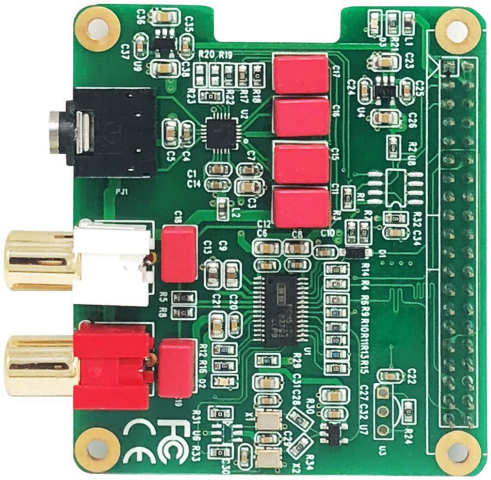
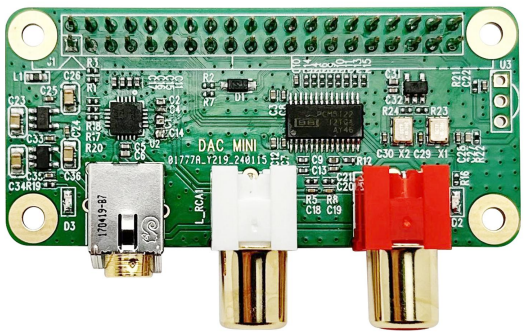
Innomaker DAC /DAC Mini HAT UserManual





目录

1. General

The Innomaker DAC/DAC Mini Hat stand as the premier choice for enhancing the audio output of the Raspberry Pi. It utilizes the onboard PCM5122 as its IIS clock master, bypassing the Raspberry Pi's inherently jittery clocks. To ensure precise sample rate clocks, it incorporates dual low jitter oscillators (45.158M and 49.152M). The device is designed for ease of use, requiring no soldering or extra cables, simply connect it and do some simple configuration, transform your Raspberry Pi into a high-end music player, but only pay 1/10 to 1/100 of the market cost.

2. Features

1. Compatible with Raspberry Pi via the 40-pin connector. Connects directly to the Raspberry Pi board, no additional cables required,no soldering. Easy to get more beautiful and fantastic sound by this RPI+DAC HIFI suits.

2. Absolutely perfect to support all Raspberry Pi music playback system ,such as LibreELEC, OSMC, RuneAudio, Volumio, Moode, PiCorePlayer, , OpenELEC, Raspbian, Ubuntu etc. Support play music from a hard disk or over the network. Support DSD over PCM(DOP)mode.

3. Class-leading stereo audio DAC PCM5122, sample rates up to 384-KHz/32-Bit. Paired with stereo high fidelity headphone amplifier TPA6133. Provides 2.1Vrms ground-centered outputs coupled with Film capacitor.

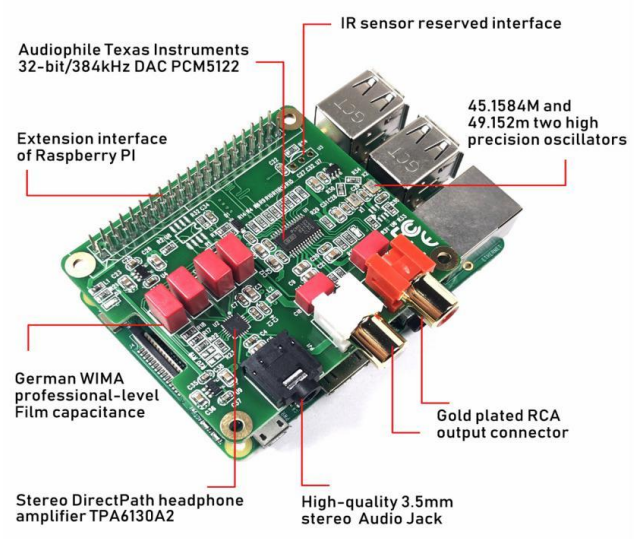
4. On-board a pair of gold plated RCA (LEFT &Right) jacks and a 3.5mm high-end headphone jack output, allow you free to play your music through Raspberry Pi to another terminals.

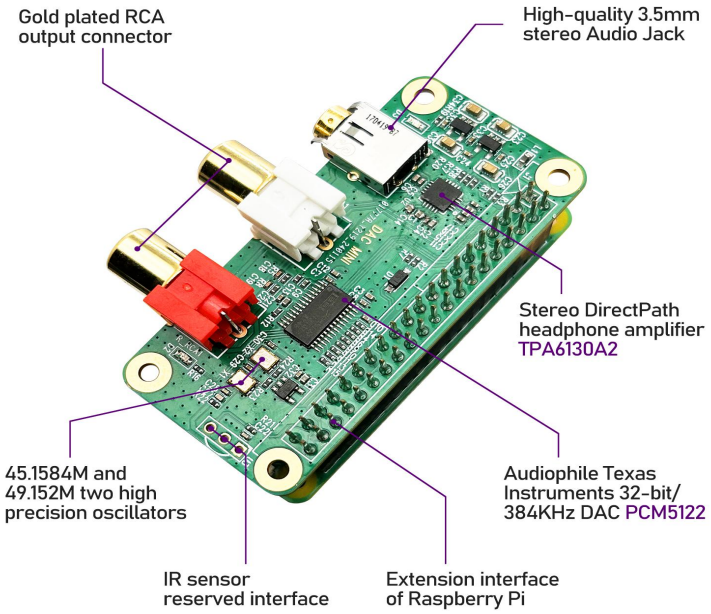
5. Comes with software, document and friendly technology support. For more information please refer to our wiki（view the link on color page comes with the goods).

3. Hardware Description

Connect the DACDAC Mini HAT module and RPI with 40 pin connector .While installing the module attention to align the first leg of the raspberry pi and HIFI DAC HAT module.

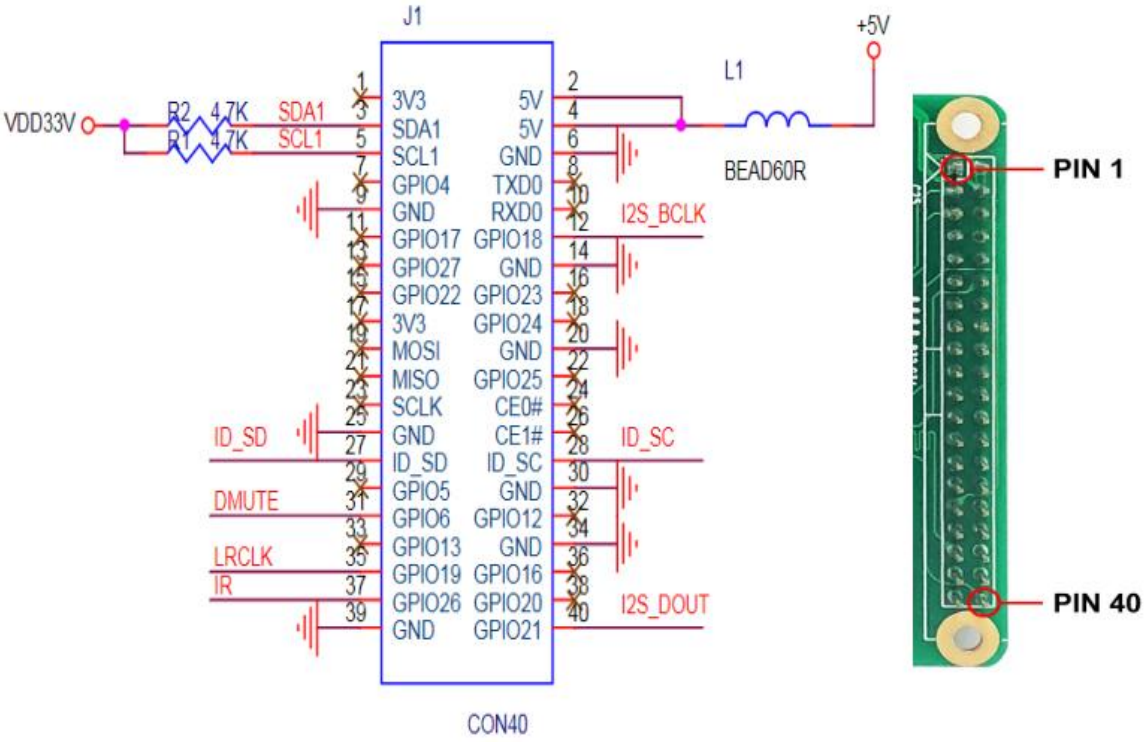
3.1Overview





3.2 PINOUT USAGE- FEMALE CONNECTOR

1) 40 PIN Interface Schematic



2) 40 PIN Interface Description

PIN	Symbol	Description
2, 4	+5V	+5V Supply Pin, connected to the main 5V supply of the Raspberry Pi
3	SDA1	SDA Used for DAC and EEPROM
5	SCL1	SCL Used for DAC and EEPROM
12	GPIO_18	IIS_BCLK
31	GPIO_6	Mute function control pin
35	GPIO_19	IIS_LRCLK
37	GPIO_26	Infrared receiver reserved port
40	GPIO_21	IIS_DOUT
27, 28	ID SCL and ID SDA	Reserved for an ID EEPROM on the Raspberry Pi. These pins are always reserved and should never be used to connect external components
6, 9, 14, 20, 25, 30, 34, 39	GND	Ground Pin, connected to the main system Ground of the Raspberry Pi
The remaining pins are unused, You can use them for your other hardware boards.		

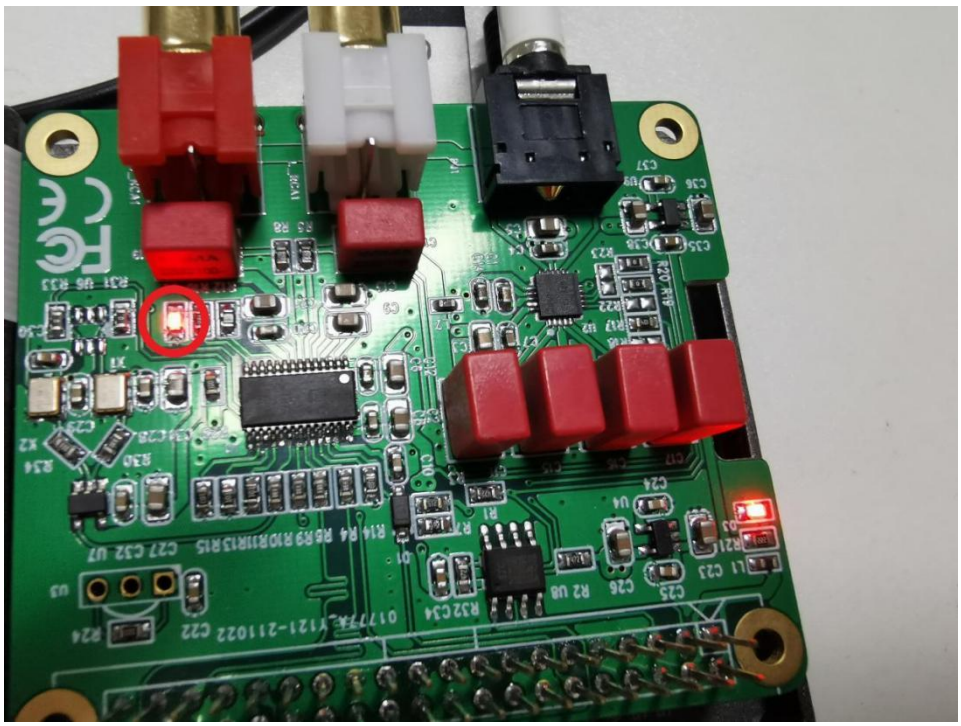
For more information about GPIO of Raspberry PI, please refer to below link:

https://www.raspberrypi-spy.co.uk/2012/06/simple-guide-to-the-rpi-gpio-header-and-pins/#prettyPhoto

https://docs.microsoft.com/en-us/windows/iot-core/learn-about-hardware/pinmappings/pinmappingsrpi

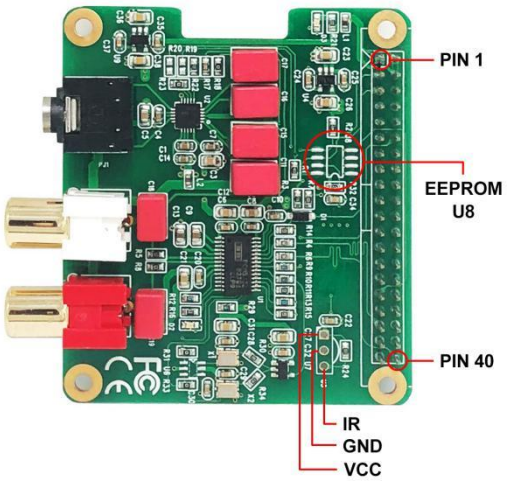
3) Indicator Light

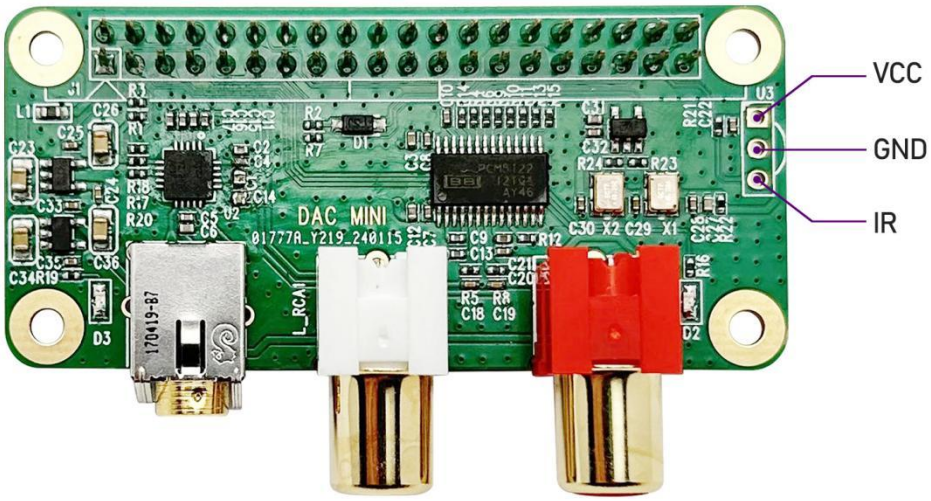
When the DAC module driver is install successfully and be detected, below red led on-board should be on.



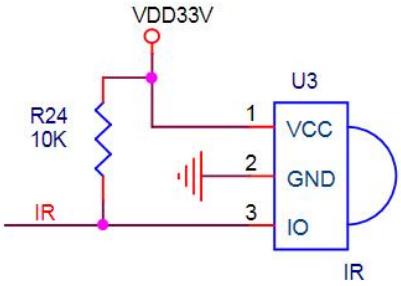
3.3 Extended Function

We reserved some function for customer DIY by themself.



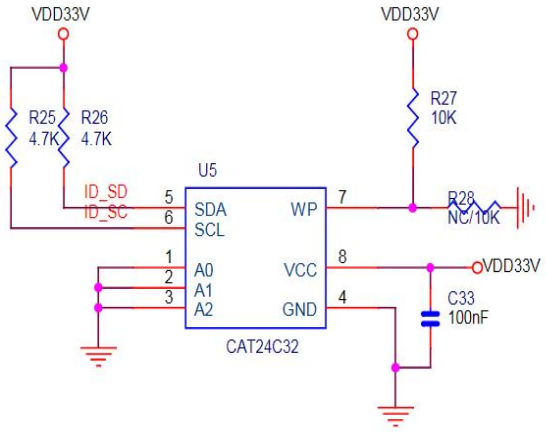

VCC
GND
IR
DAC MINI
01777A_Y219_240115
L_RCA

1) Infrared Receiver Function: (U3,No Soldering On-board)



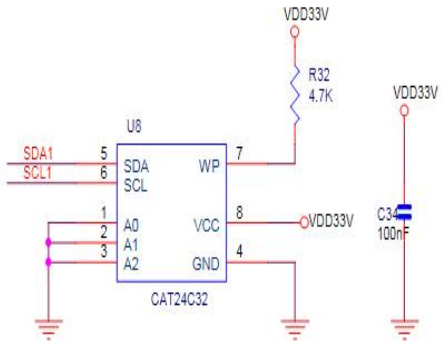
IR is connected to PIN37(GPIO_26) , But we have no software for it right now. We will release new software version after finish it. If you have any advices please feel free to E-mail to us.

2) ID EEPROM: (U5, No soldering on-board)



Pin 27 and 28 are always reserved for an ID EEPROM on the Raspberry Pi. Independently which card you use. It's useless for most application. If you want to use this function, you need to solder the IC, resistance and capacitance by yourself. The DAC MINI board does not have this feature reserved.

3) USER EEPROM: (U8 No soldering on-board)



It connected to the same IIC port with DAC. you need to solder the IC and Confirm IIC slave devices. If you a novice of Raspberry Pi, We really wouldn't advise do that.The DAC MINI board does not have this feature reserved.

4. Software Description

4.1 Overview

DAC/DAC M HAT module compatible with many Raspberry pi music playback system such as: OSMC / Max2Play / RuneAudio / Volumio / Moode / PiCorePlayer / PiMusicBox / OpenELEC etc. You can choose your favorite. We take **Volumio/MoOde/LibreELEC/Max2play/Raspbian/OSMC** Preset System for Example.

May I draw your attention below:

1) Because the third party will update the version unscheduled, so the actual UI may different from below user guide. But the configurations will be the same. If you meet any problem, you can Check the user help on the website of the third party or feel free to e-mail to our support team (support@inno-maker.com).

2) Some music systems' default volume might be quite high. Please adjust the volume in advance to avoid damaging your ears.

3) For some music systems that are not listed, you can try to find set their audio out put device as **Allo Boss Dac, innomaker Dac** or modify the config.tx files same as Raspbian system setup steps. This is a build-in driver on Linux system, so most of music systems can support it.

4.2 Download Image from website

Download the lastest image for Raspberry PI:

Volumio Image:
http://volumio.org/get-started/

MoOde Image:
http://www.moodeaudio.org/

LibreELEC：
https://libreelec.tv/downloads/raspberry/

Max2Play Image:
https://www.max2play.com/en/max2play-image/

Raspbian and Raspbian lite Image:
https://www.raspberrypi.com/software/operating-systems/

OSMC:
https://osmc.tv/download/

4.3 Load Image on to SD card.

Prepare a capacity of at least 16GB TF card and a card reader.Load the image file onto a SD card, using the instructions provided on the Raspberry Pi website for Linux, Mac or PC:
https://www.raspberrypi.org/documentation/installation/installing-images/README.md

4.4 VOLUMIO Setup

Volumio is an entirely new music system. It is designed to play all your music, whether is an Hi-Res file or a Web Radio, with the highest quality. Control it with your favourite device, a smartphone, PC or tablet, and enjoy your music as you never did before.

Volumio is a Free and Open Source Linux Distribution, designed and fine-tuned exclusively for music playback. I supports all filetypes: FLAC, Alac, Aac, Vorbis, Mp3, DSD etc. and support

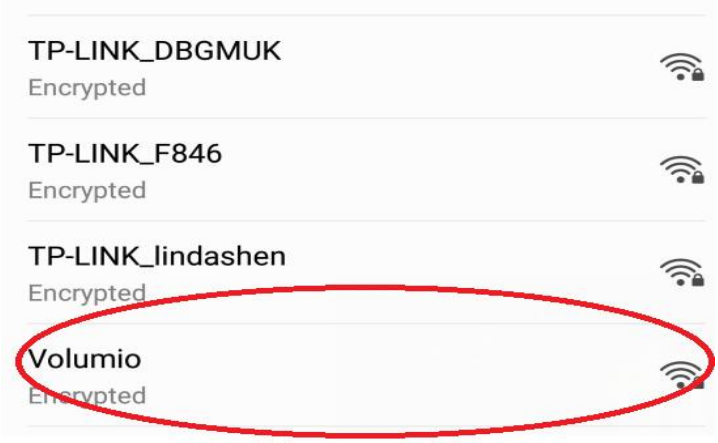
By flashing (installing) Volumio on any platforms, it will then become a headless Audiophile Music Player. Headless means that the only way to control it will be with another device, such as a Smartphone, Tablet, PC or anything that has a browser.

For more detail please refer to https://volumio.org/discover/.

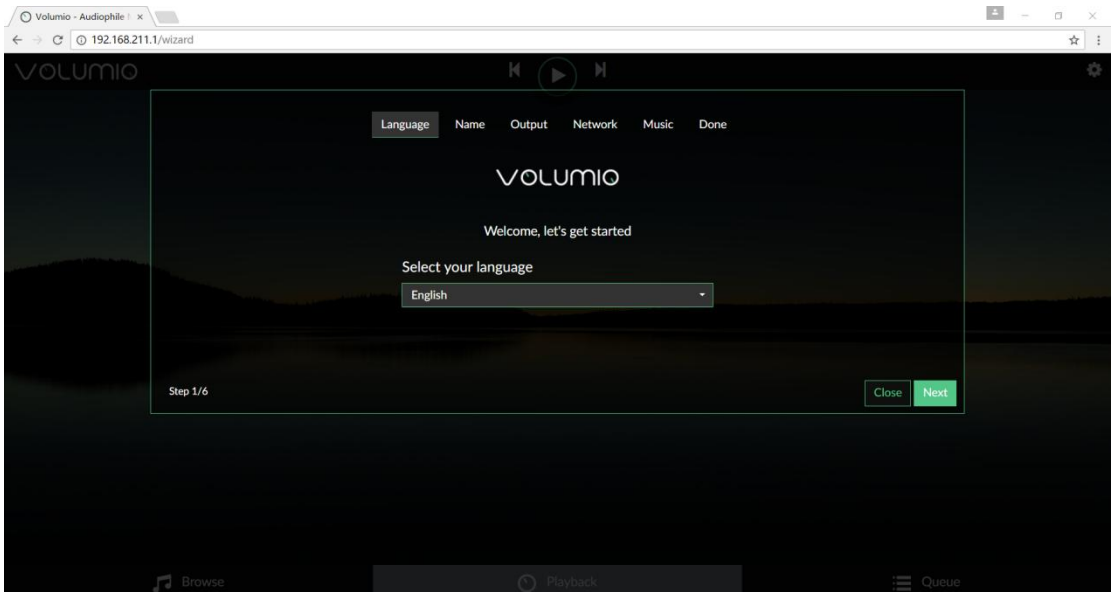
STEP:

1) Insert the TF card with volumio image into the Raspberry pi then power on.

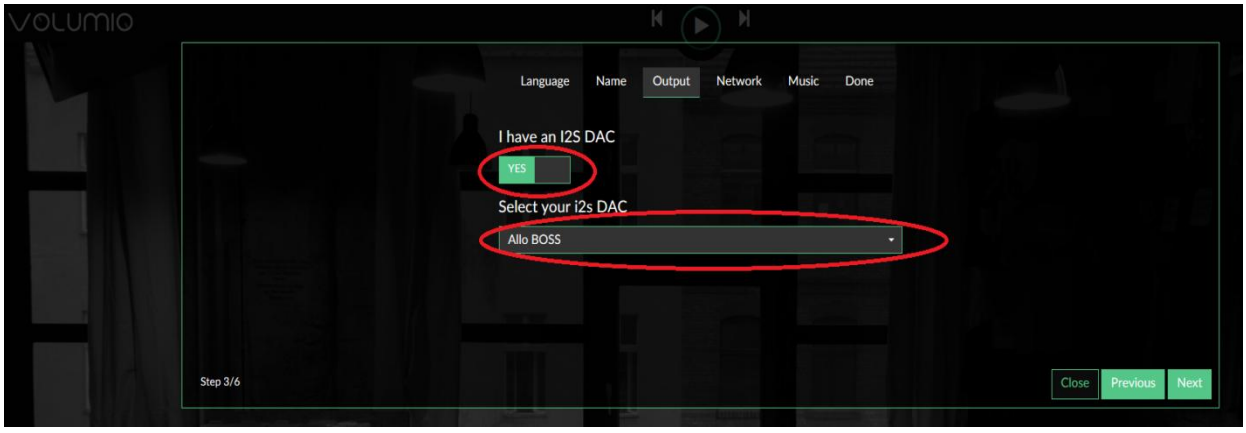
2) By using your smart phone, tablet or any device with WIFI and browser search for WIFI hotpots. You can see a 'Volumio' name in the search list. Connect this hotspot with password 'volumio2'. You can change your password after login. You alson can connect a Raspberry Pi to your router using an Ethernet cable, find the IP address of Volumio on the router, and open this IP address from a computer connected to the same router.



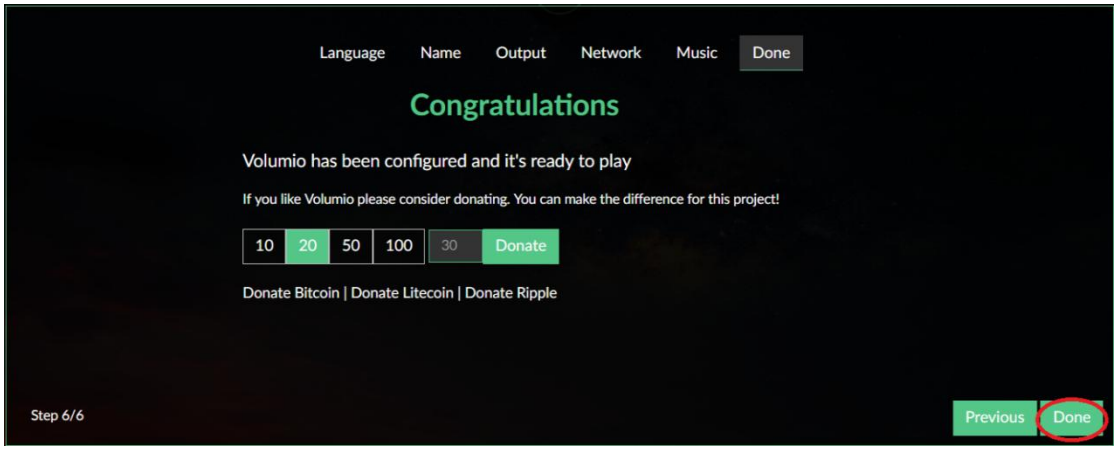
3)The browser will automatically eject playback software UI which is based on web interface (if you connect the hotspot successfully but for some reason browser can't pop up the playback page automatically, you can using http://192.168.211.1 to login. You can see below wizard of Volumio. We only need to set "Language" , "Name" "Output" and "Done" for simple application.



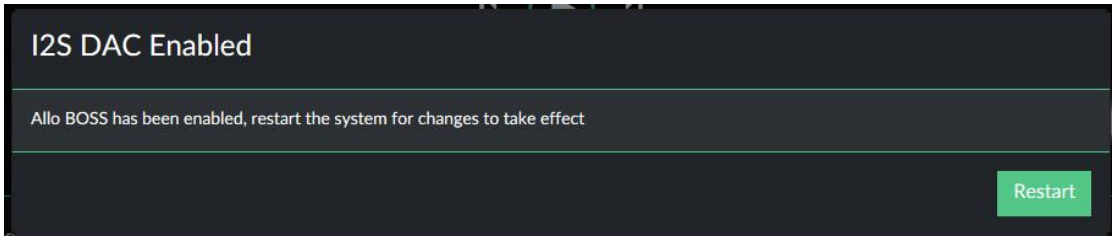
4)It should be noted that 'Output' page must set as below. This is an essential step, otherwise you can't hear anything.



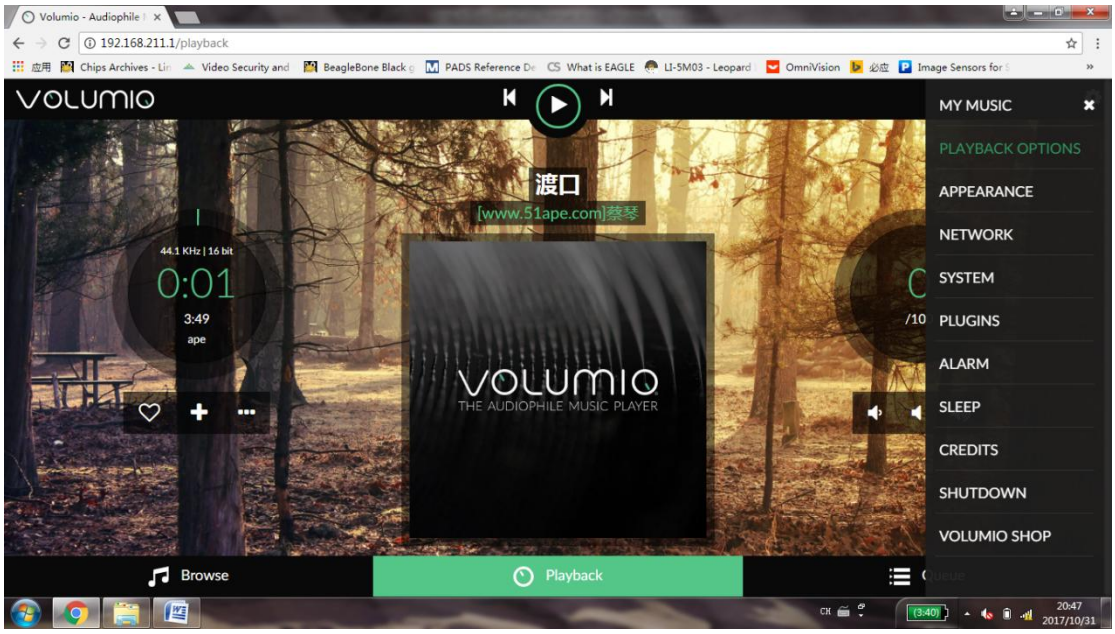
5)In ‘Done’ Page, you can see a request for donations from Volumio. It’s depand on you. You can give them some help if you like this application. Gifts of roses, hand a fragrance.



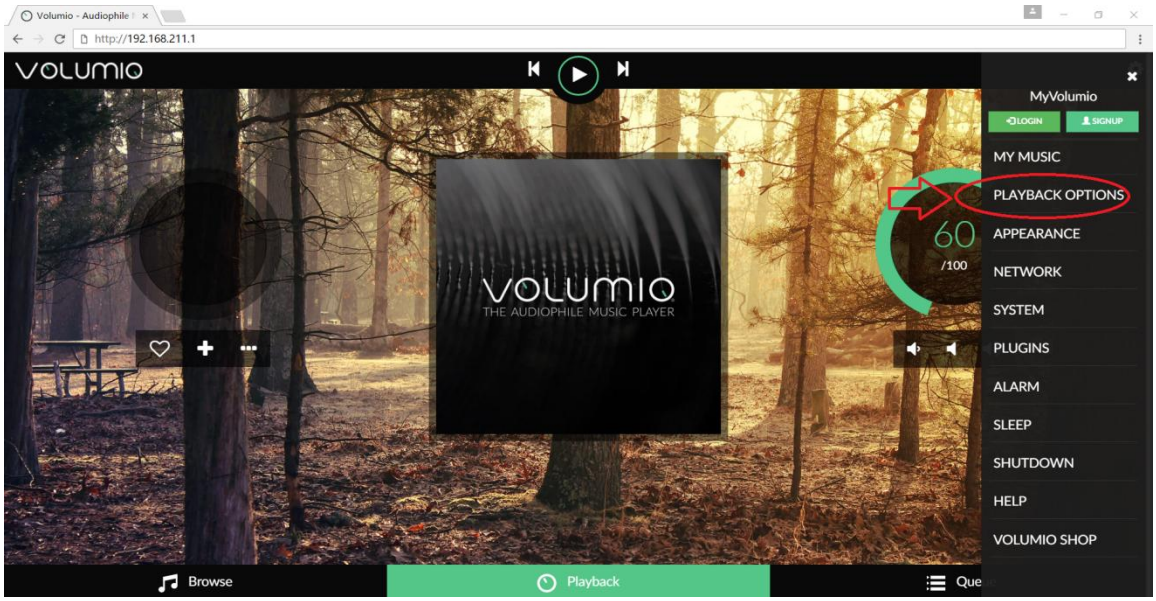
6)Click ‘Done’ to finish initialization of Volumio. And then restart Volumio.

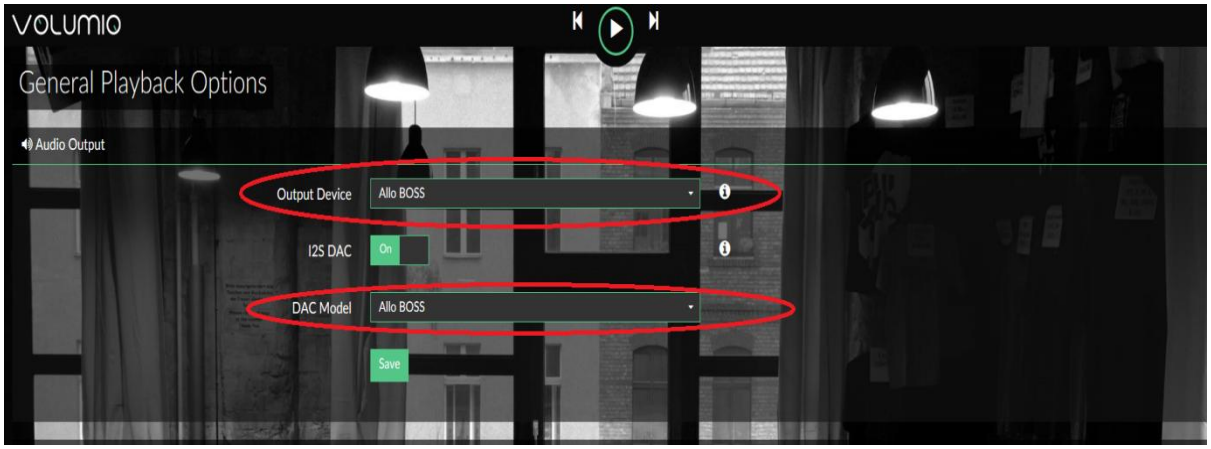


7)In this restart process, “Volumio” hotpot will turn off for a moment. Sometimes your mobile phone , Tablet or PC will automatic reconnect to your wifi nearly. You need to set back to ‘Volumio’ hotpot. After restart you can see the main page of Volumio.

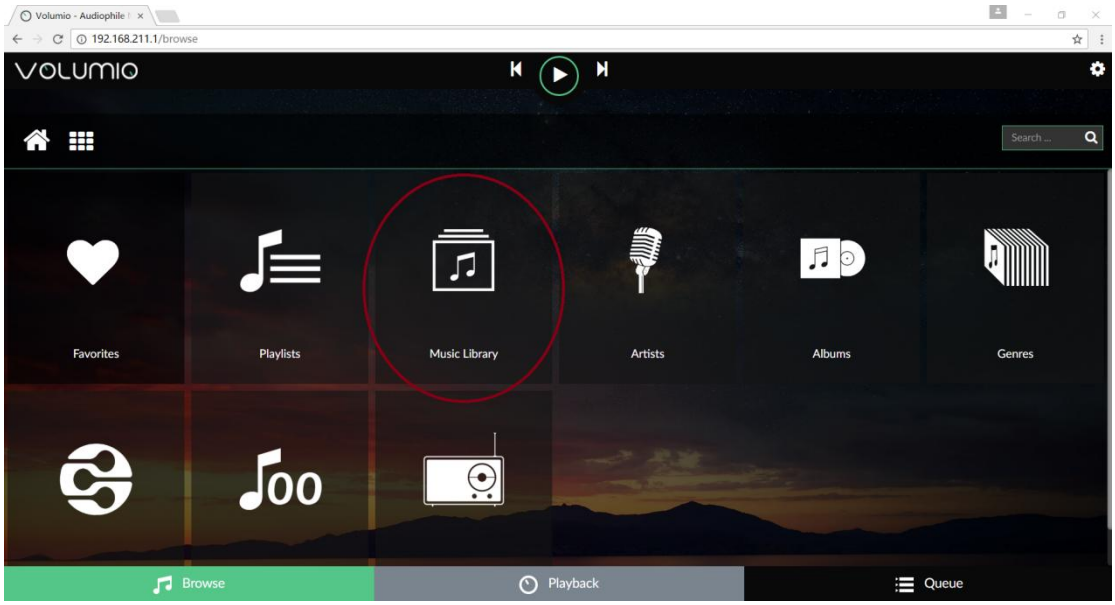


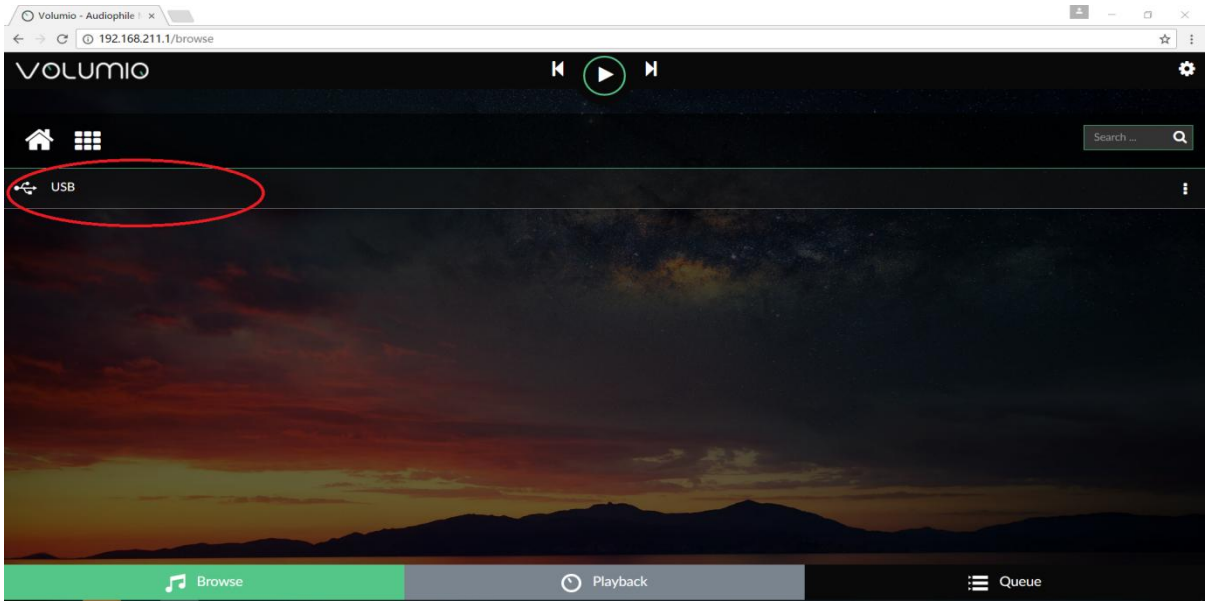
8)If you can't play music properly, please Click ‘Setting’ → PLAYBACK OPTION, check the output setting as below picture. This is an essential step, otherwise you can't hear anything.





9)You can insert the USB Disk or mobile hard disk with your own audio file into Raspberry Pi USB connector, and find the music list of your USD disk in “Music Library”.



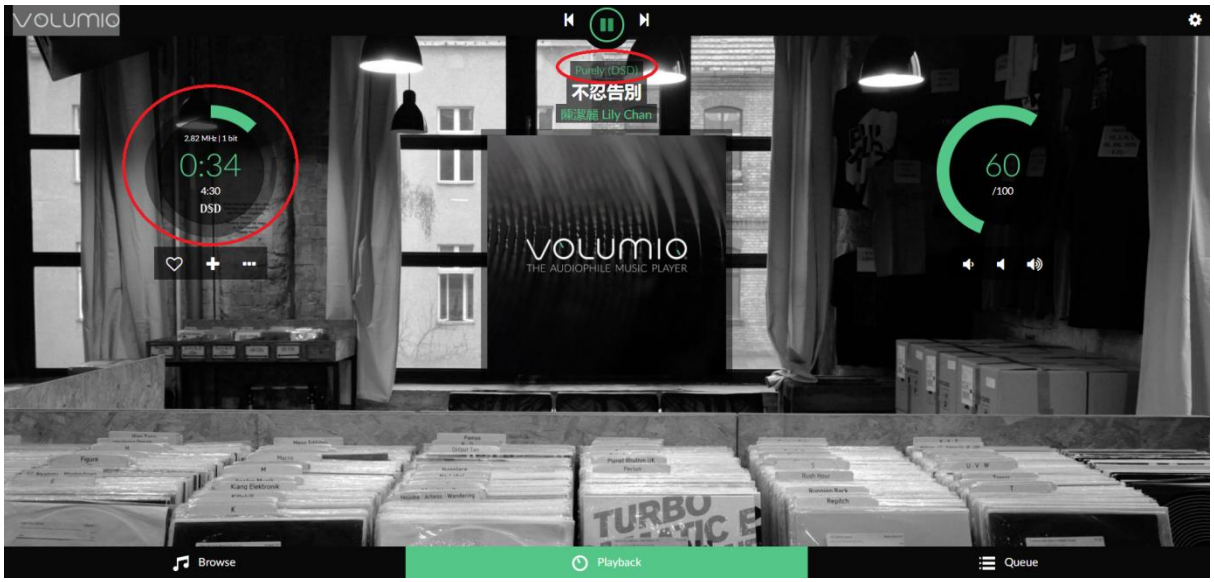


4.5 VOLUMIO Play DSD Music Files

DSD64, DSD128 AND DSD256 are now natively supported in direct DSD mode on Volumio.
For more DSD information please refer to Volumio link:
https://volumio.org/direct-dsd-support-volumio-dsd512/
Please set 'General Playback Options' mode as below picture:

Restart and enjoy DSD music.


VOLUMIO
A3.I Miss You.dff
5.64 MHz | 1 bit
1:15
5:47
DSD
VOLUMIO
THE AUDIOPHILE MUSIC PLAYER
60
/100
Browse
Playback
Queue


VOLUMIO
Purely (DSD)
不忍告別
陳潔麗 Lily Chan
2.82 MHz | 1 bit
0:34
4:30
DSD
VOLUMIO
THE AUDIOPHILE MUSIC PLAYER
60
/100
Browse
Playback
Queue

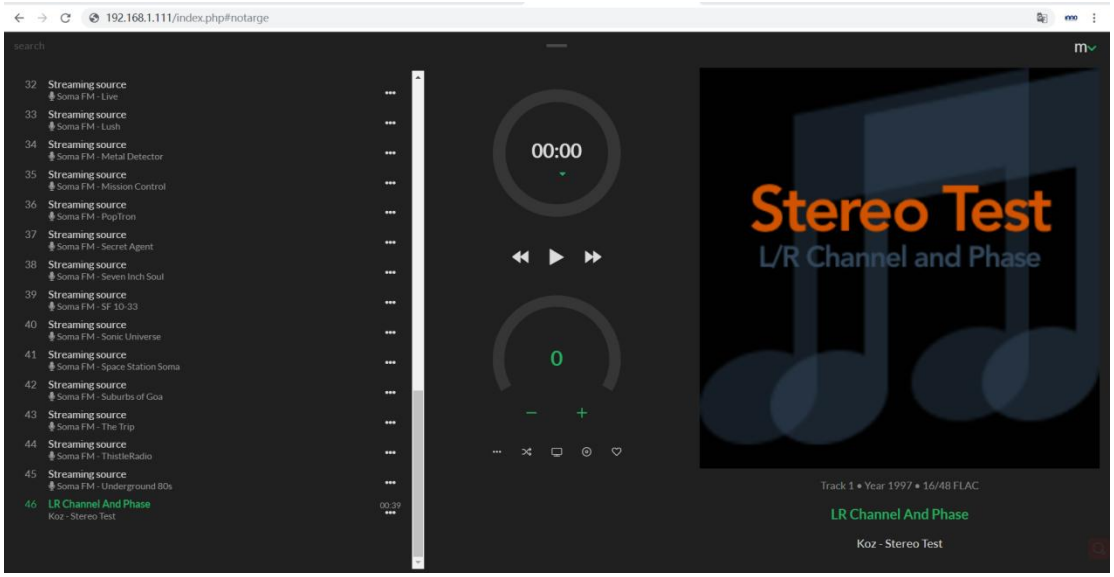
4.6 MoOde Setup

1)We just talk about the basics, for more Information please read the official user manual: https://github.com/moode-player/moode/blob/master/www/setup.txt

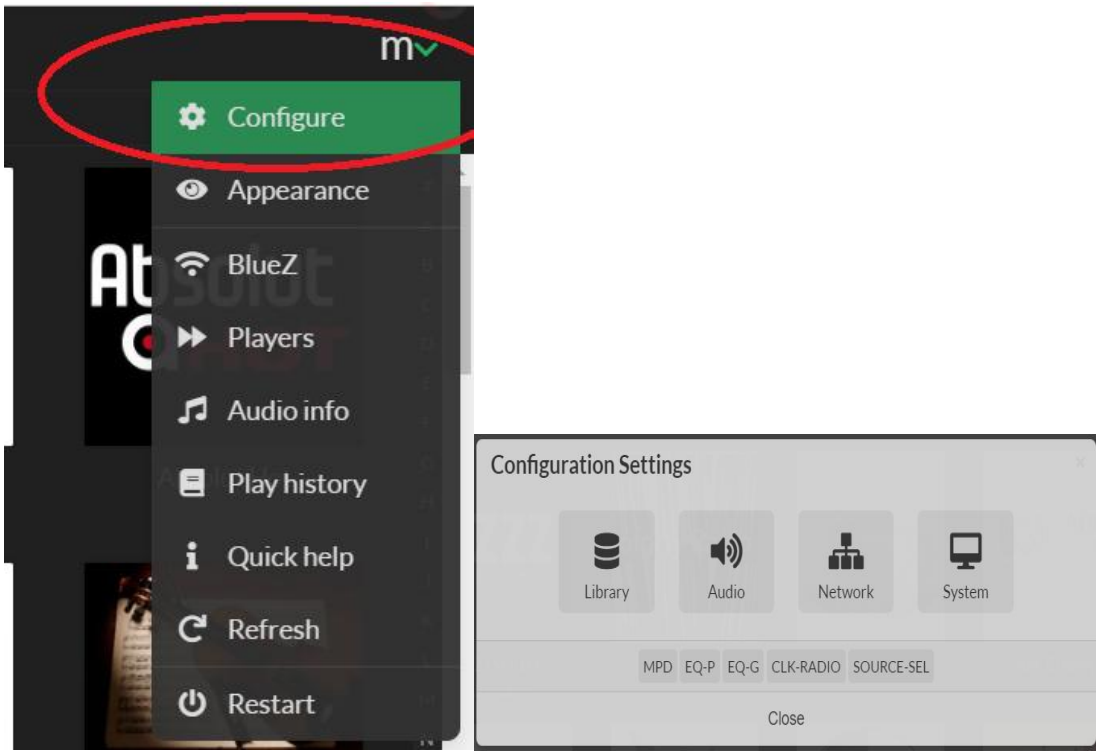
2) Insert the TF card with MoOde image into the Raspberry pi, and then connect to your router by LAN cable, Finally power on. Make sure your Raspberry Pi , Desktop (mobile phones, laptop, pad and so on) in the same local area network(LAN). Get the IP address of Raspberry PI through check up the router or use some IP checker tools.

3)You also use your device(mobile phones, laptop, pad and so on) to connect the hotspot of moode. Named: 'Moode', and Password is 'moodeaudio'. Login page: http://172.24.1.1/

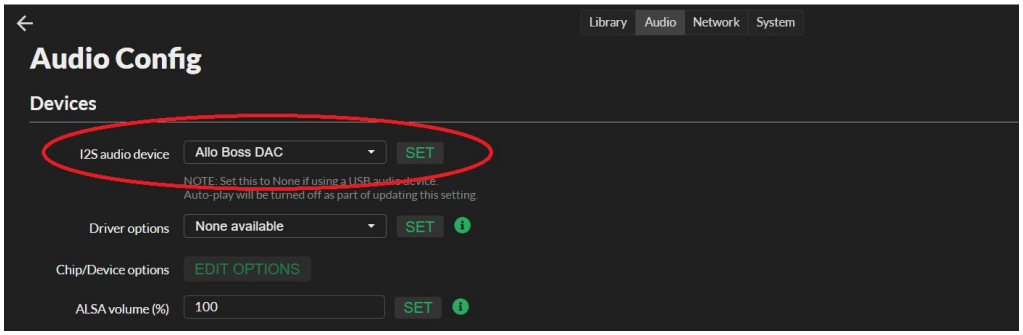
4) Connected the Raspberry Pi through browser. You get the display of Moode.



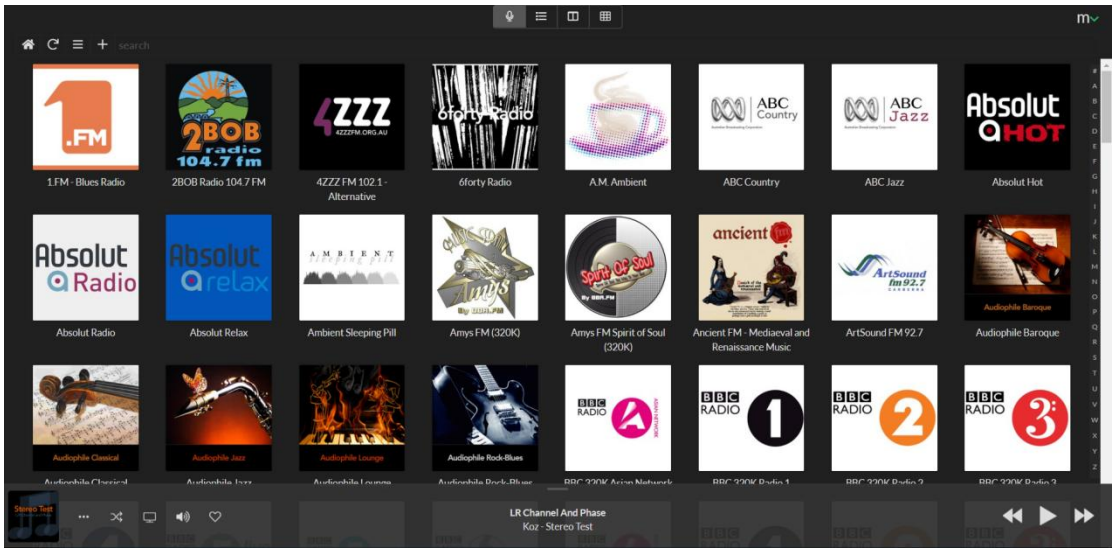
5)Click the icon in the upper righ for setting the system.



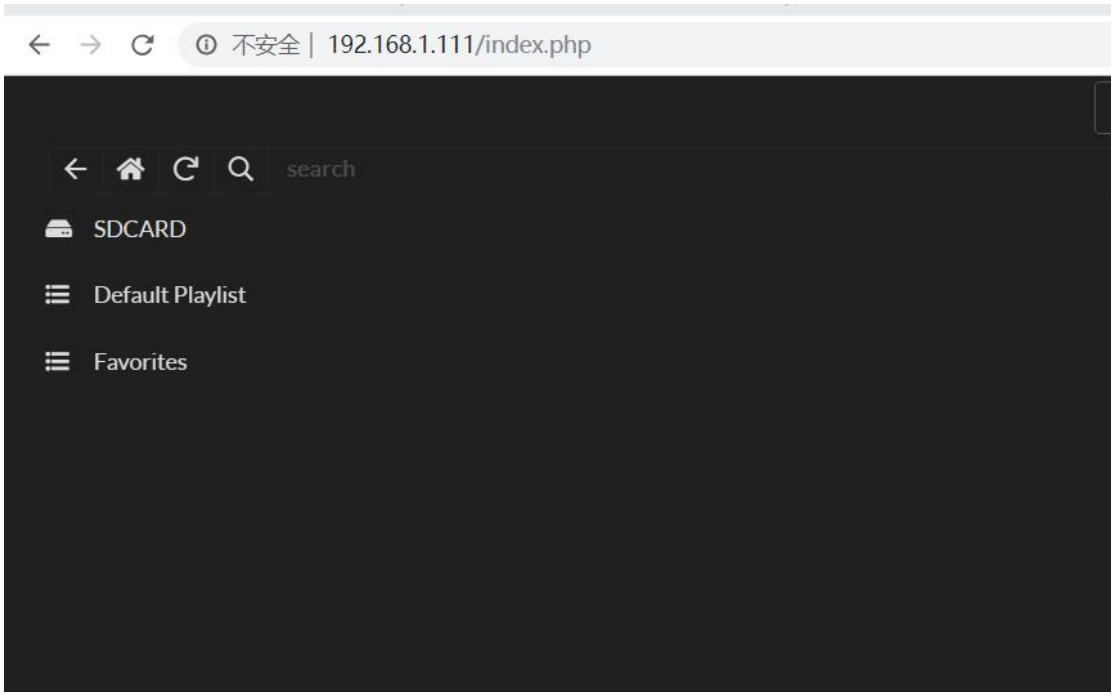
6) Click ‘Audio’, set as ‘Allo Boss DAC’ and save and restart. This is an essential step, otherwise you can't hear anything.

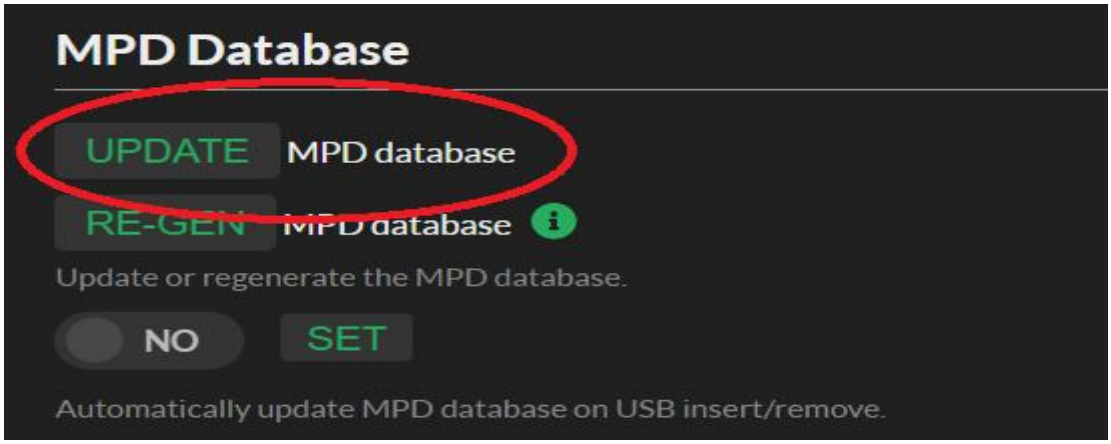


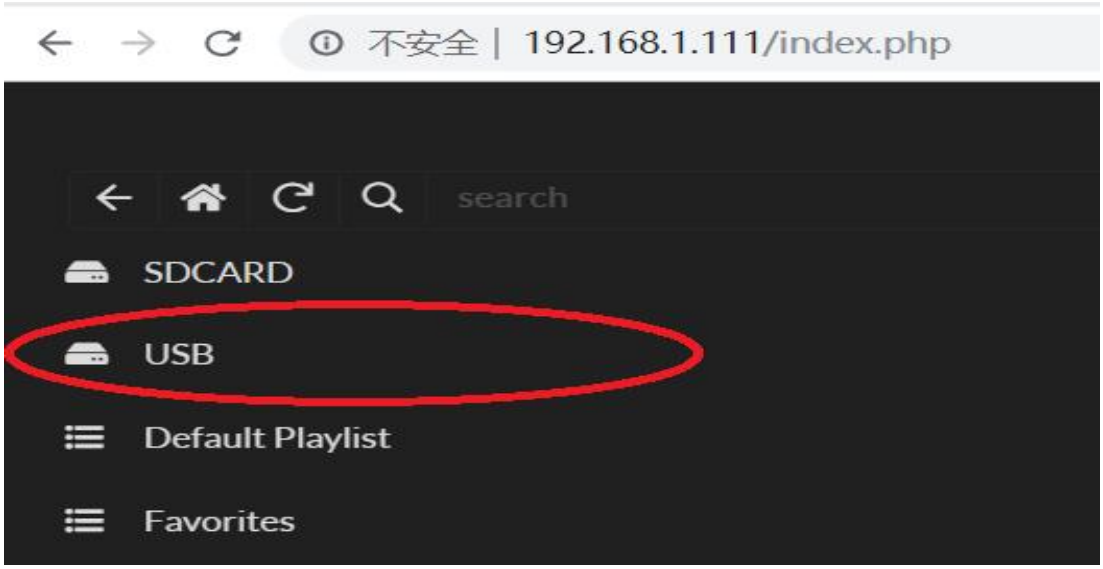
7)Now you can enjoy your music.



8)You can play music in the SD/MMC card, U disk which connected with Raspberry Pi. But Moode may not automatic update disk default, so you need to update by yourself follow these steps.

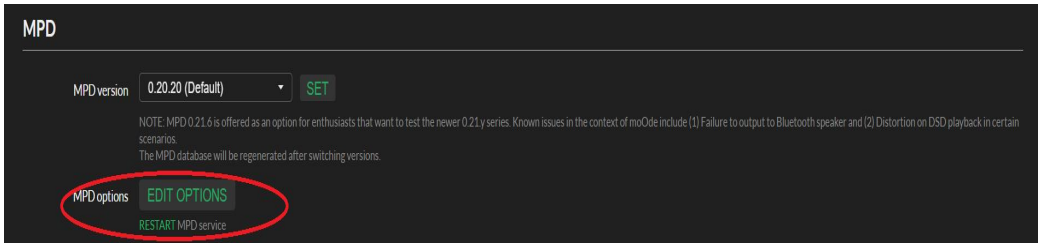


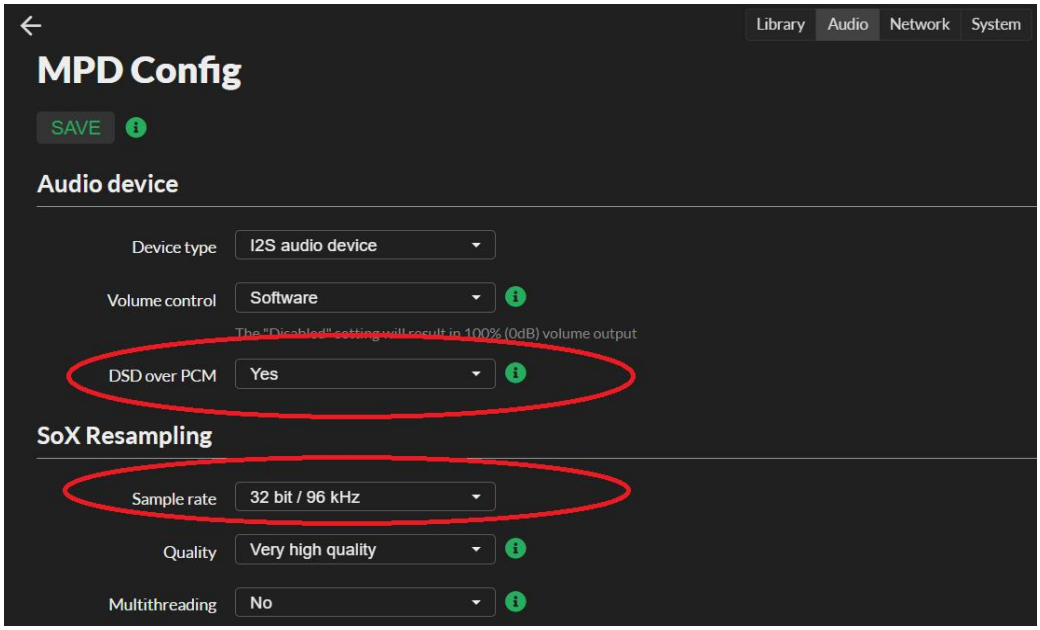

MPD Database
UPDATE MPD database
RE-GEN MPD database
Update or regenerate the MPD database.
NO
SET
Automatically update MPD database on USB insert/remove.

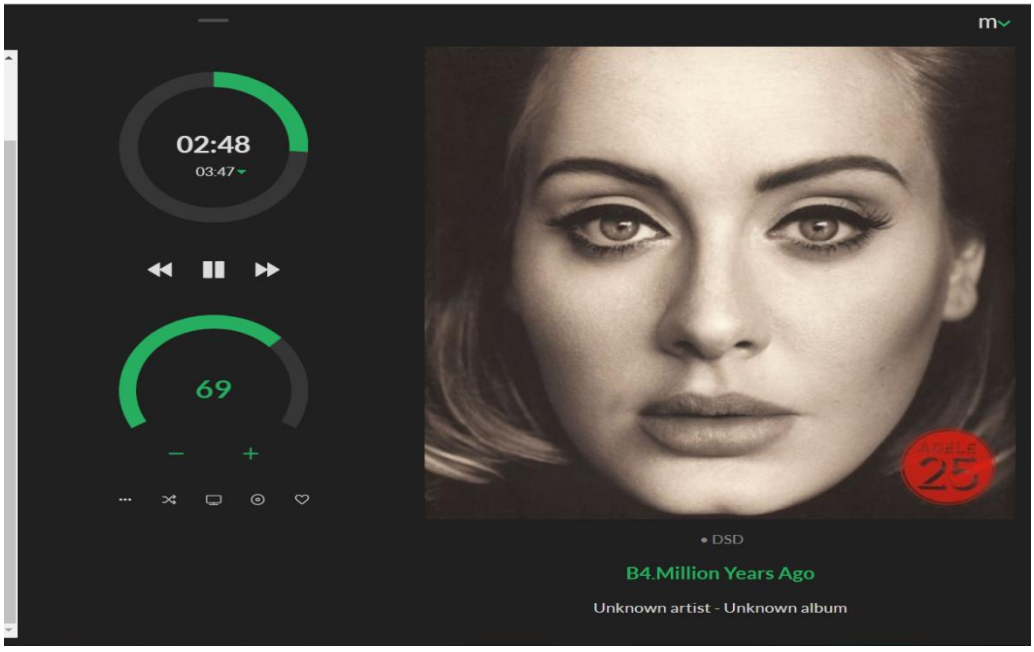

不安全 | 192.168.1.111/index.php
search
SDCARD
USB
Default Playlist
Favorites

4.7 MoOde Play DSD Music Files

Moode is very excellent in play DSD music files.If you want toplay DSD music. In MPD settings, you need to set ”DSD over PCM’ to ‘YES’, and then it’s very important to select the proper Sox resampling rate. Otherwise It dosen’t work well for play DSD music.







4.8 Raspberry Pi OS/Raspberry Pi OS Lite SetUp

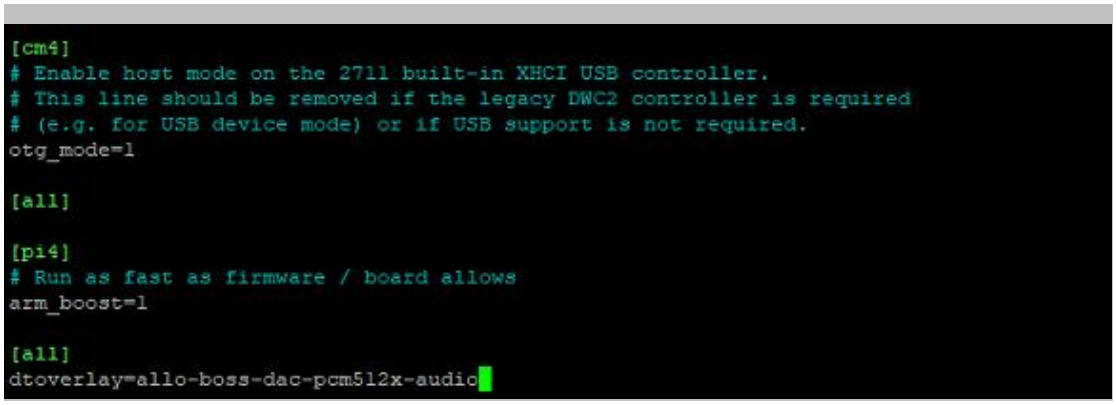
1) Modify the config.txt on termianl.

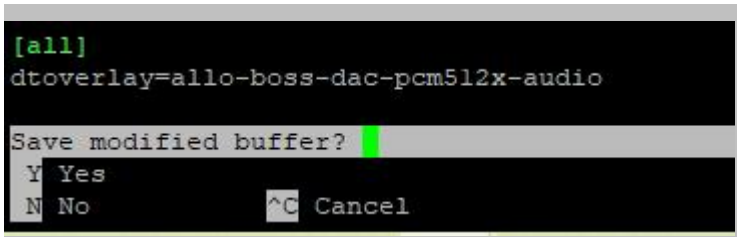
Open the config.txt in system.

sudo nano /boot/config.txt

Append the following lines to the end of the file,enable the audio module.Draw attention to the format , Otherwise it doesn't work. press "ctrl+o" and press "Enter" to save the file. Reboot the system.

dtoverlay=allo-boss-dac-pcm512x-audio





2)Check the DAC module

Type in the commands that are shown below. You can see the BossDAC, the **3** is the dac device number.

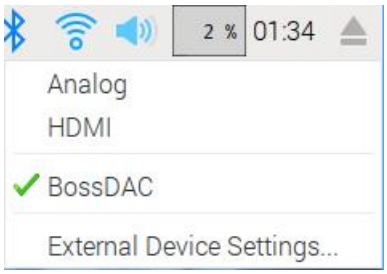
aplay -l

cat /proc/asound/cards

```
pi@raspberrypi:~ $ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: Headphones [bcm2835 Headphones], device 0: bcm2835 Headphones [bcm2835 H
eadphones]
  Subdevices: 8/8
  Subdevice #0: subdevice #0
  Subdevice #1: subdevice #1
  Subdevice #2: subdevice #2
  Subdevice #3: subdevice #3
  Subdevice #4: subdevice #4
  Subdevice #5: subdevice #5
  Subdevice #6: subdevice #6
  Subdevice #7: subdevice #7
card 1: vc4hdmi0 [vc4-hdmi-0], device 0: MAI PCM i2s-hifi-0 [MAI PCM i2s-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: vc4hdmi1 [vc4-hdmi-1], device 0: MAI PCM i2s-hifi-0 [MAI PCM i2s-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 3: BossDAC [BossDAC], device 0: Boss DAC HiFi [Master] pcm512x-hifi-0 [Boss
 DAC HiFi [Master] pcm512x-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

```
pi@raspberrypi:~ $ cat /proc/asound/cards
 0 [Headphones     ]: bcm2835_headpho - bcm2835 Headphones
                      bcm2835 Headphones
 1 [vc4hdmi0       ]: vc4-hdmi - vc4-hdmi-0
                      vc4-hdmi-0
 2 [vc4hdmi1       ]: vc4-hdmi - vc4-hdmi-1
                      vc4-hdmi-1
 3 [BossDAC        ]: BossDAC - BossDAC
                      BossDAC
pi@raspberrypi:~ $
```

If you are using the Raspberry Pi Os with desktop, Right click the sound icon on the top right corner, set the raspberry pi audio output as '**BossDAC**' .



OR DO: "sudo raspi-config" and change it from there (headless mode)

3) Set as default sound card.

Create /etc/asound.conf

```
sudo nano /etc/asound.conf
```

```
pi@raspberrypi:~ $ sudo nano /etc/asound.conf
```

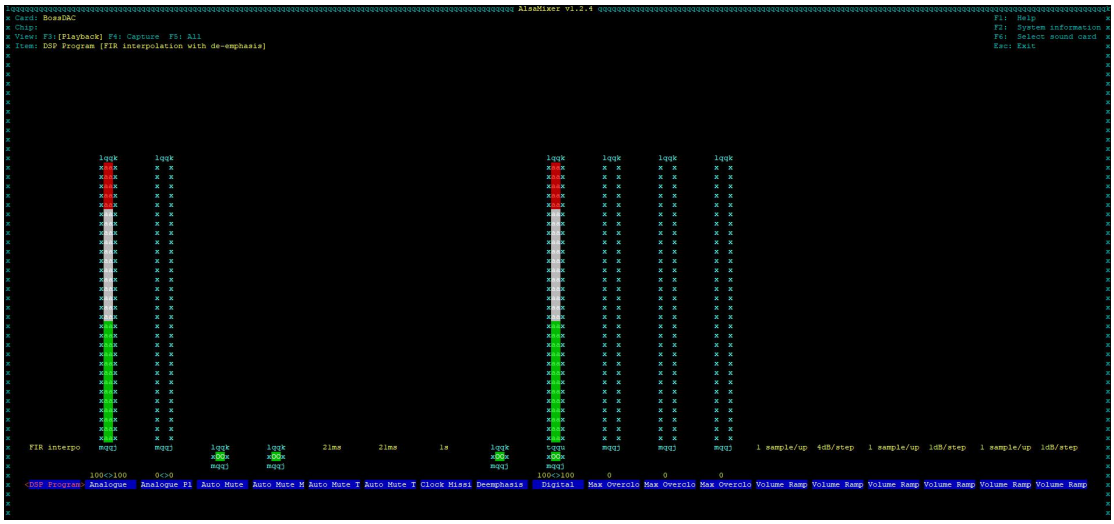
Type in the following content and then press "ctrl+o" and press "Enter" to save the file. Reboot again. 3 is the DAC module device number.

```
  GNU nano 5.4                    /etc/asound.conf *
pcm.!default  {
 type hw card 3
}
ctl.!default {
 type hw card 3
}
^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^_ Go To Line
```

4) Alsamixer

Type in the commands that are shown below, you can see the alsamixer tool.

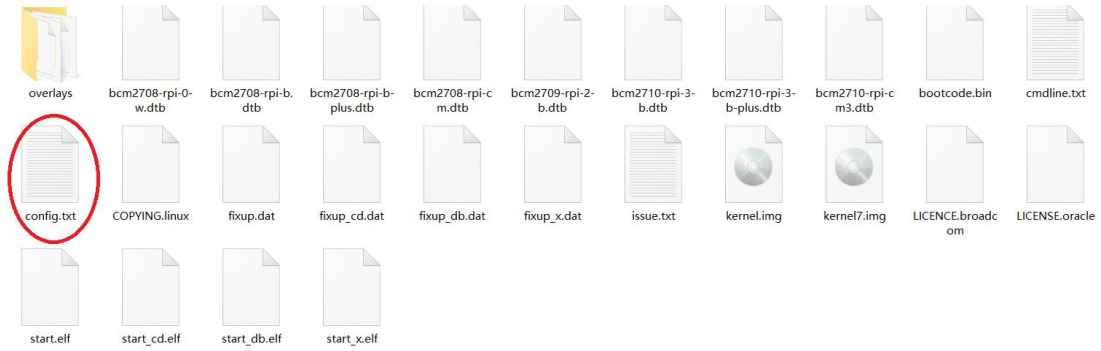
```
alsamixer
```



4.9 LibreELEC Setup

1) Modify the config.txt

After load the LibreELEC image into the TF card, Open TF disk directory on your computer and check the file named config.txt. For more information about this file please refer to : https://www.raspberrypi.org/documentation/configuration/config-txt/



Append the following lines to the end of the file,enable the audio module.Draw attention to the format , Otherwise it doesn't work.

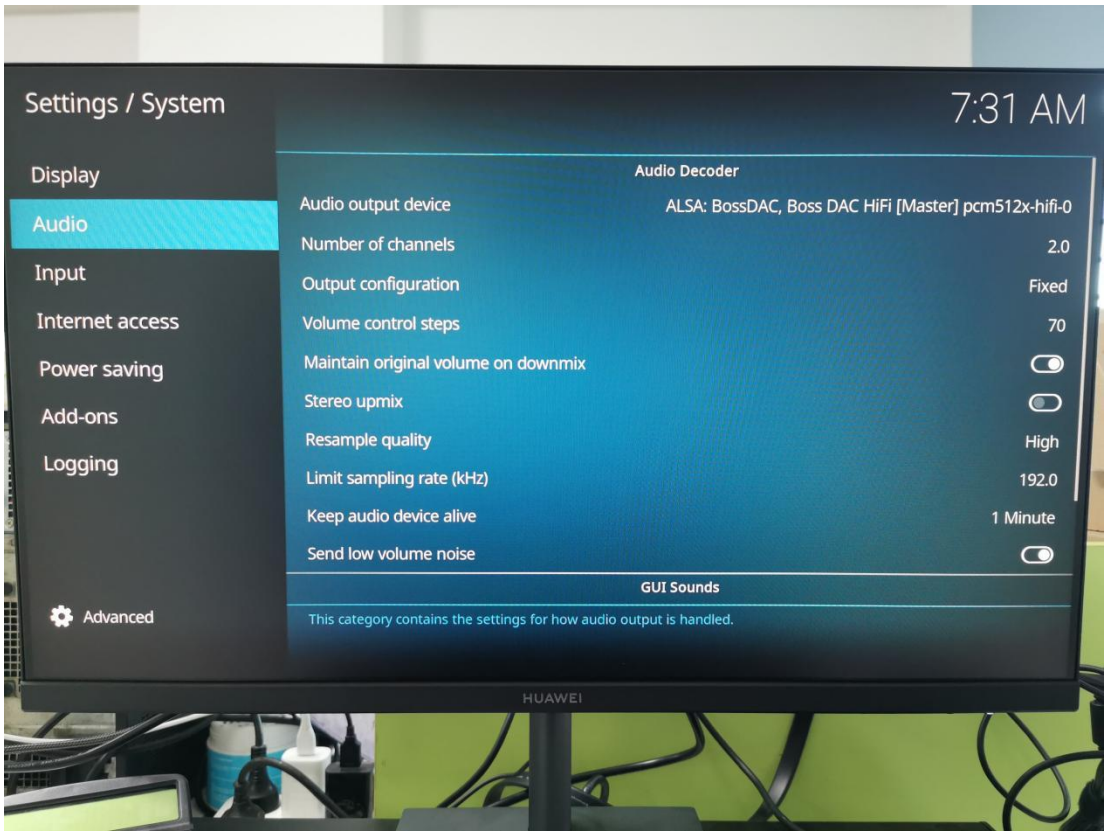
```
dtoverlay=allo-boss-dac-pcm512x-audio
```

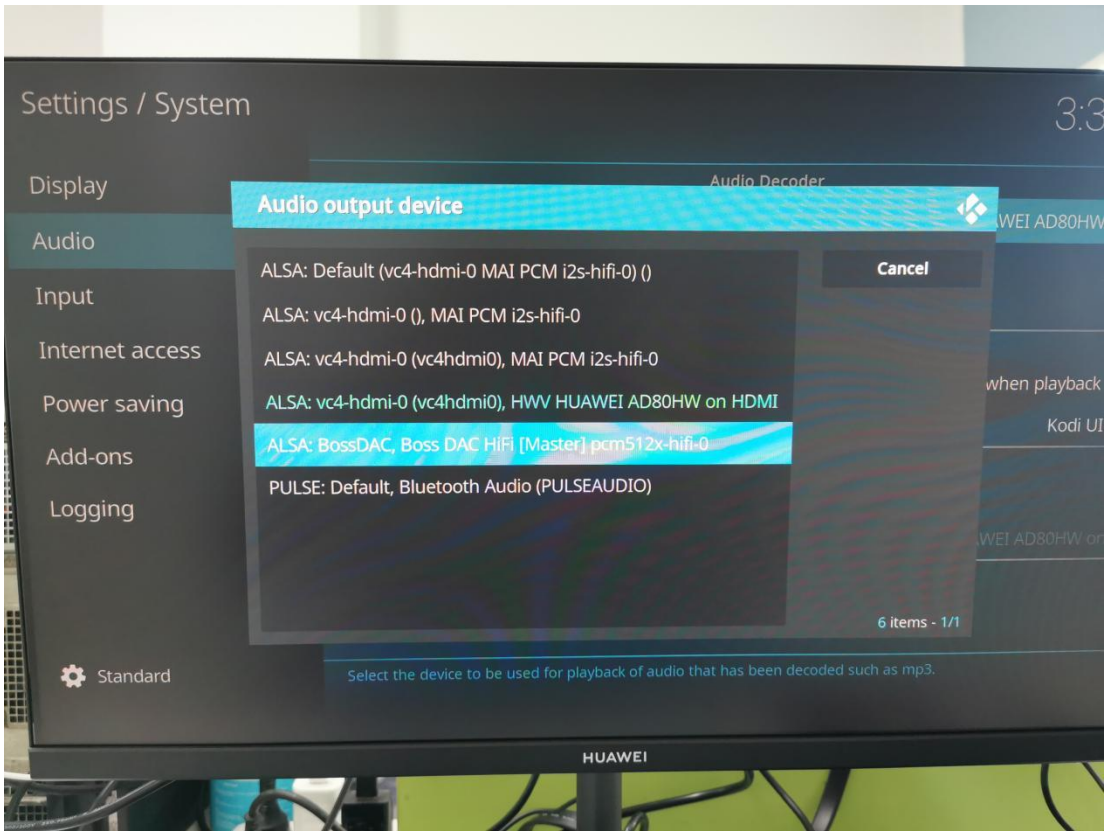
```
############################################################
# Include distribution specific config file if it exists.
############################################################
[all]
include distroconfig.txt

# uncomment to enable infrared remote recevier connected to GPIO 18
#dtoverlay=gpio-ir,gpio_pin=18
dtoverlay=allo-boss-dac-pcm512x-audio
```

2)Open the system page on LibreELEC

3) Set the Audio output device as BossDAC.





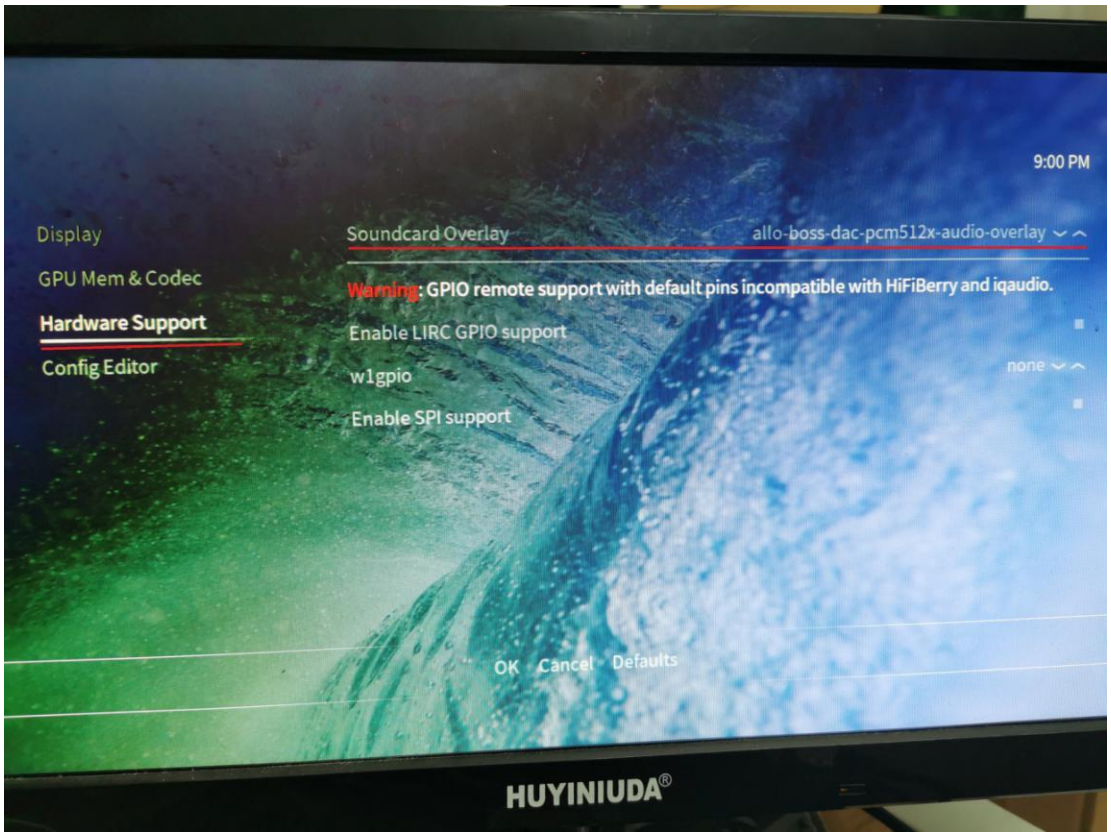
4.10 OSMC Setup

1) Insert the TF card with OSMC image into the Raspberry pi, and then connect a HDMI Display, Finally power on it. You will see the install GUI.

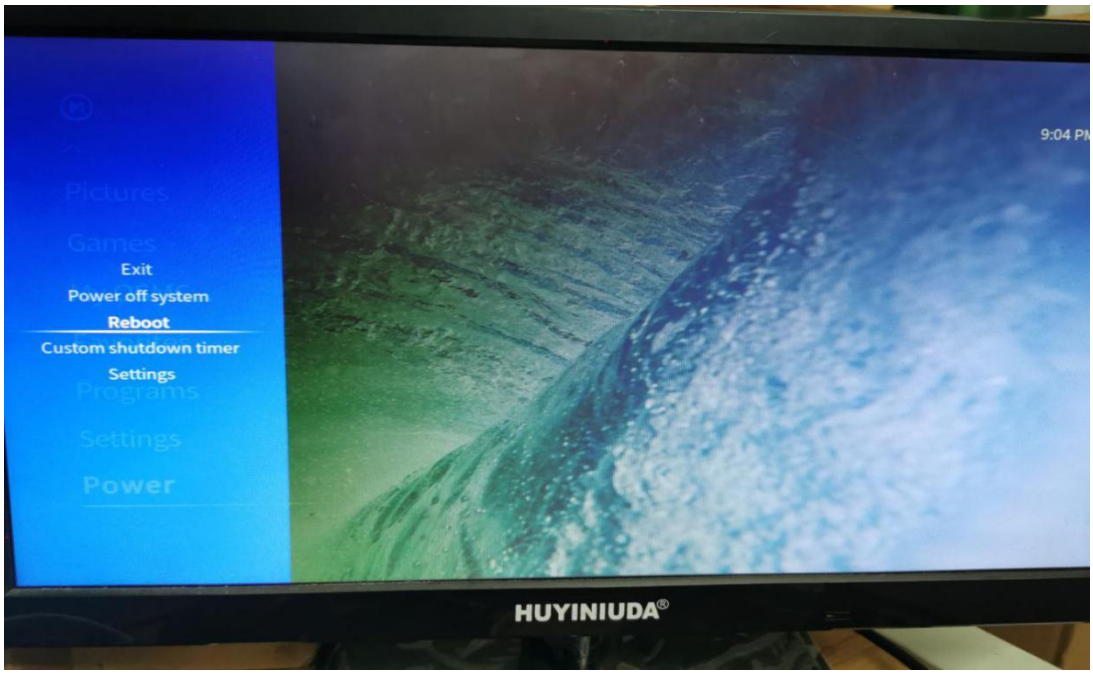
2)After some basic setup you will go to the home page.

5) Click ‘My OSMC’ ➞ ‘Pi Config’.

6) Click ‘Hardware Support’, set Soundcard Overlay ‘all-boss-dac-pcm512x-audio-overlay’.Do not enable any other options.

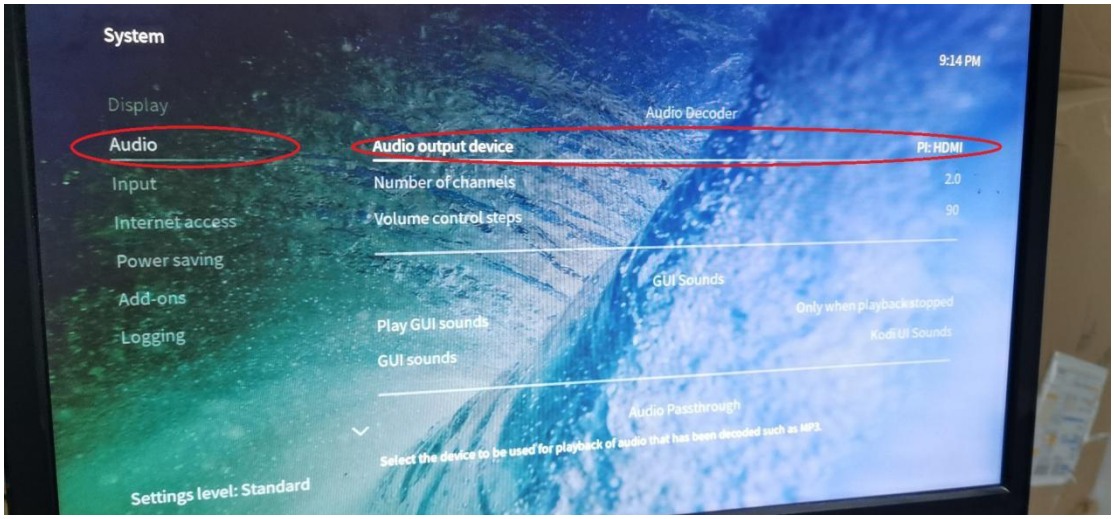


7) Back to home page. Click ‘Power’ ➞ ‘Reboot’

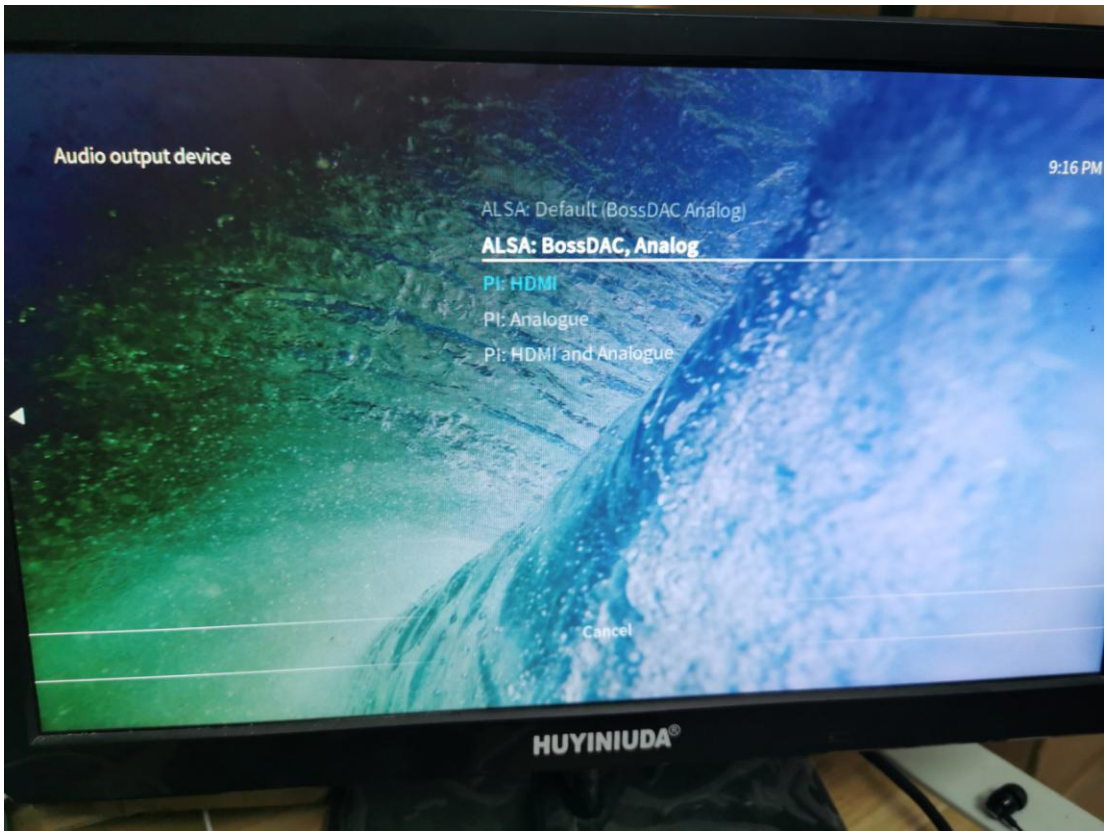


8) After restart. Click ‘Settings’→’System’

9) Click ‘Audio’→’Audio output device’.



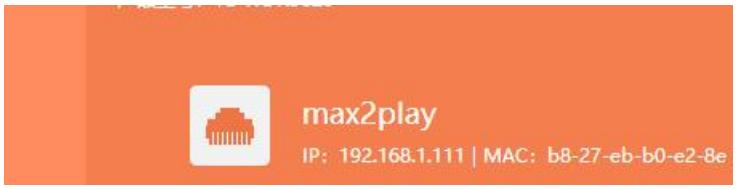
10) Choose Audio output device as ‘BossDAC, Analog’. And then reboot again.



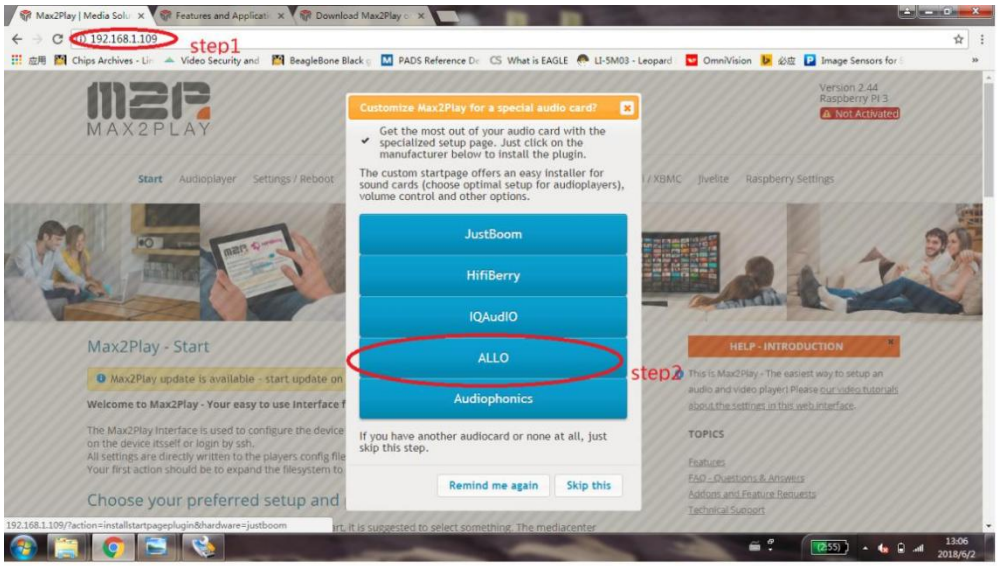
11) After that, The setting has been completed. you can hear the click voice of the mouse, and you can listen to music ,watch movie and play game normally.

4.11 Max2player

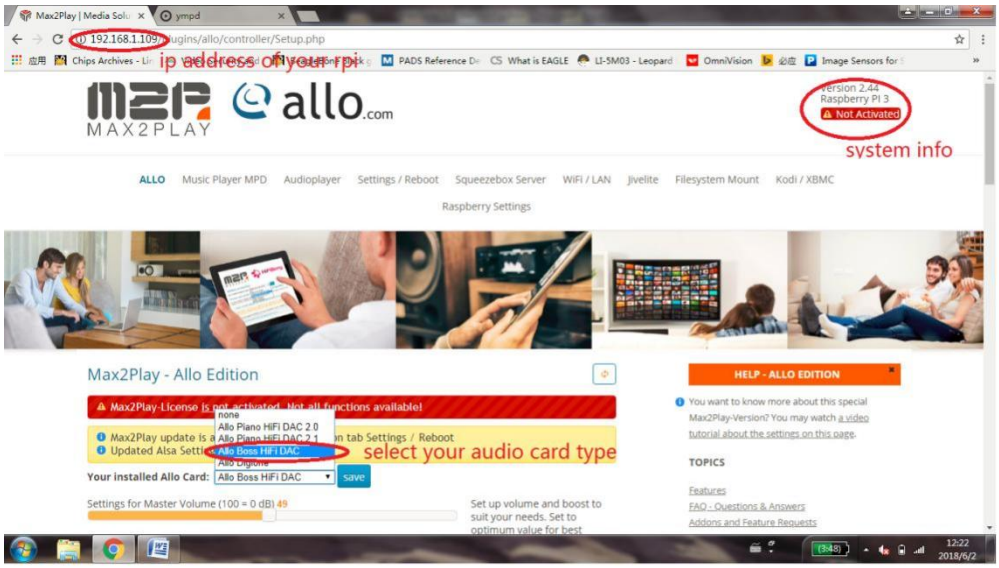
1) Insert the TF card with Max2player image into the Raspberry pi, and then connect to your router by LAN cable, Finally power on. Make sure your Raspberry Pi , Desktop (mobile phones, laptop, pad and so on) are in the same local area network(LAN). Get the IP address of Raspberry PI through check up the router or use some IP checker tools.



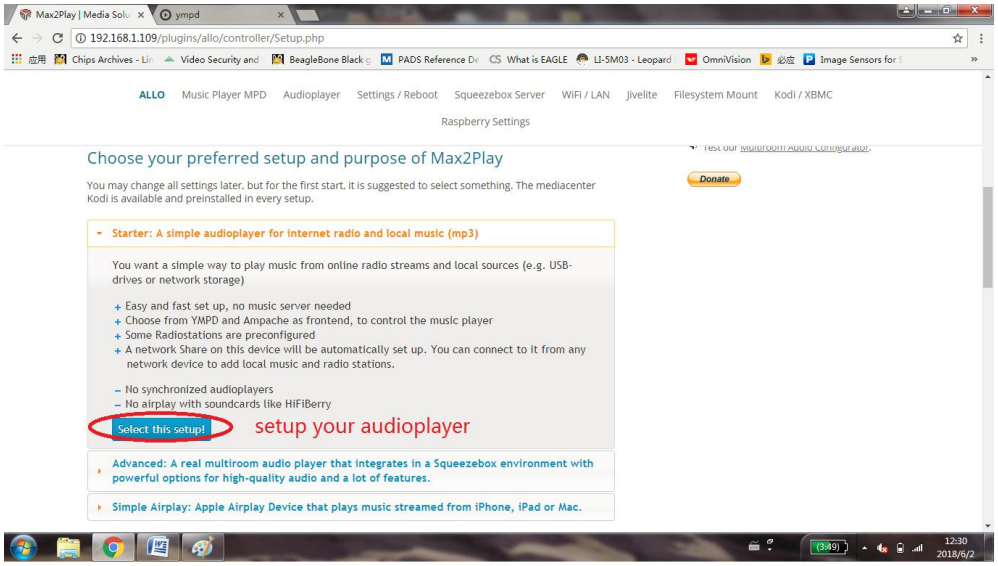
2)Choose the Card option as ‘Allo’.

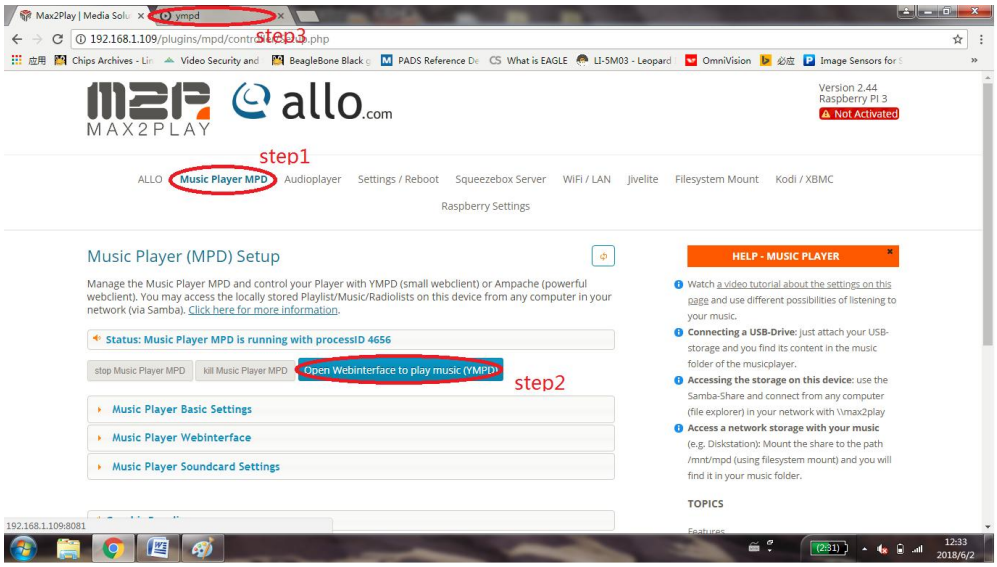


3)Setup the audio card type as below, then save and reboot the system.

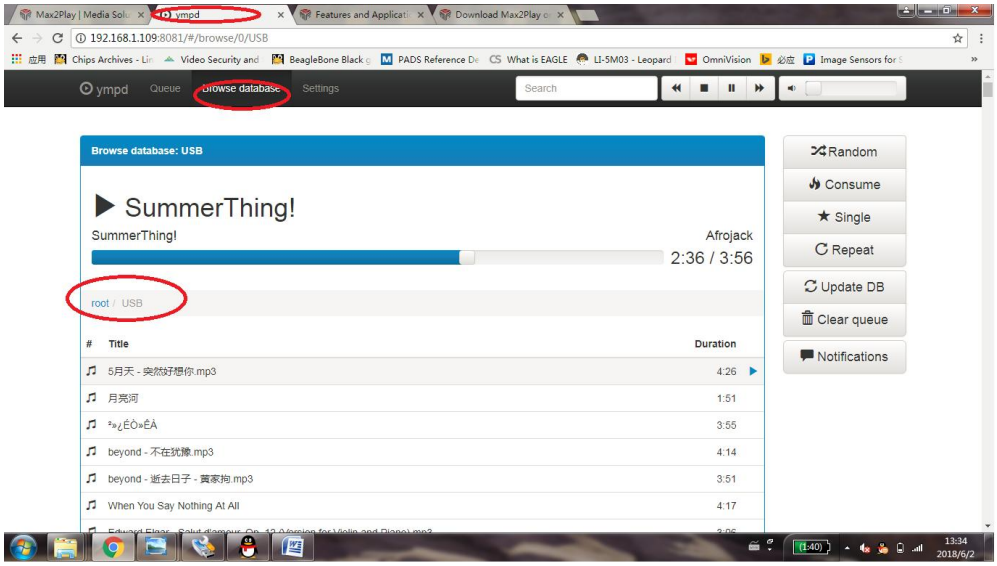


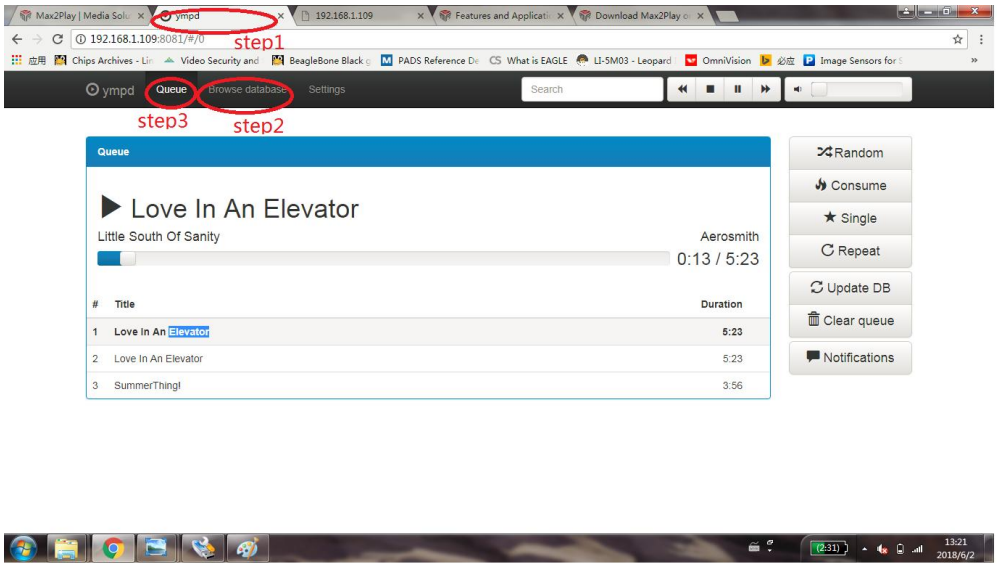
4)Setup your audio player.





5)Add music file

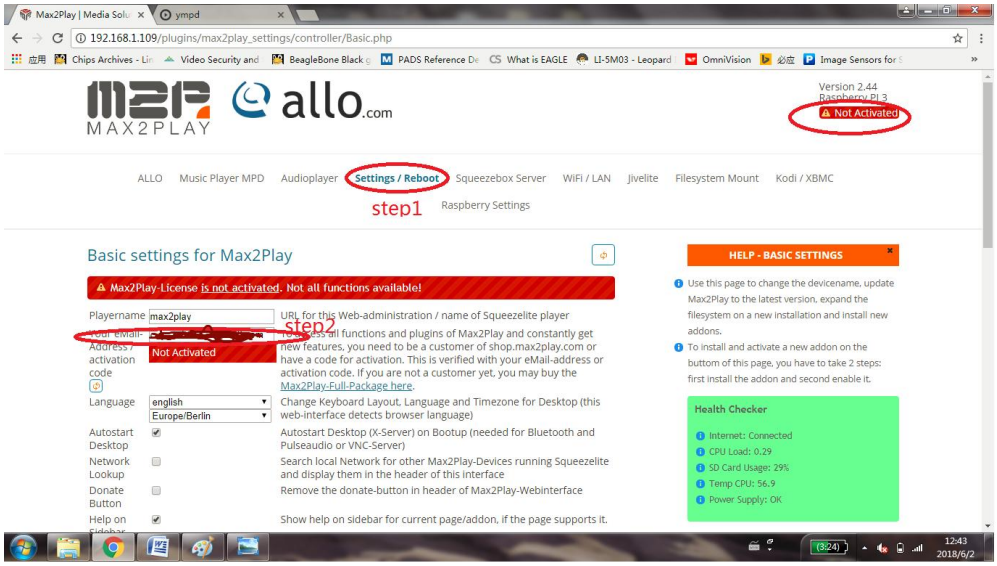




6)Note

By default Max2play License is not activated . not all functions available!

Active your license:



5. Pops and Crackles Soluations

Some customers said that there are some pops and crackles when play music over our dac module, but no problem over with HDMI of Raspberry Pi. Please try below solutions.

5.1 Power Supply

Change a better 5V power supply. The of cheap power supply will greatly affect the quality of the sound that you hear. The battery pack is a better choice.

5.2 Hotspot

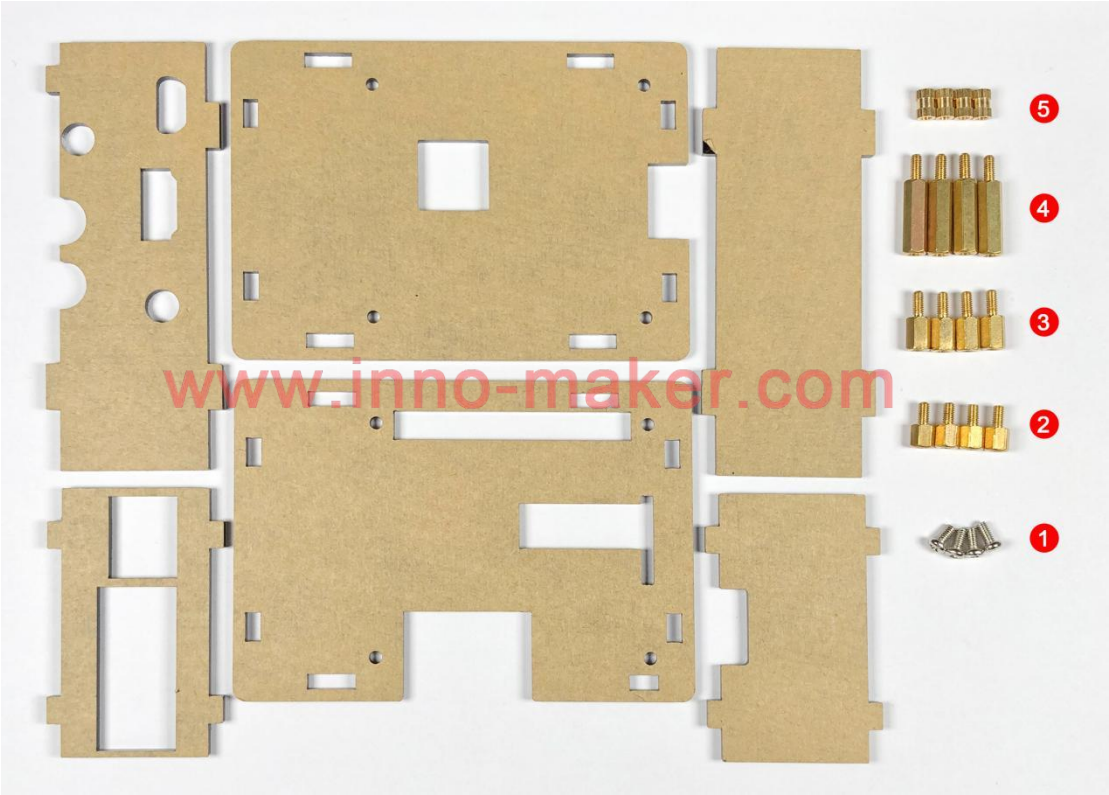
Some music system open the hotspot default. But the RCA and 3.5 mm jacks will be an antenna and received the interference signal from the WIFI module. So turn off the hotspot function of Raspberry Pi. Use the wired network will be a better choice.

6. DAC Acrylic CASE ASSEMBLY

1) Unpack it.

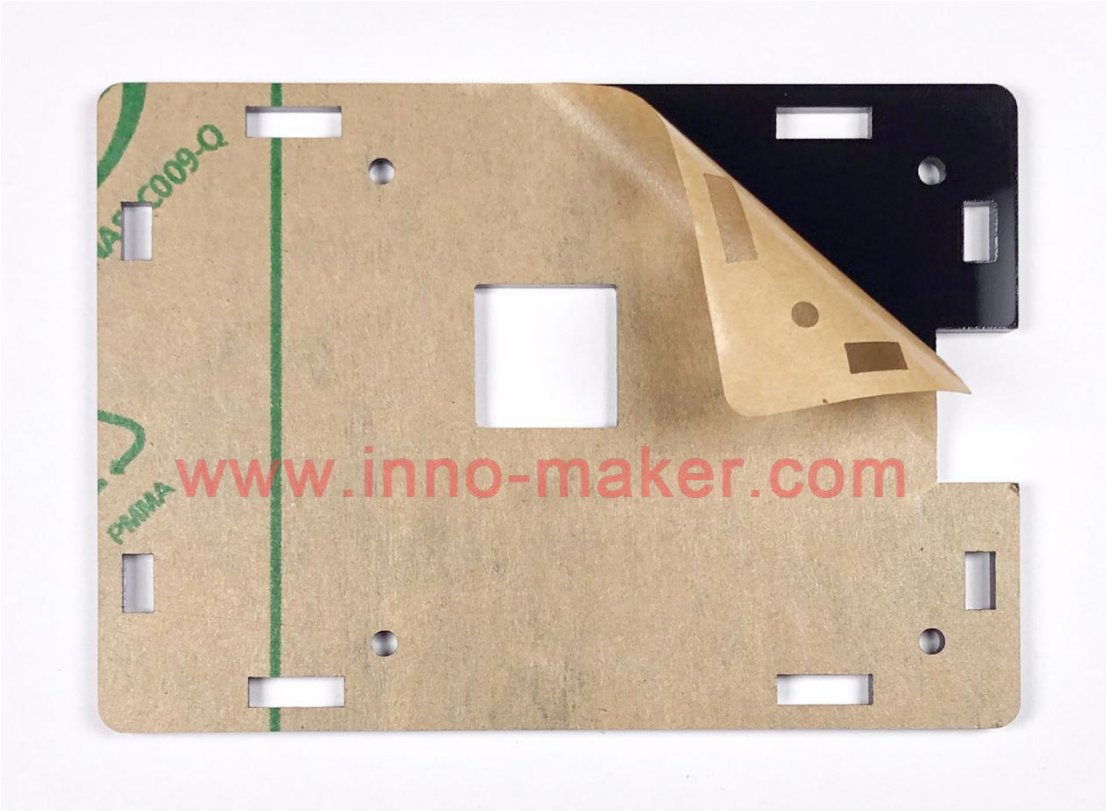
Package contain :

1. 6 pcs acrylic plate
2. 5 groups of screw
3. 1 screwdriver

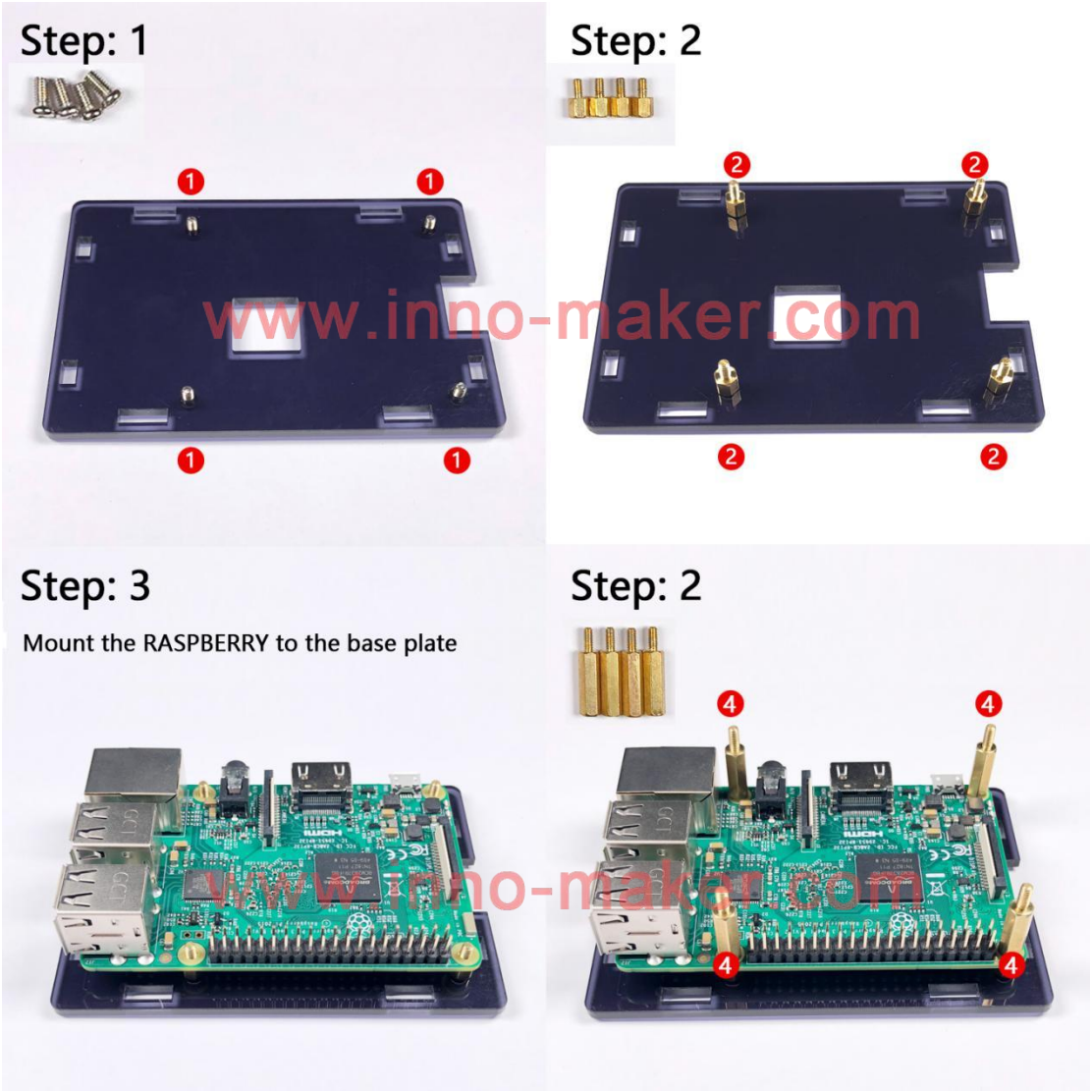


2) Peel the protection film

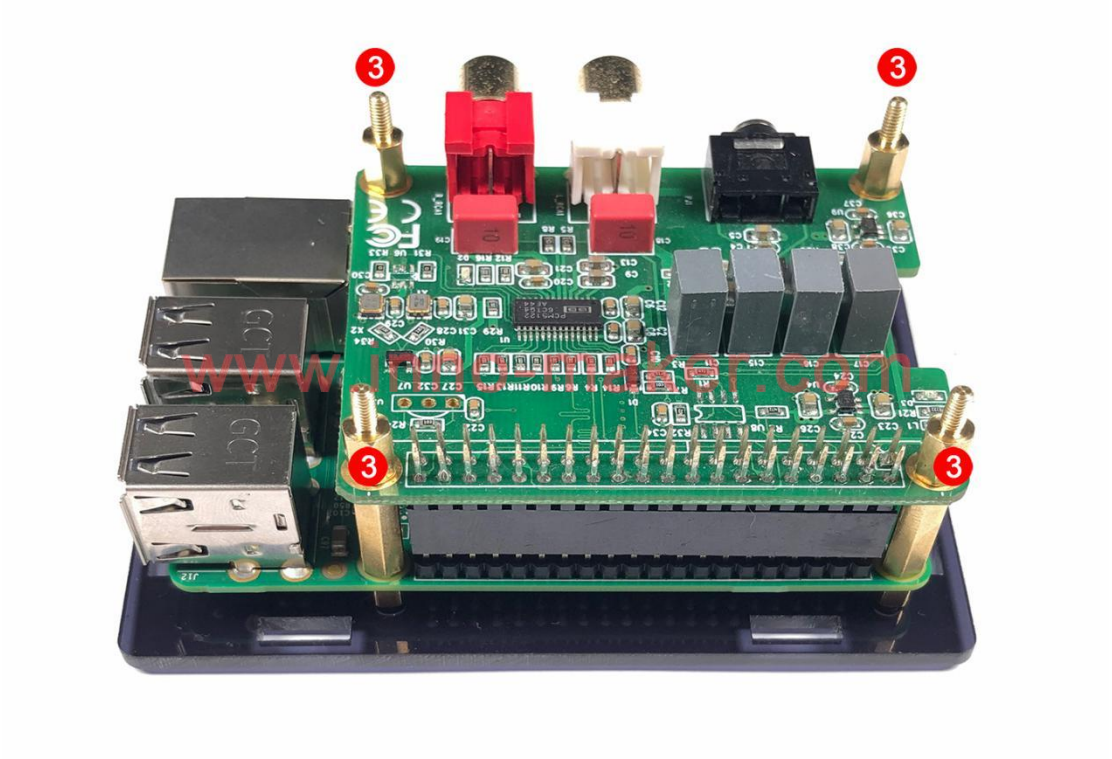
There is a protection film on both sides of all acrylic plate. You need to peel it off before assembling the case.



3) Mount the RASPBERRY to the base plate.Please pay attention to the group number.



4) Plug the DAC module into the 40 pin GPIO head.



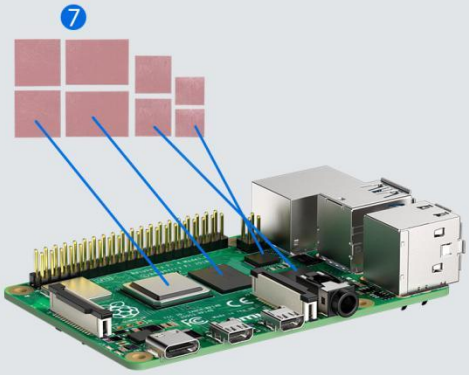
5) Add two long side plates.

6) Add two short side plates.

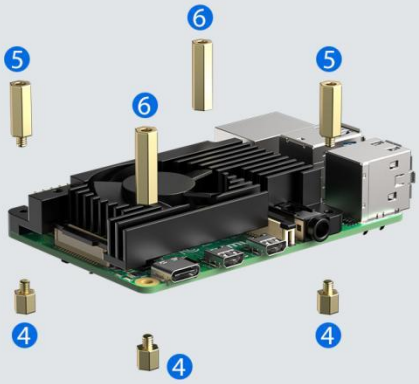
7) Add top plate and screw down.

7. DAC Aluminum CASE ASSEMBLY

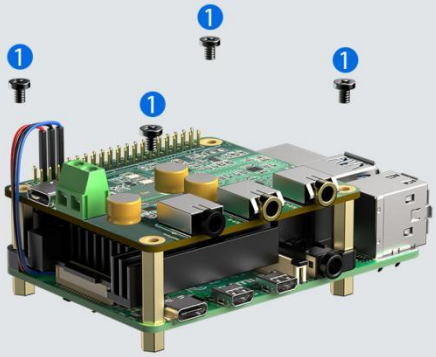
1. Install the thermal pads to raspberry pi 4



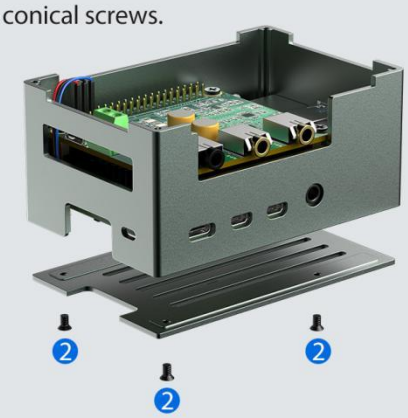
2. Install the heatsink to raspberry pi 4 with copper column screws.



3. Install InnoMaker audio hat to raspberry pi 4 with flat-head cross screws.



4. Put the item into aluminum alloy shell and install bottom with conical screws.



5. Install acrylic top cover with hexagon socket screws.

6. Install buffer strips to the bottom.