# Integration Manual: EXPLORE-NFC

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## Document information

| Info | Content |
|---|---|
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| Keywords | EXPLORE-NFC, NFC, Near Field Communication add-on board, Raspberry Pi, RFID |

NXP founded by Philips

## Revision History

| Revision | Date | Description | Author |
|---|---|---|---|
| 0.90 | 2013.10.02 | First Draft Version | Pavel Slamnik |
| 1.00 | 2014.10.08 | Second Version | Pavel Slamnik |

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# 1. EXPLORE-NFC – NEAR FIELD COMMUNICATION ADD-ON BOARD FOR THE RASPBERRY PI: PHOTO


Figure 1: EXPLORE-NFC – top view.

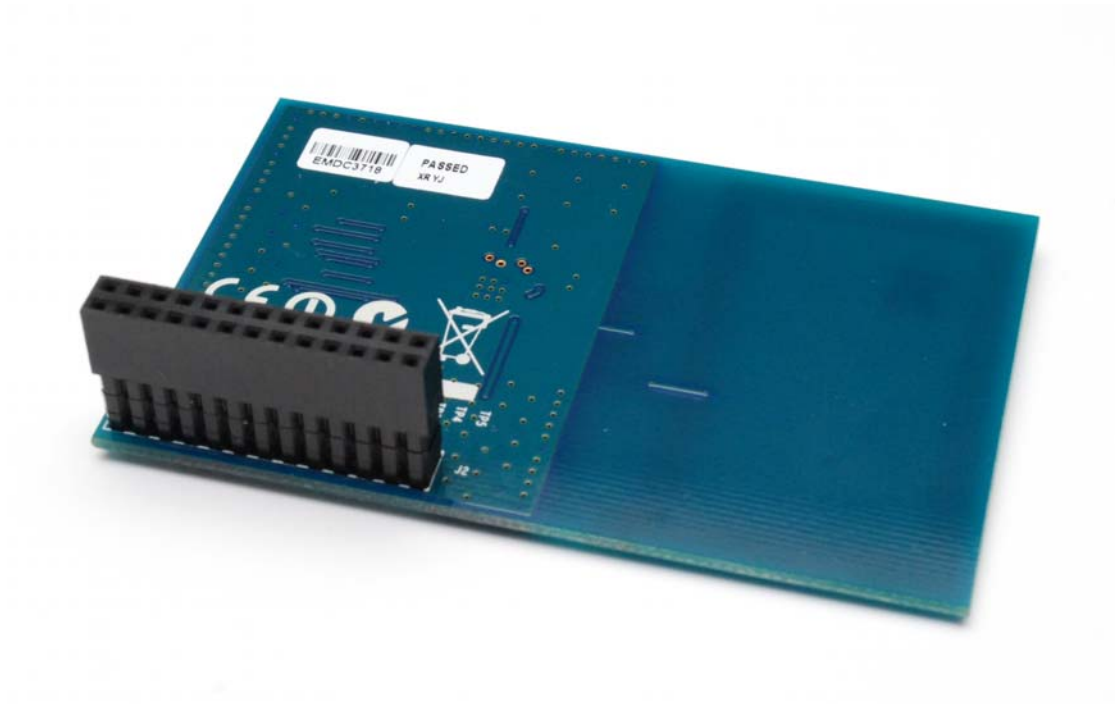


Figure 2: EXPLORE-NFC – bottom view.


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# 2. EXPLORE-NFC: Near Field Communication add-on board for the Raspberry Pi

## 2.1. Operational desription

EXPLORE-NFC, NearField Communication add-on board for the Raspberry Pi, is an example of implementation of ISO/IEC 14443A and ISO/IEC 14443B reader/writer and NFC reader/writer on the same printed board. Small size antenna, implemented on the same pcb, permits reading/writing on distance up to 30 mm (RFID card or other NFC device). The onboard connector permits direct connection and communication with with Raspberry Pi computer. Power supply is via Raspberry Pi computer and no extra power supply is needed for EXPLORE-NFC board.

On the EXPLORE-NFC, Near Field Communication add-on board for the Raspberry Pi, main parts are easily visible:

- the pcb antenna,
- the antenna matching components,
- the IC part with IC PN512, crystall oscillator and decopling capacitors,
- 26-pin header for connecting with Raspberry Pi computer Board,
- power supply voltage 3.3 V is via 26-pin GPI/O connector to to Raspeberry Pi computer board.

The EXPLORE-NearField Communication add-on board for the Raspberry Pi uses a 26-pin connector to be connected to a GPI/O connector on Rasperry Pi computer. Serial communication between EXPLORE-NearField Communication add-on board for the Raspberry Pi is via SPI or I2C interface.

The EXPLORE-NearField Communication add-on board for the Raspberry Pi with embedded firmware has following features:

- Supports ISO/IEC 14443A and ISO/IEC 14443B reader/writer up to 424 Kbps.
- Supports MIFARE 1K/4K encryption in reader/writer mode.
- Supports all NFCIP-1 modes up to 424 Kbps. The PN512 handles the complete NFC framing and error detection.
- Supports contactless RF communication according to the FeliCa protocol at 212 Kbps and 424 Kbps.
- Embedded firmware commands allow use of the NFC secure layer.
- Integrated antenna component detector.
- Serial communication: SPI or I2C.

This board is an example of implementation of a Near Field Communication reader/writer on a EXPLORE-NFC board in connection with Raspberry Pi computer.

**Disclaimer**:

This module is intended only for development and evaluation purposes, and cannot be used in a finished product without further certification on the assembly.


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Figure 3: EXPLORE-NFC Board with Raspberry Pi computer - Block diagram.

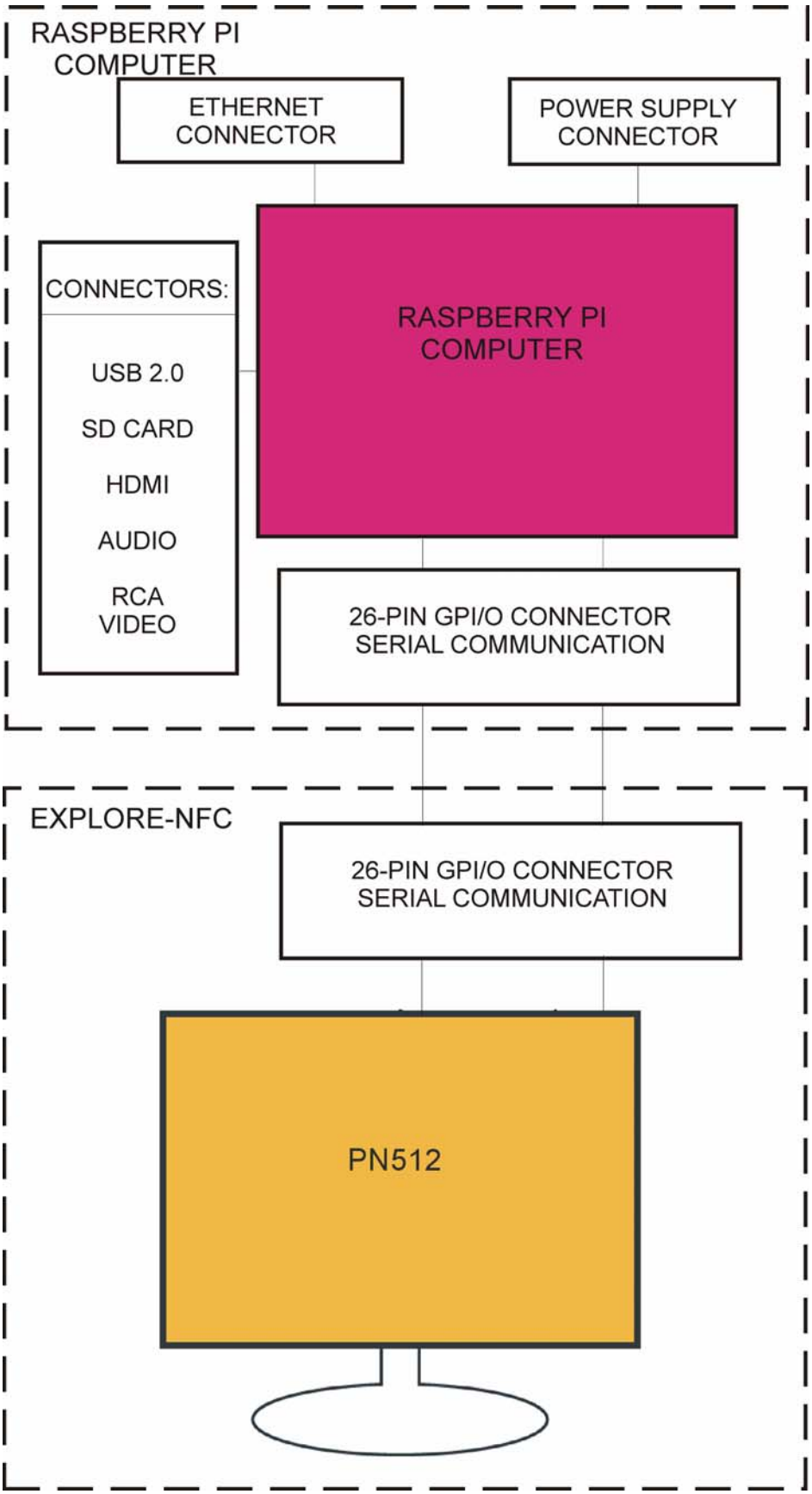



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Figure 4: EXPLORE-NFC: view and dimensions.

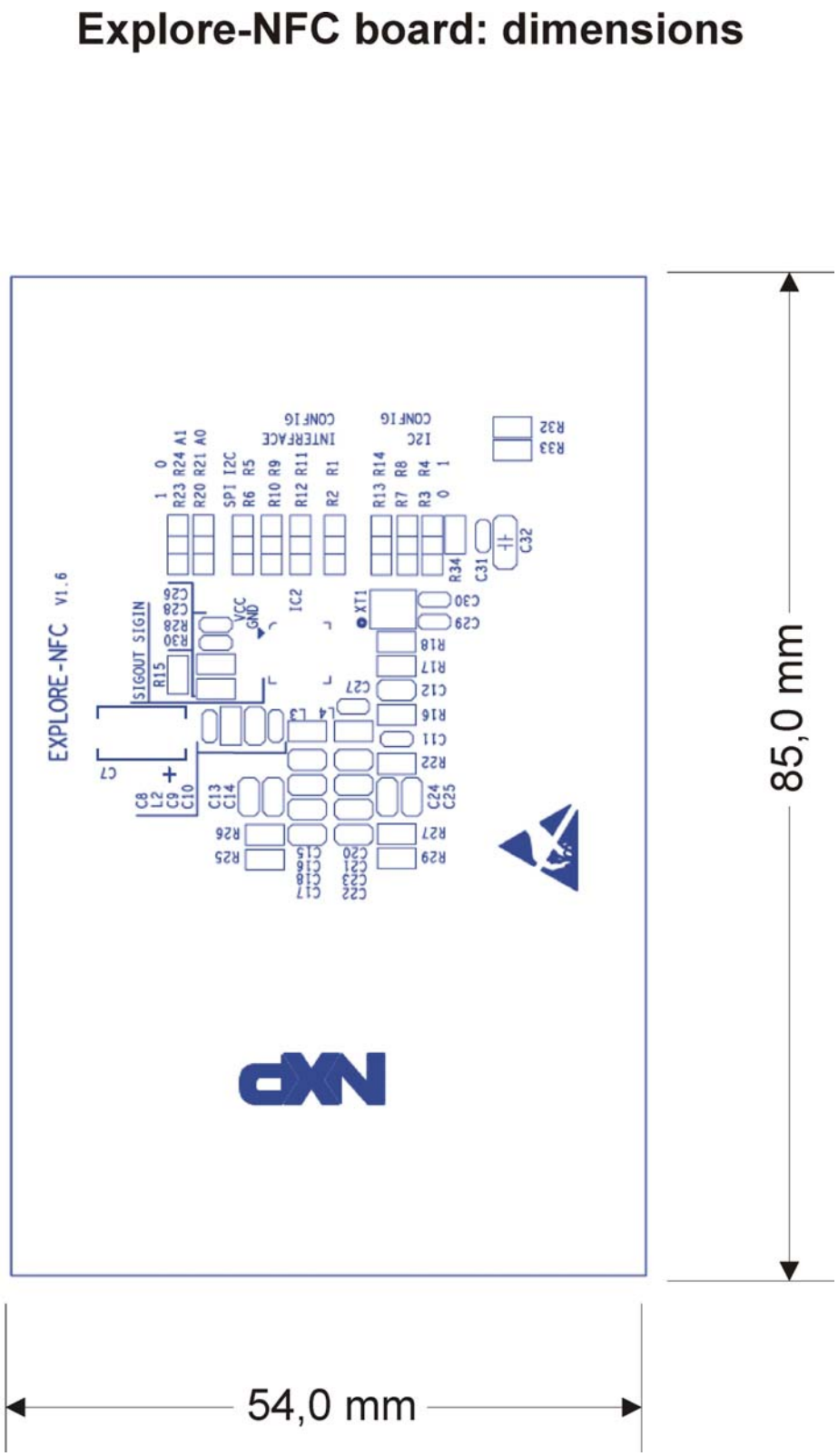



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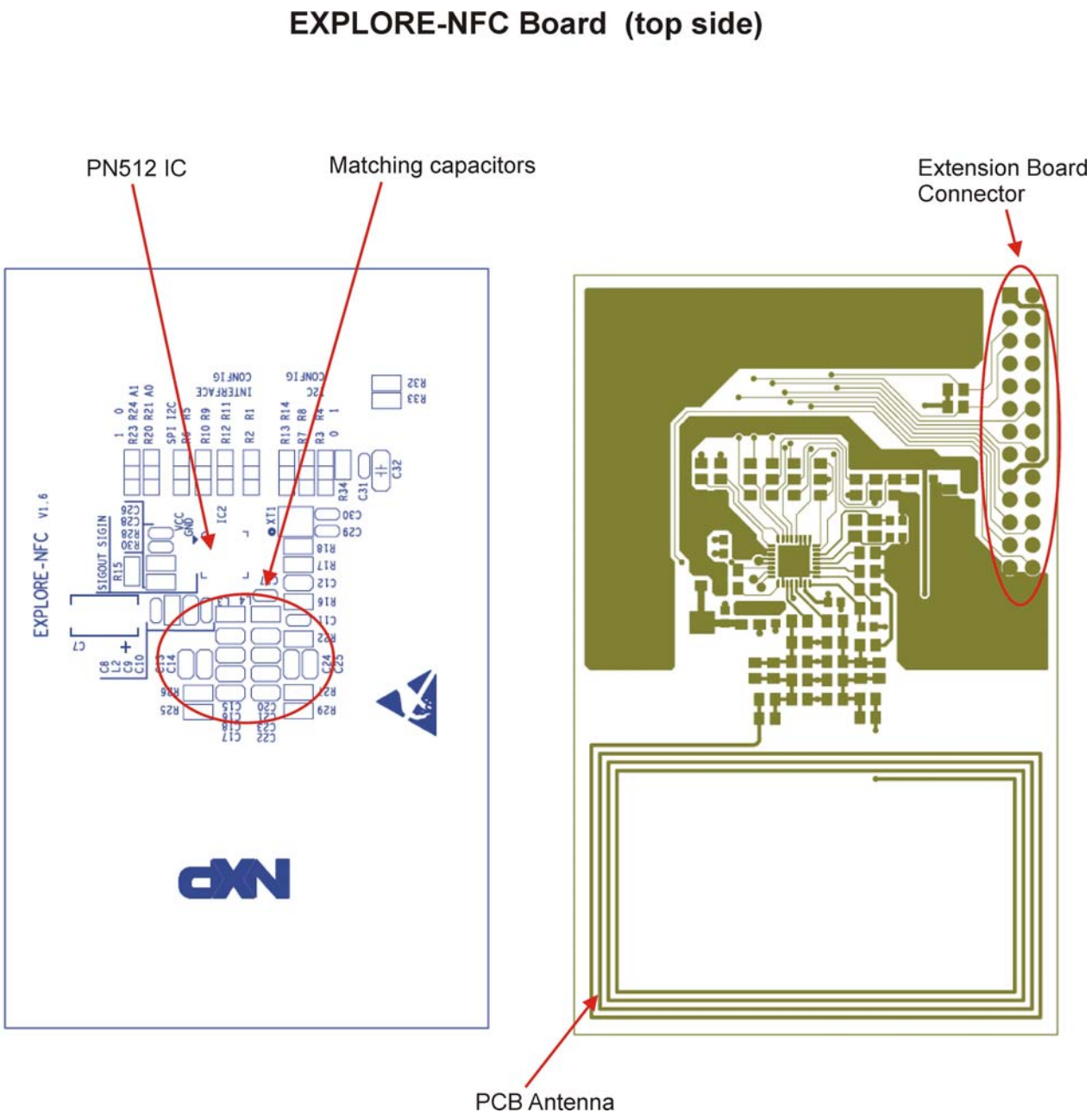
Figure 5: EXPLORE-NFC: pcb with main parts.





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## 2.2. EXPLORE-NFC Board: Description of Operation

Fuctional description of EXPLORE-NFC board is described in this section.

Raspberry Pi computer in connection with EXPLORE-NFC board via GPI/O connector are described in separate sections.


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### 2.2.1. 26-pin GPI/O connector – for connection with Raspberry Pi computer Board

EXPLORE-NFC board has 26-pin GPI/O connector (J2) on board for connection with Raspberry Pi computer board. Different communication modes (SPI, I2C) are possible between EXPLORE-NFC board and Raspberry Pi computer.

Power supply source voltage 3V3 is present on Raspberry Pi computer and is used to supply EXPLORE-NFC board .

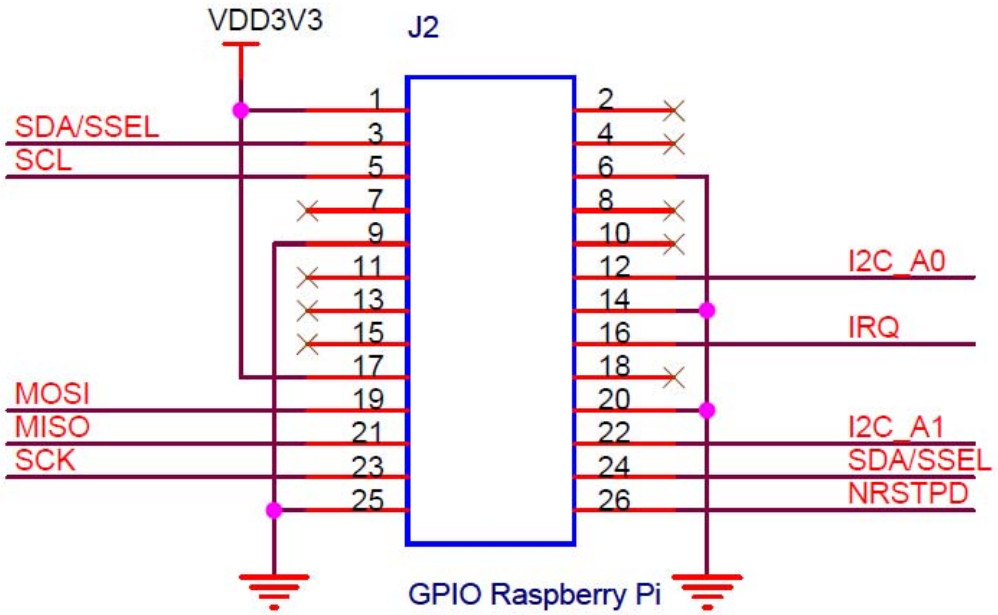


Figure 6: 26-pin GPI/O connector (J2) with signal lines and table (communication modes).


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### 2.2.2. PN512 Contactless Reader IC

Contactless Reader IC PN512 use only one power supply voltage - 3V3 V DC. All other voltages are generated internally. PN512 IC uses external quartz (27.12 MHz).

All comunication lines (SPI, I2C) are connected via 26-pin GPI/O connector to Raspberry Pi computer board.

Complementary output stage (TX1, TX2) pins are used to generate output signal for antenna. The receiver input is connected to pin RX.

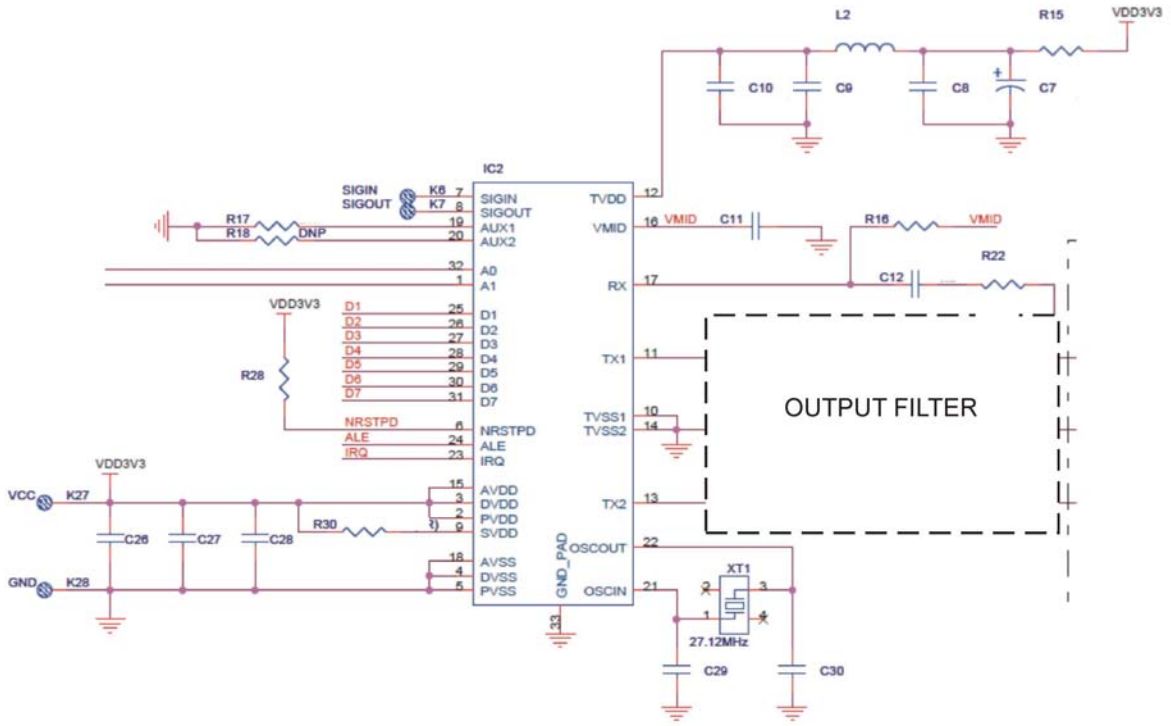


Figure 7: PN512 Contactless reader IC with sorundings parts (schematic partial).


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### 2.2.3. PCB Antenna with matching capacitors

Output stage of IC PN512 is connected to pcb antenna via filter stage (matchin capacitors). Filter stage provide maximum adaption from output stage (PN512) to antenna (with matching capacitors). The filter is located near the IC PN512.
Additional tunning between antenna and output stage of IC PN512 is not required from user.

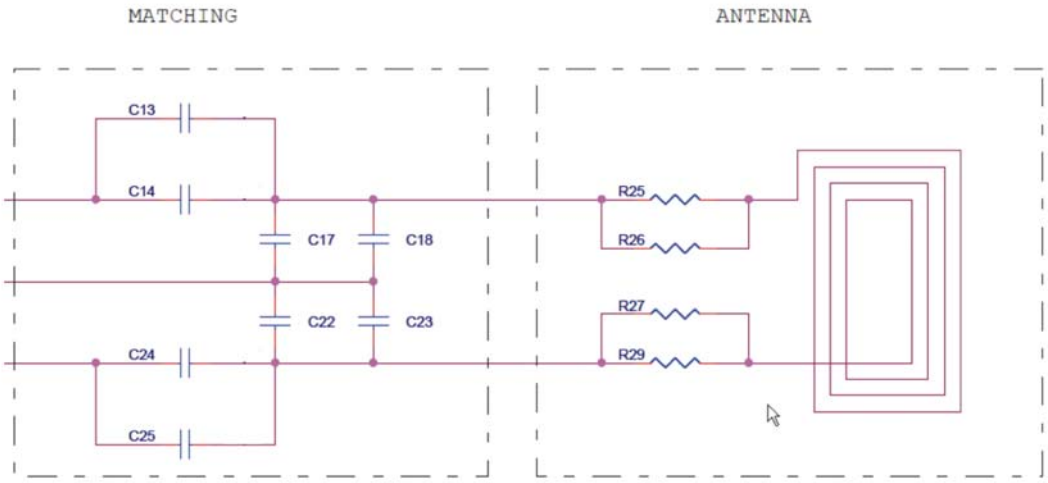


Figure 8: Output filter matching stage with antenna (principle).

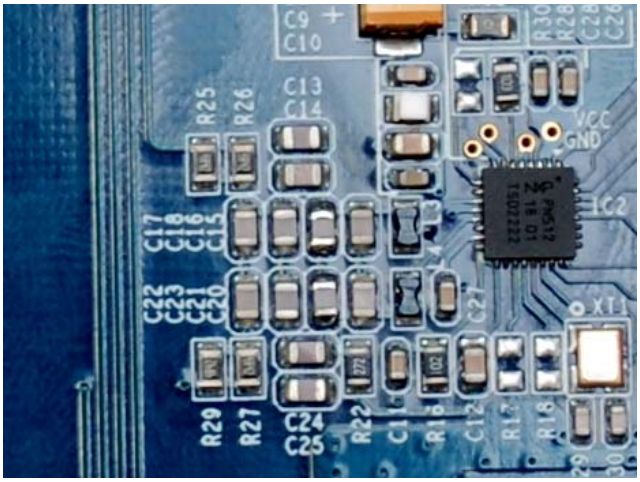


Figure 9: Output filter stage and antenna (part of antenna) part with matching capacitors – pcb view.


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### 2.2.4. Communication settings: I2C and SPI

Serial communication via GP I/O connector with Raspberry Pi computer is possible with I2C or SPI serial communication.

Figure 10 show part of schematic with configuration settings with resistors for I2C mode and SPI mode.

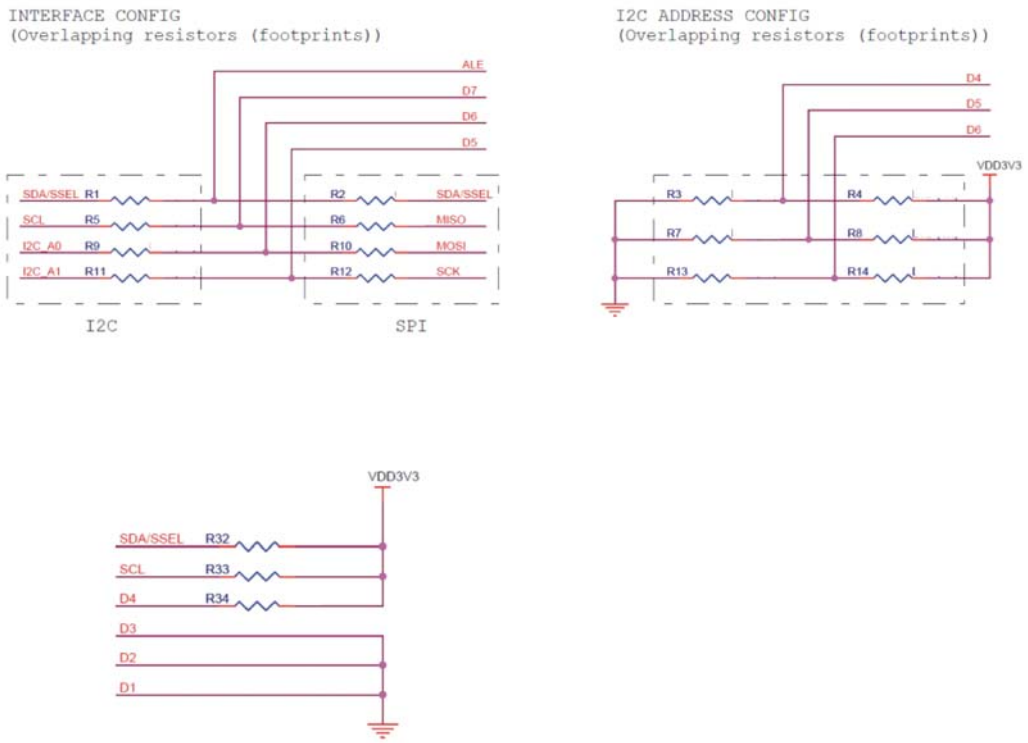


Figure 10: I2C and SPI communication settings (principle).


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### 2.2.5. Power Supply: 3,3 V DC via GPI/O connector from Raspberry Pi computer

External power supply 3V3 / 100mA (typically 60 mA) is provided from Raspberry Pi computer – via 26-pin GPI/O connector.

EXPLORE-NFC Extension board is designed to operate with 3V3 DC with typical consumption 60 mA.

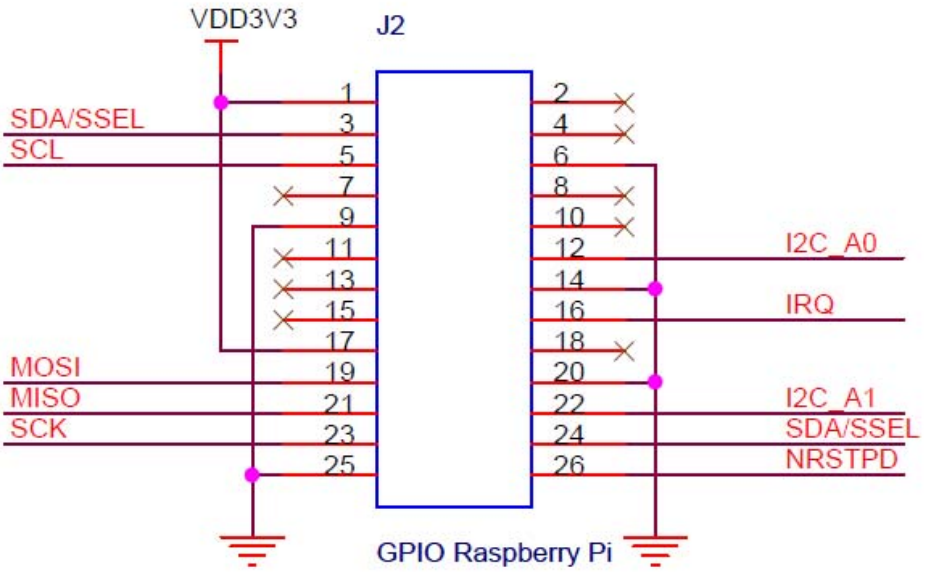


Figure 11: External power supply 3V3 is provided from Raspberry Pi computer board via 26-pin GPI/O connector.


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# 3. EXPLORE-NFC: SPECIFICATIONS

Table 1: EXPLORE-NFC board – specifications

| | |
|---|---|
| Antenna | |
| | PCB type, 52 mm x 32 mm |
| Contactless operating frequency | |
| | 13.56 MHz |
| Card reading/writing distance | |
| | Up to 30 mm |
| Contactless (RFID) Smart Card Interface | |
| | ISO 14443 A with 424 Kbps transmission rate (depending on card) |
| | ISO 14443 B with 424 Kbps transmission rate (depending on card) |
| | Supports all NFCIP-1 modes up to 424 Kbps transmission rate |
| | Supports FeliCa protocol at 212 Kbps and 424 Kbps transmission rate |
| Supported Interfaces (via 26-pin GP I/O connector for Raspberry Pi computer board) | |
| SPI | Up to 10 Mbit/s |
| I2C | Two I2C-bus interfaces to up to 400 kBd (Fast mode), up to 3400 kBs (Fast mode plus) |
| Electrical and Mechanical Specifications | |
| Power Supply | 3V3 DC / 100 mA (via 26-pin GP I/O connector from Raspberry Pi board) |
| PCB Dimensions (L x W x H) | 85 mm x 54 mm x 20 mm |
| Weight | approx. 22 g |
| Operating Temperature | 0… + 30 °C (without condensing) |
| Operating Humidity | 5 … 95% RH |
| Certificates | FCC, CE |
| | |


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Table 2: EXPLORE-NFC board – electrical characteristics

Operating Range

| Symbol | Description | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| PWR_DC | DC Power Supply | Active Reader | 2.5 | - | 3.6 | V |
| $T_{amb}$ | Ambient Temperature | / | 0 | +25 | +30 | °C |

Current Consumption

| Symbol | Description | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| IC5V | Supply Current | Active, RF on | - | 60 | 100 | mA |

Operating Distance

| Symbol | Description | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| DST | Operating Distance | Measured from the center of the antenna | - | 0 – 30 | - | mm |

Serial Interface Characteristics

| Symbol | Description | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| SPI | Baudrate | via Extension Connector | - | - | 10 | Mbit/s |
| I2C | Baudrate | via Extension Connector | - | 400 | 3400 | kBd |


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# 4. Raspberry Pi Computer Board: Description and Specifications

## 4.1. Raspberry Pi Model B – Hardware Description

The Raspberry Pi Model B board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. RPi operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply. It also requires 'mass-storage', but a hard disk drive of the type found in a typical PC is not really in keeping with the miniature size of RPi. Instead we will use an SD Flash memory card normally used in digital cameras, configured in such a way to 'look like' a hard drive to RPi's processor. RPi will 'boot' (load the Operating System into RAM) from this card in the same way as a PC 'boots up' into Windows from its hard disk.

The GP I/O connector permits serial communication with the NXP Blueboard Contactless Extension boards (CLEV663B or PNEV512B) via adapter board BluePi v1.0.

An architectural overview of Raspberry Pi Model B is shown in figure 9, GP I/O connector with pins is decribed on figure 13 and in table 3.

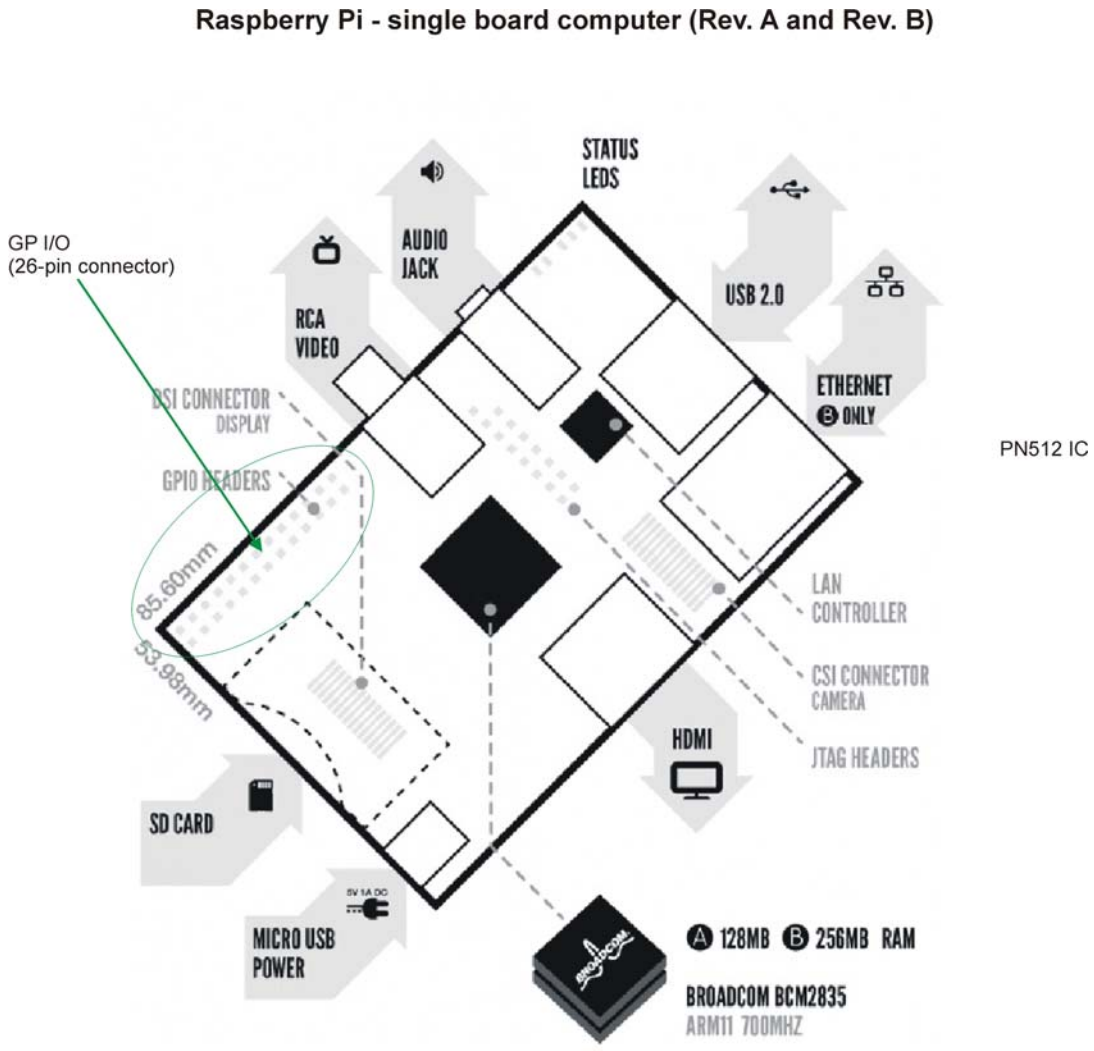


Figure 12: An architectural overview of Raspberry Pi Model B.


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## 4.2. Raspberry Pi Model B – Hardware Description

The Raspberry Pi Model B board communicate with EXPLORE-NFC extension board (PNEV512B v1.6) via GP I/O pins.

Some changes are in GP I/O connector between Rev. 1 and Rev 2. The GP I/O pins description is in table 3:

**Header Pinout, top row:**

| Pin Number | Pin Name Rev1 | Pin Name Rev2 | Hardware Notes | Alt 0 Function | Other Alternative Functions |
|---|---|---|---|---|---|
| P1-02 | 5V0 | 5V0 | Supply through input poly fuse | | |
| P1-04 | 5V0 | 5V0 | Supply through input poly fuse | | |
| P1-06 | GND | GND | | | |
| P1-08 | GPIO 14 | GPIO 14 | Boot to Alt 0 -> | UART0_TXD | ALT5 = UART1_TXD |
| P1-10 | GPIO 15 | GPIO 15 | Boot to Alt 0 -> | UART0_RXD | ALT5 = UART1_RXD |
| P1-12 | GPIO 18 | GPIO 18 | | | ALT4 SPI1_CE0_N ALT5 = PWM0 |
| P1-14 | GND | GND | | | |
| P1-16 | GPIO23 | GPIO23 | | | ALT3 = SD1_CMD ALT4 = ARM_RTCK |
| P1-18 | GPIO24 | GPIO24 | | | ALT3 = SD1_DATA0 ALT4 = ARM_TDO |
| P1-20 | GND | GND | | | |
| P1-22 | GPIO25 | GPIO25 | | | ALT4 = ARM_TCK |
| P1-24 | GPIO08 | GPIO08 | | SPI0_CE0_N | |
| P1-26 | GPIO07 | GPIO07 | | SPI0_CE1_N | |

**Header Pinout, bottom row:**

| Pin Number | Pin Name Rev1 | Pin Name Rev2 | Hardware Notes | Alt 0 Function | Other Alternative Functions |
|---|---|---|---|---|---|
| P1-01 | 3.3 V | 3.3 V | 50 mA max (01 & 17) | | |
| P1-03 | GPIO 0 | **GPIO 2** | 1K8 pull up resistor | I2C0_SDA | I2C0_SDA / I2C1_SDA |
| P1-05 | GPIO 1 | **GPIO 3** | 1K8 pull up resistor | I2C0_SCL | I2C0_SCL / I2C1_SCL |
| P1-07 | GPIO 4 | GPIO 4 | | | GPCLK0 |
| P1-09 | GND | GND | | | |
| P1-11 | GPIO17 | GPIO17 | | | ALT3 = UART0_RTS, ALT5 = UART1_RTS |
| P1-13 | GPIO21 | **GPIO27** | | PCM_DIN | ALT5 = GPCLK1 |
| P1-15 | GPIO22 | GPIO22 | | | ALT3 = SD1_CLK ALT4 = ARM_TRST |
| P1-17 | 3.3 V | 3.3 V | 50 mA max (01 & 17) | | |
| P1-19 | GPIO10 | GPIO10 | | SPI0_MOSI | |
| P1-21 | GPIO9 | GPIO9 | | SPI0_MISO | |
| P1-23 | GPIO11 | GPIO11 | | SPI0_SCLK | |
| P1-25 | GND | GND | | | |

| Colour legend |
|---|
| +5 V |
| +3.3 V |
| Ground, 0V |
| UART |
| GPIO |
| SPI |
| I²C |

Table 3: The Raspberry Pi Model B (Rev. 1 and Rev. 2) board GP I/O pins description.


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Figure 13: The Raspberry Pi Model B (Rev. 1 and Rev. 2) board GP I/O connector.


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## 4.3. Raspberry Pi computer with EXPLORE-NFC Board – Power Supply

### 4.3.1. External Power Supply: 5V DC / 1200 mA

Raspberry Pi computer board is powered via microUSB connector (only the power pins are connected) with external power supply. External power supply unit must supply 5 V DC with max. current 1200 mA. Check your power supply's ratings carefully.

EXPLORE-NFC Extension board is designed to operate with 3V3 DC with typical consumption 60 mA (max. consumtion is 100 mA). EXPLORE-NFC (PNEV512RPi) is powered from Raspberry Pi computer board via 26-pin GPI/O connector pins.

**Note 1:**
External power supply has to comply with LPS requirement of IEC60950-1.

Maximum lenght for power supply cable is 3 meter.

**Note 2:**

Do NOT USE power supply from USB ports on personal computer. USB ports on personal computer provide only 500 mA output cuurent to supply peripherals!


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### 4.4. Raspberry Pi computer - Specifications

Table 4: **Raspberry Pi computer – specifications:**

| | Model A | Model B |
|---|---|---|
| **SoC:**[7] | Broadcom BCM2835 (CPU, GPU, DSP, SDRAM, and single USB port)[3] | |
| **CPU:** | 700 MHz ARM1176JZF-S core (ARM11 family, ARMv6 instruction set)[3] | |
| **GPU:** | Broadcom VideoCore IV @ 250 MHz[74][75]<br>OpenGL ES 2.0 (24 GFLOPS)<br>MPEG-2 and VC-1 (with license[71]), 1080p30 h.264/MPEG-4 AVC high-profile decoder and encoder[3] | |
| **Memory (SDRAM):** | 256 MB (shared with GPU) | 512 MB (shared with GPU) as of 15 October 2012 |
| **USB 2.0 ports:**[14] | 1 (direct from BCM2835 chip) | 2 (via the built in integrated 3-port USB hub)[66] |
| **Video input:** | A CSI input connector allows for the connection of a RPF designed camera module[76] | |
| **Video outputs:**[7] | Composite RCA (PAL and NTSC), HDMI (rev 1.3 & 1.4),[77] raw LCD Panels via DSI[78][79]<br>14 HDMI resolutions from 640×350 to 1920×1200 plus various PAL and NTSC standards.[80] | |
| **Audio outputs:**[7] | 3.5 mm jack, HDMI, and, as of revision 2 boards, I²S audio[81] (also potentially for audio input) | |
| **Onboard storage:**[14] | SD / MMC / SDIO card slot (3,3V card power support only) | |
| **Onboard network:**[7][14] | None | 10/100 Ethernet (8P8C) USB adapter on the third port of the USB hub[66] |
| **Low-level peripherals:** | 8 × GPIO,[82] UART, I²C bus, SPI bus with two chip selects, I²S audio[83] +3.3 V, +5 V, ground[74][84] | |
| **Power ratings:** | 300 mA (1.5 W)[85] | 700 mA (3.5 W) |
| **Power source:**[7] | 5 volt via MicroUSB or GPIO header | |
| **Size:** | 85.60 mm × 53.98 mm (3.370 in × 2.125 in)[86] | |
| **Weight:** | 45 g (1.6 oz)[87] | |
| **Operating systems:** | Arch Linux ARM,[2] Debian GNU/Linux, Fedora, FreeBSD, NetBSD, Plan 9, Raspbian OS, RISC OS,[30] Slackware Linux[88] | |


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# 5. INSTALLING MANUAL

## 5.1. EXPLORE-NFC board connected to Raspberry Pi board

EXPLORE-NFC (NearField Communication add-on board for the Raspberry Pi) is NFC reader and it is intended for development use in development environment such are development departements in factories, at institutes, or as NFC reader/writer connected to Raspberry Pi computer board. External power supply supplies power to Raspberry Pi computer board. EXPLORE-NFC, Near Field Communication add-on board for the Raspberry Pi, is suplied from Raspberry Pi computer via 26-pin GPI/O connector.

**Installing procedure**

EXPLORE-NFC board must be connected with Raspberry Pi computer via GP I/O connector (figure 14). User must prepare SD card with Linux and user software for proper communicating between Raspberry Pi board and EXPLORE-NFC board and reading RFID cards or another NFC device. SD card must be inserted into SD slot into Raspberry Pi computer and then must be inserted external power supply into Raspberry Pi micro USB connector.

**Start-up procedure**

After boot sequence, system with Raspberry Pi computer and EXPLORE-NFC board is prepared for reading/writing RFID card. User must approch with RFID card (Mifare, Ultralight, or another NFC reader) to reader antena. Successfully reading/writing is signalised with ACT led diode on Raspberry Pi computer.

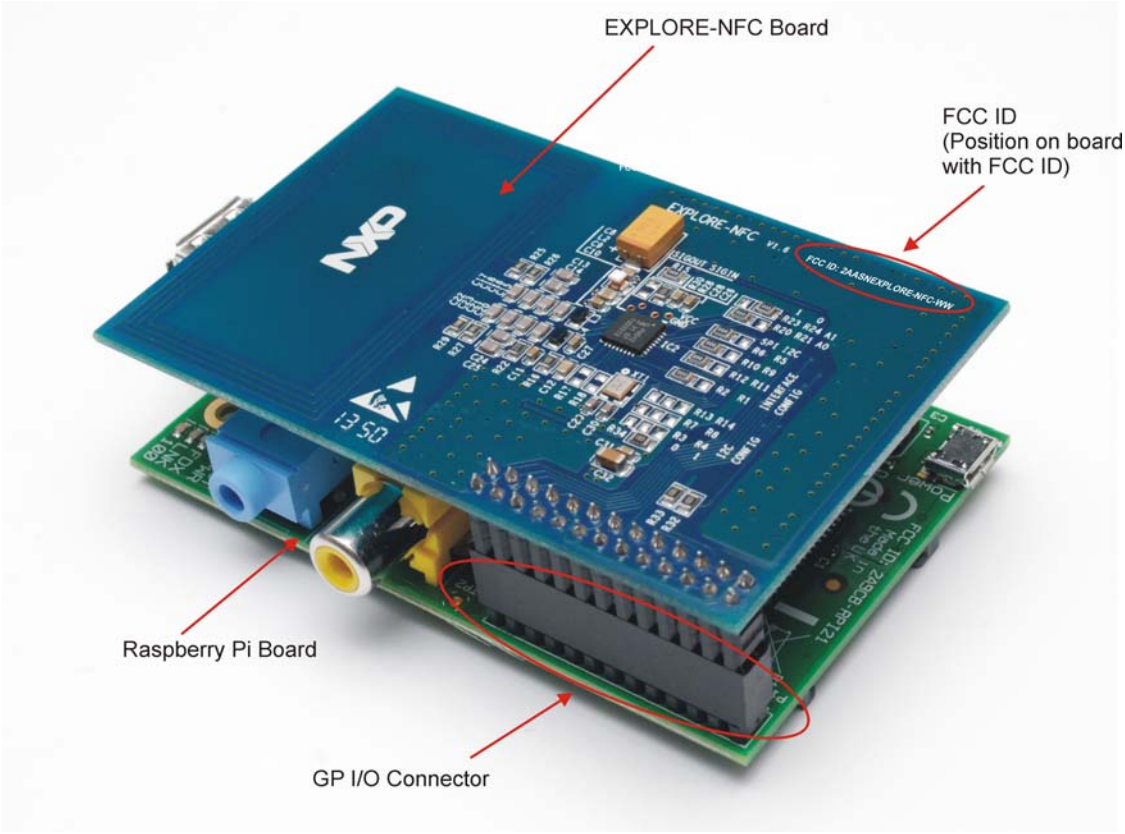


Figure 14: Explore-NFC board connected to the Raspberry Pi Model B (Rev. 1 and Rev. 2) board via GP I/O connector.


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Usuall climate conditions in development environment (room temperature and humidity) are deep inside EXPLORE-NFC board and Raspberry Pi computer specified climate conditions.

**Disclaimer**:

This module is intended only for DEVELOPMENT AND EVALUATION PURPOSES, and cannot be used in a finished product without further certification on the assembly.

**Note:**

The EXPLORE-NFC board may only be installed under the control of grantee or by professional installers instructed by the grantee.

## 5.2. Power supply via Raspberry Pi board

EXPLORE-NFC, Near Field Communication add-on board for the Raspberry Pi, is designed to operate with 3V3 DC with typical consumption 60 mA (max. consumtion is 100 mA). EXPLORE-NFC is powered from Raspberry Pi board via 26-pin GPI/O connector pins.

Raspberry Pi computer board is powered via microUSB connector (only the power pins are connected) with external power supply. External power supply unit must supply 5 V DC with max. current 1200 mA. Check your power supply 's ratings carefully.

**Note:**

External power supply has to comply with LPS requirement of IEC60950-1.

Maximum lenght for power supply cable is 3 meter.


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# 6. USER MANUAL

## 6.1. User manual

EXPLORE-NFC board is inteded to send and receive data according to the ISO 14443A and ISO 14443B protocol. Data transfer from reader to/from contactless cards or another NFC device operates at frequency 13.56 MHz. Data transfer between EXPLORE-NFC board and Raspberry PI computer is via SPI or I2C serial communication.

Also NFCIP-1 modes up to 424 Kbps transmission rate and FeliCa protocol at 212 Kbps and 424 Kbps transmission rate are supported too.

After proper installing procedure the EXPLORE-NFC board is ready to use. All software for reading/writing to/from RFID card or NFC communication is written on SD card in RaspberryPi computer.

How to installing linux operating system with user software is written in detail in Quick Start Guide of demo kit.

## 6.2. Main functions

Main functions are:

- sending and receiving data to/from contactless card according ISO 14443A and ISO 14443B protocol.
- Supportting MIFARE contactless memory cards.
- Supportting NFCIP-1 modes up to 424 Kbps transmission rate.
- Supportting contactless RF communication according to the FeliCa protocol 212 Kbps and 424 Kbps transmission rate.
- Card reading distance up to 60 mm.
- The data exchange from EXPLORE-NFC extension board to Raspberry PI computer (via SPI or I2C serial communication).

EXPLORE-NFC board is intended for development use and supports large set of commands. User can write user specific application.


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## 6.3. General user instructions

- Reading/writing is possible with MIFARE contactless cards, FeliCa cards or with NFC device.
- EXPLORE-NFC board can detect contactless card or NFC device up to 60 mm from the center reader's antenna.
- Contactless card identification is possible in electromagnetic field (created from contactless reader). Nonmetal material between antenna and RFID contactless card have no influence to reading distance or reading reliability.
- Reading/writing to/from card is very simple: user approaches his contactless card to reader's antena. EXPLORE-NFC board detects card and confirm reading via serial (SPI, I2C) communication to Raspberry Pi computer (software is installed on SD card). Successfully reading/writing is signalised with ACT led diode on Raspberry Pi computer.
- Software scripts (from PC to Raspberry Pi computer) can also be used for card reading and writing or to peer communication with another NFC.


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## 6.4. INSTRUCTIONS FOR SAFE WORK, MAINTAINING AND CARE

- Be careful not to damage the housing, connectors, antenna, PCB and other connected parts.
- Because of the specifics of the device and the damage, only quallified staff, authorized by the producer, are allowed to repair the device. All interventions of the unauthorized person and mechanical damage means repealing of the guarantee.


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## 6.5. ELECTROMAGNETIC COMPATIBILITY

EXPLORE-NFC board fulfil the following requirements of electromagnetic compatibility:

FCC, Part 15 and CE.

### 6.5.1. FCC Compliance Statement

**NOTE:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**FCC Compliance for Limited Modular Approval (§15.212(b))**

As note, the module is intended for PROFESSIONAL AND DEVELOPMENT USE ONLY and cannot be used in final products. The module is tested to comply with relevant part 15 rules without shielding and in the same configuration as it is intended to be used by developer. Explore-NFC board has passed spurious emissions test without shielding and is certified as limited modular transmitter. Under FCC part 15.212(b), shielding is not required.

Concerning §2.803 the EXPLORE-NFC board will be not offered for sale to other parties or to end users located in a residential environment.

**Caution!**

The Federal Communications Commission warns the users that changes or modifications to the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.


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### 6.5.2. COMPLIANCE INFORMATION according to 47CFR 2.1033

We, declare that the product

**EXPLORE-NFC**

**FCC 12.225, Limited Modular Approval, FCC ID: 2AASNEXPLORE-NFC-WW**

is in conformity with Part 15 of the FCC Rules.

Operation of this product is subject to the following conditions:

(1) this device may not cause harmful interference
(2) this device must accept any interference received, including interference that may cause undesired operation.

**Note:**

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**Host Device Labeling for FCC**

If the FCC identification number written on EXPLORE-NFC reader board is not visible when installed in the host device (Raspberry Pi computer), the host device must include the following exterior label:

Contains FCC ID: 2AASNEXPLORE-NFC-WW


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### 6.5.3. CE Declaration of Conformity

This Information Technology Equipment has been tested and found to comply with the following European directives:

| Harmonised Standards applied | Description |
|---|---|
| EN 300 330 – 2 V 1.5.1 | Air interface of the radio systems pursuant to § 3(2) (Article 3(2)) |
| EN 60950-1:2006 + Am 1:2010 + Am 11:2009 +Am 12:2011 | Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a) |
| EN 301 489-01 V1.8.1<br>EN 301 489-03 V1.4.1 | Protection requirements concerning electromagnetic compatibility § 3(1)2,(Article 3(1)(b)) |
| EN 55022:2010 | Electromagnetic compatibility-Limits and methods of radio disturbance characteristics of information technology class B (Part 1: Emission) |
| EN 55024:2010 | Electromagnetic compatibility - Limits and methods of radio disturbance characteristics of information technology equipment (Part 2: Immunity) |
| EN 61000-3-2 | Electromagnetic compatibility - Limits for harmonic current emissions |
| EN 61000-3-3 | Electromagnetic compatibility - Limitation of voltage fluctuations and flicker in low-voltage supply systems |
| EN 61000-4-2 | Electromagnetic compatibility – Electronic discarge immunity test |
| EN 61000-4-3 | Electromagnetic compatibility – Radiated fadio-frequency electromagnetic field immunity test |
| EN 61000-4-4 | Electromagnetic compatibility - Electrical Fast Transient / Burst immunity test |
| EN 61000-4-5 | Electromagnetic compatibility – Surge immunity test |
| EN 61000-4-6 | Electromagnetic compatibility – Immunity to conducted disturbances induced by radio fields |
| EN 61000-4-11 | Electromagnetic compatibility – Voltage dips, short interruptions and voltage immunity test |

Manufacturer’s Name: NXP Semiconductors

Manufacturer’s Address: Mikronweg 1, A-8101 Gratkorn, Austria

Type of Equipmen (Product): Near Field Communications Add-On Board

Model No.: EXPLORE-NFC

NXP Semiconductors hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s), and said equipment is in conformity with the relevant harmonised standards as mentioned above.


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# 7. WARRANTY, LIMITATIONS OF LIABILITY

**WARRANTY POLICY**

Manufacturer warrants that any product (“Product“) sold by Manufacturer to an end user (“User”) shall be free of defects in material and workmanship for a period a one year (or other period if specified) from date of sale by Manufacturer.

If any Product, Product's part fail to conform or is defective then Manufacturer, at its option, will repair or replace it at the premises of the User (On-Site).

To obtain warranty service, you must send the Product in either its original packaging or packaging offering an equal degree of protection directly to Manufacturer. Please contact Manufacturer for warranty replacement fee information.

LIMITATIONS AND EXCLUSIONS

This warranty does not cover customer instruction, installation, set up adjustments or signal reception problems (RFID readers).

This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of, or to any part of the Product, including the antenna. This warranty does not cover damage due to improper operation or maintenance, connection to improper voltage supply, or attempted repair by anyone other than a facility authorized by Manufacturer to service the Product.

Proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the unit is within the Warranty period must be presented to obtain warranty service.

This warranty is invalid if the factory applied serial number has been altered or removed from the Product.

THIS WARRANTY REPRESENTS THE ENTIRE AGREEMENT BETWEEN MANUFACTURER AND USER WITH RESPECT TO THE SUBJECT MATTER HEREIN AND SUPERSEDES ALL PRIOR OR CONTEMPORANEOUS ORAL OR WRITTEN COMMUNICATIONS, REPRESENTATIONS, UNDERSTANDINGS OR AGREEMENTS RELATING TO THIS SUBJECT.

End User: _____

Model Number: _____

Serial Number: _____

Startup Date: _____ Waranty End Date: _____


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