

PTX205RIOTEB

Rev.A5

Introduction

The PTX205RIOTEB evaluation board is designed to assist users with adopting the latest Renesas PTX205R IC for IoT applications. This document is intended for engineers and developers interested in integrating NFC functionality into their projects.

**Important:** The PTX205R IoT evaluation kit including its hardware, software, and accompanying documentation, is currently under active development. All features, specifications, interfaces, and documentation are subject to change.

The information provided reflects the current state of development and is intended for informational purposes only. No warranties or guarantees are made regarding final functionality, performance, or compatibility.

Before making any design integrations or deployment plans, consult with the Renesas [sales](#) team to ensure the most current and accurate information is utilized.

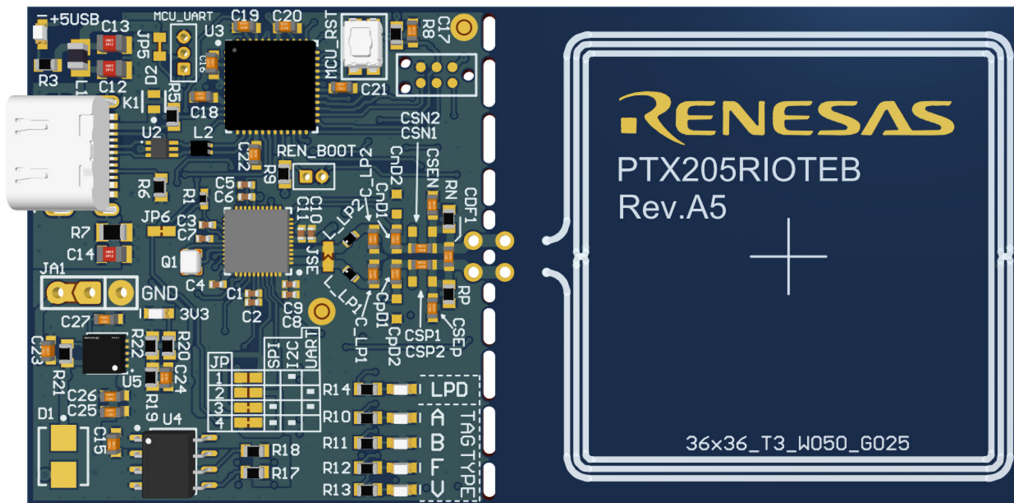


Figure 1. PTX205RIOTEB Evaluation Board

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# 1. Overview

The PTX205RIOTEB is an evaluation board designed to facilitate the adoption of the latest Renesas PTX205R IC for IoT applications. It should be read in conjunction with its accompanying materials, specifically the evaluation board schematic and [PTX205R Datasheet](#) (see section 5 for the PTX205RIOTEB schematic diagrams).

## 1.1 Resources and Information

All Renesas IoT connectivity solutions are listed on the [NFC](#) page, including datasheets and additional documentation.

*Note:* The PTX205R device is in pre-production and the datasheet is not available on this page at this time.

## 1.2 Kit Contents

The evaluation kit contains:

- 1 USB-C to USB-A cable
- PTX205RIOTEB evaluation board
- Config Tool software

## 1.3 Minimum System Requirements

The following platforms and operating systems are supported:

- Windows 11 x86 64-bit
- Ubuntu 22.04 LTS x86 64-bit

## 1.4 Acronyms and Terminology

Acronym	Terminology
HIF	Host interface (in other words, SPI, I <sup>2</sup> C or UART configurable via SIF status at boot up)
SIF	Select interface type
NFC	Near field communication
OS	Operating system (for example, Microsoft Windows, Linux, etc.)
SWD	ARM Serial wire debug
PMOD	Digilent Pmod™
EVK	Evaluation kit (a set of hardware and software)

## 2. Getting Started

Open the kit and connect the PTX205R evaluation board to a PC using the USB-C cable included in the kit. After a successful connection, the +5USB green LED at the top left of the board and the 3V3 green LED should illuminate. Both LEDs are marked as shown in [Figure 2](#).

- Use either the USB A↔C, as provided, or USB C↔C cable to connect the evaluation board to the PC.
- All USB C↔C cables support the necessary current.
- USB 3.0 ports with one or both of the following symbols should be used:



**Important:** When testing, ensure that no metal is present in close proximity of the evaluation board's antenna. Metal objects surrounding the coil antenna could result in the degradation of reading performance.

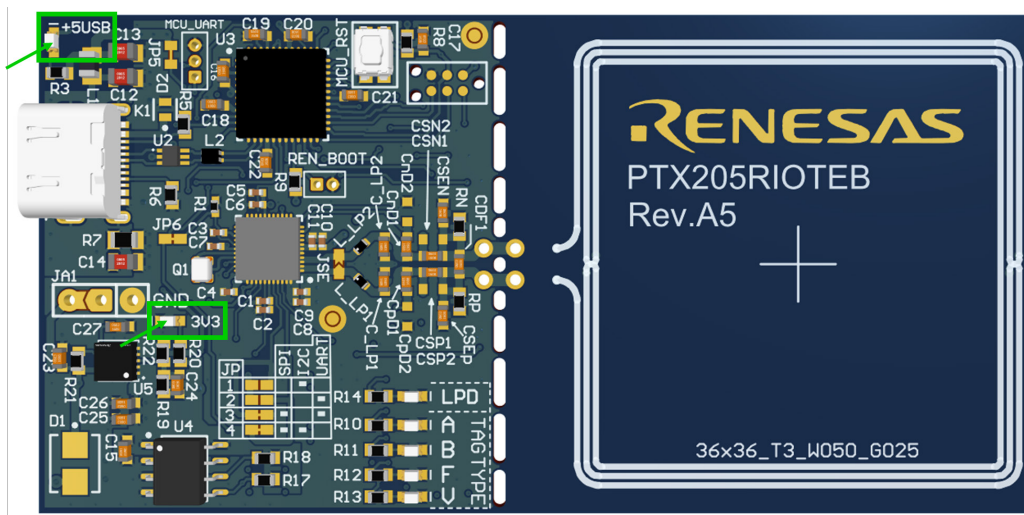


Figure 2. USB LEDs on the Evaluation Board

### 2.1 Running the Evaluation Board using the Web Tool

When plugging in the evaluation board into the PC, the web tool pop-up window appears in the bottom right-hand side corner of the screen (see [Figure 3](#)).

1. Click on the pop-up window to automatically open the Web Tool. If the pop-up is blocked, use this [link](#) to open the Web Tool.

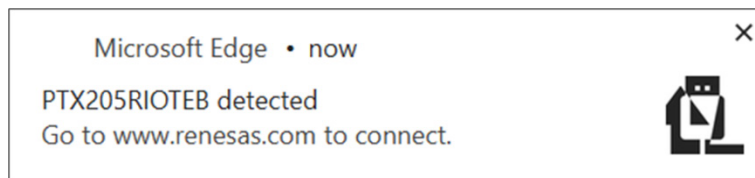


Figure 3. Device Detection Window

2. When the Web Tool opens, click the **Connect** button on the top right-hand side corner of the GUI (see [Figure 4](#)), then select the COM port where the board is connected to the PC.  
If the COM port choice is unknown, open the device manager of the PC to identify the COM port. Once the board is connected, details about the evaluation board in use are displayed on the screen.

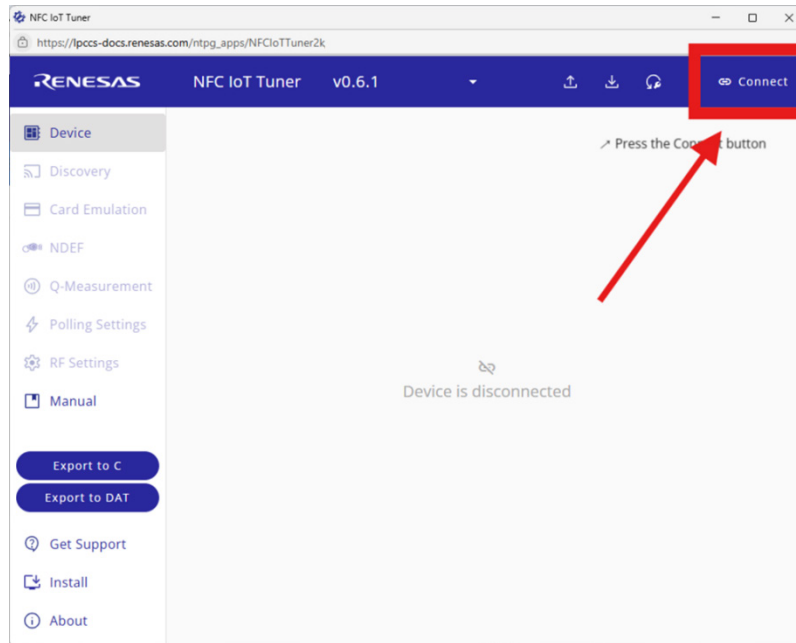


Figure 4. Device Connection Window

- To enter the evaluation board's discovery mode, select **Discovery** from the list on the left-hand side of the GUI (see Figure 5) to display the Discovery page.

Click on **Start** to start the discovery loop. Click on **Stop** to end or discontinue the process.

The pie chart indicates the type of card that is detected by the evaluation board and the Device information area displays information on the detected PICC's technology, protocol and unique ID.

The **Q-Measurement** module can also be used within the Web Tool. For more information on Q-Measurement, see section 4.2.

**Important:** For more information about the Web Tool, click on **Manual** from the list on the left-hand side of the GUI.

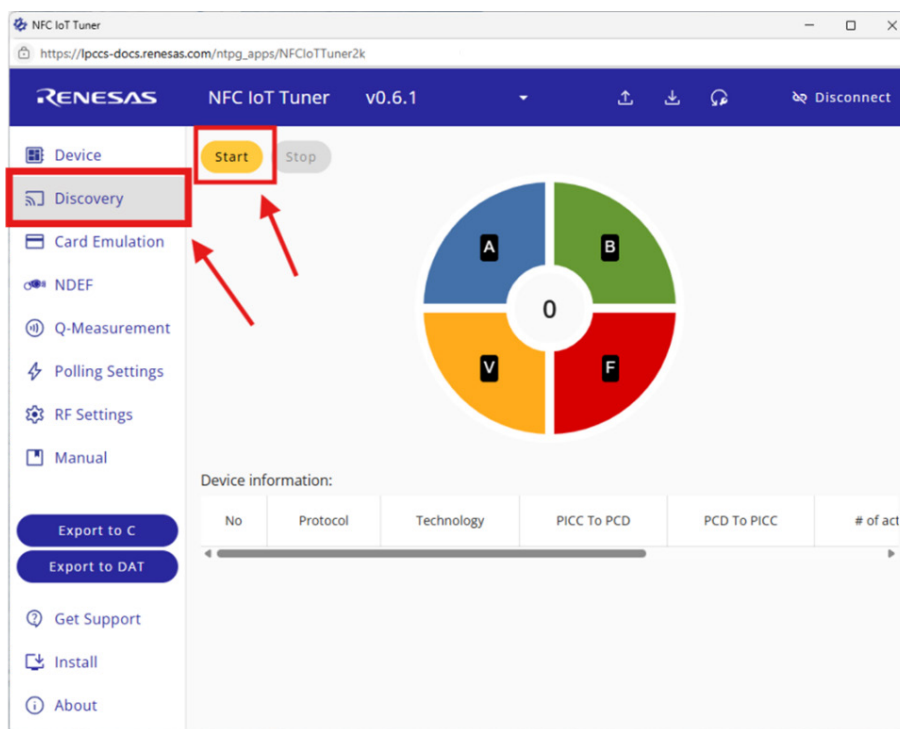


Figure 5. Discovery Loop Window

## 2.2 Running the Evaluation Board using the GUI

1. Open the latest version of the Config Tool. For details about software installation, see section 4.
2. Ensure that the evaluation board has been detected by the PC.
3. Click on the wizard button (see Figure 6). If the firmware is not working, it may be necessary to press the physical reset button on the evaluation board before updating the firmware. When started, the board's firmware is verified and upgraded (if required) – no user interaction is required (see Figure 7).

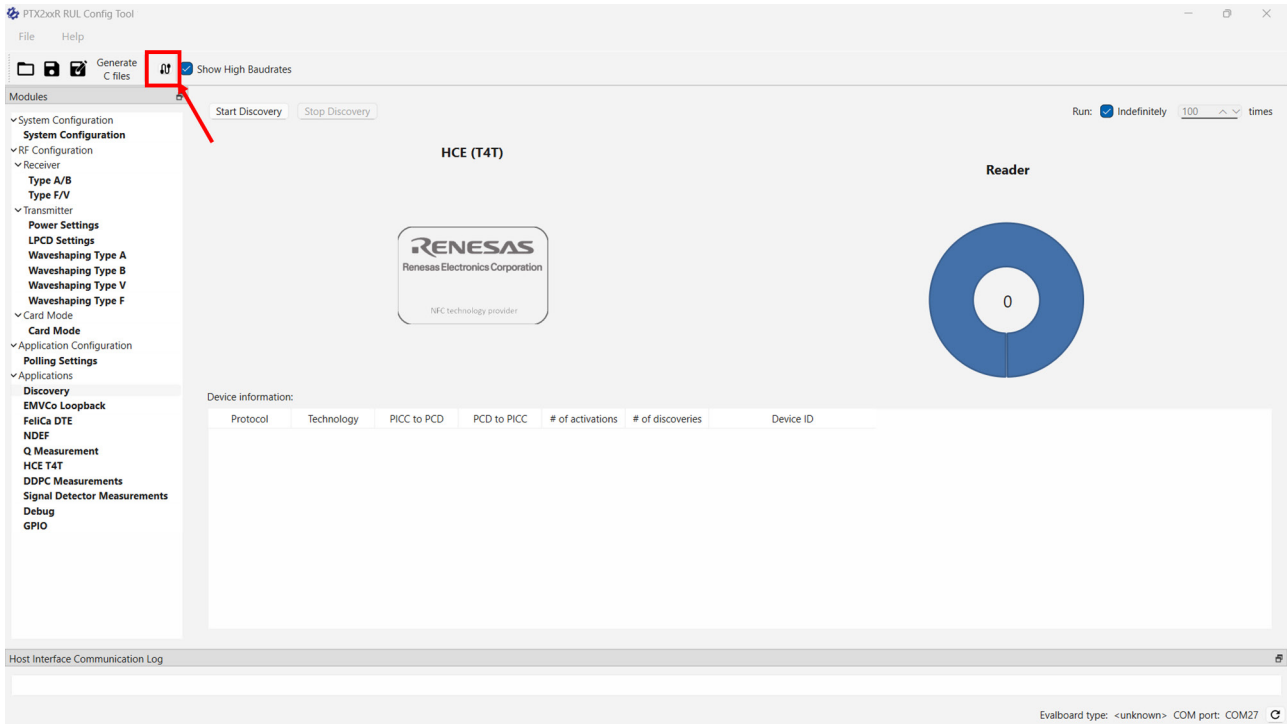


Figure 6. Config Tool Window – Connection Wizard

When running the connection wizard, the following window appears:

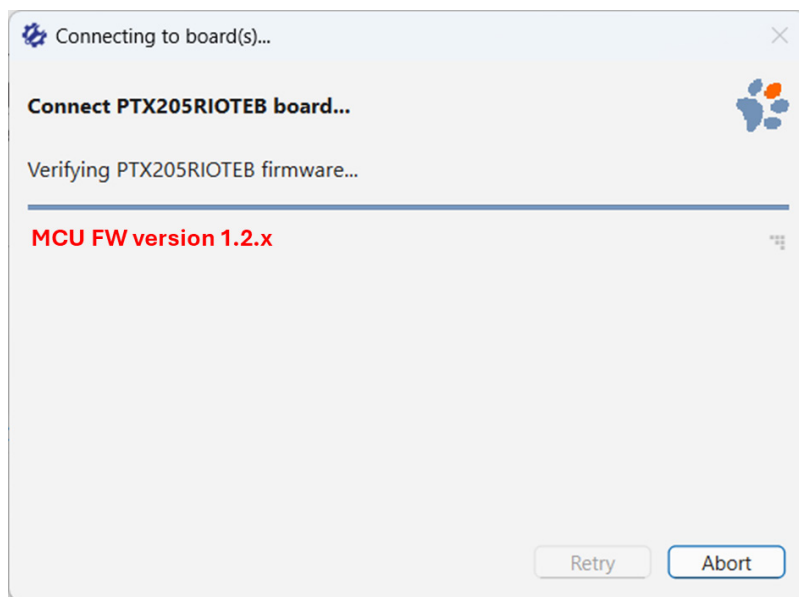


Figure 7. Connection Wizard Window

The connection wizard dialog closes automatically when an evaluation board is successfully identified.

- After the connection wizard dialog closes, another dialog box opens and prompts the user about loading the default configuration values for the detected board (see Figure 8). Since the antenna is detachable, it cannot be guaranteed to be recognized correctly, thus the antenna selection can be overridden from a list of supported antennae from the board. If the antenna has not been detached, use the default settings.

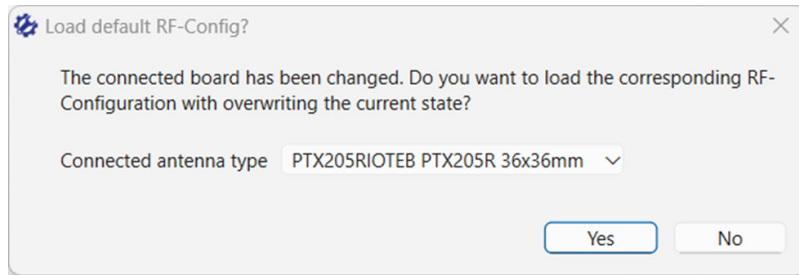


Figure 8. Load Default RF-Config Window

- In the Config Tool window under *Modules*, select *Applications* → *Discovery*. In the windowpane, a screen appears as shown in Figure 9. Use this module to start IoT discovery loop. Click on **Start Discovery** to start the discovery loop; **Stop Discovery** to stop it. The discovery loop may be combined with card emulation that can be enabled in the polling configuration.

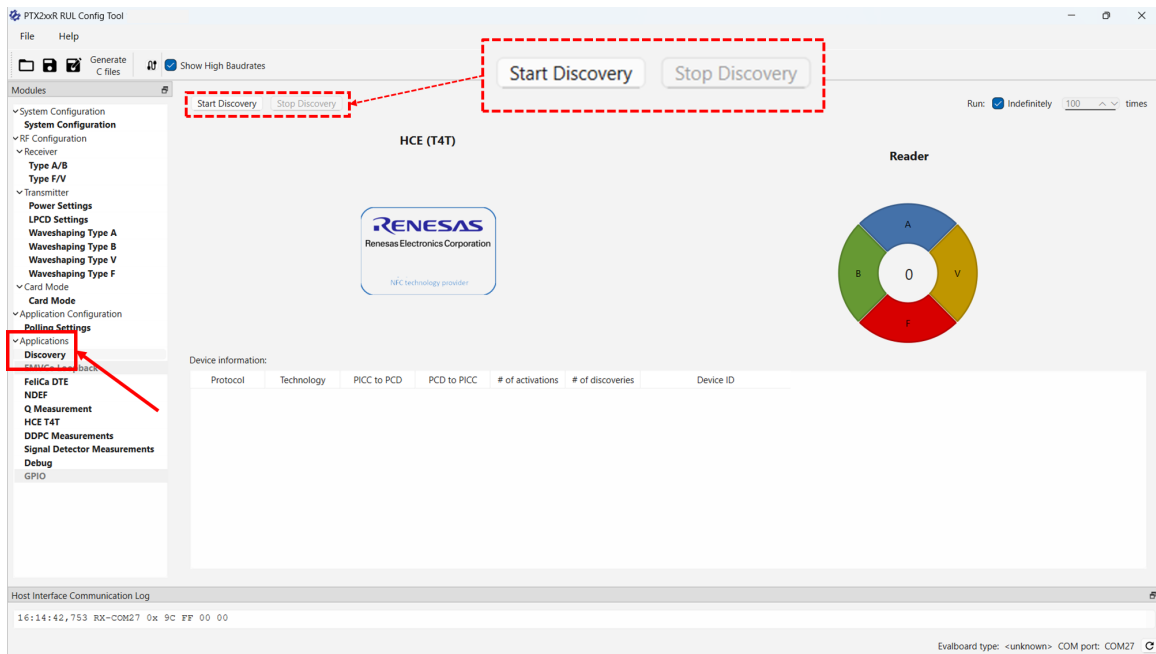


Figure 9. Applications Discovery Module Window

While discovery is active, the view displays information on the detected PICC's technology, protocol and unique ID. The pie chart displays the type of tags for which discovery is enabled.

*Note:* If the card uses random generated ID's, then each detection will create a new line in the detection table.

## 2.3 Running the Evaluation Board in Standalone Mode

The evaluation board can be operated in standalone mode using a USB power bank to supply the system.

The LEDs indicating different operating modes with dedicated colors are:

- USB +5V and LDO 3.3V (2 LEDs **green**)
- Low Power Card Detection (1 LED **orange**)
- Card detection for type A, B, F, and V (4 LEDs **blue**)
- Host Card Emulation for type A, B, F (3 LEDs **blue**)

### 3. Hardware Description

The PTX205R evaluation board consists of the three main blocks (see Figure 10):

1. USB and power supply.
2. MCU and peripherals such as LEDs, EEPROM, PMOD, etc. The microcontroller is responsible for communication with the PTX205R via SPI and with the Config Tool software via USB.
3. PTX205R with antenna matching and antenna.

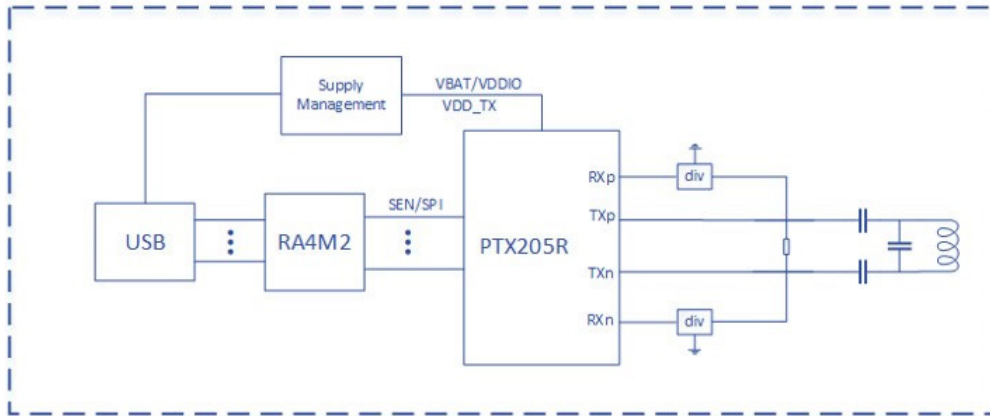


Figure 10. Main Blocks of the PTX205R

The communication between the MCU and the PTX205R happens via SPI and one IRQ signal. The PTX205R allows exceptional flexibility; for example, it also supports I<sup>2</sup>C and UART. For more information, refer to the [PTX205R Datasheet](#).

#### 3.1 PTX205RIOTEB Top View

The main components and elements of the evaluation board are shown in Figure 11:

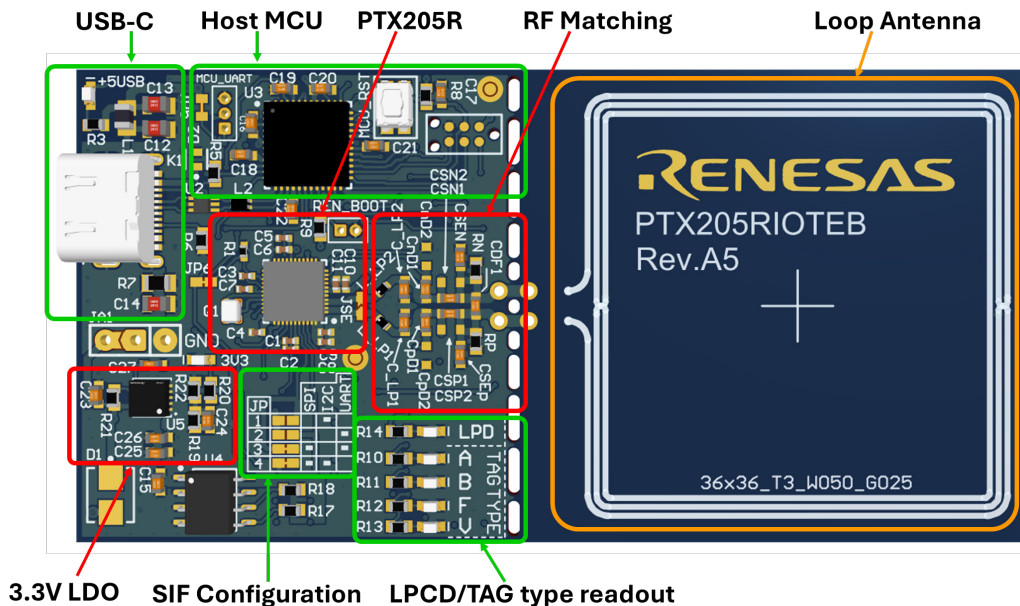


Figure 11. PTX205RIOTEB – Top View

*Note:* The Loop antenna can be broken off and another antenna can be soldered to the connector, in which case the matching circuit must be adapted to the new antenna parameters.

### 3.2 PTX205RIOTEB Bottom View

The footprint for the eventual soldering of the PMOD connector is highlighted together with the power supply jumpers (see Figure 12). For more information on configurable power supply solder jumpers, see section 3.3.

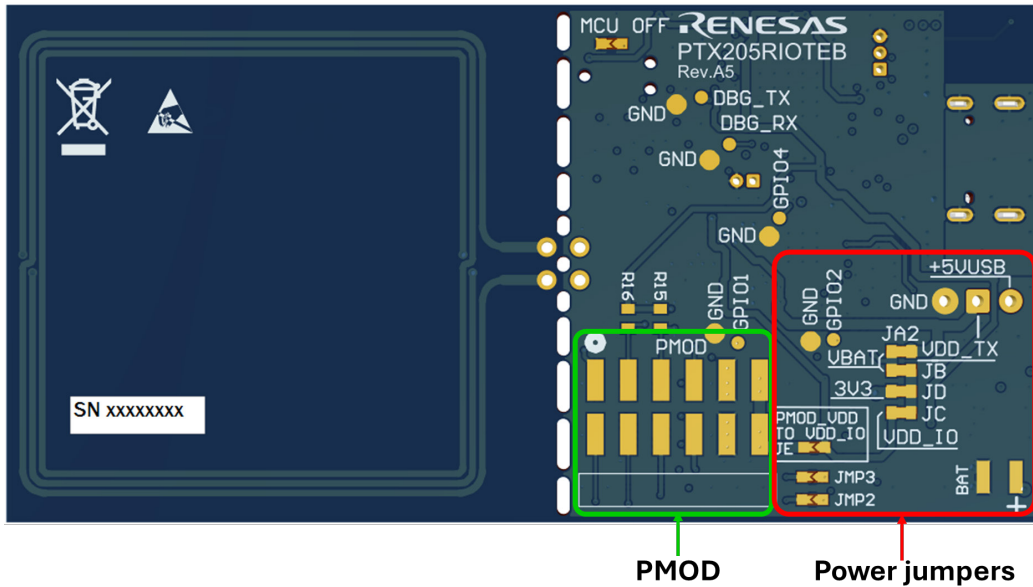


Figure 12. PTX205RIOTEB – Bottom View

### 3.3 NFC Reader Schematic

The NFC reader schematic provides a highly detailed view on the output matching network specifying each component (see Figure 13).

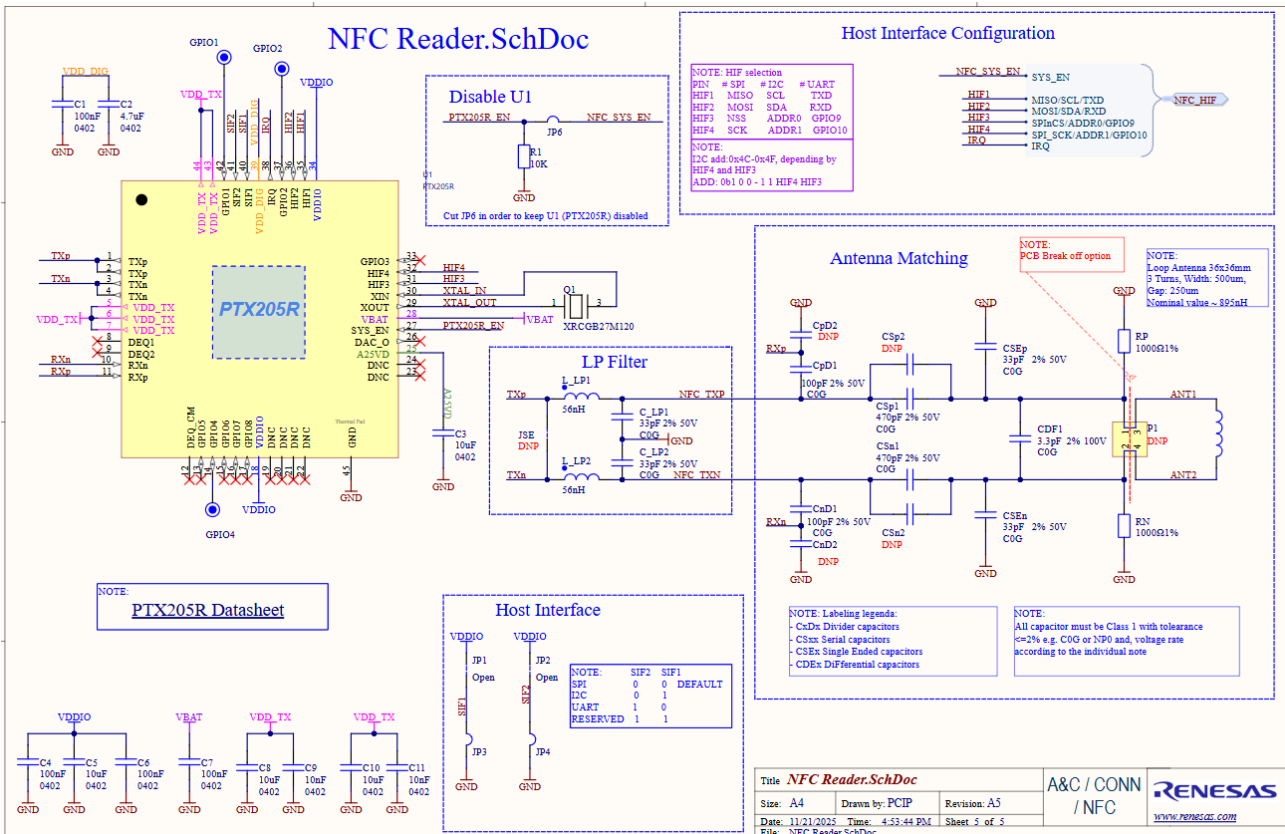


Figure 13. NFC Reader Schematic

**Important:** The accuracy of the NFC antenna matching network is crucial. It is mandatory to populate C0G / NP0 dielectric capacitors with low tolerance (1 or 2%) and adequate nominal voltage rating.

### 3.4 Power Supply Configuration

The evaluation board features a flexible configurable-power-supply-net via solder jumpers. For a conceptual overview and the supported-use cases, see Figure 14 and refer to the following table.

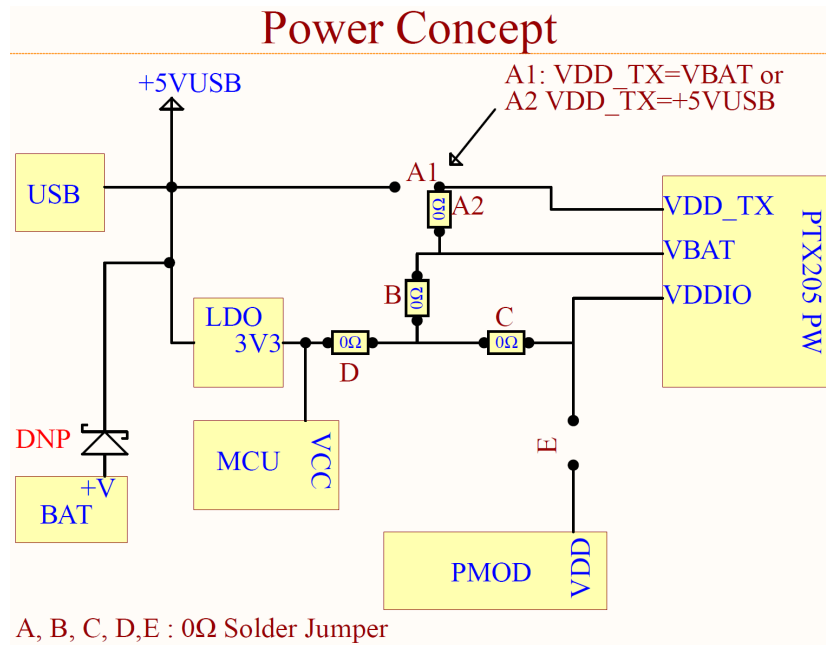


Figure 14. Conceptual Power Supply Configuration

Power Configuration Table Legend:

- solder jumper open
- solder jumper closed

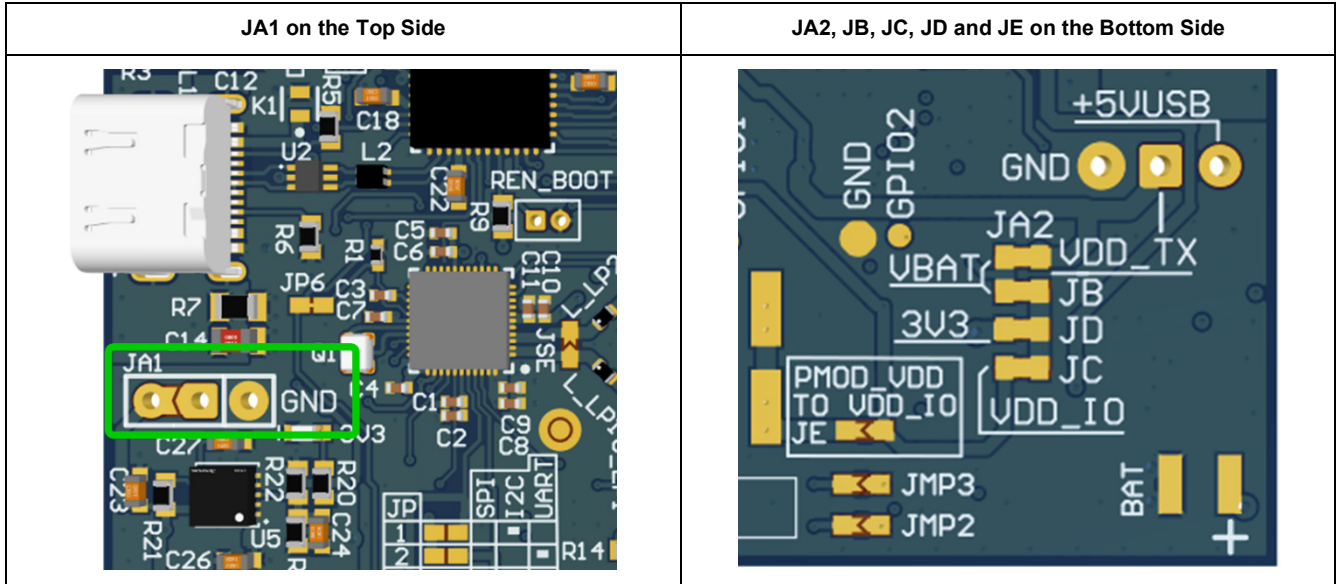
Depending on the power supply and the power configuration, jumpers must be soldered open or closed as described in the table below. Note that the first configuration is the evaluation board default configuration and is soldered this way by default.

Source Supply	A1	A2	B	C	D	E	Power Configuration
USB							<b>Default Configuration</b> ▪ VDD_TX = VBAT = VDDIO = 3.3V
							<b>High Power TX</b> ▪ VDD_TX = +5USB ▪ VBAT = VDDIO = 3.3V
Host via PMOD (Max. 3.3V)							<b>PMOD Supply</b> ▪ VDD_TX = VBAT = VDDIO = PMOD_VDD
USB + HOST (PMOD Max. 3.3V)							<b>Hybrid Configuration, High Power TX</b> ▪ VDDIO = PMOD_VDD ▪ VDD_TX = VBAT = +5USB (*or V Battery)
							<b>Hybrid Configuration, Low Power TX</b> ▪ VDDIO = PMOD_VDD ▪ VBAT = VDD_TX = 3.3V

The power supply concept above allows easy customization of the board to allow multiple possible use cases. Furthermore, the same solder jumpers could be used for the current measurement on each power domain. By default, all the power domains are powered via the local LDO at 3.3V (expected to be the most common use case).

**Caution:** Check the schematic, datasheet and the minimum and maximum operation voltage on each power domain before changing the power configuration.

The images below show the areas of the board where the aforementioned solder jumpers are located.



*Note:* JA1 is the single jumper with through hole pads that have a 2.54 mm pitch. JA1 provides an easy way for connecting an external power profiler in order to measure the current consumption and is achieved once the power network is set for a configuration where A1 is closed.

### 3.5 Antenna and Matching

The default antenna and matching that is attached to the PTX205R evaluation board is as shown in [Figure 15](#).

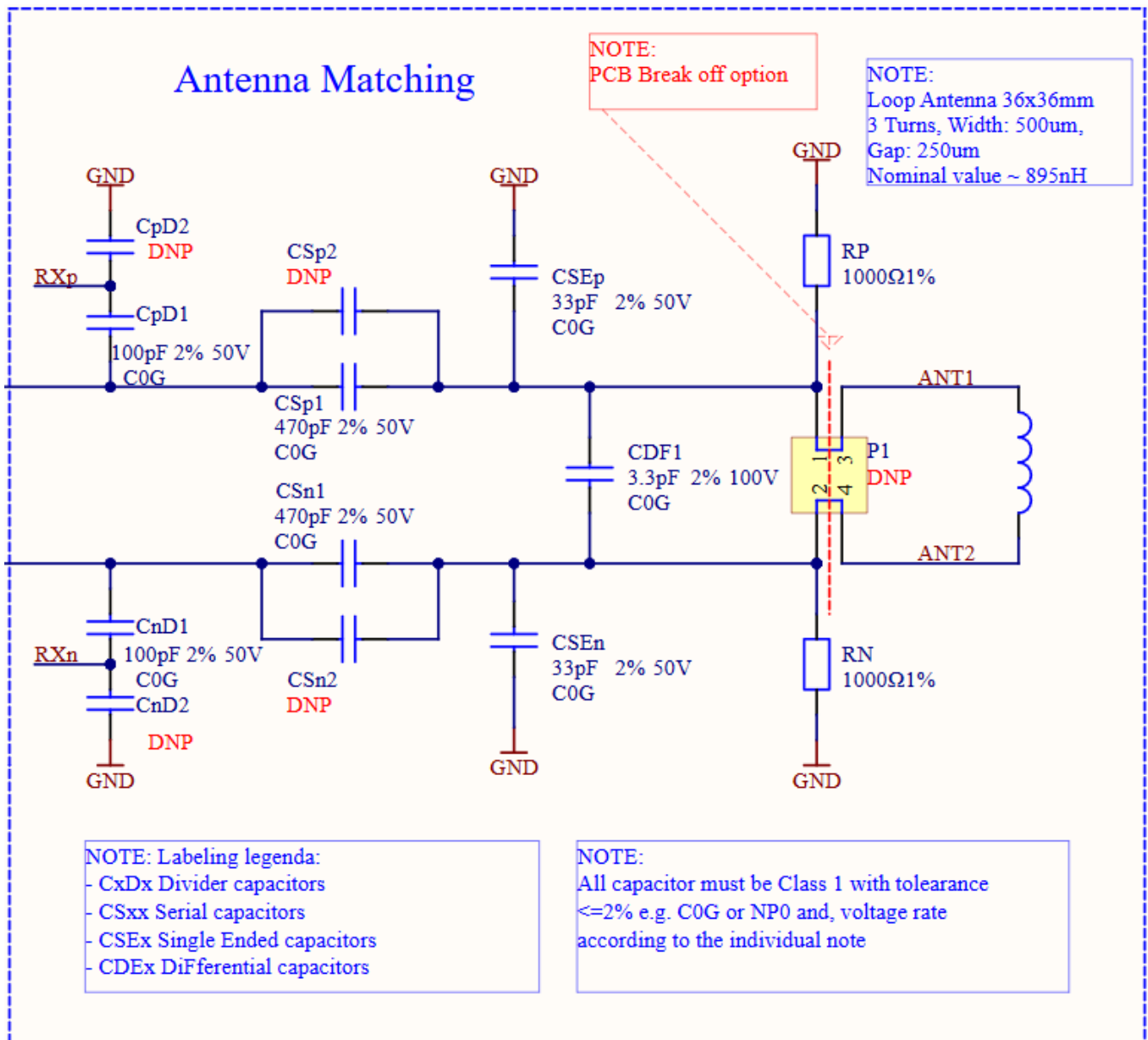


Figure 15. Default Antenna Matching Network

It is possible to remove the default antenna and fit a custom antenna.

Recommended antenna:

- 36mm × 36mm, 3 Turns, Width 0.5mm, Gap 0.25mm
- Inductance value ~900nH

Matching structure to support:

- **Differential Mode** (default setup): Driving antenna differential
- **Single-ended Mode:** Footprint for TXp, TXn connected together and drive antenna against GND

## 4. Software Description

### 4.1 Installation

The *PTX2xxR RUL Config Tool* release package is distributed as a **.zip** archive. To extract the content of the package:

1. Open Windows explorer and right-click on the file named **PTX2xxR\_RUL\_Config\_Tool\_vX.Y.Z.zip**.
2. Select **Extract All** from the list. In the window that pops up, press the Extract button and the content of the archive will be extracted to the specified folder.

The package contains the following content:

- **LINUX-x86-64Bit folder**: Application for Ubuntu 24.04 LTS (x86) 64-bit (minimal installation)
- **WINDOWS-x86-64Bit zip archive**: Application for Windows 11 (x86) 64-bit

#### 4.1.1 Linux

An **Applmage** package can start a *PTX2xxR RUL Config Tool* application without any installation on an Ubuntu 24.04 LTS distribution. To start the tool with an Applmage file, follow the steps below:

1. Download the *PTX2xxR RUL Config Tool* from the customer support portal.
2. Extract the **.zip** archive.
3. Set the execute flag of the **Applmage** file.
4. Start the **Applmage** file.

When starting the **Applmage** for the first time, you must agree to the displayed license terms.

The **Applmage** package depends on **libfuse2** which might not yet be deployed on your system. In this case, you will receive the error: "*dlopen(): error loading libfuse.so.2 Applmages require FUSE to run.*" To run the Applmage successfully, install **libfuse2** by executing the following commands:

```
sudo apt-get update sudo apt-get install libfuse2
```

#### 4.1.2 Windows

1. Double-click the installer executable in the Windows Explorer. If a previous version of *PTX2xxR RUL Config Tool* was installed on your system, it is *not* required to uninstall that version first. The new version will overwrite the old one and also update the shortcut on the desktop that links to the run file.
2. Click the box on the left of the text "*I agree to the License terms and conditions*" and press the **Next** button.
3. Press the **INSTALL** button to start the installation. Optionally, exclude the file association feature from the installation by clicking on the "*File Type Associations*" checkbox. If the product is used for the Japanese market, enable the feature "*TELEC compliant operation for Japan*" by clicking on the corresponding checkbox (for compliance reasons, certain features will not be available when using that option).
4. Press the Run button to start the *PTX2xxR RUL Config Tool* application. The installer windows will close automatically.
5. To launch the *PTX2xxR RUL Config Tool* on Windows, double-click the desktop shortcut called **PTX2xxR RUL Config Tool**.

## 4.2 Q-Measurement

From the **Modules** pane, select *Q-Measurement*. When Q-measurement is started, the window as shown in [Figure 16](#) appears.

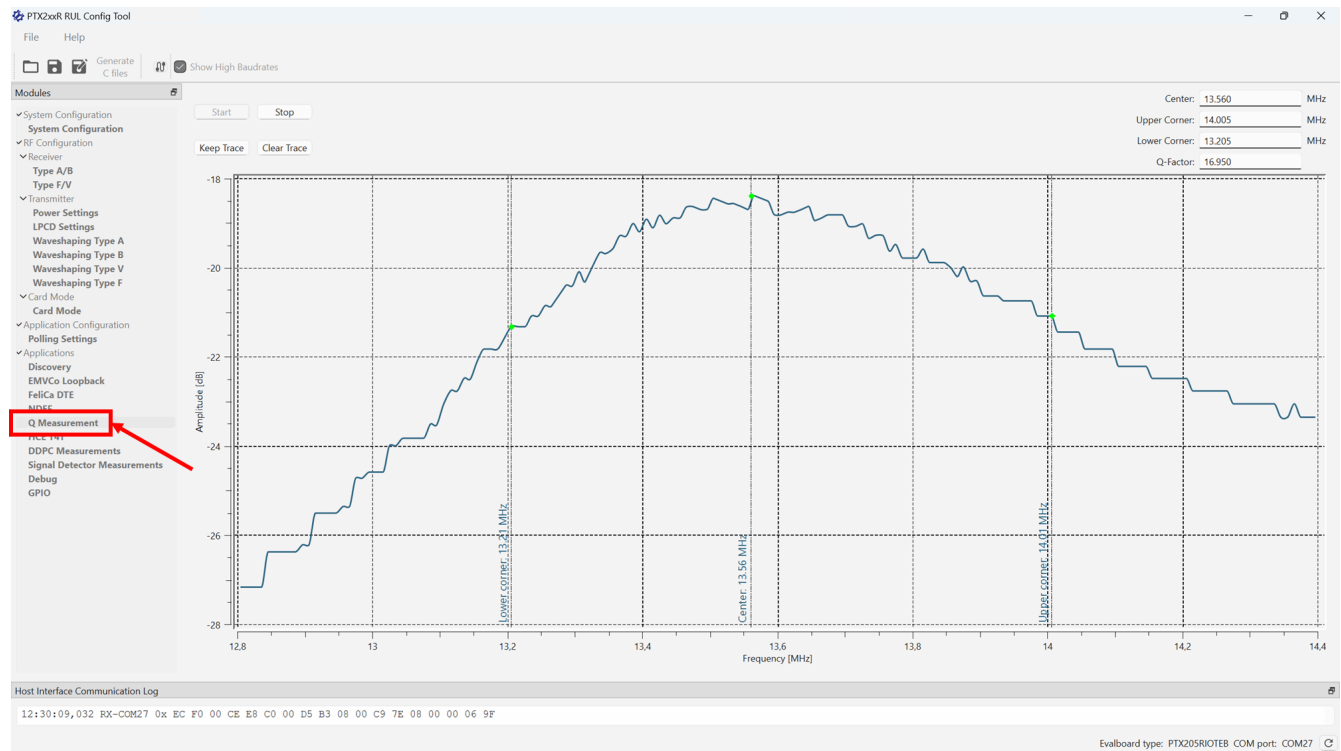


Figure 16. Q-Measurement Window

The application triggers measurements for the frequency range between 12.8MHz and 14.4MHz in increments of 5kHz. The measurement and plot run continuously and the results are updated periodically.

After each frequency sweep, the following values are updated:

- Center frequency
- Lower-corner frequency
- Upper-corner frequency
- Q-Factor

The **Keep Trace** button allows the user to freeze the currently displayed curve and display it in a light blue color while other measurements are ongoing. This curve will persist when restarting the measurement. Press the **Clear Trace** button to clear the current trace.

## 5. Schematic Diagrams and Layout Information

The PTX205RIOTEB schematic diagrams are appended at the end of this document.

## 6. Revision History

Revision	Date	Description
1.01	Feb 19, 2026	Added appendix A.
1.00	Jan 21, 2026	Initial release.

### A. Conformity Assessment

The PTX205R NFC Reader Evaluation Board (PTX205RIOTEB) conforms to laws and regulations that are described in the following subsections.

#### A.1 FCC Notice (Applicable to Evaluation Kits not FCC-Approved)

This evaluation board is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This evaluation board is not a finished product and may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product does not cause harmful interference to licensed radio stations. Unless the assembled kit is designed to operate under Part 15 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

#### A.2 CE (Radio Equipment Directive 2014/53/EU (RED)) – Europe

The PTX205RIOTEB is tested and found to comply with Radio Equipment Directive (2014/53/EU) covering electromagnetic compatibility (EMC Directive 2014/30/EU), Health, Safety and Radio. Applicable standards are:

- **Radio:** EN 300 330 V2.1.1 – NFC Full Scope
- **EMC:** ETSI EN 301 489-1 V2.2.3  
ETSI EN 201 489-3 V2.3.2 – 13,56 MHz
- **Health:** EN 62209-1528 – NFC
- **Safety:** EN 62368

##### A.2.1 Simplified Declaration of Conformity

Hereby, Renesas Design Austria GmbH declares that radio type equipment PTX205RIOTEB is in compliance with Directive 2014/53/EU and 2014/30/EU. The full texts of the EU declaration of conformity are available at the following internet address: [www.renesas.com](http://www.renesas.com).

#### A.3 UKCA – UK

The PTX205RIOTEB is tested and found to comply with Radio Equipment Directive (2014/53/EU) covering electromagnetic compatibility (EMC Directive 2014/30/EU), Health, Safety and Radio. Applicable standards are:

- **Radio:** EN 300 330 V2.1.1 – NFC Full Scope
- **EMC:** ETSI EN 301 489-1 V2.2.3  
ETSI EN 201 489-3 V2.3.2 – 13,56 MHz
- **Health:** EN 62209-1528 – NFC
- **Safety:** EN 62368

##### A.3.1 Simplified Declaration of Conformity

Hereby, Renesas Design Austria GmbH declares that radio type equipment PTX205RIOTEB is in compliance with Radio Equipment Regulations 2017 and EMC Directive 2014/30/EU. The full texts of the EU declaration of conformity are available at the following internet address: [www.renesas.com](http://www.renesas.com).

## A.4 WEEE Directive (2012/19/EU)



The Waste Electrical and Electronic Equipment Regulations 2013



### For customers in the UK and European Union

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the UK and European Union.

■ This equipment (including all accessories) is not intended for household use. After use, the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled, and disposed of in an environmentally sound manner.

Renesas Electronics Europe GmbH can take back the end-of-line equipment. Register for this service at <https://www.renesas.com/eu/en/support/regional-customer-support/weee>.

## A.5 RoHS Compliance

Renesas Electronics suppliers certify that its products are in compliance with the requirements of Directive 2011/65/EU of the European Parliament on the restriction of the use of certain hazardous substances in electrical and electronic equipment. RoHS certificates from our suppliers are available on request.

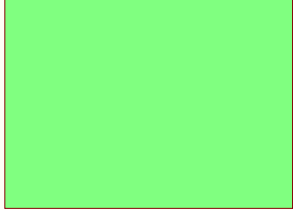
# PTX205RIOTE.B.PrjPcb

U\_USB Interface  
USB-C.SchDoc

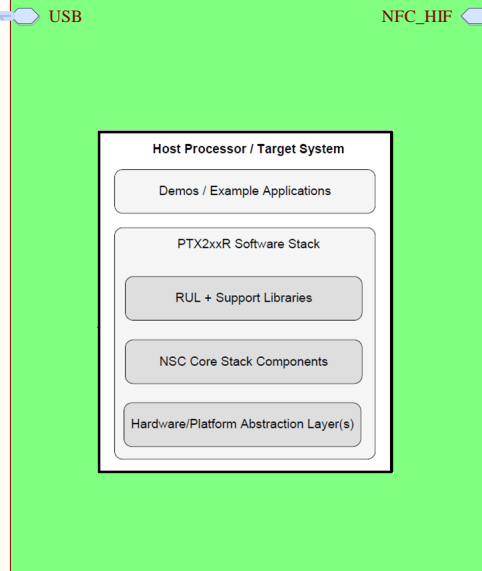


USB

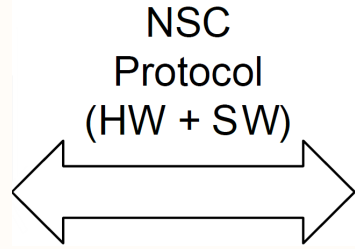
U\_Power Supply  
Power Supply.SchDoc



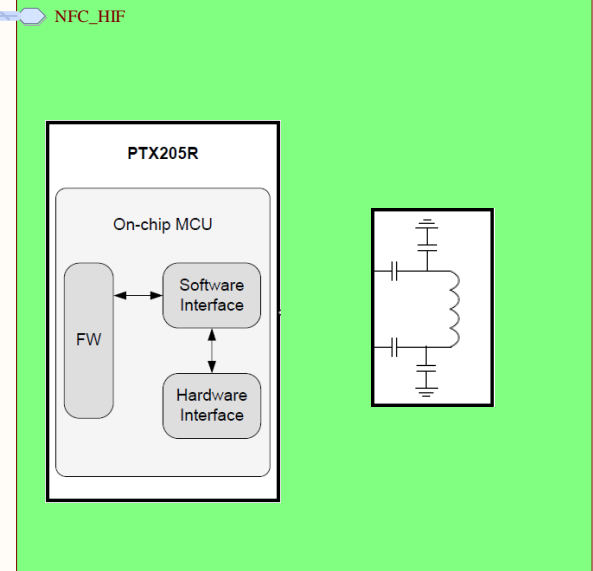
U\_MCU and Peripheral  
MCU and Peripheral.SchDoc



NFC\_HIF



U\_NFC Reader  
NFC Reader.SchDoc



NFC\_HIF

NOTE: Renesas PCB logo!

Renesas (TOP L)  
Renesas (BOTTL)

NOTE: Assembling Fiducials



## Notes' Colour legenda

NOTE: Schematic  
e.g. set X7R capacitor

NOTE: Layout  
e.g. Keep C1 close to U2-p1

NOTE: Firmware  
E.g. I2C Address XX

NOTE: Mechanic  
e.g. Fiducial as Pin1 marking

NOTE: Errata notice  
e.g. something wrong to notify

NOTE: Any other topic  
e.g., a legal topic.

Title **Top.SchDoc**

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Drawn by: **PCIP**

Revision: **A5**

Date: 19/12/2025

Time: 08:18:22

Sheet 1 of 5

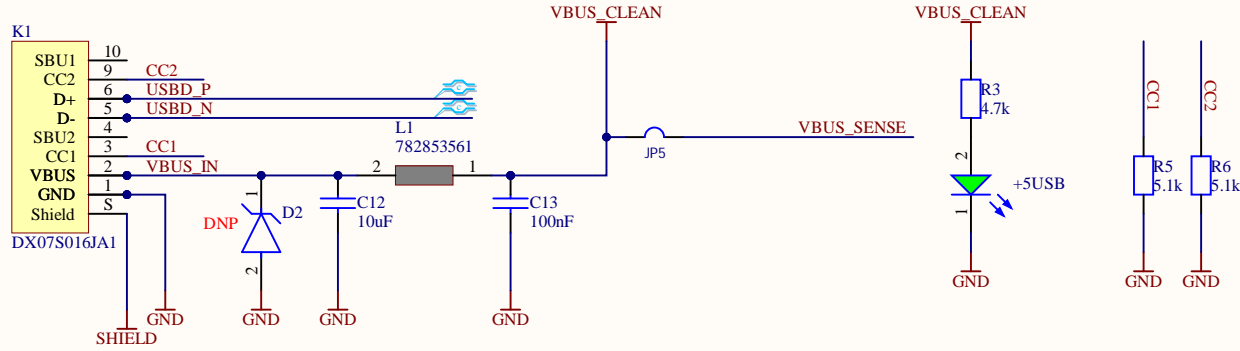
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**A&C / CONN  
/ NFC**

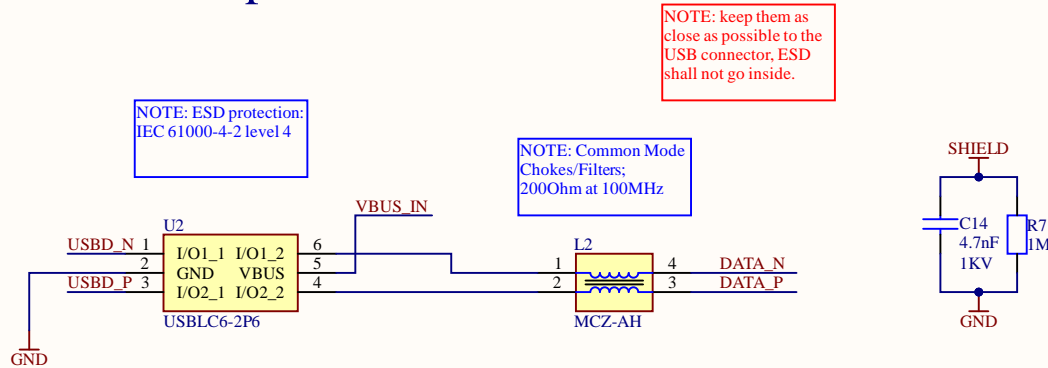
**RENESAS**  
[www.renesas.com](http://www.renesas.com)

# USB-C.SchDoc

## USB-C

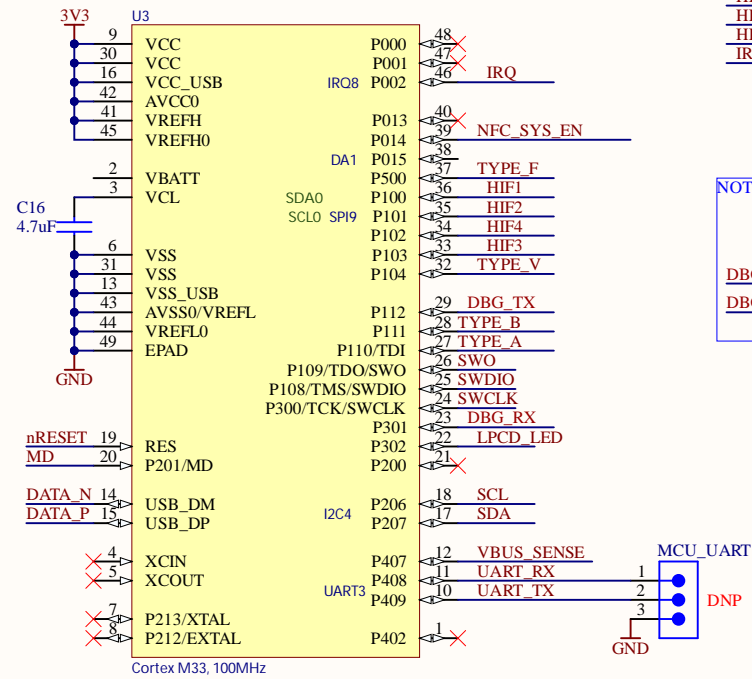
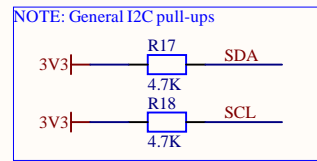
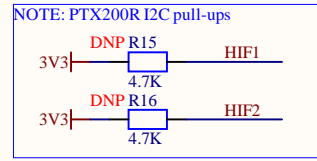
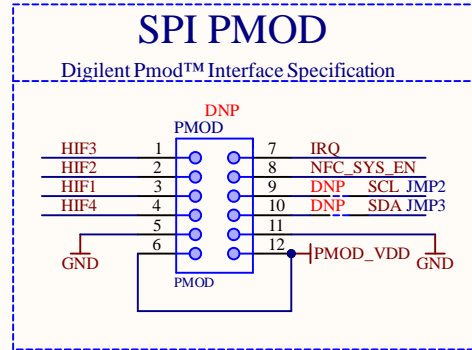
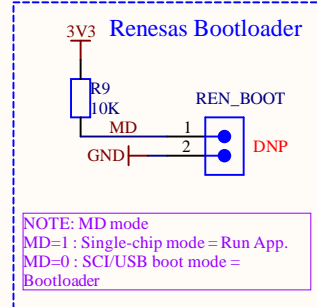
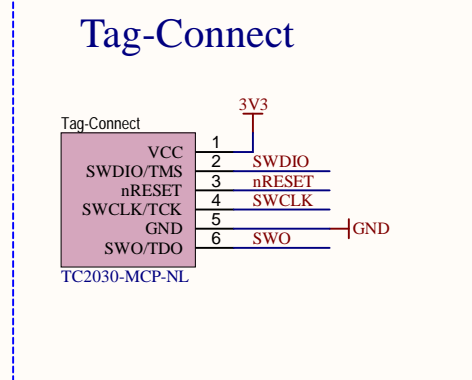
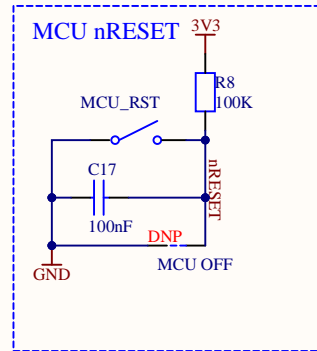
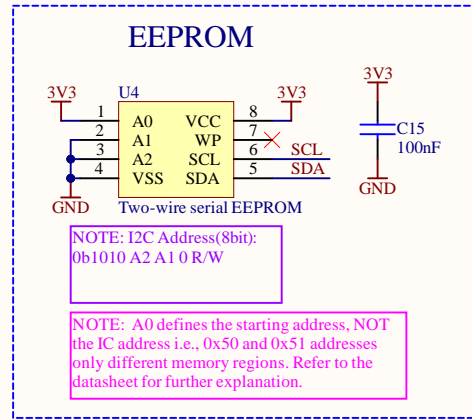


## ESD protection & filter

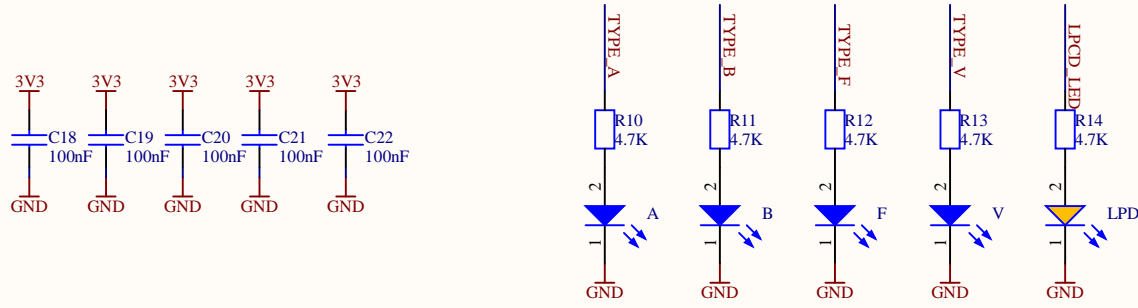


Title <b>USB-C.SchDoc</b>			A&C / CONN / NFC	<b>RENESAS</b> <a href="http://www.renesas.com">www.renesas.com</a>
Size: A4	Drawn by: PCIP	Revision: A5		
Date: 19/12/2025	Time: 08:18:22	Sheet 2 of 5		
File: USB-C.SchDoc				

# MCU and Peripheral.SchDoc

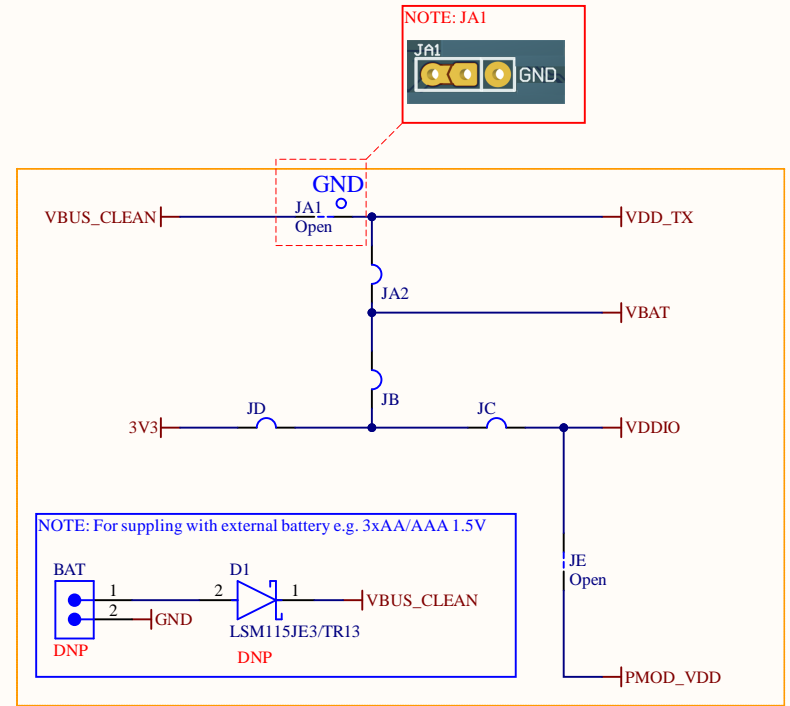
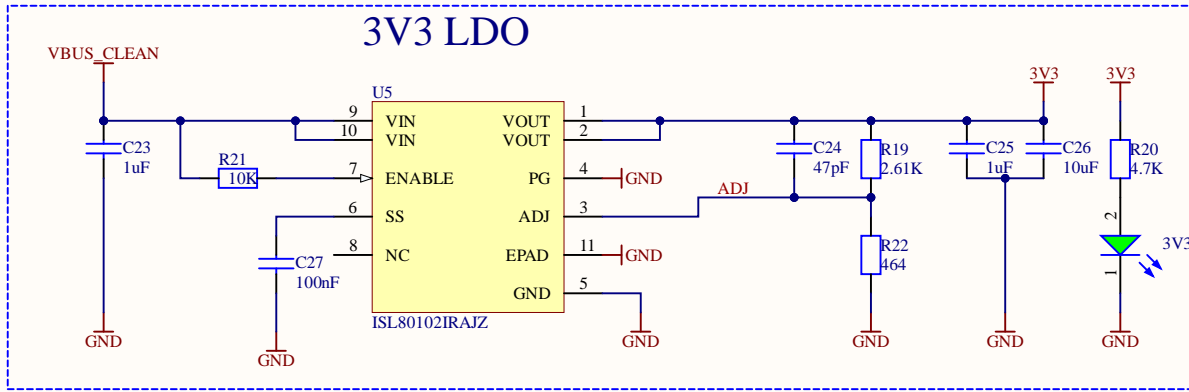


NOTE: This MCU may be subject to export control. In case of doubt check with the Trade Compliance Department

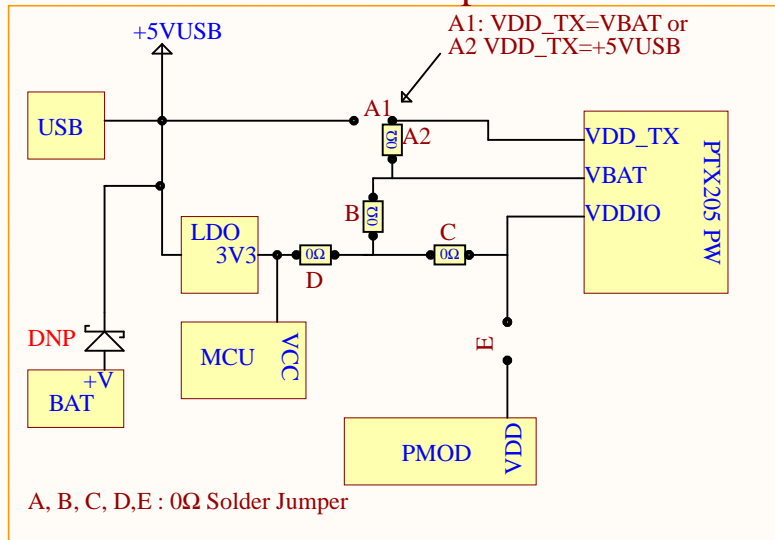


Title <b>MCU and Peripheral.SchDoc</b>			A&C / CONN / NFC	RENESAS www.renesas.com
Size: A4	Drawn by: PCIP	Revision: A5		
Date: 19/12/2025	Time: 08:18:23	Sheet 3 of 5		
File: MCU and Peripheral.SchDoc				

# Power Supply.SchDoc



## Power Concept



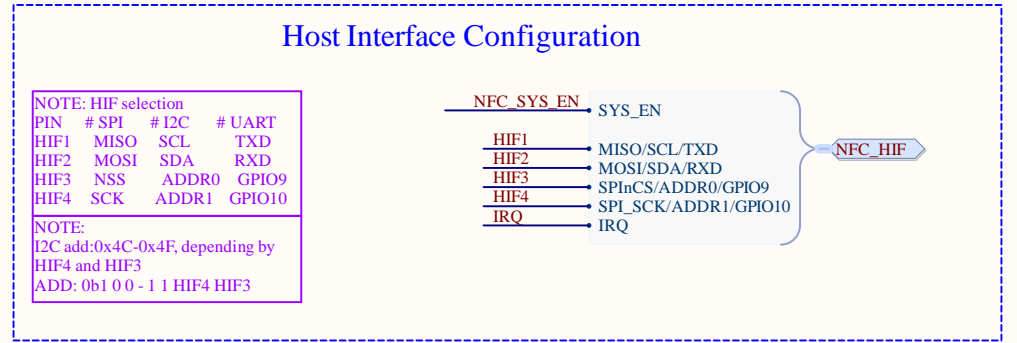
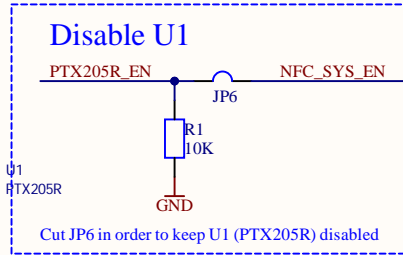
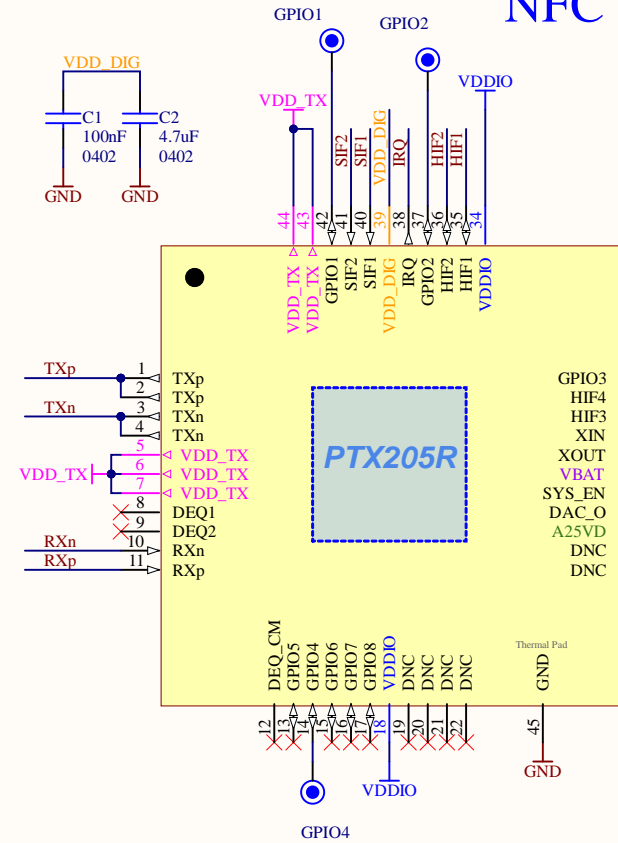
## Some of the possible Power Configurations

- \*1: USB supply: all at 3.3V
- 2: USB supply: VDD\_TX=+5VUSB
- 3: Conf. 1 or 2 but VDDIO supplied via PMOD (e.g. VDDIO=1.8V)
- 4: PMOD supply (max 3.3V)
- 5: BAT supply (No USB required): all at 3.3V
- 6: BAT Supply (No USB required) but VDDIO via PMOD (e.g. 1.8V bu max 3.3V)

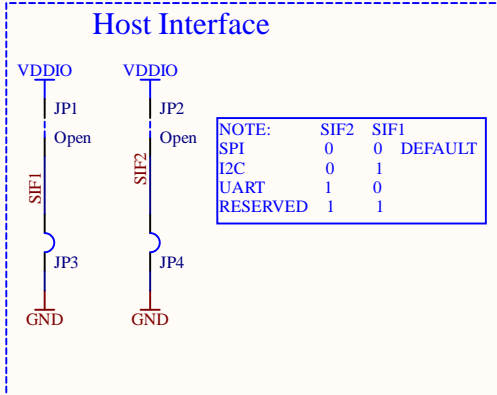
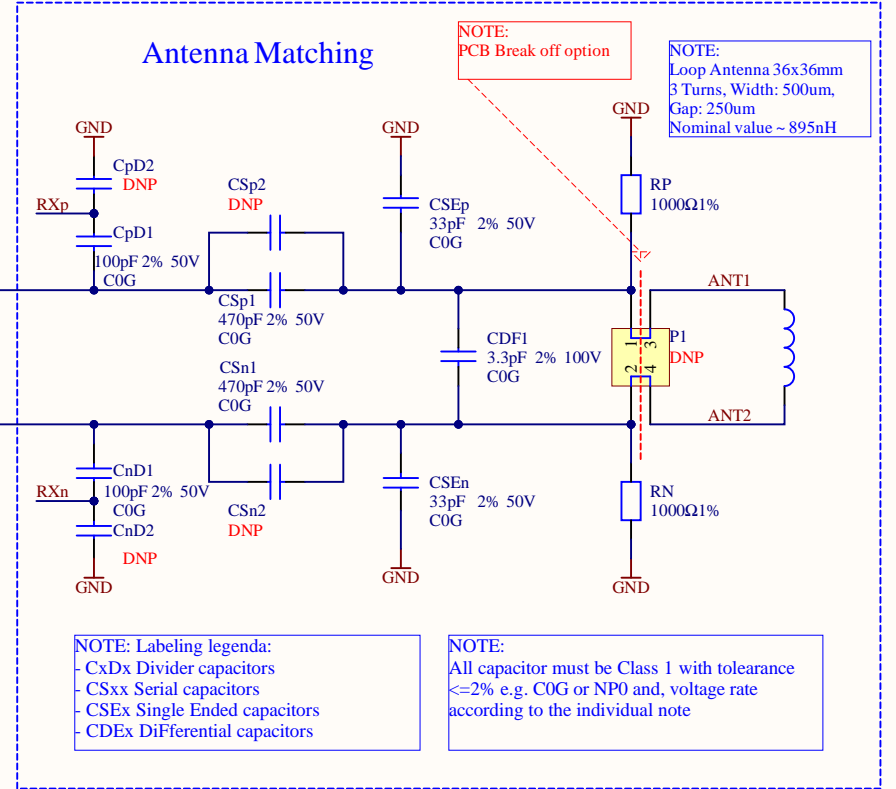
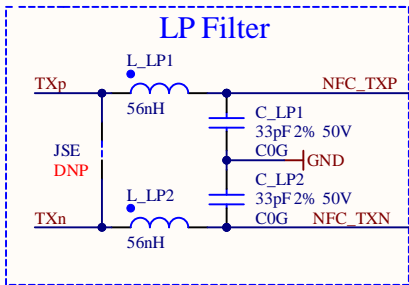
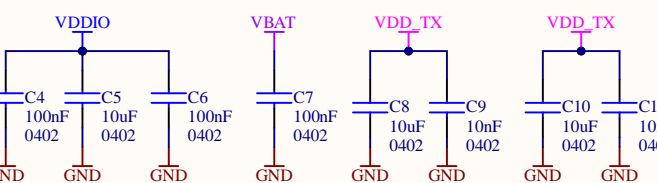
\*default

Title <b>Power Supply.SchDoc</b>			A&C / CONN / NFC	 www.renesas.com
Size: A4	Drawn by: PCIP	Revision: A5		
Date: 19/12/2025	Time: 08:18:23	Sheet 4 of 5		
File: Power Supply.SchDoc				

# NFC Reader.SchDoc



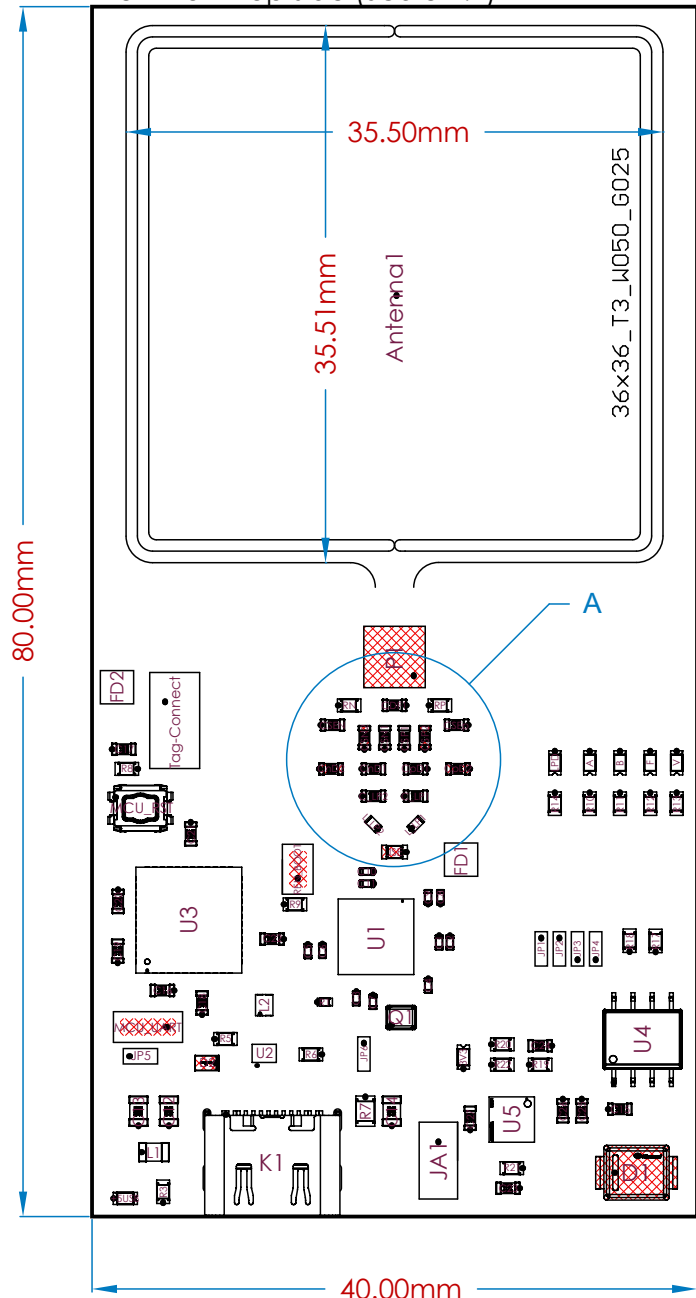
NOTE: [PTX205R Datasheet](#)



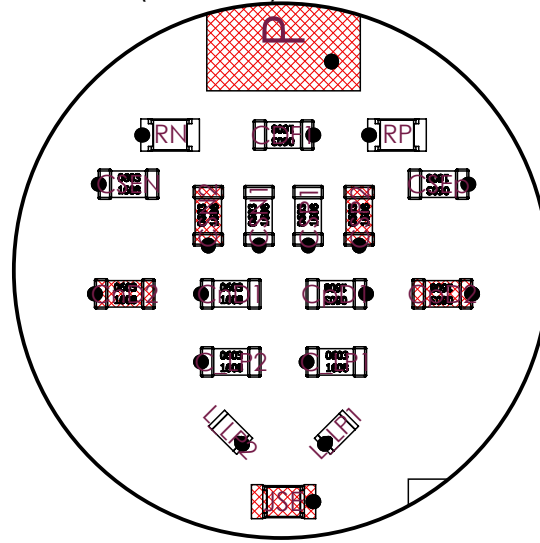
Title <b>NFC Reader.SchDoc</b>			A&C / CONN / NFC	 www.renesas.com
Size: A4	Drawn by: PCIP	Revision: A5		
Date: 19/12/2025	Time: 08:18:23	Sheet 5 of 5		
File: NFC Reader.SchDoc				

# Board Assembling

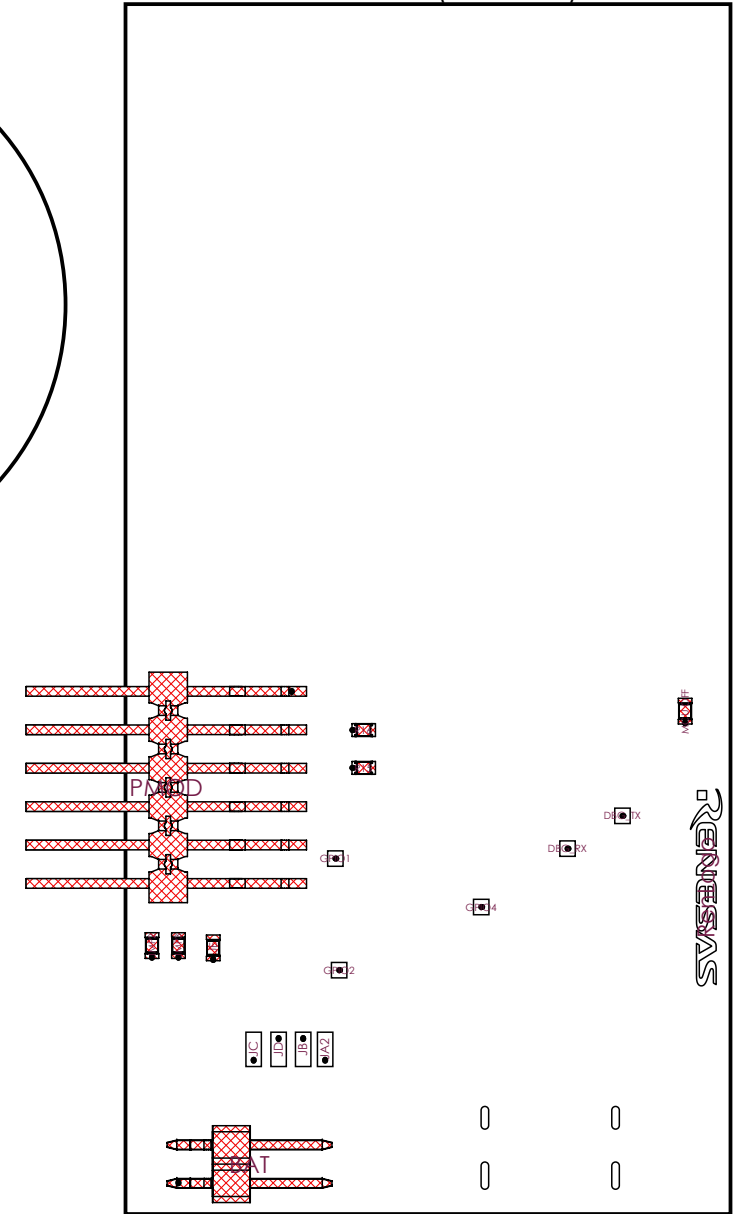
View from Top side (Scale 2:1)



DETAIL A (Scale 5:1)



View from Bottom side (Scale 2:1)



# PCB StackUp

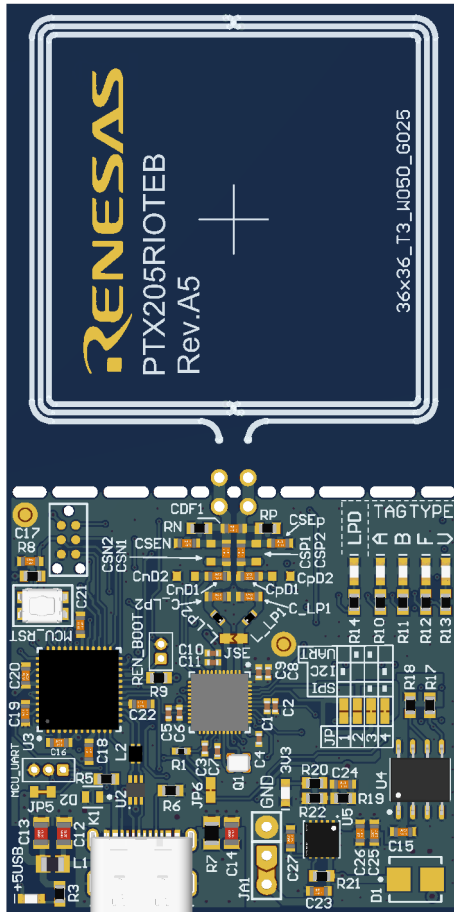
## Layer Stack Legend

Material	Layer	Thickness	Dielectric Material	Type	Gerber
	Top Overlay			Legend	GTO
Surface Material	Top Solder	0.02mm	WE-SM-0001	Solder Mask	GTS
<b>WE-ED-0009</b>	<b>TL</b>	<b>0.04mm</b>		<b>Signal</b>	<b>GTL</b>
Prepreg		0.10mm	WE-PP-0010	Dielectric	
<b>WE-ED-0004</b>	<b>L1</b>	<b>0.04mm</b>		<b>Signal</b>	<b>G1</b>
Core		0.60mm	WE-CO-0009	Dielectric	
<b>WE-ED-0004</b>	<b>L2</b>	<b>0.04mm</b>		<b>Signal</b>	<b>G2</b>
Prepreg		0.10mm	WE-PP-0010	Dielectric	
<b>WE-ED-0009</b>	<b>BL</b>	<b>0.04mm</b>		<b>Signal</b>	<b>GBL</b>
Surface Material	Bottom Solder	0.02mm	WE-SM-0001	Solder Mask	GBS
	Bottom Overlay			Legend	GBO

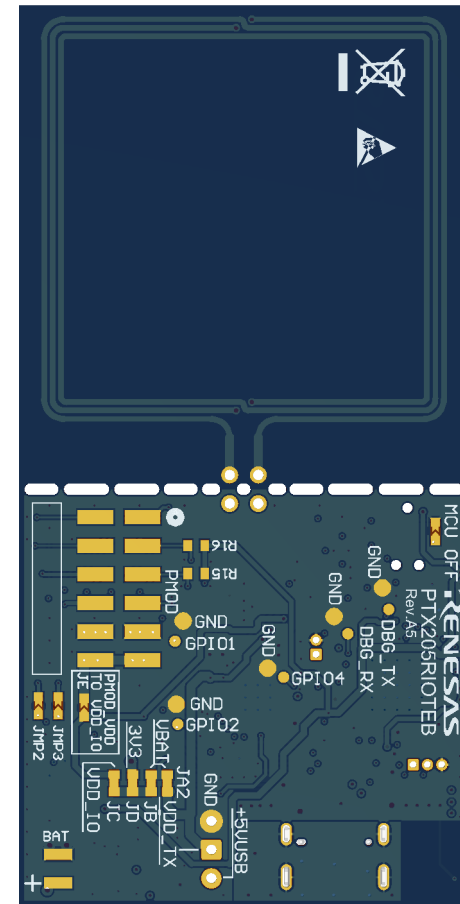
Total thickness: 0.97mm


# Board Realistic View

Realistic View



Realistic View

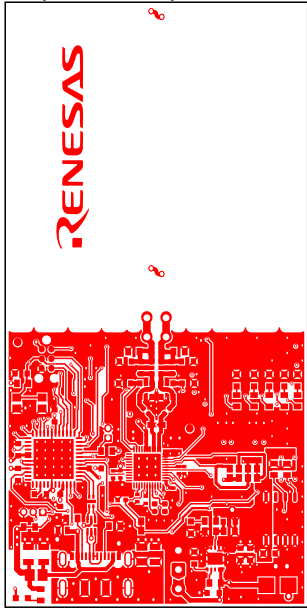


Title: <b>Manufacturing Information</b>	Size: A4	 <a href="http://www.renesas.com">www.renesas.com</a>
Project: PTX205RIOTEB.PrjPcb		
Date: 19/12/2025	Time: 08:18	
File: Manufacturing Information.PCBdwf		

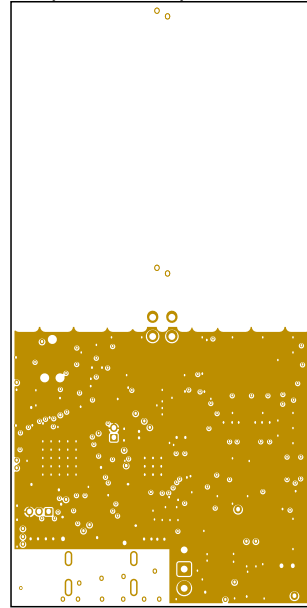
EPSPG/CSD

# PCB Layers 1:1 View

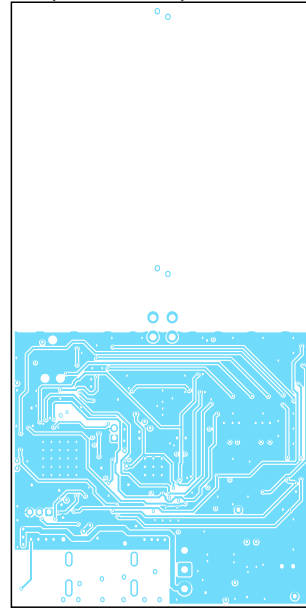
TL (Scale 1:1)



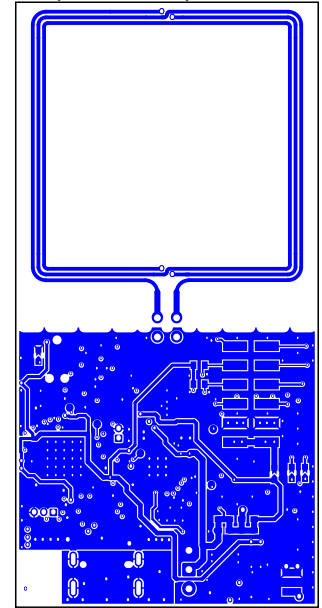
L1 (Scale 1:1)



L2 (Scale 1:1)



BL (Scale 1:1)



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