NFC/RFID Tags and Readers

- ST NFC Sensor Tag
- ST NFC Sensor Tag Form Factor Reference Design
- ST NFC Sensor Tag Open Development Platform
- ST NFC Sensor Tag Use Cases
- ST25 Portfolio / Evaluation Kits Overview
NFC Sensor TAG

- **LOW POWER**
- **LOW COST**
- **EASY TO IMPLEMENT**

**Featuring ST25DV NFC Dynamic Tag ISO15693 T5T NFC Forum**
- Energy Harvesting / Fast Transfer Mode / Low Power Mode / GPOs

**Ideal for:** IoT / Supply & Cold-Chain Management / Smart building, home, city and Farming / Retail and apparel / Smart packaging / Medical & pharmaceutical / Battery less sensing

**Components:**
- ST25DV64 NFC Dynamic Tag ISO15693 TypeV
- LPS22HB Barometer
- LIS2DW12 Accelerometer
- HTS221 Humidity + Temp.
- STM32L0x1 MCU
- Cortex®-M0 Ultra-low-power RTC w/ calibration
- LIS2DW12 Accelerometer
- Opt 1: No Battery (Full Passive)
- Opt 2: Battery assisted (not Rechargeable)
- Opt 3: Battery Assisted (Rechargeable)
NFC Sensor TAG - ODE

LOW POWER
LOW COST
EASY TO IMPLEMENT

Featuring ST25DV NFC Dynamic Tag ISO15693 T5T NFC Forum
Energy Harvesting / Fast Transfer Mode / Low Power Mode / GPOs

Ideal for: IoT / Supply & Cold-Chain Management / Smart building, home, city and Farming / Retail and apparel / Smart packaging / Medical & pharmaceutical / Battery less sensing

ST25DV64
NFC Dynamic Tag
ISO15693 TypeV
Energy Harvesting
Low power I2C bus
Up to 64Kb NVM

HTS221
Humidity +Temperature
Hum accuracy ± 3.5% rH
Temp accuracy ± 0.5 °C

LIS2DW12 Ultra-low-pwr
3-axis accelerometer
50 nA in power-down
±2g/±4g/±8g/±16g select full scales

LPS22HB Barometer
Pressure 260-1260 hPa
Water res/dust immune, Acc. 6cm

STM32L0x1 MCU
Cortex®-M0
Ultra-low-power
RTC w/ calibration
Battery Life Profile / Average

(Ref. CR2032 240mA/h batt.)

Measuring Condition:
- All sensors are selected (active)
- All sensors values are stored (written) to the NFC DTag each time (at selected sample rate)
Cloud Connectivity

• NFC reader app publishes MQTT messages to a given MQTT topic.

• AWS forwards these messages to all clients that are subscribed to the topic.
PC GUI
Use Case Example - Summary

Supply Chain & QC
- from manufacturing to end user.

Smart building/home/city:
- Environmental and Motion Data
- Building/Constructions Structure

Agriculture & Planting
- Humidity, Temperature, light...

Retail/ Fitness
- Smart Clothing / Patches: Activity, Temperature, Sweat, mktg...

Healthcare:
- Medical patches & loggers: Patient temperature & activity monitoring

Animal tracking
- Activity, Temperature, big data monitoring production, health...

Perishable Goods:
- Exp. date alert, Shelf/Storage Life Calculation/Condition of goods

Smart Packaging:
- Temperature, Vibration Use, ID, ...

And much more...
ST NFC Sensor TAG

NFCSensorTAG is an NFC-enabled sensor node that can sense temperature, humidity, pressure, vibration, motion and transmit the data when triggered by an NFC reader. It is a reference platform that can be scaled down/up based on requirement of final applications and use cases.

An alternative way to connect for applications that:

• Are extremely low POWER (also full passive) and low COST;

• Require small real estate (reduced BOM) and fast implementation;

• Do NOT require Real-Time Remote monitoring (Near Field Communication)
ST NFC Sensor TAG Benefits

- **Low Cost** compared to other Wireless Technologies. Reduced BOM (doesn’t require RF matching circuitry), Lower cost RF IC, simplified Layout (low-cost PCB), low-cost certification.

- **Low Power**: Ultra Low Power Connectivity, Computing and Sensing Technologies allow long battery life and battery-less operations.

- **Easy to implement**: easy certifications (Passive RF)

- **Flexible**: scalable to the right configuration for many applications

- **Enhanced added-value features** can be implemented though NFC TAGs (ID, Error Logs, Security, FW upgrade…)
Addressing multiple Needs & Markets
Asset Tracking

Monitoring goods from Manufacturing to the end User

NFC → Secure (Near Field). Interoperability with Smartphone and/or dedicated Reader → Cloud

Temperature, Humidity & Pressure → Monitoring for Goods sensitive to environmental changes

Motion Sensors to detect Vibrations, Shocks, Freefall etc…which can damage/alter the goods

Low Power → Passive RF Tag (also battery less operation) / Long lasting battery life

Low Cost → Reduced BOM / Low cost connectivity.

Scalable → easy to add or remove sensors based on use case.
• Environmental and Motion Data Monitoring (Smart Badge / Weather Stations…)  
• Building/Constructions Structure Monitoring (Vibration alert, Pipe Leaks…)
Smart Packaging

- Connect the “Unconnected”
- Temperature, Humidity, Vibration
- Level of Content and Use information
- Good ID / info / Commerce / Experience
• Temperature Patches (also disposable)
• Patient activity tracker (also disposable)
Perishable Goods

- Condition of goods monitoring
- Shelf/Storage Life Calculation
- Exp. date alert
- Product ID/info/History
Smart Baggage

- Baggage Check-in/out
- Baggage ID and Geo-Location
- In-flight condition monitoring
Condition monitoring enables to implement a predictive maintenance strategy by taking regular vibration measurements from sensors and comparing them to a baseline to detect health degradation.

Defects/wears have different signature

Audio
Microphones to capture noise and for ultrasound emissions

Motion
MEMS Sensors

Environmental
Humidity and Pressure

Temp Sensors

Microphone
For Audio and Ultrasound

Vibration Measurements

Imbalance
Looseness
Output shaft
Gear Mesh

Defects/wears have different signature
NFC TAGs – Connecting the Unconnected

LOW POWER (battery-less)
LOW COST
EASY TO IMPLEMENT

Featuring ST25TV NFC Tag
ISO15693 T5T NFC Forum certified.
Tamper Detection, eSignature, Long Range (100pF tuning Cap), 512b to 64Kbit user memory.

Ideal for: IoT / Supply Chain / Retail and apparel / Smart packaging / Brand Protection / Consumer Engagement / Medical & pharmaceutical / …
NFC TAGs – Connecting the Unconnected
Temper Detect Function

LOW POWER (battery-less)
LOW COST
EASY TO IMPLEMENT

Featuring ST25TV NFC Tag
ISO15693 T5T NFC Forum certified. Tamper Detection, eSignature, Long Range (100pF tuning Cap), 512b to 64Kbit user memory.

Ideal for: IoT / Supply Chain / Retail and apparel / Smart packaging / Brand Protection / Consumer Engagement / Medical & pharmaceutical / …
NFC TAGs – Connecting the Unconnected Data Management Dashboard

Provided by ST Partners

Featuring ST25TV NFC Tag
Scan counts / Scan by Device, OS, application, Geo-Location…
Customer communication
Accessory Identification
Main Unit (NFC Reader) to Accessories (NFC Tag)

Enhanced User Experience
Clone detection / Password Protection / URL redirect / Product information / Same product rebuy
NFC/RFID Tags and Readers

- NFC/RFID Tag
- Dynamic NFC Tag
- Secure NFC
- NFC / RFID Reader
- NFC Controller

- NFC/RFID Readers
- NFC Dynamic TAGS
- NFC/RFID TAG
- Evaluation Kits
High-Performance NFC/RFID Readers
ST25R
# ST NFC/RFID Front-end Portfolio

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Card emulation mode</td>
<td>Yes (ST95HF)</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>P2P mode</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RF speed</td>
<td>848kbps</td>
<td>848kbps</td>
<td>6.8Mbps (VHBR)</td>
<td>848kbps</td>
<td>848kbps</td>
</tr>
<tr>
<td>Market certification</td>
<td>-</td>
<td>Payment (EMVco, PBOC, mini-pay)</td>
<td>Payment (EMVco, PBOC, mini-pay)</td>
<td>Automotive AEC-Q100 Grade 1</td>
<td>Payment, Automotive AEC-Q100 Grade 1</td>
</tr>
<tr>
<td>Advanced features</td>
<td>Ind wake-up</td>
<td>AAT (3913 only) DPO, Ind wake-up</td>
<td>AAT, DPO, Cap &amp; Ind wake-up</td>
<td>AAT (3914) DPO, Cap &amp; Ind wake-up</td>
<td>AAT, DPO, Cap &amp; Ind wake-up</td>
</tr>
<tr>
<td>HW Interface</td>
<td>SPI 2Mbps, UART</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
</tr>
<tr>
<td>SW Interface</td>
<td>Unified Software Library for Frontends</td>
<td>Unified Software Library for Frontends</td>
<td>Unified Software Library for Frontends</td>
<td>Unified Software Library for Frontends</td>
<td>Unified Software Library for Frontends</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.7V - 5.5V</td>
<td>2.4V – 5.5V</td>
<td>2.4V – 5.5V</td>
<td>2.4V – 5.5V</td>
<td>2.4V – 5.5V</td>
</tr>
<tr>
<td>Output power</td>
<td>0.23W</td>
<td>1.0W</td>
<td>1.4W</td>
<td>1.0W</td>
<td>1.6W</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-25°C to +85°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
</tr>
<tr>
<td>Package</td>
<td>QFN32 (5x5 mm) / WLCSP (3912 only)</td>
<td>QFN32 (5x5 mm) / Wafer</td>
<td>QFN32 (5x5 mm) / WF</td>
<td>QFN32 (5x5 mm) / WF / WLP</td>
<td>QFN32 (5x5 mm) / WF / WLP</td>
</tr>
</tbody>
</table>

**Abbreviations**
- VHBR: Very High Baud Rate
- P2P: Peer to Peer mode
- AAT: Automatic Antenna Tuning
- AWS: Active Wave Shaping
- CR95HF: Entry-Level Reader
- ST25R3912/13: Mid-Range Reader & NFC initiator
- ST25R3911B: High-Perf Reader & NFC Frontend
- ST25R3914/15: High-Perf Reader & NFC Frontend for Automotive
- ST25R3916/19: Ultimate NFC Frontend

**Cap & Ind wake-up:** Capacitive & Inductive wake-up
**ALM:** Active Low Modulation
**VHBR:** Very High Baud Rate
**NCI:** NFC Controller Interface
**ANS:** Active Noise Suppression
**DPO:** Dynamic Power Output
**DSA:** Drive Slope Adjustment
Key Use Cases

- Accessory IDs
- Automotive
- Payment Terminals
- Access Control (Physical/Logical)
- Gaming / Entrainment
- Smart Home / Smart Building
- Peer-to-Peer
- NFC + Qi
- FW Upgrade / Streaming
- Transport
# ST25R UHF Readers

<table>
<thead>
<tr>
<th></th>
<th>ST25RU3993</th>
<th>ST25RU3980</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>UHF RFID Reader for Mobile and Fast Moving Consumer Goods applications</td>
<td>UHF RFID Reader for Mobile and Fast Moving Consumer Goods applications</td>
</tr>
<tr>
<td><strong>Contactless interface</strong></td>
<td>ISO18000-6c/b</td>
<td>ISO18000-6c</td>
</tr>
<tr>
<td><strong>Market certification</strong></td>
<td>EPC Gen 2</td>
<td>-</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>-90dBm</td>
<td>-90dBm</td>
</tr>
<tr>
<td><strong>Advanced features</strong></td>
<td>Internal VCO&lt;br&gt;Dense Reader Mode&lt;br&gt;Linear RSSI &amp; Phase Bit&lt;br&gt;Automatic PSRR regulation&lt;br&gt;Auto ACK</td>
<td>Internal VCO&lt;br&gt;Dense Reader Mode&lt;br&gt;Linear RSSI &amp; Phase Bit&lt;br&gt;Automatic PSRR regulation&lt;br&gt;Auto ACK</td>
</tr>
<tr>
<td><strong>Interface</strong></td>
<td>SPI 5Mbps</td>
<td>SPI 5Mbps</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>1.65V – 5.5V</td>
<td>1.65V – 5.5V</td>
</tr>
<tr>
<td><strong>Output power</strong></td>
<td>0dBm / 20dBm</td>
<td>0dBm</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
<td>-40 to +85°C</td>
<td>-40 to +85°C</td>
</tr>
<tr>
<td><strong>Package</strong></td>
<td>48-pin QFN (7x7mm)</td>
<td>48-pin QFN (7x7mm)</td>
</tr>
</tbody>
</table>

VCO: Voltage Controlled Oscillator  
RSSI: Received Signal Strength Indicator  
PSRR: Power Supply Rejection Ratio  
ACK: ACKnowledge
NFC/RFID Dynamic Tags
ST25D
NFC Comprehensive Solutions

Ticketing, Gaming, Medical, Brand protection, Access control, …
www.st.com/st25t

Industrial, Consumer, Metering, Appliance, …
www.st.com/st25d

Infrastructure, EMVCo, Automotive, Consumer, …
www.st.com/st25r
# Product Line-up by Key Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>M24SR</th>
<th>M24LR</th>
<th>ST25DV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contactless Interface</td>
<td>ISO14443A / NFC T4</td>
<td>ISO15693 / NFC</td>
<td>ISO15693 / NFC T5</td>
</tr>
<tr>
<td>RF range</td>
<td>Short range (up to 10 cm)</td>
<td>Long range (up to 1 m)</td>
<td>Long range (up to 1 m)</td>
</tr>
<tr>
<td>RF speed</td>
<td>106kbps</td>
<td>26kbps</td>
<td>26kbps</td>
</tr>
<tr>
<td>Serial Interface</td>
<td>I2C @1MHz</td>
<td>I2C @400kHz</td>
<td>I2C @1MHz</td>
</tr>
<tr>
<td>Fast Transfer mode</td>
<td>No</td>
<td>No</td>
<td>Yes (256B buffer)</td>
</tr>
<tr>
<td>Energy Harvesting</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Digital output</td>
<td>Open-Drain GPO</td>
<td>Open-Drain GPO</td>
<td>OD or CMOS GPO</td>
</tr>
<tr>
<td>Extra features</td>
<td>RF Disable</td>
<td>-</td>
<td>RF Disable-Sleep / Low Power Down Mode</td>
</tr>
<tr>
<td>Memory format</td>
<td>EEPROM (preformatted NDEF file)</td>
<td>EEPROM data</td>
<td>EEPROM data</td>
</tr>
<tr>
<td>Memory size</td>
<td>2 / 4 / 16 / 64-Kbit</td>
<td>4 / 16 / 64-Kbit</td>
<td>4 / 16 / 64-Kbit</td>
</tr>
<tr>
<td>Data protection</td>
<td>Password 128-bit</td>
<td>Password 32-bit</td>
<td>Password 64-bit</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40°C to +85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Package</td>
<td>SO8 / TSSOP8 / FPN8 / FPN12 / SBN12 / FPN12* / WLCSP10 *</td>
<td>In production</td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td>In production</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Key Use Cases

**In-Line Customization**
(no cable, no power needed @ factory or warehouse)

**IDs Storage**
(SN/manufacturing history)

**Static and Dynamic Wireless Pairing**

**Commissioning**
(to home/private network)

**Transfer Settings**
(by users or installers)

**Data/Event Logging**

**Smart Sensing**
(full or Semi-Passive)

**Battery Less Operations**

**FW Upgrade Maintenance**

---

Smart **Sensing**, Smart **Home**, Smart **Packaging**, Cold Chain/Logistic Monitoring, **Medical Patches**, Smart **Clothing**, Smart **City**, Smart **Meters**, Smart **Accessories/Refills**, Figurine **Gaming**, ....
ST25DV-PWM Dynamic NFC Tag

**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
NFC Comprehensive Solutions

- **Tags**
  - ST25T
  - 13.56MHz
  - NFC phone / RFID Reader

- **Dynamic tags**
  - STM32 microcontroller
  - ST25D
  - 13.56MHz
  - NFC phone / RFID Reader

- **Frontends + Controllers**
  - STM32 microcontroller
  - ST25R
  - SoC NCI 2.0
  - ST25N
  - 13.56MHz
  - NFC phone

**Ticketing, Gaming, Medical, Brand protection, Access control, …**
www.st.com/st25t

**Industrial, Consumer, Metering, Appliance, …**
www.st.com/st25d

**Infrastructure, EMVCo, Automotive, Consumer, …**
www.st.com/st25r
NFC Forum Standards

- **ISO14443**
  - Type A and Type B
  - « Short Range »
  - 106kbps

- **ISO15693**
  - « Long Range »
  - 26kbps

- **NFC Forum**
  - Type 2 and Type 4
  - **NFC Forum**
  - Type 5 *

- **NDEF (NFC Data Exchange Format)**

(*) ISO15693 integrated in NFC Forum specifications in October 2015 as NFC Forum type 5 (aka type V)
• ISO14443 (NFC Forum Type 2 & Type 4) is called « short range » standard while with higher RF speed
• ISO15693 (NFC Forum Type 5) is called « long range » standard
## ST25T NFC/RFID Tags Product Line-up

<table>
<thead>
<tr>
<th>Key Features</th>
<th>ST25TA512/02K</th>
<th>ST25TV512/02K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>ISO14443A Type 4 NFCF</td>
<td>ISO15693 Type 5 NFCF</td>
</tr>
<tr>
<td>Memory size</td>
<td>512b/2Kb</td>
<td>512b/2Kb (2xUser Memory Area/64 blocks of 4B)</td>
</tr>
<tr>
<td>RF Tuning Cap</td>
<td>50 pF</td>
<td>23 / 99.7pF</td>
</tr>
<tr>
<td>Data rate</td>
<td>106Kbps</td>
<td>up to 53kbps</td>
</tr>
<tr>
<td>UID</td>
<td>64bit</td>
<td>64bit</td>
</tr>
<tr>
<td>Data protection UM</td>
<td>128bit PSW</td>
<td>2x32/1x64bit encrypted PSW</td>
</tr>
<tr>
<td>Counter</td>
<td>20bit (W/R)</td>
<td>16bit (W/R)</td>
</tr>
<tr>
<td>eSignature TruST25</td>
<td>256b Register</td>
<td>256b Register</td>
</tr>
<tr>
<td>Tamper Detect</td>
<td>NA</td>
<td>√</td>
</tr>
<tr>
<td>Kill / Privacy Mode</td>
<td>NA</td>
<td>√</td>
</tr>
<tr>
<td>Electrical Article Surveillance</td>
<td>NA</td>
<td>√</td>
</tr>
<tr>
<td>AFI / DSFI</td>
<td>NA</td>
<td>√</td>
</tr>
</tbody>
</table>
Product Line-up by Key Features

- **Smart Factory**
- **Inventory Management**
- **Register Warranty, Web redirect**
  (customer engagement/commerce)
- **Clone Detection**
- **Tap & Download or Launch APK**
- **Static Wireless Pairing**
- **Accessories IDs + Usage monitoring**
- **Check-in into Games**
- **Product information**
- **Item Check-in/Out**
- **Ticketing**

Smart **Packaging**, Smart **Clothing**, Smart **City, Accessories** and **Refills**, Smart **Buildings**, Figurine **Gaming, Transport**, Smart **Library/Retail,**...
### ST25 Certification & Interoperability

<table>
<thead>
<tr>
<th>Tags</th>
<th>Dynamic tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST25TV</td>
<td>ST25DV</td>
</tr>
<tr>
<td>ST25TA</td>
<td>M24LR</td>
</tr>
<tr>
<td>ST25TB</td>
<td>M24SR</td>
</tr>
</tbody>
</table>

- **ST25T**
  - NFC Forum
  - Android
  - Apple
  - Not for NFC applications (RFID, ticketing)

- **ST25D**
  - NFC Forum
  - Android
  - Apple
  - Not for NFC applications (RFID, ticketing)

- **Tags**
  - ST25DV
  - M24LR
  - M24SR

- **Dynamic tags**
  - ST25DV: Legacy product, not focusing on NFC applications
  - M24LR: All parameters OK except chaining during write operations (***)

(*) 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
Ecosystem & Evaluation Kits
Ecosystem

- STM32Nucleo hardware ecosystem
- Discovery kit STM32 based
- Antenna e-design tool
- Schematic, BOM, Gerber
- Mobile Apps ST25 SDK
- STM32Cube software ecosystem
- PC software tool ST25 SDK
- Documentation
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

**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

**ST25T tag bag**
- ST25-TAG-BAG-E

Cloud ST25TA eval board: CLOUD-ST25TA02KB

ST25TV-eSeal: ST25TV-eSeal

ST25T tag bag: ST25-TAG-BAG-E
## ST25DV-I2C Evaluation Boards

<table>
<thead>
<tr>
<th>ST25DV-I2C Discovery kit</th>
<th>ST25DV-I2C Nucleo shield</th>
<th>ST25DV-I2C Antenna kit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ST25DV04K Dynamic NFC tag IC</strong>&lt;br&gt;40x24mm 10 turns antenna (ANT Class5)&lt;br&gt;STM32F405 MCU&lt;br&gt;2.4&quot; TFT LCD Touch screen&lt;br&gt;I2C &amp; SWIP connectors&lt;br&gt;Daughter board connector</td>
<td><strong>ST25DV04K Dynamic NFC tag IC</strong>&lt;br&gt;Ø54mm 8 turns single layer antenna etched&lt;br&gt;Energy harvesting, Low Power mode, GPO&lt;br&gt;Compatible with STM32 Nucleo boards&lt;br&gt;I2C interface to MCU &amp; Powered through Arduino™ connector</td>
<td><strong>ST25DV04K Dynamic NFC tag IC</strong>&lt;br&gt;Ready-to-use PCB including:&lt;br&gt;45x75mm (ST25DV_Discovery_ANT_C1)&lt;br&gt;18x24 mm (ST25DV_Discovery_ANT_C6)&lt;br&gt;Energy Harvesting output (Vout)&lt;br&gt;Mates with ST25Dx_Discovery MBoard</td>
</tr>
</tbody>
</table>

### ST25DV-Discovery ANT_C5

### X-NUCLEO-NFC04A1

### 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
## ST25R3911B Evaluation Boards

<table>
<thead>
<tr>
<th>ST25R3911B Discovery kit</th>
<th>ST25R3911B Nucleo shield board</th>
<th>ST25R3911B EMVCo Demo kit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ST25R3911B</strong> HF reader / NFC initiator IC</td>
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</tr>
<tr>
<td>105x52mm 2 turns antenna and associated VHBR tuning circuit</td>
<td>47x34mm 4 turns antenna</td>
<td>65x74mm 2 turns antenna etched on PCB</td>
</tr>
<tr>
<td>STM32L476RET6 32-bit MCU</td>
<td>Compatible with STM32 Nucleo boards</td>
<td>STM32L476 32-bit MCU</td>
</tr>
<tr>
<td>Micro-USB connector</td>
<td>Equipped with Arduino™ UNO R3 connector</td>
<td>Micro-USB connector</td>
</tr>
<tr>
<td>Additional UART / PC Host interfaces, as well as NFC SPI and JTAG/SWD points</td>
<td></td>
<td>Comprehensive Device Test Environment (DTE) for EMVCo Level 1 FW control</td>
</tr>
</tbody>
</table>

- **ST25R3911B DISCO**
- **X-NUCLEO-NFC05A1**
- **ST25R3911B-EMVCO**

ST25R3911B Discovery kit and Nucleo shield are also valid for ST25R3912, ST25R3913, ST25R3914 and ST25R3915
### ST25R3916 Evaluation Boards

<table>
<thead>
<tr>
<th>ST25R3916 Discovery kit</th>
<th>ST25R3916 Nucleo shield board</th>
<th>ST25R3916 EMVCo Demo kit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ST25R3916-DISCO Antenna</strong>&lt;br&gt;Gerber, BOM, Altium&lt;br&gt;ST25R3916 DISCO GUI + new Tag Editor PC GUI&lt;br&gt;ST25R3916 DISCO FW</td>
<td>• X-NUCLEO-NFC06A1 HW&lt;br&gt;• Databrief, User Manual, Schematic, Gerber, BOM, Altium&lt;br&gt;• X-NUCLEO-NFC06A1 FW</td>
<td>• ST25R3916-EMVCo-RD&lt;br&gt;• Databrief, User Manual, Schematic, Gerber, BOM, Altium&lt;br&gt;• ST25R3916 EMVCo L1 GUI&lt;br&gt;• ST25R3916 EMVCo L1 FW&lt;br&gt;• ST25R3916 EMVCo L2 FW&lt;br&gt;• EMVCo Cookbook&lt;br&gt;• EMVCo L2 Demo App</td>
</tr>
<tr>
<td><img src="image1" alt="ST25R3916-DISCO" /></td>
<td><img src="image2" alt="X-NUCLEO-NFC06A1" /></td>
<td><img src="image3" alt="ST25R3916-EMVCO" /></td>
</tr>
</tbody>
</table>

ST25R3916 Discovery kit and Nucleo shield are also valid for ST25R3919.