WKB5010

User Manual

DISCLAIMER

The data contained in this manual are derived from laboratory testing by Guangdong Weila Intelligent Technology Co., Ltd. and are for reference purposes only. Actual results may vary.

Guangdong Weila Intelligent Technology Co., Ltd. assumes no responsibility or liability for any use of the information contained herein, including but not limited to any direct or indirect damages, infringements, or losses arising from such use. No warranties, either express or implied, are made with respect to the contents of this manual.

Guangdong Weila Intelligent Technology Co., Ltd. reserves the right to modify or update the contents of this manual at any time without prior notice, in accordance with product version changes and actual conditions.

All trademarks, registered trademarks, and other intellectual property rights referenced in this manual are the property of their respective owners. Unauthorized use of such intellectual property is strictly prohibited.

Guangdong Weila Intelligent Technology Co., Ltd. reserves the right of final interpretation of this manual.

Document Revision History

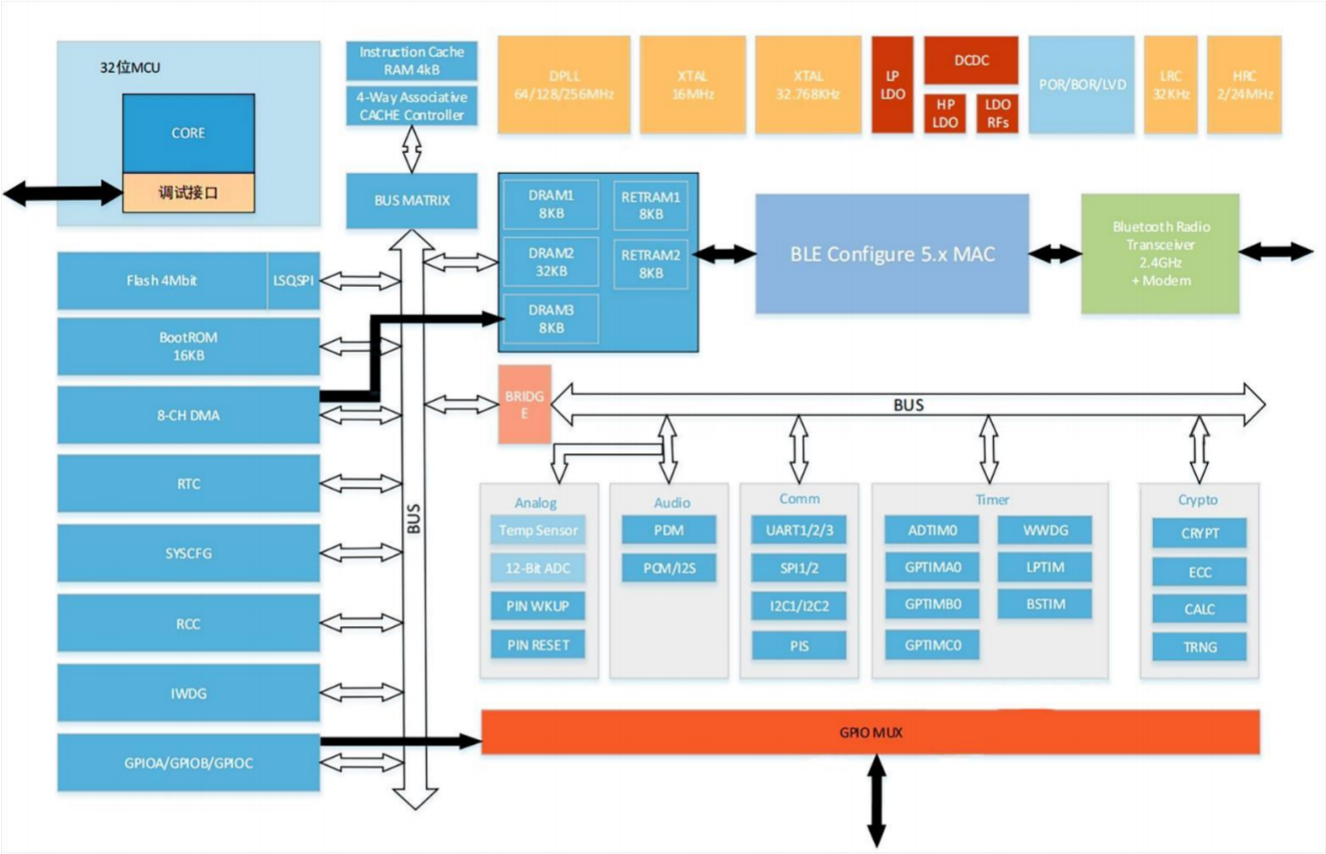
Version	Revision Description	Revised By	Date
V1.0	Initial Release	luo	2024/04/18

Table of Contents

1. Product Overview

WKB5010 Module is a Bluetooth module developed by Guangdong WEILA Intelligent Technology Co., Ltd. It is designed for a wide range of applications, particularly in HID devices, smart home systems, Bluetooth Mesh networking, and smart mobility solutions, as well as various other wireless application scenarios.

The block diagram of the chipset is shown below.



1.1 Features

- BLE5.0
  - o Supports data rates of 125Kbps/500Kbps/1Mbps/2Mbps
  - o Receiver Sensitivity: -99.7dBm @1Mbps
    -97 dBm @2Mbps
    -105 dBm @125kbps
  - o Transmit Power: Up to +12 dBm
  - o Link Budget: Up to 117 dB @ 125 Kbps
  - o Supports Single-Ended Antenna Output

- Bluetooth MESH
  - o Supports Bluetooth SIG Mesh
  - o Supports MESH

- MCU Core
  - 32-bit CPU core
  - Maximum operating frequency up to 64 MHz
  - Up to 64 KB SRAM
  - Up to 512 KB Flash memory
  - Supports two-wire debugging interface

- Power Consumption
  - RX Mode: 4.5 mA @ 3.3 V
  - TX Mode: 4.3 mA @ 3.3 V, 0 dBm
  - Deep Sleep Mode: 1.1 μA (RTC wake-up + GPIO wake-up)
  - Shutdown Mode: 700 nA (GPIO wake-up)

- Power Supply & Reset
  - Main power domain (VDD33)
  - Operating voltage range: 1.8 V ≤ VDD33 ≤ 3.6 V
  - POR,BOR,LVD

- Clock System
  - External High-Speed Crystal Oscillator: 16 MHz
  - Internal High-Speed RC Oscillator: 24 MHz
  - External Low-Speed Crystal Oscillator: 32.768 kHz
  - Internal Low-Speed RC Oscillator: 32.768 kHz

- System Peripherals
  - DMA: Supports 8 multiplexed channels
  - Watchdog Timers: IWDG & WWDG
  - Peripheral Interconnect System (PIS)
  - System Tick Timer (SysTick)

- Security & Hardware Acceleration
  - ECC (Elliptic Curve Cryptography, 256-bit)
  - AES Encryption (256/192/128-bit)
  - T/DES Encryption (192/128/64-bit)
  - True Random Number Generator (TRNG)
  - Hardware Calculation Accelerator (CALC)

- Timers
  - 1 × Advanced 16-bit Timer (ADTIM), Supports 4 PWM channels, 3 channels support complementary outputs with dead-time insertion
  - 1 × General-Purpose 32-bit Timer A (GPTIMA), Supports 4 PWM channels
  - 1 × General-Purpose 16-bit Timer B (GPTIMB), Supports 4 PWM channels
  - 1 × General-Purpose 16-bit Timer C (GPTIMC), Supports 2 PWM channels, 1 channel supports complementary outputs with dead-time insertion
  - 1 × Basic Timer (BSTIM)

- 1 × Low-Power Timer (LPTIM)

- Real-Time Clock (RTC)
  - Supports high-precision hardware temperature compensation

- Analog-to-Digital Converter (ADC)
  - 12-bit high-precision SAR ADC
  - Supports up to 9 external input channels
  - Supports 3 internal channels:
    - Built-in temperature sensor
    - 1/8,1/4,1/2,3/8 VDD
    - Internal 1.4 V reference voltage

- Communication Interfaces
  - 2 × I²C interfaces (with bus arbitration support)
  - 2 × SPI interfaces
  - 3 × UART interfaces(Supports ISO7816, LIN, IrDA, and other protocols)

- Audio Interfaces
  - 2 × PDM interfaces for digital microphones
  - 1 × I²S interface

2. Electrical Characteristics

2.1 General Specifications

Parameter	Description	Min.	Typ.	Max.	Unit
Operating Temperature		-40		85	℃
Supply Voltage	Regulator supply input	1.8	3.3	3.6	V
t_{R_SUP}	Power supply rise time （0V to 3.3V）			330	ms
Current Consumption	TX Mode @ 0dBm Output (DCDC ON)		4.3		mA
	RX Mode (DCDC ON)		4.5		mA
	Standy Mode		2		mA
	Low Power Mode2		1.1		uA
	Low Power Mode3		0.7		uA
V_{IH}	High Level Input Voltage	0.8*VDD33		VDD33	V
V_{IL}	Low Level Input Voltage	0		0.2*VDD33	V
V_{OH}	High Level Output Voltage	VDD33-0.4		VDD33	V
V_{OL}	Low Level Output Voltage			0.4	V
Source Current			30		mA
Sink Current			60		mA
V_{ESD}	Electrostatic discharge voltage		±8000		V

2.2 TX spec

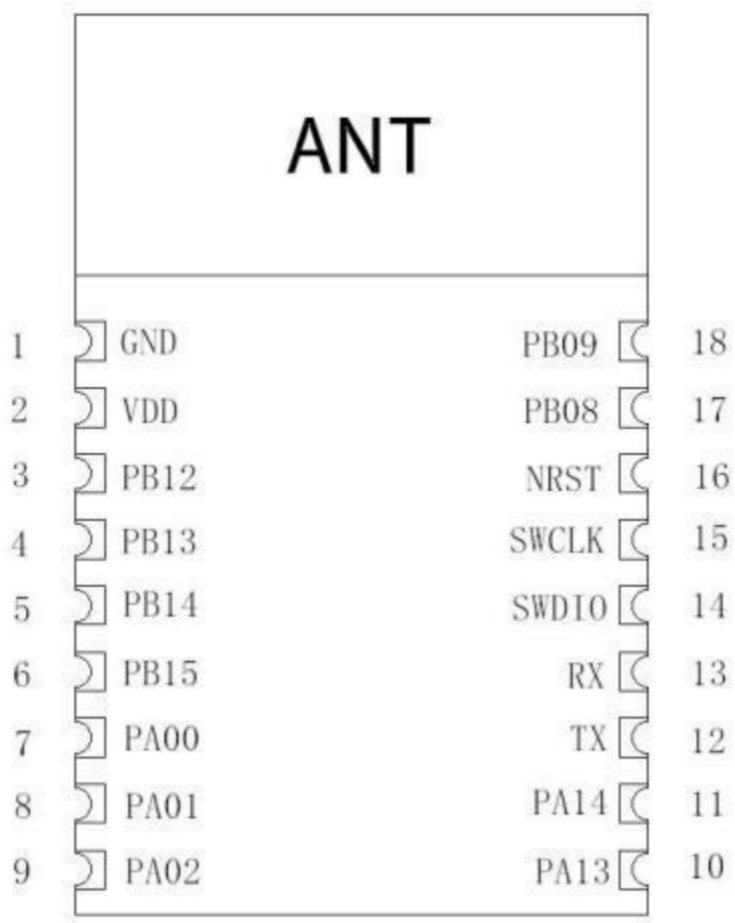
Symbol	Description	Min.	Typ.	Max.	Unit
Low Power PA					
PRF_PA	Maximum output power.		8		dBm
tR_SUP	RF power control range.		40		dB
PBW1_PA	20 dB bandwidth for modulated carrier (1 Mbps).		1000		KHz
High Power PA					
PRF_PAHP	Maximum output power.		12		dBm
PRFC_PAHP	RF power control range.		12		dB
PBW1_PAHP	20 dB bandwidth for modulated carrier (1 Mbps).		1000		KHz

2.3 RX spec

Symbol	Description	Min.	Typ.	Max.	Unit
Receiver operation					
PRX_{MAX}	Maximum received signal strength at < 0.1% BER.		-1.5		dBm
$PRX_{SENS,2M}$	Sensitivity (0.1% BER) at 2 Mbps	-97	-96		dBm
$PRX_{SENS,1M}$	Sensitivity (0.1% BER) at 1 Mbps.	-100.7	-99.7		dBm
$PRX_{SENS,500k}$	Sensitivity (0.1% BER) at 500 kbps.	-99	-98		dBm
$PRX_{SENS,125k}$	Sensitivity (0.1% BER) at 125 kbps.	-105	-104		dBm
P_{SENS} IT 1 Mbps BLE	Receiver sensitivity: Ideal transmitter.	-100	-99		dBm
P_{SENS} DT 1 Mbps BLE	Receiver sensitivity: Dirty transmitter.	-99.5	-98.5		dBm
RX selectivity					
C/I_{CO}	C/I co-channel.		-2		dB
C/I_{1ST}	1st ACS, C/I 1 MHz		-17		dB
C/I_{2ND}	2nd ACS, C/I 2 MHz.		-41		dB
C/3+N	ACS, C/I (3+n) MHz offset [n = 0, 1, 2, ___].		-50		dB
C/I_{Image}	Image blocking level.		-42.5		dB
$C/I_{Image\pm1\,MHz}$	Adjacent channel to image blocking level (±1 MHz).		-45		dB

3. WKB5010 Module

3.1 Pin Description

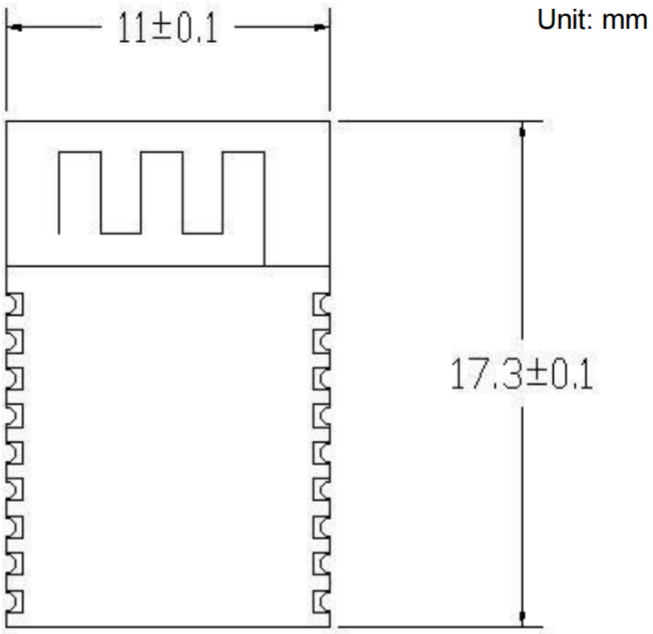


No.	Pin Name	Description
1	GND	Ground
2	VDD	3.3V
3	PB12	GPIO / ADC Channel 0
4	PB13	GPIO / ADC Channel 1
5	PB14	GPIO / BOOT Control
6	PB15	GPIO / Sleep Wake-up
7	PA00	GPIO / ADC Channel 4 / Sleep Wake-up
8	PA01	GPIO / ADC Channel 5
9	PA02	GPIO / ADC 6
10	PA13	GPIO
11	PA14	GPIO
12	TX	Default: PB00 GPIO / UART1_TXD
13	RX	Default: PB01 GPIO / UART1_RXD
14	SWDIO	Default: PB05 GPIO / SWDIO
15	SWCLK	Default: PB06 GPIO / SWCLK
16	NRST	Chip Reset Pin
17	PB08	GPIO
18	PB09	GPIO

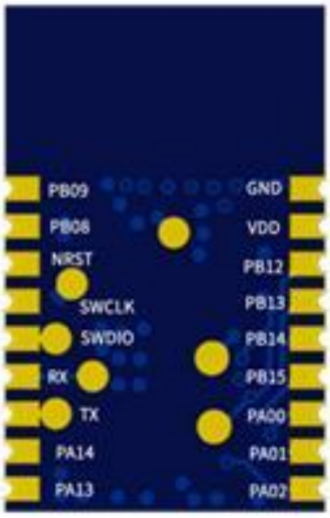
Note:

All GPIOs listed above can be multiplexed and configured for various peripheral functions.
Pull the BOOT pin high to enter UART firmware download mode.
Pull the BOOT pin low to run the previously programmed firmware normally.

3.2 Mechanical Dimensions



Front

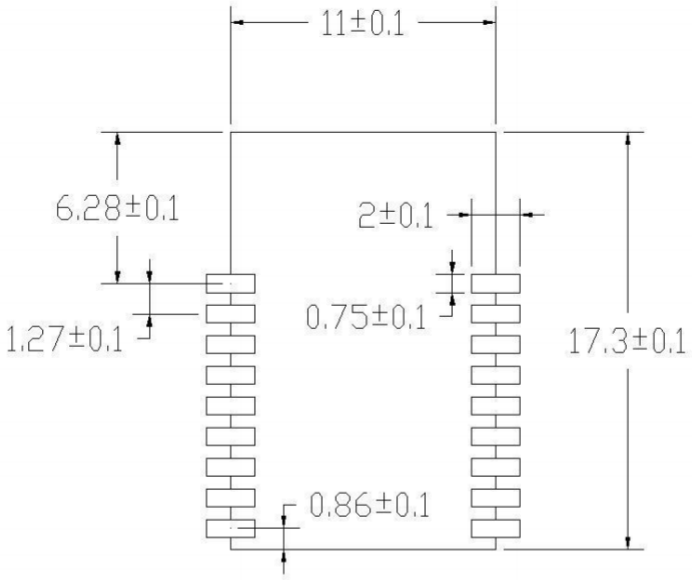


Back

3.3 Reference Schematic

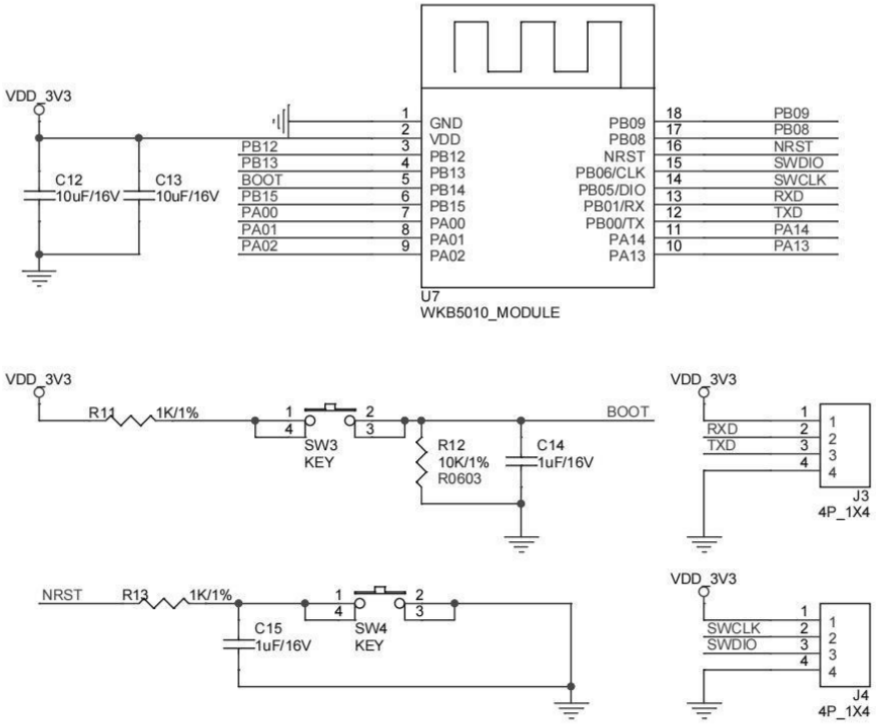
3.4 PCB Footprint

Unit： mm



3.5 Design Guidelines

3.5.1 Reference Application Circuit



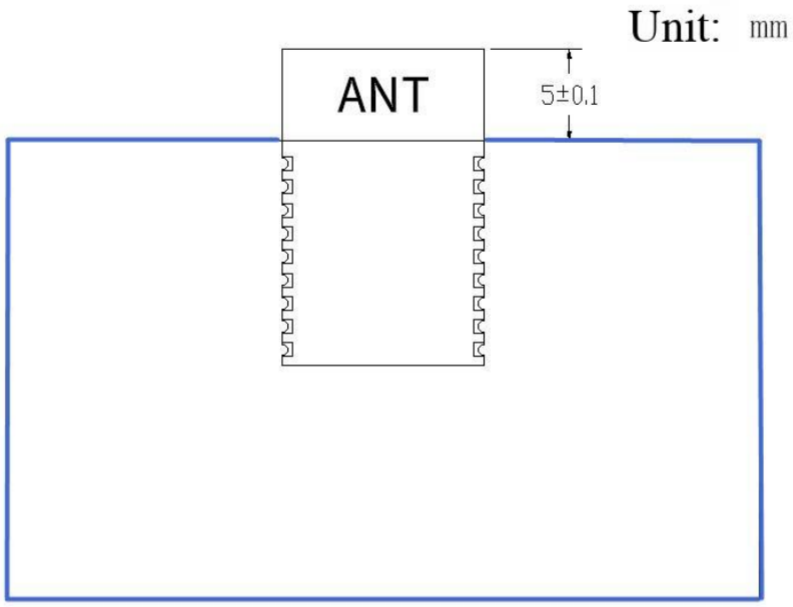
Note:

To enter UART firmware download mode, the BOOT pin must be pulled high during power-up.

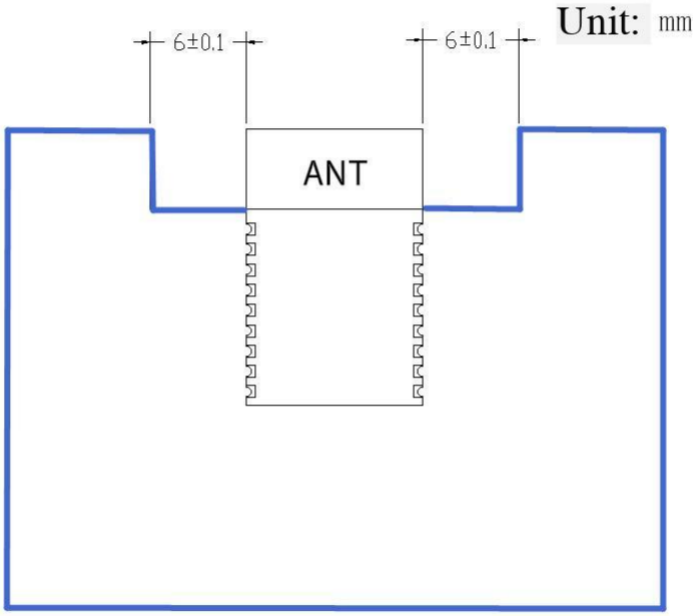
3.5.2 Onboard Antenna Placement Guidelines

To ensure optimal performance of the onboard antenna, metal objects and high-frequency components must not be placed near the antenna area. The following two antenna placement examples are recommended for reference:

Example 1

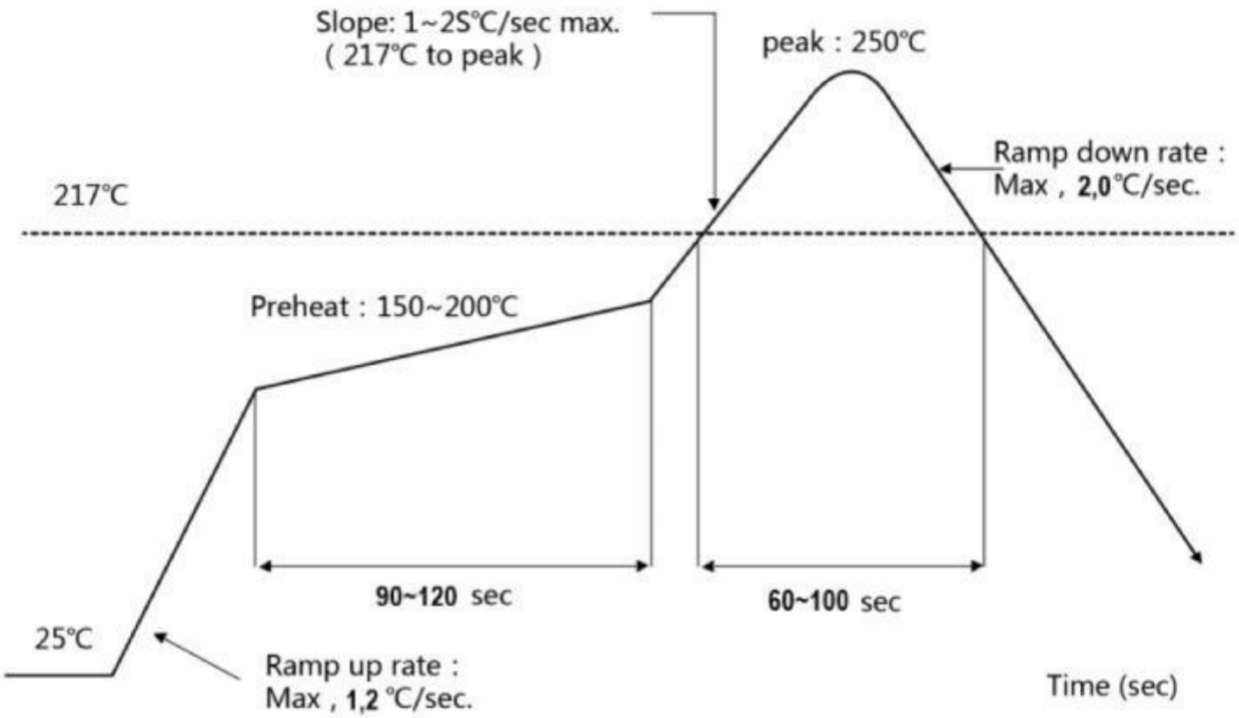


Example 2



4. Reflow Soldering Profile

Compliant with IPC/JEDEC standards.
Peak temperature: < 250°C.
Maximum reflow cycles: < 2 times.



5. Contact Us

Company：Guangdong Weila Intelligent Technology Co., Ltd
TEL：13602688458（Mr. Zeng）
Email：sales@weikengtech.com

ADD：Floor 11, Block A, Building 9, Baoneng Science and Technology Park, Qingxiang Road, Longhua District, Shenzhen