19OE107 – CONSUMER ELECTRONICS

UNIT 4 -VIDEO SYSTEMS AND DISPLAYS

TFT

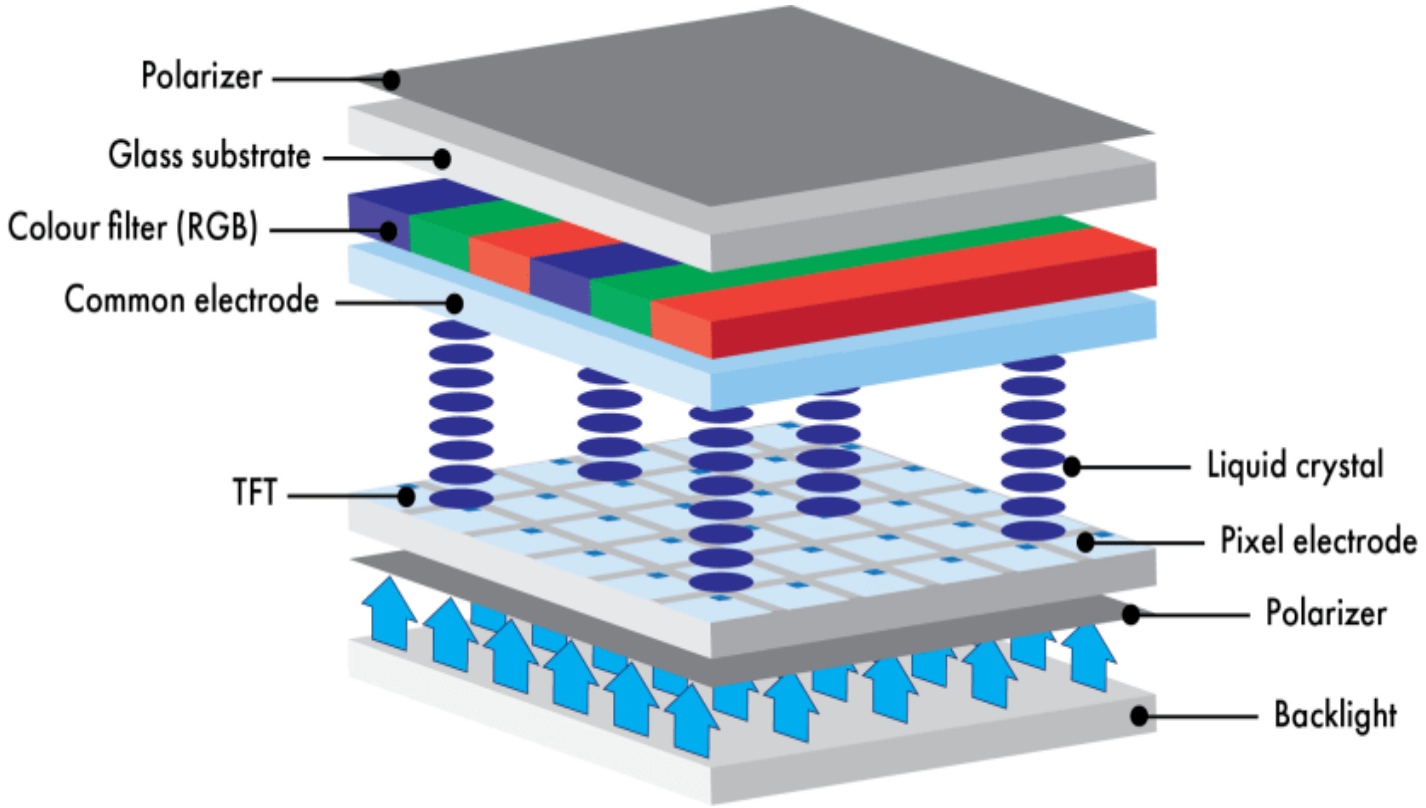
TFT

•TFT, or Thin Film Transistor, is a technology used in many LCD (Liquid Crystal Display) TVs.

•Each pixel in a TFT LCD is controlled by a transistor, which helps to improve image quality and addressability.

•The TFT technology provides the best resolution of all the flat panel techniques, but it is also the most expensive. TFT screens are sometimes called active matrix LCDs.

•TFT provides very sharp images with shortened response times. Plus, TFTs consume less power than other display types, making them energy efficient.


Polarizer
Glass substrate
Colour filter (RGB)
Common electrode
TFT
Liquid crystal
Pixel electrode
Polarizer
Backlight

Working Principle

- The TFT acts as switches that pass the correct voltage onto the relevant liquid crystals to dictate whether these pixels are light (on) or dark (off).
- The TFT are the active elements within the display.
- The electrical charge received by the liquid crystal pixels causes them to alter their molecular structure, allowing the varying color wavelengths of the backlight to ‘pass-through’.
- The TFT layer of the display is arranged in a matrix.
- The characteristics of the pixels within this are determined by the underlying density (resolution) of the color matrix and TFT layout.
- The more pixels the higher detail is available.
- Each pixel within the TFT is paired with a transistor. Each transistor contains a capacitor, which allows each individual sub-pixel to retain its charge, rather than needing a new electrical charge to be sent each time it needs to be changed.
- This technology enables a display that operates using minimal energy, without running out of operation. A TFT is in constant flux and refreshes rapidly depending upon the incoming signal from the control device.

Applications and benefits

- TFTs are very versatile and resilient and, therefore have a vast number of applications.
- These displays are designed to withstand physical shock and vibration, as well as to be protected against environmental elements such as water and dust exposure.
- In the most physically demanding applications, they can also be housed in robust enclosures to enhance their durability even more.
- Most commonly you will find TFTs in mobile devices, computer screens and some TV's.
- But due to their high readability performance, they are suited to outdoor use as well as indoor.
- The high levels of brightness and contrast mean that they can still be readable even in direct sunlight.

- For outdoor applications where visibility is paramount, particularly in emergencies, this is ideal. An operator can easily monitor a system's status with clarity through a TFT.
- TFTs are also known for having a wide temperature range, which increases their functionality in diverse climates. They are engineered to function in temperatures from the bitter cold (-30°C) to the scorching hot (+85°C).
- All these factors contribute to the impressive longevity of TFTs. They have long lifetimes which for users means minimal maintenance is required, as well as reduced need for replacement and repair costs. This adds to their popularity in remote applications and hard-to-reach installations.

Limitations

- Due to their design and more advanced technology, TFTs are currently more expensive than standard monochrome displays, and even some OLED displays.
- TFTs do provide an overall good contrast, the contrast ratio is still slightly limited. They often struggle to display deep blacks and bright whites simultaneously.
- Unlike other display technologies like OLED, TFT screens cannot emit their own light
- Similarly with viewing angles, although TFTs have much better viewing angles than standard LCDs, when viewing from extreme angles this is still limited, and the image quality can appear degraded.
- If working in an application where viewing angle is key, IPS options could be considered, as these typically offer 85 degrees viewing from all angles.
- TFTs are susceptible to image retention, which can eventually cause ghost images to appear on the display screen.


Thank
you