AUTOMATIC NIGHT LAMP WITH MORNING ALARM

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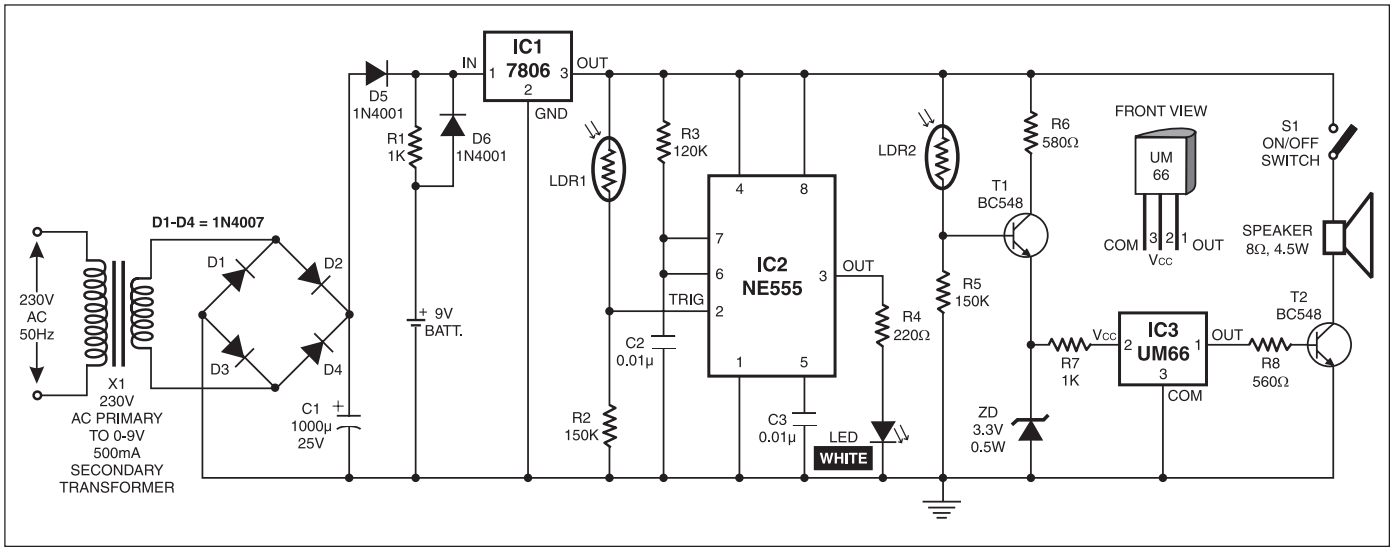
This circuit automatically turns on a night lamp when bedroom light is switched off. The lamp remains 'on' until the light sensor senses daylight in the morning. A super-bright white LED is used as the night lamp. It gives bright and cool light in the room. When the sensor detects the daylight in the morning, a melodious morning alarm sounds.



The circuit is powered from a standard 0-9V transformer. Diodes D1 through D4 rectify the AC voltage and the resulting DC voltage is smoothed by C1. Regulator IC 7806 gives regulated 6V DC to the circuit. A battery backup is provided to power the circuit when mains fails. When mains supply is available, the 9V rechargeable battery charges via diode D5 and resistor R1 with a reasonably constant current. In the event of mains failure, the battery automatically takes up the load without any delay. Diode D5 prevents the battery from discharging backwards following the mains failure and diode D6 provides current path from the battery.

The circuit utilises light-dependant resistors (LDRs) for sensing darkness and light in the room. The resistance of LDR is very high in darkness, which reduces to minimum when LDR is fully illuminated. LDR1 detects darkness, while LDR2 detects light in the morning.

The circuit is designed around the popular timer IC NE555 (IC2), which is configured as a monostable. IC2 is activated by a low pulse applied to its trigger pin 2. Once triggered, output pin 3 of IC2 goes high and remains in that position until IC2 is triggered again at its pin 2.

When LDR1 is illuminated with ambient light in the room, its resistance remains low, which keeps trigger pin 2 of IC2 at a positive potential. As a result, output pin 3 of IC2 goes low and the white LED remains off. As the illumination of LDR1's sensitive window reduces, the resistance of the device increases.

In total darkness, the specified LDR has a resistance in excess of 280 kilo-ohms. When the resistance of LDR1 increases, a short pulse is applied to trigger pin 2 of IC2 via resistor R2 (150 kilo-ohms). This activates the monostable and its output goes high, causing the white LED to glow.

Low-value capacitor C2 maintains the monostable for continuous operation, eliminating the timer effect. By increasing the value of C2, the 'on' time of the white LED can be adjusted to a predetermined time.

LDR2 and associated components generate the morning alarm at dawn. LDR2 detects the ambient light in the room at sunrise and its resistance gradually falls and transistor T1 starts conducting. When T1 conducts, melody-generator IC UM66 (IC3) gets supply voltage from the emitter of T1 and it starts producing the melody. The musical tone generated by IC3 is amplified by single-transistor amplifier T2. Resistor R7 limits the current to IC3 and zener diode ZD limits the voltage to a safer level of 3.3 volts.

The circuit can be easily assembled on a general-purpose PCB. Enclose it in a good-quality plastic case with provisions for LDR and LED. Use a reflective holder for white LED to get a spotlight effect for reading. Place LDRs away from the white LED, preferably on the backside of the case, to avoid unnecessary illumination. The speaker should be small so as to make the gadget compact.