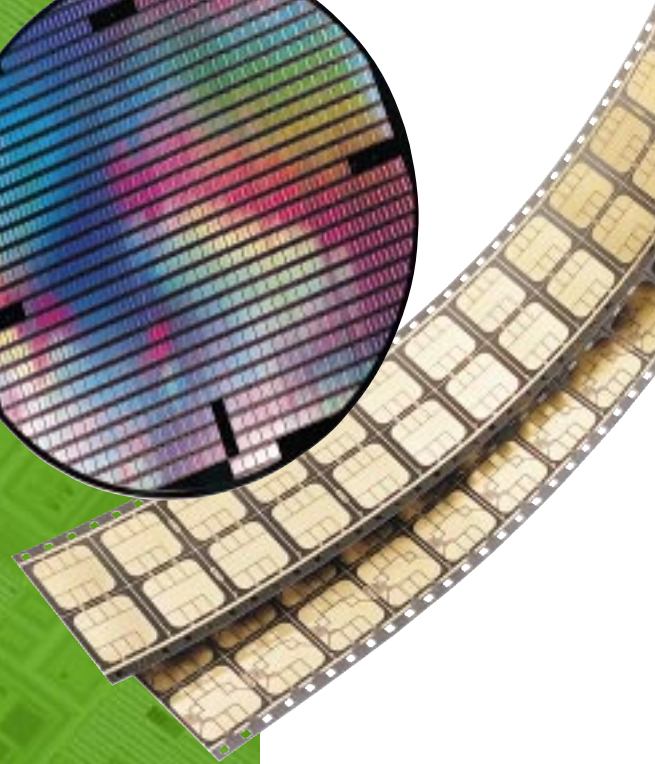
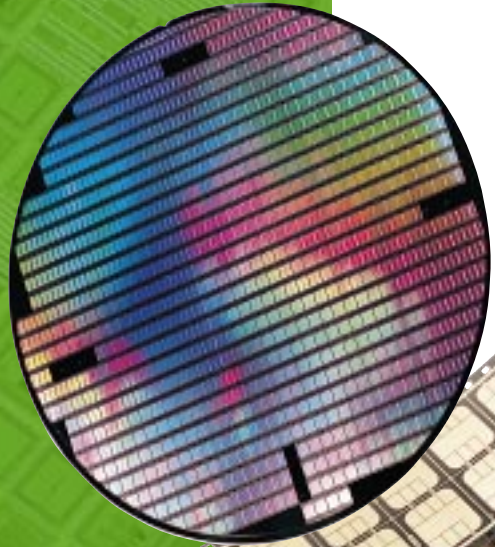


ATMEL SMART CARD ICs

SILICON
SOLUTIONS
MAKING

SMART
CARDS
SMARTER



ATMEL[®]

Atmel Corporation is a leading manufacturer of nonvolatile memory, microcontrollers, logic programmable ICs and application specific circuits. Our strategy is to develop products - often based on our patented position in nonvolatile memory - that can provide customers in these markets a competitive edge. Headquartered in San Jose, California, Atmel operates five fabs in the United States and Europe.

Make your Smart Cards even smarter. Our chips pack unique features. They'll give your cards the competitive edge. At Atmel, specialized teams create innovative ICs just for you. And we're a one-stop shop.

With everything from small memories to complex microprocessors, including contact and contactless (RFID), we've got the experience and imagination to find the smartest answer for your next product. No matter what.

WE'VE BEEN SMARTER LONGER

Through growth and acquisition, Atmel is today one of the leading IC manufacturers in the Smart Card market. Our extensive product portfolio is backed up by a unique combination of depth of experience and leading-edge technology. We partner industry leaders in Smart Card applications.

Atmel is one of the world's top manufacturers of nonvolatile memory. We are one of the largest Flash memory producers, and no one anywhere sells more EEPROMs. Atmel produces a full range of memories, microcontrollers, programmable logic ICs and application-specific chips. Our

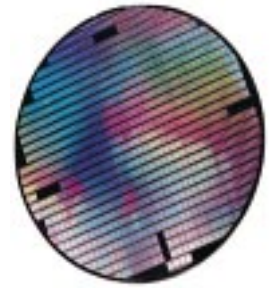
reputation for quality and reliability is second to none.

Atmel's technological strengths make secure IC products a natural business choice. These credentials and Atmel's sound strategic acquisitions have made us one of the leading IC manufacturers in the Smart Card market today. Our extensive portfolio offers a range of chips from secure memory and RF tags to secure micro- and crypto-controllers that answer our customers' various application and security demands. Significantly, Atmel is the only company that can offer Flash-based microcontrollers for Smart Cards today.



SECURE MEMORY

Your memory is secure with Atmel. We offer serial EEPROMs in two standard protocols. I²C from 1K to 512K bits and 3-wire from 1K to 4K bits.



Flash memories are available from 2M to 4M bits. Thinking about password protection? We've delivered millions of secure memories, which require a password to read, write or erase all, or portions of the memory. Need even higher security? Secure memories are available which require cryptographic authentication for memory access.

CONTACTLESS (RFID)

Want to go contactless? It's easy with Atmel. Our RFID ICs cover the entire product spectrum from simple tags to complex secure microcontroller devices. All standard communication protocols at both 125 kHz and 13.56 MHz are supported.

SECURE MICROCONTROLLERS AND CRYPTOCONTROLLERS

High performance, maximum security and shorter development times. Atmel offers both Flash- and ROM-based solutions. With Atmel's state-of-the-art Flash-based microcontrollers and cryptocontrollers, there's no waiting for the masked ROM. It's a snap to customize your Smart Cards for very specific – often complex – applications. The result? You get to market faster and cheaper. And there's a bonus! Flash memory content is more secure than traditional ROM memory. It's optically invisible and it can be obliterated at the first sign of unauthorized access or physical attack.



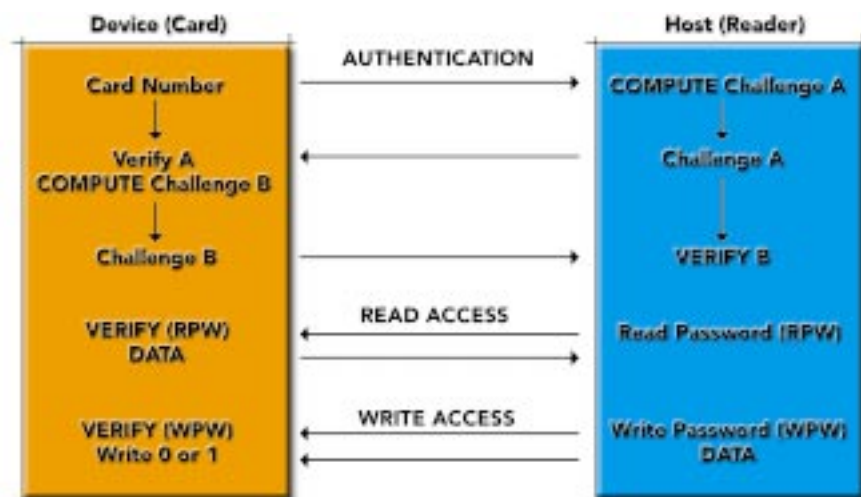
Make your next cards wiser with Atmel's Serial EEPROMs. Two of the three product lines include security features: password and authentication.



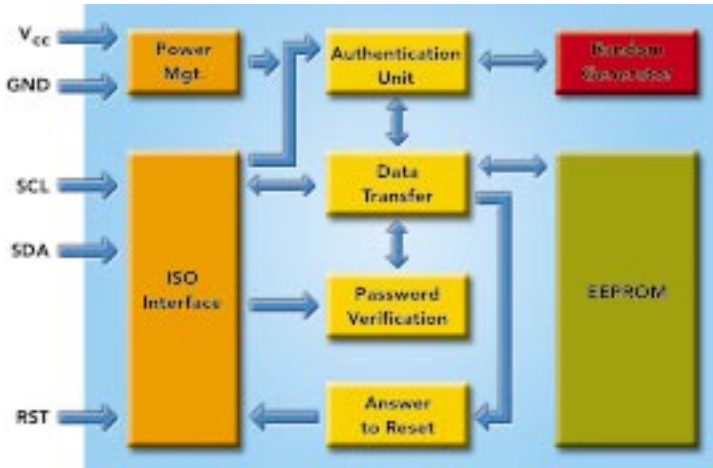
Atmel's secure memory family includes high-end security products with an embedded authentication protocol which requires the card and host to authenticate each other before granting data access. Multiple zones with individually configurable security features give unrivaled flexibility to the application designer. Memory zones may also be combined to create larger block sizes.

For your next smart card, take it from Atmel, the world's EEPROM expert. We've delivered over 1 billion Serial and Secure Memory chips.

SECURE MEMORY AUTHENTICATION PROTOCOL



AT88SC1608
WITH PASSWORD AND AUTHENTICATION



Among the features of Atmel's secure memory chips are:

- High-security memory: 1K to 16K bits
- Flexible, programmable configuration of memory partitions
- Patented 64-bit authentication protocol with anti-wiretapping
- Secure checksum calculation
- Bit configurable write lock function
- Random access addressing with 16-byte Page Write
- Configurable attempt counters for secure codes
- Highly reliable EEPROM memory
- Low-power CMOS design
- Low-voltage operation: 2.7V to 5.5V
- Self-timed write cycles with internal V_{pp} generator
- ISO 7816-3 synchronous two-wire Serial interface
- ISO 7816 compliant packaging

High-security requirements in a low-cost application? In the past, the only option has been a high-priced microcontroller-based IC. Now Atmel secure memory products offer the protection of authentication protocols and encryption algorithms at the price of a memory chip. As your Smart Card IC partner, we can work together to identify the best cost/security solution to your application needs.

SECURE MEMORY FAMILY

SERIAL EEPROMs WITHOUT SECURITY			
AT24CXX	2-wire Serial EEPROMs		
From:	AT24C01A	128 x 8	1K bit
To:	AT24C512	64K x 8	512K bit
AT93CXX	3-wire Serial EEPROMs		
From:	AT93C46	128 x 8 / 64 x 16	1K bit
To:	AT93C66	512 x 8 / 256 x 16	4K bit
AT45XXXX	SPI Flash		
AT45D021	1,024 x 264 x 8	SPI 2M bit-Flash	
AT45D041	2,048 x 264 x 8	SPI 4M bit-Flash	

SECURE SERIAL EEPROMs WITH PASSWORD SECURITY		
AT88SC101	1024 x 1	1 Zone
AT88SC102	2 (512 x 1)	2 Zones
AT88SC1601	16K x 1	1 Zone
AT88SC1604	4 (4K x 1)	4 Zones

SECURE SERIAL EEPROMs WITH PASSWORD AND AUTHENTICATION		
AT88SC153	3 (64 x 8)	Up to 3 Zones
AT88SC1608	8 (256 x 8)	Up to 8 Zones

Make your contactless cards smarter. Atmel has just the right chips, from ID card memories to sophisticated contactless/contact microprocessors. Let us apply our 15 years of experience in contactless (RFID) ICs to your next product.



Our entry-level tag product, the AT88RF256, is popular for identification applications. With 256 bits of EEPROM memory, password protection/data locking and flexible communications options, the chip is easy to integrate into new and existing ID systems. It supports multiple protocols at 125 kHz, and ISO 14443 at 13.56 MHz, both type A and type B.

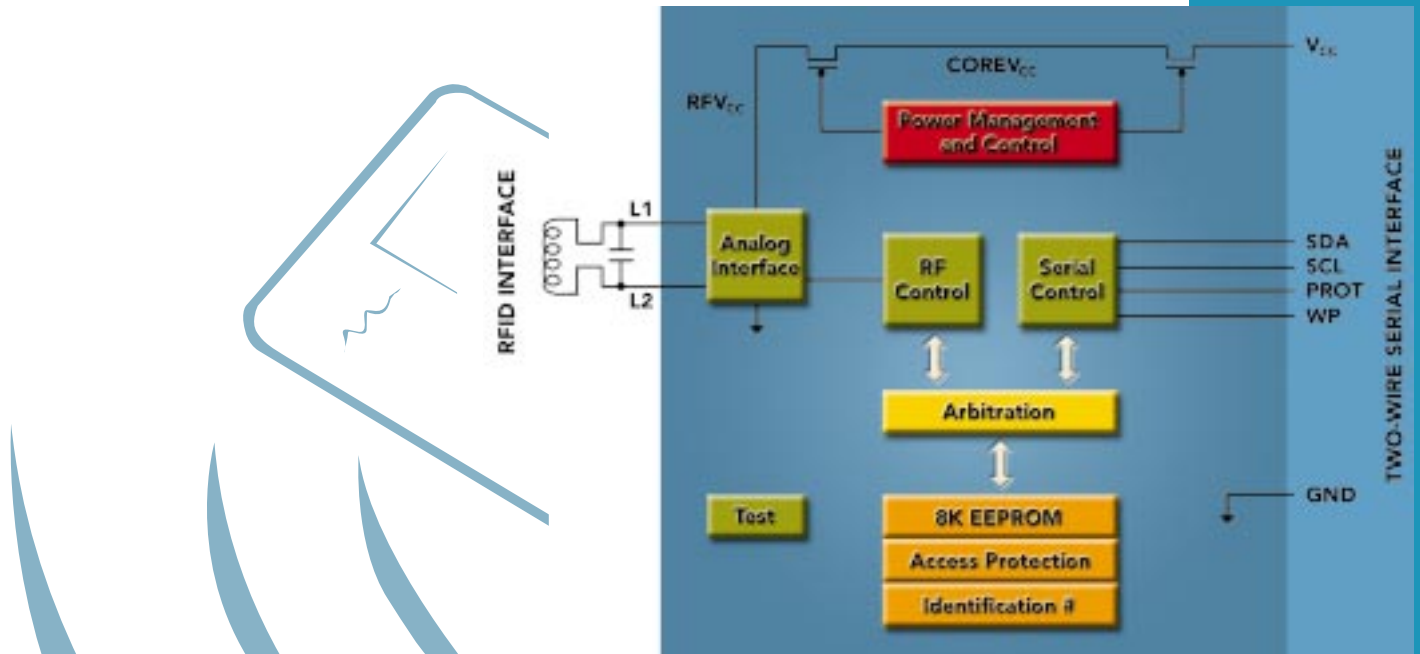
We make the silicon engines for contactless Smart Cards and passive wireless tags for industry leaders in these markets. These partners can provide you with readers/writers, systems engineering and other infrastructure needs.

CONTACTLESS (RFID) CARD ICs

Part Number	EEPROM	Features	Availability
AT88RF256/13	256 x 1	Read/Write RFID Transponder with Passwords and Locking, 13.56 MHz	2Q 2000
AT88RF256/125	256 x 1	Read/Write RFID Transponder with Passwords and Locking, 125 kHz	Now
AT24RF08	1K x 8	Combination Serial EEPROM with RFID interface, 125 kHz	Now



AT24RF08C BLOCK DIAGRAM



Atmel's AT24RF08C chip is designed to lower the cost of asset management for corporate electronic equipment. It lets you deploy, manage and track equipment using a short-range wireless communications system. It can reduce losses due to theft and provide better security for critical data.

The AT24RF08C features:

- Dual-port nonvolatile memory - RFID and serial interfaces
- Two-wire serial interface:
 - programmable access protection
 - lock/unlock function
- 125 kHz RFID interface:
 - two-wire connection to external coil antenna and tuning capacitor
 - multi-tag management
 - ultra low power single bit write
- Highly reliable EEPROM memory
- Open industry-standard protocol

Mobile phones. E-commerce. Healthcare cards. Pay television. Banking. Transport... Our Flash- and ROM-based families of secure microcontrollers and cryptocontrollers offer just the right features for all these applications. Atmel manufactures these low-power high-performance devices using its high-density CMOS nonvolatile memory technology.

AT89SC

THE VERSATILE SOLUTION

The AT89SC 8-bit microcontrollers combine the proven MCS-51[®] and MCS-251 architecture with up to 256 kilobytes of nonvolatile memory for program and data. They offer a highly flexible and cost-effective solution for many Smart Card applications.

THE DEDICATED 16-BIT CRYPTO ENGINE

Some products in the AT90SC family feature a cryptoprocessor: a 16-bit dedicated crypto-engine based on a parallel RISC architecture. Running in parallel with the AVR microcontroller core, the SC16 generates complex encryption and authentication algorithms to ensure security for the most sensitive Smart Card applications.

AT89SC FAMILY

Name	Flash Bytes	EEPROM Bytes	RAM Bytes	T=0 Hardware	Power Supply	Availability
AT89SC168A	16K	8K	512	No	2.7 - 5.5V	Now
AT89SC1616A	16K	16K	512	No	2.7 - 5.5V	Now
T89SC256C	256K	-	4K	No	2.5 - 5.5V	3Q 2000

AT05SC FAMILY

ENHANCED SECURITY AT A COMPETITIVE PRICE

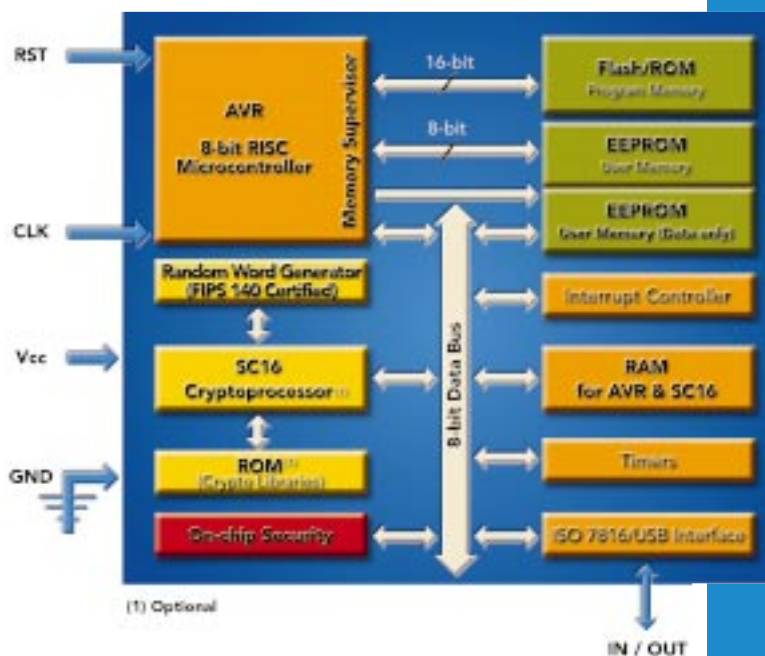
Based on the industry-standard HC05 low-power MCU core, the AT05SC family is upwards compatible with the established MSC series. It offers a range of increased memory sizes and enhanced security

features, as well as a dual-interface contact/contactless option. This makes the AT05SC family one of the most attractive product propositions for single- and multi-function applications from finance to transport, health to pre-paid mobile phone communications.

AT05SC FAMILY

Name	ROM Bytes	EEPROM Bytes	RAM Bytes	ROM Code Acceptance
AT05SC1602R (upgrade from MSC0406)	16K	2K	512	3Q 2000
AT05SC1604R (upgrade from MSC0407)	16K	4K	512	3Q 2000
AT05SC3202R	32K	2K	1024	3Q 2000
AT05SC3204R (upgrade from MSC0407)	32K	4K	1024	3Q 2000
AT05SC3208R (replaces MSC0402)	32K	8K	1024	Now
AT05SC3216R	32K	16K	1024	3Q 2000

AT90SC ARCHITECTURE



AT90SC

SPEED AND SECURITY

The high-performance Flash-based AT90SC microcontroller is based on Atmel's popular AVR[®] 8-bit RISC microcontroller core. The AVR architecture is optimized for C language and supports extremely dense assembler code programs. This code-efficient architecture achieves throughputs ten to fifteen times faster than conventional CISC microcontrollers approaching 1 MIPS per MHz.

Building firewalls in the memory is a snap thanks to a memory supervisor that controls the information flow. This makes the AT90SC the perfect solution for multi-application Smart Cards.

AT90SC FAMILY

Name	Flash Memory Program Bytes	User Memory EEPROM Bytes	RAM Bytes	Crypto processor	Power Supply	Availability
AT90SC1616C	16K	16K	1K	Yes	3V or 5V	2Q 2000
AT90SC3232	32K	32K	1.5K	No	3V or 5V	Now
AT90SC3232C	32K	32K	1K	Yes	3V or 5V	Now
AT90SC6464C	64K	64K	3K	Yes	2.7 - 5.5V	3Q 2000
AT90SC256C	256K	-	4K	Yes	2.7 - 5.5V	4Q 2000

AT91SP

THE ULTIMATE IN PERFORMANCE

With the AT91SP family, Atmel has the fastest performance in a multi-application Smart Card chip available on the market.

Based on the 32-bit ARM7 core, the AT91SP not only includes the standard ISO7816 interface, but also a high-speed SPI interface for memory expansion. In addition it features a USB interface for high-speed I/O. And, because of its on-chip DES and RSA encryption/decryption capability the secret

key never has to leave the card.

Of course the AT91SP security product includes the industry's highest levels of security technology. In addition to standard tamper detection circuits, it incorporates methods to prevent differential power analysis (DPA), timing, and other non-invasive attacks as well as top-layer metal plates to prevent micro-probing.

AT91SP FAMILY

Name	ROM Bytes	EEPROM Bytes	RAM Bytes	Crypto processor	Power Supply	Interfaces	Development Toolkit
AT91SP321	32K	32K	3.5K	DES, PKI	3 - 5V	ISO7816, USB, SPI	Available 3Q 2000

Atmel's Smart Card ICs offer a veritable electronic maze of security features, from simple password verification to state-of-the-art dual-key encryption.

Password code verification permits data access only after validation of the security code. Secure memories are permanently invalidated upon four consecutive false security code presentations. Certain memory zones have read/write protection. Secure memories with authentication permit data access only after successful completion of our patented mutual authentication protocol.

Thanks to Flash, it is impossible to extract a code by a visual inspection, and an E-beam inspection erases the memory matrix. The devices are protected against power-down, low- and high-frequencies. A transport code inserted in the OTP area protects shipping and initialization. Each chip has a unique ID number.

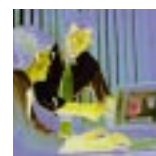
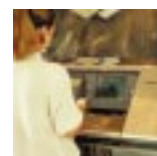
The AT90SC's dynamic logical scrambling mixes the contents of the memories, making data extracted from the memory nearly impossible to read. It can be unique for every chip. The AT89SC has a physical scrambling on the system bus.

Special care has been taken to protect the chip layout. If the software detects fraudulent access, it can erase the Flash and EEPROM. Both the Flash and EEPROM memories have an internal self-timed clock, independent of the master clock, to prevent break-ins. The ROM-based products have proven their security over many years of intensive use.

At our invitation external agencies such as ITSEC have audited our security claims. Atmel has also been a key participant in the Eurosmart Work Group and the Common Criteria Protection Profile.



GSM

Electronic
commerce

Banking

The Windows-based Atmel Smart Card Development Kit (SDK), is a complete high-performance, user-friendly tool for easy development, simulation and code emulation. Programmers can see the card operating in real time and verify each sub-application until the whole system works.

Most Atmel secure microcontrollers have user-programmable nonvolatile memory for both program and data storage. This means that, after development, the card maker has a product that corresponds exactly to the production devices. No need to wait for a ROM mask. Just start a field trial.



Simulator Features	Cycle based running performance analyzer, code coverage facility, high-level assembly and mixed-source displaying, watch window for C-variables displaying and manipulating, C-like macro language.
Emulator Features	Software breakpoint, step to step, step over, register and memory displaying/modifying, on line assembly, high level of debugging for C.

Picture your next Smart Card with all these advantages. For more information, contact your nearest Atmel representative. Together, we'll make Smart Cards smarter.



Pay TV



Health



Electronic purse



Loyalty



Identification



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