



SM130-M2 Datasheet

Release 1.0.0

SonMicro Elektronik

Nov 03, 2017

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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 is a second-generation module using SM5211-SMD module on top of the printed circuit board, is offered for one-to-one replacement with the first-generation SM130 module. In other words, SM130-M2 printed circuit board is actually a special adapter that converts SM5211-SMD module to the SM130 pinout and provides same mechanical dimensions with the SM130 module.

SM130-M2 is pin-to-pin compatible with the SM130 however the main difference is with the I/O voltage level. SM130 I/O voltage level is at 5V where as SM130-M2 voltage level is at 3.3V. SM130-M2 can still be supplied with 5V, as it has on board 5V to 3.3V regulator. I/O level is not expected to prevent migrating from SM130 in most scenarios. **For a one-to-one comparison please check [SM130-M2 and SM130 comparison](#) section.**

Attention: Main purpose for SM130-M2 is to offer replacement solution for old designs done with the SM130. For new designs it is highly recommended to use SM5210-Mini or SM5211-SMD module which have lower cost and are smaller in size.

SM130-M2, 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

SM130-M2 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.

SM130-M2 runs IP, intellectual property, firmware versions (standard and application specific) that handles the ISO14443A RFID protocol and provide easy to use communication interface, UART & I2C² with well-defined protocol, SPV1³, 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)

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.

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.

SM130-M2 is integrated with a bootloader program. It allows new firmware releases to be upgraded over UART. Application specific firmware versions (i.e. 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.

Attention: SM130 firmware upgrade files (.rme files, i.e. um1.3d.rme and i2c 2.8.rme) cannot be directly used to upgrade the SM130-M2 module. They have different microcontroller architecture and integrated bootloader system. SM130-M2 has its own configurations and firmware versions that support anything SM130 module can do.

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.

SM130 AND SM130-M2 QUICK COMPARISON

SM130-M2, is integrated with the SM5211-SMD module, provides same mechanical dimensions and pin-out order with the SM130.

SM5211-SMD has **Active Low Reset**, whereas SM130 first-generation module has **Active High Reset**. The reset signal compatibility is achieved with a transistor circuit on the SM130-M2 module to invert Active High to Active Low. Thus, reset line level is same both for SM130 and SM130-M2 module.

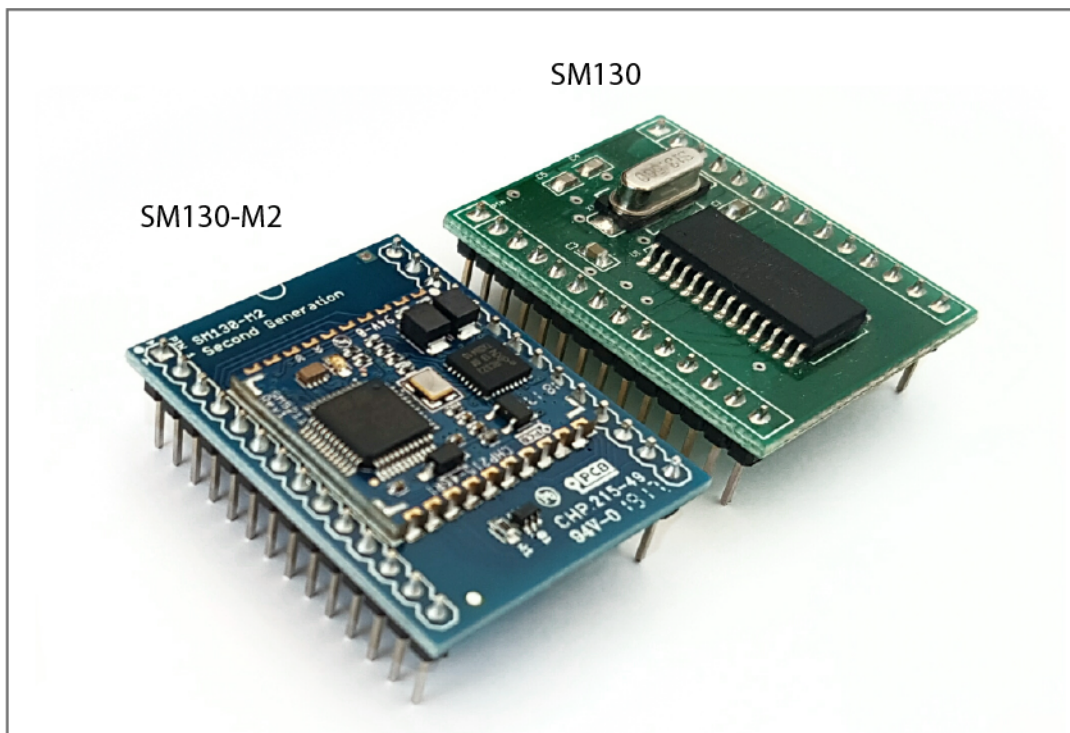


Figure 2 SM130-M2 (left) & SM130 (right)

2.1 QUICK COMPARISON TABLE

SM130-M2 (Second Generation)	SM130 (First Generation)
Arm Cortex-M3	8 bit MCU
Supply Voltage (VDD)	Supply Voltage(VDD)
VDD can be anywhere between 3.3V & 5V. SM130-M2 has on-board 5V to 3.3V regulator. In other words SM130-M2 supports both 3.3V and 5V operation however the I/O voltage level is 3.3V always. See the next row.	SM130 works with 5V supply only. It cannot work under 4.85V.
I/O Signal Voltage Level	I/O Signal Voltage Level
The I/O voltage level is 3.3V CMOS/TTL. IN1, IN2, UART and I2C pins are 5V tolerant. See the pin-out diagram for more details	I/O and communication pin voltage level is 5V CMOS/TTL
I2C	I2C
I2C is built-in. It can be enabled and disabled (default) by configuration. I2C is improved and supports full command-set and there is no restrictions. For full compatibility including the OUTPUT1 pin as Data Ready use the stdMifare V2.0.1(or later) with COMPATIBLE-1.1.4.I2C_ENABLED @User-data:0028 configuration. See the SPV1 UART/I2C protocol and stdMifare Firmware Manual document for more details.	I2C requires different firmware version (i.e. i2c 2.8) to be upgraded. It has limited command set and restrictions (e.g. to read response in 50ms)
Upgrading & Bootloader	Upgrading & Bootloader
<i>SM130 firmware upgrade files cannot be used to upgrade SM130-M2 modules and vice versa.</i>	
Built-in Bootloader is improved. • Boot program is write protected so that it cannot destroy itself • On-board function LED (FLED) indicates that the module is in boot mode	Bootloader may not recover itself from a false Program Counter Jump which may happen from external environmental effects. Thus, it has the possibility to overwrite and corrupt the boot program found in the flash on extreme circumstances
Additional I/O	
SM130-M2 comes with new I/O pins that was not exist in SM130. However, for new designs it is strongly recommended to use main stream SM5210-Mini or SM5211-SMD Module. SM130-M2 is designed primarily for SM130 replacement.	

Table 2.1 SM130-M2 and SM130 comparison.

FEATURES

- **Compatible pinout and package with SM130 first-generation module**
- **Complete** Mifare® Classic Read/Write module excluding only the antenna
- Supports **full card operations** with Mifare® Classic EV1 1K, Mifare® Classic EV1 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
- **UART Interface** up to 115200bps
- **I2C interface** up to 400KHz²
- **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

POWER DOMAIN

SM130-M2 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.

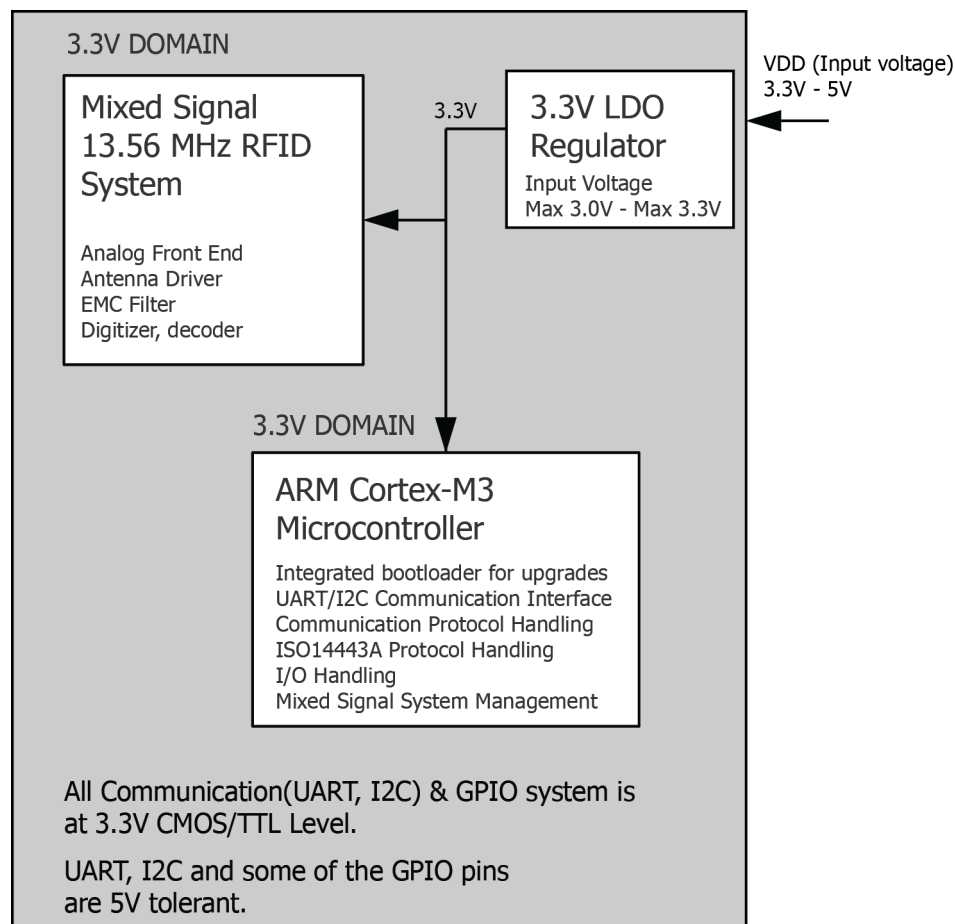


Figure 4 SM130-M2 Power Domain and Internal Block Diagram

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 micro-controller 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.

There are two types of pin connections, TypeA and TypeB. Only 3 of the pins (OUT3,OUT4 and TAGF) positions are different. TypeB connection which is not pin-compatible with SM130 first-generation module, 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). **For SM130 first-generation (um1.3d and I2C 2.8 firmware versions) compatibility, TypeA connection must be used.**

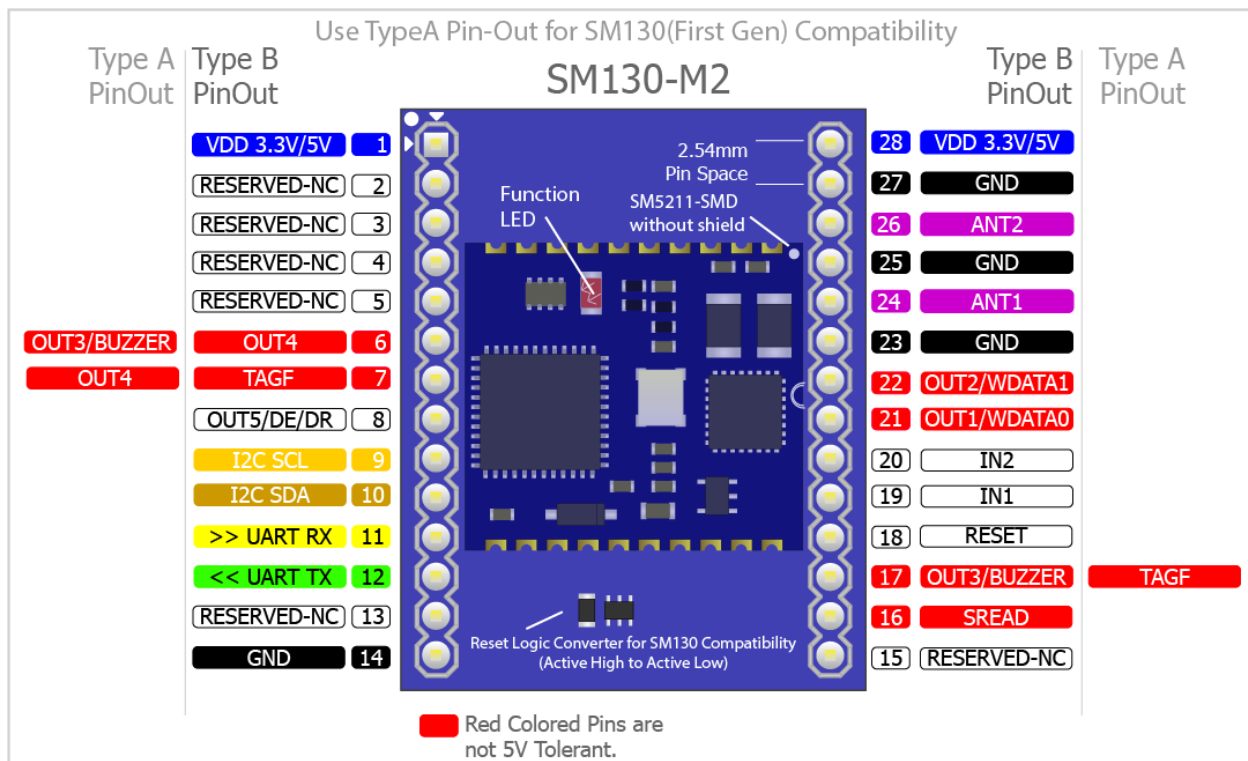


Figure 5 SM130-M2 Pin Out

5.1 PIN DESCRIPTIONS

Attention: Following pin descriptions are for standard firmware versions released. (i.e. stdMifare V2.X.X, UM1.3d, I2C 2.8 and UM1.3R 1.0.7 / 1.1.4) Pin 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	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.
2	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.
3	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.
4	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.
5	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.
* 6	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_OUPUT command For TypeB connection, this pin is an output pin and its states can be controlled by ADVANCED_OUTPUT command.
* 7	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)
8	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 the data is ready so that master can poll it. However, SM130 I2C 2.8 firmware version was using OUTPUT1 as Data Ready thus right configuration or firmware is required to be used for compatibility with the SM130 I2C 2.8 designs where OUTPUT1 (Pin#21) used as Data Ready Pin
9	I2C SCL	YES	I2C Clock. External pull-up resistor is required. I2C must be enabled thru configuration.
10	I2C SDA	YES	I2C Data. External pull-up resistor is required. I2C must be enabled thru configuration.

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Pin #	Name	5V Tolerant	Notes
11	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.
12	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.
13	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.
14	GND	.	Ground.
15	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.
16	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)
* 17	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)

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Pin #	Name	5V Tolerant	Notes
18	RESET	YES	Active High Reset Pin (Compatible with SM130). A logic high pulse will reset the module. It can be left floating, it has an internal resistor and capacitor circuit to prevent parasitic resets or it can be connected to the external micro-controller output pin.
19	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.
20	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.
21	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. For I2C, with the supporting firmware, this pin and also OUT5/DE/DR is used (optional) to notify i2c master by asserting High that the data is ready so that master can poll it. However, this pin function (as Data ready) is not standard and comes with special firmware/configuration (Ordering Config Code: 02/COMPATIBLE-SM130-I2C_28) for SM130 I2C 2.8 firmware version compatibility. 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.
22	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.
23	GND	•	Ground.
24	ANT1	•	Antenna Drive Pin 1. Connect to the PCB Antenna's Ant1 pin.
25	GND	•	Ground.
26	ANT2	•	Antenna Drive Pin 2. 180-degree phase difference with ANT1. Connect to the PCB Antenna's Ant2 pin.
27	GND	•	Ground.
28	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.

Table 5.1 SM130-M2 Pin Description Table for standard firmware versions.

5.2 FLED (Function LED)

There is a red color on-board LED on SM130-M2 (on SM5211-SMD module actually) module 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.

EXTERNAL DOCUMENTS & RESOURCES

6.1 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.

6.2 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**

6.3 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)**

6.4 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.

6.5 SDK & Code Examples

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

6.6 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.

HARDWARE INTERFACE PRECAUTIONS

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

7.1 UART

SM130-M2 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.

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 SM130-M2 Mifare Module*

- **Never connect SM130-M2 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 (i.e. PC) sides.

7.2 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.

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.

7.3 I2C

SM130-M2 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 3.3V CMOS/TTL level compliant and **5V tolerant**. Depending on the pull up resistor circuit used on the base board, the output signal level can be 3.3V or 5V.

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 base board to protect the external none-5V-tolerant controller.**

DESIGN NOTES

8.1 ESD Handling

Attention:

- SM130-M2 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 misuse, and may result in failure in long term. ESD is one of the important source for damaged electronic devices.**

8.2 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 or metal frames 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 module 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.

8.3 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.

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.

9.1 SM130-M2 Top View

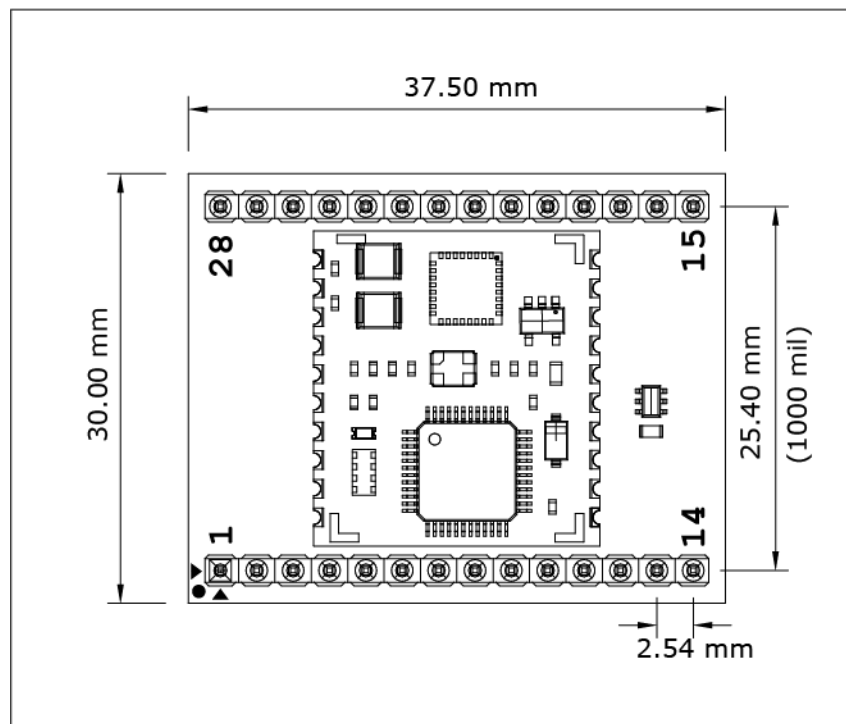


Figure 9.1 *SM130-M2 Top View*

9.2 SM130-M2 Side View

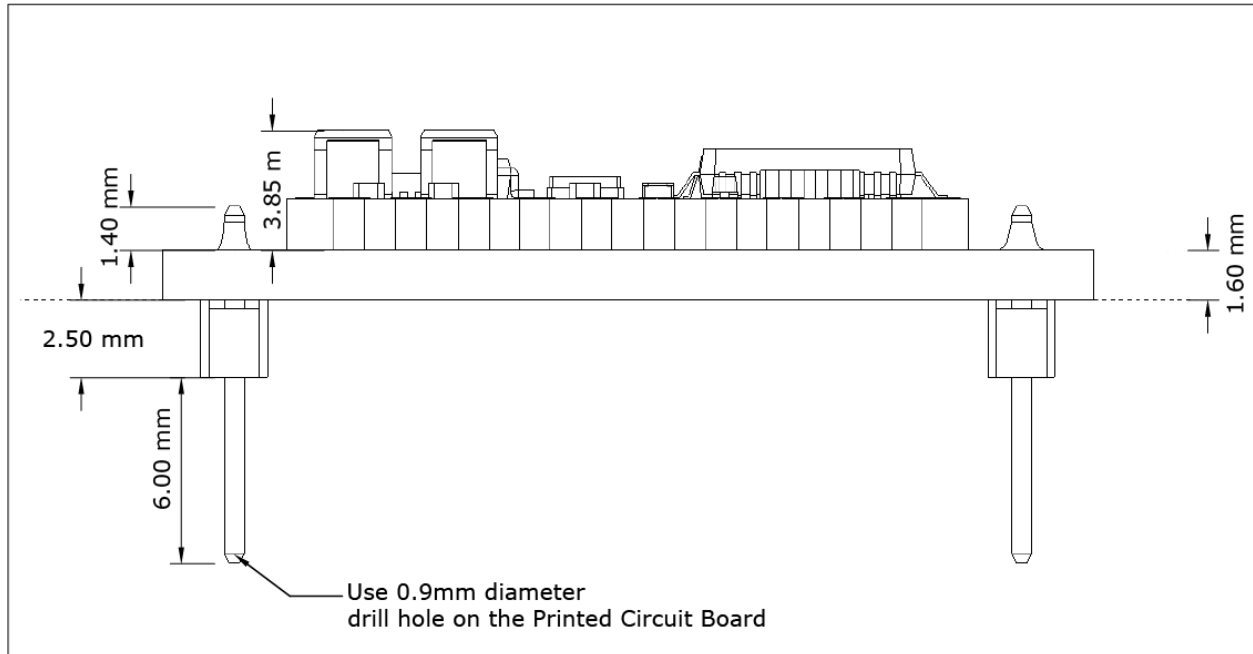


Figure 9.2 SM130-M2 Side View

9.3 SM130-M2 PCB Footprint

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.

Note: SM130 and SM130-M2 has same footprint.

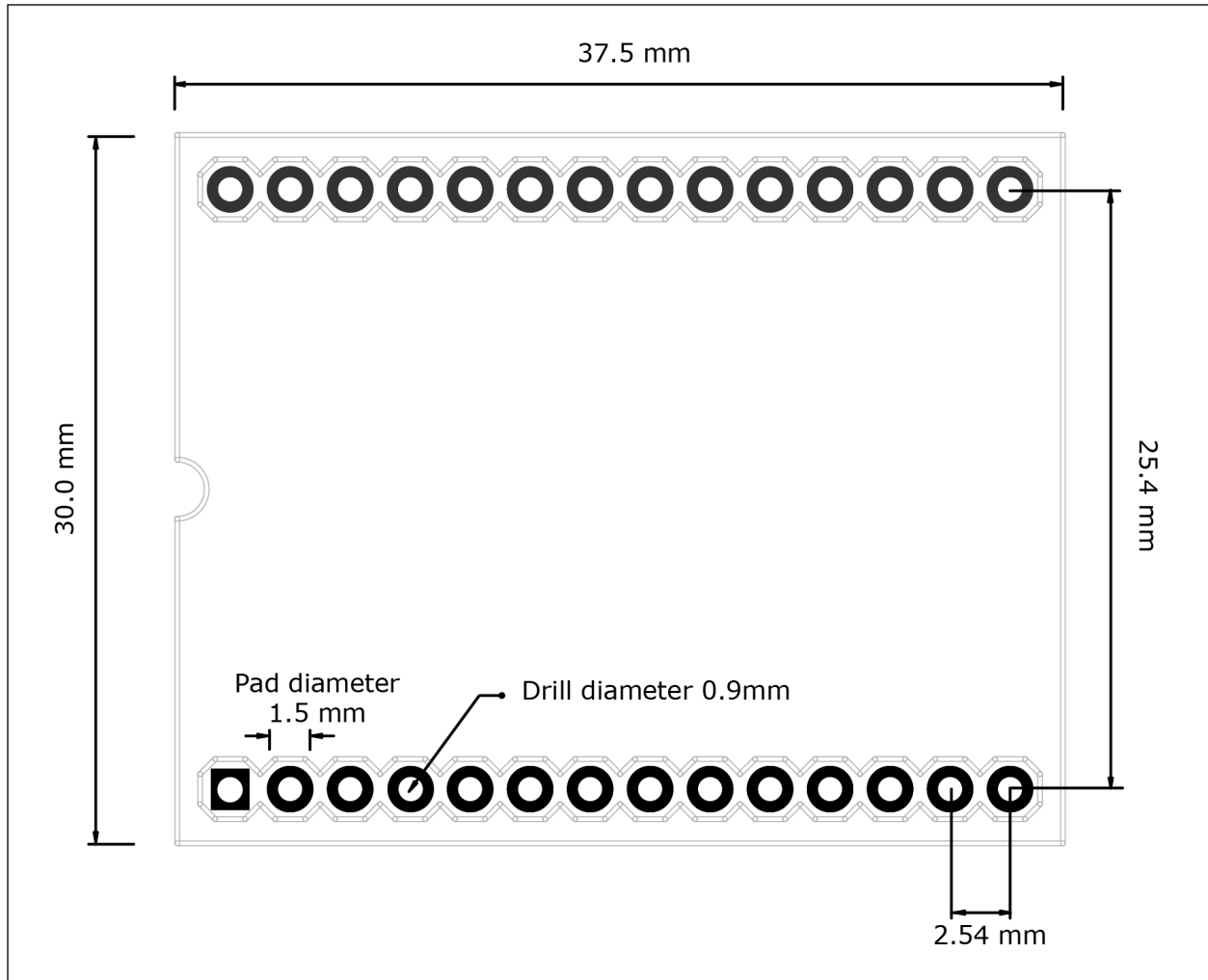


Figure 9.3 Recommended PCB layout for SM130-M2 module

HARDWARE SPECIFICATIONS

SM130-M2 is designed with SM5211-SMD module. Thus, they have same electrical characteristics and performance specifications.

10.1 DC ELECTRICAL CHARACTERISTICS

Sym-bol	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 SM130-M2 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 SM130-M2 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 SM130-M2 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 SM130-M2 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 SM130-M2 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 SM130-M2 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 SM130-M2 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 SM130-M2 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 SM130-M2 Module with PA1520 PCB antenna and credit card size Mifare tag.

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DOCUMENT REVISION HISTORY

Version 1.0.0 (03 Nov 2017)

Initial release.