**Docket #:** S06-061

# Hybrid LED-LCD Display

Stanford researchers have recently patented a **hybrid LED-LCD screen** suitable for applications ranging from large televisions to small mobile displays and capable of **significantly reducing power consumption** to as little as 1/20th that of conventional designs at the same brightness - while achieving at least a 50% power reduction in all applications. Its design uses a spatially adjustable LED backlight that is controlled to minimize power consumption by way of an algorithm that decomposes the image into LED and LCD components. This display technology delivers a **high maximum brightness** that is roughly an order of magnitude brighter than current LCD screens ( at 2000 $cd/m^2$), and manages an **excellent 20,000:1 dynamic contrast ratio** - making it well suited for high dynamic range applications. The screen is lightweight, silent, and passively air cooled, while the LEDs can be mounted on standard FR4 printed PCB circuit boards, rather than the MCPCB boards used in current designs. This increases the wiring and layout flexibility and permits designers to use well-supported modern CAD tools. The prototype itself is already performing well, with power consumption ranging from .25-.8 $W/in^2$ at a weight per unit area of only 17 $g/in^2$, including power supply.

**Stage of Research:**
Prototype has been constructed and power consumption has been tested on a variety of high dynamic range and conventional images.

## Applications

- **Display screens**, such as:
  - Home entertainment displays
  - Laptop displays
  - Portable gaming device displays
  - Computer displays

    - Mobile device displays

## Advantages

- **Low power consumption** - 0.25 - 0.8 W/in$^2$ at a brightness of 2000cd/m$^2$ (1/2 to 1/20th the power consumption per unit LCD screen area compared to conventional designs)
- **Standard circuit board** - technology can be implemented on low-cost FR4 PCBs:
    - can accommodate all system and cooling components on a single board
    - increases flexibility in wiring and layout
    - permits designers to use CAD tools
    - avoids price premium of MCPCBs
- **Improved image quality** for high contrast images
- **Passively air-cooled**
- Light-weight

## Publications

- "A Low Power, Passively Cooled 2000 cd/m$^2$ Hybrid LED-LCD Display" Barnhoefer, U. Moon-Jung Kim Erez, M. Consumer Electronics, 2006. ISCE '06. 2006 IEEE Tenth International Symposium on, June 2006, page(s): 1- 4

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