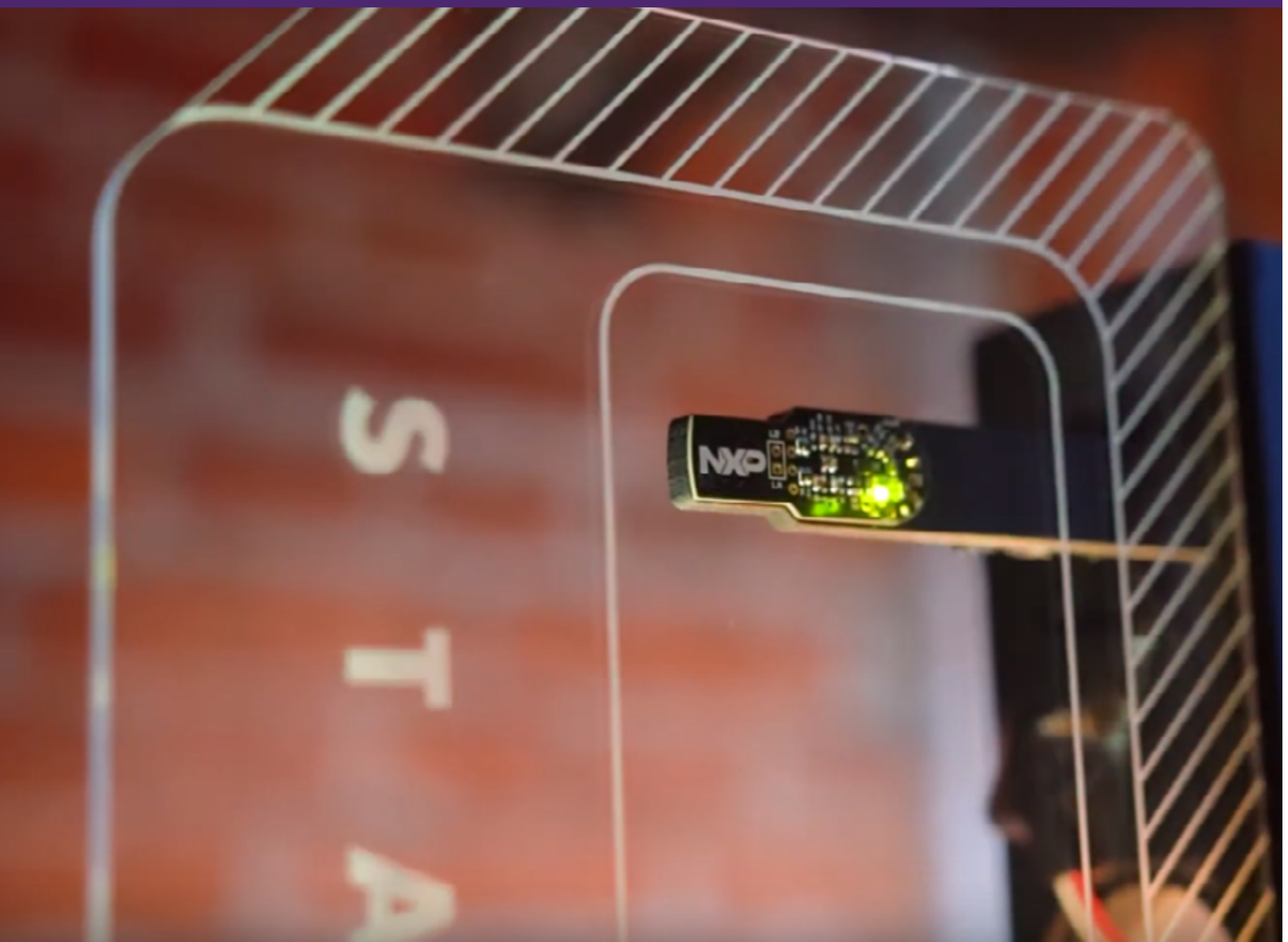
UNLOCK NFC EVERYWHERE.

NOW iOS AND
ANDROID READY

NXP

5 BIG REASONS TO CONSIDER NFC.



1. You'll speak with intention

NFC involves only two devices at once, so there's no crosstalk. Plus, you avoid being overheard and keep secrets safe by getting close before you start to speak.

2. You'll save energy

Since energy harvesting lets one device power another during an NFC transaction, the second device can save its battery for other tasks or not have a battery at all.

3. You'll play well with others

NFC is a unifying technology that makes it easier to live in a wireless world. Pair and commission just about any wireless device with a single tap of your NFC-enabled device.

4. You'll be welcome wherever you go

Fully supported by the majority of Android and iOS smartphones out there, NFC is an integral part of one of the largest infrastructures on the planet, and ready to work whenever you are.

5. You'll Always Have a Remote Control in Hand

With your smartphone or tablet as the user interface, you'll be the master of any piece of equipment, be it a robot in a factory, a sensor in a storage room, or a new set of earbuds.

6.925 BILLION
NFC-ENABLED DEVICES WILL BE SHIPPED BY 2021

Source: ABI 2019

A NEW TWIST

A recently introduced standard, issued by the NFC Forum, lets NFC use radio waves to send power and wirelessly charge devices that operate at or below 1 W.

NFC wireless charging lets us rethink the way we power battery-driven devices. Now, instead of hunting for a cord and an outlet, we can simply set a device down to initiate a recharge. What's more, this new twist on NFC functionality lets us create a whole new category of tiny products that don't use plugs or ports, so they're smaller, sleeker, and safer to use. It's taking convenience to new heights.

UNLIMITED FORWARD MOMENTUM

At NXP, we never stop moving ahead with NFC. Since 2002, when we co-invented the technology, we've been working to expand the ecosystem and improve the technology. We co-founded the NFC Forum, hold the number-one position in the market, and offer one of the broadest portfolios in the industry.

Yet we continue to push ahead, introducing new formats, including connected NFC tags for electronic systems, and delivering new approaches, such as wireless NFC charging for low-power devices. It's our way of ensuring that this remarkable technology maintains its forward momentum.

2002

NXP and Sony co-invent **NFC** technology.

2004

NXP co-founds the **NFC Forum** to lead collaborations with industry stakeholders and help standardize the technology.

2006

Nokia 6131
Nokia launches the first NFC phone.

2009

NFC Forum releases **Peer-to-Peer** standards.

2010

Nexus S
Google launches the first Android NFC phone.

2012

Sony introduces **Smart Tags**, which use NFC to change modes and profiles on a Sony smartphone at close range.

2014

Apple introduces iPhone 6 with **Apple Pay** using NFC technology.

2015

NXP ships the 1Billionth chip to enable secure **NFC transactions** in smartphones.

NXP wins prestigious European Inventor Award for NFC.

2016

Apple introduces **iPhone 7** which reads Felica cards (NFC Forum T3T) in Japan.

2017 IoT

NFC Forum IoT working group introduces NFC tag certification ensuring predictable UEX.

2018

Introduction of background NFC NDEF tag reading in iOS following App-based **NFC NDEF tag**

2019

Extended NFC support in **iOS** including reading and writing of NFC NDEF Tags, but also ISO 7816, ISO15693, MIFARE and FelicCa protocols.

NFC Forum releases standard for NFC Wireless Charging. Huawei x Gentle Monster launch the first eyewear line to use NFC charging.

USE CASES

ACCESS CONTROL

(Physical and Logical)

NFC brings mobility to a high level of security for physical and logical access, so you can do more with your smartphone or a wearable. When you leave home, your phone or wristband can lock the door, and when you arrive at work, it can serve as your ID badge, your computer logon, and your authorization to use certain machines. Your device can also open your hotel room or be your event ticket. With NFC, you reduce waste, increase security, and gain the ability to grant or deny access, as needed, from a remote location.

- Log time and attendance for secure areas
- Manage key distribution remotely
- Set limits for access times, for temporary personnel, or rental homes
- Reduce maintenance and replacement costs, with fewer lost or damaged keys, cards, or badges

WHICH PRODUCT?

NFC Frontend **CLRC663 *plus* Family**	NFC Controller with Customizable Firmware **PN7462 / PN736x**	**Contactless Multi-application Smart Card MIFARE® DESFire® Family**
		
If you already have a microcontroller on board, and need robust NFC performance with a lower power consumption, especially in a battery-operated system, use this NFC frontend to push your design further.	If you need a small footprint, for a door lock perhaps, use these all-in-one solutions to execute a fully custom application. No external MCU needed.	If you're designing a card-based access system with MIFARE DESFire EV2, get the benefit of CC EAL5+ security – the same certification level bank cards and electronic passports use. This NFC-compatible MIFARE solution is also available in multiple form factors from key-fobs to wristbands. For single-application uses, MIFARE DESFire Light offers a cost-effective solution with CC EAL4 security.

Use your phone to **open doors** at home, at work, or when you travel

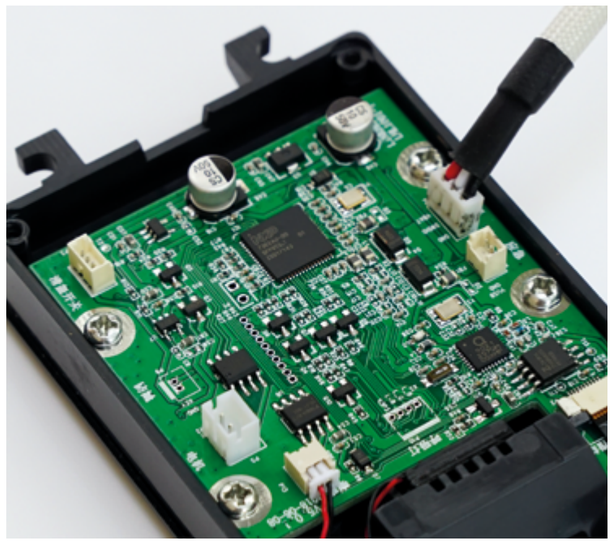
Turn your wristband into a **special-access pass**

Tap your way into work or school using NFC

Increase productivity with **fast access** to specialized machinery

RocketXS

A ready-to-produce design for the growing **smart lock** market in China that supports NFC card reading, Bluetooth LE, fingerprint reading, pinpad operation, and secure key sharing via WeChat.



USE CASES

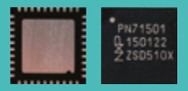
PAIRING & COMMISSIONING

Just bringing two NFC-enabled devices close together is all it takes to create a connection. What's more, NFC can also trigger other protocols, like Bluetooth, ZigBee, or Wi-Fi. Pairing is practically instantaneous and, because NFC only works when you ask it to, there aren't any unintended device connections, and none of the device conflicts that can happen with Bluetooth.

It's also easier to commission new devices or expand your home network, even if you're adding devices that don't have a battery – and there's no need to search for a connection or type in a serial number.

- Enable two-way interactions with Peer-to-Peer mode
- Pair Bluetooth or Wi-Fi devices 20x faster with NFC
- Identify a device instantly, without entering codes or creating device conflicts
- Make devices easier to use and reduce tech-support costs
- Exchange credentials securely, just by tapping
- Use protocol-agnostic operations to trigger actions

WHICH PRODUCT?

NFC Connected Tag **NTAG® I²C *plus***	NFC Controller with Integrated Firmware **PN7150**	NFC Connected Tag for Tiny Devices **NTAG 5 boost and link**
		NTAG 5 *boost*
If you're working on a battery-powered design that already has a microcontroller, such as a speaker or IoT node, use this tag IC to wake the system and initiate Bluetooth or Wi-Fi pairing.	If you're running an OS, like Android, Windows, or Linux, use the embedded NFC firmware and NCI interface in these controllers to quickly add fully compliant NFC functionality. The PN7150 is also a good choice for routers and gateways that will interact with NTAG-equipped nodes.	The NTAG 5 boost is a Type 5 Tag that delivers exceptional read range, giving tiny devices the ability to interact with the cloud and other NFC-enabled devices, including smartphones.

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 **sensors** and **lights** to your home or office network in just seconds, without entering codes

USE CASES

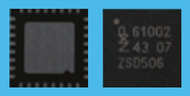
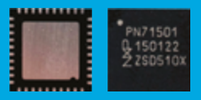
AUTHENTICATION & IDENTIFICATION

NFC is the one technology that makes it easier and safer, at every point of ownership, to enjoy any type of electronic device. From using personal care items and household appliances to adjusting settings of smart gym equipment based on your very own profile, NFC can simplify configuration, increase personalization, enable reorders, enhance safety, and fight fakes.

The same NFC operations increase automation in industrial settings, too, for greater efficiency.

- Authenticate replacement parts and automatically adjust settings of the main unit based on the accessory attached
- Identify users and immediately provide personalized settings and preferences
- Send notifications when accessories are nearing replacement, and make offers based on usage patterns

WHICH PRODUCT?

NFC Frontend **MFRC630 *plus*** Tags **NTAG21x, NTAG DNA**	NFC Frontend **SLRC610 *plus*** Tags **ICODE SLIX, ICODE DNA**	NFC Controller with Integrated Firmware **PN71xx**
		
Tags based on NTAG and MIFARE offer a wide range of security options and can be read by all NFC phones. Once you've chosen a tag, the MFRC630 *plus* is an excellentl single-protocol reader for this use case.	If you need to support longer distances between the tag and its reader, then the SLRC610 *plus* reader, which works with ICODE tags, gives you the extra margin in read range.	If you're working with an OS, like Android, Windows, or Linux, use one of these controllers for plug-and-play functionality when reading NTAG, MIFARE, and ICODE tags.

Ensure safety with **branded replacements** that automatically adjust settings

Create experiences that are more **interactive** – and more personal

Order **branded replacements** and consumables with a single tap, using authenticated redirection

Boost manufacturing by automatically choosing the right tool every time

XIAOMI AIR PURIFIER

The **Xiaomi Mi 2S** and **Mi 2Pro Air Purifiers** work with an NFC frontend in the actual purifier device and an NFC tag in the removable filter, protecting from counterfeit and ensuring good quality reputation. NFC does further allow to track the time a filter is in use and will help to reset the device automatically once you insert a new filter.

USE CASES

PARAMETRIZATION & DIAGNOSIS

Any NFC-enabled phone or tablet can serve as a temporary touchscreen for your product, enabling sophisticated interactions and configurability at little additional cost. Your product can be smaller, lighter, more rugged, and less expensive to produce – yet easier to use. What's more, NFC works with sealed devices, so sensors operating in difficult environments can easily interact with the control unit. Energy harvesting uses power from the active reader device, so unlike Bluetooth or Wi-Fi, with NFC the device doesn't need a battery to send or receive information. Systems with a battery can even remain in sleep mode while being read.

NFC advantages over Bluetooth or Wi-Fi connection:

- Device can be unpowered
- No ambiguities - the device you tap is the device you connect to
- Inherent security due to short range and additional password and AES key option
- Very cost effective

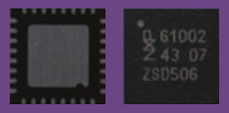
WHICH PRODUCT?

MFRC630 *plus* + NTAG I²C *plus*

With the high-performance, energy-harvesting connected tag NTAG I²C *plus* on board, your device can be read, measured, or made interactive – even if it doesn't have a power source.

To embed also the reader function into an electronic device, use the MFRC630 *plus* reader frontend to read data from or write data to the NTAG I²C *plus*.

SLRC610 *plus* + NTAG 5 Family



NTAG 5 boost will give you a great read range with very small antennas. It can even work without an onboard MCU further reducing the BoM.

Select NTAG 5 link when you need an I²C master interface, for example when reading out sensors.

NTAG 5 switch which is designed to ease the configuration of GPIOS or PMW.

The SLRC610 *plus* NFC frontend creates the right match with the new NTAG 5 Family.

Let a fully sealed, batteryfree sensor unit **interact** with the meter housing

Avoid galvanic **connections** by letting machines talk without wires

Enable **interactions** with small, sealed devices that are not powered, for example configure the current of LED drivers

Get all the details, with complete control over every **setting and configuration**, even if the device is unpowered

When precision matters, **Schneider's Zelio Timer Relay** uses NFC to deliver 50 times the accuracy of conventional timer relays.

LATE-STAGE CUSTOMIZATION

The **NTAG I²C *plus*** and **NTAG 5** support zero-power configuration, so you can save on logistics costs with late-stage customization. Limit production variants by producing a generic item that can be configured in its unpowered state, just before shipping, through the packaging.
Or let installers and consumers do the customizing for you, with a quick tap of their NFC-enabled phones.

Energy harvesting uses power from the active reader device, so the device doesn't need a battery to send or receive information.

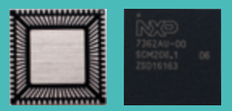
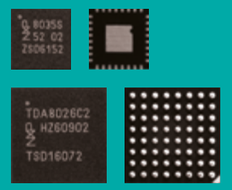
USE CASES

PAYMENT

Contactless technology lets you do business with open systems like EMV, or with closed systems like MIFARE. You can count on full compatibility with every form factor, from smartcards and NFC-equipped mobile phones to wearables, tokens, and more. Using contactless technology also lets you increase consumer share-of-mind with value-added services, such as personalized messages, loyalty programs, and coupons based on recent purchases.

- Offer tap-and-pay convenience with enhanced security
- Accept EMV and MIFARE payments, and send paperless receipts
- Increase engagement with messages, loyalty, and couponing
- Use system-level solutions to save design and certification time
- Use protocol-agnostic operations to trigger actions

WHICH PRODUCT?

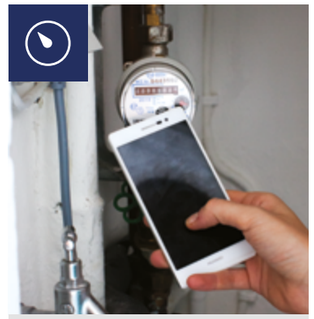
NFC Frontend **PN5190/PN5180** **CLRC663 *plus***	NFC Controller with Customizable Firmware **PN7462**	Contact Reader Frontend **TDA8035** **TDA8026**
		
If you want your design to talk to any other NFC-enabled system, and you already have a microcontroller on board, use one of these EMVCo-compliant frontends to add secure payment functions.	If you need a small footprint, use this single-chip solution to create a very compact design. You can easily add a coprocessor for time-critical functions in the EMVL1 protocol layer, for fast payment performance.	If you want to support contact cards in your terminal, you can choose the single-slot TDA8035, or select the TDA8026 for use with multiple SAMs. Both offer full support for all classes of smartcard.

Offer new **kinds of loyalty** and couponing programs, with new levels of interaction

Let **micro-merchants** accept and confirm payments just like the mega-merchants

Use a **secure, protected connection** to access your bank or initiate transactions

Get a **snack or a drink**, even if you left your cash at home



Get access to any kind of energy through prepaid systems

Create **self-service kiosks** that attract attention while selling more tickets

GET READY FOR EMV 3.0 CONTACTLESS LEVEL 1

This latest version of the payment standard improves interoperability between terminals and adds three new test targets (PICC) to support cards, mobiles, wearables, and other form factors that use antennas of different shapes and sizes. NXP is already there, with the PN5180, which includes advanced transmitter features, such as DPC, AWS, and ARC, and full compliance built into the NXP Reader Library.

INTRODUCING OUR NFC PORTFOLIO

As one of the leading providers of **NFC solutions**, we offer a wide selection of form, fit, and function.

CONNECTED TAGS

These small, passive tag ICs are a cost-effective solution when you have an NFC reader or NFC phone on the other side of the transaction. They use an RF interface that's fully compliant with the NFC Forum's specifications, and they support energy harvesting, so there's no need for a battery to power NFC interactions.

NFC CONTROLLERS WITH INTEGRATED FIRMWARE

These plug-and-play solutions combine an NFC frontend with a 32-bit Cortex-M0 microcontroller equipped with integrated firmware, and are optimized for use with an OS. They come with Linux, Android, and WinIoT drivers, and include an NCI interface, so they're fully compliant with the NFC Forum's specifications.

NFC CONTROLLERS WITH CUSTOMIZABLE FIRMWARE

These highly integrated devices combine an NFC frontend with a freely programmable 32-bit Cortex-M0 microcontroller. They let you create a fully custom design, complete with NFC, in a very compact footprint. Sophisticated options include support for both contactless and contact technologies.

NFC FRONTENDS

These NFC devices are a very flexible way to add NFC connectivity to a system. All our NFC frontends are supported by our NFC Reader Library (see **p30**), so design-in is fast and easy.

LONGEVITY

The **Product Longevity program** ensures a stable supply of products for your embedded designs. Longevity products remain in the program even if the manufacturing site changes. If we transfer a longevity product to another facility, we requalify the product to maintain its status. Supported products: CLRC663 *plus*, PN7150, NTAG I²C *plus*, and NTAG 5 family.

NFC PRODUCT SELECTION PATH FOR EMBEDDED ELECTRONICS

PASSIVE SOLUTION

My device will only communicate with *NFC phones or readers*

- I want **high** integration (single chip MCU + passive NFC interface) → **LPC8N04**
- I want a **flexible** add-on to an existing MCU/MPU → **NTAG I²C *plus***
  - I want an AES-**secured** add-on to an existing MCU/MPU → **NTAG 5 link AES**
- I want to **control** GPIOs/PWM via NFC without using any MCU/MPU → **NTAG 5 switch**
- I want to **read** instantaneous value from a sensor without using any MCU/MPU → **NTAG 5 link**
  - I want a **secure** sensor read out without an MCU/MPU → **NTAG 5 link AES**
- I want to **add** NFC to a tiny device and get a reliable and better read range → **NTAG 5 boost**

ACTIVE SOLUTION

My device will communicate with *NFC phones, readers and tags*

- I want **highest** integration (single chip MCU + Full NFC reader) → **PN7462 NFC controller family with customizable FW**
- I have an applications processor running **Linux, Android** or **WinIOT** → **PN71xx NFC controller with integrated FW**
- I have an MCU running **RTOS** or no **OS**
  - My device will interact with **contactless cards** or **NFC phones**
    - High performance **multi-protocol** reader → **CLRC663 *plus* NFC frontend**
    - Reader for **NTAG® / MIFARE®** products → **MFRC630 *plus*, ISO/IEC14443A reader frontend**
  - I need full NFC functionality including **Card emulation** and **Peer-to-peer** → **PN5180 Full NFC frontend**
    - Reader for **ICODE®** products → **SLRC610 *plus*, ISO/IEC15693 and ISO/IEC18000-3M3 reader frontend**

WE MAKE NFC EASY

We reduce complexity, streamline tasks, and add flexibility at every point in development, so you can deliver a competitive advantage in record time. Links to the support tools listed below can be found on **nxp.com/nfc**.

TOOLS TO SUPPORT PRODUCT SELECTION

Linecard NFC (print/online)

Complete NXP NFC product listings, with detailed specs and side-by-side comparisons

Parametric search

Online tool with parametric search features

NFC DEVELOPMENT KITS

NFC Development Kits

Wide range of development kits for every NFCProduct, incl. design files and Gerber files

MCU Compatibility Guide

Check compatibility with common MCU boards and single-board computers at **nxp.surl.ms/nfcmcu**

TOOLS AND APPLICATIONS

NFC Cockpit

Intuitive GUI to configure and adapt NFC IC settings without coding

NFC Antenna Design Hub

A comprehensive portal of resources and tutorials on NFC antenna design featuring the NFC Antenna Design Tool.

NFC Library

Extensive software support library for NFC Frontend ICs

Sample code to speed up development

App notes Detailed instructions on a broad range of applications

EMVCo 3.0 compliance

EMVCo 3.0 (analog and digital) library in source code

TRAINING AND SUPPORT

NFC Training Catalog

Complete index of on-demand trainings and tutorials by industry experts

Technical NFC Community

Online platform to ask and discuss NFC queries at **https://community.nxp.com/community/nfc**

Design Partners

Independent Design Houses certified by NXP Partners **www.nxp.com/partners**

NFC TAGS

Choose from a wide range of 13.56 MHz high-frequency (HF) ICs for inlays, tags, labels, and cards, featuring multiple security, memory storage, and interactivity options that address varied customer needs, from feature-light to feature-rich applications.

ICODE

ICODE® is one of the leading brand for smart, high-frequency (HF) label solutions with billions of ICs in the field. The vicinity solution is ISO/IEC 15693 and ISO/IEC 18000-3 compliant, and follows NFC Forum Tag Type 5 specifications. ICODE further provides an operating range of up to 1 m with long range readers, additional read range vs ISO/IEC 14443 with standard ISO/IEC 15693 readers for extra small form factors and NFC phone readability:

- Library management
- Consumable and accessory identification and authentication
- Brand protection and anti-counterfeiting
- Supply chain control
- Industrial

	ICODE SLIX 2	ICODE DNA
NFC Forum type format	Type 5	
User Memory [bit]	2528	2016
RF Standard	ISO/IEC 15693	
UID (TID size[bit]	64	64
Fast Inventory	✓	✓
Tag Authentication	✓	AES – 128bit
EAS/AFI	✓	✓
EAS/AFI Protection	32bit password	AES – 128bit
EAS Selective	✓	✓
AFI	✓	✓
AFI Protection	32bit password	✓
Memory write Lock	✓	✓
Memory access Protection	32bit password	AES – 128bit
Privacy Protection	32bit password	AES – 128bit
Destroy Protection	32bit password	AES – 128bit
Counter	✓	✓
Originality Signature	✓	programmable
Cres Capacitance [pF]	23.5	

NFC tags can be read by all standard **NFC-enabled phones** and are available as bare bumped dies on wafers, intended for use in inlays, tags an labels, as well as modules.

NTAG

NTAG allows to add the benefits of contactless technology to high-security and/or high-volume applications. The NTAG family fully complies to ISO 14443A and NFC Forum Tag Type 2 and 4 specifications, ensuring universal interoperability with NFC devices and operating with and without apps. NFC tags enable a number of entirely new business applications:

- Consumable and accessory identification and authentication
- Direct 1:1 consumer engagement
- Brand protection and anti-counterfeiting
- Anti-tampering and anti-refilling
- Document authentication

	NTAG 210µ	NTAG 21x	NTAG 413 DNA	NTAG424 DNA TagTamper
NFC Forum Type format	Type 2		Type 4	
User memory [byte]	48	48-888	416	
RF Standard	ISO/IEC 14443A			
RF Baud Rate [Kbit/s]	106		up to 848	
UID [byte]	7, cascaded			
Access Keys		32 bit	128-bit	
Write Protection		✓	✓	
Password		✓		
Originality signature	Programmable	32 bytes	56 bytes	
UID ASCII mirror		✓	✓	
Fast Read		✓		
NFC counter with ASCII mirror		✓	✓	
Dynamic CMAC mirroring			✓	
Authentication			3-pass mutual	
Cres Capacitance [pF]	17/50/70 depending on product		50	
Special feature				Tamper loop with once opened detection
Crypto processor			AES 128	
Certification	NFC Forum		NFC Forum, CC EAL4	
SUN – secure unique NFC message			Tap unique NFC message generation	
SAM support			MIFARE SAM AV3	

SOFTWARE

TapLinx

SDK for the creation of Android-based NFC mobile apps. NXP's entire NFC smart objects portfolio in one open API.

RFID Discover

Explore and deploy all the features of our MIFARE, NTAG, ICODE and MIFARE SAM AV2 13.56 MHz platforms.

NFC TagWriter by NXP

Quickly and easily program contacts, bookmarks, geo location, Bluetooth pairing, email, and more.

NFC TagInfo by NXP

Read out the complete tag memory layout, extract NDEF messages, use the value-checker function, and more.

CONNECTED TAGS

These tags enable an easy link to the cloud by offering both, an RF and a host interface. The user memory can be configured for multiple rewrites or can be password protected, so data can't be manipulated.

NXP's Originality Signature, an algorithm that supports digital elliptic curve cryptography (ECC), adds an extra level of security and enables tag validation without a cloud connection. The NTAG 5 family offers re-programmable originality signature on top, and scalable security with up to 128 Bit AES mutual authentication.

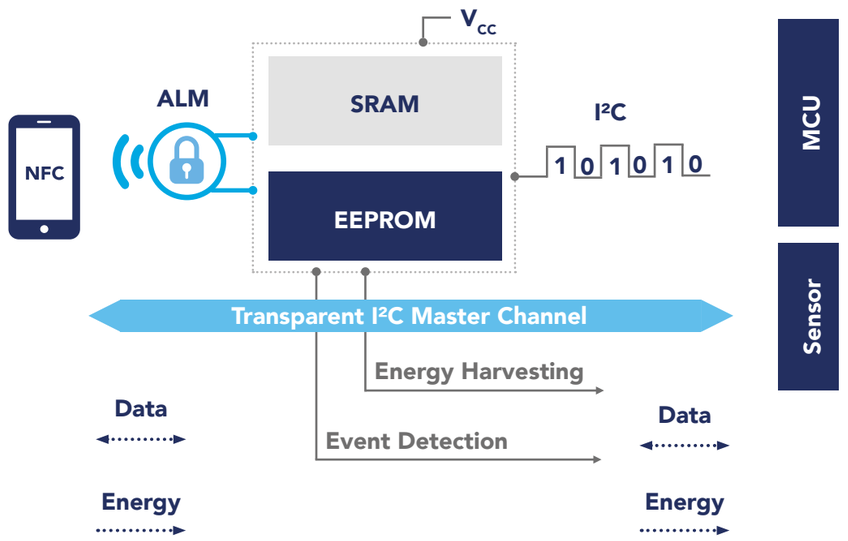
The low power stand-by mode can be used to wake the MCU when it senses an NFC interaction, helps save power. Connected tags can also use a pass-through mode (SRAM) to act as a modem for direct communication between the NFC device and the MCU.

The **NTAG 5 boost** uses active load modulation (ALM) to deliver robust and reliable communication with NFC phones, bringing a new level of convenience to tiny devices.

NFC AS MCU REPLACEMENT

In some applications, NTAG 5 enables simple and cost-effective designs without a microcontroller. It implements multiplexed pins, offering general-purpose I/O (GPIO) and pulse width modulation (PWM) as well as NFC I²C master functionality. The characteristics of the PWM or GPIO signal can be configured through the NFC interface. The I²C Master enables zero-power and instantaneous sensor read out.

NTAG 5 BOOST



PRODUCT SUPPORT PACKAGE

A broad range of connected tag development boards offers an out-of-box experience to develop a variety of NFC applications for IoT devices in consumer, industrial and medical segments.

Hardware design support

- Range of development boards for easy prototyping
- Schematics, layouts, and BoMs
- Easy to use Antenna Design Guide

Software design support

- MCU source code
- Android and iOS source codes
- "RFID Discover" App available to explore connected tags memory layout and features

Comprehensive applications notes and support material can be downloaded from **www.nxp.com/nfc**

SELECTION GUIDE

	NTAG I²C *plus*	NTAG 5 switch	NTAG 5 link	NTAG 5 boost
NFC Forum type tag	2	5	5	5
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 and 32-bit PWD	Read only locking and 32- or 64-bit PWD	Read only locking and 32- or 64-bit PWD AES mutual auth*	Read only locking and 32- or 64-bit PWD or AES mutual auth.
Memory protection from connected host	Restrict access to NFC password protected area	–	32-bit PWD	32-bit PWD
Memory areas	2	3	3	3
Originality Signature	fixed	re-programmable	re-programmable	re-programmable
Energy harvesting	yes up to 15 mW	regulated up to 30 mW	regulated up to 30 mW	when used as passive regulated up to 30 mW
Wired Interface	I²C slave; Event Detection	PWM, GPIO; Event Detection	PWM; GPIO; I²C slave, I²C transparent master*; Event detection	PWM; GPIO; I²C slave, I²C transparent master; Event detection
Typical stand-by and hard-power-down current	–	6 µA/0,25 µA	6 µA/0,25 µA	10 µA/0,25 µA
Active load modulation	–	–	–	yes, when VCC supplied
Temperature range	-40°C to +105°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C

* Only available for NTP5332

EVALUATE, PROTOTYPE & FINE-TUNE

OM5569-NT322E
OM5569-NT322ER

NTAG I²C *plus* Explorer Kit

A sophisticated demonstration and development resource to evaluate the NTAG I²C *plus* in an electronic system. Use it to explore tag operation, the NFC RF communication link, and the I²C serial bus link. The OM5569-NT322ER provides an additional NFC reader, so you can explore reader and tag functionality without having to have an NFC-enabled phone.

OM2NTx5332

Development Kits for NTAG 5 family

The dedicated NTAG 5 switch/link and NTAG 5 boost Arduino® -compatible customer development boards are suitable for any boards featuring an Arduino header, including NXP MCUXpresso, Kinetis and i.MX boards. Android and iOS application based on TapLinx is available from NXP.

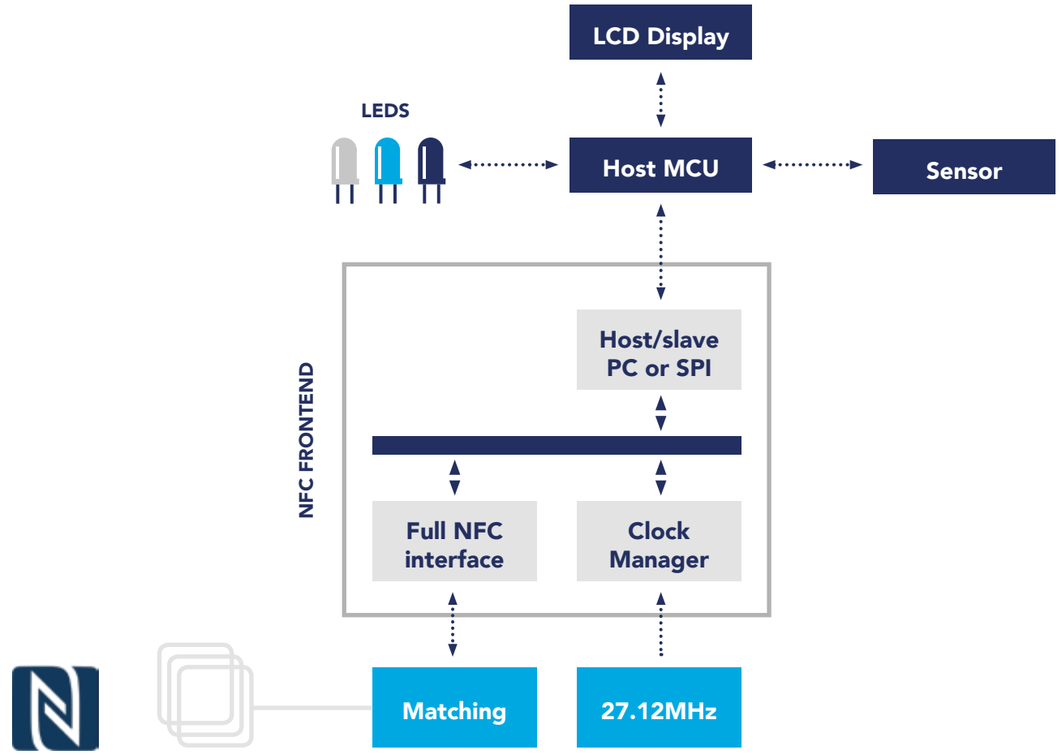
New NTAG 5 family features can be explored using the NTAG 5 Demo Kit. Search for **OM2NTA5KIT**

DOWNLOAD THE NTAG I²C DEMOBOARD AND NTAG 5 EXPLORER APPS ON ANDROID AND iOS

NFC FRONTENDS

Our frontends present flexible way to upgrade your design to NFC connectivity.
The **CLRC663 *plus*** family is primarily intended for use with contactless smartcards and tags, while the **PN5180** is designed for broad-based applications, connecting with everything from smartcards to mobile handsets.

Libraries for embedded systems, fully compliant with ISO/IEC, EMV, and the NFC Forum, deliver reliable performance and simpler certification. Energy-saving features like low-power card detection extend battery life, and seamless integration with our NFC Reader Library means you can add or subtract functions with ease.



GET READY FOR EMV 3.0

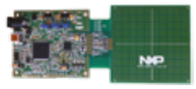
This new standard version for payment targets better interoperability between terminals and various payment form factors (like cards, mobiles, wearables) which come with different antenna sizes and shapes. EMV 3.0 defines 3 new test targets (PICC) to represent the variety of form factors. Due to its advanced transmitter features such as DPC, AWS, ARC, PN5180 can be used for EMV 3.0 certification. On top, NXP delivers a fully EMVCo 3.0 compliant NFC reader library.

SELECTION GUIDE

	PN5180	CLRC663 *plus*	CLRC661 *plus*	MFRC631 *plus*	PN5190
Reader/Writer					
ISO/IEC 14443 A	✓	✓	✓	✓	✓
ISO/IEC 14443 B	✓	✓		✓	✓
FeliCa	✓	✓			✓
ISO/IEC 15693	✓	✓	✓		✓
ISO 18000-3M3	✓	✓	✓		✓
Tag Type	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 4A, 5	1, 2, 4	1, 2, 3, 4, 5
Peer-to-Peer Support					
Passive Initiator	✓	✓			✓
Active Initiator	✓				✓
Card Emulation					
Emulate NFC Forum Tag Types	4A				4A
Other Features					
EMVCo 3.0 compliancy	✓				✓
External Clock Support Eliminates 27.12-MHz Crystal	✓				
Autonomous Transmitter and Receiver Control	✓				
Best for Battery-Powered Designs		✓	✓	✓	
Ambient Temperature Range	-30 to +85 °C	VFBGA -40 to +85 °C HVQFN -40 to +105 °C	-40 to +105 °C	-40 to +105 °C	-40 to +85 °C
Package	HVQFN, TFBGA	HVQFN, VFBGA	HVQFN	HVQFN	HVQFN, VFBGA

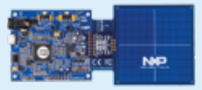
EVALUATE, PROTOTYPE & FINE-TUNE

OM25180 PN5180 Development Kit



This kit includes a PN5180 board optimized for reader and EMVCo applications), two different antenna boards (65 x 65 mm and 30 x 50 mm, equipped with matching components), three small matching boards for implementation of a custom antenna-matching circuit, an NFC sample card and ten PN5180 samples in HVQFN packages.

OM26630 CLRC663 *plus* Development Kit

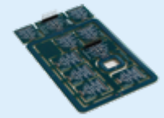


This kit includes a CLRC663 plus board demonstrating the extended Low Power Card Detection, with optimizations for access control applications, plus different antenna boards, an NFC sample card, and ten CLRC663 *plus* samples in HVQFN packages.

CLEV6630ARD CLRC663 *plus* Arduino interface board

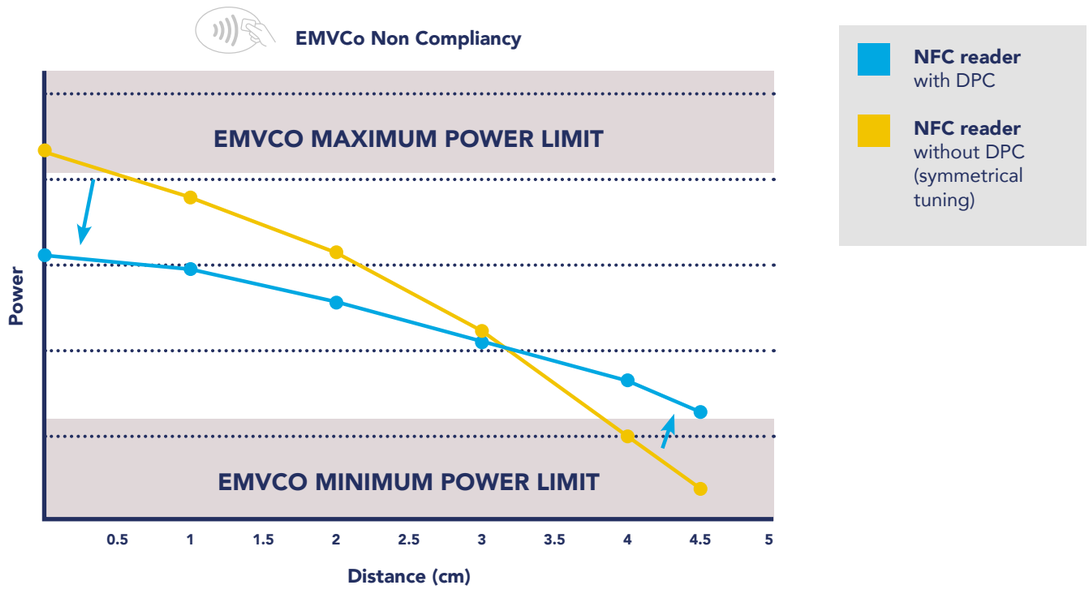
This board enables the CLRC663 plus integration with any board compatible with Arduino header, including most LPCXpresso, Kinetis and i.MX boards. Out of the box, it works perfectly with FRDM-K82F, the Freedom development platform for Kinetis® K82, K81, and K80 MCUs and is fully supported by the NFC Reader Library.

OM29263ADK NFC Antenna Development Kit



This kit comes with various ready-to-use antennas in popular sizes. The included matchings enable immediate prototyping.

PN5180: HOW DPC SOLVES POWER TRANSFER FOR EMVCO COMPLIANCY



THE NFC READER LIBRARY

Create your own **software stack** and **application** for a contactless reader – at no extra charge. Our NFC Reader Library is a modular, multi-layer software library that provides application programming interfaces (APIs) needed to complete a design and prepare it for certification.

Available for free download, written in C programming language, and capable of supporting multiple design environments and platforms, the Library includes all latest features to ensure standards compliance. It enables interoperability with devices already deployed in the market, and saves time and money at every point in the design cycle.

THE PROCESS

1 Focus on Scalability

The multi-layered software design ensures scalability of the software stack. Only the required software components and protocol implementations need to be enabled, so the final application has a smaller memory footprint.

2 Optimize Performance

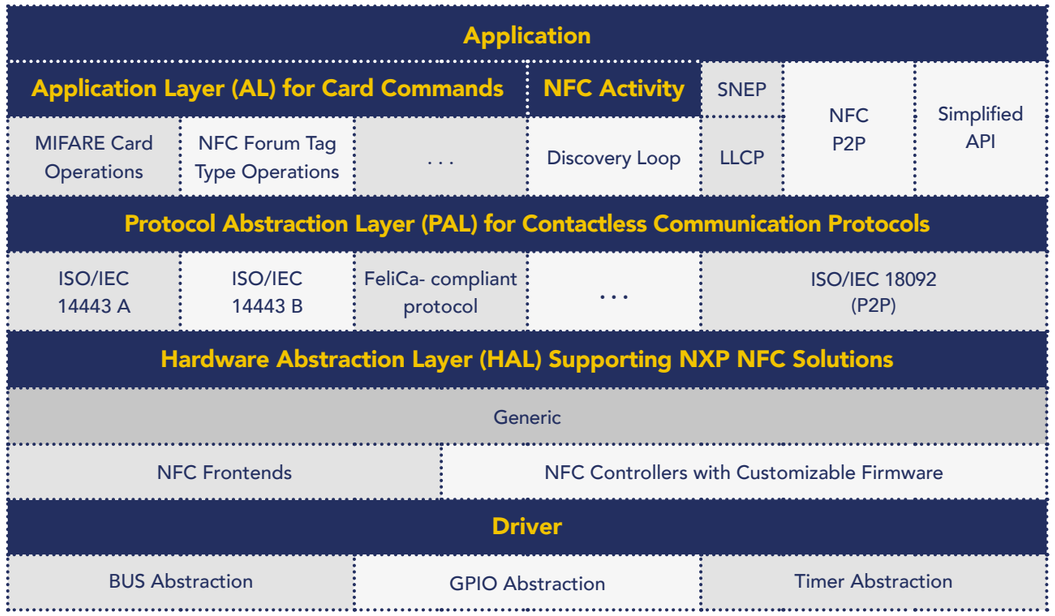
Fine-tune your design with built-in MCU support, interrupt-based event handling, a full complement of host interfaces, free RTOS support, and compilers that produce highly compact, efficient code.

3 Simplify Test & Debug

Save time and effort by using a rich set of examples for many common functionalities, including call for inventory, polling, card emulation, application for EMVCo certification, low-power card detection, and dynamic power control.

4 Validate Interoperability

Get ready for certification with test apps that cover many things from payment and ID cards to automotive, EMVCo L1, NFC Forum, and ISO/IEC 10373-6 PiCC/PCD. Broaden compatibility with the MIFARE portfolio and LLCP/SNEP protocols for P2P mode.



THE NFC COCKPIT

The CLRC663 *plus*, the PN5180, and the PN7462 family are supported by the NFC Cockpit, an intuitive graphical user interface (GUI) that lets you configure and adapt IC settings without writing a single line of software code.

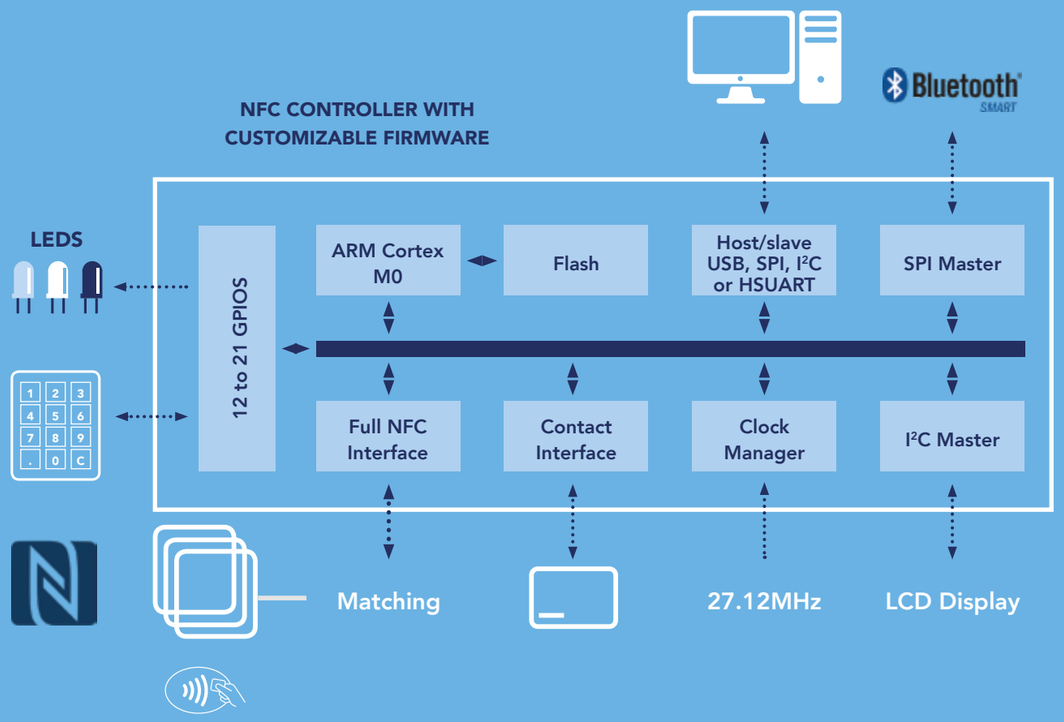
- Let the hardware designers optimize antenna parameters, including wave shape, while the software designers work on other things
- Fine-tune the Dynamic Power Control and Low Power Card Detection settings
- Activate a contactless smartcard, including basic card communication, with options for APDU and EMVCo polling
- Implement firmware updates for the PN5180
- Access all EEPROM cells and registers

Join the **NFC Community** and browse projects, questions, and answers regarding the NFC Reader Library, or make your own case and interact with our NFC experts: **https://community.nxp.com/community/nfc**

NFC WITH CUSTOMIZABLE FIRMWARE

By combining an **NFC frontend** with an advanced, power efficient 20-MHz ARM Cortex-M0 microcontroller, our **NFC controllers with customizable firmware** are a good choice for compact systems, since they enable higher integration with fewer components.

The flash memory can be loaded with fully-custom applications, and the optimized antenna operation, in combination with low-power modes, delivers advanced performance. All the controllers are accompanied by extensive support tools, including sample source code and the NFC Reader Library (see **p30**).



PN7462 FAMILY

The PN7462 Family extends the possibilities, with added features that make it easy to deliver advanced functionality. Ensure market interoperability with full MIFARE support. Full NFC Forum compliance, along with EMVCo for payments, saves time and gives you a shorter path to certification. Advanced power-management functions enable longer battery life, and DPC (see **p26**) delivers optimized antenna performance. Use the ISO/IEC 7816 interface to communicate with contact cards. This highly integrated device lets you design a complete system with one small package.

Extensive host and peripheral interfaces include:

- Host/slave & master interfaces: I2C, SPI, USB, HSUART
- Contactless interface: NFC Forum compliant, EMVCo 3.0
- Contact interface: UART, ISO/IEC 7816, EMVCo 4.3c
- 12 to 21 GPIOs

SOFTWARE

The **contactless** and **contact frontends** of the controller are supported by the freely downloadable NFC Reader Library (see **p30**).

The frontend further supports **Dynamic Power Control** (see **p26**).

SELECTION GUIDE

	PN7462AU	PN7412AU	PN7362AU	PN7360AU
Flash Memory (KB)	160	160	160	80
Contactless Interface	✓		✓	✓
Contact Interface	✓	✓		
HVQFN (9 x 9mm)	✓	✓	✓	✓
VFBGA (4.5 x 4.5mm)	✓		✓	✓

EVALUATE, PROTOTYPE & FINE-TUNE

OM27462CDKP

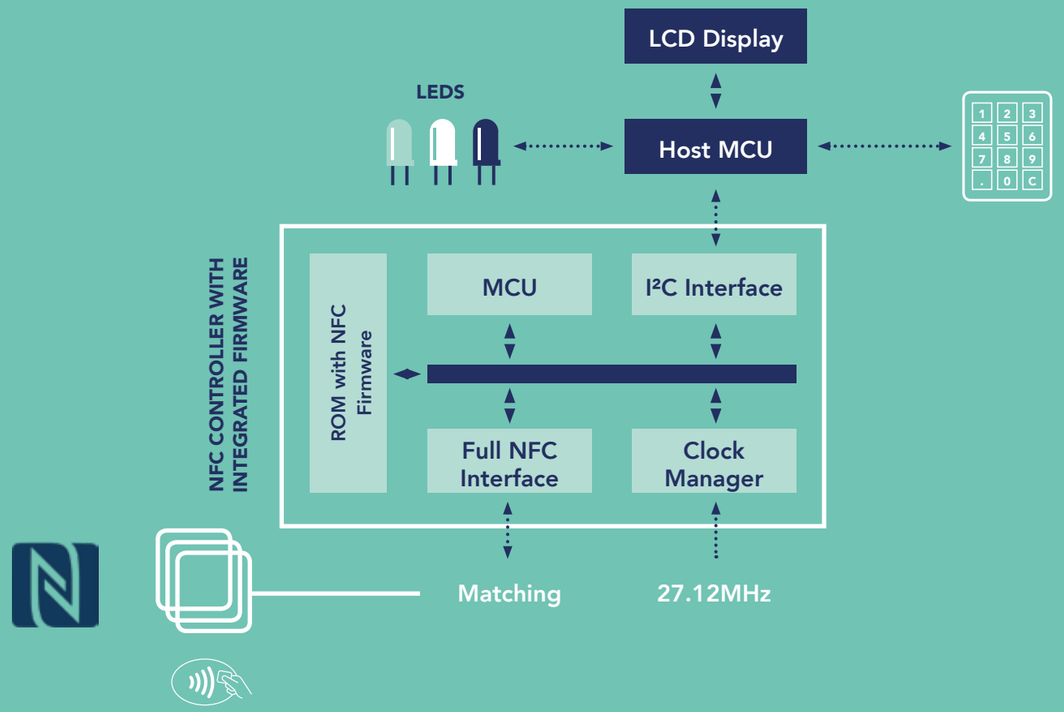
PN7462 Family Development Kit

Designed for comprehensive application development, this kit contains a PN7462 board, two different antenna boards, three small antenna-matching boards for implementation of a custom antenna-matching circuit, a smartcard reader and ten PN7462 samples. Compatibility with the NFC Cockpit and PCB adaptors simplifies antenna matching. Full NFC Forum compliance and contact software libraries save time on code development.

NFC CONTROLLERS WITH INTEGRATED FIRMWARE

Designed to save time when developing a system that uses an OS, our NFC controllers with **integrated firmware** combine an NFC frontend with an advanced, power-efficient 20-MHz ARM Cortex-M0 microcontroller, and come pre-loaded with drivers for Linux, Android, and WinIoT.

They communicate via the NCI interface, to conform with the NFC Forum's guidelines for interactions with the system's main application processor. You can move quickly from initial prototype to full production, since these controllers support a large number of popular development platforms, and are supported by sample applications and source code.



SOFTWARE FOR EVERY OS INTEGRATION

NFC controllers with **integrated firmware** for systems that use a large OS.

Our libnfc-nci library offers easy, smooth integration into **GNU Linux-based systems** and has a high-level API for NFC functionality.

Patches to **Android Open Source Project (AOSP)** are available for simple integration into Android-based systems. The solution benefits from all the NFC implementations already available with Android.

Our NFC controllers are natively supported as proximity platform devices, through the universal **NFC device driver model of the Win10 IoT OS**.

We provide code examples running on **NXP LPC, Kinetis, and i.MX MCUs**, for a full NFC experience with an RTOSbased system, or a system that doesn't use an OS.

SELECTION GUIDE

	PN7150
ROM with NFC Firmware	✓
RF Driver Supply Voltage (V)	2.7 to 4.75
NFC Tag Type Emulation: Type 3 Tag (FeliCa) and Type 4	✓
Load Modulation Concept	Active
HVQFN40 (6 x 6 x 0.85 mm)	✓

EVALUATE, PROTOTYPE & FINE-TUNE

OM5578/PN7150ARD

PN7150 Board with Arduino-Compatible Header
A PN7150 controller board with an Arduino interface board (for use with LPCXpresso, Kinetis, i.MX, and more), plus an NFC Forum Type 2 Tag.

OM5578/PN7150RPI

PN7150 Board for Raspberry Pi
A PN7150 controller board with a Raspberry Pi interface board and an NFC Forum Type 2 Tag.

OM5578/PN7150BBB

PN7150 Board for BeagleBone Black
A PN7150 controller board with a BeagleBone Black interface board and an NFC Forum Type 2 Tag.

NFC COMMUNICATION MODES

THE THREE TYPES OF NFC INTERACTIONS

Read/Write Mode

This is where NFC spends most of its time, with one NFC-enabled device interacting with another to get information or initiate an action. The initiating device can read data in from the second device or write data out to it.

Peer-to-Peer Mode

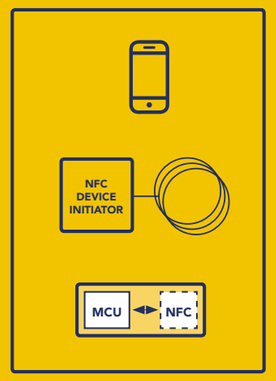
Sometimes referred to as “P2P” mode, this is the one you can use to exchange files between smartphones, or receive loyalty points when making a purchase.

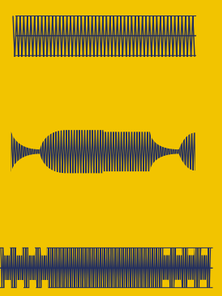
Card Emulation Mode

This mode, used almost exclusively by NFC smartphones, lets the system behave as an ISO/IEC 14443-compliant contactless smartcard. That means your phone can be used in the existing contactless infrastructure, for things like ticketing, access control, transit, tollgates, and payments. The mode takes very little power, and can work even when the phone is off.

PASSIVE OR ACTIVE COMMUNICATION?

PASSIVE COMMUNICATION SCHEME



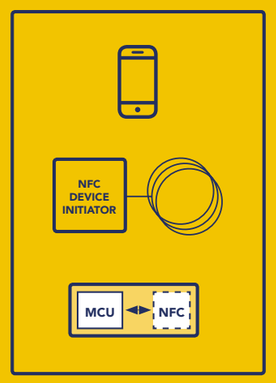


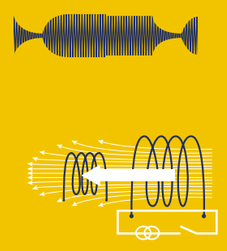
1 **The initiator produces a 13.56 MHz carrier field**
The field enables data exchanges and sends energy to the target.

2 **The initiator sends commands**
The initiator transfers data by directly modulating the field.

3 **The target responds**
The target transfers data by load-modulating the field.

ACTIVE COMMUNICATION SCHEME



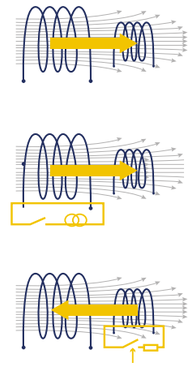


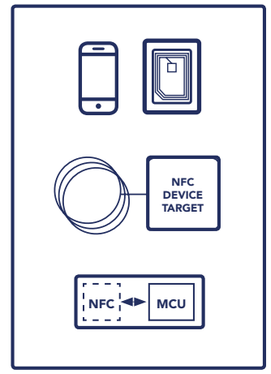
1 **The initiator sends commands**
The initiator generates a 13.56 MHz carrier field, uses Amplitude Shift Key (ASK) modulation to send commands, then cuts the field.

2 **The target responds**
Once the initiator cuts its field, the target generates its own and uses ask modulation to send responses.

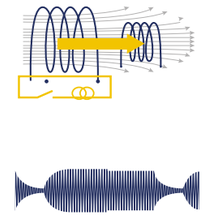
WITH PASSIVE COMMUNICATION, THE TARGET USES THE RF FIELD GENERATED BY THE INITIATOR, BUT WITH ACTIVE COMMUNICATION, EACH SIDE GENERATES ITS OWN FIELD. WHICH METHOD YOU USE DEPENDS ON THE OPERATING MODE.

READ/WRITE, PASSIVE PEER-TO-PEER, AND CARD EMULATION MODES

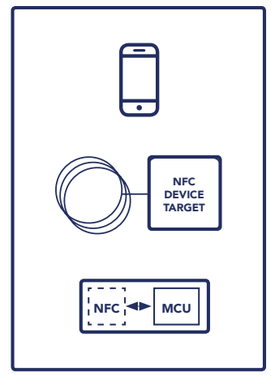




ACTIVE PEER-TO-PEER MODE



To avoid collisions, only the sending device emits an electromagnetic field. The send/receive roles are reversed as needed to support the transaction.



NFC TECH ESSENTIALS

NFC FORUM TAG TYPES

The **NFC Forum** mandates that all their defined tag types be interoperable with **NFC devices**. All the tag types are based on existing contactless formats.

Type 1 and 2 tags provide a basic set of features and can be compared to the MIFARE Ultralight format. Type 3 and 4 tags offer higher memory capacity and more advanced features. Type 3 tags are based on Japan Industry Standard JIS X 6319-4 primarily used in Japan and can be compared to FeliCa formats. Type 4 tags can be compared to MIFARE DESFire formats. Type 5 tags are designed for communication over longer ranges (up to 1m). Type 5 tags are based on the ISO/IEC 15693 standard, which is also known as vicinity RFID, and can be compared to ICODE SLIX formats.

	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5
ISO/IEC 14443 A	✓	✓			
JIS X 6319-4			✓		
ISO/IEC 14443 A or B				✓	
ISO/IEC 15693					✓

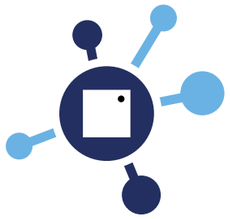
COMMON NFC RECORD TYPES

Device Information (Di)	Basic details about the device model and its identity, for use when the device acts as host
Smart Poster (Sp)	Text strings, such as URLs, SMS messages, or phone numbers stored in an NFC tag
Text (T)	Text strings in multiple languages
URI (U)	Universal Resource Identifiers (URIs), which include web addresses (URLs) and other network resources and files
Connection Handovers (Hr/Hs/Hc)	Pairing with Bluetooth, Wi-Fi, or other protocols. Includes record formats for handover request (Hr), select (Hs), and carrier (Hc).
Signature (Sig)	Provides an algorithm or certificate type for use as a digital signature

FORMATS FOR DATA EXCHANGE (NDEF, RTD, SNEP)

All NFC Forum-compliant devices and tags support the same NFC Data Exchange Format (NDEF).

NDEF lets you encode data into the device or tag so it can share information with other NFC Forum-compliant devices and tags. The NDEF message sequence includes a series of records that contain data.



The record structure varies depending on the type of data conveyed. Record formats are specified in the NFC Record Type Definition (RTD). When NDEF messages are exchanged in Peer-to-Peer mode, the transaction follows the Simple NDEF Exchange Protocol (SNEP), which improves reliability by making use of the Logical Link Control Protocol (LLCP) connection-oriented transport mode.

FOR MORE ON THESE FORMATS, CHECK OUT NFC-FORUM.ORG

RELEVANT STANDARDS & SPECIFICATIONS

NFC is compatible with a number of industry-defined formats. Here's a quick rundown, in alphanumeric order, of the ones most relevant to system designers.

STANDARD	SUBJECT	RELATIONSHIP TO NFC
EMVCo	Payment	Provides guidelines for NFC systems that accept payments or act as payment cards. Level 1 addresses the conformance of transport layer of contactless communication.
FeliCa	Contactless Smartcard	Developed by Sony and used primarily in Hong Kong, Japan, and Singapore, FeliCa is a contactless RFID smart card system that complies with JIS: X6319-4 and is also included as a condition for compliance with the NFC Forum specification.
GlobalPlatform	Secure Element	Specifies a multi-application architecture for the secure elements used to protect transactions in NFC systems.
ISO/IEC 7816	Contact smartcard	Defines the requirements for contact cards communication. ISO7816-4 layer is also used for the command set layer of most ISO14443-4 contactless cards..
ISO/IEC 10373-6	Proximity Card	Defines test methods specific to proximity cards and objects.
ISO/IEC 14443	Proximity Card	Defines the most widely used standard for proximity cards, objects, and readers in payment, transport, identification, and more. Type A and Type B cards use the same transmission protocol, but differ in their modulation methods, coding schemes, and procedures for protocol utilization. NFC Forum Type 2 and Type 4 Tags are based on the ISO/IEC 14443 series.
ISO/IEC 15693	Vicinity Card	Defines a contactless card that can be read at a range of up to 1 m, a longer distance compared to proximity cards. The NFC Forum Type 5 Tag is based on ISO/IEC 15693, and delivers an expected read range with mobile phones that is slightly longer than with Type 2 Tags.
ISO/IEC 18000-3M3	Item-level RFID	Defines an EPC Global Gen2 HF reader with an air interface at 13.56 MHz, the same operating frequency as NFC. Used for highly stackable tags with fast bulk reading.
ISO/IEC 18092	NFC Interface and Protocol	Defines Near Field Communication. Incorporates portions of ISO/IEC 14443 and FeliCa.
MISRA-C	Contactless Smartcard	Provides NFC developers with guidelines for C programming in automotive. Developed by the Motor Industry Software Reliability Association.
NFC Forum Specification	NFC Devices	Defines an NFC implementation that enables interoperability across NFC applications.

TAKE THE NEXT STEP

For more information on NFC Everywhere **www.nxp.com/nfc**


nfc everywhere