AE-3 Series

High Security 8-bit Smart Card Microcontroller

Features

AE330   8.25Kbytes EEPROM; 24Kbytes ROM; 512Bytes RAM

AE340   16.5Kbytes EEPROM; 46Kbytes ROM; 1280Bytes RAM

AE350   32.5Kbytes EEPROM; 48Kbytes ROM; 3Kbytes RAM

Smart Card Microcontroller

Integrated Security Concept (ISC)

As with every Smart Card microcontroller from Renesas Technology, the AE-3xx series has been designed with the most demanding of security conscious applications in mind. The design includes many safeguards to ensure that the device only operates in the way intended. For example, a distributed layout for critical areas make physical attack methods more difficult and an illegal address detector ensures that only valid memory addresses can be accessed, a hardware Random Number Generator (RNG) provides inputs for key generation and software randomisation techniques, and a Watchdog Timer (WDT) protects against software runaway.

The AE-3xx series has many other advanced security features to protect it against both attacks and system faults. For example, it contains hardware features specifically designed to protect data processing on the device from power analysis attacks (such as SPA/DPA).

Uniquely, Renesas Technology devices are fabricated using a MONOS (Metal Oxide Nitride Oxide Silicon) EEPROM structure. This is significantly more resistant to radiation disturbance than standard EEPROM structures. This design feature further protects the data on the device from illegal or accidental alteration.

Applications

The AE-3xx series fulfils the requirements of all Smart Card applications with high memory demand, such as GSM-SIM cards, electronic banking, multi-application cards, and access control.

For GSM-SIM cards the large EEPROM available on the AE-3xx means it can support many of the advanced applications which will be delivered by communications service providers. These include SIM Application Toolkit (SAT), Wireless Application

The SAT in today's GSM-SIM card standard allows network operators to offer value-added services to the end-users of mobile phones. These applications can include, for example, up-to-date traffic, weather or sports information as well as stock market data, all of

WAP allows Internet-like access to information, data access, and the ability to use e-mail via a mobile phone. The memory configuration of AE-3xx series can be used to store additional information on a SIM card such as e-mail addresses.

The AE-3xx series is a high security Smart Cardmicrocontroller fabricated in $0.35\,\mu\mathrm{m}$ CMOS technology and built around the high-speed 8/16-bit H8 CPU core.

Operating at a maximum of 10MHz external clock rate at 5V, the AE-3xx series rapidly executes bit manipulation instructions, arithmetic and logic instructions, and data transfer instructions.

Specifications

CPU
- Two-way general register configuration
- Sixteen 8-bit registers, or Eight 16-bit registers
- High Speed Operation
- Max clock rate: internal clock 5MHz (at 5V)
- AddSubtract: 0.4µs
- MultiplyDivide: 2.8µs
- Streamlined, concise instruction set
- Instruction length: 2 or 4 Bytes
- Register-register arithmetic and logic operations
- MOV instruction for data transfer between registers and memory
- Instruction set features
- Multiply instruction (8-bits x 8-bits)
- Divide instruction (16-bits / 8-bits)
- Bit accumulator instructions
- Register indirect specification of bit positions
- EEPROM write instruction (EEPMOV instruction)

EEPROM
- MONOS (Metal Oxide Nitride Oxide Silicon) EEPROM Process
- 8 Kbytes (AE330), 16 Kbytes (AE340), 32 Kbytes (AE350)
- 256 Bytes (AE330), 512 Bytes (AE340, AE350) EXTRA
- Easy EEPMOV write by single instruction
- Read, write and erase of EEPROM Byte by Byte
- 1 to 64 Bytes programming with one instruction (1 to 32 Bytes for AE330)
- Protected against accidental writing and erasing
- Data retention minimum 10 years
- EEPROM programming voltage generated onchip
- Endurance: greater than 100,000 times
- Erase time: 2ms max
- Write time: 4ms max
- Overwrite time: 2ms max

ROM
- 24 Kbytes (AE330), 46 Kbytes (AE340), 48 Kbytes (AE350)

RAM
- 512 Bytes (AE330), 1280 Bytes (AE340), 3 kbytes (AE350)

Peripherals
- Watchdog Timer
- Random Number Generator
- Integrated Sensors

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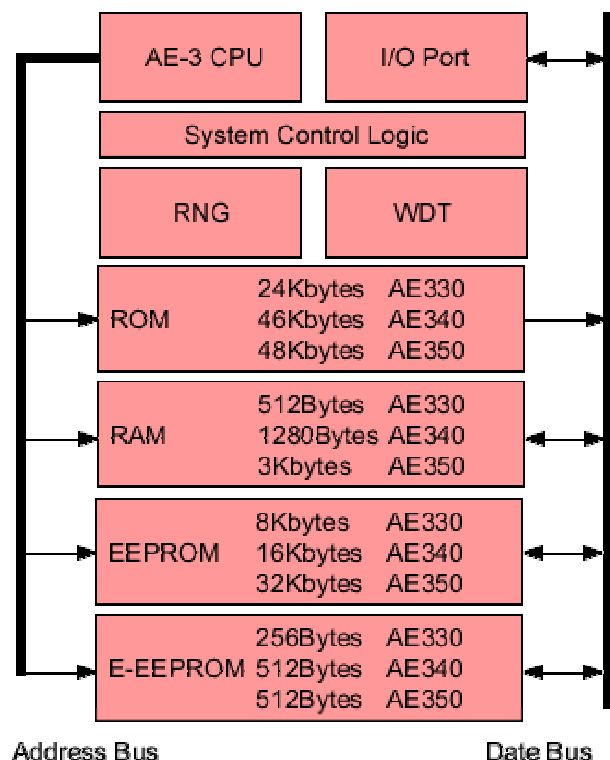- Single voltage power supply
- 4.5V to 5.5V
- 2.7V to 3.3V

Clock Frequency Range
- External Clock Input
 fCLK = 1MHz to 10MHz (Vcc = 4.5V to 5.5V)
 fCLK = 1MHz to 5MHz (Vcc = 2.7V to 3.3V)
- Internal Clock application can select external clock frequency or half external clock frequency as internal operation frequency.

Operating Temperature Range
- standard -25 to + 85°C

Block Diagram

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

www.renesas.com/smartcard