



## Security & Chip Card ICs

### SLE 5536/36E

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

<b>SLE 5536/36E Short Product Information</b>		Ref.: SPI_SLE5536_0799.doc
<b>Revision History: Current Version 07.99</b>		
Previous Releases: 08.96		
Page	Subjects (changes since last revision)	
	Layout change	

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

### Features

- **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

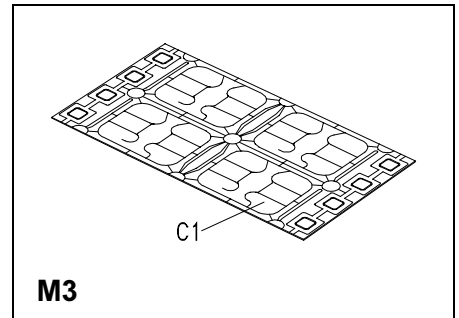
Counter tearing protection may be disabled by mask option
- **High security authentication unit**

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  $-35 \dots +80^{\circ}\text{C}$
- Supply voltage  $5 \text{ V} \pm 10 \%$
- Supply current  $< 5 \text{ mA}$
- EEPROM programming time  $5 \text{ ms}$
- ESD protection typical  $4000 \text{ V}$
- Endurance minimum  $10^5$  write/erase cycles / bit<sup>1)</sup>
- Data retention for minimum of 10 years<sup>1)</sup>
- Contact configuration and Answer-to-Reset (synchronous transmission) in accordance to standard ISO/IEC 7816

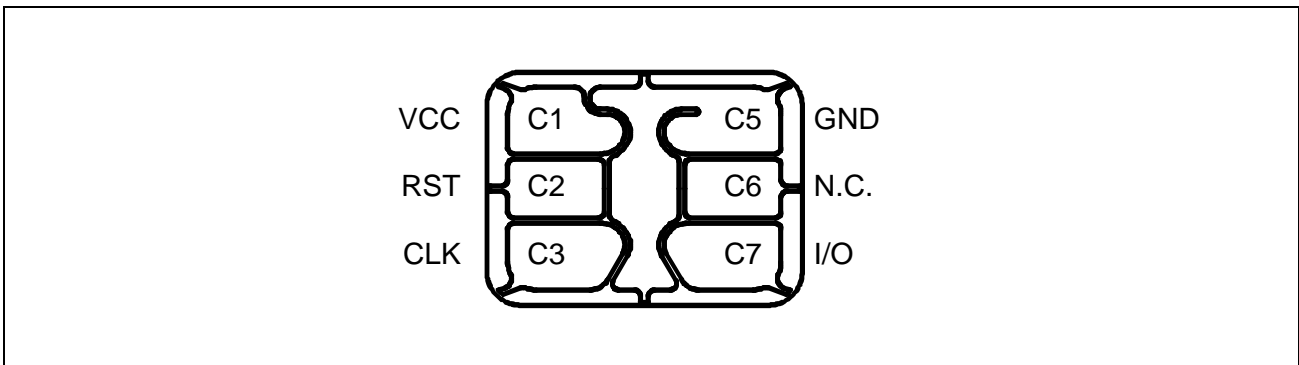
**Table 1 Ordering Information**

Type	Package <sup>2)</sup>	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		

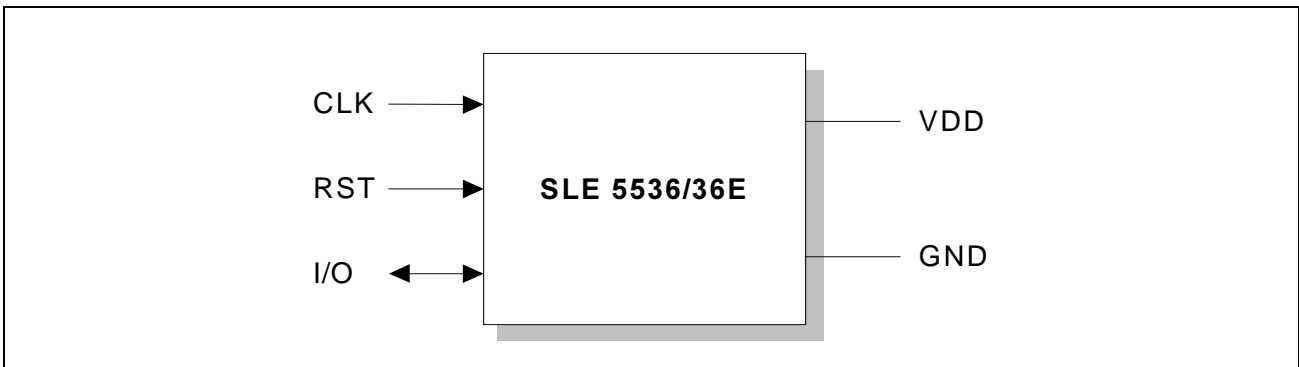
<sup>1)</sup> Values are temperature dependent

<sup>2)</sup> 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.

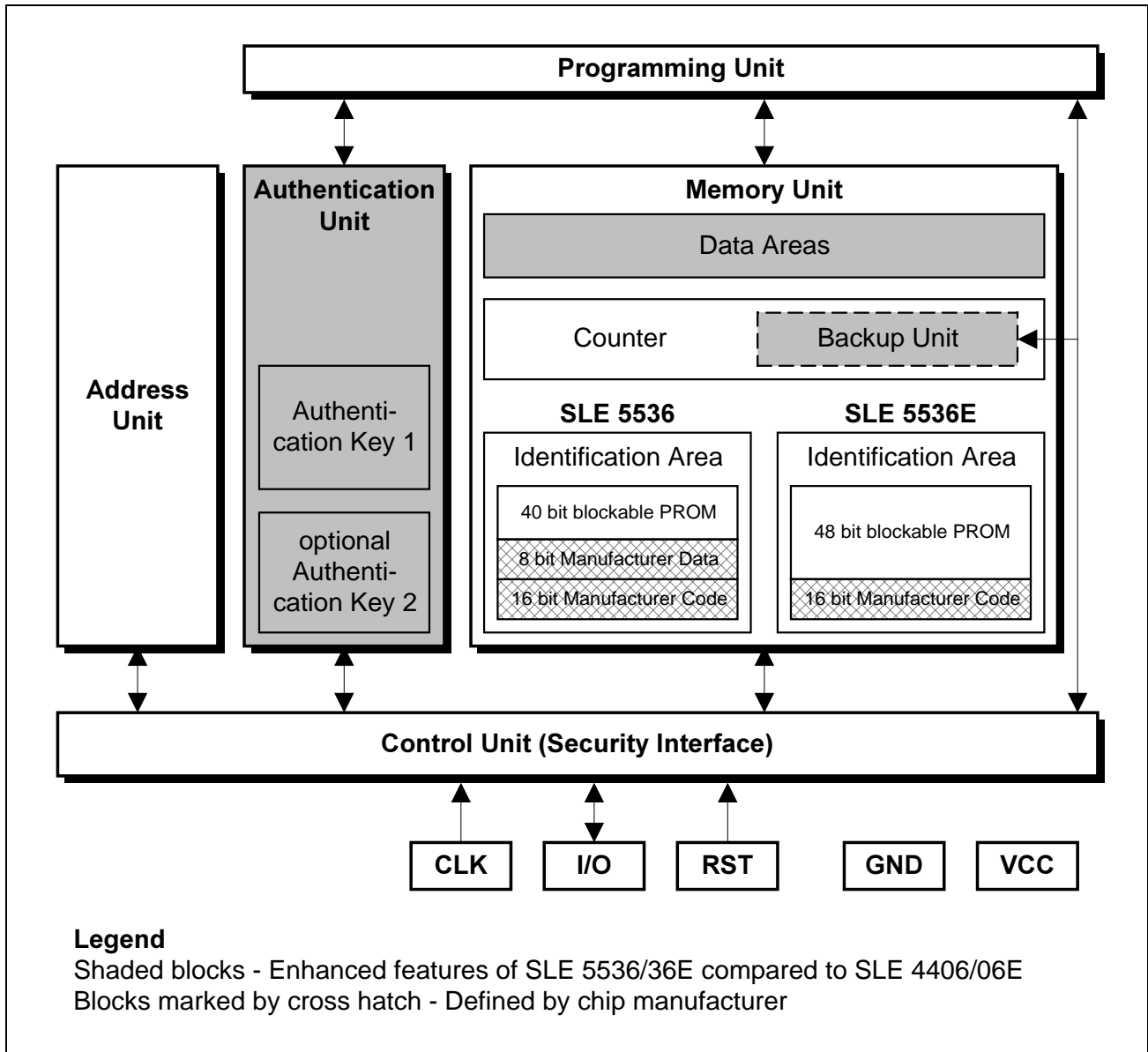


Figure 3 Block Diagram

- **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.