MIFARE® contactless tag IC family overview

Product features	MIFARE Ultralight®			MIFARE Classic®		MIFARE Plus®					MIFARE® DESFire®		
	Nano	EV1	C	EV1		S	SE	X		EV1	EV1		EV2
RF Interface						ISO/IEC 14443-2, Type A 13.56 MHz							
Protocol		ISO/IEC 14443-3				ISO/IEC 14443-3&4					ISO/IEC 14443-4		
UID – unique identifier		7-byte UID				7-byte UID, 4-byte NUID, Random ID					7-byte UID, Random ID		
Communication speed			106 Kbps					106-848 Kbps					
Memory size [Bytes]	40	48	128	144	1K	4K	2K	4K	1K	2K	4K	2K	4K	256	2K	4K	8K	2K	4K	8K
Memory model		Compact, 4-byte page					Compact, Sectors & 16-byte block					Flexible file system		
Crypto			TDES			Crypto-1		Crypto-1, AES				DES / 2K3DES / 3K3DES / AES		
Key length			112-bit			48-bit Crypto-1		48-bit Crypto-1, 128-bit AES				128-bit AES, up to 168-bit DES		
Authentication		Password							3-pass mutual					
Communication security		-				Encrypted		Plain, CMACed, Encrypted w. CMAC				Plain, CMACed, Encrypted w. CMAC		
MIsmartApp		-				-		-				-		✓
Transaction MAC		-				-		-			✓	-		✓
Multi key sets		-				-		-				-		✓
Proximity check		-				-		-		✓		-		✓
Virtual card select		-				-		✓				-		✓
Originality check features	ECC signature nn-programmable	ECC signature		ECC signature		AES originality keys				AES originality keys, ECC signature		AES originality keys, ECC signature		
CC Certification		-				EAL4+		EAL4+			EAL5+	EAL5+		EAL5+
ISO 7816-4 APDU		-				-		✓				-		✓
NFC compliance		NFC Forum tag type 2 compliant		Not supported by majority of NFC devices			NFC capable in SL3				NFC capabilities in SL1 and SL3	NFC Forum Tag Type 4 V2.0 compliant		
Target applications	Public transport & event ticketing Loyalty programs, limited use tickets			Various applications – recommended to move to higher security ICs		Public transport / campus cards / access management						Smart city platform / advanced mobility multi-applications / micropayment / loyalty programs / access management		
Input capacitance [pF]	17 / 5				17 / 50		17				17 / 70	17 / 70		
Multi applications		-				supported via MAD		supported via MAD				dynamic		

Delivery types – 7 Byte UID

	Nano	EV1	C	EV1 (Classic)		S	SE	X		EV1 (Plus)	EV1 (Plus)	EV1 (DESFire)		EV2
Wafer 120 μm / 17 pF	MF0UN0001DUD	MF0UL1101DUD	MF0ULC1101DUD	MF1CD2001DUD		MF1S5001X DUD[1]	MF1S7001 XDUD[1]	MF1SPLUS6001 DUD[1]	MF1SPLUS8001 DUD[1]	MF1SEP1001 DUD[1]	MF1PLUS6001 DUD[1]	MF1PLUS8001 DUD[1]	MF1P1201 DUD[1]	MF1P4101 DUD[1]	MF3ICDQ101 DUD	MF3ICD2101 DUD	MF3ICD4101 DUD	MF3ICD8101 DUD	MF3D2201 DUD	MF3D4201 DUD	MF3D8201 DUD
Wafer 120 μm / high cap	MF0UN0001DUF	MF0UL1101DUF	MF0ULC1101DUF	MF1CD2101DUF		-	-	-	-	-	-	-	MF1PH2101 DUD[1]	MF1PH4101 DUD[1]	MF3ICDHQ101 DUD	MF3ICDH2101 DUD	MF3ICDH4101 DUD	MF3ICDH8101 DUD	MF3DH2201 DUD	MF3DH4201 DUD	MF3DH8201 DUD
Wafer 75 μm / 17pF	MF0UN0001DUF	MF0UL1101DUF	MF0ULC1101DUF	-		MF1S5001X DUF[1]	MF1S7001 XDUF[1]	-	-	-	-	-	MF1P1201 DUF[1]	MF1P4101 DUF[1]	MF3ICDQ101 DUF	MF3ICD2101 DUF	MF3ICD4101 DUF	MF3ICD8101 DUF	MF3D2201 DUF	MF3D4201 DUF	MF3D8201 DUF
Wafer 75 μm / high cap	MF0UN0001DUF	MF0UL1101DUF	MF0ULC1101DUF	-		-	-	-	-	-	-	-	MF1PH2101 DUF	MF1PH4100 DUF	MF3ICDHQ101 DUF	MF3ICDH2101 DUF	MF3ICDH4101 DUF	MF3ICDH8101 DUF	MF3DH2201 DUF	MF3DH4200 DUF	MF3DH8200 DUF
MOA4 / 17pF	-	-	-	MF0MDU2001 DA4		MF1SPLUS6001 DA4[1]	MF1SPLUS8001 DA4[1]	MF1SEP1001 DA4[1]	MF1PLUS6001 DA4[1]	MF1PLUS8001 DA4[1]	MF1P1200 DA4	MF1P4100 DA4			MF3MODQ101 DA4	MF3MODD2101 DA4	MF3MODH4101 DA4	MF3MODH8101 DA4	MF3D2200 DA4	MF3D4200 DA4	MF3D8200 DA4
MOA4 / high cap	-	-	-	MF0MDU2101 DA4		MF1S5000 XDA4[1]	MF1S7000 XDA4[1]	-	-	-	MF1PH2100 DA4[1]	MF1PH4100 DA4[1]			MF3MODD2101 DA4	MF3MODH4101 DA4	MF3MODH8101 DA4	MF3DH2200 DA4	MF3DH4200 DA4	MF3DH8200 DA4
MOA8 / 17 pF	-	-	-	MF0UL2101 DA8		MF1SPLUS6001 DA8[1]	MF1SPLUS8001 DA8[1]	MF1SEP1001 DA8[1]	MF1PLUS6001 DA8[1]	MF1PLUS8001 DA8[1]	-	✓			MF3MODQ101 DA8	MF3MODD2101 DA8	MF3MODH4101 DA8	MF3MODH8101 DA8			
MOA8 / high cap	-	-	-	-		MF1S5000 XDA8[1]	MF1S7000 XDA8[1]	-	-	-	-	-			MF3MODHQ101 DA8	MF3MODD2101 DA8	MF3MODH4101 DA8	MF3MODH8101 DA8			
MOB6 / 17pF	-	-	-	-		-	-	-	-	-	MF1P2100 DA6[1]	MF1P4100 DA6[1]			-	-	-	-	MF3D2200 DA6	MF3D4200 DA6	MF3D8200 DA6
MOB6 / high cap	-	-	-	-		-	-	-	-	-	MF1PH2100 DA6[1]	MF1PH4100 DA6[1]			-	-	-	-	MF3DH2200 DA6	MF3DH4200 DA6	MF3DH8200 DA6

[1] available also in legacy 4 Byte NUID

MIFARE, MIFARE Ultralight, MIFARE Classic, MIFARE Plus and MIFARE DESFire are registered trademarks of NXP B.V.

MIFARE and NFC reader/writer IC solutions

Product	NFC frontend solutions							NFC controller solutions				HITAG
	MFRC522	MFRC523	MFRC630	MFRC631	CLRC663	PN512	PN5180	PN532	PN533	PN7120	PR601	HTRC110
Standards	Standard 3 V ISO/IEC14443 A MIFARE frontend	Standard 3 V ISO/IEC 14443 frontend	High-performance ISO/IEC 14443A MIFARE	High-performance ISO/IEC 14443	High-performance multi-protocol NFC frontend	Fully NFC Forum compliant	High-performance, multi protocol NFC Forum-compliant	NFC controller with integrated FW	USB NFC controller with integrated FW	High-performance multi-protocol controller with NCI interface	High-performance multi-protocol NFC controller	Highly integrated optimized HITAG short range reader/writer
Integrated microcontroller	-	-	-	-	-	-	-	integrated FW	integrated FW	integrated FW	LPC1227 for customer FW	-
Carrier frequency [MHz]	13.56	13.56	13.56	13.56	13.56	13.56	13.56	13.56	13.56	13.56	13.56 [1]	0.125
Standards & protocols												
Reader / writer	ISO/IEC 14443 A	ISO/IEC 14443	ISO/IEC 14443 A	ISO/IEC 14443	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 FeliCa	ISO/IEC 18092 ISO/IEC 14443 FeliCa	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 FeliCa	ISO/IEC 18092 ISO/IEC 14443 FeliCa	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 FeliCa	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 FeliCa	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 FeliCa	HITAG
NFC tag type support	1, 2, 4	1, 2, 4	1, 2, 4	1, 2, 4	1, 2, 3, 4	1, 2, 3, 4	1,2,3,4,5	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	-
ISO/IEC 14443 Baud-rate [KBit/s]	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	106/212/424/848	Up to 4K
FeliCa Baud-rate [KBit/s]	-	-	-	-	212/424	212/424	212/424	212/424	212/424	212/424	212/424	-
MIFARE Classic support (license included)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
ISO/IEC 15693 Baud-rate [KBit/s]	-	-	-	-	26.5/53	-	26.5/53	-	-	1.66/26.5	26.5/53	-
EPC class-1 HF / ISO/IEC 18000-3M3	-	-	-	-	✓	-	✓	-	-	-	✓	-
EMVCo compliance	-	✓	-	✓	✓	✓	✓	✓	-	✓	✓	-
Card emulation	-	-	-	-	-	✓	✓	✓	✓	✓	✓	-
NFC tag type emulation	-	-	-	-	-	✓	✓	2, 3, 4	✓	1, 2, 3, 4	✓	-
NFC tag type Baud-rate [KBit/s]	-	-	-	-	-	106/212/424	106/212/424	106/212/424	106/212/424	106/212/424	-	-
Peer-to-peer (ISO/IEC 18092)	-	-	-	-	-	✓	✓	✓	✓	✓	-	-
Passive communication	-	-	-	-	Initiator	Initiator/Target	Initiator/Target	Initiator/Target	Initiator/Target	Initiator/Target	Initiator	-
Active communication	-	-	-	-	-	Initiator/Target	Initiator/Target	Initiator/Target	Initiator/Target	Initiator/Target	-	-
Product features												
Operating distance up to [mm]	70	70	120	120	120/160	70	120/160	70	70	70	120/160	up to 200 w.o. booster
RF transmitter supply voltage [V]	3.6	3.6	3.3 to 5	3.3 to 5	3.3 to 5	3.6	5.5	3.6	2.5 to 3.6	3.1	3.3 to 5	5
Transmitter supply current, typ [mA]	100	100	250	250	250	100	250	60	60	60	200	200
Host interface	SPI, I²C, UART	SPI, I²C, UART	SPI, I²C, UART	SPI, I²C, UART	SPI, I²C, UART	SPI, I²C, UART	SPI	SPI, I²C, UART	USB, UART	I²C	SPI, I²C, UART	Serial 2/3 wire
Supply voltage host interface [V]	2.5 to 3.6	2.5 to 3.6	3.3 to 5.0	3.3 to 5.0	3.3 to 5.0	2.5 to 3.6	1.8 or 3.3	2.5 to 3.6	UART: 1.8 or 3.3 USB: 5	1.8 or 3.3	3.3 to 5.0	5
Idle mode current, typ [μA]	-	-	6	6	6	-	2-May	-	-	6	-	6
Power-down mode current, typ [μA]	5	5	0.008	0.008	0.008	5	10	2	10	10.5	0.008	7
Power-down mode with RF level detector on [μA]	-	-	-	-	-	10	-	25	30	20	-	-
Low-power card detection mode [μA]	-	-	0.5	0.5	0.5	-	0.5	-	-	150	0.5	-
Temperature range [°C]	-25 to +85	-25 to +85	-25 to +85	-25 to +85	-25 to +85	-30 to +85	-30 to +85	-25 to +85	-25 to +85	-30 to +85	-25 to +70	-40 to +85
Security features												
MIFARE SAM support in X-mode	SAM AV1 & AV2	SAM AV1 & AV2	SAM AV 2.6	SAM AV 2.6	SAM AV 2.6	SAM AV1 & AV2	-	-	-	-	SAM AV 2.6	-
MIFARE Classic security (CRYPTO1 HW)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
Product support & ordering information												
Package	HVQFN32	HVQFN32	HVQFN32	HVQFN32	HVQFN32	HVQFN32 HVQFN40 TFBGA64	HVQFN40, TFBGA64	HVQFN40	HVQFN40	VFBGA49	LQFP100	SO14
Product type	MFRC52202HN1	MFRC52302HN1	MFRC63002HN	MFRC63102HN	CLRC66302HN	PN5120A0HN1/C2	PN5180A0HN/C1	PN5321A3HN/106	PN5331B3HN/270	PN7120A0EV/C10807Y	PR601HL/C1	HTRC11001T/02EE
Software												
NFC Reader Library	✓	✓	✓	✓	✓	✓	✓					
NFC Forum reference implementation							✓					
other								HAL, card emulation example USB PCSC driver	HAL, card emulation example	Various implementation examples	Control library HTRC110

MIFARE embedded card functionality on SmartMX®

Product	MIFARE implementations							Features						
	Available card IC functionality							UID options			Parameters	Exit on		MIFARE select
	MIFARE Classic 1K	MIFARE Classic 4K	MIFARE Plus 2K	MIFARE Plus 4K	MIFARE DESFire EV1 2K	MIFARE DESFire EV1 4K	MIFARE DESFire EV1 8K	7 Byte UID	4 Byte NUID	4Byte Random ID				
PSCx145														
CD128Cx081														
CD051	✓	✓						✓	✓	✓	ATQA,SAK,ATS		✓	N/A
CD041														
CD021/CD016			-	-	-	-	-							
PSCx081V1D/CD041V1D														
CD021V1D			✓	✓	✓	✓	✓	✓	✓	✓	ATS			N/A
CD016V1D	-	-												
PSCx144														
Cx080/CD040	✓	✓						✓			ATQA,SAK,ATS		✓	N/A
CD020/CD012														
PSCx145														
CD128	✓	✓		✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS		✓	N/A
P60D144M	✓	✓	✓					✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D080M	✓	✓	✓					✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D024M	✓	✓	✓					✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D144D				✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D080D				✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D024D				✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60N144J	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D144J	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS	✓	✓	-
P60D080J	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ATQA,SAK,ATS	✓	✓	-

SmartMX is a registered trademark of NXP B.V.

Development and testing tools

Products	Short description	Supported NXP platforms
NXP Originality Checker reader (Windows)	Enables anyone in the supply chain to check the originality of NXP contactless ICs	MIFARE NTAG ICODE SLIX2
MIFARE Reader-Writer Kit (Windows)	Consists of the Pegoda II MIFARE reference design reader-writer, a set of MIFARE family tag samples and the RFIDDiscover tool	MIFARE NTAG ICODE
RFIDDiscover (Windows)	Allows easy access to the commands of any NXP 13.56MHz contactless IC with the click of a button	MIFARE NTAG ICODE
MIFARE SDK (Android)	Facilitates App Development by providing a JAVA API for MIFARE, NTAG, ICODE families	MIFARE NTAG ICODE

MIFARE – SAM (Secure Access Modules)

Product features	MIFARE SAM	
	AV1	AV2
Communication interface	ISO/IEC 7816, Class A, B, C T = 1, up to 1.5 Mbps I²C interface to MFRC52X, PN51X	ISO/IEC 7816, Class A, B T = 1, up to 1.5 Mbps I²C interface to MFRC52X, PN51X, CLRC66x
Cryptographic algorithms	TDEA 112-bit and 168-bit key MIFARE Crypto-1 AES-128 and AES-192	TDEA 112-bit and 168-bit key MIFARE Crypto-1 AES-128 and AES-192 RSA-up to 2048-bit key
Public key infrastructure (PKI)	-	✓
Hash function	-	SHA-1, SHA-224 and SHA-256.
Supported cryptography	MIFARE Classic MIFARE Ultralight C MIFARE DESFire MIFARE DESFire EV1	MIFARE Classic MIFARE Ultralight C MIFARE Plus MIFARE DESFire MIFARE DESFire EV1
Secure host communication	-	✓
X-functionalities	✓	✓
Unique serial number [Bytes]	7	7
True random number generator	✓	✓
No of symmetric key entry	128 (3 keys per key entry)	128 (3 keys per key entry)
No of RSA key entry	-	2.5 pair
Access conditions	per entry	per entry
Key usages counter	16	16
Key diversification	Encryption based	Encryption based CMAC based
RSA	-	Signature, Encryption for updating symmetric key entry
DES/ 3DES security	MACing/Encipherment	MACing/Encipherment
AES 128 security	MACing/Encipherment	MACing/Encipherment
Delivery types		
PCM1.1 contact module	✓	✓
HVQFN	HVQFN32	HVQFN32
	P5DF072EV2/T0PD4090	P5DF081

For further details please refer to:
www.MIFARE.net