

CFA HPA V2 Construction Notes R1

1) PCB circuit adds:

After the article went to press, I found several improvements to the sound quality by adding some extra capacitance in a few existing places. I added four 220 uF electrolytics, one across the top side at each of the TPA6120 power supply MLCC caps C8, 9, 10 and 11. This improved the bass response and added some surprising fullness and smoothness to the overall sound. When adding these caps to the V2.0 board, be sure to check the power supply polarity at each cap location and orient the electrolytics properly, plus side of the cap to plus 15V, minus side of the cap to minus 15V, or you risk a potentially dangerous cap failure. I also added some 1 uF MKP polypropylene film caps across the C1 and C21 bipolar electrolytic coupling caps. Without them, the circuit response measures flat out to 30KHz. Adding the film caps extended that out to about 60KHz.

If you do your own board layout from the schematic, you can add these parts to the PCB rather than tacking them on per above. A note of caution. I did one prototype without the top ground plane and ended up with the TPA6120 in oscillation. If you don't have a scope, check the TPA6120 chip temp. If oscillating, it will be hot to the touch. As always, check for DC on the inputs and outputs when completing a board and before connecting to your other system components.

2) Selecting JFET source resistors:

I did listening evaluations of the circuit using -GR grade JFETS with various resistor values in positions R4/R24. Positions R3/R23 stayed at 0 ohms (jumped) throughout the tests. To facilitate swapping out values, I found it convenient to add a little solder to the PCB's top pads and just tack the resistors to the top of the board without inserting the resistor leads into the thru-holes.

I originally listened to R4/R24 at 0 ohms and also at 33 ohms. Of those two values, I found I preferred 0 ohms (no degeneration). Then I tried some intermediate values between 10 and 33 ohms and settled on 27 ohms at the time of publication. Eventually, I tried 5.9 ohms and found yet another interesting sonic character that worked well for me for both headphones and as a preamplifier. I seem to prefer source resistances that keep the current in the 3 to 4 mA range. R4/R24 at 5.9 ohms gave me about 3.75 mA and at 27 ohms I measured around 3 mA. For reference, I_{dss} for the -GR parts is specified by Toshiba as 6.5 mA or less. My parts tended to measure I_{dss} values of around 5.2 to 5.4 mA. The differences are subtle, but I suggest you purchase a few different values in the 0 to 30 ohm range and decide for yourself what you like best for your particular application. If you experiment with the -BL grade parts, be sure to observe the 150 mW SMD package power dissipation limit of the device, about 10 mA at 15V.

3) Power supply:

I have not provided a PCB layout for the power supply shown in the article. The design is reasonably quiet but there are other designs floating around the DIY community, such as the DIY audio store Super Regulator, that could possibly outperform it. I do not recommend exceeding the maximum +/-15V supply recommended by TI for the TPA6120. If you do your own power supply layout, especially one with primary mains voltage level traces on the PCB, you need to take full responsibility for design, construction and proper safety grounding that provides for and maintains user safety.

4) Chassis:

A metal chassis is recommended for shielding and it is important that all the metal pieces are adequately bonded for continuity. I used an Alps RK27 50K audio taper pot as an input attenuator. I find it provides good performance for the cost and 50K seems to sound good and work well with all of my source components. Values from 10K to 100K should also work fine and you may prefer some value other than 50K or a different type of attenuator in your system.