

Long Distance Industrial Grade UART Serial Communication
Wireless Transparent Transmission Transceiver Module

SPECIFICATION

Model No.: DL-RTA5043M

Version: V1.1



Before using this module, please read this document carefully, and pay attention to the following important matters:

This module is an electrostatic sensitive product. Please operate it on an anti-static workbench during installation and testing.

The module uses an external antenna by default. The antenna can be a wire antenna or a standard UHF antenna. You can choose a specific antenna according to the actual situation. If the terminal product uses a metal shell, be sure to install the antenna outside the metal shell. Otherwise, the RF signal will be seriously attenuated, which will affect the effective distance.

Metal objects and wires should be kept away from the antenna as much as possible.

When installing the module, nearby objects should be kept at a sufficient safety distance from the module to prevent short circuit damage.

This module should be used in a dry environment. Please do not make any liquid substance come into this module.

Please use an independent voltage regulator circuit to supply power to this module, and avoid sharing with other circuits. The tolerance of the power supply should not be less than 5%.

Limitations:

This module is intended to be embedded in the customer's terminal product application, and does not provide a casing itself. It is not recommended that the customer directly resell this module as a final product without permission.

This series of modules are in accordance with commonly used international standards. If there is any special certification needed, we can adjust certain indicators according to your needs.

This module cannot be applied to life rescue, life-support systems, or any occasion where personal injury or life threatening may cause by equipment failure. Any organization or individual carrying out the above-mentioned applications shall bear all risks at their own.

We will not be responsible for any direct or indirect damage, injury or loss of profits caused by products that use this module.

File Version Update Management

Date	File Version	Remark
2016-8-5	MT Version V1.0	Customized Edition, ISM medical frequency band customization
2016-9-30	UART Version V1.1	Standardized UART Transparent Transmission Module, Basic Function Edition

DL-RTA5043M is a 50mW narrowband transmission (power centralized) wireless data transmission module based on AX5043 RF chip from Swiss AXSEM. It works in 407-450MHz ISM band and uses serial port for data transmission, which lowers the threshold of wireless application.

Narrow-band transmission has the advantages of concentrated power density, long transmission distance and strong anti-jamming ability, and greatly increases transmission distance compared with other similar products at the same power. The module can configure FEC forward error correction algorithm, which has high encoding efficiency and strong error correction ability. It can actively correct the jammed packets in case of sudden interference, greatly improving the reliability and transmission distance.

The module has data encryption and compression capabilities. The transmit data in the air is random but with rigorous encryption and decryption, which makes data interception meaningless. The data compression function has the probability to reduce the transmission time, reduce the probability of interference, and improve the reliability and transmission efficiency.

The module can operate in a wide voltage range of 2.1 - 5.5V to meet the needs of battery power supply. The module has four working modes, can switch freely during operation, consumes only tens of microamperes of current in power-saving mode, and is ideal for ultra-low power system and sensor applications.

1. Features:

- Transmission distance: 2100m
- Multiple baud rates can be configured at will
- Receiving Sensitivity: -126dBm
- Low Receive Power Consumption (Min. 2uA)
- Four working modes
- Sleeping current only 1.7uA
- Wake on radio function
- 256 channels frequency: 407 - 450M
- Double 512Bytes Ring Buffer
- Multiple power levels (maximum 50mW)
- Encryption algorithm + FEC error correction function
- Configurable 65536 address (easy to group)
- Built-in watchdog, never crashes

2. Applications:

- Wireless meter reading
- Intelligent Home Telemetry
- Intelligent Building
- Environmental Monitoring
- Small weather stations
- Consumer Electronics
- Other wireless transmission applications
- Wireless Sensing
 - Industrial Remote Control,
 - High Tension Line Monitoring
- Highway
 - Automatic Data Acquisition
 - Street light control

3. Basic Usage

The simplest usage: transparent data transfer. For example, from point A to point B, where 3 bytes of data 01 02 03 is sent, point B receives data 01 02 03

Flexible usage: Fixed-point transmission. Used for networking, relay and other applications.

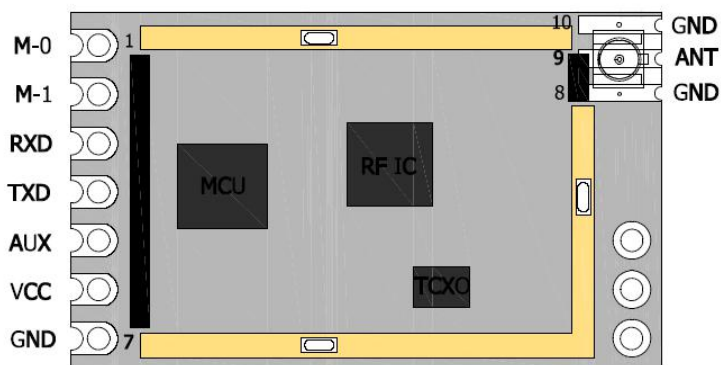
Detailed description please see this manual and related Application Note

4. Technical Parameter

No	Name	Parameter values
1	Module size	18* 33mm (Antenna excluded)
2	Place of origin	All imported components, origin from Japan, USA, Germany
3	Production process	SMT, wireless products must adopt SMT to ensure batch consistency and reliability
4	Interface type	1*7*2.54mm , Universal boards and DuPont lines are available
5	Frequency range	407 - 450MHz (A total of 255 channels, 433±5MHz recommended, factory default 433.0MHz)
6	Power Supply	2.1 - 5.5VDC
7	Communication level	Max. 5.2V, it is suggested that the difference between supply voltage should be less than 0.3V to reduce power consumption
8	Measured distance	about 2100m (Test conditions: clear, open, maximum power, antenna gain 5dBi, height greater than 2m, 1.2k AIUR)
9	Transmit power	Max. 17dBm (about 50mW). 8 levels adjustable (0-7), each level increases or decreases by 3dBm
10	Air Interface User Rate	3 levels adjustable (10, 20, 40Kbps)
11	Sleep current	1.7uA (M1 = 1, M0 = 1)
12	Transmission current	55mA@50mW
13	Receiving current	12.5mA (mode 0, mode 1); min. about 30uA (mode 2 + 2S wake-up)

14	Communication port	UART Serial Port, 8N1 1200 - 115200 Total 8 Baud Rates
15	Driving Mode	UART serial port can be set to push pull / pull up and drain open circuit.
16	Transmission length	512 bytes cache, data packet 43 bytes
17	Receiving length	512 bytes cache, data packet 43 bytes
18	Module address	65536 addresses can be configured (convenient for networking, supporting broadcast and fixed-point transmission)
19	RSSI support	Built in intelligent processing
20	Receive sensitivity	-126dbm@1.2Kbps (receiving sensitivity has nothing to do with serial baud rate and delay time)
21	Antenna	SMA Antenna / Spring Antenna
22	Working temperature	-40 ~ +85℃
23	Working humidity	10% ~ 90% relative humidity, non-condensing
24	Storage temperature	-40 ~ +125℃

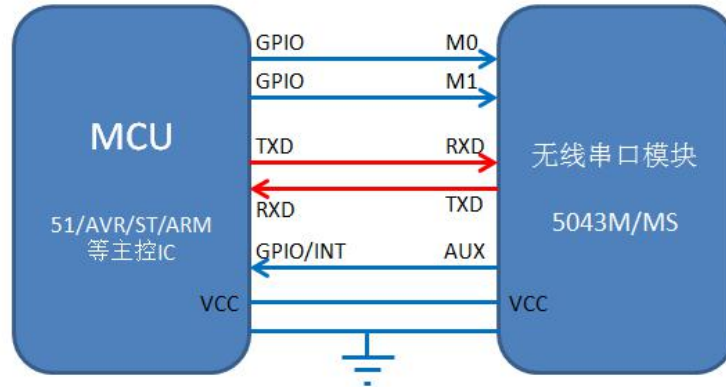
5. Pins Definition:



No	Name	I/O	Description
1	M0	Input (Extremely weak pull-up)	Used together with M1, to set the 4 operating modes of the module, cannot be suspended
2	M1	Input (Extremely weak pull-up)	Used together with M0, to set the 4 operating modes of the module, cannot be suspended
3	RXD	Input	TTL serial input, connected to external TXD output pins. Configurable drain open or pull-up input, see parameter settings for details
4	TXD	Output	TTL serial output, connected to external RXD input pins. Configurable drain open or push-pull output, see parameter settings for details
5	AUX	Output	Indicates the module operating state, wakes up by the external MCU, outputs low level during self-test initialization after power-up, and is configured as push-pull output, see parameter setting for details
6	VCC		System power supply, DC 2.1-5.5V standard voltage

7	GND		Grounding, common ground with the system
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6. Connection between module and MCU

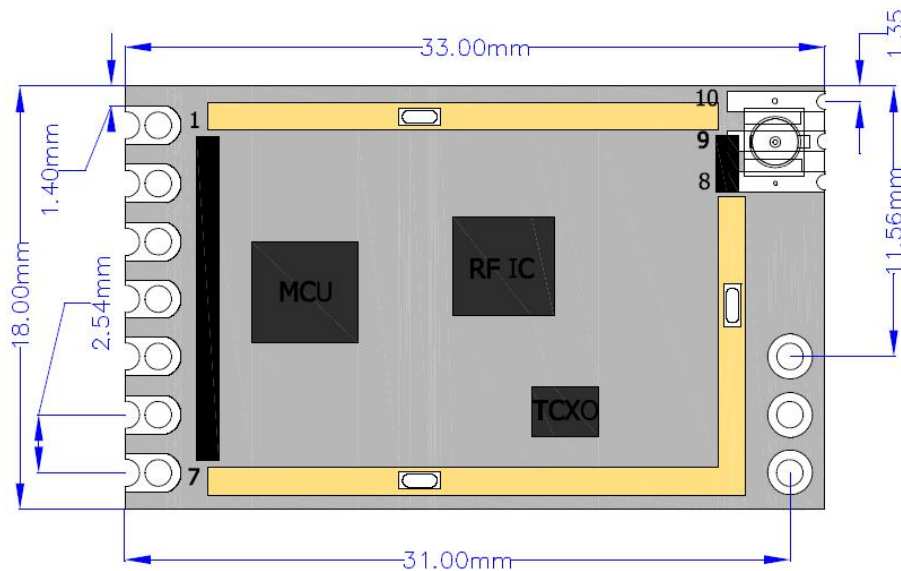


System Application Diagram

Note: the RF module adopts TTL level, please connect with MCU of TTL level, pay attention to the voltage range.

If you are using 5V MCU, a 4-10K pull-up resistance is required at the TXD and AUX feet of the module.

7. Package Outline



Remark: Gold plating PCB with half hole stamp edge and surface mounting technology (SMT) as defaulted. To avoid the resistance damage of high-power iron during mass production, please do not weld the antenna directly to the module.

For industrial control applications, it is necessary to increase the mechanical strength and

isolate the space from the application motherboard through standard 2.54mm header. While 7pin and 3pin headers are used for welding.

The antenna output port is ① IPEX adapter and IPEX to SMA adapter cable; ② SMA female is used to connect standard rubber rod antenna or sucker antenna. You can design the interface according to your own product

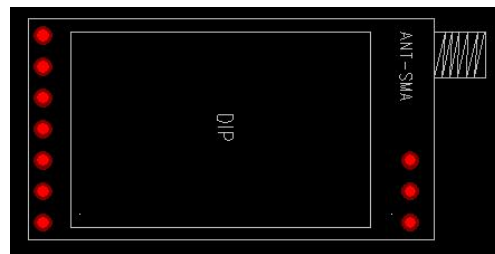
Please request module packaging from our technical support: SMT packaging, DIP direct insert packaging (reference diagram)

Package file format description:

*.ASC format imported with Protel99se; *.DXF format imported with CAD; *.PCB format opened with PADS software;



SMT packaging



DIP packaging

8. Module Reset

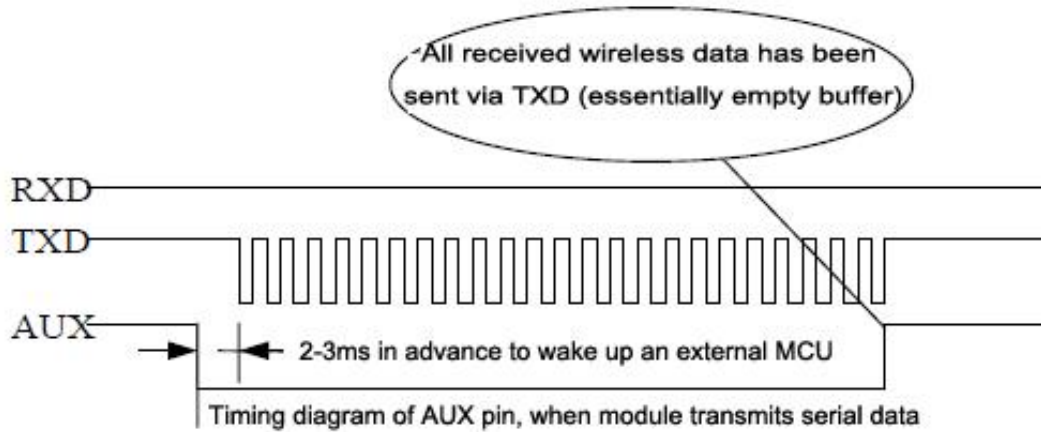
When the module is powered up, AUX outputs the low level immediately, performs hardware self-test and sets the operating mode according to user's parameters. During this process, AUX keeps low level, after that, AUX outputs high level and starts to work normally according to the working mode composed of M1 and M0. Therefore, the user needs to wait for the AUX rising edge as the starting point for the module to work properly.

9. AUX Explanation in Details

AUX is used for buffering instructions wireless transmitting and receiving, as well as self-check instructions. It indicates whether the module has data that not been sent out wirelessly, whether the wireless data has not been received through the serial port, or whether the module is in the process of initializing the self-test.

AUX function description:

Function 1: Serial port data output indication (for waking up external MCU in sleep)

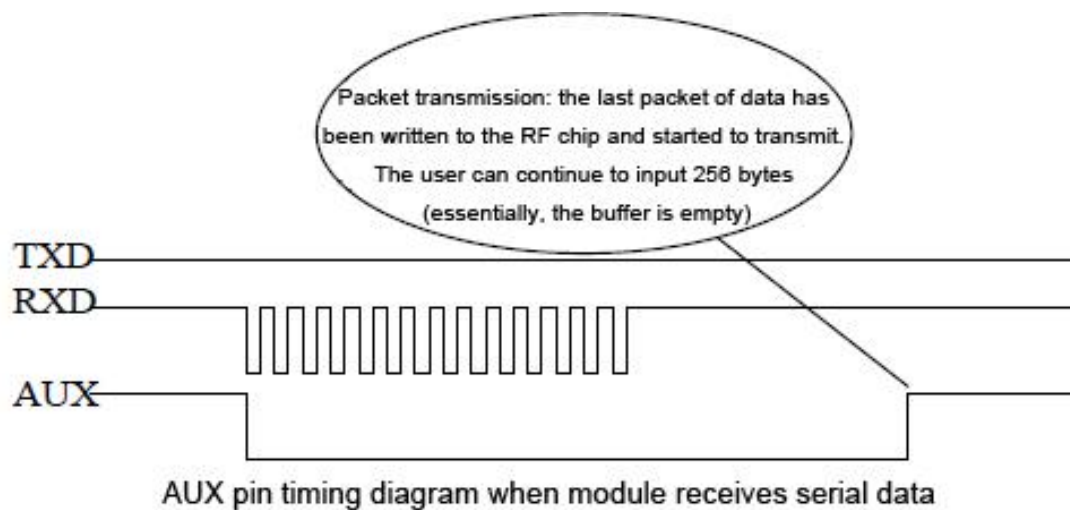


Function 2: Wireless transmission indication

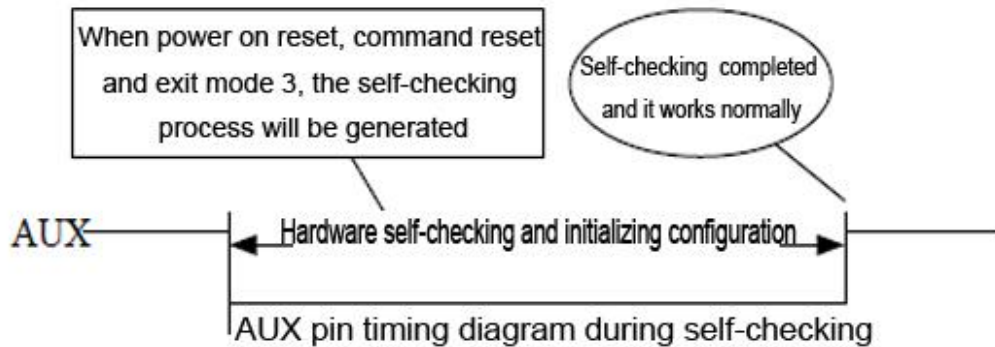
Buffer empty: Data from the internal 512-byte buffer is written to the wireless chip (automatic data divided). When AUX = 1, data will not overflow, if less than 512 bytes of data continuously initiated

When AUX=0, the buffer is not empty: data from the internal 512-byte buffer has not been written to the wireless chip completely and the transmission is started. At this time, the module may be time out for waiting the data, or is performing wireless sub-data transmission.

Note: AUX=1 does not mean that all serial data of the module has been transmitted wirelessly, or that the last package of data is being transmitted.



Function 3: Module is in the process of configuration (only under resetting mode, or exiting sleep mode)



Attention:

For the above functions 1 and 2, the output low level is preferred, that is, if any output low level condition is satisfied, AUX will output low level. When all low-level conditions are not met, AUX outputs high level.

When the AUX output low level, it means that the module is busy, and the working mode detection will not be carried out at this time. When the module AUX outputs a high level within 1ms, the mode switching will be completed.

After switching to the new working mode, the module will enter the mode after at least 2ms at the rising edge of AUX. If aux is always in high level, the mode switching will take effect immediately.

When the user enters into other modes from mode 3 (sleep mode) or in the process of reset, the module will reset the user parameters, during which the AUX output low level.

10. Working modes

The following table is an introduction to M1 and M0 input status and corresponding modes:

Mode (0-3)	M1	M0	Introduction	Remark
0 Normal Mode	0	0	Serial port open, wireless open, transparent transmission	
	0	1		Reserved
1 Sleep Mode	1	0	Module goes to sleep	
2 Setting Mode	1	1	Set module parameters in this mode	

10.1. Mode switching

You can combine M1 and M0 to set the working mode of the module. Two GPIOs of the MCU can be used to control mode switching. When M1, M0 are changed: if the module is idle, 2ms later, it can start working in the new mode. If the module has serial data that has not been transmitted through wireless, it will not enter a new working mode until the transmission is completed. If the module receives wireless data and sends it out through the serial port, it needs to send it out before it can enter the new working mode. Therefore, mode switching is only valid when AUX outputs 1, otherwise the switching will be delayed.

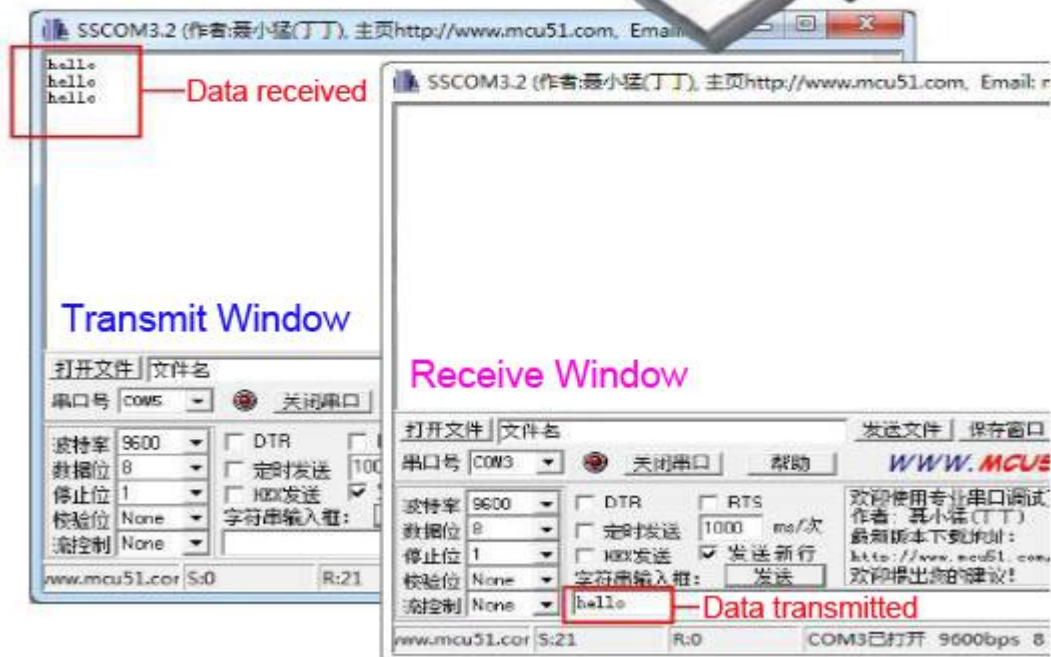
10.2. Fast Communication Test

Plug the USB testing board (optional accessory from DreamLNK) into the computer to make sure the driver is installed correctly. Plug in the mode selection jumper (M1 = 0, M0 = 0) on the USB testing board and let the module work in mode 0 as shown in the red box below.

Select 3.3V or 5V power supply.

Run the Serial Debugging Assistant software and select the correct serial number to observe the sending window and the corresponding receiving window

1. Plug in the two jumper caps (into transparent mode)
2. Open the Serial Port Debugging Assistant (available from us)



11. Instruction Format

In sleep mode (mode 3:M1=1, M0=1), the supported instructions are as follows (when set, only 9600, 8N1 format is supported):

No	Instruction Format	Description
1	C0 + Working parameters	Send C0+5 bytes of working parameters in hexadecimal format, a total of 6 bytes, which must be sent continuously (power-off save)
2	C1 C1 C1	Send three C1s in hexadecimal format, module returns saved parameters, must send continuously.
3		

11.1. Parameter Setting Instructions

C0 can be used for working parameters, the difference is that C0 command writes parameters to module FLASH and saves them after power down

Model No: DL-RTA5043M			Default Value: C0 ff ff 3a 00 07			
Frequency	Address	Channel	Air Rate	Baud Rate	Serial Format	Transmission Power
407MHz	0xffff	0x00	40kbps	115200	8N1	17dbm

Working Parameter Configuration Table (Defaulted : C0 00 00 18 50 44)

No	Name	Description	Remark
Byte0	HEAD	Fixed code 0xC0	Must be 0xC0
			The set parameters will be saved after power failure
Byte1	ADDH	Module address high byte (Defaulted FFFH)	00H-FFH
Byte2	ADDL	Module address low byte (Defaulted FFH)	00H-FFH notice : ADDH , ADDL The transmitter and receiver must be consistent in order to receive normally. Suitable for networking applications
Byte3	SPED	Rate parameters, including UART serial port rate and sky air rate	The serial port modes of both sides of the communication can be different
		7 , 6: Serial Check Bits	
		00: 8N1 (default, no parity, 1BIT stop bits)	

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		5, 4, 3 TTL Series Rate (bps)	The baud rate can be different between the two sides of the communication
		000: Serial baud rate is 1200	The serial baud rate is independent of the wireless transmission parameters and does not affect the wireless transmission and reception characteristics.
		001: Serial baud rate is 2400	
		010: Serial baud rate is 4800	
		011: Serial baud rate is 9600	
		100: Serial baud rate is 19200	
		101: Serial baud rate is 38400	
		110: Serial baud rate is 57600	
		111: Serial baud rate is 115200 (defaulted)	
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		2, 1, 0 Wireless Air rate (bps)	The lower the air speed, the longer the distance, the stronger the anti-jamming performance and the longer the transmission time.
		000: Air rate is 10K (defaulted)	The air wireless transmission rate of both sides of communication must be the same.
		001: Air rate is 20K	
		010: Air rate is 40K	
Byte4	CHAN	Communication frequency (407M + CHAN * 0.2M)	It can set up 00-250 channels
		(defaulted 50H:433M)	Note: the transmitter and receiver of CHAN must be set in the same way to transmit and receive normally
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Byte5	OPTION		
		2, 1, 0 Transmit power (approximate)	
		000: -4dBm	

		001: -1dBm	Low power transmission is not recommended, and its power utilization efficiency is not high.
		010: 2dBm	
		011: 5dBm 100: 8dBm 101: 11dBm 110: 14dBm 111: 17dBm(defaulted)	

11.2. Working parameter reading

In sleep mode (M1=1, M0=1), you can transmit commands to the module serial port (in HEX format): C1 C1 C1, the module returns the current configuration parameters. For example: C0 00 18 50 44.

12. Problems in module application

Considering the complexity of data transmission over the air, the radio frequency modulation method of the data, and some inherent characteristics of electromagnetic waves, the following issues should be considered during the application process.

1. The electromagnetic interference of the application environment will affect the actual distance of the remote control. Electromagnetic wave interference is divided into mainboard power supply interference, TFT screen data cable interference, Flash data exchange interference; and airborne carrier frequency interference, noise interference, high-power signal source interference, etc.
2. Factors such as product size, internal space, and coating of the shell will cause the attenuation of the wireless signal, which will affect the remote-control distance. Usually the narrow internal space of the product is not conducive to the extension of the antenna. The outer shell should avoid metal or metal plating as much as possible.
3. To choose a proper antenna is very important. The antenna is an important part of the communication system, and its performance directly affects the indicators of the communication system. We must pay attention to its performance (antenna type, antenna electrical performance) when selecting the antenna. Please feel free to contact us for consultation or recommendation, if you need.

13. Contact us

Shenzhen DreamLnk Technology Co., Ltd

★ Data collection, Smart home, Internet of Things applications, Wireless remote-control technology, Remote active RFID, Antennas ★

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