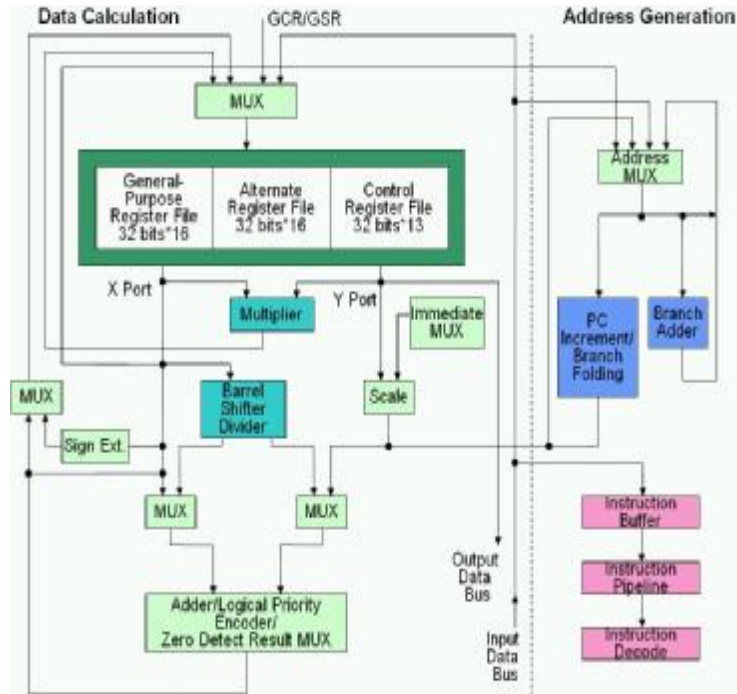


# Secure RISC Core CS320D

## Data Sheet

### Summary

The CS320D is a 32-bit RISC core designed specifically for secure applications#. The CS320D is a member of the C\*Core™ 32-bit RISC core family. In addition to providing most of the C310 core features, the CS320D incorporates advanced techniques to enable secure functionality, including a memory protection unit (MPU) integrated with the core. The MPU module provides additional security features to the CS320D core, which include flexible and powerful access protection modes, data encryption/decryption and address scrambling. It enhances protection against unauthorized access to sensitive data by providing two fixed and eight super-user programmable memory regions.



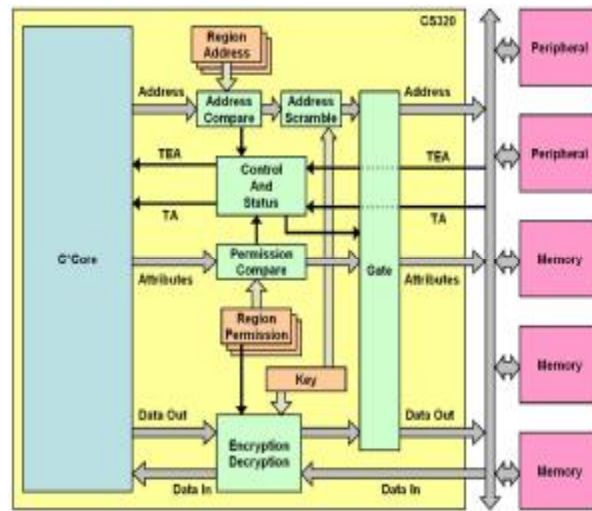
# Note: Because the CS320D core has a OnCE™ JTAG/Debug interface, which can be used to re-program or bypass the MPU, the CS320D is not considered a very secure core. The purpose of the CS320D is to enable building a test-chip for developing the secure application software, which is then embedded in another chip, which employs the CS320 core, which is secure (no debug interface).

### Core Features

- Ø Low power secure RISC core
- Ø 32-bit load/store architecture
- Ø Highly optimized pipeline
- Ø Single-cycle 32x16 multiplier
- Ø Fixed-length 16-bit instructions
  - ü Mostly single-cycle execution
  - ü Two-cycle branch execution
- Ø 16 32-bit general purpose registers
- Ø 13 32-bit control registers
- Ø C\*Bus MLB bus architecture
  - ü Support byte/halfword/word access
  - ü Optional AMBA wrapper
- Ø Debug support via JTAG-based OnCE™ Design
- Ø Fast interrupt support
  - ü 16 32-bit alternate registers for fast context switching
  - ü Vectored/auto-vectored interrupts
  - ü 128 interrupt/exception vectors
- Ø Powerful security features
  - ü Memory Protection Unit
  - ü Data encryption
  - ü Address scrambling
  - ü Programmable access protection
- Ø Debug support via JTAG-based OnCE™ Design
- Ø Extendable simulator for application software development and secure debugging

## CS320D MPU Features

- Ø Memory Encryption Unit (MEU) provided to protect sensitive data from attack
- Ø MPU features can only be enabled/disabled by super-user
  - ü Programmable regions disabled after reset by default, must be explicitly enabled by the super-user
  - ü Exception Vector Table/OS and MPU Control Space regions always protected
- Ø Eight super-user programmable regions
  - ü Variable region size: 1Kbyte to 4Gbyte
  - ü Can be based anywhere in the 4Gbyte memory map
  - ü Region base address automatically aligned to the region size
  - ü Programmable data and address encryption/decryption
  - ü Flexible access permissions:
    - Super-user/user access
    - Read/write access
    - Execute (instruction fetch) access
- Ø Regions allowed to overlap (strictest access permissions enforced for overlapped regions)
- Ø One super-user access region for Exception Vector Table and Operating System (OS)
  - ü Fixed size: 4Kbyte
  - ü Fixed location: 0x00000000
  - ü Data and address encryption
  - ü Fixed access permission
    - Super-user read/write/ execute access only
- Ø One super-user access region for the MPU Control Space
  - ü Fixed size: 64Kbyte
  - ü Fixed location: 0xFFFF0000
  - ü Fixed access permission
    - Super-user read/write access only
- Ø Programmable 32-bit data and address encryption key
- Ø Status register contains attribute and region details of access violations



## CS320D Performance and Characteristics (example)

<b>Process:</b>	HHNEC 0.25μm	SMIC 0.18μm
<b>Frequency (WCS):</b>	66MHz	90MHz
<b>Die Size:</b>	1.72 mm <sup>2</sup>	0.75 mm <sup>2</sup>
<b>Power (TYP):</b>	0.51 mW/MHz	0.21 mW/MHz

The CS320D core is typically delivered as a square-shaped hard-macro, using 5 metal layers (50% of metal 5 is available for on-chip route). The figures above are speed-optimized implementation examples. The CS320D is available in a range of technologies, and various speed and area/power optimized versions, while other implementations are available on request.

## Application Examples

- Ø Smart Cards
- Ø Banking
- Ø Security Keys
- Ø SIM Cards

## Availability

Ø Q2, 2003

To obtain more information about the CS320D or other C\*CORE™ products, please contact the C\*Core Technology Co., Ltd. by phone: 0512-68091372, email: [support@china-core.com](mailto:support@china-core.com) or web: <http://www.china-core.com>.

C\*Core™ is a trade mark of C\*Core Co., Ltd.