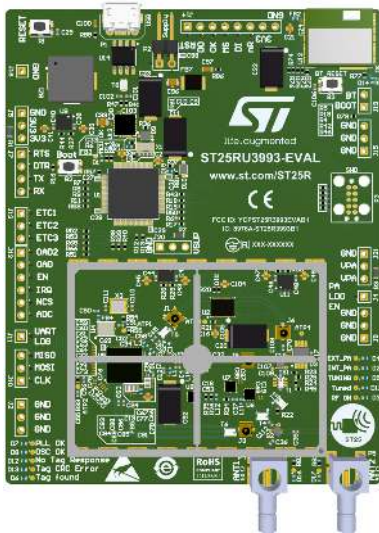


ST25RU3993 RAIN[®] (UHF) RFID reader IC evaluation board



Product status link

[ST25RU3993-EVAL](https://www.st.com/ST25RU3993-EVAL)

Features

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

- ISO/IEC 18000-63:2015 / Gen2V2
- ISO/IEC 18000-62:2012

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)

1 Description

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.



2 Kit contents

The kit contains:

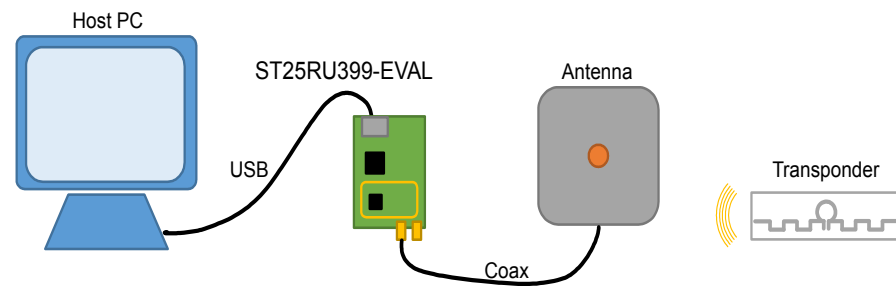
- an evaluation RAIN reader PCB
- an UHF near field antenna
- an SMA (male) / SMB (female) antenna cable
- sample tags
- the FCC note.

3 Standard setup

Figure 1. Standard setup shows the typical reader setup:

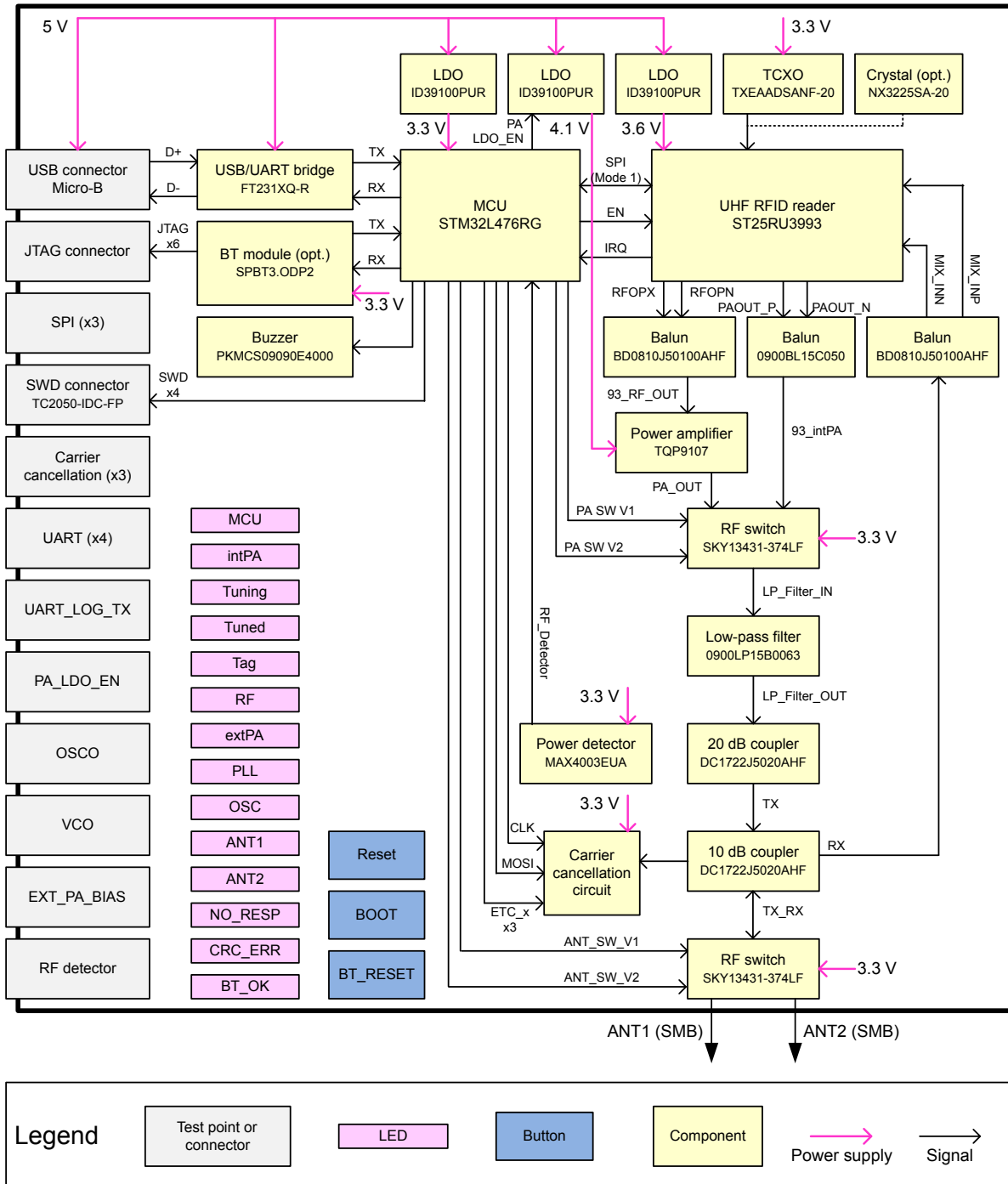
- the host PC running the GUI is connected to the ST25RU3993-EVAL board via a Micro-USB cable
- the antenna is connected to the active antenna port by means of a coaxial cable
- the transponder is within the range of the antenna.

Figure 1. Standard setup



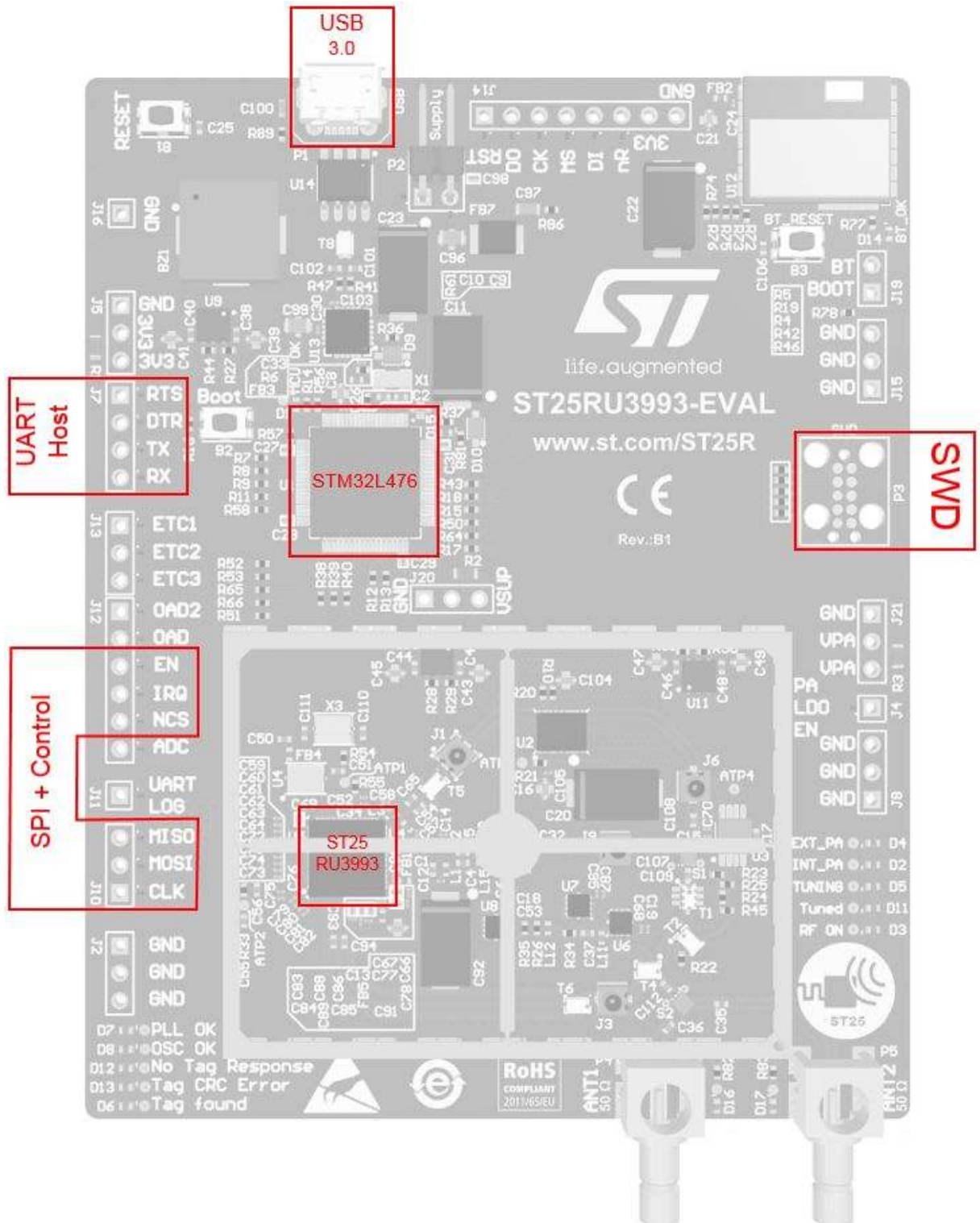
4 ST25RU3993-EVAL block diagram

Figure 2. Functional block diagram



5 Main digital interfaces

Figure 3. Main digital interfaces and devices on the board



Revision history

Table 1. Document revision history

Date	Revision	Changes
27-Mar-2017	1	Initial release.
04-Oct-2018	2	Updated: <ul style="list-style-type: none"> Features
01-Apr-2019	3	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.
15-Oct-2019	4	Updated Features.

Contents

1	Description	3
2	Kit contents	4
3	Standard setup	5
4	ST25RU3993 block diagram	6
5	Main digital interfaces	7
	Revision history	8
	Contents	9
	List of tables	10
	List of figures	11

List of tables

Table 1. Document revision history 8

List of figures

Figure 1.	Standard setup	5
Figure 2.	Functional block diagram	6
Figure 3.	Main digital interfaces and devices on the board	7

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2019 STMicroelectronics – All rights reserved