LCD stands for LIQUID CRYSTAL DISPLAY, a device which combines the properties of liquid and crystal. It has a temperature range within which the molecules are almost as mobile as they would be in a liquid. These molecules are grouped together in an ordered form similar to a crystal.

LCD consists of two glass panel. A liquid crystal material is sandwiched between these two glasses. The inner surfaces of the glass plate are coated with transparent electrodes. These electrodes define the characters, symbols or patterns to be displayed. A polymeric layer is present in between each electrode and the liquid crystal. This makes the liquid crystal molecules to maintain a defined orientation angle. There is a polarizer pasted outside on each of the glass panel. These polarizers rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the OFF state, the polarizers and the liquid crystal rotate the light rays in such a way that the light coming out of the LCD are without any orientation and hence the LCD appears transparent.

When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarisers, which would result in activating / highlighting the desired characters.

LCDs do not emit light directly. LCDs therefore need a light source and are classified as "passive" displays. Some types can use ambient light such as sunlight or room lighting. There are many types of LCDs that are designed for both special and general uses. They can be optimized for static text, detailed still images, or dynamic, fast-changing, video content.

**LCD pin descriptions**



**Vcc, Vss, and VEE**:

While Vcc and Vss provide +5V and ground, respectively, VEE is used for controlling LCD contrast.

**RS – register select:**

There are two very important registers inside the LCD. The RS pin is used for their selection as follows. If RS = 0, the instruction command code register is selected, allowing the user to send a command such as clear display, cursor at home, etc. If RS = 1 the data register is selected, allowing the user to send data to be displayed on the LCD.

**R/W – read/write:**

R/W input allows the user to write information to the LCD or read information from it. R/W = 1 when reading; R/W =0 when writing.

**E – enable:**

The enable pin is used by the LCD to latch information presented to its data pins. When data is supplied to data pins, a high to low pulse must be applied to this pin in order for the LCD to latch in the data present at the data pins. This pulse must be a minimum of 450 ns wide.

**D0 – D7:**

The 8 bit data pins, D0 – D7, are used to send information to the LCD or read the contents of the LCD‘s internal registers.

To display letters and numbers, we send ASCII codes for the letters A – Z, a – z, and numbers 0 – 9 to these pins while making RS = 1.

There are also instructions command codes that can be sent to the LCD to clear the display or force the cursor to the home position or blink the cursor. Table below lists the instruction command codes.



**LCD Commands table**

We also use RS = 0 to check the busy flag bit to see if the LCD is ready to receive information. The busy flag is D7 and can be read when R/W =1 and RS = 0, as follows: if R/W =1, RS =0. When D7 = 1(busy flag = 1), the LCD busy taking care of internal operations and will not accept any new information. When D7 = 0, the LCD is ready to receive new information. Note: It is recommended to check the busy flag before writing any data to the LCD