NFC – Near Field Communication Golden Presentation

Use cases and products

PL NFC infrastructure

June 2020

SECURE CONNECTIONS FOR A SMARTER WORLD

NFC - Pick your topic

NFC NEWS

USE CASES

PRODUCTS

INTEGRATION AND SUPPORT

NFC

- NFC is a contactless short range technology, based on inductive coupling (up to 10cm / 4 in)
- Operating frequency 13.56MHz, speed < 848 Kbits/s
- Co-invented in 2002 by NXP and Sony
- NXP is leading in the NFC market

Big reasons to consider NFC

More intuitive than any other technology
It's like shaking hands

Use Power Very Efficiently
Only one of the two devices needs to be powered

Trusted addition to other technology
Especially for pairing devices

NFC – connect to powered and unpowered devices

NFC connects any device to other objects over a short range (typically ~10 cm):

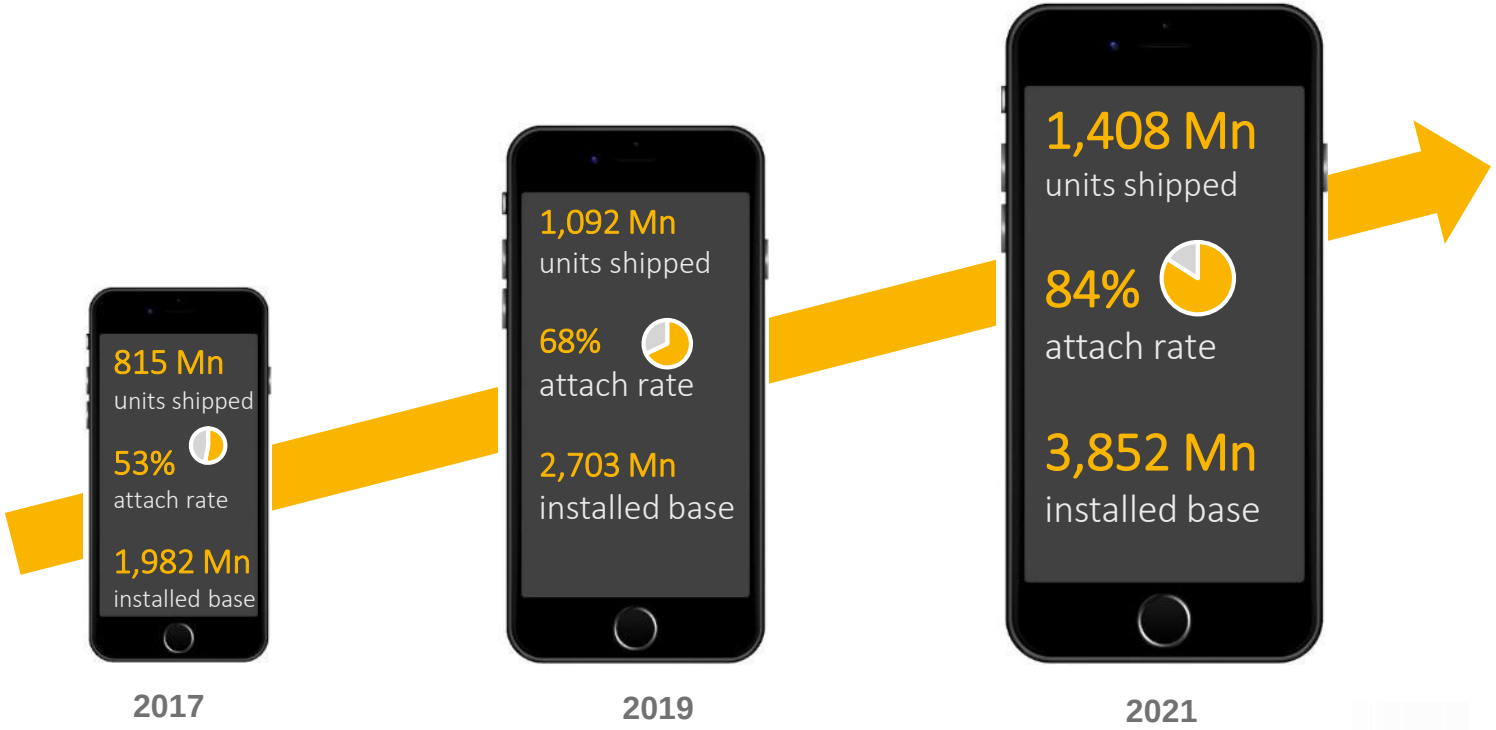
… any NFC tag or card

… any NFC-enabled smartphone

… any other NFC-enabled embedded system

Dynamic NFC Smartphone Growth

NFC Shipments, Attach Rates and Installed Bases



Source: ABI, Strategy Analytics, NXP - Nov. 2017

NFC Smartphones supporting tag interaction

All operating modes supported

Tag reading and writing supported since iOS 13

New

NFC Training Catalog

- The best overview of NFC webinars ever

- Download **here**:

NFC NEWS

NFC NEWS at a glance

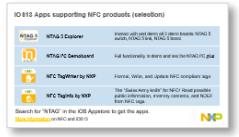
Click on the icons for more details

- **NTAG 5 fully released and available**

- **More combinations** of MCU+NFC supported natively:
  NTAG 5 + LPC55, NTAG 5 + KW41Z

- **Longevity program** extended:
  - PN7150: **NEW**
  - NTAG 5: **NEW**
  - PN5180**: NEW**

- **More iOS Apps:** NTAG 5 and NTAG I²C *plus*



iOS13 Apps supporting NFC products (selection)

	**NTAG 5 Explorer**	Interact with and demo all 3 demo boards: NTAG 5 switch, NTAG 5 link, NTAG 5 boost
	**NTAG I²C Demoboard**	Full functionality to demo and test the NTAG I²C *plus*
	**NFC TagWriter by NXP**	Format, Write, and Update NFC compliant tags
	**NFC TagInfo by NXP**	The “Swiss Army knife” for NFC! Read possible public information, memory contents, and NDEF from NFC tags.

Search for “NTAG” in the iOS Appstore to get the apps.

More information on NFC and iOS13

USE CASES

NFC use cases are growing

Identification & Authentication of consumables and accessories to combat counterfeits or configure the main unit based on accessory

Parameterization & Diagnosis using a phone as an extended user interface for small, sealed and unpowered devices

Pair with Bluetooth & Wi-Fi devices faster, without conflicts by just tapping your phone to them

Use your phone or smart card for **Access Management** to open doors or give access to machine configurations

Click on pictures for more details

NFC Reference Book V6 – more than 60 NFC implementations

Available on Sales Portal and DistyNet in Chinese and English

PRODUCTS

NFC focus products for each application need –

Readers/connected tags: for embedded electronics

Features and price

Specialist

One chip system, programmable NFC controller* with DPC
PN7462 family

High-perf full NFC with DPC
PN5180

All round

High-perf connected tag in stand-alone and MCU mode
NTAG 5 family

High-perf multi-protocol reader
CLRC663 *plus*

Plug&Play NFC for Linux, Android, WinIoT
PN7150

Entry level

Basic connected tag
NTAG I²C *plus*

High-perf proximity&vicinity readers
MFRC630 *plus*
(ISO14443A – Reader for NTAG® and MIFARE® product families)
SLRC610 *plus*
(ISO15693 / ISO18000-3M3 - Reader for ICODE® family)

Connected tag solutions
NFC tags with non-volatile memory and host connection

NFC Frontend solutions
NFC reader with NFC Reader SW Library

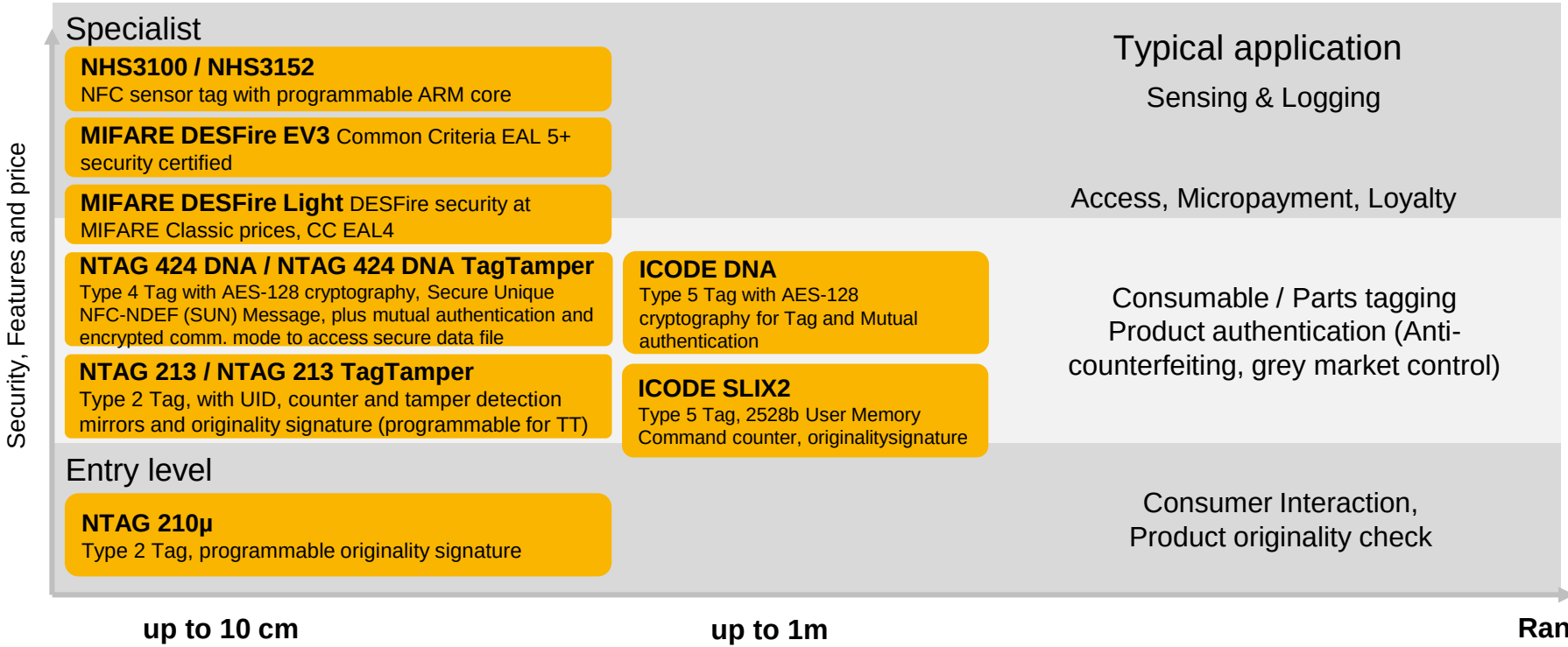
NFC controller solutions
NFC reader with integrated 32-bit Cortex MCU and either integrated firmware or freely programmable memory

= 10/15 years longevity

* Single chip: Cortex M0 MCU + last generation NFC reader + ISO 7816 Contact reader

NFC focus products for each application need –

ICs for tags, labels and cards



Entire passive tag portfolio can be found in: https://www.mifare.net/wp-content/uploads/2019/05/SMR-Z-Card-May-2019-Update-web-FINAL.pdf

Contact readers

USE CASE DETAILS

CONSUMABLES AND ACCESSORIES

Authentication and configuration

- For devices with a removable part which needs regular replacement, NFC allows to
  - **Authenticate the removable part,** making sure that the right genuine part is used:

    Protecting Revenue | Ensuring safety

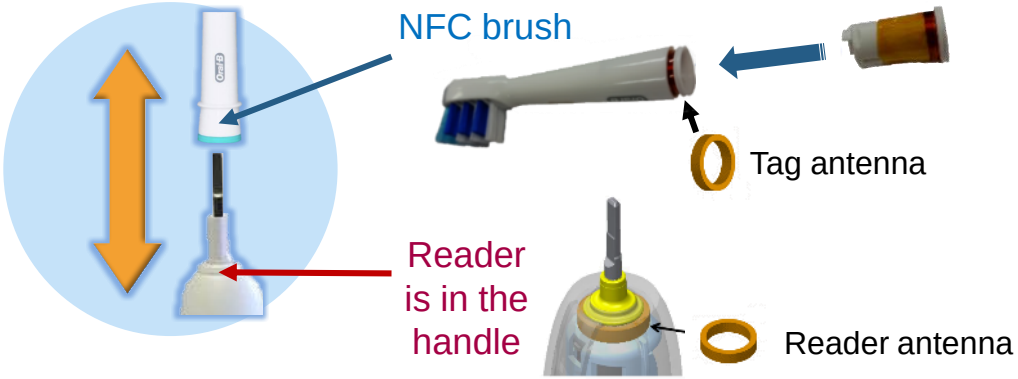
  - **Configure the base unit** to the accessory E.g. rotating and spinning parameters
  - **Easy replenishment**: tap NFC phone to the accessory and connect directly to the right web page for ordering
- **Applications:** air filter & conditioner, electric toothbrushes, facial brushes,
  hair dryer, medical equipment, …

NFC tag

NFC Reader in the base

Increase accessories revenue

NFC in electric toothbrushes: how it works



A simple tap for replenishment

Example:

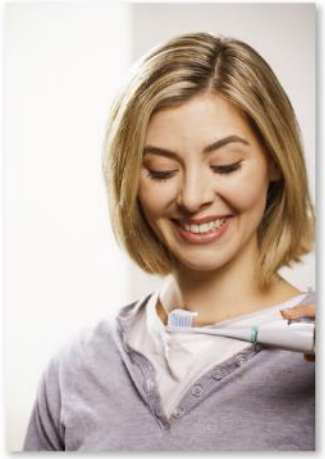
- At power-up, brush profile is read & tag counter is incremented
- Tag counter increments at start of use, and ignores short cycles within intervals of less than 10 seconds
- Upon expiration, handle vibrates and/or illuminates to indicate it's time for replenishment
- Consumer simply taps brush with their smart phone for a convenient re-order experience

Authenticated redirection

- Effortless consumable replenishment in one tap
- How this works?

Direct sales or through partners increase the product margin

1. Replacement notification
2. Phone read NFC Tag in consumable
3. Consumable authenticated via the cloud
4. Easy re-order from authorized suppliers



URL, SKU
UID, Count

amazon.com

Walmart

Consumer scans the consumable with an NFC-enabled phone. Data stored on the tag directs user phone to initiate appropriate action.

Benefits to the OEM

- Increased revenues
- Reduced ads cost
- Real-time analytics
- Offer more services

Benefits to the Consumer

- Much faster
- Verify correct model
- Ensure genuine replacement
- Pre-approved retailers

NFC increases safety

Example Healthcare: Patient Safety

- Enforce expiration dates
- Calibration data increases measurement accuracy
- Prevents re-use of disposables
- Ensures original material

NFC makes devices future proof

New accessories can configure existing devices in the field with new functions

2020

Type 1
20 measurements
correction factor 1.00
…

Type 2
40 measurements
correction factor 1.00
…

2022

Type 3
60 measurements
correction factor 0.87
…

Key concept:
Store parameters/recipes on the NFC tags, not just IDs!

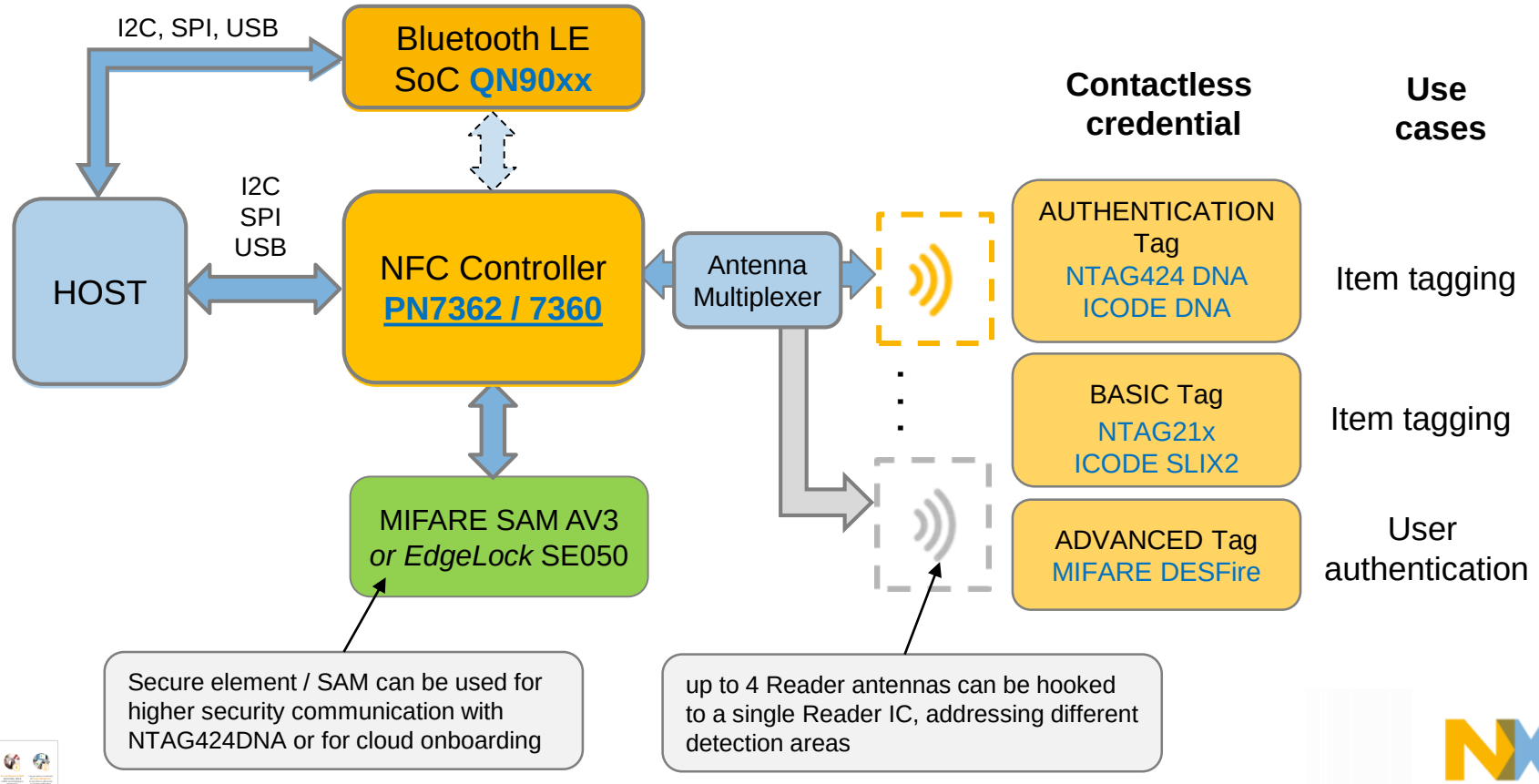
What is the cost of not to deploy NFC?

- Less revenue?
- More grey market/ counterfeit?
- Less customer interaction?
- Less profit?

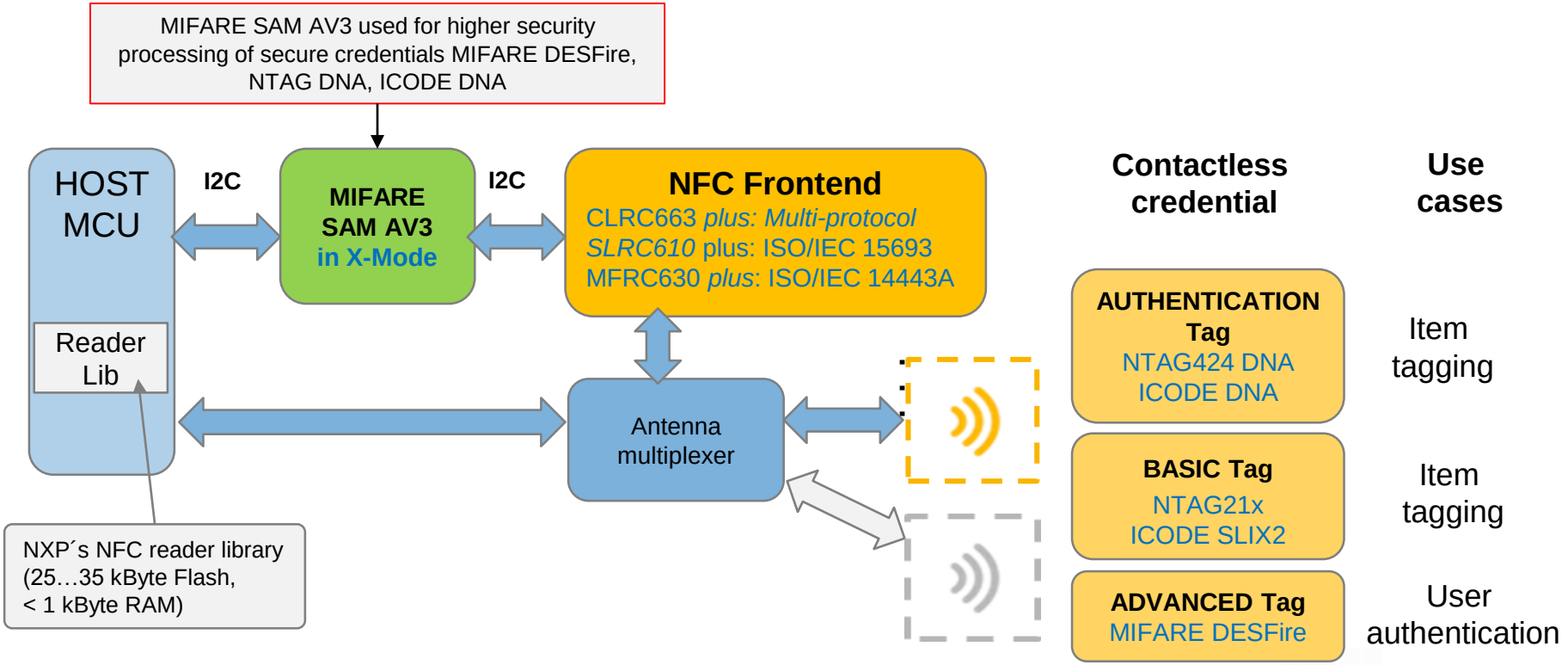
Consideration	Counterfeit Consumables	Competitive Alternatives	Replenishment 1-2 vs. 3-4 times per year	Value of direct customer interaction	Value of consumable customization	Value of social interaction*	Value of direct fulfillment
$ Loss / Value today	x Mu * $y	x Mu * $y	~ Consumable Revenue * 2 - 4	$	Consumer feature	Consumer feature	↑ Margins
Total Value attributable to NFC							

* Acquisition of customer data and preferences by merchant allows more direct marketing

NFC Reader eco-system proposal with PN736x



Basic NFC system proposal with CLRC663 plus family



CLRC663 plus family | quick reference table

	CLRC663 plus	CLRC661 plus	MFRC631 plus	MFRC630 plus	SLRC610 plus
ISO/IEC 14443A – MIFARE/NTAG	yes	yes	yes	yes	
ISO/IEC 14443B	yes		yes		
JIS X 6319-4 – FeliCa	yes				
ISO/IEC 15693 – ICODE SLIX/DNA	yes	yes			yes
ISO/IEC 18000-3m3 – ICODE ILT	yes	yes			yes
ISO/IEC 18092 passive initiator	yes				
Operating transmitter current	350 mA (max.), 500 mA (lim.)				
LPCD(1) range(2) (EMVCo RefPICC)	66 mm				
Operating ambient temp. range	VFBGA36: -40 to +85 °C | HVQFN32: -40 to +105 °C				
RF transmitter supply voltage	2.5 to 5.5 V				
HVQFN32 (5×5×0.85mm)	with wettable flanks				
VFBGA36 (3.5×3.5×0.8mm)	yes				
Product longevity program	10 years				

- **CLRC661 *plus***
  NFC reader for NTAG®, ICODE®, MIFARE® DESFIRE® and MIFARE® products families
- **MFRC631 *plus***
  Entry level EMVCo reader
- All derivatives are **pin-to-pin compatible**

1. Low Power Card Detection
2. all detection ranges measured using the standard CLRC663 *plus* development board (CLEV6630B) operated with external power supply at room temperature

REFERENCES

Philips Visapure Cleanser

- Smart motorized skin-cleansing device communicates with a brush head installed in the unit via NFC
- The tag in the brush head (NTAG®) is encoded with its unique ID and data regarding its type. The device (with NXP MFRC630 reader IC) uses the information to authenticate the brush and configure right motor speeds and pulse settings
- The tag can also be used to record the number of minutes of brush usage to alert the consumer to a required replacement – boosting sale of brushes

Vitamix Blender

- Vitamix high-performance blenders utilie NFC technology for enhanced convenience and safety
- NFC readers (NXP PN512) built into the appliance base can read NFC tags (NTAG®) embedded in containers and cups to automatically change operating parameters (up to 140!). The solution can thus modify program settings, button functions, ramp rates or maximum time settings for soups, sorbets, smoothies and much more
- NFC also offers special safety functions, such as button restrictions and interlock mechanisms, to eliminate unsafe operation conditions

NXP SUPPORT MATERIAL

Development Tools

NXP Reader Library *more information*

Feature complete software support library for MIFARE and NFC Frontend ICs. Designed to give developers a faster and simpler way to deliver NFC-enabled products. This multi-layer library, written in C, makes it easy to create MIFARE and NFC based applications. The software is designed in a way to be easily portable to many different microcontrollers.

RFID Discover - *more information*

Our well known, widely deployed powerful MIFAREDiscover tool is commonly used by the MIFARE development community as it allows to access and handle any MIFARE family chip and data processing feature. This expert tool has been further enhanced to support the latest MIFARE family members of the MIFARE Plus and the MIFARE DESFire EV2 platform including the corresponding MIFARE SAM (Secure Access Module) solutions

NFC TagInfo by NXP

more information

NFC TagWriter by NXP

more information

TapLinx *more information*

Smoother and faster designing and creating of applications

- is designed to provide access to all hardware features on Java level and enables Android apps to be created for MIFARE, ICODE and NTAG more easily than ever before.
- Enormous reduction in development time enables Android APP developers to focus on the really important things:
  - designing cool apps for a range of applications like access management, closed loop micropayment, campus cards and loyalty programs.
  - these apps can then be easily uploaded to the Google Play store, ready for the end-user.
- Product is distributed for free without any licensing fee
- To learn how to get the TapLinx click here

Back to use case overview

PARAMETERIZATION AND DIAGNOSIS

Parameterization & Diagnosis with NFC

Key Highlights:

- Use NFC phones as a touchscreen for **configuration**, **diagnosis** and even **firmware update** to a device
- Enabling sophisticated interactions and configurability
- Devices can be sealed and unpowered
- Save production cost by end-of-line configuration via NFC

Product examples: Industrial control, automation, consumer electronics

Recommended products: NTAG I²C *plus*, NTAG 5 Family

When to choose NFC vs. Bluetooth LE or Wi-Fi for phone-to-device communication

Bluetooth LE or Wi-Fi advantages

- Long communication distance
- High speed > 1 Mbps

NFC advantages

- Zero power consumption (works in off-mode, even energy harvesting possible)
- Lower cost ($0.20 … $0.30 for a connected NFC tag)
- Just tap – no ambiguities, no connection setup

Phone support

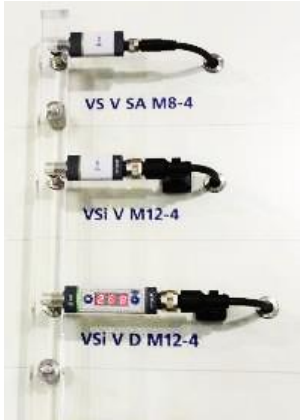
- Bluetooth LE or Wi-Fi: 100% of smartphones
- NFC: 94% of midrange and high-end smartphones in 2021*

Conclusion

If you don’t need long communication distance or large data files (>> 150 kBytes),
NFC is the better solution

* Source: ABI 2020 (Android and iOS mid-range/high-end/premium phones, above $100)

Many industrial devices using NFC for Parameterization & Diagnosis



NXP

Which mobile devices support this?

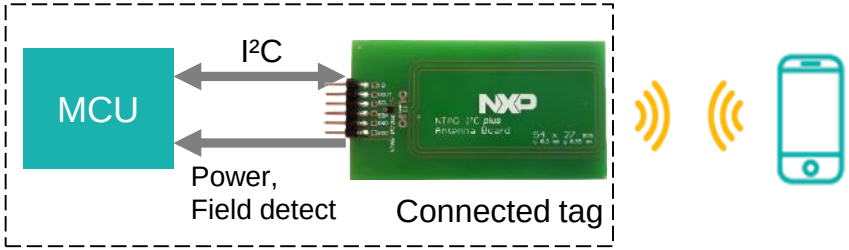
Key Use cases	Supported by*	Application Examples
Diagnosis and maintenance • Phone as UI to read out dynamic device data • Sensor readings, device information, error logs, usage statistics		Appliances, industrial automation, healthcare devices, smart meters, bike computers, thermostats …
Parameterization, firmware update • Configure a device in unpowered state • Update firmware in unpowered state		Appliances, industrial automation, healthcare devices, smart meters, bike computers, thermostats …

Dedicated readers

- It is possible to develop your own portable NFC reader for all these use cases.
- Benefits:
  - Application specific solution
  - Branding
  - Performance optimization
- Recommended reader IC: PN7150

*Android >= 4.0; iOS >= iOS11 for NDEF reading, >= iOS 13 for tag writing, according to Apple

How it works



Device to be parameterized/diagnosed/flashed

Key steps for integration

- Integrate connected tag (NTAG I²C *plus* or NTAG 5) into device
- Develop app on NFC phone

- For details, see „How-to“ guide: https://community.nxp.com/docs/DOC-333834
- Products: NTAG I²C plus (NT3H2211) or NTAG 5 family (NTP5xxx and NTA5xxx)

Parameterization

- Select settings in the app on the NFC phone
- Tap phone to the (unpowered) device
- Phone writes configuration into the connected tag‘s user memory via NFC
- At boot time, MCU reads configuration via I²C bus

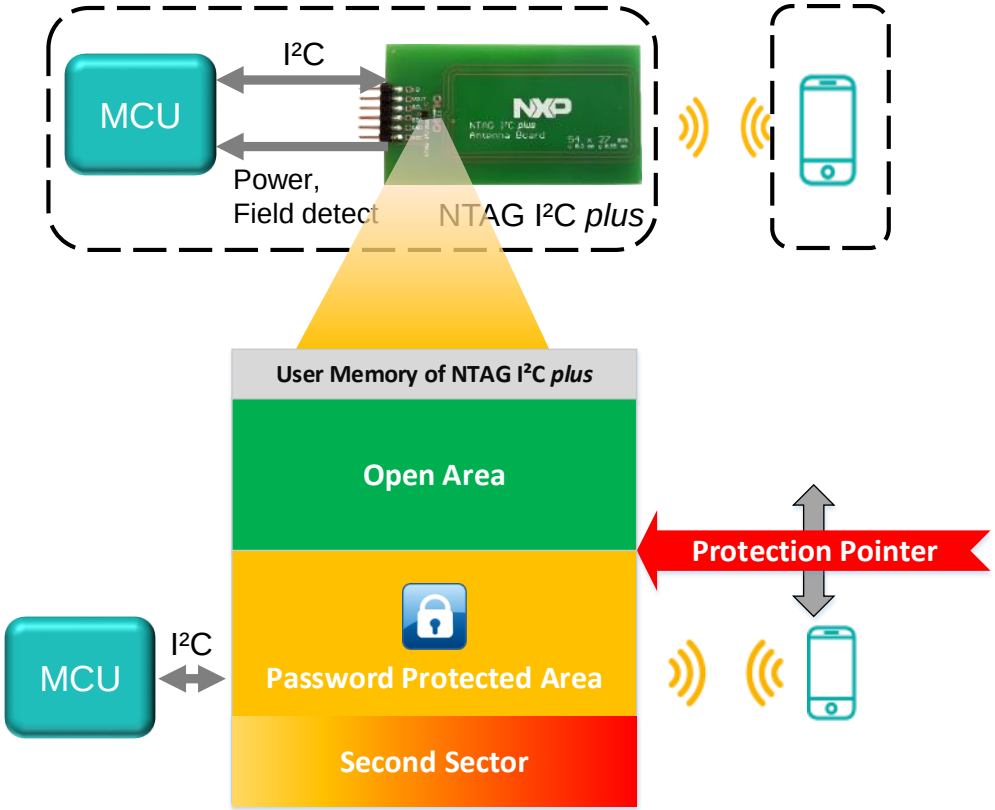
Diagnosis

- At runtime, MCU writes data into the connected tag‘s user memory via I²C
- Tap phone to the (unpowered) device
- Phone reads data via NFC and shows in an app

Firmware update

- Tap phone to the (unpowered) device
- Phone powers the MCU via energy harvesting and streams the firmware via the SRAM buffer to the MCU
- MCU flashes the new firmware

Data protection for both NFC (RF) and I²C access



The user memory of the NTAG I²C plus can be set to read only and/or can be divided with Protection Pointer into two different areas:

- Open area for phone interaction without app e.g. reading URL or BT/WiFi pairing info
  - Accessible from NFC and I²C
  - Can be set to read-only for NFC side
- Password protected area
  - 32-bit password protection for write or read/write access from NFC side
  - Full, read-only or no access from I²C side
- Second sector (2K version only) may be password protected or even hidden from NFC side

- **NTAG 5 improvements:**
  - 3 memory areas
  - Support also for AES authentication

NXP NFC connected tag solutions for parameterization & diagnosis

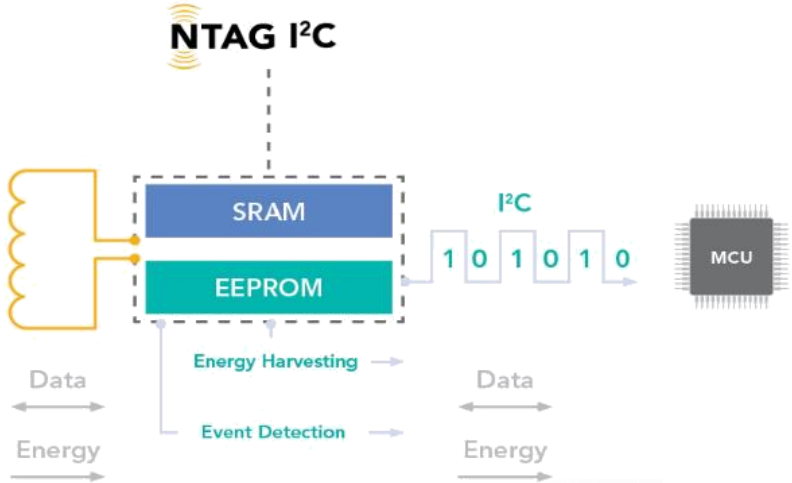
		NTAG I²C plus	NTAG 5 switch	NTAG 5 link		NTAG 5 boost
		NT3H2x11	NTP5210	NTP5312	NTP5332	NTA5332
NFC interface	ISO/IEC NFC Forum	14443 Type 2 Tag	15693 Type 5 Tag	15693 Type 5 Tag		15693 Type 5 Tag
Max. interface speed - NFC/I²C		106 kbps/400 kHz	53 kbps/-	53 kbps/400 kHz		53 kbps/400 kHz
Memory size		888 or 1912 bytes 64 bytes SRAM	512 bytes	2048 bytes 256 bytes SRAM		2048 bytes 256 bytes SRAM
Memory protection from NFC perspective		read only locking 32-bit PWD	read only locking 32- or 64-bit PWD	read only locking 32- or 64-bit PWD	read only locking 32- or 64-bit PWD AES mutual auth.	read only locking 32- or 64-bit PWD AES mutual auth.
Memory protection from I²C perspective		access restriction to NFC protected area	n.a.	32-bit PWD		32-bit PWD
Memory areas		2	3	3		3
Originality Signature		fixed	re-programmable	re-programmable		re-programmable
Event detection		NFC field and interface arbitration	multiple events	multiple events		multiple events
Energy harvesting		up to 15 mW	regulated - up to 30 mW	regulated - up to 30 mW		regulated up to 30 mW
Pulse Width Modulation and GPIO		-	yes	yes		yes
I²C interface		slave	-	slave	master/slave	master/slave
Pass-through		proprietary	-	standardized		standardized
stand-by and hard-power-down		-	6µA/0.25µA	6µA/0.25µA		10µA/0.25µA
Active load modulation		-	-	-		yes, when V_{CC} supplied
Temperature range		-40°C to +105°C	-40°C to +85°C	-40°C to +85°C		-40°C to +85°C

Supports 5…7 cm read range with a 10x10mm antenna

NTAG I²C plus product features

Features	
NFC interface	ISO/IEC 14443-3 Type A compliant NFC Forum Type 2 Tag
Memory	1912 or 888-bytes user memory area 64-bytes SRAM buffer for data transfer
Host interfaces	I²C slave 100/400 Kbit/s Field detection pin
Energy harvesting	Up to 15mW
Data transfer	Pass-through mode with 64-byte SRAM buffer FAST_WRITE and FAST_READ NFC commands for higher data throughput
Security	7-byte Unique Identifier One time programmable Capability Container Read-only locking Elliptic curve based originality signature Data access protection from NFC and I²C perspective
Temperature range	-40ºC, +105ºC

Packages	
XQFN8	1.8 x 2.6 x 0.5 mm
TSSOP8	3 x 3 x 1.1 mm
SO8	4.9 x 3.9 x 1.75 mm



More info: http://www.nxp.com/products/:NT3H2111_2211

NTAG 5 link – technical product features

Main features	
NFC Interface	ISO/IEC 15693 compliant, up to 60 cm read range NFC Forum Type 5 Tag compliant
Memory	2048 byte user memory 256 byte SRAM
Wired Interface	I²C slave (up to 400 kHz) or I²C transparent master[1] channel or Pulse Width Modulation/GPIO Event detection or PWM output Stand-by current <6 µA @ RT Hard power down current < 0.25 µA @ RT
Energy Harvesting	Configurable output 1.8 V, 2.4 V or 3 V with around 30 mW output power
Security	• AES[1] 128 bit mutual authentication or • 32-bit or 64-bit password protection from NFC perspective • 32-bit password from I²C perspective • 3 configurable user memory areas • ECC based reprogrammable originality signature • Disable NFC / I²C
Temperature range	-40°C to +105°C [2]

Wired interface details	
GPIO / PWM	I²C lines maybe used as GPIO's or PWM lines
Event Detection	Multiple events can be used as trigger to the host, or use ED pin as PWM channel in parallel to I²C
Transparent I²C master channel[1]	Attach and power any I²C slave like sensor or external memory without MCU
I²C slave	Efficient proprietary pass-through mode

[1] Two versions of NTAG 5 link	
NTP5312	With I²C slave interface; no AES
NTP5322	With I²C master interface and AES mutual authentication

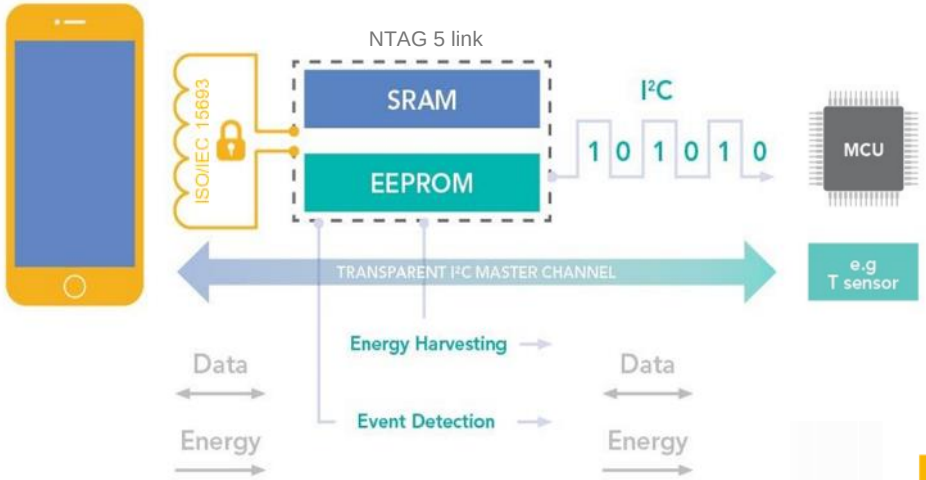
[2] For all operations except write EEPROM which is limited 85 °C

NTAG 5 link – Block diagram

- NTAG 5 link can be configured to work as I²C slave or I²C master*.
- NTAG 5 link* can act as a direct bridge between an NFC-enabled device and any I²C slave, such as a sensor or external memory.
- This is especially useful in environments that require zero-power, single-shot measurements.

NTAG 5 link capabilities of I²C master mode* can be found in **AN12368**

I²C bus specification and user manual can be found in **UM10204**

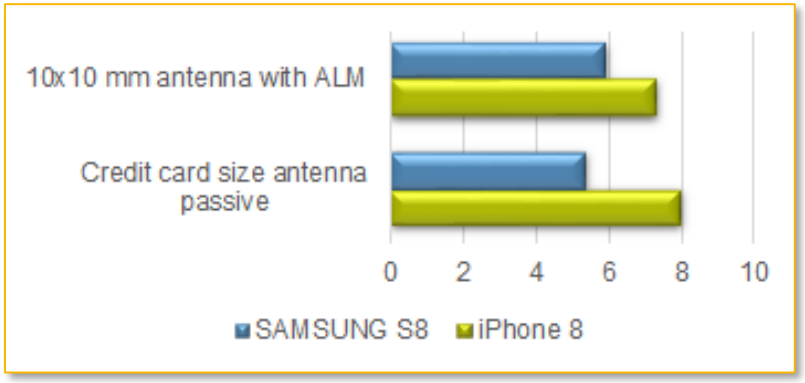


* only NTP5332 supports AES and I²C master

NTAG 5 boost – for small antennas and improved customer experience

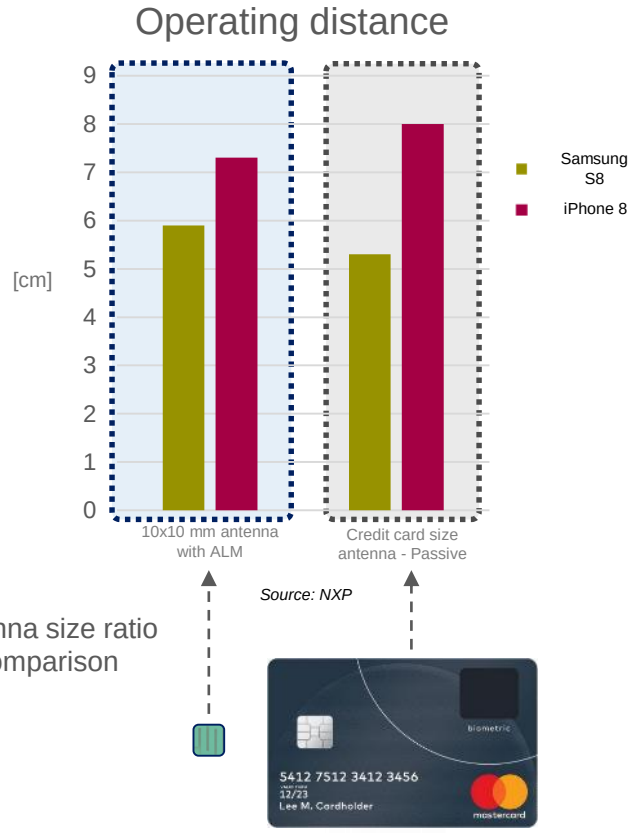
Main features	
RF Interface & protocols	NFC Forum Type 5 Tag Active Load Modulation for extra range and tiny antenna footprint
Memory	2048 Bytes user memory 256 byte SRAM
Wired Interface	I²C slave (up to 400 kHz) or I²C transparent master channel or Pulse Width Modulation/GPIO Event detection or PWM output Stand-by current <10 µA @ RT Hard power down current < 0.25 µA @ RT 1.62 V to 5.5 V supply
Security	AES 128 bit mutual authentication or 32-bit or 64-bit password protection from NFC perspective 32-bit password from I²C perspective 3 configurable user memory areas ECC based reprogrammable originality signature NFC and I²C slience
Temperature range	-40°C to +85°C

Product Type	12NC	Package	Dimensions	Packing	MOQ
NTA53321G0FUA	9353 582 84005	FFC	Bare die	Wafer	1
NTA53321G0FTT	9353 625 04431	TSSOP16	4.4 x 5.0 x 1.1 mm	Reel 13"	2500
NTA53321G0FHK	9353 549 13471	XQFN16	1.8 x 2.6 x 0.5 mm	Reel 7"	4000



NTAG 5 boost – Technical product features

Main features	
RF Interface & protocols	NFC Forum Type 5 Tag Active Load Modulation for extra range and tiny antenna footprint
Memory	2048 Bytes user memory 256 byte SRAM
Wired Interface	• I²C slave (up to 400 kHz) or I²C transparent master channel or Pulse Width Modulation/GPIO • Event detection or PWM output • Stand-by current <10 µA @ RT • Hard power down current < 0.25 µA @ RT • 1.62 V to 5.5 V supply
Security	• AES 128 bit mutual authentication or • 32-bit or 64-bit password protection from NFC perspective • 32-bit password from I²C perspective • 3 configurable user memory areas • ECC based reprogrammable originality signature • Disable NFC / I²C
Temperature range	-40°C to +105°C [1]



[1] For all operations except write EEPROM which is limited 85 °C

Operating ranges, material penetration and shielding

OPERATING RANGE

Depends on various factors:

- Size of phone / reader antenna
- Size of connected tag antenna
  - Ideally similar to reader antenna size for best coupling. Exception: NTAG 5 boost works also with very small antennas due to active load modulation.
- Phone / reader power
  - Typically NFC phones are low-power designs
  - Dedicated portable readers can maximize the power (e.g. PN7150 = 1.3W output power)
- Connected tag antenna tuning

Typical ranges:

- 2…5 cm (phone)
- up to 10 cm (dedicated reader)

MATERIAL PENETRATION AND SHIELDING

- Plastic, glass, wood: very good penetration
- Metal: no penetration. Metal fully shields the RF field.
- Connected tag antenna can be mounted on top of a metal surface if there is a ferrite layer between the metal and the antenna

Details: NTAG Antenna Design Guide, AN11276

Support material / references

- NTAG I²C *plus* product page:
  http://www.nxp.com/products/:NT3H2111_2211
- NTAG 5 link product page:
  https://www.nxp.com/products/:NTAG5-LINK
- NTAG 5 boost product page:
  https://www.nxp.com/products/:NTAG5-BOOST
- How-to guide:
  https://community.nxp.com/docs/DOC-333834
- Community for technical questions:
  https://community.nxp.com/community/nfc

NTAG I²C plus ordering details

Product	Part number	12NCs	Package	Delivery form	MOQ
NTAG I²C plus 1k	NT3H2111W0FTT (1k)	9353 069 32118	TSSOP8	Tape&reel	2.5kpcs
NTAG I²C plus 2k	NT3H2211W0FTT (2k)	9353 069 33118	TSSOP8	Tape&reel	2.5kpcs
NTAG I²C plus 1k	NT3H2111W0FT1 (1k)	9353 070 09115	SO8	Tape&reel	500pcs
NTAG I²C plus 2k	NT3H2211W0FT1 (2k)	9353 070 16115	SO8	Tape&reel	500pcs
NTAG I²C plus 1k	NT3H2111W0FHK (1k)	9353 069 39125	XQFN8	Tape&reel	4kpcs
NTAG I²C plus 2k	NT3H2211W0FHK (2k)	9353 069 43125	XQFN8	Tape&reel	4kpcs

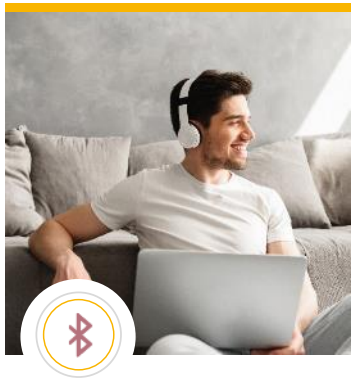
NTAG 5 part type and ordering details

Name	Part no.	Package	12nc
NTAG 5 switch	NTP52101G0JHKZ - Tape/Reel	XQFN	935354731471
NTAG 5 switch	NTP52101G0JTZ - Tape/Reel	S08	935354901431
NTAG 5 switch	NTP52101G0JTTZ - Tape/Reel	TSSOP 16	935362409431
NTAG 5 switch	NTP52101G0JUA – Bare die	FFC – Wafer	935385992005
NTAG 5 link (no AES)	NTP53121G0JHKZ - Tape/Reel	XQFN	935354903471
NTAG 5 link (no AES)	NTP53121G0JTZ - Tape/Reel	S08	935354905431
NTAG 5 link (No AES)	NTP53121G0JTTZ - Tape/Reel	TSSOP 16	935362411431
NTAG 5 link (No AES)	NTP53121G0JUA – Bare die	FFC – Wafer	9353 582 08005
NTAG 5 link	NTP53321G0JHK - Tape/Reel	XQFN	935354909471
NTAG 5 link	NTP53321G0JTZ - Tape/Reel	S08	935354911431
NTAG 5 link	NTP53321G0JTT - Tape/Reel	TSSOP 16	935362496431
NTAG 5 link	NTP53321G0JUA – Bare die	FFC – Wafer	9353 582 09005
NTAG 5 boost	NTA53321G0FHKZ - Tape/Reel	XQFN	935354913471
NTAG 5 boost	NTA53321G0FTTZ - Tape/Reel	TSSOP 16	935362504431
NTAG 5 boost	NTA53321G0FUA – Bare die	FFC – Wafer	
NTAG 5 boost Development board	OM2NTA5332	-	935394976598
NTAG 5 link/switch Development board	OM2NTP5332	-	935394937598
NTAG 5 Demo Kit	OM2NTA5KIT	-	935394934598

Back to use case overview

EASY PAIRING AND COMMISSIONING

PAIRING & commissioning



Pair with Bluetooth devices faster, without conflicts

Pair with Wi-Fi devices with just a tap

View images and videos on the big screen, with just a tap

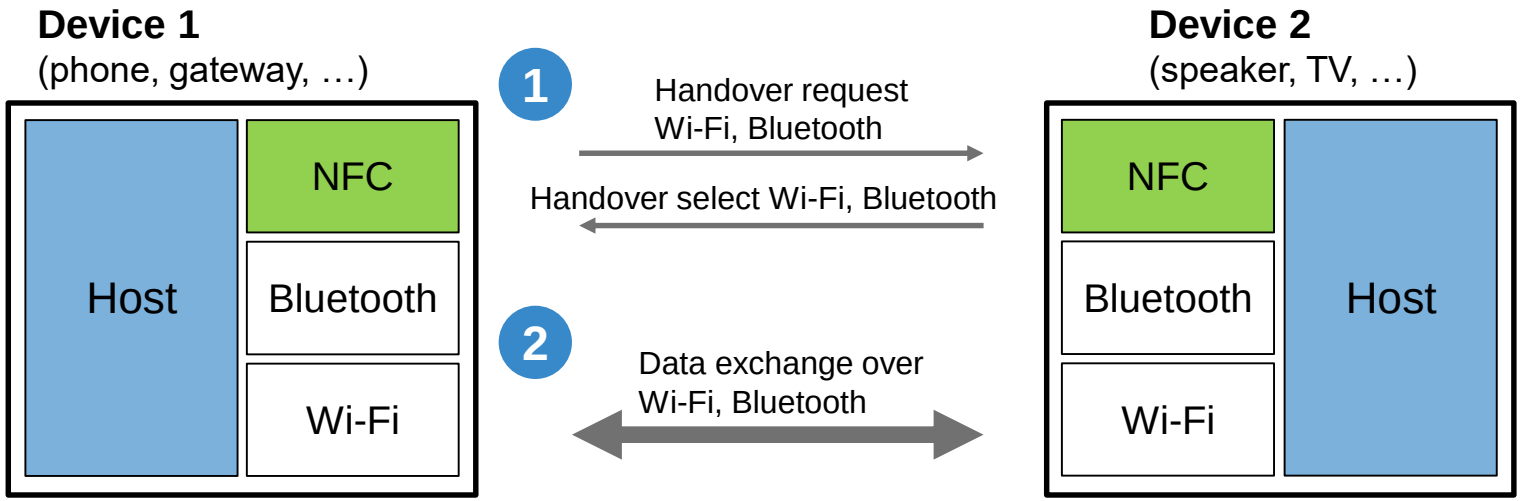
Add IoT devices (sensors, lights, …) to your home or office network in seconds, without entering codes

- Simple and quick pairing with a single tap
- Exchange credentials securely, just by tapping
- Identify a device instantly, without entering codes or creating device conflicts
- Ensure that accessories are paired to the correct device
- Flexible, all kind of protocols supported: Zigbee, Thread, Bluetooth Low-energy
- No need to power on the IoT device for commissioning
- Make devices easier to use and reduce tech-support costs

Which Product?

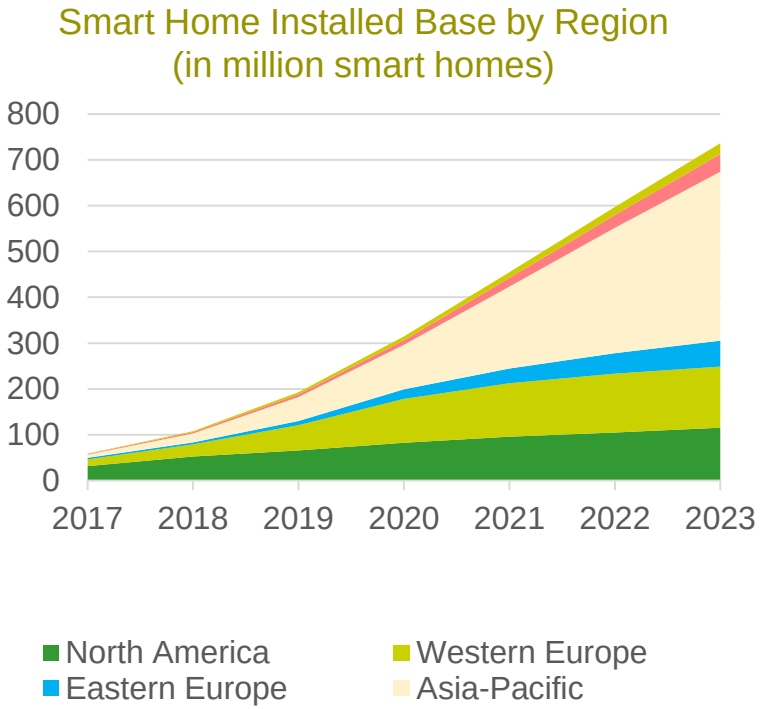
NTAG® I²C *plus*, PN7150, NTAG 5 boost & link

Wi-Fi and Bluetooth pairing with NFC



- NFC is the fast and simple way for pairing wireless devices without conflicts.
  No menu, no waiting.
- Handover mechanism (request and select) with just a tap 1
- Credentials are securely exchanged via NFC

Smart home market and challenge in IoT



Great traction with more than 300 million homes converted into smart homes by the end of 2020

Video entertainment, smart speakers and more recently home security devices are the most popular applications, with Wi-Fi, Bluetooth, and ZigBee wireless connectivity

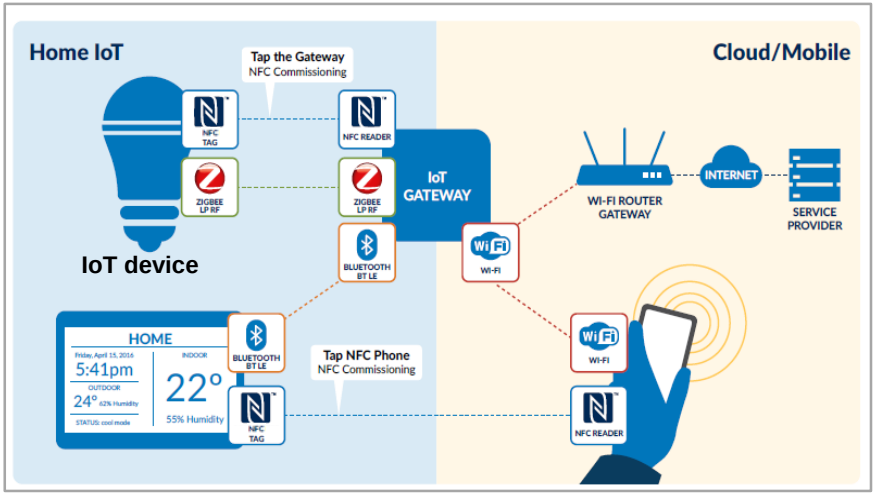
But there are still **roadblocks** for mass market adoption of more **complex smart home systems** connecting multiple IoT devices:

- How do you deliver plug-and-play IoT devices that do not require **complicated initial configuration**?
- How can you ensure a new device is **seamlessly and securely introduced to the network**?
- How do you provide an **easy-to-use user interface** so that consumers can take advantage of IoT features and capabilities?
- How do you bring assistance when IoT devices need **troubleshooting or updating**?
- How to **replace an old device** with a new one?

Source: ABI, Smart Home Systems report, 2Q2019

Smart Home commissioning with NFC

Connect securely each IoT device to the network

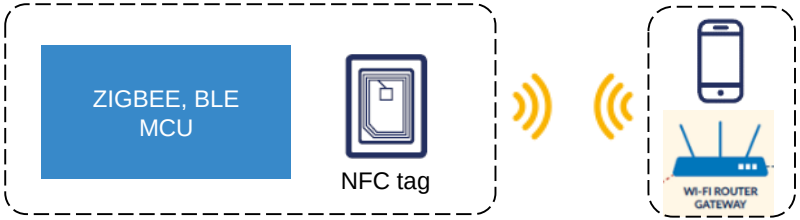


NFC reader in the gateway, NFC tag in the IoT device (sensor, bulb, detector, switch, …)

- In Factory, the profile, network identifier, public key are loaded into the IoT device
- At Home, several options are possible for connecting the IoT device to the network
  1) With NFC: tap once the IoT device to the gateway
  2) Use a phone as an intermediate device for transferring the credentials
     - With NFC only: two taps
     - With one NFC tap and Wi-Fi or BLE connectivity
- The IoT device is securely connected to the network once it's identified, added to the list of authorized devices and network credentials exchanged.
- Security level varies depending on the connectivity option and the NFC tag technology selected

2 NFC tags solutions

With an NFC tag in the IoT device



- Tag comes with an integrated antenna and can be based anywhere in the product
- IoT device data need to be written to both the NFC tag and the MCU in factory
- No connection to MCU

With a **connected NFC tag** in the IoT device

- **IoT device data need to be written only once** as this data is exchanged with I²C interface
- Network credentials or shared secret (password, key, pin) can be written into the MCU via the NFC and the I²C interface, ensuring **High secure commissioning process**
- **Other NFC use cases are possible** like error diagnosis and firmware update, control with phone.
- **MCU can be powered** from the Energy harvested out of the RF field produced by the phone

NFC vs. other competing technologies

	NFC	QR code	WPS	Received Signal Strength (RSS)
Security	Very secure Network credentials are directly written into the IoT device at short distance in a tap Simple and effective counterfeiting solution	Not secure Network credentials exchanged over the air Possible to sniff the key exchange Counterfeiting detection requires complex and often not accurate cloud solution	Known to be unsecure Network credentials exchanged over the air or over long wires (PLC) Possible to sniff the key exchange Free access to WPS button	Not secure Network credentials exchanged over the air and during 15 to 30 sec Possible to sniff the key exchange
Smartphone	Optional	Mandatory	Not required	Optional
Ease of Use	Intuitive with a tap for connection and disconnection IoT device does not necessarily need to be powered	Good lighting and good line of sight is required Subject to physical damage, scratches or dirt	Require to power each device before pressing both WPS buttons Difficult if devices are far away	Require each device to be powered and at precise distance for specific time window Often does not work
Design integration	Can be integrated into brand graphics or use N-Mark	Unattractive Must maximize barcode size to improve readability	Require one button on each device	A button is needed on the IoT device
Cost	Low	Very low	Medium	Low
Versatile	Enable additional use cases: device control, error diagnosis and maintenance	No	No	No

For the gateway:
PN7150 plug'n play NFC reader

- NFC plug'n play solution, easy to integrate in any application
- **Support NFC card emulation, reader/writer and peer-to-peer modes**
- Compatible with **ISO/IEC 14443-A&B**, **FeliCa** and **ISO/IEC 15693** cards
- Very easy to integrate thanks to embedded FW and NCI standardized interface
- **OS support: Linux, Android and WinIoT with drivers**, easing integration and reducing time to market
- **Support of Real Time OS and NullOS**
- **Low power** operation mode
- Standard package HVQFN40

OM5578/ PN7150ARD	NFC Controller SBC kit for Arduino Demokit
OM5578/PN7150BBB	NFC Controller SBC kit for BeagleBone Black
OM5578/PN7150RPI	NFC Controller SBC kit for RaspBerry Pi

http://www.nxp.com/products/:PN7150B0HN

10 years longevity

Easy to integrate

Connect directly to application host

Easy to use

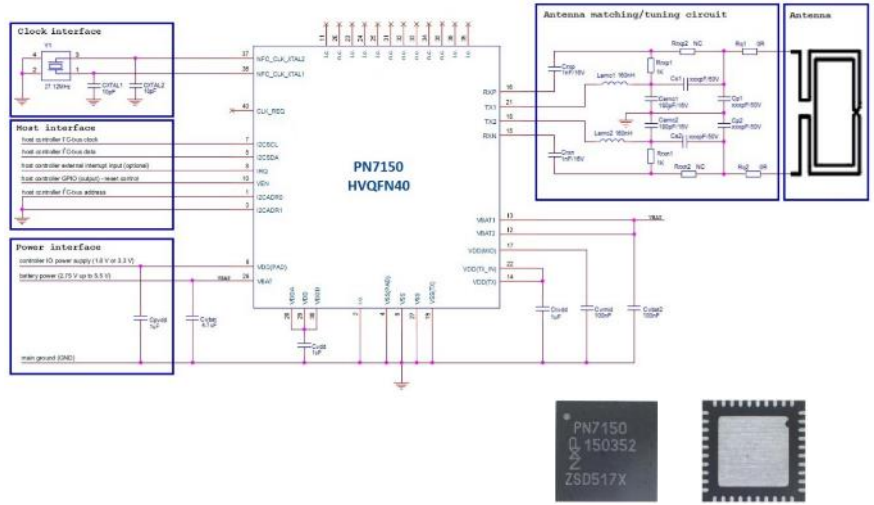
Lower bill of materials

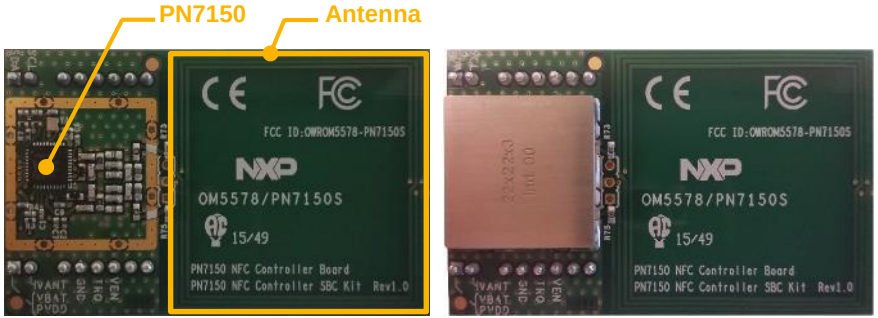
Optimized for low power

NXP

PN7150 application

- Bill of Materials components
  - Standard HVFQN40: 6 x 6 x 0.85mm
  - Antenna matching: 6R, 8C, 2L
  - Decoupling cap: 6C
  - Optional: crystal + 2 decoupling capacitors
  - Shielding is optional
- Supply voltage
  - Host interface: 1.8V or 3.3V
  - RF driver: 2.75V to 5.5V
- Application size
  - PN7150 and BoM in less than 20mm x 20mm
  - Antenna 200mm^2 (small), 1600mm^2 (dev board)
- Standard and low cost components
- Compatible with 2-layers low-cost PCB



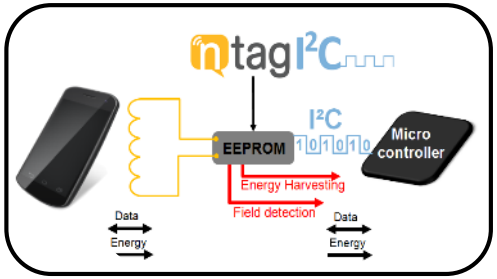


For the network node / IoT device: connected NFC tag

Feature	NTAG I²C plus	NTAG 5 link	NTAG 5 boost
Summary	Cost-effective connected NFC tag	Higher range, more security	Highest range, great user experience, easier connection without searching for the right antenna spot
NFC interface	ISO/IEC14443	ISO/IEC15693	ISO/IEC15693
Energy harvesting	up to 15 mW	regulated up to 30 mW	regulated up to 30 mW (in passive mode)
Field/event detect	✓	✓	✓
Memory areas	2	3	3
Memory protection	Password	Password and AES authentication	Password and AES authentication
I²C interface	slave	slave / master	slave / master
Pass-through via SRAM	proprietary	proprietary and standardized	proprietary and standardized
Active load modulation (when V_{CC} supplied)	-	-	✓

NTAG I²C plus connected tag

- Easy access to data from both NFC (Type 2 Tag) and from I²C
- Field detection to wake up connected devices
- Energy Harvesting capabilities
- EEPROM for offline data access
- Flexible memory management
- Originality signature for protection against cloning
- Fast & convenient data exchange via a 64 bytes SRAM buffer
- Small footprint package (1.6*1.6*0.5mm)



OM5569-NT322E	NTAG® I²C plus Explorer Kit
OM5569-NT322ER	NTAG® I²C plus Explorer Kit + NFC Reader
OM5569-NT322F	NTAG I²C plus Flex Kit

http://www.nxp.com/products/:NT3H2111W0FHK

15 years longevity

Easy to use

Easy to integrate

Low bill of material

Ideal for low power operations

Maximum interoperability with NFC devices

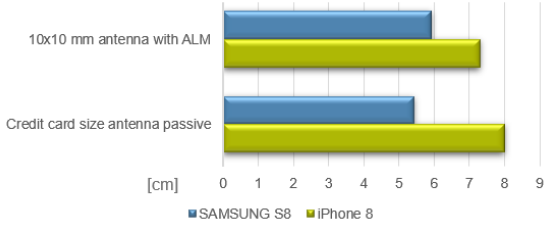
NTAG 5 family

Back to use case overview

NTAG 5 Link	
NFC Interface	NFC Forum Type 5 Tag, ISO/IEC 15693 compliant
Memory	2048 byte user memory, 256 byte SRAM
Wired Interface	I²C slave (up to 400 kHz) or I²C transparent master[1] channel or Pulse Width Modulation/GPIO Event detection or PWM output Stand-by current <6 µA @ RT Hard power down current < 0.25 µA @ RT
Energy Harvesting	Configurable output 1.8 V, 2.4 V or 3 V with up to 30 mW output power
Security	AES[1] 128 bit mutual authentication or 32-bit or 64-bit password protection from NFC perspective 32-bit password from I²C perspective 3 configurable user memory areas ECC based reprogrammable originality signature NFC and I²C slience
Temperature range	-40°C to +85°C
Package	SO8 (3.6 x 6.2 x 1.35 mm) (no energy harvesting, hard power down) TSSOP16 (4.4 x 5.0 x 1.1 mm) XQFN16 (1.8 x 2.6 x 0.5 mm)

http://www.nxp.com/products/:NTAG5-LINK

NTAG 5 Boost	
RF Interface & protocols	NFC Forum Type 5 Tag, ISO/IEC 15693 compliant Active Load Modulation for extra range and tiny antenna footprint
Memory	2048 Bytes user memory, 256 byte SRAM
Wired Interface	I²C slave (up to 400 kHz) or I²C transparent master channel or Pulse Width Modulation/GPIO Event detection or PWM output Stand-by current <10 µA @ RT Hard power down current < 0.25 µA @ RT 1.62 V to 5.5 V supply
Energy Harvesting	when used as passive, regulated up to 30 mW
Security	AES 128 bit mutual authentication or 32-bit or 64-bit password protection from NFC perspective 32-bit password from I²C perspective 3 configurable user memory areas ECC based reprogrammable originality signature NFC and I²C slience
Temperature range	-40°C to +85°C
Package	FFC (bare die) TSSOP16 (4.4 x 5.0 x 1.1 mm) XQFN16 (1.8 x 2.6 x 0.5 mm)



http://www.nxp.com/products/:NTAG5-BOOST

ACCESS MANAGEMENT / SMART LOCKS

NFC access management becoming more personal

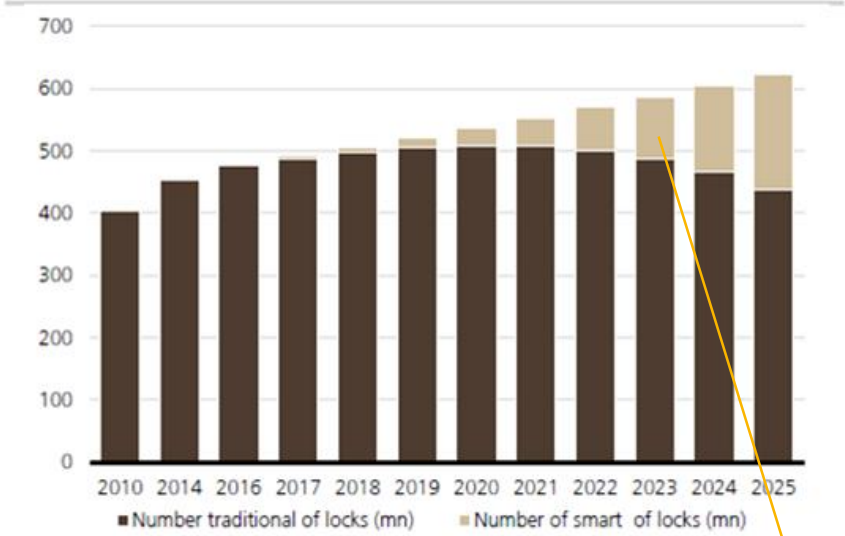
Corporate Access

Hospitality

Residential Access

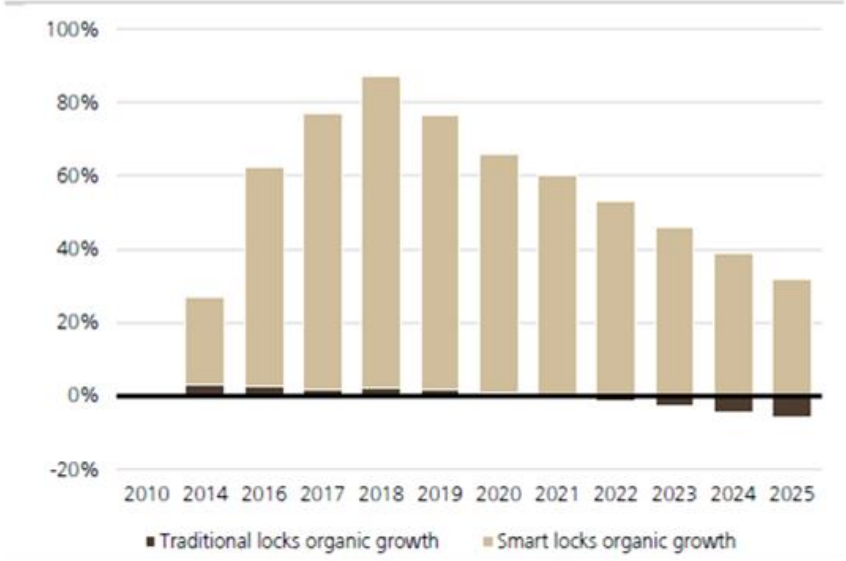
UBS Evidence Lab: Smart Lock Key to the Future of the Home Security Market

Figure 18: UBS estimate for the global lock market in units and smart locks penetration base case scenario



Source: UBS estimates

Figure 19: UBS estimate for the global lock market in units and smart locks penetration base case scenario



Source: UBS estimates

Source: UBS „Home Security Market“, 28.08.2018

2023: 100Mpcs / yr

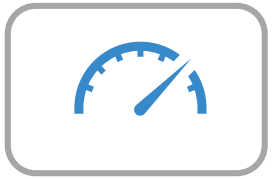
Residential smart locks – User experience requirements

- Convenience
- Security
- Configuration by phone
- Low risk of fail – lock-out
- Temporary access (for visitors, renters, service or delivery staff)
- Easy installation / retro fit

Comparison of Smart Lock Connectivity Technologies

		WI-FI	ZIGBEE	LE	NFC	
Convenience	App-based local unlocking	0	0	0	++ *no app to open, reliable connection*	Quick unlocking
	Hands-free access	--	--	0	--	
	Unlocking without phone	--	--	+ *Bluetooth remote control*	++ *Keyfobs, wristbands, cards – no battery needed*	Flexibility
	Remote unlocking	++	+ *via gateway*	+ *via gateway*	--	
	Lock battery life	0	+	+	++	Reliability
	Configuration by phone	++	++	++	+	
	Easy installation / retrofit	+	+	++ *inside only retrofit*	+	
	Security	+	+	+	++	Security
	Risk of fail / lock out	- *Multiple failure possibilities*	- *Multiple failure possibilities*	0…+ *depending on solution*	+ *emergency power, emergency cards*	
	Phone as credential	++	++ *via gateway*	++	0 *currently no iPhone support*	

NFC offers quick unlocking



NFC card/keyfob

1. Tap it to the lock

NFC phone

1. Unlock your phone
2. Tap your phone to the lock

Bluetooth LE phone

1. Unlock your phone
2. Open the app and ensure the phone is connected to the lock
3. Press a button in the app

NFC is ideal for regular use

NFC offers reliability

- **Reliable unlocking**: NFC just works
  - Biometric features (fingerprint) don‘t work for everybody
  - Hands-free (auto-unlock) not reliable based on Bluetooth LE (missing inside/outside detection)

- **Battery life** of NFC lock **higher** than a pure Bluetooth LE lock (Factor 1.5…3)
  - Bluetooth LE can still be used for lock configuration in addition to NFC.
  - Power saving by NFC even in combined case Bluetooth LE + NFC:
    - Regular unlocking with NFC (Low power card detection mode)
    - No Bluetooth LE background operation necessary (can be triggered e.g. by door handle)

NFC offers flexibility

Credentials are available in many different types and form factors, with and without battery.

Fully passive

No battery, no recharging

Quickest unlocking

For visitors

For kids / outdoor

For all

Active devices

NFC offers security

- Passive credentials (key fobs, cards, etc.) based on MIFARE DESFire family:
  - Common Criteria security certified: Ranging from EAL 4 to EAL5+
  - Built-in crypto-engine with AES128. The key stays in the card and is not transmitted in plain.


- Active credentials (smart phones, smart watches):
  - NFC can use the built-in secure element for key storage and authentication


- All credentials:
  - Short range is an additional implicit protection

Combining NFC with other connectivity: 2 Examples

		WI-FI	ZIGBEE	LE	NFC
User experience	App-based local unlocking	0	0	0	++ *no app to open, reliable connection*
	Hands-free access	--	--	0	--
	Unlocking without phone	--	--	+ *Bluetooth remote control*	++ *Keyfobs, wristbands, cards – no batt. needed*
	Remote unlocking	++	+ *via gateway*	+ *via gateway*	--
	Lock battery life	0	+	+	++
	Configuration by phone	++	++	++	+
	Easy installation / retrofit	+	+	++ *inside only retrofit*	+
	Security	+	+	+	++
	Risk of fail / lock out	- *Multiple failure possibilities*	- *Multiple failure possibilities*	0…+ *depending on solution*	+ *emergency power, emergency cards*
	Phone as credential	++	++ *via gateway*	++	0 *currently no iPhone support*

Mid-range lock: Bluetooth LE + NFC

	+ NFC
User experience: App-based local unlocking	++ *no app to open, reliable connection*
User experience: Hands-free access	0
User experience: Unlocking without phone	++ *Keyfobs, wristbands, cards – no batt. needed*
User experience: Remote unlocking	+ *via gateway*
User experience: Lock battery life	++
Configuration by phone	++
Easy installation / retrofit	+
Security	++
Risk of fail / lock out	+ *emergency power, emergency cards*
Phone as credential	++

NFC used for:

- Quick, flexible and reliably daily unlocking

Bluetooth used for:

- Configuration
- Visitor unlocking

Advanced lock: Bluetooth LE + Wi-Fi + NFC

	+ NFC	+ WI-FI + NFC
User experience: App-based local unlocking	++ *no app to open, reliable connection*	++ *no app to open, reliable connection*
User experience: Hands-free access	0	0
User experience: Unlocking without phone	++ *Keyfobs, wristbands, cards – no batt. needed*	++ *Keyfobs, wristbands, cards – no batt. needed*
User experience: Remote unlocking	+ *via gateway*	++
User experience: Lock battery life	++	++
Configuration by phone	++	++
Easy installation / retrofit	+	+
Security	++	++
Risk of fail / lock out	+ *emergency power, emergency cards*	+ *emergency power, emergency cards*
Phone as credential	++	++

NFC used for:
- Quick, flexible and reliably daily unlocking

Bluetooth used for:
- Configuration
- Visitor unlocking

Wi-Fi* used for:
- Remote operation

* Or Zigbee/Thread (with gateway)

NFC Value proposition for smart locks - summary

- **Quick unlocking**
  - No manual starting of an app or typing pins, just tap
- **Reliability**
  - NFC simply works
  - Fewer battery replacements due to lower power consumption
- **Flexibility**
  - Use NFC phone, keyfob, card, wearable
- **Security**
  - Certified security and short read range

NXP NFC PRODUCTS AND ARCHITECTURES FOR RESIDENTIAL SMART LOCKS

NFC building blocks for Smart Locks

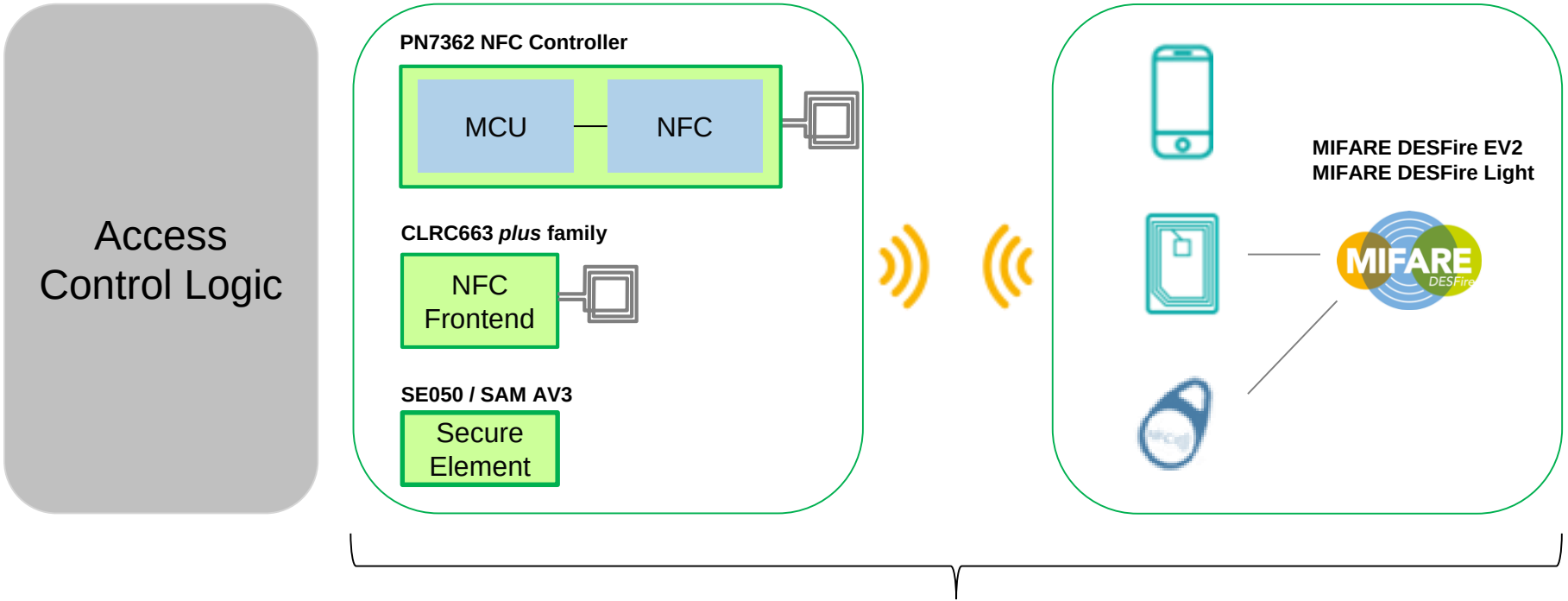
Access Control Logic

NFC Reader

Credentials

NXP reader and card IC offering perfectly matching for highest security, functionality and performance

NFC building blocks for Smart Locks



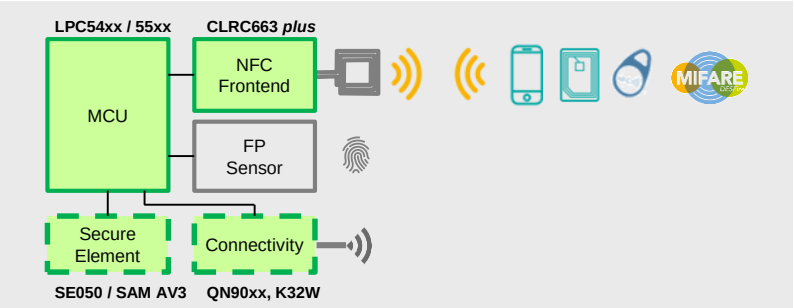
NXP reader and card IC offering perfectly matching for highest security, functionality and performance

Different NFC smart lock architectures: Overview

NFC-only lock
With connectivity option

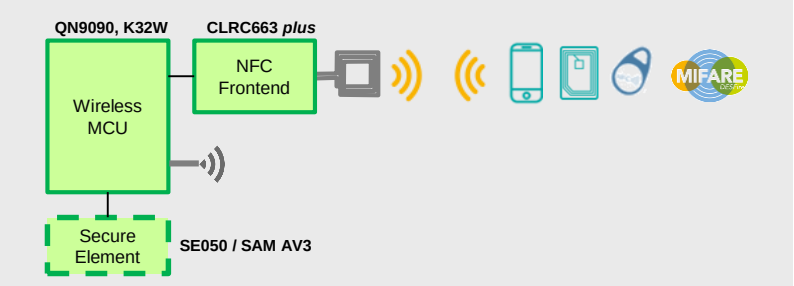
High integration for NFC-only locks with single-chip NFC controller

Fingerprint+NFC lock
With connectivity option



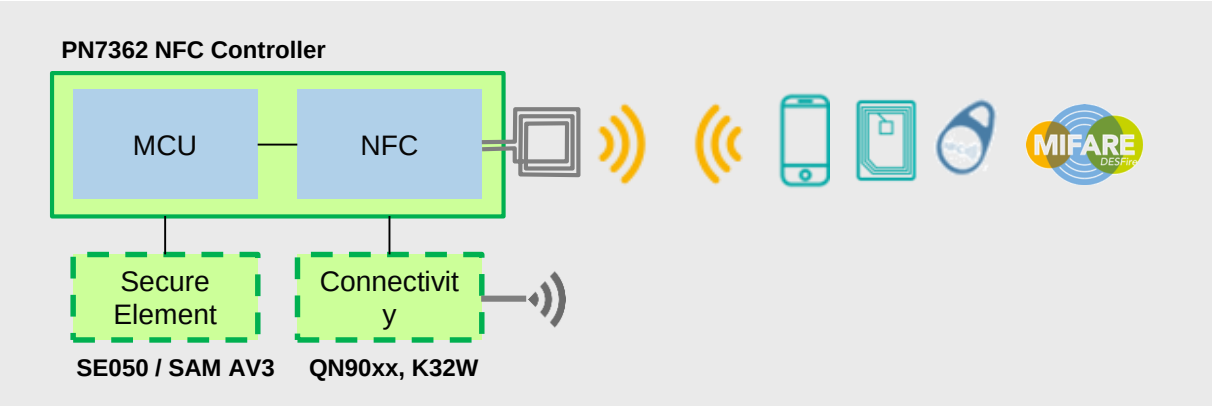
High fingerprint processing power and flexible NFC frontend family

NFC+connectivity lock



Efficient BOM for NFC and connectivity combination

NFC-only lock with connectivity option



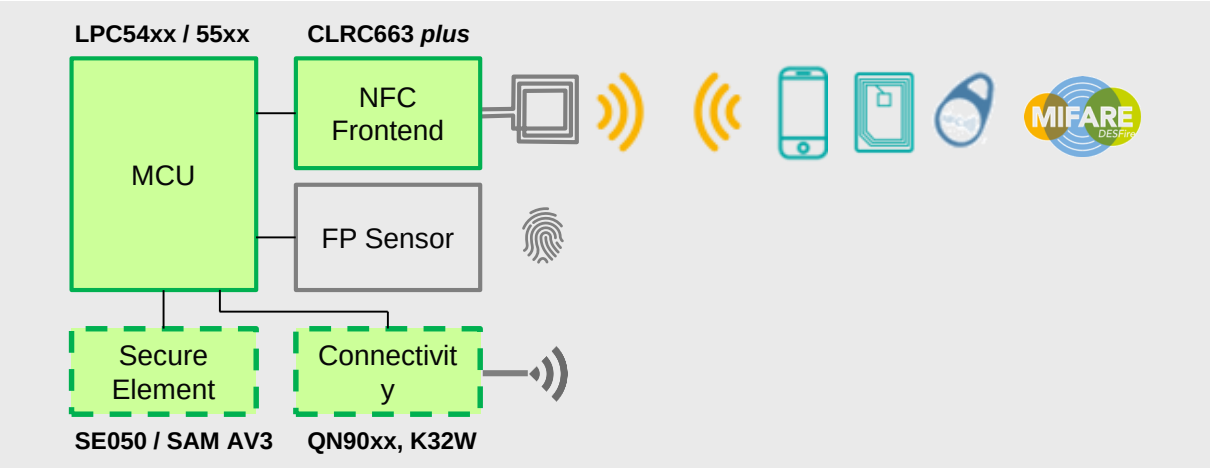
High integration for NFC-only locks with single-chip NFC controller

PN7362: All-in-one full NFC solution
- Freely programmable Cortex-M0 with 160 kByte Flash @ 20 MHz
- High-performance multi-protocol full NFC function
- HVQFN 9x9 mm or BGA 4.5x4.5 mm

EdgeLock™ SE050
- Plug & Trust Secure Element Family
- CC EAL 6+ certified
- RSA, ECC, AES, 3DES functionality
- Secure key storage

MIFARE® SAM AV3
- Optimized for MIFARE DESFire® Family
- CC EAL 6+ certified
- Supports Crypto 1, AES, TDEA, SHA, RSA ECC
- Secure key storage

Fingerprint+NFC lock with connectivity option



High fingerprint processing power through **LPC54/55** family

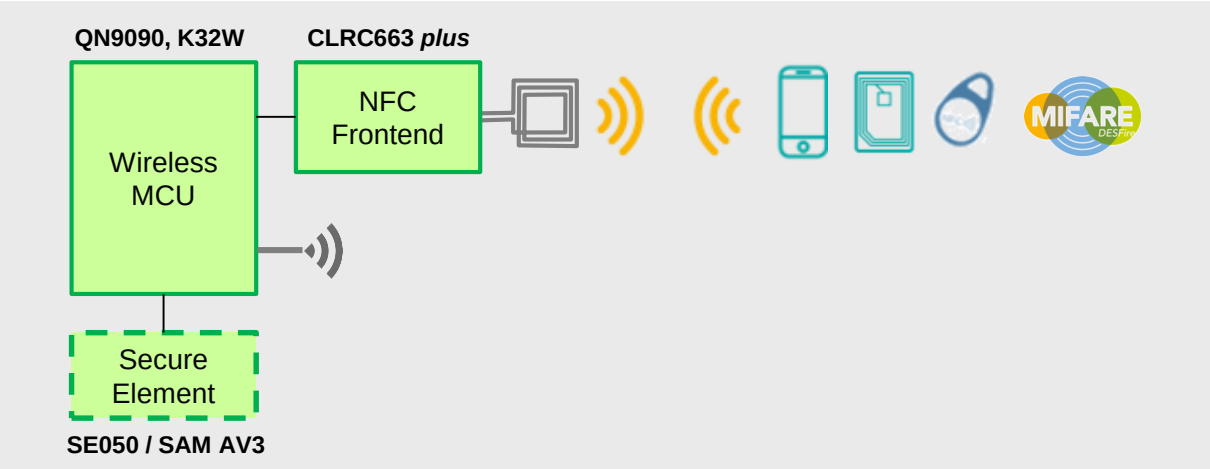
Flexible NFC frontend family **CLRC663 *plus*** for different application requirements

CLRC663 *plus* family
- High-performance multi-protocol NFC reader frontend family
- 1.8 W output power
- Pin-compatible family members MFRC630, MFRC631, MFRC661

EdgeLock™ SE050
- Plug & Trust Secure Element Family
- CC EAL 6+ certified
- RSA, ECC, AES, 3DES functionality
- Secure key storage

MIFARE® SAM AV3
- Optimized for MIFARE DESFire® Family
- CC EAL 6+ certified
- Supports Crypto 1, AES, TDEA, SHA, RSA ECC
- Secure key storage

NFC+connectivity lock



Efficient BOM for NFC and connectivity combination

Multi-standard wireless (Bluetooth LE, Zigbee, Thread) enabled by **K32W**

CLRC663 *plus* family
- High-performance multi-protocol NFC reader frontend family
- 1.8 W output power
- Pin-compatible family members MFRC630, MFRC631, MFRC661

EdgeLock™ SE050
- Plug & Trust Secure Element Family
- CC EAL 6+ certified
- RSA, ECC, AES, 3DES functionality
- Secure key storage

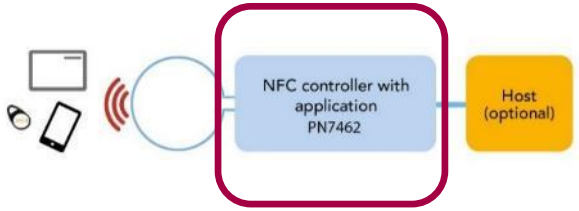
MIFARE® SAM AV3
- Optimized for MIFARE DESFire® Family
- CC EAL 6+ certified
- Supports Crypto 1, AES, TDEA, SHA, RSA ECC
- Secure key storage

NFC for Access Management – featured products

NFC controller solutions

Combination of NFC frontend with an advanced 32-bit microcontroller.
Options include integrated firmware or freely programmable microcontroller.

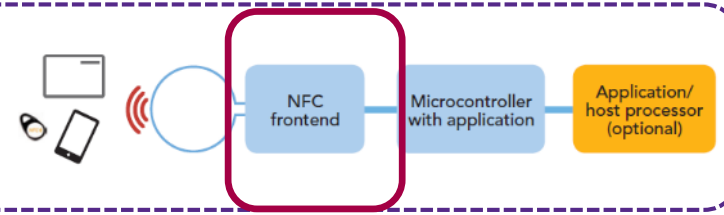
***Product**: PN7462*



NFC frontend solutions

The most flexible way to add NFC to a system.

***Product**: CLRC663 plus*

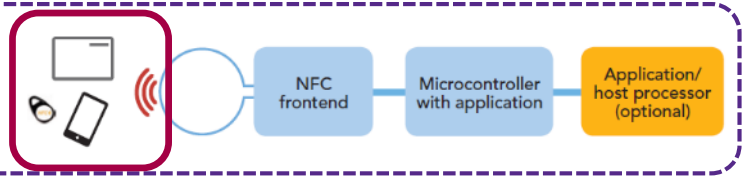


NFC Cards

***Products**:*

MIFARE DESFire

MIFARE DESFire EV3
MIFARE DESFire Light

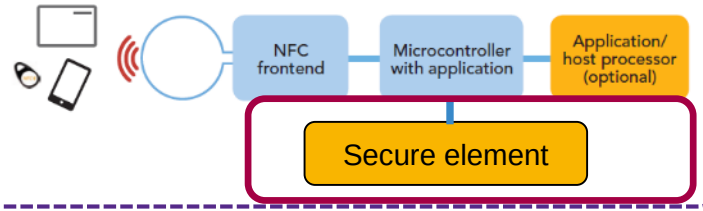


(SAM) Secure Access Module

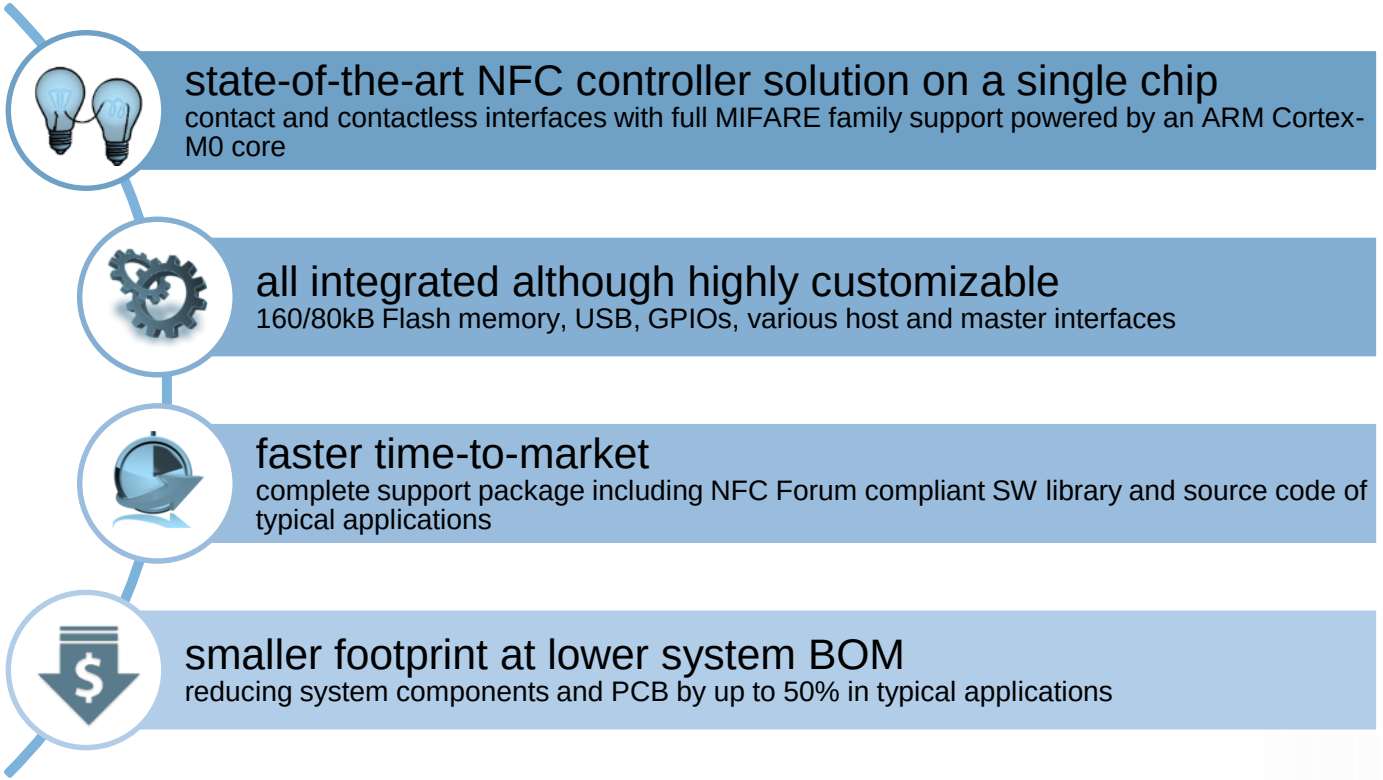
Secure key Storage in reader (optional)

***Products**:*

MIFARE SAM AV3
Edgelock SE050



PN7462 family | all-in-one full NFC solution



state-of-the-art NFC controller solution on a single chip
contact and contactless interfaces with full MIFARE family support powered by an ARM Cortex-M0 core

all integrated although highly customizable
160/80kB Flash memory, USB, GPIOs, various host and master interfaces

faster time-to-market
complete support package including NFC Forum compliant SW library and source code of typical applications

smaller footprint at lower system BOM
reducing system components and PCB by up to 50% in typical applications

PN7462 family | product features

Characteristics

Key features
- 20 MHz Cortex M0 core with 12 kB RAM and 4 kB EEPROM
- 160/80 kB user Flash
- 250mA maximum operating transmitter current with Dynamic Power Control
- Power supply from 2.7 to 5.5V
- GPIOs, master/slave SPI and I²C, host USB and HSUART
- Protected firmware download in flash
- Extended operating temperature range: -40 to +85°C

Ease of integration
- Multiple SW examples provided for several use cases
- EMVCo validated and NFC Forum compliant libraries
- Usage of standard development tools

Optional Contact Reader (PN7462AU)

- Class A, B, C cards supported (PN7462AUHN only)
- Fully integrated ISO/IEC 7816-3&4 UART
- Baud rate up to 1 Mbit/s
- Capability to drive external contact reader frontends for SAMs

Supported RF protocols

Reader and Writer mode
- ISO/IEC 14443A/MIFARE
- ISO/IEC 14443B
- JIS X 6319-4 (comparable with FeliCa1 scheme)
- ISO/IEC 15693 (ICODE-SLIX/SLIX2, ICODE-DNA)
- ISO/IEC 18000-3 mode 3/ EPC Class-1 HF (ICODE-ILT)

Card emulation
- ISO/IEC 14443-4 with Active and Passive load modulation support

Peer to Peer mode
- Active and passive initiator and target according to ISO/IEC 18092

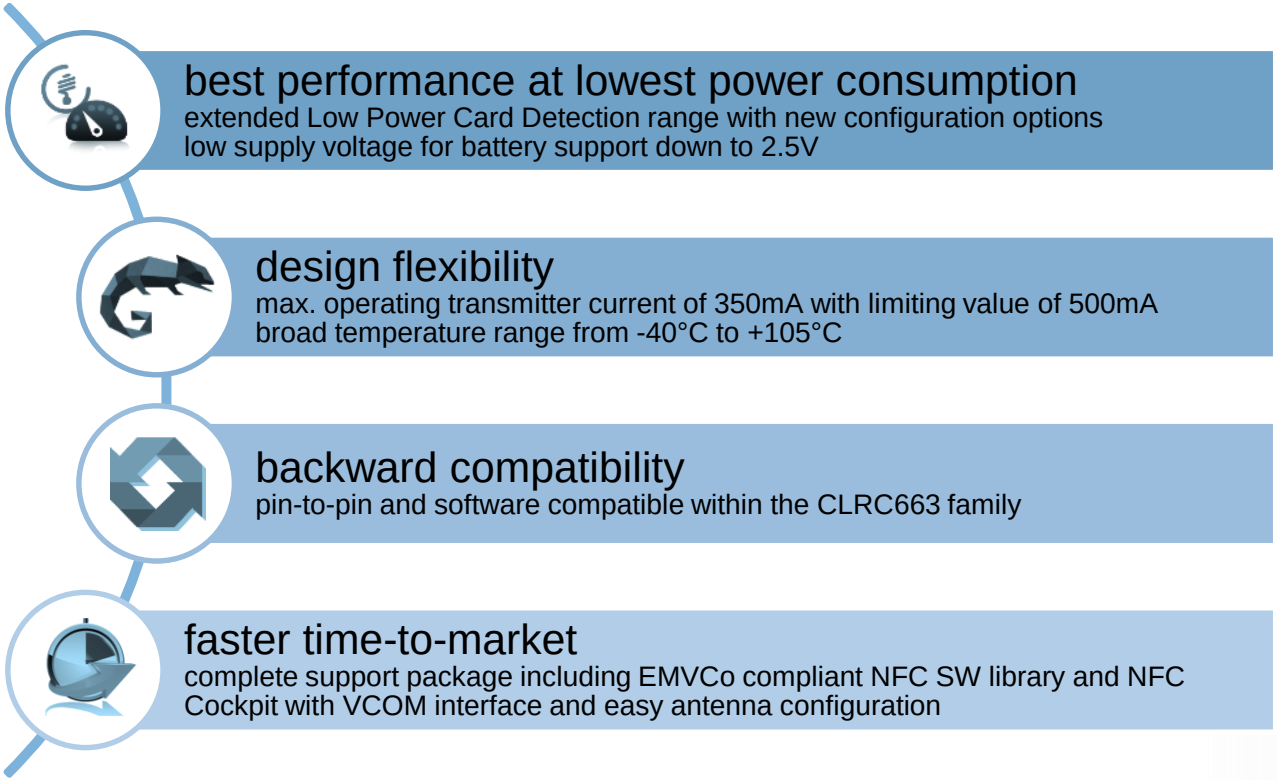
Allows to read and write
- Complete MIFARE® and DESFIRE® families
- Complete NTAG® family e.g. NTAG I²C *plus*
- Complete ICODE® family and SmartMX® family

Packages

- HVQFN64 (9x9 mm²)
- VFBGA64 (4.5x4.5 mm²)

CLRC663 *plus* family | push your design further

10 years longevity



best performance at lowest power consumption
extended Low Power Card Detection range with new configuration options
low supply voltage for battery support down to 2.5V

design flexibility
max. operating transmitter current of 350mA with limiting value of 500mA
broad temperature range from -40°C to +105°C

backward compatibility
pin-to-pin and software compatible within the CLRC663 family

faster time-to-market
complete support package including EMVCo compliant NFC SW library and NFC Cockpit with VCOM interface and easy antenna configuration

CLRC663 *plus* | product features

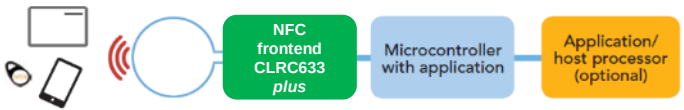
Characteristics

Key features
- 350mA maximum operating transmitter current with limiting value of 500mA
- Power supply voltage: 2.5 to 5.5V
- Extended operating temperature range: -40 to +105°C(*)
- 512byte FIFO buffer for highest transaction performance
- Flexible and efficient power saving modes including hard power down, standby and low-power card detection

Licenses and supported standards
- Includes NXP ISO/IEC14443-A, NXP MIFARE® and Innovatron ISO/IEC14443-B licenses
- Crypto 1 intellectual property licensing rights
- Hardware supports for MIFARE Classic encryption

Packages

- HVQFN32 (5×5×0.85mm) with wettable flanks
- VFBGA36 (3.5×3.5×0.8mm)



Supported RF protocols

Reader and Writer mode
- ISO/IEC 14443A/MIFARE
- ISO/IEC 14443B
- JIS X 6319-4 (comparable with FeliCa1 scheme)
- ISO/IEC 15693 (ICODE-SLIX/SLIX2, ICODE-DNA)
- ISO/IEC 18000-3 mode 3/ EPC Class-1 HF (ICODE-ILT)

Peer to Peer mode
- Passive-Initiator according to ISO/IEC 14443A (106kbit/s) and FeliCa (212 and 424kbit/s)

Allows to read and write
- Complete MIFARE® and DESFIRE® families
- Complete NTAG® family e.g. NTAG I²C *plus*
- Complete ICODE® family and SmartMX® family

Interfaces

- Host interfaces: SPI (10Mbit/s), I²C (1000kbit/s) and UART (1228.8kbit/s)
- SAM interface in X-mode
- Up-to 8 general purpose inputs/outputs
- Accurate clock generator for Microcontroller or USB

More info: http://www.nxp.com/products/:CLRC66303HN

(*) with HVQFN32 package; operating temperature range with VFBGA36 package: -40 to +85°C

CLRC663 *plus* family | quick reference table

	CLRC663 *plus*	CLRC661 *plus*	MFRC631 *plus*	MFRC630 *plus*	SLRC610 *plus*
ISO/IEC 14443A – MIFARE/NTAG	yes	yes	yes	yes	
ISO/IEC 14443B	yes		yes		
JIS X 6319-4 – FeliCa	yes				
ISO/IEC 15693 – ICODE SLIX/DNA	yes	yes			yes
ISO/IEC 18000-3m3 – ICODE ILT	yes	yes			yes
ISO/IEC 18092 passive initiator	yes				
Operating transmitter current	350 mA (max.), 500 mA (lim.)				
LPCD(1) range(2) (EMVCo RefPICC)	66 mm				
Operating ambient temp. range	VFBGA36: -40 to +85 °C | HVQFN32: -40 to +105 °C				
RF transmitter supply voltage	2.5 to 5.5 V				
HVQFN32 (5×5×0.85mm)	with wettable flanks				
VFBGA36 (3.5×3.5×0.8mm)	yes				
Product longevity program	10 years				

- **CLRC661 *plus***
  NFC reader for NTAG®, ICODE®, DESFIRE® and MIFARE® products families
- **MFRC631 *plus***
  Entry level EMVCo reader
- All derivatives are **pin-to-pin compatible**

1. Low Power Card Detection
2. all detection ranges measured using the standard CLRC663 *plus* development board (CLEV6630B) operated with external power supply at room temperature

MIFARE DESFire EV2 – features & performance

Contactless Performance

- Convenient touch‘n‘go experience through excellent read range
- Fast and reliable transactions
- Design freedom for smaller form factors on the credential and reader side (key fobs).

Security & Privacy

- Next level security certification CC EAL5+
- Security self healing mechanism with rolling keys
- Random ID for privacy protection

Multi-application

- Enabling new business models through seamless integration of additional services like loyalty or micropayment

MIFARE DESFire EV2 – features & performance

- 3rd generation of MIFARE DESFire family
- Bringing multi-application supports to the next level
- Improved end user experience with superior operating distance and performance
- Benchmark security design with Common Criteria EAL 5+ certified HW & SW

ISO/IEC 14443 A 1-4	✓
ISO/IEC 7816-4 support	extended
EEPROM data memory	2/4/8KB
Flexible file structure	✓
NFC Forum Tag Type 4	✓
Secure, high-speed cmd	✓
Unique ID	7BUID or 4B RID
Number of applications	unlimited
Number of files per app	32
High data rates support	up to 848 Kbit/s
Crypto algorithms support	DES/2K3DES/ 3K3DES/AES
CC certification (HW + SW)	EAL 5+
MIsmartApp feature	✓
Transaction MAC per app	✓
Multiple keysets per app	Up to 16 keysets
Multiple file access rights	Up to 8 keys
Inter-app files sharing	✓
Virtual Card Architecture	✓
Proximity Check	✓
Delivery types	Wafer, MOA4 & MOB6

Secure Access Module / Secure Element

Securely manage user credentials and enhance the protection of your facilities or specialized machinery.

2 options to ensure security in any lock or access reader

	Edgelock SE050	MIFARE SAM AV3
Authentication of MIFARE DESFire	Secure storage of credentials, MIFARE KDF, session key generation (MIFARE command set in MCU)	Secure storage of credentials, full MIFARE command set
Secure cloud onboarding	Secure storage of credentials and direct support of TLS	Secure storage of credentials and encryption (command flow in MCU)
X-Mode	-	Direct initialization and communication with CLRC663 NFC reader family (higher speed, easier implementation)
Target use case	On-line systems with cloud connection supporting multiple use cases	Off-line systems

SE050 Plug & Trust for IoT – 1 pager

	SE050 family features
Cryptography	ECC (ECDSA/ECDH/ECDHE/ECDAA), HMAC, CMAC, SHA-1, SHA-224, SHA-256, SHA-384, SHA-512, RSA (up to 4096), AES (128, 256) encryption/ decryption, DES, HKDF, MIFARE KDF, PRF (TLS-PSK)
Crypto curves	ECC NIST (256-bit, 384-bit), Brainpool (160 to 512-bit), Ed25519, Curve25519, secp256k1, secp256r1 Koblitz, Ed448
ECDSA sign performance	~28ms
Support ECC/RSA	Yes/Yes
Interfaces	I2C (3.4Mbps) Slave, I2C Master, NFC tag (type 4)
Secured IF (encryption/authentication on interface)	SCP03 (bus encryption + encrypted credential injection)
User Memory	50kB
Power Saving Mode	Idle: 400uA, Deep Sleep:<5uA
Temperature/Supply voltage range	-40…+105 deg/1.65…3.6V
Packaging	3x3mm (HX2QFN20)
Key Strength	Cryptographic features, EAL 6+ up to OS level, Cloud Integration & automatic onboarding, TPM like

Use Cases

- Secure connection to public/private clouds, edge computing platforms, infrastructure
- Device-to-device authentication
- Proof of origin / anti-counterfeiting
- Protected key storage
- Secure provisioning of credentials & secure data protection

Customer benefits

- Plug & Trust: Ready to use solution for easy system integration with different MCU / MPU platforms
- Root of trust for IoT applications with state of the art security measures
- Zero-touch onboarding of IoT devices to the Cloud

Part numbers and ordering information

SE050 Variant	Orderable Part Number	Description	Temperature Range	12NC
SE050C1	SE050C1HQ1/ Z01SCZ	ECC, RSA, AES, DES, MIFARE KDF, CL-IF, I2C Master	-25 to +85 °C	9353 869 87472
SE050C2	SE050C2HQ1/ Z01SDZ	ECC, RSA, AES, DES, MIFARE KDF, CL-IF, I2C Master	-40 to +105 °C	9353 869 88472
SE050B1	SE050B1HQ1/ Z01SEZ	RSA, AES, DES	-25 to +85 °C	9353 869 85472
SE050B2	SE050B2HQ1/ Z01SFZ	RSA, AES, DES	-40 to +105 °C	9353 869 86472
SE050A1	SE050A1HQ1/ Z01SGZ	ECC, AES, DES	-25 to +85 °C	9353 867 22472
SE050A2	SE050A2HQ1/ Z01SHZ	ECC, AES, DES	-40 to +105 °C	9353 869 84472
SE050 Dev Kit	OM-SE050ARD	SE050 Arduino compatible development kit	-40 to +105 °C	9353 832 82598

SAM AV3 KEY TECHNICAL FEATURES

MCU

- NXP Secure SmartMX2 smartcard microcontroller
- Low power Sleep mode

NXP Products Support

- SAM AV2 backward compatible
- Support all new security features of
  - MIFARE DESFire EV2/EV1
  - MIFARE DESFire Light
  - MIFARE Plus EV1/EV0
  - MIFARE Classic
  - MIFARE Ultralight C
  - MIFARE Ultralight EV1 (Password Authentication)
- UCODE DNA and ICODE DNA authentication support
- NTAG DNA crypto support
- ECC Originality Check support on MIFARE, NTAG and RFID products
- X-Mode interface for direct connection to NXP contactless reader ICs

Special Features

- EMVCo support
  - 48 CA key storage
  - Support up to 8 RID
  - Support PIN Encipherment, SDA, DDA and CDA commands
- Programmable functionality for customized commands & biz logic)
  - 32KB of EE for code and data
  - 1KB RAM
  - Code (mini-program) execution in a secure zone

Crypto Support

- Symmetrical Crypto support
  - 128 key storage with versioning
  - DES and 3DES up to 168 bits
  - AES up to 256 bits
  - MIFARE Crypto-1
- Asymmetrical Crypto support
  - 3 RSA and 8 ECC key, and 4 ECC curve storage
  - RSA Up to 2048 bits
  - SHA-1, SHA-225, SHA-256
  - ECC (signature verification) Up to 256 bits

Security certification

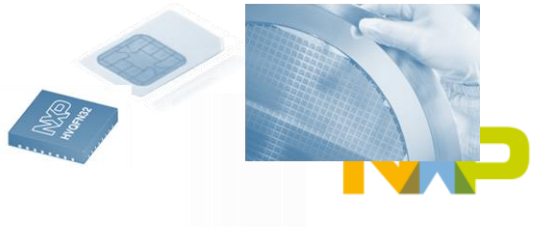
- CC EAL6+ certified hardware platform
- MIFARE Security Scheme 3.0 (equivalent to EMVCo security evaluation)
- FIPS 140-2 CAVP

Host interface

- ISO/IEC 7816 (T=1) with baud rate up to 1.5 Mbits
- I2C Slave
- (HVQFN32 only)

Product Delivery Types

- HVQFN32, PCM1.5, Wafer



Key resources on EdgeLock SE050

Web Presence

Product Page
including documentation, app notes, MW, video tutorials, etc.

>> Product Page EdgeLock SE050

Development Kit Page
including app notes, etc.

>> Dev Kit Page EdgeLock SE050

Public Webinars

EdgeLock SE050 product introduction & new use cases *(30 min)*

>> Watch the recording

Getting started with EdgeLock SE050 support package *(30 min)*

>> Watch the recording

Getting started with EdgeLock SE050 for Industrial *(30 min)*

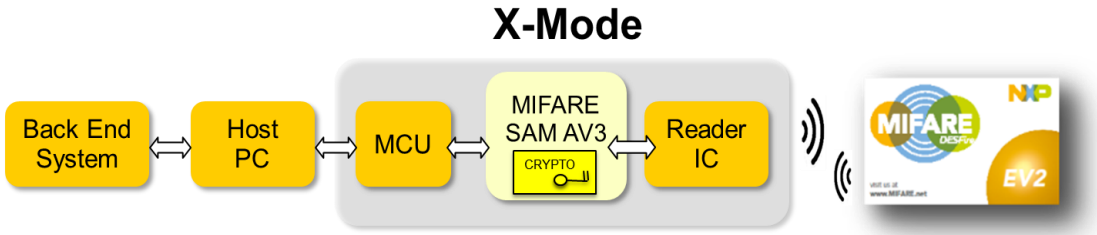
>> Watch the recording

Use Cases

Information on use cases
including one-pagers, app notes, demo videos, supporting documentation, etc.

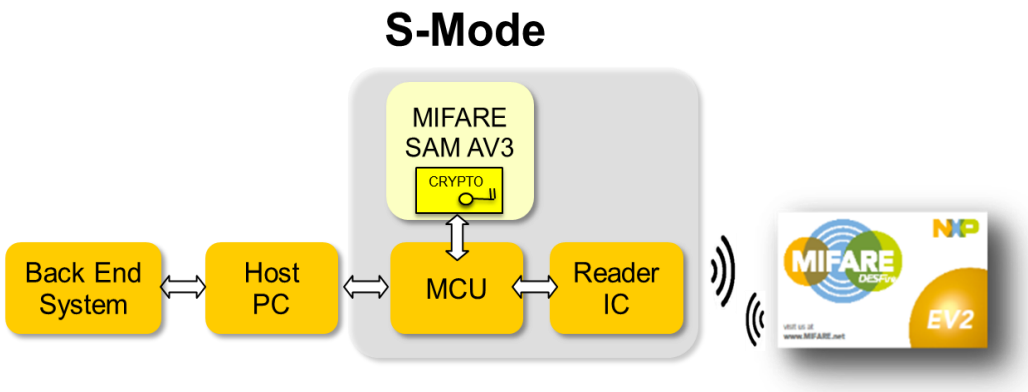
>> IoT Security

Reader Design with MIFARE SAM AV3



Built in support for the CLRC663 reader IC family in **X-Mode.** The MIFARE SAM AV3 **directly initializes and handles** the CLRC663 reader IC.

Minimal implementation effort and improved transaction performance (up to 35% higher speed compared to S-Mode)



SAM AV3 Key Features

MCU

- NXP Secure SmartMX2 smartcard microcontroller
- Low power Sleep mode

NXP Products Support

- SAM AV2 backward compatible
- Support all new security features of
  - MIFARE DESFire EV2/EV1, DESFire Light, Plus EV1/EV0, Classic, Ultralight EV1 (Password Authentication)
- Support authentication of UCODE DNA and ICODE DNA
- Support cryptography of NTAG DNA
- Support ECC Originality Check on MIFARE, NTAG and RFID products
- X-Mode interface for direct connection to NXP contactless reader ICs

Special Features

- EMVCo support
  - 24 CA key storage
  - Support up to 4 RID
  - Support PIN Encipherment, SDA, DDA and CDA commands
- Programmable functionality for customized commands & biz logic
  - 32KB of EE for code and data
  - 1KB RAM
  - Code (mini-program) execution in a secure zone

Crypto Support

- Symmetrical Crypto support
  - 128 key storage with versioning
  - DES and 3DES up to 168 bits
  - AES up to 256 bits
  - MIFARE Crypto-1
- Asymmetrical Crypto support
  - 3 RSA and 8 ECC key, and 4 ECC curve storage
  - RSA Up to 2048 bits
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- CC EAL6+ certified hardware platform
- MIFARE Security Scheme (equivalent to EMVCo security evaluation)
- FIPS 140-2 CAVP

Host interface

- ISO/IEC 7816 (T=1) with baud rate up to 1.5 Mbits
- I2C Slave supporting Standard and Fast mode (HVQFN32 only)

Product Delivery Types

- HVQFN32, PCM1.5, Wafer

Product ordering information

Product	Part type	Dev.kit
CLRC663 *plus*	CLRC66303	OM26630FDK
PN7462	PN7462AUHN	OM27462CDK
MIFARE DESFire EV2	MF3D4200DA4/00	
MIFARE SAM AV2	P5DF081HN/T1AD2060	MFEV710
MIFARE SAM AV2.6	P5DF081HN/T1AR1070	

SAM AV3 Part Type	Package	Progr. Logic
MF4SAM3xU15	wafer	no
MF4SAM3xX84	PCM 1.5 module	No
MF4SAM3xHN	HVQFN32 package	No
MF4SAM3xU15	wafer	yes
MF4SAM3xX84	PCM 1.5 module	Yes
MF4SAM3xHN	HVQFN32 package	Yes

OM27462NBR: NFC-Bluetooth® Low Energy smart lock kit

Demonstrator kit* for door access applications using:

- NFC Controller PN7362
- Bluetooth LE QN9021
- Touch sensor PCF8883

Schematics and source code on request

https://www.nxp.com/products/:OM27462NBR

* Demo requests please via email to smart.lock@nxp.com

REFERENCES

Reference installations & systems

- **Leading government institutions and corporations rely on NXP technology for access control**

- **External white papers in sync with NXP's product offering**
  - Access Management best practice paper by RWE & srlabs.de
  - BSI Technical Guidelines for the Secure Use of RFID. BSI.de

REFERENCE CAMPUS

MEDICAL CAMPUS HANNOVER

- 13,000 active Smartcards by Intercard
- Based on MIFARE DESFire EV1
- Smartcards for Staff, Students, Guests
- Multi-Application:

Micropayment	Access	Identification
Vending-machines Canteen Bistros	Parking Laboratories PC-rooms	Printers Library Time-recording




REFERENCE CORPORATE ACCESS

Chemical plant Germany

Facts & Figures

- 38,800 employees
- 2.000 buildings on more than 10km²
- Among the largest industrial sites in the world
- Attached Visitor center with 750,000 visitors per year

Visitor badges	Staff
Single Use Badges	Canteen payment
Personalized badges	Access
Coding & printing in one single step with common laser printer	Time recording




REFERENCE HEALTH & FITNESS

MCFIT GERMANY

- Largest European low cost fitness chain
- 1.2 M active member cards

Micropayment	Access
Vending-machines Showers Tanning-beds	Lockers Turnstiles at the entrance




NXP SUPPORT MATERIAL FOR ACCESS MANAGEMENT APPLICATIONS

Links to product information

MIFARE DESFire EV2

- Short datasheet: http://www.nxp.com/products/:MC_53450
- Additional product infos: https://www.mifare.net/en/products/chip-card-ics/mifare-desfire/

MIFARE SAM

- http://www.nxp.com/products/identification-and-security/nfc-and-reader-ics/mifare-sams-for-reader-systems:MC_71422

Reader ICs

- Reader IC overview: http://www.nxp.com/products/identification-and-security/nfc-and-reader-ics:MC_71110
- PN7462: http://www.nxp.com/products/:PN7462AUHN

Application notes, tools and community

Application notes

- AN10922 - Symmetric key diversification
  - http://www.nxp.com/documents/application_note/AN10922.pdf
- Establishing Security Best Practices in Access Control by SRLabs/RWE
  - https://srlabs.de/wp-content/uploads/2010/09/Access_Control_Best_Pratices_Study_v1.01-1.pdf
- NXP applications – Physical access management
  - http://www.nxp.com/applications/access-management/physical-access-management.html

Software tools

- NXP Reader Library
  - Software library providing an API to simplify the development with NXP reader ICs
  - http://www.nxp.com/products/:NFC-READER-LIBRARY
- Taplinx
  - Android software library providing an API to simplify the interaction with MIFARE cards
  - https://www.mifare.net/en/products/tools/taplinx/

Community for technical questions

https://community.nxp.com/community/nfc

PRODUCT DETAILS

New NTAG 5 family vs. other connected tags

15 years longevity

Feature	NTAG21xF	NTAG I²C *plus*	NTAG 5 switch	NTAG 5 link	NTAG 5 boost
NFC interface	ISO/IEC14443	ISO/IEC14443	**ISO/IEC15693**	**ISO/IEC15693**	**ISO/IEC15693**
Energy harvesting	-	yes up to 15 mW	**regulated** **up to 30 mW**	**regulated** **up to 30 mW**	**regulated up to 30 mW** (in passive mode)
Field/event detect	✓	✓	✓	✓	✓
GPIO + PWM	-	-	✓	✓	✓
Memory areas	2	2	**3**	**3**	**3**
Memory protection	Password	Password	Password	Password and **AES authentication**	Password and **AES authentication**
I²C interface	-	slave	-	slave / **master**	slave / **master**
Pass-through via SRAM	-	proprietary	-	proprietary and **standardized**	proprietary and **standardized**
Active load modulation (when V_{CC} supplied)	-	-	-	-	✓

NTAG 5 SWITCH

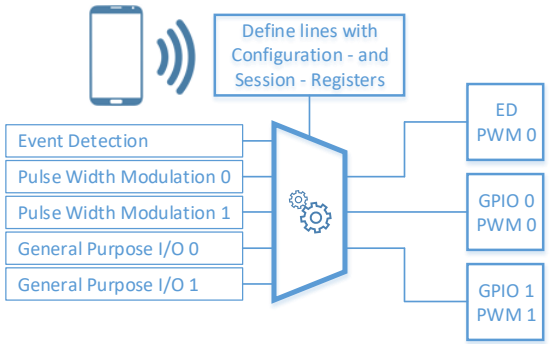
NTAG 5 switch: USPs

- NFC Forum compliant PWM and GPIO bridge based on ISO15693
- Brings innovation to the market with ability to calibrate, parameterize and control products without MCU
- Energy harvesting feature can power-up LEDs and motors delivering around 30 mW
- Low BOM for selected use cases where NTAG 5 switch can replace MCUs
- Ease of design-in by reusing iOS and Android code snippets

NTAG 5 switch (NTP5210) – Technical product features

Main features	
NFC Interface	NFC Forum Type 5 Tag compliant ISO/IEC 15693 compliant up to 53kbps
Memory	512 byte user memory
Wired Interface	Pulse Width Modulation GPIO Event detection
Energy Harvesting	Configurable output 1.8 V, 2.4 V or 3 V with around 30 mW output power
Security	• 32-bit or 64-bit password protection • 3 configurable user memory areas • ECC based reprogrammable originality signature
Temperature range	-40°C to +105°C [1]

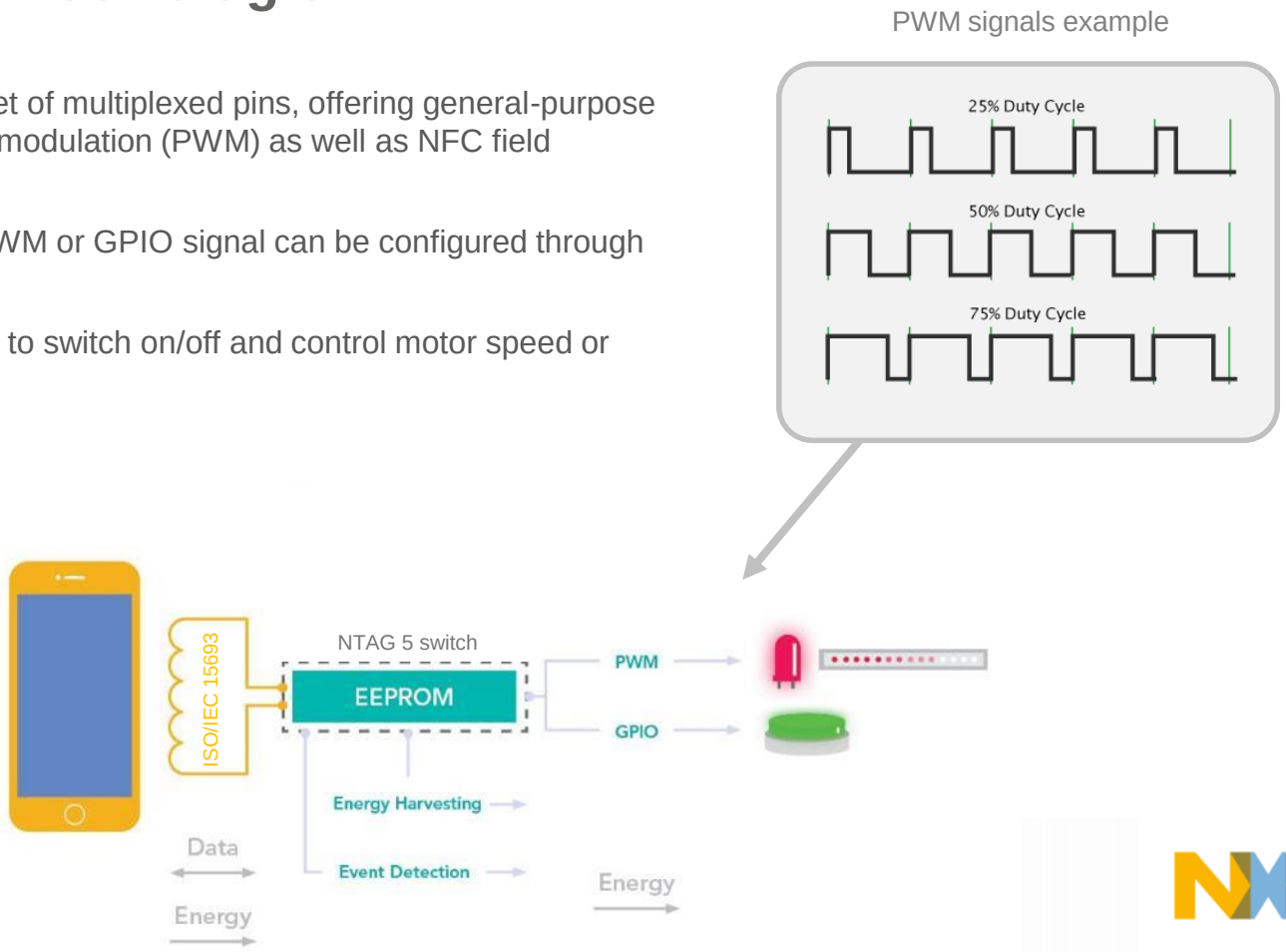
Wired Interface Details	
Total number of lines	2 in/out (push/pull) 1 out (open drain) 1 Hard Power Down
Maximum number of GPIO‘s	2
Maximum number of PWM output	2
Event detection pin (e.g. field detecion)	1



[1] For all operations except write EEPROM which is limited 85 °C

NTAG 5 switch – Block diagram

- NTAG 5 switch includes a set of multiplexed pins, offering general-purpose I/O (GPIO) and pulse width modulation (PWM) as well as NFC field detection.
- The characteristics of the PWM or GPIO signal can be configured through NFC interface.
- These features can be used to switch on/off and control motor speed or LED brightness.



NTAG 5 switch - Use case: Lighting

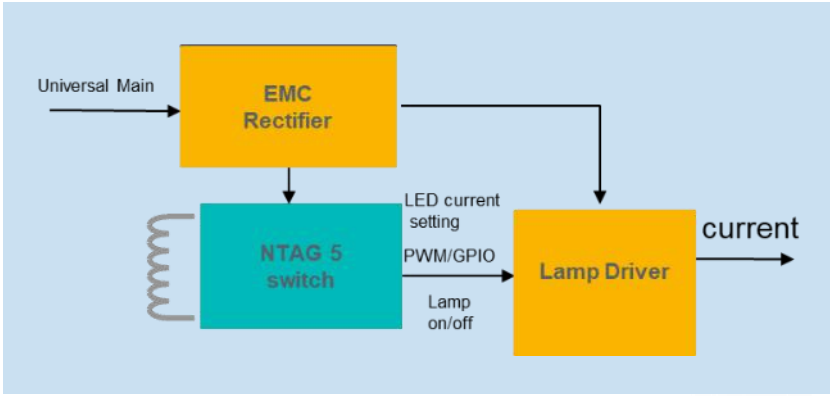
Control and dim LEDs

Calibrate the reference current without a MCU

Verify authenticity of the device

Relevant features:

- PWM to configure LED current
- GPIO to enable / disable LED
- Originality check of the product by reprogrammable ECC signature



NTAG 5 switch - Use case: Gaming

Control and dim LEDs in games

Control Motor Speeds of gaming applications

Verify authenticity of the device

Relevant feature

- PWM to control LED brightness via smartphone
- PWM to control motor speed via smartphone
- GPIO to enable/disable LEDs via smart phone
- Originality check of the product by reprogrammable ECC signature

NTAG 5 LINK

NTAG 5 link - USPs

- NFC Forum compliant I²C bridge based on ISO/IEC15693
- Brings innovation to the market with ability to read out instantaneous sensor values without an MCU and battery
- Scalable security: with **AES*** 128 Bit mutual authentication
- Can power up a sensor or an external circuit aroung 30 mW with regulated energy harvesting capabilities

* NTP5332 supports AES mutual authentication and I²C master

NTAG 5 link – Technical product features

Main features	
NFC Interface	ISO/IEC 15693 compliant, up to **60 cm read range** NFC Forum Type 5 Tag compliant
Memory	2048 byte user memory 256 byte SRAM
Wired Interface	I²C slave (up to 400 kHz) or I²C transparent **master**[1] channel or Pulse Width Modulation/GPIO Event detection or PWM output Stand-by current <**6 µA** @ RT Hard power down current < **0.25 µA** @ RT
Energy Harvesting	Configurable output 1.8 V, 2.4 V or 3 V with around **30 mW** output power
Security	• **AES**[1] 128 bit mutual authentication or • 32-bit or 64-bit password protection from NFC perspective • 32-bit password from I²C perspective • 3 configurable user memory areas • ECC based reprogrammable originality signature • Disable NFC / I²C
Temperature range	-40°C to +105°C [2]

Wired interface details	
GPIO / PWM	I²C lines maybe used as GPIO's or PWM lines
Event Detection	Multiple events can be used as trigger to the host, or use ED pin as PWM channel in parallel to I²C
Transparent I²C master channel[1]	Attach and power any I²C slave like sensor or external memory without MCU
I²C slave	Efficient proprietary pass-through mode

[1] Two versions of NTAG 5 link	
NTP5312	With I²C **slave** interface; no AES
NTP5322	With I²C **master** interface and AES mutual authentication

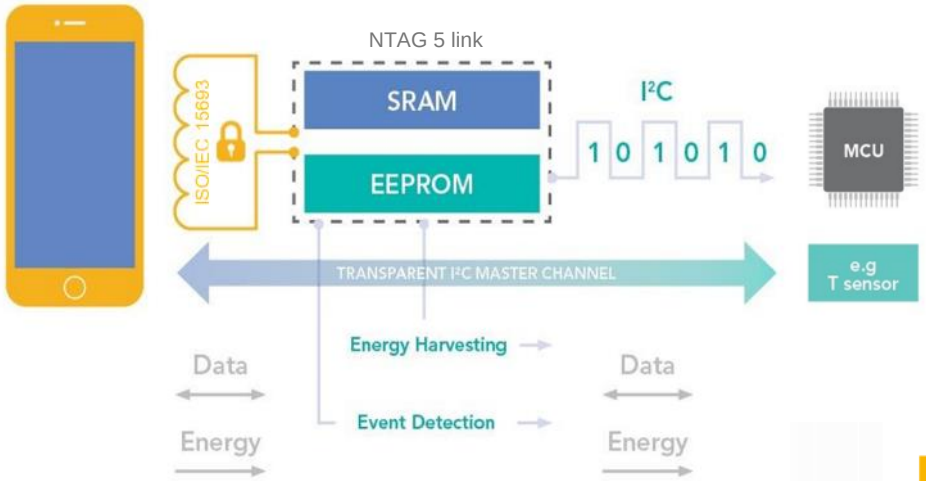
[2] For all operations except write EEPROM which is limited 85 °C

NTAG 5 link – Block diagram

- NTAG 5 link can be configured to work as I²C slave or I²C master*.
- NTAG 5 link* can act as a direct bridge between an NFC-enabled device and any I²C slave, such as a sensor or external memory.
- This is especially useful in environments that require zero-power, single-shot measurements.

NTAG 5 link capabilities of I²C master mode* can be found in AN12368

I²C bus specification and user manual can be found in UM10204



* only NTP5332 supports AES and I²C master

NTAG 5 link – Pass through mode

- Pass through mode transfers data from RF to I²C interface and vice versa using the 256-byte SRAM saving EEPROM cycles. Available for NTAG 5 link and boost models.
- Data flow from one side to the other is synchronized using interrupt signal and register settings.

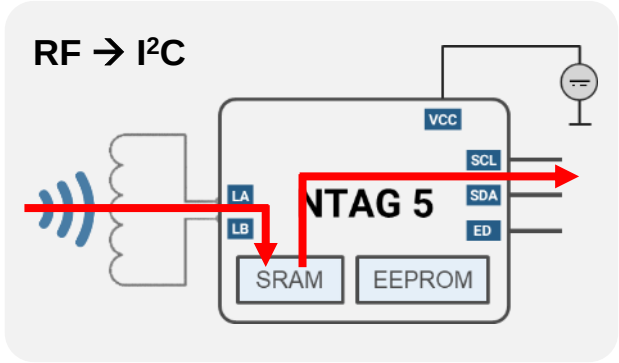
Use cases:

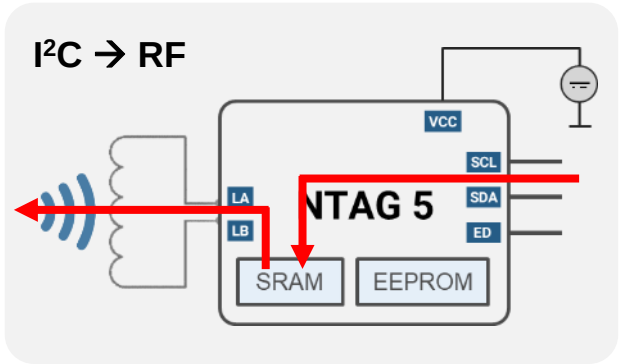
RF → I²C data exchange:

- Mobile device writes data into the microcontroller
- Update microcontroller FW from NFC interface

I²C → RF data exchange:

- Download of data into mobile device (e.g. large amount of logging data, error descriptions…)

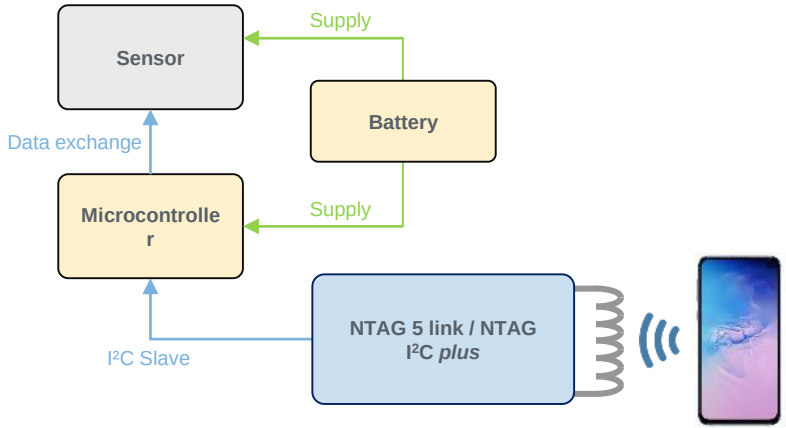


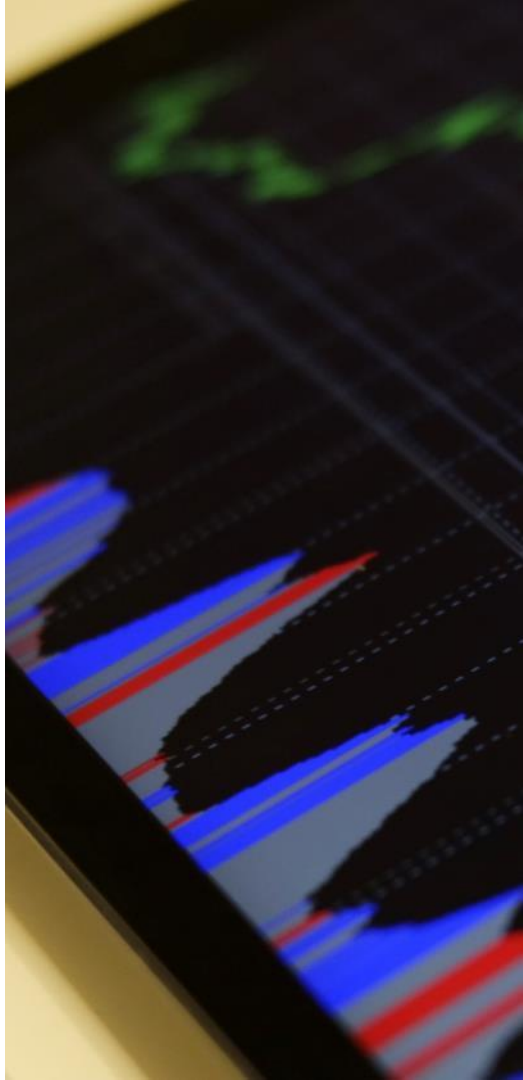


NTAG 5 link – Use case: Constant sensor monitoring

Constant monitoring of sensors

- Save front-panel space
- Device can be fully sealed → NFC communication possible through plastic, glass…
- Together with consumer mobile phone cost efficient IoT solution

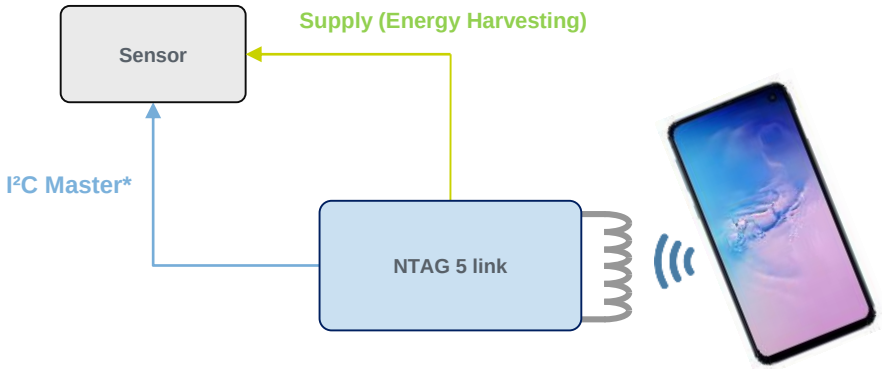




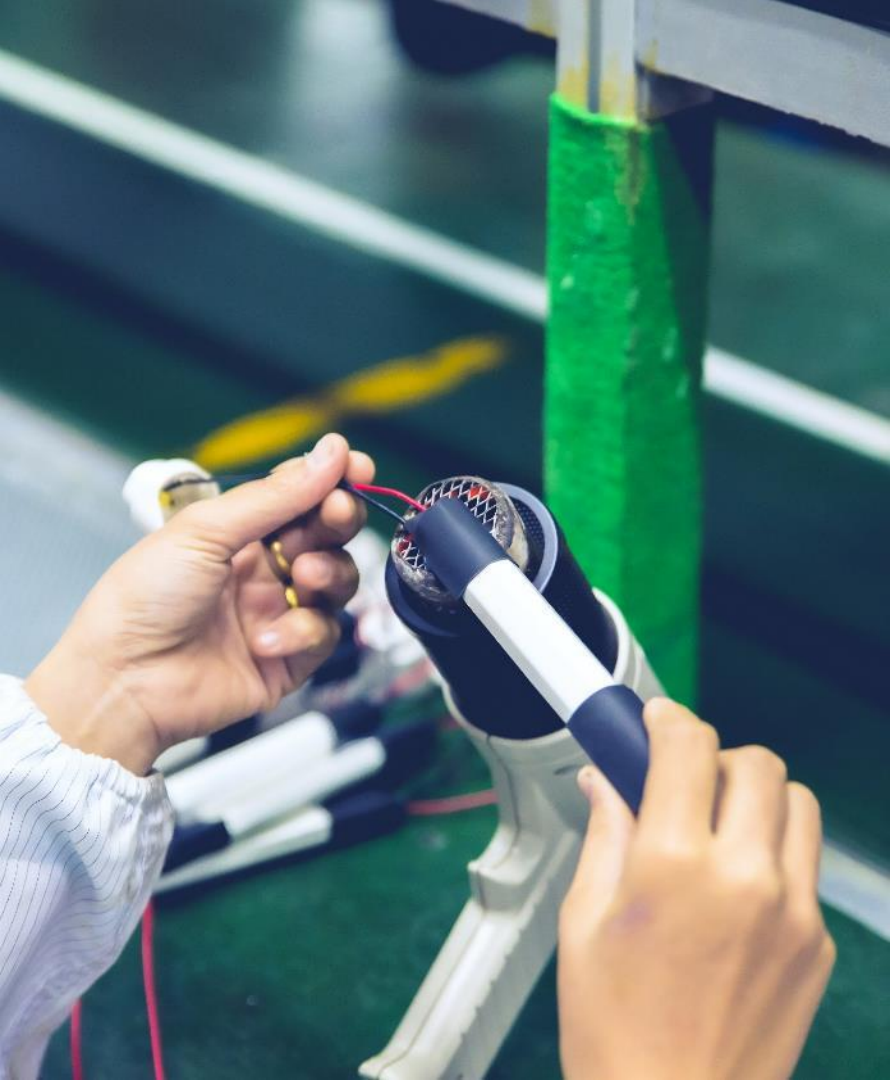
NTAG 5 link - Use case: Ad-hoc sensor read out

Ad-hoc read out of sensors

- Overall BOM reduction:
  - No Battery needed
  - No MCU needed → data process in app or cloud
- Especially for devices where power is an issue
- Device can be fully sealed



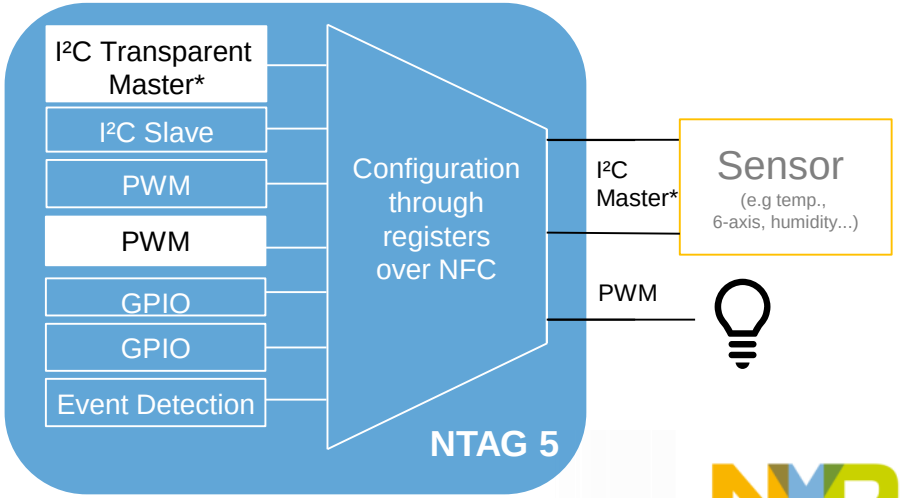
* only NTP5332 supports I²C master



NTAG 5 link

Sensor communication

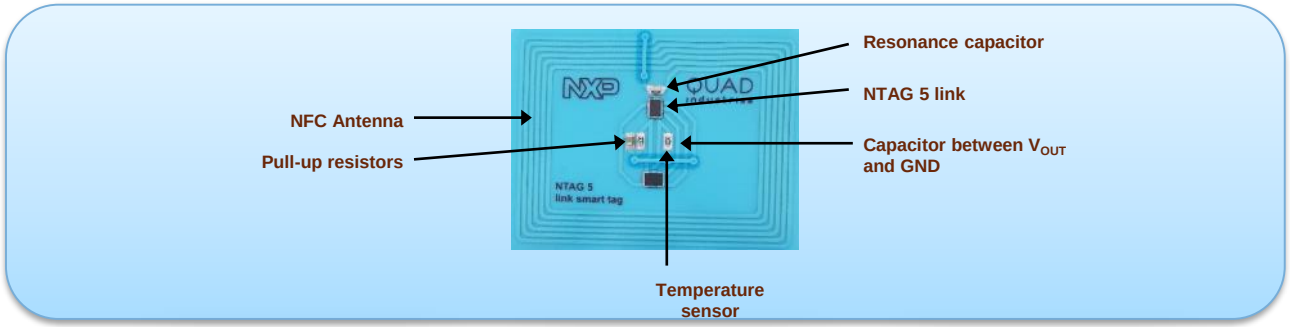
- Read/write to sensor through NFC and I²C master*
- No MCU needed for communication to the sensor
- LED brightness changed through PWM indicating the communication

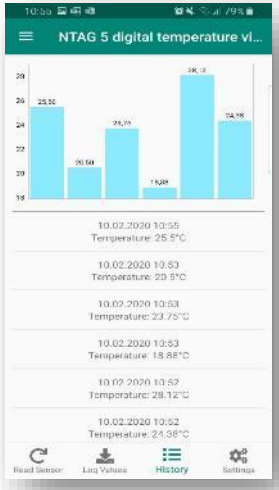


* only NTP5332 supports I²C master

NTAG 5 Temperature Sticker Example

- This temperature sticker uses NTAG 5 link to read out the temperature sensor data instantaneously.





NTAG 5 link – Use cases summary

Read out sensor information with and without an MCU

Draw power from the NFC reader to supply sensors

Secure sensor interaction

Verify authenticity of the device

Relevant features:

- I²C master interface*
- Energy harvesting
- NFC Forum Tag 5 Type tag
- AES mutual authentication*
- Originality check of the product by reprogrammable ECC signature

* only NTP5332 supports AES and I²C master

NTAG 5 BOOST

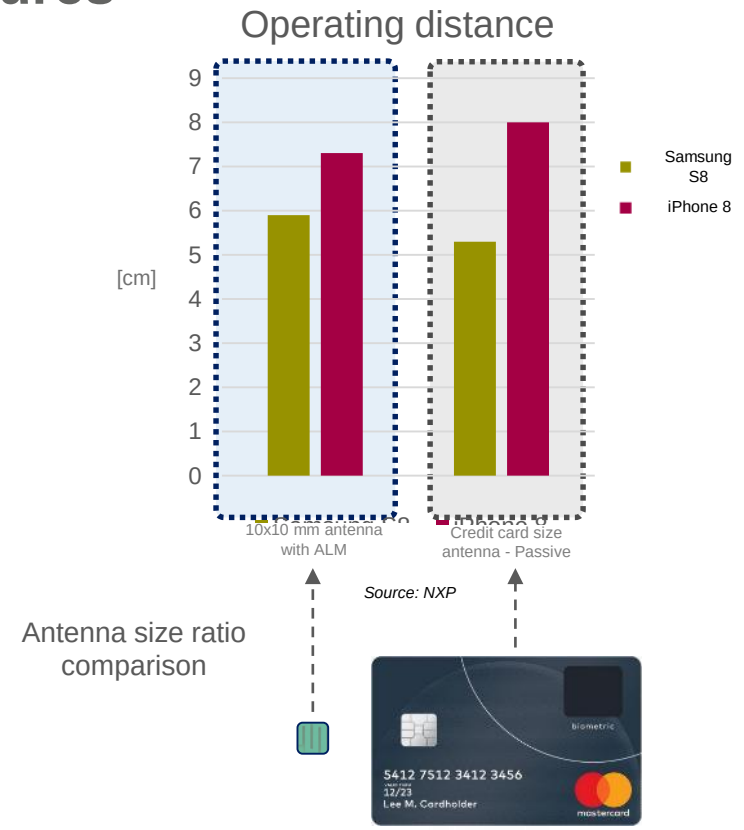
NTAG 5 boost - USPs

- Allows tiny devices to pair via NFC – Thanks to ALM feature which enables antenna designs as small as 1 cm x 1 cm
- Deliver the smallest footprint for secure sensor interactions, firmware updates and configuration
- Bringing a new enhanced level of user experience for pairing and commissioning with better reliability
- Easy design in for engineers with the dedicated NTAG 5 boost development kit and application notes

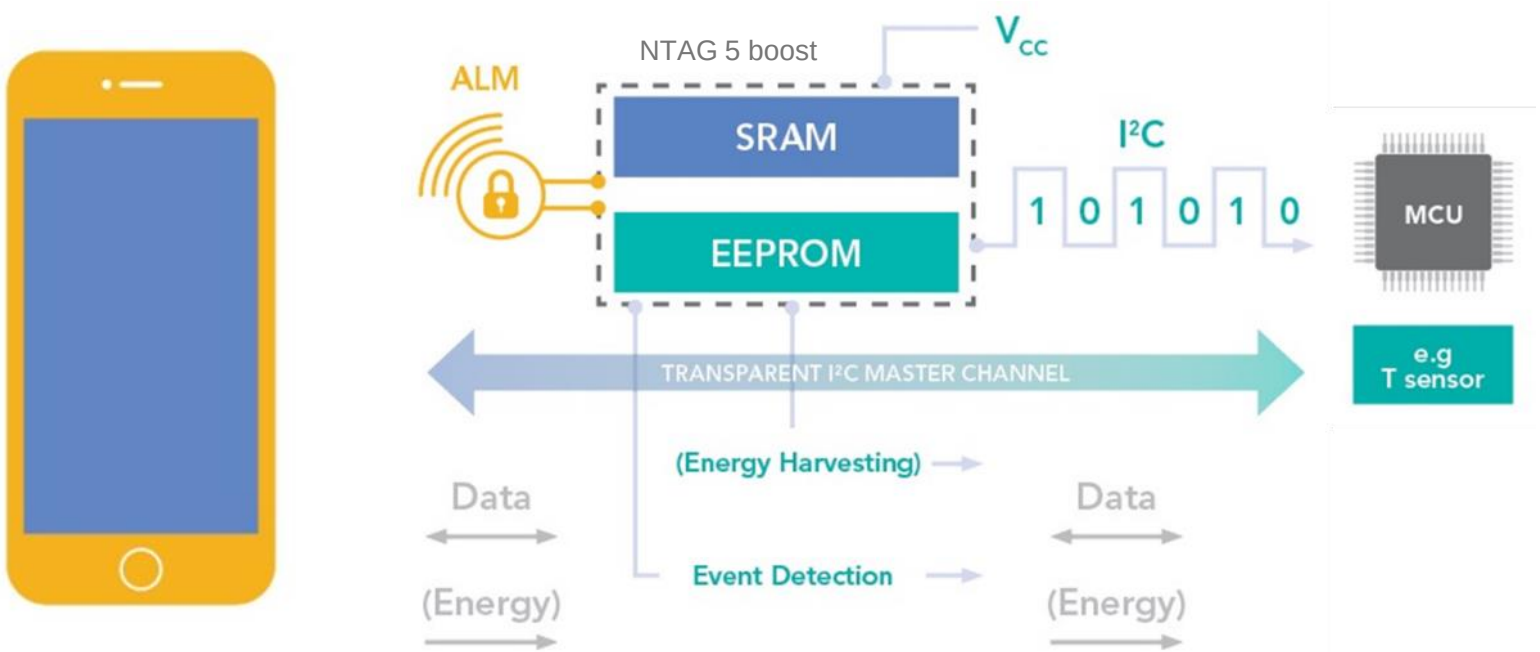
NTAG 5 boost – Technical product features

Main features	
RF Interface & protocols	NFC Forum Type 5 Tag Active Load Modulation for extra range and tiny antenna footprint
Memory	2048 Bytes user memory 256 byte SRAM
Wired Interface	• I²C slave (up to 400 kHz) or I²C transparent master channel or Pulse Width Modulation/GPIO • Event detection or PWM output • Stand-by current <**10 µA** @ RT • Hard power down current < **0.25 µA** @ RT • 1.62 V to 5.5 V supply
Security	• **AES** 128 bit mutual authentication or • 32-bit or 64-bit password protection from NFC perspective • 32-bit password from I²C perspective • 3 configurable user memory areas • ECC based reprogrammable originality signature • Disable NFC / I²C
Temperature range	-40°C to +105°C [1]

[1] For all operations except write EEPROM which is limited 85 °C



NTAG 5 boost – Block diagram



Value Proposition - NTAG 5 boost (1)

- Feature: Small form factor of products and design flexibility
- Boost Characteristic: ALM – Active load modulation
- Customer Benefits:

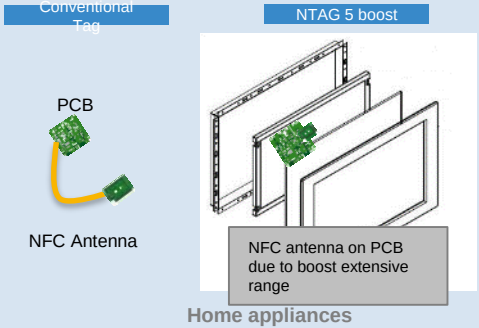
Tiny antenna possible for smaller devices to integrate NFC	Design freedom for the customers due to extended read range and smaller antenna
• With boost supporting antennas as small as 1 cm x 1 cm, it becomes very easy to design in NFC in these small devices	• Customers also have the design flexibility due to boost having longer read range with such a small antenna • Space saving on the device and cost saving for extra antenna

Size: 1.8 cm x 1.6 cm

Boost antenna Size: 1.0 cm x 1.0 cm

Antenna can be on the PCB inside and no need to have it on the top surface of the device, thus saving costs.

Small consumer devices



Home appliances

Design freedom for not only small wearable devices, but also for medium size devices like BT speakers

Value Proposition - NTAG 5 boost (2)

Better user experience for end-customer

- Great read range (5-7 cm) with phones and a 1x1 cm boost antenna
- Great user experience and convenience: Easier connection without searching for the right antenna spot
- Close to 100% success rate

NTAG 5 boost – Use cases summary

Smallest footprint Antenna

Read out sensor information without MCU

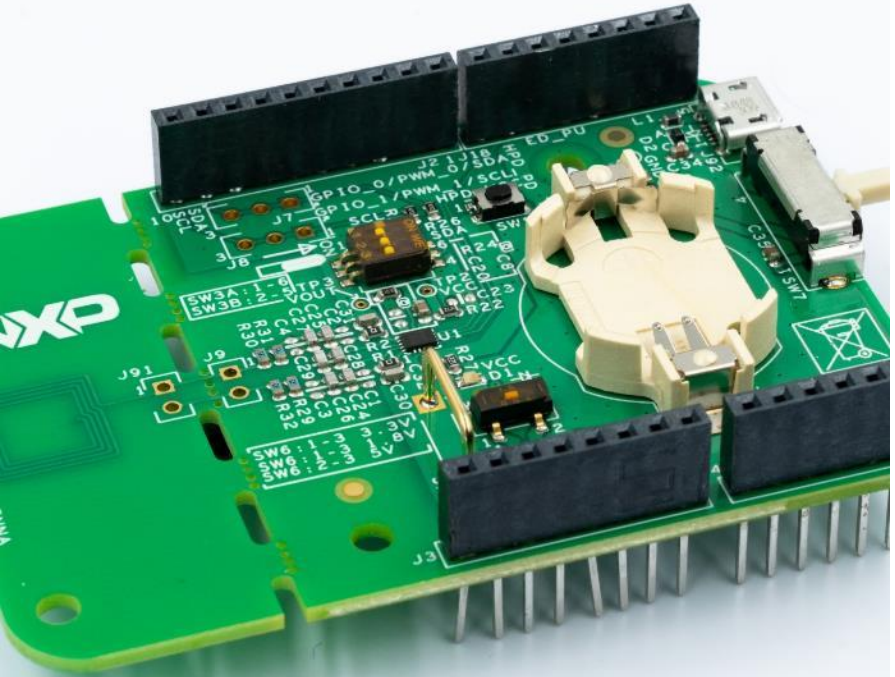
Verify authenticity of the device

Relevant feature

- Active Load Modulation
- I²C master interface
- Scalable security up to mutual AES authentication
- Originality check of the product by reprogrammable ECC signature

Segment	Description
Consumer	Reliably pair small and large consumer devices with a phone
Industrial	Read out status and error codes from small devices
IoT	Deliver tiny footprint product for firmware updates and configuration

PRODUCT SUPPORT PACKAGE

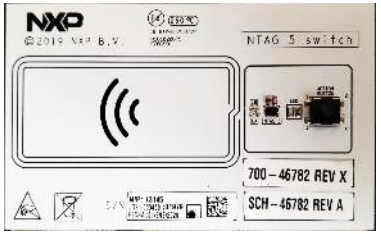


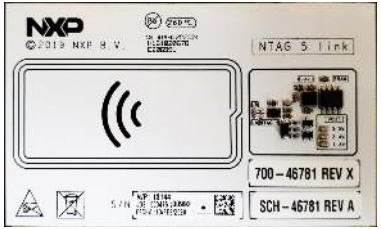
PSP Includes the following

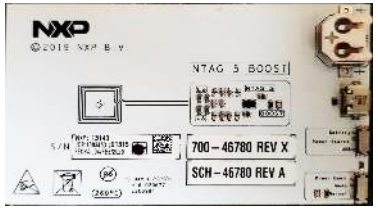
- NTAG 5 Demo kit
- NTAG 5 link/switch development board
- NTAG 5 boost development board
- NTAG 5 Webinars

NTAG 5 Demo Kit (OM2NTA5KIT)

- Demo kit for NTAG 5 is a combination of 3 boards in a single pack, one each for NTAG 5 family member.
- Each demo board makes it easy and interesting to show the new features that NTAG 5 family products offer.
- The demo kit can be ordered from NXP e-commerce and our distributors: **Order here**.
- Demo can be operated with
  - NTAG 5 explorer demo app for Android
  - NTAG 5 explorer demo app for iOS.
  - NFC cube (minimum FW version 4.1)



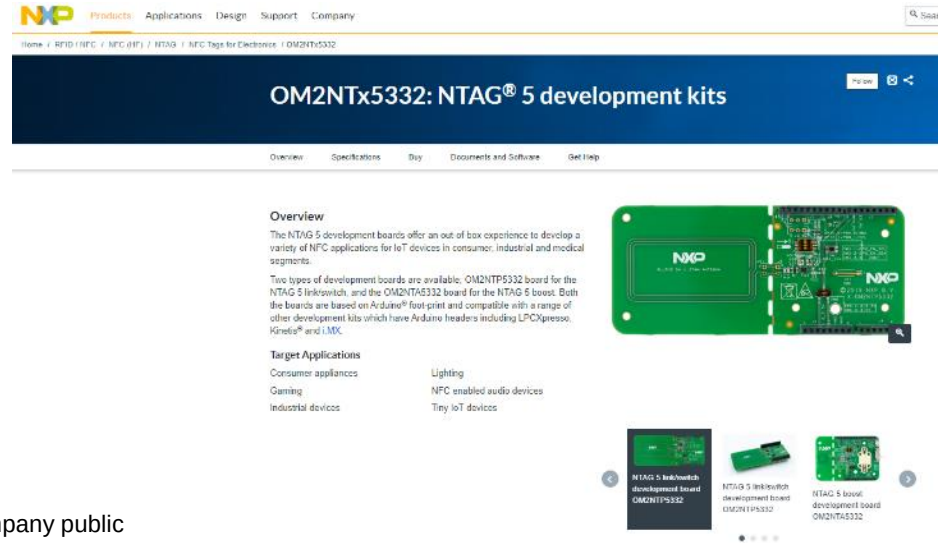




NTAG 5 Development Kit

- The NTAG 5 development boards offer an out-of-box experience to develop a variety of NFC applications for IoT devices in consumer, industrial and medical segments.
- Two types of development boards are available; OM2NTP5332 board for the NTAG 5 link/switch, and the OM2NTA5332 board for the NTAG 5 boost.
- Both the boards are based on Arduino® foot-print and compatible with a range of other development kits which have Arduino headers including LPCXpresso, Kinetis® and i.MX.

-> Click here



NTAG 5 Development Kit (switch/link)

The OM2NTP5332 kit enables developers to do an easy and quick evaluation and prototyping for NTAG 5 switch and link. It is compatible with FRDM-KW41Z development board.

The following documentation is available for the use together with the kit:

Application Notes -> Click here

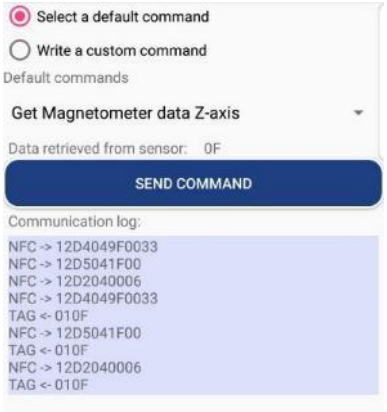
- AN12380 - Antenna design guide for NTAG 5 switch and NTAG 5 link
- AN12368 - NTAG 5 link I²C master mode
- AN12364 - NTAG 5 Bi-directional data exchange
- AN11203 - NTAG 5 Use of PWM, GPIO and event detection
- AN12365 - NTAG 5 How to use energy harvesting
- AN12366 - NTAG 5 Memory configuration and scalable security
- AN11859 - MIFARE Ultralight and NTAG Generating Originality Signature
- RM00221 - NTAG 5 Android Application development
- RM00222 - NTAG 5 KW41 firmware development

Software -> Click here

- “RFID Discover” as a PC GUI
- Android and iOS application for interfacing with the development board
- Code examples to configure PWM/GPIO and energy harvesting
- Android and iOS source code is provided by NXP.

Important Note: NTAG 5 family comprises of two versions of dev kits: 1. Dev kit for Link and Switch / 2. Dev kit for boost

NTAG 5 Development Kit (boost)



The OM2NTA5332 kit enables developers to do an easy and quick evaluation and prototyping for NTAG 5 boost. It is compatible with FRDM-KW41Z development board.

The following documentation is available for the use together with the kit:

Application Notes -> Click here

- AN12339 - Antenna design guide for NTAG 5 boost
- AN11203 - NTAG 5 Use of PWM, GPIO and event detection
- AN12368 - NTAG 5 link I²C master mode
- AN12364 - NTAG 5 Bi-directional data exchange
- AN12365 - NTAG 5 How to use energy harvesting
- AN12366 - NTAG 5 Memory configuration and scalable security
- AN11859 - MIFARE Ultralight and NTAG Generating Originality Signature
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Software -> Click here

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NTAG 5 Webinar Recordings

NTAG 5 product family introduction
Get an introduction to the NTAG 5 product family along with its applications and use cases. >>Watch Now

NTAG 5 product family support package
Get an overview of the NTAG 5 support package, including development kits, PC and mobile development applications. >>Watch Now

How to develop with NTAG 5 product family
Learn how to configure and use the main functionalities of the NTAG 5 product family, including references to the use case examples. >>Watch Now

'NTAG 5 SPOTLIGHTS' Channel https://www.gotostage.com/channel/ntag5spotlights

Series of 7 short webinars on NTAG 5 products on the following topics:

NTAG 5 Features (I): *Everything you need to know about "Regulated Energy Harvesting"*

NTAG 5 Features (II): *"I²C Master"* – why you don't need a µC to read out sensor data

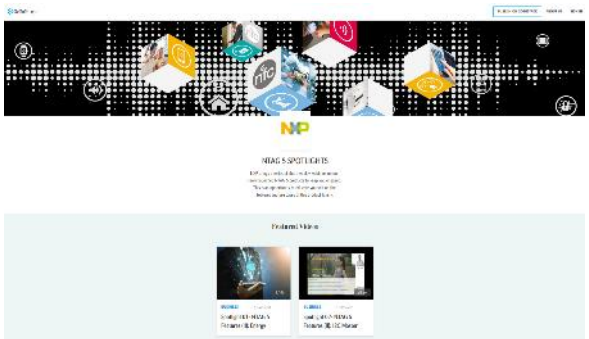
NTAG 5 Use Cases (I): Bringing life to your sensors without µC and battery with NTAG 5 link

NTAG 5 Features (III): General purpose I/O, pulse width modulation and event detection functionality replace µC.

NTAG 5 Features (IV): NTAG 5 boost reduces antenna footprint by a factor of 30 – *"Active Load Modulation"*

NTAG 5 Use Cases (II): Secrets to design innovations with NTAG 5 boost

NTAG 5 Features (V): Implementing scalable security – *"AES 128 Mutual Authentication"*

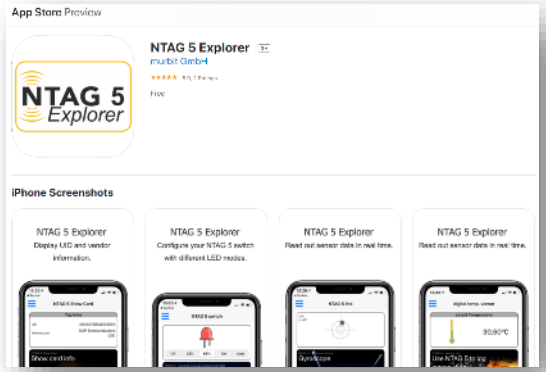


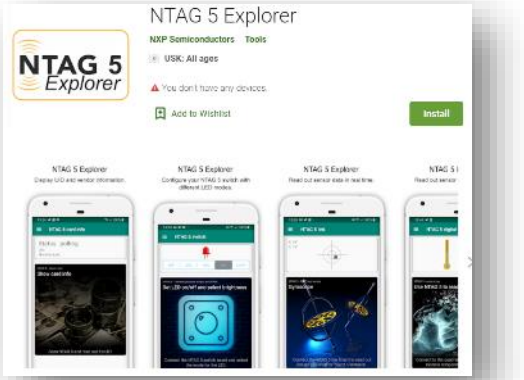
ANDROID & IOS APPS

NTAG 5 Apps

- NTAG 5 demo kit apps for android and iOS are available in Google Play and App Store respectively.
-

	iOS	Android
NTAG 5 Development Boards App	Source code available Click here -> Documents and Software	Source code available Click here -> Documents and Software
NTAG 5 Demo Kit App	Click here: NTAG 5 Demo Kit App	Click here: NTAG 5 Demo Kit App
NTAG 5 Temperature Sticker Demo	Included in Demo Kit App	Included in Demo Kit App





NTAG 5 ORDERING DETAILS

NTAG 5 part type and ordering details

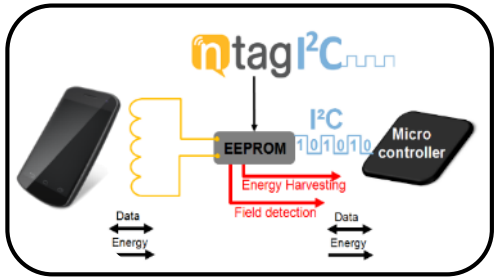
Name	Part no.	Package	12nc
NTAG 5 switch	NTP52101G0JHKZ - Tape/Reel	XQFN	935354731471
NTAG 5 switch	NTP52101G0JTZ - Tape/Reel	S08	935354901431
NTAG 5 switch	NTP52101G0JTTZ - Tape/Reel	TSSOP 16	935362409431
NTAG 5 switch	NTP52101G0JUA – Bare die	FFC – Wafer	935385992005
NTAG 5 link (no AES)	NTP53121G0JHKZ - Tape/Reel	XQFN	935354903471
NTAG 5 link (no AES)	NTP53121G0JTZ - Tape/Reel	S08	935354905431
NTAG 5 link (No AES)	NTP53121G0JTTZ - Tape/Reel	TSSOP 16	935362411431
NTAG 5 link (No AES)	NTP53121G0JUA – Bare die	FFC – Wafer	9353 582 08005
NTAG 5 link	NTP53321G0JHK - Tape/Reel	XQFN	935354909471
NTAG 5 link	NTP53321G0JTZ - Tape/Reel	S08	935354911431
NTAG 5 link	NTP53321G0JTT - Tape/Reel	TSSOP 16	935362496431
NTAG 5 link	NTP53321G0JUA – Bare die	FFC – Wafer	9353 582 09005
NTAG 5 boost	NTA53321G0FHKZ - Tape/Reel	XQFN	935354913471
NTAG 5 boost	NTA53321G0FTTZ - Tape/Reel	TSSOP 16	935362504431
NTAG 5 boost	NTA53321G0FUA – Bare die	FFC – Wafer	
NTAG 5 boost Development board	OM2NTA5332	-	935394976598
NTAG 5 link/switch Development board	OM2NTP5332	-	935394937598
NTAG 5 Demo Kit	OM2NTA5KIT	-	935394934598

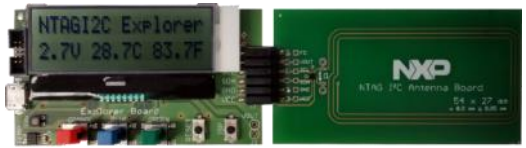
Back to product overview

NTAG I²C *PLUS*

NTAG I²C *plus* is the simplest, most cost-effective NFC solution

- Easy access to data from both NFC (Type 2 Tag) and from I²C
- Field detection to wake up connected devices
- Energy Harvesting capabilities
- EEPROM for offline data access
- Flexible memory management
- Originality signature for protection against cloning
- Fast & convenient data exchange via a 64 bytes SRAM buffer
- Small footprint package (1.6*1.6*0.5mm)





OM5569-NT322E	NTAG® I²C plus Explorer Kit
OM5569-NT322ER	NTAG® I²C plus Explorer Kit + NFC Reader
OM5569-NT322F	NTAG I²C plus Flex Kit
OM23221ARD	NTAG I²C *plus* kit for Arduino pinout

http://www.nxp.com/products/:NT3H2111W0FHK

15 years longevity

Low bill of material

Easy to use

Easy to integrate

Ideal for low power operations

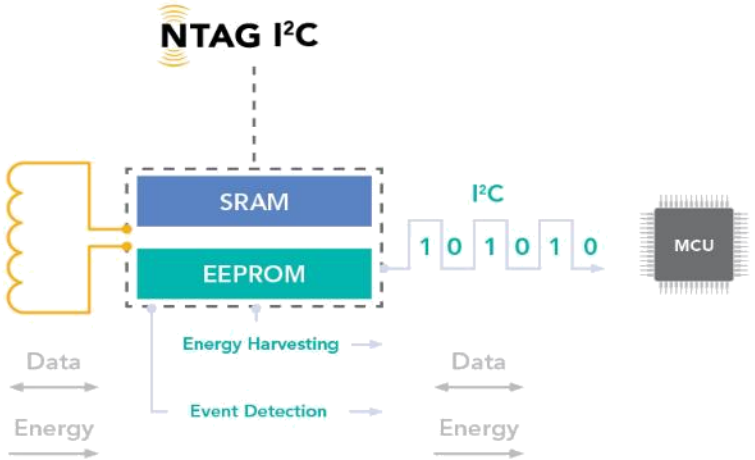
Maximum interoperability with NFC devices

NTAG I²C *plus* product features

Features	
NFC interface	ISO/IEC 14443-3 Type A compliant NFC Forum Type 2 Tag
Memory	1912 or 888-bytes user memory area 64-bytes SRAM buffer for data transfer
Host interfaces	I²C slave 100/400 Kbit/s Field detection pin
Energy harvesting	Up to 15mW
Data transfer	Pass-through mode with 64-byte SRAM buffer FAST_WRITE and FAST_READ NFC commands for higher data throughput
Security	7-byte Unique Identifier One time programmable Capability Container Read-only locking Elliptic curve based originality signature Data access protection from NFC and I²C perspective
Temperature range	-40ºC, +105ºC

More info: http://www.nxp.com/products/:NT3H2111_2211

Packages	
XQFN8	1.8 x 2.6 x 0.5 mm
TSSOP8	3 x 3 x 1.1 mm
SO8	4.9 x 3.9 x 1.75 mm



NTAG I²C *plus* target markets

INDUSTRIAL

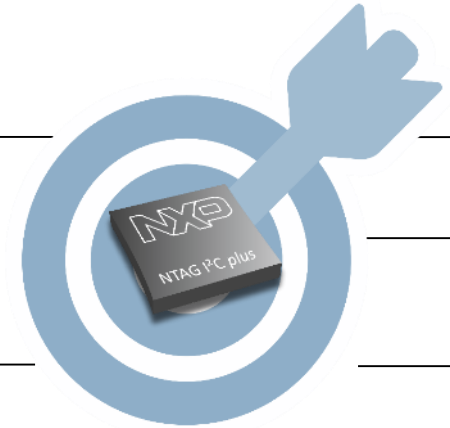
- Parametrization using NFC avoids opening the housing
- Full interoperability with NFC-enabled devices
- Non-volatile memory area to store application data.
- Energy harvesting allows operation without power supply/Battery

LOGISTICS

- Zero power operation with non-volatile data storage
- Password protection to prevent unauthorized data manipulation
- Unique ID optimizes inventory

INTERNET OF THINGS

- NFC for intentional and easy commission devices to a network
- Non-volatile memory area to store application data.



SMART METERS

- Meter maintenance via NFC avoids opening the housing.
- Full interoperability with NFC-enabled devices
- Password protection to prevent unauthorized data manipulation

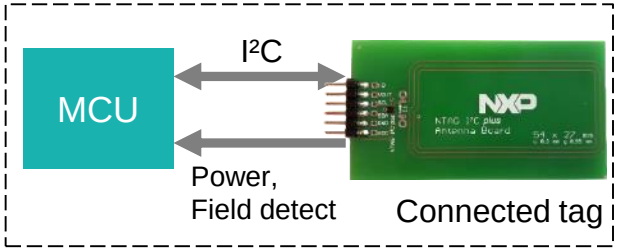
ELECTRONIC SHELF LABEL

- De facto standard in ESLs used for maintenance or for more intuitive customer interaction
- Zero power operation with non-volatile data storage
- Password protection to prevent unauthorized access.

CONSUMER ELECTRONICS

- NFC for intentional and easy commission devices to a network
- Full interoperability with NFC-enabled devices
- Non-volatile memory area to store application data.

How it works



Device to be parameterized/diagnosed/flashed

Parameterization

- Select settings in the app on the NFC phone
- Tap phone to the (unpowered) device
- Phone writes configuration into the connected tag‘s user memory via NFC
- At boot time, MCU reads configuration via I²C bus

Diagnosis

- At runtime, MCU writes data into the connected tag‘s user memory via I²C
- Tap phone to the (unpowered) device
- Phone reads data via NFC and shows in an app

Firmware update

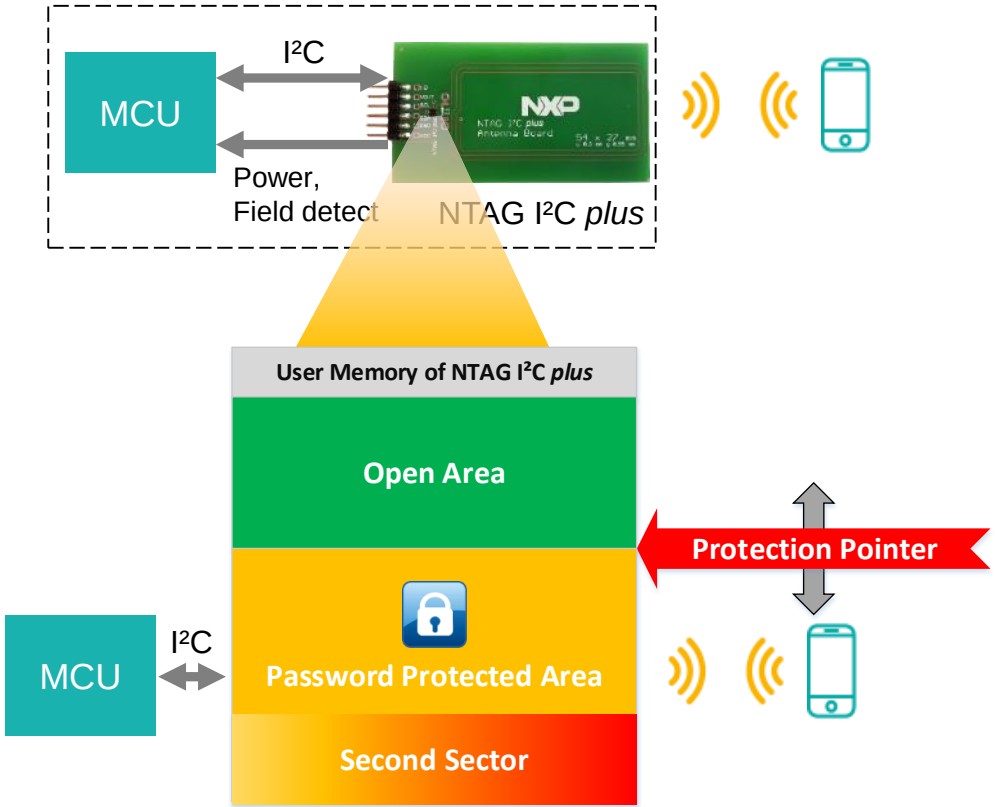
- Tap phone to the (unpowered) device
- Phone powers the MCU via energy harvesting and streams the firmware via the SRAM buffer to the MCU
- MCU flashes the new firmware

Key steps for integration

- Integrate connected tag (NTAG I²C *plus* or NTAG 5) into device
- Develop app on NFC phone

- For details, see „How-to“ guide: https://community.nxp.com/docs/DOC-333834
- Products: NTAG I²C plus (NT3H2211) or NTAG 5 family (NTP5xxx and NTA5xxx)

Data protection for both NFC (RF) and I²C access



The user memory of the NTAG I²C plus can be set to read only and/or can be divided with Protection Pointer into two different areas:

- Open area for phone interaction without app e.g. reading URL or BT/WiFi pairing info
  - Accessible from NFC and I²C
  - Can be set to read-only for NFC side
- Password protected area
  - 32-bit password protection for write or read/write access from NFC side
  - Full, read-only or no access from I²C side
- Second sector (2K version only) may be password protected or even hidden from NFC side

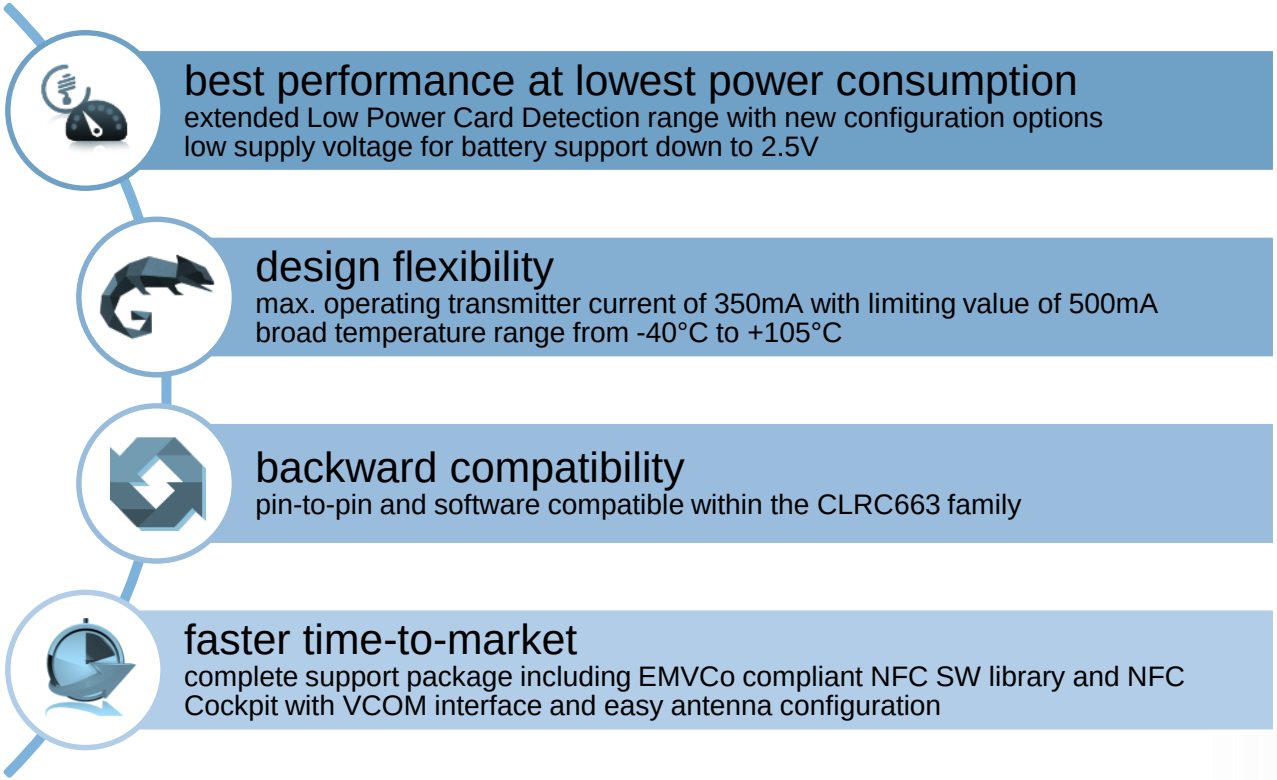
NTAG I²C plus ordering details

Product	Part number	12NCs	Package	Delivery form	MOQ
NTAG I²C *plus* 1k	NT3H2111W0FTT (1k)	9353 069 32118	TSSOP8	Tape&reel	2.5kpcs
NTAG I²C *plus* 2k	NT3H2211W0FTT (2k)	9353 069 33118	TSSOP8	Tape&reel	2.5kpcs
NTAG I²C *plus* 1k	NT3H2111W0FT1 (1k)	9353 070 09115	SO8	Tape&reel	500pcs
NTAG I²C *plus* 2k	NT3H2211W0FT1 (2k)	9353 070 16115	SO8	Tape&reel	500pcs
NTAG I²C *plus* 1k	NT3H2111W0FHK (1k)	9353 069 39125	XQFN8	Tape&reel	4kpcs
NTAG I²C *plus* 2k	NT3H2211W0FHK (2k)	9353 069 43125	XQFN8	Tape&reel	4kpcs

CLRC663 *PLUS* FAMILY

CLRC663 *plus* family | push your design further

10 years longevity



best performance at lowest power consumption
extended Low Power Card Detection range with new configuration options
low supply voltage for battery support down to 2.5V

design flexibility
max. operating transmitter current of 350mA with limiting value of 500mA
broad temperature range from -40°C to +105°C

backward compatibility
pin-to-pin and software compatible within the CLRC663 family

faster time-to-market
complete support package including EMVCo compliant NFC SW library and NFC Cockpit with VCOM interface and easy antenna configuration

CLRC663 *plus* | product features

Characteristics

Key features

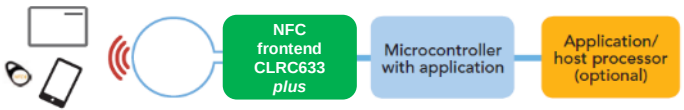
- 350mA maximum operating transmitter current with limiting value of 500mA
- Power supply voltage: 2.5 to 5.5V
- Extended operating temperature range: -40 to +105°C(*)
- 512byte FIFO buffer for highest transaction performance
- Flexible and efficient power saving modes including hard power down, standby and low-power card detection

Licenses and supported standards

- Includes NXP ISO/IEC14443-A, NXP MIFARE® and Innovatron ISO/IEC14443-B licenses
- Crypto 1 intellectual property licensing rights
- Hardware supports for MIFARE Classic encryption

Packages

- HVQFN32 (5×5×0.85mm) with wettable flanks
- VFBGA36 (3.5×3.5×0.8mm)



Supported RF protocols

Reader and Writer mode

- ISO/IEC 14443A/MIFARE
- ISO/IEC 14443B
- JIS X 6319-4 (comparable with FeliCa1 scheme)
- ISO/IEC 15693 (ICODE-SLIX/SLIX2, ICODE-DNA)
- ISO/IEC 18000-3 mode 3/ EPC Class-1 HF (ICODE-ILT)

Peer to Peer mode

- Passive-Initiator according to ISO/IEC 14443A (106kbit/s) and FeliCa (212 and 424kbit/s)

Allows to read and write

- Complete MIFARE® and DESFIRE® families
- Complete NTAG® family e.g. NTAG I²C *plus*
- Complete ICODE® family and SmartMX® family

Interfaces

- Host interfaces: SPI (10Mbit/s), I²C (1000kbit/s) and UART (1228.8kbit/s)
- SAM interface in X-mode
- Up-to 8 general purpose inputs/outputs
- Accurate clock generator for Microcontroller or USB

More info: http://www.nxp.com/products/:CLRC66303HN

(*) with HVQFN32 package; operating temperature range with VFBGA36 package: -40 to +85°C

CLRC663 *plus* family | target markets

ACCESS CONTROL

- broad temperature range from -40°C to +105°C(*)
- pin-to-pin and software compatible to CLRC663

GAMING

- extended Low Power Card Detection range with new configuration options
- low supply voltage for battery support down to 2.5V

INDUSTRIAL

- highest transmitter current
- HVQFN package with wettable flanks for best soldering quality

(*) with HVQFN32 package; operating temperature range with VFBGA36 package: -40 to +85°C

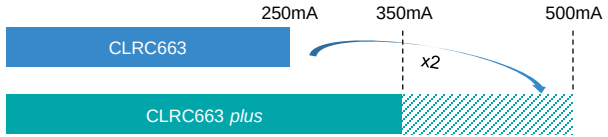
CLRC663 *plus* family | quick reference table

	CLRC663 *plus*	CLRC661 *plus*	MFRC631 *plus*	MFRC630 *plus*	SLRC610 *plus*
ISO/IEC 14443A – MIFARE/NTAG	yes	yes	yes	yes	
ISO/IEC 14443B	yes		yes		
JIS X 6319-4 – FeliCa	yes				
ISO/IEC 15693 – ICODE SLIX/DNA	yes	yes			yes
ISO/IEC 18000-3m3 – ICODE ILT	yes	yes			yes
ISO/IEC 18092 passive initiator	yes				
Operating transmitter current	350 mA (max.), 500 mA (lim.)				
LPCD(1) range(2) (EMVCo RefPICC)	66 mm				
Operating ambient temp. range	VFBGA36: -40 to +85 °C | HVQFN32: -40 to +105 °C				
RF transmitter supply voltage	2.5 to 5.5 V				
HVQFN32 (5×5×0.85mm)	with wettable flanks				
VFBGA36 (3.5×3.5×0.8mm)	yes				
Product longevity program	10 years				

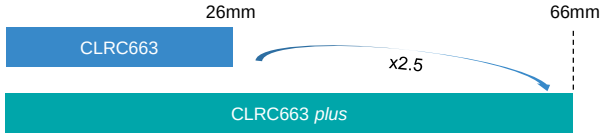
- **CLRC661 *plus***
  NFC reader for NTAG®, ICODE®, DESFIRE® and MIFARE® products families
- **MFRC631 *plus***
  Entry level EMVCo reader
- All derivatives are **pin-to-pin compatible**

1. Low Power Card Detection
2. all detection ranges measured using the standard CLRC663 *plus* development board (CLEV6630B) operated with external power supply at room temperature

CLRC663 *plus* vs. CLRC663



Maximum operating transmitter current increases by 40% for CLRC663 *plus* with 2x the limiting value of the CLRC663



CLRC663 *plus* has new configuration options(2) enabling up-to 2.5x the detection range in LPCD(1) mode

CLRC663 *plus* has an automotive or industrial operating temperature range: -40 to +105°C

CLRC663 *plus* enables better support for battery powered systems

1. Low Power Card Detection
2. New LPCD configuration options are Charge Pump (enabled/disabled) and LPCD Filter (enabled/disabled)

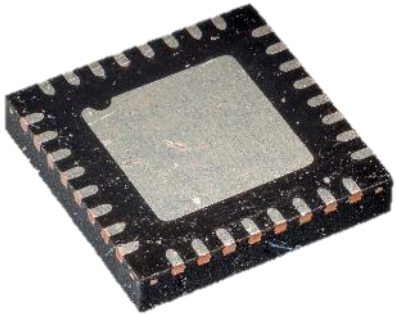
CLRC663 *plus* family – LPCD in details

Card type	Standard (CLRC663)	Charge pump enabled	LPCD_FILTER enabled	Charge pump + LPCD_FILTER enabled
MIFARE® Ultralight	11 mm(2)	16 mm	29 mm	25 mm
NTAG	19 mm	24 mm	37 mm	33 mm
MIFARE DESFire® EV2	19 mm	24 mm	39 mm	35 mm
JCOP DIF	12 mm	17 mm	30 mm	27 mm
ISO RefPICC Class 6	4 mm	7 mm	18 mm	23 mm
EMVCo RefPICC	26 mm	29 mm	57 mm	66 mm

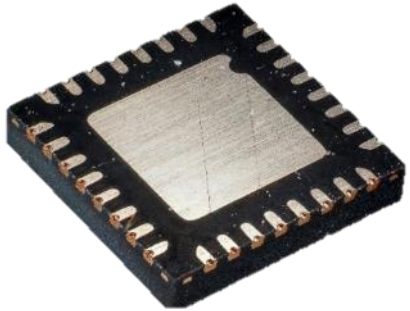
- The basic idea of the LPCD(1) is to provide a function that turns off the RF field when no card is used. This saves energy and allows battery powered NFC Reader designs
- The CLRC663 and CLRC663 *plus* offer a standalone LPCD function, which replaces the normal active card polling that is triggered by the host µController
- CLRC663 *plus* offers additional features to extend the LPCD performance
  - **Charge Pump** increases the RF field strength during the RF-on time
  - **LPCD Filter** reduces the risk of fail detections especially in case of spike noise

1. Low Power Card Detection
2. All detection ranges measured using the standard CLRC663 *plus* development board (CLEV6630B) operated with external power supply at room temperature

CLRC663 *plus* family – wettable flank package



CLRC663



CLRC663 *plus*

- In the case of standard HVQFN packages (e.g. CLRC663 family), there is no exposed pin to visually determine whether or not the package is successfully soldered onto the PCB. The package edge has exposed copper for the terminals, these are prone to oxidation, making sidewall solder wetting difficult
- The CLRC663 *plus* family, with wettable flank HVQFN package, enables 100% automatic visual inspection post-assembly ensuring higher quality of assembly

CLRC663 *plus* vs. PN5180, PN7150 and PN7462AU

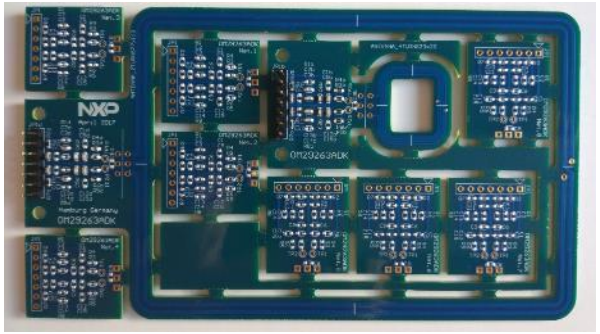
Feature	CLRC663 *plus*	PN5180	PN7150	PN7462AU	Comment
Package	HVQFN32	HVQFN40 TFBGA64	HVQFN40 WLCSP42	HVQFN64 VFBGA64	CLRC663 *plus* is pin-to-pin compatible with CLRC663
RF transmitter supply voltage	2.5 to 5.5V	2.7 to 5.5V	2.7 to 4.75V	3 to 5.5V	CLRC663 *plus* enables better support for battery powered systems
General Purpose Input/Output pins (e.g. to drive LEDs)	4 up-to 8	up-to 7 outputs only	no	12 up-to 21	PN5180 has up-to 7 general purpose outputs on TFBGA64 package only
Max. operating transmitter current	350mA (lim. 500mA)	250mA with DPC	180mA	250mA with DPC	Dynamic Power Control enables up to 30% increase of the driver current at same max spec
Temperature range	-40 to +105°C(*)	-30 to +85°C	-30 to +85°C	-40 to +85°C	PN7462AU and CLRC663 *plus* have an industrial temperature range
Low power card detection	range: very good power: best	range: best power: good	range: best power: good	range: best power: good	CLRC663 *plus* offers the lowest power consumption
Complete set of field proven software libraries	NFC & EMVCo	Full NFC & EMVCo	NFC	Full NFC & EMVCo	Full NFC forum and EMVCo 3.0 certified library PN7462AU: contact EMVCo 4.3 certified library
Waveform Control Adaptive Range Control	yes no	adaptive yes	yes no	adaptive yes	Improves wave shape stability, sensibility and robustness under detuned conditions
Full NFC Forum support	no	yes	yes	yes	CLRC663 *plus* does not feature Card Emulation and Passive Target
NFC tag type emulation	no	4A	3, 4A	4A	PN7150 can also emulate JIS X 6319-4 (FeliCa)
Freely programmable MCU (flash)	no	no	no	Cortex M0 (160kB)	PN7150 has a MCU with integrated FW and a standard NCI interface
Host interfaces	SPI, I²C, UART	SPI	I²C	USB, HSUART, SPI, I²C	PN7462AU has also two master interfaces (SPI, I²C) and one contact reader interface
SAM Interface	yes with X-mode	no	no	Yes with ISO/IEC 7816-3&4 UART	The SAM interface allows to store keys in a secure container

(*) with HVQFN32 package; operating temperature range with VFBGA36 package: -40 to +85°C

CLRC663 *plus* | development kit and board

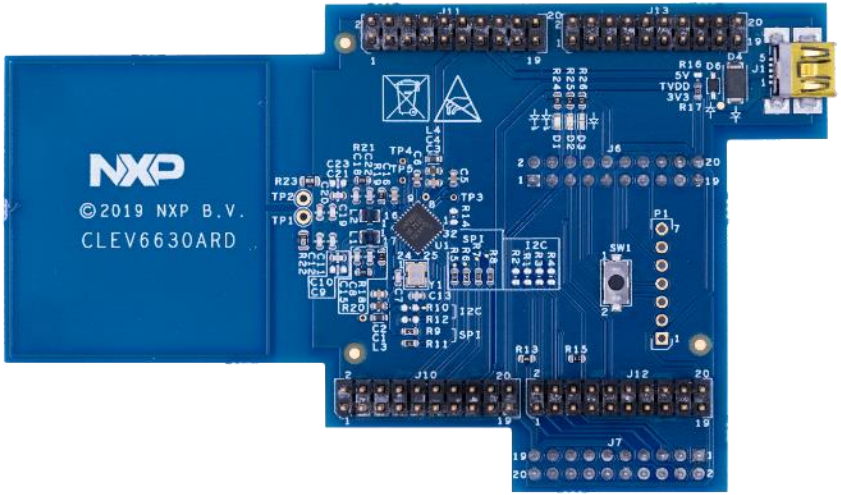
- The **OM26630FDK** is a flexible and easy to use frontend development kit for the CLRC663 *plus*
- It contains the **CLEV6630B** development board fully supported by the **NFC Cockpit** and the **NFC Reader Library** with a 65×65mm² and a 30×50mm² antenna with matching components optimized for Access Management applications
- It also includes, 3 small antenna matching PCBs for implementation of custom antenna matching circuit, NFC sample cards, and 10 CLRC663 *plus* samples in HVQFN package with wettable flank

CLRC663 *plus* | antenna development kit



- The **OM29263ADK** is a set of 2 ready-to-use pre-matched antennas for use with the CLRC663 *plus* development board
- It consists of the popular **4 turns 20×20mm²** antenna optimal to interact with mobile phones, NTAG® family or ICODE® SLIX/DNA where footprint is limited, the **2 turns 77×113mm²** antenna for best performance with ICODE ILT or MIFARE® including DESFIRE® family and **8 PCBs for individual antenna matching**
- This NFC antenna development kit complements the standard 2 turns 65×65 mm² antenna of the CLRC663 *plus* development board (CLEV6630B) and comes in addition of the 3 turns 30×50mm² antenna present in the CLRC663 *plus* development kit (OM26630FDK)

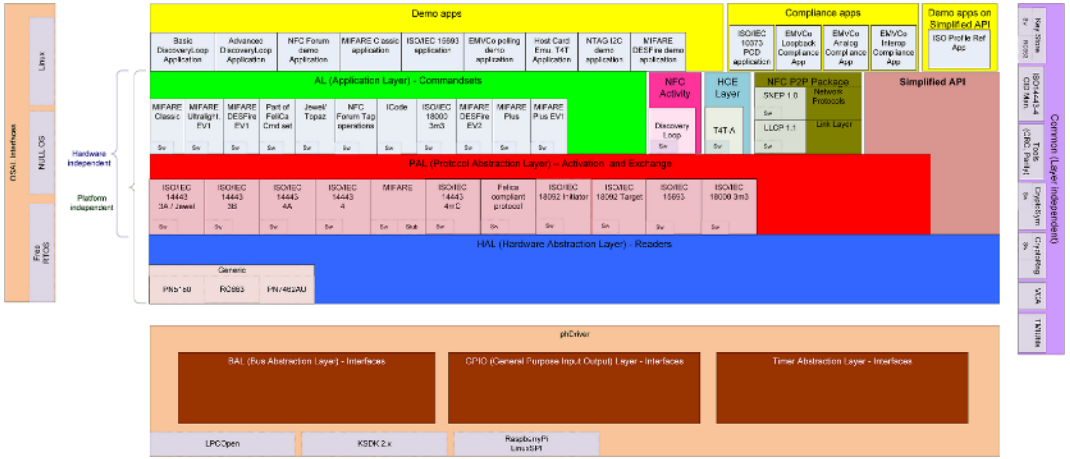
CLRC663 *plus* | Arduino interface board



- The **CLEV6630ARD** features an Arduino interface board, enabling NFC frontend CLRC663 *plus* integration with any boards compatible with Arduino header, including most LPCXpresso, Kinetis and i.MX boards
- Out of the box, this CLRC663 *plus* Arduino interface board works perfectly with FRDM-K82F, the Freedom development platform for Kinetis® K82, K81, and K80 MCUs and is fully supported by the **NFC Reader Library**

ARDUINO

NFC Reader library | scalable and pre-certified(*)



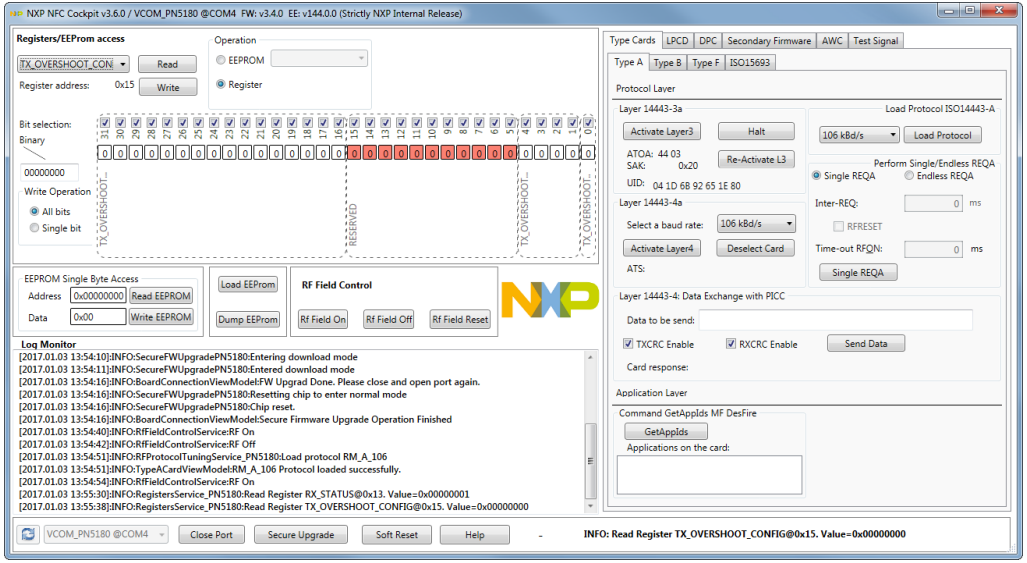
- **Optimum performance** – built-in MCU support, interrupt-based event handling, and FreeRTOS support
- **Faster development** – save time and effort by using the APIs and the rich set of sample applications for most common functions
- **Simpler certification** – get ready for certification with test applications for EMVCo L1, NFC Forum and ISO/IEC10373-6 PICC/PCD

www.nxp.com/products/:NFC-Reader-library

(*) pre-certification done on NXP development boards

NFC Cockpit | intuitive configuration of CLRC663 *plus* family

- **NFC Cockpit** is an intuitive graphical user interface that lets you configure and adapt IC settings without writing a single line of software code
- Automatic optimization of receiver settings across LMA levels using integrated **Matrix test**
- NFC Cockpit supports CLRC663 family, PN5180 and PN7462 family
- It can be used with NXP development boards and **all systems implementing a standard V-COM interface**



www.nxp.com/products/:NFC-Cockpit

Back to product overview

PN5180

PN5180 – The best full NFC frontend in the market

10 years longevity

- Contactless high power NFC
- Dynamic Power Control - strong RF in harsh environments
- NFC Cockpit Design In Tool
- NFC Forum, EMVCo and ISO/IEC compliant library
- NFC frontend development kit OM25180FDK

PN5180 – Technical product features

Characteristics

- RF driver current up to 250mA
- Dynamic Power Control DPC
- Adaptive modulation waveform control
- RF driver supply voltage: 2,7V…5.5V
- Host interface: 1,8V or 3.3V
- Flexible low power card detection
- 4 Multi purpose Outputs‘s (only on TFBGA)
- HW support for EMVCo EMD handling
- 13.56 MHz RF clock generation from external 8, 12, 16 and 24 MHz source
- Overheat protection
- Operating temperature range**:** -30…+85° C

Interface to Host

- SPI up to 7Mbit/s
- IRQ and BUSY signal for improved host communication

Supported RF protocols

Reader/Writer mode
- ISO/IEC 14443 A&B R/W support up to 848 kbit/s
- FeliCa R/W support
- R/W support for MIFARE 1K, 4K
- NFC Forum tag type 1,2,3,4,5 reader
- ISO/IEC15693 reader (I-Code SLI)
- ISO/IEC 18000-3M3 reader (I-Code ILT)
- EMVCo 2.3.1 and 2.5 compliance (L1)

Peer to Peer mode
- Passive-Initiator / Passive-Target
- Active-Initiator / Active-Target
- P2P supported for types:
  - A (106 kbit/s)
  - F (212,424 kbit/s)

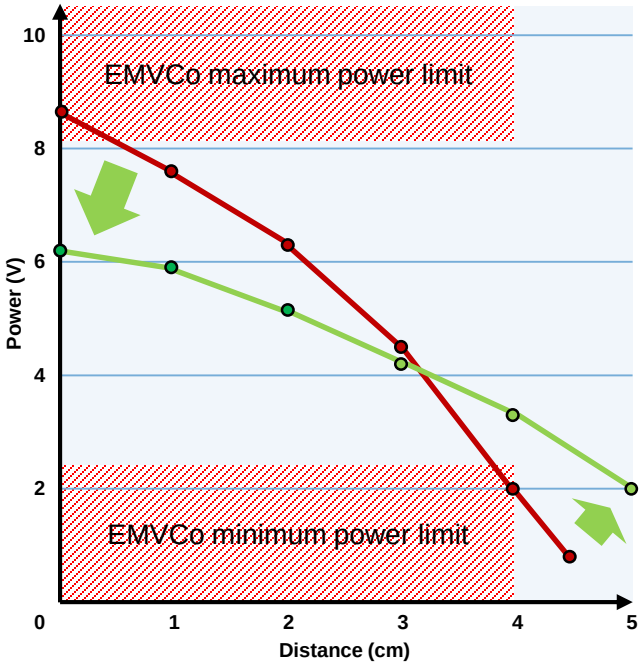
Card Emulation
- ISO/IEC 14443A (up to 848 kbit/s)
- Active Load Modulation

Packages

- HVQFN40 and TFBGA64
- Part removal detection (PRD, only on TFBGA)

Dynamic Power Control (DPC)

Dynamic Power Control simplifies EMVCO certification



Dynamic Power Control enables up to 25% increase of read range at same maximum current specification

dynamic regulation of

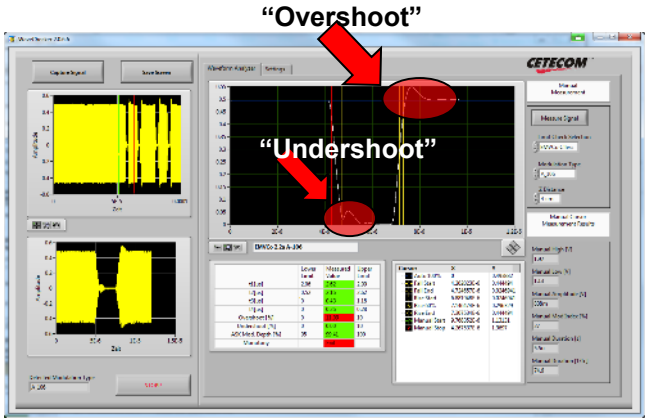
- transmitter current for detuning compensation
- H-field within the operating volume
- modulation index and rise/fall times
- receiver settings

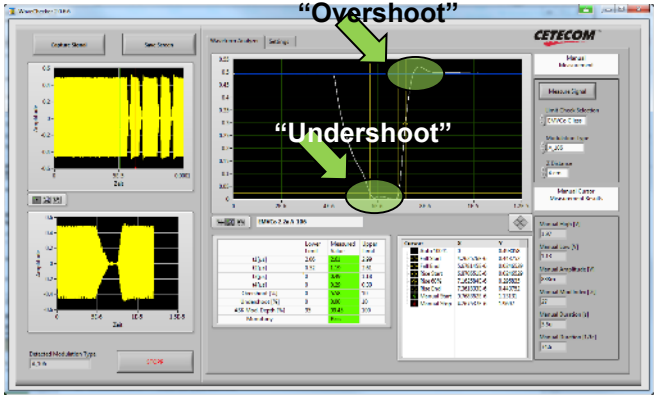
NFC reader with DPC
Getting the best long range power and avoiding close coupling power impacts

NFC reader without DPC

AWC: Automatic Waveshape Control

Easy adaptation of the waveshape by register settings without having to modify the antenna matching components

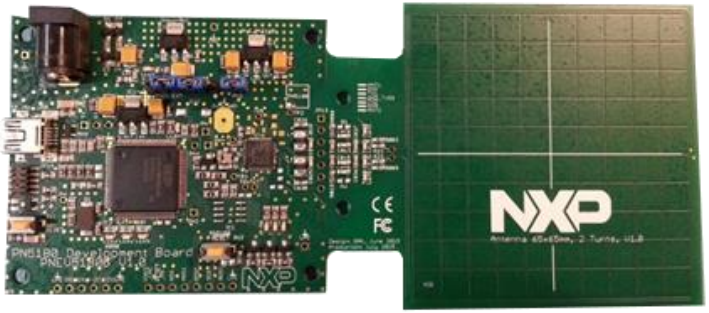




PN5180 vs. CLRC663 *plus*

Feature	CLRC663 *plus*	PN5180	Comment
BGA package	YES	YES	Suitable for payments
BGA package with anti grinding	NO	YES	Advantage for PCI certification (anti-probing protection and package removal detection)
Additional output pins to drive LEDs	NO	YES	Saves IOs on host controller
Max. operating transmitter current	350mA (500mA peak)	250mA with Dynamic Power Control	Dynamic Power Control allows to benefit at a best from the available 250mA on the PN5180
PLL & System clock	YES, output	YES, input	Can save cost (XTAL) on the system BOM (RC663) or reuse existing system frequency (PN5180)
Low power card detection	YES	YES	
Complete set of field proven libraries for embedded systems	Reader & EMVCo	Reader, Full NFC & EMVCo	
Improved waveform robustness versus antenna detuning	YES	YES with adaptive modulation waveform control	Increased stability compared to PN512 and CLRC663
Receiver structure	Differential input	Differential input with dynamic range control	Differential receiver is more sensitive and more robust in case of external noise
Integrated EMD handling	NO (SW has to handle it)	yes	No real time constraints issues from host controller for EMD handling as it is automatically done in the Front end

OM25180FDK frontend development kit

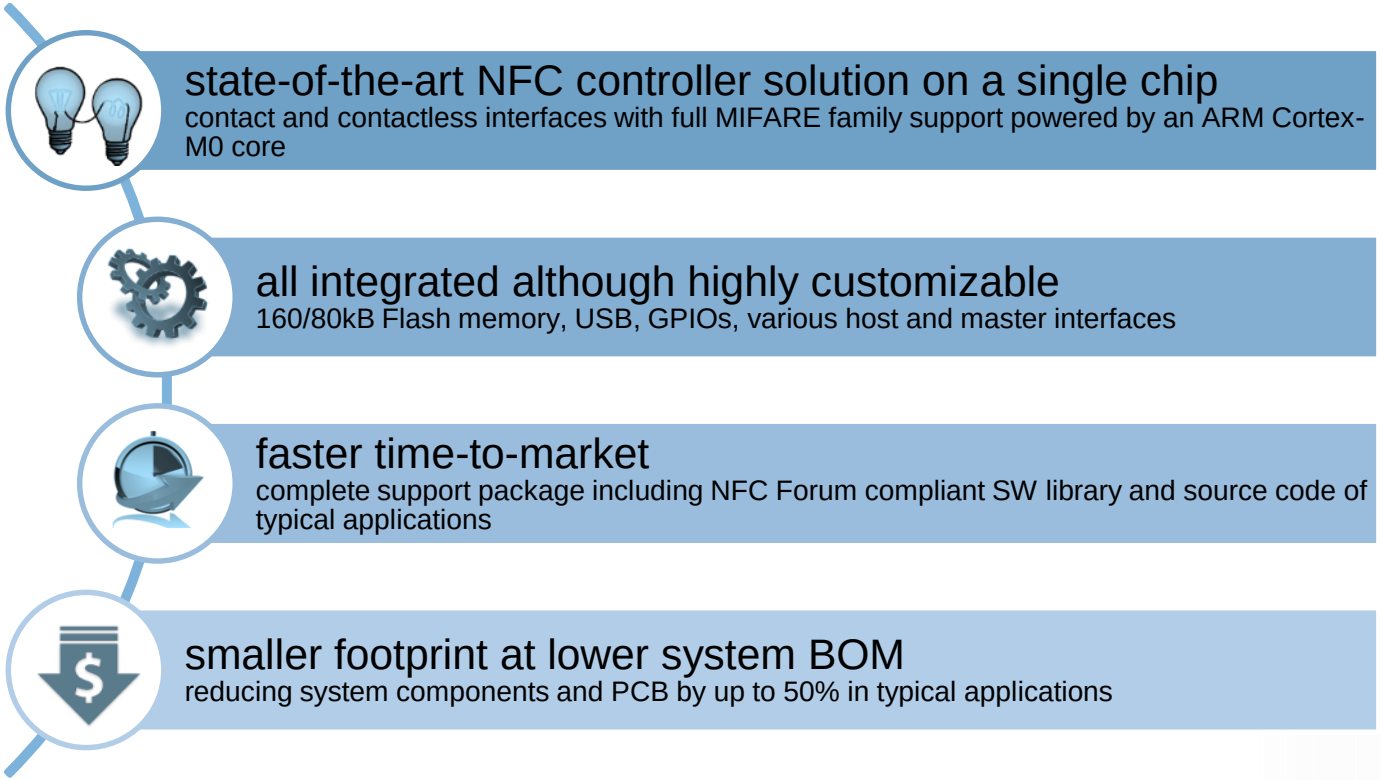


- Development board with integrated NXP LPC1769 MCU
- Comes wih two antenna sizes 65x65mm and 30x50mm
- 3 additional matching circuits
- Samples
- NFC Samplecard
- CE/FCC certified

Back to product overview

PN7462 FAMILY

PN7462 family | all-in-one full NFC solution



state-of-the-art NFC controller solution on a single chip
contact and contactless interfaces with full MIFARE family support powered by an ARM Cortex-M0 core

all integrated although highly customizable
160/80kB Flash memory, USB, GPIOs, various host and master interfaces

faster time-to-market
complete support package including NFC Forum compliant SW library and source code of typical applications

smaller footprint at lower system BOM
reducing system components and PCB by up to 50% in typical applications

PN7462 family | product features

Characteristics

Key features
- 20 MHz Cortex M0 core with 12 kB RAM and 4 kB EEPROM
- 160/80 kB user Flash
- 250mA maximum operating transmitter current with Dynamic Power Control
- Power supply from 2.7 to 5.5V
- GPIOs, master/slave SPI and I²C, host USB and HSUART
- Protected firmware download in flash
- Extended operating temperature range: -40 to +85°C

Ease of integration
- Multiple SW examples provided for several use cases
- EMVCo validated and NFC Forum compliant libraries
- Usage of standard development tools

Optional Contact Reader (PN7462AU)

- Class A, B, C cards supported (PN7462AUHN only)
- Fully integrated ISO/IEC 7816-3&4 UART
- Baud rate up to 1 Mbit/s
- Capability to drive external contact reader frontends for SAMs

Supported RF protocols

Reader and Writer mode
- ISO/IEC 14443A/MIFARE
- ISO/IEC 14443B
- JIS X 6319-4 (comparable with FeliCa1 scheme)
- ISO/IEC 15693 (ICODE-SLIX/SLIX2, ICODE-DNA)
- ISO/IEC 18000-3 mode 3/ EPC Class-1 HF (ICODE-ILT)

Card emulation
- ISO/IEC 14443-4 with Active and Passive load modulation support

Peer to Peer mode
- Active and passive initiator and target according to ISO/IEC 18092

Allows to read and write
- Complete MIFARE® and DESFIRE® families
- Complete NTAG® family e.g. NTAG I²C *plus*
- Complete ICODE® family and SmartMX® family

Packages

- HVQFN64 (9x9 mm²)
- VFBGA64 (4.5x4.5 mm²)

PN7462 family | target markets

ACCESS CONTROL

- single chip solution for stand alone reader
- full interoperability with cards and phones
- broad temperature range from -40 to +85°C

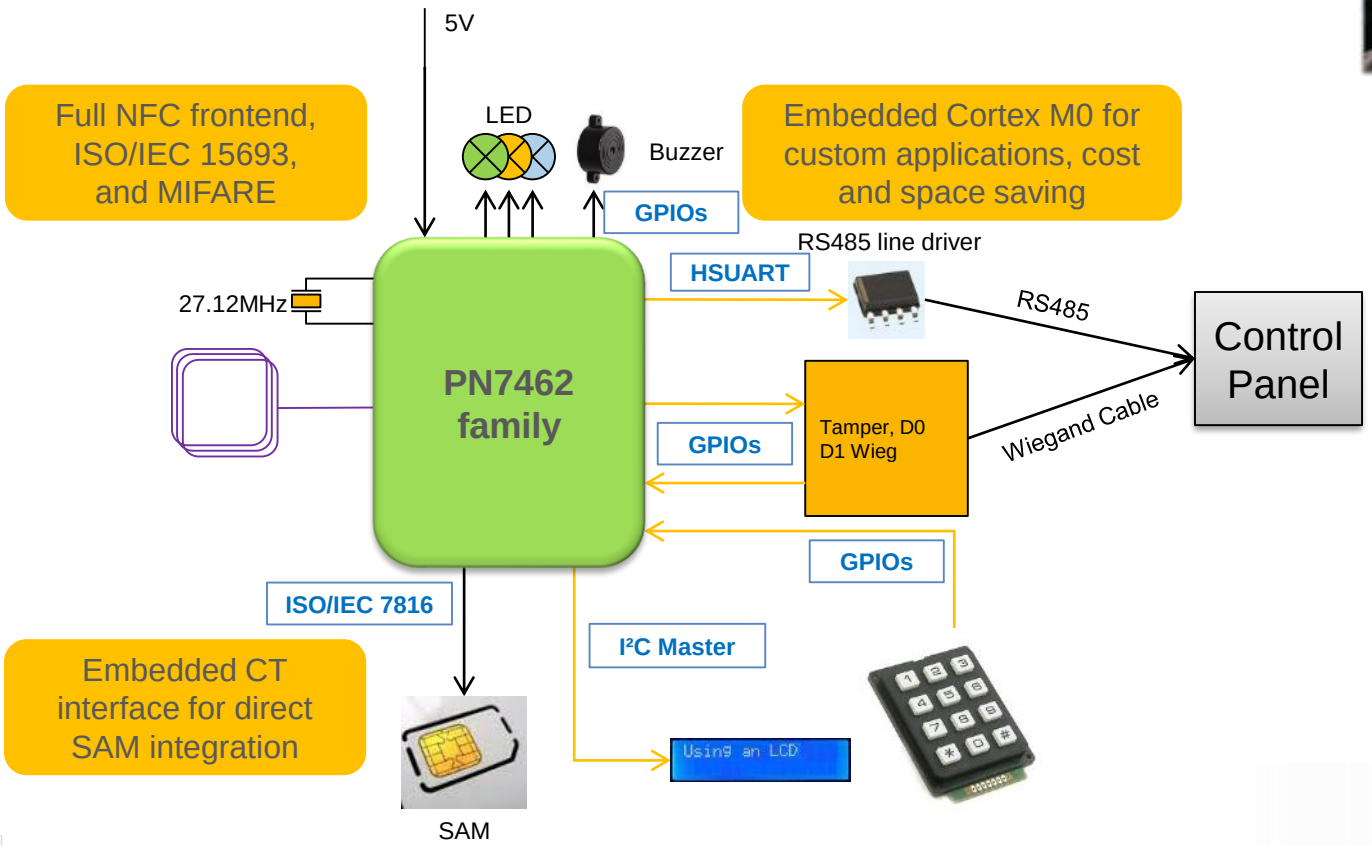
MULTI-MARKET USB READER

- highly customizable interfaces
- complete support package with NFC Forum compliant SW library
- source code of typical applications

HOME BANKING & PAYMENT

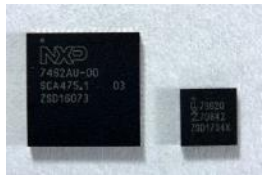
- single chip solution for minimum footprint
- EMVCo 2.6 L1 analog and digital compliant

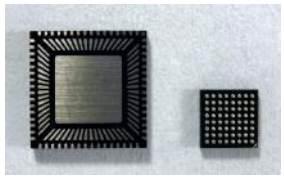
Example: PN7462 for Corporate Access



PN7462 family members

PN7462 family	PN7462AU		PN7362AU		PN7360AU	
Item reference	PN7462AUHN	PN7462AUEV	PN7362AUHN	PN7362AUEV	PN7360AUHN	PN7360AUEV
Package type	HVQFN64	VFBGA64	HVQFN64	VFBGA64	HVQFN64	VFBGA64
NFC Forum compliance	yes		yes		yes	
Reader / writer support	ISO/IEC 14443A (MIFARE/NTAG), 14443B, 15693 (ICODE SLIX/DNA), 18000-3m3 (ICODE ILT) and JIS X 6319-4 (FeliCa)					
Card emulation	NFC tag 4 type A					
Peer-to-peer (ISO/IEC 18092)	full passive and active initiator and target modes					
Operating transmitter current	250 mA (max.) with Dynamic Power Control, Adaptive Waveform Control and Adaptive Range Control					
Integrated microcontroller	20 MHz Cortex M0 Core with 12 kB RAM and 4 kB EEPROM					
Interfaces	GPIOs, master/slave SPI and I²C, host USB and HSUART					
Supply voltage	2.7 to 5.5 V					
Operating ambient temp. range	-40 to +85 °C					
Available Flash memory	160 kB				80 kB	
ISO/IEC 7816-3&4 UART	yes		no			
General purposes I/O	12 up-to 21	14 up-to 21				
Contact interface	Class A, B, C	no				





PN7462AU vs. CLRC663 *plus*, PN5180 and PN7150

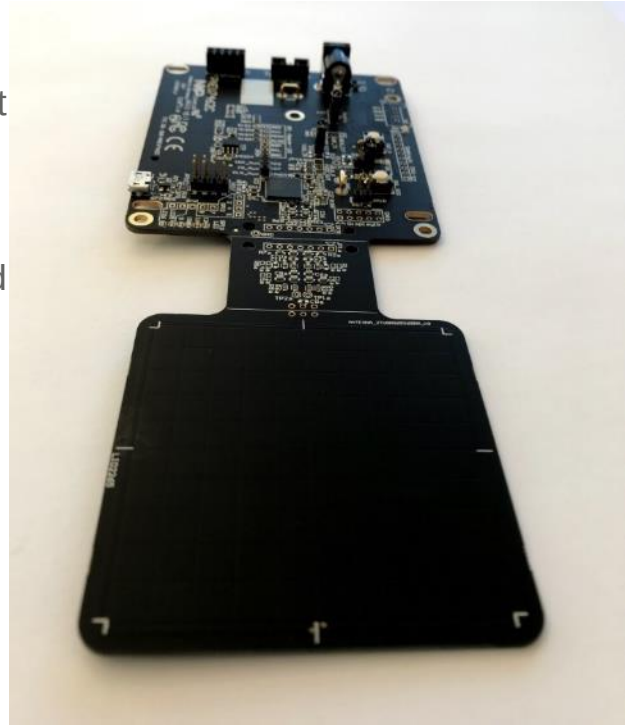
Feature	CLRC663 *plus*	PN5180	PN7150	PN7462AU	Comment
Package	HVQFN32	HVQFN40 TFBGA64	HVQFN40 WLCSP42	HVQFN64 VFBGA64	CLRC663 *plus* is pin-to-pin compatible with CLRC663
RF transmitter supply voltage	2.5 to 5.5V	2.7 to 5.5V	2.7 to 4.75V	2.7 to 5.5V	CLRC663 *plus* enables better support for battery powered systems
General Purpose Input/Output pins (e.g. to drive LEDs)	4 up-to 8	up-to 7 outputs only	no	12 up-to 21	PN5180 has up-to 7 general purpose outputs on TFBGA64 package only
Max. operating transmitter current	350mA (lim. 500mA)	250mA with DPC	180mA	250mA with DPC	Dynamic Power Control enables up to 30% increase of the driver current at same max spec
Temperature range	-40 to +105°C	-30 to +85°C	-30 to +85°C	-40 to +85°C	PN7462AU and CLRC663 *plus* has an industrial temperature range
Low power card detection	range: very good power: best	range: best power: good	range: best power: good	range: best power: good	CLRC663 *plus* offers the lowest power consumption
Complete set of field proven software libraries	NFC & EMVCo	Full NFC & EMVCo	NFC	Full NFC & EMVCo	Full NFC forum and EMVCo 2.6 certified library PN7462AU: contact EMVCo 4.3 certified library
Waveform Control Adaptive Range Control	yes no	adaptive yes	yes no	adaptive yes	Improves wave shape stability, sensibility and robustness under detuned conditions
Full NFC Forum support	no	yes	yes	yes	CLRC663 *plus* does not feature Card Emulation and Passive Target
NFC tag type emulation	no	4A	3, 4A	4A	PN7150 can also emulate JIS X 6319-4 (FeliCa)
Freely programmable MCU (flash)	no	no	no	Cortex M0 (160kB)	PN7150 has a MCU with integrated FW and a standard NCI interface
Host interfaces	SPI, I²C, UART	SPI	I²C	USB, HSUART, SPI, I²C	PN7462AU has also two master interfaces (SPI, I²C) and one contact reader interface
SAM Interface	yes with X-mode	no	no	Yes with ISO/IEC 7816-3&4 UART	The SAM interface allows to store keys in a secure container

PN7462 family | development kit and board

- The **OM27462CDKP** is a flexible and easy to use controller development kit for the PN7462 family

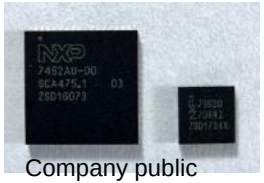
- It contains a **PNEV7462C** board fully supported by the **NFC Cockpit** and the **NFC Reader Library** with a 65*65mm² antenna optimized for EMVCo applications and a 30*50mm² antenna optimized for Access Management applications

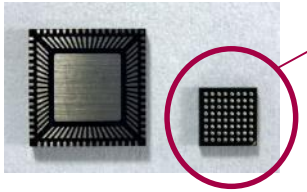
- It also includes, 3 small antenna matching PCBs for implementation of custom antenna matching circuit, NFC sample tags and cards, 5 PN7462AU samples in HVQFN64 package and an OM13054 LPC-Link2 debug adaptor



PN7462 Family Overview

PN7462 family	PN7462AU		PN7362AU		PN7360AU	
Item reference	PN7462AUHN	PN7462AUEV	PN7362AUHN	PN7362AUEV	PN7360AUHN	PN7360AUEV
Package type	HVQFN64	VFBGA64	HVQFN64	VFBGA64	HVQFN64	VFBGA64
NFC Forum compliance	yes		yes		yes	
Reader / writer support	ISO/IEC 14443A (MIFARE/NTAG), 14443B, 15693 (ICODE SLIX/DNA), 18000-3m3 (ICODE ILT) and JIS X 6319-4 (FeliCa)					
Card emulation	NFC tag 4 type A					
Peer-to-peer (ISO/IEC 18092)	full passive and active initiator and target modes					
Operating transmitter current	250 mA (max.) with Dynamic Power Control, Adaptive Waveform Control and Adaptive Range Control					
Integrated microcontroller	20 MHz Cortex M0 Core with 12 kB RAM and 4 kB EEPROM					
Interfaces	GPIOs, master/slave SPI and I²C, host USB and HSUART					
Supply voltage	2.7 to 5.5 V					
Operating ambient temp. range	-40 to +85 °C					
Available Flash memory	160 kB				80 kB	
ISO/IEC 7816-3&4 UART	yes		no			
General purposes I/O	12 up-to 21	14 up-to 21				
Contact interface	Class A, B, C	no				
12NC single tray delivery	9353 076 92551	9353 613 42551	9353 084 36551	9353 613 41551	9353 077 96551	9353 613 43551
12NC reel delivery	9353 076 92518	9353 613 42518	9353 084 36518	9353 613 41518	9353 077 96518	9353 613 43518
Development kit	OM27462CDKP (12NC 9353 639 45598)					
Development board	PNEV7462C (12NC 9353 635 25598)					





New: BGA 4.5x4.5 mm:

- **75% smaller area** than 9x9mm HVQFN

Back to product overview

PN7150

PN7150 key messages

10 years longevity

Plug’n play and high performance full NFC solution makes your application smarter!

Plug’n play NFC reader Fast to market	Smooth integration	High performance & interoperability
Standard NFC Interface (NCI) to the application host	Embedded FW minimizes host interactions and code size	Support of all NFC Forum modes: R/W, P2P and CE
Linux, Android and WinIoT drivers for OS applications	Low power detection mode, fully configurable	High output power
Code examples for RTOS and NullOS applications	Standard I^2C physical interface	NFC reader Tag type 1 to 5
3 demo-kits interface with ARD, RPI and BBB platforms	HVQFN40 package	Active Load Modulation

PN7150 Applications

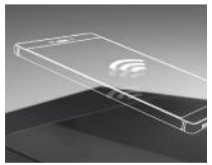
Easy and fast | No conflict | Secure exchanges | Saves UI cost | Eliminate cables | Power NFC tags

Use Cases

- Wi-Fi® and Bluetooth® pairing
- Smart Home NFC commissioning
- User identification
- Accessory authentication
- Data transfer
- Device configuration
- Error diagnosis and Firmware update

Applications

- Gateway, Router, Wireless Access Point
- Audio, Smart Speaker
- Printer, Projector
- TV, Set-Top Box, remote
- Display, E-board, E-Paper
- Home Appliances
- Healthcare, Fitness, Medical







PN7150

Characteristics

- **RF driver supply voltage:** 2.7V…4.75V
- **Max. RF driver current:** 180mA
- **Communication modes**: P2P, R/W and CE
- **OS support:** Linux, Android and Windows IoT
- **Support of Real Time OS and NullOS**
- **NFC forum** Device Requirement v1.3

Supported RF protocols

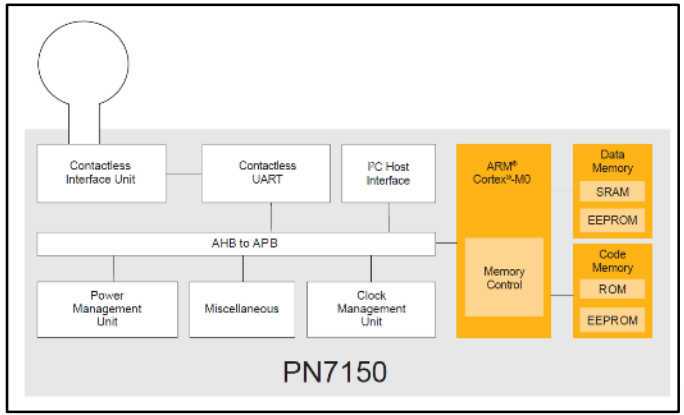
- **Fully configurable polling loop with low power mode**
- **Reader/Writer mode**
  - ISO/IEC A&B R/W support up to 848kbit/s
  - FeliCa R/W support 212 & 424kbit/s
  - R/W support for MIFARE 1K, 4K
  - NFC Forum type 1,2,3,4,5 R/W
  - ISO/IEC 15693
- **Peer to Peer mode**
  - Passive & Active, Initiator & Target,
  - all data rates
- **Card emulation from host mode**
  - NFC forum T4T - ISO/IEC A&B at 106kbps
  - NFC forum T3T - FeliCa card emulation

Interface to Host

- **I2C** 3.4Mbit/s
- **Supply** 1.8V or 3.3V
- **IRQ** signal for improved synchronization
- **NCI 1.0** compliant protocol

Package

- **HVQFN40 package**



Demo kits and support documents

PN7150 demo kit: OM5578
3 configurations

OM5578/PN7150RPI

OM5578/PN7150BBB

OM5578/PN7150ARD

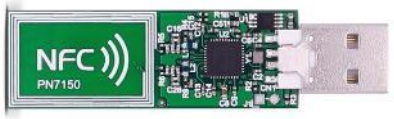
Doc ID	PN7150 Product guides
AN11759	Product Quick Start Guide
UM10936	User Manual
AN11755	Antenna Design and Matching Guide
AN11756	Hardware Design Guide
AN11757	Low Power mode configuration

Doc ID	PN7150 Demo-kit guides
UM10935	SBC Kit User Manual
HW3560	SBC Kit Hardware design files
AN11758	Raspberry Pi demo kit Quick start guide
AN11842	BeagleBone demo kit Quick start guide
AN11841	Arduino demo kit Quick start guide
AN11658	LPCXpresso example
AN11845	Kinetis Design Studio example
AN11990	NCI MCUXpresso example

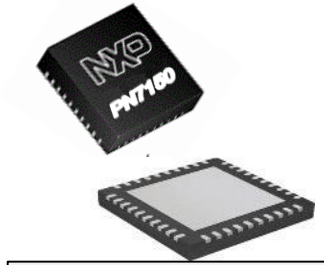
Doc ID	PN7150 Software guides
AN11697	Linux Software Stack Integration Guidelines
AN11690	Android Porting Guidelines
AN11767	Windows IoT Porting guidelines

PN7150 - resources

- **Product websites**
  http://www.nxp.com/products/:PN7150
- **Demo-board website**
  http://www.nxp.com/demoboard/OM5578.html
- **Promote community to post questions**
  https://community.nxp.com/community/nfc
- **Training**
  https://www.nxp.com/design/training:TRAINING-EVENTS
- **Other dev kit: USB dongle from MikroElektronika**
  https://www.mikroe.com/nfc-usb-dongle



PN7150 vs. PN7120



			Benefits
RF driver supply voltage	2.7V or 3.3V	2.7V...**4.75V**	More output power to work with smaller antenna or better performance
Card Emulation mode	NFC forum T4T - ISO/IEC A&B	NFC forum T4T - ISO/IEC A&B **NFC forum T3T - FeliCa**	Enable FeliCa use cases (Japan, HK, Singapore)
Package	VFBGA49	**HVQFN40**	Decrease PCB manufacturing cost (no microvias)
Load Modulation concept	Passive Load Modulation	**Active Load Modulation***	Allow decreasing antenna size with same RF performance in Card Emulation and passive Target modes

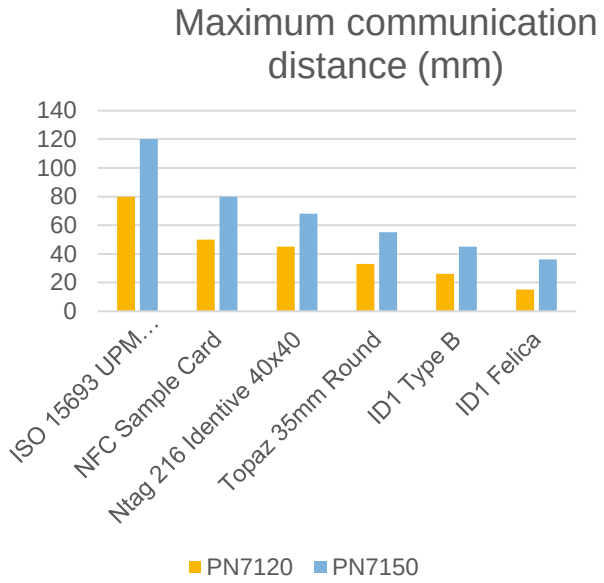
* Active Load Modulation is the fact to actively drive RF signal with the transmitters during the modulation phase.

It gives much stronger signal than the passive load modulation, which is just changing the transmitter impedance.

PN7150 vs PN7120 communication distances (2)
Based on OM5578 and OM5577 demo-kits

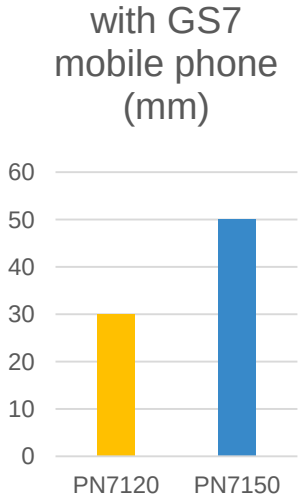
Reader mode

From 50 to 140% increase



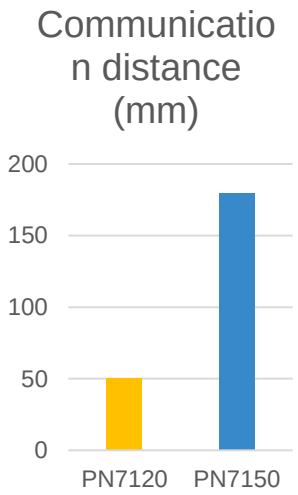
P2P mode

67% increase



Card mode

260% increase



Back to product overview

CONTACT READERS

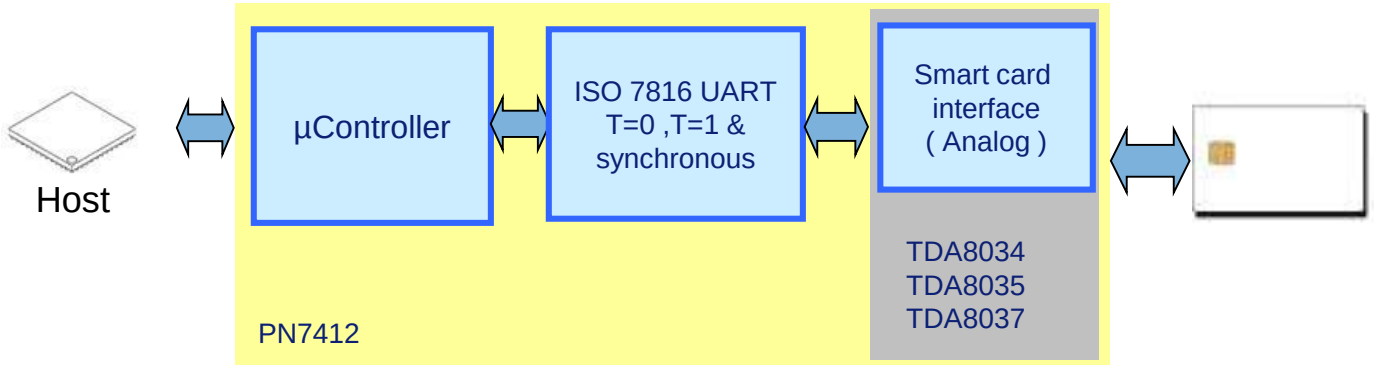
Contact Smart Card Reader ICs

Production	Card Class	ESD HBM on card contacts	EMVCo compliance	Number of slots	Host Interface	Package	SW Stack	Pay TV certification	Integrated CPU & ISO7816 UART & others
TDA8037	B	8kV	4.3c	1 Slot	I/O Lines	SO28 TSSOP16	EMVCo L1	NDS Certified	
TDA8034HN/C2	A,B,C	8kV	4.3c	1 Slot	I/O Lines	HVQFN24	EMVCo L1	NDS Certified	
TDA8035HN/C2	A,B,C	10kV	4.3c	1 Slot	IO lines	HVQFN32	EMVCo L1	NDS Certified	
TDA8026/C3	A,B,C	7kV	4.3c	5 Slots	I²C	TFBGA64	EMVCo L1		
PN7412**	A,B,C	12kV	4.3c	1 Slot/ multi slot external	UART, SPI I²C , USB	HVQFN64	EMVCo L1 CT & CL		ARM Cortex M0 ISO 7816 UART CL interface

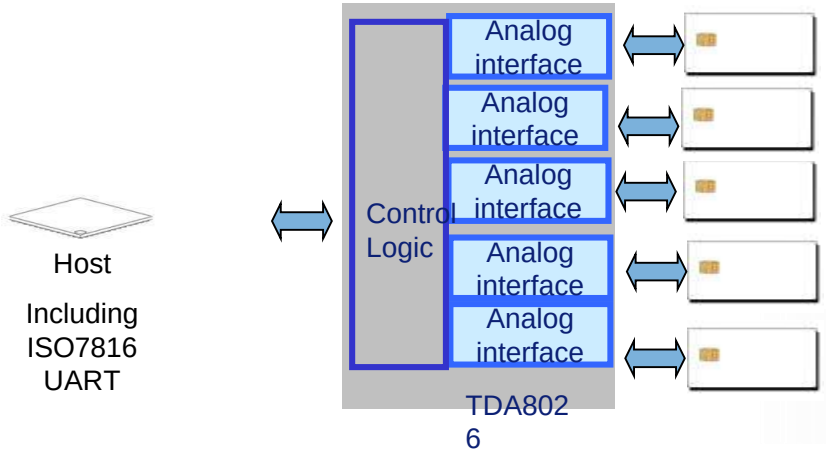
- ** PN7412 is a functional replacement part for TDA8029

Current Product Portfolio Overview

- Single interface



- multiple interfaces



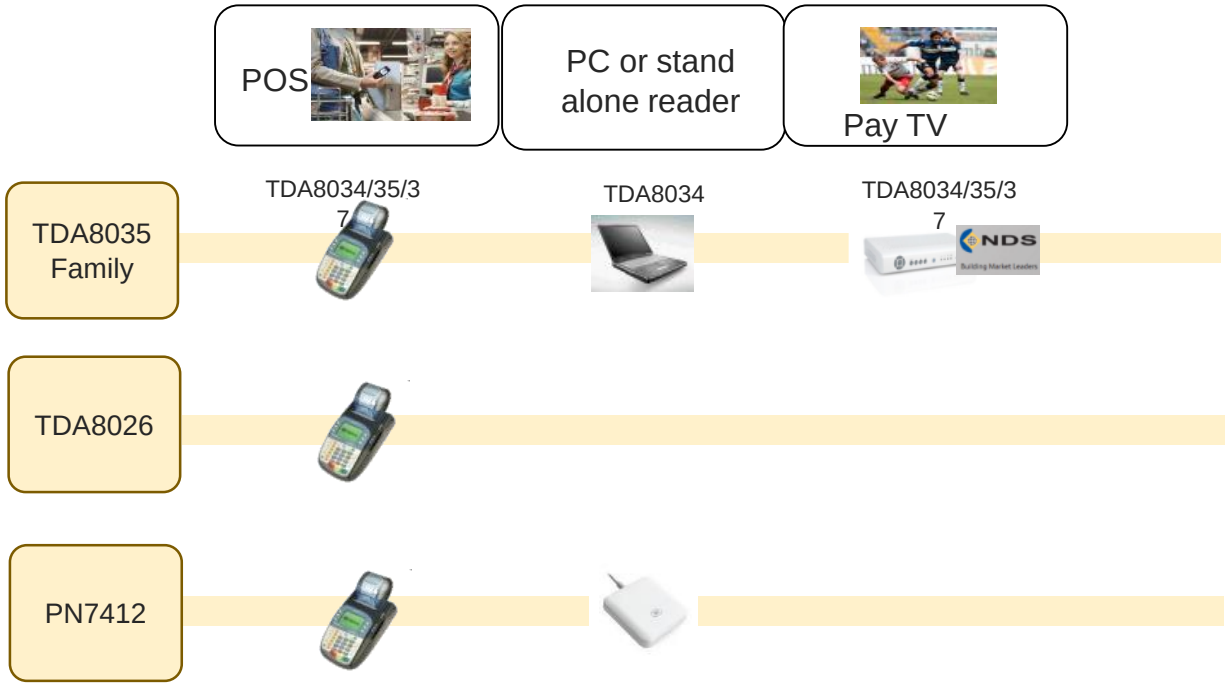
TDA80XX Product Portfolio

CONTACT SMARTCARD READER ICs

Analog, UART, and CPU

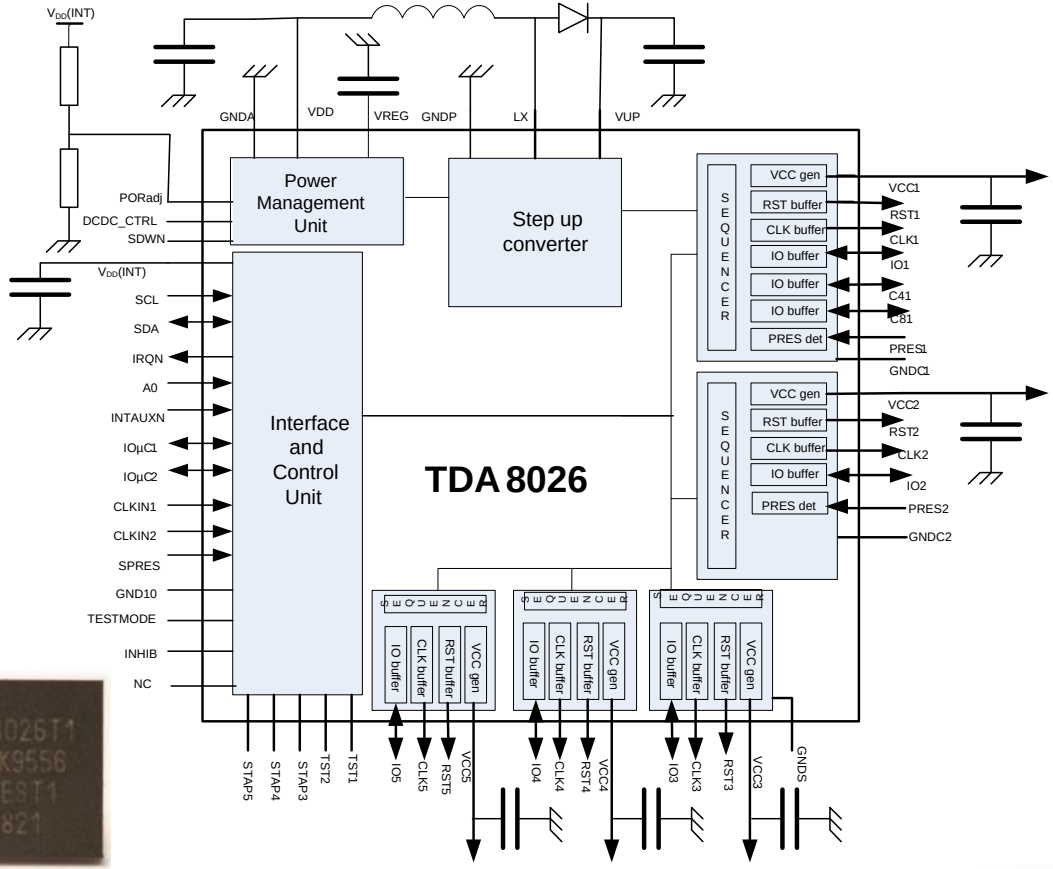
Product features	TDA8026ET	TDA8034HN	TDA8034T	TDA8035HN	TDA8037		PN7412AU
Analog interfaces	5	1	1	1	1		1
ISO/IEC 7816 UART	-	-	-	-	-		yes
ISO/IEC 7816 dedicated timers	-	-	-	-	-		yes
Microcontroller core	-	-	-	-	-		Cortex M3
ROM [kbyte] / RAM [byte]	-	-	-	-	-		Flash 160kB/RAM 12kB
Host interface	I^2C	I/O lines	I/O lines	I/O lines	I/O lines		serial or I^2C
ESD protection on ISO/IEC 7816 pins [kV]	7	8	8	10	8		12
Auxiliary protected lines for C4 and C8 contacts	2 (2)	2	-	2	2		2
VCC card power supply [V]	1.8, 3, and 5	1.8, 3, and 5	3 and 5	1.8, 3, and 5	3		1.8,3,5
Card supply current @ 5 V VCC [mA]	55	65	65	65	-		60
Card supply current @ 3 V VCC [mA]	55	65	65	65	65		55
Card supply current @ 1.8 V VCC [mA]	35	65	-	35	-		35
Card supply voltage @ 1.2 V VCC [mA]	-	-	-	-	-		-
Card clock frequency max. [MHz]	20	26	26	26	20		13,56
Card activation time max. [µs]	135	3500	3500	3400	554		283
Card deactivation time max. [µs]	100	250	250	250	250		83
Protocol support							
Synchronous card management	Yes	Yes	Yes	Yes	Yes		yes
Asynchronous protocol T=0 and T=1	Yes	Yes	Yes	Yes	Yes		yes
Security features							
Voltage supervisor and over-current detection	Yes	Yes	Yes	Yes	Yes		Yes
Current protection on VCC, I/O, RST, CLK	Yes	Yes	Yes	Yes	Yes		Yes
Additional product information							
Power-supply interface VDDI (V)	1.6 to 3.6	1.6 to 3.6	1.6 to 3.6	1.6 to 3.6	-		1.6 to 3.6
Power-supply (VDD)	2.7 to 5.5	2.7 to 5.5	2.7 to 5.5	2.7 to 5.5	3.0 to 3.6		2.7 to 5.5
Power-down current max. (µA)	15	5	5	3	400		18
Temperature range (°C)	-25 to +85	-25 to +85	-25 to +85	-25 to +85	-25 to +85		-40 to +85
EMVCo 4.3 compliance	Yes	Yes	Yes	Yes	Yes (3 V only)		yes
CISCO compliance	-	Yes	-	Yes	Yes		No
Product support & ordering information							
Product type	TDA8026ET/C3	TDA8034HN/C2	TDA8034T	TDA8035HN/C2/S1	TDA8037T	TDA8037TT	PN7412AUHN
Package	TFBGA64	HVQFN24	SO16	HVQFN32	SO28	TSSOP16	HVQFN64
12NC single tray	9353 086 35551	9353 086 34151	-	9353 086 13151	-	-	935368476551
12NC multiple tray	9353 086 35557	9353 086 34157	-	9353 086 13157	-	-	
12NC reel	-	9353 086 34118	9352 883 49118	9353 086 13118	9353 015 17118	9353 015 01118	
12NC reel dry pack	9353 086 35518	-	-	-	-	-	935368476518
12NC bulk pack	-	-	9352 883 49112	-	-	-	
Development boards	OM9800/DCT80269 352 931 69599	OM9800/DCT80 349352 931 71599	CAKE8034_01_D	OM9800/DCT803593 52 931 72599	CAKE8037_T	CAKE8037_TT	

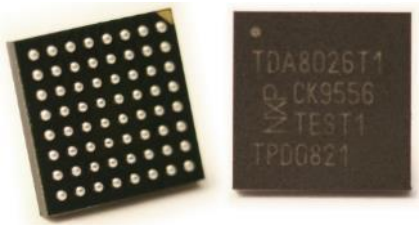
Contact Reader IC’s per application



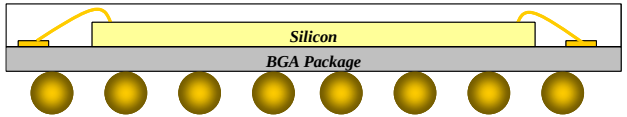
Product portfolio description

TDA8026





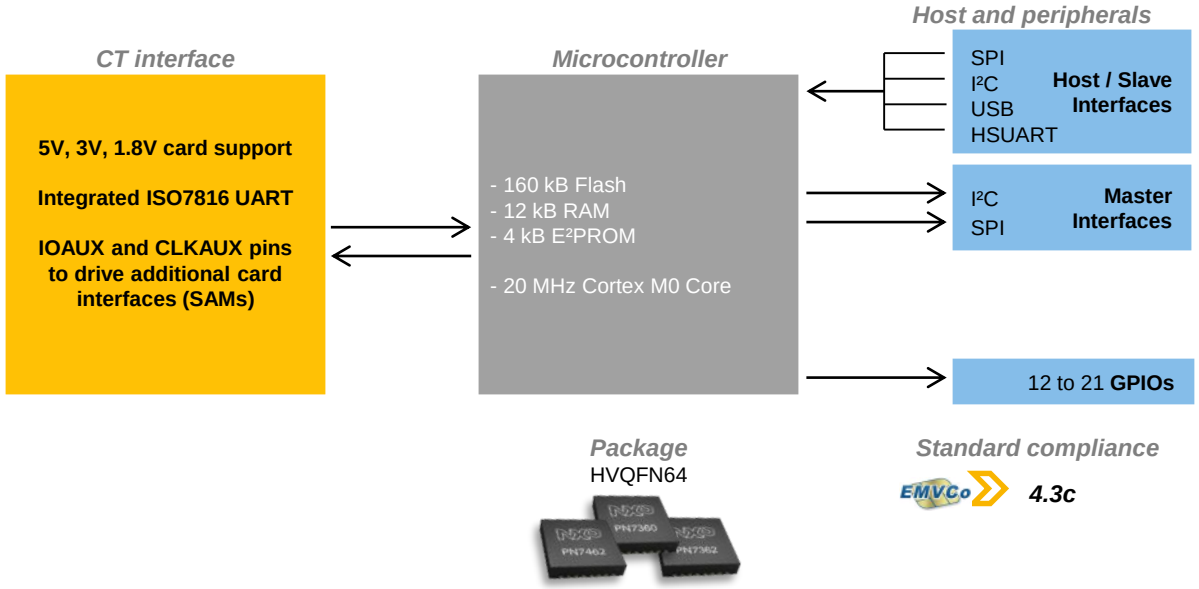
TDA8026 features



- Multi slot (up to 5) for POS terminals
- EMV 4.3 compliant
- Supports 1,8V, 3V & 5V smart cards.
- AUX IOs (C4 & C8) supported on slot 1 & 2
- 3 or 4 SAM slots (can be 4 if slot 2 is used as a SAM slot)
- I²C bus interface for control of the device. (No filter needed , integrated pull up optional); SW compatible with TDA8023. Each card slot is seen as an independent interface.
- Management of the clock cycles count during ATR
- Possibility to have two cards activated at the same time;
- VDD= 2.7 to 5.5V
- VDDI from 1.6V (Controller side)
- Current limitations on VCC, I/O, RST , CLK (EMV compliant)
- TFBGA 64 package (PCI PED requirements for security in payment terminals)
- Production started (March 2009)

Type name	Status	Package
TDA8026ET/C3	Prod	TFBGA64

PN7412: PN7462 with contact interface only



- EMVL1 library available
- Host interface example
- Free flash size for customer code
- EMV 4.3c compliant

PN7412 Technical product features

Features

CPU
- 20 MHz Cortex M0 core
- 160/80 kB Flash and 12 kB RAM

Ease of integration
- Power supply from 2.7 to 5.5V
- Multiple host interfaces
- GPIOs and master drivers for peripherals
- Protected firmware download in flash
- Extended temperature range -40°C / +85°C

Flexibility in development
- Ease of configuration
- Multiple SW examples provided for each use case
- EMVCo validated library
- Usage of standard development tools

Contact Reader

- Class A, B, C cards supported
- Fully integrated ISO/IEC 7816-3&4 UART
- Baudrate up to 1 Mbit/s
- Capability to drive external frontends for SAMs

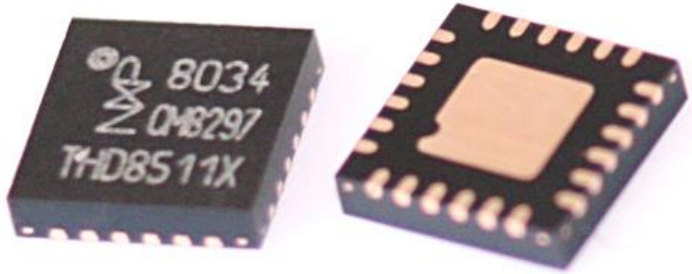
Interfaces

- I²C/SPI/USB/UART host interfaces
- SPI and I²C master interfaces

Package

- HVQFN64 (9x9 mm²)

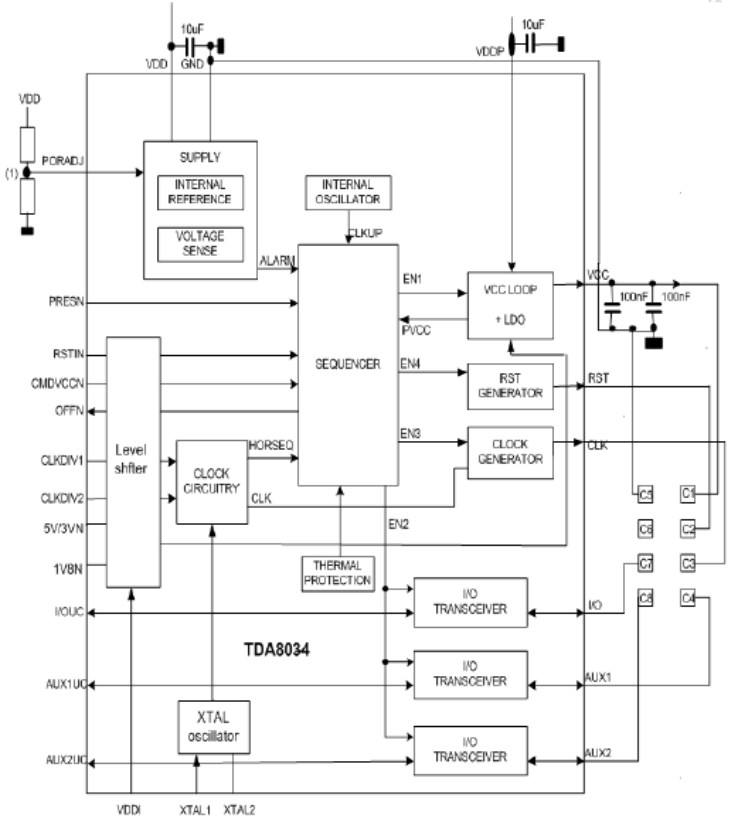
TDA8034



- TDA8034 is a Smart card interface , NDS and EMV 4.3c compliant, similar to formerTDA8024.
- This device can be used for supplying Vcc=5V to a card, when a voltage of 5V +/- 3% is available in the system so that the card Vcc should be minimum 4.75V with a current load of 65mA.
- If a supply voltage of 5V +/- 10% only is available in the system, TDA8024 should be used to guaranty a proper value on Vcc=5V.
- TDA8034 is not pin to pin compatible with TDA8024; A 24 pin package (HVQFN) and a lower pin count version (SO16) is available to fit with the Japanese low cost requirements from STB manufacturers.

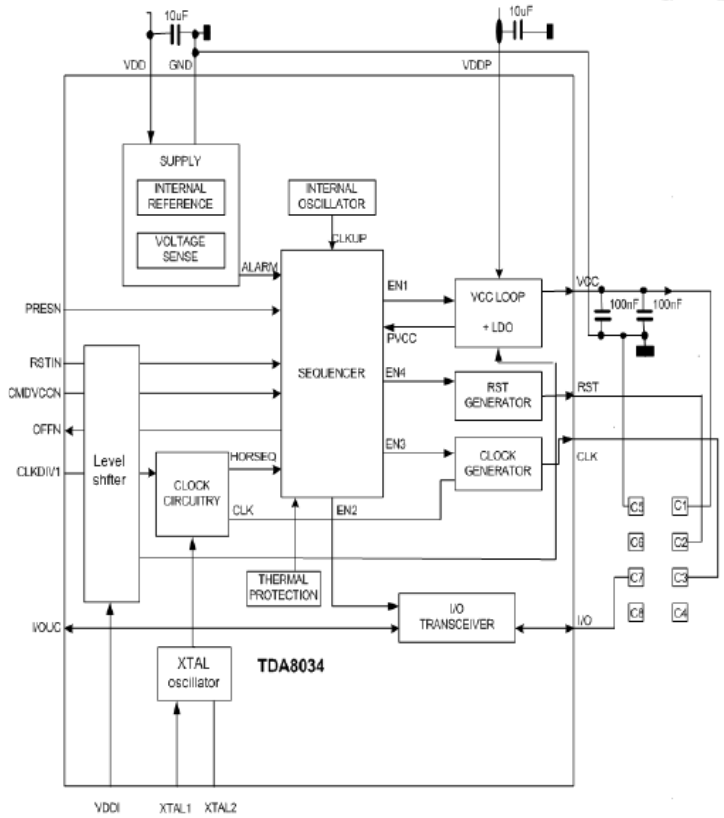
TDA8034

- TDA8024 without DC/DC
- Smaller package HVQFN24 & SO16
- NDS compliant
- EMV compliant
- BCAS compliant
- 5V, 3V and 1,8V cards supported (on 24 pins version)
- 3 full duplex I/O lines
- Synchronous clock division supported 8/4/2/1
- Interface voltage V_{DDI} down to 1.6V
- LDO instead of DC/DC means that VDDP should be >4,85V to guaranty Vcc=4,75V min with 65mA load
- On board oscillator or possibility to use external clock source on XTAL1
- Shutdown mode on both packages
- Deep shutdown on HVQFN24 (<10µA)



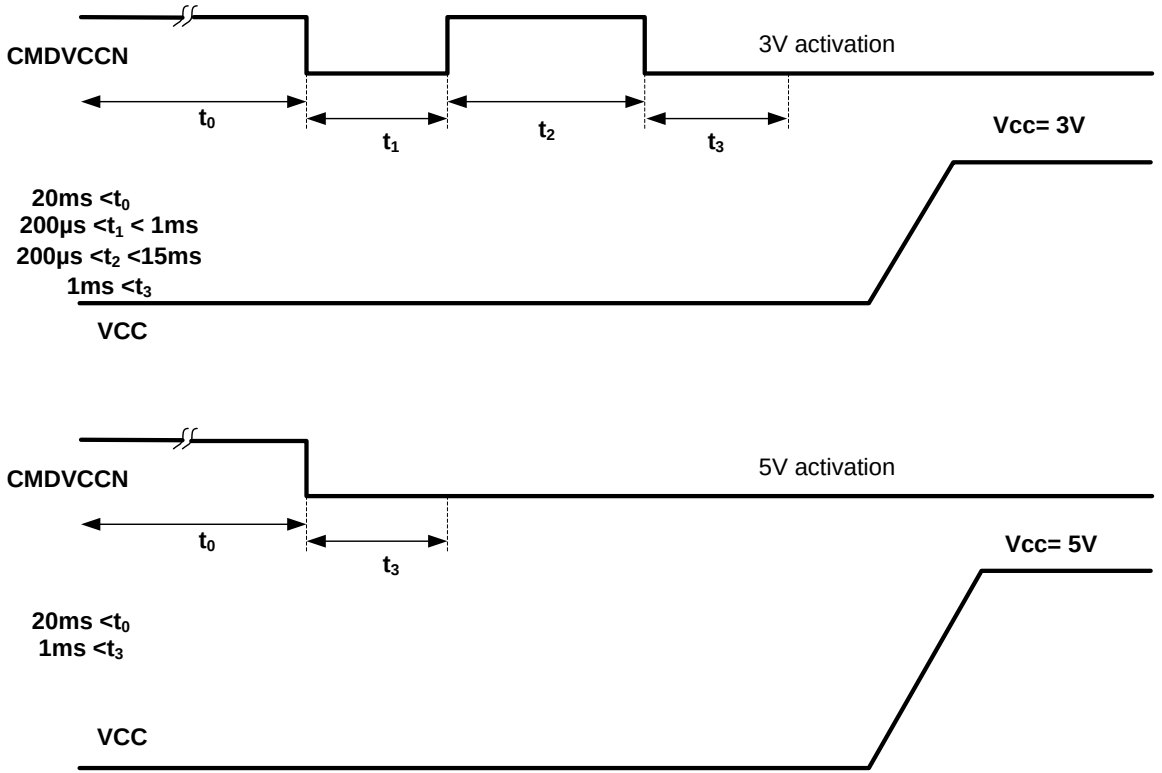
(1) Optional external resistor bridge. If this bridge is not required pin xx should be connected to ground

TDA8034T, TDA8034AT 16 pins version

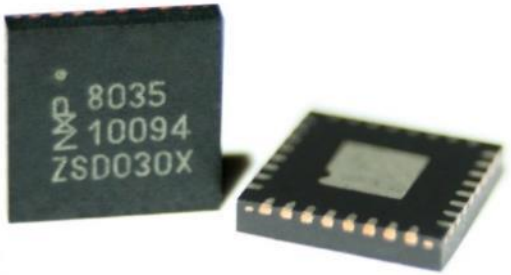


- SO 16 package
- BCAS compliant
- NDS compliant
- Reduced number of pins
  - One full duplex I/O line
  - VDDI interface down to 1.6V
  - One GND pin only
- No PORadj (external supply voltage supervisor adjustment)
  - Possibility to select 5V or 3V on CMDVCC line with specific command frame
  - Vcc =5V or 3V
  - CLKDIV 2 or 4 (TDA8034T)
  - CLKDIV 1 or 2 (TDA8034AT)

Vcc 5V/3V selection command on SO16 version

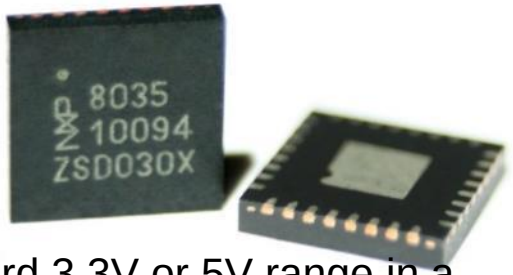


TDA8035



- TDA8035 is a Smart card interface , NDS and EMV 4.3c compliant, successor of TDA8024.
- This device can be used in a supply range from 2.7V up to 5.5V; It supports 5V, 3V , 1.8V cards with a current load of 65mA.
- It includes a DC/DC converter, current protection and limitations to the card, enhanced ESD protection on card contacts. Very Low current consumption in inactive mode (automatic shutdown mode).
- Chip Select functionality available

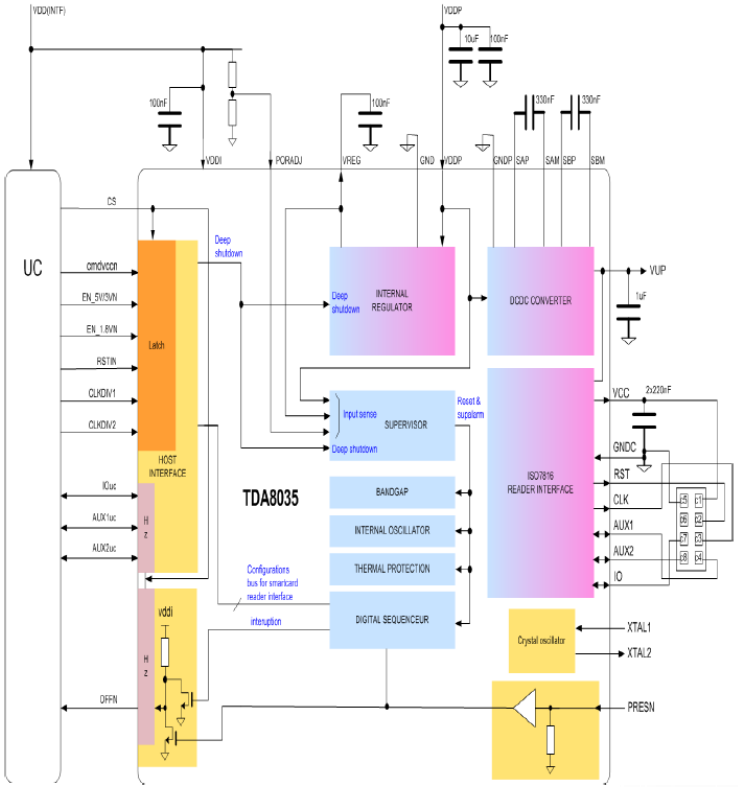
TDA8035



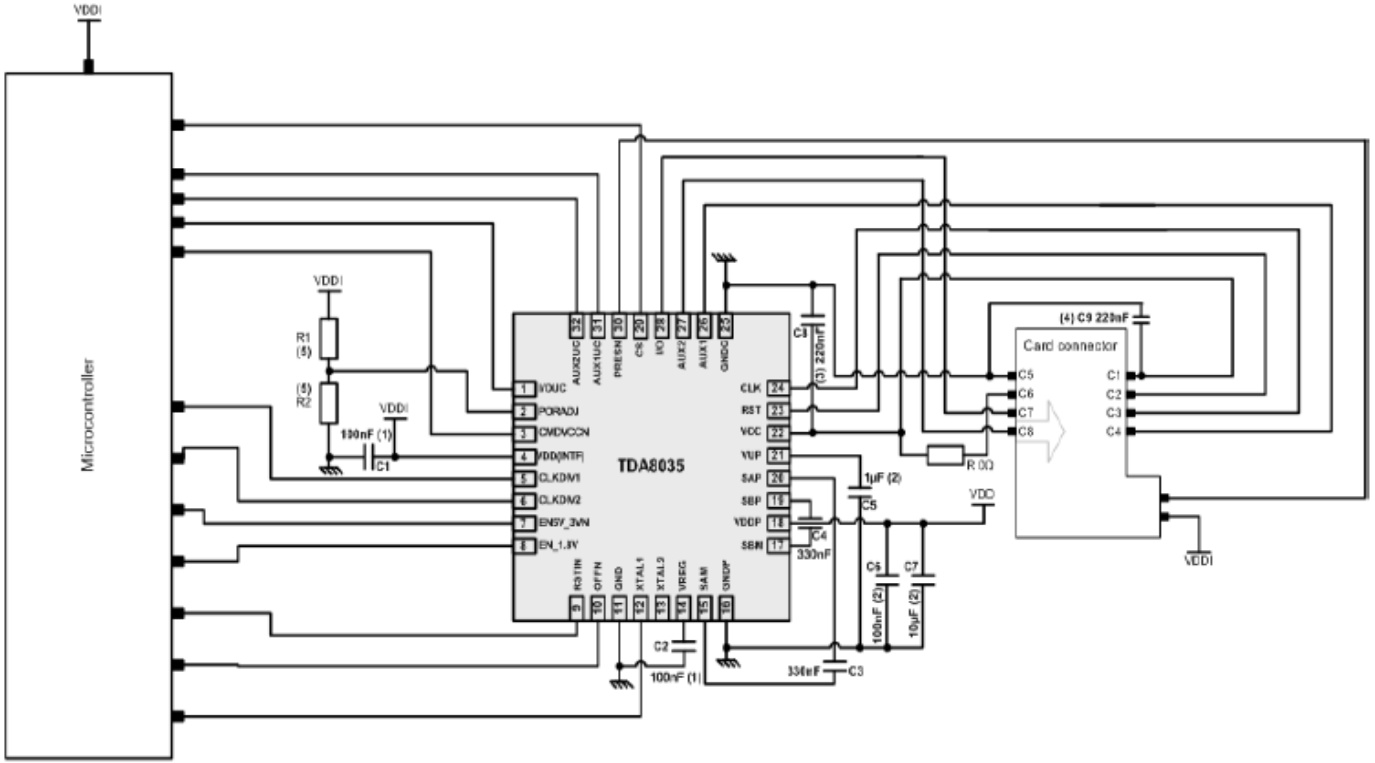
- Largest operating supply range for standard 3.3V or 5V range in a platform
- Very convenient to use in a 3.3V environment
- Very small package (5x5mm) HVQFN32
- 3 Smart Cards classes supported (1.8V/3V/5V)
- NDS & EMVCo L1 compliant
- Very low power consumption: default mode is shutdown mode; deep shutdown mode available
- High ESD protections on card pins (>8kV)
- Chip Select available for cascading two devices

TDA8035

- Integrated circuit smart card interface is an HVQFN24 package
- 5V, 3 V, 1.8 V Smart Card supply
- Very low power consumption in Deep Shutdown mode
- DC/DC converter for Vcc generation separately powered from 2.7V to 5.5V supply (VDDP and GNDP)
- Three protected half-duplex bidirectional buffered I/O lines (C4, C7 and C8)
- Vcc regulation (5V, 3 V, 1.8 V ± 5% on 2× 220 nF multilayer ceramic capacitors with low ESR, current spikes of 40 nAs (Vcc = 5V & 3 V) or 15 nAs (Vcc =1.8 V) up to 20 MHz, with controlled rise and fall times, filtered overload detection approximately 120 mA)
- Thermal and short-circuit protections on all card contacts
- Automatic activation and deactivation sequences (initiated by software or by hardware in the event of a short-circuit, card take-off, overheating, V_{DD}, $V_{DD(INTF)}$, V_{DDP} dropping)
- Enhanced ESD protection on card side (> 6 kV)
- External clock input up to 26 MHz
- Card clock generation up to 20 MHz using pins CLKDIV1 and CLKDIV2 with synchronous frequency changes of f_{XTAL}, $f_{XTAL/2}$, $f_{XTAL/4}$ or $f_{XTAL/8}$
- Non-inverted control of pin RST using pin RSTIN
- Compatible with ISO 7816, NDS and EMV 4.2 payment systems
- Supply supervisor for killing spikes during power-on and power-off (threshold internally fixed, or externally by a resistor bridge)
- Built-in debouncing on card presence contact
- Multiplexed status signal using pin OFFN
- Chip Select digital input for parallel operation of several TDA8035 ICs.



Application diagram TDA8035HN



Differences TDA8034/TDA8035

Feature	condition	TDA8034HN	TDA8034T	TDA8034AT	TDA8035HN
Package		HVQFN24	SO16	SO16	HVQFN32
Smart Card supply voltage		5V, 3V,1.8V	5V, 3V	5V, 3V	5V, 3V,1.8V
Power block type		LDO	LDO	LDO	DC/DC
Supply voltage (power) VDDP	Vcc=5V +/-5% , Icc=80mA	4.85V - 5.5V	4.85V - 5.5V	4.85V - 5.5V	2,7V - 5,5V
	Vcc=5V +/-5% , Icc=30mA	4.85V - 5.5V	4.85V - 5.5V	4.85V - 5.5V	2,7V - 5,5V
Supply voltage (interface VDDI)		1.6V- 3.6V	1.6V- 3.6V	1.6V- 3.6V	1.6V- 3.6V
Supply voltage (interface & or digital) VDD		2.7V - 3.6V	2.7V - 3.6V	2.7V - 3.6V	NA
Supervision of supplies		VDDI & VDD	VDDI & VDD	VDDI & VDD	VDDI, VDDP,
Number of bidirectional IO lines		3	1	1	3
Number of presence detection pins		1 (PRESN)	1 (PRESN)	1 (PRESN)	1 (PRESN)
Clock source		XTAL or external	XTAL or external	XTAL or external	XTAL or external
Clock division ratio		1/2/4/8	2/4	1/2	1/2/4/8
Automatic shutdown mode		yes	yes	yes	yes
RST enabled in the activation sequence	activation sequence, t5	3,4ms (wake up time)	3,4ms (wake up time)	3,4ms (wake up time)	3,4ms (wake up time)
PORadj pin		yes	no	no	yes
NDS certification		yes	no	no	yes
EMV4,3 compliance		yes	yes	yes	yes

TDA8037 3V smart card interface

Product overview

- The TDA8037 is a cost optimized contact smart card interface. It focuses on the key features needed by contact cards nowadays.
- Developed from Cisco (NDS) request (certification completed)
- Compliant with EMV L1 3V
- Support Class B(3V) smart card
- Protection of the contact smart card: current limitation, short circuit detection, ESD protection
- Easy integration in your contact reader
- 2 package versions
  - TDA8037T: SO28 package, footprint compatible with TDA8024T
  - TDA8037TT: TSSOP16 package for cost optimization
- Software compliance with TDA8024, TDA8034 and TDA8035

TDA8037 block diagram and pinning

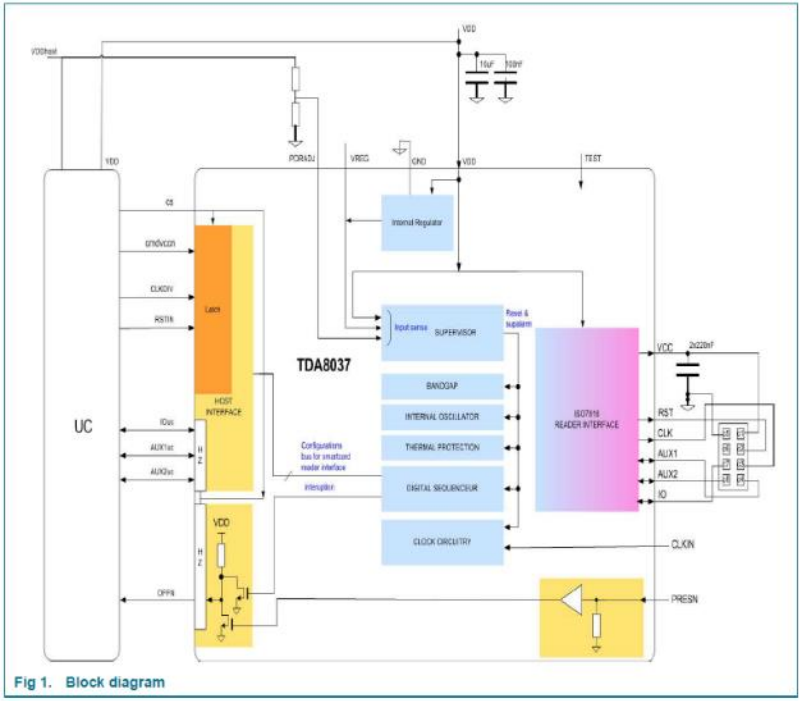
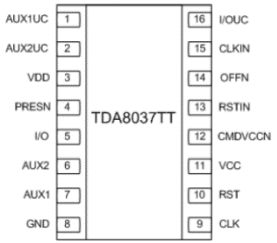
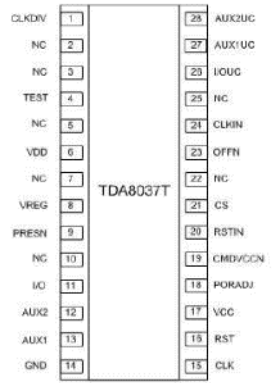


Fig 1. Block diagram

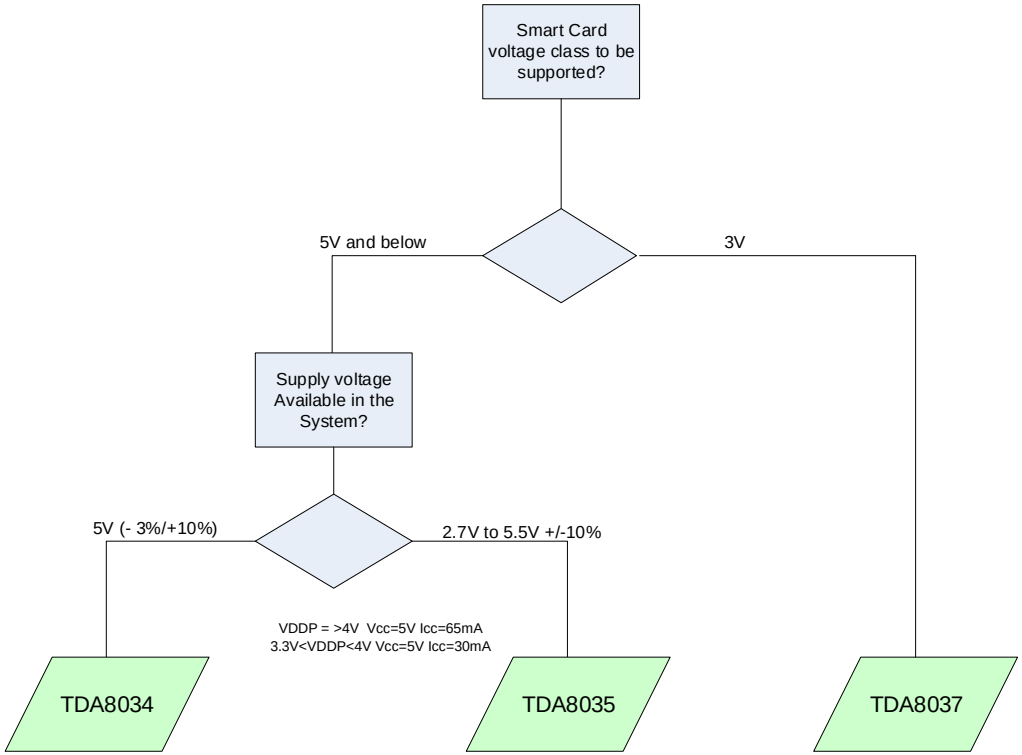


TSSOP16



SO28

Decision tree for product selection



Design guide
Documentation & Tools

Supporting material

Product	Documentation	Demo kit
Support packages	Contact reader ICs- TDA support package AN11079 TDA mother board	CAKE_80XX_MBA
TDA8026	Data sheet Application note AN10724-1 User manual UM10319 for demo board CAKE 8026_02_D	CAKE 8026_02_D
TDA8034	Data sheet (product) TDA8034HN Application note AN10792-3 TDA8034T, TDA8034AT Application note AN10807-1 Application note AN10794-1 for demo board CAKE 8034_01_D, CAKE8034_02-D	CAKE 8034_ 01-D CAKE 8034_ 02-D CAKE 8034_03-D
TDA8035	Data sheet TDA8035HN application note AN10997 Demo board description AN10999	CAKE 8035_01D
TDA8037	Data sheet (objective specification) Application note for demo board CAKE 8037T	CAKE 8037T

Back to product overview

INTEGRATION AND SUPPORT

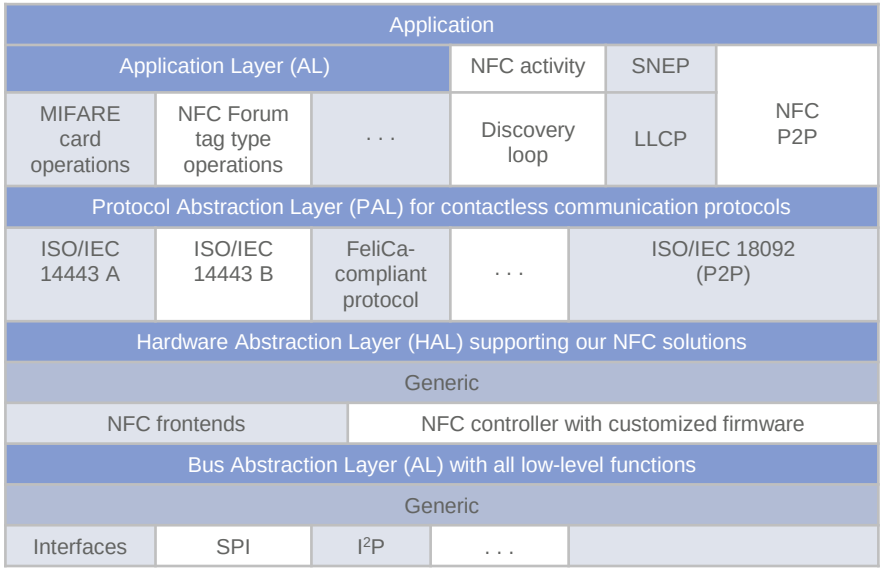
The NFC Reader Library

Focus on Scalability

Simplify Test & Debug

Optimize Performance

Validate Interoperability



Supported dev boards:

- CLEV6630A
- CLEV6630B
- PNEV5180B
- PNEV7462B

Supported platforms:

- LPC1769
- FRDM-K82F
- Raspberry Pi Model 3
- … portable to other MCUs and platforms.

www.nxp.com/products/:NFC-READER-LIBRARY

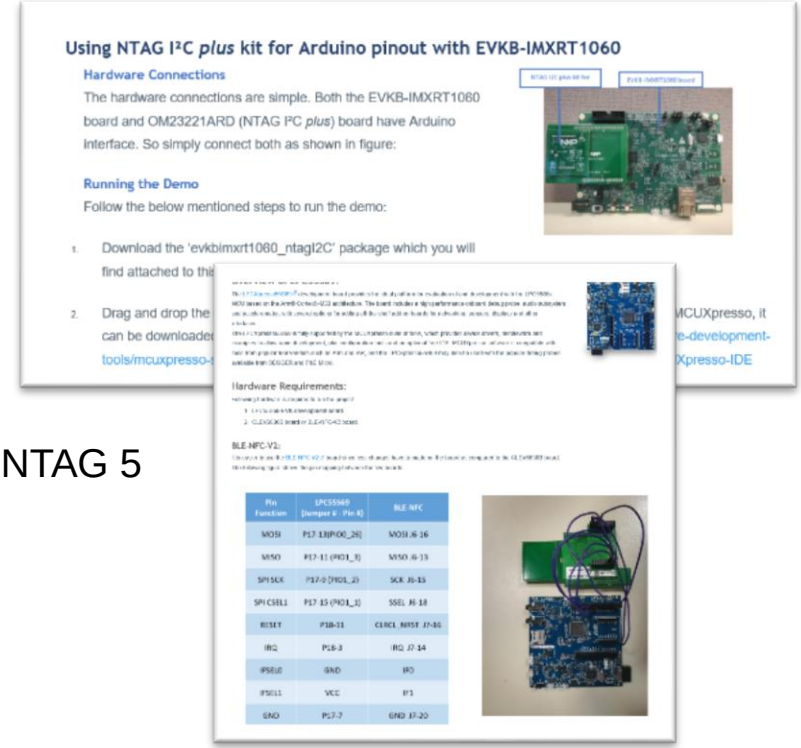
www.nxp.com/products/:NFC-COCKPIT

Supported MCU / NFC combinations

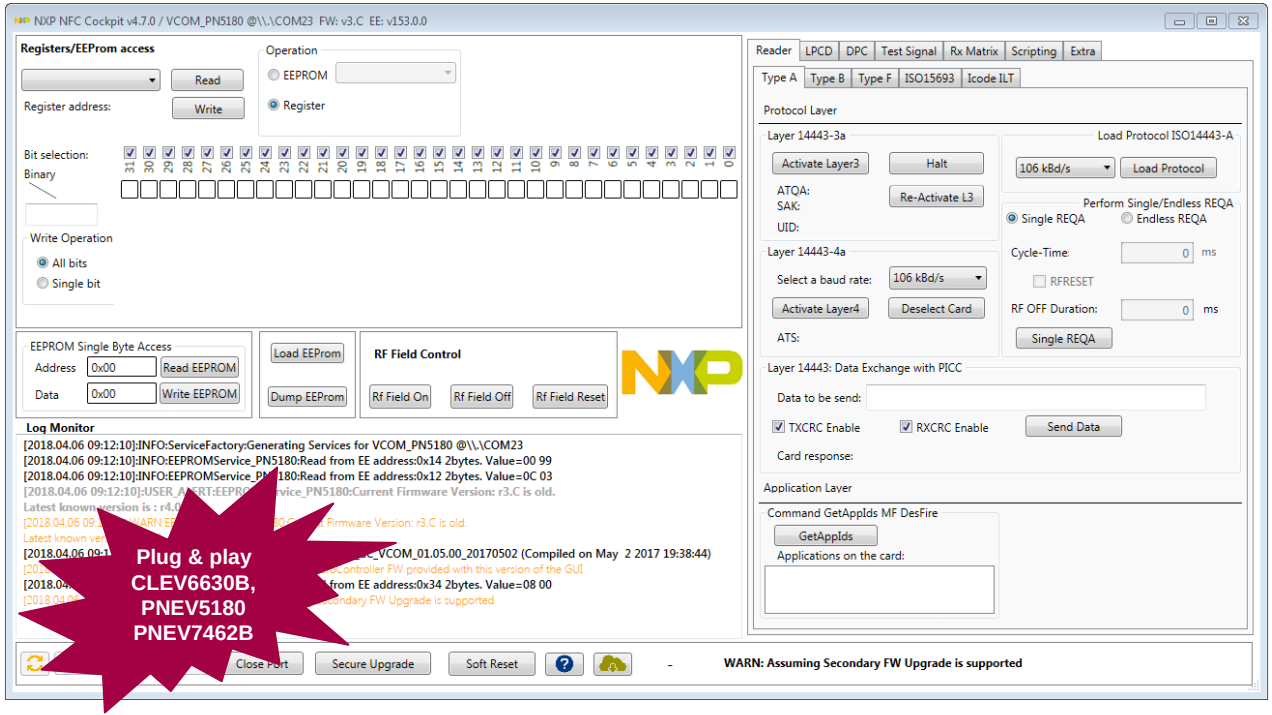
- https://nxp.surl.ms/nfcmcu

MCU ↓ NFC IC →	NTAG I²C *plus*	NTAG 5	PN7150	CLRC663 *plus* family*	PN5180
i.MX RT1050	i.MX RT1050 + NTAG I²C *plus*			i.MX RT1050 + CLRC663 *plus* Video: Using i.MX RT1050 with CLRC663 plus family and the NFC Reader Library | NXP	
i.MX RT1060	i.MX RT1060 + NTAG I²C *plus*		i.MX RT1060 + PN7150		
i.MX 8M Mini			i.MX 8M Mini + PN7150 (Andriod) i.MX 8M Mini + PN7150 (linux-yocto)		
i.MX 7 Dual Sabre					i.MX7 Dual Sabre + PN5180
LPC1769				LPC1769 + CLRC663 *plus*	LPC1769 + PN5180
LPC55S69	LPC55S69 + NTAG I²C *plus*	LPC55S69 + NTAG 5	LPC55S69 + PN7150	LPC55S69 + CLRC663 *plus* LPC55S69 + CLRC663 *plus* + SE050 (smart lock)	
LPC11u37h			LPC11u37 + PN7150	LPC11u37h + CLRC663 *plus*	
LPC11u68			LPC11u68 + PN7150		
LPC82X			LPC82X + PN7150		
LPC845				LPC845 + CLRC663 plus	
Kinetis K82F				K82F + CLRC663 *plus*	K82F + PN5180
Kinetis K64F			K64F + PN7150	K64F + CLRC663 *plus*	

New: NTAG 5



NFC Cockpit configuration tool for NFC Readers



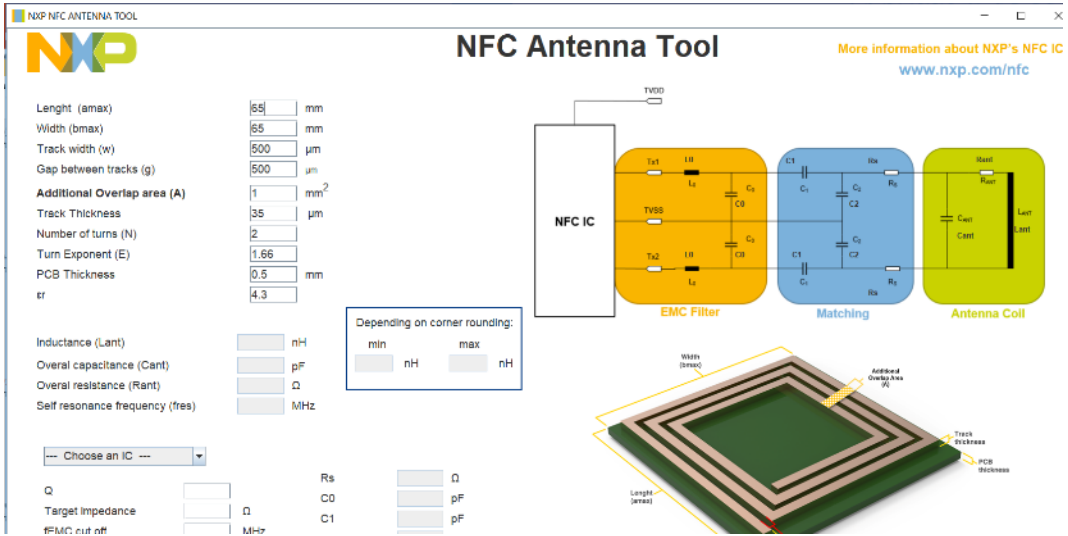
NFC Cockpit features

- Direct access to registers and EEPROM memory.
- Reader for card activation and card communication.
- Low Power Card Detection (LPCD) calibration and configuration.
- Test signal unlocking and routing.
- RX matrix test for receiver settings optimization.

- Helps to speed up the design, allows quick and easy configuration of registers (USB interface connection to PC) using the development board .
- Get familiar with the IC (on line information of register bits), a fast antenna tuning, a quick DPC parameter setting and perform some tests with NFC devices (cards or mobile phones).

New Online Antenna Design Tool

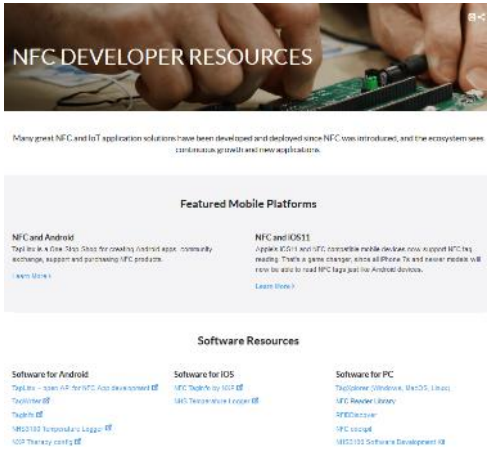
Get the starting values of your antenna matching components with two clicks!



https://www.nxp.com/products/:NFC-ANTENNA-DESIGN-TOOL

More information about NFC

Visit **NFC developer resources** for a quick start



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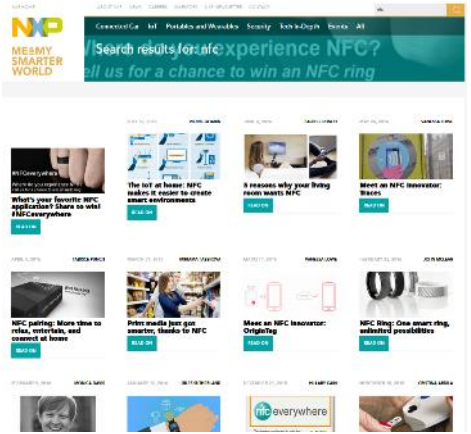

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SECURE CONNECTIONS
FOR A SMARTER WORLD