Security & Chip Card ICs

SLE 66CX160S

16-bit Security Controller
in 0.6 µm CMOS Technology
32-Kbyte ROM, 1980 Byte RAM
16-Kbyte EEPROM and
1100-bit Advanced Crypto Engine

Short Product Information 10.01

SLE 66CX160S Short Product Information	Ref.: SPI_SLE 66CX160SU_1001
This document contains preliminary information on a new product under development. Details are subject to change without notice.	
Revision History: Current Version 10.01	
Previous Releases:	
Page	Subjects (changes since last revision)

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Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office in Germany or our Infineon Technologies Representatives world-wide (see address list).

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16-bit Security Controller SLE 66CX160S with
32-Kbyte ROM, 1980 Byte RAM,
16-Kbyte EEPROM and 1100-bit Advanced Crypto Engine

Features

- 16-bit microcomputer in 0.6 µm CMOS technology
- Instruction set opcode compatible with standard SAB 8051 processor
- Enhanced 16-bit arithmetic
- Additional powerful instructions optimized for chip card applications
- Dedicated, non-standard architecture with **execution time six times faster** than standard SAB 8051 processor
- **31.5-Kbytes User ROM** for application programs
- 512-bytes reserved ROM for Resource Management System (RMS) with intelligent write/erase routines
- 16-Kbytes EEPROM as program/data memory
- 256 (+ 700) bytes internal RAM
- **1-Kbyte external RAM** (XRAM)
- **1100-bit Advanced Crypto Engine** (ACE) for fast execution of public key crypto algorithms
- **True random number generator**
- **Interrupt module for I/O interface**
- **CRC Module**
- **16-bit timer with 8-bit prescaler**
- Power saving sleep mode
- Clock freq. = int. freq.: 1 to 7.5 MHz
- Contact configuration and serial interface in accordance with ISO 7816
- Supply voltage range: 2.7 V to 5.5 V
- Current consumption < 10 mA at 5 MHz and 5.5 V
- Temperature range: -25 to +70°C
- ESD protection larger than 4 kV

EEPROM

- Reading, erasing and writing byte by byte
- Flexible page mode for 1 to 64 bytes write/erase operation
- 32 bytes security area
- Write time 3.6 ms, erase time 1.8 ms
- Programming time adaptable to clock frequency
- **Minimum of 500,000 write/erase cycles**
- Data retention for a minimum of ten years
- EEPROM programming voltage generated on chip

Security Features

Operation state monitoring mechanism

- Low and high voltage sensors
- Frequency sensors and filters

Memory Security

- 16 bytes security PROM, hardware protected
- Unique chip identification number for each chip
- MED – memory encryption/decryption device for XRAM, ROM and EEPROM
- True Random Number Generator with Firmware test function
- Security optimised layout and layout scrambling
- user settable additional encryption key for EEPROM
- Move code blocking (from EEPROM)

Support

- HW-& SW-Tools (Emulator, ROM Monitor, Card Emulator, Simulator, Softmasking)
- Application notes (e.g.: T=0, T=1, DES, RSA, RNG, etc.)

Testmode

- Irreversible Lock - Out of testmode

Anti Snooping

- HW-countermeasures against SPA/DPA-, Timing- and DFA-attacks (differential fault analysis – DFA)
- CRC - Module
- Non standard dedicated Smart Card CPU – Core

Development Tools Overview

- Short Product Information Software Development Kit SDK CC
- Short Product Information Card Emulator SCE66
- Short Product Information ROM Monitor SRM66
- Short Product Information Emulator SET66 Hitex or SET66 KSC
- Short Product Information Smart Mask Package

Supported Standards

- ISO/IEC 7816
- EMV 2000
- GSM 11.1x
- ETS I TS 102 221

Document References

- Confidential Data Book SLE 66CxxS
- Confidential Instruction SLE 66CxxS
- Confidential Quick Reference SLE 66CxxS
- Qualification report
- Chip delivery specification for wafer with chip-layout (die size, orientation,...)
- Module specification containing description of package, etc.
- Qualification report module

Features (cont'd)

Enhanced Crypto Performance

Operation	Modulus	Exponent	Calculation Time at 5 MHz
Modular Exponentiation	160 bit	160 bit	20 ms
Modular Exponentiation	256 bit	256 bit	35 ms
Modular Exponentiation	512 bit	512 bit	110 ms
Modular Exponentiation RSA Encrypt / RSA Signature Verify	1024 bit	16 bit	20 ms
Modular Exponentiation RSA Decrypt / RSA Signature Generate	1024 bit	1024 bit	820 ms
Modular Exponentiation using CRT RSA Decrypt / RSA Signature Generate	eq.1024 bit	eq.1024 bit	250 ms
DSA Signature Generate	512 bit	160 bit	145 ms
DSA Signature Verify	512 bit	160 bit	130 ms
DSA Signature Generate	1024 bit	160 bit	290 ms
DSA Signature Verify	1024 bit	160 bit	360 ms
Elliptic Curves EC-GDSA Sign. Generate	160 bit	160 bit	260 ms
Elliptic Curves EC-GDSA Sign. Verify.	160 bit	160 bit	550 ms

Ordering Information

Type	Package[1]	Voltage Range	Temperature Range	Frequency Range
SLE 66CX160S-M6	M6	2.7 V - 5.5 V	– 25°C to + 70°C	1 MHz - 5 MHz @ 5V 1 MHz - 4 MHz @ 3V
SLE 66CX160S-C	C			
SLE 66CX160S-T85-M6	M6	2.7 V - 5.5 V	– 25°C to + 85°C	1 MHz - 5 MHz @ 5V 1 MHz - 4 MHz @ 3V
SLE 66CX160S-T85-C	C			
SLE 66CX160S-V5-M6	M6	4.5 V - 5.5 V	– 25°C to + 70°C	1 MHz - 5 MHz
SLE 66CX160S-V5-C	C			
SLE 66CX160S-V5-T85-M6	M6	4.5 V - 5.5 V	– 25°C to + 85°C	1 MHz - 5 MHz
SLE 66CX160S-V5-T85-C	C			
SLE 66CX160S-V5-F7-M6	M6	4.5 V - 5.5 V	– 25°C to + 70°C	1 MHz - 7.5 MHz
SLE 66CX160S-V5-F7-C	C			

Production sites:

- Regensburg SLE 66CxxS
- UMC Taiwan SLE 66CxxU

[1] available as wire-bonded module (M6) for embedding in plastic cards or as die (C) for customer packaging

Pin Configuration

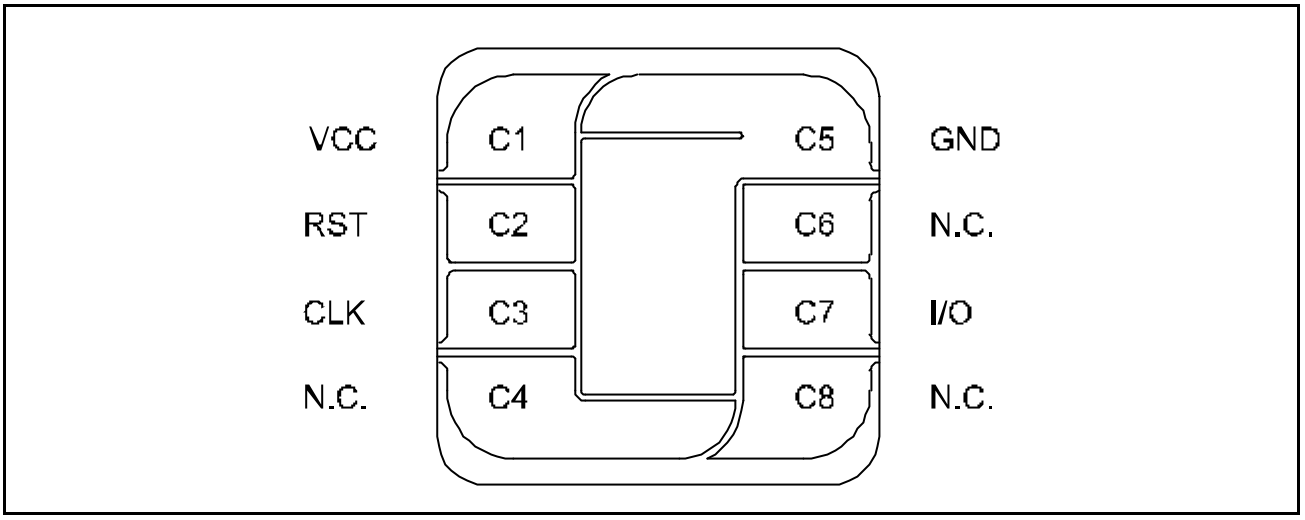

Figure 1 Pin Configuration (top view)

Pin Definitions and Functions

Card Contact	Symbol	Function
C1	VCC	Operating voltage
C2	RST	Reset input
C3	CLK	Processor clock input
C5	GND	Ground
C4; C6; C8	N.C.	Not connected
C7	I/O	Bi-directional data port

General Description

SLE 66CX160S is a member of the Infineon Technologies high end security controller family in 0.6 µm CMOS technology. The CPU provides the high efficiency of the SAB 8051 instruction set extended by additional powerful instructions together with enhanced performance, memory sizes and security features.

The cryptocontroller IC offers 31.5 Kbytes of User-ROM, 256 bytes internal RAM, 1 Kbyte XRAM and 16 Kbytes EEPROM. It suits the requirements of the new generation of operating systems.

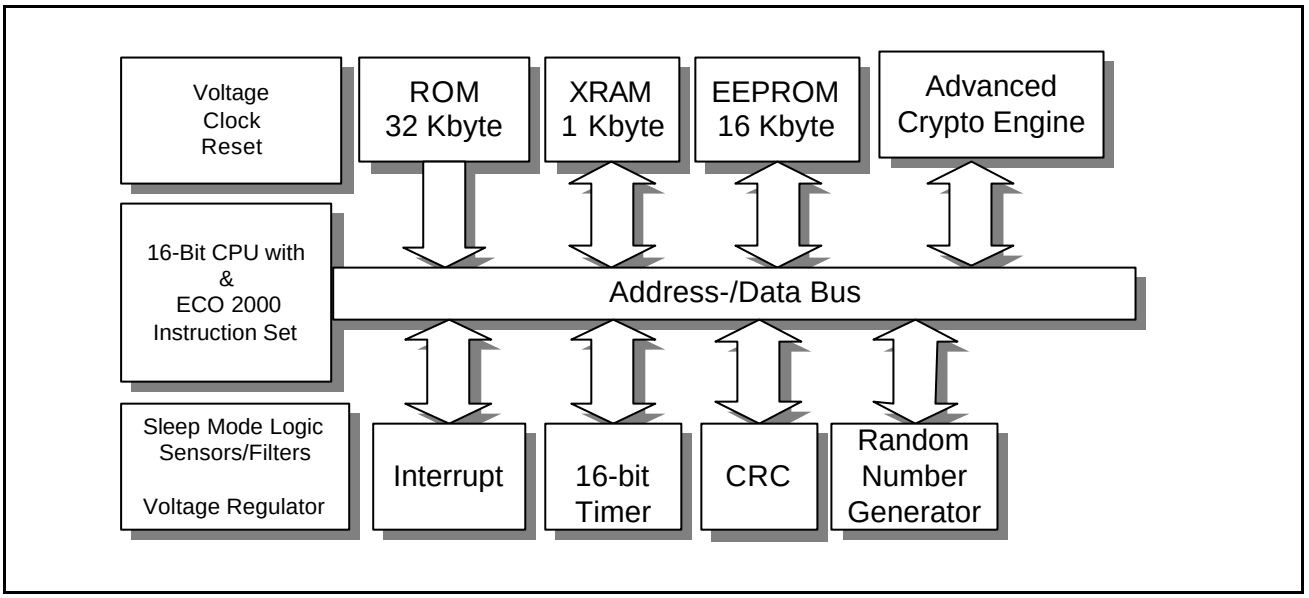

Figure 2: Block Diagram SLE 66CX160S

The Advanced Crypto Engine is equipped with its own RAM of 700 bytes and supports all of today known public-key algorithms based on large integer modular arithmetic. It allows fast and efficient calculation of e.g. RSA operations with key lengths up to 2048 bit.

The Random Number Generator (RNG) is able to supply the CPU with true random numbers on all conditions. The CRC module allows the easy generation of checksums according to ISO 3309 (16-Bit-CRC).. An additional interrupt capability of the I/O module allows parallel operation of chip card and terminal. To minimize the overall power consumption, the chip card controller IC offers a sleep mode.

As an important measure, the chip provides a new and enhanced level of on-chip security features.

In conclusion, the SLE 66CX160S fulfills the requirements of all chip card applications, as especially information security, access control, payment and health care. The SLE 66CX160S is a powerful chip card cryptocontroller IC integrating outstanding memory sizes, an extended crypto-coprocessor, additional peripherals in combination with enhanced performance and optimized power consumption on an minimized die size. Therefore, the SLE 66CX160S offers the basis for new chip card applications.