



正基科技股份有限公司

產品規格書

SPECIFICATION

PRODUCT NAME : AP62X8M

SPEC. NO. : REV : 0.2

DATE : 2017/01/16

PREPARED	REVIEW		APPROVED	DCC ISSUE
	PM	QA		

AMPAK

AP62X8M

2x2 11ac WiFi + Bluetooth4.1
Module Spec Sheet

Revision History

Date	Revision Content	Revised By	Version
2017/01/11	- Preliminary	Richard	0.1
2017/01/16	- Modify Dimension - Modify 2.4GHz HT20 Rx sensitivity	Richard	0.2

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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 Wi-Fi and Bluetooth functionalities. The highly integrated module makes the possibilities of web browsing, VoIP, Bluetooth headsets functional applications and other applications. With seamless roaming capabilities and advanced security, also could interact with different vendors' 802.11a/b/g/n/ac 2x2 Access Points in the wireless LAN.

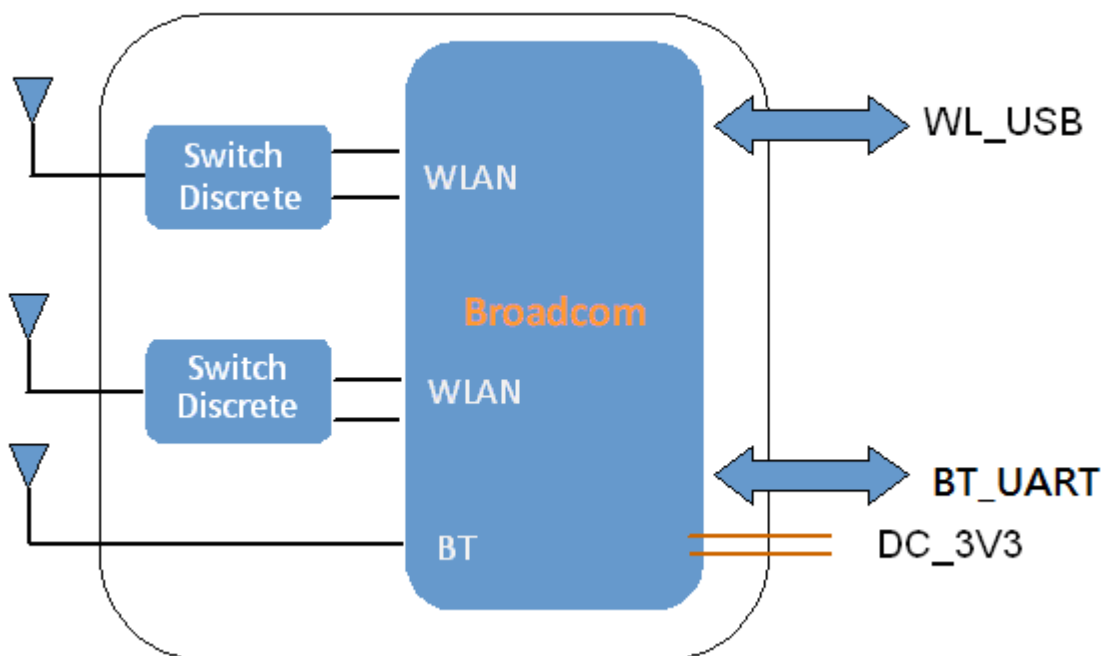
The wireless module complies with IEEE 802.11 a/b/g/n/ac 2x2 standard and it can achieve up to a speed of 867Mbps with dual stream in 802.11n to connect the wireless LAN. The integrated module provides USB interface for Wi-Fi and UART interface for Bluetooth.

This compact module is a total solution for a combination of Wi-Fi + BT technologies. The module is specifically developed for Smart TV and OTT Box application.

2. Features

- Lead Free design which is compliant with ROHS requirements.
- 802.11a/b/g/n/ac dual-band radio with virtual-simultaneous dual-band operation
- Dual-stream spatial multiplexing up to 867 Mbps data rate.
- Supports 20, 40, 80 MHz channels with optional SGI(256 QAM modulation)
- Supports IEEE 802.11 ac/n beam forming.
- Supports IEEE 802.15.2 external coexistence interface to optimize bandwidth utilization with other co-located wireless technologies such as LTE, GPS, or WiMAX.
 - Supports standard USB2.0
- BT host digital interface: high-speed UART(up to 4Mbps)
- Supports extended synchronous connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets.
- Adaptive frequency hopping (AFH) for reducing radio frequency interference.

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	AP62X8M
Product Description	Support WiFi/Bluetooth
Dimension	L x W x H : 27(± 0.1) x 20(± 0.1) x 2.55(± 0.2) (typical) mm
WiFi Interface	USB2.0
BT Interface	UART
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 85°C
Humidity	Operating Humidity 10% to 95% Non-Condensing

4.2 Voltages

4.2.1 Recommended Operating Rating

	Min.	Typ.	Max.	Unit
Operating Temperature	0	25	70	deg.C
VDD33	3.2	3.3	3.6	V

5. WiFi RF Specification

5.1 2.4GHz RF Specification

Conditions : VDD=3.3V ; Temp :25°C

Feature	Description
WLAN Standard	IEEE 802.11a/b/g/n/ac 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
Output Power	802.11b /11Mbps : 15 dBm $\pm$ 1.5 dB @ EVM $\leq$ -9dB
	802.11g /54Mbps : 14 dBm $\pm$ 1.5 dB @ EVM $\leq$ -25dB
	802.11n /MCS0, HT20 : 15 dBm $\pm$ 1.5 dB @ EVM $\leq$ -5dB
	802.11n /MCS7, HT20 : 14 dBm $\pm$ 1.5 dB @ EVM $\leq$ -27dB
	802.11n /MCS0, HT40 : 15 dBm $\pm$ 1.5 dB @ EVM $\leq$ -5dB
	802.11n /MCS7, HT40 : 14 dBm $\pm$ 1.5 dB @ EVM $\leq$ -27dB
RF transmitted Frequency tolerance	+/- 20 ppm (max.)
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -94 dBm, typical
	- 2Mbps PER @ -92 dBm, typical
	- 5.5Mbps PER @ -89 dBm, typical
	- 11Mbps PER @ -88 dBm, typical
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -91 dBm, typical
	- 9Mbps PER @ -90 dBm, typical
	- 12Mbps PER @ -89 dBm, typical
	- 18Mbps PER @ -87 dBm, typical
	- 24Mbps PER @ -84 dBm, typical
	- 36Mbps PER @ -81 dBm, typical
	- 48Mbps PER @ -76 dBm, typical
	- 54Mbps PER @ -74 dBm, typical
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -91 dBm, typical
	- MCS=1 PER @ -88 dBm, typical
	- MCS=2 PER @ -86 dBm, typical
	- MCS=3 PER @ -82 dBm, typical
	- MCS=4 PER @ -79 dBm, typical

	- MCS=5 PER @ -75 dBm, typical
	- MCS=6 PER @ -73 dBm, typical
	- MCS=7 PER @ -71 dBm, typical
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -88 dBm, typical
	- MCS=1 PER @ -85 dBm, typical
	- MCS=2 PER @ -83 dBm, typical
	- MCS=3 PER @ -77 dBm, typical
	- MCS=4 PER @ -73 dBm, typical
	- MCS=5 PER @ -72 dBm, typical
	- MCS=6 PER @ -71 dBm, typical
	- MCS=7 PER @ -69 dBm, typical
Maximum Input Level	802.11b : -10 dBm
	802.11g/n : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

5.2 5GHz RF Specification

Conditions : VDD=3.3V ; Temp:25°C

Feature	Description
WLAN Standard	IEEE 802.11a/n 2x2, WiFi compliant
Frequency Range	4.9 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz : Please see the table ¹
Modulation	802.11a : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11n : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11ac : OFDM /256-QAM
Output Power	802.11a /54Mbps : 14 dBm ± 1.5 dB @ EVM ≤ -25dB
	802.11n /MCS0, HT20 : 14 dBm ± 1.5 dB @ EVM ≤ -5dB
	802.11n /MCS7, HT20 : 13 dBm ± 1.5 dB @ EVM ≤ -27dB
	802.11n /MCS0, HT40 : 14 dBm ± 1.5 dB @ EVM ≤ -5dB
	802.11n /MCS7, HT40 : 13 dBm ± 1.5 dB @ EVM ≤ -27dB
	802.11ac /MCS0, HT20 : 14 dBm ± 1.5 dB @ EVM ≤ -5dB
	802.11ac /MCS8, HT20 : 13 dBm ± 1.5 dB @ EVM ≤ -30dB

	802.11ac /MCS0, HT40 : 14 dBm $\pm$ 1.5 dB @ EVM $\leq$ -5dB
	802.11ac /MCS9, HT40 : 13 dBm $\pm$ 1.5 dB @ EVM $\leq$ -32dB
	802.11ac /MCS0, HT80 : 13 dBm $\pm$ 1.5 dB @ EVM $\leq$ -5dB
	802.11ac /MCS9, HT80 : 11 dBm $\pm$ 1.5 dB @ EVM $\leq$ -32dB
RF transmitted Frequency tolerance	+/- 20 ppm (max.)
SISO Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -90 dBm, typical
	- 9Mbps PER @ -89 dBm, typical
	- 12Mbps PER @ -88 dBm, typical
	- 18Mbps PER @ -85 dBm, typical
	- 24Mbps PER @ -82 dBm, typical
	- 36Mbps PER @ -80 dBm, typical
	- 48Mbps PER @ -74 dBm, typical
	- 54Mbps PER @ -72 dBm, typical
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -90 dBm, typical
	- MCS=1 PER @ -88 dBm, typical
	- MCS=2 PER @ -85 dBm, typical
	- MCS=3 PER @ -82 dBm, typical
	- MCS=4 PER @ -77 dBm, typical
	- MCS=5 PER @ -74 dBm, typical
	- MCS=6 PER @ -72 dBm, typical
	- MCS=7 PER @ -70 dBm, typical
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -87 dBm, typical
	- MCS=1 PER @ -84 dBm, typical
	- MCS=2 PER @ -82 dBm, typical
	- MCS=3 PER @ -79 dBm, typical
	- MCS=4 PER @ -75 dBm, typical
	- MCS=5 PER @ -73 dBm, typical
	- MCS=6 PER @ -70 dBm, typical
	- MCS=7 PER @ -68 dBm, typical
SISO Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0, NSS1 PER @ -88 dBm, typical
	- MCS=1, NSS1 PER @ -86 dBm, typical
	- MCS=2, NSS1 PER @ -84 dBm, typical

	- MCS=3, NSS1 PER @ -81 dBm, typical
	- MCS=4, NSS1 PER @ -77 dBm, typical
	- MCS=5, NSS1 PER @ -74 dBm, typical
	- MCS=6, NSS1 PER @ -73 dBm, typical
	- MCS=7, NSS1 PER @ -70 dBm, typical
	- MCS=8, NSS1 PER @ -66 dBm, typical
SISO Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0, NSS1 PER @ -86 dBm, typical
	- MCS=1, NSS1 PER @ -83 dBm, typical
	- MCS=2, NSS1 PER @ -81 dBm, typical
	- MCS=3, NSS1 PER @ -78 dBm, typical
	- MCS=4, NSS1 PER @ -75 dBm, typical
	- MCS=5, NSS1 PER @ -70 dBm, typical
	- MCS=6, NSS1 PER @ -69 dBm, typical
	- MCS=7, NSS1 PER @ -68 dBm, typical
	- MCS=8, NSS1 PER @ -63 dBm, typical
	- MCS=9, NSS1 PER @ -62 dBm, typical
SISO Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=0, NSS1 PER @ -83 dBm, typical
	- MCS=1, NSS1 PER @ -80 dBm, typical
	- MCS=2, NSS1 PER @ -78 dBm, typical
	- MCS=3, NSS1 PER @ -74 dBm, typical
	- MCS=4, NSS1 PER @ -71 dBm, typical
	- MCS=5, NSS1 PER @ -68 dBm, typical
	- MCS=6, NSS1 PER @ -66 dBm, typical
	- MCS=7, NSS1 PER @ -62 dBm, typical
	- MCS=8, NSS1 PER @ -60 dBm, typical
	- MCS=9, NSS1 PER @ -58 dBm, typical
Maximum Input Level	802.11a/n : -30 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

5GHz(20MHz) Channel table

Band (GHz)	Operating Channel Numbers	Channel center frequencies(MHz)
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320

5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
	140	5700
5.725GHz~5.825GHz	149	5745
	153	5765
	157	5785
	161	5805

6. Bluetooth Specification

6.1 Bluetooth Specification

Conditions : VDD=3.3V ; Temp:25°C

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V4.0 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	79 channels		
Modulation	FHSS, GFSK, DPSK, DQPSK		
RF Specification			
	Min.	Typical.	Max.
Output Power ¹	0	-	10
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-87 dBm	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-89 dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-84 dBm	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

NOTE¹ : Output power can be configured by HCD firmware.

7. Pin Assignments

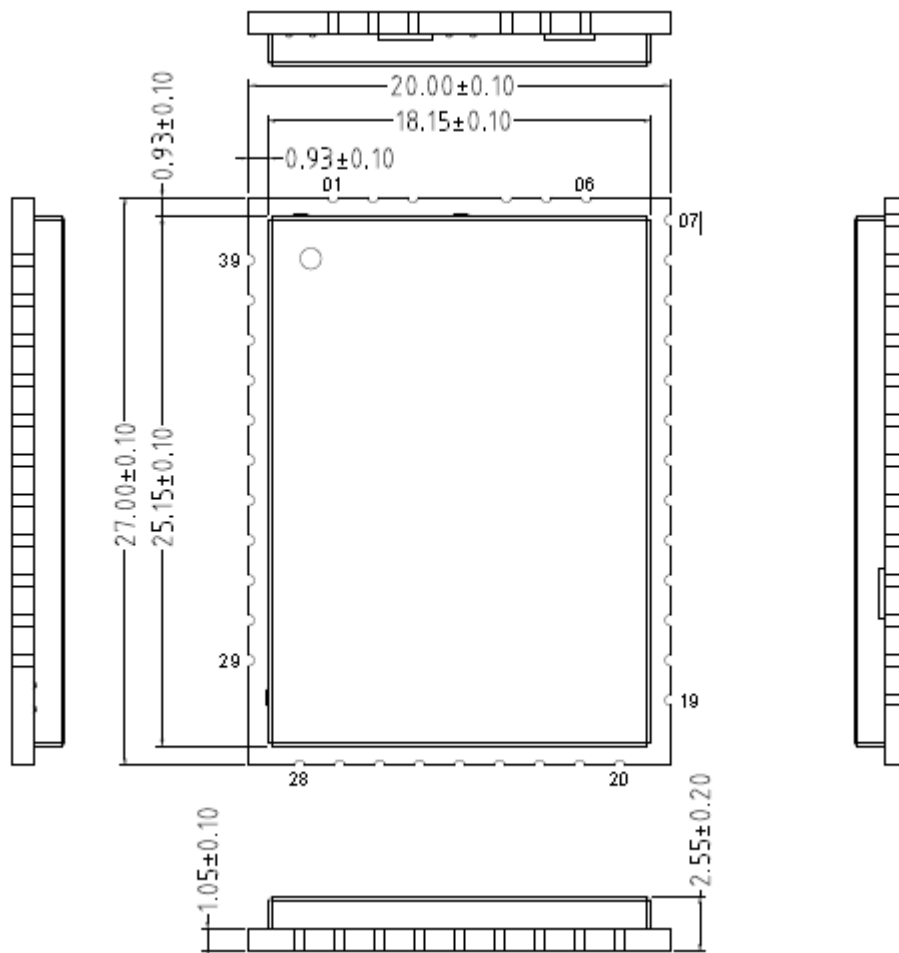
7.1 Pin Out

NO	Name	Type	Description
1	GND	—	Ground connections
2	WL_RF1	I/O	WIFI RF port1
3	GND	—	Ground connections
4	GND	—	Ground connections
5	WL_RF0	I/O	WIFI RF port0
6	GND	—	Ground connections
7	BT_GPIO_2	I/O	BT GPIO
8	BT_VSYNC_OUT	I/O	BT sync from Module to Host(BT_GPIO3)
9	BT_VSYNC_IN	I/O	BT sync from Host to Module (BT_GPIO5)
10	BT_WAKE	I	Wake up BT
11	BT_HOST_WAKE	O	BT wake up HOST
12	BT_UART_TXD	I/O	HCI UART data transmit
13	BT_UART_RXD	I/O	HCI UART data receive
14	BT_UART_CTS_L	I/O	HCI UART clear-to-send(Action low)
15	GND	—	Ground connections
16	BT_RF	I/O	BT RF port
17	GND	—	Ground connections
18	BT_USB_DP	I/O	BT USB data+
19	BT_USB_DM	I/O	BT USB data-
20	WL_GPIO_6	I/O	WL GPIO
21	WL_USB_DM	I/O	WLAN USB data-
22	WL_USB_DP	I/O	WLAN USB data+
23	GND	—	Ground connections
24	GND	—	Ground connections
25	BT_PCM_SYNC	I/O	PCM frame synch.
26	BT_PCM_OUT	I/O	PCM data output.
27	BT_PCM_IN	I/O	PCM data input.
28	BT_PCM_CLK	I/O	PCM clock
29	GND	—	Ground connections
30	BT_REG_ON	I	GPIO Control BT device enabled
31	WL_REG_ON	I	GPIO Control WIFI device enabled
32	GND	—	Ground connections

33	VDD33	I	3.3V Voltage input
34	WL_GPIO_0	I/O	WL GPIO
35	WL_GPIO_1	I/O	WL GPIO
36	BT_UART_RTS_L	I/O	HCI UART request-to-send.(Action low)
37	WL_WAKE_HOST	O	WLAN wake up HOST
38	GND	—	Ground connections
39	GND	—	Ground connections

8. Dimensions

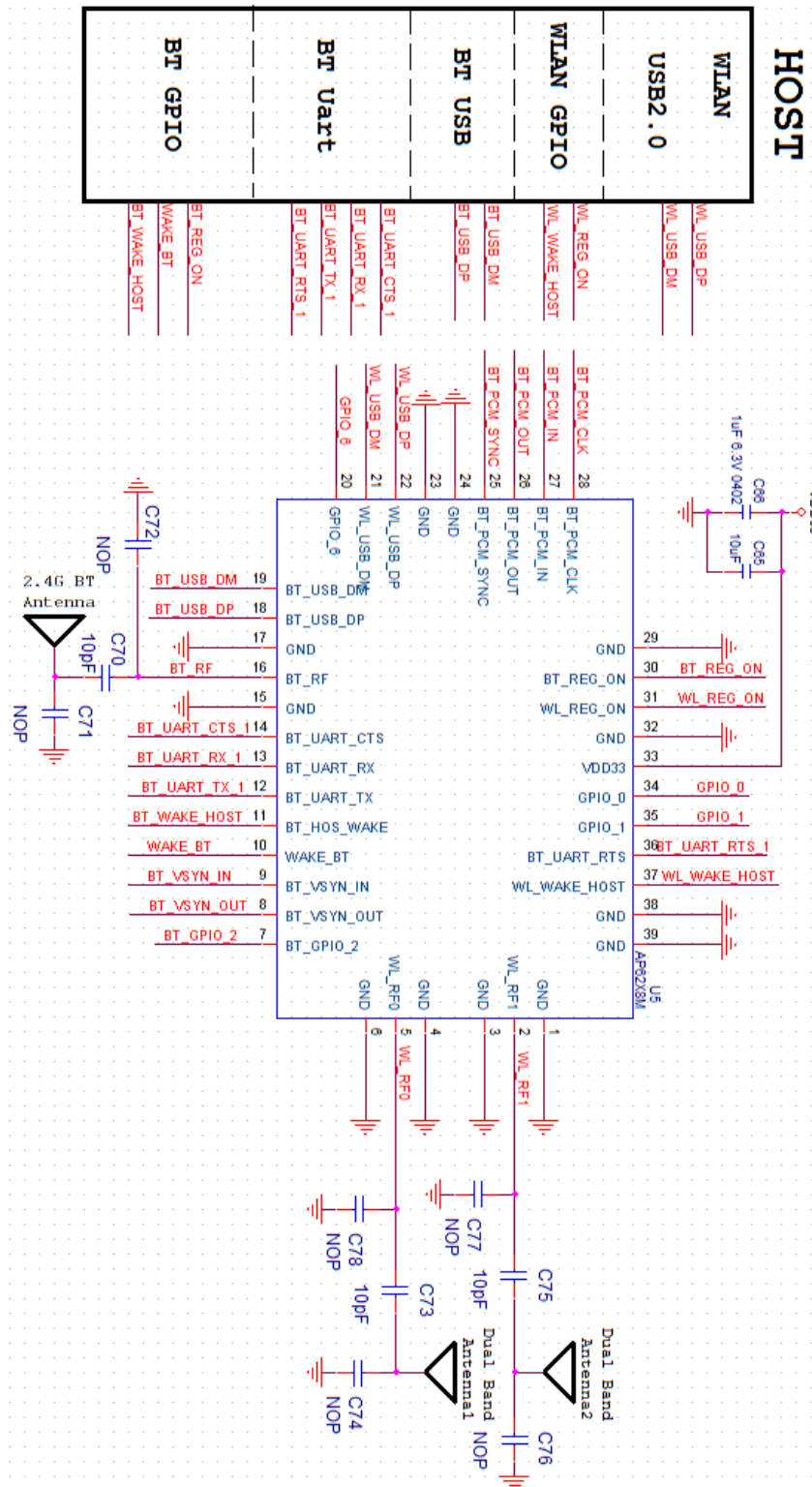
UNIT: mm



9. Recommended Footprint (TBD)

UNIT: mm

10. Reference Design



Note1: USB D+/D- layout trace must be matched 90ohm impedance.

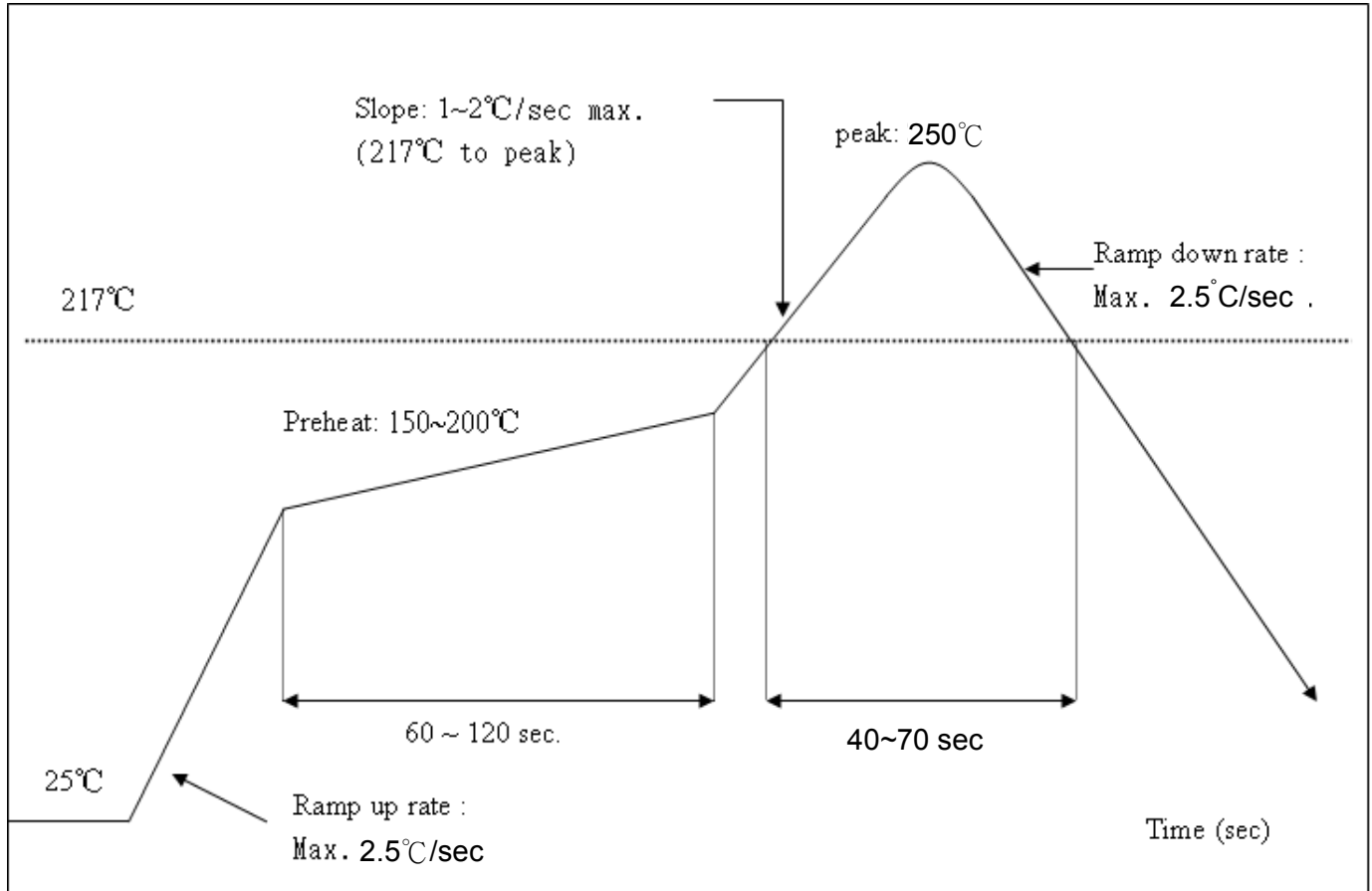
Note2: RF layout trace must be matched 50ohm impedance.

11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



The notification of WiFi module before mounting:

The aperture of stencil should be larger than foot print of module, and the stencil thickness should be not less than 0.12mm.

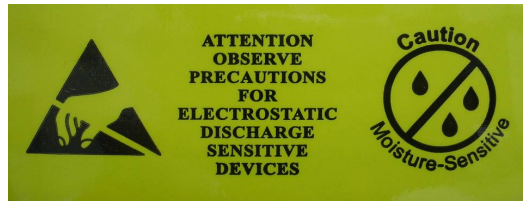
Reflow 時需使用 N2, 含氧量建議 5000 ppm 以下,

It must use N2 for reflow and suggest the concentration of oxygen less than 5000 ppm .

12. Package Information

12.1 Label

Label A→ Anti-static and humidity notice



Label B→ MSL caution / Storage Condition

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

Label C→ Inner box label .

PO:	
AMK DEVICE:	
PKG S/N:	 9PKGXXXXXXXXXX
Model :	 AP6XXX(HF)
P/N:	 99P-W01-0XXXR
Qty :	 1500
Date Code :	 XXXX
Lot Code :	 TXXXXXX

Label D→ Carton box label .

AMPAK Technology	
PO :	
AMK DEVICE:	
Model Name :	 AP6XXX (HF)
Part No.:	 99P-W01-0XXXR
Quantity :	 7500
Lot D/C:	 TXXXXXXX XXXX
Manufacture:	 YYYY/MM/DD

12.2 Dimension (TBD)

12.3 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 $<40^{\circ}\text{C}$ and $<90\%$ relative humidity (RH) 2. Peak package body temperature: <u>250</u> $^{\circ}\text{C}$ 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: <u>72</u> hours of factory conditions If blank, see adjacent bar code label $\leq 30^{\circ}\text{C} / 60\% \text{ RH, or}$ 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 $23 \pm 5^{\circ}\text{C}$ 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