

## Special Feature 2: One-of-a-Kind Devices and Products



### Technology Revolution in LCD Panels

**Leveraging Sharp's proprietary technologies, centered on IGZO LCDs, we will realize the features of high-definition, low-power consumption and high-performance touch screens, and will create new demand.**

#### **Sharp Begins Mass Production of IGZO LCDs —a World's First**

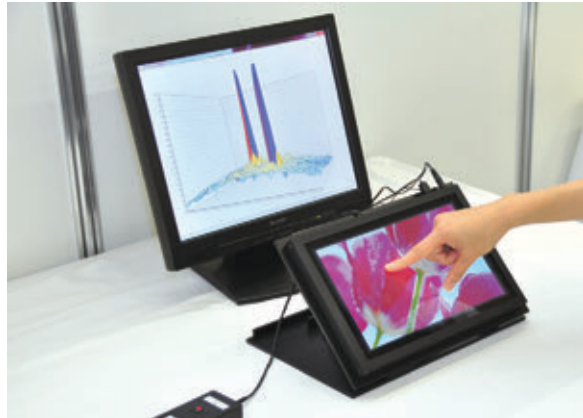
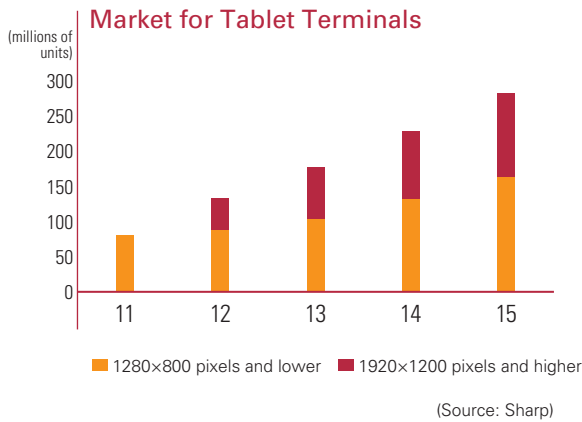
Sharp has been working to expand applications for its high-performance mobile LCDs, employing one-of-a-kind technologies, such as CG-Silicon technology.

Demand for higher-definition mobile LCDs is expected to grow, due to the ongoing enlargement of smartphone screens and expansion in the market for tablet terminals.

Under such circumstances, Sharp commenced the world's first production of high-performance IGZO LCDs employing oxide semiconductors\*<sup>1</sup> at the Kameyama No. 2 Plant in March 2012. In April, the transition to mass production took place, and we are planning to further enhance production capacity in the future.



The Kameyama No. 2 Plant, which produces IGZO LCDs



Front: IGZO LCD featuring touchscreen  
 Back: Shows the signals and the noise status of the touchscreen in the graph

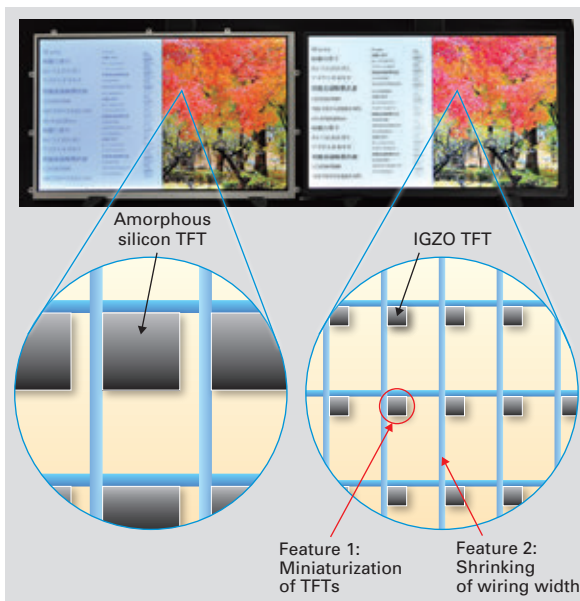
### Features of IGZO LCDs

IGZO LCDs employ oxide semiconductors (IGZO) comprising Indium (In), Gallium (Ga) and Zinc (Zn) to their thin-film transistors (TFTs). This enables miniaturization of TFTs compared to conventional amorphous silicon TFTs and shrinking of wiring width, which allows for increased light transmittance per pixel. These advances make it possible to produce LCD panels that achieve high-definition and low power consumption. In addition, the application of the UV<sup>2</sup>A technology\*<sup>2</sup> used in AQUOS LCD TVs enables a high image quality.

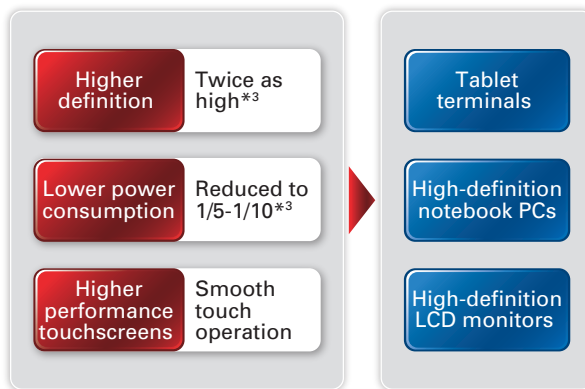
### Targeting Wider Applications

Not only for use in tablet terminals, Sharp anticipates the application of IGZO LCDs to extend to high-definition notebook PCs and LCD monitors—which are both expected to grow in demand. In addition, we also foresee demand in new fields that are not an extension of conventional applications, such as medical equipment. The IGZO technology can also be adapted for use in OLEDs.

Sharp is creating new demand by offering one-of-a-kind products employing its proprietary technologies, such as IGZO and CG-Silicon technologies.



Comparison of display quality and close-ups of pixel images  
 Conventional LCD (left) and IGZO LCD (right)



Features of IGZO LCDs and expansion of applications

\*1 A TFT using oxide semiconductors (IGZO) has been developed in collaboration with Semiconductor Energy Laboratory Co., Ltd.

\*2 Photo-alignment technology that can precisely control the alignment of liquid crystal molecules in a simple LCD panel structure

\*3 Compared with Sharp's LCD panels that employ amorphous silicon TFTs



Plasmacluster Ion air purifier/humidifier and robotic home appliance

**Creation of New Essential Products and Expansion of Business Fields**

**We will deploy one-of-a-kind technology to make a shift in categories for home appliances and provide new solutions.**

Special Feature 2: One-of-a-Kind Devices and Products

**Plasmacluster Ion Technology**

Sharp also has a history of generating new demand by developing various one-of-a-kind technologies in the field of home appliances.

Plasmacluster Ion technology is one such example. It is an air purification technology that removes airborne mold spores and other impurities, while also suppressing the activity of airborne viruses and reducing static electricity.

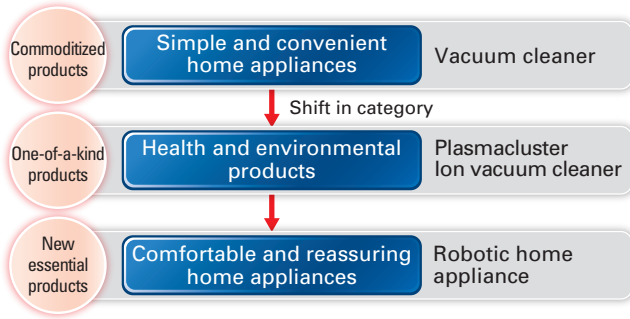
Since 2000, when we launched an air purifier equipped with Plasmacluster Ion technology for the first time, its application has spread in tandem with the growing consumer awareness about health and the environment. Sharp now incorporates this proprietary technology in many other home appliances, including Plasmacluster Ion generators, air conditioners, refrigerators and vacuum cleaners.

Plasmacluster Ion technology is also being adopted in a wide array of products in other companies, and its application is spreading in transportation and public spaces including vehicles, train cars and elevators.



Plasmacluster Ion generators  
(From left: For personal use with a humidifying function, a portable model with a humidifying function, for car use, a portable model for small spaces and a mobile model)

**Create “New Essential Products” through a Shift in Categories**



**Expanding Markets for Plasmacluster Ion Technology**

- Solution for space hygiene and energy conservation**
  - Marine product processing plants
  - Food processing plants
  - Supermarket back rooms
- Solution for air quality**
  - Daycare centers, nursery schools
  - Medical centers, elderly care facilities
  - Restaurants

**A Category Shift for Home Appliances**

In addition to the growing health and environmental concerns, in recent years there has been a rise in the number of households consisting of singles, working couples and the elderly. Consequently, there is a growing need for appliances that reduce household chores or take over housekeeping duties and also make daily life more safe and secure. In response to this trend, Sharp has made a category shift for its vacuum cleaner equipped with Plasmacluster Ion technology by launching a robotic home appliance that makes daily life more comfortable and reassuring in June 2012.

The robotic home appliance not only employs Plasmacluster Ion technology, but is also equipped with artificial intelligence technology, allowing users to enjoy a diverse range of responses based on the level of battery power available and other factors. It is also able to process speech operations through its voice recognition function\*1. In addition, by connecting the robotic home appliance to a wireless LAN, users can check images taken with its built-in camera from a remote location via smartphones\*2.

**Delivering New Solutions**

Sharp is now, more and more frequently, incorporating Plasmacluster Ion technology into a variety of businesses as a solution for both saving energy and ensuring a hygienic environment. Recently, Sharp conducted practical trials\*3 at a marine product processing plant. It was confirmed that environmental hygiene could be maintained at previous levels, even if the controlled interior temperature is raised by two degrees, from 15°C to 17°C, when Plasmacluster Ion technology is used. This is expected to enable reductions in cooling costs in places such as factories where temperatures must be kept constantly low. We will work to create new markets by promoting B2B business that deploys these distinctive features.

**Creation of New Essential Products and Expansion of Business Fields**

Sharp will expand its business fields by providing new solutions while creating new essential products through a category shift for home appliances.



The voice recognition function makes it possible for the robot to respond to your commands

\*1 Only the top-of-the-line model (RX-V100) has a voice recognition function. It is equipped with a voice recognition engine developed by RayTron, INC.  
 \*2 The top-of-the-line model (RX-V100) only. Wireless LAN is in compliance with IEEE 802.11b/g. Broadband Internet connection and set-up, wireless routers, smartphones and other devices as well as specialized applications (available for download from Sharp-designated websites) are required.  
 \*3 Conducted a joint testing with Tarumizu City Fishermen’s Cooperative (Kagoshima Prefecture, Japan) for six-month period from October 2011. Results may differ depending on the testing conditions.