// OLEDs: The Most Beautiful, Greenest, Thinnest Displays... with an EnLIGHTened™ Future

Organic light-emitting diode (OLED) technology takes the display and lighting industry into new dimensions in both viewing performance and lighting (energy) efficiency. Consumers seeing an OLED TV for the first time, say "it's like looking out the window with the glass missing"[1] and "the other displays look like they are covered in layers of thin gauze."[2] Because of their breath-taking beauty, "green" virtues, extremely thin form factor and durability, OLEDs will emerge in an increasing variety of new product offerings in the years to come.

The same benefits provided by today's OLED displays are also yielding new forms of lighting that promise new form factors, significant gains in power efficiency, and controllable color temperatures – all in a technology that is safer to handle and easier to recycle than today's incandescent or compact fluorescent lamps.

1 David Pogue, "TV Images to Dazzle the Jaded," New York Times, May 1, 2008.
2 Justin Peters, "A Little Piece of Heaven," Slate Magazine, May 16, 2008 (http://www.slate.com/id/2191493/).

// OLED-A Mission

OLED-A, a global not-for-profit trade organization, promotes growth and development within the OLED value chain from materials, equipment and component vendors to OEMs and ODMs to end-users.

Our Mission:

+ Serve as a primary resource of OLED information for the industry, media and investment community
+ Provide a forum for information exchange to address common industry needs
+ Drive interest in OLED products by building awareness of their value to end users
+ Develop technology road maps that focus on addressing commercialization needs and common OLED vocabulary that will serve both the industry and its customers

We regularly speak at industry and consumer events and have established a number of subcommittees to address the needs of our membership.

Our website is a repository for industry news and information – some for broad distribution and some for members only including market, technical, and competitive information.

Contact us for further information.

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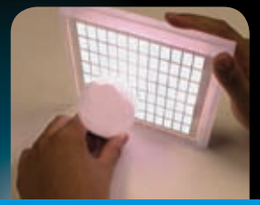
OLED ASSOCIATION

*// Making Lives **Brighter***



Courtesy of Universal Display

// Why OLEDs:

Breathtaking Beauty

+ Perfect rendition of saturated and unsaturated colors (>100% of NTSC)
+ The darkest blacks and the whitest whites resulting in the highest contrast ratios
+ Widest viewing angles with no loss of contrast ratio
+ Inherently fast refresh rate (no ghosting)

The "Green" Screen

+ Exceptional energy efficiency through use of phosphorescence translates into low power consumption
+ Manufacturing process has a small carbon signature
+ Easy handling and disposal support lower product life-cycle costs

Striking Thinness and Transparency

+ Light weight, streamlined form factor
+ Inherently transparent for use in unique applications (e.g., embedded display or light in a glass window)
+ Even thinner, conformable and flexible formats under development

Durability

+ Long-lived for today's display and niche lighting
+ Stable in very cold, as well as hot environments
+ Rugged even in high vibration conditions

Cost-effective Design and Operation

+ Thin-film, solid-state construction
+ Efficient manufacturing process takes advantage of expertise/infrastructure of existing LCD production

// OLEDs

Courtesy of Samsung

Courtesy of Eastman Kodak Company

Courtesy of Pioneer

// Taking Video Mobile

Today, OLED displays appear in a variety of consumer products including mobile phones, digital media players, digital cameras, and digital photo frames. Maybe in one of yours. In these applications, OLEDs offer a variety of advantages as compared to LCDs.

Superb Image Quality – OLEDs have it all: Excellent color quality, extremely fast response times, intrinsically wide viewing angles, and high contract ratios. These features make them great for use in many environments. Even in bright daylight, images on an OLED can be seen quite well. Simply put, OLEDs look better than LCDs!

Leading Power Efficiency – Because they use power so efficiently, batteries in your portable device will last longer than with an LCD for many video modes.

Thin and Lightweight –They are super thin and lightweight. So designers can make even more appealing gadgets for our gear bags. Also, personal displays based on OLED microdisplays for your MP3 players, and your personal video devices are here.

Durable – And OLED displays are tough, too. These solid-state devices work readily and readably in situations where LCDs don't work so well – including hot and cold environments and those where vibration can be problematic for LCDs.

Flexible – Mobile devices by their very nature have small displays. Because OLEDs are thin and intrinsically durable in a flexed configuration, these devices could be made to fold or roll and double the size of the display but maintain the same form factor.

Mobile devices with OLEDs make mobility more fun, more functional, and more focused for your busy, active life. For your next cell phone or mobile appliance purchase, ask to see one with an OLED display and compare it to an LCD. You'll see the differences immediately.

// Finally the TV of the Future

To see an OLED TV is to experience television in a whole new way. The video is crisp, even in high-speed action sequences. The colors are clear and sharply defined, and the contrast shows up subtle distinctions even in the darkest scenes. An OLED picture is simply – and breathtakingly – beautiful, superior to today's best LCDs and plasma display panels (PDPs). When the first OLED TV was introduced in late 2007, the reactions were overwhelmingly favorable. The reasons are clear.

Superior Picture Quality – With more vivid, lifelike colors, better representation of fast action video, wider viewing angles, and much higher contrast ratios, OLED TVs dramatically enhance the viewing experience. Each frame is sharp; each detail pops! That's because OLED displays naturally refresh up to a thousand times faster than an LCD. Their color gamut can exceed NTSC standards. And OLEDs feature almost 180 degree viewing angle and an inherent contrast ratio of >1,000,000:1.

High Efficiency – OLED TVs use power more efficiently than existing LCD and PDP TVs. With TVs getting larger, they are becoming an increasingly energy-intensive consumer of electricity. Purchasing power efficient TVs will save money and critical energy resources.

Never Too Thin – Much thinner and lighter weight than existing PDPs and LCDs, OLED TVs can be the thickness of a pane of glass, and with gains made in flexible electronics could get even thinner. They can also be lightweight enough so that even large OLED screens will be easily moved or hung on the wall.

Cost-effective – While the first OLED TVs hitting the market today are expensive, those prices will fall dramatically as the technology matures and volume ramps. Ultimately, OLED televisions will prove more cost-effective because they require fewer materials and fewer processing steps than LCDs and PDPs. As the process matures and larger-scale manufacturing capacity is in place, OLED TVs will be as cost-effective, if not more so, than current products.

Better picture. More power-efficient. Competitive cost. Why watch anything else?

// The EnLIGHTened™ Solution

The sun is setting. Your window begins to glow – emitting a soft light that becomes brighter as the sky outside darkens. No, it's not a sci-fi flick; it's an OLED. While OLED lighting in windows is not yet available, thin, efficient OLED lighting solutions have been demonstrated and will soon be available. So why OLED lighting?

More power-efficient – White OLEDs have the potential to be significantly more power efficient than very energy-inefficient incandescent bulbs – only 10- 15 lm/W (lumens per Watt) and mercury-containing fluorescent tubes (ranging from 50-90 lm/W, but typically operated at the lower end of this range). With a number of development programs underway, laboratory results continue to show progress – with power efficacy as high as 102 lm/W already demonstrated.

More natural white light – Incandescent bulbs emit a warm yellow-red light, and fluorescent lamps emit a cooler, bluish light. OLEDs can be made to emit a wide range of hues, including the highly prized natural white light. Add to this, OLEDs can be easily tuned to operate under very low as well as very high brightness levels. It may also be possible in the future to tune the color of white that the OLED emits.

Supporting innovative design – Built on thin sheets of glass, (and in the future possibly available on thin, flexible plastic or metallic foil substrates), OLED lighting is the first technology to offer uniform, large-area light for diffuse lighting applications. Thinner, lighter lighting panels will enable windows or panels of light rather than single points.

"Green-ing" white light – In addition to being very energy-efficient, OLEDs are themselves environmentally benign in comparison with other lighting technologies. In addition, their manufacture and end-of-life disposal requirements make OLEDs ecologically friendly – especially compared to mercury-containing compact fluorescent lamps.

OLED lights, like OLED displays, make our world a brighter and cleaner place to live and grow.