SM5210/SM5211-SMD Datasheet

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SonMicro Elektronik

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CHAPTER

ONE

INTRODUCTION

Note: SonMicro Mifare modules exist in the market since 2004. The firmware and the hardware are designed and developed more than 10 years of experience by collecting customers' requirements and feedbacks. Final result is the reliable, robust design and long-term availability worldwide with the qualified support and resources.

SM5210/SM5211-SMD is a second-generation module that is successor of the first generation SM130 Mifare module. It supports same SM130 functionality and communication interface with more features and comes with smaller size. Second generation modules bring additional features and commands that is explained in the firmware manual document. They have also better integrated bootloader, lower current consumption specifications and wide input supply voltage between 3.3V and 5V. SM130-M2, which is pin-to-pin compatible with SM130, is a second-generation module available for SM130 replacement. Please see *SM130 Migration section*

SM5210/SM5211-SMD is a 13.56MHz ISO1443A Mifare® Classic read/write module that is integrated with ARM® Cortex®-M3 microcontroller, mixed signal processor IC and passive components in a small form factor.

SM5210/SM5211-SMD supports all operations such as authenticate/read/write for the Mifare Classic 1K, Mifare Classic 4K and Mifare Classic Ultralight tags. NTAG, ISO14443A NFC Tags are also supported. **See Limitations:**[1]

SM5210/SM5211-SMD supports also reading card serial number, UID (Unique Identifier) of all ISO14443A cards e.g. Mifare DESfire, Mifare Plus, Mifare Ultralight C. However, authenticate/read/write operations are not supported with these cards.

SM5210/SM5211-SMD runs IP, intellectual property, firmware versions (standard and application specific) that handles the ISO14443A RFID protocol and provide easy to use communication interface, UART & I2C[2] with well-defined protocol, SPV1[3] , and rich API. Firmware provides commands such as activate, authenticate, read/write data block and more to interact with the Mifare card and the hardware. A contactless smart card application can be designed easily with a microcontroller or PC with the provided commands and SDKs (i.e. Python, .Net, Qt)

Firmware (e.g. stdMifare V2.x.x) also supports 'Auto Mode' so it can report card UID with protocol or ASCII output, or do some operations such as driving buzzer and LED without any need of an external controller for access control or similar applications.

SM5210/SM5211-SMD is integrated with a bootloader program. It allows new firmware releases to be upgraded over UART. Application specific firmware versions (e.g. offline reader, access control for elevators) may be available or developed for such requirements. **See Limitations.**[4] Please check for the firmware manuals at support page for different target applications if exist any.

[1] NTAG, ISO14443A NFC tags can be read/write with the standard firmware versions but some NFC specific features have not been available yet. UID reading of these cards are straight forward.

[2] I2C is not enabled in default. It needs to be enabled thru configuration or it should be requested to be enabled when shipping from the factory.

[3] Spv1 - Standard Protocol Version 1 is name of the protocol used with the Mifare Module UART and I2C communication. Please see *Mifare Readers Communication Protocol* document for more details.

[4] For custom firmware development or custom feature requests please contact with us. We are committed to develop new firmware versions for general industry requirements for different target applications to reduce overall system cost and provide flexibility and faster time to market. Please also check for the availability of the firmware versions for specific applications at our support page.

1.1 SM5210 vs SM5211-SMD

SM5210 and SM5211-SMD shares the same design, firmware and pin-out order, only the mechanical dimensions are different.

SM5211-SMD is a smaller module has surface-mount pads so that it can be used just like an IC. It is appropriate for automated assembly that results in faster manufacturing and lower labor cost in addition to having no socket cost.

Note: Both SM5210 and SM5211-SMD have standardized module packages, named Mini20 and SMD20 package respectively. The pinout and mechanical dimensions are designed to be one-to-one compatible with same package of other types of RFID modules (i.e. 125 kHz RFID and 13.56 MHz RFID) SonMicro offers different modules with same type package i.e. SM1250 (Mini20 package) and SM1251-SMD (SMD20 package) for 125KHz RFID Modules. Thus same user board (mother board) can be used with different modules for different applications. Even for different RFID frequencies, i.e. 13.56MHz Mifare and 125KHz RFID, same board can be used only by changing the module and the antenna.

1.2 SM130(First Generation Module) Migration

It is highly recommended to use SM5210-Mini or SM5211-SMD module for the new designs. However, for one-to-one SM130 replacement with the second-generation module alternative, please check for SM130-M2 datasheet at our support page. A new design, SM130-M2, is available and designed as same pinout with the SM130 and using second generation SM5211-SMD module on top of its printed circuit board. SM130-M2 brings the second-generation module advantages with the SM130 pinout and offer one-to-one replacement of SM130 modules.

CHAPTER

TWO

FEATURES

- **Complete** Mifare® Classic Read/Write module excluding only the antenna
- Supports **full card operations** with Mifare® Classic 1K, Mifare® Classic 4K, Mifare® Ultralight and NTAG®[1]
- Supports reading card serial number, **UID - Unique Identifier of all ISO1443A cards** such as Mifare DESFire, Mifare Plus and Mifare Ultralight C.
- Fast data transfer - Contactless communication up to 106Kbit/s
- Secure - Encrypted contactless communication
- **Ultra Compact Size** 2.2 x 2.0 cm SMD package (appropriate for automated assembly) and **Compact Size** 2.7 x 2.2 cm with 2mm pitch low profile pins.
- **Compatible pinout and package** for different modules to support same mother board design (i.e. SM1250/SM1251-SMD 125KHZ RFID Modules)
- **UART Interface** up to 115200bps
- **I2C interface** up to 400KHz[2]
- **General Purpose Inputs and Outputs** control-able with advanced timing sequence and non-blocking operation.
- **Firmware upgrade-able.** Integrated with **bootloader** to flash new firmware versions and upgrades over UART
- Full control with **Command/Response Mode** or **Auto Mode**
- Python, .Net **SDKs** and microcontroller **code examples** available
- Wide range of supported mother boards available supporting RS232, RS485 and USB.

CHAPTER

THREE

POWER DOMAIN

SM5210/SM5211-SMD has internal 3.3V regulator on board. Input voltage can be between 3.3V and 5V. Maximum input voltage must not exceed 5.2V and minimum voltage must not drop below 3.0V. Input voltage is converted to 3.3V and all system components is supplied with 3.3V LDO output thus all outputs are at 3.3V CMOS/TTL level.

Most of the pins (UART/I2C communication and Inputs) are 5V tolerant. Please see *connection pinout diagram*

For input voltage(VDD) lower than 3.3V, i.e. 3.0V, internal power will be equal to input voltage without any conversion.

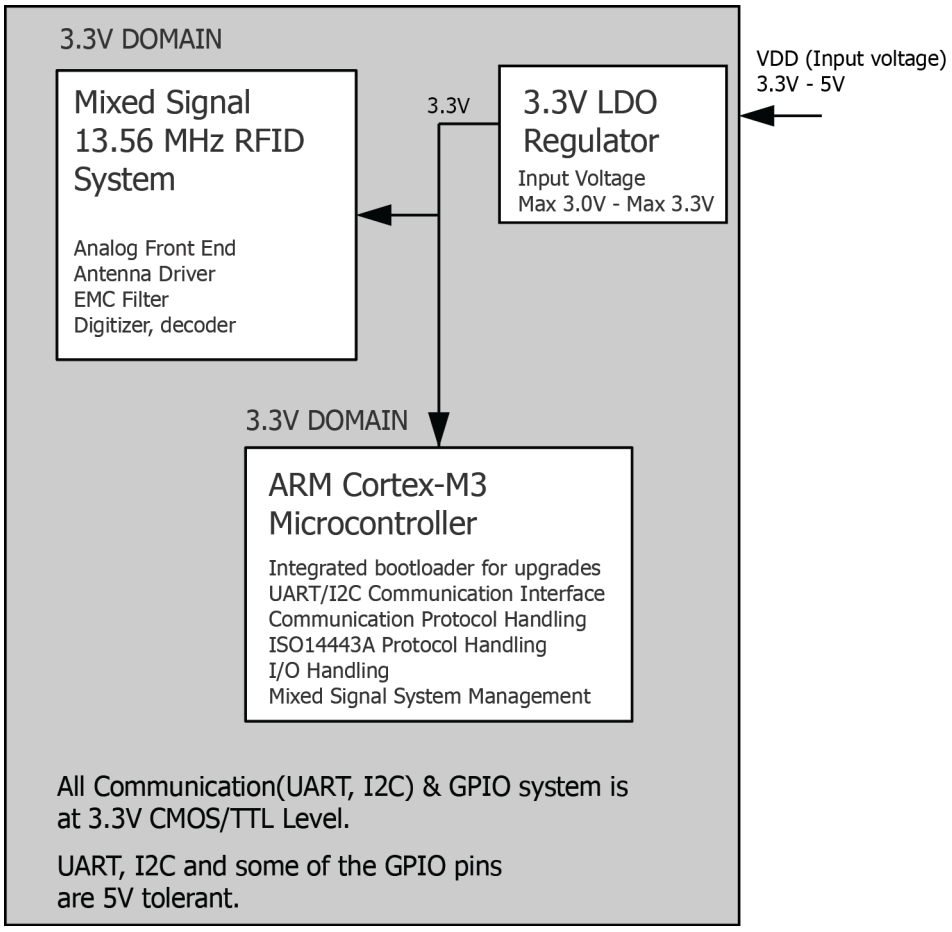

Figure 3 *SM5210/SM5211-SMD Power Domain and Internal Block Diagram*

CHAPTER

FOUR

CONNECTION PINOUT DIAGRAM

All system components work with internally regulated 3.3V. Output signal levels are at 3.3V and CMOS/TTL compliant. Communication(UART/I2C) and input pins are 5V tolerant and can be connected to 5V TTL/CMOS microcontroller or chip. However, 6 of the outputs, OUT1, OUT2, OUT3, OUT4, TAGF and SREAD, marked as red color on the pinout diagrams, are not 5V tolerant. Special care must be taken in case these pins are used as inputs with a possible customized firmware version.

Both SM5210 and SM5211-SMD have same pinout order and only the mechanical dimensions are different.

There are two types of pin connections, TypeA and TypeB. Only 3 of the pins (OUT3,OUT4 and TAGF) positions are different. TypeB connection supports driving PWM buzzer in addition to driving a DC buzzer. Connection type can be configured by command or software tools (e.g. Mifare Panel).

Note: Why Type B connection

Main purpose for TypeB connection is to create a resource (Pin# 13) for a PWM driven buzzer that does not exist in TypeA connection. Requirement for a PWM driven buzzer arises because if a DC Buzzer is placed just under the antenna then it may cause weak or deformed sound, affected by the antenna magnetic field. For such a design limitation, this issue can be resolved by using PWM buzzer with TypeB connection.

Note:

- SM2250 (Obsolete) main board used with SM5210-EK Evaluation kit is designed for TypeA connection.
- SM2251 (New) main board used with SM5210-EK Evaluation kit is designed for TypeB connection.

For new designs it is recommended to use TypeB connection. New possible mother boards and readers will be designed for TypeB connection.

4.1 SM5210 Pinout

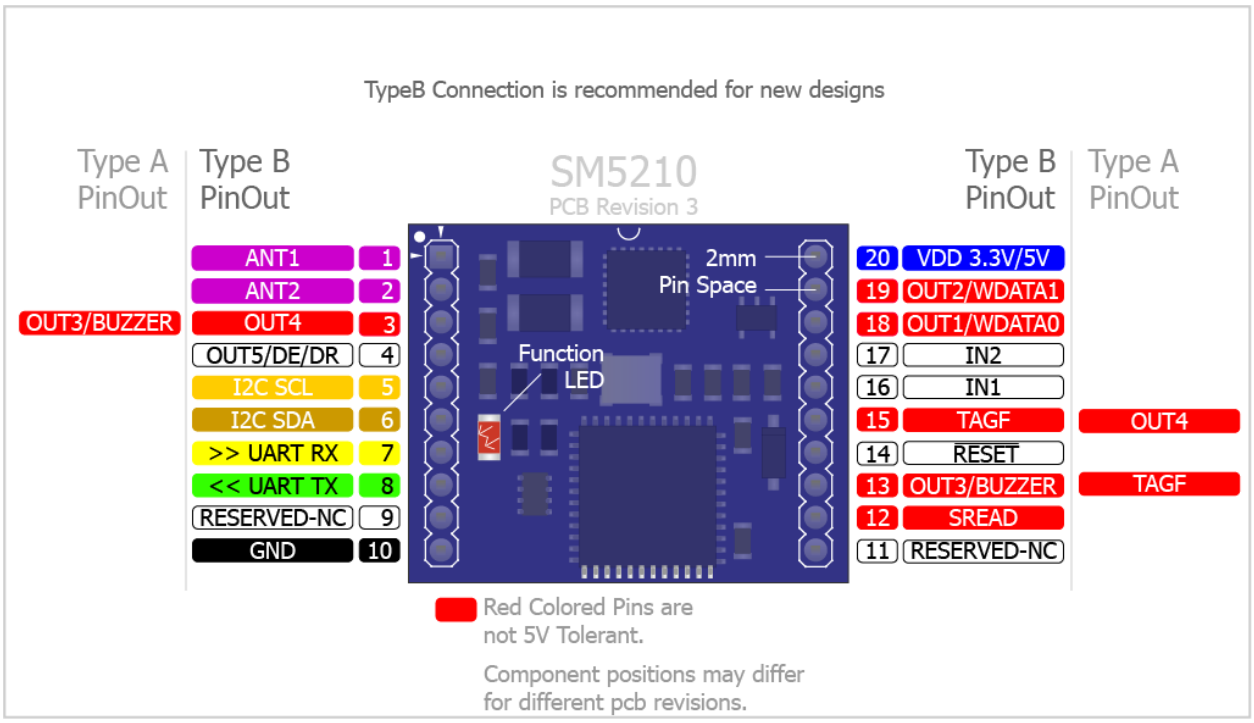

Figure 4.1 *SM5210 Pin Out*

4.2 SM5211-SMD Pinout

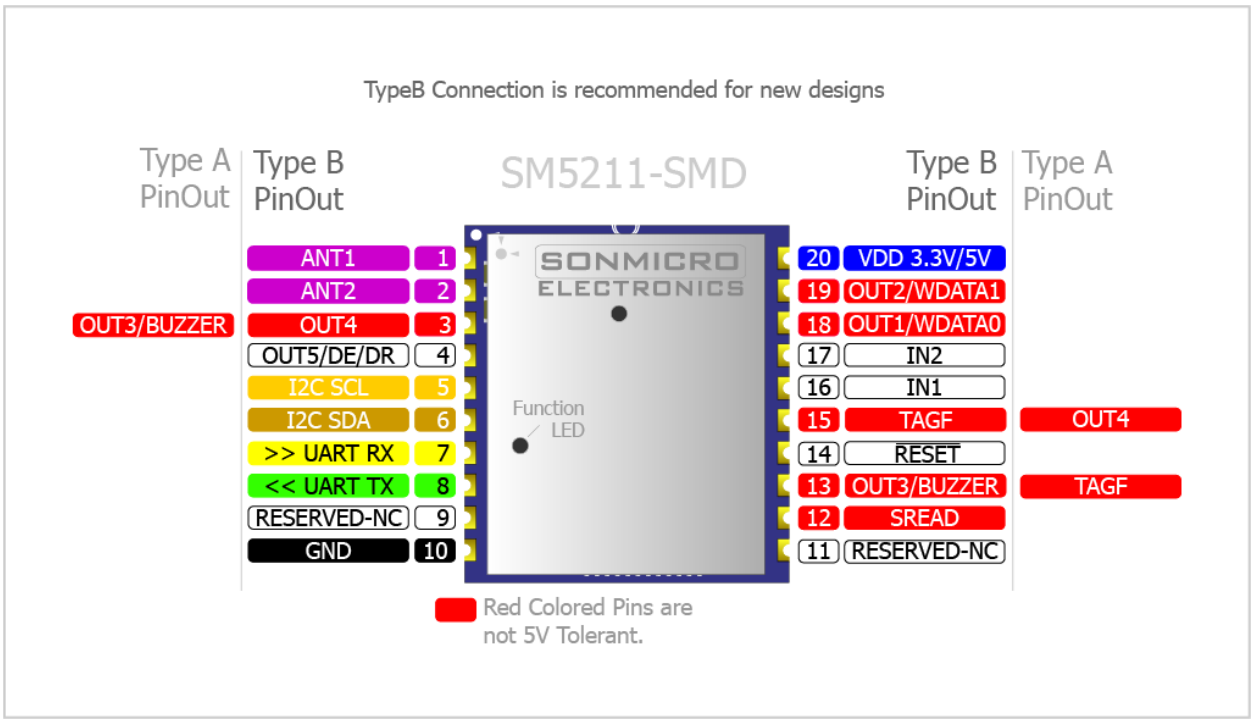

Figure 4.2 *SM5211-SMD Pin Out*

4.3 PIN DESCRIPTIONS

Attention: Following pin descriptions are for standard firmware versions released. (i.e. stdMifare V2.0.X and UM1.3R 1.0.7 / 1.1.4) Pins behavior may vary depends on the custom or special firmware running on the module for different target applications. Internal module design permits most of the pins configurable as input or output or different behavior (not possible to change by the user). If any different firmware version is available then please reference the firmware manual documents for possible differences.

Pin #	Name	5V Tolerant	Notes
1	ANT1	•	Antenna Drive Pin 1. Connect to the PCB Antenna's Ant1 pin.
2	ANT2	•	Antenna Drive Pin 2. 180-degree phase difference with ANT1. Connect to the PCB Antenna's Ant2 pin.
* 3	**TypeA:**OUT3/BUZZER **TypeB:**OUT4	**NO**	General Purpose Input Output. For TypeA connection, this pin can be used to drive DC buzzer with supported firmware commands and features or as general purpose output pin and its states can be controlled by ADVANCED_OUTPUT command For TypeB connection, this pin is an output pin and its states can be controlled by ADVANCED_OUTPUT command.
4	OUT5/DE/DR	YES	General Purpose Input Output. For RS485 this pin controls DE (Data Enable) pin of the RS485 IC. It is High when transmitting data. For I2C, this pin is used (optional) to notify i2c master by asserting High that data is ready so that master can poll data.
5	I2C CLK	YES	I2C Clock. External pull-up resistor is required. I2C must be enabled thru configuration.
6	I2C SDA	YES	I2C Data. External pull-up resistor is required. I2C must be enabled thru configuration.
7	UART RX	YES	UART RX. UART Receive pin of the module. It is required to be connected to UART TX(Transmit) of the external controller, or RS232/RS485/FT232 interface chip relevant pin. If you do not use this pin then connect a pull-up resistor to prevent it floating. Otherwise it will process random noise data continuously. **It is strongly recommended to have connection to UART pins and isolate UART RX pin of the module by jumpers (or 0R resistors) from your external MCU whereas possible to support onboard upgrading, and/or configure settings by USB-UART converter.**
8	UART TX	YES	UART TX. UART Transmit pin of the module. It is required to be connected to UART RX(Receive) of the external controller, or RS232/RS485/FT232 interface chip relevant pin. **It is strongly recommended to have connection to UART pins to support onboard upgrading, and/or configure settings by USB-UART converter.**
9	RESERVED NC	**NO**	Reserved - No Connection. This pin is reserved for internal use only and must be left floating and must not be connected to any signal.
10	GND	•	Ground.
11	RESERVED NC	**NO**	Reserved - No Connection. This pin is reserved for internal use only and must be left floating and must not be connected to any signal.

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Pin #	Name	5V Tolerant	Notes
12	SREAD	**NO**	Status Read. General Purpose Input Output. It can be connected to a LED for visual feedback or can be used as a general purpose I/O. Please see more details (at section SREAD & TAGF Pin/LED Functionality) in firmware and user manual document of relevant firmware (e.g. stdmifare V2.0.X Firmware Manual)
* 13	**TypeA:**TAGF **TypeB:**OUT3/BUZZER	**NO**	Tag Found (TypeA). General Purpose Input Output. (TypeA/B) For TypeA connection, it can be connected to a LED for visual feedback or can be used as a general purpose I/O. Please see more details (at section SREAD & TAGF Pin/LED Functionality) in firmware and user manual document of relevant firmware (e.g. stdmifare V2.0.X Firmware Manual) For TypeB connection, this pin can be used to drive DC or PWM buzzer with supported firmware commands and features. DC or PWM buzzer driving can be configured thru SET_CONFIGURATION command with the supporting firmware (e.g. stdMifare V2.X.X). **PWM driving is only supported with TypeB connection and relevant supporting firmware (e.g. stdMifare V2.X.X)**
14	RESET	YES	Active Low Reset Pin. A logic low pulse will reset the module. It can be left floating, it has an internal pull-up resistor and capacitor to prevent parasitic resets or it can be connected to the external microcontroller output pin.
* 15	**TypeA:**OUT4 **TypeB:**TAGF	**NO**	Tag Found (TypeB). General Purpose Input Output. (TypeA/B) For TypeA connection, this pin is an output pin and it's states can be controlled by ADVANCED_OUTPUT command. For TypeB connection, it can be connected to a LED for visual feedback or can be used as a general purpose I/O. Please see more details (at section SREAD & TAGF Pin/LED Functionality) in firmware and user manual document of relevant firmware (e.g. stdmifare V2.0.X Firmware Manual)
16	IN1	YES	General Purpose Input Output. This pin is an input pin with 5V tolerance. IRQ is not supported on state change in standard firmware versions. Input state can be read by relevant command.
17	IN2	YES	General Purpose Input Output. This pin is an input pin with 5V tolerance. IRQ is not supported on state change in standard firmware versions. Input state can be read by relevant command.
18	OUT1/WDATA0	**NO**	General Purpose Input Output. This pin can be used as an output pin and its states can be controlled by ADVANCED_OUTPUT command. Alternatively this pin can be used for Wiegand Data 0 output with supporting firmware. Standard firmware versions may not support wiegand output, please check for the availability.

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Pin #	Name	5V Tolerant	Notes
19	OUT2/WDATA1	**NO**	General Purpose Input Output. This pin can be used as an output pin and its states can be controlled by ADVANCED_OUTPUT command. Alternatively this pin can be used for Wiegand Data 1 output with supporting firmware. Standard firmware versions may not support wiegand output, please check for the availability.
20	VDD	YES	Input Supply voltage. It can be anywhere between 3.3V and 5V. Performance will not be affected by input voltage, it will be converted to 3.3V internally. **However, if possible try to use 5V input voltage on your board to support pin compatible modules that gives better performance at 5V, i.e. SM1250 125KHz Module, or higher power modules possibly exist in the future.**

Table 4.3 *SM5120/SM5211-SMD Pin Description Table for standard firmware versions.*

4.4 FLED (Function LED)

There is a red colored on-board LED on SM5210 and SM5211-SMD modules for assisting purpose. This LED is useful to understand the following states:

- When module first powers up, FLED blinks one time at startup indicating that the module is successfully running the firmware.
- When a command is received thru UART or I2C, FLED blinks for one time indicating that the command is received successfully.
- FLED blinks continuously indicating it is in boot mode and ready for the upgrade operation.

CHAPTER

FIVE

EXTERNAL DOCUMENTS & RESOURCES

5.1 Communication Interface & Protocol

For UART & I2C protocol details, frame structure and usage please check for the

- **Mifare Readers UART/I2C Communication Protocol - SPV1**

You can reference this document if you want to communicate with the module over UART, including RS232, RS485 and virtual com port, or I2C by directly using low level command API that is provided with the firmware manual.

You can skip checking this document if you are using a software tool, SDK or ready-to-use microcontroller code library if provided. Software tools, SDK and MCU code library already handles with the communication protocol and serves higher level, easy to use API or examples to user by hiding inner details of the communication and the protocol.

5.2 Firmware and User Manuals

Mifare modules comes with standard and application specific firmware versions. Each firmware may differ by usage and has different user manual document. Please check for the relevant firmware manual document for full command API and functional behavior.

For the standard firmware manual document please check for the

- **stdMifare V2.X.X - Firmware & User Manual**

There are also user manuals for quick introduction to Mifare Cards. For more detailed information about the Mifare Cards NXP documents should be referenced.

- **Mifare Classic EV1 1K/4K Cards - User Manual**
- **Mifare Ultralight EV1 Cards - User Manual**

5.3 Reference Design & Schematics

You can use SM2250/51 boards as a reference design:

- **SM2251 Hardware Manual (SM5210/11 Evaluation Kit Board for Type B connection)**
- **SM2250 Hardware Manual (SM5210 Evaluation Kit Board for Type A connection)**

5.4 Software Tools

There are software tools supporting full command API (hardware control, configuration and card operations) to quickly evaluate and test the Mifare modules and Readers.

- **Mifare Panel** is a cross platform software tool supports new features comes with stdMifare V2.X.X firmware version.
- **SMRFID Mifare 1.2** is an old tool for windows. It does not supports new features that comes with stdMifare V2.X.X firmware versions. However, it has better UI for card operations.
- **Mifare Quick and Light** is a .NET software tool with source code available. Please notice that it does not support new features (i.e. stdmifare V2.X.X configuration). A new .NET SDK and software is planned for future time.
- **SBoot Upgrader** is a firmware upgrade tool for windows.
- **Firmware Upgrader** is a cross platform firmware upgrade tool.

Firmware files are distributed by email upon request. They are not available for download.

5.5 SDK & Code Examples

Python and .Net SDK are available at our support page. There are also ARDUINO® and ARM® mbed™ code examples provided.

5.6 CAD/PCB Resources

AutoDesk Eagle, previously named Eagle CadSoft, PCB schematic and footprint library for SonMicro modules can be downloaded at our support page.

Trimble Sketchup, formerly Google Sketchup, 3D .skp files and .step files for the SonMicro modules can be downloaded at our support page.

3D Sketchup files are also appropriate for eagleUp project which is a useful tool to convert Eagle PCB to the 3D Sketchup drawings.

CHAPTER

SIX

HARDWARE INTERFACE PRECAUTIONS

Please first read the precautions to protect your reader and external controller before you make any connections.

6.1 UART

SM5210/SM5211-SMD UART I/O signal levels are CMOS/TTL level compliant and **5V tolerant**.

UART TX output signal level is at 3.3V level. Thus, you can use it with a 3.3V, none-5V-tolerant external controller reliably.

SM5210/SM5211-SMD UART RX input can be connected to any 3.3V or 5V controller's UART TX output pin, as it is 5V tolerant.

UART communication bit level protocol is exactly same for RS232, RS485 and USB Virtual Com Port. **However, hardware interface is required for RS232, RS485 or USB Virtual Serial port.**

Attention: *Protect your external controller*

- Even though SM5210/SM5211-SMD UART TX output pin is 3.3V, they might be used in a reader, base board or evaluation kit where a USB-UART Converter with 5V is connected at the same time to your none-5V-tolerant controller e.g. **Raspberry Pi.** Avoid connecting multiple interfaces or devices at the same time on the Mifare module mother board and check the none-5V-tolerant controller does not interact with 5V directly.

Attention: *Protect SM5210/SM5211-SMD Mifare Module*

- **Never connect SM5210/SM5211-SMD UART pins (or any other pin) to an RS232 device directly.** RS232 have +/- 12V signals, shares the same bit level protocol with the UART but they have different electrical characteristics. Direct RS232 connection will damage the module. You should avoid connecting your module directly to the PC com port or any USB/RS232 converter. In such a requirement, USB To UART converter or UART To RS232 (e.g. st232/max232) hardware interface is required between the module-UART and RS232 (e.g. PC) sides.

6.2 RS485

Spv1, Standard Serial Protocol Version 1, supports RS485 interface by using DE (Data Enable) signal and node address byte in the spv1 protocol frame.

SM5210/SM5211-SMD modules can be connected to RS485 interface (e.g. ST485/MAX485). There are also ready to use RS485 readers and boards available with bias, diode protection and simple filter circuits integrated with Mifare modules.

Attention:

- RS485 infrastructure (cabling, termination resistors etc.) is extremely important for reliable communication. It is assumed that you have understanding of RS485 interface and experience with the infrastructure. Extended support is not offered for RS485 caused problems. It is highly recommended to investigate RS485 networks. For example, a star or random style connections should be avoided. Even the application confirmed to be working good, you may have problems in midterm.
- **Upgrading the module firmware over RS485 is not supported.**

6.3 I2C

SM5210/SM5211-SMD supports the I2C communication with full command set and is disabled by default. **It requires to be enabled by relevant set configuration command (it is sent over UART) or it should be requested to be enabled in factory.**

Modules' I2C signal levels are CMOS/TTL level compliant and **5V tolerant**. Depending on the pull up resistor circuit used on the mother board, the output signal level can be 3.3V or 5V. For SonMicro mother boards, please check relevant board's hardware manual document for the pull-up resistor connections.

Attention: *Protect your external controller*

- **It is important to know about if the pull up resistors is connected to 5V or 3.3V on the mother board to protect external none-5V-tolerant controller.**

CHAPTER

SEVEN

DESIGN NOTES

7.1 ESD Handling

Attention:

- SM5210/SM5211-SMD is an Electrostatic Sensitive Device. Do not open, carry or handle except at a static-free environment.
- Do not carry or store the modules with Non-Antistatic bags such as nylon, plastic, Styrofoam type of general usage materials.
- **Please be aware that static electricity may cause partial damages inside the chips which cannot be observable at the time of misusage, and may result in failure in long term. ESD is one of the important source for damaged electronic devices.**

7.2 Antenna & Read Range

Read range depends on many factors. Please be aware and take care of the following guides. Please always test your setup or final product practically before going into the production.

- Mifare module design uses directly matched PCB antennas thus **try to place the antenna as close as possible to the module antenna pins.** Keep the antenna tracks parallel to each other and almost same length and bending style.
- Connecting the antenna outside of the Mifare module's board with a cable may result in poor performance. In such a case EMI affects are reduced by the filter circuit on the module side. However, it may still cause EMI problems affecting the other surrounding devices. If the antenna needs to be placed away from the module try to stay not to exceed 30cm length. Type of the cable used between the antenna and the module is very important. Some cables may cause extremely reduced performance. Flex data cables gives better result and has less effects on read range performance if compared with other types of cables. Please test your cables practically.
- Better read range can be achieved by using a bigger antenna and bigger tag. If you need to achieve maximum read range then consider using biggest PCB antenna size that your design permits.
- Antenna and card communicates each other with magnetic field variations. **Thus communication between the reader and the card is affected by the metallic objects.** Metallic objects surrounding the antenna including the printed circuit board, copper, LCD will decrease the read range. Try to place antenna as far as possible away from such metallic objects or components. Please be aware that it is not possible to read a card completely below a metal plane. If the surrounding is a metal frame then using the antenna even 1 cm away from it yields better results. Please test your setup practically in such a case.

None metallic objects, such as plastic, wood, acrylic, glass etc. has no effect on read range performance. **You can place the antenna below none metallic planes reliably.**

- Mifare card or tag has also integrated antenna that is tuned by the card manufacturer. Unfortunately, small variations of the tuning may vary by the card manufacturers and this results in different read ranges. Thus **the type of the card, or the manufacturer, other than the size, is also important for read range performance.**

  SonMicro Mifare modules and PCB antennas are designed to matched by collecting the averages of different types of cards thus it is expected to see similar results for different manufacturers' tags.

- Try to use linear low dropout voltage regulators where as possible. LDO regulators if compared with switch mode regulators, have less signal noise ratio and yields better results for the read range. If you are using switch mode power regulator please make sure you have back EMF and voltage protection diode or circuit to prevent transient high voltage ramping to prevent damage to the module or your system.

7.3 General Notes

- Use a 10uF tantalum capacitor close to the module VDD on your board. In addition to this, please be aware it is experienced that other ICs on your board, especially the ST232/MAX232 or FT232 may add noise to the overall system. **It is strongly recommended to use a 10uF tantalum and 100nF bypass capacitors close to these chips.** Otherwise you may experience communication problems, functional failures or poor read range performance.
- Critical components just beneath the antenna may cause unwanted signal disturbances or failures. One of the affected component is DC Buzzer. If you have to use a buzzer just beneath the antenna then it is strongly recommended to use TypeB connection and a PWM Buzzer. Otherwise you can observe weak or deformed buzzer sounds.

CHAPTER

EIGHT

MECHANICAL DRAWINGS

Note: Please notice that the following files are provided at our support page to ease your design progress.

- 3D .step file
- Sketchup 3D Drawing(.skp) file which is useful for eagleUp project to convert Eagle PCB to 3D
- Eagle PCB Schematic & Footprint Library.

8.1 SM5210 Mechanical Drawings

8.1.1 SM5210 Top View

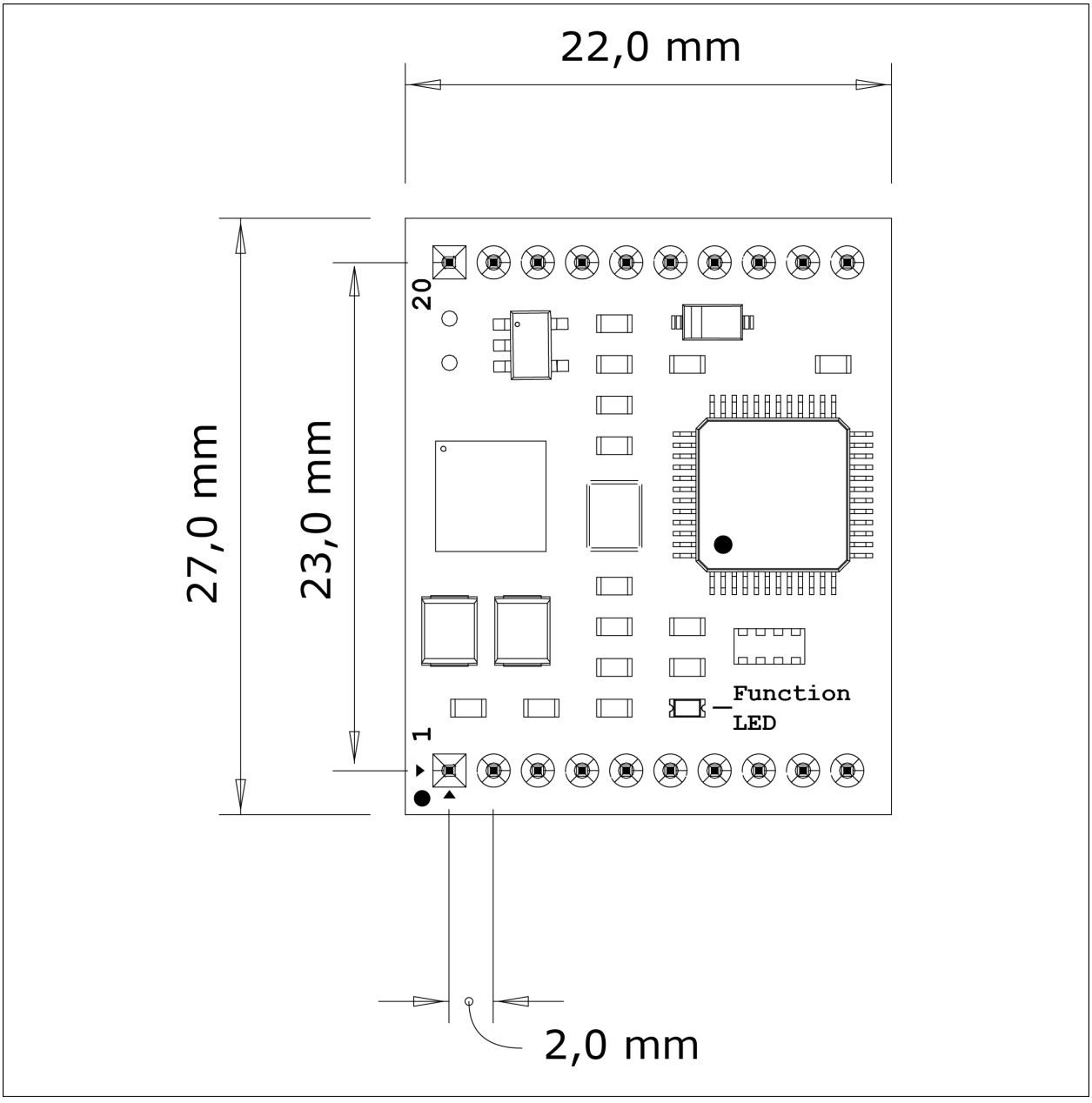

Figure 8.1.1 *SM5210 Top View*

8.1.2 SM5210 Side View

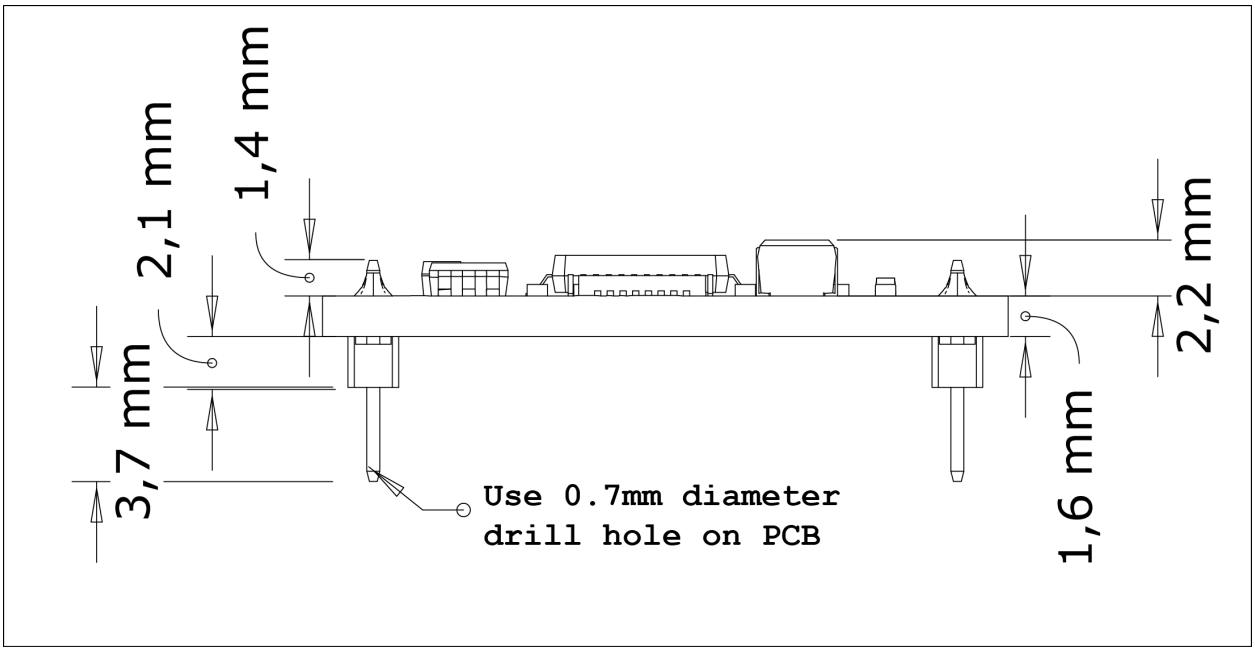

Figure 8.1.2 *SM5210 Side View*

8.1.3 SM5210 PCB Footprint (Mini20 Package)

Please notice that there is a ready to use Autodesk Eagle, previously named Eagle CadSoft, PCB Library provided for SonMicro modules. You can reference the following footprint for different PCB layout software.

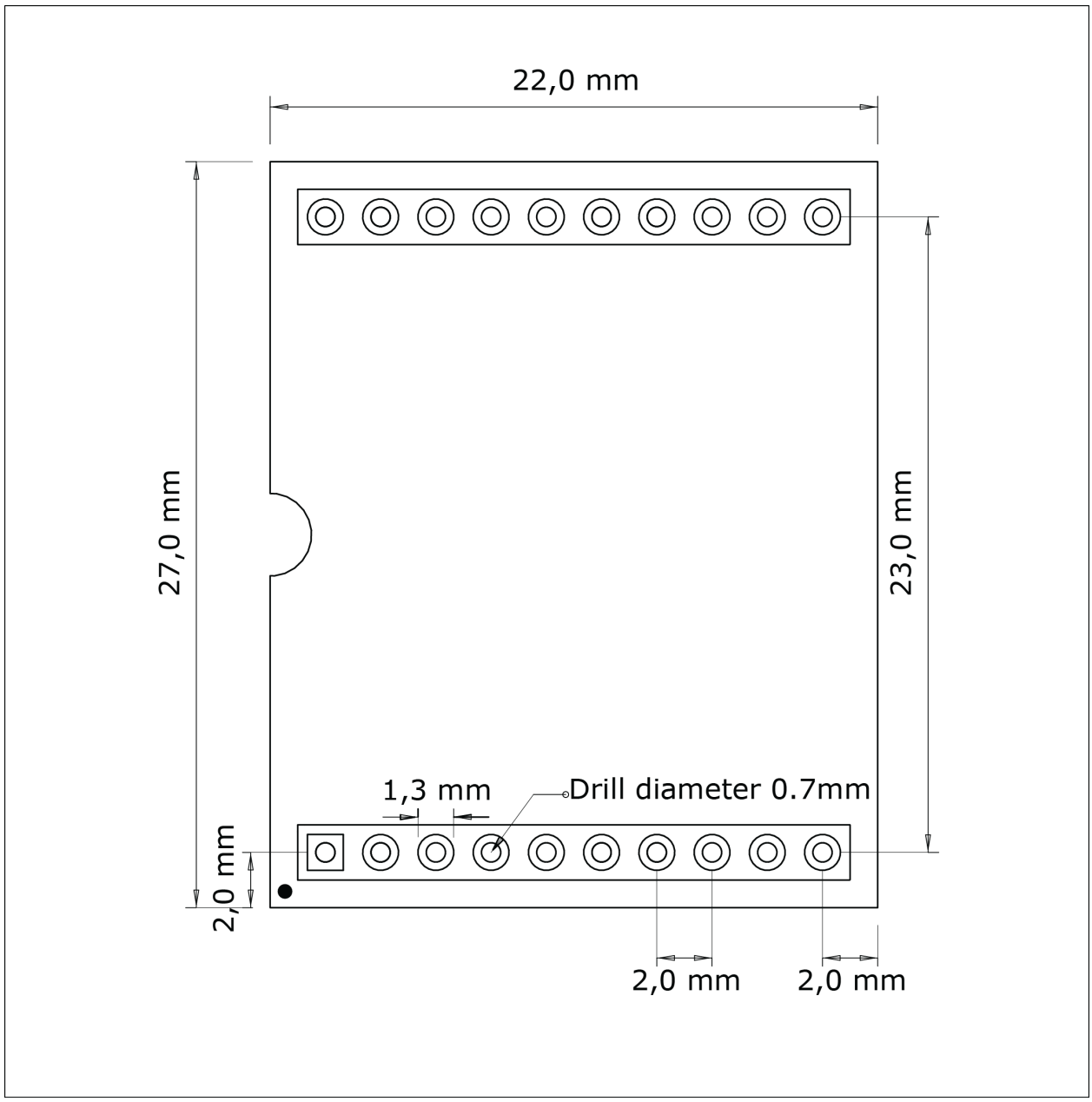

Figure 8.1.3 *Recommended PCB layout for SM5210 module(Mini20 package)*

8.2 SM5211-SMD Mechanical Drawings

8.2.1 SM5211-SMD Top View

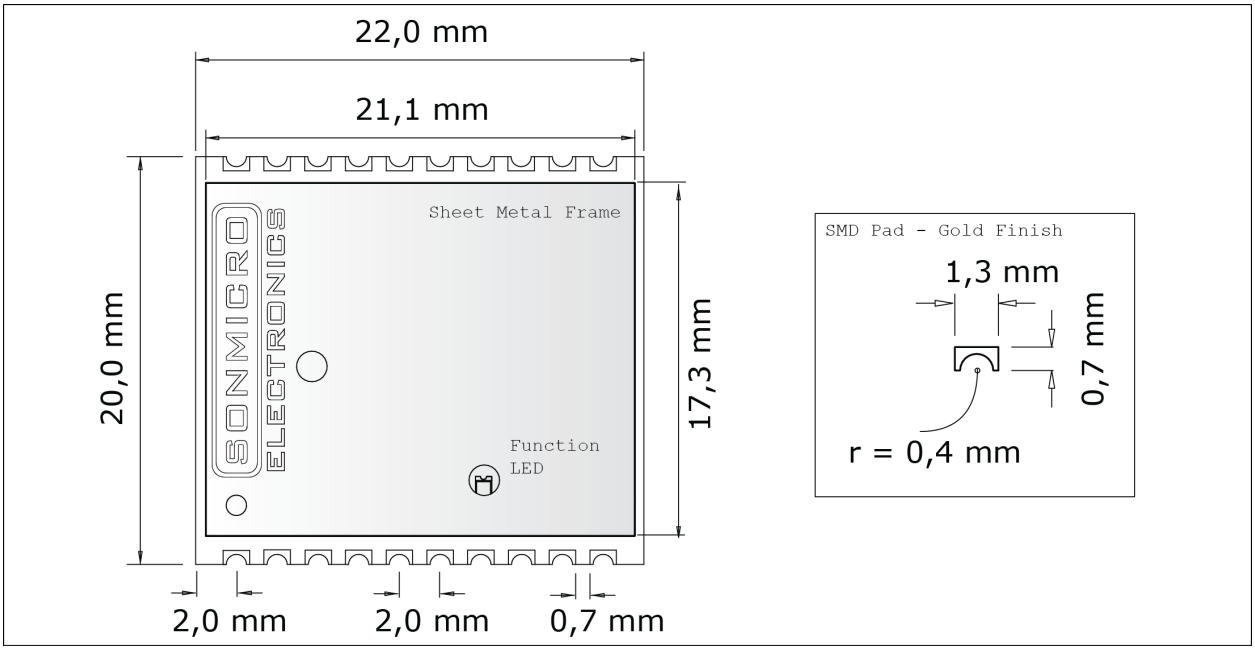

Figure 8.2.1 *SM5211-SMD Top View & SMD Pad Dimensions*

8.2.2 SM5211-SMD Side View

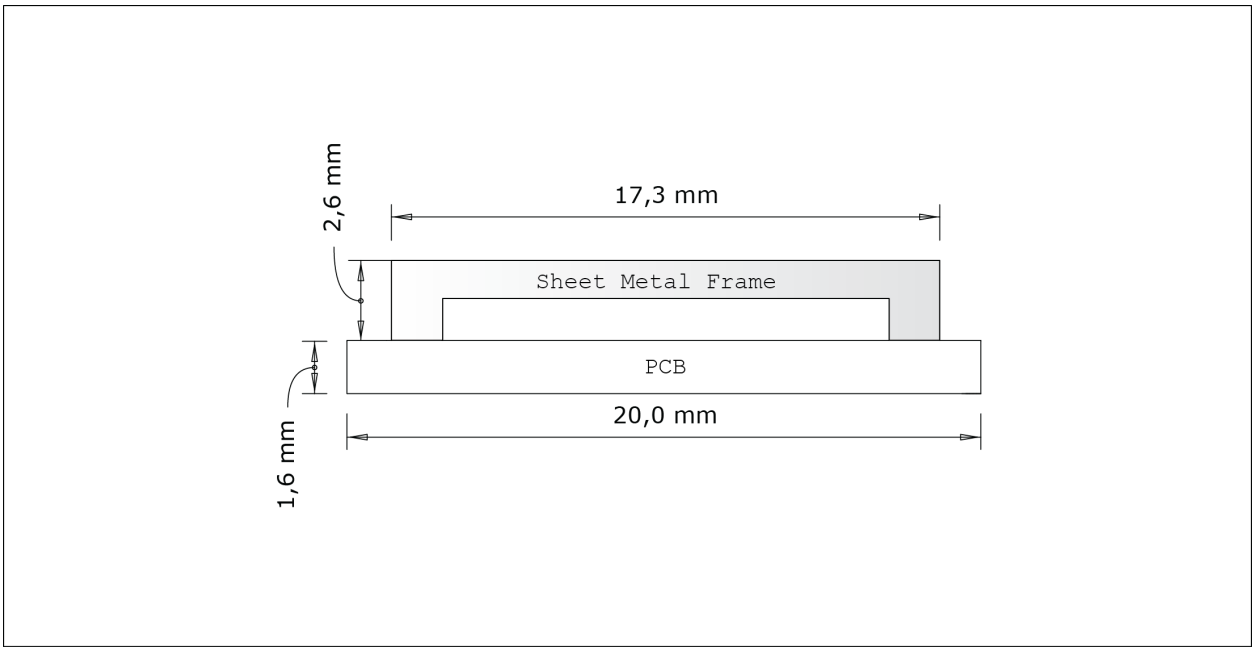

Figure 8.2.2 *SM5211-SMD Side View*

8.2.3 SM5211-SMD PCB Footprint (SMD20 Package)

Please notice that there is a ready to use Autodesk Eagle, previously named Eagle CadSoft, PCB Library provided for SonMicro modules. You can reference the following footprint for different pcb layout software.

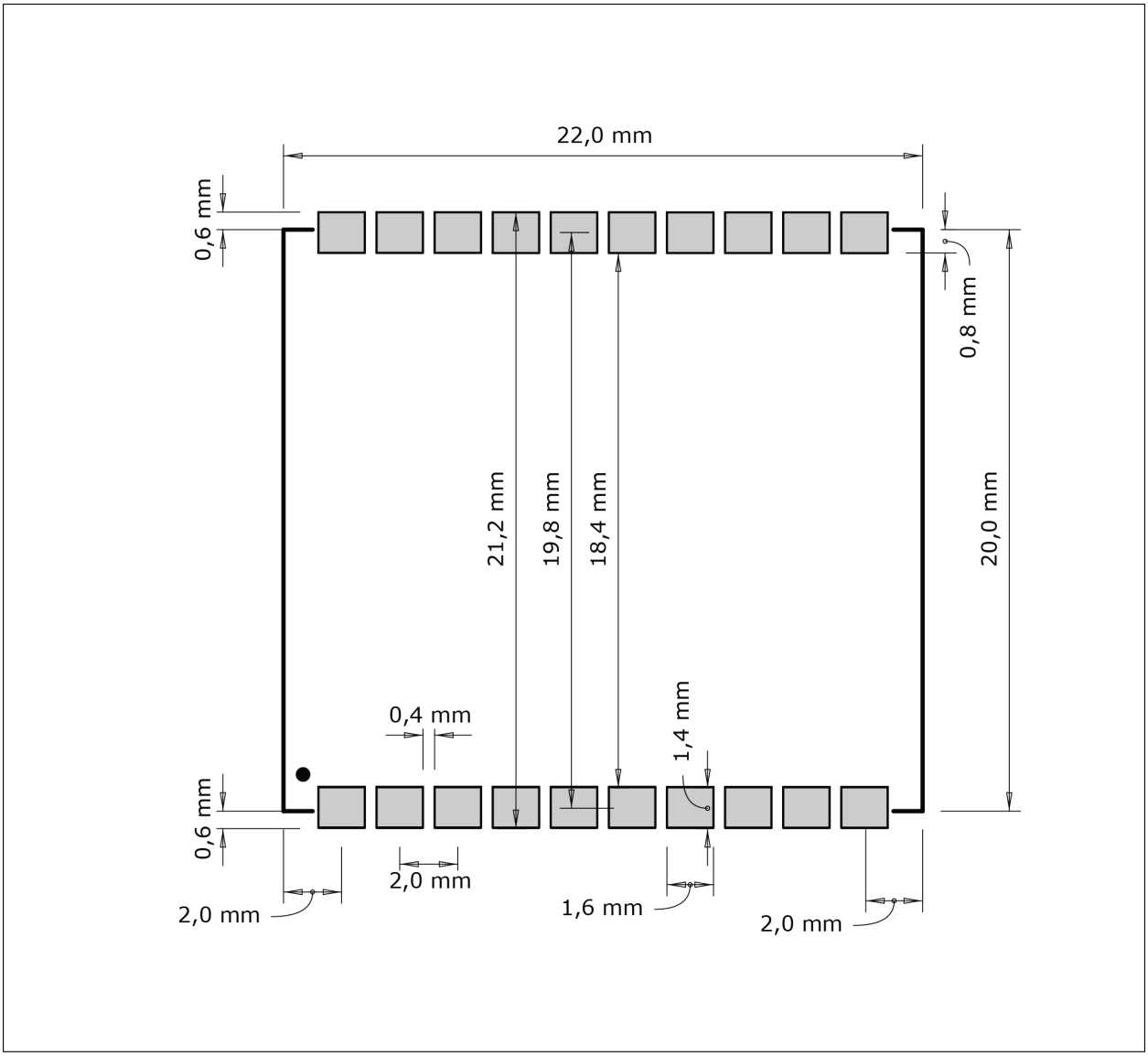

Figure 8.2.3 *Recommended PCB layout for SM5211-SMD module(SMD20 package)*

CHAPTER

NINE

PACKING INFORMATION

9.1 SM5210 Packing Information

SM5210 Modules are placed on **ESD Dissipative Pink PE Foam** sheet which protects modules from static electricity and also protects 2mm pin headers from external forces. Later the foam sheet is packaged with antistatic shielding bag. There is no standardized number of modules per package, they are created manually by the ordering quantity.

Figure 9.1 *SM5210 Packing*

9.2 SM5211-SMD Packing Information

SM5211-SMD modules are packaged with **Antistatic ESD PET trays contains 25 of each** or shipped as bulk packing with antistatic shielding bags. While the ESD tray option protects the module, they are also useful for automated assembly machines to pick up.

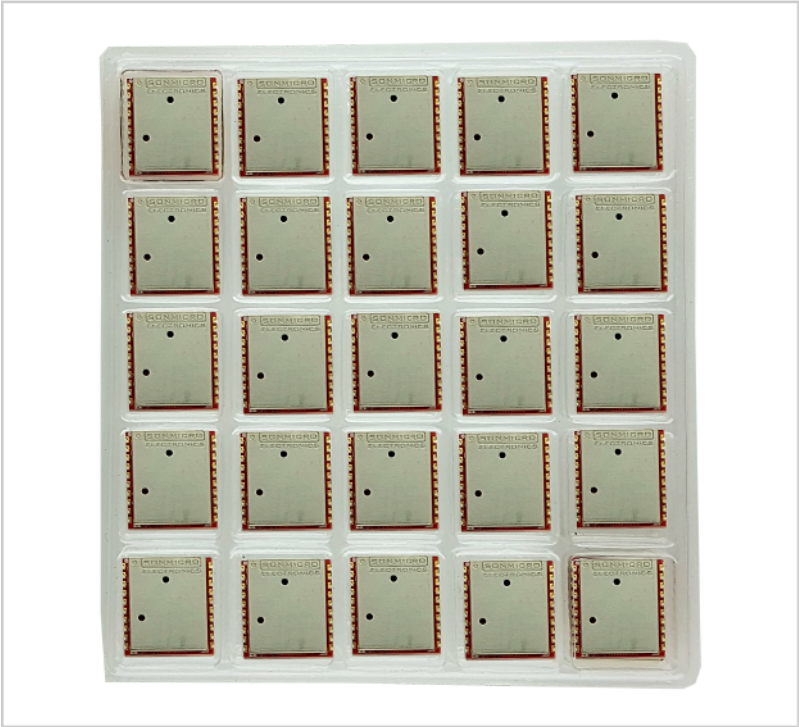

Figure 9.2 *SM5211-SMD Antistatic ESD Tray Packing. Modules in the photo are SM1251-SMD which is same with SM5211-SMD packing*

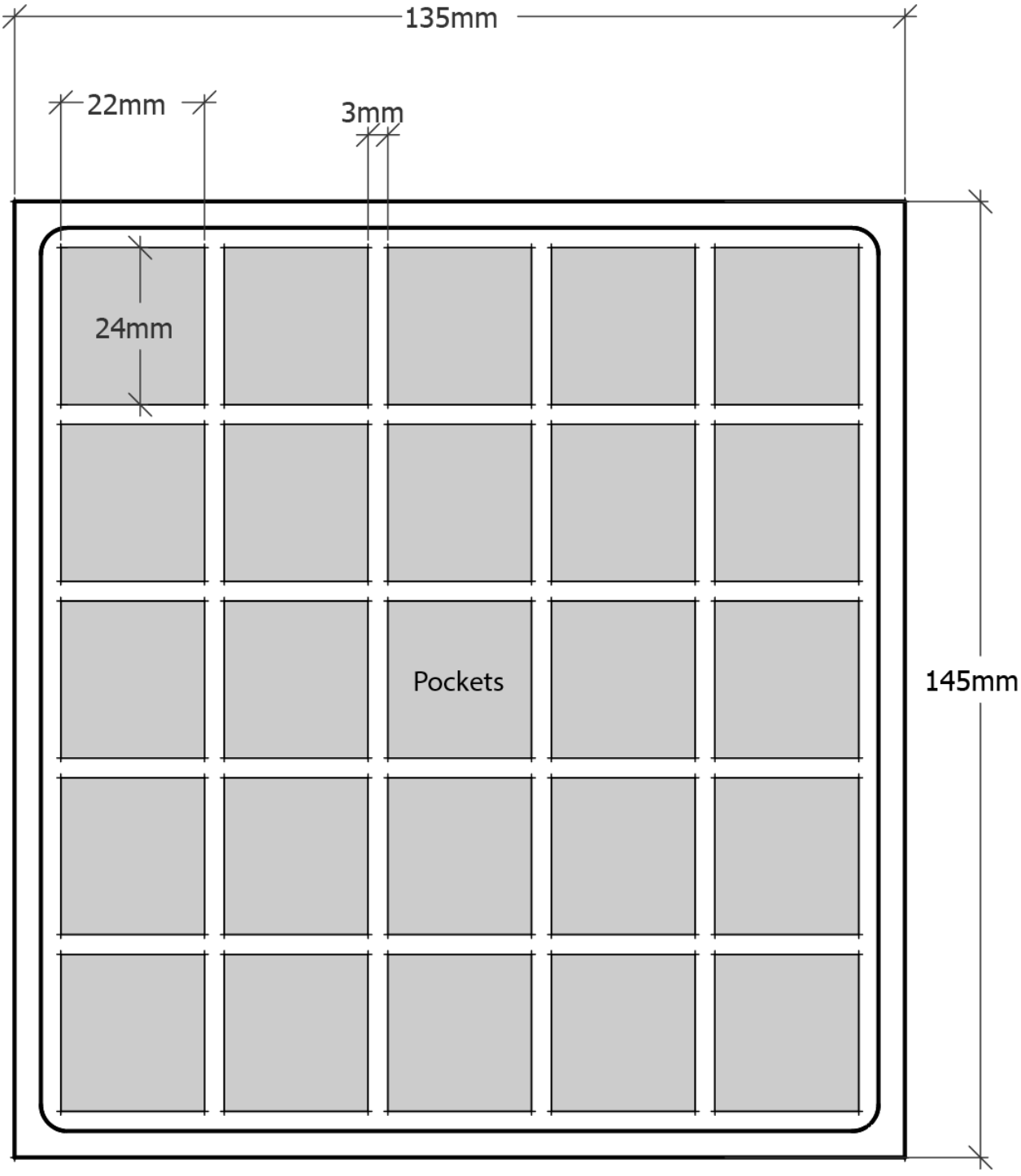

Figure 9.2 *SM5211-SMD Antistatic ESD Tray Dimensions for 5x5 pcs*

CHAPTER

TEN

HARDWARE SPECIFICATIONS

SM5210 and SM5211-SMD shares exactly same design thus they have same electrical characteristics and performance specifications.

10.1 DC ELECTRICAL CHARACTERISTICS

Symbol	Name	Min	Typ	Max	Units	Notes
VDD	Supply Voltage	3.0	3.3V - 5V	5.2	V	Performance remains same between 3.3V and 5V.
Io	Supply Current	40	50	100	mA	Supply current may vary depends on the antenna and I/O used

Table 10.1 *DC Electrical Characteristics of SM5210, SM5211-SMD Module*

10.2 OPERATING TEMPERATURE

Symbol	Name	Min	Typ	Max	Units	Notes
TA	Ambient Temperature	-10	•	+70	°C	Can be extended to [-25°C,+85°C] with custom production

Table 10.2 *Operating Temperature of SM5210, SM5211-SMD Module*

10.3 PERFORMANCE SPECIFICATION

Read distance depends on many factors. Please read the *Design Notes Section* for best practices.

Performance tests are done in ideal conditions with SM-USB-UART Converter to supply 5V power and UART communication interface.

Performance may also vary depending on the power supply signal-noise quality.

10.3.1 PA1356-1 (55x55mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	7.5	8.5	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.1 *Read range of SM5210, SM5211-SMD Module with PA1356-1 PCB antenna and credit card size Mifare tag.*

10.3.2 PA1356-3 (45x50mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	7.0	8.0	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.2 *Read range of SM5210, SM5211-SMD Module with PA1356-3 PCB antenna and credit card size Mifare tag.*

10.3.3 PA1356-4 (26x45mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	6.5	7.5	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.3 *Read range of SM5210, SM5211-SMD Module with PA1356-4 PCB antenna and credit card size Mifare tag.*

10.3.4 PA3030 (30x30mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	6.0	7.0	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.4 *Read range of SM5210, SM5211-SMD Module with PA3030 PCB antenna and credit card size Mifare tag.*

10.3.5 PA1356-21 (125x110mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	10.0	12.0	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.5 *Read range of SM5210, SM5211-SMD Module with PA1356-21 PCB antenna and credit card size Mifare tag.*

10.3.6 PA2020 (20x20mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	3.5	4.5	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.6 *Read range of SM5210, SM5211-SMD Module with PA2020 PCB antenna and credit card size Mifare tag.*

10.3.7 PA1520 (15x20mm PCB Antenna) and Card Size RFID Tag

Distance	Min	Typ	Max	Units	Notes
Authenticate/Read/Write Block	•	3.0	3.5	cm	UID reading can be 0.5cm - 1.0cm better than authenticate/read/write data block

Table 10.3.7 *Read range of SM5210, SM5211-SMD Module with PA1520 PCB antenna and credit card size Mifare tag.*

CHAPTER

ELEVEN

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CHAPTER

TWELVE

DOCUMENT REVISON HISTORY

Version 1.1.0 (03 Nov 2017)

- Minor document fixes.
- Reference for new documents added.

Version 1.0.0 (01 May 2017)

Initial release.