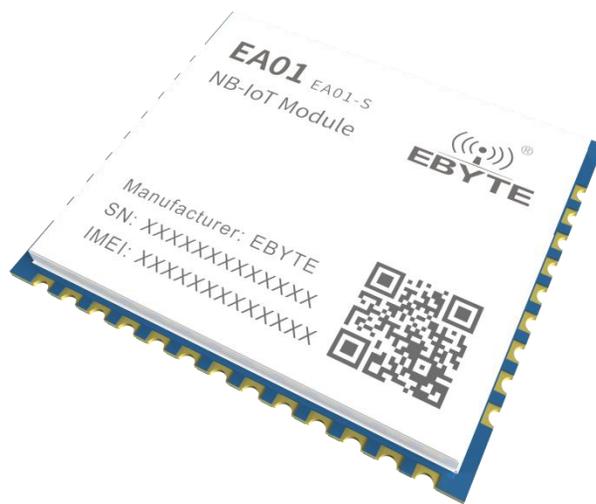




EA01-S User Manual

NB-IoT Module



CONTENTS

| | |
|--------------------------------------------------------------------------------------------------|-----------|
| 1 OVERVIEW..... | 2 |
| 1.1 INTRODUCTION..... | 2 |
| 1.2 FEATURES..... | 2 |
| 1.3 APPLICATION..... | 2 |
| 2 PARAMETERS AND PIN DEFINITION..... | 3 |
| 2.1 MAIN PERFORMANCE..... | 3 |
| 2.2 PIN DEFINITION..... | 4 |
| 2.3 PIN TYPE..... | 4 |
| 2.4 PIN DESCRIPTION..... | 5 |
| 3 EBYTE EXTENDED COMMAND AND FUNCTION DESCRIPTION..... | 6 |
| 3.1 EBYTE TRANSPARENT TRANSMISSION APPLICATION ENABLE..... | 6 |
| 3.2 SELECT THE SERVICE TO AUTOMATICALLY CONNECT AFTER POWER-ON..... | 6 |
| 3.3 CONFIGURE DTU FUNCTION APPLICATION TO ENTER TRANSMISSION MODE BY DEFAULT AFTER POWER-ON..... | 7 |
| 3.4 MODULE VOLTAGE QUERY..... | 7 |
| 3.5 AT MODE AND DATA TRANSPARENT TRANSMISSION MODE SWITCH..... | 8 |
| 3.6 DEVICE SOFTWARE RESTART..... | 8 |
| 3.7 APPLICATION OF POWER SAVING LOCK WORKLOCK..... | 8 |
| 3.8 SERIAL PORT BAUD RATE SETTING..... | 9 |
| 3.9 COMMUNICATION PROTOCOL TYPE CONFIGURATION..... | 9 |
| 3.10 TCP/UDP TRANSPARENT TRANSMISSION CHANNEL FUNCTION CONFIGURATION..... | 10 |
| 3.11 HEARTBEAT PACKET FUNCTION CONFIGURATION..... | 11 |
| 3.12 REGISTRATION PACKET FUNCTION CONFIGURATION..... | 12 |
| 3.13 MODBUS RTU/TCP CONVERSION FUNCTION..... | 13 |
| 3.14 MQTT APPLICATION CONFIGURATION..... | 14 |
| 3.15 COAP FUNCTION CONFIGURATION..... | 16 |
| 3.16 EBYTE CLOUD FUNCTION CONFIGURATION..... | 19 |
| 4 3GPP STANDARD COMMAND AND OPERATOR CLOUD PLATFORM STANDARD COMMAND.. | 20 |
| 5 POWER-ON PROCESS AND TRANSPARENT TRANSMISSION DESCRIPTION..... | 20 |
| 6 HARDWARE DESIGN..... | 21 |
| 7 FAQ..... | 22 |
| 7.1 COMMUNICATION DISTANCE IS TOO SHORT..... | 22 |
| 7.2 MODULE IS EASY TO DAMAGE..... | 22 |
| 7.3 BER(BIT ERROR RATE) IS HIGH..... | 22 |
| 8 WELDING INSTRUCTION..... | 23 |
| 8.1 REFLOW SOLDERING TEMPERATURE..... | 23 |
| 8.2 REFLOW SOLDERING CURVE..... | 23 |
| 9 PACKET..... | 24 |
| REVISION HISTORY..... | 24 |
| ABOUT US..... | 24 |

1 Overview

1.1 Introduction

This module uses XinYi Information Technology’s XY1100 chip solution. This chip is currently the world’s first Single Die integrated CMOS PA mass-produced NB-IoT system single chip, which directly integrates the commercially available PA on the single Die. It is currently the world's most integrated NB-IoT chip. The chip integrates a dual-core processor including ARM core and DSP core. The DSP core handles 3GPP protocol and ARM handles application protocol. It is equipped with dual-core processor of Huawei LiteOS operating system to work at the same time and run fast and stable. It supports different power consumption modes, such as deep sleep, normal sleep, standby, and low power consumption working modes, and the lowest power consumption can reach 0.7uA.



1.2 Features

- Work at B3 B5 B8 frequency band;
- Support TCP, UDP, MQTT, COAP, LwM2M and other protocols;
- Support Telecom Cloud CTWING, Huawei Cloud OceanConnect, Unicom Cloud, China Mobile Onenet Cloud Platform, Alibaba Cloud, Baidu Cloud, and Ebyte Cloud transparent transmission;
- The deep sleep state current is less than 1uA, the typical value is 0.7uA;
- Support 3GPP standards R13;
- Support TCP/UDP transparent transmission;
- Support SMS in PDU format;
- Support FOTA remote upgrade of Onenet and CTWING;
- Support registration packet, heartbeat packet;
- Support Modbus RTU/TCP conversion;
- Support PSM, eDRX;

1.3 Application

- Smart lighting
- Smart Home
- Smart fire protection
- Smart meter reading
- Smart parking
- Smart buildings
- Automatic data acquisition
- Health sensor

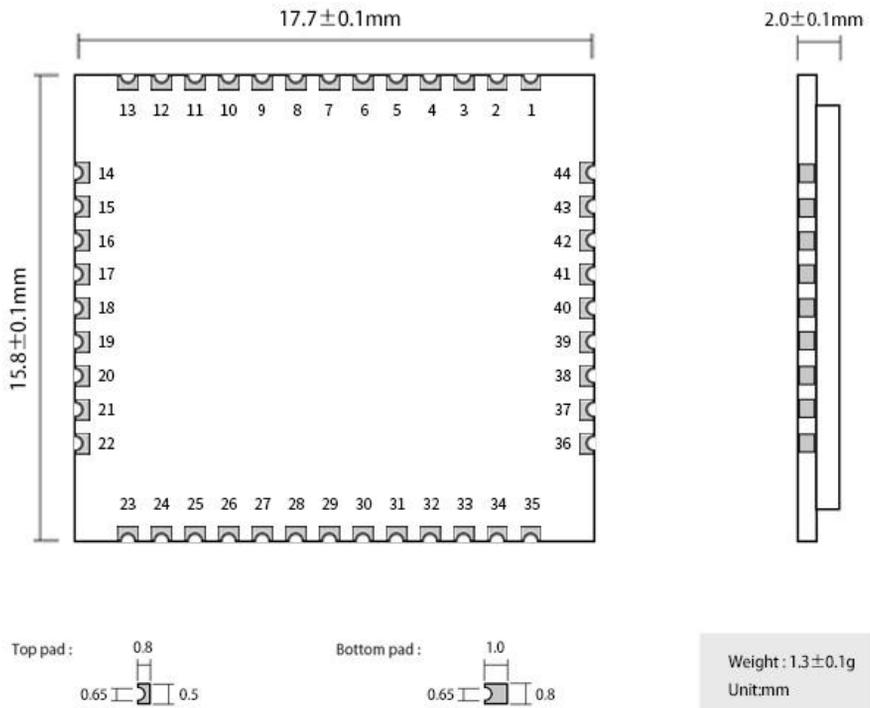
- Automotive testing equipment
- Intelligent robot

2 Parameters and pin definition

2.1 Main performance

| Parameter | Description |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply | Power supply: 3.1V~4.2V Typical power supply: 3.6V |
| Power consumption | Working status (business data interaction status): 200-500mA (typical value 320mA) Idle state (non-business data interaction state): 30-60mA (typical value 45mA) PSM status: 0.7uA (typical value) |
| Frequency | 699MHz~960MHz 1.71GHz~2.2GHz |
| Tx Power | 20dBm±2dB |
| USIM interface | Support 1.8V/3V adaptive USIM card |
| Firmware upgrade | Serial port and FOTA upgrade |
| Physical feature | Size: (17.7±0.15)mm × (15.8±0.15)mm × (2.0±0.2)mm |
| Temperature range | Normal operating temperature: -35°C~+75°C Extending operating temperature: -40°C~+85°C Storage temperature: -40°C~+90°C |
| Antenna interface | Stamp hole (50Ω) |
| RoHS | All components meet EU RoHS standard |
| Weight | 1.3±0.1g |

2.2 Pin definition



2.3 Pin type

| Pin | Description |
|-----|----------------------------|
| IO | Digital bidirectional port |
| DI | Digital input port |
| DO | Digital output port |
| AI | Analog input port |
| AO | Analog output port |
| PI | Power input port |
| PO | Power output port |

2.4 Pin description

| No. | Pin | I/O | Description | DC characteristics | Remark |
|---------------------------------|----------|-----|-------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | DATA | DO | Socket data indicator | | Valid in low level |
| 4 | LINK-B | DO | Socket1 connection status indicator | | Valid in low level |
| 5 | LINK-A | DO | Socket0 connection status indicator | | Valid in low level |
| 6 | IO_RST | DI | Restore factory settings | | Valid in low level |
| 10 | SIM_GND | GND | USIM card grand | | |
| 11 | SIM_DATA | IO | USIM card data signal | | Add 20K pull-up resistor |
| 12 | SIM_RST | DO | USIM card reset signal | | |
| 13 | SIM_CLK | DO | USIM card clock signal | | |
| 14 | SIM_VDD | DO | USIM card power supply | 1.8/3V adaptive | 10mA max loading |
| 15 | RST/WKUP | DI | Reset/wake up indicator, valid in high level | V _L =0V V _{IHmin} =1.2V V _{IHmax} =3.6v | When the pulse width of the high level signal is greater than 100us and less than 5s, it is regarded as a wake-up signal, when it is greater than 6 seconds, it is regarded as a reset signal. (There is a pull-down resistor inside) |
| 16 | NETLIGHT | DO | Network status indication | | Fast flashing indicator while on the network |
| 17 | RXD | DI | AT interactive and transparent transmission interface | | 3V voltage |
| 18 | TXD | DO | AT interactive and transparent transmission interface | | |
| 24 | VDD_EXT | PO | 3V output power | V _{nom} =3V | 80mA max loading |
| 35 | RF_ANT | IO | RF antenna interface | | 50 Ω characteristic impedance |
| 38 | RXD_LOG | DO | Debug serial port (for log output) | | 3V voltage |
| 39 | TXD_LOG | DI | Debug serial port (for log output) | | |
| 42 | VBAT_BB | PI | Module baseband power supply | V _{max} =4.2V V _{min} =3.1V V _{nom} =3.6V | Can provide static current no less than 0.5A |
| 43 | VBAT_RF | PI | Module RF power supply | V _{max} =4.2V V _{min} =3.1V V _{nom} =3.6V | |
| 1, 27, 34, 36, 37, 40, 41 | GND | GND | Ground | | |
| 8, 9, 20~22, 25, 26, 28, 29, 44 | RESERVED | | Reserved | | Keep floating |
| 2, 7, 19, 23, 30~33 | NC | | No connection | | |

Notes:

- Data, socket data receiving and sending status indicator, output high level when idle. When the socket receives wireless data, the pin will continue to pull down 500ms. If there is wireless data coming within 500ms, it will continue to pull down 500ms, If there is no data coming within 500ms, the high-level output will be restored; when the socket sends data, it will continue to pull down 500ms; if there is data transmission within 500ms, it will continue to pull down 500ms; if there is no data transmission within 500ms, the high-level output will be restored.
- Link-B, socket1 connection status indicator, socke1 output high level when not connected, low level output after successful connection, and high level output after disconnection.
- LINK-A, socket0 connection status indicator, socke0 output high level when not connected, low level output after successful connection, and high level output after disconnection.
- IO_Rst, restore the factory settings. This pin is pulled down for about 1 second. If the serial port returns to factory reset, the factory settings will be restored and the automatic restart will take effect.

3 Ebyte extended command and function description

3.1 Ebyte transparent transmission application enable

| AT command | Response |
|--------------------------|----------------------------------|
| AT+EBYTEAPP=<enable>\r\n | OK |
| AT+EBYTEAPP | Ebyte app enable: <enable> OK |

(1) This AT command configures whether to use TCP, UDP, Ebate Cloud, MQTT and COAP transparent transmission applications. By default, AT+EBYTEAPP=1 is enabled. When you need to access the China mobile Onenet cloud, Telecom CTWING cloud, AT+NSOCR AT+NSOCO AT+NSOST and other comamnd sets, you need to set AT+EBYTEAPP=0 to close the transparent transmission application.

(2) Configuration parameter description:

< enable >: 0 means to close the transparent application, and 1 means to open the transparent application.

Note: When power-off saving is required, input AT+NRB command will save the parameters to flash, and automatically restart to take effect.

3.2 Select the service to automatically connect after power-on

| AT command | Response |
|--------------------------|-----------------------------------|
| AT+POWONLINK=<type >\r\n | OK |
| AT+POWONLINK | power on link socket type: <type> |

(1) This AT command configuration selects the SOCKET that is automatically connected after power-on, and the TCP/UDP channel is automatically connected when power-on by default.

(2) Configuration parameter description:

<type>: 1 means that it is connected to the MQTT channel when it is powered on, 2 means it is connected to the COAP channel when it is powered on, and 3 means it is connected to the Ebyte cloud when it is powered on.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.3 Configure DTU function application to enter transmission mode by default after power-on

| AT command | Response |
|-------------------------|------------------------|
| AT+DTUUSER=<enable>\r\n | OK |
| AT+DTUUSER | DTU enable: < enable > |

(1) The AT command configuration selects whether to enter the transmission mode by default when the power is turned on, and the default is to close the DTU application, that is, to turn on the AT mode.

(2) Configuration parameter description:

<enable>: 0 means close, 1 means open, input AT+NRB command will save the parameters to flash, and automatically restart to take effect.

3.4 Module voltage query

| AT command | Response |
|------------|---------------------|
| AT+VBAT=? | +VBAT:<value> OK |

(1) VBAT is the current power supply voltage of the module, and the normal working range is 3.1-4.2V

3.5 AT mode and data transparent transmission mode switch

| AT command | Response |
|------------|------------------|
| ATD*98\r\n | CONNECTING OK |
| +++ | OK |

(1) Power-on defaults to work in AT command mode. In AT command mode, send ATD*98\r\n or ATD*99\r\n to switch to transparent transmission mode.

(2) <+++>: In transparent transmission mode, the last three bytes of user data are "+++", or three bytes "+++" are sent after user data transmission is completed, the transparent transmission mode will end.

3.6 Device software restart

| AT command | Response |
|------------|-----------|
| AT+NRB\r\n | REBOOTING |

After inputting the AT command, the device will restart, and the AT parameters will be saved in the flash at the same time. When the AT parameters need to be memorized after power-off, first configure the parameters through the AT command, and then input the AT+NRB command to save the parameters to the flash.

3.7 Application of power saving lock WORKLOCK

| AT command | Respond |
|---------------------------|---------|
| AT+WORKLOCK =<enable>\r\n | OK |

(1) If module is in deep sleep mode for a long time (chip power down state), in order to ensure that the data interaction fails to enter deep sleep ahead of time during the application period, input AT+WORKLOCK =1 and add work lock to prevent it from entering deep sleep in advance. After data interaction is completed, input AT+WORKLOCK=0 to release the lock, then module will enter deep sleep.

(2) The module supports serial port wake-up, which can be waked up by inputting AT command. After the AT command wakes up the module, the work lock will be automatically added. Therefore, after each wake-up for business interaction, you must enter AT+WORKLOCK=0 to release the lock to enter deep sleep.

Note: You must also enter AT+WORKLOCK=0 after power-on again to enter deep sleep.

3.8 Serial port baud rate setting

| AT command | Response |
|--------------------------------|----------|
| AT+UARTSET =<rate>,<store>\r\n | OK |

(1) This command is used to set the baud rate parameters of the serial port. The default is 9600 baud rate. When store is 0, the baud rate takes effect dynamically. When store is 1, the baud rate is divided by 2400 and saved to flash. And will automatically restart to take effect.

(2) Configuration parameter description:

<rate>: Baud rate, currently the highest support 115200.

<store>: Whether to save or not, the default is not to save, that is, the baud rate is dynamically switched; if it is set to 1, it will be saved to NV and restarted immediately; if it is set to 0, it means dynamic effect, and the other party needs to switch the baud rate synchronously rate.

3.9 Communication protocol type configuration

| AT command | Response |
|---------------------------|-----------------------|
| AT+PDUTYPE=<pdu_type>\r\n | OK |
| AT+PDUTYPE\r\n | type:<pdu_type> OK |

(1) Currently supports MQTT, COAP, TCP/UDP and Ebyte cloud. Currently, the module supports two sockets, while allowing TCP/UDP communication and one of MQTT, COAP, and Ebyte cloud communication. TCP/UDP always opens socket0, One of MQTT, COAP, and Ebyte opens socket1.

(2) Configuration parameter description:

<pdu_type>: 0 means based on TCP or UDP protocol, 1 means based on MQTT protocol, 2 means based on COAP protocol, 3 means based on Ebyte cloud protocol.

Note: When you need to save after power-off, input AT+NRB command to save the parameters to the flash, and automatically restart to take effect..

3.10 TCP/UDP transparent transmission channel function configuration

3.10.1 TCP/UDP address and port configuration

| AT Command | Response |
|------------------------------------------------------------|----------------------------------------------------------------------------------|
| AT+SOCKADDR =<addr>,<port>,<local_port>,<type> \r\n | OK |
| AT+SOCKADDR \r\n | address:< addr >,port:< port >,local port: <local_port>,type:<type> OK |

(1) Socket0 address supports IP address and domain name, and the maximum byte length supports 50 bytes. Device software restart, hardware reset and normal power-on automatically connect to socket0. To wake up the device from deep sleep, you need to enter the command AT+SOCKONOFF to connect to socket0. If the server does not release the link before connecting, the terminal needs to successfully disconnect the link first and then connect to socket 0.

(2) Configuration parameter description:

<addr>: Support IP address or domain name, the maximum byte length is 50 bytes.

<Port>: The port of the remote server.

<local_port>: Local port, 0 means freely selected by tcpip, the default is 0.

<type>: 0 means TCP protocol, 1 means UDP protocol.

Note: When you need to save after power-off, input AT+NRB command to save the parameters to the flash, and automatically restart to take effect..

(2) Socket connection status changes will be actively reported: AT+XSSTATE:<id>,<state>:

<id>: It means the created socket id, currently only supports 0 and 1, TCP/UDP channel can only use 0, COAP, MQTT, Ebyte cloud uses 1.

<state>: It represents the socket connection status, 1 means connected, 0 means disconnected.

3.10.2 Open and close TCP/UDP socket0 connection

| AT command | Respond |
|------------------------------------|----------------------------------|
| AT+SOCKONOFF=<enable>,<on-off>\r\n | +XSSTATE:< id>,<state> OK |

<enable>: It indicates whether to enable the TCP/UDP channel, 1 indicates enable, and 0 indicates disable. The default is to enable TCP/UDP channel opening.

<on-off>: It means opening or closing socket 0, 1 means open, 0 means closed.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.11 Heartbeat packet function configuration

3.11.1 Configure TCP/UDP heartbeat packet content

| AT command | Response |
|--------------------------------|--------------|
| AT+HEARTINFO=<type>,<data>\r\n | OK |
| AT+HEARTINFO \r\n | <data> OK |

<type>: 0 indicates that the heartbeat packet type is in HEX format, and 1 indicates that the heartbeat type is in ASCII code (string) format.

<data>: The data content of the heartbeat packet, the maximum length is less than 40, and the default value is "Ebyte nbiot heart rate data".

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect..

3.11.2 Send heartbeat packet command

| AT command | Response |
|-------------------------|----------|
| AT+SENDHEART=<send>\r\n | OK |

- (1) Input AT command AT+SENDHEART=1, then the heartbeat packet can be sent.
- (2) If <pdu_type> is selected as TCP/UDP, the TCP/UDP heartbeat packet will be sent, if it is MQTT, the MQTT heartbeat packet will be sent ("PINGRESP" will be printed on the serial port after successful transmission), and if it is Ebyte Cloud, the Ebyte Cloud heartbeat packet will be sent.

3.11.3 Heartbeat packet mode and heartbeat cycle configuration

| AT command | Response |
|---------------------------------|----------|
| AT+HEARTMOD=<mode>,<period>\r\n | OK |

- (1) This command is used to realize the function of sending heartbeat packets periodically. The function of sending heartbeat periodically is mainly used in DTU function scenarios (no low power consumption required). To set the periodic heartbeat function, you first need to set AT+DTUUSER=1 and AT+NRB to save after power-off, that is, the

periodic heartbeat packet must be sent in transmission mode.

(2) Configuration parameter description:

<mode>: 0 means to turn off the periodic sending of heartbeat packet function, used in standby sleep or deep sleep application scenarios, only after serial port wakes up manually by setting AT+SENDHEART=1 to send heartbeat packets; 1 means to send heartbeat packets to the network side server , If <pdu_type> select TCP/UDP, send TCP/UDP heartbeat packet, select MQTT, send MQTT heartbeat packet (the serial port will print “PINGRESP” after sending successfully), select Ebyte Cloud, send Ebyte Cloud heartbeat packet; 2 means the local serial port prints heartbeat packets.

<period>: It indicates the heartbeat period of the heartbeat packet, the range is 1-65535, the unit is 500ms, the default value is 120, which means 120*500ms=60s, this parameter AT+NRB restarts to take effect.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.12 Registration packet function configuration

3.12.1 Registration packet mode configuration

| AT command | Response |
|----------------------|--------------------|
| AT+REGMOD=<mode>\r\n | OK |
| AT+REGMOD\r\n | OK mode: <mode> |

<mode>: 0 means to close the registration packet, 1 means to add the IMEI registration packet before each packet of data sent, 2 means to add a custom registration packet before each packet of data sent, 3 means only to send an IMEI registration packet when connecting to the server at the first timef; 4 means only send a custom registration packet when connecting to the server at the first time.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.12.2 Registration Packet content configuration

| AT command | Response |
|------------------------------|----------------|
| AT+REGINFO=<type>,<data>\r\n | OK |
| AT+REGINFO \r\n | OK < data > |

<type>: 0 means that the registration packet type is in HEX format, and 1 means that the registration packet type is in ASCII code (string) format.

<data>: The content of the registration packet data, the maximum length is less than 40, and the default value is "Ebyte Register packet".

3.13 Modbus RTU/TCP conversion function

3.13.1 Function description

After the Modbus RTU/TCP conversion function is turned on, when receiving Modbus RTU format data, it will automatically convert to Modbus TCP format data and print it through the serial port. When receiving Modbus TCP format data, it will automatically convert to Modbus RTU format data and print it through the serial port. In the transmitting state, when the serial port receives Modbus RTU format data, it will automatically convert to Modbus TCP format data and send it wirelessly. When the serial port receives Modbus TCP format data, it will automatically convert to Modbus RTU format data and sent wirelessly.

3.13.2 Modbus RTU/TCP enable configuration

| AT command | Response |
|------------------------------|-----------------------------------|
| AT+MODBUS=<enable>,<Id> \r\n | OK |
| AT+MODBUS \r\n | OK enable:< enable>, Id:< Id > |

(1) Configuration parameter description:

<enable>: 0 means to turn off the Modbus RTU/TCP conversion function, 1 means to turn on the Modbus RTU/TCP conversion function.

<Id>: It represents the Modbus TCP transaction processing identifier, (0~65535) 2 bytes.

(2) Transaction processing identifier Id description:

In the state of Modbus TCP to Modbus RTU, when Id = 0, any Modbus TCP data received will be converted to the corresponding Modbus RTU data, otherwise, it will be converted only when the transaction Id matches.

In the state of modbus RTU to modbus TCP, it means the converted modbus TCP transaction identifier.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.14 MQTT application configuration

3.14.1 Instructions for using MQTT command set

First, AT+MQTTMODE is used to configure the working mode of MQTT to take effect after software reset and restart. Second, AT+PDUTYPE is used to confirm whether the data frame type is MQTT transmission. Secondly, AT+MQTTCONN is used to configure the three elements of the connection. AT+MQTTSUBTOP and AT+MQTTPUBTOP are used to configure subscription and publishing topics. Finally, ATD*98 is used to enter the transmission mode for data interaction. After the interaction is completed, use the command +++ to enter the AT command mode. When low power consumption is required, enter AT+WORKLOCK=0 command to release the work lock and enter the deep sleep mode.

3.14.2 MQTT mode configuration

| AT command | Response |
|------------------------|---------------------|
| AT+MQTTMODE=<mode>\r\n | OK |
| AT+MQTTMODE \r\n | OK mode:< mode > |

<type>: 0 means to disable the mqtt function, 1 means to access the Aliyun platform, 2 means to access the Onenet platform and other IoT platforms that support the standard MQTT protocol, and 3 means to access the Baidu cloud platform.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.14.3 MQTT address and port configuration

| AT command | Response |
|-------------------------------|------------------------------------|
| AT+MQTTADDR=<addr>,<port>\r\n | OK |
| AT+MQTTADDR \r\n | OK address: <addr>,port: <port> |

(1) When the MQTT mode is 0, input this command will prompt "MQTT closed". When the MQTT mode is 1, configure the address and port of the Aliyun platform. When the MQTT mode is 2, configure the address and port of the Onenet platform or other platforms. When the mqtt mode is 3, configure the address and port of the Baidu cloud platform.

Note: The domain name addresses of the three major platforms of Baidu cloud, Onenet, and Aliyun will generally not

change. If the domain name does change, it can be modified through comamnd.

(2) Configuration parameter description:

<addr>: It is the IP address or domain name of the server, the maximum length is 50 bytes.

<port>: It is the port of the server.

3.14.4 Three elements configuration of MQTT connection

| AT command | Response |
|--------------------------------------------|----------------------------------------------------|
| AT+MQTTCONN=<value0>,<value1>,<value2>\r\n | OK |
| AT+MQTTCONN \r\n | OK <value0> <value1> <value2> |

The length of each of the three elements is no more than 40 bytes.

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.14.5 MQTT subscription topic configuration

| AT command | Response |
|---------------------------------------|-------------------------------------------|
| AT+MQTTSUBTOP=< topicName>, <qos>\r\n | OK |
| AT+MQTTSUBTOP \r\n | OK qos:< qos > < topicName> |

<topicName>: A string within 200 bytes of the content of the subscription topic.

<qos>: The quality of service supports qos=0, qos=1, qos=2.

3.14.6 MQTT publish topic configuration

| AT command | Response |
|---------------------------------------|-------------------------------------------|
| AT+MQTTPUBTOP=< topicName>, <qos>\r\n | OK |
| AT+MQTTPUBTOP \r\n | OK qos:< qos > < topicName> |

<topicName>: A string within 200 bytes of the content of the subscription topic.

<qos>: The quality of service supports qos=0, qos=1, qos=2.

3.14.7 MQTT and server keepalive settings

| AT command | Response |
|---------------------------------|--------------------------------------|
| AT+MQTTALIVE=< alive_time >\r\n | OK |
| AT+MQTTALIVE \r\n | OK keep alive time:< alive_time > |

<alive_time>: Keep alive time with the server (unit: second), the data range is 2 bytes, and the default is 600 seconds (10 minutes).

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.15 COAP function configuration

3.15.1 COAP function description

- First, AT+COAPADDR is used to configure the address and port of the COAP server and enable the COAP function at the same time, and the AT+NRB for software resets to take effect.
- Secondly, AT+PDUTYPE is used to select the data protocol type as COAP.
- Then, AT+ADDOPTION, AT+ADDTOKEN, AT+COAPMINUS are used to add or delete option or token in the message.
- Finally, AT+COAPHEADER is used to send messages without payload; ATD*98 enters the transparent transmission mode, then enters the serial port transparent transmission data. At this time, the data sent is a COAP message with payload (the serial port transparent transmission data is COAP payload of the message).

3.15.2 COAP address parameter configuration

| AT command | Response |
|-----------------------------------------------------|-------------------------------------------------------------------------------|
| AT+COAPADDR=<addr>,<port>,<local_port>,<enable>\r\n | OK |
| AT+COAPADDR \r\n | OK address: <addr>,port: <port> , local port:< local_port >,enable<enable> |

<addr>: Support IP address or domain name, the maximum length is 50 bytes

<port>: the port of the server

<local_port>: the local port

<enable>: COAP enable, 0 means turn off COAP function, 1 means turn on COAP function

Note: When power-off saving is required, input AT+NRB command will save the parameters to the flash, and the automatic restart will take effect.

3.15.3 Command for adding option to COAP message

| AT command | Response |
|-------------------------------------------|----------------------------------------------------------------|
| AT+ADDOPTION=<index>,< type>,< value>\r\n | OK |
| AT+ADDOPTION \r\n | OK index : <index> , type:<type> , value:<value> |

<index>: The serial number of the option, ranging from 0 to 7, a maximum of 8 options can be configured, and the storage space is 1024 bytes.

<type>: Tthe number of option, as shown in the figure below:

| No. | C | U | N | R | Name | Format | Length | Default |
|-----|---|---|---|---|----------------|--------|--------|-------------|
| 1 | x | | | x | If-Match | opaque | 0-8 | (none) |
| 3 | x | x | - | | Uri-Host | string | 1-255 | (see below) |
| 4 | | | | x | ETag | opaque | 1-8 | (none) |
| 5 | x | | | | If-None-Match | empty | 0 | (none) |
| 7 | x | x | - | | Uri-Port | uint | 0-2 | (see below) |
| 8 | | | | x | Location-Path | string | 0-255 | (none) |
| 11 | x | x | - | x | Uri-Path | string | 0-255 | (none) |
| 12 | | | | | Content-Format | uint | 0-2 | (none) |
| 14 | | x | - | | Max-Age | uint | 0-4 | 60 |
| 15 | x | x | - | x | Uri-Query | string | 0-255 | (none) |
| 17 | x | | | | Accept | uint | 0-2 | (none) |
| 20 | | | | x | Location-Query | string | 0-255 | (none) |
| 35 | x | x | - | | Proxy-Uri | string | 1-1034 | (none) |
| 39 | x | x | - | | Proxy-Scheme | string | 1-255 | (none) |
| 60 | | | x | | Size1 | uint | 0-4 | (none) |

For example, type=11, indicating that the option resource type is Uri-Path.

<value>, the specific content of the option, such as Uri-Path path option specific value is \temperature, If the data type of value is Uint, the data length only supports 0-4 bytes in the data range 0-4294967295.

You can configure multiple options, up to 8 can be configured, for example, enter the command in sequence below:

AT+ADDOPTION=0,3,iot.eclipse.org

AT+ADDOPTION=1,7,5683

AT+ADDOPTION=2,11,\temperature

AT+ADDOPTION read command return

index: 0, type: 3, value: iot.eclipse.org

index: 1, type: 7, value: 5683

index: 2, type: 11, value: \temperature

3.15.4 Command for adding token in COAP message

| AT command | Response |
|--------------------------|---------------|
| AT+ADDTOKEN =<token>\r\n | OK |
| AT+ADDTOKEN \r\n | OK <token> |

<token>: The data format is HEX.

For example, the parameter that needs to be entered is 0x7A5B69EF

AT+ADDTOKEN=7A5B69EF

Read command AT+ADDTOKEN

AT+ADDTOKEN

7A5B69EF

3.15.5 Command for removing the option or token in the message

| AT command | Response |
|-----------------------------------|----------|
| AT+COAPMINUS=<token>,<option>\r\n | OK |

<token> =1, remove the token in the message

<option>=1, remove the option in the message

3.15.6 Command for COAP message without payload

| AT command | Response |
|----------------------------------|--------------------------------|
| AT+COAPHEADER =<type>,<code>\r\n | OK |
| AT+COAPHEADER \r\n | OK type:<token>,code:<code> |

<type>: Configure the type of sent message.

Type=0, CON frame, a request that needs to be confirmed. If a CON request is sent, the other party must respond.

Type=1, NON frame, request that does not need to be confirmed, if the NON request is sent, then the other party does not need to respond.

Type=2, ACK frame, response message, response to CON message received.

Type=3, RST frame, reset message, when the message received by the receiver contains an error, if the receiver parses the message or no longer cares about the content sent by the sender, the reset message will be sent.

<code>: Configure the function code for sending messages.

code =1, GET method, used to obtain a resource

code = 2, POST method, used to create a resource

code = 3, PUT method, used to update a resource

code = 4, DELETE method, used to delete a resource

For example, using the command AT+COAPHEADER =0,1, you can send a COAP get message. The message includes a fixed header which may have option or token.

3.15.7 COAP data receiving description

- Serial port prints the header information of the received COAP data frame: response code: <code>, type: <type>, tid: <tid>, ending with \r\n. <code>: indicates the function code of the server response, <type>: indicates the type of the received message, <tid>: indicates the message id (decimal format) of the received message;
- If there is a token in the received message, the serial port prints the token: <token>. ending with \r\n, and <token> is in the form of a HEX string.
- If there is option in the received message, the serial port will print option type: <type>, value: <value> and ending with \r\n.
- If there is payload in the received message, the serial port will print payload: <payload> and ending with \r\n.

3.16 Ebyte cloud function configuration

3.16.1 Address and port configuration

| AT command | Response |
|-------------------------------|------------------------------------|
| AT+EIOTADDR=<addr>,<port>\r\n | OK |
| AT+EIOTADDR \r\n | OK address: <addr>,port: <port> |

<addr>: It can be IP address or domain name, the maximum length is 50 bytes

<port>: The port of the server

3.16.2 Turn on/off Ebyte Cloud and the configuration of SN

| AT command | Response |
|-----------------------------|-------------------------------------|
| AT+EIOT=<onoff>,<keysn>\r\n | OK |
| AT+EIOT \r\n | OK onoff: <onoff>,keysn: <keysn> |

<onoff>: 1 means open the Ebyte Cloud, 0 means close the Ebyte Cloud

<keysn>: The serial number key of Ebyte, that is, the SN of the module, it can be obtained with the command AT+CGSN=0.

Note: Before using Ebyte Cloud, first use the command AT+PDUTYPE=3 to configure the data protocol type to Ebyte Cloud.

4 3GPP standard command and operator cloud platform standard command

Please refer to "EA01-S 3GPP and Operator Cloud Platform Standard command Manual"

5 Power-on process and transparent transmission description

First, the serial port reports "System power on mode:<mode>" to indicate the power-on mode of the module.

<mode>=0, means normal power-on mode;

<mode>=1, means that the reset pin hardware reset and power on;

<mode>=2, means software reset and power on;

<mode>=3, means RTC wakes up from deep sleep and power on;

<mode>=4, means the serial port RX pin wakes up from deep sleep and power on;

<mode>=5, means watchdog reset and power on.

Secondly, the serial port reports "TCPIP is OK" to indicate that the network is ready and the TCP/UDP link is ready.

Finally, the serial port reports "+XSSTATE:<id>,<state>" to indicate whether the TCP/UDP Socket is successfully connected.

<id> means the created socket id, currently only supports 0 and 1, TCP/UDP channel can only use 0, COAP, MQTT, Ebyte cloud can use 1.

<state> means the socket connection status, 1 means connected, 0 means disconnected.

| AT command | Response |
|------------|------------------|
| ATD*98\r\n | CONNECTING OK |
| +++ | OK |

(1) The module works in AT command mode by default. In AT command mode, sending ATD*98\r\n or ATD*99\r\n will switch to transparent transmission mode.

(2) <+++>: In transparent transmission mode, the last three bytes of user data are "+++", or three bytes "+++" are sent after user data transmission is completed, the transparent transmission mode will end.

Finally, if you need to enter deep sleep mode after data transmission, use "+++" to exit the transmission mode and enter the AT command mode, and use AT+WORKLOCK=0 to enter deep sleep. Next time you need to send data, use the AT command to wake the module from deep sleep. After the power-on process is completed, use the AT+SOCKONOFF command to open the TCP/UDP socket0 to enter the transmission mode for data transmission. If you do not need to enter deep sleep, no other operations will be performed, and it will always work in transmission mode for real-time data sending and receiving.

6 Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible and the module needs to be reliably grounded;
- Please pay attention to the correct connection of the positive and negative poles of the power supply, reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that between the recommended supply voltage, if exceeding the maximum, the module will be permanently damaged;
- Please check the stability of the power supply. Voltage can not fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so the whole machine is beneficial for long-term stable operation;
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- Bottom Layer High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees;
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;
- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference. If

necessary, appropriate isolation and shielding can be done;

- The mounting structure of antenna has a great influence on the performance of the module. It is necessary to ensure that the antenna is exposed, preferably vertically upward. When the module is mounted inside the case, use a good antenna extension cable to extend the antenna to the outside;
- The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly weakened.

7 FAQ

7.1 Communication distance 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;
- Sea water 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 recommended value, the lower the voltage, the lower the transmitting power;
- Due to antenna quality or poor matching between antenna and module.

7.2 Module is easy to damage

- Please check the power supply source, ensure it is between the recommended supply voltage, voltage higher than the maximum 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.

7.3 BER(Bit Error Rate) is high

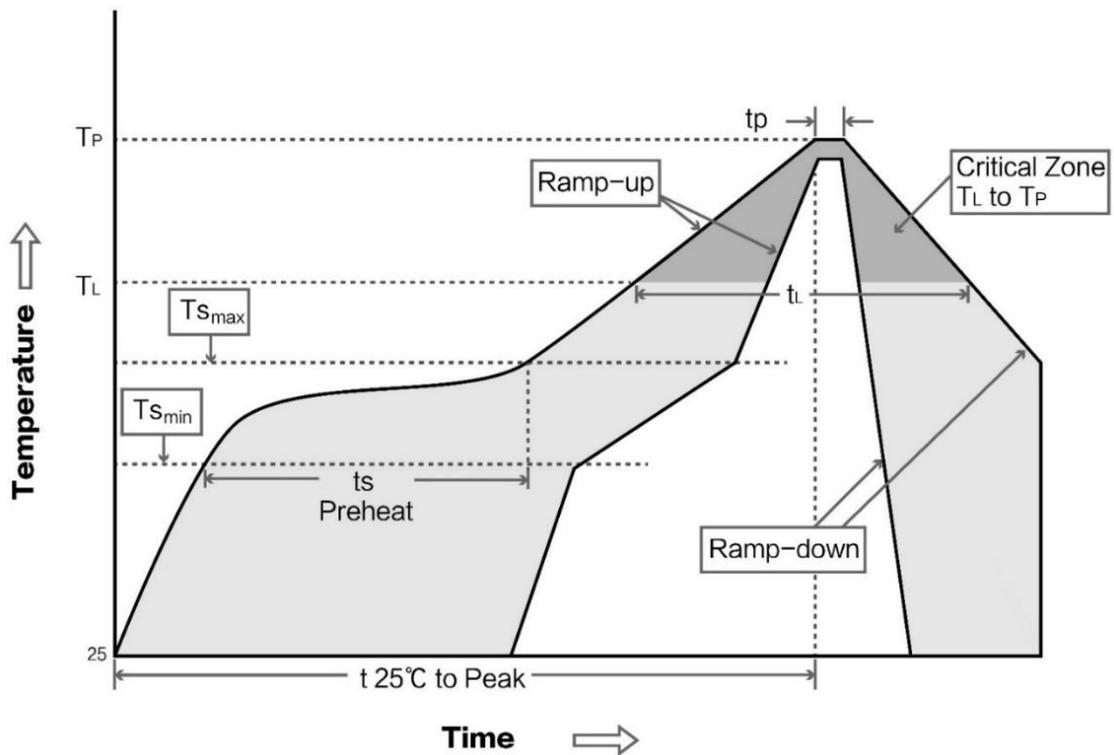
- There are co-channel signal interference nearby, please be away from interference sources or modify frequency and channel to avoid interference;
- Poor power supply may cause messy code. Make sure that the power supply is reliable;
- The extension line and feeder quality are poor or too long, so the bit error rate is high.

8 Welding instruction

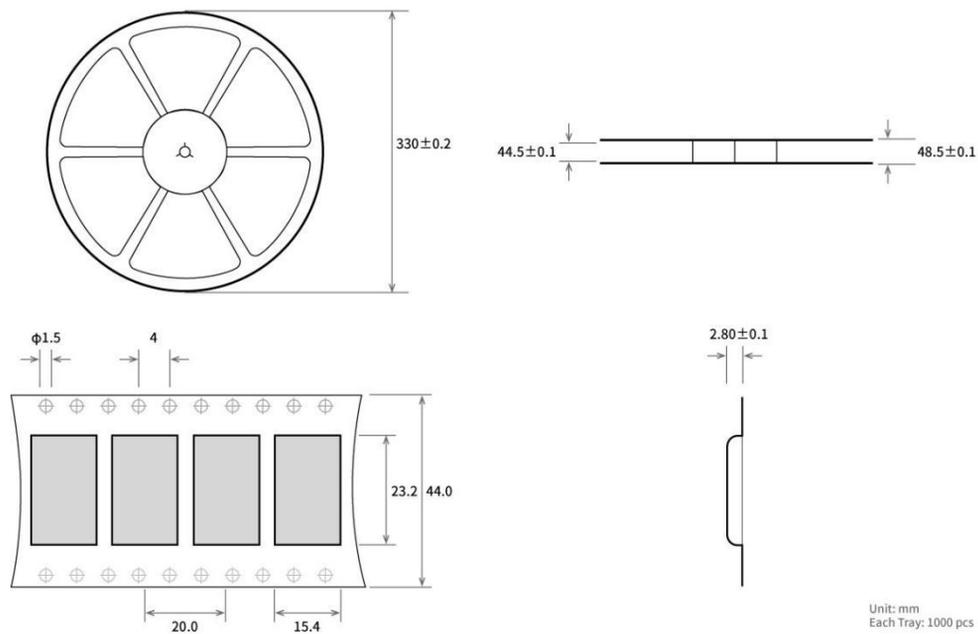
8.1 Reflow soldering temperature

| Profile Feature | Curve characteristics | Sn-Pb Assembly | Pb-Free Assembly |
|-------------------------------------------------------------------------|-----------------------------------|----------------|------------------|
| Solder Paste | Solder paste | Sn63/Pb37 | Sn96.5/Ag3/Cu0.5 |
| Preheat Temperature min (T _{smin}) | Min preheating temp. | 100°C | 150°C |
| Preheat temperature max (T _{smax}) | Max preheating temp. | 150°C | 200°C |
| Preheat Time (T _{smin} to T _{smax})(t _s) | Preheating time | 60-120 sec | 60-120 sec |
| Average ramp-up rate(T _{smax} to T _p) | Average ramp-up rate | 3°C/second max | 3°C/second max |
| Liquidous Temperature (T _L) | Liquid phase temp. | 183°C | 217°C |
| Time (t _L) Maintained Above (T _L) | Time below liquid phase line | 60-90 sec | 30-90 sec |
| Peak temperature (T _p) | Peak temp | 220-235°C | 230-250°C |
| Average ramp-down rate (T _p to T _{smax}) | Average ramp-down rate | 6°C/second max | 6°C/second max |
| Time 25°C to peak temperature | Time to peak temperature for 25°C | 6 minutes max | 8 minutes max |

8.2 Reflow soldering curve



9 packet



Revision history

| Version | Date | Description | Issued by |
|---------|------------|-----------------|-----------|
| 1.0 | 2020-03- | Initial version | Xxx |
| 1.3 | 2020-11-10 | Command upgrade | Ren |

About us

Technical support: support@cdebyte.com

Documents and RF Setting software download link: www.ebyte.com

Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com

Official hotline:028-61399028

Web: www.ebyte.com

Address: B5 Mould Park, 199# Xiqu Ave, High-tech District, Sichuan, China

