

Panel Displays

FOR TELEVISIONS AND COMPUTERS

Backlit displays (the right half of the diagram) provide fine sub-pixel modulation by varying the extinction of the polarized light source with an array of **LIQUID CRYSTAL** cells that rotate the polarization proportional to an alternating drive voltage. The **BACKLIGHT** itself can be constant luminance, globally dimmed to improve sequential contrast, or locally dimmed to improve simultaneous contrast.

Emissive displays (the left half of the diagram) provide an array of **ACTIVE EMITTERS** (historically plasma cells, but now light emitting diodes) that produce the light for each sub-pixel, proportional to a drive current.

Imagery is provided through the **INPUT PORTS**, converted into the native color space of the display, and fed to the drive circuitry. The **ACTIVE MATRIX** provides a transistor at each sub-pixel to maintain the electrical drive for both liquid crystal cells and active emitters while the rest of the display is being refreshed.

ORGANIC LIGHT-EMITTING DIODE (OLED) PANEL

- Ultra-fast temporal response speeds
- No color shifts across grayscale
- High contrast, high brightness
- Deep black levels, supports HDR
- Excellent color saturation and wide color gamut (DCI P3)
- Excellent viewing angles
- Uses RGB and RGBW stripes

IN-PLANE SWITCHING (IPS) LCD PANEL

- Fast temporal response speeds
- No color shifts across grayscale
- Good contrast, high brightness
- Good viewing angles
- Low contrast but good color viewing angle

PATTERNED VERTICAL ALIGNMENT (PVA) MULTI-DOMAIN ALIGNMENT (MDA) LCD PANEL

- Fast temporal response speeds
- Good contrast, high brightness
- Good viewing angles
- Good contrast but poor color viewing

HIGH DEFINITION MULTIMEDIA INTERFACE (HDMI)

- Interface speeds to 18 Gb/s, TMDS format
- Full-size, micro, mini variations
- Carries embedded audio, metadata
- Version 2.0a supports CEA 861.3 HDR
- Most popular display interface worldwide
- Supports *HDCP 2.2



SUPERMHL

- Interface speeds to 36 Gb/s, TMDS format
- Full-size connector
- Carries embedded audio, metadata
- Supports Display Stream Compression (DSC)
- Compatible with USB 3.0 Type-C
- Supports *HDCP 2.2

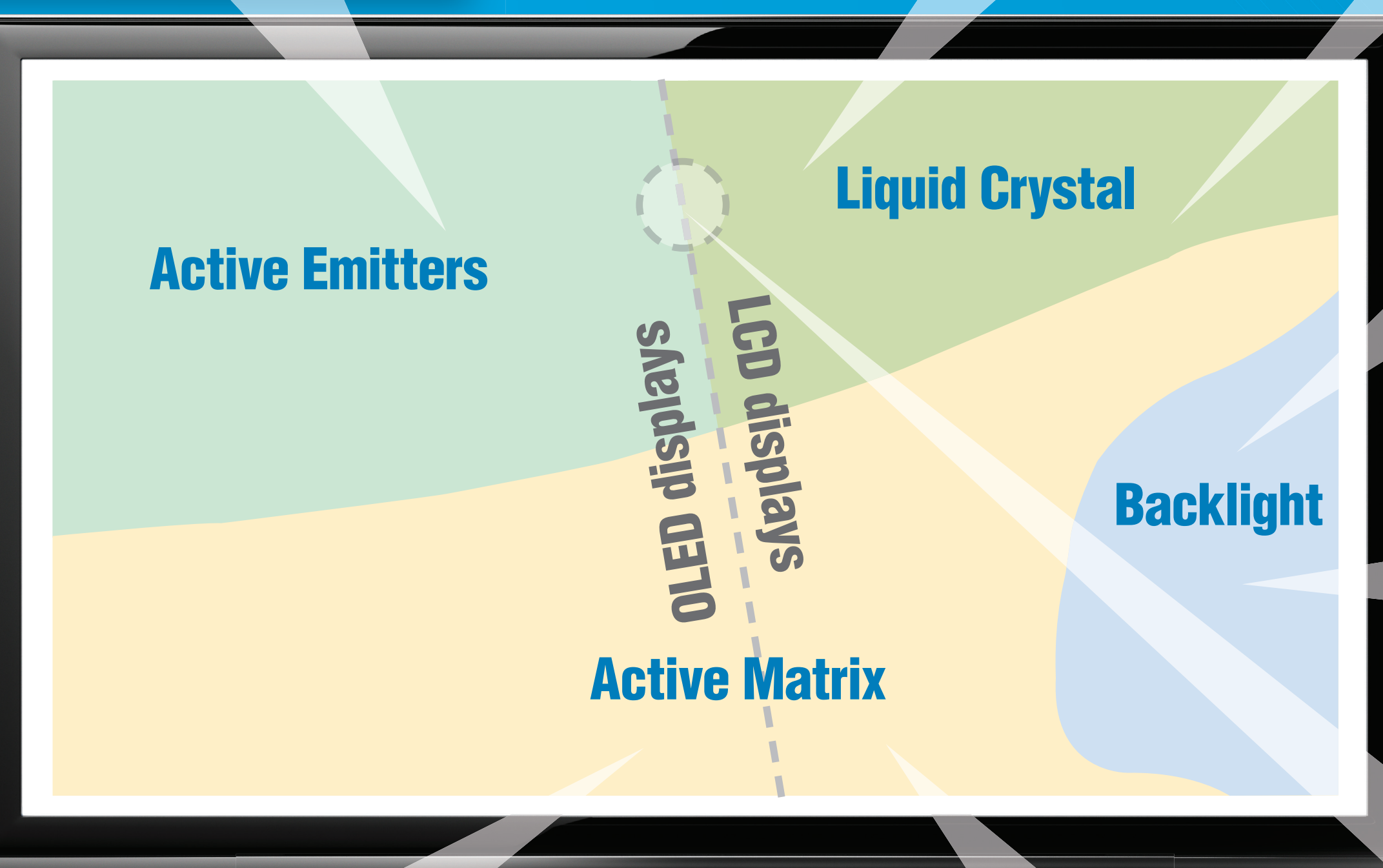


DISPLAYPORT

- Interface speeds to 32 Gb/s, packet format
- Full-size, micro, mini variations
- Carries embedded audio, metadata
- Versions 1.2/1.3 support DSC
- Versions 1.2a – 1.4 support CEA 861.3 HDR
- Compatible with USB 3.0 Type-C
- Supports *HDCP 2.2



*High-Bandwidth Digital Copy Protection



INDIUM GALLIUM ZINC OXIDE THIN-FILM TRANSISTORS (TFTs)

- Fast switching speeds
- Low power consumption
- Extremely low leakage current
- Small form factor, larger light aperture

AMORPHOUS SILICON (ASI) THIN-FILM TRANSISTORS (TFTs) LOW TEMPERATURE POLYSILICON (LTPS) TFTs

- Fast switching speeds
- Moderate power consumption
- Low leakage current
- Inexpensive to manufacture

QUANTUM DOT BACKLIGHT

- Excellent color saturation and wide color gamut (DCI P3)
- Pure colors (40 nm BW)
- Fast temporal response for local area dimming
- Used in HDR LCD displays
- Used for local, global, or edge-lit illumination

WHITE LED BACKLIGHT

- Fast switching speeds
- Use with RGB color filters
- Used for local, global, or edge-lit illumination
- High contrast when used with local dimming

PIXEL STRUCTURE

