



Security & Chip Card ICs

SLE 5536/36E

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

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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Information

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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

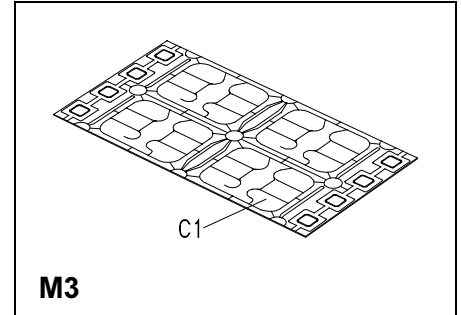
Counter tearing protection may be disabled by mask option
- **High security authentication unit**

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 ms
- ESD protection typical 4000 V
- Endurance minimum 10^5 write/erase cycles / bit¹⁾
- Data retention for minimum of 10 years¹⁾
- 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

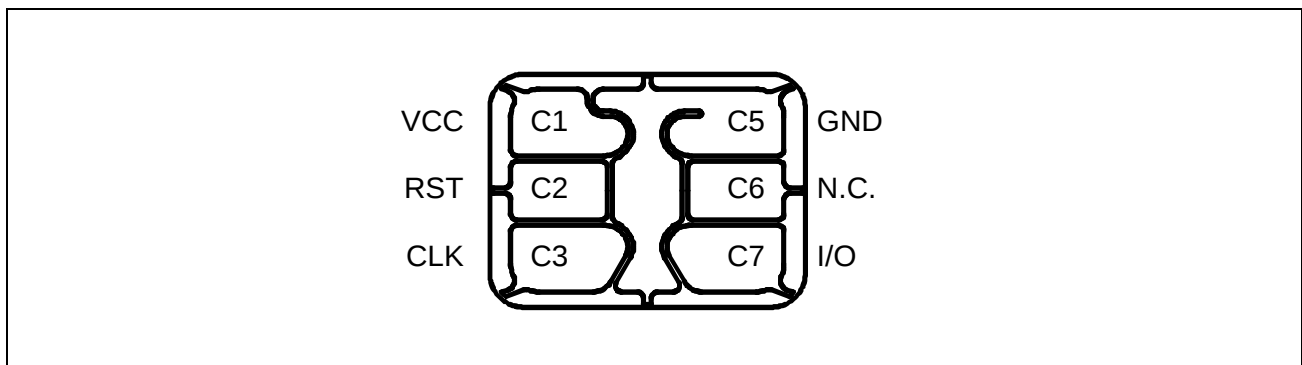


Figure 1 Pin Configuration Wire-bonded Module (top view)

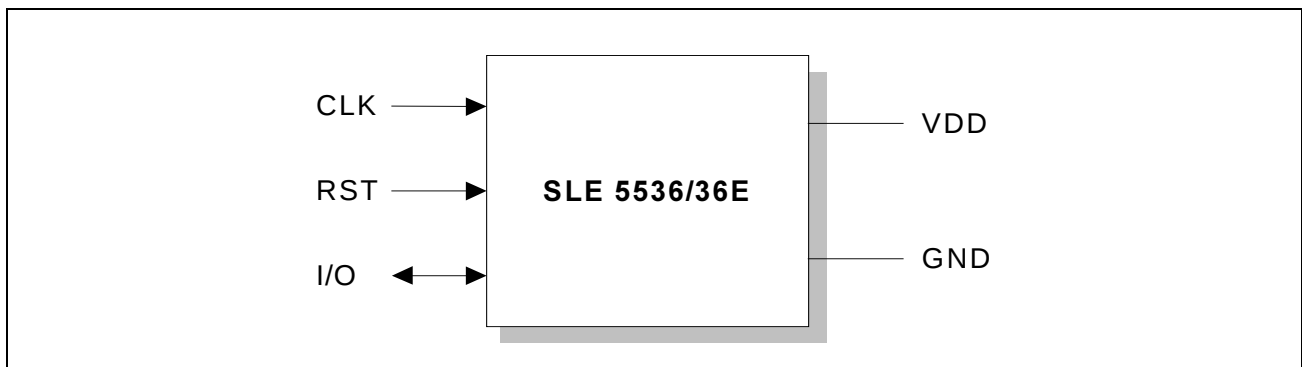


Figure 2 Pad Configuration Die

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.

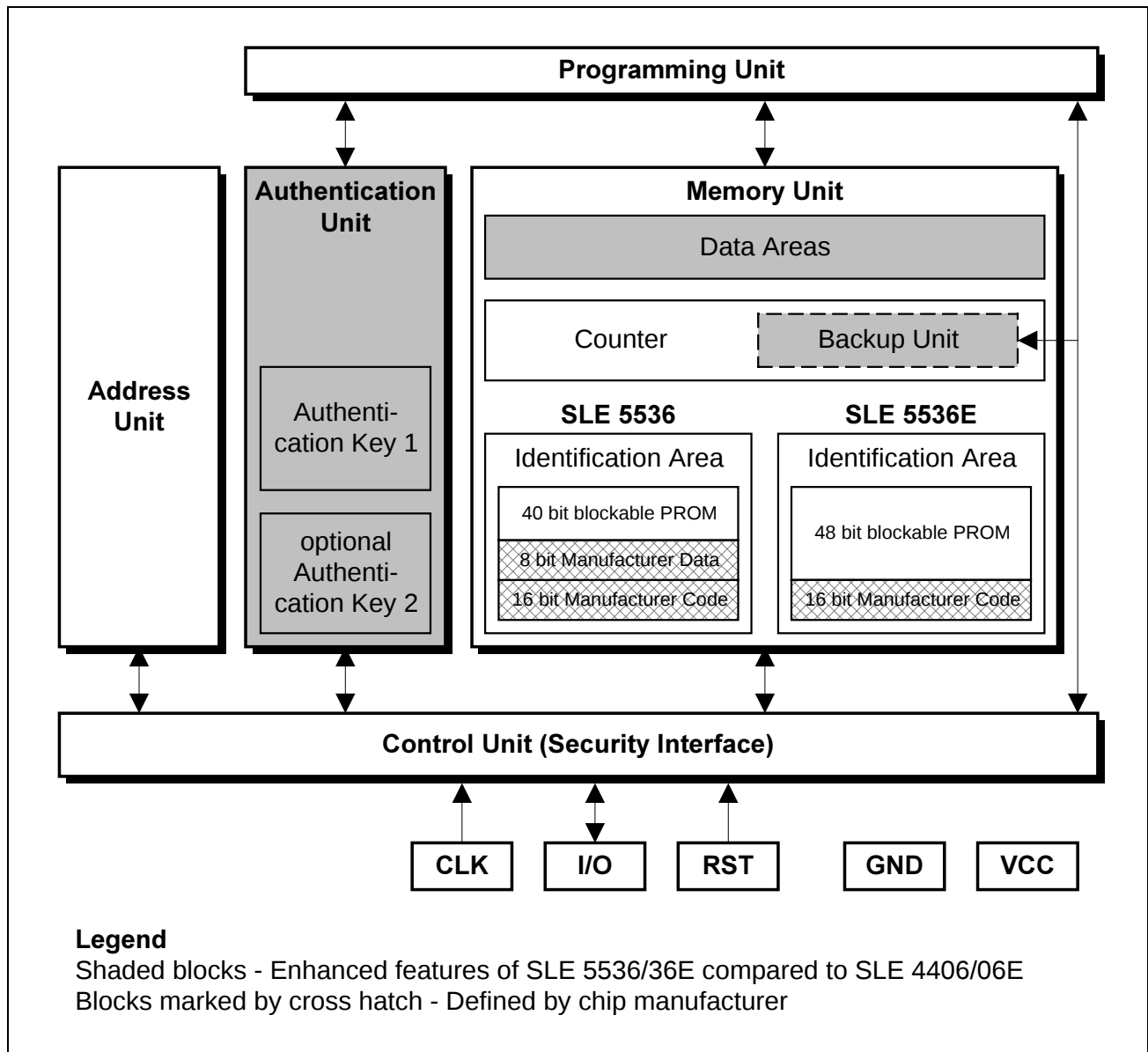


Figure 3 Block Diagram

- **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.