Catalog

1. DRF Series ZigBee Module Advantage
2. The Parameters for DRF Series ZigBee Module
3. How to create network for ZigBee Module
4. How to transmitter data using DRF series ZigBee Module
5. The setting for DRF series ZigBee Module
6. Order Information
1. DRF Series Zigbee Module Advantage:

DRF Series Zigbee Module include DRF1601, DRF1602 and DRF1605, it use TI-CC2530F256 chip, and have ZigBee 2007/PRO protocol inside. Create network automatically is the mainly specification for DRF series ZigBee Module, this can quick customer’s products to marketing. Customers not need to learn ZigBee protocol and can use ZigBee advantage at their products.

The Advantage:
1. Create network automatically
At the first using, when DRF1600 Zigbee Module power on, the Router can search and join network automatically, after the first using, all the network point can keep this network status, no mater you turn on or turn off these points, all of them will keep in the network.

2. Very easy to use
At the most situations, two Zigbee points just as one RS232 (or UART) cable, using Zigbee Module not need driver or API.

3. Simply data transmission
The data received from UART at Coordinator can send to all point automatically. The data received from UART at Router can send to Coordinator automatically. Data transceiver can be at any points, just need one instruction.

DRF Series Products:

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRF1601</td>
<td>RS232, Debug interface, 10 IO, 2 LED for Active and TX/RX, TEST &amp; RESET key</td>
</tr>
<tr>
<td>DRF1602</td>
<td>As above and housing</td>
</tr>
<tr>
<td>DRF1605</td>
<td>All IO for CC2530, UART interface (TX, RX for 3.3V TTL ), little size fit for embedded application</td>
</tr>
</tbody>
</table>
2. The parameters for DRF series Zigbee module

**DRF1601**

**Electronics**
- Input Power: DC 5-12V
- Temperature: -40°C -- 85°C
- Interface: RS232
- UART baud rate: 38400bps (Default), Selectable 9600bps, 19200bps, 38400bps, 115200bps
- Wireless Frequency: 2.4GHz
- Wireless Protocol: ZigBee2007 / PRO
- Transfer Distance: 400 meters for in sighted distance
- MAX send current: 34mA
- MAX receiving current: 25mA
- Receiving sensitivity: -96dBm
- Chips: CC2530F256, 256KFLASH

**Mechanism**

Size: 74 * 41.5 mm
3. Inner structure
DRF1602

Electronics
Input Power: DC 5-12V
Temperature: -40°C --85°C
Interface: RS232
UART brand rate: 38400bps (Default), Selectable 9600bps, 19200bps, 38400bps, 115200bps.
Wireless Frequency: 2.4GHz
Wireless Protocol: ZigBee2007 /PRO
Transfer Distance: 400 meters for in sighted distance
MAX send current: 34mA
MAX receiving current: 25mA
Receiving sensitivity: -96dBm
Chips: CC2530F256, 256KFLASH

Mechanism

DRF1602 Size: 79.5 * 49.5 * 21.3mm
Inner structure
(As same as DRF1601)

Outside
DRF1605

Electronics

Input Power: **DC 3.3V**
Temperature: -40°C – 85°C
Interface: UART, 3.3V (TTL or 3.3V CMOS)
UART brand rate: 38400bps (Default), Selectable 9600bps, 19200bps, 38400bps, 115200bps.
Wireless Frequency: 2.4GHz
Wireless Protocol: ZigBee2007 /PRO
Transfer Distance: 400 meters for in sighted distance
MAX send current: 34mA
MAX receiving current: 25mA
Receiving sensitivity: -96dBm
Chips: CC2530F256, 256KFLASH

Mechanism

![Mechanism Diagram](image)

Unit: mm
DRF1605 Pin definition

Outside

- Dimensions: 31.5mm x 32mm
The advantage for DRF1605

Customer can use it with ZigBee USB mother board as follow, this function as USB to Zigbee.

Customer can use it with RS485 mother board, this function as RS485 to Zigbee.

As the pin distance is 2.54mm or 2.54*n, thus it can connector to versatile board
Any MCU can connect to this module, just need MCU has UART (TX & RX @ 3.3V).
3, How to create network for ZigBee Module

**The point type for Zigbee network:**
There are three point type for Zigbee network: Coordinator, Router and End Device.

**Coordinator:** Used to create a Zigbee network and assign address to Router or End Device when they join this network, Coordinator used as all powered on device, at one Zigbee network only need one Coordinator, Coordinator use PAN ID to differentiate other network, the networks which have different PAN ID can't conflict at one space.

**Router:** Can receive and send data, can resend data as other points bridge, Router also have keep a Zigbee network function, and Router can assign address to others points when them join this network. Normally, Router also called as FFD (Full Function Device).

**End Device:** this point only can receive and send data, at most situations, this type of point defined as battery powered device, can periodically weak up to receive or send data.

DTK Zigbee Module's main function is data transceiver, so our Zigbee Module only have Coordinator and Router points, when a Zigbee network include one Coordinator and n Routers, this Zigbee network normally called as MESH network, as follow:

So, when you order Zigbee Module, we will send you 1 Coordinator and n PCS Routers as default configure.

**To crates a Zigbee network:**
1, turn on the Coordinator;
2, turn on other Routers, these Router can search and join this network automatically;
To view the network structure at TI Sensor Monitor Software

1. Connect the Coordinator to PC, than run the TI Sensor Monitor, select the right COM port and click RUN, than, you will see a red point, this is Coordinator
   (This software can download at: http://www.ti.com/cn/litv/zip/swrc096d

2. turn on one Router, if it’s the first use, this Router can search and join this network automatically, the two LED blink than lighting, after this, than press the TEST Key, you will see a blue point at Sensor Monitor, this is a Router point
   (at DRF1605, the TEST key is J2-PIN3 )
3, same as above, turn on others Routers and press the TEST key, you will see some others Router point.

The MESH network points quantity:
One Coordinator can allow 6 Routers join this network directly and assign address to them.
Every Router can allow other 6 Routers to join this network directly.
Total 6 layers Router can allow joining this network.
The MESH network characteristic

When a Router joined network, he will get a address (Short Address), and this address will keep if this point always in this network.

In this network, any points can communication

Even Coordinator turn off, other powered points also can communication.

Even Coordinator turn off, a new Router also can join this network through a Router which joined.
4, How to transmitter data using DRF series ZigBee Module

There are two data transceiver method: transparent transceiver and point to point transceiver

**Transparent transceiver:**
The data received from UART at Coordinator, will send to all point automatically
The data received from UART at Router can send to Coordinator automatically.

**Point to point transceiver:**
Only one instruction can send data between any two points

**Transparent transceiver (The main function for DRF1600 Zigbee Module)**
1, if the fist data byte is not 0xFE, 0xFD or 0xFC, than the data package will be send as transparent data
2, the data received from UART at Coordinator, will send to all point automatically, the data received from UART at Router can send to Coordinator automatically.
3, the MAX data package length is 256 Bytes.
**Data transparent transmission performance:**

<table>
<thead>
<tr>
<th>Direction</th>
<th>Length of data package</th>
<th>Fastest interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router → Coordinator</td>
<td>16 Bytes</td>
<td>20 ms</td>
</tr>
<tr>
<td></td>
<td>32 Bytes</td>
<td>20 ms</td>
</tr>
<tr>
<td></td>
<td>64 Bytes</td>
<td>20 ms</td>
</tr>
<tr>
<td></td>
<td>128 Bytes</td>
<td>50 ms</td>
</tr>
<tr>
<td></td>
<td>256 Bytes</td>
<td>200 ms</td>
</tr>
<tr>
<td></td>
<td>&gt; 256 Bytes</td>
<td>Can’t send</td>
</tr>
<tr>
<td>Coordinator → Router</td>
<td>16 Bytes</td>
<td>100 ms</td>
</tr>
<tr>
<td></td>
<td>32 Bytes</td>
<td>100 ms</td>
</tr>
<tr>
<td></td>
<td>64 Bytes</td>
<td>100 ms</td>
</tr>
<tr>
<td></td>
<td>128 Bytes</td>
<td>200 ms</td>
</tr>
<tr>
<td></td>
<td>256 Bytes</td>
<td>500 ms</td>
</tr>
<tr>
<td></td>
<td>&gt; 256 Bytes</td>
<td>Can’t send</td>
</tr>
</tbody>
</table>

Test Condition:
1. at room temperature, the laboratory condition
2. module distance between 2 meters, signal is good
3. Baud Rate: 38400bps
4. continuous sending, receiving 100K bytes, no error, consecutive testing 10 times
5. test software: serial port debug assistant SSCOM3.2

With the transmission distance between modules increases, the transmission rate can be decreased Coordinator to Router is sent to broadcast way to send, the transmission rate will be slow General application, suggested that each packet 32 bytes, interval 200-300ms transmission
**Point to point transceiver:**

**Send command formats:**
Data transfer instructions (0xFD) + data length + target address + data (up to 32 Bytes)

<table>
<thead>
<tr>
<th>FD</th>
<th>Length</th>
<th>Target Address</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Equals data section length of data

**Example:**

```
FD 0A 14 3E 01 02 03 04 05 06 07 08 09 10
```

- **FD:** Data transfer instructions
- **0A:** length, 10 Bytes
- **14 3E:** Target Address
- **01 02 03 04 05 06 07 08 09 10:** Data

**Received data formats:**
Data transfer instructions (0xFD) + data length + target address + data (up to 32 Bytes) + Source Address

<table>
<thead>
<tr>
<th>FD</th>
<th>Length</th>
<th>Target Address</th>
<th>Data</th>
<th>Source Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Equals data section length of data

**Example:**

```
FD 0A 14 3E 01 02 03 04 05 06 07 08 09 10 50 F5
```

- **FD:** Data transfer instructions
- **0A:** length, 10 Bytes
- **14 3E:** Target Address
- **01 02 03 04 05 06 07 08 09 10:** Data
- **50 F5:** Source Address

The above introduced the data send from 50F5 to 143E, as picture
Point to Point data transceiver performance:

<table>
<thead>
<tr>
<th>Direction</th>
<th>Length of data package</th>
<th>Fastest interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router → Router</td>
<td>32 Bytes</td>
<td>40 ms</td>
</tr>
<tr>
<td>Coordinator → Router</td>
<td>32 Bytes</td>
<td>40 ms</td>
</tr>
<tr>
<td>Router → Coordinator</td>
<td>32 Bytes</td>
<td>40 ms</td>
</tr>
</tbody>
</table>

Test Condition:
6. at room temperature, the laboratory condition
7. module distance between 2 meters, signal is good
8. Baud Rate: 38400bps
9. continuous sending, receiving 100K bytes, no error, consecutive testing 10 times
test software: serial port debug assistant SSCOM3.2

The Target Address = 0xFFFF, broadcast send to all points
The Target Address = 0x0000, send to Coordinator
5. The setting for DRF series ZigBee Module

(All the data as follow is HEX format, and all setting will available after reset the module)

<table>
<thead>
<tr>
<th>NO</th>
<th>Instruction</th>
<th>Function</th>
<th>Return</th>
<th>Need Reset ?</th>
</tr>
</thead>
</table>
| 1  | FC 02 91 01 XX XY | Set the PAN ID to value XX XY  
If set to FF FF:  
Coordinator: after restart, set to a random value  
Router: search network and join  
Can’t set to FF FE | XX XX  
Example:  
Input: FC 02 91 01 12 34  
D6  
Return: 12 34 | Y |
| 2  | FC 00 91 02 (canceled) | | | |
| 3  | FC 00 91 03 A3 B3 XY | Read PAN ID | PAN ID value  
1, If out off network, the value will is 0xFFFE. | N |
| 4  | FC 00 91 04 C4 D4 XY | Read Short Address | Short Address | N |
| 5  | FC 00 91 05 (canceled) | | | N |
| 6  | FC 01 91 06 XX F6 XY | Set Baud Rate  
XX = 01: 9600  
XX = 02: 19200  
XX = 03: 38400  
XX = 04: 57600  
XX = 05: 115200 | 00 00 09 06 00 00  
00 01 09 02 00 00  
00 03 08 04 00 00  
00 05 07 06 00 00  
01 01 05 02 00 00 | Y |
| 7  | FC 00 91 07 97 A7 XY | Test UART Baud Rate | If right, return: 01 02 03 04 05  
If Error, no return | N |
| 8  | FC 00 91 08 A8 B8 XY | Read MAC Address | 8 Bytes MAC Address  
Example: 00 12 4B FF 56 78 FE FF | N |
You can use the Zigbee Module Configure software:
5, Order Information

There are 3 type of ZigBee point at network as Coordinator, Router and End Device. We programmed different firmware in these modules before delivery, so, you need select how many Coordinator, Router or End Device do you need.

As normal, one Zigbee net work just need one Coordinator, End Device just can send and receive data, Router has all the functions at End Device and route data.

So, as recommends, if you just want to create one Zigbee network, you can select 1 Coordinator + n Routers.