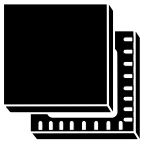
ST25R500

Data brief

Automotive high performance NFC reader for CCC digital key and car center console



VFQFPN32

(5 x 5 mm)

Product status
ST25R500

Features

AEC-Q100 qualified

Operating modes

- Reader/writer
- Card emulation

RF communication - reader/writer

- EMVCo® 3.2a analog- and digital-compliant
- NFC-A/ISO/IEC 14443A up to 848 kbit/s
- NFC-B/ISO/IEC 14443B up to 848 kbit/s
- NFC-V/ISO/IEC 15693 up to 212 kbit/s
- NFC-F/FeliCa™ up to 424 kbit/s
- Low-level modes to implement MIFARE Classic®-compliant and protocols (Kovio BC, CTS, B')

RF communication - card emulation

- NFC-A/ISO/IEC 14443A 106 kbit/s
- NFC-F/FeliCa™ 212/424 kbit/s

Key characteristics

- Passive P2P mode
- NFC Forum universal device
- CCC digital key reader
- USI WLC reader device
- Low-power inductive card detection
- I/Q demodulator with baseband channel summation
- Dynamic power output (DPO) controls the field strength to stay within given limits (software feature)
- Active wave shaping (AWS) reduces both overshoots and undershoots
- Noise suppression receiver (NSR) allows reception in a noisy environment
- Serial peripheral interface (SPI) up to 10 Mbit/s
- Possibility to drive one differential or two independent single-ended antennas

Electrical characteristics

- Wide supply voltage range: 2.7 V to 5.5 V
- Wide peripheral communication supply range: 1.65 to 5.5 V
- Wide ambient temperature range: -40 °C to +125 °C
- Quartz oscillator capable of operating with 27.12 MHz crystal with fast startup

Application

The ST25R500 is suitable for a wide range of applications, among them:

- Automotive access control
- Center console applications and NFC charging
- CCC digital key
- Automotive infrastructure application

1 Description

The ST25R500 is an automotive grade high-performance NFC universal device supporting NFC initiator, NFC target, NFC reader, and NFC card emulation modes. Designed for CCC (Car Connectivity Consortium®) digital key applications, the device enables fast product development for car access/start applications in areas like door handle or center console, and enables additional functionality, like pairing or NFC card protection combined with a Qi charger. Being very robust and noise tolerant while at the same time reducing electromagnetic emission, the device works even under harsh conditions, enabling an easier certification.

The device includes an advanced analog front end (AFE) and a highly integrated data framing system for NFC-A/B (ISO/IEC 14443A/B) reader, including higher bit rates, NFC-F (FeliCa™) reader, NFC-V (ISO/IEC 15693) reader up to 212 kbps, and NFC-A/NFC-F card emulation.

It meets the most demanding requirements set by car and phone OEMs, delivering market-leading performance and ensuring a superior user experience.

The device features high RF power with dynamic power output to directly drive antennas at high efficiency, achieving large interaction distances even with small antenna sizes common in door handles. The device includes additional features, making it incomparable for low-power applications. It offers low-power card detection by performing a measurement of the I and Q channel, which represent the real and imaginary part of the antenna signal. It is designed to operate from a wide power supply range (from 2.7 to 5.5 V), ambient temperature range from -40 °C to +125 °C, and a wide peripheral I/O voltage range (from 1.65 to 5.5 V). Due to this combination of high RF output power, low-power modes, wide supply range, and AEC-Q100 grade 1 qualification, the device is perfectly suited for automotive applications.

Revision history

Table 1. **Document revision history**

Date	Revision	Changes
11-Apr-2025	1	Initial release.

Contents

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