Power Options for a Portable Speaker System

The project being worked on by this group is for a “backpack” portable speaker system with amplifier and microcontroller for Bluetooth connectivity and audio controls. This paper will focus specifically on the power supply options needed for the speaker. Some things to consider are that this speaker will need to be able to run on wall power supply as well as battery. Therefore, it needs to be as efficient as possible with energy consumption, however it still needs to have a loud enough sound output. Options discussed in this paper will be using a toroid transformer and a switching power supply.

The first option is a toroidal transformer which will help increase the charge density of the signal. The output voltage of a standard audio amplifier is not large enough for optimum speaker performance. This is where a transformer is able to assist. The basics of a transformer is that it is made up of conductive coils that are wound around a common magnetic core. When an alternating current is applied to the input coil, it creates a magnetic flux, allowing current to flow through the core and induces a voltage on the other coils containing the same signal pattern to that of the input. If the outer coil has more “turns” than the input coil, then the output voltage will be higher. This is commonly used for boosting the signal of a speaker. However, it is very possible to experience lossy sounds and distortion using a standard transformer. Luckily, the toroid core transformer seems to stand out from the rest in terms of its architecture and quality.

The toroidal transformer is just one strip of magnetic material rolled up into a coil. Unlike other transformers, there are no air gaps in the toroidal one since it is continuous. A coil is formed by the primary and secondary wires being wrapped through the center hole of the core, all the way around the core, and back through the center hole again. This provides the least losses, especially when compared to other types using separate pieces. It also seems to be fairly affordable (i.e. in the range of 15 to 30 U.S. dollars for the purposes of the project). This type of transformer seem to make no compromises when it comes to sound quality.

Switching power supply is another consideration for this speaker system. The main function of switching is for converting unregulated current (DC) to a regulated output. All types are possible (i.e. AC-DC,AC-AC,DC-AC, and DC-DC). The power transistor inside acts as a switch, hence the name, and turns on or off. Using this power supply, a transformer is not necessary. Switching supply has the advantage of producing a higher output voltage than the input if needed. Linear supply output must always be lower than the input. Switching mode power supply is considerably lighter than a linear power supply. This is perfect for this project since the speaker system needs to be portable. A downside of this type of power supply is that it can generate high frequency noise which can interfere with other sensitive components. However, the components used for the speaker system will likely not be bothered by this, and the portability of the switching supply will be too good to ever consider the linear supply. The price of this component is similar to the toroid transformer mentioned earlier, so cost is not really an issue. One con of using a switching regulator is that a more complex circuit is needed, however this should not be a problem as this is a long project.

In conclusion, both of the mentioned power supplies seems to stand out very well compared to similar technology. It is likely that experiments will have to be tested to see which one is better in the case of this project. Both can be purchased relatively cheaply and tested to make sure which one fits the best for this project. The main things to consider will be battery charging, audio quality of course, and making sure the circuitry is easilty portable.

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