



## Security & Chip Card ICs

### SLE 66C160S

16-bit Security Controller  
in 0.6  $\mu\text{m}$  CMOS Technology  
32-Kbyte ROM, 1280 Byte RAM and  
16-Kbyte EEPROM

**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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## **16-bit Security Controller with 32-Kbyte ROM, 1280 Byte RAM and 16-Kbyte EEPROM**

### **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
- **1280 bytes RAM**
- **True random number generator (RNG)**
- **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  
Software

### **Testmode**

- Irreversible Lock - Out of testmode

### **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 3.62 ms, erase time 1.81 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, RNG, etc.)

**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

**Ordering Information**

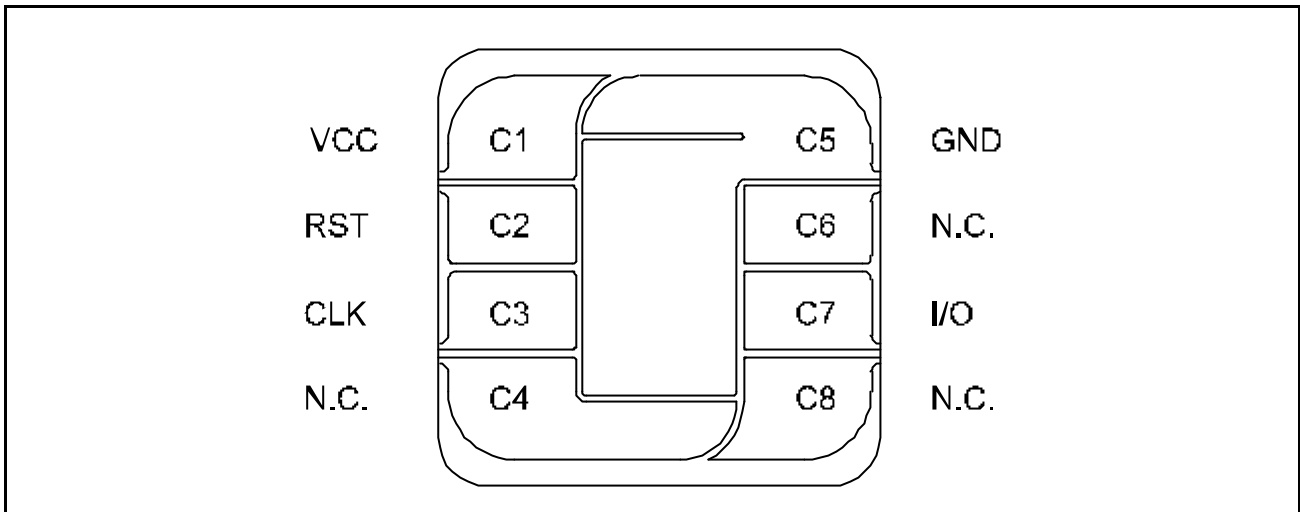
Type	Package <sup>1</sup>	Voltage Range	Temperature Range	Frequency Range
SLE 66C160S	M4	2.7 V - 5.5 V	– 25°C to + 70°C	1 MHz - 5 MHz @ 5V 1 MHz - 4 MHz @ 3V
SLE 66C160S	C			
SLE 66C160S-T85	M4	2.7 V - 5.5 V	– 25°C to + 85°C	1 MHz - 5 MHz @ 5V 1 MHz - 4 MHz @ 3V
SLE 66C160S-T85	C			
SLE 66C160S-V5	M4	4.5 V - 5.5 V	– 25°C to + 70°C	1 MHz - 5 MHz
SLE 66C160S-V5	C			
SLE 66C160S-V5-T85	M4	4.5 V - 5.5 V	– 25°C to + 85°C	1 MHz - 5 MHz
SLE 66C160S-V5-T85	C			
SLE 66C160S-V5-F7	M4	4.5 V - 5.5 V	– 25°C to + 70°C	1 MHz - 7.5 MHz
SLE 66C160S-V5-F7	C			

**Production sites:**

- Regensburg SLE 66CxxS
- UMC Taiwan SLE 66CxxU

<sup>1</sup> available as wire-bonded module (M4) for embedding in plastic cards or as die (C) for customer packaging

**Pin Description**



**Figure 1 Pin Configuration (top view)**

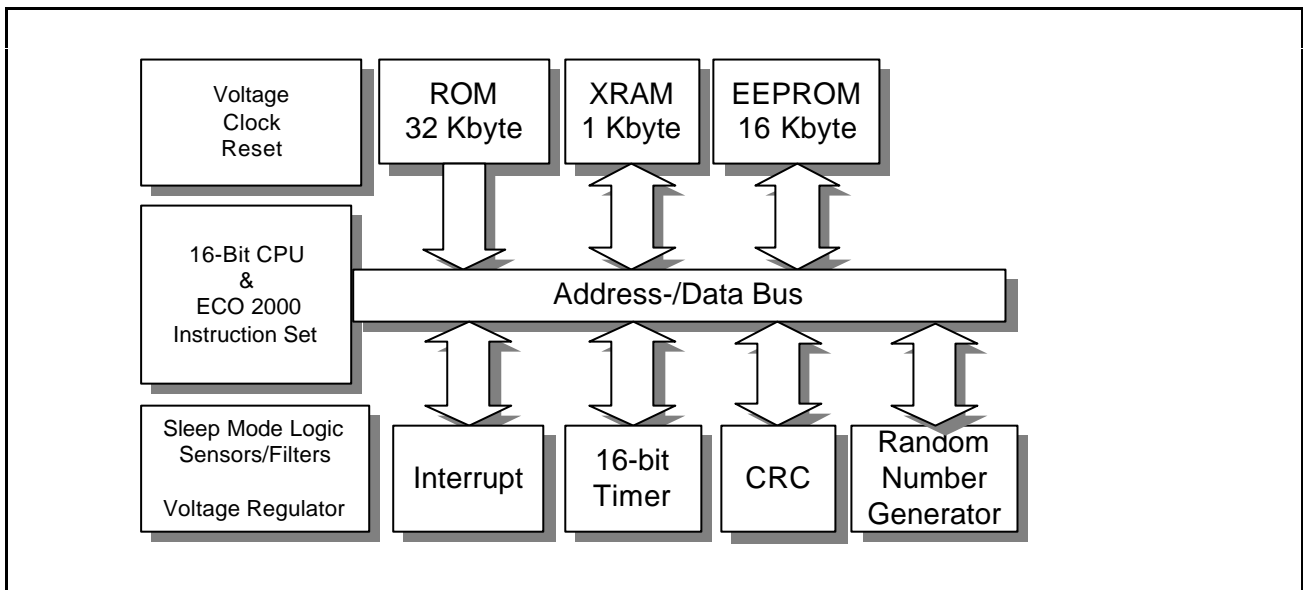
**Pin Definitions and Functions**

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 66C160S is a member of the Infineon Technologies high end security controller family in 0.6  $\mu\text{m}$  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 controller 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 66C160S**

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). The timer makes it easy to implement advanced communication protocols such as T=1 and all other time critical processes. 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 66C160S fulfills the requirements of all chip card applications, as especially SIM Cards for GSM Phones, payment and health care. The SLE 66C160S is a powerful chip card controller IC integrating outstanding memory sizes, additional peripherals in combination with enhanced performance and optimized power consumption on a minimized die size. Therefore, the SLE 66C160S offers the basis for new chip card applications.