# ST25R3916 NFC Reader – ESP32 Sample Code Test Document

## **1. Document Overview**

This document guides you through verifying the basic functionality of the Elechouse ST25R3916 NFC reader using an ESP32 board. You will install the example code, wire up the hardware, upload the sketch, and validate that NFC tags/cards can be detected and read.

## 2. Objective

- Confirm that the ST25R3916 and ESP32 communicate correctly over SPI.
- Verify that the sample "LED notification" sketch compiles, uploads, and runs.

• Validate that presenting an NFC tag/card triggers the expected behavior (LED toggle and serial output).

## **3. Test Environment**

### 3.1 Hardware

- ESP32 development board (e.g. ESP32-WROOM-32)
- Elechouse ST25R3916 NFC reader module
- USB-A to micro-USB (or USB-C) cable for ESP32 programming
- Jumper wires (male-female)

### 3.2 Software

- Arduino IDE v1.8.13 or later
- ESP32 board support (install via "Boards Manager")
- ST25R3916 Arduino library (provided sample)
- Serial Monitor (built into Arduino IDE)

## 4. Prerequisites

- 1. Arduino IDE installed (verify under Help  $\rightarrow$  About).
- 2. ESP32 board package installed (via Tools  $\rightarrow$  Board  $\rightarrow$  Boards Manager  $\rightarrow$  search "esp32"  $\rightarrow$  install).
- 3. ST25R3916 library ZIP file downloaded and placed in the Arduino libraries folder.

## **5. Setup Instructions**

- 5.1 Code Installation
- 1. Download the sample code archive:
- https://github.com/wilson-

elechouse/ST25R3916/blob/main/ESP32\_ST25R3916\_sample%20code.zip

- 2. Unzip the archive directly into your Arduino libraries directory.
- On Windows: C:\Users\<YourUser>\Documents\Arduino\libraries\
- On macOS/Linux: ~/Arduino/libraries/

3. After unzipping, confirm a folder named ESP32\_ST25R3916\_sample code appears under your libraries.

### 5.2 Opening the Example Sketch

- 1. Launch Arduino IDE.
- 2. Navigate to File  $\rightarrow$  Examples  $\rightarrow$  ESP32\_ST25R3916\_sample code  $\rightarrow$  testingCode\_LED.
- 3. Select testingCode\_LED.ino to open the LED notification example.

#### 5.3 Hardware Wiring

ESP32 Pin	ST25R3916 Pin
D23	MOSI
D19	MISO
D18	SCLK
D5	CS
D4	IRQ
VIN	5V
GND	GND

#### **5.4 Arduino IDE Configuration**

• Board: select your ESP32 board (e.g., "ESP32 Dev Module").

• Upload Speed: 115200 baud (default).

• Port: choose the COM (Windows) or /dev/ttyUSBx (macOS/Linux) corresponding to your ESP32.

### 6. Test Procedure

Step	Action	Expected Result
1	Click "Verify" ( 🗸 ) in Arduino IDE.	Sketch compiles without errors.
2	Click "Upload" ( $\rightarrow$ ) to flash the ESP32.	"Done uploading" message appears; module resets.
3	Open Serial Monitor at 115200 baud.	You see startup messages, e.g., "ST25R3916 initialized."
4	Present a standard NFC tag/card to the reader coil.	LED blinks once per detection; Serial Monitor logs UID.
5	Remove the tag/card from the reader coil.	LED returns to idle state; no further UID messages.

## 7. Detailed Test Cases

- 1. Card Detection:
- Procedure: Swipe a MiFare Classic 1K tag directly over the reader.
- Expected: LED blinks once per detection; Serial Monitor prints UID line.

### 2. No-Card Idle:

- Procedure: Leave reader idle for 30 seconds.
- Expected: LED remains off; no serial messages.

- 3. Rapid Repeated Reads:
- Procedure: Quickly present and remove the tag 5× in succession.
- Expected: LED toggles each time; at least 5 UID messages appear.

## 8. Troubleshooting

• Compilation Warnings about Architecture:

library STM32duino NFC-RFAL claims to run on stm32 architecture(s)

 $\rightarrow$  Ensure you have the correct version of the ST25R3916 library branch. The sample code targets ESP32; ignore warnings if compilation succeeds.

- No Serial Output:
- Verify correct COM/USB port.
- Check that the ESP32 is in normal (not bootloader) mode.
- Confirm baud rate in Serial Monitor is 115200.

### • LED Never Blinks:

- Re-check wiring of IRQ (D4) and CS (D5).
- Swap MOSI/MISO to rule out miswiring.
- Ensure the tag is held within  $\sim$ 2 cm of the reader coil.

## 9. Conclusion

By following this test plan, you have validated basic NFC tag detection and SPI communication between the ESP32 and ST25R3916. For advanced tests (e.g., ISO14443-4 communication, data read/write), refer to the full Elechouse ST25R3916 library examples and datasheet.