

UM11008

PN7120 NFC Controller Arduino SBC Kit User Manual

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User manual
COMPANY PUBLIC

Document information

Info	Content
Keywords	OM5577, PN7120, Demo kit, Arduino
Abstract	This document is the user manual of the PN7120 NFC Controller Arduino SBC kit.



Revision history

Rev	Date	Description
1.2	20170104	Added CE certification details
1.1	20160707	Added demo kit performance details
1.0	20160518	First official release version

Contact information

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1. Introduction

The present document describes the OM5577/PN7120ARD demonstration kit, a flexible and easy-to-use Single Board Computer (SBC) Arduino Kit for the PN7120 NFC Controller.

It allows easy integration of PN7120 NFC Controller on platforms offering Arduino compatible interface (see [1]), like LPCXpresso (see [3]) or Kinetis Freedom (see [2]).

Another PN7120 demo kit offers easy integration of Raspberry Pi or BeagleBone Black platform, refer to OM5577 web page [5] for more information.

It enables the development of an NFC solution based on PN7120 in a Linux environment or even in system based on RTOS or without OS.

This document presents first an overview of the kit.

Then, it gives printed circuit boards details.

Finally, it provides information for reuse of the kit in different environments.

This kit is registered as FCC certified module (FCC ID: OWROM5577-PN7120S)

2. Overview

2.1 Kit description



Fig 1. OM5577/PN7120ARD Kit overview

OM5577/PN7120ARD kit is comprised of:

- ✓ a PN7120 NFC Controller Board
- ✓ an Arduino Interface Board
- ✓ a NFC Sample Card in form of an NFC Forum Type 2 Tag



PN7120 NFC Controller Board

Arduino Interface Board

NFC Sample Card

Fig 2. OM5577/PN7120ARD kit overview

2.1.1 PN7120 NFC Controller Board

The PN7120 NFC Controller Board is the main board of the demonstration kit. It embeds the PN7120 and all related circuitry.

It also includes an on-board RF antenna with related matching circuitry.

This main board has to be used in association with the Arduino Interface board.

For this purpose, it integrates dedicated connectors allowing boards assembly.

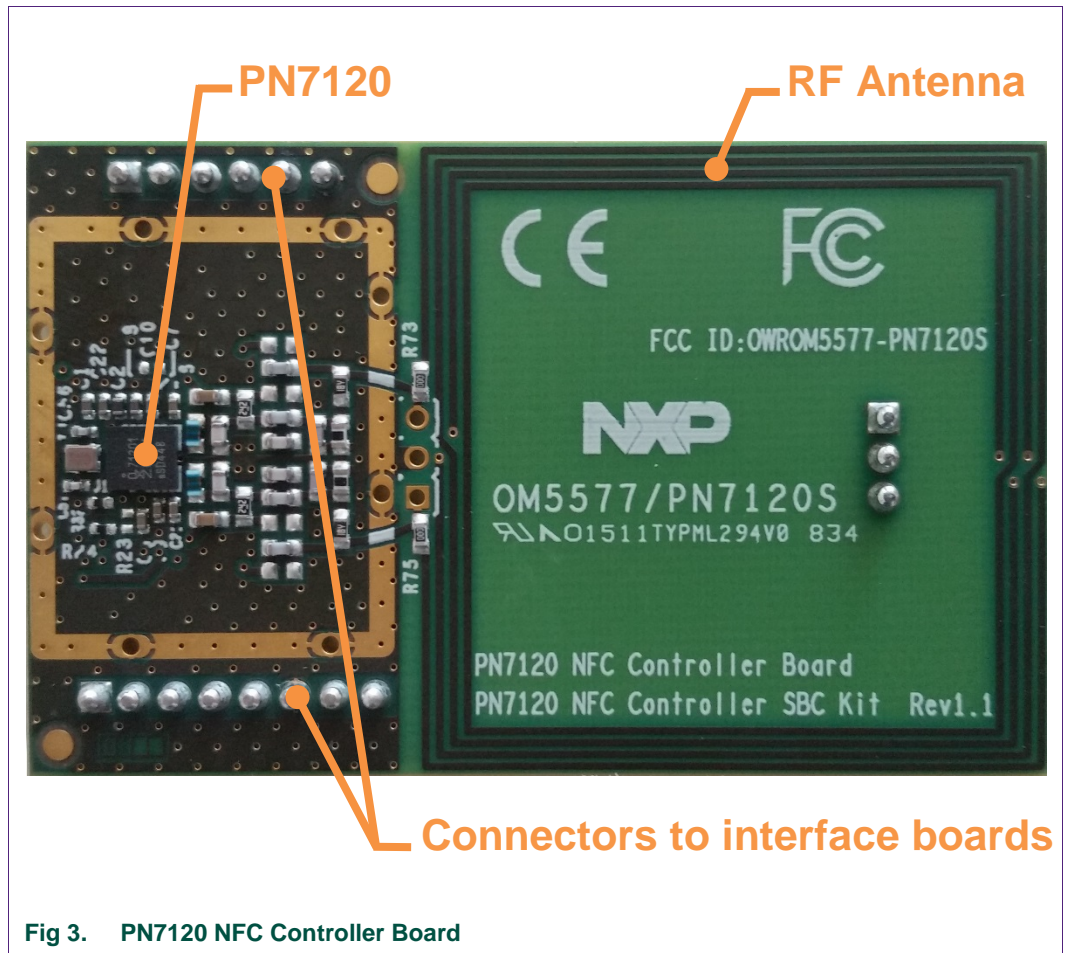


Fig 3. PN7120 NFC Controller Board

2.1.2 Arduino Interface Board

The Arduino Interface Board offers support for connection to Arduino Compatible Interface platforms.

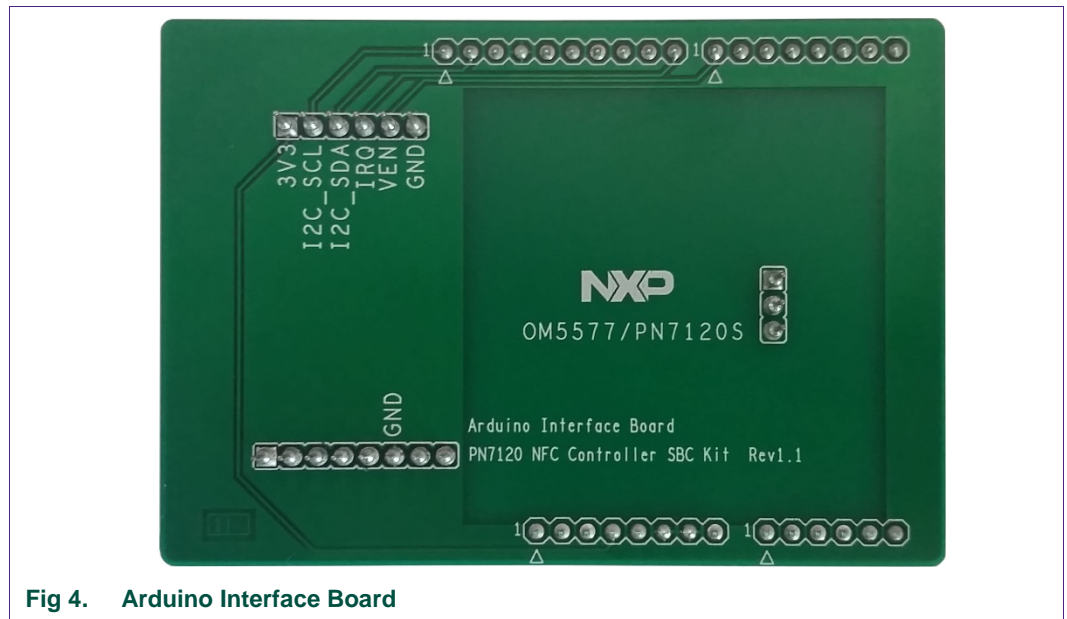


Fig 4. Arduino Interface Board

2.2 NFC Sample Card

OM5577/PN7120ARD kit includes an NFC Sample Card, based on NTAG216 tag IC, allowing to demonstrate NFC reader capabilities of PN7120 NFC Controller.

For the current purpose of PN7120 NFC Controller demonstration, the card has been pre-configured with NDEF URI type message "<http://www.nxp.com/demoboard/OM5577>".

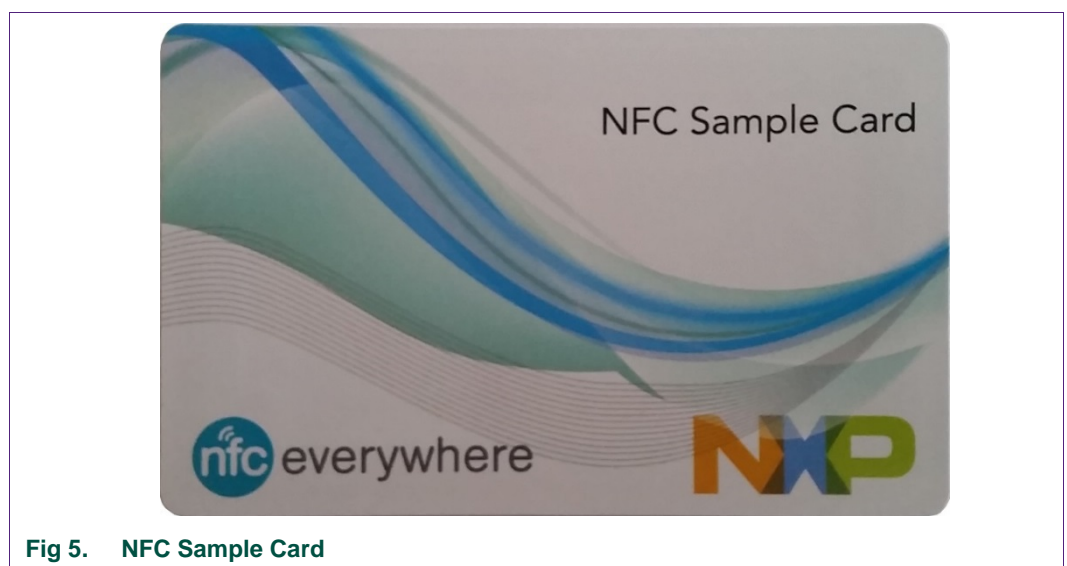
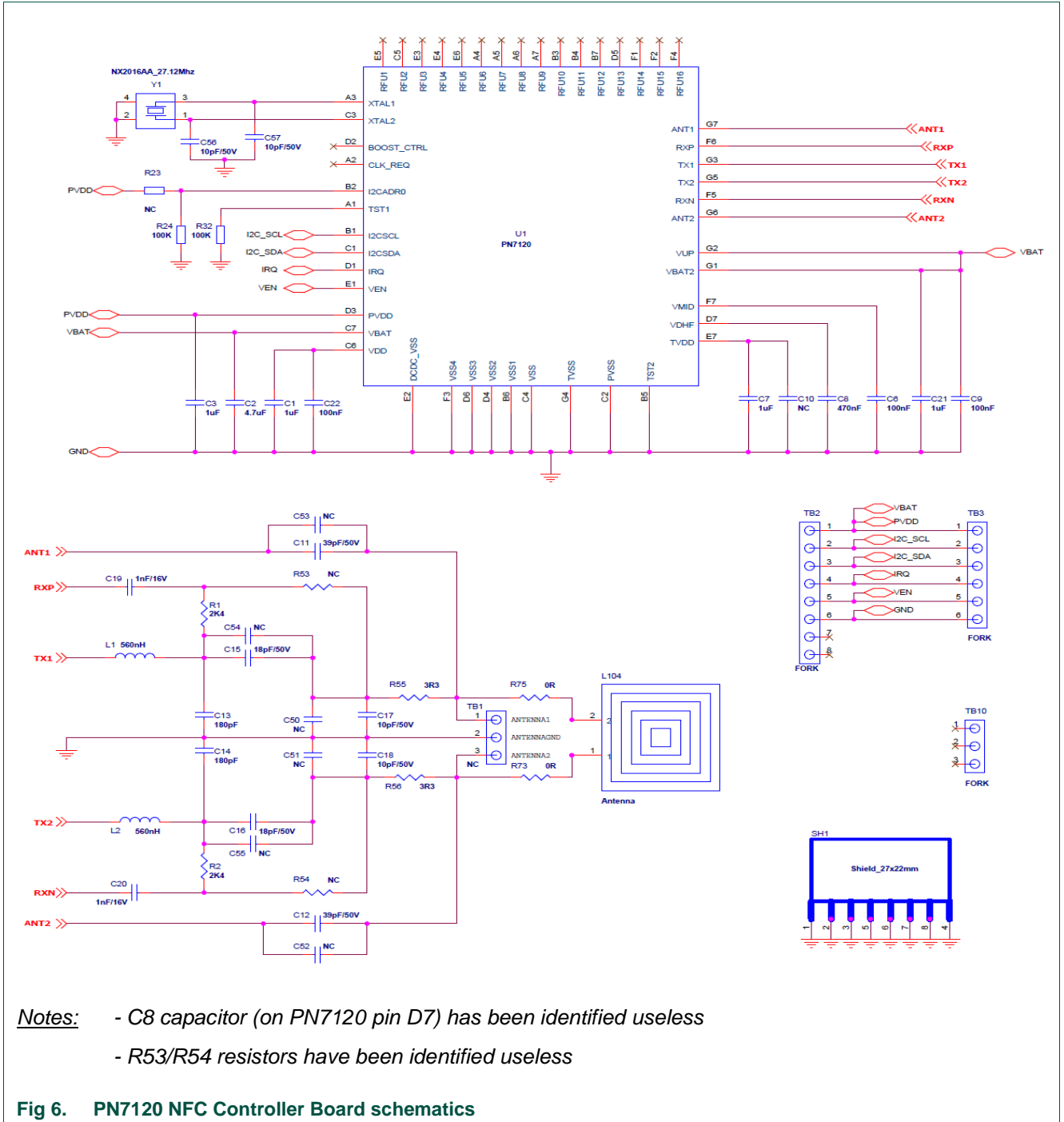


Fig 5. NFC Sample Card

3. Details

3.1 PN7120 NFC Controller Board

3.1.1 Schematics



3.1.2 Layout

3.1.2.1 Components layers

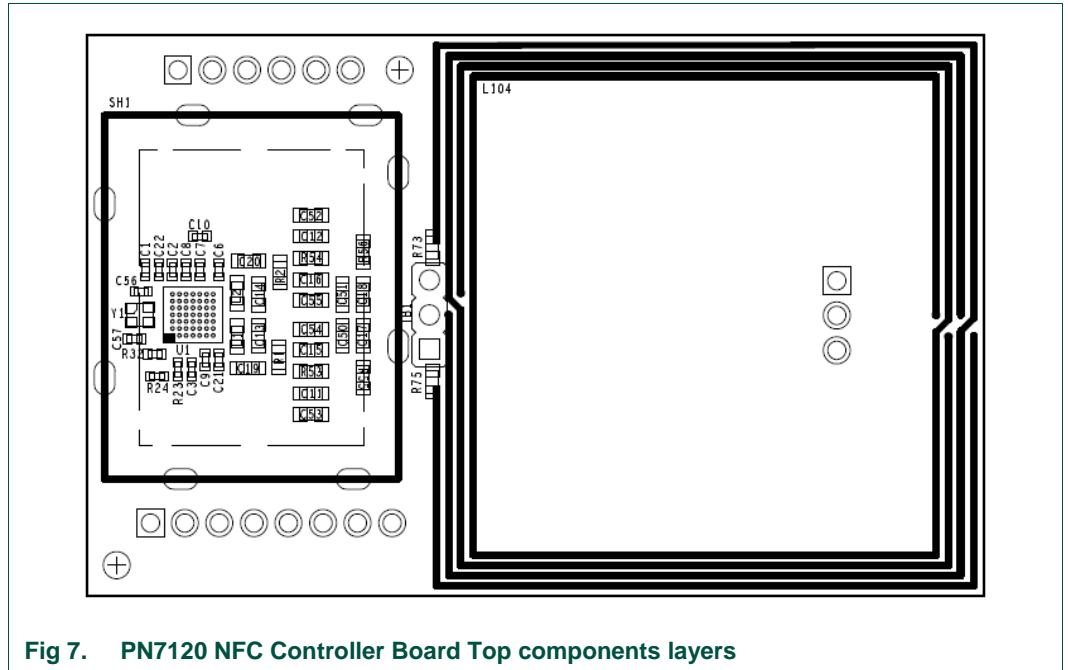


Fig 7. PN7120 NFC Controller Board Top components layers

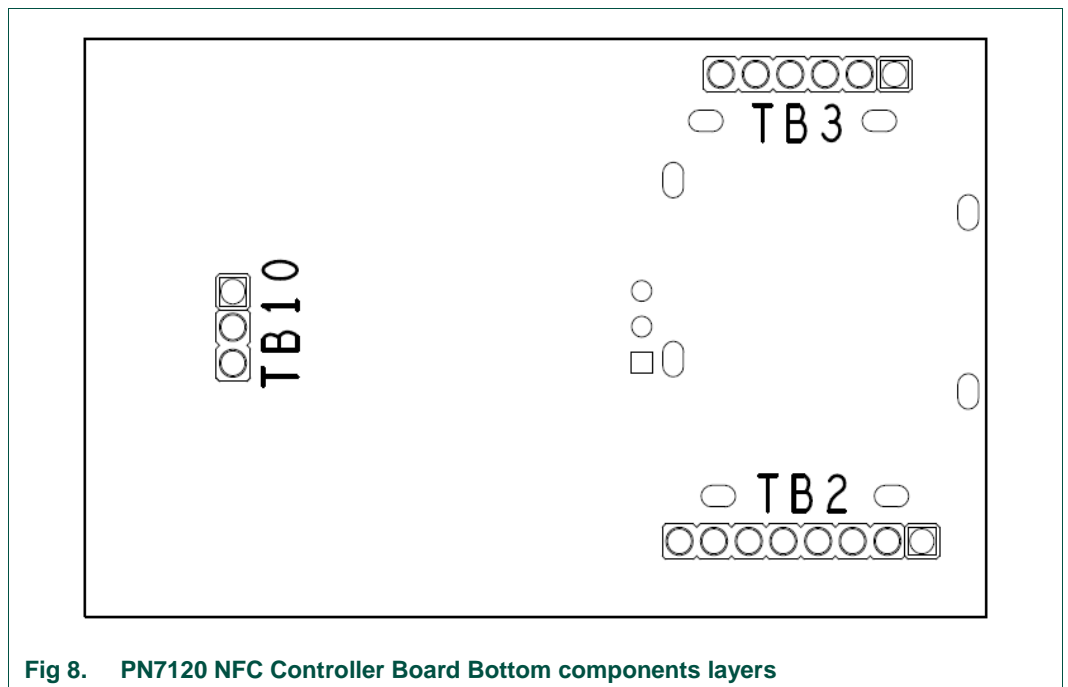
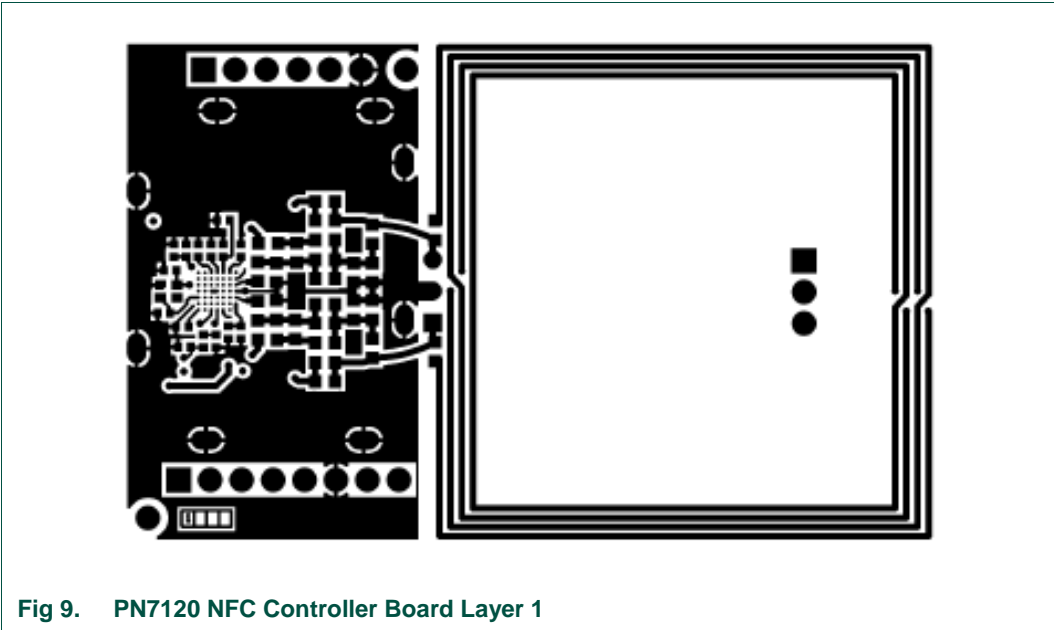
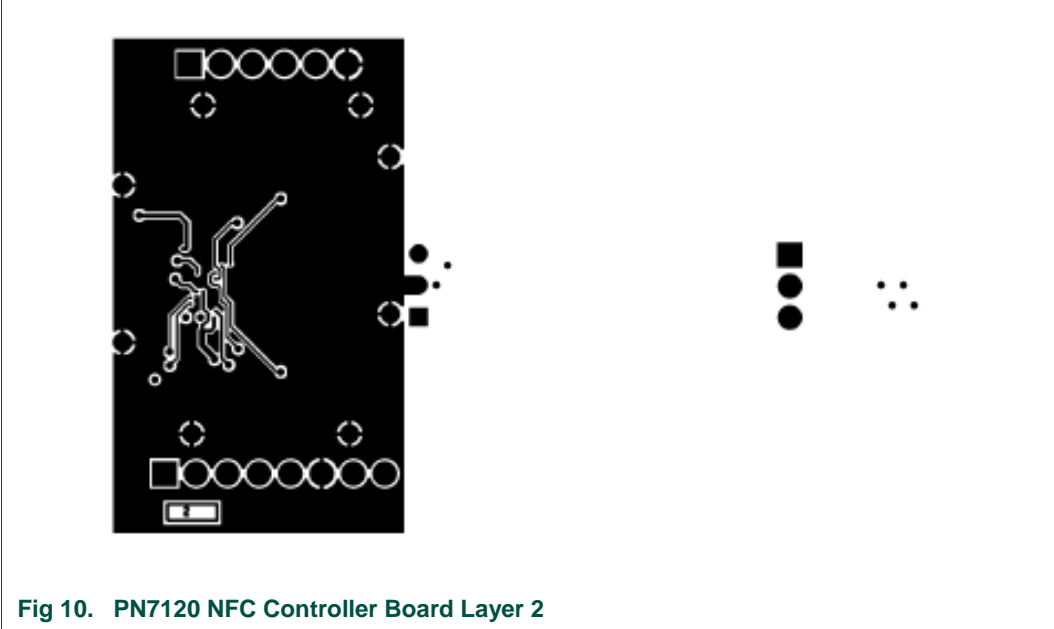


Fig 8. PN7120 NFC Controller Board Bottom components layers

3.1.2.2 Layer 1



3.1.2.3 Layer 2



3.1.2.4 Top Silkscreen layer

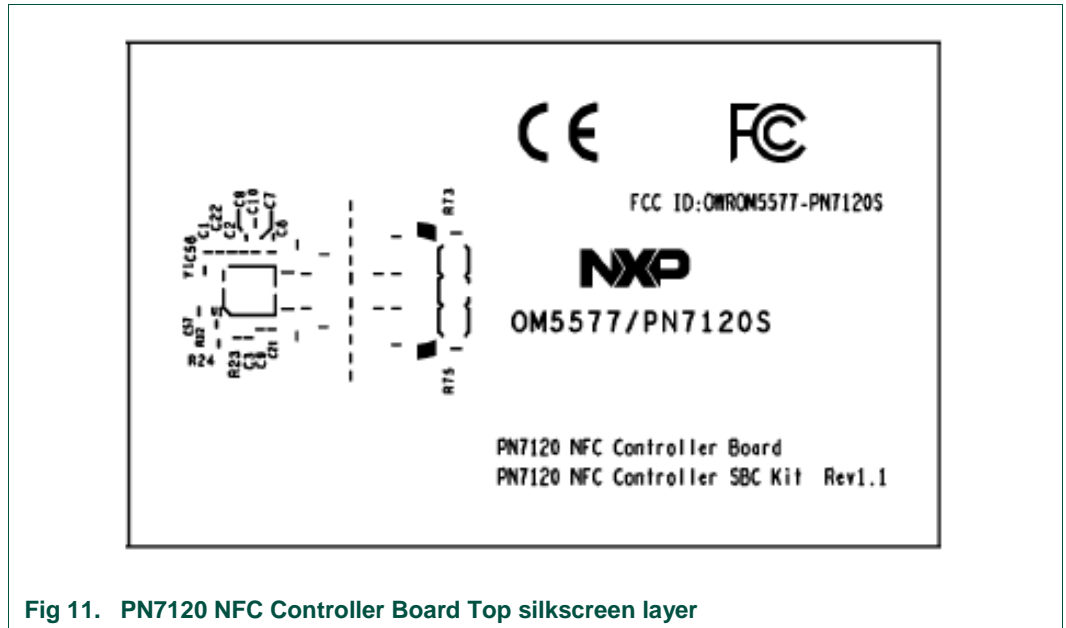


Fig 11. PN7120 NFC Controller Board Top silkscreen layer

3.2 Arduino Interface Board

3.2.1 Schematics

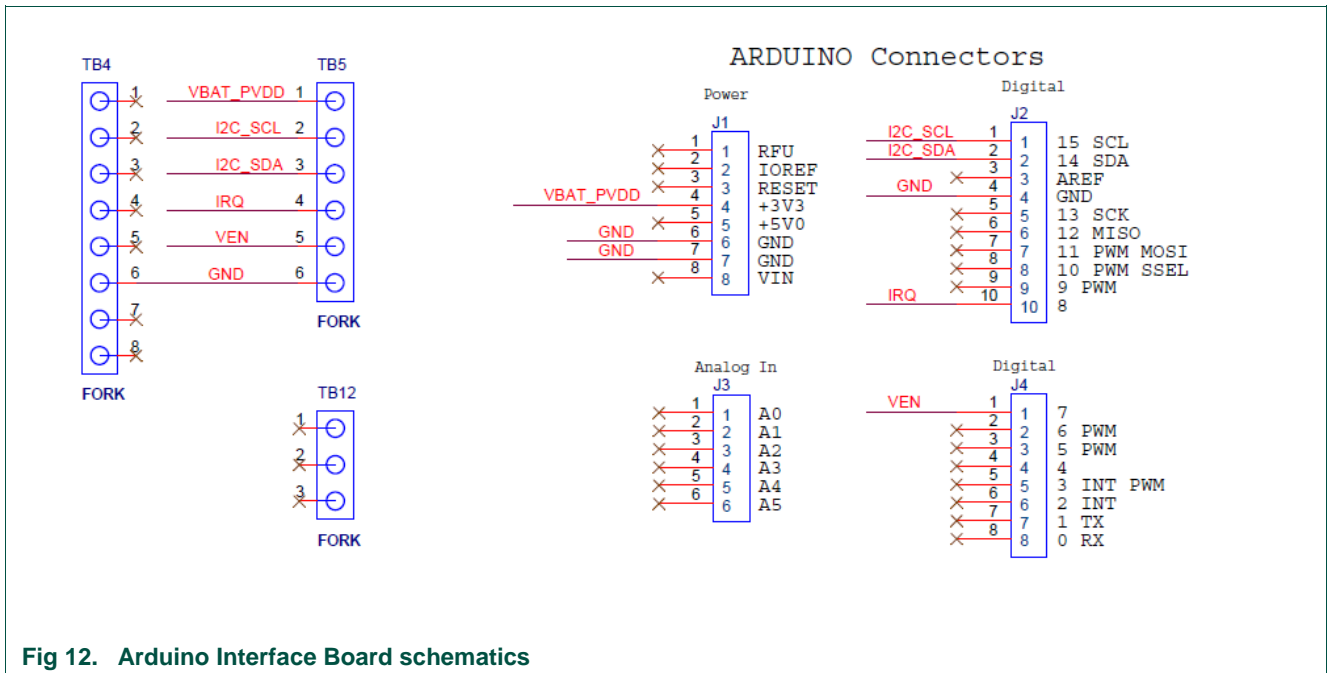


Fig 12. Arduino Interface Board schematics

3.2.2 Layout

3.2.2.1 Components layers

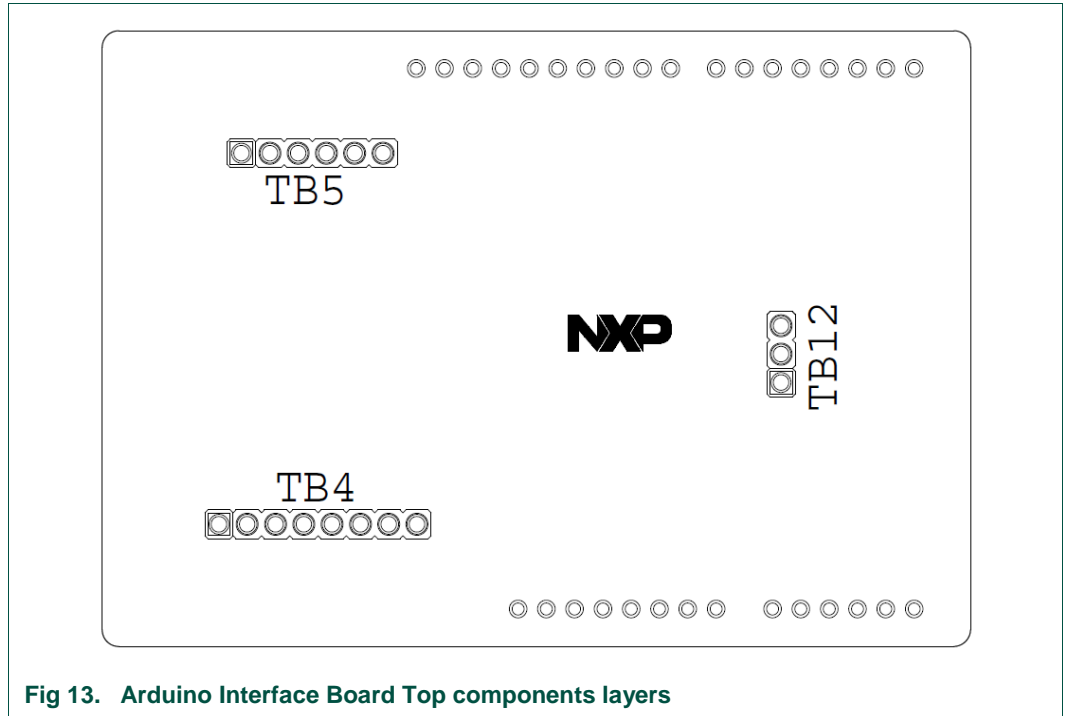


Fig 13. Arduino Interface Board Top components layers

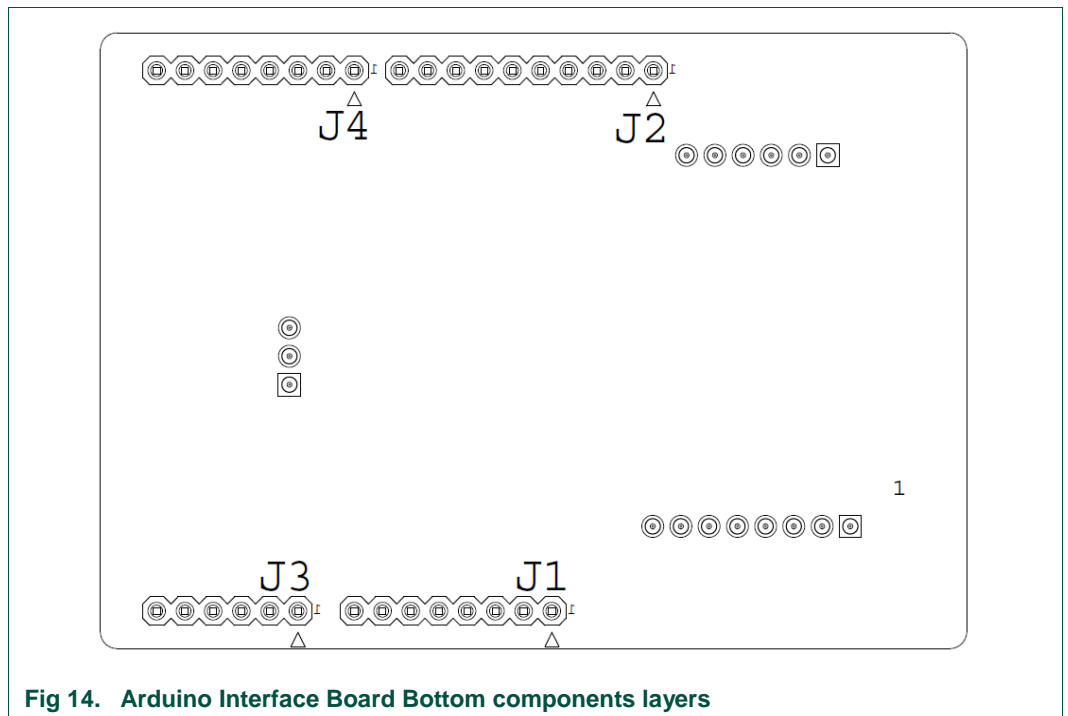


Fig 14. Arduino Interface Board Bottom components layers

3.2.2.2 Layer 1

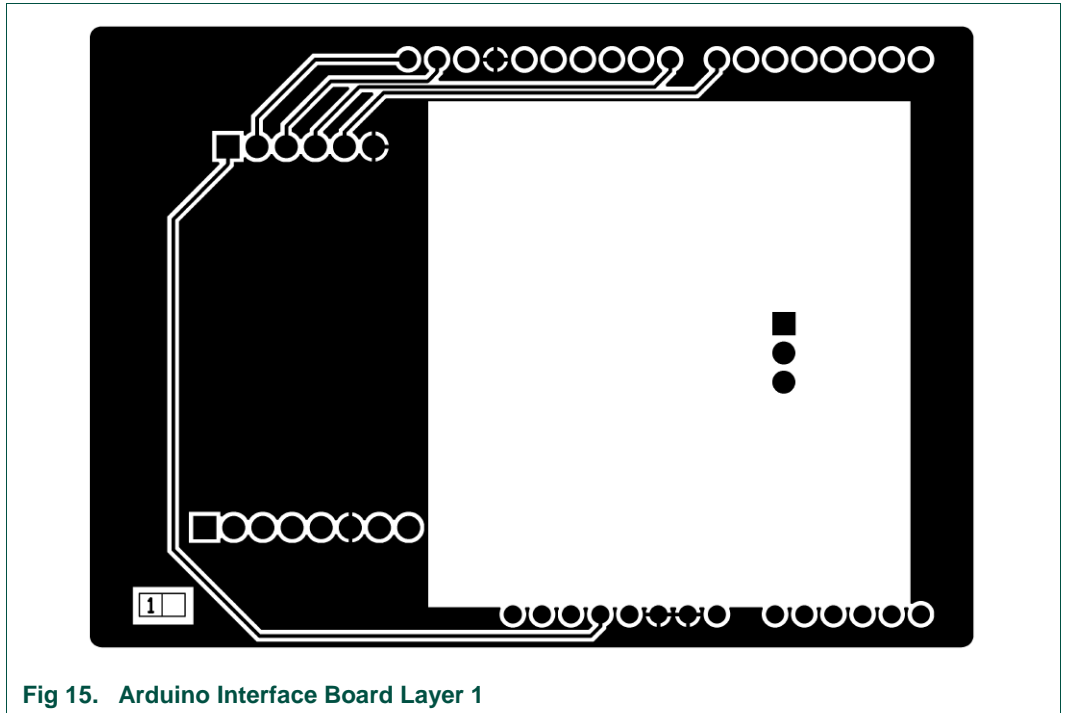


Fig 15. Arduino Interface Board Layer 1

3.2.2.3 Layer 2

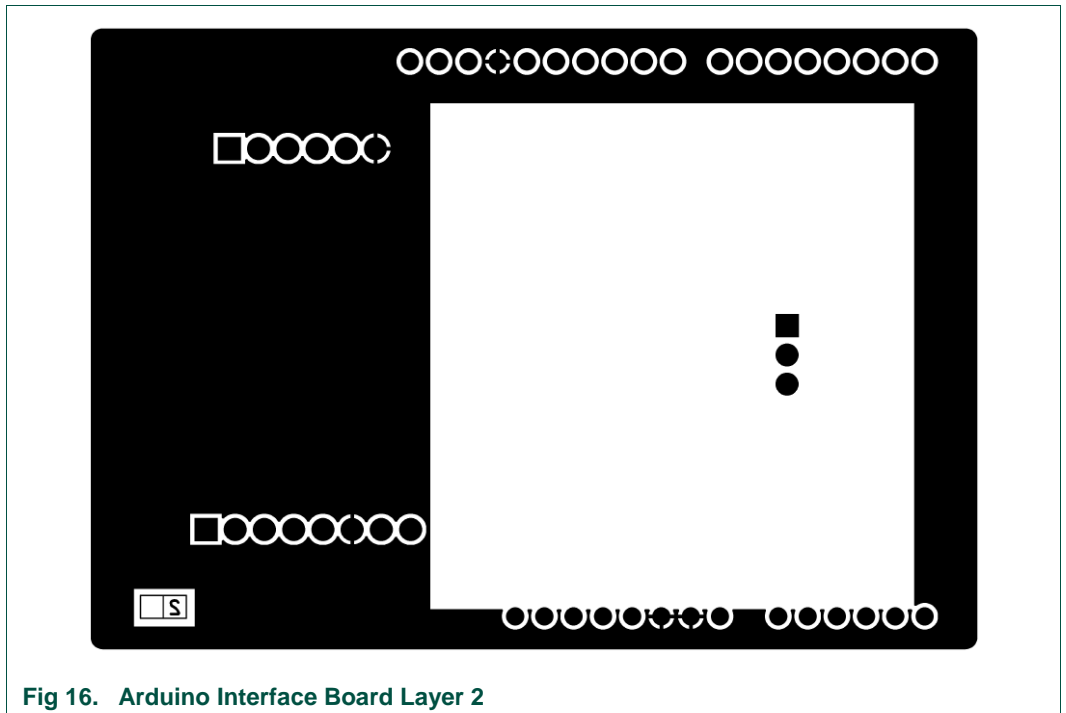


Fig 16. Arduino Interface Board Layer 2

3.2.2.4 Top Silkscreen layer

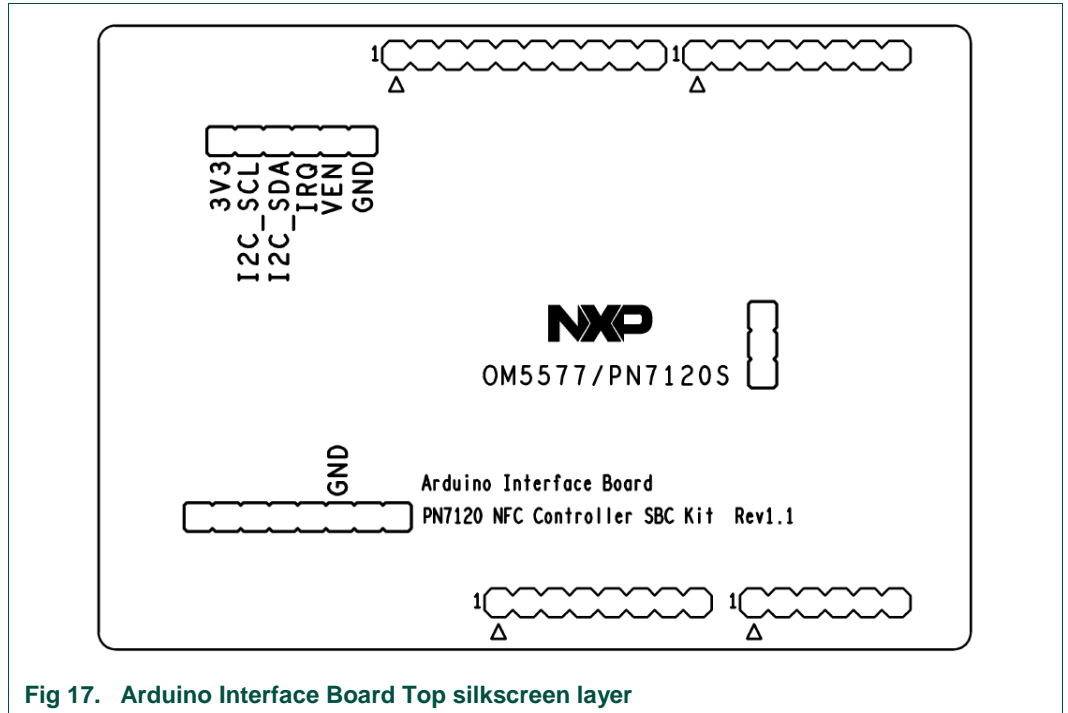


Fig 17. Arduino Interface Board Top silkscreen layer

4. PN7120 NFC Controller Board performances

Following RF performance results are obtained running the demo kit:

Table 1. Power Transfer (Poll mode)

Measured with EMVCo reference PICC

@ 0cm	@ 1cm	@ 2cm	@3 cm
7.6 V	6.7 V	4,3 V	1,2 V

Table 2. Reader/Writer mode performance

Card type	Communication distance (mm)
ISO 15693 UPM RaceTrack	120
NFC Sample Card (NTAG216 – ID1)	80
NFC Sticker (NTAG216 – 40x40)	68
Topaz (35mm Round)	55
Type B (ID1)	45
Felica (ID1)	36

Table 3. Peer to Peer mode performances

Vs Samsung Galaxy S7 phone

Communication distance	
moving phone from far to close	moving Phone from close to far
50	65

Table 4. Card Mode performance

Vs NXP Pegoda Reader

Communication distance (mm)
180

5. Additional information

5.1 Using different Antenna

The OM5577/PN7120S kit provide a flexible way of connecting an external RF antenna to be used in place of the on-board one.

On the PN7120 NFC Controller Board, the dedicated 3 pins connector referenced as TB1 allows to connect your own antenna.

In this case the on-board antenna must be first disconnected, removing resistors R75 and R73.

Obviously matching circuitry must be adapted as described in related document “AN11564 - PN7120 Antenna and Tuning Design Guide” (can be downloaded from PN7120 Product Web Page [4]).

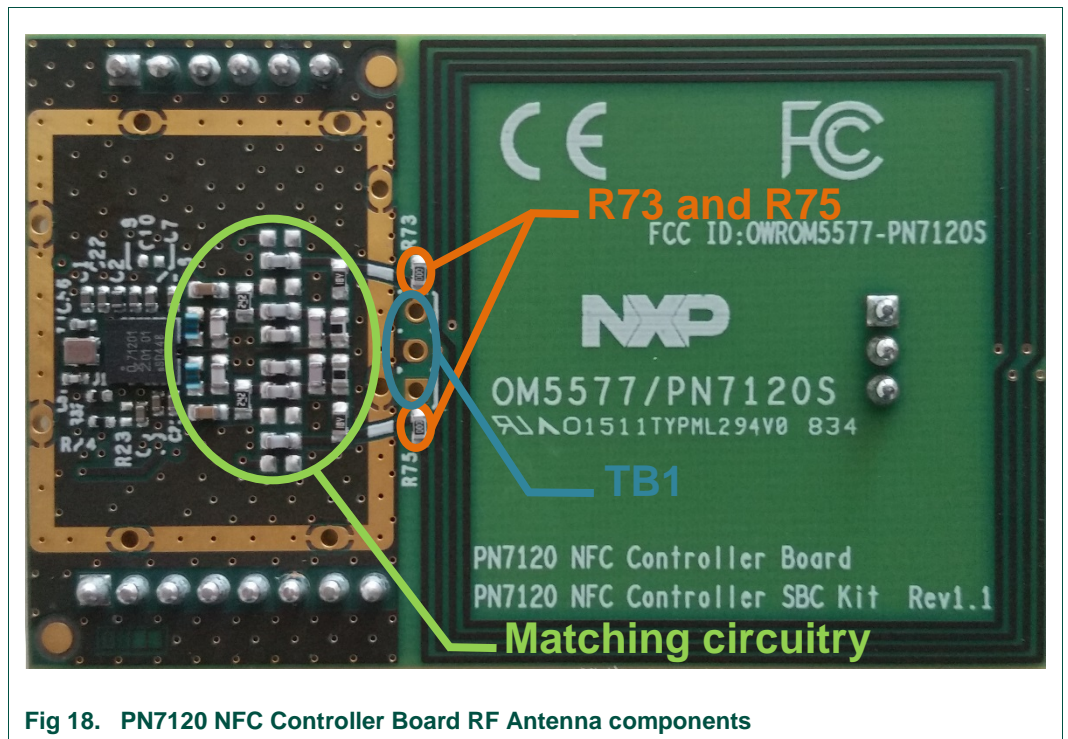


Fig 18. PN7120 NFC Controller Board RF Antenna components

Table 5. PN7120 NFC Controller Board TB1 connector pinout

TB1	PN7120 signal
#1	ANTENNA 1
#2	GND
#3	ANTENNA 2

5.2 Using in another system

The OM5577/PN7120S demonstration kit can be reuse in system without Arduino compatible connectors.

Indeed, the PN7120 NFC Controller Board provides all required signal on TB2 and TB3 (signals are duplicated on both connectors) connectors to interface boards.

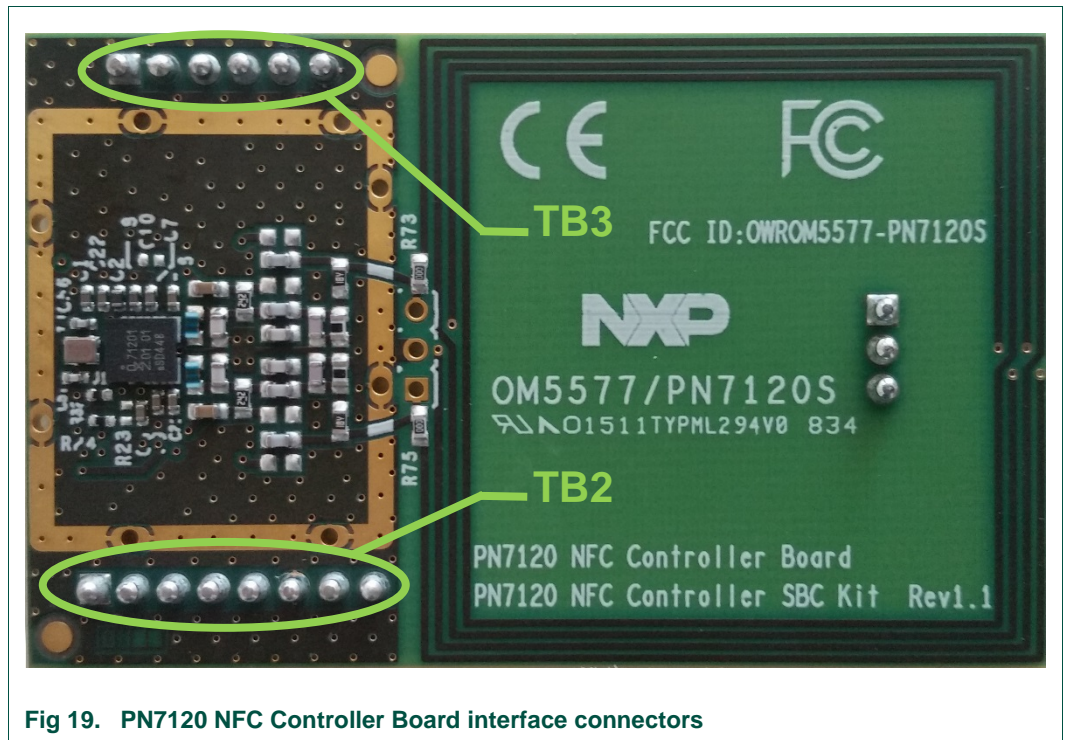


Fig 19. PN7120 NFC Controller Board interface connectors

Table 6. PN7120 NFC Controller Board TB2 connector pinout

TB2	PN7120 signal
#1	VBAT/VDD(PAD): 3.3V supply voltage
#2	I2CSCL: I2C-bus serial clock input
#3	I2CSDA: I2C-bus serial data
#4	IRQ: interrupt request output
#5	VEN: reset pin
#6	GND: ground
#7	Not connected
#8	Not connected

Table 7. PN7120 NFC Controller Board TB3 connector pinout

TB3	PN7120 signal
#1	VBAT/VDD(PAD): 3.3V supply voltage
#2	I2CSCL: I2C-bus serial clock input
#3	I2CSDA: I2C-bus serial data
#4	IRQ: interrupt request output
#5	VEN: reset pin
#6	GND: ground

6. Product certification

Only the default configuration of the product is considered in below certification statements. Others configurations, described in chapter 5, are excluded.

6.1 European Conformity

The PN7120 NFC Controller Board (see chapter 2.1.1) meets applicable tests and performance criteria for residential, commercial and light industrial environments in European standards:

- EN 301 489-3: Electromagnetic compatibility and Radio spectrum Matters; ElectroMagnetic Compatibility
- EN 50364: Limitation of human exposure to electromagnetic fields
- EN 300 330-2: Electromagnetic compatibility and Radio spectrum Matters; Short Range Devices
- EN 60950-1: Information Technology Equipment - Safety

Electrostatic discharge immunity evaluation not been conducted on the whole accessible parts, the device must be protected against those discharges.

Arduino Interface Board (see chapter 2.1.2) have not been used during the conformity evaluation then they are not in the scope of the current conformity statement.

The product must be provided with Fire enclosure or must be supplied by a limiter power source according to Item 2.5 of EN 60950-1. Power must deliver Safety Extra Low Voltage.

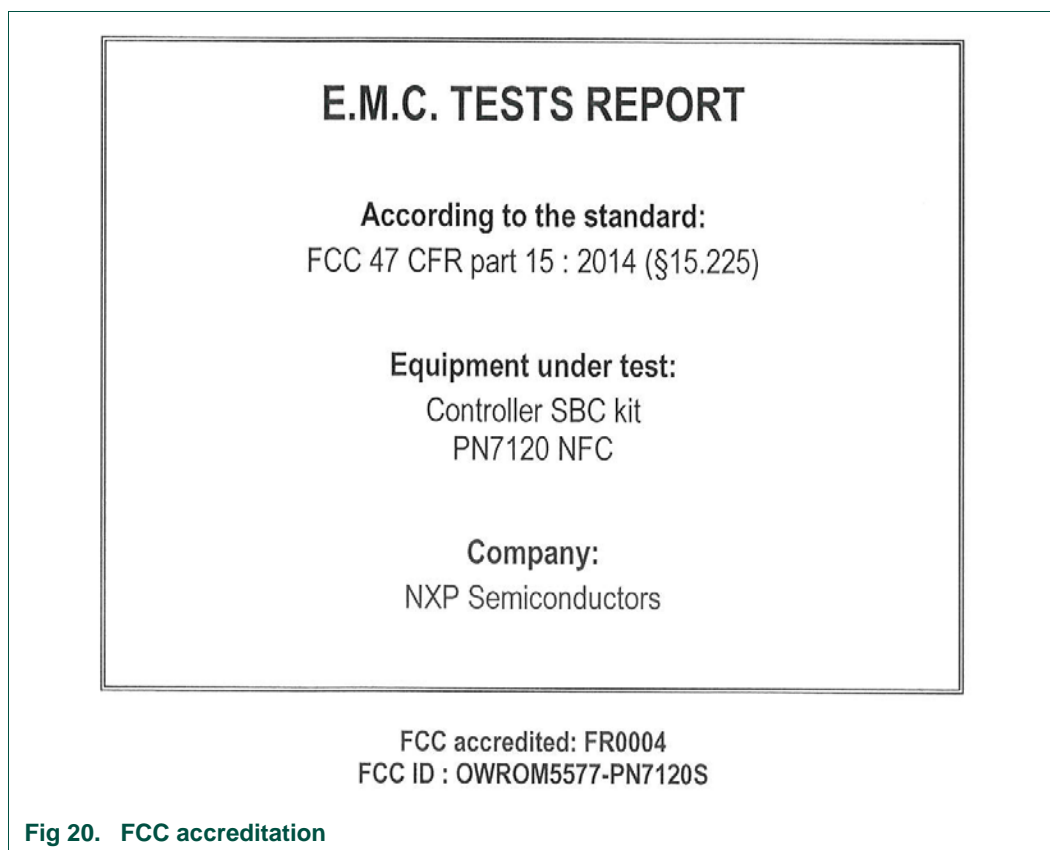
Additionally, the current conformity is only applicable in the following conditions:

- Product VBAT power supply is 3.3V
- Operational temperature is between -20°C and 55°C
- Cables used to enforce the product must be of maximum 3 meters length

6.2 Federal Communication Commission Interference Statement

6.2.1 FCC Grant

The PN7120 NFC Controller Board have been tested to fulfil the approval requirements FCC 47 CFR part 15: 2014 (§15.225).



6.2.2 Installation instructions

PN7120 NFC Controller board can then be reused as a module for integration into end devices following below instruction/restrictions:

- The module is limited to OEM installation ONLY
- The OEM/Integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module
- The module is limited to installation in mobile or fixed applications, according to Part 2.1091(b)
- Separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
- Authorized antennas per Part 15.204 (including ant. spec.)
- Antenna installation requirements, where relevant
- The finished product's user manual must include following statements:
 - Part 15.19 Warning Statement:

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful

interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- Part 15.21 Warning Statement:

The user manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: The grantee is not responsible for any changes or modifications not expressly approved by the third party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

- End-users must be provided with transmitter/antenna installation requirements and operating conditions for satisfying RF exposure compliance:

- A separate section should clearly state "FCC RF Exposure requirements"
- Required operating conditions for end users
- Antenna/or transmitter installation requirements, where relevant (for example: The antenna used with this module must be installed to provide a separation distance of at least 20 cm from all persons, and must not transmit simultaneously with any other antenna or transmitter.)

- « Contains Transmitter module FCC ID :OWROM5577-PN7120S » or «Contains FCC ID : OWROM5577-PN7120S »

7. References

- [1] The Arduino Uno is a microcontroller board with 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

For more information about it please visit <https://www.arduino.cc/en/Main/ArduinoBoardUno>.

- [2] The Freedom-K64F is an ultra-low-cost development platform for Kinetis K64, K63, and K24 MCUs.

For more information about it please visit <http://www.nxp.com/products/software-and-tools/hardware-development-tools/freedom-development-boards/freedom-development-platform-for-kinetis-k64-k63-and-k24-mcus:FRDM-K64F>

- [3] LPCXpresso is a low-cost development platform available from NXP, supporting NXP's ARM-based microcontrollers. The platform is comprised of a simplified Eclipse-based IDE and low-cost target boards which include an attached JTAG debugger. LPCXpresso is an end-to-end solution enabling embedded engineers to develop their applications from initial evaluation to final production.

For more information about it please visit <http://www.nxp.com/products/software-and-tools/hardware-development-tools/lpcxpresso-boards:LPCXPRESSO-BOARDS>

- [4] PN7120 Product Web Page: http://www.nxp.com/products/identification_and_security/nfc_and_reader_ics/nfc_controller_solutions/PN7120A0EV.html

- [5] OM5577 demo kit Web Page: <http://www.nxp.com/demoboard/OM5577>

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