

**DATASHEET | DEVELOPMENT KIT**

# **ELECHOUSE**

## **Network RFID Reader V0.1H**

ESP32-S3 and ST25R3916B based HF RFID/NFC development kit for network reader evaluation, firmware integration, and interface testing.

**Version: V0.1H**

**HF: 13.56 MHz**

**Power: 5V**

**Status: Development Kit**

**Product resources:**

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# 1. Product Positioning

ELECHOUSE Network RFID Reader V0.1H is a development kit, not a finished access-control reader. It is intended for HF RFID/NFC function evaluation, firmware development, network data upload testing, and hardware interface planning before a production version is finalized.

## PRODUCT STAGE

**V0.1H development kit**

## CURRENT MODULE SET

**Main controller + HF**

## CURRENT RF TARGET

**13.56 MHz HF/NFC**

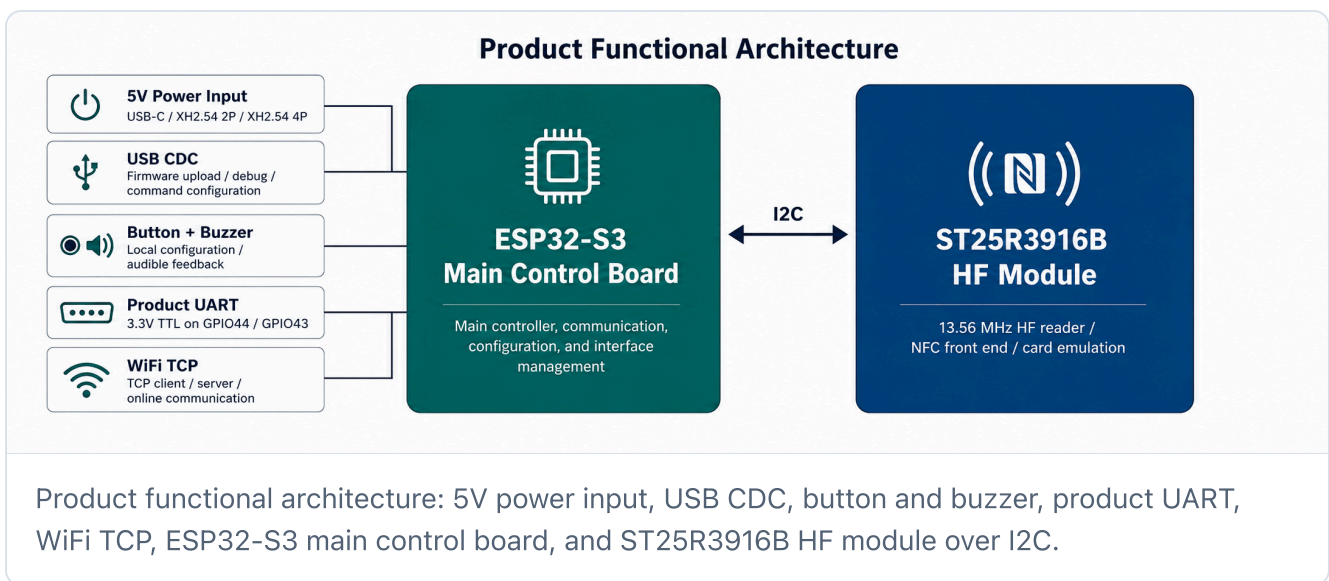
**Scope note:** LF 125 kHz, dual-frequency operation, BLE, 12V input, PoE, external WiFi antenna, and productized Wiegand/ABA electrical interfaces are roadmap items or experimental directions. They are not part of the V0.1H formal hardware specification.

## 2. Key Features

Category	V0.1H Status	Notes
HF RFID/NFC ID reading	Current	HF card UID/ID reading through the ST25R3916B front end.
HF card emulation	Current	NFC-A Type 2 Tag and Type 4 Tag emulation modes with configurable UID and NDEF payloads.
WiFi configuration	Current	2.4 GHz WiFi station configuration through command line, portal, or Web Serial tool.
Command configuration	Current	Commands are available through USB CDC, product UART, and TCP when enabled.
UART data output	Current	3.3V TTL UART on GPIO44/GPIO43. No 5V to 3.3V level conversion is fitted in V0.1H.
TCP data output	Current	TCP client, TCP server, and ELECHOUSE online Broker test mode.
Buzzer feedback	Current	On-board buzzer for local read/configuration feedback.
Button	Current	On-board button available for configuration and reset workflows.
LED indicator	Not fitted	No LED is populated on V0.1H. LED status feedback is planned for a later hardware revision.

Category	V0.1H Status	Notes
Wiegand/ABA output	<b>Firmware capable</b>	Can be mapped to GPIO44/GPIO43 in firmware, but productized electrical interface is planned for V0.2H.

### 3. System Architecture



## 4. Hardware Overview



V0.1H internal layout reference. This prototype has button and buzzer populated, but no LED indicator and no UART level-shift/protection circuit.

Item	V0.1H Specification
Main controller	ESP32-S3 module
Wireless	2.4 GHz WiFi. BLE is planned, not enabled as a V0.1H product feature.
HF front end	ST25R3916B, 13.56 MHz
HF bus	I2C by default: SCL GPIO5, SDA GPIO7, IRQ GPIO9
Power	5V DC input through USB-C connector, XH2.54 2P cable, or XH2.54 4P cable. 12V and PoE are not supported in V0.1H.
Feedback	Buzzer populated. LED not populated.
Configuration control	Button on GPIO10, active-low
Product interface	UART on GPIO44/GPIO43, 3.3V TTL logic

**Electrical caution:** ESP32-S3 GPIO is 3.3V logic and is not 5V tolerant. Do not connect 5V controller signals directly to UART, Wiegand, ABA, or other GPIO pins on V0.1H.

## 5. Electrical Characteristics

Parameter	Value	Notes
Input voltage	5V DC	V0.1H does not support direct 12V input or PoE power input.
Rated current	0.19A	Measured during normal powered operation.
Rated power	0.95W	Calculated from 5V x 0.19A.
Standby current	0.08A	Standby state, not a low-power MCU mode.
Standby power	0.40W	Calculated from 5V x 0.08A.
Power input methods	USB-C connector, XH2.54 2P cable, XH2.54 4P cable	Use only one 5V supply path at a time unless the test setup is explicitly designed for shared power.
GPIO logic level	3.3V	ESP32-S3 GPIO is not 5V tolerant.

**Standby wording:** The standby current and standby power values describe a low-activity standby condition. They should not be interpreted as a low-power MCU mode consumption value.

## 6. Connector and Pin Reference

Interface	Signals	Electrical Note	V0.1H Use
USB-C on ESP32-S3	USB data, 5V power	Physical USB-C connector. Provides USB CDC serial, firmware upload, and debug power.	Recommended development interface
5V power connector	5V_IN , GND	XH2.54 2P, 5V only	External 5V supply input
Product UART connector	TX , RX , 5V_USB , GND	XH2.54 4P. GPIO44/GPIO43, 3.3V TTL. No 5V level conversion.	Product data output and command input
HF module connection	I2C SCL/SDA, IRQ, 5V, GND	Internal module connection	ST25R3916B HF RFID/NFC operation
Button	GPIO10 active-low	Board-level user/config input	Configuration portal and reset workflow support
Buzzer	GPIO12	On-board audible feedback	Read/configuration feedback

### Default GPIO Mapping

<b>Function</b>	<b>GPIO</b>	<b>Status</b>
HF SCL	GPIO5	Current I2C bus
HF SDA	GPIO7	Current I2C bus
HF IRQ	GPIO9	Current interrupt input
Button	GPIO10	Current, active-low
Buzzer	GPIO12	Current
Product UART RX	GPIO44	Current, 3.3V TTL
Product UART TX	GPIO43	Current, 3.3V TTL
LED data	GPIO11 in firmware profile	Not populated on V0.1H hardware

# 7. Software and Firmware Features

## HF RFID/NFC

HF UID/ID reading through ST25R3916B.

NFC-A Type 2 Tag and Type 4 Tag card emulation modes.

Configurable emulation UID.

NDEF payload support for URL, text, vCard, and WiFi records.

## Configuration Interfaces

USB CDC serial command configuration.

Product UART command configuration when enabled.

TCP command configuration when TCP commands are enabled.

WiFi configuration portal.

Web Serial configuration through the ELECHOUSE Serial Config Tool.

## Data Output

UART event output, default 115200 8N1.

TCP Client mode for connecting to a LAN or cloud service.

TCP Server mode for local host connection.

ELECHOUSE Broker test mode for online validation.

JSON or line-based event output.

## Typical Event Format

```
{"band": "HF", "type": "ISO14443A", "id": "04 A1 B2 C3 D4", "ms": 123456}
```

Actual card type and ID fields depend on the card technology, reader mode, and enabled output format.

## Core Command Groups

Group	Examples	Purpose
System	status , pins , save , reboot	Inspect device state and persist configuration.
WiFi	wifi status , wifi set <ssid> <password>	Configure station WiFi credentials.
TCP	tcp client <host> <port> , tcp server <port> , tcp off	Configure network data transport.
ELECHOUSE Broker	elechouse on <session_code> , elechouse status , elechouse off	Connect to the online Broker test page.
HF	hf mode scan , hf mode card , hf card type nfc-a-t2t	Configure HF scanning or card emulation.

## 8. Wiegand/ABA Evaluation

The firmware can reuse the current product interface pins, GPIO44 and GPIO43, as two-wire pulse outputs for Wiegand D0/D1 or ABA Clock/Data. This is practical at firmware level because UART TX/RX are general ESP32-S3 GPIO pins.

**V0.1H decision:** Wiegand/ABA should not be described as a production-ready electrical interface for this hardware revision. V0.1H has no 5V to 3.3V conversion, no open-drain output stage, and no ESD/surge protection on the product interface.

Question	Assessment
Can GPIO44/GPIO43 implement Wiegand or ABA in firmware?	Yes. They can be switched from UART to pulse output mode by firmware.
Can V0.1H connect directly to a typical 5V access controller?	No. Direct connection is not recommended because ESP32-S3 GPIO is 3.3V only and not 5V tolerant.
Can it be used for lab evaluation?	Only with a 3.3V-compatible receiver, common ground, short wiring, and controlled test conditions.
What should V0.2H add?	Level conversion or open-drain drivers, pull-up strategy, ESD/surge protection, connector labeling, and validation with real access controllers.

# 9. Mechanical Reference



Reference enclosure dimensions: 115 mm x 75 mm x 21.5 mm.



Rear mounting plate and cable window reference for installation planning.

Mechanical Item	Reference
Enclosure outer size	115 mm x 75 mm x 21.5 mm
Mounting style	Rear mounting plate with cable access window
Case drawing source	<a href="#">downloads/ELECHOUSE_Network_RFID_Reader_Enclosure_Dimensions.pdf</a> , <a href="#">downloads/ELECHOUSE_Network_RFID_Reader_Enclosure_2D.dxf</a> , <a href="#">downloads/ELECHOUSE_Network_RFID_Reader_Enclosure_2D.dwg</a>
Installation caution	Keep HF antenna area away from large metal surfaces, high-current power wiring, and strong RF/noise sources where possible.



Reference enclosure parts: front panel, frame, and rear mounting plate.

## 10. Download and Design Resources

Resource	Link	Use
Enclosure dimension PDF	<a href="#">ELECHOUSE_Network_RFID_Reader_Enclosure_Dimensions.pdf</a>	Mechanical size and installation reference.
Enclosure DXF	<a href="#">ELECHOUSE_Network_RFID_Reader_Enclosure_2D.dxf</a>	2D CAD reference for enclosure and mounting planning.
Enclosure DWG	<a href="#">ELECHOUSE_Network_RFID_Reader_Enclosure_2D.dwg</a>	Native CAD reference for mechanical integration.
Firmware source code	<a href="https://github.com/wilson-elechouse/network_RFID">github.com/wilson-elechouse/network_RFID</a>	Firmware, local libraries, examples, and development documentation.
Mainboard schematic	<a href="#">ELECHOUSE_Network_RFID_Reader_Mainboard_SCH.pdf</a>	V0.1H mainboard schematic reference.

**Publishing note:** These local file links work when the datasheet is opened from this documentation package. When publishing to the website, upload the linked resources to fixed web paths and replace the relative links with public URLs.

# 11. Online Tools and Developer Resources

## SERIAL CONFIGURATION

### [RFID Serial Config](#)

Web Serial based configuration page for WiFi, TCP, UART, reader output, and HF card emulation settings.

## TCP ONLINE TEST

### [RFID TCP Broker](#)

Online test page for validating TCP upload and web-to-device command downlink.

## BROKER SOURCE CODE

### [TCPServer4NetworkRFID](#)

Reference source code for developers who need to customize the online Broker workflow.

## 12. Current Limitations and Roadmap

Item	V0.1H Status	Roadmap Direction
LF 125 kHz	Not in V0.1H scope	Planned for V0.xL and later dual-frequency versions.
Dual frequency HF + LF	Not in V0.1H scope	Planned for V1 and later versions.
12V input	Not supported	Add regulator, protection, and validation in a later mainboard revision.
PoE	Not supported	Evaluate PoE PD and Ethernet/power architecture in a later product stage.
BLE	Planned	BLE provisioning, configuration, status readback, and possibly BLE event output.
LED feedback	Not fitted	Add product LED indicator and status patterns in a later hardware revision.
UART level conversion	Not fitted	V0.2H should add 5V/3.3V conversion or protected external-interface design.
Certification and environmental rating	Not specified	To be defined for a production reader, not for this development kit stage.

## 13. Revision History

Document Version	Product Version	Date	Description
0.1	V0.1H	2026-07-05	Initial English HTML datasheet draft for development-kit positioning, hardware overview, firmware capability, and roadmap.