

Flicker Free

The dimming problem: Stay efficient but don't generate flicker

Dimming LEDs works by two methods. Changing the forward current or using PWM to interrupt the current to reduce the overall power supplied to the LED.

Changing the forward current does also slightly shift the wavelength of the LED, it usually reduces the energy efficiency too.

Using PWM can cause perceptible flicker, interference with cameras, and physiological problems like headache and more severe effects. It also can also produce electromagnetic emission beyond legal limits. So the question is how to get the optimal result. There are two options.

Go fast

or

go smart

Fast PWM

- Be faster than the human eye
- Be faster than cameras

Pros:

- High efficiency
- Works with most drivers

Cons:

- Still some potential for interference
- Frequency limited by EMC

Our solution:

LW07, LW10, and LW12 implement fast PWM at 730 Hz, their dimming ranges from 0,1 % to 100 %.

The PWM frequency is high enough to avoid flicker and most interference while keeping EMC problems small.

Spread spectrum PWM

- Rapid random changes in frequency
- Avoid regular patterns

Pros:

- High efficiency
- No interference at all
- Reduced EMC problems

Cons:

- We yet have to find any...

Our solution:

LW04 varies the PWM frequency in a range from 182 Hz to 187,500 Hz. While the spectral maximum moves with dimming ratio the actual frequency is never static.

So instead of a pattern LW04 generates a noise like signal.

