

Somador e decodificador BCD para display de 7 segmentos

Aula 4

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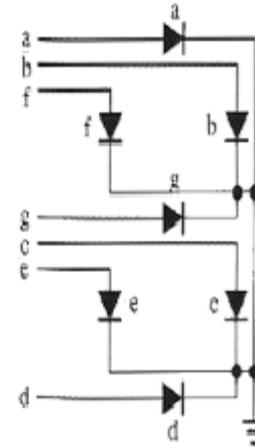
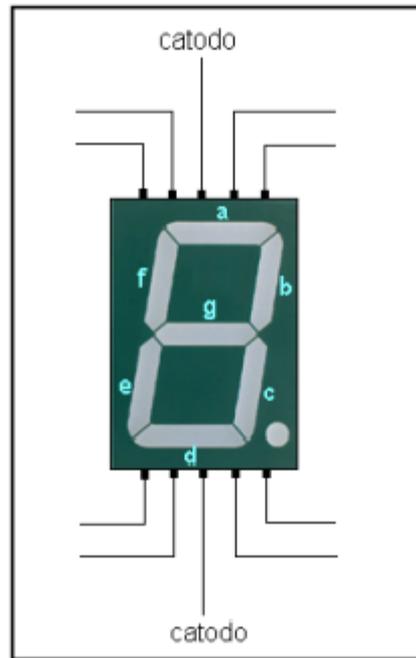
Display de 7 segmentos

Um display de sete segmentos é usado como forma de exibir uma informação numérica, resultado de alguma saída de um circuito digital



Display de 7 segmentos

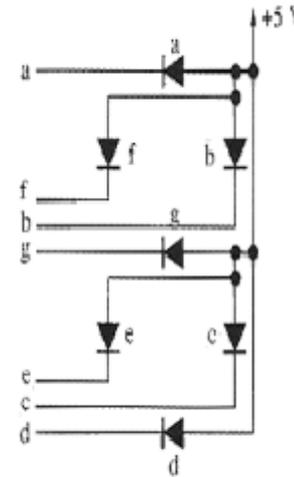
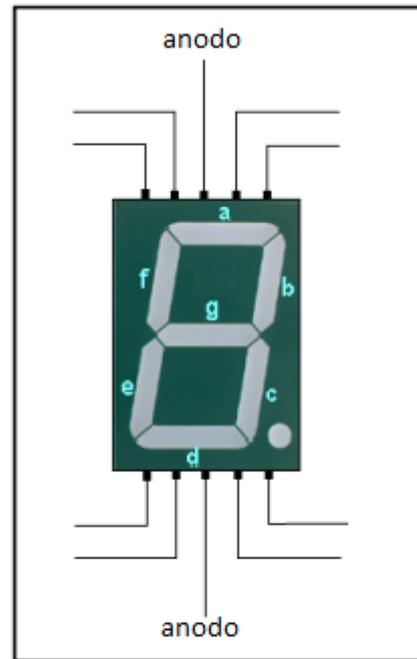
Configuração catodo comum:



Ref fig http://www.ppgel.net.br/rabelo/ensino/sistemas_digita1/aula%20pratica%2002.pdf

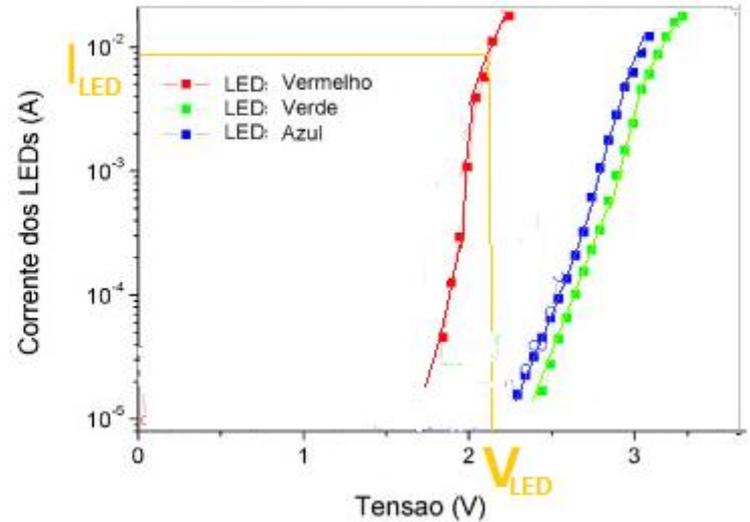
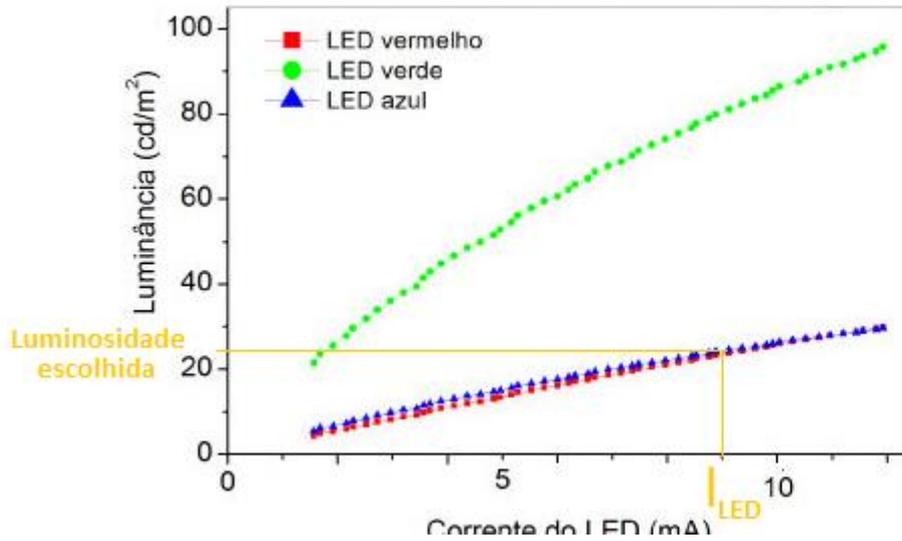
Display de 7 segmentos

Configuração anodo comum:

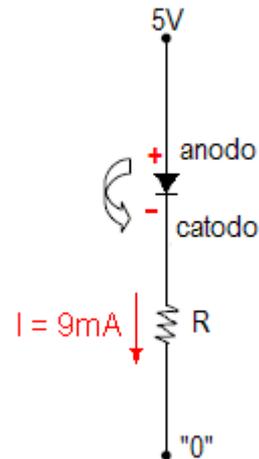


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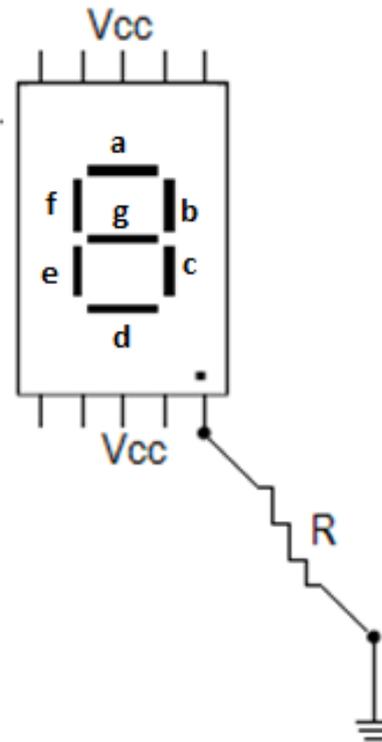
Cálculo do Resistor ara ligação do display anodo comum



$$I_{LED} = 9\text{ mA} \quad \text{e}$$
$$V_{LED} = 2,1\text{ V}$$



Mapeamento dos segmentos do Display de 7 segmentos



Decodificador com Display de 7 segmentos

As entradas do segmentos do display recebem o sinal de um decodificador binário para 7 segmentos, a qual deve fornecer corrente suficiente para polarizar os LEDs e acender os segmentos corretos para representar os números referentes às entradas binárias.

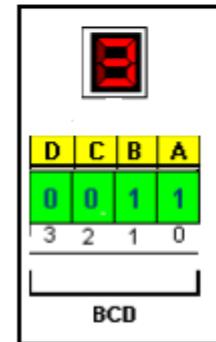
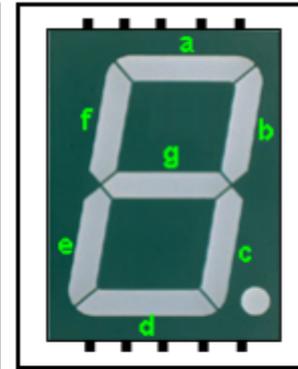


Ref fig <http://www.fpgaparatodos.com.br/>

Decodificação de display de 7 segmentos anodo comum

- ▶ *Entradas binárias e números decimais apresentados no display*

entradas BCD				segmentos de saída							DISPLAY
D	C	B	A	a	b	c	d	e	f	g	
0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	1	1	0	0	1	1	1	1	1
0	0	1	0	0	0	1	0	0	1	0	0
0	0	1	1	0	0	0	0	1	1	0	0
0	1	0	0	1	0	0	1	1	0	0	0
0	1	0	1	0	1	0	0	1	0	0	0
0	1	1	0	0	1	0	0	0	0	0	0
0	1	1	1	0	0	0	1	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	1	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1

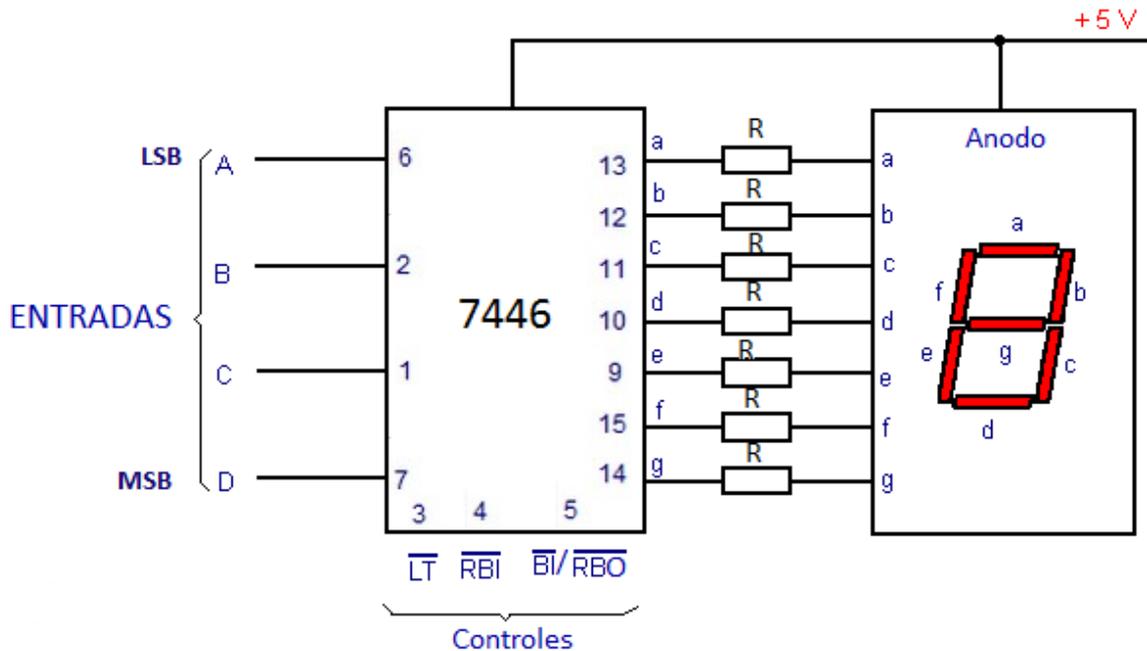


Para este decodificador as demais combinações de entrada mostram os segmentos apagados (11111111)

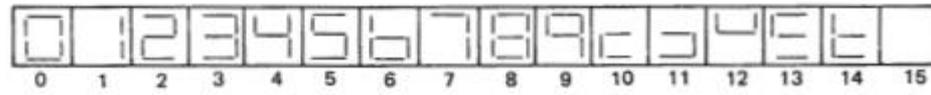
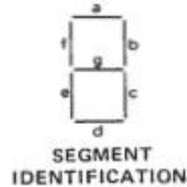
Ref fig http://www.ppgel.net.br/rabelo/ensino/sistemas_digitais1/aula%20pratica%2002.pdf

Decodificador BCD para 7 segmentos:

- 7446 é um CI coletor aberto com 4 entradas BCD e saída para ligar em, display de 7 segmentos anodo comum;
- O 7446 apresenta três entradas de controle que devem ser ligadas adequadamente para o perfeito funcionamento
- O resistor R é ligado entre a saída do decodificador e as entradas do display afim de fornecer uma corrente suficiente para acender os segmentos.



Decodificador 7446: BCD para display de 7 seq. anodo comum



NUMERICAL DESIGNATIONS AND RESULTANT DISPLAYS

'46A, '47A, 'LS47 FUNCTION TABLE (T1)

DECIMAL OR FUNCTION	INPUTS						$\overline{BI}/\overline{RBO}^\dagger$	OUTPUTS							NOTE
	\overline{LT}	\overline{RBI}	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	ON	ON	ON	ON	ON	ON	OFF	1
1	H	X	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	X	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	X	L	L	H	H	H	ON	ON	ON	ON	OFF	OFF	ON	
4	H	X	L	H	L	L	H	OFF	ON	ON	OFF	OFF	ON	ON	
5	H	X	L	H	L	H	H	ON	OFF	ON	ON	OFF	ON	ON	
6	H	X	L	H	H	L	H	OFF	ON	ON	ON	ON	ON	ON	
7	H	X	L	H	H	H	H	ON	ON	ON	OFF	OFF	OFF	OFF	
8	H	X	H	L	L	L	H	ON	ON	ON	ON	ON	ON	ON	
9	H	X	H	L	L	H	H	ON	ON	ON	OFF	OFF	ON	ON	
10	H	X	H	L	H	L	H	OFF	OFF	OFF	ON	ON	OFF	ON	
11	H	X	H	L	H	H	H	OFF	OFF	ON	ON	OFF	OFF	ON	
12	H	X	H	H	L	L	H	OFF	ON	OFF	OFF	OFF	ON	ON	
13	H	X	H	H	L	H	H	ON	OFF	OFF	ON	OFF	ON	ON	
14	H	X	H	H	H	L	H	OFF	OFF	OFF	ON	ON	ON	ON	
15	H	X	H	H	H	H	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
BI	X	X	X	X	X	X	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
RBI	H	L	L	L	L	L	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
LT	L	X	X	X	X	X	H	ON	ON	ON	ON	ON	ON	ON	4

H = high level, L = low level, X = irrelevant

- NOTES:
1. The blanking input (\overline{BI}) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (\overline{RBI}) must be open or high if blanking of a decimal zero is not desired.
 2. When a low logic level is applied directly to the blanking input (\overline{BI}), all segment outputs are off regardless of the level of any other input.
 3. When ripple-blanking input (\overline{RBI}) and inputs A, B, C, and D are at a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output (\overline{RBO}) goes to a low level (response condition).
 4. When the blanking input/ripple blanking output ($\overline{BI}/\overline{RBO}$) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.

$^\dagger \overline{BI}/\overline{RBO}$ is wire AND logic serving as blanking input (\overline{BI}) and/or ripple-blanking output (\overline{RBO}).

Decodificador 7446: BCD para display de 7 seg. anodo comum

LT(Lamp Test): quando em nível baixo testa todos os segmentos

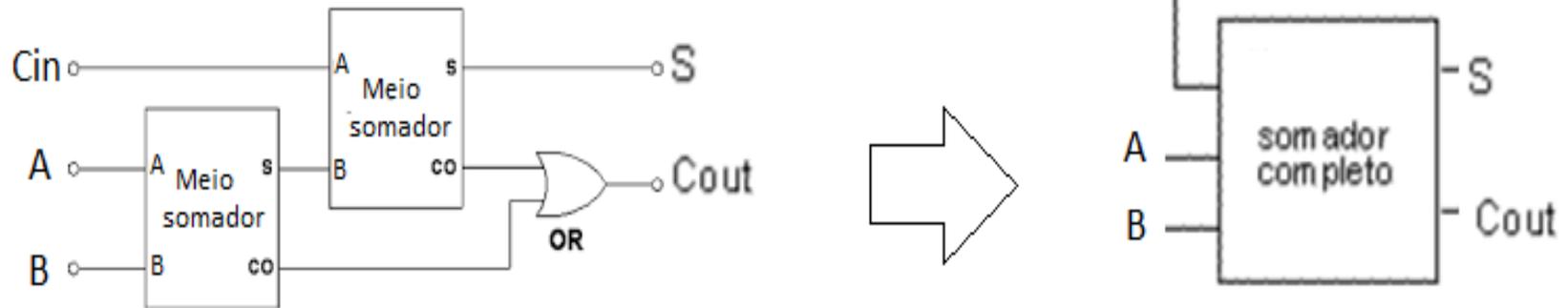
RBI (Ripple Blanking Input): quando em nível baixo apaga o o display quando as entradas forem zero

BI/RBO (Blanking Input/ Ripple Blanking Output) : quando em nível baixo apaga o display, independente do valor das entradas e serve como saída para transmitir esse sinal para outros displays.

Somador Completo de 1 bit:

Um somador completo de 1 bit soma 2 bits de cada palavra (palavra A e palavra B) com um carry inicial(Cin) e o resultado é obtido na saída S e o carry final em Cout

A



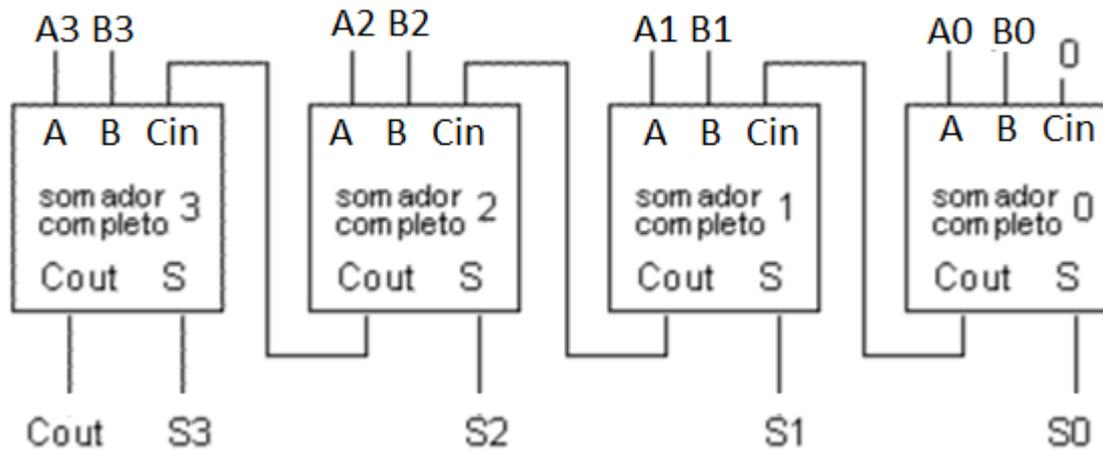
Carry inicial ("0" ou "1") \Rightarrow **Cin** +

Palavra A de 1 bit \Rightarrow **A** +

Palavra B de 1 bit \Rightarrow **B**

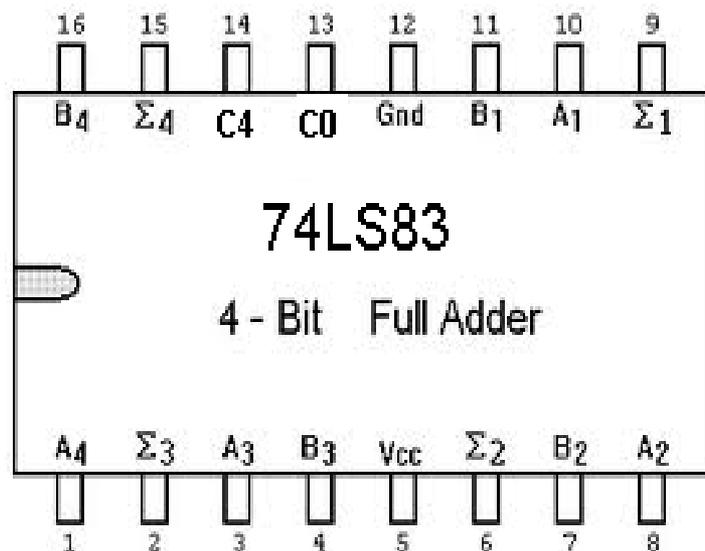
Cout **S** \leftarrow Resultado (2 bits)

Somador Completo de 4 bits:



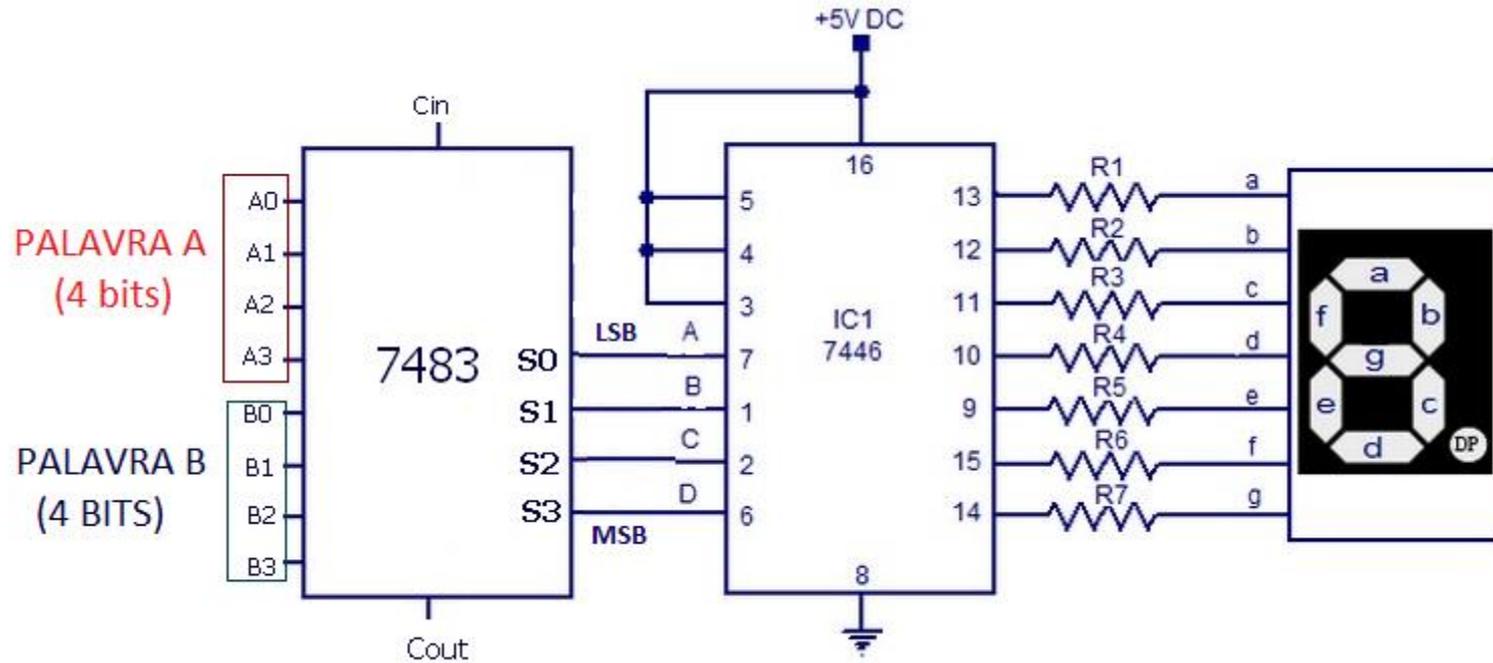
$$\begin{array}{r}
 + C_{in} \\
 + \left(\begin{array}{cccc} A_3 & A_2 & A_1 & A_0 \\ B_3 & B_2 & B_1 & B_0 \end{array} \right) \\
 \hline
 C_{out} \quad S_3 \quad S_2 \quad S_1 \quad S_0
 \end{array}$$

7483: Somador Completo de 4 bits:

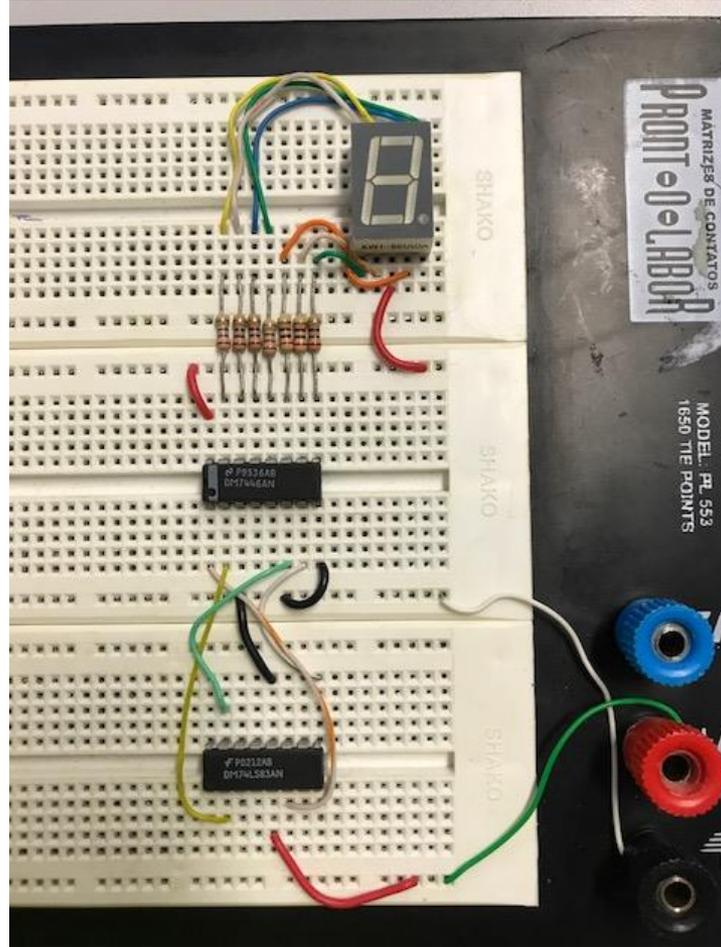


$$\begin{array}{r}
 C_0 \\
 + \left(\begin{array}{cccc} A_4 & A_3 & A_2 & A_1 \\ B_4 & B_3 & B_2 & B_1 \end{array} \right) \\
 \hline
 C_4 \quad \Sigma_4 \quad \Sigma_3 \quad \Sigma_2 \quad \Sigma_1
 \end{array}$$

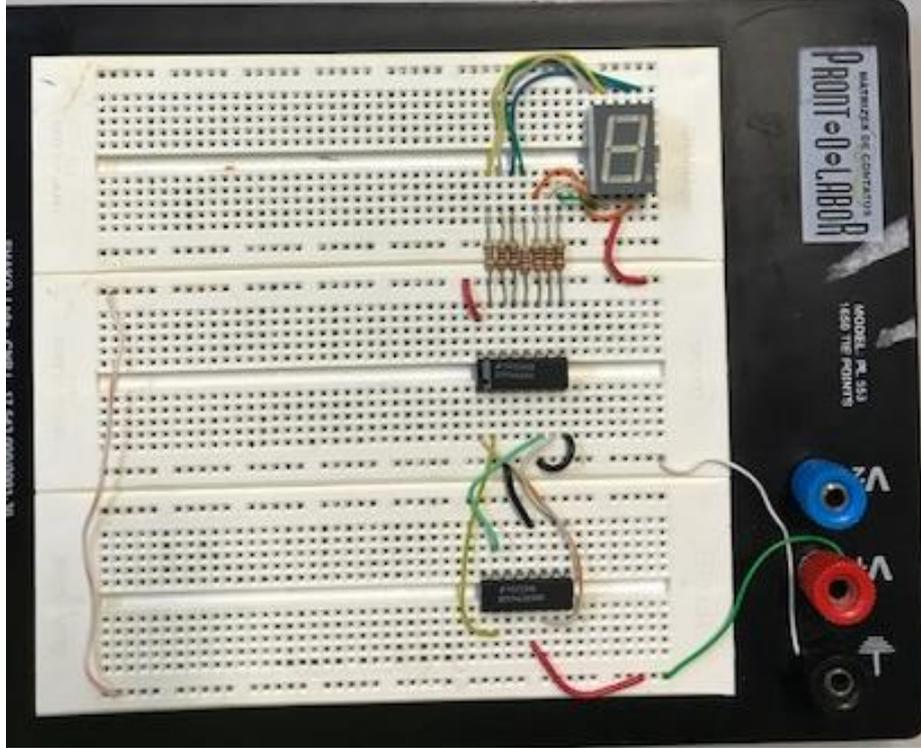
Somador , decodificador e display



Circuito Somador , decodificador e display no protoboard



Circuito Somador , decodificador e display no protoboard



Circuito Somador , decodificador e display no módulo de Montagem

autores alunas: Daniela Miura Tamiya e Karina Yumi da Cruz

