
Liquid Crystal Display Technology

Liquid crystal displays, or LCDs, are divided into two main classes: active and passive matrix LCDs. Passive matrix displays scan each of the cells, or pixels, sequentially. They are less complex and less expensive than active matrix devices, but the addressing technique they use means that each cell is only driven for a small fraction of the time. To maintain the image, the cells must hold their state for a long time (analogous to long decay phosphors in a slow-scan CRT). The disadvantage is that the response time of the display is slowed, which leads to ghosting on rapidly changing images, such as when the cursor is moved.

Active matrix displays have circuitry associated with each cell. The usual technique for building active matrix LCD circuits is to use a thin film of silicon grown on the display glass. This technique is known as thin-film transistor, or TFT. This type of LCD can be thought of as a big dynamic RAM, with one cell for each pixel. The RAM drives each liquid crystal cell continuously, and the RAM cells are refreshed by scanning the display. This enables the liquid crystal cell to be faster, improving response time dramatically. It also allows the display to have much higher resolution, since the drive time of each cell is not reduced by adding more cells. The increased resolution makes it more practical to build a color display since a color display has at least three times as many effective pixels as a monochrome display (one red, one green, and one blue subpixel for each pixel).

LCDs offer a number of advantages over CRTs. Because they are fabricated with a lithographic process, they offer excellent linearity, convergence, and purity. LCDs have no electron beam, making them unsusceptible to magnetic fields. They have lower power requirements (about 55W versus 100W for a comparable-size CRT). Because conventional CRTs need to deflect an electron beam, they must have a greater depth, and thus a larger footprint, than an LCD monitor. CRTs need to accelerate the electron beam, which requires high voltages that are not necessary for LCD monitors. Side effects of the high voltages include x-ray emissions and potential electrostatic problems in some environments. Finally, LCD monitors don't need a heavy glass bottle to maintain a vacuum, so they weigh much less than CRTs.
