ET-TUTORIALS
ELEKTROTECHNIK ONLINE

# *Entwicklung eines synchronen Modulo 5 Vorwärts- Rückwärts Zählers mit JK-Flipflops*

Videos unter:
***ET-Tutorials.de/Digitaltechnik***

| | Zustand | | | | Folgezustand | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **V** | **Q2** | **Q1** | **Q0** | | **Q2'** | **Q1'** | **Q0'** | | **J2** | **K2** | | **J1** | **K1** | | **J0** | **K0** |
| 0 | 0 | 0 | 0 | | 1 | 0 | 1 | | 1 | x | | 0 | x | | 1 | x |
| 0 | 0 | 0 | 1 | | 0 | 0 | 0 | | 0 | x | | 0 | x | | x | 1 |
| 0 | 0 | 1 | 0 | | 0 | 0 | 1 | | 0 | x | | x | 1 | | 1 | x |
| 0 | 0 | 1 | 1 | | 0 | 1 | 0 | | 0 | x | | x | 0 | | x | 1 |
| 0 | 1 | 0 | 0 | | 0 | 1 | 1 | | x | 1 | | 1 | x | | 1 | x |
| 0 | 1 | 0 | 1 | | 1 | 0 | 0 | | x | 0 | | 0 | x | | x | 1 |
| 0 | 1 | 1 | 0 | | x | x | x | | x | x | | x | x | | x | x |
| 0 | 1 | 1 | 1 | | x | x | x | | x | x | | x | x | | x | x |
| 1 | 0 | 0 | 0 | | 0 | 0 | 1 | | 0 | x | | 0 | x | | 1 | x |
| 1 | 0 | 0 | 1 | | 0 | 1 | 0 | | 0 | x | | 1 | x | | x | 1 |
| 1 | 0 | 1 | 0 | | 0 | 1 | 1 | | 0 | x | | x | 0 | | 1 | x |
| 1 | 0 | 1 | 1 | | 1 | 0 | 0 | | 1 | x | | x | 1 | | x | 1 |
| 1 | 1 | 0 | 0 | | 1 | 0 | 1 | | x | 0 | | 0 | x | | 1 | x |
| 1 | 1 | 0 | 1 | | 0 | 0 | 0 | | x | 1 | | 0 | x | | x | 1 |
| 1 | 1 | 1 | 0 | | x | x | x | | x | x | | x | x | | x | x |
| 1 | 1 | 1 | 1 | | x | x | x | | x | x | | x | x | | x | x |

| Q | | Q' | | J | K |
|---|---|---|---|---|---|
| 0 | | 0 | | 0 | x |
| 0 | | 1 | | 1 | x |
| 1 | | 0 | | x | 1 |
| 1 | | 1 | | x | 0 |

$J2=(Q0 \wedge Q1 \wedge V) \vee (\overline{V} \wedge \overline{Q0} \wedge \overline{Q1})$

$K2=(\overline{Q0} \wedge \overline{V}) \vee (V \wedge Q0)$

$J1 = (\overline{V} \wedge \overline{Q0} \wedge Q2) \vee (V \wedge Q0 \wedge \overline{Q2})$

$K1 = (V \wedge Q0) \vee (\overline{Q0} \wedge \overline{V})$

$J0=1$

$K0=1$

| **J2** | V | V | | |
|---|---|---|---|---|
| Q2 | x | x | x | x |
| Q2 | x | x | x | x | Q0 |
| | 0 | 1 | 0 | 0 | Q0 |
| | 0 | 0 | 0 | 1 | |
| | | Q1 | Q1 | |

| **J1** | V | V | | |
|---|---|---|---|---|
| Q2 | 0 | x | x | 1 |
| Q2 | 0 | x | x | 0 | Q0 |
| | 1 | x | x | 0 | Q0 |
| | 0 | x | x | 0 | |
| | | Q1 | Q1 | |

| **J0** | V | V | | |
|---|---|---|---|---|
| Q2 | 1 | x | x | 1 |
| Q2 | x | x | x | x | Q0 |
| | x | x | x | x | Q0 |
| | 1 | 1 | 1 | 1 | |
| | | Q1 | Q1 | |

| **K2** | V | V | | |
|---|---|---|---|---|
| Q2 | 0 | x | x | 1 |
| Q2 | 1 | x | x | 0 | Q0 |
| | x | x | x | x | Q0 |
| | x | x | x | x | |
| | | Q1 | Q1 | |

| **K1** | V | V | | |
|---|---|---|---|---|
| Q2 | x | x | x | x |
| Q2 | x | x | x | x | Q0 |
| | x | 1 | 0 | x | Q0 |
| | x | 0 | 1 | x | |
| | | Q1 | Q1 | |

| **K0** | V | V | | |
|---|---|---|---|---|
| Q2 | x | x | x | x |
| Q2 | 1 | x | x | 1 | Q0 |
| | 1 | 1 | 1 | 1 | Q0 |
| | x | x | x | x | |
| | | Q1 | Q1 | |