Loudspeaker Connection Delayer

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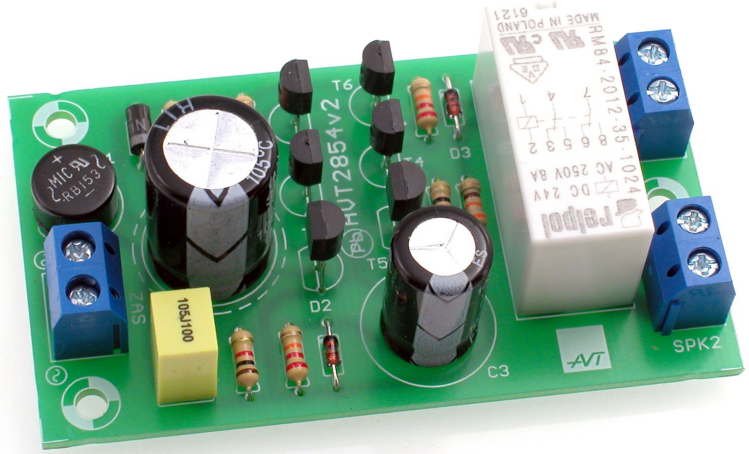
AVT 2854



ASSEMBLY DIFFICULTY

A simple, useful circuit for audio power amplifiers. Prevents knocks in the speakers. It realizes dual function: connects speakers to the amplifier output with a delay of a few seconds, but disconnects them immediately upon switching off supply voltage.

Characteristics

- switch-on delay approx. 2 s
- switch-off delay of less than 0.5 s
- executive element - relay
- two pairs of contacts 2×8 A
- can be used with amplifiers up to 500W/channel
- circuit connected only to power supply and loudspeaker circuits
- power supply: 20-30 VAC

Circuit description

Schematic diagram of the device is shown in Figure 1. The circuit uses an AC voltage directly from the mains transformer used in the power amplifier. Voltage from secondary winding is pre-straightened with an M1 bridge. Filter capacitor C2 has a very small capacitance and is loaded with a resistor divider R1, R6. Because of this, there are significant ripples on C2 and what important, the voltage drops quickly when disconnected from mains voltage. This fact is used to rapid disconnection of speakers. However, the main filter capacitor and energy storage is "electrolyte" C1, connected via diode D1. Voltage on it contains only slight ripples. After the mains voltage is switched on, it quickly charges capacitor C1 and C2. Transistor T1 is opened and shorts the base of transistor T2 to ground. This allows charging the capacitor C3. C3 is charged by R3. The resistance of R7 has no effect on charging, because the two connectors connected in parallel base - emitter T4 and T5 hold on voltage R7 during charging of about 1.2V. Transistors T4 and T5 are open during charging of C3. Open transistor T5 short-circuits the T3 base to ground. T5 collector voltage is practically equal to the ground potential. Growing voltage on capacitor C3 and base T6 causes also increase of the voltage at the emitter of T6, and the voltage occurring at the T6 emitter is divided: the major part occurs on the relay coil, the smaller on the resistor R5. A few seconds after switching on power supply, the voltage on the relay will increase enough to short contacts and connect the speakers to the amplifier output. The voltage on C3 continues to rise, and what important, as charging decreases the

current flowing through the R3. The current flowing in the base circuit of T4 and T5 also decreases. When capacitor C3 is almost completely charged, the charging current is already so low that the current in T4 base decreases to zero, resulting in plugging of T4 and T5. Previously, transistor T5 shorted the base of T3 to ground, and a current flows through the coil of the relay with a value of close to its nominal current. After plugging T5 a current-saving circuit is activated. This takes advantage of the fact that in a relay the hold current is several times less than the rated current. Therefore, after the relay has operated you can confidently lower the current and voltage on the relay. This is realised by the T3 and R8, which, together with the T6 form a typical current source system. A voltage drop on R8 causes a partial opening of the T3, and the same, such a reduction in voltage on C3 and on the relay to maintain a voltage on R8 of approx. 0.7V. The value of R8 is chosen so that when T5 is plugged the relay current will be limited to approximately 10 mA. This is advantageous because of less heating relay and R5. Importantly, resistors R3, R7 are so selected that first reliably switched on is PK1 relay and only then T4, T5 will plug and the relay current is limited. The circuit is designed for amplifiers of any power rating. Typically, higher power amplifiers are powered by symmetrical voltage and the transformers used in them have two identical windings. Type of the transformer used is irrelevant.

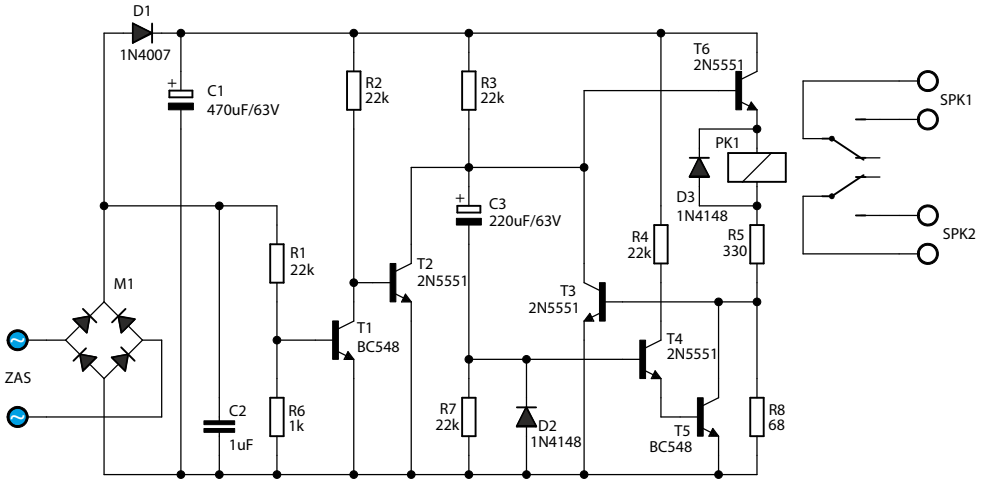


Fig. 1 Schematic diagram

Mounting and start-up

Mount the circuit on a board shown in Figure 2. The mounting is classic.
First, solder the smallest components, then the bigger ones. The circuit, assembled from efficient components, will not require any start up procedure or calibration and, when connected to a transformer with a voltage of 20...30 VAC, should work properly straight away - see Figure 3.

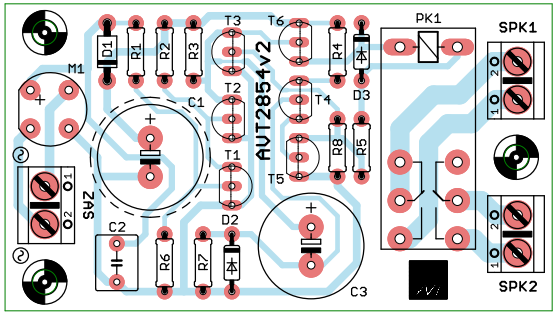


Fig. 2 Arrangement of components on the PCB.

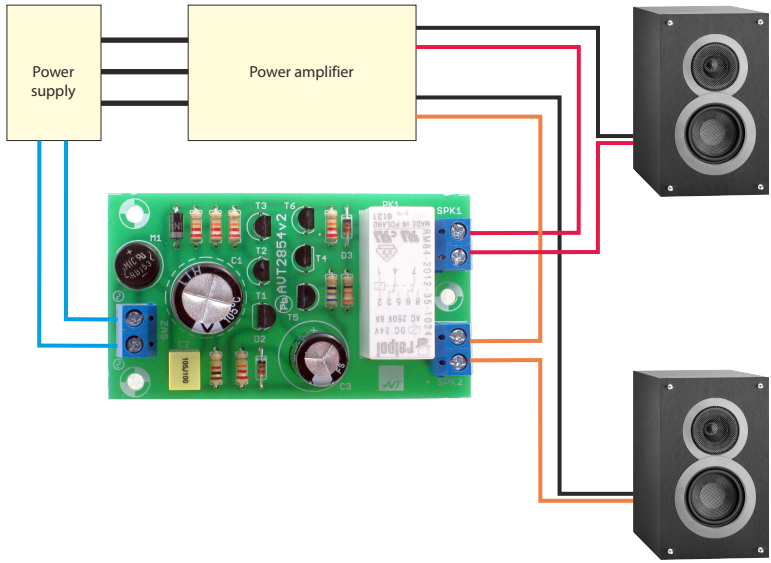
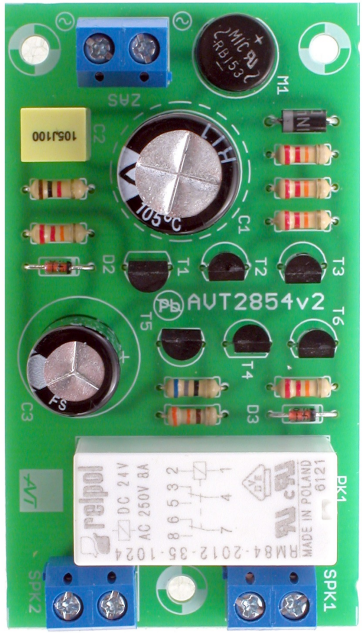


Fig. 3.

List of components

Resistors:
R1-R4, R7: ..... 22 kΩ
R5: ..... 330 Ω
R6: ..... 1 kΩ
R8: ..... 68 Ω
Capacitors:
C1: ..... 470 µF / 63 V
C2: ..... 1 µF / 63 V solid
C3: ..... 220 µF / 63 V
Semiconductors:
D1: 1N4007
D2, D3: 1N4148
T1, T5: ..... BC548 or similar
T2-T4, T6: 2N5551
M1: ..... Rectifier bridge
Other:
PK1: ..... RM84P24 or similar
ZAS, SPK1, SPK2: DG301-5.0/2



Notes

AVT SPV Sp. z o.o.

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