PenTile RGBW™ Display Technology

PenTile RGBW technology enables high-resolution mobile displays that are not only brighter but also consume much less power than comparable RGB Stripe modules -- significantly improving cost/performance ratios for small-screen LCDs and increasing device design flexibility for ODMs and OEMs.

By taking advantage of the human visual system and the perception of colored light, Clairvoyante created a set of optimal pixel architectures and corresponding algorithms that use subpixels more efficiently than conventional displays to dramatically improve display performance or decrease power consumption (see Figure 1).

The PenTile RGBW architecture renders information using on average only two subpixels per pixel (see Figure 2), whereas the legacy RGB Stripe approach uses three subpixels (red, green, and blue) per pixel.

Licensees

Clairvoyante develops and licenses optimized pixel architectures and algorithms to LCD panel manufacturers and has engaged 12 of the world’s leading panel suppliers in the development of a wide variety of prototype and commercial panels, including high-performance PenTile RGBW qVGA and VGA resolution small-screen LCDs.

OEM/ODM inquiries about these high-performance displays can be made via Clairvoyante or by contacting preferred LCD suppliers directly.

PenTile RGBW technology enables the future of mobile LCDs... today!
**Performance**

Nature is dominated by very bright non-saturated colors. The greatest performance impact of PenTile RGBW technology is in rendering such bright, natural colors with the contribution of the bright white subpixel, giving rise to significantly higher brightness as depicted in Figure 3.

Note the color gamut remains unchanged, yet the PenTile RGBW panel is better tuned to the luminosity statistics of less saturated natural images.

*Figure 3. PenTile RGBW technology brightens natural images, enabling high-brightness (400 nits) mobile phone displays using low power backlights. This power efficiency is essential in extending battery life and enhancing key mobile media applications such as camera phones, portable media players, and mobile TV phones.*

**Implementation**

PenTile RGBW LCD panel production does not require significant changes to existing manufacturing processes and there may be considerable yield improvements due to the use of one-third fewer TFTs compared to an RGB Stripe panel.

Standard display driver integrated circuits are easily updated to support PenTile RGBW panels. As illustrated in Figure 4, integrating a small PenTile processing block in a standard driver IC may reduce the frame buffer and source driver area by one-third. Multiple driver manufacturers are now developing PenTile-compatible driver ICs.

*Figure 4. PenTile processing on the LCD Driver IC greatly reduces the frame buffer size and number of source drivers and typically results in more cost-effective use of silicon area.*

**PenTile RGBW Versus RGB Stripe**

The high light-transmission properties of PenTile RGBW displays enable the industry’s brightest and lowest power qVGA (240x320) solutions (Figure 5). This subpixel rendering technology also provides the most cost-effective means of achieving VGA (480x640) visual resolution with only half the power or twice the brightness of an equivalent RGB Stripe panel.

*Figure 5. For a given backlight, PenTile RGBW panels exhibit up to 65% brightness gain for 1.8-inch quarter-VGA configurations and up to 100% gain for 2.4-inch VGA configurations relative to RGB Stripe panels. Alternatively, any demanding brightness specification can be achieved using a lower power, less expensive backlight comprised of fewer LEDs.*