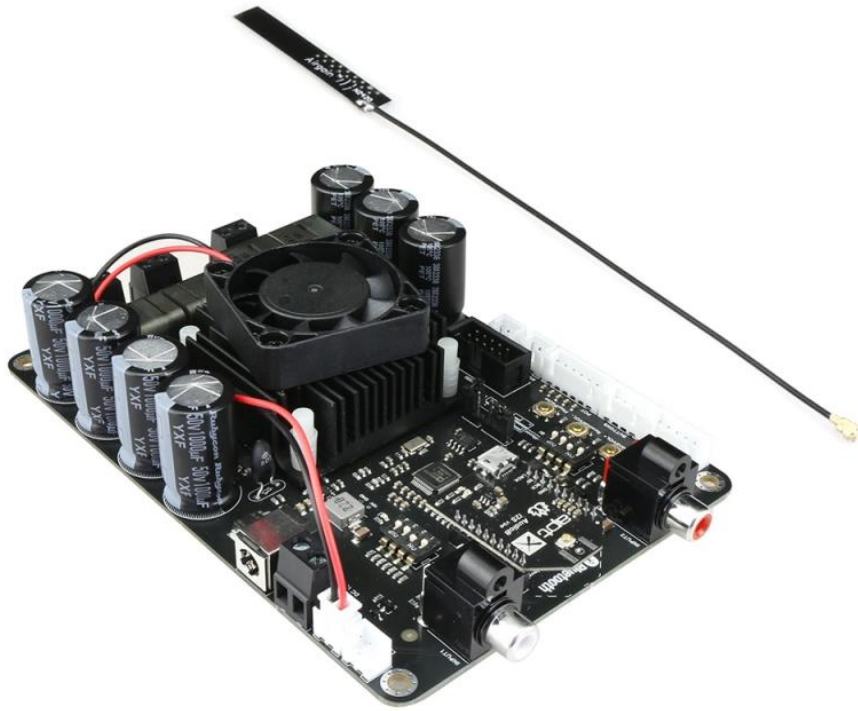# TSA8800

2 x 100W + 200W 2.1 Channels Bluetooth + DSP Audio Amplifier

Board Datasheet

TinySine

1 Features:

- Wide-range 12-V to 30-V Supply Voltage Operation
- 2x100W Stereo output power at THD=10% with R_L = 4 Ω in BTL Configuration
- 200W Mono output power at THD=10% with R_L = 2 Ω in PBTL Configuration
- Size: 145*100*20mm
- DSP programmable
- Bluetooth programmable
- TWS connection
- Bluetooth 5.1
- Smart cooling system
- Qualcomm cVc audio technology
- Qualcomm TrueWireless Technology
- I2S Sampling Rate: 48KHz
- Effective transmission distance: 80-100m
- Four selectable, fixed gain settings of nominally 18dB, 24 dB, 30 dB and 34 dB
- Compatible with all Bluetooth devices that support media audio, including iPhone
- Over/under voltage protection
- Over current protection
- Over temperature protection

2 Applications:

- Wireless and Powered Speakers
- Soundbars
- Car audio
- Subwoofers
- Wireless Surround Sound System
- Bookshelf Stereo Systems

3 Description:

TSA8800B 2x100W + 200W 2.1 channels Bluetooth+DSP amplifier board with an **AudioB I2S** Bluetooth module that supports Apt-X. TSA8800B is a very flexible DSP/DAC/Amplifier combination board. It has perfect class-D architecture (Based on TPA3221) and 2 channels have 100W power output and another one channel has 200W power output. All the channels are capable of outputting nominal power simultaneously and continuously. This board can be powered by any DC12V-30V power supply. It can be used to drive any 4Ω or 8Ω passive speakers (Subwoofer channel can drive 2Ω speaker).
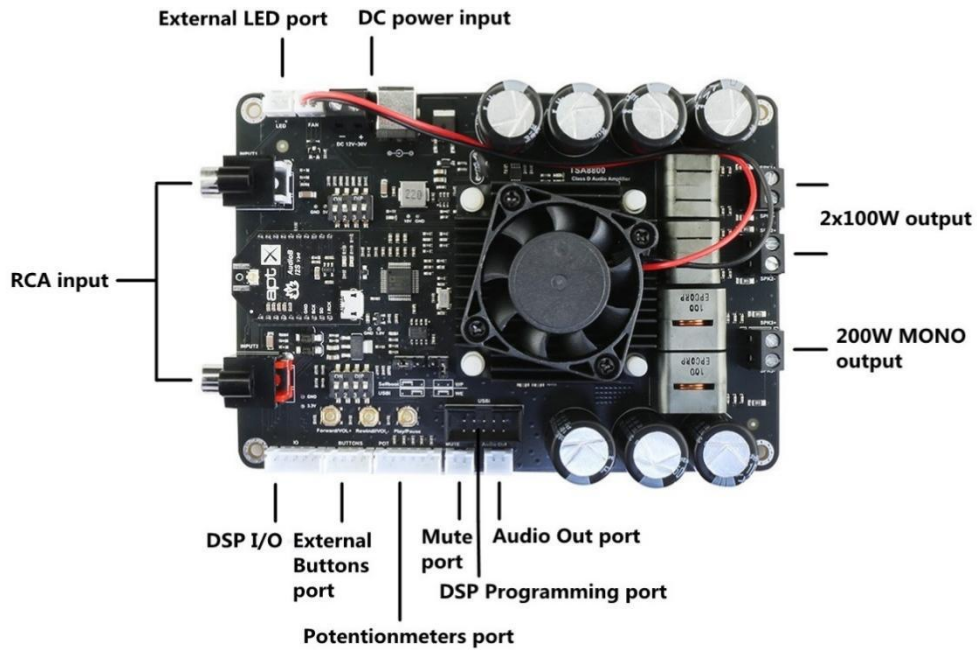
It's a 2.1 channels amplifier board. That channel for subwoofer are 200W mono output (User can change the DSP program to let it becomes right or left channel or mixed output). You can pair it with a mobile phone or a computer (etc). Power the amplifier board. Use your phone or PC (etc) to search for a new Bluetooth device. The module will appear as "TSA8800B". You don't need a PIN, pair it and then you can play music.

The highlight point is ADAU1701 DSP chip on board. User can set each channel audio tones separately. Apt-X and TWS supported. Therefore, Users can stream audio to 2 paired amplifier boards at the same time wirelessly.

Table of Contents

4 Device function diagram:

5 Specifications

Specifications typical @ +25℃, Powered by 24VDC, unless otherwise noted. Specifications subject to change without notice.

Parameter	Condition	Min	Typ	Max
Supply Voltage (VDC)	-	10	24	26
Output Power per channel(W)	RL=3Ω, 10%, THD+N	-	112	-
	RL=4Ω, 10%, THD+N	-	105	-
	RL=3Ω, 1%, THD+N	-	100	-
	RL=4Ω, 1%, THD+N	-	88	-
	200W channel:RL=2Ω, 10%, THD+N	-	208	-
	200W channel:RL=2Ω, 1%, THD+N	-	170	-
	THD = 1%	-	170	-
THD+N	1W	-	0.02%	-
SNR	A-weighted, Gain=18dB	-	108	-
DNR	A-weighted, Gain=18dB	-	109	-

Minimum Load Impedance(Ω)	-	3	4	-
Gain (dB)	-	18	24	34
Minimum Load (ohm)	-	3	4	-
Efficiency	100W @4 Ohm	-	90%	-
Input Impedance(Ω)	18dB	-	48	-
	24dB	-	24	-
	30dB	-	12	-
	34dB	-	7.7	-

6 Connection Ports and Functions

6.1 Power input

TSA8800 has 2 power input ports. One is a screw terminal connector and another one is a DC Jack connector. The DC input jack is 2.5mm with positive core polarity. These two ports are connected in parallel. You can only connect power to one of them at the same time.

● DC input voltage: DC12V-30V.
● Power reverse connect protection

The Recommend input voltage is DC12-30V. Higher input voltage can get full power output. But the board will have more heat output. This will cause the fan running frequently. Lower input voltage will have less heat output.

6.2 Control buttons

● Forward/VOL+ Button
- Click to forward.
- Long press to volume increase.
● Rewind/VOL- Button
-- Click to rewind.
- Long press to volume decrease.
● Play/Pause Button
- Click to play or pause.
- Long press 5 seconds clear pairing info.
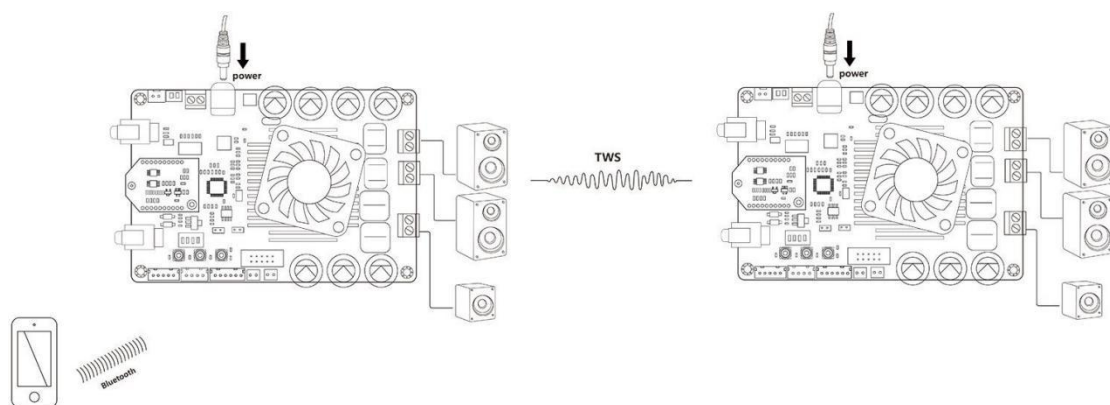
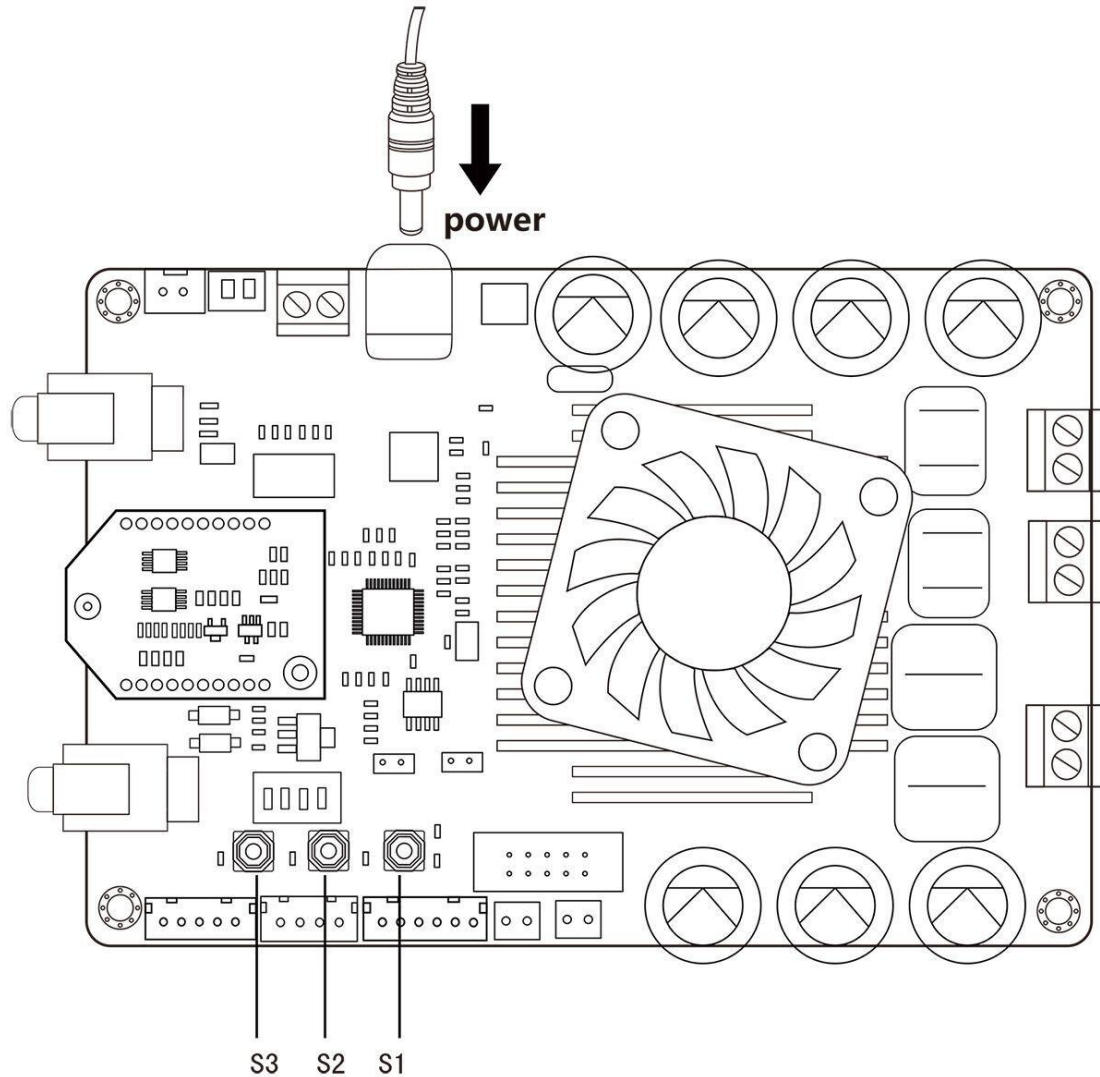## 6.2.1 Standard working mode
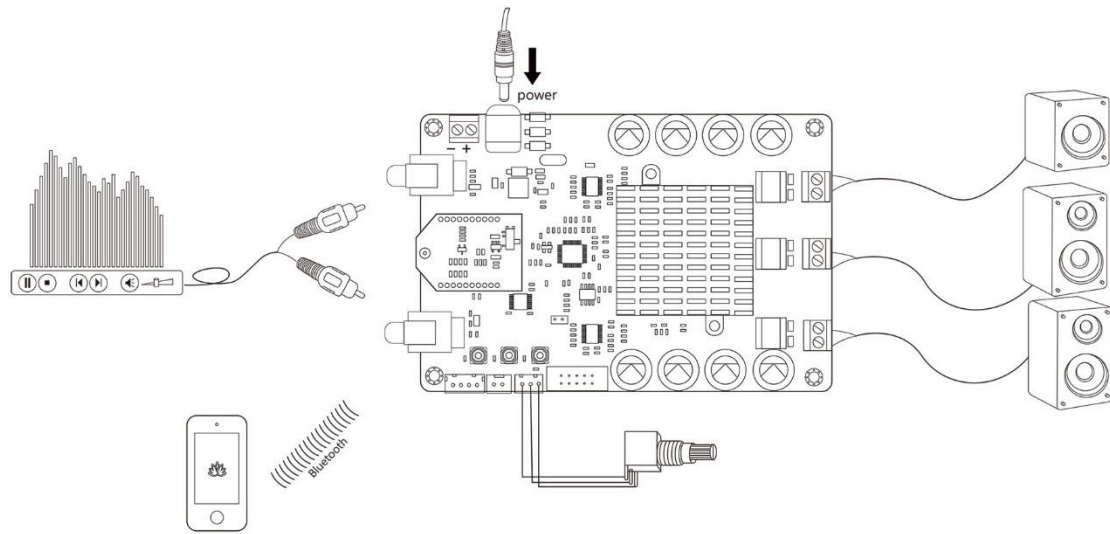
One board works alone

How to use:

1. Connect speakers with TSA8800 and Power up the TSA8800, red LED slow blink then red and blue LED flash alternately.
2. Now, your smartphone will be able to find a new Bluetooth device which name is "TSA8800B". Connect it. (Voice: Pairing successful)
3. You can play the music now.

6.2.2 TWS mode

2 boards work in TWS mode

How to Use:

Master board:

1. Power up the TSA8800, red LED slow blink then red and blue LED flash alternately.
2. Now, your smartphone will be able to find a new Bluetooth device which name is "TSA8800B". Connect it. (Voice: Pairing successful)
3. You can play the music now. If you only use one amplifier board. You don't need do the following steps.
4. Long press S1+S3 1s into TWS master mode.

Slave board:

1. Power up another TSA8800, red LED slow blink then red and blue LED flash alternately.
2. Long press S1+S2 1s into TWS slave mode.

3. The master board will auto searching (30s) slave board. Both master and slave board will be connected. (Voice: Pairing successful)
4. The slave board will have music out now.
5. If you want to disconnect TWS connection, long press S2+S3 1s disconnect TWS connection.

6.3 External LED port

Wiring:
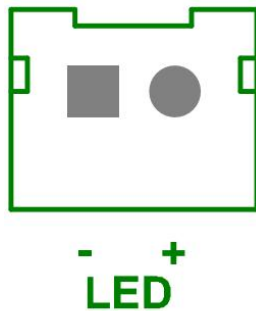
LED connector, it is connected to the blue LED on the Bluetooth module to indicate the current operating status of the Bluetooth module. You can connect an LED to this port

Pin functions

Pin#	Name	Description
1	LED -	Connect to the negative terminal of the LED
2	LED +	Connect to the positive terminal of the LED

Bluetooth LED states

LED	Name	Description
RED	Automatically reconnect state	Slow Blink: Automatically reconnecting
		Fast Blink: Automatically reconnect fail
		Always off: Automatically reconnect successful
BLUE	Bluetooth link state	Fast Blink: Bluetooth can be found by new device
		Three blinks a second: Bluetooth connected
		Blinks twice a second: Streaming A2DP

6.4 DSP I/O Port

We provide 3 I/O pins of ADAU1701 DSP chip for use: MP6, MP7 and MP0. User can develop DSP program to fulfill different requirement. For the default DSP firmware, if you connect these pins to GND, TSA8800B will output 1kHz sine wave.

Wiring:
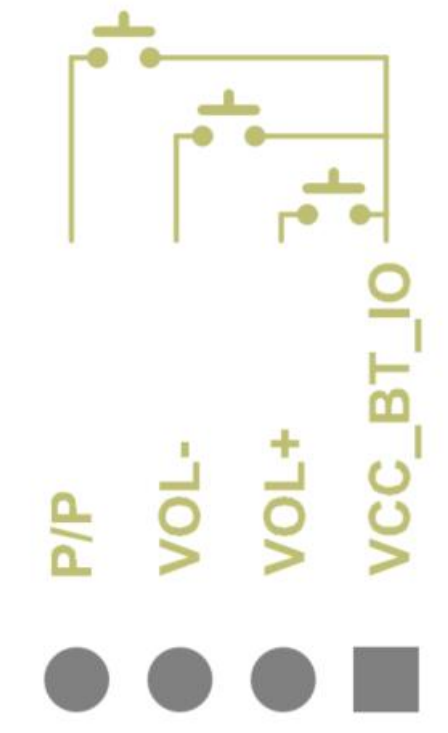

Pin functions

Pin#	Name	Description
1	GND	Ground
2	MP0	DSP MP0 pin
3	MP7	DSP MP7 pin
4	MP6	DSP MP6 pin
5	3.3V	3.3V output

6.5 External Buttons port

Wiring:

Pin functions

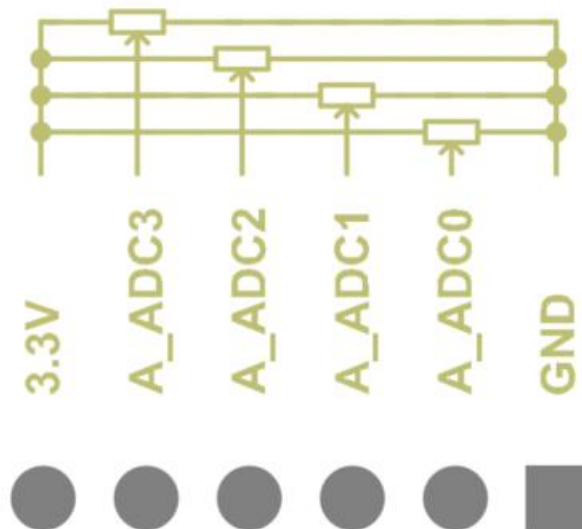| Pin#	Name	Description
1	VCC_BT_IO	Provides voltage to the IO port of the Bluetooth module
2	VOL+	VOL+ button 1.Short click: Audio volume + 2.Long press: Next track
3	VOL-	VOL- button Short click: Audio volume - Long press: Previous track
4	P/P	Play/Pause button

6.6 Ext POT port

User can connect external potentiometer(5K~20K) to control the Main volume, treble, middle, Bass. You need update the DSP program first. You can download the DSP program in the product page.
We also provided a potentiometer kit (Part number: G6438C446C9585) which can be connected to this port directly.

Wiring:

Pin functions

Pin#	Name	Description
1	GND	Ground

2	ADC0	DSP ADC0 pin - Main volume
3	ADC1	DSP ADC1 pin - Bass volume
4	ADC2	DSP ADC2 pin - Middle volume
5	ADC3	DSP ADC3 pin - Treble volume
6	3.3V	3.3V output

6.7 MUTE port

MUTE connector, TSA8800 will mute and go into Standby Mode when the jumper installed.
Wiring:

Pin functions

Pin#	Name	Description
1	GND	-
2	nMUTE	Connect with TPA3221 pin 17 0: Standby Mode. Open: Normal Mode

6.8 Audio Out port

We reserved a VOUT DAC output (VOUT3 pin) of ADAU1701 DSP chip, user can develop DSP program to fulfill different requirement.
Wiring:

VOUT3   GND

Pin functions

Pin#	Name	Description
1	GND	-
2	VOUT3	Connect with ADAU1701 DSP pin 43 (VOUT3)

6.9 USBi - DSP programming port

This port is for ADAU1701 DSP programming. User need to connect the USBi JTAG Sigma DSP programmer(Part number: G5EF991701A0EB) to program the DSP chip.

6.10 Fan connector

TSA8800 has smart cooling integrated. There is a temperature sensor on the board that monitors the temperature of the board in real-time. The fan will auto run/stop according the board temperature.
Fan RUN/STOP temperature value and working voltage:
- RUN: >55℃
- STOP:<35℃
- Working voltage: 10VDC

6.11 Amplifier chip Gain settings

We use 2 amplifier chips on the TSA8800 board. One chip is a stereo output and the other is a mono output. We can set gains of each amplifier chip separately.

GAIN	DIP SWITCH			
	1	2	3	4
18dB	OFF	OFF	OFF	ON
24dB	OFF	OFF	ON	OFF
30dB	OFF	ON	OFF	OFF

TinySine

| 34dB | ON | OFF | OFF | OFF |

7 DSP programming

Please download and read the related documents on the Analog Devices website to learn how to use the ADI SigmaStudio software

- How to write DSP program to DSP board
- Default DSP program
- DSP program (with external POTs)

8 Bluetooth programming

TSA8800 use Qualcomm QCC3031 as the main Bluetooth chip. User can do the programming via the USB port on the board. You can change the BT name, Audio tones, Firmware ect... by using the Official Qualcomm software.

- Bluesuite3.3
- ADK_QCC512X_QCC302X_WIN_6.4.2.26
- QCC3031 Bluetooth firmware
- How to change the BT name

9 Dimensions
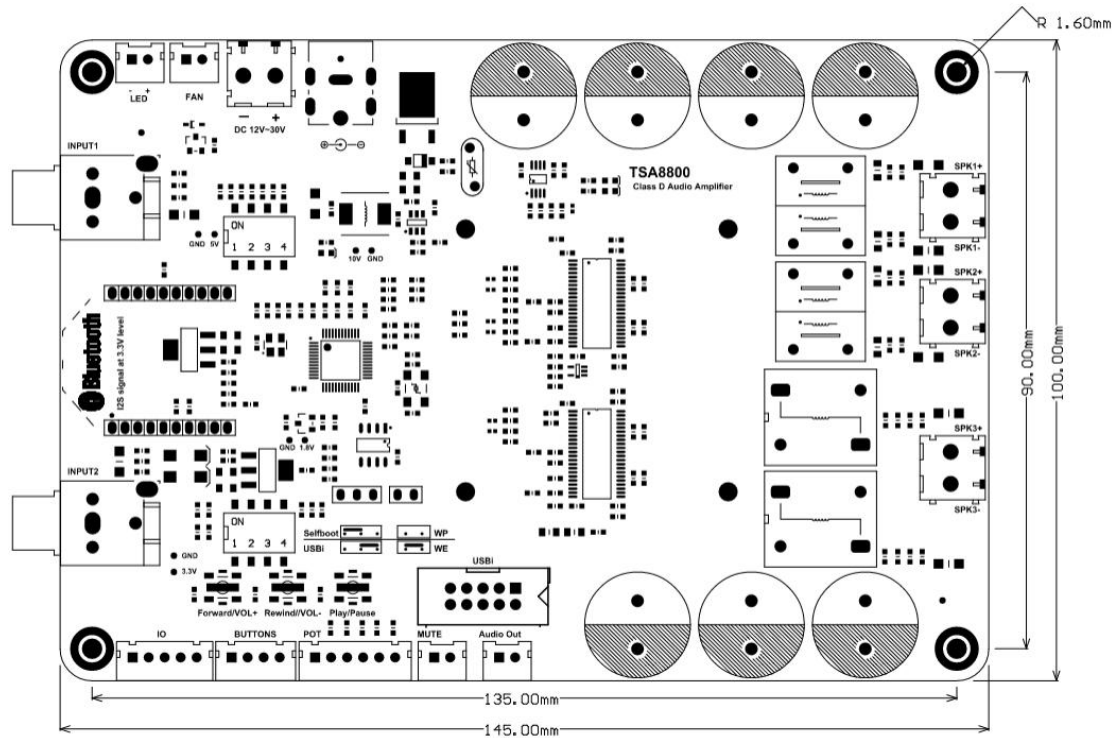
10 Revision history

Document revision history

Date	Revision	Changes
26-Jan-2024	1	Initial release