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thyristor switched regulator

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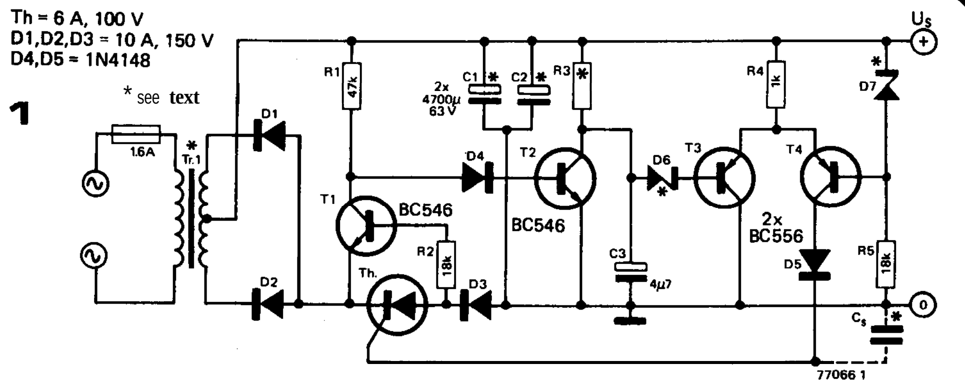
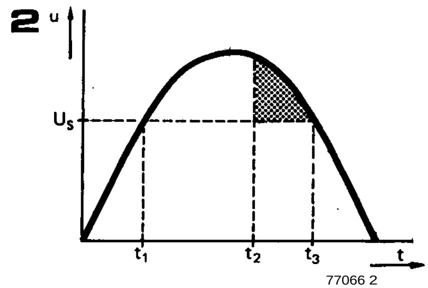


Conventional stabilised power supplies which use a series regulator transistor suffer from one serious disadvantage: a large amount of power is dissipated in the series transistor, especially when the output current is large and the difference between the input and output voltages is high. A solution to this problem is to use a thyristor switched power supply. As thyristors are either turned off (passing no current) or turned on (passing current at a low forward voltage drop) they dissipate relatively little power.

The circuit functions as follows: Dl and D2 full-wave rectify the AC supply from the secondary of the transformer. Assuming that reservoir capacitors Cl and C2 are charged to a certain voltage, then at the beginning of each half cycle of the AC waveform Tl will be turned off, since its emitter voltage will be higher than its base voltage. T2 will be turned on, shorting out C3, so T3 will be turned on and T4 turned off. When the rectified voltage exceeds the voltage on Cl and C2 by about 1.5 V Tl will turn on, turning off T2 and allowing C3 to charge through R3 until T3 turns off and T4 turns on, triggering the thyristor. Cl and C2 will now charge until the rectified voltage falls below the voltage on Cl and C2, when the thyristor will turn off and the cycle will repeat.

The time for which the thyristor is switched on is represented by t2-t3 in figure 2.

If the voltage across Cl and C2 (i.e. the output voltage) should tend to rise then the base voltage of T4 will rise by the same amount, pulled up via D7. It will thus take longer for C3 to charge to the point where the thyristor is triggered, i.e. the thyristor



will trigger later in the cycle and Cl and C2 will receive less charge.

Should the voltage on Cl and C2 tend to fall then the base voltage of T4 will also fall and it will take less time for C3 to charge to the point where the thyristor triggers. The thyristor will thus trigger earlier in the cycle and Cl and C2 will receive more charge.

This circuit is particularly useful as a power supply for audio amplifiers where the power requirements are fairly large and conventional regulators with large heatsinks would take up too much space. Component values are given in the table for use with the 45 and 60 V versions of the Equin amplifier **described** in Elektor 12 and 13, April/May **1976.**

The ‘circuit can easily be adapted to suit other supply **voltages** by changing the values of R3, D6, D7 and the transformer voltage. The combined capacitance of Cl and C2 should be at least 10,000 μF.

Us	45 v	60 V	other
R3	22 k	33 k	approx. **½Us** k
D6	18V	27 V	approx. **½Us** V
D7	27 V	33 v	Us – **UD6 V**