



MEAN WELL USA, INC.
44030 Fremont Blvd. Fremont, CA 94538
Tel: 510-6838886; Fax: 510-6838899

LED Grow Lighting

Introduction

According to a market research report ^[1], the LED grow light market is expected to rise to more than \$1.9 Billion by 2020. According to a new market research, LED grow light market is expected to rise to more than \$1.9 Billion by 2020. LED grow light is expected to witness high growth phase in applications such as vertical farming, commercial greenhouse, and indoor farming in the next few years. With increasing awareness about its benefits, it has started being adopted in larger scale in vertical farming and commercial greenhouse applications. Also, the rising trend of indoor farming, government regulations favoring LED lighting, and requirement for energy-efficient and long-lasting lighting technology as a supplement to natural lighting for plant growth, drive the growth of the LED grow light market. These new opportunities will not only drive the market in the coming years but also lead to opening up new market segments.

A grow light or agriculture light is an artificial light source, generally an electric light, designed to stimulate plant growth by emitting an electromagnetic spectrum appropriate for photosynthesis. Grow lights are used in applications where there is either no naturally occurring light, or where supplemental light is required.

Light-Emitting Diode (LED) grow lights may be relatively new in the grow light market, but they become popular because of energy efficient, dimmable and long life cycle.

Specific Spectrum

Normally LED grow lights combine different LED color to achieve a specific wavelength for different plants. LED grow lights can be designed to a specific color to provide optimal growth and yields for certain plants because a different light color possesses different wavelength, and plants respond favorably to specific wavelengths with respect to light spectrum. For example, the wavelength of red light is around 630-660nm and it is essential for the growth of stems, as well as the expansion of leaves. While the wavelength of blue light is only 400-520nm, blue light affects the chlorophyll content present in the plant as well as leaf thickness. Since LED is effectively a diode, its forward current and voltage characteristics curves of various colors are different. Different color LEDs characteristic curves are shown as below:

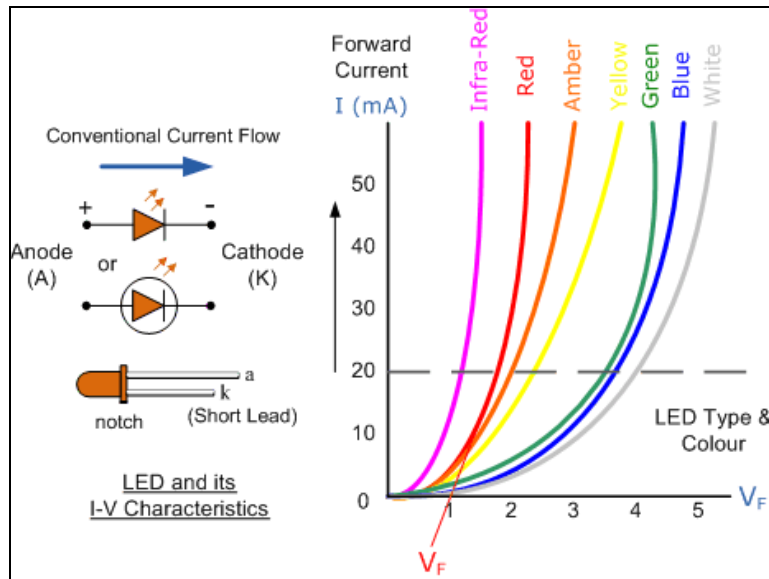


Figure 1

As shown in Figure 1, with a 20mA forward current, forward voltage is 1.8V for a standard red LED and 3.6V for a blue LED.

To achieve a specific wavelength by combining different color LEDs, the total forward voltage range is wide and various. It requires a LED driver to be able to operate in a wide constant current region so that one driver can be used with different LED grow light.

Energy Efficiency

As discussed above, an individual LED could emit a specific light color. Below is an illustration of spectral output of a red LED (red curve) and a typical HPS lamp (rainbow curve). Note how narrow the LED light output is in comparison to the HPS lamp.

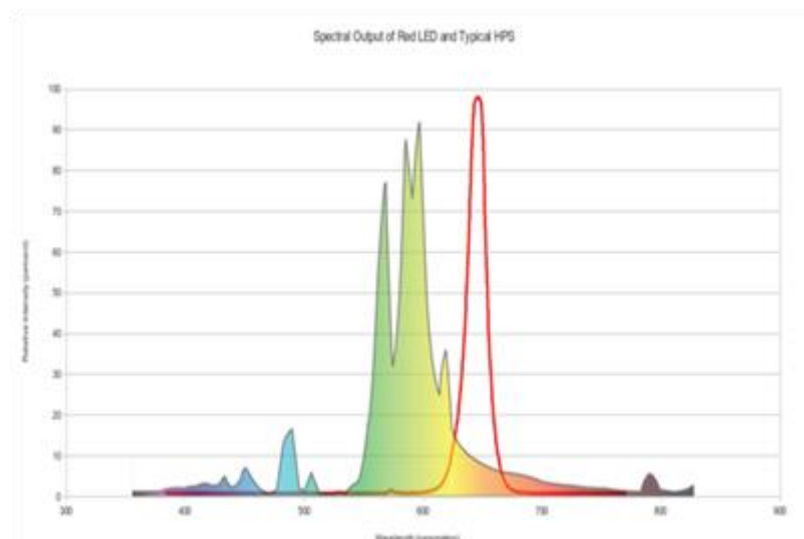


Figure 2



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LEDs are special because they produce a very narrow range of colored light in the electromagnetic spectrum, as the red curve shown in Figure 2. All the energy used to create light outside of the PAR region is more or less wasted. The PAR (Photosynthetically active radiation) region that plants are able to use in the process of photosynthesis is from 400 to 700 nanometers.

This is precisely why LEDs are “more efficient” than HIDs. In terms of lumens per watt, today’s double ended HPS lights are quite efficient compared to other types of traditional artificial lighting, producing over a 100 lumens per watt. However, when we consider LEDs, light output has already exceeded 300 lumens per. In other words, LED grow light efficacy is about 3 time higher than the HPS grow light. Thus, in order for LED grow light to maintain high efficiency, LED driver must possess efficient voltage conversion capability as well.

Stability, Lifetime

In all types of lights, the quantity of light emitted (measured in lumens or PAR photon irradiance) decreases with use. For example, the output of HID lamps can degrade as much as 10-15% after only one year of operation, and in the case of HPS, as they degrade, the spectrum shifts toward the Green/Yellow range, which is the range of spectrum most poorly utilized by plants. For this reason, most professional growers replace their HID lamps a minimum of once every year. However, LEDs grow light are rated at for at least 50,000 hours with less than 10% drop in output and often continue to operate way beyond their rating with little or no shift in spectrum. To build a compelling LED grow light, a high reliable and qualified LED driver certainly can’t be absent.

Dimming

Theoretically, with LEDs, we have greater control over the intensity of light as LEDs are dimmable. Dimming is important because the amount of light provided is associated with photosynthesis. Too much light, and the energy turns into heat and diminishes photosynthetic activity. Every plant is different in this regard and during the plant’s life cycle. The dimmable capability of LEDs offers the distinct advantage of creating the best light environment tailored to the various needs of different plants in different growth phase. Sometimes, the LED grow light that is equipped with a dimmable LED driver would be more popular in the grow light market.



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Summary

In general, LED grow light features optimal specific spectrum, high energy efficiency, long term stability and dimmable, which all rely on the built-in LED drivers. MEAN WELL's ELG, HLG and HVG LED driver series, which provide up to 5~7 years warranty, wide constant current region, 3 in 1 dimming function, high working temperature up to 70°C and high anti-moisture permeability IP67/IP65 rated, are highly recommended for LED grow light applications. Also, their efficiency up to 95% leverage the LED grow light to maintain high efficacy over HPS grow light. Moreover, for North America market, the HVG series is suitable for LED grow light requiring high input line voltage 277/347/480Vac.



HVG-480 series
with 277/374/480Vac input



Red and Blue LED Grow Light

Reference:

1. LED Grow Light Market by Wattage, Type of Installation, Spectrum, Application, and Geography - Forecast to 2020 (Published: July 2015)

Established in 1982, MEAN WELL Enterprises Co., Ltd. is one of the leading switching power supply providers in the world. MEAN WELL dedicated in developing energy-saving concept products for many years. Since 2006, we started to endeavor the effort to the LED / outdoor power supply development. Thus far, full range of LED power family with more than 1000 models (100 series) from 8W to 600W was launched in the market with utmost success. Please contact MEAN WELL USA or check www.meanwellusa.com for more info.