



Horticultural Lighting Solutions

Better than the sun.

 **LUMILEDS**



Horticultural lighting is used to grow fruit, vegetables, herbs, plants and flowers. The purpose is to increase the number of harvest cycles or yield and improve quality of the crop in appearance and nutrient content.

The horticultural lighting market includes top lighting LED systems, interweaving to create better vertical uniformity alongside the crop (e.g. tomato plants) or full indoor vertical farming without any natural daylight.

Today, horticultural lighting can be either traditional HPS 400, 600 or 1,000W systems for top lighting or LED lighting. The LED lighting market is emerging due to the increasing popularity of LED technology, delivering more efficient narrow band spectra at lower energy consumption.



The Growing LED Horticultural Market At a Glance

\$633 million
projected growth by 2022 and

30% CAGR
during 2018-2022
and consequently one of the
fastest growing segments in
the lighting industry.¹

¹ LEDinside, *The On-going LED Horticulture Lighting Market Expansion*, July 26, 2018

Together with our customers, Lumileds is making the world better, safer, more beautiful—with light. At Lumileds we're collaborating with our customers to push the boundaries of light. We have an ambitious vision for the future of light, and we're taking the lead. The best innovation happens when great minds work together—when we act with integrity as trusted partners to our customers, honoring commitments, offering deep expertise, and going the extra mile. Because it's only together that we can make the world better, safer, more beautiful—with light.

For companies who require innovative lighting solutions, Lumileds is a global leader employing more than 9,000 team members operating in over 65 countries. Lumileds partners with its customers to push the boundaries of light.

Ushering in a new era in horticultural lighting.

Greater innovation leads to greater adoption.

Rising population, urbanization, changing policies and increasing focus on nutrition are just some of the factors motivating horticulture professionals to turn to indoor and vertical farming. Spurred on by recent improvements in performance and economics, LEDs are now positioned as a clear alternative to legacy lighting options in this burgeoning market.

The unique performance benefits of LEDs allow for highly customized color spectrum tuning to meet the specific requirements and conditions necessary for optimal crop yields. They also deliver superior economics by using less power and offering a lifespan that is around 2.5 times longer than high-pressure sodium bulbs—resulting in exceptional energy efficiency and cost savings.

LED acceptance continues to climb.

While luminaire manufacturers and growers are realizing the benefits of including LEDs in horticultural applications, they are not alone. Today, the adoption of LED grow light fixtures is quickly expanding to include contractors and do-it-yourselfers—with sales at big-box home improvement stores steadily rising. Add it up and it's clear that LEDs are helping to transform horticultural lighting by offering impressive levels of exactness, performance and reliability.

Innovation that makes a difference today—and tomorrow.

By making significant investments in horticulture LED research and development, Lumileds continues to break new ground. This ongoing commitment has paid significant dividends for manufacturers already in, or considering entry into, the horticultural lighting market.

Not long ago, the idea of LEDs being a go-to lighting source for horticulture would have raised more than a few eyebrows. But today, LEDs are viewed as the standard for indoor vertical farming and are quickly eclipsing traditional greenhouse lighting options in new greenhouse construction. What's more, LEDs are even making strides in the tough-to-penetrate greenhouse retrofit market. For luminaire manufacturers, this rapid global adoption of LEDs in horticulture represents a fast-growing market opportunity that shows no signs of slowing.

The Horticultural LED lighting market is a true emerging market.

This is particularly true in areas with limited hours of sunlight during the year. The direct relationship between prolonging the plant growth cycle and higher yield or the positive impact on freshness and nutrient content are driving higher value for the grower. This is also an attractive market for luminaire manufacturers to proliferate into with linear or high bay and low bay product offerings, potentially extended with other products and services to manage the entire eco-system in a greenhouse, vertical farm or growth chamber.

Over the past few years, we've witnessed a seismic shift in the role LEDs play in horticultural lighting. Once a promising alternative to traditional light sources, LEDs are quickly evolving to become the industry standard. This has proven to be a win-win-win—with lighting manufacturers reaping sizable economic upside, growers producing larger harvests and consumers benefiting from the abundant availability of higher-quality crops.

Five-year forecasts predict continued growth across key horticulture segments. Whether it's in the well-established global greenhouse market—where LEDs are dominating in new construction and growing in retrofit deployments—or the global vertical farming sector where LEDs are seen as the de facto standard. In fact, LED-based horticultural fixture revenue is predicted to eclipse \$2.35 billion by 2022.

To help manufacturers capitalize on this dynamic and lucrative sector, we're doubling down on our commitment to horticultural LED design and production innovation. The result is LUXEON SunPlus Series for Horticulture, the cornerstone of our advanced Lumileds Horticultural Lighting Solutions.

Lumileds expands horticultural LED possibilities.

Building on a rich tradition of LED firsts, Lumileds brings its legacy of innovation to the horticulture market. By immersing itself in the specific needs of both manufacturers and growers, Lumileds has designed, developed and produced a next-generation portfolio of horticulture-specific LEDs that establish a new standard for the industry.

LEDs that shatter the horticultural lighting status quo.

To meet the exacting requirements of the horticulture market, Lumileds offers the breakthrough LUXEON SunPlus Series. These remarkable LEDs, available as single emitters or modules as part of the infinitely configurable Matrix Platform, deliver peerless performance, efficiency and consistency in a broad spectrum of colors.

Lumileds is the only LED company that researches, develops and manufactures its own phosphors.

Phosphors is the principal material that enables a customized spectrum from a single LED. These industry-leading phosphor technologies allow manufacturers to design more highly differentiated luminaires—a major advantage in an increasingly competitive environment.

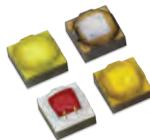
Understanding the value of consulting with the brightest minds, Lumileds has teamed up with leading university and research organizations to conduct extensive growth studies. These analyses are invaluable in helping Lumileds increase the efficacy of the LEDs it delivers to market, as well as strengthening the business case to growers of the quantitative and qualitative benefits of LEDs in horticulture.



Products – Top picks from our portfolio that add the best value.



Matrix Platform: Simplifying system design through integrated connectivity, controls and application specific driver topologies, enabling smaller and more efficient luminaires. Color tunable solutions accommodate different crops and offer ultimate flexibility and the optimal light spectrum and intensity during every phase in the plant growth cycle.



LUXEON SunPlus 20 Line: With the LUXEON SunPlus 20 Line, manufacturers have access to a lighting solution that is ideal for greenhouse applications where directional light must reach the plant canopy or for interweaving where higher PPF levels are required.



LUXEON SunPlus CoB Line: With the innovative LUXEON SunPlus CoB Line, manufacturers are able to provide fixed spectra in directional applications.



LUXEON SunPlus 2835 Line: The LUXEON SunPlus 2835 Line is a perfect solution for vertical farming and interweaving with optimized spectra for vertical farming.

What makes Lumileds solution better and different?

- Specific and targeted wavelengths that are tuned and beneficial to growing fruits and vegetables
- Industry leading photosynthetic photon flux density (PPFD) through maximum spectral output resulting in optimal plant growth, quality and uniformity
- Unique offering as our parts are binned in photosynthetic photon flux (PPF) relevant to the application
- Optimized optical design delivering the best uniformity

About Lumileds

Companies developing automotive, mobile, IoT and illumination lighting applications need a partner who can collaborate with them to push the boundaries of light. With over 100 years of inventions and industry firsts, Lumileds is a global lighting solutions company that helps customers around the world deliver differentiated solutions to gain and maintain a competitive edge. As the inventor of Xenon technology, a pioneer in halogen lighting and the leader in high performance LEDs, Lumileds builds innovation, quality and reliability into its technology, products and every customer engagement. Together with its customers, Lumileds is making the world better, safer, more beautiful —with light.

To learn more about our lighting solutions, visit lumileds.com.



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