Ultra-Low Power UART Wireless SoC Transceiver Module

SPECIFICATION

Model No.: DL-CC1310-B

Version: V1.12

DreamLNK
DL-CC1310-B
SN: DL35D0300001
RoHS

DL-CC1310-B 915MHz

Before using this module, please 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.

This DL-CC1310-B UART Wireless Module uses an external antenna by default, which is intended to be embedded in your product or application, and does equip with a metal shield itself for a better anti-interference ability. The antenna can be a wire antenna or a standard UHF antenna. You can choose a specific antenna according to the actual situation.

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

Disclaimer:

This specification is just for your information, all the charts and pictures used in this specification are for reference only. The actual test shall prevail for details. We do not assume any responsibility for personal injury or property loss caused by user's improper operation.

This specification is subject to change due to the continuous improvement and upgrading of the product version, and the latest version specification shall prevail. DREAMLNK reserves the right of final interpretation and modification of all contents in this specification.

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Revision History

Date	Version	Formulation / Revision of Contents	Approved by
2022-4-5	V1.0	DL-CC1310-B Standard Version UART Module	Fagan Xu
2022-6-18	V1.1	Specification Update	Fagan Xu

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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1. Module Overview

1.1 Brief Introduction

DL-CC1310-B Wireless Module is an SoC embedded Serial Port RF Transceiver Module (UART Module) with AT command, which was developed by DREAMLNK based on Texas Instruments' CC1310F128RHBR (built-in dual-core ARM) Radio Frequency chip. It combines an integrated RF Controller (Cortex®-MO) and a powerful Arm® Cortex®-M3 Processor, the Clock Speed of the MCU can reach up to 48MHz.

This DL-CC1310-B Wireless Module supports Narrow-band Communication, Direct Sequence Spread Spectrum (DSSS), Long-range Transmission and High-efficiency Communication. With its fully functional AT Commands, this CC1310 RF module support any Serial Baud Rate setting from 1920bps to 256000bps, which can greatly improve the communication efficiency with up to -124dBm receiving sensitivity.

The embedded software makes this Wireless Module support not only Transparent Transmission Mode, accurate RSSI acquisition, automatic CCA (Clear Channel Assessment) function, but also High-speed Data Stream & Packet Segmentation Transmission, which can effectively reduce the probability of signal collision.

Moreover, it has defaulted low power consumption software, as well as other muti-functions serial port programs when it is manufactured. A variety of Wireless Baud Rates and functions can be configured, including Long-range Spread Spectrum Mode and Common Mode, Wake-on-Radio (eWOR) function, etc. These different configurations can provide simple and efficient solutions for various long-range communication and IoT applications.

All these features above make this DL-CC1310-B Wireless Module to an excellent RF performance and strong anti-interference in the 860-950MHz frequency band. It combines a flexible, very low power RF transceiver with a powerful MCU in a platform supporting multiple physical layers and RF standard, which is ideal to use especially for battery power applications. You can also make secondary development based on TI’s development Kit if needed.

1.2 Features

Hardware Features:

- Original CC1310 Chip from TI;
- SOC integrated RF module with metal shield
- Wide supply voltage range: 1.8V to 3.8V;
- Ultra-low sleep current < 1uA;
- High efficiency receiving performance (RX current @ 5.5mA);
- High Transmission Efficiency:

  TX (+10dBm): 17mA;
  TX (+14dbm): 27mA;
- Excellent Receiver Sensitivity:

  Long Range Mode: -124dbm at 0.625kbps;
  Universal Mode: -110dbm at 50kbps;
- Accurate RSSI acquisition and automatic Clear Channel Assessment (CCA).
- Compact size for SMD mounting (Dimensions = 18x16.5mm)

Software Features:

- Easily configure with AT command, for a simple development;
- Transparent Transmission Mode supported;
- Data flow control & high-speed data stream transmission supported;
- 1920-256000bps serial baud rate is supported;
- 0.6kbps-500kbps wireless baud rate is supported;
- Wake-on-Radio (eWOR) function supported (intermittent receiving), which can be greatly increases the battery standby time;
- Packet Segmentation Supported
- Preset CCA (Clear Channel Assessment) function, which can effectively reduce the collision probability of co-frequency interference;
- Strong Anti-jamming: supports anytime RSSI acquisition and CCA (Clear Channel Assessment);
- Supports manual fast frequency hopping to avoid co-frequency interference;
- Fixed Point, Broadcasting and Monitoring transmissions are all available.

1.3 Typical Application

- Smart Grid and Automatic Meter Reading (water meter, electricity meter, gas meter)
- Long-Range Data Communication
- Smart Home Systems
- Wireless Sensor Networks
- Industrial Automation (Data Acquisition)
- Remote Control and Telemetry of Field Data
- Various Transmitter, Intelligent Flow Meter Instrument
- Building Automation and Security
- Monitoring and Control of Petroleum Equipment in Mines
- Environment, Energy Saving, Temperature Monitoring
- Intelligent Transportation, Smart City
- Intelligent Robot
- Home and Building Automation
- Wireless Alarm and Security Systems
- Industrial Monitoring and Control
- Wireless M-BUS

2. Technical Parameter

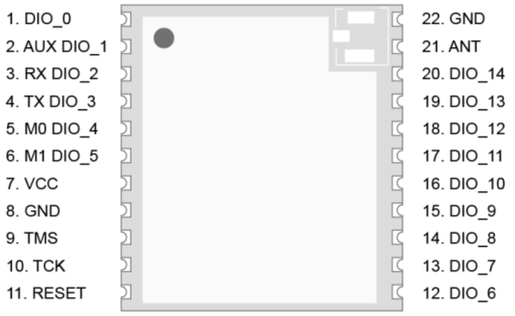
Parameter	Min.	Typical	Max.	Unit	Remarks
Operating Conditions					
Working Voltage	2.0	3.3	3.6	V	Voltage above range may damage the RF module
I/O Voltage Range	1.8	3.3	3.6	V	Recommended Operating voltage is +3.3V
Working Temperature Range	-40	25	85	℃	
Current Consumption					
Receiving Current	5	5.5	6.1	mA	@ Radio Frequency Receiving Current (MCU sleep)
Receiver Working Current	6	6.8	8	mA	@ Overall Receiving Current
Transmission Current	27 16	29 18	32 21	mA	@915M 14dBm Peak value @915M 10dBm Peak value
Standby Current	1	1.5	2	mA	@ RF Receive Function Disable
Sleep Current	0.2	<1	2	uA	@M1=0
RF Parameters					
Recommended Frequency (Ensure best performance))	902	915	928	MHz	@915Mhz RF module
Transmitting Power Range	-10	14	15	dBm	@0-10dBm, 1dbm resolution
Max. Receiver Sensitivity @ FSK	-120	-124	-127	dBm	@915Mhz @625bps
FSK Rate Range	0.625	9.6	500	Kbps	@ See Table 18 for details
Wake-on-Radio Mode Consumption		0.04		mAH	@AT+RXGAS=500

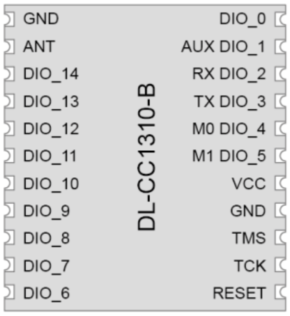
Table 1: Technical Parameter

Parameter	Value	Remark
Max. Wireless Rate	500000bps	The transmission rate of wireless data, the higher the rate, the lower the delay, but the communication distance will decrease
Max. Rate of the Wireless Module	210000bps	Limited by Wireless Rate, Serial Baud Rate and Buffer. Test conditions: Wireless Rate: 500000bps Serial Baud Rate: 256000bps
AT Response Time	500us	The time from when the command is sent to when the module responds to the command; Test command: AT Baud rate: 115200
Buffer	TX: 600Byte RX: 600Byte	More than 512Byte will be considered to have reached the buffer tolerance;
Reset Duration	40ms	Time to perform reset to completion of initialization
AT Command -> Transparent Transmission Mode	<2ms	Shift between AT Command and Transparent Transmission Mode
Sleep Mode -> Transparent Transmission Mode	<8ms	Switching from Sleep Mode to Transparent Transmission Mode only available when AUX @ Low Level
WOR -> Transparent Transmission Mode	<8ms	Switching from Sleep Mode to Work Mode only available when AUX @ Low Level

Table 2: Supplementary Instructions

3. Pin Definitions


1. DIO_0
2. AUX DIO_1
3. RX DIO_2
4. TX DIO_3
5. M0 DIO_4
6. M1 DIO_5
7. VCC
8. GND
9. TMS
10. TCK
11. RESET
22. GND
21. ANT
20. DIO_14
19. DIO_13
18. DIO_12
17. DIO_11
16. DIO_10
15. DIO_9
14. DIO_8
13. DIO_7
12. DIO_6


GND
ANT
DIO_14
DIO_13
DIO_12
DIO_11
DIO_10
DIO_9
DIO_8
DIO_7
DIO_6
DL-CC1310-B
DIO_0
AUX DIO_1
RX DIO_2
TX DIO_3
M0 DIO_4
M1 DIO_5
VCC
GND
TMS
TCK
RESET

Front Side Back Side

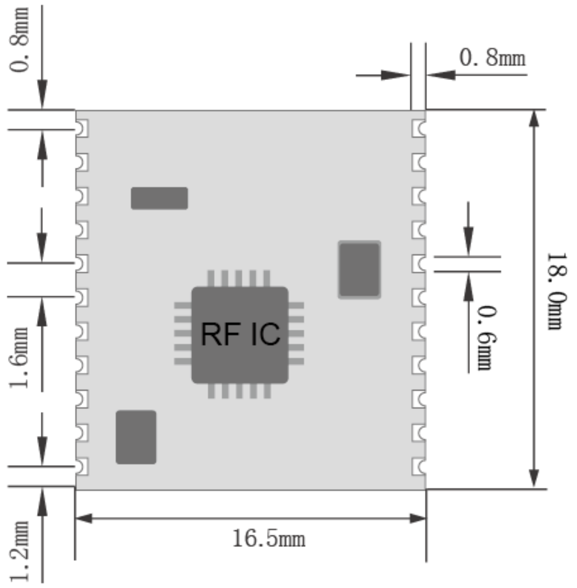
Pin Name	I/O Type	Pin Description
VCC	PWR	To maximize the chip function, ≥2.5V stable voltage is recommended
GND	PWR	Reference Ground
ANT	Analog I/O	RF signal input/output port, π-matching circuit must be reserved; Adopt 50Ω impedance matching for RF routing, route the ground and add via holes around it
DIO1(AUX)	Out	**Indicate the working status of the module:** **Start-up initialization, exit Sleep Mode or WoR Mode:** 0: Initialization completed; serial port transmission can be carried out 1: Serial port transmission is not allowed until initialization is completed **Transparent Transmission Mode & Wake-on-Radio (WOR) Mode:** 0: Idle 1: The module receives the data and outputs the data through the serial port after the set delay **When Transmitting Data to the Module:** 0: The buffer is empty (Transmitting completed) 1: Buffer is not empty
DIO2(UART-RX)	In	TTL serial port input, connected to external TXD output pin
DIO3(UART-TX)	Out	TTL serial port output, connected to external RXD input pin
DIO4(M0)	In	Switching between **AT Command** and **Transparent Transmission Mode**, defaulted high level 0: **Transparent Transmission Mode** 1: AT **Command Mode**
DIO5(M1)	In	Control Module Sleep, defaulted high level 0: Sleep (or wake-on-radio) 1: Wake up High level can be directly connected, if no need to consider low power consumption
RESET	In	Hardware reset, active low
DIO6-DIO14	Out / In	Common I/O port, no function at present, can be customized to realize the following functions: 1. ADC detection 2. Key value fast transmit

		3. RF status indication 4. PA control If not used, it must be N/C (No Connection)

Table 3: Pin Definitions

Note: if DIO4(M0) and DIO5(M1) are N/C (No Connection) during debugging, the RF module will be in AT command mode, which is convenient for testing;
After entering the sleep mode, these two Pins need to be connected to certain levels; otherwise, electric leakage will occur.

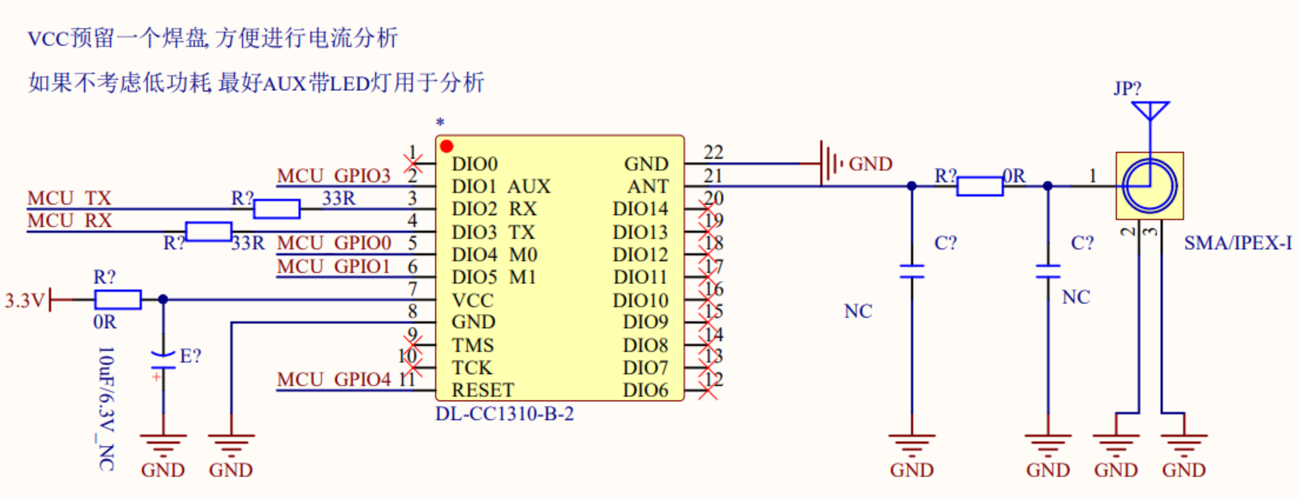
4. Module Dimension



DL-CC1310-B Module Dimension

5. Application Connection Diagram

Recommended Circuit are as below: please reserve a pad on VCC for current analysis; and if low power consumption is not considered, AUX with LED light is also recommended for analysis


VCC预留一个焊盘, 方便进行电流分析
如果不考虑低功耗, 最好AUX带LED灯用于分析
*
MCU_TX
MCU_RX
MCU_GPIO3
R?
33R
R?
33R
MCU_GPIO0
MCU_GPIO1
MCU_GPIO4
3.3V
R?
0R
E?
10uF/6.3V_NC
GND
GND
DIO0
DIO1 AUX
DIO2 RX
DIO3 TX
DIO4 M0
DIO5 M1
VCC
GND
TMS
TCK
RESET
GND
ANT
DIO14
DIO13
DIO12
DIO11
DIO10
DIO9
DIO8
DIO7
DIO6
1
2
3
4
5
6
7
8
9
10
11
22
21
20
19
18
17
16
15
14
13
12
DL-CC1310-B-2
GND
R?
0R
C?
NC
C?
NC
JP?
1
2
3
SMA/IPEX-I
GND
GND
GND
GND

Notice for Pin Connection:

1. DIO2 RX and DIO3 TX are used for data transmission and should be inversely connected with the UART pins of external MCU.
2. AUX M0 M1 RESET are used for the module control, and needs to be connected with the GPIO port of the external MCU.
3. DIO4(M0) and DIO5(M1) are high level defaulted. When the Wireless Module enters sleep mode, these two Pins need to be connected to certain levels; otherwise, electric leakage will occur.
4. The unused DIO Pins can be NC, which are marked with X in above figure.

6. Circuit Design

6.1 Power Supply Design

- Please pay attention to the power supply voltage of the device, exceeding the recommended voltage range may cause function abnormally and permanently damage;
- Try to use a DC stabilized power supply, and the power ripple coefficient should be as small as possible; the power load when transmitting the maximum power needs to be also considered;
- The module needs to be grounded reliably, and a good grounding can achieve better performance output and reduce the impact of RF on other sensitive devices.

6.2 RF Routing Design

- The module should be far away from RF interference sources, such as high-frequency circuit transformer, and it is forbidden to route the wires directly under the module, otherwise it may affect the receiving sensitivity;
- When using the on-board antenna, the antenna needs to be clear on both sides, and the ground should not be too close to the antenna at the same time, otherwise it will absorb the radiated energy;
- Route 50Ω impedance line, lay the ground and drill more ground holes;

- The PCBA space allows to reserve a π-type matching network, first connect it through a 0R resistor, otherwise the antenna is open.

6.3 Antenna Design

- There are many types of antennas, choose the appropriate antenna according to your needs;
- Choose a suitable placement position, according to the Antenna polarity, and it is recommended to be vertically upward;
- There should be no metal objects in the antenna radiation path, otherwise the transmission distance will be affected (such as a closed metal casing).

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
external antenna with antenna gain 2dBi
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.
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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.
We will retain control over the final installation of the modular such that compliance of the end product is assured. In such cases, an operating condition on the limit modular approval for the module must be only approved for use when installed in devices produced by a specific manufacturer. If any hardware modify or RF control software modify will be made by host manufacturer,C2PC or new

certificate should be apply to get approval,if those change and modification made by host manufacturer not expressly approved by the party responsible for compliance ,then it is illegal.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.This modular complies with FCC RF 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 modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification 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 wording such as the following: “Contains Transmitter Module FCC ID: 2ASHLDL-CC1310-B Or Contains FCC ID: 2ASHLDL-CC1310-B”

When the module is installed inside another device, the user manual of the host must contain below warning

statements;

1. 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.

(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.

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

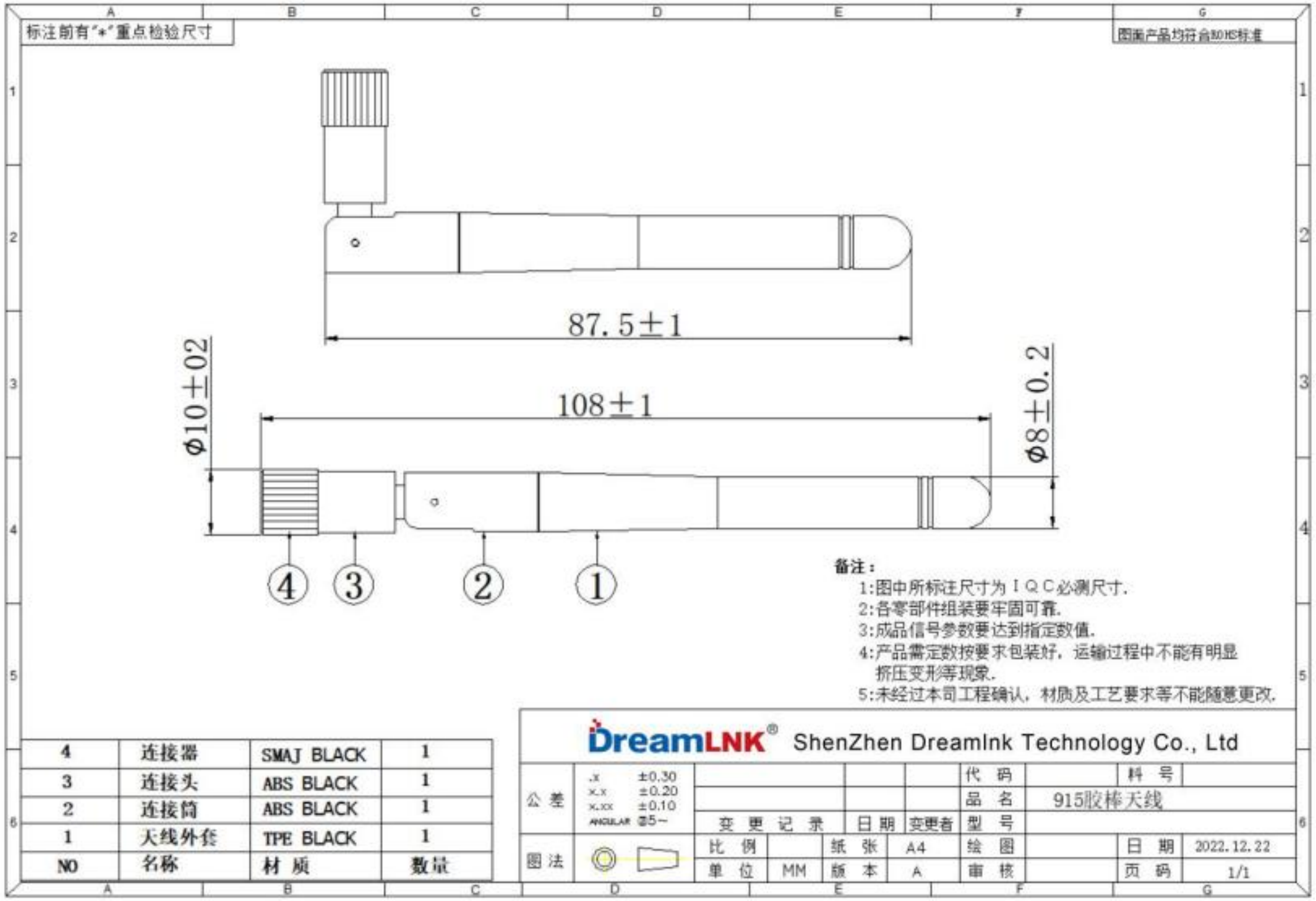
Any company of the host device which install this modular with modular approval should perform the test of radiated & conducted emission and spurious emission,etc. according to FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement，then the host can be sold legally.

1. Photos

2. Parameters

Test parameters			
Product Name	**915MHz Rubber Rod Antenna**	**Model No**	W10-915M
Electrical Specifications			
Frequency Range	915MHz	**Polarization**	LINEAR
Input Impedance	50 Ω	**Radiation direction**	OMNI
VSWR	≦2.0	**Power Capacity**	10W
Gain	2dBi	**Bandwidth**	/
Mechanical Specifications			
Dimensions	10.8cm	**Color**	Black
Connector Model	SMA-J	**Cable Length**	/
Antenna Material	ABS & Copper	**Storage Temp.**	-10-+70℃
Working Temperature	-10℃-+60℃	**Relative Humidity**	40~85%

4. Structure diagram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87.5±1
Φ10±02
108±1
Φ8±0.2
④
③
②
①
备注：
1:图中所标注尺寸为ＩＱＣ必测尺寸.
2:各零部件组装要牢固可靠.
3:成品信号参数要达到指定数值.
4:产品需定数按要求包装好，运输过程中不能有明显挤压变形等现象.
5:未经过本司工程确认，材质及工艺要求等不能随意更改.
4 连接器 SMAJ BLACK 1
3 连接头 ABS BLACK 1
2 连接筒 ABS BLACK 1
1 天线外套 TPE BLACK 1
NO 名称 材质 数量
DreamLNK®
ShenZhen Dreamlnk Technology Co., Ltd
公差
.x ±0.30
x.x ±0.20
x.xx ±0.10
ANGULAR ±5~
变更记录
日期
变更者
代码
品名
915胶棒天线
型号
料号
图法
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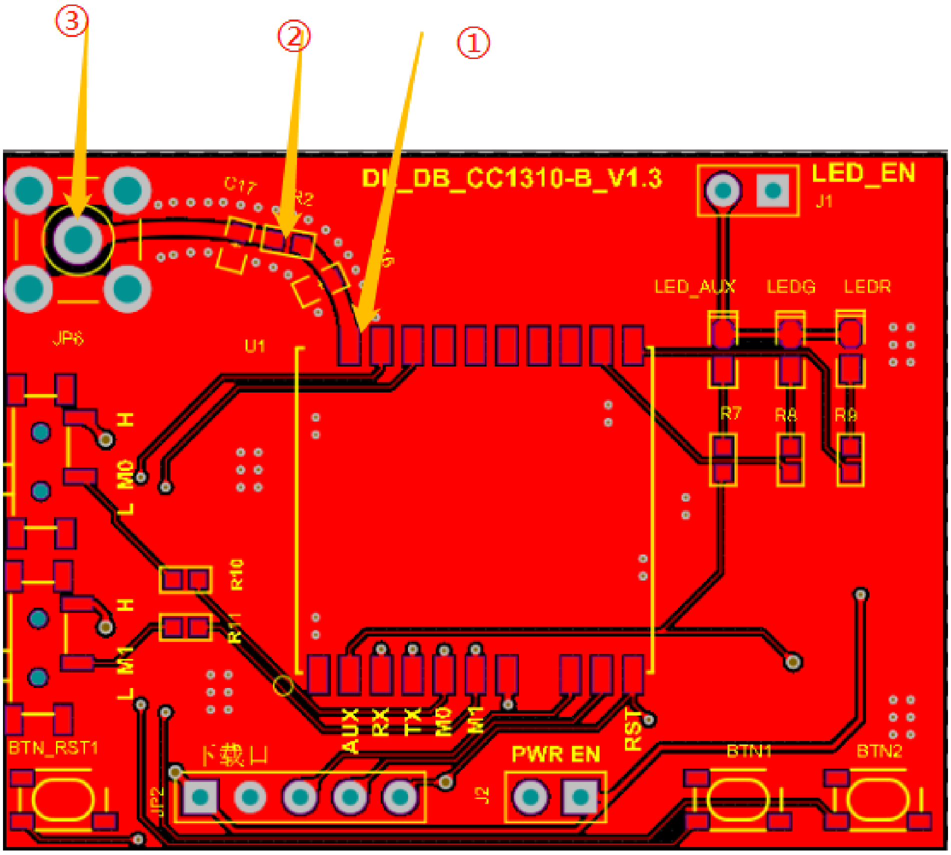
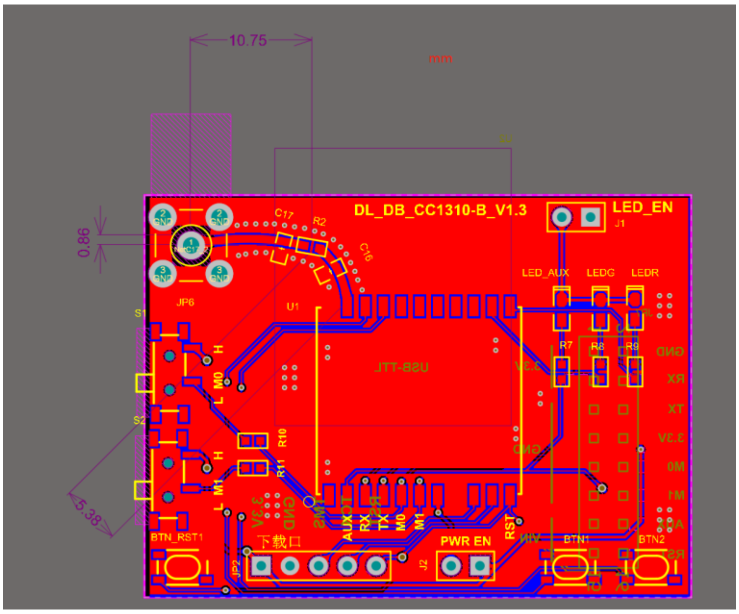
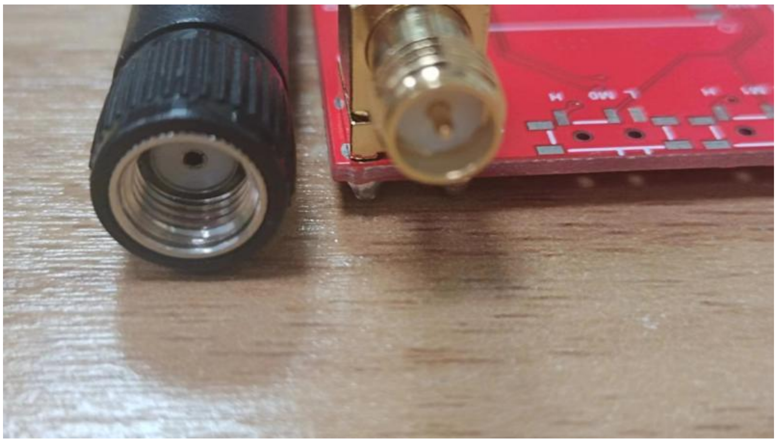
日期 2022.12.22
页码 1/1


③
②
①
DL_DB_CC1310-B_V1.3
LED_EN
J1
C17
R2
16
JP6
U1
LED_AUX
LEDG
LEDR
R7
R8
R9
H
M0
L
R10
H
R11
M1
L
BTN_RST1
下载口
JP2
AUX
RX
TX
M0
M1
J2
PWR EN
RST
BTN1
BTN2

① is the ANT of the module,

② is the matching circuit used to match the 50 ohm impedance, currently R2 is 0R, and C17 C16 are NC

③ is the SMA connector used for external stick antennas.


10.75
mm
0.86
5.38
DL_DB_CC1310-B_V1.3
LED_EN
J1
C17
R2
C16
JP6
U1
S1
S2
LED_AUX
LEDG
LEDR
R7
R8
R9
H
M0
L
M1
R10
R11
3.3V
GND
AUX
RX
TX
RST
BTN_RST1
下载口
JP2
PWR EN
J2
BTN1
BTN2