



**Hardware Manual - SM2251 Evaluation  
Kit Board**  
*Release 1.0.0*

**SonMicro Elektronik**

Oct 08, 2017



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## INTRODUCTION

SM2251 is a fully integrated universal evaluation kit board that supports both 125 kHz RFID and 13.56 MHz Mifare pin-to-pin compatible modules.

SM2251 can be used to evaluate and configure both 125 kHz RFID and Mifare modules (seperately) only by changing the module and the antenna.

It has female pin sockets, 20 pin - 2mm pin space, for use with Mini20 package type modules. Additionally, SMD20 package type modules are also supported with ADP-SMDMINI20 which is a special package adapter that converts SMD20 to Mini20 package.

### 1.1 FEATURES

- 5 pin USB-UART Converter connection.
- UART Interface
- I2C Interface with pull-ups connected to VDD.
- RS232 Interface
- RS485 Interface (optional, instead of RS232) with ESD protection and filter circuit.
- 9V/12V DC to 5V DC LDO Power Supply circuit
- Module I/O pins
- SREAD & TAGF Led connections
- Low profile AC/PWM Buzzer (2730Hz)
- PCB Antenna connection for 13.56 MHz Mifare applications
- Coil Wire Antenna connection for 125 kHz RFID applications

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**Note: RS485 interface comes optional.** Default board is integrated with RS232 circuit in addition to UART and I2C communication interface.

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**Attention:** Connect the appropriate antenna(coil or PCB) only for the target module.

- Do not use supplied coil wire antenna with a Mifare Module. Coil wire antenna can be used only with a 125 kHz RFID Module.
- Do not use Mifare PCB antenna with a 125 kHz RFID Module. Mifare PCB antenna can be used only with a 13.56MHz Module.

- Do not connect both antenna type at the same time. This will cause short circuit and may damage the RFID module.

## 1.2 SUPPORTED MODULES

SM2251 is designed for modules with Type B connection pinout which is a firmware modification to interchange few of the I/O pins role. For more details please check the relevant module hardware manual. You can upgrade the existing modules with supporting firmware version for Type B pinout connection.

### Mini20 package modules (20 pin - 2mm pin space - DIP)

- SM5210 Mifare Module (Mini20 package)
- SM1250 125 kHz RFID Module (Mini20 package)

### SMD20 package modules (20 pin - SMD)

- SM5211-SMD Mifare Module with ADP-SMDMINI20 package adapter.
- SM1251-SMD 125 kHz RFID Module with ADP-SMDMINI20 package adapter.

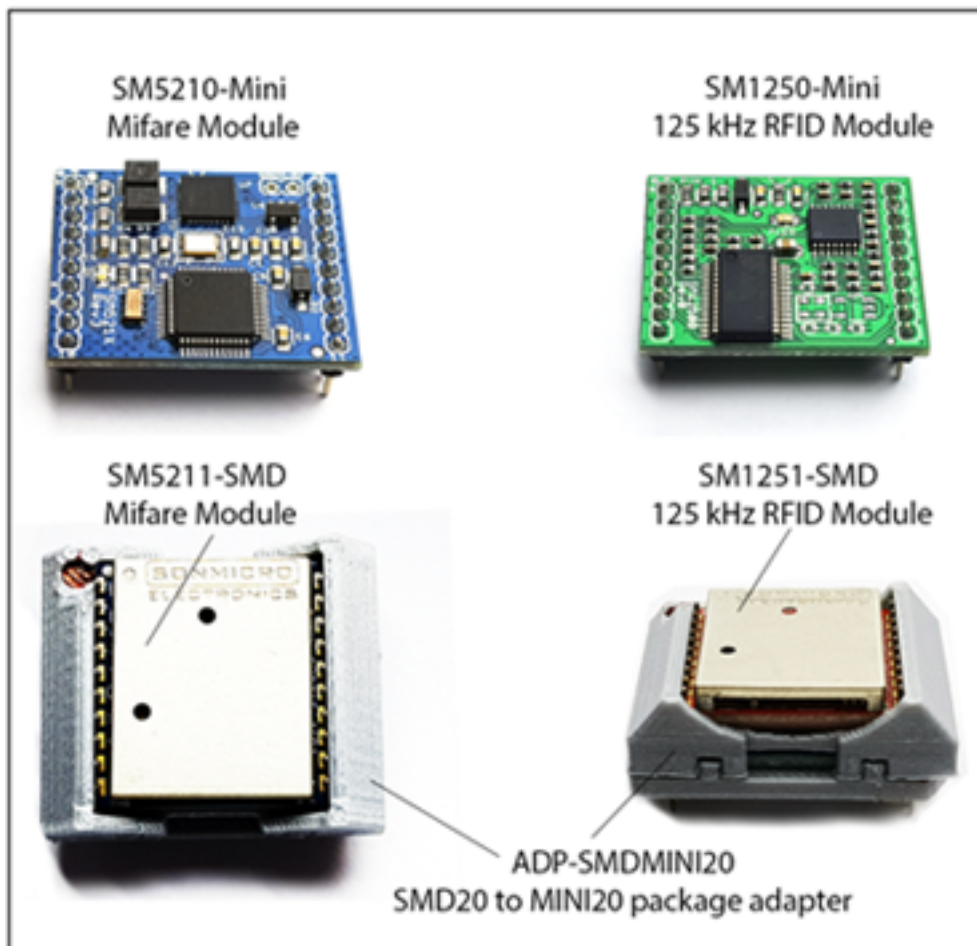


Figure 1.2 Supported modules with the SM2251 Evaluation Kit Board

## CONNECTION PINOUT DIAGRAM

For detailed connections please check the *SM2251 Schematic* and target module datasheet.

**Attention:** Connection diagram must also be checked with the target module hardware manual for differences in electrical characteristics(i.e. 3.3V / 5V levels) that depends on the target module.

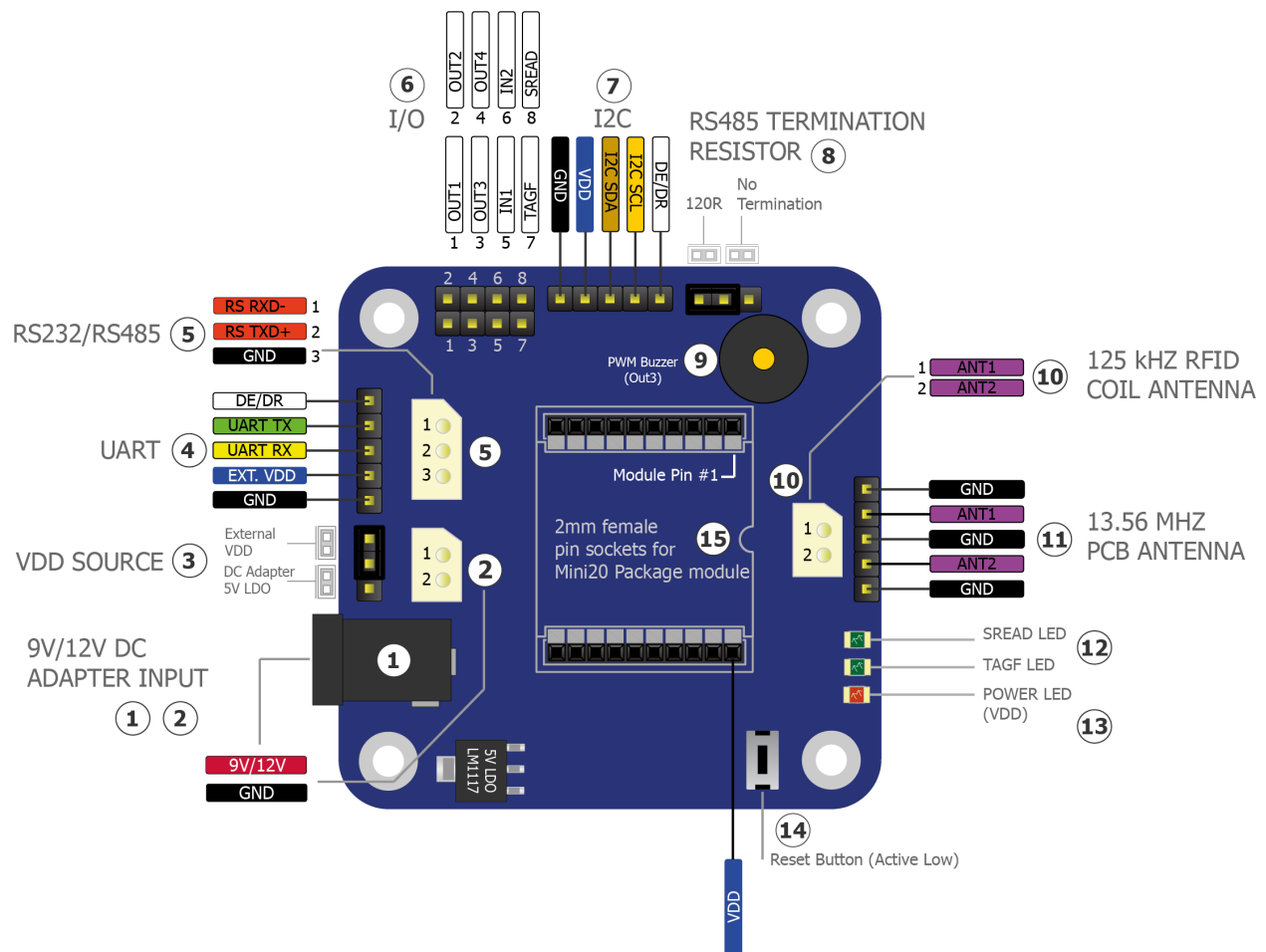


Figure 2 SM2251 Connection Diagram

## 2.1 SM5210-Mini Mifare Module and USB-UART Converter

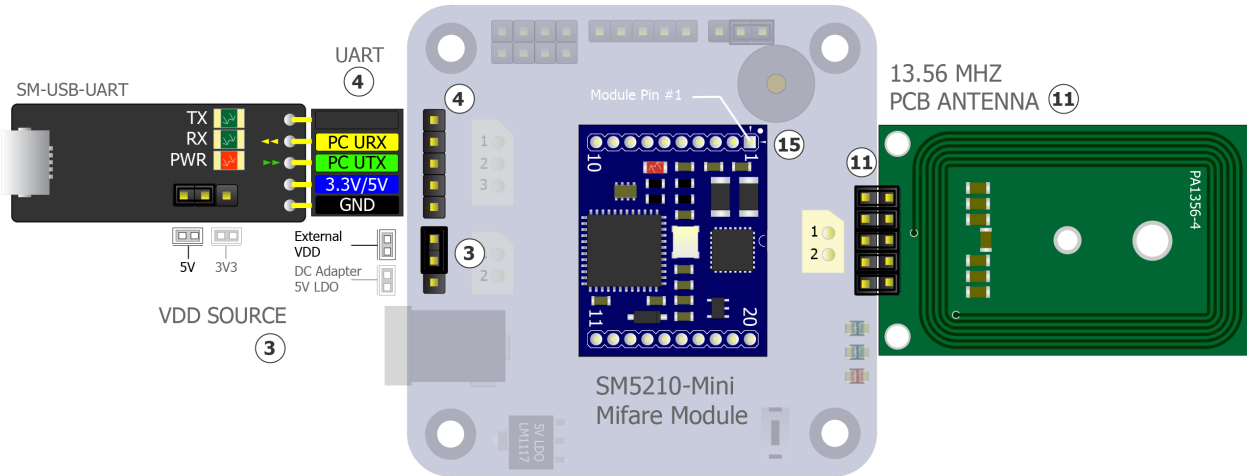


Figure 2.1 Typical connection with SM5210 Mifare module, PCB Antenna and USB-UART Converter

## 2.2 SM1250-Mini 125KHz RFID Module and USB-UART Converter

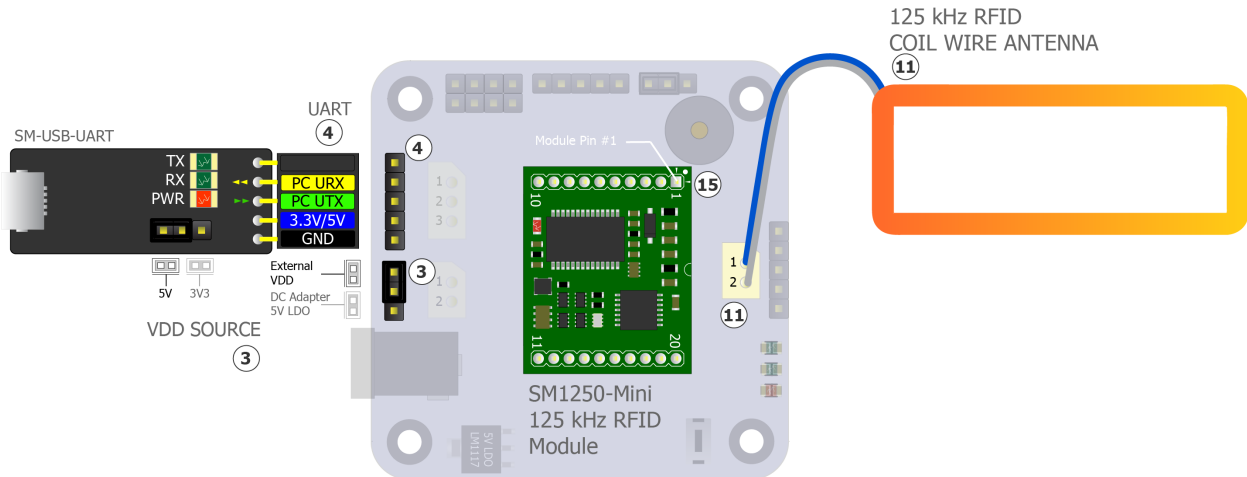


Figure 2.2 Typical connection with SM1250-Mini 125 kHz RFID module, Coil Wire Antenna and USB-UART Converter

## POWER OPTIONS

SM2251 is integrated with a 5V LDO Regulator (LM1117). Power can be supplied by 9V/12V DC input thru (#1) or (#2) or externally (max 5V) thru (#4).

If 9V/12V DC input is used and jumper (#3) position is selected appropriately then the VDD voltage will be 5V(LDO 5V).

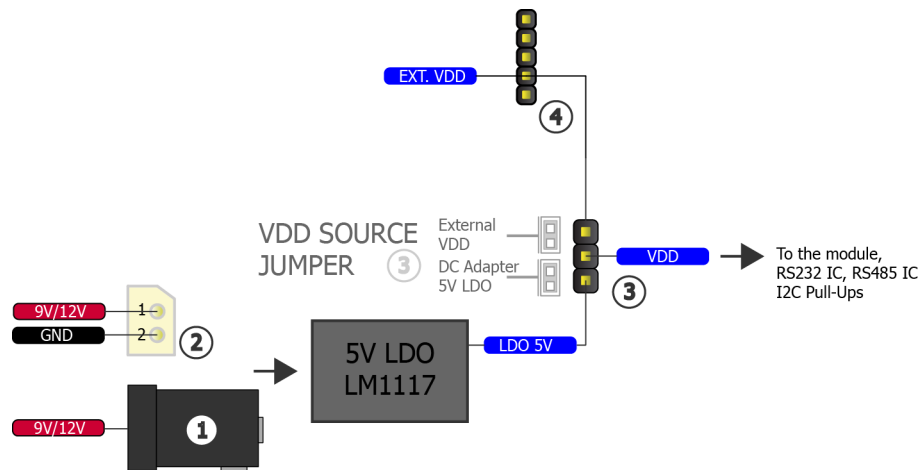


Figure 3 SM2251 Power Supply Selection

An alternative and recommended option for easier connections is to use SM-USB-UART Converter. It supplies power to the board thru USB and it brings also USB-UART communication with PC or USB Host. SM-USB-UART Converter includes a 3.3V LDO and supports both 5V and 3.3V output with appropriate jumper selection on board.

**Note:** Please notice that ST232(RS232) or ST485(RS485, optional) chips that are integrated on the SM2251 board is designed for 5V operation. It is possible to connect 3.3V thru Ext.VDD if target module supports 3.3V operation. In this case, standard module functions and UART, I2C, I/O etc. will work without any problem. **However, RS232 and RS485 operations are not guaranteed to work with 3.3V external VDD supply.**

**Attention:**

- Vdd or Ext.Vdd maximum voltage value should not exceed 5V!
- Use 9V/12V DC input only thru connector (#1) and (#2).
- Use only single source for powering the SM2251 board, do not use dc adapter input and external vdd (i.e. USB-UART converter) at the same time.

### 3.1 USB-UART Converter & External VDD Connection

External Vdd input or SM-USB-UART can be used by selecting the appropriate jumper position (#3) as illustrated in the connection diagram.

SM-USB-UART converter pin-out mates one-to-one with the UART Connector (#4) on the SM2251 board. Please notice that UART TX and RX signals cross connected to each other as one side is transmitting and the other side is receiving.

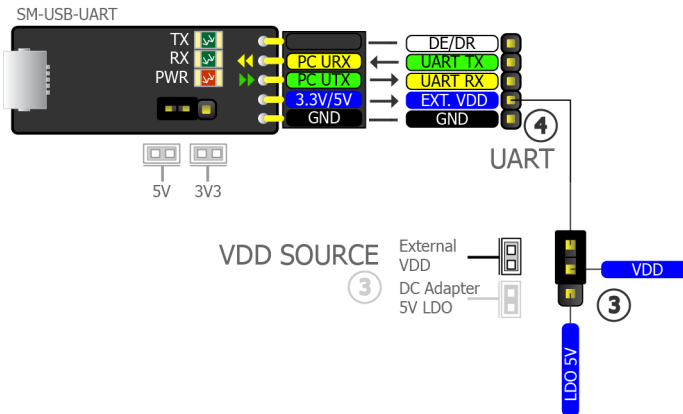


Figure 3.1 SM2251 and SM-USB-UART Converter connection

### 3.2 9V/12V DC Input Connection

To use a 9V/12V DC input power supply, instead of direct Vdd connection externally, select the appropriate jumper position (#3) as illustrated in the connection diagram below. 9V/12V DC can be supplied from dc adapter socket (#1) or from two pin connector (#2).

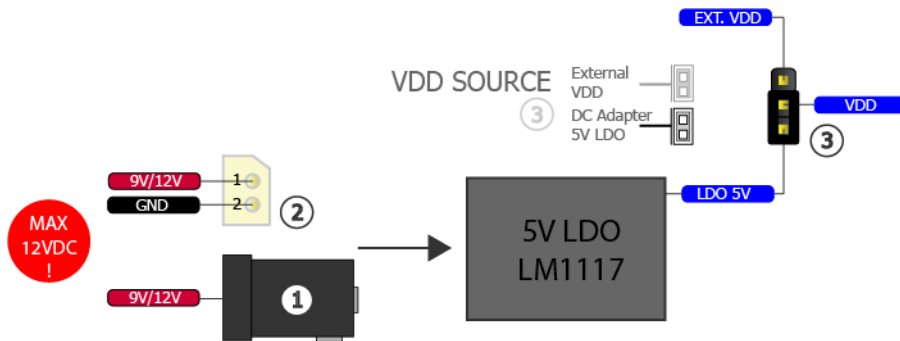


Figure 3.2 SM2251 9V/12V DC Input Connection

## RS232 CONNECTION

SM2251 is integrated with ST232(RS232 Transceiver IC) as default option. It is designed to work for 5V operation only. 3.3V operation for RS232 is not supported. 5V can be supplied directly from Ext.VDD pin (#4) or from 5V LDO by using 9V/12V DC input from (#1) or (#2). Use the jumper (#3) for the desired power option.

**Note:**

- RS232 will not function properly if USB-UART converter is used at the same time. USB-UART converter will function properly in this case.
- If External VDD is used then it should be 5V for RS232 operation.
- If DC Adapter or 9V/12V DC input is used then 5V (VDD) will be supplied thru LM1117 Regulator to the RS232 and the module.

### 4.1 RS232 Connection with DC Adapter or 9V/12V Input

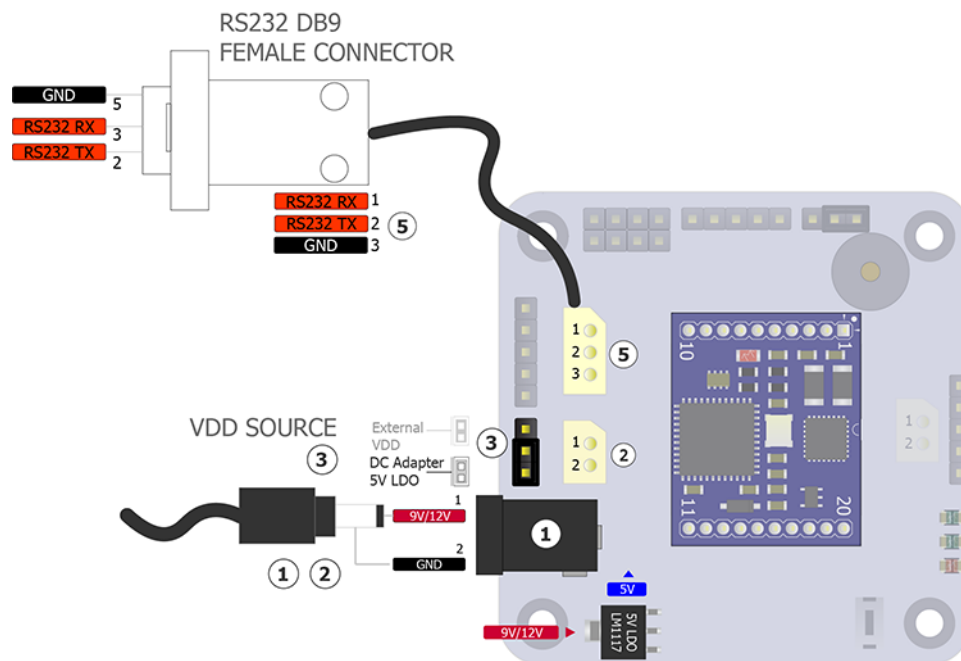


Figure 4.1 Typical RS232 connection with 9V/12V DC input

## 4.2 RS232 Connection with External 5V Input

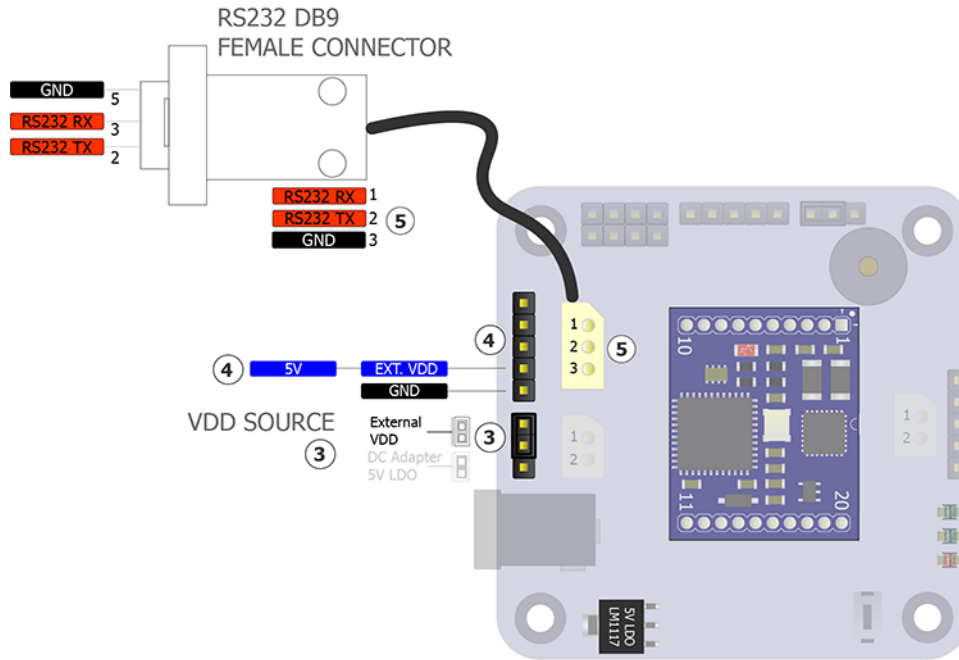


Figure 4.2 Typical RS232 connection with external 5V Input

## 4.3 RS232 DESIGN NOTES

**Attention:** Please take special care and check your connections if the external controller is a 3.3V device and have not 5V tolerant UART RX/TX pins.

- If the supplied voltage is 5V then the 125 kHz RFID modules, SM1250-Mini and SM1251-SMD, will have 5V CMOS/TTL signal level. In this case none-5V-tolerant pins of the external controller must be protected.
- SM5210-Mini and SM5211-SMD modules have integrated 5V to 3.3V LDO regulator on board and will always have 3.3V CMOS/TTL level if supplied with 3.3V or 5V. However, I2C pull-up resistors(4K7) on the SM2251 board is connected to VDD (can be 5V).
- If USB-UART converter and none-5V-tolerant external controller are connected at the same time, make sure the USB-UART converter works in 3.3V mode with the appropriate jumper selected on it.

A resistor divider on module UART RX pin, where the external microcontroller's UART TX pin is connected, is used for two purposes.

One of these purpose is to protect the 3.3V tolerant external microcontroller's UART TX pin by not directly interfacing it with 5V signal level coming from the ST232 IC as it is designed for 5V operation.

However if the RFID module's UART\_TX pin is at 5V level - which is the case for SM1250/SM1251 125 kHz RFID modules if supplied with 5V, then the external microcontroller's UART RX pin must be 5V tolerant. If the external microcontroller has not 5V tolerant UART RX pin then the RFID module can be supplied with 3.3V (provided that it supports 3.3V operation) or a protection circuit such as resistor divider can be used at the external microcontroller side.

Second purpose of the resistor divider is; it makes USB-UART converter possible to be functional by not directly interfacing it with the ST232 R1OUT pin, and reduce effects of the output conflict.

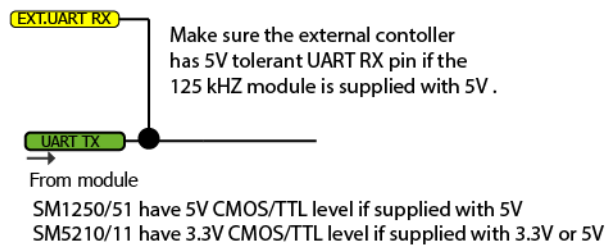
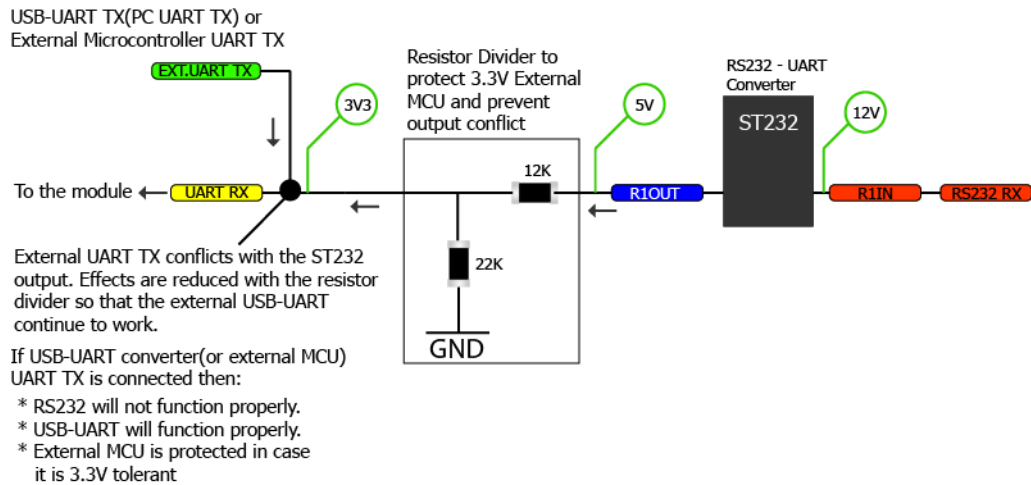


Figure 4.3 SM2251 internal RS232 circuit



## I2C CONNECTION

SM2251 board provides I2C connections of the target module. **4.7K pull-up resistors connected internally to the VDD on board.**

**Attention:** If VDD is 5V then I2C pull-up is connected to 5V. Please make sure your external microcontroller can tolerate 5V I2C signals in this case. **If not(i.e. Raspberry Pi) it is strongly recommended to remove pull-up resistors on the SM2251 board to protect the external microcontroller. Otherwise external microcontroller will interface with 5V.**

**Please remember that if you use 9V/12V DC input supply option then the VDD will be 5V.**

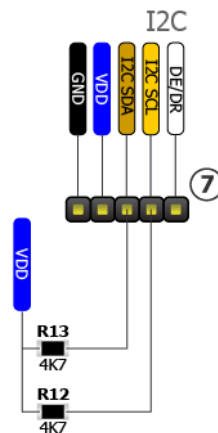


Figure 5 SM2251 I2C connection





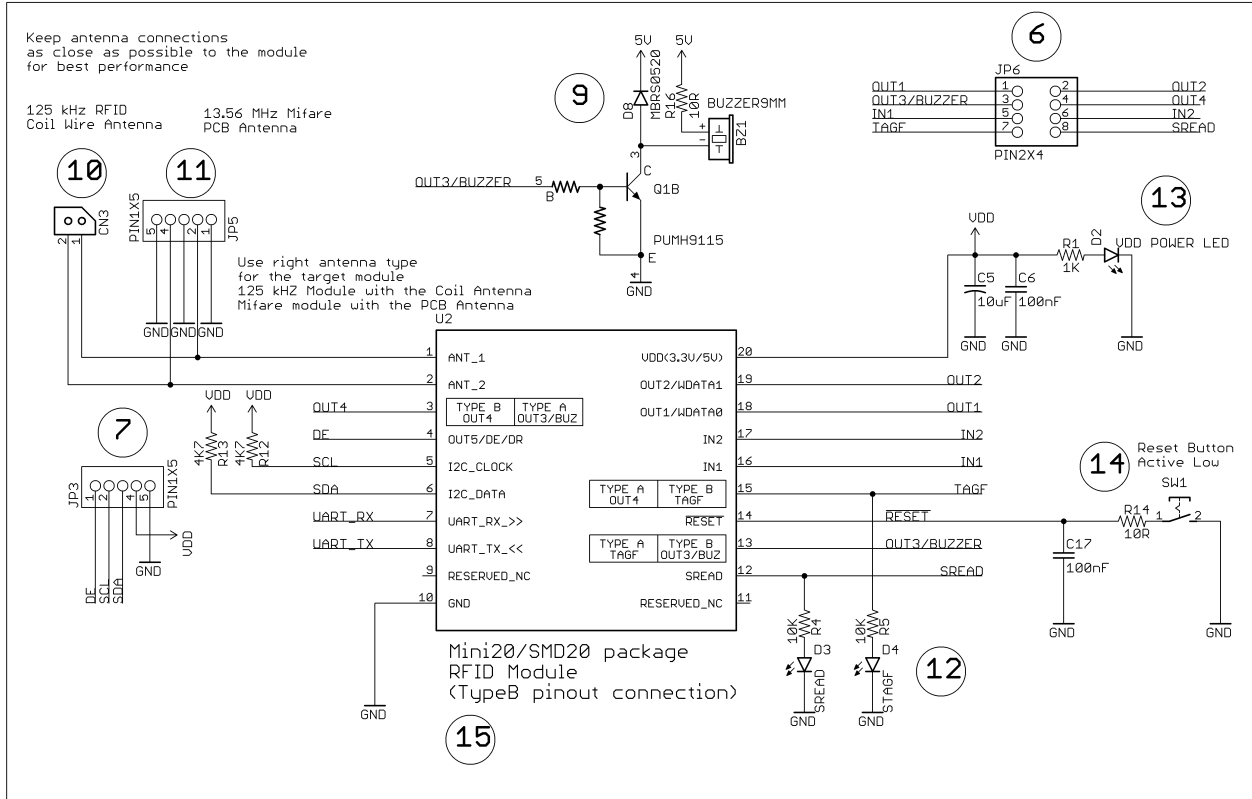


Figure 6 SM2251 Schematic Part 2/4

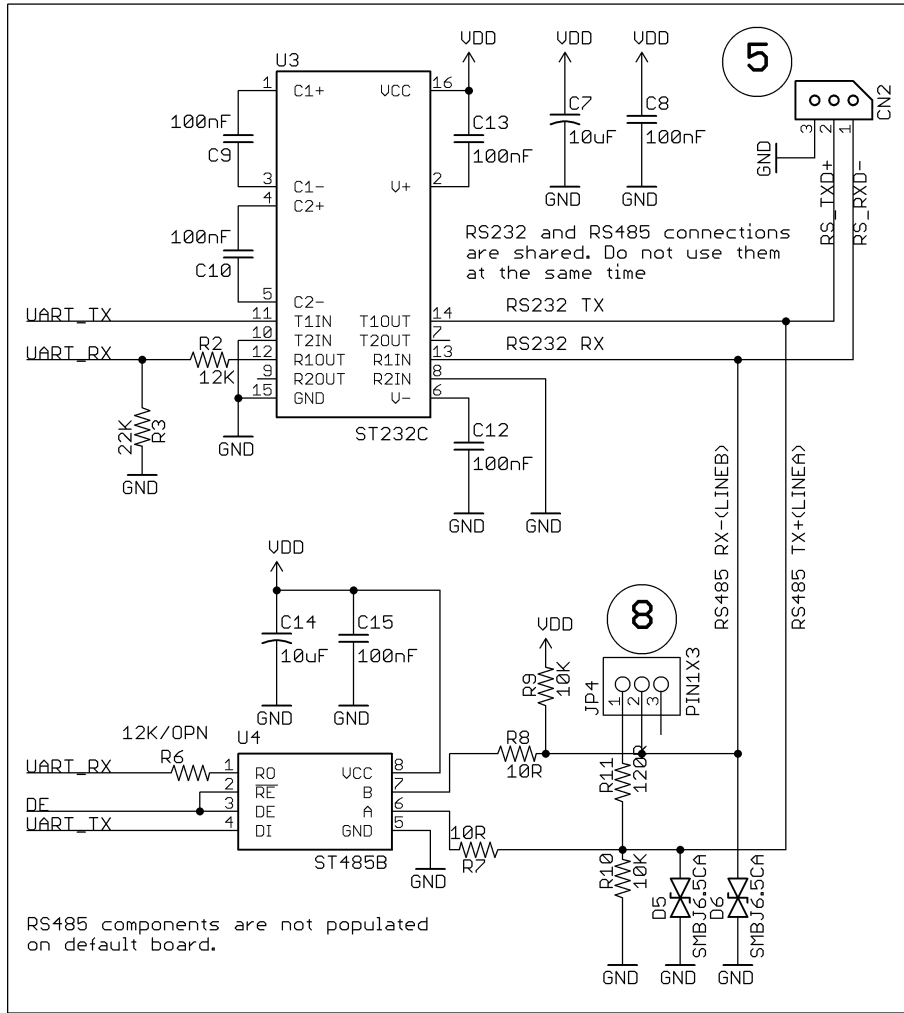


Figure 6 SM2251 Schematic Part 3/4



MECHANICAL DRAWINGS

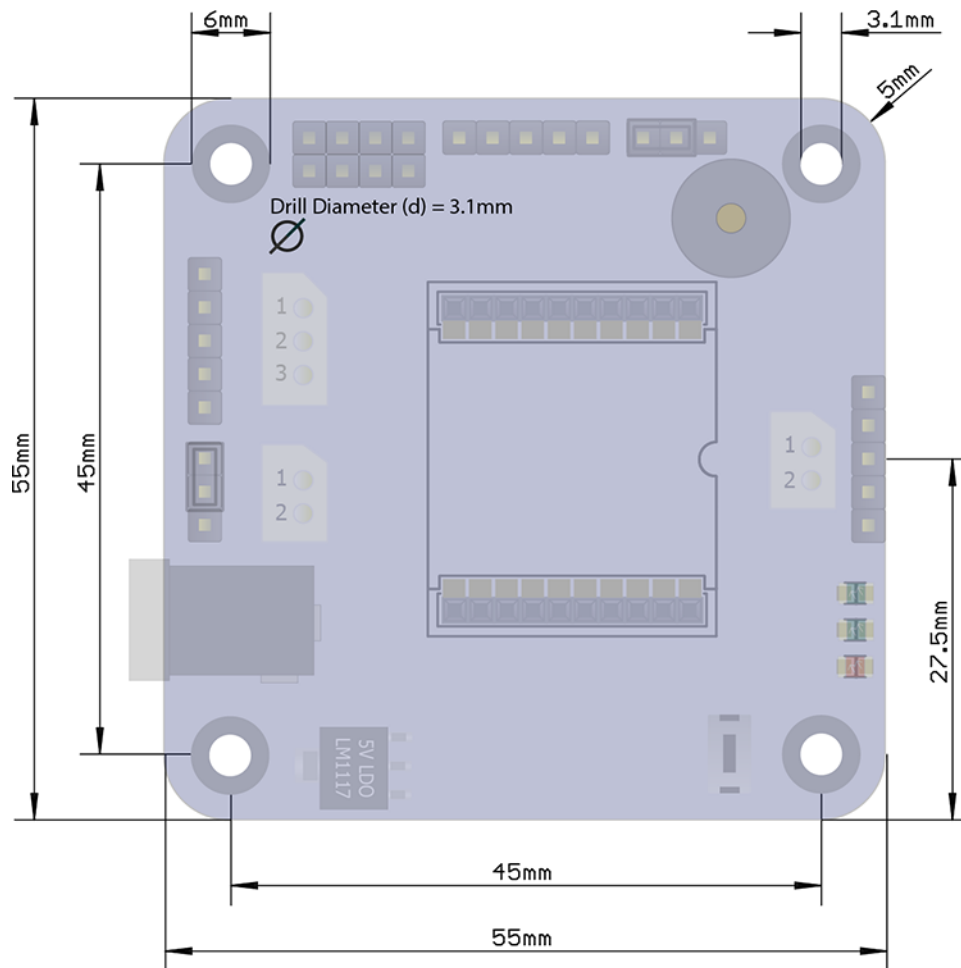


Figure 7 SM2251 Mechanical Dimensions



## REVISION HISTORY

**Version 1.0.0 (08 Oct 2017)**

Initial release.