peripheral-to-memory transfers.

AT91SAM7XC family adds integrated Ethernet, USB and CAN interface, and security features. Its extensive peripheral set includes a USB 2.0 Full Speed Device Port, Ethernet MAC 10/100 base T, CAN 2.0A and 2.0B compliant Controller, an AES128 encryption accelerator, a Triple DES, USARTs, SPI, SSC, TWI, and an 8-channel 10-bit A/D converter. Its Peripheral DMA Controller channels eliminate processor bottlenecks during peripheral-to-memory transfers.

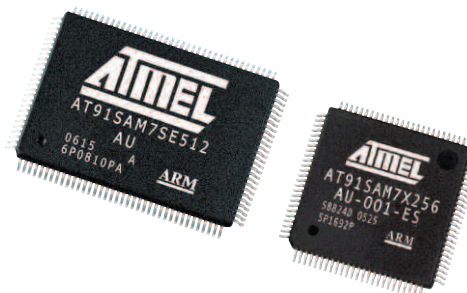
Each AT91SAM7 family member is supported by an Evaluation Board and extensive application development tools.

Features ▶

- Proven architecture based on ten years experience in ARM-based standard products
- Predictable response to a real-time event within a specified number of clock cycles
- Peripheral DMA eliminates bottlenecks in memory-to-peripheral transfers
- Advanced interrupt control enhances real-time performance
- Single-instruction bit set/reset simplifies application code
- Embedded Flash memory for flexible code and reference data storage

- Connectivity: USB, Ethernet, SPI, USART, etc.
- Security: AES/TDES accelerators, memory lock bits, etc.

AT91SAM7



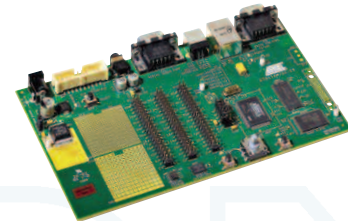
Family Comparative Features ▶

Part Number	Memory		Temperature °C	Package	Core Variant	Frequency (MHz)	A/D (channel/bits)	Timers (channels/bits)	Serial Interface(s) (#/Type)	GPIO	Ethernet (#/Type)	USB (#/Type)	Other Key Peripherals
	Flash (KB)	RAM (KB)											
AT91SAM7A3	256	32	-40 to +85	LQFP100	ARM7TDMI	60	16/10	9/16	2 x SPI / TWI / 2 x SSC UART / 3 x USART	62	-	Device 2.0	2 x CAN, MCI
AT91SAM7L128	128	6	-40 to +85	LQFP128 LFPGA144	ARM7TDMI	37	4/10	3/16	SPI / TWI UART / USART	80	-	-	Segment LCD
AT91SAM7L64	64	6	-40 to +85	LQFP128 LFPGA144	ARM7TDMI	37	4/10	3/16	SPI / TWI UART / USART	80	-	-	Segment LCD
AT91SAM7S512	512	64	-40 to +85	LQFP64 QFN64	ARM7TDMI	55	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	32	-	Device 2.0	-
AT91SAM7S256	256	64	-40 to +85	LQFP64 QFN64	ARM7TDMI	55	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	32	-	Device 2.0	-
AT91SAL7S128	128	32	-40 to +85	LQFP64 QFN64	ARM7TDMI	55	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	32	-	Device 2.0	-
AT91SAM7S64	64	16	-40 to +85	LQFP64 QFN64	ARM7TDMI	55	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	32	-	Device 2.0	-
AT91SAM7S32	32	8	-40 to +85	LQFP48 QFN64	ARM7TDMI	55	8/10	3/16	SPI / TWI / SSC UART / USART	21	-	-	-
AT91SAM7S321	32	8	-40 to +85	LQFP64 QFN64	ARM7TDMI	55	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	32	-	Device 2.0	-
AT91SAM7SE512	512	32	-40 to +85	LQFP128 LFPGA144	ARM7TDMI	48	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	88	-	Device 2.0	EBI
AT91SAM7SE256	256	32	-40 to +85	LQFP128 LFPGA144	ARM7TDMI	48	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	88	-	Device 2.0	EBI
AT91SAM7SE232	32	8	-40 to +85	LQFP128 LFPGA144	ARM7TDMI	48	8/10	3/16	SPI / TWI / SSC UART / 2 x USART	88	-	Device 2.0	EBI
AT91SAM7X512	512	128	-40 to +85	LQFP100 LFPGA100	ARM7TDMI	55	8/10	3/16	2 x SPI / TWI / SSC UART / 2 x USART	62	MAC 10/100	Device 2.0	CAN
AT91SAM7X256	256	64	-40 to +85	LQFP100 LFPGA100	ARM7TDMI	55	8/10	3/16	2 x SPI / TWI / SSC UART / 2 x USART	62	MAC 10/100	Device 2.0	CAN
AT91SAM7X128	128	32	-40 to +85	LQFP100 LFPGA100	ARM7TDMI	55	8/10	3/16	2 x SPI / TWI / SSC UART / 2 x USART	62	MAC 10/100	Device 2.0	CAN
AT91SAM7XC512	512	128	-40 to +85	LQFP100 LFPGA100	ARM7TDMI	55	8/10	3/16	2 x SPI / TWI / SSC UART / 2 x USART	62	MAC 10/100	Device 2.0	CAN TDES, AES
AT91SAM7XC256	256	64	-40 to +85	LQFP100 LFPGA100	ARM7TDMI	55	8/10	3/16	2 x SPI / TWI / SSC UART / 2 x USART	62	MAC 10/100	Device 2.0	CAN TDES, AES
AT91SAM7XC128	128	32	-40 to +85	LQFP100 LFPGA100	ARM7TDMI	55	8/10	3/16	2 x SPI / TWI / SSC UART / 2 x USART	62	MAC 10/100	Device 2.0	CAN TDES, AES

Development Tools Matrix ▶

Type	Description	Part Number
AT91SAM7L-STK	The AT91SAM7L-STK Starter Kit enables the evaluation of and code development for applications running on the AT91SAM7L devices	AT91SAM7L-STK
AT91SAM7S-EK	The AT91SAM7S-EK Evaluation Kit enables the evaluation of and code development for applications running on AT91SAM7S devices	AT91SAM7S-EK
AT91SAM7SE-EK	The AT91SAM7SE-EK Evaluation Kit enables the evaluation of and code development for applications running on AT91SAM7SE devices	AT91SAM7SE-EK
AT91SAM7X-EK	The AT91SAM7X-EK Evaluation Kit enables the evaluation of and code development for applications running on AT91SAM7X devices; contains crypto hardware—export restrictions apply	AT91SAM7X-EK
AT91SAM-ICE	SAM-ICE is a JTAG emulator designed for all Atmel AT91 ARM7 cores	AT91SAM-ICE

AT91SAM7SE-EK Development Board



For more information on Arrow's ARM solutions, pricing, and availability, visit www.arrow.com/arm or call 1-866-910-3650.



AT91SAM9 32-Bit ARM-Based Microcontrollers

Core: [ARM926EJ-S](#)



The AT91SAM9 family is a pin-compatible ARM926EJ-S-based microcontroller family that shares the same programming model as ARM7-based controllers, allowing direct

migration between controllers based on different ARM cores.

AT91SAM9R64 is aimed at high performance USB-enabled embedded control applications. Designed to boot from the USB port, SDCard or an external NAND Flash, the SAM9R64 offers the flexibility to reduce the number of memories for program and bulk data storage. In addition, the 32-bit microcontroller is optimized for space constrained applications, or intelligent USB High speed to SDIO, or SPI connectivity modules by being in a 10 mm x10 mm, 0.8 mm ball pitch, BGA package.

AT91SAM9RL64 is an interactive GUI microcontroller with high throughput, ideal peripherals, and OS support to implement "smart" control panel applications that can provide access to content including user manuals, video clips, and audio, as well as offering a robust interface to system control functions. The SAM9RL64 can be used as the main processor in a system or as the co-processor dedicated to the user interface. A USB High Speed link provides the bandwidth to transfer streaming video between the host- and the AT91SAM9RL64 co-processor.

AT91SAM9XE is the first generation of monolithic ARM9-based Flash microcontrollers that combines an ARM926EJ-S processor core with up to 512 KB of high-performance on-chip Flash. The SAM9XE provides multiple networking/connectivity options with on-chip USB 2.0 Full Speed Host and Device Ports, an Ethernet 10/100 Base-T MAC as well as

a two-slot Multimedia Card Interface (SDCard/SDIO and MultiMediaCard Compliant).

AT91SAM9260 operates at 210 MIPS with a 190 MHz clock. It features 8 KB of SRAM and 32 KB of ROM with single cycle access at maximum processor or bus speed, together with an external bus interface with controllers for SDRAM and static memories including NAND Flash and CompactFlash. Its extensive peripheral set includes USB Full Speed Host and Device interfaces, a 10/100 Ethernet MAC, Image Sensor Interface, Multimedia Card Interface (MCI), and peripheral DMA channels maximize the data throughput between these interfaces and the on- and off-chip memories.

AT91SAM9261 operates at 210 MIPS with a 190 MHz clock. It features 160 KB of SRAM and 32 KB of ROM with single cycle access at maximum processor or bus speed, together with an External Bus Interface (EBI) with controllers for SDRAM and static memories including NAND Flash and CompactFlash. Its extensive peripheral set includes USB Full Speed Host and Device interfaces, an LCD Controller, with peripheral DMA channels.

AT91SAM9263 operates at 220MIPS with a 200 MHz clock. Its parallel bus architecture incorporating distributed DMA overcomes the bottlenecks that occur with conventional MCUs in graphically-interfaced, data-intensive applications such as networked medical monitoring equipment and GPS navigation systems. The AT91SAM9263 employs 27 DMA channels including Atmel's 20-channel Peripheral DMA Controller (PDC), a 9-layer bus matrix, and two additional busses for data- and instruction-tightly-coupled-memories to boost CPU performance and provide on-chip data transfer rates of up to 41.6 Gb/s.

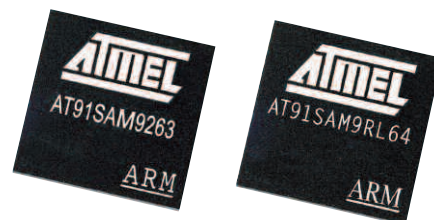


Features ▶

- Proven architecture based on ten years experience in ARM-based standard products
- Predictable response to a real-time event within a specified number of clock cycles
- Peripheral DMA eliminates bottlenecks in memory-to-peripheral transfers
- Advanced interrupt control enhances real-time performance
- Single-instruction bit set/reset simplifies application code
- Connectivity: USB, Ethernet, SPI, USART, LCD, etc.

- Code compatibility across all products
- WinCE, Linux, extensive compiler and application support from industry-leading third parties

AT91SAM9



Family Comparative Features ▶

Part Number	Memory		Temperature °C	Package	Core Variant	Frequency (MHz)	A/D (channel/bits)	Timers (channels/bits)	Serial Interface(s) (#/Type)	GPIO	Ethernet (#/Type)	USB (#/Type)	Other Key Peripherals
	Flash (KB)	RAM (KB)											
AT91RM9200	-	16	-40 to +85	QFP208 LBGA256	ARM920T	180	-	6/16	SPI / TWI / 3 x SSC UART / 4 x USART	122	MAC 10/100	Device, 2 x Host	EBI, MCI
AT91SAM9260	-	8	-40 to +85	QFP208 LBGA217	ARM926EJ-S	210	4/10	6/16	2 x SPI / TWI / SSC 3 x UART / 4 x USART	96	MAC 10/100	Device, 2 x Host	EBI, MCI, ISI
AT91SAM9261	-	160	-40 to +85	LBGA217	ARM926EJ-S	240	-	3/16	2 x SPI / TWI / 3 x SSC UART / 3 x USART	96	-	Device, 2 x Host	EBI, MCI, LCD
AT91SAM9261S	-	16	-40 to +85	LBGA217	ARM926EJ-S	240	-	3/16	2 x SPI / TWI / 3 x SSC UART / 3 x USART	96	-	Device, 2 x Host	MCI, LCD
AT91SAM9263	-	96	-40 to +85	LBGA324	ARM926EJ-S	240	-	3/16	2 x SPI / TWI / 2 x SSC UART / 3 x USART	160	MAC 10/100	Device, 2 x Host	2 x EBI, 2 x MCI, CAN, LCD, ISI, AC97
AT91SAM9R64	-	64	-40 to +85	LBGA144	ARM926EJ-S	240	3/10	3/16	SPI / TWI / SSC UART / 4 x USART	48	-	Device High Speed	EBI, MCI
AT91SAM9RL64	-	64	-40 to +85	LFPGA217	ARM926EJ-S	240	6/10	3/16	SPI / 2 x TWI / 2 x SSC UART / 4 x USART	118	-	Device High Speed	EBI, MCI, LCD, AC97 Touch Screen
AT91SAM9XE512	512	32	-40 to +85	QFP208 LBGA217	ARM926EJ-S	210	4/10	6/16	2 x SPI / 2 x TWI / SSC 2 x UART / 4 x USART	96	MAC 10/100	Device, 2 x Host	EBI, MCI, ISI
AT91SAM9XE256	256	32	-40 to +85	QFP208 LBGA217	ARM926EJ-S	210	4/10	6/16	2 x SPI / 2 x TWI / SSC 2 x UART / 4 x USART	96	MAC 10/100	Device, 2 x Host	EBI, MCI, ISI
AT91SAM9XE128	128	16	-40 to +85	QFP208 LBGA217	ARM926EJ-S	210	4/10	6/16	2 x SPI / 2 x TWI / SSC 2 x UART / 4 x USART	96	MAC 10/100	Device, 2 x Host	EBI, MCI, ISI

Development Tools Matrix ▶

Type	Description	Part Number
AT91RM9200-EK	The AT91RM9200-EK Evaluation Kit supports the AT91RM9200 ARM9-based 32-bit RISC microcontroller and enables real-time code development and evaluation	AT91RM9200-EK
AT91SAM9XE-EK	The AT91SAM9XE-EK Evaluation Kit enables the evaluation of and code development for applications running on an AT91SAM9XE device	AT91SAM9XE-EK
AT91SAM9260-EK	The AT91SAM9260-EK Evaluation Kit enables the evaluation of and code development for applications running on an AT91SAM9260 device	AT91SAM9260-EK
AT91SAM9261-EK	The AT91SAM9261-EK Evaluation Kit enables the evaluation of and code development for applications running on an AT91SAM9261 device	AT91SAM9261-EK
AT91SAM9263-EK	The AT91SAM9263-EK Evaluation Kit enables the evaluation of and code development for applications running on an AT91SAM9263 device	AT91SAM9263-EK
AT91SAM9RL-EK	The AT91SAM9RL-EK Evaluation Kit enables the evaluation of and code development for applications running on an AT91SAM9RL64 or an AT91SAM9R64 device	AT91SAM9RL-EK
AT91SAM-ICE	SAM-ICE is a JTAG emulator designed for all Atmel AT91 ARM9 cores	AT91SAM-ICE

Each member of the AT91SAM9 family is supported by Evaluation Boards and extensive third-party application development tools. These boards support both Linux and Windows CE. They have been developed for advanced system-on-chip applications that require both high computing performance and high data throughput.

AT91SAM9RL-EK Development Board



For more information on Arrow's ARM solutions, pricing, and availability, visit www.arrow.com/arm or call 1-866-910-3650.



AT91CAP Customizable Microcontrollers

Core: ARM7TDMI® and ARM926EJ-S®



Atmel's CAP™ is a microcontroller-based system-on-chip with fast local memory, a wide range of industry-standard peripherals and interfaces, and a Metal Programmable (MP) Block that allows the designer to add custom logic. By combining the performance, density, and low power consumption of the fixed portion of the device with the flexibility of the MP Block, CAP enables application-specific products to be developed in a fraction of the time and at a fraction of the cost of standard-cell ASICs,

but at a unit price close to that of standard cell devices. CAP also offers superior performance, smaller form factor, and lower power consumption at a unit price significantly lower than an MCU-plus-FPGA combination for the same functionality. CAP is fully supported with an emulation board, software development tools, operating systems, code modules, and a worldwide network of expert design centers to facilitate application software development. The CAP MP Block can be personalized with IP developed by the customer, by third-party design centers or from Atmel's extensive libraries.



Features ▶

- The AT91CAP product family includes two ARM®-based architectures:
 - AT91CAP7S, based on the ARM7TDMI® processor core, and AT91CAP9S, based on the ARM926EJ-S®. These architectures are designed to cover a broad range of ARM based applications.
- AT91CAP7S
 - 160 KB of fast on-chip SRAM
 - A large MP Block of 450K ASIC gates (2-input NAND equivalents)
 - Micro Core = ARM7TDMI® at 80 MHz
 - MPRAM = 2x DPRAM 2K x 16
 - ROM = 256 KB
 - A minimal number of ARM peripherals are instantiated in the fixed portion of the design to address low cost applications
 - Flexibility to instantiate other peripherals in the MP Block using IP available in Atmel's vast library
- AT91CAP9S
 - Offers superior performance at clock rates of up to 200 MHz
 - A number of standard interfaces (USB Host and Device, Ethernet, CAN, LCD Controller, Image Sensor Interface, etc.)
 - High-performance peripherals including eight 10-bit A/D converter channels
 - MP Block of 500K gates
 - SRAM = 16K/16K Cache, 32 KB
 - MPRAM = 8x SRAM 512 x 72, 10x DPRAM 512 x 36
 - ROM = 32 KB

- The secured alternative, AT91CAPSC, offers AES and Triple DES encryption blocks. These are connected via a parallel bus structure that, together with a distributed DMA architecture, delivers the extremely high internal data bandwidth that is required by deeply embedded networked applications.

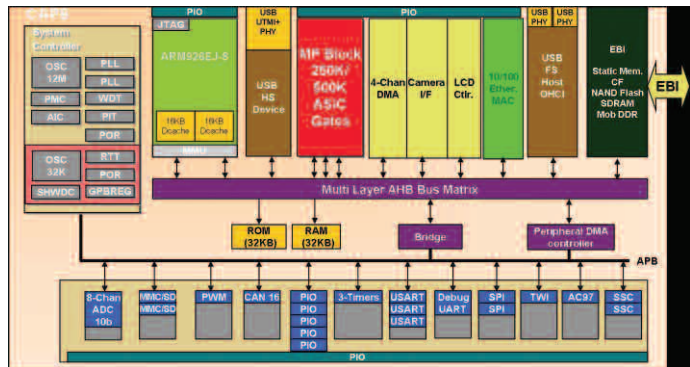
Benefits ▶

- Risk is reduced since the ARM core and peripherals (over 70 percent of the design) are fully verified in silicon, the designer does not have to worry about any of the ARM design aspects—that work is already done.
- Design time is reduced since the general-purpose portion of the design is complete and the designer only has to focus on the application-specific aspect. This logic is captured in the MP Block of the CAP device.
- The CAP cycle time for place&route and prototype fabrication is extremely short. Place&route is limited to the metal layers of the MP block and the ROM personalization layer; everything else is fixed. Fabrication time for prototypes is reduced since wafers are staged at the metal layers awaiting the Metal Programmable logic and ROM code from the designer. This cuts the fab cycle time in half.
- Design cost savings: CAP NRE cost is significantly lower than that for standard cell ASICs. The total design cost for an ARM-based SoC using CAP technology is a fraction of that for a standard-cell equivalent, thanks to re-use of hardware/software functional blocks, reduced place&route effort and the smaller number of masks.
- Low unit cost: In volume, CAP costs only slightly more than an equivalent standard cell ASIC, and much less than an MCU + FPGA combination for the same functionality.
- The CAP Emulation Board, industry-standard software development tools, operating systems and extensive re-usable software modules facilitate software development, and enable hardware and software development to proceed in parallel.

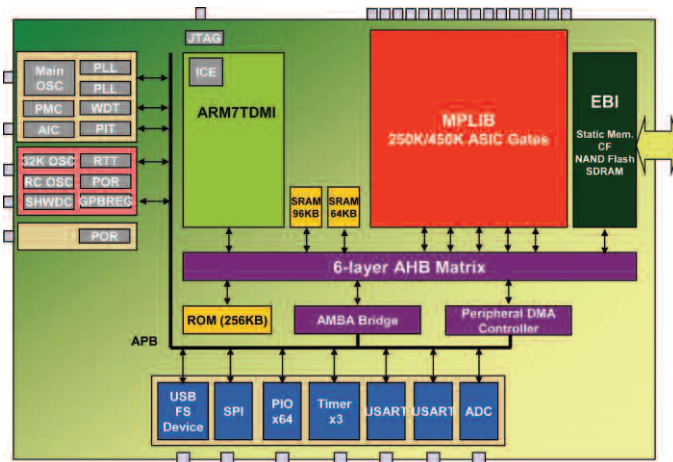
Family Comparative Features ▶

Product	Processor			Memory		System Features							Package	
	Core	Clock Frequency	Cache Memory	ROM	SRAM	Usable Gates	AHB Masters	AHB Slaves	Interrupts	DMA Channels	SRAM	DPRAM		General Purpose I/O **
AT91CAP7S450A	ARM7TDMI	80 MHz	-	256 KB	160 KB	450K gates	4	4	18	-	64 KB, 96 KB	2 blocks, 2K x 16	90	144, 176, 208 QFP/BGA, 225 BGA
AT91CAP7S250A	ARM7TDMI	80 MHz	-	256 KB	160 KB	250K gates	4	4	18	-	64 KB, 96 KB	2 blocks, 2K x 16	90	144, 176, 208 QFP/BGA, 225 BGA
AT91CAP7S	ARM7TDMI	80 MHz	-	256 KB	160 KB	FPGA Interface implanted in MP Block							-	144, 176, 208 QFP/BGA, 225 BGA
AT91CAP9S500A	ARM926EJ-S	200 MHz	16K/16 KB	32 KB	32 KB	500K gates	3	4	7	4	8 blocks 512 x 72-bit	10 blocks, 512 x 36 bit	77	LFBGA400, TFBGA324
AT91CAP9S250A	ARM926EJ-S	200 MHz	16K/16 KB	32 KB	32 KB	250K gates	3	4	7	4	8 blocks 512 x 72-bit	10 blocks, 512 x 36 bit	77	LFBGA400, TFBGA324
AT91CAP9S	ARM926EJ-S	200 MHz	16K/16 KB	32 KB	32 KB	FPGA Interface implanted in MP Block							-	LFBGA400, TFBGA324
AT91CAP9SC500A	ARM926EJ-S	200 MHz	16K/16 KB	32 KB	32 KB	500K gates	3	4	7	4	8 blocks 512 x 72-bit	10 blocks, 512 x 36 bit	77	LFBGA400, TFBGA324
AT91CAP9SC250A	ARM926EJ-S	200 MHz	16K/16 KB	32 KB	32 KB	250K gates	3	4	7	4	8 blocks 512 x 72-bit	10 blocks, 512 x 36 bit	77	LFBGA400, TFBGA324
AT91CAP9SC	ARM926EJ-S	200 MHz	16K/16 KB	32 KB	32 KB	FPGA Interface implanted in MP Block							-	LFBGA400, TFBGA324

AT91CAP9S Block Diagram



AT91CAP7S Block Diagram



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