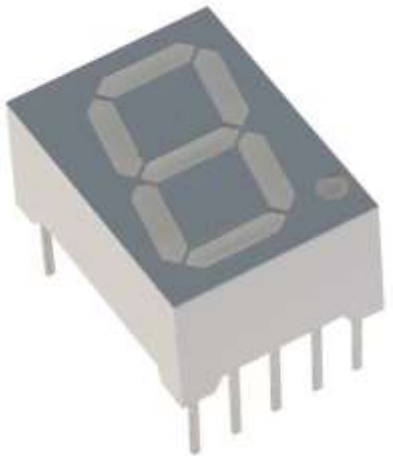
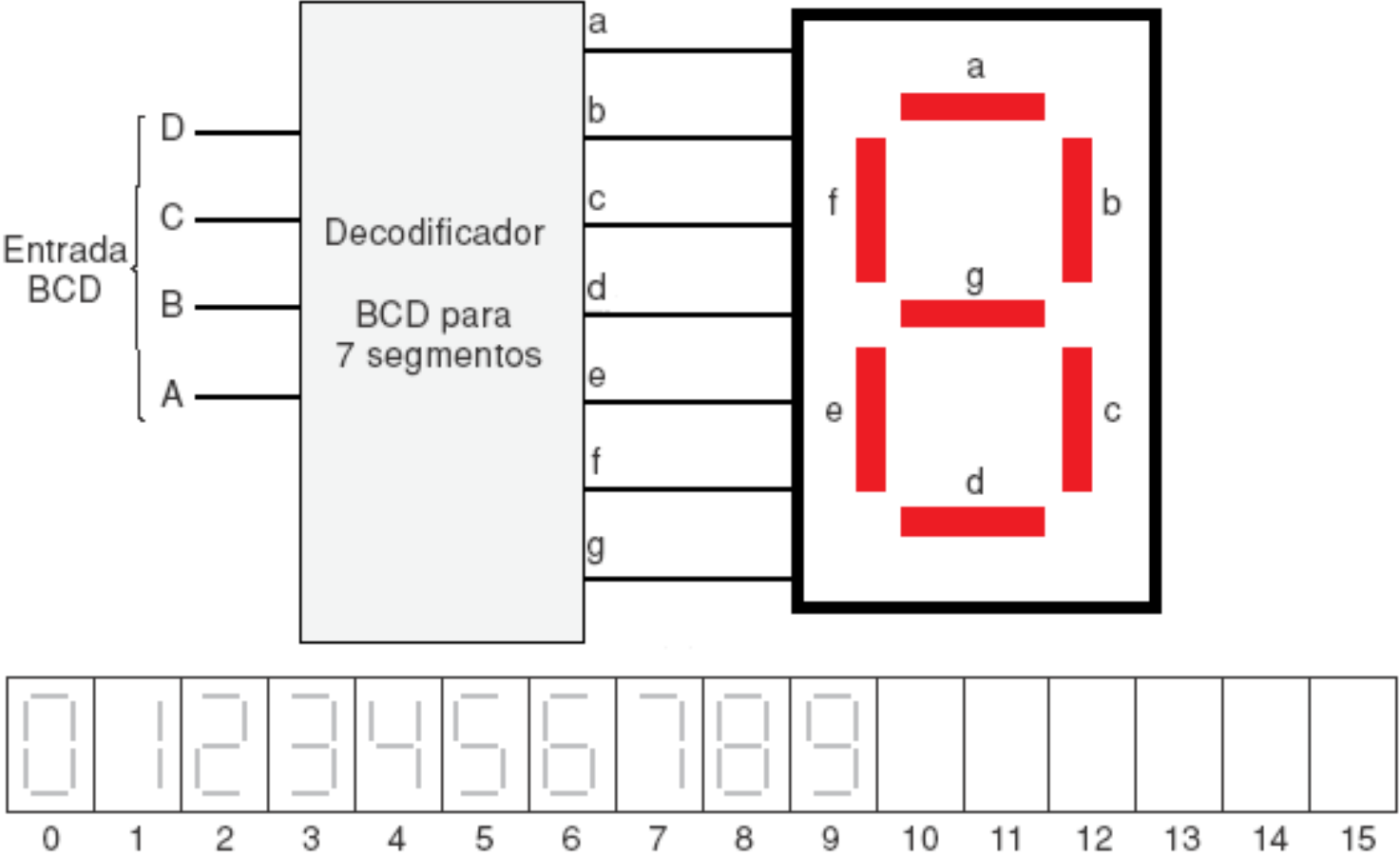


Exemplo de Projeto de Decodificador

- Esta apresentação mostra o início do projeto de decodificador BCD (Binary Coded Decimal) para Display de 7 Segmentos e traz alguns conceitos importantes.
- Termine o projeto para treinar!!!

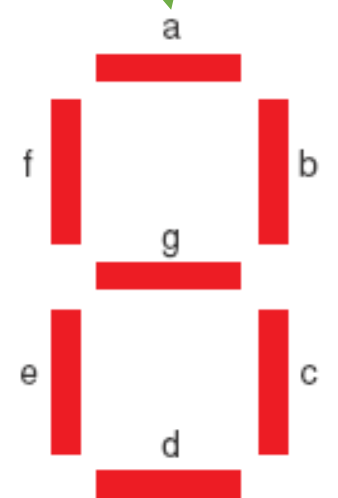
Decodificador BCD – 7-Segmentos



Considerar um display catodo comum, com os segmentos sendo acesos com nível alto.

nº	D	C	B	A	a	b	c	d	e	f	g	nº
0	0	0	0	0	1	1	1	1	1	1	0	0
1	0	0	0	1	0							1
2	0	0	1	0	1							2
3	0	0	1	1	1							3
4	0	1	0	0	0							4
5	0	1	0	1	1							5
6	0	1	1	0	1							6
7	0	1	1	1	1							7
8	1	0	0	0	1							8
9	1	0	0	1	1							9
-	1	0	1	0	0							-
-	1	0	1	1	0							-
-	1	1	0	0	0							-
-	1	1	0	1	0							-
-	1	1	1	0	0							-
-	1	1	1	1	0							-

Como fica o segmento a para cada entrada?



D	C	B	A	a
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$	1		1	1
$\bar{D}C$		1	1	1
DC				
$D\bar{C}$	1	1		

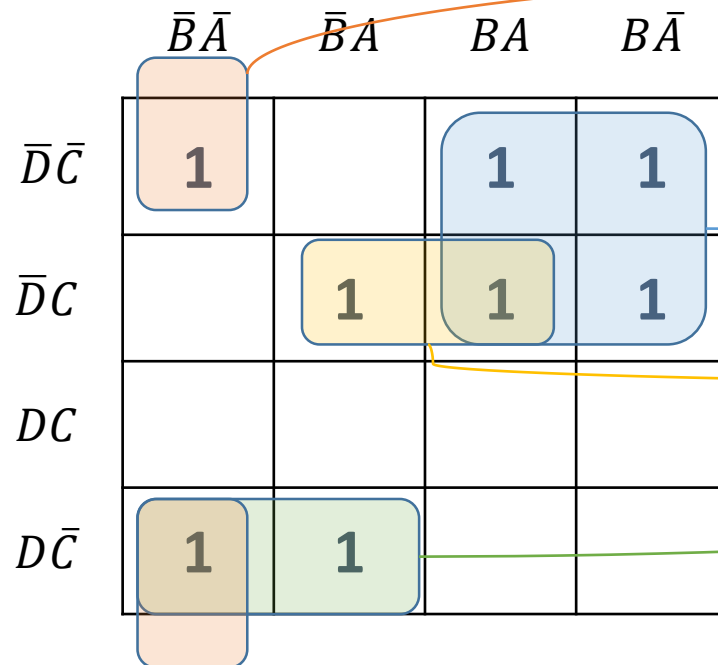
D	C	B	A	a
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$	1		1	1
$\bar{D}C$		1	1	1
DC				
$D\bar{C}$	1	1		

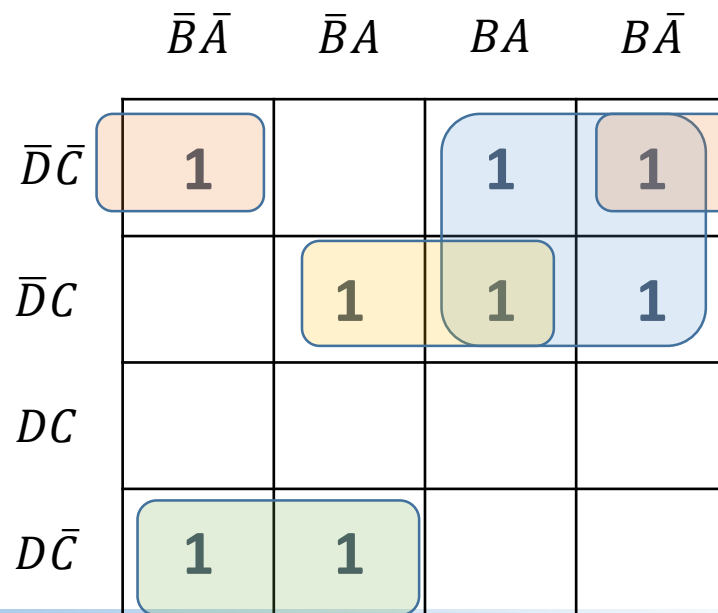
2 possibilidades

	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$	1		1	1
$\bar{D}C$		1	1	1
DC				
$D\bar{C}$	1	1		

D	C	B	A	a
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0



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

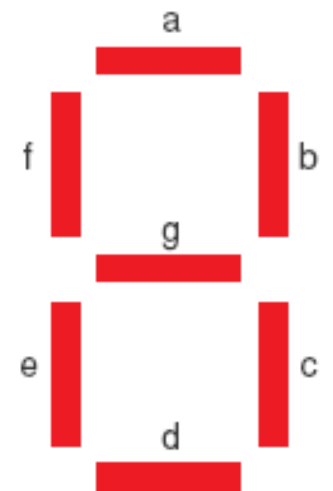


$$a = \bar{D}B + \bar{D}CA + D\bar{C}\bar{B} + \bar{D}\bar{C}\bar{A}$$

Um problema... Ou solução!?

- Por se tratar de um decodificador BCD para 7 segmentos, podemos imaginar que este display será usado em equipamentos como relógios digitais, calculadora simples, etc.
 - Imagine o relógio marcando a hora DA:BF, ou a calculadora simples apresentando BDA como resultado! :s
- Neste projeto o display simplesmente não pode receber valores de A a F (10 a 15). É preciso garantir que isso não aconteça.
 - Portanto a saída do display para os valores de A a F...
 - **NÃO IMPORTA! CONDIÇÃO IMPOSSÍVEL!**

nº	D	C	B	A	a	b	c	d	e	f	g	nº
0	0	0	0	0	1	1	1	1	1	1	0	0
1	0	0	0	1	0	1						1
2	0	0	1	0	1	1						2
3	0	0	1	1	1	1						3
4	0	1	0	0	0	1						4
5	0	1	0	1	1	0						5
6	0	1	1	0	1	0						6
7	0	1	1	1	1	1						7
8	1	0	0	0	1	1						8
9	1	0	0	1	1	1						9
-	1	0	1	0	X	X						-
-	1	0	1	1	X	X						-
-	1	1	0	0	X	X						-
-	1	1	0	1	X	X						-
-	1	1	1	0	X	X						-
-	1	1	1	1	X	X						-

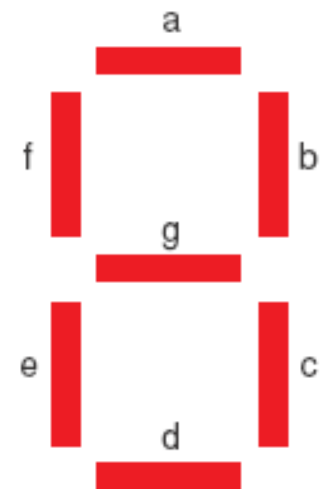


X = Don't care

nº	D	C	B	A	a	b	c	d	e	f	g	nº
0												0
1							$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$		1
2												2
3					$\bar{D}\bar{C}$							3
4					$\bar{D}C$							4
5												5
6					DC	X	X	X	X	X	X	6
7												7
8					$D\bar{C}$			X	X			8
9												9
-	1	0	1	0	X	X	X	X	X	X	X	-
-	1	0	1	1	X	X	X	X	X	X	X	-
-	1	1	0	0	X	X	X	X	X	X	X	-
-	1	1	0	1	X	X	X	X	X	X	X	-
-	1	1	1	0	X	X	X	X	X	X	X	-
-	1	1	1	1	X	X	X	X	X	X	X	-

Cada X pode ser
0 ou 1. O que for
mais conveniente.

$\bar{D}\bar{C}$				
$\bar{D}C$				
DC	X	X	X	X
$D\bar{C}$			X	X

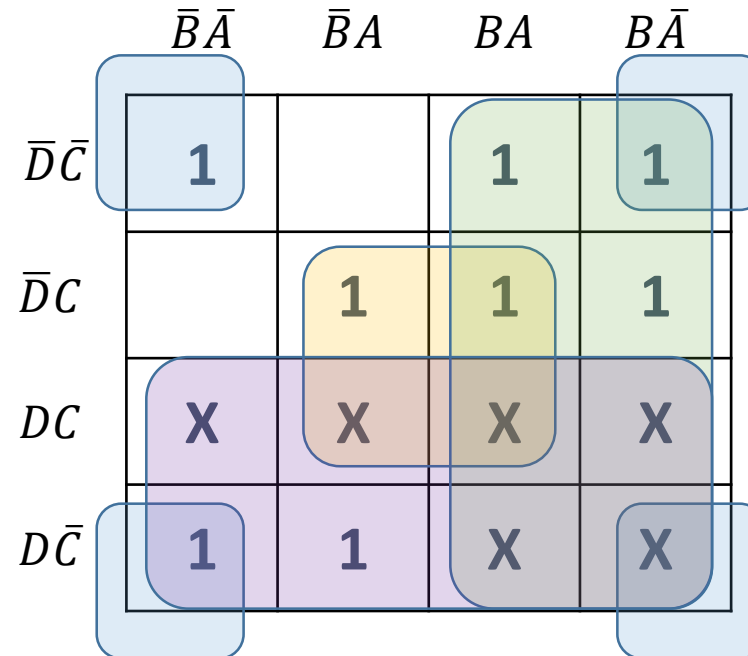


X = Don't care

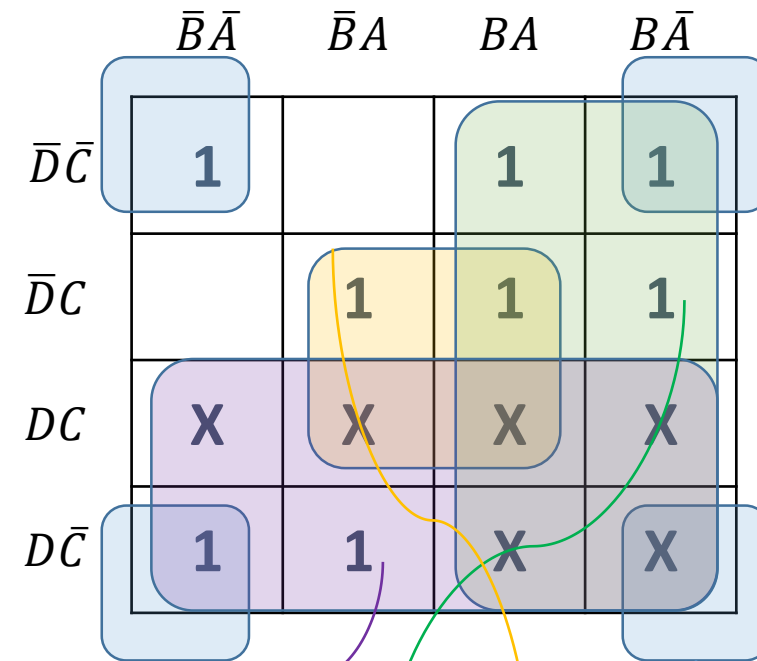
D	C	B	A	a
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X

	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$	1		1	1
$\bar{D}C$		1	1	1
DC	X	X	X	X
$D\bar{C}$	1	1	X	X

D	C	B	A	a
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X



D	C	B	A	a
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X



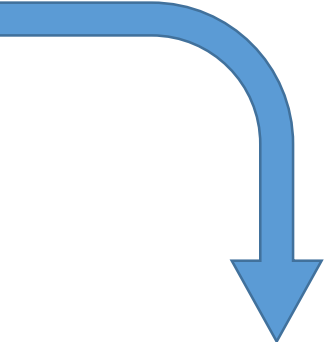
$$a = D + B + CA + \bar{C}\bar{A}$$

Porém : $CA + \bar{C}\bar{A} = C \odot A$

$$\therefore a = D + B + C \odot A$$

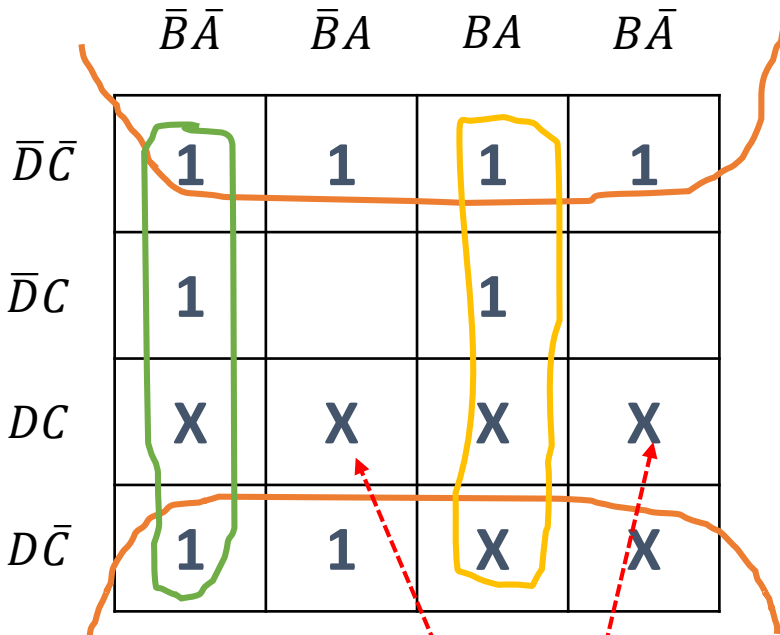
D	C	B	A	b
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X

	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$				
$\bar{D}C$		0		0
DC	X	X	X	X
$D\bar{C}$			X	X



	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$	1	1	1	1
$\bar{D}C$	1		1	
DC	X	X	X	X
$D\bar{C}$	1	1	X	X

D	C	B	A	b
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X



Considerar 0

D	C	B	A	b
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X

	$\bar{B}\bar{A}$	$\bar{B}A$	BA	$B\bar{A}$
$\bar{D}\bar{C}$	1	1	1	1
$\bar{D}C$	1		1	
DC	X	X	X	X
$D\bar{C}$	1	1	X	X

$$b = \bar{C} + \bar{B}\bar{A} + BA$$

$$b = \bar{C} + B \odot A$$

