



# 正基科技股份有限公司

# **SPECIFICATION**

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PRODUCT	NAME:	AP6214	

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NAME				



# **AMPAK**

AP6214

WiFi + Bluetooth 4.0 SIP Module Spec Sheet



# **Revision History**

Date	Revision Content	Revised By	Version
2015/01/13	- Preliminary	Brian	1.0
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		. 6	10
		9,7/	100





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## 1. Introduction

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

The 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 WiFi, UART / PCM interface for Bluetooth.

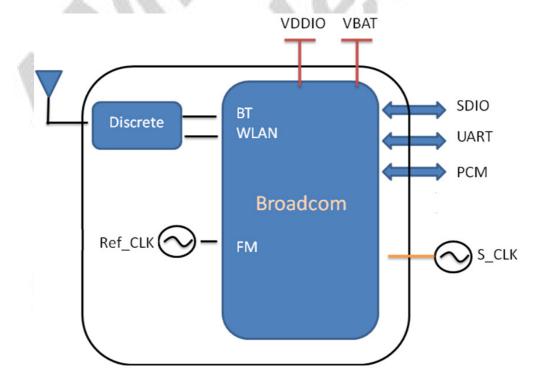
This compact module is a total solution for a combination of WiFi + BT technologies. The module is specifically developed for Smart phones and Portable devices.



## 2. Features

- 802.11b/g/n single-band radio
- Bluetooth V4.0(HS) with integrated Class 1.5 PA and Low Energy (BLE) support
- Concurrent Bluetooth, and WLAN operation
- Simultaneous BT/WLAN receive with single antenna
- WLAN host interface options:
  - SDIO v2.0 up to 50 MHz clock rate
- BT host digital interface:
  - UART (up to 4 Mbps)
- IEEE Co-existence technologies are integrated die solution
- ECI enhanced coexistence support, ability to coordinate BT SCO transmissions around WLAN receives

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 General Specification

Model Name	AP6214	
Product Description	Support WiFi/Bluetooth functionalities	
Dimension	L x W x H: 7 x 7 x 1.5 (typical) mm	
WiFi Interface	SDIOV2.0	
BT Interface	UART / PCM	
Operating temperature	-30 ℃ to 85 ℃	
Storage temperature	-40℃ to 85℃	
Humidity	Operating Humidity 10% to 95% Non-Condensing	

### 4.2 Voltages

### 4.2.1 Absolute Maximum Ratings

Symbol	Description		Max.	Unit
VBAT	Input supply Voltage		5.5	V
VDDIO	Digital/Bluetooth/SDIO/ I/O Voltage		3.6	V

### 4.2.2 Recommended Operating Rating

The module requires two power supplies: VBAT and VDDIO.

		Тур.	Max.	Unit
Operating Temperature	-30	25	85	deg.C
VBAT	3.0	3.6	4.8	V
VDDIO	1.7	3.3	3.6	V



# 5. WiFi RF Specification

## 5.1 2.4GHz RF Specification

Conditions: VBAT=3.6V; VDDIO=3.3V; Temp:25 ℃

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				
Modulation	802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK				
	802.11b /11Mbps : 16 dBm ± 1.5 dB @ EVM ≤ -9dB				
Output Power	802.11g /54Mbps : 15 dBm ± 1.5 dB @ EVM ≤ -25dB				
	802.11n /65Mbps : 14 dBm ± 1.5 dB @ EVM ≤ -28dB				
100	- MCS=0 PER @ -85 dBm, typical				
A 117	- MCS=1 PER @ -84 dBm, typical				
Receive Sensitivity	- MCS=2 PER @ -82 dBm, typical				
(11n,20MHz)	- MCS=3 PER @ -80 dBm, typical				
@10% PER	- MCS=4 PER @ -77 dBm, typical				
@ 10701 211	- MCS=5 PER @ -73 dBm, typical				
W.	- MCS=6 PER @ -71 dBm, typical				
₩.	- MCS=7 PER @ -68 dBm, typical				
	- 6Mbps PER @ -86 dBm, typical				
	- 9Mbps PER @ -85 dBm, typical				
((	- 12Mbps PER @ -85 dBm, typical				
Receive Sensitivity (11g)	- 18Mbps PER @ -83 dBm, typical				
@10% PER	- 24Mbps PER @ -81 dBm, typical				
	- 36Mbps PER @ -78 dBm, typical				
	- 48Mbps PER @ -73 dBm, typical				
" - =	- 54Mbps PER @ -71 dBm, typical				
	- 1Mbps PER @ -90 dBm, typical				
Receive Sensitivity (11b)	- 2Mbps PER @ -88 dBm, typical				
@8% PER	- 5.5Mbps PER @ -87 dBm, typical				
	- 11Mbps PER @ -84 dBm, typical				
Data Rate	802.11b : 1, 2, 5.5, 11Mbps				
Data Hato	802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps				





Data Rate	802.11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps
(20MHz ,Long GI,800ns)	
Data Rate	802.11n : 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65,72.2Mbps
(20MHz ,short GI,400ns)	
Maximum Input Laval	802.11b : -10 dBm
Maximum Input Level	802.11g/n : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain





# 6. Bluetooth Specification

## 6.1 Bluetooth Specification

Conditions: VBAT=3.6V; VDDIO=3.3V; Temp:25 ℃

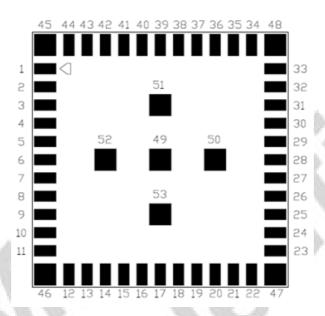
Feature	Description	Description			
General Specification	- 1				
Bluetooth Standard	Bluetooth V4.0	Bluetooth V4.0 of 1, 2 and 3 Mbps.			
Host Interface	UART	UART			
Antenna Reference	Small antennas	with 0~2 dBi peak	gain		
Frequency Band	2402MHz ~ 2480MHz				
Number of Channels	79 channels	79 channels			
Modulation	FHSS, GFSK, [	FHSS, GFSK, DPSK, DQPSK			
RF Specification					
1/40.	Min.	Typical.	Max.		
Output Power (Class 1.5)	100	9 dBm			
Sensitivity @ BER=0.1% for GFSK (1Mbps)	1/1	-86 dBm			
Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps)		-86 dBm			
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-80 dBm			
	GFSK (1Mbps):	-20dBm			
Maximum Input Level	π/4-DQPSK (2N	π/4-DQPSK (2Mbps) :-20dBm			
	8DPSK (3Mbps	) :-20dBm			



# 7. Pin Assignments

### 7.1 Pin Outline

#### < TOP VIEW >



### 7.2 Pin Definition

NO	Name	Туре	Description
1	WL_BT_ANT	I/O	RF I/O port
2	GND	1	Ground connections
3	BT_WAKE	I	HOST wake-up Bluetooth device
4	BT_HOST_WAKE	0	Bluetooth device to wake-up HOST
5	BT_REG_ON	ΙÏ	Bluetooth device enable/disable pin
6	BT_GPIO3	I/O	BLUETOOTH GPIO
7	BT_GPIO4	I/O	BLUETOOTH GPIO
8	BT_GPIO5	I/O	BLUETOOTH GPIO
9	GND	_	Ground connections
10	NC	_	Floating (Don't connected to ground)
11	NC	_	Floating (Don't connected to ground)
12	XTAL_IN	I	For external Crystal option
13	XTAL_OUT	0	For external Crystal option
14	GND	_	Ground connections
15	WL_GPIO3	I/O	WLAN GPIO
16	WL_GPIO4	I/O	WLAN GPIO



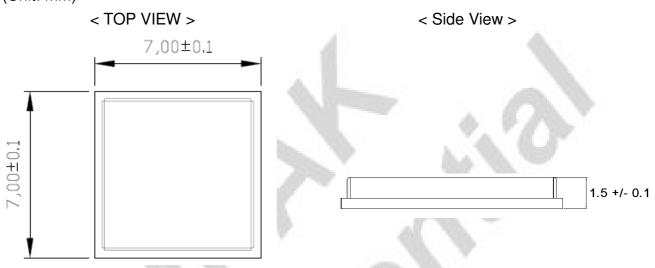
17	WL GPIO2	I/O	WLAN GPIO
18	WL GPIO1	I/O	WLAN GPIO
19	WL_HOST_WAKE	0	WLAN device to wake-up HOST
20	WL REG ON	ı	WLAN device enable/disable pin
21	GND		Ground connections
22	NC		Floating (Don't connected to ground)
23	SDIO DATA CMD	I/O	SDIO command line
24	SDIO DATA CLK	I/O	SDIO clock line
25	SDIO DATA 2	I/O	SDIO data line 2
26	SDIO DATA 0	I/O	SDIO data line 0
27	SDIO DATA 3	I/O	SDIO data line 3
28	SDIO_DATA_1	I/O	SDIO data line 1
29	GND	-	Ground connections
30	VDDIO	Р	I/O Voltage supply input
31	LPO	41	External Low Power Clock input (32.768KHz)
32	VIN_LDO	Р	Internal Buck voltage generation pin
33	VBAT	Р	Main power voltage source input
34	VIN_LDO_OUT	Р	Internal Buck voltage generation pin
35	GND	- 7	Ground connections
36	PCM_CLK	I/O	PCM clock
37	PCM_SYNC	1/0	PCM sync signal
38	PCM_OUT	0	PCM Data output
39	PCM_IN	FIL	PCM data input
40	UART_TXD	0	Bluetooth UART interface
41	UART_RXD	1	Bluetooth UART interface
42	UART_CTS_N	1	Bluetooth UART interface
43	UART_RTS_N	0	Bluetooth UART interface
44	GND	-	Ground connections
45	GND	_	Ground connections
46	GND		Ground connections
47	GND	_	Ground connections
48	GND	_	Ground connections
49	GND	_	Ground connections
50	GND	_	Ground connections
51	GND	_	Ground connections
52	GND	_	Ground connections
53	GND	_	Ground connections



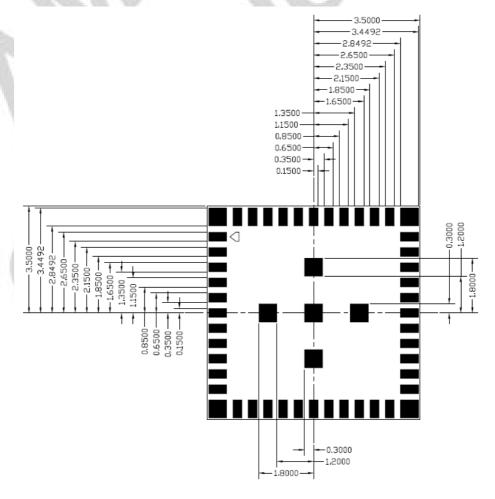
# 8. Dimensions

## 8.1 Physical Dimensions

(Unit: mm)



### < TOP VIEW >

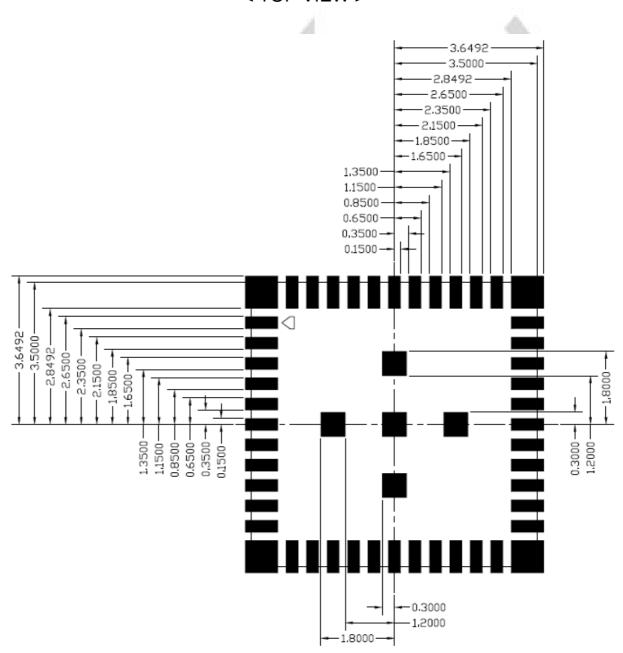




## 8.2 Layout Recommendation

(Unit: mm)

#### < TOP VIEW >





## 9. External clock reference

### 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	- A	
Input impedance	>100k	Ω	
Input impedance	<5	pF	
Clock jitter (integrated over 300Hz – 15KHz)	<1	Hz	
Output high voltage	0.7Vio - Vio	V	

#### External Ref\_CLK signal characteristics

No.	Item	Symb.	Electrical Specification				Remark
NO.			Min.	Туре	Max.	Units	Kemark
1	Nominal Frequency	F0		26.00000 MHz			
2	Mode of Vibration			Fundamental			
3	Frequency Tolerance	△F/F0	-10	-	10	ppm	at 25°C±3°C
4	Operating Temperature Range	Topr	-30	-	85	$^{\circ}\!\mathbb{C}$	
5	Frequency Stability	TC	-10	-	10	ppm	
6	Storage Temperature	T <sub>STG</sub>	-55	-	125	$^{\circ}\!\mathbb{C}$	
7	Load capacitance	CL	-	16		pF	
8	Equivalent Series Resistance	ESR	-	-	50	Ω	
9	Drive Level	DL	-	100	200	μW	
10	Insulation Resistance	IR	500	-	-	ΜΩ	At 100V <sub>DC</sub>
11	Shunt Capacitance	C0	-	-	3	pF	
12	Aging Per Year	Fa	-2	-	2	ppm	First Year

### 9.1 SDIO Pin Description

The module supports SDIO version 2.0 for 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
DATA0	Data Line 0
DATA1	Data Line 1 or Interrupt
DATA2	Data Line 2 or Read Wait
DATA3	Data Line 3
CLK	Clock
CMD	Command Line

# 10. Host Interface Timing Diagram

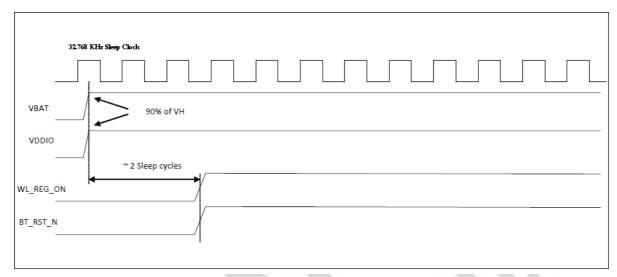
### 10.1 Power-up Sequence Timing Diagram

The module has signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN and internal regulator blocks. These signals are described below.

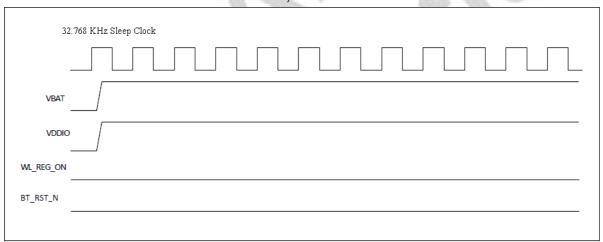
Additionally, diagrams are provided to indicate proper sequencing of the signals for carious operating states. The timing value indicated are minimum required values: longer delays are also acceptable.

- WL\_REG\_ON: Used by the PMU to power up the WLAN section. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset.
- BT\_RST\_N: Low asserting reset for Bluetooth. This pin has no effect on WLAN and
  does not control any PMU functions. This pin must be driven high or low (not left
  floating).

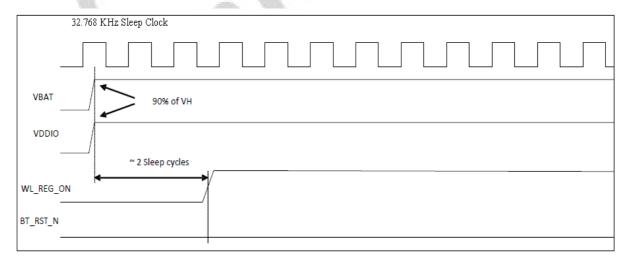




### WLAN=ON, Bluetooth=ON

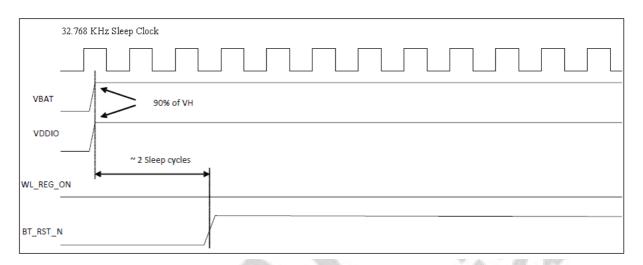


## WLAN=OFF, Bluetooth=OFF



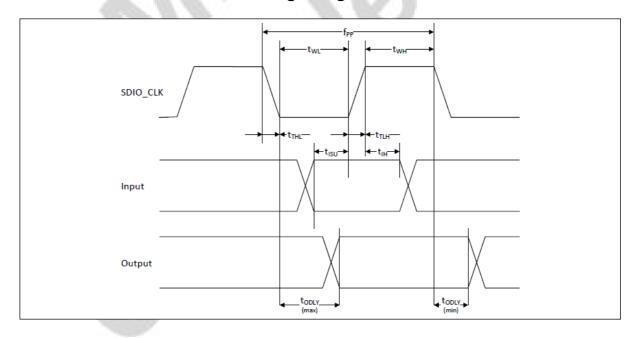
WLAN=ON, Bluetooth=OFF





WLAN=OFF, Bluetooth=ON

## 10.2 SDIO Default Mode Timing Diagram

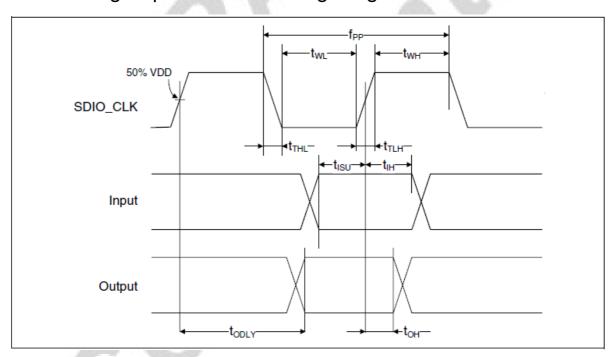




Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are refferred to mini	mum VIH and	d maximum VI	'L <sup>b</sup> )		
Frequency-Data Transfer mode	fPP	0	-	25	MHz
Frequency-Identification mode	fOD	0	-	400	kHz
Clock low time	tWL	10	-	-	ns
Clock high time	tWH	10	-	-	ns
Clock rise time	tTLH	-	-	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.

## 10.3 SDIO High Speed Mode Timing Diagram



Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are refferred to mini	mum VIH and	d maximum VI	L <sup>b</sup> )		
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  $\leq$  40pF load on CMD and Data.

b. min(Vih) = 0.7 x VDDIO and max(ViI) = 0.2 x VDDIO.

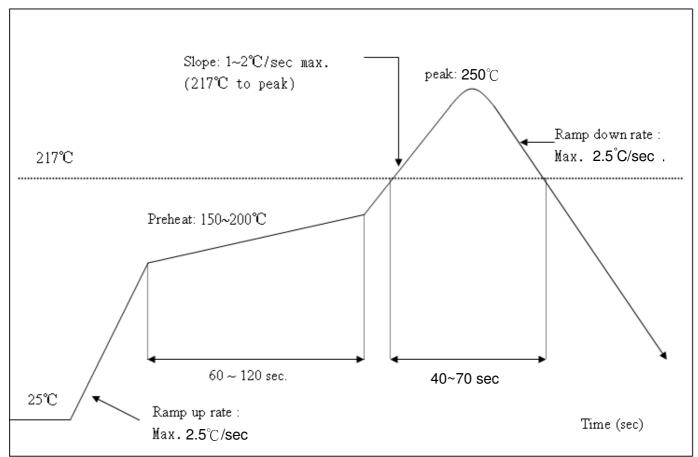
b. min(Vih) = 0.7 x VDDIO and max(ViI) = 0.2 x VDDIO.



## 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature: <250 ℃ Number of Times : ≤2 times





# 12. Package Information

### 12.1Label

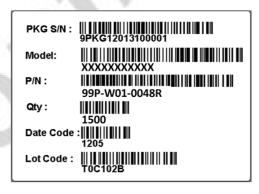
Label A→ Anti-static and humidity notice



#### Label B→ MSL caution / Storage Condition

	Caution This bag contains MOISTURE-SENSITIVE DEVICES H blank, see adjacent
1.	Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
2.	Peak package body temperature:°C
3.	After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
	a) Mounted within: hours of factory conditions  significant bar code label  significant bar code label  significant bar code label
	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 $23\pm5^{\circ}$ C
	b) 3a or 3b are not met
5.	If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure
Ba	ag Seal Date:
	Note: Level and body temperature defined by IPC/JEDEC J-STD-020

#### Label C→ Inner box label.

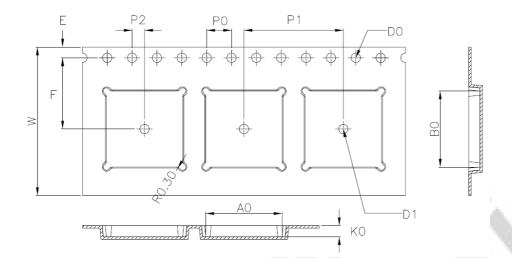


#### Label D→ Carton box label.



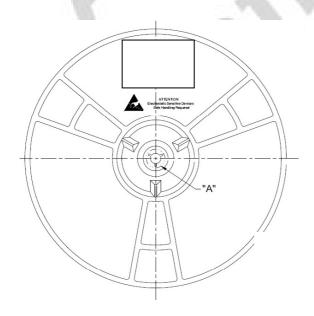


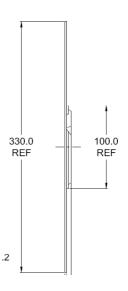
### 12.2 Dimension



W	24.00±0.30
Α0	12.30±0.10
В0	12.30±0.10
K0	1.80±0.10
Ε	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
D1	Ø1.50MIN

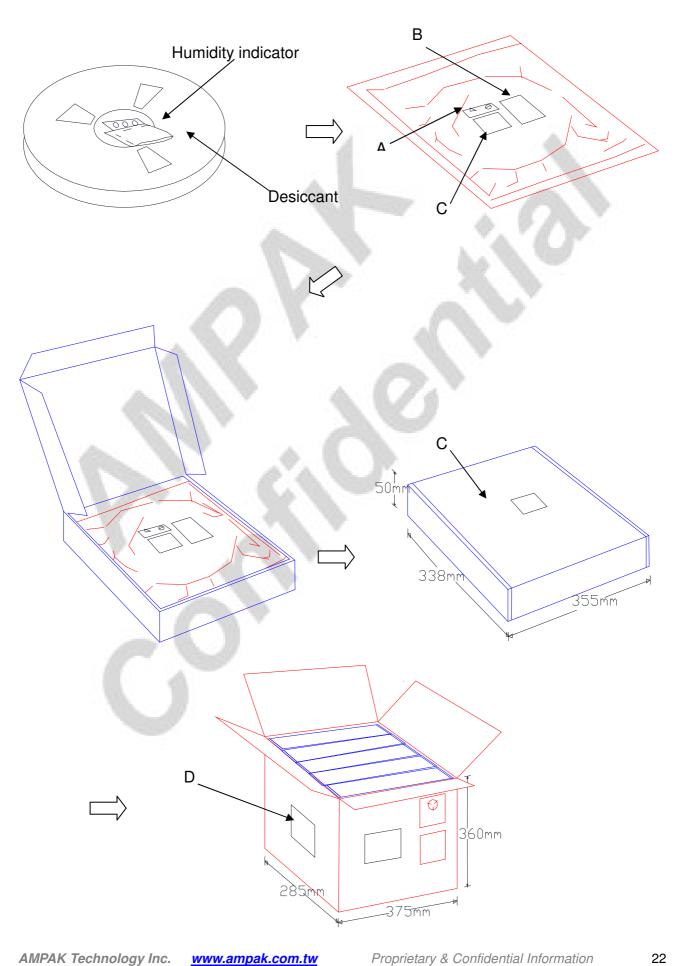
- 1. 10 sprocket hole pitch cumulative tolerance  $\pm 0.20$ .
- 2. Carrier camber is within 1 mm in 250 mm.
- 3. Material: Black Conductive Polystyrene Alloy.
- 4. All dimensions meet EIA-481-D requirements.
- 5. Thickness: 0.30±0.05mm.
- 6. Packing length per 22" reel: 98.5 Meters.(1:3)
- 7. Component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













## 12.3 MSL Level / Storage Condition

Caution This bag contains MOISTURE-SENSITIVE DEVICES  Do not open except under controlled conditions  1. Calculated shelf life in sealed bag: 12 months at < 40°C and
< 90% relative humidity(RH)  225 © 240 © 250 © 260 ©  2. Peak package body temperature:
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°C/60% RH, OR b) Stored at <10% RH
<ol> <li>Devices require bake, before mounting, if:         <ul> <li>a)Humidity Indicator Card is&gt;10%when read at 23±5℃</li> <li>b)3a or 3b not met</li> </ul> </li> </ol>
5. If baking is required, devices may be baked for 24 hours at 125±5°C
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