

AN13425

PN5190 EMV L1 SW porting to IMX1170

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Application note
COMPANY PUBLIC

Document information

Information	Content
Keywords	PN5190, MIMXRT1170, NFC Reader Library
Abstract	This application note describes, how to connect PN5190 with MIMXRT1170 and run NFC Reader Library on that setup.



Revision history

Revision history

Rev	Date	Description
v.1.0	20211130	Initial version

1 Introduction

The goals of this document are:

- Describe the process to set up the HW and connect the MIMX1170EVK together with the PNEV5190B to run the ported examples from the NFC Reader Lib.
- Describe the process to set up and configure the projects of the NFC Reader Lib in the MCUXpresso IDE to be able to run the examples.

2 Preparation of HW and assembly

2.1 PNEV5190 bring up

The PNEV5190 comes with a Kinetis K82F as a host MCU to drive the PN5190.

Since the goal is to drive PN5190 from the IMX1170-EVK via SPI, we need to prepare the PNEV5190 for it:

- Power up board correctly
- Enable external SPI pins
- Disable K82F interface with PN5190

2.1.1 Power up and jumper configuration

- To power up the board correctly:
 - Powering it up over USB does not provide enough current. It will be powered with an external power supply between 5 V and 12 V over connector J17.
- Put jumper on following pins: (see Figure1)
 - J9 2-3: External power supply
 - J8: VBATPWR supplied with VBAT=3.3 V
 - J12: VBAT supplied with 3.3 V
- Remove jumpers on following pins: (see [Figure1](#))
 - J22, J23: open SDA signals for K82F
 - J19: RTS push-button bypass for K82F
 - J3, J4, J5, J6: pull down jumpers for NFC module signals
- Set GPIO and SPI voltage to 3.3 V: supplying 3.3 V to VDDIO and the μ C supply: (see [Figure1](#))
 - Remove short circuit on R19
 - Place short circuit on R20
- For any additional configuration, please see PNEV5190B evaluation board quick start guide [\[1\]](#).

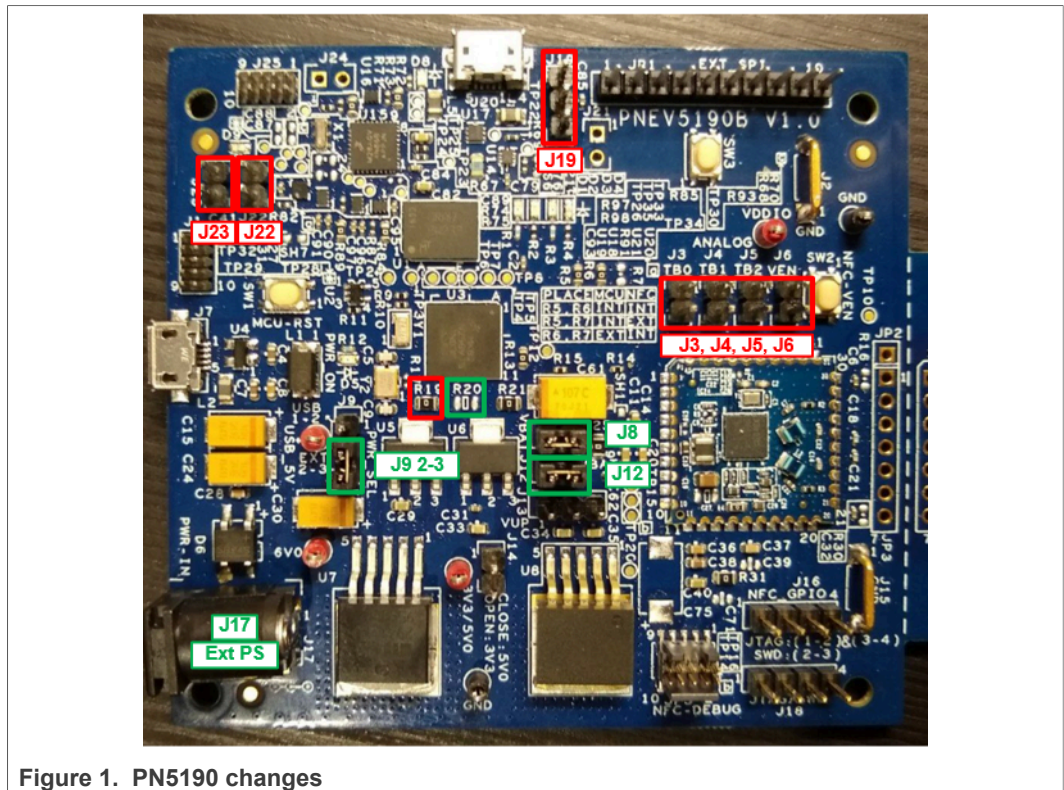


Figure 1. PN5190 changes

2.1.2 Routing NFC module communication pins to JP1

To enable the pins on JP1 for communication, we have to enable a switch and disable another one in the NFCC Host Interface (see [Figure 2](#)).

Remove short on R5 to disable communication routing to K82F.

Place short on R7 to enable communication routing to JP1 pins.

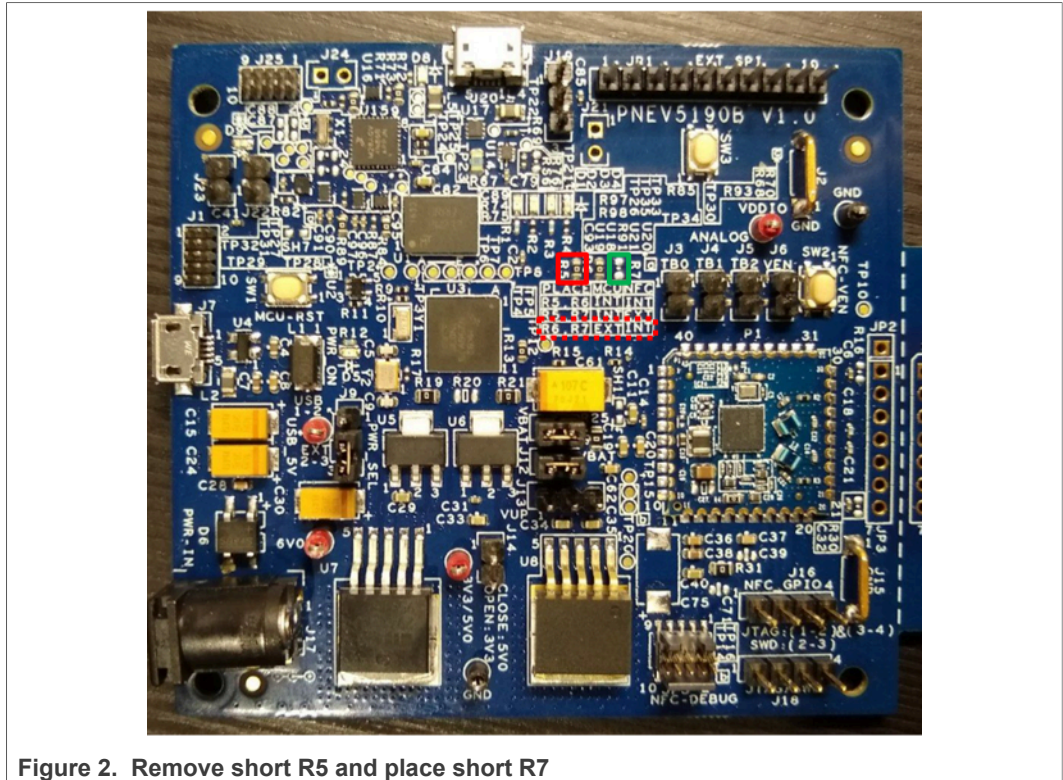


Figure 2. Remove short R5 and place short R7

2.2 MIMXRT1170-EVK bring up

- To power up the board with external power supply on connector J43, put jumper on J38 1-2 and turn on switch SW5. (see [Figure 3](#))
- To program the MCU, there are two options: (see [Figure 3](#))
 - Use the onboard CMSIS-DAP: connect a USB micro cable to J11 and place jumpers J5, J6, J7, J8.
 - Use J-Link or LPC-Link debug probe: connect the JTAG connector to J1 and remove jumpers J5, J6, J7, J8.
- To be able to read UART1, there are two options: (see [Figure 3](#))
 - From the USB: place jumpers J31, J32.
 - Direct signal through a serial probe: remove jumpers J31, J32 and place TX-RX pins of the probe on pin 2 of J31 and J32
- For any additional configuration, please see MIMXRT1170 EVK Board Hardware User's Guide [\[2\]](#).

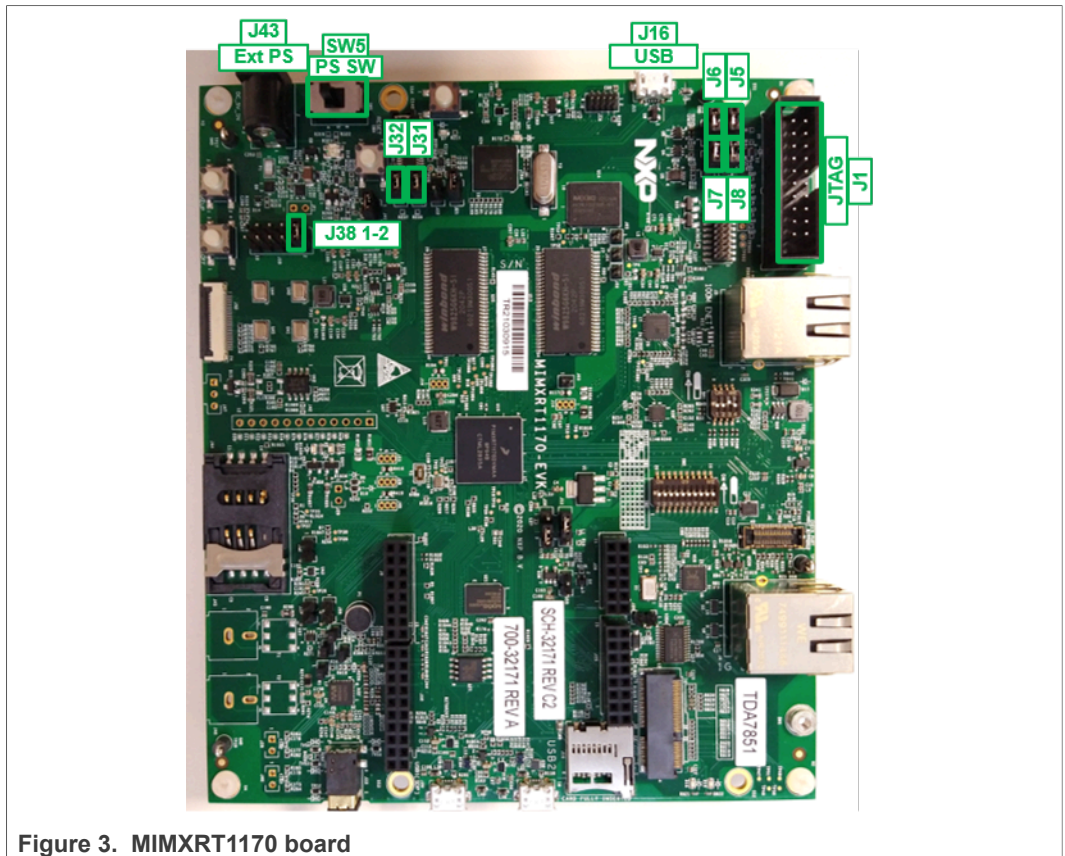


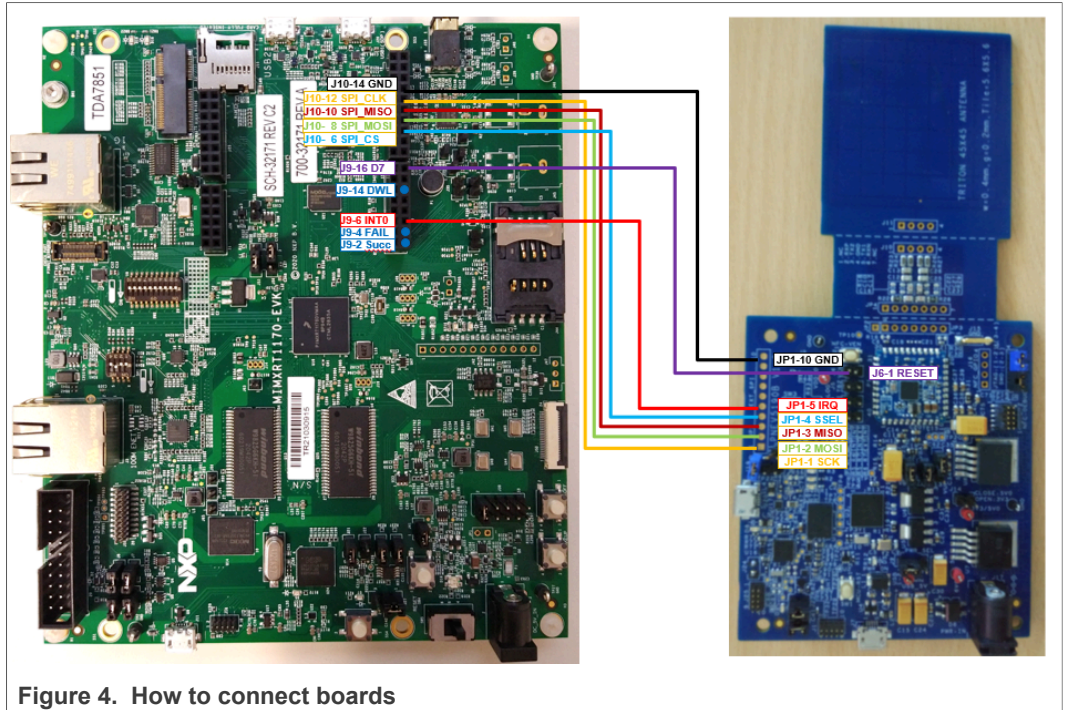
Figure 3. MIMXRT1170 board

2.3 Boards interconnection assembly

Table 1. Pin configuration

Pin configuration	IMX1170	PN5190
MOSI	J10-8	JP1-2
MISO	J10-10	JP1-3
SCK	J10-12	JP1-1
SSEL	J10-6	JP1-4
RESET	J9-16	J6-1
IRQ	J9-6	JP1-5
GND	J10-14	JP1-10
SUCCESS	J9-2*	-
FAIL	J9-4*	-
DWL	J9-12*	-

* Pins that need to be configured for library compatibility, but are not used and do not need to be connected.



3 Preparation of SW and configuration

The steps to set up the SW project are:

- Download and install MCUXpresso IDE (at this document we are using version 11.3.1)
- Download and import MIMXRT1170 SDK (at this document we are using version 2.10.1)
- Import NFC Reader Library to MCUXpresso IDE
- Build and run desired application

3.1 Download and install MCUXpresso IDE

Go to <https://www.nxp.com/design/software/development-software/mcuxpresso-software-and-tools/mcuxpresso-integrated-development-environment-ide:MCUXpresso-IDE> and follow the process to download the MCUXpresso IDE V11.3.1. (see [Figure 5](#))

Once downloaded, run the executable downloaded file and follow the instructions to install MCUXpresso IDE v11.3.1.

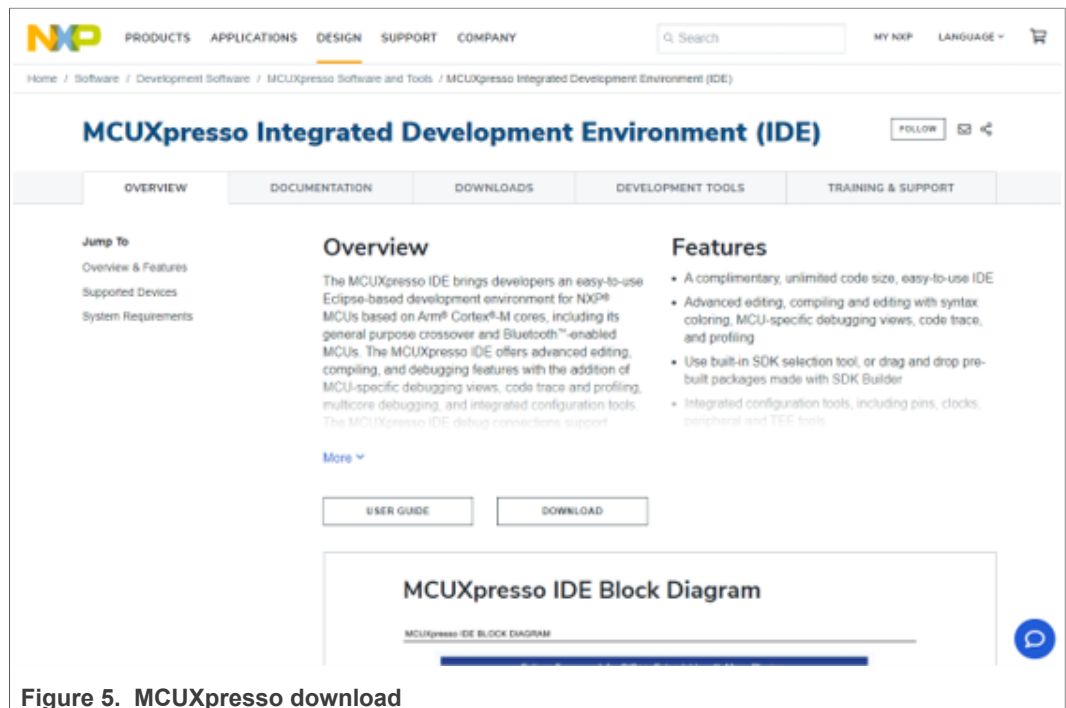


Figure 5. MCUXpresso download

After the installation:

- Create a new directory where you will place your workspace for this project.
- Open MCUXpresso IDE
- You will be asked to select a directory as workspace. Put the path to the recently created directory and click "Launch".
- MCUXpresso will open with welcome view.
- Close the Welcome tab clicking the "x".

3.2 Download and import MIMXRT1170 SDK

Go to <https://mcuxpresso.nxp.com/en/welcome> and click Select Development Board (see Figure 6).

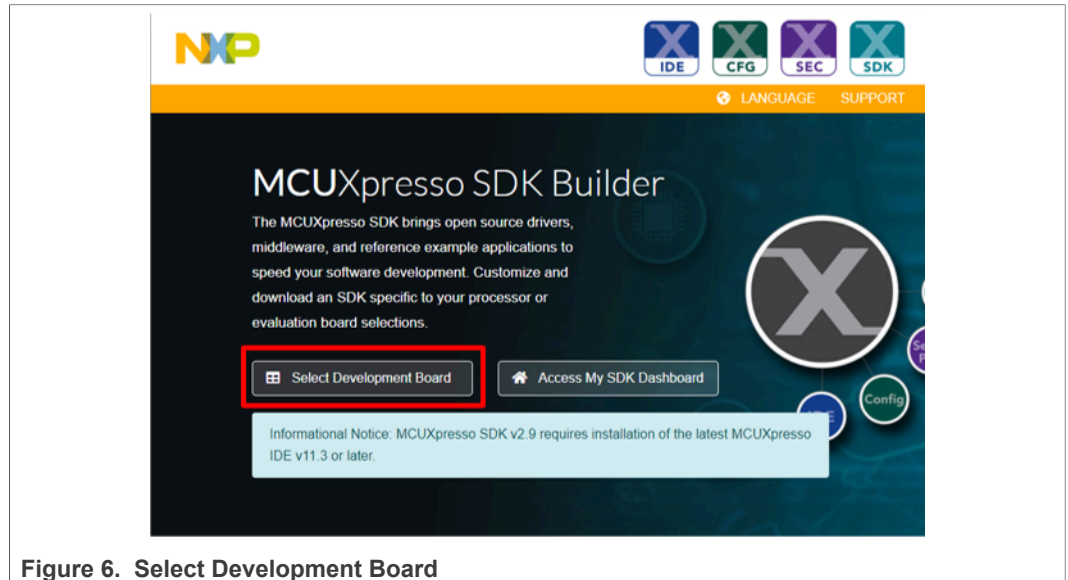


Figure 6. Select Development Board

Then look for MIMXRT1170-EVK board (see Figure 7).

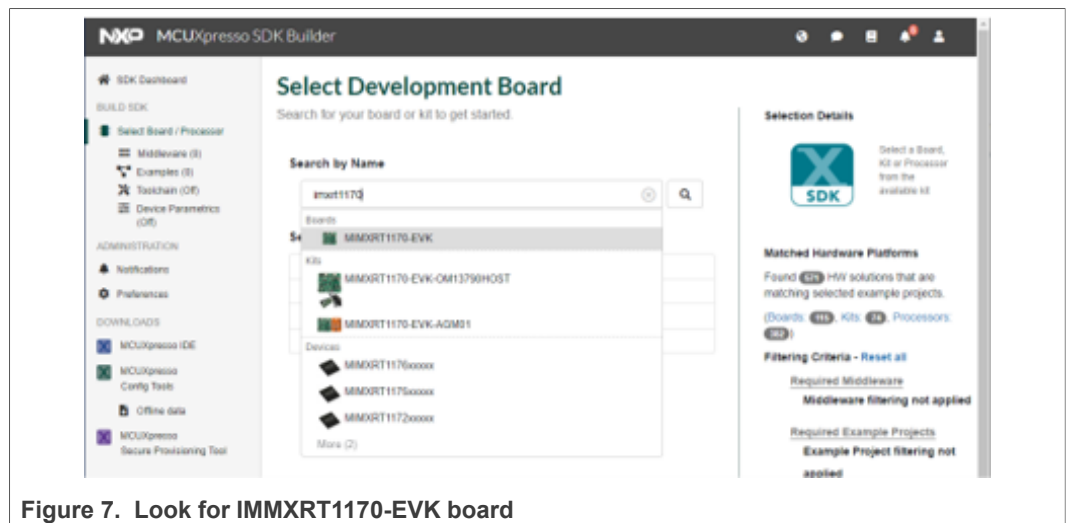


Figure 7. Look for IMMXRT1170-EVK board

Select MIMXRT1170-EVK (MIMXRT1176xxxxx) board. Choose latest version and click "Build SDK" (see Figure 8).

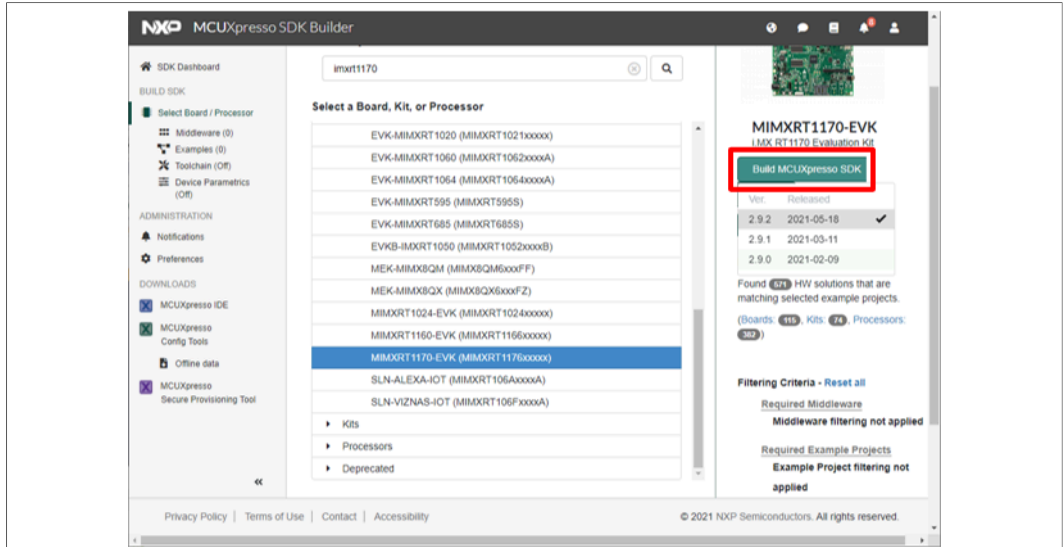


Figure 8. Select MIMXRT1170-EVK (MIMXRT1176xxxxx) board

Check Freertos checkbox and Download SDK (see [Figure 9](#)).

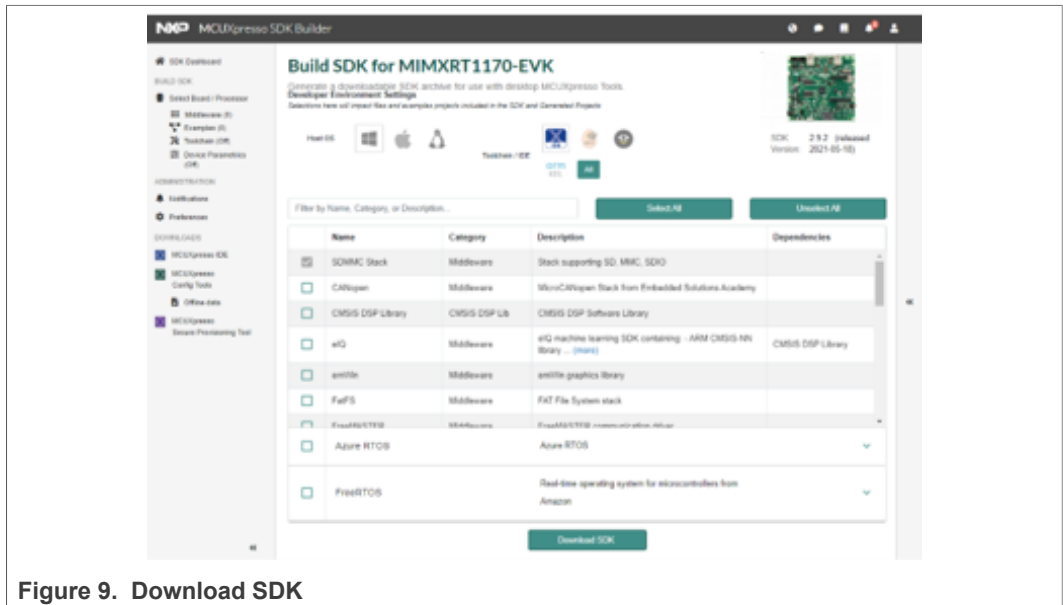


Figure 9. Download SDK

To import the MCU SDK, just drag and drop the recently downloaded compressed file containing the SDK files into the Installed SDKs window of the MCUxpresso IDE (see [Figure 10](#)).

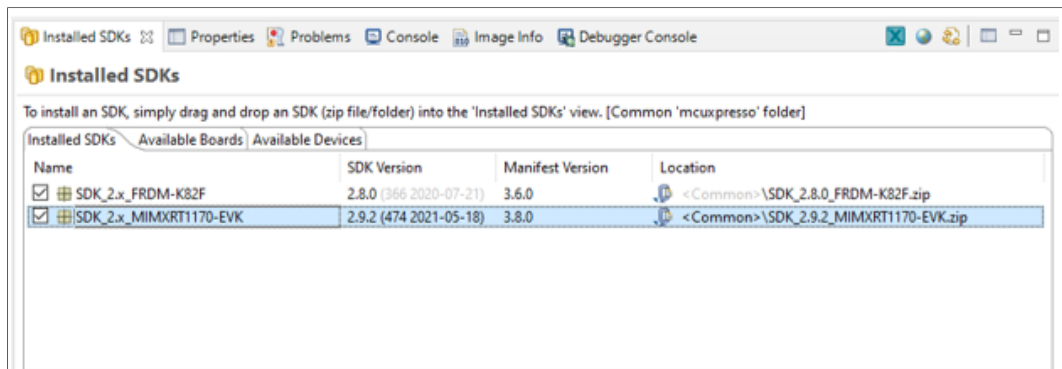


Figure 10. Import SDK

3.3 Import NFC Reader Library

First you need to unpack the content of the zip file.

Import project(s) from the file system (see [Figure 11](#))

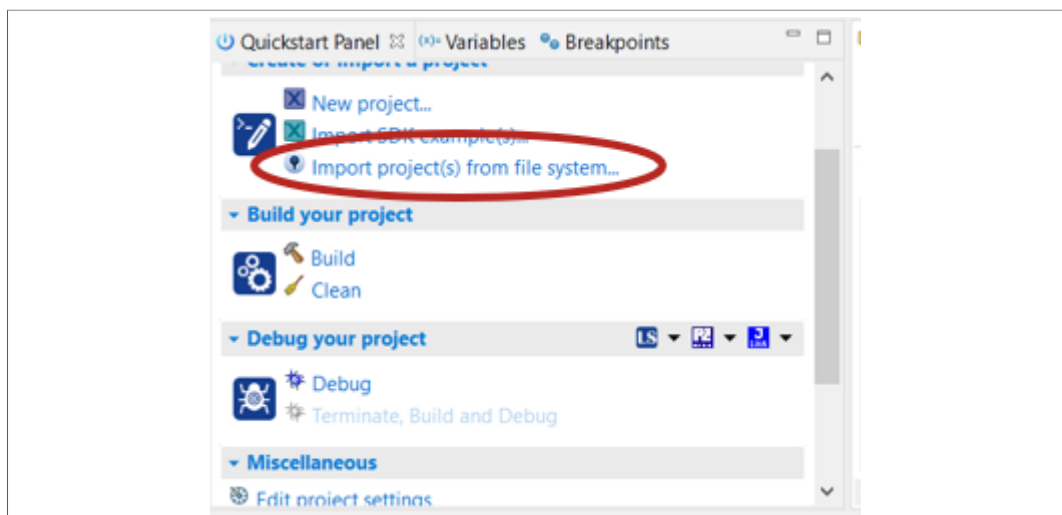


Figure 11. Import project from file system

Select the root directory and click next (see [Figure 12](#)).

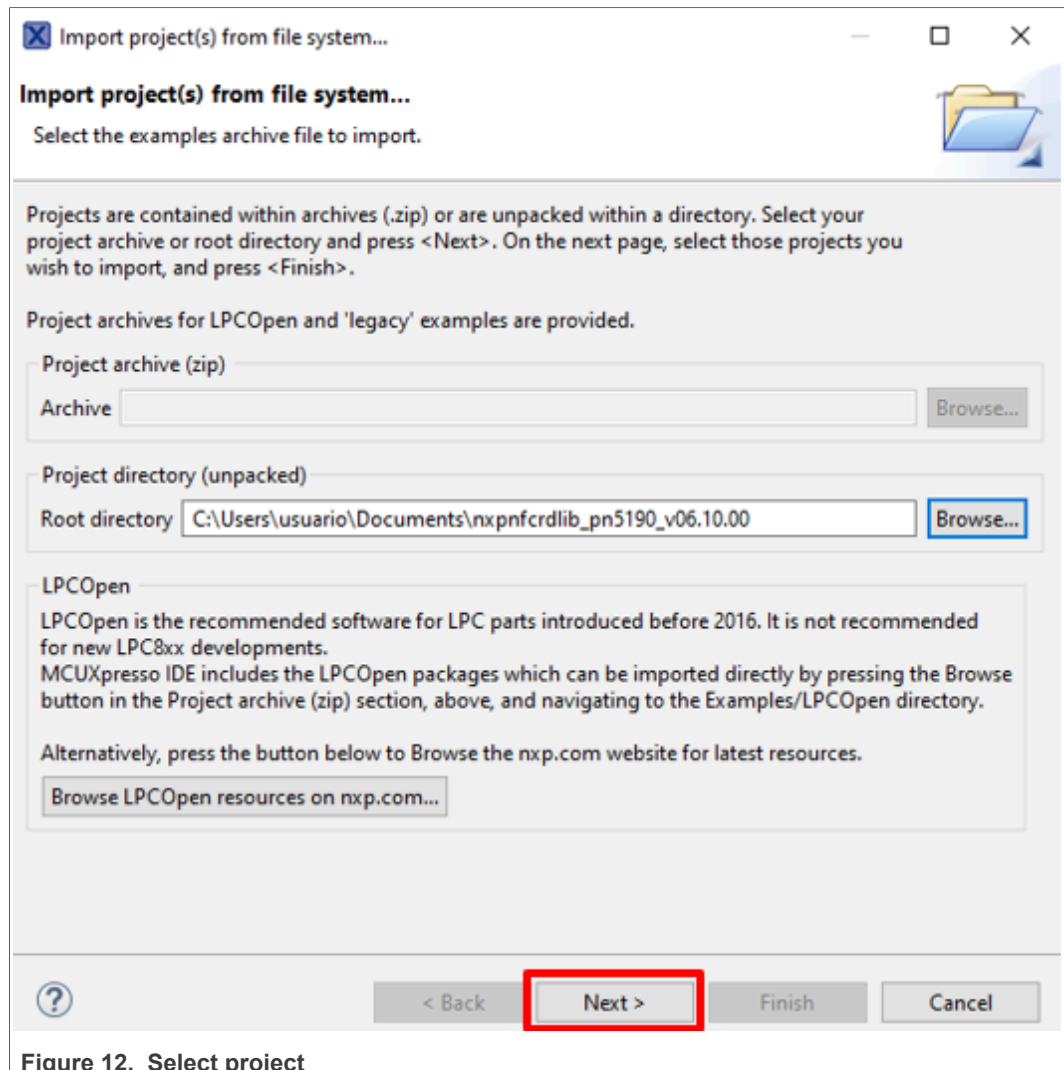


Figure 12. Select project

Select the project that you want to import. Minimum required:

1. Free RTOS
2. phOsal
3. NxpNfcRdLib
4. SDK_2.x_MIMXRT1170

Uncheck option "Copy projects into workspace" and click "Finish" (see [Figure 13](#)).

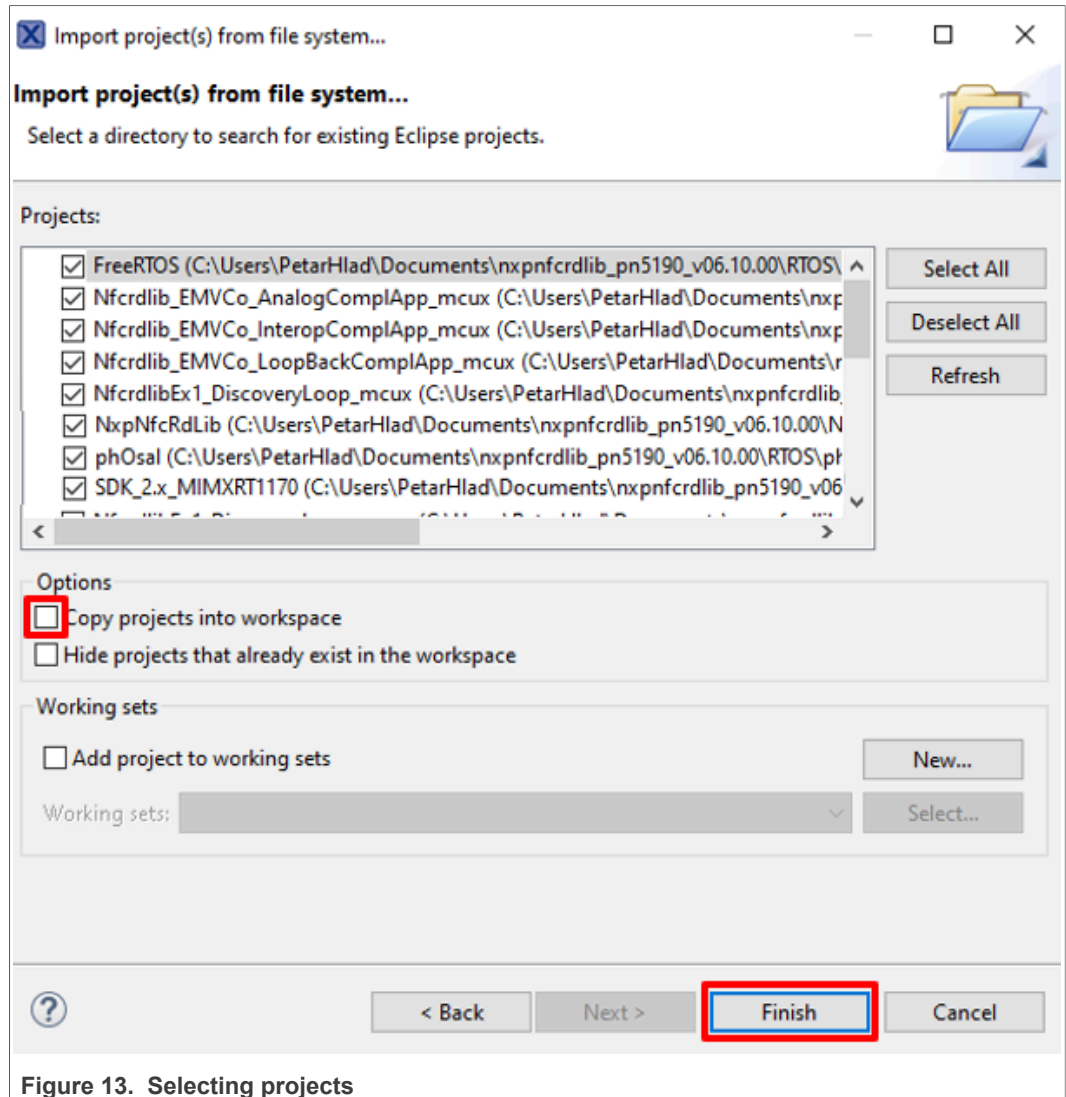


Figure 13. Selecting projects

3.4 Build IMX Library

Left click "SDK_2.X_MIMXRT1170" library project.

Click the manage Configuration button and select desired build configuration for the IMX Library. E.g., Debug configuration (see [Figure 14](#)).

After setting the build configuration, click "Build project". It will build the library file (see [Figure 15](#)).

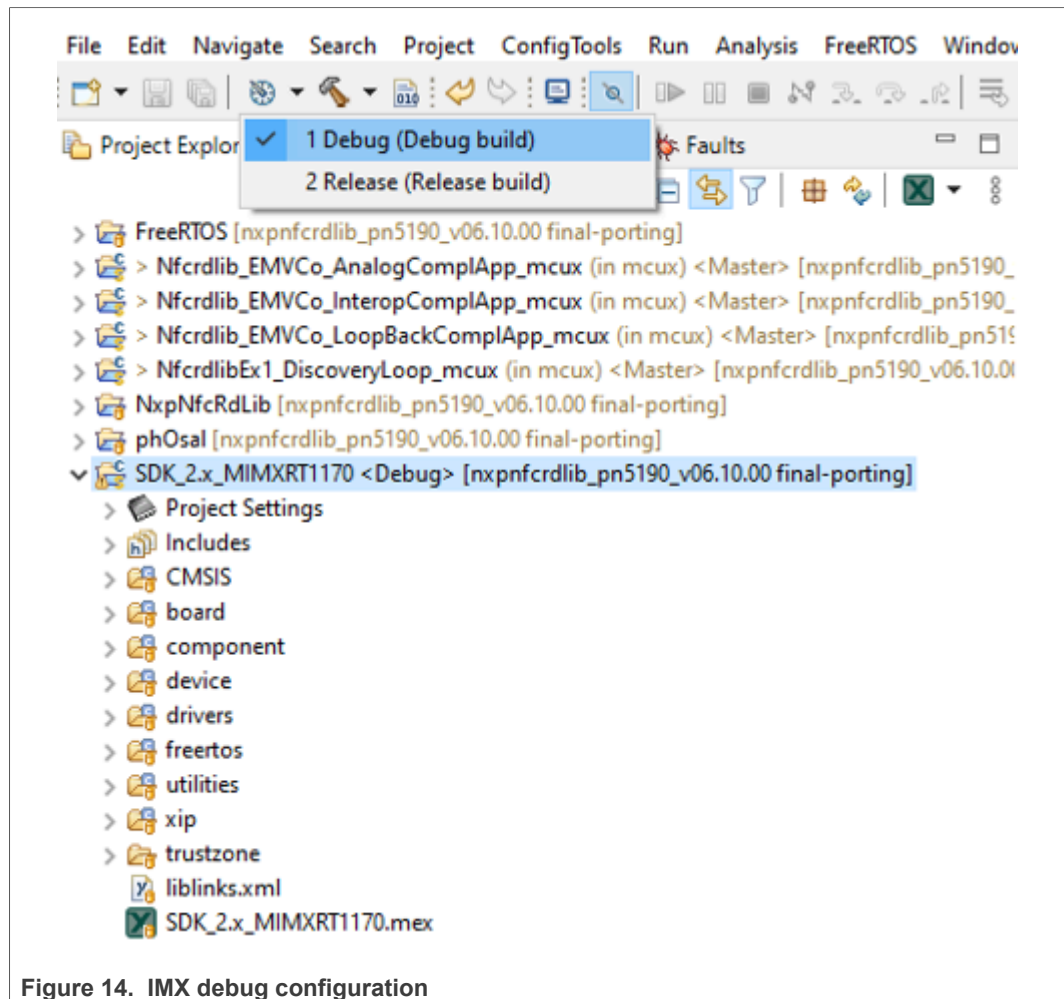


Figure 14. IMX debug configuration

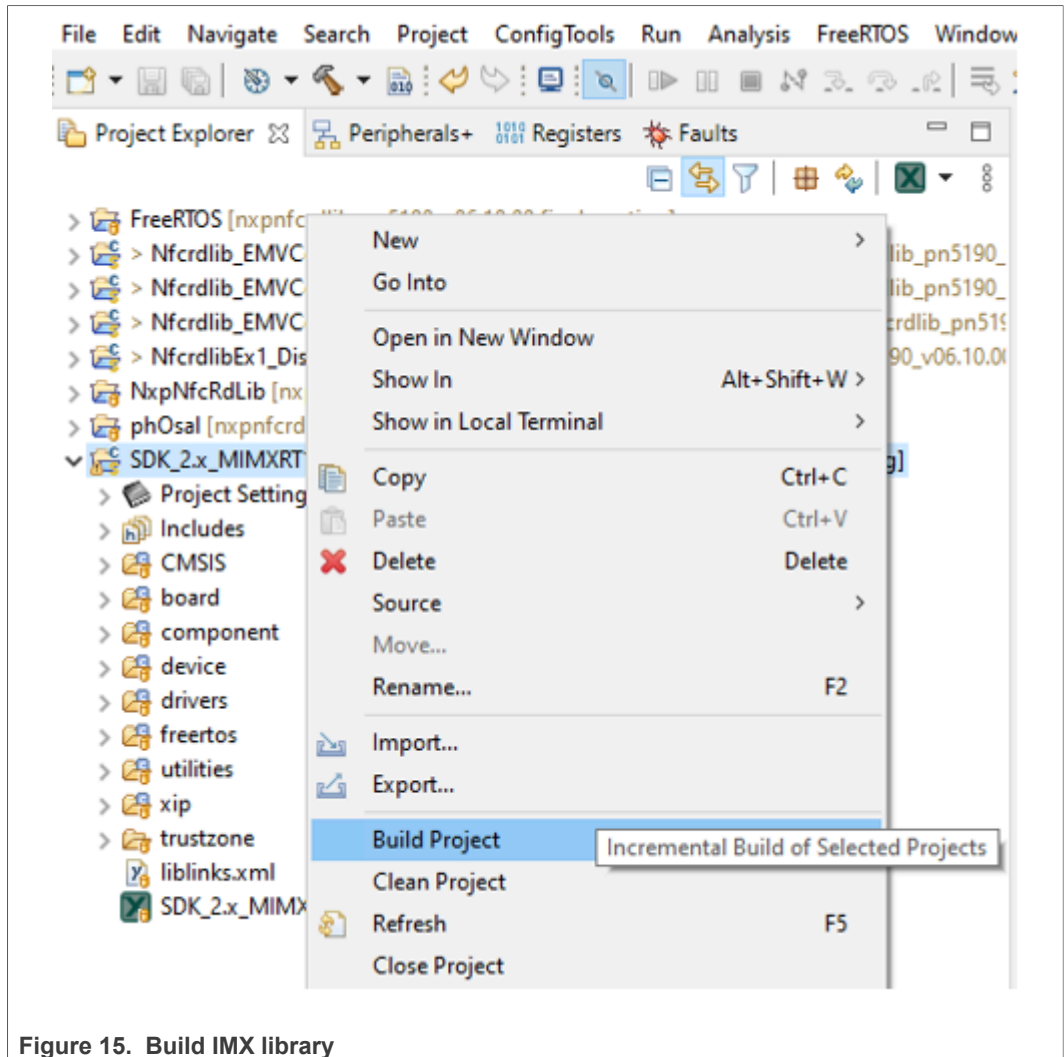


Figure 15. Build IMX library

3.5 Build NFC Reader Library

Left click on desired application to run. Click the "Manage Configurations" button and select desired build configuration. To see output on UART, we select the DebugMIMXRT1170EVK configuration (see [Figure 16](#)).

Right click on selected project and click "Build project". It will build the project (see [Figure 17](#)).

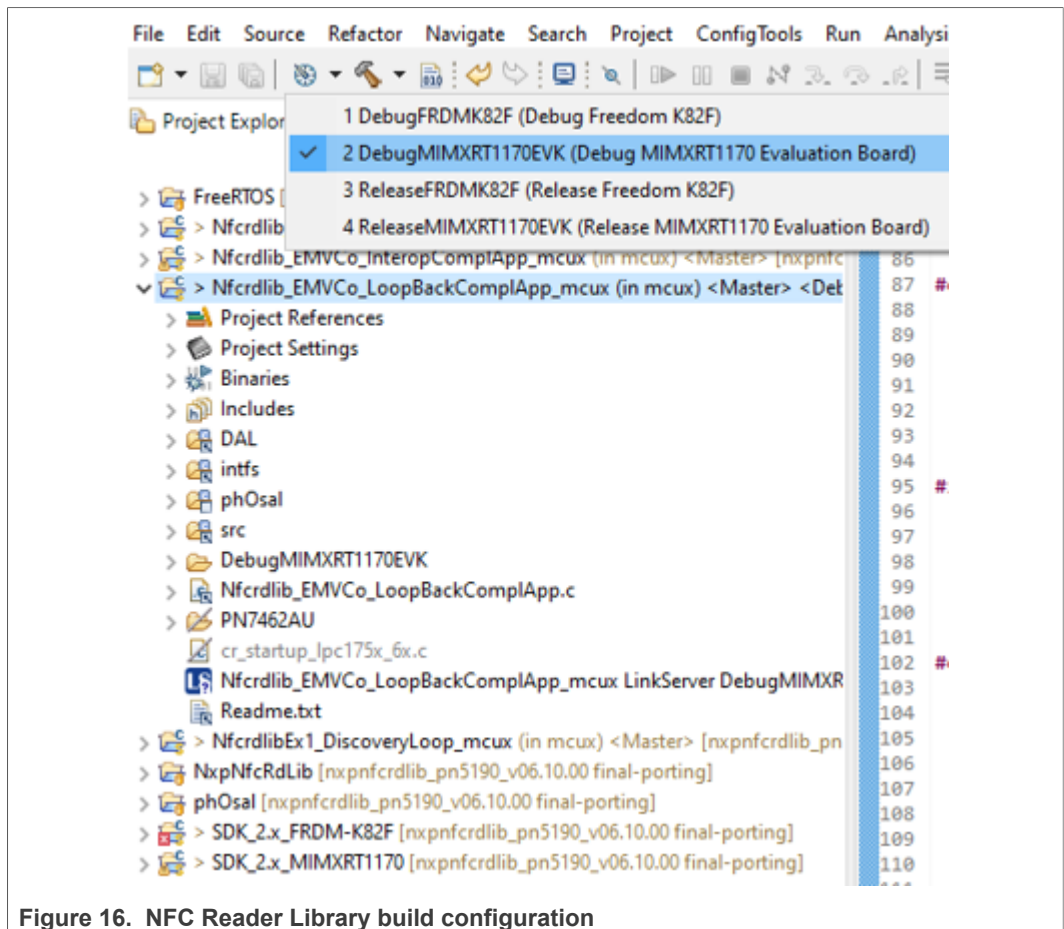


Figure 16. NFC Reader Library build configuration

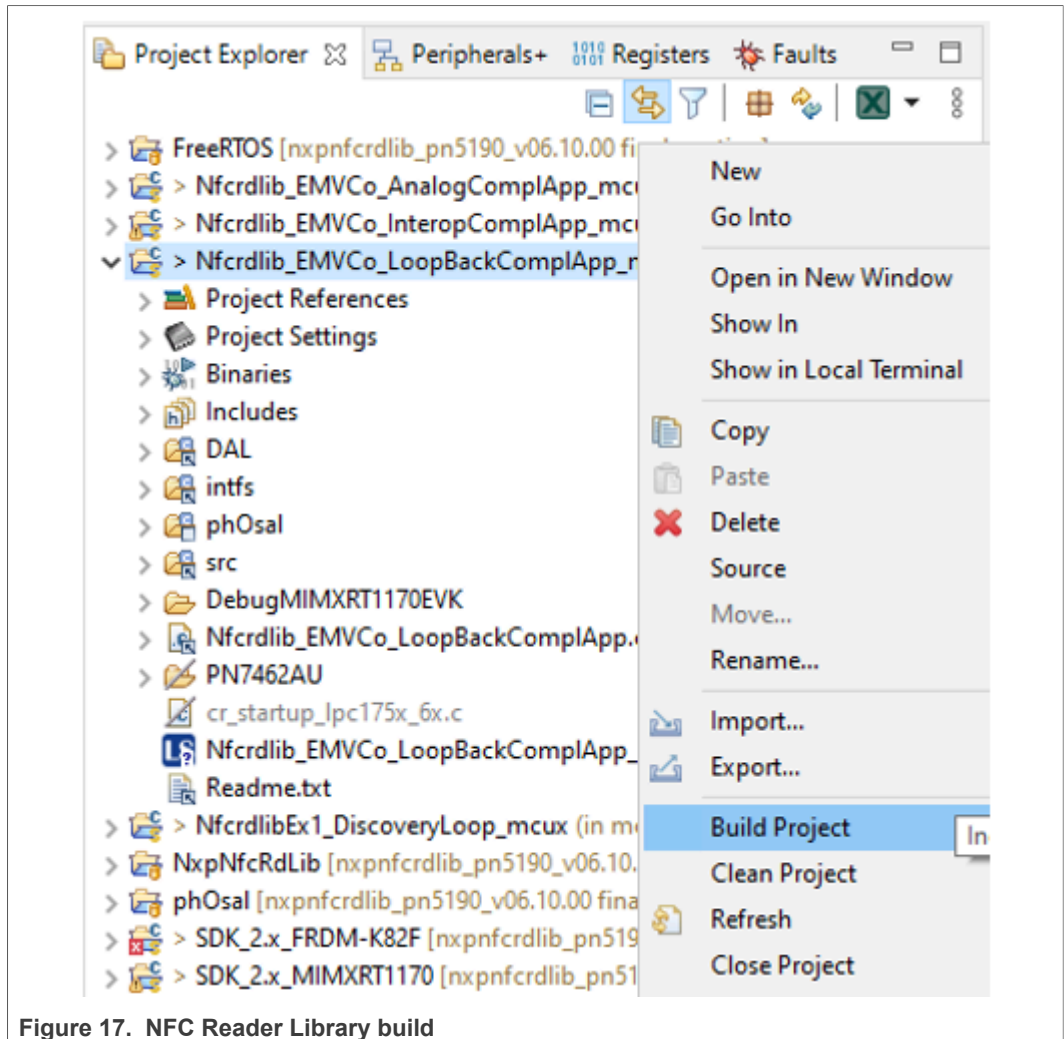


Figure 17. NFC Reader Library build

3.6 Run application

To check the correct behavior of the application, we can use serial terminal to read the UART output of the IMX (if build in debug configuration) (see [Figure 18](#)).

In this case, we are using the IMX's onboard CMSIS-DAP. We shall connect a USB cable from the computer to the connector J11 of the board, in the proper jumper configuration (see [MIMXRT1170-EVK Bringup](#) section). At the Quickstart Panel, click "LinkServer drop down list" button and click "Debug using LinkServer probes". This begins a debug session for the selected project (see [Figure 19](#)).

Acknowledge the selection of CMSIS-DAP probe. Once the Debug Session is set, click the Resume button so the app runs (see [Figure 20](#)).

Once the app starts running, you should read the init message of the app on the UART output. For the EMVCo LoopBack case, the message is "EMVCo compliance example:". This app is used to run the EMV L1 PCD Digital test, and will wait for a test bench to begin with the test cases (see [Figure 21](#)).

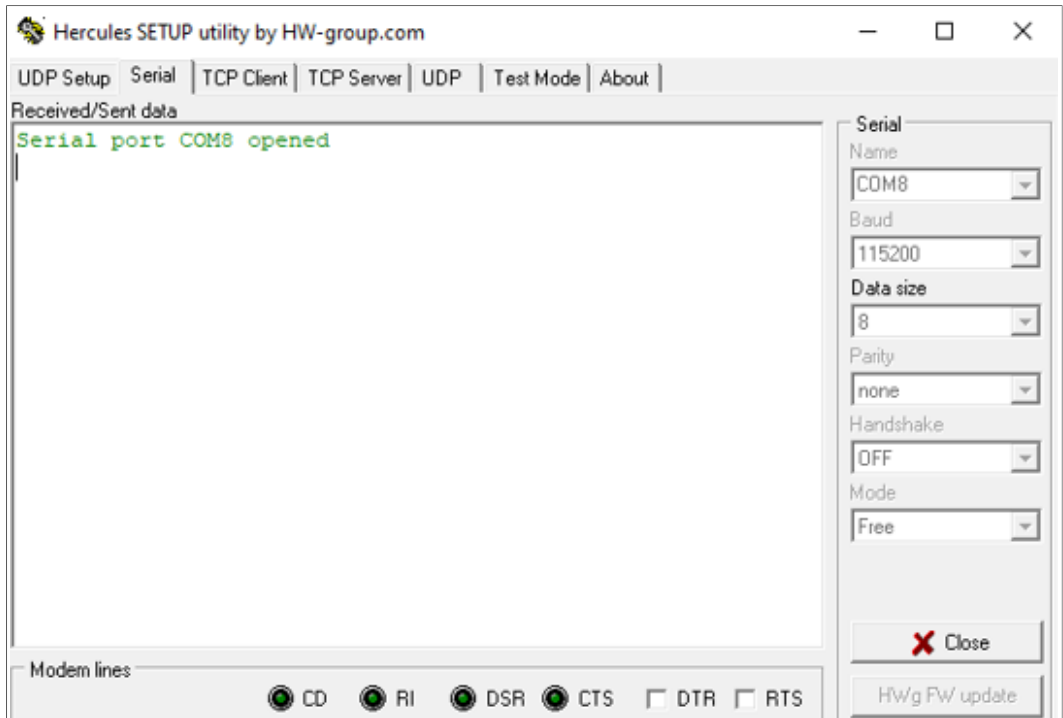


Figure 18. Connect to COM port

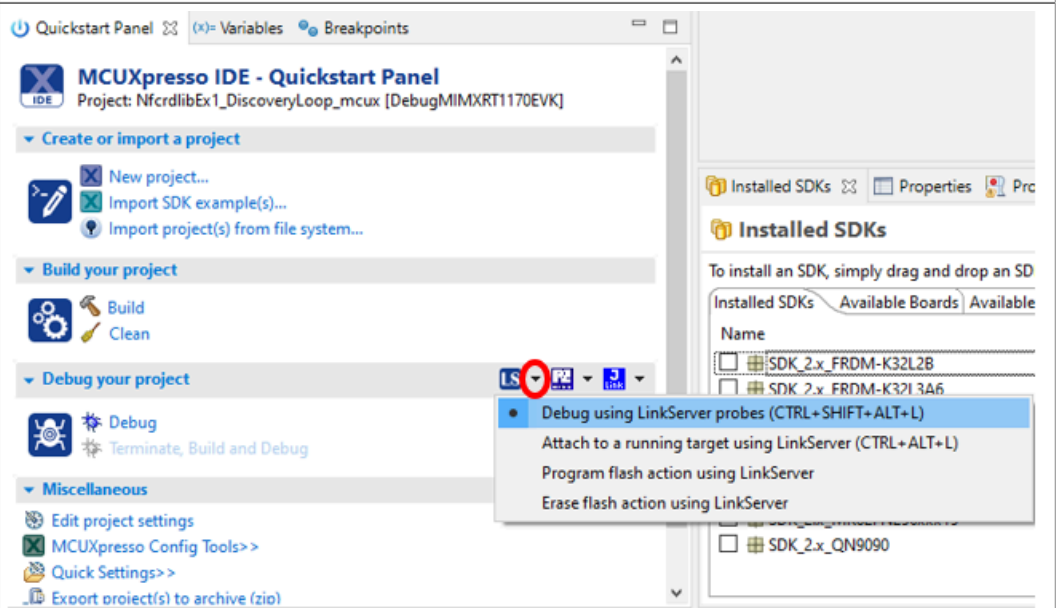


Figure 19. Select debugger

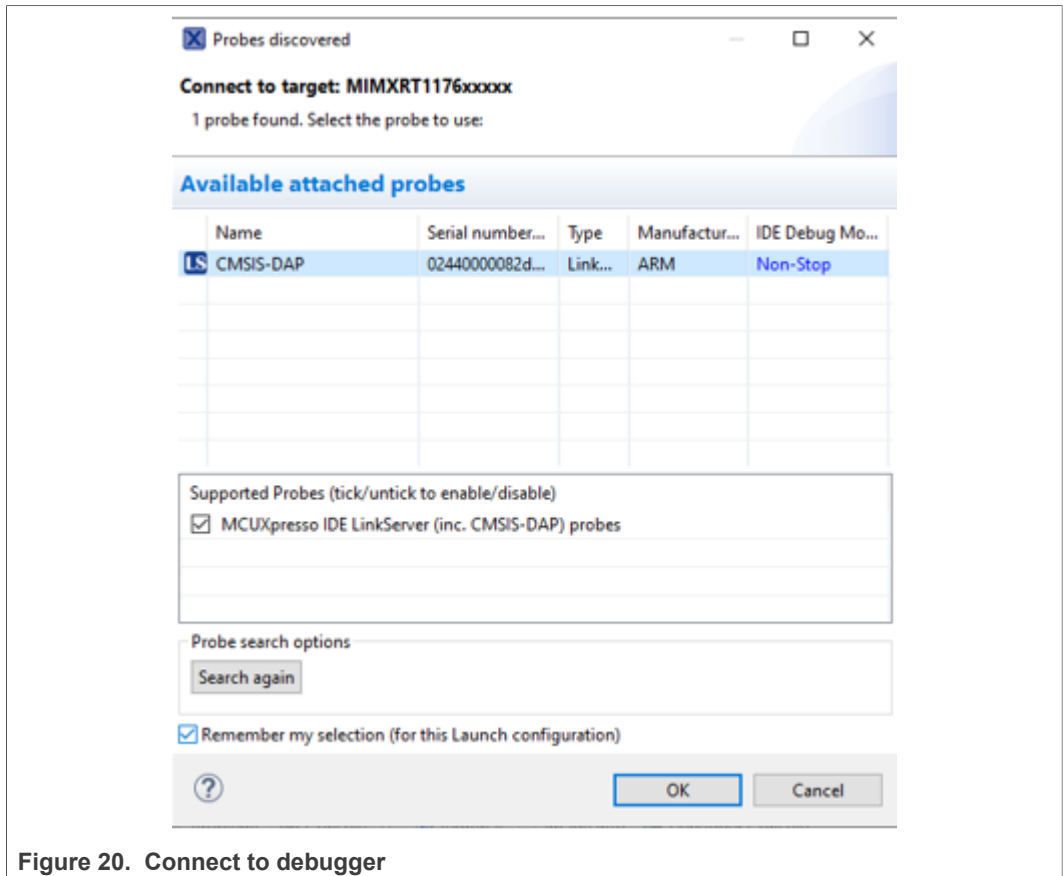


Figure 20. Connect to debugger

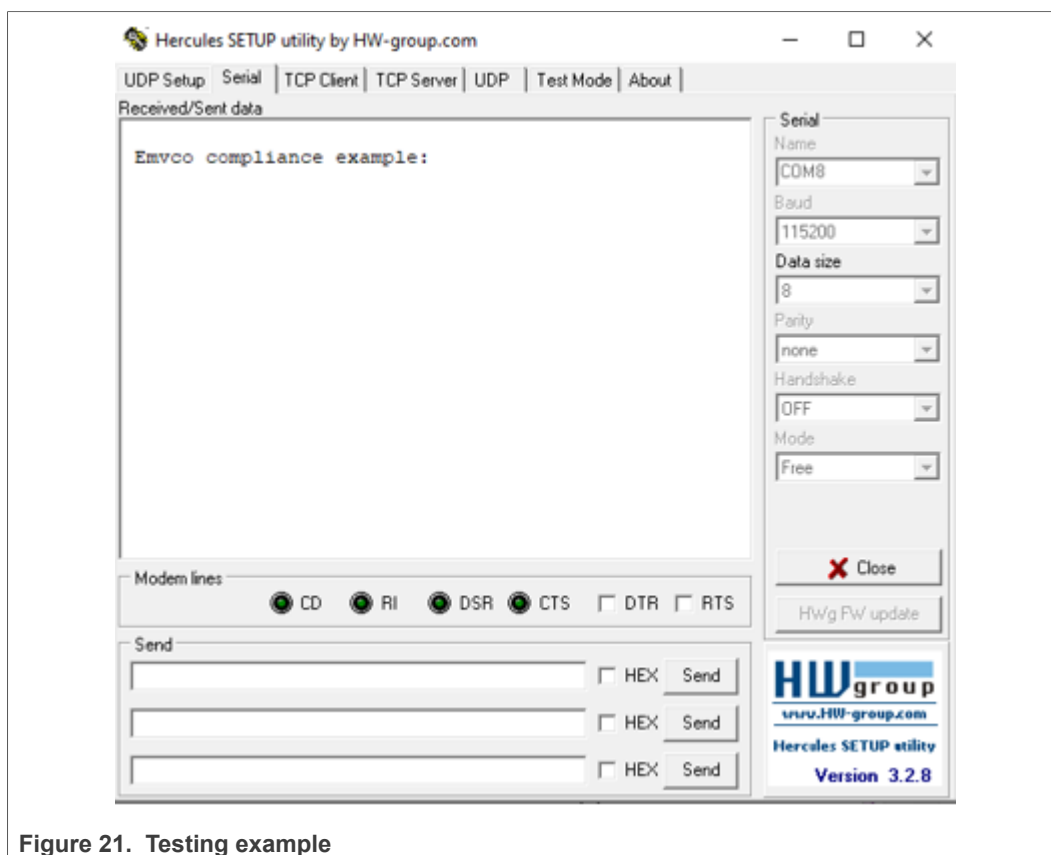


Figure 21. Testing example

4 References

- [1] AN12550 PN5190B evaluation board quick start guide; [AN12550](#)
- [2] MIMXRT1170 EVK Board Hardware User's Guide; www.nxp.com/products/i.MX-RT1170

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