my-d™ move
my-d™ move NFC

SLE 66R01P
SLE 66R01PN

Intelligent 1216 bit EEPROM with
Contactless Interface compliant to
ISO/IEC 14443-3 Type A and support of
NFC Forum™ Type 2 Tag Operation

Short Product Information

2011-11-24

Chip Card & Security

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my-d™ move / my-d™ move NFC - SLE 66R01P / SLE 66R01PN Short Product Information
The information in this document is subject to change without notice.

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Previous Release: Preliminary 2011-11-18

Page	Subjects (major changes since last revision)
All	Editorial changes; removed "Preliminary" status

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Features

**Intelligent 1216 bit EEPROM with Contactless Interface compliant to
ISO/IEC 14443-3 Type A and support of NFC Forum™ Type 2 Tag Operation**

Contactless Interface

- Physical Interface and Anticollision compliant to ISO/IEC 14443-3 Type A
  – Operation frequency 13.56 MHz
  – Data rate 106 kbit/s in both direction
  – Contactless transmission of data and supply energy
  – Anticollision logic: several cards may be operated in the field simultaneously
- Unique IDentification number (7-byte double-size UID) according to ISO/IEC 14443-3 Type A
- Read and Write Distance up to 10 cm and more (influenced by external circuitry i.e. reader and inlay design)

152 byte EEPROM

- Organized in 38 blocks of 4 bytes each
- 128 bytes freely programmable User Memory
- 24 bytes of Service Area reserved for UID, Configuration, LOCK Bytes, OTP Block and Manufacturer Data
- Read and Write of 128 bytes of User Memory in less than 100 ms
- Programming time per block < 4 ms
- Endurance minimum 10,000 erase/write cycles[1]
- Data Retention minimum 5 years[1]

Privacy Features

- 32 bit of One Time Programmable (OTP) memory area
- Locking mechanism for each block
- Block Lock mechanism
- Optional 32 bit Password for Read/Write or Write access
- Optional Password Retry Counter
- Optional 16 bit Value Counter

Data Protection

- Data Integrity supported by 16 bit CRC, parity bit, command length check
- Anti-tearing mechanism for OTP, Password Retry Counter and Value Counter

NFC Forum™ Operation

- Compliant to NFC Forum™ Type 2 Tag Operation
- Support of Static and Dynamic Memory Structure according to NFC Forum™ Type 2 Tag Operation
- SLE 66R01PN: pre-configured NFC memory with empty NDEF message (INITIALIZED state, non-reversible)
- SLE 66R01P: UNINITIALIZED state, may be configured to INITIALIZED state

Electrical Characteristics

- On-Chip capacitance 17 pF ± 5%
- ESD protection minimum 2 kV
- Ambient Temperature -25℃ … +70℃ (for the chip)

1) Values are temperature dependent

1 Ordering and packaging information

Table 1   Ordering information

Type	Package	Total Memory / User Memory[1]	Ordering code
SLE 66R01P C	wafer sawn / unsawn		on request
SLE 66R01P NB	NiAu Bumped (sawn wafer)	152 / 128 bytes	SP000911428
SLE 66R01PN C	wafer sawn / unsawn		on request
SLE 66R01PN NB	NiAu Bumped (sawn wafer)		SP000953914

1) Total memory size includes the service area whereas user memory size is freely programmable for user data.

For more ordering information about the form of delivery please contact your local Infineon sales office.

1.1 Pin description
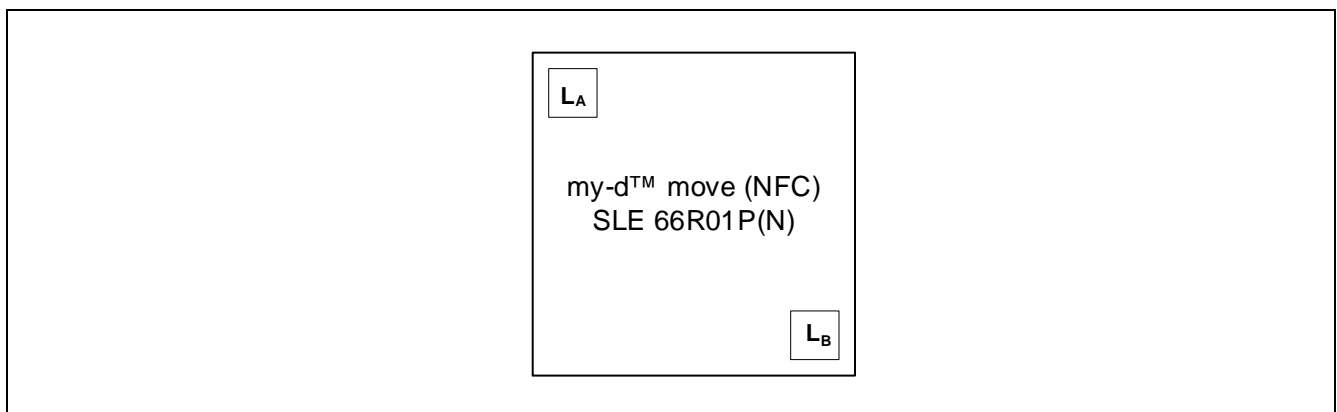
Figure 1   Pin configuration die

Table 2   Pin description and function

Symbol	Function
L_A	Antenna Connection
L_B	Antenna Connection

2.2 Application Segments

my-d™ products are optimized for personal and object identification. Please find in the following table some dedicated examples

Table 3   my-d™ family product overview

Product	Application
my-d™ move - SLE 66R01P	Public Transport, Smart Posters, NFC Device Pairing
my-d™ move NFC - SLE 66R01PN	Public Transport, Smart Posters, NFC Device Pairing, NFC INITIALIZED state
my-d™ move lean - SLE 66R01L	Public Transport, Smart Posters, NFC Device Pairing
my-d™ NFC - SLE 66RxxP	Smart Posters and Maps, NFC Device Pairing, Loyalty Schemes, Consumer Good Information, Healthcare Monitoring
my-d™ proximity 2 - SLE 66RxxS	Access Control, Entertainment, Public Transport, Customer Loyalty Schemes, Micro Payment
my-d™ proximity enhanced - SLE 55RxxE	Access Control, Gaming, Entertainment, Customer Loyalty Schemes
my-d™ light - SRF 55V01P	Libraries, Laundry, Factory Automation, Media Management, Event Ticketing, Leisure Park Access
my-d™ vicinity plain - SRF 55VxxP	Factory Automation, Healthcare, Ticketing, Access Control
my-d™ vicinity plain HC - SRF 55VxxP HC	Ticketing, Brand Protection, Loyalty Schemes, Ski passes
my-d™ vicinity secure - SRF 55VxxS	Ticketing, Brand protection, Loyalty Schemes, Access Control

3 Scope of my-d™ move / my-d™ move NFC

The SLE 66R01P and SLE 66R01PN are part of the Infineon my-d™ product family and support Infineon's transport and ticketing strategy and are designed to meet the requirements of NFC applications.

They are compliant to ISO/IEC 14443-3 Type A, to ISO/IEC 18092 and to NFC Forum™ Type 2 Tag Operation.

3.1 Circuit Description

The SLE 66R01P and SLE 66R01PN are made up of an EEPROM memory unit, an analog interface for contactless operation, a data transmission path and a control unit. The following diagram shows the main blocks of the SLE 66R01P and SLE 66R01PN.
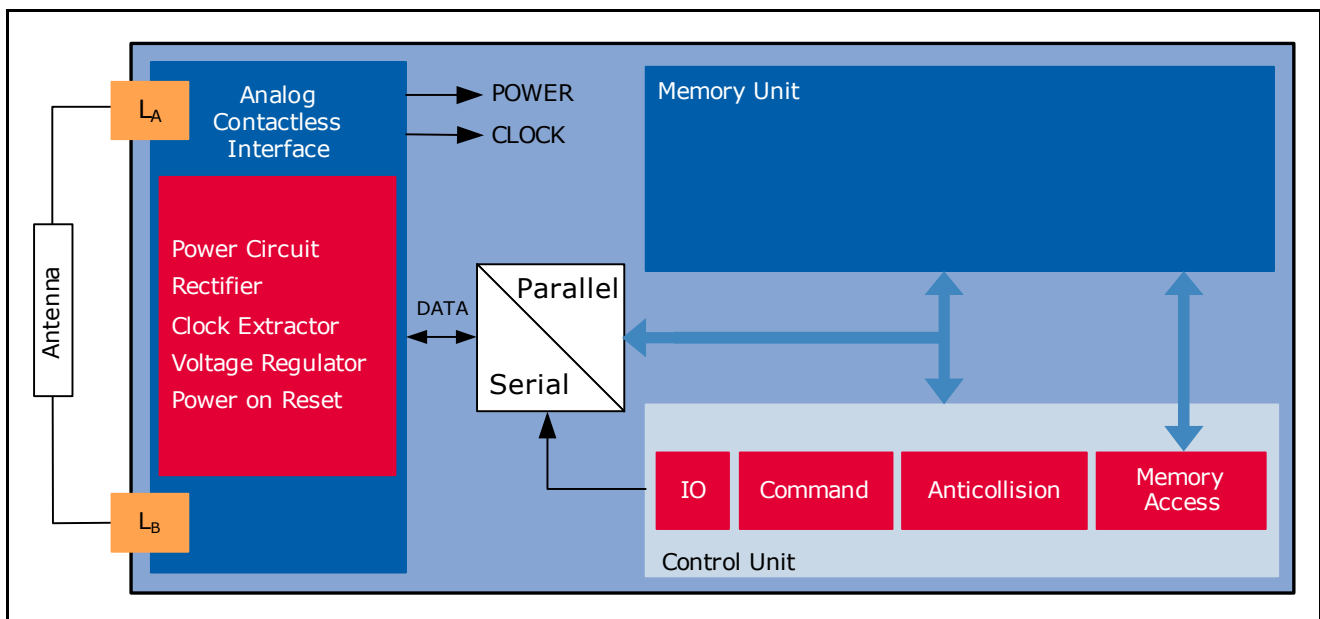

Figure 2 Block Diagram of the SLE 66R01P and SLE 66R01PN

The SLE 66R01P and SLE 66R01PN comprise the following three parts:

- **Analog Contactless Interface**
  – The Analog Contactless Interface contains the voltage rectifier, voltage regulator and system clock to supply the IC with appropriate power. Additionally the data stream is modulated and demodulated.
- **Memory Unit**
  – The Memory Unit consists of 38 blocks of 4 bytes each.
- **Control Unit**
  – The Control Unit decodes and executes all commands. Additionally the control unit is responsible for the correct anticollision flow.

3.2 Memory Principle

The total amount of addressable memory is 152 bytes organized in blocks of 4 bytes each.

The general structure comprises Service Areas as well as User Areas:

- 24 bytes of service and administration data (located in Service Area 1 and 2) reserved for
  - 7-byte double-size UID
  - configuration data
  - LOCKx bytes
  - OTP memory
  - Manufacturing Data
- 128 bytes of User memory (located in User Area 1 and 2) reserved for
  - User Data
  - Value Counter

Additionally the Password and Password Retry Counter are available and accessible via dedicated commands.
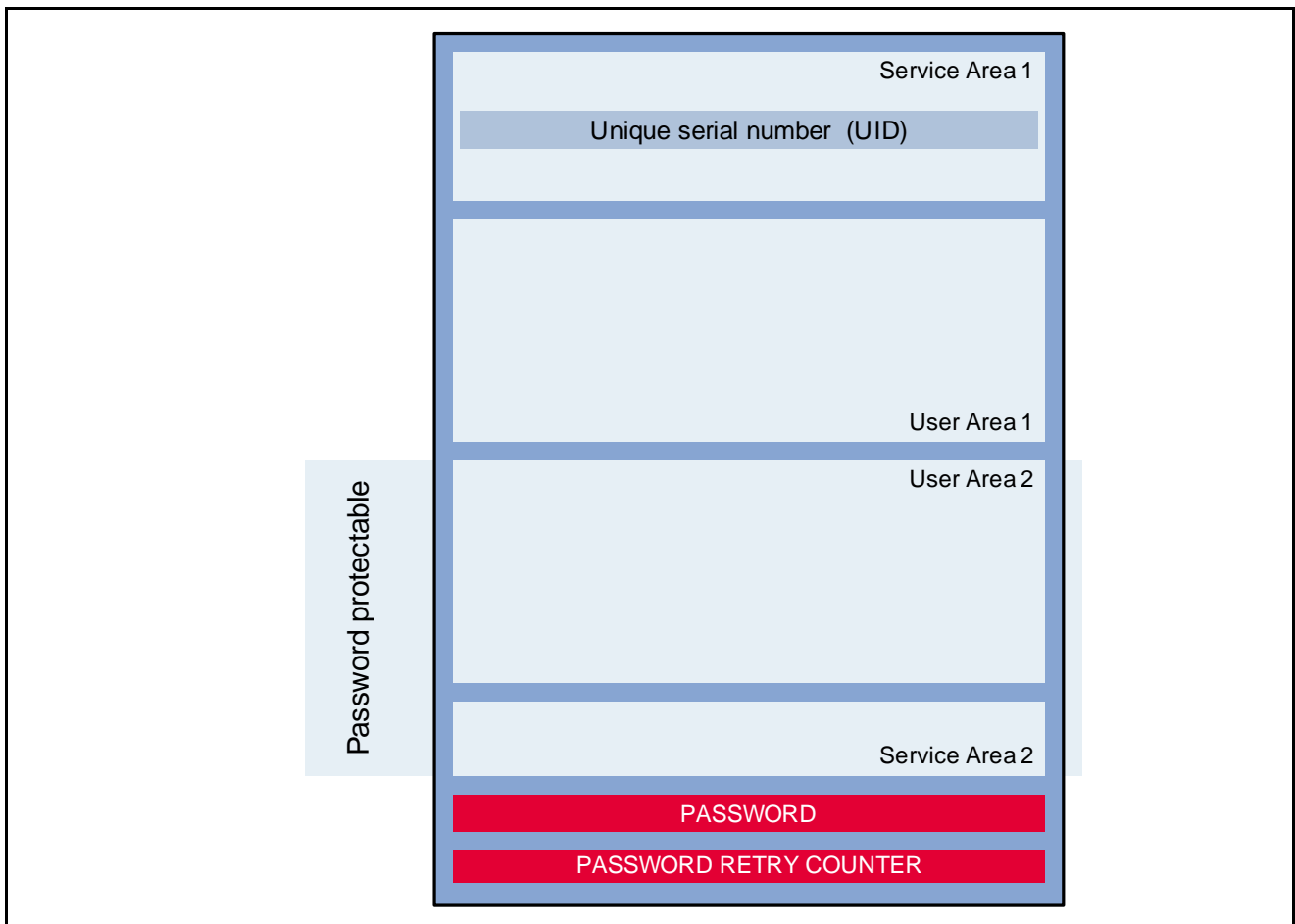

Figure 3   SLE 66R01P and SLE 66R01PN memory principle

3.2.1 Service Area 1

Service Area 1 contains

- the 7-byte UID which is programmed at manufacturing of the chip and cannot be changed
- CONFIG byte to enable the Password (incl. the Password Retry counter) and the Value Counter functionality
- LOCK0, LOCK1 bytes to enable an irreversible write-protection for the blocks located in User Area 1
- 32 bits of the One-Time-Programmable (OTP) memory block can irreversibly be programmed from 0_B to 1_B

3.2.2 User Area 1

48 bytes (12 blocks, 4 bytes each) of memory for user data.

3.2.3 User Area 2

User Area 2 contains

- 80 bytes (20 blocks, 4 bytes each) of user memory for user data. These memory blocks can be used to store user data. This portion of the memory may be protected with a 32 bit password.
- a 16-bit Value Counter may be activated providing a mechanism to store some value (points, trips, ...) on the my-d™ move and my-d™ move NFC chip.

3.2.4 Service Area 2

Service Area 2 contains

- lock bytes LOCK2 to LOCK5 to enable an irreversible write-protection for the blocks loacted in User Area 2
- Manufacturing Data (programmed during manufacturing of the chip) which cannot be changed

3.3 Memory Principle for NFC Forum™ Type 2 Tag

The memory organization is configurable according to the NFC Forum™ Type 2 Tag Operation specification. Static or dynamic memory structures are supported.

Figure 4 illustrates the principle of the SLE 66R01P and SLE 66R01PN as a NFC Forum™ Type 2 Tag compatible chip. The memory can be accessed with NFC Forum™ Type 2 Tag commands.
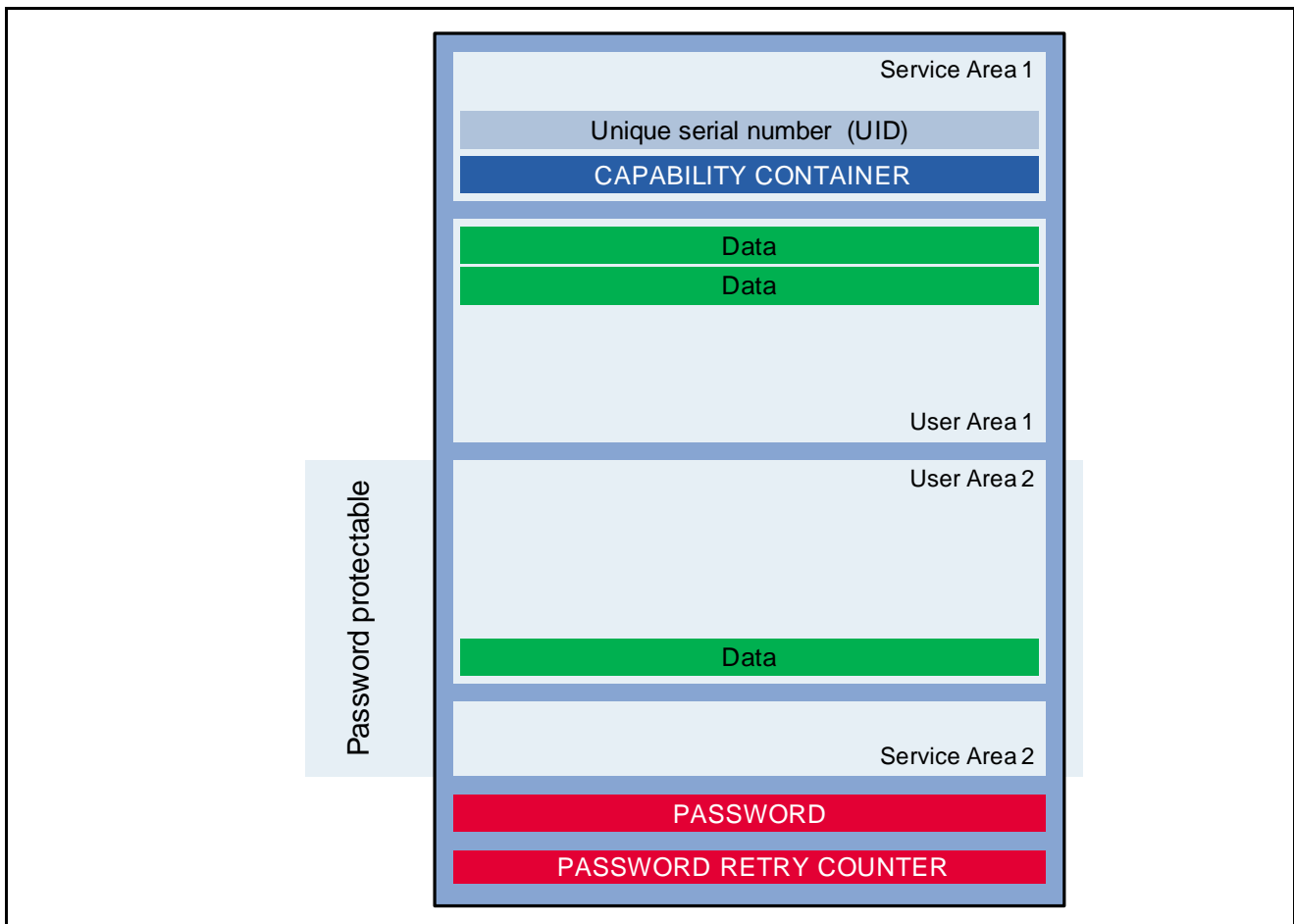
Figure 4   SLE 66R01P and SLE 66R01PN NFC Forum™ Type 2 Tag memory structure

Based on SLE 66R01P the SLE 66R01PN already contains a pre-configuration of the NFC memory indicating the INITIALIZED state according to the definition of the NFC Forum™ Type 2 Tag life cycle. With this pre-configuration the my-d™ move NFC can be immediately used in NFC infrastructures.

For details regarding the NFC initialization of my-d™ move and my-d™ move NFC please refer the the Application Note "How to operate my-d™ move and my-d™ move NFC devices in NFC Forum™ Type 2 Tag infrastructures" and the Data Book available at Chip Card & Security security.chipcard.ics@infineon.com.

Attention: The pre-configuration of SLE 66R01PN is nonreversible and the my-d™ move NFC cannot be overwritten and used as plain, standard my-d™ move anymore.

3.4   System Overview

The system consists of a host system, one or more SLE 66R01P / SLE 66R01PN tags or other ISO/IEC 14443-3 Type A compliant cards and an ISO/IEC 14443-3 Type A compatible contactless reader.

Alternatively, since the SLE 66R01P and SLE 66R01PN can be used in NFC Forum™ Type 2 Tag memory structures, a NFC Forum™ device in card reader/writer mode can be used to operate the chip.
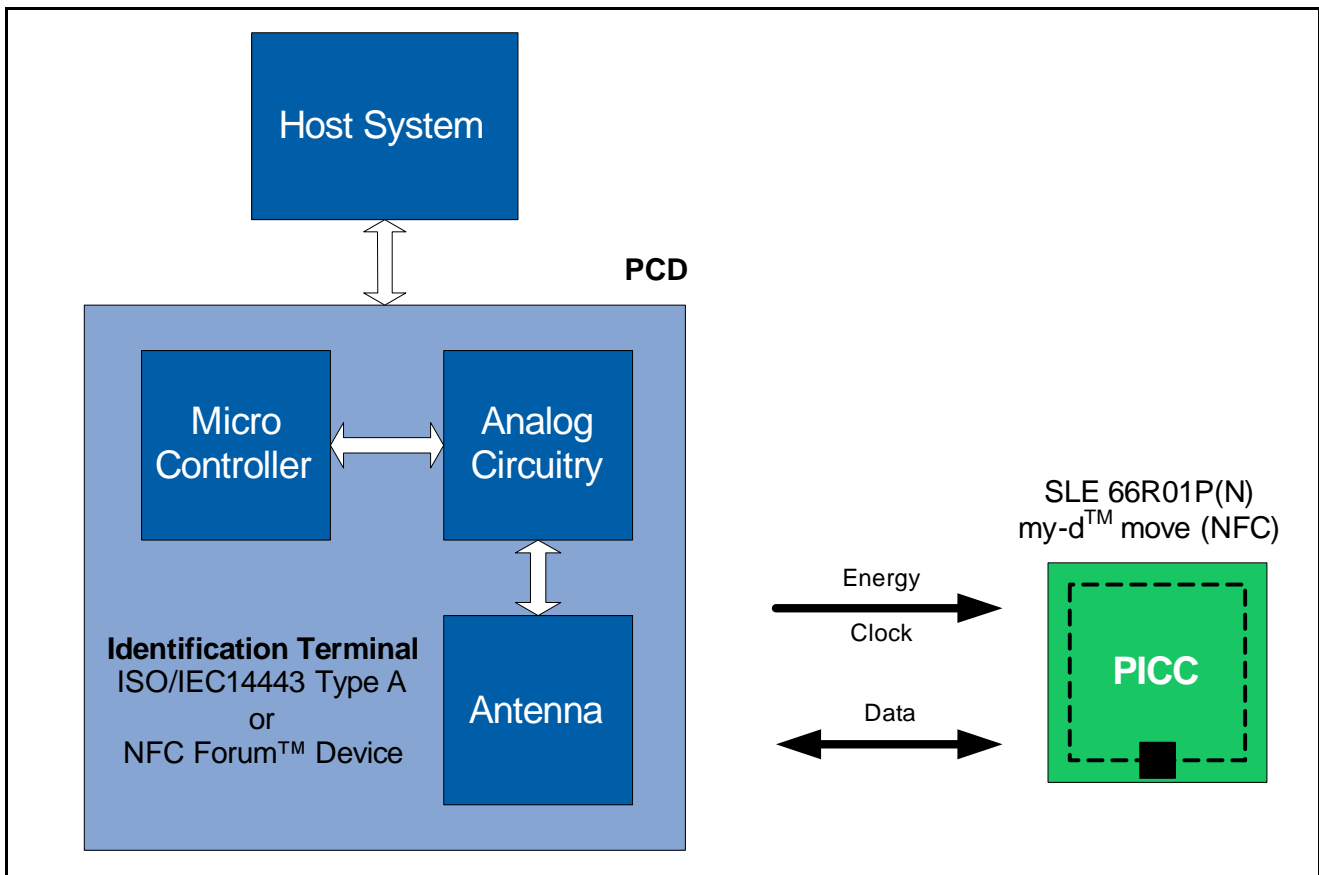

Figure 5   SLE 66R01P and SLE 66R01PN Contactless System Overview

3.5 UID Coding

To identify a SLE 66R01P and SLE 66R01PN chip the manufacturer code and a chip family identifier are coded into the UID as described in the **Table 4**. The chip family identifier can be used to determine the basic command set for the chip.
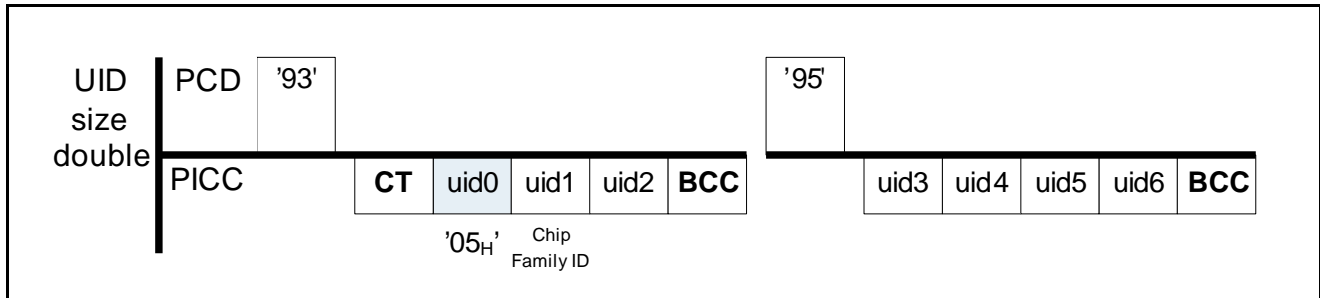

Figure 6   SLE 66R01P and SLE 66R01PN double-size UID

Table 4   UID Coding

UID Field	Value	Description
uid0	05_H	IC Manufacturer Code according to ISO/IEC 7816-6
uid1	$3x_H$	Chip Family Identifier Higher Nibble: 0011_B: my-d™ move and my-d™ move NFC Lower Nibble: part of the UID number

3.6 Supported Standards

the SLE 66R01P and SLE 66R01PN support the following standards:

* ISO/IEC 14443 Type A (Parts 1, 2 and 3)
  tested according to ISO/IEC 10373-6 (PICC Test & Validation)
* ISO/IEC 14443-3 Type A
* NFC Forum™ Type 2 Tag Operation

3.7 Command Set

The SLE 66R01P and SLE 66R01PN is compliant to the ISO/IEC 14443-3 Type A standard.

A set of standard ISO/IEC 14443-3 Type A commands is implemented to operate the chip.

Additionally NFC Forum™ Type 2 Tag commands and a my-d™ move and my-d™ move NFC specific command set is implemented. This facilitates the access to the on-chip integrated memory and supports the execution of password and counter functionality.

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