Power Supplies

In the article, we have not talked about power supplies. Amplifier performance can be affected by the power supplies to which it is connected.

The amplifiers presented in the article do not have a great Power Supply Rejection Ratio (PSRR) as some op-amps do. So the quality of the power supply is a significant concern with regard to amplifier performance.

Our goal for a power supply is to convert the AC line voltage to a DC voltage emulating an ideal battery; that is a DC voltage with virtually no ripple and no noise. Also, we want the power supply to be such that each amplifier is isolated from all the other amplifiers in the system.

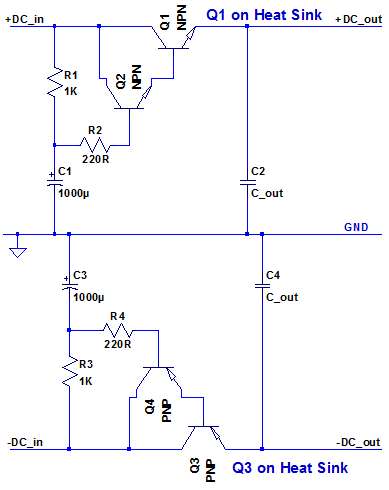
There is not room here for a treatise on power supplies for audio, but a few recommendations are in order.

1. Be mindful of the noise in the power supply output voltage.
2. If the output impedance of the power supply is significant, add a capacitance multiplier stage at its output to isolate the individual amplifiers from each other.
3. Add heat sinks for the power transistors, if required.
4. Use good quality capacitors to decouple the power supply at the PCB, and at points where the current draw can change with the input signal.

A capacitance multiplier can be effective for reducing power supply noise and preventing channel to channel crosstalk through the power supply. A capacitance multiplier can be made with BJTs or MOSFETs.

Capacitance multipliers provide isolation when each circuit section has its own capacitance multiplier.

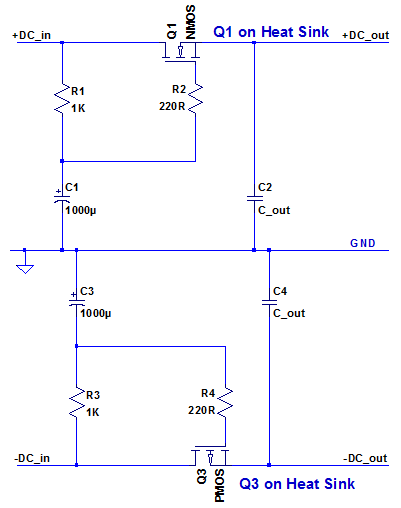
Below is a BJT capacitance multiplier.



A BJT-based capacitance multiplier has a voltage drop of about 1.5V. Q1 and Q3 are devices that handle the full supply current of the amplifier, and may need to be attached to heatsinks (depending on the current draw). Q2 and Q4 are small signal transistors, included to insure there is sufficient current gain.

R1 and C1 filter the input DC signal. The filtered signal is applied to the base of Q2 and then to the base of Q1 via Q2. R2 is present to insure that the emitter followers do not oscillate. R2 should be located close to Q2.

And here is an MOS capacitance multiplier.



In the MOSFET version, we do not need Q2 and Q4 as the impedance at the MOSFET gate is very high. R2 and R4 should be located close to the gates of Q1 and Q3 to prevent oscillations. The voltage drop in the MOSFET capacitance multiplier can be in the range of 3V to 5V.

There are experts who advise that the output capacitors should not be electrolytic capacitors, but should be only high quality film capacitors. If you do this, the decoupling capacitors in the amplifier following the capacitance multiplier should be equally high quality film capacitors.