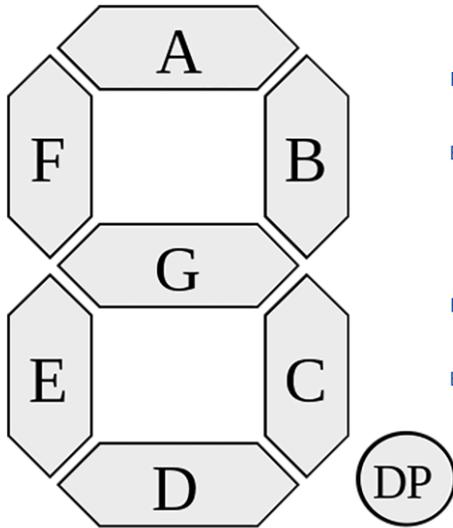
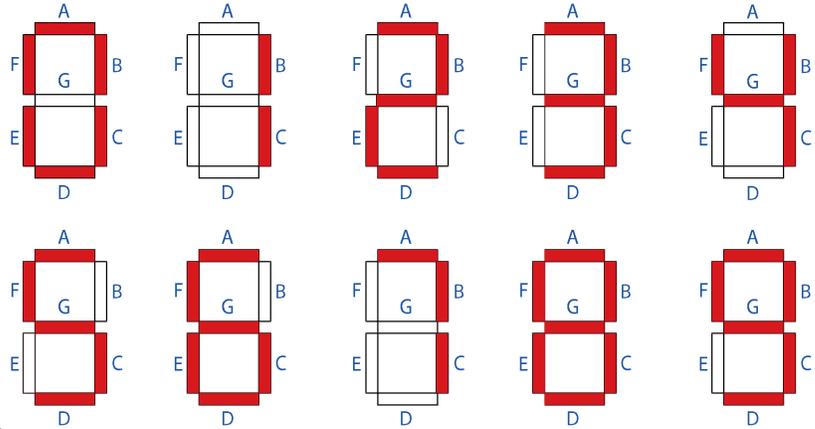


## 7-Segment Display

This circuit displays the numbers 0-9 on a 7-segment display. Below two images are attached. The first is of how the display looks and how it is numbered and the second is how the different numbers show up on the display.



Standard 7-Segment Display



<https://www.rhti.co.uk/wp-content/uploads/2024/02/7-segment-diagram-standard.jpg>  
<https://hackaday.com/wp-content/uploads/2015/04/sevenseg.png?w=600&h=600>

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## Truth Table

W	X	Y	Z	digit	A	B	C	D	E	F	G
0	0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	1	0	1	1	0	0	0	0
0	0	1	0	2	1	1	0	1	1	0	1
0	0	1	1	3	1	1	1	1	0	0	1
0	1	0	0	4	0	1	1	0	0	1	1
0	1	0	1	5	1	0	1	1	0	1	1
0	1	1	0	6	1	0	1	1	1	1	1
0	1	1	1	7	1	1	1	0	0	0	0
1	0	0	0	8	1	1	1	1	1	1	1
1	0	0	1	9	1	1	1	1	0	1	1

Note: the rest of the rows don't cares.

## K-Maps

		A			
YZv	WX>	00	01	11	10
00		0. 1	4. 0	12. x	8. 1
01		1. 0	5. 1	13. x	9. 1
11		3. 1	7. 1	15. x	11. x
10		2. 1	6. 1	14. x	10. x

<b>B</b>					
YZv	WX>	00	01	11	10
00		0. 1	4. 1	12. x	8. 1
01		1. 1	5. 0	13. x	9. 1
11		3. 1	7. 1	15. x	11. x
10		2. 1	6. 0	14. x	10. x

<b>C</b>					
YZv	WX>	00	01	11	10
00		0. 1	4. 1	12. x	8. 1
01		1. 1	5. 1	13. x	9. 1
11		3. 1	7. 1	15. x	11. x
10		2. 0	6. 1	14. x	10. x

<b>D</b>					
YZv	WX>	00	01	11	10
00		0. 1	4. 0	12. x	8. 1
01		1. 0	5. 1	13. x	9. 1
11		3. 1	7. 0	15. x	11. x
10		2. 1	6. 1	14. x	10. x

<b>E</b>					
YZv	WX>	00	01	11	10
	00	0. 1	4. 0	12. x	8. 1
	01	1. 0	5. 0	13. x	9. 0
	11	3. 0	7. 0	15. x	11. x
	10	2. 1	6. 1	14. x	10. x

<b>F</b>					
YZv	WX>	00	01	11	10
	00	0. 1	4. 1	12. x	8. 1
	01	1. 0	5. 1	13. x	9. 1
	11	3. 0	7. 0	15. x	11. x
	10	2. 0	6. 1	14. x	10. x

<b>G</b>					
YZv	WX>	00	01	11	10
	00	0. 0	4. 1	12. x	8. 1
	01	1. 0	5. 1	13. x	9. 1
	11	3. 1	7. 0	15. x	11. x
	10	2. 1	6. 1	14. x	10. x

## Boolean Algebra

$$A = (X' + Y + Z)(W + X + Y + Z')$$

$$B = (X' + Y + Z')(X' + Y' + Z)$$

$$C = X + Y' + Z$$

$$D = (X' + Y + Z)(W + X + Y + Z')(X' + Y' + Z)$$

$$E = X'Y'Z' + W'YZ'$$

$$F = (W + X + Y + Z')(X + Y' + Z)(Y' + Z')$$

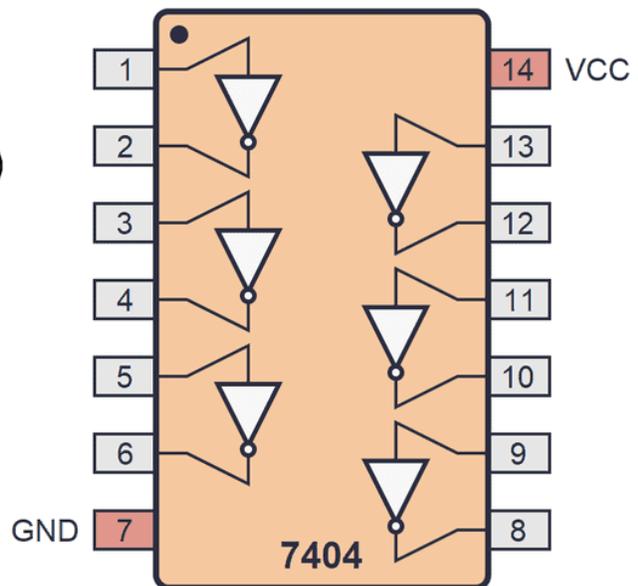
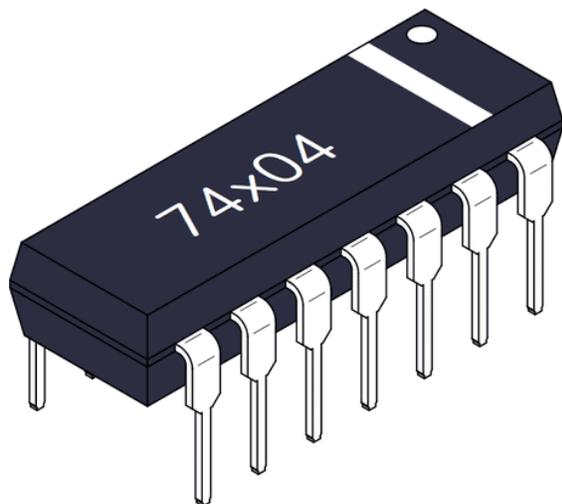
$$G = (X' + Y' + Z')(W + X + Y)$$

Note: Highlighted are the shared expressions

## Pin-out Diagrams

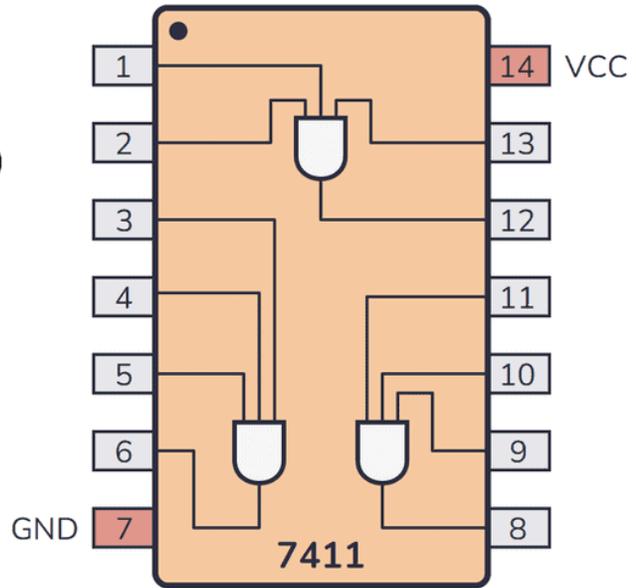
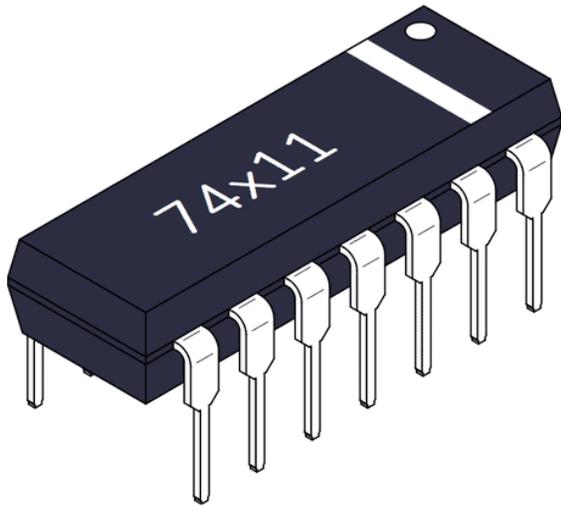
Not Gate:

<https://www.build-electronic-circuits.com/7400-series-integrated-circuits/74hc04-74ls04/>



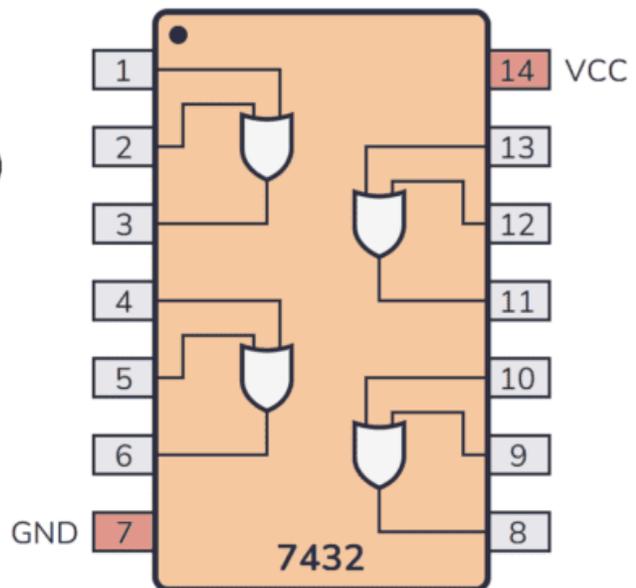
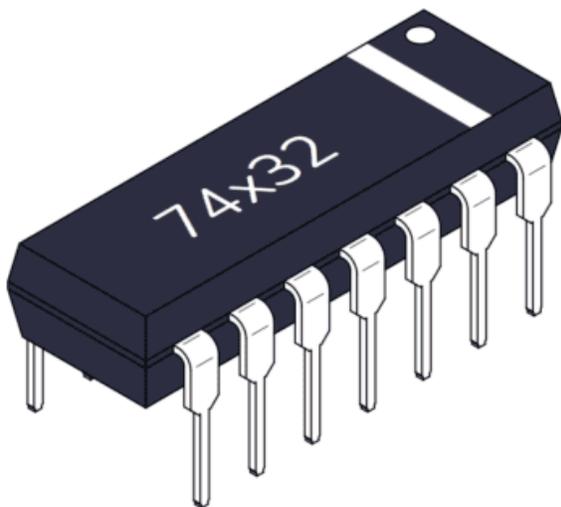
3-input And Gate:

<https://www.build-electronic-circuits.com/7400-series-integrated-circuits/74hc11-74ls11/>



Or Gate:

<https://www.build-electronic-circuits.com/7400-series-integrated-circuits/74hc32-74ls32/>



## Notes on the circuit

- This circuit is colorcoded:
  - Red = VCC
  - Black = ground
  - Pink = W
  - Green = X
  - Light blue = Y
  - Yellow = Z
  - Purple = W'
  - Brown = X'
  - Dark blue = Y'
  - Orange = Z'