EA01-SG User Manual

NB-IoT Module

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Content

CHAPTER I: OVERVIEW

1.1 PRODUCT PROFILE

This Module Is The Nb + GPS/ Beidou Positioning Module Using Xy1100 And Gk9501 Chip Solutions Of Core Wing Technology. Xy1100 Is The World's First Single Chip Of Single Die Mass Production Nb-Iot System With CMOS Pa. It Integrates The Universal Commercial Power Amplifier Directly Into The Single Die, And Is The Most Integrated Nb-Iot Chip In The World.The Chip Integrates Dual-Core Processors Including Arm Core And DSP Core, DSP Core Processing 3Gpp Protocol, Arm Processing Application Protocol, Equipped With Huawei Liteos Operating System Dual-Core Processor While Running Fast And Stable.Support For Different Power Consumption Modes, Deep Sleep, Ordinary Sleep, Standby, Low Power Consumption Work Mode, The Minimum Power Consumption Is Up To 0.7ua.

Gk9501 Uses An RF Base band Integrated Design That Integrates DC/ DC, LDO, RF Front-End, Low-Power Application Processor, RAM, Flash Storage, RTC, And Power Management.Support For BDS / GPS / GLONASS / GALILEO / QZSS / SBAS.

1.2 FEATURE FUNCTION

- Support For The B3 B5 B8 Frequency Band;;
- Support TCP, UDP ,MQTT, COAP, Lwm2M And Other Protocols;
- Support Telecom Cloud Ctwing, China Unicom Cloud, China Mobile Onenet Cloud Platform, Ali baba Cloud, Baidu Cloud And Ebyte Cloud Transparent Transmission;
- The Deep Sleep STATE Current Was Less Than 1ua, With a Typical Value Of 0.7ua;
- Support For The 3Gpp Standard R13;
- Support TCP / UDP Trans-transmission;
- Support For The PDU Format Of SMS;
- Supports Fota Remote Upgrades;
- Support The Registration Package, The Heartbeat Package;
- Support For The Modbus RTU/ TCP Conversion;
- Supports PSM, eDRX;
- Support For The BDS / GPS / GLONASS / GALILEO / QZSS / SBAS Multi-System Joint Positioning And Single-System Independent Positioning;
- D-GNSS Differential Localization, A-GNSS Assisted Localization, Ephemeric Calendar Prediction, Dr Combined Navigation Application, And The Fastest DATE Update REAT Of 10Hz;
- PPS Output Is Supported With a Default Period Of 1s;
- Supports The UART Communication Interface;
- High Sensitivity: Capture The Cold Start-149dbm, The Hot Start-162dbm, And The Trace-166dbm;
- Output Format: Support Nmea0183 V4.1 And Previous Versions, The Maximum Fixed Update Frequency Up To 10Hz;
- Support For Built-In RTC Power Supply And External Power Supply Ports;

1.3 APPLICATION

- Smart Lighting；
- Smart Home；
- Smart Fire Fighting；
- Intelligent Meter Reading；
- Smart Parking；
- Intelligent Building, Intelligent Building
- Automated DATE Collection；
- Health Sensor；
- Automobile Testing Equipment；
- Vehicle Positioning And Navigation Equipment；
- Smart Robot
- Wearable s，Such As GPS Trackers Etc.；
- UAV Positioning, Industrial Computer, Etc；
- Industrial Equipment That Requires GNSS Positioning Or Navigation

CHAPTER II: SPECIFICATION PARAMETERS AND PIN DEFINITIONS

2. 1 MAIN PERFORMANCE

Module Basic Performance Parameters：

PARAMETER	INSTRUCTION
POWER	Power Supply Voltage Rang：3.1V～4.2V Typical Power Supply Voltage：3.6V
WORKING CURRENT	Emission Current 300-600mA （Representative Value 400Ma） Receive Current 26-32mA(GPS Close) Receive Current 50-75mA(GPS Open) Dormant Current 1uA(NB Dormant +GPS Close)
NB FREQUENCY	699MHz～960MHz 1.71GHz～2.2GHz
GPS COMMUNICATING PROTOCOL	Support NMEA0183 V4.1 And Previous Versions, The Maximum Fixed Update Frequency Can Reach 10Hz
SYSTEMS	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS
INTERFACES	UART（TXD/RXD）OR GPIO
CERTIFICATION	GPS Certification（Pending）；NB Certification (Network Access License, Model Approval)
SERIAL PORT	NB Serial Port And GPS Serial Port, Default 9600bps, DATE Bit 8bit, Stop Bit 1, No Parity NB Serial Port Default 3.0V, GPS Serial Port Default 2.8V, Compatible With 3.3V;
TRANSMITTING POWER	20dBm±2dBm
USIM INTERFACE	Support 1.8V/3V Adaptive USIM Card

FIRMWARE UPDATE	Main at Serial Port Upgrade, Support Fota Upgrade Of Mobile Cloud And Telecom Cloud
PHYSICAL CHARACTERISTICS	Size：(18.7±0.15)mm × (16±0.15)mm × (2.3±0.2)mm
TEMPERTURE RANGE	Working Temperature：-35°C～+75°C

ANTENNA INTERFACE	50Ω Characteristic Impedance
ROHS	All Devices Are Fully EU RoHS Compliant
WEIGHT	1.4g

GPS Performance Parameters：

CATEGORY	INDICATOR ITEM	TYPICAL VALUE	UNIT
Positioning Time （Test Condition 1）	Cold Boot	27.5	S
	Warm Boot	＜1	S
	Re-Capture	＜1	S
	A-GNSS	＜10	S
Sensitivity （Test Condition 2）	Cold Boot	-149	dBm
	Warm Boot	-162	dBm
	Re-Capture	-164	dBm
	Track	-166	dBm
	One-Way Reception	-118	dBm
	128 Retransmissions Received	-137	dBm
Precision （Test Condition 3）	Horizontal Positioning Accuracy	2.5	m
	Highly Positioned Accuracy	3.5	m
	Speed Positioning Accuracy	0.1	m/s
	Time Accuracy	30	ns

NOTE: THE ABOVE RESULTS ARE GPS/BEIDOU DUAL-MODE WORKING MODE

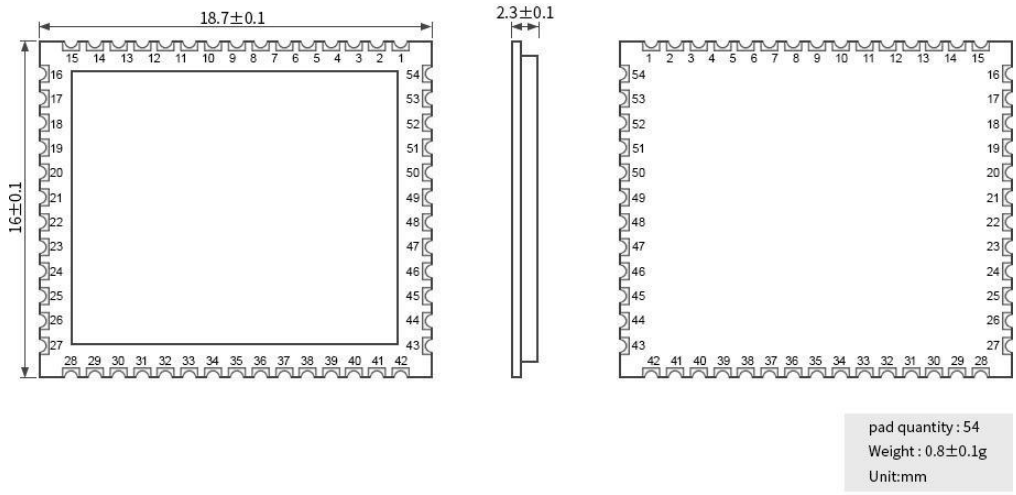
[Test Condition 1]：The Number Of Receiving Satellites Is Greater Than 6, The Signal Strength Of All Satellites Is -130dBm, The Average Value Is Obtained After 10 Tests, And The Positioning Error Is Less Than 10 Meters.

[Test Condition 2]：The External Lna Noise Coefficient Is 0.8, The Number Of Received Satellites Is Greater Than 6, And The Received Signal Intensity Value Is Locked Or Unlocked Within Five Minutes.

[Test Condition 3]：Open With No Shielding Environment, 24 Hours Of Continuous Boot Test 50%CEP.

[Test Condition 4]：The Number Of Received Satellites Is Greater Than 6, And The Signal Intensity Of All Satellites Is -130dBm.

2.2 PIN ASSIGNMENT



2.3 PIN TYPE DEFINITION

NAME	DESCRIPTION
IO	Digital Two-Way 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

Pin Number	Pin Name	I/O	Description	DC Characteristic	NOTE
4	LINK-B	DO	Socket1 connection status indication		Low level is effective
5	VDD_EXT	PO	3V output power supply	Vnom=3V	80mA max loading
10	DATE	DO	Socket, DATE sending and receiving indication		Low level is effective
11	LINK-A	DO	The Socket0 connection status indication		Low level is effective
15	GNSS_ANT	AI	GPS antenna interface		50Ω characteristic impedance
16	SIM_GND	GND	USIM, card site		
17	1PPS	DO	Second pulse output, the user can set the frequency, duration, etc		
18	SIM_VDD	DO	USIM card power supply	1.8/3V adaptive	10mA max loading
19	SIM_CLK	DO	USIM card clock signal		
20	SIM_RST	DO	USIM card has a reset signal		
21	SIM_DATE	IO	USIM card DATE signal		Add a 20K pull-up resistor to the DATE line
22	TXD_GNSS	DO	GPS serial port TXD		2.8V level compatible with 3.3V, default 9600bps
23	RXD_GNSS	DI	GPS serial port RXD		
29	TXD_DBG	DO	Module debugging serial port, TXD, reserved		Reserved, recommended suspension
30	RXD_DBG	DI	Module debugging serial port, RXD, reserved		
33	RXD	DI	Module DATE and at serial port RXD		3V voltage domain
34	TXD	DO	Module DATE and at serial port TXD		
41	RF_ANT	AI/AO	RF antenna interface		50Ω characteristic impedance
47	NETLIGHT	DO	Network status indication		Flash indication when park
52	VBKP	PI	RTC auxiliary power supply input for the GPS		3.0V-4.2V
53	RST/WKUP	DI	Return / wake-up indication, and the high level is valid	VIL=0V VIHmin=1.2V VIHmax=3.6v	The High-Level Signal Is Regarded As a Wake-Up Signal When The Pulse Width Is Greater Than 100us And Less Than 5s.The Reset Signal Is Considered When The High-Level Signal Width Is Greater Than 6 Seconds.(Interior Pull-Down Resistance)
54	IO_RST	DI	Restore factory parameters		Low level is effective
50,51	VBat	PI	Module main power supply	Vmax=4.2V Vmin=3.1V Vnom=3.6V	Power supply shall meet at least 0.6A current
14,27,31, 40,42,44 ,45,48,49	GND	GND	power ground		
3,6,8,9,12 ,38,39	RESERVED	-	reserved		Keep Hanging

1,2,7,13, 24,25,26, 28,32,35, 36,37,43, 46	NC	-	Empty Feet		

NOTE：

- DATE, Socket DATE Sending And Receiving Status Indication, Output High Level When Idle, This Pin Will Continue To Pull Low For 500ms After The Socket Receives Wireless DATE In The Air, If There Is Wireless DATE Within 500ms, It Will Continue To Pull Low Again For 500ms, If If No DATE Arrives Within 500ms, It Will Resume High-Level Output; When The Socket Sends DATE, It Will Continue To Pull Low For 500ms. If There Is DATE To Send Within 500ms, It Will Continue To Pull Low Again For 500ms. If No DATE Is Sent Within 500ms, It Will Resume High Level. Output.
- LINK-B, Socket1 Connection Status Indication, Output High Level When Socket1 Is Not Connected, Output Low Level After Successful Connection, And Restore High Level Output After Disconnection.
- LINK-A, Socket0 Connection Status Indication, Output High Level When Socket0 Is Not Connected, Output Low Level After Successful Connection, And Restore High Level Output After Disconnection.
- IO_RST, Restore The Factory Parameters, This Pin Is Continuously Pulled Down For About 1 Second, The Serial Port Returns To Factory Reset, The Function Of Restoring The Factory Parameters Will Be Executed, And The Automatic Restart Will Take Effect.

CHAPTER III: EXPLANATION OF EBYTE EXTENDED INSTRUCTIONS AND FUNCTIONS

3.1 EBYTE TRANSPARENT TRANSMISSION APPLICATION ENABLE

AT ORDER	RESPONSE
AT+EBYTEAPP=<ENABLE><NEWLINE>	OK
AT+EBYTEAPP	EBYTE APP ENABLE:<ENABLE> OK

- This at Command Configures Whether To Use TCP, DUP, EBYTE Cloud, MQTT And COAP Transparent Transmission Applications. The Default Is To Enable at+EBYTEAPP=1. When Access To Mobile Is Required at+EBYTEAPP=0 Is Required To Close The Transparent Transmission Application When One net Cloud, Telecommute Cloud Or Socket Extended at Command Is Transmitted.
- Configuration Parameter Description: <Enable>, 0 Means To Close The Transparent Transmission Application, 1 Means To Open The Transparent Transmission Application.
- Note: When Power-Off Saving Is Required, Input at+NRB Command Will Save Parameters To Flash, And Automatically Restart To Take Effect.

3.2 SELECT THE SERVICE TO AUTOMATICALLY CONNECT WHEN POWER ON

AT ORDER	RESPONSE
AT+POWONLINK=<TYPE ><NEWLINE>	OK
AT+POWONLINK	POWER ON LINK SOCKET TYPE: <TYPE>

- The AT command configuration selects the SOCKET the at is automatically connected when powered on. By default, only the TCP/UDP channel is automatically connected when powered on.
- Description of configuration parameters: , 1 means the MQTT channel, 2 means the COAP channel, 3 means the power is connected to the Eater Cloud channel
- Note: When Power-Off Saving Is Required, Input at+NRB Command Will Save Parameters To Flash, And Automatic ally Restart To Take Effect.

3.3 CONFIGURE THE DTU FUNCTION AND THE APPLICATION ENTERWHEN IT IS POWERED ON

AT ORDER	RESPONSE
AT+DTUUSER=<ENABLE><NEWLINE>	OK
AT+DTUUSER	DTU ENABLE:< ENABLE >

- The AT Command Configuration Selects Whether To Enter The Transmission Mode By Default When The Device Is Powered On.
- Con-figuration Parameter Description: <Enable>, 0 Means Close, 1 Means Open, Input at+NRB Command Will Save The Parameters To Flash, And Automatic-ally Restart To Take Effect.

3.4 MODULE VOLTAGE QUERY

AT ORDER	RESPONSE
AT+VBAT=?<NEWLINE>	+VBAT:<VALUE> OK

- VBAT Is The Current Power Supply Voltage Of The Module. The Normal Working Range Is 3.1-4.2V.

3.5 SWITCH BETWEEN at MODE AND DATE TRANSMISSION

AT ORDER	RESPONSE
ATD*98<NEWLINE>	CONNECTING OK
+++	OK

- It Works In at Command Mode By Default After Power-On. In at Command Mode, Send ATD*98<Line Feed> Or ATD*99<Line Feed>, It Will Switch To Transparent Transmission Mode.
- In The Transparent Transmission Mode, The Last Three Bytes Of The User DATE Are "+++", Or The Three Bytes "+++" Are Sent After The User DATE Transmission Is Completed, And The Transparent Transmission Mode Will Be Ended.

3.6 SWITCH BETWEEN at MODE AND DATE TRANSMISSION

AT ORDER	RESPONSE
AT+NRB<NEWLINE>	REBOOTING

- After Inputting The at Command, The Device Will Restart Softly And Save The at Parameters To The Flash. When The at Parameters Need To Be Remembered After Power-Off, Configure The Parameters Through The at Command First, And Then The AT+NRB Parameters Must Be Input Before They Can Be Stored In The Flash.

3.7 APPLICATION OF WORKLOCK

AT ORDER	RESPONSE
AT+WORKLOCK =<ENABLE><NEWLINE>	OK

- Since The NB Module Is In Deep Sleep Mode For a Long Time (The Chip Is Powered Off), In Order To Ensure That The DATE Interaction Fails Due To Entering Deep Sleep Early During The Application Period, Input at+WORKLOCK=1 To Add a Work Lock To Prevent Early Deep Sleep. After The DATA Service Interaction Is Completed Enter AT+WORKLOCK=0 To Release The Lock Module Into Deep Sleep.
- The Module Supports Serial Port Wake-Up. Enter at Command To Wake Up. After The at Command Wakes Up The Module, It Will Automatically Add a Work Lock. Therefore, After Each Wake-Up And Business Interaction, You Must Enter at+WORKLOCK=0 To Release The Lock To Enter Deep Sleep.
- Note: You Must Also Input at+WORKLOCK=0 To Enter Deep Sleep After Powering On Again.

3.8 SERIAL PORT BAUD REAT SETTING

AT ORDER	RESPONSE
AT+UARTSET =<REAT>,<STORE><NEWLINE>	OK

- This Command Is Similar To The "AT+NAT SPEED" Function Of Becquerel. It Is Used To Set Parameters Such As The Baud REAT Of The at Serial Port. The Default Is 9600 Baud REAT. When Store Is 0, The Baud REAT Will Take Effect Dynamically. Divide The Set Baud REAT By 2400 And Save It To Flash And Automatically Restart To Take Effect。
- Parameter Configuration Description: <REAT>: Baud REAT, Currently Supports Up To 115200. <Store>: Whether To Save, The Default Is Not To Save, That Is To Dynamically Switch The Baud REAT; If Set To 1, It Will Be Saved To NV And Restarted Immediately; If Set To 0, It Means That The Dynamic Will Take Effect, And The Other Party Needs To Switch The Baud REAT Synchronously .。

3.9 COMMUNICATION PROTOCOL TYPE CONFIGURATION

AT ORDER	RESPONSE
AT+PDUTYPE=<PDU_TYPE><NEWLINE>	OK
AT+PDUTYPE<NEWLINE>	TYPE:<PDU_TYPE> OK

- Currently Supports MQTT, COAP, TCP/UDP And Ebyte Cloud Protocols. Currently The Module Supports Two Sockets, Allowing Simultaneous Communication Between TCP/UDP And One Of MQTT, COAP And Ebyte Cloud. TCP/UDP Always Opens Socket0, MQTT One Of , COAP, And Ebyte Open Socket1.。
- Configuration Parameter Description: <PDU_type>, 0 Means Based On TCP Or UDP Protocol, 1 Means Based On MQTT Protocol, 2 Means Based On CAOP Protocol, 3 Means Based On EBYTE Cloud Protocol.。
- NOTE：When It Needs To Be Saved After Power-Off, Input AT+NRB Command To Save The Parameters To 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 ORDER	RESPONSE
AT+SOCKADDR =<ADDR>,<PORT>,<LOCAL_PORT>,<TYPE><NEWLINE>	OK
AT+SOCKADDR<NEWLINE>	ADDRESS:< ADDR >,PORT: PORT >,LOCAL PORT: <LOCAL_PORT>,TYPE:<TYPE> OK

- Socket0 Address Supports IP Address And Domain Name, And The Maximum Byte Length Supports 50 Bytes. The Device Will Automatically Connect To Socket0 After Soft Restart, Hardware Reset And Normal Power-On. When The Device Wakes Up From Deep Sleep, It Needs To Enter The On And Off Command at+Sock on off To Connect To Socket0. If The Server Does Not Release The Link Before Connecting, The Terminal Needs To Successfully Disconnect The Link Before Connecting To Socket0.
- Configuration Parameter Description：
  <Addr>，Support IP Address Or Domain Name, The Maximum Byte Length Is 50 Bytes.
  <Port>，Remote Server Port。
  <Local_Port>，Local Port, 0 Means Freely Selected By TCP IP, Default Is 0.
  <Type>，0 Means TCP Protocol, 1 Means UDP Protocol.
  Note: When It Needs To Be Saved After Power-Off, Input AT+NRB Command Will Save The Parameters To Flash, And Automatically Restart To Take Effect.
- Socket Connection Status Changes Will Be Actively Reported +XSSTATE:<Id>,<STATE>；
  <Id>，Indicates The Created Socket Id, Currently Only 0 And 1 Are Supported. Only 0 Can Be Used For TCP/DUP Channels, And 1 Is Used For COAP, MQTT, And EBYTE Cloud Channels.
  <STATE>, Indicates Socket Connection STATE, 1 Indicates Connection STATE, 0 Indicates Disconnection. If Socket0 Is Successfully Connected, It Will Actively Report +XSSTATE:0,1, And When The Server Or Terminal Disconnects Socket0, It Will Also Actively Report +XSSTATE:0,0.

3.10.2 OPEN AND CLOSE THE SOCKET0 CONNECTION FOR THE TCP / UDP

AT ORDER	RESPONSE
AT+SOCKONOFF=<ENABLE>,<ON-OFF><NEWLINE>	+XSSTATE:< ID>,<STATE> OK

- Parameter Configuration Instructions：
  <Enable>，It Indicates Whether The TCP / UDP Channel Is Enabled, 1 Means Enabled, And 0 Means Not Enabled.The Default Is To Enable The Opening Of The TCP / UDP Channel.
  <On-Off>，It Indicates Socket0 On Or Off, 1 Open And 0 Closed.
- Note: When The Power Loss Needs To Be Saved, The Input at + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3.11 HEARTBEAT PACKET FUNCTION CONFIGURATION

3.11.1 CONFIGURE THE TCP / UDP HEARTBET PACKAGE CONTENT

AT ORDER	RESPONSE
AT+HEARTINFO=<TYPE>,<DATE><NEWLINE>	OK
AT+HEARTINFO <NEWLINE>	<DATE> OK

- Parameter Configuration Instructions：
  <Type>， 0 Means Heartbeat Packet Type Is In Hex Form at And 1 Means Heartbeat Type Is In ASCII Code (String) Form at.。
  <DATE>，Heartbeat Packet DATE Content Sent, The Maximum Length Is Less Than 40, The Default Value Is "EBYTE Nbiot Heart REAT DATE".
- Note: When The Power Loss Needs To Be Saved, The Input AT + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3.11.2 SEND A HEARTBEATPACKET COMMAND

AT ORDER	RESPONSE
AT+SENDHEART=<SEND><NEWLINE>	OK

- Enter the ATCOMMAND At+SENDHEART=1 To Complete t He Heart Beta Packet Sending.
- If Pdu_Type Selects TCP / UDP, Send TCP / UDP Heartbeat Packet, Select MQTT, Send MQTT Heartbeat Packet (The Serial Port Will Print "PINGRESP" After Successful Sending), Select EBYTE Cloud, Send EBYTE Cloud Heartbeat Packet.

3.12 REGISTRATION PACKAGE FUNCTION CONFIGURATION

3.12.1 REGISTER THE PACKAGE MODE CONFIGURATION

AT ORDER	RESPONSE
AT+REGMOD=<MODE><NEWLINE>	OK
AT+REGMOD<NEWLINE>	OK MODE: <MODE>

- Parameter Configuration Instructions：
  <Mode>，0 Represents a Registration Package; 1 Represents An Mime Registration Packet Before Each Packet Of DATE Sent; 2 Represents a Custom Registration Packet Before Each Packet Of DATE Sent; 3 Means Only An Mime Registrations Packet Is Sent On The First Link To The Server; 4 Means Only a Custom Registration Packet Is Sent On The First Link To The Server.
- Note: When The Power Loss Needs To Be Saved, The Input AT+ NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3.12.2 CUSTOMIZE THE REGISTRATION PACKAGE DATE CONTENT CONFIGURATION

AT ORDER	RESPONSE
AT+REGINFO=<TYPE>,<DATE><NEWLINE>	OK
AT+REGINFO<NEWLINE>	OK < DATE >

- Parameter Configuration Instructions：

<Type>，0 Indicates That The Package Type Is In Hex Format And 1 Means That The Package Type Is In ASCII Code (String) Format.
<DATE>，Registration Package DATE Content Sent, The Maximum Length Is Less Than 40, The Default Value Is "EBYTE Register

- Note: When The Power Loss Needs To Be Saved, The Input AT + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3. 13 THE MODBUSRTU / TCP CONVERSION FUNCTION

3. 13. 1 FUNCTION DECLARATION

When The Modbus RTU / TCP Conversion Function Is Enabled, In The Receiving STATE, When The Wireless Received Modbus RTU DATE Format Is Automatically Converted To Modbus TCP DATE Format Serial Printing, When Receiving The Modbus TCP DATE Format Wirelessly, It Will Be Automatically Converted To The Modbus RTU DATE Format Serial Port Printing; In The Emission STATE, When The Serial Port Receives The Modbus RTU DATE Format, It Is Automatically Converted To The Modbus TCP DATE Format And Sent Wirelessly, When The Serial Port Receives The Modbus TCP DATE Format, It Will Be Automatically Converted To The Modbus RTU DATE Format For Wireless Transmission

3. 13. 2 THE MODBUSRTU / TCP ENABLES THE CONFIGURATION

AT ORDER	RESPONSE
AT+MODBUS=<ENABLE>,<ID><NEWLINE>	OK
AT+MODBUS<NEWLINE>	OK ENABLE:<ENABLE>,ID:<ID>

- Parameter Configuration Instructions：
  <Enable>，0 Represents The Modbus RTU / TCP Off; 1 Means The Modbus RTU / TCP On. , Indicating The Modbus TCP Transaction Identity, (0~65535) 2-Byte Length,
- Transaction Id Id Function Description:
  In The Modbus TCP To Modbus RTU STATE, When Id=0, Any Modbus TCP Received Is Converted To The Corresponding RTU Protocol, Otherwise Only The Transaction Identity Matches Will Convert.
- From Modbus RTU To Modbus TCP, It Indicates The Modbus TCP Transaction Standard
- Note: When The Power Loss Needs To Be Saved, The Input at + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3. 14 MQTT APPLICATION CONFIGURATION

3. 14. 1 MQTT INSTRUCTION SET USAGE INSTRUCTIONS

First, The AT + MQTTMODE Instruction Configuration Mott Working Mode Soft Reset Restart Takes Effect, Secondly, AT + PDUTYPE Confirms Whether The Transmission Is MQTT In The DATE Frame Type, Secondly, The Three Elements Of The AT + MQTTCONN Configuration Connection, Again The at + MQTTSUBTOP And at + MQTTPUBTOP Instructions Configure The Subscription And Release Topics, Finally, The ATD * 98 Enters The Transmission Mode For Business Interaction, Enter + + + Into The at Command Mode After The Interaction, Related Low Power Service Requires Input AT + WORKLOCK=0 Command Release Lock Into Deep Sleep Mode.

3. 14. 2 MQTT MODE CONFIGURATION

AT ORDER	RESPONSE
AT+MQTTMODE=<MODE><NEWLINE>	OK
AT+MQTTMODE <NEWLINE>	OK MODE:< MODE >

- Parameter Configuration Instructions：

  <Type>，0 Means Shutdown Of MQTT Function; 1 Means Access To Ali Cloud Platform; 2 Means Access To Onenet Platform And Other Internet Of Things Platform Supporting Standard MQTT Protocol; 3 Means Access To Baidu Cloud Platform.

- Note: When The Power Loss Needs To Be Saved, The Input AT+ NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3.14.3 MQTT ADDRESS AND PORT CONFIGURATION

AT ORDER	RESPONSE
AT+MQTTADDR=<ADDR>,<PORT><NEWLINE>	OK
AT+MQTTADDR<NEWLINE>	OK ADDRESS: <ADDR>,PORT: <PORT>

- When MQTT Mode Is 0, This Command Prompts "MQTT Closed"; When MQTT Mode Is 1; When MQTT Mode, Onenet Or MQTT Mode Is 2; And When m q t t Mode Is 3;；
- Parameter Configuration Instructions：

  <Addr>，Represents The Server's IP Address Or Domain Name, Up To 50 Bytes.。

  <Port>，Represents The Server-Side Port。
- Note: The Domain Name Addresses Of The Three Platforms Of Baidu Cloud, Onenet, And MQTT Generally Do Not Change. If The Domain Name Does Change, It Can Also Be Modified Through Instructions.

3.14.4 MQTT CONNECTION THREE-ELEMENT CONFIGURATION

AT ORDER	RESPONSE
AT+MQTTCONN=<VALUE0>,<VALUE1>,<VALUE2><NEWLINE>	OK
AT+MQTTCONN<NEWLINE>	OK <VALUE0> <VALUE1> <VALUE2>

- Each Of The Three Elements Is No Longer Than 40 Bytes.
- For The Three Element Values Of Each Platform, See The Corresponding Application Guidance.
- Note: When The Power Loss Needs To Be Saved, The Input AT + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect

3.14.5 MQTT SUBSCRIPTION TOPIC CONFIGURATION

AT ORDER	RESPONSE
AT+MQTTSUBTOP=<TOPICNAME>.<QOS><NEWLINE>	OK

AT+MQTTSUBTOP<NEWLINE>	OK QOS:< QOS > < TOPICNAME>

- Parameter Configuration Instructions：
  <Topicname>：Subscribe To a String Of Content Within 200 Bytes.
  <Qos>：Quality Of Service Support Is Qos=0, Qos=1, And Qos=2.

3. 14. 6 MQTT PUBLISH THEME CONFIGURATION

AT ORDER	RESPONSE
AT+MQTTPUBTOP=<TOPICNAME>,<QOS><NEWLINE>	OK
AT+MQTTPUBTOP<NEWLINE>	OK QOS:< QOS > < TOPICNAME>

- Parameter Configuration Instructions：
  <Topicname>：Publish The Content Of The Topic In a String Within 200 Bytes.
  <Qos>：Quality Of Service Support Qos=0; Qos=1; Qos=2.

3. 14. 7 MQTT AND SERVER KEEPALIVE SETTINGS

AT ORDER	RESPONSE
AT+MQTTALIVE=<ALIVE_TIME><NEWLINE>	OK
AT+MQTTALIVE<NEWLINE>	OK KEEP ALIVE TIME:< ALIVE_TIME >

- Parameter Configuration Instructions：
  <Alive_Time>， Server Keep-Alive Time, The Unit Is Seconds, The DATE Range Is 2 Bytes, The Default Is 600 Seconds (10 Minutes).
- Note: When The Power Loss Needs To Be Saved, The Input AT + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect。

3. 15 COAP FUNCTION CONFIGURATION

3. 15. 1 COAP FUNCTION DECLARATION

- Firstly, The AT + COAP ADDR Command Is Used To Configure The Address And Port Of The COAP Server To Open The COAP Function at The Same Time, And The at + NRB Soft Reset Restart Takes Effect;;
- Secondly, The AT + PDUTYPE Instruction Selects The DATE Protocol Type As COAP;;
- Thirdly, The AT + ADDOPTION, AT + ADDTOKEN, AND AT + COAPMINUS Instructions Add Or Remove The Option Or Token In The Message;
- Finally, The AT + COAPHEADER Command Sends An Unloaded Message; The ATD * 98 Enters The Transmission Mode To Input Serial Port Transmission DATE, And The DATE Sent Is Loaded.COAP Message (Serial Port Transmission DATE Is The Payload Of COAP Message).

3. 15. 2 COAP ADDRESS PARAMETER CONFIGURATION

AT ORDER	RESPONSE

AT+COAPADDR=<ADDR>,<PORT>,<LOCAL_PORT>,<ENABLE><NEWLINE>	OK
AT+COAPADDR<NEWLINE>	OK ADDRESS: <ADDR>,PORT: <PORT> , LOCAL PORT:< LOCAL_PORT >,ENABLE<ENABLE>

- Parameter Configuration Instructions:
  <Addr>, Support IP Address Or Domain Name, The Maximum Byte Length Is 50 Bytes.。
  <Port>, The Port Of The Server.。
  <Local_Port>, The Local Port。
  <Enable>, COAP Enabled, 0 Means COAP Off; 1 Means COAP On.。
- Note: When The Power Loss Needs To Be Saved, The Input AT + NRB Instruction Will Save The Parameters Into The Flash, And Automatically Restart The Effect.

3. 15. 3 ADD OPTION COMMAND IN COAP MESSAGE

AT ORDER	RESPONSE
AT+ADDOPTION=<INDEX>,<TYPE>,<VALUE><NEWLINE>	OK
AT+ADDOPTION<NEWLINE>	OK INDEX: <INDEX>,TYPE: <TYPE>,VALUE: <VALUE>

- Parameter Configuration Instructions:
  <Index>, The Serial Number Of The Option Option, With The Range From 0 To 7, Can Be Configured With Up To 8 Options, With a Storage Space Of 1,024 Bytes.。
  <Type>, The Number Of The Option 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)

As In Type=11, It Indicates That The Option Resource Type Is Uri-Path.
<Value>, Specific Content Of The Option, Such As Uri-Path Path Option Specific Value Is \ Temperature, If The Value DATE Type Is Uint, DATE Range 0-4294967295 Range, DATE Length Is Only 0-4 Bytes.

- You Can Configure Multiple Options, Including a Maximum Of Eight, For Example, Enter Instructions In Order Below:
  AT+ADDOPTION=0,3,IOT.ECLIPSE.ORG

AT+ADDOPTION=1,7,5683
AT+ADDOPTION=2,11,\Temperature
Read The Instructions AT+ADDOPTION
Back
Index：0，
Type：3，
Value: IOT.ECLIPSE.ORG
Index：1，
Type：7，
Value: 5683
Index：2，
Type：11，
Value: \Temperature

3.15.4 INSTRUCTIONS FOR ADDING TOKEN IN COAP MESSAGE

AT ORDER	RESPONSE
AT+ADDTOKEN =<TOKEN><NEWLINE>	OK
AT+ADDTOKEN<NEWLINE>	OK <TOKEN>

Parameter Configuration Instructions：
<Token>，The DATE Format Is Hex。

- For Example, The Parameter To Be Input Is, 0x7A5B69Ef
  Enter The Write Instruction AT+ADDTOKEN=7A5B69Ef
  Enter The Read Instruction AT+ADDTOKEN
  Return Parameter 7A5B69Ef

3.15.5 REMOVE THE OPTION OR TOKEN INSTRUCTIONS IN THE MESSAGE

AT ORDER	RESPONSE
AT+COAPMINUS=<TOKEN>,<OPTION><NEWLINE>	OK

Parameter Configuration Instructions：
<Token>=1，Remove The Token From The Message。
<Option>=1，Remove From The Message, Option。

3.15.6 COAP SENDS AN INSTRUCTION WITHOUT A LOAD MESSAGE

AT ORDER	RESPONSE
AT+COAPHEADER =<TYPE>,<CODE><NEWLINE>	OK
AT+COAPHEADER <NEWLINE>	OK TYPE:<TOKEN>,CODE:<CODE>

Parameter Configuration Instructions：
<Type>，Configure The Type Of Message Sent。
Type=0，Con Frame, The Request Needs To Be Confirmed, If The Con Request Is Sent, Then The Other Party Must Make a Response;;
Type=1，Non Frame, No Need To Be Confirmed Request, If The Non Request Is Sent, Then The Other Party Does Not Have To Respond;
Type=2，ACK Frame, Answer Message, Response Received To The Con Message;
Type=3，RST Frame, Reset Message, When The Recipient Receives The Message Contains An Error, The Recipient Parses The Message Or No Longer Cares About The Content Sent By The Sender, Then The Reset Message Is Sent.。
<Code>，Configure The Function Code For Sending Messages。

Code=1，The Get Method That Is Used To Obtain a Certain Resource；
Code=2，The Post Method, Used For Creating a Resource；
Code=3，The Put Method That Is Used For Updating a Resource；
Code=4，The Delete Method That Is Used To Delete a Resource。
For Example, Enter at + COAPHEADER =0,1 To Send a Frame Of a COAP Get Message, Including a Fixed Header That May Have a Option Or Token.

3. 11. 7 COAP DATE RECEIVING INSTRUCTIONS

- Head Information For Serial Print Received COAP DATE Frame: Response Code: , Type: , TID: To End With Return Newline. , Indicates The Function Code Of The Server Response; , Indicates The Type Of Received Message; , Indicates The Received Message Of Message Id (Decimal Format)；

If There Is a Token In The Received Message, The Serial Print Token: Ends With a Return Newline, And Forms As An Hex String;
If There Is a Option In The Received Message, The Serial Print Option Type: , Value: Ends With The Return Newline.
If Payload Is Included In The Received Message, The Serial Print Payload: Ends With The Return Newline.。

3. 16 EBYTE SPECIAL CLOUD FUNCTION CONFIGURATION

3. 16. 1 ADDRESS AND PORT CONFIGURATION

AT ORDER	RESPONSE
AT+EIOTADDR=<ADDR>,<PORT><NEWLINE>	OK
AT+EIOTADDR<NEWLINE>	OK ADDRESS: <ADDR>,PORT: <PORT>

Parameter Configuration Instructions：
<Addr>，IP Address Or Domain Name With Maximum Byte Length Of 50 Bytes.
<Port>，The Port Of The Server.

3. 16. 2 CONFIGURATION FOR ON / OFF AND SN

AT ORDER	RESPONSE
AT+EIOT=<ONOFF>,<KEYSN><NEWLINE>	OK
AT+EIOT<NEWLINE>	OK ONOFF: <ONOFF>,KEYSN: <KEYSN>

Parameter Configuration Instructions：
<Onoff>1 Open The Connection Of EBYTE Cloud, 0 Means Close The Connection Of EBYTE Cloud Connection.
<Keysn>，The Serial Number Key, AT + CGSN=0 Command Acquisition.
Note: Before Using EBYTE Cloud, at + PDUTYPE=3 Is Configured As The DATE Protocol Type Of EBYTE Cloud.

CHAPTER IV: GNSS-RELATED AT INSTRUCTIONS

4.1 CONFIGURE THE GNSS COMMAND PARAMETERS

AT ORDER	RESPONSE

AT+GNSSCMD=<NMEACMD><NEWLINE>	OK
AT+GNSSCMD<NEWLINE>	OK COMMAND LIST

- This at Instruction Is Mainly Used To Configure The GNSS Command Parameters, And The Details Of The Command Parameters Are Shown In The GNSS Command Manual,
- Parameter Configuration Instructions: , For The Details Of The GNSS Command, See The GNSS Command Manual.

For Example: at + GNSSCMD=$Pgkc030,1,1 * 2C

4.2 CONFIGURE THE NMEA STATEMENT FOR THE at SERIAL PORTOUTPUT

AT ORDER	RESPONSE
AT+NMEAPRINT=<NMEA_ITEM><NEWLINE>	OK
AT+ NMEAPRINT<NEWLINE>	OK NMEA ITEM

- The AT Instruction Mainly Configuration at Serial Port Output NMEA Statements Mainly Includes GLL, RMC, VTG, GGA, GSA, GSV And Other Statements
- Parameter Configuration Instructions：
  <NMEA_Item>，Select The Output NMEA Statement, Null Means No Output Statement, GLL / R M C/VTG / GGA / GSA / GSV Indicates The Output Corresponding Statement, The Default Is Null.
  For Example：AT + NMEAPRINT=GLL / RMC / GSA, Indicating The Output Statement Such As GLL RMC GSA.
  AT+NMEAPRINT=GGA/GSA/GSV, Representing The Out Put Statement Such As GGA GSA GSV.

4.3CONFIGURE HOW THE NMEA STATEMENT IS OUTPUT

AT ORDER	RESPONSE
AT+NMEAOP=<MODE><NEWLINE>	OK
AT+ NMEAOP<NEWLINE>	OK NMEA OUTPUT MODE: <MODE>

- This AT Instruction Mainly Configures The Output Mode Of The NMEA Statement. Select The at Serial Port Output Or The Socket Output.
- Parameter Configuration Instructions：<Mode>，0 Represents The at Serial Port Output, And 1 Represents The Socket Channel Output.Default at Serial Port Output.

4.4CONTROL THE GNSS POWER SUPPLY

AT ORDER	RESPONSE
AT+GNSSVCC=<MODE<NEWLINE>	OK
AT+GNSSVCC<NEWLINE>	OK GNSS POWER MODE:<MODE>

- The AT Command Mainly Configure Power Supply Mode Of GNSS. The Default Power Supply Is Turned On, And The GNSS Power Supply Should Be Turned Off After The Business Interaction.
- Parameter Configuration Instructions：<Mode>，0 Means GNSS Power Is Turned Off, 1 Means Only For GNSS Auxiliary Power, And 2 Means That Both GNSS Primary And Secondary Power Are Supplied.The Default Is 2, And at + NRB Saves In Flash.

CHAPTER IV: 3GPP STANDARD DIRECTIVE AND OPERatOR CLOUD PLatFORM STANDARD RECTIVE

This Section Refers To The Ea01-S 3Gpp And Operator Cloud Platform Standard Instruction Manual

CHAPTER v: POWER SUPPLY PROCESS AND DEEP SLEEP INSTRUCTIONS

First, The Serial Port Report "System Power On Mode: " Indicates The Module Mode.

<Mode>=0,Represents The Normal Power-Up Mode;

<Mode>=1,Represents The Reset Pin Hardware Reset On The Power;

<Mode>=2,Indicates That The Software Is Reset And Overpowered;

<Mode>=3, Represents RTC Deep Sleep Wake Up;

<Mode>=4,Represents The Serial Rx Pin Deep Sleep Wake Up Power;

<Mode>=5,It Means That The Watchdog Returns To Power;

Secondly, The Serial Report "TCPIP Is Ok" Indicates The Success Of The Network, And The TCP / UDP Link Is Ready.
Finally, The Serial Port Report "+ XSSTATE: , " Indicates Whether The Socket Of The TCP / UDP Is Successfully Connected.
<Id> Represents The Socket Id Created, Currently Supports Only 0 And 1, TCP / DUP Channels Can Only Use 0, COAP, MQTT, Cloud Channels With 1.
<STATE> Socket Connection STATE, 1 Is Connected STATE And 0 Is Disconnected.

AT ORDER	RESPONSE
ATD*98<NEWLINE>	CONNECTING OK
+++	OK

- Up-power Works In at Instruction Mode By Default. In at Order Mode, ATD * 98 Or ATD * 99 Will Switch To Trans transmission Mode.
- In Transmission Mode, The Last Three Bytes Of User DATE Are "+ + +", Or The Three Bytes Of "+ + +" Are Sent After The Completion Of The User DATE Transmission, Which Will End The Transmission Mode.

Finally, If You Need To Enter The Deep Sleep After The DATE Communication Ends, Then Enter The "+ + +" Exit Transmission Mode To Enter The at Command Mode And Input The AT + WORKLOCK=0 Into The Deep Sleep.The Next Time The DATE Needs To Be Sent, Input at Instruction To Wake Up The Module From Deep Sleep. After The Power-Up Process, Call AT + SOCKONOFF Instruction To Open The Socket0

CHAPTER VI: HARDWARE DESIGN

- It Is Recommended To Use Dc Voltage Supply To Supply The Module, The Power Ripple Coefficient Is As Small As Possible, The Module Should Be Reliably Grounded;
- Please Note The Correct Connection Of The Positive And Negative Poles Of The Power Supply, If The Reverse Connection May Cause Permanent Damage To The Module;
- Please Check The Power Supply To Ensure That The Module Damage Exceeds The Maximum Voltage;
- Lease Check The Stability Of The Power Supply, The Voltage Can Not Fluctuate Greatly Frequently;
- When Designing The Power Supply Circuit For The Module, It Is Often Recommended To Retain More Than 30% Surplus, And The Whole Machine Is Conducive To Long-Term And Stable Work;
- Module Should Be As Far As Possible Away From The Power Supply, Transformer, High-Frequency Wiring And Other Large Electromagnetic Interference Part;
- High Frequency Digital Wiring, High Frequency Analog Wiring, Power Wiring Must Avoid Below The Module, If It Is Really Necessary To Pass Through Below The Module Bottom, Assuming That The Module Is Welded In Top Layer, In The Top Layer Copper Contact Part Of The Module (All Copper And Good Grounding), Must Be Close To The Digital Part Of The Module And Wire In Bottom Layer;
- Assuming That The Module Is Welded Or Placed In The Top Layer, It Is Also Wrong To Walk Randomly at The Bottom Layer Or Other Layers, Which Will Affect The Stray Dispersion And Receiving Sensitivity Of The Module To Different Degrees;
- Assuming That Devices With Large Electromagnetic Interference Around The Module Will Also Greatly Affect The Performance Of The Module, It Is Recommended To Keep The Distance From The Module According To The Interference Strength, And The Appropriate Isolation And Shielding Can Be Done;
- Suppose a Large Em Walk Around The Module
- High Frequency Digital, High Frequency Simulation, Power Wiring) Will Also Greatly Affect The Performance Of The Module, According To The Strength Of The Interference Is Recommended To Appropriately Stay Away From The Module, If The Situation Allows You Can Do Appropriate Isolation And Shielding;
- The Antenna Installation Structure Has a Great Impact On The Performance Of The Module, So Make Sure That The Antenna Is Exposed, Preferably Vertical Upward.When The Module Is Installed Inside The Enclosure, Quality Antenna Extension Can Extend The Antenna To The Outside Of The Enclosure;
- The Antenna Must Not Be Installed Inside The Metal Shell, Which Greatly Weakens The Transmission Distance.

CHAPTER VII : FAQ

7.1 TRANSMISSION DISTANCE IS NOT IDEAL

- When There Is a Linear Communication Obstacle, The Communication Distance Will attenuate Accordingly;
- Temperature, Humidity, The Same Frequency Interference, Will Lead To The Communication Packet Loss REAT Increase;
- The Ground Absorption, Reflection Of Radio Waves, Close To The Ground Test Effect Is Poor;
- Sea Water Has a Very Strong Radio Wave Absorption Ability, So The Seaside Test Effect Is Poor;
- There Are Metal Objects Near The Antenna, Or Placed In The Metal Shell, The Signal attenuation Will Be Very Serious;
- The Power Register Setting Is Wrong, And The Air REAT Setting Is Too High;
- at Room Temperature, The Power Supply Low Voltage Is Below The Recommended Value, The Lower The Voltage, The Lower The Power;
- The Antenna Is Poor To Match The Module Or The Quality Of The Antenna Itself.

7.2 MODULE IS EASY TO DAMAGE

- Please Check The Power Supply To Ensure That The Module Damage Exceeds The Maximum Voltage;
- Please Check The Stability Of The Power Supply, The Voltage Should Not Fluctuate Greatly And Frequently;
- Please Ensure Anti-Static Operation And Electrostatic Sensitivity Of High-Frequency Devices;
- Please Ensure That The Humidity Is Not Too High During Installation, And Some Of The Components ;
- It Is Not Recommended If There Is No Special Requirement.

7.3 THE ERROR REAT IS TOO HIGH

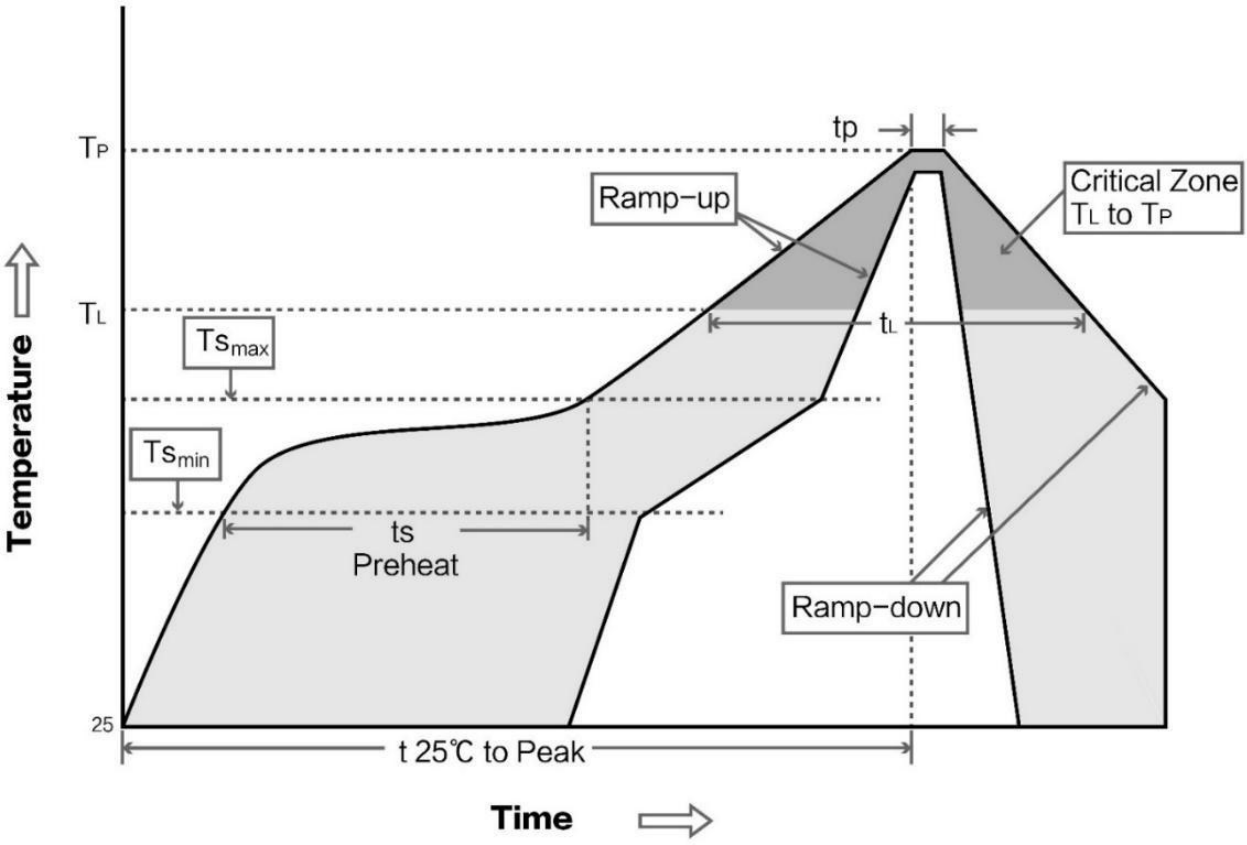
- Nearby Has The Same Frequency Signal Interference, Stay Away From The Interference Source Or Modify The Frequency, Channel To Avoid Interference;
- The Power Supply Is Not Ideal May Also Cause Disorderly Code, Be Sure To Ensure The Reliability Of The Power Supply;
- Extension Line, Feeder Quality Is Poor Or Too Long, Will Also Cause High Code Error REAT.

CHAPTER VIII: WELDING OPERATION GUIDANCE

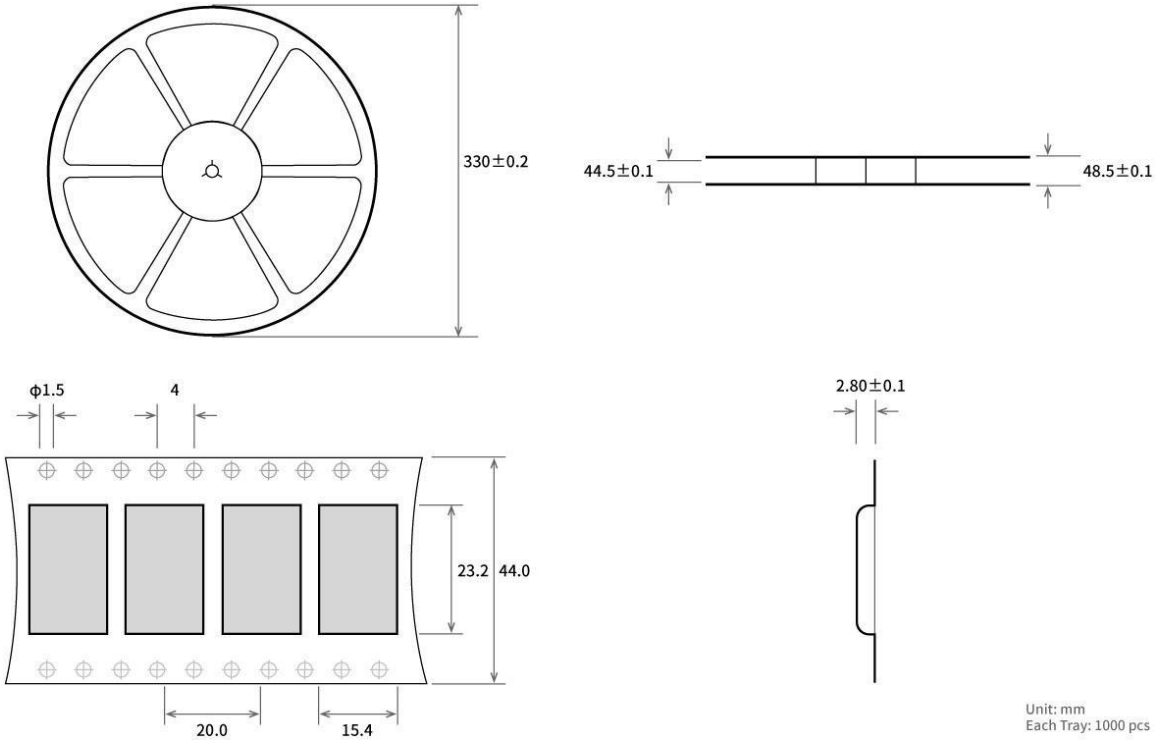
8.1 REFLUX WELDING TEMPERATURE

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

8.2 FLOW WELDING CURVE DIAGRAM



CHAPTER IX : BATCH PACKAGING METHOD



REVISE HISTORY

Version	Revision Date	Revision Notes	Maintenance Man
1.0	2020-09-28	Initial Version	Linson
1.4	2022-6-9	Command Format Correction	Yan

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