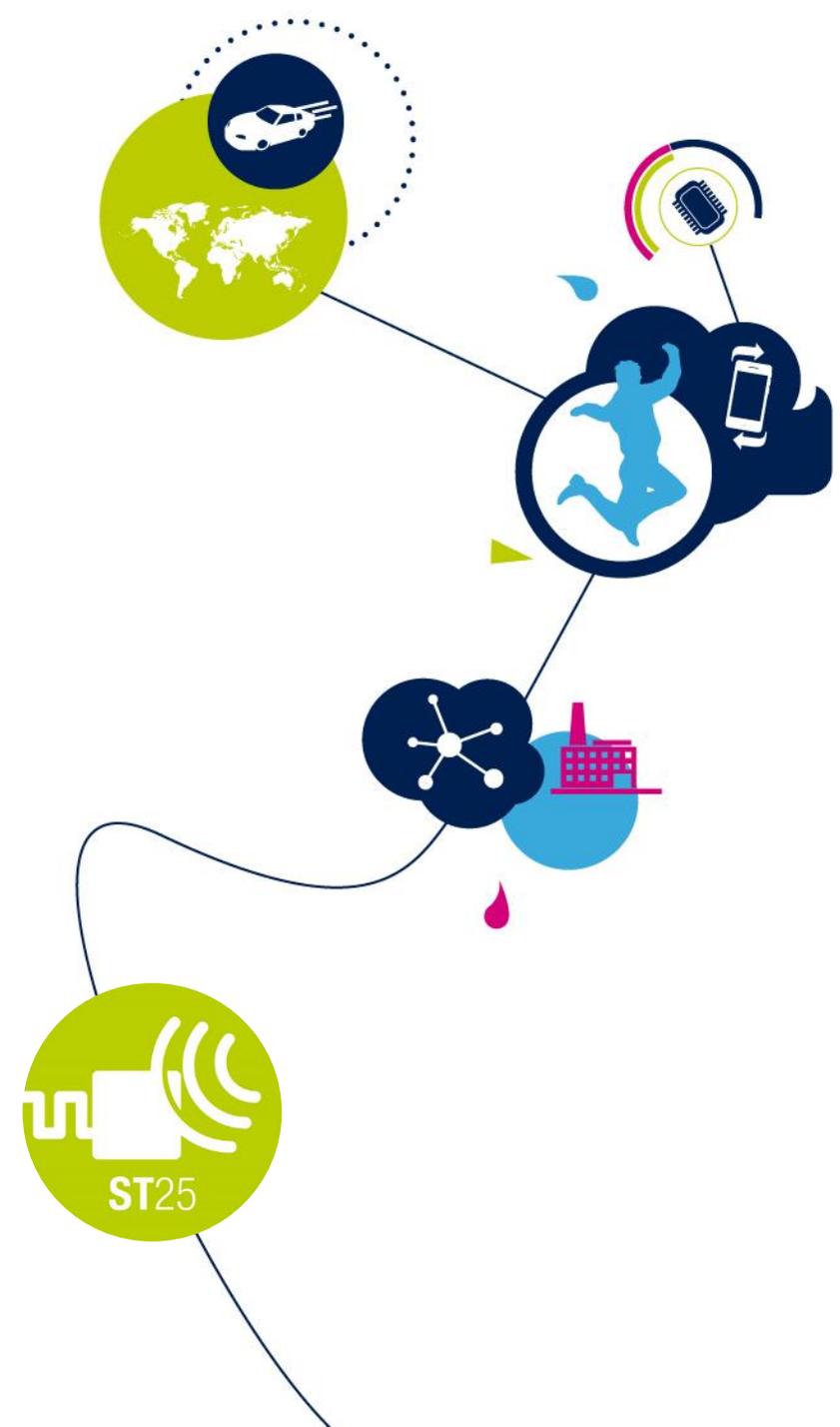


# NFC / RFID ST25 product overview

May 2018



# Solutions for NFC / RFID Tags and Readers



**ST25**  
Simply  
More Connected





# NFC Technology at a Glance

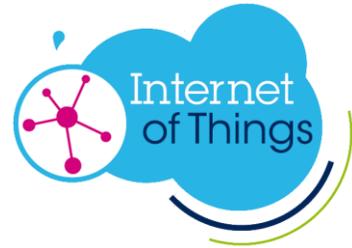
## An interactive technology enabling engagement with IoT devices



- 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 convenient connection to the Internet of Things
- ➔ **NFC-enabled mobile phone 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,...)
- Fast growing deployment in Mobile phone
  - In 2018, two in three phones to come with NFC
  - NFC is used for ApplePay, and in 2017 Apple added support of NFC reader mode from iOS11 onward



# ST25 Matching ST Strategy



Wearable & Healthcare

Gaming & Payment



Connected Home

Home Appliance & Automation



Lighting & Metering

Asset tracking



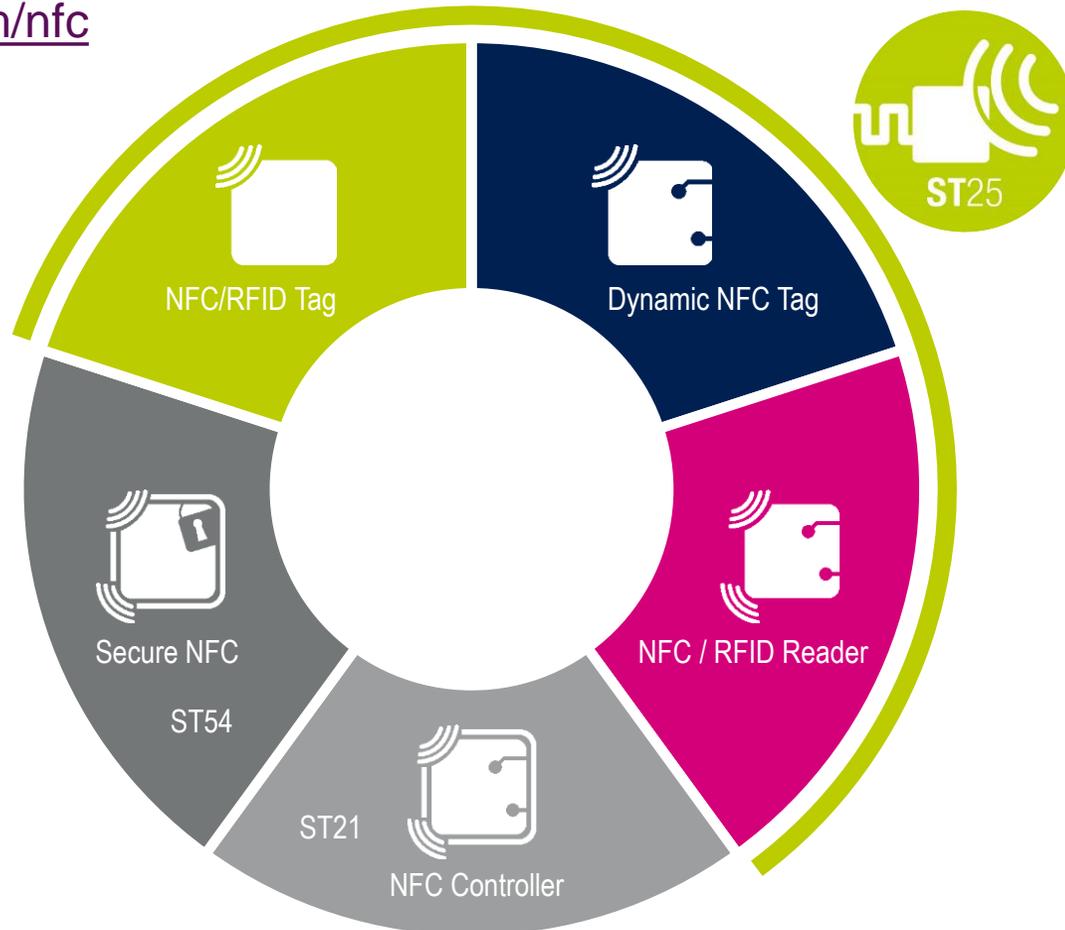
Car access

Car center console



Covering all NFC application needs and leveraging a rich ecosystem

[www.st.com/nfc](http://www.st.com/nfc)



ST is Member of NFC Forum,  
RAIN Alliance and ISO  
organisations

# ST25 Products Families

Ticketing, Gaming, Medical, Brand protection, Access control, ...

[www.st.com/st25t](http://www.st.com/st25t)



Industrial, Consumer, Metering, Appliance, ... (Fast Transfer Mode and SW upgrade)

[www.st.com/st25d](http://www.st.com/st25d)



POS & mPOS Terminals, Automotive, Access control, ...

[www.st.com/st25r](http://www.st.com/st25r)



# ST25 Series Enriching Our Lives!



Consumer  
Home Appliance



Healthcare  
Gaming



Brand recognition  
Accessory



Asset  
Tracking



Transport



Main Applications



Industrial



Smart Home  
Smart City



Access  
control



Automotive



Point  
of sales

# Certification & Interoperability Status



	Tags			Dynamic tags		
	ST25TV	ST25TA	ST25TB	ST25DV-I2C	M24LR	M24SR
NFC Forum			Not for NFC applications (RFID, ticketing)		Legacy product, not focusing on NFC applications	All parameters OK except chaining during write operations (**)
Android			Not for NFC applications (RFID, ticketing)			
iOS			Not for NFC applications (RFID, ticketing)			

(\*) M24LR: 04E interoperable with iOS11 - 16E and 64E not iOS. ST25DV16K or ST25DV64K as replacement product for iOS interoperability

(\*\*) Chaining during write operations is not used by Smartphones



# ST25 Series Overview



# ST25 Tags & Dynamic Tags DNA

Standard  
Compliant

Feature-  
rich

Best-In-  
Class  
Memory

High  
Volume &  
Quality



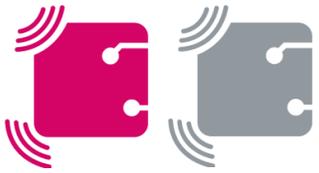
NFC Forum  
ISO14443A  
ISO14443B  
ISO15693

13.56MHz  
I2C interface  
Energy Harvesting  
Fast Transfer Mode  
Digital Signature  
20-bit counter

From 512-bit to 64-Kbit  
1M erase-write cycles  
Up to 200 years retention  
128-bit password

In-House manufacturing  
Leverage Automotive  
EEPROM quality  
Leverage Consumer  
EEPROM volume

Comprehensive Portfolio



# ST25 Readers DNA

## Standard Compliant



NFC Forum

ISO14443A/B

ISO15693

ISO18092

ISO18000



## High performing HF Readers

13.56MHz

Very High Bit Rate (6.8Mbit/s)

Automatic Antenna Tuning

High output power (1.4W)

Low power wake-up modes

Temperature -40°C to 125°C

## High performing UHF Readers

840-960 MHz

High Rx Sensitivity (-90dBm)

Low noise Voltage Controlled Oscillator

Dense Reader Mode filters

Tag movement detection

## Certification

EMVCo

PBOC

Mini-pay

Automotive AEC-Q100

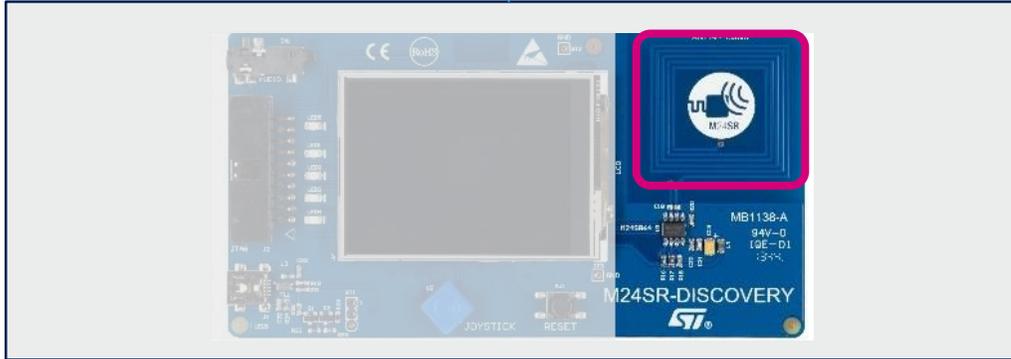
FCC/ETSI

Comprehensive Portfolio

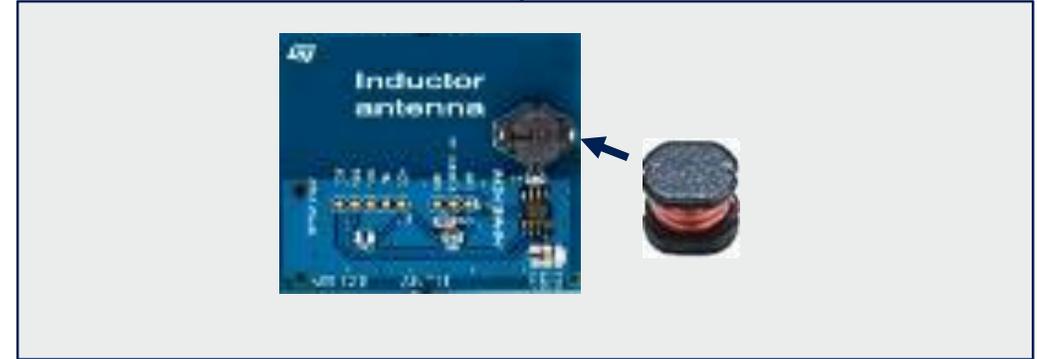


# Easy Antenna Integration

## On-board antenna



## On-board inductor



## Off-board antenna



## Sticker tag (inlay)



# Antenna e-Design and Matching Tools

46

## Fast and easy prototyping

### Antenna eDesign suite

**Geometry**

- Turns: 3 (12 segments)
- Antenna Length: 40 mm
- Antenna Width: 25 mm
- Number of Layer: 1

**Conductor**

- Width: 0.6 mm
- Spacing: 0.6 mm
- Thickness: 35 µm

**Substrate**

- Thickness: 1 mm
- Relative Electrical Permittivity ( $\epsilon_r$ ): 4.6

#### Antenna Results

Segmentation Mode: Vertical  
Equivalent inductance: **627.5 nH**  
@13.56 MHz



### ST25R antenna matching tool

**Antenna parameters**

- Antenna inductance: 929 [nH]
- DC resistance: 329 [mOhm]
- Parallel resistance: 1500 [Ohm]
- Self resonance: 62667000 [Hz]

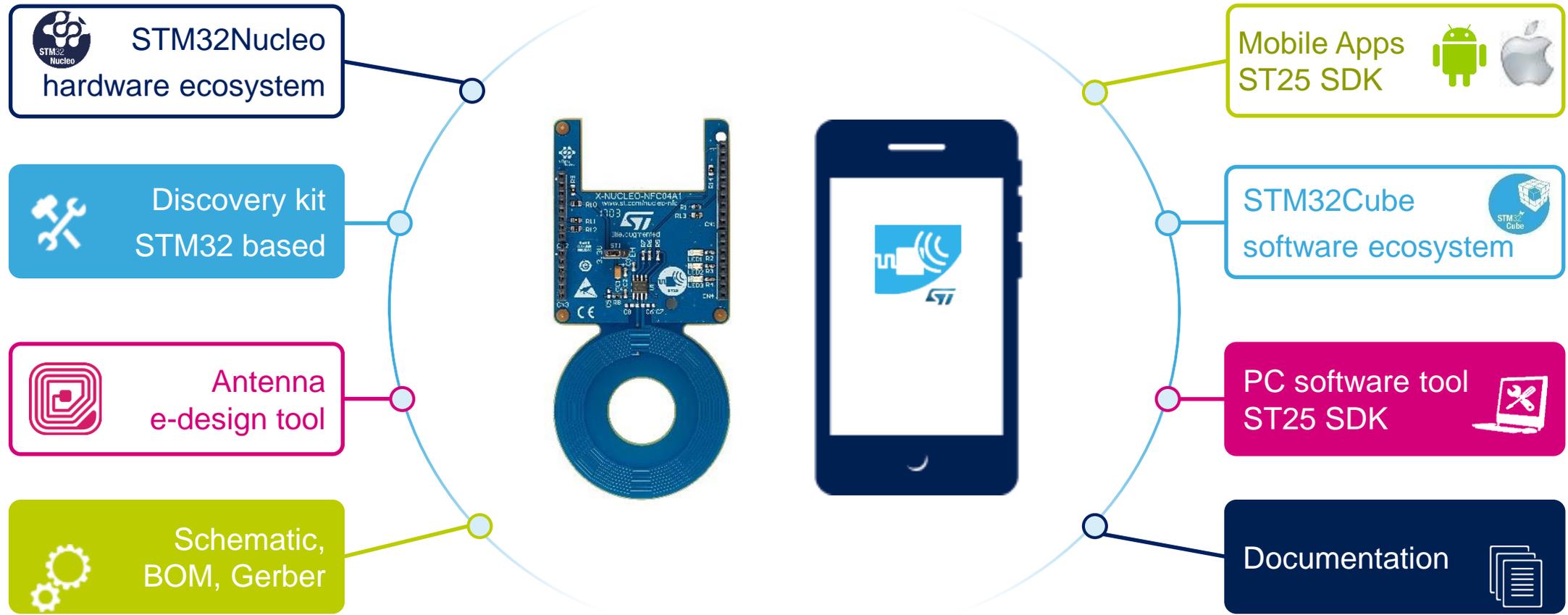
**Matching inputs**

- Preset: General Purpose
- EMC Inductor: 270 [nH]
- DC Resistance: 500 [mOhm]
- EMC filter: 11750 [kHz]
- Target matching Z: 16 [Ohm]
- Target antenna Q: 17

undamped Q: 35

# ST25 Eco-system DNA

## Easy-to-use and customer-oriented



# ST25 Products Families

Ticketing, Gaming, Medical, Brand protection, Access control, ...

[www.st.com/st25t](http://www.st.com/st25t)



Tags



ST25T



13.56MHz



NFC phone / RFID Reader

Industrial, Consumer, Metering, Appliance, ...

[www.st.com/st25d](http://www.st.com/st25d)



Dynamic tags



STM32 microcontroller



ST25D



13.56MHz



NFC phone / RFID Reader

POS & mPOS Terminals, Automotive, Access control, ...

[www.st.com/st25r](http://www.st.com/st25r)



Readers



STM32 microcontroller



ST25R



13.56MHz



NFC phone

or



or



# ST25 Portfolio

## One-stop-shop for Tags and Readers

Tags			Dynamic tags				HF Readers			UHF Readers
ST25TA	ST25TB	ST25TV	M24SR	M24LR	ST25DV-I2C	ST25DV-PWM	CR95HF ST95HF	ST25R3910	ST25R3911B - ST25R3915	ST25RU3993
ISO14443-A 106kb/s NFC type 4	ISO14443-B 106kb/s	ISO15693 up to 53kb/s NFC type 5	ISO14443-A 106kb/s NFC type 4	ISO15693 up to 53kb/s	ISO15693 up to 53kb/s NFC type 5	ISO15693 up to 53kb/s NFC type 5	ISO14443-A/B ISO15693	ISO14443-A/B ISO15693 FeliCa	ISO14443-A/B FeliCa ISO15693 ISO18092	ISO18000 6c & b Gen2 Protocol
EEPROM 512b-64Kbit 200-year 1Mcycles	EEPROM 512b-4Kbit 40-year 1Mcycles	EEPROM 512b-64Kbit 60-year 100kcycles	EEPROM 2Kbit to 64Kbit 200-year 1Mcycles	EEPROM 4Kbit to 64Kbit 40-year 1Mcycles	256Bytes buffer EEPROM 4Kbit to 64Kbit 40-year 1Mcycles	EEPROM 2Kbit 40-year 100kcycles	Reader / Writer Card Emulation	Reader / Writer Limited P2P	Reader / Writer P2P EMVCo & PBOC AEC-Q100 grade 1	Reader / Writer -90dBm sensitivity Internal VCO
TruST25 128bit password 20bit counter UID Field Detect	32bit counters Lock OTP bits UID	TruST25 64bit password 16-bit counter UID Tamper detect	128bit password RF disable Field Detect UID	32bit password E-harvesting Field Detect UID	Fast Transfer Mode 64bit password E-harvesting Field Detect UID	TruST25 64bit password UID	-	AAT	VHBR AAT Multi Antenna Dynamic output power	Dense Reader Mode Linear RSSI Automatic PSRR Auto ACK
			I2C 1MHz 2.7V - 5.5V	I2C 400kHz 1.8V - 5.5V	I2C 1MHz 1.8V - 5.5V	2x PWM 488 - 31250Hz 1.8V - 5.5V	SPI & UART 2Mbit/s 2.7V - 5.5V 230mW	SPI 6Mbit/s 2.4V - 3.6V 700mW max	SPI 6Mbit/s 2.4V - 5.5V 1 - 1.4W max	SPI 5Mbit/s 1.65V - 5.5V 0/20dBm Output

# 10-year Longevity Program

- For ST25 Tags & ST25DV-I2C Dynamic Tags, the 10 years longevity commitment starts from the following dates
  - ST25TA series, starting September 1st 2015
  - ST25TB series, starting November 1st 2016
  - ST25DV-I2C series, starting January 1st 2017
- For the rest of ST25 products, it will be managed case by case after contacting division
- The 10 years longevity commitment includes the period of notification as set forth in the standard STMicroelectronics end-of-life notification policy (PTN)
- In case of significant volume decrease, technology or manufacturing changes, a switch to a comparable product, another technology or a different manufacturing facility could be decided by STMicroelectronics who will notify customers using the standard STMicroelectronics product/process change policy (PCN)





# ST25T Product ID cards



# ST25TV Low Density NFC Tags



## ST25TV512 / 02K

RF Tag	ISO 15693	EEPROM 512-bit / 2K-bit
	NFC Type V	<div style="border: 1px solid black; padding: 2px; text-align: center;">NDEF</div>
	Long range	<div style="border: 1px solid black; padding: 2px; text-align: center;">64-bit "encrypted" password</div>
	26kb/s (53kb/s)	<div style="border: 1px solid black; padding: 2px; text-align: center;">16-bit counter</div>
		<div style="border: 1px solid black; padding: 2px; text-align: center;">TruST25 Digital signature</div>
Tamper Detect		



FPN5



SBN12 / SBN075

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

### Use cases

- Identification, access control, NFC tags, gaming
- Tamper proof application



### Key Features

- **ISO15693** and **NFC Type V**
- Long range operations, up to 53kb/s speed
- **Tamper Detect pin** for open / short detection
- **TruST25** digital signature
- Counter 16-bit with anti-tearing

### Key Benefits

- **Specific Features** for Library Application
- Cloning Protection with **Digital Signature** in association with Cloud management
- Same RF tuning capacitor as LRI2K (23.5pF / 97pF)



# ST25TV High Density NFC Tags



## ST25TV64K

<b>RF Tag</b>	<b>ISO 15693</b>  <b>NFC Type V</b>  Long range  26kb/s (53kb/s)	<b>EEPROM</b> 64K-bit  <code>01001101110000</code> <code>00110101001110</code> <code>10110001101110</code>  <b>64-bit password</b>
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### SBN12

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

## Use cases

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

## Key Features

- **ISO15693** and **NFC Type V**
- **Long range** operations, up to 53kb/s speed
- **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 (28.5pF)





# ST25TA Low Density NFC Tags



## ST25TA512B / 02KB

RF Tag	ISO 14443-A	EEPROM 512 / 2K-bit
	NFC Type 4	NDEF
	Short Range	128-bit password
	106kb/s	20-bit counter
		TruST25 Digital signature



**SBN12 / SBN075**

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

### Use cases

- NFC token, NFC tag
- Smart poster, gaming
- NFC business card (name card, vcard)



### Key Features

- **ISO14443-A** Type A and **NFC type 4**
- High speed operations (**106kb/s**)
- **TruST25** digital signature
- Data protection thanks to **128-bit password**
- Counter 20-bit with anti-tearing

### Key Benefits

- Optimized PCB footprint
- 50pF internal RF tuning capacitor allowing small antenna design
- **200 years** data retention, **1M cycles** erase/write





# ST25TA with GPO NFC Tag



## ST25TA02KB-P / -D

RF Tag	ISO 14443-A	EEPROM 2K-bit
	NFC Type 4	NDEF
Short Range	106kb/s	128-bit password
		20-bit counter
		TruST25 Digital signature
Digital output (GPO)		



FPN5



SBN12 / SBN075

Die form, sawn and Bumped inkless 8" wafer, 120µm/75µm 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 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 Tags



## ST25TA16K / 64K

<b>RF Tag</b>	<b>ISO 14443-A</b>  <b>NFC Type 4</b>  Short Range  106kb/s	<b>EEPROM</b> 16K / 64K-bit  <b>NDEF</b>  <b>128-bit password</b>
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### 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, 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 Tags

## ST25TB512 / 02K / 04K

<b>RF Tag</b>	<b>ISO 14443-B</b>	<b>EEPROM</b> 512-bit / 2K / 4K-bit
	Short range	<pre>01001101110000 00110101001110 10110001101110</pre>
	106kb/s	32-bit counter x2
		64-bit UID



### SBN12

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





# NFC / RFID Tag Product Family

**ST25TB512**  
**ST25TB02K**  
**ST25TB04K**

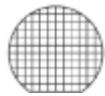
**ST25TA512B**  
**ST25TA02KB**  
**ST25TA02KB-D**  
**ST25TA02KB-P**

**ST25TA16K**  
**ST25TA64K**

**ST25TV512**  
**ST25TV02K**  
**ST25TV02K-AD**

**ST25TV64K**

	<b>ST25TB512</b> <b>ST25TB02K</b> <b>ST25TB04K</b>	<b>ST25TA512B</b> <b>ST25TA02KB</b> <b>ST25TA02KB-D</b> <b>ST25TA02KB-P</b>	<b>ST25TA16K</b> <b>ST25TA64K</b>	<b>ST25TV512</b> <b>ST25TV02K</b> <b>ST25TV02K-AD</b>	<b>ST25TV64K</b>
<b>Contactless Interface</b>	ISO14443B	ISO14443A NFC Forum Type 4	ISO14443A NFC Forum Type 4	ISO15693 NFC Forum Type 5	ISO15693 NFC Forum Type 5
<b>RF range</b>	Short range (up to 10cm)	Short range (up to 10cm)	Short range (up to 10cm)	Long range (up to 100cm)	Long range (up to 100cm)
<b>RF speed</b>	106kbps	106kbps	106kbps	26kbps (53kbps)	26kbps (53kbps)
<b>Memory format</b>	EEPROM data	EEPROM (preformatted NDEF)	EEPROM (preformatted NDEF)	EEPROM (preformatted NDEF)	EEPROM data
<b>Memory size</b>	512-bit & 2k / 4k-bit	512-bit / 2k-bit	16k / 64k-bit	512-bit / 2k-bit	64k-bit
<b>Data protection</b>	OTP bits	Password 128-bit Digital signature	Password 128-bit	Password 64-bit Digital signature	Password 32-bit
<b>Digital output</b>	NA	GPO Field detect -P: CMOS_P -D: Open-drain	NA	Tamper Detect	NA
<b>Counter</b>	32-bit (x2)	20-bit	NA	16-bit	NA
<b>RF tuning capacitor</b>	64pF	50pF	25pF	23.5pF & 97pF	28.5pF
<b>Temperature range</b>	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
<b>Package</b>	SBN12 *	SBN12 * / SBN075 <sup>2</sup> FPN5 (1.7x1.4mm)	SBN12 *	SBN12 * / SBN075 <sup>2</sup>	SBN12 *



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

<sup>2</sup> SBN075: Die form, sawn and Bumped wafer, 75µm thickness, inkless 8" wafer



# ST25D Product ID cards



# M24SR Dynamic NFC Tags



## M24SR02 / 04 / 16 / 64

RF Tag	ISO 14443-A	EEPROM 2K / 4K / 16K / 64K-bit	I <sup>2</sup> C
	NFC Type 4	NDEF	2.4/5.5V
	106kb/s	128-bit password	1MHz
Digital output (GPO)			
RF disable			



SO8



TSSOP8



FPN8



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,...

### 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 Tags

## M24LR04E / 16E / 64E

RF Tag	ISO 15693	EEPROM 4K / 16K / 64K-bit	I <sup>2</sup> C
	26kb/s (53kb/s)	<pre>01001101110000 00110101001110 10110001101110</pre>	1.8/5.5V
		32-bit password	1MHz
Digital output (GPO)			
Energy Harvesting			



### Use cases

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

### Key Features

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

### Key Benefits

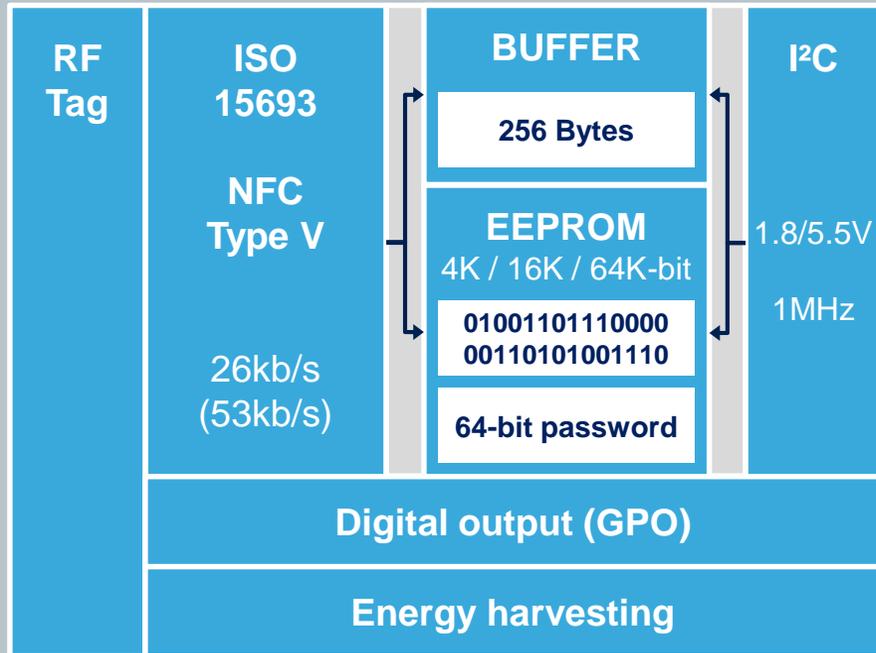
- Easy of use (limited BOM, 8-pin package)
- Flexible interrupt pin for MCU wake-up
- Cost optimized discovery kit with Android app
- 40 years data retention, **1M cycles** erase/write



# ST25DV-I2C Dynamic NFC Tag



## ST25DV04K / 16K / 64K



### Use cases

- Fast data exchange with NFC phones / HF readers. Long range
  - Fast data transfer for MCU FW upgrade, Fast data exchange
  - Parameters settings and update, with in the box programming
  - Datalog download
- Battery less applications



### Key Features

- **ISO15693** and **NFC Type V**
- **Fast data transfer** thanks to 256 Bytes buffer
- Low Power mode, < 1µA power consumption in Standby
- -40 to **+125°C** (I2C) industrial Grade 8 temperature range
- **Energy harvesting** function through RF

### 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 M24LR



# ST25DV-PWM Dynamic NFC Tag



## ST25DV02K-W1 / -W2

RF Tag	ISO 15693	EEPROM 2K-bit
	NFC Type V	<pre>01001101110000 00110101001110 10110001101110</pre>
	26kb/s (53kb/s)	64-bit password
		TruST25 Digital signature
PWM output		



SO8



TSSOP8

### Use cases

- Industrial applications like Lighting LED driver, Motor control

### 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

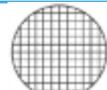
- 2 in 1 chip, putting NFC connectivity with PWM functionality
- Cost optimized solution to address low end Lighting market
  - Significant BOM reduction as no MCU is required to drive the system





# Dynamic NFC / RFID Tags

	M24SR series	M24LR series	ST25DV-I2C series	ST25DV-PWM series
<b>Contactless Interface</b>	ISO14443A NFC Type 4	ISO15693 NFC compatible	ISO15693 NFC Type 5	ISO15693 NFC Type 5
<b>RF range</b>	Short range (up to 10cm)	Long range (up to 1m)	Long range (up to 1m)	Long range (up to 1m)
<b>RF speed</b>	106kbps	26kbps	26kbps	26kbps
<b>Serial Interface</b>	I2C @1MHz	I2C @400kHz	I2C @1MHz	No
<b>Fast Transfer mode</b>	No	No	Yes (256B buffer)	No
<b>Energy Harvesting</b>	No	Yes	Yes	No
<b>Digital output</b>	Open-Drain GPO	Open-Drain GPO	OD or CMOS GPO	2x PWM
<b>Extra features</b>	RF Disable	-	Low Power mode	-
<b>Memory format</b>	EEPROM (preformatted NDEF)	EEPROM data	EEPROM data	EEPROM data
<b>Memory size</b>	2k / 4k / 16k / 64k-bit	4k / 16k / 64k-bit	4k / 16k / 64k-bit	2k-bit
<b>Data protection</b>	Password 128-bit	Password 32-bit	Password 64-bit	Password 64-bit Digital signature
<b>Temperature range</b>	-40°C to +85°C -40°C to +105°C (85°C RF)	-40°C to +85°C	-40°C to +85°C -40°C to +125°C (105°C RF)	-40°C to +85°C (105°C RF)
<b>Package</b>	SO8 / TSSOP8 / FPN8 / SBN12 *	SO8 / TSSOP8 / FPN8	SO8 / TSSOP8 / FPN8 / FPN12 / WLCSP10 / SBN12 <sup>2</sup>	SO8 / TSSOP8



<sup>2</sup> SBN12: Die form, sawn and Bumped wafer, 120µm thickness, inkless 8" wafer



# ST25R Product ID cards



# CR95HF NFC / RFID Reader



## CR95HF

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER  528-Byte	SPI 2.7/5.5V 2Mb/s
	NFC  848kb/s		UART 2.7/5.5V 2Mb/s
0.23W	Digital output (IRQ)		



QFN32

### Use cases

- RFID / NFC reader
  - Product identification or authentication
  - Product configuration (parameter settings)
  - Access Control, Digital Door Locks
  - Medical, industrial & production reader equipment

### Key Features

- All NFC modes supported (ISO14443, ISO15693, FeliCa)
- Fast data transfer (up to **848kb/s**)
- Low power modes

### Key Benefits

- Simple implementation / limited BOM
- Easy-to-use evaluation / development kits
- Reference designs, application notes
- Cost effective solution





# ST95HF NFC / RFID Transceiver



## ST95HF

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI
Card Emulation	NFC	528-Byte	2.7/5.5V
0.23W	848kb/s		2Mb/s
Digital output (IRQ)			



QFN32

### Use cases

- Dynamic data exchange between a NFC phone and a NFC device
  - User settings update, information log download, firmware upgrade...
- Dynamic wireless pairing with hand-over

### Key Features

- **Reader-Writer** (R/W) and **Card Emulation** (CE)
- All NFC modes supported (ISO14443, ISO15693, FeliCa)
- Fast data transfer (up to **848kb/s**)

### Key Benefits

- Simple implementation / limited BOM
- Easy-to-use evaluation / development kits
- Reference designs, application notes
- Cost effective solution



# ST25R3911B NFC / RFID Reader

## 1.4W High Power Payment Reader Solution



### ST25R3911B

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI
	NFC		
1.4W	6.8Mb/s		6Mb/s
	Digital output (IRQ)		
Automatic Antenna Tuning			



QFN32



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 at 5V
- **EMVCo** & **PBOC** certification without external power amplifier
- Automatic Antenna Tuning
- **VHBR** support up to **6.8Mb/s**
- -40°C to **125°C** temperature range

### Key Benefits

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





# ST25R3912/13 NFC / RFID Reader

## Smallest Footprint, High Power Solution



### ST25R3912/13

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI
	NFC	96-Byte	2.4/5.5V
	848kb/s		6Mb/s
1W	Digital output (IRQ)		
	Automatic Antenna Tuning		



QFN32



WLCSP



QFN32  
Wetable flank

### Use cases

- Ideal for **Payment** applications **small handheld mPOS**
- Access Control, Gaming

### Key Features

- All NFC modes supported (ISO14443, ISO15693, FeliCa) with P2P
- 1W output power at 5V
- **EMVCo** & **PBOC** certification without external power amplifier
- Automatic Antenna Tuning (3913 only)
- Small 3x2.8 **WLCSP** package (3912 only)
- -40°C to **125°C** temperature range

### Key Benefits

- Small Footprint on PCB, Low power operation & Stand-by mode
- 2 antennas operation at the same time
- Support market Standard Crypto





# ST25R3914/15 NFC / RFID Reader

## High Power Automotive Solution



### ST25R3914/15

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI  2.4/5.5V  6Mb/s
	NFC  848kb/s	96-Byte	
1W	Digital output (IRQ)		
	Automatic Antenna Tuning		



QFN32

QFN32  
Wetable flank

### Use cases

- Ideal for **Automotive** applications
  - Keyless entry and start and driver authentication
  - Pairing, data transfer, in car payment
  - NFC enhanced Foreign Object Detection for Qi wireless charging

### Key Features

- All NFC modes supported (ISO14443, ISO15693, FeliCa) with P2P
- **Automotive AEC-Q100 grade 1** certified
- 1W output power at 5V
- Automatic Antenna Tuning (3914 only)
- -40°C to **125°C** temperature range

### Key Benefits

- Low power operation & Stand-by mode (capacitive wake-up)
- 2 antennas operation at the same time
- Reliable performance even in metallic environment





# ST25R HF Readers

**CR95HF  
ST95HF**

**ST25R3911B**

**ST25R3912**

**ST25R3913**

**ST25R3914**

**ST25R3915**

Description	Entry-Level Reader	High-Perf Reader & NFC initiator for Payment / Passport applications			High-Perf Reader & NFC initiator for Automotive	
<b>Reader/Writer mode</b>	ISO14443A/B ISO15693 Felica	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa
<b>Card emulation mode</b>	Yes (ST95HF)	-	-	-	-	-
<b>P2P mode</b>	-	Yes	Yes	Yes	Yes	Yes
<b>RF speed</b>	848kbps	6.8Mbps (VHBR)	848kbps	848kbps	848kbps	848kbps
<b>Market certification</b>	-	Payment (EMVco, PBOC, mini-pay)	Payment (EMVco, PBOC, mini-pay)	Payment (EMVco, PBOC, mini-pay)	Automotive AEC-Q100 Grade 1	Automotive AEC-Q100 Grade 1
<b>Advanced features</b>	Ind wake-up	AAT, DPO, Cap & Ind wake-up	DPO, Ind wake-up	AAT, DPO, Ind wake-up	AAT, DPO, Cap & Ind wake-up	DPO, Cap & Ind wake-up
<b>Interface</b>	SPI 2Mbps UART (CR95HF)	SPI 6Mbps	SPI 6Mbps	SPI 6Mbps	SPI 6Mbps	SPI 6Mbps
<b>Power supply</b>	2.7V - 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V
<b>Output power</b>	0.23W	1.4W	1.0W	1.0W	1.0W	1.0W
<b>Temperature range</b>	-25°C to +85°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C
<b>Package</b>	32-pin QFN (5x5mm)	32-pin QFN (5x5mm) / Wafer	32-pin QFN / WF 32-pin QFN (5x5mm) / WLCSP	32-pin QFN / WF 32-pin QFN (5x5mm)	32-pin QFN / WF 32-pin QFN (5x5mm)	32-pin QFN / WF 32-pin QFN (5x5mm)

VHBR: Very High Baud Rate  
P2P: Peer to Peer mode  
AAT: Automatic Antenna Tuning

Cap & Ind wake-up: Capacitive & Inductive wake-up  
VHBR: Very High Baud Rate  
DPO: Dynamic Power Output



# ST25RU Product ID cards



# ST25RU3980 UHF RFID Reader

## for Fast Moving Consumer Goods (FMCG)

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### ST25RU3980

UHF Reader	EPC Class1 Gen2 ISO18000-6c	FIFO 24-Byte	SPI 1.65/5.5V 6Mb/s
0dBm	Digital output (IRQ)		



QFN48

### Use cases

- Embedded consumer / industrial readers
  - Beverage dispensing, Access control
  - Authentication / calibration, Retail / Pharmaceutical
- Fast Moving Consumer Goods, Gaming, Portable Data Capture

### Key Features

- Fixed Single ended Rx input & 0dBm output power
- Receive sensitivity of **-90dBm**
- Power consumption down to 65mA

### Key Benefits

- **Reduced overall BOM** costs / count and competitive price
- Robust against poor antenna
- Prolonging battery life



# ST25RU3993 UHF RFID Reader

## with Dense Reader Mode for Battery Handheld

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### ST25RU3993

UHF Reader	EPC Class1 Gen2 ISO18000-6c/b	FIFO 24-Byte	SPI 1.65/5.5V 6Mb/s
0dBm	Digital output (IRQ)		



QFN48

### Use cases

- **Retail**, Stationary readers
- Industrial PDA's, Authentication
- Tablets / Smartphones, Dongles / Snap Ons, Handheld readers
- Portable Data Capture

### Key Features

- **Dense Reader Mode filtering** on board
- Fixed Single ended Rx input & 0dBm output power
- Receive sensitivity of **-90dBm**
- Power consumption down to 65mA

### Key Benefits

- Ideal for **mobile** applications
- Prolonging battery life & robust against poor antenna
- Works in a dense reader environment



# ST25R UHF Readers

## ST25RU3993

## ST25RU3980

Description	UHF RFID Reader for Mobile and Fast Moving Consumer Goods applications	UHF RFID Reader for Mobile and Fast Moving Consumer Goods applications
Contactless interface	ISO18000-6c/b	ISO18000-6c
Market certification	EPC Gen 2	-
Sensitivity	-90dBm	-90dBm
Advanced features	Internal VCO Dense Reader Mode Linear RSSI & Phase Bit Automatic PSRR regulation Auto ACK	Internal VCO Dense Reader Mode Linear RSSI & Phase Bit Automatic PSRR regulation Auto ACK
Interface	SPI 5Mbps	SPI 5Mbps
Power supply	1.65V – 5.5V	1.65V – 5.5V
Output power	0dBm / 20dBm	0dBm
Temperature range	-40 to +85°C	-40 to +85°C
Package	48-pin QFN (7x7mm)	48-pin QFN (7x7mm)

VCO: Voltage Controlled Oscillator  
RSSI: Received Signal Strength Indicator

PSRR: Power Supply Rejection Ratio  
ACK: ACKnowledge



# Product Part Number



# ST25T Part Numbers

## ST25T NFC / RFID tags

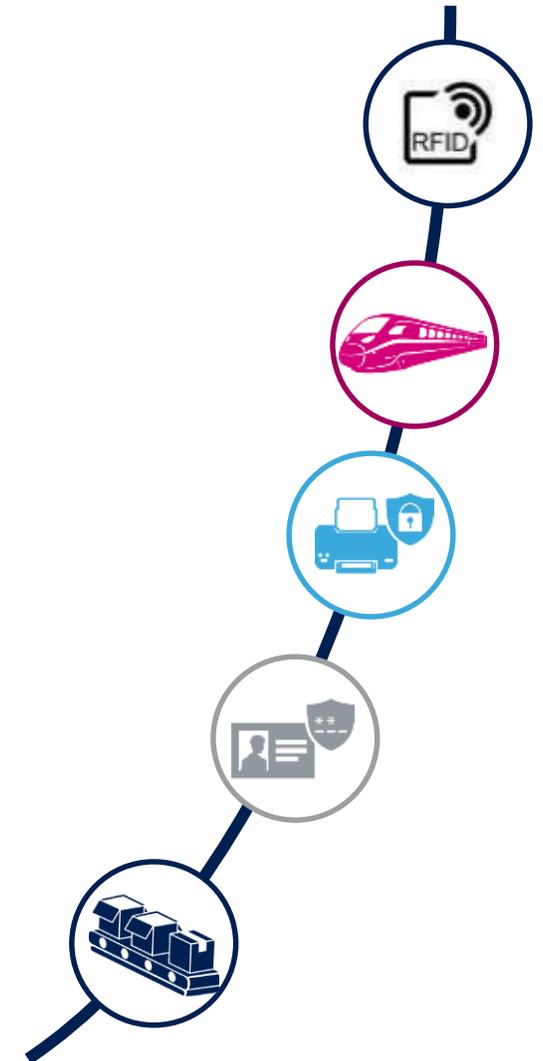
ST25TB	Package	512-bit	2k-bit	4k-bit
RFID tag RF ISO14443B (-AT for Transport)	SBN12	ST25TB512-AC6G6	ST25TB02K-AC6G6	ST25TB04K-AB6G6
	SBN12	ST25TB512-AT6G6		

ST25TA	Package	512-bit	2k-bit	16k-bit	64k-bit
NFC tag RF ISO14443A	SBN12	ST25TA512-AC6G5	ST25TA02K-AC6G5	ST25TA16K-AB6G5	ST25TA64K-AB6G5

ST25TA -P / -D	Package	2k-bit GPO CMOS-P	2k-bit GPO Open Drain
NFC tag RF ISO14443A + GPO	FPN5	ST25TA02K-PC6H5	ST25TA02K-DC6H5
	SBN12	ST25TA02K-PC6B5	

ST25TV	Package	512-bit	2k-bit	64k-bit
RFID tag RF ISO15693	SBN075	ST25TV512-AP6F3	ST25TV02K-AP6F3	
		ST25TV512-AP6F9	ST25TV02K-AP6F9	
	SBN12	ST25TV512-AP6G3	ST25TV02K-AP6G3	ST25TV64K-AP6G3
		ST25TV512-AP6G9	ST25TV02K-AP6G9	

ST25TV -AD	Package	2k-bit
NFC tag RF ISO15693 + Tamper Detect	FPN5	ST25TV02K-AD6H3
	SBN12	ST25TV512-AD6G3
		ST25TV512-AD6G9





# ST25D Part Numbers

## ST25D dynamic NFC / RFID tags

M24SR	Package	2k-bit	4k-bit	16k-bit	64k-bit
Dynamic NFC tag RF ISO14443A + I2C IF + GPO + RF disable	SO8	M24SR02-YMN6T/2	M24SR04-YMN6T/2	M24SR16-YMN6T/2	M24SR64-YMN6T/2 M24SR64-YMN8T/2
	TSSOP8	M24SR02-YDW6T/2	M24SR04-YDW6T/2	M24SR16-YDW6T/2	M24SR64-YDW6T/2 M24SR64-YDW8T/2
	FPN8	M24SR02-YMC6T/2	M24SR04-YMC6T/2	M24SR16-YMC6T/2	M24SR64-YMC6T/2
	SBN12	M24SR02-YSB12I/2			M24SR64-YSB12I/2

M24LR	Package	4k-bit	16k-bit	64k-bit
Dynamic NFC / RFID tag RF ISO15693 + I2C IF + GPO + Energy harvesting	SO8	M24LR04E-RMN6T/2	M24LR16E-RMN6T/2	M24LR64E-RMN6T/2
	TSSOP8	M24LR04E-RDW6T/2	M24LR16E-RDW6T/2	M24LR64E-RDW6T/2
	FPN8	M24LR04E-RMC6T/2	M24LR16E-RMC6T/2	M24LR64E-RMC6T/2

ST25DV-I2C	Package	4k-bit	16k-bit	64k-bit
Dynamic NFC / RFID tag RF ISO15693 + I2C IF + Fast Transfer Mode + GPO + Energy harvesting + Extended temperature	SO8	ST25DV04K-IER6S3	ST25DV16K-IER6S3	ST25DV64K-IER6S3
		ST25DV04K-IER8S3	ST25DV16K-IER8S3	ST25DV64K-IER8S3
	TSSOP8	ST25DV04K-IER6T3	ST25DV16K-IER6T3	ST25DV64K-IER6T3
		ST25DV04K-IER8T3	ST25DV16K-IER8T3	ST25DV64K-IER8T3
	FPN8	ST25DV04K-IER6C3		
		ST25DV04K-IER8C3		
FPN12	ST25DV04K-JFR6D3	ST25DV16K-JFR6D3	ST25DV64K-JFR6D3	
	WLCSP10	ST25DV04K-JFR6L3		

ST25DV-PWM	Package	2k-bit – 1xPWM	2k-bit – 2xPWM
Dynamic NFC / RFID tag RF ISO15693 + PWM IF + Extended temperature	SO8	ST25DV02K-W1R8S3	ST25DV02K-W2R8S3
	TSSOP8	ST25DV02K-W1R8T3	ST25DV02K-W2R8T3





# ST25R Part Numbers

## ST25R HF NFC / RFID readers

95HF	Package	Features	Part Number
Entry-Level HF Readers	QFN32	Reader / Writer (R/W)	CR95HF-VMD5T
	QFN32	R/W & Card emulation (CE)	ST95HF-VMD5T

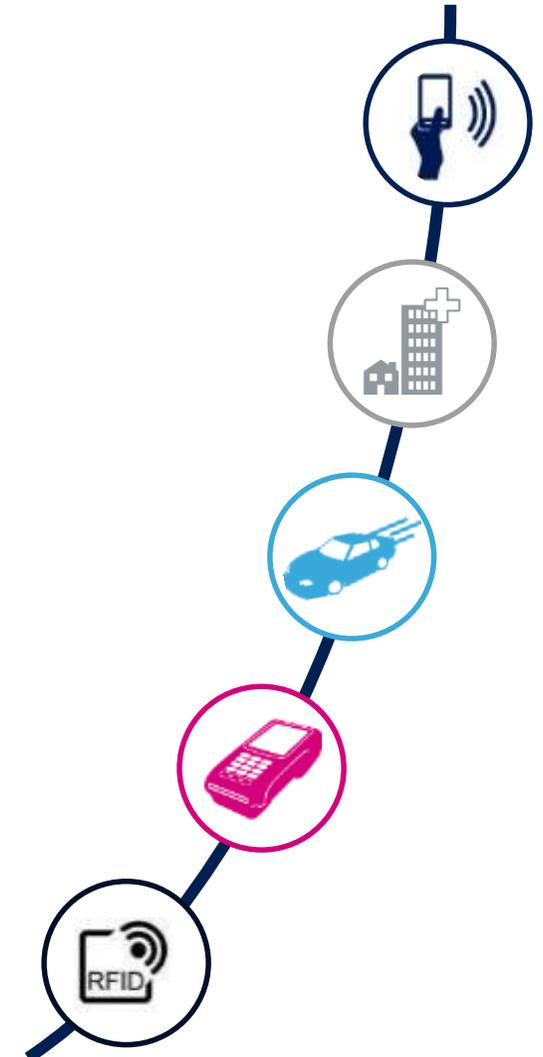
ST25R3911B-12-13	Package	Features	Part Number
High-Perf HF Readers for POS & mPOS	QFN32	VHBR & AAT	ST25R3911B-AQFT
	Wafer	VHBR & AAT	ST25R3911B-ASWB
	WF QFN32	No VHBR / No AAT	ST25R3912-AQWT
	QFN32	No VHBR / No AAT	ST25R3912-AQFT
	WLCSP	No VHBR / No AAT	ST25R3912-AWLT
	QFN32	VHBR / No AAT	ST25R3913-AQFT
WF QFN32	VHBR / No AAT	ST25R3913-AQWT	

ST25R3914-15	Package	Features	Part Number
High-Perf HF Readers for Automotive	WF QFN32	VHBR & AAT	ST25R3914-AQWT
	QFN32	VHBR & AAT	ST25R3914-AQFT
	WF QFN32	VHBR / No AAT	ST25R3915-AQWT
	QFN32	VHBR / No AAT	ST25R3915-AQFT

## ST25RU UHF RFID readers

ST25RU3993-80	Package	Features	Part Number
UHF Readers for Handheld devices	QFN48	Fast moving consumer good	ST25RU3980-BQFT
	QFN48	Dense reader mode	ST25RU3993-BQFT





# Evaluation Boards



# ST25TA Evaluation Boards & Kits

## Cloud ST25TA eval board

- ST25TA02KB-P NFC/RFID tag IC
- UDFPN5 package
- 18mm diameter 12 turns antenna
- 256-Byte (2-kbit) NDEF EEPROM
- Configurable GPO (Field Detection) with connector on PCB



CLOUD-ST25TA02KB

## ST25TA tag bag ASIA



ST25-TAG-BAG-A

## ST25TA tag bag EMEA



ST25-TAG-BAG-E



# ST25TV Evaluation Board

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## ST25TV eSeal Board

- ST25TV02K NFC/RFID tag IC
- UDFPN5 package
- 48x39 mm 9-turn antenna
- Custom Fast read access up to 53 Kbit/s
- Featuring Tamper detect loop



ST25TV-eSeal



# ST25DV-I2C Evaluation Boards

## ST25DV-I2C discovery kit

- ST25DV04K Dynamic NFC tag IC
- 40x24mm 10 turns antenna (ANT Class5)
- STM32F405 MCU
- 2.4" TFT LCD Touch screen
- I2C & SWIP connectors
- Daughter board connector



ST25DV-DISCOVERY

## ST25DV-I2C Nucleo shield

- ST25DV04K Dynamic NFC tag IC
- Ø54mm 8 turns single layer antenna etched
- Energy harvesting, Low Power mode, GPO
- Compatible with STM32 Nucleo boards
- I2C interface to MCU & Powered through Arduino™ connector



X-NUCLEO-NFC04A1

## ST25DV-I2C Antenna kit

- ST25DV04K Dynamic NFC tag IC
- Ready-to-use PCB including:
- 45x75mm (ST25DV\_Discovery\_ANT\_C1)
- 18x24 mm (ST25DV\_Discovery\_ANT\_C6)
- Energy Harvesting output (Vout)
- Mates with ST25Dx\_Discovery MBoard



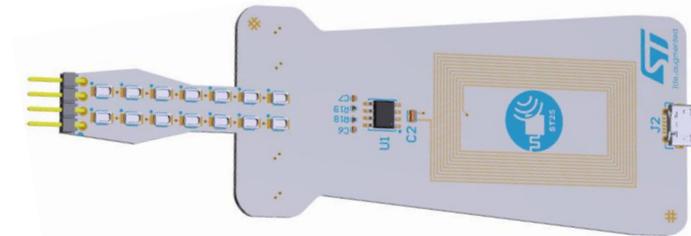
ANT-1-6-ST25DV



# ST25DV-PWM Evaluation Board

## ST25DV-PWM discovery kit

- ST25DV02K-W Dynamic NFC tag IC
- 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



ST25DV-PWM-eSET

Available in June 2018



# M24SR Evaluation Boards

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## M24SR discovery kit

- 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-DISCO-PREM

## M24SR Nucleo shield board

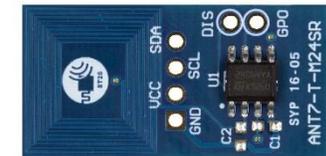
- M24SR64 Dynamic NFC Tag IC
- 31x30mm 5 turns double layer antenna
- Compatible with STM32 Nucleo boards
- I2C interface to MCU through Arduino™ connector
- Open drain output for MCU wake-up



X-NUCLEO-NFC01A1

## M24SR ANT7 board

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



ANT7-T-M24SR

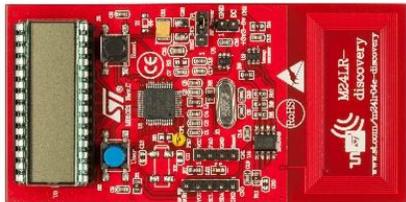


# M24LR Evaluation Boards

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## M24LR discovery kit

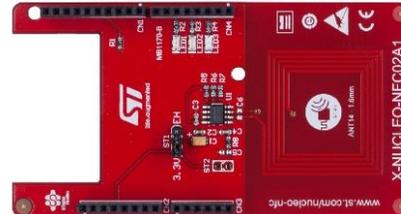
- M24LR04E Dynamic NFC/RFID tag IC
- 20x40mm 9 turns antenna
- STM8L152 micro-controller
- LCD display
- I2C & SWIP connectors
- Temperature sensor



M24LR-DISCOVERY

## M24LR Nucleo shield board

- M24LR04E Dynamic NFC/RFID tag IC
- 30x30mm 5 turns double layer etched antenna
- Energy harvesting feature
- Compatible with STM32 Nucleo boards
- I2C interface to MCU & Powered through Arduino™ connector



X-NUCLEO-NFC02A1

## M24LR ANT7 board

- M24LR04E Dynamic NFC/RFID tag
- 14x14mm dual layer etched antenna
- I2C test points to connect to MCU
- GPO RF WIP / RF BUSY (RF)
- Analog Energy Harvesting output (EH)



ANT7-T-M24LR



# CR95HF Evaluation Boards

## CR95HF demo board

- CR95HF NFC multi-protocol reader IC
- 47x34 mm 2 turns double layer antenna etched on PCB and associated tuning circuit
- STM32F1 micro-controller
- USB & JTAG connectors



M24LR-DISCOVERY

## CR95HF Nucleo shield board

- CR95HF NFC multi-protocol reader IC
- 47x34mm 4 turns antenna etched on PCB
- SPI (Slave interface) or UART
- Up to 528-byte command/reception buffer
- Optimized power management
- Powered through Arduino™ UNO R3 connector



X-NUCLEO-NFC03A1



# ST95HF Evaluation Boards

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## ST95HF discovery kit

- ST95HF NFC transceiver IC
- 47x34mm 4 turns antenna
- STM32F1 micro-controller
- LCD color display + Joystick + LEDs
- USB & JTAG connectors



EVAL-ST95HF



# ST25R3911B Evaluation Boards

## ST25R3911B discovery kit

- ST25R3911B HF reader / NFC initiator IC
- 105x52mm 2 turns antenna and associated VHBR tuning circuit
- STM32L476RET6 32-bit MCU
- Micro-USB connector
- Additional UART / I<sup>2</sup>C Host interfaces, as well as NFC SPI and JTAG/SWD points



ST25R3911B-DISCO

## ST25R3911B Nucleo shield board

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



X-NUCLEO-NFC05A1

## ST25R3911B EMVCo Demo kit

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



ST25R3911B-EMVCO

# Solutions for NFC / RFID Tags and Readers



**Thank You!**



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