HEAT-SENSITIVE SWITCH

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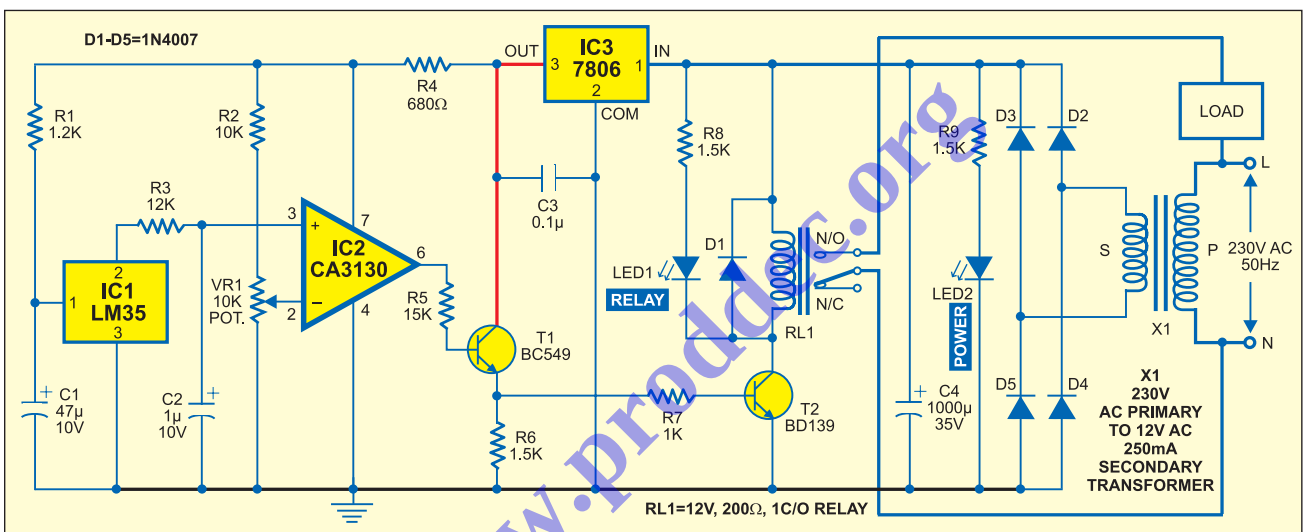
At the heart of this heat-sensitive switch is IC LM35 (IC1), which is a linear temperature sensor and linear temperature-to-voltage converter circuit.



The converter provides accurately linear and directly proportional output signal in millivolts over the temperature range of 0°C to 155°C. It develops an output voltage of 10 mV per degree centigrade change in the ambient temperature. Therefore the output voltage varies from 0 mV at 0°C to 1V at 100°C and any voltage measurement circuit connected across the output pins can read the temperature directly.

The input and ground pins of this heat-to-voltage converter IC are connected across the regulated power supply rails and decoupled by R1 and C1. Its temperature-tracking output is applied to the non-inverting input (pin 3) of the comparator built around IC2. The inverting input (pin 2) of IC2 is connected across the positive supply rails via a voltage divider network formed by potmeter VR1.

Since the wiper of potmeter VR1 is connected to the inverting input of IC2, the voltage presented to this pin is linearly variable. This voltage is used as the reference level for the comparator against the output supplied by IC1.

So if the non-inverting input of IC2 receives a voltage lower than the set level, its output goes low (approximately 650 mV). This low level is applied to the input of the load-relay driver comprising npn transistors T1 and T2. The low level presented at the base of transistor T1 keeps it non-conductive. Since T2 receives the forward bias voltage via the emitter of T1, it is also kept non-conductive. Hence, relay RL1 is in de-energised state, keeping mains supply to the load 'off' as long as the temperature at the sensor is low.

Conversely, if the non-inverting input receives a voltage higher than the set level, its output goes high (approximately 2200 mV) and the load is turned 'on.' This happens when IC1 is at a higher temperature and its output voltage is also higher than the set level at the inverting input of IC2. So the load is turned on as soon as the ambient temperature rises above the set level. Capacitor C3 at this pin helps iron out any ripple that passes through the positive supply rail to avoid errors in the circuit operation.

By adjusting potmeter VR1 and thereby varying the reference voltage level at the inverting input pin of IC1, the temperature threshold at which energisation of the relay is required can be set. As this setting is linear, the knob of potmeter VR1 can be provided with a linear dial caliberated in degrees centigrade. Therefore any temperature level can be selected and constantly monitored for external actions like turning on a room heater in winter or a room cooler in summer. The circuit can also be used to activate emergency fire extinguishers, if positioned at the probable fire accident site.

The circuit can be modified to operate any electrical appliance. In that case, relay RL1 must be a heavy-duty type with appropriately rated contacts to match the power demands of the load to be operated. ●

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