Security & Chip Card ICs

SLE 5536/36E

Intelligent 221–Bit EEPROM Counter
for > 20000 Units with Security Logic
and High Security Authentication

Short Product Information 07.99

SLE 5536/36E Short Product Information		Ref.: SPI_SLE5536_0799.doc
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Page	Subjects (changes since last revision)	
	Layout change	

Important: Further information is confidential and on request. Please contact:
Infineon Technologies AG in Munich, Germany,
Security & Chip Card ICs,
Fax +49 89 234-28925
E-Mail: Security-and.Chipcard-ICs@infineon.com

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Infineon Technologies is an approved CECC manufacturer.

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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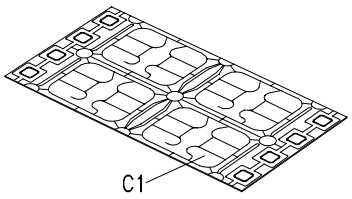
Intelligent 221–Bit EEPROM Counter for > 20000 Units with Security Logic and High Security Authentication

Features



M3

- **221 bit EEPROM and 16 bit mask-programmable ROM**

  104 bit user memory fully compatible with SLE 4406/06E
  - 64 bit Identification Area consisting of
    - 16 bit Manufacturer code (mask-programmable ROM)
    - SLE 5536:
      8 bit Manufacturer data, card issuer dependent (ROM)
      40 bit for personalization data of card issuer (PROM)
    - SLE 5536E:
      48 bit for personalization data of card issuer (PROM)
  - 40 bit Counter Area including 1 bit for personalization (PROM/EEPROM)

  133 bit additional memory for advanced features
  - 4 bit Counter Backup (anti-tearing flags)
  - 1 bit initiation flag for Authentication Key 2
  - 16 bit Data Area 1 for free user access
  - 48 bit Authentication Key 1
  - either 48 bit Data Area 2 for user defined data or 48 bit Authentication Key 2
  - 16 bit Data Area 3 for free user access

- **Counter with up to 33352 count units fully compatible with SLE 4406/06E**
  - Five stage abacus counter
  - Due to testing purposes a maximum of 21064 count units is guaranteed

- **Counter tearing protection**
  - Backup feature activated at choice

  Counter tearing protection may be disabled by mask option

- **High security authentication unit**

  individual card authentication fully compatible with SLE 4436/36E
  - Random number as challenge
  - Individual secret Authentication Key 1
  - Optional individual secret Authentication Key 2
  - Calculation of up to 16 bit response
  - Calculation of a 16 bit response within 30 ms at a clock frequency of 100 kHz

  optional activation of
  - Response calculation with cipher block chaining
  - Certification of the counter value

- **Transport Code protection for delivery**
- **EEPROM security cells in sensitive areas**
- **Chip circuitry and chip layout optimised for high security against physical and electrical signal analysis**

Features (cont'd)

- **Ambient temperature –35 … +80°C**
- **Supply voltage 5 V ± 10 %**
- **Supply current < 5 mA**
- **EEPROM programming time 5 ms**
- **ESD protection typical 4000 V**
- **Endurance minimum 10^5 write/erase cycles / bit**[1)]
- **Data retention for minimum of 10 years**[1)]
- **Contact configuration and Answer-to-Reset (synchronous transmission) in accordance to standard ISO/IEC 7816**

Table 1 Ordering Information

Type	Package[2)]	Counter tearing protection	Access of 3rd byte
SLE 5536 M3	M3	Enabled	Data of 3rd byte are programmed by Infineon exclusively
SLE 5536 C	C		
SLE 5536-BD M3	M3	Disabled	
SLE 5536-BD C	C		
SLE 5536E M3	M3	Enabled	Data of 3rd byte are programmed by the card manufacturer at personalisation
SLE 5536E C	C		
SLE 5536E-BD M3	M3	Disabled	
SLE 5536E-BD C	C		

1) Values are temperature dependent
2) Available as a wire-bonded module (M3) for embedding in plastic cards or as a die (C) for customer packaging

Pin Description

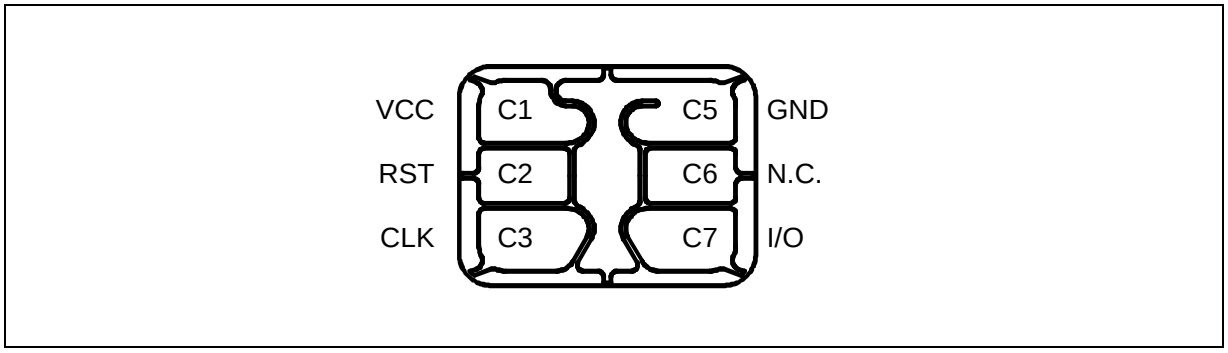


Figure 1 Pin Configuration Wire-bonded Module (top view)

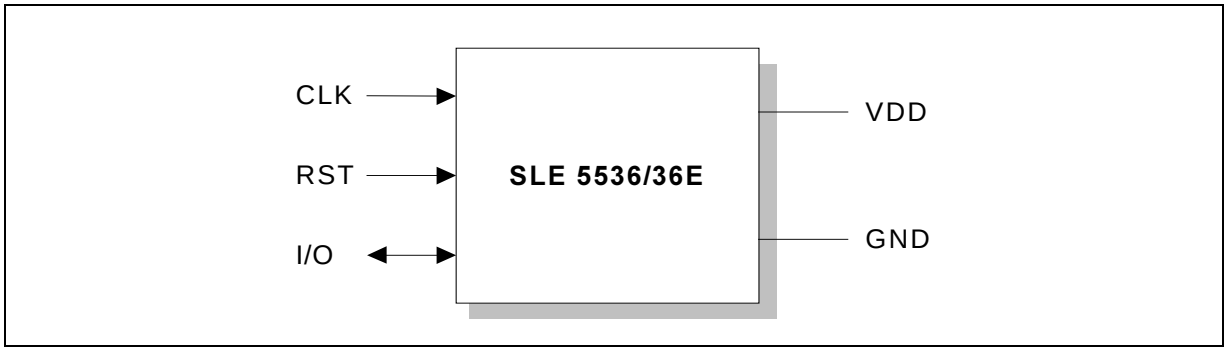


Figure 2 Pad Configuration Die

Table 2 Pin Definitions and Functions

Card Contact	Symbol	Function
C1	VCC	Supply voltage
C2	RST	Control input (Reset Signal)
C3	CLK	Clock input
C5	GND	Ground
C6	N.C.	Not connected
C7	I/O	Bi-directional data line (open drain)

General Description

SLE 5536/36E is designed for applications in prepaid telephone cards. The chip consists of an EEPROM memory of 221 bit, a ROM of 16 bits, a control/security unit and a special computing unit for chip authentication. The shaded blocks in the block diagram (Figure 3) contain the enhanced features of SLE 5536/36E compared to SLE 4406/06E.

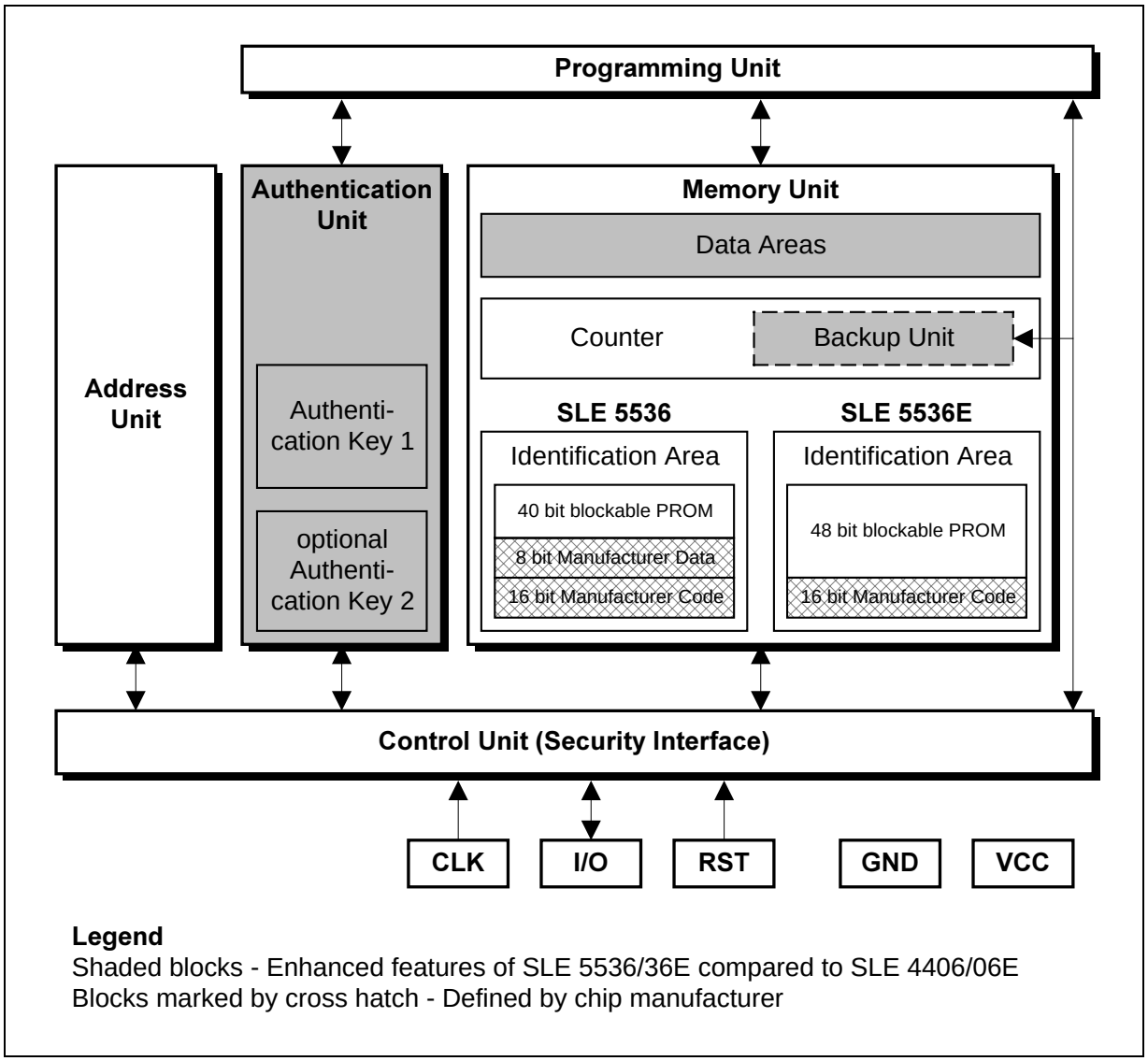


Figure 3 Block Diagram

- **Memory Unit**
  Counter, Identification Data (e.g. serial number, expiry date) and Data Areas.
- **Address Unit**
  Setting of the address counter is synchronously with the CLK.
- **Programming Unit**
  The programming voltage for the EEPROM/PROM is generated internally.

- **Backup Unit**
  An associated backup bit indicates an interrupt caused by e.g. tearing a card out of a reader without mechanical locking device during a reloading cycle of a devaluated counter stage.
  Note: The counter tearing protection may be disabled by mask option
- **Authentication Unit**
  The secret algorithm offers a challenge & response procedure for individual card authentication fully compatible with SLE 4436/36E; the optional activation of cipher block chaining allows the certification of a counter decreasing procedure.
- **Security Interface**
  Ensures a minimum and a maximum frequency and proper logical voltage levels.