ST25 NFC Tags & Readers solutions

NFC Technology

NFC technology at a glance

An interactive technology enabling engagement with IoT devices

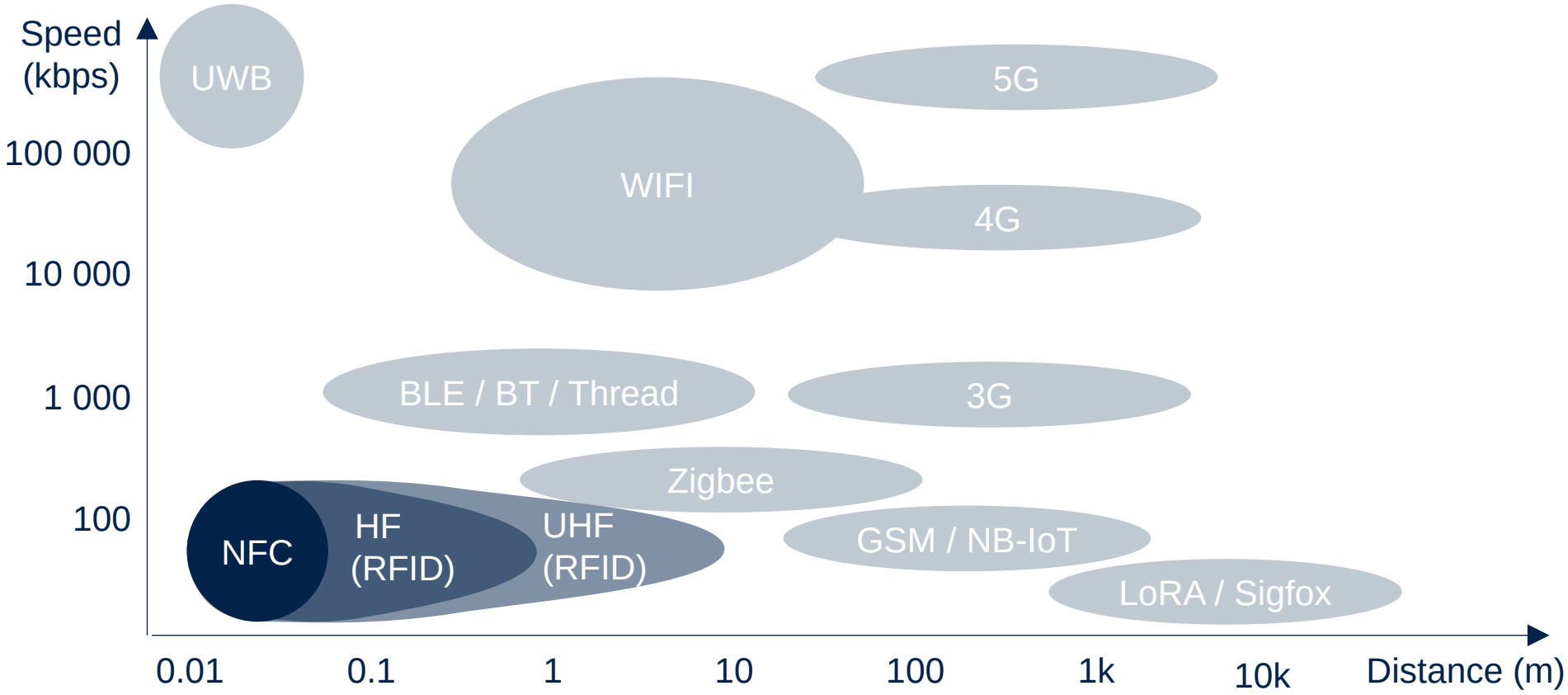
- Near Field Communication, a **short range** wireless technology
  - Operating at **13.56MHz**
  - Based on the RFID HF standard (ISO14443 & ISO15693)
- **Interactive** and **zero power**, enabling a convenient connection to the Internet of Things

  ➔ **NFC-enabled mobile phones can engage with items by a simple tap**
- NFC is developed by the NFC Forum
  - **Interoperability** between devices
  - **Standardized** use cases (web link, Bluetooth handover, etc.)
- Fast growing NFC deployment in mobile phones
  - In 2024, more than 75% phones come with NFC
  - NFC is used for Mobile payment (EMVCo®) like Apple Pay or Google Pay
  - Apple added in 2017 support of NFC reader mode from iOS11 onward and support of NFC writer mode from iOS13 in September 2019




NFC in the wireless spectrum

NFC is unique in the wireless spectrum:
short distance, low data-rate and zero power for the application



Typical NFC / RFID range

- **ISO14443** (NFC Forum type 2 & type 4) is called **"contactless short range"** standard with higher RF speed.
- **ISO15693** (NFC Forum type 5) is called **"contactless long range"** standard.

NFC phones

ISO14443 (106kb/s) — **Up to 5 cm (2in.)**

ISO15693 (26kb/s) — **Up to 7 cm (3in.)**

RFID readers

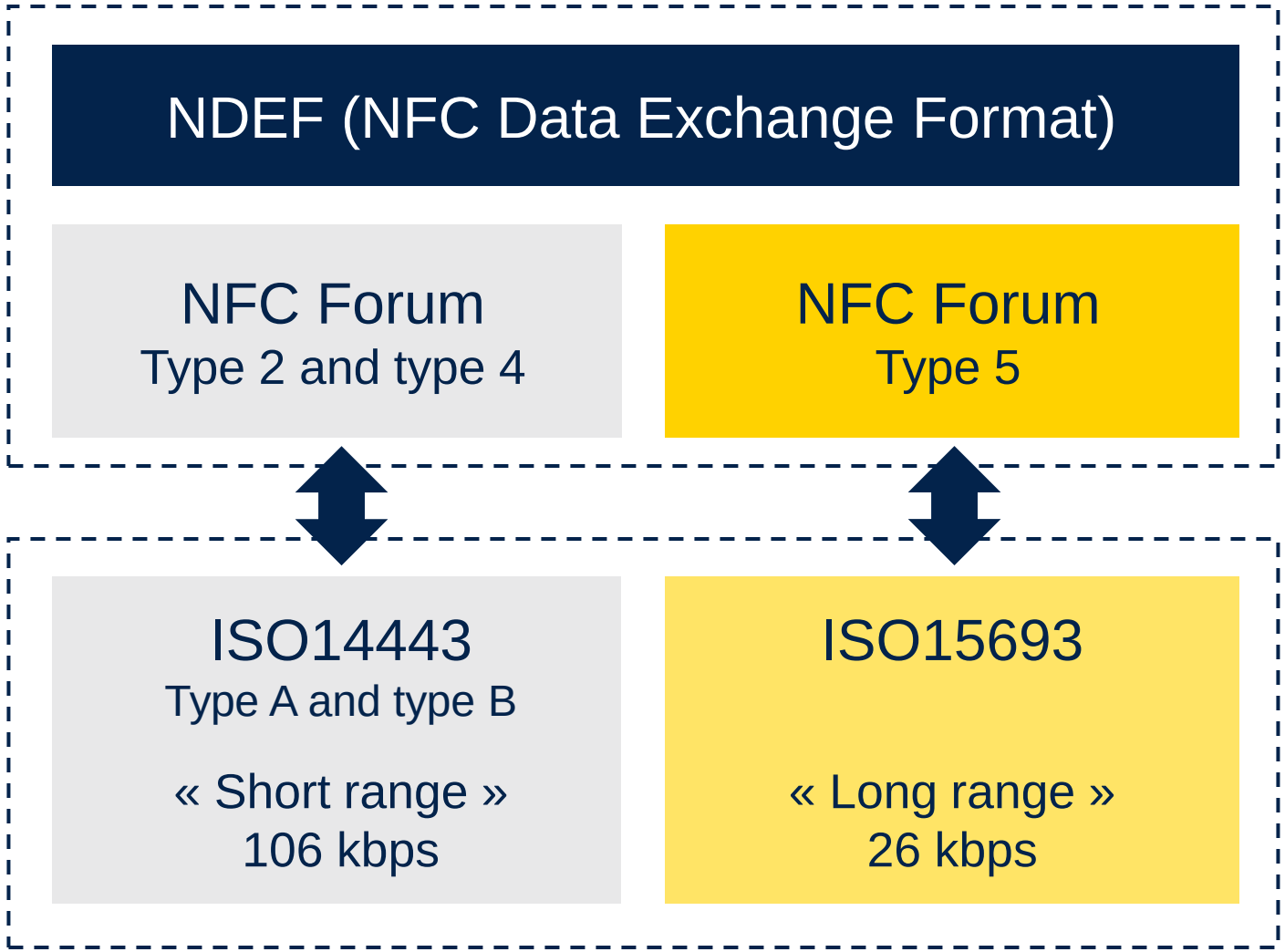
ISO14443 (106kb/s) — **Up to 10 cm (4in.)**

ISO15693 (26kb/s) — **Up to 1 m (3 ft)**

NFC Forum standards

NFC specification
→ **Upper layer SW**

RFID HF ISO standards
→ **HW / SW protocol**



From factory to consumer bridging RFID and NFC

RFID

ISO 15693

NFC Type 5

Introduction to the NFC Wayfinding Mark

- N-Mark remains the official logo of NFC Forum, used for certified products.
- The Wayfinding Mark is made to ensure optimal NFC User experience.

Directional

- Occasional use
- Tapping point

Instructional

- One-time use
- Learning to tap

Simplified

- Everyday use
- For users already familiar with NFC

Charging

- Everyday use
- Device charging antenna location

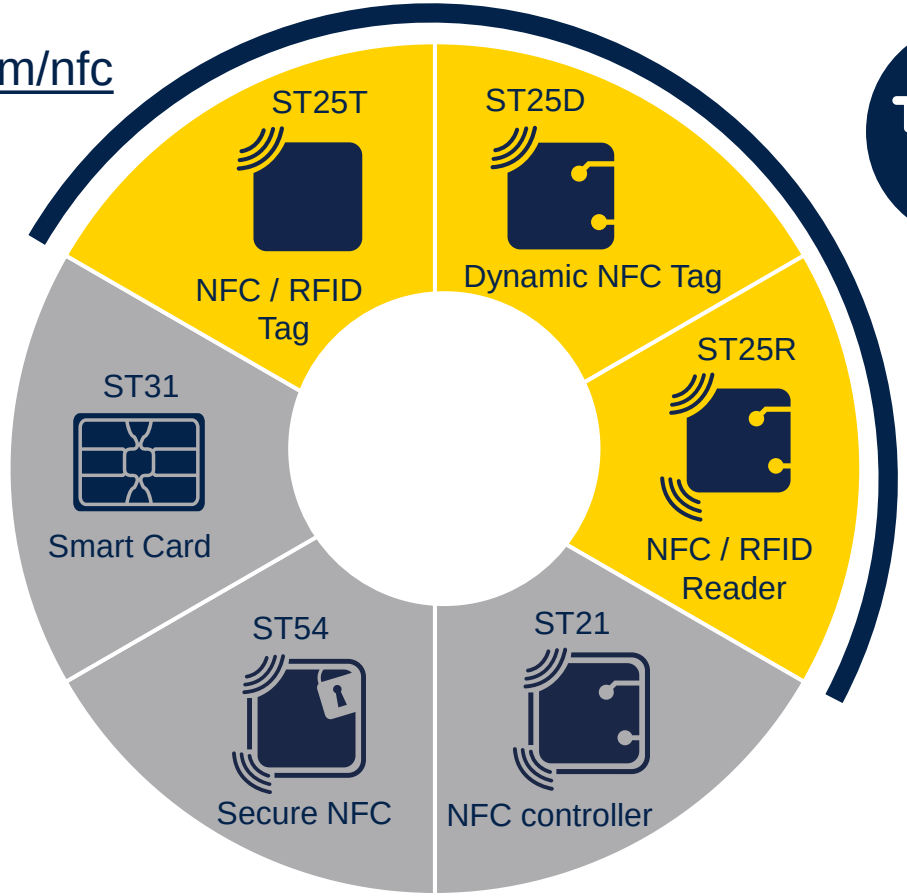
More details: https://nfc-forum.org/wayfinding-mark/
How to use the wayfinding mark: https://nfc-forum.org/wp-content/uploads/2021/11/Wayfinding-Mark-Guidelines.pdf

ST25 NFC Portfolio

ST NFC portfolio

Covering all NFC application needs and leveraging a rich ecosystem

www.st.com/nfc



ST25

STMicroelectronics is a member of:

- **NFC Forum**
- **ISO organizations**
- **Zhaga consortium**
- **LoRa alliance**
- **EMVCo®** (Europay, Mastercard & Visa Consortium)
- **WPC** (Wireless Power Consortium)
- **CSA** (Connectivity Standards Alliance)

ST25 product family

Passive tag - EEPROM with contactless NFC interface

www.st.com/st25t

Tags

NFC phone
or RFID reader

Passive connected tag – EEPROM with contactless NFC and wired I2C interfaces

www.st.com/st25d

Dynamic tags

NFC phone
or RFID reader

Active reader – Provides power to NFC devices and initiates the communication as a master

www.st.com/st25r

Readers

NFC phone

or

or

ST25 NFC / RFID portfolio
one-stop-shop for tags and readers

Tags					Dynamic tags			NFC / HF readers			
ST25TA	**ST25TA-E**	**ST25TB**	**ST25TN**	**ST25TVC**	**M24SR**	**ST25DVC-I2C ***	**ST25DV-PWM**	**ST25R200 ST25R100**	**ST25R3916B ST25R3917B ST25R3919B**	**ST25R3918**	**ST25R300**
ISO14443-A 106 kbps NFC type 4	ISO14443-A 106 kbps NFC type 4	ISO14443-B 106 Kbps	ISO14443-A 106 kbps NFC type 2	ISO15693 up to 53 Kbps NFC type 5	ISO14443-A 106 kbps NFC type 4	ISO15693 up to 53 kbps NFC type 5	ISO15693 up to 53 kbps NFC type 5	ISO14443-A/B ISO15693	ISO14443-A/B ISO15693 Felica ISO18092	ISO14443-A/B ISO15693 Felica ISO18092	ISO14443-A/B ISO15693 Felica ISO18092
EEPROM 512b - 64Kb 200-year retention 1M cycles	Flash 2Kb 25-year retention 500k cycles	EEPROM 512b-4Kb 40-year retention 1M cycles	EEPROM 512b-1.6Kb 40-year retention 100k cycles	EEPROM 512b-64Kb 60-year retention 100k cycles	EEPROM 2Kb-64Kb 200-year retention 1M cycles	256B buffer EEPROM 4Kb-64Kb 40-year retention 1M cycles	EEPROM 2Kb 40-year retention 100k cycles	Reader/Writer	Reader/Writer P2P Card Emulation EMVCo® & PBOC	Reader/Writer P2P Card Emulation	Reader/Writer P2P Card Emulation EMVCo® & PBOC
TruST25 digital signature 128b password 20b counter UID RF Field Detect	Augmented NDEF Edge TruST25 digital signature ECC crypto engine 4-digit UTC 24b counter UID	32b counter Lock OTP bits UID	Augmented NDEF TruST25 digital signature 24b UTC UID	Augmented NDEF TruST25 digital signature 64b password 24b UTC UID Tamper Detect	128b password RF disable RF Detect UID	Fast X-fer Mode 64b password E-harvesting RF Detect UID	TruST25 digital signature 64b password UID	Dynamic Power Out (DPO) OverShoot Protection (OSP)	Active Wave Shaping (AWS) Dynamic Power Out (DPO) Auto Antenna Tuning (AAT) Multi-antenna	Dynamic Power Out (DPO) Multi-antenna	Active wave shaping (AWS+) Dynamic Power Out (DPO+) Auto Antenna Tuning (AAT) Multi-antenna
					I2C 1MHz 2.4V-5.5V	I2C 1MHz Write 16B page 1.8V-5.5V	2x PWM 488-31.25 kHz 1.8V-5.5V	SPI 10 / 6Mbps 2.7V-5.5V 1.2W - 0.8W	SPI 10Mbps I2C 3.4Mbps 2.4V-5.5V 1.6W	SPI 5Mbps I2C 3.4Mbps 2.4V-5.5V 0.5W	SPI 10Mbps 2.7V-6.0V 2.2W
SBN12 / SBN075 / FPN5	SBN14 / SBN075	SBN12 / SBN075	SBN12 / SBN075 / FPN5	SBN12 / SBN075 / FPN5	SO8 / TSSOP8 / FPN8 / SBN12	SO8 / TSSOP8 / FPN8 / FPN12 / WLCSP10	SO8 / TSSOP8	24-pin TQFN	32-pin QFN / WLCSP-36	32-pin QFN	32-pin QFN

*: successor of M24LR and ST25DV-I2C

ST25 series enriching our lives!

Main applications of ST25 series

Consumer
Gaming

Healthcare
Medical, wellness

Brand protection
Accessory recognition

Smart home
Home appliance

Industrial
Lighting, metering

Asset tracking

Access control

Point of sale

Transport

Certification & interoperability status

	Tags		Dynamic tags			Readers	
	ST25TV	ST25TN	ST25DV-I2C	ST25DV-PWM		ST25R200	ST25R300
NFC Forum	CERTIFIED	CERTIFIED	CERTIFIED	CERTIFIED	**NFC Forum**	CERTIFIED	CERTIFIED
iOS app					**RFAL SW**		
Android app					**Linux SW**		

Contactless market: booming opportunities
ST25 NFC tags & readers pervasion

Comprehensive portfolio:
Short range – Long range

Growing contactless markets

ST25 Ecosystem

for easy adoption and fast development

Readers
ST25R

Tags
ST25T

Dynamic tags
ST25D

Best-in-class RF performance

- Payment
- Lighting
- Metering
- Healthcare
- Appliances
- Access control
- Transportation
- Consumer electronics
- Consumer brands

ST25 product series overview

ST25 tags & dynamic tags DNA

Comprehensive portfolio

Standard compliant	Feature-rich	Best-in-class memory	High volume & quality
NFC Forum ISO14443A ISO14443B ISO15693	13.56 MHz Digital signature TruST25 Counter / Unique tap code ECC-based crypto I2C interface Fast transfer mode Energy harvesting	From 512-bit to 64-Kbit 1M erase-write cycles Up to 200 years retention 128-bit password OTP bits	In-house manufacturing Leverage automotive EEPROM quality Leverage consumer EEPROM volume

ST25 readers DNA

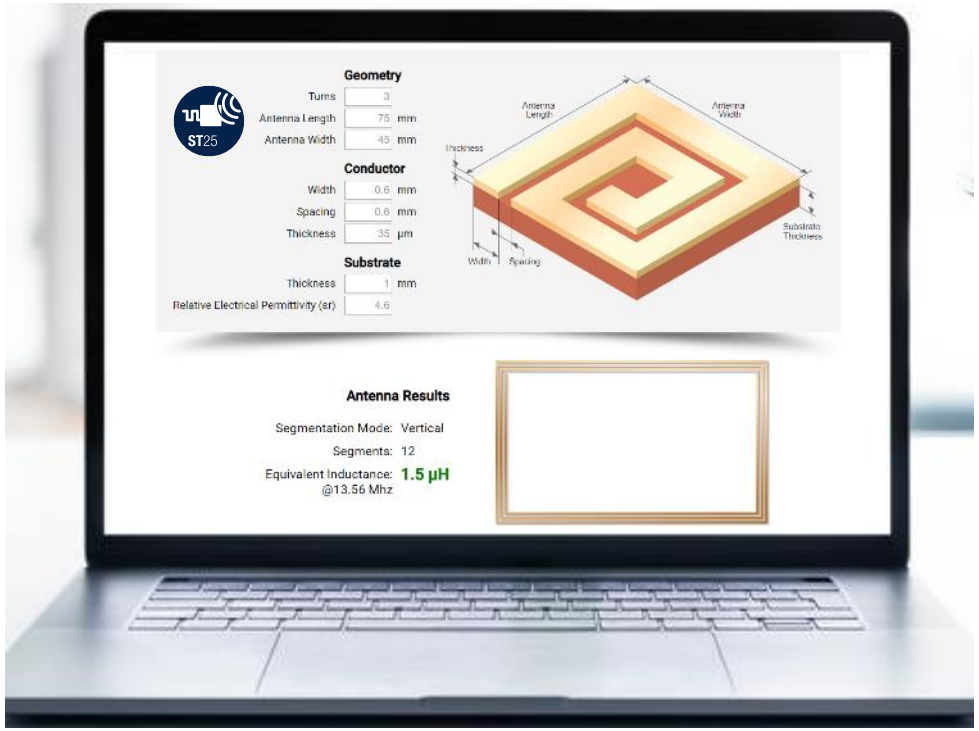
Comprehensive portfolio

Standard compliant	High performing	Advanced features	Certification
NFC Forum	13.56MHz	Active wave shaping	EMVCo®
ISO14443A/B	Very high bit rate (6.8Mbit/s)	Automatic antenna tuning	PBOC
ISO15693	High output power (2.2W)	Low power wake-up modes	FCC
Felica	Temperature -40°C to 105°C	Dynamic power output	CE mark
		Noise suppression receiver	

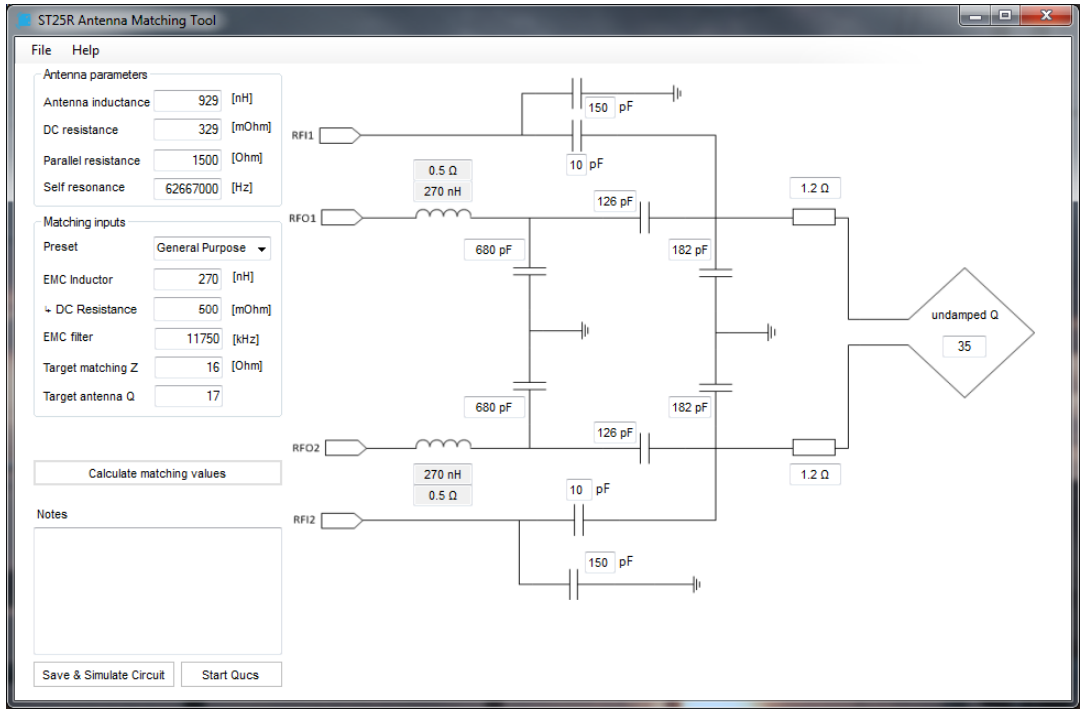
Antenna e-design and matching tools

Fast and easy prototyping

Antenna eDesign suite



ST25R antenna matching tool

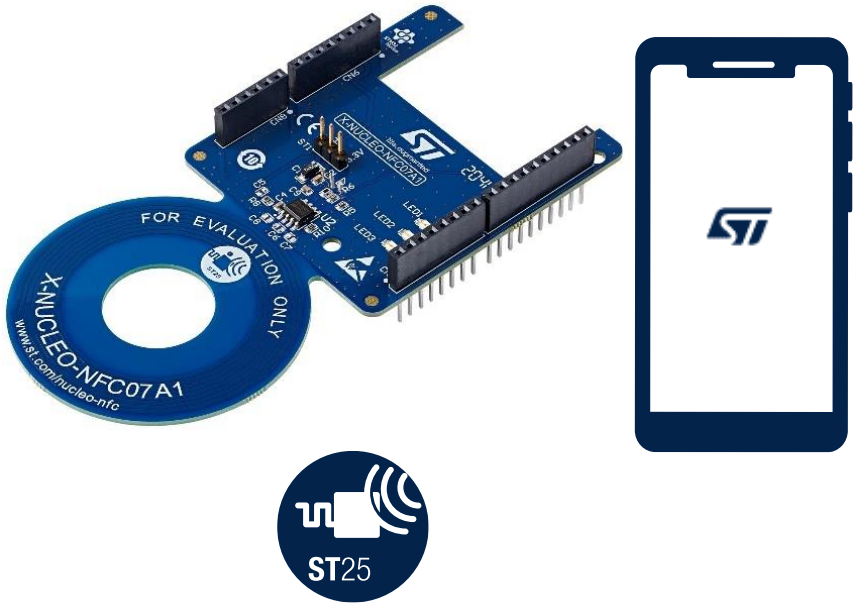


Available on www.st.com/st25

ST25 ecosystem DNA

Easy-to-use and customer-oriented

- STM32 Nucleo HW ecosystem
- Discovery kit STM32 based
- Antenna e-design tool
- Schematic, BOM, Gerber



- Mobile apps ST25 SDK
- STM32Cube SW ecosystem
- PC software tool ST25 SDK
- Documentation

ST25T product ID cards

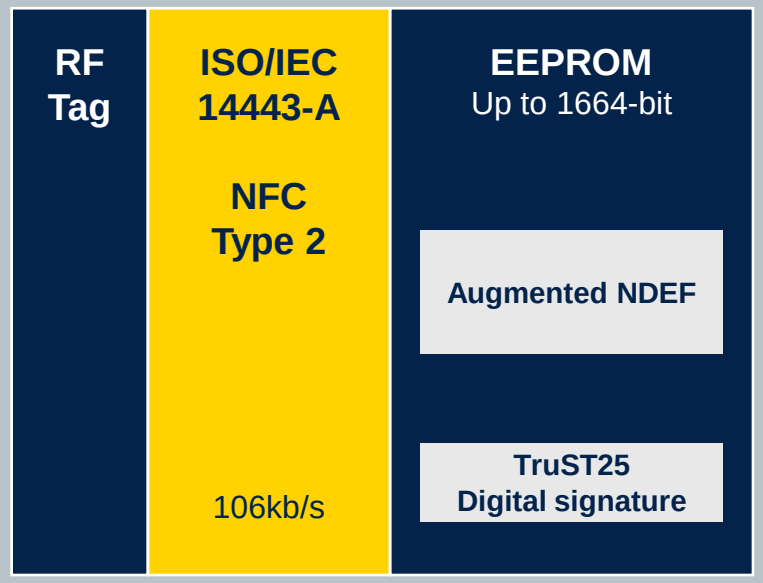
NFC / RFID tags product family

	ST25TA	ST25TA-E	ST25TB	ST25TN	ST25TVC	
RF protocol	ISO14443A NFC type 4	ISO14443A NFC type 4	ISO14443B	ISO14443A NFC type 2	ISO15693 NFC type 5	ISO15693 NFC type 5
RF speed	106 kbps	106 kbps	106 kbps	106 kbps	26kbps (53 kbps)	26kbps (53 kbps)
Memory format	EEPROM (preformatted NDEF)	Flash	EEPROM	EEPROM (preformatted NDEF)	EEPROM (preformatted NDEF)	EEPROM
Memory size	2k /16k / 64k-bit	2k-bit	512-bit / 2k / 4k-bit	512-bit / 1.6k-bit	512-bit / 2k-bit	16k / 64k-bit
Data protection	Password 128-bit	Password 64-bit	OTP bits	Lock blocks	Password 64-bit	Password 64-bit
Digital signature	Off-chip TruST25	On-chip Edge TruST25	-	Off-chip TruST25	Off-chip TruST25	-
Digital output	GPO Field Detect CMOS_P / Open-drain (2k only)	-	-	-	Tamper Detect	-
Counter / UTC	20-bit counter	24-bit counter 4-digit UTC	32-bit (x2) counters	24-bit UTC	24-bit UTC	-
Extra features	-	ECC-based crypto engine	Tag for transport ticket	Augmented NDEF	Augmented NDEF Untraceable mode	-
RF tuning capacitor	50pF / 25pF	68pF	64pF	50pF	23.5pF & 99.7pF	28.5pF
Temperature range	-40°C to +85°C	-25°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Package	SBN12*	SBN14" / SBN075²	SBN12* / SBN075²	SBN12* / SBN075² FPN5	SBN12* / SBN075² FPN5	SBN12*

" SBN14: Die form, Sawn and Bumped wafer, 140µm thickness, inkless 12" wafer
* SBN12: Die form, Sawn and Bumped wafer, 120µm thickness, inkless 8" wafer
² SBN075: Die form, Sawn and Bumped wafer, 75µm thickness, inkless 8" wafer

ST25TN
Entry level NFC type 2 tag

ST25TN512 / 01K



UFDFPN5

SBN12 / SBN075
Die form, sawn and Bumped inkless 8" wafer, 120µm/75um thickness

Use cases

- NFC consumer engagement, NFC token
- Product configuration, accessory recognition, smart poster, gaming

Key features

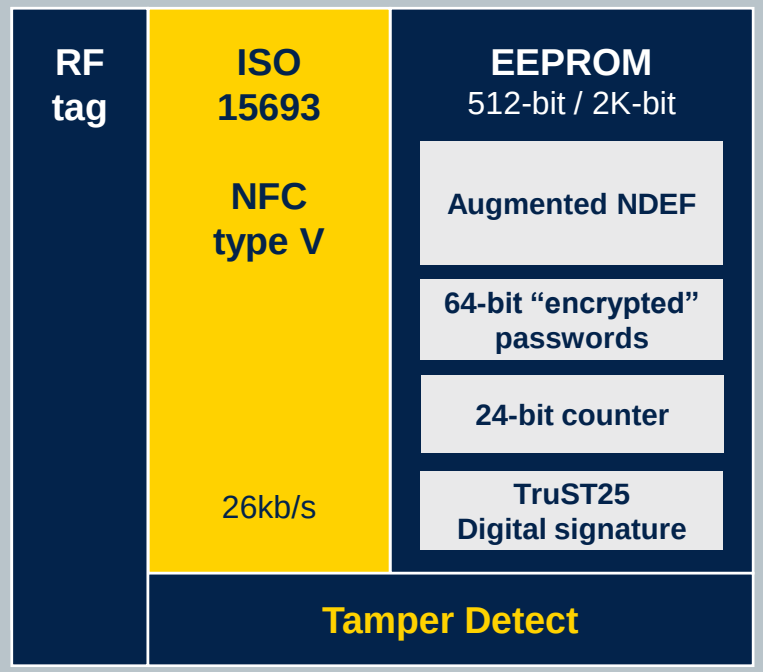
- **ISO/IEC 14443-A** and **NFC type 2 Tag**
- High speed operations (**106kb/s**)
- **Memory configuration:** 512-bit and 1280-bit (up to 1664-bit depending on features usage)
- 24-bit **Unique Tap Code (UTC)** with anti-tearing
- **Customizable Augmented NDEF** with UID and UTC
- **TruST25** digital signature

Key benefits

- Tiny DFN5 package (1.7x1.4mm)
- 50pF internal RF tuning capacitor allowing small antenna design
- **40 years** data retention, 100K cycles erase/write
- Cost effective applications

ST25TVC
NFC type 5 tag with Augmented NDEF

ST25TV512C / 02KC



UFDFPN5

SBN12 / SBN075
Die form, sawn and Bumped inkless 8" wafer, 120µm/75um thickness

Use cases

- Consumer engagement, product identification, accessory recognition, wireless pairing, asset tracking, access control, gaming
- Tamper proof application, brand protection

LONGEVITY 10 YEARS COMMITMENT

Key features

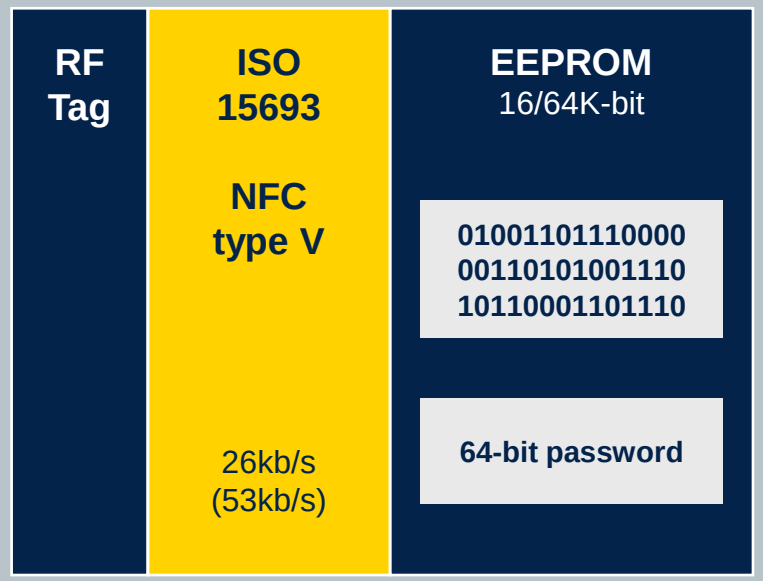
- ISO15693 and **NFC type V** (long range operations, 26kb/s)
- Memory configuration : 512-bit and up to 2560-bit
- **TruST25 Digital Signature** (can be used into ANDEF: 2K-bit only)
- 24-bit **Unique Tap Code (UTC)** with anti-tearing
- Untraceable (by default possible) & Kill modes
- Tamper Detect pin for open / short detection
- **Augmented NDEF**: UID, UTC, tamper status, signature, password counter…

Key benefits

- Configurable User Memory Area
- Cloning Protection with Digital Signature (Cloud management)
- **60 years** data retention, **100k cycles** erase/write

ST25TVC
High density NFC type 5 tag

ST25TV16/64K



SBN12
Die form, sawn and Bumped inkless 8” wafer, 120µm thickness

Use cases

- Asset tracking, product identification
- Maintenance, repair and operations
- Gaming

LONGEVITY 10 YEARS COMMITMENT

Key features

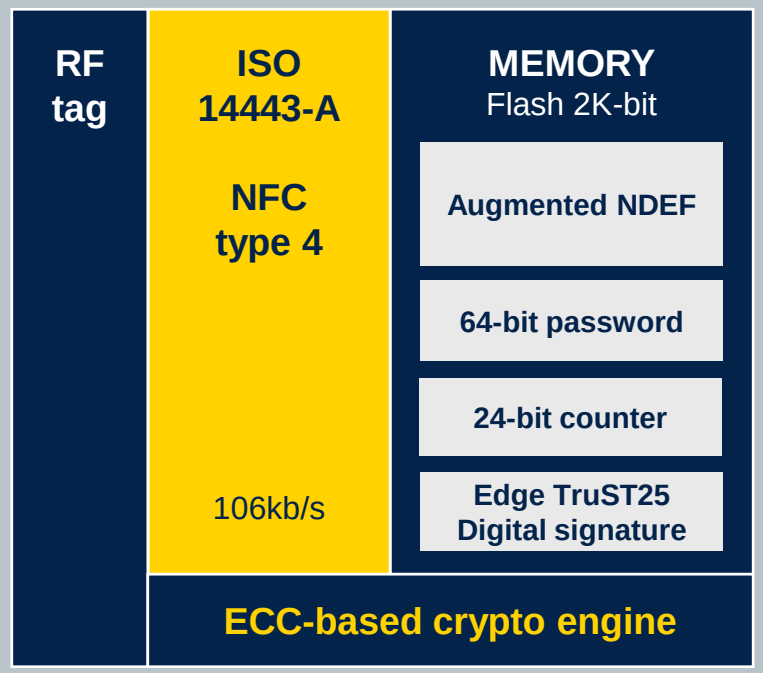
- **ISO15693** and **NFC type V**
- **Long range** operations, up to 53kb/s speed
- **16/64K-bit** EEPROM density

Key benefits

- Temperature range -40°C to +85°C
- Enhanced protection with multiple **64-bit password**
- **40 years** data retention, **1M cycles** erase/write
- Same RF tuning capacitor as in M24LR / ST25DV-I2C (28.5pF)

ST25TA-E
Secure Tag for product authentication

ST25TA-E



SBN14 / SBN075
Die form, sawn and Bumped inkless 12" wafer, 140/75µm thickness

Use cases

- Product authentication, brand protection, anticloning, asset tracking

Key features

- **ISO14443-A** and **NFC type 4**
- Short-range operations, up to 106kb/s speed
- Data protection using password-based authentication
- **Cloning protection** thanks to Edge TruST25TM digital signature
- Configurable general-purpose counter
- **Privacy-enabled** communication modes
- Tag-related credential appended dynamically to NDEF for consumer engagement (ANDEF)

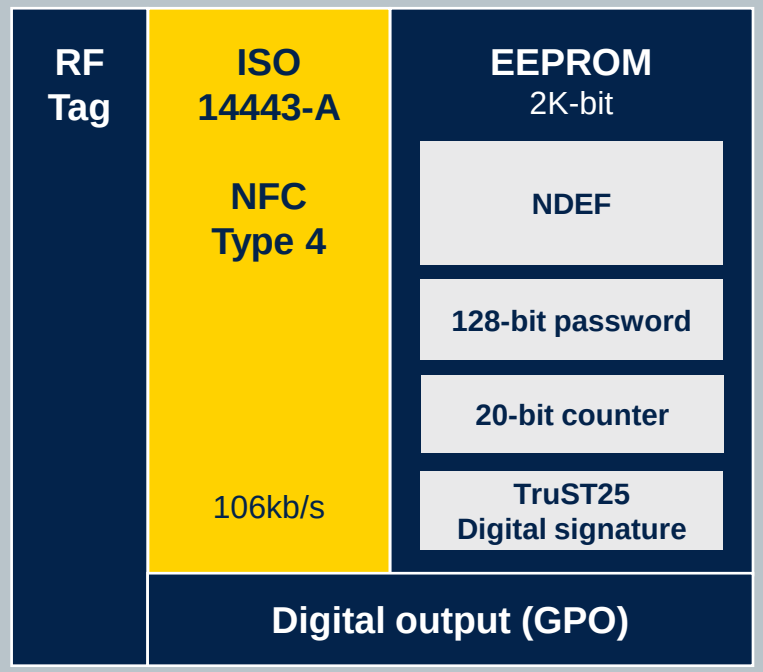
Key benefits

- **Strong product authentication** thanks to on-chip ECDSA signature
- **Blockchain compatibility**

Mat29 targeted end of Feb 2025

ST25TA
NFC type 4 tag with GPO

ST25TA02KB-P / -D



UFDFPN5

SBN12 / SBN075
Die form, sawn and Bumped inkless 8" wafer, 120µm/75um thickness

Use cases

- Convenient wireless **pairing**
  - Bluetooth pairing
  - Wi-Fi static pairing

Key features

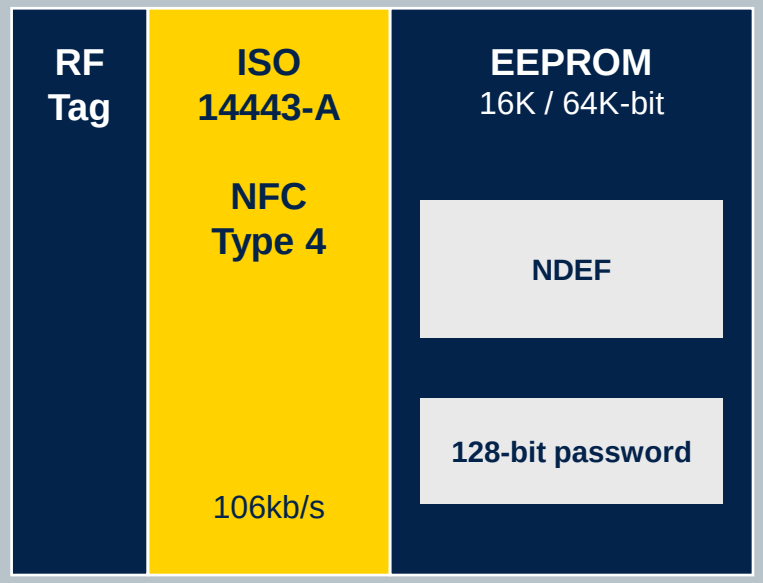
- **ISO14443-A** type A and **NFC type 4**
- Data protection thanks to **128-bit** password
- **TruST25** Digital Signature
- **Digital output GPO** feature (for MCU wake-up)
  - -P: CMOS_P GPO (active high, no external resistor)
  - -D: Open Drain GPO (active low, pull-up resistor)

Key benefits

- Tiny **FPN5** package (1.7x1.4mm)
- 50pF internal RF tuning capacitor allowing small antenna design
- **200 years** data retention, **1M cycles** erase/write

ST25TA
High density NFC type 4 tag

ST25TA16K / 64K



SBN12
Die form, sawn and Bumped inkless 8" wafer, 120µm thickness

Use cases

- Smart poster, gaming, NFC token
- NFC business card (name card, vcard) with ID picture, web-link and extra digital contents

Key features

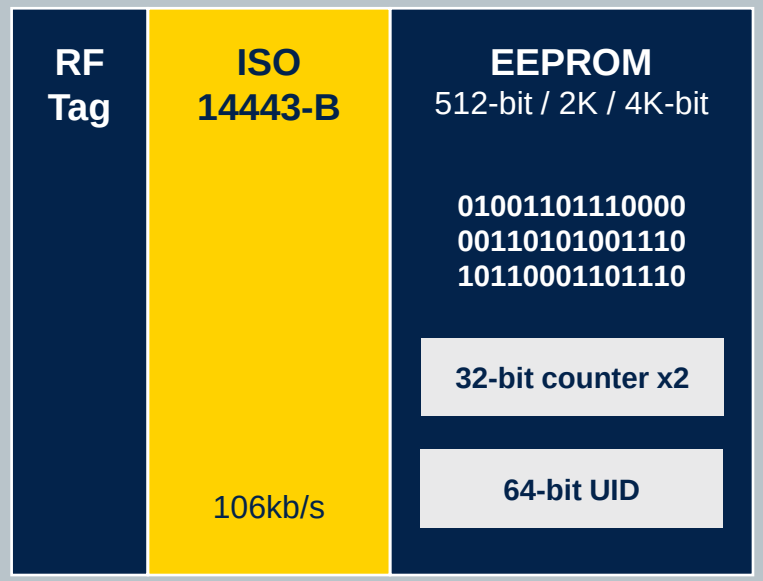
- **ISO14443-A** type A and **NFC type 4**
- High speed operations (**106kb/s**)
- NDEF memory format
- Data protection thanks to **128-bit password**

Key benefits

- **Large memory size** (up to 64k-bit)
- Same RF antenna design as M24SR product
- **200 years** data retention, **1M cycles** erase/write

ST25TB RFID tag

ST25TB512 / 02K / 04K



SBN12 / SBN075
Die form, sawn and Bumped inkless 8" wafer, 120µm/75µm thickness

Use cases

- Mass transit and **transport**
- Event ticketing
- Asset tracking
- Brand protection, identification

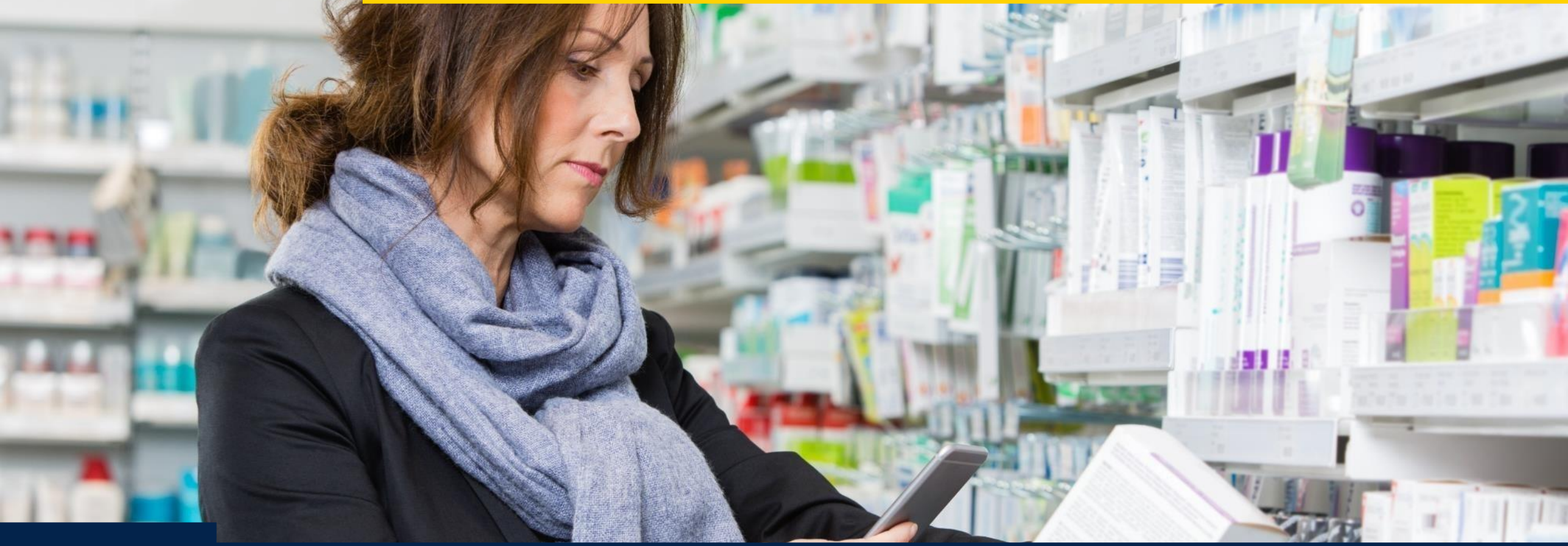
Key features

- Fast data transfer (ISO14443-B)
- Large and flexible counting capability with anti-tearing feature
- ST25TB512-AT version dedicated to transport
- 2x counters 32-bit with anti-tearing

Key benefits

- Temperature range **-40°C to +85°C**
- 40 years data retention, **1M cycles** erase/write

ST25D product ID cards



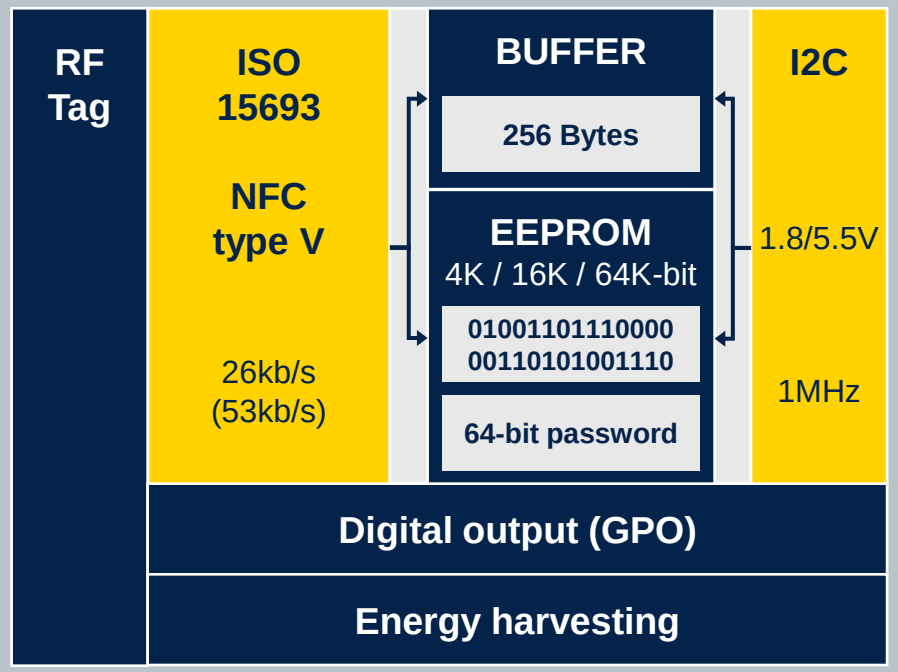
Dynamic NFC / RFID tags product family

	M24SR	M24LR	ST25DVC-I2C	ST25DV-PWM
RF protocol	ISO14443A NFC type 4	ISO15693 NFC compatible	ISO15693 NFC type 5	ISO15693 NFC type 5
RF speed	106kbps	26kbps	26kbps	26kbps
Serial interface	I2C @1MHz	I2C @400kHz Write 4-Byte page size	I2C @1MHz Write **16-Byte** page size	No
Fast Transfer Mode	No	No	Yes (256B buffer)	No
Energy harvesting	No	Yes	Yes	No
Digital output	Open-Drain GPO	Open-Drain GPO	OD or CMOS GPO	2x PWM
Extra features	RF Disable	-	Low Power mode	-
Memory format	EEPROM (preformatted NDEF)	EEPROM data	EEPROM data	EEPROM data
Memory size	2k / 4k / 16k / 64k-bit	4k / 16k / 64k-bit	4k / 16k / 64k-bit	2k-bit
Data protection	Password 128-bit	Password 32-bit	Password 64-bit	Password 64-bit Digital signature
Temperature range	-40°C to +105°C	-40°C to +85°C	-40°C to +125°C	-40°C to +105°C
Package	SO8 / TSSOP8 / FPN8 / SBN12*	SO8 / TSSOP8 / FPN8	SO8 / TSSOP8 / FPN8 / FPN12 / WLCSP10	SO8 / TSSOP8

* SBN12: Die form, Sawn and Bumped wafer, 120µm thickness, inkless 8” wafer

ST25DVC-I2C
Enhanced dynamic NFC type 5 tag

ST25DV04KC / 16KC / 64KC



 SO8

 UFDFPN8

 WLCSP10

 TSSOP8

 UFDFPN12

Use cases

- Fast data exchange with NFC phones / HF readers
  - Fast data transfer for MCU FW upgrade, fast data exchange
  - Parameters settings and update, with in-the-box programming
  - Data log download

Key features

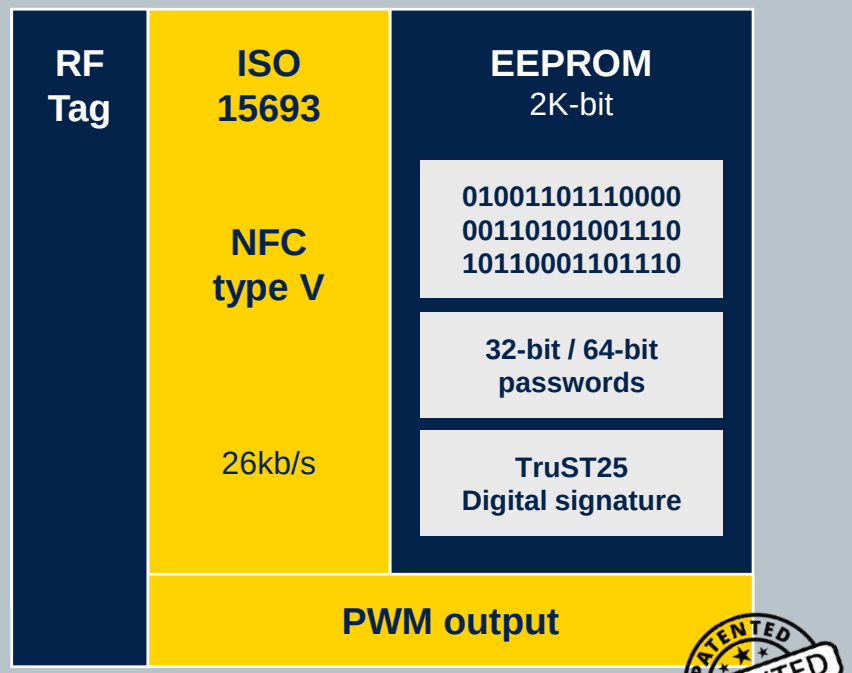
- **ISO15693** and **NFC type V**
- **Fast data transfer** thanks to 256 Bytes buffer
- I2C write on **16-Byte page**
- Low Power mode, < 1µA power consumption in Standby
- -40 to **+125°C** (I2C) industrial Grade 8 temperature range
- **Energy harvesting** function through RF
- I2C enhanced features (write time improved, address configurable, access priority…)

Key benefits

- Smart applications using a **flexible interrupt GPO**
- Enhanced protection with multiple **64-bit passwords**
- Same 28.5pF internal RF tuning capacitor, as in ST25DV-I2C & M24LR

ST25DV-PWM
Dynamic NFC type 5 tag with PWM

ST25DV02K-W1 / -W2



SO8

TSSOP8

Use cases

- Targeted industrial applications such as lighting LED driver, motor control, power supply unit

Key features

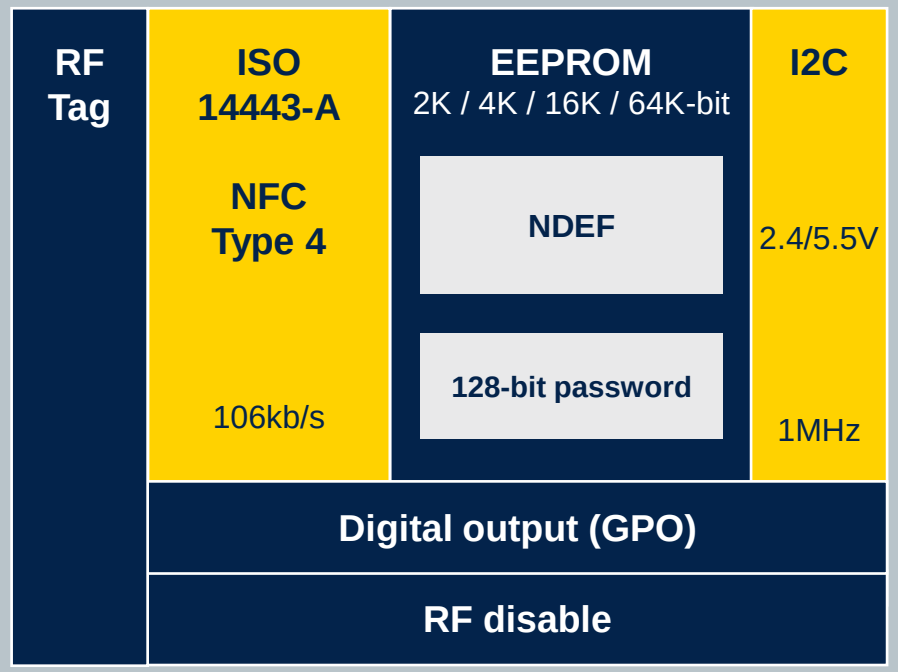
- **ISO15693** and **NFC type V**
- 2K-bit memory
- Up to **2 PWM** signal (push pull)
- Up to 15 bits resolution (62.5ns resolution step)
- Power Supply 1.8V - 5.5V
- -40°C to **+105°C** (PWM) temperature range
- **TruST25 Digital Signature**

Key benefits

- 2 in 1 chip, putting NFC connectivity with PWM functionality
- Cost optimized solution to address low end Lighting market
  - Significant BOM reduction as no MCU is required to drive the system

M24SR
Dynamic NFC type 4 tag

M24SR02 / 04 / 16 / 64




SO8


TSSOP8


UFDFPN8


SBN12
Die form, sawn and Bumped inkless 8" wafer, 120µm/ thickness

Use cases

- Convenient wireless pairing (Bluetooth, Wi-Fi)
- Dynamic data exchange with NFC phone
  - User settings update, information log download, etc.

Key features

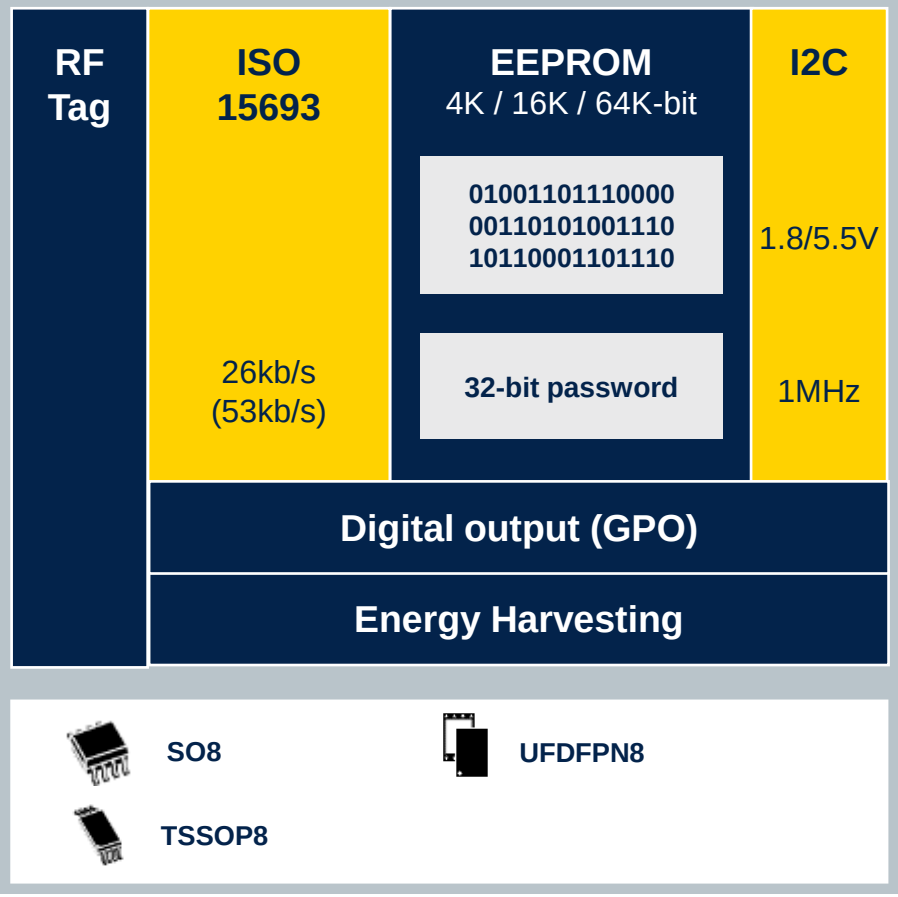
- **ISO14443-A** type A and **NFC type 4**
- High speed operations (**106kb/s**)
- NDEF memory format
- Data protection thanks to **128-bit password**

Key benefits

- Easy of use (limited BOM, 8-pin package)
- Flexible interrupt pin (configurable GPO)
- **200 years** data retention, **1M cycles** erase/write

M24LR
Dynamic NFC / RFID type 5 tag

M24LR04E / 16E / 64E



Use cases

- Dynamic data exchange with NFC phone
- Battery-less applications
- Parameter upgrade with RFID readers

Key features

- **ISO15693**
- **Long range** operations, up to 53kb/s speed
- **Energy harvesting** through RF (~2V / 5mA)

Key benefits

- Easy to use (limited BOM, 8-pin package)
- Flexible interrupt pin for MCU wake-up
- Cost optimized discovery kit with Android app
- 40 years data retention, **1M cycles** erase/write

ST25R product ID cards

ST25R NFC / HF readers product family

	ST25R200/R100	ST25R3911B/12	ST25R3916B/17B/19B	ST25R3918	ST25R300
Description	Entry-level NFC Reader	Mid-range NFC Forum Reader	Mid-range+ NFC & EMVCo® Reader	Multi-purpose NFC transceiver	High-performance NFC & EMVCo® Reader
Reader/Writer mode	ISO14443A/B, ISO15693	ISO14443A/B, ISO15693, FeliCa	ISO14443A/B, ISO15693, FeliCa	ISO14443A/B ISO15693	ISO14443A/B ISO15693, FeliCa
Card emulation mode	-	-	Yes (16B)	Yes	Yes
AP2P mode	-	Initiator & Target	Initiator & Target (16B)	-	-
PP2P mode	-	Initiator	Initiator & Target (16B)	Initiator & Target	Initiator & Target
RF speed	106kbps	6.8Mbps VHBR (11B) 848kbps	848kbps	848kbps	848kbps
Market	Reader+Tag, IoT, Gaming, Industrial, Consumer	Payment EMVCo® 2.6, Industrial, Consumer	Payment EMVCo® 3.1, Industrial, Consumer	Reader+Tag, IoT, Consumer	Payment EMVCo® 3.x, Industrial, Consumer
Advanced features	DPO, IWU, NSR (200), EMD (200), OSP (200)	AAT (11B), DPO, IWU	AAT (16B), DPO, NSR, DSA, AWS, IWU , EMD	DPO, NSR, DSA, AWS, IWU, EMD	AAT, DPO, NSR, DSA, AWS+, IWU, EMD
HW interface	SPI 10Mbps (200) / 6Mbps	SPI 6Mbps	SPI & I2C 10Mbps	SPI & I2C 10Mbps	SPI 10Mbps
SW interface	RFAL Unified Software Library for NFC Front Ends				
Power supply	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.7V – 6.0V
Output power	1.2W (200) / 0.8W (100)	1.4W (11B) / 1.0W (12)	1.6W	0.5W	2.2W
Temperature range	-40°C to +85°C (A) (200) -25°C to +85°C (A) (100)	-40°C to +125°C (J)	-40°C to +105°C (A)	-40°C to +105°C (A)	-40°C to +105°C (A)
Package	24-pin TQFN	32-pin QFN / WLCSP-30	32-pin QFN / WLCSP-36	32-pin QFN	32-pin QFN

VHBR: Very High Baud Rate
P2P: Peer to Peer mode
AAT: Automatic Antenna Tuning
AWS: Active Wave Shaping
EMD: Automatic EMD suppression
VHBR: Very High Baud Rate
DPO: Dynamic Power Output
CIWU: Capacitive & Inductive wake-up
DSA: Drive Slope Adjustment
(J) Junction
NSR: Noise Suppression Receiver
IWU: Inductive wake-up

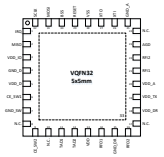
ST25R300
High-perf. NFC universal device & EMVCo® reader

ST25R300

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI
P2P Card Emulation **2.2W**	**NFC** 848kb/s	**256-Byte**	**Vdd:** 2.7-6V **Vio:** 1.8-5V 10Mb/s >2.7V 5Mb/s <2.7V

DPO: Dynamic Power Output
LRCD: Long Range Card Detection
AWS: Active Wave shaping
NSR: Noise Suppression Receiver
AAT: Automatic antenna tuning
EMD: Automatic EMD Error Handling

5x5 TQFN-32



Use cases

- EMVCo payment, NFC charging, industrial & consumer

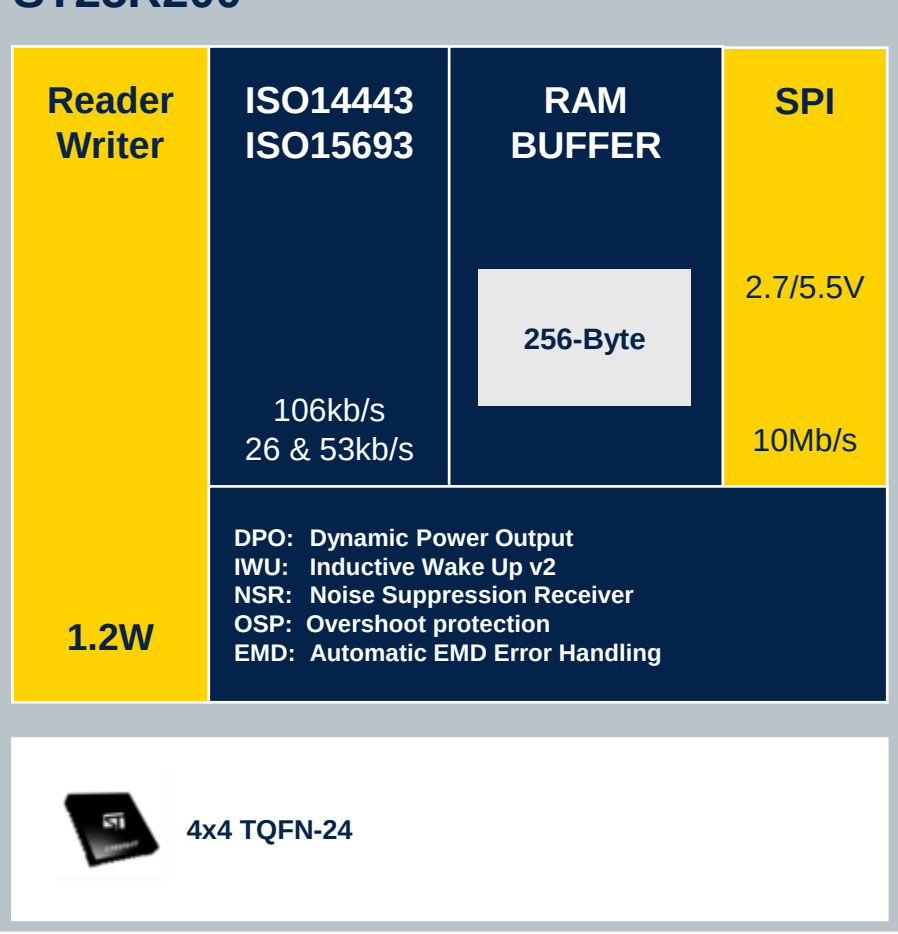
Key Features

- EMVCo and CR13 NFC Forum Universal Device
- **2.2W** output power with DPO, **Active Waveshaping**
- **Noise Suppression** for antenna behind or close to displays
- **Long Range LPCD**
- Vdd 2.7-6V with reduced capacitor BOM
- SPI interface: Vio 1.8-5V (+/-10%)
- QFN-32 5x5mm package
- -40°C to +**105°C** ambient temperature range

Key Benefits

- Excellent output power and sensitivity for EMVCo applications and several different use cases

ST25R200
Powerful multi-purpose NFC reader



Use cases

- Ideal for **Reader+Tag** applications
- Consumer and industrial applications, Access control, Transportation
- Accessory recognition, Brand protection, Parameter setting

Key Features

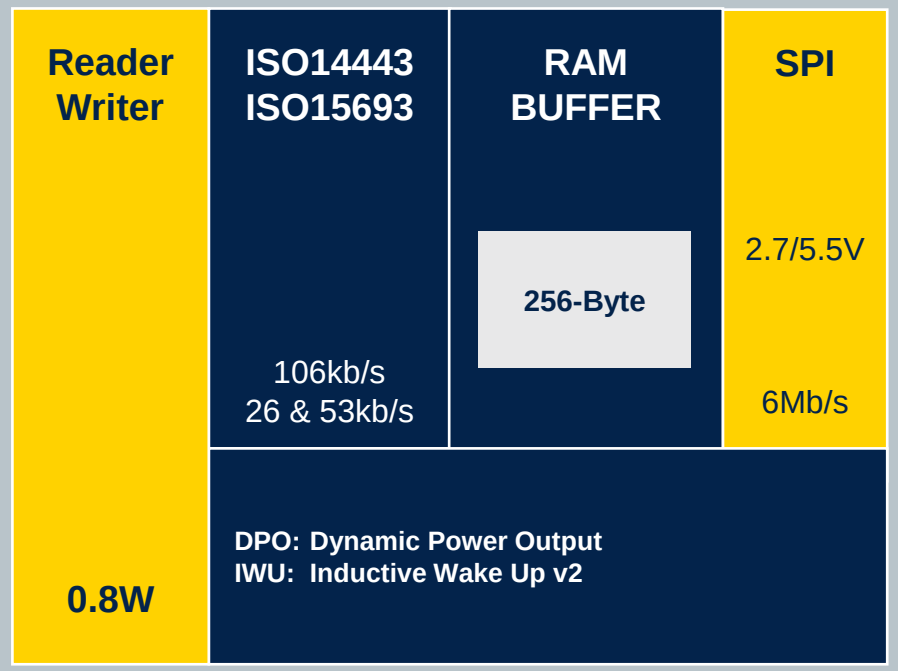
- **1.2W** dynamic output power
- Up to 250mA via internal LDO
- **Improved inductive wake-up** function & **overshoot protection**
- -40°C to 85°C ambient temperature
- Small 4x4mm TQFN-24 package

Key Benefits

- **Tiny package size** for easy integration into applications
- Low power operation & great card detection range
- Cost efficient and powerful at the same time

ST25R100
Entry-level NFC reader

ST25R100



4x4 TQFN-24

Use cases

- Ideal for **Reader+Tag** applications
- Consumer applications, Access control, Transportation
- Accessory recognition, Brand protection, Parameter setting

Key Features

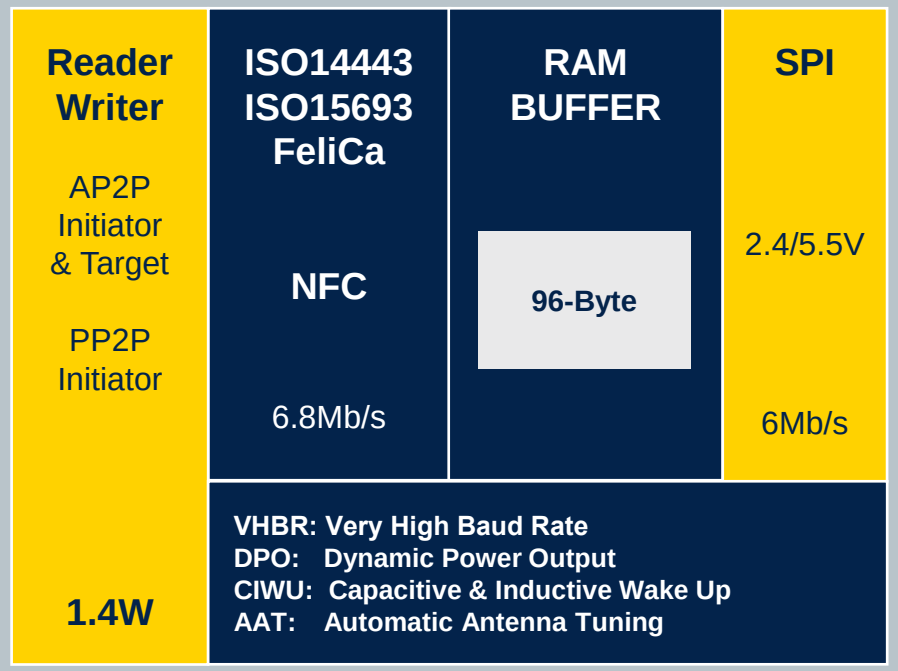
- **0.8W** dynamic output power
- Up to 180mA via internal LDO
- **Improved inductive wake-up** function
- -25°C to 85°C ambient temperature
- Small 4x4mm-24 TQFN package

Key Benefits

- **Tiny package size** for easy integration into applications
- Low power operation & great card detection range
- Optimized for cost conscious applications

ST25R3911B
Mid-range NFC reader

ST25R3911B



 5x5 QFN-32

 Wafer

Use cases

- Ideal for **payment** applications
- Access control, gaming, eGovernment passport

Key features

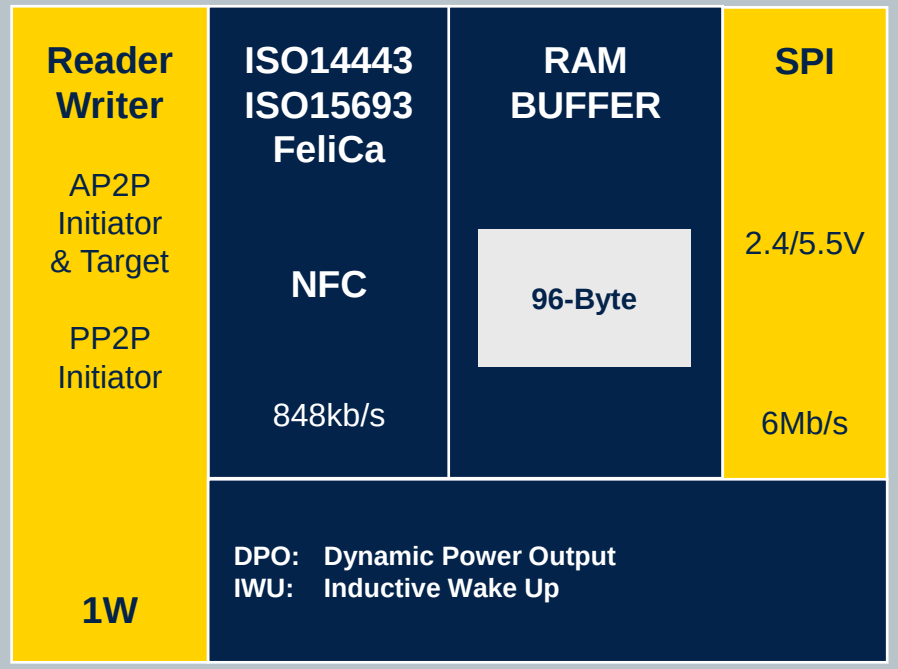
- All NFC modes supported (ISO14443, ISO15693, FeliCa) with P2P
- **1.4W** output power
- **EMVCo® 2.6** & **PBOC** certification without external power amplifier
- Automatic antenna tuning
- **VHBR** support up to **6.8Mb/s**
- -40°C to **125°C** junction temperature range

Key benefits

- Low power operation & standby mode (capacitive wake-up)
- 2 antennas operation at the same time
- Enhanced fast transfer rate for passport application

ST25R3912
Smallest footprint and powerful reader

ST25R3912



5x5 QFN-32
Wettable flank

WLCSP-30

Use cases

- Ideal for EMVCo® 2.6 legacy **payment** and **small handheld mPOS**
- Access Control
- Gaming

Key features

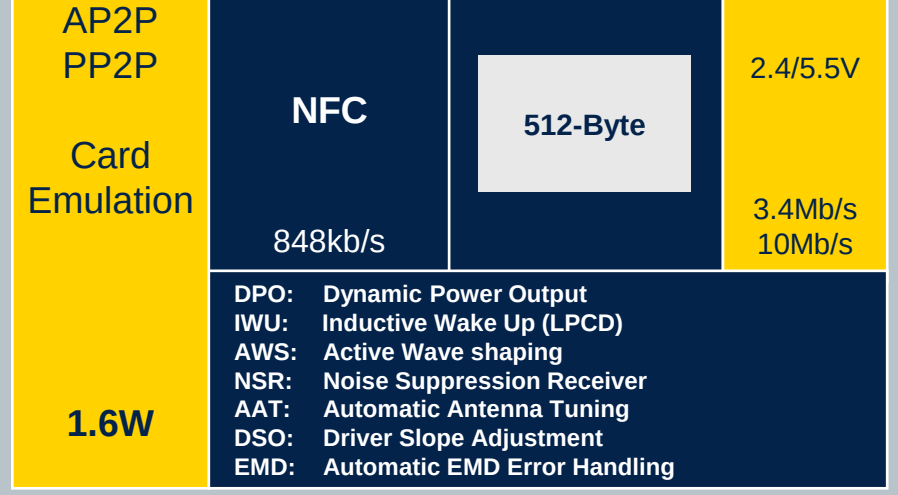
- All NFC modes supported (ISO14443, ISO15693, FeliCa) with P2P
- **1W** output power
- **EMVCo® 2.6** & **PBOC** certification without external power amplifier
- Small 3x2.8 **WLCSP** package
- -40°C to **125°C** junction temperature range

Key benefits

- Small footprint on PCB, low power operation & standby mode
- 2 antennas operation at the same time

ST25R3916B
NFC universal device & EMVCo® reader

ST25R3916B




5x5 QFN-32
Wettable flank


WLCSP


Thin 5x5 QFN-32

Use cases

- Ideal for **payment** applications with CE mode for additional functions
- Apple ECP, access control, gaming, IOT, and pairing

Key features

- NFC Forum Universal Device (with CE mode)
- **1.6W** output power with **dynamic power output**
- **EMVCo® 3.1a** certification without external power amplifier
- Improved **active wave shaping v2, noise suppression receiver**
- **Automatic antenna tuning**
- -40°C to **105°C** ambient temperature range (QFN)

Key benefits

- Low power operation & standby mode (low power card detection)
- Works in challenging environment like noisy LCD displays
- Ideal for passing newest EMVCo® standards

ST25R3917B
Cost efficient - performant NFC & EMVCo® reader

ST25R3917B

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI/I2C
PP2P Initiator	NFC	512-Byte	2.4/5.5V
	848kb/s		3.4Mb/s 10Mb/s
1.6W	DPO: Dynamic Power Output IWU: Inductive Wake Up AWS: Active Wave shaping NSR: Noise Suppression Receiver DSO: Driver Slope Adjustment EMD: Automatic EMD Error Handling		

5x5 QFN-32
Wettable flank

Thin 5x5 QFN-32

Use cases

- Ideal for **payment** applications
- Apple ECP, Access Control, Gaming, Consumer

Key features

- NFC Forum Reader device
- **1.6W** output power with **dynamic power output**
- **EMVCo® 3.1a** certification without external power amplifier
- Improved **active wave shaping v2, noise suppression receiver**
- -40°C to **105°C** ambient temperature range

Key benefits

- Low power operation & standby mode (low power card detection)
- Works in challenging environment like noisy LCD displays
- Ideal for passing newest EMVCo® standards

ST25R3919B
Cost efficient and performant NFC reader

ST25R3919B

Reader Writer	ISO14443 ISO15693	RAM BUFFER	SPI/I2C
	NFC	512bytes	2.4/5.5V
	848kb/s		3.4Mb/s 10Mb/s
1.6W	DPO: dynamic power output IWU: inductive wake-up AWS: active wave shaping NSR: noise suppression receiver DSO: driver slope adjustment EMD: automatic EMD error handling		

Thin 5x5 QFN-32

Use cases

- Ideal for **payment** applications
- Apple ECP, access control, gaming, consumer

Key features

- NFC Forum reader device
- **1.6W** output power with **dynamic power output**
- Improved a**ctive wave shaping v2, noise suppression receiver**
- -40°C to **105°C** ambient temperature range

Key benefits

- Low power operation & standby mode (low power card detection)
- Works in challenging environment like noisy LCD displays
- Ideal for passing the newest EMVCo® standards

ST25R3918
Multi-purpose NFC Transceiver

ST25R3918

Reader Writer	ISO14443 ISO15693	RAM BUFFER	SPI/I2C
PP2P Initiator & Target Card Emulation **0.5W**	**NFC** 848kb/s	**512-Byte**	2.4/5.5V 3.4Mb/s 10Mb/s

DPO: Dynamic Power Output
IWU: Inductive Wake Up
AWS: Active Wave shaping
NSR: Noise Suppression Receiver
DSO: Driver Slope Adjustment
EMD: Automatic EMD Error Handling

5x5 QFN-32
Wettable flank

Thin 5x5 QFN-32

Use cases

- Ideal for **Reader+Tag** applications
- Access control, gaming, consumer
- Apple AppClip, Android InstantApp

Key features

- **0.5W** output power
- Active wave shaping
- **Noise suppression receiver**
- -40°C to **105°C** ambient temperature range

Key benefits

- Low power operation & standby mode
- Works in challenging environment like noisy LCD displays
- Excellent performance for low power applications

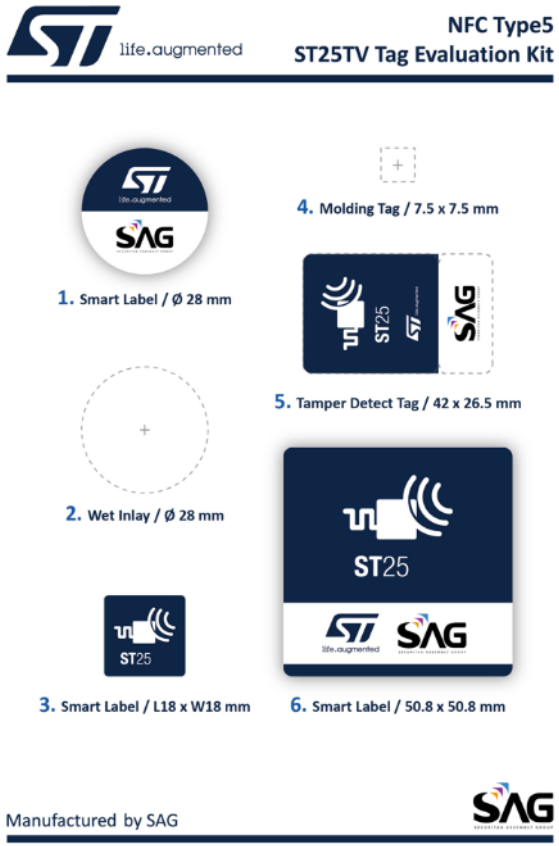
ST25 HW ecosystem

ST25T tag bag kits

ST25 tag bag AME

ST25-TAG-BAG-UI1

ST25 tag bag APAC



ST25-TAG-BAG-AB

ST25 tag bag EMEA

ST25-TAG-BAG-EC

ST25TVC evaluation board

ST25TV02KC ASEAL board

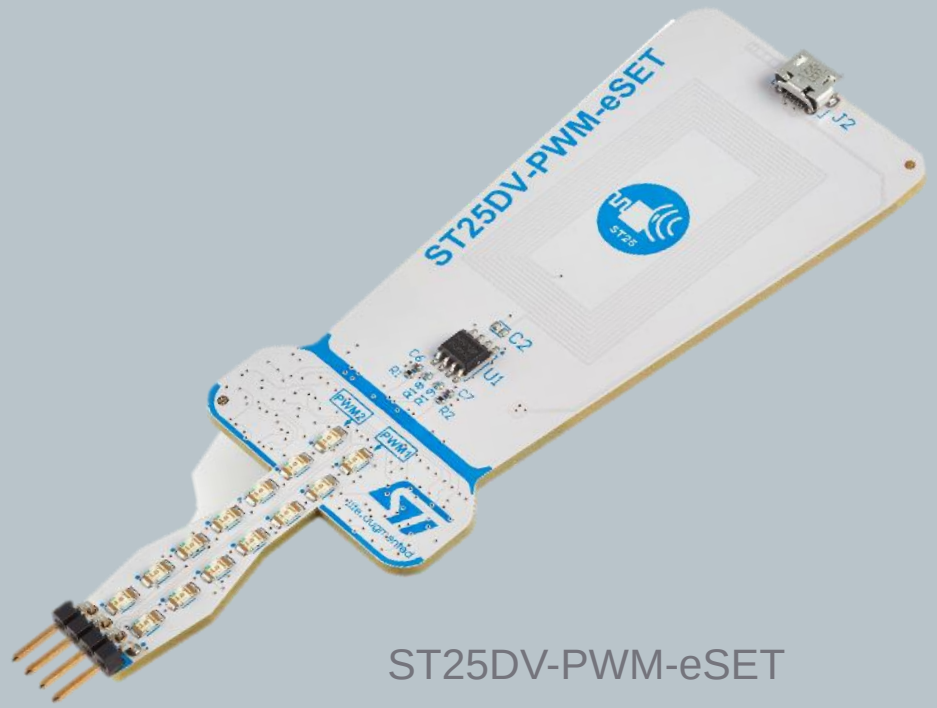
ST25TV02KC-ASEAL

- UDFPN5 package
- Class-6 18 turns single layer antenna
- 256-Byte (2-kbit) NDEF EEPROM
- Tamper detect capability
- TruST25 digital signature
- Augmented NDEF (ANDEF)

ST25 IC	**ST25TV02KC** NFC tag IC

ST25DV-PWM evaluation board

ST25DV-PWM discovery kit



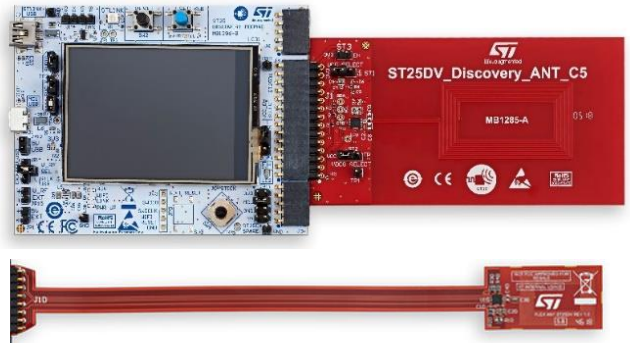
ST25DV-PWM-eSET

- 49x26mm 8 turns antenna
- PWM frequency and duty cycle through Android App or PC Software
- Duty cycle illustration with LED ramp
- Connector to ST25DV-DISCOVERY kit to monitor the PWM signal on display

ST25 IC	**ST25DV02K-W2** dynamic NFC tag IC

ST25DVC-I2C evaluation boards

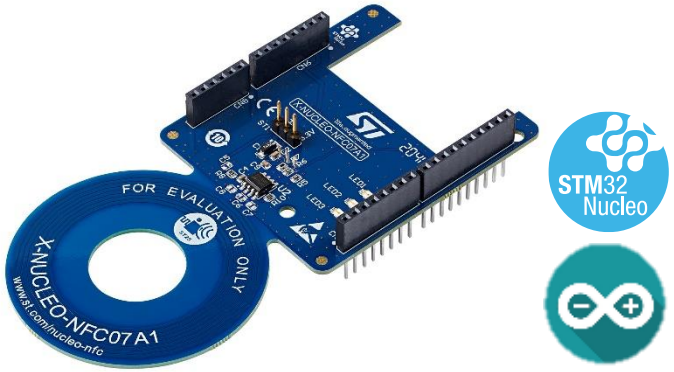
ST25DVC-I2C discovery kit



ST25DV64KC-DISCO

- **ST25DV64KC** dynamic NFC tag IC
- 49x37mm 8 turns antenna (ANT Class3)
- STM32F405 MCU
- 2.4” TFT LCD Touch screen
- I2C & SWIP connectors
- Daughter board connector
- 14.5x24mm 15 turns antenna (Flex antenna)
- 5 samples ST25DV64KC

ST25DVC-I2C Nucleo shield



X-NUCLEO-NFC07A1

- **ST25DV64KC** Dynamic NFC tag IC
- Ø54mm 8 turns single layer antenna energy harvesting, Low power mode, GPO
- Compatible with STM32 Nucleo boards
- I2C interface to MCU & Powered through Arduino™ connector

ST25DVC-I2C tiny antenna

ANT7-T-25DV64KC

- **ST25DV64KC** Dynamic NFC tag IC
- Ready-to-use PCB including:
- 14x14 mm, dual layer etched antenna
- I2C test points
- RF event configurable GPO
- Analog energy harvesting (EH) output

NFC sensor tag evaluation board

NFC Dynamic tag sensor and processing node

STEVAL-SMARTAG2

NFC sensor tag

- STM32L4 ultralow-power MCU
- ST25DV64KC dynamic NFC tag IC
- LIS2DUXS12 ultralow-power 3-axis smart accelerometer
- H3LIS331DL low-power high-g 3-axis accelerometer
- LPS22DF nano pressure sensor
- VD6283TX ambient light sensor
- 40x40mm 8 turns antenna
- Optional CR2032 / LIR2032 battery

ST25 IC	**ST25DV64KC** dynamic NFC tag

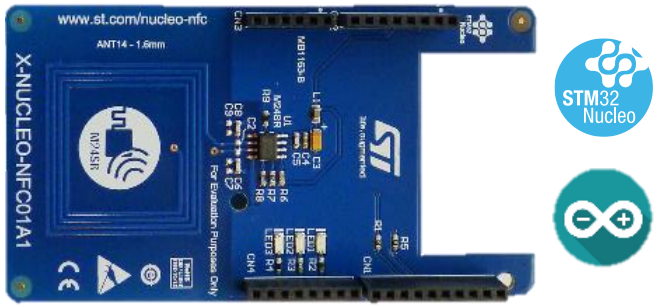
M24SR evaluation boards

M24SR discovery kit

M24SR-DISCO-PREM

- **M24SR64** Dynamic NFC tag IC
- 30x30mm 5 turns double layer antenna
- STM32F1 MCU
- LCD Color display + Joystick + LEDs
- USB & JTAG connectors
- BT / Audio module with audio headset

M24SR Nucleo shield



X-NUCLEO-NFC01A1

- **M24SR64** Dynamic NFC tag IC
- 31x30mm 5 turns double layer antenna
- Compatible with STM32 Nucleo boards
- I2C interface to MCU through Arduino™ connector
- Open drain output for MCU wake-up

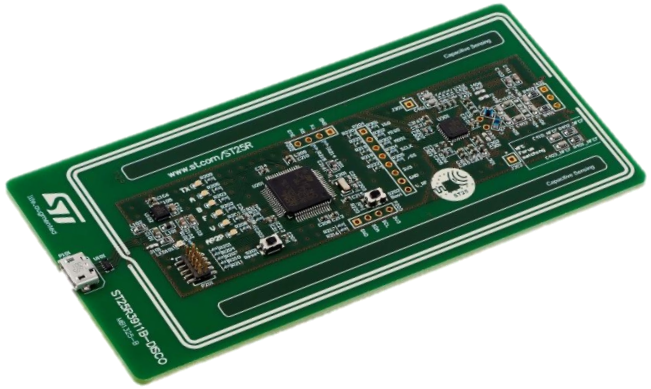
M24SR tiny antenna

ANT7-T-M24SR64

- **M24SR64** Dynamic NFC tag IC
- 14x14mm dual layer antenna
- I2C test points to connect to MCU
- GPO open drain user configurable output to indicate an ongoing RF operation

ST25R3911B evaluation boards

ST25R3911B discovery kit



ST25R3911B-DISCO

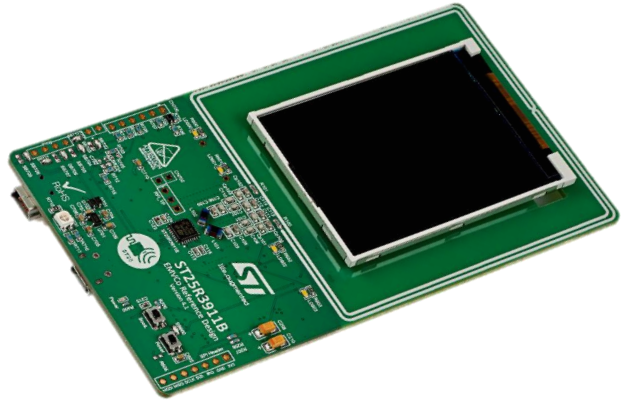
- **ST25R3911B** NFC reader IC
- 105x52mm 2 turns antenna and associated VHBR tuning circuit
- STM32L476RET6 32-bit MCU
- Micro-USB connector
- Additional UART / I2C Host interfaces, as well as NFC SPI and JTAG/SWD points

ST25R3911B Nucleo shield

X-NUCLEO-NFC05A1

- **ST25R3911B** NFC reader IC
- 47x34mm 4 turns antenna
- Compatible with STM32 Nucleo boards
- Equipped with Arduino™ UNO R3 connector

ST25R3911B EMVCO® kit



ST25R3911B-EMVCO

- **ST25R3911B** NFC reader IC
- 65x74mm 2 turns antenna etched
- STM32L476 32-bit MCU
- Micro-USB connector
- Comprehensive Device Test Environment (DTE) for EMVCo® Level 1 FW control
- S-Touch controller

ST25R3911B discovery kit and Nucleo shield are also valid for ST25R3912.

ST25R3916B evaluation boards

ST25R3916B discovery kit

STEVAL-25R3916B

- **ST25R3916B** NFC reader IC
- 66x66 mm 2 turns antenna etched on PCB
- STM32L476 ULP 32-bit MCU
- Micro-USB connector
- Additional UART / I2C host interfaces, as well as NFC SPI and JTAG/SWD points

ST25R3916B Nucleo shield

X-NUCLEO-NFC08A1

- **ST25R3916B** NFC reader IC
- 47x34mm 4 turns antenna etched on PCB
- Compatible with STM32 Nucleo boards
- Equipped with Arduino® UNO R3 connector

ST25R3916B EMVCo® kit

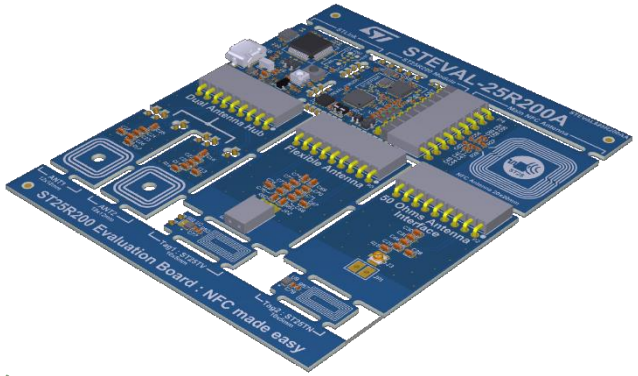
ST25R3916B-EMVCO

- **ST25R3916B** NFC reader IC
- 51x27mm 3 turns antenna etched on PCB
- STM32L476 ULP 32-bit MCU
- Micro-USB connector
- Comprehensive device test environment (DTE) for EMVCo® Level 1 FW control

Discovery kit and Nucleo shield are also valid for ST25R3917B and ST25R3919B.

ST25R200/100 evaluation boards

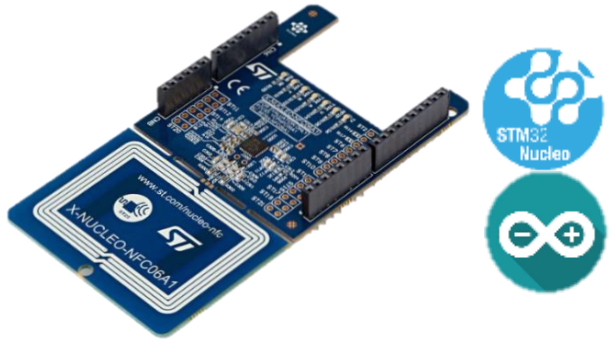
ST25R200 discovery kit



STEVAL-25R200

- **ST25R200** NFC reader IC
- Onboard antennas: 20x20mm, 12x12mm dual antennas, flex antenna & 50Ohm antenna interface
- Onboard NFC tags: ST25TV & ST25TN, 10x5mm antenna
- STM32G0B1KE 32-bit MCU
- Stand-alone module or control with PC GUI through USB connector

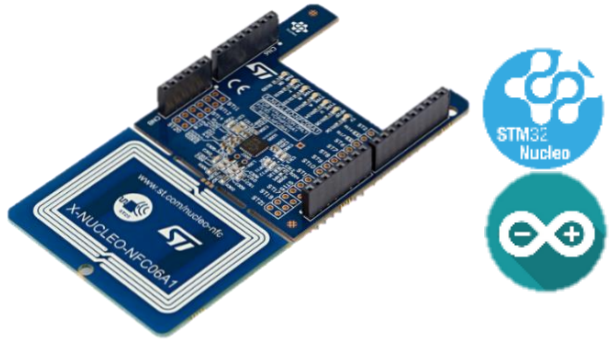
ST25R200 Nucleo shield



X-NUCLEO-NFC10A1

- **ST25R200** NFC reader IC
- 47x34mm 4 turns antenna on PCB
- Compatible with STM32 Nucleo boards
- Equipped with Arduino® UNO R3 connector fitting to STM32 Nucleo, Raspberry Pi and other platforms

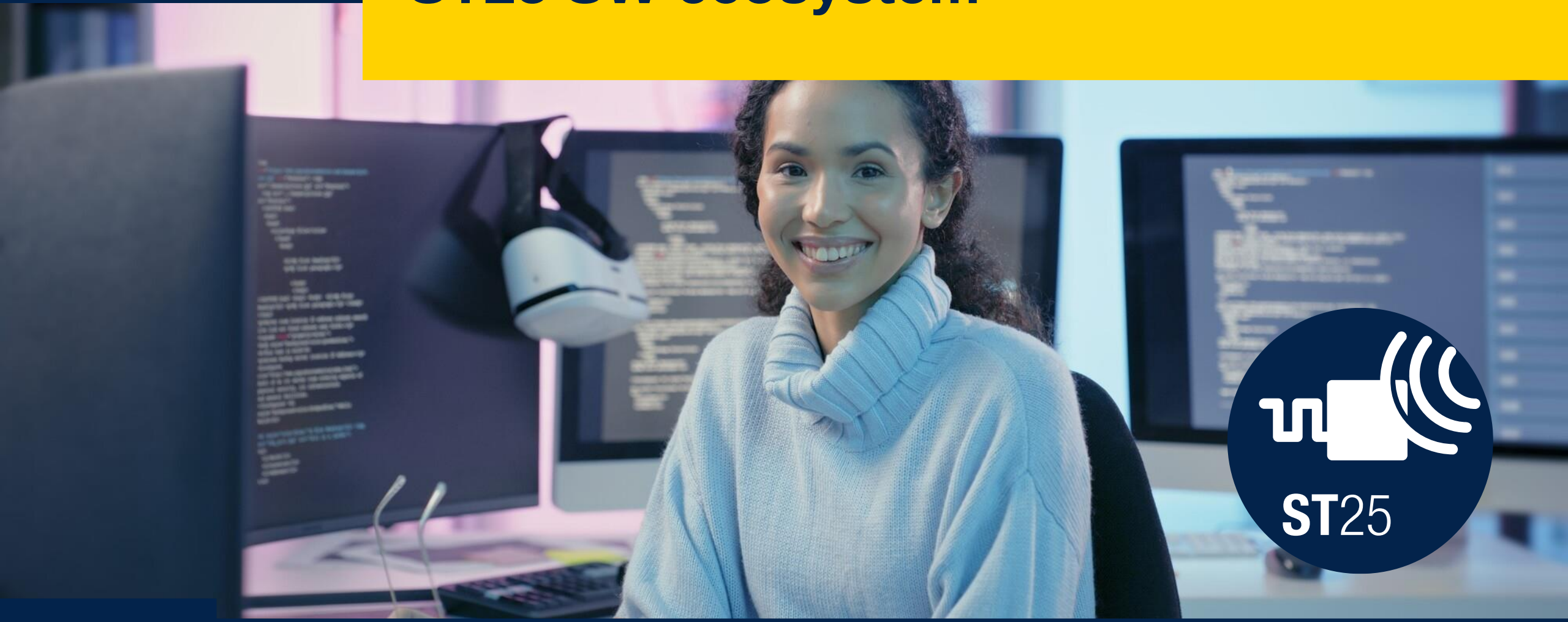
ST25R100 Nucleo shield



X-NUCLEO-NFC09A1

- **ST25R100** NFC reader IC
- 47x34mm 4 turns antenna on PCB
- Compatible with STM32 Nucleo boards
- Equipped with Arduino® UNO R3 connector fitting to STM32 Nucleo, Raspberry Pi and other platforms

ST25 SW ecosystem



ST25T & ST25D software overview

SW supporting ST25 NFC tags and dynamic NFC tags

ST25 Mobile apps

- ST25 NFC Tap app for Android
- ST25 NFC Tap app for iOS
- Based on ST25 SDK

ST25 Webserver

- Demo for ST25 NFC tags

ST25 PC Software

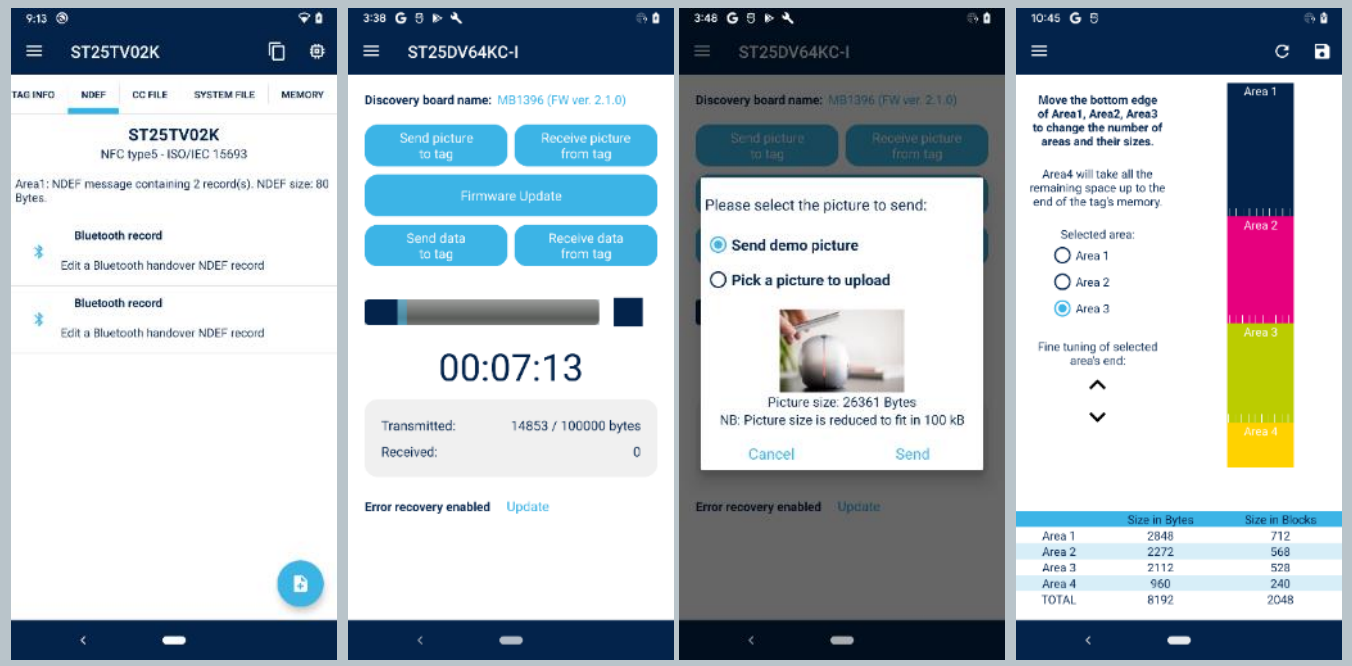
- ST25 PC Software for NFC readers
- Support of tags and dynamic tags functionalities including TruST25 services
- Based on ST25 SDK

Firmware for MCU

- Firmware for STM32 microcontrollers
- SW driver for Dynamic NFC tags IC
- Including demos

ST25 Android mobile apps

ST25 NFC tap for Android



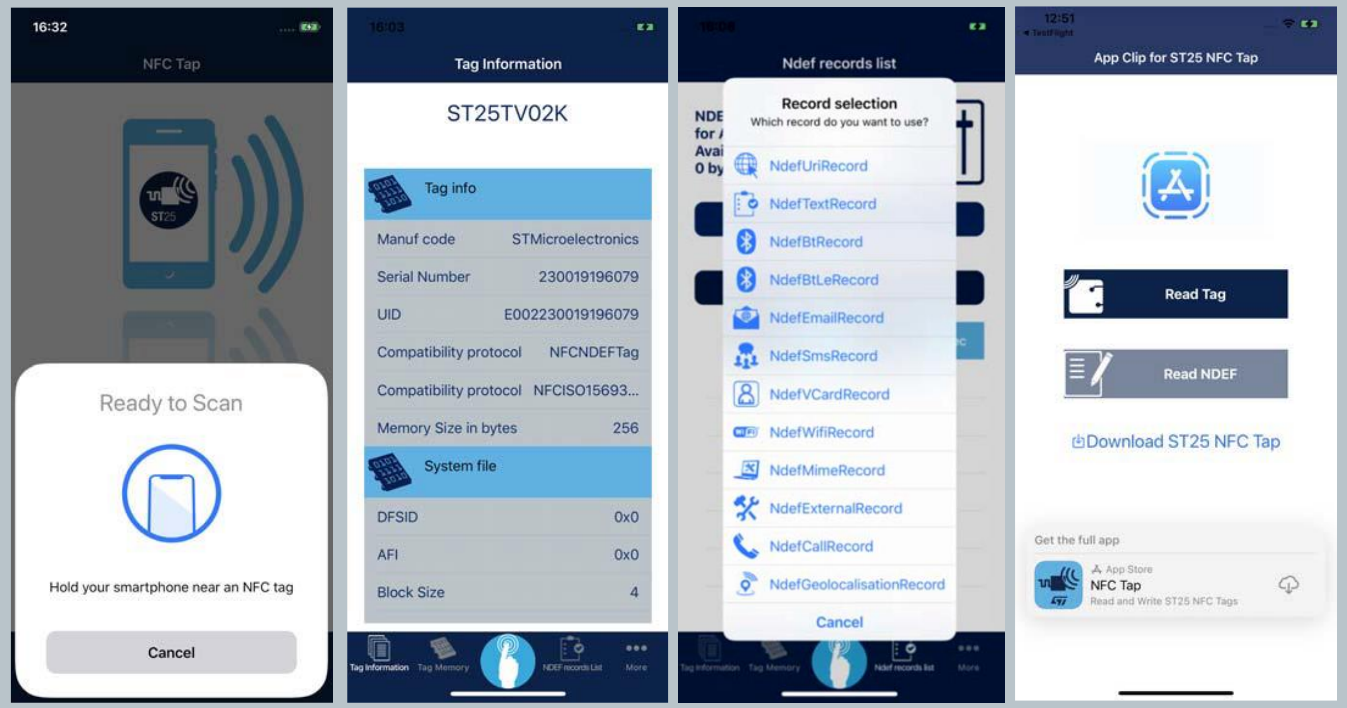
- Read/Write NDEF and user memory of ST25 Tags
- Support of specific functionalities of ST25 Tags (Tamper detect, Augmented NDEF, PWM output, TruST25 digital signature, etc.)
- Includes demos for Fast Transfer Mode (FTM), PWM and Wi-Fi or Bluetooth pairing
- Automatic launch of Android app
- ST25 NFC tap APK file (*STSW-ST25001APK*)
- ST25 NFC tap open-source code (*STSW-ST25001SC*)

ST solutions

- ST25 Dynamic Tags
- ST25 Tags

ST25 iOS mobile apps

ST25 NFC Tap for iOS



- App Clip for User Experience
- Read/Write NDEF and User memory of ST25 tags
- Support of specific functionalities of ST25 tags (PWM output, TruST25 digital signature…)
- Includes demos for Fast Transfer Mode (FTM), Bluetooth pairing and PWM
- Support of NFC background tag reading
- Automatic launch of iOS app
- ST25 NFC Tap (*STSW-ST25IOS001*)
- ST25 NFC Tap open-source code (*STSW-ST25IOS002*)

ST solutions

- ST25 Dynamic Tags
- ST25 Tags

ST25 PC software

ST25 PC software for ISO15693, ISO14443-A/B & NFC readers

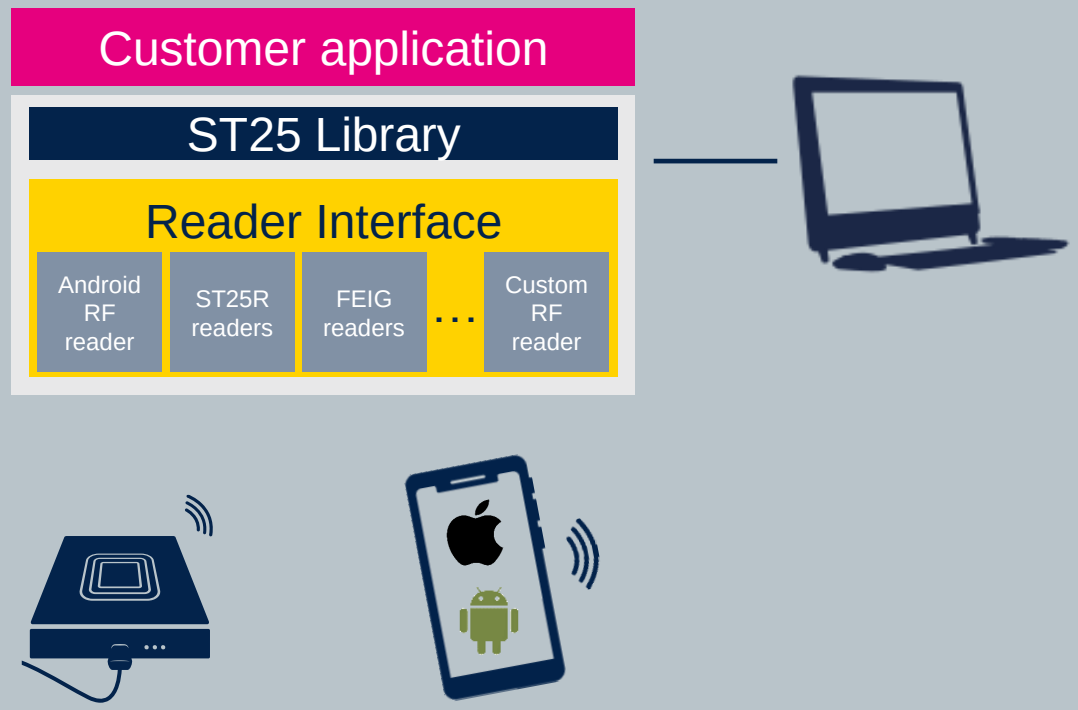
- Feature set support of ST25 NFC tags and dynamic tags
- PC SW for Windows
- Read/Write NDEF records on multiple tags
- Support of TruST25 digital signature feature
- Compatible with ST25R3916B, ST25R3911B & CR95HF demo boards and industrial readers (FEIG)
- Fast Transfer Mode (FTM) demo with ST25DV-Discovery board
- Free to use demo PC SW (*STSW-ST25PC001*) and open-source code (*STSW-ST25PC002*)

ST solutions

- ST25 Dynamic Tags
- ST25 Tags

ST25 SDK

ST25 Software Development Kit



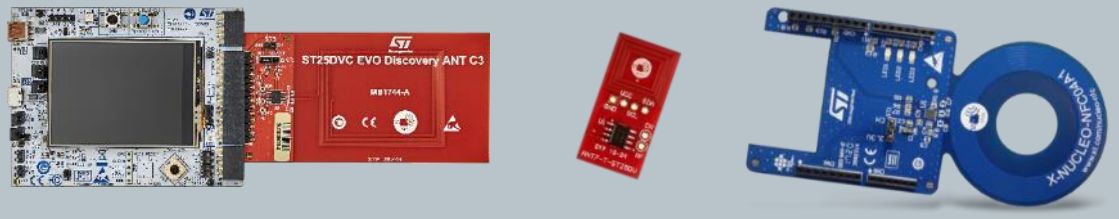
- SW library for Java™ applications development
- Multiplatform (Windows, Linux…)
- RF library used in Android & iOS *ST25 NFC Tap* apps as well as PC software
- Includes examples and readers reference implementations
- API documentation
- ST25 SDK SW package (*STSW-ST25SDK001*)

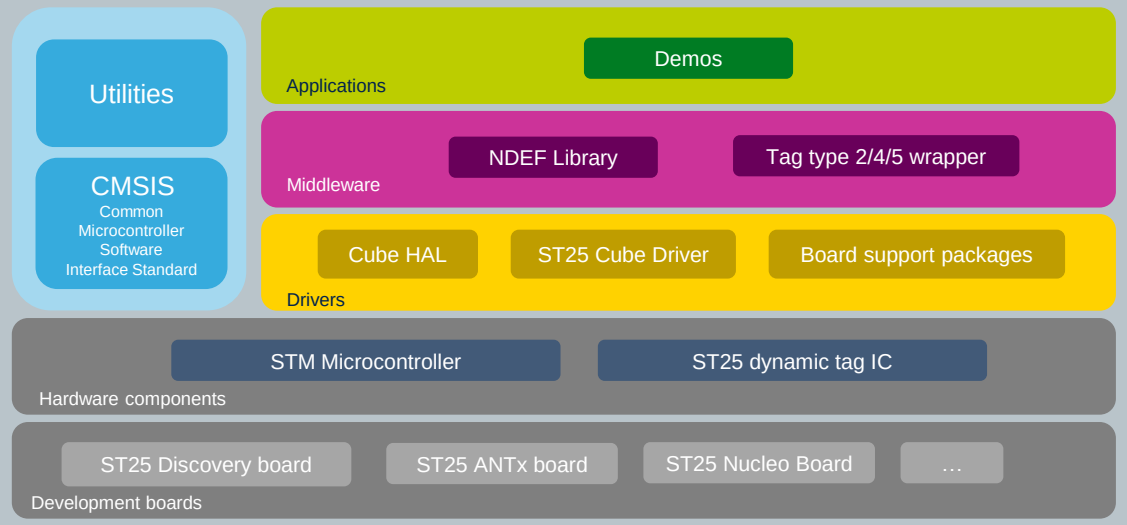
ST solutions

- ST25 Dynamic Tags
- ST25 Tags

ST25D Firmware for MCU

Firmware for ST25D Discovery, Nucleo & ANT7 boards





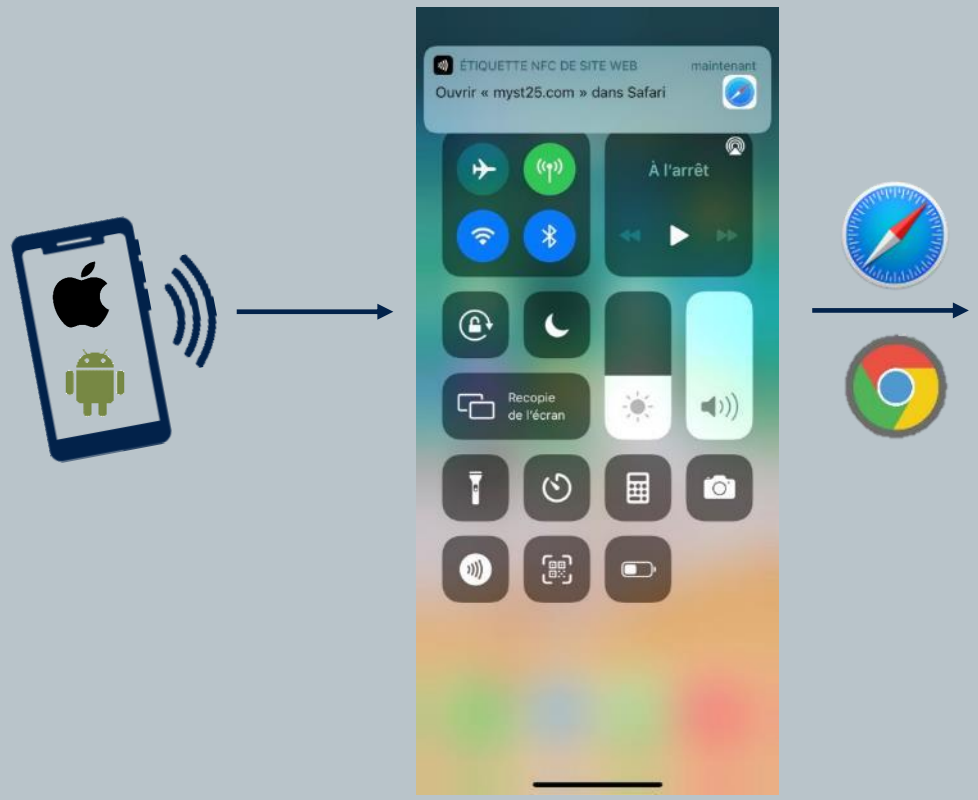
- Complete set of source files to compile firmware for development boards (Discovery, Nucleo…)
- Includes Fast Transfer Mode (FTM) demo
- Read/store NDEF messages
- Supports specific features of ST25 dynamic tags IC (Energy harvesting, interrupts, states…)
- Compatible with any NFC Readers
- Compatible with any NFC smartphones, using the *ST25 NFC Tap* app
- ST25DV-I2C-EVO Discovery kit FW (*STSW-ST25DV002*) and Nucleo board FW (*X-CUBE-NFC7*)

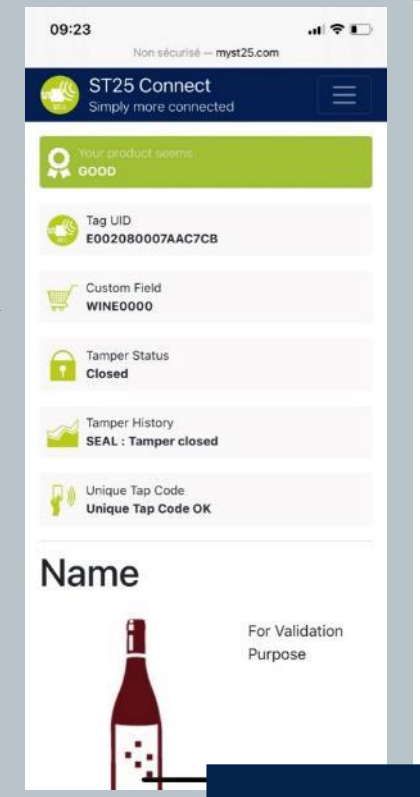
ST solutions

- ST25 Dynamic Tags

ST25 Webserver

ST25 Webserver demo for ST25 NFC Tags





- Open-source webserver: www.myst25.com
- Compatible with ST25TV and ST25TN product series
- Augmented NDEF experience
- Native and automatic access to NDEF records
- Shared with customers on specific request and through MFT platform (SLA0085 process)
- Developed in HTML5 and PHP7.0 – Uses MySQL database
- Source code can be shared on request

ST solutions

- ST25 Tags

ST25R software overview

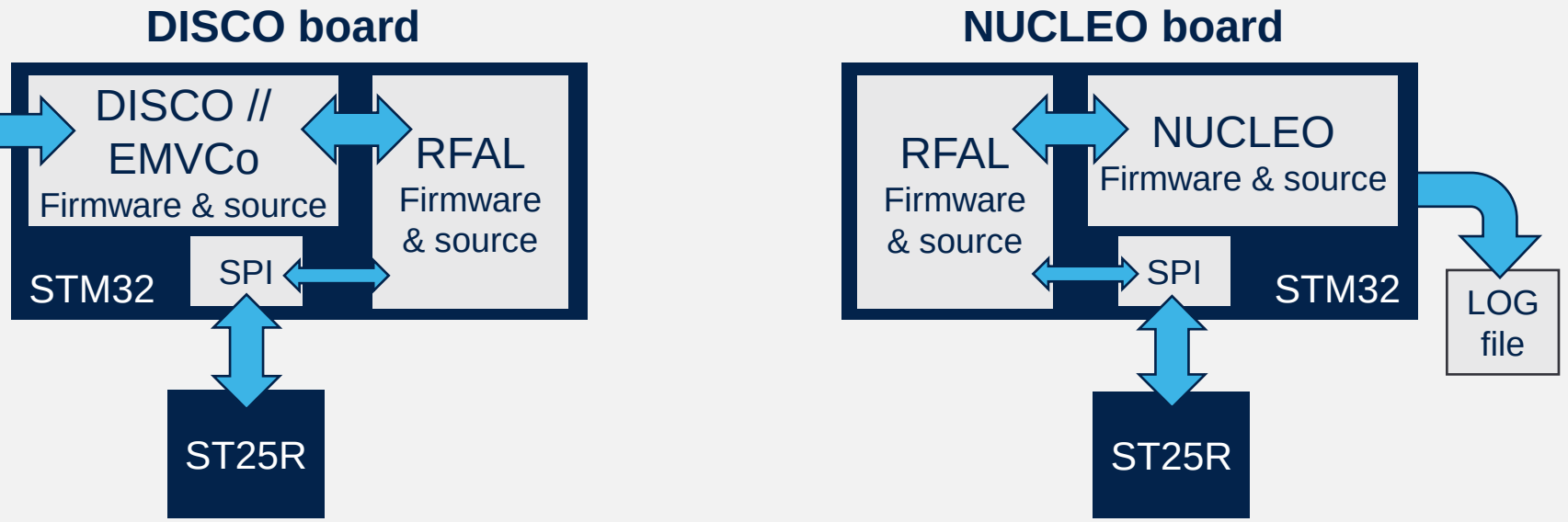
Software development tools for ST25R HF Reader IC

Graphical User Interface (GUI)

GUI for ST25R
PC software for Windows

On request:
GUI for ST25R EMVCo
PC software for Windows

Firmware

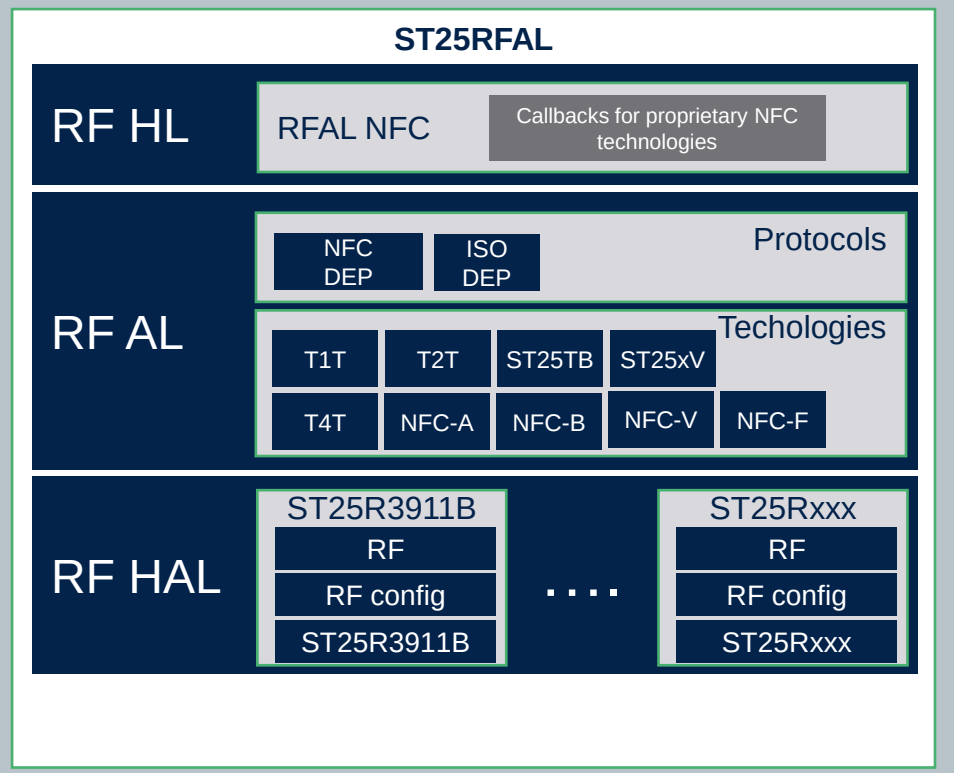


ST solutions

- ST25 HF Reader

ST25R RFAL SW suite

ST NFC Reader “RFAL” software suite



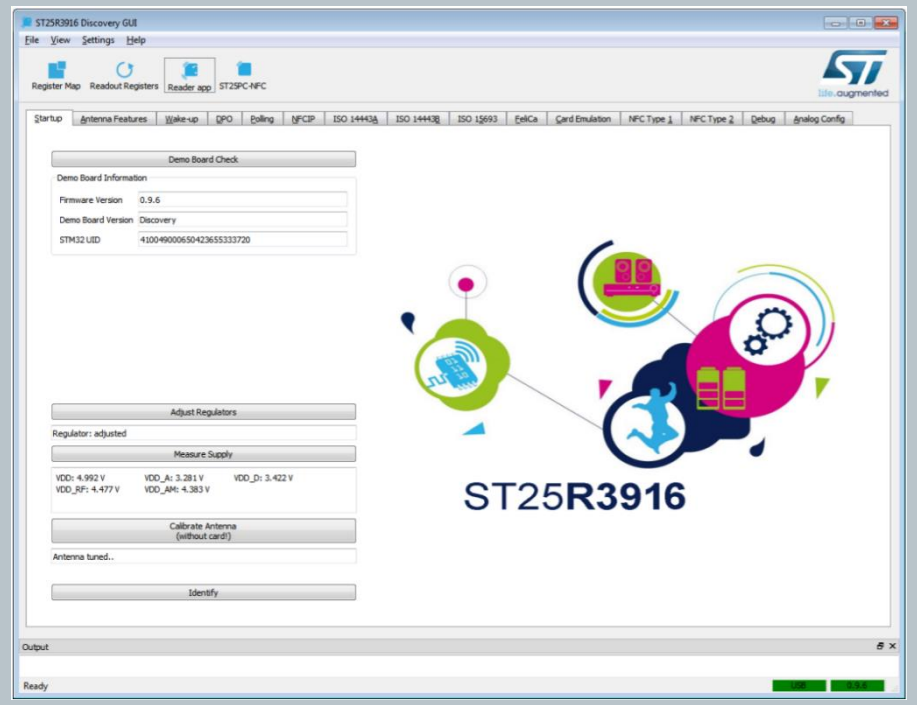
- Comprehensive device driver and middleware to build NFC enabled applications for reader devices based on ST25R NFC Readers
- Written in pure ANSI C
- Straightforward portability across different platforms (MCU/RTOS/OS) with non-blocking API
- Compliant with main HF/NFC standards (NFC Forum, ISO)
- Source code example implementations available: embedded (STM32, STM8 device, SPC5 on request) and Linux® (Raspberry Pi)
- Easy callback function for proprietary NFC technologies on application layer like Apple™ Mfi (delivered under Mfi conditions) and other technologies
- ST25R200 RFAL SW (*STSW-ST25RFAL004*), ST25R3916B RFAL SW (*STSW-ST25RFAL002*) and ST25R3911B RFAL SW (*STSW-ST25RFAL001*)

ST solutions

- ST25 HF Reader

ST25R PC GUI software

ST NFC Reader “Discovery” software suite



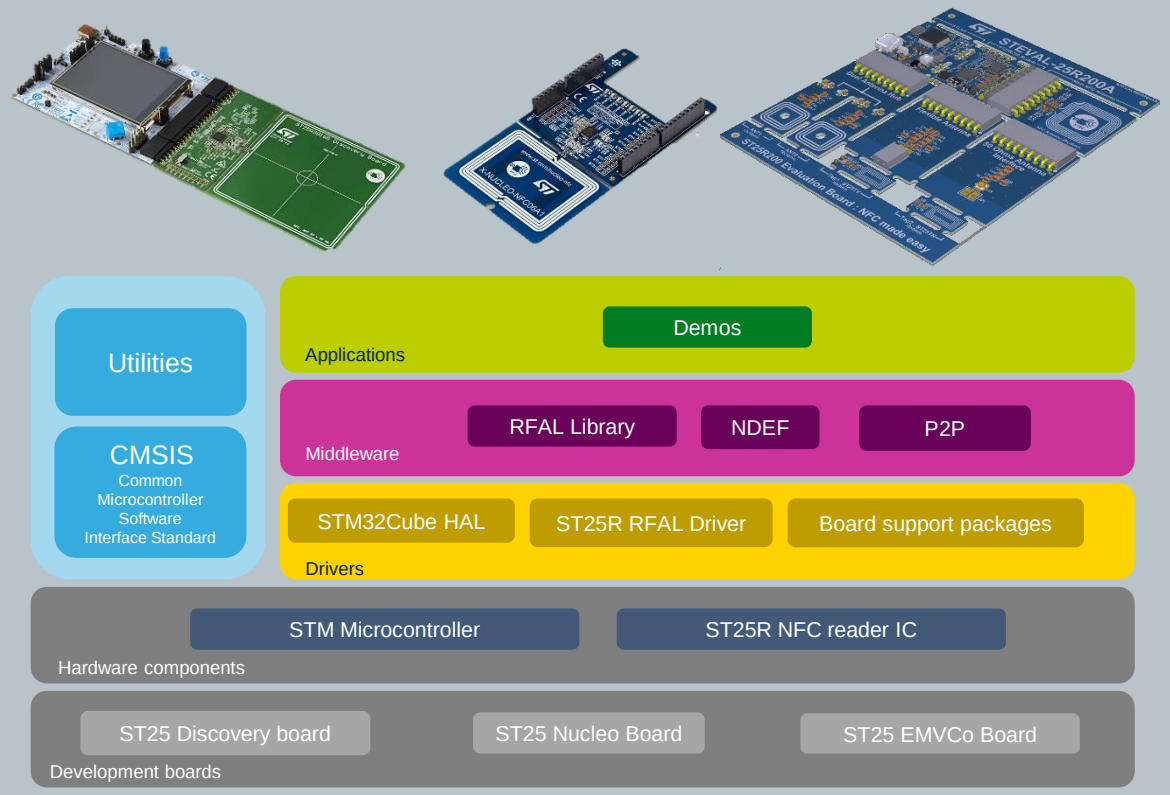
- Supports several RF protocols (ISO14443-A / NFC-A, ISO14443-B / NFC-B, FeliCa™ / NFC-F and ISO15693 / NFC-V)
- Active P2P (peer to peer) according to ISO18092, including SNEP
- Card emulation in NFC-A (106kbps) and NFC-F (212 and 424kbps)
- Wakeup feature, analog configuration and register access of ST25R3916
- Support of Automatic Antenna Tuning (AAT) & Dynamic Power Output (DPO)
- Access to all ST25 Tag features thanks to ST25PC NFC SW (*STSW-ST25PC001*)
- ST25R200 PC GUI (available soon), ST25R3916B PC GUI SW (*STSW-ST25R010*) and ST25R3911B PC GUI SW (*STSW-ST25R001*)

ST solutions

- ST25 HF Reader

ST25R Firmware for MCU

Firmware for ST25R Discovery, Nucleo & EMVCo boards



Complete set of source files to compile firmware for development boards (Discovery, Nucleo…)

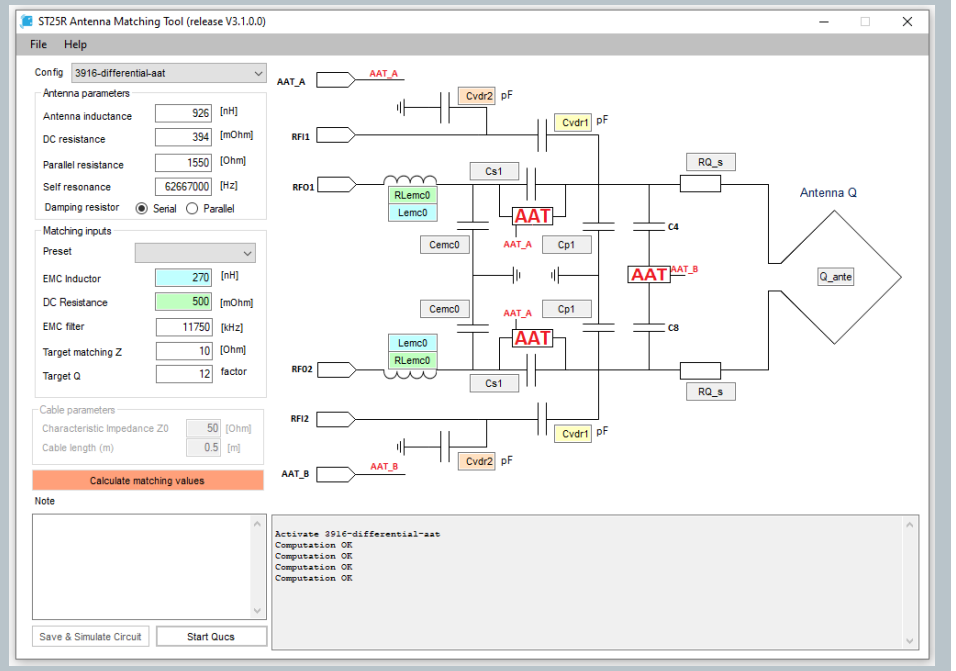
- Reader / Writer demonstration
  - Tag inventory, read and write (all NFC standard protocols supported)
  - Dynamic power output, NFC Forum NDEF messages
- Card emulation demonstration
  - NFC Type 4A Tag emulation (all tag types supported in USB mode)
  - NFC Forum NDEF messages, possibility to be written by a reader or a phone
- Peer to peer (P2P) demonstration
- EMVCo Layer 1 support FW, on request
- STEVAL-25R200 kit FW (available soon), ST25R200/R100 Nucleo boards FW (available soon & available soon)
- ST25R3916B Disco kit FW (*STSW-ST25R018*), ST25R3916B Nucleo board FW (*X-CUBE-NFC6*)

ST solutions

- ST25 HF Reader

ST25R antenna matching software kit

ST NFC Reader “Antenna Matching” software kit



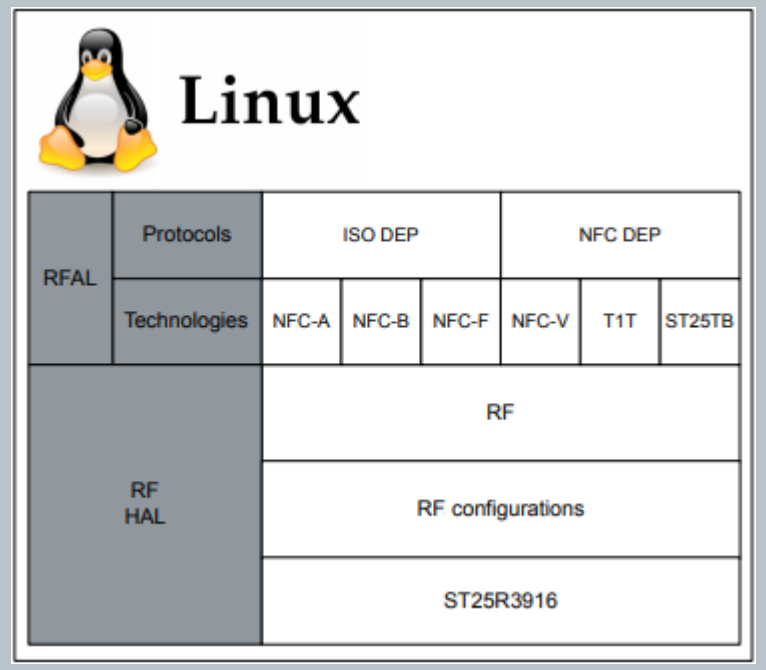
- Comprehensive antenna matching tool with GUI to find the right external component values for a chosen configuration
- Available for the entire ST25R HF Reader product line
- Allows configuration with or without AAT functionality
- Integrates circuit simulator (QUCS), automatic component value selection and generates the Smith Chart
- Standalone version for Windows PC and online tool available
- Antenna Matching tool for ST25R NFC/HF Reader (*STSW-ST25R004*)

ST solutions

- ST25 HF Reader

ST25R Linux software kit

ST NFC Reader “Linux” software kit



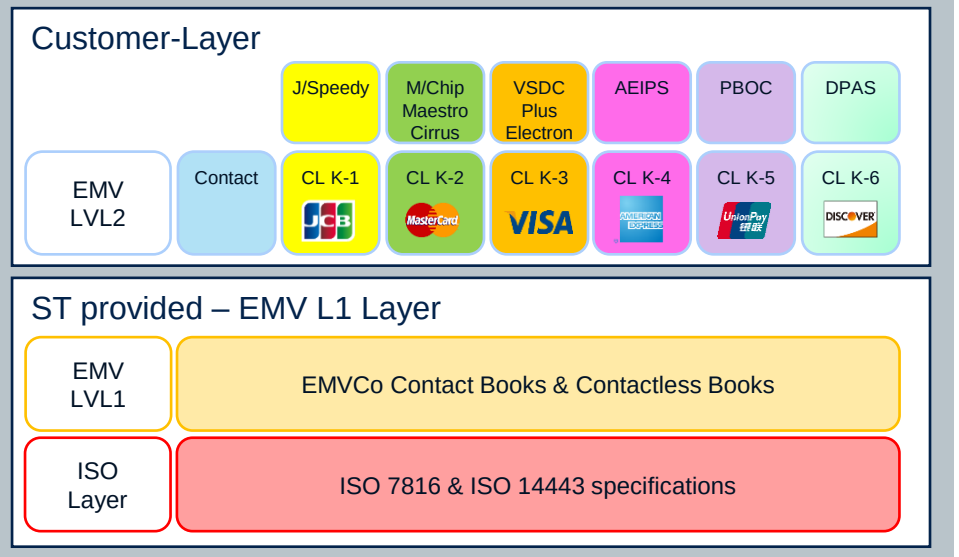
- Provides a pure user space port of the RFAL onto Raspberry Pi 3 and 4
- Support ST25R HF Readers
- Sample applications demonstrating Poller (R/W-mode) and Listener (Card Emulation)
- Linux host communication through SPI
- Free, user-friendly license terms
- Linux for ST25R3916B Raspberry Pi using X-NUCLEO-NFC08A1 (*STSW-ST25R013*) and Linux for ST25R3911B Raspberry Pi using X-NUCLEO-NFC05A1 (*STSW-ST25R009*)

ST solutions

- ST25 HF Reader

ST25R EMVCo software kit

ST NFC Reader “EMVCo” software Kit



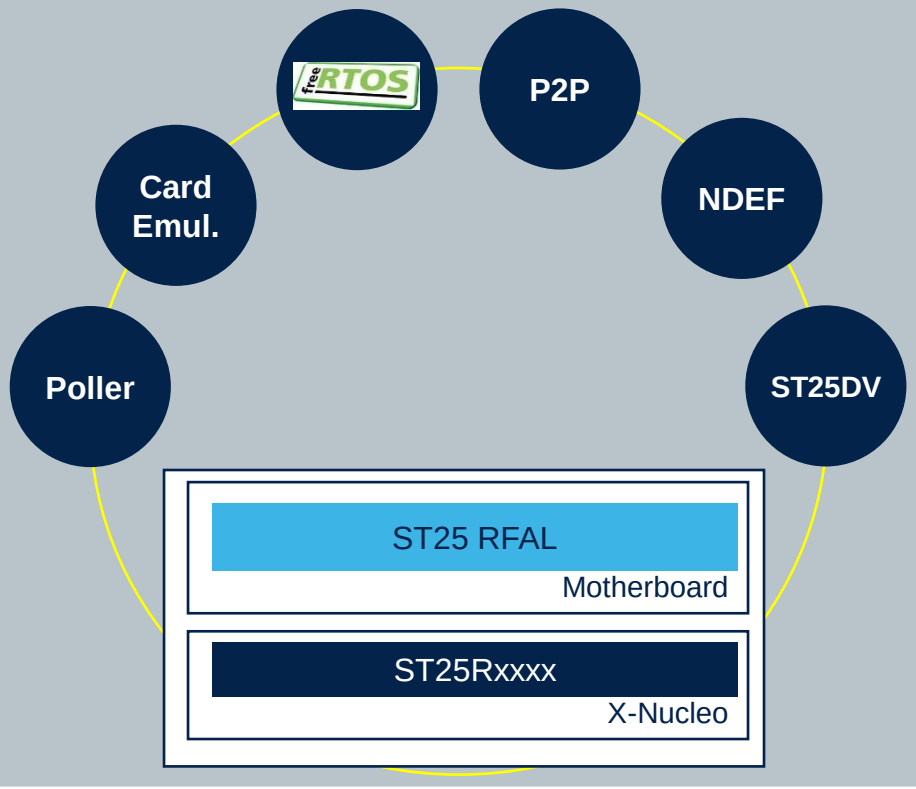
- ST provides EMVL1 firmware stack for contact-less products, as is
- Stack accessible under NDA for usage with ST25R series and available as source code
- Firmware accompanied by a GUI which allows easy configuration the device as well as active waveshaping and dynamic power output
- Written in pure ANSI C based on RFAL
- EMV L1 layer pre-validated (kept up to date)
- Portable on various architectures thanks to the abstraction layers which are integrated in the delivery
- Stack available with our POS demo kits on request

ST solutions

- ST25 HF Reader

ST25R embedded NFC library software kit

ST NFC Reader “NFC Lib” software kit



- Collection of middleware to build advanced NFC enabled applications such as
  - NFC poller
  - NDEF reader / writer
  - FreeRTOS poller
  - Proprietary active peer-to-peer & Card emulation
- Support for ST25 Tag and Dynamic Tag features
- ST25 Fast Transfer Mode (for ST25 Readers and Dynamic Tags)
- Easy portability across different platforms (MCUs / RTOSs / OSs)
- Available for all ST25R HF Readers, on request (free and user-friendly license terms)

ST solutions

- ST25 HF Reader

Solutions for NFC / RFID Tags & Readers

ST25

ST25 SIMPLY MORE CONNECTED

Our technology starts with You

Find out more at www.st.com/st25