



## Smartico LoRa Module

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Product name: **LoRa Module**

Product number: **RF86 2.1A**

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### Revision History

| Version | Date         | Status      | Author    | Change Description                  |
|---------|--------------|-------------|-----------|-------------------------------------|
| 0.1     | Jun 06, 2018 | Preliminary | A. Repich | Initial Release                     |
| 1.0     | Jul 10, 2019 | Release     | A. Repich | Adapted to the hardware version 2.1 |

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## 1 Overview

The Datasheet describes LoRa Module produced by SPE SMARTICO, LLC.

RF86 2.1A is a highly integrated low-power radio module with LORA modulation. That provides ultra-long range spread spectrum communication and high interference immunity whilst minimizing current consumption.

Using LoRa modulation technique it can achieve a high sensitivity using a low cost crystal and bill of materials. The high sensitivity combined with the integrated +20 dBm power amplifier yields industry leading link budget making it optimal for any application. This modulation, in contrast to legacy modulation techniques, permits an increase in link budget and increased immunity to in-band interference.

The RF86 2.1A module has SPI interface for communication with MCU.

RF86 2.1A module's interface voltage is 2.7-3.6 V. The module has low consumption in transmit mode and idle mode. Using the RF86 2.1A module you do not need to develop the RF part. This will save time and resources.

### Application

- Automated Meter Reading
- Wireless sensor
- Home and Building Automation
- Wireless Alarm and Security Systems
- Distributed data collection
- Remote control
- Industrial Monitoring and Control
- Power system monitoring
- Wireless logistics management

### Features

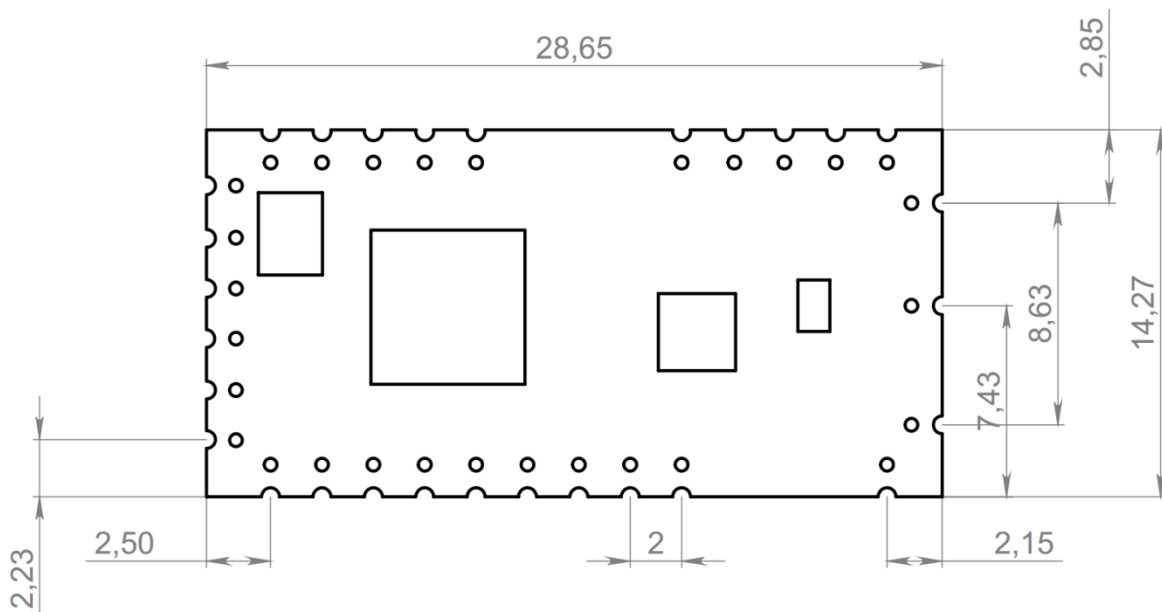
- LoRa
- EU 863-870MHz ISM band support
- US 902-928MHz ISM band support
- Transmission distance > 10000 m
- High sensitivity down to -145 dBm
- Maximum transmission power 14.13dBm
- Low sleep current less 1uA
- Receiving mode current 13mA
- Small size 28.65mm \* 14.27mm \* 3mm



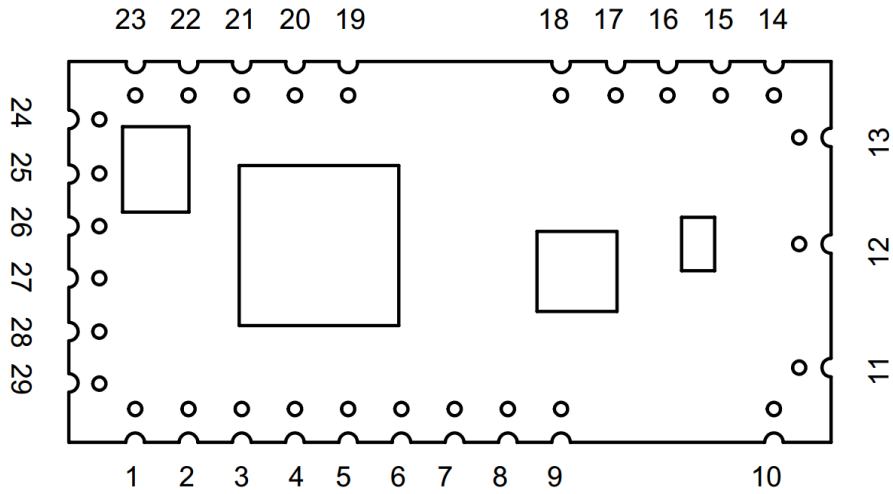
## 2 Electrical Characteristic

|                                |                           |
|--------------------------------|---------------------------|
| Radio Frequency                | 862~930MHz                |
| Transmission Power             | 5~20dBm                   |
| Receiving Sensitivity          |                           |
| Programmable bit rate          | up to 300 kbps            |
| Working Humidity               | 10%~90% (no condensation) |
| Working Temperature            | -45°C ~ 85°C              |
| The power Supply               | 2.7 ~ 3.6V                |
| Transmission Current (typical) | 120mA@100mW               |
| CAD/ Receives Current(typical) | 13mA                      |
| Sleep Current(typical)         | <1 uA                     |
| Size                           | 28.65mm * 14.27mm * 3mm   |
| Antenna Impedance              | 50Ω                       |

## 3 Mechanical Dimensions



## 4 Pin Definition



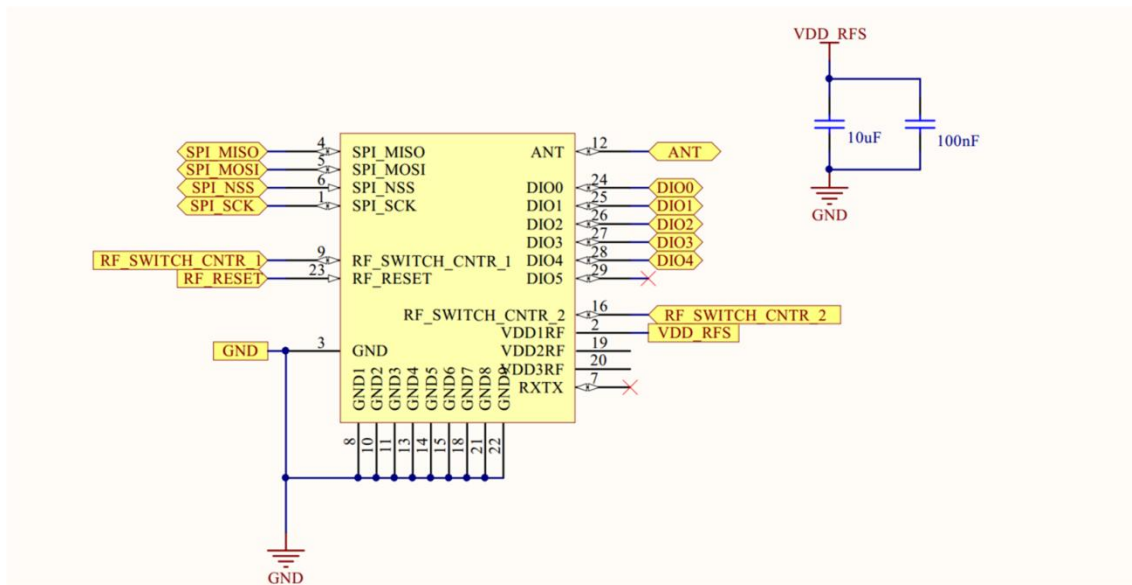
RF86 2.1A module has twenty nine pins; specific definitions are as the following table:

**Table 1: Pin definition**

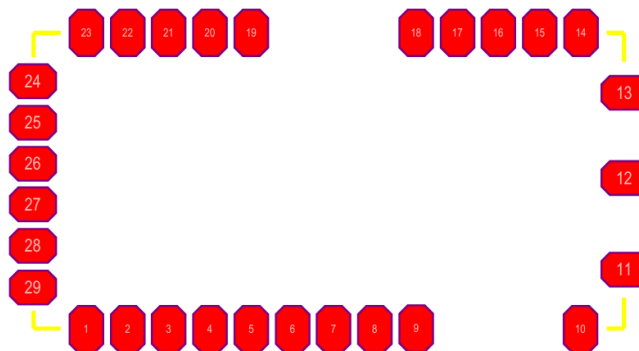
| Pin | Name             | Direction    | State/Description                            |
|-----|------------------|--------------|--|
| 1   | SPI_SCK          | Input/Output | SPI interface clock signal                   |
| 2   | VDD              | Power        | Power supply 2.7~3.6V                        |
| 3   | GND              | Power Ground | Power Ground, 0V                             |
| 4   | SPI_MISO         | Input/Output | SPI Interface, master in and out             |
| 5   | SPI_MOSI         | Input/Output | SPI Interface, master and slave              |
| 6   | SPI_NSS          | Input/Output | Chip select pin, low level strobe            |
| 7   | RXTX(NC)         | -            | Pin Not Connection, Reserved for future use  |
| 8   | GND              | Power Ground | Ground, 0V                                   |
| 9   | RF_SWITCH_CNTR_1 | Input/Output | RF switch, control pin1. TX=1; RX=0; SLEEP=0 |
| 10  | GND              | Power Ground | Power Ground, 0V                             |
| 11  | GND              | Power Ground | Power Ground, 0V                             |
| 12  | ANT              | -            | 50 ohm matching antenna interface            |
| 13  | GND              | Power Ground | Power Ground, 0V                             |
| 14  | GND              | Power Ground | Power Ground, 0V                             |
| 15  | GND              | Power Ground | Power Ground, 0V                             |
| 16  | RF_SWITCH_CNTR_2 | Input/Output | RF switch, control pin2 TX=0; RX=1; SLEEP=0  |
| 17  | NC               | -            | Pin Not Connection                           |
| 18  | GND              | Power Ground | Power Ground, 0V                             |
| 19  | VDD              | Power        | Power supply 2.7~3.6V                        |
| 20  | VDD              | Power        | Power supply 2.7~3.6V                        |
| 21  | GND              | Power Ground | Power Ground, 0V                             |

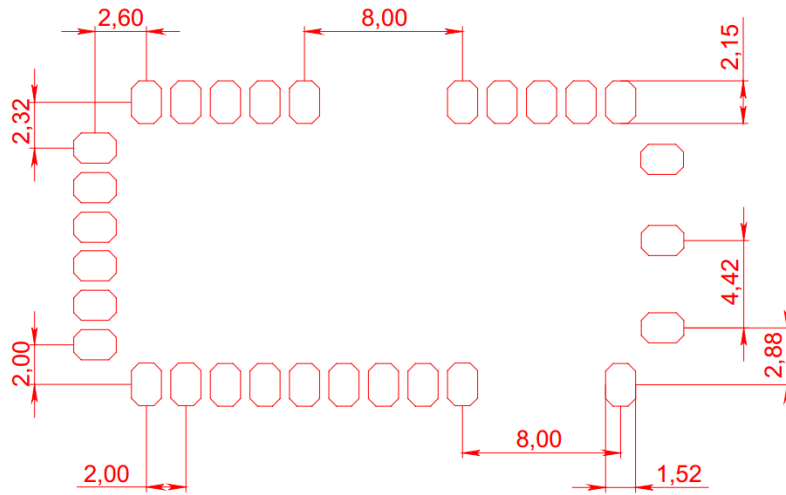
|    |          |              |                            |
|----|----------|--------------|----------------------------|
| 22 | GND      | Power Ground | Power Ground, 0V           |
| 23 | RF_RESET | Input/Output | Reset pin, low level RESET |
| 24 | DIO0     | Input/Output | Digital IO                 |
| 25 | DIO1     | Input/Output | Digital IO                 |
| 26 | DIO2     | Input/Output | Digital IO                 |
| 27 | DIO3     | Input/Output | Digital IO                 |
| 28 | DIO4     | Input/Output | Digital IO                 |
| 29 | DIO5     | Input/Output | Digital IO                 |

## 5 Typical Application Schematic



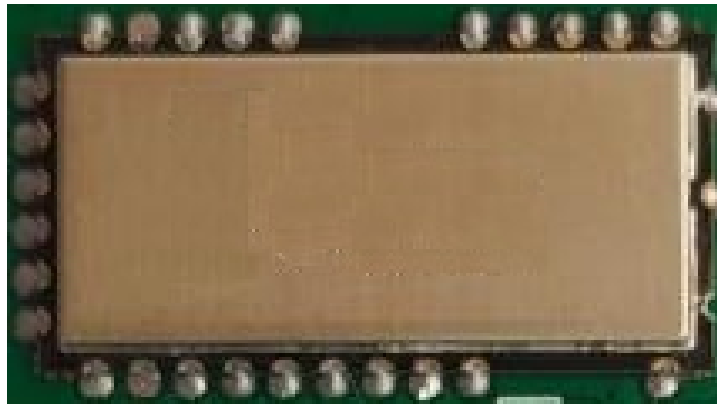
## 6 Footprint



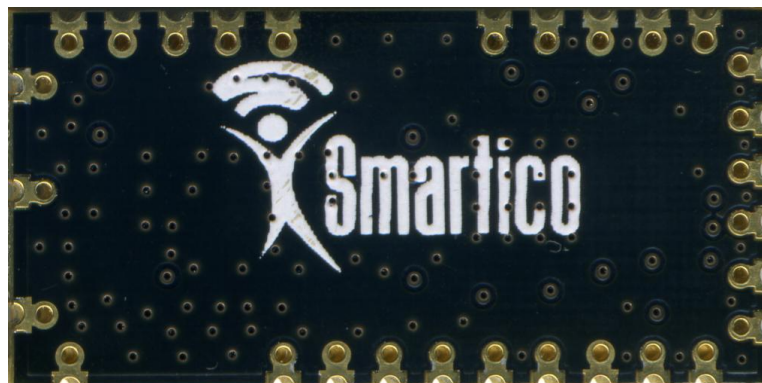


## 7 External view

Top



Bottom



## 8 Regulatory Statements

### FCC Statements

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

**Note:** This product has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**Warning:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

### FCC Modular Usage Statement

**Note 1:** This module certified complies with RF exposure requirement under mobile or fixed condition; this module is to be installed only in mobile or fixed applications.

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Transmitting



devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

A fixed device is defined as a device is physically secured at one location and is not able to be easily moved to another location.

**Note 2:** Host product manufactures must provide in their user manual the required RF exposure information for mobile & fixed usage of this module. Host product manufacturers must use the following RF exposure statement in their user manual “This equipment complies with the FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and all persons. This transmitter must not be co-location or operating in conjunction with any other antenna or transmitter.”

**Note 3:** Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user shall have no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

**Note 4:** Additional testing and certification may be necessary when multiple modules are used.

**Note 5:** The module may be operated only with an antenna that was tested with this device, or or similar antennas with equal or lesser gain

**Note 6:** To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier’s Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, the manufacturer shall provide guidance to the host manufacturer for compliance with the part 15B requirements.

**Note 7:** The FCC ID label on the final system must be labeled with “Contains FCC ID: 2AURW- LORARF” or “Contains transmitter module FCC ID: 2AURW- LORARF”.

**Note 8:** The FCC rule/s for this module are CFR 47 Part 15 Subpart C.

**Note 9:** This modular transmitter is only FCC authorized for the specific rule parts listed on its grant. The host product manufacturer is responsible to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product will require Part 15 Subpart B compliance when the modular transmitter is installed.

**Note 10:**The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369.

## ISED Statements

This device complies with Innovation, Science and Economic Development Canada's license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement Économique Canada applicables aux appareils radioexempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Innovation, Science and Economic Development Canada's regulations, this radio transmitter may only be operated only with an antenna that was tested with this device, or similar antennas with equal or lesser gain.

En vertu des règlements d'Innovation, Sciences et Développement économique Canada, cet émetteur radio ne peut être utilisé qu'avec une antenne qui a été testée avec cet appareil, ou des antennes similaires avec un gain égal ou inférieur.

## ISED RF Exposure Statement

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le rayonnement de la classe b respecte ISED fixaient un environnement non contrôlés. Installation et mise en œuvre de ce matériel devrait avec échangeur distance minimale entre 20 cm ton corps. Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d'autres.

## ISED Modular Usage Statement

**NOTE 1:** When the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use the wording "Contains transmitter module IC: 25518-LORARF" or "Contains IC: 25518-LORARF".

**NOTE 1:** Lorsque le numéro de certification ISED n'est pas visible lorsque le module est installé dans un autre appareil, l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut être libellée Contient le module émetteur IC: 25518-LORARF ou Contient IC: 25518-LORARF.