

# CDW-B1AI880-10

## Dual band WiFi6+BT5.0 Module Spec

### Software:

客 户 Customer	客户承认 Approve (请盖印章)	日 期 Date

拟制 Design	审核 Check	批准 Approve	版本 Version	日期 Date
			V1.0	2021.09.11

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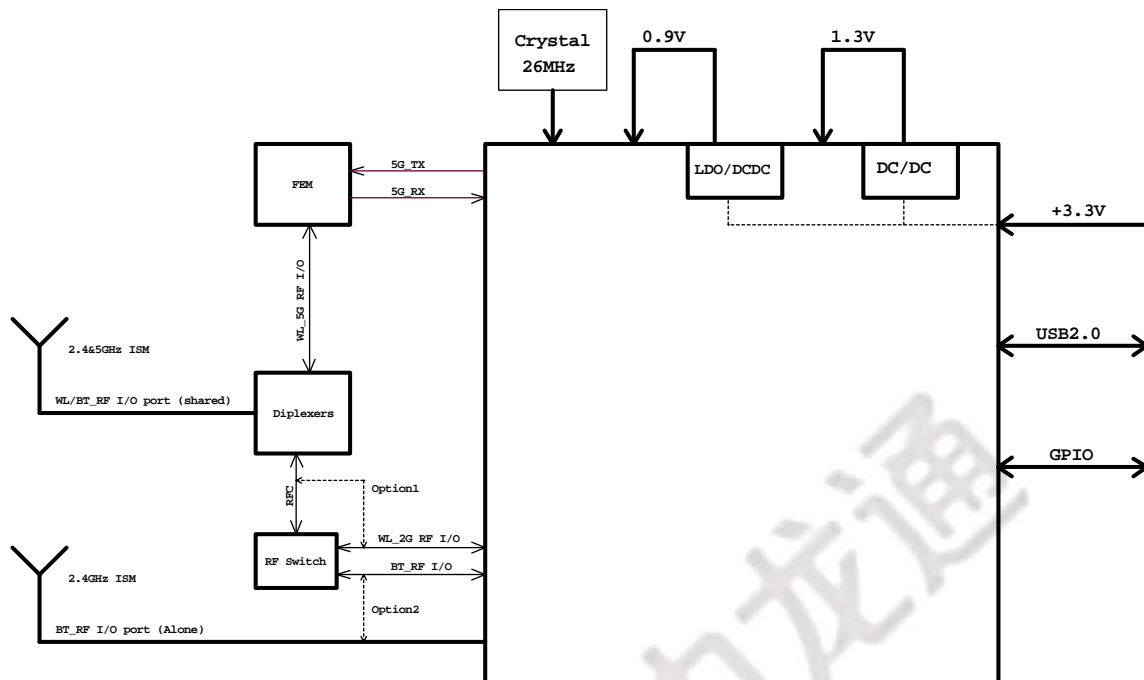
## 1. Overview

The B1AI880-10 is a single-die wireless local area network (WLAN) and Bluetooth (BT) combination solution to support 1 × 1 IEEE 802.11b/g/n/ax WLAN standards and BT 5.0 enabling seamless integration of WLAN/BT and low-energy technology.

## 2. Features

- Baseband PHY and RF in a single chip for IEEE 802.11a/b/g/n/ac/ax compatible WLAN
- Provides a highly integrated WLAN system-on-chip (SoC) for 2.4 GHz/5 GHz 802.11 ax
- Support 802.11ax
- Support WLAN 2.4GHz and 5GHz band channels
- Supports a single-ended RF port for cleaner and lower cost design
- Supports 20 MHz/40 MHz at 2.4 and 5 GHz
- Supports BT 5.0 + HS, BLE, and ANT+ and backward compatibility with BT 1.x and BT 2.x + Enhanced Data Rate

### 3. Block Diagram



### 4. General Specification

Model	CDW-B1AI880-10
Product Name	Dual band 1T1R WiFi6 + Bluetooth 5.0 module
Major Chipset	AIC8800D
Standard	802.11a/b/g/n/ac/ax
Modulation Method	BPSK/ QPSK/ 16-QAM/ 64-QAM/256-QAM/1024-QAM
Frequency Band	Dual band 2.4&5GHz ISM
WiFi Interface	USB2.0
BT Interface	USB2.0
Operating Temperature	-20° C ~ 70° C
Storage Temperature	-20° C ~ 125°C
Humidity	5% to 90% maximum
Dimension	13x12.2x1.8 (LxWxH) ±0.2mm

## 5. RF Specification

### A. 2.4GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11b/g/n WiFi compliant
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz : Ch1 ~ Ch14
Modulation	802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11 ax : OFDM /1024-QAM, 256-QAM, 64-QAM, 16-QAM, QPSK, BPSK
Output Power	802.11b / 1Mbps : 17dBm $\pm$ 2 dB @ EVM $\leq$ -10dB 802.11b /11Mbps : 17dBm $\pm$ 2 dB @ EVM $\leq$ -15dB
	802.11g / 6Mbps : 17dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11g /54Mbps : 14 dBm $\pm$ 2 dB @ EVM $\leq$ -28dB
	802.11n /MCS0(20/40M) : 17 dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11n /MCS7(20/40M) : 14 dBm $\pm$ 2 dB @ EVM $\leq$ -30dB
	802.11ax /HE0(20/40M) : 17 dBm $\pm$ 2 dB @ EVM $\leq$ -5dB 802.11ax /HE11(20/40M) : 13 dBm $\pm$ 2 dB @ EVM $\leq$ -34dB
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -93 dBm, typical
	- 2Mbps PER @ -90 dBm, typical
	- 5.5Mbps PER @ -88 dBm, typical
	- 11Mbps PER @ -86 dBm, typical
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -91 dBm, typical
	- 9Mbps PER @ -89 dBm, typical
	- 12Mbps PER @ -86 dBm, typical
	- 18Mbps PER @ -83 dBm, typical
	- 24Mbps PER @ -80 dBm, typical
	- 36Mbps PER @ -77 dBm, typical
	- 48Mbps PER @ -74 dBm, typical
- 54Mbps PER @ -72 dBm, typical	
Receive	- MCS=0 PER @ -90 dBm, typical
	- MCS=1 PER @ -87 dBm, typical
	- MCS=2 PER @ -84 dBm, typical
	- MCS=3 PER @ -81 dBm, typical

Sensitivity (11n,20MHz) @10% PER	- MCS=4 PER @ -78 dBm, typical
	- MCS=5 PER @ -75 dBm, typical
	- MCS=6 PER @ -72 dBm, typical
	- MCS=7 PER @ -70 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -87 dBm, typical
	- MCS=1 PER @ -84 dBm, typical
	- MCS=2 PER @ -81 dBm, typical
	- MCS=3 PER @ -78 dBm, typical
	- MCS=4 PER @ -75 dBm, typical
	- MCS=5 PER @ -72 dBm, typical
	- MCS=6 PER @ -69 dBm, typical
	- MCS=7 PER @ -67 dBm, typical
Receive Sensitivity (11ax,20MHz) @10% PER	- HE=0 PER @ -90 dBm, typical
	- HE=1 PER @ -88 dBm, typical
	- HE=2 PER @ -86 dBm, typical
	- HE=3 PER @ -84 dBm, typical
	- HE=4 PER @ -81 dBm, typical
	- HE=5 PER @ -79 dBm, typical
	- HE=6 PER @ -76 dBm, typical
	- HE=7 PER @ -73 dBm, typical
	- HE=8 PER @ -70 dBm, typical
	- HE=9 PER @ -68 dBm, typical
Receive Sensitivity (11ax,40MHz) @10% PER	- HE=0 PER @ -88 dBm, typical
	- HE=1 PER @ -86 dBm, typical
	- HE=2 PER @ -83 dBm, typical
	- HE=3 PER @ -80 dBm, typical
	- HE=4 PER @ -77 dBm, typical
	- HE=5 PER @ -74 dBm, typical
	- HE=6 PER @ -72 dBm, typical
	- HE=7 PER @ -69 dBm, typical
	- HE=8 PER @ -66 dBm, typical
- HE=9 PER @ -64 dBm, typical	
Maximum Input Level	802.11b : -10 dBm
	802.11g/n/ax : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

## B. 5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac/ax WiFi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz : CH36~CH64, CH100~CH144, CH149~CH'65
Modulation	802.11a : OFDM /64-QAM, 16-QAM, QPSK, BPSK 802.11n : OFDM /64-QAM, 16-QAM, QPSK, BPSK 802.11ac/ax : OFDM /1024-QAM , 256-QAM
Output Power	802.11a / 6Mbps : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11a /54Mbps : 13 dBm ± 2 dB @ EVM ≤ -25dB
	802.11n HT20 /MCS0 : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11n HT20 /MCS7 : 13 dBm ± 2 dB @ EVM ≤ -28dB
	802.11n HT40 /MCS0 : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11n HT40 /MCS7 : 13dBm ± 2 dB @ EVM ≤ -28dB
	802.11ac VHT20 /MCS0 : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11ac VHT20 /MCS8 : 13 dBm ± 2 dB @ EVM ≤ -30dB
	802.11ac VHT40 /MCS0 : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11ac VHT40 /MCS9 : 13 dBm ± 2 dB @ EVM ≤ -32dB
	802.11ax HE0(20M) : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11ax HE11(20M) : 12 dBm ± 2 dB @ EVM ≤ -34dB
	802.11ax HE0(40M) : 17 dBm ± 2 dB @ EVM ≤ -5dB 802.11ax HE11(40M) : 12 dBm ± 2 dB @ EVM ≤ -34dB
Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -93dBm, typical
	- 9Mbps PER @ -90 dBm, typical
	- 12Mbps PER @ -87 dBm, typical
	- 18Mbps PER @ -84 dBm, typical
	- 24Mbps PER @ -81 dBm, typical
	- 36Mbps PER @ -78 dBm, typical
	- 48Mbps PER @ -76 dBm, typical
- 54Mbps PER @ -74 dBm, typical	
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -92 dBm, typical
	- MCS=1 PER @ -89 dBm, typical
	- MCS=2 PER @ -86 dBm, typical
	- MCS=3 PER @ -83 dBm, typical
	- MCS=4 PER @ -80 dBm, typical
	- MCS=5 PER @ -77 dBm, typical
	- MCS=6 PER @ -74 dBm, typical
- MCS=7 PER @ -72 dBm, typical	

Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -90 dBm, typical
	- MCS=1 PER @ -87 dBm, typical
	- MCS=2 PER @ -84 dBm, typical
	- MCS=3 PER @ -81 dBm, typical
	- MCS=4 PER @ -78 dBm, typical
	- MCS=5 PER @ -75 dBm, typical
	- MCS=6 PER @ -72 dBm, typical
	- MCS=7 PER @ -70 dBm, typical
Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0, NSS1 PER @ -91 dBm, typical
	- MCS=1, NSS1 PER @ -88 dBm, typical
	- MCS=2, NSS1 PER @ -85 dBm, typical
	- MCS=3, NSS1 PER @ -82 dBm, typical
	- MCS=4, NSS1 PER @ -79 dBm, typical
	- MCS=5, NSS1 PER @ -76dBm, typical
	- MCS=6, NSS1 PER @ -73 dBm, typical
	- MCS=7, NSS1 PER @ -70 dBm, typical
	- MCS=8, NSS1 PER @ -68 dBm, typical
Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0, NSS1 PER @ -89 dBm, typical
	- MCS=1, NSS1 PER @ -86 dBm, typical
	- MCS=2, NSS1 PER @ -83 dBm, typical
	- MCS=3, NSS1 PER @ -80 dBm, typical
	- MCS=4, NSS1 PER @ -77 dBm, typical
	- MCS=5, NSS1 PER @ -74 dBm, typical
	- MCS=6, NSS1 PER @ -71 dBm, typical
	- MCS=7, NSS1 PER @ -68 dBm, typical
	- MCS=8, NSS1 PER @ -65 dBm, typical
	- MCS=9, NSS1 PER @ -63 dBm, typical
Receive Sensitivity (11ax,20MHz) @10% PER	- HE=0 PER @ -89 dBm, typical
	- HE=1 PER @ -86 dBm, typical
	- HE=2 PER @ -83 dBm, typical
	- HE=3 PER @ -80 dBm, typical
	- HE=4 PER @ -77 dBm, typical
	- HE=5 PER @ -74 dBm, typical
	- HE=6 PER @ -71 dBm, typical
	- HE=7 PER @ -68 dBm, typical
	- HE=8 PER @ -65 dBm, typical

	- HE=9 PER @ -63 dBm, typical
Receive Sensitivity (11ax,40MHz) @10% PER	- HE=0 PER @ -87 dBm, typical
	- HE=1 PER @ -84 dBm, typical
	- HE=2 PER @ -81 dBm, typical
	- HE=3 PER @ -78 dBm, typical
	- HE=4 PER @ -75 dBm, typical
	- HE=5 PER @ -72 dBm, typical
	- HE=6 PER @ -69 dBm, typical
	- HE=7 PER @ -66 dBm, typical
	- HE=8 PER @ -63 dBm, typical
	- HE=9 PER @ -61 dBm, typical
Maximum Input Level	802.11a/n/ac/ax : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

### C. Bluetooth Section:

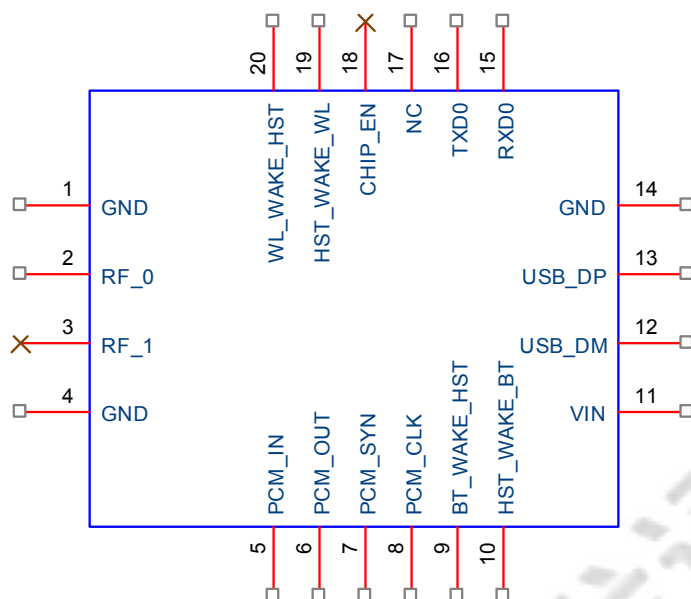
Feature	Description
<b>General Specification</b>	
Bluetooth Standard	Bluetooth V5.0 of 1, 2 and 3 Mbps.
Host Interface	UART
Antenna Reference	Small antennas with 0~2 dBi peak gain
Frequency Band	2402 MHz ~ 2480 MHz
Number of Channels	BR/EDR :79 channels;BLE:40 channels
Modulation	FHSS, GFSK, DPSK, DQPSK
RF Specification	
Output Power, tolerance $\pm 2$ dBm	
BDR Output Power	7 dBm
EDR Output Power	5 dBm
BLE Output Power	4 dBm

Sensitivity, tolerance $\pm 2$ dBm	
Sensitivity @ BER=0.1% for GFSK(1Mbps)	-88 dBm
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK(2Mbps)	-91 dBm
Sensitivity @ BER=0.01% for 8DPSK(3Mbps)	-85 dBm
Sensitivity @ BLE=30.8% for LE(1Mbps)	-90 dBm
Sensitivity @ BLE=30.8% for LE(2Mbps)	-91 dBm
Maximum Input Level	GFSK(1Mbps): -20 dBm
	$\pi/4$ -DQPSK(2Mbps): -20 dBm
	8DPSK(3Mbps): -20 dBm

## 6. Recommended Operating Rating

symbol	Parameter	Minimum	Typical	Maximum	Units
VDD	3.3V supply voltage	3.0	3.3	3.6	V
VDDIO	I/O supply voltage	1.7	1.8	1.9	V
Current	3.3V rating current	--	--	1000	mA

## 7. Pin Description

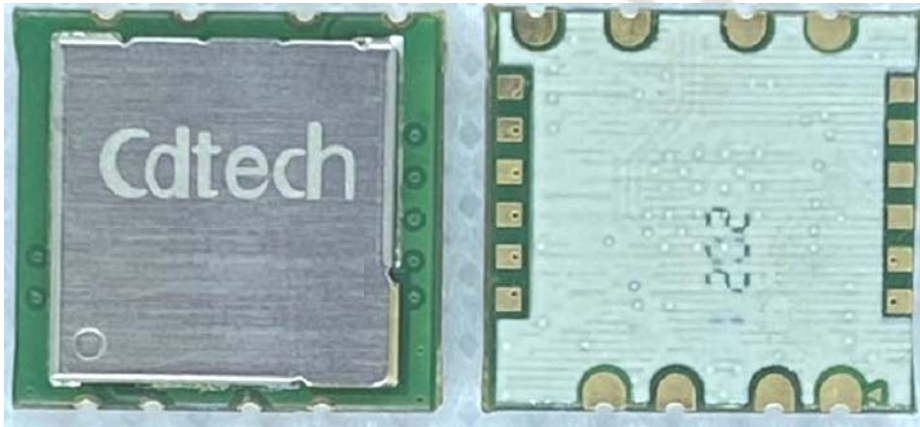


NO.	Name	Type	Description
1	GND	—	Ground connections
2	RF_0	I/O	WLAN/BT RF I/O port (2.4G and 5G)
3	RF_1	—	BT_RF I/O port(Reserved)
4	GND	—	Ground connections
5	PCM_IN	—	No connect
6	PCM_OUT	—	No connect
7	PCM_SYN	—	No connect
8	PCM_CLK	—	No connect
9	BT_WAKE_HOST	O	BT wake up host(GPIOB3)
10	HOST_WAKE_BT	I	Host wake up BT(GPIOB5)
11	VDD33	P	3.3V POWER INPUT
12	USB_DM	I/O	USB DATA DM
13	USB_DP	I/O	USB DATA DP
14	GND	—	Ground connections
15	RXD0	—	keep floating(for debug RXD0)
16	TXD0	—	keep floating(for debug TXD0)
17	NC	—	No connect
18	CHIP_EN	I	Chip enable, Don't use, Please keep floating
19	HOST_WAKE_WL	I	HOST wake up WL device(GPIOB4)
20	WL_WAKE_HOST	O	WL device to wake Host(GPIOB2)

## 8. Suplier

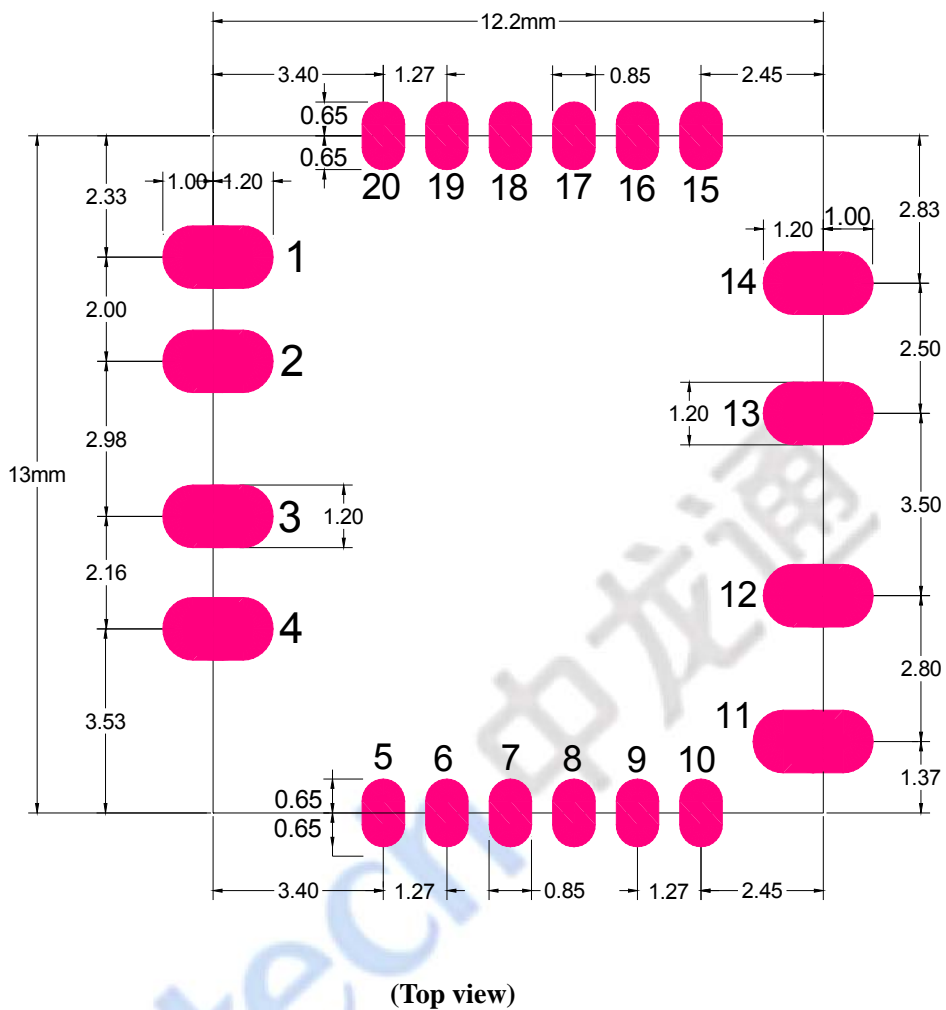
Supplier list	
Name of material	Material brand
Crystal	JWT/FK/TKD/Murata/TXC
Duplexer	ACX/GLEAD/Sunlord/Walsin
Inductor	Sunlord/ CHILISIN/ SAMWHA/Murata
Wifi chip	AIC
RF FEM	CB/GSR
RF Switch	Richwave/RDA/QWAVE/Maxscend
Capacitance	SAMSUNG /EYANG/Murata
Resistance	UniOhm /YAGEO
PCB(13x12.2x0.8mm)	A,O,I,F

## 9. Physical photo



说明：PCB 不同供应商，底部丝印有微小差异

## 10. Layout Recommendation



## 11. Baking & storage temperature & Recommended Reflow Profile

(烘烤, 储存温度和推荐炉温)

### 11.1 Baking & storage temperature

A. Storage life: 12 months. Storage conditions:  $<40^{\circ}\text{C}$ . Relative humidity:  $<90\%\text{R.H.}$

(保存期限: 12个月, 储存环境条件: 温度在:  $<40^{\circ}\text{C}$ , 相对湿度:  $<90\%\text{R.H.}$ )

B. After this bag is opened, devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be. (模块包装被拆后, SMT 组装之时限)

a. Check the humidity card :stored at  $\cong 20\%\text{RH}$ . If :30%~40%(pink) or greater than 40%(red). Labeling module has moisture absorption. (检查湿度卡: 显示值应小于30% (蓝色), 如: 30%~40%(粉红色) 或者大于40% (红色) 表示模块已吸湿气.)

b. Mounted within 168 hours at factory conditions of:  $t \cong 30^{\circ}\text{C}$ ,  $\cong 60\%\text{R.H.}$

(工厂环境温度湿度管制:  $\cong 30^{\circ}\text{C}$ ,  $\cong 60\%\text{R.H.}$ , 168小时内.)

c. Once opened, the workshop the preservation of life for 168 hours.

(拆封后, 车间的保存寿命为168小时.)

C. Module apart packing after 168 hours, If baking is required, devices may be baked for.

(如在拆封后的168个小时内未使用完, 需要烘烤, 烘烤条件如下: )

a. Modules must be to remove module moisture problem. (模块须重新烘烤, 以除去模块吸湿问题.)

b. Baking temperature:  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 120 hours. (烘烤温度条件:  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 120小时.)

c. After baking, put proper amount of desiccant to seal packages.

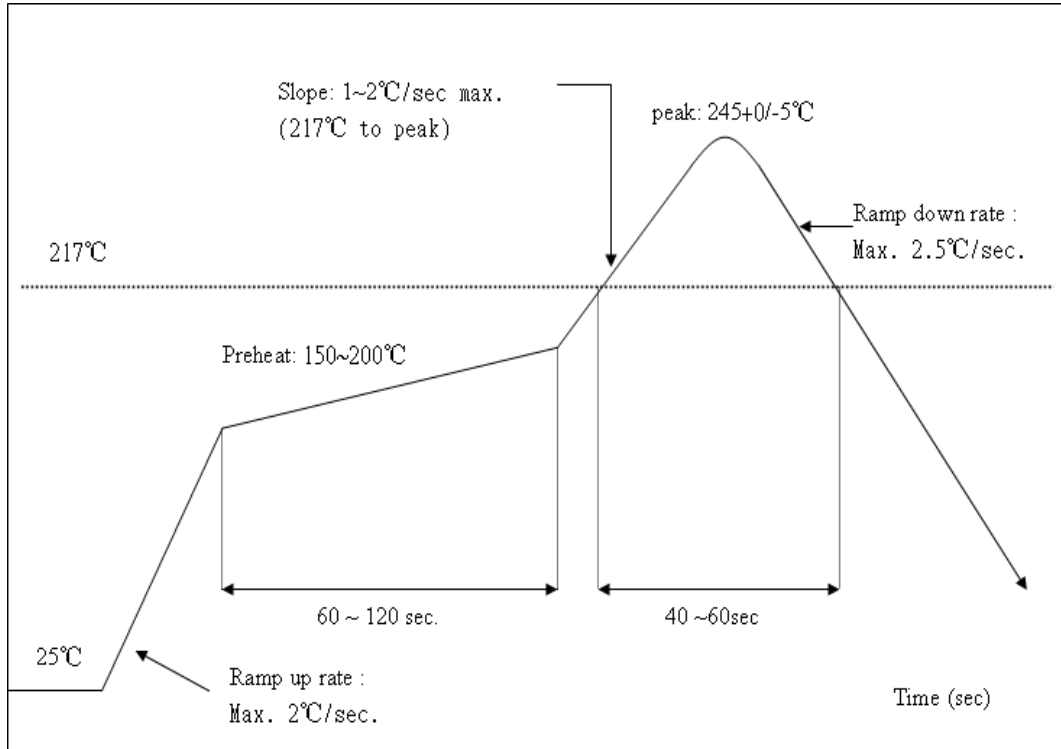
(烘烤后, 放入适量的干燥剂再密封包装)

## 11.2 Recommended Reflow Profile

Referred IPC/JEDEC standard.

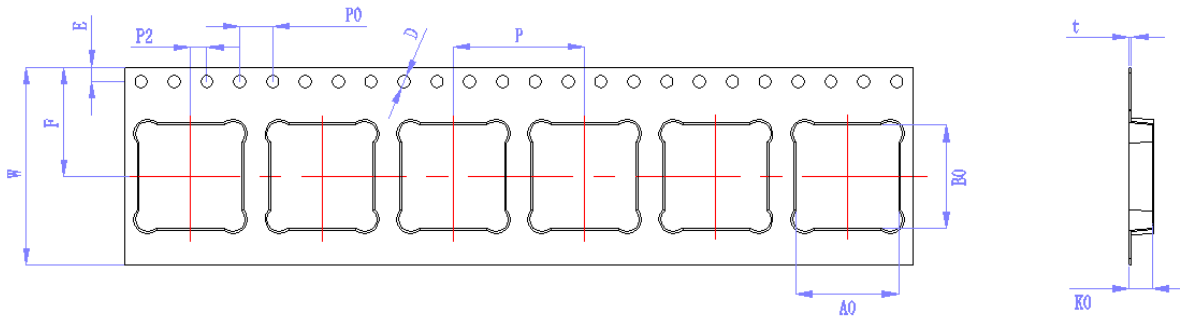
Peak Temperature : <250°C

Number of Times : 2 times



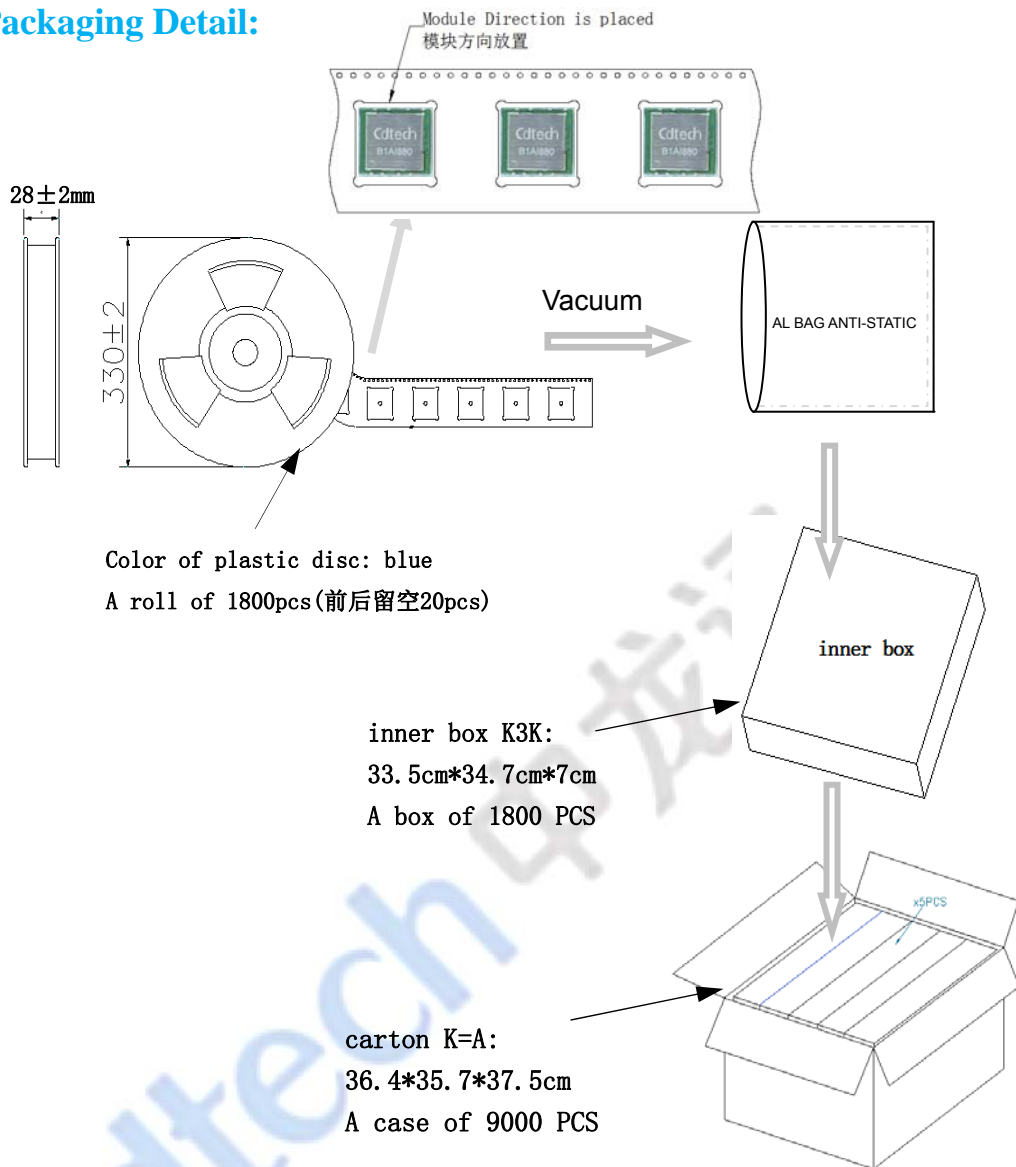
## 12. Packing information

### 12.1 Carrier size Detail:



ITEM	W	A0	B0	K0	P	F	E	D	P0	P2	T
DIM	24	12.5	12.5	2.8	16	13.25	1.75	1.50	4	2	0.3
TOLE	$\frac{+0.30}{-0.30}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.10}{-0.10}$	$\frac{+0.05}{-0.05}$

**12.2 Packaging Detail:**



**ESD CAUTION**

The B1AI880-10 module is ESD (electrostatic discharge) sensitive device and may be damaged with ESD or spike voltage. Although B1AI880-10 module is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.