ULTRA-BRIGHT LED LAMP

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This ultra-bright white LED lamp works on 230V AC with minimal power consumption. It can be used to illuminate VU meters, SWR meters, etc.

Ultra-bright LEDs available in the market cost Rs 8 to 15. These LEDs emit a 1000-6000mCd bright white light like welding arc and work on 3 volts, 10 mA. Their maximum voltage is 3.6 volts and the current is 25 mA. Anti-static precautions should be taken when handling the LEDs. The LEDs in water-clear plastic package emit spotlight, while diffused type LEDs have a wide-angle radiation pattern.

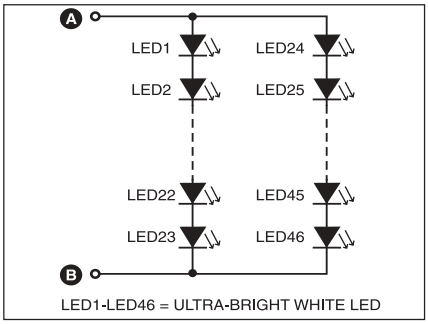

Fig. 3: 46-LED combination

This circuit (Fig. 1) employs capacitive reactance for limiting the current flow through the LEDs on application of mains voltage to the circuit. If we use only a series resistor for limiting the current with mains operation, the limiting resistor itself will dissipate around 2 to 3 watts of power, whereas no power is dissipated in a capacitor. The value of capacitor is calculated by using the following relationships:

$X_C = 1/(2\pi fC)$ ohms ——————(a)

$X_C = V_{RMS}/I$ ohms ——————(b)

where X_C is capacitive reactance in ohms, C is capacitance in farads, I is the current through the LED in amperes, f is the mains frequency in Hz, and Vrms is the input mains voltage.

The 100-ohm, 2W series resistor avoids heavy 'inrush' current during transients. MOV at the input prevents surges or spikes, protecting the circuit. The 390-kilo-ohm, ½-watt resistor acts as a bleeder to provide discharge path for capacitor Cx when mains supply is disconnected. The zener diode at the output section prevents excess reverse voltage levels appearing across the LEDs during negative half cycles. During positive half cycle, the voltage across LEDs is limited to zener voltage.

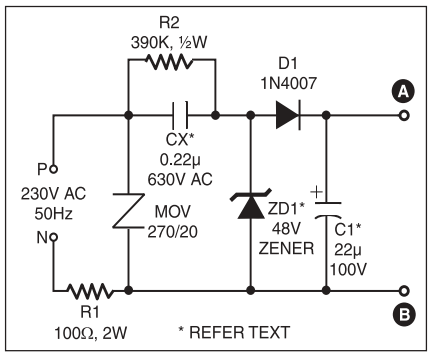

Fig. 1: The circuit of ultra-bright white LED lamp

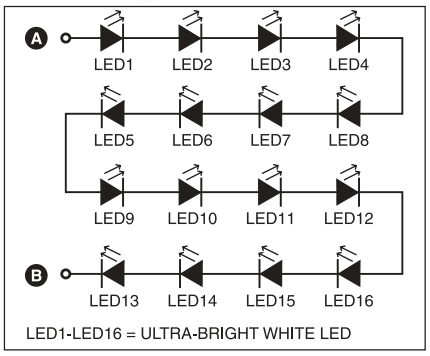

Fig. 2: 16-LED combination

Use AC capacitors for Cx. Filter capacitor C1 across the output provides flicker-free light. The circuit can be enclosed in a CFL round case, and thus it can be connected directly to AC bulb holder socket. A series combination of 16 LEDs (Fig. 2) gives a luminance (lux) equivalent of a 12W bulb. But if you have two series combinations of 23 LEDs in parallel (total 46 LEDs as shown in Fig. 3), it gives light equal to a 35W bulb. 15 LEDs are suitable for a table-lamp light.

Diode D1 (1N4007) and capacitor C1 act as rectifying and smoothing elements to provide DC voltage to the row of LEDs. For a 16-LED row, use Cx of 0.22 µF, 630V; C1 of 22 µF, 100V; and zener of 48V, 1W. Similarly, for 23 + 23 LED combination use Cx of 0.47 mF, 630V; C1 of 33 µF, 150V; and zener of 69V, 1W.

This circuit (inclusive of LEDs) costs Rs 200 to Rs 400.