

BLE 5.3 + 2.4G Dual-mode RF Transceiver module**Low Power Consumption | PAN1070 SoC Chip**

SPECIFICATION

Model No.: DL-P1070-AM

Version: V1.0



DL-P1070-AM

Before using this module, please pay attention to the following important matters:

This module is an electrostatic sensitive product. Please operate it on an anti-static workbench during installation and testing.

This DL-P1070-AM BLE Module uses a PCB-on-board antenna by default, which is intended to be embedded in your product or application, and does equip with a metal shield itself for a better anti-interference ability.

Metal objects and wires should be kept away from the PCB antenna as far as possible. If the product uses a metal shell, be sure to leave enough space for the antenna (cannot be covered by metal). Otherwise, the RF signal will be seriously attenuated, which will affect the effective distance.

Disclaimer:

This specification is just for your information; all the charts and pictures used in this specification are for reference only. The actual test shall prevail for details. We do not assume any responsibility for personal injury or property loss caused by user's improper operation.

This specification is subject to change due to the continuous improvement and upgrading of the product version, and the latest version specification shall prevail. DREAMLNK reserves the right of final interpretation and modification of all contents in this specification.

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Revision History

Date	Version	Formulation / Revision of Contents	Approved by
2025-7-01	V1.0	DL-P1070-AM Standard Version BLE Module	Fagan Xu

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

1. Module Overview

1.1 Brief Introduction

The DL-P1070-AM is a BLE Module designed base on the PAN1070 series of low-power Bluetooth chips (supporting dual-mode BLE 5.3 and 2.4GHz). It features a compact design and powerful functionality, with a small size that makes it suitable for various space-constrained application scenarios. The DL-P1070-AM offers up to 19 GPIO pins and multiple communication interfaces, including UART, SPI, and I2C, providing users with flexible configuration options for practical applications.

Equipped with a 48MHz Cortex-M0+ core, 512KB Flash, and 48KB SRAM, the DL-P1070-AM provides ample storage for complex applications. The module supports deep sleep mode, with standby power consumption as low as 0.3 μ A, making it ideal for devices requiring long battery life, such as Smart Home devices, Electronic Shelf Labels (ESL), and wireless Mouse/Keyboards.

In terms of performance, its optimized RF capabilities enable a receiving sensitivity of up to -99dBm, and the adjustable transmit power of up to +9dBm ensures stable and reliable Bluetooth connections in various environments. When the receiving current is 2.5mA and the transmitting power is 0dBm, the module only consumes 8mA, its ultra-low power consumption design is well-suited for low-power applications. Moreover, this DL-P1070-AM wireless module supports various data transmission modes of BLE 5.3, offering flexible data transfer capabilities. Additionally, the DL-P1070-AM is compatible with Bluetooth Mesh networking, enabling multi-device interconnection and smart control, and can work alongside other smart devices such as Smart Speakers to create richer application scenarios.

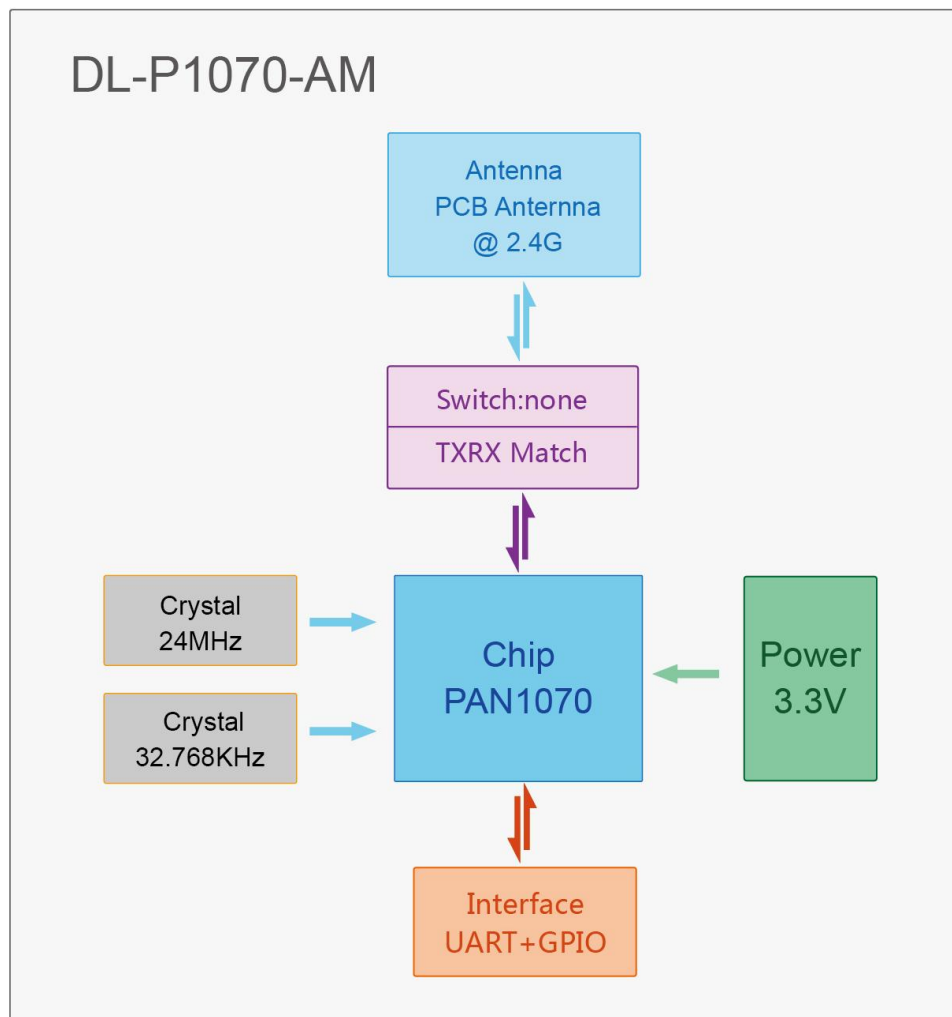
For secondary development, the Keil MDK integrated development environment (IDE) is used, with versions between MDK v5.25 and v5.36 recommended. Programs are debugged and flashed via J-Link SWD. A Python3 environment is required on the PC, with Python 3.8 or higher version is recommended, as the example programs invoke Post Build scripts after compilation to implement special functions.

1.2 Features

- Working Voltage: 1.8-3.6V;
- Operating Frequency Band: BLE 2.4GHz;
- Maximum Output Transmission Power: +9dBm;
- Receiving Current: 2.5mA;
- Sleep Current: 5 μ A;
- Receiving Sensitivity: -99dBm@125kbp, -96dBm@1Mbps ;
- BLE5.3 support: 1Mbps, 2Mbps, 500kbps, 125kbps;

- 2.4G Private Protocol support: 1Mbps, 2Mbps, 500kbps, 250kbps, 125kbps, supports hardware ACK;
- Physical Layer: LE 1M PHY, LE 2M PHY, and Coded PHY (S2 and S8);
- Support LE function, compatible with Bluetooth SIG Mesh;
- Support Human Interface Devices (HID);
- Support multiple connections;

1.3 Circuit Schematic Diagram



1.4 Typical Application

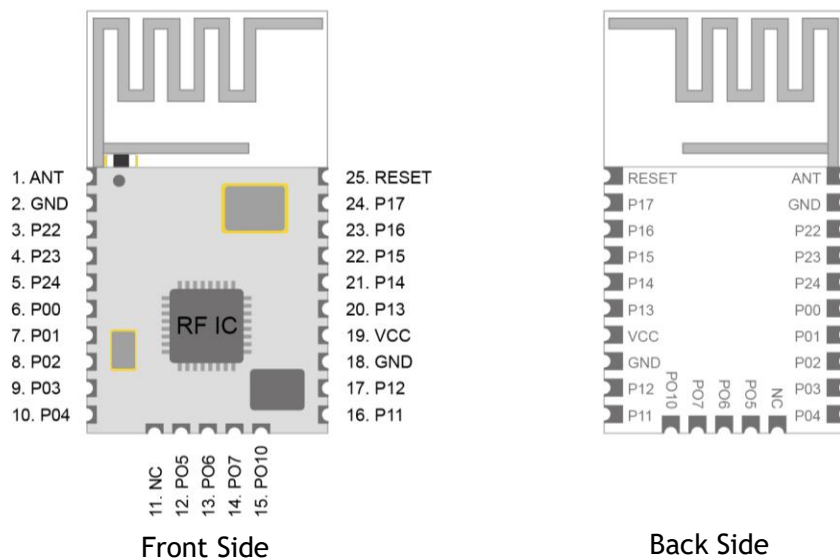
- Smart Wearable Devices
- Smart Home System
- Vehicle Mounted Equipment
- Electronic Shelf Labels (ESL)
- Health Monitoring
- LED Light Control
- Intelligent Security Monitoring
- Wireless Mouse and Keyboard
- Intelligent Parking System
- Thermal Energy Collection, Meter Measurement

2. Technical Parameters

Parameter	Min.	Typical	Max.	Unit	Remark
Operating Conditions					
Working Voltage (VDD)	1.8	3.3	3.6	V	Unable to output Max. power when the power supply voltage is below 3.0V
Communication Level	-0.3	3.3	3.6	V	Exceeding this range may damage the RF chip
Working Temperature	-40	25	85	°C	The larger the temperature difference, the greater the required bandwidth
Current Consumption					
RX Current (Radio+MCU)	2	2.5	3	mA	
TX Current (Radio+MCU)		5.8 8 20		mA	@ -10dbm @ 0dbm @ +9dbm
Sleep Current	0.3	5	10	uA	
RF Parameters					
Recommended Frequency (Ensure best performance)	2400		2483	MHz	2.4G ISM Frequency Band
Transmission Power Range	-40	0	9	dBm	
Sensitivity		-99 -96 -93		dBm	@ 125 kbps @ 1 Mbps @ 2 Mbps

Table 1: Technical Parameters

3. Pin Diagram (AT Firmware Defaulted Definition)



Pin Diagram of DL-P1070-AM

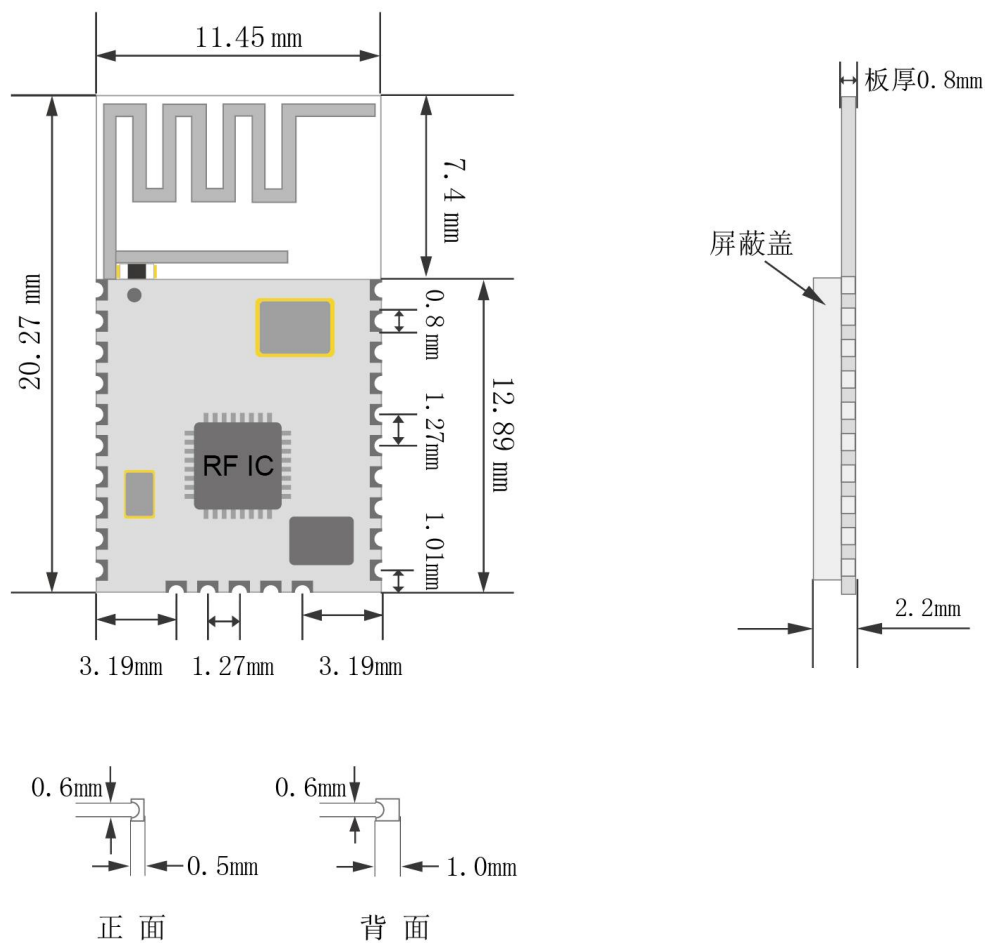
Pin Functions:

NO.	Pin Name	Type	Pin Description
1	ANT/NC	AI/AO	It has a PCB-on-board antenna, and the ANT pin does not need to be used normally. It is important to ensure that there are no leads, otherwise it will affect the performance. RF signal input/output port, π -matching circuit must be reserved; Adopt 50 Ω impedance matching for RF routing, route the ground and add via holes around it
2	GND	PWR	Reliable grounding
3	P22	IO	SPI1_CLK / SPI0_MOSI / PWM_CH0 / ADC_CH2 / TADC_DATL
4	P23	IO	SPI1_CS / I2C0_SCL / PWM_CH1 / ADC_CH1 / TADC_DATH / DPLL_DIV8
5	P24	IO	SPI1_MISO / UART1_RX / PWM_CH2 / TIMER1_CNT_OUT / ADC_CH6
6	P00	IO	SWD_CLK / UART1_RX / I2C0_SCL / SPI0_CLK
7	P01	IO	SWD_DAT / UART1_TX / I2C0_SDA / SPI0_CS
8	P02	IO	UART0_CTS / UART1_CTS / SPI1_MISO / PWM_CH3
9	P03	IO	UART0_CTS / SPI0_CS / PWM_CH2 / TIMER0_CNT_OUT
10	P04	IO	UART0_RTS / SPI0_CLK / PWM_CH3 / TM0_EXT / ADC_CH0
11	N/C	NA	No connection
12	P05	IO	UART0_TX / SPI0_MISO / PWM_CH4 / EXT_STADC
13	P06	IO	UART0_RX / SPI0_MISO / PWM_CH5 / TM1_EXT / AHB_CLK
14	P07	IO	PWM_CH0 / SPI0_MOSI / UART1_RX / I2C0_SCL / ADC_CH5
15	P10	IO	PWM_CH5 / SPI0_MISO / UART1_TX / I2C0_SDA
16	P11	IO	CLK_32K / UART0_TX / PWM_CH7 / UART1_RTS / SPI0_MOSI
17	P12	IO	SPI0_MISO / TIMER0_CNT_OUT / UART1_TX / UART0_RX / PWM_CH4 / ADC_CH3
18	GND	PWR	Reliable grounding
19	VCC	PWR	To ensure maximum chip performance, a stable voltage ($\geq 3.0V$) is required
20	P13	IO	SPI0_CS / SPI1_CS / PWM_CH3 / UART0_RTS / I2C0_SDA / USB_DM
21	P14	IO	SPI0_CLK / PWM_CH2 / UART0_CTS / I2C0_SCL / USB_DP

22	P15	IO	TM0_EXT / UART0_RX / SPI0_CS / PWM_CH5
23	P16	IO	I2C0_SCL / SPI1_CLK / PWM_CH0 / UART0_TX / TIMER2_CNT_OUT
24	P17	IO	RCH / PWM_CH1 / UART0_RX / TM2_EXT
25	RESET	I	Hardware reset, low level effective

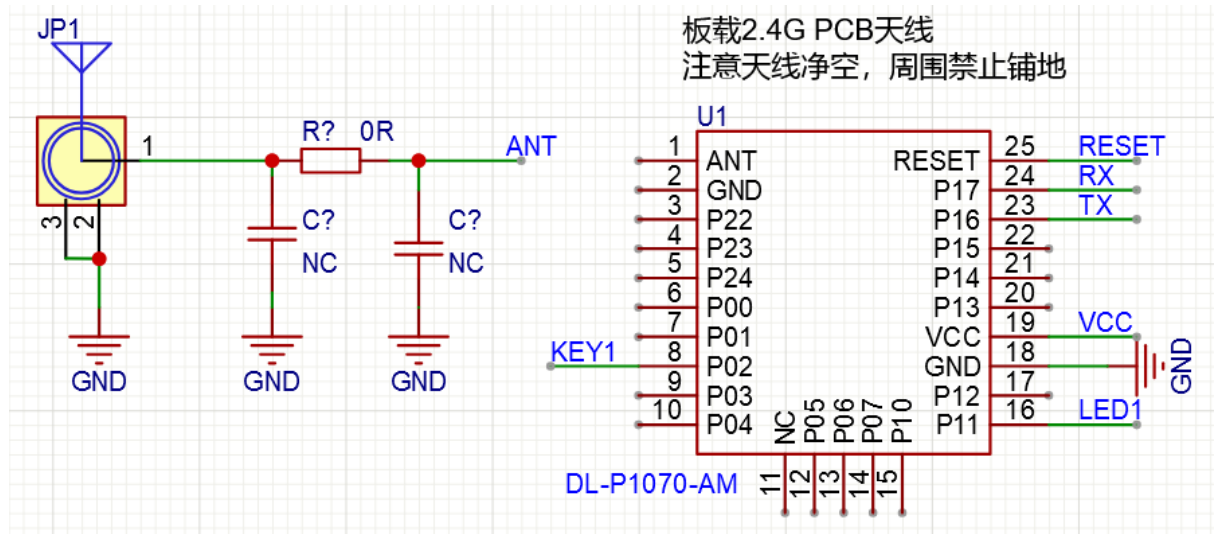
Table 2: Pin Functions of DL-P1070-AM

4. Module Dimension



DL-P1070-AM Module Dimension

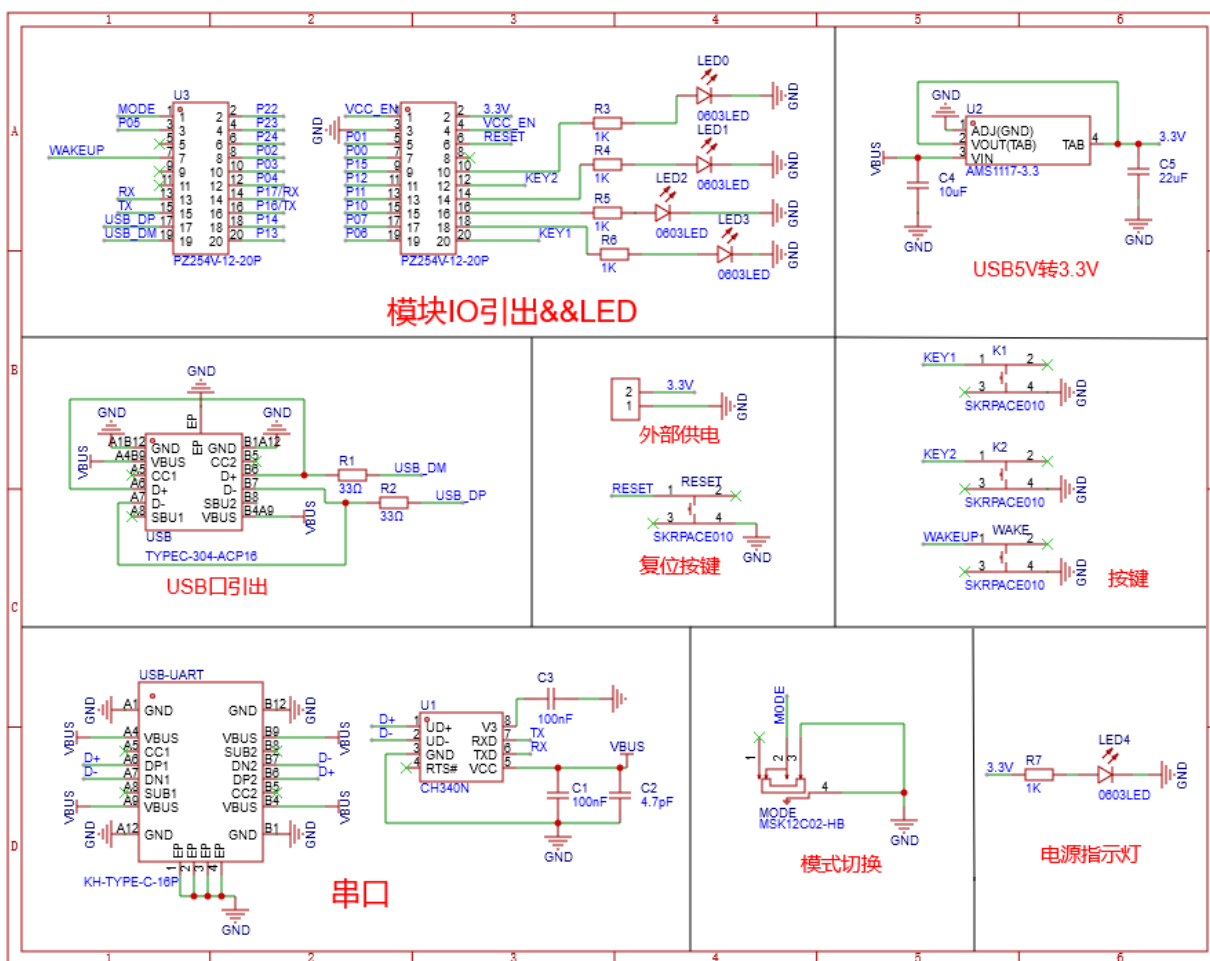
5. Application Connection Diagram



Remark:

1. If an external antenna (customized hardware) is required, please reserve π -type matching circuit on your PCBA; If PCB on-board antenna will be used, please make ANT Pin N/C (No Connection);
2. If PCB-on-board antenna been used, sufficient clearance needs to be left above the antenna (the antenna area needs to be clear on both sides), and make sure no copper laying under the antenna;
3. The working voltage of the module is 3.3V. Please ensure that the voltage is within the recommended range to prevent abnormal operation of the module.
4. The P16 and P17 pins are used for the UART0 debugging interface, facilitating data serial port debugging.
5. Can be connected to buttons and LEDs for status indication and debugging functions.
6. The RESET pin can achieve hardware reset, low level effective.

Schematic Diagram of Secondary Development Board



6. Circuit Design

6.1 Power Supply Design

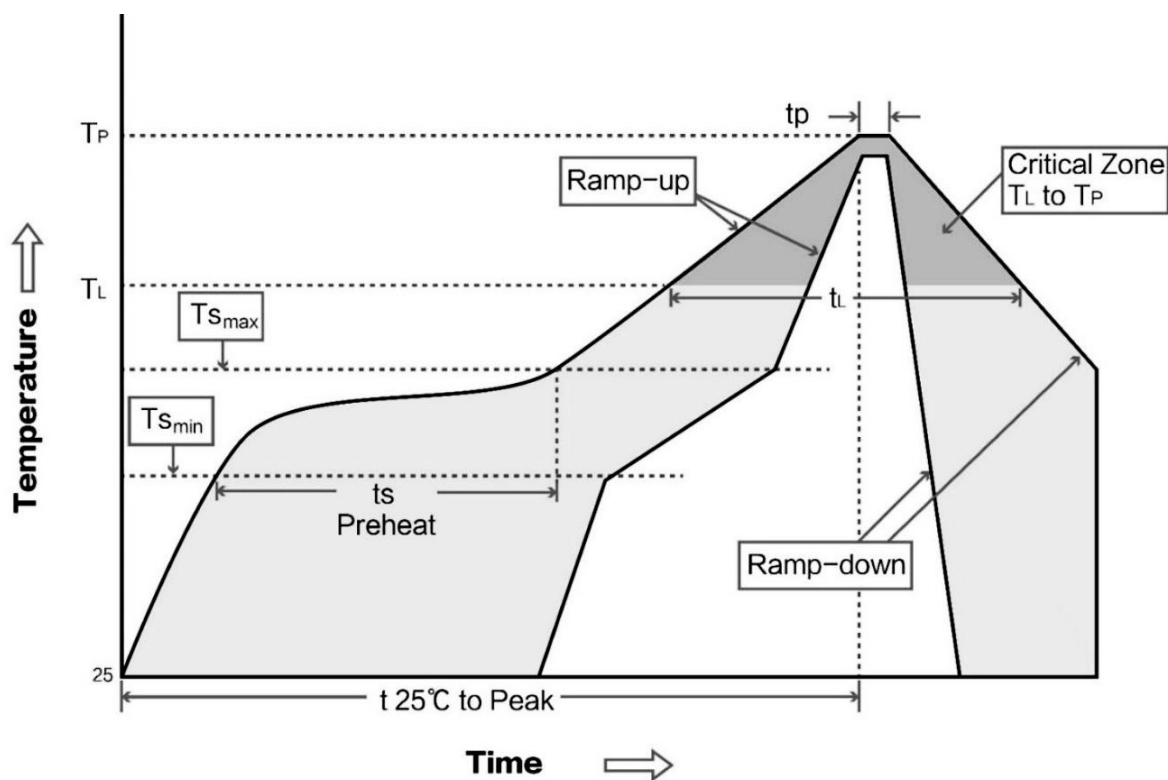
- Please pay attention to the power supply voltage of the device, exceeding the recommended voltage range may cause function abnormally and permanently damage;
- Try to use a DC stabilized power supply, and the power ripple coefficient should be as small as possible; the power load when transmitting the maximum power needs to be also considered;
- The module needs to be grounded reliably, and a good grounding can achieve better performance output and reduce the impact of RF on other sensitive devices.

6.2 RF Routing Design

- The module should be far away from RF interference sources, such as high-frequency circuit transformer, and it is forbidden to route the wires directly under the module, otherwise it may affect the receiving sensitivity;
- When using the on-board antenna, the antenna part needs to be clear on both sides. It is strictly prohibited to lay the ground around the antenna (within 5mm), and it is best to extend the antenna out of the board frame.

7. Welding Operation Guidance

7.1 Reflow Soldering Curve Chart



7.2 Reflow Soldering Temperature

IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	Big size components (thickness ≥ 2.5 mm)
The ramp-up rate (T_L to T_P)	3°C/s (max.)
Preheat Temperature	
- Temperature Minimum ($T_{S_{min}}$)	150°C
- Temperature Maximum ($T_{S_{max}}$)	200°C
- Preheat Time (t_s)	60~180s
Average ramp-up rate ($T_{S_{max}}$ to T_P)	3°C/s (Max.)
- Liquidous temperature (T_L)	217°C
- Time at liquidous(t_L)	60~150 second
Peak Temperature (T_P)	245+/-5°C

8. Notice for module application

- (1) This module is an electrostatic sensitive product. Please operate on an anti-static workbench during installation and testing;
- (2) When installing the module, make sure that nearby objects keep a sufficient safe distance from the module to prevent short-circuit damage;
- (3) Liquid substance is not allowed to come into contact with this module, and this module should be used in a dry environment;
- (4) Please use an independent voltage stabilizing circuit to supply power to this module, and avoid sharing with other circuits. The tolerance of the power supply should not be less than 5%.
- (5) The indicators of this module are accord to commonly used international standard. If special certifications needed, we can adjust certain indicators according to your needs.

9. Contact us

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★ Data collection, Smart home, Internet of Things applications, Wireless remote control technology, Remote active RFID, Antennas ★

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