

my-d™ NFC Type 2 Tag Operation

Application Note

How to operate my-d™ devices in NFC Forum™ Type 2 Tag infrastructures

Devices

- SLE 66R01P
- SLE 66R01PN
- SLE 66R01L
- SLE 66R01LN
- SLE 66R16P
- SLE 66R32P
- SLE 66R64P

About this document

Scope and purpose

This document serves as a guideline for the Infineon's contactless memory products compliant to ISO/IEC 14443-3 Type A. The recommendations given are for orientation only. The specific behavior of the my-d™ NFC devices shall be verified by measurement as described within this document.

Intended audience

The information within this document is intended for device integrators and application developers.

Table of contents

	Devices	1
	About this document	1
	Table of contents	2
	List of tables	4
	List of figures	6
1	Introduction	7
1.1	my-d™ variants	7
1.2	NFC Forum™ Type 2 Tag characteristics	8
1.2.1	Memory structure	8
1.2.1.1	Static memory structure	8
1.2.1.2	Dynamic memory structure	8
1.2.2	TLV blocks	9
1.2.3	Life cycle	10
1.2.4	Command set	12
1.2.4.1	Sector select command	13
1.2.4.2	Read command	15
1.2.4.3	Write command	16
2	Setting up my-d™ to support NFC Forum™ Type 2 Tags	17
2.1	my-d™ memory configuration at delivery	17
2.2	my-d™ move and my-d™ move lean	17
2.3	my-d™ NFC	19
3	NFC Forum™ Type 2 Tag examples	21
3.1	Static memory structure	21
3.1.1	Empty NDEF message in static memory structure: State INITIALIZED	21
3.1.2	NDEF message in static memory structure: State READ/WRITE, CC3 = 00 _H	22
3.1.3	NDEF message in static memory structure: State READ-ONLY, CC3 = 0F _H	23
3.2	Dynamic memory structure	24
3.2.1	Empty NDEF message in dynamic memory structure: State INITIALIZED	24
3.2.1.1	Lock control TLV	25
3.2.1.2	Memory control TLV	26
3.2.1.3	NDEF message TLV	26
3.2.1.4	Terminator TLV	26
3.2.2	NDEF message in dynamic memory structure: State READ/WRITE, CC3 = 00 _H	26
4	Details about my-d™ NFC	28
4.1	my-d™ NFC derivatives	28
4.2	my-d™ NFC memory configuration	28
4.2.1	my-d™ NFC service area	33

Table of contents

4.3	Command sets	34
4.3.1	my-d TM read	35
4.3.2	my-d TM write	36
4.3.3	my-d TM write byte	37
4.4	Block locking with my-d TM NFC	38
4.5	Important notes	40
	References	41
	Glossary	42
	Revision history	43
	Disclaimer	44

List of tables

List of tables

Table 1	Chip variants of my-d™	7
Table 2	NFC Forum™ Type 2 Tag memory organization (based on memory size of 1024 bytes)	8
Table 3	TLV blocks	9
Table 4	NFC Forum™ Type 2 Tag INITIALIZED state (based on memory size of 1024 bytes)	11
Table 5	NFC Forum™ Type 2 Tag READ/WRITE state (based on memory size of 1024 bytes)	11
Table 6	NFC Forum™ Type 2 Tag READ ONLY state (based on memory size of 1024 bytes)	12
Table 7	NFC Forum™ Type 2 Tag command set	12
Table 8	‘Sector select’ command parameters (packet 1)	13
Table 9	‘Sector select’ command response parameters (packet 1)	13
Table 10	‘Sector select’ command parameters (packet 2)	14
Table 11	‘Sector select’ command response parameters (packet 2)	14
Table 12	‘Read’ command parameters	15
Table 13	‘Read’ command response parameters	15
Table 14	‘Write’ command parameters	16
Table 15	‘Write’ command response parameters	16
Table 16	my-d™ move - SLE 66R01P in UNINITIALIZED state	17
Table 17	Capability Container settings for my-d™ move lean (NFC) and my-d™ move (NFC)	18
Table 18	Empty NDEF message	18
Table 19	my-d™ move NFC - SLE 66R01PN in INITIALIZED state	18
Table 20	my-d™ NFC - SLE 66R16P in UNINITIALIZED state	19
Table 21	Capability Container settings for my-d™ NFC	19
Table 22	my-d™ NFC - SLE 66R16P in INITIALIZED state	20
Table 23	Static memory structure - INITIALIZED state (based on my-d™ move)	21
Table 24	Static memory structure - READ/WRITE state (based on my-d™ move)	22
Table 25	Static memory structure - READ/WRITE state (based on my-d™ move)	23
Table 26	Dynamic memory structure - INITIALIZED state (based on SLE 66R16P)	24
Table 27	Dynamic memory structure - INITIALIZED state (based on SLE 66R16P)	27
Table 28	Chip variants of my-d™ NFC (memory sizes in bytes)	28
Table 29	my-d™ NFC SLE 66R16P memory configuration	28
Table 30	my-d™ NFC SLE 66R32P memory configuration	29
Table 31	my-d™ NFC SLE 66R64P memory configuration	30
Table 32	NFC Forum™ Type 2 Tag memory mapping (based on SLE 66R32P)	32
Table 33	my-d™ NFC service area content	33
Table 34	Chip family identification my-d™ NFC	33
Table 35	Issuer tag (IT) of my-d™ NFC	33
Table 36	Chip information (CI) of my-d™ NFC	34
Table 37	NFC Forum™ Type 2 Tag command set	34
Table 38	my-d™ NFC command set	34
Table 39	‘my-d™ read’ command parameters	35
Table 40	‘my-d™ read’ command response parameters	35
Table 41	‘my-d™ write’ command parameters	36
Table 42	‘my-d™ write’ command response parameters	36
Table 43	‘my-d™ write byte’ command parameters	37

List of tables

Table 44	‘my-d™ write byte’ command response parameters	37
Table 45	NFC Forum™ Type 2 Tag memory mapping (based on SLE 66R16P)	39
Table 46	Access conditions and access rights	39

List of figures

List of figures

Figure 1	Type 2 Tag life cycle	10
Figure 2	Sector select command, packet 1	13
Figure 3	Sector select command, packet 2	14
Figure 4	Read command	15
Figure 5	Write command	16
Figure 6	my-d™ read command	35
Figure 7	my-d™ write command	36
Figure 8	my-d™ write byte command	37
Figure 9	Chip type determination	38

1 Introduction

1 Introduction

This document provides the following details:

- The available my-d™ devices offering NFC Forum™ Type 2 Tag functionality
- Default settings of my-d™ devices at delivery
- State transitions
- Command sets of my-d™ products

Furthermore, some examples are given describing how to use the NFC memory block within the my-d™ devices.

This application note shall be used together with:

- ISO/IEC 14443-3 Type A standard [2]
- NFC Forum™ Type 2 Tag specification [8]
- my-d™ NFC extended datasheet
- my-d™ move extended datasheet [4]

For more details please contact Connected Secure Systems CSSCustomerService@infineon.com.

1.1 my-d™ variants

The following my-d™ variants are available supporting NFC Forum™ Type 2 Tag functionality. NFC commands allow to address data space listed in column 'NFC memory size', whereas 'NFC user data size' indicates the amount of memory available for user purpose. The difference is reserved for administrative data such as internal bytes and Capability Container.

Table 1 **Chip variants of my-d™**

Device name	Type	NFC memory size [bytes]	NFC user data size [bytes]
my-d™ move	SLE 66R01P	152	128
my-d™ move NFC ¹⁾	SLE 66R01PN	152	128
my-d™ move lean	SLE 66R01L	64	48
my-d™ move lean NFC ¹⁾	SLE 66R01LN	64	48
my-d™ NFC	SLE 66R16P	1024	1008
my-d™ NFC	SLE 66R32P	2048 ²⁾	2032
my-d™ NFC	SLE 66R64P	4096	4080

1) Delivered in NFC INITIALIZED state

2) Two NFC memory sectors of 1 KB

1 Introduction

1.2 NFC Forum™ Type 2 Tag characteristics

1.2.1 Memory structure

Table 2 shows a 1024 byte memory area allocated to a Type 2 Tag. These 1024 bytes are organized in 256 blocks of 4 bytes each.

Table 2 NFC Forum™ Type 2 Tag memory organization (based on memory size of 1024 bytes)

	NFC block address	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	internal0	internal1	internal2	internal3	Internal
	01 _H	internal4	internal5	internal6	internal7	Internal
	02 _H	internal8	internal9	LOCK0	LOCK1	Internal/lock
	03 _H	CC0	CC1	CC2	CC3	Capability Container
	04 _H	D0	D1	D2	D3	Data
	05 _H	D4	D5	D6	D7	Data
	...	...				Data
	...	...				Data
	FE _H	D1000	D1001	D1002	D1003	Data
	FF _H	D1004	D1005	D1006	D1007	Data

The given address range (from 00_H to FF_H) represents an NFC Forum™ Type 2 Tag with 1 KB of memory. NFC block addresses 00_H to 03_H hold:

- Internal bytes: internal0 - internal9
 - These bytes are reserved for manufacturing use and shall not be used to store information data
- Static lock bytes: LOCK0 - LOCK1
 - Read-only locking bits (Note: Does not imply physical locking!)
- Capability Containers: CC0 - CC3
 - Manage the information about the Type 2 Tag

Block addresses higher than 03_H belong to the NFC Forum™ Type 2 Tag data area (D0 to D1007) and are available to the user. The Type 2 Tag memory structure required by an application can be arranged within this memory area.

The memory structure depends on the available memory on the Type 2 Tag platform.

1.2.1.1 Static memory structure

The static memory structure may be applied to Type 2 Tag platforms with a physical memory size equal to 64 bytes or if the application requires small amounts of user memory (up to 48 bytes).

1.2.1.2 Dynamic memory structure

The dynamic memory structure is used for Type 2 Tag platforms with memories bigger than 64 bytes. This memory layout contains optional configuration information (lock control TLV and memory control TLV) to identify reserved memory areas within the data area.

1 Introduction

1.2.2 TLV blocks

Encoding of data on an NFC Forum™ Type 2 Tag is realized with TLV blocks:

- T → Tag field (identifies the type of TLV block)
- L → Length field (provides the size of the value field)
- V → Value field (indicates the value field)

Table 3 lists defined TLV blocks used to encode data. The NFC Forum™ device shall use these TLV blocks to write data to the data area of the NFC Forum™ Type 2 Tag.

Table 3 TLV blocks

TLV block name	Tag field value	Description
NULL TLV	00 _H	Used for padding memory areas
Lock control TLV	01 _H	Defines details of the lock bits
Memory control TLV	02 _H	Identifies reserved memory areas
NDEF message TLV	03 _H	Contains an NDEF message
Proprietary TLV	FD _H	Proprietary information
Terminator TLV	FE _H	Last TLV block in the data area

The order of the TLV blocks are specified as listed:

- If present: Lock control TLV(s)
- If present: Memory control TLV(s)
- NDEF message TLV(s) and proprietary TLV(s)
- Terminator TLV

Note: For more detailed information about the NFC Forum™ Type 2 Tag memory structures and TLV blocks please refer to the NFC Forum™ Type 2 Tag specification [8].

1 Introduction

1.2.3 Life cycle

The NFC Forum™ Type 2 Tag device may be in different states. The current state is identified by the content of the Type 2 Tag memory.

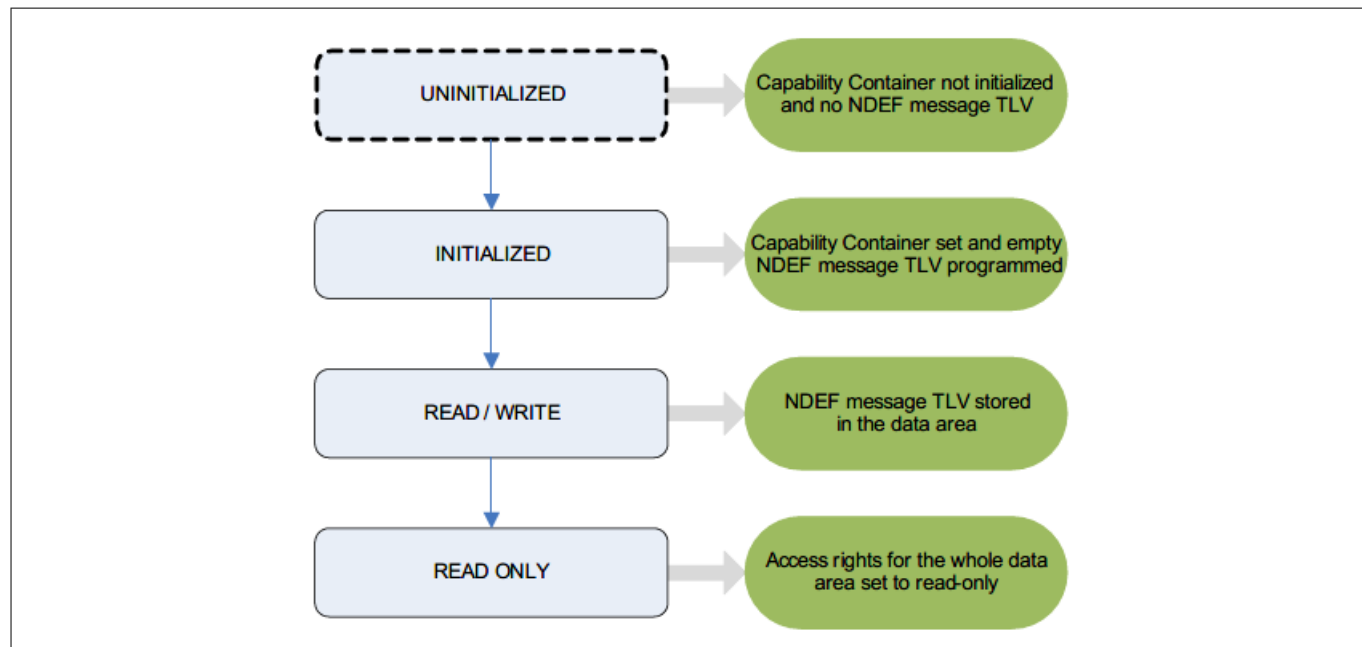


Figure 1 Type 2 Tag life cycle

In the UNINITIALIZED state the memory is not prepared to be immediately used in an NFC Forum™ Type 2 Tag infrastructure. The chip supports the NFC Forum™ Type 2 Tag command set but the NFC Forum™ device may ignore the Type 2 Tag platform as it is not in a valid state.

The valid states within the NFC Forum™ Type 2 Tag infrastructure are:

- INITIALIZED
 - The NFC Forum™ Type 2 Tag Capability Container bytes are set and allow read/write access (CC3 = 00_H)
 - The data area contains an NDEF message TLV with the length field set to 00_H (empty NDEF)
 - Terminator TLV
 - The NFC Forum™ device may then modify the data stored in the NFC Forum™ Type 2 Tag

1 Introduction

Table 4 NFC Forum™ Type 2 Tag INITIALIZED state (based on memory size of 1024 bytes)

	NFC block address	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	internal0	internal1	internal2	internal3	Internal
	01 _H	internal4	internal5	internal6	internal7	Internal
	02 _H	internal8	internal9	LOCK0 = 00 _H	LOCK1 = 00 _H	Internal/lock
	03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 7E _H	CC3 = 00 _H	Capability Container
	04 _H	03 _H	00 _H	FE _H	D3	Empty NDEF
	05 _H	D4	D5	D6	D7	Data
	...	...				Data
	...	...				Data
	FE _H	D1000	D1001	D1002	D1003	Data
	FF _H	D1004	D1005	D1006	D1007	Data

- WRITE/READ
 - The NFC Forum™ Type 2 Tag Capability Container bytes are set and allow read/write access (CC3 = 00_H)
 - The data area contains an NDEF message TLV with the length value equal to the length of the NDEF message stored in the value field

Table 5 NFC Forum™ Type 2 Tag READ/WRITE state (based on memory size of 1024 bytes)

	NFC block address	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	internal0	internal1	internal2	internal3	Internal
	01 _H	internal4	internal5	internal6	internal7	Internal
	02 _H	internal8	internal9	LOCK0 = 00 _H	LOCK1 = 00 _H	Internal/lock
	03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 7E _H	CC3 = 00 _H	Capability Container
	04 _H	03 _H	0B _H	D1 _H	01 _H	NDEF message
	05 _H	07 _H	54 _H	02 _H	65 _H	NDEF message
	06 _H	6E _H	4E _H	44 _H	45 _H	NDEF message
	07 _H	46 _H	FE _H	D14	D15	NDEF message
	...	...				Data
	FE _H	D1000	D1001	D1002	D1003	Data
	FF _H	D1004	D1005	D1006	D1007	Data

- READ ONLY
 - The NFC Forum™ Type 2 Tag Capability Container bytes are set and allow read access only (CC3 = 0F_H)
 - The data area contains an NDEF message TLV with the length value equal to the length of the NDEF message stored in the value field

1 Introduction

Table 6 NFC Forum™ Type 2 Tag READ ONLY state (based on memory size of 1024 bytes)

	NFC block address	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	internal0	internal1	internal2	internal3	Internal
	01 _H	internal4	internal5	internal6	internal7	Internal
	02 _H	internal8	internal9	LOCK0 = 00 _H	LOCK1 = 00 _H	Internal/lock
	03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 7E _H	CC3 = 0F _H	Capability Container
	04 _H	03 _H	0B _H	D1 _H	01 _H	NDEF message
	05 _H	07 _H	54 _H	02 _H	65 _H	NDEF message
	06 _H	6E _H	4E _H	44 _H	45 _H	NDEF message
	07 _H	46 _H	FE _H	D14	D15	NDEF message
	...	...				Data
	FE _H	D1000	D1001	D1002	D1003	Data
	FF _H	D1004	D1005	D1006	D1007	Data

Note: Please note that CC3 = 0F_H indicates a “soft-lock” only and does not physically lock the memory.

1.2.4 Command set

Table 7 lists the NFC Forum™ Type 2 Tag commands available with the my-d™ devices.

Table 7 NFC Forum™ Type 2 Tag command set

Command ¹⁾	Op-code	Comment	Address range
Sector select ²⁾	C2 _H	Sector selection	-
Read	30 _H	Reads 16 bytes of data	00 _H - FF _H
Write	A2 _H	Writes 4 byte of data	00 _H - FF _H

1) Please refer to the NFC Forum™ Type 2 Tag specification [8] for detailed command descriptions.

2) For variants with more than 1 KB of Type 2 Tag memory.

1 Introduction

1.2.4.1 Sector select command

The sector select command supports the access to NFC Forum™ Type 2 Tag platforms with physical memories bigger than 1 KB. The sector size is 1 KB.

The sector select command is divided into two command packets:

- Packet 1: Contains the command code and a single byte parameter (set to FF_H); valid responses are:
 - ACK for Type 2 Tag platforms with bigger memories than 1 KB
 - NACK for Type 2 Tag platforms with smaller memories than 1 KB

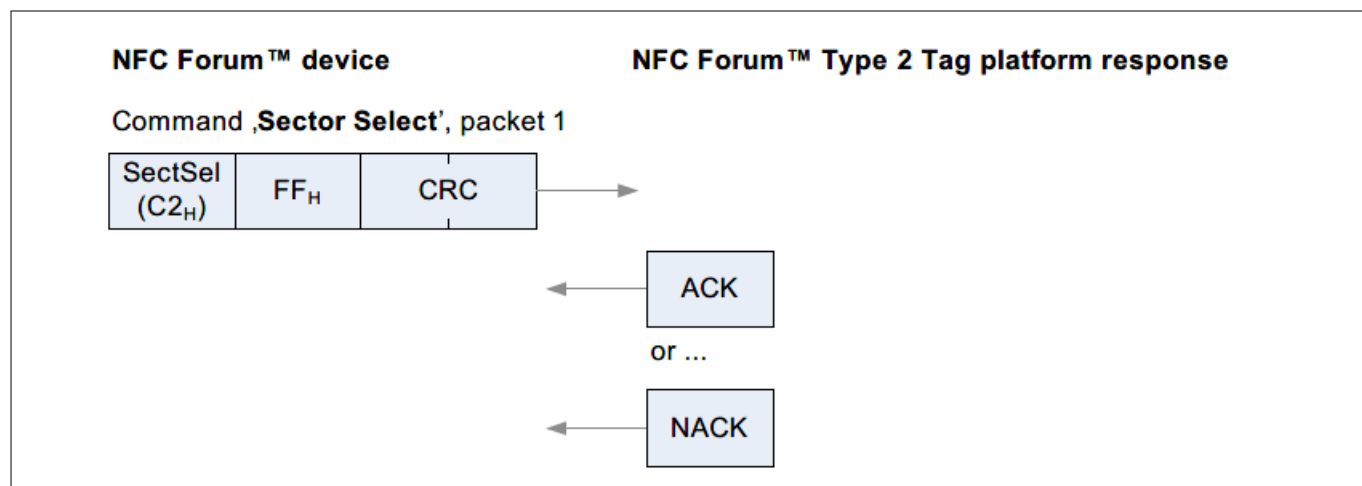


Figure 2 Sector select command, packet 1

Table 8 'Sector select' command parameters (packet 1)

Name	Length ¹⁾	Remark
SelectSel	1	Command opcode: C2 _H
FF _H	1	Fixed value for packet 1
CRC	2	CRC

1) Length of parameter field in [byte(s)]

Table 9 'Sector select' command response parameters (packet 1)

Name	Length	Remark
ACK	1	Replied without CRC
NACK	1	Error on sector select command: Replied without CRC

Note: Packet 2 will be skipped if the response to packet 1 was NACK.

- Packet 2: Contains the sector number and three additional bytes which are reserved for future use and set to 00_H
 - Passive ACK (= no response) if the sector number is valid
 - NACK if the addressable data memory space is exceeded

1 Introduction

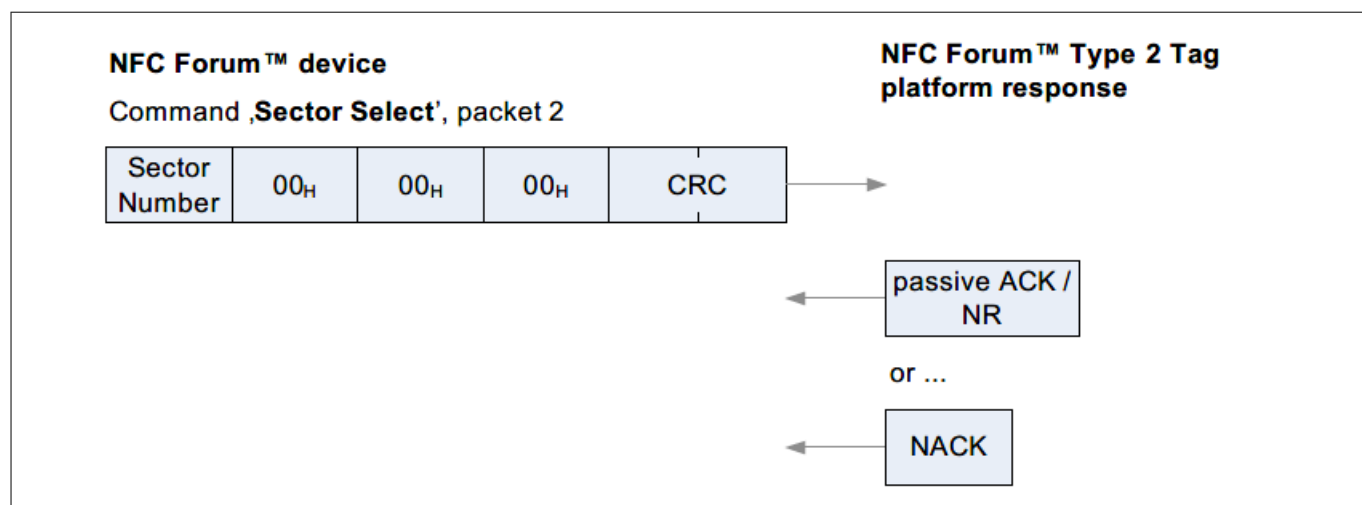


Figure 3 Sector select command, packet 2

Table 10 'Sector select' command parameters (packet 2)

Name	Length ¹⁾	Remark
Sector number	1	Valid range for sector number: 00 _H to FE _H
00 _H	3	RFU
CRC	2	CRC

1) Length of parameter field in [byte(s)]

Table 11 'Sector select' command response parameters (packet 2)

Name	Length	Remark
Passive ACK - NR	0	No reply
NACK	1	Error on sector select command: Replied without CRC

1 Introduction

1.2.4.2 Read command

The read command reads 16 bytes of data out of the memory starting from the specified address.

The valid address range is 00_H to FF_H and depends on the available memory. If an address outside the chip-specific address range is specified the my-d™ chip responds with a NACK.

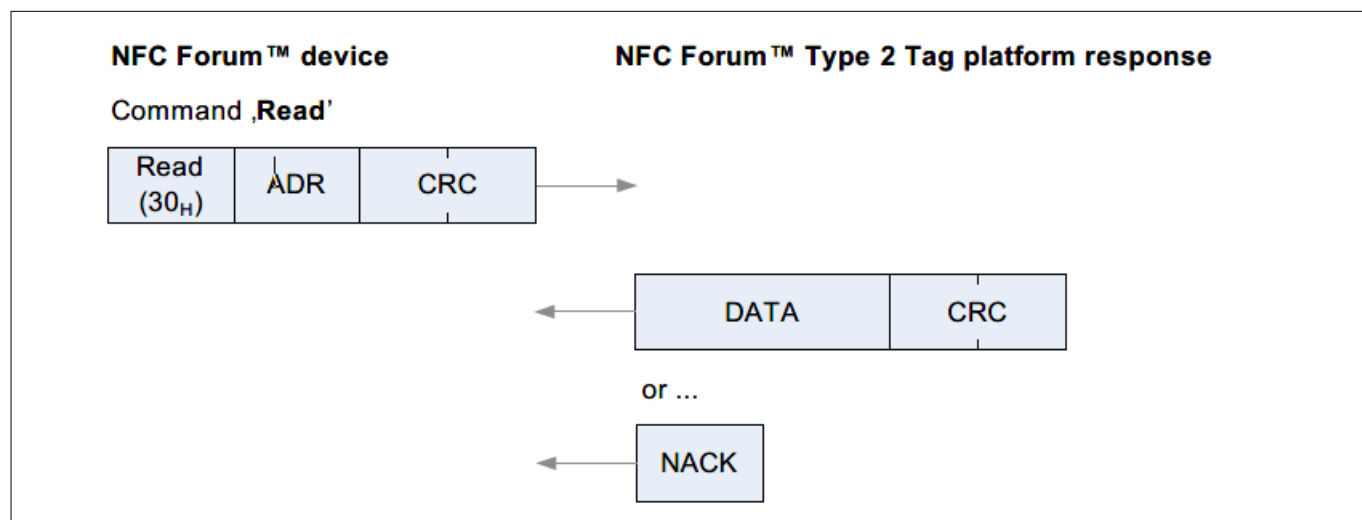


Figure 4 Read command

Table 12 'Read' command parameters

Name	Length ¹⁾	Remark
Read	1	Command opcode: 30 _H
ADR	1	Block address to be read The valid address range is from 00 _H to FF _H (depending on the available memory)
CRC	2	CRC

1) Length of parameter field in [byte(s)]

Table 13 'Read' command response parameters

Name	Length	Remark
DATA	16	Content of four blocks
CRC	2	CRC
or		
NACK	1	Error on read command: Replied without CRC

1 Introduction

1.2.4.3 Write command

If the write access is granted the write command is used to program 4 bytes of data to the specified address in the memory. This command should be used to program the OTP block and LOCKx bytes as well.

The valid address range is from 00_H to FF_H and depends on the available memory. If an address outside the chip-specific address range is specified the my-d™ chip responds with a NACK.

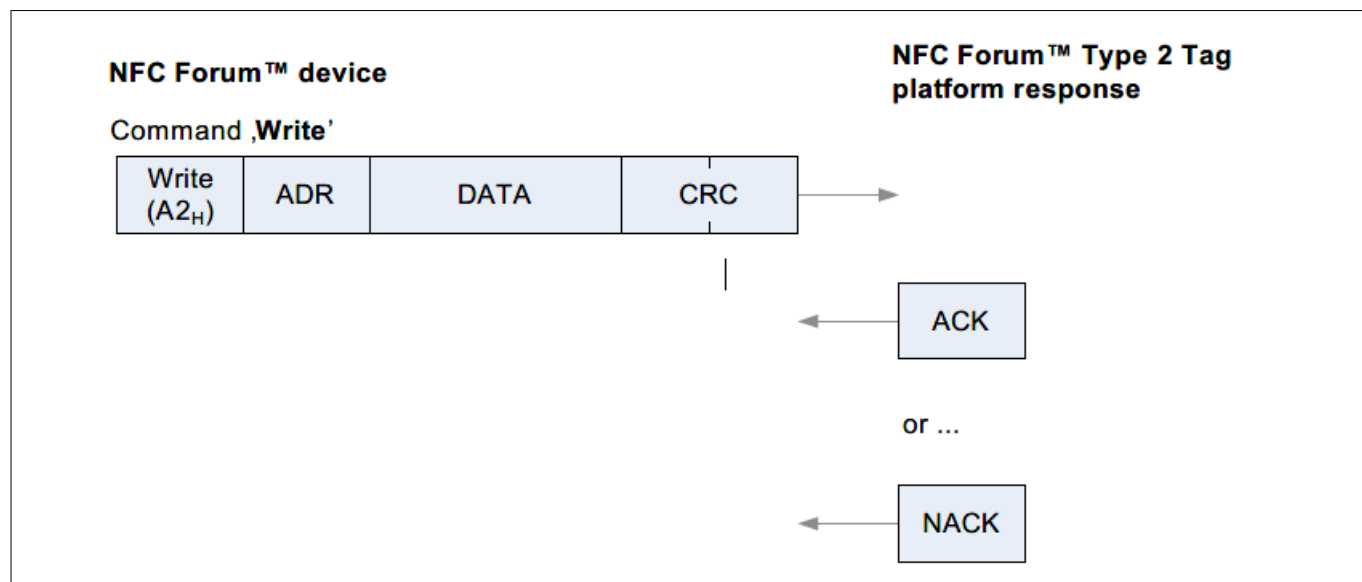


Figure 5 Write command

Table 14 'Write' command parameters

Name	Length ¹⁾	Remark
Write	1	Command opcode: A2 _H
ADR	1	Block address to be written The valid address range is from 00 _H to FF _H (depending on the available memory)
DATA	4	Data to be written
CRC	2	CRC

1) Length of parameter field in [byte(s)]

Table 15 'Write' command response parameters

Name	Length	Remark
ACK	1	Write successful: Replied without CRC
NACK	1	Error on write command: Replied without CRC

2 Setting up my-d™ to support NFC Forum™ Type 2 Tags

2 Setting up my-d™ to support NFC Forum™ Type 2 Tags

The following sections describes the recommended procedure to set up the NFC Forum™ Type 2 Tag memory on a my-d™ device.

2.1 my-d™ memory configuration at delivery

Depending on the application and order form my-d™ devices could be delivered in a UNINITIALIZED or INITIALIZED state.

In the UNINITIALIZED state the my-d™ devices are delivered with the memory set to 00_H. The NFC Forum™ Type 2 Tag platform needs to be initialized before being used in an NFC Forum™ Type 2 Tag infrastructure.

In the INITIALIZED state the necessary memory content has already been programmed to the my-d™ devices and they can be used in NFC Forum™ Type 2 Tag infrastructures immediately.

Table 16 and Table 20 show the default memory configuration of the my-d™ devices at delivery.

2.2 my-d™ move and my-d™ move lean

These chips come with:

- A 7-byte UID including two BCC bytes programmed during manufacturing (uid0 - uid6, BCC0 and BCC1); these bytes are internal bytes. This UID is used during the ISO/IEC 14443-3 Type A anti-collision.
- INT2 set to 00_H
- LOCK0 and LOCK1 set to 00_H¹⁾ (Lock bytes for block 00_H - 0F_H)
- LOCK2 to LOCK5 set to 00_H (my-d™ move only: Lock bytes for block 10_H - 23_H)
- OTP memory in block 03_H set to 00_H (Capability Container)
- Complete data area set to 00_H
- Address range: my-d™ move lean: 00_H - 0F_H; my-d™ move: 00_H - 25_H

Table 16 my-d™ move - SLE 66R01P in UNINITIALIZED state

	NFC block	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	uid0	uid1	uid2	BCC0	Serial number/BCC
	01 _H	uid3	uid4	uid5	uid6	Serial number
	02 _H	BCC1	INT2 = 00 _H	LOCK0 = 00 _H	LOCK1 = 00 _H	BCC1/internal/lock
	03 _H	00 _H	00 _H	00 _H	00 _H	OTP
	04 _H	00 _H	00 _H	00 _H	00 _H	Data
	...	...				Data
	0F _H	...				Data
	10 _H	...				Data
	...	...				Data
	23 _H	00 _H	00 _H	00 _H	00 _H	Data
	24 _H	LOCK2 = 00 _H	LOCK3 = 00 _H	LOCK4 = 00 _H	LOCK5 = 00 _H	Lock
	25 _H	Manufacturing data				Reserved

¹ 00_H indicates block read/write access

2 Setting up my-d™ to support NFC Forum™ Type 2 Tags

To initialize my-d™ move variants, the Capability Container bytes (block 03_H) and an empty NDEF message (block 04_H) need to be programmed.

Table 17 defines settings of the Capability Container bytes to address the NFC memory.

Table 17 Capability Container settings for my-d™ move lean (NFC) and my-d™ move (NFC)

Chip type	CC0 ¹⁾	CC1 ²⁾	CC2 ³⁾	CC3 ⁴⁾
SLE 66R01L	E1 _H	10 _H	06 _H	00 _H
SLE 66R01LN	E1 _H	10 _H	06 _H	00 _H
SLE 66R01P	E1 _H	10 _H	10 _H	00 _H
SLE 66R01PN	E1 _H	10 _H	10 _H	00 _H

- 1) Magic number defines that NFC Forum™ defined data is stored in the data area
- 2) The version number of the supported specification
- 3) CC2 indicates the memory size of the data area of the Type 2 Tag; the given values represent the maximum values for the chips
- 4) Indicates read and write access capabilities of the data area

Table 18 defines the empty NDEF Message TLV (identified with the Tag field value of 03_H). The length field value is set to 00_H; due to that the value field is not present. The terminator TLV is the last TLV block in the data area.

Table 18 Empty NDEF message

NDEF message TLV			Terminator TLV		
Tag field	Length field	Value field	Tag field	Length field	Value field
03 _H	00 _H	-	FE _H	-	-

The programming of this information (CCx and empty NDEF) has to be done with the NFC Forum™ Type 2 Tag write command. After that, the my-d™ move is in the INITIALIZED state.

Table 19 shows a my-d™ move device in the INITIALIZED state (correlates with the SLE 66R01PN memory content at delivery).

Table 19 my-d™ move NFC - SLE 66R01PN in INITIALIZED state

	NFC block	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	uid0	uid1	uid2	BCC0	Serial number/BCC
	01 _H	uid3	uid4	uid5	uid6	Serial number
	02 _H	BCC1	INT2 = 00 _H	LOCK0 = 00 _H	LOCK1 = 00 _H	BCC1/internal/lock
	03 _H	E1 _H	10 _H	10 _H	00 _H	Capability Container
	04 _H	03 _H	00 _H	FE _H	...	Empty NDEF
	05 _H	...				Data
	...	...				Data
	23 _H	...				Data
	24 _H	LOCK2 = 00 _H	LOCK3 = 00 _H	LOCK4 = 00 _H	LOCK5 = 00 _H	Lock
	25 _H	Manufacturing data				Reserved

2 Setting up my-d™ to support NFC Forum™ Type 2 Tags

Note: Please note that the configuration of the different my-d™ move devices to INITIALIZED state is non-reversible; the Capability Containers (located in the OTP memory block 03_H) cannot be overwritten to use the my-d™ move as plain, standard device anymore.

2.3 my-d™ NFC

The my-d™ NFC chip in UNINITIALIZED state comes with the whole NFC memory set to 00_H; they need to be initialized before being used in an NFC Forum™ Type 2 Tag infrastructure.

Table 20 my-d™ NFC - SLE 66R16P in UNINITIALIZED state

	NFC block	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	00 _H	00 _H	00 _H	00 _H	Data
	01 _H	00 _H	00 _H	00 _H	00 _H	Data
	02 _H	00 _H	00 _H	00 _H	00 _H	Data
	03 _H	00 _H	00 _H	00 _H	00 _H	Data
	...	...				Data
	FE _H	00 _H	00 _H	00 _H	00 _H	Data
	FF _H	00 _H	00 _H	00 _H	00 _H	Data

To enable the INITIALIZED state at least, the Capability Containers and the empty NDEF have to be programmed to the memory.

If the application requires some internal information block 00_H, block 01_H and the first two bytes of block 02_H may be used (internal0 - internal9).

- Block 02_H, byte 2 and 3: Static lock bytes
- Block 03_H: Capability Containers
- Block 04_H: Start of the data area

Table 21 defines the valid settings of the Capability Container bytes.

Table 21 Capability Container settings for my-d™ NFC

Chip type	CC0	CC1	CC2 ¹⁾	CC3
SLE 66R16P	E1 _H	10 _H	7E _H	00 _H
SLE 66R32P	E1 _H	10 _H	FE _H	00 _H
SLE 66R64P	E1 _H	10 _H	FE _H	00 _H

1) CC2 indicates the memory size of the data area of the Type 2 Tag; the given values represent the maximum values for the chips

2 Setting up my-d™ to support NFC Forum™ Type 2 Tags

Table 22 my-d™ NFC - SLE 66R16P in INITIALIZED state

	NFC block address	Byte number within a block				Description
		0	1	2	3	
Type 2 Tag address range	00 _H	internal0	internal1	internal2	internal3	Internal
	01 _H	internal4	internal5	internal6	internal7	Internal
	02 _H	internal8	internal9	LOCK0 = 00 _H	LOCK1 = 00 _H	Internal/lock
	03 _H	E1 _H	10 _H	7E _H	00 _H	Capability Container
	04 _H	03 _H	00 _H	FE _H	00 _H	Empty NDEF
	05 _H	...				Data
	...	...				Data
	FE _H	...				Data
	FF _H	00 _H	00 _H	00 _H	00 _H	Data

3 NFC Forum™ Type 2 Tag examples

3 NFC Forum™ Type 2 Tag examples

The following examples show the Type 2 Tag memory on a my-d™ chip in two different memory structures (static and dynamic) as defined in the NFC Forum™ Type 2 Tag specification.

3.1 Static memory structure

The static memory structure may be applied to Type 2 Tag platforms with a physical memory size equal to 64 bytes or if the application requires small amounts of user memory (up to 48 bytes).

3.1.1 Empty NDEF message in static memory structure: State INITIALIZED

The example shows a my-d™ move chip in the INITIALIZED state with a static memory structure, an empty NDEF message TLV and the terminator TLV. The 48 bytes of NFC Forum™ Type 2 Tag data memory are located in the address range from 04_H to 0F_H.

Table 23 Static memory structure - INITIALIZED state (based on my-d™ move)

NFC block address	Byte number within a block			
	0	1	2	3
00 _H	uid0	uid1	uid2	INT0
01 _H	uid3	uid4	uid5	uid6
02 _H	INT1	INT2	LOCK0 = 00 _H	LOCK1 = 00 _H
03 _H	CC0 = E1 _H ¹⁾	CC1 = 10 _H	CC2 = 06 _H ²⁾	CC3 = 00 _H
04 _H	03 _H ³⁾	00 _H	FE _H ⁴⁾	...
05 _H	...	...	...	...
...
...
0F _H	D44	D45	D46	D47
10 _H	...	...	...	...
...
23 _H	...	...	...	...
24 _H	LOCK2 = 00 _H	LOCK3 = 00 _H	LOCK4 = 00 _H	LOCK5 = 00 _H
25 _H	Manufacturing data			

1) E1_H = 'magic number'

2) NFC data memory size is 48 bytes (highest block address 0F_H). The whole memory may be used for an NFC application with the CC2 set to 10_H (highest block address 23_H)

3) NDEF message TLV (here: empty NDEF)

4) Terminator TLV

The static lock bytes LOCK0 and LOCK1 are set to 00_H indicating that the memory blocks are not locked.

The Capability Containers indicate:

- CC0 = E1_H: Present NDEF data inside the Tag
- CC1 = 10_H: Support of version 1.0 of the NFC Forum™ Type 2 Tag specification
- CC2 = 06_H: 48 bytes of memory for data
- CC3 = 00_H: Read and write access is granted without any security

3 NFC Forum™ Type 2 Tag examples

The data area starts at block 04_H and holds two TLV blocks:

- NDEF message TLV
 - T: 03_H indicates the NDEF message
 - L: 00_H defines the length of the stored NDEF message (here: empty NDEF)
 - V: Not present
- Terminator TLV

3.1.2 NDEF message in static memory structure: State READ/WRITE, CC3 = 00_H

Based on the INITIALIZED NFC Forum™ Type 2 Tag configuration given in [Empty NDEF message in static memory structure: State INITIALIZED](#) the following example shows an NFC Forum™ Type 2 Tag in READ/WRITE state in a static memory structure, an NDEF message TLV and the terminator TLV.

Table 24 Static memory structure - READ/WRITE state (based on my-d™ move)

NFC block address	Byte number within a block			
	0	1	2	3
00 _H	uid0	uid1	uid2	INT0
01 _H	uid3	uid4	uid5	uid6
02 _H	INT1	INT2	LOCK0 = 00 _H	LOCK1 = 00 _H
03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 06 _H	CC3 = 00 _H
04 _H	03 _H ¹⁾	13 _H ²⁾	D1 _H	01 _H
05 _H	0F _H	54 _H	02 _H	65 _H
06 _H	6E _H	48 _H	65 _H	6C _H
07 _H	6C _H	6F _H	20 _H	77 _H
08 _H	6F _H	72 _H	6C _H	64 _H
09 _H	21 _H	FE _H	...	...
...
0F _H	D44	D45	D46	D47
10 _H	...	...	...	...
...
23 _H	...	...	...	...
24 _H	LOCK2	LOCK3	LOCK4	LOCK5
25 _H	Manufacturing data			

1) NDEF message TLV

2) Length of the value field (NDEF Message TLV)

Settings for the static lock bytes LOCK0 and LOCK1 and Capability Containers remain unchanged.

The data area starts at block 04_H and holds two TLV blocks:

- NDEF message TLV
 - T: 03_H indicates the NDEF message

3 NFC Forum™ Type 2 Tag examples

- L: 13_H defines the length of the stored NDEF message
- V: NDEF record holding the “Hello world!” payload according to the NFC Forum™ text RTD

The data area is programmed with the NFC Forum™ Type 2 Tag write command.

The static lock bytes LOCK0 and LOCK1 may be used to lock blocks within the data area.

3.1.3 NDEF message in static memory structure: State READ-ONLY, CC3 = 0F_H

Based on the example of the NFC Forum™ Type 2 Tag in READ/WRITE state (see [NDEF message in static memory structure: State READ/WRITE, CC3 = 00_H](#)) the NFC Forum™ Type 2 Tag platform may be set to a READ-ONLY state.

The data area of the NFC Forum™ Type 2 Tag platform already contains an NDEF message TLV and the length field of the NDEF message TLV is different to 00_H. This data remains unchanged.

To set the NFC Forum™ Type 2 Tag platform to READ-ONLY state the Capability Container byte, CC3 needs to be modified.

Table 25 Static memory structure - READ/WRITE state (based on my-d™ move)

NFC block address	Byte number within a block			
	0	1	2	3
00 _H	uid0	uid1	uid2	INT0
01 _H	uid3	uid4	uid5	uid6
02 _H	INT1	INT2	LOCK0 = 00 _H	LOCK1 = 00 _H
03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 06 _H	CC3 = 0F _H ¹⁾
04 _H	03 _H	13 _H	D1 _H	01 _H
05 _H	0F _H	54 _H	02 _H	65 _H
06 _H	6E _H	48 _H	65 _H	6C _H
07 _H	6C _H	6F _H	20 _H	77 _H
08 _H	6F _H	72 _H	6C _H	64 _H
09 _H	21 _H	FE _H	...	...
...
0F _H	D44	D45	D46	D47
10 _H	...	...	...	...
...
23 _H	...	...	...	...
24 _H	LOCK2	LOCK3	LOCK4	LOCK5
25 _H	Manufacturing data			

1) CC3 indicates the access capabilities of the data area

In this example, the settings for the static lock bytes LOCK0 and LOCK1 remain unchanged.

An NFC Forum™ device shall identify the READ-ONLY state of the NFC Forum™ Type 2 Tag platform.

For CC3 the higher nibble (0_H) indicates that read access is granted without any security; the lower nibble (F_H) controls the write access condition. Here: No write access is granted. The READ-ONLY state indicates a soft-lock only; physical locking of appropriate memory is done by setting dedicated bits within the LOCK bytes.

3 NFC Forum™ Type 2 Tag examples

3.2 Dynamic memory structure

The dynamic memory structure is defined for Tags with memory sizes bigger than 64 bytes.

3.2.1 Empty NDEF message in dynamic memory structure: State INITIALIZED

The example shows an NFC Forum™ Type 2 Tag in the INITIALIZED state with a dynamic memory structure with 32 data area block. It holds one lock control TLV, one memory control TLV, an empty NDEF message TLV and the terminator TLV.

Table 26 Dynamic memory structure - INITIALIZED state (based on SLE 66R16P)

NFC block address	Byte number within a block			
	0	1	2	3
00 _H	internal0	internal1	internal2	internal3
01 _H	internal4	internal5	internal6	internal7
02 _H	internal8	internal9	LOCK0 = 00 _H	LOCK1 = 00 _H
03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 7E _H	CC3 = 00 _H
04 _H	01 _H ¹⁾	03 _H	D0 _H	20 _H
05 _H	24 _H	02 _H ²⁾	03 _H	E0 _H
06 _H	2C _H	04 _H	03 _H ³⁾	00 _H
07 _H	FE _H ⁴⁾
08 _H	...			
...	...			
34 _H	DynLock2 = 00 _H	DynLock3 = 00 _H	DynLock4 = 00 _H	DynLock5 = 00 _H
35 _H	Reserved	Reserved	Reserved	Reserved
...	Reserved	Reserved	Reserved	Reserved
3F _H	Reserved	Reserved	Reserved	Reserved
40 _H	...			
...	...			
FF _H	...			

1) Start of lock control TLV

2) Start of memory control TLV

3) NDEF message TLV (here: Empty NDEF)

4) Terminator TLV

The internal bytes (internal0 - internal9) are reserved to hold application-specific internal data like a serial number or manufacturing data. The NFC Forum™ device shall not use it to store information data.

The static lock bytes LOCK0 and LOCK1 are set to 00_H indicating that the memory blocks are not locked.

Dynamic lock bytes (DynLock2 - DynLock5) are located in the data area.

The Capability Containers indicate:

- CC0 = E1_H: Present NDEF data inside the Tag
- CC1 = 10_H: Support of Version 1.0 of the NFC Forum™ Type 2 Tag specification

3 NFC Forum™ Type 2 Tag examples

- CC2 = 7E_H: 1008 bytes of memory for data (here: SLE 66R16P, Sector 0)
- CC3 = 00_H: Read and write access is granted without any security

The data area starts at block 04_H and holds the following four TLV blocks.

3.2.1.1 Lock control TLV

A lock control TLV provides details and control information about the lock area(s) like the location of the dynamic lock bytes, the number of dynamic lock bits.

- **T: 01_H** indicates the lock control TLV
- **L: 03_H** defines the length of the value field
- **V:** Indicates the position and size of the lock area
 - **D0_H**: Defines the position of the dynamic lock bytes inside the Tag
The higher nibble codes the 'PageAddr' by the number of pages (D_H)
The lower nibble codes the 'ByteOffset' within the page (0_H)
 - **20_H**: Coded as the number of bits. It indicates the size of the dynamic lock area in bits (here: 20_H to lock 32 data area blocks)
 - **24_H**: Page control information defines the size of a page and the number of bytes each dynamic lock bit is able to lock
The higher nibble codes the number of locked bytes: $2^{\text{BytesLockedPerLockBit_Index}} = 2^2 = 4$
The lower nibble codes the size of a page: $2^{\text{BytesPerPage}} = 2^4 = 16$

Using the settings within the lock control TLV an NFC Forum™ device may calculate the byte address of the dynamic lock area:

$$\text{ByteAddr} = \text{PageAddr} \times 2^{\text{BytesPerPage}} + \text{ByteOffset}$$

$$\text{ByteAddr} = D_H \times 2^4 + 0 \quad (1)$$

$$\text{ByteAddr} = 13 \times 16 = 208 (\text{BlockAddr} = 34_H)$$

So the dynamic lock area starts at byte 00_H of block 34_H and contains 32 dynamic lock bits, where every lock bit is able to lock 4 bytes within the data area.

3 NFC Forum™ Type 2 Tag examples

3.2.1.2 Memory control TLV

The memory control TLV provides control information about the reserved area(s); this data covers information about the location and the size of the reserved bytes.

- **T: 02_H** indicates the memory control TLV which identifies reserved memory areas
- **L: 03_H** defines the length of the value field
- **V:** Indicates the position of the reserved area and the number of reserved bytes
 - **E0_H:** Defines the position of the reserved bytes inside the Tag
The higher nibble codes the 'PageAddr' by the number of pages, the lower nibble codes the 'ByteOffset' within the page
 - **2C_H:** Coded as the number of bytes it indicates the size of the reserved area in bytes (here: 2C_H to reserve 44 bytes of memory)
 - **04_H:** Partial page control information indicates the size of a page ('BytesPerPage'); this information is coded to the lower nibble and the higher nibble is RFU

Using these settings within the memory control TLV an NFC Forum™ device may calculate the byte address of the reserved area:

$$\text{ByteAddr} = \text{PageAddr} \times 2^{\text{BytesPerPage}} + \text{ByteOffset}$$

$$\text{ByteAddr} = E_H \times 2^4 + 0 \quad (2)$$

$$\text{ByteAddr} = 14 \times 16 = 212 (\text{BlockAddr} = 35_H)$$

3.2.1.3 NDEF message TLV

The NDEF message TLV stores NDEF coded messages inside the value field.

- **T: 03_H** indicates the NDEF message
- **L: 00_H** defines the length of the stored NDEF message (here: empty NDEF)
- **V:** Not present

3.2.1.4 Terminator TLV

The terminator TLV is the last TLV block in the data area of an NFC Forum™ Type 2 Tag.

- **T: FE_H** indicates the terminator TLV
- **L:** Not present
- **V:** Not present

3.2.2 NDEF message in dynamic memory structure: State READ/WRITE, CC3 = 00_H

Based on the INITIALIZED NFC Forum™ Type 2 Tag configuration given in [Empty NDEF message in dynamic memory structure: State INITIALIZED](#) the following example shows an NFC Forum™ Type 2 Tag in READ/WRITE state with a dynamic memory structure, a NDEF message TLV and the terminator TLV.

3 NFC Forum™ Type 2 Tag examples

Table 27 Dynamic memory structure - INITIALIZED state (based on SLE 66R16P)

NFC block address	Byte number within a block			
	0	1	2	3
00 _H	internal0	internal1	internal2	internal3
01 _H	internal4	internal5	internal6	internal7
02 _H	internal8	internal9	LOCK0 = 00 _H	LOCK1 = 00 _H
03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 7E _H	CC3 = 00 _H
04 _H	01 _H	03 _H	D0 _H	20 _H
05 _H	24 _H	02 _H	03 _H	E0 _H
06 _H	2C _H	04 _H	03 _H ¹⁾	13 _H
07 _H	D1 _H	01 _H	0F _H	54 _H
08 _H	02 _H	64 _H	65 _H	48 _H
09 _H	65 _H	6C _H	6C _H	6F _H
0A _H	20 _H	77 _H	6F _H	72 _H
0B _H	6C _H	64 _H	21 _H	FE _H ²⁾
0C _H	...			
...	...			
34 _H	DynLock2 = 00 _H	DynLock3 = 00 _H	DynLock4 = 00 _H	DynLock5 = 00 _H
35 _H	Reserved	Reserved	Reserved	Reserved
...	Reserved	Reserved	Reserved	Reserved
3F _H	Reserved	Reserved	Reserved	Reserved
40 _H	...			
...	...			
FE _H	...			
FF _H	...			

1) Start of changed NDEF message record

2) Terminator TLV

Settings for the static lock bytes LOCK0 and LOCK1 and Capability Containers remain unchanged.

The data area starts at block 04_H and holds the unchanged values for lock control TLV and memory control TLV.

The NDEF message record is updated:

- NDEF message TLV
 - **T: 03_H** indicates the NDEF message
 - **L: 13_H** defines the length of the stored NDEF message
 - **V:** NDEF record holding the “Hello world!” payload according to the NFC Forum™ text record type definition

Note: The read-only state can be configured by setting the CC3 byte to 0F_H (“soft-lock”).

4 Details about my-d™ NFC

4 Details about my-d™ NFC

The following section focuses on my-d™ NFC and the available derivatives.

4.1 my-d™ NFC derivatives

The derivatives of the my-d™ NFC will be delivered with different settings to identify the chip. This information is programmed into the service area at manufacturing and cannot be modified. [Table 28](#) gives details on the chip variants.

Access to the memory can be executed with both the NFC Forum™ Type 2 Tag and the my-d™ command set.

Table 28 Chip variants of my-d™ NFC (memory sizes in bytes)

Chip type	Total memory size	Service area	User area (my-d™)	NFC memory size
SLE 66R16P	2560	24	2024	1024
SLE 66R32P	5120	24	4072	2048
SLE 66R64P	10240	24	8168	4096

The my-d™ NFC devices are available in UNINITIALIZED or in INITIALIZED configuration:

- In the UNINITIALIZED state the whole memory in the my-d™ data area is set to 00_H and the memory needs to be initialized before being used in an NFC Forum™ Type 2 Tag infrastructure. The NFC sector can be set up using NFC Forum™ commands to enter the INITIALIZED and/or READ/WRITE state. Please refer to [my-d™ NFC](#)
- In the INITIALIZED state the my-d™ NFC devices come with the Capability Container bytes programmed and an empty NDEF message in the first NFC Forum™ Type 2 Tag sector. [Table 45](#) shows the memory content of a SLE 66R16P chip in the INITIALIZED state. As long as this information is not locked (see [Block locking with my-d™ NFC](#)) the data may be overwritten to use the my-d™ NFC as plain, standard device again (= UNINITIALIZED state)

4.2 my-d™ NFC memory configuration

[Table 29](#), [Table 30](#) and [Table 31](#) show the default memory configuration of the my-d™ NFC devices. The whole memory is configured to be plain memory and the chip is in user mode.

Table 29 my-d™ NFC SLE 66R16P memory configuration

	my-d™ page address	Byte number within a page							
		0	1	2	3	4	5	6	7
my-d™ service area	0000 _H	my-d™ service area							
	0001 _H								
	0002 _H								

(table continues...)

4 Details about my-d™ NFC

Table 29 (continued) my-d™ NFC SLE 66R16P memory configuration

	my-d™ page address	Byte number within a page							
		0	1	2	3	4	5	6	7
my-d™ data area	0003 _H	my-d™ user data							
	0004 _H								
	...								
	007F _H								
	0080 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 0							
	...								
	...								
	...								
	00FF _H								

Table 30 my-d™ NFC SLE 66R32P memory configuration

	my-d™ page address	Byte number within a page							
		0	1	2	3	4	5	6	7
my-d™ service area	0000 _H	my-d™ service area							
	0001 _H								
	0002 _H								
my-d™ data area	0003 _H	my-d™ user data							
	0004 _H								
	...								
	...								
	00FF _H								
	0100 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 0							
	...								
	...								
	017F _H								
	0180 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 1 ¹⁾							
	...								
	...								
	01FF _H								

1) Sector 1 has to be selected with the 'sector select' command

4 Details about my-d™ NFC

Table 31 my-d™ NFC SLE 66R64P memory configuration

	my-d™ page address	Byte number within a page							
		0	1	2	3	4	5	6	7
my-d™ service area	0000 _H	my-d™ service area							
	0001 _H								
	0002 _H								
my-d™ data area	0003 _H	my-d™ user data							
	0004 _H								
	...								
	...								
	00FF _H								
	0100 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 0							
	...								
	...								
	017F _H								
	0180 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 1 ¹⁾							
	...								
	...								
	01FF _H								
	0200 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 2 ¹⁾							
	...								
	...								
	027F _H								
	0280 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 3 ¹⁾							
	...								
	...								
	02FF _H								
	0300 _H	my-d™ user area							
	...								
	...								
	037F _H								
	0380 _H	my-d™ user area							
	...								
	...								
	03FF _H								

1) Sector 1, 2 and 3 has to be selected with the 'sector select' command

4 Details about my-d™ NFC

The general memory organization consists of pages with 8 bytes each. In the dedicated Type 2 Tag memory area two 4 byte NFC memory blocks are mapped into one my-d™ page. Additionally, the my-d™ NFC provides an associated byte for each page to control read/write access (access condition byte, write-only).

The whole memory area (service area and user area) is accessible with the my-d™ command set. The given page address range is valid for the my-d™ command set.

The NFC Forum™ Type 2 Tag memory is mapped into the my-d™ data area; the start address of the dedicated NFC Forum™ Type 2 Tag memory depends on the chip variant (see [Table 35](#)). This portion of the memory is accessible with the NFC Forum™ Type 2 Tag command set.

my-d™ NFC provides for each page an associated byte to control read/write access.

4 Details about my-d™ NFC

Table 32 NFC Forum™ Type 2 Tag memory mapping (based on SLE 66R32P)

	NFC block address	Byte number within a block				my-d™ page address	Block reference	
		0	1	2	3			
	N/A ¹⁾	my-d™ service area and my-d™ user data				0000 _H		my-d™ address range
						0001 _H		
						...		
						00FF _H		
Type 2 Tag address range Sector 0	00 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 0				0100 _H	L ²⁾	
	01 _H						H ³⁾	
	02 _H					0101 _H	L	
	03 _H						H	
	
	
	FC _H					017E _H	L	
	FD _H						H	
	FE _H					017F _H	L	
	FF _H						H	
Type 2 Tag address range Sector 1	00 _H	Dedicated 1 KB NFC Forum™ Type 2 Tag memory Sector 1				0180 _H	L	my-d™ address range
	01 _H						H	
	02 _H					0181 _H	L	
	03 _H						H	
		
	...							
	FC _H					01FE _H	L	
	FD _H						H	
	FE _H					01FF _H	L	
	FF _H						H	

1) N/A ... not addressable with the NFC Forum™ Type 2 Tag command set

2) L ... even NFC block addresses references to byte 0 - 3 of a my-d™ page

- The lower nibble of the access byte controls the read/write access of the byte 0 - 3 of a my-d™ page

3) H ... odd NFC block addresses references to byte 4 - 7 of a my-d™ page

- The higher nibble of the access byte controls the read/write access of the byte 4 - 7 of a my-d™ page

4 Details about my-d™ NFC

4.2.1 my-d™ NFC service area

The service area is built-up with three my-d™ pages; they contain the unique chip ID (uid0 - uid6), the issuer tag (IT) and the chip information (CI).

This information shall be used to determine:

- Chip type including memory size
- Supported command set
- NFC memory configuration

Table 33 my-d™ NFC service area content

	my-d™ page address	Byte number within a page							
		0	1	2	3	4	5	6	7
Service area	0000 _H	88 _H ¹⁾	uid0 ²⁾	uid1 ³⁾	uid2	uid3	uid4	uid5	uid6
	0001 _H		IT ⁴⁾						
	0002 _H	CI ⁵⁾							

1) Cascade Tag = 88_H according to ISO/IEC 14443-3 Type A

2) Manufacturer ID

3) Chip family identifier

4) Issuer Tag

5) Chip information

The service area is outside the address range of the NFC Forum™ Type 2 Tag command set; to access the service area memory my-d™ commands have to be used. Writing to it is prohibited by the read-only access condition which is stored in the internal chip administration area.

The chip family identifier is available immediately after the anti-collision (page 0000_H); the chip manufacturer and the supported command set can be determined quickly.

Table 34 Chip family identification my-d™ NFC

UID field	Value	Description
uid0	05 _H	Manufacturer ID according to ISO/IEC 7816-6/AM1 [3]
uid1	20 _H ¹⁾	Identifies the support of the my-d™ and the NFC Forum™ Type 2 Tag command set Lower nibble: RFU and set to 0 _H

1) Please note that the lower nibble shall not be checked for chip family identification!

In order to determine the exact chip variant, it is necessary to select the chip (to read pages 0001_H and 0002_H). After selecting the my-d™ NFC chip memory access is possible for further operations.

The lower nibble of the issuer tag (IT) defines parts of the memory to be accessible with NFC Forum™ Type 2 Tag commands and the start address of the NFC sector.

Table 35 Issuer tag (IT) of my-d™ NFC

Issuer Tag (lower nibble)	Type	NFC sector start address	NFC memory size [bytes]	Highest page address
0010 _B	SLE 66R16P	0080 _H	1024	00FF _H
0100 _B	SLE 66R32P	0100 _H	2048	01FF _H
0100 _B	SLE 66R64P	0100 _H	4096	03FF _H

4 Details about my-d™ NFC

Table 36 Chip information (CI) of my-d™ NFC

Chip information ¹⁾	Type
11xx x100 _B	SLE 66R16P
11xx x100 _B	SLE 66R32P
11xx x110 _B	SLE 66R64P

1) Please note that bit [5:3] shall not be evaluated as this information may change for future revisions

For more details please refer to the my-d™ NFC extended datasheet.

4.3 Command sets

Table 37 and Table 38 list the commands which shall be used to set up the NFC sector in the my-d™ device. my-d™ NFC devices can be operated using the NFC Forum™ Type 2 Tag command set only within the whole life cycle of the NFC platform.

Table 37 NFC Forum™ Type 2 Tag command set

Command ¹⁾	Op-code	Comment	Address range
Sector select ²⁾	C2 _H	Sector selection	-
Read	30 _H	Reads 16 bytes of data	NFC sector, 00 _H - FF _H
Write	A2 _H	Writes 4 bytes of data	NFC sector, 00 _H - FF _H

1) Please refer to the NFC Forum™ Type 2 Tag specification [8] for detailed command descriptions

2) For variants with more than 1 KB of Type 2 Tag memory

It is recommended to use the my-d™ commands in order to clearly identify the chip type. This information is necessary to realize correct block locking within the my-d™ NFC devices. NFC memory block can only be physically locked with the my-d™ write byte command.

Table 38 my-d™ NFC command set

Command ¹⁾	Op-code	Comment
my-d™ read	10 _H	Reads data from one page (8 bytes)
my-d™ write	30 _H	Writes data to one page (8 bytes)
my-d™ write byte	E0 _H	Write data to the specified byte within a page

1) Please refer to the my-d™ NFC extended datasheet for detailed command descriptions

4 Details about my-d™ NFC

4.3.1 my-d™ read

The my-d™ read command reads 8 bytes of the memory (one page) if the access condition permits a read access.

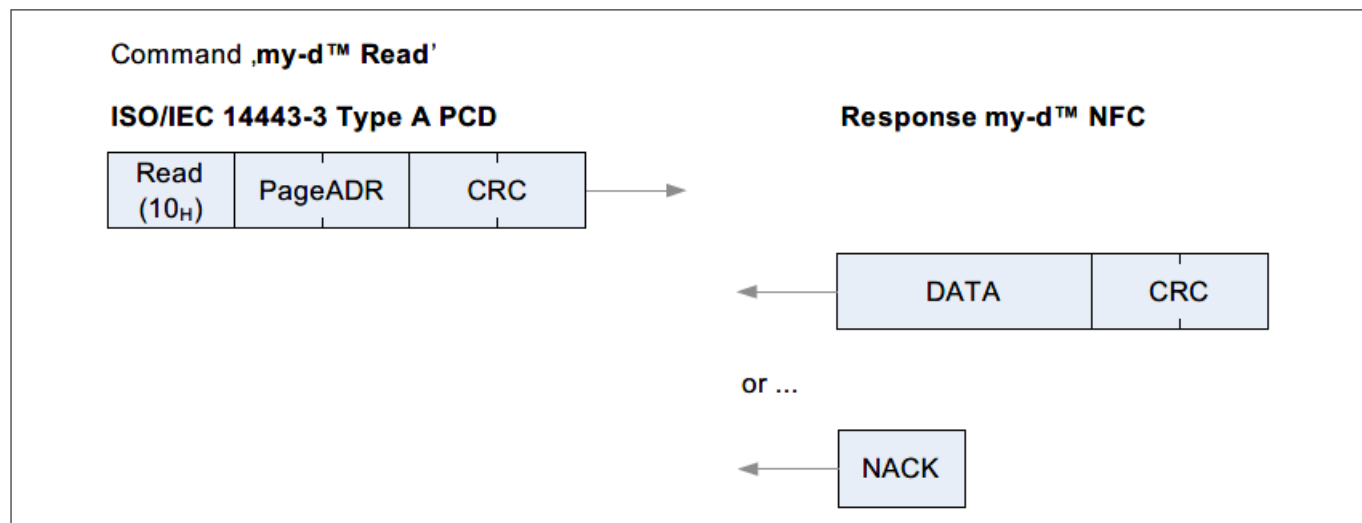


Figure 6 my-d™ read command

Table 39 'my-d™ read' command parameters

Name	Length ¹⁾	Remark
Read	1	Command opcode: 10 _H
PageADR ²⁾	2	Page address to be read The valid address range depends on product variant: <ul style="list-style-type: none"> SLE 66R16P: 0000_H - 00FF_H SLE 66R32P: 0000_H - 01FF_H SLE 66R64P: 0000_H - 03FF_H
CRC	2	CRC

1) Length of parameter field in [byte(s)]

2) Lower byte sent first

Table 40 'my-d™ read' command response parameters

Name	Length	Remark
DATA	8	Page content
CRC	2	CRC
or		
NACK	1	Error on read command: Replied without CRC

4 Details about my-d™ NFC

4.3.2 my-d™ write

The my-d™ write command writes data to the specified page (8 bytes).

In case of successful programming the my-d™ chip sends back an acknowledge. In case of an error or if the access conditions do not allow to write a “not acknowledge” will be returned to the PCD.

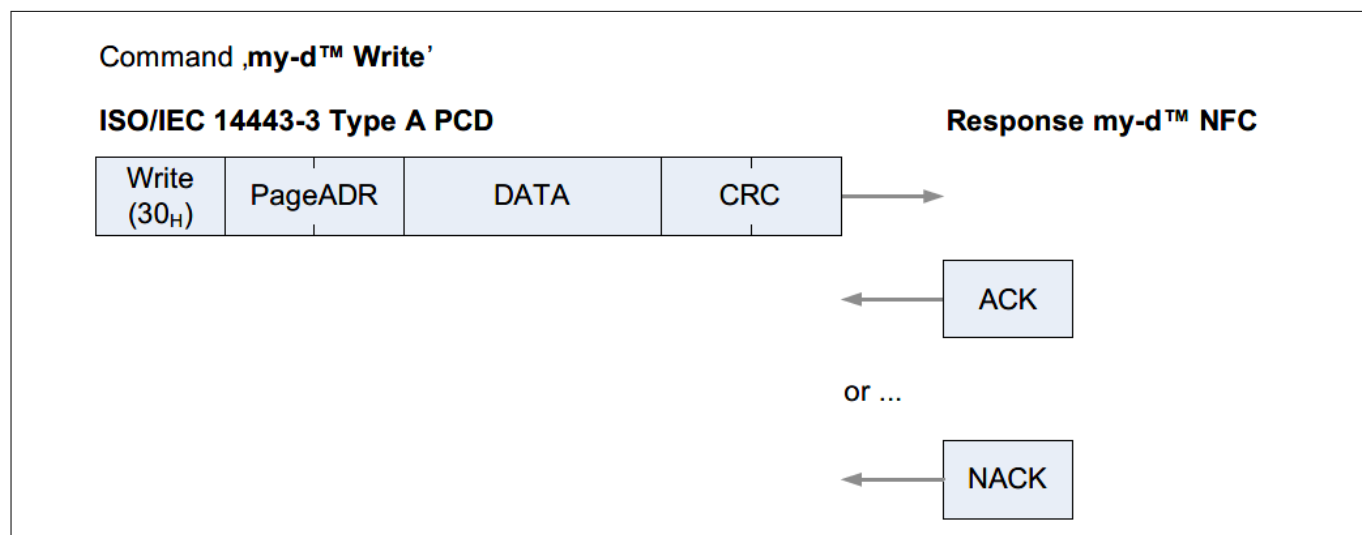


Figure 7 my-d™ write command

Table 41 'my-d™ write' command parameters

Name	Length ¹⁾	Remark
Write	1	Command opcode: 30 _H
PageADR ²⁾	2	Page address to be written The valid address range depends on product variant: <ul style="list-style-type: none"> SLE 66R16P: 0000_H - 00FF_H SLE 66R32P: 0000_H - 01FF_H SLE 66R64P: 0000_H - 03FF_H
DATA	8	Data to be written
CRC	2	CRC

1) Length of parameter field in [byte(s)]

2) Lower byte sent first

Table 42 'my-d™ write' command response parameters

Name	Length	Remark
ACK	1	Write successful: Replied without CRC
NACK	1	Error on write command: Replied without CRC

4 Details about my-d™ NFC

4.3.3 my-d™ write byte

The my-d™ write byte command writes the data to the specified byte in the specified page. This command shall be used to modify the access condition of a page.

In case of successful programming the chip sends back an acknowledge frame.

In case of an error or if the access condition does not allow the access a “not acknowledge” frame will be send back to the PCD. Please note that the only possible access condition for the execution of this command is READ/WRITE (A_H).

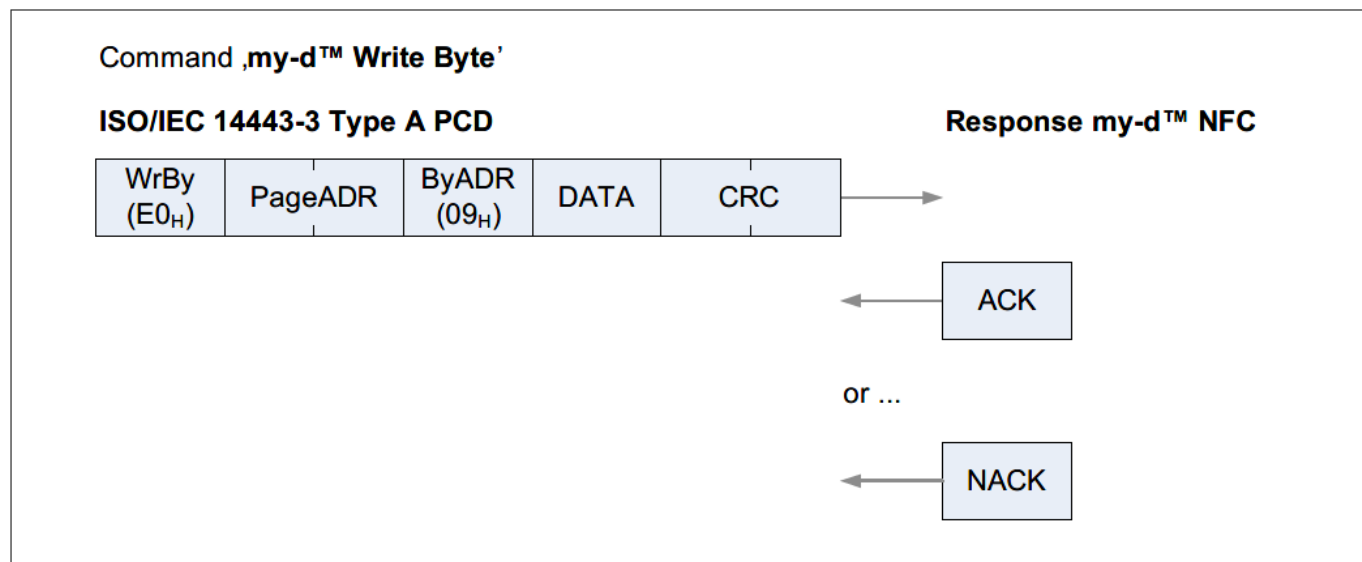


Figure 8 my-d™ write byte command

Table 43 'my-d™ write byte' command parameters

Name	Length ¹⁾	Remark
WrBy	1	Command opcode: E0 _H
PageADR ²⁾	2	Page address to be written The valid address range depends on product variant: <ul style="list-style-type: none"> SLE 66R16P: 0000_H - 00FF_H SLE 66R32P: 0000_H - 01FF_H SLE 66R64P: 0000_H - 03FF_H
ByADR	1	Byte address within a page; valid address range: 00 _H - 09 _H ByADR must be set to 09 _H (address of access condition byte)
DATA	1	Data to be written
CRC	2	CRC

1) Length of parameter field in [byte(s)]

2) Lower byte sent first

Table 44 'my-d™ write byte' command response parameters

Name	Length	Remark
ACK	1	Write successful: Replied without CRC
NACK	1	Error on write command: Replied without CRC

4 Details about my-d™ NFC

4.4 Block locking with my-d™ NFC

In the INITIALIZED state the my-d™ NFC chips come with the Capability Container bytes programmed and an empty NDEF message in the first NFC Forum™ Type 2 Tag sector.

Some applications may require to lock blocks in the NFC Forum™ Type 2 Tag user data area without changing the setting of the Capability Container to READ-ONLY (CC3 - read and write access capability).

my-d™ NFC offers irreversible block locking. This feature can be used by accessing the internal administration area memory of the chip. This portion of the memory can only be addressed with the my-d™ command set (listed in [Table 38](#)).

In order to correctly address the administration area it is necessary to determine the exact chip type: For this reason, the my-d™ read command has to be used as the service area holding this information cannot be read with the NFC Forum™ Type 2 Tag command set to retrieve the information.

[Figure 9](#) illustrates the sequence to determine the chip type.

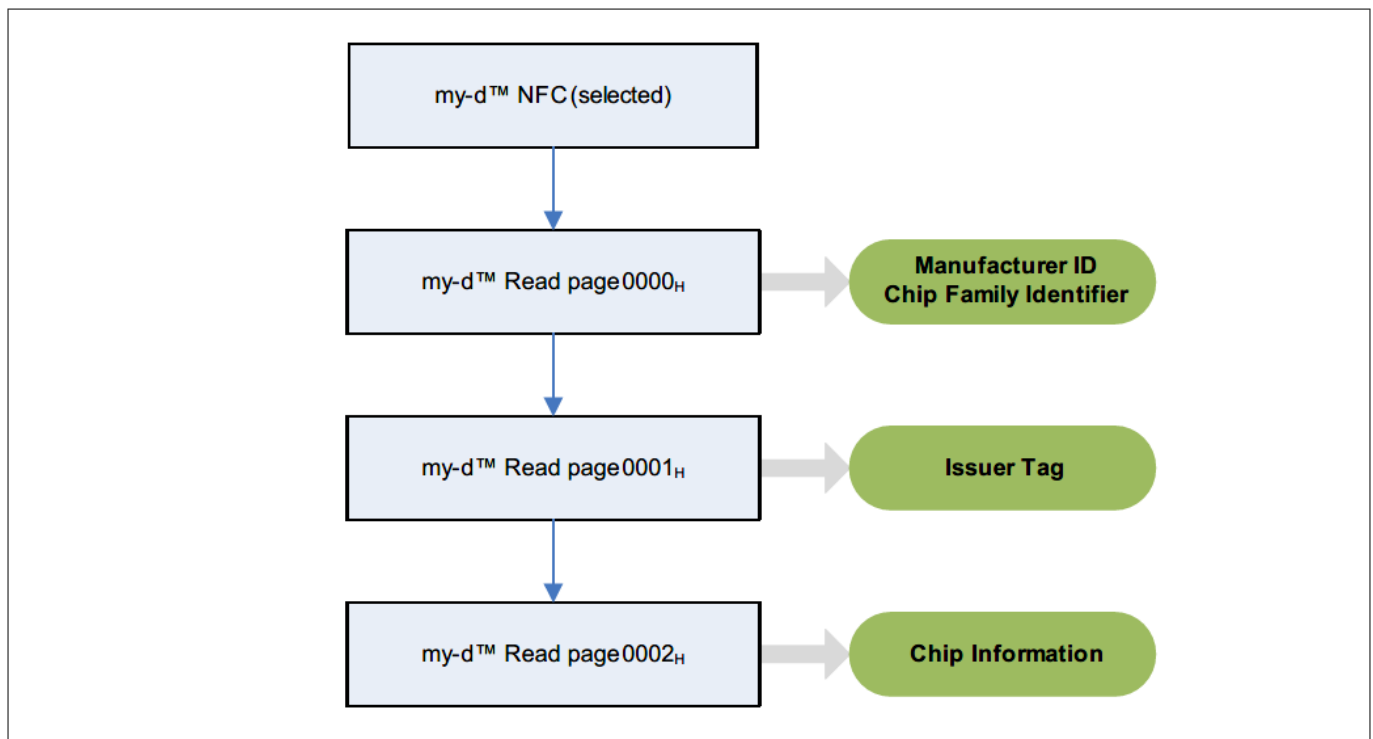


Figure 9 Chip type determination

After reading pages 0000_H to 0002_H the chip type, memory size and the start address of the NFC sector are identified.

To lock a block it is necessary to access the internal administration area to modify the access condition. For this reason, the my-d™ write byte command has to be used. The default setting of the access condition allows READ/WRITE access.

As two NFC Forum™ Type 2 Tag blocks are mapped into one my-d™ page also the access condition is split into two parts; each nibble defines the access rights for a single Type 2 Tag block. The lower nibble of the access condition determines the access rights for the block with the even block address, whereas the block when the odd address is controlled by the higher nibble of the access condition of the corresponding my-d™ page.

[Table 45](#) shows the mapping of the NFC Forum™ Type 2 Tag memory blocks into the my-d™ pages. It includes also the content of the my-d™ service area, but this memory portion is outside the Type 2 Tag address range. Furthermore, the allocation of the access condition to my-d™ pages respectively NFC Forum™ Type 2 Tag memory blocks are listed.

4 Details about my-d™ NFC

Table 45 NFC Forum™ Type 2 Tag memory mapping (based on SLE 66R16P)

	NFC block address	Byte number within a block				my-d™ page address	Block reference	
		0	1	2	3			
	N/A	88 _H	05 _H ¹⁾	20 _H ²⁾	uid2	0000 _H	L	my-d™ address range
		uid3	uid4	uid5	uid6		H	
		...	IT ³⁾	0001 _H	L	
		...	...	...	...		H
		CI ⁴⁾	0002 _H	L	
		...	...	...	...		H
		my-d™ user data				0003 _H	L	
						H		
						
						
						007F _H	L	
						H		
Type 2 Tag address range	00 _H	Internal0	Internal1	Internal2	Internal3	0080 _H	L	
	01 _H	Internal4	Internal5	Internal6	Internal7		H	
	02 _H	Internal8	Internal9	LOCK0 = 00 _H	LOCK1 = 00 _H	0081 _H	L	
	03 _H	CC0 = E1 _H	CC1 = 10 _H	CC2 = 7E _H	CC3 = 00 _H		H	
	04 _H	03 _H	00 _H	FE _H	0082 _H	L		
	05 _H					H		
		
		
	FE _H				00FF _H	L		
	FF _H					H		

- 1) Manufacturer ID
2) Chip family identifier
3) Issuer Tag
4) Chip information

The access condition for every my-d™ memory page is stored in the internal administration area of the my-d™ NFC chip. It is located at byte 09_H on any my-d™ page. [Table 46](#) defines the available access rights. Please be aware that any value different from A_H or 6_H prevents any access to the corresponding block. [Important notes](#) summarizes the considerations for my-d™ NFC devices.

Table 46 Access conditions and access rights

Access condition ¹⁾	Access right byte 0 - 3 (even block)	Access right byte 4 - 7 (odd block)
AA _H	READ/WRITE	READ/WRITE

(table continues...)

4 Details about my-d™ NFC

Table 46 (continued) Access conditions and access rights

Access condition ¹⁾	Access right byte 0 - 3 (even block)	Access right byte 4 - 7 (odd block)
A6 _H	READ/WRITE	READ-ONLY
6A _H	READ-ONLY	READ/WRITE
66 _H	READ-ONLY	READ-ONLY
Any other value	Invalid	Invalid

1) Access condition value A6_H and 66_H lock the internal access condition

4.5 Important notes

In order to prevent problems using the Type 2 Tag memory within my-d™ NFC it is important to consider the following:

- Access conditions can only be changed with my-d™ commands and not with Type 2 Tag commands
- To write-protect a certain Type 2 Tag block, the access condition in the lower nibble (for even pages) or the higher nibble (for odd pages) of the corresponding my-d™ page has to be set to 6_H (READ-ONLY)
- Any access conditions other than A_H or 6_H prevent access to the Type 2 Tag memory
- The lower nibble of the access condition byte defines the access right for all my-d™ commands. If the lower nibble is set to 6_H, it is not possible to change the data content or the access condition anymore. Therefore, by programming the access condition byte to A6_H, page data bytes 0 to 3 are set to READ-ONLY whereas page data bytes 4 to 7 allow READ/WRITE access using the NFC command set
- LOCK0 and LOCK1 values have to be programmed by the issuer/user and have no influence on the memory access rights of the Type 2 Tag memory. The memory can be altered with as long as the access condition allows the execution of the command
- my-d™ write byte command shall only be used with the byte address parameter set to 09_H. Any other value may change unintentionally the Type 2 Tag memory content or the access condition. Access to certain blocks in the memory may be disrupted

References

ISO/IEC

- [1] ISO/IEC 14443-3:2016: *Identification cards - Contactless integrated circuit cards - Proximity cards - Part 3: Initialization and anticollision (Third edition)*; 2016-06
- [2] ISO/IEC 14443-3:2018: *Cards and security devices for personal identification – Contactless proximity objects – Part 3: Initialization and anticollision (Fourth edition)*; 2018-07
- [3] ISO/IEC 7816-6:2016: *Identification cards - Integrated circuit cards - Part 6: Interindustry data elements for interchange (Third edition)*; 2016-06

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- [4] Infineon Technologies': *my-d™ move and my-d™ move NFC; extended datasheet (Revision 3.0)*; 2021-12-21
- [5] Infineon Technologies': *my-d™ move lean and my-d™ move lean NFC; extended datasheet (Revision 3.0)*; 2021-12-21
- [6] Infineon Technologies': *my-d™ NFC; extended datasheet (Revision 1.0 or later)*; 2019-02-11

NFC Forum™

- [7] NFC Forum: *Type 2 Tag Operation Specification*
- [8] NFC Forum: *Type 2 Tag Technical Specification (Version 1.2 and Version 1.1)*

Glossary

CC

Capability Container (CC)

CRC

cyclic redundancy check (CRC)

A procedure that uses a checksum to check the validity of a data transfer.

IEC

International Electrotechnical Commission (IEC)

The international committee responsible for drawing up electrotechnical standards.

ISO

International Organization for Standardization (ISO)

NDEF

NFC data exchange format (NDEF)

NFC

near field communication (NFC)

RFU

reserved for future use (RFU)

TLV

tag length value (TLV)

UID

unique identifier (UID)

Revision history

Revision history

Reference	Description
Revision 3.0, 2022-03-10	
All	<ul style="list-style-type: none">• Migrated to latest IFX template and updated editorial changes• Added SLE 66R01LN, SLE 66R64P and updated References list
Revision 2.0, 2011-11-14	
All	Added information about SLE 66R01PN (my-d™ move NFC)
Revision 1.0, 2011-10-06	
All	Initial release

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