

# First System-on-Glass Driver LSI Chip to Achieve 768 Outputs for XGA TFT-LCDs

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Corporation announced the development of a panel-sized scan driver, the world's first system-on-glass (SOG), large-scale integrated (LSI) chip to achieve 768 outputs for extended graphics array, thin-film transistor, liquid crystal displays (XGA TFT LCDs). The new driver is expected to realize lower manufacturing costs and smaller module volume for medium to large TFT-LCDs.

Panel-sized drivers possess a length approximate to that of LCD width or height, have identical outputs for scan and column lines, and do not require tape-carrier packages (TCPs) or printed circuit boards (PCBs) in assembly. The drivers are silicon-on-insulator (SOI) devices made on a glass substrate with a complementary metal-oxide-semiconductor (CMOS) TFT circuit. Taking into account the floating-body effect, NEC has successfully fabricated a 189-mm-long scan driver with 768 outputs for XGA TFT LCDs using NEC's own low-voltage (5V) and high-voltage (15V, 40V) CMOS TFTs.

The features of the prototype panel-sized scan driver are as follows:

- (1) With a length of 189 millimeters (mm) and a width of 1.41 mm, the driver is narrow enough to be assembled at the edge of an LCD.
- (2) Although conventional modules need to be assembled with more than 10 parts, panel-sized driver modules only require that the drivers be assembled directly on the LCD panel. In addition, they do not require PCBs or TCPs. As a result, the assembly time for panel-sized drivers is significantly accelerated, as there are only three parts to assemble.
- (3) Due to a new level-shifter circuit, which greatly reduces unexpected delays caused by the floating-body effect of TFTs, stable operations can be achieved in wide duty/voltage ranges.

Panel-sized drivers are fabricated on a large, rectangular, glass substrate with SOG technology

and possess identical thermal expansion coefficient to LCD glasses. They also contain functions for TCPs and PCBs. As a result, SOG panel-sized drivers can be fabricated at a reasonable cost with superior assembly reliability.

"The development of the world's first prototype of a panel-sized scan driver is a great breakthrough for the semiconductor industry. We expect it will contribute significantly to the lowering of manufacturing costs for TFT LCDs, enabling thinner modules, and thus eventually decreasing the price of laptop computers and portable terminals with TFT LCDs," said Dr. Masao Fukuma, vice president, R&D Unit, NEC Corporation.

SOG TFT LCDs, in which poly-silicon (p-Si) driver circuits are monolithically integrated on LCD panels, are often used for mobile phones and other applications because they do not need driver LSI assembly and have small module volumes. As LCD size increases, the proportion of the driver circuit area in a whole display panel decreases rapidly. It is well known that p-Si TFT fabrication processes are more expensive than those of amorphous-silicon (a-Si) TFTs. As expected costs for existing SOG LCDs do not seem to match market prices, a-Si TFT-LCDs assembled with LSI drivers are currently widely used for medium to large LCDs. However, there is still strong demand for small-module volumes in portable-terminal applications such as laptop personal computers.

NEC will continue to carry out aggressive research activities toward commercialization of its panel-sized scan drivers.

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