

TOSHIBA REVIEW

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Special Reports I

Image Projectors for Business Use

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High-Resolution Liquid Crystal Displays

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Special Reports I

Image Projectors for Business Use

*Evolution of Image Projectors for Business Use

KAI Minoru

*Trends in and Future Prospects for Data Projectors

MIURA Kenji TANABE Toshiyuki

Projectors for business use are evolving into light and compact products due to LCD system and DLP™ (Digital Light Processing) system technologies, and their brightness, contrast, color purity, and other performance characteristics have greatly improved. As a result of this evolution, demand is increasing for rear projectors employing the LCD system and video wall projectors employing the DLP™ system. Accompanying the spread of personal computers, data projectors are now replacing the overhead projectors used as a presentation tool in corporations and institutes.

This paper describes the current situation of business-use projectors in Toshiba and the prospective technological trends.

*P401LC LCD Rear Projector

IYONO Eiichi WATANABE Hitoshi

With the advancement of visual information media ,projectors have developed into large screen display devices capable of handling various picture sources, while providing high picture quality and high brightness. The scope of application of projectors as multimedia information displays is expanding as a result. In this situation, projectors are required to be lightweight, thin, compact, and low in price. Easy installation and maintenance are also expected by users.

We have developed the P401LC 40-inch LCD (liquid crystal display) rear projector featuring a short-focus projection lens, high-contrast screen, and definition transformer, using our technologies for business-use LCD data projectors. The P401LC can be installed on the floor, hung from the ceiling, or mounted on the wall, and a combination of several projectors can be used as a large-screen visual information display device, making it suitable for various applications.

*P410DL DLP™ System Video Wall Projector

TAKAHASHI Kiyoshi

We have developed the P410DL 41-inch projector using a DLP™(Digital Light Processing) optical engine for a video wall system. The P410DL has simplified video wall processor signal expansion and digital signal link functions. These features enable a video wall system of up to 6T6 magnification to be constructed without an external processor.

The P410DL provides SVGA resolution and can accept computer signals up to XGA. It is also possible to input NTSC/PAL/SECAM video signals and high-definition television (HDTV) signals by using an optional unit. Moreover, effects such as wipe and freeze can be performed on the displayed images using an external control computer.

*3D-Image Theater System Using TLP770J LCD Data Projector

KAWASATO Hisao

In today's multimedia era, visual systems are widely used not only for two-dimensional images but also for the depiction of virtual reality and for simulated three-dimensional images. At the same time, the projection technology used in large-screen projectors is shifting from the cathode ray tube (CRT) to the liquid crystal display (LCD).

Toshiba has developed a simplified 3D-image theater system using the TLP770J LCD data projector, which offers easy maintenance and lower costs.

*TLP650 Series Portable LCD Projector

WATANABE Kohei

In recent years there has been increasing demand for portable LCD projectors for use in presentations with notebook PCs. In July 1999, Toshiba commenced sales of the TLP651 portable LCD projector, which is equipped with a document-imaging camera. The TLP650 series is an A4-size, high-brightness, 3-LCD projector with XGA resolution (1,024 x 768 pixels) panels. This is the brightest and smallest class of 0.9-inch 3-LCD projectors. It also has automatic keystone correction and overlay functions.

Special Reports II

High-Resolution Liquid Crystal Displays

*Liquid Crystal Displays for the Digital Networking Era

ARAI Sakae

*Market and Product Trends of LCDs

ECHIGO Hiroyuki

The display performance and quality of liquid crystal displays (LCDs) have been improved by continuous technological development, with the result that they have been adopted for various applications. The demand for high-resolution images has been growing recently, and a shift in the market toward higher resolution has clearly appeared.

Toshiba has commenced mass-production of large-size, low-temperature, polycrystalline silicon thin-film transistor LCDs (p-Si TFT-LCDs) to satisfy such demand, and has positioned itself as a leading manufacturer in the LCD industry. This paper provides an overview of the market, technologies, and new product development in the field of LCDs.

*Low-Temperature p-Si TFT-LCD

NISHIBE Tohru

This paper focuses on excimer laser crystallized poly-Si TFT technologies for obtaining high-performance notebook-size displays with high pixel density. Among the topics covered are TFT structures for CMOS circuits and their process integration, threshold voltage control, and reliability of TFT characteristics.

*Superhigh-Resolution 200 ppi Series TFT-LCDs

KAWAMATA Kenji HIRAI Hoko

We have developed a 202 pixels per inch (ppi) thin-film transistor liquid crystal display (TFT-LCD) using low-temperature polycrystalline silicon (LTPS) technology. The superhigh resolution of 202 ppi offers the same image quality as printed matter such as magazines. The 200 ppi series TFT-LCDs are expected to support further developments in such areas as electronic books (e-books) and personal digital-picture viewers.

Our lineup of 200 ppi TFT-LCDs includes a 4-inch display with VGA resolution, which is suitable for palmtop-size applications, and a 6.3-inch display with XGA resolution, which is suitable for typical photograph or paperback book-size applications. Larger size LCDs with 200 ppi resolution will be developed.

*10.4-inch, XGA, Low-Temperature, p-Si TFT-LCD

AOKI yoshiro

A 10.4-inch thin-film transistor liquid crystal display (TFT-LCD) with XGA resolution has been commercialized for mobile PC applications. It employs low-temperature polycrystalline silicon (p-Si) CMOS driver circuits integrated on a glass substrate, realizing a high resolution of 123 pixels per inch (ppi).

We newly developed a novel circuit construction and a driving technology for this LCD. These result in a wide driving margin, high-quality display, low power consumption, and high reliability.

*Development of 10.4-inch Diagonal, Low-Temperature, p-Si TFT-LCD Module

MORI Hideaki

TOSHIBA has developed a 10.4-inch diagonal, XGA (1,024 x 768 pixels), thin-film transistor liquid crystal display (TFT-LCD) using low-temperature polycrystalline silicon (p-Si) technology. In order to realize a very thin and lightweight LCD, we integrated the driving circuit on the glass substrate and employed a B2i™ (buried bump interconnection technology) printed circuit board (PCB) and chip-size package (CSP). We also succeeded in optimizing the backlight system to obtain high luminance with low power consumption.

Our p-Si technology has enabled the first 10.4-inch diagonal, XGA TFT-LCD to be developed, for use in B5-size notebook PCs.

*52.8 cm (20.8-inch) Diagonal, a-Si TFT-LCD with Ultrahigh-Resolution of 192 ppi

SHIBA Koichi

Toshiba has developed a 52.8 cm (20.8-inch) diagonal, ultrahigh-resolution, amorphous silicon thin-film transistor liquid crystal display (a-Si TFT-LCD) with a resolution of 192 pixels per inch (ppi). It is intended for high-resolution display applications such as computer-aided design (CAD).

The new TFT-LCD was realized through the development of a new, low-resistance wiring material and the adoption of the 4 parallel data transmission method.

*6.94cm Diagonal, Low-Temperature, p-Si TFT-LCD for Rear-Projection TV

WATANABE Yoshihiro

This paper describes a 6.94cm diagonal, low-temperature, polycrystalline silicon thin-film transistor liquid crystal display (p-Si TFT-LCD) developed for rear-projection TV, which is equipped with a microlens color-separation optical system. The new LCD has high resolution (345,600 (720 x 480) pixels), high optical transmittance (effective aperture ratio of more than 70%), and multi-operation functions for scan direction selection and display aspect-ratio selection.

Feature Articles

*Development of Anamorphic Aspheric Plastic Lenses for High-Speed Digital Copier

NISHIMURA Tetsuro AMANO Akira HONDA Satoru

As a consequence of the remarkable diffusion of personal computers and information networks, demand has arisen for digital equipment with multiple functions. In line with this trend, Toshiba has introduced the PREMAGE 551/651 high-speed digital copier and printer, featuring a laser scanning optical system using four isolated semiconductor lasers. Anamorphic aspheric plastic lenses are utilized as important elements of the optical system.

This paper comprehensively describes the manufacturing technology for these plastic lenses, centering around structural designs for molds, machining methods for mold inserts, and polymer processing.

*Recycling Technology for Printed Circuit Boards Using Vacuum Thermal Treatment

OYASATO Naohiko MAEZAWA Yukishige

A new law to promote recycling of electric appliances is to go into effect in Japan in 2001. Under this law, manufacturers will be responsible for recycling of their products.

We have developed a recycling technology for printed circuit boards (PCBs), which are difficult to recycle, using a vacuum thermal treatment. This technology comprises a treatment to separate and collect metals that have higher vapor pressure by vaporization in a vacuum furnace. The application of this technology to waste PCBs makes it possible to recover lead in their solder. The results of lead leaching tests of the treated residue comply with the Japanese regulations. The treatment also makes the PCBs fragile, allowing copper foil to be easily recovered from multilayer substrates.

*46 cm 100° Super-High Deflection Sensitivity Color Display Tube

ISHIKAWA Masayoshi SONEDA Koichi

We have developed a 46 cm wide-deflection 100° super-high deflection sensitivity color display tube (S-S CDT), which is shorter than the conventional 41 cm 90° CDT.

To reduce deflection power, we adopted a mini-neck (22.5 mm dia.) and rectangular cone (RAC) system. Despite the wide angle of deflection, the horizontal deflection sensitivity of the CDT is higher than that of the conventional 41 cm 90° CDT, while the resolution is as same as the conventional 46 cm 90° CDT. Moreover, the temperature rise of the deflection yoke is low enough for high-frequency scanning operation under 110 kHz.

*Half-Bridge Inverter for Microwave Combination Oven

TAKEI Tamotsu NAKAGAWA Tatsuya

In the development of a microwave oven, it is becoming increasingly important to reduce cooking time and electric power consumption, while at the same time providing a large oven capacity with compact outside dimensions for installation in a small kitchen space.

Taking these market requirements into consideration, we have developed a microwave combination oven with a high output power of 900W, which achieves the industry's highest levels of reheating speed and cooking efficiency by applying a new half-bridge inverter system. We have also realized a large oven capacity with a compact body by minimizing the circuit parts.

Techno Notes

*Fuel Cell

Epoch-Making Toshiba Technologies

*2.Helical CT Scanner