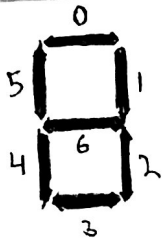


# 7 Segment Display ENCODER



pin labels  
for DEO.  
7seg. display

Note:  
High off (1)  
Low on (0)

Inputs:  $x_3, x_2, x_1, x_0$

Outputs:  $S_0, S_1, S_2, S_3, S_4, S_5, S_6$

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	0	0	1	0	0
01	1	1	0	1	0
11	0	0	0	0	1
10	0	0	0	0	0

Pin 0

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	0	0	0	1	0
01	0	0	1	0	0
11	0	0	0	1	1
10	0	0	1	1	0

Pin 1

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	0	0	0	1	0
01	0	0	0	0	0
11	0	0	0	1	0
10	1	0	0	1	0

Pin 2

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	0	0	1	0	0
01	1	0	0	0	0
11	0	0	1	1	0
10	0	0	0	0	1

Pin 3

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	0	0	1	0	0
01	0	1	1	0	0
11	1	1	1	0	0
10	0	0	0	0	0

Pin 4

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	0	0	0	0	0
01	1	0	0	1	0
11	1	1	1	0	0
10	1	0	0	0	0

Pin 5

$x_3, x_2$	$x_1, x_0$	00	01	11	10
00	1	0	0	1	0
01	1	0	0	0	0
11	0	1	0	0	0
10	0	0	0	0	0

Pin 6

$$S_0 = \bar{x}_3 \bar{x}_2 \bar{x}_1 x_0 + \bar{x}_3 x_2 \bar{x}_1 \bar{x}_0 + \dots + x_3 x_2 \bar{x}_1 x_0 + x_3 \bar{x}_2 x_1 x_0$$

$$S_1 = x_2 \bar{x}_1 x_0 + x_3 \bar{x}_2 x_1 x_0 + \bar{x}_3 x_2 x_1 \bar{x}_0$$

$$S_2 = x_3 x_2 x_1 + x_3 x_2 \bar{x}_1 + \bar{x}_3 \bar{x}_2 x_1 \bar{x}_0$$

$$S_3 = \bar{x}_3 x_2 \bar{x}_1 \bar{x}_0 + x_2 x_1 x_0 + \bar{x}_3 \bar{x}_2 \bar{x}_1 x_0 + \dots + x_3 \bar{x}_2 x_1 \bar{x}_0$$

$$S_4 = \bar{x}_3 x_0 + \bar{x}_3 x_2 \bar{x}_1 + \bar{x}_2 \bar{x}_1 x_0$$

$$S_5 = \bar{x}_3 \bar{x}_2 x_0 + \bar{x}_3 \bar{x}_2 x_1 + \bar{x}_3 x_1 x_0 + x_3 x_2 \bar{x}_1$$

$$S_6 = \bar{x}_3 \bar{x}_2 \bar{x}_1 + x_3 x_2 \bar{x}_1 \bar{x}_0 + \bar{x}_3 x_2 x_1 x_0$$

# encoder for 2's compi

$x_3 x_2$

$x_1 x_0$	00	01	11	10
00	0 <sub>0</sub>	1 <sub>4</sub>	1 <sub>4</sub>	0 <sub>-1</sub>
01	1 <sub>1</sub>	0 <sub>5</sub>	0 <sub>-3</sub>	0 <sub>-7</sub>
11	0 <sub>3</sub>	0 <sub>7</sub>	1 <sub>4</sub>	0 <sub>-5</sub>
10	0 <sub>2</sub>	0 <sub>6</sub>	0 <sub>-2</sub>	0 <sub>-6</sub>

Pin 0

	00	01	11	10
00	0 <sub>0</sub>	0 <sub>4</sub>	0 <sub>-1</sub>	0 <sub>-8</sub>
01	0 <sub>1</sub>	1 <sub>5</sub>	0 <sub>-3</sub>	0 <sub>-7</sub>
11	0 <sub>3</sub>	0 <sub>7</sub>	0 <sub>-1</sub>	1 <sub>-5</sub>
10	0 <sub>2</sub>	1 <sub>6</sub>	0 <sub>-2</sub>	1 <sub>-6</sub>

Pin 1

	00	01	11	10
00	0 <sub>0</sub>	0	0 <sub>4</sub>	0 <sub>3</sub>
01	0 <sub>1</sub>	0	0 <sub>-1</sub>	0 <sub>-1</sub>
11	0 <sub>3</sub>	0	0	0
10	1 <sub>2</sub>	0	1	0

Pin 2

	00	01	11	10
00	0 <sub>0</sub>	0 <sub>4</sub>	1 <sub>4</sub>	0 <sub>8</sub>
01	0 <sub>1</sub>	0 <sub>5</sub>	0 <sub>-3</sub>	1 <sub>-7</sub>
11	0 <sub>3</sub>	1 <sub>7</sub>	1 <sub>-1</sub>	0 <sub>-5</sub>
10	0 <sub>2</sub>	0 <sub>6</sub>	0 <sub>-2</sub>	0 <sub>-6</sub>

Pin 3

	00	01	11	10
00	0	1	1	0
01	1	1	1	1
11	1	1	1	1
10	0	0	0	0

Pin 4

	00	01	11	10
00	0	0	0	0
01	1	0	1	1
11	1	1	1	0
10	1	0	1	0

Pin 5

	00	01	11	10
00	1	0	0	0
01	1	0	0	1
11	0	1	1	0
10	0	0	0	0

Pin 6

	00	01	11	10
00			1	1
01			1	1
11			1	1
10			1	1

neg

$$S_0 = \bar{x}_3 \bar{x}_2 \bar{x}_1 x_0 + \bar{x}_3 x_2 \bar{x}_1 \bar{x}_0 + x_3 x_2 \bar{x}_1 x_0 + x_3 \bar{x}_2 x_1 x_0$$

$$= \bar{x}_3 \bar{x}_1 (x_0 \oplus x_2) + x_3 x_0 (x_2 \oplus x_1)$$

$$S_1 = x_2 \bar{x}_1 x_0 + x_3 \bar{x}_2 x_1 x_0 + \bar{x}_3 x_2 x_1 \bar{x}_0$$

$$= x_2 \bar{x}_1 x_0 + x_1 (x_3 \bar{x}_2 x_0 + \bar{x}_3 x_2 \bar{x}_0)$$

$$S_2 = x_2 x_2 x_1 + x_3 x_2 \bar{x}_0 + \bar{x}_3 \bar{x}_2 x_1 \bar{x}_0$$

$$x_3 x_2 (x_1 + \bar{x}_0) + \bar{x}_3 \bar{x}_2 x_1 \bar{x}_0$$

$$S_3 = \bar{x}_3 x_2 \bar{x}_1 \bar{x}_0 + x_2 x_1 x_0 + \bar{x}_3 \bar{x}_2 \bar{x}_1 x_0 + \cancel{x_3 \bar{x}_2 x_1 \bar{x}_0}$$

$$= \bar{x}_3 \bar{x}_1 (x_2 \oplus x_0) + x_1 (x_2 x_0 + x_3 \bar{x}_2 \bar{x}_0)$$

$$S_4 = \bar{x}_3 x_0 + x_3 x_2 \bar{x}_1 + \bar{x}_2 \bar{x}_1 x_0$$

$$= \bar{x}_3 (x_0 + x_2 \bar{x}_1) + \bar{x}_2 \bar{x}_1 x_0$$

$$S_5 = \bar{x}_3 \bar{x}_2 x_0 + \bar{x}_3 \bar{x}_2 x_1 + \bar{x}_3 x_1 x_0 + x_3 x_2 \bar{x}_1 x_0$$

$$= \bar{x}_3 (\bar{x}_2 (x_0 + x_1) + x_1 x_0) + x_3 x_2 \bar{x}_1 x_0$$

$$S_6 = \bar{x}_3 \bar{x}_2 \bar{x}_1 + x_3 x_2 \bar{x}_1 \bar{x}_0 + \bar{x}_3 x_2 x_1 x_0$$

$$S_7 = \bar{x}_3 (\bar{x}_2 \bar{x}_1 + x_2 x_1 x_0) + x_3 x_2 \bar{x}_1 \bar{x}_0$$