Symmetrical Power Supply for Audio Amplifiers

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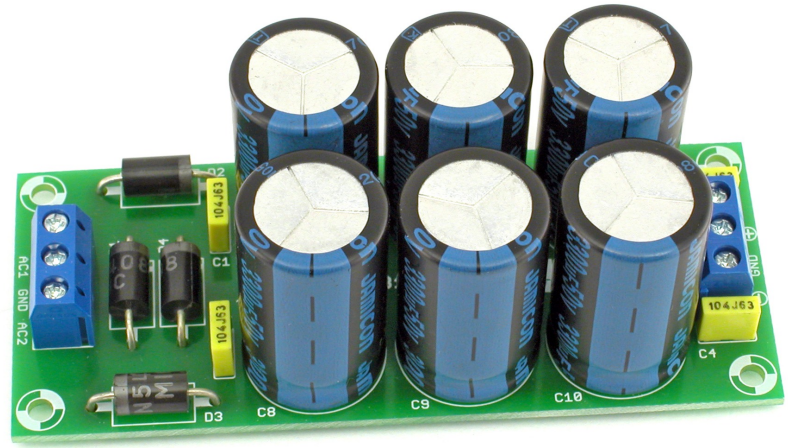
AVT 3233



ZOOM

ASSEMBLY DIFFICULTY

Amplifiers over a dozen watts require a power supply that provides two voltages (i.e., symmetrical voltage). This circuit is a simple power supply, allowing it to work with audio amplifiers up to 100 W. The unit can complement a self-built audio system. It allows to make a non-stabilised power supply with a maximum output current of up to 6 A.

Features

- designed to power audio amplifiers up to 100 W
- symmetrical voltage supply
- integrated filter capacitors
- integrated rectifier bridge
- connection - screw terminals
- maximum transformer voltage 2×34 VAC
- board size 40×96 mm

Circuit description

Schematic diagram of the device is shown in Figure 1. This power supply is a simple two-voltage rectifier. Two alternating, symmetrical secondary voltages of the transformer with opposite phases obtained from the two windings connected in series are applied to the connectors AC1, AC2 and GND of the power supply, and then go to Graetz bridge made up of rectifier diodes D1-D4, where they are two half rectified and smoothed by electrolytic capacitors C5-C7 for the positive supply line and C8-C10 for the negative line. This results in a positive voltage at the output of the power supply and a negative voltage relative to the GND of the circuit. The 1N540x diodes are provided in the unit. Each diode can rectify a current of up to 3A, and as there are two diodes working in pairs in the bridge, the maximum output current of the power supply is 6A. It is worth knowing that the specified value of 3A refers to the rectified current, while the maximum current pulse of 10 ms duration (one half-period of the network) for the 1N5408 diodes can have as much as 200 A. The amplifier, with a continuous (sinusoidal) output power of 1×200 W operating with an 8 Ω load, draws just over 5 A of current at full drive. However, an amplifier with an actual output power of 50W draws just over 2.5 A, hence a 2×50 W stereo amplifier will draw over 5 A at its peaks. With a 4 Ω load, a single 100 W amplifier draws more than 5 A. While a 2×50 W amplifier with a 4 Ω load will draw at its peaks more than 7 A of current. This is a current in excess of the maximum output current of the power supply, however, there is an advantage in a power amplifier circuit because in practice the amplifier never runs continuously at full, unchanging power. Audio signals

are of a variable, impulsive nature and full power is only used for a relatively short time. Electrolytic capacitors must be used in the module, the nominal voltage of which should be higher than the amplitude of the transformer's unloaded voltage (idle AC voltage multiplied by 1.41). It must be noted that there are no strict requirements or specific formula for the minimum filter capacity of a power supply. Of course, at rest, when current consumption is low, the ripples are negligible, but they only become apparent under heavy load. This means that a slight grid hum may occur, but only during strong driving - such a small hum will be effectively drowned out by the large usable signal. Of course, it is nevertheless a good idea to use as large a filter capacity as possible. Typically, the power supply will work with a typical toroidal transformer with two separate windings. The layout of the connections, indicating the phase of the windings, is shown in Figure 2.

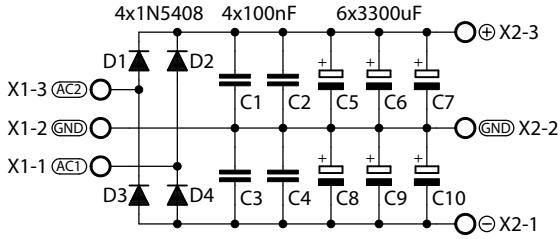


Fig. 1 Schematic diagram

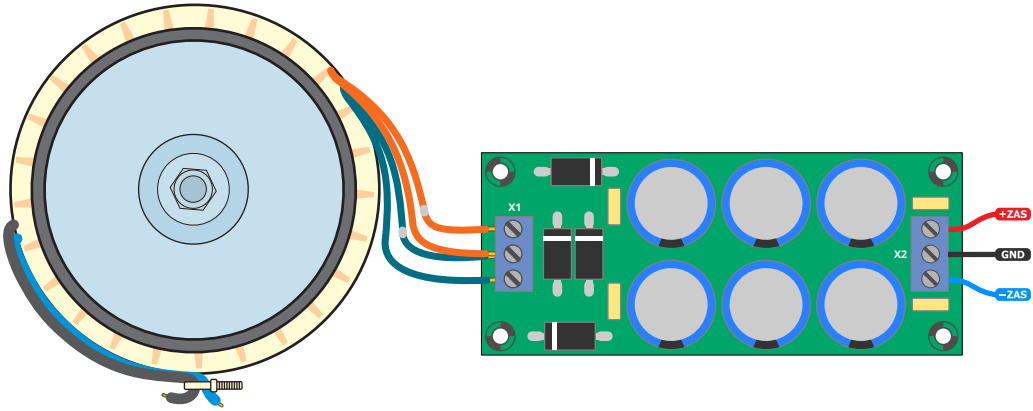


Fig. 2 Connection arrangement

Mounting and start-up

Mounting of the components on the single-sided 40×96 mm PCB in Figure 3 is a classic one, which should start with soldering on the diodes and other small components and end with the electrolytic capacitor.
Cover photograph and photograph 1 will facilitate mounting. The tracks on the board are without soldermask and therefore covered with a layer of tin. If the current drawn from the power supply will be greater than 2.5 A, the paths should be further thickened by applying an additional layer of tin or by soldering e.g., 1mm^2 silver. This treatment will reduce the resistance of the paths and increase the current carrying capacity. A circuit flawlessly assembled from working components will work correctly straight away. Even though one power supply can handle both channels of a stereo amplifier, for various reasons it is worth using two separate transformers and two described power supplies, one for each amplifier. To avoid ground problems, connect the grounds not at the power supplies, but at the inputs of the power amplifiers, where no large currents flow.

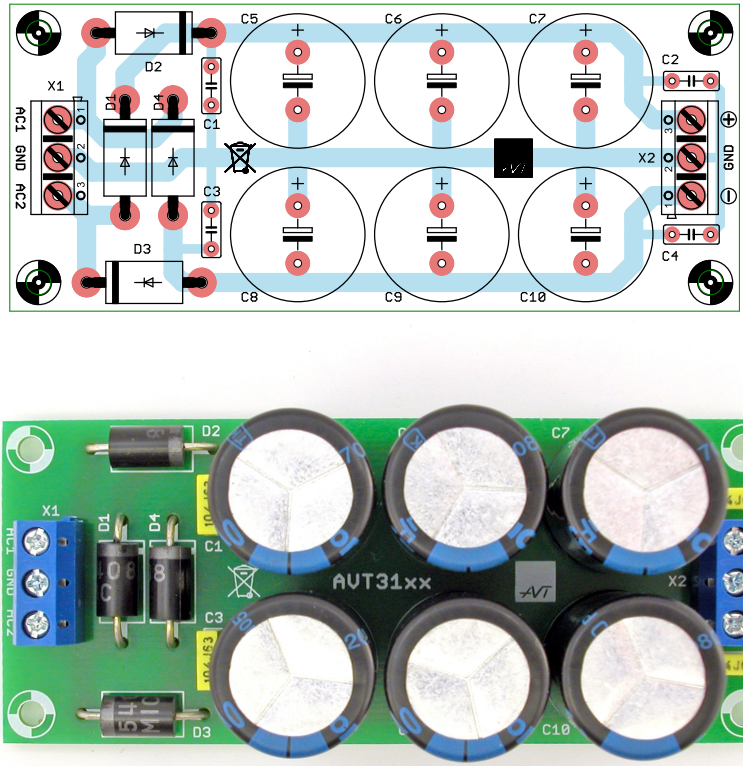


Fig. 3 Mounting diagram

Note!
Electrolytic capacitors connected to a voltage higher than their nominal voltage and switched on in reverse can explode, posing a serious health risk!
Voltages hazardous to health and life are present in the power supply, which can persist long after the power supply has been disconnected. Before connecting your amplifier to the power supply, make sure that capacitors C5...C10 are discharged.

List of components

Capacitors:
C1-C4:.....100 nF / 63 V
C5-C10:.....3300 µF / 50 V
Semiconductors:
D1-D4:.....1N5408
Other:
X1, X2: .....screw connector, 3 poles

Notes

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