



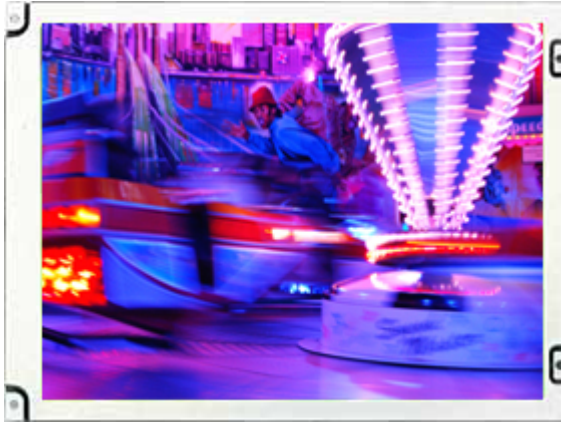
TFT development for outdoor application

Optrex solves the problems inherent in delivering highly readable and reliable displays for outdoor use with its line of TFT displays optimized with:

- **High brightness (greater than 600 nits luminance)**
- **Anti-reflective surfaces / Transflective**
- **Extended temperature ranges**
- **High clearing temperature**
- **Outstanding readability at ultra-wide viewing angles**



High Luminance



High Luminance



Normal Luminance

Greater than 600 nits luminance, Optrex TFT displays provide legibility and image clarity in high ambient light environments, with display readability at angles up to 170 degrees.

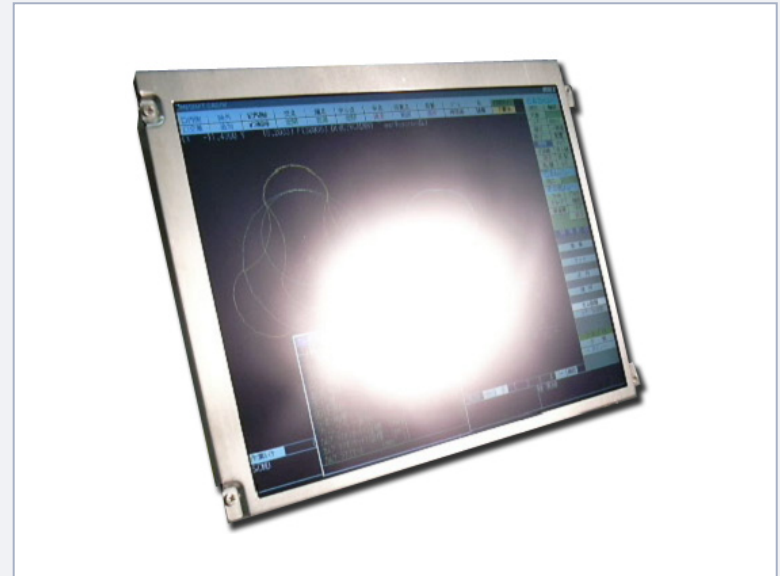
Anti-Reflection (AR)

AR-coating



Reflectance: less than 1% (typ. 0.3%)
You can still see the screen image under strong light.

Conventional AG (Anti-glare)



Reflectance: about 4%
Screen image is washed out by strong light.

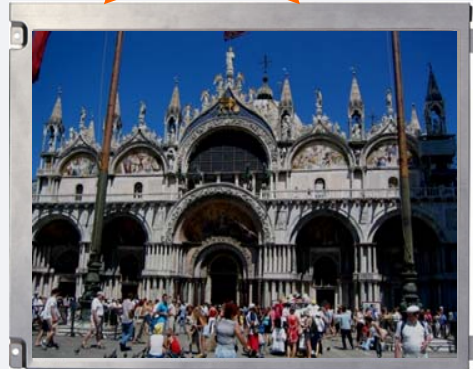
AR-coating has better readability!

AR-coating and High Brightness



Standard LCD
400nits w/ AG

Poor



AR LCD
400nits w/ AR



Super HiBr LCD
1000nits w/ AR

Good

Sunlight Readability

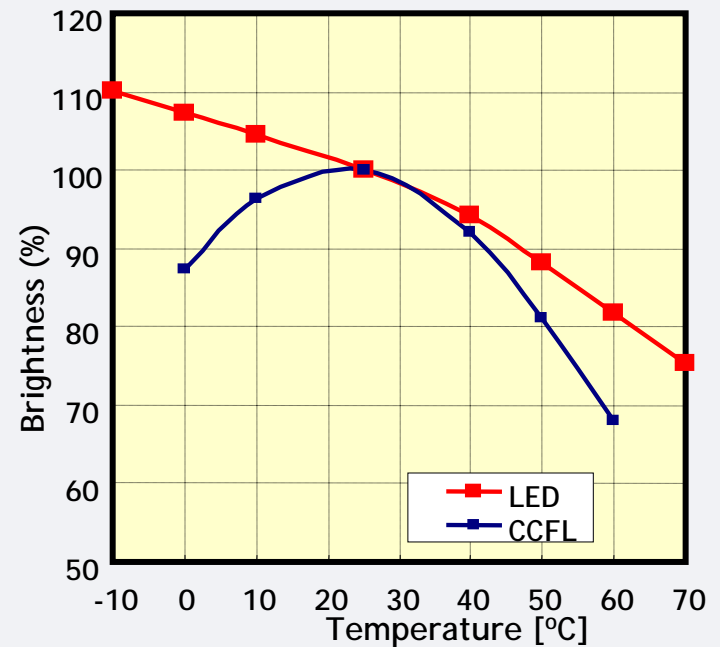




LED Backlight for wide temperature range

Advantage

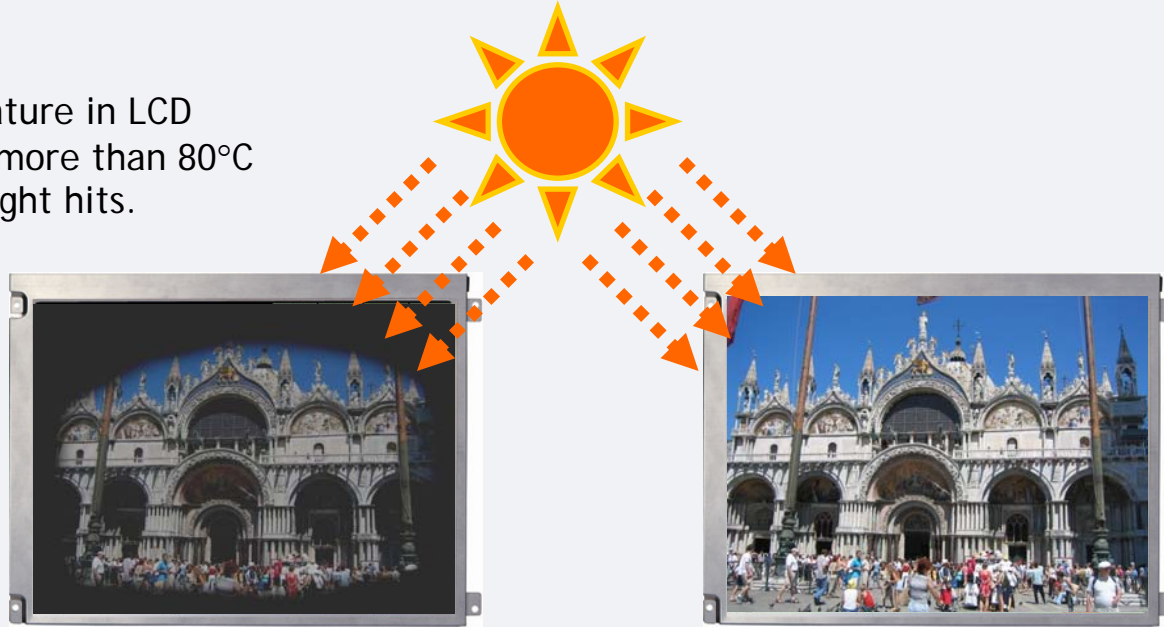
- Mercury Free
- High Performance under Low Temperature
 - High Brightness
 - Quick Kick-off Brightness
- Wider Range of Brightness Control
- No High Voltage Component (Inverter)



Temperature vs. Brightness Curve

Liquid crystal material clearing temp (Tni) 95°C

Ambient temperature in LCD chassis becomes more than 80°C when direct sunlight hits.



Conventional LC material

Tni = 85°C

New LC material

Tni = 95°C

New LC material is suited for outdoor application



Ultra wide viewing angle

Less image reversal

Wider viewing angle LCD

H:160, V:150

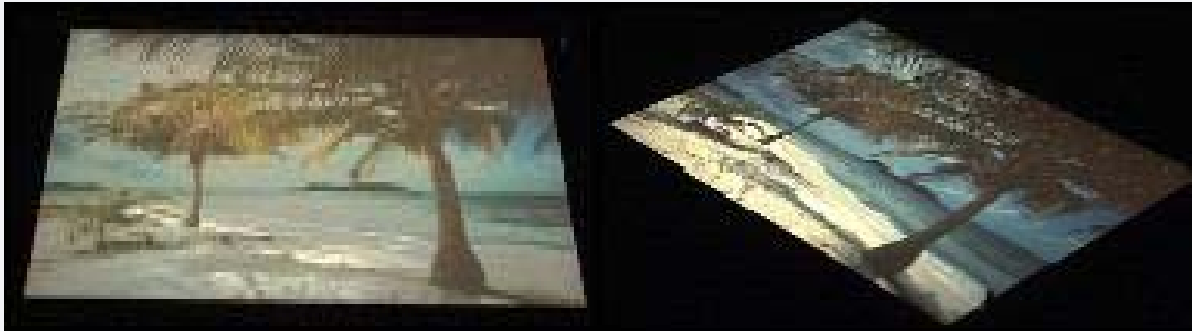
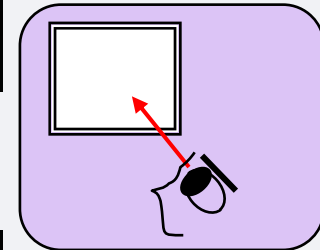
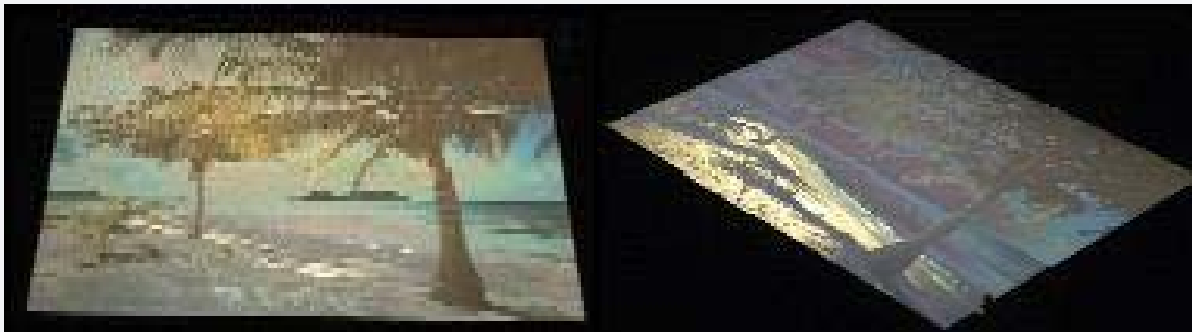


Image reversal occurs

Conventional LCD
(WV film)

H:140, V:110



Viewing direction