NFC in Automotive

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The Digital Key and Beyond

Leverage all the capabilities NFC technology!
Automotive NFC Key Drivers

Keyless GO hacked

Keyless GO systems are not considered secure anymore. Industry considers NFC as a safe replacement.

Key cost reduction

A NFC Keycard with cryptography costs <<1$
A Keyfob replacement costs 120~800$
=> considerable cost reduction also for initial production costs on both car & key side.

Key Management solved

E-call (a safety feature) 3G/LTE uplink mandatory for all cars starting 2018.

First cars available with NFC

A leading electric automotive car maker decided to equip all of his cars with NFC capability for door lock and start.
There are already models available which implement NFC door locks.
The Digital Key

Center Console
Protect, pair & authenticate

Keyfob
Access & exchange data

Door
Access & authenticate
Wireless Charging & NFC Card Detection
Door Handle Demo

- Door Handle board features:
  - ST25R3920
  - STM8A MCU (automotive grade)
  - USB, LIN, CAN interfaces
  - Status LEDs
  - USB power supply
  - 12V power supply
Combine NFC + Qi for Protection

The NFC reader can protect customer cards

Qi Charger

MCU

NFC Reader
Configure to your Taste
Enhance Customer Experience

Automatic out-of-the-box connection

Opportunity to leverage NFC readers installed in cars

+ Wireless charging (Qi)

Connect
Disconnect
Ad-Hoc Audio
Consumables in Cars

Authentication and detection of consumables

- Proof of origin
- Lifetime counter
- Parts in place
- Parameter readout
  - Temperature
  - Voltage
  - …
From NFC for Digital Key…
Car access & start
Safe wireless Qi charging
Personal settings & secure pairing
Diagnostics & payment
Consumable authentication

... to Beyond the Key!
Automotive Requirements

**Large operating volume**
ST25R3914/15 offers highest output power combined with automatic antenna tuning.

**Low power consumption**
ST25R3914/15 offers low power wakeup functionality combining inductive sensors.

**Wide Interoperability**
ST25R3914/15 offers excellent P2P compatibility with NFC devices.

**EMC performance**
Benefits in Automotive

• **No external Booster required for required performance**
  • ST25R3914/15 offers by far the highest output power of all readers on the market. No additional booster circuitry is required. This is critical with small antennas and metal environment.

• **Programmable Low power wakeup**
  • Optimized for operation in battery mode

• **Automatic antenna tuning**
  • Reader is independent on placement. Influence of multiple objects (tags or others) is minimized
  • Higher efficiency / less power consumption

• **Fastest time to market (Dynamic Power adjustment, Automatic Gain Control, Squelch Feature)**
  • ST25R3914/15 reduced time to market at our customers significantly vs. competitor solutions
<table>
<thead>
<tr>
<th></th>
<th>ST25R3911B</th>
<th>ST25R3912/13</th>
<th>ST25R3916</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>High-Performance NFC Forum Reader</td>
<td>Mid-Range NFC Forum Reader</td>
<td>High-performance NFC Universal Device &amp; EMVCo Reader</td>
</tr>
<tr>
<td><strong>Card emulation</strong></td>
<td>-</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>AP2P mode</strong></td>
<td>Initiator &amp; Target</td>
<td>Initiator &amp; Target</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>PP2P mode</strong></td>
<td>Initiator</td>
<td>Initiator</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>RF speed</strong></td>
<td>6.8Mbps (VHBR)</td>
<td>848kbps</td>
<td>848kbps</td>
</tr>
<tr>
<td><strong>Market certification</strong></td>
<td>Payment, Industrial</td>
<td>Access Control, Metering, Consumer</td>
<td>Payment, Industrial, Consumer</td>
</tr>
<tr>
<td><strong>Advanced features</strong></td>
<td>AAT, DPO, CWU</td>
<td>DPO, MU, AAT (3913 only)</td>
<td>AAT, DPO, NSR, DSA, AWS, CWU, EMD</td>
</tr>
<tr>
<td><strong>HW Interface</strong></td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 10Mbps // FIC</td>
</tr>
<tr>
<td><strong>SW Interface</strong></td>
<td>Real Unified Software Library for Frontends</td>
<td>Real Unified Software Library for Frontends</td>
<td>Real Unified Software Library for Frontends</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>2.4V – 5.5V</td>
<td>2.4V – 5.5V</td>
<td>2.4V – 5.5V</td>
</tr>
<tr>
<td><strong>Output power</strong></td>
<td>1.4W</td>
<td>1.0W</td>
<td>1.6W</td>
</tr>
<tr>
<td><strong>Temperature range</strong></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><strong>Package</strong></td>
<td>QFN32 (5x5 mm) / Wafer</td>
<td>QFN32 (5x5 mm) / WLCSP (3912 only)</td>
<td>QFN32 (5x5 mm) WF / WLP</td>
</tr>
<tr>
<td><strong>ST25R3914</strong></td>
<td>Automotive Grade NFC Forum Reader</td>
<td>Automotive Grade NFC Forum Reader</td>
<td>Automotive Grade NFC Universal Device</td>
</tr>
<tr>
<td><strong>ST25R3915</strong></td>
<td>Automotive Grade NFC Forum Reader</td>
<td>Automotive Grade NFC Universal Device</td>
<td></td>
</tr>
<tr>
<td><strong>ST25R3920</strong></td>
<td>Automotive Grade NFC Universal Device</td>
<td>Automotive Grade NFC Universal Device</td>
<td>Automotive Grade NFC Universal Device</td>
</tr>
</tbody>
</table>

**Notes:**
- **VHBR:** Very High Baud Rate
- **NCI:** NFC Controller Interface
- **AAT:** Automatic Antenna Tuning
- **DPO:** Dynamic Power Output
- **AWS:** Active Wave Shaping
- **CIWU:** Capacitive & Inductive Wakeup
- **EMD:** Automatic EMD suppression
- **DSA:** Drive Slope Adjustment
- **ANS:** Active Noise Suppression
- **IWU:** Inductive Wakeup
ST25RU3993 UHF Reader
UHF Markets

- Retail
- Automation
- Authentication
- Smart Home
- Healthcare
- Transport
- IoT

4G LTE

WiFi

Bluetooth
UHF Applications

Medical
- Patient tracking
- Asset management
- Automated inventory
- Access Control

Manufacturing
- Intelligent sensing
- Item level tracking
- Inventory/Asset management
- Manufacturing optimization

Retail
- Automated Inventory Control
- Security/ Loss Prevention
- Door to Door tracking
- Authentication

Smart Home
- Intelligent Sensing
- Smart Appliance
- Asset Management
### 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
- Differential input & 20dBm internal PA or 0dBm output
- 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
ST25RU3993-EVAL Evaluation Board

The ST25RU3993-EVAL is based on the ST25RU3993 high performance Rain (UHF) RFID reader IC and an STM32L476 MCU. A short range antenna is included which allows communication on <50cm. For greater distances other UHF antennas can be connected via two SMB (female) antenna connectors, which can be controlled via the GUI.

Features:

- External PA: 29 dBm max TX power
- Internal PA: 18 dBm max TX power
- Differential RX input
- Max. sensitivity: -80 dBm
- Frequency: 840 MHz – 960 MHz
- Two antenna connectors: SMB (F)
- 28cm Antenna Cable
- 5x4.4cm Antenna (6x6cm PCB)

New Disclaimer Text for FCC included. Board can be sold now worldwide.