

# **mSWV+ Technology for Wide Angle Mobile Viewing Under Impaired Lighting Conditions**

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Samsung Electronics, the world's leading supplier of thin-film-transistor, liquid crystal displays (TFT LCD), has developed a new design for mobile displays 10 inches or smaller that allows viewing of ultra-sharp LCD images at a 160-degree viewing angle in a variety of low or high ambient lighting conditions.

The company's proprietary PVA technology, which until now has been

used to improve off-axis viewing characteristics for large-sized LCDs, has been successfully adapted to work with small and medium-sized LCDs. When combined with a transfective mobile display mode, the new Mobile Super Wide View+ (mSWV+) will enable a new generation of rotational mobile multimedia displays.

Conventional transmissive LCDs are difficult to view in high ambient light conditions, even with a backlight. Samsung has created a high contrast, low-power, wide-angle mobile display that can be viewed with backlighting for indoor applications, or without a backlight by reflecting natural sunlight in outdoor environments.

With a transfective mode mobile LCD and Samsung's mSWV+ technology, a number of viewers can enjoy multimedia images simultaneously, whether indoors or outdoors, because of the wide viewing angle. Uses include watching movies via digital multimedia broadcasting at an airport, viewing a game stored in mobile handset's memory, or conducting a video teleconference in poor lighting or at a less than optimal viewing angle.

Previously, small and medium-sized transmissive LCDs had a low contrast ratio of 250:1 with a viewing angle of only 80-degrees up and down and 100-degrees left and right. The combination of transfective mode LCD and Samsung mSWV+ technologies increase the contrast ratio by 60 percent to 400:1 with no gray scale inversion. Screen colors remain unchanged as the display moves throughout a 160-degree bi-axial direction.

According to Mr. Jin-Hyuk Yun, senior vice president of the Mobile Display Business Team, "Our challenge was to develop a transfective mobile display with enhanced optical and electrical advantages. The Samsung Electronics transfective mSWV+ offers breakthrough features, in terms of high contrast, superior aperture ratio and lower

power consumption. This development reaffirms Samsung's commitment to the advancement of mobile display technology, while underscoring the many ways in which our PVA viewing enhancements can be applied.”

Samsung will begin mass production of its transfective mSWV+ technology for high-end handsets in 2006. Later uses may include medium-sized audio-video products, such as personal media players and car navigation systems.

## Terminology

**PVA technology** Patterned-ITO Vertical Alignment is a proprietary Samsung technology that enhances off-axis image quality. The liquid crystal molecules are originally aligned at 90-degrees vertically to the ITO electrodes, and an electric field is passed through the electrodes to deflect the liquid crystal molecules off-vertical and produce the required image. As with commercial vertical alignment technology, it uses a 4-domain liquid crystal cell structure.

**Gray-scale inversion** : A phenomenon in which light and dark colors invert when a display is viewed from off-axis conditions.

**Transflective** The light is shared between two fields, with some passing through the transmissive field and the remaining light passing through the reflective field. In this mode, the screen brightness is determined by how much of the total surface is occupied by the transmissive mode. Reflectance, on the other hand, is determined by how much of the surface is reflecting the light.

**Transmissive** All light passes through the same pixels. This is the display mode common to notebook PCs, LCD desktop monitors, and LCD TVs.

## **Transflective mSWV+ LCD Functions and Specifications**

Viewing angle 160°

Contrast ratio 400:1

Contrast at high ambient light condition 50:1

Number of Colors 260,000

Gray-scale inversion Negligible

Brightness 150 nits

Resolution QVGA (240 x RGB x 320)

Screen size 2.22"

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