EWM151-2G4T10S/SX User Manual

2.4G wireless synchronous transmission module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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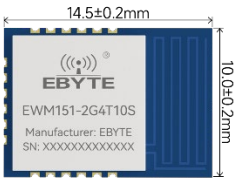
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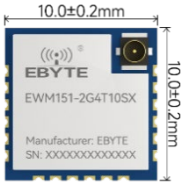
1 Product Overview

1.1 Product Introduction

EWM151-2G4T10S/SX is a newly launched wireless synchronous transmission module from Chengdu Ebyte. It enables remote wireless synchronization of level signals between two modules, supports input signal acquisition (DI) transmission, and controls the other side to output the same signal (DO). It integrates transceiver functionality, operates in the 2.4GHz band, and features ultra-low latency, ease of use, compact size, and flexible applications.

The module uses a standard stamp-hole package, features a UART communication interface, and supports AT commands. Its core function is to achieve remote synchronous control; users only need to pair the two devices to use them immediately. During use, the module can synchronously feed back the status of the DI on one side to the DO on the other side, with the reverse control working in the same manner, supporting up to four channels.





1.2 Features and Functions

- Parameters can be set via AT commands;
- Under ideal conditions, the control distance reaches 300m (tested in an open environment).
- It supports simultaneous synchronization of the status of 4 DI inputs to 4 DO outputs on the other side;
- Synchronization time difference within 30ms ;
- Supports 1.9 to 4.2V power supply, with a typical 3.3V power supply voltage;
- The EWM151-2G4T10S uses an onboard antenna on the PCB.
- The EWM151-2G4T10SX uses a third-generation IPEX antenna mount;
- Supports serial port upgrades ;
- Industrial-grade standard design, supporting long-term use at temperatures ranging from -40°C to +85°C ;
- Dual antennas are optional (IPEX/stamp hole), which facilitates secondary development and integration by users.

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2 Specifications

2.1 Radio Frequency Parameters

RF parameters	Parameter value	Remark
Operating frequency band	2400～2480 MHz	Supports ISM band
Transmit power	10 dBm	Software adjustable
Receiver sensitivity	-99 dBm	Air speed 250kbps
air speed	250 Kbps	Fixed airspeed 250 kbps
Modulation method	FSK	Modulation technology
Communication distance	300m	Clear, open environment; onboard PCB antenna; antenna height 1.5 meters; air speed 250kbps.

2.2 Hardware Parameters

Hardware parameters	Parameter value		Remark
	E WM151-2G4T10S	E WM151-2G4T10SX	
Packaging method	SMD		-
Interface method	stamp perforation		-
Communication interface	UART serial port		Supports AT commands
Serial port configuration	9600bps 8N1		-
External dimensions	10 * 10 mm	10 * 14.5 mm	±0.2mm
Antenna type	PCB onboard antenna	IPEX-3 Antenna Mount	Equivalent impedance approximately 50Ω
Product net weight	0.45 g	0.50g	±0.1g

2.3 Electrical Parameters

Main parameters	Performance			Remark
	Minimum value	Typical value	Maximum value	
Operating voltage (V)	1.9	3.3	4.2	Output power can be guaranteed with a voltage of ≥3.3V; a voltage exceeding 4.2V poses a risk of burnout.
Transmitting current (mA)	-	24	-	With a 3.3V power supply and a standard 50-ohm impedance antenna interface, the instantaneous power consumption is 10dBm of transmit power.
Receiving current (mA)	-	11	-	-

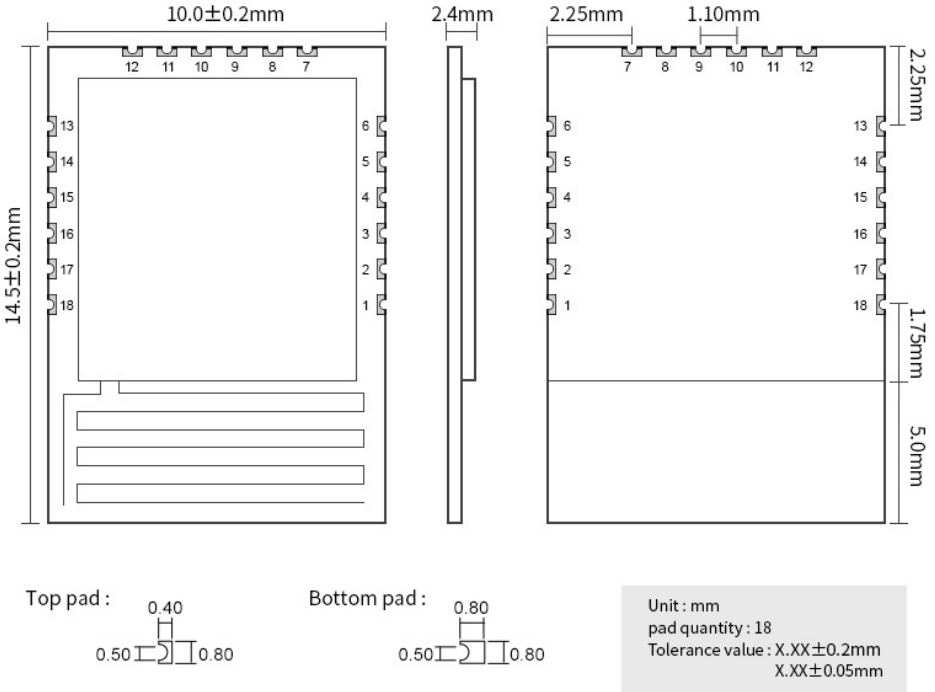
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Sleep current (uA)	-	1.5	-	-
Operating temperature (°C)	-40	20	85	Industrial-grade design
Operating humidity (%)	10	60	90	-
Storage temperature	-40	20	125	-

3 Mechanical Dimensions and Pin Definitions

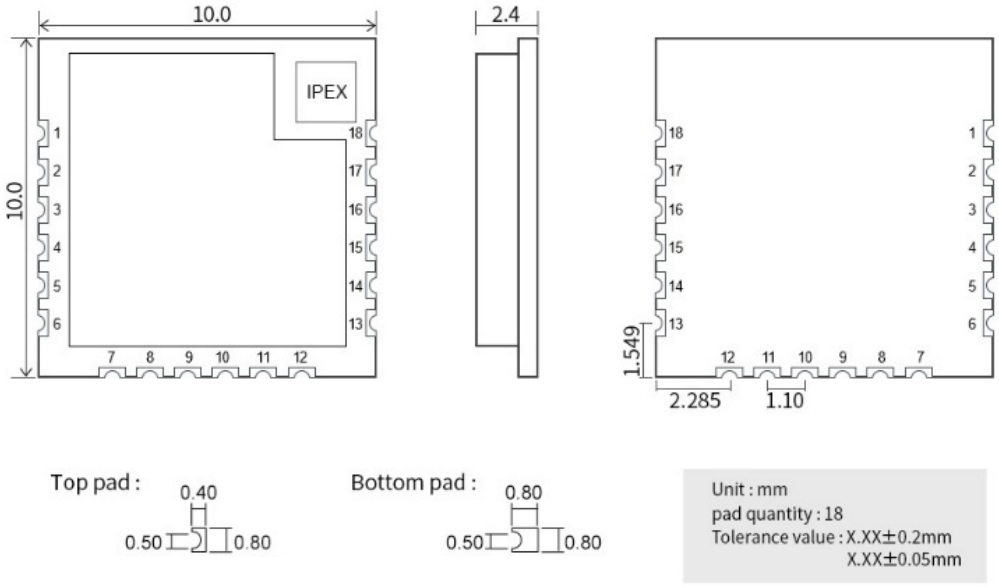
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EWM151-2G4T10SX



Pin number	Pin Name	Pin direction	Pin Applications
1	GND	GND	Ground
2	DI1	Input	Switch input channel 1
3	DI2	Input	Switch input channel 2
4	DI3	Input	Switch input channel 3
5	DI4	Input	Switch input channel 4
6	KEY	Input	Active low, pairing/factory reset Pull-down low level for 2-10 seconds to initiate pairing; pull-down low level for more than 10 seconds to reset factory settings.
7	RST	Input	Low-level reset
8	WKP	Input	Sleep control pin: Keep low to wake up. Default is sleep mode;
9	RXD	Input	UART RX pin
10	TXD	Output	UART TX pin
11	GND	GND	Ground
12	VBAT	VCC	Power supply, supports DC 1.9V ~ 4.2V.
13	STA	Output	Status indicator lights
14	DO4	Output	Switch output channel 4
15	DO3	Output	Switch output channel 3
16	DO2	Output	Switch output channel 2
17	DO1	Output	Switch output channel 1
18	GND	GND	Ground

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4 Functional Details

4.1 Pairing

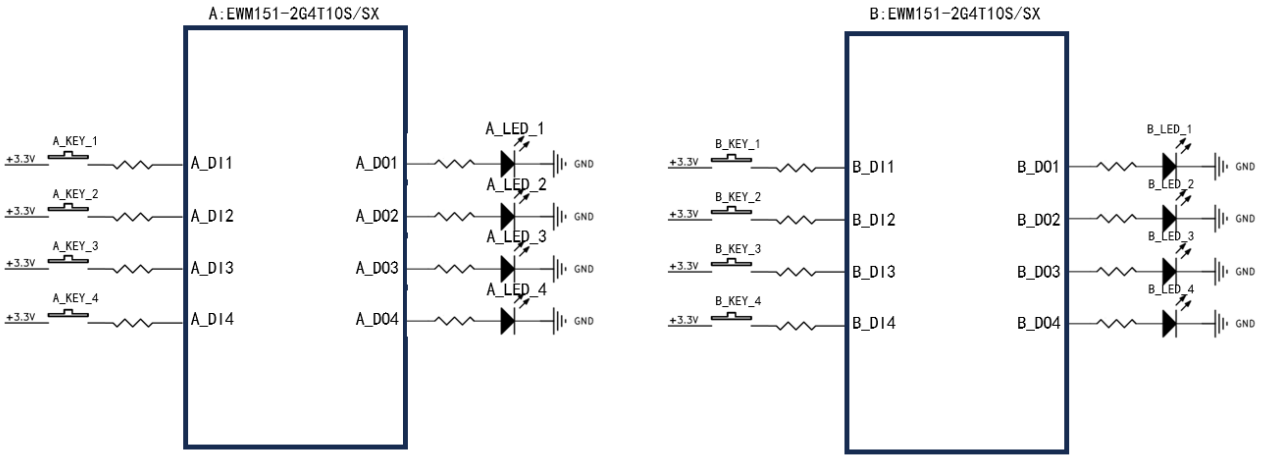
The module supports two pairing methods: automatic pairing and manual pairing. Pairing is required before use, and it only supports point-to-point use.

Pairing method	Operation method	Instruction method
Automatic pairing	KEY pin: Pull down to low level for 2 seconds to enter pairing mode <mode=2>; the same operation must be performed on both sides;	SAT pin (indicator pin): ① While waiting for pairing, output a low level once every 1 second; ② When pairing is successful, the STA pin outputs a low level for 5 seconds and then returns to a high level; ③ If pairing is not completed within 30 seconds, the high level will be automatically restored.
Manual pairing	In configuration mode <mode=0>, write the address of the paired target module using the AT+PAIR command, then switch to working mode <mode=1>. The same operation needs to be performed on both sides.	

Note: Automatic pairing and manual pairing cannot be used together;

4.2 Follow-up Feedback

Once modules A and B are paired, the high and low levels of module A's DI interface can be fed back through module B's DO interface. At the same time, module A's DO interface can also feed back the status of module B's DI interface, thus achieving synchronous transmission.



For application instructions, please refer to the image above.

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1. When A_KEY_1 is high-level triggered, a signal is transmitted, B_D01 synchronously receives and outputs a high-level signal, B_LED_1 lights up, and turns off when released;
2. When B_KEY_1 is pressed, A_LED_1 lights up; when released, it turns off. Both sides can be operated simultaneously.
3. All KEY buttons on both sides can be operated simultaneously, and all indicator lights on both sides will also light up at the same time.

4.3 Clear Code

KEY pin: Pull down to a low level and hold for more than 10 seconds to clear the code. Re-pairing is required before use.

5 Instructions and Factory Parameters

5.1 Command Format

- **Before sending commands, please switch the module to configuration mode (AT+MODE=0), otherwise it will be unable to receive and respond to commands** .
- All command parameters are in ASCII format;
- The default baud rate for the serial port is 9600, with 8 data bits, 1 stop bit, and no parity.
- AT commands end with a carriage return (\r) and a newline (\n), which will not be elaborated in the following description.
- Commands are case-sensitive;
- All AT commands must not contain invisible characters such as spaces or tabs.

Instruction type	Instruction format	For example
Query command	AT+[X]?	This command is used to query the parameters of the setting command.
Configuration instructions	AT+[X]=<…>	This command is used to set user-defined parameters.
Execute instructions	AT+[X]	Used for commands without parameters, such as module reset.

5.2 Return Value Description

AT command return value	Illustration
= OK	success
= ERR	Instruction error

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5.3 AT Command Table

Serial Number	Instruction type	Iinstruction	Description
1	Query command	AT+HELP=?	Query all AT commands
2	Query command	AT+ DEVTYPE =?	Query module model
3	Query command	AT+FWCODE=?	Query module firmware version
4	Query command	AT+UID=?	Query local UID address
5	Query/Configuration Commands	AT+MODE=<xxx>	Query/Configuration Module Working Mode
6	Query/Configuration Commands	AT+PAIR=<xxx>	Query/Configure Pairing Target UID Address
7	Query/Configuration Commands	AT+POWER =<xxx>	Query/Configure Module Transmit Power
8	Execute instructions	AT+RESET	Module restart command
9	Execute instructions	AT+DEFAULT	Module reset command
10	Execute instructions	AT+IAP	IAP Upgrade Instructions

5.4 AT Command Description

Note: Before sending configuration commands, please switch the module to configuration mode (AT+MODE=0), otherwise it will not be able to receive configuration commands;

5.4.1 Use AT+HELP to query all AT commands

Syntax commands:

Instruction	Response	Example
AT+HELP=?	Output all supported commands.	Send: AT+HELP=? Return: AT+DEVTYPE AT+FWCODE AT+UID AT+MODE AT+PAIR AT+POWER AT+RESET AT+DEFAULT AT+IAP

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Parameter description:

Parameter	Description	Illustration
Output all supported commands .	-	none
= ERR	error message	Instruction error

5.4.2 AT+DEVTYPE Query Module Model

Syntax commands:

Instruction	Response	Example
AT+DEVTYPE=?	AT+DEVTYPE = <type>	Send: AT+DEVTYPE=? Return: AT+DEVTYPE=EWM151-2G4T10S/SX

Parameter description:

Parameter	Description	Illustration
<type>	Module model	Module model
= ERR	error message	Instruction error

5.4.3 AT+FWCODE Query Module Firmware Version

Syntax commands:

Instruction	Response	Example
AT+FWCODE=?	AT+FWCODE=<fwcode>	Send: AT+FWCODE =? Return: FWCODE=FW-7490-3-10

Parameter description:

Parameter	Description	Illustration
<fwcode>	Module firmware version	Module firmware version
= ERR	error message	Instruction error

5.4.4 AT+UID query for local UID address

Syntax commands:

Instruction	Response	Example
AT+UID=?	AT+UID=<xx>:<xx>:<xx>:<xx>:<xx>:<xx>:<xx>:<xx>	Send: AT+UID=? Return: AT+UID=36:34:34:16:21:0F:18:45

Parameter description:

Parameter	Description	Illustration
<xx>:<xx>:<xx>:<xx>:<xx>:<xx>:<xx>:<xx>	Local UID address (hexadecimal)	The serial port returns the UID address of the current module.
= ERR	error message	Instruction error

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5.4.5 AT+MODE Query/Configure Module Current Mode

Syntax commands:

Instruction	Response	Example
AT+MODE=<mode>	= OK	Send: AT+MODE=0 Return: =OK
AT+MODE=?	AT+MODE=<mode>	Send: AT+MODE=? Return: AT+MODE=0

Parameter description:

Parameter	Description	Illustration
<mode>	Current mode	0: Indicates configuration mode 1: Indicates the working mode 2: Indicates pairing mode
= ERR	error message	Instruction error

Note: The module is in normal working mode <mode=1> by default. After switching to configuration mode <mode=0>, you need to switch back to normal working mode via <AT+MODE=1>.

5.4.6 AT+PAIR Query/Configure Pairing Target UID Address

Syntax commands:

Instruction	Response	Example
AT+PAIR=<uid>	= OK	Send: AT+PAIR = 01:02:03:04:05:06:07:08 Return: =OK
AT+PAIR=?	AT+PAIR=<xx>:<xx>:<xx>:<xx>: <xx>:<xx>:<xx>:<xx>	Send: AT+PAIR=? Return: AT+PAIR=01:02:03:04:05:06:07:08

Parameter description:

Parameter	Description	Illustration
<uid>	Pairing target UID address (hexadecimal)	The serial port returns the UID address of the paired target module.
= ERR	error message	Instruction error

5.4.7 AT+POWER Query/Configure Module Transmit Power

Syntax commands:

Instruction	Response	Example
AT+POWER=<pwr>	= OK	Send: AT+POWER=0 Return: =OK
AT+POWER=?	AT+POWER =<pwr>	Send: AT+POWER=?

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		Return: AT+POWER=0

Parameter description:

Parameter	Description	Illustration
<pwr>	Power parameters	After setting the parameters, the mode switch will take effect; Default parameter power=0: power=0 indicates 10dBm power=1 indicates 8dBm power=2 indicates 6dBm power=3 indicates 4dBm power=4 indicates 2dBm power=5 indicates 0dBm
= ERR	error message	Instruction error

5.4.8 AT+RESET module restart command

Syntax commands:

Instruction	Response	Example
AT+RESET	= OK	Send: AT+RESET Return: =OK

Parameter description:

Parameter	Description	Illustration
= OK	The instruction is correct.	Respond to the command first, then execute the restart.
= ERR	error message	Instruction error

Note: Module restart will return to the default working mode.\

5.4.9 AT+DEFAULT Module Reset Command

Syntax commands:

Instruction	Response	Example
AT+DEFAULT	= OK	Send: AT+DEFAULT Return: =OK

Parameter description:

Parameter	Description	Illustration
= OK	The instruction is correct.	
= ERR	error message	Instruction error

Note: After the command is executed correctly, all configuration parameters will be restored to their default values, and the system will return to the default working mode <mode=1>.

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5.4.10 AT+IAP IAP Upgrade Command

Syntax commands:

Instruction	Response	Example
AT+IAP	= OK	Send: AT+IAP Return: =OK

Parameter description:

Parameter	Description	Illustration
= OK	The instruction is correct.	Respond to the command first, then execute the restart.
= ERR	error message	Instruction error

Note: 1. Use upgrade commands with caution;

2. Upgrades require the use of a host computer.

6 Hardware Design

- It is recommended to use a DC regulated power supply to power this module, with the power supply ripple coefficient as small as possible, and the module must be reliably grounded;
- Please ensure the correct connection of the power supply positive and negative terminals. Reversing the connection may cause permanent damage to the module.
- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to retain a margin of more than 30% to ensure long-term stable operation of the entire unit.
- The module should be kept as far away as possible from power supplies, transformers, high-frequency traces, and other parts with high electromagnetic interference.
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the area under the module. If it is absolutely necessary to run under the module, assuming the module is soldered on the Top Layer, lay ground copper on the Top Layer of the module contact area (all copper and well grounded), and run the traces close to the digital part of the module on the Bottom Layer.
- Assuming the module is soldered or placed in the Top Layer, it is also wrong to arbitrarily route traces in the Bottom Layer or other layers, as this will affect the module's stray emissions and receiver sensitivity to varying degrees.
- If there are devices around the module that cause significant electromagnetic interference, it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If there are traces around the module that cause significant electromagnetic interference (high-frequency digital, high-frequency analog, power supply traces), it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, as there is still a risk of damage).
- The antenna mounting structure has a significant impact on module performance; it is essential to ensure that the antenna is

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exposed and preferably vertically upward.

- When the module is installed inside the housing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- Antennas should never be installed inside a metal casing, as this will greatly reduce the transmission distance.

7 Frequently Asked Questions

7.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications.
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground.
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside.
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe.
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance).
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output.
- The antenna may be poorly matched with the module or have quality issues.

7.2 The module is easily damaged.

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge.
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive.
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

7.3 The effect was not ideal.

- If the power supply ripple is too high, it is essential to reduce the power supply ripple by adding decoupling capacitors and EMC filtering circuits.
- There may be interference from co-channel signals nearby; please re-pair and use.
- The module's transmission performance deteriorated (low transmit power, decreased receive sensitivity), the module was damaged, and it was returned to the factory for repair.
- If the antenna is loose, rusted, or damaged, tighten the antenna connection or replace the antenna.
- If a new source of interference is found, priority should be given to re-pairing the antenna and adjusting/upgrading it.

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8 Welding Operation Instructions

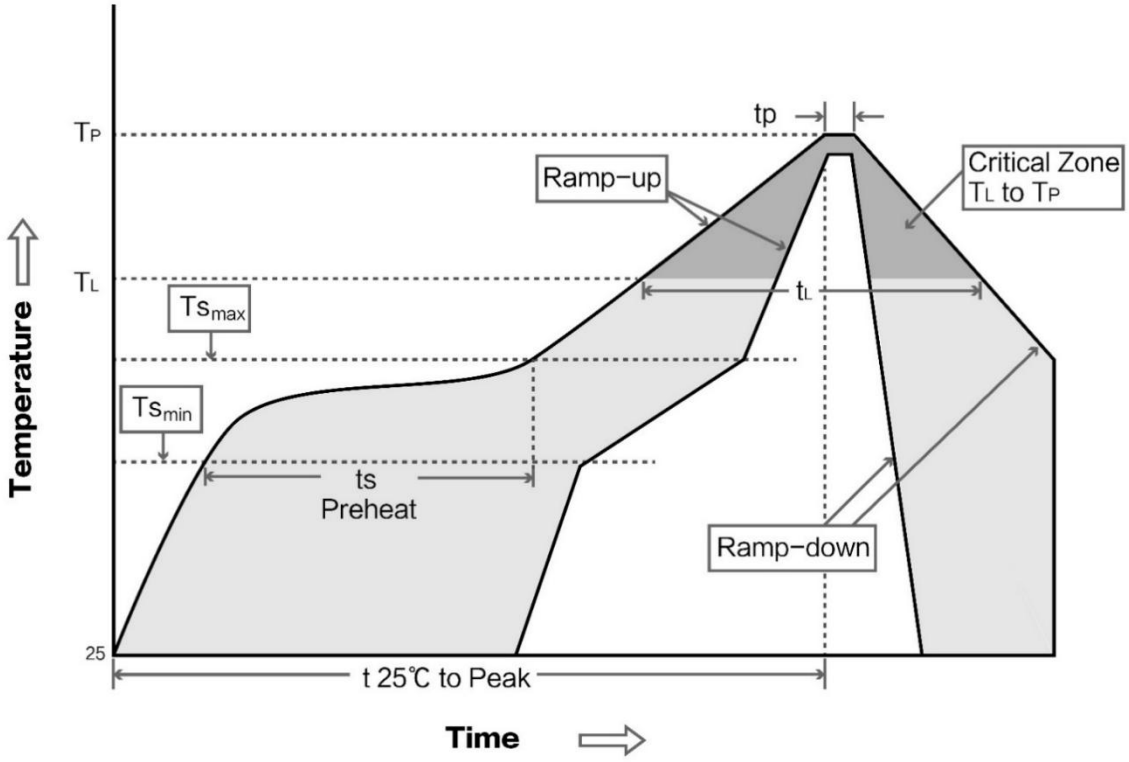
8.1 Reflow soldering temperature

Reflow soldering profile characteristics		Lead-based assembly	Lead-free assembly
Preheating/Insulation	Minimum temperature (Tsmin)	100℃	150℃
	Maximum temperature (Tsmax)	150℃	200℃
	Time (Tsmin~Tsmin)	60-120 seconds	60-120 seconds
Temperature rise slope (TL~Tp)		3℃/second, maximum value	3℃/second, maximum value
Liquid phase temperature (TL)		183℃	217℃
Duration above TL		60~90 seconds	60~90 seconds
Package peak temperature Tp		Users must not exceed the temperature specified on the product's "humidity sensitivity" label.	Users must not exceed the temperature specified on the product's "humidity sensitivity" label.
The time (Tp) within 5°C of the specified grading temperature (Tc) is shown in the figure below.		20 seconds	30 seconds
Cooling slope (Tp~TL)		6℃/second, maximum value	6℃/second, maximum value
Time from room temperature to peak temperature		6 minutes, the longest	8 minutes, the longest
* The peak temperature (Tp) tolerance of the temperature profile is defined as the user's upper limit.			

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8.2 Reflow Soldering Profile



Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-11-04	Initial version	Lei

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