# MF3ICDx21_41_81

## MIFARE DESFire EV1 contactless multi-application IC

## 1. General description

MIFARE DESFire EV1 (MF3ICD(H) 21/41/81), a Common Criteria (EAL4+) certified product, is ideal for service providers wanting to use secure multi-application smart cards in public transport schemes, access managment or closed-loop e-payment applications. It is fully complies with the requirements for fast and highly secure data transmission, flexible memory organization and interoperability with existing infrastructure.

MIFARE DESFire EV1 is based on open global standards for both air interface and cryptographic methods. It is compliant to all 4 levels of ISO/IEC 14443A and uses optional ISO/IEC 7816-4 commands.

Featuring an on-chip backup management system and the mutual three pass authentication, a MIFARE DESFire EV1 card can hold up to 28 different applications and 32 files per application. The size of each file is defined at the moment of its creation, making MIFARE DESFire EV1 a truly flexible and convenient product.

Additionally, an automatic anti-tear mechanism is available for all file types, which guarantees transaction oriented data integrity. With MIFARE DESFire EV1, data transfer rates up to 848 kbit/s can be achieved, allowing fast data transmission.

The main characteristics of this device are denoted by its name "DESFire": DES indicates the high level of security using a 3DES or AES hardware cryptographic engine for enciphering transmission data and Fire indicates its outstanding position as a fast, innovative, reliable and secure IC in the contactless proximity transaction market. Hence, MIFARE DESFire EV1 brings many benefits to end users. Cardholders can experience convenient contactless ticketing while also having the possibility to use the same device for related applications such as payment at vending machines, access control or event ticketing. In other words, the MIFARE DESFire EV1 silicon solution offers enhanced consumer-friendly system design, in combination with security and reliability.

MIFARE DESFire EV1 delivers the perfect balance of speed, performance and cost efficiency. Its open concept allows future seamless integration of other ticketing media such as smart paper tickets, key fobs, and mobile ticketing based on Near Field Communication (NFC) technology. It is also fully compatible with the existing MIFARE reader hardware platform. MIFARE DESFire EV1 is your ticket to contactless systems worldwide.

# 2. Features and benefits

## 2.1 RF interface: ISO/IEC 14443 Type A

- Contactless transmission of data and powered by the RF-field (no battery needed)
- Operating distance: up to 100 mm (depending on power provided by the PCD and antenna geometry)
- Operating frequency: 13.56 MHz
- Fast data transfer: 106 kbit/s, 212 kbit/s, 424 kbit/s, 848 kbit/s
- High data integrity: 16/32 bit CRC, parity, bit coding, bit counting
- True deterministic anticollision
- 7 bytes unique identifier (cascade level 2 according to ISO/IEC 14443-3 and option for random ID)
- Uses ISO/IEC 14443-4 protocol

## 2.2 ISO/IEC 7816 compatibility

- Supports ISO/IEC 7816-3 APDU message structure
- Supports ISO/IEC 7816-4 INS code 'A4' for SELECT FILE
- Supports ISO/IEC 7816-4 INS code 'B0' for READ BINARY
- Supports ISO/IEC 7816-4 INS code 'D6' for UPDATE BINARY
- Supports ISO/IEC 7816-4 INS code 'B2' for READ RECORDS
- Supports ISO/IEC 7816-4 INS code 'E2' for APPEND RECORD
- Supports ISO/IEC 7816-4 INS code '84' for GET CHALLENGE
- Supports ISO/IEC 7816-4 INS code '88' for INTERNAL AUTHENTICATE
- Supports ISO/IEC 7816-4 INS code '82' for EXTERNAL AUTHENTICATE

## 2.3 Non-volatile memory

- 2 kB or 4 kB or 8 kB NV-Memory
- Data retention of 10 years
- Write endurance typcial 500 000 cycles

## 2.4 NV-memory organization

- Flexible file system
- Up to 28 applications simultaneously on one PICC
- Up to 32 files in each application (standard data file, back-up data file, value file, linear record file and cyclic record file)
- File size is determined during creation

## 2.5 Security

- Common Criteria Certification: EAL4+ (Hardware and Software)
- Unique 7 bytes serial number for each device
- Optional "RANDOM" ID for enhance security and privacy
- Mutual three pass authentication
- Mutual authentication according to ISO/IEC 7816-4

- 1 card master key and up to 14 keys per application
- Hardware DES using 56/112/168 bit keys featuring key version, data authenticity by 8 byte CMAC
- Hardware AES using 128-bit keys featuring key version, data authenticity by 8 byte CMAC
- Data encryption on RF-channel
- Authentication on application level
- Hardware exception sensors
- Self-securing file system
- Backward compatibility to MF3ICD40: 4 byte MAC, CRC 16

## 2.6 Special features

- Transaction oriented automatic anti-tear mechanism
- Configurable ATS information for card personalisation
- Backward compatibility mode to MF3ICD40
- Optional high input capacitance (70pF) for small form factor design (MF3ICDH 21/41/81)

## 3. Applications

- Advanced public transportation schema
- Highly secure access management
- Closed-loop e-payment scheme
- Event ticketing
- eGovernment applications

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# 4. Quick reference data

**Table 1. Quick reference data [1][2]**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------|-----|-----|-----|------|
| $f_i$ | input frequency | | - | 13.56 | - | MHz |
| $C_i$ | input capacitance for MF3ICD21/41/81 | $T_{amb} = 22$ °C; $f_i = 13.56$ MHz; 2.8 V RMS | [3] 14.96 | 17.0 | 19.04 | pF |
| | input capacitance for MF3ICDH21/41/81 | | 64 | 69 | 74 | pF |
| **EEPROM characteristics** | | | | | | |
| $t_{ret}$ | retention time | $T_{amb} = 22$ °C | 10 | - | - | year |
| $N_{endu(W)}$ | write endurance | $T_{amb} = 22$ °C | 200000 | 500000 | - | cycle |
| $t_{cy(W)}$ | write cycle time | $T_{amb} = 22$ °C | - | 2.9 | - | ms |

[1] Stresses above one or more of the values may cause permanent damage to the device.

[2] Exposure to limiting values for extended periods may affect device reliability.

[3] Measured with LCR meter.

# 5. Ordering information

**Table 2. Ordering information**

| Type number | Package | | |
|-------------|---------|--|--|
| | **Name** | **Description** | **Version** |
| MF3ICD8101DUD/05 | FFC | 8 inch wafer (sawn; 120 µm thickness, on film frame carrier; electronic fail die marking according to SECSII format); see Ref. 4, 8K EEPROM, 17pF input capacitance | - |
| MF3ICD4101DUD/05 | FFC | 8 inch wafer (sawn; 120 µm thickness, on film frame carrier; electronic fail die marking according to SECSII format); see Ref. 4, 4K EEPROM, 17pF input capacitance | - |
| MF3ICD2101DUD/05 | FFC | 8 inch wafer (sawn; 120 µm thickness, on film frame carrier; electronic fail die marking according to SECSII format); see Ref. 4, 2K EEPROM, 17pF input capacitance | - |
| MF3ICDH8101DUD/05 | FFC | 8 inch wafer (sawn; 120 µm thickness, on film frame carrier; electronic fail die marking according to SECSII format); see Ref. 5, 8K EEPROM, 70pF input capacitance | - |
| MF3ICDH4101DUD/05 | FFC | 8 inch wafer (sawn; 120 µm thickness, on film frame carrier; electronic fail die marking according to SECSII format); see Ref. 5, 4K EEPROM, 70pF input capacitance | - |
| MF3ICDH2101DUD/05 | FFC | 8 inch wafer (sawn; 120 µm thickness, on film frame carrier; electronic fail die marking according to SECSII format); see Ref. 5, 2K EEPROM, 70pF input capacitance | - |
| MF3MOD8101DA4/05 | PLLMC[1] | plastic leadless module carrier package; 35 mm wide tape; see Ref. 6, 8K EEPROM, 17pF input capacitance | SOT500-2 |
| MF3MOD4101DA4/05 | PLLMC[1] | plastic leadless module carrier package; 35 mm wide tape; see Ref. 6, 4K EEPROM, 17pF input capacitance | SOT500-2 |
| MF3MOD2101DA4/05 | PLLMC[1] | plastic leadless module carrier package; 35 mm wide tape; see Ref. 6, 2K EEPROM, 17pF input capacitance | SOT500-2 |

**Table 2.    Ordering information** …continued

| Type number | Package | | | |
|---|---|---|---|---|
| | **Name** | **Description** | | **Version** |
| MF3MODH8101DA4/05 | PLLMC[1] | plastic leadless module carrier package; 35 mm wide tape; see Ref. 6, 8K EEPROM, 70pF input capacitance | | SOT500-2 |
| MF3MODH4101DA4/05 | PLLMC[1] | plastic leadless module carrier package; 35 mm wide tape; see Ref. 6, 4K EEPROM, 70pF input capacitance | | SOT500-2 |
| MF3MODH2101DA4/05 | PLLMC[1] | plastic leadless module carrier package; 35 mm wide tape; see Ref. 6, 2K EEPROM, 70pF input capacitance | | SOT500-2 |

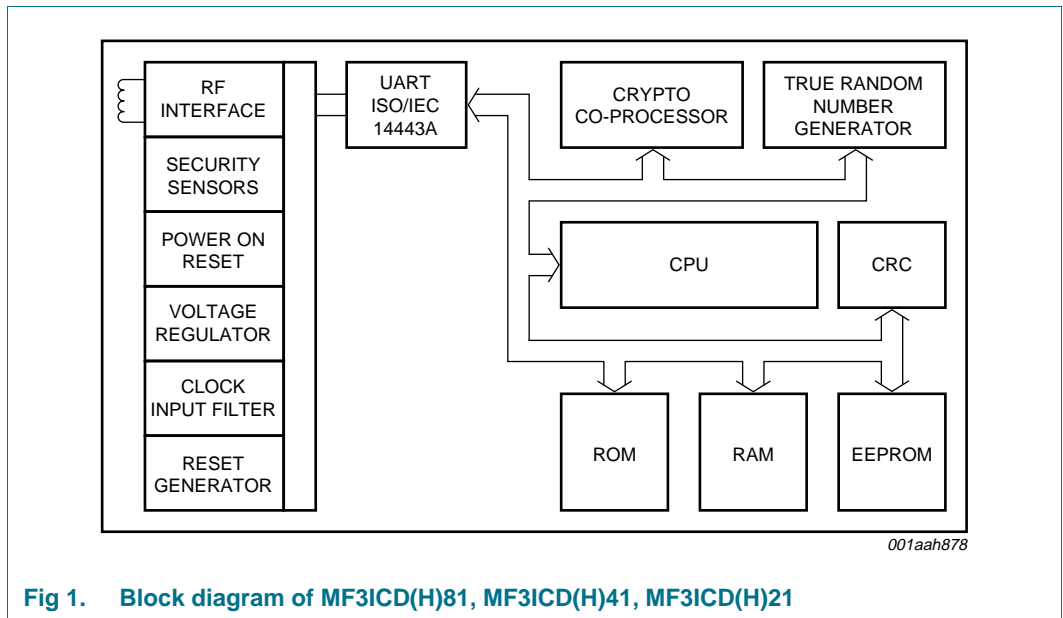[1]    This package is also known as MOA4.

# 6.  Block diagram



**Fig 1.    Block diagram of MF3ICD(H)81, MF3ICD(H)41, MF3ICD(H)21**

# 7. Limiting values

**Table 3.    Limiting values** [1][2]

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $I_I$ | input current | | - | 30 | mA |
| $P_{tot}$/pack | total power dissipation per package | | - | 200 | mW |
| $T_{stg}$ | storage temperature | | −55 | 125 | °C |
| $T_{amb}$ | ambient temperature | | −25 | 70 | °C |
| $V_{ESD}$ | electrostatic discharge voltage | [3] | 2 | - | kV |
| $I_{lu}$ | latch-up current | | ±100 | - | mA |

[1]    Stresses above one or more of the limiting values may cause permanent damage to the device.

[2]    Exposure to limiting values for extended periods may affect device reliability.

[3]    MIL Standard 883-C method 3015; human body model: C = 100 pF, R = 1.5 kΩ.

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# 8. Functional description

## 8.1 Contactless energy and data transfer

In the MIFARE system, the MIFARE DESFire EV1 is connected to a coil consisting of a few turns embedded in a standard ISO/IEC smart card (see Ref. 8). A battery is not needed. When the card is positioned in the proximity of the PCD antenna, the high speed RF communication interface allows data to be transmitted up to 848 kbit/s.

## 8.2 Anti-collision

An intelligent anti-collision mechanism allows more than one MIFARE DESFire EV1 in the field to be handled simultaneously. The anti-collision algorithm selects each MIFARE DESFire EV1 individually and ensures that the execution of a transaction with a selected MIFARE DESFire EV1 is performed correctly without data corruption resulting from other MIFARE DESFire EV1s in the field.

## 8.3 UID/serial number

The unique 7 byte (UID) is programmed into a locked part of the NV memory which is reserved for the manufacturer. Due to security and system requirements these bytes are write-protected after being programmed by the IC manufacturer at production time. According to ISO/IEC 14443-3 (see Ref. 12) during the first anti-collision loop the cascade tag returns a value of 88h and also the first 3 bytes of the UID, UID0 to UID2 and BCC. The second anti-collision loop returns bytes UID3 to UID6 and BCC.

UID0 holds the manufacturer ID for NXP (04h) according to ISO/IEC 14443-3 and ISO/IEC 7816-6 AMD 1.

MIFARE DESFire EV1 also allows Random ID to be used. In this case MIFARE DESFire EV1 only uses a single anti-collision loop. The 3 byte random number is generated after RF reset of the MIFARE DESFire EV1.

## 8.4 Memory organization

The 2/4/8 KB NV memory is organized using a flexible file system. This file system allows a maximum of 28 different applications on one MIFARE DESFire EV1. Each application provides up to 32 files. Every application is represented by its 3 bytes Application IDentifier (AID).

Five different file types are supported; see Section 8.5.

A guideline to assign MIFARE DESFire AIDs can be found in the application note *MIFARE Application Directory* (MAD); see Ref. 9.

Each file can be created either at MIFARE DESFire EV1 initialization (card production/card printing), at MIFARE DESFire EV1 personalization (vending machine) or in the field.

If a file or application becomes obsolete in operation, it can be permanently invalidated.

Commands which have impact on the file structure itself (e.g. creation or deletion of applications, change of keys) activate an automatic rollback mechanism, which protects the file structure from being corrupted.

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If this rollback is necessary, it is done without user interaction before carrying out further commands. To ensure data integrity on application level, a transaction-oriented backup is implemented for all file types with backup. It is possible to mix file types with and without backup within one application.

As the commands are the same for MF3ICD(H)81, MF3ICD(H)41 and MF3ICD(H)21, the command details are available in Ref. 1. Only the memory size and input capacitance are different between the devices.

## 8.5 Available file types

The files within an application can be any of the following types:

- Standard data files
- Backup data files
- Value files with backup
- Linear record files with backup
- Cyclic record files with backup

## 8.6 Security

The 7 byte UID is fixed, programmed into each device during production. It cannot be altered and ensures the uniqueness of each device.

The UID may be used to derive diversified keys for each ticket. Diversified MIFARE DESFire EV1 keys contribute to gain an effective anti-cloning mechanism and increase the security of the original key; see Ref. 7.

Prior to data transmission a mutual three pass authentication can be done between MIFARE DESFire EV1 and PCD depending on the configuration employing either 56-bit DES (single DES, DES), 112-bit 3DES (triple DES, 2K3DES), 168-bit 3DES (3 key triple DES, 3K3DES) or AES. During the authentication the level of security of all further commands during the session is set. In addition the communication settings of the file/application result in the following options of secure communication between MIFARE DESFire EV1 and PCD:

- Plain data transfer (only possible within the backwards-compatible mode to MF3ICD40)
- Plain data transfer with cryptographic checksum (MAC): Authentication with backwards-compatible mode to MF3ICD40: 4 byte MAC, all other authentications based on DES/3DES/AES: 8 byte CMAC
- Encrypted data transfer (secured by CRC before encryption): Authentication with backwards-compatible mode to MF3ICD40: A 16-bit CRC is calculated over the stream and attached. The resulting stream is encrypted using the chosen cryptographic method. All other authentications based DES/3DES/AES: A 32-bit CRC is calculated over the stream and attached. The resulting stream is encrypted using the chosen cryptographic method.

Find more information on the security concept of the product in Ref. 1. Be aware not all levels of security are recommended. The recommended secure handling of the product can be seen in Ref. 2 and in Ref. 11.

## 9. DESFire command set

A detailed description of all commands is provided in Ref. 1.

### 9.1 ISO/IEC 14443-3

**Table 4.    ISO/IEC 14443-3**

| Command | Description |
|---|---|
| REQA | REQA and ATQA are implemented fully according to ISO/IEC 14443-3 |
| WUPA | WUPA is implemented fully according to ISO/IEC 14443-3 |
| ANTICOLLISION/SELECT Cascade Level 1 | ANTICOLLISION and SELECT commands are implemented fully according to ISO/IEC 14443-3; the response is part 1 of the UID |
| ANTICOLLISION/SELECT Cascade Level 2 | ANTICOLLISION and SELECT commands are implemented fully according to ISO/IEC 14443-3; the response is part 2 of the UID |
| HALT | brings MIFARE DESFire EV1 to the HALT state |

### 9.2 ISO/IEC 14443-4

**Table 5.    ISO/IEC 14443-4**

| Command | Description |
|---|---|
| RATS | identifies the MIFARE DESFire EV1 type to the PCD |
| PPS | allows individual selection of the communication baud rate between PCD and MIFARE DESFire EV1; for DESFire it is possible to set different communication baud rates for each direction i.e. DESFire allows a non-symmetrical information interchange speed. |
| WTX | if the MIFARE DESFire EV1 needs more time than the defined FWT to respond to a PCD command it requests a Waiting Time eXtension (WTX) |
| DESELECT | allows MIFARE DESFire EV1 to be brought to the HALT state |

## 9.3 MIFARE DESFire EV1 command set overview – security related commands

**Table 6. Security related commands**

| Command | Description |
|---|---|
| Authenticate | MIFARE DESFire EV1 and the reader device show in an encrypted way that they possess the same secret which especially means the same key; this not only confirms that both entities are permitted to perform operations on each other but also creates a session key which can be used to keep the further communication path secure; as the name "session key" implicitly indicates, each time a new authentication procedure is successfully completed a new key for further cryptographic operations is generated |
| Change KeySettings | changes the master key settings on MIFARE DESFire EV1 and application level |
| Set Configuration | configures the card and pre-personalizes the card with a key, defines if the UID or the random ID is sent back during communication setup and configures the ATS string |
| Change Key | changes any key stored on the MIFARE DESFire EV1 |
| Get Key Version | reads out the current key version of any key stored on the MIFARE DESFire EV1 |

**Remark:** All command and data frames are exchanged between MIFARE DESFire EV1 and PCD by using block format as defined in ISO/IEC 14443-4.

## 9.4 MIFARE DESFire EV1 command set overview – MIFARE DESFire EV1 level commands

**Table 7. Level commands**

| Command | Description |
|---|---|
| Create Application | creates new applications on the MIFARE DESFire EV1 |
| Delete Application | permanently deactivates applications on the MIFARE DESFire EV1 |
| Get Applications IDs | returns the Application IDentifiers of all applications on a MIFARE DESFire EV1 |
| Free Memory | returns the free memory available on the card |
| GetDFNames | returns the DF names |
| Get KeySettings | gets information on the MIFARE DESFire EV1 and application master key settings; in addition it returns the maximum number of keys which are configured for the selected application |
| Select Application | selects one specific application for further access |
| FormatMF3ICD81 | releases the MF3ICD81 user memory |
| Get Version | returns manufacturing related data of the MIFARE DESFire EV1 |
| GetCardUID | returns the UID |

**Remark:** All command and data frames are exchanged between MIFARE DESFire EV1 and PCD by using block format as defined in ISO/IEC 14443-4.

## 9.5 MIFARE DESFire EV1 command set overview – application level commands

**Table 8.    Application level commands**

| Command | Description |
|---|---|
| Get FileIDs | returns the File IDentifiers of all active files within the currently selected application |
| Get FileSettings | gets information on the properties of a specific file |
| Change FileSettings | changes the access parameters of an existing file |
| Create StdDataFile | creates files for the storage of plain unformatted user data within an existing application on the MIFARE DESFire EV1 |
| Create BackupDataFile | creates files for the storage of plain unformatted user data within an existing application on the MIFARE DESFire EV1, additionally supporting the feature of an integrated backup mechanism |
| Create ValueFile | creates files for the storage and manipulation of 32-bit signed integer values within an existing application on the MIFARE DESFire EV1 |
| Create LinearRecordFile | creates files for multiple storage of similar structural data, for example, loyalty programs within an existing application on the MIFARE DESFire EV1; once the file is filled completely with data records, further writing to the file is not possible unless it is cleared |
| Create CyclicRecordFile | creates files for multiple storage of similar structural data, for example, logging transactions within an existing application on the MIFARE DESFire EV1; once the file is filled completely with data records, the MIFARE DESFire EV1 automatically overwrites the oldest record with the latest written one (this wrap is fully transparent for the PCD) |
| DeleteFile | permanently deactivates a file within the file directory of the currently selected application |

**Remark:** All command and data frames are exchanged between MIFARE DESFire EV1 and PCD by using block format as defined in ISO/IEC 14443-4.

## 9.6 MIFARE DESFire EV1 command set overview – data manipulation commands

**Table 9.    Data manipulation commands**

| Command | Description |
|---|---|
| Read Data | reads data from Standard Data files or Backup Data files |
| Write Data | writes data to Standard Data files or Backup Data files |
| Get Value | reads the currently stored value from Value files |
| Credit | increases a value stored in a Value file |
| Debit | decreases a value stored in a Value file |
| Limited Credit | allows a limited increase of a value stored in a Value file without having full Credit permissions to the file |
| Write Record | writes data to a record in a Cyclic or Linear Record file |
| Read Records | reads out a set of complete records from a Cyclic or Linear Record file |

**Table 9.**   **Data manipulation commands** *…continued*

| Command | Description |
|---|---|
| Clear RecordFile | resets a Cyclic or Linear Record file to empty state |
| Commit Transaction | validates all previous write accesses on Backup Data files, Value files and Record files within one application |
| Abort Transaction | invalidates all previous write accesses on Backup Data files, Value files and Record files within one application |

**Remark:** All command and data frames are exchanged between MIFARE DESFire EV1 and PCD by using block format as defined in ISO/IEC 14443-4.

## 9.7   MIFARE DESFire EV1 command set - ISO/IEC 7816 APDU commands

The MIFARE DESFire EV1 provides the following commands according to ISO/IEC 7816-4:

- – INS code 'A4' SELECT
- – INS code 'B0' READ BINARY
- – INS code 'D6' UPDATE BINARY
- – INS code 'B2' READ RECORDS
- – INS code 'E2' APPEND RECORD
- – INS code '84' GET CHALLENGE
- – INS code '88' INTERNAL AUTHENTICATE
- – INS code '82' EXTERNAL AUTHENTICATE

### 9.7.1   ISO/IEC 7816-4 APDU message structure

MIFARE DESFire EV1 supports the APDU message structure according to ISO/IEC 7816-4 for:

- – an optional wrapping of the native MIFARE DESFire EV1 APDU format
- – additionally implemented ISO/IEC 7816-4 commands

Find more information on the ISO/IEC 7816-4 commands in Ref. 1.

# 10. Abbreviations

**Table 10.    Abbreviations**

| Acronym | Description |
|---------|-------------|
| AES | Advanced Encryption Standard |
| AID | Application IDentifier |
| APDU | Application Protocol Data Unit |
| ATS | Answer to Select |
| CC | Common Criteria |
| CMAC | Cryptic Message Authentication Code |
| CRC | Cyclic Redundancy Check |
| DES | Digital Encryption Standard |
| DF | Dedicated File |
| EAL | Evaluation Assurance Level |
| EEPROM | Electrically Erasable Programmable Read-Only Memory |
| FWT | Frame Waiting Time |
| ID | IDentifier |
| INS | Instructions |
| LCR | inductance, Capacitance, Resistance |
| MAC | Message Authentication Code |
| MAD | MIFARE Application Directory |
| NV | Non-Volatile Memory |
| PCD | Proximity Coupling Device |
| PPS | Protocol Parameter Selection |
| RATS | Request Answer To Select |
| REQA | Request Answer |
| RF | Radio Frequency |
| UID | Unique Identifier |
| WTX | Waiting Time eXtension |
| WUPA | Wake Up Protocol A |

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## 11. References

**[1]** **Data sheet** — *MF3ICD81 MIFARE DESFire EV1*, document number: 13403\*\*[1].

**[2]** **Data sheet** — *MF3ICD81 Guidance, Delivery and Operation Manual*, document number: 1469\*\*.

**[3]** **Data sheet** — *Specification addendum MF3ICD81*, document number: 1673\*\*.

**[4]** **Data sheet** — *MF3ICD8101 Sawn bumped 120 $\mu$m wafer addendum*, document number: 1318\*\*.

**[5]** **Data sheet** — *MF3ICDH8101 Sawn bumped 120 $\mu$m wafer addendum*, document number: 1970\*\*.

**[6]** **Data sheet** — *MF3MODx21_41_81 Contactless chip card module*, document number: 1439\*\*.

**[7]** **Application note** — *MIFARE DESFire - Implementation hints and examples*, document number: 0945\*\*.

**[8]** **Application note** — *Card Coil Design Notes for MIFARE DESFire EV1*, document number: 1713\*\*.

**[9]** **Application note** — *MIFARE Application Directory*, document number: 0018\*\*.

**[10]** **Application note** — *MIFARE ISO/IEC 14443 PICC Selection*, document number: 1308\*\*.

**[11]** **Application note** — *End to end system security risk considerations for implementing contactless cards*, document number: 1550\*\*.

**[12]** **ISO/IEC Standard** — *ISO/IEC 14443 Identification cards - Contactless integrated circuit cards - Proximity cards*.

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1. \*\* ... BU-ID document version number

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## 12. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| MF3ICDX21_41_81_SDS v3.1 | 20101221 | Product short data sheet | | MF3ICD21_41_81_SDS_2 |
| Modifications: | • Data sheet title updated |||||
| | • Section 1 "General description", Section 2 "Features and benefits", Section 3 "Applications", Section 11 "References", Section 13 "Legal information": updated |||||
| | • Section 5 "Ordering information": type number MF3ICD801DUD/04 changed to MF3ICD8101DUD/05 |||||
| MF3ICD21_41_81_SDS_2 | 20090306 | Product short data sheet | - | MF3ICD8101_SDS_N_1 |
| Modifications: | • Section 5 "Ordering information": type number MF3ICD8101DUD/01 changed to MF3ICD8101DUD/04 |||||
| | • Section 5 "Ordering information": added root type numbers MF3ICD41 and MF3ICD21 |||||
| | • Section 1 "General description", Section 2 "Features and benefits" and Section 3 "Applications": updated |||||
| | • Section 11 "References": added |||||
| MF3ICD8101_SDS_N_1 | 20071213 | Objective short data sheet | - | - |

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# 13. Legal information

## 13.1 Data sheet status

| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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# 14.  Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

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