

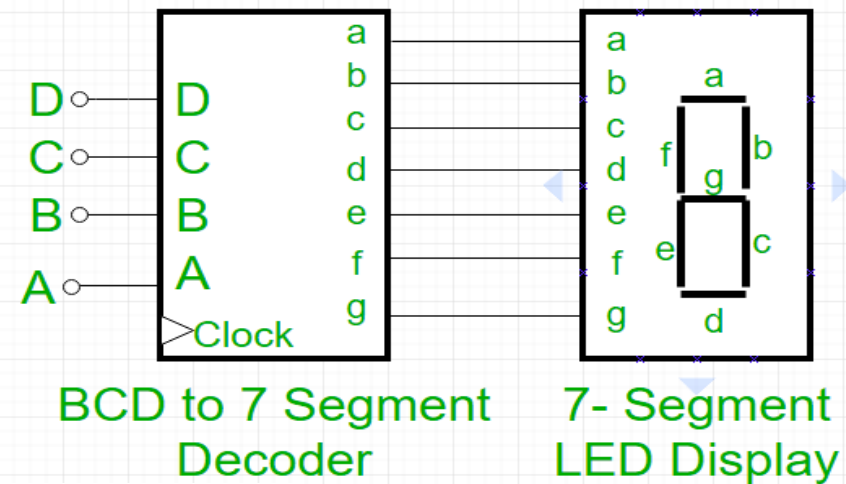
7 Segment Display

Team Members: Saba Syed
Laxmi Panch
Tanay Zope
Pratik Pingale

What is 7 Segment Display?

- Seven segment display is the most common device used for displaying digits and alphabet. You can see the Seven Segment Display devices in TV shows counting down to '0'.
- Use of LEDs in seven segment displays made it more popular.
- The binary information can be displayed in the form of decimal using this seven segment display. Its wide range of applications is in microwave ovens, calculators, washing machines, radios, digital clocks etc.
- The seven segment displays are made up of either LEDs (Light emitting diode) or LCDs (Liquid crystal display). LED or light emitting diode is P-N junction diode which emits the energy in the form of light, differing from normal P-N junction diode which emits in the form of heat.
- These LED's or LCD are used to display the required numeral or alphabet. Single seven segment or number of segments arranged in an order meets our requirements.
- It consists of 8 LEDs connected in parallel that can be lit in different combinations to display the numbers (0, 1, 2, 3, 4, 5, 7, 8, 9, A, b, C, d, E, F, etc.).
- Each segment (LED) is denoted by letters A to G.
- The eighth segment called "Decimal Point" is denoted by DP and is used for the display of non-integer numbers.

Truth Table & BCD to 7-SD



Binary Inputs				Decoder Outputs							7 Segment Display Outputs
D	C	B	A	a	b	c	d	e	f	g	
0	0	0	0	1	1	1	1	1	1	0	0
0	0	0	1	0	1	1	0	0	0	0	1
0	0	1	0	1	1	0	1	1	0	1	2
0	0	1	1	1	1	1	1	0	0	1	3
0	1	0	0	0	1	1	0	0	1	1	4
0	1	0	1	1	0	1	1	0	1	1	5
0	1	1	0	1	0	1	1	1	1	1	6
0	1	1	1	1	1	1	0	0	0	0	7
1	0	0	0	1	1	1	1	1	1	1	8
1	0	0	1	1	1	1	1	0	1	1	9

Kmaps

AB \ CD	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	x	x	x	x
10	1	1	x	x

$$g = \bar{B}C + C\bar{D} + B\bar{C} + B\bar{C} + A$$

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	x	x	x	x
10	1	1	x	x

$$a = A + C + BD + \bar{B}\bar{D}$$

AB \ CD	00	01	11	10
00	1	0	1	1
01	1	0	1	0
11	x	x	x	x
10	1	1	x	x

$$b = \bar{B} + \bar{C}\bar{D} + CD$$

AB \ CD	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	x	x	x	x
10	1	1	x	x

$$c = B + \bar{C} + D$$

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	x	x	x	x
10	1	1	x	x

$$d = \bar{B}\bar{D} + C\bar{D} + B\bar{C}D + \bar{B}C + A$$

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	x	x	x	x
10	1	0	x	x

$$e = \bar{B}\bar{D} + C\bar{D}$$

AB \ CD	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	x	x	x	x
10	1	1	x	x

$$f = A + \bar{C}\bar{D} + B\bar{C} + B\bar{D}$$

Simplification & Circuit Diagram

$$a = A + C + BD + \bar{B} \bar{D}$$

$$b = \bar{B} + \bar{C} \bar{D} + CD$$

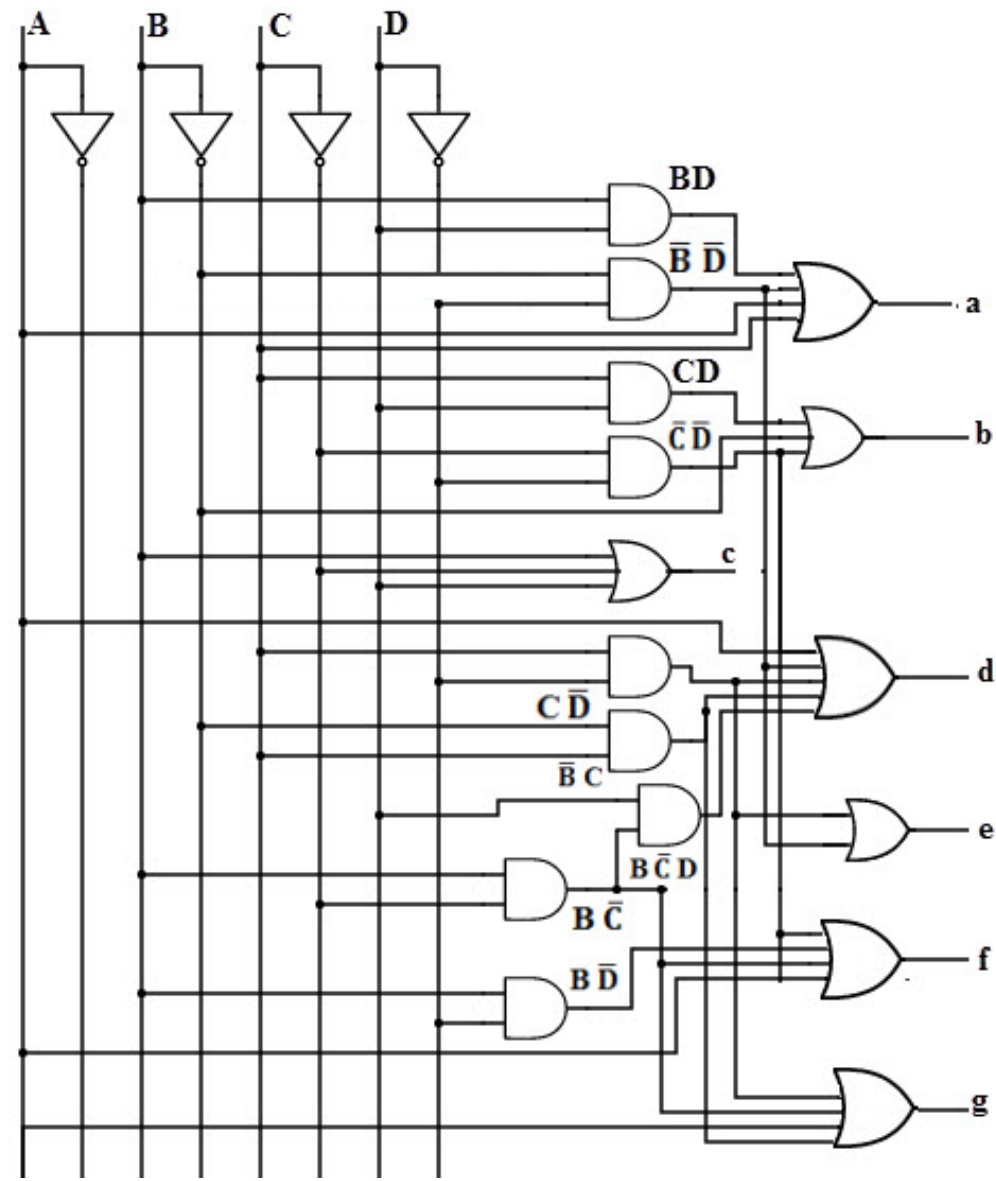
$$c = B + \bar{C} + D$$

$$d = \bar{B} \bar{D} + C \bar{D} + B \bar{C} D + \bar{B} C + A$$

$$e = \bar{B} \bar{D} + C \bar{D}$$

$$f = A + \bar{C} \bar{D} + B \bar{C} + B \bar{D}$$

$$g = A + B \bar{C} + \bar{B} C + C \bar{D}$$

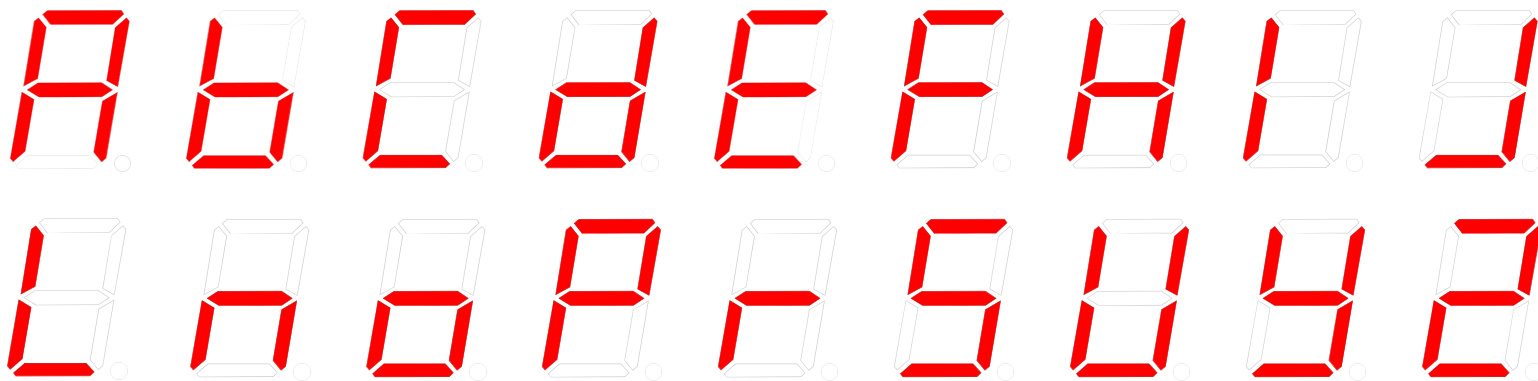


Possible Characters in 7-SD

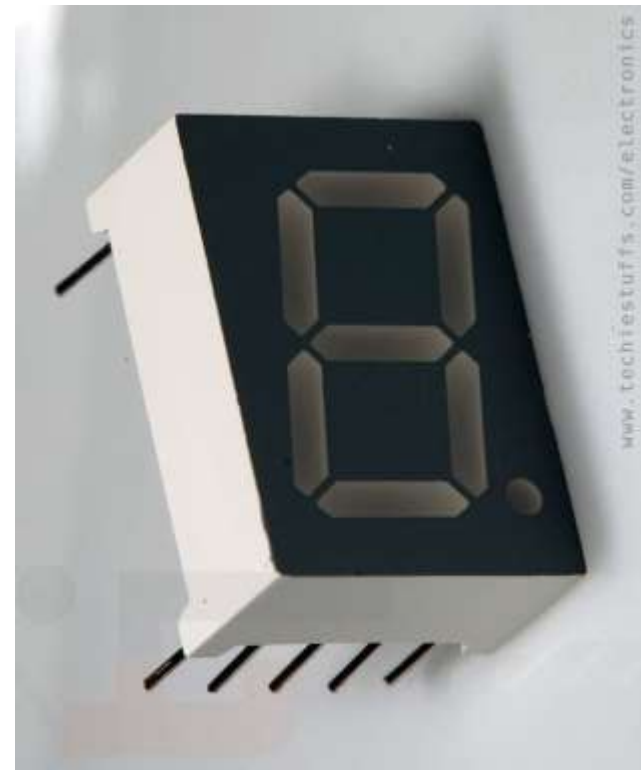
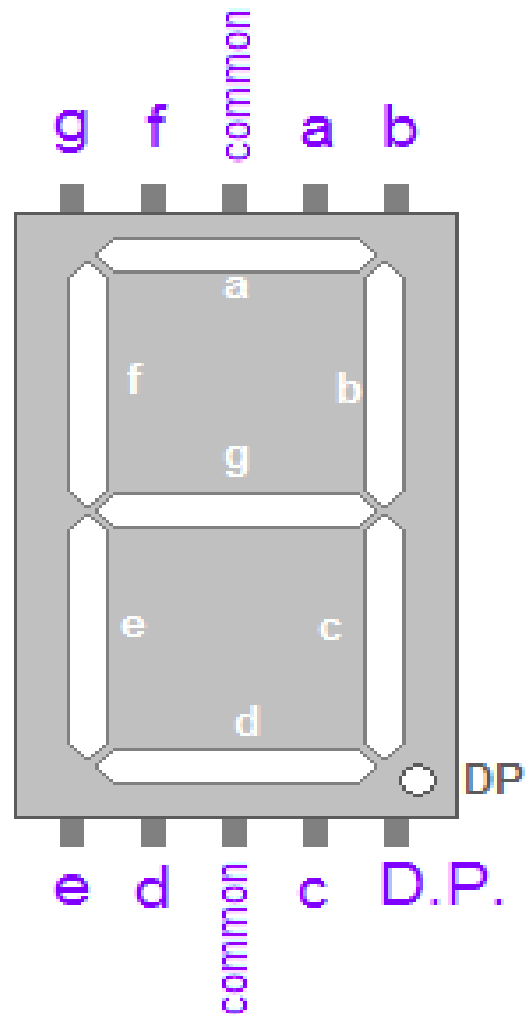
Decimal Digits 0-9



Alpha Characters



Pin Configuration of 7-SD



Applications of 7 Segment Display

- The applications of seven segments are mostly in digital calculators, electronic meters, digital clocks, odometers, digital clocks, clock radios, etc.
- Today most of the 7 segment applications are using LCDs, because of low current consumption.
- This circuit can be modified using timers and counters to display the number of clock pulses.
- This circuit can be modified to develop an alphabet display system instead of a decimal number display system.
- It can be used as a timer circuit.

Limitations of 7 Segment Display

- This circuit involves lot of logic gates and is quite complex.
- Timing delay by each logic gate is a matter of concern and this circuit might not produce accurate results when used to display count of pulses.
- This is a theoretical circuit and may require few modifications.