Relógio digital OAC

Primeiro passo eu preciso construir um contador de 4 bits que vai de 0 a 9, ou seja, reseta no 10,11,12,13,14 e 15.

Para isso vou construir uma tabela verdade de quando eu devo dar reset

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **Reset** |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

Agora montemos o mapa de Karnaugh

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CD |  |  |  |
| AB | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 0 | 0 |
| 01 | 0 | 0 | 0 | 0 |
| 11 | 1 | 1 | 1 | 1 |
| 10 | 0 | 0 | 1 | 1 |

Resolvendo chegamos a expressão AB + CA. Esse será o nosso reset

Para seguir precisamos exibir o numero do contador em um display de 7 seguimentos.

Tabela verdade:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | D |  | a | b | c | d | e | f | g |
| 0 | 0 | 0 | 0 |  | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0 | 0 | 0 | 1 |  | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |  | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 |  | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |  | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 |  | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 |  | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |  | 1 | 1 | 1 | 1 | 0 | 1 | 1 |

O restante é X

Mapa de Karnaugh para a:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 0 | X | 1 |
| 01 | 0 | 1 | X | 1 |
| 11 | 1 | 1 | X | X |
| 10 | 1 | 1 | X | x |

a = C + A + BD + ~B~D

a = C + A + ~(B xor D)

Mapa de Karnaugh para b:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 1 | X | 1 |
| 01 | 1 | 0 | X | 1 |
| 11 | 1 | 1 | X | X |
| 10 | 1 | 0 | X | x |

b = ~B + ~(C xor D)

Mapa de Karnaugh para c:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 1 | X | 1 |
| 01 | 1 | 1 | X | 1 |
| 11 | 1 | 1 | X | X |
| 10 | 0 | 1 | X | x |

c = ~C + D + B

Mapa de Karnaugh para d:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 0 | X | 1 |
| 01 | 0 | 1 | X | 1 |
| 11 | 1 | 0 | X | X |
| 10 | 1 | 1 | X | x |

d = A+C ~D+~B C+~B ~D+ B ~C D

Mapa de Karnaugh para e:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 0 | X | 1 |
| 01 | 0 | 1 | X | 1 |
| 11 | 1 | 0 | X | X |
| 10 | 1 | 1 | X | x |

e = C ~D+~B~D

Mapa de Karnaugh para f:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 0 | X | 1 |
| 01 | 0 | 1 | X | 1 |
| 11 | 1 | 0 | X | X |
| 10 | 1 | 1 | X | x |

f = A+~C~D+B ~C+B ~D

Mapa de Karnaugh para g:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 00 | 01 | 11 | 00 |
| CD | 00 | 1 | 0 | X | 1 |
| 01 | 0 | 1 | X | 1 |
| 11 | 1 | 0 | X | X |
| 10 | 1 | 1 | X | x |

g = A + C~D+B xor C

Ficamos com:

a = C + A + ~(B xor D)

b = ~B + ~(C xor D)

c = ~C + D + B

d = A+C ~D+~B C+~B ~D+ B ~C D

e = C ~D+~B~D

f = A+~C~D+B ~C+B ~D

g = A + C~D+B xor C

A diagram of a circuit

AI-generated content may be incorrect.

Para a dezena dos minutos faremos um contador de 0 a 5, segue a tabela verdade.

|  |  |  |  |
| --- | --- | --- | --- |
| **A** | **B** | **C** | **Reset** |
| 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

Mapa de Karnaugh

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | AB | | | |
|  |  | 0 | 1 | 11 | 10 |
| C | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 |

Reset = AB

A diagram of a circuit

AI-generated content may be incorrect.

Agora precisamos sincronizar o contador de 0 a 9 com o contador de 0 a 6

O clock do contador de 0 a 6 sobe quando o contador de 0 a 9 passar do nove e voltar para o zero