



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	EV2	EV2	EV2	EV2	EV2						
RF Interface	ISO/IEC 14443-2, Type A 13.56 MHz													ISO/IEC 14443-4							
Protocol	ISO/IEC 14443-3													ISO/IEC 14443-3B4							
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	2K	4K	8K	2K	4K	8K		
Memory model	Compact, 4-byte page				Compact, Sectors & 16-byte block											Flexible file system					
Crypto	TDES				Crypto-1							DES / 2K3DES / 3K3DES / AES									
Key length	112-bit				48-bit Crypto-1							128-bit AES, up to 168-bit DES									
Authentication	Password				3-pass mutual							Plain, CMACed, Encrypted w. CMAC									
Communication security	-				Encrypted							Plain, CMACed, Encrypted w. CMAC									
MISmartApp	-													-							
Transaction MAC	-													-							
Multi key sets	-													-							
Proximity check	-													-							
Virtual card select	-													-							
Originality check features	ECC signature (re-programmable)	ECC signature		ECC signature			AES originality keys							AES originality keys, ECC signature			AES originality keys, ECC signature				
CC Certification	-				EAL4+							EAL5+			EAL4+			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 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						
Multi applications	-				supported via MAD							supported via MAD			dynamic						
Delivery types – 7 Byte UID																					
Wafer 120µm / 17 pF	MF0U001 DUD	MF0U1101 DUD	MF0U2101 DUD	MF0U3101 DUD	MF1S5001X DUD ¹⁾	MF1S7001X DUD ¹⁾	MF1SPLUS6001 DUD ¹⁾	MF1SPLUS8001 DUD ¹⁾	MF1SEP1001 DUD ¹⁾	MF1PLUS6001 DUD ¹⁾	MF1PLUS8001 DUD ¹⁾	MF1P2101 DUD ¹⁾	MF1P4101 DUD ¹⁾	MF3CDQ101 DUD	MF3CD2101 DUD	MF3CD4101 DUD	MF3CD8101 DUD	MF3D2201 DUD	MF3D4201 DUD	MF3D8201 DUD	
Wafer 120 µm / high cap	MF0U001 DUF	MF0U1101 DUF	MF0U2101 DUF	MF0U3101 DUF	-	-	-	-	-	-	-	MF1PH2101 DUD ¹⁾	MF1PH4101 DUD ¹⁾	MF3CDH101 DUD	MF3CDH2101 DUD	MF3CDH4101 DUD	MF3CDH8101 DUD	MF3DH2201 DUD	MF3DH4201 DUD	MF3DH8201 DUD	
Wafer 75 µm / 17pF	MF0U0001 DUD	MF0U1101 DUF	MF0U2101 DUF	MF0U3101 DUF	MF1S5001X DUF ¹⁾	MF1S7001X DUF ¹⁾	-	-	-	-	-	MF1P2101 DUF ¹⁾	MF1P4101 DUF ¹⁾	MF3CDQ101 DUF	MF3CD2101 DUF	MF3CD4101 DUF	MF3CD8101 DUF	MF3D2201 DUF	MF3D4201 DUF	MF3D8201 DUF	
Wafer 75 µm / high cap	MF0U0001 DUF	MF0U1101 DUF	MF0U2101 DUF	MF0U3101 DUF	-	-	-	-	-	-	-	MF1PH2101 DUF ¹⁾	MF1PH4101 DUF ¹⁾	MF3CDH101 DUF	MF3CDH2101 DUF	MF3CDH4101 DUF	MF3CDH8101 DUF	MF3DH2201 DUF	MF3DH4201 DUF	MF3DH8201 DUF	
MOA4 / 17pF	-	-	-	MF0U02101 DA4	-	-	MF1SPLUS6001 DA4 ¹⁾	MF1SPLUS8001 DA4 ¹⁾	MF1SEP1001 DA4 ¹⁾	MF1PLUS6001 DA4 ¹⁾	MF1PLUS8001 DA4 ¹⁾	MF1P2100 DA4 ¹⁾	MF1P4100 DA4 ¹⁾	-	MF3MOD2101 DA4	MF3MOD4101 DA4	MF3MOD8101 DA4	MF3D2200 DA4	MF3D4200 DA4	MF3D8200 DA4	
MOA4 / high cap	-	-	-	MF0U02101 DA4	MF1S5000 XDA4 ¹⁾	MF1S7000 XDA4 ¹⁾	-	-	-	-	-	MF1PH2100 DA4 ¹⁾	MF1PH4100 DA4 ¹⁾	MF3MODH2101 DA4	MF3MODH4101 DA4	MF3MODH8101 DA4	MF3DH2200 DA4	MF3DH4200 DA4	MF3DH8200 DA4		
MOA8 / 17 pF	-	-	MF0U2201 DA8	MF0U02101 DA8	-	-	MF1SPLUS6001 DA8 ¹⁾	MF1SPLUS8001 DA8 ¹⁾	MF1SEP1001 DA8 ¹⁾	MF1PLUS6001 DA8 ¹⁾	MF1PLUS8001 DA8 ¹⁾	-	-	MF3MODQ101 DA8	MF3MOD2101 DA8	MF3MOD4101 DA8	MF3MOD8101 DA8	-	-	-	
MOA8 / high cap	-	-	-	-	MF1S5000 XDA8 ¹⁾	MF1S7000 XDA8 ¹⁾	-	-	-	-	-	-	-	MF3MODHQ101 DA8	MF3MODH2101 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 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/IEC 14443A 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	Full NFC Forum compliant	High-performance, multi-protocol NFC Forum-compliant	NFC controller with integrated FW	USB NFC controller with integrated FW	Full NFC Forum-compliant 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 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	106/212/424/848	106/212/424	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, 5	2, 3, 4	2, 3, 4	1, 2, 3, 4	-	-
NFC tag type Baud-rate [KBit/s]	-	-	-	-	-	106/212/424	106/212/424/848	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, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	USB, UART	I ² C	SPI, I ² C, 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	200
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	PN7120A0EVC/10801Y	PR601HL/C1	HTRC1001T/02EE
Software												
NFC Reader Library	✓	✓	✓	✓	✓	✓	✓	-	-	✓	✓	-
NFC Forum reference implementation	-	-	-	-	-	✓	-	✓	✓	-	-	-
other	-	-	-	-	-	-	-	HAL, card emulation example	HAL, card emulation example USB PCSC driver	-	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 X 2K	MIFARE Plus X 4K	MIFARE DESFire EV1 2K	MIFARE DESFire EV1 4K	MIFARE DESFire EV1 8K	7 Byte UID	4 Byte NUID	4Byte Random ID		incomplete SAK	Time out UART RF-Field	
P5Cx145														
CD128Cx081														
CD051	✓	✓					✓	✓	✓		ATQA,SAK,ATS	-	✓	N/A
CD041														
CD021/CD016														
P5Cx081V1D/CD041V1D														
CD021V1D					✓	✓	✓				ATS	-		N/A
CD016V1D	-	-	-	-	-	-	-	-	-	-				
P5Cx144														
Cx080/CD040	✓	✓					✓				ATQA,SAK,ATS	-	✓	N/A
CD020/CD012														
P5Cx145	✓	✓			✓	✓	✓	✓	✓		ATQA,SAK,ATS		✓	N/A
CD128														
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	✓	✓	✓

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 PC interface to MFRC52X, PN51X	ISO/IEC 7816, Class A, B T = 1, up to 1.5 Mbps I ² C 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
	PSDF072EV2/TOPD4090	PSDF081

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