

# Automatic night-light feeds directly from the ac line

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There are many approaches to the problem of activating a light when it becomes dark, and a recent Design Idea covers this topic (**Reference 1**). Some approaches require a dc power supply and an electromechanical relay, but a better approach involves feeding the device

directly from the ac line, minimizing the number of components (**Figure 1**).

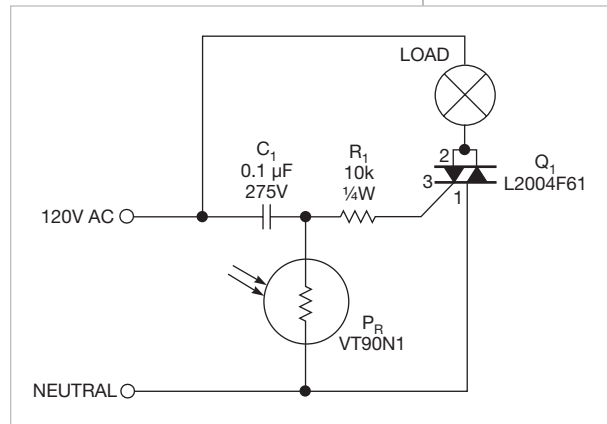
The heart of the device is a light-sensitive cadmium-sulphide resistor,  $P_R$ , with a resistance of approximately 200 k $\Omega$  in the dark, decreasing to a few kilohms in the light.  $P_R$  and capacitor  $C_1$  form an ac-voltage divider. In daylight, the voltage across  $P_R$  is too low to generate the required gate-trigger current to turn on bidirectional ac switch  $Q_1$ , thus keeping the load—usually a lamp—off. When it becomes dark,  $P_R$ 's resistance rises, resulting in an increase in the TRIAC's gate current that triggers the TRIAC and lights the lamp.

The circuit uses inexpensive, off-the-shelf components, including the VT90N1 photoresistor; a 0.1- $\mu$ F, 275V capacitor; and an L2004F61 TRIAC with a load current of 4A rms, a peak blocking voltage of 200V, and a gate-trigger current of 5 mA. The exact specifications of these components are not critical; you could use others instead.

**Editor's note:** Attributes worth mentioning include the fact that the capacitor introduces a phase shift, which places the peak of the gate voltage close to the zero crossing of the load's sine wave for optimum turn-on timing. Another benefit is thermal hysteresis, which occurs due to the reduction of the required triggering voltage and current as the TRIAC warms up after the initial turn-on. **EDN**

## REFERENCE

Tran, Chau, "Simple night-light uses a photoresistor to detect dusk," *EDN*, Dec 15, 2011, pg 49, <http://bit.ly/HPI1GG>.



**Figure 1** The photoresistor activates the TRIAC and the load when darkness falls.