

# How to Dim LED Lighting in the Home?

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How to Dim LED Lighting in the Home? (On photo Dimmer Switch)

## Introduction

**LED lighting** in the home is becoming more popular due to the energy and money saving benefits it offers over traditional halogen lighting. One of the most common problems that an electrician faces when installing LED's is enabling them to dim.

## Resistive Dimming

**Resistive dimming** has become a standard way of dimming halogen lighting and it works by reducing the voltage allowed to the bulb with a variable resistor.

A resistive dimmer switch is easy to install because it is simply wired between the mains (240V) power and the **bulb**, however whilst the lighting is dimmed the voltage resistance is converted to heat and is not considered energy efficient.

LED's use between 12V to 48V so a transformer is required to convert mains power ( 110V-240V) to the required reduced voltage. Using a resistive dimmer between the main voltage and the transformer **will damage the transformer** and using a resistive dimmer between the transformer and the LED will cause it to **flicker instead**

of dimming.

**Note:** LED's cannot be dimmed using resistive dimming; *it will slowly damage the LED's*.

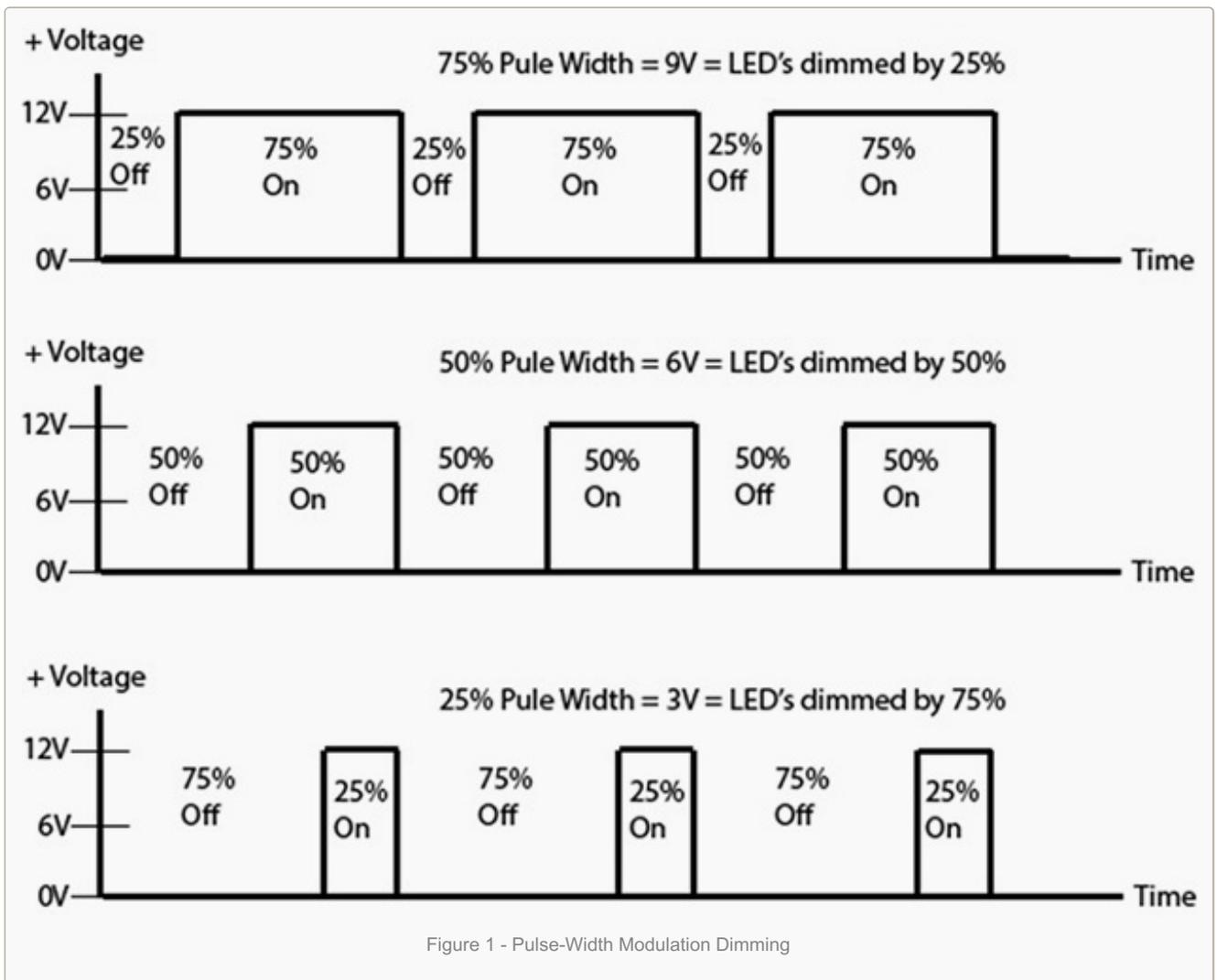
## Pulse-Width Modulation Dimming

**Pulse-width modulation** works by switching the voltage on and off at a variable speed. This causes a flickering effect that is too quick for the human eye to see. By increasing and decreasing the switching speed it increases and decreases the max possible light output and dims the LED.

PWM dimming is **energy efficient** because unlike the resistive dimming the more the LED is dimmed the less wattage it uses.

A problem found with PWM dimming is as the amount of dimming increases so does the amount of time the voltage is turned off. This will eventually fall within the flickering speed in which the human eye can see.

**This flickering can normally be seen when the LED is dimmed to below 10% of its original light output.**

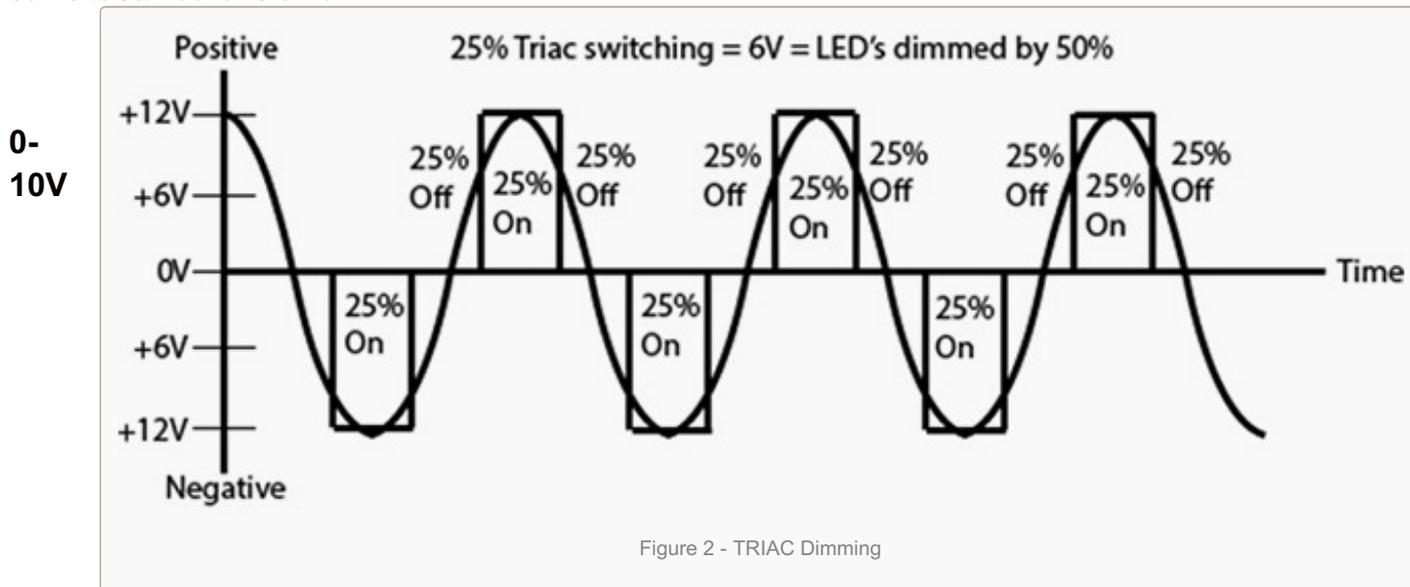


## TRIAC Dimming

A **TRIAC** (*Triode for Alternating Current*) dimmer works by **conducting the current in both directions**, alternating at a variable speed. This makes the switching much faster than Pulse-width modulation dimming so it never goes within the flickering speed of the human eye.

## Dimming Signals

Both PWM and TRIAC dimmer modules require a signal to tell the dimmer how much to dim the LED's. **The current standard is 0-10V.**



## Dimming

0-10V signals work by sending a separate 10v signal to the PWM/TRIAC dimmer module and then using a resistive dimmer to reduce the voltage on the 10V signal. As the voltage drops the dimmer module reduces the brightness on the LED's in relation to the voltage.

### Example:

10V = Dim at 100%

8V = Dim at 80%

3V = Dim at 30%

## DALI Dimming

**DALI** is an open source 2 way protocol designed for controlling lighting in the home. It is a royalty free standard meaning it is possible to mix and match DALI module's from different manufactures. DALI works by assigning zones and linking all the DALI modules for each zone together.

The DALI controller can then control multiple zones individually.

## DMX Dimming

The **DMX 512 protocol** was originally designed to control nightclub and theatre lighting and has only recently started to be used in the home.

DMX works by sending a data signal with a value between 0-255 on each channel. There can be a maximum of 512 channels and the signal carries the information for all the channels to each dimmer module receiving the DMX.

This means that each dimmer module is given a DMX address so it knows which channel to read and adjust the brightness accordingly. Each dimmer module has a DMX In and DMX out socket so the data signal can be daisy chained from one module to next.

DMX can control colour changing lighting as well as non-lighting devices. E.G. Fog machines, Blinds and even

motorised doors.

Source:

<http://electrical-engineering-portal.com/how-to-dim-led-lighting-in-the-home>