Features

Based on the ST25RU3993 RAIN® (UHF) RFID reader IC

- ISO/IEC 18000-63:2015 / Gen2V2

Two SW-controlled power amplifier (PA) options

- External PA: 29 dBm max TX power
- Internal PA: 18 dBm max TX power
- Configurable TX power level
- Power detector to monitor TX power
- Carrier cancellation circuitry enabling pre- and re-tuning
- Automatic / manual carrier cancellation
- Differential RX input
- Maximum sensitivity: -80 dBm
- Maximum tag read rate: 700 tags/s (with 16-bit tag EPC length)
- External reference: 20 MHz TCXO, clipped sine wave
- External reference option: 20 MHz crystal
- Frequency: 840 to 960 MHz
- Adaptive / manual anti-collision slot handling
- Continuous modulated RF output mode
- Continuous wave RF output mode
- Two antenna connectors: SMB (F)
- Automatic / manual antenna port switching
- Reflected power measurement
- Carrier sense (LBT)
- Transponder RSSI display
- Direct command support
- Transponder EPC read / write
- Application start based on transponder reads
- Generic custom transponder command tool
- Store / recall reader configuration
- Configurable register map

Host interface and supply

- USB / UART bridge
- USB receptacle: Micro, B-type
- Main supply: 5 V USB (3.0)

MCU

- STM32L476RGT6 (Arm® 32-bit Cortex®-M4)
- 64 MHz
- 128-Kbyte RAM
• 1-Mbyte Flash memory
• SPI mode 1 (4 MHz)
• Firmware programmable through USB / UART
• SWD debug interface

**LED Indicators**
• Power amplifier selection
• Carrier cancellation tuning activity
• Carrier cancellation tuning OK
• OSC OK (20 MHz external reference)
• PLL OK
• RF ON
• No tag response
• Tag CRC error
• Tag found
• Active antenna port
• Power amplifier option
• BT OK (not installed)

**Test points**
• In-circuit RF power levels and signals
• RFID communication TX and RX
• UART and SPI signal lines
• UART_LOG for debug purposes
• Control voltage of internal VCO
• RF power detector output voltage
• 20 MHz reference signal
• External PA BIAS voltage
• LDO output voltages
• LDOs: 0 Ω resistor for current consumption measurement
• Main supply: jumper for current consumption measurement

**Buttons**
• MCU reset
• MCU boot mode
• BT module reset button (optional)

**Buzzer (optional)**

**Wireless interface (optional)**
• BT4.0 - SPP profile
• JTAG interface: for BT module programming
• BT module boot mode jumper (optional)
The ST25RU3993-EVAL board is a RAIN® RFID (UHF) reader system based on the ST25RU3993 integrated reader IC. The objective of the ST25RU3993-EVAL board is to provide engineers, students and technically interested people with a comprehensive RAIN RFID reader system, which allows evaluation of the properties and the feature set of the ST25RU3993. For this purpose the architecture of the ST25RU3993-EVAL board combines a high RF power, long-range reader and a low RF power, short-range RAIN RFID reader. In addition the ST25RU3993-EVAL board has been fitted with numerous easy to access test points and measurement possibilities.

The ST25RU3993-EVAL is controlled by a graphical user interface (GUI) running on a host PC through a USB/UART bridge (it requires a driver installation). The GUI can be found on www.st.com.

The ST25RU3993-EVAL is powered through a USB3.0 port to correctly operate the high RF power long-range configuration of the reader. If a USB3.0 port is not available, a USB2.0 Y-cable or an external power supply can be used to enable the long-range capabilities of the reader. If neither is available only the low RF power short-range reader configuration is available.

The ST25RU3993-EVAL provides two SMB (male) antenna connectors, which can be controlled via the GUI. To enable scanning for RAIN RFID transponders the user must connect the provided kit antenna or a suitable 50 Ω UHF antenna for the targeted frequency range.

The ST25RU3993-EVAL board supports frequency channels ranging from 840 to 960 MHz and Arm®-based devices.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.
Kit contents

The kit contains:

• an evaluation RAIN reader PCB
• an UHF near field antenna
• an SMA (male) / SMB (female) antenna cable
• sample tags
• the FCC note.
3 Standard setup

Figure 1. Standard setup shows the typical reader setup:
• the host PC running the GUI is connected to the ST25RU3993-EVAL board via a Micro-USB cable
• the antenna is connected to the active antenna port by means of a coaxial cable
• the transponder is within the range of the antenna.
Figure 2. Functional block diagram

Legend
- Test point or connector
- LED
- Button
- Component
- Power supply
- Signal
Main digital interfaces

Figure 3. Main digital interfaces and devices on the board
### Revision history

**Table 1. Document revision history**

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<td>1</td>
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<td>04-Oct-2018</td>
<td>2</td>
<td>Updated:</td>
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<td></td>
<td></td>
<td>• Features</td>
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<tr>
<td>01-Apr-2019</td>
<td>3</td>
<td>Updated Features, Section 1 Description, Figure 2. Functional block diagram and Figure 3. Main digital interfaces and devices on the board, and added Section 2 Kit contents.</td>
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