AE43C

High Security 16-bit Smart Card Microcontroller

Features

● 8.5kbytes EEPROM
● 64kbytes ROM
● 2.5kbytes RAM
● 1024-bit Coprocessor

Integrated Security Concept (ISC)

The AE43C designed under Hitachi's ISC is ideally suited for high security applications. The ISC means that security is not an add-on feature to standard modules or cores - security has been built in from the start forming an integral part of the whole Smart Card design concept. The whole ISC process (secure chip design environment, secured production facilities and secure handling during shipment to the customer) is constantly reviewed in order to maximise the overall security package.

All devices of the AE-series will be evaluated and certified by independent evaluation authorities.

Many security features such as integrated sensors, distributed layout, Random Number Generation (RNG), Watch Dog Timer (WDT), DES-Engine and power analysis attack protection are all included providing a strong on-chip hardware security structure.

Uniquely, Hitachi Smart Card devices are fabricated using a Metal Oxide Nitride Oxide Silicon (MONOS) EEPROM structure. MONOS advantages compared to standard EEPROM structures are: high resistance to radiation disturbance; high reliability; and endurance.

A high performance Coprocessor is complementary to the design concept ensuring final operating system efficiency, application integrity and performance that meet tomorrow's needs today.

Applications

The AE43C fulfils the requirements of Smart Card applications requiring large memory, high security and high speed secure authentication, data encryption or electronic signature. Examples include: Public Key Infrastructure (PKI), m-commerce, digital signature, and secure banking applications.

Where PKI is a core requirement, a high speed Coprocessor is needed that can process arithmetical data in a time frame that ensures a fast and free flowing application environment. The AE43C Coprocessor ensures the high performance required by today's high security applications.

Applications such as WAP and m-commerce are continually expanding in scope and consequently the need for greater memory storage for both data and program code is constantly increasing. The AE43C provides a significant increase in ROM for program storage over previous devices whilst ensuring a balance of EEPROM for data storage.

The move from single to multi-application on a single component is also rising due in part to new systems such as WAP and m-commerce. This requires not only additional memory for application data storage but also features such as Firewall Management Units (FMU) in order to provide data integrity between applications.

Specifications

Process
- 0.35µm CMOS process

CPU
- AE-4 High performance 16-bit
- 16Mbytes Linear Address Space

Minimum Instruction Timing
- 0.25µs for 32-bit addition
- 1.75µs for 16 x 16-bit multiplication

EEPROM
- MONOS EEPROM Process
- 8kbytes
- 512bytes Extra
- Easy access by single instruction
- 1 to 32bytes programming with one instruction
- Protected against accidental writing and erasing
- Data retention minimum 10 years
- Programming & erasing voltage generation on-chip
- Endurance greater than 100,000 cycles
- Erase time   2ms (maximum)
- Write time   4ms (maximum)
- Overwrite time   2ms (maximum)

ROM
- 64kbytes

RAM
- 2kbytes

Coprocessor
- 1024-bit Key length
- 512bytes RAM
- RSA/ECC Cryptography

On-chip
- Security sensors
- DES-Engine. Minimum execution time is 18 clock cycle
- WDT supports real time OS & applications with exact time measurements
- RNG (Random Number Generator)
- FMU (Firewall Management Unit)
- UART

Power
- Single voltage power supply
- 4.5V to 5.5V
- 2.7V to 3.3V

External Clock input
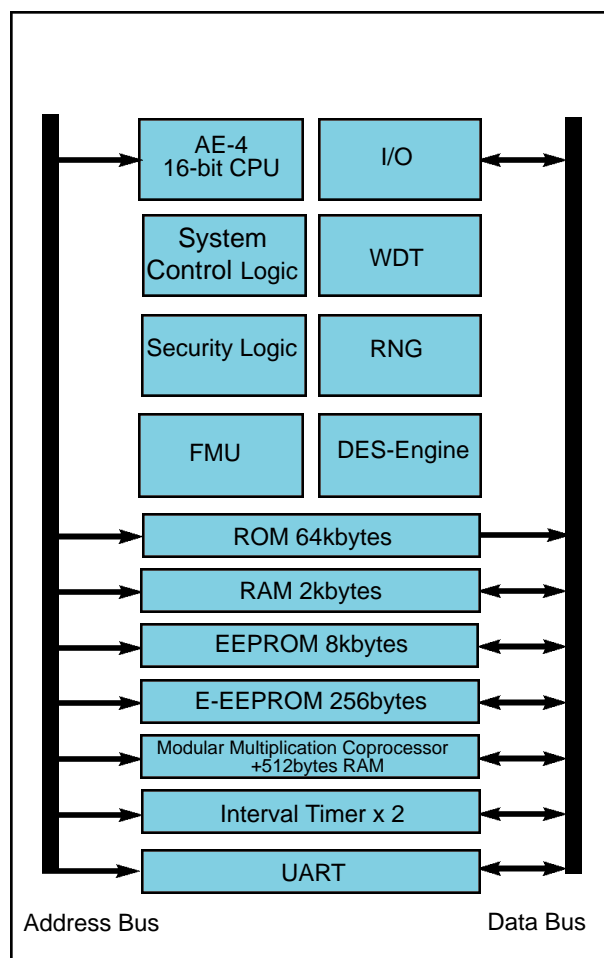- fclk = 1 to 10 MHz at 5V, fclk = 1 to 5 MHz at 3V

Operating Temperature
- Standard -25 to +85 C

Shipping Form 8 inch wafer
- Sawn wafer, un-sawn wafer and Chip on Tape (COT) Module

Block Diagram

Address Bus   Data Bus

For further information on Hitachi's Smart Card products and services including details of sales offices in your region, please visit:

www.hitachisemiconductor.com/eng/smartcard

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