41Hz Audio

www.41hz.com

AMP9-BASIC

Assembly Instructions (First Draft) Revision 0.9 December 2021

Document ID: **194**

Written by Jan F

AMP9-BASIC FEATURES

- Relatively easy to build
- Quad, Stereo or Mono output
- Outputs can easily be paralleled
- Ready made filter inductors
- Low impedance load capability, can drive 2 ohm loads and even less with outputs parallelled
- Single rail12-24VDC supply. Suitable for 12V or 24V battery
- High efficiency 80-90% mean small heat sink and small transformer requirements
- Line level analogue audio inputs with fixed gain and input impedance 50K
- All inputs and logic are protected
- Mute function for click-less on-off
- Over current protection, temperature overload protection
- Mute, sleep inputs
- Status outputs (LEDs) Awake, Un-mute and input Overload
- Footprint, 60x100 mm

Tripath TAA4100A chip FEATURES

- Class-T architecture
- High Power, high current
- Drives four 2-ohm loads with 12V supply
- Audiophile sound quality, < 0,01% TDH+N at 4x40 W RMS, 4 ohm , 4x80W at 10%THD, 24V
- High Efficiency
- Auto DC offset nulling
- Mute Input
- Over-current protection (4x10A)
- Over and under-voltage protection
- Bridged outputs, high power from low voltages
- Outputs can be paralleled for 1,2,3 or 4 channels
- 32-pin SSIP package
- Suppy overvoltage spike tolerant, 60V, 50mS

Assembly instructions AMP9-BASIC

Thank you for choosing an audio product from 41hz.com!

Check delivery

On delivery, check that all components have been included. We do double-check the component count but mistakes can happen. A bill of material (BOM) and schematic are found as separate documents.

Tools needed

Assembly of the kits requires the usual set of electronics working tools; soldering iron, wire cutter etc. The boards are double sided, double weight copper so a high-power solder iron is recommended, especially for components connected to the ground plane. Solder irons without temperature control should not be used. A magnifying glass/loupe of the type that you wear like a pair of glasses or like a cap is recommended, as it increases the precision and quality of your work.

IMPORTANT

NOTE: components packaged in a shielded, aluminized bag should be considered ESD sensitive and should be handled with ESD care. The Tripath chips use MOSFEt outputs which by nature are sensitive to ESD (Electro Static Discharge). Use ESD precautions. Preferably work on a conductive, grounded “ESD mat”, and avoid touching the chip leads with your fingers. Discharge yourself before working with the components.

Additional components

The following will at some stage be needed to complete the amplifier, but is not included in the kit:

- Heat sink. Screws and heat conductive paste to mount the heat sink. The main sources of heat on the board is the Tripath chip. In most cases, if you mount the board and chip to an aluminum amplifier casing, it is sufficient to cool the chip. However, for high power applications the heat dissipated increases and you must ensure this has adequate cooling. The Tripath chip does not need to be electrically insulated, as the back of the chip is internally connected to ground.

- Hookup wire. Screw terminals are provided. You can also solder the connection wires to the board.

- Mute/un-mute switch or jumper. Preferably wire this to a switch on your panel. Optionally use a 2.54 mm jumper (50 mil) on the board. Muting the amp before power on minimizes the turn on thump and is recommended.

- Transformer / power supply / battery /, power switch and main fuse.

- The boards for AMP9-BASIC are double weight, double sided copper. Even if the PCB and components are small, quite a powerful soldering iron is helpful. Especially components and pads connected to the ground plane require significant heating. A temperature controlled 50W soldering iron is recommended. At the same time, applying excessive heat may damage the board, causing the copper leads to come off. Preheating the board to around 100ºC will make work easier and allows using a lower solder iron temperature which decreases the damage risk. Some information on how to solder both SMT and hole-mounted components is available in the forum on http://www.41hz.com

Considerations

1. You can use screw terminals or solder hookup wire to the PCB. Soldering is generally the best connection from an electrical / signal point of view but may be unpractical. Note that you should avoid soldering on/off the cables, especially the power and speaker cables. As these cables are usually quite thick, they will require substantial heating. So repeatedly soldering these may cause the copper tracks to come off, lift, because the FRP below them is beginning to deteriorate. It is then better to unsolder/cut the “other” end of the cable or use a board connector.

2. Power supply. For testing, any 12-24V supply should work and a slow fuse of 1A is adequate for low-medium power testing. For final use, the transformer / power supply would normally determine the fuse rating. The fuse should not be higher rated than recommended for thepower supply. Fuses on the primary side of a transformer may need to be quite large and slow blow type, to allow the transformer startup current.

3. Input clamping diodes. There are input clamping diodes that protect the chip from input signals that are too high. Purists exclude these diodes as there is a small reverse current leakage throug all diodes. The diodes can also fool the amplifiers DC nulling, which happnes at power-on. I suggest leaving the diodes out to start with, and use a low level test signal from a battery operated MP3-player or similar for first testing. Later you can add the diodes, if you will use the amp with a higher voltage signal source.

Schematic of AMP9-BASIC

The schematics used for AMP9 –BASIC is has similarities to the schematics in the Tripath data sheet for the TAA4100A chip, but not identical. A schematic for AMP9-BASIC and a BOM (Bill Of Materials) is available in a separate document.

Mounting the components

Work slowly. Do not rush! Think twice and double-check before soldering! Fixing a mistake is often very time consuming and can be very frustrating!

Suggested work order:

1. It is usually handy to mount the stand-offs in the corners with the screws..

2. Solder all the small capacitors on the bottom side of the board. There are a number of them near where the main Tripath chip will be, and there are two for each output filter and one for the 5V supply for the logc / digital section.

3. Continue with the sixteen overshoot clamping diodes. These are quite small and tightly spaced. Note: the diodes must be in the correct direction. Double-check that there are no solder bridges, as these carry high power and are near the Tripath chip.

4. Turn the board over and continue withthe top side of the board by mounting the 4 input capacitors, C1 to C4

5. Mount all small resistors.

6. Mount the connectors for power, outputs, inputs and signals. These are J1, J2, J3, J4 and J10.

7. Mount the output filter capacitors C11, C12, C21, C22, C31, C32, C41, C42

8. Mount the inductors L1-L4. Make sure all connections are well solderd. They will carry the full output currents.

9. Mount the output filter resistors R1 to R4. These are larger 2W resistors. Note that these are best mounted vertically.

10. Mount all electrolytic (round can) caps except the large C71 and C72. With all electrolytic capacitors the polarity must be respected. The positive pads on the PCB are usually rectangular and marked with a “+” on the PCB, while the negative are usually round. On the capacitors, the negative side is usually printed with a minus sign and the positive lead is usually longer than the negative.

11. Mount L5 which connects the signal ground plane with the power section ground plane.

12. Solder the socket for the IC in place. The socket makes replacement of the IC simple, in case of “misfortunes”.

13. Solder IC2 in place. It is a 5V regulator for the logic signals.

14. Now mount the Tripath chip in place. Avoid touching the leads. Make sure the chip is well aligned, making sure it is well aligned, horizontally and vertically, with the back side at right angle to the PCB

15. Solder the two large capacitors C71 and C72 in place.

16. Plug-in IC3 into the socket. Again, avoid touching the leads.

17. Last connect signal, loud speaker and power connectors, via a fuse of 250 to 500mA and you are ready for testing. For testing at low power no heat sink is required.

    1. I suggest using a battery powerd MP3 or CD player for first testing, as these have a moderate signal level and are entirely floating compared to the power supply

    2. Power on and check that the fuse does not blow.

    3. The chip does get a bit hotter than other Tripath chip, due to the 4 channels. The chip uses around 200mA at idle.

    4. Check the status signals and. Measure the signal offset on each speaker output. It should be less than 10mV (with no input signal).

    5. Play some music at low level and check that all seems OK. Enjoy!

        i. Playing louder, just below the level where the fuse blows, may cause a significant voltage drop in the fuse, making the amp clip / sounding terrible or even shutting down the amp. Playing loud may also make the fuse blow.

18. After testing.

    1. Low or medium power applications will not dissipate a lot of heat and the amplifier housing may be sufficient as a heat sink. The heat slug of the TAA4100A chip is connected to ground and does not require electrically insulated mounting. Silica heat transfer compound or similar should be used to improve cooling.

    2. The eight zener diodes near the input capacitors may be added later to protect inputs from very high signals. (D10, D11, D20, D21, D30, D31, D40, D41). If you do, again check that the offset DC on the outputs is acceptable. It should be below 10mV.

    3. Note the polarity of inputs, outputs and speakers. While reversing inputs or speaker polarity may work, the result will be speakers out of phase, sesulting in damped output, especially in the bass range.

    4. The positive power input is protected by diodes D1, D2 and D3. However if the capacitors on the PCB are charged, there may still be damage in case of connecting the power with reverse polarity

5. The protection diodes are low voltage drop schottky diodes rated 4A continous each. If you will use the amp at more than 12° continous (100W@12V or 200W@24V) continously, then you can bridge these diodes. However of course the polarity protection will be lost.

6. When mounting the amp in a case or similar, avoid touching any leads on the PCB.

If you have any questions, comments or feedback, please write in the forum on the web site http://www.41hz.com. You can of course also contact us at jan@41hz.com

APPENDIX 1 BOM (Bill of Materials)

Pin connections

J1

1	**AGND**	**Analogue ground (for input 1)**
2	**In1**	**Signal input 1**
3	**AGND**	**Analogue ground (for input 2)**
4	**In2**	**Signal input 2**
5	**AGND**	**Analogue ground (for input 3)**
6	**In3**	**Signal input 3**
7	**AGND**	**Analogue ground (for input 4)**
8	**In4**	**Signal input 4**

J2

1	**VPP**	**Positive rail (for unmuting)**
2	**In1**	**To 5V regulator (for unmuting)**
3	**AGND**	**Analogue ground**
4	**In2**	**Mute input**
5	**AGND**	**Analogue ground**
6	**In3**	**AM mode (see TAA4100A chip data sheet)**
7	**AGND**	**Analogue ground (for input 4)**
8	**In4**	**Signal input 4**
9	**“AM mode” (AGND)**	**Setting AMP into A/B class mode (normally not used)**
10	**SLEEP**	**Input. 0v=>sleep +5V=>awake**
11	**HMUTE LED**	**Output. On when amp is on**
12	**MUTE**	**Input. 0v=>muted +5V=>un-muted**
13	**+5V**	**+5v for mute & sleep**
14	**OVRLDB_LED**	**Output. Normally on. Off when input is overloaded.**
15	**FAULT_LED (not used)**	**Output. Not used**
16	**AGND**	

J3

1	**AGND**	**Analogue ground (From ”5V” LED)**
2	**Awake /5V LED**	**(=”5V” is ON)**
3	**AGND**	**Analogue ground (From OVRLD LED)**
4	**OVRLD LED**	**(LED (blinking) OFF = Input signal too high)**
5	**AGND**	**Analogue ground**
6	**MUTE LED**	**(LED OFF = Amp Muted**

J4

1	**Chan 4 speaker positive**
2	**Chan 4 speaker negative**
3	**Chan 3 speaker negative**
4	**Chan 3 speaker positive**
5	**Chan 2 speaker positive**
6	**Chan 2 speaker negative**
7	**Chan 1 speaker negative**
8	**Chan 1 speaker positive**

Note:
Speaker negative are NOT ground. Speaker outputs must be wired independent of ground.

J10

1	**Power Negative / Ground**
2	**Power Positive**