K181-HI38-SW

IEEE802.11b/g/n Wireless LAN

Combo Stamp Module

DATASHEET

REV: 1.2

DATA: 08.09.2022

Revision History

Date	Revision Content	Revised By	Version
2022/05/21	- Preliminary	Zhong	1.0
2022/06/06	- Pin Definition Modified	Liu	1.1
2022/08/19	- Test Report Modified	Shawn	1.2

Contents

1. Introduction

1.1 About KERTONG

KERTONG Technologies Inc was established in Shenzhen in 2008. It is located in Baoan, Shenzhen. It is a high-tech enterprise specializing in the radio - related radio frequency series module application and the integrated solution platform of the products. At present, the product lines are: wireless network WIFI access module, wireless routing application module, wireless Bluetooth module, wireless Bluetooth box module, NFC communication module, GPS navigation module, Zigbee control module, wireless communication module and so on, as well as related module application solutions. The company has a complete set of 60 radio frequency integrated testers, 10 communication integrated testers, with a variety of wireless testing standards.

1.2 Product Overview

KERTONG Technologies to announce a low-cost and low-power consumption the combo module of K181-HI38-SW model which has all of the WiFi(IEEE802.11b/g/n), functionalities. And the highly integrated module makes the possibilities of web browsing Mini audio; Wireless projector applications. With seamless roaming capabilities and advanced security, also could interact with different vendors' 802.11b/g/n Access Points in the wireless LAN.

This K181-HI38-SW module using the chipset from Hisilicon's the HI3861L is advanced design techniques and process technology to reduce active and idle power, and designed to address the needs of highly mobile devices that require minimal power consumption and compact size. It includes a power management unit that simplifies the system power topology and allows for operation directly from a rechargeable mobile platform battery while maximizing battery life.

The K181-HI38-SW module complies with IEEE 802.11 b/g/n standard and it can achieve up to a speed of 72.2Mbps with single stream in 802.11n draft, 54Mbps as specified in IEEE802.11g or 11Mbps for IEEE 802.11b to connect to the wireless LAN. The integrated module provides SDIO interface for WiFi and stand alone of SOC, also support the UART(3unit) / I2C / SPI /PWM /ADC input interface .

2. Features

- IEEE802.11b/g/n single-band radio
- MAC supporting IEEE802.11 d/e/h/i/k/v/w
- ANT Support :1T1R,Maximum rate of 72.2 Mbit/s@HT20 MCS7
- Integrates a High-performance 32-bit RISC microprocessor with a maximum operating frequency of 160 MHz for IOT applicable.
- Built-in 2.4G WLAN RF PA and LNA, integrated with TX/RX switch and balu
- Module Built-in 352 KB SRAM and 288 KB ROM, module built-in 2 MB flash memo
- Main Input voltage range : DC 2.3~3.6V（Default: 3.3V）; I/O Supply voltage : 1.8 V or 3.3
- Low power consumption:

  Ultra deep sleep mode: 5 μA@3.3 V

  Delivery traffic indication map 1 (DTIM1): 0.9 mA@3.3 V

  DTIM3: 0.4 mA@3.3 V

  DTIM10: 250 μA@3.3 V
- SZIE 12mm * 12mm * 1.5mm (L*W*H) LGA package

2.1 WLAN

- IEEE 802.11b/g/n single-band radio with an internal power amplifier, LNA, and T/R switch
- WLAN host interface options:

  ❒ SDIO

  ❒ gSPI
- Security:

  ❒ WEP

  ❒ WPA™ Personal

  ❒ WPA2™ Personal

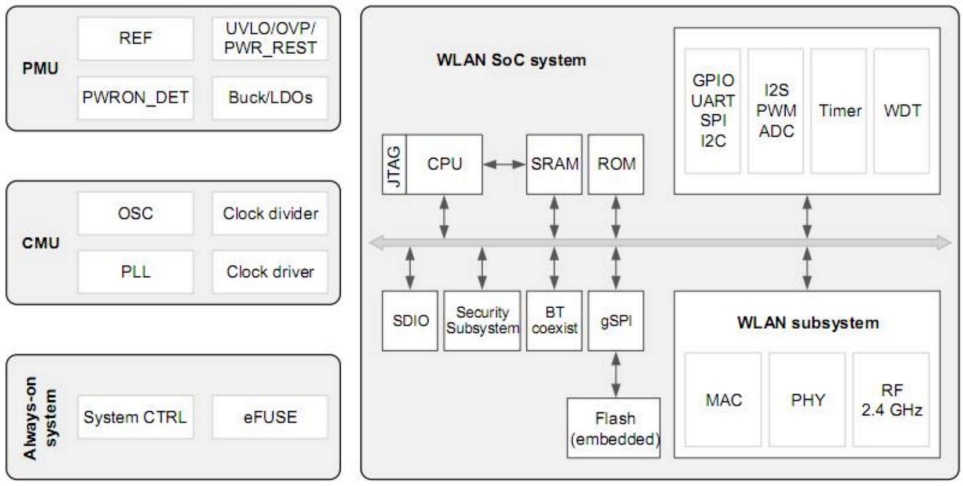
  ❒ WMM

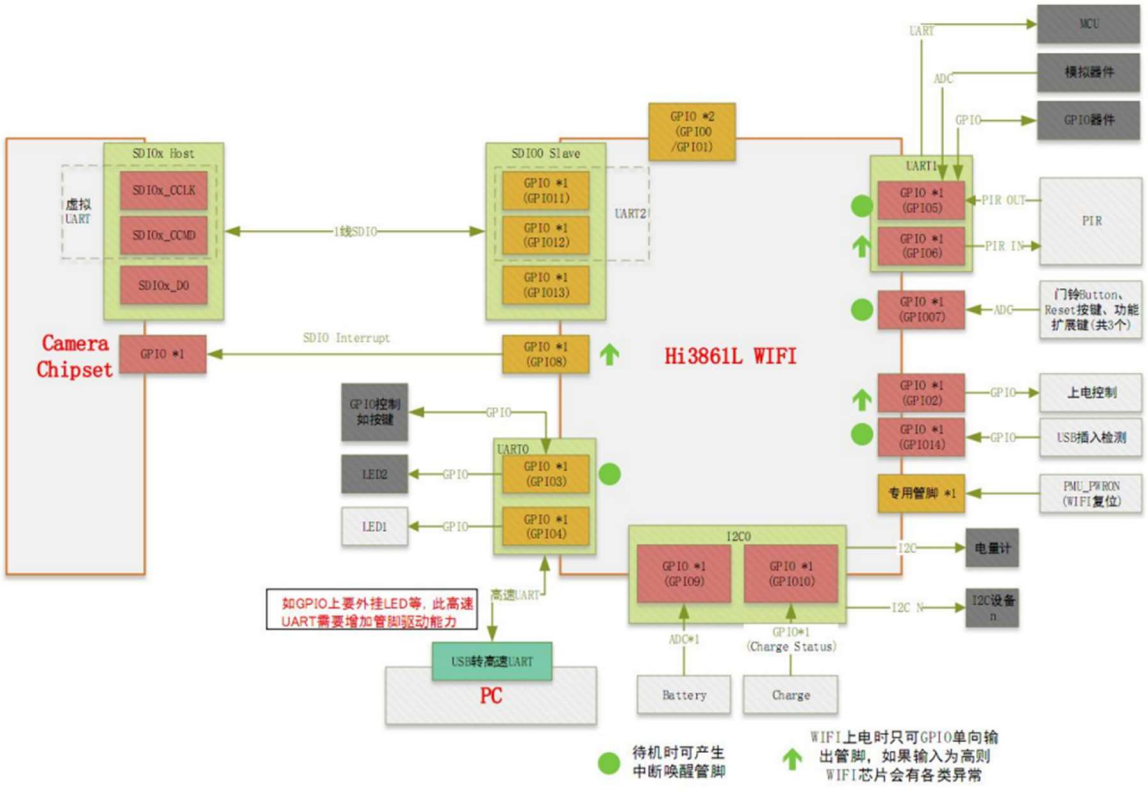
  ❒ WMM-PS (U-APSD)

- ❒ WMM-SA
- ❒ WAPI
- ❒ AES (Hardware Accelerator)
- ❒ TKIP (host-computed)
- ❒ WIFI Mode (apsta; ap ; p2p)

2.2 Block Diagram

A simplified block diagram of the K181-HI38-SW module is depicted in the figure below:





3. Specification Table

3.1 General Specification

Major Chipset	Hisilicon HI3861L
Model Name	K181-HI38-SW
Product Description	Support WiFi/Bluetooth functionalities
Dimension	L x W x H: 12 x 12 x 1.5mm
WiFi Host Interface	SDIO ; SPI
BT Interface	NC
Operating	-30°C to 85°C
Storage temperature	-40°C to 85°C
Humidity	Operating Humidity 10% to 95% Non-Condensing

3.2 Voltages (Absolute Maximum Ratings)

Symbol	Description	Min.	Max.	Unit
VBAT	Input supply Voltage	2.3	3.6	V
WL_VIO_SD	Digital /SDIO/ I/O Voltage	1.7	3.3	V

※NOTE: Max VBAT=3.6V

Current Consumption

Conditions: VDD=3.3V ; Ta:30℃	
User Case	VDD Current (3.3V)
Ultra deep sleep mod	5uA
DTIM1 (Delivery traffic indication	0.9mA
DTIM3	0.4mA
DTIM10	248uA
TX (11b 11Mbps RF test 18dbm)	290mA
RX (11b 11Mbps RF t	45mA

3.3 2.4GHz RF Specification

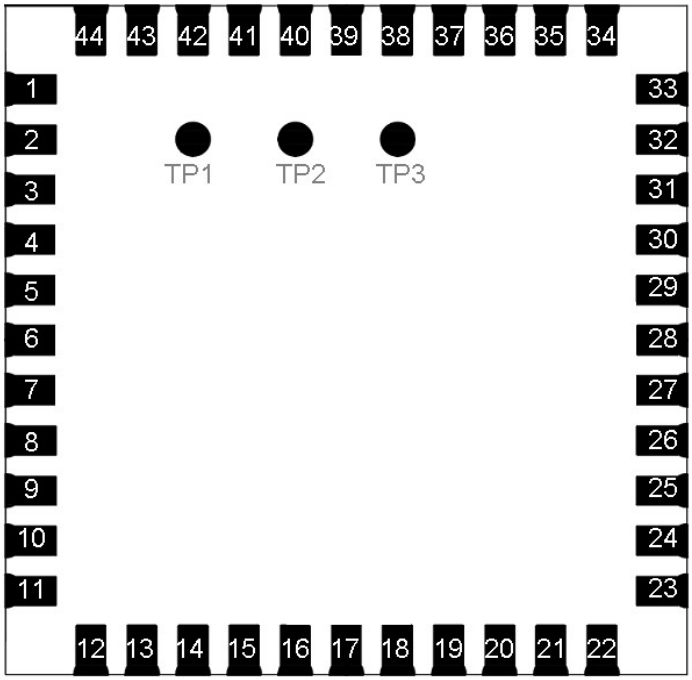
Feature	Description
WLAN Standard	IEEE 802.11b/g/n, WiFi compliant
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)
Channels	2.4GHz：Ch1 ~ Ch13
Modulation	802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK
Output Power	802.11b /11Mbps : 17 dBm ± 2 dB @ EVM ≤ -15dB
	802.11g /54Mbps : 15 dBm ± 2 dB @ EVM ≤ -28dB
	802.11n /MCS7： 14 dBm ± 2 dB @ EVM ≤ -28dB
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -91 dBm, typical
	- MCS=1 PER @ -89 dBm, typical
	- MCS=2 PER @ -85 dBm, typical
	- MCS=3 PER @ -82 dBm, typical
	- MCS=4 PER @ -78 dBm, typical
	- MCS=5 PER @ -76 dBm, typical
	- MCS=6 PER @ -76 dBm, typical
	- MCS=7 PER @ -73 dBm, typical
Receive Sensitivity (11g) @10% PER	- 6Mbps PER @ -92 dBm, typical
	- 9Mbps PER @ -90 dBm, typical
	- 12Mbps PER @ -88 dBm, typical
	- 18Mbps PER @ -85 dBm, typical
	- 24Mbps PER @ -81 dBm, typical
	- 36Mbps PER @ -78 dBm, typical
	- 48Mbps PER @ -78 dBm, typical
	- 54Mbps PER @ -75 dBm, typical
Receive Sensitivity (11b) @8% PER	- 1Mbps PER @ -97 dBm, typical
	- 2Mbps PER @ -96 dBm, typical
	- 5.5Mbps PER @ -92 dBm, typical
	- 11Mbps PER @ -90 dBm, typical
Data Rate	802.11b : 1, 2, 5.5, 11Mbps
	802.11g : 6, 9, 12, 18, 24, 36, 48, 54Mbps

Data Rate (20MHz ,Long	802.11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps
Data Rate (20MHz ,short	802.11n : 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65,72.2Mbps
Maximum Input Level	802.11b : -10 dBm
	802.11g/n : -20 dBm
Antenna Re	Small antennas with 0~2 dBi peak gain

4. Pin Assignments

4.1 Pin Map

< TOP VIEW >



4.2 Pin Table

NO	Name	Type	Description
1	GND	—	Ground connections
2	WL_BT_ANT	I/O	WLAN (RF->TX/RX) patch
3	GND	—	Ground
4	NC	—	Floating (Don't connected to ground)
5	NC	—	Floating (Don't connected to ground)
6	GPIO6	I	HOST to wake-up device,rising edge trigger
7	GPIO8_INT	I/O	GPIO8 (INT PIN)
8	NC	—	Floating (Don't connected to ground)
9	VBAT	P	Main power voltage source input (2.3V-3.6V)
10	XTAL_IN	I	Crystal input (option)
11	XTAL_OUT	O	Crystal output (option)
12	WL_REG_ON	I	Internal regulators power enable/disable
13	GPIO2	I/O	SDIO data interrupt (GPIO2)
14	SDIO_DATA_2	I/O	SDIO data line 2 (GPIO9)
15	SDIO_DATA_3	I/O	SDIO data line 3 (GPIO10)

16	SDIO_DATA_CMD	I/O	SDIO command line (GPIO11)
17	SDIO_DATA_CLK	I/O	SDIO clock line (GPIO12)
18	SDIO_DATA_0	I/O	SDIO data line 0 (GPIO13)
19	SDIO_DATA_1	I/O	SDIO data line 1 (GPIO14)
20	GND	—	Ground connections
21	NC	—	Floating (Don't connected to ground)
22	VDDIO	P	I/O Voltage supply input (IO3.3V/1.8V by host)
23	NC	—	Floating (Don't connected to ground)
24	LPO_GPIO0	—	RTC_32.768K_XOUT (module support clk)
25	LPO _GPIO1	—	RTC_32.768K_XIN (module support clk)
26	NC	—	Floating (Don't connected to ground)
27	NC	—	Floating (Don't connected to ground)
28	NC	—	Floating (Don't connected to ground)
29	NC	—	Floating (Don't connected to ground)
30	NC	—	Floating (Don't connected to ground)
31	GND	—	Ground connections
32	NC	—	Floating (Don't connected to ground)
33	GND	—	Ground connections
34	NC	I	Floating (Don't connected to ground)
35	NC	—	Floating (Don't connected to ground)
36	GND	—	Ground connections
37	GPIO3	I/O	UART_LOG_TX, for module debug (option)
38	GPIO4	I/O	UART_LOG_RX, for module debug (option)
39	WL_RST_GPIO7	I/O	WiFi resrt signal PIN,setting to low asserts a global resrt, setting to high desserts a global reset(GPIO7)
40	GPIO5	I/O	Device to wake-up host, rising edge trigger (GPIO5)
41	NC	—	Floating (Don't connected to ground)
42	NC	—	Floating (Don't connected to ground)
43	NC	—	Floating (Don't connected to ground)
44	NC	—	Floating (Don't connected to ground)
45	TP1	O	NC
46	TP2	O	NC
47	TP3 (NC)	—	Floating (Don't connected to ground)

※NOTE: P: Power, I: Input, O: Output, I/O: In/Output, RF: Analog RF Port. IPU:keep high Power-up
NC: No Connection, GPIO: If not used keep Float

4.3 IO Description (Function)

The GPIO pins' MUX function can be referred to Pin Function Group Table in the following :

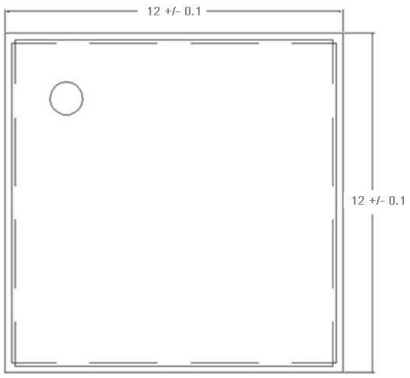
PIN No.	Fun=0	Fun=1	Fun=2	Fun=3	Fun=4	Fun=5	Fun=5
1	GPIO0	UART1_TXD	PWM3_OUT	SPI1_CLK	I2C1_SDA		
2	GPIO1	UART1_RXD	PWM4_OUT	SPI1_RXD	I2C1_SCL		
3	GPIO2	UART1_RTS	PWM2_OUT	SPI1_TXD			
4	GPIO3	UART1_CTS	PWM5_OUT	SPI1_CS1	I2C1_SDA		UART0_LOG_TX
5	GPIO4		PWM1_OUT		I2C1_SCL		UART0_LOG_RX
6	GPIO5	UART1_RXD	PWM2_OUT	SPI0_CS1			I2S0_MCK
7	GPIO6	UART1_TXD	PWM3_OUT	SPI0_CLK			I2S0_TX
8	GPIO7	UART1_CTS	PWM0_OUT	SPI0_RXD			I2S0_CLK
9	GPIO8	UART1_RTS	PWM1_OUT	SPI0_TXD			I2S0_WS
10	GPIO9	UART2_RTS	PWM0_OUT	SPI0_TXD	I2C0_SCL	SDIO_D2	I2S0_MCK
11	GPIO10	UART2_CTS	PWM1_OUT	SPI0_CLK	I2C0_SDA	SDIO_D3	I2S0_TX
12	GPIO11	UART2_TXD	PWM2_OUT	SPI0_RXD		SDIO_CMD	I2S0_RX
13	GPIO12	UART2_RXD	PWM3_OUT	SPI0_CS1		SDIO_CLK	I2S0_CLK
14	GPIO13	UART2_RTS	PWM4_OUT	UART0_LOG_TX	I2C0_SDA	SDIO_D0	I2S0_WS
15	GPIO14	UART2_CTS	PWM5_OUT	UART0_LOG_RX	I2C0_SCL	SDIO_D1	

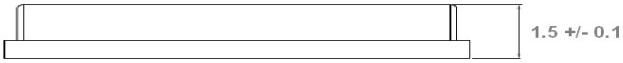
5. Mechanical and Layout Design

※NOTE (Unit:mm)

< TOP VIEW >

< Side View >





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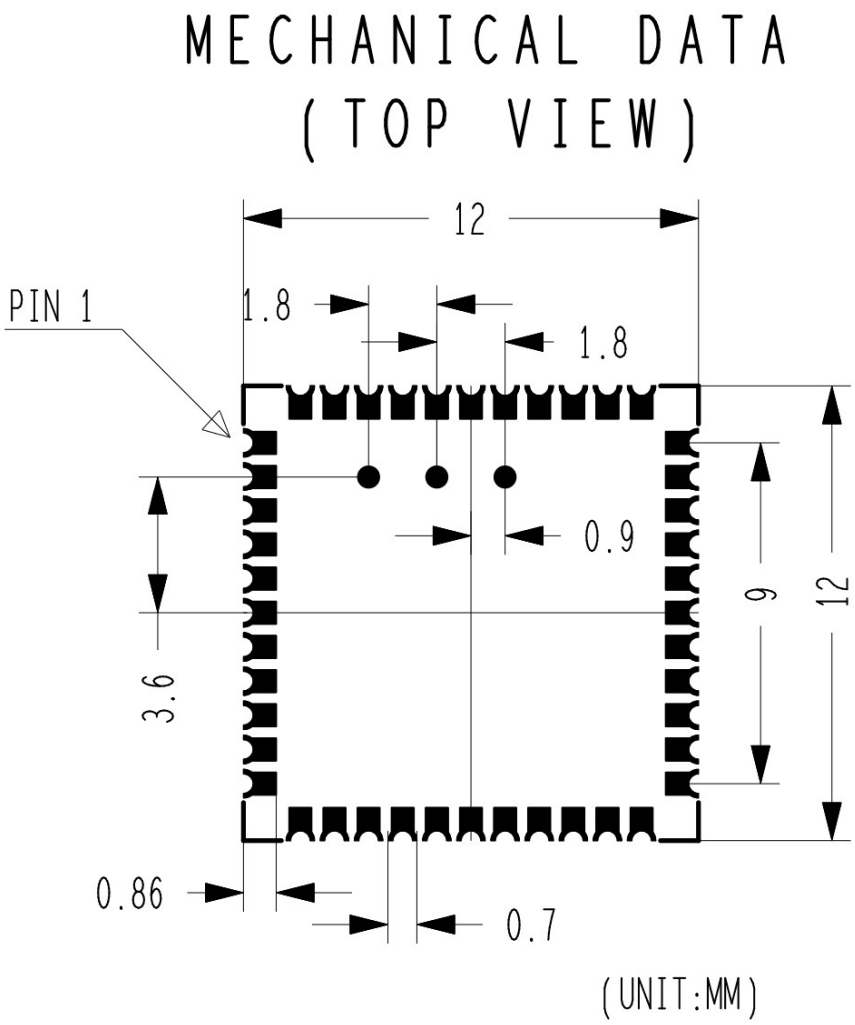


6. Frequency References

6.1 External Clock Reference

The module uses a secondary low-frequency sleep clock for low-power mode timing. Either the internal low-precision LPO or an external 32.768 kHz precision oscillator is required. The internal LPO frequency range is approximately 33 kHz ± 30% over process, voltage, and temperature, which is adequate for some applications. However, one trade-off caused by this wide LPO tolerance is a small current consumption increase during power save mode that is incurred by the need to wake up earlier to avoid missing beacons.

External LPO signal characteristics:

Parameter	Specification	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	±30	ppm
Duty cycle	30 - 70	%
Input signal amplitude	400 to 1800	mV, p-p
Signal type	Square-wave or sine wave	-
Input impedance	>100k	Ω
	<5	pF
Clock jitter (integrated over 300Hz – 15KHz)	<10,000	ppm

※NOTE: Module Built in crystal

External LPO signal characteristics:

1、ELECTRICAL SPECIFICATIONS

Hold Style	3225 Seam
Nominal Frequency	26.000000MHz
Mode	Fundamental / AT
Frequency Tolerance (at 25°C)	±10ppm
Frequency Stability Over Operating Temperature Characteristics	±10ppm
Operating Temperature Range	-20℃ ~ +70℃
Storage Temperature Range	-55℃ ~ +125℃
Shunt Capacitance (C_0)	5.0pF Max
Driver Level (Typical)	100μW
Load Capacitance(C_L)	12pF
ESR	60Ω Max
Insulation Resistance	More than 500Mohms at DC100V
Aging @25°C 1st year (Max)	±3ppm/year

REMARK: SPECIFICATIONS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE. PLEASE CONFIRM WITH OUR SALES ENGINEER.

6.2 SDIO v2.0

The module supports SDIO version 2.0 for both 1-bit (25Mbps) and 4-bit (100Mbps),as well as high speed 4-bit (50 MHz clocks – 200 Mbps). Then has the ability to map the interrupt signal on a GPIO pin. This out-of-band interrupt signal notifies the host when the WLAN device wants to turn on the SDIO interface. The ability to force control of the gated clocks from within the WLAN chip is also provided.

Three functions are supported:

■ Function 0 standard SDIO function. The maximum block size is 32 bytes.

■ Function 1 backplane function to access the internal System-on-a-Chip (SoC) address space. The maximum block size is 64 bytes.

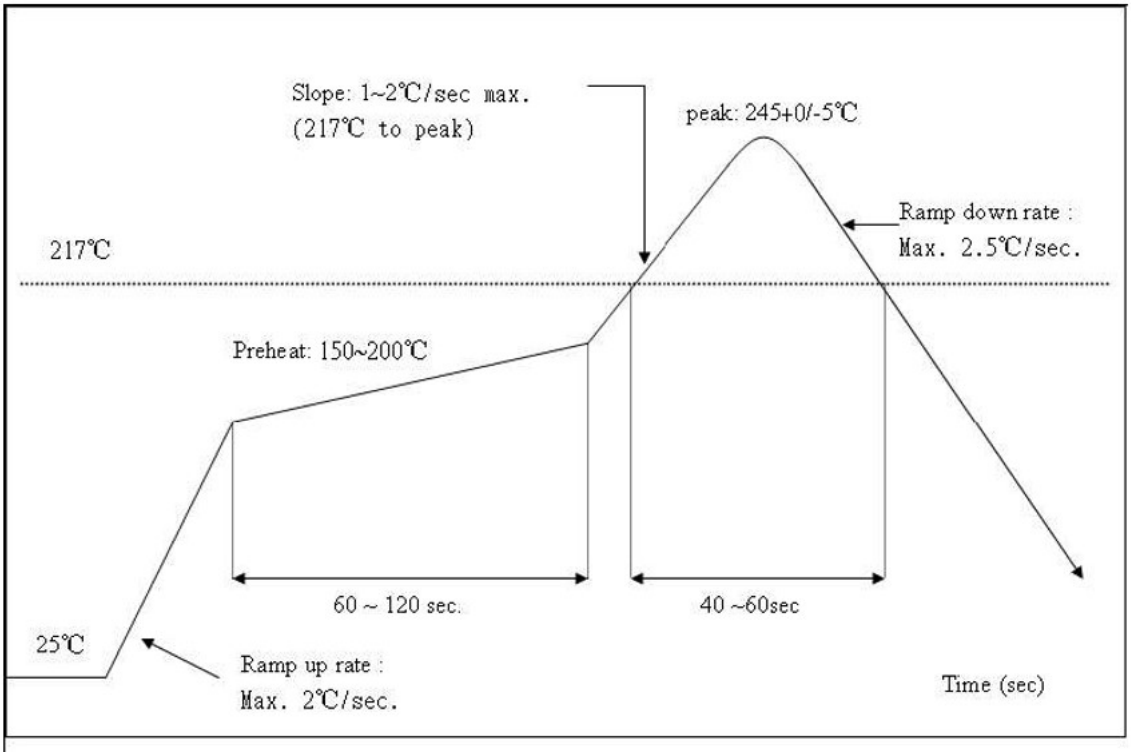
■ Function 2 WLAN function for efficient WLAN packet transfer through DMA. The maximum block size is 512 bytes.

SDIO PIN Descriptions

SD 4-Bit Mode	
DATA0	Data line 0
DATA1	Data line 1 or Interrupt
DATA2	Data line 2
DATA3	Data line 3
CLK	Clock
CMD	Command line

7. Recommended Reflow Profile

Referred to IPC/JEDEC standard.
Peak Temperature :<250°C Number
of Times : ≤2 times



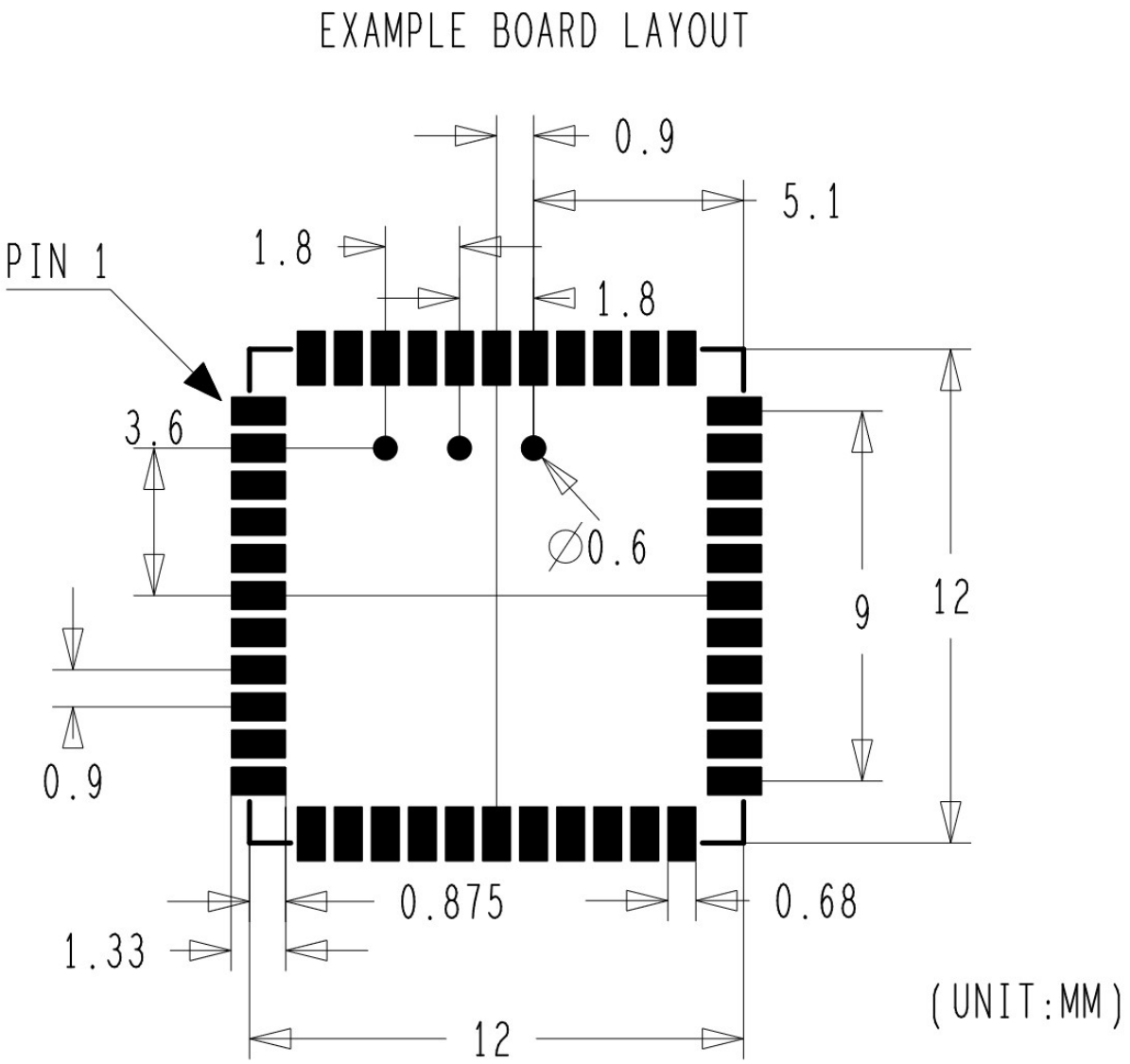
ENVIRONMENTAL.
Operating :
※Operating Temperature: -10°C to +70 °C
※Relative Humidity: 5-90% (non-condensing)

Storage
※Temperature: -40°C to +80°C (non-operating)
※Relevant Humidity: 5-95% (non-condensing)

MTBF caculation
※Over 150,000hour

NOTE: it must use N2 for reflow and suggest the coneentration of oxygenless than 5000 ppm

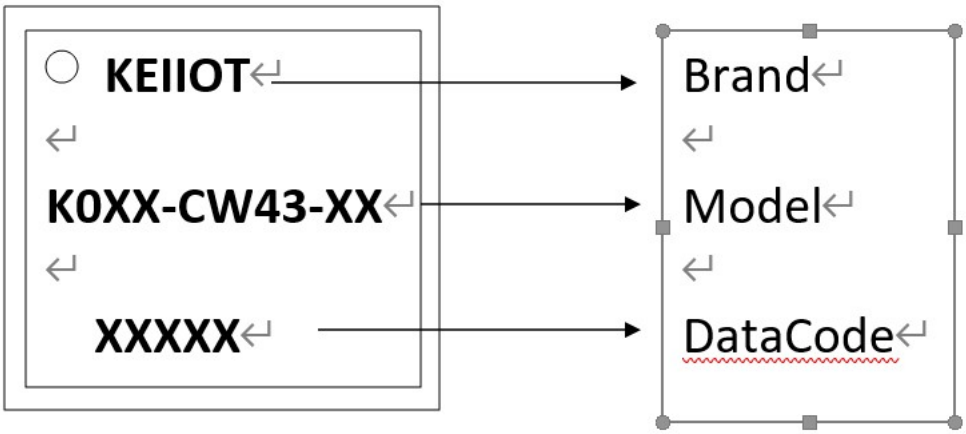
8. PCB Layout Solder Paste

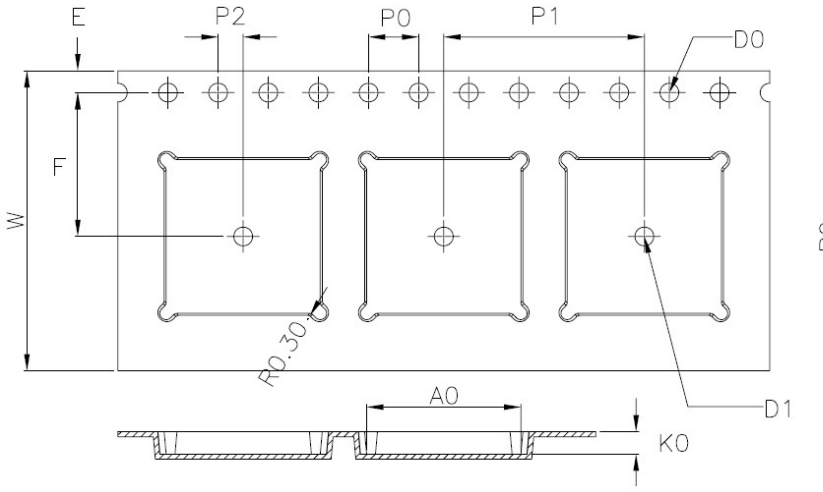


- Module Specifications : W:0.65mm * L:0.95mm pitch 0.9 mm
- The proposed design W:0.65~0.75 mm * L:1.33mm. Consider not place other parts in the peripheral area of 1 mm ~ 1.5 mm to facilitate additional amount of solder for PCB pad.
- We Suggest the thickness of Stencil between 0.12 mm ~0.15mm, the W between 0.6~0.65mm and the L between L1.5~1.6mm.
- If the thickness of the stencil is thinner, we suggest to adding more solder, to increase the wetting ability. Depends on different production situation, if the stencil thickness is 0.08~0.1mm, and the module nearby area is no more space for expending soldering area, we will suggest to increase the stencil thickness to increase the wetting ability.
- The major consideration parts of stencil design is to increase the solder paste wetting ability.

- Module Specifications L 0.7mm
- The design for PCB Pad : L:0.8mm
- We recommend the apertures for stencil L:0.5mm~0.6mm
- In order to avoid highness impact caused solder paste thickness, the stencil open size can be appropriately retracted

9. Package Information



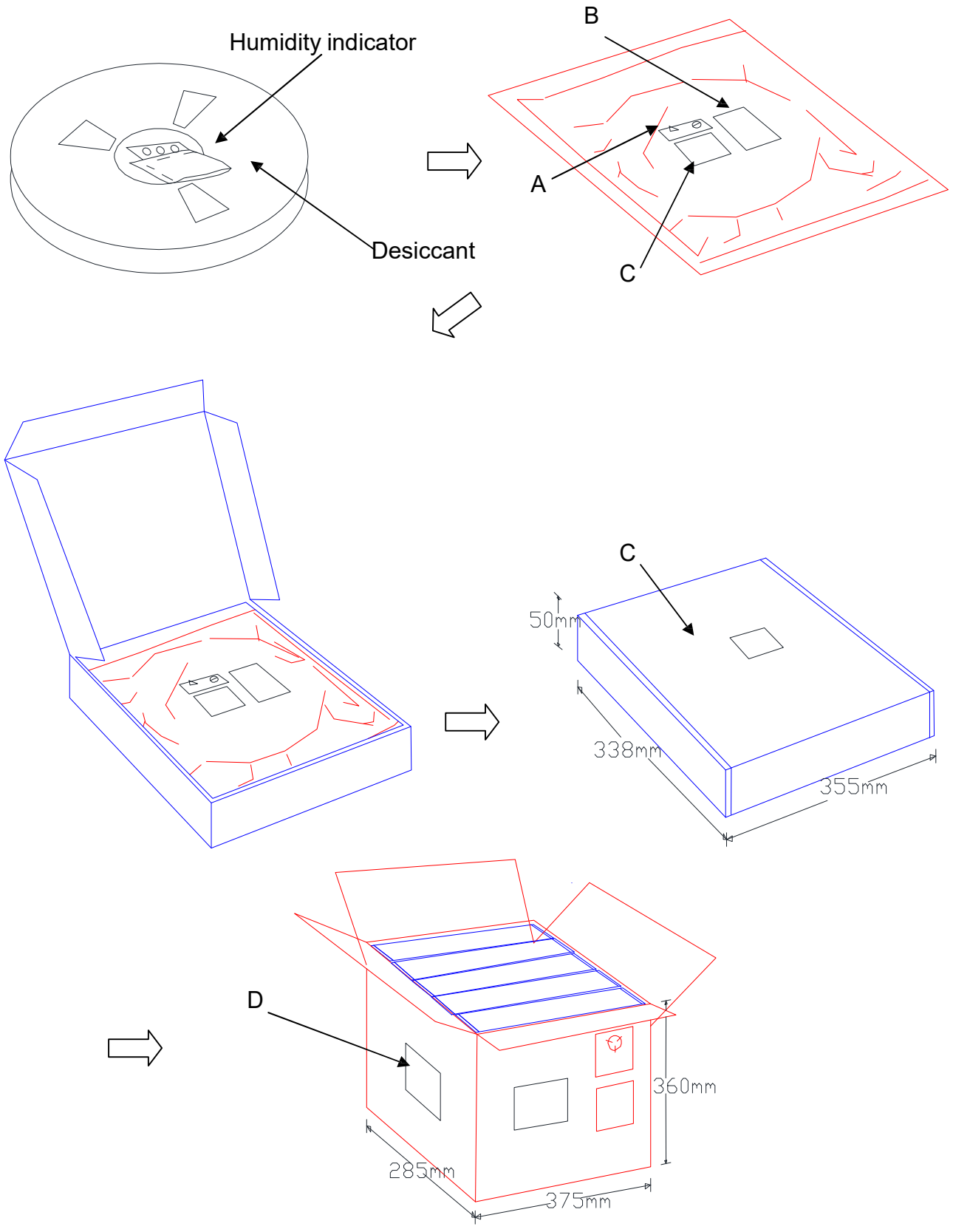


W	24.00±0.30
A0	12.30±0.10
B0	12.30±0.10
K0	1.80±0.10
E	1.75±0.10
F	11.50±0.10
P0	4.00±0.10
P1	16.00±0.10
P2	2.00±0.10
D0	1.50 $^{+0.10}_{-0.00}$
D1	ø1.50MIN

1. 10 sprocket hole pitch cumulative tolerance ±0.20.
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481-D requirements.
5. Thickness : 0.30±0.05mm.
6. Packing length per 22" reel : 98.5 Meters.(1:3)
7. Component load per 13" reel : 1500 pcs.

1> 1500pcs of per disc

2> 1500pcs * 5 =7500pcs (one Cartoon)



10. This product is RoHS compliance

Wireless module before the SMT Note:

When customers Open stencil must be sure the hole bigger to the Wireless module plate, please press 1 to 1 and 0.7 mm is widened to open outward, the thickness of 0.12 mm.

① Can't get the wifi module bare hands when needs,must we wear the gloves and static ring.

The furnace temperature according to the size of the customer the mainboard ,generally like to stick on a tablet standard temperature of 250 + - 5,can do 260 + - 5. Storage and use Wifi module control should pay attention to the following matters:

① Module of the storage life of vacuum packaging：

1-1. Storage life：12 months. Storage conditions:<40 . Relative ℃ humidity:<90%R.H.

1-2. 1-2.After this bag is opened , devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be

1-3. Check the humidity card :stored at ≦20%RH.If :30%~40%(pink)or greater than 40%(red).Labeling module has moisture absorption.

① Mounthed within 168 hours at factory conditions of: ≦ ℃t 30% ， ≦60%R.H.

② Once opened, the workshop the preservation of life for 168 hours.

1-4. If baking is required,devices may be baked for:

① Modules must be to remove module moisture problem.

② Baking temperature: 125 , 8 hours. ℃

③ After baking, put proper amount of desiccant to seal packages.

1-5. The actual number of module vacuum packing which is based on the actual number of packages to the customer requirements.

2. Module reel packaging items as follows.

2-1. Storage life：12 months. Storage conditions:<40 . Relative ℃ humidity:<90%R.H.

2-2. Module apart packing after 168 hours，To launch patch need to bake, to remove the module hygroscopic, baking temperature conditions：125℃，8hours.

2-3. The actual number of module reel packing which is based on the actual number of packages to the customer requirements.

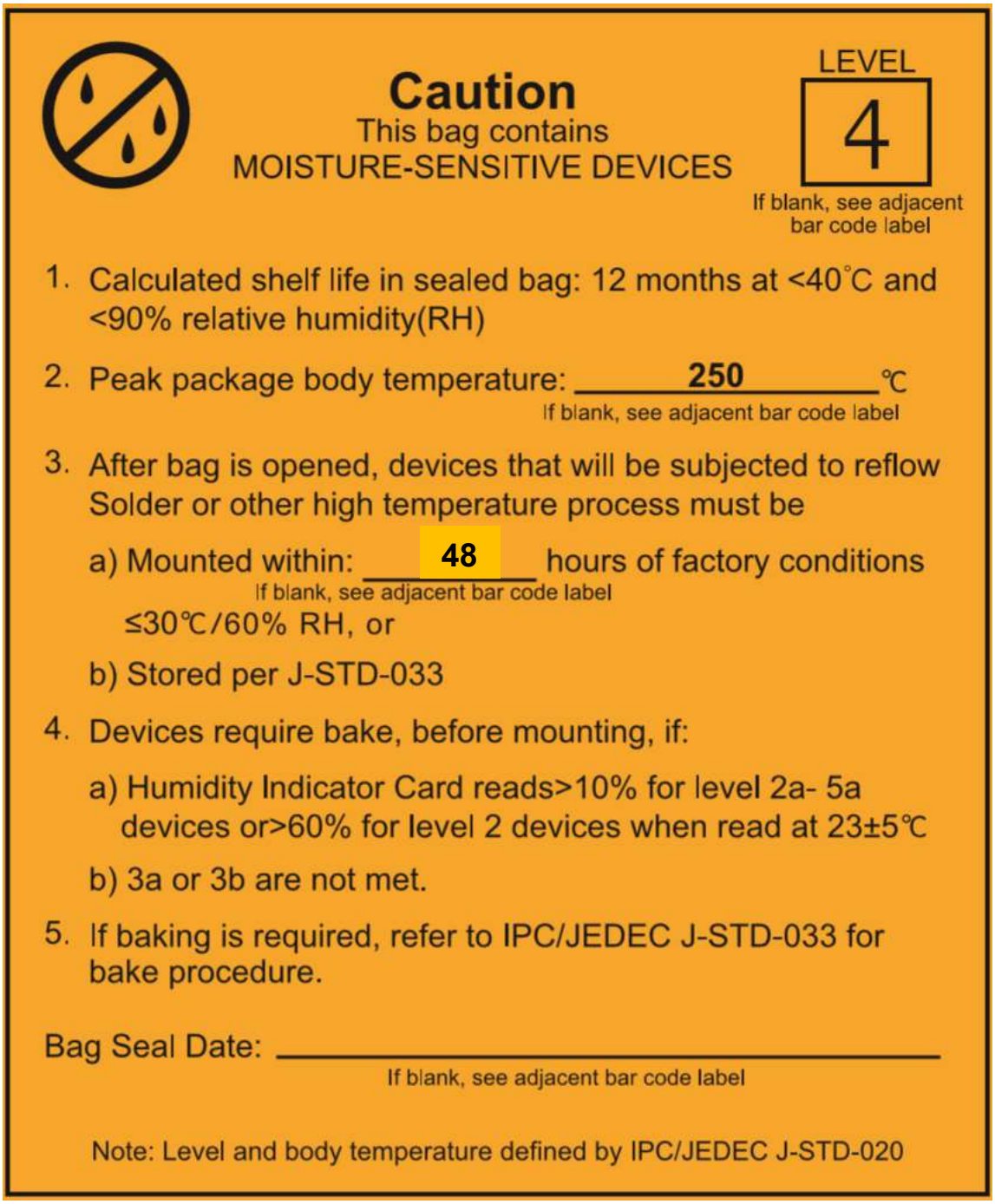
3. Module pallet packaging items as follows：

3-1. Storage life：3 months. Storage conditions:<40 . Relative ℃ humidity:<90%R.H.

3-2. Module if not used within 48 hours, before launch the need for baking, baking temperature: 125 , 8 hours. ℃

3-3. Pallet packaging each plate is 100 PCS.The actual number of module pallet packing which is based on the actual number of packages to the customer requirements.

11. MSL Level / Storage Condition



Caution
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL 4

If blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity(RH)
2. Peak package body temperature: 250 ℃
   If blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow Solder or other high temperature process must be
   a) Mounted within: 48 hours of factory conditions
   If blank, see adjacent bar code label
   ≤30℃/60% RH, or
   b) Stored per J-STD-033
4. Devices require bake, before mounting, if:
   a) Humidity Indicator Card reads>10% for level 2a- 5a devices or>60% for level 2 devices when read at 23±5℃
   b) 3a or 3b are not met.
5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure.

Bag Seal Date: _____
If blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

※NOTE : Accumulated baking time should not exceed 96hrs