



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

E43-433T13S Datasheet v1.2

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1.Introduction

1.1 Features



E43-433T13S is a wireless rf module with super high cost performance designed by Chengdu Ebyte. It has 4 operating mode and 2 transmitting methods, which has it' s own characteristics, suitable for various application. With strict testing before factory, E43-433T13S perfectly supports the industrial application, ensuring the reliability and the consistency of batch production.

E43-433T1S supports maximum 13dbm transmitting current, users can set a lower output power to save consumption. It works on 433MHz, TTL level and compatible with 3.3V IO port.

The module has the function of data encryption & compression. The data of the module transmit in 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 interference, while improving the reliability & transmission efficiency. It' s a low cost wireless UART transmitter and receiver module.

No.	Features	Description
1	Operating mode	4 Operating mode: Transmitting mode, RSSI mode, Setting mode, Sleep mode. Users can switch it quickly with the GPIO of 2 MCU.
2	Transmitting method	2 Transmitting methods: Transparent transmission and fixed transmission
3	RSSI output	In RSSI mode, module will output RSSI information in every 100ms so that users can monitor the signal strength of actual environment.
4	Application	433M belongs to free frequency, so users can use it directly. Comparing with 2.4G, 433M has the capability of penetration and diffraction.
5	Ultra low cost	Comparing with the CC1101 and others. this module has more cost advantages and the performance is much better than CC1101.
6	Fixed transmission	Module can communicate with other modules which work in different channels and address, easy for networking and repeater. 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).
7	Broadcast and monitor	Set the module address as 0xFFFF, then the module can communicate with other modules in same channel.
8	Customized software	Available.
9	Minimal volume	small size: 13*18.5mm, and has shield and half-hold+IPEX antenna interface.

1.2 Electrical Parameters

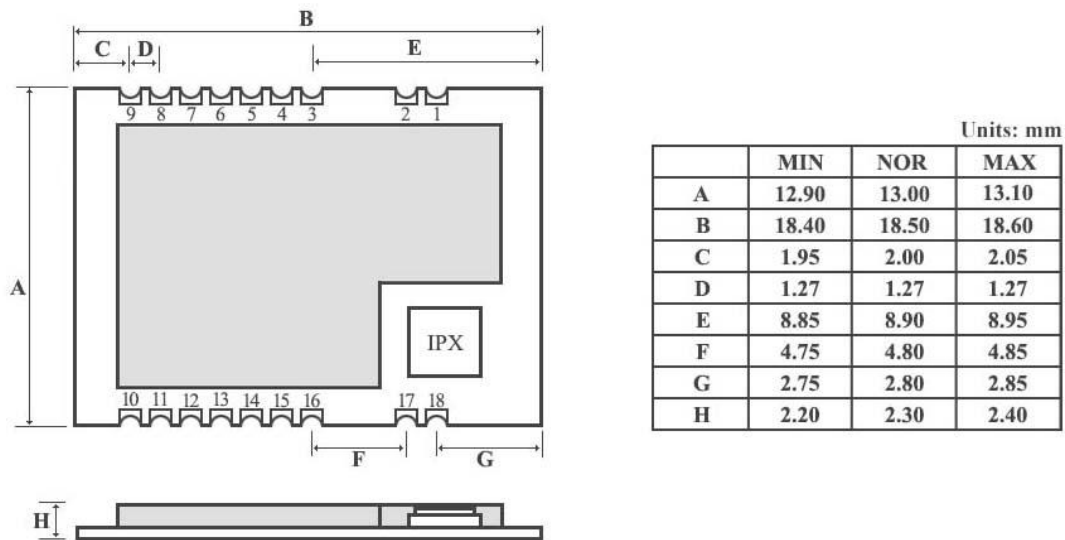
No.	Item	Parameter details	Description
1	Size	18.5*13mm	-
2	Weight	0.93g	Average Weight
3	Frequency Band	425~440.75MHz	Default: 433MHz, channel: 64
4	Process	Lead-free, SMT	Ensure consistency and reliability of mass production
5	Connector	SMD	SMD
6	Supply voltage	1.8~ 3.6V DC	3.3V is recommended, the voltage higher than 3.6V is forbidden.
7	Communication level	3.3V	The difference with supply voltage should be less than 0.3V to reduce the power consumption.
8	Operation Range	650m	Test condition :clear and open area& maximum power , antenna gain: 5dBi , height:> 2m , air data rate: 2.4kbps
9	Transmitting power	13dBm	About 20mW, Four optional level (3,7,10,13dBm)
10	Air data rate	1.2kbps	Can be configured to 1.2, 2.4, 4.8, 9.6kbps.
11	Standby current	2uA	M1=1, M0=1 (Mode 3)
12	Transmitting current	30mA@ 13dBm	Power supply must be over 100mA
13	Receiving current	14.5mA	Mode 0
14	Communication interface	UART	8N1, 8E1, 8O1 , Eight kinds of UART baud Rate from 1200 to 115200 bps
15	Driving mode	UART	UART can be configured to push-pull/high pull, open-drain
16	Transmitting length	80 bytes buffer	40 bytes per package
17	Receiving length	80 bytes buffer	40 bytes per package
18	Address	65536	Easy for network, broadcast and fixed transmission
19	WOR	N/A	This function can be customized.
20	Antenna type	IPX/Stamp hole	50 ohm impedance
21	Operating temperature	-40 ~ +85°C	-
22	Operating humidity	10% ~ 90%	Relative humidity, No condensation
23	Storage temperature	-40 ~ +125°C	-
24	Receiving sensitivity	-109dBm@ 2.4kbps	Sensitivity has nothing to do with serial baud rate or timing

1.3 E43 Series

Model	Connector	Frequency (Hz)	Power (dBm)	Range (m)	Air data rate (bps)	Size(mm)	Packing
E43-433T13S	UART	433M	13	650	1.2k~9.6k	18.5*13	SMA
E43-433T13S is compatible with other E43 series							

2.Function description

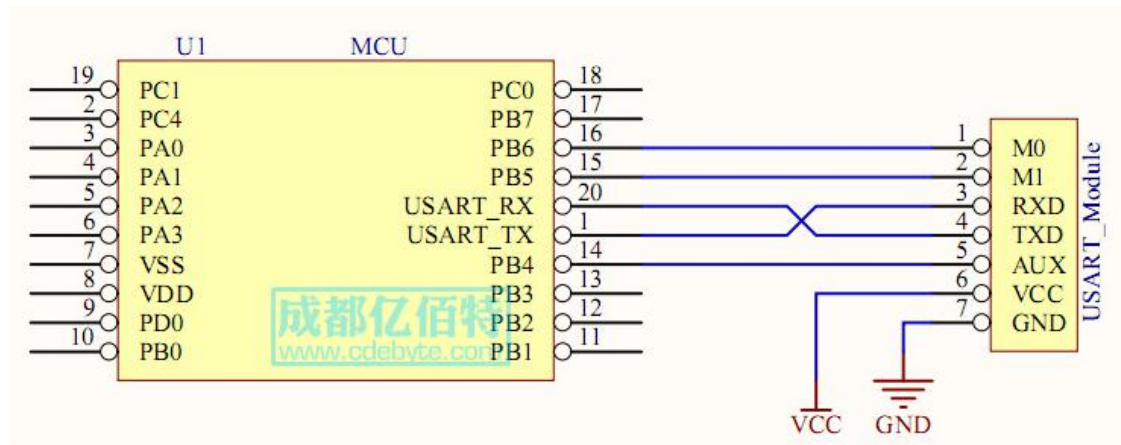
2.1 Pin definition



For package library of Altium designer, please download from <http://www.cdebyte.com/en/>
or contact: support@cdebyte.com

Pin No.	Pin item	Pin direction	Pin application
1	GND	Input	Ground wire, connect to power reference ground.
2	GND	Input	Ground wire, connect to power reference ground.
3	GND	Input	Ground wire, connect to power reference ground.
4	GND	Input	Ground wire, connect to power reference ground.
5	GPIO1	--	Floated only. Any external electrical connection is forbidden.
6	RX	Input	TTL input, connect to external TXD output pin.
7	TX	Output	TTL output, connect to external RXD output pin.
8	AUX	Output	To indicate the working status of the module.
9	GND	Input	Ground wire, connect to power reference ground.
10	VCC	Input	Positive power supply 2.8V-3.6V
11	RSTb	Input	Active homing of low level and can be floated when free.
12	C2D	--	Floated only. Any external electrical connection is forbidden.
13	GND	Input	Ground wire, connect to power reference ground.
14	M2	--	Floated only. Any external electrical connection is forbidden.
15	M1	Input (weak pull-up)	Work with M1 & decide the four operating modes. Floating is not allowed, can be ground.
16	M0	Input (weak pull-up)	Work with M0 & decide the four operating modes. Floating is not allowed, can be ground.
17	GND	Input	Ground wire, connect to power reference ground.
18	ANT	Output	Antenna interface(high frequency signal output,50ohm impedance)

2.2 Connect to MCU



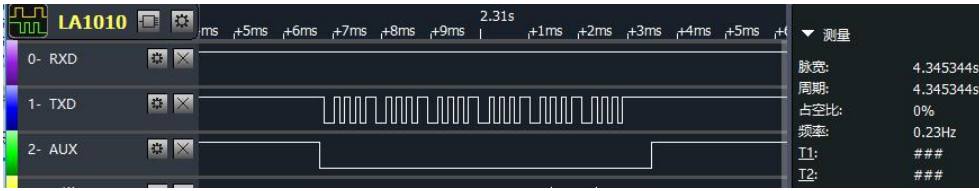
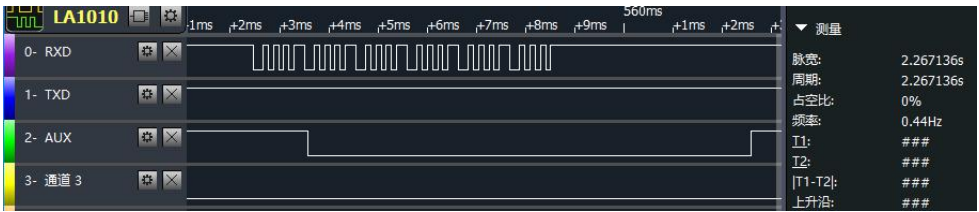
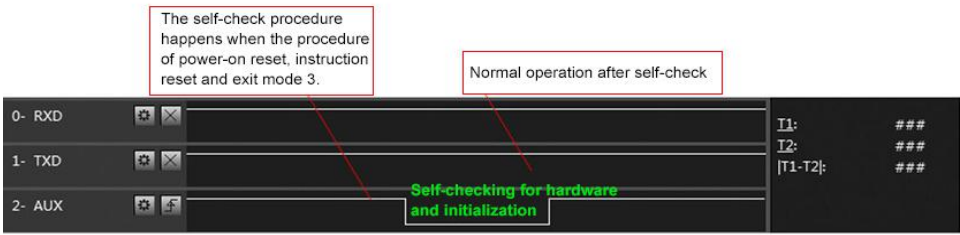
No.	Description (STM8L MCU)
1	The UART module is TTL level.
2	For some MCU works at 5VDC, it may need to add 4-10K pull-up resistor for the TXD & AUX pin.

2.3 Reset

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

2.4 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 via wireless way, or whether all wireless data has been sent through UART, or whether the module is still in the process of self-check initialization.

No.	Description
1	<p>【Indication of wireless transmitting and receiving】</p> 
2	<p>【Indication of wireless transmitting】</p> <p>Buffer (empty): the internal 80 bytes data in the buffer are written to the RFIC (Auto subpackage). When AUX=1, the user can input data less than 80 bytes continuously without overflow.</p> <p>Buffer (not empty): when AUX=0, the internal 80 bytes data in the buffer have not been written to the RFIC completely. If the user starts to transmit data at this circumstance, it may cause overtime when the module is waiting for the user data, or transmitting wireless subpackage.</p> <p>Notes: When AUX = 1, it does not mean that all the UART data of the module have been transmitted already, perhaps the last packet of data is still in transmission.</p> 
3	<p>【Configuration procedure of module】</p> <p>Only happened when power-on resetting or exiting sleep mode.</p>  <p style="text-align: center;">Timing Sequence Diagram of AUX when self-check</p>

No.	Notes for AUX
1	<p>For function 1 & function 2 mentioned above, the priority should be given to the one with low level output, which means if it meets each of any low level output condition, AUX outputs low level, if none of the low level condition is met, AUX outputs high level.</p>
2	<p>When AUX outputs low level, it means the module is busy & cannot conduct operating mode checking.</p> <p>Within 1ms since AUX outputs high level, the mode switch will be completed.</p>
3	<p>When the user switches to other operating modes from mode 3 (sleep mode) or it's still in reset process, the module will reset user parameters, in which AUX outputs low level.</p>

3.Operation mode

Contents in below table are the introduction of input status of M1 & M0 and their corresponding mode:

Mode (0-3)	M1	M0	Mode introduction	Remark
Mode 0 Transmitting mode	0	0	UART and wireless channel are open, then modules starts to transmit and receive data according to the set transmission mode.	Both transmitter and receiver must be the same transmission mode.
Mode 1 RSSI mode	0	1	UART and wireless channel are opened, the module will output the value of signal strength in every 100ms.	The value of strength is relative.
Mode 2 Setting mode	1	0	Module can receive the UART command, baud rate fixed as 9600, 8N1.	Parameter setting.
Mode 3 Sleep mode	1	1	UART and wireless channel is closed.	

3.1 Mode switch

No.	Remarks
1	The user can decide the operating mode by the combination of M1 and M0. The two GPIO of MCU can be used to switch mode. After modifying M1 or M0, it will start to work in new mode 1 ms later if the module is free. If there are any serial data that are yet to finish wireless transmitting, it will start to work in new mode after the UART transmitting finished. After the module receives the wireless data & transmits the data through serial port, it will start to work in new mode after the transmitting finished. Therefore, the mode-switch is only valid when AUX outputs 1, otherwise it will delay.
2	For example, in mode 0 or mode 1, 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 process completed. It is recommended to check AUX pinout status and wait 2ms after AUX outputs high level before switching the mode.
3	If the module switches from other modes to stand-by mode, it will work in stand-by mode only after all the remained data process completed. The feature can be used to save power consumption. For example, when the transmitter works in mode 0, after the external MCU transmits data "12345" , it can switch to sleep mode immediately without waiting 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 reduces 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 enables the user to omit the procedure of AUX inquiry and switch mode swiftly. For example, when switching from transmitting mode to receiving mode, the user MCU can go dormancy before mode-switch, using external interrupt function to get AUX change so that the mode-switch can be realized.
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 the work load and power consumption of the whole system has been reduced and the efficiency of whole system is largely improved.

3.2 Transmitting mode (mode 0)

When M1 = 0 & M0 = 0, module works in mode 0	
Transmitting	<p>The module can receive the user data via serial port, and transmit wireless data package of 40 bytes. When the data inputted by user is up to 40 byte, the module will start wireless transmission. During which the user can input data continuously for transmission.</p> <p>When the required transmission bytes are less than 40 bytes, the module will wait 3-byte time and treat it as data termination unless continuous data inputted by user. Then the module will transmit all the data through wireless channel.</p> <p>When the module receives the first data packet from user, the AUX outputs low level.</p> <p>After all the data are transmitted into RF chip and transmission is started, AUX outputs high level.</p> <p>At this time, it means that the last wireless data package transmission is started, which enables the user to input another 80 bytes continuously. The data package transmitted from the module working in mode 0 can only be received by the module working in mode 0.</p>
Receiving	<p>The wireless receiving function of the module is on, the data packet transmitted from the module working in mode 0 can be received.</p> <p>After the data packet is received, the AUX outputs low level, 5ms later the module starts to transmit wireless data through serial port TXD pin.</p> <p>After all the wireless data have been transmitted via serial port, the AUX outputs high level.</p>

3.3 RSSI mode (mode 1)

When M1 = 0 & M0 = 1, module works in mode 1.	
Transmitting	N/A, the received serial port data will be dropped.
Receiving	N/A. Modules only scan the signal strength of present channel and output the strength value(relative) in every 100ms.

3.4 Setting mode (mode 2)

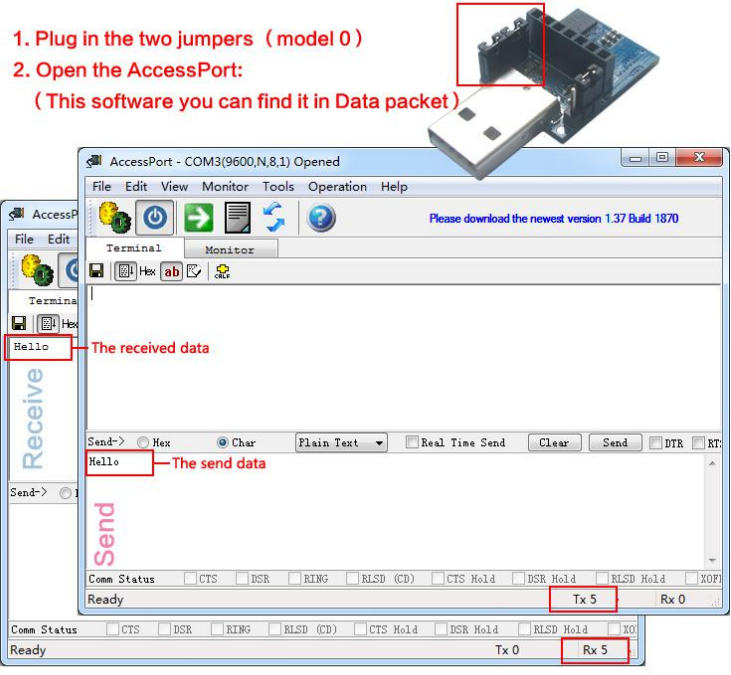
When M1 = 1 & M0 = 0, module works in mode 2.	
Transmitting	N/A, the received serial port data will be dropped.
Receiving	N/A.
Setting	Parameters setting with serial port 9600. The working parameters can be set in specified instruction format.
Note	The module will reconfigure parameters when the operating mode switched from setting mode to others. During this process, AUX keeps low level. After the process finished, AUX outputs high level. So it is recommend to check the rising edge of AUX.

3.5 Sleep mode (mode 3)

When M1=1,M0=1,module works in mode 3	
Transmitting	N/A.
Receiving	N/A.
Other	All function of module is closed. Only exit the sleep mode through status switch of M1&M0.

3.6 Quick communication test

Steps	Operation
1	Plug the USB test board (E15-USB-T2) into computer, make sure the driver is installed correctly. Plug mode-select jumper in the USB test board (M1 = 0 , M0 = 0).
2	Choose 3.3V (module supports 2.8~3.6V)
3	Operate AccessPort software and select the correct serial port code. See as below.



4. Instruction format

In command mode (mode 2 : M1=1, M0=0) , it supports below instructions on list.

(Only support 9600 and 8N1 format when setting)

No.	Instruction format	Illustration
1	C0 + working parameters	C0 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes in total and must be send 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 must be send in succession.
3	C2 + working parameters	C2 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes in total and they must be send in succession. (Do not save the 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 send in succession.

4.1 Default parameter

Default parameter values : C0 00 00 18 20 00						
Model	Frequency	Address	Channel	Air data rate	Baud rate	Transmitting power
E43-433T13S	433MHz	0x0000	0x20	1.2kpbs	9600	20

4.2 Reading operating parameters

Instruction format	Description
C1+C1+C1	In sleep mode (M0=0 , M1=1) , User gives the module instruction (HEX format): C1 C1 C1, Module returns the present configuration parameters. For example, C0 00 00 18 20 00.

4.3 Reading version number

Instruction format	Description
C3+C3+C3	In commend mode (M0=0 , M1=1) , User gives the module instruction (HEX format): C3 C3 C3, Module returns its present version number, for example C3 43 xx yy. 43 here means the module model (E43 series); xx is the version number and yy refers to the other module features.

4.4 Parameter setting instruction

No.	Item	Description	Remark
0	HEAD	Fix 0xC0 or 0xC2, it means this frame data is control command	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	SPEED	Rate parameter , including UART baud rate and air data rate 7 ,6 Reserved Bits 0 is recommended ----- 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 Reserved Bits 0 is recommended ----- 1 , 0 Air data rate (bps) 00 : 1.2Kbps (default) 01 : 2.4Kbps 10 : 4.8Kbps 11 : 9.6Kbps	<ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> The lower the air data rate, the longer the transmitting distance, better anti-interference performance and longer transmitting time The air data rate must keep the same

			for both communication parties.
4	CHAN	<p>7,6 Reserved Bits 0 is recommended</p> <p>-----</p> <p>5,4,3,2,1,0 communication channel</p> <p>Communication frequency (425M + CHAN * 0.25M) (default 20H:433M)</p>	<p>-----</p> <ul style="list-style-type: none"> ● 00H-3FH ● 425~440.75MHz
5	OPTION	<p>7, Fixed transmission (similar to MODBUS)</p> <p>0 : Transparent transmission mode (default)</p> <p>1 : Fixed transmission mode</p> <p>-----</p> <p>6,5,4,3,2 Reserved Bits</p> <p>0 is recommended</p> <p>-----</p> <p>1,0 transmission power (approximation)</p> <p>00 : 13dBm (Default)</p> <p>01 : 10dBm</p> <p>10 : 7dBm</p> <p>11 : 3dBm</p>	<ul style="list-style-type: none"> ● In fixed transmission mode, the first three bytes of each user's data frame can be used as high/low address and channel. The module changes its address and channel when transmit. And it will revert to original setting after complete the process. ● The external power must make sure the ability of current output more than 100mA and ensure the power supply ripple within 100mV. ● Low power transmission is not recommended due to its low power supply efficiency.

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

The binary bit of the byte	7	6	5	4	3	2	1	0
The specific value (user configures)	0	0	0	1	1	0	0	0
Meaning	Reserved Bits		UART baud rate is 9600			Air data rate is 1.2k		
Corresponding hexadecimal	1				8			

5.Parameter setting

Step	Operation	Description
1	Install Driver	Please install the USB adapter driver (CP2102).
2	Pull out the jumper	Pull the M0, M1 jumper out.
3	Connect to module	Connect the module with USB adapter. Connect to the USB interface of PC.
4	Open serial port	Operate the parameter setting software, choose corresponding serial number and press the "OpenPort" button. Please choose other serial numbers until open successfully.
5	Interface	Press "Preset" button , the interface will be as below. If failed, please check if the module is in mode 2, or if the driver has been installed.
6	Input parameter	Please adjust the parameter as your request according to the corresponding setting, then click "SetParam" button, write the new parameter to the module.
7	Complete the operation.	Please operate the "Fifth step" if you need to reconfigure, if the configuration is completed, please click "ClosePort" and then take off the module.
8	Commands Configuration	Parameter configuration is also available for MCU (in mode 2).

RF Setting V3.41 ✕



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Chengdu Ebyte Electronic Technology Co.,Ltd.

中文

English

ID: E43
Version: 1.2
Freq Now: 433.00MHz
Param Now: 0x0, 0x0, 0x18, 0x20, 0x0

COM4

UartRate
Parity
AirRate
Power

FEC
Fixed mode
WOR timing
IO mode

Address

Channel

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6.Package and Welding

E43-433T13S has two packing method: static bag and tape. Usually, for samples or small quantity order, we will choose the static bag, and tape packing for bulk order or customized item.

Please see more details about welding and install instruction in related documents.

7.Customization

★Please contact us for customization.

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



8.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.