成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

E70(915T30S)-User Manual-V1.0

Contents

1. Introduction

1.1 Feature

E70(915T30S) is wireless UART transceiver module based on the original CC1310 of TI, operating at 907~922.5MHz (Default: 915MHz), TTL level and 3.3V IO port.

The module has the function of data encryption & compression. The data of the module transmitted over the features randomness. With the rigorous encryption & decryption, data interception becomes pointless. The function of data compression decreases the transmission time & probability of being interfered, while improving the reliability & transmission efficiency.

No.	Usage	Description
1	Continuous transmission	In this mode, the data transmitting length is unlimited: Perfectly realize continuous transmission for the highest baud rate of 115200bps.
2	Fixed-length transmission	Air data rate, FEC and Encryption are configurable by users; Transmitting data to the receiver in present air data rate with a most effective way to realize low delay and high respond.
3	Consumption advantage	The receiving current is 14mA, and the stand by current is 4uA. Battery-powered application is available.
4	WOR	Ultra-low power consumption, suitable for the battery-powered application. When the module is on the power-saving mode, the receiving response delay time of module can adjust the power consumption.
5	Fixed transmission	Module can communicate with other modules which are work in different channels and addresses, it is easy for networking and repeater. For example: module A transmits AA BB CC to module B (address: 0x00 01, channel: 0x80), HEX format is 00 01 80 AA BB CC (00 01 refers to the address of module B, 80 refers to the channel of module B), then module B receives AA BB CC (only module B).
6	Broadcast transmission	Set the module address as 0xFFFF, then the module can communicate with other modules in same channel.
7	FEC	It has the feature of FEC (Forward Error Correction) algorithm,with high coding efficiency & good correction performance. In a sudden interference, it can correct the interfered data packets proactively, so that the reliability & transmission range are improved proactively. Without FEC, those data packets can only be dropped.
8	Parameter saving	The parameter will be saved after users set the parameters and it won’ t be lost if powered-off. After module powered-on again, the module will work as previous settings.
9	Ultra-small size	24 * 38.5mm, suitable for some application which has strict limitation for the size.
10	Secondary development	All IO port lead out already for secondary development.
11	Customized Service	If the existing UART module cannot meet customers’ requirements, Ebyte accept customization of appropriate firmware. Ebyte has provided customized wireless modules to tens of well-known enterprises. Please contact us for more details.
12	Complete series	CC1310 has different size and packing, in which main difference is the number of GPIO. Ebyte has completely developed CC1310, including different size, frequency, power etc.

1.2. Electrical Parameter

No.	Parameter item	Parameter details	Description
1	Size	24 * 38.5mm	-
2	Weight	4.9g	Average weight
3	Frequency Band	Default: 915MHz	Frequency range: 907~922.5MHz, channel: 32
4	PCB	4-layer	Impedance-matching, lead-free and SMT
5	Connector	1.27mm spacing	SMD
6	Supply voltage	2.6 ~ 5.5V DC	5V is recommended (Note: the voltage higher than 5.5V is forbidden)
7	Communication level	Maximum 3.8V	3.3V is recommended
8	Operation Range	6000m	Test condition: clear and open area& 30dBm, antenna gain: 2dBi , height: 2m , air data rate: 2.5kbps
9	Transmitting power	30dBm	Four optional level: 30, 27, 24, 17dBm
10	Air data rate	2.5kbps	Six optional level: 2.5, 5, 12, 28, 64, 168kbps
11	Standby current	4.0uA	Mode 3 (M0=1, M1=1, M2=1)
12	Transmitting current	602mA@30dBm	≥1A (recommended) (the voltage supply is 5V)
13	Receiving current	14mA	Mode 0, Mode 1, Mode 2 （5v power supply）
14	Communication interface	UART	8N, 8E1, 8O1, eight kinds of UART baud rate, from 1200 to 115200 bps (default: 9600)
15	Driving mode	UART	Can be configured to push-pull/high pull, open-drain.
16	Transmitting length	Depends on mode	Please refer to the transmission mode
17	Receiving length	Depends on mode	Please refer to the transmission mode
18	Address	65536	Easy for networking, broadcast and fixed transmission
19	WOR	Available	The minimum average power consumption is about 30uA (it fits for battery-powered applications)
20	RSSI	Available	It supports RSSI, refer to contents as follow
21	Antenna type	IPEX/Stamp hole	50Ω characteristic impedance
22	Operating temperature	-40 ~ +85℃	-
23	Operating humidity	10% ~ 90%	Relative humidity, no condensation
24	Storage temperature	-40 ~ +125℃	-
25	Sensitivity	-110dBm@50kbps	Sensitivity has nothing to do with baud rate or timing

2. UART functional description (default)

2.1 Fixed transmission

	Hex	Description
The format: :Hexadecimal, such as：00 03 04 AA BB CC 00 03 is the address of receiving module；04 is the channel ；AA BB CC is the transmission data。		
Transmitting module A	Hexadecimal	Address：00 01；Channel :02
Receiving module B	Hexadecimal	Address：00 03；Channel :04
Receiving module C	Hexadecimal	Address：00 05；Channel :04
Receiving module D	Hexadecimal	Address：00 07；Channel :06
Module A must be in fixed mode.		
Module A Transmitting data	Hexadecimal	00 03 04 AA BB CC
Module B receiving data	Hexadecimal	AA BB CC
Module C receiving data	Hexadecimal	No
Module D receiving data	Hexadecimal	No
Only the modules with matched address and channel can receive the data. In fixed transmission, modules only support 1 packet length (pls refer to electrical parameters). If the data packets exceed, then it needs to be subcontracted automatically.		

2.2 Broadcast transmission

	Hex	Description
The format: Hexadecimal, such as：FF FF 04 AA BB CC FF FF is the address；04 is the channel of receiving module；AA BB CC is the transmission data。		
Transmitting module A	Hexadecimal	Address：00 01；Channel :02
Receiving module B	Hexadecimal	Address：00 03；Channel :04
Receiving module C	Hexadecimal	Address：00 05；Channel :04
Receiving module D	Hexadecimal	Address：00 07；Channel :06
Module A must be in fixed mode.		
Module A Transmitting data	Hexadecimal	FF FF 04 AA BB CC
Module B receiving data	Hexadecimal	AA BB CC
Module C receiving data	Hexadecimal	AA BB CC
Module D receiving data	Hexadecimal	No
All the module with this channel can receive the data. In fixed transmission, modules only support 1 packet length (pls refer to electrical parameters). If the data packets exceed, then it need to be subcontracted automatically.		

2.3 Broadcast address

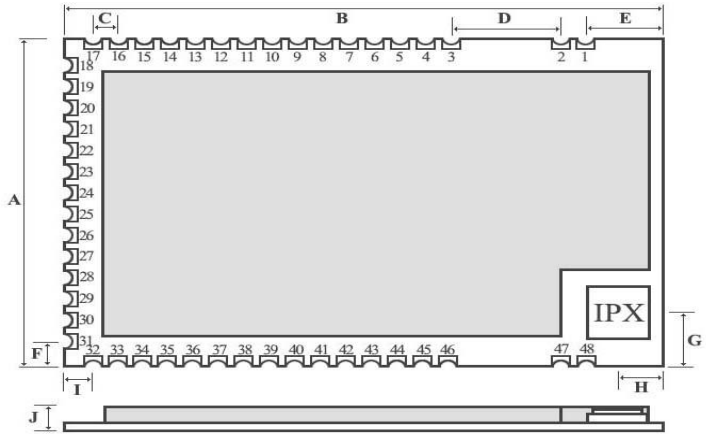
1. For example, set the address of module A as 0xFF FF, and the channel as 0x04.
2. When module A works as the transmitter (transparent transmission), all the receiving module with the channel 0x04 can receive the data, so as to realize the broadcast.

2.4 Monitoring address

1. For example, set the address of module A as 0xFF FF, and the channel as 0x04.
2.When module A works as the receiver, all the receiving module with the channel 0x04 can receive the data, so as to realize the monitoring.

3. Functional description

3.1 Pin Definition



Units: mm

	MIN	NOR	MAX
A	23.90	24.00	24.10
B	38.40	38.50	38.60
C	1.27	1.27	1.27
D	11.45	11.48	11.51
E	5.34	5.36	5.38
F	3.71	3.76	3.81
G	2.55	2.60	2.65
H	2.69	2.72	2.75
I	2.59	2.61	2.63
J	3.75	3.80	3.85

No.	Pin item	Pin direction	Application
1	GND	Ground	Ground electrode
2	GND	Ground	Ground electrode
3	GND	Ground	Ground electrode
4	NC	Reserved pin	Reserved, to be floated
5	NC	Reserved pin	Reserved, to be floated
6	NC	Reserved pin	Reserved, to be floated
7	NC	Reserved pin	Reserved, to be floated
8	NC	Reserved pin	Reserved, to be floated
9	NC	Reserved pin	Reserved, to be floated
10	NC	Reserved pin	Reserved, to be floated
11	LNA_EN	Output	Internal MCU controlled LNA pin, valid in high level, connect to pin 44
12	PA_EN	Output	Internal MCU controlled PA pin, valid in high level, connect to pin 45
13	NC	Reserved pin	Reserved, to be floated
14	NC	Reserved pin	Reserved, to be floated
15	NC	Reserved pin	Reserved, to be floated
16	M2	Input	M2, M1, M0 jointly decide the 8 working modes; an external 1k protective resistor shall be connected in series when in use.
17	GND	Ground	Ground electrode
18	M0	Input	M2, M1, M0 jointly decide the 8 working modes; An external 1k protective resistor shall be connected in

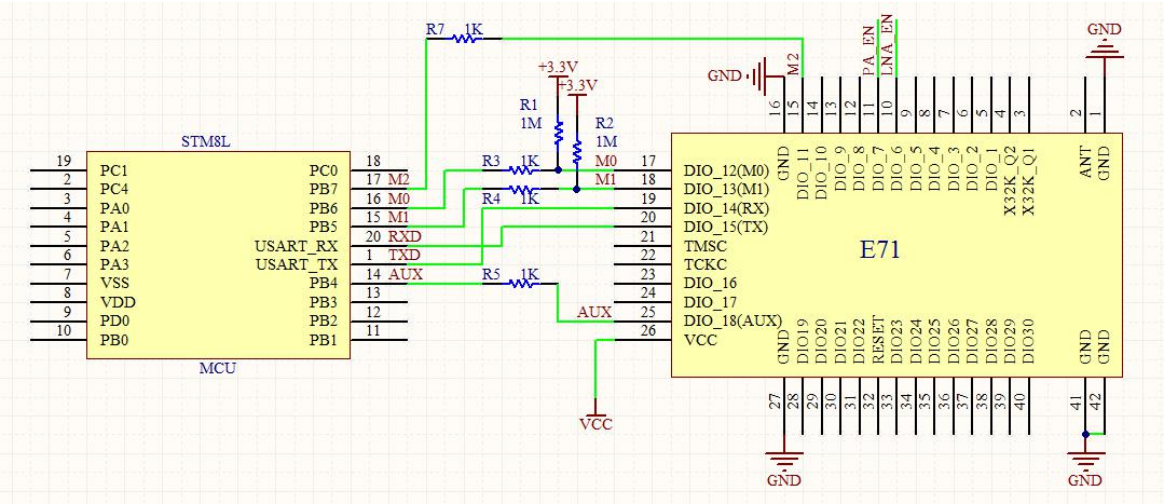
			series and a 1M pull-up resistor shall be added when in use. (Cannot be floated, it can be grounded when not used)
19	M1	Input	M2, M1, M0 jointly decide the 8 working modes; An external 1k protective resistor shall be connected in series and a 1M pull-up resistor shall be added when in use. (Cannot be floated, it can be grounded when not used)
20	RXD	Input	TTL serial port input connects to external TXD pin. It can be configured as open-drain or high pull input, please refer to Parameter setting. An external 1k protective resistor shall be connected in series when using.
21	TXD	Output	TTL serial port output connects to external RXD input pin. It can be configured as open-drain or push-pull input, please refer to Parameter setting. An external 1k protective resistor shall be connected in series when using.
22	TCKC	Input	JTAG TCKC
23	TMSC	Input	JTAG TMSC
24	RESET	Input	Reset pin, valid in low level
25	NC	Reserved pin	Reserved, to be floated
26	NC	Reserved pin	Reserved, to be floated
27	AUX	Output	It is used to indicate the operation status of module, for user to wake up the external MCU, the module outputs low level during self-checking and initialization at power on, it can be configured as open-drain output or pull-up output, please refer to parameter setting part, An external 1k protective resistor shall be connected in series when using. (can be floated)
28	VCC	-	Power positive reference, Power supply 2.6V ~ 5.5V DC
29	VCC	-	Power positive reference, Power supply 2.6V ~ 5.5V DC
30	GND	Ground	Ground electrode
31	GND	Ground	Ground electrode
32	NC	Reserved pin	Reserved, to be floated
33	NC	Reserved pin	Reserved, to be floated
34	NC	Reserved pin	Reserved, to be floated
35	NC	Reserved pin	Reserved, to be floated
36	NC	Reserved pin	Reserved, to be floated
37	NC	Reserved pin	Reserved, to be floated

38	NC	Reserved pin	Reserved, to be floated
39	NC	Reserved pin	Reserved, to be floated
40	NC	Reserved pin	Reserved, to be floated
41	NC	Reserved pin	Reserved, to be floated
42	NC	Reserved pin	Reserved, to be floated
43	NC	Reserved pin	Reserved, to be floated
44	LNA_EN	Input	Internal LNA pin, valid in high level, connect to pin 11
45	PA_EN	Input	Internal PA pin, valid in high level, connect to pin 12
46	GND	Ground	Ground electrode
47	GND	Ground	Ground electrode
48	ANT	-	Antenna (50Ω characteristic impedance)

Real values of MCU controlled PA and LNA are as follows:

No.	PA_EN	LNA_EN	Notes
1	1	0	In transmitting
2	0	1	In receiving
3	0	0	In sleeping mode

3.2 Connect to MCU



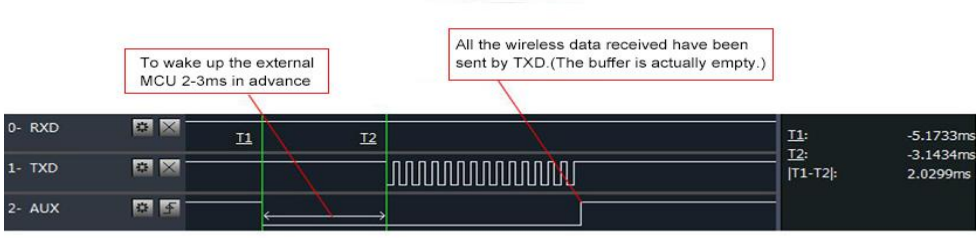
No.	Description (STM8L MCU)
1	The UART module is TTL level., please connect to the MCU of TTL level.
2	For some MCU works at 5V DC, it may need to add 4 ~ 10K pull-up resistor for the TXD & AUX pins.

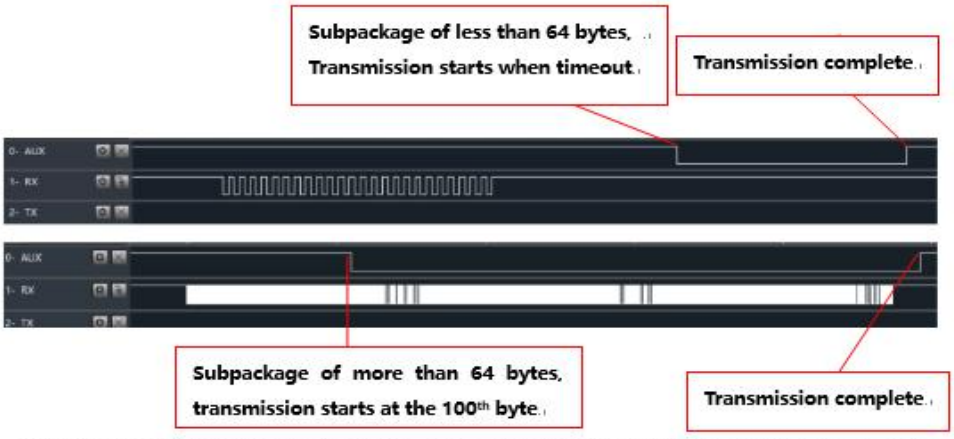
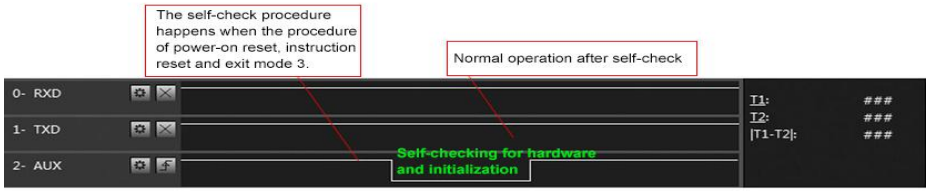
3.3 Reset

No.	Description
1	When the module is powered on, AUX outputs low level immediately, conducting hardware self-check and setting the operating mode on the basis of the user parameters. During the process, the AUX keeps low level. After this process, the AUX outputs high level and starts to work as per the operation mode combined by M2, M1, M0. Therefore, the user needs to wait the AUX rising edge as the starting point of module' s normal work.

3.4 AUX description

It can indicate whether there are data that has been sent through wireless, or whether all wireless data have been sent through UART, or whether the module is still in the process of self-check initialization.

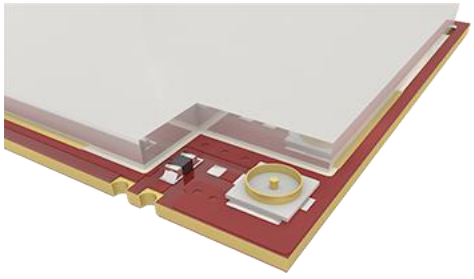
No.	Description
1	【Indication of UART output】 It can be used to wake up external MCU (In continuous mode, the AUX indication isn't delayed.)  Timing Sequence Diagram of AUX when TXD pin transmits

2	【Indication of wireless transmitting】 1. Under subpackage transmission mode, the internal buffer size depends on the subpackage size, if the data packet length is 1024 bytes, the corresponding buffer is 1024 bytes, when the AUX=1, user could transmit data continuously ，no more than 1024 bytes . 2. Under continuous transmission mode, AUX=1, there is no limitation on user data input length. 3. Under WOR transmission mode, AUX=1, user could continuously input less than 84 bytes. 4. AUX=1 means the serial port data has been transmitted completely.  Time sequence diagram of AUX pin when module receiving serial port data (subpackage mode)  Time sequence diagram of AUX pin when module receiving serial port data (continuous mode)
3	【Configuration procedure of module】only when resetting and exiting sleep mode  Timing Sequence Diagram of AUX when self-check

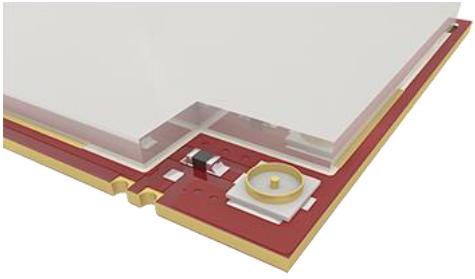
4. Choose antenna

The 0R resistance welding before factory is as below(left), the antenna type is stamp hole;

If users need to change the antenna type to IPEX, pls change the 0R resistance as below(right).



Choose stamp hole



choose IPEX

5. About us

Chengdu Ebyte Electronic Technology Co., Ltd. (Ebyte) is specialized in wireless solutions and products.

- We research and develop various products with diversified firmware;
- Our catalogue covers WiFi, Bluetooth, Zigbee, PKE, wireless data transceivers & etc.;
- With about one hundred staffs, we have won tens of thousands customers and sold millions of products;
- Our products are being applied in over 30 countries and regions globally;
- We have obtained ISO9001 QMS and ISO14001 EMS certifications;
- We have obtained various of patents and software copyrights, and have acquired FCC, CE, RoHs & etc.

FCC Statement

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.

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device .

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. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2ALPH-E70 Or Contains FCC ID: 2ALPH-E70"

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.

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.