# ST23YR80

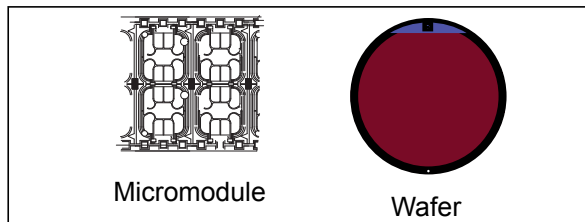## Dual contactless secure MCU with 80-Kbyte EEPROM, enhanced security, cryptoprocessor and optimized RF performance

**Data brief**



Micromodule

Wafer

## Features

### Hardware features

- Enhanced 8/16-bit ST23 CPU core with 16 Mbytes linear addressable memory
- 390 Kbytes of User ROM
- 6 Kbytes of User RAM
- 2 Kbytes of NESCRYPT RAM
- 80 Kbytes of User EEPROM including 128 bytes of User OTP area:
  – 30-year data retention at 25° C
  – 500,000 Erase/Write cycles endurance typical at 25° C
  – 1 to 64 bytes Erase or Program in 1.5 ms
- Operating temperature: –25° to +85° C (certain restrictions apply)
- Three 8-bit timers with watchdog and interrupt capability
- 3 V and 5 V supply voltage ranges
- External clock frequency up to 10 MHz
- High performance provided by:
  – CPU clock frequency up to 29 MHz
- Power-saving Standby state
- Contact assignment compatible with ISO/IEC 7816-3 standards
- Asynchronous receiver transmitter (IART) for high speed serial data support (ISO/IEC 7816-3 and EMV™ compliant)
- ESD protection greater then 6 kV (HBM) for contact pads and 4 kV for contactless pads

### Contactless features

- Complies with ISO/IEC 14443 Type B standards
- 13.56 MHz carrier frequency
- 512-byte RF frame buffer in dedicated RFUART RAM
- RFUART (RF universal asynchronous receiver transmitter) up to 848 Kbps
- BPSK - NRZ load modulation (card-to-reader)
- 8 to 14% amplitude modulation reception (reader to card) as minimum range
- Enhanced RF performance provided by CPU clock frequency up to 29 MHz coupled with clock frequency divider

### Security features

- Active shield
- Enhanced NESCRYPT crypto-processor for public key cryptography
- Hardware security enhanced DES accelerator
- Monitoring of environmental parameters
- Protection mechanisms against faults
- AIS-31 class P2 compliant true random number generator (TRNG)
- ISO 3309 CRC calculation block
- Memory protection unit (MPU)
- Unique serial number on each die

### Development environment

- Reference implementation compatible with ISO/IEC 14443 standards
- Software development and firmware generation are supported by a comprehensive set of development tools dedicated to software design and validation: C compiler, simulator and emulator

## Applications

ST23YR80 major applications include:

- ePassport, eGovernment and ID applications including driving licenses

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# 1 Description

The ST23YR80 is a serial access secure microcontroller custom-designed for secure smartcard applications.

It is based on an enhanced STMicroelectronics 8/16-bit CPU core offering 16 Mbytes linear addressing space. ST23YR80 devices are manufactured using an advanced highly reliable ST CMOS EEPROM technology.

An RF Interface including an RF universal asynchronous receiver transmitter (RFUART) enables contactless communication up to 848 Kbits/s compatible with the ISO/IEC 14443-B standard.

Moreover, an ISO/IEC 7816-3 EMV-compliant asynchronous receiver transmitter (IART) communication peripheral is available.

**Figure 1. ST23YR80 block diagram**
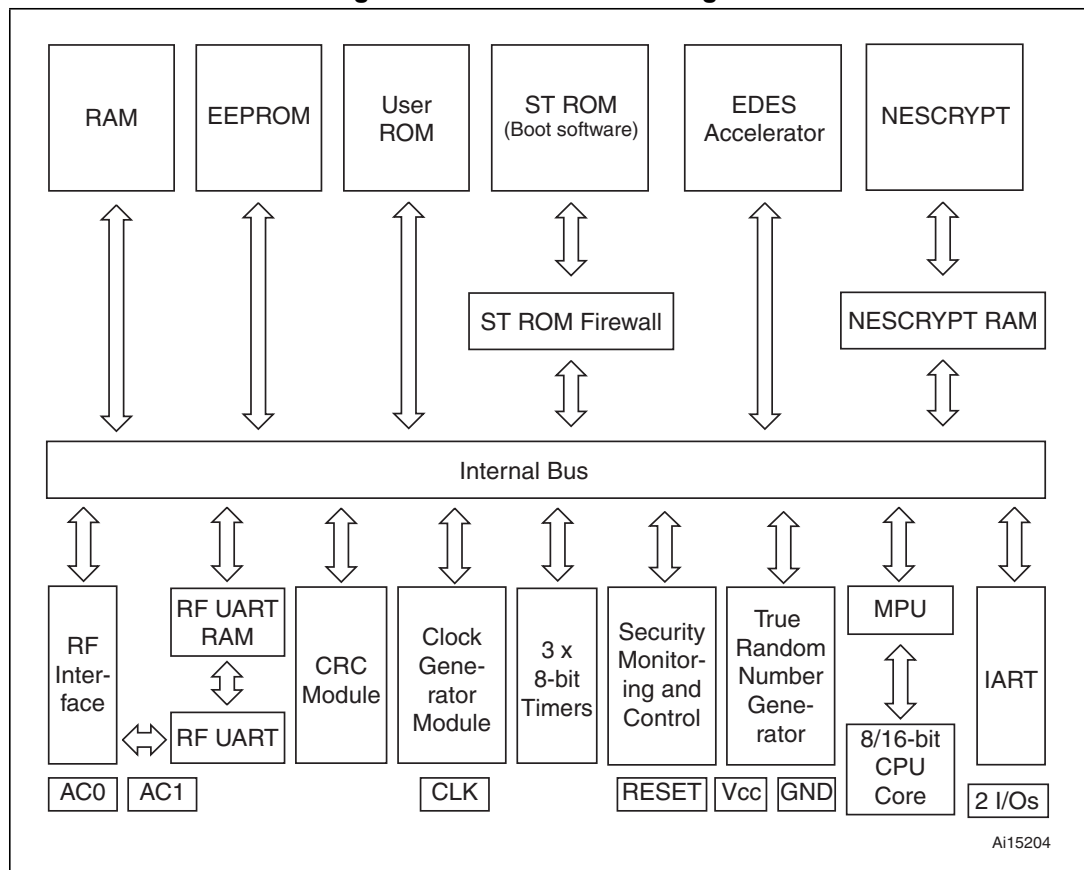


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## 1.1 Development environment

Development tools for secure MCU products include a complete range of hardware systems and software tools from STMicroelectronics and third-party tool suppliers. The range of tools includes solutions to help you to develop and debug your application and evaluate secure MCU products and their peripherals.

An Integrated Development Environment (IDE), the ST Visual Develop (STVD), provides a set of tools for developing embedded applications. This interface manages the project configuration, code edition, code generation and program debugging.

A Smartcard ICS emulator and simulator are available for developing and validating your application code.

All the information needed to generate the application code and personalization will be collected in a delivery file (.DLV extension). This file is created using the Delivery menu of the STMicroelectronics configuration software tool, SCOOL.

# 2 Revision history

**Table 1. List of modifications**

| Date | Revision | Changes |
|------|----------|---------|
| 15-Jul-2008 | 1 | First release. |
| 08-Jun-2010 | 2 | Updated list of hardware features on cover page. |
| 11-Feb-2011 | 3 | Removed "Obsolete" watermark. |
| 16-Aug-2013 | 4 | Updated logo information on page 2. |

**Please Read Carefully:**