TinySine

# TSA7551B

## 1 x 200W Bluetooth + DSP Mono Audio Amplifier Board Datasheet

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# 1 Features:

- Wide-range 14V to 39V Supply Voltage Operation
- 1 x 220 W output power mono parallel BTL at THD = 10% with RL = 3 Ω and VCC = 36 V
- Size: 135*92*35mm
- DSP programmable
- Bluetooth programmable
- TWS connection
- Bluetooth 5.1
- I2S Sampling Rate: 48KHz
- Mono output
- Smart cooling system
- Qualcomm TrueWireless Technology
- Four selectable, fixed gain settings of nominal value 23.8dB, 29.8 dB, 33.3 dB and 35.8 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:

TSA7551B 200W Bluetooth+DSP mono amplifier board with an **AudioB plus** Bluetooth module that supports Apt-X. TSA7551B is a very flexible DSP/Amplifier combination board. It has perfect class-D architecture (Based on TDA7498E) and the mono channel has 200W power output. This board can be powered by any DC14V-39V power supply. It can be used to drive any 3Ω,4Ω or 8Ω passive speakers. TSA7551B has a smart cooling system, and the fan does not work in normal case to reduce the noise. The fan only starts when the board overheats.
It's a one channel amplifier board. The only channel is 200W mono output (Bluetooth stereo right and left channel audio mixed in the DSP program). 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

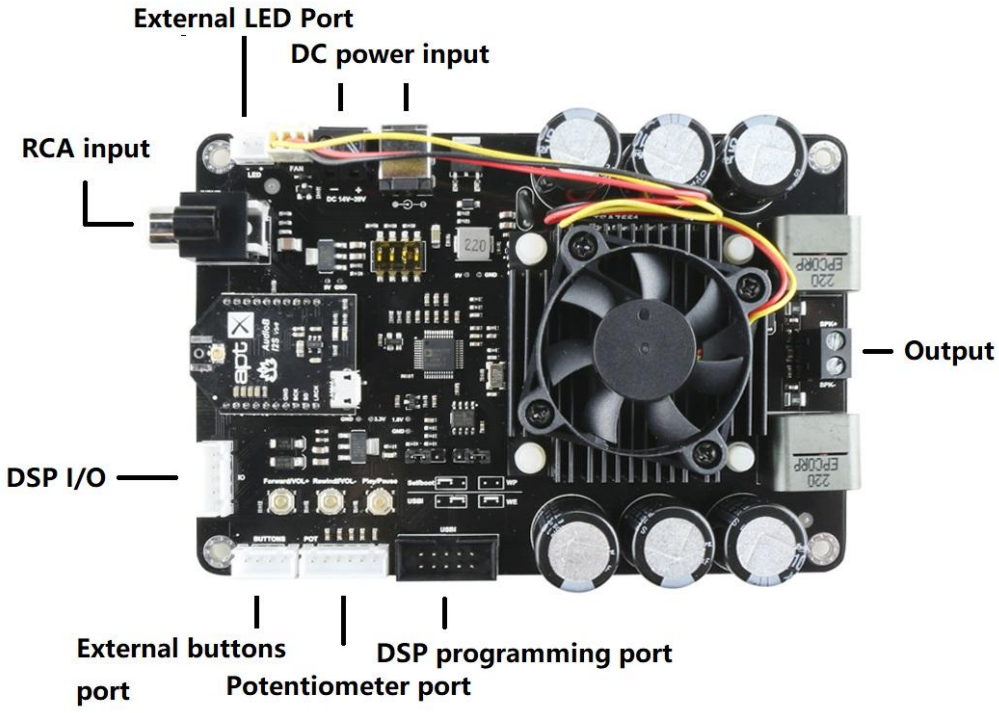
Bluetooth device. The module will appear as "TSA7551B". You don't need a PIN, pair it and then you can play music.

TSA7551B has a ADAU1701 DSP chip on board. It has a default DSP program loaded. Customers can adjust the gain, bass, midrange and treble in the DSP program. It also has a debug port for Sigima Studio and users can program this module with our USBi programmer to get more functions that include equalization, crossover, bass enhancement, multiband dynamics processing, delay compensation, etc...

TSA7551B supports Apt-X and TWS. 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 36V DC, unless otherwise noted. Specifications subject to change without notice.

| Parameter | Condition | Min | Typ | Max |
|---|---|---|---|---|
| Supply Voltage (VDC) | - | 14 | 36 | 39 |
| Power Output (W) | Parallel BTL(Mono) output power, RL=3Ω, THD=10% | - | 220 | - |
| | Parallel BTL(Mono) output power, RL=3Ω, THD=1% | - | 170 | - |
| THD | Po=1W | - | 0.05% | - |
| Bandwidth @ ±3dB | @4Ω | 20Hz | - | 20KHz |
| Input Impedance(Ω) | - | - | 69KΩ | - |
| Undervoltage protection threshold (V) | - | - | - | 8 |
| Gain (dB) | - | 23.6 | 29.6/33.1 | 35.6 |
| Minimum Load Impedance(Ω) | - | 3 | - | - |
| Efficiency | - | - | 85% | - |

# 6 Connection Ports and Functions

## 6.1 Power input

TSA7551B 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.

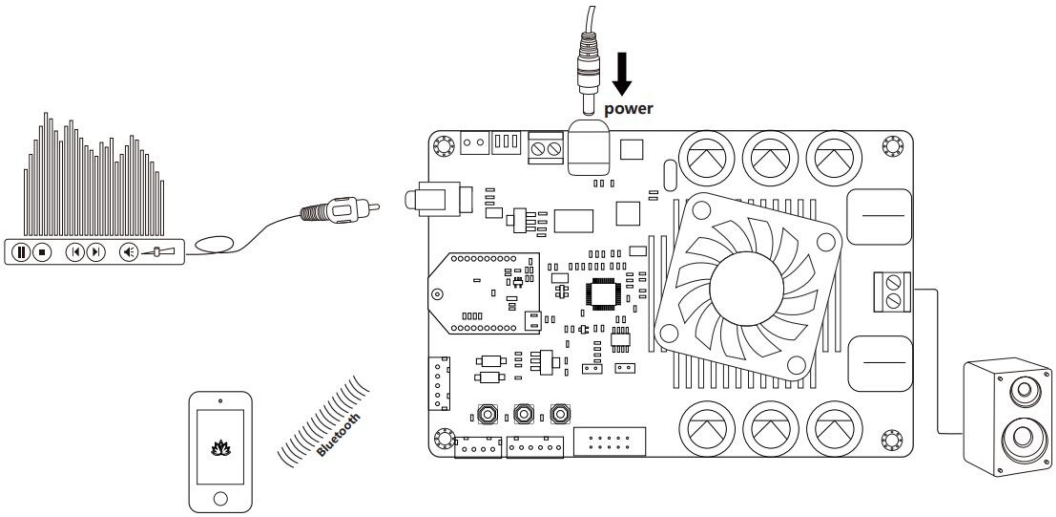
- DC input voltage: DC14V-39V.
- Power reverse connect protection

The recommended input voltage is DC14-30V. Higher input voltage can get full power output. But the board will have more heat output. This will cause the fan to run frequently. Lower input voltage will have less heat output.

## 6.2 Control buttons

| Buttons | Functionality |
|---|---|
| S1<br>(Play/Pause Button) | 1.Click to play or pause<br>2.Long press 5 seconds to clear pairing info<br>3.Long press S1+S3 to search for slave |
| S2<br>(Rewind/VOL- Button) | 1.Click to play the previous song<br>2.Long press to decrease volume<br>3.Long press S2+S1 to search for master |
| S3<br>(Forward/VOL+ Button) | 1.Click to play the next song<br>2.Long press to increase volume<br>3.Long press S3+S2 to disconnect TWS connection |

## 6.2.1 Standard working mode




One board works alone

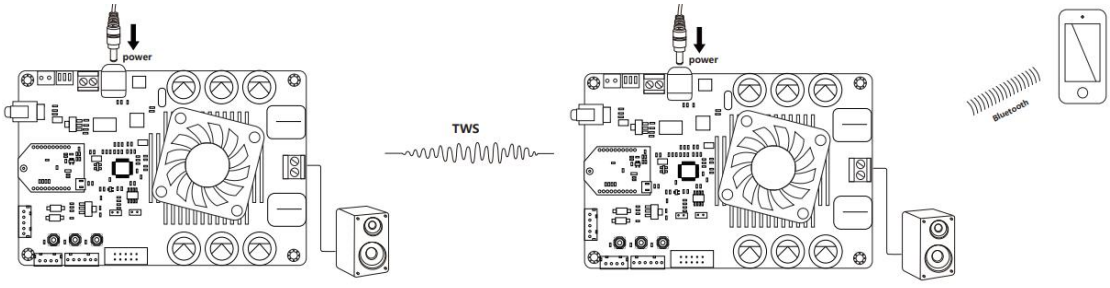
**How to use:**

1. Connect speaker with TSA7551B and Power up the TSA7551B, red LED slow blinks then red and blue LED flash alternately.
2. Now, your smartphone will be able to find a new Bluetooth device whose name is "TSA7551B". Connect it.
3. You can play the music now.

## 6.2.2 TWS mode

In this mode, user can have two TSA7551B paired and work together. One TSA7551B works as master (transmitter) and the other work as slave (receiver). Smartphone only connects with the master board. Two TSA7551B have audio output when your smartphone plays the music.

In TWS mode one of the TSA7551B outputs the left channel and the other outputs the right channel. The master will resume stereo output when the slave is disconnected from the master.




2 boards work in TWS mode

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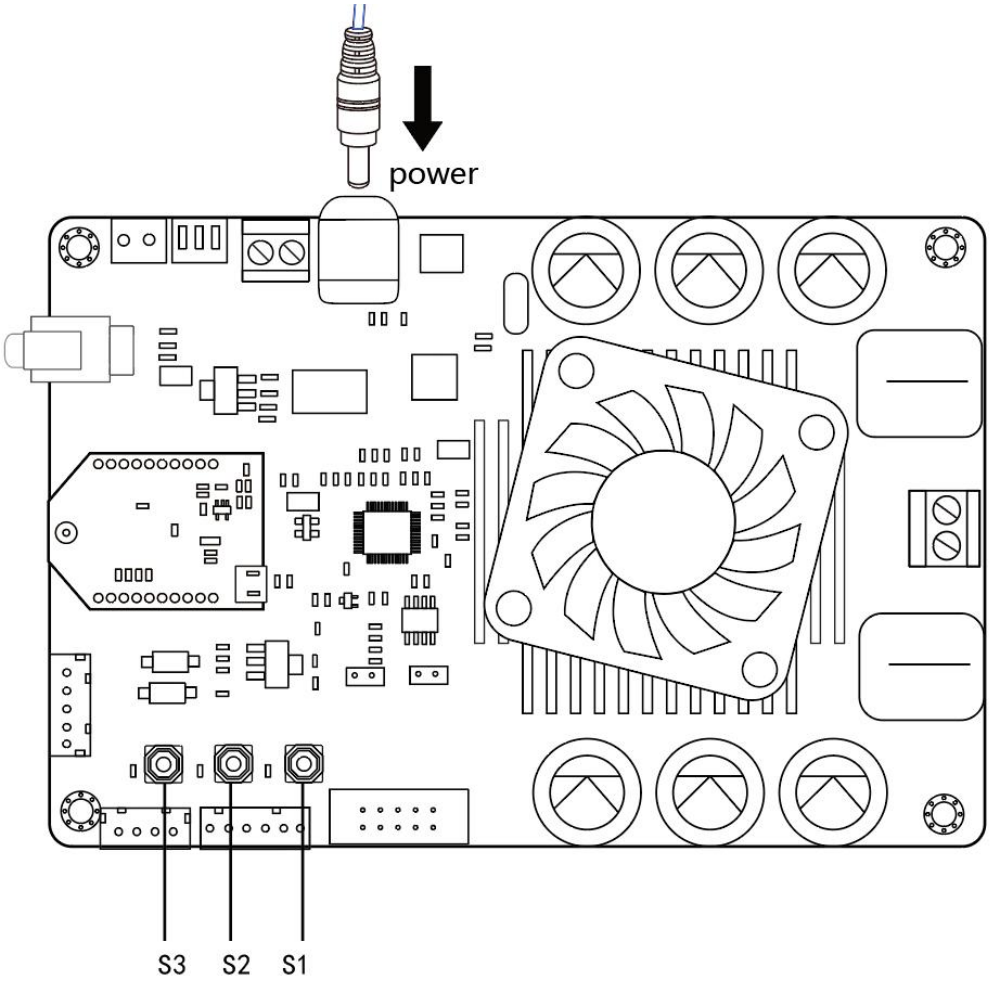



**How to use:**

Master board:

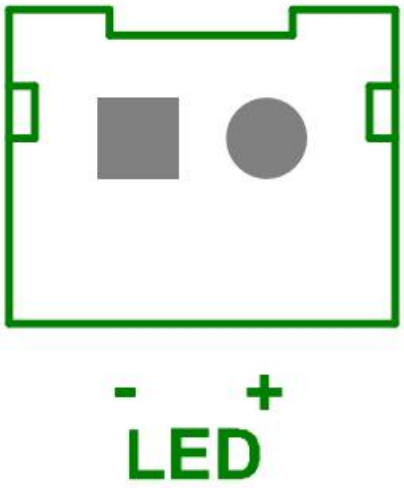
1. Power up the TSA7551B, red LED slow blinks then red and blue LED flash alternately.
2. Now, your smartphone will be able to find a new Bluetooth device whose name is "TSA7551B". Connect it.
3. You can play the music now. If you only use one amplifier board, you don't need do the following steps.
4. Long press S1+S3 1s into TWS master mode.

Slave board:

1. Power up another TSA7551B, red LED slow blinks then red and blue LED flash alternately.
2. Long press S1+S2 1s into TWS slave mode.
3. The master board will automatically search (30s) slave board. Both master and slave board will be connected.
4. The slave board can play music now.
5. If you want to disconnect TWS connection, long press S2+S3 1s to 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 |

There are 2 LEDs on the Bluetooth module to indicate the current Bluetooth status.

Bluetooth LED states

| LED | State | Description |
|---|---|---|
| RED | Slow Blink | Automatically reconnecting |
| | Always off | Automatically reconnect successful |
| BLUE | Three flashes per cycle | Bluetooth cannot be discovered by new devices |
| | Two flashes per cycle | Bluetooth can be found by new device |
| | Three blinks a second | Bluetooth connected |
| | Blinks twice a second | Streaming A2DP |
| RED+BLUE | Red LED and Bluetooth LED flash alternately | 1.Bluetooth can be found by new devices<br>2.Searching for each other in TWS mode |

## 6.4 DSP I/O Port

We provide 3 I/O pins of ADAU1701 DSP chip for use: MP0, MP6 and MP7. User can develop DSP program to fulfill different requirements.

**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

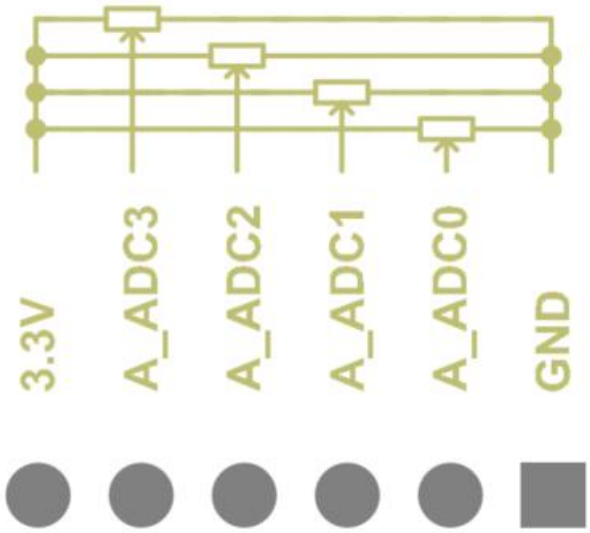
| Pin# | Name | Description |
|---|---|---|
| 1 | VCC_BT_IO | Provides voltage to the IO port of the Bluetooth module |

| | | |
|---|---|---|
| 2 | VOL+ | VOL+ button<br>1.Short click: Audio volume +<br>2.Long press: Next track |
| 3 | VOL- | VOL- button<br>Short click: Audio volume -<br>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 and Bass. You need to update the DSP program first. You can download the DSP program in the product page.
We also provided a potentiometer kit (Part number: G6438C446C9585) or potentiometer kit V2 (Part number: G666FB584A75E1) 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 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.

## 6.8 Fan connector

TSA7551B 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 automatically run/stop according to the board temperature.
Fan RUN/STOP temperature value and working voltage:

- RUN: >55℃
- STOP:<35℃
- Working voltage: 9VDC

## 6.9 Amplifier chip Gain settings

We can set the gain of the amplifier via DIP switches

| GAIN | DIP SWITCH | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 35.6dB | ON | OFF | OFF | OFF |
| 33.1dB | OFF | ON | OFF | OFF |
| 329.6dB | OFF | OFF | ON | OFF |
| 23.6dB | OFF | OFF | OFF | ON |

# 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)

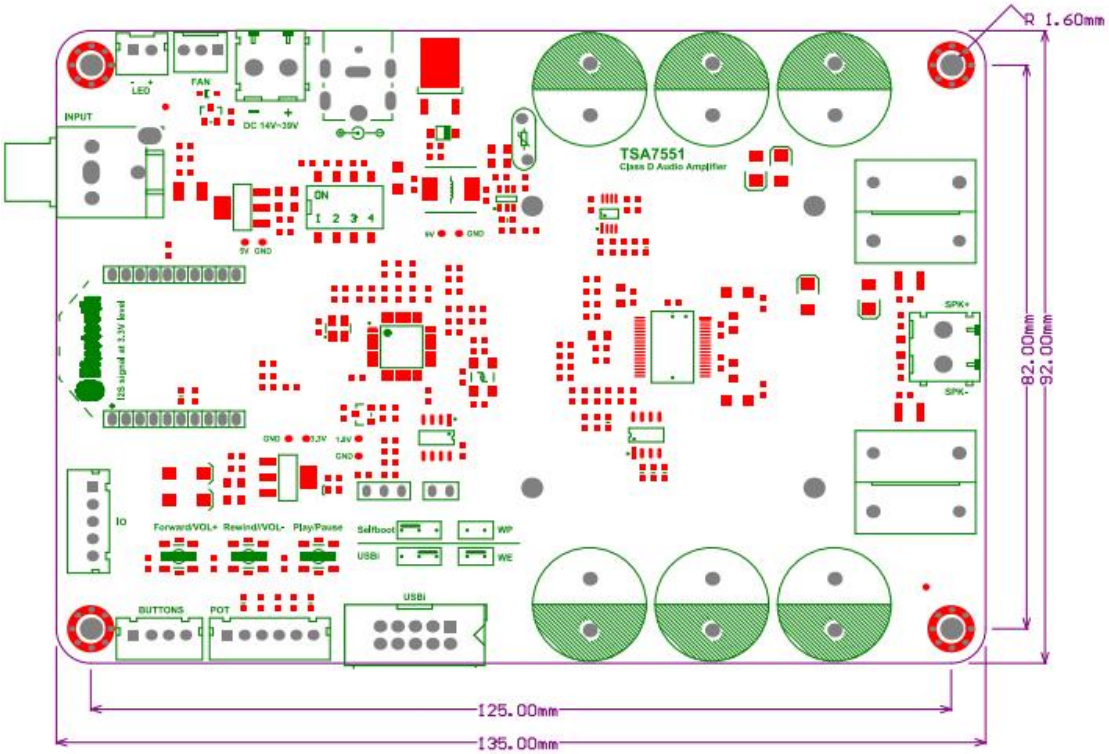
# 8 Bluetooth programming

TSA7551B uses 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 Official Qualcomm software.

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

# 9 Dimensions



# 10 Revision history

**Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 11-Jul-2024 | 1 | Initial release |