

Features

General

- High-performance, Low-power secureAVR® Core RISC Architecture
 - 135 Powerful Instructions (Most Executed in a Single Clock Cycle)
- Full contactless interface
- ESD Protection to $\pm 2000V$
- Power-saving Wait and Very Low-power Stop Modes
- Power-up Detection
- Available in Wafers, Contactless Modules or Inlays and Industry-standard Packages
- Compliant with SPS Dual Interface Technology
- Compliant with VISA / Master Card PayPassT Specifications

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 120pF
- 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 and 424Kbps

Memory

- 64K Bytes of ROM Program Memory
- 4K Bytes of EEPROM, Including 64 OTP Bytes and 192 Bit-addressable Bytes
 - 1 to 64-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
- 1K Bytes of RAM + 256 Bytes of DMA dedicated RAM

Peripherals

- Programmable Internal Oscillator (Up to 20 MHz for internal CPU Clock)
- Two 16-bit Timers
- Random Number Generator (RNG)
- 2-level, 8-vector Interrupt Controller
- Hardware DES and Triple DES DPA/DEMA Resistant
- Checksum Accelerator
- CRC 16 & 32 Engine (Compliant with ISO/IEC 3309)
- DMA Controller (Used to Speed-Up Data Transfers when Communicating via the Contactless Interface)



Secure Microcontrollers for Smart Cards

AT90SC6404RFT

6520CS-SPD-27Mar07



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



Security

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

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 AT90SC6404RFT 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 contactless interface.

By executing powerful instructions in a single clock cycle, the AT90SC6404RFT 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 AT90SC6404RFT 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.

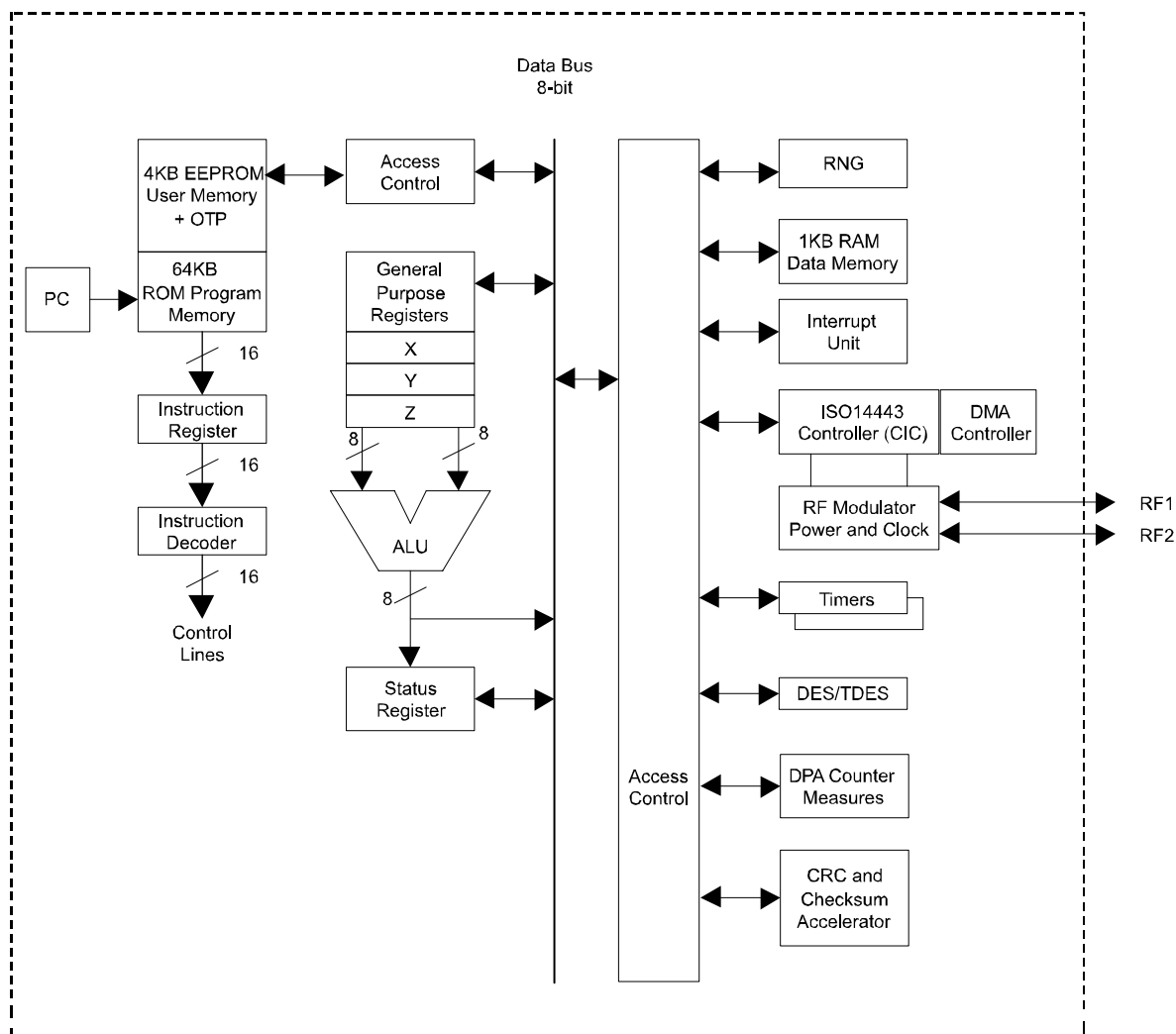
The AT90SC6404RFT features 4K bytes of high-performance EEPROM (fast erase/write time, high endurance). The ability to map the EEPROM in the code space allows parts of the program memory to be reprogrammed in-system.

Additional security features include 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 Transport and Banking applications.

Figure 1 shows a block diagram of the AT90SC6404RFT.

Figure 1. AT90SC6404RFT Contactless secureAVR Enhanced Architecture





Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 487-2600

Regional Headquarters

Europe

Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
TEL (41) 26-426-5555
FAX (41) 26-426-5500

Asia

Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimhatsui
East Kowloon
Hong Kong
TEL (852) 2721-9778
FAX (852) 2722-1369

Japan

9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
TEL (81) 3-3523-3551
FAX (81) 3-3523-7581

Atmel Operations

Memory

2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 436-4314

Microcontrollers

2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
TEL (33) 2-40-18-18-18
FAX (33) 2-40-18-19-60

ASIC/ASSP/Secure Products

Zone Industrielle
13106 Rousset Cedex, France
TEL (33) 4-42-53-60-00
FAX (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906
TEL 1(719) 576-3300
FAX 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
TEL (44) 1355-803-000
FAX (44) 1355-242-743

RF/Automotive

Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
TEL (49) 71-31-67-0
FAX (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906
TEL 1(719) 576-3300
FAX 1(719) 540-1759

Biometrics/Imaging/Hi-Rel MPU/ High Speed Converters/RF

Datacom

Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
TEL (33) 4-76-58-30-00
FAX (33) 4-76-58-34-80

Literature Requests

www.atmel.com/literature

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. **EXCEPT AS SET FORTH IN ATMEL'S TERMS AND CONDITIONS OF SALE LOCATED ON ATMEL'S WEB SITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Atmel's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

© Atmel Corporation 2007. All rights reserved. Atmel®, logo and combinations thereof, Everywhere You Are® and others, are registered trademarks or trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.