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REVISION HISTORY		
Rev.	**Description of Changes**	**Date**
V1.0	✦Initial release	2012-05-08

NW51 Wi-Fi SIP Module

Spec Sheet

NUFRONT ®

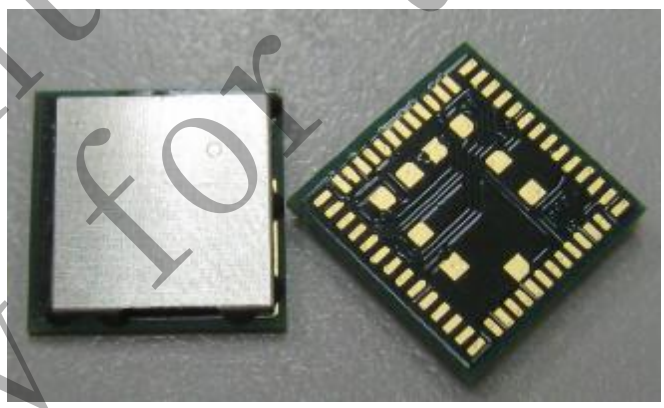
APPROVALS	NAME	DATE	DOCUMENT TITLE	
EDITOR		2012-05-08	NW51 Wi-Fi SIP Module Spec Sheet	
MANAGEMENT				
			DOCUMENT NUMBER	REV V1.0

Nufront

NW51

Wi-Fi SIP Module

Spec Sheet



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Contents

1. Introduction

Nufront would like to announce a low-cost and low-power consumption module which has all of the Wi-Fi functionalities. The highly integrated NW51 module makes the possibilities of web browsing, VoIP, headsets and other applications. With seamless roaming capabilities and advanced security, NW51 can also interact with different vendors' 802.11b/g/n Access Points in the wireless LAN.

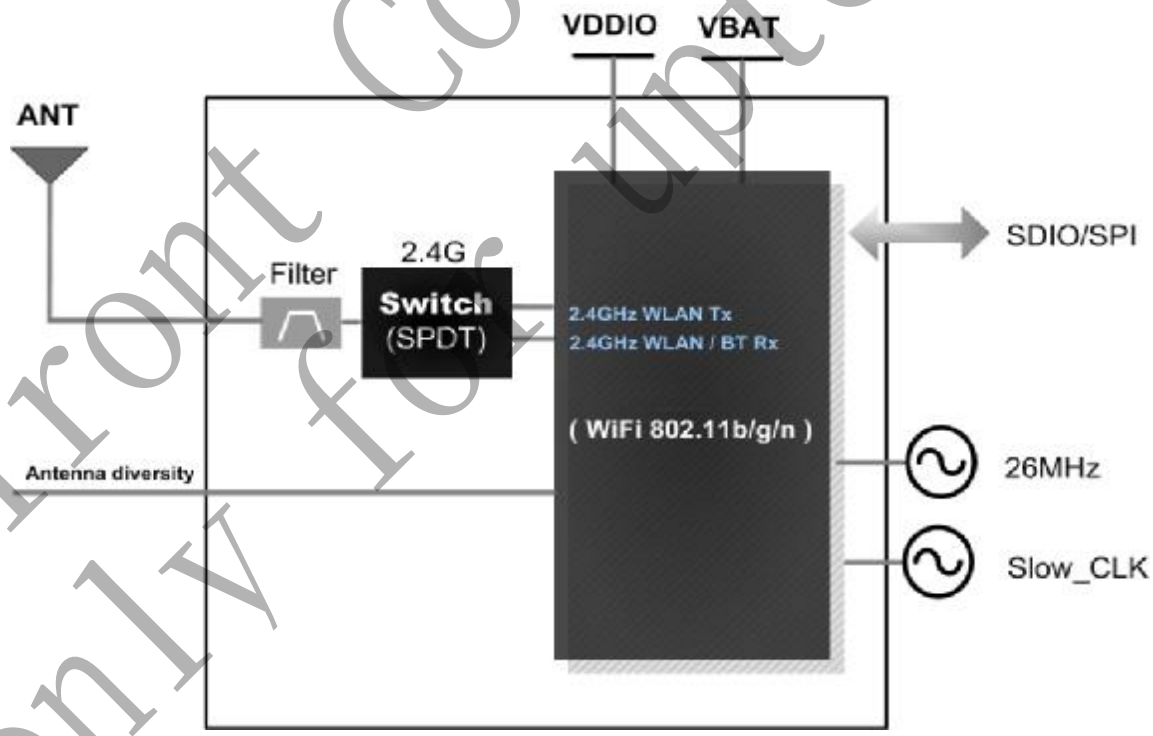
This wireless module complies with IEEE 802.11 b/g/n standard and it can achieve up to a speed of 72.2Mbps with single stream in 802.11n draft, 54Mbps as specified in IEEE 802.11g, or 11Mbps for IEEE 802.11b to connect to the wireless LAN. The integrated module provides SDIO interface for Wi-Fi.

This compact module is a total solution for Wi-Fi technologies. The module is specifically developed for Smart phones and Portable devices.

2. Features

- Single-band 2.4GHz IEEE 802.11b/g/n
- Supports standard interfaces SDIO v2.0(50MHz, 4-bit and 1-bit) and generic SPI(up to 50MHz)
- Integrated ARM Cortex-M3™ CPU with on-chip memory enables running IEEE802.11 firmware that can be field-upgraded with future features.
- Supports per packet Rx antenna diversity
- Security:
  i. Hardware WAPI acceleration engine
  ii. AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
  iii. WPA™ – and WPA2™ - (Personal) support for powerful encryption and authentication

A simplified block diagram of the module is depicted in the figure below.



3. Deliverables

3.1 Deliverables

The following products and software will be part of the product.

- Module with packaging
- Evaluation Kits
- Software utility for integration, performance test.
- Product Datasheet.
- Agency certified pre-tested report with the adapter board.

3.2 Regulatory certifications

The product delivery is a pre-tested module, without the module level certification. For module approval, the platform’s antennas are required for the certification.

4. General Specification

4.1 Wi-Fi RF Specification

Conditions : VBAT=3.6V ; VDDIO=3.3V ; Temp:25°C

Feature	**Description**
Product Name	NW51 Wi-Fi SIP Module
WLAN Standard	IEEE 802.11b/g/n, WiFi compliant
Host Interface	SDIO
Dimension	L x W x H: 9.5 x 9.5 x 1.5 mm
Frequency Range	2.412 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)
Number of Channels	11 for North America, 13 for Europe, and 14 for Japan
Modulation	802.11b : DQPSK, DBPSK, CCK 802.11g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK
Output Power	802.11b /11Mbps : 16 dBm ± 1.5 dB @ EVM ≤ -9dB
	802.11g /54Mbps : 15 dBm ± 1.5 dB @ EVM ≤ -25dB
	802.11n /65Mbps : 14 dBm ± 1.5 dB @ EVM ≤ -28dB
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -85 ± 1dBm, typical
	- MCS=1 PER @ -84 ± 1dBm, typical
	- MCS=2 PER @ -82 ± 1dBm, typical
	- MCS=3 PER @ -80 ± 1dBm, typical
	- MCS=4 PER @ -77 ± 1dBm, typical
	- MCS=5 PER @ -73 ± 1dBm, typical
	- MCS=6 PER @ -71 ± 1dBm, typical
	- MCS=7 PER @ -69 ± 1dBm, typical
Receive Sensitivity (11g) @10% PER	- 6Mbps PER @ -87 ± 1dBm, typical
	- 9Mbps PER @ -86 ± 1dBm, typical
	- 12Mbps PER @ -85 ± 1dBm, typical
	- 18Mbps PER @ -83 ± 1dBm, typical
	- 24Mbps PER @ -81 ± 1dBm, typical
	- 36Mbps PER @ -78 ± 1dBm, typical
	- 48Mbps PER @ -74 ± 1dBm, typical
	- 54Mbps PER @ -72 ± 1dBm, typical
Receive Sensitivity (11b) @8% PER	- 1Mbps PER @ -90 ± 1dBm, typical
	- 2Mbps PER @ -89 ± 1dBm, typical
	- 5.5Mbps PER @ -87 ± 1dBm, typical
	- 11Mbps PER @ -84 ± 1dBm, typical

Data Rate	802.11b : 1, 2, 5.5, 11Mbps
	802.11g : 6, 9, 12, 18, 24, 36, 48, 54Mbps
Data Rate (20MHz ,Long GI,800ns)	802.11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps
Data Rate (20MHz ,short GI,400ns)	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
Operating temperature	-30°C to 85°C
Storage temperature	-40°C to 85°C
Humidity	Operating Humidity 10% to 95% Non-Condensing Storage Humidity 5% to 95% Non-Condensing

4.2 Voltages

4.2.1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VBAT	Input supply Voltage	-0.5	6.5	V
VDDIO	Digital/Bluetooth/SDIO/SPI I/O Voltage	-0.5	4.1	V

4.2.2 Recommended Operating Ratings

Test conditions: At room temperature 25°C				
Symbol	**Min.**	**Typ.**	**Max.**	**Unit**
VBAT	3.0	3.6	4.8	V
VDDIO	1.7	1.8	1.92	V
	2.97	3.3	3.6	V

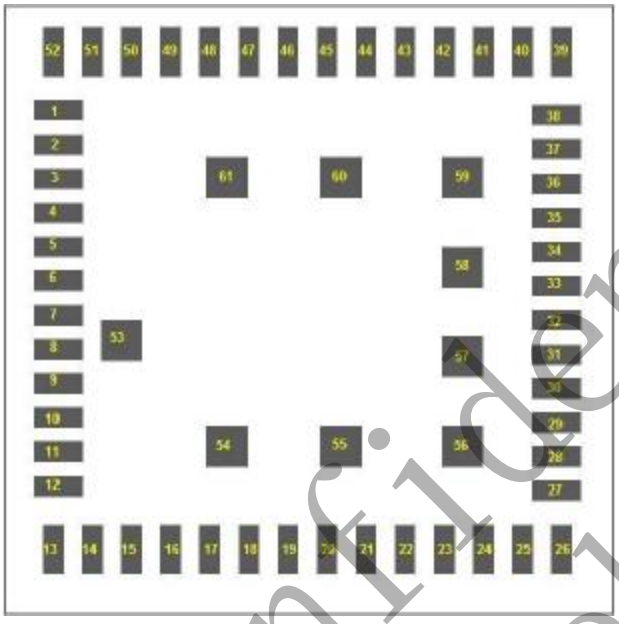
Note: The voltage of VDDIO is depended on system I/O voltage.

Test conditions: At operating temperature -10°C ~65°C				
Symbol	**Min.**	**Typ.**	**Max.**	**Unit**
VBAT	3.0	3.6	4.8	V
VDDIO	1.7	-	3.35	V

Note: VDDIO operating voltage range from 1.7V to 3.35V at operating temperature is guaranteed.

5. Pin Assignments

5.1 PCB Pin Outline



< TOP VIEW >

5.2 Pin Definition

NO	Name	Type	Description
1	WLAN_ANT	I/O	RF signal I/O port
2	GND	—	Ground
3	JTAG_TRST_L	I	JTAG interface, if JTAG not used unconnected (NC)
4	JTAG_TDO_UART_TX	O	JTAG interface, if JTAG not used unconnected (NC) this pin. This pin is also muxed with UART_TX, which can be enabled by software
5	JTAG_TDI_UART_RX	I	JTAG interface, if JTAG not used unconnected (NC) this pin. This pin is also muxed with UART_RX, which can be enabled by software
6	JTAG_TCK	I	JTAG interface, if JTAG not used unconnected (NC)
7	JTAG_TMS	I	JTAG interface, if JTAG not used unconnected (NC)
8	GND	—	Ground
9	OSC_IN	I	XTAL oscillator input
10	OSC_OUT	I/O	XTAL oscillator output
11	GND	—	Ground
12	RF_SW_CTRL0	—	Floating (Don’t connected to ground)
13	RF_SW_CTRL3	—	Floating (Don’t connected to ground)

14	GND	—	Ground
15	GND	—	Ground
16	GND	—	Ground
17	GND	—	Ground
18	VIO	I	Digital I/O Voltage input
19	CLK_32K	I	Sleep clock (32.768KHz) input
20	SDIO_DATA_2	I/O	SDIO data line 2
21	SDIO_DATA_0	I/O	SDIO data line 0
22	SDIO_CLK	I	SDIO clock
23	SDIO_CMD	I/O	SDIO command line
24	SDIO_DATA_1	I/O	SDIO data line 1
25	SDIO_DATA_3	I/O	SDIO data line 3
26	VIN_LDO	I	Internal DC-DC regulator input
27	GND	—	Ground
28	SR_VLX	O	Internal DC-DC regulator output
29	GND	—	Ground
30	VBAT	I	DC voltage input
31	WL_RST_N	I	Active low WLAN reset signal
32	GND	—	Ground
33	GND	—	Ground
34	GND	—	Ground
35	GND	—	Ground
36	XTAL_PU	O	Floating (Don’t connected to ground)
37	GND	—	Ground
38	GND	—	Ground
39	GND	—	Ground
40	GND	—	Ground
41	GND	—	Ground
42	GND	—	Ground
43	VDD_TCXO	—	Floating (Don’t connected to ground)
44	GND	—	Ground
45	TCXO_IN	—	Floating (Don’t connected to ground)
46	GPIO_5	—	Floating (Don’t connected to ground)
47	GPIO_4	—	Floating (Don’t connected to ground)
48	GPIO_3	—	Floating (Don’t connected to ground)
49	GPIO_1	—	Floating (Don’t connected to ground)
50	GPIO_0	—	Floating (Don’t connected to ground)
51	WRF_GPIO_OUT	—	Floating (Don’t connected to ground)

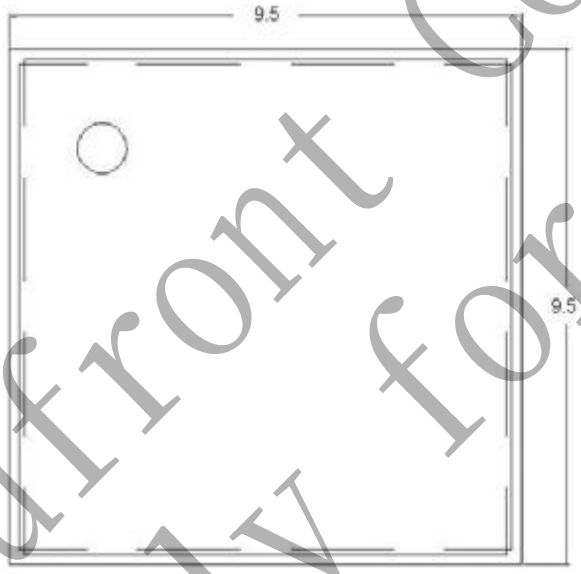
52	GND	—	Ground
53	GND	—	Ground
54	GND	—	Ground
55	GND	—	Ground
56	GND	—	Ground
57	GND	—	Ground
58	GND	—	Ground
59	GND	—	Ground
60	GND	—	Ground
61	GND	—	Ground

6. Dimensions

6.1 Physical Dimensions

(Unit: mm)

< TOP VIEW >



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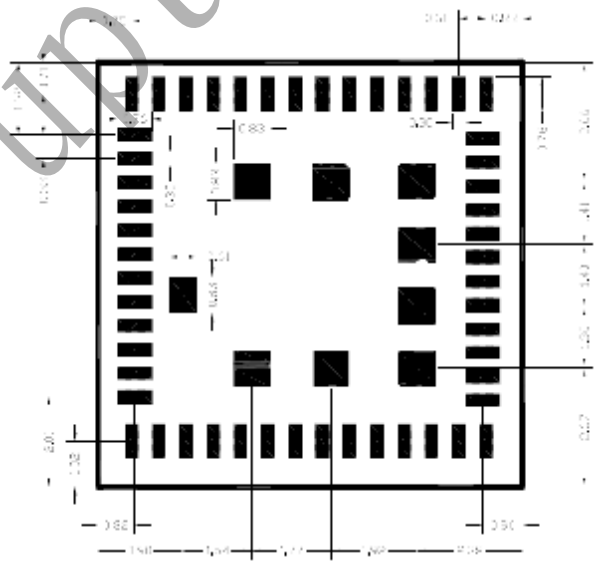
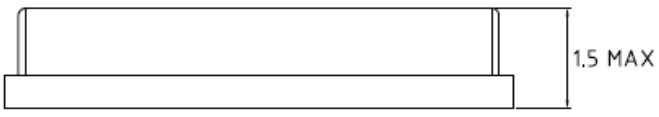


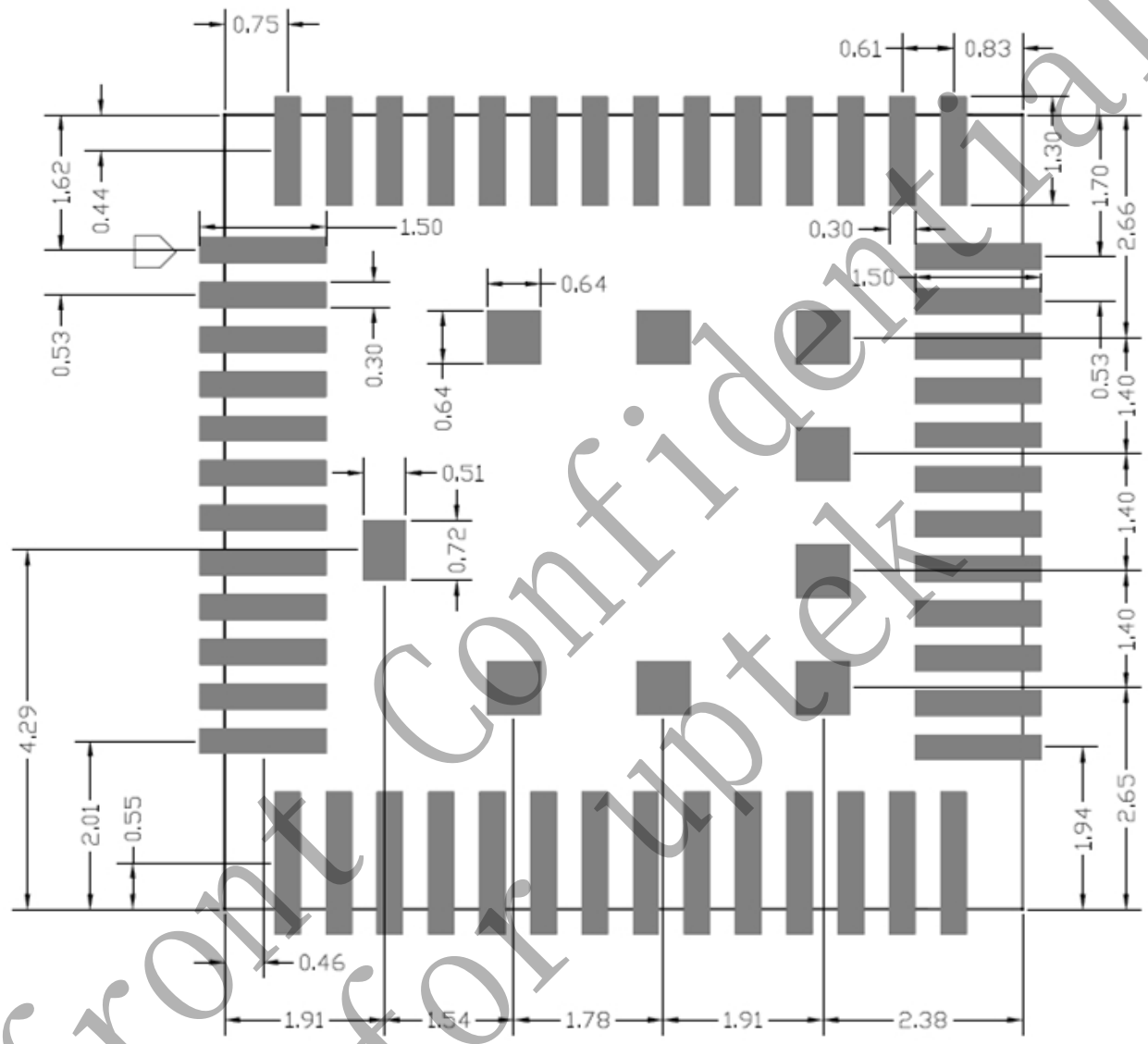
< Side View >



6.2 Recommended Footprint

(Unit: mm)

< TOP VIEW >



7. External clock reference

External LPO signal characteristics

Parameter	LPO Clock	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	±30	ppm
Duty cycle	30 - 70	%
Input signal amplitude	1600 to 3300	mV, p-p
Signal type	Square-wave or sine-wave	-
Input impedance	>100k <5	Ω pF
Clock jitter (integrated over 300Hz – 15KHz)	<1	Hz

7.1 SDIO Pin Description

The NW51 supports SDIO version 1.2 for both 1-bit (25 Mbps), 4-bit modes (100 Mbps), and high speed 4-bit (50 MHz clocks – 200 Mbps). It has the ability to stop the SDIO clock and map the interrupt signal into 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 the control of the gated clocks from within the WLAN chip is also provided.

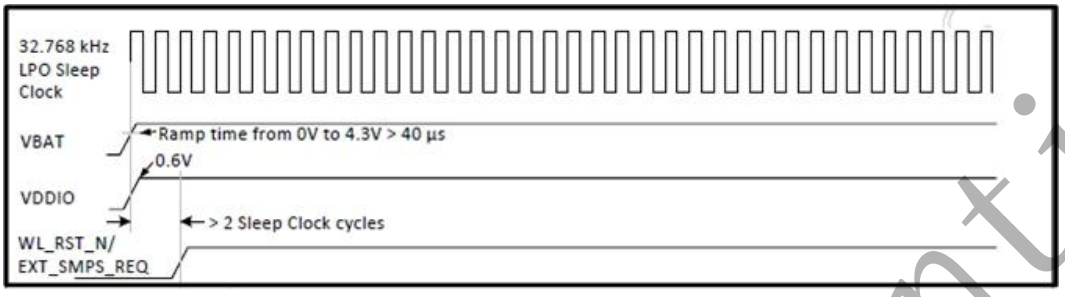
- ※ Function 0 Standard SDIO function (Max BlockSize / ByteCount = 32B)
- ※ Function 1 Backplane Function to access the internal System On Chip (SOC) address space (Max BlockSize / ByteCount = 64B)
- ※ Function 2 WLAN Function for efficient WLAN packet transfer through DMA (Max BlockSize / ByteCount = 512B)

SDIO Pin Description

SD 4-Bit Mode		SD 1-Bit Mode		SPI Mode	
DATA0	Data Line 0	DATA	Data Line	DO	Data Output
DATA1	Data Line 1 or Interrupt	IRQ	Interrupt	IRQ	Interrupt
DATA2	Data Line 2 or Read Wait	RW	Read Wait	NC	Not Used
DATA3	Data Line 3	NC	Not Used	CS	Card Select
CLK	Clock	CLK	Clock	SCLK	Clock
CMD	Command Line	CMD	Command Line	DI	Data Input

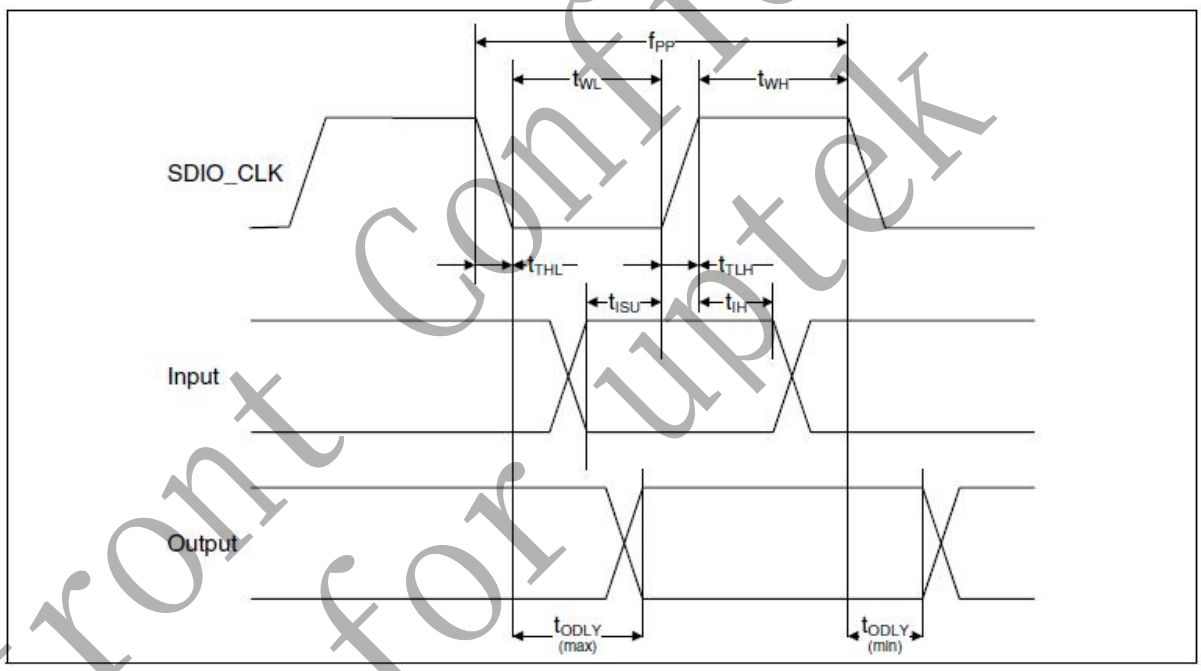
8. Host Interface Timing Diagram

8.1 Power-up Sequence Timing Diagram



※ WL_RST_N: Low asserting Reset for WLAN Core. This pin must be driven high or low (not left floating).

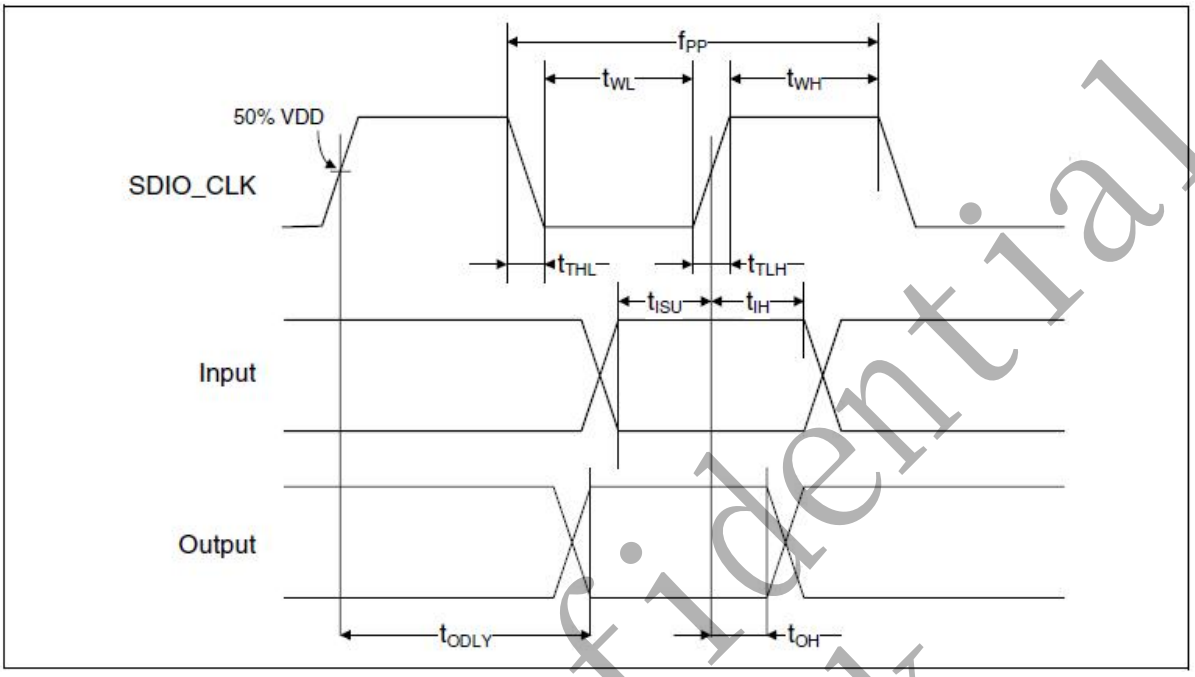
8.2 SDIO Default Mode Timing Diagram



Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are refferred to minimum VIH and maximum VIL[b])					
Frequency-Data Transfer mode	fPP	0	-	25	MHz
Frequency-Identification mode	fOD	0	-	400	kHz
Clock low time	tWL	10	-	-	ns
Clock high time	tWH	10	-	-	ns
Clock rise time	tTLH	-	-	10	ns
Clock low time	tTHL	-	-	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup time	tISU	5	-	-	ns
Input hold time	tIH	5	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer mode	tODLY	0	-	14	ns
Output delay time – Identification mode	tODLY	0	-	50	ns

a. Timing is based on CL ≤ 40pF load on CMD and Data.
b. min(Vih) = 0.7 x VDDIO and max(Vil) = 0.2 x VDDIO.

8.3 SDIO High Speed Mode Timing Diagram

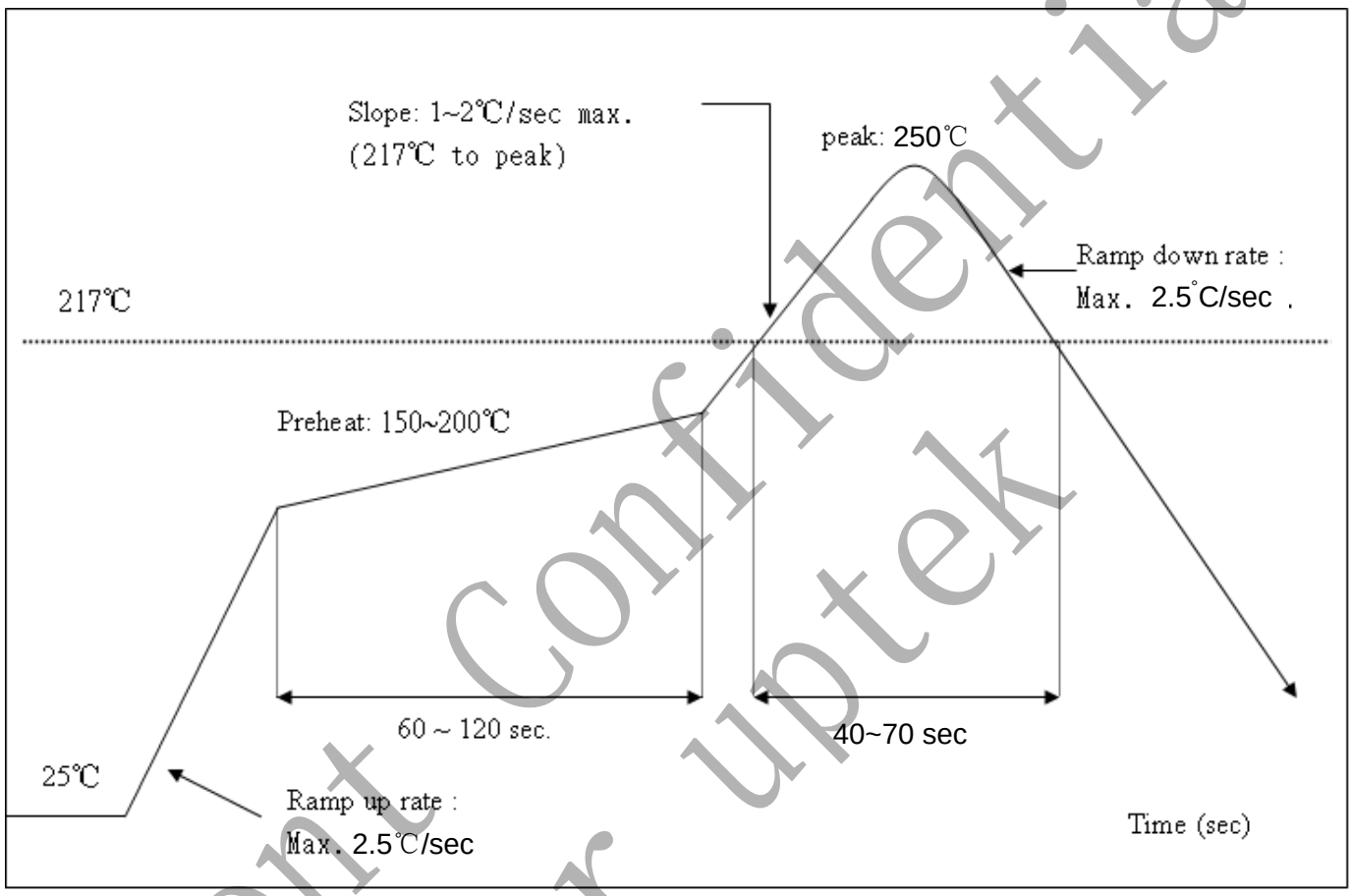


Parameter	*Symbol*	*Minimum*	*Typical*	*Maximum*	*Unit*
SDIO CLK (All values are refferred to minimum VIH and maximum VIL[b])					
Frequency-Data Transfer mode	fPP	0	-	50	MHz
Frequency-Identification mode	fOD	0	-	400	kHz
Clock low time	tWL	7	-	-	ns
Clock high time	tWH	7	-	-	ns
Clock rise time	tTLH	-	-	3	ns
Clock low time	tTHL	-	-	3	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup time	tISU	6	-	-	ns
Input hold time	tIH	2	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer mode	tODLY	-	-	14	ns
Output hold time	tOH	2.5	-	-	ns
Total system capacitance (each line)	CL	-	-	40	pF

a. Timing is based on CL ≤ 40pF load on CMD and Data.
b. min(Vih) = 0.7 x VDDIO and max(Vil) = 0.2 x VDDIO.

9. Recommended Reflow Profile

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

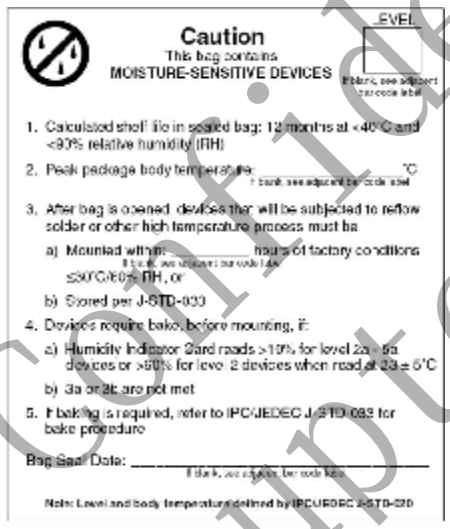


10. Packing Information

10.1 Label

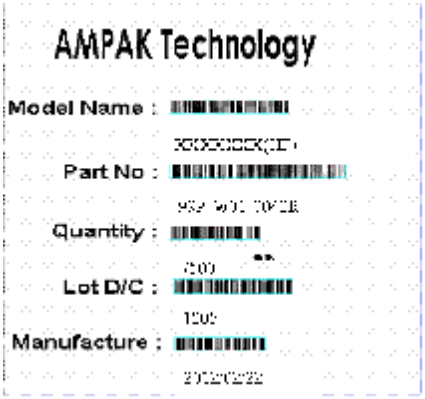
Label A **à** Anti-static and humidity notice

Label B **à** MSL caution / Storage Condition

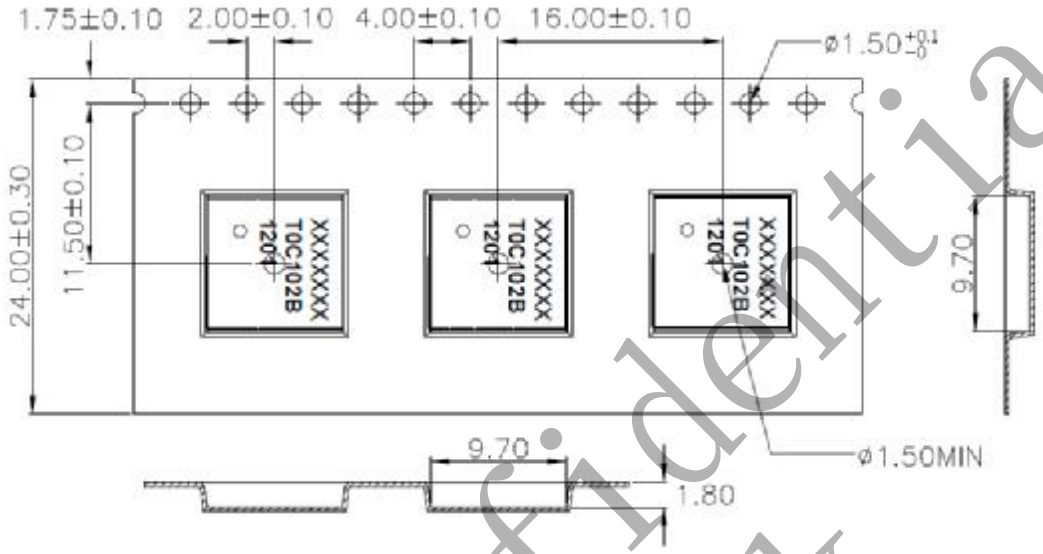


Label C **à** Inner box label .

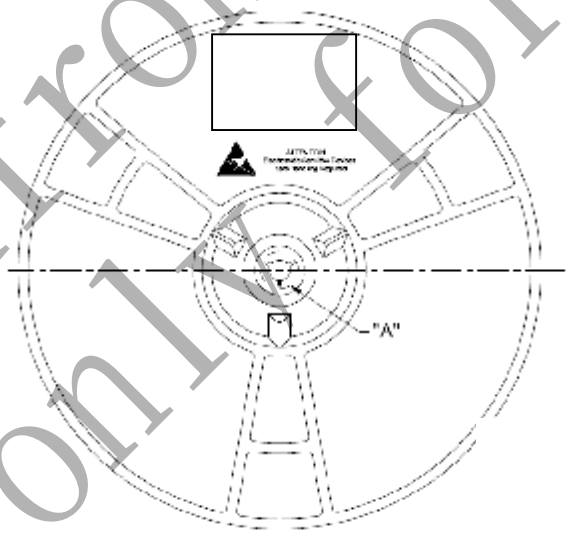
Label D **à** Carton box label .

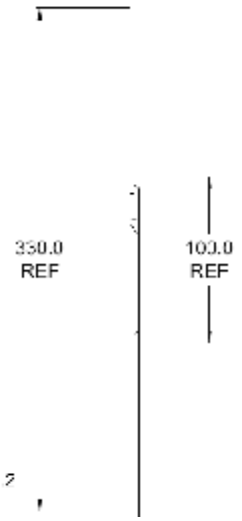


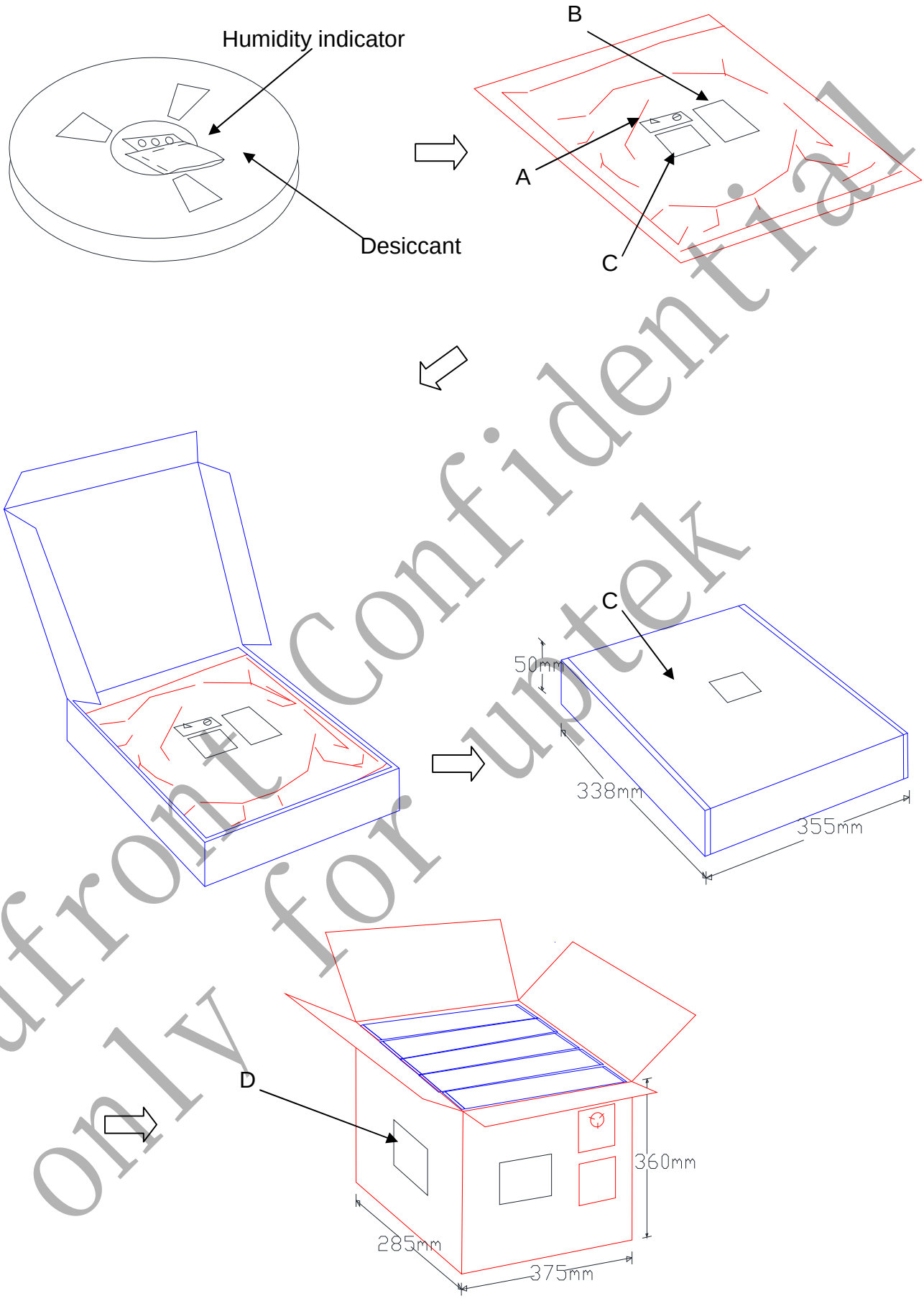
10.2 Dimension



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.







10.3 MSL Level / Storage Condition

Caution

This bag contains

MOISTURE-SENSITIVE DEVICES

Do not open except under controlled conditions

LEVEL 4

1. Calculated shelf life in sealed bag: 12 months at< 40℃ and < 90% relative humidity(RH)
2. Peak package body temperature: 225℃ ☐ 240℃ ☐ 250℃ ☑ 260℃ ☐
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
   a) Mounted within: 48 hours of factory conditions <30℃/60% RH OR
   b) Stored at <10% RH
4. Devices require bake, before mounting, if:
   a) Humidity Indicator Card is >10% when read at 23±5℃
   b) 3a or 3b not met
5. If baking is required, devices may be baked for 24 hours at 125±5℃

Note : If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: **See-SEAL DATELABEL**

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

※NOTE : Accumulated baking time should not exceed 96hrs