

**Editorial Backgrounder
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For more information, contact:

Martha Brounoff, Brounoff Communications
315-682-1609; broucomm@twcny.rr.com

Carlo Strippoli, TAOS, Inc.
972-673-0759, x204; cstrippoli@taosinc.com

Flat Panel Displays Are Key Focus as Electronics Industry Strives to “Go Green”

TAOS, Inc. Display Management Light Sensing Solutions Provide Means for Electronic Equipment Manufacturers to Achieve Increased Energy Efficiency

“Going green.”

It is literally impossible these days to pick up a newspaper or a magazine or turn on the television without learning about the latest efforts – often driven by government and/or industry mandates -- to “go green”

But, what does “going green” really mean?

“Going green” is a worldwide, multifaceted initiative among all levels of government, corporations of all sizes, industry associations, private citizen organizations and special interest groups to protect our planet’s environment by conserving natural resources, increasing energy conservation, reducing waste and recycling existing energy into clean, renewable and sustainable sources, thereby reducing global green house gas (GHG) emissions. Some examples of these ongoing initiatives are:

- European Union experts say up to 2 billion euros could be saved every year if each household in the 27-member Union, whose population is approximately 500 million, were to use one energy-saving light bulb. (*UPI's "Outside View"* commentary by Andrei Fedyashin, August 7, 2008)
- In August 2008, Spain introduced Europe's first plan for saving gas, diesel fuel and electricity, imposing stringent limits on speed and energy consumption. Spain is the most hydrocarbon-dependent country in Europe and imports 84 percent of its petroleum and coal. (*UPI's "Outside View"* commentary by Andrei Fedyashin, August 7, 2008)
- Californians are already among the cleanest users of energy on the planet – without crimping their suburban, car-based lifestyle. To generate each dollar of Gross Domestic Product (GDP), the state emits 20 percent fewer greenhouse gases than some of the world's greenest countries such as Germany or Denmark. (*Newsweek*, March 2, 2009 issue)
- In July 2008, the City of Syracuse, NY launched a marketing effort to nickname the city "The Emerald City" to highlight Syracuse's extensive greening efforts. (*CNY Connected*, a WCNY Publication, March/April 2009 issue)
- In 2008, Wal-Mart, acknowledged to be the world's largest corporation by revenue, announced that it has committed to supply 15 percent of its total energy usage with energy generated from wind power. (*CNY Connected*, A WCNY Publication, March/April 2009)
- The electronics industry has made a major effort on a worldwide basis to comply with government environmental regulations such as Restriction of Hazardous Substances (RoHS), Waste Electrical and Electronic Equipment (WEEE), Energy using Products (EuP), Energy Star and TCODevelopment.

Flat panel displays have become a ubiquitous component in a wide spectrum of high tech electronic products targeting the business and consumer user in the computer, consumer, industrial, medical and automotive markets. The technology, form factor and capabilities of these flat panel displays are now playing an increasing role in – and having an impact on -- driving the end user total experience. As such, flat panel displays have become an important means for manufacturers to differentiate their products in a highly competitive global market. According to market analyst DisplaySearch, worldwide leader in display market research, the total flat panel display market was approximately \$103 billion in 2008, and within that, US\$92 billion were contributed by TFT LCD, which requires the backlight unit. There were more than 2 billion units of TFT LCD, ranging from 1" to 100" shipped in 2008.

However, because flat panel displays often have the highest power consumption of any component in electronic products, there is increased focus on utilizing power-saving technologies and eco-friendly components in their design and manufacture. There are basically four ways to implement green flat panel displays:

- Green components (such as optical sensors, LED backlights, driver ICs, glass, color filter, liquid crystal and optical films)
- Green panel design
- Energy-saving production processes
- Packaging

Many manufacturers of electronic products that utilize flat panel displays are transitioning to LED (light-emitting diode) backlighting because it improves energy efficiency and enables higher contrast ratios and slimmer product designs. LED backlit displays are mercury-free, highly recyclable and generate significant energy savings as compared to cold-cathode fluorescent lamp (CCLF) technology. Display Search reports that in 2008, 20% of flat panel display shipments had green features; this share is expected to soar to 70% by 2012 and dominate the market by 2014.

Two major electronics end equipment manufacturers – Dell Computers and Samsung – recently announced plans to transition their flat panel displays to LED backlighting:

- In September 2008, Dell Computers announced plans to transition all of its new laptop displays to LED backlighting in the next 12 months. Dell estimates that at least 80% of its total laptop volume will be delivered with LEDs as a standard back-lit display by the end of 2009 and 100% in 2010. (*Electronic Engineering Times*, Gina Roos, 09/24/2009)
- At the International Consumer Electronics Show in January 2009, Samsung unveiled its lineup of new LED backlit HDTVs. During media interviews, Samsung pointed out that LED backlighting provides improved energy efficiency, higher contrast ratios and slimmer designs. Samsung also noted that it has a line of LED-backlit LCD TVs that are less than an inch thick. Samsung stressed that the slim down of its LCD TVs has been enabled by LED backlighting technology. LCD displays consume significantly less power during the equipment's product life relative to conventional CRT displays. (*LIGHTimes* staff, 01/08/2009)

“LED backlights are part of the ‘greening’ of flat panel displays, because they are mercury-free, and consume less power than traditional lamps. A key part of reducing power consumption is brightness adjustment, and ambient sensing technology can enable dynamic brightness adjustment,” noted David Hsieh, Vice President of DisplaySearch. DisplaySearch forecasts that in 2012, LED backlights will dominate notebook PC displays with 89% share, and will also take a 10% share of the LCD TV market.”

Average of Power Consumption by Display Type

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
CRT	114	110	107	100	92	91	87	91	76	72	
LCD	37	49	51	49	47	44	42	41	40	38	36

Source: PEW Center on Global Climate Change, October 23, 2008

Optoelectronic light sensing solutions are an essential component in a display management system because they enable significant reduction of overall system power consumption while delivering an enhanced user experience. Optoelectronic light sensing solutions from TAOS play a major role in the following key display management applications:

- **Ambient Light Sensing – Intensity**: Measures ambient light to control display brightness.
- **Ambient Light Sensing – Color Temperature**: Provides color temperature (and/or RGB color chromaticity) to white-color balance the display panel under various ambient conditions (over time and temperature)
- **LED Backlighting**: Manages backlight control and RGB LED backlighting using closed loop optical feedback to maintain RGB color chromaticity
- **Embedded Display Calibration**: Provides integrated display calibration using RGB color chromaticity to eliminate manual color adjustment for accurate color rendition.
- **Proximity Detection**: Detects user presence to turn on/off display.

With more than a decade of technology innovation and market leadership, Texas Advanced Optoelectronic Solutions®, Inc. (TAOS) offers the broadest family of Display Management Light Sensing Solutions for a wide range of light-centric, display-based products that include both ambient light sensing and proximity detection in a single-chip solution. The TAOS display management opto-sensors utilize state-of-the-art technology to combine precision mixed-signal functionality with photo-detectors on the same integrated circuit, simplify

analog-to-digital conversion of light and are designed to reduce the need for signal conditioning or preprocessing circuitry. These devices deliver improved display system performance, provide increased levels of system integration and functionality, and enable reduced total system power consumption while delivering an enhanced user experience.

“When TAOS brought the industry’s first digital ambient light sensor – the TSL2550 – to market in 2002, it was originally designed to increase battery life in mobile devices,” said Carlo Strippoli, TAOS vice president of marketing and sales. “However, it became clear that ambient light sensors would also play a critical role in managing power consumption for AC-powered displays as well as improving the visual experience and we developed new generations of digital ambient light sensors to fulfill these needs. TAOS is now able to leverage its optoelectronic technology leadership and IP to help manufacturers of display-based electronic products to ‘green up’ their flat panel displays.”

The TAOS family of display management light sensing solutions enables green flat panel displays through the following applications:

- **Ambient Light Sensing:**
 - Minimizes the display power and energy consumption by controlling the display brightness to suit the exact ambient light conditions
 - Extends the product life of the LCD display and reduces material waste/disposal by extending the LED lifetime through precise brightness control
- **Proximity Detection:**
 - Increased energy savings through reduced power consumption by automatically turning on/off the display as required based on detecting a user presence

TAOS display management sensor solutions are utilized in a wide-spectrum of products including:

- **Mobile phones**
- **LCD TVs**
- **LCD Monitors**
- **Notebooks/laptops/Netbooks/eBooks**
- **Digital cameras/camcorders**
- **Portable MP3/DVD players**

- **Games**
- **Portables navigation devices**
- **Multifunction printers**
- **Digital picture frames**
- **Digital signage**

The attached Table 1 provides details on the display management applications for each of the above end user products. Details on the user benefits and system benefits realized through TAOS display management sensor solutions are also included in Table 1.

The attached Table 2 provides details on the specific TAOS sensor product families that are supported for display management light sensing solutions in each of the above end user products.

“The ‘going green’ movement has helped create worldwide recognition that protecting our environment is everyone’s responsibility,” concluded Mr. Strippoli. “Ambient light sensing is emerging as a key element for improving energy efficiency in flat panel displays as the use of display-based electronic equipment becomes increasingly pervasive in all aspects of our lives. TAOS, as an ambient light sensing pioneer, will continue to develop ever more effective light sensing solutions that will bring new and expanded benefits to both manufacturers and users. When it comes to overall protection of our environment now and in the future, it is critical that such win/win situations be created and sustained.”

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About TAOS, Inc. (Texas Advanced Optoelectronic Solutions)

Texas Advanced Optoelectronic Solutions (TAOS), Inc. is based in Plano, Texas. Established in 1998, the company develops, manufactures and markets leadership integrated optoelectronic products. These devices combine precision mixed-signal functionality and photo-detectors on the same integrated circuit to produce advanced products with performance and cost advantages over conventional solutions. TAOS optoelectronic products include:

- Light-to-Digital Converters
- Light-to Frequency Converters
- Light-to-Voltage Converters
- Color Sensors
- MOS Linear Sensor Arrays
- Custom and Semi-Custom Optoelectronic Devices

More information can be found at <http://www.taosinc.com> or by phone at **972-673-0759**.

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