

Features

General

- Based on the ARM® SC100™ SecureCore™ 32-bit RISC Processor
- Two Instruction Sets
 - ARM High-performance 32-bit Instruction Set
 - Thumb® High-code-density 16-bit Instruction Set
- Von Neumann Load/Store Architecture
 - Single 32-bit Data Bus for Instructions and Data
- 3-stage Pipeline Architecture
 - Fetch, Decode, and Execute Stages
- 8-bit, 16-bit, and 32-bit Data Types
- On-chip Programmable System Clock up to 38MHz
- Very Low Power Consumption
 - Industry Leader in MIPS/Watt
 - Low power Idle and Power down Modes
- Bond Pad Locations Confirming to ISO7816-2
- ESD Protection to $\pm 6000V$
- Operating range: 1.62V to 5.5V
- Compliant with GSM, 3G, PC Industry Compatible, EMV

Memory

- 464K Bytes of ROM Program Memory
- 384K Bytes of EEPROM, Including 256 OTP Bytes
 - Typically More than 500,000 Write/Erase Cycles at a Temperature of 25°C
 - 10 Years Data Retention
- EEPROM Erase Only Mode
- Write EEPROM With or Without Autoerase
- 18K Bytes of RAM (2K Bytes shared with AdvX™ crypto processor)
- 32K Bytes of ROM dedicated to Atmel's crypto Library

Peripherals

- One ISO 7816 Controller
 - Up to 625 Kbps at 5 MHz
- Single Wire Interface (Digital Interface to RF front end chip)
- Two 16-bit Timers
- Random Number Generator (RNG)
- 2-level, 15-vector Interrupt Controller
- Hardware DES and Triple DES (DPA Resistant)
- Checksum Accelerator
- CRC16 & 32 Engine
- 32-bit Cryptographic Accelerator for Public Key Operations
 - RSA, DSA, ECC, Diffie-Hellman
- High performance Hardware Java Card Accelerator



32-bit Secure Microcontrollers

AT91SC464384RCU Summary

6546A-SPD-29Mar07



Security

- **Dedicated Hardware for Protection Against SPA/DPA Attacks**
- **Protection Against Physical Attack**
- **Environmental Protection Systems**
- **Voltage, Frequency, Light, and Temperature Protection Systems**
- **Secure Memory Management/Access Protection**

Development Tools

- **Hardware Development Support on the ATV4-91SC Voyager Emulation Platform**
- **Software Libraries and Application Notes**

Description

The AT91SC464384RCU is a low power, high performance, 32-bit RISC microcontroller with ROM program memory, EEPROM data memory, and cryptographic accelerator, based on the ARM SC100 advanced secure processor. This general purpose 32-bit processor offers high performance, very low power consumption, and additional features to help combat fraud.

The AT91SC464384RCU features 384K bytes of high performance EEPROM (fast erase/write time, high endurance).

On top of the SC100s MPU, a real hardware firewall can be used to increase the overall security level of the application without intense software development.

The cryptographic accelerator featured in the AT91SC series is the AdvX, an N-bit multiplier-accumulator dedicated to performing fast encryption and authentication functions. AdvX is based on a custom 32-bit co-processor, thus enabling fast computation and low power operation. The AdvX in conjunction with controlling firmware running within the SC100 core, supports standard finite arithmetic functions (including RSA, DSA, DH and ECC) and GF(2N).

Unique hardware features significantly accelerate the execution of Java Card Byte Code by removing the common software bottlenecks encountered during the implementation of a Java Virtual Machine.

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

Pin Configuration

The AT91SC512384RCT pinout configuration confirms to the ISO7816-2 interface.

Note: By convention, the RST pin corresponds to the RST signal of the ISO7816-3 Protocol, both are active low.)

GND	Ground (reference voltage)
Vcc	Power Supply Input
ISO I/O0	Input or Output for serial data (ISO7816)
ISO CLK	Clock signal input to external clock operating circuit
ISO $\overline{\text{RST}}$	Reset signal input, a low state stops the ARM core
C6	SWP dedicated pin

Architectural Overview

The SC100 is a 3 stage pipeline, 32-bit RISC processor. It uses a Von Neumann Load/store architecture, this architecture is characterized by a single data and address bus for instruction data. The SC100 processor employs a unique architectural strategy known as Thumb®, a super reduced instruction set that is ideally suited for high volume applications with memory restrictions, and applications where code density is an important factor. Essentially, the SC100 processor has two instruction sets:

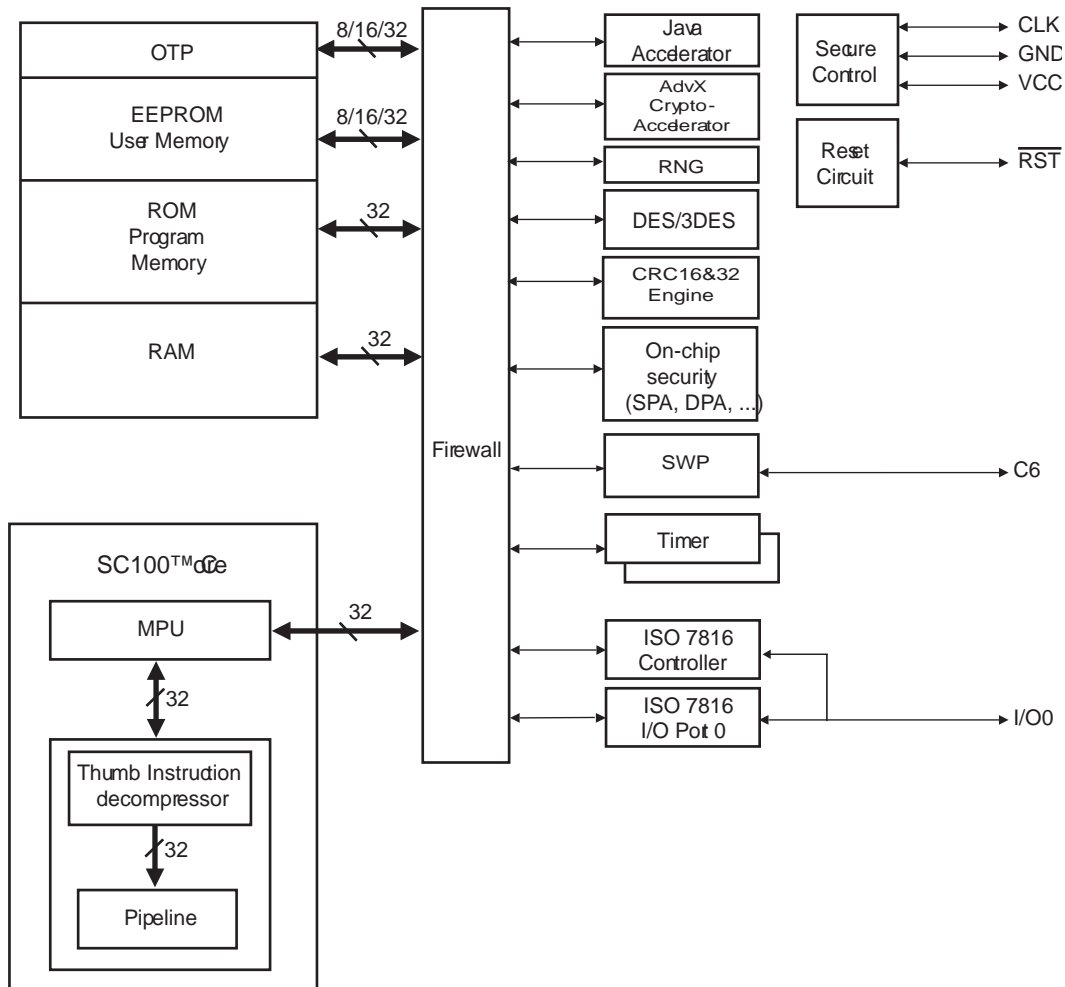
- The standard ARM instruction set using 32-bit instructions and offering maximum performance
- The Thumb instruction set using 16-bit instructions and offering maximum code density

Both instruction sets operate on 8-bit, 16-bit and 32-bit data types.

The Thumb's 16-bit instruction length allows it to achieve almost twice the density of standard ARM code, whilst retaining most of the ARM performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because the 16-bit Thumb instructions operate on the same 32-bit register set as the 32-bit ARM instruction set. Thumb code can be up to 35% smaller than the equivalent ARM code, whilst providing 160% of the performance of an equivalent ARM processor connected to a 16-bit memory system.

Figure 1 shows the block diagram of the AT91SC464384RCU device.

Figure 1. AT91SC464384RCU block diagram





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