

## Features

### General

- 0.35 $\mu$  Process Technology
- Industry-standard M68HC05 Instruction Set, including: 8 x 8 Bits Unsigned Multiply Instruction, True Bit Manipulation, Memory-mapped I/O
- Operating Voltage: 3.0V  $\pm$  10% or 5.0V  $\pm$  10%
- Meets GSM 11.11 & 11.12 Specifications
- 5.0 MHz Maximum Internal Bus Frequency at 3.0V and 5.0V
- ESD Protection to  $\pm$  4000V
- Bond Pad Layout Conforming to ISO Standard ISO 7816/2
- External Maskable Interrupt on ISO Standard I/O Port (PA0)
- Power-saving WAIT and Very Low Power STOP Modes
- Power-up Detection
- Available as Sawn or Unsawn Wafers

### Contactless Mode

- RF Contactless Interface with Full Support for ISO 14443 Type B Protocol
- Supply Voltage Clamp and Regulation
- Full-bridge Power Rectification
- 3.4 MHz Maximum CPU Clock Frequency
- 13.56 MHz Clock Extraction
- Memory-mapped RF I/O Port
- Card-to-reader
  - Modulation of Incoming RF Carrier by Load Switching
  - Generation of 847.5 kHz Subcarrier with BPSK Modulation
  - NRZ-L or Manchester Data Encoding

### EEPROM

- 16320 bytes of on-chip User EEPROM plus 64 Security Bytes
- 64-byte Write/Program/Erase
- 1 ms Program Time, 1 ms Erase Time
- 10 Years Data Retention
- Typically more than 1,000,000 Write/Erase Cycles
- On-chip Charge Pump for EEPROM Programming Driven by an Internal Oscillator

### RAM and ROM

- 32752 Bytes of On-chip User ROM plus 16 Bytes Reserved for Vectors
- 1536 Bytes of On-chip RAM with Security Wipe on Selected Areas

### Peripherals

- Single Bidirectional I/O Line (1-bit ISO 7816/3 Standard I/O Port)
- Interrupt Driven Serial Communications Interface (SCI) with Transmit/Receive Speeds of up to 1.25 Mbit/s
- Time Base Circuitry (with Preset and Maskable Interrupt Capabilities)
- Watchdog Capability
- Hardware DES Module (Capable of Single Encryption or Decryption in 16 Clock Cycles)
- CRC Module (allowing Generation of Checksums (ISO/IEC 3309))
- Random Number Generator



## 8-bit Microcontroller with 16K EEPROM, Dual Interface, and Advanced Security Features

**AT05SC3216RF**

**Preliminary**

**Summary**

Rev. 1534AS-04/00



Note: This is a summary document. A complete document is available under NDA. For more information, please contact your local Atmel sales office.

## Features (continued)

### Security

- Dedicated Hardware to Resist Power Analysis Attacks
- Featureless ROM
- Low and High Voltage Monitors
- Low and High Temperature Monitors
- Low Frequency Monitor
- High Frequency Filter/Monitor
- Advanced Physical Barrier to Enhance Tamper Resistance
- Illegal Address Reset
- Illegal Opcode Reset
- Memory Partitioning with Address Lockout Reset
- Scrambling Logic
- Tamper Monitor
- Physical Removal of Test Mode when Testing is Complete

### Development Tools

- Hardware Emulation Module (for the Motorola MMDS05 Development System)
- Software Simulator based on HIWARE's HI-WAVE Product

## Description

The AT05SC3216RF is a new member of Atmel's AT05SC family of single chip microcontrollers. Designed specifically for embedded conditional access systems and other security conscious systems, these devices are based on the industry-standard M68HC05 low-power core and its instruction set, and are manufactured in Atmel's standard 0.35 $\mu$  process technology.

The AT05SC3216RF is designed to give a high level of protection against physical attack, and includes hardware features to assist in protecting against SPA and DPA attacks. On-board DES, CRC and RNG modules are provided to assist in the design of high-security applications.

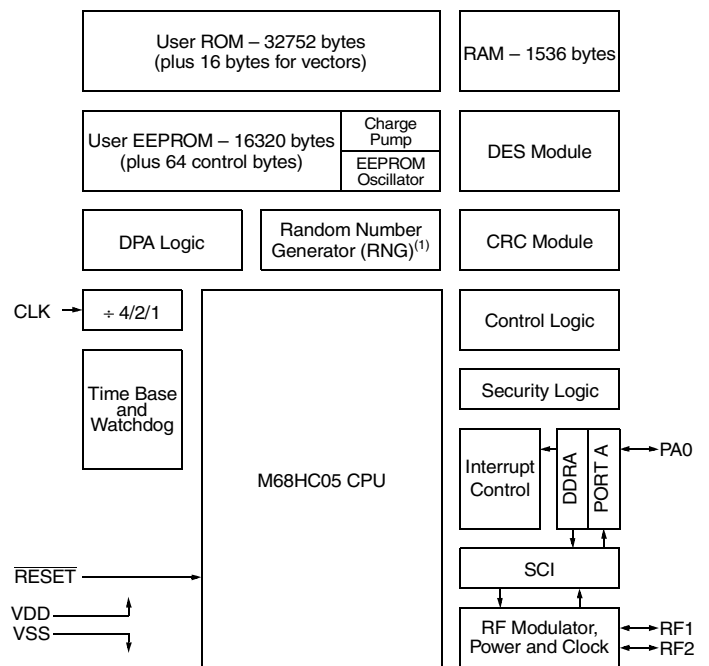
On-board memory comprises 32K bytes of ROM, 1.5K bytes of RAM and 16K bytes of EEPROM. The EEPROM features 64-byte write, 1 ms program time, 1 ms erase

time, typically more than 1,000,000 write/erase cycles, and greater than 10 years data retention.

The AT05SC3216RF has on-board contact and contactless interfaces, and is designed in accordance with the ISO standards for integrated circuit cards (ISO 7816 and ISO 14443), and with GSM specifications 11.11 and 11.12, where appropriate. An on-board serial communications interface is also provided.

Application areas for the AT05SC3216RF include Dual Interface Multifunction Cards, e.g. Transport Card plus Electronic Purse/Bank Card.

## Block diagram



- Notes: 1. A sampling/smoothing algorithm MUST be used in conjunction with the RNG to obtain statistically random results across all operating conditions.



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