

NFC AND WLC INTRODUCTION (PANTHRONICS)

JUNE 2023
CABD
RENESAS ELECTRONICS CORPORATION

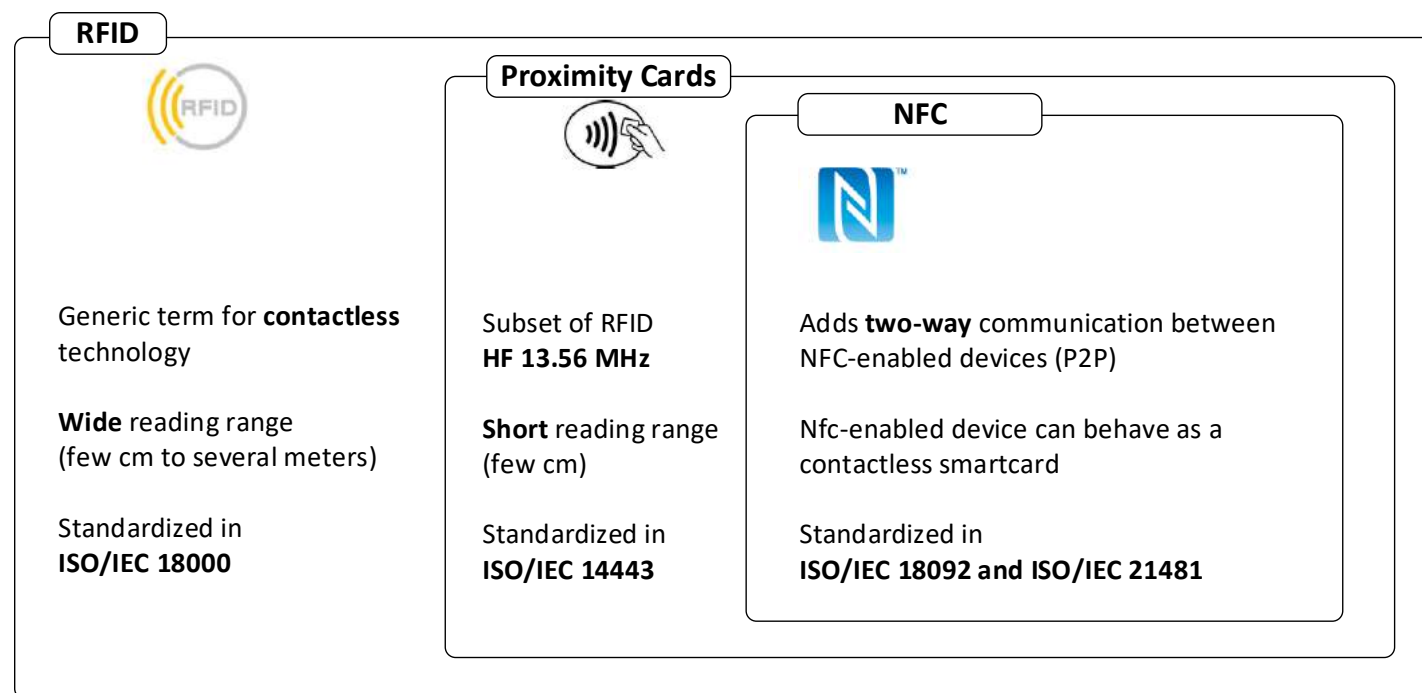
NFC STANDARD AND ECOSYSTEM



NFC – OVERVIEW

Technical Data

- **Short range (< 10cm) contactless technology**
- **Standardized** in ISO/IEC, ECMA International and ETSI
- **Compatible to existing contactless card & reader infrastructure** (ISO/IEC 14443 and FeliCa)
- **Multiple operating modes** (Reader/Writer, Card Emulation, P2P)
- **Data exchange** rates 106 (A) / 212 (F) / 424 (F) kBit/s



NFC OPERATING MODES

Reader/Writer (Poller)

- The system performs the functions of a contactless reader
- Interacts with contactless Cards & Tags/Tag-devices
- POS terminal, Transport gate, Passport reader ...



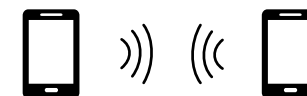
Card/Tag (Listener)

- The system behaves as a contactless smartcard
- Can be passive device (bank card) or active (phone, wearable)
- Emulate card for Payment, Transit, Access control, Identity, ...

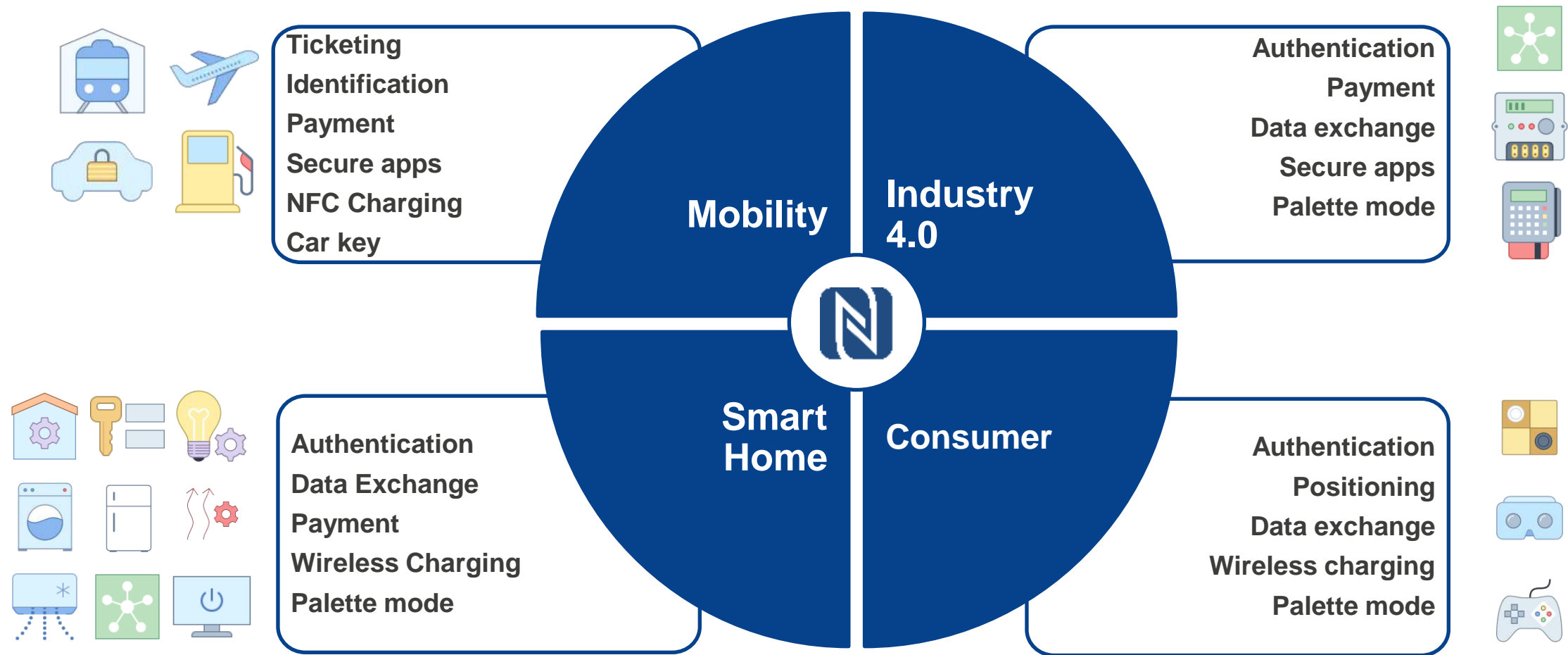


Peer-to-Peer (P2P)

- Establishes a two-way communication channel between two NFC-devices
- File exchange, Social-media...



THE OMNIPRESENCE OF NFC



PRODUCTS AND TECHNOLOGY



PANTHRONICS RELEASED PRODUCT SERIES



NFC Readers R Series

- Improved interoperability, easing certification
- Ability to work behind display / in challenging environments
- Delivering up to 2W directly onto the antenna
- PTX100R, PTX130R, PTX105R

Reader Product Overview

Poller



NFC Pollers W Series

- Direct connection to antenna reduces design complexity
- Reduced harmonics easing EMI and FCC certification
- Maximize charging efficiency
- PTX130W

Listener



NFC Listener W Series

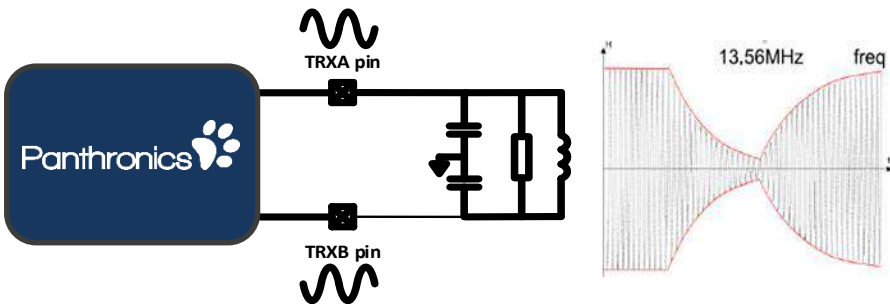
- Fully integrated NFC charger in ultra-small package reducing BOM complexity and size
- Efficient harvesting up to 1W
- Maximum flexibility in antenna design and placement
- PTX30W

WLC Product Overview

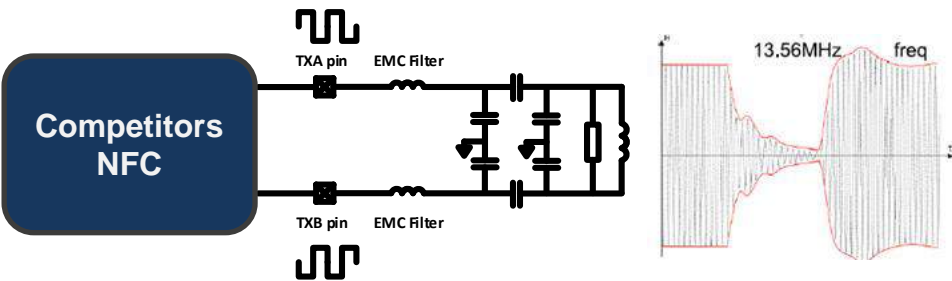
NFC READER SYSTEM SOLUTION AS A KEY TECH

Ground Breaking NFC Architecture

Pantronics grounds-up Sine Wave architecture



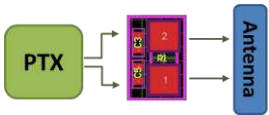
Legacy Push – Pull architecture



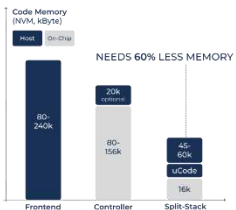
Benefits & Enablers



Best in class performances for higher reading distance, Smaller Antenna and NFC Integration and Certification in challenging environment



Smaller BOM reduces antenna matching complexity, area and cost



Modular SW handling Protocol integration complexity for simple SW integration

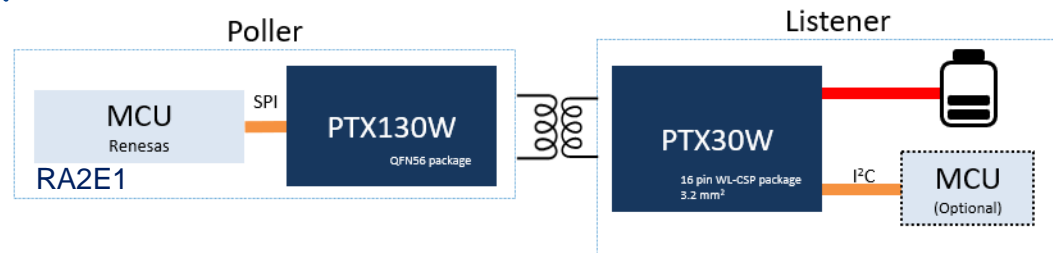


SAM enablement: Applications such as behind display, small form factor and for new and challenging Certification

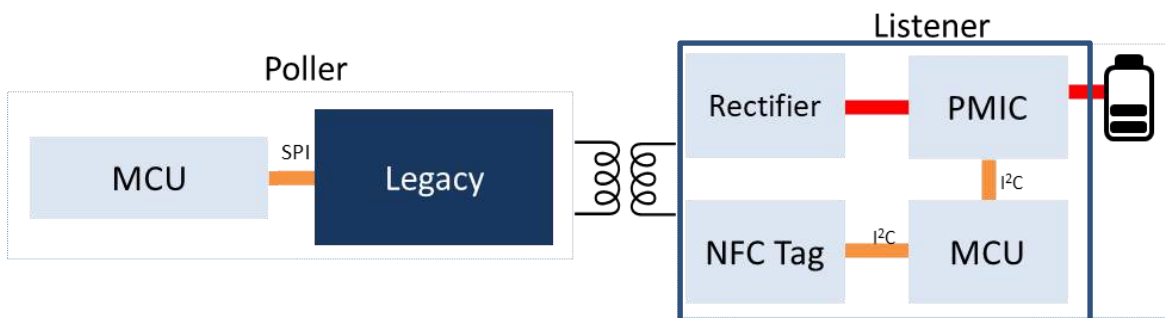
WLC SYSTEM SOLUTION AS A KEY TECH

First fully integrated system for NFC WLC

Pantronics delivering full end to end control



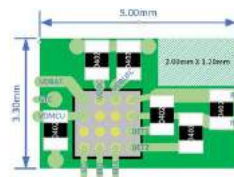
Legacy Discrete solution



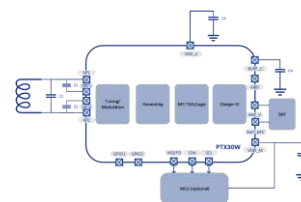
USP's & SAM Enablement



Ultra small Rx only 3.2mm² for space constrained designs



Smallest BOM reduces complexity, area and cost



Full Rx Integration, delivers best in class system level efficiency with total autonomy.



SAM enablement, Listener roadmap enabling new use cases and increasing SAM to >700Mu by 2027 (Tx + Rx)

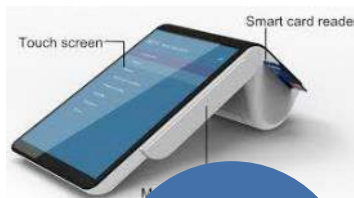
PANTHRONICS DIFFERENTIATORS

Market Key Needs	PTX Differentiators
<ul style="list-style-type: none"> ▪ Small Form Factor POS for EMVCo 3 ▪ EMVCo 3 behind display ▪ Extended reading distance 	<ul style="list-style-type: none"> ▪ Best in Class Transmit power (up to 2W on Antenna) ▪ Best in Class Receiver sensitivity (-80dBc) ▪ Higher performance enables use of ultra compact antenna (<2mm²)
<ul style="list-style-type: none"> ▪ Turn-key solution ▪ Fast Charging ▪ More flexibility in placement of Poller vs Listener 	<ul style="list-style-type: none"> ▪ Poller and Listener ▪ Up to 1W on output of listener, >= 2x better than competitor solution ▪ Direct antenna connection for constant matching over volume
<ul style="list-style-type: none"> ▪ Simplify compliance with Standards 	<ul style="list-style-type: none"> ▪ Accurate Digital Wave Shaping, passes EMVCo and NFC Forum Waveform tests with margin
<ul style="list-style-type: none"> ▪ Simplify manufacturing and assure same performance across devices 	<ul style="list-style-type: none"> ▪ BoM reduction (EMI and Xtal) ▪ Minimal NFC variation between devices during production
<ul style="list-style-type: none"> ▪ Simplify Software Integration 	<ul style="list-style-type: none"> ▪ NFC solutions delivered with NFC stack SDK with high level API for ease of integration

NFC READER APPLICATIONS



NFC APPLICATIONS FOR POS, IOT AND WLC



PoS

Challenges:

- New EMVCo 3.0/3.1
- NFC behind the screen
- Compact device



Combined with **RA6M4 Secure MCU**



IoT



Challenges:

- High output power
- Interoperability
- Small antenna
- Metallic environment



Combined with **Renesas MCU and MPU**

NFC
Wireless
Charging




Challenges:

- High power transfer
- Allowing antenna mis-alignment
- Communication while charging




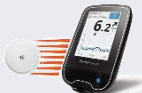


Combined with **RA2E1**




NFC ENABLED IOT APPLICATIONS

	End product	Requirement	Challenges	PTX differentiators
NFC Pen		Very small antenna reader May require to connect to accessories with NFC tag to guarantee authenticity	small antenna on Reader and Tag	- High output power and sensitivity allows the use of very small reader antenna (few sq mm)
E-cigarette		Brand protection & NFC WLC Example of integration removing any type of contact interface: - PTX100R for e-cigarette body to authenticate the capsule - Secure Tag for capsule authenticity (brand protection with SE partner) - PTX100W in e-cigarette charging station to enable wireless charging	small antenna on Reader and Tag small antenna for NFC WLC	- High output power and sensitivity allows the use of very small reader antenna (few sq mm) - High power transfer capability for NFC WLC
Access Control		Type A/B MIFARE	Presence of a noisy display Proximity with metal Distance and good performance are required	Higher reading distance thanks to high output power and high receiver sensitivity Simple matching circuit without EMI bring better interoperability with cards and phones. Limited BoM for antenna tuning allow to reduce dramatically NFC variation in production

NFC ENABLED IOT APPLICATIONS

	End product	Requirement	Challenges	PTX differentiators
Door Lock		Type A/B, MIFARE	metallic environment	<p>Good reader performance even in proximity of metal thanks to high output power and high receiver sensitivity</p> <p>Simple matching circuit without EMI bring better interoperability with cards and phones.</p> <p>Limited BoM for antenna tuning allow to reduce dramatically NFC variation in production</p>
Smart Library		Type V 50 tag anticollision Reading up to 50cm	metallic environment	<p>10dBc more sensitivity on Receiver than competition allows to offer longer range reading in Type V</p> <p>SDK support Anticollision with 50 Type V cards</p>
Printers		Type A,B reader Tag feature QFN package NCI	Requires QFN package Requires NCI	CSP package is not suitable
Glucose Monitoring		Type A and B	small device, small antenna Low power consumption	<p>- High performance even with small antenna thanks to high output power and sensitivity</p> <p>- Low Power Card detection support</p>

NFC ENABLED IOT APPLICATIONS

	End product	Requirement	Challenges	PTX differentiators
Industrial PDA		Type A, B, V Reader Long range reader	Reading distance is key	<ul style="list-style-type: none"> - 10dBc more sensitivity on Receiver than competition allows to offer longer range reading in Type A and V - High output power allows to achieve longer reading distance with Type B
Passport control/ Check-in Counter		Type A,B with High Bitrate		<ul style="list-style-type: none"> - 10dBc more sensitivity on Receiver than competition allows to offer longer range reading in Type A and V - High output power allows to achieve longer reading distance with Type B <p>This performance allows an NFC integration with a smaller antenna</p>
Gaming		Type A/B, F MIFARE	small Reader antenna	<ul style="list-style-type: none"> - High output power and sensitivity allows the use of very small reader antenna (few sq mm)

WHY PTX FOR IOT READERS

Higher reading distance, Smaller Antenna, challenging NFC integration

- High output power up to 2W @5.5V on Antenna
- Two times higher Receiver sensitivity than competition

No 3rd harmonic simplifying FCC certification

- Sine Wave on Tx output

Simplify SW integration

- NFC Controller with Split Stack handling Time critical commands
- Less packet exchanged between NFC and MCU
- NCI support for Android Integration

Simplify HW integration

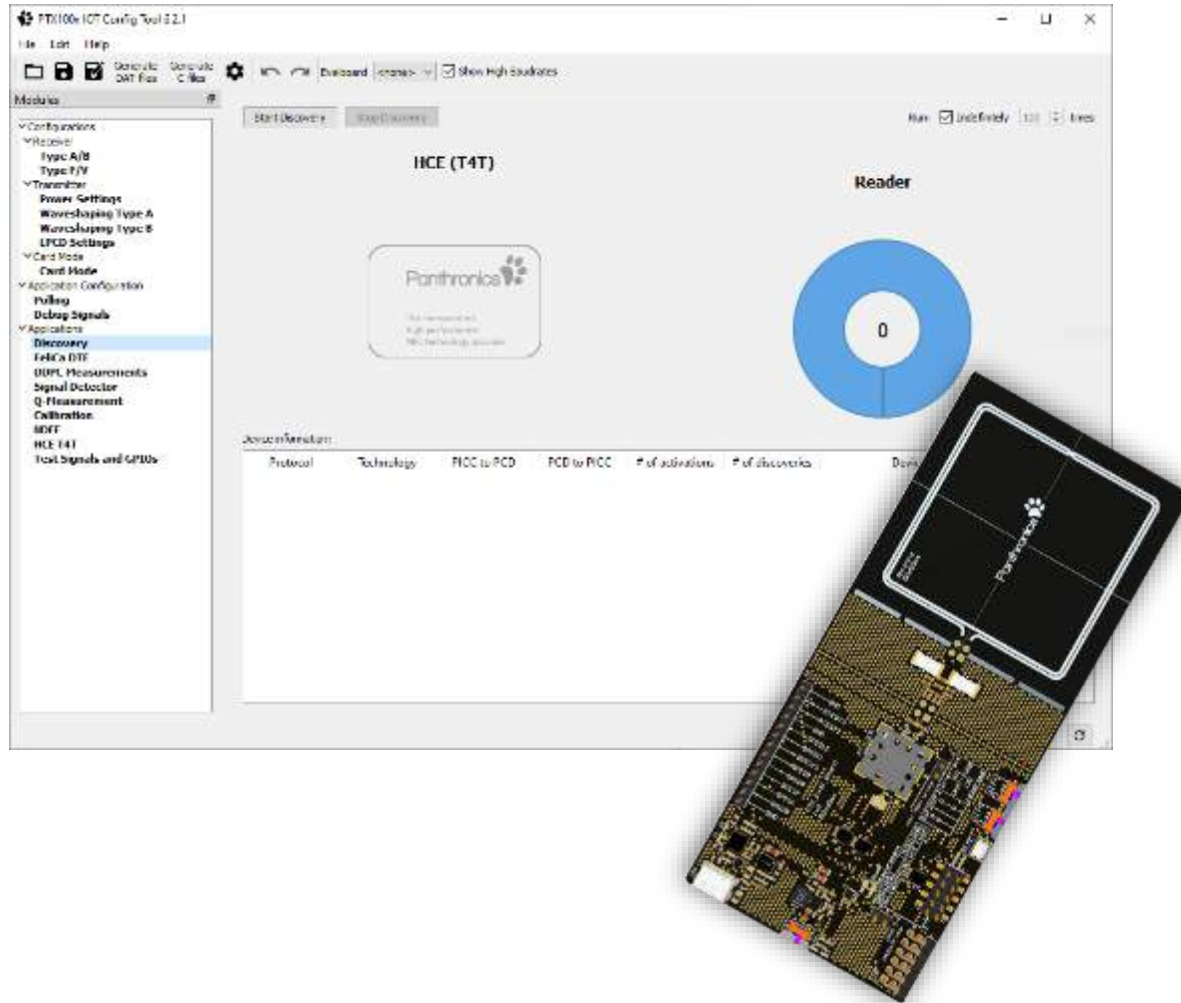
- Extended GPIO functionality on NFC
- DiRAC architecture leading to simplified Antenna matching



EVALS AND SUPPORT



PTX100R POS/IOT EVALUATION KIT



Content

- EvalBoard with PTX100R (USB powered) and all accessories
- GUI with User Manual
- Documentation for configuration, register settings etc.

Purpose

- PoS/IoT reader integration
- Mock-up with own antenna for RF evaluation
- Software evaluation and integration (SPI, UART, I2C)

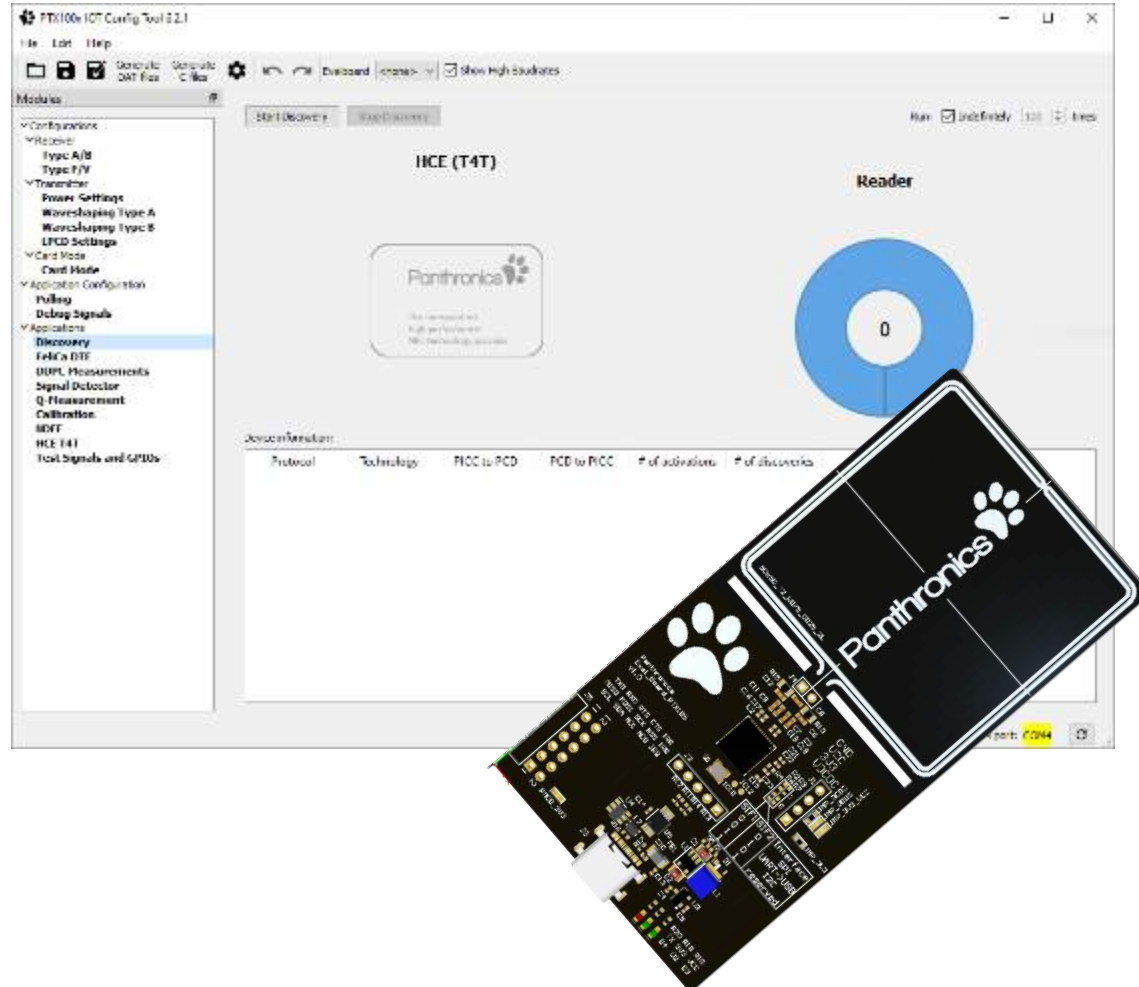
SDK

- OS: Windows, (embedded) Linux, RTOS etc.
- Non OS: for bare metal integration into small MCU

Documentation

- HW/SW integration notes
- Board description, schematics, layout
- Antenna and matching guideline, RF tuning documentation
- Register configuration Guideline

PTX105R IOT EVALUATION KIT



Content

- EvalBoard with PTX105R (USB powered) and all accessories
- GUI with User Manual
- Documentation for configuration, register settings etc.

Purpose

- IoT reader integration
- Mock-up with own antenna for RF evaluation
- Software evaluation and integration (SPI, UART, I2C)

SDK

- OS: Windows, (embedded) Linux, RTOS etc.
- Non OS: for bare metal integration into small MCU

Documentation

- HW/SW integration notes
- Board description, schematics, layout
- Antenna and matching guideline, RF tuning documentation
- Register configuration Guideline

PTX105R NFC READER IN RENESAS QUICK CONNECT



EFFORTLESS PROTOTYPING

Hardware that can be daisy-chained allowing for fast and easy setup. Software libraries are integrated into IDEs for seamless workflow.

FAST TIME-TO-MARKET

With a common hardware and software platform, go from demo and proof-of-concept to development and production, with very few modifications.

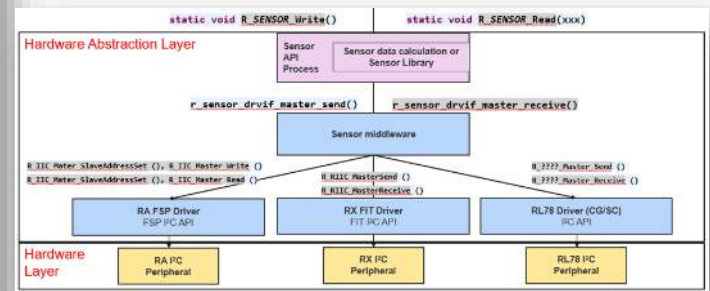
MODULAR DEVELOPMENT

Extensible and interchangeable hardware makes it easy to try different combinations of MCU or MPU platforms to fit your needs.



MCU HW

- Supported connector types
- PMOD (SPI, UART, and I²C new standard)
 - MIKRO Click
 - Arduino



SW API and HAL Block

Supported MCU Families*

- RL78
- RX
- RA

NFC READERS DOCUMENTATION & COLLATERAL

Ordering info

Part #	MOQ	Package
PTX105RDQ56D7	3ku	QFN56
PTX100RDQ56D13	3ku	QFN56
PTX130RDQ56D13	3ku	QFN56

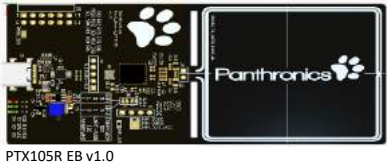
Available Collateral

Item	Details	Location
Datasheets	PTX100R,105R,130R	Renesas.com
Factsheets	PTX100R,105R,130R	Seismic
One Pagers	PTX100R,105R,130R	Seismic
Product Presentations	PTX Reader General Presentation	Seismic
	Fighting Guide	
Apps Notes	SDK Integration Notes	Renesas.com
	HW Setup for Android Systems	
	Antenna matching guideline	
	Hardware descriptions	
	Layout guidelines	
	RF setting & configurations	
	Eval Board descriptions	

Demo & Eval Kits

Board Name	Description	Order No
PTX105R NFC Reader Eval Kit	Mid-power (1W) NFC Reader kit for universal reader hardware platform IC PTX105R.	10009105
NFC IoT PTX105R Pmod™ Board	NFC Reader with Pmod for Quick Connect ecosystem	10009106
PTX100R NFC Reader Eval Kit	High-power (2W), high-performance NFC Reader kit for universal reader hardware platform IC PTX100R. EMVCo L1 with antenna behind display.3Ku	10009100
PTX130R NFC Reader Eval Kit	High-efficiency, high-power (2W), high-performance NFC Reader kit for universal reader hardware platform IC PTX130R. EMVCo L1 with antenna behind display.	10009130

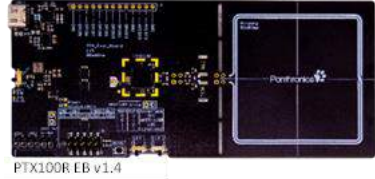
PTX105R EB



PTX105R Pmod



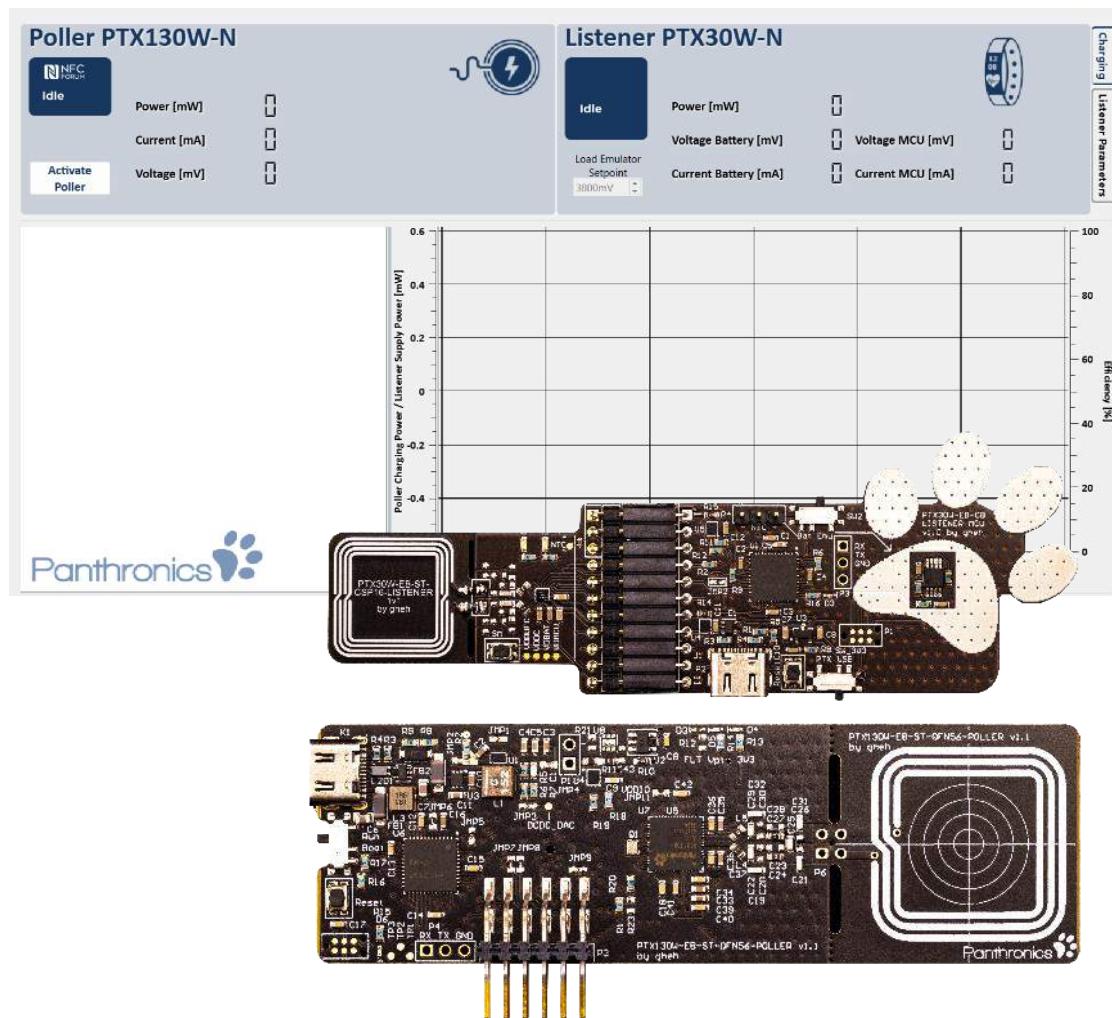
PTX100/130R EB



Internal Support and Ordering Portal

<https://panthronics.atlassian.net/servicedesk/customer/portal/16>

NFC WLC EVALUATION KIT



Content

- Poller board with PTX130W
- Listener board with PTX30W to demonstrate retrieved power
- MCU board

Purpose

- Demonstrate up to 1W charging power on the Listener
- Evaluate NFC wireless charging with customer target device
- Mock-up with own antenna for RF evaluation
- Software evaluation and integration

SDK

- Non OS: for bare metal integration into small MCU

Documentation

- HW/SW integration notes
- Board description, schematics, layout
- Antenna and matching guideline, RF tuning documentation

NFC WINNING COMBINATIONS

Renesas + Panthronics Winning Combinations

1-Phase Power Meter

Mobile Point of Sale (POS) Terminal

Green 3-Phase Smart Energy Meter

Personal Safety Tracker

High-Performance Electric Vehicle (EV) Charger Wall Box

Printer Control Panel with NFC Authentication

High-Performance Human Machine Interface (HMI) System

Single Board Computer

Human Machine Interface (HMI) Solution for Appliances

Smart Lock with Super Low Power Wi-Fi and Bluetooth Low Energy

IoT Communications Gateway Hub

Smart NFC Access Control System

Metered Electric Vehicle (EV) Charging Station

<https://www.renesas.com/br/en/applications?wc=NFC>

[Renesas.com](https://www.renesas.com)