

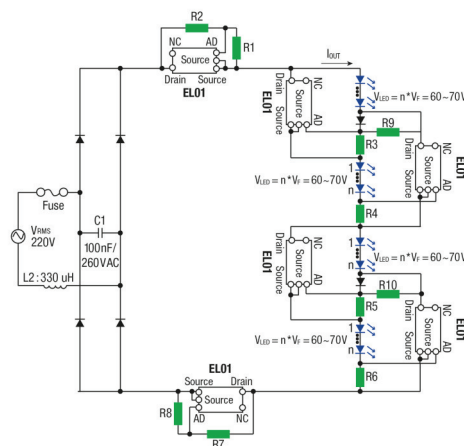
Directly on mains voltage – alternative to PSUs

Suitable circuits allow LEDs to be operated directly on mains voltage without a power supply unit. The solution is scalable and space-saving. It also allows LEDs to be dimmed evenly and without flickering. The electric light bulb served us well for over 100 years since it was invented by Edison in 1879. Light-emitting diodes were discovered as luminescent crystals about 60 years ago and have made triumphant progress since then. Power supply units for operating LEDs have also been available for many years. But since the invention of ICs which can be operated directly with 230 V AC while supplying LEDs with direct current, the question arises whether conventional power supply units are still required. LED lights operated with alternating current have been successfully sold as series-produced items for many years. In the beginning these were Retrofit GU10 lamps with 8 to 10 W, followed by built-in spotlights and floodlights with 120 W and more.

Use of AC drivers

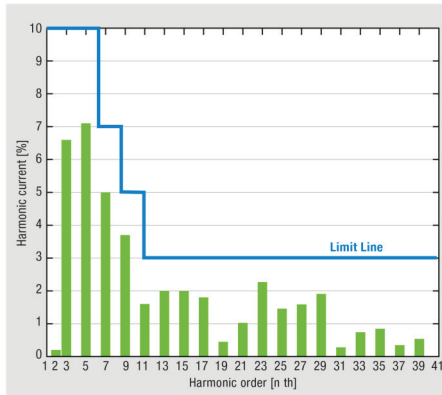
The use of AC chips not only means uncomplicated designs. It also allows good dimming characteristics, AC or DC operation, low space requirements for the power supply and a long service life. Today the Asian markets offer a comprehensive range of AC-operated products. EuroLighting developed the compact EL01 chip for controlling LED lights directly with 230 V AC, at low cost and with simple circuits. It increases the service life of the power supply to the level of light-emitting diodes with 50,000 hours and more. Components such as electrolytic capacitors and transformers are not required.

The sample circuit in figure below shows how an LED lamp with power supply can be built with only few components.



Simple operating principle

The operating principle of the AC chips is simple: The mains voltage is rectified and fed into an AC direct driver without smoothing.



No measures are required for EMC for power levels up to 24 W

This driver pulses with 100 to 120 Hz and supplies the LEDs with a constant current and a voltage between 60 and 70 V. This allows LEDs from a variety of manufacturers with different voltages to be controlled directly as long as 70 V is not exceeded within a group. Any power level can be achieved through parallel connection of several groups.

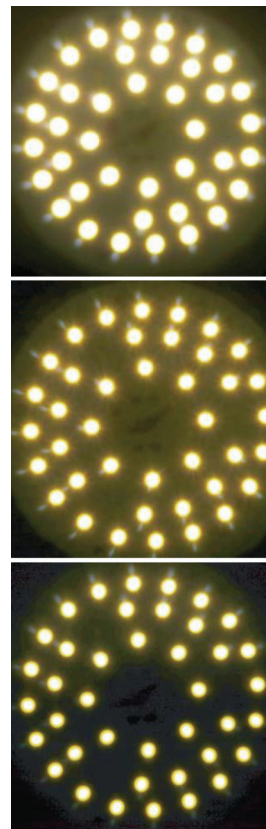
In an existing circuit, the power level can easily be adjusted by changing the resistance values.

One advantage of circuits with the EL01 is dimmability with leading edge control and TRIAC. Additionally, up to 24 W

no further measures are required for complying with electromagnetic compatibility.

Higher power levels can be achieved with small changes.

An integrated NTC is used for power reduction from 85 °C, the PFC achieves a power factor of over 0.98 and an efficiency of 85 to 90 %. Total harmonic distortion (THD) is below 18 % and the working temperature ranges from -40 to +85 °C.

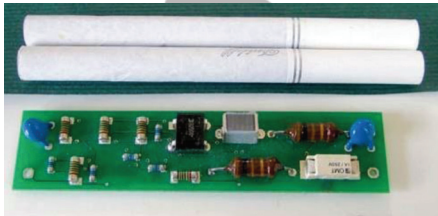




Even dimming with the EL01:
 an LED module with 5 W (top), 2 W
 (middle) and 1 W (bottom)
 Some solutions in the market switch off individual
 LEDs during dimming - left: 6W; right: 4W)

Flicker-free light is ensured at all power
 levels which meets the Japanese
 regulations for flicker-free light.

In addition, the circuit can alternatively
 be operated with AC or DC. Space
 requirements are low: a circuit with 30
 to 40 W only requires the space of two
 cigarettes



The LED power supply requires little space

Even dimming

LED drivers that can be operated with
 mains power are offered by several
 renowned manufacturers. These often
 differ substantially from the EL01,
 though.

Circuits with the EL01 require several
 chips of this type which spreads
 dissipation to several surfaces
 Competitors' products generally consist
 of a large chip, focusing the dissipating
 heat on one point.

There are also significant differences
 during dimming. The EL01 chip allows
 even dimming by simultaneously
 dimming all LEDs in one circuit.

Some competitors' chips implement
 sequential dimming of the individual
 groups. Individual LED groups are
 switched off in sequence.

This means the beam of light is not
 homogeneous and the LEDs of the
 lowest groups are used more often than
 those in the top group, which can affect
 the service life of the light-emitting
 diodes.

Variable for customer requirements

EuroLighting offers two solution
 approaches for the AC chips: The power
 supply can be integrated into a compact
 printed circuit board in the lamp housing.

Alternatively, the circuit can be located
 at the edge of the circuit board on which
 the LEDs are mounted. The IC dies are
 bonded directly onto the circuit board
 and protected with epoxy resin (title
 image).

Based on this technology, round LED circuit boards with integrated power supply are offered as standard products with up to 40 W for a module diameter of 54 mm.

Round modules with an open design and 150 mm diameter are available with up to 120 W.

Also available are illuminated surfaces with an area of 280 x 280 mm² and 12 W, which can be connected as desired, as well as strip elements for use in LED tubes.

Another advantage of these AC circuits is that LEDs from different manufacturers can be exchanged in the circuits.

This allows adaptations for reasons of price or light colour and light output. The result is a modular design with many common parts which can be varied depending on customer requirements.

