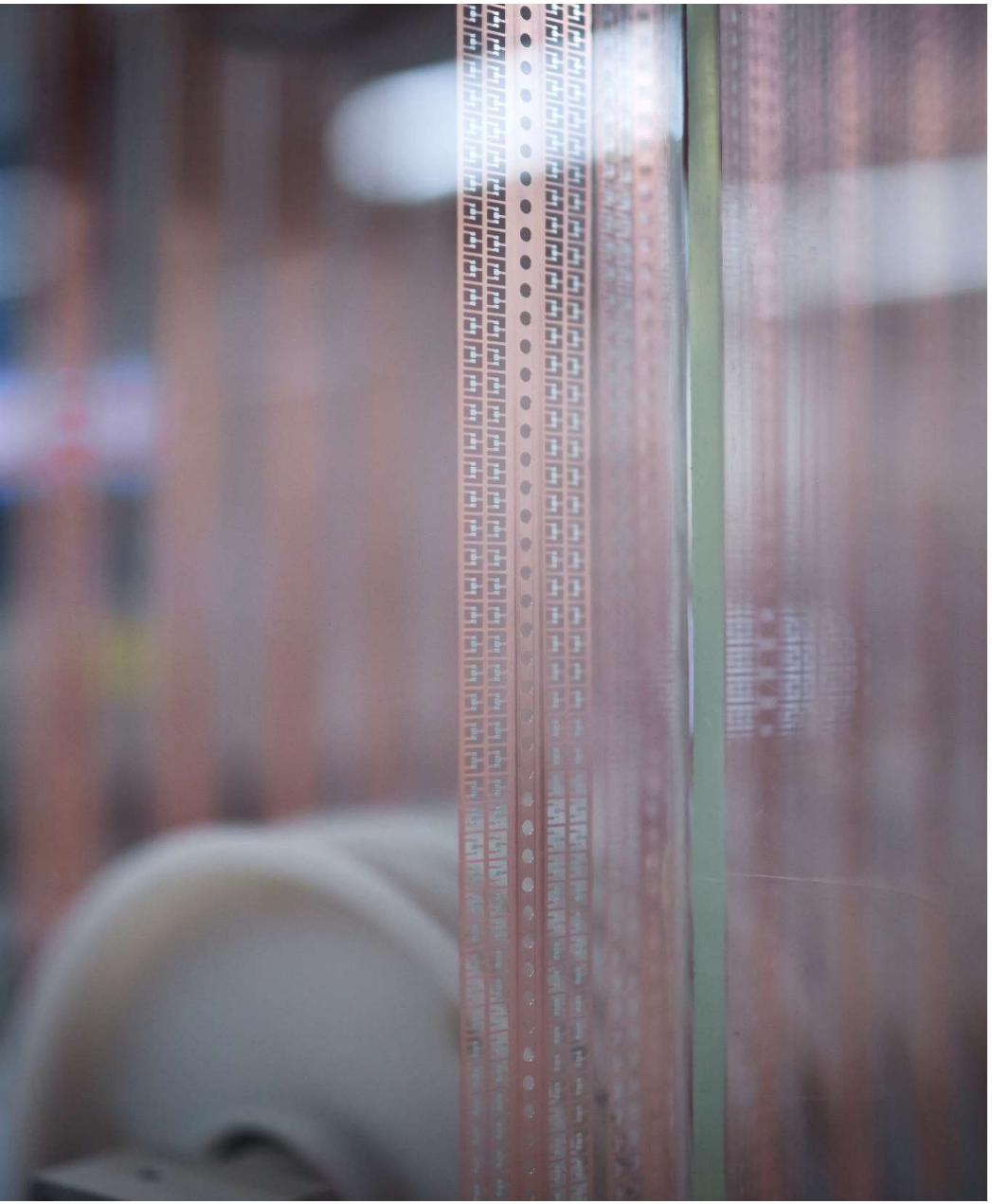
NTAG 5 SUPPORT PACKAGE

NTAG 5 WEBINAR SERIES

PABLO FUENTES

FEBRUARY 2020

SECURE CONNECTIONS
FOR A SMARTER WORLD



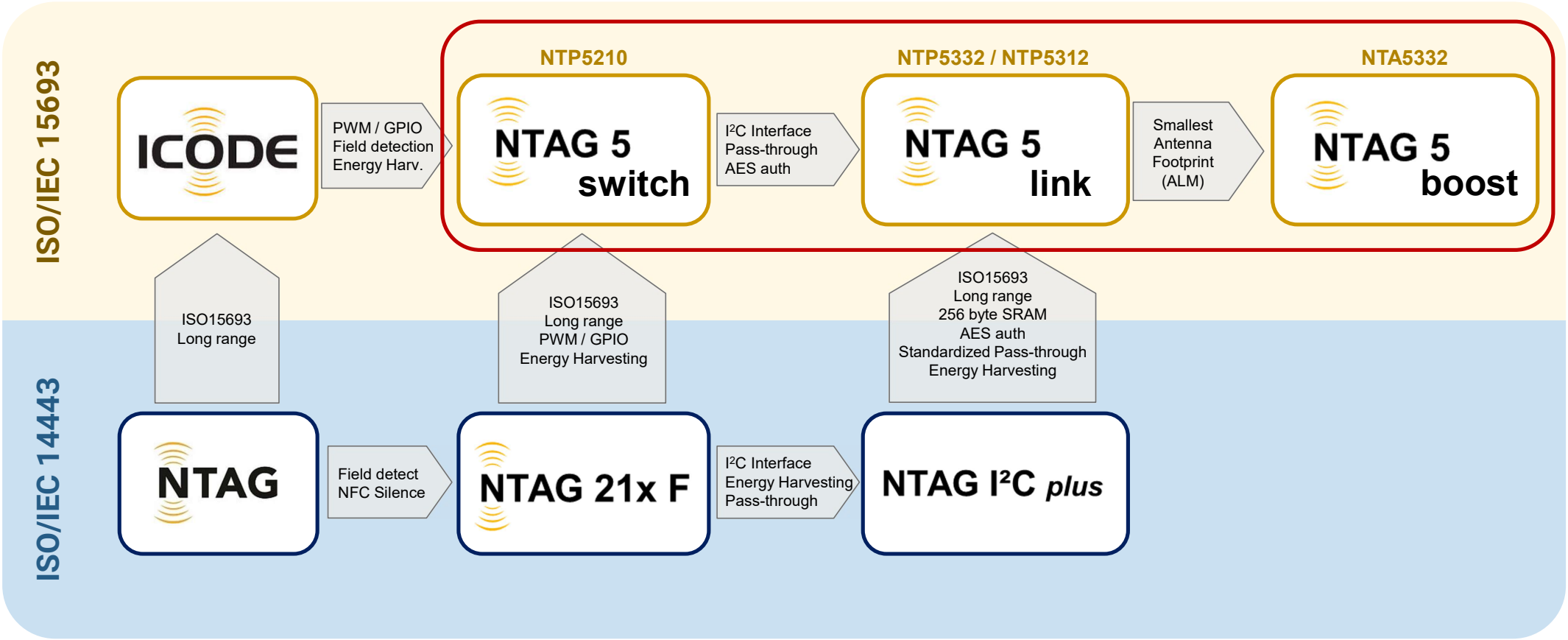
Agenda

- NTAG 5 Family Overview
- NTAG 5 Product Support Package
- NTAG 5 Development kits
- NTAG 5 Support material
- NTAG 5 Demo boards
- Mobile applications
- Peek and Poke PC app
- NFC Cube
- More support

NTAG 5 Family Overview

NTAG 5 Family Overview

Positioning



Training Mobile Knowledge

NTAG 5 Family Overview
Main features

NTAG 5 switch

- NFC Forum compliant Type 5 tag
- ISO/IEC 15693 compliant
- 512 bytes user memory
- Configurable wired interfaces:
  - PWM / GPIO
  - NFC Field detection
- Energy harvesting with output up to 30mW
- 3 configurable user memory areas
  - 32/64-bit password protection
- ECC reprogrammable originality Signature
- Low power consumption
  - < 6 µA Standby
  - < 0.25 µA Hard power down

NTAG 5 link

- NFC Forum compliant Type 5 tag
- ISO/IEC 15693 compliant
- 2048 bytes user memory
- 256 bytes SRAM
- Configurable wired interfaces:
  - I²C master and slave*
  - PWM / GPIO
  - NFC Field detection
- Energy harvesting with output up to 30mW
- 3 configurable user memory areas
  - 32/64-bit password protection
  - 128-bit AES mutual authentication*
- ECC reprogrammable originality Signature
- NFC Silence
- Low power consumption
  - < 6 µA Standby
  - < 0.25 µA Hard power down

NTAG 5 boost

- NFC Forum compliant Type 5 tag
- ISO/IEC 15693 compliant
- Active Load Modulation feature for performance boost
- 2048 bytes user memory
- 256 bytes SRAM
- Configurable wired interfaces:
  - I²C master and slave
  - PWM / GPIO
  - NFC Field detection
- Energy harvesting with output up to 30mW
- 3 configurable user memory areas
  - 32/64-bit password protection
  - 128-bit AES mutual authentication
- ECC reprogrammable originality Signature
- NFC Silence
- Low power consumption
  - < 10 µA Standby
  - < 0.25 µA Hard power down

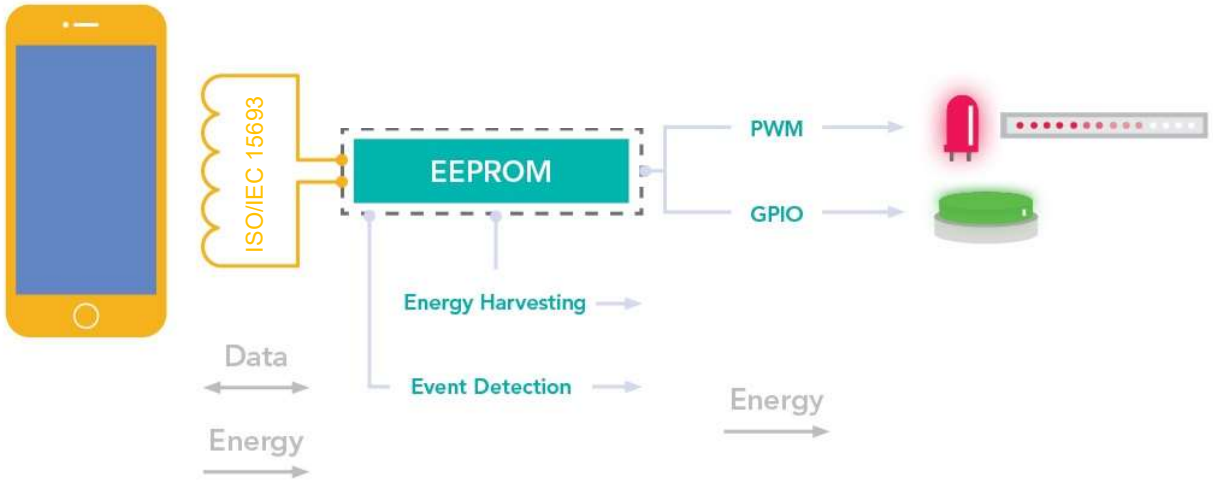
Training Mobile Knowledge

* only NTP5332 supports AES and I²C master

NTAG 5 switch

NFC Forum compliant PWM and GPIO bridge

- NTAG 5 switch supports operating with general-purpose I/O (GPIO) and pulse width modulation (PWM) signals which allows end-device manufacturers to use it as an MCU replacement in various gaming and lighting applications.



Control and dim LEDs

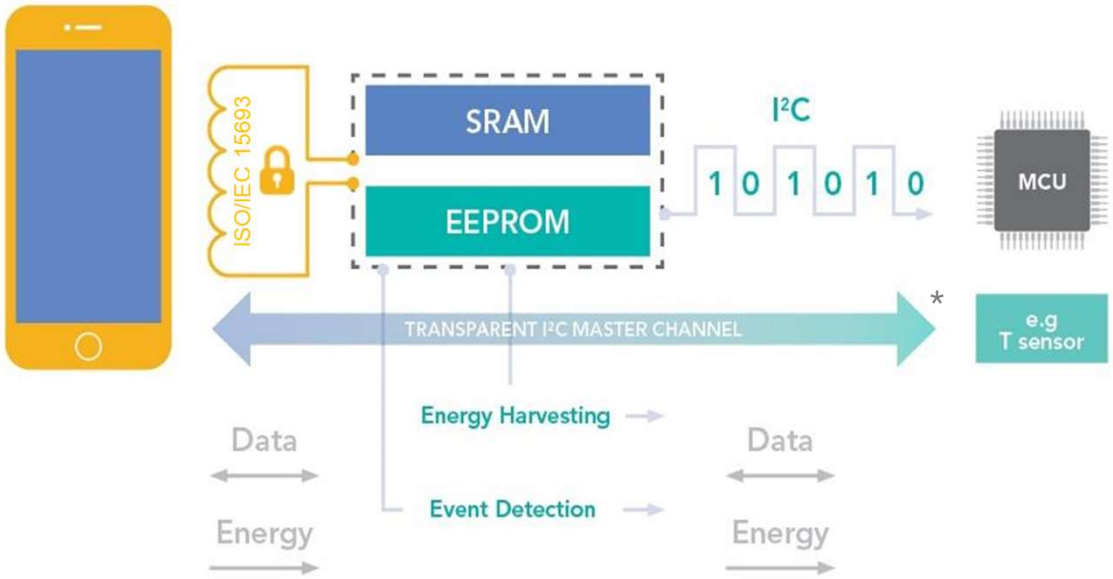
Calibrate reference current without MCU

Verify authenticity of the device

Training Mobile Knowledge

NTAG 5 link
NFC Forum compliant I²C bridge

- NTAG 5 link is based on NTAG 5 switch, incorporating an I²C interface and a SRAM memory. It supports I²C master* / slave role, enabling the communication with a microcontroller or even directly reading from an I²C sensor.



Draw power from the NFC reader to supply sensors

Read out sensor information with and without an MCU

Verify authenticity of the device

Secure sensor interaction

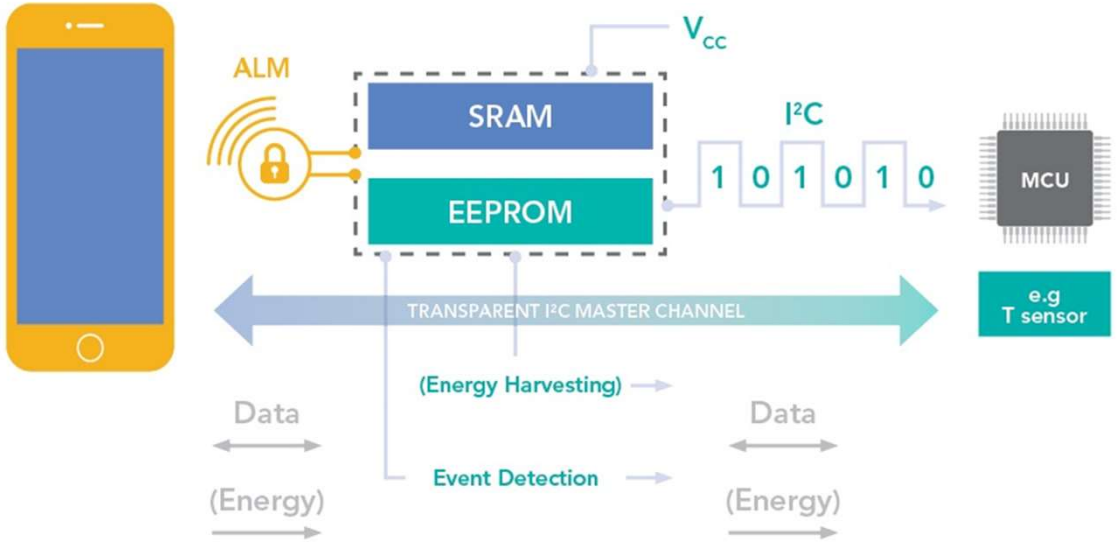
Training Mobile Knowledge

* only NTP5332 supports AES and I²C master

NTAG 5 boost

NFC Forum Compliant I²C Bridge for Tiny Devices

- NTAG 5 boost uses active load modulation (ALM) to deliver robust and reliable communication with NFC phones, helping in the design of ultra-compact devices for use in IoT, consumer and industrial applications.



Smallest footprint Antenna

Read out sensor information with and without an MCU

Verify authenticity of the device

Secure sensor interaction

Training Mobile Knowledge

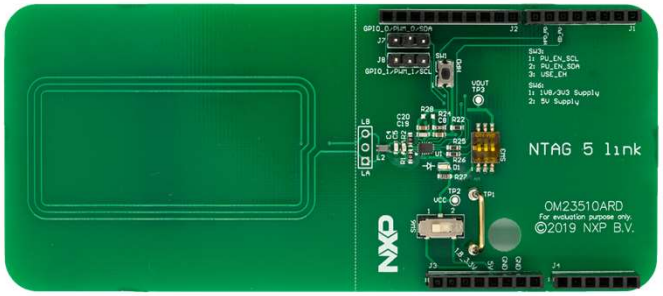
NTAG 5
Product Support Package

NTAG 5 PSP
Components

NTAG 5 Development Kits[1]

- NTAG 5 Link Evaluation board
- NTAG 5 Boost Evaluation board

NTAG 5 link eval. board

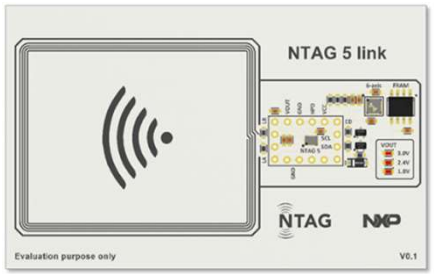


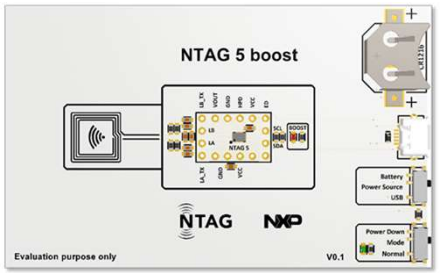
NTAG 5 boost eval. board

Available from mid February!

NTAG 5 demo boards[2]

- NTAG 5 switch demo board
- NTAG 5 link demo board
- NTAG 5 boost demo board





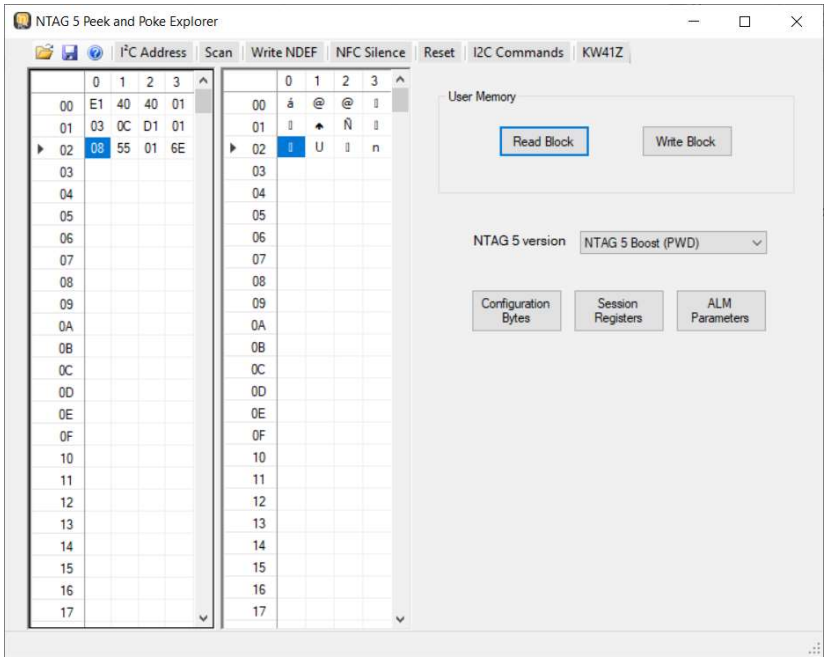
Training Mobile Knowledge

[1] Full support from CAS. Boards will be available from mid-February.
[2] No support from CAS on SW & HW. Dev kit shall be used as source.

NTAG 5 PSP
Components

NTAG 5 Dev. kit application

Peek and Poke PC Application

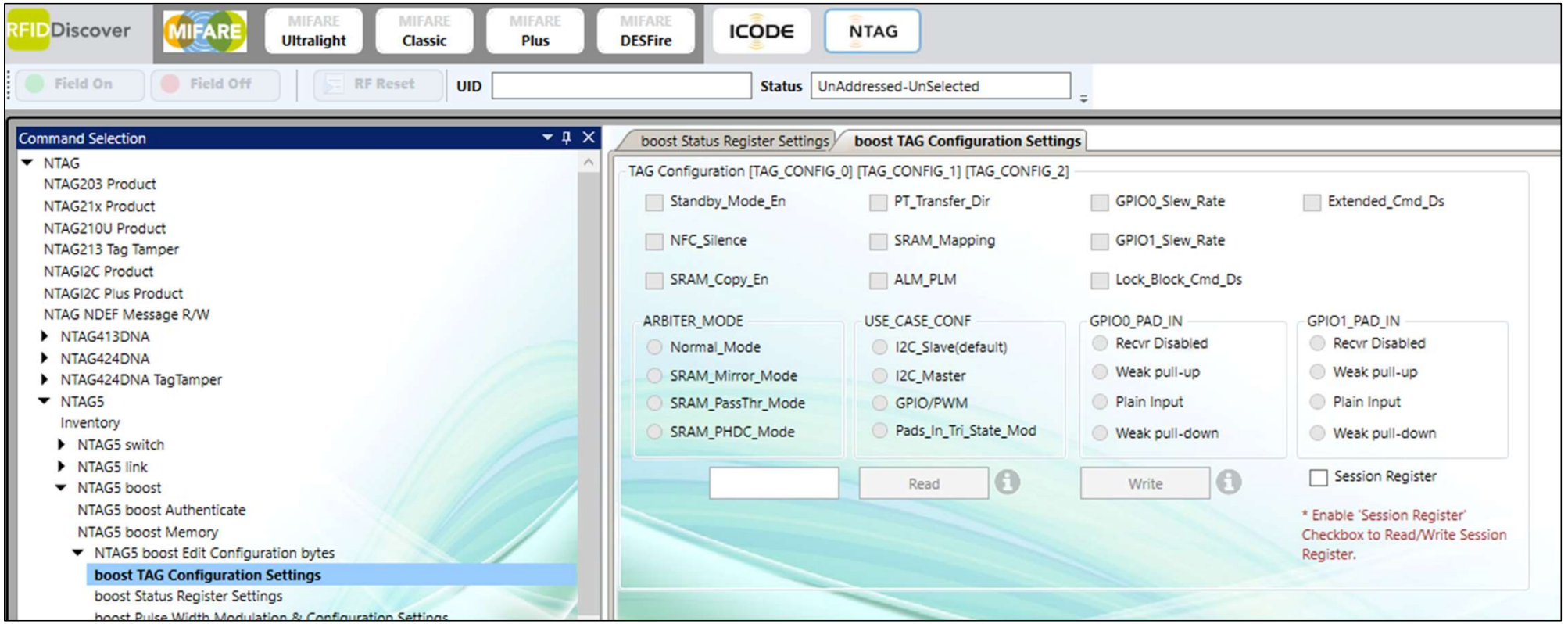


NFC Cube

Training Mobile Knowledge

NTAG 5 PSP
Components

RFID Discover

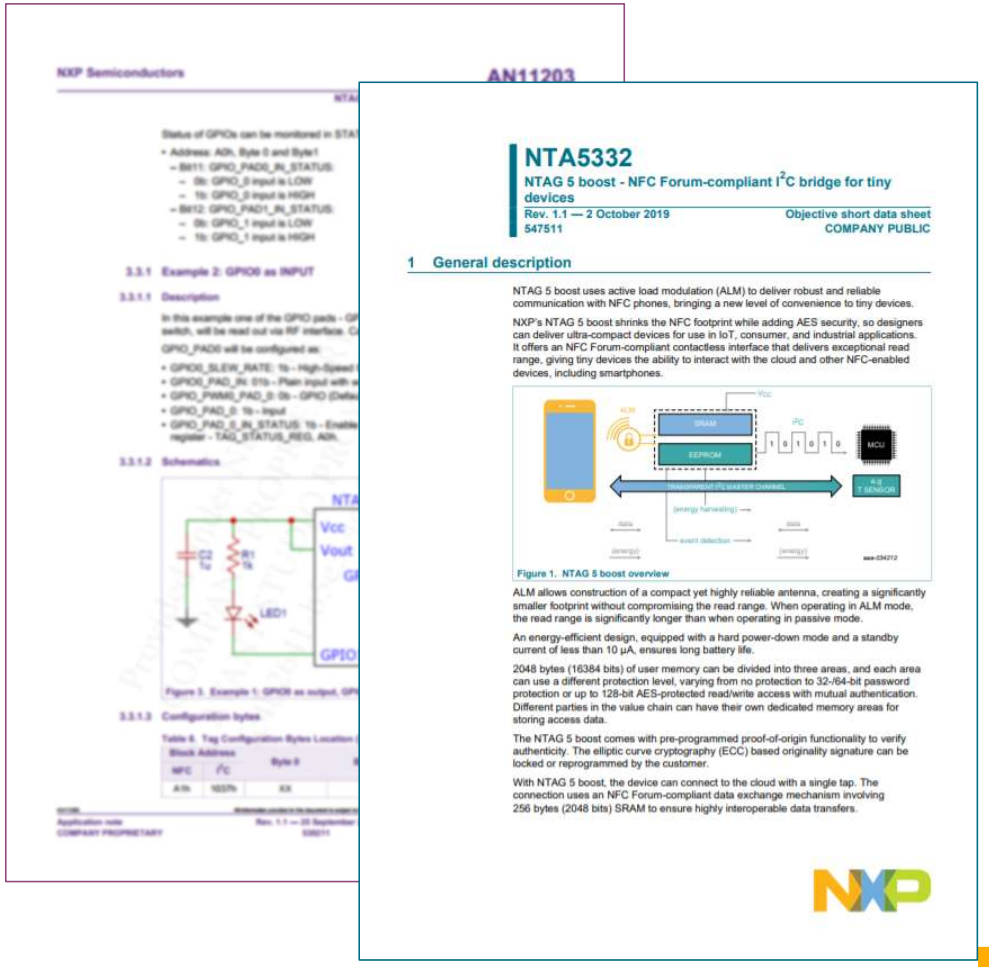


Training Mobile Knowledge

NTAG 5 PSP
Components

Support documentation

- NTAG Antenna design guide
- Memory configuration and scalable security
- How to use energy harvesting
- Bi-directional data exchange
- Originality signature validation
- I²C master mode
- Use of PWM, GPIO and event detection
- Design recommendations for FCC and CE certifications

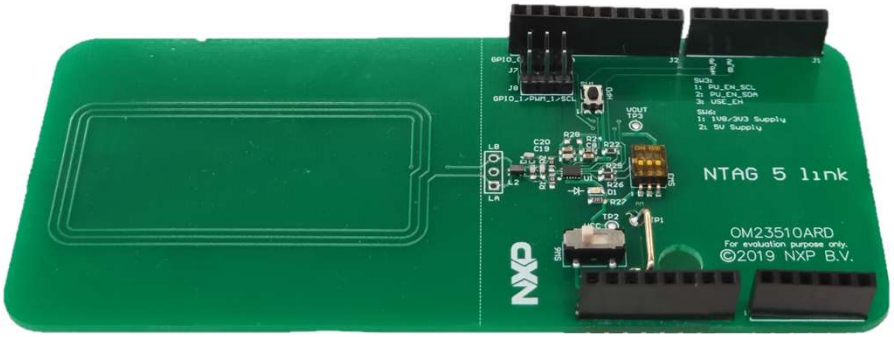


Training Mobile Knowledge

NTAG 5 Development kits

NTAG 5 Development kit
Components

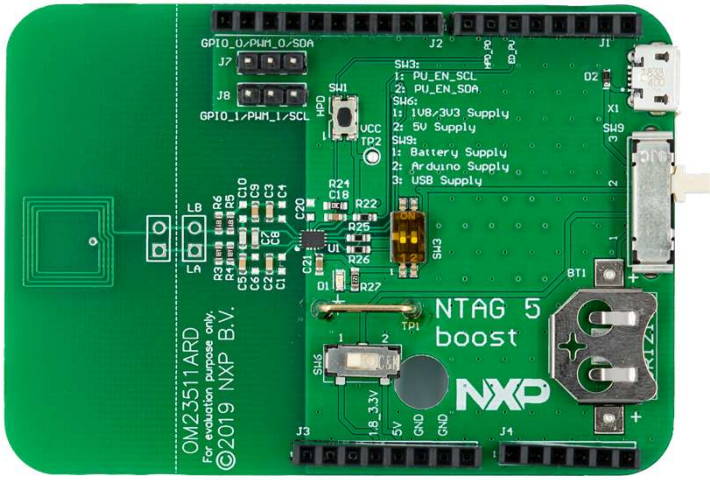
- **NTAG 5 link Evaluation board (OM2NTP5332)**
  - Integrating NTAG 5 link (NTP53321)
  - Integrating 50mm x 25mm antenna
  - Jumper to select between different supply voltages
  - Hard-power-down button
  - Arduino header
  - Easy to access wired interface signals through pins



FRDM-KW41Z board not included in development kit

NTAG 5 Development kit
Components

- **NTAG 5 boost Evaluation board (OM2NTA5332)**
  - Integrating NTAG 5 boost (NTA53321)
  - Integrating 10mm x 10mm antenna for evaluating ALM functionalities
  - Jumper to select between different supply voltages
  - Hard-power-down button
  - Arduino header
  - Easy to access wired interface signals through pins



FRDM-KW41Z board not included in development kit

Training Mobile Knowledge

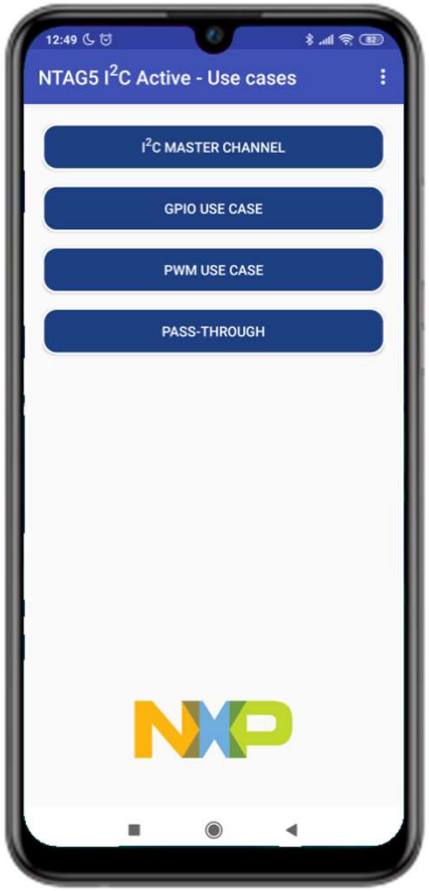
NTAG 5 Development kit app

NTAG 5 Development kit app

Introduction

Mobile application designed to interact with NTAG 5 development kits to showcase product functionalities.

- Available for Android and iOS devices
- Developed to work with a demonstration setup including KW41Z development board
- Divided in four use cases:
  1. I²C master
  2. GPIO
  3. Pulse Width Modulation
  4. Pass-through
- Allows user to reconfigure NTAG 5 wired interface through NFC



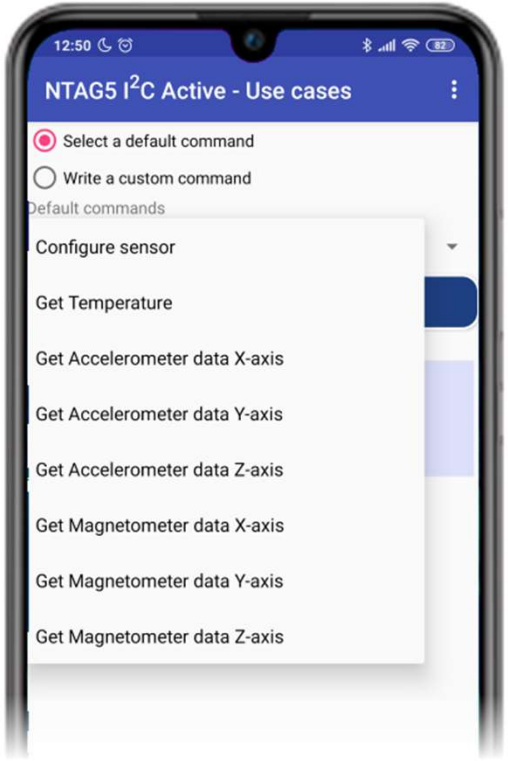
Reference and guidance on mobile application and related FW development can be found in RM00221 and RM00222 documents respectively

Training Mobile Knowledge

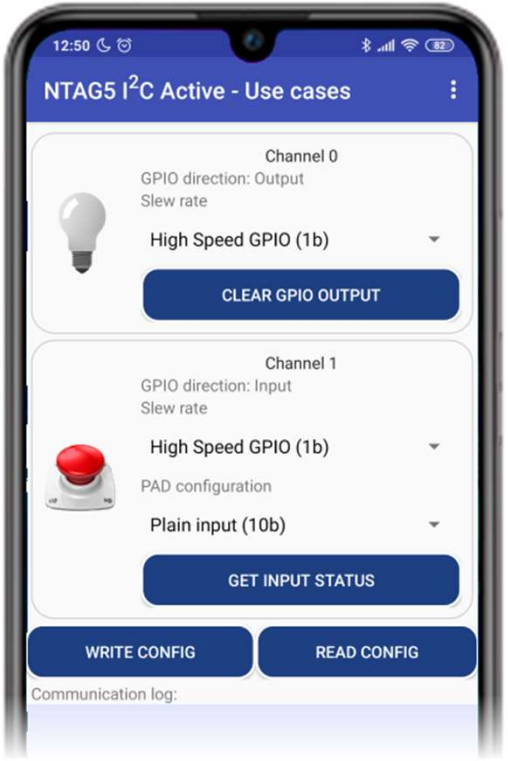
NTAG 5 Development kit app

Use cases supported

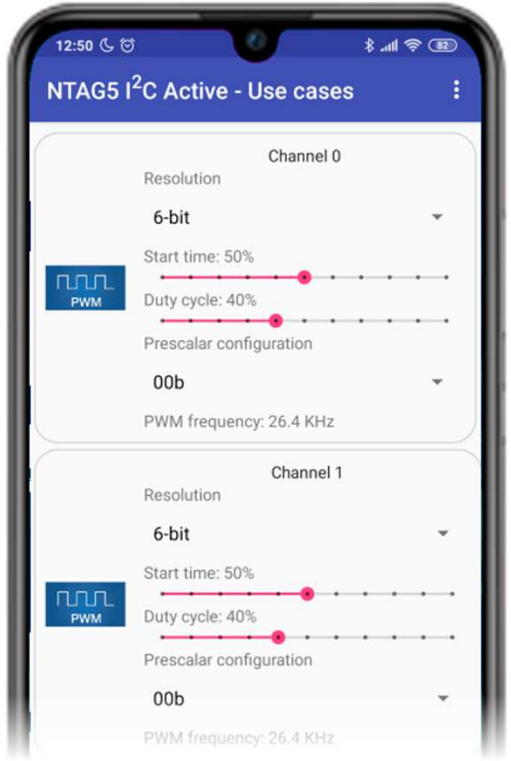
I²C Master Channel



GPIO



PWM

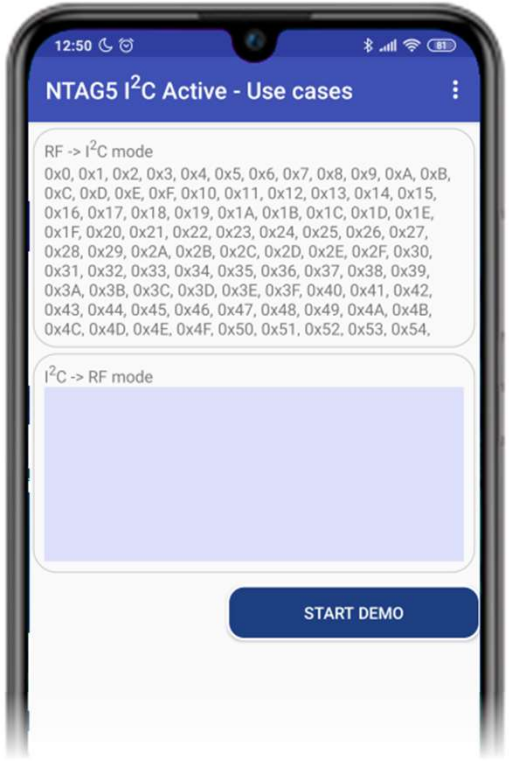


Training Mobile Knowledge

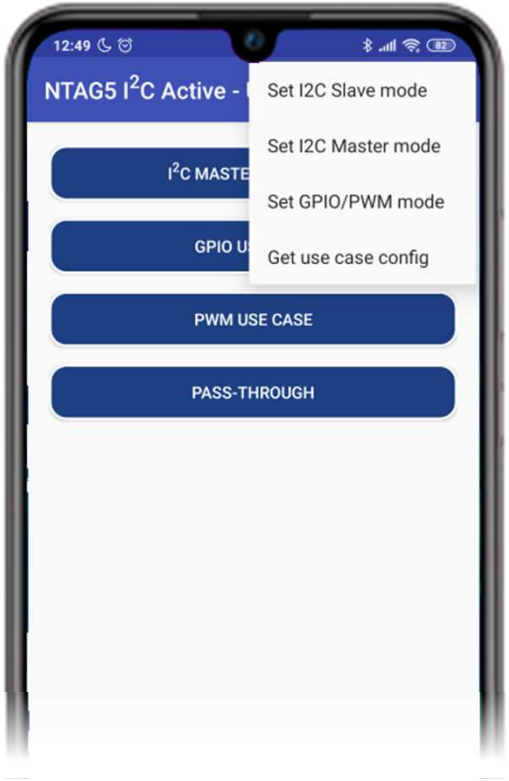
NTAG 5 Development kit app

Use cases supported

Pass-through



Setting NTAG5 wired interface



Training Mobile Knowledge

Peek and Poke application

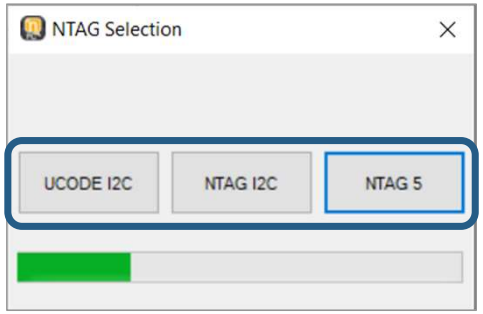
Peek and Poke application
Introduction

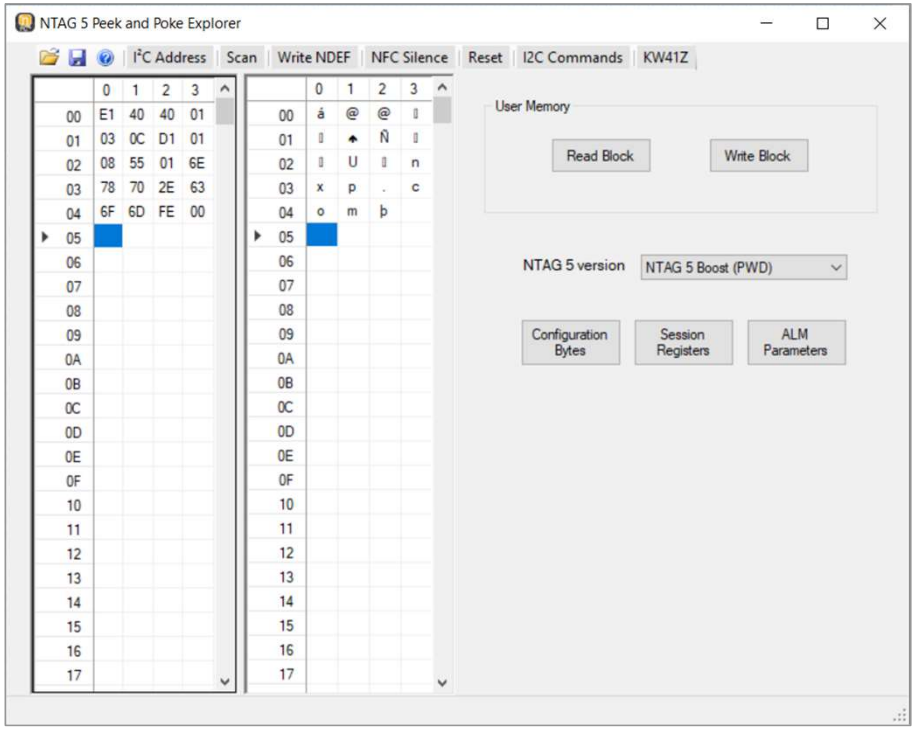
Peek and Poke application

MS Windows application enabling communication with different NXP tag products through USB connection to explore registers and memory.

Updated to support communication with NTAG 5 development kits using FRDM-KW41Z* board as bridge.

- Compatible with NTAG 5, UCODE I²C and NTAG I²C products
- Memory map for intuitive access to memory blocks





* Easy portability to other platforms

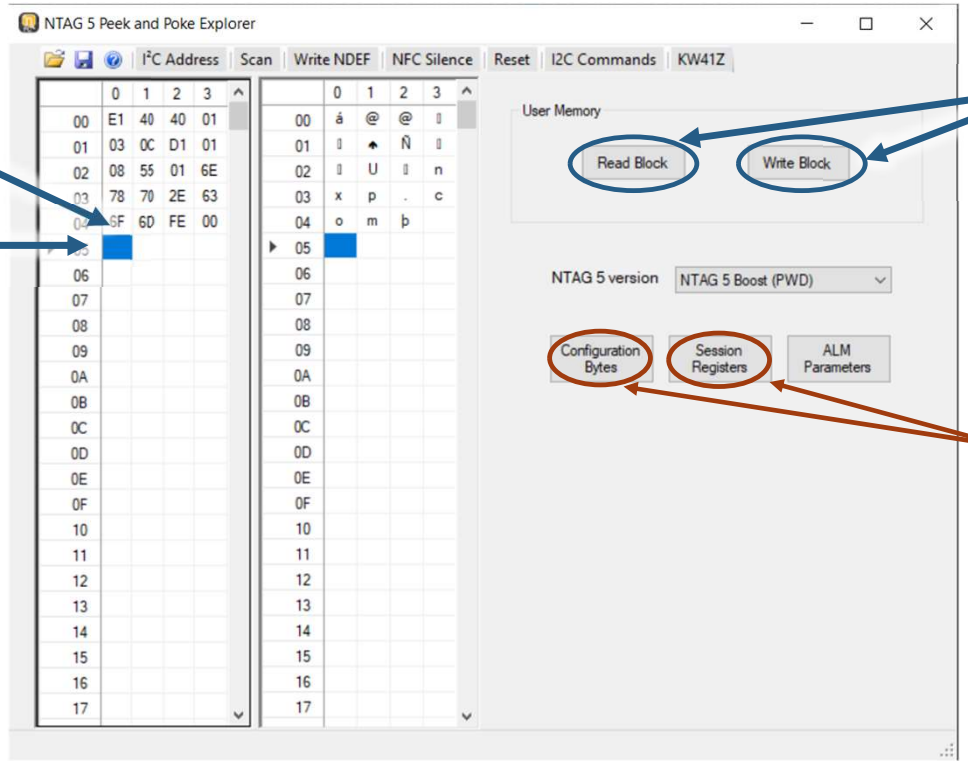
Peek and Poke application

Read/Write user memory

Peek and Poke application allows user to read and write blocks from user memory through its intuitive memory maps.

1. Select memory block

2. Write data you want in respective bytes



3. Click on read / write block

To access:
- Configuration bytes
- Session registers

Training Mobile Knowledge

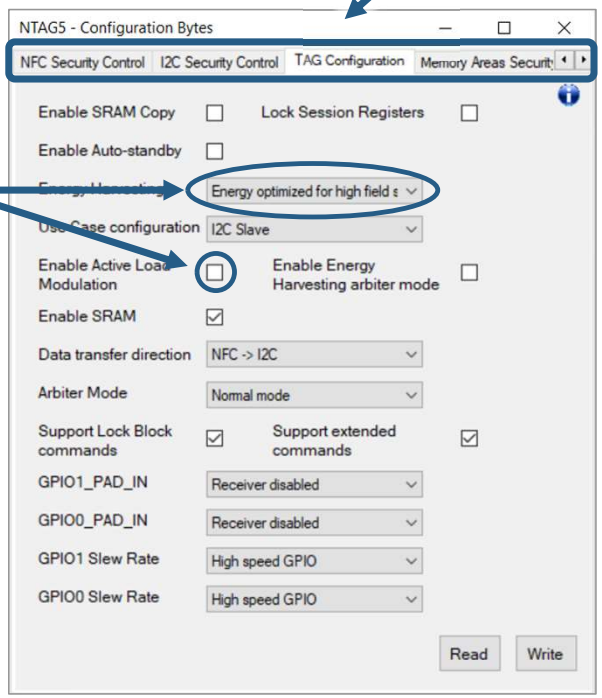
Peek and Poke application

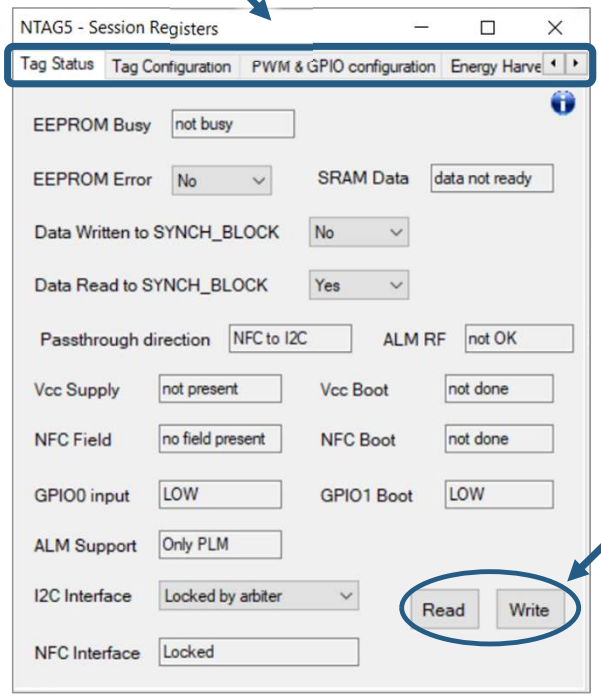
Access to configuration and session registers

User can easily navigate and explore the different configuration and session registers through specific menus available from main window.

Registers are organized in tabs depending on their functionality

Information displayed in checkboxes, drop-down list and textboxes for a user-friendly experience





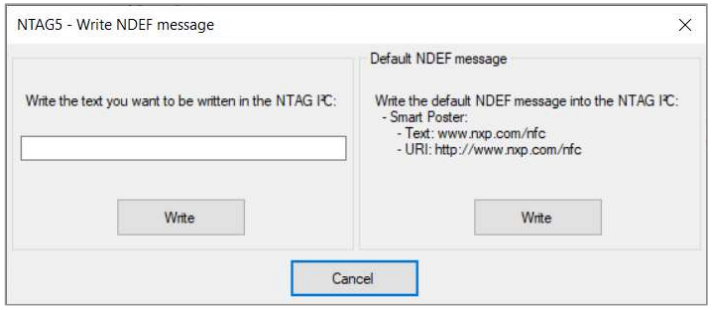
Read and Write parameters

Training Mobile Knowledge

Peek and Poke application
More options

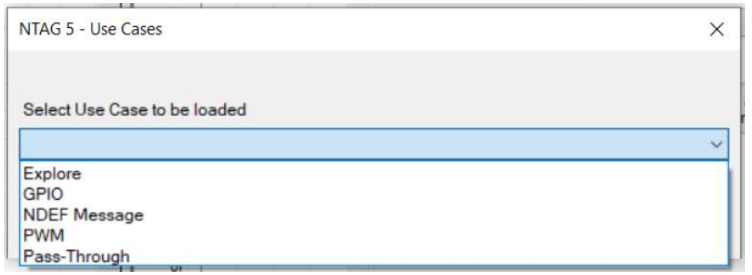
Write NDEF message in NTAG 5

Allows user to write a personalized NDEF message or a default message with a URI link



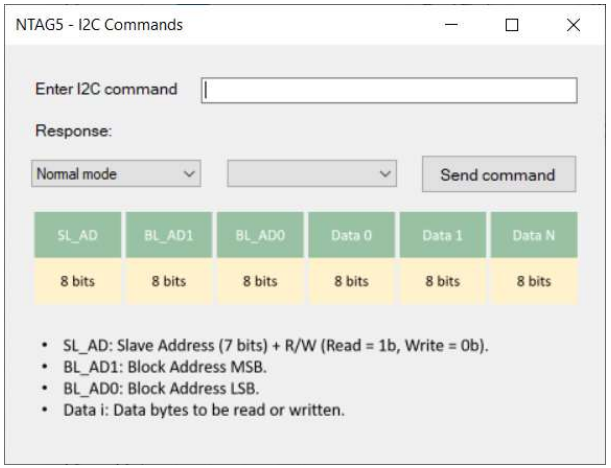
Flash other use cases in microcontroller board

Five different use cases available to showcase NTAG 5 functionalities



Send I²C commands

Allows user to send raw I²C commands to the NTAG 5. User can also configure I²C signal (mode and SCL period)



Training Mobile Knowledge

Development setup

Development setup
Components

NTAG 5 link / boost evaluation board

+

FRDM-KW41Z development board

KW41Z development board (FRDM-KW41Z)

- NXP's ultra-low-power KW41Z Wireless MCU
- Fully compliant Bluetooth v4.2 Low Energy
- 4-Mbit external serial flash memory for OTAP support
- 2 LED indicator and 2 push-button switches
- Arduino compatible header
- Not included in NTAG 5 development kit

Arduino header connection

FRSM-KW41Z can be easily replaced with any other Arduino compatible microcontroller board just by porting related FW to other platforms using NTAG 5 libraries.

Training Mobile Knowledge

Demonstration setup
Use cases

NTAG 5 Demo application comes with five different use cases to showcase main functionalities of the NTAG 5.

For each use case, a specific FW shall be flashed to KW41Z. NTAG 5 shall be configured to operate with FRDM-KW41Z board accordingly.

Available use cases are:

- GPIO
- PWM
- I²C Master mode
- Explorer
- Pass-through
- NDEF message

Training Mobile Knowledge

Demonstration setup
Use cases

GPIO use case:

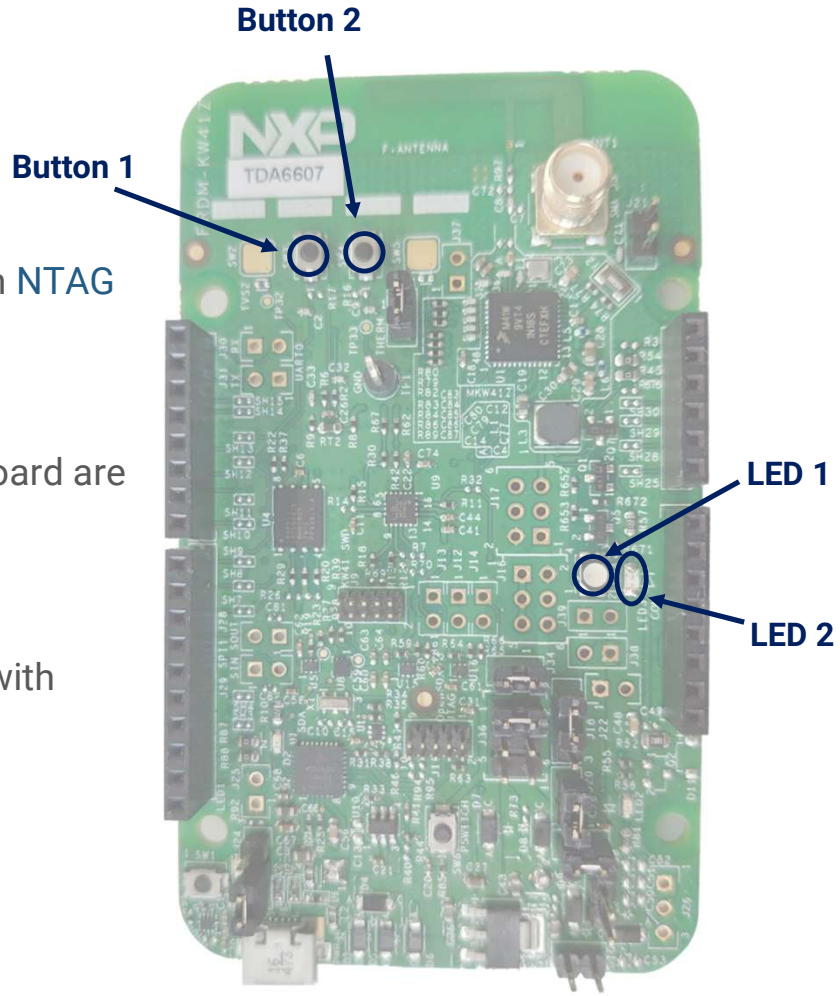
NTAG 5 pins configured as GPIO (One input, one output). Used along with NTAG 5 Demo app.

- Output channel → Turn On/Off LED 1 from FRDM board
- Input channel → Used to monitor when buttons 1 and 2 from FRDM board are pressed

PWM use case:

NTAG 5 pins configured as Pulse Width Modulation signals. Used along with NTAG 5 Demo app.

- Output channel 1 → Control light intensity of LED 1
- Output channel 2 → Control light intensity of LED 2



Demonstration setup
Use cases

I²C Master mode use case:

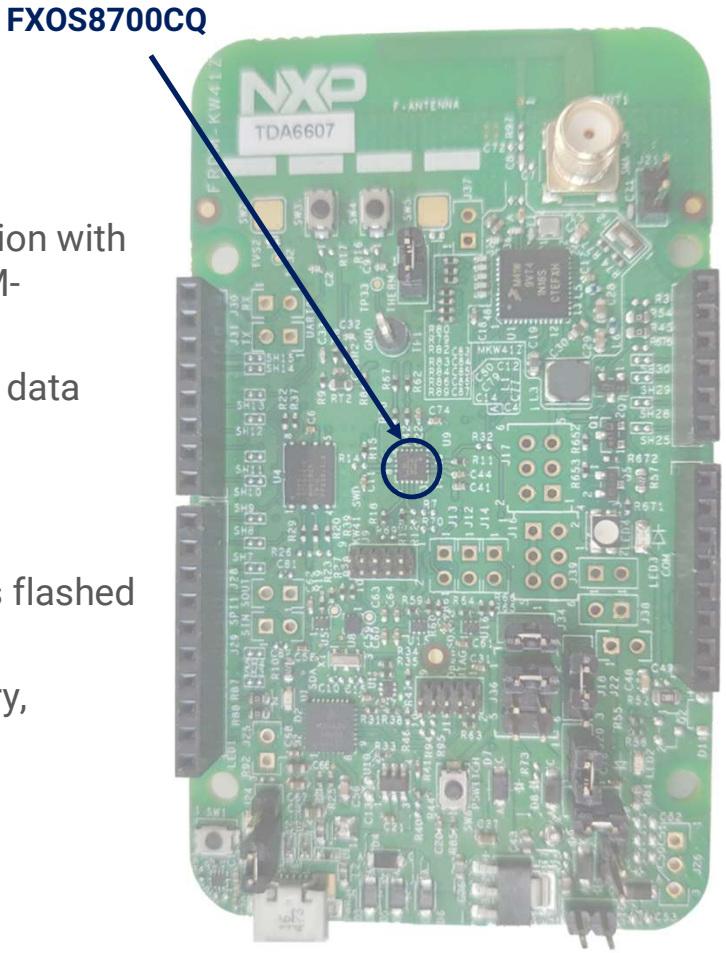
NTAG 5 wired interface configured as I²C master to control communication with FXOS8700CQ accelerometer and magnetometer sensor present in FRDM-KW41Z board.

- NTAG 5 Demo application allows user to send I²C commands to read data from sensor.

Explorer use case:

NTAG 5 is configured as I²C slave to communicate with KW41Z, which is flashed to act as I²C master.

- Using Peek and Poke PC application user can access NTAG 5 memory, configuration and session registers.



Demonstration setup
Use cases

Pass-through use case:

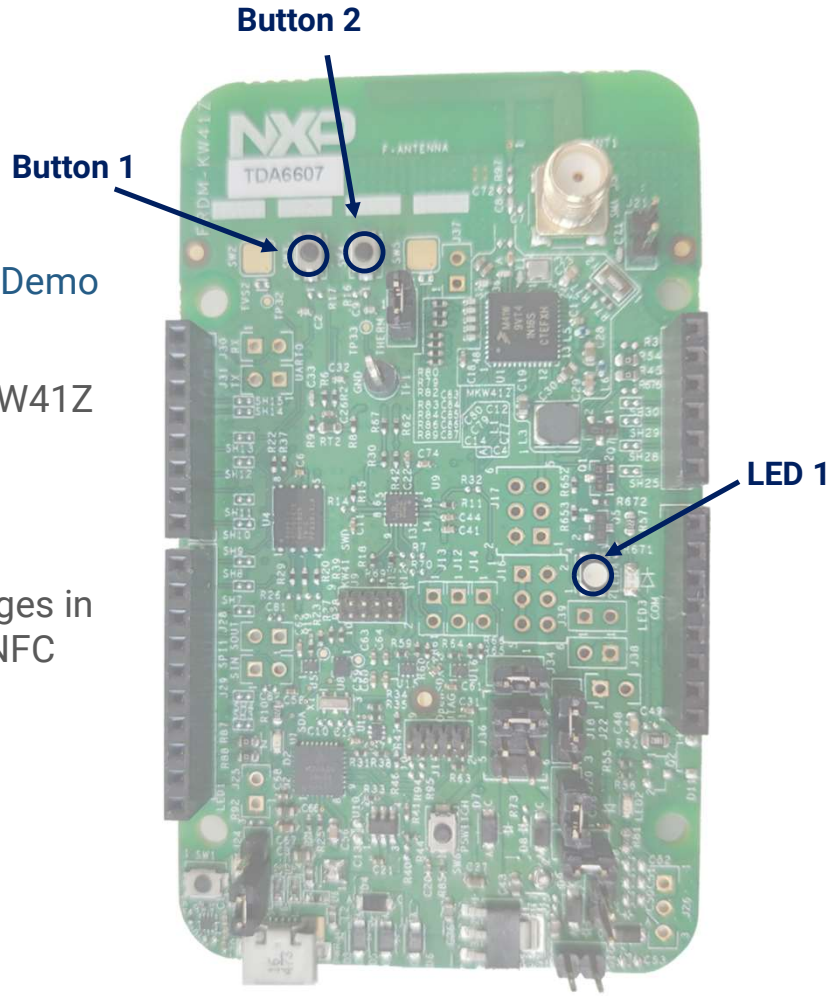
NTAG 5 wired interface configured as I^2C slave. Used along with NTAG 5 Demo app.

- It exchanges a pre-defined amount of data between NFC phone and KW41Z and vice versa using NTAG 5 pass-through functionality.

NDEF message use case:

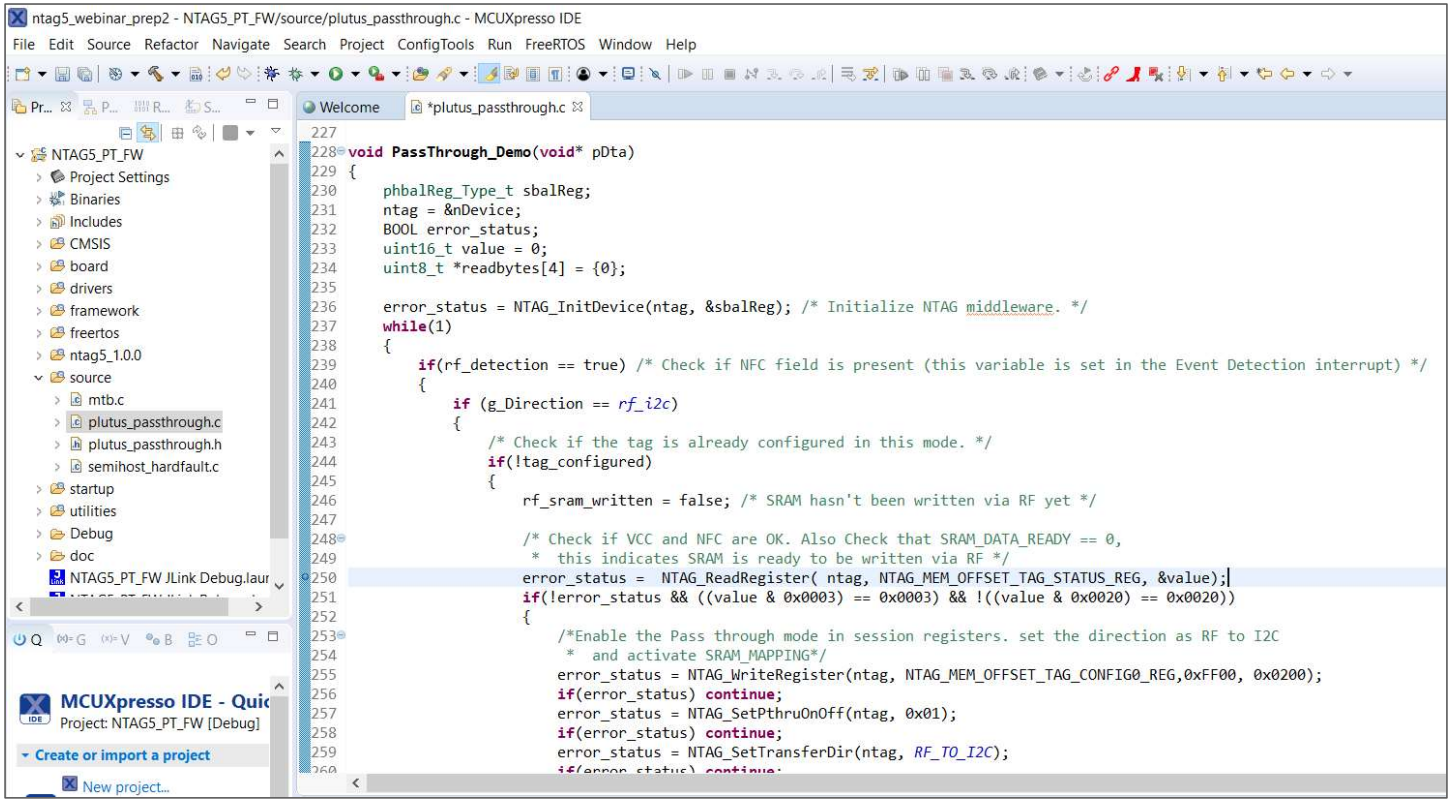
KW41Z is flashed so user can choose to write two different NDEF messages in NTAG 5 memory. These NDEF messages can later be checked using an NFC phone.

- Button 1 → KW41Z writes NDEF Message 1 on NTAG 5
- Button 2 → KW41Z writes NDEF Message 2 on NTAG 5



Demonstration setup
Pass-through mode example (1/2)

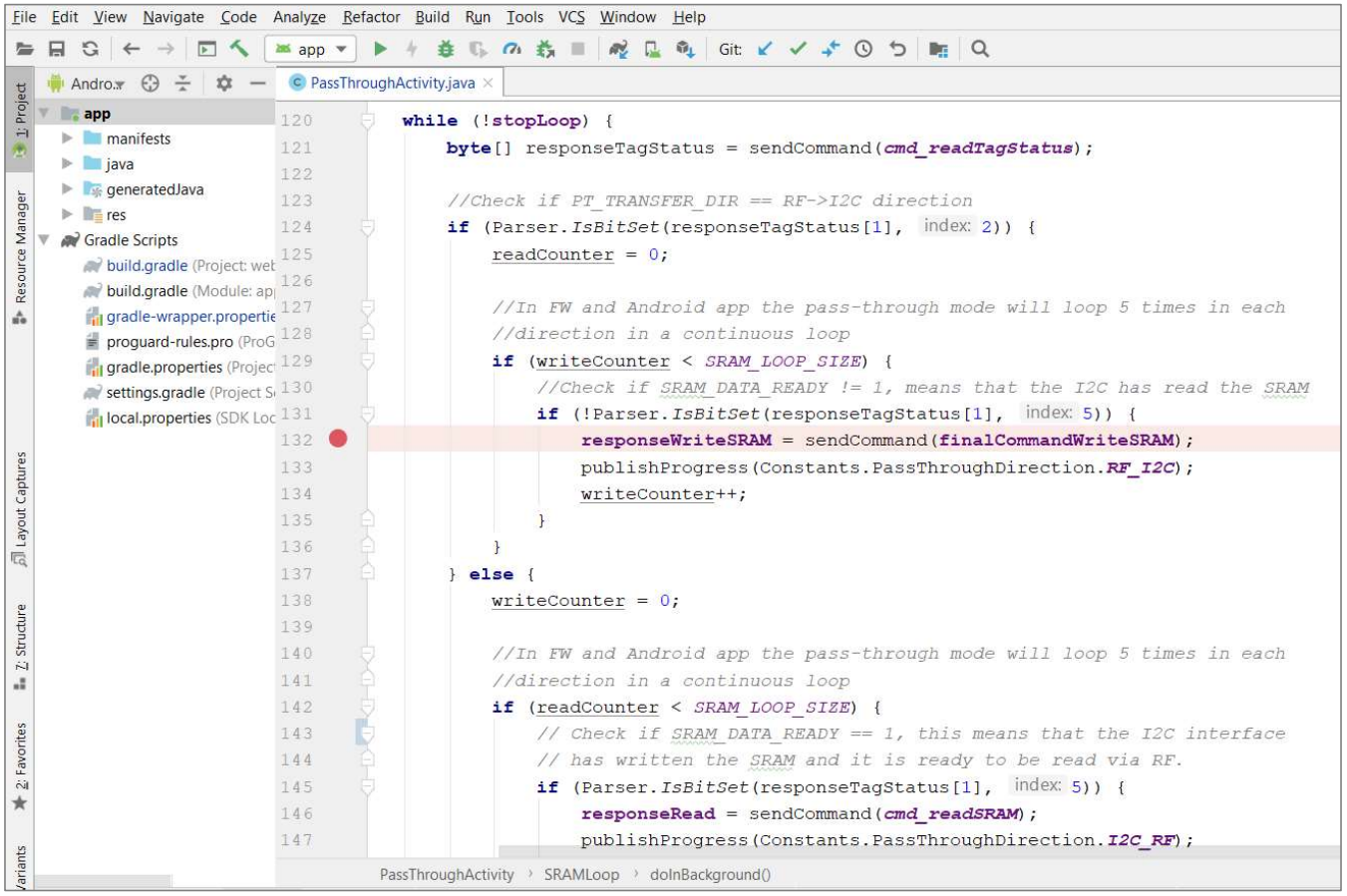
FW development:



Training Mobile Knowledge

Demonstration setup
Pass-through mode example (2/2)

Mobile app development:



Training Mobile Knowledge

Demo boards

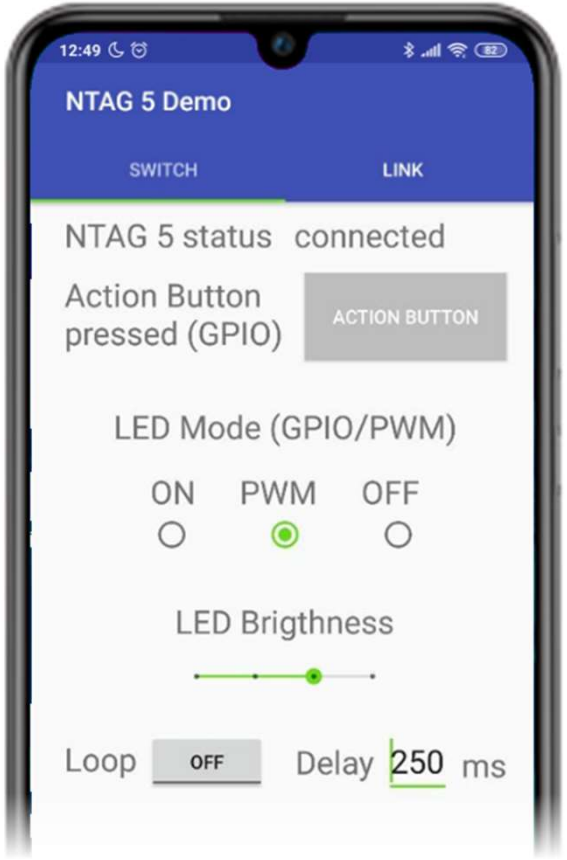
NTAG 5 Demo boards

NTAG 5 switch demo board

The NTAG 5 switch demo board is a tool to demonstrate GPIO and PWM features through the LED and action button integrated in the demo board.

The demo board is controlled by the NTAG 5 demo board app:

- A slider changes the intensity of the LED
- Reading of GPIO button status



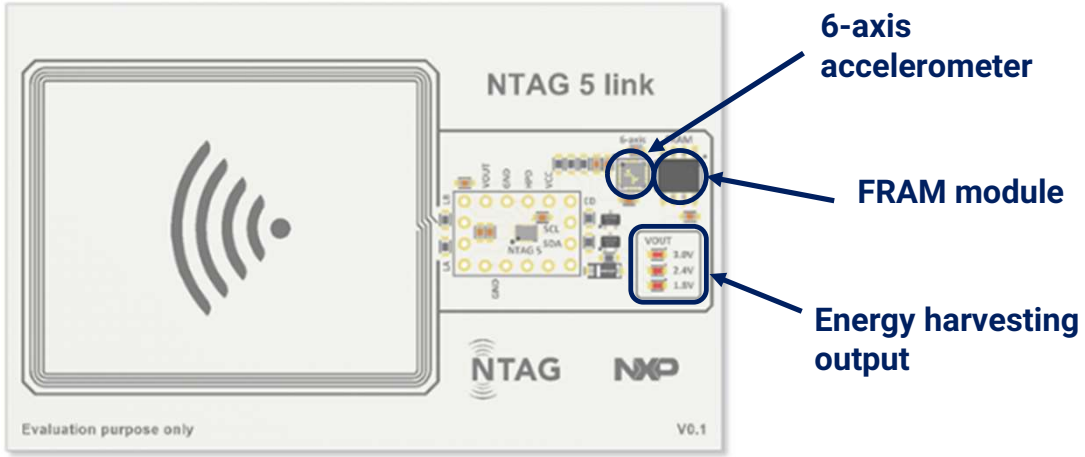
Training Mobile Knowledge

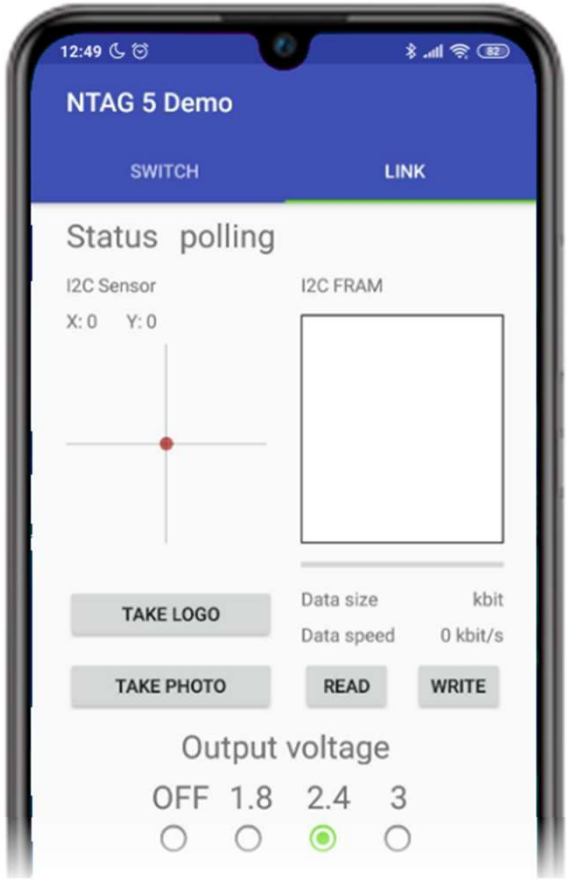
NTAG 5 Demo boards
NTAG 5 link demo board

The NTAG 5 link demo board is a tool to demonstrate I²C interface features.

The demo board is controlled by the NTAG 5 demo board app:

- 6 axis sensor is read out using I²C master channel and visualized in a graph
- External memory can be written from NFC without MCU with a logo or photo
- Configurable energy harvesting is shown with three indicators (1.8V, 2.4V, 3V)





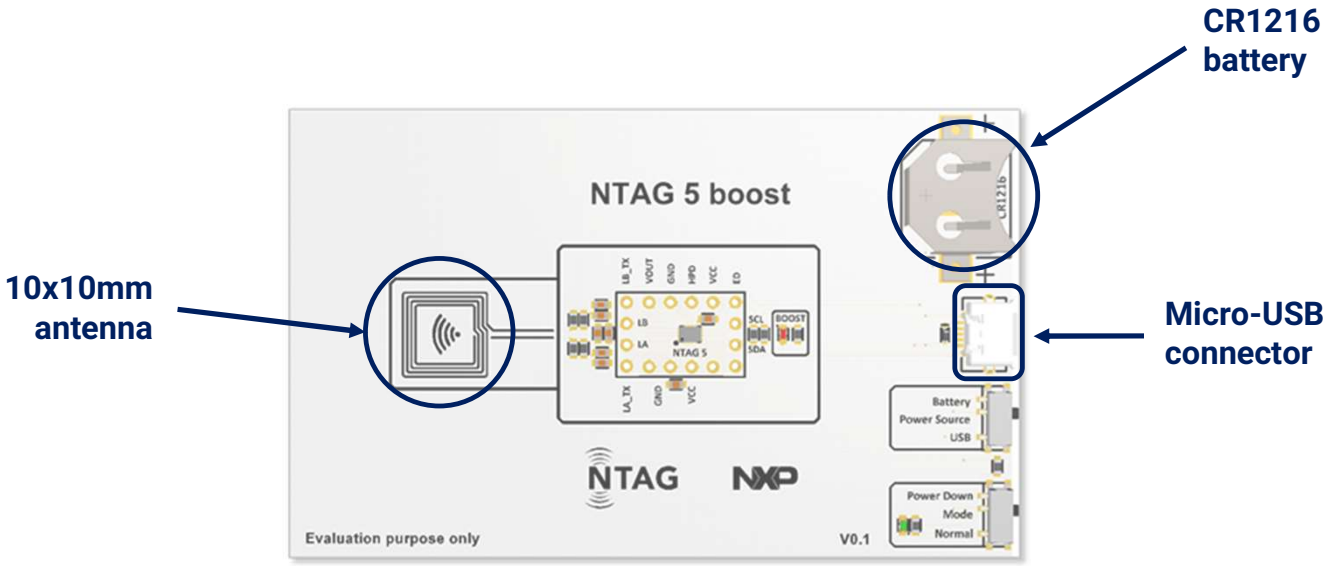
Training Mobile Knowledge

NTAG 5 Demo boards

NTAG 5 boost demo board

The NTAG 5 boost demo board is a tool to demonstrate ALM feature. It integrates a compact yet highly reliable antenna of 1x1 cm showing an extraordinary read range with ALM feature.

User can use an NFC-enabled mobile phone or NFC reader to compare the operating performance when chip is using active modulation (powered through battery or USB) and when it is working in passive mode (not powered).



Training Mobile Knowledge

Design and development resources

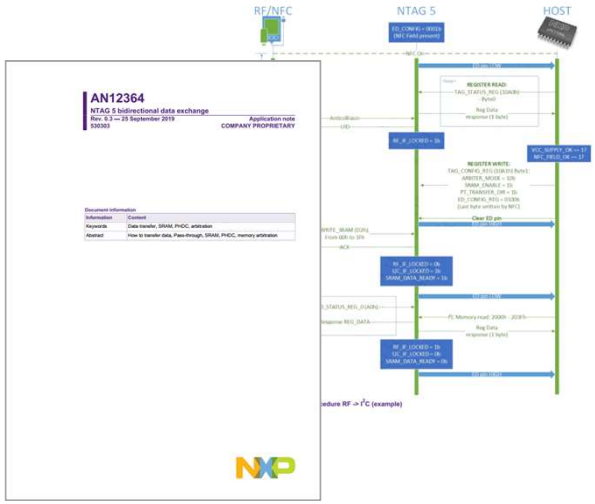
Design and development resources

Documentation

Datasheets

Complete datasheets are available through NXP docstore, providing information about the features each NTAG 5 version offers. Includes:

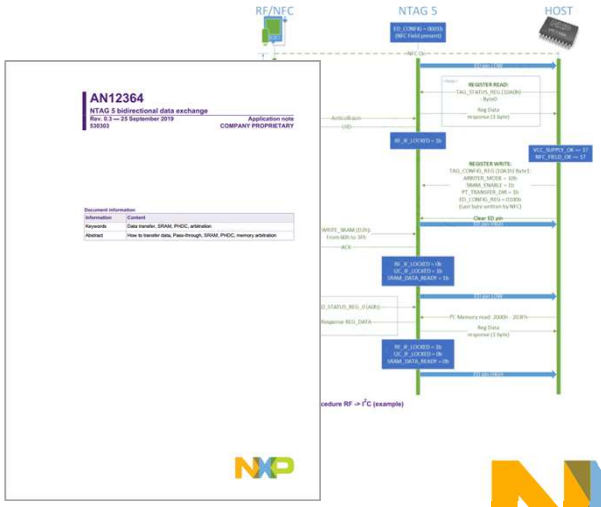
- Memory organization
- NFC Interface and supported commands
- I²C Interface and supported commands
- Block diagram



Bi-directional data exchange (AN12364)

Document describing how NTAG 5 link and boost chips can be used to exchange data between an NFC device and a device connected to the I²C interface.

- SRAM mirroring
- Interface arbitration for memory access
- Pass-through mode
- PHDC
- TNEP



Training Mobile Knowledge

Design and development resources

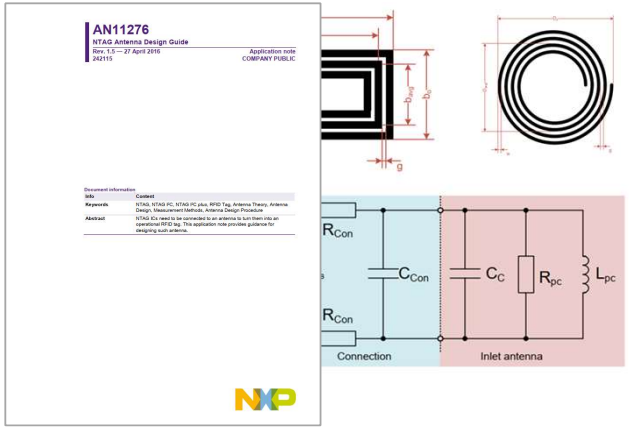
Documentation

Antenna design guides (AN12380 & AN12339)

Helps customers in the design, analysis and optimization of NFC antennas for their solutions integrating NTAG ICs.

The document describes and explains:

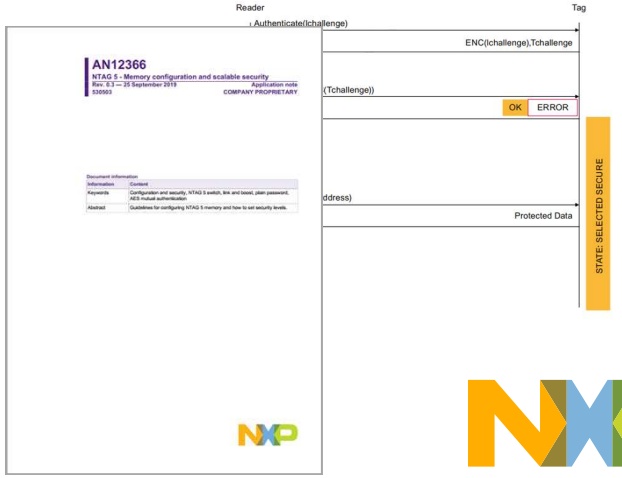
- Relevant concepts in antenna theory
- Measurement of antenna characteristics
- Procedure for antenna design
- Description of the different antenna classes



Memory configuration and scalable security (AN12366)

Describes recommended use of NTAG 5 data protection features in order to enhance security and privacy.

- Description of how to define memory areas for NFC and I²C perspectives
- Password and AES protection for memory areas
- Reprogrammable originality signature
- Examples of device security configuration for the field



Training Mobile Knowledge

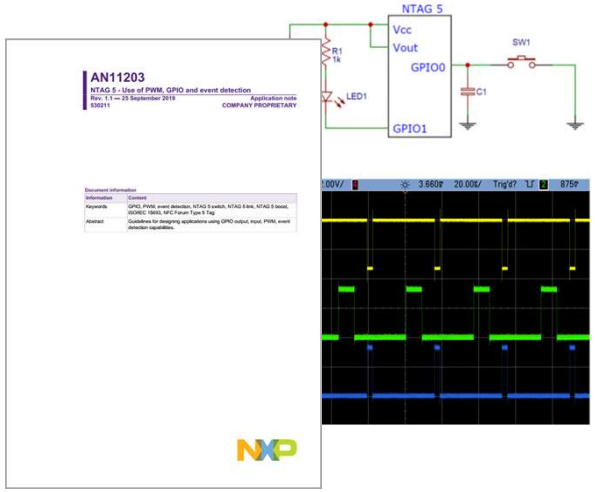
Design and development resources

Documentation

Use of PWM, GPIO and event detection (AN11203)

Description of GPIO and PWM capabilities of NTAG 5 family ICs.

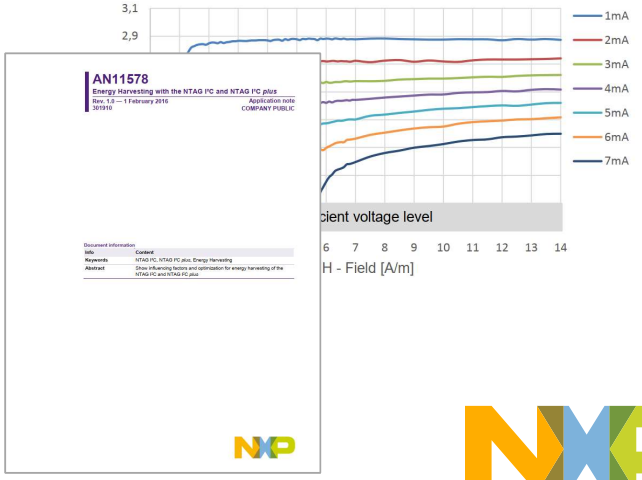
- GPIO pins configuration for input / output
- Setting up PWM signals (duty cycle, frequency…)
- Event detection pin configuration for peripheral devices notification



How to use energy harvesting (AN12365)

The document explains the energy harvesting feature and how it can be used to supply external circuits like microcontrollers with enough energy to operate.

- Influencing factors
- Recommendations for optimized efficiency
- Example energy harvesting data



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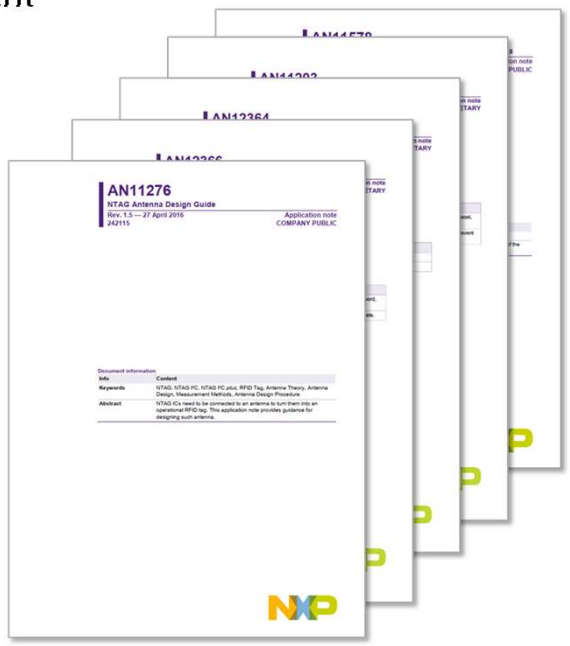
Design and development resources
Documentation

More documentation:

- AN12368 – NTAG 5 link I²C Master Mode
- AN11350 – NTAG Originality signature validation
- AN12428 – NTAG 5 design recommendations for FCC and CE certifications
- RM00221 – NTAG 5 Android application development
- RM00222 – NTAG 5 KW41Z firmware development
- Peek and Poke User manual
- NTAG 5 I²C Active with KW41Z



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Other resources

Other resources

NFC Cube

The NFC Cube kit is a set of tools to demonstrate Near Field Communication (NFC) and the variety of use cases enabled by NXP's NFC solution, and the use cases offered by this standard and by NXP products.

- Support for NTAG 5 family ***Latest FW available!***

For more information on how to acquire and upgrade NFC cube please visit:

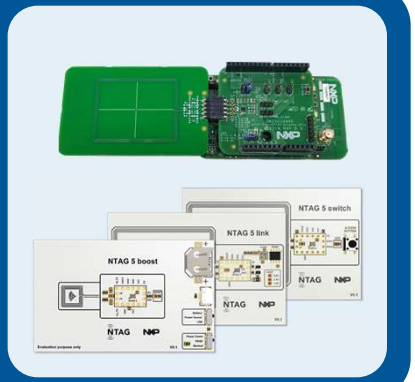
http://www.nxp.com/NFCcube

Summary

Summary
Product Support Package

Kits & demoboards

- Development kit
  - NTAG 5 Evaluation board
  - FRDM-KW41Z dev board
- NTAG 5 switch demo board
- NTAG 5 link demo board
- NTAG 5 boost demo board



PC and mobile apps

- Peek and Poke PC application
- NTAG 5 demo apps
- NTAG 5 boards app

Documentation

- Datasheets
- Energy harvesting guide
- Bi-directional data exchange
- I²C master mode
- Antenna design guide

... and more

Others

- NFC Cube

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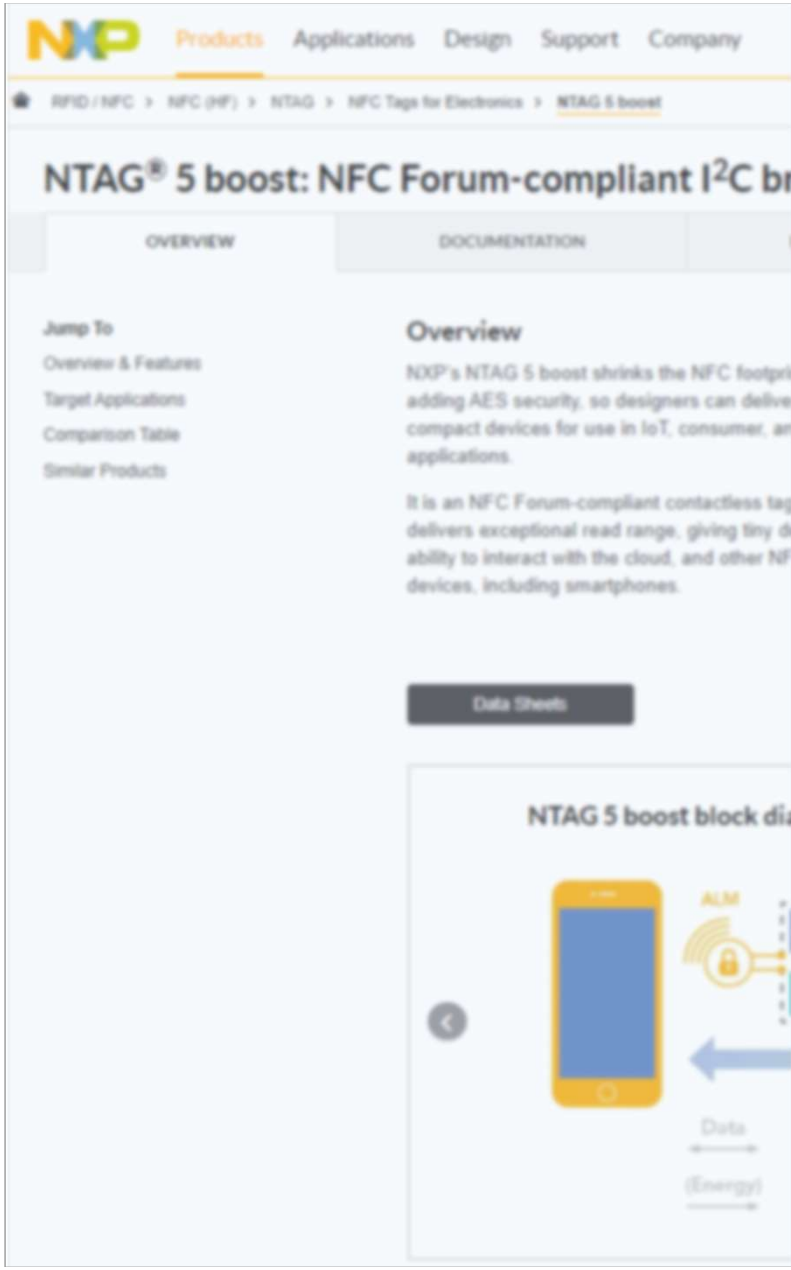
More support

More support

Relevant resources regarding NTAG 5 family

- NTAG 5 switch website
  https://www.nxp.com/products/rfid-nfc/nfc-hf/ntag/nfc-tags-for-electronics/ntag-5-switch-nfc-forum-compliant-pwm-gpio-bridge-for-lighting-and-gaming:NTAG5-SWITCH
- NTAG 5 link website
  https://www.nxp.com/products/rfid-nfc/nfc-hf/ntag/nfc-tags-for-electronics/ntag-5-link-nfc-forum-compliant-ic-bridge-for-iot-on-demand:NTAG5-LINK
- NTAG 5 boost website
  https://www.nxp.com/products/rfid-nfc/nfc-hf/ntag/nfc-tags-for-electronics/ntag-5-boost-nfc-forum-compliant-ic-bridge-for-tiny-devices:NTAG5-BOOST
- NTAG 5 development kit
  http://www.nxp.com/products/rfid-nfc/nfc-hf/ntag/ntag-5-development-kit:OM23510ARD
- NXP Tech community
  https://www.nxp.com/support/support:SUPPORTHOME



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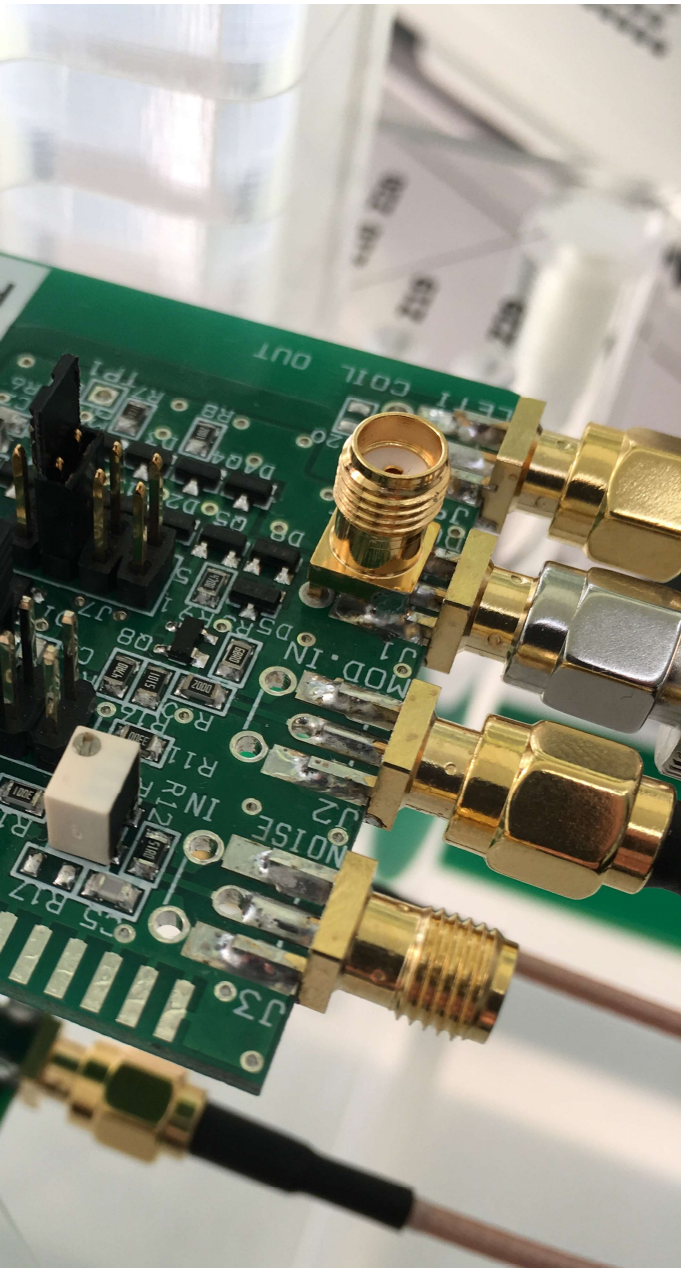

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Contact

We are your ideal **engineering consultant** for any specific support in connection with your **IoT** and **NFC** developments. We design and develop secure HW systems, embedded FW, mobile phone and secure cloud applications.

Our services include:

- **Secure hardware design**
- **Embedded software development**
- **NFC antenna design** and **evaluation**
- **NFC Wearable**
- **EMV L1 pre-certification support**
- **Mobile** and **cloud application development**
- **Secure e2e system design**

Your trusted partner and expert design house for NFC technology

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themobileknowledge.com

NTAG 5 Webinar series – Product Support Package

Pablo Fuentes (Speaker)
Angela Gemio (Host)

Time for

Q & A

NTAG 5 Webinar series – Product Support Package

Thank you for your kind attention!

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Please check NXP and MobileKnowledge websites for **upcoming webinars** and **training sessions**

http://www.nxp.com/support/classroom-training-events:CLASSROOM-TRAINING-EVENTS

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We help companies leverage
the **secure IoT revolution**