

# PAM8004-EV Board User Guide

## AE Department

## 1. Revision Information

[illegible]

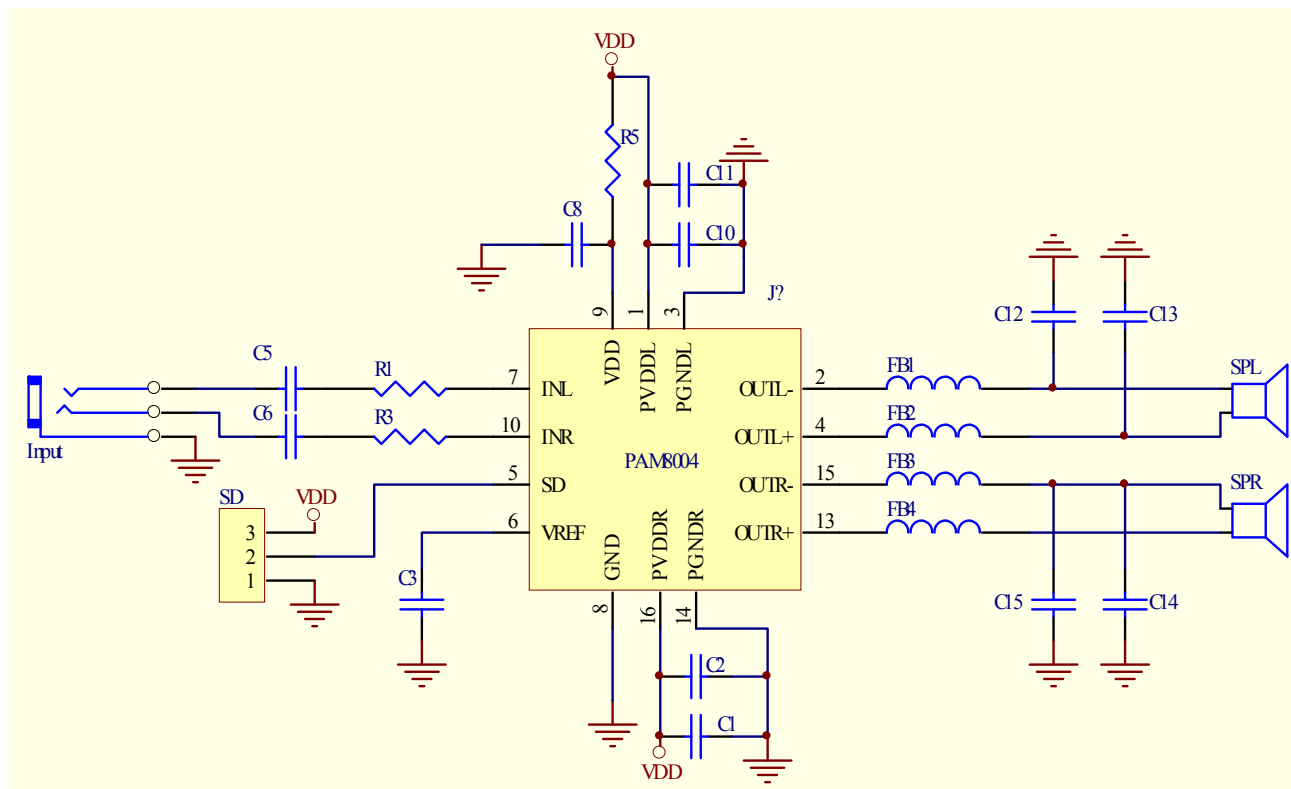
## 2. PAM8004 General Description

The PAM8004 is a 3W, class-D audio amplifier. It offers low THD+N, allowing it to achieve high-quality sound reproduction. The new filterless architecture allows the device to drive the speaker directly, requiring no low-pass output filters, thus to save the system cost and PCB area

### 3. Key Features

- 3W Output at 10% THD with a 3Ω Load and 5V Power Supply
- 2.5W Output at 10% THD with a 4Ω Load and 5V Power Supply
- Filterless, Low Quiescent Current and Low EMI
- Low THD+N
- Superior Low Noise
- Short Circuit Protection
- Thermal Shutdown
- TEW External Components to Save the Space and Cost
- Pb-Free Package

## 4. EV Board Schematic



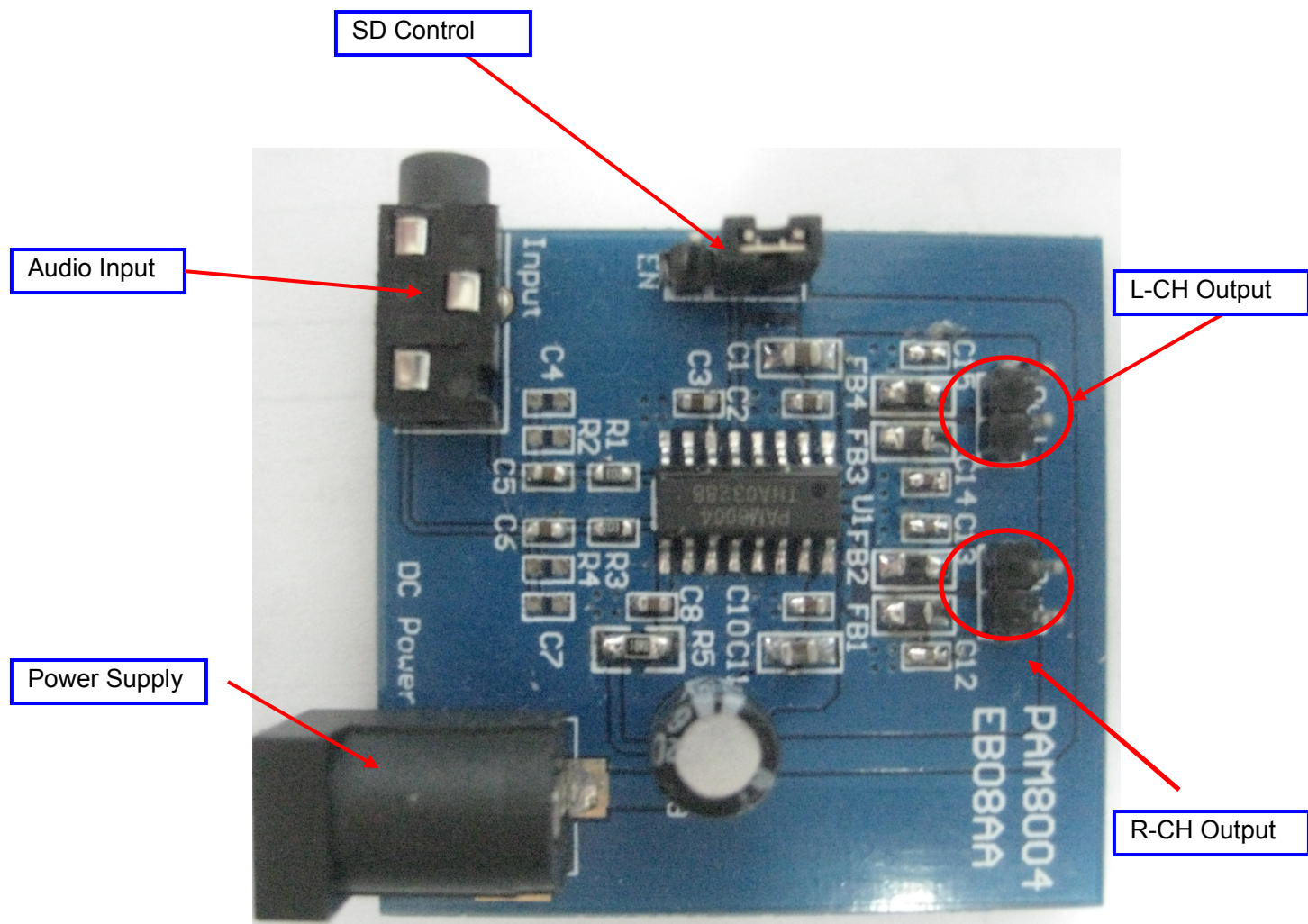
**Figure 1**

## 5. EVB PAM8004 EVB EB08AA Description

PAM8004 EB08AA is an evaluation board for the PAM8004, a stereo class-D audio power amplifier. The board is targeted to be used in providing a simple and convenient evaluation environment for the PAM8004. Requires parts, the standard RCA jacks for audio inputs, pin jacks for power supply and signal outputs etc. on the board make it easy to be evaluated.

## 6. EV Board View and Jack Description

Top Layer



### EV Board Operational Sequence:

- Connect SD to a high for normal operation
- Connect audio input from audio input jack
- Connect the loading(speaker or power resistor) to the output jack
- Power on: 2.5V to 5.5V DC power supply

## 7. EV Board BOM List

| Item            | Value        | Type                  | Rating | Description                                       |
|-----------------|--------------|-----------------------|--------|---------------------------------------------------|
| C5,C6           | 1 $\mu$ F    | X5R/X7R, Ceramic/0603 | 10V    | Input coupling CAP                                |
| C2,C10          | 1 $\mu$ F    | X5R/X7R, Ceramic/0603 | 25V    | PVDD coupling CAP,                                |
| C1,C11          | 10 $\mu$ F   | X5R/X7R, Ceramic/0805 | 25V    | PVDD main coupling CAP,                           |
| C3              | 1 $\mu$ F    | X5R/X7R, Ceramic/0603 | 10V    | Internal 2.5V bias decoupling CAP                 |
| C8              | 1 $\mu$ F    | X5R/X7R, Ceramic/0603 | 25v    | AVCC coupling CAP                                 |
| R1, R3          | 5.1k         | 0603                  | 1%     | Input Resistor                                    |
| FB1,FB2,FB3,FB4 | 200 $\Omega$ | 0805                  | 2A     | For EMI eliminate components form a FB-CAP filter |
| C12,C13,C14,C15 | 220pF        | 0603                  | 25V    |                                                   |
| C9              | 470 $\mu$ F  | Electrolytic          | 16V    | Power supply decoupling CAP                       |
| R5              | 10 $\Omega$  | 0805                  | 5%     | Separate AVCC from PVDD                           |

## 8. External Compnents Selection

### Input Capacitors (C5, C6)

- (1) Form a high pass filter with  $R_i$ , and the cut off frequency is  $f_c = 1/2\pi R_i C_i$
- (2) Have a tolerance of 10% or better for matching : any mismatch in capacitance causes an importance mismatch at the corner frequency and below
- (3) Low leakage current needed, 1.0 $\mu$ F, X5R/X7R ceramic recommend

### Input Resistors (R1, R3)

- (1) Limit the closed-loop gain
- (2) Form a high pass filter with  $C_i$ , and the cut off frequency is  $f_c = 1/2\pi R_i C_i$
- (3) 1% tolerance needed for resistor matching to improve CMRR, PSRR

### Power Supply decoupling Caps (C1, C2, C10, C11, C8)

- (1) Low ESR for good THD, PSRR
- (2) 1 $\mu$ F ceramic for higher frequency transients, spikes, or digital hash on the line of PVDD/AVCC
- (3) Additional 10 $\mu$ F or greater for low frequency noise filtering and serves as a local storage capacitor for supplying current during large signal transients on the amplifier outputs
- (4) Need place very closed to the IC

## 8. External Components Selection (cont.)

### Internal 2.5V Bias Supply Capacitor (C3)

- (1) Internal power supply for pre-amplifier,
- (2) 1uF, X5R/X7R ceramic recommend
- (3) Place very closed to the device

### EMI Eliminate Filter (FB1, FB2, FB3 and FB4)

- (1) High impedance at high frequency and very low impedance at low frequency
- (2) The current rating is higher than 2A

## 9. PCB Layout Guidelines

### Grounding

- (1). Use plane grounding or separate grounds
- (2). Do not use one line connecting power GND and analog GND
- (3). Output noise grounds must tie to system ground at the power in exclusively.
- (4). Signal currents for the inputs need to be returned to quite ground. This ground only ties to the signal components and the GND pin.

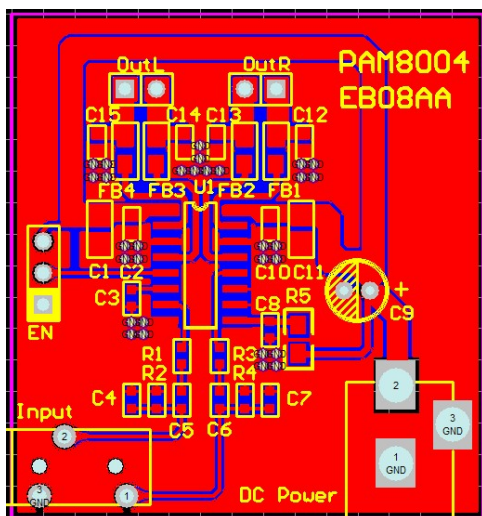
### Power Supply

#### Others

- (1). The power supply capacitors (C1, C2, C10, C11,C8) need to place very close to the PAM8003's pins.
- (2). Input capacitors (C5, C6) place closed to input pin as near as possible.

## 10. PCB Layout Example

Top Layer



Bottom Layer

