

## Catalogue

|                                                                                             |        |
|---------------------------------------------------------------------------------------------|--------|
| 1. Overview .....                                                                           | - 3 -  |
| 2. Features.....                                                                            | - 3 -  |
| 3. Applications .....                                                                       | - 3 -  |
| 4.Electrical Characteristics .....                                                          | - 4 -  |
| 5.Performance.....                                                                          | - 4 -  |
| 6. Typical application circuit .....                                                        | - 5 -  |
| 7.Pin definition .....                                                                      | - 7 -  |
| 8. Communication Antenna .....                                                              | - 8 -  |
| 9.Mechanical Dimensions (Unit:mm) .....                                                     | - 9 -  |
| Appendix 1: Demo Board (Only communication DEMO, without ranging function) .....            |        |
| Appendix 2: SMD Reflow Chart .....                                                          | - 11 - |
| We recommend you should obey the IPC related standards in setting the reflow profile: ..... | - 11 - |

### Note: Revision History

| Revision | Date       | Comment               |
|----------|------------|-----------------------|
| V1.0     | 2018-11-1  | First release         |
| V1.1     | 2018-12-15 | Update PIN definition |
| V1.2     | 2019-11-23 | Update picture        |
| V2.0     | 2020-11    | Modify description    |
| V2.1     | 2020-11    | Update format         |
|          |            |                       |

## 1. Overview

There are three types of modules in LoRa1280-81 series: LoRa1280-TCXO、LoRa1280 and LoRa1281. Users can choose one of them according to their practical application, the specific differences are as follows:

| Module type | chip             | Ranging function                             | Crystal                                                                 |
|-------------|------------------|----------------------------------------------|-------------------------------------------------------------------------|
| Lora128X-T  | SX1280<br>SX1281 | Support ranging, more accurate<br>★Recommend | 0.5ppm industrial grade TCXO temperature compensated crystal oscillator |

This series of modules is designed based on the original sx1280/sx1281 radio frequency chip of Semtech in the United States. It uses LoRa modulation mode, which improves the short communication distance of ordinary 2.4GHz modules. The whole series of modules use a 10ppm industrial-grade crystal oscillator, and the LoRa1280-TCXO module is also specially equipped with a higher-precision industrial-grade 0.5ppm TCXO temperature-compensated crystal oscillator, which guarantees stable frequency output under harsh environments such as high and low temperature. It also has the "time of flight" function, which can realize RF ranging applications.

The high penetration performance of the 2.4GHz frequency band combined with the LoRa modulation enables the module to have high receiving sensitivity and environmental anti-interference ability. The whole series of modules are widely used in applications requiring long-distance 2.4GHz transmission.

## 2. Features

- Operating frequency range: 2400-2500MHz
- Operating temperature range: -40~+85°C
- Data transfer rate: 0.476-202 Kbps@LoRa
- Maximum output power: 12.5dBm
- Packet communication mode (receiving FiFo 256 bytes)
- High precision crystal oscillator (0.5ppm TCXO/10ppm)
- Operating voltage range: 1.8-3.7 V
- Sensitivity : -132dBm@LoRa
- LoRa FLRC FSK modulation

## 3. Applications

- Wireless remote
- Smart home
- Tag reader
- Toy control
- Tire pressure monitoring
- Health monitoring

## 4. Electrical Characteristics

★ The following parameters are obtained by connecting the instrument with a 50 ohm copper axis.  
@VCC=3.3V.

| Parameter             | Min.  | Typ. | Max. | Unit | Condition                           |
|-----------------------|-------|------|------|------|-------------------------------------|
| Operation Condition   |       |      |      |      |                                     |
| Working voltage       | 1.8   | 3.3  | 3.7  | V    |                                     |
| Temperature range     | -40   |      | 85   | °C   |                                     |
| Current Consumption   |       |      |      |      |                                     |
|                       |       | < 12 |      | mA   | @Lora128X-T                         |
|                       |       | 28   | 32   | mA   | @Vcc=3.3V,12.5dBm<br>@Lora1280-TCXO |
| Sleep current         |       | < 1  |      | uA   |                                     |
| RF Parameter          |       |      |      |      |                                     |
| Frequency range       | 2400  |      | 2500 | MHz  |                                     |
| Data rate             | 0.476 |      | 202  | Kbps | @LoRa                               |
|                       | 260   |      | 1300 | Kbps | @FLRC                               |
|                       | 125   |      | 2000 | Kbps | @FSK                                |
| Output power          | -18   |      | 12.5 | dBm  | @VCC=3.3V                           |
| Receiving sensitivity |       | -132 |      | dBm  | LoRa@0.476Kbps                      |

## 5. Performance

Note: The power level in the following description is the display value of our DEMO board, and the module can also set other more levels through the register.

➤ The output power parameter indicators corresponding to the module under different power levels

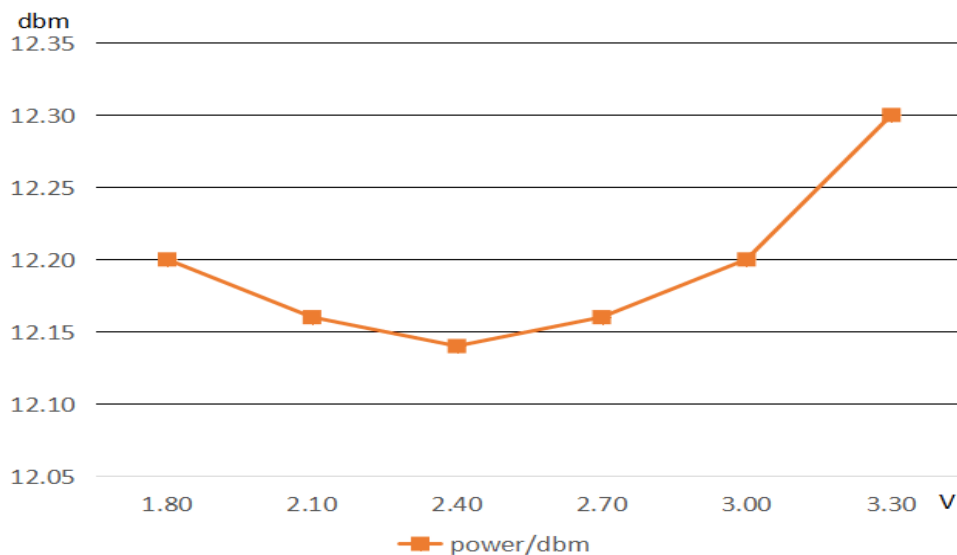
are shown in the following table:

Test conditions: @ANT connected to 50 ohm load Frequency: 2480MHz VCC=3.3V

| Register value | Power level | @Lora1280-TCXO      |                |
|----------------|-------------|---------------------|----------------|
|                |             | Output power ( dBm) | Tx Current(mA) |
| 13             | 9           | 12.2                | 30.5           |
| 10             | 8           | 9.6                 | 25.5           |
| 7              | 7           | 6.9                 | 20.5           |
| 4              | 6           | 4                   | 17.1           |
| 1              | 5           | 0.9                 | 14.3           |
| -3             | 4           | -2.3                | 11.8           |
| -6             | 3           | -5.7                | 10.6           |
| -9             | 2           | -8.9                | 9.9            |
| -12            | 1           | -12.6               | 9.3            |
| -15            | 0           | -15.5               | 8.9            |

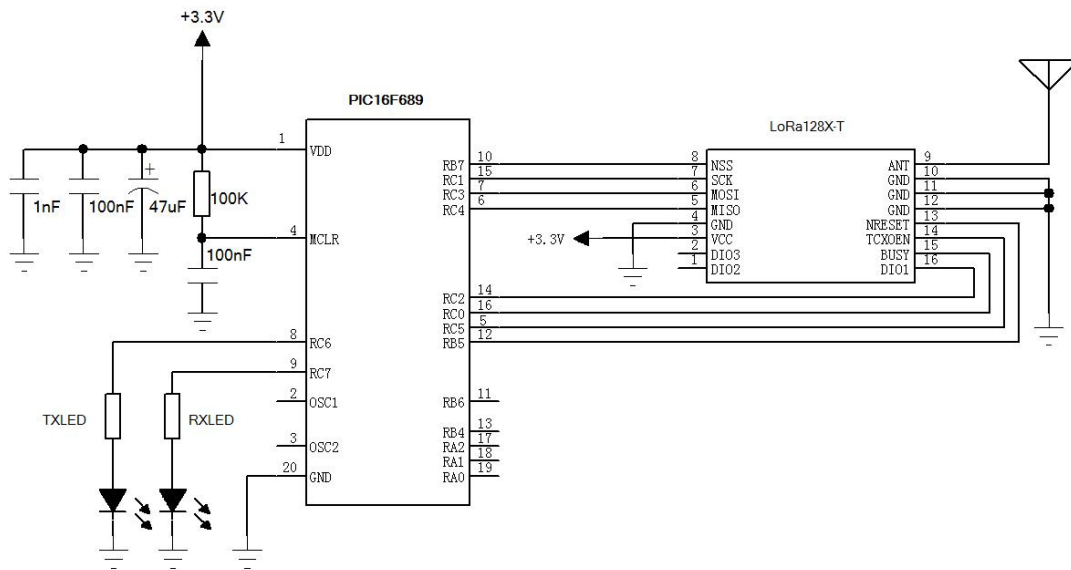
#### ➤ Voltage VS TX power

Test conditions: @ANT connected to 50 ohm, Frequency: 2480MHz Power level = 9.

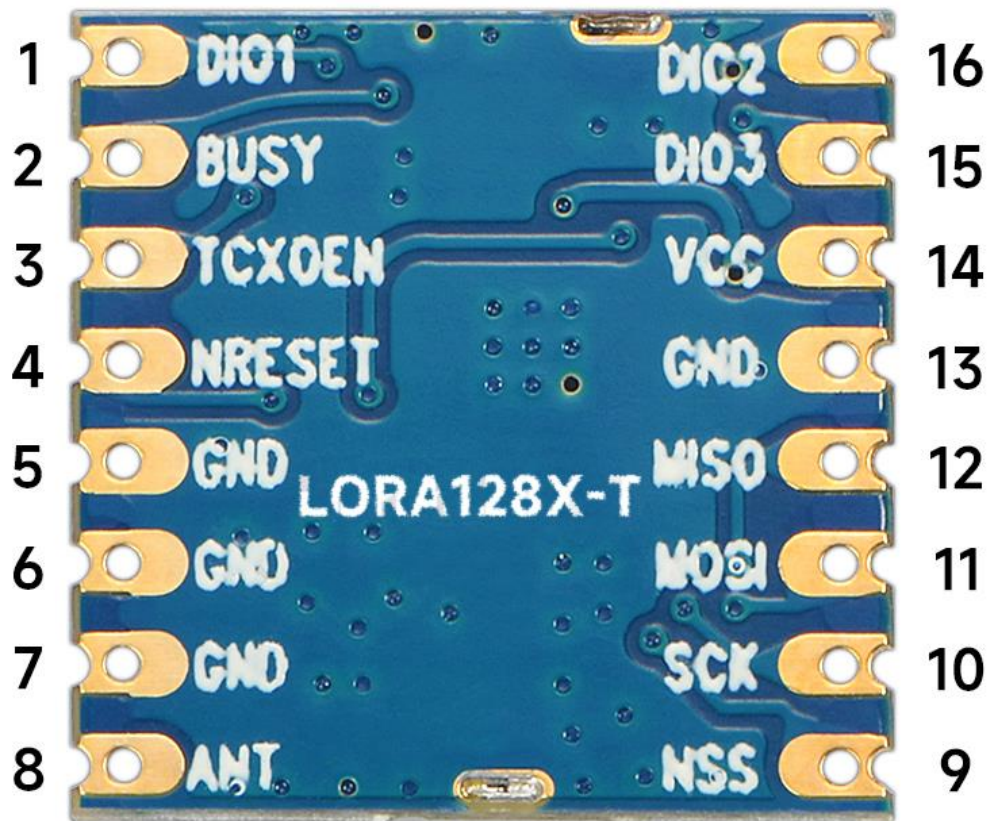


## 6. Typical application circuit

Lora128X-T



## 7.Pin definition

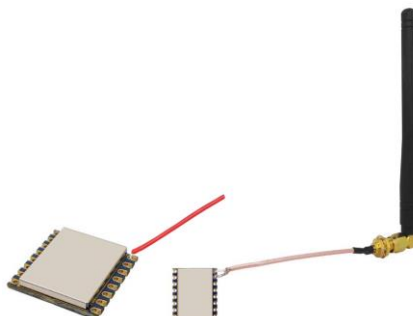


| Pin NO | Pin name | Description                                                                                                              |
|--------|----------|--------------------------------------------------------------------------------------------------------------------------|
| 1      | DIO2     | Directly connected to the chip pin, configurable general-purpose IO (see the chip SX1280/1281 specification for details) |
| 2      | DIO3     | Directly connected to the chip pin, configurable general-purpose IO (see the chip SX1280/1281 specification for details) |
| 3      | VCC      | Connected to the positive pole of the power supply (1.8-3.7V)                                                            |
| 4      | GND      | Connected to the negative pole                                                                                           |
| 5      | MISO     | SPI data output pin                                                                                                      |
| 6      | MOSI     | SPI data input pin                                                                                                       |
| 7      | SCK      | SPI clock input pin                                                                                                      |
| 8      | NSS      | Module chip select pin                                                                                                   |

|                                                        |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9                                                      | ANT    | Connect with 50 ohm coaxial antenna                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 10,11,12                                               | GND    | Connected to the negative pole                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 13                                                     | NRESET | Chip reset trigger pin, active low                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Note: For Lora1280 and Lora1281 modules, PIN 14 is GND |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 14                                                     | GND    | Connected to the negative pole                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Note: For Lora128X-TCXO module, PIN 14 is TCXOEN       |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 14                                                     | TCXOEN | Turn on TCXO:<br>1. Turn TCXOEN pin to high level before reset SX1280;<br>2. Delay at least 3ms to wait for the TCXO startup;<br>3. During the use of the 1280 module, TCXOEN must keep in high level;<br>Turn off TCXO (if the module needs to enter sleep mode):<br>1. Call the SetSleep() function to make the module enter the sleep mode;<br>2. Delay at least 1ms to wait for module sleep;<br>3. Turn TCXOEN pin to low level to turn off TCXO; |
| 15                                                     | BUSY   | Status indicator pin (see SX1280/1281 specification for details)                                                                                                                                                                                                                                                                                                                                                                                       |
| 16                                                     | DIO1   | Directly connected to the chip pin, configurable general-purpose IO (see the chip SX1280/1281 specification for details)                                                                                                                                                                                                                                                                                                                               |

## 8. Communication Antenna

The antenna is an important part of the communication system. Its performance directly affects the parameters of the communication system. The antenna impedance required by the module is 50 ohms. The universal antenna has wires and spring antenna, and can also be used for SMA adapter straight/elbow/folding rods, small suction cups, etc. Users can purchase antennas according to their own application environment. In order to make the module work optimally, it is recommended to use the antenna from our company.



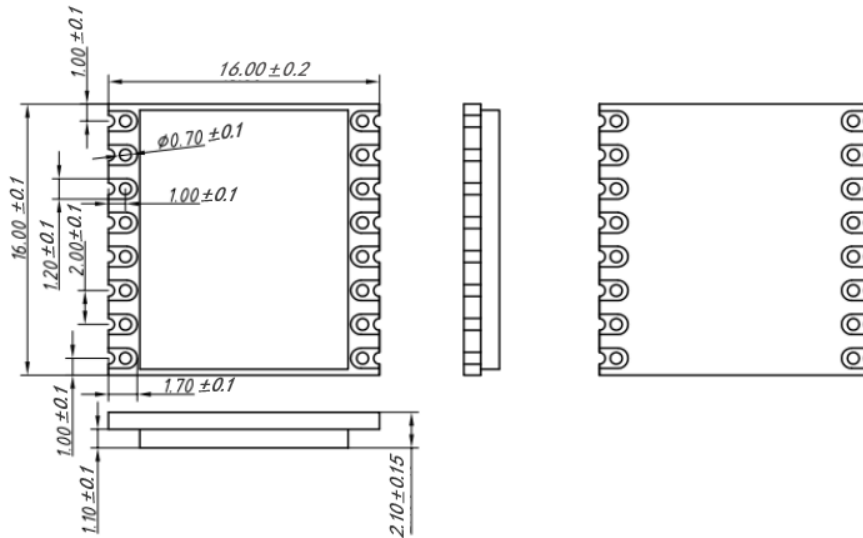
★ The following principles should be followed during antenna use to ensure the best communication distance of the module:

- The antenna should not be close to the ground surface, and the surrounding area should be kept away

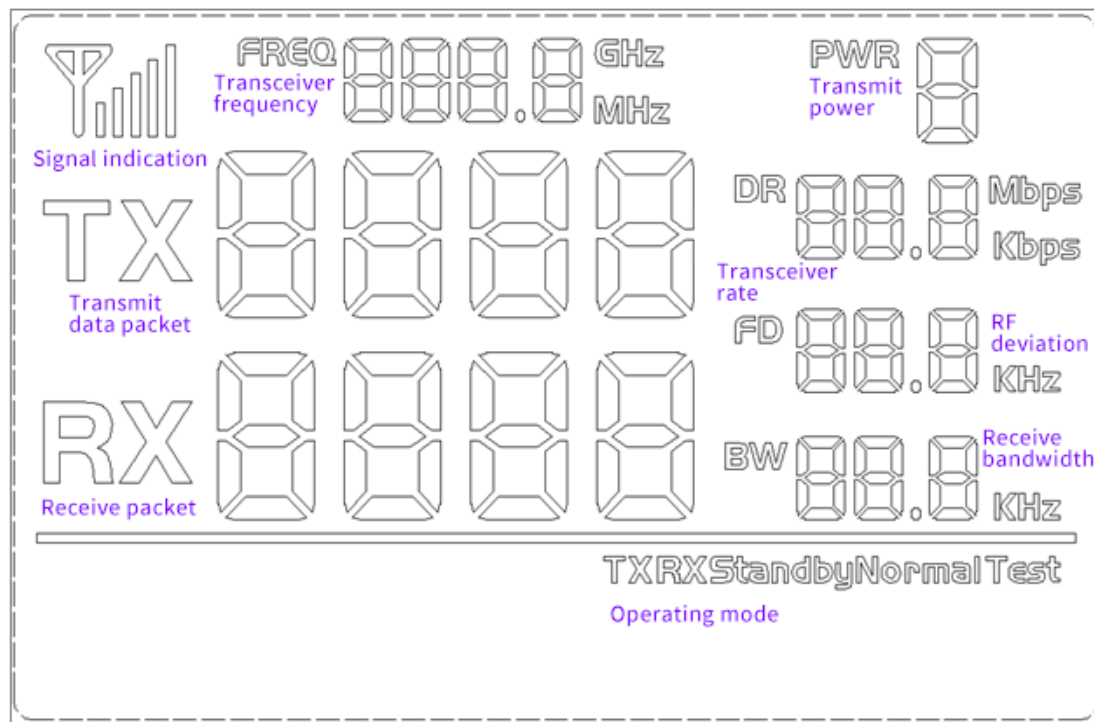
from obstacles;

- If the suck antenna is purchased, the lead wire should be straightened as much as possible, and the base should be attached to the metal object;

## 9.Mechanical Dimensions (Unit:mm)



The LCD Full Segment is as below:



Users can set the parameters of the RF module such as working mode /frequency / transmitter power / transmission data rate through the buttons, and measure the wireless communication distance.

#### ➤ Working Mode:

- 1) Normal transmission mode: Send data packets at regular intervals (in the setup mode, no data packets are sent temporarily);
- 2) Normal receiving mode: power-on enters the receiving state, receives the data packet, and re-issues the correctly received data packet;
- 3) Normal transmission mode: the module is in the normal state;
- 4) Constant acceptance mode: the module is in the normal receiving state (no data is forwarded);
- 5) Sleep mode: The RF module is in the standby state.

#### ➤ Button Operation:

##### 1) [SET] Button

Press the [SET] button to enter into setting mode; Or press the [SET] button to be out of the setting mode upon the last parameter is done.

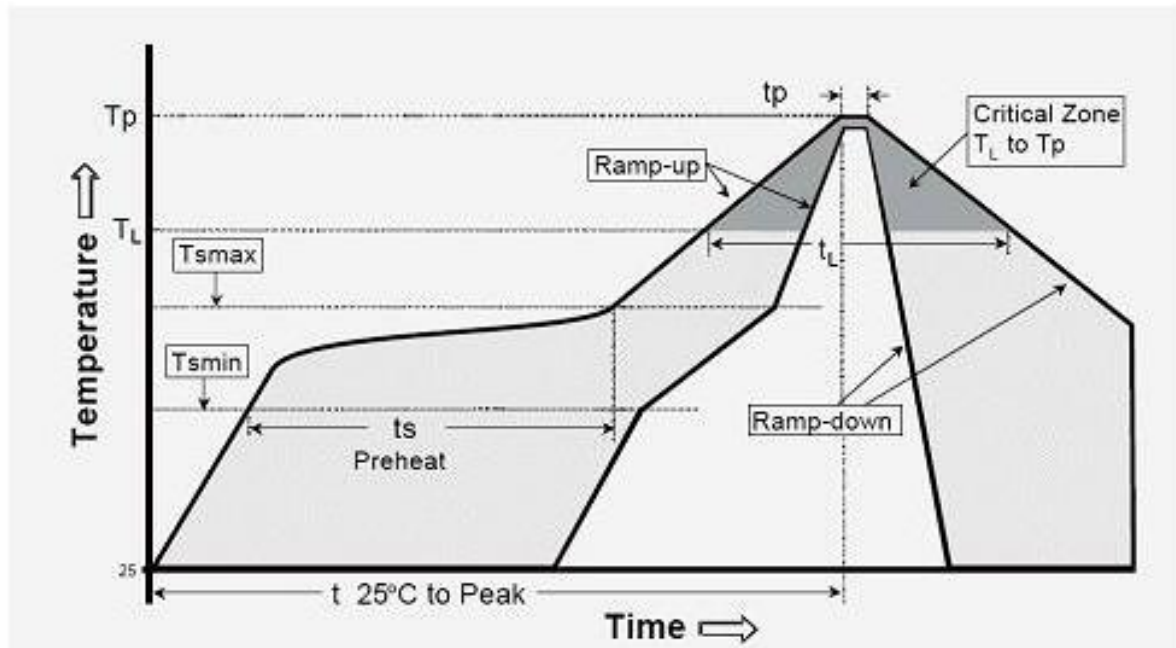
##### 2) [UP/Down] Button

In the setting mode, press the button to modify the corresponding setting parameters.

Note: The DEMO board has FLASH memory inside, all the setting parameters will be saved automatically and keep unchanged even power-off.

## Appendix 2: SMD Reflow Chart

We recommend you should obey the IPC related standards in setting the reflow profile:



|                                                                   |                                                         |
|-------------------------------------------------------------------|---------------------------------------------------------|
| IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering | big size components<br>(thickness $\geq 2.5\text{mm}$ ) |
| The ramp-up rate ( $T_l$ to $T_p$ )                               | $3^\circ\text{C/s}$ (max.)                              |
| preheat temperature                                               |                                                         |
| - Temperature minimum ( $T_{smin}$ )                              | $150^\circ\text{C}$                                     |
| - Temperature maximum ( $T_{smax}$ )                              | $200^\circ\text{C}$                                     |
| - preheat time ( $t_s$ )                                          | $60\sim 180\text{s}$                                    |
| Average ramp-up rate( $T_{smax}$ to $T_p$ )                       | $3^\circ\text{C/s}$ (Max.)                              |
| - Liquidous temperature( $T_l$ )                                  | $217^\circ\text{C}$                                     |
| - Time at liquidous( $t_L$ )                                      | $60\sim 150$ second                                     |
| peak temperature( $T_p$ )                                         | $245\pm 5^\circ\text{C}$                                |

**9. Statements**

FCC:

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: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or changes to this equipment. Such modifications or changes could void the user's authority to operate the equipment.

RF exposure information: To maintain compliance with FCC RF exposure requirements, use the product that maintain a 20cm separation distance between the user's body and the host.

CE:

This product can be used across EU member states.

**EU Regulatory Conformance**

Hereby, NiceRF Wireless Technology LTD. Corporation declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

For the declaration of conformity, visit the Web site <http://www.nicerf.com> certification.

**This device is intended only for OEM integrators under the following conditions:**

1. The antenna must be installed such that 20 cm is maintained between the antenna and users.
  2. The transmitter module may not be co-located with any other transmitter or antenna.
- As long as the two conditions above are met, additional transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required for the installed module.

**Important Note:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Federal Communications Commission of the U.S. Government (FCC) is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator shall be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate FCC and IC authorization in the U.S..

**OEM Integrators - End Product Labeling Considerations:**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains, FCC ID: 2AD66-LORA128X-T. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

**OEM Integrators - End Product Manual Provided to the End User:**

The OEM integrator shall not provide information to the end user regarding how to install or remove this RF module in end product user manual. The end user manual must include all required regulatory information and warnings as outlined in this document.