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

E70-433MS14 Datasheet v1.1

Contents

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1. Introduction

E70-433MS14 is an UART wireless transceiver module based on originally imported RFIC CC1310 of TI with transparent transmission available, it operates at 431~446.5MHz MHz (default: 433MHz) with TTL output and 3.3V IO voltage.

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

2. Features

Item	Description
Ultra-low power consumption	The receiving current is only 8mA and the standby current is only 1uA. It can be powered by battery, it has significant functional advantage.
Fixed transmission	Master can transmit data to other modules in different channels or addresses, easy for network and repeater, etc. For example: module A transmits AA BB CC to DTU 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 DTU B receives AA BB CC (only module B).
Broadcast transmission	Set the module address as 0xFFFF, then the module can communicate with other modules in the same channel.
FEC	It features FEC (Forward Error Correction) algorithm. It has 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.
Parameter save	The module will automatically save the parameters set by the user, and the parameters will not get lose at powerdown, the module will operate with the parameters as previously set when re-powered.
Super small size	The volume of this module is only less than 1/2 of that of similar ones, it is highly recommended for those applications requiring strict limitation of size.
Secondary development	CC1310 is embedded with ARM MCU, all IOs are led out to facilitate secondary development, it also supports customization.
Customization	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.
Complete series	CC1310 has packings of different sizes, the difference is the number of GPIO. Ebyte has developed complete products based on CC1310, they are of difference sizes, frequencies, functions and models. Please contact us for more details.

3. E70 Series

Model	Interface	Frequency (Hz)	Power (dBm)	Operation range (km)	Air data rate (bps)	Antenna
E70-433MS14	UART	433M	14	1.0	2.5k~168k	IPX/Stamp hole
E70-868MS14	UART	868M	14	1.5	2.5k~168k	IPX/Stamp hole
E70-915MS14	UART	915M	14	1.5	2.5k~168k	IPX/Stamp hole

4. Electrical Parameter

No.	Parameter item	Parameter details	Description
1	Size	14 * 20mm	-
2	Weight	2.0g	Average weight
3	Frequency Band	Default: 433MHz	Frequency range: 431~446.5MHz, channel: 32
4	PCB	4-layer	Impedance-matching, lead-free and SMT
5	Connector	1.27mm spacing	SMD
6	Supply voltage	2.2 ~ 3.8V DC	3.3V is recommended (Note: the voltage higher than 3.8V is forbidden)
7	Communication level	Maximum 3.8V	3.3V is recommended
8	Operation Range	1000m	Test condition: clear and open area& 14dBm, antenna gain: 5dBi , height: 2m , air data rate: 2.5kbps
9	Transmitting power	14dBm	25mW, can be configured to 14, 10, 7, 4dBm.
10	Air data rate	2.5kbps	Can be configured to 2.5, 5, 12, 28, 64, 168kbps.
11	Standby current	1.0uA	Mode 3 (M0=1. M1=1, M2=1)
12	Transmitting current	37mA@14dBm	≥300mA (recommended) (this is the current at 3.3V voltage supply)
13	Receiving current	8mA	Mode 0, mode 1, mode 2
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 transmission mode
17	Receiving length	Depends on mode	Please refer to transmission mode
18	Address	65536 configurable addresses	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 behind
21	Antenna type	IPEX	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.

5. UART Functional description (default)

5.1 Fixed transmission

	Format	Values
Fixed transmission format (hexadecimal) for example: 00 03 04 AA BB CC 00 03 are the address of target module; 04 is the channel of target module; AA BB CC are the data to be sent.		
Transmitter A	HEX	Address: 00 01; Channel: 02
Receiver B	HEX	Address: 00 03; Channel: 04
Receiver C	HEX	Address: 00 05; Channel: 04
Receiver D	HEX	Address: 00 07; Channel: 06
Module A must be in fixed transmission mode.		
Module A sends	HEX	00 03 04 AA BB CC
Module B receives	HEX	AA BB CC
Module C receives	HEX	Null
Module D receives	HEX	Null
The receivers cannot receive data unless the address and channel match. Only 1 data packet length is supported for fixed transmission (refer to electrical parameters); If the data exceeds 1 data packet length, it will be sub-packed automatically.		

5.2 Broadcast transmission

	Format	Values
Fixed transmission format (hexadecimal) for example: FF FF 04 AA BB CC FF FF are broadcast address; 04 is the channel of target module; AA BB CC are the data to be sent.		
Transmitter A	HEX	Address: 00 01; Channel: 02
Receiver B	HEX	Address: 00 03; Channel: 04
Receiver C	HEX	Address: 00 05; Channel: 04
Receiver D	HEX	Address: 00 07; Channel: 06
Module A must be in fixed transmission mode.		
Module A sends	HEX	FF FF 04 AA BB CC
Module B receives	HEX	AA BB CC
Module C receives	HEX	AA BB CC
Module D receives	HEX	Null
All modules in the target channel will receive data. Only 1 data packet length is supported for fixed transmission (refer to electrical parameters); If the data exceeds 1 data packet length, it will be sub-packed automatically.		

5.3 Broadcast address

1.	For example: Set the address of module A as 0xFF FF, and channel as 0x04;
2.	When module is the transmitter (transparent transmission), all modules under channel 0x04 will receive the data, the purpose of broadcast is realized.

5.4 Monitor address

1.	For example: Set the address of module A as 0xFF FF, and channel as 0x04;
2.	When module is the receiver, it can receive the data sent from all modules under channel 0x04, the purpose of monitor is realized.

6. Functional description

6.1 Pin Definition
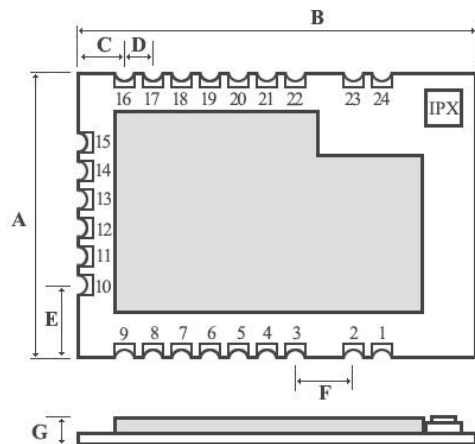
Units: mm	MIN	NOR	MAX
A	13.81	14.01	14.21
B	19.80	20.00	20.00
C	2.59	2.69	2.79
D	1.27	1.27	1.27
E	3.73	3.83	3.93
F	2.92	2.92	2.92
G	2.37	2.57	2.77

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	VCC		Positive power reference of the module Voltage range : 2.2V ~ 3.8V DC
9	GND	Ground	Ground electrode
10	GND	Ground	Ground electrode
11	PA_EN	Output	External PA control output, valid in high level (floatable)
12	LNA_EN	Output	External LNA control output, valid in high level (floatable)

13	M2	Input	M2, M1, M0 jointly decide the 8 working modes; an external 1k protective resistor shall be connected in series when in use.
14	RESET	Input	Module reset pin, valid in low level
15	GND	Ground	Ground electrode
16	AUX	Output	It is used to indicate the module operation status, 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 (can be floated)
17	TXD	Output	It also can be used as TTL serial port output connecting to external RXD input pin. It can be configured as open-drain or push-pull input, please refer to parameter setting part
18	TCKC	Input	JTAG TCKC
19	TMSC	Input	JTAG TMSC
20	RXD	Input	TTL serial port input connecting to external TXD pin. It can be configured as open-drain or high pull input, please refer to parameter setting part.
21	M1	Input	M2, M1, M0 jointly decide the 8 working modes; (Cannot be floated, it can be grounded when not used)
22	M0	Input	M2, M1, M0 jointly decide the 8 working modes; (Cannot be floated, it can be grounded when not used)
23	GND	Ground	Ground electrode
24	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	When transmitting
2	0	1	When receiving
3	0	0	When in sleep

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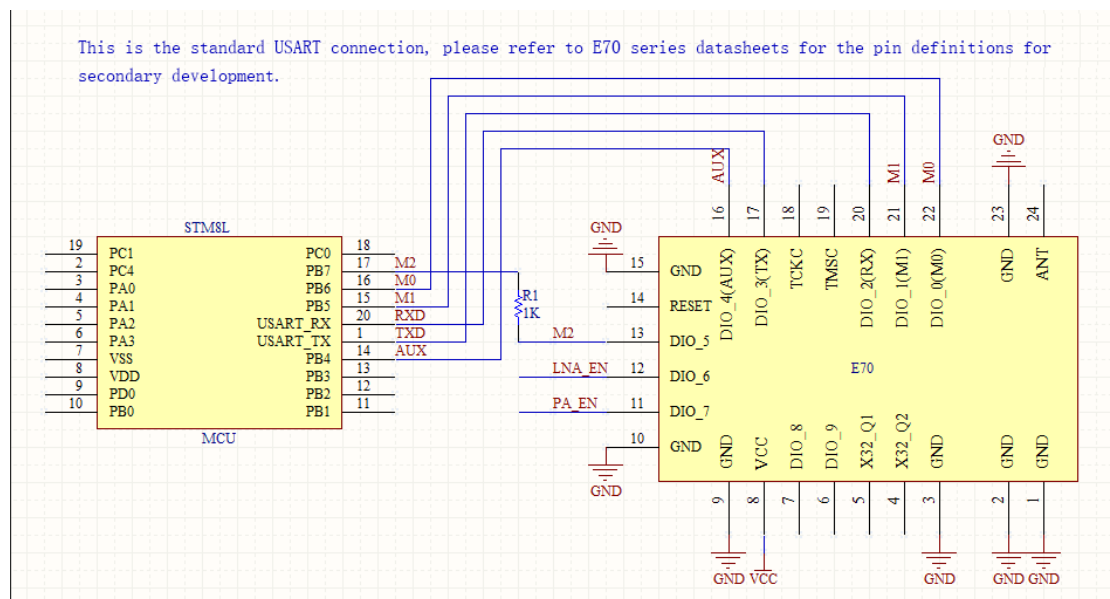
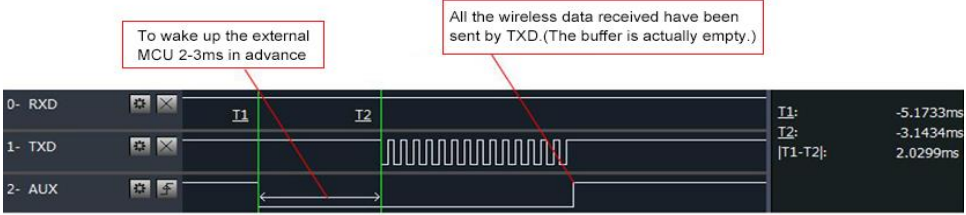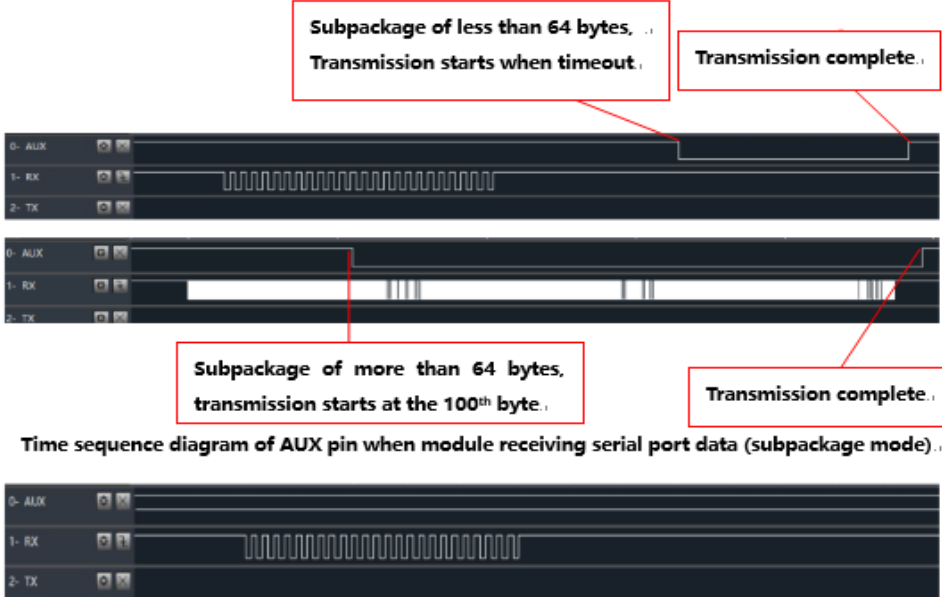| No.	Description (STM8L MCU)
1	The UART module is TTL level., please connect to the MCU of TTL level.
2	For some MCU works at 5VDC, it may need to add 4 ~ 10K pull-up resistor for the TXD & AUX pins.
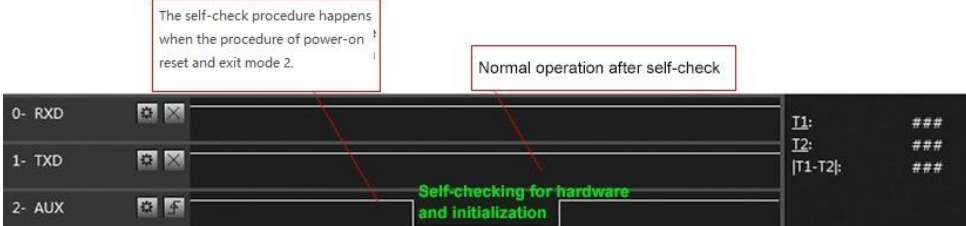
6.3 Reset

No.	Description
1	When the module is powered on, AUX outputs low level immediately, conducts hardware self-check and set 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.

6.4 AUX description

AUX Pin can be used as indication for wireless send & receive buffer and self-check.

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

No.	Description
1	【Indication of UART output】can be used to wake up external MCU. **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 buffer is 1023 bytes, when the AUX=1, user could transmit no more than 1024 bytes continuously. 2. Under continuous transmission mode, AUX=1, there is no limit 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 quitting sleep mode **Timing Sequence Diagram of AUX when self-check**

7. Operating mode

The module has 8 modes, which are decided by M0, M1, M2 jointly, please refer to below table:

Mode (0-7)	M2	M1	M0	Mode introduction	Remark
0 RSSI mode	0	0	0	UART open, wireless closed, transmission not available.	Module outputs RSSI value each 100ms through UART
1 continuous mode	0	0	1	UART open, wireless open, continuous transparent transmission available.	Air data rate automatically adjust according to baud rate, baud rate must be same on both receiver and transmitter, applicable for high speed continuous data transmission.
2 subpackage mode	0	1	0	UART open, wireless open, subpackage transparent transmission available.	Air data rate and baud rate can be adjusted independently, applicable for data packet transmission.
3 configuration mode	0	1	1	UART open, wireless closed, for parameter configuration.	Baud rate is fixed as 9600 8N1.
4 WOR mode	1	0	0	UART open, wireless open, subpackage transparent transmission available.	Receiving not available under this mode, wake up code will be added automatically before transmission to wake up the receiver under mode 6.
5 same as 3 (configuration mode)	1	0	1	-	-
6 power saving mode	1	1	0	UART closed, wireless works at WOR power saving mode, multiple time grades can be configured.	Transmission not available under this mode, it can be woken up by transmitter under mode 4 in order for low power consumption receiving.
7 sleep mode	1	1	1	UART closed, wireless transmission, sleep mode.	Can be woken up by any falling edge of M2, M1, M0.

7.1 Mode switch

No.	Remarks
1	The user can decide the operating mode by the combination of M2, M1 and M0. The GPIO of MCU can be used to control the mode-switch. After modifying M2, M1 or M0, it will start to work in new mode if the module is free (AUX in high level); If there are any serial data that is yet to be transmitted, it will start to work in new mode after the data is transmitted completely. After the module receives the wireless data & transmits the data through serial port, it will start to work in new mode after the transmitting is completed. Therefore, the mode-switch is only valid when AUX outputs 1, otherwise switch will be delayed.
2	For example, in mode 2 or mode 4, if the user inputs massive data consecutively and switches operating mode at the same time, the mode-switch operation is invalid. New mode checking can only be started after all the user's data is processed. It is recommended that after check AUX pinout status and wait 2ms after AUX outputs high level, then switch the mode.
3	If the module switches from other modes to configuration mode, it will be work in sleep mode only after all the remained data process completes. The feature can be used to enter sleep mode quickly for power saving. For example, the transmitter works in mode 0, after the external MCU transmits data "12345". It can switch to sleep mode immediately without waiting for the rising edge of the AUX pin, also the user's main MCU will go dormancy immediately. Then the module will transmit all the data through wireless transmission & go dormancy 1ms later automatically. Which reduce MCU working time & save power.
4	Likewise, this feature can be used in any mode-switch. The module will start to work in new mode within 1ms after completing present mode task, which enable the user to omit the procedure of AUX inquiry and switch mode swiftly. For example, when switch from transmitting mode to receiving mode, the user MCU can go dormancy in advance of mode-switch, using external interrupt function to get AUX change so that the mode-switch can be done.
5	This operation is very flexible and efficient. It is totally designed on the basis of the user MCU's convenience, at the same time reduce the whole system work load as much as possible, increase the efficiency of system work and reduce power consumption.

7.2 RSSI mode (mode 0)

Status	M2M1M0 = 000
Transmitting	Wireless data transmission not available
Receiving	Wireless data receiving not available
Baud rate & air data rate	Current baud rate
Advantage	On byte of RSSI value outputted each 100ms for indicating the noise value of current environment.
Disadvantage	Data transmission and receiving not available
Applications	For monitoring environmental noise
Note	-

7.3 Continuous mode (mode 1)

Status	M2M1M0 = 001
Transmitting	Wireless data transmission available
Receiving	Wireless data receiving available
Baud rate & air data rate	Module will calculate the minimum air data rate according to the configured baud rate. Since modules with different air data rate cannot communicate, so the serial port parameters must be the same on both receiver and transmitter.
Advantage	The data output on the receiver is continuous, it meets the requirements for MODBUS continuous transmission and low latency.
Disadvantage	The baud rates on both receiver and transmitter must be same, the module will raise its air data when the baud rate is raised, thus the receiving sensitivity will be lowered and operation range will be shorter.
Applications	Applicable for those applications not requiring distance but continuous data and response time.
Note	1. The "wireless air data" in the configuration commands is invalid (SPED.210 bits), software will calculate automatically. 2. 0000 and FFFF are the broadcast addresses, which can be used to monitor and broadcast. 3. The addresses and baud rates must be same on both receiver and transmitter.

7.4 Subpackage mode (mode 2)

Status	M2M1M0 = 010
Transmitting	Wireless data transmission available
Receiving	Wireless data receiving available
Baud rate & air data rate	Under this mode, the baud rate and air data rate are independent, both receiver and transmitter can have different baud rate but same air data rate.
Advantage	Very low air data rate can be configured for longer distance, the data continuousness between output data depends on the data packet length.
Disadvantage	Since the air data rate is low and the receiver needs to wait for the data packet length or timeout byte numbers, it may cause some delay, which depends on the actual value as set.
Applications	Applicable for those applications requiring distance and continuous data while not requiring transmission speed.
Note	1. Air data rate and baud rate are not relative; the values are valid. 2. 0000 and FFFF are the broadcast addresses, which can be used to monitor and broadcast. 3. The addresses and air data rates must be same, but baud rates can be different on both receiver and transmitter. 4. The size of individual data packet depends on the subpackage size CHAN [7:5] (excluding address and channel for directional transmission)

7.5 Configuration mode (mode 3)

Status	M2M1M0 = 011
Transmitting	Transmission not available, serial data received will be discarded.
Receiving	Receiving not available
Configuring	Parameter configuration can be made in configuration mode with specific instruction format and UART 9600, 8N1.
Note	When entering other modes from configuration mode, the module will reconfigure parameters, AUX keeps low level during configuration; After configuration completed, it outputs high level, so users are recommended to check the AUX rising edge.

7.6 Wake-up mode (mode 4)

Status	M2M1M0 = 100
Transmitting	Transmission available
Receiving	Receiving not available
Baud rate & air data rate	Under this mode, the baud rate and air data rate are independent, both receiver and transmitter can have different baud rate but same air data rate.
Advantage	It can wake up the receiver under mode 6; wake up code will be added automatically before transmitting, the code number depends on the wake up time.
Disadvantage	The transmission time is long, only applicable to wake up the receiver, not applicable for common data transmission.
Applications	For waking up the receiver under WOR mode.
Note	Under wake up mode, the single data packet length is 84 bytes (excluding the address and channel for directional transmission).

7.7 Configuration mode (mode 5)

Status	M2M1M0 = 101
Transmitting	Transmission not available, serial data received are considered as configuration command.
Receiving	Receiving not available
Configuration	Parameter configuration can be made in configuration mode with specific instruction format and UART 9600, 8N1.
Note	When entering other modes from configuration mode, the module will reconfigure parameters, AUX keeps low level during configuration; After configuration completed, it outputs high level, so users are recommended to check the AUX rising edge.

7.8 Power saving mode (mode 6)

Status	M2M1M0 = 110
Transmitting	Transmission not available
Receiving	Receiving available
Baud rate & air data rate	Under this mode, the baud rate and air data rate are independent, both receiver and transmitter can have different baud rate but same air data rate.
Advantage	The module works under WOR status, it wakes up periodically and monitors the wireless data packets, when data packet monitored, the module enters receiving mode and receives complete data packets, and outputs the data through serial port, and then enters WOR status again, which can save power consumption significantly.
Disadvantage	Transmission is not available under this mode, the module must be switched to other mode for data transmission.
Applications	Applicable for those devices which have requirement on power consumption and need to receive data.
Note	It can only receive the data sent from the transmitter under mode 4.

7.9 Sleep mode (mode 7)

Status	M2M1M0 = 111
Transmitting	Transmitting not available.
Receiving	Receiving not available
Others	Other functions of the module are closed, only can quit sleep mode by switching the M2M1M0 status.

8. Instruction format

In configuration mode (mode 3 : M0=1, M1=1, M2=0), it supports below instructions on list.

(**Only support 9600 and 8N1 format when setting**):

No.	Format	Description
1	C0+working parameter	C0 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes (in total) must be sent in succession. (Save the parameters when power- down)
2	C1+C1+C1	Three C1 are sent in hexadecimal format. The module returns the saved parameters and they must be sent in succession.
3	C2+working parameter	C2 + 5 bytes working parameters are sent in HEX format. 6 bytes (in total) must be sent in succession. (Don't save parameters when power- down).
4	C3+C3+C3	Three C3 are sent in hexadecimal format. The module returns the version information and they must be sent in succession.
5	C4+C4+C4	Three C4 are sent in hexadecimal format. The module will be reset one time and they must be sent in succession.

8.1 Factory default parameter

Factory default parameter: C0 00 00 18 4E 1C							
Model	Frequency	Address	Channel	Air data rate	Baud rate	UART format	Transmitting power
E70-433MS14	433MHz	0x0000	0x04	2.5kbps	9600	8N1	25mW

8.2 Reading operating parameter

Instruction format	Description
C1+C1+C1	In configuration mode (M0=1, M1=1, M2=0), user gives module instruction (HEX format): C1 C1 C1. The module returns the present configuration parameters. For example, C0 00 00 18 44 1C.

8.3 Reading version number

Instruction format	Description
C3+C3+C3	In configuration mode (M0=1, M1=1, M2=0, user gives module instruction (HEX format): C3 C3 C3 , Module returns its settings, for example: C3 0070 XX1 XX2 XX3 XX4 XX5; 0070 here means the module model (E70 series), XX1 is the version number and XX2 XX3 XX4 XX5 refers to other features.

8.4 Reset instruction

Instruction format	Description
C4+C4+C4	In configuration mode (M0=1, M1=1, M2=0, user gives module instruction (HEX format): C4 C4 C4 , Module resets for one time and conducts self-checking, AUX outputs low level, when resetting is completed, AUX outputs high level, then module works normally. Now, mode switch can be made or another instruction can be sent.

8.5 Parameter setting instruction

No.	Item	Description	Notes
0	HEAD	Fix 0xC0 or 0xC2, it means this frame data is control instruction	● Must be 0xC0 or 0xC2 C0: Save the parameters when power- down C2: Do not save the parameters when power- down
1	ADDH	High address byte of module (the default 00H)	00H-FFH
2	ADDL	Low address byte of module (the default 00H)	00H-FFH
3	SPED	Rate parameter , including UART baud rate and air data rate 7 , 6 UART parity bit 00 : 8N1 (default) 01 : 8O1 10 : 8E1 11 : 8N1 (equal to 00) -- 5 , 4 , 3 TTL UART baud rate (bps) 000 : 1200bps 001 : 2400bps 010 : 4800bps 011 : 9600bps (default) 100 : 19200bps 101 : 38400bps 110 : 57600bps 111 : 115200bps -- 2 , 1 , 0 Air data rate (bps) 000 : 2.5k (default) 001 : 5k 010 : 12k 011 : 28k 100 : 64k 101 : 168k 110 : 168k (equal to 101) 111 : 168k (equal to 101)	● UART mode can be different between communication parties. ------------------------------------ ● UART baud rate can be different between communication parties. ● The UART baud rate has nothing to do with wireless transmission parameters & won't affect the wireless transmit / receive features. ------------------------------------ ● The lower the air data rate, the longer the transmitting distance, the better anti-interference performance and longer transmitting time ● The air data rate must keep the same for both communication parties ● Under continuous mode (M2M1M0=001), this parameter is invalid

4	CHAN	7、6、5：Packet length (only for subpackage mode) 000： 16 bytes 001： 32 bytes 010： 64 bytes (default) 011： 128 bytes 100： 256 bytes 101： 512 bytes 110： 1024 bytes 111： 2048 bytes --- 4 - 0： Channel, (431M+CHAN*0.5M) 　　　 default 04H (433MHz)	----------------------------------- ● 00H-1FH 　431~446.5MHz
5	OPTION	7， 　Fixed transmission (similar to MODBUS) 　 0：Transparent transmission mode (default) 　 1：Fixed transmission mode --- 6，5，4　wireless wake-up time 000： 500ms 001： 1000ms (default) 010： 1500ms 011： 2000ms 100： 2500ms 101： 3000ms 110： 3500ms 111： 4000ms	● When it is 1, the first three bytes of each user data frame can be used as high/low address and channel. The module changes its address and channel when transmitting. And it will revert to original setting after the process is completed. ● It is transparent transmission under transparent mode ● This parameter is only valid for mod 4, 6. ● For mode 6, the wake-up time will affect the WOR cycle of the module, and affect the power consumption. ● For mode 4, the wake-up time decides the number of wake-up code before transmission so as to ensure the wake up the module in mode 6. ● Generally, mode 4 and 6 shall be used jointly and the wake-up time on both modules shall be the same.

			--------------------------------------	--------------------------------------
			3,　　　FEC switch 　　　0：Turn off FEC 　　　1：Turn on FEC (default)	● After turn off FEC, the actual data transmission rate increases while anti-interference ability decreases. Also, the transmission distance is relatively short. ● Both communication parties must keep on the same pages about turn-on or turn-off FEC.
			--------------------------------------	--------------------------------------
			2　　IO drive mode (default 1) 　　1：TXD and AUX push-pull outputs, RXD pull-up inputs 　　0：TXD、AUX open-collector outputs, RXD open-collector inputs	● This bit is used to the internal pull-up resistor. It also increases the level's adaptability in case of open drain. But in some cases, it may need external pull-up resistor.
			--------------------------------------	--------------------------------------
			1, 0　　transmission power (approximation) 　　00：14dBm (default) 　　01：10dBm 　　10：7dBm 　　11：4dBm	● The external power must ensure that the ability of current output is more than 300mA and the power supply ripple is within 100mV. ● Low power transmission is not recommended due to its low power supply efficiency

For example: The meaning of No.3 "SPED" byte:

	7	6	5	4	3	2	1	0
The binary bit of the byte	7	6	5	4	3	2	1	0
The specific value (configured by user)	0	0	0	1	1	0	0	0
Meaning	UART parity bit 8N1		UART baud rate is 9600			Air data rate is 2.5k		
Corresponding hexadecimal	1				8			

9. Parameter setting

Steps	Operations	Descriptions
1	Install driver	Please install the USB-TTL adaptor driver (CP2101)
2	Choose mode	Put the module to configuration mode; connect with 5V power supply.
3	Connect modules	Match the module pinouts with the UART pins of the adaptor (RX & TX), plug the adaptor into PC USB port.
4	Open serial port	Open our RF Setting software, choose corresponding Com number and open relevant serial ports.
5	Enter interface	Click on the "GetParam"; if reading failed, please check if the module is in mode 3; or if the driver is installed correctly.
6	Write in parameters	Change the parameters as needed, click on the "SetParam" button.
7	Complete operation	Please repeat the step 5 if you need to reconfigure the parameters; click on the "ClosePort" and take off the module.
8	Command configuring	The MCU could use command to configure the module parameters, please refer to above "Instruction format –parameter setting instruction" for detailed settings.

10. Secondary Development

E70-433MS14 supports secondary development, it is embedded with CC1310 SOC chip, users could conduct secondary development based on below pin definition, Ebyte provides firmware customization service, please contact us for more details.
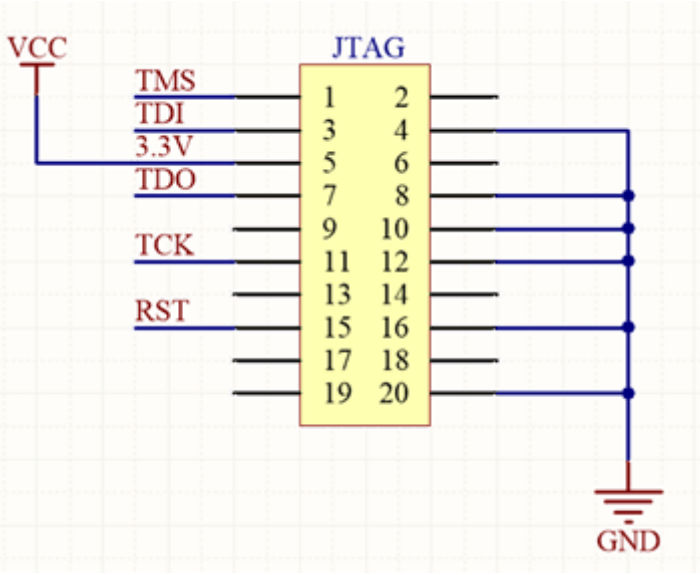
10.1 Size
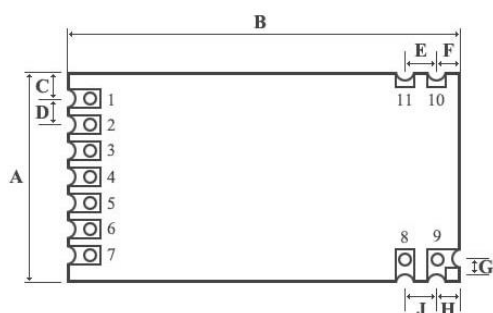
	MIN	MIN	MAX
A	16.9	17.0	17.1
B	25.4	25.5	25.6
C	2.45	2.50	2.55
D	2.00	2.00	2.00
E	2.00	2.00	2.00
F	1.25	1.30	1.35
G	1.30	1.35	1.40
H	1.25	1.30	1.35
J	2.00	2.00	2.00
K	2.00	2.10	2.20

Units: mm

10.2 Pin definition for secondary development

No.	Pin item	Pin direction	Application
1	GND	Ground	Ground electrode
2	GND	Ground	Ground electrode
3	GND	Ground	Ground electrode
4	X32K_Q1	Input/Output	Connected to 32.768K quartz crystal oscillator with pin 5
5	X32K_Q2	Input/Output	Connected to 32.768K quartz crystal oscillator with pin 4
6	DIO_9	Input/Output	MCU GPIO
7	DIO_8	Input/Output	MCU GPIO
8	VCC	Input	Positive power reference. Voltage: 2.2V ~ 3.8V DC
9	GND	Ground	Ground electrode
10	GND	Ground	Ground electrode
11	DIO_7	Input/Output	MCU GPIO
12	DIO_6	Input/Output	MCU GPIO
13	DIO_5	Input/Output	MCU GPIO
14	RESET	Input	Reset pin
15	GND	Ground	Ground electrode
16	DIO_4	Input/Output	MCU GPIO
17	DIO_3	Input/Output	MCU GPIO
18	TCKC	Input	JTAG TCKC
19	TMSC	Input	JTAG TMSC
20	DIO_2	Input/Output	MCU IO
21	DIO_1	Input/Output	MCU IO (this module pin is with a 1MΩ pull-up resistor)
22	DIO_0	Input/Output	Can be configured as general GPIO; (this pin is embedded with a 1MΩ pull-up resistor)
23	GND	Ground	Ground electrode
24	ANT		Antenna (50Ω characteristic impedance)

10.3 Programming

Key word	Notes
Programming	This module is a SOC with GPIO, CC series downloaders can be used to program the module: JTAG downloader (or TI official development board matching CC1310), serial port or any other ISP, ICP tools are not allowed. Below figure is the JTAG connection diagram (XDS100). Please refer to TI official document for development method. (TDI and TDO pins can be disconnected). JTAG downloader connection diagram

11. Customization

★Please contact us for customization.

★Ebyte has established profound cooperation with various well-known enterprises.

12. 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.