Figure 4. The laptop PSU adaptor circuit diagram.

the output (Pin1) and non inverting input of the difference amplifier. The IC clock frequency is defined by the RC network formed by R8 and C13. The component values shown give an operating frequency of around 42 kHz. C14 provides decoupling of the internal reference voltage at pin 8. The supply decoupling network formed by R12, C15 and C16 on the supply pin 7 is important for reliable operation of IC1. The current sense input (pin 3) is not used in this application.

The power FET has a gate capacitance of around 5,000 pF which must be charged and discharged 42,000 times per second if the FET is to be switched successfully. It is important that the transition between on and off occurs as quickly as possible so that there is minimum dissipation in the FET. It is therefore necessary to use a low impedance driver (T2 and T3) between the PWM output of IC1 and the gate pin of the FET. The BD139 and BD140 complimentary pair can handle around 1.5 A limited by resistors R9 and R10. R11 will turn off T1 if for any reason both T2 and T3 become non-conducting or IC1 is defective.

Printed circuit board

The complete circuit fits on the single-sided PCB (**Figure 6**) without the need for any wire links. Before any of the

components are fitted it is best to construct the coil. The PCB layout also includes pads for an off-the-shelf 56µH inductor but it must be able to handle the high switching currents. The prototype circuit used a coil with an ETD 29 core and was constructed as follows:

The coil has a total of urns but to make things a bit more interesting the wire consists of 10 strands of 0.5 mm diameter enamelled copper wire (ECW) connected in parallel. The effective cross sectional area of all the

strands is 1.96 mm^2. This method of construction produces a coil with much better properties at this switching speed than would be achieved with a single wire with a cross sectional area of 1.96 mm^2 (the skin effect has less influence).

The strands are first carefully twisted together before they are soldered to the coil termination posts, if the twisting is too tight the there will not be enough space to fit all the 21 turns. Each strand is 2 m long so overall 20 m of 0.5 mm enamel covered wire will be
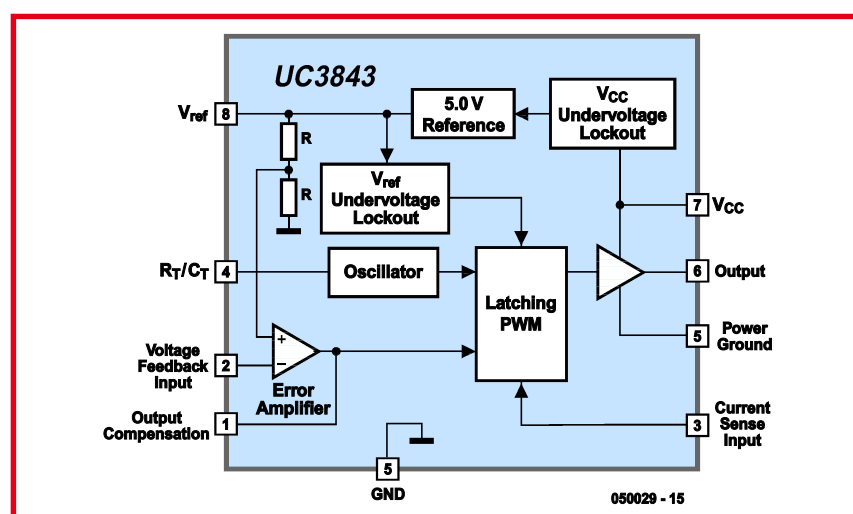
Figure 5. Block diagram of the PWM IC UC3843.