



正基科技股份有限公司

## **SPECIFICATION**

SPEC. NO. : \_\_\_\_\_ REV : 1.1

DATE : 06. 06.2014

PRODUCT NAME : AP6354

|      | APPROVED | CHECKED | PREPARED | DCC ISSUE |
|------|----------|---------|----------|-----------|
| NAME |          |         |          |           |

# AMPAK

## AP6354

2x2 WiFi + Bluetooth4.1  
Module Spec Sheet

# Revision History

| Date       | Revision Content | Revised By | Version |
|------------|------------------|------------|---------|
| 2014/05/08 | -Preliminary     | Brian      | 1.0     |
| 2014/06/06 | -Pin out modify  | Brian      | 1.1     |
|            |                  |            |         |
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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 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.

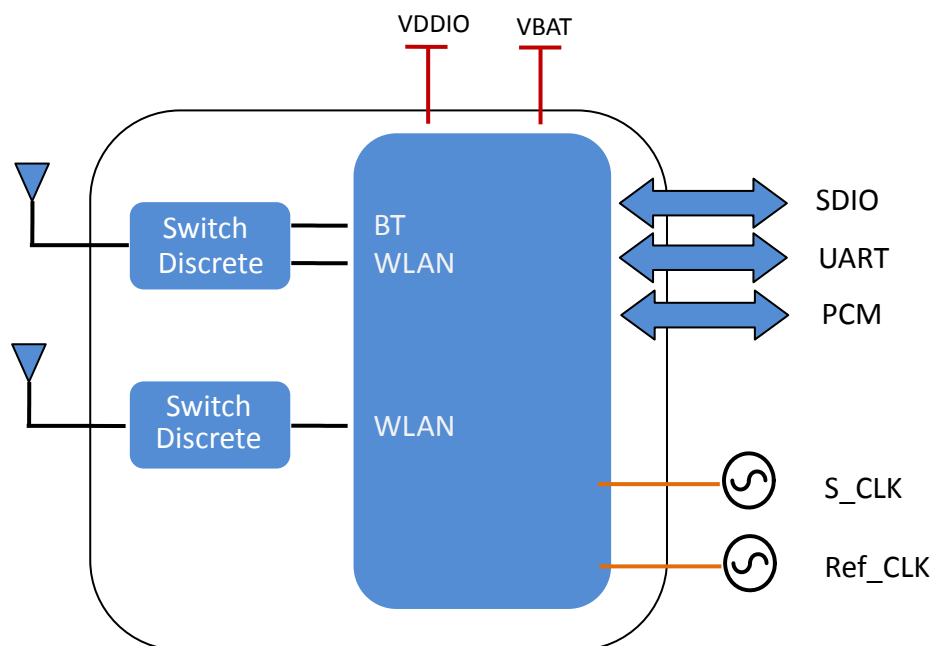
The wireless module complies with IEEE 802.11 a/b/g/n/ac 2x2 MIMO standard and it can achieve up to a speed of 867Mbps with dual stream in 802.11n to connect the wireless LAN. The integrated module provides SDIO interface for WiFi, UART / PCM interface for Bluetooth.

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

- 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 SDIO v3.0 and backward compatible with SDIO v2.0 host interfaces.
  - SDIO v3.0(4-bit) — up to 208 MHz clock rate in SDR104 mode
- BT host digital interface:
  - HCI UART (up to 4 Mbps)
  - PCM for audio data
- Complies with Bluetooth Core Specification Version 4.1 with provisions for supporting future specifications. With Bluetooth Class 1 or Class2 transmitter operation.
- 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            | AP6354                                       |
| Product Description   | Support WiFi/Bluetooth functionalities       |
| Dimension             | L x W x H: 15 x 13 x 1.5 (typical) mm        |
| WiFi Interface        | Support SDIO3.0/2.0                          |
| BT Interface          | UART / PCM                                   |
| Operating temperature | -10°C to 65°C                                |
| Storage temperature   | -40°C to 85°C                                |
| Humidity              | Operating Humidity 10% to 95% Non-Condensing |

### 4.2 Voltages

#### 4.2.1 Absolute Maximum Ratings

| Symbol | Description                         | Min. | Max. | Unit |
|--------|-------------------------------------|------|------|------|
| VBAT   | Input supply Voltage                | -0.5 | 5.5  | V    |
| VDDIO  | Digital/Bluetooth/SDIO/ I/O Voltage | -0.5 | 3.8  | V    |

#### 4.2.2 Recommended Operating Rating

The module requires two power supplies: VBAT and VDDIO.

|                       | Min. | Typ. | Max. | Unit  |
|-----------------------|------|------|------|-------|
| Operating Temperature | -10  | 25   | 65   | deg.C |
| VBAT                  | 3.0  | 3.6  | 4.8  | V     |
| VDDIO                 | 1.7  | -    | 3.6  | V     |

## 5. WiFi RF Specification

### 5.1 2.4GHz RF Specification

Conditions : VBAT=3.6V ; VDDIO=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<br>802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK |
| Output Power                                  | 802.11b /11Mbps : 16 dBm $\pm$ 1.5 dB @ EVM $\leq$ -9dB                     |
|                                               | 802.11g /54Mbps : 15 dBm $\pm$ 1.5 dB @ EVM $\leq$ -25dB                    |
|                                               | 802.11n /MCS7 : 14 dBm $\pm$ 1.5 dB @ EVM $\leq$ -28dB                      |
|                                               | 802.11ac/256-QAM(R=3/4) : 13 dBm $\pm$ 1.5 dB @ EVM $\leq$ -30dB            |
|                                               | 802.11ac/256-QAM(R=5/6) : 11 dBm $\pm$ 1.5 dB @ EVM $\leq$ -32dB            |
| 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 @ -87 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 @ -86 dBm, typical                                             |
|                                               | - 24Mbps PER @ -83 dBm, typical                                             |
|                                               | - 36Mbps PER @ -80 dBm, typical                                             |
|                                               | - 48Mbps PER @ -75 dBm, typical                                             |
|                                               | - 54Mbps PER @ -73 dBm, typical                                             |
| MIMO Receive Sensitivity (11g,20MHz) @10% PER | - 6Mbps PER @ -92 dBm, typical                                              |
|                                               | - 9Mbps PER @ -92 dBm, typical                                              |
|                                               | - 12Mbps PER @ -91 dBm, typical                                             |
|                                               | - 18Mbps PER @ -89 dBm, typical                                             |
|                                               | - 24Mbps PER @ -86 dBm, typical                                             |
|                                               | - 36Mbps PER @ -83 dBm, typical                                             |
|                                               | - 48Mbps PER @ -78 dBm, typical                                             |
|                                               | - 54Mbps PER @ -76 dBm, typical                                             |

|                                                     |               |                        |
|-----------------------------------------------------|---------------|------------------------|
| SISO Receive<br>Sensitivity (11n,20MHz)<br>@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 @ -74 dBm, typical |
|                                                     | - MCS=6       | PER @ -73 dBm, typical |
|                                                     | - MCS=7       | PER @ -71 dBm, typical |
| MIMO Receive<br>Sensitivity (11n,20MHz)<br>@10% PER | - MCS=0       | PER @ -92 dBm, typical |
|                                                     | - MCS=1       | PER @ -91 dBm, typical |
|                                                     | - MCS=2       | PER @ -89 dBm, typical |
|                                                     | - MCS=3       | PER @ -86 dBm, typical |
|                                                     | - MCS=4       | PER @ -82 dBm, typical |
|                                                     | - MCS=5       | PER @ -77 dBm, typical |
|                                                     | - MCS=6       | PER @ -75 dBm, typical |
|                                                     | - MCS=7       | PER @ -74 dBm, typical |
|                                                     | - MCS=8       | PER @ -89 dBm, typical |
|                                                     | - MCS=15      | PER @ -70 dBm, typical |
| SISO Receive<br>Sensitivity (11n,40MHz)<br>@10% PER | - MCS=0       | PER @ -88 dBm, typical |
|                                                     | - MCS=1       | PER @ -85 dBm, typical |
|                                                     | - MCS=2       | PER @ -83 dBm, typical |
|                                                     | - MCS=3       | PER @ -80 dBm, typical |
|                                                     | - MCS=4       | PER @ -76 dBm, typical |
|                                                     | - MCS=5       | PER @ -72 dBm, typical |
|                                                     | - MCS=6       | PER @ -70 dBm, typical |
|                                                     | - MCS=7       | PER @ -69 dBm, typical |
| MIMO Receive<br>Sensitivity (11n,40MHz)<br>@10% PER | - MCS=0       | PER @ -90 dBm, typical |
|                                                     | - MCS=1       | PER @ -88 dBm, typical |
|                                                     | - MCS=2       | PER @ -86 dBm, typical |
|                                                     | - MCS=3       | PER @ -83 dBm, typical |
|                                                     | - MCS=4       | PER @ -79 dBm, typical |
|                                                     | - MCS=5       | PER @ -75 dBm, typical |
|                                                     | - MCS=6       | PER @ -73 dBm, typical |
|                                                     | - MCS=7       | PER @ -72 dBm, typical |
|                                                     | - MCS=8       | PER @ -88 dBm, typical |
|                                                     | - MCS=15      | PER @ -69 dBm, typical |
| SISO Receive                                        | - MCS=0, NSS1 | PER @ -90 dBm, typical |

|                                                         |                                      |
|---------------------------------------------------------|--------------------------------------|
| Sensitivity<br>(11ac,20MHz) @10%<br>PER                 | - MCS=1, NSS1 PER @ -87 dBm, typical |
|                                                         | - MCS=2, NSS1 PER @ -86 dBm, typical |
|                                                         | - MCS=3, NSS1 PER @ -82 dBm, typical |
|                                                         | - MCS=4, NSS1 PER @ -79 dBm, typical |
|                                                         | - MCS=5, NSS1 PER @ -74 dBm, typical |
|                                                         | - MCS=6, NSS1 PER @ -72 dBm, typical |
|                                                         | - MCS=7, NSS1 PER @ -71 dBm, typical |
|                                                         | - MCS=8, NSS1 PER @ -68 dBm, typical |
| MIMO Receive<br>Sensitivity<br>(11ac,20MHz) @10%<br>PER | - MCS=0, NSS1 PER @ -90 dBm, typical |
|                                                         | - MCS=1, NSS1 PER @ -89 dBm, typical |
|                                                         | - MCS=2, NSS1 PER @ -88 dBm, typical |
|                                                         | - MCS=3, NSS1 PER @ -85 dBm, typical |
|                                                         | - MCS=4, NSS1 PER @ -82 dBm, typical |
|                                                         | - MCS=5, NSS1 PER @ -77 dBm, typical |
|                                                         | - MCS=6, NSS1 PER @ -76 dBm, typical |
|                                                         | - MCS=7, NSS1 PER @ -74 dBm, typical |
|                                                         | - MCS=8, NSS1 PER @ -70 dBm, typical |
|                                                         | - MCS=0, NSS2 PER @ -90 dBm, typical |
|                                                         | - MCS=8, NSS2 PER @ -66 dBm, typical |
| SISO Receive<br>Sensitivity<br>(11ac,40MHz) @10%<br>PER | - MCS=0, NSS1 PER @ -87 dBm, typical |
|                                                         | - MCS=1, NSS1 PER @ -85 dBm, typical |
|                                                         | - MCS=2, NSS1 PER @ -83 dBm, typical |
|                                                         | - MCS=3, NSS1 PER @ -80 dBm, typical |
|                                                         | - MCS=4, NSS1 PER @ -76 dBm, typical |
|                                                         | - MCS=5, NSS1 PER @ -72 dBm, typical |
|                                                         | - MCS=6, NSS1 PER @ -70 dBm, typical |
|                                                         | - MCS=7, NSS1 PER @ -69 dBm, typical |
|                                                         | - MCS=8, NSS1 PER @ -64 dBm, typical |
|                                                         | - MCS=9, NSS1 PER @ -63 dBm, typical |
| MIMO Receive<br>Sensitivity<br>(11ac,40MHz) @10%<br>PER | - MCS=0, NSS1 PER @ -89 dBm, typical |
|                                                         | - MCS=1, NSS1 PER @ -88 dBm, typical |
|                                                         | - MCS=2, NSS1 PER @ -86 dBm, typical |
|                                                         | - MCS=3, NSS1 PER @ -83 dBm, typical |
|                                                         | - MCS=4, NSS1 PER @ -78 dBm, typical |
|                                                         | - MCS=5, NSS1 PER @ -75 dBm, typical |
|                                                         | - MCS=6, NSS1 PER @ -73 dBm, typical |
|                                                         | - MCS=7, NSS1 PER @ -72 dBm, typical |

|                     |                                       |
|---------------------|---------------------------------------|
|                     | - MCS=8, NSS1 PER @ -68 dBm, typical  |
|                     | - MCS=9, NSS1 PER @ -66 dBm, typical  |
|                     | - MCS=0, NSS2 PER @ -87 dBm, typical  |
|                     | - MCS=9, NSS2 PER @ -62 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 : VBAT=3.6V ; VDDIO=3.3V ; Temp:25°C

| Feature                                          | Description                                                                                                        |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| WLAN Standard                                    | IEEE 802.11a/n 2x2, WiFi compliant                                                                                 |
| Frequency Range                                  | 4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)                                                                           |
| Number of Channels                               | 5.0GHz : Please see the table <sup>1</sup>                                                                         |
| Modulation                                       | 802.11a : OFDM /64-QAM,16-QAM, QPSK, BPSK<br>802.11n : OFDM /64-QAM,16-QAM, QPSK, BPSK<br>802.11ac : OFDM /256-QAM |
| Output Power                                     | 802.11a /54Mbps : 13 dBm $\pm$ 1.5 dB @ EVM $\leq$ -25dB                                                           |
|                                                  | 802.11n /MCS7 : 12 dBm $\pm$ 1.5 dB @ EVM $\leq$ -28dB                                                             |
|                                                  | 802.11ac /MCS9 : 10 dBm $\pm$ 1.5 dB @ EVM $\leq$ -32dB                                                            |
| SISO Receive Sensitivity<br>(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 @ -79 dBm, typical                                                                                    |
|                                                  | - 48Mbps PER @ -74 dBm, typical                                                                                    |
|                                                  | - 54Mbps PER @ -72 dBm, typical                                                                                    |

|                                                  |          |                        |
|--------------------------------------------------|----------|------------------------|
| MIMO Receive Sensitivity<br>(11a,20MHz) @10% PER | - 6Mbps  | PER @ -91 dBm, typical |
|                                                  | - 9Mbps  | PER @ -91 dBm, typical |
|                                                  | - 12Mbps | PER @ -90 dBm, typical |
|                                                  | - 18Mbps | PER @ -88 dBm, typical |
|                                                  | - 24Mbps | PER @ -85 dBm, typical |
|                                                  | - 36Mbps | PER @ -82 dBm, typical |
|                                                  | - 48Mbps | PER @ -77 dBm, typical |
|                                                  | - 54Mbps | PER @ -73 dBm, typical |
| SISO Receive Sensitivity<br>(11n,20MHz) @10% PER | - MCS=0  | PER @ -90 dBm, typical |
|                                                  | - MCS=1  | PER @ -87 dBm, typical |
|                                                  | - MCS=2  | PER @ -85 dBm, typical |
|                                                  | - MCS=3  | PER @ -82 dBm, typical |
|                                                  | - MCS=4  | PER @ -78 dBm, typical |
|                                                  | - MCS=5  | PER @ -73 dBm, typical |
|                                                  | - MCS=6  | PER @ -72 dBm, typical |
|                                                  | - MCS=7  | PER @ -70 dBm, typical |
| MIMO Receive Sensitivity<br>(11n,20MHz) @10% PER | - MCS=0  | PER @ -91 dBm, typical |
|                                                  | - MCS=1  | PER @ -90 dBm, typical |
|                                                  | - MCS=2  | PER @ -88 dBm, typical |
|                                                  | - MCS=3  | PER @ -85 dBm, typical |
|                                                  | - MCS=4  | PER @ -81 dBm, typical |
|                                                  | - MCS=5  | PER @ -76 dBm, typical |
|                                                  | - MCS=6  | PER @ -75 dBm, typical |
|                                                  | - MCS=7  | PER @ -73 dBm, typical |
|                                                  | - MCS=8  | PER @ -90 dBm, typical |
|                                                  | - MCS=15 | PER @ -70 dBm, typical |
| SISO Receive Sensitivity<br>(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 @ -71 dBm, typical |
|                                                  | - MCS=6  | PER @ -69 dBm, typical |
|                                                  | - MCS=7  | PER @ -68 dBm, typical |
| MIMO Receive Sensitivity<br>(11n,40MHz) @10% PER | - MCS=0  | PER @ -89 dBm, typical |
|                                                  | - MCS=1  | PER @ -87 dBm, typical |
|                                                  | - MCS=2  | PER @ -85 dBm, typical |

|                                                   |                                      |
|---------------------------------------------------|--------------------------------------|
|                                                   | - MCS=3 PER @ -82 dBm, typical       |
|                                                   | - MCS=4 PER @ -78 dBm, typical       |
|                                                   | - MCS=5 PER @ -74 dBm, typical       |
|                                                   | - MCS=6 PER @ -72 dBm, typical       |
|                                                   | - MCS=7 PER @ -71 dBm, typical       |
|                                                   | - MCS=8 PER @ -87 dBm, typical       |
|                                                   | - MCS=15 PER @ -68 dBm, typical      |
| SISO Receive Sensitivity<br>(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 @ -72 dBm, typical |
|                                                   | - MCS=6, NSS1 PER @ -71 dBm, typical |
|                                                   | - MCS=7, NSS1 PER @ -70 dBm, typical |
|                                                   | - MCS=8, NSS1 PER @ -66 dBm, typical |
| MIMO Receive Sensitivity<br>(11ac,20MHz) @10% PER | - MCS=0, NSS1 PER @ -90 dBm, typical |
|                                                   | - MCS=1, NSS1 PER @ -89 dBm, typical |
|                                                   | - MCS=2, NSS1 PER @ -87 dBm, typical |
|                                                   | - MCS=3, NSS1 PER @ -84 dBm, typical |
|                                                   | - MCS=4, NSS1 PER @ -80 dBm, typical |
|                                                   | - MCS=5, NSS1 PER @ -75 dBm, typical |
|                                                   | - MCS=6, NSS1 PER @ -74 dBm, typical |
|                                                   | - MCS=7, NSS1 PER @ -73 dBm, typical |
|                                                   | - MCS=8, NSS1 PER @ -69 dBm, typical |
|                                                   | - MCS=0, NSS2 PER @ -89 dBm, typical |
|                                                   | - MCS=8, NSS2 PER @ -65 dBm, typical |
| SISO Receive Sensitivity<br>(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 |

|                                                   |                                      |
|---------------------------------------------------|--------------------------------------|
| MIMO Receive Sensitivity<br>(11ac,40MHz) @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 @ -78 dBm, typical |
|                                                   | - MCS=5, NSS1 PER @ -73 dBm, typical |
|                                                   | - MCS=6, NSS1 PER @ -72 dBm, typical |
|                                                   | - MCS=7, NSS1 PER @ -71 dBm, typical |
|                                                   | - MCS=8, NSS1 PER @ -66 dBm, typical |
|                                                   | - MCS=9, NSS1 PER @ -65 dBm, typical |
|                                                   | - MCS=0, NSS2 PER @ -86 dBm, typical |
|                                                   | - MCS=9, NSS2 PER @ -61 dBm, typical |
| SISO Receive Sensitivity<br>(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 @ -64 dBm, typical |
|                                                   | - MCS=9, NSS1 PER @ -60 dBm, typical |
|                                                   | - MCS=9, NSS1 PER @ -58 dBm, typical |
| MIMO Receive Sensitivity<br>(11ac,80MHz) @10% PER | - MCS=0, NSS1 PER @ -84 dBm, typical |
|                                                   | - MCS=1, NSS1 PER @ -83 dBm, typical |
|                                                   | - MCS=2, NSS1 PER @ -81 dBm, typical |
|                                                   | - MCS=3, NSS1 PER @ -77 dBm, typical |
|                                                   | - MCS=4, NSS1 PER @ -74 dBm, typical |
|                                                   | - MCS=5, NSS1 PER @ -71 dBm, typical |
|                                                   | - MCS=6, NSS1 PER @ -69 dBm, typical |
|                                                   | - MCS=7, NSS1 PER @ -67 dBm, typical |
|                                                   | - MCS=8, NSS1 PER @ -63 dBm, typical |
|                                                   | - MCS=9, NSS1 PER @ -61 dBm, typical |
| Maximum Input Level                               | 802.11a/n : -30 dBm                  |
|                                                   | Antenna Reference                    |
| Small antennas with 0~2 dBi peak gain             |                                      |

<sup>1</sup>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                            |
|                   | 149                       | 5745                            |
| 5.725GHz~5.825GHz | 153                       | 5765                            |
|                   | 157                       | 5785                            |
|                   | 161                       | 5805                            |

## 6. Bluetooth Specification

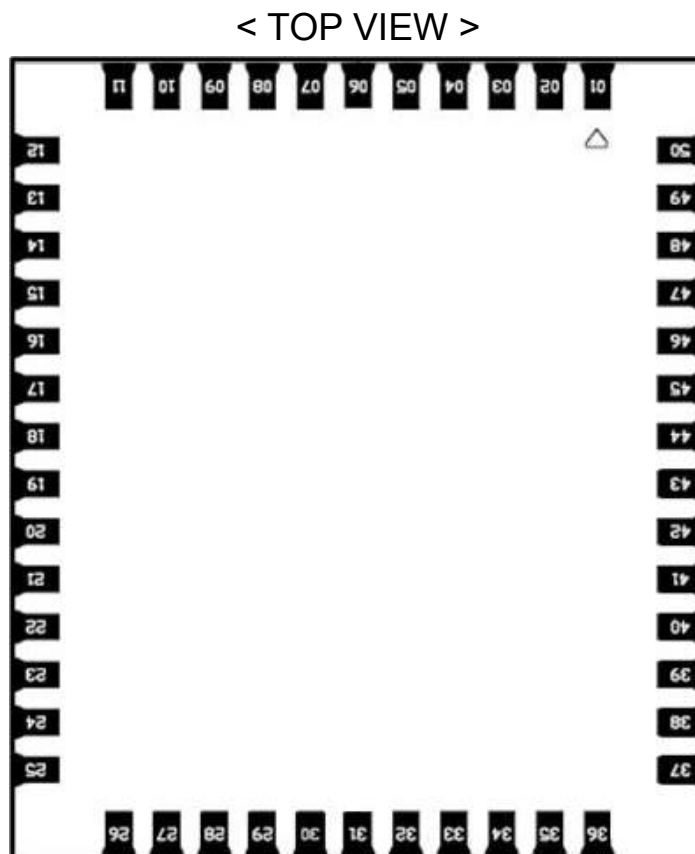
### 6.1 Bluetooth Specification

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

| Feature                                               | Description                           |          |      |
|-------------------------------------------------------|---------------------------------------|----------|------|
| <b>General Specification</b>                          |                                       |          |      |
| Bluetooth Standard                                    | Bluetooth V4.1 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               |          |      |
| <b>RF Specification</b>                               |                                       |          |      |
|                                                       | Min.                                  | Typical. | Max. |
| Output Power (Class 1.5)                              |                                       | 10 dBm   |      |
| Output Power (Class 2)                                |                                       | 2 dBm    |      |
| Sensitivity @ BER=0.1%<br>for GFSK (1Mbps)            |                                       | -86 dBm  |      |
| Sensitivity @ BER=0.01%<br>for $\pi/4$ -DQPSK (2Mbps) |                                       | -86 dBm  |      |
| Sensitivity @ BER=0.01%<br>for 8DPSK (3Mbps)          |                                       | -80 dBm  |      |
| Maximum Input Level                                   | GFSK (1Mbps):-20dBm                   |          |      |
|                                                       | $\pi/4$ -DQPSK (2Mbps) :-20dBm        |          |      |
|                                                       | 8DPSK (3Mbps) :-20dBm                 |          |      |

## 7. Pin Assignments

### 7.1 Pin Outline



### 7.2 Pin Definition

| NO | Name       | Type | Description                          |
|----|------------|------|--------------------------------------|
| 1  | GND        | —    | Ground connections                   |
| 2  | WL/BT_ANT0 | I/O  | RF I/O port0                         |
| 3  | GND        | —    | Ground connections                   |
| 4  | GND        | —    | Ground connections                   |
| 5  | GND        | —    | Ground connections                   |
| 6  | GND        | —    | Ground connections                   |
| 7  | GND        | —    | Ground connections                   |
| 8  | GND        | —    | Ground connections                   |
| 9  | WL_ANT1    | I/O  | RF I/O port1                         |
| 10 | GND        | —    | Ground connections                   |
| 11 | GND        | —    | Ground connections                   |
| 12 | NC         | —    | Floating (Don't connected to ground) |
| 13 | XTAL_OUT   | O    | External Crystal out                 |

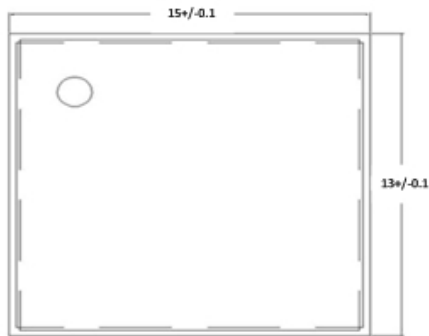
|    |               |     |                                             |
|----|---------------|-----|---------------------------------------------|
| 14 | XTAL_IN       | I   | External Crystal in/ Single clock source in |
| 15 | WL_REG_ON     | I   | Low asserting reset for WiFi core           |
| 16 | WL_HOST_WAKE  | O   | WLAN to wake-up HOST                        |
| 17 | SDIO_DATA_CMD | I/O | SDIO command line                           |
| 18 | SDIO_DATA_CLK | I/O | SDIO clock line                             |
| 19 | SDIO_DATA_3   | I/O | SDIO data line 3                            |
| 20 | SDIO_DATA_2   | I/O | SDIO data line 2                            |
| 21 | SDIO_DATA_0   | I/O | SDIO data line 0                            |
| 22 | SDIO_DATA_1   | I/O | SDIO data line 1                            |
| 23 | GND           | —   | Ground connections                          |
| 24 | NC            | —   | Floating (Don't connected to ground)        |
| 25 | VIN_LDO       | P   | Internal Buck voltage generation pin        |
| 26 | VIN_LDO_OUT   | P   | Internal Buck voltage generation pin        |
| 27 | PCM_SYNC      | I/O | PCM sync signal                             |
| 28 | PCM_IN        | I   | PCM data input                              |
| 29 | PCM_OUT       | O   | PCM Data output                             |
| 30 | PCM_CLK       | I/O | PCM clock                                   |
| 31 | LPO           | I   | External Low Power Clock input (32.768KHz)  |
| 32 | GND           | —   | Ground connections                          |
| 33 | NC            | —   | Floating (Don't connected to ground)        |
| 34 | VDDIO         | P   | I/O Voltage supply input                    |
| 35 | NC            | —   | Floating (Don't connected to ground)        |
| 36 | VBAT          | P   | Main power voltage source input             |
| 37 | NC            | —   | Floating (Don't connected to ground)        |
| 38 | BT_REG_ON     | I   | Low asserting reset for Bluetooth core      |
| 39 | GND           | —   | Ground connections                          |
| 40 | UART_TXD      | O   | Bluetooth UART interface                    |
| 41 | UART_RXD      | I   | Bluetooth UART interface                    |
| 42 | UART_RTS_N    | O   | Bluetooth UART interface                    |
| 43 | UART_CTS_N    | I   | Bluetooth UART interface                    |
| 44 | NC            | —   | Floating (Don't connected to ground)        |
| 45 | NC            | —   | Floating (Don't connected to ground)        |
| 46 | NC            | —   | Floating (Don't connected to ground)        |
| 47 | NC            | —   | Floating (Don't connected to ground)        |
| 48 | NC            | —   | Floating (Don't connected to ground)        |
| 49 | BT_WAKE       | I   | HOST wake-up Bluetooth device               |
| 50 | BT_HOST_WAKE  | O   | Bluetooth device to wake-up HOST            |

# 8. Dimensions

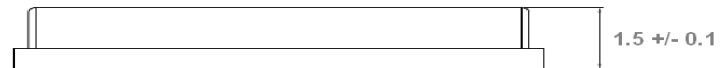
## 8.1 Physical Dimensions

(Unit: mm)

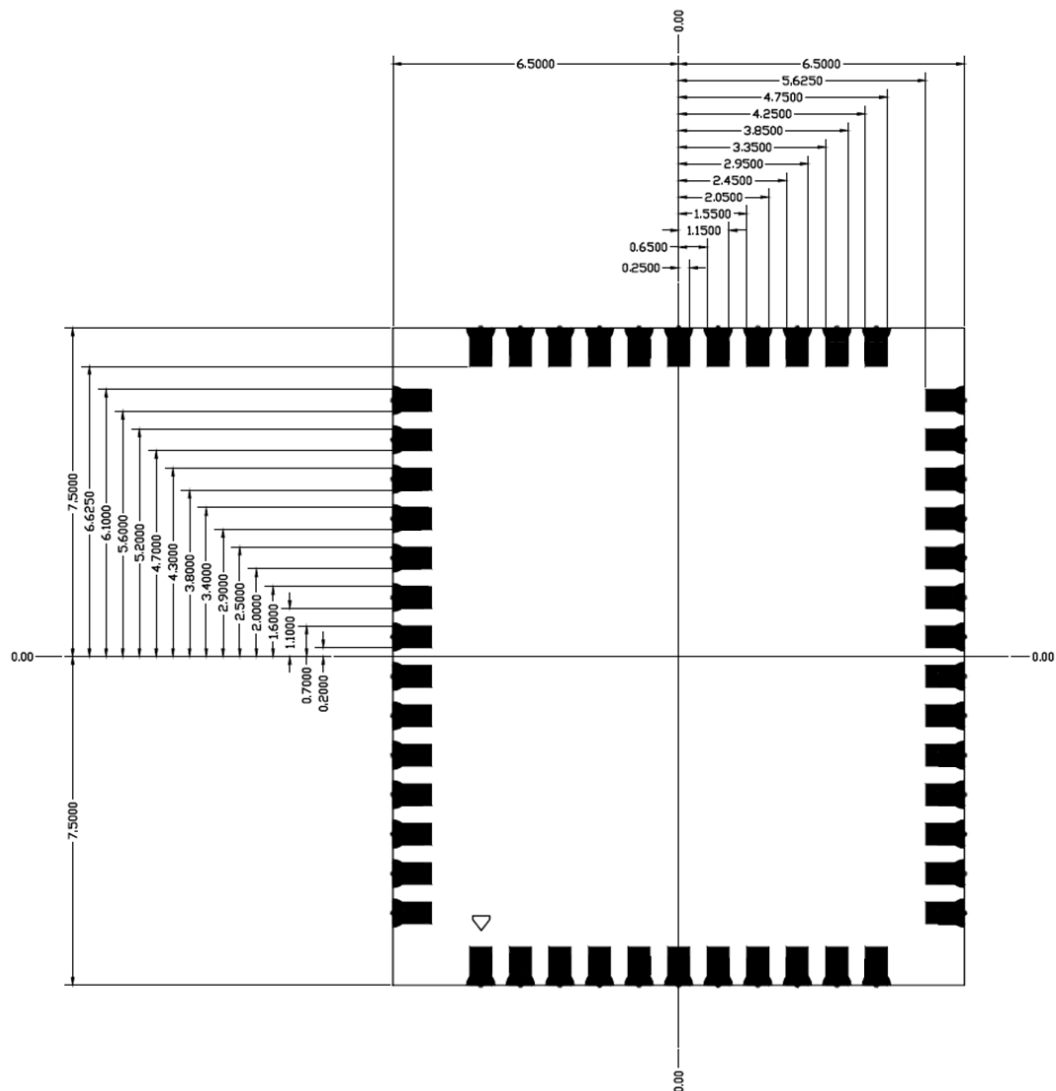
< TOP VIEW >



< Side View >



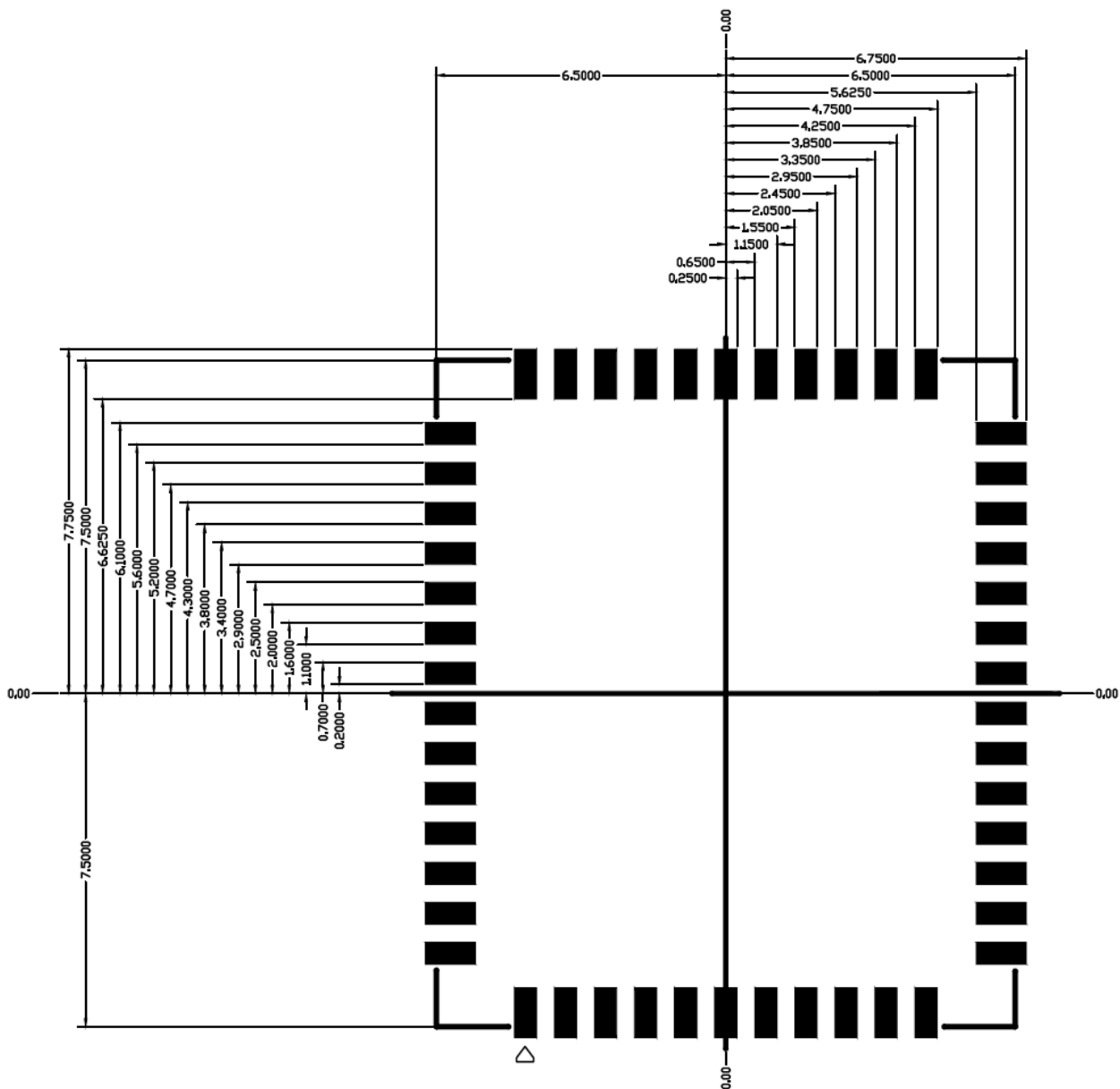
< TOP VIEW >



## 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                           | $\pm 30$                             | ppm      |
| Duty cycle                                   | 30 - 70                              | %        |
| Input signal amplitude                       | 1600 to 3300                         | mV, p-p  |
| Signal type                                  | Square-wave or sine-wave             | -        |
| Input impedance                              | >100k                                | $\Omega$ |
|                                              | <5                                   | pF       |
| Clock jitter (integrated over 300Hz – 15KHz) | <1                                   | Hz       |
| Output high voltage                          | 0.7V <sub>io</sub> - V <sub>io</sub> | V        |

### 9.1 SDIO Pin Description

The module supports SDIO version 3.0 for all 1.8V 4-bit UHSI speeds: SDR50(100 Mbps),SDR104(208MHz) and DDR50(50MHz, dual rates) in addition to the 3.3V default speed(25MHz) and high speed (50 MHz). 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             |

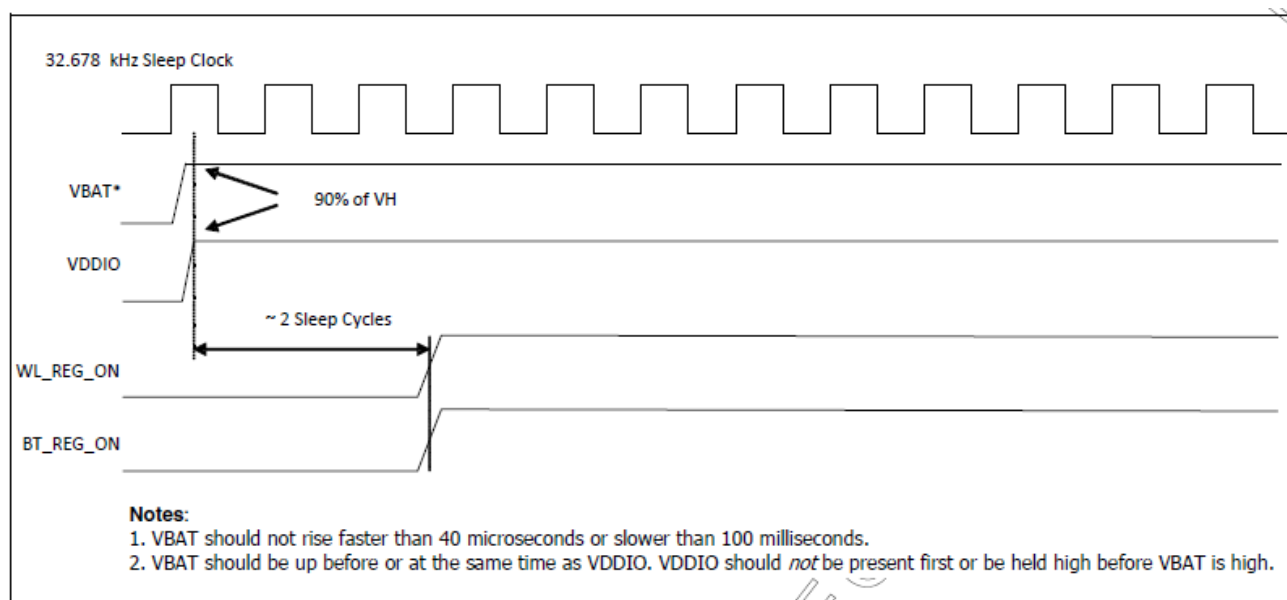
# 10. Host Interface Timing Diagram

## 10.1 Power-up Sequence Timing Diagram

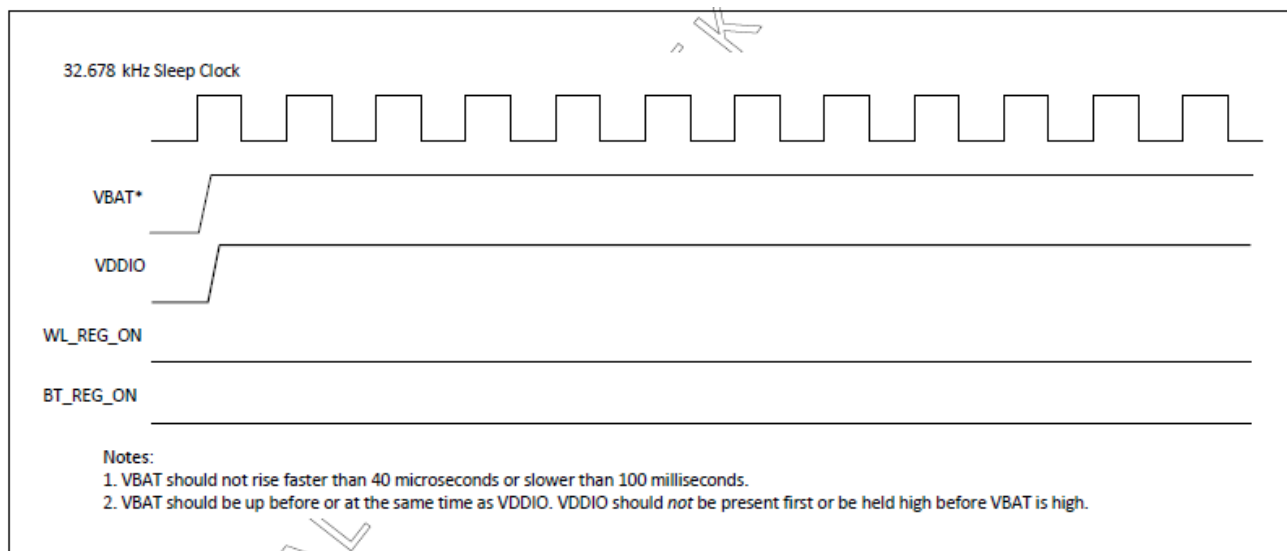
The module has signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN and internal regulator blocks. These signals are described below.

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

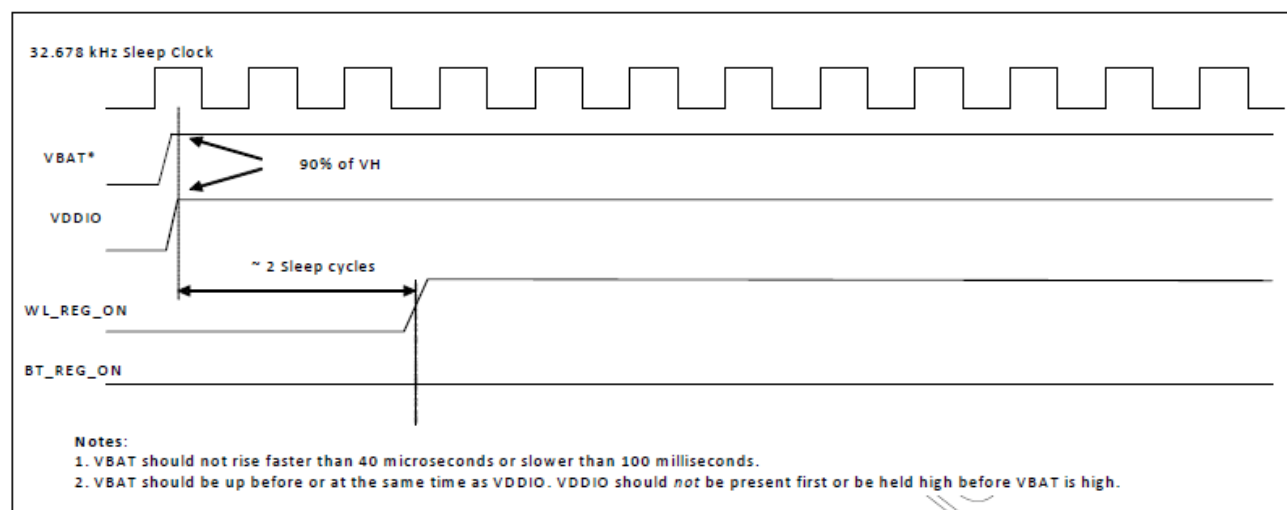
- ※ WL\_REG\_ON: Used by the PMU to power up or power down the internal regulators used by the WLAN section. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset.
- ※ BT\_REG\_ON: Used by the PMU to power up or power down the internal regulators used by the BT section. 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).



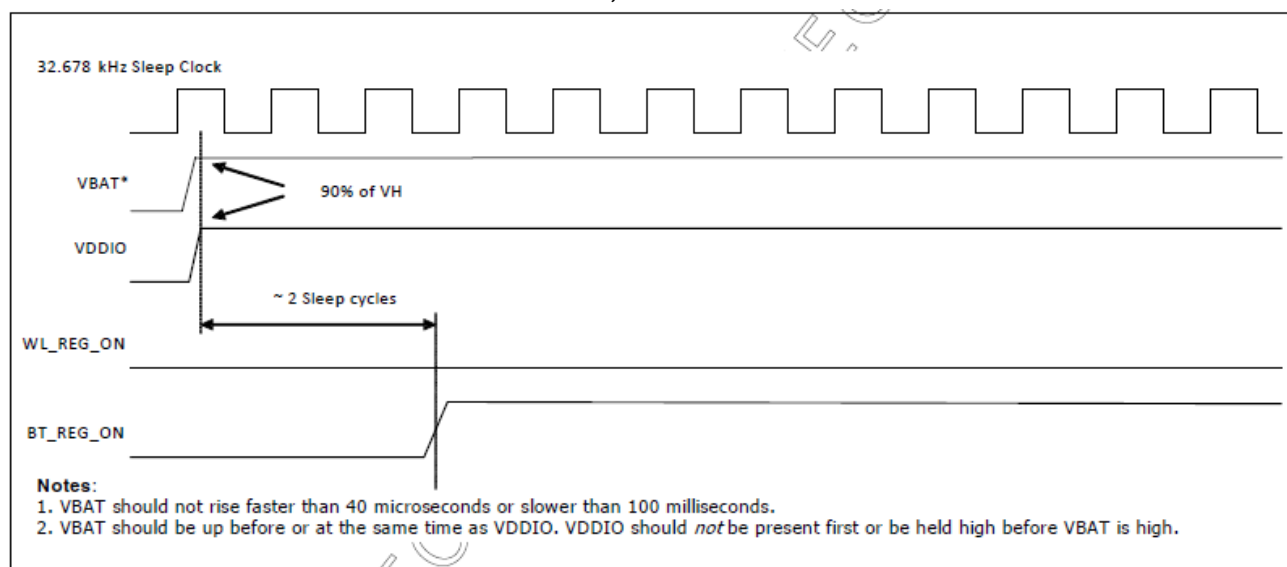
WLAN=ON, Bluetooth=ON



WLAN=OFF, Bluetooth=OFF

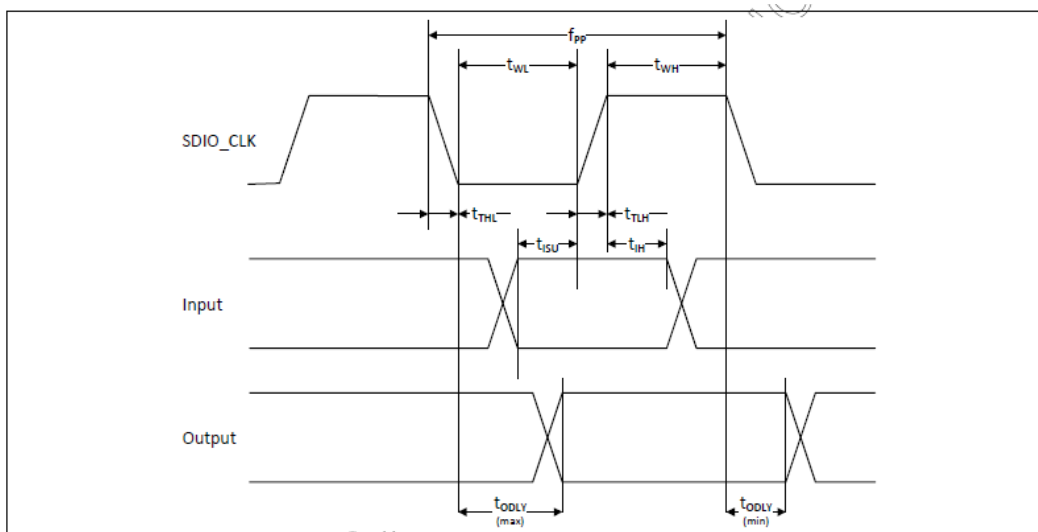


WLAN=ON, Bluetooth=OFF



WLAN=OFF, Bluetooth=ON

## 10.2 SDIO Default Mode Timing Diagram

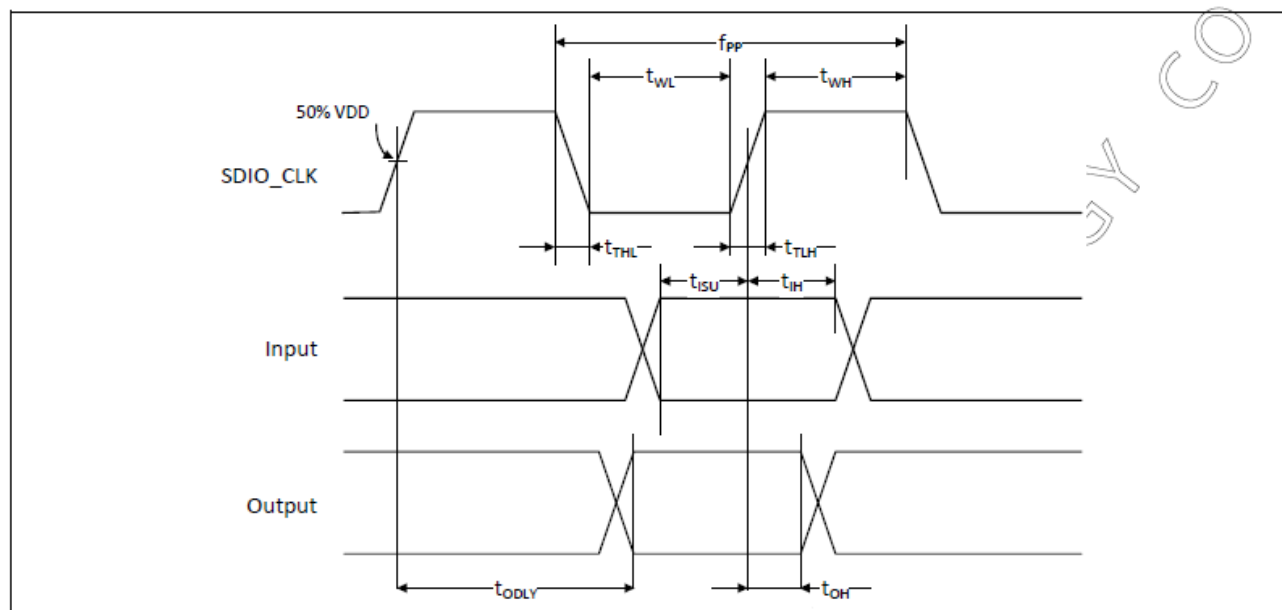


| Parameter                                                                            | Symbol | Minimum | Typical | Maximum | Unit |
|--------------------------------------------------------------------------------------|--------|---------|---------|---------|------|
| <b>SDIO CLK (All values are referred to minimum VIH and maximum VIL<sup>b</sup>)</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   |
| <b>Inputs: CMD, DAT (referenced to CLK)</b>                                          |        |         |         |         |      |
| Input setup time                                                                     | tISU   | 5       | –       | –       | ns   |
| Input hold time                                                                      | tIH    | 5       | –       | –       | ns   |
| <b>Outputs: CMD, DAT (referenced to CLK)</b>                                         |        |         |         |         |      |
| Output delay time – Data Transfer mode                                               | tODLY  | 0       | –       | 14      | ns   |
| Output delay time – Identification mode                                              | tODLY  | 0       | –       | 50      | ns   |

a. Timing is based on  $CL \leq 40pF$  load on CMD and Data.

b.  $\min(V_{ih}) = 0.7 \times V_{DDIO}$  and  $\max(V_{il}) = 0.2 \times V_{DDIO}$ .

### 10.3 SDIO High Speed Mode Timing Diagram



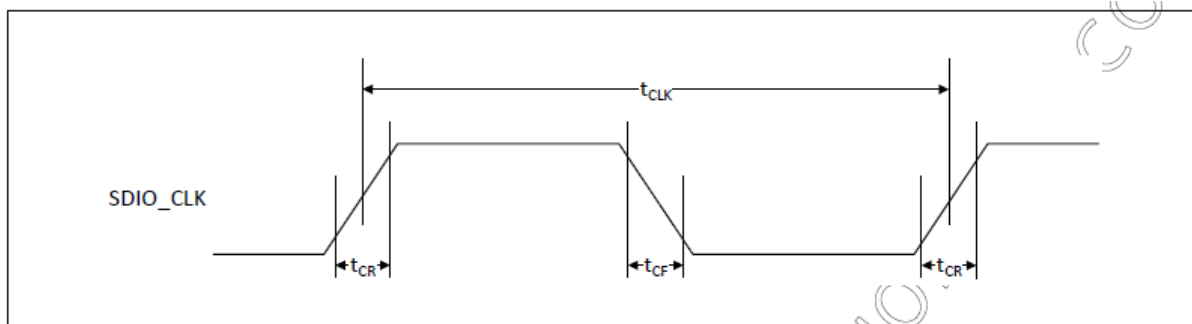
| Parameter                                                                                                  | Symbol            | Minimum | Typical | Maximum | Unit |
|------------------------------------------------------------------------------------------------------------|-------------------|---------|---------|---------|------|
| <b>SDIO CLK (all values are referred to minimum <math>V_{IH}</math> and maximum <math>V_{IL}^b</math>)</b> |                   |         |         |         |      |
| Frequency – Data Transfer Mode                                                                             | f <sub>PP</sub>   | 0       | –       | 50      | MHz  |
| Frequency – Identification Mode                                                                            | f <sub>OD</sub>   | 0       | –       | 400     | kHz  |
| Clock low time                                                                                             | t <sub>WL</sub>   | 7       | –       | –       | ns   |
| Clock high time                                                                                            | t <sub>WH</sub>   | 7       | –       | –       | ns   |
| Clock rise time                                                                                            | t <sub>TLH</sub>  | –       | –       | 3       | ns   |
| Clock low time                                                                                             | t <sub>THL</sub>  | –       | –       | 3       | ns   |
| <b>Inputs: CMD, DAT (referenced to CLK)</b>                                                                |                   |         |         |         |      |
| Input setup Time                                                                                           | t <sub>ISU</sub>  | 6       | –       | –       | ns   |
| Input hold Time                                                                                            | t <sub>IH</sub>   | 2       | –       | –       | ns   |
| <b>Outputs: CMD, DAT (referenced to CLK)</b>                                                               |                   |         |         |         |      |
| Output delay time – Data Transfer Mode                                                                     | t <sub>ODLY</sub> | –       | –       | 14      | ns   |
| Output hold time                                                                                           | t <sub>OH</sub>   | 2.5     | –       | –       | ns   |
| Total system capacitance (each line)                                                                       | CL                | –       | –       | 40      | pF   |

a. Timing is based on CL ≤ 40 pF load on CMD and Data.

b. min( $V_{ih}$ ) = 0.7 × VDDIO and max( $V_{il}$ ) = 0.2 × VDDIO.

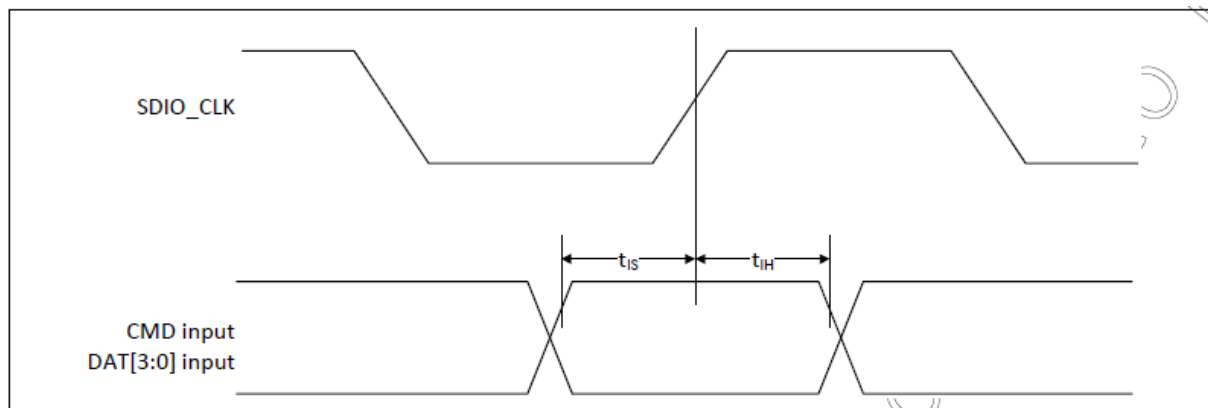
## 10.4 SDIO Bus Timing Specifications in SDR Modes

### Clock timing(SDR Modes)



| Parameter  | Symbol           | Minimum | Maximum              | Unit | Comments                                                                                                                             |
|------------|------------------|---------|----------------------|------|--------------------------------------------------------------------------------------------------------------------------------------|
| –          | $t_{CLK}$        | 40      | –                    | ns   | SDR12 mode                                                                                                                           |
|            |                  | 20      | –                    | ns   | SDR25 mode                                                                                                                           |
|            |                  | 10      | –                    | ns   | SDR50 mode                                                                                                                           |
|            |                  | 4.8     | –                    | ns   | SDR104 mode                                                                                                                          |
| –          | $t_{CR}, t_{CF}$ | –       | $0.2 \times t_{CLK}$ | ns   | $t_{CR}, t_{CF} < 2.00$ ns (max) @100 MHz,<br>$C_{CARD} = 10$ pF<br>$t_{CR}, t_{CF} < 0.96$ ns (max) @208 MHz,<br>$C_{CARD} = 10$ pF |
| Clock duty | –                | 30      | 70                   | %    | –                                                                                                                                    |

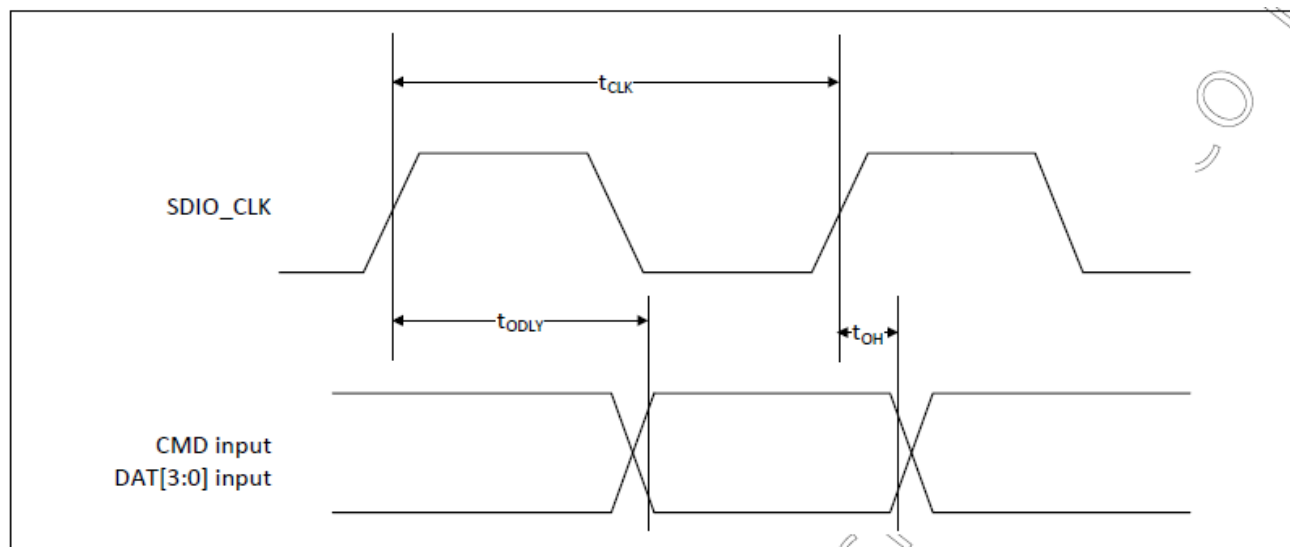
### Card Input timing (SDR Modes)



| Symbol             | Minimum           | Maximum | Unit | Comments                         |
|--------------------|-------------------|---------|------|----------------------------------|
| <b>SDR104 Mode</b> |                   |         |      |                                  |
| $t_{IS}$           | 1.70 <sup>a</sup> | –       | ns   | $C_{CARD} = 10$ pF, VCT = 0.975V |
| $t_{IH}$           | 0.80              | –       | ns   | $C_{CARD} = 5$ pF, VCT = 0.975V  |
| <b>SDR50 Mode</b>  |                   |         |      |                                  |
| $t_{IS}$           | 3.00              | –       | ns   | $C_{CARD} = 10$ pF, VCT = 0.975V |
| $t_{IH}$           | 0.80              | –       | ns   | $C_{CARD} = 5$ pF, VCT = 0.975V  |

a. SDIO 3.0 specification value is 1.40 ns.

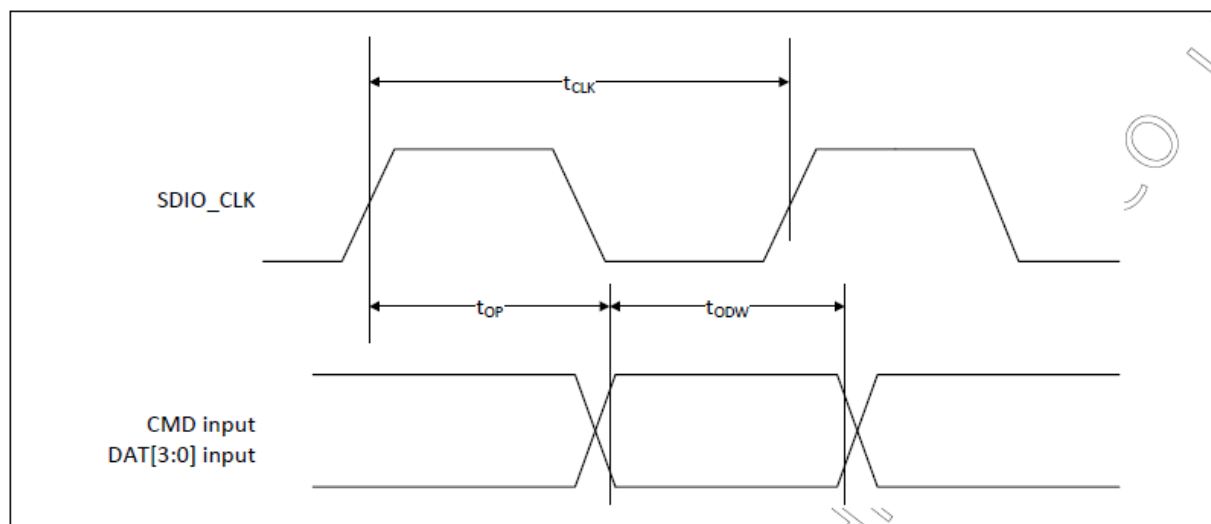
### Card output timing (SDR Modes up to 100MHz)



| Symbol     | Minimum | Maximum           | Unit | Comments                                                         |
|------------|---------|-------------------|------|------------------------------------------------------------------|
| $t_{ODLY}$ | –       | 7.85 <sup>a</sup> | ns   | $t_{CLK} \geq 10$ ns $C_L = 30$ pF using driver type B for SDR50 |
| $t_{ODLY}$ | –       | 14.0              | ns   | $t_{CLK} \geq 20$ ns $C_L = 40$ pF using for SDR12, SDR25        |
| $t_{OH}$   | 1.5     | –                 | ns   | Hold time at the $t_{ODLY}$ (min) $C_L = 15$ pF                  |

a. SDIO 3.0 specification value is 7.5 ns.

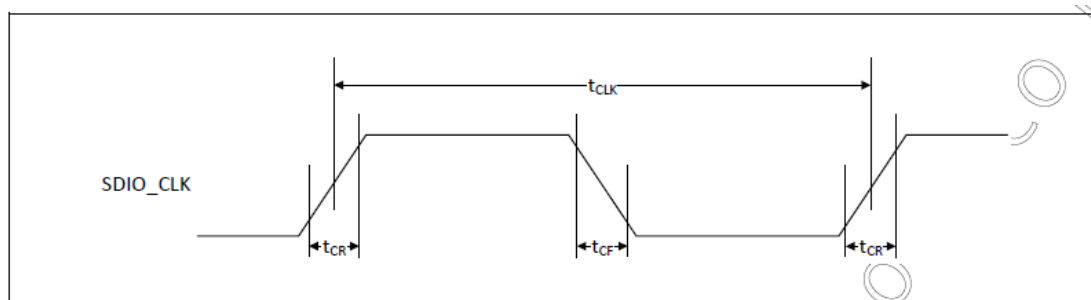
### Card output timing (SDR Modes 100MHz to 208MHz)



| Symbol          | Minimum | Maximum | Unit | Comments                                        |
|-----------------|---------|---------|------|-------------------------------------------------|
| $t_{OP}$        | 0       | 2       | UI   | Card output phase                               |
| $\Delta t_{OP}$ | –350    | +1550   | ps   | Delay variation due to temp change after tuning |
| $t_{ODW}$       | 0.60    | –       | UI   | $t_{ODW} = 2.88$ ns @ 208 MHz                   |

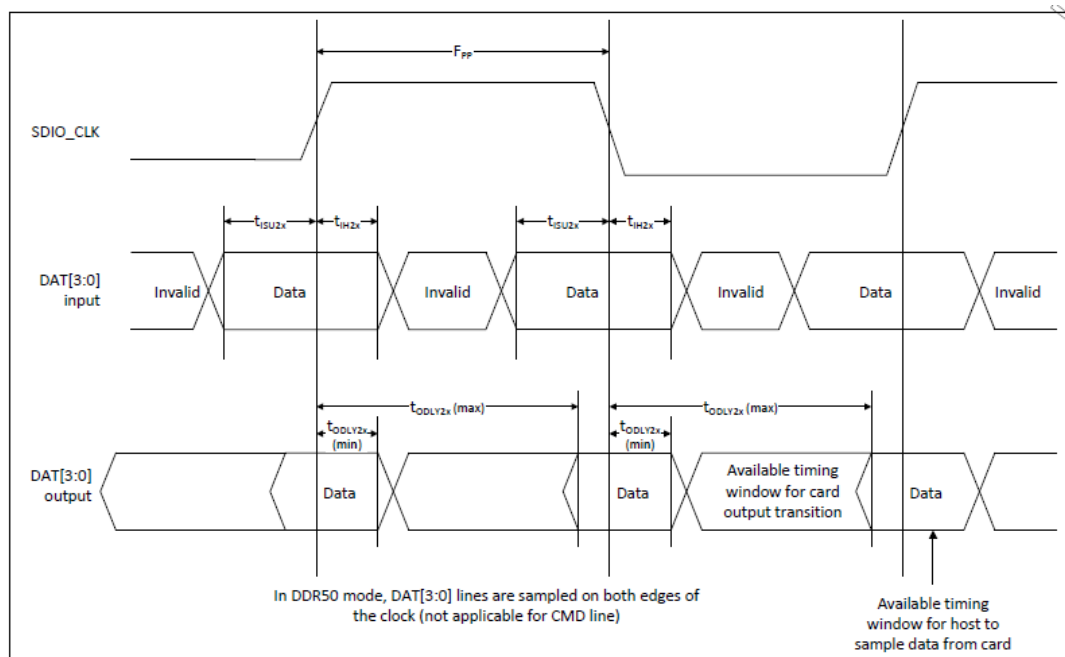
- $\Delta t_{OP} = +1550$  ps for junction temperature of  $\Delta t_{OP} = 90$  degrees during operation
- $\Delta t_{OP} = -350$  ps for junction temperature of  $\Delta t_{OP} = -20$  degrees during operation
- $\Delta t_{OP} = +2600$  ps for junction temperature of  $\Delta t_{OP} = -20$  to  $+125$  degrees during operation

## 10.5 SDIO Bus Timing Specifications in DDR50 Mode



| Parameter  | Symbol           | Minimum | Maximum              | Unit | Comments                                                        |
|------------|------------------|---------|----------------------|------|-----------------------------------------------------------------|
| –          | $t_{CLK}$        | 20      | –                    | ns   | DDR50 mode                                                      |
| –          | $t_{CR}, t_{CF}$ | –       | $0.2 \times t_{CLK}$ | ns   | $t_{CR}, t_{CF} < 4.00$ ns (max) @50 MHz,<br>$C_{CARD} = 10$ pF |
| Clock duty | –                | 45      | 55                   | %    | –                                                               |

### Data Timing



| Parameter         | Symbol       | Minimum | Maximum           | Unit | Comments                    |
|-------------------|--------------|---------|-------------------|------|-----------------------------|
| <b>Input CMD</b>  |              |         |                   |      |                             |
| Input setup time  | $t_{ISU}$    | 6       | –                 | ns   | $C_{CARD} < 10$ pF (1 Card) |
| Input hold time   | $t_{IH}$     | 0.8     | –                 | ns   | $C_{CARD} < 10$ pF (1 Card) |
| <b>Output CMD</b> |              |         |                   |      |                             |
| Output delay time | $t_{ODLY}$   | –       | 13.7              | ns   | $C_{CARD} < 30$ pF (1 Card) |
| Output hold time  | $t_{OH}$     | 1.5     | –                 | ns   | $C_{CARD} < 15$ pF (1 Card) |
| <b>Input DAT</b>  |              |         |                   |      |                             |
| Input setup time  | $t_{ISU2x}$  | 3       | –                 | ns   | $C_{CARD} < 10$ pF (1 Card) |
| Input hold time   | $t_{IH2x}$   | 0.8     | –                 | ns   | $C_{CARD} < 10$ pF (1 Card) |
| <b>Output DAT</b> |              |         |                   |      |                             |
| Output delay time | $t_{ODLY2x}$ | –       | 7.85 <sup>a</sup> | ns   | $C_{CARD} < 25$ pF (1 Card) |
| Output hold time  | $t_{ODLY2x}$ | 1.5     | –                 | ns   | $C_{CARD} < 15$ pF (1 Card) |

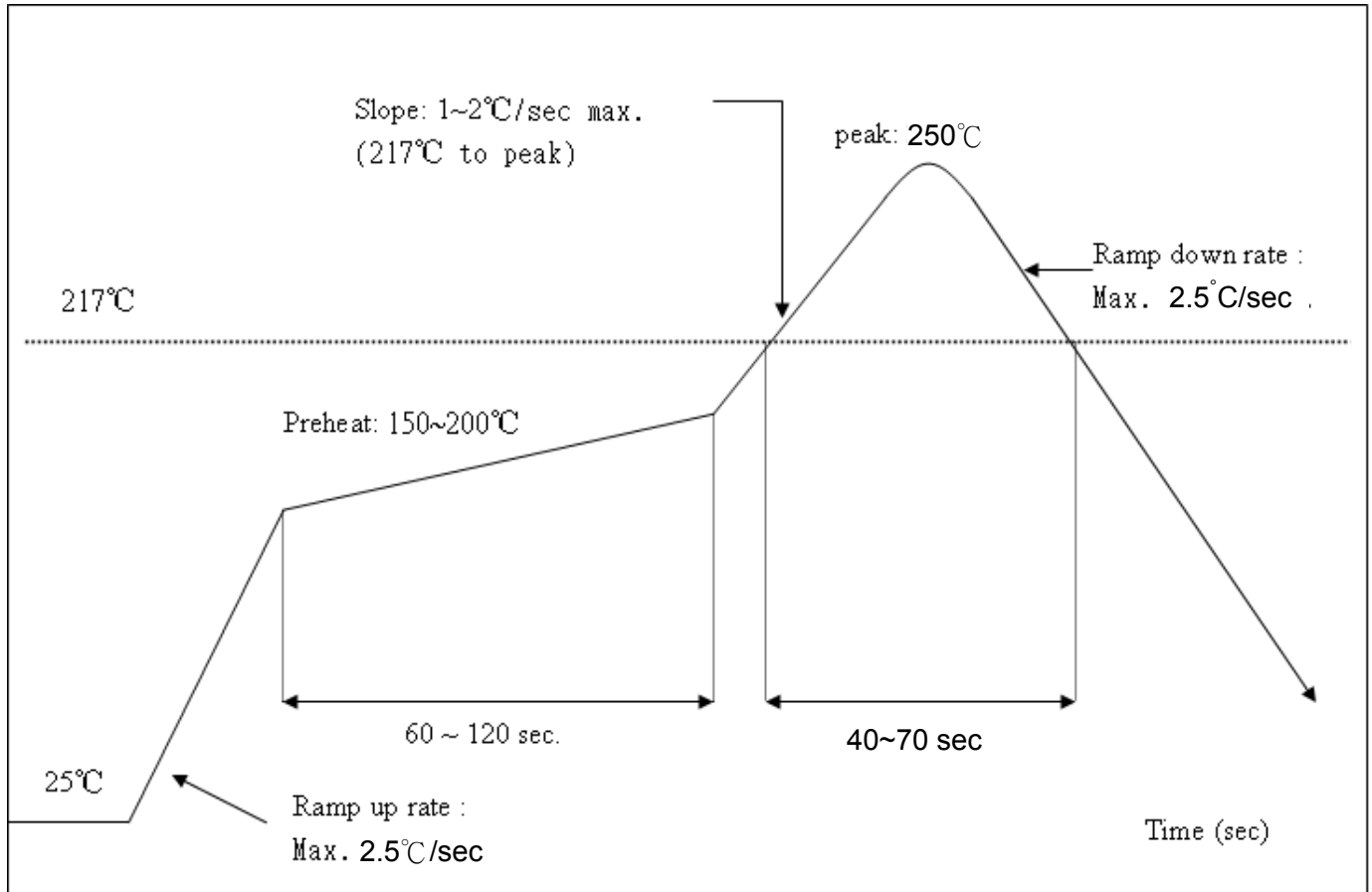
<sup>a</sup> SDIO 3.0 specification value is 7.0 ns.

# 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature :  $<250^{\circ}\text{C}$

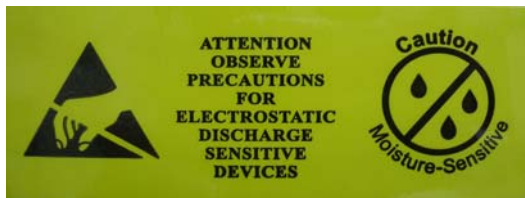
Number of Times :  $\leq 2$  times



# 12. Package Information

## 12.1 Label

Label A→ Anti-static and humidity notice



Label B→ MSL caution / Storage Condition

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Caution</b><br>This bag contains<br>MOISTURE-SENSITIVE DEVICES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | LEVEL<br><div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div><br><small>If blank, see adjacent bar code label</small> |
|                                                                                   | <ol style="list-style-type: none"> <li>Calculated shelf life in sealed bag: 12 months at &lt;40°C and &lt;90% relative humidity (RH)</li> <li>Peak package body temperature: _____ °C<br/><small>If blank, see adjacent bar code label</small></li> <li>After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be               <ol style="list-style-type: none"> <li>Mounted within: _____ hours of factory conditions<br/><small>If blank, see adjacent bar code label</small><br/>≤30°C/60% RH, or</li> <li>Stored per J-STD-033</li> </ol> </li> <li>Devices require bake, before mounting, if:               <ol style="list-style-type: none"> <li>Humidity Indicator Card reads &gt;10% for level 2a - 5a devices or &gt;60% for level 2 devices when read at 23 ± 5°C</li> <li>3a or 3b are not met</li> </ol> </li> <li>If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure</li> </ol> |                                                                                                                                                                 |
| Bag Seal Date: _____<br><small>If blank, see adjacent bar code label</small>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                 |
| <small>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</small>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                 |

Label C→ Inner box label .

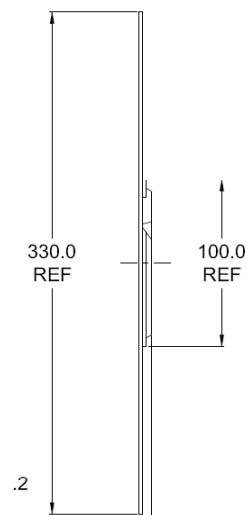
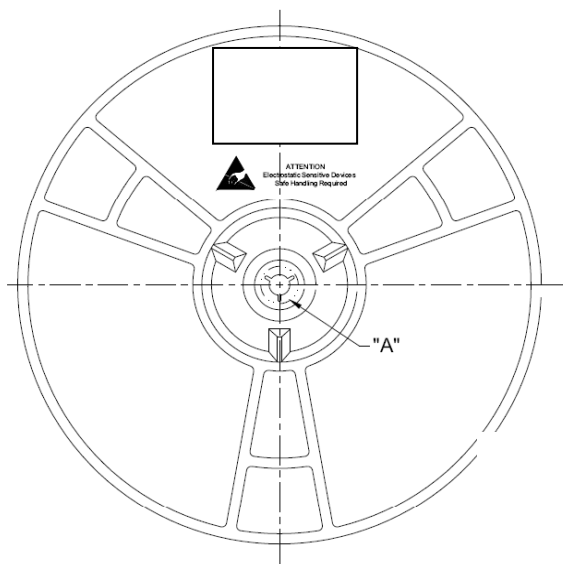
|                    |                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------|
| <b>PKG S/N :</b>   | <br>9PKG12013100001 |
| <b>Model:</b>      | <br>XXXXXXXXXXXX   |
| <b>P/N :</b>       | <br>99P-W01-0048R  |
| <b>Qty :</b>       | <br>1500            |
| <b>Date Code :</b> | <br>1205            |
| <b>Lot Code :</b>  | <br>T0C102B         |

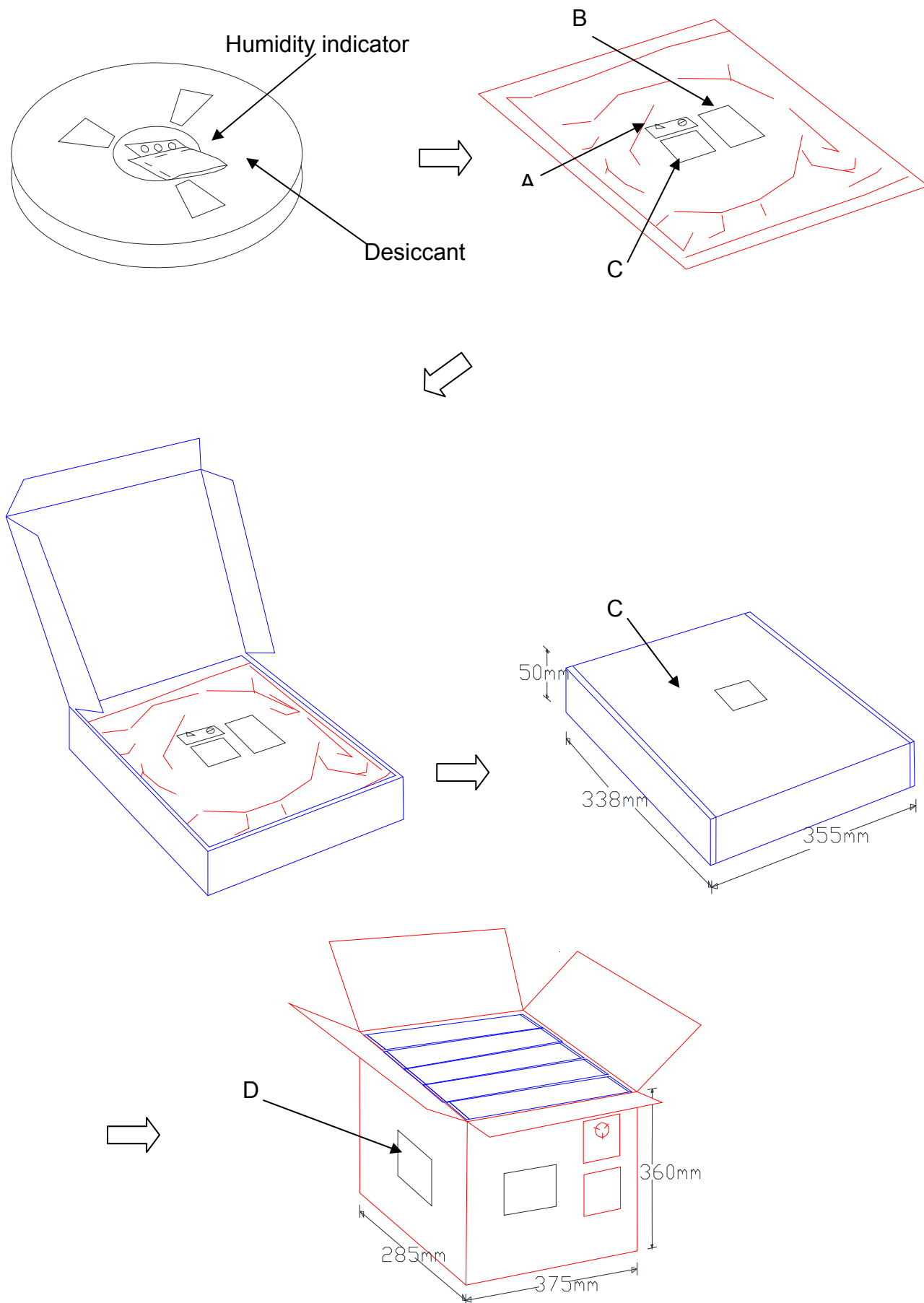
Label D→ Carton box label .

|                         |                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------|
| <b>AMPAK Technology</b> |                                                                                                      |
| <b>Model Name :</b>     | <br>XXXXXXXXXXXX  |
| <b>Part No :</b>        | <br>99P-W01-0048R |
| <b>Quantity :</b>       | <br>7500 ea       |
| <b>Lot D/C :</b>        | <br>20081000033   |
| <b>Manufacture :</b>    | <br>2012/02/22    |

## 12.2 Dimension

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 :  $0.30 \pm 0.05$ mm.
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

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Caution</b></p> <p>This bag contains</p> <p><b>MOISTURE-SENSITIVE DEVICES</b></p> <p>Do not open except under controlled conditions</p> <p>1. Calculated shelf life in sealed bag: 12 months at <math>&lt; 40^{\circ}\text{C}</math> and <math>&lt; 90\%</math> relative humidity(RH)</p> <p>2. Peak package body temperature:      <math>225^{\circ}\text{C}</math>   <math>240^{\circ}\text{C}</math>   <math>250^{\circ}\text{C}</math>   <math>260^{\circ}\text{C}</math></p> <p style="margin-left: 100px;"> <input type="checkbox"/>      <input type="checkbox"/>      <input checked="" type="checkbox"/>      <input type="checkbox"/> </p> <p>3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must</p> <p style="margin-left: 20px;">a) Mounted within: 48 hours of factory conditions</p> <p style="margin-left: 40px;"><math>&lt; 30^{\circ}\text{C}/60\% \text{ RH}</math>, OR</p> <p style="margin-left: 20px;">b) Stored at <math>&lt; 10\% \text{ RH}</math></p> <p>4. Devices require bake, before mounting, if:</p> <p style="margin-left: 20px;">a) Humidity Indicator Card is <math>&gt; 10\%</math> when read at <math>23 \pm 5^{\circ}\text{C}</math></p> <p style="margin-left: 20px;">b) 3a or 3b not met</p> <p>5. If baking is required, devices may be baked for 24 hours at <math>125 \pm 5^{\circ}\text{C}</math></p> <p>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</p> <p>Bag Seal Date:      <b>See-SEAL DATE LABEL</b></p> <p>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</p> | <p>LEVEL</p> <div style="border: 1px solid black; width: 60px; height: 60px; margin: 0 auto; display: flex; align-items: center; justify-content: center; font-size: 24px; font-weight: bold;">4</div> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

※NOTE : Accumulated baking time should not exceed 96hrs