



Secure Mobile Solutions

SLE 66R35

Intelligent 1 Kbyte Memory Chip
with Interface for Contactless Transmission
according to the MIFARE[®]-System

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|---|--|-----------------------------|
| SLE 66R35 Short Product Information | | Ref.: SPI_SLE66R35_0803.doc |
| Revision History: Current Version 2003-08-07 | | |
| Previous Releases: | | |
| Page | Subjects (changes since last revision) | |
| | | |

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To our valued customers

We constantly strive to improve the quality of all our products and documentation. We have spent an exceptional amount of time to ensure that this document is correct. However, we realise that we may have missed a few things. If you find any information that is missing or appears in error, please use the contact section above to inform us. We appreciate your assistance in making this a better document.

Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

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).

Warnings

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Intelligent 1 Kbyte Memory Chip with Interface for Contactless Transmission, Security Logic and Anticollision according to the MIFARE[®]-System ¹⁾

Features

1 Kbyte EEPROM

- Organised in 16 sectors with 4 blocks of 16 byte each
- User definable access condition for each memory block
- Unique chip identification number

Contactless Mifare[®] Interface

- Read and write distance up to 10 cm and more (influenced by external circuitry i.e. reader-antenna configuration)
- Physical Interface and Anticollision complying to ISO/IEC 14443, part 2-3
 - Contactless transmission of data and supply energy
 - Anticollision logic: Several cards may be operated in the field simultaneously
 - Operating frequency 13.56 MHz
 - Data rate transfer 106 Kbit/s
- Short transaction times: Typical ticketing transaction < 100 ms (including backup); transaction possible with moving card

Security Features

- Mutual three pass authentication between card and reader
- Data encryption for RF channel
- Data integrity supported by several mechanisms: anticollision, 16 bit CRC, parity check, bit count checking and channel monitoring
- Suited for multifunctional applications by individual key sets for each EEPROM sector
- Access protection to EEPROM by transport key on chip delivery

Sophisticated electrical characteristics

- EEPROM programming time 5 ms
- Endurance minimum 100 000 write/erase cycles / bit²⁾
- Data retention for minimum of 10 years²⁾
- ESD protection typical 6 kV
- Ambient temperature – 25 ... +70°C

¹⁾ Mifare[®] is a registered trademark of Philips Electronics N.V.

²⁾ Values are temperature dependent

1 Ordering and Packaging information

Table 1 Ordering Information

| Type | Package ¹⁾ | Ordering Code |
|-----------|-----------------------|---------------|
| SLE 66R35 | Die (on Wafer) | on request |
| SLE 66R35 | P-MCC2-2-1 | on request |
| SLE 66R35 | P-MCC8-2-1 | on request |

Pin Description

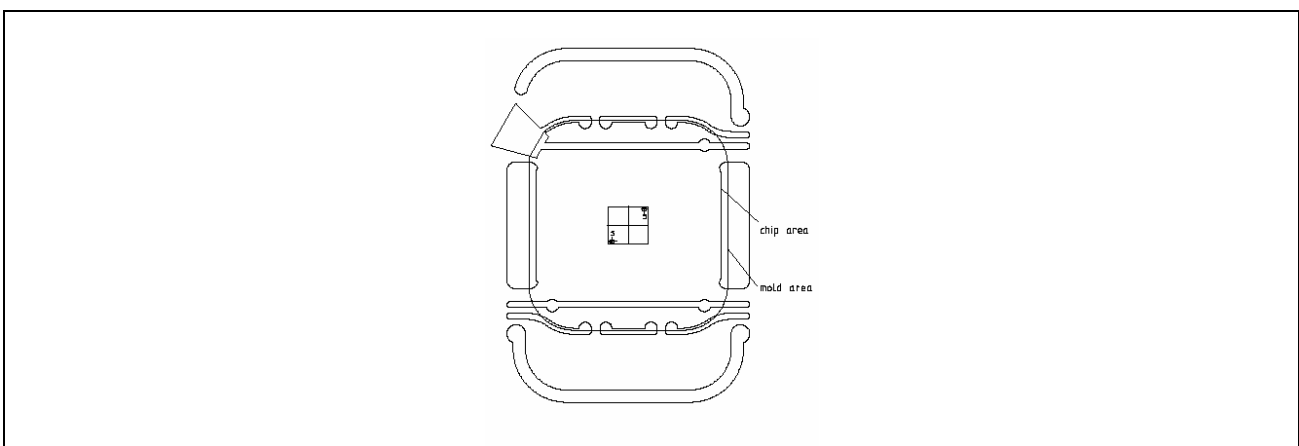


Figure 1 Module Contactless Card - MCC8 in Top View

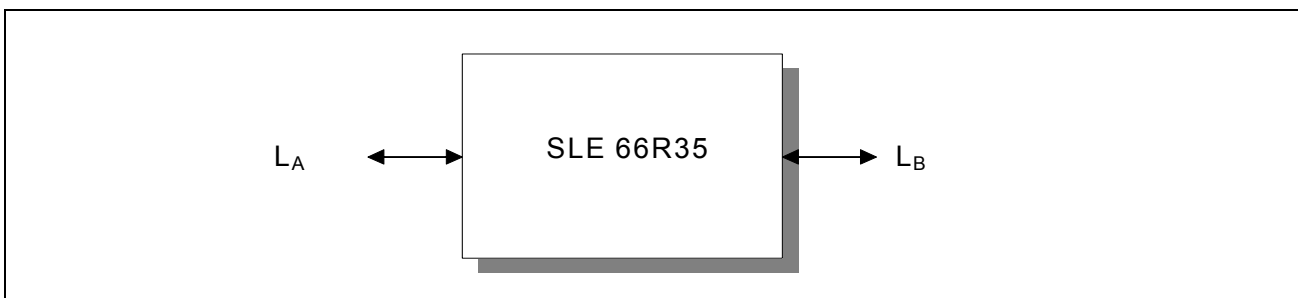


Figure 2 Pad Configuration Die

Table 2 Pin Definitions and Functions

| Card Contact | Function |
|----------------|--------------------|
| L _A | Antenna Connection |
| L _B | Antenna Connection |

¹⁾ Available as a Module Contactless Card (MCC) for embedding in plastic cards or as a die (C) for customer packaging

2 Mifare® System Overview

SLE 66R35 is designed to operate in the Mifare® system, a contactless proximity smart card system compliant to the ISO/IEC 14443, part 2-3. The system consists of a smart card on the one hand and a card reader together with an antenna on the other hand.

Contactless Energy and Data Transfer

In the Mifare® system the operating distance between card and reader antenna is up to 10 cm and more (influenced by external circuitry i.e. reader-antenna configuration). The card's antenna consists of a simple coil with a few turns embedded in plastic. Mifare® cards are passive and work without battery. The high speed RF communication interface allows transmitting data with 106 Kbit/s.

Mifare® - The User-Friendly Contactless System

The Mifare® system is designed for optimal user-friendliness. The high data transmission rate permits short transaction times. For example, a ticketing transaction can be handled in less than 100 ms so that the Mifare® card user does not need to stop at the reader target (antenna). The Mifare® card may also remain in the wallet of the user even if there are coins in it.

An intelligent anticollision function allows to operate more than one card in the field simultaneously. The anticollision algorithm selects each card individually and ensures that the execution of a transaction with a selected card is performed correctly without data corruption resulting from other cards in the field.

Multi-Application Functionality

The Mifare® system is especially suited for the use in payment systems as in ticketing systems, e.g. public transport applications. Both kinds of applications can be performed with the same card. Hierarchical key management is supported i.e. two different keys for each memory sector allow authentication.

High System Security

In the Mifare® system design, special emphasis has been placed on security against fraud. An access to the card memory is only possible after a three pass authentication. The serial number is unique for each card and can never be changed. Each data transmission is enciphered. Configurable access conditions protected by secret keys for memory operations as read or write protect from misuse.

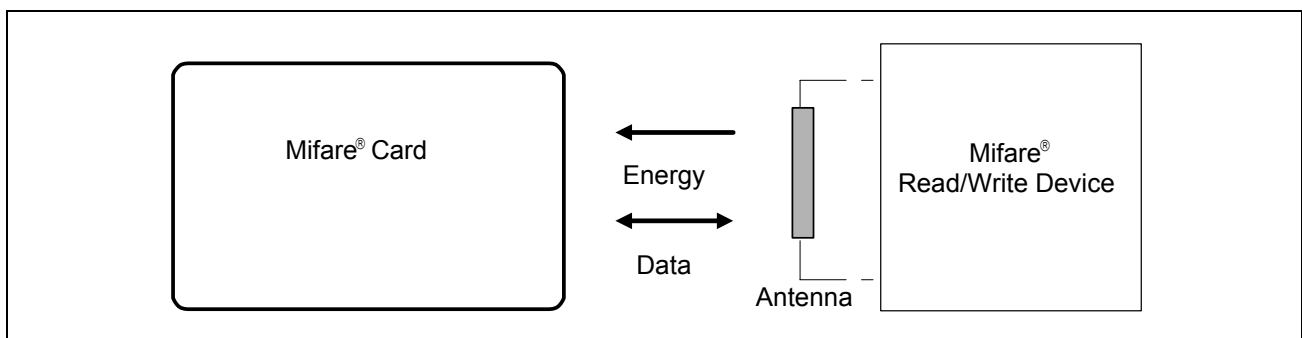


Figure 3 Mifare® System Overview

3 Circuit Description

SLE 66R35 consists of an EEPROM memory of 1 Kbyte organised in 16 sector with 4 blocks each containing 16 bytes, an analog interface for contactless energy and data transmission and a control unit. The power supply and data are transferred to SLE 66R35 via an antenna, which consists of a coil with a few turns directly connected to the chip. No further external components are necessary. The circuit is designed to communicate with a card-reader at an operating distance up to 10 cm (or more) depending on the reader-antenna configuration.

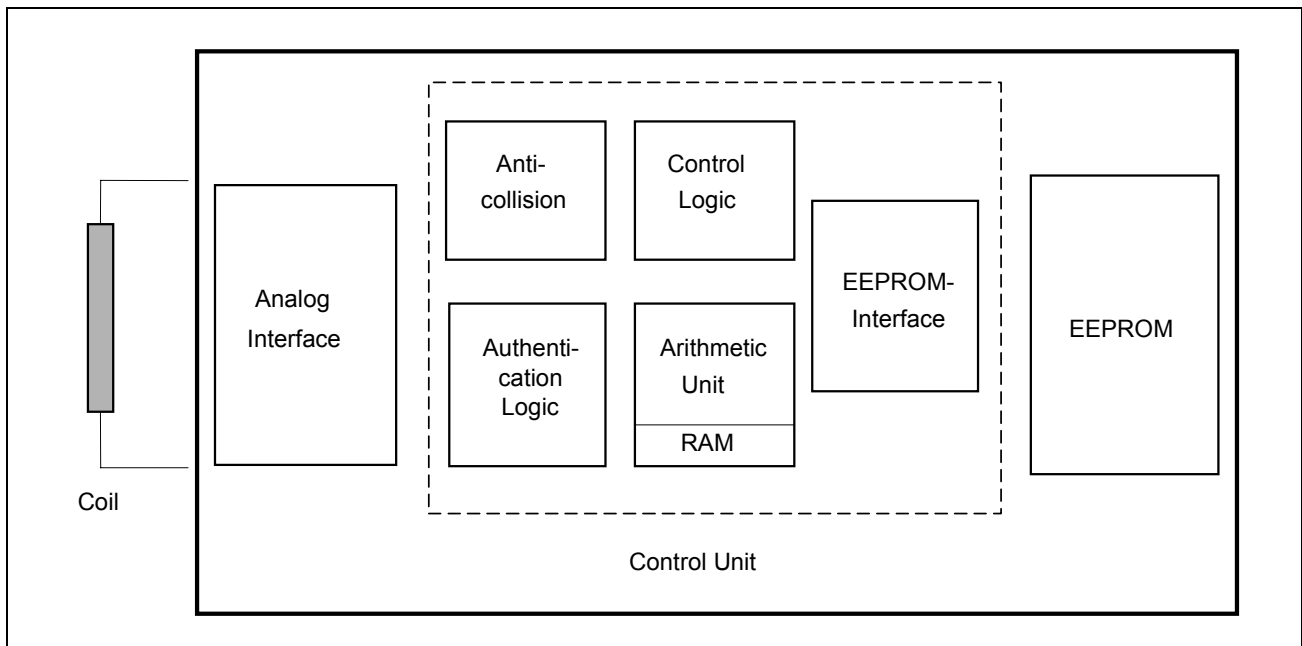


Figure 4 Block Diagram

- **Analog Interface**
 - Modulator / Demodulator circuit
 - Rectifier circuit
 - Clock Recovery circuit
 - Power on Reset circuit
 - Voltage Regulator circuit
- **Anticollision**

Internal logic of SLE 66R35 ensures the recognition of several cards in the field, which may be selected and operated in sequence.
- **Authentication Logic**

Only after the authentication procedure with specific key, correct execution of any memory operation is permitted.
- **Control Logic**

Access to a block is defined by the associated access conditions of a block that are programmed individually for each block in a sector.
- **Arithmetic Unit / RAM**

Arithmetic Capability: Increase and decrease of values stored in a special redundant format.
- **EEPROM: 1 Kbyte organized in 16 sectors with 4 blocks by 16 bytes each. Last block of each sector is called "Sector Trailer" and used for a pair of secret keys and programmable access conditions for each block.**