E180-ZG120A/B Product Specifications

EFR32 2.4GHz ZigBee Multifunction SoC Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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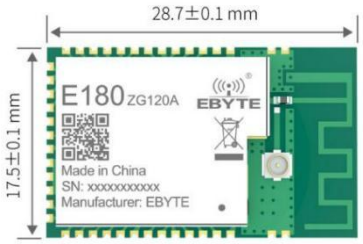
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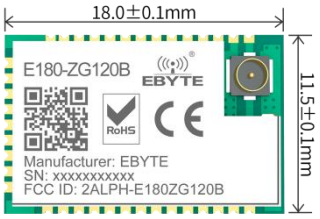
1. Overview

1.1 Introduction

E180-ZG120A/B is a ZIGBEE module designed and produced by Chengdu Ebyte based on Silicon Labs EFR32MG1B series wireless SOC with small size, low power consumption, high reliability and working in the 2.4GHz frequency band. The chip comes with a high-performance 32-bit module. ARM Cortex-M4 core, integrated power amplifier, transmit power up to 20dBm.

EFR32 is a wireless microcontroller with great potential to become the preferred wireless microcontroller for future smart furniture, IoT transformation, and industrial automation. Its network characteristics conform to the ZIGBEE 3.0 standard and provide a complete application integration solution based on the IEEE802.15.4 standard ISM frequency band. The products have been tested and certified by a series of authoritative RF instruments, combined with years of market experience and the actual needs of users in the industry, the extremely complex communication protocols of wireless products are integrated into the built-in SoC, the serial port transparent transmission mode is supported, and the integration is fast and easy. It provides multi-channel configurable ADC, IO, and PWM interfaces, which greatly simplifies the complex development process of wireless products, so that your products can be quickly put into the market at a lower cost.





1.2 Features

- Centralized network management: ZIGBEE 3.0 security standard centralized network access mechanism, data security and reliability;
- Interoperability: Compliant with zigbee 3.0 standard network mechanism, compatible with ZCL network protocol;
- Large capacity: 256K flash, 32K RAM, the maximum number of network nodes can be expanded to 80;
- Role switching: the user can switch the device among the four types of coordinator, router, terminal and dormant terminal at will through serial port commands;
- Support a variety of network topologies: point-to-point, star network, MESH network;

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- Network self-healing: If the intermediate node of the network is lost, a new Mesh topology is automatically formed, and the lost node is automatically retrieved after restarting;
- Automatic routing: The module supports network routing function;
- Open and close the network networking: The coordinator controls the opening or closing of the network. During the time period when the network is open, devices that conform to the ZigBee3.0 standard can join the network. After the network is closed, any device cannot join. If the coordinator does not close the network after opening the network, it will automatically close after 180 seconds.
- One-click networking: The node does not need to set the PANID and channel, and only needs to trigger the networking within the window time when the coordinator opens the network.
- Automatic channel and PANID: The coordinator automatically creates the network on the optimal channel, and automatically assigns the PANID to avoid duplication with other coordinators.
- Automatically obtain MAC address: The coordinator can obtain the node MAC address and short address at the moment when the node is connected to the network, and does not need to be processed on the device side.
- Address search: The user can find the corresponding short address according to the MAC address (unique, fixed) of the node that has joined the network, and can also find the corresponding long address of each node in the network according to the short address of the node;
- Data security: Integrated ZIGBEE 3.0 secure communication standard, the network contains multi-level security keys;
- Serial port configuration: The module has built-in serial port commands, and the user can configure (view) the parameters and functions of the module through the serial port commands;
- PWM control: local/remote PWM control, 3 PWM channels for users to choose;
- One-key restore baud rate: If the user forgets or does not know the baud rate, this function can be used to restore the default baud rate to 115200bps;
- Serial port receive wake-up: support serial port receive wake-up function, when the module is in sleep state, it will wake up when it receives a data of any byte, this data is a wake-up frame used to wake up the module and will not be treated as data;
- Module reset: the user can reset the module through serial port commands;
- Restore factory settings: Users can restore the module to factory settings through serial port commands;
- Over-the-air configuration: Users can use over-the-air configuration commands to remotely configure other devices in the network.
- Multiple command formats: Users can use hexadecimal format commands and AT commands to configure and control the module, realize networking, set transparent transmission, control lights and other operations.
- With the national invention patent certificate, the name of the invention: a ZigBee3.0-based wireless transparent transmission module interconnection method Patent number: ZL 2019 1 1122430.X



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1.3 Device Type Introduction

There are three logical device types in ZigBee network: Coordinator (coordinator), Router (router), End-Device (non-sleep terminal) and Sleep-End-Device (sleep terminal). The ZigBee network consists of a Coordinator, multiple Routers and multiple End_Devices (its terminal nodes can be divided into sleeping terminals and non-sleeping terminals).

1.3.1 non-sleep terminal

The main task of the terminal device is to send and receive messages, and other nodes are not allowed to connect to the terminal device. The non-sleep terminal is always in working state and can receive and send data at any time. The standby current of this device type is about 4mA, which is used for scenarios with low power consumption requirements.

1.3.2 dormant terminal

The dormant terminal, when there is no data to send and receive, enters the dormant state, and the dormant current is as low as about 2.5uA.

When you need to send wireless data or perform command operations, you need to send a wake-up frame through the serial port first. There are three ways to send the wake-up frame (for details, see Section 4.2 Sleep Node Serial Wake-up).

1.3.3 router

It allows other nodes to connect with the routing device to expand the coverage of the network. Its main task is to forward packets, play the role of relay routing, and have all the functions of terminal devices. If there are multiple paths from one node to another node, when one of the paths fails, the network will automatically adjust to other optimal paths for transmission to ensure data arrival. A router can build its own network or join someone else's network, the router is always active, so it must be powered from the mains.

1.3.4 Coordinator

It has the function of establishing and managing the network, controlling whether other nodes are allowed to join the network, storing network information, and having all the functions of the routing device. Its main tasks are to manage the network, record the information of sub-nodes, and forward messages. It is necessary to authenticate the terminal authority requesting access to the network.After the coordinator loses power, the network will not crash, and the routers and terminals will work normally in the current network.

Note: The factory default role of the module is coordinator.

1.4 Application

- Smart home and industrial sensors, etc.;
- Security system, positioning system;
- Wireless remote control, drone;
- wireless game remote control;
- healthcare products;
- Wireless voice, wireless headset;
- Advanced Meter Reading Architecture (AMI);

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- Application in the automotive industry;
- Building automation solutions;
- Agricultural greenhouse automation application.

2. Parameter

2.1 Limit parameter

Main parameter	Performance		Remark
	Min.	Max.	
voltage（V）	0	3.8	Exceeding 3.8V will permanently burn the module
blocking power（dBm）	-	10	The probability of burning at close range is small
Operating temperature（℃）	-40	+85	Industrial grade
Working humidity(%)	10	90	%
Storage temperature (℃)	-40	+125	℃

2.2 Working parameter

Main parameter		Performance			Remark
		Min.	Type	Max.	
Operating voltage（V）		2	3.3	3.8	≥3.3V can guarantee the output power, more than 3.8V will damage the module
Communication level（V）		-	3.3	-	Risk of burnout with 5V TTL
Operating temperature（℃）		-40	-	+85	Industrial grade design
Working frequency（Hz）		2405	-	2480	Support ISM band
Power consumption	Emission current (mA)	-	135	-	Instantaneous power consumption
	Receive current (mA)	-	10	-	
	Sleep current (μA)	1.7	2.5	3.2	Periodic wake-up sleep current
Transmit power (dBm)		18	19	20	
Air rate (bps)		-	250kbps	-	
Single bag length (byte)		4	-	220	The minimum length of a data packet is 4 bytes
main parameters		**description**			**Remark**
Communication distance		1300m			Clear and open environment, antenna gain 5dBi, antenna height 2.5 meters, air rate 250kbps
crystal frequency		38.4MHz			
supporting agreement		Zigbee 3.0			
Packaging method		SMD			
interface		1.27mm			stamp hole
IC full name		EFR32MG1B232F256GM32			
FLASH		256KB			

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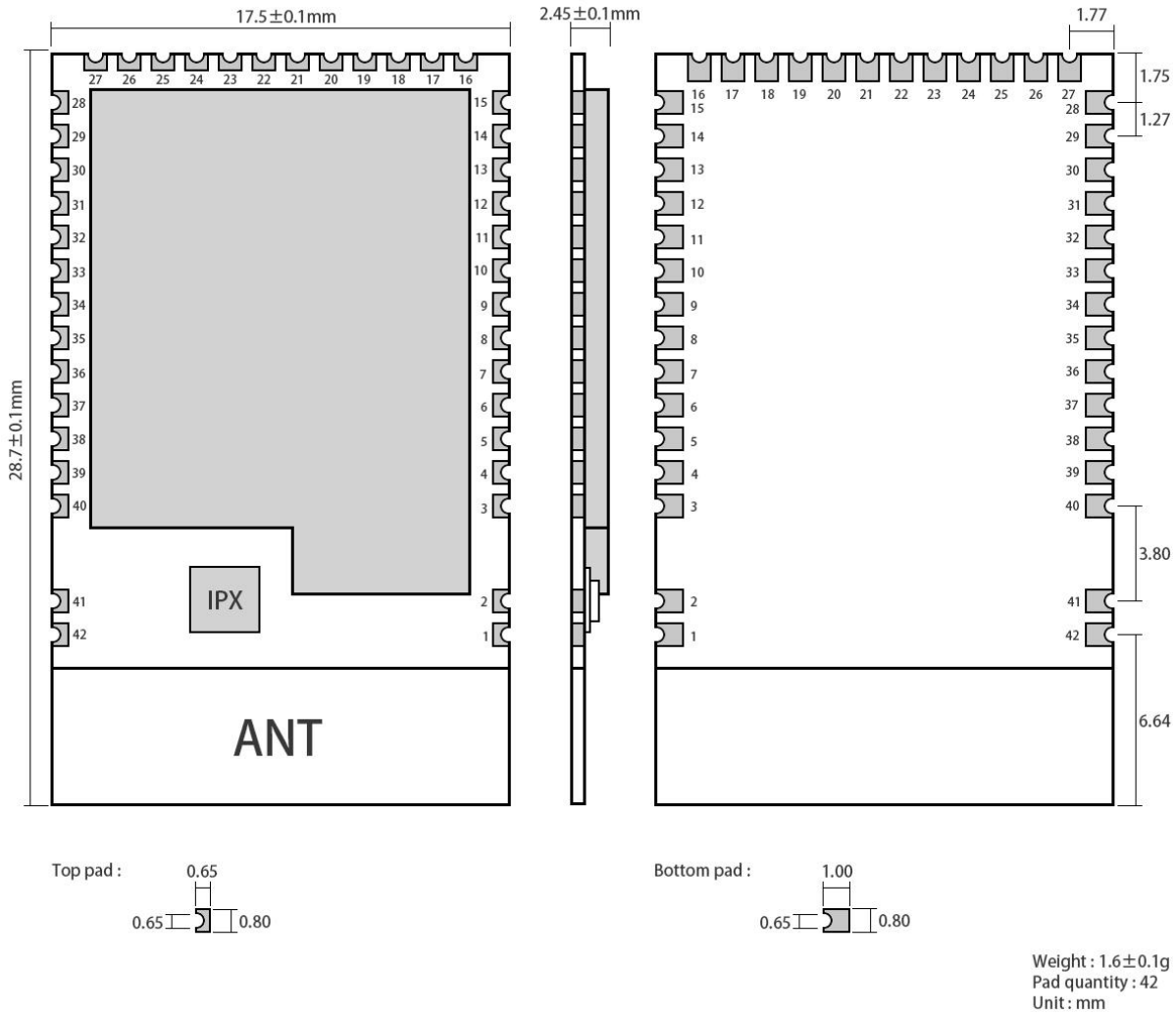
RAM	32KB	
kernel	Cortex-M4	
Dimensions	17.5*28.7mm(E180-ZG120A) 11.5*18mm(E180-ZG120B)	±0.1mm
Antenna interface	IPEX/PCB(E180-ZG120A) stamp hole/IPEX(E180-ZG120B)	Equivalent impedance is about 50Ω
product weight	1.8g (E180-ZG120A) 0.9g (E180-ZG120B)	±0.1g

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3. Size and Pin Definition

E180-ZG120A



pin number	pin name	Pin Orientation	pin usage
1	GND	enter/output	Ground wire, connected to the power reference ground
2	GND	enter/output	Ground wire, connected to the power reference ground
3	VCC	enter	Module power positive reference power, voltage range
4	GND	enter/output	Ground wire, connected to the power reference ground
5	PD10	enter/output	reserved
6	PD11	enter/output	reserved
7	PD12	enter/output	reserved
8	PD13	enter	NET key pin, this pin is continuously pulled down for 20ms~200ms, it can be controlled by network, please refer to Section 4.4.2 for details
9	PD14	enter	The WAKE pin is mainly used to wake up the dormant terminal. It is high level when powered on. When the pin is pulled low externally, the

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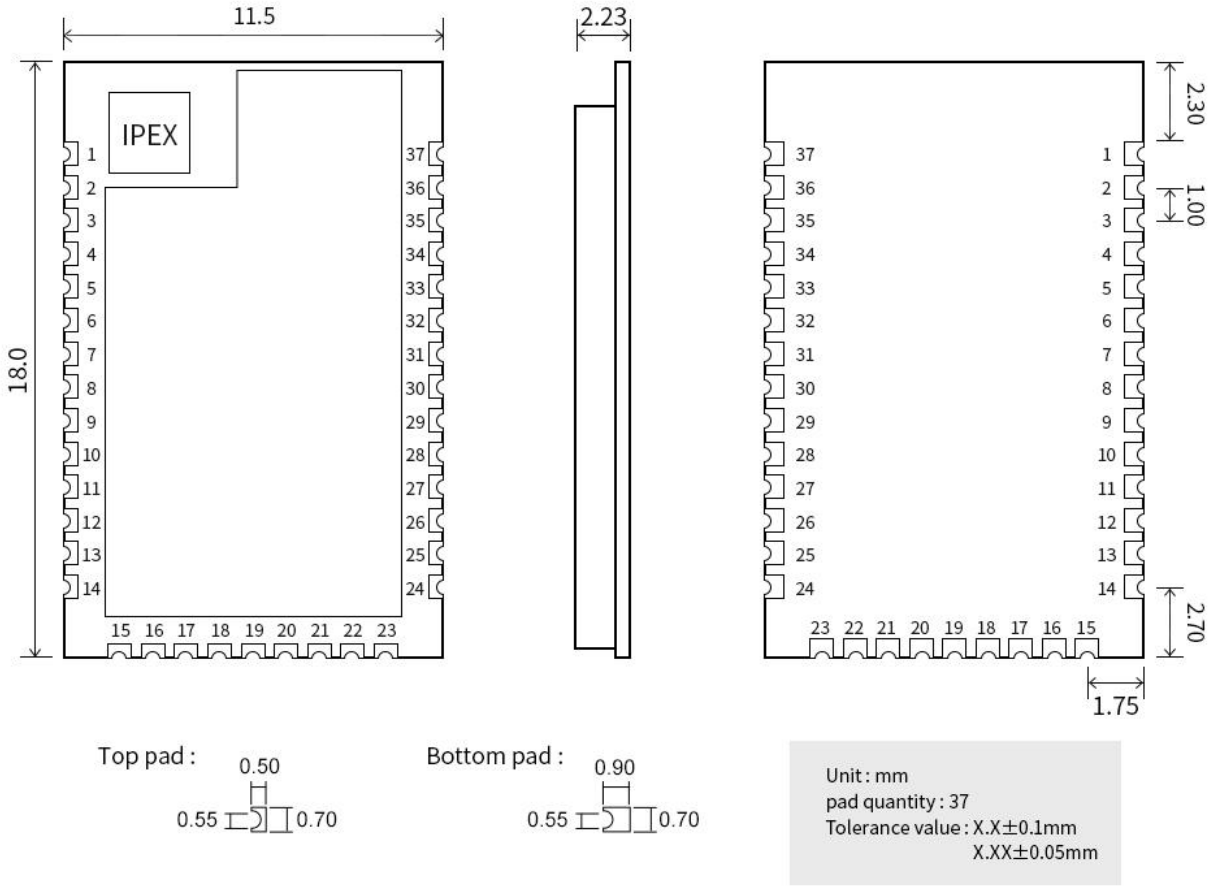
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			dormant terminal device will be woken up.
10	PD15	output	The AUX pin indicates the current working state of the device. When the pin is low, it indicates that the device is busy, and when the pin is high, it indicates that the device is idle.
11	PA0(TX)	output	Serial send port TX
12	PA1(RX)	enter	Serial receiving port RX
13	PA2	enter/output	reserved
14	PA3	enter/output	reserved
15	PA4	enter/output	reserved
16	PA5	enter/output	reserved
17	PB11	enter	Working mode switching pin, when the pull-down time is greater than 500ms, the working mode is switched.
18	PB12	enter	The UART_BAUD_RESET pin is used to reset the baud rate of the device. It defaults to a high level when powered on. In any mode, if the pin is pulled down for more than 1000ms, the serial port parameters of the module will be restored to the default 115200.
19	PB13	output	The ACK pin is used to indicate the last user data transmission status. The pin is pulled low before the transmission is started, and the pin is pulled high after the transmission is successful.
20	GND	enter/output	Ground wire, connected to the power reference ground
21	PB14(GPIO0)	enter/output	GPIO enter/output port 0
22	PB15(GPIO1)	enter/output	GPIO enter/output port 1
23	GND	enter/output	Ground wire, connected to the power reference ground
24	GND	enter/output	Ground wire, connected to the power reference ground
25	GND	enter/output	Ground wire, connected to the power reference ground
26	PC6(GPIO2)	enter/output	GPIO enter/output port 2
27	PC7(GPIO3)	enter/output	GPIO enter/output port 3
28	PC8(ADC1)	enter	ADC detection port 1
29	PC9(ADC2)	enter	ADC detection port 2
30	PC10(ADC3)	enter	ADC detection port 3
31	PC11(ADC4)	enter	ADC detection port 4
32	SWCLK	enter/output	DBG_SWCLKTCK
33	SWDIO	enter/output	DBG_SWDIOTMS
34	PF2(PWM0)	output	PWM output port 0
35	PF3(PWM1)	output	PWM output port 1
36	PF4(PWM2)	output	PWM output port 2
37	PF5	-	reserved port
38	PF6	-	reserved port
39	PF7	output	The LINK pin indicates the current network status of the module, see section 4.4.3 for details
40	RESETN	enter	reset pin
41	GND	enter/output	Ground wire, connected to the power reference ground
42	GND	enter/output	Ground wire, connected to the power reference ground

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E180-ZG120B



pin number	pin name	Pin Orientation	pin usage
1	ANT	enter/output	Antenna external stamp hole
2	GND	-	Ground wire, connected to the power reference ground
3	PD13	enter	NET key pin, this pin is continuously pulled down for 20ms~200ms, it can be controlled by network, please refer to Section 4.4.2 for details
4	PD14	enter	GPIO enter/output ports are not used
5	PA0(TX)	output	Serial send port TX
6	PA1(RX)	enter	Serial receiving port RX
7	NC	-	-
8	NC	-	-
9	PD15	-	reserved port
10	PB11	enter	The UART_BAUD_RESET pin is used to reset the baud rate of the device. It defaults to a high level when powered on. In any mode, if this pin is pulled down for more than 5000ms, the serial port parameters of the module will be restored to the default 115200bps.
11	PB12	output	GPIO enter/output ports are not used
12	PB13(PWM2)	enter/output	PWM output port 2 (corresponding to ZCL application port 4)

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13	VCC	enter	Module power
14	GND	enter	power reference ground
15	NC	-	-
16	NC	-	-
17	NC	-	-
18	PC10	-	reserved port
19	PF2	-	reserved port
20	NC	-	-
21	PC11	-	reserved port
22	NC	-	-
23	NC	-	-
24	NC	-	-
25	SWCLK	enter/output	DBG_SWCLKTCK
26	SWDIO	enter/output	DBG_SWDIOTMS
27	PB14(PWM0)	output	PWM output port 0 (corresponding to ZCL application port 2)
28	PB15(PWM1)	output	PWM output port 1 (corresponding to ZCL application port 3)
29	NC	-	-
30	PF3	output	The LINK pin indicates the current network status of the module, see section 4.4.3 for details
31	NC	-	-
32	NC	-	-
33	NC	-	-
34	NC	-	-
35	NC	-	-
36	GND	enter	Ground wire, connected to the power reference ground
37	nRESET	enter	Reset pin, floating during normal operation, pull low for reset to take effect

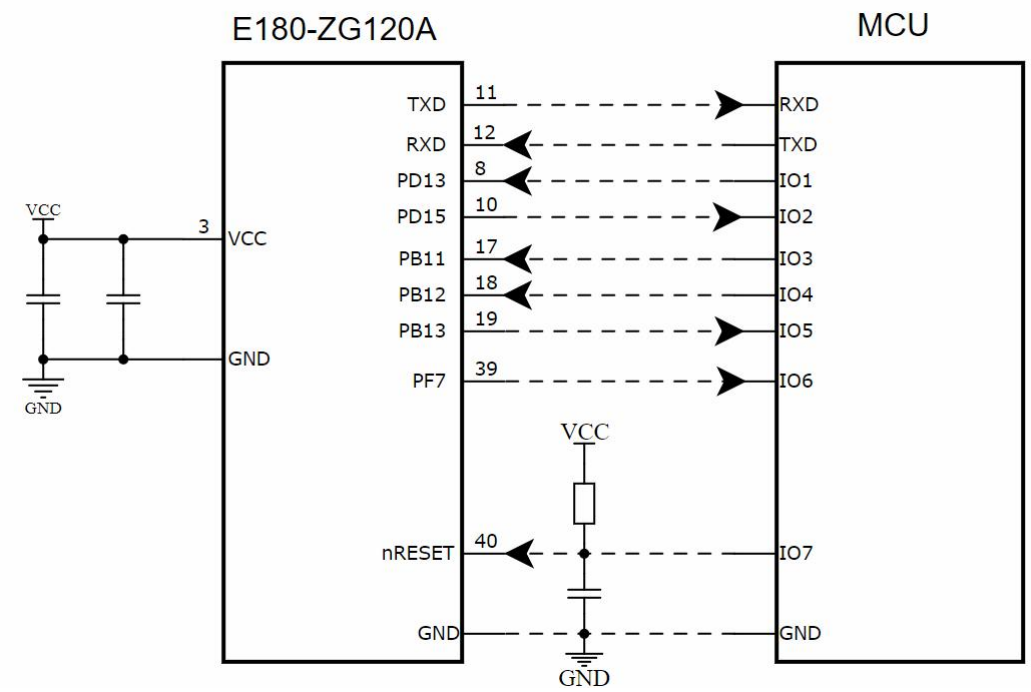
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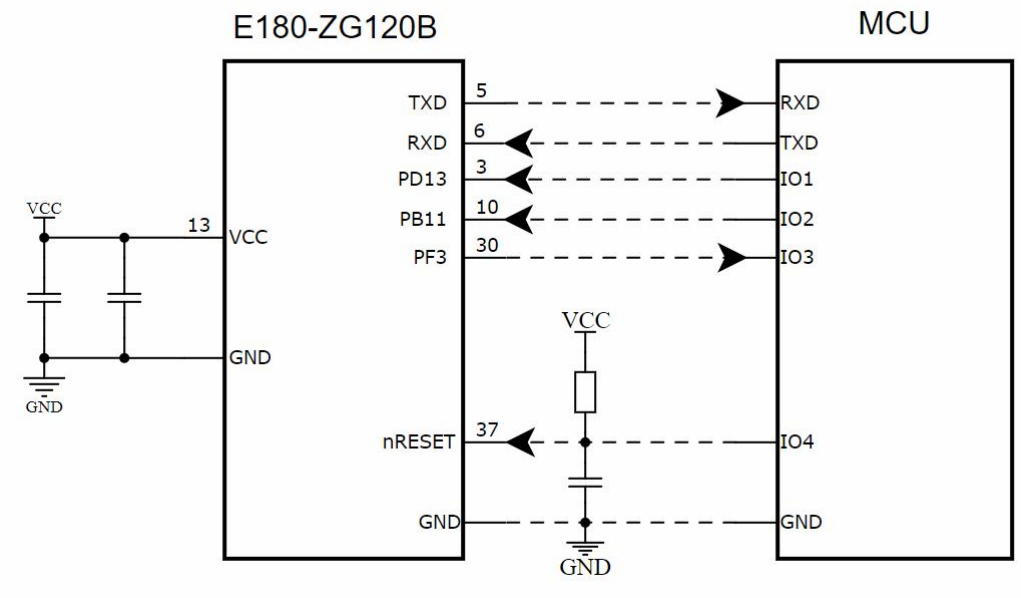
4. Application and Operation

4.1 Recommended circuit diagram

E180-ZG120A



E180-ZG120B



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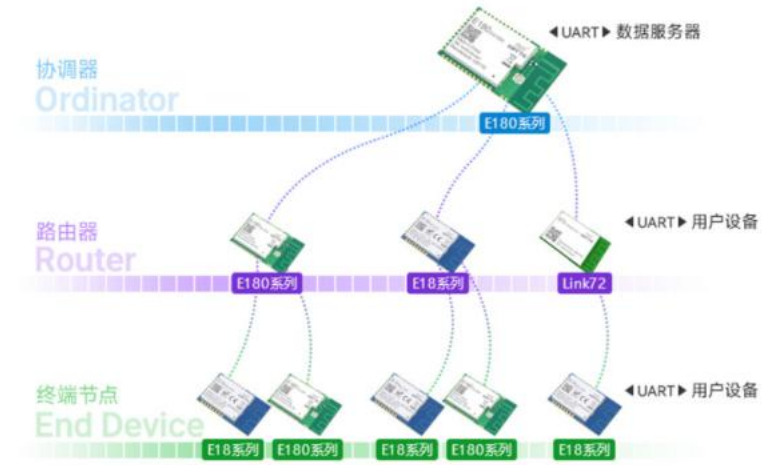
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4.2 Network topology

E180-ZG120A/B modules can be used as coordinators, routers, and terminal equipment. The E180-ZG120A/B module supports the ZigBee 3.0 specification and has powerful networking capabilities and interconnection capabilities. It supports networking of up to 80 ZigBee 3.0 devices, and supports the networking of ZigBee devices produced by third-party manufacturers such as X meters, X crows, X Pu, and Mc X grams. E180-ZG120A/B module works in ZigBee coordinator mode, supports other ZigBee device networking, and manages all networking nodes through serial port HEX commands. When the device joins the network or exits the network, the E180-ZG120A/B module will generate corresponding messages.

In addition to powerful networking capabilities, E180-ZG120A/B modules also have powerful management capabilities: real-time monitoring of device access to the network, network access device address management, device information and status management, and device identification functions, providing data for users to manage network devices in the background support.

At present, our products that support ZigBee3.0 specification include E18 series and Link72 modules. E180-ZG120A/B and modules form a ZigBee3.0 product system with low cost and high processing capacity. The following figure combines our products to show the general ZigBee network application topology.





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4.3 Serial command operation

Please refer to "E180-ZG120series_Software_Datasheet" and "Ebyte ZigBee3.0 Module HEX Command Standard Specification" documents.

4.4 Function buttons, status indicators and PWM output

The E180ZG120 module has 2 groups of key input IO ports, 1 group of LED flashing indication IO ports, and 3 groups of PWM output IO ports.

4.4.1 pin assignment

Network function key –> PD_13
Baud rate reset key –> PB_11
Status Indicator -> PF_7 (E180-ZG120A)
Port 0 PWM -> PF2 (E180-ZG120A)
Port 1 PWM -> PF3 (E180-ZG120A)
Port 2 PWM -> PF4 (E180-ZG120A)
Status Indicator -> PF_3 (E180-ZG120B)
Port 0 PWM -> PB_14 E180-ZG120B)
Port 1 PWM -> PB_15 (E180-ZG120B)
Port 2 PWM -> PB_13 (E180-ZG120B)
UART_RX -> PA_1
UART_TX -> PA_0

4.4.2 Network function key function introduction

One key network function：

Modules that have been configured as routing nodes, terminal nodes and dormant terminal nodes can be added to a coordinator with a network turned on by pressing the network function key briefly (less than 1 second) and then releasing it without entering the network or leaving the network.

If the module is configured as a coordinator, short press the network function key when the coordinator has not established a network to directly create a new network, short press the key for the coordinator of an existing network to start the distribution network, and short press the key for the coordinator of an existing network to close the network.

Automatic binding function：

Any two nodes that have been connected to the network, press this key successively (3 seconds interval, the status indicator of the module to be pressed first flashes), automatically bind data transparent transmission; if you need to bind the control light or switch, you can Let the light or switch enter the Identify state, and then short press the button on the module. After the binding is successful, the module can control the light or switch through AT commands, and receive the status attribute report of the light and switch. When binding lights or switches, you can set multiple lights or switches to enter the Identify state at one time, and the module can bind multiple lights or switches at the same time with one keystroke. The coordinator does not support the automatic binding function.

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Off-grid and factory reset：

For modules that have been connected to the network, press and hold this button for 5 seconds until the status indicator is always on, release the button, and the module exits the current network. When the module has been disconnected from the network, press and hold this button for 5 seconds. When the status indicator is always on, restore the factory settings.

4.4.3 Status indicator: (It is recommended that this pin be connected to a low level to drive the LED)

This pin is usually high level, when the following events occur, it will output a continuously changing high and low level.

Node access status：

The module is configured as routing, terminal node, and sleep terminal node. After the first network connection is successful, this pin outputs a low level of 166ms 3 times, and the interval between the two low levels is 166ms.With v1.1 firmware, the LED flashes rapidly (10Hz strobe) during the node's distribution network. The strobe lasts for several seconds. If the LED stops flashing and does not convert to 166ms slow flash, the node's distribution network fails.

The coordinator created the network successfully：

The coordinator successfully created the network for the first time, the pin outputs a low level of 166ms 3 times, and the interval between the two low levels is 166ms.

network open state：

When the coordinator starts to distribute the network, or the network of the routing node is opened by the coordinator, this pin outputs a low level of 500ms, and outputs a low level again every 500ms, until the network is closed (including manual closing and automatic closing).

Identify Flag Status：

When the router or terminal node is marked by Identify, this pin outputs a low level for 500ms until the end of the Identify mark. This function can be used to visually detect where the module with a certain MAC address or short address is located.

Precautions：

The network open state and Identify flag state of the routing node, the output signal of this pin is the same, so in actual operation, it should be avoided to perform both operations at the same time.

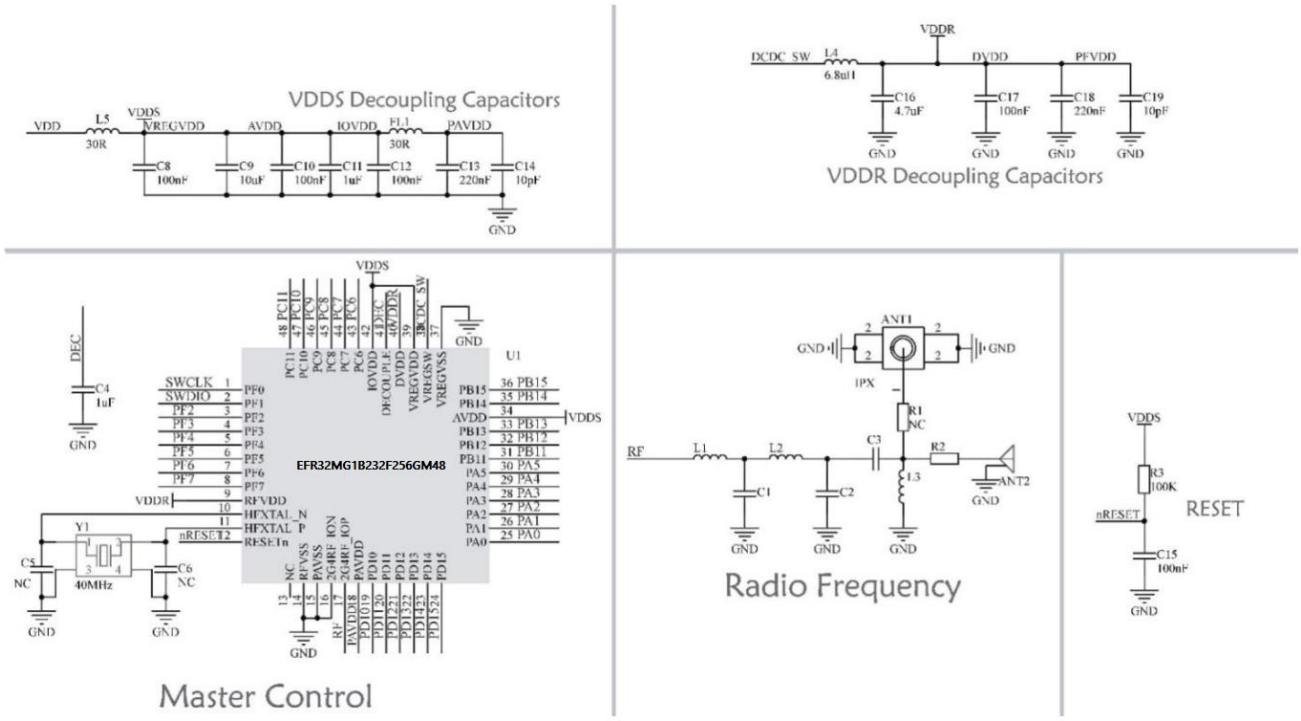
5. Secondary development design reference

5.1 Module schematic

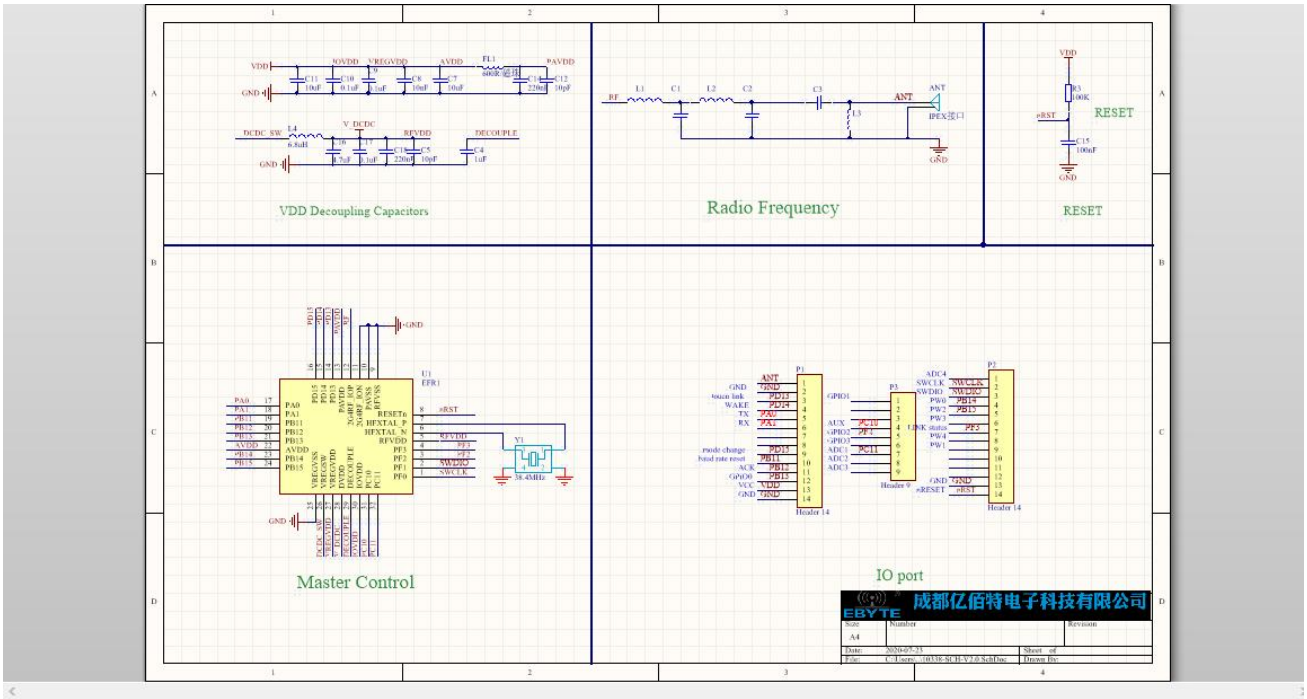
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E180-ZG120B



5.2 development use

serial number	keywords	Precautions

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<table>
<tr><td>1</td><td>Burn program</td><td>The module is a SOC module with its own GPIO port, and the program download uses the J-LINK dedicated downloader；
Program download interface definition
<table><tr><td>E180-ZG120 series pins</td><td>J-LINK interface</td></tr><tr><td>VCC</td><td>VCC</td></tr><tr><td>PF0</td><td>SWCLK</td></tr><tr><td>PF1</td><td>SWDIO</td></tr><tr><td>GND</td><td>GND</td></tr></table>Note: After the second burning, the original firmware will not be available!</td></tr>
<tr><td>2</td><td>Test backplane</td><td>The E180-ZG120B-TB test kit is provided. Please check the official website for details.</td></tr>
</table>

5.3 hardware design

- It is recommended to use a DC regulated power supply to supply power to the module, the power supply ripple coefficient should be as small as possible, and the module should be reliably grounded;
- Please pay attention to the correct connection of the positive and negative poles of the power supply, such as reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that it is between the recommended supply voltages, if exceeding the maximum value will cause permanent damage to the module;
- Please check the stability of the power supply, the voltage should 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 that the whole machine can work stably for a long time;
- The module should be kept away from parts with large electromagnetic interference such as power supply, transformer, and high-frequency wiring as far as possible;
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the underside of the module. If it is absolutely necessary to pass under the module, assuming that the module is soldered on the Top Layer, copper is placed on the Top Layer of the contact part of the module (all copper is applied). And well grounded), it must be close to the digital part of the module and routed on the Bottom Layer;
- Assuming that the module is soldered or placed on the Top Layer, it is also wrong to arbitrarily route wires on the Bottom Layer or other layers, which will affect the stray and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference. If the situation allows, appropriate isolation and shielding can be done;
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power traces), it will also greatly affect the performance of the module. It is recommended to stay away from the module according to the intensity of the interference. isolation and shielding;
- If the communication line uses 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage);
- Try to stay away from some TTL protocols whose physical layer is also 2.4GHz, for example: USB3.0;
- The antenna installation structure has a great influence on the performance of the module. Make sure that the antenna is exposed, preferably vertically upward. When the module is installed inside the casing, a high-quality antenna extension cable can be used

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to extend the antenna to the outside of the casing;

- The antenna must not be installed inside the metal shell, which will greatly weaken the transmission distance.

5.4 software writing

- The core of this module is EFR32, and its driving method is completely equivalent to EFR32. Users can operate according to the EFR32 chip manual (see EFR32 manual for details);
- Burning program: The module is a SOC module with its own GPIO port, and the program download uses the J-LINK dedicated downloader.Note: After the second burning, the original firmware will not be available!
- Program download interface definition：

pin	J-LINK interface
VCC	VCC
PF0	SWCLK
PF1	SWDIO
GND	GND

6. Common problem

6.1 The transmission distance is not ideal

- When there is a straight-line communication obstacle, the communication distance will be correspondingly attenuated;
- Temperature, humidity, and co-channel interference will increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect close to the ground is poor;
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there is a metal object near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- The power register is set incorrectly, and the air rate is set too high (the higher the air rate, the closer the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, and the lower the voltage, the lower the output power;
- Poor matching between the antenna and the module or the quality of the antenna itself.

6.2 Module is easily damaged

- Please check the power supply to ensure that it is between the recommended supply voltages, if exceeding the maximum value will cause permanent damage to the module;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;
- Please ensure anti-static operation during installation and use, and high-frequency components are electrostatically sensitive;
- Please ensure that the humidity during installation and use should not be too high, and some components are humidity-sensitive devices;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

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6.3 Bit error rate too high

- There is co-frequency signal interference nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- If the power supply is not ideal, it may also cause garbled characters. Be sure to ensure the reliability of the power supply;
- Poor quality or too long extension cables and feeders will also cause high bit error rates.

7. Welding work guide

7.1 reflow temperature

When reflow soldering, all temperatures refer to the package center temperature, measured on the package surface facing up (leads are placed down, i.e. the live insects are facing). If the temperature of the module is not measured in the direction of live insects (the lead is placed upward, that is, the direction of dead insects) for reflow soldering, the measured Tp temperature is within ±2°C of the Tp temperature measured in the direction of the live insects, which still meets the requirements of Tc . Otherwise, the temperature curve should be adjusted to meet the requirements of Tc. In order to accurately measure the actual peak temperature of the package body, it is recommended to use the method recommended by JEP140 for furnace temperature testing.

In order to obtain a better welding effect, the production workshop recommends a constant temperature of 25°C.

When soldered components need to be re-profiled, they should be reflowed with a carrier fixture of the same construction, or verified to have an equivalent thermal load.

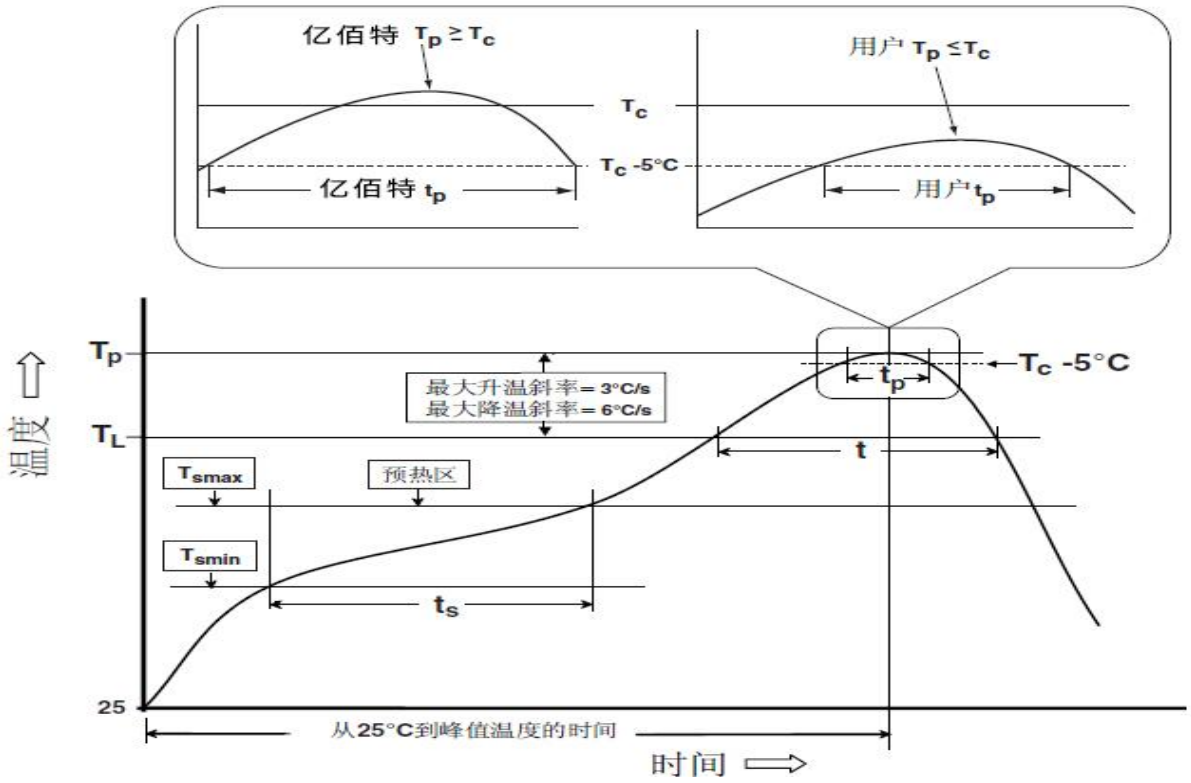
The reflow profiles in this document are some suggestions for soldering only Ebyte modules, and cannot be used to confirm the actual assembly profile of the user. The actual production process of the user should be based on the specific production process, needs and circuit board design to develop the actual production assembly curve, and should not exceed the parameters in the table below.

Reflow Profile Characteristics	Leaded process assembly	Lead-free process assembly
Preheat/Keep Warm Minimum temperature (Tsmin) Maximum temperature (Tsmax) Time (Tsmin~Tsmin)	 100℃ 150℃ 60-120 seconds	 150℃ 200℃ 60-120 seconds
Heating slope (TL~Tp)	3°C/sec, max	3°C/sec, max
Liquidus Temperature (TL) Hold time above TL	183℃ 60~90 seconds	217℃ 60~90 seconds
Package body peak temperature Tp	The user must not exceed the temperature indicated on the product's "Moisture Sensitivity" label.	The user must not exceed the temperature indicated on the product's "Moisture Sensitivity" label.
The time (Tp) within 5°C of the specified grading temperature (Tc), see Figure 6-3-2	20 seconds	30 seconds
Cooling slope (Tp~TL)	6°C/sec, max	6°C/sec, max
Time from room temperature to peak temperature	6 minutes, maximum	8 minutes, maximum
※The peak temperature (Tp) tolerance definition of the temperature curve is the upper limit of the user		

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7.2 Reflow Soldering Curve



Revise History

Version	revision date	Revision Notes	Maintenance man
1.0	2022-09-20	first edition	Bin
1.1	2022-10-23	Error correction	Bin
1.2	2022-11-1	Error correction	Bin
1.3	2022-11-16	Error correction	Bin
1.4	2022-12-6	Error correction	Bin
1.5	2023-04-17	Error correction	Bin
1.6	2023-07-26	Error correction	Bin
1.7	2023-08-29	Error correction	Bin
1.8	2024-09-27	Modify the recommended wiring diagram	Bin

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