瑞瀛模块

智慧点亮生活

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Zigbee Module Data Sheet

REX3T

V1.1.0

Copyright

Document Change List

|		
V1.0.0	20190309	Initial version
V1.0.1	20190312	Ordering information added
V1.0.2	20190415	Zigbee transparent protocol added
V1.0.3	20190628	Chip information add

Content

1. Product Introduction

1.1. Introduction

With chip of TLSR825X, REX3T provides a complete 2.4GHz Zigbee system with high performance, low-consumption and low cost. This module conforms to Zigbee , integrating 32 byte MCU, 64KBS RAM，512KB Flash, 14byte ADC and 6-channel PWM, one QDEC and and sufficient GPIO.
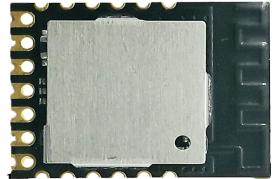
1.2. Application

REX3T conforms to Zigbee 3.0

- Transparent communication: users can develop according to AT Command of REXENSE.
- Customization: we can provide customers with reliable and safe application software according to their specific application.

- Parts for smart phone and tablet
- Remote controller and 3D glass
- Tracking of sports and gym
- Wearable devices

1.3. Main Characteristics

- Dimension：**20.4*14.8*2.4mm**（No shield）
  20.4*14.8*3.0mm （with shield）
- Max receiving sensitivity: -100dBm@IEEE802.15.4 250kpbs
- Reliable communication distance：300m（line of sight range）
- Multiple antenna options
  Extreme low power consumption

- Sleep mode：<1μA
- Receiving mode：5.3mA
- Transmitting mode：20mA@10dBm
- Big storage resource:

- 512K Flash；64K RAM

14 GPIOs can be configured for various functional interfaces according to application

- GPIO
- External interrupts
- 14 bytes precision ADC sampling channel
- USART Hardware flow control
- TWI interface
- SPI/I^{2}C interface
- PWM output
- Hardware watchdog

1.4. Product Advantage

- Package is small, which fits the small device well.
- Advanced link budget in the industry
- Outstanding battery longevity
- Big storage resource, good for client software application
- Powerful mesh network forming ability
- With development kit easy to use and cost-effective
- ISM band license free

1.5. Abbreviations

ADC	Analog-to -Digital Converter
GPIO	General Purpose Input/Output
HVAC	Heating, Ventilating and Air Conditioning
TWI	Inter-Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
ISM	Industrial, Scientific and Medical radio band
JTAG	Digital interface for debugging of embedded device, also known as IEEE 1149.1 standard interface
MAC	Medium Access Control layer
PCB	Printed Circuit Board
RAM	Random Access Memory
RF	Radio Frequency
RTS/CTS	Request to Send/ Clear to Send
RX	Receiver
SMA	Surface Mount Assembly
SPI	Serial Peripheral Interface
TX	Transmitter
UART	Universal Asynchronous Receiver/Transmitter

2. Product Overview

2.1. Overview

REX3T is a ZigBee module of compact layout, higher sensitivity and lower power, and conforms to Zigbee 3.0 protocol, with outstanding RF characteristics, lower power consumption, powerful processor and big on-chip resource, and easy for user to integrate.
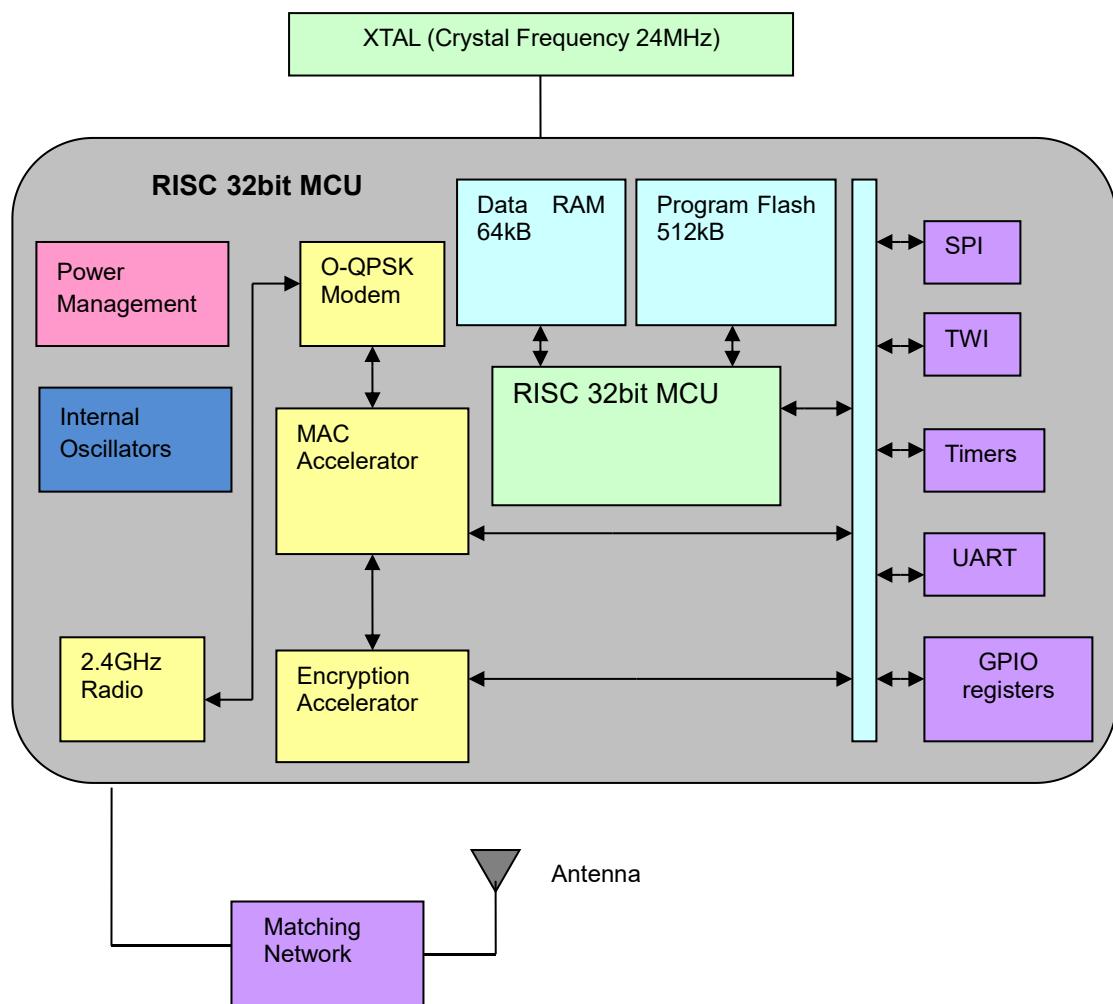
Table 2-1 Product diagram

REX3T module conforms to the FCC, IC, CE, and can be applied to various devices in different environments.

3. Technical Specification

3.1. Electrical Specification

3.1.1. Electrical Specification

Table 3-1. Absolute Maximum Ratings

Parameter	Min	Max
Module input voltage (VCC)	1.8V	3.6V
Pin voltage (except ADC pin)	-0.3V	VDD_PADS+0.3
ADC Pin voltage	-3.3V	3.6V
Data of maximum drive current of all I/Os		16 mA
Maximum RF signal receiving density of chips		+6 dBm

Note: exceeding the absolute maximum ratings may damage module. In any case, the user shall not violate the absolute maximum ratings listed in the previous table. If there is a violation, it may cause irreparable damage to the module.

3.1.2. Test Conditions

Table 3-2. Test conditions (unless otherwise agreed), VCC = 3.3V, temperature = 25°C

Parameter	Range	Unit
Receiving current	5.3	mA
（@10dBm）Transmitting current	20	mA
Sleeping current	1	μA
Transmitting power	-9 to +10.0	dBm
Receiving sensitivity（99%）@IEEE802.15.4 250kpbs	-100	dBm

3.1.3. RF Electrical Characteristics

Table 3-3. RF Electrical Characteristics

Parameter	Test Conditions	Range	Unit
Frequency range		2400~2483.5	MHz
Quantity of Channels		16	
Channel No.		0B~1A	Hex
Channel spacing		5	MHz
Transmitting power		-9 to +10.0	dBm
Receiving sensitivity（99%）@IEEE802.15.4 250kpbs		-100	dBm
Rated Input / Output Impedance	For unbalanced output	50	Ω

3.1.4. Processor Characteristics

Table 3-4. Processor Characteristics

Parameter	Test Conditions	Range	Unit
On-chip flash storage		512K	bytes
On-chip RAM storage		32K(SRAM Retention) + 32K(Without SRAM Retention)	bytes
Working frequency		48	MHz

3.1.5. Module Interface Characteristics

Table 3-5. Module Interface Characteristics

Parameter	Test Conditions	Range	Unit
UART Max baud rate		115200	bps
The resolution of analog channel		14	Bits/μs
Analog input impedance		>1	MΩ
Analog reference voltage (VREF)		1.2	V
Analog input voltage		0-3.6 V	V
I2C bus maximum clock frequency		400	KHz
GPIO output voltage (logic 0)	-8/ 4 mA	0 ~ 0.2*VDD	V
GPIO output voltage (logic 1)	-8/ 4 mA	0.80*VDD ~ VDD	V
Real-time clock frequency		32.768	KHz

3.2. Physical/Ambient Characteristics

Table 3-6. Physical/Ambient Characteristics

Parameter	Value	Note
Physical size	20.4*14.8*1.8mm	
Weight	<1g	
*Working temperature	-40℃ to +85℃（default）	
Relative working Humidity	<95%	

3.3. Pin Configuration
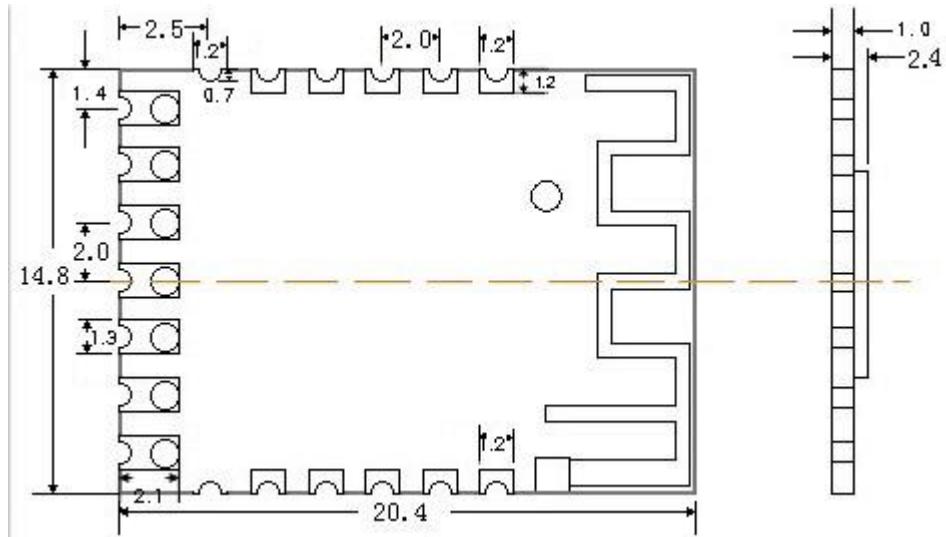
Figure3-1. Layout Dimension
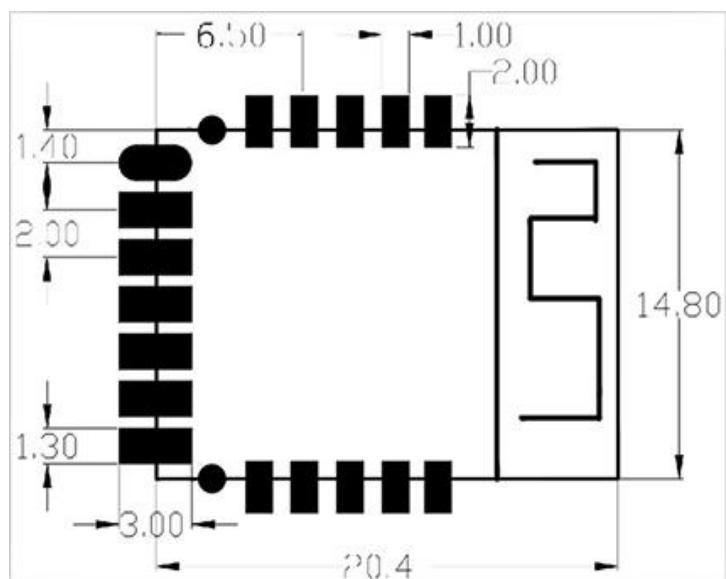
Figure3-2. Product Packages
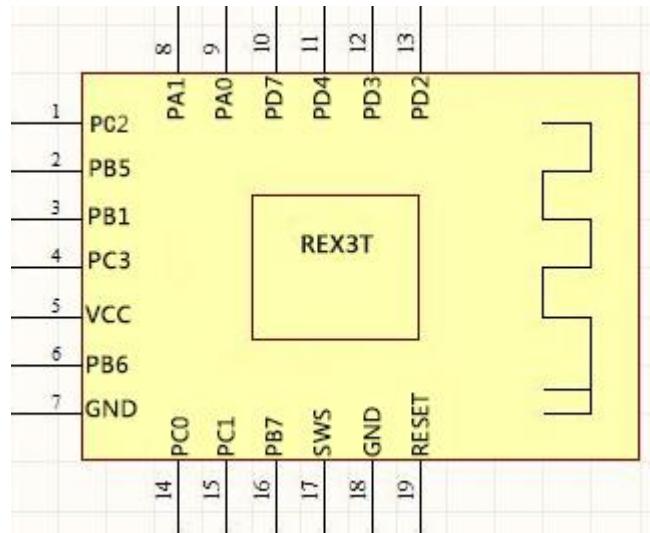
Figure 3-3. Pin Configuration

Table 3-7. Pin Description

Pin No of Module	QFN32 Pin No of Package	Pin signal	方向 Output/ Input	Pin description
1	23	PC2	I/O	GPIO
2	15	PB5	I/O	GPIO
3	6	PB1	I/O	GPIO;TXD
4	23	PC3	I/O	GPIO;RXD
5	9,18,33	3.3V	I	VCC
6	16	PB6	I/O	GPIO
7	7	GND	I	GND
8	4	PA1	I/O	GPIO
9	3	PA0	I/O	GPIO
10	2	PD7	I/O	GPIO
11	1	PD4	I/O	GPIO
12	32	PD3	I/O	GPIO

Pin No of Module	QFN32 Pin No of Package	Pin signal	方向 Output/ Input	Pin description
13	31	PD2	I/O	GPIO
14	28	PC0	I/O	GPIO
15	29	PC1	IO	GPIO
16	17	PB7	IO	GPIO
17	5	SWS	IO	GPIO
18	7	GND	I	GND
19	8	RESET	I	RESET

3.4. 天线规格 Antenna Specification

REX3T has integrate different antennas, with details below:

3.4.1. PCB Antenna
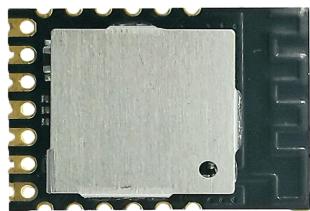
Figure 3-4. PCB Antenna

With PCB antenna, there are points to be noted:

1. Avoid placing modules in a metal shell.
2. Keep metal object from the PCB antenna (at least 1cm above, 2.7cm plus recommend).
3. Do not keep module nearby the devices with electromagnetic radiation source, such as transformers.
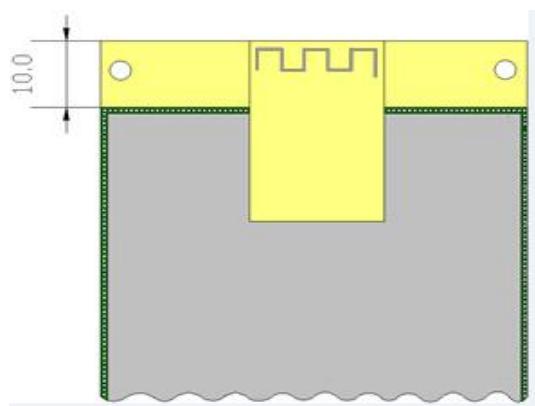
The design of a user's PCB should prevent the module's PCB antenna from the interference of its components, traces and bottom. The basic principles are:

- No traces, bottom around the PCB antenna with no other components placed

- The PCB antenna shall be out of PCB board
- Do not cover the PCB antenna with metal shell

Components, traces, copper allowed
No components around, or traces or copper at bottom. Preferred is hollow on top or at bottom of PCB antenna.

Table 3-5.PCB Board Layout regarding to Positioning PCB Antenna of Module

3.5. Soldering Temperature for Module

The max temperature for soldering module shall be within 237-245℃ in 20s.

3.6. Packing Layout Of Module
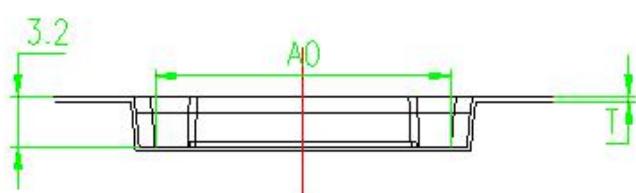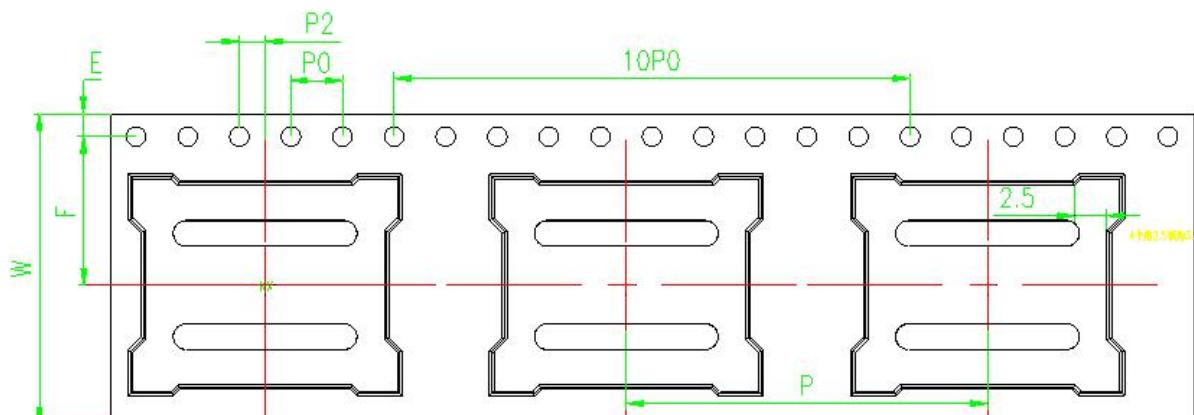
ITEM	SPEC(mm)
W	32.00±0.30
F	14.5±0.10
P	1.75±0.10
ΦD0	1.5
P0	4.00±0.10
A0	21.00±0.30
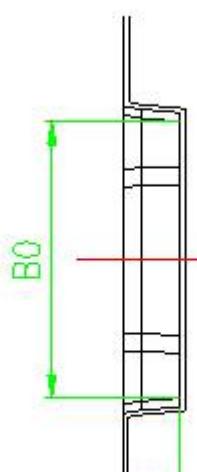
4.Zigbee transparent interface protocol

4.1. Form of transparent interface protocol

Table4-1 Zigbee SPP Command (from Host to 3T module)

Field	Bytes	Description
CmdID	2	Command ID
ParaLen	2	Length of parameters
Parameters	n	Parameter payload

Table 4-2 Zigbee SPP Events (from 3T module to Host)

Field	Bytes	Description
Token	1	Always be 0xFF
ParaLen	1	Length of parameters
eventId	2	Event ID
Parameters	n	Parameter payload

Zigbee SPP Command stands for command to be sent to zigbee module

Zigbee SPP Events stand for synchronization event or asynchronous event

Synchronization event is the confirm event responding to command, for example "command finished event"

Asynchronous event is report event, used to indicate what is happening to zigbee module, for example " Data Recevied event"）.

4.2. 透传指令集 List of transparent command

Table 4-3 General AT command set

CmdFunction	cmdID	ParaLen	Parameters	Format	Corresponding event
Set Advertising Interval	0xFF01	0x0002	Interval: e.g. 0x0050 Advertising interval = 80* 0.625ms= 50ms	e.g. 01 FF 02 00 50 00	Command Complete event
Set Advertising Data	0xFF02	<=0x0010 e.g. 0x0006	Data set: e.g. 01 02 03 04 05 06	e.g. 02 FF 06 00 01 02 03 04 05 06	Command Complete event
Enable/Disable Advertising	0xFF0A	0x0001	Enable: 0x01 Disable: 0x00	e.g. 0A FF 01 00 01	Command Complete event
Get Module Available Data Buffer	0xFF0C	0x0000	NA	0C FF 00 00	Command Complete event
Set Advertising Type	0xFF0D	0x0001	0x00: connectable undirected adv 0x01: connectable directed adv 0x02: scannable undirected adv 0x03: non-connectable adv	e.g. 0D FF 01 00 00	Command Complete event
Set Advertising Direct Address	0xFF0E	0x0007	**Parameter 1: dirAddrType** 0x00: Public Address 0x01: Random Address **Parameter 2: dirAddress** e.g. 01 02 03 04 05 06	e.g. 0E FF 07 00 00 01 02 03 04 05 06	Command Complete event

CmdFunction	cmdID	ParaLen	Parameters	Format	Corresponding event
Add White List Entry	0xFF0F	0x0007	**Parameter 1: addrType** 0x00: Public Address 0x01: Random Address **Parameter 2: address** e,g, 01 02 03 04 05 06	0F FF 07 00 00 01 02 03 04 05 06	Command Complete event
Delete White List Entry	0xFF10	0x0007	**Parameter 1: addrType** 0x00: Public Address 0x01: Random Address **Parameter 2: address** e.g. 01 02 03 04 05 06	e.g. 10 FF 07 00 00 01 02 03 04 05 06	Command Complete event
Reset White List Entry	0xFF11	0x0000	NA	11 FF 00 00	Command Complete event
Set Filter Policy	0xFF12	0x0001	00: All device 01: connReq from all device, scanReq from WL 02: scanReq from all device, connReq from WL 03: scanReq and connReq from WL	e.g. 12 FF 01 00 00	Command Complete event
Set device name	0xFF13	<=0x0012 e.g. 0x000A	Device name in hex format e.g. 01 02 03 04 05 06 07 08 09 0A	13 FF 0A 00 01 02 03 04 05 06 07 08 09 0A	Command Complete event
Get connection parameters	0xFF14	0x0000	NA	14 FF 00 00	Command Complete event

Set connection parameters	0xFF15	0x0008	Parameters: u16 interval Min; e.g. 0x00A0 means current device	15 FF 08 00 A0 00 A2 00 00 00 2C 01	Command Complete event

CmdFunction	cmdID	ParaLen	Parameters	Format	Corresponding event
			accepts minimum connection interval 0xA0*1.25ms=200ms u16 interval Max; e.g. 0x00A2 means current device accepts maximum connection interval 0xA2*1.25ms=202.5ms u16 connLatency; e.g. 0x0000 means current device expects new latency 0x00 u16 connTime out; e.g. 0x012C means current device expects new timeout 0x12C*10ms=3000ms		
Get module's current work state	0xFF16	0x0000	NA	16 FF 00 00	Command Complete Event
Terminate connection	0xFF17	0x0000	NA	17 FF 00 00	Command Complete Event
Restart Module	0xFF18	0x0000	NA	18 FF 00 00	Command Complete Event

			fEnable '0x01': enable MAC binding function. After MAC binding is enabled, only the devices with MAC address in the MAC table can be connected with this module.		
Enable or **Disable MAC** **Binding** **Function**	0xFF19	0x0001		19 FF 01 00 01/00	Command Complete Event

CmdFunction	cmdID	ParaLen	Parameters	Format	Corresponding event
			'0x00': disable MAC binding function		
Add device's MAC address to MAC binding table	0xFF1A	0x0006	**MacAddr** MAC address to be added into MAC binding table. Note: MAC table supports public MAC address only. e.g. B4 CE BF 01 E7 60	e.g. 1A FF 06 00 B4 CE BF 01 E7 60	Command Complete Event
Delete a MAC item from MAC binding table	0xFF1B	0x0006	**MacAddr** MAC address to be deleted from MAC binding table. e.g. B4 CE BF 01 E7 60	e.g. 1B FF 06 00 B4 CE BF 01 E7 60	Command Complete Event
Send Data	0xFF1C	<=0x0016 e.g. 0x0007	**Handle（2 bytes）of the Attribute "Service to client"** E.g. 0x0011 **Data payload（Max Len: 20bytes）** E.g. 01,02,03,04,05	e.g. 1C FF 07 00 11 00 01 02 03 04 05	Command Complete Event

表 **4-4** General events

Event name	Type	Token	ParaLen	EventID	Parameters	Format
Command Complete event	Synchronous	0xFF	0x03	corresponding to the command **Rule:** **eventID = (cmdID & 0x03FF) | 0x0400** e,g, 0x0701 (cmdID=0xFF01, corresponding to the "Set Advertising Interval" command)	Indicates status information Success: 0x00 Others: error code, @ble_sts_t	e,g. FF 03 01 07 00
Data received event	Asynchronous	0xFF	Variable: n+2 Eg.If n=6, Len is 0x08	0x07A0	**data** (indicates received data, n bytes) Eg. 01, 02, 03, 04, 05, 06	e.g. FF 08 A0 07 01 02 03 04 05 06
Get Available Buffer Num	Asynchronous	0xFF	0x03	0x070C	0x06	FF 03 0C 07 06
Connection Event	Asynchronous	0xFF	0x02	0x0783	NA	FF 02 83 07
Terminate Event	Asynchronous	0xFF	0x02	0x0784	NA	FF 02 84 07
Channel map change Event	Asynchronous	0xFF	0x02	0x078a	NA	FF 02 8a 07

Connection parameter update Event	Asynchronous	0xFF	0x02	0x078b	NA	FF 02 8b 07

4.3. How to interface 3T module

Hardware interface protocol:

- ■ Baud rate ：115200 bps
- ■ Data bits ：8
- ■ Check bit ：None
- ■ Stop bit ：1
- ■ Flow control ：None
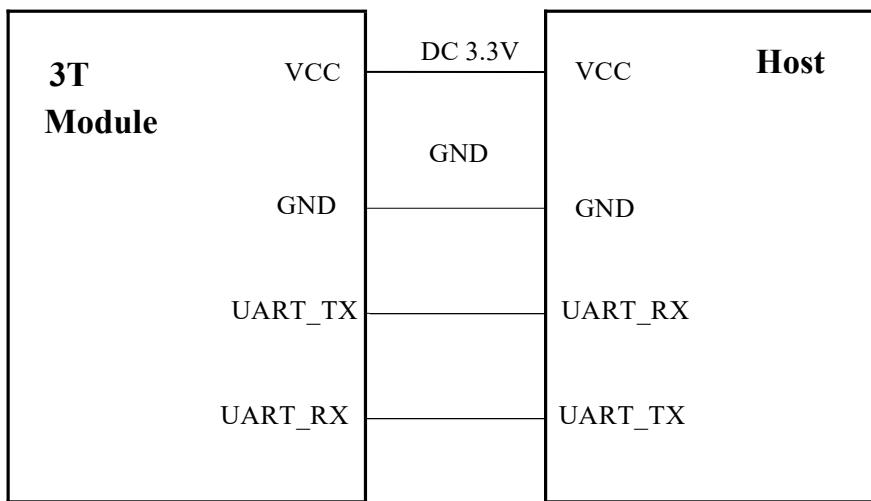
**Figure 4-1.** Interface under normal condition
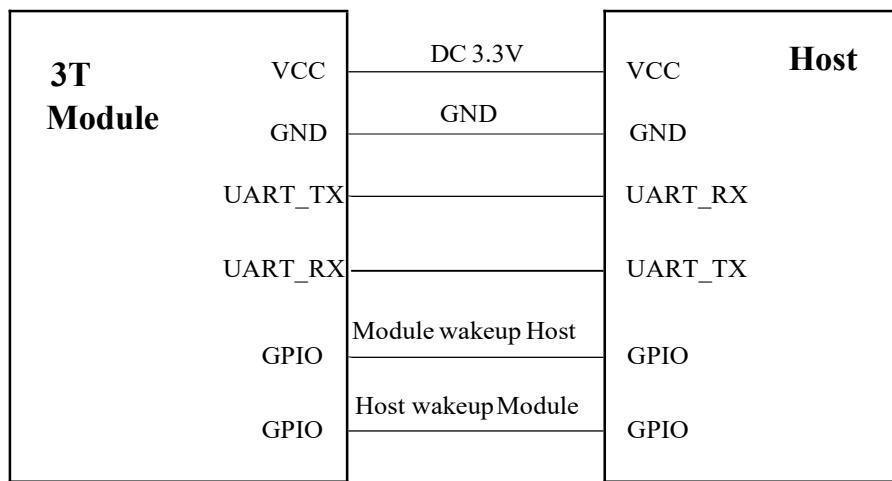
**Figure 4-2.** Interface under low consumption condition

5. Ordering information

Manufacturer

                                                                    REX   3   T   250   B   -   V1   B0

REX=REXENSE

Series

3=2.4G

Packaging Type

T=Telink 3B

Chips

258=TLSR8258F512ET32

250=TLSR8250F512ET32

Antenna

B=PCB Antenna（Default）

Hardware Version

V1=Version V1

Appearance

B0=Black Ink without shielding (default)

B1= Black Ink with shielding

6. Contact Us

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FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
Integral PCB antenna with antenna gain 1.0dBi

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.

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

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.

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: 2AOE2-REX3T Or Contains FCC ID: 2AOE2-REX3T"
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.