



# User Manual



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**PRODUCT NAME : AP6398SV**

**REVISION : 1.6**

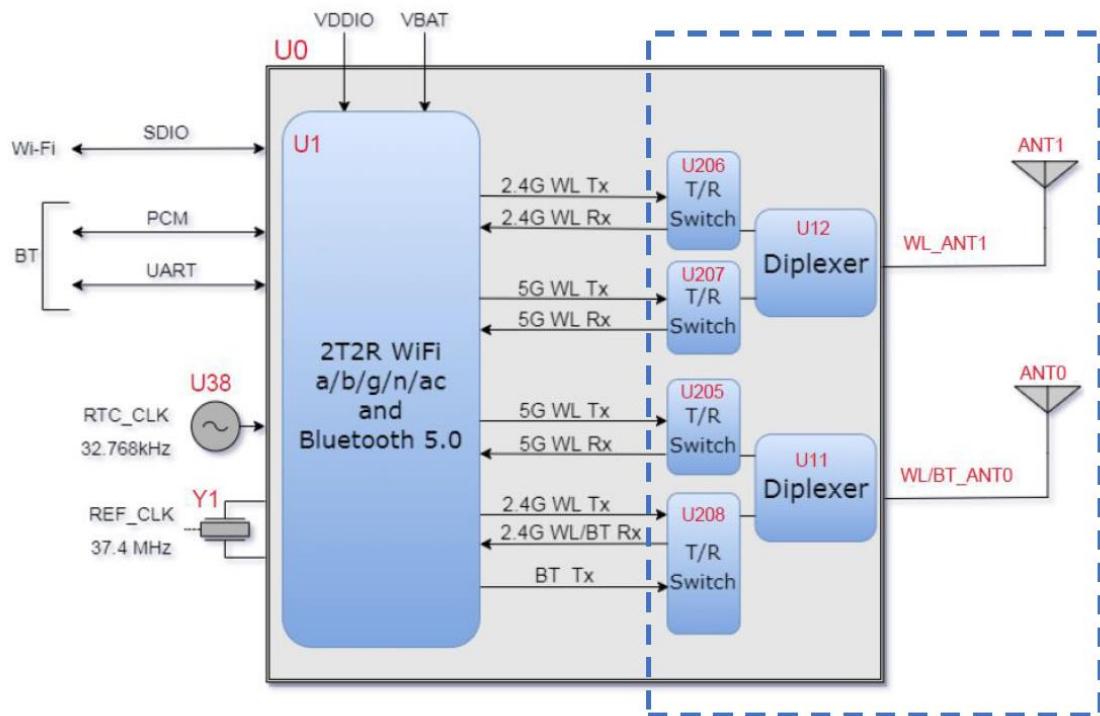
**DATE : Nov. 19<sup>th</sup> , 2021**



## 1 Overview

The AMPAK Technology® AP6398SV is a fully Wi-Fi and Bluetooth functionalities module with seamless roaming capabilities and advance security, also it could interact with different vendors' 802.11a/b/g/n/ac2x2 Access Points with MIMO standard and can accomplish up to speed of 866Mbps with dual stream in 802.11ac to connect the wireless LAN. Furthermore AP6398SV included SDIO interface for Wi-Fi, UART/ PCM interface for Bluetooth.

In addition, this compact module is a total solution for a combination of Wi-Fi + BT technologies. The module is specifically developed for tablet, OTT box and portable devices.





## 2 Product Features

### IEEE 802.11 Key Feature

- Lead Free design which is compliant with ROHS requirements.
- TX and RX low-density parity check (LDPC) support for improved range and power efficiency.
- Dual-stream spatial multiplexing up to 866Mbps data rate.
- 20, 40, 80 MHz channels with optional SGI (256 QAM modulation)
- Client MU-MIMO
- Supports standard SDIO v3.0, compatible with SDIO v2.0 HOST interfaces.

### Bluetooth Key Feature

- BT host digital interface:
  - HCI UART (up to 4 Mbps)
  - PCM for audio data
- Complies with Bluetooth Core Specification Version 5.1 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 above.



### 3 General Specification

#### 3.1 General Specification

|                       |   |
|-----------------------|---|
| Model Name            | AP6398SV  |
| Product Description   | 2T2R 802.11 a/b/g/n/ac Wi-Fi + BT 5.1 Module        |
| Dimension             | L x W : 15 x 13 (typical) mm , H : 2.0 (Maximum) mm |
| WiFi Interface        | Support SDIO V3.0/2.0                               |
| BT Interface          | UART / PCM  |
| Operating temperature | -30°C to 85°C                                       |
| Storage temperature   | -40°C to 125°C                                      |
| Humidity              | Operating Humidity 10% to 95% Non-Condensing        |



### 3.2. Absolute Maximum Ratings

| Symbol | Description                            | Min. | Max. | Unit |
|--------|--|------|------|------|
| VBAT   | Input supply Voltage                   | -0.5 | 4.5  | V    |
| VDDIO  | Digital/Bluetooth/SDIO and I/O Voltage | -0.5 | 2.07 | V    |

### Recommended Operating Rating

The module requires two power supplies: VBAT and VDDIO.

| Voltage rails | Min. | Typ. | Max. | Unit |
|---------------|------|------|------|------|
| VBAT          | 3.0  | 3.3  | 3.8  | V    |
| VDDIO         | 1.68 | 1.8  | 1.98 | V    |

VBAT current consumption 2000mA(Peak), when VBAT = 3.3V

The module requires two power supplies: other Digital I/O Pins.

| For VDDIO=1.8V            | Min.         | Max.        | Unit |
|---------------------------|--------------|-------------|------|
| Input high voltage        | 0.65 x VDDIO | NA          | V    |
| Input low voltage         | NA           | 0.4 x VDDIO | V    |
| Output high voltage @ 2mA | VDDIO – 0.4  | NA          | V    |
| Output low voltage @ 2mA  | NA           | 0.4         | V    |



## 4 Wi-Fi RF Specification

2.4GHz

| Feature                   | Description  |
|---------------------------|--|
| <b>WLAN Standard</b>      | IEEE 802.11 b/g/n & Wi-Fi compliant                                    |
| <b>Frequency Range</b>    | 2.400 GHz ~ 2.4835 GHz (2.4GHz ISM Band)                               |
| <b>Number of Channels</b> | 2.4GHz : Ch1 ~ Ch11  |
| <b>Modulation</b>         | 802.11b : DQPSK、DBPSK、CCK<br>802.11g/n : OFDM /64-QAM、16-QAM、QPSK、BPSK |

5GHz

| Feature                   | Description  |
|---------------------------|--|
| <b>WLAN Standard</b>      | IEEE 802.11a/n/ac & Wi-Fi compliant  |
| <b>Frequency Range</b>    | 5.15~5.25GHz、5.725~5.85GHz   |
| <b>Number of Channels</b> | 5.15~5.25GHz : Ch36 ~ Ch48<br>5.725~5.85GHz : Ch149 ~ Ch165  |
| <b>Modulation</b>         | 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、64-QAM、16-QAM、QPSK、BPSK |

## 5 Bluetooth Specification

| Feature                      | Description                                 |
|------------------------------|---|
| <b>General Specification</b> |   |
| Bluetooth Standard           | BDR、EDR(1Mbps & 2Mbps)、LE(1Mbps)、2LE(2Mbps) |
| Host Interface               | UART  |
| Frequency Band               | 2402 MHz ~ 2480 MHz                         |
| Number of Channels           | 79 channels for classic、40 channels for BLE |
| Modulation                   | GFSK, $\pi/4$ -DQPSK, 8DPSK                 |

## 6 FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**Caution:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## Module Letter

### 2.2 List of applicable FCC rules

FCC Part 15.247, FCC Part 15.407

### 2.3 Summarize the specific operational use conditions

The module requires two power supplies: VBAT and VDDIO.

| Voltage rails | Min. | Typ. | Max. | Unit |
|---------------|------|------|------|------|
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VBAT current consumption 2000mA(Peak), when VBAT = 3.3V

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| Input high voltage        | 0.65 x VDDIO | NA          | V    |
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| Output low voltage @ 2mA  | NA           | 0.4         | V    |

### 2.4 Limited module procedures

This applicant applied single modular certification.

### 2.5 Trace antenna designs

Not applied.

### 2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of FCC RF Rules. This equipment should be installed and operated with minimum distance of 20mm between the radiator and your body. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter



To be used in any other way, such as mobile to portable or with other transmitters simultaneously, requires additional evaluation, testing, or testing and Class 2 permissive change.

## 2. 7 Antennas

There are two antennas, type: PCB antenna, gain is as below:

| WIFI Main |          |          |               | WIFI Aux  |          |          |               |
|-----------|----------|----------|---------------|-----------|----------|----------|---------------|
| Freq(MHz) | Eff.(dB) | Eff. (%) | Peak Gain(dB) | Freq(MHz) | Eff.(dB) | Eff. (%) | Peak Gain(dB) |
| 2400      | -4.47    | 36       | -0.35         | 2400      | -4.22    | 38       | 0.83          |
| 2450      | -3.17    | 48       | 1.51          | 2450      | -3.12    | 49       | 1.53          |
| 2500      | -4.35    | 37       | 0.73          | 2500      | -4.06    | 39       | 1.31          |
| 5150      | -3.41    | 46       | 3.90          | 5150      | -4.19    | 38       | 4.58          |
| 5250      | -3.18    | 48       | 4.08          | 5250      | -3.95    | 40       | 4.69          |
| 5350      | -3.01    | 50       | 4.23          | 5350      | -3.74    | 42       | 4.61          |
| 5470      | -3.14    | 49       | 4.31          | 5470      | -3.75    | 42       | 4.76          |
| 5600      | -3.46    | 45       | 4.45          | 5600      | -4.32    | 37       | 4.50          |
| 5725      | -3.62    | 43       | 4.66          | 5725      | -4.22    | 38       | 4.37          |
| 5785      | -3.69    | 43       | 4.26          | 5785      | -4.30    | 37       | 4.30          |
| 5850      | -3.74    | 42       | 4.53          | 5850      | -4.35    | 37       | 4.35          |
| 5925      | -3.59    | 44       | 4.49          | 5925      | -4.32    | 37       | 4.23          |



## 2.8 Label and compliance information

### Labelling Instruction for Host Product Integrator

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: TN7-AP6398SV" any similar wording that expresses the same meaning may be used.

### NOTE

To satisfy FCC exterior labeling requirements, the following text must be placed on the exterior of the end product Contains Transmitter module FCC ID: \*\*\*\*\*

## 2.9 Information on test modes and additional testing requirements

Test modes should take into consideration different operational conditions for a standalone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

Use the software RTLBTAPP to set the max power, OBW and other test parameter.

The host must Comply with Part 15 Subpart B compliant.





## 2.10 Additional testing, Part 15 Subpart B disclaimer

This module complies with FCC part 15.247, if it is installed in a host device, the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

## 2.11 Note EMI Considerations

The host manufacturer is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

Use the software RTLBTAPP to set the max power, OBW and other test parameter.

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

## 2.12 How to make changes

This module is not permitted to change.

