2*2W @4Ω PAM8803 Class-D Audio Amplifier Board User's Guide

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NOTES:

Product Version : Ver 1.0

Document Version : Ver 1.0

2*2W @4Ω PAM8803 CLASS-D AUDIO AMPLIFIER BOARD USER'S GUIDE

Chapter 1. Overview

1.1 Overview

Thanks for using 2*2W audio amplifier board series. Each member is a high-quality dual-channel class-D audio amplifier board capable of delivering 2W per channel of output power into a 4Ω load. It employs PAM's PAM8803 IC which offers 64-step digital volume control and low THD+N, allowing it to produce high-quality sound reproduction. It's especially suitable for small speakers. This amplifier board can also be used to drive passive 4Ω or 8Ω speakers.

TABLE 1-1 2*2W AUDIO AMPLIFIER BOARD SERIES

Product No.	Product Name
AA-AB32131	2*2W @4Ω PAM8803 Class-D Audio Amplifier Full-featured Board
AA-AB32133	2*2W @4Ω PAM8803 Class-D Audio Amplifier Simple Board

FIGURE 1-1 OVERVIEW OF AA-AB32131

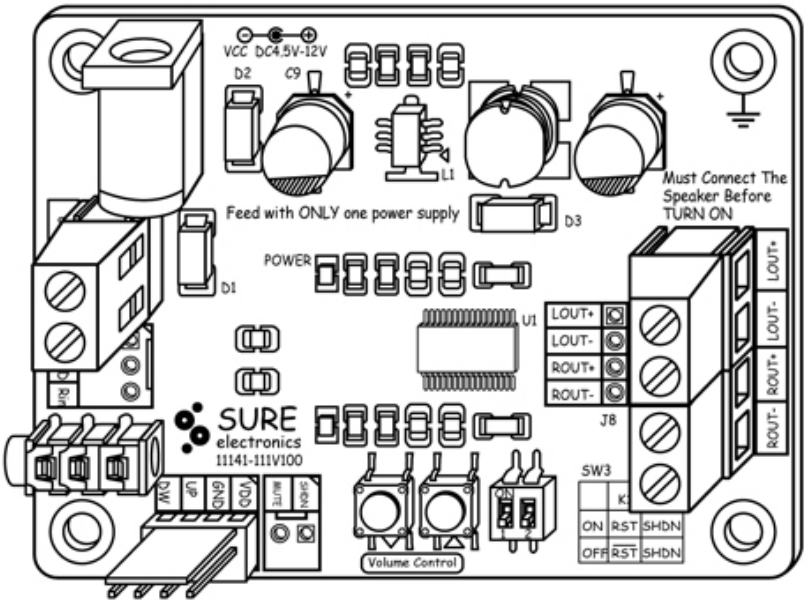


FIGURE 1-2 OVERVIEW OF AA-AB32133

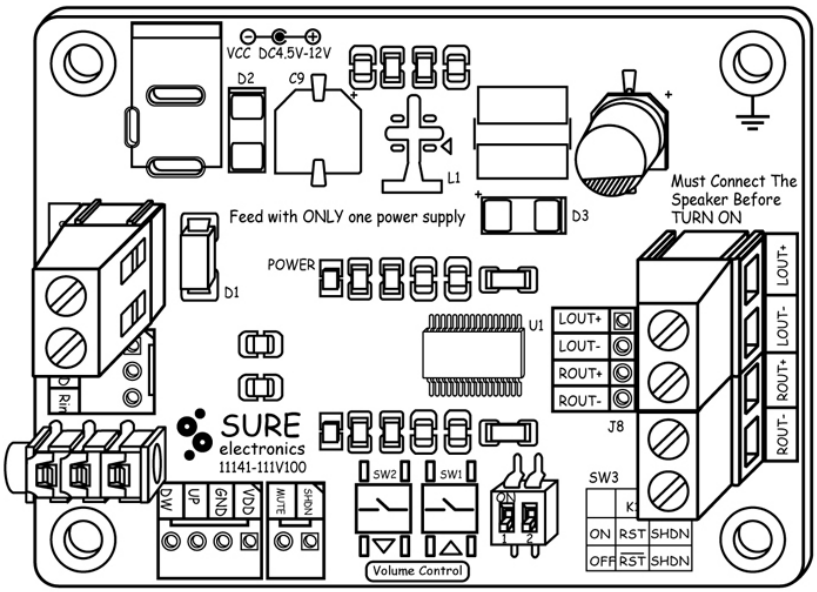
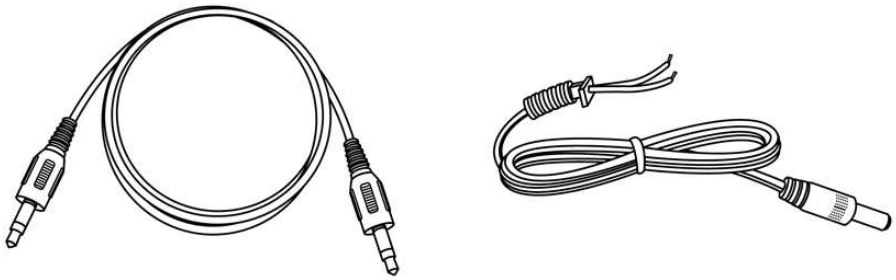


FIGURE 1-1 ACCESSORY



Note: All the diagrams in this manual are for reference only.

1.2 Features

- A perfect “Class D” architecture
- Fully-bridged stereo output
- power supply:
  - AA-AB32131:
  - Wide power supply range: DC4.5V to12V via a power port
  - Two to three AA batteries or DC2.5V to 4.0V via a terminal block
  - AA-AB32133:
  - Two to three AA batteries or DC2.5V to 4.0V via a terminal block
- Two kinds of input:
  - Line level input via 2510 connector
  - Audio input via 3.5 headphone jack
- Frequency response: 20Hz to 20KHz(±3dB)
- Signal/Noise Ratio: 85dB (f=22 to 22KHz, THD=1%)
- High Output Power
  - 1.2W @ 8Ω, < 10.0% THD+N
  - 2.0W @ 4Ω, < 10.0% THD+N
- High Efficiency
  - 85% @ 1.2W 8Ω

88% @ 2.0W 4Ω

- Audiophile Quality Sound
  0.19% THD+N @ 0.5W 8Ω
  0.17% THD+N @ 1.0W 4Ω
- Volume control:
  Volume control buttons
  External rotary encoder daughter board
- Over/under voltage turn off
- Over current protection
- Over temperature protection

1.3 Applications

- Home Active Speaker
- Home Theater Receiver
- Multi-channel Distribution
- Active DVD System
- Mini/micro Systems

1.4 Benefits

- Mounting holes facilitate installation and fixing
- Several wiring methods facilitate connection
- Excellent heat dissipation eliminate the requirement of an extra heat sink
- Tactile switches for volume control are adjustable

1.5 Quick Start

Suggested connection is shown in figure 1-4 and figure 1-5.

FIGURE 1-4 CONNECTION (AA-AB32131)

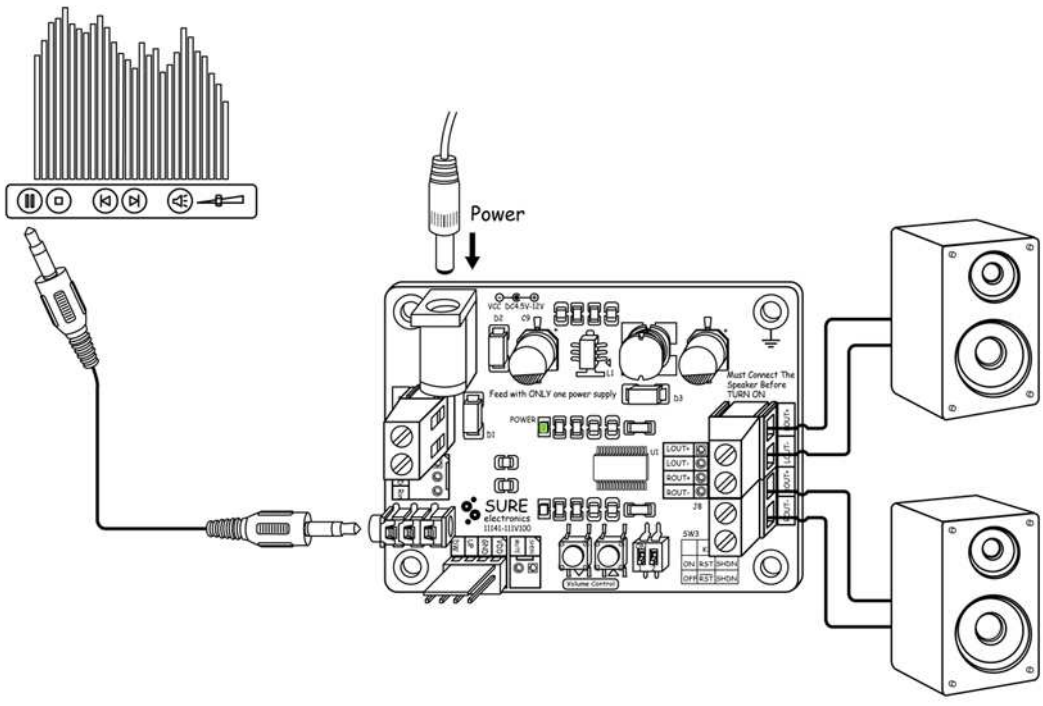
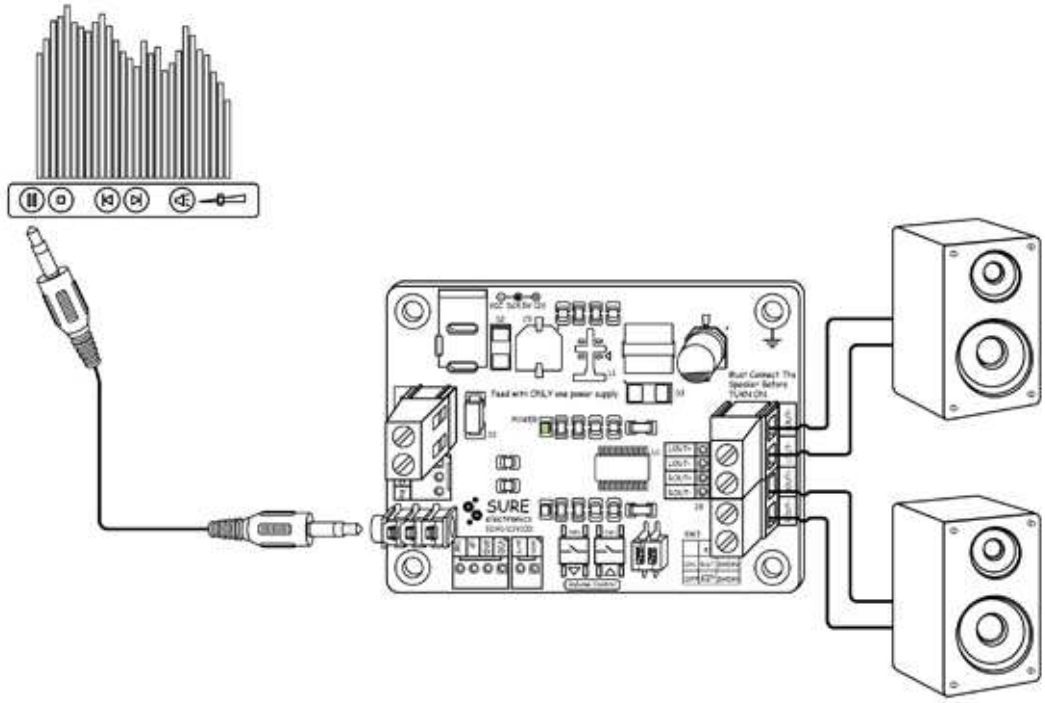


FIGURE 1-5 CONNECTION (AA-AB32133)



Note: Please observe the following steps to complete verification so as to ensure the products are intact during transit.

1. Open the amplifier package and make sure the product is intact (No missing or damaged components and no deformation)
2. Please observe the connection schematics when connecting the amplifier board. Use a nearby sound source, such as MP3 or CD player to have a trial. This amplifier board can be deemed as qualified if you can hear the sound corresponding to that sound source.
3. Ensuring the long life time, load connection is recommended before the power is turned on.
4. GND should be grounded or connected to the housing of the device.
5. The mounting holes of this product should be grounded.

Chapter 2. Hardware Detail

2.1 Power Connection

To power the amplifier board, use either jack or terminal blocks. On-board diodes can prevent the consequence of wrong connection of power supply.

FIGURE 2-1 POWER CONNECTION (AA-AB32131)

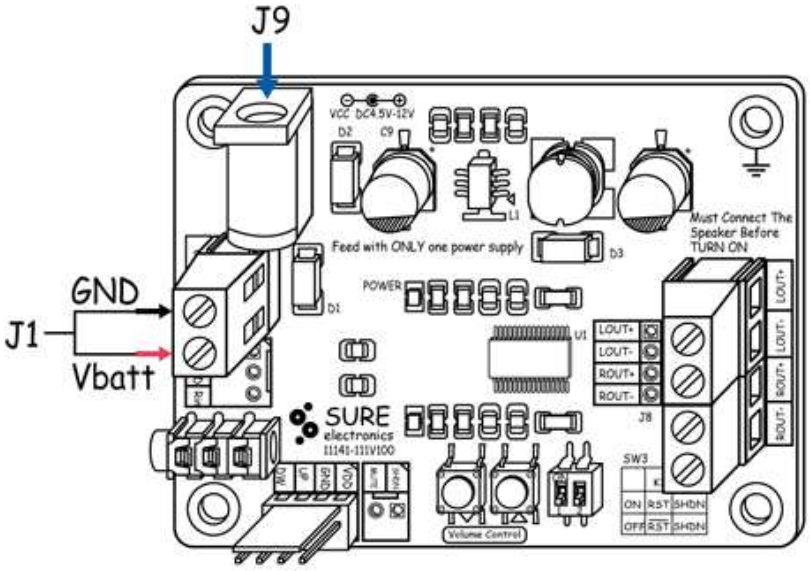


FIGURE 2-2 POWER CONNECTION (AA-AB32133)

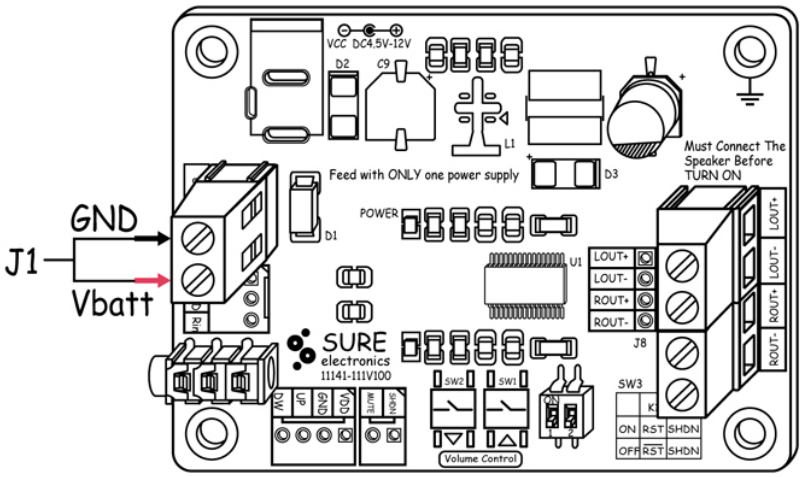


TABLE 2-1 POWER PORT

Connector Mark			Description
Jack (AA-AB32131)	J9		DC 4 to 12 power supply
Terminal Blocks (AA-AB32131, AA-AB32133)	J1	Vbatt	The positive of 2 to 3 AA batteries
		GND	The negative of 2 to 3 AA batteries

Note:
1. You are allowed to use only one way to power the amplifier board at a time.
2. The maximum supply voltage shall not exceed 14V.
3. One less than 6V battery or more connected in series can be used to power the board. The minimum limited number is 2 AA batteries.

2.2 Input Connection

You may use 3.5mm headphone jack for audio signal input or use 2510 socket's mounting holes for line level audio input.

FIGURE 2-3 INPUT CONNECTION (AA-AB32131)

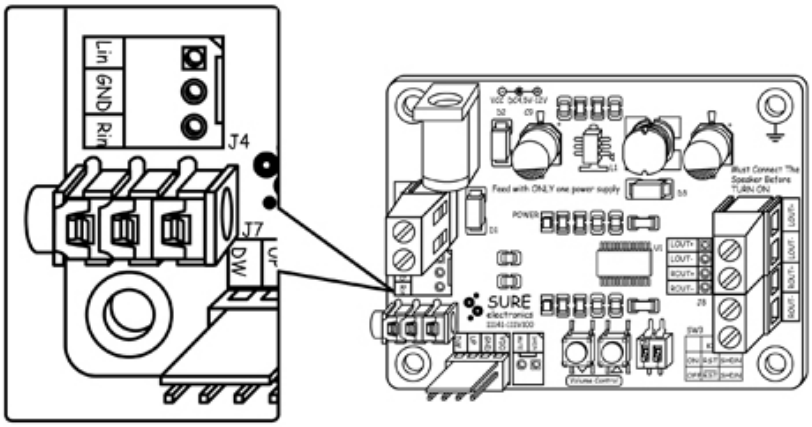


FIGURE 2-4 INPUT CONNECTION (AA-AB32133)

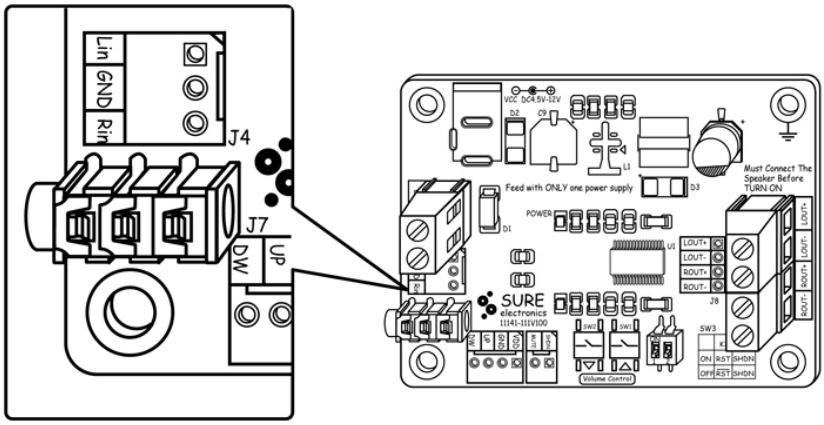


TABLE 2-2 INPUT PORT

Connector Mark		Description
Mounting Holes (J4)	Lin	Left Channel Input
	GND	GND
	Rin	Right Channel Input
3.5mm Headphone Jack	J7	Left and Right Channel Input

Note: You are allowed to feed only one group (dual channel) of audio signal to the amplifier board at a time.

2.3 Output Connections

You may use either terminal blocks for audio signal output or use mounting holes when this board is used as a daughter board.

FIGURE 2-5 OUTPUT CONNECTION (AA-AB32131)

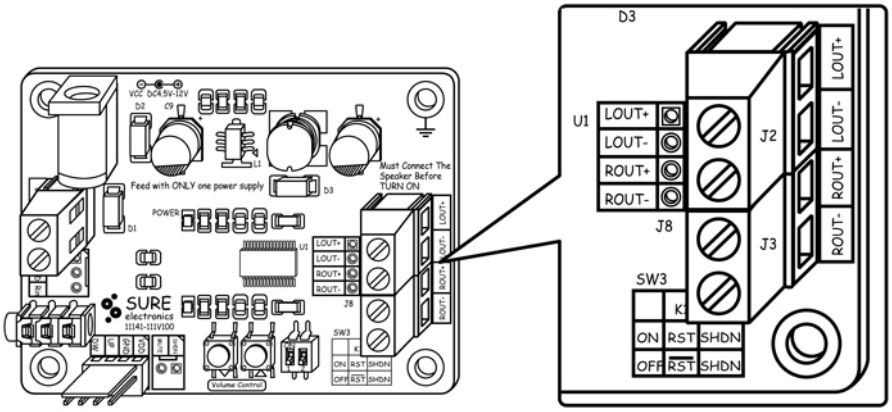


FIGURE 2-6 OUTPUT CONNECTION (AA-AB32133)

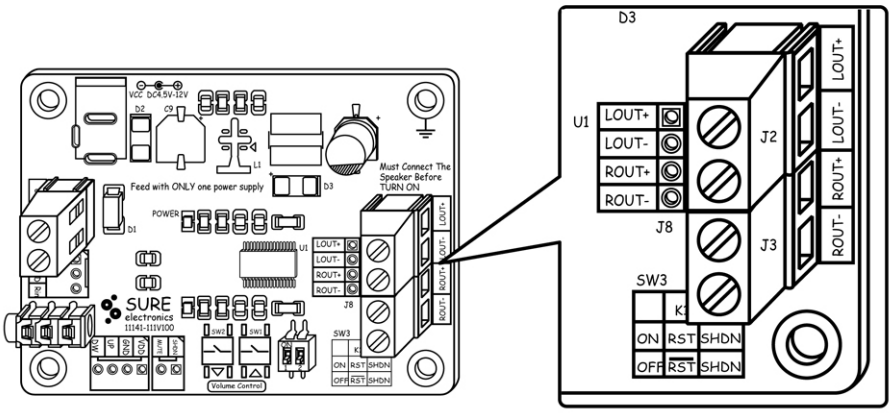


TABLE 2-3 OUTPUT PORT

Connector Mark		Description
Mounting holes (J8)	LOUT+	Positive Output of Left Channel
	LOUT-	Negative Output of Left Channel
	ROUT+	Negative Output of Right Channel
	ROUT-	Positive Output of Right Channel
Terminal Blocks*	J2	Output of Left Channel
	J3	Output of Right Channel

Note:
1. Never connect more than one group of speaker to the audio output.
2. * Refer to on-board descriptions for connection details.

2.4 Mute Settings

The hole for MUTE is reserved on the board. To mute the output audio signal, connect “GND” and “MUTE” of the terminal block with a piece of lead. Usually, “MUTE” shall be left unconnected.

FIGURE 2-7 MUTE SETTINGS (AA-AB32131)

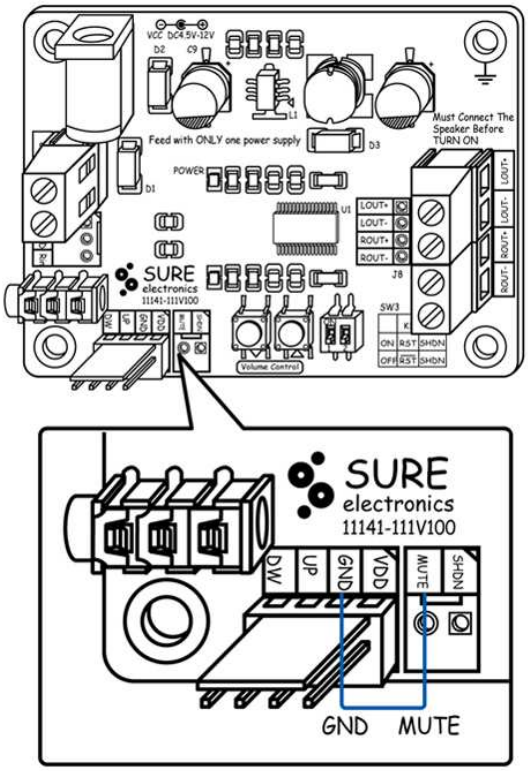


FIGURE 2-8 MUTE SETTINGS (AA-AB32133)

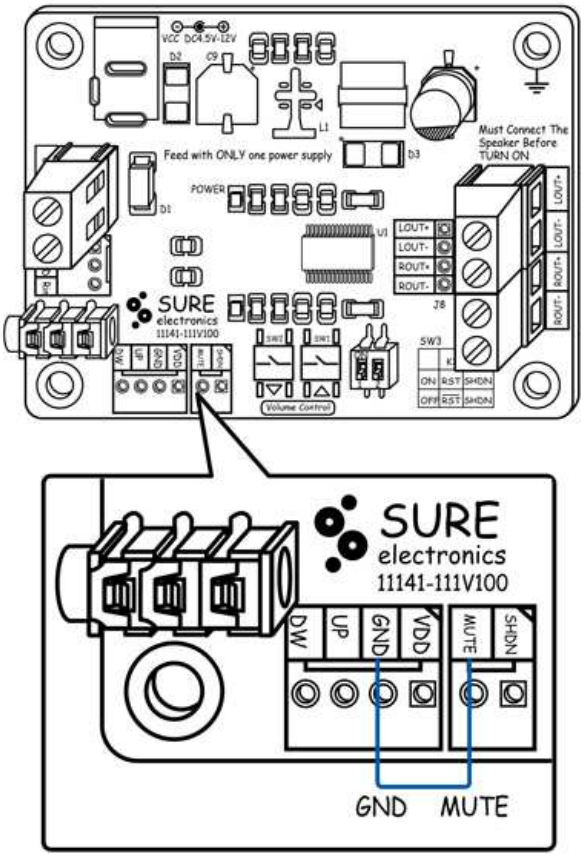


TABLE 2-4 MUTE SETTINGS

Connector Mark		Description
J6	MUTE	When “MUTE” is connected with “GND”, both channels will be muted and enter into idle mode. When connected with high level or left unconnected, both channels will resume regular operation.

Note: Never connect MUTE to any power supply or voltage higher than +5V.

2.5 Sleep Settings

Two kinds of connection and installation are available: mounting holes and DIP switches. To enable sleep settings, connect “GND” and “SHDN” of the terminal block with a piece of lead. Usually, “SHDN” shall be left unconnected.

FIGURE 2-9 SLEEP SETTINGS (AA-AB32131)

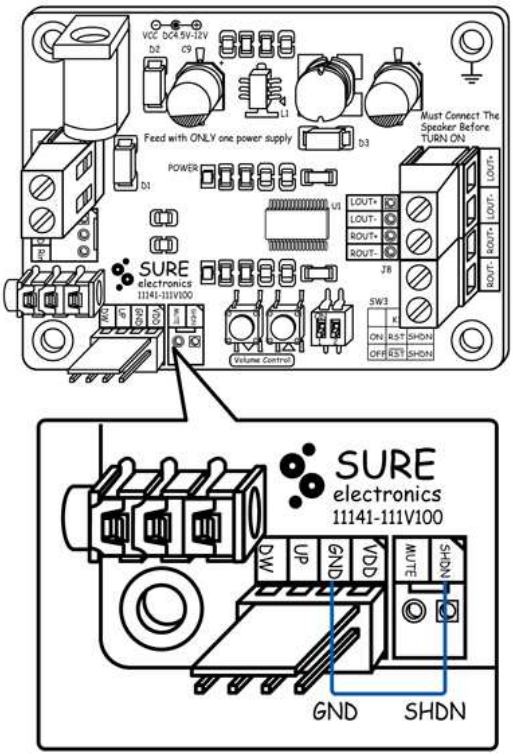


FIGURE 2-10 SLEEP SETTINGS (AA-AB32133)

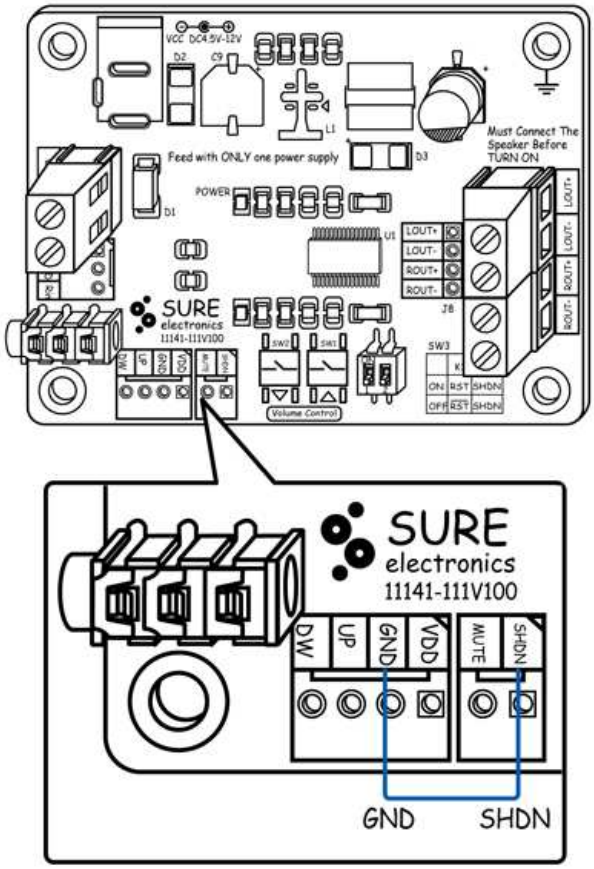


TABLE 2-5 SLEEP SETTINGS

Connector Mark		Description
J6	SHDN	When “SHDN” is connected with “GND”, the chip will be set to SLEEP and enter low-power-consumption working mode. When “SHDN” is connected with high level or left unconnected, the chip will resume regular operation.

Settings of DIP switches are shown as follows.

FIGURE 2-11 SETTINGS OF DIP SWITCHES (AA-AB32131)

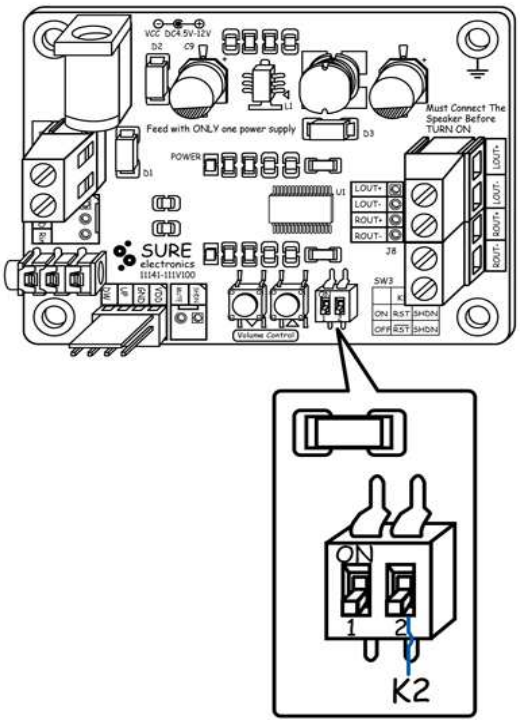


FIGURE 2-12 SETTINGS OF DIP SWITCHES (AA-AB32133)

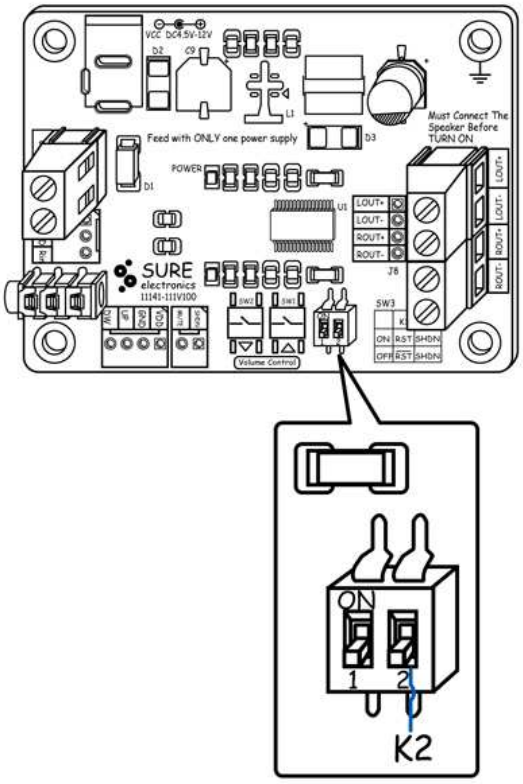


TABLE 2-6 SETTINGS OF DIP SWITCHES

SHDN Settings	
K2	Function
ON	Sleep mode
OFF	Working mode

Note: SLEEP means that the chip works with low power consumption. MUTE means that the chip normally works with no output.

2.6 Volume Control Settings

On-board 2-slide DIP switches marked as “SW3” is used for volume control. K1 is used to set volume and K2 used to set the SHDN of the chip.

FIGURE 2-13 VOLUME CONTROL SETTINGS (AA-AB32131)

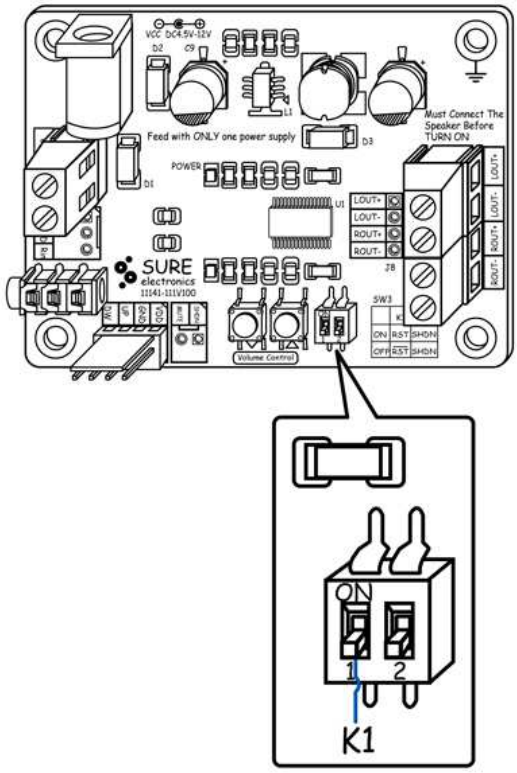


TABLE 2-7 VOLUME CONTROL SETTINGS (AA-AB32131)

Volume Control Settings	
K1	Function
ON	Disable the tactile switches
OFF	Enable the tactile switches for volume control

Note: When K1 is ON, the chip will amplify the audio signal with 4dB gain and the tactile switches are disabled.

2.7 Volume Control

Two kinds of control input are provided to control volume: on-board tactile switches and external rotary encoder control daughter board interface.

FIGURE 2-14 VOLUME CONTROL (AA-AB32131)

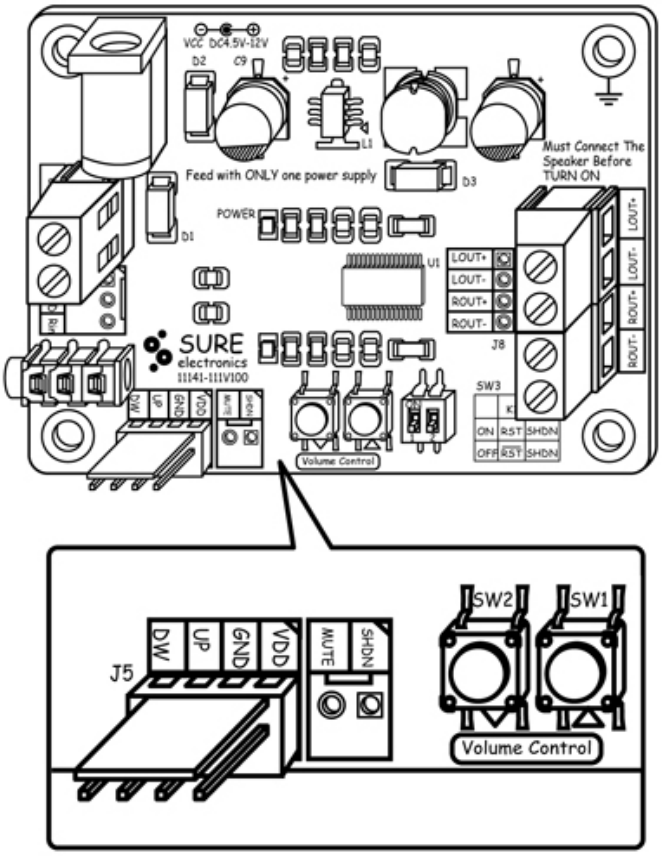


TABLE 2-8 VOLUME CONTROL (AA-AB32131)

Connector Mark		Description
SW1	UP	Tactile Switch for Volume Increase
SW2	DOWN	Tactile Switch for Volume Decrease
J5	VDD	4.2V Voltage Output
	GND	GND
	UP	Volume Increase Input (Low Level Valid)
	DOWN	Volume Decrease Input (Low Level Valid)

TABLE 2-9 CORRESPONDING GAIN OF EACH STEP OF VOLUME CONTROL

Step	Gain(dB)	Step	Gain(dB)	Step	Gain(dB)	Step	Gain(dB)
1	-75.0	17	4.8	33	11.2	49	17.6
2	-39.7	18	5.1	34	11.6	50	18.0
3	-34.0	19	5.5	35	12.0	51	18.4
4	-28.2	20	5.9	36	12.3	52	18.8
5	-22.4	21	6.3	37	12.7	53	19.2
6	-16.5	22	6.7	38	13.2	54	19.6
7	-10.5	23	7.1	39	13.6	55	20.0
8	-8.0	24	7.5	40	14.0	56	20.4
9	-5.5	25	7.9	41	14.4	57	20.9
10	-2.9	26	8.3	42	14.8	58	21.3
11	-0.4	27	8.7	43	15.2	59	21.7
12	1.1	28	9.1	44	15.6	60	22.1
13	2.6	29	9.6	45	16.0	61	22.5
14	3.6	30	10.0	46	16.4	62	22.9
15	4.0	31	10.4	47	16.8	63	23.4
16	4.4	32	10.7	48	17.2	64	23.8

2.8 LED Indicator

This amplifier has one power LED indicator which is marked “Power (D4)”. The power indicator will be illuminated in green when power-up. Please refer to the connection schematic of the board for the LED location.

2.9 Notes

In order to protect amplifier board and extend its service lifetime, please read the following warnings carefully since warranties will be voided if you do not observe the following warnings:

Warning 1:

Quality-related issues caused by potentiometers installed by buyers.

Warning 2:

In order to achieve a better sound quality, please use stable power supply since a bad or unstable power supply may worsen the sound quality or even cripple the amplifier board.

Warning 3:

Never equip a pre-amplifier to the audio input since the amplifier itself has powerful amplification ability and a high signal input will burn out the amplifier chip.

Warning 4:

In order to protect amplifier and speaker, please turn the volume output to the minimum when hooking up the amplifier and you may readjust the volume when you are sure that the amplifier is functioning properly.

Chapter 3. Electrical Characteristics

Following table lists all typical data. For full specification, please refer to the PAM's data sheet of PAM8803 chip.

T_A=20℃, f=1000Hz RL=4Ω, f=1000Hz, Sine wave input, R_L=4Ω (unless otherwise stated)

FIGURE 3-1 ELECTRICAL CHARACTERISTICS

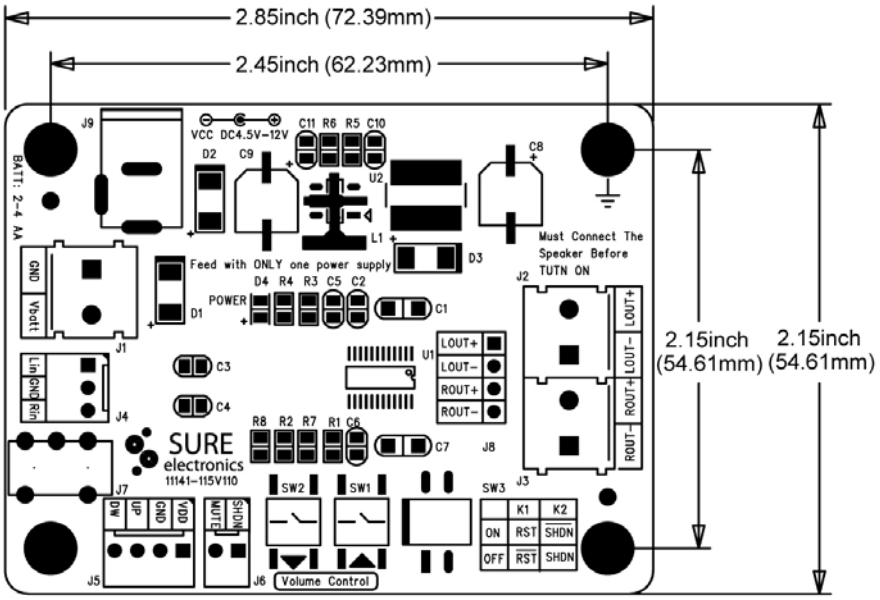
Parameter		Condition	Min.	Typ.	Max.
Supply Voltage	AA-AB32131	-	4V	-	12V
	AA-AB32131 AA-AB32133	-	2.5V	-	4.5
Quiescent Current	AA-AB32131	DC12V, NO load	-	100mA	-
		MUTE=0	-	10mA	40mA
	AA-AB32133	2AA batt, NO load	-	20mA	-
		MUTE=0	-	10mA	20mA
Signal/Noise Ratio		-	-	85dB	-
Input Sensitivity		A=0dB	-	0.720V	-
THD+N*		RL=4Ω, Pout=1W	-	0.17 %	-
		RL=8Ω, Pout=0.5W	-	0.19 %	-
Frequency Range		-	20HZ to 20KHz (±3dB)		
Efficiency		RL=4Ω, Pout=2.6W	-	88%	-
		RL=8Ω, Pout=1.5W	-	85%	-
Output Power	THD+N<1%	RL=4Ω, f=1000Hz	-	1.5W	-
		RL=8Ω, f=1000Hz	-	1.0W	-
	THD+N<10%	RL=4Ω, f=1000Hz	-	2.0W	-
		RL=8Ω, f=1000Hz	-	1.2W	-
Input Impedance		-	-	60K	-
Minimum Load		-	3.2ohm	-	-
SHUD, UP, DOWM, MUTE*	High-level input voltage	-	1.2V	-	-
	Low-level input voltage	-	-	-	0.5V
Channel Separation*		Po=1W, RL=4ohm	60dB	80dB	-

Power Gain*	Volume Adjustable	K1=OFF	-75dB	-	23.8dB
	Volume not adjustable	K1=ON	-	2.6dB	-
Operating Temperature		-	0℃	20℃	70℃
Storage Temperature		-	-20℃	20℃	105℃
Thermal Shutdown*		-	-	150℃	-

Note: *The chip specifications from PAM's PAM8803 Data Sheet.

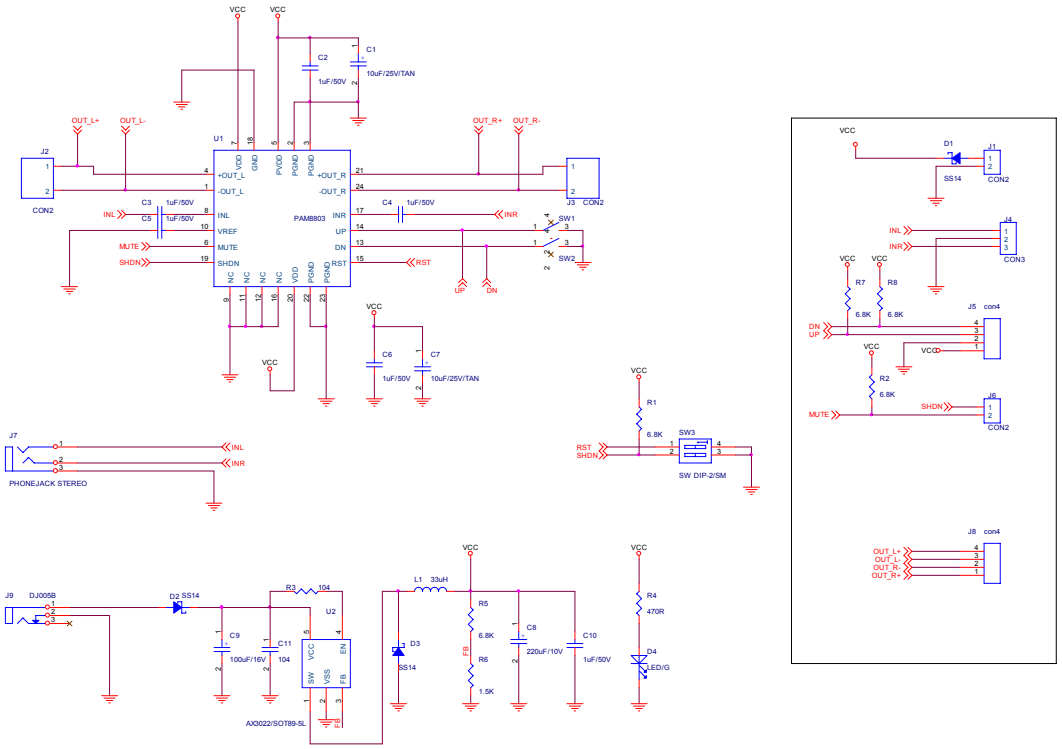
Chapter 4. Mechanical Drawing

FIGURE 4-1 MECHANICAL DRAWING



Chapter 5. Appendix

FIGURE 5-1 SCHEMATIC



Note: The schematic is for reference only.

Chapter 6. Contact Us

Sure Electronics Co., Ltd.
5F, Zone A,
Qinhuai Technology Innovation Center
105-2 DaMing Rd (ZIP:210022)
Nanjing
P.R.China
Tel: +86-13601408832 (For technical questions only)
+86-25-66606340 (English service, from GMT1-10AM)
Fax: +86-25- 66606341-866
Website: www.sure-electronics.com
www.sure-electronics.net