

QOGRISYS

欧飞信科技

O9101SA

Wi-Fi Dual-band 1x1
802.11ax + Bluetooth5.4
Module Datasheet

Cover of Approval Sheet

PRODUCT NAME	Part No.	Description
O9101SA	FWAAO9101SA10	WQ9101S SDIO 3.3V 1T1R 12*12*1.9mm 80MHz 11ax WI FI6+BT5.4 External 1Antenna

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

Maker Information:

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Revision History

Version	Date	Description	Draft	Approved
V1.0	2025-09-16	Preliminary Project version	EZX	Ben·Chen
V2.0	2025-11-11	Revise Company Logo and Address Revised Operating Temperature Specifications	EZX	Ben·Chen
V2.1	2025-12-15	Adjust layout dimensions	EZX	Ben·Chen
V2.2	2026-01-29	Correct the pin description error	EZX	Ben·Chen

CONTENTS

1.OVERVIEW	4
1.1 INTRODUCTION	4
1.2 FEATURES	4
1.3 BLOCK DIAGRAM	4
1.4 GENERAL SPECIFICATION	5
1.5 RECOMMENDED OPERATING RATING	5
2. RF SPECIFICATION	5
2.1 WI-FI RF SPECIFICATION	5
2.2 BT RF SPECIFICATION	7
3.PIN ASSIGNMENTS	8
3.1 PIN OUTLINE	8
3.2 PIN DEFINITION	8
4.DIMENSIONS.....	10
4.1 PHYSICAL DIMENSIONS AND MODULE PHOTO	10
4.2 MODULE PHYSICAL DIMENSIONS.....	10
5 REFERENCE DESIGN	11
5.1 REFERENCE SCHEMATIC.....	11
5.2 EXTERNAL ANTENNA.....	11
5.3 REAL-WORLD TESTING	11
6 RECOMMENDED REFLOW PROFILE.....	12
7 PACKAGE.....	13
7.1 REEL.....	13
7.2 STORAGE TEMPERATURE AND HUMIDITY	13

1. Overview

1.1 Introduction

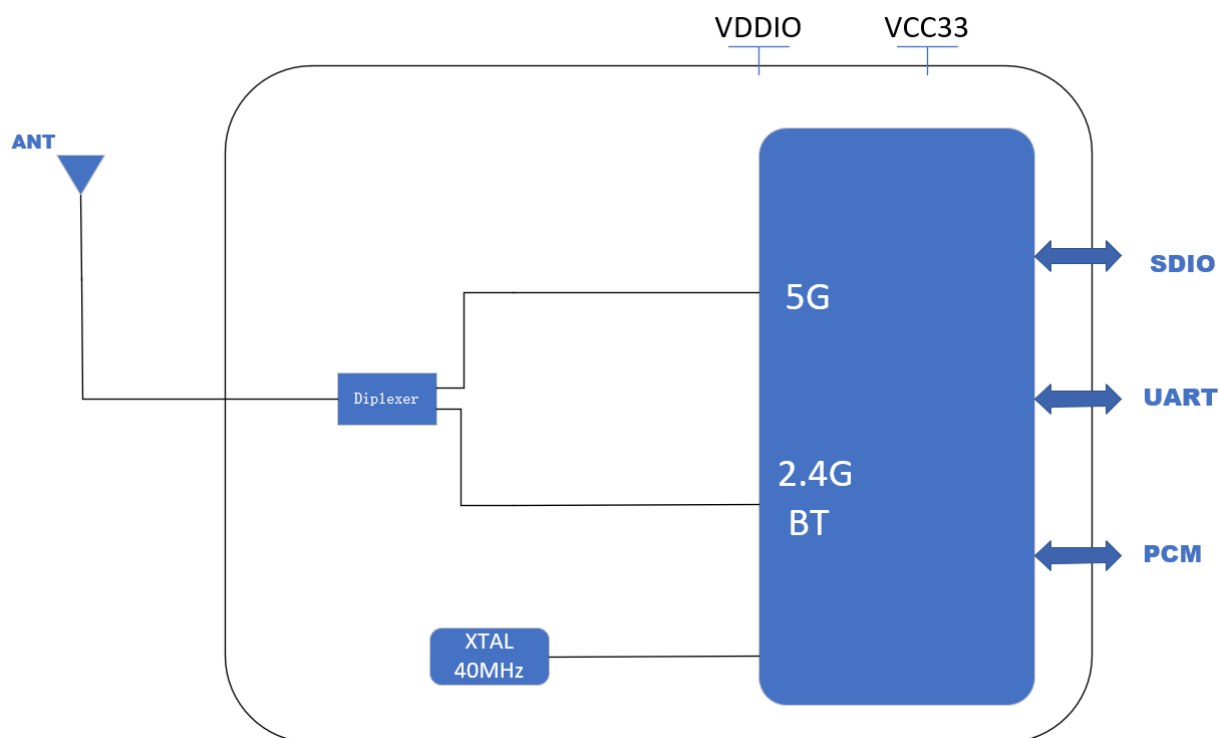
The O9101SA is a dual-mode chip, support 1x1 2.4G + 5G dual-frequency Wi-Fi function and Bluetooth function. Wi-Fi Da We supports Wi-Fi protocol IEEE 802.11ax and backward compatibility protocol 802.11a/b/g/n/ac. The Bluetooth subsystem supports the Bluetooth system Protocol 5.4 with low-power audio.

The O9101SA chip integrates five high-performance RISC-VCPUs, high-speed interfaces (SDIO3.0).The chip supports a good radio frequency with very low power consumption And baseband performance.

1.2 Features

- Supported for the IEEE 802.11 a / b / g / n / ac / ax protocol.
- Dual-band 2.4 GHz/5 GHz support.
- 20MHz/40MHz channel bandwidth for 2.4 GHz and 20MHz/40MHz/80MHz channel bandwidth for 5 GHz.
- Support WFA、WPA/WPA2/WPA3、WEP、WAPI.
- Supports IEEE 802.11k /v/r protocol.
- Support Soft AP/STA/P2P mode.
- Fully compatible with Bluetooth 5.4 protocol.
- Support for BT / BLE dual-mode.

1.3 Block Diagram



1.4 General Specification

Model Name	O9101SA
Product Description	Support WiFi6+BT5.4
Dimension	L x W x H: 12 x 12 x 1.9 (typical) mm
Wi-Fi Interface	SDIO3.0
BT Interface	UART/PCM
Operating temperature	-10 to 70°C
Storage temperature	-40°C to 120°C

Note: This module operates normally within a temperature range of -20°C to 85°C; continuous operation at extreme temperature points over extended periods is not recommended.

1.5 Recommended Operating Rating

Feature		Minimum	Type	Maximum	Units
Operating Temperature		-10	25	70	°C
VCC		3.15	3.3	3.45	V
Power Consumption (Type VCC)	TX (2.4G HE40)	298 mA			
	RX (2.4G HE40)	179 mA			
	TX (5G HE80)	317 mA			
	RX (5G HE80)	208 mA			
	BT TX(3DH5)	171 mA			
	BT RX(3DH5)	98 mA			

2. RF Specification

2.1 Wi-Fi RF Specification

2.4GHz RF Specification			
Feature		Description	
Operating Frequency		2.400~2.4835GHz	
Standards		Wi-Fi: IEEE 802.11b/g/n/ax & Wi-Fi compliant	
Operating Channel		2.4GHz : Ch1~14	
Modulation		802.11b : CCK 802.11 g/n/ac/ax : OFDM /1024-QAM、256-QAM、64-QAM、16-QAM、QPSK、BPSK	
PHY Data rates		Wi-Fi:802.11b:11,5.5,2,1Mbps 802.11g:54,48,36,24,18,12,9,6Mbps 802.11n: up to 150Mbps (2.4G HT40) 802.11ax: up to 286Mbps data rate (2.4G HE40)	
Output Power, tolerance ± 1.5 dB			
Protocol Standard		Data Rate	Spec.(dBm) EVM(dB)
802.11b		@11Mbps	19 ≦ -9
802.11g		@54Mbps	15 ≦ -25
802.11ax		@HE20 MCS 0	17 ≦ -13
802.11ax		@HE20 MCS 11	13 ≦ -35

802.11ax	@HE40 MCS 11	13	≤-35
Receiver Sensitivity, CCK modulation PER≤8%、OFDM modulation PER≤10%			
Protocol Standard	Data Rate	Spec.(dBm)	
802.11b(20MHz)	1Mbps	-85	
	11Mbps	-82	
802.11g(20MHz)	6Mbps	-85	
	54Mbps	-68	
802.11n(20MHz)	MCS 0 NSS1	-85	
	MCS 7 NSS1	-67	
802.11n(40MHz)	MCS 0 NSS1	-82	
	MCS 7 NSS1	-64	
802.11ac(20MHz)	MCS 0 NSS1	-85	
	MCS 9 NSS1	-60	
802.11ac(40MHz)	MCS 0 NSS1	-82	
	MCS 9 NSS1	-57	
802.11ax(20MHz)	MCS 0 NSS1	-85	
	MCS 11 NSS1	-55	
802.11ax(40MHz)	MCS 0 NSS1	-82	
	MCS 11 NSS1	-52	
5GHz RF Specification			
Feature	Description		
Operating Frequency	5G:5.15 GHz ~ 5.845 GHz (5.0 GHz ISM Band)		
Standards	Wi-Fi: IEEE 802.11 a/n/ac/ax Wi-Fi compliant		
Modulation	802.11 a/n/ac/ax : OFDM /1024-QAM、256-QAM、64-QAM、16-QAM、QPSK、BPSK		
PHY Data rates	Wi-Fi: 802.11a:54,48,36,24,18,12,9,6Mbps 802.11n: up to 150Mbps(5G HT40) 802.11ac: up to 433Mbps (5G VHT80) 802.11ax: up to 600Mbps data rate (5G HE80)		
Output Power, tolerance ± 1.5 dB			
Protocol Standard	Data Rate	Spec.(dBm)	EVM(dBm)
802.11a	@54Mbps	14	≤-25
802.11ac	@VHT80 MCS 9	12	≤-32
802.11ax	@HE20 MCS 11	12	≤-35
802.11ax	@HE80 MCS 11	11	≤-35
Receiver Sensitivity,OFDM modulation PER≤10%			
Protocol Standard	Data Rate	Spec.(dBm)	
802.11a(20MHz)	6Mbps	-85	
	54Mbps	-68	
802.11n(20MHz)	MCS 0 NSS1	-85	
	MCS 7 NSS1	-67	

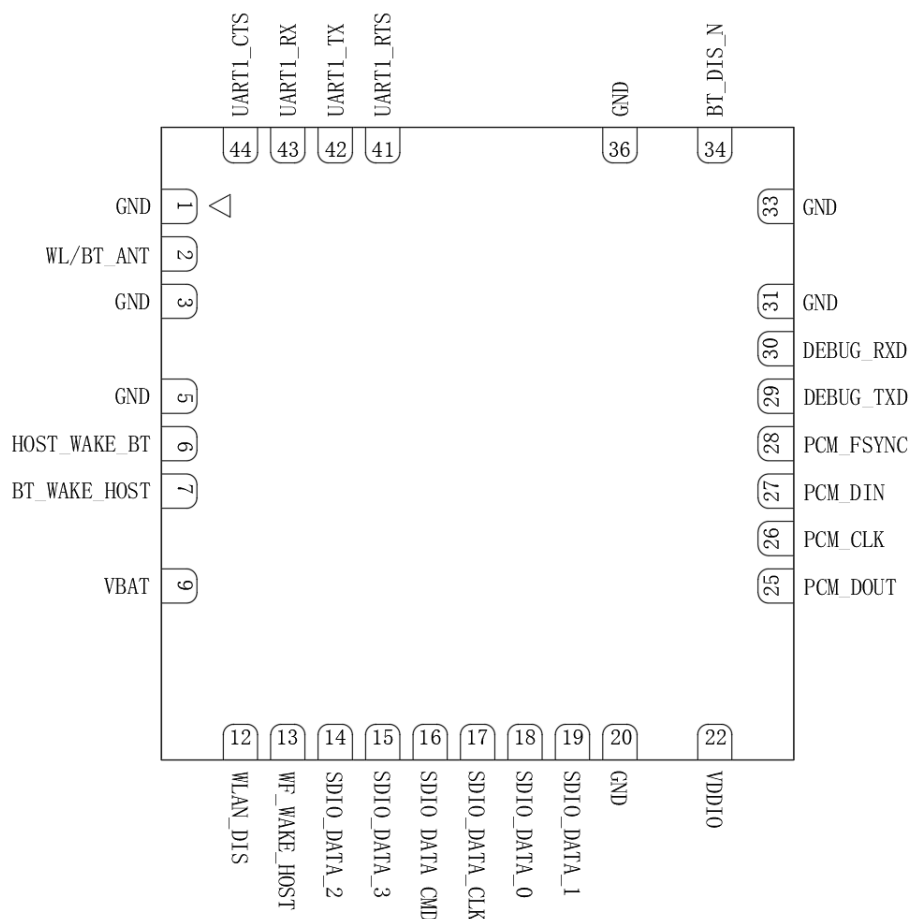
802.11n(40MHz)	MCS 0 NSS1	-82
	MCS 7 NSS1	-64
802.11ac(20MHz)	MCS 0 NSS1	-85
	MCS 9 NSS1	-60
802.11ac(40MHz)	MCS 0 NSS1	-82
	MCS 9 NSS1	-57
802.11ac(80MHz)	MCS 0 NSS1	-79
	MCS 9 NSS1	-54
802.11ax(20MHz)	MCS 0 NSS1	-85
	MCS 11 NSS1	-55
802.11ax(40MHz)	MCS 0 NSS1	-82
	MCS 11 NSS1	-52
802.11ax(80MHz)	MCS 0 NSS1	-79
	MCS 11 NSS1	-49

2.2 BT RF Specification

Feature	Description		
Operating Frequency	2.402~2.480GHz		
Number of Channels	79 channels		
Standards	Bluetooth V5.4		
Modulation	8DPSK, $\pi/4$ DQPSK, GFSK		
PHY Data rates	Supports 2Mbps Bluetooth Low Energy(BLE),BLELong Range		
Output Power	Min(dBm)	Typical(dBm)	Max(dBm)
	8	9.5	11
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-96	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-93	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-90	

3.Pin Assignments

3.1 Pin Outline



3.2 Pin Definition

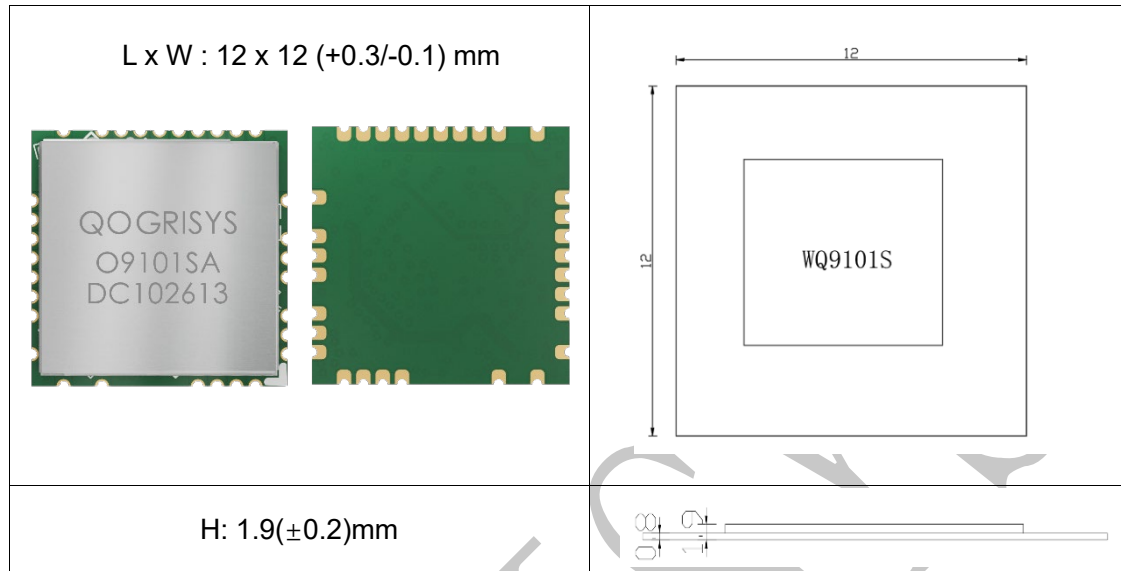
PIN	Name	Type	Description	Voltage
1	GND	-	Ground connections	
2	WL/BT_ANT	I/O	WLAN and BT RF I/O port	
3	GND	-	Ground connections	
5	GND	-	Ground connections	
6	HOST_WAKE_BT	I	GPIOB3/HOST_WAKE_BT	
7	BT_WAKE_HOST	O	GPIOB3/HOST_WAKE_BT	
9	VBAT	I/PU	Main power voltage source input	3.3V

12	WLAN_DIS	P	Enable pin for WLAN Radio ON: pull high; OFF: pull low External pull low to disable WLAN Radio	VDDIO
13	WF Wake Up Host		WF Wake Up Host	VDDIO
14	SD_D2		SDIO data line 2	VDDIO
15	SD_D3		SDIO data line 3	VDDIO
16	SD_CMD		SDIO command line	VDDIO
17	SD_CLK		SDIO clock line	VDDIO
18	SD_D0		SDIO data line 0	VDDIO
19	SD_D1		SDIO data line 1	VDDIO
20	GND	-	Ground connections	
22	VDDIO		I/O Voltage	1.8 or 3.3V
25	PCM_DOUT		PCM Data output	VDDIO
26	PCM_CLK		PCM clock	VDDIO
27	PCM_DIN		PCM data input	VDDIO
28	PCM_SYNC		PCM sync signal	VDDIO
29	DEBUG_TXD		Debug UART TXD don't connect to ground	VDDIO
30	DEBUG_RXD		Debug UART RXD don't connect to ground	VDDIO
31	GND	-	Ground connections	
33	GND	-	Ground connections	
34	BT_DIS_N	I/PU	Enable pin for Bluetooth device ON: pull high; OFF: pull low External pull low to shut down BT, recommended 10K pull high.	VDDIO
36	GND	-	Ground connections	
41	UART1_RTS		BT_UART1_RTS	VDDIO
42	UART1_TX		BT_UART1_TX	VDDIO
43	UART1_RX		BT_UART1_RX	VDDIO
44	UART1_CTS		BT_UART1_CTS	VDDIO

4. Dimensions

4.1 Physical Dimensions and Module Photo

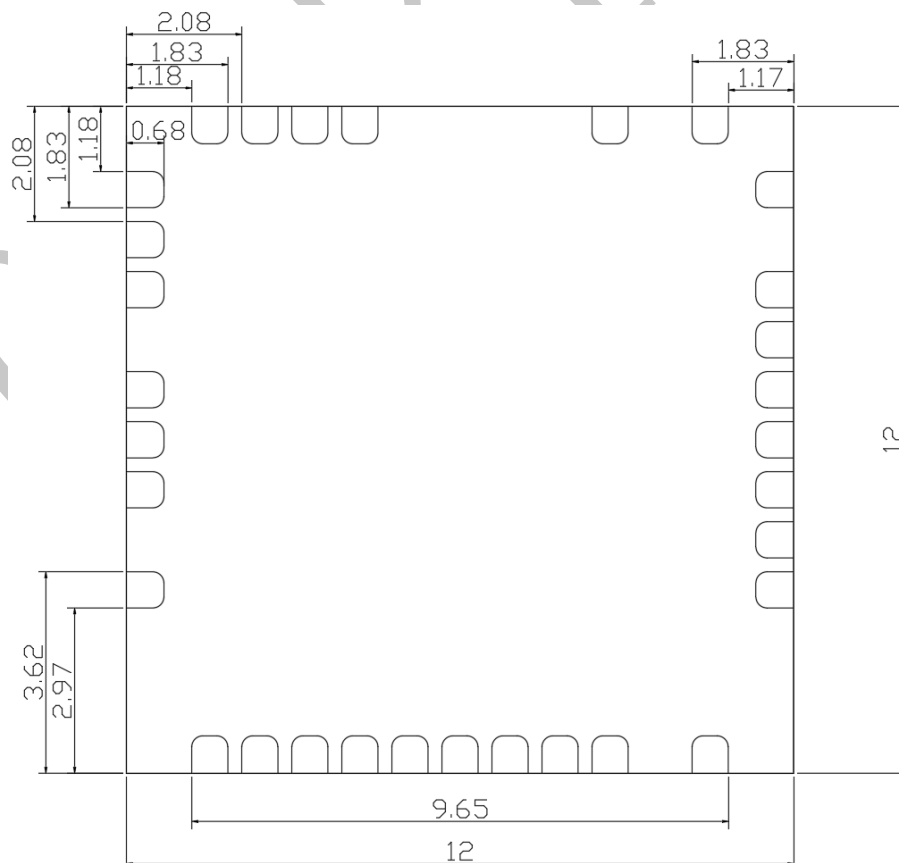
(Unit: mm)



4.2 Module Physical Dimensions

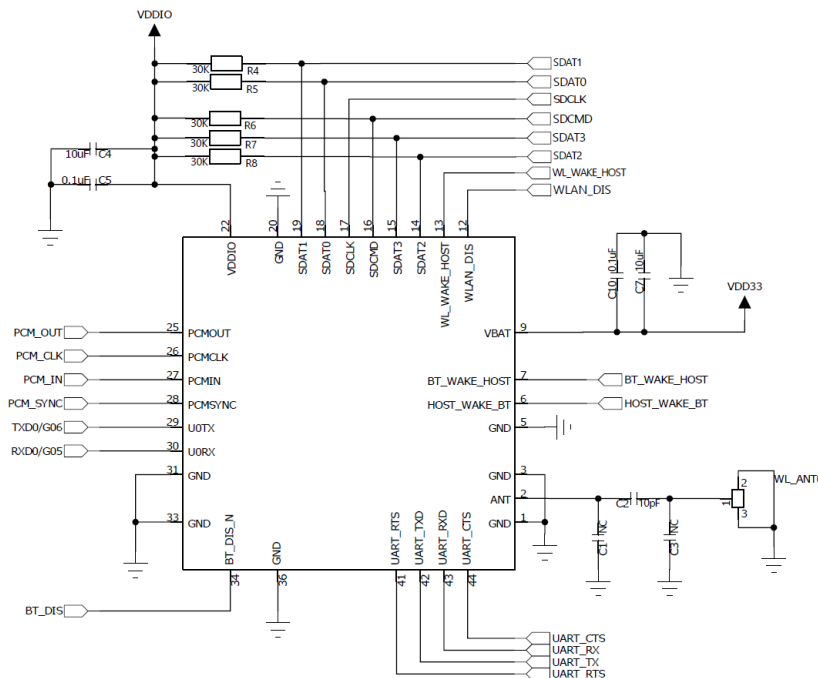
(Unit: mm)

< TOP VIEW >



5 Reference Design

5.1 Reference schematic



5.2 External Antenna

When the customer selects an external antenna, the external antenna selected must meet the parameter requirements specified, Impedance 50Ω

5.3 Real-world Testing

2.4G Real-world Testing					
Protocol Standard		channel	Power (dBm)	EVM(dB)	Rx Sensitivity (dBm)
802.11g(54Mbps)	ANT1	2412	15.3	-37.8	-76
		2437	15.7	-38.5	-76
		2472	15.7	-39.9	-76
802.11ax(HE20_MCS11)	ANT1	2412	13.2	-40.9	-65
		2437	13.6	-41.2	-65
		2472	13.6	-41.9	-65
802.11ax(HE40_MCS11)	ANT1	2422	13.5	-39.5	-62
		2462	13.0	-40.9	-62
5G Real-world Testing					
Protocol Standard		channel	Power (dBm)	EVM(dB)	Rx Sensitivity (dBm)
802.11a(54Mbps)	ANT1	5180	14.3	-38.9	-76
		5600	14.8	-35.9	-76
		5825	14.8	-36.0	-76

802.11ax(HE20_MCS11)	ANT1	5180	12.2	-40.0	-64
		5500	12.6	-39.3	-64
		5825	12.7	-40.9	-64
802.11ax(HE80_MCS11)	ANT1	5210	11.1	-38.7	-58
		5690	11.2	-38.1	-58
		5775	11.0	-38.1	-58

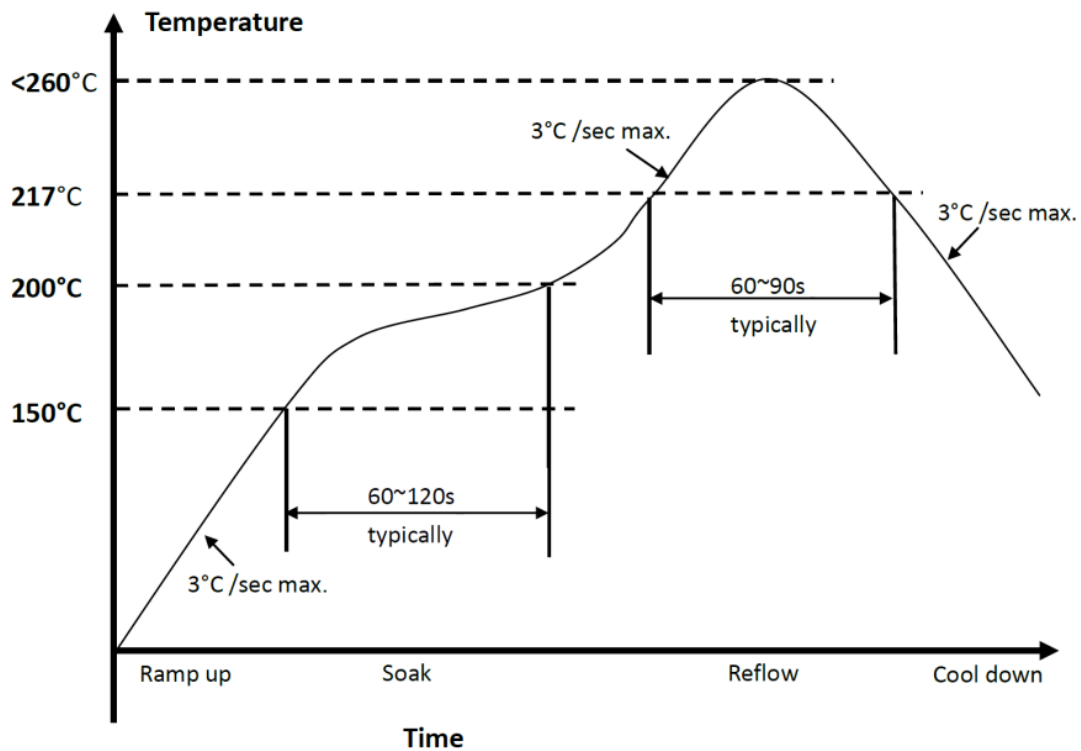
Description: The test environment is: temperature 25 °C humidity 60%

6 Recommended Reflow Profile

Referred to IPC/JEDEC standard.

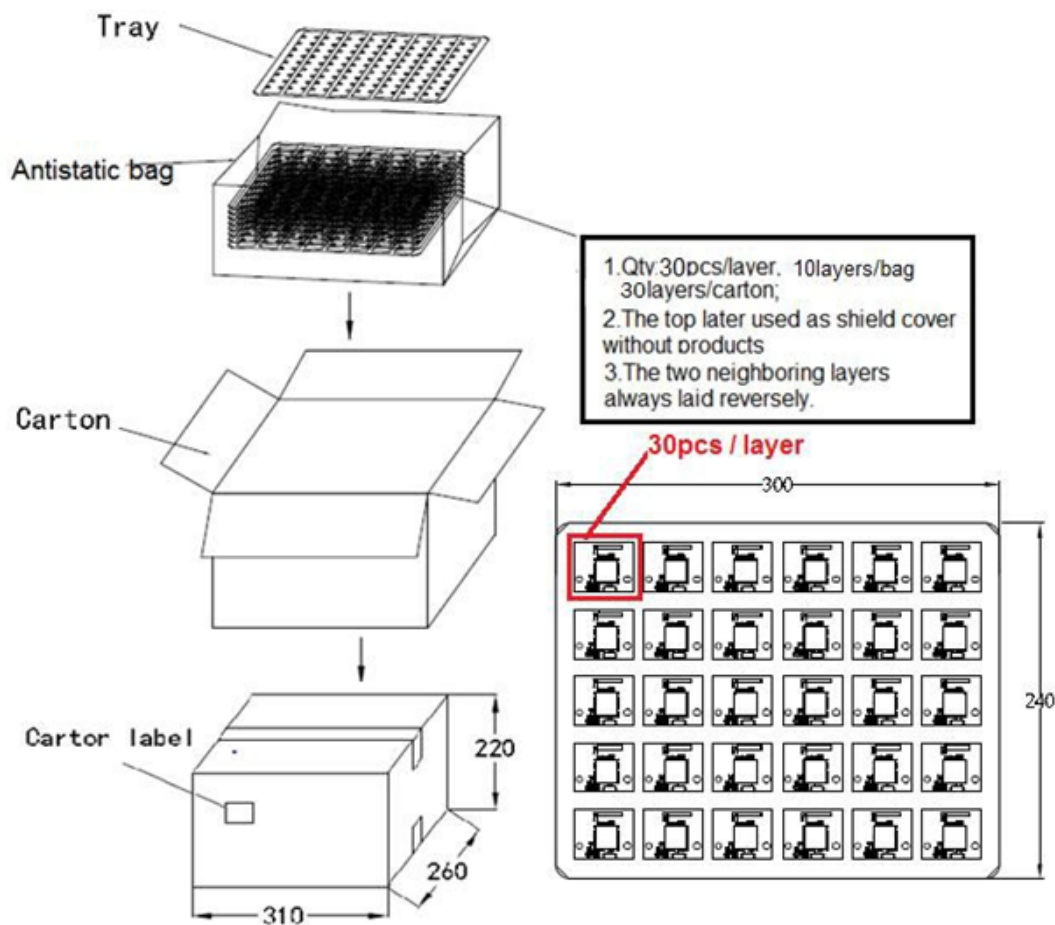
Peak Temperature : <260°C

Number of Times : 2 times max



7 Package

7.1 Reel



7.2 Storage Temperature And Humidity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- Calculated shelf life in sealed bag: 12 months at $<40^{\circ}\text{C}$ and $<90\%$ relative humidity (RH).
- Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5.
- The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition.
- "IPC/JEDEC J-STD-033A paragraph 5.2" is respected.
- Baking is required if conditions b) or c) are not respected.
- Baking is required if the humidity indicator inside the bag indicates 10% RH or more.

THE END