



Wireless UART Module

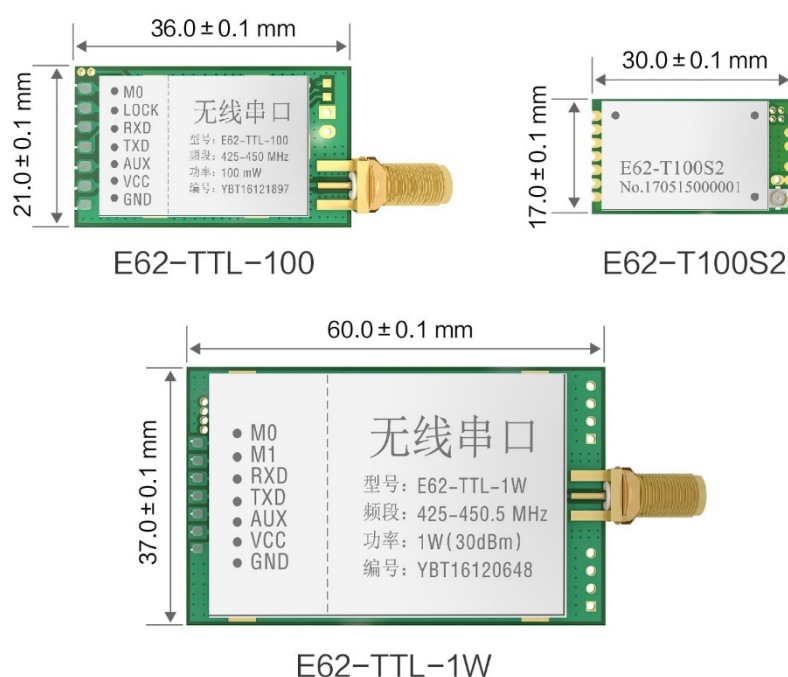
E62 Series

User Manual

This manual may be modified based on product upgrade, please refer to the latest version.
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1.00	2017/12/14	Initial version	huaa

Brief Introduction



E62 series are full duplex wireless transceiver modules (UART interface), operating at 425-450MHz (default: 433MHz) with transparent transmission available. Module features FHSS (Frequency-Hopping Spread Spectrum). During the transmission, both sides will conduct frequency-hopping automatically in a maximum of 52 channels on the basis of frequency-hopping logic (The number of FHSS channel and sequence are configurable.), which greatly improves the anti-interference performance. Ebyte is the leader in the FHSS at 433M.

Module features TDD (Time Division Duplex). User can transmit data while receiving, instead of waiting for the end of receiving. The module can transmit data continuously with some particular combination of air data rate and baud rate. Under this circumstance, there is no limit for the packet length that users transmits each time and it achieves a very low latency communication link.

Model	Frequency	Transmitting power	Distance	Packing	Antenna
E62-T100S2	433M	20dBm	1000m	SMD	Stamp hole
E62-TTL-100	433M	20dBm	1000m	DIP	SMA-K
E62-TTL-1W	433M	30dBm	3000m	DIP	Stamp hole

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1. Features

- **TDD (Time Division Duplex):** Data receiving and transmitting of both sides can be conducted at the same time. Users can transmit data while receiving, instead of waiting for the end of the receiving. The module can transmit data continuously with some particular combinations of air data rate and baud rate.
- **FHSS (Frequency-Hopping Spread Spectrum):** During the transmission, both sides will conduct frequency-hopping automatically in a maximum of 52 channels on the basis of frequency-hopping logic (The number of FHSS channel and sequence are configurable), which greatly improves the anti-interference performance.
- **FEC:** Forward Error Correction has high coding efficiency & good correction performance. In case of sudden interference, it can correct the interfered data packets proactively, so that the reliability & transmission range are improved correspondingly. Without FEC, those data packets can only be dropped.
- **Watch dog:** With built-in watchdog, the modules have the accurate time layout. Once something happened, modules restart within 0.107s and resume to work according to the previous parameter.
- **Parameter save:** After users set the parameter, it will be saved and won't be lost if powered off. Module will restart to work according to the previous parameter after powered on.

2. Technical Parameters

Model	IC	Size	Net weight	Operating temperature	Operating humidity	Storage temperature
E62-T100S2	-	17*30mm	6.7±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E62-TTL-100	-	21*36mm	6.7±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E62-TTL-1W	-	37*60mm	25±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C

2.1 Electrical Parameters

2.1.1 Transmitting Current

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	94	102	112	mA	<ul style="list-style-type: none"> When designing current supply circuit, 30% margin is recommended to be remained so as to ensure long-term stable operation of the whole module. The current at the instant of transmitting may be high, but the total energy consumed may be lower due to very short transmitting time. When using external antenna, the impedance matching degree at different frequency points between antenna and module may affect the transmitting current value at different levels.
E62-TTL-100	96	104	114	mA	
E62-TTL-1W	589	640	704	mA	

2.1.2 Receiving Current

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	31	34	37	mA	<ul style="list-style-type: none"> The current consumed when the RF chip is only working at receiving mode is called as receiving current , the tested receiving current may be higher for some RF chips with communication protocol or the developers have loaded their own protocol to the whole module. The current at pure receiving mode will be mA level, the users have to realize μA level receiving current through firmware development.
E62-TTL-100	30	33	36	mA	
E62-TTL-1W	37	40	44	mA	

2.1.3 Voltage Supply

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	2.3	3.3	5.2	V DC	<ul style="list-style-type: none"> If the module stays at maximum voltage for a long time, it may be damaged. The power supply pin has certain surge-resistance ability, but the potential pulse higher than the maximum power supply voltage. The power supply is not advisable to be below 3.0V, or the RF parameters will be influenced at different degree.
E62-TTL-100	3.3	5.0	5.2	V DC	
E62-TTL-1W	3.3	5.0	5.2	V DC	

2.1.4 Communication Level

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	2.5	3.3	3.6	V DC	<ul style="list-style-type: none"> If the module stays at maximum communication level for a long time, it may be damaged. Modules are compatible with some of the microcontrollers at 5V communication level. They are too many to be listed here. Please base on practical test or talk to us for more information.
E62-TTL-100	2.5	3.3	3.6	V DC	
E62-TTL-1W	2.5	3.3	3.6	V DC	

2.2 RF Parameters

2.2.1 Transmitting Power

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	19	20	21	dBm	<ul style="list-style-type: none"> Due to the error of the materials, each LRC component has $\pm 0.1\%$ error, so error accumulation will occur since multiple LRC components are used in the whole RF circuit, and the transmitting currents will be different at different modules. The power consumption can be lowered by lowering the transmitting power, but the efficiency of the internal PA will be decreased by lowering transmitting power due to various reasons. The transmitting power will be lowered by lowering the power supply voltage.
E62-TTL-100	19	20	21	dBm	
E62-TTL-1W	29	30	31	dBm	

2.2.2 Receiving Sensitivity

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	-104	-106	-108	dBm	<ul style="list-style-type: none"> The sensitivity is tested under the air data rate 1.3kbps. Due to the error of the materials, each LRC component has $\pm 0.1\%$ error, so error accumulation will occur since multiple LRC components are used in the whole RF circuit, and the transmitting currents will be different at different modules. The receiving sensitivity will be reduced and communication range will be shortened while increasing the air data rate.
E62-TTL-100	-104	-106	-108	dBm	
E62-TTL-1W	-107	-109	-111	dBm	

2.2.3 Recommended Working Frequency

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	425.0	433.0	450.5	MHz	<ul style="list-style-type: none"> To work within the recommended frequency can assure the modules to meet all the parameters. To avoid the crowded integral frequency like 433.0MHz、868.0MHz、915MHz etc. is advisable.
E62-TTL-100	425.0	433.0	450.5	MHz	
E62-TTL-1W	425.0	433.0	450.5	MHz	

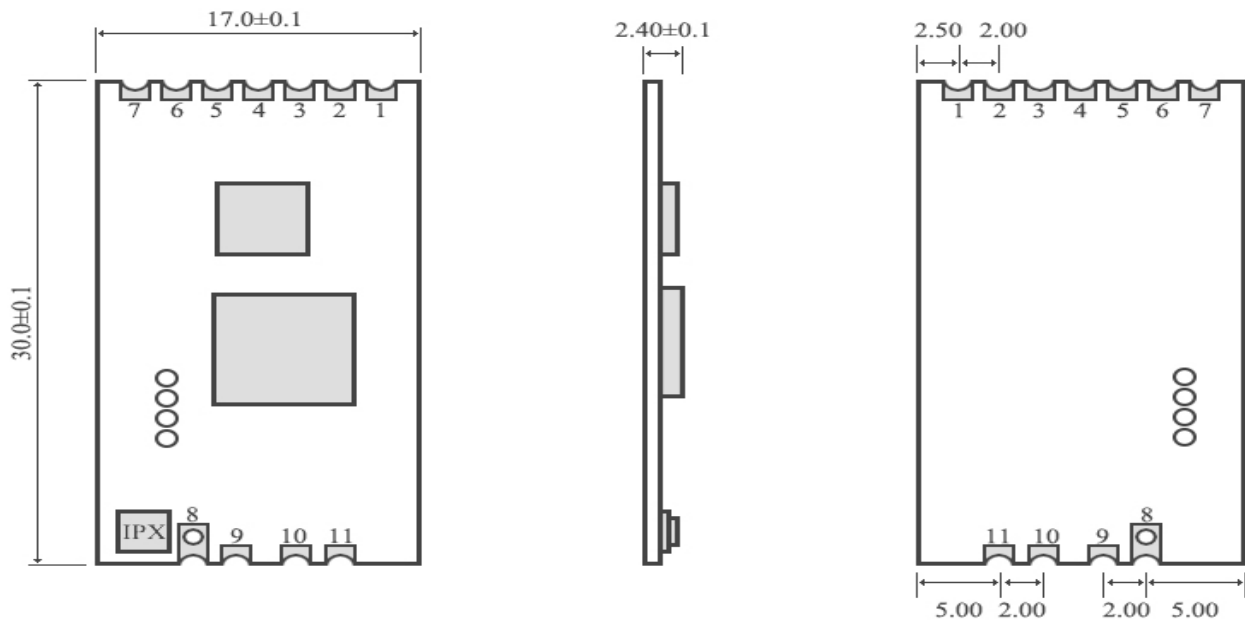
2.3 Tested Parameters

Model	Min	Typ	Max	Unit	Remarks
E62-T100S2	900	1000	1100	m	<ul style="list-style-type: none"> The external antenna used is of 2.5dBi gain and vertical polarization. The height is 2.5 meters. The interval between each data packet is 2s, sending 100 packets with 30 bytes in each packet, the range at data lose rate of lower than 5% is valid range. In order to obtain meaningful and reproducible results, we conducted the tests under in clear weather with little electromagnetic interference at suburb areas. Distance may be shorter with interference or obstacles.
E62-TTL-100	900	1000	1100	m	
E62-TTL-1W	2700	3000	3300	m	

3. Mechanical Characteristics

3.1 E62-T100S2

3.1.1 Dimension

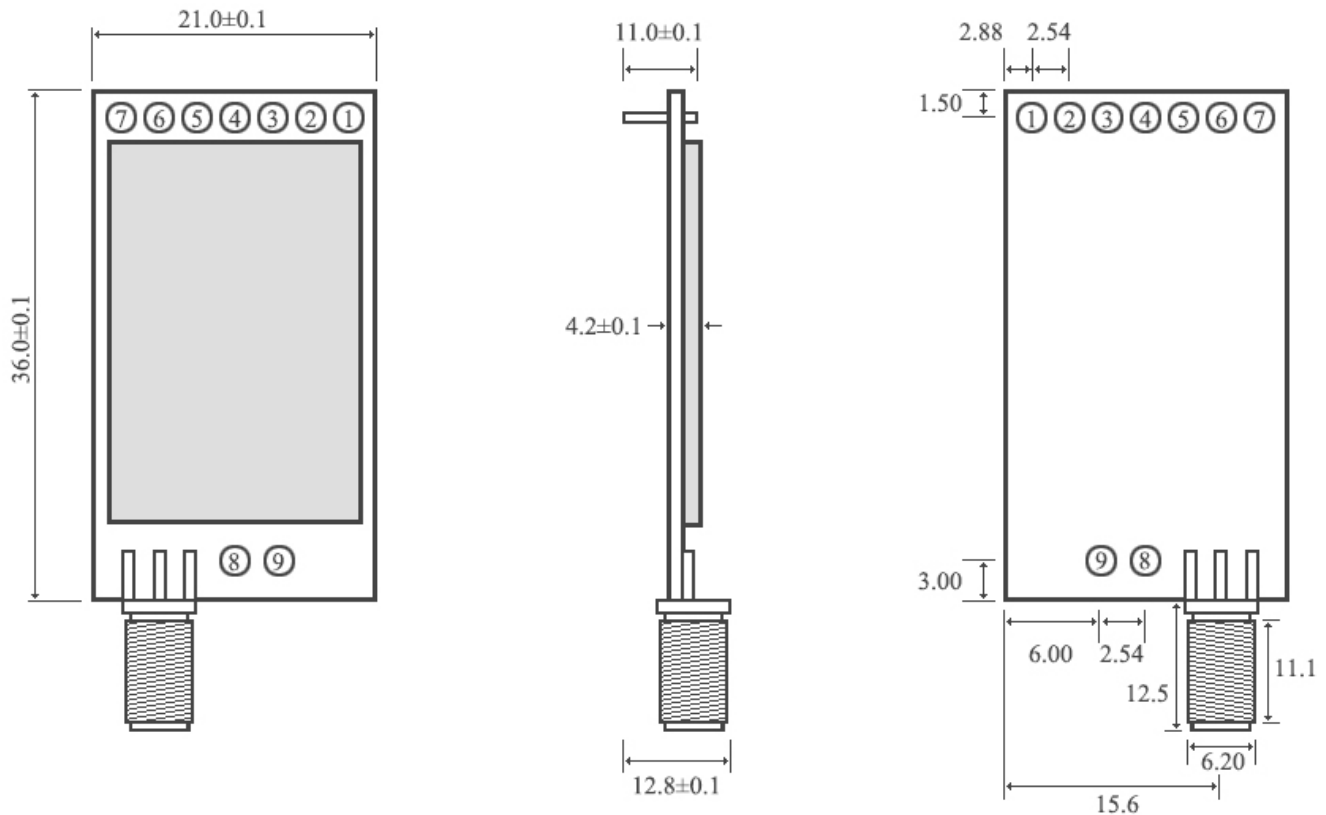


3.1.2 Pin Definition

Pin no.	Pin item	Pin direction	Pin application
1	M0	Input (weak pull-up)	Decide the two operating modes. Floating is not allowed, can be ground.
2	LOCK	Output	Indicating of synchronization. High-level means synchronization completed by both sides and data transmitting is available. Otherwise low-level means synchronization is uncompleted, it will lead to package lost during transmitting.
3	RXD	Input	TTL UART inputs, connects to external (MCU, PC) TXD output pin. Can be configured as open-drain or pull-up input.
4	TXD	Output	TTL UART outputs, connects to external RXD (MCU, PC) input pin. Can be configured as open-drain or push-pull output.
5	AUX	Output	To indicate module' s working status & wakes up the external MCU. During the procedure of self-check initialization, the pin outputs low level. Can be configured as open-drain output or push-pull output. (Floating is allowed).
6	VCC	Input	Power supply 2.1V ~ 5.5V DC.
7	GND	Input	Ground electrode
8	ANT	Input	Antenna (High frequency signal output pin)
9	GND	Input/Output	Antenna (High frequency signal reference ground)
10	GND	Input	Ground electrode
11	GND	Input	Ground electrode

3.2 E62-TTL-100

3.2.1 Dimension

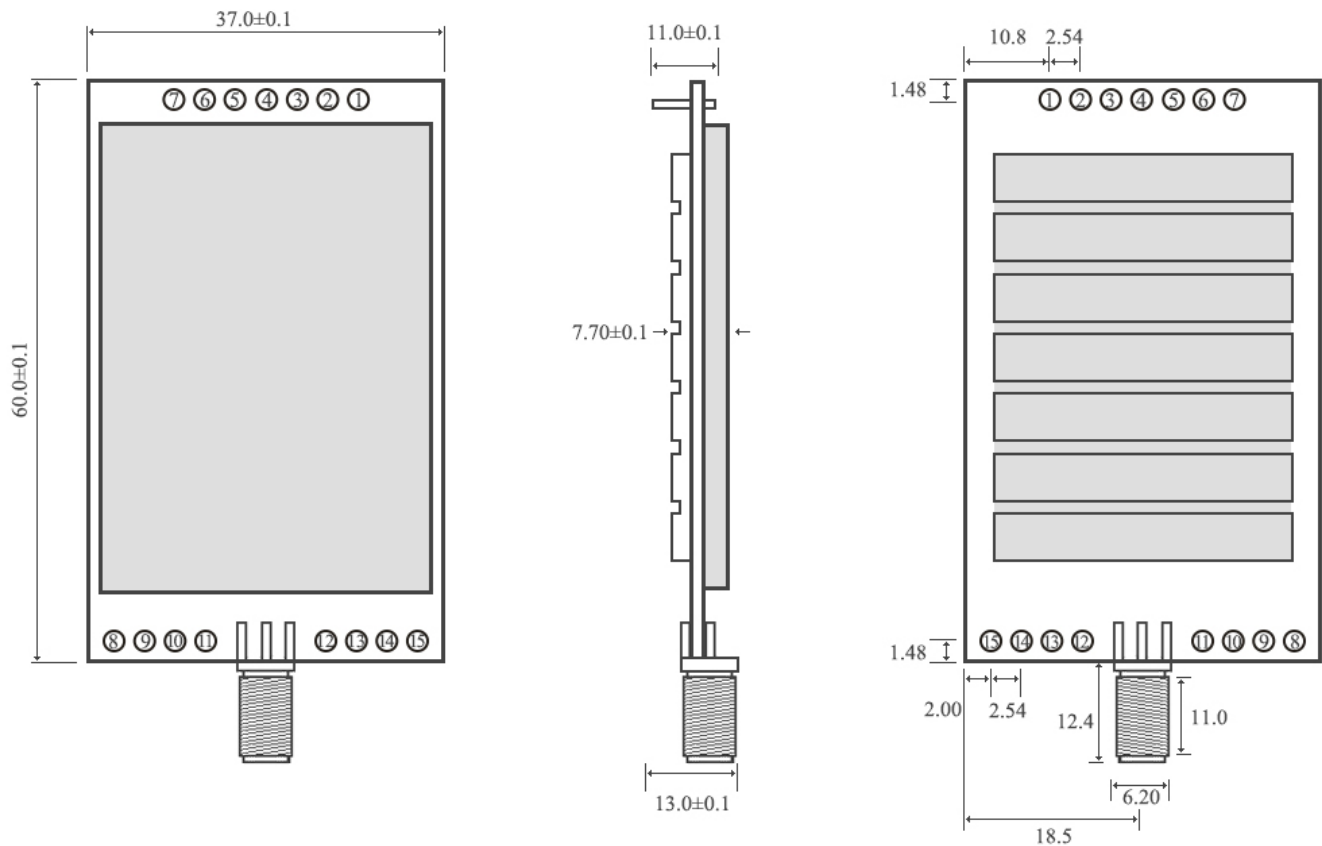


3.2.2 Pin Definition

Pin No.	Pin item	Pin direction	Pin application
1	M0	Input (weak pull-up)	Work with M1 & decide the four operating modes. Floating is not allowed, can be ground.
2	M1	Input (weak pull-up)	Work with M0 & decide the four operating modes. Floating is not allowed, can be ground.
3	RXD	Input	TTL UART inputs, connects to external (MCU, PC) TXD output pin. Can be configured as open-drain or pull-up input.
4	TXD	Output	TTL UART outputs, connects to external RXD (MCU, PC) input pin. Can be configured as open-drain or push-pull output.
5	AUX	Output	To indicate module' s working status & wakes up the external MCU. During the procedure of self-check initialization, the pin outputs low level. Can be configured as open-drain output or push-pull output. (Floating is allowed).
6	VCC	Input	Power supply 2.1V-5.5V DC.
7	GND	Input	Ground electrode
8	Fixing hole		Fixing hole
9	Fixing hole		Fixing hole
10	Fixing hole		Fixing hole

3.3 E62-TTL-1W

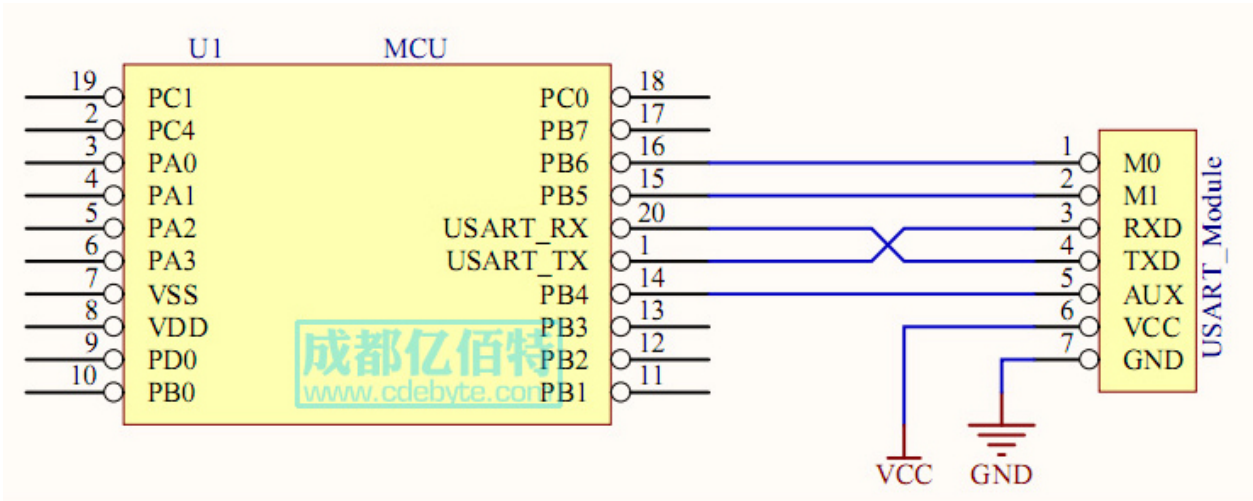
3.3.1 Dimension



3.3.2 Pin Definition

Pin No.	Pin item	Pin direction	Pin application
1	M0	Input (weak pull-up)	Work with M1 & decide the four operating modes. Floating is not allowed, can be ground.
2	M1	Input (weak pull-up)	Work with M0 & decide the four operating modes. Floating is not allowed, can be ground.
3	RXD	Input	TTL UART inputs, connects to external (MCU, PC) TXD output pin. Can be configured as open-drain or pull-up input.
4	TXD	Output	TTL UART outputs, connects to external RXD (MCU, PC) input pin. Can be configured as open-drain or push-pull output.
5	AUX	Output	To indicate module' s working status & wakes up the external MCU. During the procedure of self-check initialization, the pin outputs low level. Can be configured as open-drain output or push-pull output. (Floating is allowed).
6	VCC	Input	Power supply 2.1V-5.5V DC.
7	GND	Input	Ground electrode
8/9	Fixing hole	NC	No connection
10/11	Fixing hole	NC	No connection
12/13	Fixing hole	NC	No connection
14/15	Fixing hole	NC	No connection

4. Recommended Circuit Diagram



No.	Description (STM8L MCU)
1	The UART module is TTL level. Please connect to 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 pin.

5. Function Description

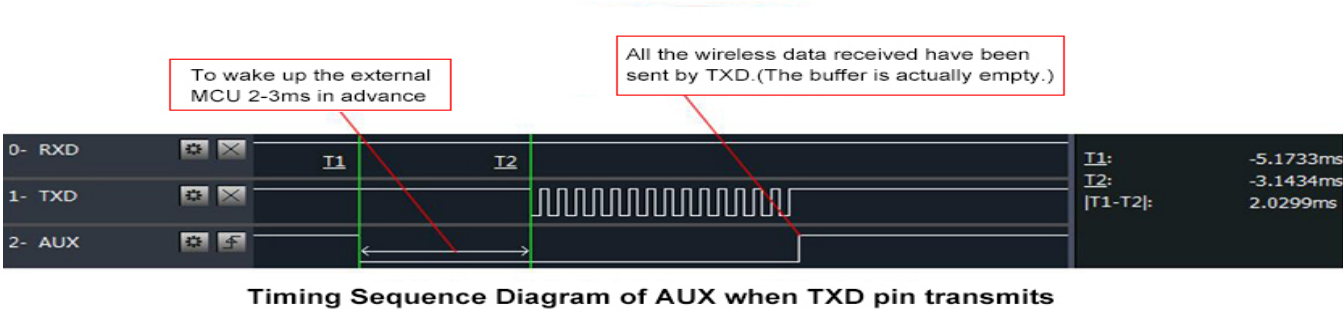
5.1 Reset

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 byM1 and M0. Therefore, the user needs to wait the AUX rising edge as the starting point of module’ s normal work.

5.2 AUX Description

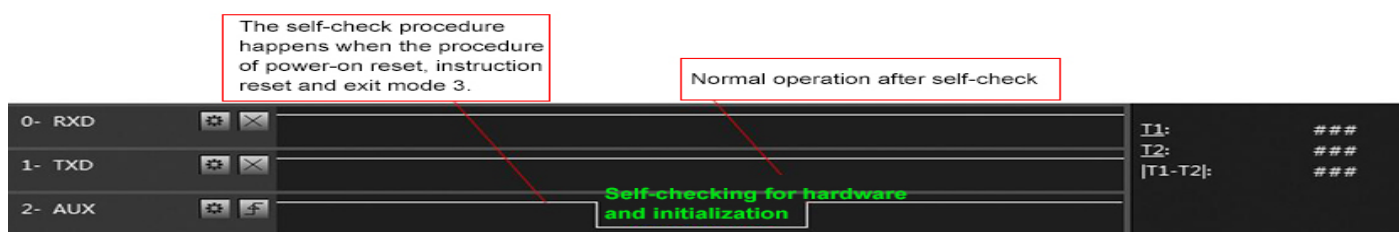
5.2.1 Indication of UART Output

To wake up external MCU:



5.2.2 Configuration Procedure of Module

Only happened when power-on resetting or exiting sleep mode.



Timing Sequence Diagram of AUX when self-check

5.2.3 Notes for AUX

- 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.
- When AUX outputs low level, it means the module is busy & cannot conduct operating mode checking. Within 1ms since AUX outputs high level, the mode switch will be completed.
- After switching to new operating mode, it won't be work in the new mode immediately until AUX rising edge 2ms later. If AUX is on the high level, the operating mode switch can be effected immediately.
- 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, during which AUX outputs low level.

5.3 Lock Description

Due to the characteristics of TDD and frequency modulation spread spectrum, the module can operate at the same time. Lock is used to indicate the synchronization situation for both side (transmitter and receiver). When lock is at high level, it means that synchronization has completed and communication is available. Otherwise when lock is at low level, it means that synchronization has completed, communication is unavailable (data lost).

6. Operating Mode

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

Mode (0-1)	M0	Mode introduction	Remark
Mode 0 Transmitting	0	UART and wireless channel is open, transparent transmission is on.	Both parties must work in mode 0.
Mode 1 Configuration	1	The baud rate is 9600bps, wireless channel is closed. Parameter setting.	See more details in the manual.

6.1 Mode Switch

- The user can decide the operating mode by the combination of M0, M1 and M2. The two GPIOs of MCU can be used to switch mode. After modifying M0, M1 or M2, it will start to work in new mode 1ms 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.

- 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 process completed. It is recommended to check AUX pin out status and wait 2ms after AUX outputs high level before switching the mode.
- 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.
- 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.
- 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.

6.2 Transmission Mode (Mode 0)

Status	When M0 = 0, module works in mode 0
Normal transmission	The users can transmit the data after the module completes the synchronization (the LOCK pin is high). The module features full-duplex. When the module is receiving data, it can transmit data as well, with maximum of 2048 bytes. After previous transmission completed and the AUX pin reaches high level, another 2048 bytes can be transmitted.(It means that, the full-duplex can be conducted at any air data rate and UART baud rate without continuous transmission.)
Continuous transmission	Continuous transmission can be conducted at certain combination of air data rate and UART baud rate without the high level of pin. Where air data is at 16k, both sides of transmitting and receiving adopt UART baud rate at 2400bps or lower. Where air data is at 32k, both sides of transmitting and receiving adopt UART baud rate at 4800bps or lower. Where air data is at 64k, both sides of transmitting and receiving adopt UART baud rate at 9600bps or lower. Where air data is at 128k, both sides of transmitting and receiving adopt UART baud rate at 19200bps or lower. The higher the air data rate is, the lower the delay is. The higher the baud rate to achieve the continuous transmission, and the shorter the communication distance is.

6.3 Configuration Mode (Mode 1)

Status	When M0 = 1, module works in mode 1.
Transmitting	N/A. User can configure the module at baud rate = 9600bps, parity = 8N1.
Receiving	N/A. User can configure the module at baud rate = 9600bps, parity = 8N1.

7. Instruction Format

In configuration mode (Mode 1 : M0=1,) , it supports instructions below.

(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 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 must be sent in succession.
3	C2 + working parameters	C2 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes in total and must be sent 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 sent in succession.
5	C4+C4+C4	Three C4 are sent in hexadecimal format. The module will reset one time and they must be sent in succession.
6	C5+C5+C5	Three C5 are sent in hexadecimal format. Modules return the RSSI value.

7.1 Default Parameter

Default parameter values : C0 01 0A 1A 0A 44							
Model	Frequency	Address	Channel	Air data rate	Baud rate	Parity	Transmitting power
E62-T100S2	425-450.5MHz	1	10	64kbps	9600	8N1	100mW

Default parameter values : C0 01 0A 1A 0A 44							
Model	Frequency	Address	Channel	Air data rate	Baud rate	Parity	Transmitting power
E62-TTL-100	425-450.5MHz	1	10	64kbps	9600	8N1	100mW

Default parameter values : C0 01 0A 1A 0A 44							
Model	Frequency	Address	Channel	Air data rate	Baud rate	Parity	Transmitting power
E62-TTL-1W	425-450.5MHz	1	10	64kbps	9600	8N1	100mW

7.2 Reading Operating Parameters

Instruction format	Description
C1+C1+C1	In sleep mode (M0=1) , User gives the module instruction (HEX format): C1 C1 C1. Module returns the present configuration parameters. For example, C0 01 0A 1A 0A 44.

7.3 Reading Version Number

Instruction format	Description
C3+C3+C3	In sleep mode (M0=1) , User gives the module instruction (HEX format): C3 C3 C3, Module returns its present version number, for example C3 62 xx yy. 62 here means the module model (E62 series); xx is the version number and yy refers to the other module features.

7.4 Reset Instruction

Instruction format	Description
C4+C4+C4	<p>In sleep mode (M0=1) ,</p> <p>User gives the module instruction (HEX format): C4 C4 C4, the module resets for one time.</p> <p>During the reset process, the module will conduct self-check, AUX outputs low level. After reset completing, the AUX outputs high level, then the module starts to work regularly which the working mode can be switched or be given another instruction.</p>

7.5 Reading RSSI

Instruction format	Description
C5+C5+C5	<p>In configuration mode (M0=1) ,</p> <p>User gives the module instruction (HEX format): C5 C5 C5. The module returns the RSSI value.</p> <p>The format is C5 RSSI NOISE, in which RSSI refers to received signal strength indicator.</p>

7.6 Parameter Setting Instruction

C0 and C2 are operating parameters. The difference between C0 command and C2 command is that C0 command will write parameters into the internal flash memory and can be saved when power-down, while C2 command cannot be saved when power-down, because C2 command is temporarily mend instruction. C2 is recommended for the occasion that need to change the operating parameters frequently, such as C0 01 0A 1A 0A 44.

No.	Item	Description	Remark
0	HEAD	Fixed 0xC0 or 0xC2, it means this frame data is controlling instruction.	<p>Must be 0xC0 or 0xC2</p> <p>C0: Save the parameters when power-down</p> <p>C2: Do not save the parameters when power-down</p>
1	ID	Frequency-hopping sequence ID (Default 01H)	Frequency-hopping sequence is decided by frequency-hopping ID, both sides must keep the same.
2	FHSS number	The quantity of frequency hopping channel (default 0AH)	Both sides must keep the same. The more quantity of frequency-hopping channel, the better anti-interference while synchronization time is longer for both sides. Otherwise the less quantity of frequency-hopping channel, the worse anti-interference while synchronization time is shorter.
3	SPED	<p>Rate parameter, including UART baud rate and air data rate</p> <p>7, 6 UART parity bit</p> <p>00 : 8N1 (Default)</p> <p>01 : 8O1</p> <p>10 : 8E1</p> <p>11 : 8N1 (equal to 00)</p> <p>-----</p> <p>5, 4, 3 TTL UART baud rate (bps)</p> <p>000 : 1200bps</p> <p>001 : 2400bps</p> <p>010 : 4800bps</p> <p>011 : 9600bps (Default)</p> <p>100 : 19200bps</p> <p>101 : 38400bps</p> <p>110 : 57600bps</p> <p>111 : 115200bps</p> <p>-----</p> <p>2, 0 is recommended.</p>	<p>UART mode can be different between communication parties</p> <p>-----</p> <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. <p>-----</p>

		<p>-----</p> <p>1, 0 Air data rate (bps)</p> <p>00 : 16Kbps</p> <p>01 : 32Kbps</p> <p>10 : 64Kbps (default)</p> <p>11 : 128Kbps</p>	<p>-----</p> <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>Communication frequency</p> <p>(425M+CHAN*0.5M)</p> <p>Default 0AH</p>	<ul style="list-style-type: none"> 00H- 33H , for 425 – 450.5MHz When the frequency-hopping quantity sets as 1, the module works only at the fixed frequency (425M + CHAN * 0.5M). Otherwise the module works at a band (425MHz+CHAN*0.5MHz+FHSS_nums*0.5MHz).
5	OPTION	<p>7, 0 is recommended.</p> <p>-----</p> <p>6 IO drive mode (Default 1)</p> <p>1 : TXD and AUX push-pull outputs, RXD pull-up inputs</p> <p>0 : TXD、AUX open-collector outputs, RXD open-collector inputs</p> <p>-----</p> <p>5, 4, 3, N/A</p> <p>-----</p> <p>2 FEC switch</p> <p>0 : Turn off FEC</p> <p>1 : Turn on FEC (Default)</p> <p>-----</p> <p>1, 0 transmission power (approximation)</p> <p>00 : 20dBm (Default)</p> <p>01 : 17dBm</p> <p>10 : 13dBm</p> <p>11 : 10dBm</p> <p>-----</p> <p>1, 0 transmission power (approximation)</p> <p>00 : 30dBm (Default)</p> <p>01 : 27dBm</p> <p>10 : 24dBm</p> <p>11 : 21dBm</p>	<p>-----</p> <ul style="list-style-type: none"> This bit is used to the module 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. <p>-----</p> <ul style="list-style-type: none"> 0 is recommended. <p>-----</p> <ul style="list-style-type: none"> After turning 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. <p>-----</p> <ul style="list-style-type: none"> For E62-T100S2 The external power must make sure the ability of current output more than 300mA and ensure the power supply ripple within 100mV. Low power transmission is not recommended due to its low power supply efficiency. <p>-----</p> <ul style="list-style-type: none"> For E62-TTL-1W The external power must make sure the ability of current output more than 300mA 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	1	0
Meaning	UART parity bit 8N1		UART baud rate is 9600			Air data rate is 64k		
Corresponding hexadecimal	1				A			

8. Parameter Setting

When the module is in Mode 1 (M0=1), the parameter can be set by instruction or software in PC.

Please visit www.cdebyte.com to download the software.

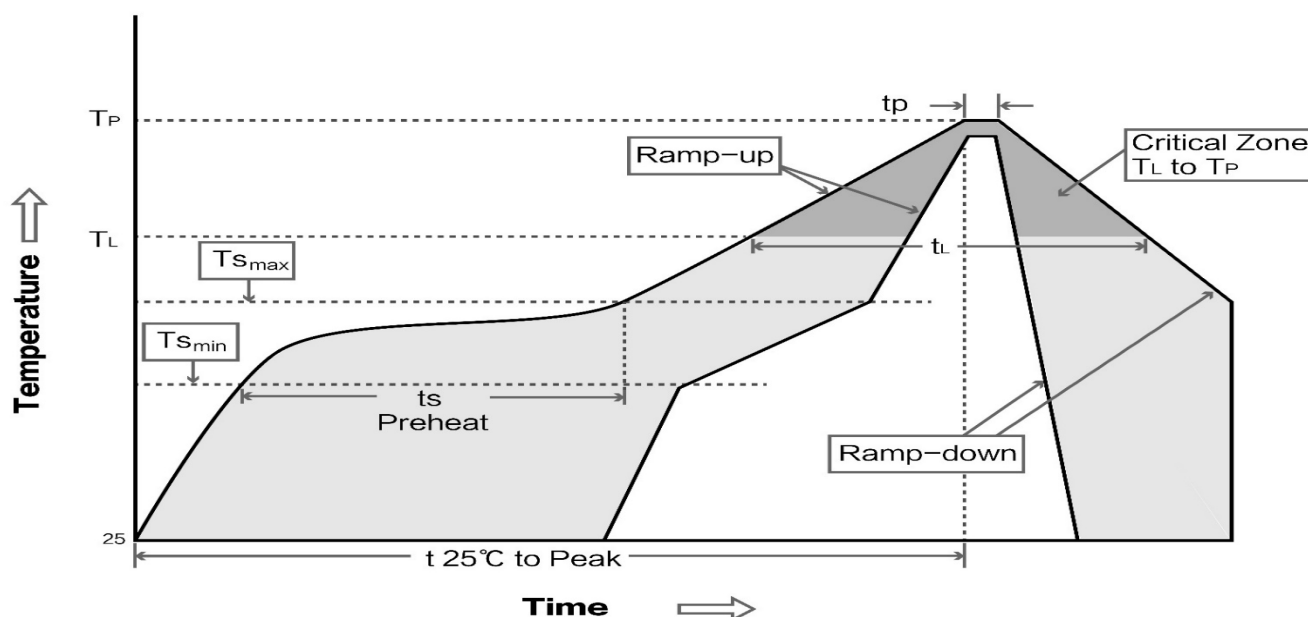


9. Production Guidance

9.1 Reflow Soldering Temperature

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (Tsmin)	100C°	150C°
Preheat temperature max (Tsmax)	150C°	200C°
Preheat Time (Tsmin to Tsmax)(ts)	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	3C°/second max	3C°/second max
Liquidous Temperature (TL)	183C°	217C°
Time (tL) Maintained Above (TL)	60-90 sec	30-90 sec
Peak temperature (Tp)	220-235C°	230-250C°
Aveage ramp-down rate (Tp to Tsmax)	6C°/second max	6C°/second max
Time 25C° to peak temperature	6 minutes max	8 minutes max

9.2 Reflow Soldering Curve



10. FAQ

10.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Seawater has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- The power supply low voltage under room temperature is lower than the recommended value, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

10.2 Module is easy to damage

- Please check the power supply source, ensure it is within the recommended value, voltage higher than that will damage the module.
- Please check the stability of power source, the voltage cannot fluctuate too much.
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

11. Important Notes

- All rights to interpret and modify this manual belong to Ebyte.
- This manual will be updated based on the upgrade of firmware and hardware, please refer to the latest version.
- Please refer to our website for new product information

12. About Us

Technical support: support@cdebyte.com

Documents and RF Setting download link: www.cdebyte.com/en/



Tel : +86-28-61399028 Ext. 812

Fax : 028-64146160

Web : www.cdebyte.com/en/

Address : Innovation Center D347, 4# XI-XIN Road, Chengdu, Sichuan, China