



WHITEPAPER

# LED TRENDS IN ENTERTAINMENT



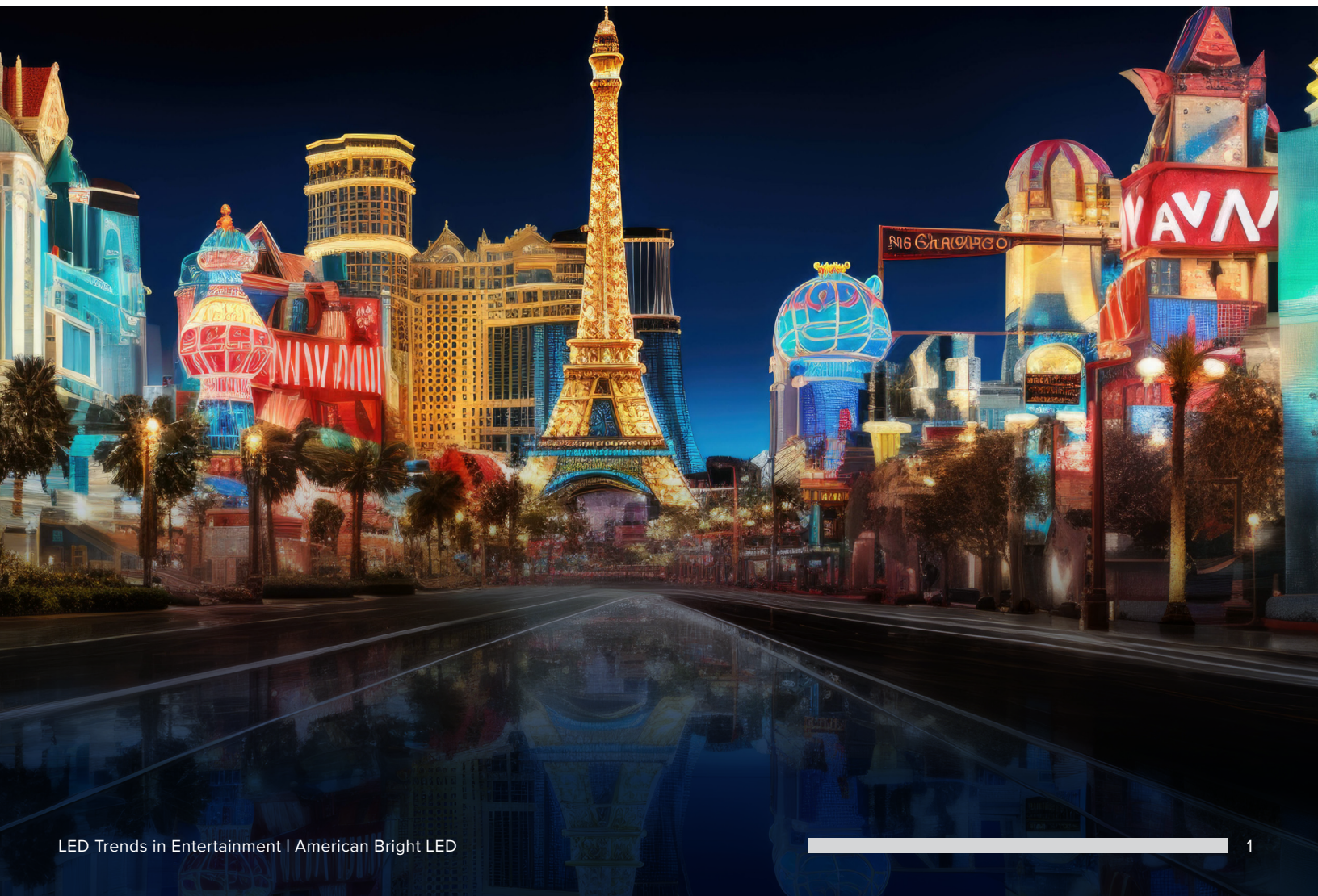


# LED TRENDS IN ENTERTAINMENT

## INTRODUCTION

In today's entertainment industry, LED technology plays a central role in creating an engaging experience. This goes beyond general lighting. The capabilities and form factors of LEDs vastly expand the ways light can be used in the modern entertainment and amusement environment. LEDs add easy color and lighting effects to equipment like slot machines and arcade games. They take lighting to new heights of sophistication and excitement in public venues ranging from theaters to arenas to bowling alleys. Offering programmable output levels and color-changing capabilities, LEDs can

make any entertainment environment pop. And they can do this while saving money by reducing energy and maintenance costs. This ability to take any type of entertainment to the next level is why operators and OEMs across the industry are putting LEDs at the center of their latest products and upgrades.







## BENEFITS OF LEDs FOR ENTERTAINMENT

LED technology equips entertainment providers and supply-chain OEMs to enhance the patron experience while minimizing cost and effort, from product development through day-to-day operations. They offer benefits in performance, in design and assembly, and in cost of ownership.

### *In performance*

- **Wide color variety:** Monochromatic LEDs are available in a rainbow of colors as well as white in various correlated color temperatures (CCTs).
- **Color changing:** LEDs are available as multicolor devices that can be toggled among specific colors or RGB/RGBW devices that can be tuned to any shade in the color gamut.
- **Programmable:** Because the color and luminous flux of multicolor/tunable LEDs depend on the drive voltage and current, RGB LEDs with built-in ICs can be software controlled for completely automated sequences or easy switching among preset programs.
- **Individually addressable:** When equipped with an IC, RGB LEDs in strips or arrays can be independently addressed, making it possible to create dynamic, eye-catching effects.

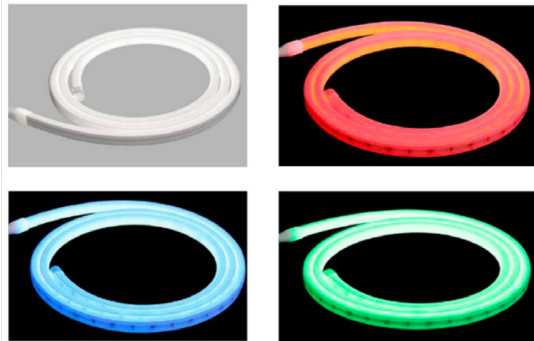
### *In design and assembly*

LEDs are ultracompact (millimeters to microns in diameter) and available in a variety of easily customizable subassemblies that go far beyond traditional discrete through-hole and surface-mount devices.



**LED light strips:** LED light strips consist of narrow (8 to 10 mm), flexible circuit boards populated with surface-mount LEDs and the associated drive circuitry. The LEDs can be monochromatic or multicolor, including RGB triads or RGBW chips. With the addition of a built-in IC, each LED on a light strip can be individually addressed and software controlled, making it possible to add dramatic accents to even the smallest spaces. LED density can be customized for the application.

The circuit boards used in light strips vary from nearly rigid to extremely flexible, so that they can be curved and even twisted to a certain extent. They're adhesive backed for ease of installation and can be ordered to length, spliced, or cut at designated locations. Light strips are available with IP ratings as high as IP68.



**LED rope lights:** LED rope lights enclose the flexible LED circuit board in a protective silicone jacket. They're available in monochromatic, multicolor, and addressable RGB/RGBW versions. With built-in ICs, they can be color tuned and controlled on a pixel-by-pixel basis.

The silicone jackets can be transparent, to show individual LEDs as discrete points of light, or doped with diffusers for a continuous glow. Rope lights support very tight bending radii, especially the side-emitting versions. They are ideal for curved surfaces and are available with IP68 ratings.

Rope lights tend to be wider than light strips (~15 mm versus 8-10 mm) and they require manual installation with clips.



**COB LED light strips:** In chip on board (COB) light strips, the unpackaged LED chips are mounted on a thermally efficient substrate placed below a uniform phosphor coating. The approach supports a much higher packing density. COB light strips produce consistent output along their length, eliminating hotspots and generating up to 1200 lm/m.

COB LED light strips are available in monochromatic offerings, dual-color versions with warm white and cool white, and RGB versions with built-in ICs. They're adhesive backed for ease of installation. Individual strips can be cut to fit at designated locations.

**LED modules:** Not all designs require rope lights or light strips. LED modules are available in different shapes (square, round, and custom). They frequently use specialty LED printed circuit boards designed for simplified thermal management [Building Board-Level Assemblies for LED Modules].





The types of LEDs discussed above are available as commercial-off-the-shelf products. Even LED modules may be available as pre-populated boards. In many cases, however, OEMs may get better results by working with lighting manufacturers to develop custom LED light strips or modules. Experienced lighting design engineers can help design teams identify the optimum LED types, pixel sizes, light strip and/or module dimensions, and data-path options for a project. By sharing expertise, lighting manufacturers can help customers streamline the development and production of exceptional products with reduced effort and cost.

***In total cost of ownership (TCO)***

LEDs dramatically reduce total cost of ownership (TCO) through high efficiencies, long lifetimes, and ruggedness. Failure modes are typically in the form of gradual dimming over time rather than catastrophic failure. An LED strip light designed to both adorn the stair tread and provide emergency exit lighting in a movie theater, for example, can be depended on night after night and year after year.

**TRENDS FOR LEDs IN ENTERTAINMENT**

Let’s look at some of the ways that LEDs are delivering benefits in the entertainment industry.

**Trend #1: Nighttime entertainment**



**Casinos**

When a patron steps into the glitz and glamour of a casino, they’re bombarded with the light and noise of hundreds or even thousands of amusements competing for their attention. Gaming equipment manufacturers are using LED lighting to make their slot machines and tables stand out.

In one example, a slot machine manufacturer used flexible light strips with diffusing overlays to outline the case of the machine and additional light strips to outline the screens from the interior. In both cases, the light strips were based on RGB LEDs with a built-in IC. This enables each LED to be dynamically tuned to a specific color instantly and individually. When a player hits a jackpot, the LEDs can be programmed to create a rainbow of colors circulating around the screen and up and down the vertical light strips that outline the case. As a bonus, the same part number can be used in the assemblies of a number of different machines, reducing inventory and bill of materials.

Elsewhere, LED light strips, rope lights, modules, or even individual devices are adding flash to gaming tables ranging from roulette to blackjack and poker. LED lighting surrounds the inside edge of the playing surfaces with white, monochromatic, or color tunable output. Light strips, light modules, or even just LEDs installed in a ring also can be used to light up the bases, installing in minutes and lasting for years.



**Nightclubs**

Nightclubs are all about delivering a memorable experience that lures club goers in and makes them stay. American Bright’s dual-color COB light strips, for example, can be switched between cool white and warm white, changing the mood from electrifying to intimate. To this, add RGB light strips or rope lights to broaden the color palette. With built-in ICs, these light strips can instantly change color and luminous flux on a pixel-by-pixel basis to match the beat, energizing the crowd on the dance floor.

**Arenas**

Arenas are increasingly using LED lighting to amp up the excitement of performances while minimizing costs. LED rope lighting and strip lighting provide ac-



cent lighting around the venue. LEDs are also used for accent lighting and patterns in elaborate stage sets. The high luminous flux of COB light strips is particularly valuable in this environment. RGBW LED light strips with built-in ICs make it possible to develop dazzling lighting sequences that can be executed with the touch of a key. Having integrated electronics and ICs simplifies engineering, and new effects can be added with a few lines of code or a control app.

### Trend #2: Recreational



#### Bowling alleys

LED lighting is bringing a new level of excitement to the formerly mundane neighborhood bowling alley. Arrays of individually addressable RGB/RGBW LED light strips under translucent alley decks and LED modules under the pins present scintillating light shows. With software-controlled, individually addressable LEDs, an alley can add special effects like flashy light shows to celebrate strikes and spares. Lighting can be synchronized to music, an advantage for special events and private parties.

#### Arcade game venues

In the era of Mortal Kombat, LED-enhanced arcade games provide a way to lure patrons away from their gaming consoles and out to arcades, theme restaurants, and bars. Flexible light strips outline the play window of games, flashing and changing colors in sequence. The joysticks and function buttons are underlit by custom LED modules or flexible light strips. Rope lights outline the cases and the tabletops with eye-catching displays. And the all-important ticket kiosk gets the star treatment with high output COB LED light strips.

Pinball machines have made a comeback, with themed tables featuring multiple modes and complex videogame-like challenges and ascending play levels. Light strips with individually addressable RGB LEDs outline the frame and add visual interest to the display. LED modules with color-changing capabilities under the deck help direct play and reward successes. To this, add more overhead lighting synchronized to music for an exuberant atmosphere.

### Trend #3: Movie theaters



To draw moviegoers back into the theater, exhibitors are busy upgrading the experience and LEDs play an important role. The upgrades start at the sidewalk with architectural accent lighting and LED-based marquees. Flexible light strips make it easy to refresh even a static marquee by adding colored accents and patterns. Rope lighting delivers continuous output in monochromatic designs and eye-catching color-tunable RGB versions. In addition, side-emitting designs are available with RGB LEDs with built-in ICs for pixel-by-pixel control to support sophisticated, attention-grabbing light shows. Installation is as simple as peeling off the backing tape on the adhesive and connecting the power source.

Inside, more accent lighting adds to the glamour. Flexible light strips can be used to outline ceiling features and doors. In the auditoriums, the accent lighting is both stylish and functional, highlighting handrails and stair treads. In the case of stair treads, transparent RGB LED rope lights can light the way during normal operation. Because of their programmable, dynamic performance, during an emergency, RGB rope lights with built-in ICs can instantly turn red and light up in sequence to direct evacuation.



## CONCLUSION

Across the entertainment spectrum, LED technology creates a high-impact patron experience while streamlining design and operations for the venue owner and equipment designer alike. LEDs deliver brilliant color in a vast range of hues that can be changed dynamically and automatically. A variety of form factors like flexible light strips, flexible rope lights, COB LED light strips, and LED modules put light and color exactly where designers want it. And user-friendly design makes them just as easy to install in retrofits as in new builds. The effects range from dramatic to sophisticated to exuberant. Meanwhile, the results for owners and suppliers are just as compelling – reduced TCO, increased safety, improved reliability, and greater sales. The key is to choose the ideal LED products for each project. This is where American Bright brings great value.

American Bright provides LED light strips, rope lights, COB light strips, and LED modules to companies throughout the entertainment industry. Our comprehensive portfolio of stock products is just the start. Our expert engineering team has extensive experience collaborating with customers to develop the ideal custom products for their projects. Reach out to us today to find out what these products can add to your next project.

