ST25R3916
product presentation

MMY Division

February 2019
ST25R3916 Benefits

• Outstanding analog performance
  • High noise immunity
  • No external amplifier required to achieve high field strength
  • Automatic antenna tuning
  • Low power wakeup
  • Excellent P2P interoperability

• Fast time to market
  • EMVCo, NFC Forum, and ISOcompliant SW library
  • Single SW library for all products
  • Full integration into STM32 eco system

• Proven solution
  • Market proven solution in the consumer and automotive space
  • Ensures best customer experience
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Reader/Writer mode</strong></td>
<td>Entry-Level NFC Reader</td>
<td>Mid-Range NFC Forum Reader</td>
<td>Mid-Range NFC Forum Reader</td>
<td>High-Performance NFC Forum Reader</td>
<td>Automotive Grade NFC Forum Reader &amp; EMVCo Reader</td>
<td>High-performance NFC Universal Device &amp; EMVCo Reader</td>
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<tr>
<td>Felica</td>
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<tr>
<td><strong>Card emulation mode</strong></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>AP2P mode</strong></td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td><strong>PP2P mode</strong></td>
<td>-</td>
<td>Initiator</td>
<td>Initiator</td>
<td>Initiator</td>
<td>Initiator</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>RF speed</strong></td>
<td>848kbps</td>
<td>848kbps</td>
<td>848kbps</td>
<td>6.8Mbps (VHBR)</td>
<td>848kbps</td>
<td>848kbps</td>
</tr>
<tr>
<td><strong>Market certification</strong></td>
<td>-</td>
<td>Payment (EMVco, PBOC, mini-pay)</td>
<td>Payment (EMVco, PBOC, mini-pay)</td>
<td>Payment (EMVco, PBOC, mini-pay)</td>
<td>Automotive AEC-Q100 Grade 1</td>
<td>Payment, Industrial, Consumer</td>
</tr>
<tr>
<td><strong>Advanced features</strong></td>
<td>IWU</td>
<td>DPO, IWU</td>
<td>AAT, DPO, IWU</td>
<td>AAT, DPO, CIWU</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
</tr>
<tr>
<td><strong>HW Interface</strong></td>
<td>SPI 2Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
<td>SPI 6Mbps</td>
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<tr>
<td><strong>SW Interface</strong></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>
<td>Unified Software Library for Frontends</td>
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<tr>
<td><strong>Power supply</strong></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>
<td>2.4V – 5.5V</td>
</tr>
<tr>
<td><strong>Output power</strong></td>
<td>0.23W</td>
<td>1.0W</td>
<td>1.0W</td>
<td>1.4W</td>
<td>1.0W</td>
<td>1.6W</td>
</tr>
<tr>
<td><strong>Temperature range</strong></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>
<td>-40°C to +125°C</td>
</tr>
<tr>
<td><strong>Package</strong></td>
<td>QFN32 (5x5 mm)</td>
<td>QFN32 (5x5 mm)</td>
<td>QFN32 (5x5 mm)</td>
<td>QFN32 (5x5 mm)</td>
<td>QFN32 (5x5 mm)</td>
<td>QFN32 (5x5 mm)</td>
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<td>/ WLCSP</td>
<td></td>
<td></td>
<td>/ Wafer</td>
<td></td>
<td>/ WF /WLP</td>
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</tbody>
</table>

**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 Wakeup
**DSA**: Drive Slope Adjustment
**NSR**: Noise Slope Suppression Receiver
**IWU**: Inductive Wakeup
ST25R3916
High-performance NFC Universal Device & EMVCo Reader

Use cases
- Ideal for **Payment** applications
- Access Control, Gaming, IOT and pairing

Key Features
- NFC Forum Device
- **1.6W** output power at 5V
- **Active Waveshaping**
- Automatic Antenna Tuning
- **Noise Suppression Receiver**
- -40°C to 125°C junction temperature range

Key Benefits
- Low power operation & Standby mode (capacitive wake-up)
- Works in challenging environment like noisy LCD displays
- Ideal for passing newest EMVCo standards
More robust against noise

Decoding at high noise level with up to 19.3dB better SNR.

Cheap/noisy LCD possible for EMVCo POS terminals.

Easiest environmental/lifetime compensation

Automatic adjustment of the tuning resonance and matching impedance driving adjustable capacitors.

Easier FCC approval

Programmable Push/Pull driver slope, minimizes high frequency EMC noise.

Faster/easier NFC Forum/EMVCo analog approval

Under/Overshoot can be reduced to achieve required wave shaping easily and fast.
Reduced/faster SW integration effort

Complete frames can be transmitted and received without SW interaction.

Time critical EMD suppression is handled automatically.

Larger operating volume/ smaller antenna

Unrivaled RX sensitivity combined with increased TX output power delivers maximum margin for challenging antenna designs.

CIWU: Capacitive & Inductive Wakeup

Low power consumption in card detection mode

Capacitive and Inductive wakeup allow for low power consumption while in card detection mode.

DPO: Dynamic Power Output

Increase Efficiency and achieve min/max Limits

The output power is adjusted automatically to reduce power and stay within certification limits.
DPO: Dynamic Power Output

- Achieve min/max power limits easier
  - The ST25R series allows to adjust the output power dynamically via Dynamic Power Output

- Optimal performance from weak to strong card response
  - ST25R series allows to adopt to different power level of card responses via Active Gain Control

- Improved noise immunity
  - Squelch feature allows to scale the signal level to have improved immunity against noise
NSR: Noise Suppression Receiver

- Proper decoding
  - Proper decoding still possible even though LCD noise level exceeds card signal strength
  - ANS jumps in as soon as the receiver locks on a card response.

- Noise immunity compared to non NSR
  - Type A 106 display noise immunity improved by a factor of 3.3 vs ST25R3911B
  - Type B 106 display noise immunity improved by a factor of 9.2 vs ST25R3911B
AWS: Active Waveshaping

- Traditional A 106 modulation pulse
- Improved A 106 modulation pulse with Over/Undershoot Protection

Over/Undershoots can be solved with register settings
No rematching of antenna required
EMD: Automatic EMD Suppression

• Automatic PCD EMD handling
  • When the ST25R3916 receives a PICC frame it is checked for transmission errors. Transmission errors are detected in real time and if the number of received bytes when a transmission error is detected is less than 4, then the PCD shall ignore the transmission and be ready to receive a new PICC frame.

• Increased Robustness
  • EMD handling enhances the robustness of the contactless communication between ST25R3916 and the PICC against PICC generated electromagnetic disturbance (EMD)
Low Power Wakeup

• Internal wakeup circuitry
  • The ST25R3916 includes a fully programmable wakeup scheme. All relevant parameters like cycle time & sensitivity can be programmed.
  • No MCU required to run the wakeup; Capacitive & Inductive wakeup can be serially combined in for sophisticated wakeup scripts

• Capacitive wakeup
  • ST25R3916 can detect capacitive changes. Eg. the approach of a hand.

• Inductive wakeup
  • The inductive wakeup is dedicated to detect approaching cards only
ST25R Support Eco-system

Documentation

- High performance NFC universal device and EM4100 reader
- Reader antenna kit
- Squirrel (8-bit microcontroller)
- AP8200Q (RFIC)

Antenna Design & Application Notes

Eval Board

- Features:
  - High performance NFC universal device and EM4100 reader
  - Reader antenna kit
  - Squirrel (8-bit microcontroller)
  - AP8200Q (RFIC)

Schematic, BOM, Gerber

PC SW tools

MCU drivers (FW)

e2e community
ST25R3916-DISCO

The ST25R3916-DISCO consists of the ST25R3916 high performance NFC universal device controlled by a STM32L476 ultra-low-power ARM Cortex-M4 MCU with 512Kbytes flash. It can be operated in stand alone mode via the LCD display or can be connected via USB to a Windows PC and controlled via the ST25R3916 GUI.

Features

- Onboard 66x66mm, two turns, 13.56 MHz inductive antenna and possibility for external antenna.
- RF Operation
  - NFC-A/B / ISO14443A/B up to 848 kbit/s
  - NFC-F / Felica™ up to 424 kbit/s
  - NFC-V / ISO15693 up to 53 kb/s
  - NFC-A / ISO14443A and NFC-F / FeliCa™ card emulation
- Active and passive peer to peer initiator and target modes, up to 424 kbit/s

Free comprehensive development library and schematics/Gerber files available.
Easier EMVCo Certification

Fast development and more freedom for payment terminals

- EMVCo development kits
- L1 EMVCo software
- L2 SW partner
- EMVCo 3.0 ready
- More flexibility on LCD
The ST25R3916-EMVCO consists of the ST25R3916 High-performance NFC Universal Device & EMVCo Reader controlled by an STM32L476 ultra-low-power ARM Cortex-M4 MCU with 512Kbytes flash. It connects via USB to a Windows PC and can be controlled via the provided EMVCo L1 software.

Features:
- Onboard 73 mm x 65 mm, two turn antenna
- LCD display
- Free EMVCo L1 software and sources
- Free Schematics, Layout, and Gerber files
Thank You!

Solutions for NFC / RFID Tags and Readers
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