Features

General

- High-performance, Low-power secureAVR® Core RISC Architecture
  - 135 Powerful Instructions (Most Executed in a Single Clock Cycle)
- Bond Pad Locations Conforming to ISO 7816-2
- ESD Protection to ± 6000V on contact pins, ± 2000V on RF pins
- Operating Ranges: 2.7V to 5.5V
- Compliant with ICAO e-passport specifications (BAC, AA, EAC)
- Compliant with EMV 2000 Specifications; PC Industry Compatible
- Power-saving Wait and Very Low-power Stop Modes
- Power-up Detection
- Available in Wafers, Modules, Contactless Module or Inlay and Industry-standard Packages

Contactless Mode

- Contactless Interface Controller (CIC) with Full Support for ISO/IEC 14443 Type A and B Protocol
- Supply Voltage Clamp and Regulation
- Full-bridge Power Rectification
- On-chip Tuning Capacitance: 20pF or 100pF
- 13.56 MHz Clock Extraction
- 6.78 MHz Internal Bus Frequency
- Reader-to-card:
  - ISO/IEC Type A: 100% ASK Modulation and Modified Miller Bit Coding
  - ISO/IEC Type B: 10% ASK Modulation and NRZ Bit Coding
  - Baud Rates: 106Kbps, 212Kbps and 424Kbps
- Card-to-reader:
  - ISO/IEC Type A: Generation of 847.5KHz Subcarrier with OOK Modulation and Manchester Bit Coding
  - ISO/IEC Type B: Modulation of Incoming RF Carrier by Resistive Load Switching / Generation of 847.5KHz Subcarrier with BPSK Modulation / NRZ data Encoding
  - Baud Rates: 106Kbps, 212Kbps, 424Kbps and 848Kbps

Memory

- 128K Bytes of ROM Program Memory
- 36K Bytes of EEPROM, plus 128 OTP Bytes and 384 Bit-addressable Bytes
  - 1 to 128-byte Program/Erase
  - 2 ms Program, 2 ms Erase
  - Endurance: 500,000 Write/Erase Cycles at 25°C
  - 10 Years Data Retention
  - EEPROM Erase Only Mode
  - Write EEPROM without or with Auto-Erase
- 5K Bytes of RAM + 256 Bytes of DMA dedicated RAM
- 32K Bytes of ROM Dedicated to Atmel's Crypto Library

Security

- Dedicated Hardware for Protection Against SPA/DPA Attacks
- Advanced Protection Against Physical Attack, Including Active Shield
- Environmental Protection Systems
  - Voltage Monitor
  - Frequency Monitor
  - Temperature Monitor
  - Light Protection
- Secure Memory Management/Access Protection (Supervisor Mode)
- Security Certification Targeted: Common Criteria EAL5+, VISA, CAST

Secure Microcontrollers for Smart Cards

AT90SC12836RCFT

6515CS-SPD-27Mar07

Note: This a summary and preliminary document. For more information, please contact your local Atmel sales office.

Peripherals

- **One ISO 7816 controller**
  - **Up to 625 kbps at 5 MHz**
  - **Compliant with T = 0 and T = 1 Protocols**
- **Two I/O Ports (Can be Configured to Support 7816-3, 2-wire Protocols...)**
- **Programmable Internal Oscillator (Up to 40 MHz for AdvX™ and up to 20 MHz for internal CPU Clock)**
- **Three 16-bit Timers**
- **Random Number Generator (RNG)**
- **2-level, 8-vector Interrupt Controller**
- **Hardware DES and Triple DES DPA Resistant**
- **Checksum Accelerator**
- **CRC 16 & 32 Engine (Compliant with ISO/IEC 3309)**
- **32-Bit Cryptographic Accelerator for Public Key Operations**
  - **RSA, DSA, ECC, Diffie-Hellman**
- **DMA Controller (Used to Speed-Up Data Transfers when Communicating via the Contactless Interface)**

Development Tools

- **Voyager Emulation Platform (ATV4 Advanced) to Support Software Development**
- **IAR Embedded Workbench® V3.20c Debugger or Atmel's AVR Studio® Version 4.07 or Above**
- **Software Libraries and Application Notes**

Description

The AT90SC12836RCFT is a low-power, high-performance, 8-/16-bit microcontroller with ROM program memory, EEPROM data memory, based on the secureAVR enhanced RISC architecture and with a dual interface (contact+contactless).

By executing powerful instructions in a single clock cycle, the AT90SC12836RCFT achieves throughputs close to 1 MIPS per MHz. Its Harvard architecture includes 32 general-purpose working registers directly connected to the ALU, allowing two independent registers to be accessed in one single instruction executed in one clock cycle.

The AT90SC12836RCFT uses the secureAVR architecture that allows the linear addressing of up to 8M bytes of code and up to 16M bytes of data as well as a number of new functional and security features.

The AT90SC12836RCFT features 36K bytes of high-performance EEPROM (fast erase/write time, high endurance). The ability to map the EEPROM in the code space allows parts of the program memory to be reprogrammed in-system.

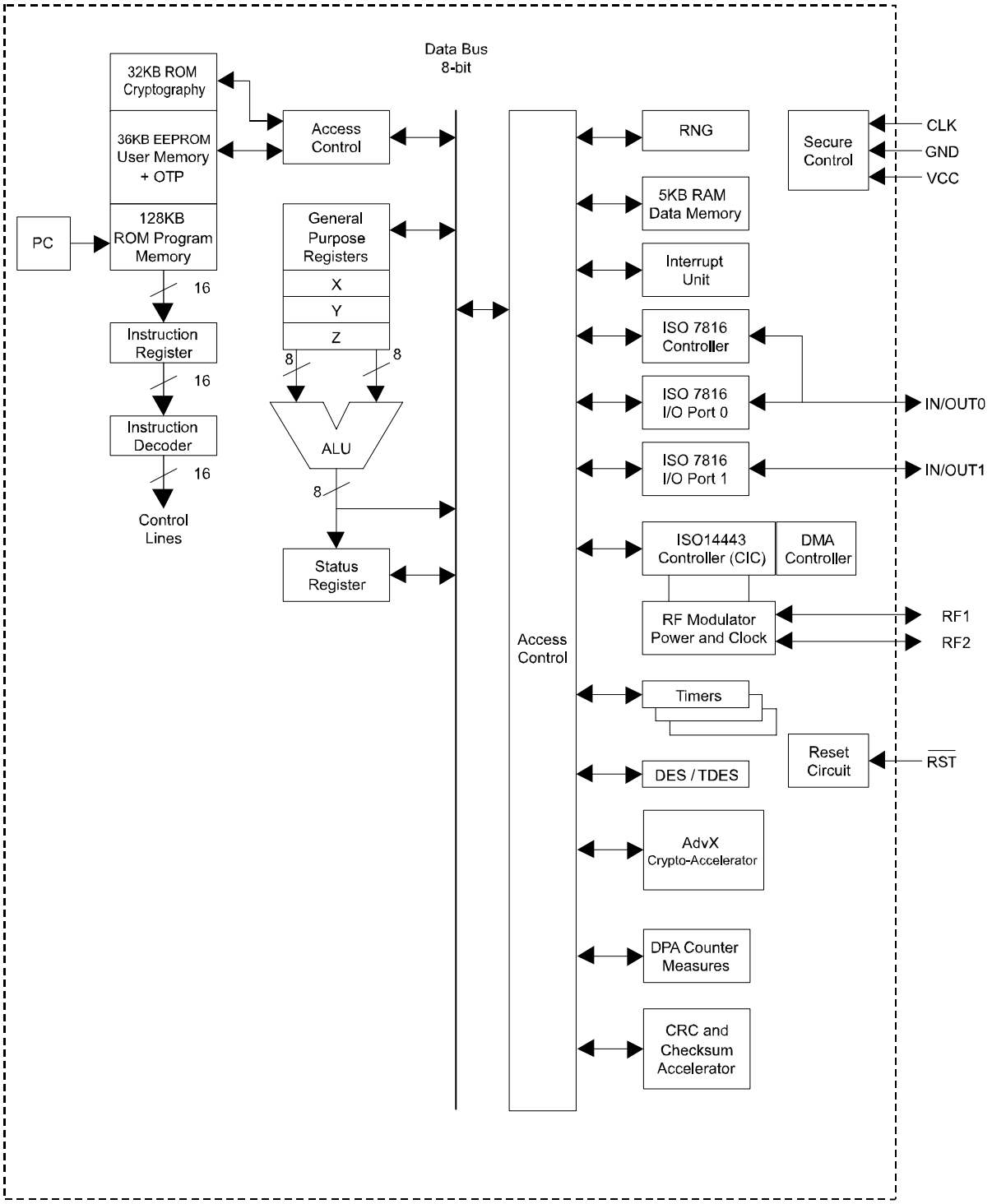
The cryptographic accelerator featured in the AT90SC12836RCFT is the new AdvX, a N-bit multiplier-accumulator dedicated to performing fast encryption and authentication functions. All cryptographic routines are executed on the secureAVR core which uses the AdvX accelerator during encryption/decryption. AdvX is based on a 32-bit technology, thus enabling fast computation and low power operation. AdvX supports standard finite fields arithmetic functions (including RSA, DSA, DH and ECC) and GF(2N) arithmetic functions (including ECC).

Additional security features include power, frequency and temperature protection logic, logical scrambling on program data and addresses, power analysis countermeasures, and memory accesses controlled by a supervisor mode.

This product is specifically designed for Smart Cards and targets Access Control and ID applications.

A block diagram of the AT90SC12836RCFT is shown in Figure 1.

Figure 1. AT90SC12836RCFT Contact/Contactless secureAVR Enhanced Architecture



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