

# E104-BT10 User Manual

## TLSR8269F512 UART SMD SIG Mesh Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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### 1. Overview

#### **1.1 Brief Introduction**

E104-BT10 is a Bluetooth mesh network module designed and manufactured by Ebyte Electronic Technology Co., Ltd., which conforms to the sig mesh V1.0 standard. The single network can accommodate up to 10922 node devices. The device automatically remembers network information after entering the



network. Completion in 1 second; mobile APP can be connected to the network by any node to realize remote control of mesh network; it can easily realize intranet broadcast or transparent transmission of any fixed point data, the maximum single packet data for transparent transmission supports 80 bytes; conforms to sig standard HSL (H: Hue, S: Saturation, L: lightness) model, one-click implementation of the lighting control application scenario. Ideal for IoT information collection, large-scale networking communication scenarios, smart home applications, etc.

### **1.2 Features**

- With PCB antenna, transmission distance in open and clear air is up to 50 meter
- Max TX power of +8dbm, can be configured to different level
- UART baud rate can be configured
- Communication channel is 37, 38, 39
- No central node (gateway)
- Remember network info, automatically entering network once power on
- Entering network once power on in 1 second
- Entering network via phone APP available
- Max networking node is 10922
- Support SIG MESH Generic model
- Support SIG MESH HSL light control model
- Serial port data transparent transmission model can be customized
- Self-defined low power (Non-standard) available
- UART wake up available

## **1.3 Application**

- Smart home;
- Building automation;
- Light control;
- Wireless sensor network;

• IoT.

## 2. Specification and Parameter

## 2.1 Limit parameter

| Main Danamatan             | Performance |     | Note   |  |
|----------------------------|-------------|-----|--|--|
| Main rarameter             | Min         | Max | Note   |  |
| Voltage supply [V]         | 0 36 V      |     | Voltage over 3.6V will cause permanent damage    |  |
| voltage suppry [v]         | 0           | 5.0 | to module  |  |
| Dissling nower [dDm]       |             | 10  | Chances of burn is slim when modules are used in |  |
| Blocking power [dBlii]     | -           | 10  | short distance                                   |  |
| Operating temperature [°C] | -40         | +85 | -  |  |

## 2.2 Operating parameter

| Main naramatar                    |                                     | Performance |     |        | Noto  |  |
|-----------------------------------|-------------------------------------|-------------|-----|--------|---|--|
| IVIAI                             | i par ameter                        | Min         | Тур | Max    | Note  |  |
|                                   | Voltage supply [V]                  | 1.9         | 3.3 | 3.6    | $\geq$ 3.3 V ensures output power             |  |
| C                                 | ommunication level [V]              | -           | 3.3 | -      | For 5V TTL, it may be at risk of burning down |  |
| Op                                | erating temperature [ $^{\circ}$ C] | -40         | -   | +80    |   |  |
| Frequency [MHz]                   |                                     | 2400        |     | 2483.5 | ISM band                                      |  |
| D                                 | Transmitting current (mA)           |             | 29  | -      | Instant power consumption                     |  |
| Power                             | Receiving current (mA)              | -           | 29  | -      | -   |  |
|                                   | Stand-by current(uA)                |             | 1.6 |        |   |  |
| Transmitting power [dBm]          |                                     | -           | 8.0 | -      | -   |  |
| Receiving sensitivity [dBm]       |                                     | -88         | -92 | -97    | Air data rate is 1Mbps                        |  |
| Communicati<br>on rate GFSK (bps) |                                     |             | 1M  |        | -   |  |

| Main parameter     | Description | Note   |
|--------------------|-------------|--|
| Distance           | 50m         | Test condition clear and open area, antenna height: 2.5m, air data rate: |
|                    |             | 1Mbps  |
| FIFO               | 80byte      | Max. Transmitting length per packet                                      |
| Crystal oscillator | 16MHz       | -  |
| Modulation         | GFSK        | GFSK Mode  |
| Package            | SMD         | -  |
| Connector          | 1.27mm      | -  |
| Interface          | UART        | 4800~230400bps   |

| Size    | 19*13mm | -             |
|---------|---------|---------------|
| Antenna | PCB     | 50Ω Impedance |

## 2.3 Dimension and Pin Definition



| Pad q | uantity | :26 |
|-------|---------|-----|
| Unit: | mm      |     |

| No. | Pin item | Pin direction | Application   |
|-----|----------|---------------|---|
| 1   | GND      | -             | Ground, connecting to power source reference ground       |
| 2   | PE0      | PWM output    | Corresponds to green indicator of SIGMESH HSL             |
| 3   | PE1      | PWM output    | Corresponds to red indicator of SIGMESH HSL               |
| 4   | DM       | -             | GPIO  |
| 5   | DP       | -             | GPIO  |
| 6   | PA0      | -             | GPIO  |
| 7   | PA1      | -             | GPIO  |
| 8   | PA3      | -             | GPIO  |
| 9   | PA4      | -             | GPIO  |
| 10  | PA7      | -             | GPIO  |
| 11  | SWS      | -             | Program download interface                                |
| 12  | PB1      | -             | GPIO  |
| 13  | PB4      | output        | Networking indicator, when succeed pin outputs high level |
| 14  | PB5      | -             | GPIO  |
| 15  | PB6      | PWM output    | Corresponds to blue indicator of SIGMESH HSL              |

| 16 | PB7 | -       | GPIO   |
|----|-----|---------|--|
| 17 | TXD | output  | UART TX pin for transmitting   |
| 18 | RXD | input   | UART RX pin for receiving  |
| 10 | VCC |         | Power supply, $1.9V \sim 3.6V$ (recommend to add external ceramic filter |
| 17 | VCC | -       | capacitor)   |
| 20 | GND | -       | Ground, connecting to power source reference ground                      |
| 21 | PC5 | -       | GPIO   |
| 22 | PC4 | -       | GPIO   |
| 23 | PD2 | -       | GPIO   |
| 24 | PD3 | wake up | To wake up in low power mode and only valid in low level                 |
| 25 | RST | input   | Chip reset initiation input pin, valid under low level                   |
| 26 | GND | -       | Ground, connecting to power source reference ground                      |

## 3. Basic Operation

### 3.1 Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible, and the module needs to be reliably grounded;
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure it is within the recommended voltage otherwise when it exceeds the maximum value the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not be fluctuated frequently;
- When designing current supply circuit, 30% margin is recommended to be remained so as to ensure long-term stable operation of the whole module;
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees;
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;
- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;
- Try to stay away from some physical layers such as TTL protocol at 2.4GHz, for example: USB3.0;

• The module must not be installed inside metal shield, which will greatly reduce the transmission distance.

## 3.2 Circuit Diagram



As shown, to connect VCC, GND, TX, RX, then communication test can be conducted.

## 4. Function introduction

MESH network is shown as below



The best advantage of this module is that it can repeater any data in the network. Any module works as a repeater. When as a repeater, it can receive data at the same time. The coverage of the module data signal is about 50 meters. The following figure is a function diagram of repeater for user's reference.



Interpret the above simulation application scenario:

The distance from module A to module C is 70 meters, which is beyond the transmission distance of 50 meters of the module. Therefore, the A module cannot directly send data to the C module. If module B is placed between the A module and the C module, then the data will be repeatered by B and then received by C.

Module A needs to send data to the entire network. Modules B, C, D, and E need to receive data from A. Then A module sends data by broadcast address (0XFFFF).

If the A module needs to send the specified data to the E module, just fill in the address of the E module at the address in the data format (see the instruction format for details), but the E module is 140 meters away from the A module, and the data cannot be directly transmitted. As long as these modules belong to the same network, the data will be transmitted to module E with the following link, A sends data to B, B to C, C to D, and D to E.

### 4.1Basic concept

Here we introduce and explain some words used in SIG mesh.

#### 4.1.1 Network Key (NetKey)

Network keys are used to protect network layer communications. It is a key generated using a random number generator that meets the requirements of the core specification. (see details from Mesh Profile3.86)



#### 4.1.2 Application key (AppKey)

Application keys are used to protect the upper transmission layer. Generated using a compatible random number generator, the application key identifier (AID) is used to identify the application key (See details from Mesh Profile3.86)



#### 4.1.3 Device role

In SIG MESH protocol, roles include node, low power node, relay node, friend node, proxy node. Related functions are as explained below,

Node: An edge node in the entire mesh network. It has the ability to receive and transmit data, but cannot work as a repeater.

Low power node: Low-power nodes, due to the existence of the friend node, the low-power nodes do not need to always send or listen to the data packets on the broadcast channel, and only need to query whether there is data on the friend node. (not supported at this time)

**Relay node:** It is the core node of the network layer to extend network coverage. After receiving the data packet sent by other nodes, it determines whether it needs to be forwarded according to the judgment condition of the network protocol.

**Friend node:** The low power node can establish a friendly connection with the friend node. As the proxy node of the low power node, when the data of the low power node is reached, it can be cached in the Friend node, waiting for the low power node to query and obtain.

**Proxy node:** A proxy node that accepts information through a bearer layer (broadcast bearer layer or GATT bearer layer) and resends the message through another broadcast bearer layer or GATT bearer layer. It plays a key role in the process of non-mesh low-power Bluetooth devices becoming members of the Bluetooth mesh network. The fundamental purpose of the proxy node is to perform bearer layer conversion. It enables conversion from the broadcast bearer layer to the GATT bearer layer and vice versa. Therefore, devices that do not support the broadcast bearer layer can send and receive various Bluetooth mesh messages through the GATT connection. The E104-BT10N supports the proxy node function, and the mobile terminal APP can implement mesh network control (the data compression package includes the APP related SDK for the customer to develop).

A single device supports only one role. In EBYTE solution, our module supports two roles: the provisioning node and the mesh node. The provisioning node is the device responsible for networking. The mesh node is the repeater node that sends and receives data and forwards data.

There are four connection methods in SIG\_mesh:

1. ADV (Not Relayed) :That is, there is no connection with the relay capability. This situation applies to the fact that two nodes send and receive messages to each other, but without relay capability, data packets cannot be forwarded.

2、 ADV (Lower power): That is, a low-power broadcast connection. Used to send and receive data packets between the low power node and the friend node. On this connection, the low power node will initiate a request to establish a connection with the friendship, and query the friend node for its own data packet.

3. ADV Bearer: Broadcast forwarding connection. The broadcast message can be sent and received between the two nodes based on the broadcast forwarding, and can be forwarded as a relay. (Our products work on this connection)

4. GATT Bearer: For nodes without ADVbearer capability, they can also participate in the MESH network, and send and receive proxy PDUs on the GATT connection with other nodes through the proxy protocol.

Devices supported include provision and mesh.

Provision node: It is a special node and is the initiator of the entire network. Also known as gateway. It adds unnetworked devices to the mesh network. The Provision node provides provision data to the unprovisioned device, including netkey, appkey, and the unicast address corresponding to each element of the device.

Mesh nodes: plays role of node, relay node, friend node, proxy node. It is very convenient.

#### 4.1.4 Model

There are many models in SIG MESH. There are three element addresses in the module. Each address can be bound to multiple models. Each row in the table below is a model. The HSL model is specially bound with three addresses for in the HSL model, you need to control the brightness, saturation, and color temperature.

| Model name            | Model ID |              |
|-----------------------|----------|--------------|
| Health Server         | 0002     |              |
| Health Client         | 0003     |              |
| SIG_MD_FW_UPDATE_S    | FE00     |              |
| SIG_MD_FW_UPDATE_C    | FE01     | Main address |
| SIG_MD_FW_DISTRIBUT_S | FE02     | -            |
| SIG_MD_OBJ_TRANSFER_S | FF00     |              |
| SIG_MD_OBJ_TRANSFER_C | FF01     |              |
| Generic OnOff Server  | 1000     |              |

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| 1002     |  |  |
|----------|--|--|
| 1004     |  |  |
| 1006     |  |  |
| 1007     |  |  |
| 1300     |  |  |
| 1301     |  |  |
| 1307     |  |  |
| 1308     |  |  |
| 00000211 |  |  |
| 1002     | M 11 11  |  |
| 130A     | - Main address+1   |  |
| 1002     | M . 11 . 2   |  |
| 130B     | Main address+2   |  |
|          | 1002         1004         1006         1007         1300         1301         1307         1308         00000211         1002         130A         1002         130B |  |

#### 4.1.5 Address (unicast), Element(element)

An address corresponds to an element, and there are three elements, we can call it the element address, which is the unique address assigned to the node by the provision device during the provisioning process. In the same mesh network, each node device may have multiple addresses. However, a model in each device can only have one address, but different models can be bound to one address in the subsequent mesh network communication process. The device is relying on this address to find other devices.

E104\_BT10G is for the Provision role. E104\_BT10N is for the node role

#### 4.2 Specific instruction

#### 4.2.1 Networking introduction

E104\_BT10 includes E104\_BT10G, E104\_BT10N, E104\_BT10G (provisioner), E104\_BT10N (node), E104\_BT10G is the initiator of the whole network and it is unique in the network.

Using E104\_BT10G to put E104\_BT10N into the network of E104\_BT10G. Both E104\_BT10G and E104\_BT10N are necessary.

4.2.2 Node networking process and status indication

Environment: Serial debugging assistant (baud rate 115200, 8N1)

Hardware preparation: one E104\_BT10G, one and more E104\_BT10N.

Software setting: E104\_BT10G need to set netkey, APPkey (see more from command <u>3.1.1</u>) which need to be set. The values cannot be the same between different networks, because E104\_BT10G will assign netkey to E104\_BT10N and bind APPkey when networking.

#### Networking process steps and results

The formation of the entire network is completely automatic. The user only needs to give the "Add Node to Network" command on the serial port. The networking process takes up to 30 seconds, but usually it takes 10 seconds to 20 seconds to succeed.

#### Step 1. Start networking.

Use the serial port assistant hexadecimal to send the "device access network" command (see manual 3.1.10). The indicator of E104 BT10G lights up. When it is lit, it means that the process of networking has started. Go to step 2.

#### Step 2. Scan the surrounding equipment

After our E104\_BT10G receives the "Add Node to Network" command, the indicator lights up. At this time, E104\_BT10G will search for E104\_BT10N devices that can be networked. The search time is 10 seconds. If it is within 10 seconds. If the networkable device is successfully scanned, go to step 3. Otherwise, the E104\_BT10G indicator will go out. The serial port will return the error code of the device that has not been scanned to the network (see manual 3.1), and the networking process will end.

#### Step 3. Assign Netkey

The timeout period for assigning netkey is 10 seconds. If netkey is successfully assigned within 10 seconds, go to step 4. Otherwise, the indicator will go out. The serial port will return the error code for assigning netkey failure (see details from 3.1) and terminate the networking process.

#### Step 4. Bind Appkey

The timeout period for binding the APPkey is 10 seconds. If the APPkey is successfully bound within 10 seconds, the serial port will return data in the following format.

| Length (0B) | Data hea | d Operation | MAC( 6 byte)      | Element       | Element quantity |
|-------------|----------|-------------|-------------------|---------------|------------------|
|             | (40)     | code (09)   |                   | address ( two | (03)             |
|             |          |             |                   | byte)         |                  |
| Row: 0B     | 40       | 09          | EA FD CD BA FE DF | 00 04         | 03               |

The entire network can be used normally.

If the binding of appkey fails, the serial port returns the error code of binding APPkey or APPkey timeout (see details from 3.1). When the network is finished, E104\_BT10G will be restarted. If this happens, please execute manual section 2.3.

The above two error return processing methods can be found in the 2.3

#### 4.2.3 Networking whitelist

The whitelist function is MAC filtering. Our whitelist has a total of 8 levels of depth, that is, MAC filtering for up to eight devices. This function is based on the fact that the eight levels of depth have an index, as long as you go to this. The MAC is written inside, then the index is valid, then this function is enabled. We have the delete command. The user can delete the whitelist and restore the index value to 0. Then the whitelist will not take effect. Network devices can be grouped into the network (see 3.1.7 for details)

#### 4.2.4 Network exception and processing

There are two failure scenarios. Type one: fail to assign netkey; Type two: fail to bind APPkey.

#### The solution to assign netkey failure is as follows:

To deal with the failure to assign netkey, user needs to repeat the above networking process.

#### The solution to the failure to bind APPkey is as follows:

Method 1. If the user knows which E104\_BT10N device is used, directly restore the E104\_BT10N device to the factory (see details from 3.1.17) and repeat the above networking process again.

Method 2: The serial port reads the next networking address "A" of E104\_BT10G (see details from 3.1.6), and then uses the SIGmesh command to delete the device whose node address is "A minus 3" (see details from 3.2 SIG message), and the above networking process is repeated again.

#### 4.2.5 Remove nodes

The instruction to delete a node can only be sent by E104\_BT10G of the current network, and it returns. If it is not deleted, it is not returned.

See the manual (3.2 SIG message) for instructions and usage details.

#### 4.3 Data format

All data exchanged by the serial port, including parameter configuration, network control, and data transparent transmission, meet the following format requirements. Any remaining data will be considered invalid and the module will not respond. The parameter configuration is used for parameter configuration of the current module, the SIG message is a standard mesh control message defined by sig, and the transparent transmission message is defined by Ebyte.

| Length (1byte HEX) | Effective load (N byte HEX)      |
|--------------------|----------------------------------|
|                    | Parameter configuration          |
| Ν                  | SIG message                      |
|                    | Transparent transmission message |

#### 4.3.1Parameter configuration

The configuration data is used to read and write various parameter information of the module and the device access operation. The format is as follows:

|              | command(1byte) | <b>Operation code</b> (1 | Data (N byte) |
|--------------|----------------|--------------------------|---------------|
|              |                | byte)                    |               |
| Transmitting | 0xC0           | 0~255                    | Request data  |
| Receiving    | 0x40           | 0~255                    | Respond data  |

Notes: The correct configuration operation gets the corresponding response data. If the configuration error returns an error code, as follows

| Error code | Explain                  |
|------------|--------------------------|
| 0xFF       | Invalid parameter        |
| 0xFE       | Busy operation           |
| 0xFD       | Invalid command          |
| 0xFC       | Networking device not    |
|            | scanned                  |
| 0xFB       | Parameter obtain failure |

| 0xFA | Assign netkey failure |
|------|-----------------------|
| 0xF9 | Bind Appkey overtime  |
| 0xF8 | Bind Appkey failure   |
| 0XF7 | Last networking not   |
|      | finished              |

### 1. NetKey configuration

Key is for network ID assigned by provisioner, format is as follows

|                           | Operation  | Parameter                                 |  |
|---------------------------|--|---|--|
|                           | code   |   |  |
| Request                   | 0x00   | Configure 16 bytes of NetKey data         |  |
| Respond                   | 0x00   | Return configured 16 bytes of NetKey data |  |
| For                       | Request: 12 C0 00 11223344556677889900112233445566   |   |  |
| example                   | Respond: 1   | 2 40 00 11223344556677889900112233445566  |  |
| Notes:                    |  |   |  |
| 1、suitable for E104-BT10G |  |   |  |
| 2、After co                | 2. After configuration, the system will restart once |   |  |

### 2.To read NetKey

|  | Operation         | Parameter                                 |
|--|-------------------|---|
|  | code              |   |
| Request                                      | 0x01              | 1   |
| Respond                                      | 0x01              | Return configured 16 bytes of NetKey data |
| For  | Request: 02 C0 01 |   |
| example                                      | Respond: 1        | 2 40 00 11223344556677889900112233445566  |
| Notes: This is for reading configured NetKey |                   |   |

### 3. AppKey configuration

|                           | Operation  | Parameter                                 |  |
|---------------------------|--|---|--|
|                           | code   |   |  |
| Request                   | 0x02   | Configure 16 bytes of AppKey data         |  |
| Respond                   | 0x02   | Return configured 16 bytes of AppKey data |  |
| For                       | Request: 12 C0 02 11223344556677889900112233445566   |   |  |
| example                   | Respond: 12 40 02 11223344556677889900112233445566   |   |  |
| Notes:                    |  |   |  |
| 1、Suitable for E104-BT10G |  |   |  |
| 2. After c                | 2. After configuration, the system will restart once |   |  |

### 4. To read AppKey

|            | Operation  | Parameter                                 |  |
|------------|--|---|--|
|            | code   |   |  |
| Request    | 0x03   | Read 16 bytes of AppKey data              |  |
| Respond    | 0x03   | Return configured 16 bytes of AppKey data |  |
| For        | Request: 02 C0 03                                  |   |  |
| example    | Respond: 12 40 02 11223344556677889900112233445566 |   |  |
| Notes:     |  |   |  |
| 1、Suitab   | 1、Suitable for E104-BT10G                          |   |  |
| 2, This is | 2、This is for reading configured AppKey            |   |  |

### 5.Networking address configuration

|           | Operation   | Parameter  |  |
|-----------|---|--|--|
|           | code  |  |  |
| Request   | 004   | Configure the unicast address for networking next time |  |
|           | 0x04  | (2 bytes)  |  |
| Respond   | 004   | Return the currently configured unicast address for    |  |
|           | 0x04  | networking (2 bytes little-end mode)                   |  |
| For       | Request: 04 C0 04 0007                                    |  |  |
| example   | Respond: 04 40 04 0700                                    |  |  |
| Notes:    | otes:   |  |  |
| 1, Suitab | 1、Suitable for E104-BT10G                                 |  |  |
| 2、Configu | 2. Configure the unicast address for networking next time |  |  |

### 6.To read networking address

|                           | Operation                                 | Parameter                               |  |
|---------------------------|---|---|--|
|                           | code                                      |   |  |
| Request                   | 0x05                                      | /                                       |  |
| Respond                   | 0x05                                      | Return address for networking next time |  |
| For                       | Request: 02 C0 05                         |   |  |
| example                   | Respond: 04 40 05 0007                    |   |  |
| Notes:                    |   |   |  |
| 1、Suitable for E104-BT10G |   |   |  |
| 2、Return                  | 2、Return address for networking next time |   |  |

### 7.Networking filter configuration

| Operation | Parameter |
|-----------|-----------|
| code      |           |

| Request                   | 0x06 Serial number +MAC address of allowed device            |                         |  |
|---------------------------|--|-------------------------|--|
| Respond                   | 0x06 MAC address of allowed device                           |                         |  |
| Request: 09 C0            |  | 0 C0 06 00 112233445566 |  |
| FOr                       | Respond: 33 40 06 01 112233445566 0000 (0000 means space for |                         |  |
| example                   | unbound MAC)   |                         |  |
| Notes:                    |  |                         |  |
| 1、Suitable for E104-BT10G |  |                         |  |
| 2, R                      | 2 Return started serial number and joined MAC                |                         |  |

### 8.To delete networking filter

|   | Operation  | on Parameter                                 |  |
|---|--|--|--|
|   | code   |  |  |
| Request                                 | 0x07   | Serial number to be deleted (1 byte)         |  |
| Respond                                 | 0x07   | Serial number +MAC address of deleted device |  |
| F                                       | Request: 03 C0 07 00   |  |  |
| ror                                     | Respond: 33 40 07 00 1234567890AB 0000 (0000 means space for |  |  |
| example                                 | unbound MAC)   |  |  |
| Notes:                                  |  |  |  |
| 1、Suitable for E104-BT10G               |  |  |  |
| 2. Return deleted serial number and MAC |  |  |  |

### 9.To read networking filter

|                           | Operation  | n Parameter                                      |  |
|---------------------------|--|--|--|
|                           | code   |  |  |
| Request                   | 0x08   | /  |  |
| Respond                   | 0x08   | 0x08 Return started serial number and joined MAC |  |
| For<br>example            | Request: 02 C0 08<br>Respond: 33 40 08 01 112233445566 0000, 0000 (means space for<br>unbound MAC) |  |  |
| Notes:                    |  |  |  |
| 1、Suitable for E104-BT10G |  |  |  |
| 1、Return                  | 1、Return started serial number and MAC   |  |  |

#### 10.Device enters network

|         | Operation | Parameter  |
|---------|-----------|--|
|         | code      |  |
| Request | 0x09      | /  |
| Respond | 0-00      | Return MAC of networking device and assigned unicast |
|         | 0x09      | address and element numbers                          |

| For  | Request: 02 C0 09                      |  |  |
|--|--|--|--|
| example  | Respond: 0B 40 09 112233445566 0004 03 |  |  |
| Notes:   | Notes:                                 |  |  |
| 1、Suitable for E104-BT10G  |  |  |  |
| 2、Return MAC of networking device and assigned unicast address and element |  |  |  |
| numbers  |  |  |  |

### 11.Baud rate configuration

|         | Operation code | Parameter  |  |
|---------|----------------|--|--|
| Request | 00E            | Baud rate serial number to be configured (range: |  |
|         | UXUE           | 0x00~0x07)                                       |  |
| Respond | 0x0E           | Return the current baud rate serial number       |  |
|         | Command        | Baud rate serial number notes                    |  |
|         | 03 C0 0E xx    | Xx is baud rate serial number to be configured   |  |
|         |                | (0x00~0x07)                                      |  |
|         |                | 00: 230400                                       |  |
| E.a.    |                | 01: 128000                                       |  |
| For     |                | 02: 115200                                       |  |
| example |                | 03: 76800  |  |
|         |                | 04: 57600  |  |
|         |                | 05: 19200  |  |
|         |                | 06: 9600   |  |
|         |                | 07: 4800   |  |
| Notes:  |                |  |  |

1、Suitable for E104-BT10G and E104-BT10N

2. For example 3 C0 0E 02, when succeed, return 03 40 0E 02, if exceed range, return 03 40 0E FF

#### 12. To read baud rate

|         | Operation code Parameter |  | Parameter              |
|---------|--------------------------|--|------------------------|
| Request | 0x0F                     | /  |                        |
| Respond | 0x0F                     | Return the current baud rate serial number |                        |
| For     | Command                  | Return                                     | Notes                  |
| example |                          | 03 40 0F xx                                | Xx is baud rate number |
|         |                          |  | 00: 230400             |
|         |                          |  | 01: 128000             |
|         | 02 C0 0F                 |  | 02: 115200             |
|         |                          |  | 03: 76800              |
|         |                          |  | 04: 57600              |
|         |                          |  | 05: 19200              |

|        |  | 06: 9600 |
|--------|--|----------|
|        |  | 07: 4800 |
| Notes: |  |          |

1、Suitable for E104-BT10G and E104-BT10N

### 13.Power configuration

|            | Operation code      | Parameter                                       |  |  |
|------------|---------------------|---|--|--|
| Request    | 0x12                | Power number to be configured (range:0x00~0x0A) |  |  |
| Respond    | 0x12                | Return configured power number                  |  |  |
|            | Command             | Notes   |  |  |
|            |                     |   |  |  |
|            | 03 C0 12 xx         | Xx is baud rate serial number to be configured  |  |  |
|            |                     | (0x00~0x0A)                                     |  |  |
|            |                     | 00: +8dBm                                       |  |  |
|            |                     | 01: +4dBm                                       |  |  |
| For        |                     | 02: 0dBm  |  |  |
| example    |                     | 03: -4dBm                                       |  |  |
|            |                     | 04: -10dBm                                      |  |  |
|            |                     | 05: -14dBm                                      |  |  |
|            |                     | 06: -20dBm                                      |  |  |
|            |                     | 07: -24dBm                                      |  |  |
|            |                     | 08: -28dBm                                      |  |  |
|            |                     | 09: -30dBm                                      |  |  |
|            |                     | 0A: -37bBm                                      |  |  |
| Notes:     | Notes:              |   |  |  |
| 1 Suitable | e for E104-BT10G ar | nd E104-BT10N                                   |  |  |

### 14.To read power

|         | Operation code | Parameter                       |                    |
|---------|----------------|---------------------------------|--------------------|
| Request | 0x13           | /                               |                    |
| Respond | 0x13           | Return the current power number |                    |
| For     | Command        | Return                          | Notes              |
| example |                | 03 40 13 xx                     | Xx is power number |
|         |                |                                 | 00: +8dBm          |
|         |                |                                 | 01: +4dBm          |
|         |                |                                 | 02: 0dBm           |
|         | 02 C0 13       |                                 | 03: -4dBm          |
|         |                |                                 | 04: -10dBm         |
|         |                |                                 | 05: -14dBm         |
|         |                |                                 | 06: -20dBm         |
|         |                |                                 | 07: -24dBm         |

|        | 08: -28dBm |
|--------|------------|
|        | 09: -30dBm |
|        | 0A: -37bBm |
| Notes: |            |

1、Suitable for E104-BT10G and E104-BT10N

#### 15.To read MAC

|  | Operation                                 | Parameter |  |
|--|---|-----------|--|
|  | code                                      |           |  |
| Request                                  | 0x11                                      | /         |  |
| Respond                                  | 0x11 Return current MAC address of device |           |  |
| For                                      | Request: 02 C0 01                         |           |  |
| example                                  | Respond: 08 40 F0 112233445566            |           |  |
| Notes:                                   | Notes:                                    |           |  |
| 1、Suitable for E104-BT10G and E104-BT10N |   |           |  |

#### 16.To restart device

|  | Operation            | Parameter                     |  |  |
|--|----------------------|-------------------------------|--|--|
|  | code                 |                               |  |  |
| Request                                  | 0x14                 | /                             |  |  |
| Respond                                  | 0x14                 | Return operation status value |  |  |
| For                                      | Request: 02 C0 14    |                               |  |  |
| example                                  | Respond: 03 43 14 00 |                               |  |  |
| Notes:                                   |                      |                               |  |  |
| 1、Suitable for E104-BT10G and E104-BT10N |                      |                               |  |  |
| 2. Status value 00 means succeed         |                      |                               |  |  |

### 17.Restore factory setting

|  | Operation            | Parameter |  |  |
|--|----------------------|-----------|--|--|
|  | code                 |           |  |  |
| Request                                  | 0x15                 | /         |  |  |
| Respond                                  | 0x15                 | /         |  |  |
| For                                      | Request: 02 C0 15    |           |  |  |
| example                                  | Respond: 03 43 15 00 |           |  |  |
| Notes:                                   |                      |           |  |  |
| 1、Suitable for E104-BT10G and E104-BT10N |                      |           |  |  |
| 2. Status value 00 means succeed         |                      |           |  |  |

#### 18. To obtain software version number

|  | Operation               | Parameter               |  |  |
|--|-------------------------|-------------------------|--|--|
|  | code                    |                         |  |  |
| Request  | 0x16                    | /                       |  |  |
| Respond  | 0x16                    | software version number |  |  |
| For  | Request: 02 C0 16       |                         |  |  |
| example  | Respond: 04 40 16 10 00 |                         |  |  |
| Notes:   |                         |                         |  |  |
| 1、Suitable for E104-BT10G and E104-BT10N           |                         |                         |  |  |
| $2_{3}$ software version number is an unique value |                         |                         |  |  |

#### 19.To obtain main address of current device

|  | Operation code            | Parameter  |  |  |
|--|---------------------------|--|--|--|
| Request  | 0x0B /                    |  |  |  |
| Respond  | 0x0B                      | Return main address of current E104-BT10N device |  |  |
| For  | Request: 02 C0 0B         |  |  |  |
| example  | Respond: 05 40 0B 01 0004 |  |  |  |
| Notes:   |                           |  |  |  |
| 1、Suitable for E104-BT10G and E104-BT10N                         |                           |  |  |  |
| 2、return unicast address of E104-BT10N device in current network |                           |  |  |  |

#### 20. Set whether enter sleep and timeout for entering sleep

|                            | Operation  | Parameter  |  |  |
|----------------------------|--|--|--|--|
|                            | 1  |  |  |  |
|                            | code   |  |  |  |
| Request                    | 0x17   | /  |  |  |
| Respond                    | $0 \times 17$  | Set whether E104-BT10N enter sleep and timeout for |  |  |
|                            | 0.11/  | entering sleep                                     |  |  |
| For                        | Request: 03 c0 17 05   |  |  |  |
| example                    | Respond: 03 40 18 05   |  |  |  |
| Notes:                     |  |  |  |  |
| 1、 Suitable for E104-BT10N |  |  |  |  |
| 2, Se                      | et parameter 05 to the sleep timeout after the serial port stops working., unit: |  |  |  |

S, range: 0X01-0XFF, parameter 00 means do not enter sleep.

#### 21. Query whether enter sleep and timeout for entering sleep

|         | Operation code | Parameter |
|---------|----------------|-----------|
| Request | 0x18           | /         |



| Respond                    | 0.18  | Query whether E104-BT10N enter sleep and timeout for |  |  |  |  |
|----------------------------|---|--|--|--|--|--|
|                            | 0x10  | entering sleep                                       |  |  |  |  |
| Г                          | Request: 02   | 2 c0 18  |  |  |  |  |
| For examp                  | Respond: 0  | Respond: 03 40 18 05                                 |  |  |  |  |
| Notes:                     |   |  |  |  |  |  |
| 1、 Suitable for E104-BT10N |   | BT10N  |  |  |  |  |
| 2、 Q                       | Query parameter 05 for the sleep timeout after the serial port stops working, |  |  |  |  |  |
| ur                         | unit : S. range: 0X01-0XFF,   |  |  |  |  |  |

#### 4.3.2 SIG Message

Mesh Profile and E104-BT10 supports SIG generic model and Lighting HSL model control ( refer to Mesh Model for details about SIG message).SIG message follows format below:

|                  | Transmitting            |                  |         |  |  |  |  |
|------------------|-------------------------|------------------|---------|--|--|--|--|
| Command (1 byte) | Target address (2 byte) | Sig mesh message |         |  |  |  |  |
| 0xC1             | Main address of target  | Request          |         |  |  |  |  |
|                  | device                  |                  |         |  |  |  |  |
|                  | Receiving               |                  |         |  |  |  |  |
| Command (1 byte) | Sig mesh                |                  |         |  |  |  |  |
|                  |                         | byte)            | message |  |  |  |  |
| 0x41             | Main address of target  | Main address of  | Respond |  |  |  |  |
|                  | device                  | original device  |         |  |  |  |  |

For example: 1, Generic onoff control:

| Control device with main address 0004, outputting high |                                  |  |  |  |
|--|----------------------------------|--|--|--|
| level witho  | ut latency                       |  |  |  |
| Request  | Request 09 C1 0004 8202 01000000 |  |  |  |
| Respond  | 08 41 0004 0001 8204 01          |  |  |  |
| Control device with main address 0004, outputting low  |                                  |  |  |  |
| level without latency                                  |                                  |  |  |  |
| Request  | 09 C1 0004 8202 00000000         |  |  |  |
| Respond  | 08 41 0004 0001 8204 00          |  |  |  |

#### 2. Delete node control:

| Remove  | nodes                       | with           | main   | address   | 0004 | out | of | current | network |
|---------|-----------------------------|----------------|--------|-----------|------|-----|----|---------|---------|
| (E104-B | (E104-BT10G starts control) |                |        |           |      |     |    |         |         |
| Request | 09                          | OC1 00         | 04 820 | 02 010000 | 00   |     |    |         |         |
| Respond | 08                          | 3 <b>4</b> 1 C | 004 00 | 01 8204 0 | 00   |     |    |         |         |

#### 4.3.3 Transparent transmission

E104-BT10 supports transparent transmission of user data. The maximum length of serial port sub-package is 80 bytes. (Mesh under-transport single-package maximum payload is 8 bytes. Data larger than 8 bytes will be automatically sub-packet and sent. The whole mesh network efficiency is not high in packet transmission. it is recommended to send data within a single limit of 8 bytes), the data format is as follows:

| Command (1 byte) |                         |                  |            |  |  |  |  |
|------------------|-------------------------|------------------|------------|--|--|--|--|
| 0xC2             | Main address of target  | Valid data       |            |  |  |  |  |
|                  | device                  |                  |            |  |  |  |  |
|                  | Receiving               |                  |            |  |  |  |  |
| Command (1 byte) | Target address (2 byte) | Original address | Data       |  |  |  |  |
|                  |                         | (2 byte)         |            |  |  |  |  |
| 0x42             | Main address of target  | Main address of  | Valid data |  |  |  |  |
|                  | device                  | original device  |            |  |  |  |  |

For example: device 0001 send hex data "00112233445566778899" to device 004

| Transmitting | 09 C2 0004 00112233445566778899      |
|--------------|--------------------------------------|
| Receiving    | 08 42 0004 0001 00112233445566778899 |

## 5、Quick start

This chapter introduces how E104-BT10 forms network, and how to control transmitting and receiving of network message.

### 5.1 Restore factory setting

Send the following command 02 C0 15 (Restore factory setting) Then there are a return, 03 43 15 00 (sometimes the value returned after restarting or restoring the factory may be one more byte, ignore it. See the FF of the mesh device as shown below)

Baud rate: 115200, 8N1, do not press enter to start new line.

| XCOM V2.0                       |     |     |    |            | 1000       |       | X                   |
|---------------------------------|-----|-----|----|------------|------------|-------|---------------------|
| 03 43 15 00 00                  |     |     |    | ~          | 串口选择       |       |                     |
|                                 |     |     |    |            | COM6: USB- | SERIA | L v                 |
|                                 |     |     |    |            | 波特率        | 1152  | 00 ~                |
|                                 |     |     |    |            | 停止位        | 1     | ~                   |
|                                 |     |     |    |            | 数据位        | 8     | ~                   |
|                                 |     |     |    |            | 奇偶校验       | 无     | ~                   |
|                                 |     |     |    | ~          | 串口操作       |       | 关闭串口                |
| 单条发送 多条发送 协议传输 帮助<br>□ 02 c0 15 | 0   |     |    |            |            | 5     |                     |
| 02 00 09                        | 1   |     |    |            |            | 6     | ⊡ ≪.2<br>  [7] 16jį |
| 08 o2 0002 11223344AA           | 2   |     |    |            |            | 7     | <br>□ 关₹            |
| 09 C1 0002 8202 00000000        | 3   |     |    |            |            | 8     |                     |
|                                 | 4   |     |    |            |            | 9     | 周期:                 |
| 首页上                             | :一页 | 下一页 | 尾の | ī          |            |       | 导入                  |
|                                 |     | R:5 |    | CTS=0 DSR= | 0 DCD=0    |       |                     |

### 5.2 Enter network

E104-BT10G test board and E104-BT10N are respectively plugged into the computer USB interface (PC needs to install USB serial drive, see the data compression package), open the serial debugging assistant to select the baud rate 115200bps, 8 data bits, no parity, 1 stop bit, select hexadecimal transmission. The E104-BT10G terminal edits and sends the "Device Access" command 02 C0 09. When E104-BT10N enters the network successfully, the indicator light is constant. E104-BT10G receives 0B 40 09EAFD CDBAFEAD 0007 03, where EAFDCDBAFEAD indicates successful network access equipment. The MAC address 0007 indicates the device's main address (see 2.3 for the format description). The device is successfully connected to the network.

| ATT XCOM V2.0                         | <u>88</u> 6 |        | × | XCOM V2.0                | 1.773     |        | × |
|---------------------------------------|-------------|--------|---|--------------------------|-----------|--------|---|
| DE 40 09 EA FD CD BA FE DB 00 02 03   | 串口选择        |        |   | ^ ·                      | 串口选择      |        |   |
|                                       | COM6: USB-  | SERIAL | ~ |                          | COM5:USB- | SERIAL | ~ |
|                                       | 波特率         | 115200 | ~ |                          | 波特率       | 115200 | ~ |
| E104-BT10G                            | 停止位         | 1      | ~ |                          | 停止位       | 1      | ~ |
|                                       | 数据位         | 8      | ~ |                          | 数据位       | 8      | ~ |
|                                       | 奇偶校验        | 无      | ~ |                          | 奇偶校验      | 无      | ~ |
| ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● |             |        | 3 | 单条发送 多条发送 协议传输 帮助        |           |        |   |
| 02 c0 15                              |             |        |   | 02 c0 15                 |           |        |   |
| 02 c0 09                              |             |        |   | 02:009                   |           |        |   |
| 08 c2 00 01 11223344AA 2              |             |        |   | 08 c2 00 02 1122334455 2 |           |        |   |
| 09 C1 FFFF 8202 00000000 3            |             |        |   |                          |           |        |   |
|                                       |             |        |   |                          |           |        |   |
| 首页上一页                                 | 下一页         | 尾页     |   | 首页上一页                    | 下一页       | 尾页     | ] |
|                                       | R:12        |        |   | · www.openedv.com S:0 R  | :0        |        |   |

### 5.3 SIG Message

E104-BT10G send command to turn on light (generic onoff command) see details from  $\underline{3.2}$  (see details from Mesh Model  $\underline{3.2.1.2}$  Generic OnOff Set)

| Transmitting | 09 C1 0004 8202 01000000             |
|--------------|--------------------------------------|
| Respond      | 08 41 0004 0001 8204 <mark>01</mark> |



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| XCOM V2.0  | 100         |           | XCOM V2.0                | <u>199</u> 7 |              |
|--|-------------|-----------|--------------------------|--------------|--------------|
| 38 41 00 02 00 01 82 04 01                         | 串口选择        |           | <u>^</u>                 | 串口选择         |              |
|  | COM6 : USB- | SERIAL ~  |                          | COM5:USB-S   | SERIAL 🗸     |
|  | 波特率         | 115200 ~  |                          | 波特率          | 115200 🗸     |
| E104-BT10G   | 停止位         | 1 ~       |                          | 停止位          | 1 ~          |
|  | 数据位         | 8 ~       | E104-BT10N               | 数据位          | 8 ~          |
|  | 奇偶校验        | 无 ~       |                          | 奇偶校验         | 无 ~          |
|  | 串口操作        | ● 关闭串口    |                          | 串口操作         | ● 关闭串口       |
|  | 保方室口        | 海轮拉街      |                          | 保存窗口         | <b>湛除挨</b> 版 |
| 单条发送 多条发送 协议传输 帮助                                  |             | 1 消1小1女4× | 单条发送 多条发送 协议传输 帮助        | M II B H     | HMIRA        |
| 02 00 15   | ]           |           | 02 c0 15                 |              |              |
| 02 c0 09   | ]           |           | 02c009                   |              |              |
| 08 o2 00 01 11223344AA 2                           | ]           |           | 08 c2 00 02 1122334455 2 |              |              |
| 09 C1 0002 8202 01000000 3                         | ]           |           |                          |              |              |
| 4  | ]           |           |                          |              |              |
| 首页 上一页 下   | -页 尾        | 5         | 首页上一页                    | 下一页          | 尾页           |
| ♥         www.openedv.com         S:10         R:9 |             |           |                          | R:0          |              |



E104-BT10G send comand to turn off light (generic onoff command) see details from  $\underline{3.2}$ (see details from Mesh Model 3.2.1.2 Generic OnOff Set)

| Transmitting | 09 C1 0004 8202 00000000 |
|--------------|--------------------------|
| Respond      | 08 41 0004 0001 8204 00  |

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| XCOM V2.0                  | _      | - 🗆            | ×          | XCOM V2.0                    | 1.000      |             | ×           |
|----------------------------|--------|----------------|------------|------------------------------|------------|-------------|-------------|
| 08 41 00 02 00 01 82 04 00 | ↑ 串口选  | 译              |            |                              | 串口选择       |             |             |
|                            | COM6:U | SB-SERIAL      | ~          |                              | COM5: USB- | SERIAL      | ~           |
| E104-BT10G                 | 波特率    | 115200         | ~          |                              | 波特率        | 115200      | ~           |
|                            | 停止位    | 1              | ~          | E104-BT10N                   | 停止位        | 1           | ~           |
|                            | 数据位    | 8              | ~          | EI04 BIION                   | 数据位        | 8           | ~           |
|                            | 奇偶校明   | da 无           | ~          |                              | 奇偶校验       | 无           | ~           |
|                            | 보다偈    | e jo<br>r 🏹 ža | ± n        |                              | 中口場作       | 70<br>() 关闭 | en.         |
|                            |        | н 💽 Хи         | THE A      |                              | THE        | . – XNI     | IШЦ         |
| 从专业22 《久中洋 11.35.644 地址    | ── 保存額 | <b>百日</b> 清除持  | <b>建</b> 收 |                              | 保存窗口       | 清除措         | <del></del> |
| 甲余友医 多示反应 协议传输 帮助          |        |                |            | 单条发送 多余友法 协议传输 帮助 □ 02 -0.15 | _          |             |             |
|                            |        |                |            |                              |            |             | _           |
|                            |        |                |            |                              |            |             |             |
|                            |        |                |            | 08 02 00 02 1122334455       |            |             |             |
|                            |        |                |            |                              |            |             |             |
| 4                          |        |                |            | 4                            |            |             |             |
| 首页上一页                      | 下一页    | 尾页             |            | 首页上一页                        | 下一页        | 尾页          | ]           |
|                            | R:9    |                |            |                              | R:0        |             |             |



## 5.4Transparent transmission

#### 5.4.1 Broadcast transmission

Device 0001 broadcasts "11223344AA" in hex format

See  $\underline{3.3}$ , input target address as FFFF, all device in the network can receive data

| Transmitting | 08 c2 FFFF 11223344AA         |
|--------------|-------------------------------|
| Receiving    | 08 0A 42 0001 FFFF 11223344AA |

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| TIM XCOM V2.0                    | – 🗆 X             | XCOM V2.0                        | — 🗆 X             |
|----------------------------------|-------------------|----------------------------------|-------------------|
| 0A 42 00 01 FF FF 11 22 33 44 AA | ^ 串口选择            | 0A 42 00 01 FF FF 11 22 33 44 AA | 串口选择              |
| Set Configuration Streams        | COM6:USB-SERIAL 🗸 |                                  | COM5:USB-SERIAL V |
| E104-BT10G                       | 波特率 115200 ~      | E104-BT10N                       | 波特率 115200 ~      |
|                                  | 停止位 1 ~           |                                  | 停止位 1 🗸           |
|                                  | 数据位 8 ~           |                                  | 数据位 8 ~           |
|                                  | 奇偶校验 无 🗸          |                                  | 奇偶校验 无 🗸          |
|                                  | 串口操作 💽 关闭串口       |                                  | 串口操作 💽 关闭串口       |
|                                  | ▼ 保友窓口 法除掉版       |                                  | 保存窗口 清除接版         |
| 单条发送 多条发送 协议传输 帮助                |                   | 单条发送 多条发送 协议传输 帮助                |                   |
| 02 c0 15                         | ]                 | 02 00 15 0                       |                   |
| 02 c0 09                         |                   | 02:009                           |                   |
| 08 c2 FFFF 11223344AA 2          |                   | 08 02 00 02 1122334455           |                   |
| 09 C1 0002 8202 00000000 3       |                   |                                  |                   |
| 4                                | ]                 |                                  |                   |
| 首页 上一页 1                         | 「一页 尾页            | 首页 ↓页                            |                   |
|                                  | 11 .::            | 🥥 👻 www.openedv.com S:0          | R:11              |

### 5.4.2 Fixed point transmission

For example: Device 0001 sends "11223344AA" in hex format to device 001

See details from 3.3

| Transmitting | 08 c2 0002 11223344AA         |
|--------------|-------------------------------|
| Receiving    | 08 0A 42 0001 FFFF 11223344AA |

| KIM XCOM V2.0     | 377        |         | ×   | XCOM V2.0                                 | 50X        |             |
|-------------------|------------|---------|-----|---|------------|-------------|
|                   | 串口选择       |         |     | 0A 42 00 01 00 02 11 22 33 44 AA          | 串口选择       |             |
|                   | COM6 : USE | -SERIAL | ~   |   | COM5: USB- | -SERIAL 🗸 🗸 |
|                   | 波特率        | 115200  | ~   |   | 波特率        | 115200 ~    |
|                   | 停止位        | 1       | ~   |   | 停止位        | 1 ~         |
| E104-BT10G        | 数据位        | 8       | ~   | E104-DT10N                                | 数据位        | 8 ~         |
| DIOI DII00        | 奇偶校验       | 无       | ~   | E104-D110N                                | 奇偶校验       | 无 ~         |
|                   | 串口操作       | ie ¥ì   | 闭串口 |   | 串口操作       | ● 关闭串口      |
|                   |            |         |     |   |            |             |
| 黄条光泽 多条发洋 传动连续 那時 | 保存窗口       | コー清除    | 接收  | ★ # 11 YM # 40 \$ # 11 YM # 40 \$ # 10 \$ | 保存窗口       | 清除接收        |
| 平宗友法 少示发达 协议传输 帮助 | E          |         |     | ■余友法 多余友法 协议传输 帮助                         |            |             |
|                   |            |         |     |   |            |             |
|                   |            |         |     |   |            |             |
|                   |            |         |     |   |            |             |
|                   |            |         |     |   |            |             |
|                   |            |         |     | 4   |            |             |
| 首页 上一页 下          | 一页 属       | 页       |     | 首页上一页                                     | 下一页        | 尾页          |
|                   |            |         |     | Q   | R:11       |             |

#### 5.5 Low power

Entering the sleep mode (refer to 4.3.1.20-4.3.1.21) requires configuration parameter instructions. It can be awakened by setting the 24 pin low, or it can be awakened by sending any data through the serial port (wake data will be discarded).

## 6, FAQ

#### 6.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Seawater has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- When the power supply at room temperature is lower than the recommended low voltage, the lower the voltage is, the lower the transmitting power is.

### 6.2 Module is easy to damage

- Please check the power supply and ensure it is within the recommended range. Voltage higher than the peak will lead to a permanent damage to the module.
- Please check the stability of power supply and ensure the voltage not to fluctuate too much.
- Please make sure anti-static measures are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range for some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

### 6.3 Bit error rate is too high

- When there are co-channel signal interference nearby, be away from interference sources or modify frequency and channel to avoid interference;
- The clock waveform on the SPI is not standard. Check whether there is interference on the SPI line. The SPI bus should not be too long.
- Unfavorable power supply may cause messy code. Make sure that the power supply is reliable.

## 7、 Production Guidance

## 7.1 Reflow Soldering Curve

| Profile Feature                     | Sn-Pb Assembly | Pb-Free Assembly |  |  |
|-------------------------------------|----------------|------------------|--|--|
| Solder Paste                        | Sn63/Pb37      | Sn96.5/Ag3/Cu0.5 |  |  |
| Preheat Temperature min (Tsmin)     | 100°C          | 150°C            |  |  |
| Preheat temperature max (Tsmax)     | 150℃           | 200°C            |  |  |
| Preheat Time (Tsmin to Tsmax)(ts)   | 60-120 sec     | 60-120 sec       |  |  |
| Average ramp-up rate(Tsmax to Tp)   | 3°C/second max | 3°C/second max   |  |  |
| Liquidous Temperature (TL)          | 183°C          | 217℃             |  |  |
| Time (tL) Maintained Above (TL)     | 60-90 sec      | 30-90 sec        |  |  |
| Peak temperature (Tp)               | 220-235℃       | 230-250°C        |  |  |
| Aveage ramp-down rate (Tp to Tsmax) | 6°C/second max | 6°C/second max   |  |  |
| Time 25°C to peak temperature       | 6 minutes max  | 8 minutes max    |  |  |

## 7.2 Reflow Soldering Curve



## **8** Series product

| Model     | IC           | Frequency | TX power | Distance | Size  | Package | Interface |
|-----------|--------------|-----------|----------|----------|-------|---------|-----------|
|           |              | Hz        | dBm      | m        | mm    |         |           |
| E104-BT10 | TLSR8269F512 | 2.4G      | 8        | 50       | 19*13 | SMD     | TTL       |

## **Revision history**

| Version | Date       | Description     | Operator |
|---------|------------|-----------------|----------|
| 1.0     | 2019-4-12  | Initial Version | -        |
| 1.2     | 2019-11-11 | Function update | Ren      |

## About us

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