ST25R3914/15 product presentation

MMY Division

ST25R3914/15 use cases

Access & start

- Convenient access to the car (door handle)
- NFC being the RF back-up interface for keyfob in case of battery off
- Secured start
- Cloud-based distribution of keys to an NFC enabled phone

Pairing, set-up & safety

- Convenient BT pairing via P2P to connect NFC phone to car
- Automatic driver identification & personal settings configuration (seat, temperature…)
- NFC credit cards or badges detection to prevent damaging them during Qi charging
- In car secured payment

Consumable & diagnostics

- NFC also enables consumable authentication
  (e.g. air filter, oil filter)
- No physical connection (ODB) is required anymore for car diagnostics.

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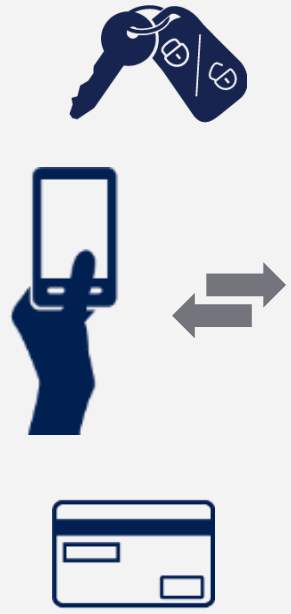
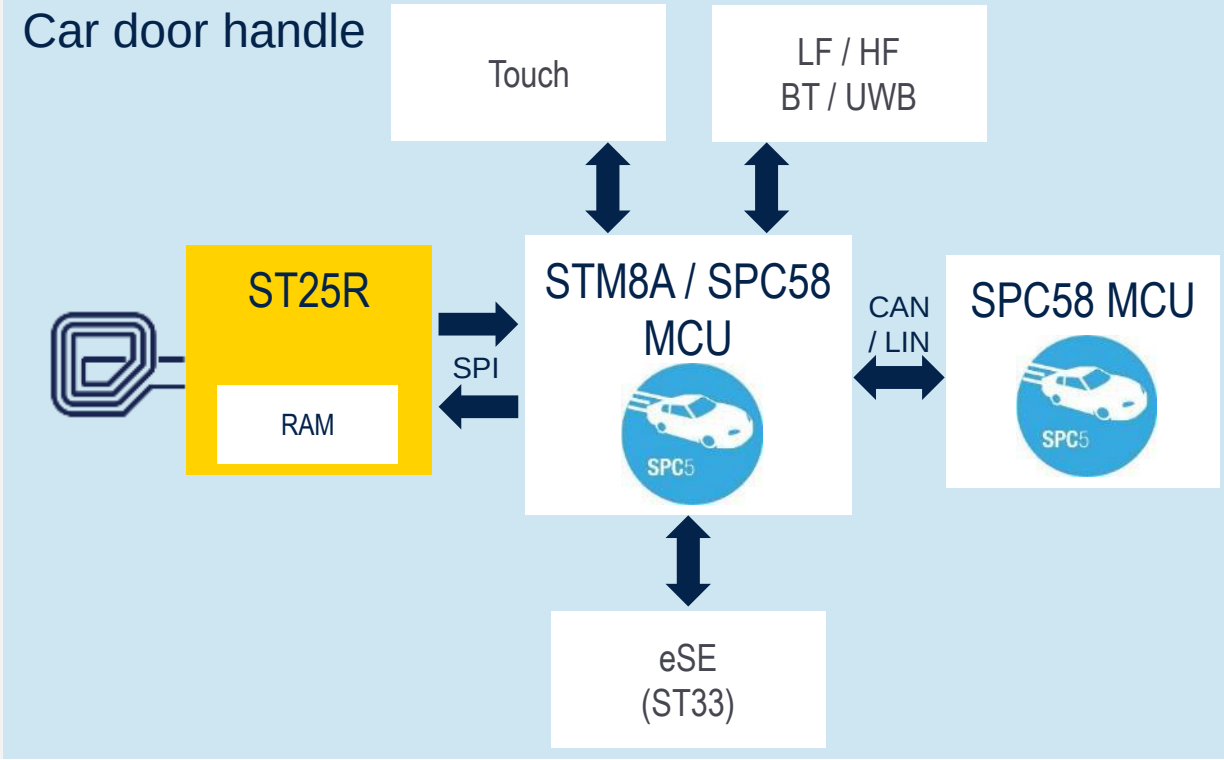
NFC reader for door handle

Typical NFC Reader Block Diagram & Usage for Car door handle





ST25R3914/15

High output power
Low power consumption
Automatic antenna tuning
Phone compatibility

Keyless car access
(CCC specification)

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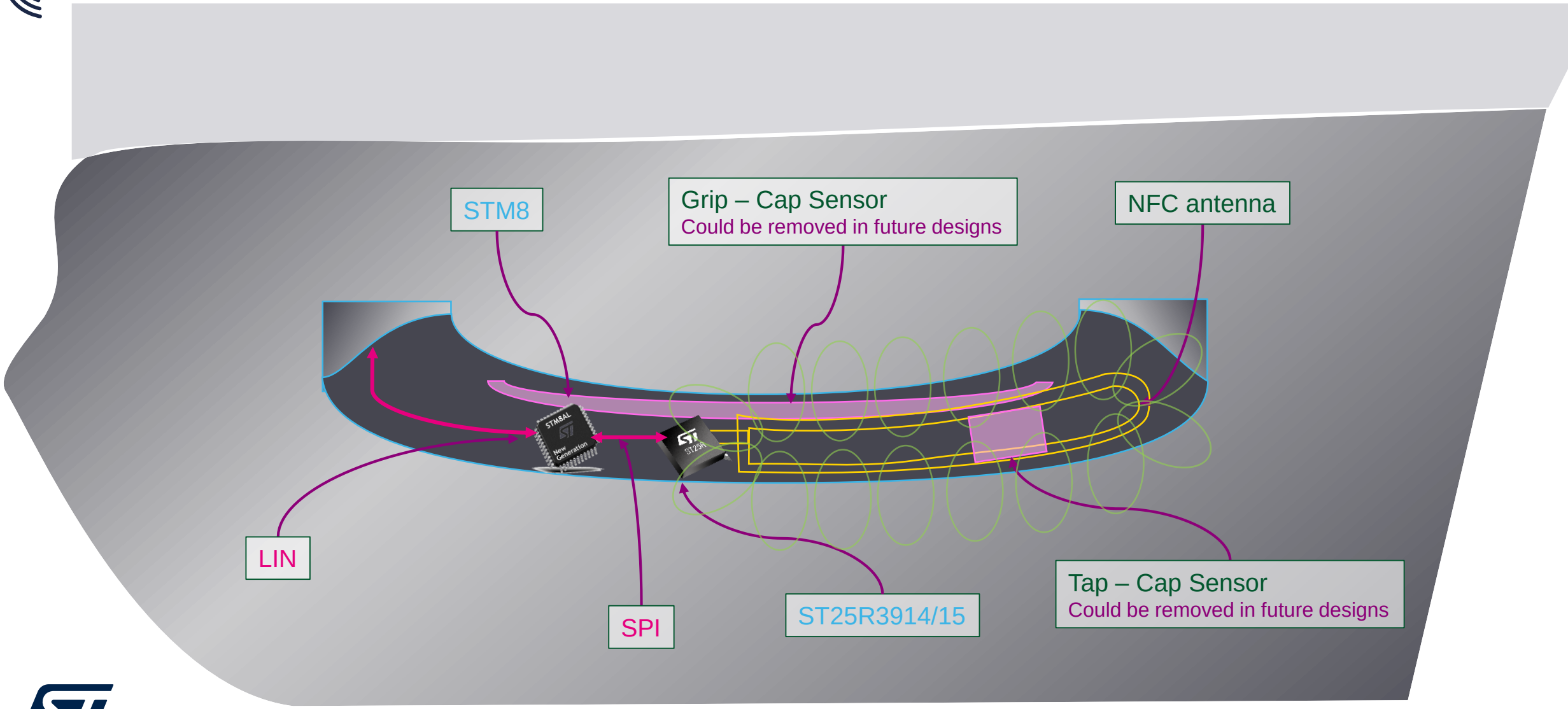
NFC in doorhandle



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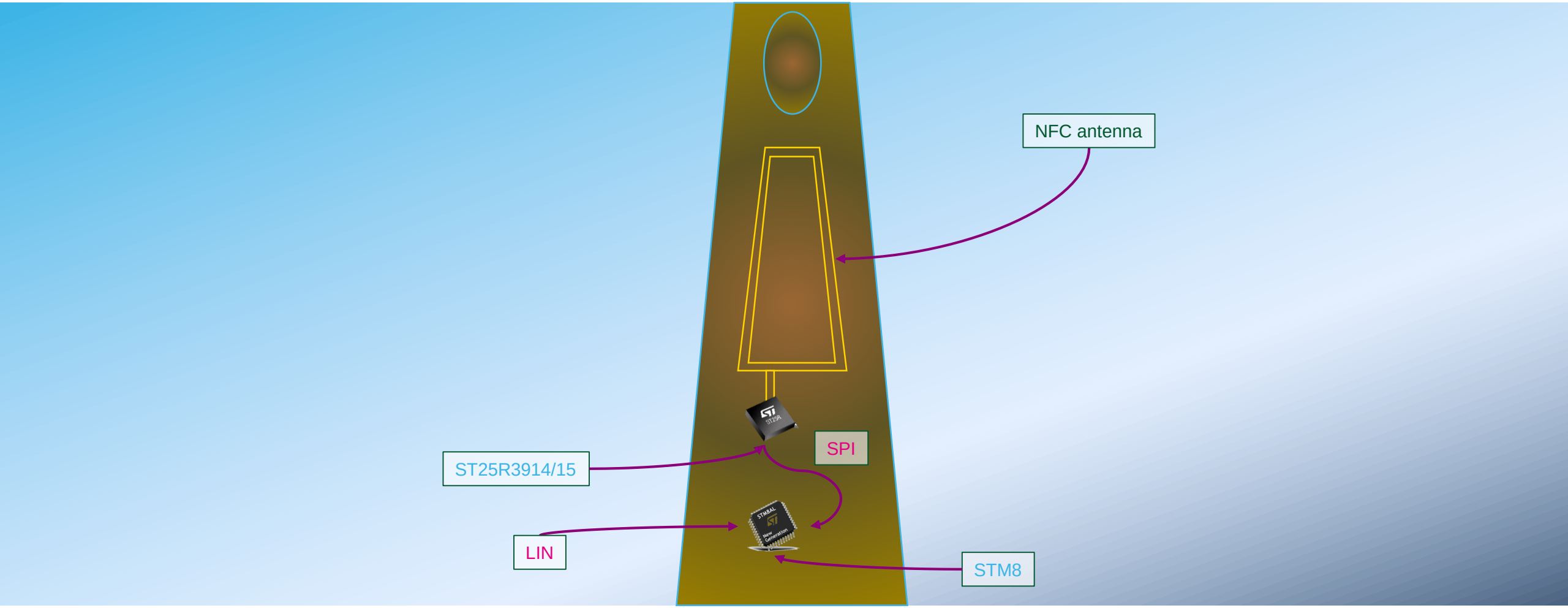
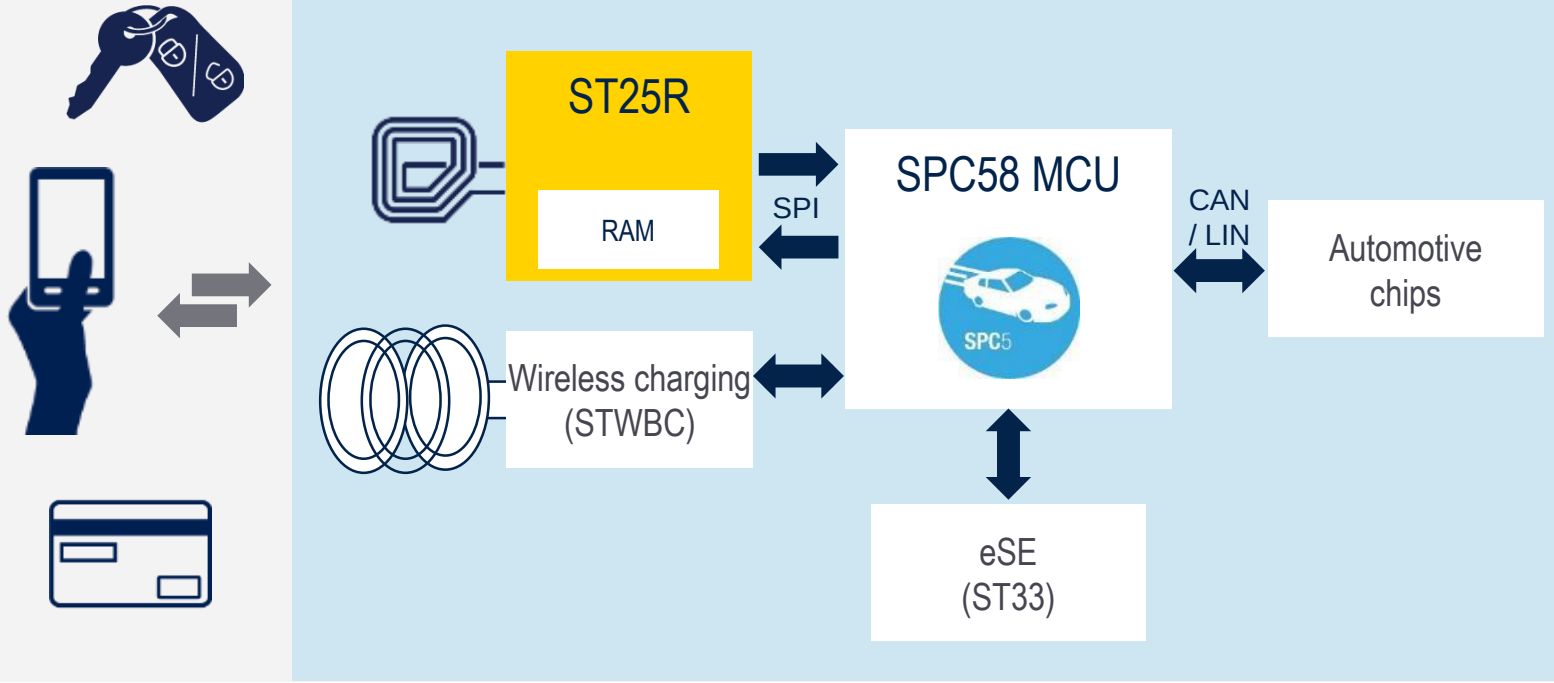
NFC in b-pillar



NFC reader for center console

Typical NFC Reader Block Diagram & Usage for Car center console

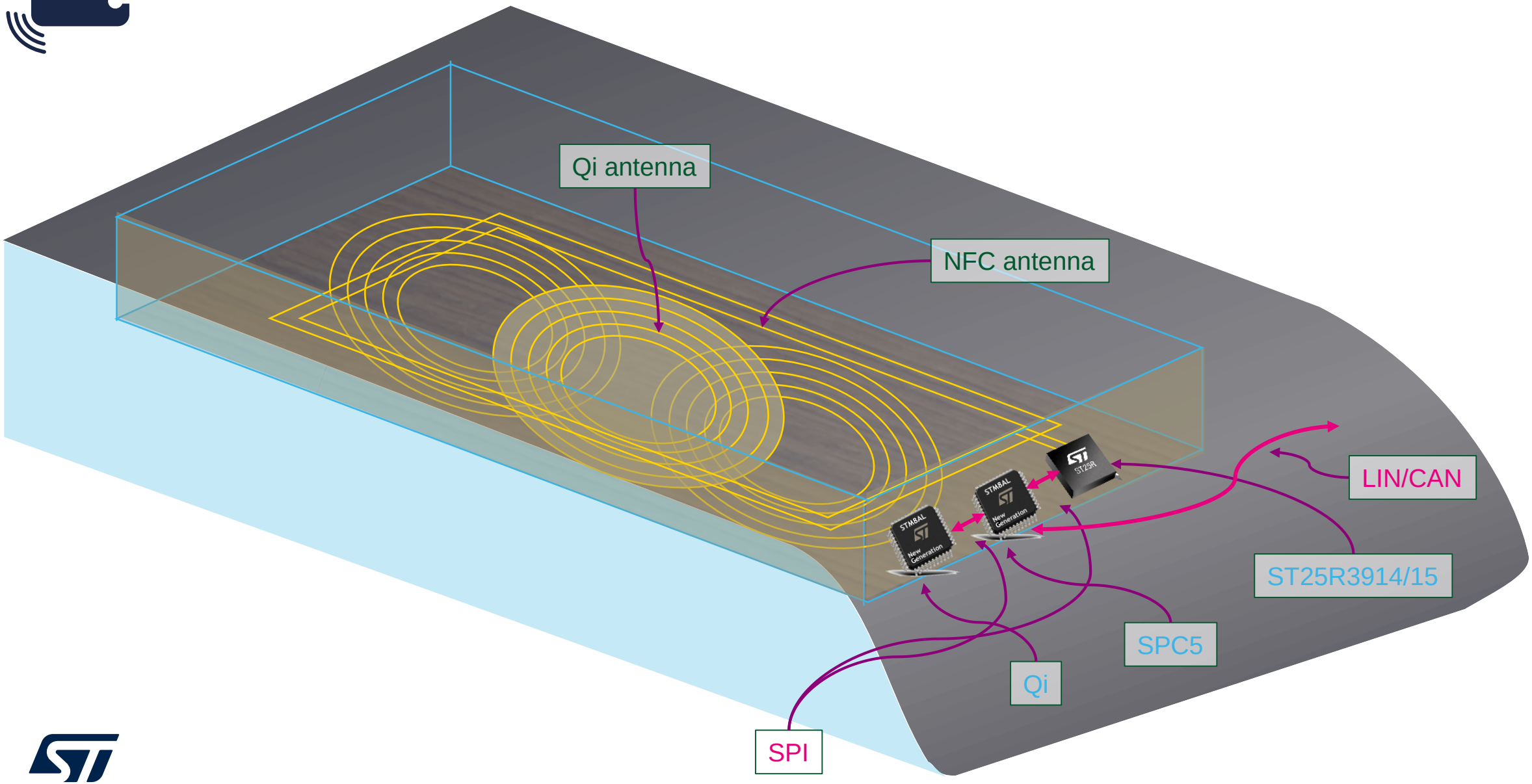


ST25R3914/15

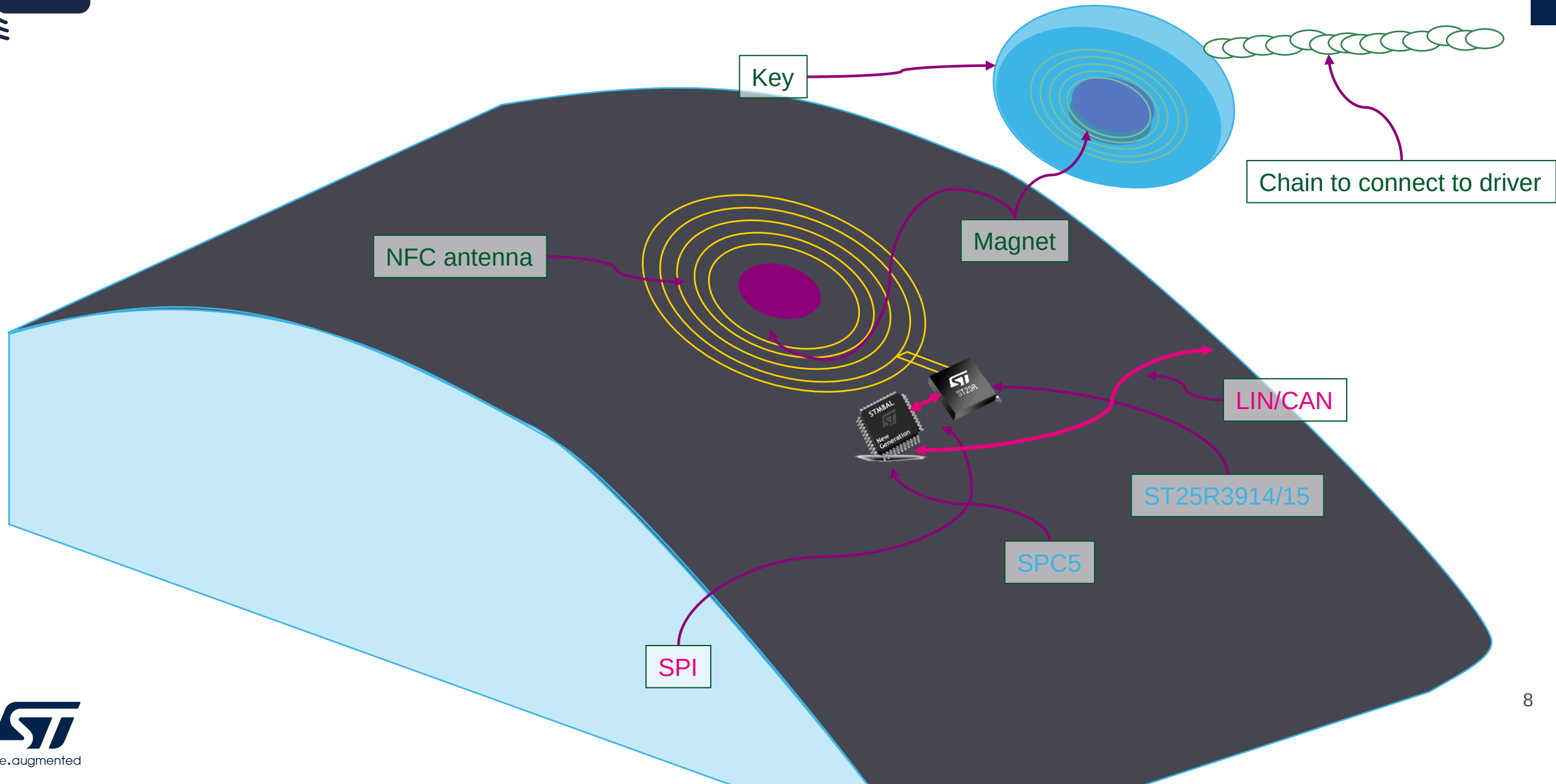
High output power
Low power consumption
Automatic antenna tuning
Phone compatibility

Car easy start
BT pairing
Driver settings
NFC for Wireless charging

NFC in the middleconsole



NFC for bikes, skidoo, jetski



Automotive requirements

Large operating volume

- Door handles are in metal environment and allow space for small antennas only; There is a influence of metalized windscreens if placed behind those.
- Coins, pencil and other metallic objects as well as wireless chargers are detuning the antenna in the middle console.
- ST25R3914/15 offers highest output power combined with automatic antenna tuning.

Short interaction time

- The entry function continuously checks for cards. The time window for interaction must be low to ensure best user experience.
  ST25R3914/15 offers low power wakeup functionality combining capacitive & inductive sensors.

Wide Interoperability

- Communication should work immediately. No retries or different placement required.
- ST25R3914/15 offers excellent P2P compatibility with NFC devices

ST25R product lineup

	ST25R95	ST25R3911B	ST25R3912	ST25R3914/15	ST25R3916	ST25R3917	ST25R3920
Description	Entry-Level NFC Reader	High-Performance NFC Forum Reader	Mid-Range NFC Forum Reader	Automotive Grade NFC Forum Reader	High-performance NFC Universal Device & EMVCo Reader	High-performance NFC & EMVCo Reader	Automotive Grade NFC Forum Reader
Reader/Writer mode	ISO14443A/B ISO15693 Felica	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa
Card emulation mode	Yes	-	-	-	Yes	-	Yes
AP2P mode	-	Initiator & Target	Initiator & Target	Initiator & Target	Initiator & Target	Initiator & Target	Initiator & Target
PP2P mode	-	Initiator	Initiator	Initiator	Initiator & Target	Initiator	Initiator & Target
RF speed	424kbps	6.8Mbps (VHBR)	848kbps	848kbps	848kbps	848kbps	848kbps
Market	Consumer	Payment EMVCo 2.6, Industrial	Access control, Metering, Consumer	Automotive AEC-Q100 grade 1	Payment EMVCo 3.0, Industrial, Consumer	Payment EMVCo 3.0, Industrial, Consumer	Automotive AEC-Q100 grade 1
Advanced features	IWU	AAT, DPO, CIWU	DPO, IWU	AAT (3914), DPO, CIWU	AAT, DPO, NSR, DSA, AWS, CIWU, EMD	DPO, NSR, DSA, AWS, IWU, EMD	AAT, DPO, NSR, DSA, AWS, CIWU, EMD
HW interface	SPI 2Mbps	SPI 6Mbps	SPI 6Mbps	SPI 6Mbps	I²C // SPI 10Mbps	I²C // SPI 10Mbps	I²C // SPI 5Mbps
SW interface	RFAL Unified Software Library for Frontends						
Power supply	2.7V - 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V
Output power	0.23W	1.4W	1.0W	1.0W	1.6W	1.6W	1.6W
Temperature range	-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	-40°C to +125°C
Package	32-pin QFN	32-pin QFN / Wafer	32-pin QFN / WF 32-pin QFN / WLCSP-30	32-pin QFN / WF 32-pin QFN	WF 32-pin QFN / WLCSP-36	WF 32-pin QFN	WF 32-pin QFN

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
* Peak output power
NSR: Noise Suppression Receiver
IWU: Inductive Wakeup

ST25R3914/15 product and features

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ST25R3914
high power automotive reader with AAT

ST25R3914

Reader Writer	ISO14443 ISO15693 FeliCa	RAM BUFFER	SPI
AP2P Initiator & Target PP2P Initiator	NFC 848kb/s	96-Byte	2.4/5.5V 6Mb/s
1W	AEC-Q100 qualification DPO: Dynamic Power Output CIWU: Capacitive & Inductive Wake Up AAT: Automatic Antenna Tuning		

QFN32
Wettable flank

Use cases

- Ideal for **Automotive** applications
  - Keyless entry and start according to **CCC Digital Key**
  - NFC enhanced Foreign Object Detection for Qi wireless charging

Key Features

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

Key Benefits

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

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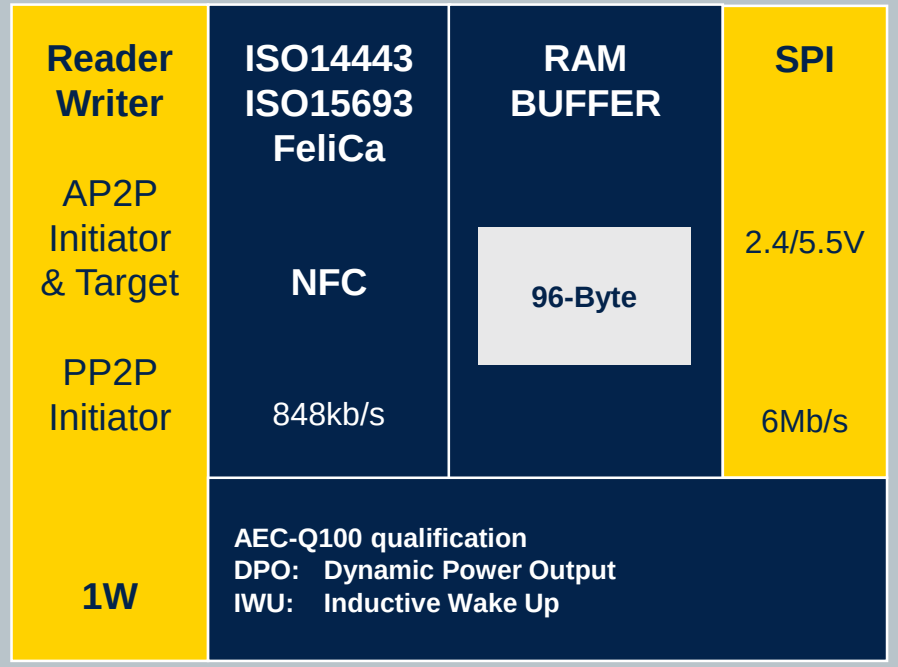
ST25R3915
high power automotive reader solution

ST25R3915



QFN32

Use cases

- Ideal for **Automotive** applications
  - Keyless entry and start according to **CCC Digital Key**
  - NFC enhanced Foreign Object Detection for Qi wireless charging

Key Features

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

Key Benefits

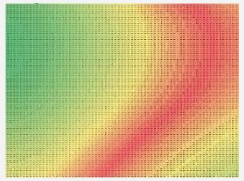
- Low power operation & Stand-by mode (inductive wake-up)
- 2 antennas operation at the same time
- Reliable performance even in metallic environment

ST25R3914/15 benefits

High RF Performance

- Larger operating volume/ smaller antenna
- Unrivaled RX sensitivity for challenging antenna designs simplifies electro-magnetic immunity and eases certification.

AAT: Automatic Antenna Tuning



- Easiest environmental/ lifetime compensation:
- Automatic adjustment of the tuning resonance and matching impedance driving adjustable capacitors

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.

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.

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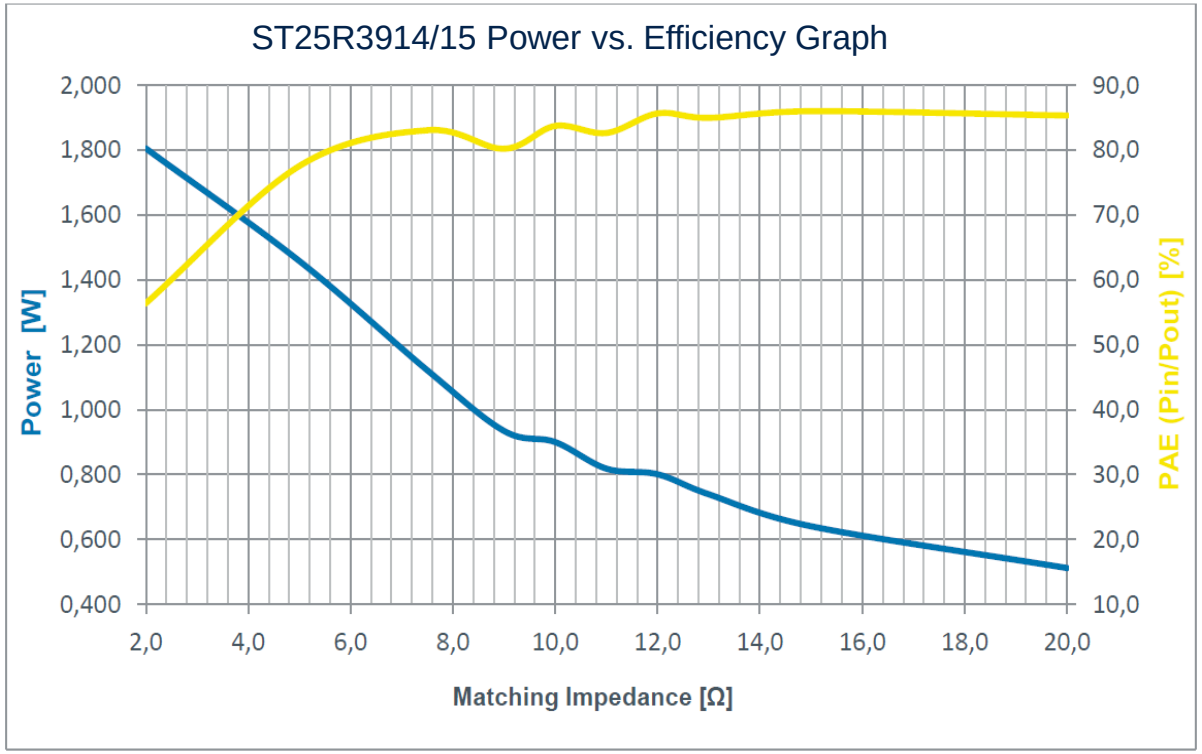
Highest output power & efficiency

Enough power for great user experience

- No external Booster required
  - The ST25R3914/15 includes low impedance drivers capable of generating >1W of output power
  - EMVco certification for in car payment easily possible without external boosters
- Maximum transferred Power
  - Energy harvest for keyfob's
  - Ideal for small door handle antennas
- Ideal for Challenging Environment
  - The ST25R series is able to operate in metal encapsulation like doorlocks



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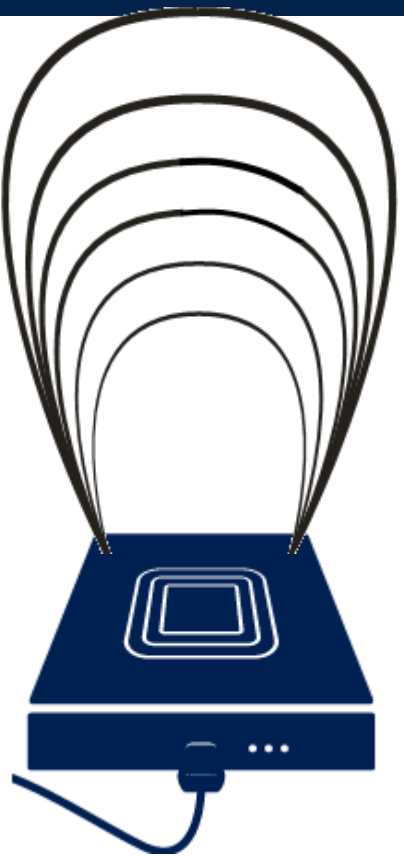
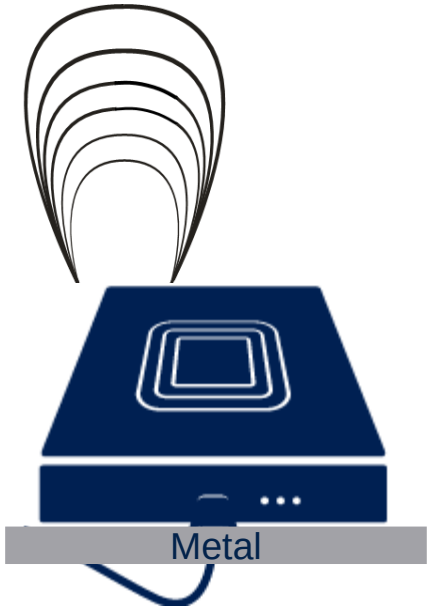
AAT: Match the antenna well and make sure it stays tuned

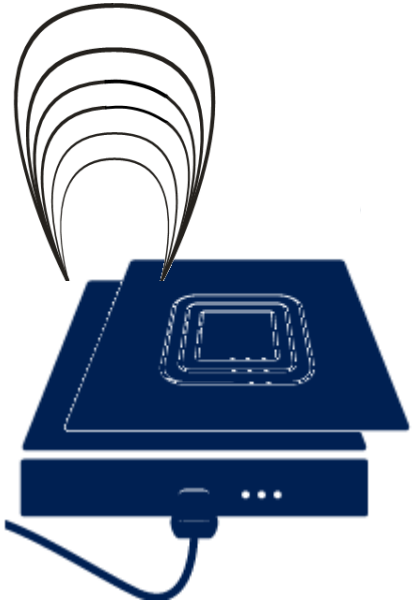
Placement, mounting and outside factors can detune and reduce performance – AAT will help



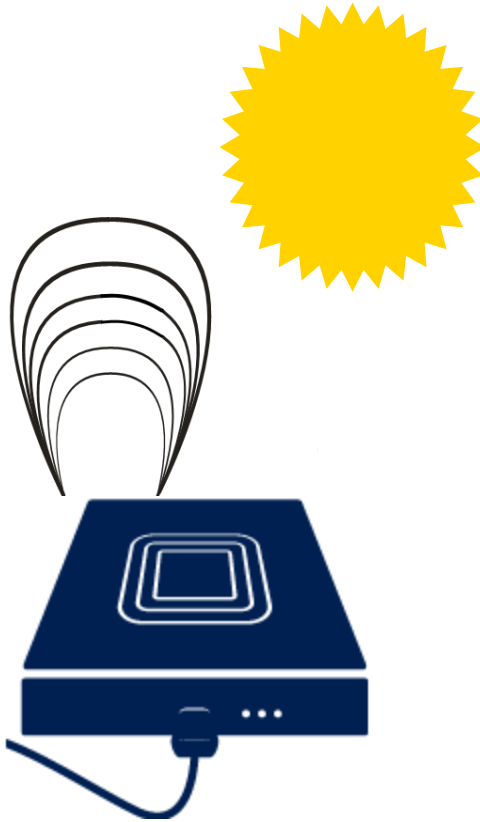
Metal objects



Placement



Mounting

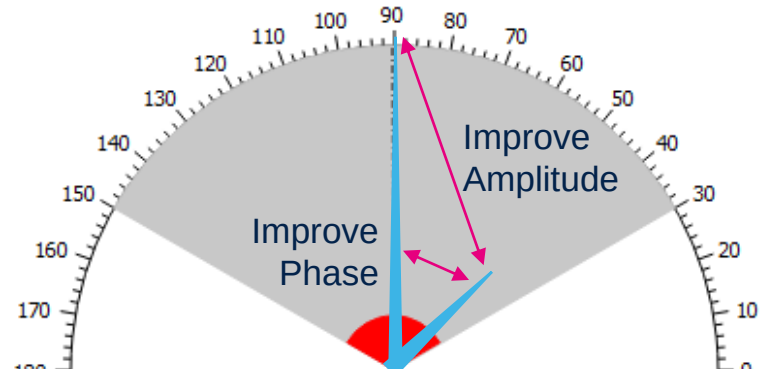


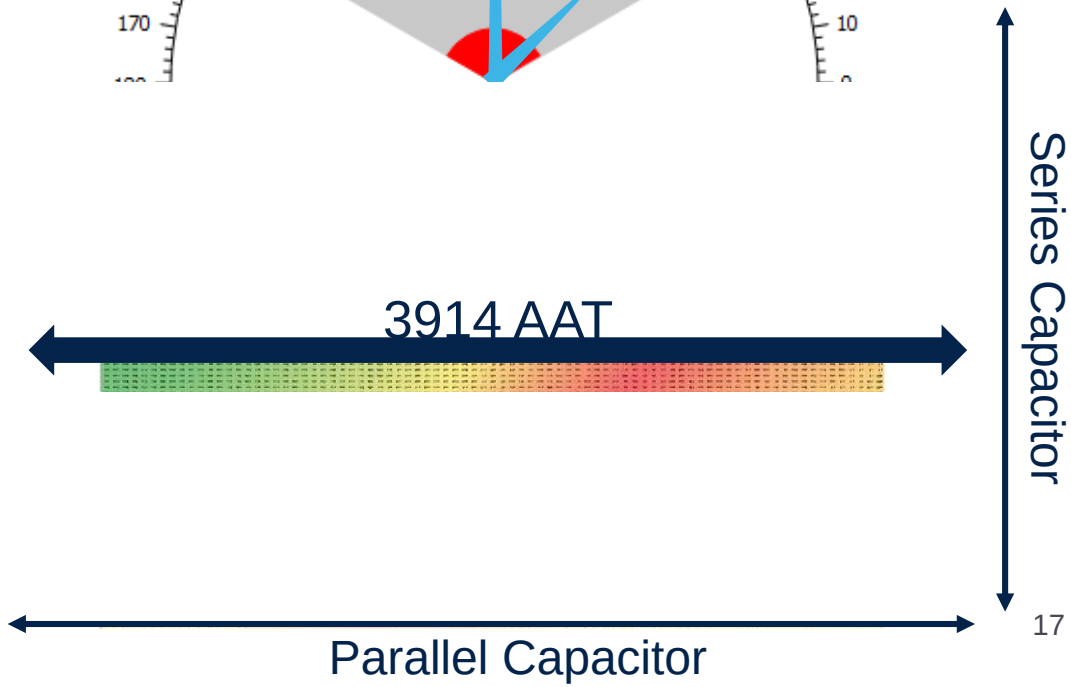
Temperature

AAT: automatic antenna tuning be sure your antenna stays tuned

AAT will help to maximize performance in different situations

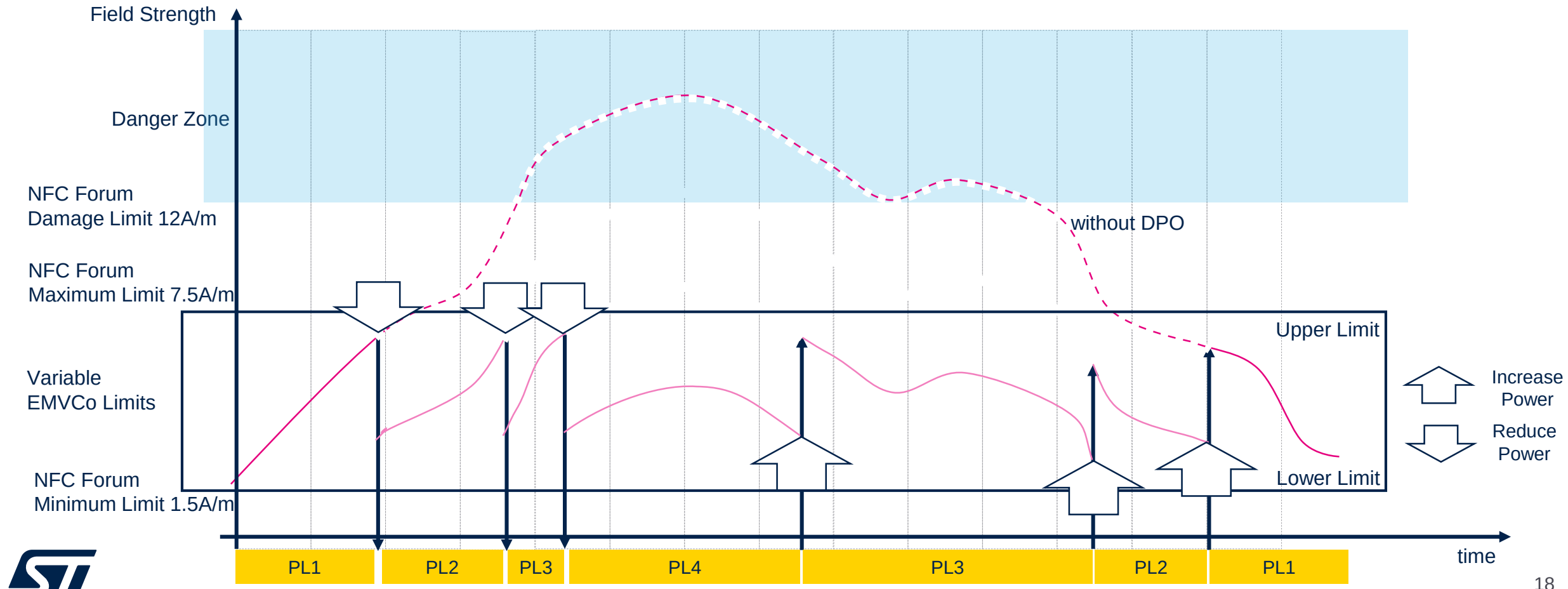
- Algorithm is based on antenna amplitude and phase measurement
- On ST25R3914 tuning is possible on the parallel path of the antenna
- Ideal for center console applications





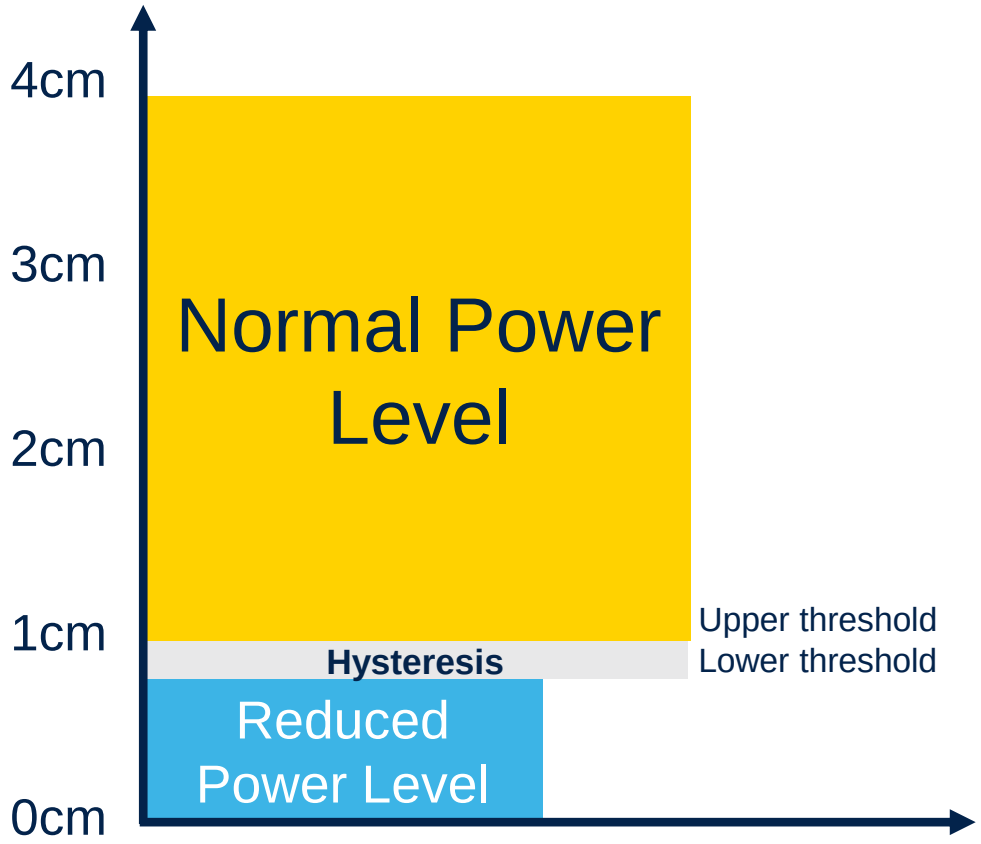
DPO: dynamic power output tweaks the power to your needs

DPO will keep power levels within requirements & limits



DPO: dynamic power output tweaks the power to your needs

- DPO Working Principle
  - The ST25R family is able to measure the antenna amplitude via Register 0x20 with the direct command “Measure amplitude”.
  - The antenna amplitude can be used to define certain levels/distances in which the power output defined in Register 0x27 can be changed via the driver resistance.
  - Thresholds can be set to decrease or to increase power output.



CIWU: Reduce power consumption while offering good detection range

Consider reaction time/sensitivity of the system

Card Polling
Can be set

Timer period
Time in which the IC stays in Sleep mode before checking if a card is present.
Can be set from 10 to 800ms in 16 steps

System time
Varies on application

Sensitivity
Distance of detection

Time to action
Usually expected to be <500ms for human interaction

Delta (window size)
Set the sensitivity of the wakeup in 256 steps

Auto averaging
Higher noise immune or to compensate for slow environmental changes.
Can be set to average over the last 4/8/16/32 cycles

Automatic reference measurement
Measure the environmental influence to the capacitive sensor or the antenna
Used to calibrate the wakeup system at system start or at any required time

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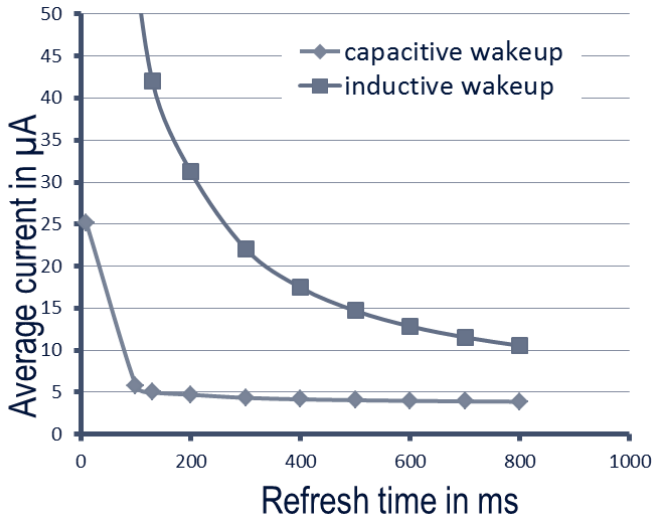
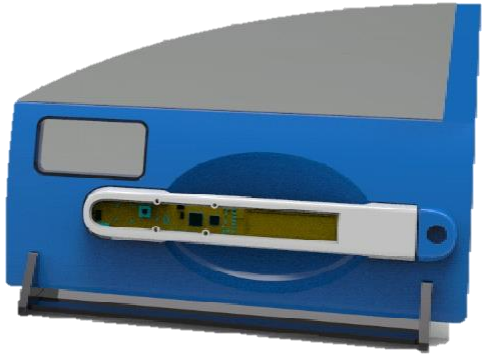
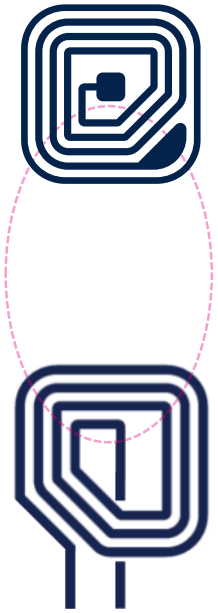
CIWU: Low power wakeup keeps the power consumption low

Low Power Wakeup will maximize your application lifetime

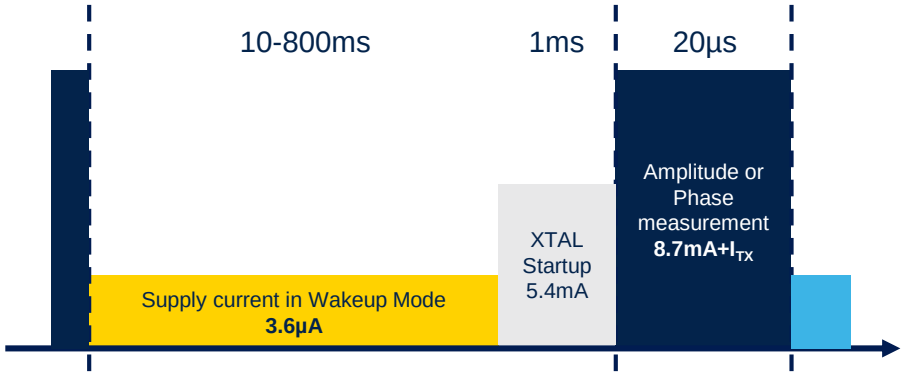






Inductive antenna

Inductive



Fully programmable wakeup scheme.
All relevant parameters like cycle time & sensitivity can be programmed and do not need MCU interaction.

ST25R series benefits

- The ST25R family is an integrated reader IC for contactless applications with several benefits:
  - Outstanding analog performance
    - No external amplifier to achieve high field strength required
    - Automatic antenna tuning
    - Lowest power wakeup
    - Excellent P2P compatibility
  - Fastest time to market
    - reduced time to market at our customers significantly
  - Proven solution
    - The ST25R family is a market proven solution used in the consumer and automotive space.
    - Ensures best customer experience
  - Full integration into the STM32 & STM8 library

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Evaluation boards & ecosystem

ST25

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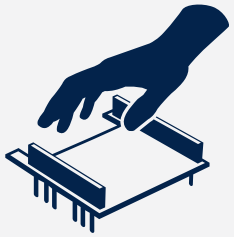
ST25R rich eco-system



- Dicovery kits based on STM32 MCU
- STM32 Nucleo boards ecosystem
- STM32Cube software ecosystem

- Antenna e-design tool
- Schematic, BOM
- Gerber files

- PC software tool ST25
- MCU drivers firmware

- Documentation
- e2e community
- Webinar / MOOC
- Training

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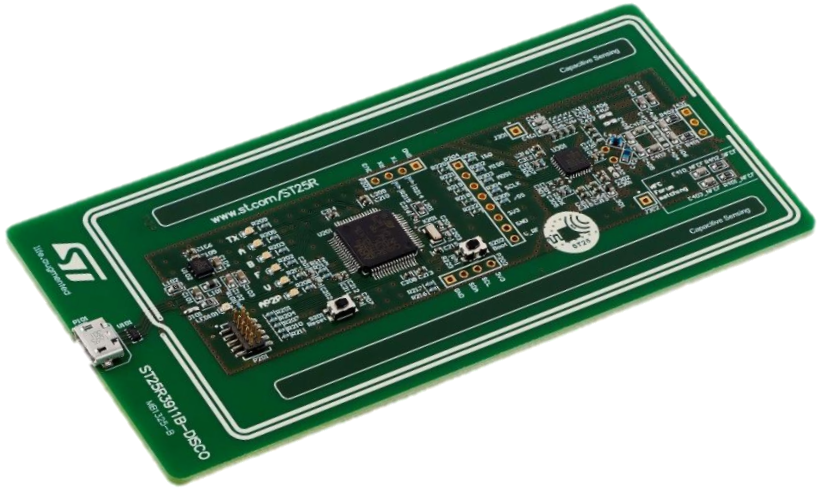
Evaluation boards



ST25R3911B-DISCO

X-NUCLEO-NFC05A1

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 / I²C Host interfaces, as well as NFC SPI and JTAG/SWD points

ST25R3911B Nucleo shield

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

ST25R3911B discovery kit and Nucleo shield are valid ST25R3914 and ST25R3915

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Solutions for NFC / RFID Tags & Readers

ST25

ST25 SIMPLY MORE CONNECTED

Thank you

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