

E70-433T series User Manual

CC1310 433MHz TTL

high-speed continuous transmission wireless module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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Chapter 1 Product Overview

1.1 Product introduction

E70-433T series is a wireless serial port module (UART) based on TI's CC1310 (built-in dual-core ARM) radio frequency chip, which can work in the 431-446.5 MHz frequency band (default 433MHz), GFSK modulation method, TTL level output, 3.3V IO port voltage; this product adopts 24MHz industrial-grade crystal oscillator to ensure its industriality and stability.

The module has data encryption and compression functions, and the data transmitted by the module in the air is random, and the data interception is meaningless through strict encryption and decryption algorithms. The data compression function has the possibility to reduce the transmission time, reduce the probability of being interfered, and improve reliability and transmission efficiency.

The factory has built-in low-power multi-function wireless serial port program, and users can also carry out secondary development according to their needs.



picture 3: E70-433T14S2



picture 2: E70-433T14S



picture 4: E70-433MT14S

1.2 Features

- Support high-speed continuous transmission, send and receive unlimited data packet length;
- Support continuous data frame without packetization, perfect support for ModBus protocol;

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- Support custom subcontracting settings to improve communication efficiency;
- Support fixed-point transmission/broadcast transmission/channel monitoring;
- Support RSSI signal strength reading;
- Support over-the-air wake-up, i.e. low-power function, suitable for battery-powered solutions;
- Developed based on CC1310 chip, built-in dual-core ARM;
- Ultra-small volume design;
- Ultra-low receiving current, only about 8mA;
- E70-433 T30S maximum transmit power of 30dBm, the other three models are 25mW, softwaremulti-level adjustable;
- Under ideal conditions, the communication distance can reach 1.5km;
- E70-433T30S built-in PA+LNA, transmission power 1W, communication distance up to 6km;
- Supports the global license-free ISM 433MHz band;
- Support 2.5K~168kbps air transmission rate;
- Support 2.2~3.8V power supply, greater than 3.3V power supply can ensure the best performance;
- E70-433T30S supports 2.6~5.5V power supply , more than 5V power supply can ensure the best performance;
- Dual antenna optional (IPEX/stamp hole) is convenient for users to develop and facilitate integration.

1.3 Application scenarios

- Home security alarm and remote keyless entry;
- Smart home and industrial sensors;
- Wireless alarm security system;
- Building automation solutions;
- Wireless industrial-grade remote control;
- healthcare products;
- Advanced Meter Reading Architecture (AMI);
- Automotive applications.

Chapter 2 Specification Parameters

2.1 RF Parameters

RF parameters unit			Мо			
		F70 400T000	570 4007440	E70-433T14S	E70-433MT14	remark
		E70-4331305	E70-4331145	2	S	
Transmit power	dBm	30	14	14	14	
Receive sensitivity	dBm	-107~-109	-109~-111	-108	-108	The air rate is 2.5kbps
Reference distance	М	6000m	1500m	1500m	1500m	Clear and open, antenna gain

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						5dBi, antenna height 2.5
						meters, air rate 2.5kbps
Operating			125	4E0 E		The factory default is 433MHz
frequency band	IVIHZ		425	and supports the ISM band		
Air velocity	bps		2.5k~	User programmatic control		
Placking nower	dPm		10			The probability of burning is
blocking power	UDITI	TO			less when used at close range	
Launch length	/		The transmission	See Transfer Modes for details		

2.2 Electrical parameters

Electrical parameters		unit	E70 422T20S	E70 422T145	E70-433T14S	E70-433MT1	remark	
			E70-4331303	270-4331143	2	4S		
Operating voltage		V	2.6~5.5	2.2~3.8	2.2~3.8	2.2~3.8	The E70-433T30S permanently burns modules over 5.5 V, and the other three models permanently burn modules over	
Communication level				3.8 V. Using 5V TTL carries a risk of burnout				
	Emitted current	mA	530	27	36	32	Instantaneous power consumption	
power consumption	Receive current	mA	14	8	8	9		
	Sleep current	μΑ	4	1	1.2	1.7	The software shuts down	
tomporatura	Operating temperature	°C		-20~+85				
temperature	Storage temperature	C		-40~+125				

2.3 Hardware Parameters

Hardware		Мо	romorte
parameters	E70-433T30S	E70-433T14S	Ternark
chip		CC1	
Cache capacity		2048	User defined



FLASH		12			
RAM		8	KB		
kernel		Cortex-M3 (MCU)	+Cortex-MO (RF)		
Communication		UART ser	ial port		TTL level
interface					
Modulation		GF			
method					
Encapsulation		20			
method		31			
Antenna	IPEX/stamp	IPEX/stamp	IPEX/stamp	Stamp boloc	The characteristic impedance is
interface	hole	hole	hole	about 50 ohms	
sizo	24+29 5mm	10.00	14 + 20 mm	10+10mm	The E70-433T14S2 does not
SIZE	24*30.5000		14 * 20 mm		include SMA

Chapter 3 Mechanical dimensions and pin definitions

3.1 E70-433T30S dimensional drawing and pin definition



Pin Serial Number	Pin Name	Pin Direction	The chip corresponds to the pin	Pin Usage
1	GND	Reference Ground	_	Module Ground Wire
2	GND	Reference Ground	_	Module Ground Wire
3	GND	Reference Ground	_	Module Ground Wire
4	NC	Reserved foot	X32K_Q1	Reserved for unused, need to overhang

5	NC	Reserved foot	X32K_Q2	Reserved for unused, need to overhang
6	NC	Reserved foot	DIO_1	Reserved for unused, need to overhang
7	NC	Reserved foot	DI0_2	Reserved for unused, need to overhang
8	NC	Reserved foot	DIO_3	Reserved for unused, need to overhang
9	NC	Reserved foot	DIO_4	Reserved for unused, need to overhang
10	NC	Reserved foot	DIO_5	Reserved for unused, need to overhang
11	LNA_EN	Output	DIO_6	Internal microcontroller control LNA pin, active high, connected to pin 44
12	PA_EN	Output	DIO_7	Internal microcontroller control PA pin, active high, connected to pin 45
13	NC	Reserved foot	DIO_8	Reserved for unused, need to overhang
14	NC	Reserved foot	DIO_9	Reserved for unused, need to overhang
15	NC	Reserved foot	DIO_10	Reserved for unused, need to overhang
16	M2	Input	DI0_11	M2M1M0 combined to determine the 8 modes of operation of the module, the use of a series of 1K protection resistor
17	GND	Reference Ground	_	Module Ground Wire
18	МО	Input	DI0_12	The M2M1M0 combination determines the 8 operating modes of the module. When using a series 1K protection resistor, and add a 1M pull-up resistor (not suspended, if not used can be grounded)
19	M1	Input	DI0_13	M2M1M0 Common combination determines the 8 operating modes of the module When using a series 1K protection resistor, and add a 1M pull-up resistor (not suspended, if not used can be grounded)
20	RXD	Input	DI0_14	TTL serial input, connected to external TXD output pins. Configurable as Open drain or pull-up input, See parameter settings for details. A 1K protective resistor in series is required for use.
21	TXD	Output	DIO_15	TTL serial output, connected to the external RXD input pin. Configurable as open-drain or push-pull output,

				Details See parameter settings. A 1K protective resistor
				in series is required for use.
22	TMSC	Input	JTAG_TMSC	JTAG TMSC
23	TCKC	Input	JTAG_TCKC	JTAG TCKC
24	RESET	Input	RESET_N	Module reset pin, active low
25	NC	Reserved foot	DI0_16	Reserved for unused, need to overhang
26	NC	Reserved foot	DIO_17	Reserved for unused, need to overhang
27	AUX	Output	DIO_18	Used to indicate the working status of the module, the user wakes up the external MCU, output low during power-on self-test initialization, can be configured as open-drain output, or push-pull output, see parameter settings for details. A 1K protective resistor needs to be connected in series when using (can be suspended)
28	VCC	-	-	Module power supply positive reference, voltage range: 2.6 to 5.5V DC
29	VCC	-	-	Module power supply positive reference, voltage range: 2.6 to 5.5V DC
30	GND	Reference Ground	_	Module Ground Wire
31	GND	Reference Ground	_	Module Ground Wire
32	NC	Reserved foot	DI0_19	Reserved for unused, need to overhang
33	NC	Reserved foot	DI0_20	Reserved for unused, need to overhang
34	NC	Reserved foot	DI0_21	Reserved for unused, need to overhang
35	NC	Reserved foot	DI0_22	Reserved for unused, need to overhang
36	NC	Reserved foot	DI0_23	Reserved for unused, need to overhang
37	NC	Reserved foot	DI0_24	Reserved for unused, need to overhang
38	NC	Reserved foot	DI0_25	Reserved for unused, need to overhang
39	NC	Reserved foot	DI0_26	Reserved for unused, need to overhang
40	NC	Reserved foot	DI0_27	Reserved for unused, need to overhang

41	NC	Reserved foot	DI0_28	Reserved for unused, need to overhang
42	NC	Reserved foot	DI0_29	Reserved for unused, need to overhang
43	NC	Reserved foot	DI0_30	Reserved for unused, need to overhang
44	LNA_EN	Input	RX_EN	Internal LNA enable pin, active high, connected to pin 11
45	PA_EN	Input	TX_EN	Internal PA enable pin, active high, connects to 12 pins
46	GND	Reference Ground	_	Module Ground Wire
47	GND	Reference Ground	_	Module Ground Wire
48	ANT	_	_	Antenna (50 Ohm characteristic impedance)

3. 2 E70-433T14S dimensional drawing and pin definition



Pin Serial Number	Pin Name	Pin Direction	The chip corresponds to the pin	Pin Usage
1	GND	Reference Ground	_	Module Ground Wire
2	ANT	-	-	Antenna (50Ω characteristic impedance)
3	NC	Reserved Foot	X32K_Q1	Reserved for unused, need to overhang
4	NC	Reserved Foot	X32K_Q2	Reserved for unused, need to overhang
5	NC	Reserved Foot	DIO_1	Reserved for unused, need to overhang
6	LNA_EN	Output	DIO_2	External LNA control output, active high (can be dangled)
7	PA_EN	Output	DIO_3	External PA control output, active high (can be dangled)
8	NC	Reserved Foot	DIO_4	Reserved for unused, need to overhang
9	NC	Reserved Foot	DIO_5	Reserved for unused, need to overhang
10	NC	Reserved Foot	DIO_6	Reserved for unused, need to overhang
11	NC	Reserved Foot	DIO_7	Reserved for unused, need to overhang
12	NC	Reserved Foot	DIO_8	Reserved for unused, need to overhang
13	NC	Reserved Foot	DIO_9	Reserved for unused, need to overhang
14	NC	Reserved Foot	DI0_10	Reserved for unused, need to overhang
15	M2	Input	DI0_11	The combination of M2, M1 and MO determines the 8 modes of operation of the module. A 1K external series protection resistor is required for use
16	GND	Reference Ground	_	Module Ground Wire
17	МО	Input	DI0_12	The combination of M2, M1 and M0 determines the 8 modes of operation of the module. A 1K external series protection resistor is required for use, and a 1M pull-up resistor is added (not suspended, grounded if not in use)
18	M1	Input	DIO_13	The combination of M2, M1 and M0 determines the 8 modes

				of operation of the module. A 1K external series protection resistor is required for use, and a 1M pull-up resistor is added (not suspended, grounded if not in use)
19	RXD	Input	DI0_14	TTL serial input, connected to the external TXD output pin. Can be configured as an open drain or pull-up input, see parameter settings for details
20	TXD	Output	DIO_15	TTL serial output, connected to the external RXD input pin.Can be configured as open-drain or push-pull output, see parameter settings for details
21	TMSC	Input	JTAG_TMSC	JTAG TMSC
22	ТСКС	Input	JTAG_TCKC	JTAG TCKC
23	NC	Reserved Foot	DIO_16	Reserved for unused, need to overhang
24	NC	Reserved Foot	DIO_17	Reserved for unused, need to overhang
25	AUX	Output	DI0_18	Indicates the working status of the module, the user wakes up the external MCU, outputs low during power-on self-test initialization, can be configured as open-drain output, or push-pull output, see parameter settings for details. A 1K external series protection resistor is required for use (can be suspended)
26	VCC	-	_	Module power supply positive reference, voltage range: 2.2 to 3.8V DC
27	GND	Reference Ground	-	Module Ground Wire
28	NC	Reserved Foot	DIO_19	Reserved for unused, need to overhang
29	NC	Reserved Foot	DIO_20	Reserved for unused, need to overhang
30	NC	Reserved Foot	DI0_21	Reserved for unused, need to overhang
31	NC	Reserved Foot	DI0_22	Reserved for unused, need to overhang
32	RESET	Input	RESET_N	Module reset pin
33	NC	Reserved Foot	DI0_23	Reserved for unused, need to overhang
34	NC	Reserved Foot	DI0_24	Reserved for unused, need to overhang
35	NC	Reserved Foot	DI0_25	Reserved for unused, need to overhang

36	NC	Reserved Foot	DI0_26	Reserved for unused, need to overhang
37	NC	Reserved Foot	DI0_27	Reserved for unused, need to overhang
38	NC	Reserved Foot	DI0_28	Reserved for unused, need to overhang
39	NC	Reserved Foot	DI0_29	Reserved for unused, need to overhang
40	NC	Reserved Foot	DI0_30	Reserved for unused, need to overhang
41	GND	Reference Ground	_	Module Ground Wire
42	GND	Reference Ground	_	Module Ground Wire

3. 3 E70-433T14S2 dimensional drawing and pin definition



Pin Serial Number	Pin Name	Pin Direction	The chip corresponds to the pin	Pin Usage
1	GND	Reference Ground	_	Module Ground Wire
2	GND	Reference Ground	_	Module Ground Wire
3	GND	Reference Ground	_	Module Ground Wire
4	NC	Reserved Foot	X32K_Q2	Reserved for unused, need to overhang
5	NC	Reserved Foot	X32K_Q1	Reserved for unused, need to overhang
6	NC	Reserved Foot	DI0_9	Reserved for unused, need to overhang
7	NC	Reserved Foot	DIO_8	Reserved for unused, need to overhang
8	VCC	_	_	Module power supply positive reference, voltage range: 2.2 to 3.8V DC
9	GND	Reference Ground	_	Module Ground Wire
10	GND	Reference Ground	_	Module Ground Wire
11	PA_EN	Output	DIO_7	External PA control output, active high (can be dangled)
12	LNA_EN	Output	DIO_6	External LNA control output, active high (can be dangled)
13	M2	Input	DIO_5	The M2M1MO combination determines the 8 operating modes of the module and requires a 1K external series protection resistor for use
14	RESET	Input	RESET_N	Module reset pin, active low
15	GND	Reference Ground	_	Module Ground Wire
16	AUX	Output	DIO_4	Used to indicate the working status of the module, the user wakes up the external MCU, output low during power-on self-test initialization, can be configured as
17	TXD	Output	DIO 3	output, see parameter setting (can be suspended) Can also be used as a TTL serial output, connected

				to an external RXD input pin.
				Can be configured as an open-drain or push-pull
				output, see parameter settings for details
18	TCKC	Input	JTAG_TCKC	JTAG TCKC
19	TMSC	Input	JTAG_TMSC	JTAG TMSC
				TTL serial input, connected to the external TXD
20	BAD	Input		output pin.
20	KAD		D10_2	Can be configured as an open drain or pull-up input,
				see parameter settings for details
				M2M1M0 Common combination determines the 8
21	M1	Input	DIO_1	operating modes of the module (not suspended, can
				be grounded if not in use)
				M2M1M0 Common combination determines the 8
22	МО	Input	DIO_0	operating modes of the module (not suspended, can
				be grounded if not in use)
0.0	CNID	Reference		Module Ground Wire
23	GND	Ground	_	
24	ANT	_	_	Antenna (50Ω characteristic impedance)

3. 4 E70-433MT14S dimensional drawing and pin definition



Pin Serial Number	Pin Name	Pin Direction	Corresponds to the chip pin	Pin Usage
1	VCC	Power supply	_	Module power supply positive reference, voltage range: 2.2 to 3.8V DC
2	GND	Reference Ground	_	Ground wire, connected to power reference ground
3	RESET	Input	RESET_N	Module reset pin, active low
4	TCK	Input/output	JTAG_TCKC	Program download port, JTAG TCKC
5	TMS	Input/output	JTAG_TMSC	Program download port, JTAG TMSC
6	ANT	Input/output	_	Antenna connector, stamp hole (50 Ω characteristic impedance)
7	GND	Reference Ground	_	Ground wire, connected to power reference ground
8	NC	Reserved Foot	_	Reserved for unused, need to overhang
9	NC	Reserved Foot	X32K_Q2	Reserved for unused, need to overhang
10	NC	Reserved Foot	X32K_Q1	Reserved for unused, need to overhang
11	AUX	Output	DIO_4	Used to indicate the working status of the module, the user wakes up the external MCU, output low during power-on self-test initialization, can be configured as open-drain output, or push-pull output, see parameter settings for details (can be overhung)
12	TXD	Output	DIO_3	Can also be used as a TTL serial output, connected to an external RXD input pin. Can be configured as an open-drain or push-pull output, see parameter settings for details
13	RXD	Input	DIO_2	TTL serial input, connected to the external TXD output pin. Can be configured as an open drain or pull-up input, see parameter settings for details
14	LNA_EN	Output	DIO_6	External LNA control output, active high (can be overhung)
15	PA_EN	Output	DIO_7	External PA control output, active high (can be overhung)
16	GND	Reference Ground	-	Ground wire, connected to power reference ground
17	NC	Reserved Foot	DIO_9	Reserved for unused, need to overhang
18	M2	Input	DIO_5	M2M1M0 combined to determine the module's eight operating modes, the use of an external series of 1K protection resistor
19	M1	Input	DIO_1	M2M1MO combined to determine the module's eight operating modes, the use of an external series of 1K protection resistor

20	МО	Input	DIO O	M2M1MO combined to determine the module's eight operating modes, the use of an external series of 1K
		Ĩ	_	protection resistor

3. 5 Precautions

- This series of products can achieve pin compatibility, Pin to Pin replacement.
- The single-chip microcomputer control PA and LNA truth table is as follows:

state	PA_EN	LNA_EN
When launched	1	0
When receiving	0	1
When sleeping	0	0

Chapter 4 Recommended Wiring Diagrams



serial number	Brief connection description of the module and the MCU (the above figure takes the STM8L MCU as an example).
1	The wireless serial port module is TTL level, please connect with the TTL level MCU.
2	Some 5V MCUs may need to add 4~10K pull-up resistors to the TXD and AUX pins of the module.

Chapter 5 Detailed Explanation of Functions

5.1 Fixed-point launch (1in base 6).



5.2 Broadcast transmission (16 base).



5.3 Broadcast Address

- Example: Set module A address to 0xFFFF and channel to 0x04.
- When module A is used as a transmitter (same mode, transparent transmission mode), all receiving modules under the 0x04 channel can receive data to achieve the purpose of broadcasting.

5.4 Listening address

- Example: Set module A address to 0xFFFF and channel to 0x04.
- When module A is received, all data under the 0x04 channel can be received to achieve the purpose of monitoring.

5.5 Module reset

• After the module is powered on, AUX will immediately output a low level, perform hardware self-test, and set the working mode according to user parameters;

During this process, AUX remains low, and after completion, AUX outputs a high level, and starts to work normally according to the working mode formed by the combination of M2, M1 and M0;

Therefore, the user needs to wait for the AUX rising edge as a starting point for the module to work normally.

5.6 AUX in detail

5.6.1 Serial port data output indication

• Used to wake up the external MCU in sleep (note that AUX indicates no delay in continuous transmission mode);



5.6.2 Wireless Transmission Indication

- In packet transmission mode, the internal buffer size is specified by the packet size, such as the packet length is set to 1024 bytes, the corresponding buffer size is 1024 bytes, and the user can continuously initiate no more than 1024 bytes of data when AUX=1;
- In continuous transmission mode, AUX=1 remains unchanged, and the length of user data input data is not limited;
- In WOR send mode, AUX=1 users can continuously initiate data less than 84 bytes;
- When AUX=1, it means that all serial port data of the module is transmitted wirelessly.



模块接收串口数据时, AUX引脚时序图(连传模式)

5.6.3 Module is in the process of being configured

• only when resetting and exiting sleep mode;





Chapter 6 Work Modes

6.1 Mode switching

Mode (0-7).	M2	M1	м0	Schema introduction	remark
0 PSSI modo	0	0	0	The serial port is open, closed	The module outputs RSSI intensity values every
0 K331 1100e	0	0	0	wirelessly, and cannot be transmitted	100ms serial port
1 Continuous transmission mode	0	0	1	The serial port is opened, the wireless is opened, and the transmission is continuous and transparent	The airspeed is automatically adjusted with the baud rate, and the baud rate of both sides must be consistent. Suitable for high-speed continuous data
2 Subcontracting mode	0	1	0	The serial port is opened, the wireless is opened, and the subpacket is transmitted transparently	Airspeed and baud rate and independent configuration for packet communication.
3 Configuration mode	0	1	1	The serial port is open and closed wirelessly for parameter configuration	The baud rate is fixed at 9600 8N1
4 Wake mode	1	0	0	The serial port is opened, the wireless is opened, and the subpacket is transmitted transparently	This mode can not receive, automatically increase the wake code before transmission, Receiver in wake-up mode 6.
5 Same mode 3 (configuration mode).	1	0	1	The serial port is open and closed wirelessly for parameter configuration	The baud rate is fixed at 9600 8N1
6 Power saving mode	1	1	0	The serial port is closed, and it works wirelessly in WOR power-saving mode, and multiple time levels can be configured	This mode cannot transmit and can be woken up by the transmitter operating in mode 4 for low-power wireless reception
7 Sleep mode	1	1	1	The serial port is closed, wireless propagation, and sleep	Can be awakened by any falling edge of M2M1M0

• The user can combine the high and low levels of M2M1M0 to determine the module operating mode. The MCU's GPIO can be used to control mode switching; When changing M2M1M0: if the module is idle (AUX high), it can start working according to the new mode; If the module has serial port data that has not been transmitted wirelessly, it can enter the new working mode only after the transmission is completed; If the module receives wireless data and sends out data through the serial port, it needs to be sent before it can enter the new working mode; So the mode switch can only be used when AUX outputs 1, otherwise the switching will be delayed.

- For example, in mode 2 or mode 4, the user continuously enters a large amount of data and switches the mode at the same time, and the switching mode operation is invalid; The module will process all user data before performing new pattern detection; Therefore, the general recommendation is: detect the AUX pin output status, wait for the AUX output high level and then switch for 2ms.
- When the module is switched from other modes to configuration mode, if there is data that has not been processed; The

module will process this data, including sending and receiving, before entering sleep mode. This feature can be used for fast sleep, thus saving power consumption; For example: the transmitter module works in mode 0, the user initiates the serial port data "12345", and then does not have to wait for the AUX pin to be idle (high level), you can directly switch to sleep mode, and the user's main MCU immediately sleeps, the module will automatically send all the user data through the wireless Automatically enter sleep within 1ms; This saves the working time of the MCU and reduces power consumption.

- Similarly, any mode switch can take advantage of this feature, after the module processes the current mode event, within 1ms, it will automatically enter the new mode; Thus, the user's work of querying AUX is omitted, and the purpose of fast switching can be achieved; For example, switching from transmit mode to receive mode; The user MCU can also go to sleep early before the mode switch and use the external interrupt function to capture the AUX change for mode switching.
- This operation is very flexible and efficient, designed exactly for the user's MCU to operate, and can minimize the workload of the entire system, improve system efficiency, and reduce power consumption.

state	M2、M1、M0 = 000
launch	Wireless data transmission is not possible.
reception	Wireless data reception is not possible.
Baud rate and airspeed	The current baud rate
merit	The module outputs a byte RSSI signal strength value at a timed 100ms for determining the noise value of the current environment.
shortcoming	Data sending and receiving is not possible
Applicable scenarios	Used to listen to ambient noise
note	not

6.2 RSSI mode (mode 0).

6.3 Continuous transmission mode (mode 1).

state	M2、 M1、 M0 = 001
launch	Wireless data transmission is possible.
reception	Wireless data reception is possible.
Baud rate and airspeed	Based on the user's baud rate setting, the module automatically calculates the minimum airspeed required to meet continuous output requirements. Since modules with different airspeeds cannot communicate, the serial port parameter settings of both sides of the sending and receiving must be consistent.
merit	The serial data output of the wireless receiver is continuous, which meets the continuous transmission requirements of

	MODBUS and also meets the requirements of low time delay.				
	The baud rate of the serial port of both the sending and receiving parties must be consistent; After the serial baud rate				
shortcoming	is increased, the module will be adjusted to a higher airspeed, resulting in a decrease in reception sensitivity and a				
	decrease in transmission distance.				
Appliaghle segmenting	It is suitable for occasions where the distance requirements are not high, but the data continuity and response time				
Applicable scenarios	are very high.				
note	1. The "wireless air rate" in the configuration instruction is invalid (SPED.210 bits), the software automatically				
	calculates;				
	2. 0000 and FFFF are broadcast addresses that can be used for monitoring and broadcasting;				
	3. The addresses and baud rates of both communicating parties must be consistent;				
	4. Both transceiver modules must use the same model, such as E70 (868T14S) and E70 (868T30S) cannot				
	communicate continuously				

6.4 Subcontracting mode (mode 2).

state	M2、M1、M0 = 010			
launch	Wireless data transmission is possible.			
reception	Wireless data reception is possible.			
Baud rate and	In this mode, the serial port baud rate and airspeed are independent, and the sending and receiving parties can have			
airspeed	different serial port baud rates, but must have the same airspeed setting.			
morit	A very low airspeed can be set to achieve long-distance transmission, and the continuity between output data bytes			
	depends on the module package length.			
shortcoming	Depending on the setting, the airspeed can be set very low and the transmitter needs to wait for the number of packet			
shortconning	length bytes or timeout bytes.			
Applicable scoparios	Occasions where the distance requirements are high, and a certain output continuity is required, but the transmission			
	rate is required to be low.			
	1 Airspeed and baud rate are independent and their settings are in effect.			
note	2 0000 and FFFF are broadcast addresses that can be used for monitoring and broadcasting.			
	3. The airspeed and address of both sides of the communication must be consistent, and the baud rate can be			
	inconsistent.			
	4. The maximum packet data per packet is defined by the packet size [7:5] (excluding addresses and channels for			
	directed sends).			

6.5 Configuration Mode (Mode 3).

state	M2、M1、M0 = 011			
launch	Wireless transmission is not possible, and the received serial port data will be discarded.			
reception	Wireless reception is not possible.			
disposition	It can be used for module parameter setting, using serial ports 9600, 8N1, to set module working parameters			
	through a specific instruction format			

	When entering other modes from the setup mode, the module will reconfigure the parameters, and AUX will
note	remain low during the configuration process;
	The output level is high after completion, so it is recommended that the user detect the rising edge of the AUX.

6.6 Wake mode (mode 4).

state	M2、M1、M0 = 100			
launch	Wireless data transmission is possible.			
reception	Nireless data reception is not possible.			
Baud rate and	n this mode, the serial port baud rate and airspeed are independent, and the sending and receiving parties can have			
airspeed	different serial port baud rates, but must have the same airspeed setting.			
morit	Can wake up receivers operating in mode 6; The wake code is automatically increased before launch, and the number			
	of increases depends on the wake-up time setting.			
shortcoming	The transmission time is long, and it is only suitable for waking the receiver, not for conventional transmission data.			
Applicable scenarios	Used to wake up receivers in WOR state.			
note	In wake-up mode, the maximum transmit length of a single packet is 84 bytes (excluding directed addresses and			
	channels).			

6.7 Configuration Mode (Mode 5).

state	M2, M1, M0=101			
launch	Vireless transmission is not possible, and the data of the serial port is regarded as a configuration instruction.			
reception	Wireless reception is not possible.			
disposition	It can be used for module parameter setting, using serial ports 9600, 8N1, to set module working parameters			
	through a specific instruction format			
	When entering other modes from the setup mode, the module will reconfigure the parameters, and AUX will			
note	remain low during the configuration process;			
	The output level is high after completion, so it is recommended that the user detect the rising edge of the AUX.			

6.8 Power saving mode (mode 6).

state	M2、M1、M0 = 110	
launch	No wireless data transmission.	
reception	Wireless data reception is possible.	
Baud rate and	In this mode, the serial port baud rate and airspeed are independent, and the sending and receiving parties can have	
airspeed	different serial port baud rates, but must have the same airspeed setting.	
merit	The module works in the WOR state, periodically automatically wakes up and listens to the air wireless packets, when	

the packet is heard, the module enters the receive mode and receives the whole packet, serial port outp			
	enters the WOR state again. Power consumption can be greatly saved.		
shortcoming	This mode cannot emit data, and when you need to emit data, you need to switch to another working mode.		
Applicable scenarios	Devices that require high power consumption and need to receive data.		
note	Only data from the transmitter of mode 4 can be received.		

6.9 Sleep mode (mode 7).

state	M2、M1、M0 = 111
launch	Wireless data cannot be transmitted.
reception	Unable to receive wireless data.
other	All other functions of the module are turned off and can only exit sleep mode by state switching of M2M1M0.

Chapter 7 Instruction Format

In the configuration mode (mode 3: M0=1, M1=1, M2=0), the list of supported instructions is as follows (when setting, only 9600, 8N1 format is supported):

serial number	Instruction format	Detailed description	
1	C0+ operating	The base 16 format sends C0+5 bytes of working parameters, a total of 6 bytes, which must	
L	parameters	be sent continuously (saved by power loss).	
2	C1+C1+C1	Three C1s are sent in base 16 format, and the module returns saved parameters that must	
Z		be sent consecutively.	
2	C2+ operating	The base 16 format sends C2+5 bytes of working parameters, a total of 6 bytes, which must	
5	parameters	be sent continuously (power down is not saved).	
4	C3+C3+C3	The decimal format sends three C3s, and the module returns version information, which must	
4		be sent continuously.	
5	C4+C4+C4	The decimal format sends three C4s, and the module will produce a reset that must be sent	
		continuously.	

7.1 Factory default parameters

Model		Factory	Factory default parameter value: C0 00 00 18 04 1C			1C	
Module model	frequency	address	channel	Air velocity	baud rate	Serial port format	Transmit power
E70-433MT14S	433MHz	0x0000	0x04	2.5kbps	9600	8N1	25mW

7.2 Working parameter reading

Instruction format	Detailed description
	Under configuration (M0=1, M1=1, M2 =0), issue commands (HEX format) to the module serial port:
C1+C1+C1	C1 C1 C1,
	The module returns the current configuration parameters, such as: C0 00 00 18 4E 1C.

7.3 Version number read

Instruction format	Detailed description			
	Under Configuration (M0=1, M1=1, M2 =0), issue the command (HEX format) to the module serial port:			
	C3 C3 C3, and the module will return the current configuration parameters			
C3+C3+C3	For example: C3 0070 XX1 XX2 XX3 XX4 XX5; The 70 here represents the module model E70 series, if it is			
	71, then the E71 series; XX1 is the version number, and XX2 XX3 XX4 XX5 refers to other features of the			
	module.			

7.4 Reset Command

Instruction format	Detailed description
	Under the configuration (M0=1, M1=1, M2 =0), issue a command (HEX format) to the module serial port:
	C4 C4 C4, and the module will generate a reset;
C4+C4+C4	During the reset process, the module performs a self-test, the AUX output is low, and after the reset is
	completed, the AUX output is high, and the module starts to work normally. At this point, you can switch
	modes or initiate the next instruction.

7.5 Parameter Setting Instructions

serial number	name	description	remark
0	HEAD	Fixed 0xC0 or 0xC2, indicating that this frame data is a control command	C0: The set parameters will be saved in power failure; C2: The set parameters will not be saved without power loss.
1	ADDH	Module address high byte (default 00H).	00H-FFH
2	ADDL	Module address low byte (default 00H).	00H-FFH

		7	6	Serial	port check digit		
		0	0	8N1 (default).		
		0	1	801		The serial port mode of the communication side can	
		1	0	8F1		be different.	
		1	1	8N1 (equivalent 00)		
				3	TTL serial port haud rate (bps)		
		0	4	0	The serial port baud rate (bps).		
		0	0	1	The serial port baud rate is 1200	The baud rate of the two sides of the communication	
		0	1		The serial port baud rate is 2400	can be different;	
		0	1	1	The serial port baud rate is 4000	The serial part haud rate has nothing to do with	
		0			(default)	wireless parameters and does not affect the wireless	
		1	0	0	The sorial port baud rate is 10200	transcoiver characteristics	
		1	0	1	The serial port baud rate is 19200		
3	SPED	1	1		The serial port baud rate is 56400		
		1		1	The serial port baud rate is 57600		
		1	1		The serial port baud rate is 115200		
		2	1	0	Wireless air rate (bps).		
		0	0	0	The air speed is 2.5k (default).		
		0	0	1	The air rate is 5k	The lower the air speed, the farther the distance, the	
		0	1	0	The air rate is 12k	stronger the anti-interference performance, and the	
		0	1	1	The air rate is 28k	longer the transmission time;	
		1	0	0	The air rate is 64k		
		1	0	1	The air speed is 168k	Both communicating parties must have the same	
		1	1	0	The air speed is 168k	over-the-air wireless transmission rate.	
		1	1	1	The air speed is 168k		
		7	6	5	Package length setting		
					(subcontracting mode only)		
		0	0	0	16 bytes		
		0	0	1	32 bytes		
		0	1	0	64 bytes (default).	In continuous transmission mode (M2, M1, M0 = 001) this parameter is invalid	
		0	1	1	128 bytes		
4	CHAN	1	0	0	256 bytes		
		1	0	1	512 bytes	-	
		1	1	0	1024 bytes		
		1	1	1	2048 bytes		
		Comr	nunica	tion ch	annel		
		00H~	1FH c		anding to 431~446 5MHz	DEFAULT 04H (433MHZ)	
		7				is 1 the first 3 bytes of each user data frame	
		1		DBUS-		serve as high low channel: When transmitting the	
5	ΟΡΤΙΟΝ	0	Trans		transmission (default)	module changes its own address and channel and	
Ŭ			- rans	parent		after completion, it restores the original settings. The	
		1	Fixed	-point	transmission	continuous transmission mode is transparent	
			1				

									transmission.			
		6	5	4 Wake-up time				This parameter is only valid for modes 4 and 6;				
		0	0	0	500n	ns			-			
		0	0	1	1000)ms (defau	ult).		For mode 6, the wake-up time affects the WOR period of the module and has a large impact on			
		0	1	0	1500)ms						
		0	1	1	2000)ms			power consu	mption.		
		1	0	0	2500	2500ms			For mode 4,	the wake-up tir	me determines	the
		1	0	1	3000ms 3500ms 4000ms				number of wa	ake-up codes t	hat the module	increases
		1	1	0				before launch	ning, so as to er	nsure that the r	nodule in	
		1	1	1					mode 6 is eff	ectively awaker	ned;	
									Generally spe	aking, modes 4	and 6 need t	o be used
									together, and	the wake-up t	ime set by bot	h parties
								must be cons	sistent.			
		3	FEC s	witch (fo	vitch (forward error correction).				After the FEC	is turned off,	the actual da	ta
		0	Turn	off the I	off the FEC				transmission	rate is increase	d, but the	
		1	Open	FEC (d	efault).			anti-interfere	nce ability is we	eakened, and t	ne distance
									is slightly closer, which is selected according to the actual application; Both parties to the communication must be on or off. This bit is used to enable the internal pull-up resistor			
		2	IO dr	ive mod	le							
		0	TXD,	AUX op	en ou	itput, RXD) open input		of the modul	e;		
		1		AUX nu	ish-ni	ill output	RXD pull-u	o input	Open-drain mode is more level adaptable, and external pull-up resistors may be required in some			
			(defa	ult).	ion pe	an output,		o mpar				
									cases.			
		1	0	Transr	nit po	wer			The external	power supply n	nust provide a	current
		0	0	14dBn	n (def	ault).			output capab	ollity of more th	an 80mA and	ensure that
		0	1	10dBn	n				the power su	pply ripple is le	ss than 100mV	,
		1	0	7dBm								
		1	1	4dBm					It is not recor	nmended to us	e smaller powe	er
								transmission,	and its power	utilization effici	ency is not	
			Circe						nign.)" (b. et a)		
Tho k	pipany bit of th		Give		npie (ine mear				byte).	1	0
Specific v			ion)	0		0	0	1	1	2	1	0
Specific v	aiue (usei coi	ingulat	.011)	Soria	al nort		0	L T		U	0	0
Repr	resentative me	eaning			digit 8	N1	The serial	port baud	ud rate is 9600 The air rate is 2.5k			
Corresponds to hexadecimal			0					18				

Chapter 8 Parameter Configuration

• When the module is in mode 3 (M2, M1, M0 = 011) or mode 5 (M2, M1, M0 = 101), you can configure the module

parameters through instructions or host computer software, and please visit www.ebyte.com download for supporting host computer software.

(((.))		七朝仁	7佰胜由	ZR	出古	限公司	中文
EBY	TE c	hengdu	Ebyte Elect	ronic 1	rix H	ogy Co.,Ltd	English
模块型号: E	70				COM3 v	关闭串口	查看支持型导
10(本: 1.2 当前频率: 8 当前参数: 0	68.0MHz x0, 0x0, 0x18	3, 0x4e, 0x1c			读取参数	写入参数	恢复出厂设置
波特率	9600bps	~	前向纠错	打开	~	模块地址	0
奇偶校验	8N1	~	传输方式	透传	~	频率信道	14
空中速率	2.5Kbps	~	唤醒时间	1000MS	5 ~		
	14dBm	~	이팬코	推择	~	有长设定	64 Bytes

Chapter 9 Secondary Development

- The module supports secondary development, CC1310 RF chip, users can carry out secondary development according to the product pin description required in **Chapter 3** of this article;
- Ebaite can customize function development for customers, please contact the sales hotline 4000-330-990 .

9.1 Program Burning

keywords	Precautions							
Programming	The module is an SoC module, with its own GPIO port, and the program downloads using a CC series dedicated downloader : JTAG downloader (or TI official CC1310 supporting development board), can not use serial port or any other ISP, ICP tools.							
procedures	The figure below shows a JTAG connection diagram (XDS100), and the specific development method is detailed in the relevant documents of Ti (where the TDI and TDO pins can not be connected).							

Chapter 10 Hardware Design

• It is recommended to use a DC regulated power supply to supply the module, the power supply ripple coefficient is as small as possible, and the module needs to be reliably grounded;

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- Please pay attention to the correct connection of the positive and negative poles of the power supply, such as reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that between the recommended supply voltages, if the maximum value is
 exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not fluctuate sharply and frequently;
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% of the margin, which is conducive to long-term stable work;
- The module should be as far away as possible from the power supply, transformer, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital traces, high-frequency analog wiring, power traces must avoid the bottom of the module, if it is really necessary to pass under the module, assuming that the module is welded in the Top Layer, the Top Layer of the module contact part is covered with copper (all copper is laid and well grounded), must be close to the digital part of the module and routed in Bottom Layer:
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to route the wire at will in the Bottom Layer or other layers, which will affect the spurious and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module will also greatly affect the performance of the module, it is recommended to stay away from the module appropriately according to the intensity of interference, and if the situation permits, appropriate isolation and shielding can be done;
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power wiring) will also greatly affect the performance of the module, it is recommended to stay away from the module appropriately according to the intensity of interference, and if the situation permits, appropriate isolation and shielding can be done;
- If the communication line uses 5V level, 1k-5.1k resistors must be connected in series (not recommended, there is still a risk of damage);
- Try to stay away from some TTL protocols that are also 2.4GHz at the physical layer, such as USB3.0;
- The antenna installation structure has a great impact on the performance of the module, so it is necessary to ensure that the antenna is exposed and preferably vertically upward;
- When the module is installed inside the case, a high-quality antenna extension cable can be used to extend the antenna to the outside of the case;
- The antenna must not be installed inside the metal case, which will greatly weaken the transmission distance.

Chapter 11 Frequently Asked Questions

11.1 The transmission distance is not ideal

- When there is a straight-line communication barrier, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-frequency interference will lead to an increase in the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect close to the ground is poor;
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there is a metal object near the antenna, or placed in a metal case, the signal attenuation will be very serious;
- power register setting error, air rate setting too high (the higher the air speed, the closer the distance);
- At room temperature, the low voltage of the power supply is lower than the recommended value, and the lower the

voltage, the smaller the power;

• The use of antennas is poorly matched with the module or the quality of the antenna itself is a problem.

11.2 Modules are prone to breakage

- Please check the power supply to ensure that between the recommended supply voltages, if the maximum value is exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not fluctuate sharply and frequently;
- Please ensure that the installation and use process anti-static operation, high-frequency device electrostatic sensitivity;
- Please ensure that the humidity during installation and use should not be too high, and some components are humidity-sensitive devices;
- If there is no special need, it is not recommended to use it at too high or too low temperature.

11.3 The bit error rate is too high

- There is co-frequency signal interference nearby, stay away from the source of interference or modify the frequency and channel to avoid interference;
- The power supply is not ideal, it may also cause garbled codes, and the reliability of the power supply must be guaranteed;
- Poor quality or long extension cables and feeders will also cause high bit error rates.

Chapter 12 Welding Operation Instructions

12.1 Reflow soldering temperature

Reflow cu	urve features	There is lead process	Lead-free process assembly
		assembly	
Preheating/insulation	Minimum temperature (Tsmin).	100°C	150°C
	Maximum temperature (Tsmax).	150°C	200°C
	Time (T smin~Tsmin).	60-120 seconds	60-120 seconds

Heating slope (T L~Tp).	3°C/sec, maximum	3°C/sec, maximum	
Liquid phase temperature (TL).	183℃	217°C	
Hold time above ⊤∟	60~90 seconds	60~90 seconds	
	The user must not exceed the	The user must not exceed the	
The peak temperature of the package body is Tr	temperature indicated on the	temperature indicated on the	
The peak temperature of the package body is tp	product's "Moisture	product's "Moisture	
	Sensitivity" label.	Sensitivity" label.	
The time (Tp) within 5°C of the specified grading	20 seconds	20 seconds	
temperature (Tc) is shown in the figure below	183°C 217' 60~90 seconds 60~90 seconds is Tp The user must not exceed the product's The user must not exceed the product's Sensitivity" label. Sensitivity" label. Sensitivity" label ading low 20 seconds 30 sec 6 °C/sec, max 6 °C/sec 6 minutes, the longest 8 minutes, the	30 Seconds	
Cooling slope (T p~TL).	6 °C/sec, max	6 °C/sec, max	
Time from room temperature to peak	6 minutes, the longest	8 minutes, the longest	
temperature			
*The peak temperature (Tp) tolerance definition	of the temperature curve is the u	pper limit for the user	

12.2 Reflow soldering curve



Product model	Chip solutions	Carrier frequency Hz	Transmit power dBm	Test distance km	Air velocity bps	Package form	Product size mm	Antenna form
E70-433T14S	CC1310	433M	14	1.5	$2.5k{\sim}168k$	SMD	16 * 26	IPEX/stamp hole
E70-433T30S	CC1310	433M	30	6.0	2.5k~168k	SMD	24 * 38.5	IPEX/stamp hole
E70-433T14S2	CC1310	433M	14	1.5	2.5k~168k	SMD	14 * 20	IPEX/stamp hole
E70-900T30S	CC1310	868M	30	6.0	$2.5k{\sim}168k$	SMD	24 * 38.5	IPEX/stamp hole
E70-900T14S	CC1310	868M	14	1.5	$2.5k{\sim}168k$	SMD	16 * 26	IPEX/stamp hole
E70-900T14S2	CC1310	868M	14	1.5	2.5k~168k	SMD	14 * 20	IPEX/stamp hole

Chapter 13 Related models

Chapter 14 Antenna Guide

14.1 Antenna Recommendations

Product model	tuno	Band	intorfaco	gain	height	Feeder	Fosturos
Flouder	type	Hz	IIIteriace	dBi	mm	cm	reatures
TV422 ND 4210	Flexible	42214	. 1.1	2.0	42+10		Elovible EDC soft antenna
<u>17433-INP-4310</u>	antenna	433101	weid	2.0	43*10	-	
TV422 17 E	Glue stick	42214	CMA 1	2.0	E 2		Ultra-short straight,
<u>17433-JZ-5</u>	antenna	433101	SIVIA-J	2.0	52	-	omnidirectional antenna
	Glue stick	42214	CMA 1	2.0	FO		Fixed bend,
17433-100-5	antenna	433101	SIVIA-J	2.0	50	-	omnidirectional antenna
TY422 17C 6	Glue stick	42214	SMA 1	2.5	52		Ultra-short straight,
17433-120-0	antenna	433101	SIVIA-J	2.5	52	-	omnidirectional antenna
	Glue stick	12214	SMA 1	2.5	75		Fixed bend,
17433-100-7	antenna	433101	SIVIA-J	2.5	15	-	omnidirectional antenna
דעו 22 אין 11	Glue stick	42214	SMA 1	25	110		Bendable glue stick,
<u>17433-JK-11</u>	antenna	433101	SIVIA-J	2.0	110	-	omnidirectional antenna
TY422 14 20	Glue stick	12211	CMA 1	2.0	210		Bendable glue stick,
<u>17433-JK-20</u>	antenna	433101	SIVIA-J	3.0	210	-	omnidirectional antenna
TY422 YDI 100	Suction cup	42214	CMA 1	2 5	1950	100	Small suction cup
<u>17435-7FL-100</u>	antenna	433101	SIVIA-J	5.5	1000	100	antenna, cost-effective
TV422 VD 200	Suction cup	42214	CMA 1	4.0	1000	200	Medium suction cup
<u>17433-7F-200</u>	antenna	433101	SMA-J	4.0	1900	200	antenna, low loss
TX433 XDH 300	Suction cup	13311	SMA 1	60	0650	300	Large suction cup
<u>17435-7FH-300</u>	antenna	455101	SIVIA-J	0.0	9000	500	antenna, high gain

14. 2 Antenna selection





Enable IPEX interface (default) Enable the stamp hole

Chapter 15 Bulk packaging method

1 5.1 E70-433T30S bulk packaging



15. 2 E70-433T14S batch packing



15. 3 E70-433T14S2 bulk packaging



15. 4 E70-433MT14S bulk packing



Revision history

version	Date of revision	Revision Notes	Maintainers
1.0	2022-10-22	Initial Version	Нао
1.1	2024-6-19	Add the chip corresponding pin description	Нао

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