my-d™ NFC

SLE 66RxxP

Intelligent EEPROM with Contactless Interface compliant to ISO∕IEC 14443 Type A and support of NFC Forum™ Type 2 Tag Operation

Chip Card & Security

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Never stop thinking

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my-d™ NFC - SLE 66RxxP Short Product Information

Revision History: Current Version 2008-12-11

Previous Release: 2008-07-17

Page	Subjects (major changes since last revision)
all	editorial changes

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my-d™

Other Trademarks

NFC Forum™ of Near Field Communication Forum

Features

Intelligent EEPROM with
Contactless Interface compliant to ISO/IEC 14443 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 up to 848 kbit/s from PICC to PCD, 106 kbit/s from PCD to PICC
  – Contactless transmission of data and supply energy
  – Anticollision logic: Several cards may be operated in the field simultaneously
- Read / write distance up to 10 cm (influenced by external circuitry i.e. reader and inlay design)

Up to 5120 bytes EEPROM

- Organized in up to 512 pages
- Each page organized in 8 bytes for data storage + 2 bytes for administrative purposes
- Up to 509 pages of user memory (user page size 8 byte)
- EEPROM Error Correction Unit (ECC)
- Unique IDentification number (UID)
- EEPROM programming time per page < 4 ms
- EEPROM endurance minimum 100,000 erase/write cycles[1]
- Data retention minimum 10 years[1]

NFC Tag Operation

- Support of NFC Forum™ - Type 2 Tag Operation
- Up to 2048 bytes available as dynamic memory structure
- Predefined memory size for NFC Forum™ - Type 2 Tag Operation

Value Counters: up to 65536 (value range from 0 to 2^{16}-1)

- Each page in the User Area is configurable as a Value Counter
- Support of Anti-Tearing

Electrical characteristics

- ESD protection minimum 2 kV
- Ambient temperature -25°C ... +70°C (for the chip)

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1) Values are temperature dependent

1 Ordering and packaging information

Table 1-1   Ordering information

Type	Package[1]	Total/User Memory[2]	Total/User Pages[2]	Ordering code
SLE 66R04P C	Die (sawn/unsawn wafer)	770/592 bytes (no NFC Memory)	77/74	on request
SLE 66R04P NB	NiAu Bumped (sawn wafer)			on request
SLE 66R04P MCC2	P-MCC2-2-1			on request
SLE 66R04P MCC8	P-MCC8-2-3			on request
SLE 66R16P C	Die (sawn/unsawn wafer)	2560/2024 bytes (1024 bytes NFC Memory)	256/253	on request
SLE 66R16P NB	NiAu Bumped (sawn wafer)			on request
SLE 66R16P MCC2	P-MCC2-2-1			on request
SLE 66R16P MCC8	P-MCC8-2-3			on request
SLE 66R32P C	Die (sawn/unsawn wafer)	5120/4072 bytes (2048 bytes NFC Memory)	512/509	on request
SLE 66R32P NB	NiAu Bumped (sawn wafer)			on request
SLE 66R32P MCC2	P-MCC2-2-1			on request
SLE 66R32P MCC8	P-MCC8-2-3			on request

1) MCC is short for Module Contactless Card
2) Total memory size and page count includes the service area and the 2 administrative bytes per page whereas user memory size and page count is freely programmable for user data.

For more ordering information (wafer thickness and height of NiAu-Bump) please contact your local Infineon sales office.

Pin description
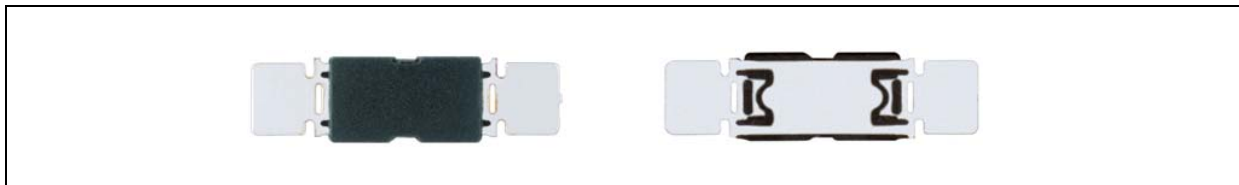
Figure 1-1   Pin configuration Module Contactless Card - MCC2 (top / bottom view)

Figure 1-2   Pin configuration Module Contactless Card - MCC8 (top / bottom view)
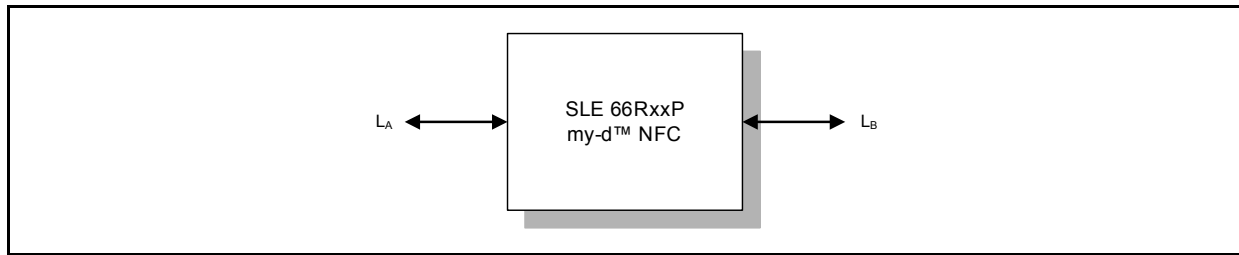
Figure 1-3   Pad configuration die

Table 1-2   Pin description and function

Symbol	Function
L_A	Antenna connection
L_B	Antenna connection

2 my-d™ product family

The my-d™ products are designed to meet increased demands for basic security and design flexibility. The family of contactless memory my-d™ supplies the user with different memory sizes and incorporates security features to enable considerable flexibility in the application design.

The functional architecture, meaning the memory organization and authentication of my-d™ products is the same for both my-d™ proximity (ISO/IEC 14443) and my-d™ vicinity (ISO/IEC 18000-3 mode 1 or ISO/IEC 15693). This eases the system design and allows simple adaptation between applications.

All my-d™ products are available in plain mode with open memory access and in secure mode with memory access controlled by authentication procedures.

Flexible controls within the my-d™ ICs start with plain mode operation and individual page locking; for more complex applications various settings in secure mode can be set for multi user / multi application configurations.

In secure mode a cryptographic algorithm based on a 64-bit key is available. Mutual authentication, message authentication codes (MAC) and customized access conditions protect the memory against unauthorized access. Configurable value counters featuring anti-tearing functionality are suitable for value token applications, such as limited use transportation tickets.

Architectural interoperability of all my-d™ products enables an easy migration from simple to more demanding applications.

In addition, the my-d™ light (ISO/IEC 18000-3 mode 1 or ISO/IEC 15693) is part of the my-d™ family. Its optimized command set and memory expands the range of applications to cost sensitive segments.

2.1 Application Segments

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

Table 1-3   my-d™ products overview

Product	Application
my-d™ proximity 2 – SLE 66RxxS	Access Control, Entertainment, Public Transport, Customer Loyalty Schemes, Micro Payment
my-d™ NFC – SLE 66RxxP	Smart Poster, Public Transport, Event Ticketing, Access Control, Consumer Good information
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

Table 1-3   my-d™ products overview

| Product	Application
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 my-d™ NFC - SLE 66RxxP

The my-d™ NFC products are based on the ISO∕IEC 14443-3 Type A standard for contactless proximity cards. The my-d™ NFC family additionally features my-d™ commands and NFC Forum™ Type 2 Tag commands. The products are targeting access and event ticketing, amusement and entertainment in particular high memory applications such as 'Smart Posters'. They are fulfilling the requirements of state of the art contactless memory ICs with respect to compatibility to the ISO∕IEC 14443-3 standard part 1-3, operating range and command as well as feature set. Furthermore, the SLE 66RxxP family can be operated as NFC Forum™ - Type 2 Tag.

3.1 Circuit Description

The my-d™ NFC is made up of an EEPROM memory unit, an analog interface for contactless energy and data transmission and a control unit.

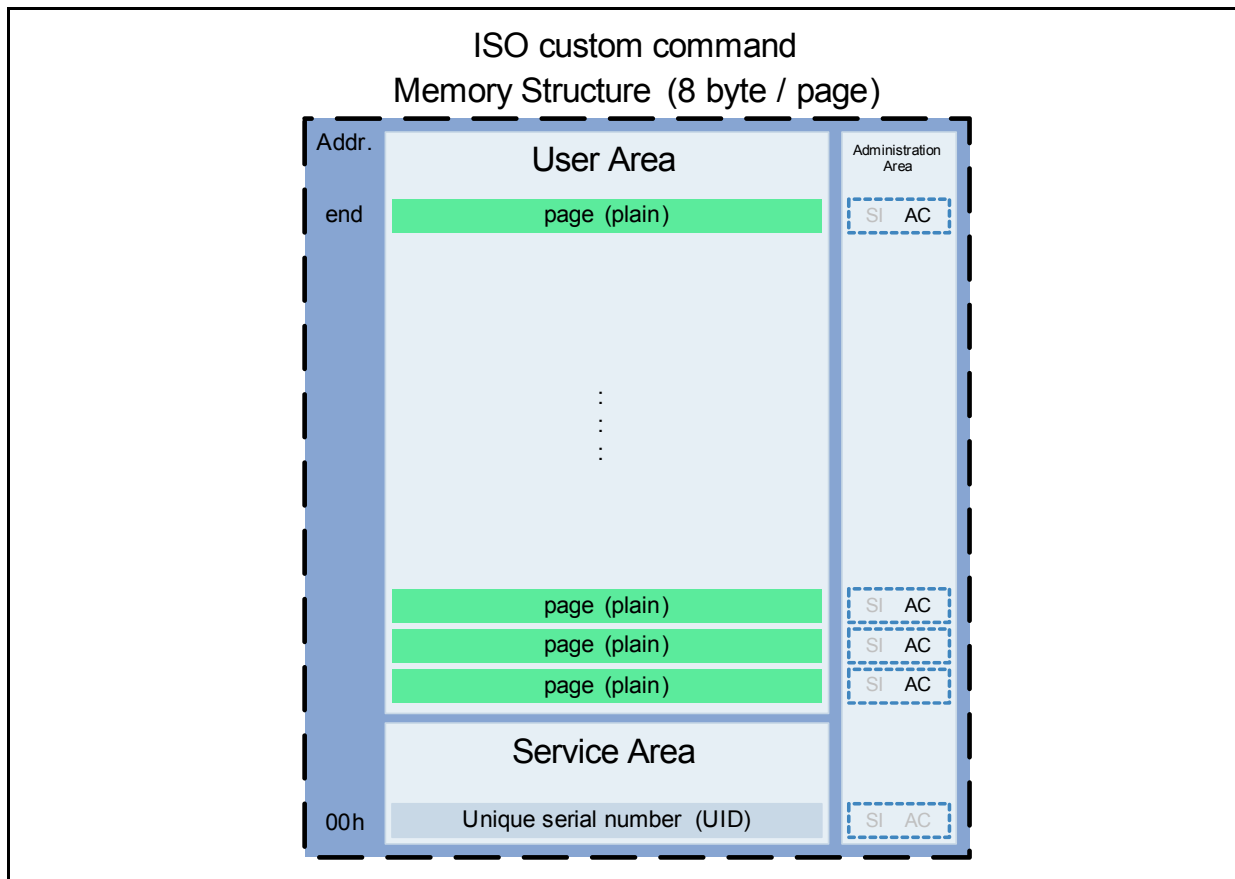**Figure 3-1 Block diagram of the my-d™ NFC**
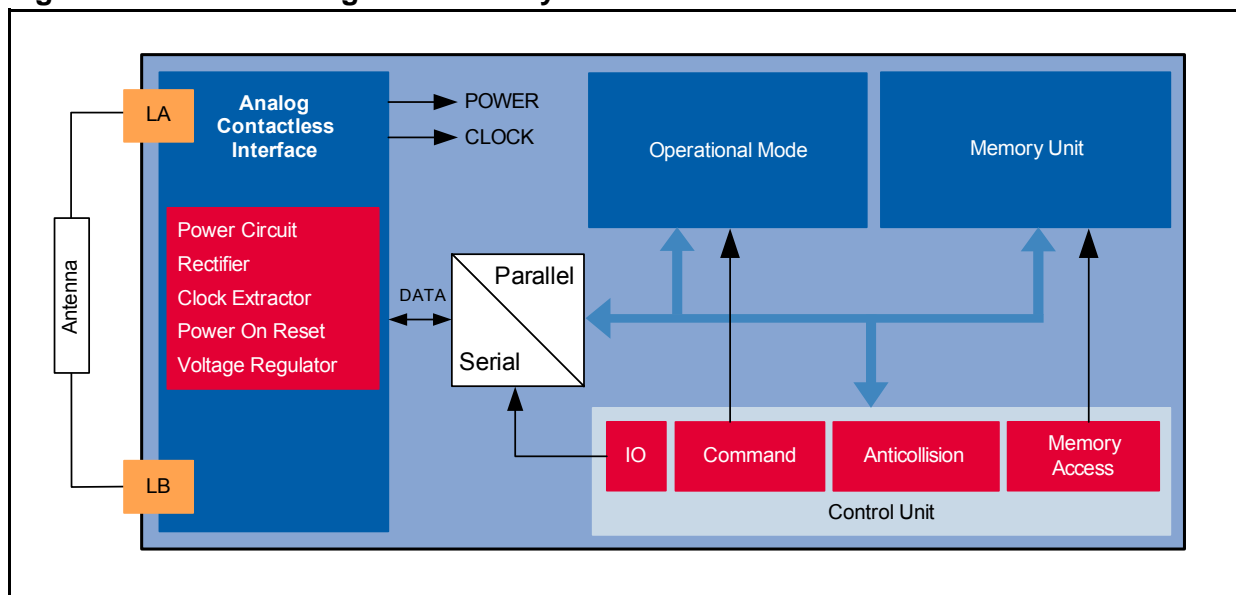
- **Analog Contactless Interface**
  The Analog Contactless Interface comprises the voltage rectifier, voltage regulator and system clock to supply the IC with appropriate power. Additionally the data stream is modulated and demodulated.
- **Operational mode**
  The access to the memory depends on the actual configuration of the my-d™ NFC.
- **Memory Unit**
  The Memory Unit consists of up to 5120 bytes memory organized in up to 512 pages each of 8 user and 2 administration bytes.
- **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 memory is organized in 3 areas:

- User Area
- Service Area
- Administration Area

ISO custom command
Memory Structure (8 byte / page)

Addr.
User Area
Administration Area

end   page (plain)   SI AC

⋮

page (plain)   SI AC
page (plain)   SI AC
page (plain)   SI AC

Service Area

00h   Unique serial number (UID)   SI AC

Figure 3-2   my-d™ Memory Organization

The **User Area** stores User Data in up to 509 pages.

The **Service Area** stores the UID, manufacturer data and configuration data. This information is programmed at manufacture of the chip and cannot be changed.

The **Administration Area** stores 2 bytes of information about page administration (SI - Sector Index and AC - Access Condition). The Access Condition and Sector Index byte are corruption protected.

3.3   Memory Principle for NFC Forum™ Type 2 Tag

Some parts of the my-d™ NFC memory are configured to be accessible with NFC Forum™ Type 2 Tag commands. Static or a dynamic memory structures are configurable. The principle memory structure is shown in Figure 3-3
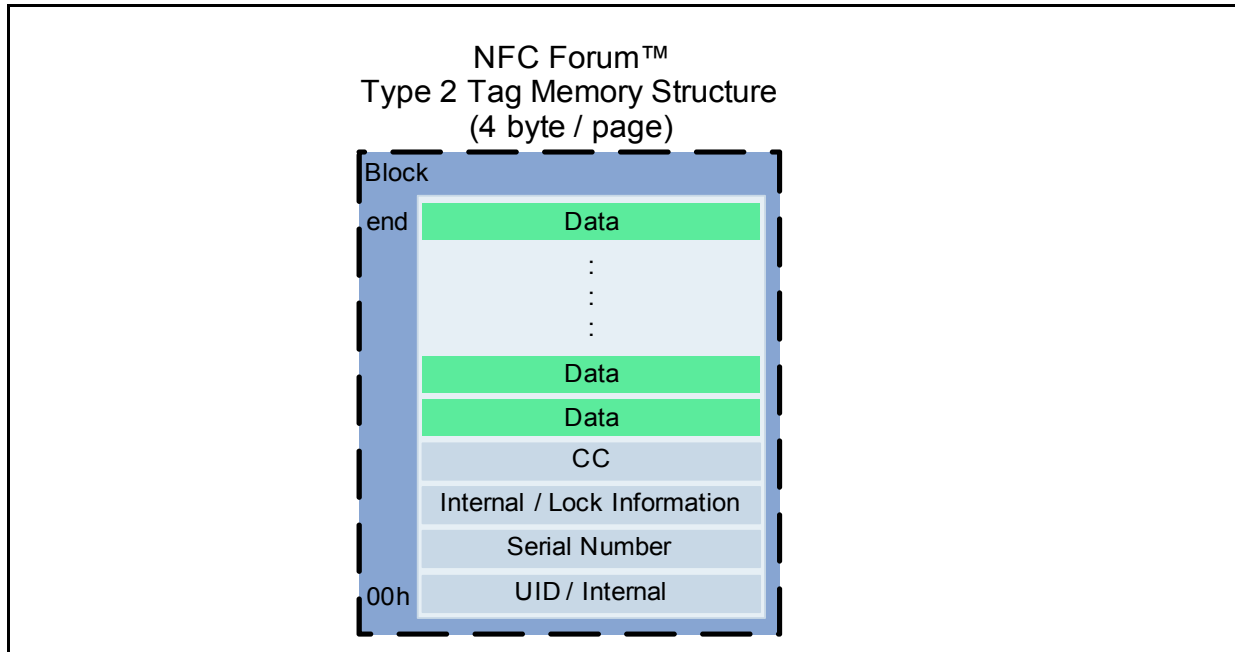
Figure 3-3   NFC Memory Organization

The block size in the NFC memory organization is 4 bytes. These blocks are accessible with NFC Forum™ Type 2 Tag commands as well as with my-d™ commands.

3.4 System Overview

The system consists of a host system, one or more my-d™ NFC or other ISO∕IEC 14443-3 compliant cards and an ISO∕IEC 14443-3 compatible contactless reader with an antenna. Alternatively, since the my-d™ NFC is configured to hold a NFC Forum™ Type 2 Tag memory structure, a NFC Forum™ Device in card reader/writer mode can be used to operate the chip.
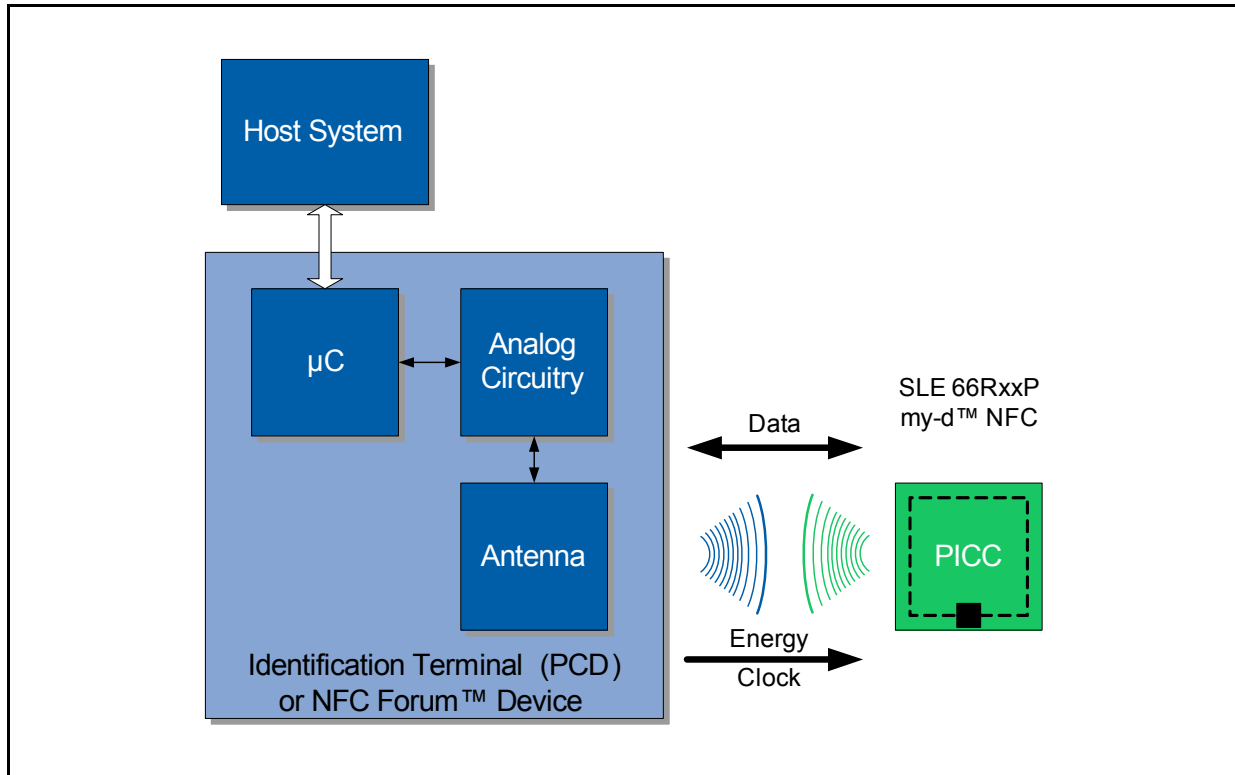

Figure 3-4   Secure my-d™ NFC RFID system

3.5 Product Versions

To identify the different types of my-d™ NFC contactless memories special chip type information is coded into the manufacturer page (page 02_h, byte 0). The table below briefly describes the values of this byte for the different chip versions.

Table 3-1   Chip Information for different product variants

Sales Code	Chip Information Byte
SLE 66R04P	$11xx\ x010_b$
SLE 66R16P	$11xx\ x100_b$
SLE 66R32P	$11xx\ x101_b$

Note: Bit [5:3] should not be evaluated since their value may be changed for future revisions.

Note: *In addition to the chip type information, the manufacturer code and a chip family identifier are coded into the UID as described in Table 3-2. The chip family identifier can be used to determine the basic command set for the chip.*

Table 3-2   Manufacturer and Chip Family Identifier

UID Field	Value	Description
UID0	05_h	Manufacturer ID according to ISO/IEC 7816-6/AM1
UID1	$x0_h$	The higher nibble of UID1 is the chip family identifier coded as: 1_h ... my-d™ command set 2_h ... my-d™ command set and NFC Forum™ Type 2 Tag commands The lower nibble is RFU and set to 0_h. *Note:* The lower nibble shall not be checked for chip family determination.

3.6   Supported Standards

- ISO/IEC 14443-3 Type A (Parts 1, 2 and 3)
  tested according to ISO/IEC10373-6 (PICC Test & Validation)
- Support of NFC Forum™ - Type 2 Tag Operation[1]

3.7   Command set

The my-d™ NFC chip is compliant to the ISO/IEC 14443-3 standard. A set of standard ISO commands is implemented to operate the chip. Additional to the ISO/IEC 14443 commands, NFC Forum™ - Type 2 Tag commands and a my-d™ specific command set is implemented. This facilitates the access to the on-chip integrated memory.

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[1] Application note concerning NFC Forum™ Type 2 Tag Operation available on request

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