2009 Display Week / DYA Awards Issue

Information DISPLAY

SID

May/June 2009
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- Display of the Year Awards
- Products on Display
- Plasmaco Revisited
- *JSID* 2008 Outstanding Paper Award Winner
- *Journal of the SID* May and June Contents

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COVER: *The 2009 SID/*Information Display *Display of the Year Awards honor the best display products of 2008 for outstanding features, novel applications, or novel components that significantly enhance the performance of displays.*

CREDIT: Cover design by Acapella Studios, Inc. From top left, clockwise: Merck's PS-VA mixtures that enable a new LCD technology, Samsung's 240-Hz LCD-TV panel, Amazon's Kindle electrophoretic e-Reader, Texas Instruments' DLP Pico Chipset that enables enlarged viewing for a wide variety of mobile devices, Corning's Jade fusion glass for LTPS applications, and iZ3D's new monitor that offers flicker-free imagery for prolonged 3-D viewing. The background image was provided by Corning representing their Jade glass substrate.

Next Month in *Information Display*

3-D Technology Issue

- Adoption of 3-D-Ready TV Sets
- Next-Generation 3-D TV
- 3-D Broadcast and Recording/Playback Standards
- Understanding Gamma and Gray levels
- Just How Good is an 8-bit System?
- *Journal of the SID* July Contents

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Welcome to San Antonio

by Steve Atwood

In America, dancing has always played an important part in social gatherings, especially in the southern and southwestern parts of the United States. Among the many types of dance is one called "line dancing," in which large groups of people arranged in lines execute synchronized, well-rehearsed steps to music. This is not unique to the U.S., of course; the people in the English court of King Henry VIII engaged in line dances in the 1500s. But there is something special about line dancing as practiced in the southern U.S., and it flourishes today as a form of expression and celebration. One particular dance called the San Antonio Stroll consists of some 32 different moves and a fairly energetic choreography that requires lots of practice to master. Immortalized sometime in the 1970s, it has become synonymous with the Texas town it is named after, the place where we are all gathering for Display Week 2009. The dance has its origins in other line dances as well as square dance and it is hard to say exactly how long the San Antonio Stroll has been around, but it would be hard to imagine San Antonio without people line dancing in auditoriums or meeting halls to the signature sound of pedal steel guitars and fiddles driving the crowd along. As Display Week 2009 gets under way, we are certainly a long way from LA and facing a very different technological and economic world than we did a year ago. I know that many of you will not be at Display Week this June, constrained either by travel restrictions and smaller budgets, or maybe by the need to keep your business activities afloat while covering for a smaller staff and fewer co-workers. It's not worth trying to pretend that all is well in the industry, because it isn't. But, just as people have always practiced their favorite dances regardless of their health or economic condition, so must we keep working on the things that make us more innovative and creative as technologists. Now more than at any other time, innovation will be the hallmark of successful endeavors and there is never a shortage of new opportunities for innovation in the display business. To be innovative, you need to be inspired, and one of the ways to get inspiration is to leave your desk or lab and do the dance with all the rest of us at Display Week.

If you are new to SID, welcome! As a veteran of Display Week, I strongly encourage you to look beyond the world-class exhibition and consider all the other things going on during the week as well, including almost 500 papers, as well as the short courses, seminars, the business and investors conferences, keynotes, application tutorials, and awards luncheons. I have been attending Display Week for too many years to count, and I still treat it like a trip to Disney World. I gather the maps and schedules; I mark off the things that are most important to me; I plan my days to try to minimize down time; I coordinate with colleagues to make sure the stuff I miss is covered by someone else; and I normally turn off my cell phone because this is my week to learn and grow with the industry. Usually there are a number of events I know I want to attend, but there are also many surprises that I can only discover if I explore as much as possible.

Maybe one of the biggest benefits of Display Week is simply the chance to meet so many other colleagues from around the world that I might never have the chance to visit otherwise. My memories of previous events are rich with chance meetings with people from Europe and Asia who have become friends and trusted advisors. Meeting people face-to-face establishes a relationship that e-mail and phone calls cannot do,

(continued on page 61)

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industry news

True Green?

Part 1: Marketing and the Display Industry

by Jenny Donelan

Manufacturing, retail, food service – name an industry and you can be sure its members have been promoting their companies' environmentally responsible products and practices. Whether the subject is planting a tree for so many widgets sold, using organic cotton to make a new line of clothes, or using paper wrappers instead of polystyrene clamshells to enclose fast-food burgers, green is the color of our day. But this swift emergence of a "green conscience" among commercial entities has almost as swiftly created a backlash of "green skepticism" on the part of consumers and the media. Words like "natural" and "sustainable" are pretty easy to throw around, and there is often no way to quantify or qualify them.

The display industry is in step with the rest of the world on this issue and here as elsewhere it is no less easy to separate the hype from the reality. Every other day, it seems, the e-mail inboxes of *Information Display* receive at least one press release from a display company promoting its sustainable activities or a report from an analyst on green practices. Consider the recent Web and TV ad campaign from Apple for its new line of MacBook Pro notebooks. The battery life is longer than ever, and the display features a 60% increase in color gamut over previous generations as well as a 700:1 contrast ratio. How did Apple choose to promote the line? As "The greenest MacBook Pro ever," with the system itself displaying the requisite vibrant, green blades of grass adorned with glistening water droplets. In the past, improved battery live was touted as a convenience. Now it's also a sustainability issue. Display glass is also arsenic- and mercury-free (although Apple is not the only manufacturer to so proceed — see next month's Industry News) and described as "highly recyclable." So, is Apple guilty of hype or worthy of admiration? In fact, a bit of both.

For the display industry in general, "We are seeing two trends," says Norbert Hildebrand, analyst with Insight Media (itself holding a Green Display Expo in July 2009). "Number one is marketing hype – where existing TVs are 'painted' green. The second is that technologies really are increasing the greenness of TVs. The energy usage of large TVs is coming down. PDPs are more efficient." Are these real green initiatives? Yes. Do companies often exaggerate the truth? Of course.

Further complicating matters is that marketing hype in itself does not prove a technology less green, even if that technology or process is pre-existing . (Pretzels, low fat since forever, are now marketed as "low-fat" snacks, as if their lack of fat is a new development.) Presumably, however, it's the newer initiatives that are going to make the difference.

The rule of thumb, says Hildebrand, is that when three key criteria are met, a green initiative will be adopted: "It has to be good for the environment, good for the consumer, and good for the manufacturer," he says. "When these three things overlap, that is the initiative that is adopted first." In the United States especially, he says, "Green in itself is not a driver. No one will buy a TV that is dim and fuzzy because it's green." Bring the quality up, however, and point out the greenness and customers will come. Of course, especially when it comes to manufacturing and its processes, there are shades of green.

Next month, we will look at the specific ways that display manufacturers are changing their operations toward real sustainability, and some of the special problems this industry faces. In subsequent issues, we will examine the different ways end-user products are being designed for greater efficiency and sustainability. Last, we will check out pending legislation that is changing how the display industry does business throughout the world.

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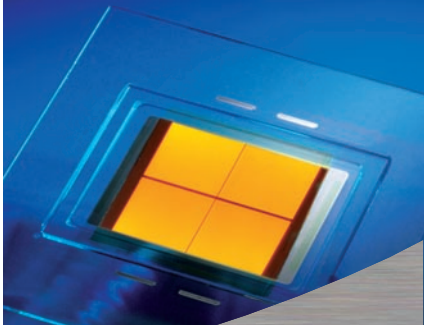

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Opportunities in China

by Paul Drzaic

President, Society for Information Display

China is growing. Anyone paying the least bit of attention to the global economy over the past few years knows this. The electronic-display industry is no exception to this trend, with a solid infrastructure for display-module manufacturing and increasing demand from the citizens of China for devices incorporating electronic displays. There is also a growing interest, and investment, in display R&D and in the manufacture of advanced display components. SID plans on being an important participant in the development of a vibrant China display industry.

Earlier this year, I spent several days in Beijing, as a first step in building a solid connection between the growing electronic-display industry in China and SID. I was accompanied by Tom Miller, the Executive Director of SID, and Dr. Shaoher Pan, Chair of the SID Membership Committee. We were hosted by Professor Baoping Wang, Director of the SID Beijing Chapter, and Vice President at Southeast University in Nanjing. Dr. Pan and Professor Wang have been working for many months to co-ordinate a meaningful set of discussions between the SID leadership and corresponding leadership in China.

Despite the cold February weather, we were shown a warm welcome. Professor Wang provided perspective on how the Chinese government has chosen electronic displays as a desirable area for growth and is working to coordinate the establishment of advanced display technology within China. We saw firsthand how local industry and universities are working together in emerging areas of display technology, such as OLEDs. Our visit included a tour arranged by Dr. Yong Qiu, who is both a Professor at Tsinghua University and Chief Scientist at Visionox. Professor Qiu showed us how the company and university have established a basic capability in the manufacture of OLED displays and are on a path to developing advanced capabilities in OLED materials and devices. We also met with Dr. Ling Wu, General Secretary of the China Solid State Lighting Alliance, who described to us the strong commitment China has made for the development and deployment of solid-state lighting. An evening tour of the Beijing Olympic Park, where the lighting for its amazing architecture – including the "Water Cube" (aquatic center), the Olympic tower, and the "Bird's Nest" stadium – comes from LEDs, was a powerful demonstration of this commitment.

The highlight of our trip was a meeting with representatives of the High-Tech R&D Center (HTRDC) from the Chinese Ministry of Science and Technology. We met with Zhimin Chen, who is Vice Director of the HTRDC, with responsibility for investment in R&D for a number of technology portfolios, including electronic displays. After getting an update on the status of several technology investment areas, we signed a Memorandum of Understanding between the HTRDC and SID to investigate areas of cooperation. SID plans to host a delegation from the HTRDC during Display Week in San Antonio.

I look forward to a growing presence for SID in China. For Chinese display researchers and industry, SID will bring the benefits and engagement that have proven beneficial to other countries involved in electronic displays. For SID, this is also an opportunity to maintain its leadership in display technology in a country that will clearly be making its presence felt in the coming years. ■

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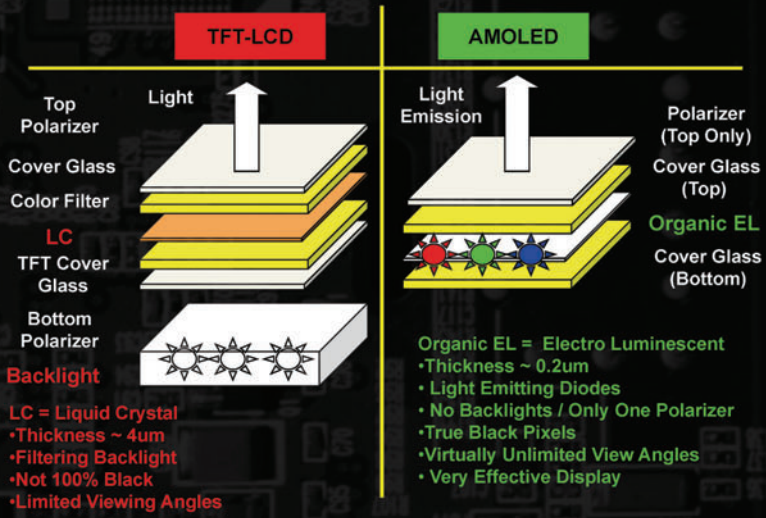

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2009 Display of the Year Award Winners

The SID Display of the Year Awards Committee selected six winners – in the categories of display of the year, display component of the year, and display application of the year – that advanced the state of the art of electronic-display technology in 2008.

by Jenny Donelan

IF THERE IS A COMMONALITY among the six winners of the SID/*Information Display* Display of the Year Awards this year, it is that they take existing technology to new levels. "The general trend," says Dick McCartney, SID's Display of the Year Committee Chair, "is an increasing sophistication of display performance that enables wholly new applications." An example, he says, is the Display Application of the Year winner, Amazon's Kindle. "Here is a way of reading books that might have been thought of as science fiction just a few years ago that is now being enabled through display technology," says McCartney. Similarly fantastic-seeming is the way that Texas Instruments reduced a chip containing thousands of micro-mechanical mirrors to a footprint smaller than a U.S. dime. The DLP Pico Chipset from TI, the Silver Award winner for Display of the Year, creates enlarged (and therefore more visible and useful) imagery from small-screen mobile displays.

The Pico Chipset is actually one of three winners this year that provide support for mobile devices. Corning's Jade fusion glass, the Gold Award winner for Display Component, is optimized for the more demanding processes necessary to create today's mobile devices. And Merck's PS-VA mixtures, the Silver Award winner in the component category, reduces backlight power consumption for LCDs, thus enabling longer-lasting battery life in mobile devices and more energy-efficient TVs.

One of the most striking examples of taking technology to the next level is the Display of the Year Gold Award winner, Samsung's 240-Hz LCD-TV panel. LCDs have evolved exponentially in every way – except that motion-image performance is still a stumbling block. Samsung's technology, however, overcomes that stumbling block, thus helping LCD TV to achieve its full potential. And the Silver Award winner in the Display Application category, the iZ3D monitor, uses liquid-crystal technology in a new way to bring the types of 3-D applications that are becoming mainstream in movie theaters into the home.

These products will be honored at a ceremony during the annual SID Luncheon, which takes place on June 3 during Display Week in San Antonio, Texas. During the ceremony, the three 2009 Gold Award winners will each present a short video about the winning product. Tickets for the luncheon cost $35 each and can be obtained at www.sid2009.org or at the show registration desk prior to June 3.

The award-winning displays, components, and applications are described as follows, based on information supplied by the winning companies.

Display of the Year

This award is granted for a display with novel and outstanding features such as new physical or chemical effects, or a new addressing method.

Gold Award: Samsung's 240-Hz LCDs

Samsung has broken new ground with the introduction of its 40-, 46-, and 52-in.-diagonal full-high-definition (FHD, 1020 × 1080) 240-Hz LCD panels. These panels deliver unprecedented motion-image performance for LCD TVs, enabling superlative image quality even for fast-action high-speed moving images. Recent increases in LCD resolution, luminance, contrast ratio, viewing angle, color gamut, and color depth have all brought LCD-TV picture quality to new levels, but motion-image performance has been widely considered to be the final obstacle between LCD TV and the ultimate viewing experience. Samsung's 240-Hz LCD panels have now removed that obstacle with a highly innovative pixel-cell structure and a new driving architecture that overcomes hold-type driving limitations inherent in LCDs and other matrix-addressed displays.

NTSC video streams provide a new frame of data 60 times per second. In Samsung's new 240-Hz panels, a motion-estimation motion-compensation (ME/MC) engine creates three interpolated frames for every one incoming frame. The three interpolated frames are inserted between each two incoming frames. Therefore, the viewer sees four times as many frames as with conventional TV, which reduces by a factor of 4 the frame-to-frame image-holding time that causes motion blur.

Motion performance of displays is characterized using the motion-picture response-time (MPRT) metric. LCDs refreshed at 60 Hz

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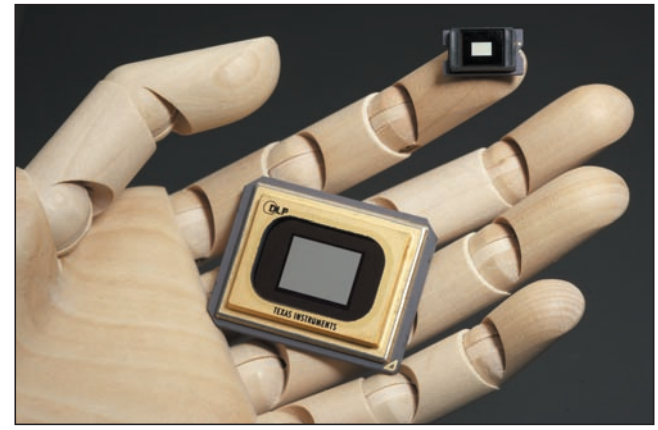
DISPLAY OF THE YEAR

Gold Award: *Samsung's 240-Hz LCD-TV panels enable groundbreaking motion-image performance that was heretofore unavailable in LCD-TV technology. The viewer sees four times as many frames as with pre-existing TVs, which has the effect of reducing by a factor of 4 the frame-to-frame image-holding time that causes motion blur. Image courtesy Samsung.*



Silver Award: *The first-generation DLP Pico Chipset from TI incorporates more than 100,000 microscopic, hinge-mounted mirrors that can project up to 50-in. diagonally in size, thus enabling enlarged viewing for a wide variety of mobile devices. Shown here is the conventionally larger DLP imager (bottom) capable of over 1 million mirrors compared to the new miniature DLP imager (top). Image courtesy Texas Instruments.*

typically deliver MPRT values at about 16 msec. This level of MPRT performance results in significant motion blur for fast-moving image sequences, especially on larger screens. In 2007, Samsung was first to market with 120-Hz panels, delivering MPRT scores of 7–8 msec, similar to that of plasma-display-panel (PDP) screens. Samsung's new 240-Hz panels deliver MPRT results on the order of 4 msec, which is a performance level comparable to that of a CRT. This type of "CRT-like" motion-image performance was previously considered unattainable on LCDs and other matrix-addressed displays.

Since the first showing of Samsung's panels at the IFA show in August 2008, other manufacturers have released pseudo-240-Hz panels that are based on a combination of 120-Hz driving and backlight blinking. Unlike those products, Samsung's panels actually update the pixel data values 240 times per second. This "true 240-Hz" design approach avoids ghosting images and other display artifacts that have been associated with the hybrid techniques.

Key technologies that enable Samsung's 240-Hz system include an advanced ME/MC interpolation architecture, new embedded-clock interface technologies to handle the higher data bandwidth between the timing controller and source boards, a new LCD panel architecture based on half-gate double-data (hG-2D) driving, and a novel pixel structure based on charge-shared super-patterned ITO vertical alignment (CS S-PVA). Samsung's CS S-PVA structure is a key enabling technology that effectively doubles the available pixel charging time, in turn allowing the 240-Hz panel's data lines to be driven cost effectively with a single bank of column drivers.

Samsung commenced mass production of its 240-Hz panels in September, 2008. Initial TV-system shipments commenced in Q4 '08. Further technical details will be presented at Display Week 2009 in San Antonio, where one of the 240-Hz panels will be on display.

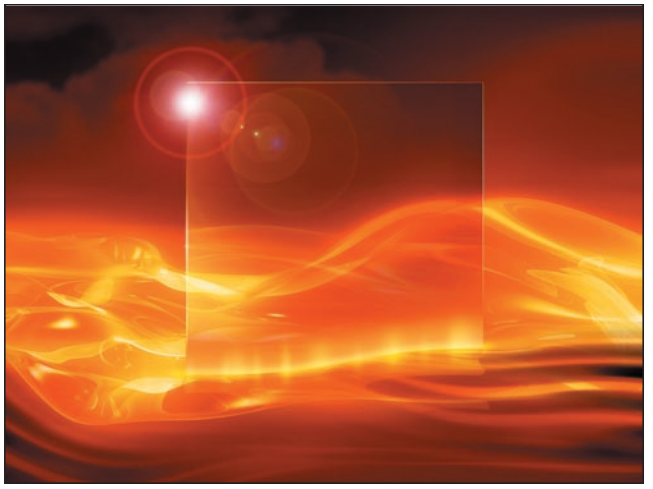
Silver Award: Texas Instruments' DLP Products – DLP Pico Chipset

Texas Instruments DLP Products has developed a way of offering large-scale viewing of the increasing amount of mobile content consumers have at their fingertips with the first generation of the DLP Pico Chipset. This new technology is so small that device manufacturers can embed DLP projectors into mobile phones and accessories, enabling enhanced viewing on the go. DLP pico technology allows users to project enlarged images, video, and Web browsing onto any flat surface. A coffee shop becomes a boardroom, a camping tent becomes a theater, and the classroom wall transforms into the newest backdrop for share-and-tell.

By utilizing unconventional light sources such as LEDs, DLP pico technology features an aperture ratio of more than 92%, tens of thousands of pixel elements, switching speeds of less than 20 µsec, and TI's DarkChip native-contrast-ratio process technology. In addition, the chipset is capable of displaying the widest color gamuts possible. Images are produced using the same technology that goes into all DLP products. Over 100,000 tiny hinge-mounted mirrors are used to project up to 50-in. diagonally in size.

The initial concept for DLP pico technology emerged about 3 years ago. With a value proposition of projecting the biggest image from the smallest box, an opportunity to expand into new categories became apparent. The DLP team looked at cell phones, handhelds, and laptops and identified limitations in

DISPLAY COMPONENT OF THE YEAR



Gold Award: *Jade fusion glass from Corning is the first glass substrate optimized for LTPS applications, which are critical for makers of small devices such as mobile phones. Image courtesy Corning.*

Silver Award: *Merck's PS-VA mixtures enable a new LCD technology that reduces backlight power, ultimately reducing power consumption for both mobile devices and TVs. Image courtesy Merck.*

screen size and viewing capabilities. For example, when checking e-mail from a smart phone, users cannot see an attachment.

The first-generation DLP Pico Chipset can be found in mobile devices, handhelds, portable media players, and notebook companions. Leading brands including Samsung, Optoma, Dell, and others have already launched products based on this technology, with additional hardware manufacturers bringing new implementations to market later this year.

Looking ahead, Texas Instruments is in a unique position to impact the future of the mobile industry with DLP pico technology by transforming individual to shared viewing environments. Whether for work or play, DLP pico technology enhances the way consumers view and digest content. The boundaries are virtually limitless, with opportunities in the health and education industries as well as entertainment.

Display Component of the Year

This award is granted for a novel component that has significantly enhanced the performance of a display. A component is sold as a separate part destined to be incorporated into a display. A component may also include display-enhancing materials and/or parts fabricated with new processes.

Gold Award: Corning's Jade Glass for Advanced Display

In January 2008, Corning launched Jade glass for advanced display, a fusion-formed glass with high thermal stability, designed for the high-end feature-rich mobile-device market. Jade works with two display technologies – low-temperature polysilicon (LTPS) applications and organic light-emitting diodes (OLEDs) – to solve some of the challenges facing the mobile-device industry. Jade is the first glass substrate optimized for LTPS. Beyond this application, Jade provides capabilities that may enable the scaling of OLEDs to large-sized TVs.

The amorphous-silicon (a-Si) process is used in the manufacture of LCDs for TVs and monitors, while the LTPS process is used by makers of displays for small devices. Compared to a-Si, the LTPS process is much more demanding in terms of temperature, surface, and dimensional requirements, and while it may seem a contradiction to talk about a high-thermal-capability glass for a process described as "low temperature," that is precisely what is needed. The LTPS process requires the glass to be very stable and not change shape. Throughout the process, the glass must also maintain a pristine surface quality. The keys are uniformity and consistency.

The primary distinction between Jade and other polysilicon glasses is that Jade needs no secondary heat treatment or polishing to meet the demanding surface and thermal stability requirements of the LTPS and OLED manufacturing processes. Previously, fusion manufacturers (including Corning) needed to heat-treat a-Si glass in order to stabilize it so that it could withstand the process – in effect, pre-shrinking the glass. Not only does this pre-treatment make the entire process more complex, it also creates the potential for the glass to change shape under high temperature, and the extra handling can degrade the surface quality of the glass.

Furthermore, if the glass was made using the float process rather than fusion, it would also need special polishing to ensure the extraordinary surface-quality demands of the polysilicon backplane. Corning knew that these extra steps could be eliminated by developing a new composition for fusion manufacturing applications. Eliminating the heat treatment preserves the benefits of a fusion-formed-glass pristine surface, excellent control of thickness and shape, flexible capacity, and reliable supply.

The end result is that Jade permits the tighter design rule needed for increased integration of electronic functionality onto the

glass. For device makers, this type of component integration means lower cost and increased design flexibility; for consumers, the end result is more-compact devices with brighter displays, higher resolution, and longer battery life.

In addition to its benefits for LTPS-LCD, Jade provides the superior surface and thermal stability required for OLED displays. One of the major technical challenges slowing the growth of the OLED industry has been polysilicon backplane performance. Because OLEDs are current-driven devices, they require a backplane with much higher performance than a conventional LCD. There are at present a number of new and exciting approaches to scaling polysilicon backplane technology for the particular requirements of OLEDs to large-sized TV. Some use microcrystalline-silicon technology. Others use new types of laser technology. What all these potentially scalable processes have in common is the need for high-temperature capability from their substrate. Jade gives customers process flexibility that can help them achieve optimized backplane performance for OLEDs.

Polysilicon has always had the promise to deliver higher-performance devices, but the limitations of LTPS technology have confined it to a small portion of the marketplace. Jade will now help move LTPS technology forward, providing increased flexibility for innovation in performance and scalability.

Silver Award: Merck's PS-VA Mixtures
Polymer-stabilized vertical-alignment (PS-VA) is a novel LCD technology that enables displays with very fast switching and very high contrast, as well as high transmission. Thus, backlight brightness can be significantly reduced, which prolongs battery lifetime in mobile devices and reduces power consumption in TV sets – making both these products "greener." Lower backlight power, as well as the PS-VA-specific LCD-electrode layout, also provide a cost benefit to LCD makers.

PS-VA technology needs very specific LC mixtures and also a specific panel-manufacturing process: in the PS-VA mixture, a small amount of polymerizable LC (reactive mesogen) is the key component. During the PS-VA process step at the panel manufacturer, that reactive mesogen is polymerized by UV light while a voltage is applied to the LCD panel. For well-chosen liquid-crystal mixture formulations, display layouts, and process conditions, a local, small deviation of the LC orientation from the vertical direction, or "tilt," is generated, which brings about the above-mentioned significant enhancements in LCD performance.

From a practical point of view, incorporating a tiny, but well-defined amount of reactive mesogen into an LC mixture is not a trivial matter, as modern displays demand the utmost purity in all materials. "Normal" LCs are basically inert, but due to the reactivity of the new component, special large-scale LC-mixture production processes and equipment as well as new quality-control methods need to be employed (while also minimizing any drawbacks in takt time and yield).

The PS-VA display principle was developed several years ago, and Merck was deeply involved in the creation of suitable materials from the beginning. Since PS-VA needs specific reactive mesogens, Merck's long-running activities with regard to reactive mesogens for optical compensation films were an important basis for this development – both from a physics as well as a chemistry point of view. Significant challenges had to be overcome in the field of materials as well as in the LCD panels, and only quite recently have PS-VA panels begun entering the market. In all cases, specifically developed innovative materials from Merck were an important key to the success.

In these first commercial products, the flexibility of the PS-VA concept has clearly been used for the optimization of very different LCD performance parameters: ultimate resolution in mobile phones, high contrast and color saturation in portable gaming devices, and ultimate static contrast in TVs. The basic strength of PS-VA is the new degree of freedom it gives to LCD design and layout – thus allowing for new solutions beyond the standard LCD modes. There is more to come, and Merck is very active in developing materials for today's and future requirements.

Display Application of the Year

This award is granted for a novel and outstanding application of a display, where the display itself is not necessarily a new device.

Gold Award: Amazon.com's Kindle 1
The Amazon Kindle is a revolutionary portable reader that wirelessly downloads books, blogs, magazines, and newspapers to a crisp, high-resolution electronic-paper display that is designed to look and read-like real paper, even in bright sunlight. Kindle uses a display technology called electronic paper that provides a sharp black-and-white screen that works by using ink, just like books and newspapers, but displays the ink particles electronically. It reflects light like ordinary paper and uses no backlight, which helps eliminate the eyestrain and glare associated with other electronic displays such as computer monitors or PDA screens.

When Amazon began the Kindle project, "we knew that we had set an audacious goal for ourselves," writes the company. "The book has been a technological stalwart since the first century and despite many attempts, there has not been another portable reader that made reading digital books better than reading physical books. If we were going to be successful, we knew that we could not try to 'outbook' the book – we had to take everything we love about books and add breakthrough conveniences. The number-one design goal for Kindle was to make it disappear. We wanted people to become so engrossed by the story within that they forget they are reading on a device." Amazon therefore created the following requirements for the project:

- Kindle had to have ubiquitous wireless access – when customers anywhere in the U.S. thought of a book, they needed to be able to have it in a minute. So Amazon built its own wireless delivery system, Amazon Whispernet, to make that possible.
- It had to offer an engrossing reading experience to make people forget they were reading on a device. According to Amazon, "we gave Kindle an electronic-paper screen that reads like real paper and a design that makes it easy to hold and navigate for long-form reading."
- Kindle could not limit people's reading options – it had to expand them. Amazon made it a complete reading device for books, newspapers, magazines, and blogs, and stocked the Kindle Store with over 260,000 book titles.
- The device had to be simple and hassle free. It requires no PC, software installation, or syncing. Kindle also has no monthly wireless bills, 2-year commitments, or service plans.

DISPLAY APPLICATION OF THE YEAR

Gold Award: *Amazon's Kindle uses electrophoretic display technology that helps users enjoy the experience of reading digital content in a unique, lightweight form factor with very long battery life. Image courtesy Amazon.*

Silver Award: *The iZ3D monitor leverages LCD technology to offer home users flicker-free imagery for comfortable prolonged 3-D viewing. Image courtesy iZ3D.*

Amazon's stated goal is to offer the world's best purpose-built reading device. The company's long-term vision for Kindle is to have every book ever published, in any language, in print or out of print, all available in less than 60 sec. It started out with 90,000 available books in 2008 and today offers over 260,000 books, plus newspapers, magazines, and blogs.

The Story Behind Electronic Paper

The electronic-paper display used by the Kindle is a proprietary material developed by E Ink Corp. that is processed into a film (called E Ink Vizplex) for integration into electronic displays. The principal components of E Ink Vizplex are millions of tiny microcapsules, about the diameter of a human hair. Each microcapsule contains positively charged white particles and negatively charged black particles suspended in a clear fluid. When a negative electric field is applied, the white particles move to the top of the microcapsule where they become visible to the user. This makes the surface appear white at that spot. At the same time, an opposite electric field pulls the black particles to the bottom of the microcapsules where they are hidden. By reversing this process, the black particles appear at the top of the capsule, which now makes the surface appear dark at that spot.

E Ink's Vizplex is ideally suited for e-books such as the Kindle, as it is a reflective technology that requires no front or backlight, is viewable under a wide range of lighting conditions, including direct sunlight, and requires no power to maintain an image.

– Information Display Staff

Silver Award: iZ3D's 3-D Monitor

In 2005, Neurok Optics decided that the autostereoscopic solutions it had been developing for monitors lacked the necessary "wow" factor for users. But the company was eager to attract a U.S. game-playing population of 100 million and encouraged by the increasing number of 3-D game titles on the market. It therefore made the decision to compromise its original goal of unaided 3-D viewing with the idea that consumers would find it preferable to wear some vision aid that enabled a 3-D "wow" factor as opposed to autostereoscopic 3-D with limited 3-D effects. Neurok then used the intrinsic electro-optical characteristics of liquid crystals to create its "iZ3D" technology with stacked panels in

which liquid-crystal material acts as a polarized light-directing valve.

The software algorithm of iZ3D's polarization-based technology creates slightly different images for the left and right eye. But unlike film with fixed polarizer angles for projectors, iZ3D controls left- and right-eye images by dynamically changing the polarity of each picture element (pixel). Left- and right-eye images are addressed and controlled simultaneously. With the software-based iZ3D image-control algorithm, the back TFT-LCD controls the intensity of the transmitted light and the front TFT-LCD controls the polarization angle of the transmitted light. In actuality, iZ3D updates images 60 times per second. However, the change to the required polarization angle is performed subpixel by subpixel. That means that for 1680 × 1050 resolution, up to 600 million subpixels are reoriented every second for each image frame change. The polarizer films on the back LCD panel determine the polarizer axis of the light as it enters the front panel. To dynamically control the light transmission of the back and the front panel, iZ3D takes advantage of liquid crystal's inherent polarizing characteristics: the liquid crystal of the front panel redirects the entering polarized light, according to the degree of the liquid-crystal twist. To control the liquid-crystal twist, an electrical field is applied. Varying the electric field, subpixel by subpixel, results in polarization angle changes for each subpixel. The specific liquid-crystal material in iZ3Ds will respond to electrical-field changes with changes in the polarization angle anywhere between 45 and 135°. This method of simultaneously addressing, controlling, and displaying left- and right-eye images creates flicker-free images for comfortable, prolonged 3-D viewing enjoyment.

One obstacle the design team encountered was that stacking TFT panels results in ~95% light loss. Neurok overcame this barrier, however, by working with engineers at Chi Mei Optoelectronics (CMO) to eliminate polarizers and color filters from the front LC panel. With this breakthrough, light efficiency, cost reduction, reliability, and viewing quality were enabled. CMO and Neurok Optics then formed a joint-venture company, iZ3D, to produce 3-D monitors.

The 22-in.-wide iZ3D monitor is a 2-D/3-D switchable display bundle that includes passive 3-D glasses and stereoscopic 3-D display drivers. The monitor is designed for work in 2-D and for single- and multiple-player gaming in 3-D. Watching 3-D movies and videos is also supported with the addition of a software stereo player. The LCD panels feature a 16:9 aspect ratio with 1680 × 1050 resolution, 300-nit luminosity, and 5-msec response time. Inputs are dual-video DVI/DVI or DVI/VGA to drive the two stacked LCD panels. The monitor works with all current graphic cards that have dual outputs.

Currently, more than 300 electronic games are available in 3-D and new 3-D movies are being released with increasing frequency. In the future, the company plans to produce larger iZ3Ds to help usher 3-D into the consumer-electronics market space. ■

It's based on a thorough knowledge of applications and how to achieve low cost of ownership for precision lithography, whether on rigid glass, flexible, or roll-to-roll substrates.

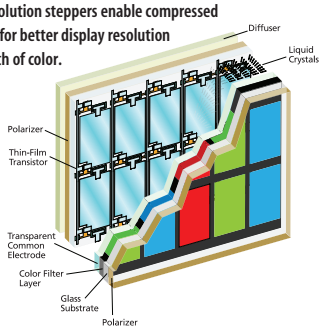
For amorphous-silicon AMLCDs, thin-film transistor backplanes are produced on glass substrates, with feature sizes down to 3 to 5 µm and overlay accuracy of ± 1 µm.

LTPS TFT-LCDs, used for PDAs and mobile smartphones, require more mask layers because of additional circuitry. Feature sizes are down to 1.5 µm, overlay accuracy is <± 0.4 µm.

For FEDs, photolithography generates precise holes in the cathode plate in which emitters are fabricated. Hole diameters range from 0.8 to 1 µm, emitter heights from 3 to 5 µm.

For X-ray sensors, as many as 10 mask layers or more with 2 µm CDs are required to produce highly uniform large area sensors. An accurate photolithographic process with precision stitching and repeatable exposure dosages is critical to generate high yields.

Amorphous-silicon AMLCD backplane showing transistor and clear aperture locations. Azores' high-resolution steppers enable compressed circuitry for better display resolution and depth of color.



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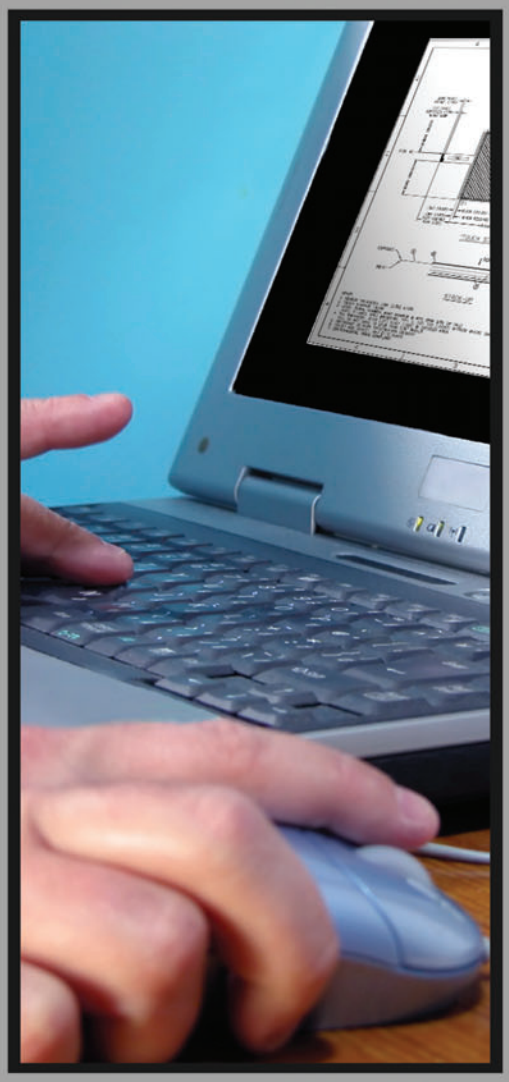

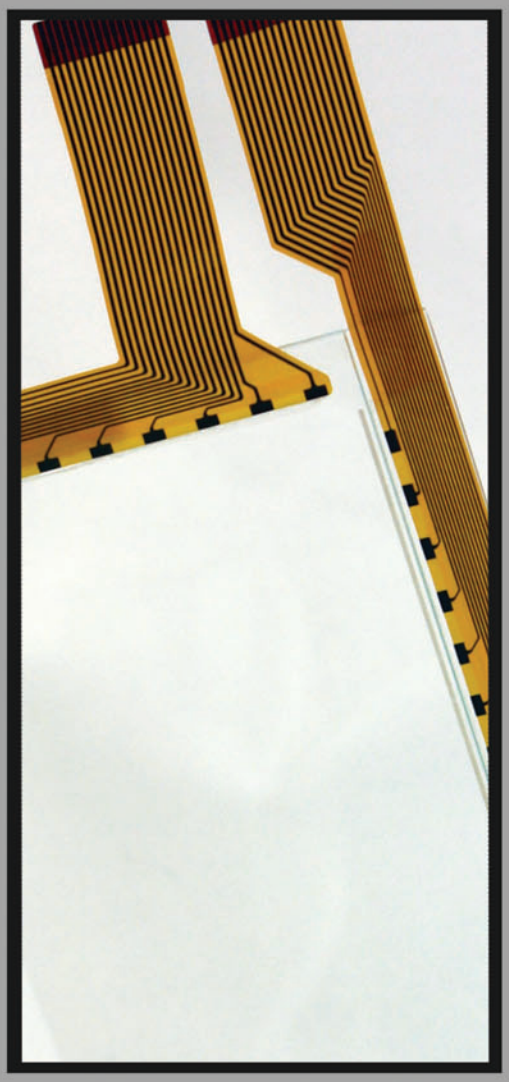

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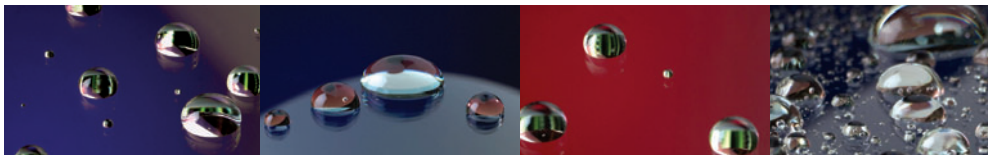

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The Plasmaco Story

Display Week was the scene of many Plasmaco milestones over the years, and so the show issue of Information Display *seems an appropriate place to look back at the tumultuous history of the little company with a disproportionately big place in overall display history.*

by Jane D. Birk

IN JUNE 2008, an important chapter of electronic-display history came to an end when parent company Panasonic closed its Highland, New York, plasma-display-panel (PDP) facility formerly known as Plasmaco. More than 20 years has passed since the start-up plasma developer established operations in a former apple-juice processing plant in rural upstate New York. There, among humble surroundings, some fairly state-of-the-art design took place, often under desperate and even heroic circumstances. Since 1987, when Plasmaco commenced operations, the company (which, for most of its existence, was independently owned) went through more turmoil, near misses, and last-minute saves than most companies two or three times its age. Plasmaco came so close to disaster so many times that its eleventh-hour triumphs must have begun to seem like certainties.

But finally, in order to consolidate plasma research and development at its main display research sites, Panasonic pulled the plug last year, shutting down the Plasmaco plant.

Plasmaco lives on, however, through the legacy of its achievements in plasma design and manufacturing. Although other companies played important roles in the development of plasma, among them Fujitsu, Pioneer, Hitachi, NEC, and NHK, tiny Plasmaco certainly had the biggest impact-to-resources ratio of them all.

Important milestones in Plasmaco's history includes its first 21-in. color plasma display in 1994, having a high-contrast ratio of 400:1, and its first high-quality 60-in.-diagonal HDTV plasma display in 1999, having a high luminance of 450 cd/m^2 and a contrast ratio of greater than 500:1. Plasmaco technology also provided the foundation for the 150-in. plasma display that Panasonic showed at CES 2008. Other Plasmaco firsts included products that used the low-energy-recovery sustain circuit

Fig. 1: *Plasmaco's 21-in. display capable of showing 24-bit-color full-motion video imagery was introduced at the Flat Information Displays Conference in December 1994.*

As a Plasmaco applications engineer for 9 years, ***Jane Birk*** *is a Display Week veteran and participated in many of the activities mentioned in this article. She is currently employed by Exscribe, Inc., a medical software development firm. She can be reached at jdbirk_2000@yahoo.com.*

0362-0972/05/2009-024$1.00 + .00 © SID 2009

(which helped make the technology commercially viable in terms of energy consumption), and the high-contrast-ratio color-display technology used in plasma TVs to this day.

The company's legacy also survives through its former employees, some of whom went on to work in Panasonic's flat-panel groups, as well as in many other areas of display technology. Over the course of its history, Plasmaco employed over 240 individuals in varying capacities and from a wide range of backgrounds.

Somewhat like Plasmaco (at least until just recently), plasma technology itself has more than once been pronounced dead, only to rise from the ashes. Even at this writing, the industry had recently consolidated, with the withdrawal of Pioneer Electronics from plasma, leading many to speculate that the technology's days are numbered. But as plasma expert and pioneer Larry Weber says, "People have been saying that for a long time." Read on.

Rural Beginnings

The history of Plasmaco is intertwined with the history of Weber, its co-founder and underlying visionary. In 1987, he was an electrical-engineering professor at the University of Illinois, trying to revive IBM's fading plasma program with new technologies invented at the university. At that time, IBM was the sole major U.S. manufacturer still involved in plasma design. Companies such as AT&T, Burroughs, NCR, Owens-Illinois, Sperry, and Texas Instruments had dropped out. In February of that year, Weber was to meet with IBM to discuss a design revival, but an ice storm delayed the meeting. By the time it could be rescheduled, IBM had already decided to close its plasma-display manufacturing operations in Kingston, New York.

Weber persevered by forming a partnership with IBM's Jim Kehoe and Everton Henriques, as well as Mike Marentic, a former graduate student of his. The team secured 6 months of financing and exclusive rights to IBM's manufacturing equipment, patents, and technology. Weber himself searched the Kingston area from his small airplane, keeping an eye out for large buildings with empty parking lots. He finally located a vacant apple-juice processing plant about 20 miles from Kingston. It might have seemed like an unlikely choice, but it was one that proved highly suitable and cost-effective. In all, it took 88 trailer truckloads to haul IBM's PDP manufacturing equipment from Kingston to the new location in Highland. A hole needed to be cut into the side of the building in order to get the equipment inside.

There, development work began in earnest, with the goal of making a big splash at the SID Symposium, Seminar, and Exhibition in California in May 1988. Time was tight: due to lack of funds, the first clean room was not constructed until a month before the show. On the Friday before SID began, work commenced on the first Plasmaco panel. The final processing was completed the next Monday morning – while the courier waited. The team finished assembling the unit in Marentic's living room in California, and Plasmaco's first display prototype made its public debut at SID, to strong positive reactions from exhibit goers.

Money Woes

The stock-market crash of October 1987 had already crippled Plasmaco's fund-raising efforts. Nonetheless, it continued developing displays that incorporated Weber's energy-recovery sustain circuitry, chip-on-glass, and independent sustain and address (ISA) technologies. A 10-in. prototype was finished and shown at SID in 1989.

After having stretched the initial 6-month financing to last over a period of 2 years, Plasmaco finally secured major financing in August 1989, enabling it to begin manufacturing. Just as production of 10-in.-diagonal displays was getting under way, however, a mid-1991 European recession constrained the market (Europe was the biggest market for the displays at the time). Plasmaco then introduced a 21-in. high-resolution display in 1991, but it, along with its 10-in. counterpart, met with limited acceptance due to the increasing availability and affordability of color LCDs.

In 1993, financial hardships led Plasmaco's board of directors to fire three of the company's founders. Only Weber, as chief technology officer, remained from the original management team. A renowned turnaround expert was brought in, but in Weber's words, the expert "turned around and left" after 6 weeks. The board then asked Weber to step up as acting CEO and to lay off half the dedicated workforce.

At the same time, an audit revealed that it cost $1750 to make one of Plasmaco's 10-in. panels, which sold for $500, so production was terminated. Funds were then in shorter supply than ever.

In January of 1994, refusing to give up, Weber devised a way to manufacture 21-in. color plasma displays using the company's existing monochrome equipment. The goal was to demo the display at the next SID sym-

Fig. 2: *Plasmaco co-founder Larry Weber poses on a golf course next to one of the company's 60-in. plasma panels. Image: Will Faller.*

posium in 1994, only 5 months away. The catch was that $80,000 was needed for development materials, and although $80,000 does not seem like all that much, it was more than anyone wanted to give Plasmaco at the time.

Two investors eventually came through with the money, but only after Weber had put up a considerable sum from his own personal funds. In the meantime, Plasmaco's bank was threatening to foreclose on loans. Weber came up with a novel solution. He approached the bank and said that if the company were foreclosed on, the bank would get almost nothing from the sale of Plasmaco's aging equipment. However, if the bank allowed the continuation of the color-display development, its rewards would be much greater. As a condition of forestalling foreclosure, Weber agreed that a color panel would be shown at SID 1994. If not, foreclosure proceedings would be reinstated immediately.

Color development work commenced, day and night. In a finish that was tight even by Plasmaco standards, the panel was completed just 2 hours before the end of the exhibition. That 21-in. display showed only a simple color-bar pattern, but due to its bright image and high-contrast ratio, caused considerable excitement at the conference.

Nonetheless, the following months were among the company's darkest. The SID showing had prevented foreclosure, but the company was still out of money. Plasmaco owed nearly everyone. The electric and telephone companies threatened to cut off service, and most of the company's employees were put on a 2-day work week to reduce expenses. Development continued, however. An improved Plasmaco 21-in. display, showing a 24-bit-color full-motion video image, was first publicly exhibited at the Flat Information Displays Conference in December 1994 (Fig. 1).

Brighter Days

Earlier that same year (September 1994), a group of venture capitalists had been impressed enough by the color-display progress to provide enough money to allow Plasmaco once again to avoid foreclosure. These venture capitalists then helped Plasmaco find a larger and more long-term source of funding, in the shape of a joint development agreement with Panasonic (then Matsushita Electric Industrial Co.). The company's staff returned to full-time status, and at the 1995 SID show, Plasmaco demonstrated a display with double the brightness and four times the contrast ratio of competing displays. In January of 1996, Panasonic bought Plasmaco, retaining Weber as president and CEO.

Fig. 3: *The company's 60-in. prototypes were used extensively to promote HDTV around the start of the millennium.*

The first challenge was to construct a 42-in. display to exhibit at the Japan Electronics show in October 1996. Suddenly, Plasmaco's existing equipment was inadequate. Staff members rallied to obtain new equipment, create a new clean room, and put in the requisite overtime so that the display could be unveiled in Japan. (It was completed an hour before shipping.)

Until that time, panels were produced using most of the same equipment that Plasmaco had acquired from IBM many years earlier. On one plant tour, a visitor commented that much of the equipment was "antique" compared to that in other FPD facilities. To improve productivity and achieve ever-larger panel sizes, over the next few years new, modern equipment was commissioned and acquired, but it was not easy to come by – in fact, what Plasmaco's engineers wanted often did not exist. In many cases, the equipment specified by Plasmaco engineers was the first of its type or scale to be fabricated, pushing the envelope of what was possible and paving the way for the equipment that is now standard in PDP plants throughout the world.

60-in. PDP Development

Panasonic's goal was for Plasmaco to deliver its first 60-in. panels for display at the Japan Electronics Show in October 1999. However, Plasmaco was determined to have the panels debut even earlier, at the SID exhibition in May of that year.

Most events featuring Plasmaco PDP prototypes were accompanied by at least one Plasmaco engineer on hand to make "last minute" adjustments or repairs. At SID 1999 in Anaheim, California, 10 engineers and numerous spare parts were on standby as Plasmaco prepared to exhibit its first 60-in. display. Many long hours were spent setting up, making last-minute changes, swapping-out circuit boards, and tweaking circuits. The hard work paid off, and the 60-in. displays performed flawlessly throughout the show (Fig. 2).

Even though Plasmaco continued development of its 60-in. PDPs, they were never commercially produced. However, they played a major part in promoting the technology. In addition to SID, the 60-in. prototype panels were exhibited at over 30 events worldwide over the next 2 years and were featured as part of Panasonic's PDP marketing efforts, attracting considerable attention from potential customers, competitors, and the general public.

These "proof of concept" PDPs demonstrated that PDPs could be both big and bright and helped spur the display industry – both PDPs and LCDs – to achieve even larger, brighter, and higher-resolution panels.

In 2003, Plasmaco developed a 61-in. PDP that became a commercial product, sold on a limited basis by Panasonic's consumer PDP division. It was exhibited by Panasonic at the 2004 Consumer Electronics Show and served as the prototype for the 65-in. PDP that Panasonic introduced to the market later that same year.

Promoting HDTV

As is obvious today, large-format PDPs are intrinsically suited to display high-definition television. However, at the time the first HD-PDPs were being developed, few people outside development labs and high-end professional studios had even seen large-screen HDTV, much less understood its potential. The power of the format just was not clear when it was viewed on 37-in. CRTs from a distance, which was how most people had been exposed to it.

As broadcast HDTV made its entrance, Plasmaco (along with Panasonic) helped to promote the format to a wider audience through providing its 60-in. HDTV PDP prototypes to events produced by major HDTV innovators (Fig. 3). Among these were an HDTV conference hosted by the BBC near London and attended by TV leaders from throughout Europe, exhibitions at the 2000 presidential conventions sponsored by NHK, and ABC TV's initial HDTV broadcasts of "Monday Night Football" during the 1999–2000 season.

These "seeing is believing" events, viewed by industry leaders, government officials, the press, celebrities, and ordinary citizens, helped demonstrate the advantages of HDTV over conventional broadcasting. At each demo, people were amazed at the clarity of minute details – such as the expressions on the players' faces that were now clearly visible through the HDTV transmissions. During one early ABC "Monday Night Football" event, viewers were entranced by the sight of crickets on the field prior to kick-off – something that would never have been visible in an NTSC broadcast.

From Prototype to $1000 at Wal-Mart

When Plasmaco's first large-format (42-in. plus) PDPs were introduced at SID, CES, and other shows, one of the questions often asked by attendees was "When will we be able to purchase it for $1000 at Wal-Mart?" This question was often asked with more than a touch of sarcasm. Back then, Plasmaco's stock answer, which was based on no particular knowledge, was "about 10 years from now." That "prediction" has come true – today 42-in. or larger PDPs are available at major "big box" and online retailers at or below the $1000 price point.

At the time that Plasmaco helped demonstrate large-screen high-definition television, "The PDP industry was creating what soon became the world's largest market for displays," says Weber. Of course, these efforts did not go unnoticed by the LCD industry, he notes. Once a rarity, large PDP and LCD panels are now ubiquitous – not only are they a routine sight in public and commercial venues such as malls, super markets, airports, and hotel lobbies, but they are major players in the mainstream television marketplace. The electronics departments of all major retailers today feature a large array of LCD and PDP televisions – with few CRT-based TVs in sight.

The End of the Story?

In 2004, Larry Weber retired as president of Plasmaco. During his tenure as Plasmaco's leader, he oversaw efforts to bring PDPs from an academic concept at the University of Illinois during the 1960s to a viable and profitable consumer-electronics product. Today, Panasonic is the world's largest maker of plasma TVs, demonstrating 103-in. models in 2007 and 150-in. models in 2008. LCDs currently have the upper hand in terms of sales, but plasma is still strongest in the larger diagonals.

The "human element" of the company must also be acknowledged. Plasmaco's success was a direct result of the varied talents of the many people it employed, built upon the foundation laid by the vision, leadership, and contributions of its original founders, including Weber. Their leadership in forming and sustaining the company during often difficult times was essential in the early stages and formed the basis for the "can-do" attitude the company demonstrated throughout the years.

As for Weber, he is currently involved in PDP research, working on low-power plasma technology in his basement. He says the story of plasma definitely isn't over. Certainly the entrepreneurial spirit of Plasmaco lives on. Stay tuned. ■

For a more detailed accounting of the company's history, from founding through its purchase by Panasonic in 1997, see "The Perils of Plasmaco" in the December 1997 issue of Information Display *magazine.)*

Mixed Media

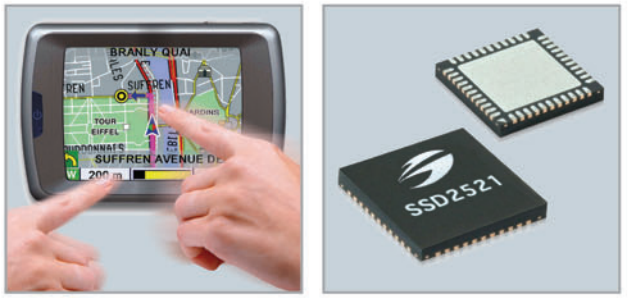
One little-known but eye-catching PDP application was at the request of one of Panasonic's advertising executives. His vision was to have a wall-mounted PDP showing a video of a fish pond dripping water out of the panel to an actual pond below. Plasmaco was asked to make this display for the Panasonic consumer electronics division's sales meeting (Phoenix, 1998), which was done by fabricating a special wall-mount for the PDP and routing a piece of vinyl tubing to run water "through" the panel. The display was duplicated later in a storefront window at Rockefeller Center in New York City, where it remained for several months.

Actual water dripped "through" the bottom corner of a plasma panel in this specially designed installation. Jane Birk, the author of the article, appears in the picture.

Capacitive touch panel controller

Eric Ng
Solomon Systech Limited

A user-friendly interface is always a successful factor of a handheld product design and the touch panel is probably a most welcome solution that provides substantial flexibility for a fancy interface design. Generally, resistive touch panels are adopted in touch interface designs, but are increasingly changing to capacitive touch panels due to the benefits of better durability and higher optical clarity. Besides these physical advantages, capacitive touch panels scale new heights in realizing multi-touch application, which has changed the perception of the touch panel interface. With such distinctive features, the capacitive touch panel will become a mainstream touch technology and bring the market lots of innovative touch interface designs.



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SSD2521 is capable to detect maximum 4 fingers movement and enables user to operate the system more than a click. With the Multi-Touch feature, many more fascinating functions can be created!

To fulfill the market needs, Solomon Systech introduced the touch interface solution, SSD2521 which is a capacitive touch panel controller. This controller integrates all the necessary components and functions into a single chip such as power circuits, panel driving and sensing circuits, high resolution ADC, fast response signal processor and finger tracking unit. To support high accuracy and fast touch detection, the controller adopts several arithmetic algorithms for finger extraction and tracking. It can track up to a maximum four fingers simultaneously and report the absolute coordinate of each finger. In addition, it can detect individual touch incidents and events based on the tracked finger coordinates. SSD2521 supports true multi-touch and can drive up to 5" capacitive touch panels on a WVGA display. SSD2521 is an easy-to-use touch panel controller with excellent cost performance efficiency.

Module cost saving solution - OLED Driver with built-in charge pump from Solomon Systech

Ada Ng
Solomon Systech Limited

Solomon Systech Limited, a world leader in OLED display driver technology, is proud to present the SSD1306, an OLED Driver designed for saving total system cost. With only three capacitors and built-in charge pump, the SSD1306 can support the OLED module at high performance using a low voltage supply (3.3V~4.2V). Moreover, SSD1306 is value-added with an intelligent content scrolling function, which allows size-limited panels to display infinite content.

SSD1306 supports resolutions of up to 128x64 and has intelligent display features for applications such as USB thumb drives, watches, mobile phones and MP3 players.

SSD1306 demonstration

Table 1: System cost comparison between SSD1306 and traditional driver IC.

OLED driver operating voltage supply circuit	SSD1306	Traditional driver IC
External components	3 capacitors	DC-DC converter, Inductor, MOSFET, Schottky Diode, Resistors, Capacitors
PCB layout	Minimized PCB space for 3 capacitors	Large PCB space for whole external DC-DC circuit

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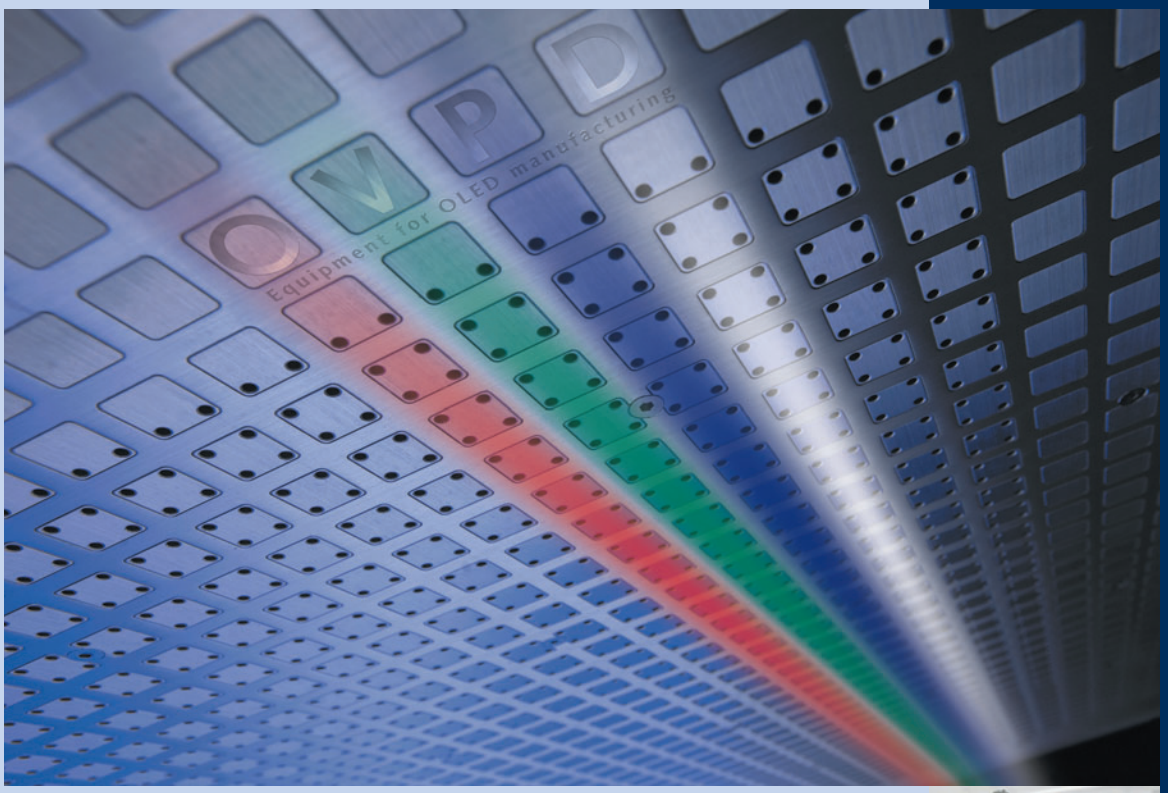

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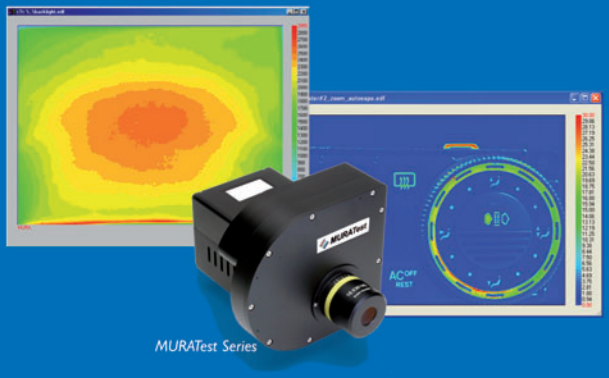

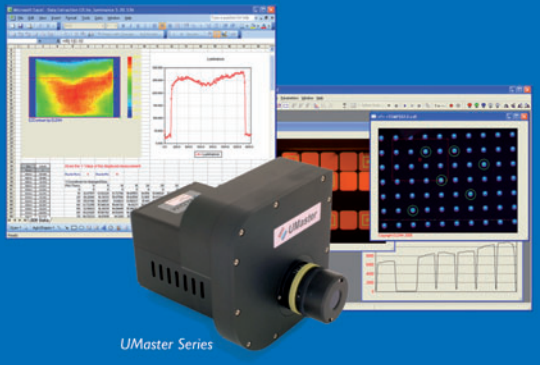

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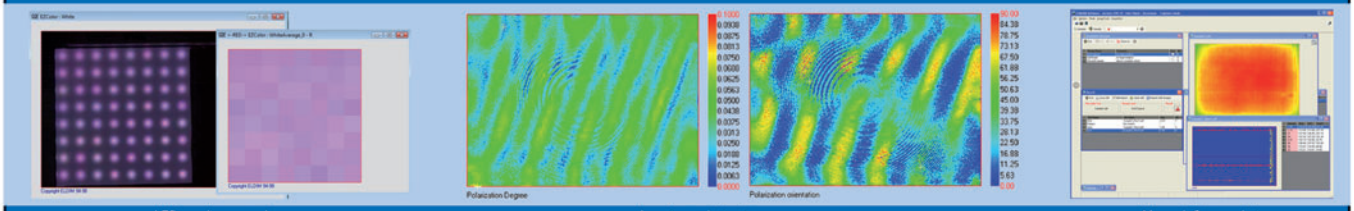

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ELDIM

Products on Display at SID 2009

Some of the products on display at North America's largest electronic-display exhibition are previewed.

by The Editorial Staff

THE SID 2009 International Symposium, Seminar, and Exhibition (Display Week 2009) will be held at the Henry B. Gonzalez Convention Center in San Antonio, Texas, the week of May 31. For 3 days, June 2–4, leading manufacturers will present the latest displays, display components, and display systems. To present a preview of the show, we invited the exhibitors to highlight their offerings. The following is based on their responses.

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Saint Paul, MN 651/733-3497
www.vikuiti.com
Booth 203

Brightness-enhancement film for notebooks

3M's newest notebook film – the Vikuiti™ Brightness-Enhancement Film (BEF-RP NB) – combines a reflective polarizer with a prism film that is only 225 µm thick. The film enables displays that are 90 µm thinner than using two separate films and also provides a wider viewing angle. Furthermore, the BEF-RP NB film reduces power consumption in backlights so it can be readily available for other uses, such as CPU power or extended battery life.

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www.adhesivesresearch.com
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Electrically conductive pressure-sensitive adhesives (PSAs) from Adhesives Research are used in the electronic field for electrical interconnection and assembly, thermal management, EMI/RFI shielding and grounding, and static dissipation and control. The PSAs instantly provide a thin, uniform bond line to increase the functionality of products by delivering the required essential bonding and conductive properties. Easy-to-use PSA tapes may be customized by modifying the adhesive chemistry, forms and constructions, and adhesive thickness.

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Booth 618

Sunlight-readable touch panel

RayShine Photonics Corp., a pioneer in the field of optical technology, will introduce at SID 2009 its latest innovation in sunlight-readable technology: the DRT-TRIO Touch™ and 4H polarizer. The DRT-TRIO Touch™, based on the RT-TRIO Touch (sunlight-readable touch panel) from RayShine, offers unparalleled sunlight-readable performance (≤4% reflection) and great durability, being impervious to flames, dirt, water, chemical solvents, and fingerprints, with a surface hardness of up to 7H. The durability of the 4H polarizer makes it suitable for almost any rugged outdoor environment, and it is compatible with most LCD sizes.

For daily display industry news, visit www.informationdisplay.org

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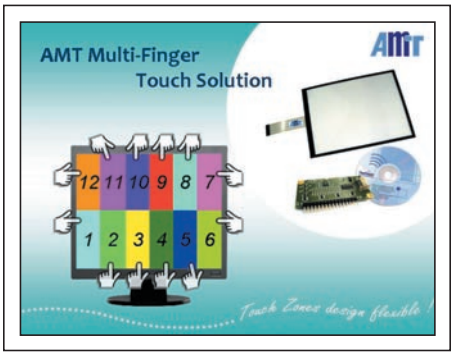
AED's LED Backlight Kits upgrade existing CCFL backlit LCD panels to high-efficiency high-brightness sunlight-readable displays. For example, a 12.1-in. LCD panel at 1200 nits with 10 W of power can be increased to 1600 nits with 15 W of power and up to 2200 nits with 24 W of power. No active cooling is required up to 1600 nits. Also in production are 15- and 19-in. LCD panel kits with more sizes available on request.

APEX MATERIAL TECHNOLOGY CORP.
Taipei, Taiwan +886-2-2664-8138
www.amtouch.com.tw
Booth 682

Multi-touch solutions

AMT will feature two multiple-touch solutions: one involves resistive technology and the other capacitive technology. The resistive multiple-touch solution is the AMT MF (Multi-Finger) touch screen driven by the PenMount controller board/IC chip and its in-house developed driver. The MF touch screen is capable of supporting up to 12 finger touches simultaneously on one single touch screen. This previously inconceivable concept of multiple touches on a resistive touch screen is now a reality. The MF touch screen, designable from 3 to 22 in. on the diagonal, is most in demand from the industrial sector with applications requiring touch functions that allow more than one finger touch for safety and confirmation purposes. The capacitive multiple-touch solution is the projected capacitive type supported by the PenMount controller and driver. AMT's capacitive multiple-touch solution is designable from 3 to 15 in. on the diagonal and allows for two-finger touch with gesture recognition supported.



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Booth 245

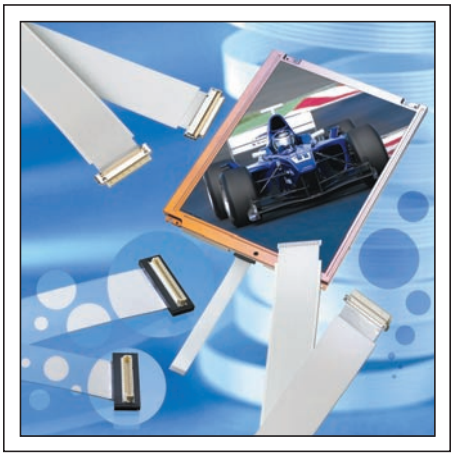
Haptic acutuators

Artificial Muscle's new smartTOUCH haptic actuators revolutionize tactile feedback and vibratory applications by enabling a whole new world of alternatives to traditional actuator technologies. The smartTOUCH SDS-100 Development System provides programmable control over the "fidelity" of the haptics signal and includes a sample selection of waveform types with variable frequency, duration, and amplitude as well as pre-loaded applications. The SDS-100 enables programming of haptics effects into products ranging from the latest handheld multimedia devices to medical instrumentation displays to toys offering a wide dynamic range of configurable localized haptics effects. Shielded flat Cables for LVDS displays also available.

AXON' CABLE & INTERCONNECT
Schaumburg, IL 972/516-2966
www.axoncable.com
Booth 464

LVDS shielded flat cables

Axon' Cable is offering LVDS shielded flat cables with a pitch of 1.00 mm, consisting of a 100-Ω flat flexible cable with 30 conductors in tin, copper, or gold plating, insulated with polyester tapes and terminated with FI-X connectors. Axon' also offers 0.50-mm-pitch 100-Ω shielded flat cables with 41 or 51 conductors terminated with connectors compatible with FI-R connectors. The LVDS shielded flat cables are an alternative to twisted pairs and miniature coaxial cable featuring lower cost and better performance (perfect 100-Ω impedance, better eye-pattern results). Equipped with appropriate connectors, the cables can work at up to 1 Gbit. The shielding of these cables is a result of a ground plane grounded on the connector, reducing crosstalk and assuring a constant impedance of 100 Ω for a very stable picture transmission.



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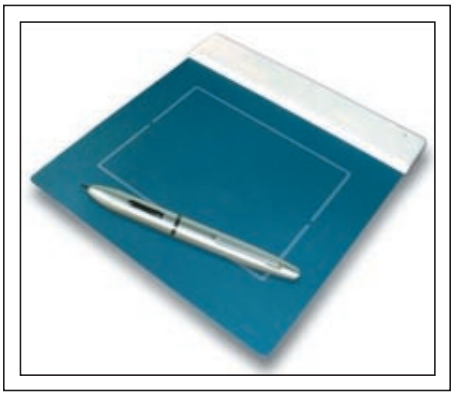


BREAULT RESEARCH ORGANIZATION (BRO)
Tucson, AZ 520/721-0500
www.breault.com
Booth 619

Optical design software

BRO's ASAP® is an optical-design program that unites geometrical and physical optics with full 3-D models of optical and mechanical systems. Over 20 years of continuous development allows ASAP to simulate the actual physics of optical systems. ASAP offers optical-system designers unmatched capability, flexibility, speed, and accuracy that predicts the real-world performance of automotive lighting, bio-optic systems, coherent systems, displays, imaging systems, lightpipes, luminaires, medical devices, as well as other systems.

For Industry News, New Products, Forthcoming Articles, and Continually Updated Conference Calendar, see ***www.sid.org***

CHROMA ATE
Irvine, CA 949/421-0355
www.chromaus.com
Booth 242

Programmable video pattern generator

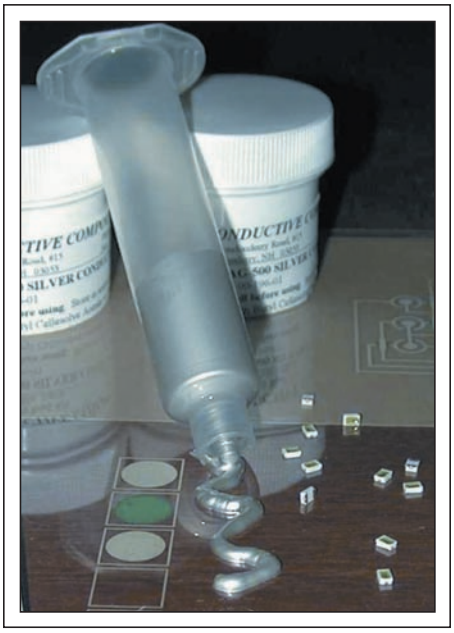
The Chroma 2234 video pattern generator provides high-frequency digital and analog signals and multiple outputs to meet the needs of FPD applications. It supports the latest HDMI and DisplayPort standards with higher bandwidth and color depth. For the application of multiple tests, the Chroma 2234 supports DVI Dual HDCP tests and various audio/video formats with 1080p resolution. It is a must for R&D, production test, and quality assurance in video and related industries.

Have you forgotten about this issue? Log onto informationdisplay.org and click "ID Archive."

CONDUCTIVE COMPOUNDS
Hudson, NH 603/595-6221
www.conductivecompounds.com
Booth 336

Conductive epoxy adhesive

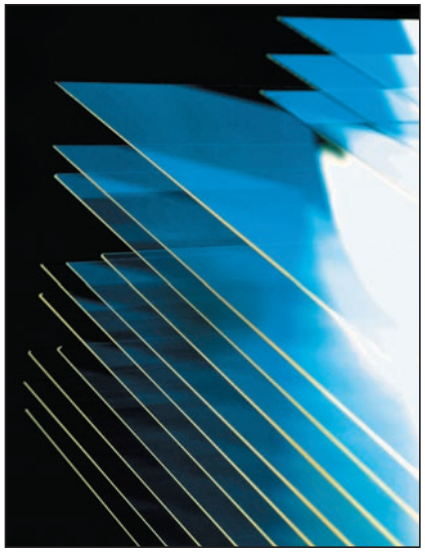
Conductive Compounds manufactures EP-600 silver-filled two-part epoxy adhesive for attaching components such as resistors, LEDs, and grounding wires to metal, metal oxide, or temperature-sensitive polymer substrates. EP-600 cures quickly at low temperatures and works in high-speed dot-dispense and screen-printing processes. EP-600's slight elasticity allows for differences in thermal expansion and for flexing and bending substrates without fracturing surface-mount joints. EP-600 is ideal for electrically connecting layers in EL panels, touch screens and other glass substrate or polymer film applications.



CORNING INCORPORATED
Corning, NY 607/974-8741
www.corning.com
Booth 453

Gen 10 glass substrates

Corning will feature green-laser technology for portable microprojectors, a Gen 10 glass substrate, and silicon-on-glass technology, as well as information on Jade™ glass for advanced displays, the company's environmentally friendly EAGLE XG™ glass substrates, and Gorilla™ glass, a highly durable, scratch-resistant protective cover glass for LCDs.



CPFILMS
Canoga Park, CA 818/678-1420
www.cpfilms.com
Booth 747

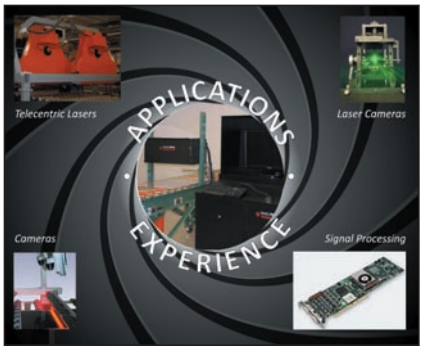
Specialty coated films

CPFilms, a subsidiary of Solutia, Inc., is showcasing its newest products for the electronic-display market, including LTMF20 low tack, optically clear protective masking film, produced in a clean room; high reflection "Invisible ITO" film which matches the substrates color after etching, as well as eliminates obvious signs of etching while creating a smooth appearance; and "Low Color b" ITO film which provides a neutral to bluish appearance on touch screens, with transmission b < 0 and VLT greater than 85%. CPFilms is the only converting company under one roof capable of providing optically clear adhesives and laminates, silicone release, aluminum and metal sputtered, and deep dyed films.

DARK FIELD TECHNOLOGIES
Orange, CT 203/298-0731
www.darkfield.com
Booth 642

Inspection system

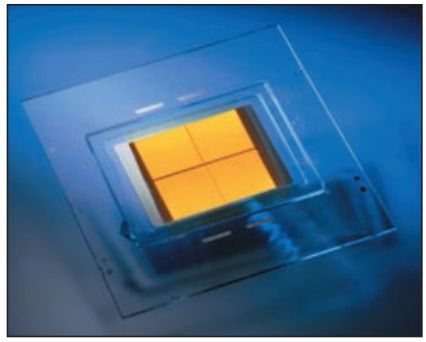
Dark Field Technologies will introduce NxtGen™, a versatile inspection system. Representing the confluence of laser and camera technologies, NxtGen™ revolutionizes inspection technology by offering a unique array of capabilities, including high performance; design convergence of laser, camera, and self-aligning optical systems; patented, self-aligning optical systems; multiple optical channels; variable field scanners deliver extraordinary detection; and 100% U.S. developed, engineered, manufactured, and serviced.



DELO INDUSTRIAL ADHESIVES
Windach, Germany +49-8193-9900-264
www.DELO.de
Booth 542

Sealants for flexible displays

DELO Industrial Adhesives has recently developed highly efficient sealants for flexible displays used in e-reader applications: A variety of sealants with different flexibilities and low water-vapor transmission rates (WVTR) is available. The sealants can be used either as edge seal or as lamination adhesive. Because of a special photoinitiator system, they can be cured not only with UV but also with visible light. Furthermore, DELO and Merck will present new adhesives for OLED applications within the scope of their strategic partnership in the field of OLED technology. The OLED encapsulation compounds offer the lowest WVTR values combined with high glass adhesion and an extraordinary durability under high temperature und high humidity conditions.



DELTA
Hoersholm, Denmark +45-20-90-53-37
www.delta.dk/icam
Booth 376

2-D colorimeter

Delta will feature the ICAM, a filter-based high-accuracy 2-D colorimeter that measures absolute color and luminance. Temporal measurements even in fractions of a frame period are possible, and parameters such as color and luminance uniformity, image sticking, contrast ratio, and color gamut can be measured at a glance. The ICAM Viewer, especially for measuring e-paper, will also be featured.

DIGITAL VIEW
Morgan Hill, CA 408/782-7773
www.digitalview.com
Booth 583

LCD controller and image-enhancement board

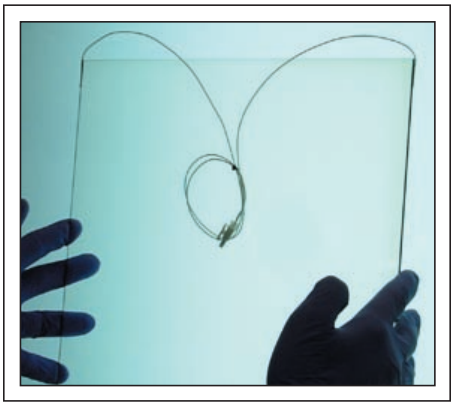
Digital View announces the SVX-1920 LCD controller and IE-1000 Image Enhancement board. The SVX-1920 features support for 6-, 8- and 10-bit panels from VGA to WUXGA resolution. Input signals include HDMI, DVI, ARGB, and YPbPr. The IE-1000 adapter adds support for 120-Hz panels. The Motion Adaptive Sharpness Control eliminates film judder and motion-compensated

frame interpolation that reduces latency blur caused by LCD response time. This board works with both 8- and 10-bit panels and can be used in conjunction with either the SVH-1290 or the new SVX-1920. The SVX-1920 and IE-1000 solution will be demonstrated with a 120-Hz panel from NEC.

DONTECH, INC.
Doylestown, PA 215/348-5010
www.dontech.com
Booth 264

Transparent heaters

Dontech's Therma Klear™ transparent heaters provide the warmth necessary to extend the operating temperature of LCDs in cold environments (*e.g.*, from 0° to below –40°C) and for the anti-fog, anti-icing, and de-icing of optics and optical displays. A Therma Klear heater is composed of an electrically conductive thin-film coating on a visually transparent substrate. When current flows across the coating, it generates heat. Dontech manufactures heaters using different types of crystalline materials (*e.g.*, zinc sulfide or germanium), glass, acrylic, and polycarbonate substrates. Applications include avionic displays, vehicle displays, mobile computers, kiosks, and handheld devices. Custom shapes are available in sizes up to 42 in. on the diameter.



E INK
Cambridge, MA 617/499-6030
www.eink.com
Booth 681

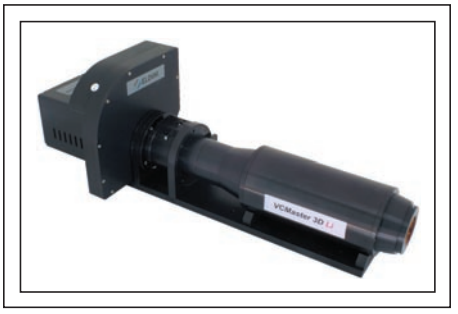
Imaging-film-based displays

E Ink will be showcasing Vizplex™ displays. The battery-life gauge on these displays is always on without draining the battery. The segmented display can be easily integrated on any product that contains multi-cell batteries. The lightweight, rugged, plastic display cells can be shaped to any two-dimensional size to best suits the industrial design of any product.

ELDIM S.A.
Herouville, Saint Clair, France
+33-2-31-94-76-00
www.eldim.fr
Booth 234

Optical characterization of 3-D displays

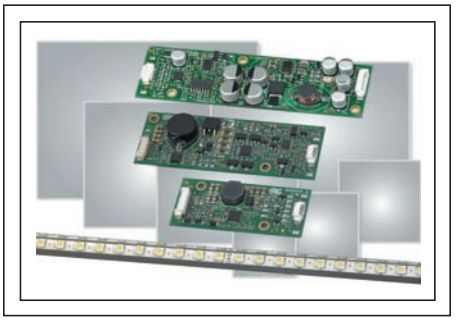
Optical characterization of 3-D displays is mandatory in order to optimize performances and to make efficient comparisons between them. Most sophisticated techniques such as goniometers or Fourier optics instruments have been used in a restricted way, analyzing only one single cross section in the observer space. From this limited information, different parameters have been defined such as 3-D crosstalk, optimum viewing distance, and viewing freedom that gives a first evaluation of the performances of a twin-view 3-D display. ELDIM's VCMaster 3D device features an ultra-high angular resolution for precise characterization of the 3-D contents regardless of the technology. The VCMaster 3D also includes brand new software tools specific to this technology.



ENDICOTT RESEARCH GROUP (ERG)
Endicott, NY 607/754-9187
www.ergpower.com
Booth 470

New family of LED backlight drivers

ERG's Smart Force™ family of LED Drivers provide full-function power supplies for LED-backlit LCDs and can be used with ERG's LED rails with proprietary thermal-management design. These plug-and-play drivers provide a wide input voltage range that maintains a constant current to maximize LED backlight lifetime. Included are the SFDM (Mini) – only 0.96 in. (24.4 mm) × 2.19 in. (55.6 mm) and <5 mm high – and the SFDE (economy), with an outstanding cost/performance ratio. ERG offers the widest selection of drivers matched to OEM LED-backlit LCDs. The company's new online cross-reference guide contains of nearly 75 different driver boards for more than 100 OEM panels from major manufacturers.



EVAPORATED COATINGS
Willow Grove, PA 215/659-3080
www.evaporatedcoatings.com
Booth 365

Conductive coatings

ECI manufactures ITO, transparent gold, and other conductive coating designs. These films are used for EMI/RFI shielding, LCD fabrication, and ESD static dissipation. ECI's coatings are deposited to customer-specified Ω/sq. and transmission requirements on glass and polymer substrates featuring a resistivity of 4–1000 Ω/sq., typical transmission > 90% at visible spectrum. Coatings meet the durability of MIL-C-48497.

FALCON DESIGN AND MANUFACTURING
Shawnee Mission, KS 913/492-1066
www.falcondesignmfg.com
Booth 238

Screen-printed control panels and overlays

Falcon Design and Manufacturing produces screen-printed control panels, overlays, decals, and membrane switches for the OEM market. Falcon introduced the look of "jewel tone" printing on a variety of substrates that have won awards in the industry. Falcon uses an assortment of transparent and opaque inks to make unique, durable, well-designed panels and overlays.

FLAT DISPLAY TECHNOLOGY CORP.
Taipei, Taiwan +886-2-2392-6960
www.fdt.com.tw
Booth 371

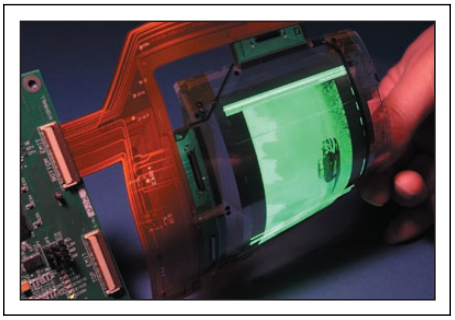
TFT-LCD modules

FDT provides various functional integration of 2.5–15-in. TFT-LCD modules for applications such as touch panels, multimedia card readers, sunlight readability, firmware, mechanical integration, *etc*. Products have features such as wide operational temperature, long operation time, and a fastened metal frame that could be applied to AV products, industrial equipment, instruments, medical devices, *etc*. Providers of sunlight-readable solutions based on different requirements. Industrial-application TFT-LCD graphic modules are also available.

FLEXIBLE DISPLAY CENTER
Tempe, AZ 480/727-8936
www.flexdisplay.asu.edu
Booth 523

Flexible QVGA OLED display

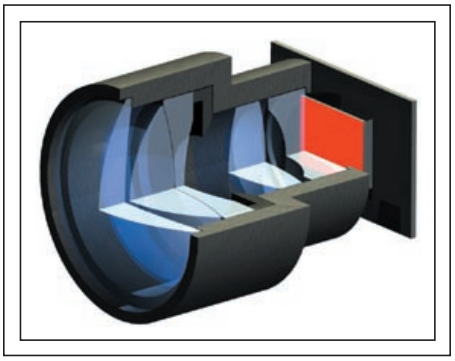
The Flexible Display Center (FDC) at Arizona State University will introduce the first flexible a-Si:H active-matrix OLED display fabricated directly on temporary bonded plastic. The 4.1-in.-diagonal monochrome QVGA OLED display is manufactured on DuPont Teijin's polyethylene naphthalate (PEN) substrate material. The FDC's proprietary bond–debond technology enables the manufacture of flexible AMOLED devices using conventional tools and manufacturing processes. Universal Display Corp. (UDC) integrated the FDC backplane designed for their PHOLED material to produce the display. The luminous efficiency of the display is 37 cd/A at 1000 nits.



FRAUNHOFER INSTITUTE FOR APPLIED OPTICS AND PRECISION ENGINEERING
Jena, Germany +49-3641-807-236
www.iof.fraunhofer.de
Booth 200-3 (German Pavillion)

OLED projection system

The newly developed Nano Projector is based on a highly efficient OLED microdisplay. In contrast to present pico projection systems based on LCOS or DLP microdisplays, the OLED projection system needs no additional light source. This advantage leads to a minimization of system volume and energy consumption. The Nano Projector generates a picture with a diagonal of 150 mm and has a total size of less than 10 cm^3. A demonstrator of the system will be presented at Display Week.



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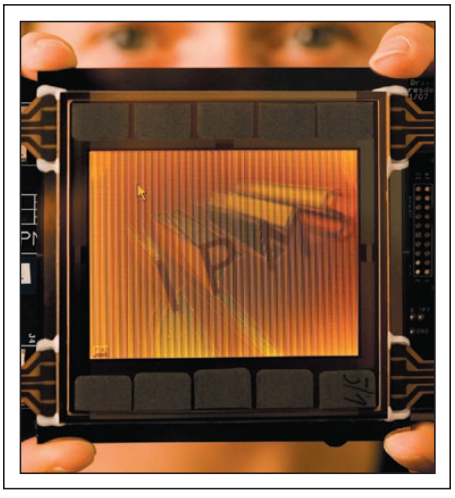
www.informationdisplay.org

FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS (FRAUNHOFER IPMS)
Dresden, Germany +49-35-1882-3238
www.ipms.fraunhofer.de
Booth 101-4 (German Pavillion)

Bi-directional microdisplay (OLED on CMOS)

At DisplayWeek 2009, Fraunhofer IPMS will present an advanced version of a bi-directional microdisplay as well as a possible application in a head-mounted display. For the first time ever, OLEDs and OLED-on-CMOS integration offer the possibility to integrate highly efficient light sources with photodetectors on a single CMOS chip. This enables monolithically integrated optoelectronic applications based on standard silicon. Besides classic optoelectronic sensor applications, this also enables innovative solutions for personalized information systems. One of them is the so-called bi-directional microdisplay, *i.e.*, an element that displays an image and acts as a camera at the same time by interleaving display pixels and photodetectors in a mosaic style. This provides visual information to the user, at the same time the device is capable of sensing eye movements of the user.



FRANHOFER HHI
Berlin, Germany +49-30-3100-2345
www.hhi.fhg.de
Booth 101-3

Digital desktop 3-D displays

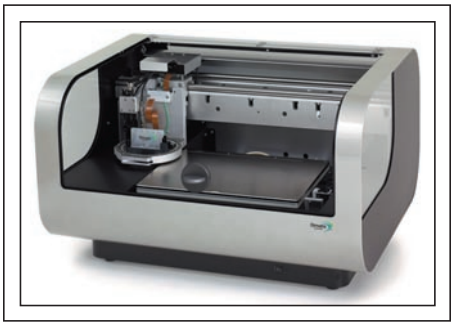
With the Free2C_digital display, an approach for the manufacturing of spatial-representing low-cost desktop 3-D displays has been developed. A large sweet spot and electronical tracking allow the user a comfortable freedom of movement. Development setups from 10.6 to 24 in. image diagonals have been built. Content and comfort are similar important as good image quality and depth sensation. The

interface box of the Free2C_digital provides both the capability to process multi-synchrony signals and compatibility that enables the representation of almost stereo application on Free2C_digital displays with different resolutions. Anti-alias filtering improves the readability of text and preserves the finest details.

FUJIFILM DIMATIX
Santa Clara, CA 408/565-0670
www.dimatix.com
Booth 408

R&D ink-jet printer for electronic materials

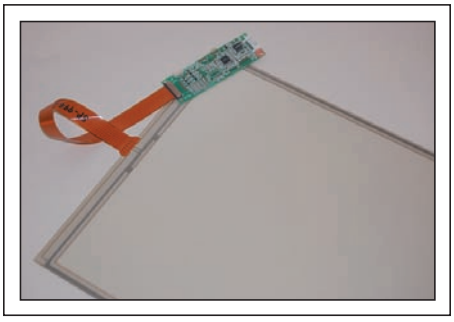
Accelerated development in ink-jet-printing research and development of printed electronic materials has been made possible by using the Dimatix Materials Printer (DMP). The DMP enables precision fluid deposition with a disposable piezoelectric ink-jet cartridge. It is a cost-effective easy-to-use tool that is utilized for process development of displays, wearable electronics, and flexible circuits, allowing new materials and products to enter the market more rapidly.



FUJITSU COMPONENTS AMERICA
Sunnyvale, CA 408/745-4924
www.fcai.fujitsu.com
Booth 671

5-wire touch panel

Fujitsu Components America will introduce a new 5-wire resistive touch panel featuring a minimum operating life of 35 million touches, narrow frame border (*e.g.*, 9 mm for 15-in. sizes) and improved edge-area linearity performance. Specifications include sizes from 10.4 to 17 in., a transmissivity of 80–85%, an operating environment of from –20 to +60°C, and a relative humidity of 20–90%. Complete support is offered including USB controller, cables, and driver software. Fujitsu's initial release is a 15-in. panel for 4:3 displays.



GENERAL DIGITAL CORP.
South Windsor, CT 860/282-2900 x145
www.generaldigital.com
Booth 128

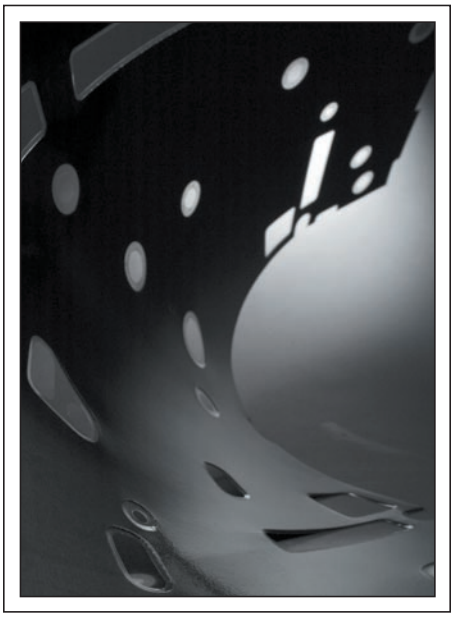
LED backlights

General Digital's rugged LCD monitors are now available with LED-backlit displays. LED backlights have numerous beneficial properties: high tolerance to shock and vibration; they easily operate at temperatures as low as –40° C; their low voltage allows high-altitude operation with no risk of arcing; their low infrared signature makes them ideal for NVIS applications; they have low power consumption and thus low heat emissions; they contain no mercury; and they require no inverters. In the event of an individual LED failure, the unique LED-backlight design ensures continued usable operation.

GRAFTECH INTERNATIONAL LTD.
Parma, OH 216/676-2538
www.graftech.com
Booth 243

2-D heat spreaders

Made from natural graphite, eGRAF® SPREADERSHIELD™ products distribute heat evenly while providing thermal insulation through the thickness. This unique combination of spreading and shielding properties make natural graphite an excellent material choice for thermal solutions. SPREADERSHIELD products are offered in a variety of engineered in-plane thermal conductivities from 300–500 W/m-K. By eliminating heavy thermal solutions, SPREADERSHIELD products have enabled slimmer product design and reduced product weights by up to 50%.



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iREX TECHNOLOGIES BV
Eindhoven, The Netherlands +31-40-85-14650
www.irextechnologies.com
Booth 471

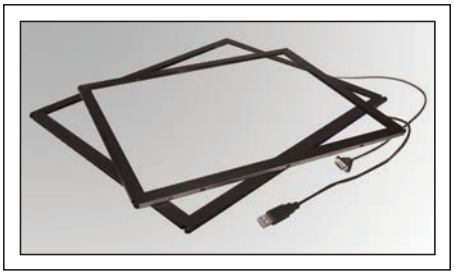
Digital readers

The iRex Digital Reader series, featuring an extra large 10.2-in. display and a sleek and lightweight design, are the world's largest e-readers. Thanks to the amazingly paper-like electronic-paper display, reading from the screen is as sharp and natural as reading ink on paper and nothing like the strain and glare of a computer screen.

IRTOUCH SYSTEMS CO.
Beijing, China 650/585-2195
www.irtouch.com
Booth 764

Slim-profile infrared touch screens

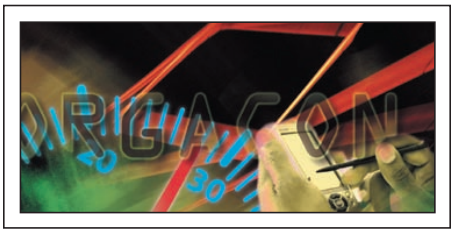
IRTOUCH Systems offers slim-profile infrared touch screens for easy integration into LCDs. E-series supports from 6.4 to 19-in. and the W- and T-series supports from 24 to 52 in. They benefit from the robust infrared touch technology and are ideal for rugged and demanding environments offering scratch-free, drift-free, total transparency, shock resistance, glove/hand/any object activation, as well as long product lifetime. They offer ideal support for POS, ATM, industrial control, kiosks, medical, gaming, in-vehicle displays, and marine applications.



ITO AMERICA
Tempe, AZ 480/998-2250
www.ito-group.com
Booth 567

Conductive polymer products

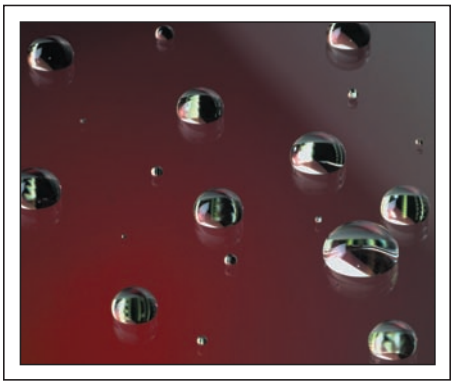
Ito America is now a U.S. distributor of Orgacon™, the trade name for Agfa Materials' conductive polymer product line. The Orgacon™ line covers a wide range of products designed for different applications such as EL lamps, touch pads, touch screens, displays, dashboard panels, *etc*. Ito produces coating solutions, printing inks, as well as highly transparent conductive films. The six key properties of Orgacon™ products are conductivity, transparency, printability, flexibility, formability (cold and thermo), and patternability.



JDSU
Milpitas, CA 408/546-4327
www.jdsu.com
Booth 753

HEA performance-enhancing top coat

Using their PrintFree™ top coat, JDSU eliminates the conventional tradeoff of a high-performance HEA coating – its sensitivity to contamination when foreign substances adhere to the coating. PrintFree eliminates this tradeoff by enhancing HEA performance with a surface that repels fingerprints, water, oil, and chemicals. It is chemically bonded directly to the optical layer of the HEA coating, allowing it to maintain low reflectivity. The durable, inert PrintFree top surface is ideal for information displays – without the tradeoff.



KENT DISPLAYS, INC.
Kent, OH 330/673-8784
www.kentdisplays.com
Booth 265

No-power LCDs

Kent Displays will feature Reflex bistable LCDs which do not require power to maintain an image and are flexible, reflective, rugged, and thin. These features, coupled with superior optical characteristics including sunlight readability and wide viewing angles, open the door to myriad new display applications from electronic paper to electronic skins! Reflex displays also represent our commitment to Push Green™ by offering more-sustainable solutions through technology innovation. When used in conventional paper and backlit-LCD applications, Reflex displays improve sustainability by reducing energy consumption and conserving natural resources.

KOPIN CORP.
Westborough, MA 508/870-5959
www.kopin.com
Booth 646

Ultra-compact binocular display module

Kopin's new BDM-308K is an ultra-compact binocular display module with a 432 × 240 full-color resolution. The 16:9-format displays provide a wide-screen TV viewing experience (a virtual 40-in. screen viewed from a 7-ft. distance). The BDM-308K integrates two pre-aligned Kopin CyberDisplay® 308K color displays, LED backlights, and a pair of high-quality lenses. Video eyewear manufacturers can easily incorporate the compact BDM-308K into their video eyewear products. Video eyewear incorporating the BDM-308K will be ideal for watching TV or movies on the go.

LASER FOCUS WORLD
Nashua, NH 603/891-9231
www.laserfocusworld.com
Booth 272 (Publications Booth)

Laser Focus World

Displays, OLEDs, optics, lasers, optoelectronics, applied vision, software, and hardware ... whatever the need, we cover it all! Find out why scientists, engineers, industry executives, and manufacturers worldwide rely on *Laser Focus World* magazine to cover the technologies and applications vital to the optoelectronics and photonics industry.

MICROVISION
Auburn, CA 530/888-8344
www.microvsn.com
Booth 627

Display measurement systems

Microvision will demonstrate its latest innovation in automated display testing systems, the SS400 series. The SS400 series includes several hardware advancements such as USB-controlled 16-bit spectrometers and 12-bit CCD cameras. New software includes improved response-time measurements, an ISO 9241-300 test suite, and a TCO 5.0 test suite. The response-time software includes motion-blur measurements such as MPRT, blur edge time, moving edge response time, and blur edge width. The ISO 9241-300 and TCO 5.0 suites test in full accordance to their respective ergonomics standard. Also included is a spreadsheet report that shows all computations and final pass/fail results.

MICROVISION, INC.
Redmond, WA 425/415-6668
www.microvision.com
Booth 759

Laser pico projector

Microvision, Inc., will be demonstrating the SHOW WX, a pre-production consumer accessory laser pico projector which delivers stunningly colorful, bright, vivid, and detailed images. Combining ultra-thin pocket-sized convenience with the power to project large DVD-quality images, SHOW WX is the world's first laser pico projector to use Microvision's PicoPT Display Engine technology. Requiring neither projection lenses nor focal adjustment, SHOW WX images are always in focus, regardless of projection distance-producing widescreen images as small as 6 in. to as large as 100 in. across. The production version of this plug-n-play pico projector is expected in 2009.

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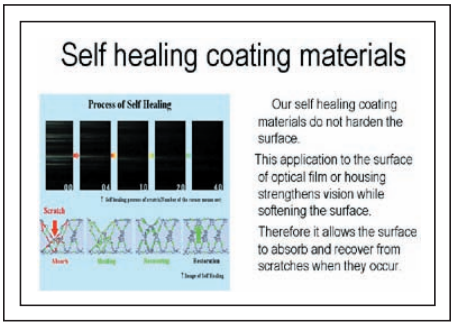
NAGASE AMERICA CORP.
Santa Clara, CA 408/567-9728
www.nagase.co.jp/english
Booth 359

Self-healing coating materials

Nagase America's self-healing coating materials do not harden the surface. This application to the surface of optical film or housing strengthens vision while softening the surface. Therefore, it allows the surface to absorb and recover from scratches when they occur.



NISSHA USA
Schaumburg, IL 847/525-7851
www.nissha.co.jp/english
Booth 442

Touch-input devices

Nissha's touch input devices are highly regarded for their high-precision technology and functionality. Nissha uses state-of-the-art photomechanical process techniques to create touch-input devices. The main product, the conventional resistive-type FineTouch "Classic," is widely used in displays in PDAs, portable game devices, mobile phones, car navigation systems, video cameras, *etc*. Then,

the decorative resistive-type FineTouch "Touch-Window®" was created by merging the FineTouch "Classic" with our decorative printing technology. It expands the degree of freedom in product design by an approach unique only to a printing company.

N-TRIG
Kfar Saba IL, Israel +972-9-799-616
www.n-trig.com
Booth 479

Digitizers

N-trig is the provider of DuoSense™ digitizer technology, the combined pen, touch, and multi-touch interface for advanced computers. Providing the most technologically advanced digitizer on the market, N-trig sets the stage for OEMs to introduce computer products that offer an intuitive, Hands-on™, and interactive experience. DuoSense digitizers are easily integratable on top of any LCD and keep devices slim, light, and bright. N-trig's technology can be implemented in a broad range of products from small notebooks to large-format LCDs and can support a variety of applications, including mobile computing, gaming, graphic and industrial design, entertainment, all-in-one, and multimedia.

OPTREX AMERICA
Plymouth, MI 734/781-4879
www.optrex.com
Booth 765

LED-backlit TFT-LCD modules

Optrex's newly developed 9-in. WVGA TFT-LCD features in-plane-switching (IPS) technology, with viewing angles of 85/85/85/85º. It has a slim design with a thickness of only 9 mm. It offers a luminance of 400 cd/m^2, contrast ratio of 700:1, operating temperature range from -30 to 80ºC, standard LVDS interface, and long-lifetime LED backlight (60 khours). A conventional TN-mode version is also available, which features a viewing angle of 80/80/60/80º, a contrast ratio 600:1, and a luminance of 600 cd/m^2. Optrex has introduced many TFT-LCD modules with LED backlighting in sizes of 3.0, 3.5, 5.7, 6.5, 8.4, 12.1, and 15.0 in.

OPTRONIC LABORATORIES
Orlando, FL 407/422-3171 x206
www.olinet.com
Booth 476

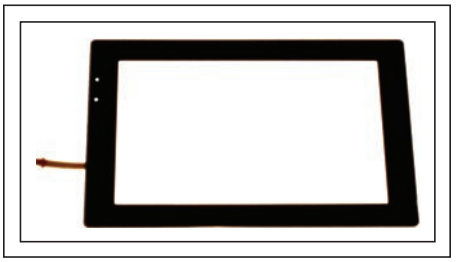
Night-vision-display test and measurement system

Optronic Laboratories' OL 770-NVS Night Vision Display Test and Measurement System offers a complete solution for the measurement of NVG-compatible lighting and displays. The system features multi-channel detection for ultra-fast measurements while exceeding all MIL-L-86762A Appendix B requirements. It is portable and lightweight, and offers a choice of measurement modes. The software is capable of all calculations currently required and is easily extended to new requirements. Seamless integration with Microsoft Excel™ and Word™ provides powerful extensions to data collection and reporting. The Windows 2000/XP compatible software allows for turnkey automated operation.

PANJIT TOUCH SCREENS
Tempe, AZ 480/379-2802
www.panjit.com
Booth 867

Touch window

PanJit Touch Screens will introduce Touch Window, an integrated solution for interactive display applications, offering a broad range custom-tailored solutions that meet or exceed project specifications. Features include no edge effects, completely flat surface with better visual effect, bezel-less designs, shapes and sizes, a variety of decorative printing, and substrate flexibility for glass or PC.



PERFORMANCE COATINGS INTERNATIONAL
West Caldwell, NJ 973/227-5401
www.vueguard.com
Booth 653

Scratch-resistant coating for molded plastics

Performance Coatings International (PCI) will display its new Vueguard® 801 WC scratch and abrasion resistant coating at Display Week 2009. Vueguard® 801 WC is a water-clear solvent-based UV-curable coating that maintains optical clarity on molded plastics. In tests using PC steel wool (type 0000 at 50 psi, 25 revolutions), the scratch resistance of the plastic surface is increased by 5000%. It can be applied via spray, dip, spin, and flow processes.

PHOTO RESEARCH
Chatsworth, CA 818/725-9750 x125
www.photoresearch.com
Booth 404

Cooled detector spectroradiometers

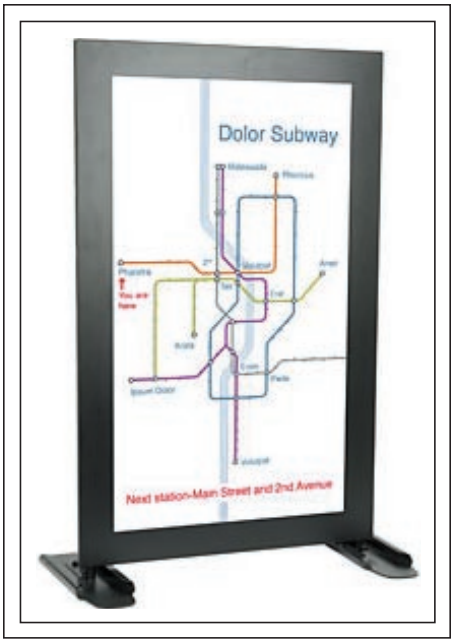
Photo Research will feature their new cooled detector PR-730/735 SpectraScan spectroradiometers having a sensitivity of more than 0.0001 fL) with virtually no polarization error (<0.2%) and stray light (<0.1%), resulting in more apertures (up to eight automated); twice as many detectors (512);

added USB, RS-232, and Bluetooth interfaces; a full-color touch-screen display; SD-card measurement storage (thousands of measurements); and a Li-ion rechargeable battery. The PR-730 measures from 380 to 780 nm (380–1100 nm for the PR-735) with a resolution of 0.781 nm/pixel.

PLANAR SYSTEMS
Beaverton, OR 503/748-5886
www.planar.com
Booth 577

TFT display enhancements

Planar's TFT display enhancement capabilities will be demonstrated on a 32-in. TFT monitor at Display Week. This display is very power-friendly, utilizing only 9.5 W/nit. A maximum luminance of 800 nits has been achieved. The fiber-optic video and control interface is ideal for widely dispersed digital signage and TEMPEST-driven applications.



RADIANT IMAGING
Redmond, WA 425/844-0152
www.radiantimaging.com
Booth 249

Light and color measurement system

Radiant Imaging addresses multiple light and color measurement requirements for display design, development, and production with their Imaging Sphere™ systems. By using a novel optical configuration to allow their ProMetric® Imaging color imeters to "see" a sample from all directions in a hemisphere simultaneously, the Imaging Sphere can be configured to measure display viewing-angle performance – including brightness and color variations. The Imaging Sphere can also be equipped with a light source that enables the measurement of the reflectance and transmission of films, such as BEF or anti-reflection coatings, and other display components.

ROCKWELL COLLINS
Cedar Rapids, IA 319/295-5933
www.rockwellcollins.com
Booth 643

Ruggedized modules

Rockwell Collins brings the latest advances in ruggedized modules utilizing our innovative dry-film optical-bonding capability. Modules are available in common sizes from 8.4 to 17 in. Options include bonding of anti-reflective (AR)/anti-glare (AG)/anti-smudge coated glass, low reflectance resistive or capacitive touch screens, specialty films, and LED brightness enhancements. Our environmentally friendly optical bonding technology is well suited for applications that require demanding optical or environmental performance and applications requiring precision alignment of multiple substrates. This technology, also available for licensing, is ideal for high-volume bonding of small displays.

SAMSUNG LCD BUSINESS
San Jose, CA 408/544-4212
www.samsung.com
Booth 318

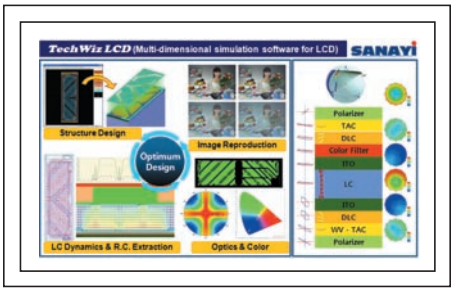
Soluble oxide TFT-LCD

Samsung will be exhibiting the world's first 4-in. TFT-LCD that uses oxide TFTs derived from a solution process. Most oxide TFT-LCDs used up to now have utilized conventional sputtering processes for the semiconductor layer deposition. Samsung fabricated its new oxide TFTs by spin-coating a solution of zinc tin oxide (ZnSnO) semiconductors and then applying a thermal annealing process. Soluble oxide semiconductors are a promising candidate for future LCD manufacturing (similar to organic semiconductors). They are easily patterned in a low-cost printing process. The new panel has a resolution of 240 × 320 lines (4-in., qVGA, 100 ppi) and a TFT-array mobility of 0.6 cm^2/V-sec, which is higher than that of a-Si TFT panels. Samsung is going to develop its soluble oxide TFT as a new TFT technology for use in manufacturing low-cost large-sized TFT-LCDs in the near future.

SANAYI SYSTEM CO.
Incheon, Korea +82-32-254-2520
www.sanayisystem.com
Booth 344

Simulation software

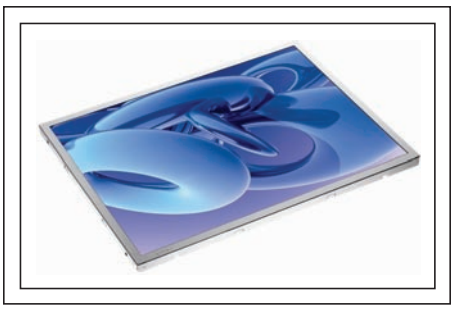
Sanayi System Co. provides simulation software for 3D and 1D TechWiz LCDs. Products and services cover the design and optimization of all LCD electrical and optical characteristics. Data exchange functions can be used with various measurement instruments for higher reliability.



SHARP MICROELECTRONICS
Camas, WA 360/834-8024
www.sharpsma.com
Booth 421

15-in. LED-backlit TFT-LCD module

Sharp's new 15-in. TFT-LCD module adds yet another size option to their growing line of LED-backlit displays. The new LQ150X1LG82 delivers a long operating life of 50,000 hours, extending customers' investment with greater uptime and fewer service calls. LED backlights also require less energy to operate, enabling new design advancements and lighter environmental impact. This landscape-mode panel delivers a 550:1 contrast ratio, brightness of 350 nits, and a fast response time of 8 msec. The module also features anti-glare and hard-coating for viewability and durability in demanding environments.



SHELDAHL
Northfield, MN 507/663-8564
www.sheldahl.com
Booth 261

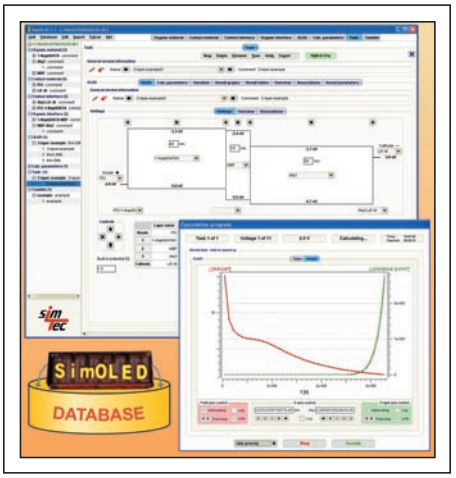
Specialty materials

Sheldahl Optical Materials is pleased to showcase their complete family of specialty materials to support the display, touch screen, and flexible-display markets at the Display Week 2009. Products include vacuum-deposited transparent coatings of ITO on a variety of flexible film substrates for the resistive and capacitive touch screen, EMI shielding, flat-panel, and EL-display markets. Sheldahl will showcase their world-class manufacturing facility offering high-resolution roll-to-roll patterned ITO coatings, screen printing, material laminations, and component assembly options.

sim4tec GmbH
Dresden, Germany +49-(0)-351-446-6499
www.sim4tec.com
Booth 101

OLED device simulator

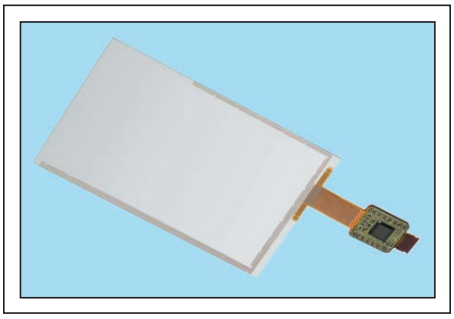
sim4tec GmbH, a provider of numerical simulation software for organic electronics, will feature version 1.1 of the OLED simulation software SimOLED®. The device simulator SimOLED® can model the complete optoelectrical characteristics of multilayered OLEDs (*e.g.*, current density, luminance, and efficiency), including special effects such as carrier and emitter doping, exciplex states, and exciton quenching. Version 1.1 includes our completely redesigned data visualization tool. The first results of the beta version of SimOLED® Optics, where spectrally and angularly resolved emission as well as color coordinates of OLEDs can be simulated, will be shown.



SMK ELECTRONICS CORP.
Chula Vista, CA 619/216-6477
www.smkusa.com
Booth 473

Capacitive touch screen

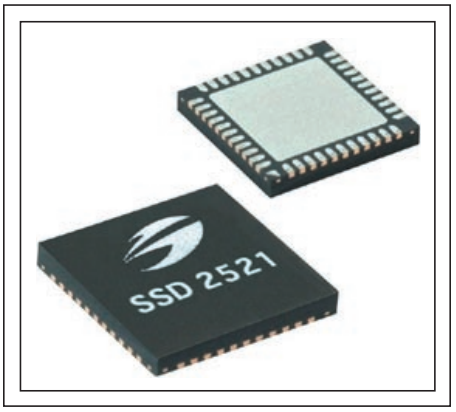
SMK will introduce a capacitive touch screen with multi-touch and gesture-input capabilities featuring a super-low transparency as high as 93%. This new touch screen is ideal for hand-held devices requiring high visual clarity, soft/light input sensitivity, and a screen size of up to 4 in., making this touch screen suitable for mobile phones, smart phones, and digital cameras. SMK offers the capacitive touch screen in a glass or film on film structure. To increase the effectiveness of circuit space, a COF (chip-on-film) is utilized at the screen's tail next to the controller IC.



SOLOMON SYSTECH
Pak Shek Kok NT, Hong Kong
+852-2207-1560
www.solomon-systech.com
Booth 343

Capacitive touch-panel controller

The SSD2521 from Solomon Systech is an all-in-one capacitive-touch-panel controller that integrates the power circuits and driving and sensing circuits into a single chip. It can drive capacitive touch panels on WVGA-resolution displays. Its DSP-based architecture supports up to four fingers of simultaneous detection. It also supports auto-calibration for each crossover point and has an embedded noise-rejection correlator for better signal-to-noise ratio. With a highly compact and competitive design, the SSD2521 enables the use of touch panels in portable devices such as mobile phones, PNDs, digital still cameras, and more.



STANTUM
Bordeaux, France +33-556-460-344
www.stantum.com
Booth 443

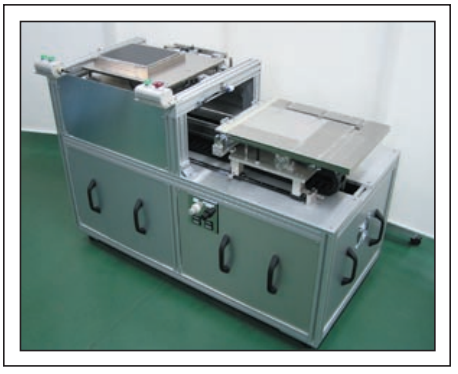
Software engine

Stantum will feature PMatrix™, a software engine for multi-touch technology. It runs as a chip firmware or software on controllers or any embedded processing devices. PMatrix scans and delivers an exact representation of what is happening on the touch panel. The multi-touch driver dynamically updates the cursor list, enabling any application to control the graphical-user-interface objects. Performance includes fast, accurate, and versatile; portable and lightweight; low power consumption; true multi-touch (unlimited number of pointers); and robust scanning method.

SUN-TEC AMERICA
Scottsdale, AZ 480-922-5344
www.m-choi@sun-tec.net
Booth 252

Film lamination equipment

Sun-Tec America will feature the TMS-SA film lamination machine for laminating films to various substrates used in the display industry. It can laminate substrate sizes from 10 to 22 in. Machines for substrates up to 65 in. are available. The TMS-SA series of lamination machines are designed to be affordably priced for R&D and low–to–medium-volume production without sacrificing the performance of more expensive models. These machines maintain Sun-Tec's high production standards and are capable of bubble-free lamination with placement accuracy of 0.2 mm. Options include a table for laminating substrates with flex circuits, deionizer, Hepa filter, safety light curtain, and lamination rollers suitable for a variety of products.



TANNAS ELECTRONICS
Orange, CA 714/633-7874
www.tannas.com
Booth 534

Resizing LCDs

For over ten years, Tannas Electronic Displays, Inc., (TED) has been successfully resizing LCDs at their facility in Orange, California. TED has an extensive patent portfolio covering the product and process. Most recently, TED has expanded the tooling and methods to accomplish the resizing of very large LCDs. This is exemplified in the accompanying photo of a Samsung 40-in. HDTV LCD that has been resized to 10.5 × 35.5 in. There does not appear to be a limit on how large an LCD can be to be resized.

TEXAS INSTRUMENTS
Dallas, TX 214/567-2905
www.ti.com
Booth 229

16-channel LED driver

The TLC5941 is a 16-channel constant-current-sink LED driver. Each channel has an individually adjustable 4096-step gray-scale PWM brightness control and a 64-step constant-current sink (dot correction), which adjusts the brightness variations between LED channels and other LED drivers. The dot correction and gray-scale control are accessible via a serial interface, while a single external resistor sets the maximum current value of all 16 channels. The TLC5941 features two error information circuits. The LED open detection (LOD) indicates a broken or disconnected LED at an output terminal and the thermal error flag (TEF) indicates an over temperature condition.

TIANMA MICROELECTRONICS
City of Industry, CA 646/336-8188
www.tianma.com
Booth 775

TFT module

Tianma Microelectronics will highlight their 4.7-in. TFT module featuring high quality, wide format, and fast response time. With a resolution of 480 ×

272 pixels, the 4.7-in. TFT module offers a bright and vivid color display at an affordable price. This size is ideal for GPS, MP4, PMP, and other hand-held devices.

TOSHIBA AMERICA ELECTRONIC COMPONENTS
Irvine, CA 408/526-2454
www.taec.toshiba.com
Booth 125

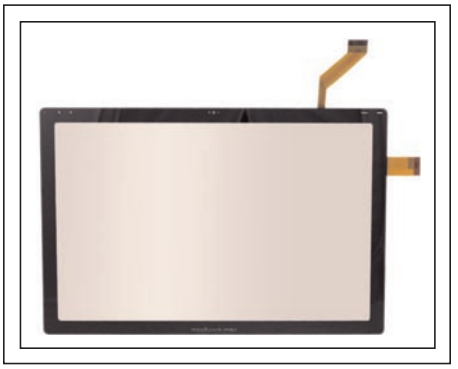
Industrial LED-backlit TFT-LCD Lineup

Toshiba will exhibit its 70,000-hour long-life, LED-backlit TFT-LCDs for industrial applications at Display Week 2009. Toshiba's line-up includes LCDs ranging in diagonal size from 5.7 to 10.4 in. and resolutions from QVGA (320 × 240) to XGA (1024 × 768). These modules each feature an on-board LED driving circuit to facilitate customer design-in. Today's common industrial-use TFT-LCDs use cold-cathode fluorescent lamps (CCFLs) as their backlight source. An LED-backlit TFT-LCD provides many benefits including low electro-magnetic interference (EMI), low-power consumption, wide backlight dimming range, and light weight. The LED backlights also support important industry environmental initiatives.

TOUCH INTERNATIONAL
Austin, TX 512/646-0310
www.touchintl.com
Booth 742

A 15-in. projected capacitive touch screen with graphics

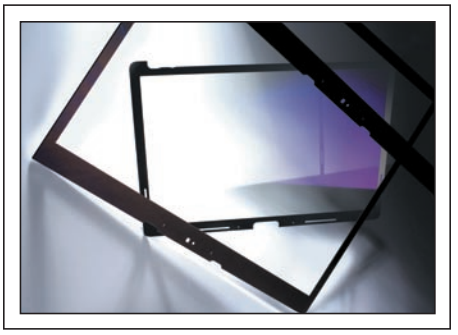
Touch International will display a broad range of projected capacitive (iPhone-type) touch screens with advanced features including pen-entry, unbreakability, thinness, and proximity sensing. The company's products range from 3 in. on the diagonal for hand-held and medical markets to 22 in. on the diagonal for industrial terminals, kiosks, and gaming applications.



UNIBRIGHT CHEMICAL CO.
Taipei, Taiwan +886-2-239-269260
www.ub-chem.com
Booth 446

Optical coatings

UniBright has been devoting time and effort to create long-lasting and precision coatings such as T-AR (traditional anti-reflection), G-AR (gradient anti-reflection), AG (anti-glare), AS (anti-smudge), AF (anti-fog), Easy Cleaning, as well the processing of cutting, grinding, and printing, that perform very well for the most demanding applications.



UNIVERSAL DISPLAY CORP.
Ewing, NJ 609/671-0980 x206
www.universaldisplay.com
Booth 676

Phosphorescent OLED materials and technology

Energy efficient and environmentally friendly PHOLED™ phosphorescent OLED materials and technology enable manufacturers to produce OLEDs with dramatically higher power efficiency compared to conventional OLEDs and LCDs. Available in many colors, PHOLEDs offer excellent performance for displays and white lighting. UDC will also exhibit prototypes showcasing other proprietary technologies, including FOLED® Flexible OLED, TOLED® Transparent OLED, and WOLED™ White OLED technologies. Also offering technology evaluation, joint development, and technology-transfer services to support the smooth adoption of our technology and materials.

U S MICRO PRODUCTS
Austin, TX 512/385-9000 x1127
Booth 665
www.usmicroproducts.com

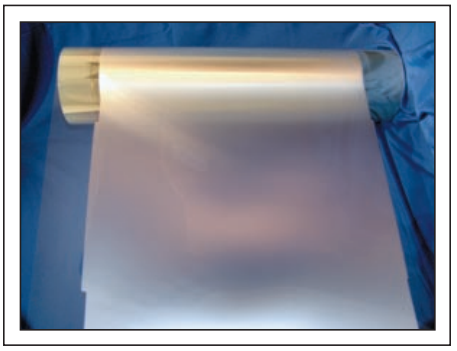
AMOLED displays

U S Micro Products will feature a 7.6-in. AMOLED display manufactured by CMEL. This display offers stunning life-like image quality and extremely fast response time. The thin and lightweight design make them perfect for all applications. AMOLEDs are highly reliable and offer a wide operation temperature range of –40 to 60°C. Other benefits include a super-wide 160° viewing angle, 10,000:1 contrast ratio, 200-nit brightness, and 30-khour life-time. Also offering 2.0-, 2.4-, 2.8-, and 3.4-, and 4.3-in. AMOLEDs. A 13.3-in. AMOLED is under development.

WAVEFRONT TECHNOLOGY
Paramount, CA 562/634-0434
www.wft.bz
Booth 662

Large-format thin-film micrdiffusers

WaveFront Technology will introduce a large-format 42-in.-diagonal high-performance Tailored Micro-Diffuser (TMD®). These thin-film diffusers can replace conventional bulk diffusers or thick plates in direct-lit backlight units (BLUs) and improve performance in edge-lit BLU systems from mobile LCDs to large LCD TV monitors. Compared with conventional bead-type diffusers, the TMD® can provide the following advantages: higher brightness, better contrast and viewing angle, less thickness, and fewer layers (such as elimination of diffuser plate and/or prism film). Although BEF and DBEF (which are much more expensive then TMD® films) are still the best films for brightness enhancement, TMD® can provide a cost-effective alternative solution by replacing BEF and DBEF.



WESTAR DISPLAY TECHNOLOGIES
Saint Charles, MO 636/300-5100
www.westardisplaytechnologies.com
Booth 658

Small-format-display QC test system

Westar Display Technologies' QuickTest™ is a turnkey display quality test system that automatically verifies the critical optical performance parameters of a small-format display. A complete electro-optical test suite is completed in under 30 sec. QuickTest™ employs three fast sensors: CCD camera, spectrometer, and TRD-100A – each optimized for specific measurement tasks. The system includes automated tray handling and probing, editable test definitions and pass/fail criteria, and supporting statistical and database functions for production QA/QC. Several system options are available. Westar offers a tooling solution, called New Display Tooling, to enable displays to be tested on the QuickTest™.

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ZYTRONIC
Blaydon on Tyne, UK +44-191-4145-511
www.zytronic.co.uk
Booth 519

Projected capacitive touch sensors

Zytronic will be showing touch-sensor products and solutions based on the company's proprietary Projected Capacitive Technology (PCT™). Completely customizable in sizes from 5 to 82 in., ZYBRID® is extremely damage and weather resistant, and suitable for all digital signage, industrial, gaming, and other public-access applications. PCT can create stylish, bezel-free touch-sensitive user interfaces. ZYBRID can be further enhanced by integrated features such as printed borders, mirror finishes, and optical filters. ZYPROFILM® flexible rear-projection film touch sensors will be demonstrated as will ZYSWITCH®, a rugged PCT-based replacement for soft membrane switches. ■

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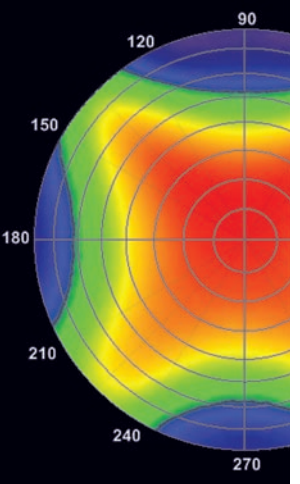
CONOMETER 80



80° Contrast vs Viewing Angle

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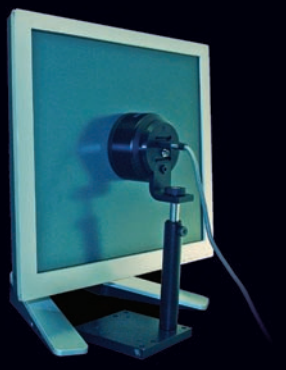

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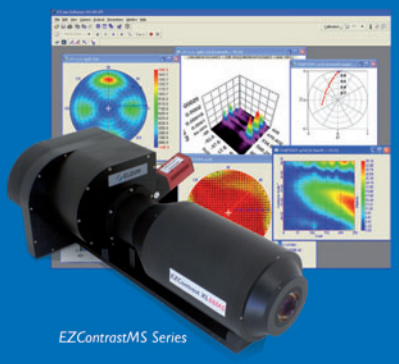
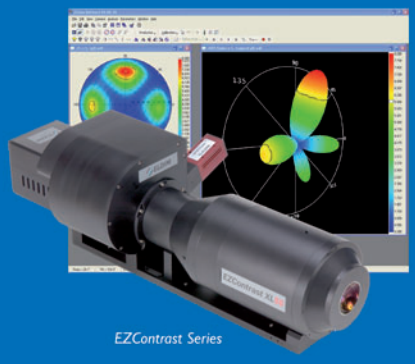
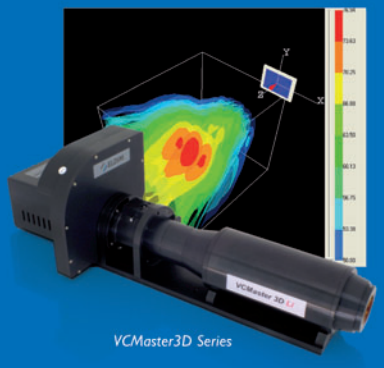
See Us at Display Week 2009 Booth 547

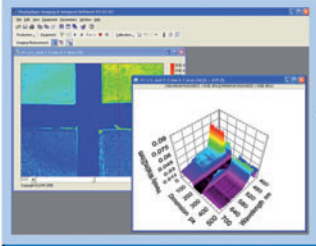
Viewing Cone Analysis Solutions

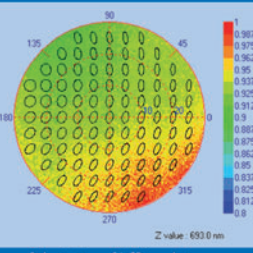

EZContrastMS Series

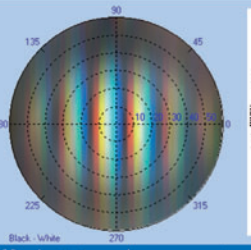

EZContrast Series

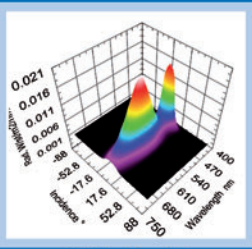

VCMaster3D Series

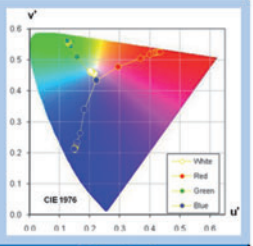
For HDTV, 3D displays, LEDwalls, projectors, backlights, lamps, dashboards, cockpits, films, cellphones, white-box handset, monitors, CRT, microdisplays, semiconductors - LCDs, automotive, avionics, medical, lighting, entertainment, press printings, artpaints, ...


viewing angle spectral measurement


Polarization of LCD analysis


3D color viewing angle measurement


LED spectral analysis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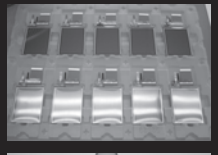

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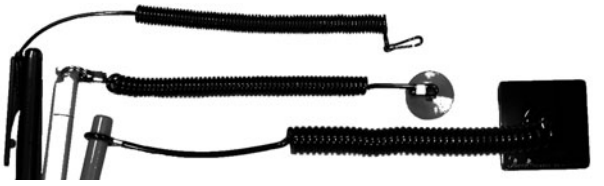

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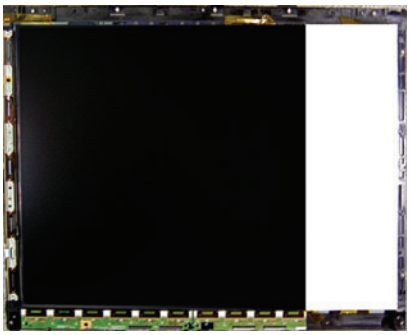

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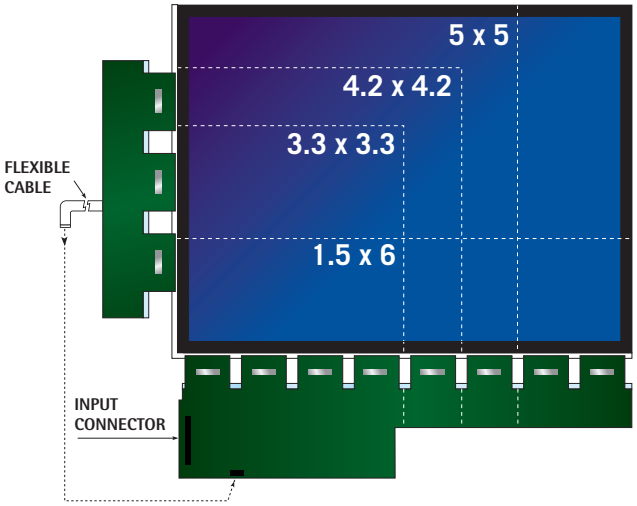

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book review

LCD Backlights

Edited by Shunsuke Kobayashi, Shigeo Mikoshiba, and Sungkyoo Lim
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Reviewed by Munisamy Anandan

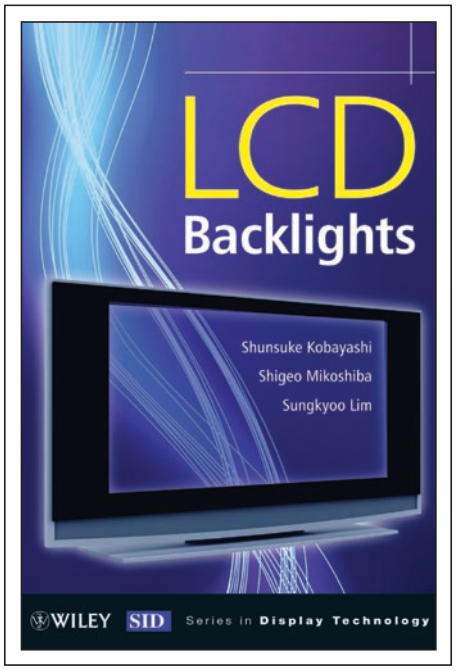
Liquid-crystal-display (LCD) backlighting is a rapidly advancing field. Progress in every component of backlight systems – light sources, drive electronics, light guides, optical films, and assemblies to house all these components – is being made at galloping speed. It can be difficult to keep pace with all the developments and equally difficult to find information from a single source: the literature appears in various journals and conference proceedings. In this context, *LCD Backlights* is an invaluable resource for researchers and general readers alike.

The book has a few shortcomings. Even while it was being written, LCD-backlighting technology was rapidly advancing. Therefore, although most of the information is reasonably well updated, some is not. In certain chapters, acronyms such as OLED, CCFL, and PDP are not defined, which would have been especially helpful to general readers. And a few chapters lack sufficient references, while one has none at all.

LCD Backlights is organized into two parts and 21 chapters. Each chapter is authored by different experts in the field. Part 1, Backlight by Use, examines different ways that backlighting is being employed in areas such as LCD TVs, notebook PCs, and handheld data terminals. Part 2, Light Source Devices, looks at CCFLs (cold-cathode fluorescent lamps), HCFLs (hot-cathode fluorescent lamps), EEFLs (external-electrode fluorescent lamps), and many other types of light sources.

The first chapter, "Technical Trends and Requirements/Specifications for LCD-TV Backlights" provides a good general overview of LCD backlighting. Different light sources are reviewed according to merit, and the structure of backlighting with various components is clearly illustrated. The author makes a clear comparison between the technology of CCFLs and LEDs with regard to their generation of color gamut and correctly emphasizes the potential of LEDs as compared to other light sources.

One chapter in Part 1 that contains information that is seldom found is "Multiple Primary Color Backlights," which discusses widening



the color gamut through multi-primary colors of LED light sources and employing LEDs with correct sequences of driving. The author also describes the change in the peak wavelength of LEDs with ambient temperature, which is very relevant to this topic.

A discussion on motion blur in another chapter describes techniques of black-frame insertion and backlight blinking/scrolling/dimming combined with increases in frame rate, but does not mention the recent trend in increasing the frame rate to 240 Hz.

"Reduction of Backlight Power Consumption of LCD TVs" is authored by the co-inventor (with the editor of this book) of the Adaptive Dimming Technique (ADT), and therefore emphasizes ADT. The two writers have also published a paper on 0D, 1D, and 2D dimming. Lately, this technique has come to be known as "local dimming," which is commercially very popular in modern LCD TVs. The concept of ADT is well illustrated here with photographs.

Part 1 finishes up with practical information about the fabrication of a light guide for notebook PC/monitor backlights and LED backlights for handheld data terminals.

Part 2 looks at a variety of light sources for backlights, such as CCFL (featuring some seldom-reported information on the surface temperature of long CCFLs in a single-end mode of driving), and HCFL.

The sections on EEFL, FFL (flat-fluorescent lamp), and mercury-free fluorescent lamps contain some information that has not been updated. EEFLs are no longer used in LCD backlights, for example. However, the author makes interesting comparisons between CCFLs and EEFLs. The authors of the chapter on FFL do not refer to the fact that FFLs are not used in commercial backlighting for LCD TVs. The technique adopted for fabricating the channels of the "serpentine" lamp is well described, however. As for mercury-free fluorescent lamps, they are also not used in today's commercial backlights for LCD TVs.

A chapter on the historical development of the "electrode-less lamp" is interesting to read, despite the fact that this type of lamp is also not commercially used for LCD backlights. Readers may find the content more appropriate for a book on fluorescent lamps than on backlighting.

"LED Backlights" and "Technological Trends of LED Backlight Units" describe more current backlight solutions, and a chapter on white-OLED (organic light-emitting-diode) backlights provides information about R&D efforts at various academic institutions and industries throughout the world. This chapter should be of particular interest to the research community. White-light emission from light-generating host layers of single- and double-layered configurations is well illustrated, and the state of the art on white OLEDs, in general, is well brought-out. What is missing is a simple white-OLED backlight structure, as well as a description of its performance to demonstrate the advantage of a white-OLED backlight over an LED backlight in terms of the simplified flat light source of a white OLED that does not require optical light guides and films. White OLEDs are not commercially employed for backlighting LCDs, but this approach has a bright future.

The book ends with chapters on inorganic EL (electroluminescent) backlights, field-emission backlights, light-guide plates, optical diffuser plates, lens films, and reflective-polarization films.

LCD Backlights includes an impressive spectrum of topics. Having specialized for nearly 10 years in this field, I can attest to the fact that it would be hard to find anywhere else the range of backlighting technology and information covered in this book.

***Munisamy Anandan** is with Organic Lighting Technologies LLC, located in Austin, Texas.*

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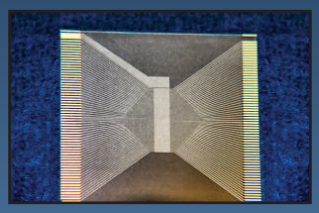
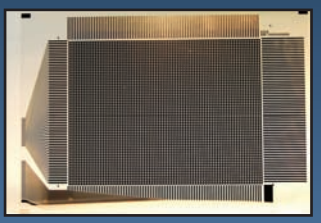
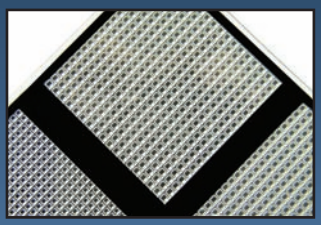


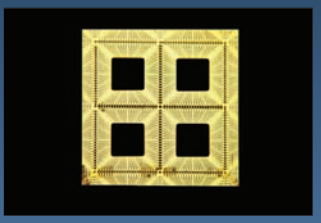
2 µm ITO With Bus Bar



OLED on Plastic



Color Filter



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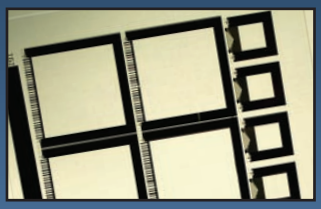
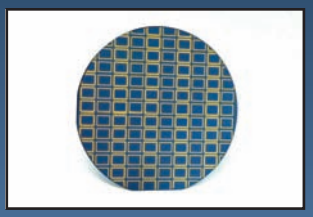


OLED Display W with Black Chromse & AR



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2008 JSID Outstanding Student Paper Award

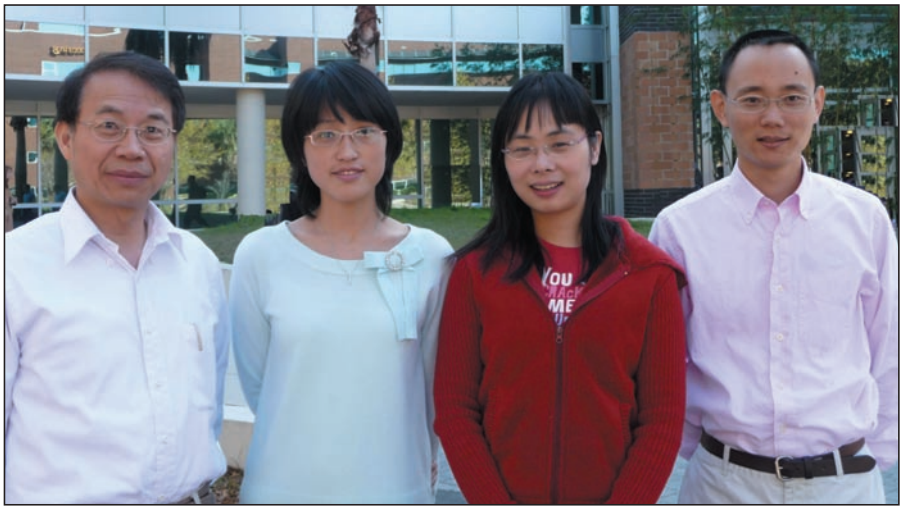
by Yan Li with editorial assistance from the *Information Display* staff

Each year, the *Journal of Society for Information Display* (*JSID*) recognizes a published student paper on the basis of originality, significance of results, organization, and clarity. The 2008 award went to "Fast-Response Liquid-Crystal Displays Using Crossed Fringe Fields" by Yan Li, Zhibing Ge, Ruibo Lu, Meizi Jiao, and Professor Shin-Tson Wu from the College of Optics and Photonics at the University of Central Florida.

Many of the major technical problems of liquid-crystal displays (LCDs), such as viewing angle and contrast ratio, had already been addressed to acceptable levels, but the problem of response time, however, still remained. The response time of LCDs is relatively slow, and a slow response time results in unfavorable image blur, especially for moving images.

During the turn-on process, response time can be improved by using overdrive (*i.e.*, applying a higher driving voltage pulse to generate a stronger electric field), but the turn-off time, which depends mainly on the inherent physical properties of the liquid-crystal materials, is very difficult to reduce. After studying literature describing many different approaches to this problem, the authors redesigned the electrodes of the fringe-field-switching (FFS) LCD device so that overdrive could be utilized during the turn-off process as well as to expedite the LC molecules in restoring their initial orientation. As a result, the decay time was improved by a factor of 2 compared to that of conventional FFS LCDs. Yan and the other team members believed this approach would greatly help make moving images sharper in wide-view FFS LCDs.

The team consisted of Yan Li, a second-year graduate student who is currently working toward her Ph.D. at the College of Optics and Photonics at the University of Central Florida (UCF); Dr. Zhibing Ge, research scientist at UCF; Dr. Ruibo Lu, former research scientist at UCF and current Director of Liquid Crystal Engineering at Pixel Qi; Meizi Jiao, a third-year graduate student at UCF; and thesis advisor Professor Shin-Tson Wu also from the College of Optics and Photonics at UCF.



From left to right: Professor Shin-Tson Wu, Meizi Jiao, Yan Li, and Dr. Zhibing Ge. Dr. Ruibo Lu is not pictured.

While initially investigating the subject of slow response time in LCDs, Yan studied approaches such as the use of a thin cell gap with a low-viscosity LC material, the overdrive and undershoot voltage effect, the temperature effect and others. One idea particularly intrigued her: the crossed-field effect from the three-electrode method used in a positive VA cell (first proposed in 1975 by Channin). Based on this approach, Yan came up with the idea of using crossed fringing fields in the wide-view fringing-field-switching mode.

After Yan proposed her idea to Professor Wu, he called together a small group to further explore it. (Yan notes that Prof. Wu always encourages his students to be bold in terms of proposing new ideas.) The team identified the pros and cons of the design and came up with even better solutions.

To verify the concept, Yan and Meizi carried out computer simulations. Each time they faced obstacles, they received encouragement and constructive suggestions from the other team members. Finally, they achieved a 2x improvement in response time by applying an erasing electric field in the crossed direction.

Since this was Yan's first journal publication, Professor Wu asked her to keep in mind the critical ingredients in writing a research paper: organization, clarity, and how to present exciting results. He revised the manuscript eight times before it was finally submitted to *JSID* for publication. Says Yan, "His philosophy is that when your children and grandchildren read your papers 2–3 decades later, they will still be proud of you."

She adds, "The research group would like to thank the award committee. It is really a great honor for our team to receive this prestigious award." ■

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The 2009 award winner will be selected in December 2009 by the JSID Awards Committee. It will be awarded to a published paper on the basis of: originality, significance of results, organization and clarity. ***The award consists of plaques, given to all the listed student authors of the paper, and a US$2000 prize***, to be shared among all the student authors of the selected paper. It will be presented to the winner(s) at one of the international conferences sponsored by the Society for Information Display. All manuscripts published in JSID during 2009, for which the ***first author is a student***, are eligible. The plaque and prize is given to the student author(s) only. Manuscripts are to be submitted to the Editor, Journal of the Society for Information Display. The Journal publishes all manuscripts in full color. Page charges are now mandatory for all published papers. Detailed instructions for the submission of manuscripts may be found at www.sid.org, or authors may contact the Editor for additional information by sending e-mail to editor@sid.org.

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continued from page 2

and therefore Display Week is an important vehicle for this as well as its many other features. Often it is in those personal interactions and candid conversations that I get my inspiration. Just like people who seek the comfort of celebration even in the face of hardship, I think we all need the time to recharge our imaginations and get inspired by each other in order to take on an industry that seems to be more demanding than ever before.

Everything in this Display Week issue of *Information Display* is a tribute to this innovation and inspiration, with a healthy dose of hard work and endurance thrown in. In our feature, "The Plasmaco Story," author Jane Birk describes the amazing achievements of a small R&D company founded by SID Past President Larry Weber and his colleagues. Over the course of 20 years, Plasmaco literally invented the technology used today for color plasma televisions. While others around the world were also developing plasma displays at the time, Plasmaco was doing it with a very small, highly motivated staff and almost no money to pay the bills and buy equipment. It was the sheer will power to overcome financial hardship and the true imagination of the Plasmaco team that made plasma TVs what they are today.

Similarly, we unveil the recipients of the SID/*Information Display* Display of the Year Awards, and in each case you can see how imagination and innovation are alive and well in our industry. From the Samsung 240-Hz-refresh TV (yes, that is not a misprint) to the miniature Texas Instruments DLP imager, the products recognized form a tapestry of creative thinking that will be the foundation for many future products and new applications. Thanks to our Managing Editor Jenny Donelan, you can read about all the winners and appreciate how they have made real differences in their respective market areas. I'm really excited about the DYA program sponsored by SID because it is the only one of its kind to look beyond the products and also recognize the components and applications that enable the display products we love.

While we are all supposed to be impartial here at *ID*, I can't help but confess my fascination with e-book readers such as the Amazon Kindle (our display application of the year Gold Award winner), which in some senses are really very specialized low-power tablet computers. At first, I was a bit skeptical, noting the lack of color in the displays and the burden of having yet another electronic device to charge and carry on my numerous trips. But as I look around me on some of the many airplane segments I fly each month, I constantly see people leaving their laptops in their bags and pulling out their e-book readers instead. It is clearly a practical solution to the problem of carrying around physical books, and the feature-rich array of digital publications available today makes having one of these e-readers almost a must. Once again, we see how display technology, in this case electrophoretic technology from companies such as E Ink, can literally make our lives easier – for example, by making my arms less tired after a trip!

So, welcome to Display Week in San Antonio. Whether you are new to SID or a regular member and *ID* reader I hope you enjoy this issue, and I thank you for your generous support of SID. ■

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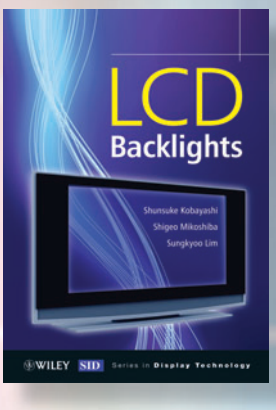
The Society for Information Display (SID) is an international society which has the aim of encouraging the development of all aspects of the field of information display. Complementary to the aims of the society, the **Wiley-SID Series** is intended to explain the latest developments in information display technology at a professional level. The broad scope of the series addresses all facets of information displays from basic phenomena through product and systems aspects to standards and ergonomics. Each Volume in the series is intended to provide a comprehensive, self contained treatment of its subject.



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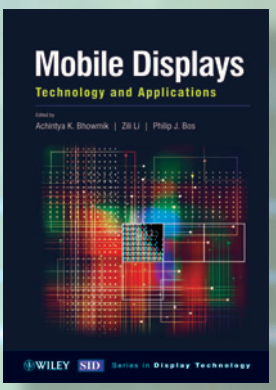

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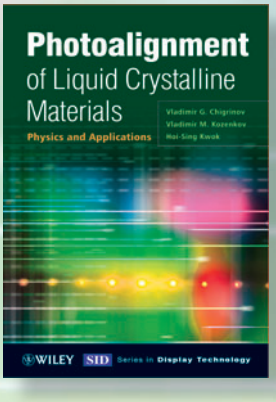

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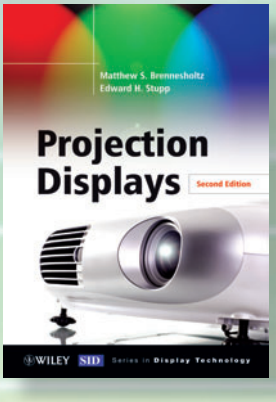

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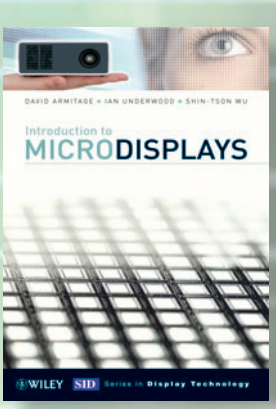

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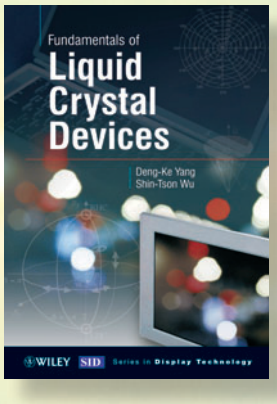

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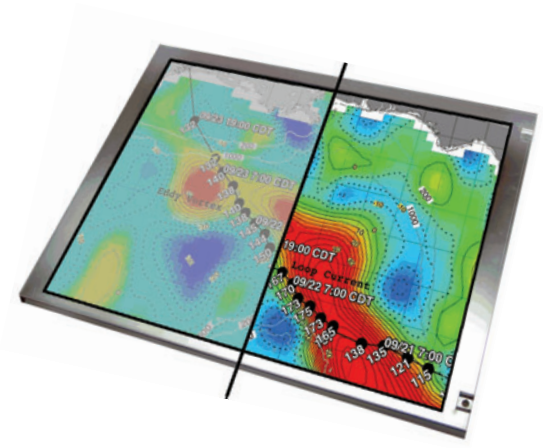

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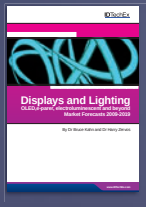

Displays & Lighting: OLED, e-paper, electroluminescent and beyond 2009-2019

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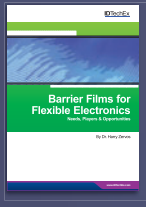

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