

AN11906

Starting a product development with PN5180

Rev. 1.0 — 4 January 2017
406210

Application note
COMPANY PUBLIC

Document information

Info	Content
Keywords	PN5180, PNEV5180B, OM25180FDK, PN5180 evaluation board, PN5180 customer board, PN5180 GUI, GUI, PN5180 Support Tool, NFC Cockpit
Abstract	This document describes the steps towards development of an NFC reader board and how to use available tools to achieve it. It describes briefly how to use NFC Cockpit to properly configure PN5180 registers and EEPROM, aiming an optimum design, in combination with basic reader functionality, given well defined boundary conditions (antenna dimensions, desired use cases and aimed qualifications).



Revision history

Rev	Date	Description
1.0	20170104	First release

Contact information

For more information, please visit: <http://www.nxp.com>

1. Introduction

1.1 Introduction to PN5180, an NFC Front end reader

PN5180 is the latest, most advanced High-Performance Multi-Protocol Full NFC Forum-Compliant Frontend.

The high RF output power, innovative features and a comprehensive set of development tools help to finalize a design successfully within shortest time.

PN5180 is a full NFC compliant frontend IC which can be used for Reader mode, Card Emulation Mode and all Peer to Peer Modes. The interoperability with latest mobile phones had been tested, which reduces the risk of problems after a product launch.

This document gives an overview of all available tools, documentation and material facilitating the NFC Implementation process.



Fig 1. NFC Implementation Process

1.1.1 Deciding on Reader functionality

The NFC implementation process starts typically with the decision which functionality shall be implemented and the selection of the product fitting to the targeted application requirements. The following support material may help in the decision process:

- Our website have [online selection tools](#), using our parametric search the right product can be selected.
- [The line card](#) with NFC Reader Portfolio, called Z-card, show all NFC products in comparison and help to find the IC fulfilling all requirements.
- Our [NFC Everywhere brochure](#) guides you through all use case and gives recommendation on the product to be selected (see mentioned document, page 20).
- Webinars on all use cases as well as on our products are available in our [on-demand library](#).
-

In the following chapters the product support material for PN5180 are described, facilitating the next steps in the implementation process:

- [Evaluating Features](#)
- [Prototyping Hardware](#)
- [Prototyping Software](#)
- [Testing & Debugging](#)
- [Getting Certified](#)

2. Evaluating features

If the product characteristics of the PN5180 match the requirements of the application, an evaluation of the product can be planned and facilitated by the following enablement tools.

2.1 OM25180 Demokit

The demokit for the PN5180 can be ordered using the following order number from NXP through many distribution partners:

Order Number: 9353 073 19699

Name: OM25180FDK



Fig 2. Blister containing OM25180 demokit

It contains a PNEV5180B board with LPC1769 microcontroller connected to the PN5180 and a ready to use 65x65mm antenna. Furthermore blister contains an additional 30 mm x 50 mm antenna with matching components, optimized for NFC applications, three small antenna matching PCBs (approximately 20 mm x 40 mm sized, intended for implementation of a custom antenna matching circuit), one NFC sample card based on NTAG216F (NFC Forum Type 2 Tag - allowing a first check of the boards functionality) and 10 PN5180 samples in HVQFN package, to support quick prototyping.

The kit can be purchased from your [favorite distributor](#).

2.2 NFC Cockpit use with OM25180

The same PN5180-equipped demokit can be used in two ways:

1. Demoboard connected to PC, making use NFC Cockpit tool
2. Stand alone reader (embedded application) making use of firmware to be loaded into MCU flash.

The easiest option is to use the kit together with the PC-based graphical configuration tool NFC Cockpit, which can be downloaded [here](#).

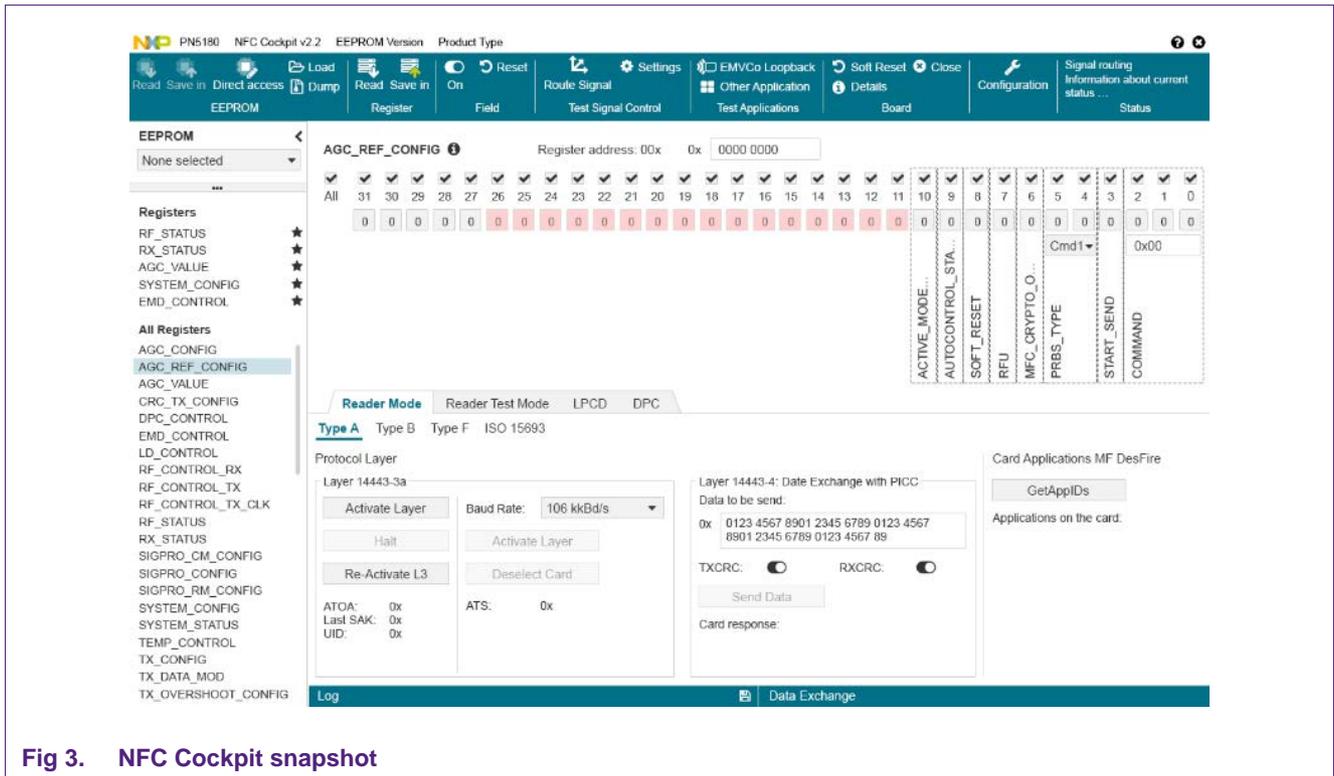


Fig 3. NFC Cockpit snapshot

The NFC Cockpit can be installed on any windows PC and the PNEV5180B connects to the PC by the USB interface. The tool allows an immediate test of the RF-Performance of the PNEV5180B. Documents containing info about installation and use of NFC Cockpit can be found in [2]. For the use of PNEV5180B as embedded reader, please read chapter related to [NFC Reader Library](#)

2.2.1 Additional resources: recorded webinar on “Introduction to NFC Cockpit tool”

<http://www.nxp.com/video/:NFC-APPLICATION-COCKPIT>

2.3 Application Notes and Datasheet

The public NXP website gives an overview on the PN5180 and allows a quick access to all public support material.

The latest datasheet of PN5180 [7], is available for download and gives all information about the functionality and characteristics of the product. Additional documents which require an NDA are available on the NXP docstore (<https://www.docstore.nxp.com>). Such documents include, for example, a description of the PN5180 in BGA package, EMVCo certification test reports, and all necessary info for PN5180 firmware update.

2.4 Additional resources: recorded webinar on “Introduction to PN5180”

Browse here: <http://www.nxp.com/video/:PN5180-NFC-FRONTEND>

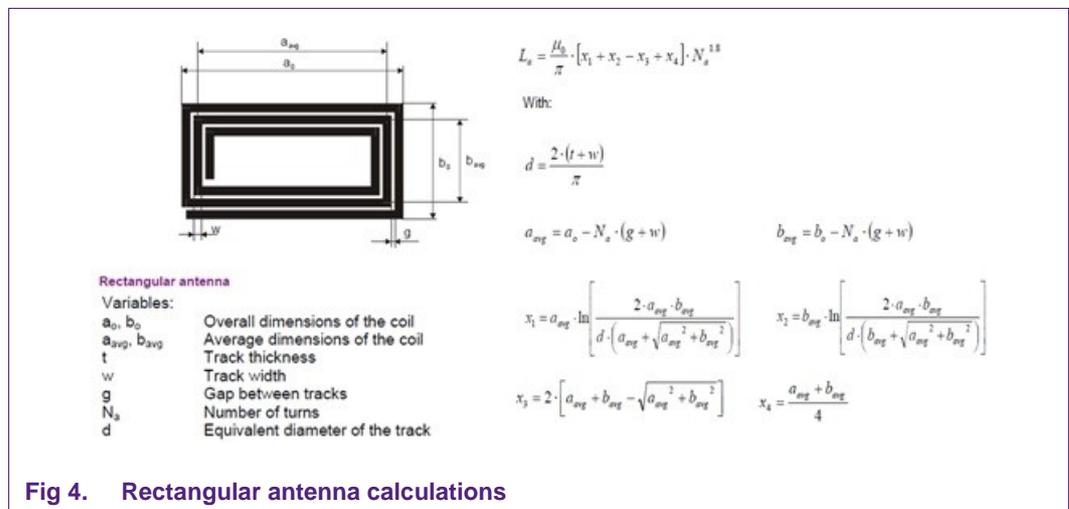
If link above doesn't work in your browser, search for this keyword "PN5180-NFC-FRONTEND" in the general video directory link above.

3. Hardware development of a prototype reader

3.1 RF reader design and matching between RF output and customer antenna

After the choice of NFC chip reader, next major choice to be done is on the final antenna topology; besides geometric boundary conditions, the use case and aimed certifications will impact on antenna layout and specifications.

Extensive explanation around Reader RF performance versus customer application is given in [3]. It is important that customer does not expect strong performance from a very tiny/small antenna. If available space is really reduced, then NXP advises customer to get in touch with NXP partner specialized in antenna manufacturing to avoid frustration. Antenna synthesis is a critical development and some end product configuration, like presence of TFT displays, ground chassis all around reader pcb might influence antenna performance. All such RF boundary conditions should be taken into account during feasibility study mainly if NFC reader is a candidate for EMVCo qualification [3], [4].



3.1.1 Antenna Design Guide

For the antenna synthesis, freeware applications can be widely found on web or it is possible to use formulae available for circular antenna and rectangular antenna.

Rectangular antenna calculations

For the application of a commercial product the 65x65mm antenna (present in PN5180 demokit blister) is not recommended. The antenna PCB shows copper field strength damping areas in the middle of the antenna to simulate the performance which can be expected in a real life application if the antenna is used in free air. This copper areas shall be in any case removed on antennas for a commercial product.

The antenna of a commercial product will typically be surrounded by either metal, or an application PCB with copper ground planes can be found in the proximity below the antenna. The resulting performance of such an antenna without copper field strength damping areas, but with damping metal in proximity of the antenna can be expected to be similar. In any case a dedicated antenna tuning and matching will be required for this new antenna in a dedicated mounting environment. The application note describing the details of the antenna matching is “PN5180 Antenna design guide” [3].

3.1.2 Development kit preparation for matching

The PN5180 development kit OM25180FDK contains 3 small PCBs which can be used to implement own matching values for a user specific antenna. The EMC filter components L_{EMC} , C_{EMC} mounted on the main part of the PCB which contains PN5180 and LPC1769 can typically be left unchanged.

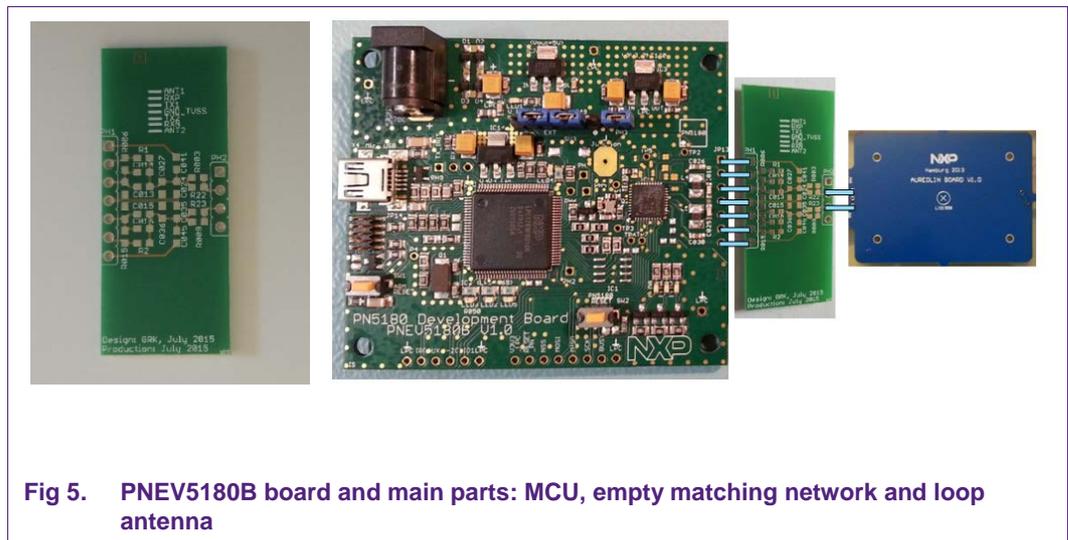


Fig 5. PNEV5180B board and main parts: MCU, empty matching network and loop antenna

3.2 Antenna design additional information

NXP has prepared specific antenna design recorded webinars (and respective presentation slides) which can be found in following links:

Table 1. NXP webinars on antenna design

Webinar Title		Agenda	Presentation & Recorded Webinar
1	Which Antenna for what purpose?	<ul style="list-style-type: none"> • What is the best antenna size & form? • Major design parameters • Layout & design tips 	Recorded webinar Materials
2	Antenna „Matching“	<ul style="list-style-type: none"> • What does „matching“ mean? • What are the required simulation tools? • What are the required measurement tools? 	Recorded webinar Materials
3	Metal environment	<ul style="list-style-type: none"> • How does metal environment influence the antenna? • How to use ferrite? • Generic guidelines regarding metal 	Recorded webinar Materials
4	Optimization & Debugging	<ul style="list-style-type: none"> • How can I optimize the performance? • Relevant test signals & registers • Major test & debug setup 	Recorded webinar Materials

3.3 Dynamic Power Control with NFC Cockpit

DPC is a very important added value of PN5180 as high power reader, that is, it is the capability to tune output power level as function of transponder vicinity: the closer a card is to reader antenna, the less power reader should issue in order to execute transaction. This can be achieved after proper design, fine tuning and enabling of DPC.

The unique feature Dynamic Power Control (DPC) allows to control the output power dependent on the loading condition of the antenna. This feature allows to use the full transmitter output power for conditions in which a card is far away from the antenna. The DPC senses if a card or mobile phone is approaching the antenna and reduces the transmitter output power accordingly to avoid a RF-field which is too strong in close antenna proximity to meet the standard requirements of e.g. ISO/IEC14443. All this behavior can be fully configured by the developer, but runs fully automatic and in real-time without any host processor interaction.

It is important to know that the special features of the IC like Dynamic Power Control (DPC), require a specific – symmetric - matching of the antenna. The feature cannot be used with an asymmetric matching that is used typically for other NFC Frontend IC’s like the PN512.

NXP offers a detailed application note describing all the details of this feature and how to use it at a best in an application: “PN5180 Dynamic Power Control”, see [2], [4] and [5].

For best performance, a calibration of each individual IC under unloaded condition is required. In practice, this can be done during personalization of a reader in the production environment. Also during production tests, special fine tuning is stored in specific register to take into account small variations from board to board.

The development board of the PN5180 is using the DPC feature by default. Please note that the settings/configuration of the DPC is different for each different antenna design and need to be configured individually for each application. The easy configuration of the DPC is supported by the NFC Cockpit.

3.3.1 Additional resources: recorded webinar on “Introduction to Dynamic Power Control AGC assessment and calibration using NFC Cockpit tool”

<http://www.nxp.com/video/:NXP-DPC-CORRELATION>

<http://www.nxp.com/video/:NXP-DPC-CALIBRATION>

3.4 NFC Cockpit with other MCUs

The NFC cockpit can be used together with other microcontrollers than the LPC1769 as well. In order to achieve this, a virtual com port interface (VCOM interface) is available in source code which can be ported to any other controller. The main porting work which is required relates to the adaption of the interface Host Microcontroller <-> PC. This allows to connect the PN5180 to the application specific host microcontroller directly on the application board and connect a PC running the NFC cockpit to the application specific microcontroller. This is especially useful for fine-tuning of a register configuration without the need of additional software development.

3.4.1 Firmware update with NFC Cockpit

The PN5180 supports the possibility to update the integrated firmware provided by NXP. The latest firmware is always supplied with the NFC Cockpit, which can be used to update PNEV5180B development boards. The latest – and all previous - versions of the firmware can be found on the NXP docstore. The firmware is provided by NXP in binary form, pre-formatted for easy download. Please note that the host interface commands used for NFC operation of the PN5180 and for the download mode are different. The PN5180 is always able to recover from interrupted download operations, e.g. caused by a power supply interrupt. It is not possible to download modified or non-NXP firmware binaries to the PN5180. A security system implemented in the PN5180 accepts only the original firmware provided by NXP.

3.5 Low Power Card Detection

LPCD capability, as introduced in previous readers (CLRC663 and derivatives), is also present in PN5180, and its calibration and enabling can be also done through NFC Cockpit tool. More information can be found in [2] and [6].

3.6 Pulse shaping using NFC Cockpit

NFC Cockpit provides TX Shaping features, which help to meet the pulse shape requirements. These TX Shapings can be adjusted to be dynamically set properly even under the different loading cases. The required setup is described in [5], and examples of such use for ISO/IEC14443-A and –B signals are shown in on-line videos available in [Testing and debugging](#) chapter.

3.6.1 Additional resources: recorded webinar on “Introduction to Pulse shaping & adjustment techniques using NFC Cockpit tool”

<http://www.nxp.com/video/:PN5180-WAVE-SHAPE-A>

<http://www.nxp.com/video/:PN5180-WAVE-SHAPE-B>

3.7 PN5180 register configurations and software optimization

3.7.1 PN5180 Registers

As many other NXP front end readers, PN5180 includes registers which shall be configured by MCU state machine firmware in order to implement ISO protocol while executing customer application. All registry bank is described in detail in [PN5180 datasheet](#), including several tables in paragraph 11.4. For better control of analog performance of transmitted and received signals, NXP designed an executable aiming reader optimization (see next paragraph).

3.7.2 PN5180 Rx Matrix Test

The performance of the final RFID system is heavily dependent on the register settings of the IC. NXP offers one tool, the MATRIX test, which allows to find the optimal register settings without deep knowledge of the IC internals. “PN5180 Rx Matrix Test” can be downloaded from [this link](#).

The PN5180 supports the possibility to update the integrated firmware provided by NXP. The latest firmware is always supplied with the NFC Cockpit, which can be used to update PNEV5180B development boards. The latest – and all previous - versions of the firmware can be found on the NXP docstore. The firmware is provided by NXP in binary form, pre-formatted for easy download. Please note that the host interface commands used for NFC operation of the PN5180 and for the download mode are different. The PN5180 is always able to recover from interrupted download operations, e.g. caused by a power supply interrupt. It is not possible to download modified or non-NXP firmware binaries to the PN5180. A security system implemented in the PN5180 accepts only the original firmware provided by NXP.

3.7.3 PN5180 EEPROM

All EEPROM bank is described in detail in PN5180 datasheet, including several tables in paragraph 11.5. Customer can manage EEPROM by using NFC Cockpit, which includes dumping of whole EEPROM bank in an XML file and the other way around (restoring Reader EEPROM by reading existent XML). For more info, see [\[2\]](#).

4. Software development of a prototype reader

4.1 Software development

At the same time as the Hardware development takes place, your software engineer can start writing MCU code using our NFC Reader Library, which includes support for every relevant type of transponders and other NFC objects (like other readers or mobile phones).

The NFC reader library comes with several application notes, see this [link](#), tutorials available in our on-line on-demand training library (click [here](#)). And NFC cockpit, as mentioned before (see NFC Cockpit uses OM25180), can help to test the register settings before implementing in SW.

4.2 NFC Reader Library

Alternatively, the PNEV5180B can be used with the NXP reader Library. The NXP reader library is written in C, can be installed immediately on the LPC1769. Special features, including interrupt-based event handling, Free RTOS support and MISRA-C compliancy, are provided along with the NFC Reader Library.

This Library API is organized in independent layers (see [6]) which helps a lot software engineers to build up own NFC application starting from bottom physical layers (digital interfaces connection between MCU and NFC frontend) until upper Application layers.

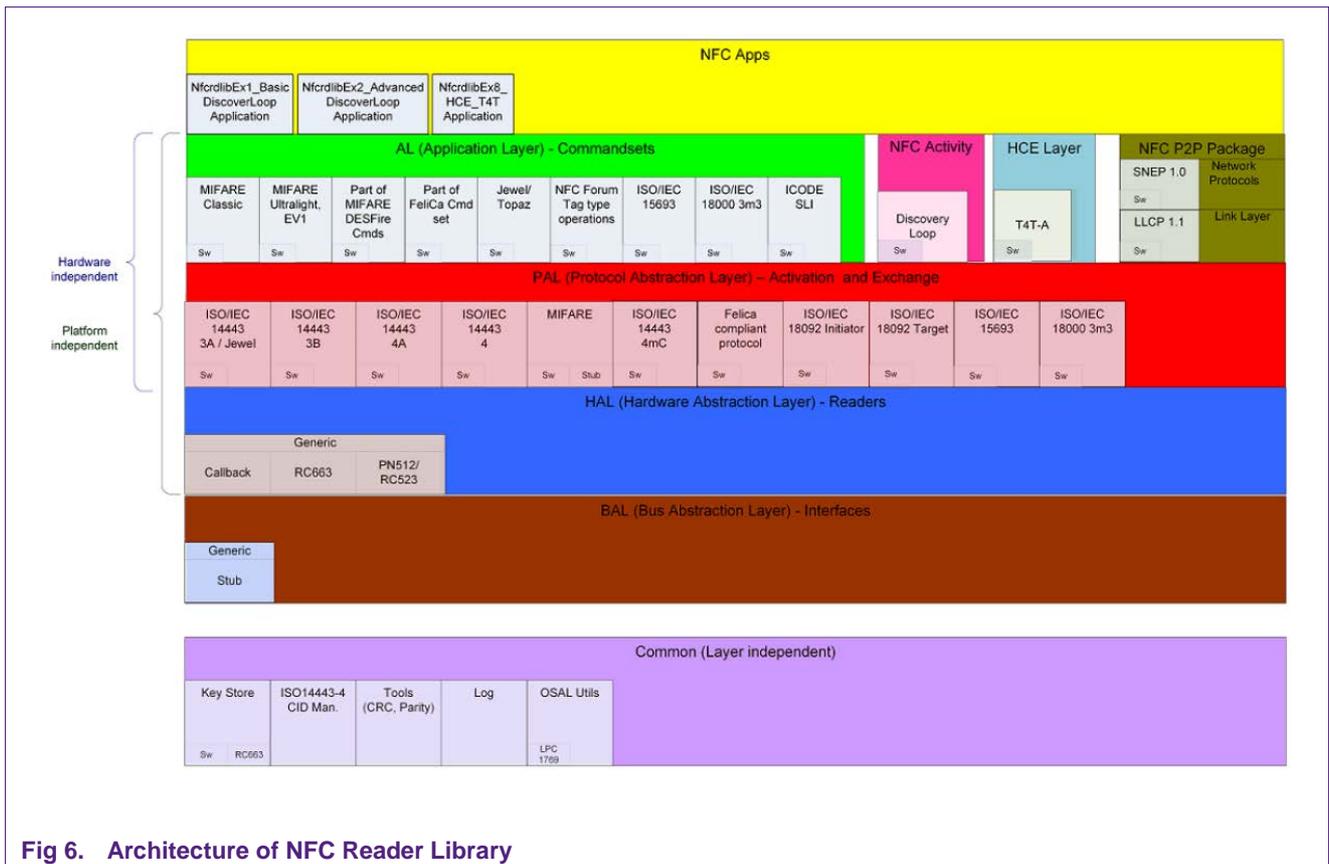


Fig 6. Architecture of NFC Reader Library

The NFC Reader Library software is designed in a way to be easily portable to many different microcontrollers.

The free of charge development environment LPCXpresso is used for compilation of the source code, see [NXP website](#). In order to download the compiled binaries to the LPC1769 which is implemented on the board, a debug interface [LPC-LINK2](#) is required. NXP reader library precompiled for the PN5180 Board can be found in [NXP website](#) (“NFC Reader Library for PNEV5180B including all software examples”).

The NFC Reader library is free of charge as long as it is used together with NXP NFC products, and can be modified by developers according to their needs. It is not required to feedback modifications of the software to NXP. The detailed licensing conditions of the NFC Reader library are included in the download package.

The library is available for LINUX or ANDROID based systems as well. Such package contains the complete NFC Reader Library with the relevant layers ported to Linux. The download package is configured for the Raspberry Pi, but can be run on any Linux system, see [here](#) (“NFC Reader Library for Linux”).

Since LINUX and ANDROID use the same low level kernel for the OS, the usage of this software package on ANDROID based systems is possible with low software porting efforts.

More details about NFC reader library can be found in this on-demand webinar: <http://www.nxp.com/video/:NFC-APPS-SUPPORT-NFC-FRONTEND> .

4.3 Point Of Sales reader

NXP plans to provide information on PN5180-equipped reference design architecture aiming payment use case, running on the K81. The sample code includes an EMVCo Level1 library in source code helping set the first steps in the implementation of a payment terminal. For more information, browse this link [here](#).

4.4 PN5180 Firmware update

The firmware can be updated as well for products which had been already deployed. In order to support the developers to implement his own secure firmware download function, an example code is available which illustrates how to implement this function.

[“PN5180 Secure firmware update library”](#)

5. Testing and debugging

For the sake of product development, NXP is committed to maintain current demoboards (HW and SW) allowing customers to implement their contactless functionality independent of RF & Analog performance; in this way, development engineer may test interaction between infrastructure and smartcards assuming reader is optimized in terms of RF. This is currently the aim of PNEV5180B evaluation board contained inside OM25180FDK. Important testing resource is the already mentioned list of movies explaining the use of features like DPC, LPCD, Pulse shaping, all available in video repository in NXP public website:

<http://www.nxp.com/video/vault?searchLabel=renderHomepage>

All these recording sessions on NFC Cockpit can be used for application debugging and possibly for platform certification tests.

6. Getting Certified

As far as NFC forum is concerned, PN5180 is a reader IC which has already been certified, and can be found here.

Generally speaking, any NFC-equipped product starting from development and up to mass production stages shall take into account most important certification and compliancy standards, in order to be properly placed in the market.

Examples of most popular certifications are:

- [CE European conformity certification](#)
- NFC regulatory measurements, according to ETSI EN 302 291-1 V1.1.1 – now superseded by [EN 300 300](#)
- [EMVCo](#) L1 and L2 compliancy standards

Each of these standard bundle represent an important milestones in an NFC project. Depending on the use case and application, also multiple standards have to be considered during the design.

6.1 NXP resources on design for compliancy

6.1.1 NFC Forum and EMVCo

Customers can find on [3] a detailed explanation on antenna design for NFC Forum compliancy as well as for EMVCo Level 1 compliancy in terms of RF performance.

6.1.2 EMC approval and good RF performance

Customers can find on following webinar presentations and videos how to best develop own hardware towards good EMC behavior and maximize chances to be success in final qualification tests.

Table 2. NFC webinars on EMC design, Test & Qualification

Webinar Title	Agenda	Presentation & Recorded Webinar
---------------	--------	---------------------------------

1	Test & Qualification	<ul style="list-style-type: none"> • Which tests are required? • What are the required test tools? • References to ISO/IEC 14443, EMVCo & NFC-Forum 	Recorded Webinar Materials
2	EMC related Design	<ul style="list-style-type: none"> • What is the impact of EMC? • What are the EMC critical parts of the design? • Basic rules to improve EMC behavior 	Recorded Webinar Materials

6.2 NXP partners for certification

In order to coach and support customers along certification process, NXP is promoting a list of partners with specific competencies on ISO/IEC certification, EMVCo L1/L2 and NFC Forum test pre-assessments (NXP Partner Program). This list can be found here: <http://www.nxp.com/webapp/connect/memberDirSearch.sp>

Just select tab “Partner Directory”, add keyword NFC and select filters like country, services supported, devices supported, etc. Then press search to get contact info.

7. Available on-demand webinars on NFC technology as additional support to PN5180 reader development

Archive of NXP on-demand webinars can be found in this weblink or typing keyword “webinars archive” in “Search window” of NXP webpage www.nxp.com. In particular, NFC related webinars have been grouped together under cluster “Near Field Communication”.

8. Summary

For the sake of product development, NXP has developed several demo boards allowing customers to implement their contactless functionality independent of RF & Analog performance; this grants development engineer to test interaction between infrastructure and smartcards assuming reader is optimized in terms of RF; all above is covered by this document in relation to NXP PN5180-equipped demokit and related hardware contained in the OM25180 FDK blister. The aim of whole document is to steer customer to consolidate this contactless functionality (for instance, access control or fare collection using contactless technologies as MIFARE products; payment applications or home banking; eGov reading of electronic passports, etc). After customer is convinced about application or functionality, NXP provides all necessary information so that customer can dedicate effort to synthesize reader HW and proceed to tests (analog and digital debugging) and further certification.

9. References

- [1] [NFC and Reader IC's](#)
- [2] [AN11744](#) - PN5180 Evaluation board quick start guide
- [3] [AN11740](#) – PN5180 Antenna design guide
- [4] [AN11741](#) - How to design an antenna with DPC
- [5] [AN11742](#) - PN5180 Dynamic Power Control
- [6] [UM10954](#) - PN5180 SW Quick start guide
- [7] [PN5180 datasheet](#)

10. Legal information

10.1 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

10.2 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Evaluation products — This product is provided on an "as is" and "with all faults" basis for evaluation purposes only. NXP Semiconductors, its affiliates and their suppliers expressly disclaim all warranties, whether express, implied or statutory, including but not limited to the implied warranties of non-infringement, merchantability and fitness for a particular purpose. The entire risk as to the quality, or arising out of the use or performance, of this product remains with customer.

In no event shall NXP Semiconductors, its affiliates or their suppliers be liable to customer for any special, indirect, consequential, punitive or incidental damages (including without limitation damages for loss of business, business interruption, loss of use, loss of data or information, and the like) arising out of the use of or inability to use the product, whether or not based on tort (including negligence), strict liability, breach of contract, breach of warranty or any other theory, even if advised of the possibility of such damages.

Notwithstanding any damages that customer might incur for any reason whatsoever (including without limitation, all damages referenced above and all direct or general damages), the entire liability of NXP Semiconductors, its affiliates and their suppliers and customer's exclusive remedy for all of the foregoing shall be limited to actual damages incurred by customer based on reasonable reliance up to the greater of the amount actually paid by customer for the product or five dollars (US\$5.00). The foregoing limitations, exclusions and disclaimers shall apply to the maximum extent permitted by applicable law, even if any remedy fails of its essential purpose.

10.3 Licenses

Purchase of NXP ICs with NFC technology

Purchase of an NXP Semiconductors IC that complies with one of the Near Field Communication (NFC) standards ISO/IEC 18092 and ISO/IEC 21481 does not convey an implied license under any patent right infringed by implementation of any of those standards. Purchase of NXP Semiconductors IC does not include a license to any NXP patent (or other IP right) covering combinations of those products with other products, whether hardware or software.

10.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are property of their respective owners.

MIFARE — is a trademark of NXP Semiconductors N.V.

11. List of figures

- Fig 1. NFC Implementation Process 3
- Fig 2. Blister containing OM25180 demokit 5
- Fig 3. NFC Cockpit snapshot 6
- Fig 4. Rectangular antenna calculations 7
- Fig 5. PNEV5180B board and main parts: MCU, empty matching network and loop antenna 8
- Fig 6. Architecture of NFC Reader Library 12

12. List of tables

Table 1. NXP webinars on antenna design.....9
Table 2. NFC webinars on EMC design, Test & Qualification 14

13. Contents

1. Introduction	3	4. Software development of a prototype reader..	12
1.1 Introduction to PN5180, an NFC Front end reader.....	3	4.1 Software development.....	12
1.1.1 Deciding on Reader functionality.....	4	4.2 NFC Reader Library	12
2. Evaluating features	5	4.3 Point Of Sales reader	13
2.1 OM25180 Demokit	5	4.4 PN5180 Firmware update.....	13
2.2 NFC Cockpit use with OM25180	5	5. Testing and debugging	14
2.2.1 Additional resources: recorded webinar on “Introduction to NFC Cockpit tool”	6	6. Getting Certified	14
2.3 Application Notes and Datasheet.....	6	6.1 NXP resources on design for compliancy.....	14
2.4 Additional resources: recorded webinar on “Introduction to PN5180”	6	6.1.1 NFC Forum and EMVCo	14
3. Hardware development of a prototype reader ..	7	6.1.2 EMC approval and good RF performance.....	14
3.1 RF reader design and matching between RF output and customer antenna.....	7	6.2 NXP partners for certification.....	15
3.1.1 Antenna Design Guide	7	7. Available on-demand webinars on NFC technology as additional support to PN5180 reader development	15
3.1.2 Development kit preparation for matching.....	8	8. Summary	15
3.2 Antenna design additional information	9	9. References	16
3.3 Dynamic Power Control with NFC Cockpit.....	9	10. Legal information	17
3.3.1 Additional resources: recorded webinar on “Introduction to Dynamic Power Control AGC assessment and calibration using NFC Cockpit tool”	10	10.1 Definitions.....	17
3.4 NFC Cockpit with other MCUs	10	10.2 Disclaimers.....	17
3.4.1 Firmware update with NFC Cockpit.....	10	10.3 Licenses	17
3.5 Low Power Card Detection.....	10	10.4 Trademarks	17
3.6 Pulse shaping using NFC Cockpit.....	10	11. List of figures.....	18
3.6.1 Additional resources: recorded webinar on “Introduction to Pulse shaping & adjustment techniques using NFC Cockpit tool”	10	12. List of tables	19
3.7 PN5180 register configurations and software optimization	11	13. Contents	20
3.7.1 PN5180 Registers	11		
3.7.2 PN5180 Rx Matrix Test	11		
3.7.3 PN5180 EEPROM.....	11		

Please be aware that important notices concerning this document and the product(s) described herein, have been included in the section 'Legal information'.