



For further details please refer to:
www.negotecnica.com

MIFARE® contactless tag IC family overview

Product features	MIFARE Ultralight*				MIFARE Classic*		MIFARE Plus*			MIFARE® DESFire*							
	Nano	EV1	C		EV1	SE	EV2		Light	EV3	EV2						
RF Interface	ISO/IEC 14443-2, Type A 13.56 MHz																
Protocol	ISO/IEC 14443-3				ISO/IEC 14443-3B4			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	1K	2K	4K	640	2K	4K	8K	16K	32K		
Memory model	Compact, 4-byte pages				Compact, sectors & 16-byte blocks			Pre-configured file system			Flexible file system						
Crypto	-				3KDES		Crypto-1		Crypto-1, AES			AES/LRP		DES/2K3DES/3K3DES/AES			
Key length	-				112-bit		48-bit		48-bit Crypto-1, 128-bit AES			128-bit AES		128-bit AES, up to 168-bit DES			
Authentication	-				Password							3-pass mutual					
Communication security	-				Encrypted							Plain, CMACed, encrypted w. CMAC					
MisMARTApp	-				-		-		-			-					
Transaction MAC	-				-		-		-			-					
Transaction Timer	-				-		-		-			-					
Security Level upgrade	-				-		card		sector per sector			-					
SL1SL3MixMode	-				-		-		-			-					
Multi key sets	-				-		-		-			-					
Proximity check	-				-		-		-			-					
Virtual card concept	-				-		-		-			-					
Restrict update operations in SL1	-				-		-		-			-					
Originality check features	ECC signature programmable	ECC signature		-		ECC signature	-		AES originality keys	AES originality keys, ECC signature		-			AES originality keys, ECC signature		
CC Certification	-				-		-		-			-					
ISO 7816-4 APDU	-				-		-		-			-					
NFC compliance	NFC Forum type 2 tag compliant				-		Not supported by majority of NFC devices		NFC capable in SL3		NFC capable in SL1 and SL3		NFC Forum type 4 tag V2.0 compliant				
Target applications	Public transport & event ticketing loyalty programs, limited use tickets				-		Single application - not recommended for new design		Public transport/ campus cards/ access management			Smart city platform/ advanced mobility multi-applications/ micropayment/ loyalty programs/ access management					
Input capacitance [pF]	17/50				-		17		17/70			17/50		17/70			
Multi applications	-				-		Supported via MAD		Supported via MAD			Fixed, single application		Dynamic			
Delivery types – 7 Byte UID																	
Wafer 120µm/17 pF	MFOUN 0001DUD	MFOUL 1101DUD *	MFOUL 2101DUD *	MFOICU 2001DUD	MF1S 5001XDUD*	MF1S 7001XDUD*	MF1SEP 1001DUD	MF1P 2201DUD	MF1P 4201DUD	MF2DL 1001DUD	MF3D 2301DUD	MF3D 4301DUD	MF3D 8301DUD	-	-		
Wafer 120 µm/high cap	MFOUNH 0001DUF	MFOULH 1101DUF	MFOULH 2101DUF	MFOICU 2101DUD	-	-	MF1SEP H1001DUD	MF1PH 2201DUD	MF1PH 4201DUD	MF2DLH 1001DUD	MF3DH 2301DUD	MF3DH 4301DUD	MF3DH 8301DUD	-	-		
Wafer 75 µm/17pF	MFOUN 0001DUF	MFOUL 1101DUF	MFOUL 2101DUF	MFOICU 2001DUF	MF1S 5001XDUF	MF1S 7001XDUF	-	-	-	MF2DL 1001DUF	-	-	-	-	-		
Wafer 75 µm/high cap	MFOUNH 0001DUF	MFOULH 1101DUF	MFOULH 2101DUF	MFOICU 2101DUF	-	-	-	-	-	MF2DLH 1001DUF	-	-	-	-	-		
MOA4/17pF	-	-	-	MFOUO 2001DA4	MF1S 5000XDA4	MF1S 7000XDA4	MF1SEP 1001DA4	MF1P 2200DA4	MF1P 4200DA4	MF2DL 1000DA4	MF3D 2300DA4	MF3D 4300DA4	MF3D 8300DA4	MF3D 9200DA4	MF3DA 200DA4		
MOA4/high cap	-	-	-	MFOUO 2101DA4	-	-	MF1SEP H1001DA4	MF1PH 2200DA4	MF1PH 4200DA4	MF2DLH 1000DA4	MF3DH 2300DA4	MF3DH 4300DA4	MF3DH 8300DA4	MF3DH 9200DA4	MF3DHA 200DA4		
MOA8/17 pF	-	-	MFOUL 2101DA8	MFOUO 2001DA8	MF1S 5000XDA8	MF1S 7000XDA8	MF1SEP 1001DA8	MF1P 2200DA8	MF1P 4200DA8	MF2DL 1000DA8	MF3D 2300DA8	MF3D 4300DA8	MF3D 8300DA8	-	-		
MOA8/high cap	-	-	-	MFOUO 2101DA8	-	-	MF1SEP H1001DA8	MF1PH 2200DA8	MF1PH 4200DA8	MF2DLH 1000DA8	MF3DH 2300DA8	MF3DH 4300DA8	MF3DH 8300DA8	-	-		
MOB6/17pF	-	-	-	-	-	-	-	-	-	-	-	-	-	MF3D 9200DA6	MF3DA 200DA6		
MOB6/high cap	-	-	-	-	-	-	-	-	-	-	-	-	-	MF3DH 9200DA6	MF3DHA 200DA6		

* MIFARE Ultralight EV1 and MIFARE Classic EV1 wafer deliveries are next to 8 inch as well available on 12 inch

MIFARE and NFC reader/writer IC solutions selection

Product	NFC frontend solutions				NFC controller solutions		HITAG
	SLRC610	MFR630	CLRC663	PN5180	PN7150	PN7462	HITRC110
Integrated microcontroller	High-performance ISO/IEC 15693 ICODE	High-performance ISO/IEC 14443A MIFARE and NTAG	High-performance multi-protocol NFC frontend	High-performance multi-protocol NFC frontend	Full NFC Forum-compliant controller with integrated FW and NCI interface	Full NFC open microcontroller Cortex M0 - with contact smartcard interface and 160K Flash for user's application	Highly integrated optimized HITAG short range reader/writer
Carrier frequency [MHz]	13.56				0.125		
Standards & protocols							
Reader/ writer	ISO/IEC 15693 ISO/IEC 18000-3M3	ISO/IEC 14443 A	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 ISO/IEC 18000-3M3 Felica	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 ISO/IEC 18000-3M3 Felica	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 Felica	ISO/IEC 18092 ISO/IEC 14443 ISO/IEC 15693 ISO/IEC 18000-3M3 Felica	HITAG
NFC tag type reader	5	1, 2, 4	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 3, 4, 5	-
ISO/IEC 14443 Bit-rate [KBit/s]	106/212/424/848						
Felica Bit-rate [KBit/s]	212/424						
MIFARE Classic support (license included)	-	✓	✓	✓	✓	✓	-
ISO/IEC 15693 Bit-rate [KBit/s]	26.5/53	-	26.5/53	26.5/53	26.5	26.5/53	-
EPC class-1 HF/ ISO/IEC 18000-3M3	✓	✓	✓	✓	✓	✓	-
EMVCo compliance	-	-	✓	✓	✓	✓	-
Card emulation	-	-	-	✓	✓	✓	-
NFC tag type emulation	-	-	-	4A	3, 4A, 4B	4A	-
NFC tag type Bit-rate [KBit/s]	-	-	-	106/212/424/848	106/212/424	106/212/424/848	-
Peer-to-peer (ISO/IEC 18092)	-	-	✓	✓	✓	✓	-
Passive communication	-	-	Initiator	Initiator/Target	Initiator/Target	Initiator/Target	-
Active communication	-	-	-	Initiator/Target	Initiator/Target	Initiator/Target	-
Operating distance up to [mm]	160	120	120/160	120/160	120/160	120/160	up to 200 w.o. booster
RF transmitter supply voltage [V]	3.0 - 5.5	3.0 - 5.5	3.0 - 5.5	2.7 - 5.5	2.7 - 4.75	3.0 - 5.5	5
Transmitter supply current, typ [mA]	250	250	250	250	180	250	200
Host interface	SPI, I ² C, UART	SPI, I ² C, UART	SPI, I ² C, UART	SPI	I ² C	USB, HSUART, SPI, I ² C	Serial 2/3 wire
Supply voltage host interface [V]	3.3 - 5.0	3.3 - 5.0	3.3 - 5.0	1.8 - 3.3	1.8 - 3.3	1.8 or 3.3	5
Standby mode current, typ [µA]	3	3	3	15	20	18	200
Power-down mode current, typ [µA]	0.008	0.008	0.008	10	10	12	7
Dynamic power contr./ Adaptive modulation contr.	✓	✓	✓	✓	✓	✓	-
Lower-power card detection mode	✓	✓	✓	✓	✓	✓	-
Temperature range [°C]	-25 to +85	-25 to +85	-25 to +85	-30 to +85	-30 to +85	-40 to +85	-40 to +85
Security features							
MIFARE SAM support	-	In X-mode	In X-mode	-	-	via UART ISO 7816	-
MIFARE Classic security (CRYPTO1 HW)	-	✓	✓	✓	✓	✓	-
Product support & ordering information							
Package	HVQFN32	HVQFN32	HVQFN32	HVQFN40 TFBGA64	HVQFN40	HVQFN64	S014
Product type	SLRC61002HN	MFR63002HN	CLRC66302HN	PN5180A0HN	PN7150B0HN	PN7462AUHN	HTRC11001T/02EE
Software							
NFC Reader library	✓	✓	✓	✓	N/A	✓	-

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	4 Byte Random ID		incomplete SAK	Time out UART RF-Field		
P5Cx145															
CD128Cx081	✓	✓	-	-	-	-	-	✓	✓	✓	ATQA,SAK,ATS	-	✓		N/A
CD051															
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	✓	✓		✓



MIFARE – SAM (Secure Access Modules)

Product features	MIFARE SAM AV3
Communication interface	Host Interface: ISO/IEC 7816, Class A, B and C, T=1, up to 1.5 Mbps Optional I ² C slave Standard and Fast Mode (HVQFN32 only) X-Mode Interface: MFRCS2x, PN51x and CLRC6xx
Cryptographic algorithms	TDEA 112-bit and 168-bit key MIFARE Crypto-1 AES-128, AES-192 and AES-256 RSA up to 2048-bit key, ECDSA up to 256-bit key
Public key infrastructure (PKI)	✓
Hash function	SHA-1, SHA-224 and SHA-256
Supported cryptography	MIFARE Classic, MIFARE Ultralight, MIFARE Plus (up to EV1), MIFARE DESFire (up to EV2), NTAG DNA, ICODE DNA, UCODE DNA
Secure host communication	✓
X-functionalities	✓
Unique serial number [Bytes]	7
True random number generator	✓
No of symmetric key entry	128 (3 keys per key entry)
No of RSA key entry	2 key pairs, 1 public key
No of ECC key and curve entry	8 keys, 4 curves
No of EMV key entry and RID	24 keys, 4 RIDs
Access conditions	per entry
Key usages counter	16
Key diversification	Encryption based, CMAC based
RSA	MACing/ Encipherment/ Signature
ECC	Signature
DES/3DES security	MACing/ Encipherment
AES 128 security	MACing/ Encipherment
Programmable Logic	✓

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 RFID Discover tool	MIFARE NTAG ICODE
RFID Discover (Windows)	Allows easy access to the commands of any NXP 13.56Mhz contactless IC with the click of a button	MIFARE NTAG ICODE
TapLinX	Facilitates App Development by providing a JAVA API for MIFARE, NTAG, ICODE families	MIFARE NTAG ICODE

Delivery types	MIFARE SAM AV3
Contact module	PCM1.5
HVQFN	HVQFN32
Part Type	MF4SAM3