025 Max. Temp. Detector for Fan controller

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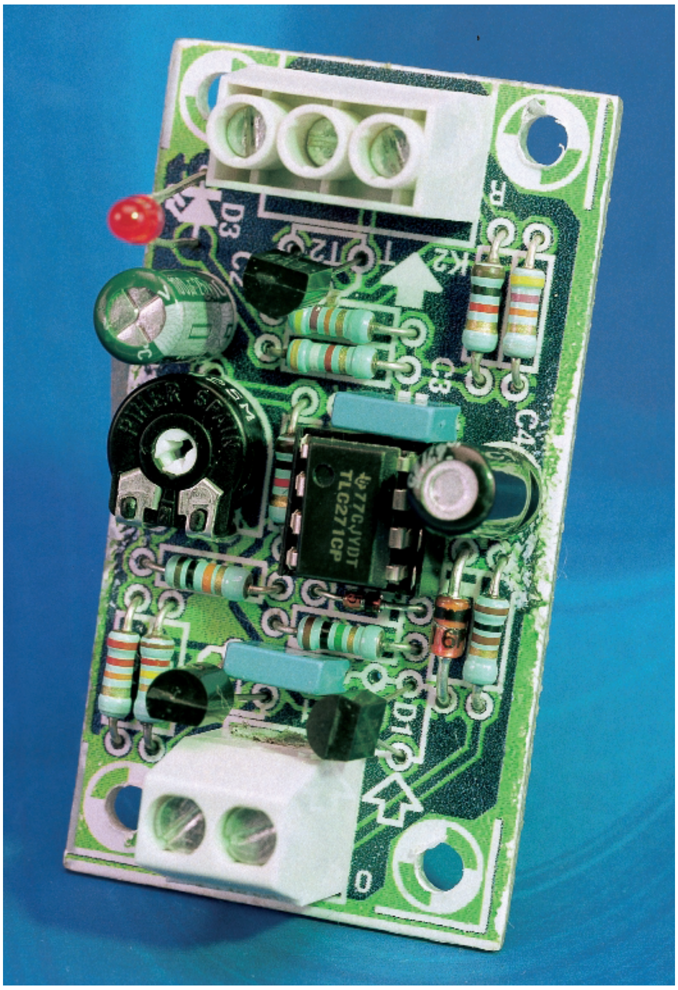

The fan controller circuit for the Titan 2000 and other AF heavy-duty power amplifiers, published in the May 1999 issue, has an output that sets a voltage if the fan controller reaches the end of its range. Since the controller responds to temperature, this signal is seen by the amplifier protection circuitry as an overtemperature indication. The disadvantage of this output is that the maximum voltage for the fans is not constant, but depends on the load (number of fans, defective fans) and the mains voltage. This variation is caused by the fact that the supply voltage for the output stage is taken directly from the filtered transformer voltage. If the fans should fail, for example, the maximum temperature limit would lie at a considerably higher level than the desired value. The accompanying circuit, which compares the magnitude of the fan voltage to a fixed reference value, has been developed to allow the maximum temperature to be reliably detected. This circuit is tailored for 12-V fans.

The reference voltage is generated by the 'micropower voltage reference' D1 and the FET T1, which is wired as a current source. These components are powered directly from the applied fan voltage. The current source is set up to deliver approximately 50 μA. D1 can work with as little as 10 μA.

The supply voltage for the IC is decoupled by R10, C3 and C4, with D4 providing overvoltage protection. A maximum supply voltage of 16 V is specified for the TLC271. This opamp works with a supply voltage as low as 3 V and can handle a common-mode voltage up to approximately 1.5 V less than the positive supply voltage. Accordingly, 1.2 V has been chosen for the reference voltage. The fan voltage is reduced to the level of the reference voltage by the voltage divider R2–R3–P1. The limits now lie at 11.2 V and 16.7 V. If you find these values too high, you can reduce R2 to 100 kΩ, which will shift the limits to 9.5 V and 14.2 V.

The output of the voltage divider is well decoupled by C2. A relatively large time constant was selected here to prevent the circuit from reacting too quickly, and to hold the output active for a bit longer after the comparator switches states. A small amount of hysteresis (around 1 mV) is added by R4 and R5, to prevent instability when the comparator switches. D2 ensures that the magnitude of the hysteresis is independent of the supply voltage.

Two outputs have been provided to make the circuit more versatile. Output 'R' is intended to directly drive the LED of an optocoupler. In addition, transistor T2 is switched on by the output of the opamp via R7 and R8, so that a relay can be actuated or a protection circuit triggered using the 'T' output. The high-efficiency LED D3 indicates that IC1 has switched. It can be used as a new 'maximum' temperature' indicator when this circuit is added to the fan controller of the May 1999 issue.

The circuit draws only 0.25 mA when the LED is out, and the measured no-load current consumption (with a 12.5-V supply voltage) is 2.7 mA when the LED is on.

The PCB shown here is unfortunately not available ready-made through the Publishers' Readers Services.

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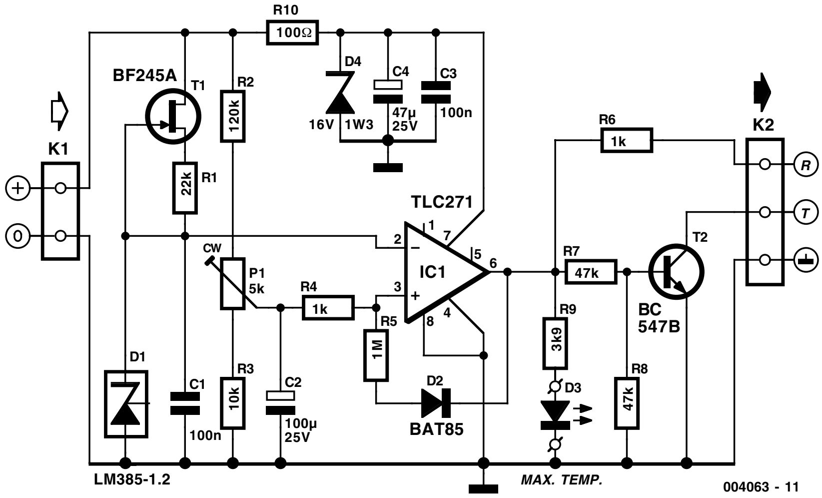

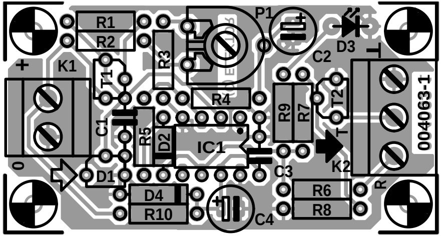

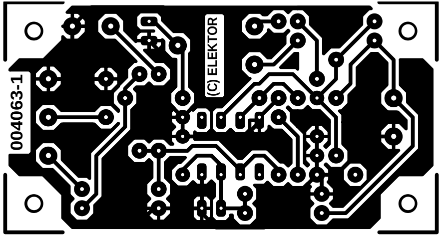

COMPONENTS LIST

Resistors:
R1 = 22kΩ
R2 = 120kΩ
R3 = 10kΩ
R4,R6 = 1kΩ
R5 = 1MΩ
R7,R8 = 47kΩ
R9 = 3kΩ9
R10 = 100Ω
P1 = 5kΩ preset

Capacitors:
C1,C3 = 100nF
C2 = 100μF 25V radial
C4 = 47μF 25V radial

Semiconductors:
D1 = LM385-1.2
D2 = BAT85
D3 = high-efficiency-LED
D4 = zener diode 16V/1W3
T1 = BF245A
T2 = BC547B
IC1 = TLC271CP

Miscellaneous:
K1 = 2-way PCB terminal block, raster 5mm
K2 = 3- way PCB terminal block, raster 5mm