

Seven Segment Displays

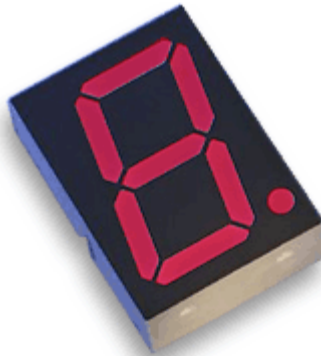


This presentation will demonstrate how

- A seven-segment display can be used to display the decimal numbers 0-9 and some alpha characters.
- A common anode seven-segment display works.
- A common cathode seven-segment display works.
- To select the resistor value for a seven-segment display.



Seven Segment Displays

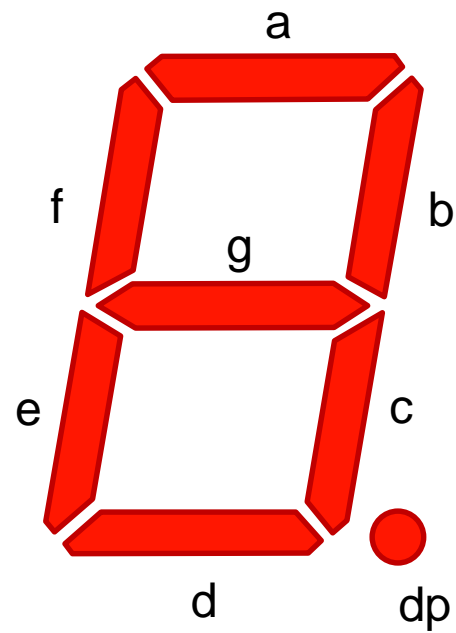


Retro
LED Watch
(Circa 1970s)

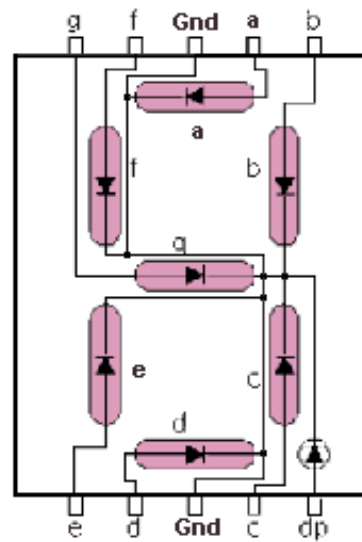


Segment Identification

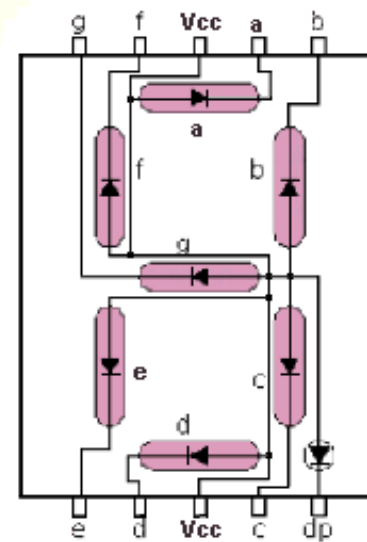
- A Seven-Segment Display (SSD) is simply a figure eight grouping of LEDs {some include a decimal point (DP)}.
- Each Segment is labeled (a) thru (g).
- SSDs are available in two configurations
 - Common Cathode (all LED cathodes are connected)
 - Common Anode (all LED anodes are connected)



Common Cathode

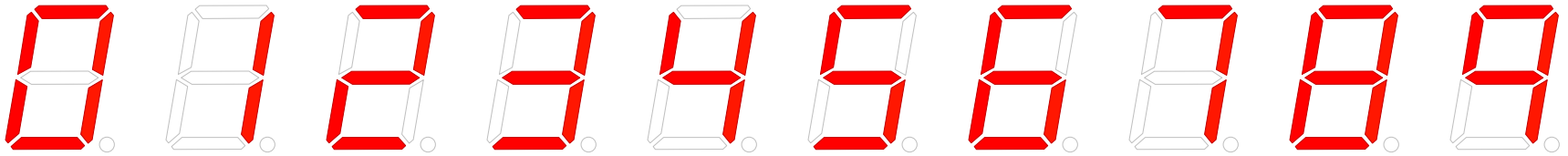


Common Anode

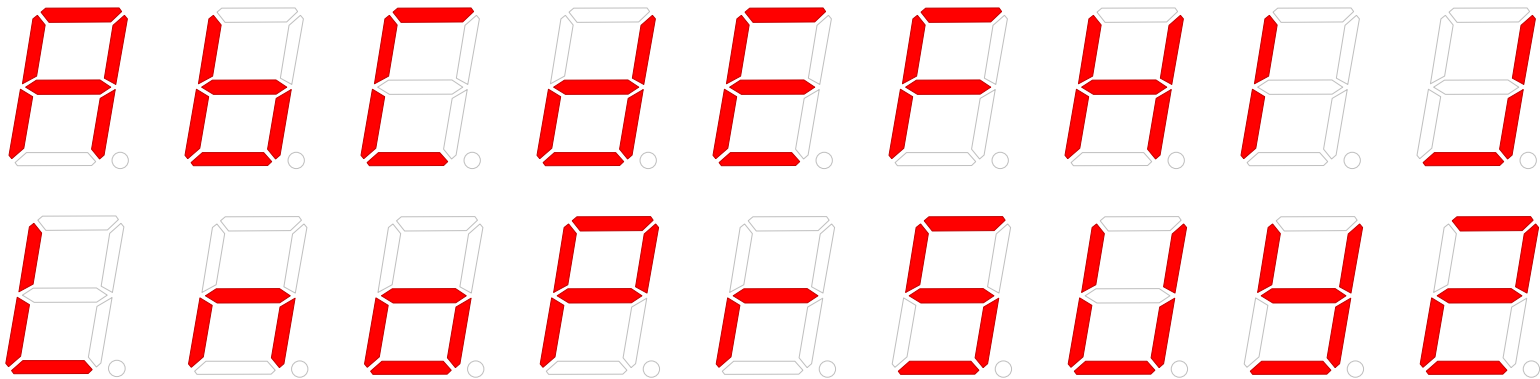


SSD Display Possibilities

Decimal Digits 0-9



Select Alpha Characters



Simple Messages



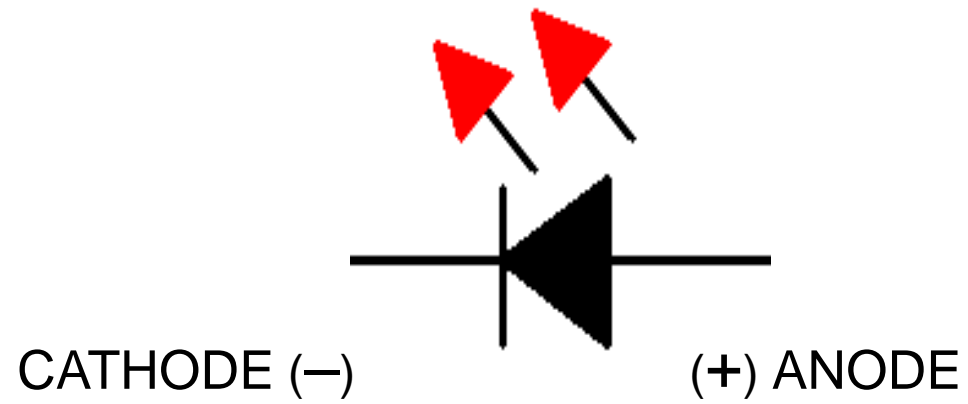
Basic LED Operations

To understand how a seven-segment display works, we must review how an LED works.

To Turn an LED ON . . .

- The ANODE must be at a higher voltage potential (~1.5v) than the CATHODE.
- The amount of current flowing through the LED will determine the brightness of the LED.
- The amount of current is controlled by a series resistor. (not shown)





← Current Flow

LED Configuration – Anode @ 5 Volts

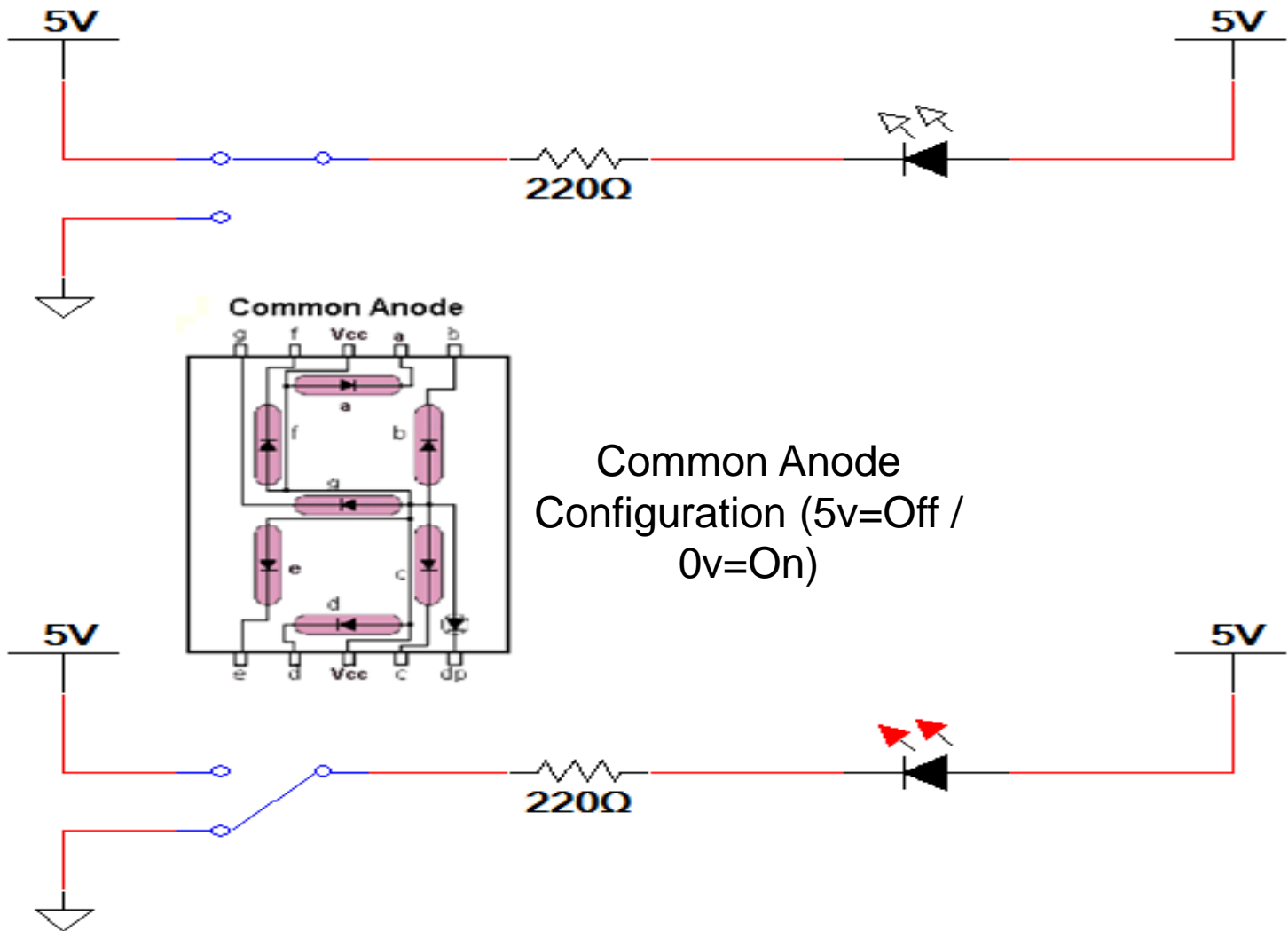
Switch @ 5v

- Top Circuit
- LED Off

Switch @ 0v

- Bottom Circuit
- LED On
- **ANODE @ 5v**
- **CATHODE @ 0v (nearly)**
- The 220 Ω resistor controls the current.
- A larger resistor . . . less current . . . dimmer LED
- A smaller resistor . . . more current . . . brighter LED





Example #1: Common Anode SSD

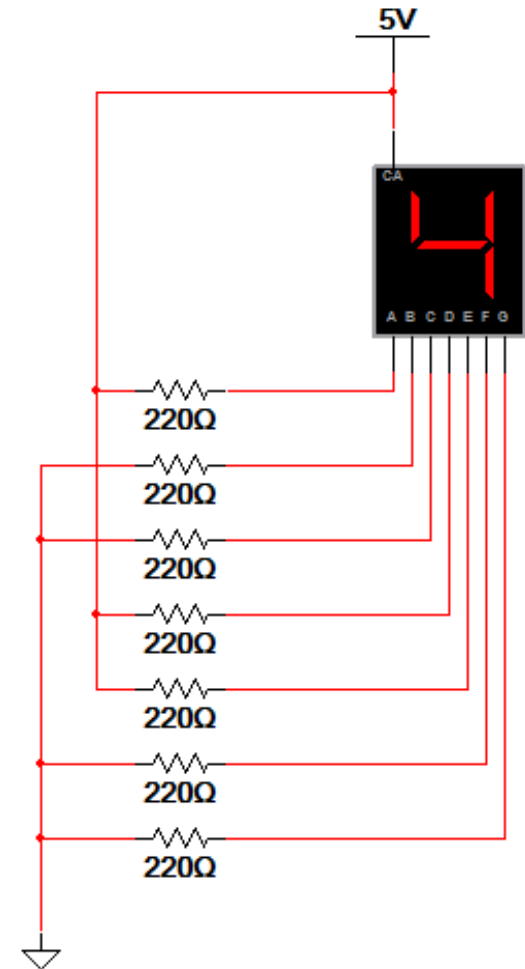
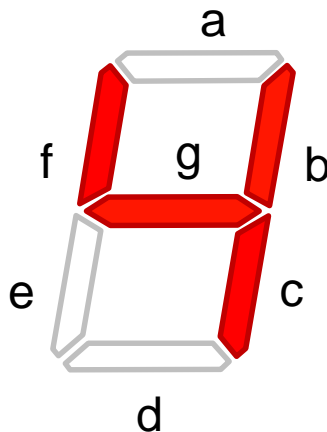
Example

What value would be displayed in the common anode seven-segment display shown?

Solution

Common Anode:

- 0 volts = Segment On
 - b, c, f, & g
- 5 volts = Segment Off
 - a, d, & e



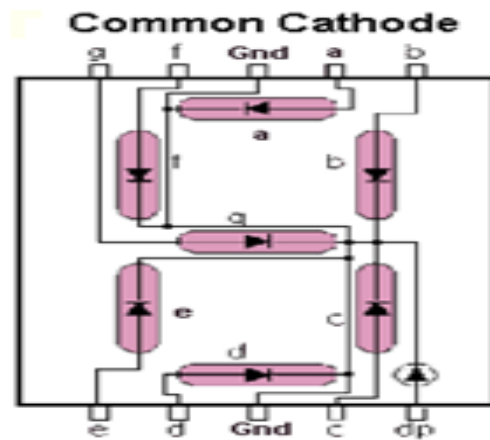
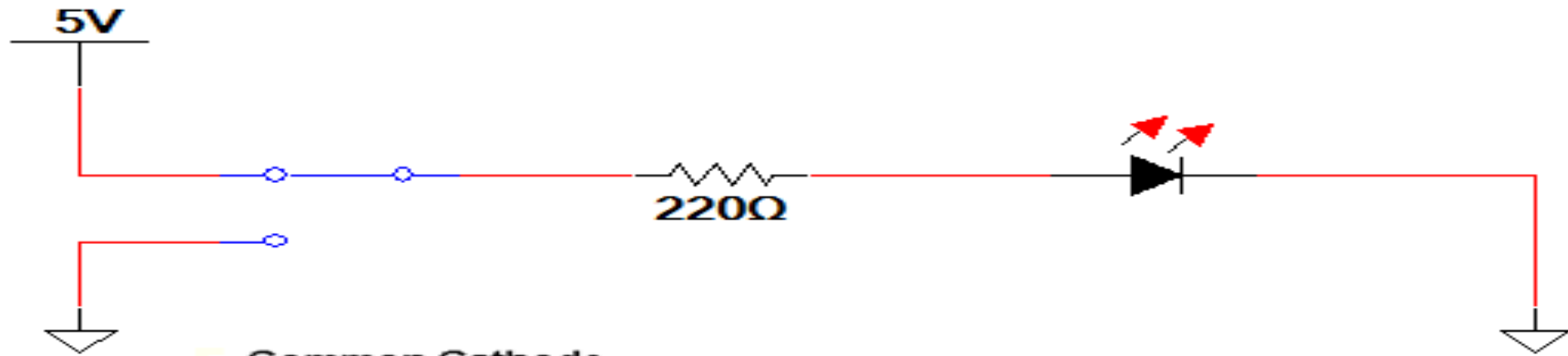
LED Configuration – Cathode @ Ground

Switch @ 5v

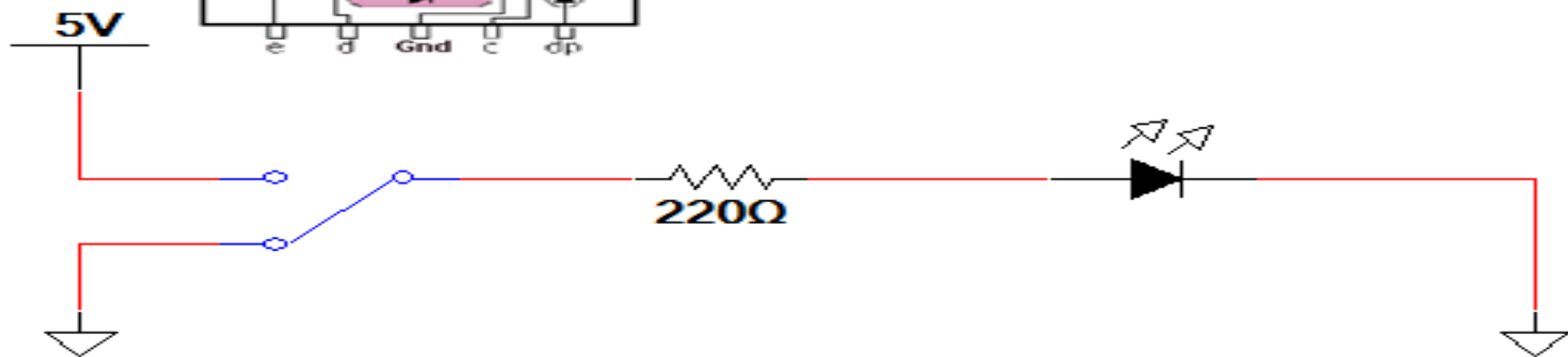
- Top Circuit
- LED On
- **ANODE @ 5v (nearly)**
- **CATHODE @ 0v**
- The 220 Ω resistor controls the current.
- A larger resistor . . . less current .
. . . dimmer LED
- A smaller resistor . . . more
current . . . brighter LED

Switch @ 0v

- Bottom Circuit
- LED Off



Common Cathode SSD
Configuration (5v=On / 0v=Off)



Example #2: Common Cathode SSD

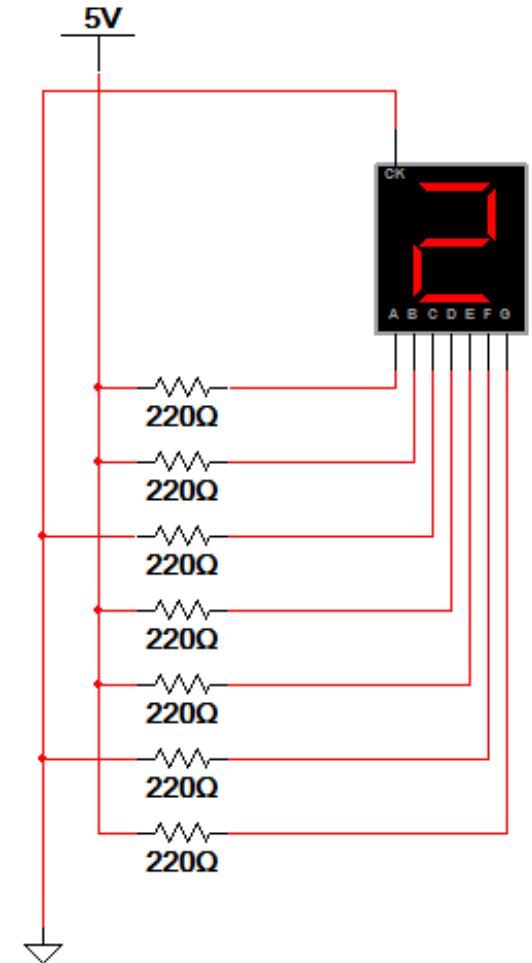
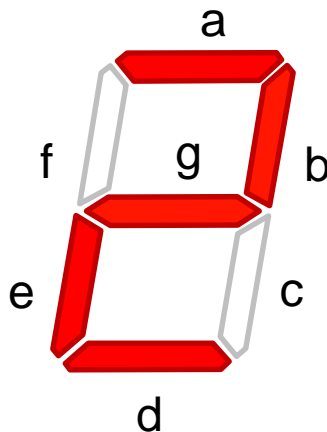
Example

What value would be displayed in the common cathode seven-segment display shown?

Solution

Common Cathode:

- 5 volts = Segment On
 - a, b, d, e, & g
- 0 volts = Segment Off
 - c & f



Resistor Values for SSD

- The resistor value determines the amount of current that is flowing through the LED in the SSD.
- This is why they are sometimes called *current limiting resistors*.
- The amount of current determines how luminous (bright) the LED will be.
- If the resistor is too large, the current will be too small and the LED will not be visible.
- If the resistor is too small, the current will be too large and the LED will be damaged.