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# **Linkplay Wireless Smart Audio Module (A98)**

## **User Manual**

**Revision 0.6**

**July 31, 2019**

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

## **HISTORY**

| <b>Version</b> | <b>Date</b> | <b>Description</b>                                 |
|----------------|-------------|----------------------------------------------------|
| 0.1            | 05/04/2018  | Initial Version Release                            |
| 0.2            | 09/13/2018  | Hardware Parameter Update                          |
| 0.3            | 03/27/2019  | Hardware Interface and Mechanical Dimension Update |
| 0.4            | 05/11/2019  | Update Dimension                                   |
| 0.5            | 06/11/2019  | Update Dimension and Package                       |
| 0.6            | 07/30/2019  | Add I/O Power Domain Information                   |

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|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

## **INDEX**

|      |                                             |    |
|------|---------------------------------------------|----|
| 1.   | Overview .....                              | 4  |
| 1.1. | Parameter .....                             | 5  |
| 2.   | Hardware Description .....                  | 9  |
| 2.1. | Description of Hardware Interface .....     | 9  |
| 2.2. | Mechanical Dimension .....                  | 12 |
| 2.3. | External Antenna .....                      | 14 |
| 2.4. | Typical Application .....                   | 15 |
| 2.5. | Power on Sequence .....                     | 17 |
| 2.6  | USB OTG Port.....                           | 17 |
| 3.   | Software Introduction .....                 | 18 |
| 3.1. | Feature List .....                          | 18 |
| 3.2. | APP Support .....                           | 18 |
| 3.3. | Certifications.....                         | 19 |
| 4.   | Module Environmental and Package .....      | 19 |
| 4.1. | Environmental Ratings .....                 | 19 |
| 4.2. | Electrostatic Discharge Specifications..... | 19 |
| 4.3. | A98 Module Picture.....                     | 20 |
| 4.4. | Sticker Specification .....                 | 20 |

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

# 1. Overview

Linkplay Wireless Smart Audio module–A98, is our 3rd generation smart audio modules developed to be used in the connected speaker, sound bar and other connected audio devices. It integrates the low power Broadcom BCM43455 Wi-Fi/BT chip and Amlogic A113X application processor. A113X is an advanced application processor designed for connected audio applications. It integrates a powerful CPU subsystem, advanced multi-format audio processing unit, a secured running environment and all major peripherals to form the low power audio AP.

The main system CPU is a quad-core ARM Cortex-A53 CPU with L1 instruction/data cache for each core and a large unified L2 cache to improve system performance. Each Cortex-A53 CPU can run up to 1.5GHz (DVFS + hot plug) and has a wide bus connecting to the memory sub-system. When the system is suspended, the main CPU can be powered off and the cortex-M3 in the always-on power domain can resume the system from multiple interrupt sources.

The audio processing engine (APE) is based on ARM® NEON™ general-purpose SIMD architecture which works seamlessly with main CPU to accelerate the multimedia processing algorithms, enhancing the user experience. It is able to decode all major high resolution audio formats including MP3, AAC, WMA, RM, FLAC, Ogg, etc and with the flexibility to support future audio standards.

A113X integrates all standard audio input/output interfaces including multiple TDM, PCM, I2S and SPDIF digital audio input/output interfaces, and 8 channel far-field PDM digital microphone (DMIC) inputs. Audio input has power detector to wake up from low activity states and hardware assisted synchronization blocks for multiple room audio applications. Audio input data can be restricted to trusted memory space to protect always-on audio privacy.

A98 module supports IEEE 802.11 a/b/g/n/ac 2.4GHz and 5GHz. It also supports BT4.2 with EDR and BLE.

A98 module also provides USB, I2S, I2C, PDM, SPI, UART etc. interfaces.

The firmware is fully compatible with Apple AirPlay and digital living network alliance (DLNA) streaming standards. It supports Hi-Fi audio up to 192KHz, 24-bit with most popular audio formats. It supports multi-room and multi-channel audio streaming with perfect synchronization.

With this module, you can play the music on your speaker wirelessly from iPhone, iPad , iPod touch, Android devices or PC. More important, it enables the traditional speaker system to become the Internet enabled device through the wired or wireless connection provided by the module. Thus, you could freely playback any Internet audio contents such as music, podcast, radio or either the accompany audio in the movie directly from the Internet.

## Features

- Amlogic A113X application processor
- 128MB DRAM
- 128MB NAND FLASH
- Support IEEE 802.11 a/b/g/n/ac 1x1 antenna diversity Wi-Fi dual band
- Support BT4.2 with EDR and BLE

## Application

- Connected speaker, Sound Bar
- Connected audio devices

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

## 1.1. Parameter

| Type         | Items                                         | Performance                                            |
|--------------|-----------------------------------------------|--------------------------------------------------------|
| Wi-Fi        | Certification                                 | Wi-Fi Alliance                                         |
|              | WLAN Standard                                 | IEEE 802.11 a/b/g/n/ac Wi-Fi compliant                 |
| Wi-Fi (2.4G) | Frequency Range                               | 2.400 GHz ~ 2.483 GHz (2.4 GHz ISM Band)               |
|              | Number of Channels                            | Ch1 ~ Ch13                                             |
|              | Modulation                                    | 802.11b : DQPSK, DBPSK, CCK                            |
|              |                                               | 802.11g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK            |
|              | Output Power                                  | 802.11b /11Mbps : 16 dBm ± 1.5 dB @ EVM≤-9dB           |
|              |                                               | 802.11g /54Mbps : 15 dBm ± 1.5 dB @ EVM≤-25dB          |
|              |                                               | 802.11n /MCS7@HT20 : 14 dBm ± 1.5 dB @ EVM≤-27dB       |
|              | SISO Receive Sensitivity (11b,20MHz) @8% PER  | - 1Mbps PER @ -96 dBm, ± 2 dB                          |
|              |                                               | - 2Mbps PER @ -90 dBm, ± 2 dB                          |
|              |                                               | - 5.5Mbps PER @ -88 dBm, ± 2 dB                        |
|              |                                               | - 11Mbps PER @ -86 dBm, ± 2 dB                         |
|              | SISO Receive Sensitivity (11g,20MHz) @10% PER | - 6Mbps PER @ -90 dBm, ± 2 dB                          |
|              |                                               | - 9Mbps PER @ -88 dBm, ± 2 dB                          |
|              |                                               | - 12Mbps PER @ -87 dBm, ± 2 dB                         |
|              |                                               | - 18Mbps PER @ -85 dBm, ± 2 dB                         |
|              |                                               | - 24Mbps PER @ -83 dBm, ± 2 dB                         |
|              |                                               | - 36Mbps PER @ -80 dBm, ± 2 dB                         |
|              |                                               | - 48Mbps PER @ -76 dBm, ± 2 dB                         |
|              |                                               | - 54Mbps PER @ -73 dBm, ± 2 dB                         |
|              | Receive Sensitivity (11n,20MHz) @10% PER      | - MCS=0 PER @ -89 dBm, ± 2 dB                          |
|              |                                               | - MCS=1 PER @ -85 dBm, ± 2 dB                          |
|              |                                               | - MCS=2 PER @ -84 dBm, ± 2 dB                          |
|              |                                               | - MCS=3 PER @ -80 dBm, ± 2 dB                          |
|              |                                               | - MCS=4 PER @ -77 dBm, ± 2 dB                          |
|              |                                               | - MCS=5 PER @ -75 dBm, ± 2 dB                          |
|              |                                               | - MCS=6 PER @ -72 dBm, ± 2 dB                          |
|              |                                               | - MCS=7 PER @ -70 dBm, ± 2 dB                          |
|              | Maximum Input Level                           | 802.11b : -10 dBm                                      |
|              |                                               | 802.11g/n : -20 dBm                                    |
|              | Antenna Reference                             | External: I-PEX, Small antennas with 0~2 dBi peak gain |
| Wi-Fi (5G)   | WLAN Standard                                 | IEEE 802.11a/n 2x2, Wi-Fi compliant                    |
|              | Frequency Range                               | 4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)               |
|              | Number of Channels                            | Please see the following table                         |
|              | Modulation                                    | 802.11a : OFDM /64-QAM,16-QAM, QPSK, BPSK              |

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

|  |                                                  |                                                        |
|--|--------------------------------------------------|--------------------------------------------------------|
|  |                                                  | 802.11n : OFDM /64-QAM,16-QAM, QPSK, BPSK              |
|  |                                                  | 802.11ac : OFDM /256-QAM                               |
|  | Output Power                                     | 802.11a /64-QAM(R=3/4) : 14 dBm ± 2 dB @<br>EVM≤-25dB  |
|  |                                                  | 802.11n /64-QAM(R=5/6) : 13 dBm ± 2 dB @<br>EVM≤-27dB  |
|  |                                                  | 802.11ac/256-QAM(R=3/4) : 12 dBm ± 2 dB @<br>EVM≤-30dB |
|  |                                                  | 802.11ac/256-QAM(R=5/6) : 10 dBm ± 2 dB @<br>EVM≤-32dB |
|  | SISO Receive Sensitivity<br>(11a,20MHz) @10% PER | - 6Mbps PER @ -90 dBm, ± 2 dB                          |
|  |                                                  | - 9Mbps PER @ -88 dBm, ± 2 dB                          |
|  |                                                  | - 12Mbps PER @ -87 dBm, ± 2 dB                         |
|  |                                                  | - 18Mbps PER @ -85 dBm, ± 2 dB                         |
|  |                                                  | - 24Mbps PER @ -81 dBm, ± 2 dB                         |
|  |                                                  | - 36Mbps PER @ -78 dBm, ± 2 dB                         |
|  |                                                  | - 48Mbps PER @ -73 dBm, ± 2 dB                         |
|  |                                                  | - 54Mbps PER @ -72 dBm, ± 2 dB                         |
|  | SISO Receive Sensitivity<br>(11n,20MHz) @10% PER | - MCS=0 PER @ -89 dBm, ± 2 dB                          |
|  |                                                  | - MCS=1 PER @ -87 dBm, ± 2 dB                          |
|  |                                                  | - MCS=2 PER @ -84 dBm, ± 2 dB                          |
|  |                                                  | - MCS=3 PER @ -81 dBm, ± 2 dB                          |
|  |                                                  | - MCS=4 PER @ -77 dBm, ± 2 dB                          |
|  |                                                  | - MCS=5 PER @ -73 dBm, ± 2 dB                          |
|  |                                                  | - MCS=6 PER @ -71 dBm, ± 2 dB                          |
|  |                                                  | - MCS=7 PER @ -70 dBm, ± 2 dB                          |
|  | Receive Sensitivity<br>(11n,40MHz) @10% PER      | - MCS=0 PER @ -87 dBm, ± 2 dB                          |
|  |                                                  | - MCS=1 PER @ -84 dBm, ± 2 dB                          |
|  |                                                  | - MCS=2 PER @ -82 dBm, ± 2 dB                          |
|  |                                                  | - MCS=3 PER @ -78 dBm, ± 2 dB                          |
|  |                                                  | - MCS=4 PER @ -75 dBm, ± 2 dB                          |
|  |                                                  | - MCS=5 PER @ -70 dBm, ± 2 dB                          |
|  |                                                  | - MCS=6 PER @ -69 dBm, ± 2 dB                          |
|  |                                                  | - MCS=7 PER @ -67 dBm, ± 2 dB                          |
|  | Receive Sensitivity<br>(11ac,20MHz) @10% PER     | - MCS=0 PER @ -88 dBm, ± 2 dB                          |
|  |                                                  | - MCS=1 PER @ -86 dBm, ± 2 dB                          |
|  |                                                  | - MCS=2 PER @ -83 dBm, ± 2 dB                          |
|  |                                                  | - MCS=3 PER @ -80 dBm, ± 2 dB                          |
|  |                                                  | - MCS=4 PER @ -76dBm, ± 2 dB                           |
|  |                                                  | - MCS=5 PER @ -72 dBm, ± 2 dB                          |
|  |                                                  | - MCS=6 PER @ -70 dBm, ± 2 dB                          |

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

|           |                                                                  |                                                        |
|-----------|------------------------------------------------------------------|--------------------------------------------------------|
|           |                                                                  | - MCS=7 PER @ -69 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=8 PER @ -65 dBm, $\pm 2$ dB                      |
|           | Receive Sensitivity<br>(11ac,40MHz) @10% PER                     | - MCS=0 PER @ -86 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=1 PER @ -82 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=2 PER @ -80 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=3 PER @ -77 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=4 PER @ -74 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=5 PER @ -69 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=6 PER @ -67 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=7 PER @ -65 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=8 PER @ -63 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=9 PER @ -62 dBm, $\pm 2$ dB                      |
|           | Receive Sensitivity<br>(11ac,80MHz) @10% PER                     | - MCS=0 PER @ -82 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=1 PER @ -79 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=2 PER @ -77 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=3 PER @ -73 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=4 PER @ -70 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=5 PER @ -68 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=6 PER @ -64 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=7 PER @ -62 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=8 PER @ -59 dBm, $\pm 2$ dB                      |
|           |                                                                  | - MCS=9 PER @ -58 dBm, $\pm 2$ dB                      |
|           | Maximum Input Level                                              | 802.11a/n : -30 dBm                                    |
|           | Antenna Reference                                                | External: I-PEX, Small antennas with 0~2 dBi peak gain |
| Bluetooth | Certification                                                    | BQB                                                    |
|           | Bluetooth Standard                                               | Bluetooth V4.2 of 1, 2 and 3 Mbps                      |
|           | Antenna Reference                                                | External: I-PEX, Small antennas with 0~2 dBi peak gain |
|           | Frequency Band                                                   | 2402 MHz ~ 2480 MHz                                    |
|           | Number of Channels                                               | 79 channels                                            |
|           | Modulation                                                       | FHSS, GFSK, DPSK, DQPSK                                |
|           | Output Power<br>(Output power can be configured by HCD firmware) | 10 dBm (Max.)                                          |
|           | Sensitivity @ BER=0.1% for GFSK (1Mbps)                          | -86 dBm, typical                                       |
|           | Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)               | -86 dBm, typical                                       |
|           | Sensitivity @ BER=0.01% for 8DPSK (3Mbps)                        | -80 dBm, typical                                       |
|           | Maximum Input Level                                              | GFSK (1Mbps): -20dBm                                   |
|           |                                                                  | $\pi/4$ -DQPSK (2Mbps) : -20dBm                        |

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|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

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|-----------------|-------------------------------|-------------------------------|
|                 |                               | 8DPSK (3Mbps) : -20dBm        |
| <b>Hardware</b> | Working Voltage               | 3.5-5.5V                      |
|                 | Working Current               | 200 ~ 240mA (STA mode)        |
|                 | Standby Current               | 5mA                           |
|                 | Operating Ambient Temperature | 0°C ~ 40°C                    |
|                 | Storage Temperature           | -5°C ~ 45°C                   |
|                 | Wi-Fi Working Distance        | 2.4G 80 meters/5G 150meters   |
|                 | IO Extension                  | USB, I2S, I2C, PWM, SPI, UART |
|                 | Dimension                     | NGFF golden finger 67PIN      |

Table1-1 Linkplay A98 module parameters

5GHz(20MHz) Channel table

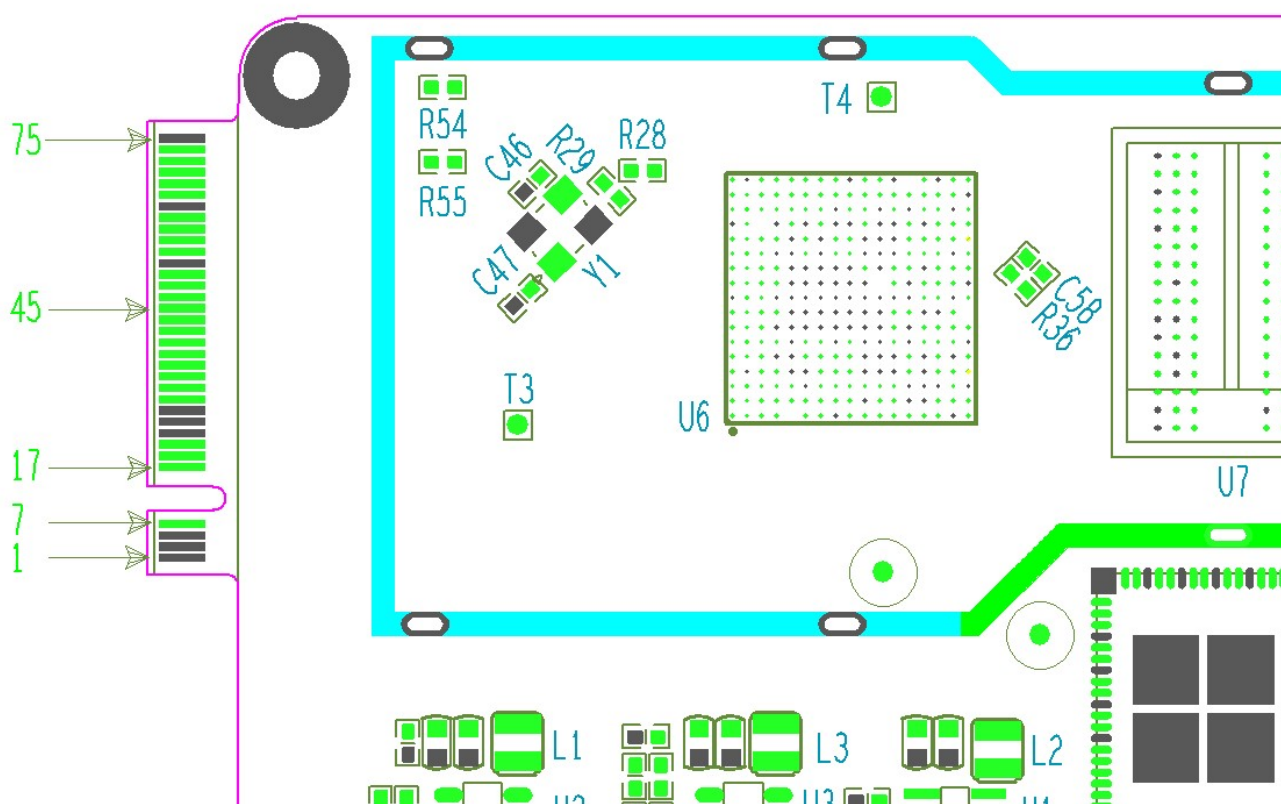
| <b>Band (GHz)</b> | <b>Operating Channel Numbers</b> | <b>Channel Center Frequencies(MHz)</b> |
|-------------------|----------------------------------|----------------------------------------|
| 5.15GHz~5.25GHz   | 36                               | 5180                                   |
|                   | 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                                   |
| 5.725GHz~5.845GHz | 140                              | 5700                                   |
|                   | 149                              | 5745                                   |
|                   | 153                              | 5765                                   |
|                   | 157                              | 5785                                   |
|                   | 161                              | 5805                                   |
|                   | 165                              | 5825                                   |

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|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

## 2. Hardware Description

### 2.1. Description of Hardware Interface

A98 provides the option to connect with customer board through its 67-pins NGFF golden finger. The detail is as follows.



|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

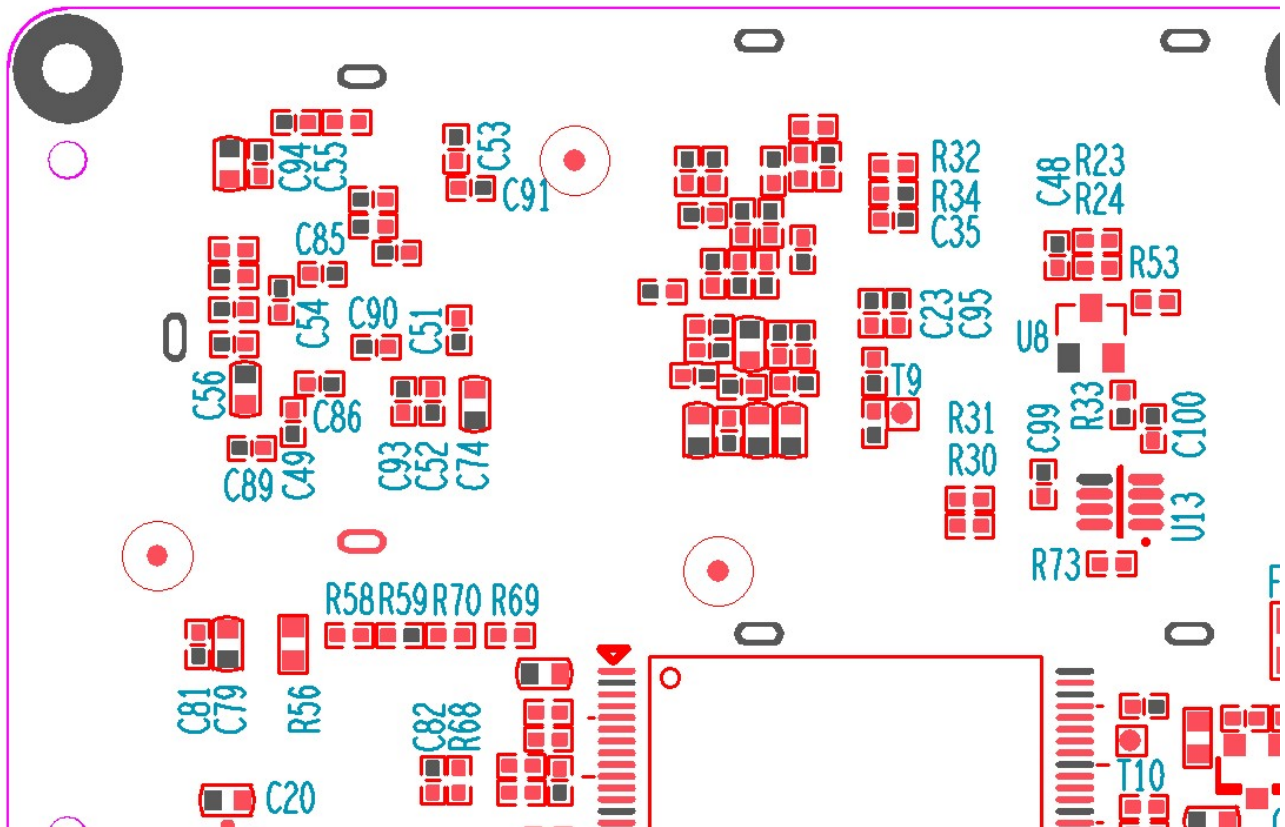


Figure 2-1 A98 Interface Pins

#### Pin Description:

| Pin No.                                                                                     | Pin Name | Type   | Description                  | Power Domain |
|---------------------------------------------------------------------------------------------|----------|--------|------------------------------|--------------|
| 1, 3, 5,<br>16, 23,<br>25, 27,<br>28, 34,<br>46, 50,<br>53, 54,<br>58, 63,<br>64, 74,<br>75 | GND      | Supply | Digital ground               | GND          |
| 2, 4, 6                                                                                     | VDD_5V   | Power  | Power supply input > 800mA   | 3.5 - 5.5V   |
| 7                                                                                           | GPIOZ_7  | I/O    | General purpose input output | 3.3V         |
| 17                                                                                          | I2C1_SCL | I/O    | I2C bus1 clock               | 3.3V         |
| 19                                                                                          | I2C1_SDA | I/O    | I2C bus1 data                | 3.3V         |
| 21                                                                                          | GPIOZ_3  | I/O    | General purpose input output | 3.3V         |
| 29                                                                                          | GPIOZ_6  | I/O    | General purpose input output | 3.3V         |
| 31                                                                                          | PWM_B    | O      | Pulse Width Modulation B     | 3.3V         |
| 33                                                                                          | PWM_D    | O      | Pulse Width Modulation C     | 3.3V         |
| 35                                                                                          | PWMAO_C  | O      | Pulse Width Modulation AO_C  | 3.3V         |

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

|    |           |       |                              |      |
|----|-----------|-------|------------------------------|------|
| 37 | PWMAO_D   | O     | Pulse Width Modulation AO_D  | 3.3V |
| 39 | UART0_RXD | I     | UART0 receive                | 3.3V |
| 41 | UART0_TXD | O     | UART0 transmit               | 3.3V |
| 43 | GPIOAO_7  | I/O   | General purpose input output | 3.3V |
| 45 | GPIOAO_6  | I/O   | General purpose input output | 3.3V |
| 47 | PWMAO_A   | O     | Pulse Width Modulation AO_A  | 3.3V |
| 49 | I2C0_SDA  | I/O   | I2C0 bus data                | 3.3V |
| 51 | I2C0_SCL  | I/O   | I2C0 bus clock               | 3.3V |
| 55 | GPIOA_19  | I/O   | General purpose input output | 3.3V |
| 57 | ADC_CH0   | I/IPU | ADC input                    | 1.8V |
| 59 | MCLK_C    | O     | Master clock C               | 3.3V |
| 61 | GPIOAO_13 | I/O   | General purpose input output | 3.3V |
| 65 | GPIOA_20  | I/O   | General purpose input output | 3.3V |
| 67 | USB_DM    | I/O   | USB data minus               | 3.3V |
| 69 | USB_DP    | I/O   | USB data plus                | 3.3V |
| 71 | USB_VBUS  | I     | USB voltage detection        | 5V   |
| 73 | USB_ID    | I     | USB ID                       | 1.8V |
| 18 | GPIOZ_5   | I/O   | General purpose input output | 3.3V |
| 20 | GPIOZ_1   | I/O   | General purpose input output | 3.3V |
| 22 | GPIOZ_0   | I/O   | General purpose input output | 3.3V |
| 24 | PWM_C     | I/O   | Pulse Width Modulation C     | 3.3V |
| 26 | GPIOZ_2   | I/O   | General purpose input output | 3.3V |
| 30 | UART1_RXD | I     | UART1 receive                | 3.3V |
| 32 | UART1_TXD | O     | UART1 transmit               | 3.3V |
| 36 | PDM_DIN3  | I     | PDM input data 3 signal      | 3.3V |
| 38 | PDM_DIN1  | I     | PDM input data 1 signal      | 3.3V |
| 40 | PDM_DIN2  | I     | PDM input data 2 signal      | 3.3V |
| 42 | PDM_DCLK  | O     | PDM output clock             | 3.3V |
| 44 | PDM_DIN0  | I     | PDM input data 0 signal      | 3.3V |
| 48 | TDMB_DIO1 | I/O   | TDM B input and output data1 | 3.3V |
| 52 | TDMB_SCLK | I/O   | TDM B bit clock              | 3.3V |
| 56 | TDMB_DIO0 | I/O   | TDM B input and output data0 | 3.3V |
| 60 | TDMB_FS   | I/O   | TDM B L/R clock              | 3.3V |
| 62 | TDMC_DIO1 | I/O   | TDM C input and output data1 | 3.3V |
| 66 | TDMC_DIO0 | I/O   | TDM C input and output data0 | 3.3V |
| 68 | TDMC_FS   | I/O   | TDM C L/R clock              | 3.3V |
| 70 | TDMC_SCLK | I/O   | TDM C bit clock              | 3.3V |
| 72 | MCLK_B    | O     | Master clock B               | 3.3V |

Table 2-1 A98 Module Pin Description

Notes:

1. I: Input

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

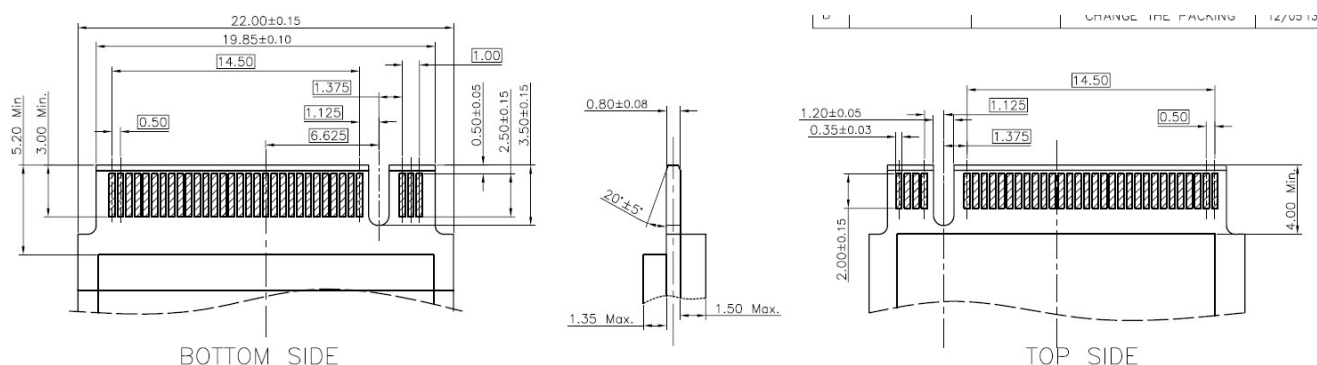
2. O: Output
3. P: Power
4. IPU: Internal Pull Up
5. IPD: Internal Pull Down

## 2.2. Mechanical Dimension

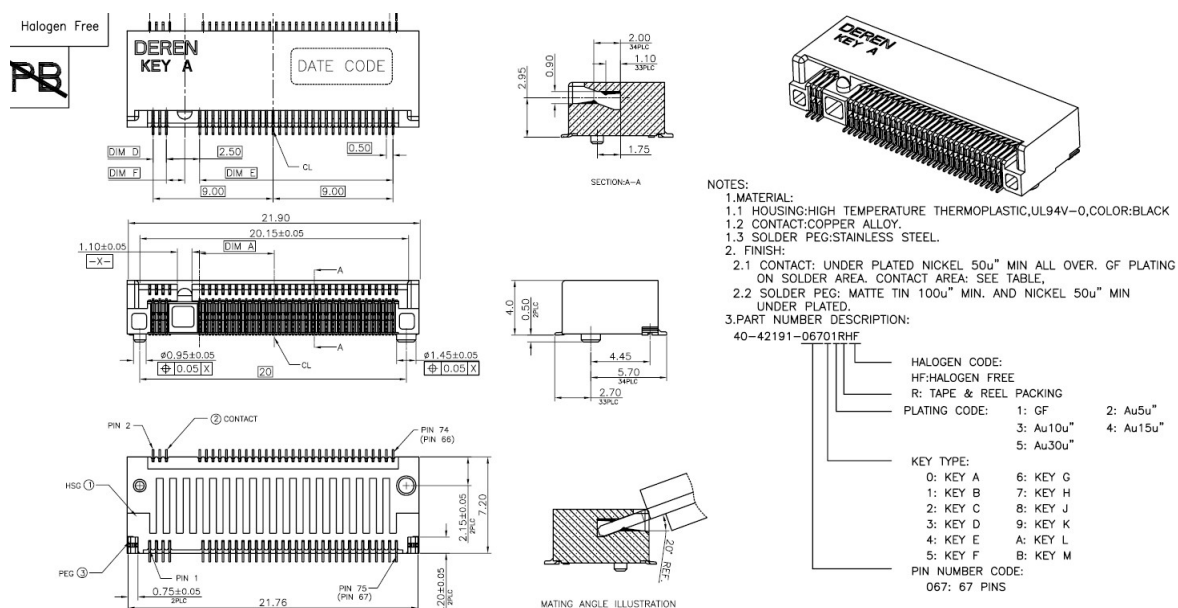
Linkplay A98 module has the dimension of 62.8mm x 42mm. The detailed layout will be given shortly below.

Unit: mm

PLUG PCB dimensions:

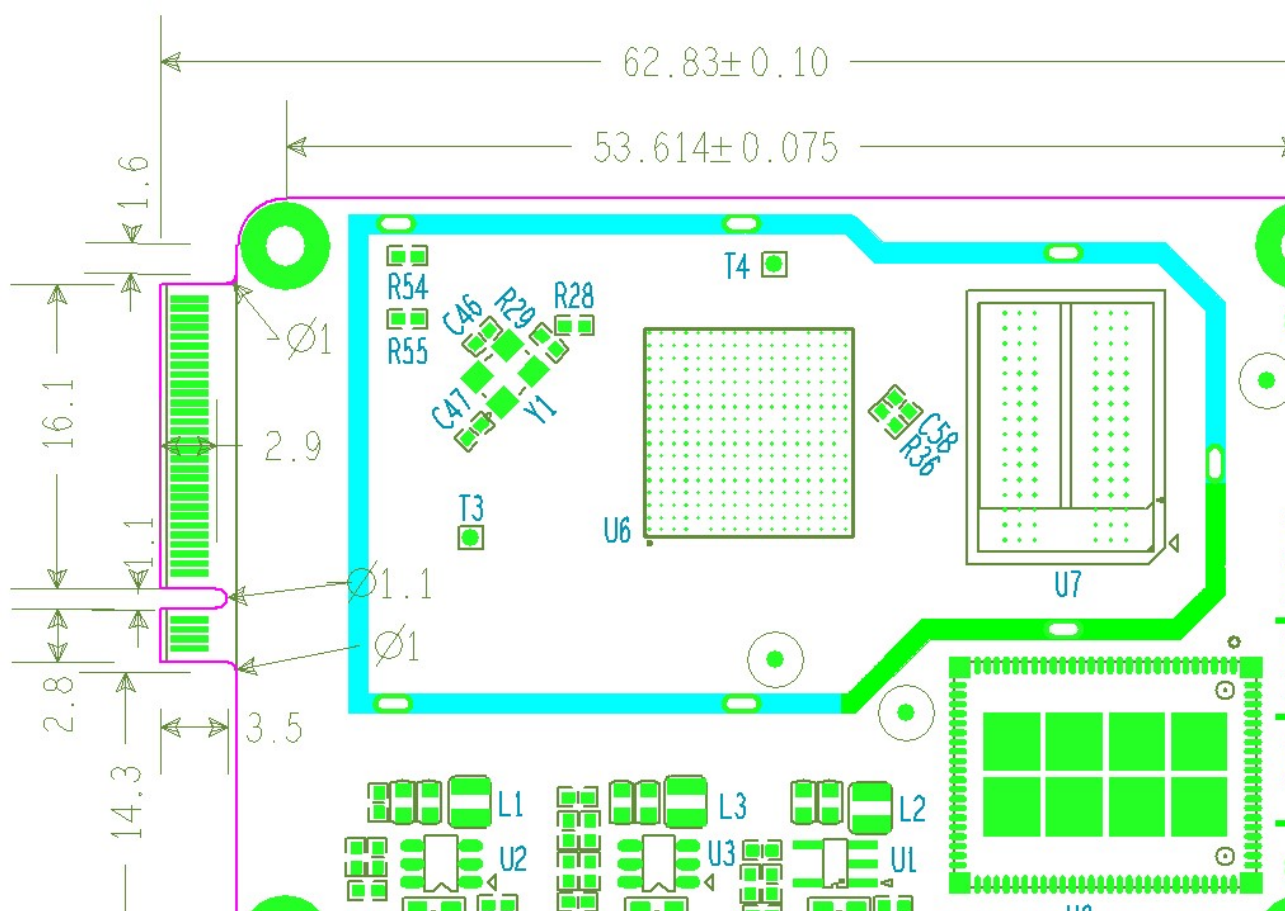


NGFF connector dimensions:

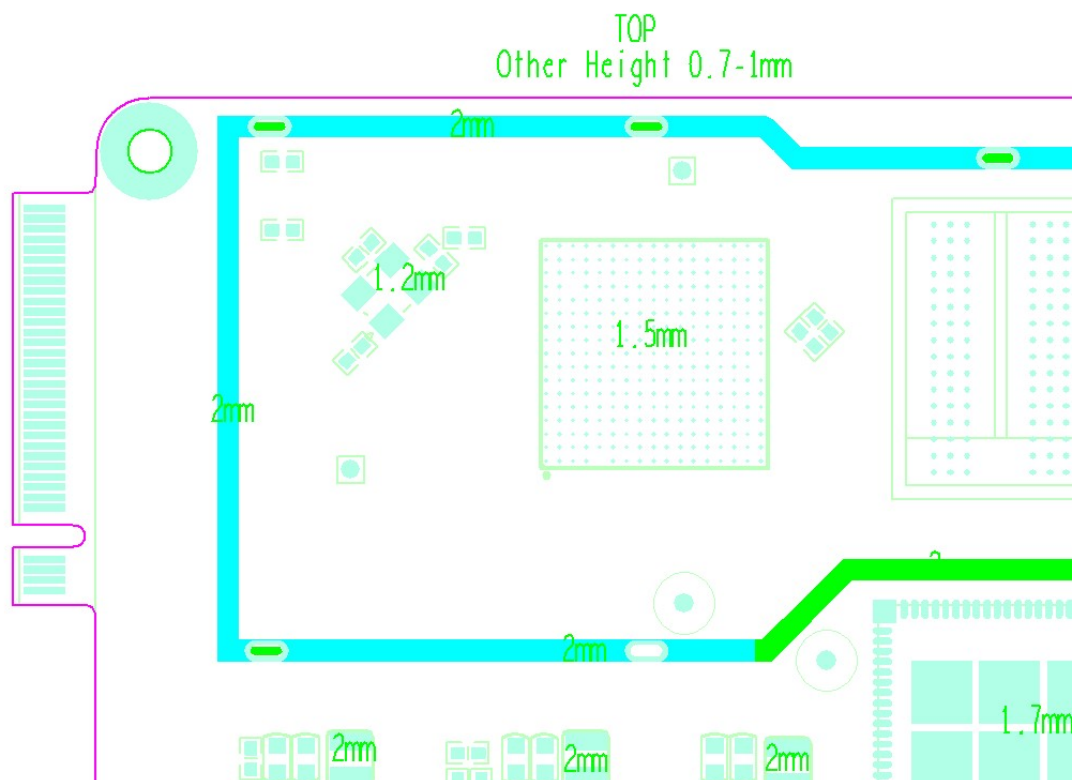


Top View Dimension

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |



### TOP Components Height Limit



|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

### Bottom Components Height Limit



Figure 2-2 A98 Physical Dimension

## 2.3. External Antenna

A98 uses the external antenna for the best Wi-Fi performance. To use external antenna, please choose the antenna type that meets the requirement of IEEE 802 a/b/g/n/ac Wi-Fi standard running at 2.4GHz/5GHz frequency. The detailed parameters are shown in the table below.

| Item            | Parameter                  |
|-----------------|----------------------------|
| Frequency range | 2.4 ~ 2.5GHz/4.9 ~ 5.8GHz  |
| Impedance       | 50 Ohm                     |
| VSWR            | 2 (Max.)                   |
| Reflection loss | -10dB (Max.)               |
| Connector       | I-PEX or populate directly |

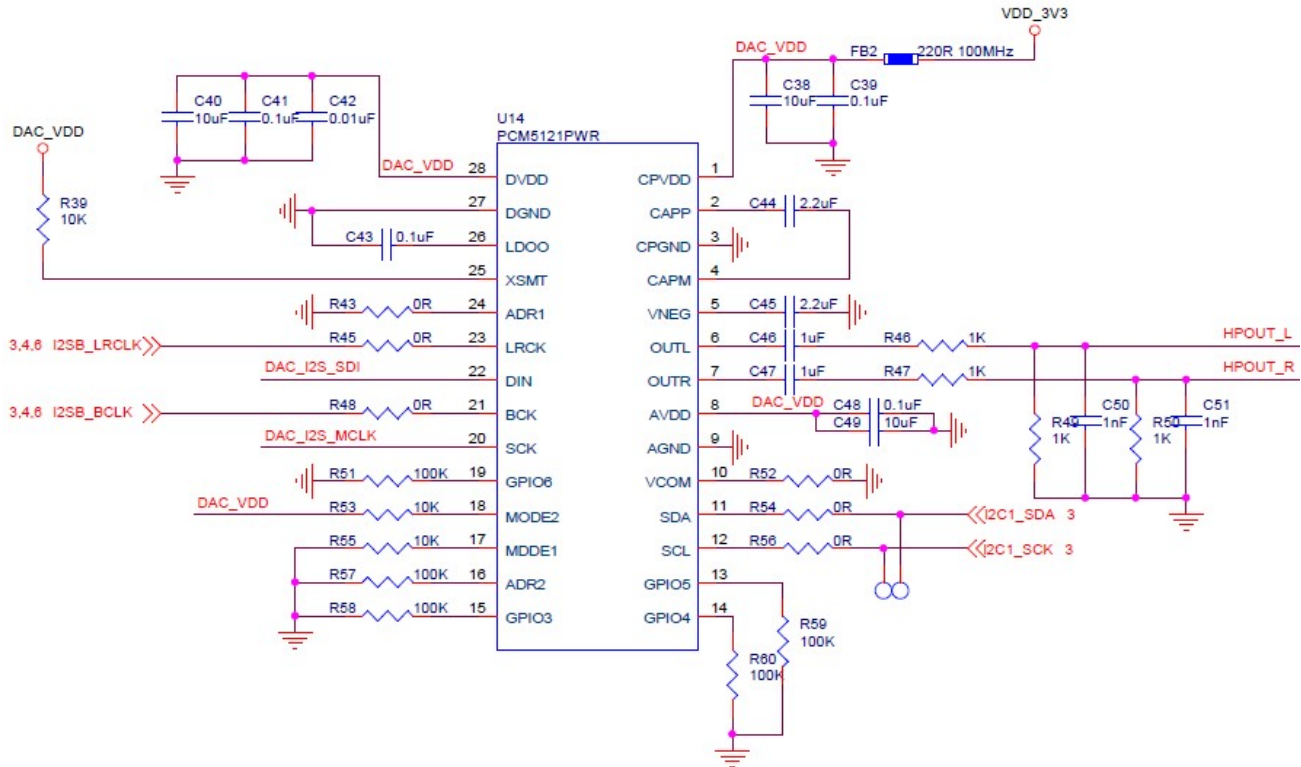
Table 2-5 External Antenna Parameters for A98

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

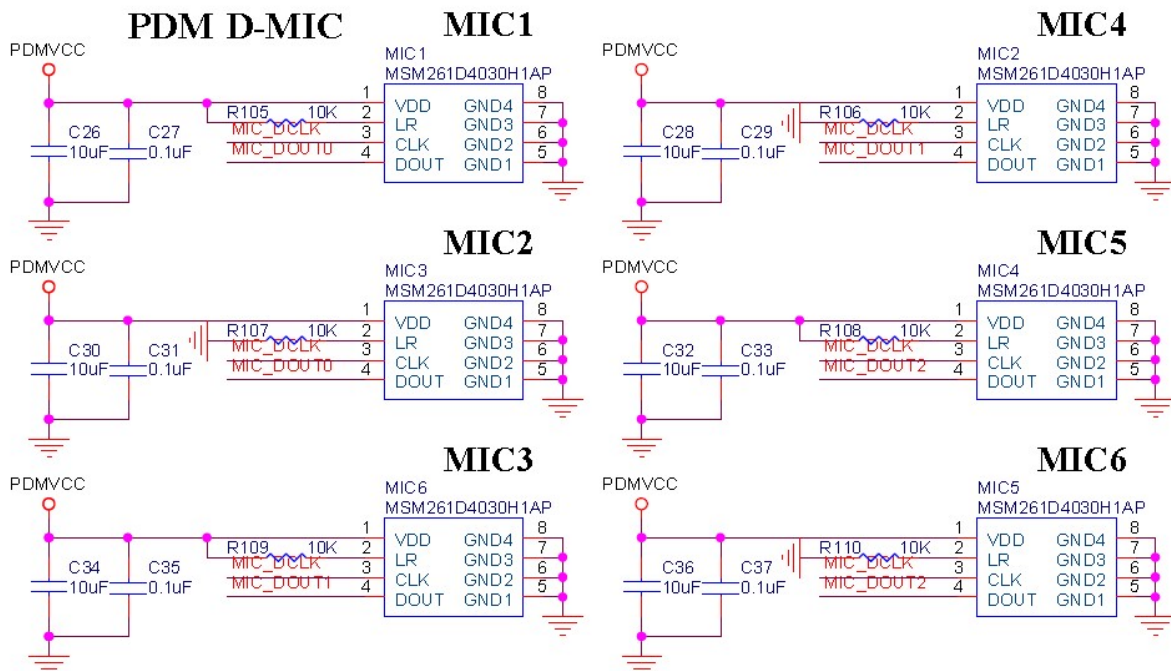
## 2.4. Typical Application

A98's typical reference design:

DAC

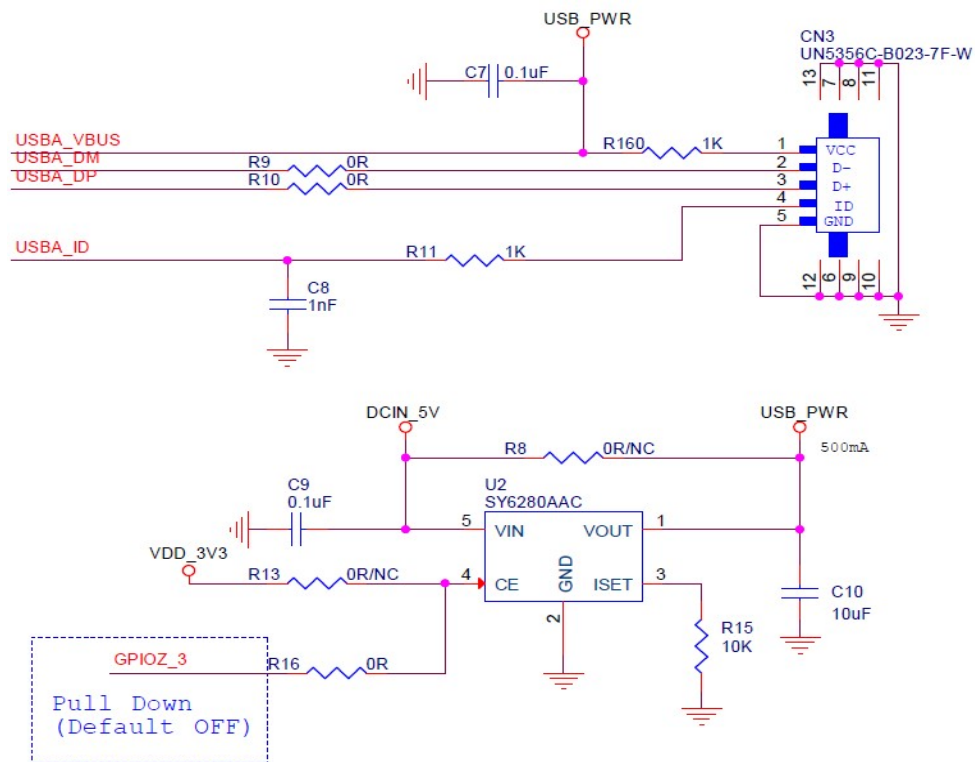


2/4/6-MIC Far-Field



|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

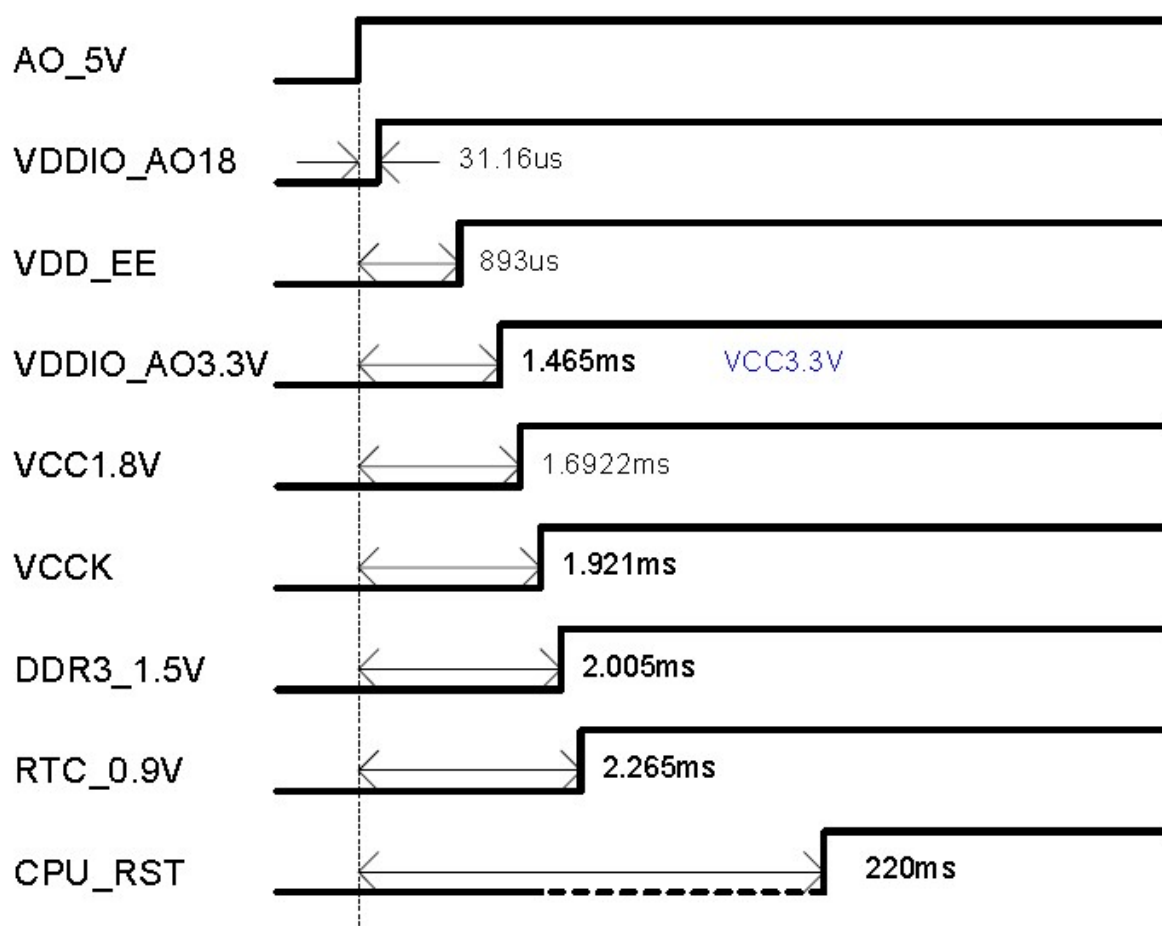
## Power and OTG



|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

## 2.5. Power on Sequence

# Power on sequence



## 2.6 USB OTG Port

Please follow the design rule below to populate the USB host interface:

| Item                                  | Parameter                        |
|---------------------------------------|----------------------------------|
| Signal Group                          | USB                              |
| Topology                              | Differential Pair Point-to-Point |
| Reference Plane                       | Ground Referenced                |
| Characteristic Trace Impedance (Zo)   | 90 $\Omega$ $\pm$ 10%            |
| Trace Width                           | 4 mils                           |
| Serpentine Spacing (center to center) | 8.5 mils                         |

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

|                                                |                                            |
|------------------------------------------------|--------------------------------------------|
| Minimum Isolation Spacing to Clock Signals     | 50 mils                                    |
| Minimum Isolation Spacing to Low-Speed Signals | 20 mils                                    |
| Minimum Isolation Spacing to other USB Pair    | 20 mils                                    |
| Total Length (with package length)             | < 8000 mils                                |
| Maximum Recommended Via Count                  | 2 (per side)                               |
| DM to DP Length Matching (with package length) | Match total length to within $\pm 10$ mils |

Table 2-2 A98 USB Design Rule

## 3. Software Introduction

### 3.1. Feature List

- “Easy Setup” to setup your network, with the help of one button of your device, you can connect the device to your home router quickly.
- Music stream protocol  
Support Spotify Connect, Airplay, DLNA and QPlay protocol
- Amazon Alexa
- Music content  
Support iHeartRadio, Napster/Rhapsody, Tidal, Deezer, vTune, Qobuz, Audible, Radio.de, NPR, Ximalaya, Qingting FM, QQ FM, Douban FM inside, with the help of App, you can search, stream, playback and preset the musics of the above music services.
- Multiroom  
Support multiroom.  
Support Airplay, Spotify, Bluetooth, Aux-in multiroom playback.
- Music format  
HTTP/HTTPS/RTSP/MMS/TS protocol  
HLS/ASX/M3U playlist format  
MP3/AAC/FLAC/ALAC/WMA/APE/OGG codec
- BT  
Support 4.2: A2DP, AVRCP, HFP, HID profiles  
Support BLE  
Support EDR
- Preset  
With the help of App, you can store the music account token and playlist in the A98. Then the end user can play the playlist by the button/voice or timer even without the App.

### 3.2. APP Support

- iOS App  
 $\geq$  iOS6.1, suggest iOS10 and above

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

- Android APP  
≥ Android 4.3.3
- Quick Customization  
With the help of the Linkplay compile server, you can change the brand and some strings, change the logo and some pictures to get a customization App.

### 3.3. Certifications

Linkplay can help you to finish follow certifications:

- Wi-Fi Logo
- BQB
- Amazon Alexa
- MFi
- Spotify Connect
- DLNA
- Qplay

## 4. Module Environmental and Package

### 4.1. Environmental Ratings

The environmental ratings are shown as following table.

| Characteristic      | Value        | Units | Conditions/CommentsA |
|---------------------|--------------|-------|----------------------|
| Storage Temperature | -5 ~ 45      | °C    |                      |
| Relative humidity   | Less than 60 | %     | Storage              |
|                     | Less than 80 | %     | Operation            |

### 4.2. Electrostatic Discharge Specifications

Extreme caution must be exercised to prevent electrostatic discharge (ESD) damage. Proper use of wrist and heel grounding straps to discharge static electricity is required when handling these devices. Always store unused material in its antistatic packaging.

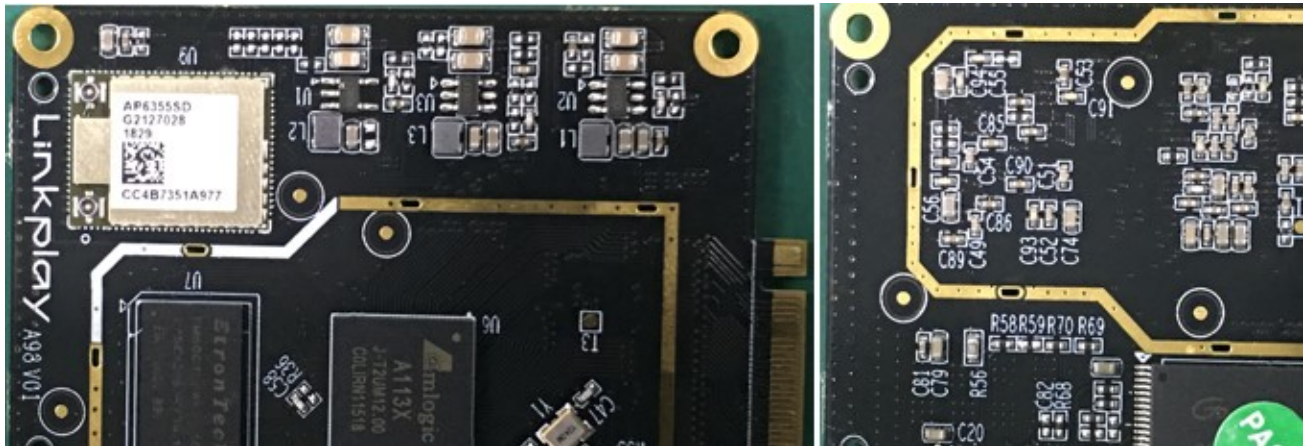
ESD Specifications

| Type                  | Symbol       | Condition                                                          | ESD Rating | Unit |
|-----------------------|--------------|--------------------------------------------------------------------|------------|------|
| ESD Handling          | ESD_HAND_HBM | Human Body Model Contact<br>Discharge per<br>JEDEC EID/JESD22-A114 | 1000       | V    |
| Machine Model<br>(MM) | ESD_HAND_MM  | Machine Model Contact                                              | 30         | V    |

|           |                                           |         |             |
|-----------|-------------------------------------------|---------|-------------|
| Doc Title | Wireless Smart Audio Module-A98 Datasheet | Number  | WMB20180504 |
|           |                                           | Version | 0.6         |

|     |              |                                                                        |     |   |
|-----|--------------|------------------------------------------------------------------------|-----|---|
| CDM | ESD_HAND_CDM | Charged Device Model Contact<br>Discharge per<br>JEDEC EIA/JESD22-C101 | 300 | V |
|-----|--------------|------------------------------------------------------------------------|-----|---|

### 4.3. A98 Module Picture



Notes:

Linkplay: Linkplay logo

A98: module number

V01: MP version of A98 module

### 4.4. Sticker Specification



Notes:

Line 1. Model Name: AP6355SD

Line 2. Lot Code (Tracking No.): Coding by 98P Manufacture order, 8 characters in total.

Line 3. Date Code: YYWW, 4 characters in total base on week of testing

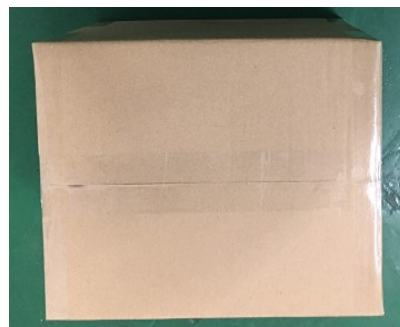
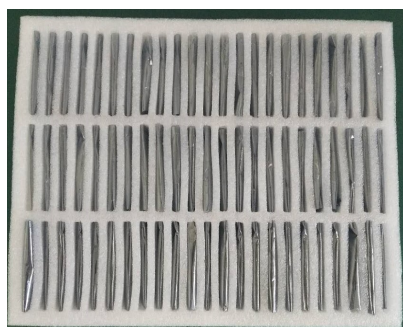
Line 4. Wi-Fi MAC, CODE SYMBOLOGY: data matrix, Configuration by Manufacture order.

Line 5. Wi-Fi MAC, 12 characters, Configuration by Manufacture order.

Sticker size: 10mm\*9mm (High temperature sticker)

1) Delivery

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |



Notes:

One tray = 69pcs

1 box in total 4\*69 pcs= 276 pcs

Carton with the size= 350\*260\*270 mm

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

## Single Module

### 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.

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

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.

### FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

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 Transmitter Module FCC ID: 2ANOG-A98XX Or Contains FCC ID: 2ANOG-A98XX”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with Single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C : 15.247 and 15.407 requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.407 requirement, then the host can be sold legally.

|                  |                                           |                |             |
|------------------|-------------------------------------------|----------------|-------------|
| <b>Doc Title</b> | Wireless Smart Audio Module-A98 Datasheet | <b>Number</b>  | WMB20180504 |
|                  |                                           | <b>Version</b> | 0.6         |

The module complies with FCC Part 15.247/ Part 15.407