F8L10T LoRa Terminal
User Manual

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2016-12-19	V1.0.0	Initial version	WSP
2017-02-20	V1.1.0	According to the product line , modify the radio frequency description. Adjust the parameter configuration section with multiple details.	ZDD
2017-08-17	V1.1.1	Add Formulas to calculate collected value of ADC	YSL
2017-11-09	V1.1.2	Add Fcc Warning Add Working Principle Modify Communication Frequency Band Modify TX Power Modify F8L10T transmit data	YSL

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FCC WARNING

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 equipment 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 equipment 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 equipment 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.

This product needs a professional installation. The installer must be trained by our company. Installer must follow the instructions to install.

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Chapter 1 Brief Introduction of Product

1.1 General

F8L10T LoRa data transmission terminal is a wireless data transmission terminal based on LoRa spread spectrum technology. At the same time using Lora wireless transmission technology for short distance data transmission.

This product adopts industrial grade Lora scheme with high performance, based on embedded real-time operating system as the software platform, while providing RS232 and RS485 (or RS422) interface, can be directly connected to the serial device, realize the transparent data transmission function; low power design, lowest power consumption is less than 5ma@ 12VDC; 5 I/O, can achieve the digital input output, analog input, pulse counting function.

It has been widely used on M2M fields, such as electric power, intelligent trafic, wireless metering, industrial automation, telemetry, water supply, environment protection, weather, and so on.

1.2 Features and Benefits

Design for Industrial Application
◆ High-powered industrial LoRa chip and MCU
◆ High-powered industrial 32 bits CPU
◆ Support low power consumption mode, including multi-sleep and trigger modes to reduce the power dissipation farthest
◆ Housing: iron, providing IP30 protection
◆ Power range: DC 5~36V

Stability and Reliability
◆ Support hardware and software WDT
◆ RS232/RS485/RS422 port: 15KV ESD protection
◆ Power port: reverse-voltage and overvoltage protection
◆ Antenna port: lightning protection(optional)

Standard and Convenience
◆ Adopt terminal block interface, convenient for industrial application
◆ Support standard RS232 and RS485(or RS422) port that can connect to serial devices directly
◆ TTL logic level RS232 interface can be customized, ADC interface can be customized
◆ Support intellectual mode, enter into communication state automatically when powered
◆ Provide management software for remote management

◆ Support several work modes
◆ Convenient configuration and maintenance interface

High-performance

◆ Support Lora wireless short-range data transmission capabilities, with self-organizing network capabilities
◆ Relay routing and terminal device functionality
◆ Network capacity: 65000 nodes (typical number of 300)
◆ Send mode flexible: Broadcast send or destination address send mode optional
◆ Supply 5 I/O channels, can achieve the analog input of the 3 channels, the digital input and output of the 2 channels; compatible with the pulse count function of the 2 channels

1.3 Specifications

LoRa Specification
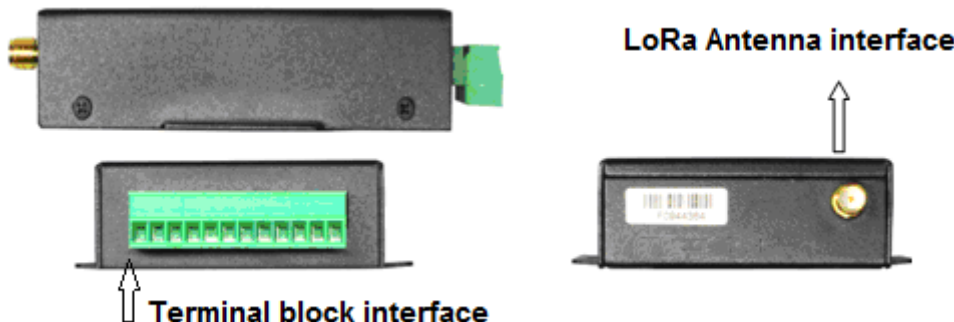
Item	Content
Module	Industrial LoRa module
Communication Frequency Band	The product family supports a wide range of frequency bands ISM: 903-927MHz
Indoor/Urban Communication Distance	F8L10T:1km
Outdoor/Visual Communication Distance	F8L10T:3.5km
Rate	6 level adjustable（0.3、0.6、1.0、1.8、3.1、5.5Kbps）
TX Power	903-927 MHz：92.91dBuV/m@3m
RX Sensitivity	-140dBm
Channel Number	25

Hardware System

Item	Content
CPU	Industrial 32bits CPU
FLASH	128KB
RAM	16KB

Interface type

Item	Content
Serial	1 RS232 port and 1 RS485(orRS422) port, 15KV ESD protection Data bits: 8 Stop bits: 1, 2 Parity: none, even, odd, space, mark

	Baud rate: 300、600、1200、2400、4800、9600、19200、38400、57600、115200bps
Indicator	"Power", "ACT", "Online"
Antenna	LoRa : Standard SMA female interface, 50 ohm, lighting protection(optional)
Power	Terminal block interface, reverse-voltage and overvoltage protection

Power supply

Item	Content
Standard Power	DC 12V/0.5A
Power range	DC 5~36V

Consumption

Item	Working condition	Consumption
F8L10T	Sleep	3.1～3.2mA@12 VDC
	Receive data	13.2～13.4mA@12 VDC
	Transmit data	60.3～61.2mA@12 VDC
	Sleep	7.3～7.4mA@5 VDC
	Receive data	26.1～26.2mA@5 VDC
	Transmit data	107.3～115.1mA@5 VDC

Physical Characteristics

Item	Content
Housing	Iron, providing IP30 protection
Dimensions	101x74x23 mm
Weight	205g

Environmental Limits

Item	Content
Operating Temperature	-40~+85ºC（-40~+185℉）
Storage Temperature	-40~+125ºC（-40~+257℉）
Operating Humidity	95% (unfreezing)

Chapter 2 Installation Introduction

2.1 General

The LoRa Terminal must be installed correctly by professional Installer to make it work properly.

Warning: 1.Forbid to install the MODEM when powered!

2.This device will not be sold to the general public,it will be sold to dealers only.

3.This device requires controlled installation location by professional installers.

4.This device requires prfessional configuration for use.

5.Be sure to install the original antenna, the installation of other antenna, it will cause disputes, need to bear the relevant legal responsibility.

2.2 Encasement List

Name	Quantity	Remark
LoRa Terminal host	1	
LoRa Antenna	1	
Power adapter	1	
RS232 data cable	1	optional
RS485 data cable	1	optional
Manual CD	1	
Certification card	1	
Maintenance card	1	

2.3 Installation and Cable Connection

Dimension: (unit: mm)
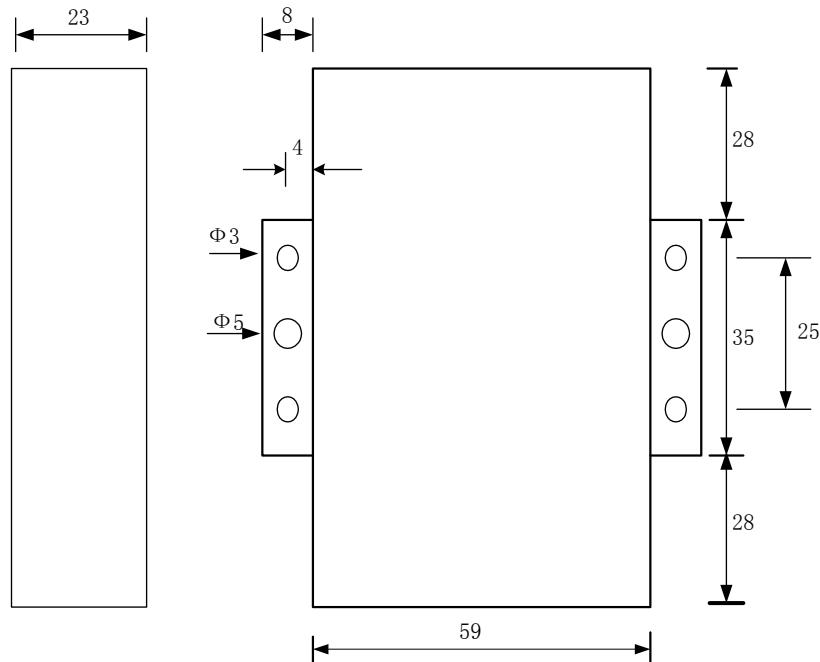
Installation of antenna:

Screw the SMA male pin of the LoRa antenna to the female SMA interface of the Device with sign "LoRa".

Warning: The cellular antenna and the LoRa antenna can not be connected wrongly. And the antennas must be screwed tightly, or the signal quality of antenna will be influenced!

Antenna Installation Instructions:

1, Install the antenna far away from the large area metal and ground.

2, Keep the antennas visual.

3, Minimize obstructions between the antennas.

4, Antenna extension line try to straighten, sucker base to be adsorbed on the metal object.

The performance of different antenna installation types, as the figure 2-2.
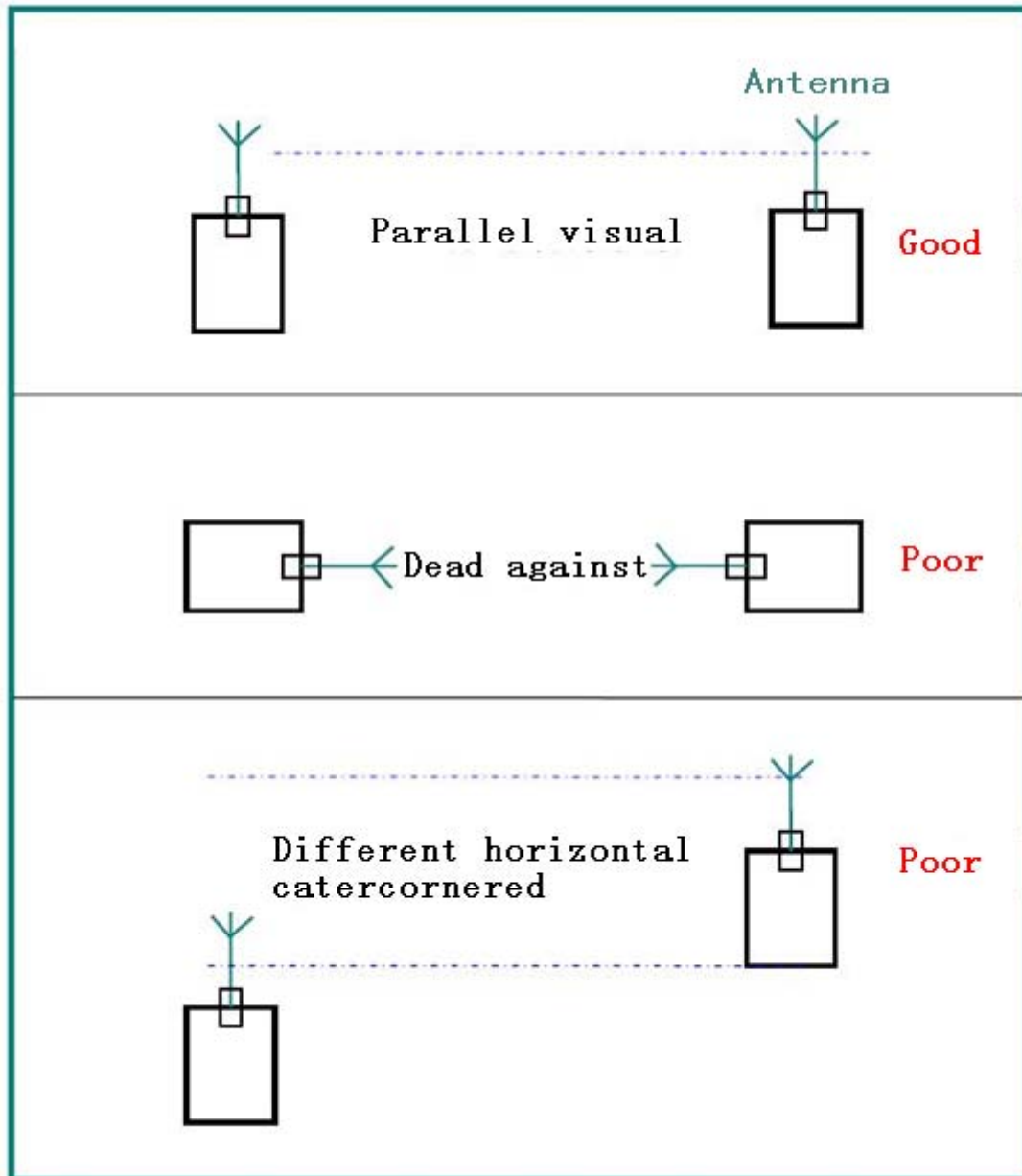
Figure 2-2 Installation antenna mode

User Interface Signal Definition

Pin Number	Signal Name	Default Function	Extensible Function
1	PWR	Power input anode	N/A
2	GND	Power Ground	N/A
3	GND	Power Ground	N/A
4	RX	RS232 RX	N/A
5	TX	RS232 TX	N/A
6	A	RS485 anode	N/A
7	B	RS485 cathode	N/A
8	IO1	GPIO	sleep control
9	IO2	GPIO	N/A
10	IO3	ADC, analog input	GPIO

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		function (voltage acquisition 0 ~ 5 V)	
11	IO4	ADC, analog input function (current collection 0 ~ 20 mA)	GPIO
12	IO5	ADC, analog input function (current collection 0 ~ 20 mA)	GPIO

Formulas to calculate collected value of ADC

Voltage: (collected value)*3.3*20.16/(4095*12.1) V

Current: (collected value)*3.3*1000/（4095*150）（mA）

Installation of cable:

IP MODEM adopts industrial terminal block interface. The recommendatory cable Is 28-16AWG. The detail description of standard layout adapter and communication cables as is following:

Adapter（Rating Output 12VDC/0.5A）：

Cable Color	Power Output Polarity
Black &White Alternate	Anode
Black	Cathode

RS232 Cable：

Cable Color	Corresponding DB9-M Pin Number
Brown	Pin 2
Blue	Pin 3
Black	Pin 5

RS485 Cable：

Cable Color	Signal definition
Red	RS485(A)
Black	RS485(B)

Power adapter and communication cable connection chart as following:

Connect via RS232   **Connect via RS485**

F8L10T		User Device (DB9M)	F8L10T		User Device
PWR 1	+ Anode		PWR 1	+ Anode	
GND 2	- Cathode		GND 2	- Cathode	
GND 3	1		GND 3		
RX 4	2 RX		RX 4		
TX 5	3 TX		TX 5		
A 6	4		A 6	A	
B 7	5 GND		B 7	B	
IO1 8	6		IO1		
IO2 9	7		IO2 9		
IO3 10	8		IO3 10		
IO4 11	9		IO4 11		
IO5 12			IO5 12		
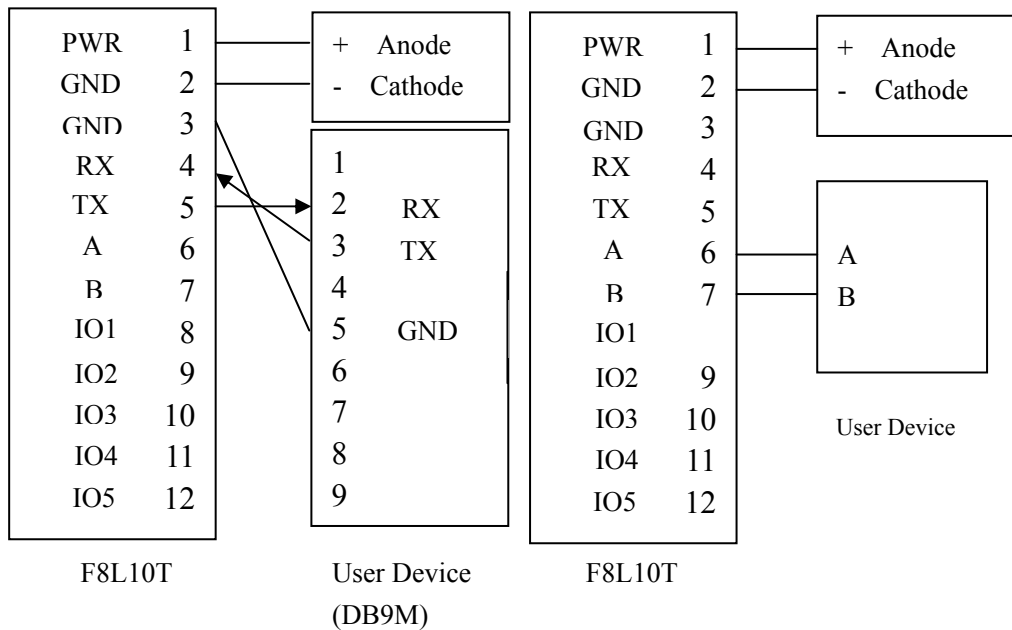
2.4 Power

The power range of the LoRa Terminal is DC 5~36V.

Warning: When we use other power, we should make sure that the power can supply power above 4W.

We recommend user to use the standard DC 12V/0.5A power.

2.5 Indicator Lights Introduction

The LoRa Terminal provides three indicator lights: "Power", "ACT", "Online".

Indicator Light	State	Introduction
Power	ON	LoRa Terminal is powered on
	OFF	LoRa Terminal is powered off
ACT	BLINK	Data is communicating
	OFF	No data
Online	ON	LoRa Terminal has logged on network
	OFF	LoRa Terminal hasn't logged on network

Chapter 3 Configuration

3.1 Configure connection

In the Lora digital transmission terminal configuration, the need to pass the factory configuration RS232 serial cable or RS232-485 conversion line Lora data transmission terminal and configured to connect the PC together, as follows:

Figure 3-1 F8L10T configuration connection with PC

3.2 Introduction of parameter configuration

F8L10T parameter configuration in two ways:

Through the Four-Faith configuration software LoRaConfig: all configuration is configured with the corresponding entry software interface, this configuration is only suitable for professional Installer to facilitate the configuration of PC Case.

By extending the at command (hereinafter referred to as the AT command) way to deploy: in this configuration, the professional Installer only needs to have the serial communication program can configure all parameters such as F8L10T, windows of the super terminal, Linux minicom, putty, or directly by the user's SCM system to node configuration. In the use of extended at command to configure F8L10T to bring F8L10T into the configuration state.

Among them, AT command configuration can refer to "AT command manual".

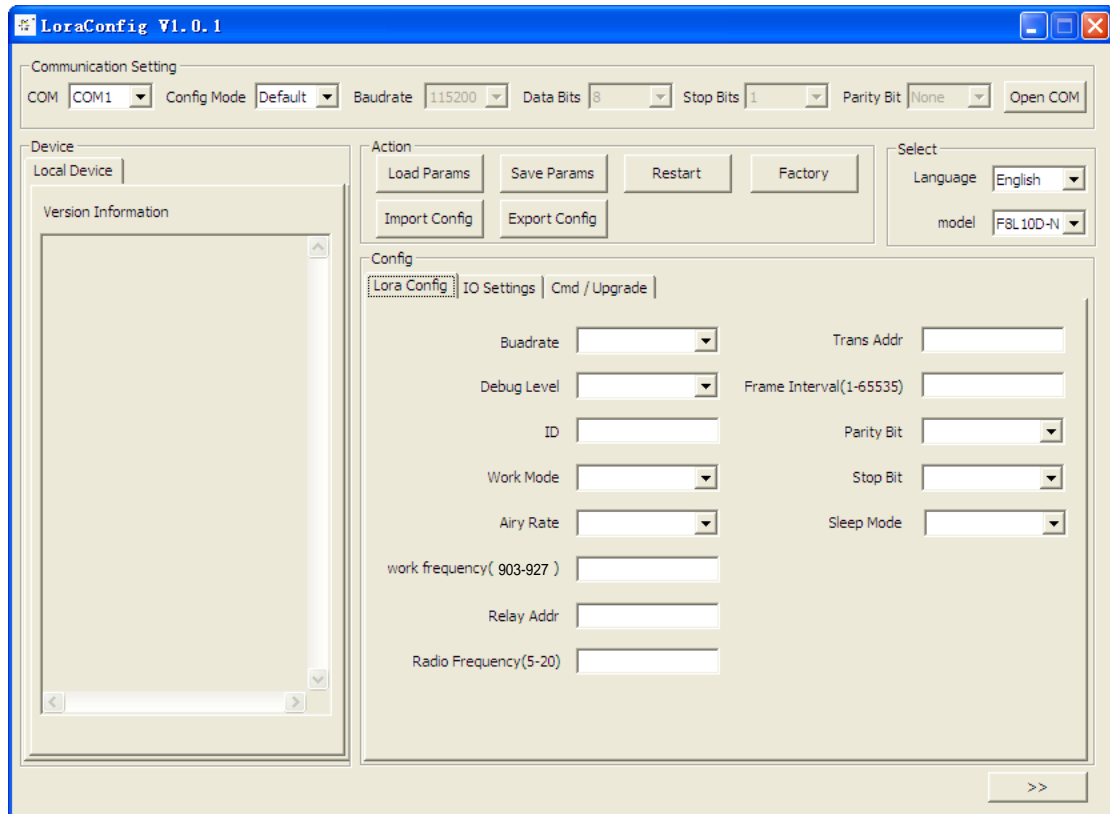Configure the f8l10t parameters by configuration software, as shown in Figure 3-2.

Figure 3-2 configuration interface

Column display serial parameters currently open serial port settings in the serial port parameters,please choose the correct value of this configuration, at the same time, open the serial port. The serial port parameter settings column if the right button is displayed as "closed serial". That serial port has been opened, otherwise please open the serial port.

The equipment again after power, configuration software f8l10t into the configuration state, and automatically load the current configuration parameters of equipment, in the area on the right side of the display parameters, thus can start all configuration parameters in the configuration F8L10T, as shown in Figure 3-2.

3.3　Detailed parameters

3.3.1　serial port configuration

It can configure the baud rate, data bit, parity bit and stop bit of the communication serial port.

3.3.2 serial port work mode

Module serial data work can be divided into "TRNS","AT" and "API".

"TRNS": data transmission, when the need to pass through the address configuration, namely the destination address.

"AT": protocol format reference "Lora AT commands manual",usually used for parameter configuration and manual testing.

"API": serial data must be based on a certain data format for sending and receiving, protocol format reference "Lora API commands manual". The maximum length is 100 bytes.

Default: TRNS

3.3.3 ID

Set the module ID, configurable range 0~65535.

3.3.4 working frequency

Module data transmission frequency, different hardware modules can work different frequency bands,Typical operating frequency band is 903-927 MHz, 1000 kHz spacing for a channel. Different application areas have different frequency band restrictions, as well as different channel interference factors, the error rate is different, so need to adjust the value according to the actual situation.

The default value is 903.

3.3.5 Relay address

When the transmission distance between nodes is too far, this parameter is set to the relay node' ID, and the relay node will help the node forward the data to the final destination node.

Default: 1000

3.3.6 sleep mode

When the device is in low power mode, can be set to NONE(not dormant), TIME(timing dormant) and DEEP(deep sleep). Regular sleep, you need to configure the "wake up time"and "sleep time"; the depth of dormancy, only through the IO1 pin to wake up.

Default: NONE

In regular sleep, keep the device wake-up time, unit MS, when the device wake up super this time will go to sleep.

In regular sleep, keep the device dormant time, unit MS, when the device sleep over this time will wake up, in a normal working state.

3.3.7   Debug level

Debug level control module log display, can be divided into three debugging levels, which:

0 do not output any log information

1 output Key log information

2 output detailed log information

Default: 1