

Display Types

LED

Light Emitting Diode
 very inexpensive
 long life
 lots of wavelength/color choice
 can be single or "grouped" (displays)
 can control brightness with
 current or duty cycle

VFD

Vacuum Fluorescent Display
 very bright
 blue-green color
 used to be more popular
 old technology (Nixie Tubes)
 medium power

LCD

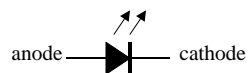
Liquid Crystal Display
 very popular
 inexpensive
 very low power
 color determined by backlight/filters
 more climate sensitive than LEDs
 needs light (passive device)

Plasma Display

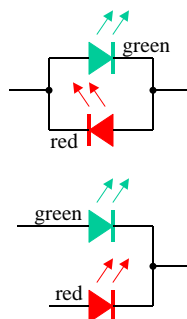
good for low light graphics
 compact (compared to CRT)
 military uses
 uses high voltages
 (needs to make gas glow)

LEDs

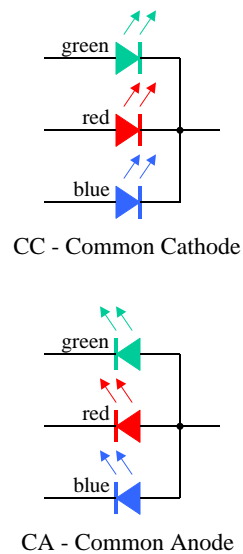
Single LED



Dual-Color LED

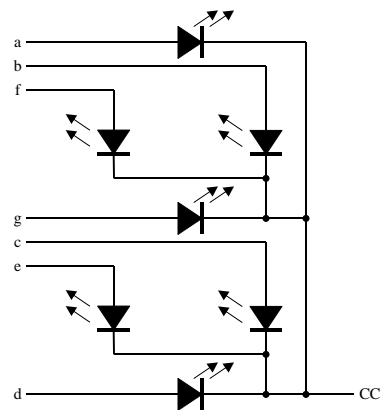
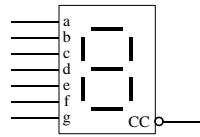


Tri-Color LED

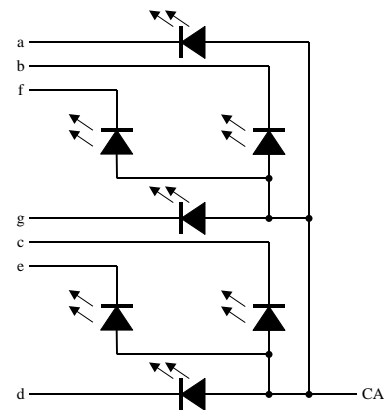
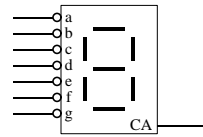


LED Displays - 7-Segment

Common Cathode

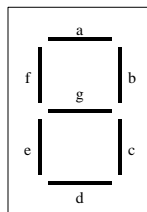


Common Anode

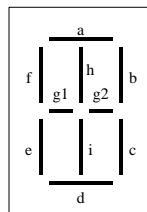


LED Displays

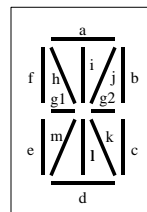
7-Segment



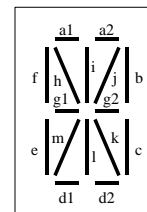
10-Segment



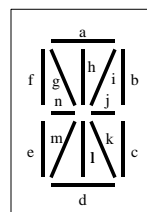
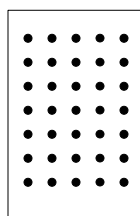
14-Segment



16-Segment

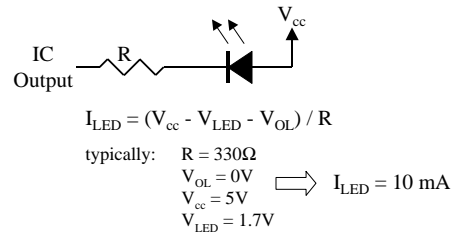


5x7 Dot Matrix



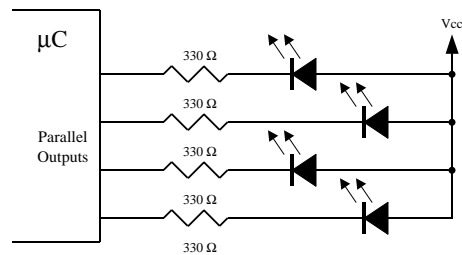
Driving LEDs

Typical Circuit



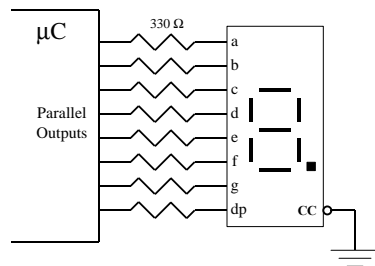
$V_{LED} = 1.7V$ Red
 $V_{LED} = 2.1V$ Yellow
 $V_{LED} = 2.1V$ Green
 $V_{LED} = 3.5V$ Blue
 $V_{LED} = 3.5V$ White
 $V_{LED} = 1.7V$ IR

Non-Multiplexed Individual LED Interfacing

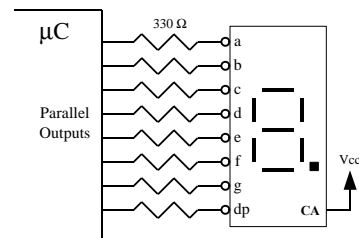


Non-Multiplexed 7-Segment LED Interfacing

Common Cathode



Common Anode

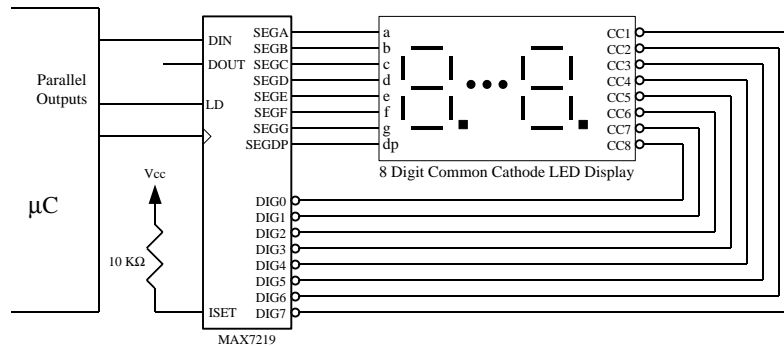


Multiplexing LEDs

The diagram illustrates a multiplexing circuit for LEDs. It consists of a 6x4 grid of LEDs. Each LED is connected to a common row line and a common column line. The row lines are labeled 'Rows - can turn on multiple (source)' and each has a resistor 'R' connected to a common source. The column lines are labeled 'Columns - turn on one at a time (sink)'. The LEDs are represented by diodes with arrows indicating light emission. The circuit allows for selecting one column at a time to turn on all LEDs in that column simultaneously.

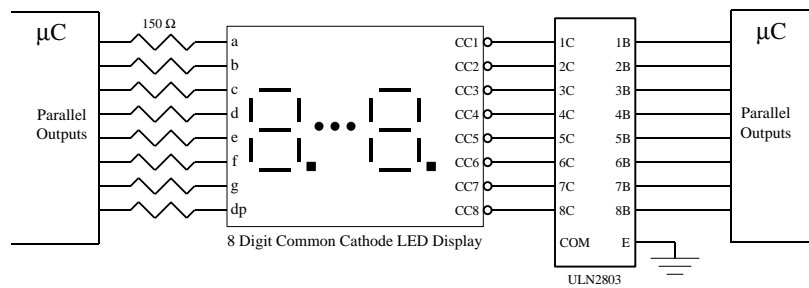
Multiplexed 7-Segment LED Interfacing

Hardware Multiplexing

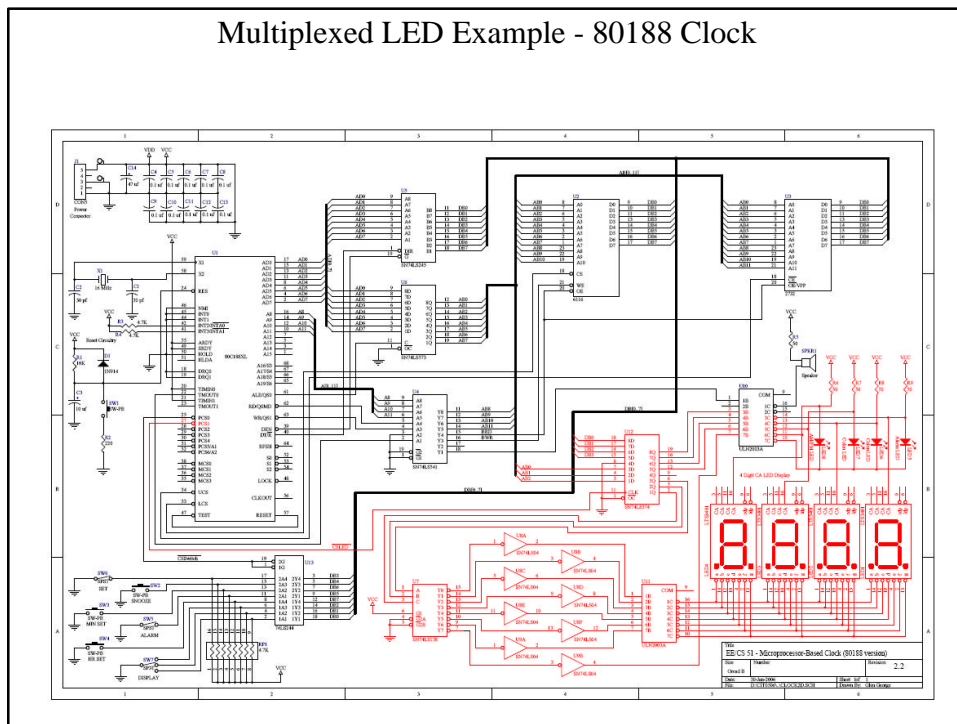


Multiplexed 7-Segment LED Interfacing

Software Multiplexing



Multiplexed LED Example - 80188 Clock



Multiplexed LED Example - AVR Clock

