



NXP®  
MIFARE Plus® X

# Migrate contactless systems to the next security level

The MIFARE Plus X IC brings benchmark security to contactless smart card applications. The MIFARE Plus products are the only mainstream ICs compatible with MIFARE Classic®, offering a seamless upgrade path for existing infrastructures and services.

## KEY FEATURES

- ▶ 2K or 4K EEPROM
- ▶ Simple fixed memory structure compatible with MIFARE Classic with 1K memory (MF1ICS50), MIFARE Classic with 4K memory (MF1ICS70)
- ▶ Migration path from MIFARE Classic to MIFARE Plus security level supported
- ▶ Open standard AES crypto for authentication, integrity, and encryption
- ▶ Common Criteria certification: EAL4+ for IC HW and SW
- ▶ Complies with ISO/IEC 14443-A
- ▶ 7-Byte Unique Identifier (UID) or 4-Byte Non Unique Identifier (NUID) and random IDs
- ▶ Multi-sector authentication, multi-block read and write
- ▶ Anti-tear function for writing AES keys
- ▶ Keys can be stored as Crypto1 keys (2 x 48 bit per sector) or as AES keys (2 x 128 bit sector)
- ▶ Supports virtual card concept
- ▶ High data rates up to 848 kbit/s
- ▶ Available in MOA4 and MOA8 modules or 8-inch sawn bumped wafer

## TARGET APPLICATIONS

- ▶ Public transportation
- ▶ Access management, e.g. employee, school, or campus cards
- ▶ Electronic toll collection
- ▶ Car parking
- ▶ Loyalty programs

## KEY BENEFITS

- ▶ Fully backwards compatible with MIFARE Classic with 1K or 4K memory
- ▶ Uses AES for authentication, encryption, and data integrity
- ▶ Supports high-speed communication up to 848 kbps/s for time critical services



## INTRODUCING MIFARE Plus X

The MIFARE Plus product family brings benchmark AES security to contactless applications. It offers the benefit of a seamless upgrade of existing MIFARE Classic product-based installations and services with minimum effort. This results into the possibility to issue cards, being fully backwards compatible to MIFARE Classic, into existing system environments prior to infrastructure security upgrades. After the security upgrade, the MIFARE Plus X products use AES security for authentication, data integrity and encryption which is based on open, global standards.

MIFARE Plus X, the eXpert version, offers a straightforward migration of MIFARE Classic product-based systems with additional flexibility to optimize the command flow for speed, privacy, and confidentiality. It comes with a rich feature set, including proximity checks against relay attacks.

### SECURITY LEVELS

MIFARE Plus X product-based cards support one pre-personalization level and three security levels. Cards operate in one security level at any given time and can only be switched to a higher level. An automatic anti-tear mechanism is available for secure deployment of rolling keys. If a smart card is removed from the field during a key update, it either concludes the update or automatically falls back to the previous key.

NXP recommends 7-Byte UID, but offers 4-Byte UID versions of MIFARE Plus during migration. MIFARE Plus X is available in the proven MOA4 module and as sawn bumped wafers; no changes for existing manufacturing processes are necessary.

#### ▶ Security Level 1 (SL1)

MIFARE Plus X product-based smart cards are fully backwards compatible with MIFARE Classic product-based smart cards using 1K or 4K memory. Cards work seamlessly in existing infrastructures.

#### ▶ Security Level 2 (SL2)

Mandatory AES for authentication. MIFARE Classic Crypto1 keys for data confidentiality.

#### ▶ Security Level 3 (SL3)

Mandatory AES for authentication, communication confidentiality and integrity. Optional proximity detection.

## FEATURES

Feature	MIFARE Plus X	
<b>Memory</b>		
EEPROM size [byte]	2K	4K
Write endurance [typical cycles]	200 000	
Data retention [years]	10	
Organization	32 sectors with 4 blocks	32 sectors with 4 blocks 8 sectors with 16 blocks
<b>RF-Interface</b>		
Acc. To ISO 14443A	yes - up to layer 4	
Frequency [MHz]	13.56	
Baudrate [kbit /s]	106 ... 848	
Anticollision	bit-wise	
<b>Security</b>		
Unique Serial Number [byte]	4 or 7	
4 byte Random ID	yes in SL3	
True Random Number Generator	yes	
Access keys	Crypto1 or AES keys per sector	
Access conditions	per sector	
AES security	CMACing / Encipherment	
Anti-tearing	for AES keys, sector trailers and configuration	
Cryptography	AES (128 bit), Crypto1	
<b>Special Features</b>		
Supported security levels	SL1, SL2, SL3	
Multi-sector authentication	yes	
Virtual card support	yes, full command set	
Proximity check	yes	
<b>Packaging</b>		
<b>Sawn Wafer (Au Bumped)</b>		
7 Byte UID	MF1PLUS6001DUD	MF1PLUS8001DUD
4-Byte Non Unique (NUID)	MF1PLUS6031DUD	MF1PLUS8031DUD
<b>MOA4 Module</b>		
7 Byte UID	MF1PLUS6001DA4	MF1PLUS8001DA4
4-Byte Non Unique (NUID)	MF1PLUS6031DA4	MF1PLUS8031DA4
<b>MOA8 Module</b>		
7 Byte UID	MF1PLUS6001DA8	MF1PLUS8001DA8
4-Byte Non Unique (NUID)	MF1PLUS6031DA8	MF1PLUS8031DA8