Chip Card & Security
SLE 4406SP
SLE 4406SPE

Intelligent 112–Bit EEPROM Counter for > 20000 Units with Security Logic
Intelligent 112–Bit EEPROM Counter for > 20000 Units with Security Logic

Features

- **100% functional compatibility to 4406S/06SE**
- **112 bit EEPROM and 16 bit ROM**
  - 104 bit user memory fully compatible with SLE 4406/06E
    - 64 bit Identification Area 1 consisting of
      - 16 bit Manufacturer code
      - SLE 4406SP:
        - 8 bit Manufacturer data, card issuer dependent
        - 40 bit for personalization data of card issuer
      - SLE 4406SPE:
        - 48 bit for personalization data of card issuer
    - 40 bit Counter Area including 1 bit for personalization (PROM/EEPROM)
    - 24 bit additional memory for advanced features configurable during personalization
      - either 24 bit Identification Area 2 for personalization data of card issuer
      - or 24 bit Data Area for free user access
- **Counter with up to 33352 count units**
  - Five stage abacus counter
  - Due to testing purposes a maximum of 21064 count units is guaranteed
- **Transport Code protection for delivery**
- **Contact configuration and Answer-to-Reset (synchronous transmission) in accordance to standard ISO/IEC 7816**
- **Sophisticated electrical characteristics**
  - Ambient temperature $T_A$ –40 … +80°C for chip
  - Supply voltage 5 V ± 10 %
  - Supply current < 1 mA
  - EEPROM programming time 5 ms
  - ESD protection minimum 2,000 V, typical 4,000 V
  - Endurance minimum 100,000 write/erase cycles / bit\(^1\)
  - Data retention for minimum of 30 years\(^1\)
- **Advanced 1.2 μm CMOS-technology optimised for security layout**
  - EEPROM-cells protected by shield
  - Secure wiring for all security relevant signals
  - Shielding of deeper layers via metal
  - Sensory and logical security functions
  - No isolation on backside necessary

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\(^1\) Values are temperature dependent
**Table 1  Ordering Information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Package¹)</th>
<th>Remark</th>
<th>Access of 3rd byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLE 4406SP C</td>
<td>Die (on Wafer)</td>
<td>unsawn</td>
<td>Data of 3rd byte are programmed by Infineon exclusively</td>
</tr>
<tr>
<td>SLE 4406SP D</td>
<td>Die (on Wafer)</td>
<td>sawn</td>
<td>Data of 3rd byte are programmed by the card manufacturer at personalisation</td>
</tr>
<tr>
<td>SLE 4406SP M3</td>
<td>T-M3.2-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLE 4406SP MFC3</td>
<td>S-MFC3.1-6-1</td>
<td>FCoS™ ²)</td>
<td></td>
</tr>
<tr>
<td>SLE 4406SPE C</td>
<td>Die (on Wafer)</td>
<td>unsawn</td>
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<td></td>
</tr>
</tbody>
</table>

**Pin Description**

Figure 1  Pin Configuration Wire-bonded Module M3.2 (top view)

Figure 2  Pin Configuration Flip Chip Module MFC3.1 (top view)

¹) Available as a Flip Chip Module (MFC3), wire-bonded module (M3) for embedding in plastic cards or as a die on unsawn (C) / sawn wafer (D) for customer packaging

²) FCoS™ Flip Chip on Substrate
Table 2  Pin Definitions and Functions

<table>
<thead>
<tr>
<th>Card Contact</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>VCC</td>
<td>Supply voltage</td>
</tr>
<tr>
<td>C2</td>
<td>RST</td>
<td>Control input (Reset Signal)</td>
</tr>
<tr>
<td>C3</td>
<td>CLK</td>
<td>Clock input</td>
</tr>
<tr>
<td>C5</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>C6</td>
<td>N.C.</td>
<td>Not connected</td>
</tr>
<tr>
<td>C7</td>
<td>I/O</td>
<td>Bi-directional data line (open drain)</td>
</tr>
</tbody>
</table>
General Description
SLE 4406SP/06SPE is designed for applications in prepaid telephone cards. The chip consists of an EEPROM memory of 112 bit, a ROM of 16 bits and a control/security unit.

Figure 4  Block Diagram

- **Memory Unit**
  Counter, Identification Data (e.g. serial number, expiry date) and Data Area.

- **Address Unit**
  Setting of the address counter is synchronously with the CLK.

- **Programming Unit**
  The programming voltage for the EEPROM/PROM is generated internally.

- **Security Interface**
  Ensures a minimum and a maximum frequency and proper logical voltage levels.