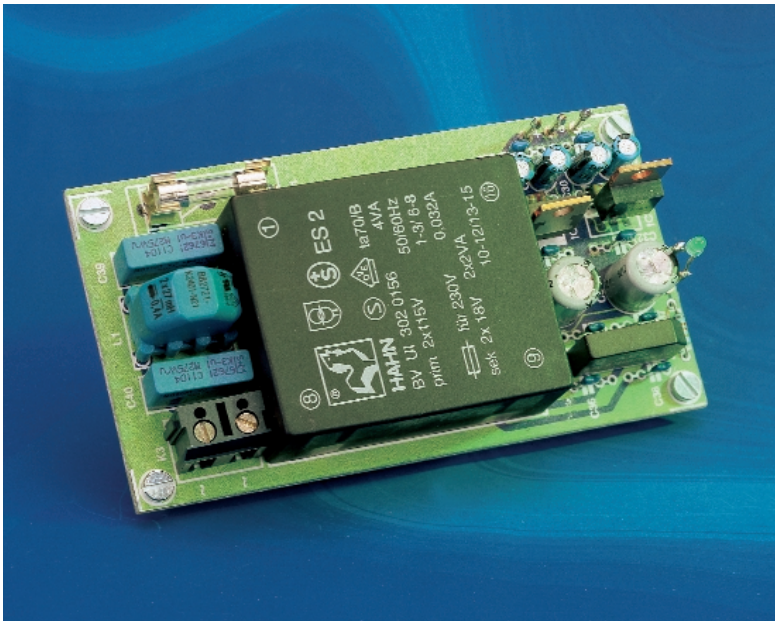
054 Universal Symmetric Power Supply

T. Giesberts



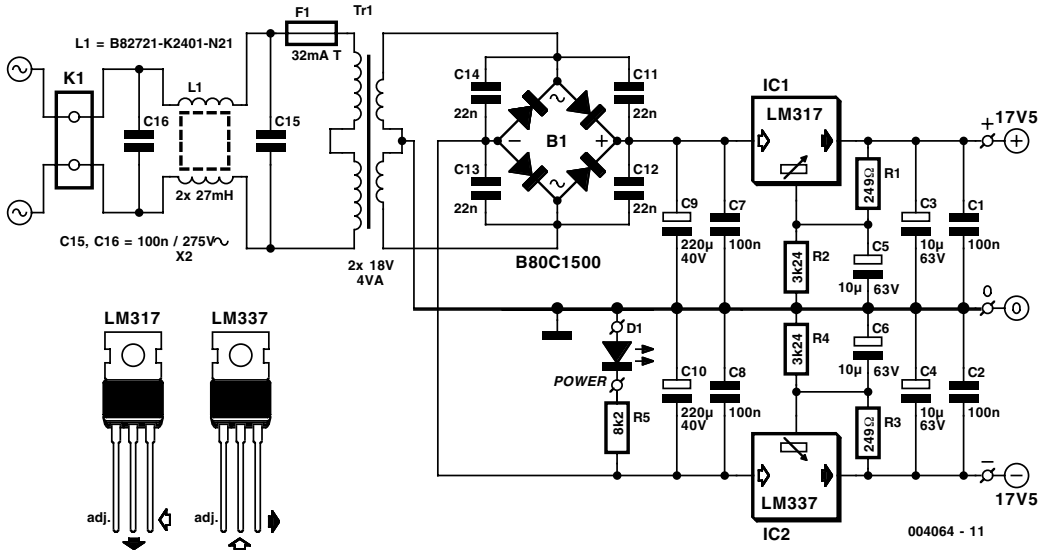
This power supply has been specially designed for the 20th-order filter described elsewhere in this issue, but it can also be used for a legion of other opamp circuits. The supply voltage is set to ±17.5 V, in light of the maximum output level of the filter. This benefits the signal to noise ratio. The specified absolute maximum supply voltage for most opamps is ±18 V, and we have intentionally kept a bit below this limit.

The transformer is one of a series made by Hahn (model UI 30), so the circuit can be easily adapted for higher power levels by using a different transformer. All transformers in this series have the same footprint (53 × 44 mm), with only the height changing according to the power capacity. The series consists of 3, 4, 6, 10 and 16-VA models, which are respectively 16.3, 18.3, 21.8, 27.7 and 37.6 mm high. There are two secondary windings, with standard voltages of 2 × 6, 2 × 9, 2 × 12, 2 × 15 and 2 × 18 V. We chose a 4 VA transformer with 2 × 18 V secondaries for this application. Certain models are also available from other manufactures, but the locations of the secondary connections are different. The circuit board layout can accommodate two different types.

The circuit is based on the well-known LM317 and LM337 voltage regulators. Since the output voltages are set by voltage dividers, any voltage between 1.25 V and 40 V is possible. In case you don't already know, the formula for the positive output voltage (LM317) is

$$V_{out} = 1.25 \cdot (1 + R2/R1) + I_{adj} \cdot R2$$

The same formula applies to the negative regulator, using R3



COMPONENTS LIST

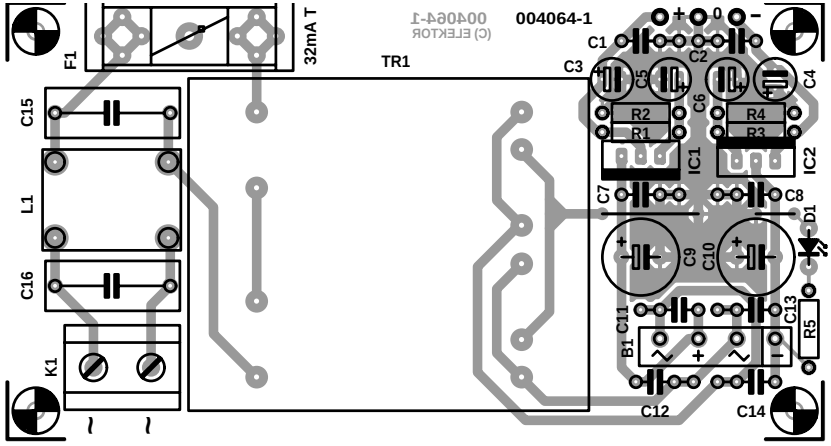
Resistors:
R1,R3 = 249Ω 1%
R2,R4 = 3kΩ24 1%
R5 = 8kΩ2

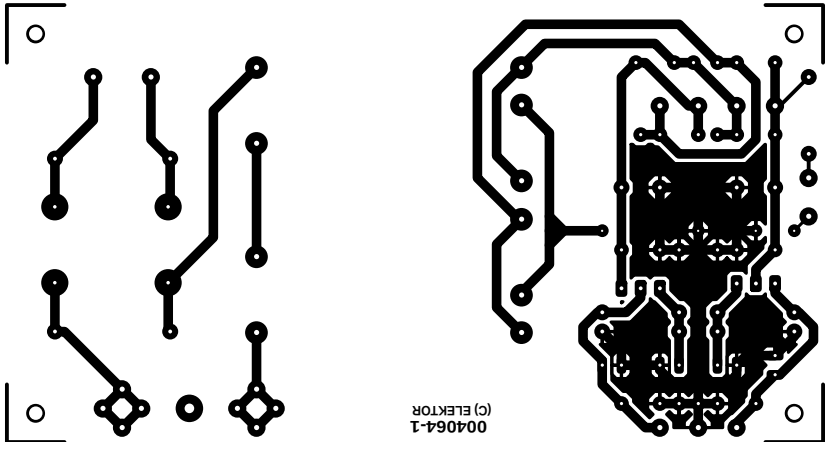
Capacitors:
C1,C2,C7,C8 = 100nF ceramic
C3...C6 = 10µF 63V radial
C9,C10 = 220µF 40V radial
C11-C14 = 22nF ceramic
C15,C16 = 100nF 275V_{AC} class X2

Inductors:
L1 = 2x27 mH (e.g., Siemens type B82721-K2401-N21) (Electrovalue)

Semiconductors:
D1 = high-efficiency LED
IC1 = LM317T (TO220 case)
IC2 = LM337T (TO220 case)

Miscellaneous:
K1 = 2-way PCB terminal block, raster 7.5mm
B1 = B80C1500, rectangular case (80V piv, 1.5A peak)
F1 = fuse, 32mA slow, with PCB mount holder and cap
Tr1 = mains transformer, PCB mount, secondary 2x18 V/4VA (e.g., Hahn type BV UI 302 0156)
PCB, order code **004064-1**





and R4 instead. Capacitors C5 and C6 increase the ripple suppression to 80 dB. Depending on the application and the output power, it may be necessary to use heat sinks for the regulator ICs.

The power supply has a simple mains filter to suppress common-mode interference. This is primarily needed if the supply is used to power sensitive circuits. The coil is a Siemens type that has been used in many other *Elektor Electronics* projects. D1 acts as a mains voltage indicator. The indicated value of the fuse, both in the diagram and on the circuit board, is 32 mA (slow). This value will have to be modified for higher power levels (as will the label on the circuit board!). With lower output voltages and larger output currents, the filter capacitors C9 and C10 must be made larger. The working voltage can then be reduced, so the physical dimensions will probably remain the same.

The PCB shown here is available ready-made through the Publishers' Readers Services.

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