

CD4023M/CD4023C Triple 3-Input NAND Gate
CD4025M/CD4025C Triple 3-Input NOR Gate

General Description

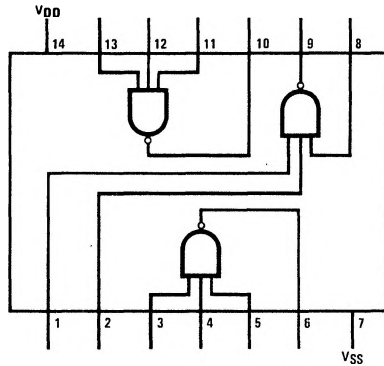
These triple gates are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement mode transistors. All inputs are protected against static discharge with diodes to V_{DD} and V_{SS} .

Features

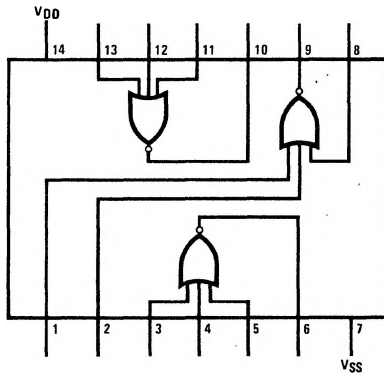
- Wide supply voltage range
- High noise immunity
- 5-10V parametric ratings
- Low Power

3.0V to 15V
 0.45 V_{DD} (typ.)

Connection Diagrams



CD4023M/CD4023C
 TOP VIEW



CD4025M/CD4025C
 TOP VIEW

Absolute Maximum Ratings (Note 1)

| | | | |
|-----------------------------|-----------------------------------|--|-----------------------------------|
| Voltage at Any Pin | $V_{SS} -$ to $V_{DD} + 0.3V$ | Storage Temperature Range | $-65^{\circ}C$ to $+150^{\circ}C$ |
| Operating Temperature Range | $-55^{\circ}C$ to $+125^{\circ}C$ | Package Dissipation | 500 mW |
| CD4023M, CD4025M | $-55^{\circ}C$ to $+125^{\circ}C$ | Operating V_{DD} Range | $V_{SS} + 3.0V$ to $V_{SS} + 15V$ |
| CD4023C, CD4025C | $-40^{\circ}C$ to $+85^{\circ}C$ | Lead Temperature (Soldering, 10 seconds) | $300^{\circ}C$ |

DC Electrical Characteristics — CD4023M, CD4025M

| Parameter | Conditions | Limits | | | | | | | Units |
|--|---|----------------|------|---------------|-------|------|----------------|------|---------|
| | | $-55^{\circ}C$ | | $25^{\circ}C$ | | | $125^{\circ}C$ | | |
| | | Min. | Max. | Min. | Typ. | Max. | Min. | Max. | |
| I_L Quiescent Device Current | $V_{DD} = 5.0V$ | | 0.05 | | 0.001 | 0.05 | | 3.0 | μA |
| | $V_{DD} = 10V$ | | 0.1 | | 0.001 | 0.1 | | 6.0 | μA |
| P_D Quiescent Device Dissipation/Package | $V_{DD} = 5.0V$ | | 0.25 | | 0.005 | 0.25 | | 15 | μW |
| | $V_{DD} = 10V$ | | 1.0 | | 0.01 | 1.0 | | 60 | μW |
| V_{OL} Output Voltage Low Level | $V_{DD} = 5.0V, V_I = V_{DD}, I_O = 0A$ | | 0.05 | | 0 | 0.05 | | 0.05 | V |
| | $V_{DD} = 10V, V_I = V_{DD}, I_O = 0A$ | | 0.05 | | 0 | 0.05 | | 0.05 | V |
| V_{OH} Output Voltage High Level | $V_{DD} = 5.0V, V_I = V_{SS}, I_O = 0A$ | 4.95 | | 4.95 | 5.0 | | 4.95 | | V |
| | $V_{DD} = 10V, V_I = V_{SS}, I_O = 0A$ | 9.95 | | 9.95 | 10 | | 9.95 | | V |
| V_{NL} Noise Immunity (All Inputs) | $V_{DD} = 5.0V, V_O = 3.6V, I_O = 0A$ | 1.5 | | 1.5 | 2.25 | | 1.4 | | V |
| | $V_{DD} = 10V, V_O = 7.2V, I_O = 0A$ | 3.0 | | 3.0 | 4.5 | | 2.9 | | V |
| V_{NH} Noise Immunity (All Inputs) | $V_{DD} = 5.0V, V_O = 0.95V, I_O = 0A$ | 1.4 | | 1.5 | 2.25 | | 1.5 | | V |
| | $V_{DD} = 10V, V_O = 2.9V, I_O = 0A$ | 2.9 | | 3.0 | 4.5 | | 3.0 | | V |
| I_{DN} Output Drive Current N-Channel (4025) | $V_{DD} = 5.0V, V_O = 0.4V, V_I = V_{DD}$ | 0.5 | | 0.40 | 1.0 | | 0.28 | | mA |
| | $V_{DD} = 10V, V_O = 0.5V, V_I = V_{DD}$ | 1.1 | | 0.9 | 2.5 | | 0.65 | | mA |
| I_{DP} Output Drive Current P-Channel (4025) | $V_{DD} = 5.0V, V_O = 2.5V, V_I = V_{SS}$ | -0.62 | | -0.5 | -2.0 | | -0.35 | | mA |
| | $V_{DD} = 10V, V_O = 9.5V, V_I = V_{SS}$ | -0.62 | | -0.5 | -1.0 | | -0.35 | | mA |
| I_{DN} Output Drive Current N-Channel (4023) | $V_{DD} = 5.0V, V_O = 0.4V, V_I = V_{DD}$ | 0.31 | | 0.25 | 0.5 | | 0.175 | | mA |
| | $V_{DD} = 10V, V_O = 0.5V, V_I = V_{DD}$ | 0.63 | | 0.5 | 0.6 | | 0.35 | | mA |
| I_{DP} Output Drive Current P-Channel (4023) | $V_{DD} = 5.0V, V_O = 2.5V, V_I = V_{SS}$ | -0.31 | | -0.25 | -0.5 | | -0.175 | | mA |
| | $V_{DD} = 10V, V_O = 9.5V, V_I = V_{SS}$ | -0.75 | | -0.6 | -1.2 | | -0.4 | | mA |
| I_I Input Current | | | | | 10 | | | | pA |

DC Electrical Characteristics — CD4023C, CD4025C

| Parameter | Conditions | Limits | | | | | | Units | |
|---|---|--------|------|-------|-------|------|--------|-------|------|
| | | -40°C | | 25°C | | | 85°C | | |
| | | Min. | Max. | Min. | Typ. | Max. | Min. | | Max. |
| I _L Quiescent Device Current | V _{DD} = 5.0V | | 0.5 | | 0.005 | 0.5 | | 15 | μA |
| | V _{DD} = 10V | | 5.0 | | 0.005 | 5.0 | | 30 | μA |
| P _D Quiescent Device Dissipation/Package | V _{DD} = 5.0V | | 2.5 | | 0.025 | 2.5 | | 75 | μW |
| | V _{DD} = 10V | | 50 | | 0.05 | 50 | | 300 | μW |
| V _{OL} Output Voltage Low Level | V _{DD} = 5.0V, V _I = V _{DD} , I _O = 0A | | 0.01 | | 0 | 0.01 | | 0.05 | V |
| | V _{DD} = 10V, V _I = V _{DD} , I _O = 0A | | 0.01 | | 0 | 0.01 | | 0.05 | V |
| V _{OH} Output Voltage High Level | V _{DD} = 5.0V, V _I = V _{SS} , I _O = 0A | 4.99 | | 4.99 | 5.0 | | 4.95 | | V |
| | V _{DD} = 10V, V _I = V _{SS} , I _O = 0A | 9.99 | | 9.99 | 10 | | 9.95 | | V |
| I _I Input Current | | | | | 10 | | | | pA |
| V _{NL} Noise Immunity (All Inputs) | V _{DD} = 5.0V, V _O = 3.6V, I _O = 0A | 1.5 | | 1.5 | 2.25 | | 1.4 | | V |
| | V _{DD} = 10V, V _O = 7.2V, I _O = 0A | 3.0 | | 3.0 | 4.5 | | 2.9 | | V |
| V _{NH} Noise Immunity (All Inputs) | V _{DD} = 5.0V, V _I = 0.95V, I _O = 0A | 1.4 | | 1.5 | 2.25 | | 1.5 | | V |
| | V _{DD} = 10V, V _O = 2.9V, I _O = 0A | 2.9 | | 3.0 | 4.5 | | 3.0 | | V |
| I _{DN} Output Drive Current N-Channel (4025) | V _{DD} = 5.0V, V _O = 0.4V, V _I = V _{DD} | 0.35 | | 0.3 | 1.0 | | 0.24 | | mA |
| | V _{DD} = 10V, V _O = 0.5V, V _I = V _{DD} | 0.72 | | 0.6 | 2.5 | | 0.48 | | mA |
| I _{DP} Output Drive Current P-Channel (4025) | V _{DD} = 5.0V, V _O = 2.5V, V _I = V _{SS} | -0.35 | | -0.3 | -2.0 | | -0.24 | | mA |
| | V _{DD} = 10V, V _O = 9.5V, V _I = V _{SS} | -0.3 | | -0.25 | -1.0 | | -0.2 | | mA |
| I _{DN} Output Drive Current N-Channel (4023) | V _{DD} = 5.0V, V _O = 0.4V, V _I = V _{DD} | 0.145 | | 0.12 | 0.5 | | 0.095 | | mA |
| | V _{DD} = 10V, V _O = 0.5V, V _I = V _{DD} | 0.3 | | 0.25 | 0.6 | | 0.2 | | mA |
| I _{DP} Output Drive Current P-Channel (4023) | V _{DD} = 5.0V, V _O = 2.5V, V _I = V _{SS} | -0.145 | | -0.12 | -0.5 | | -0.095 | | mA |
| | V _{DD} = 10V, V _O = 9.5V, V _I = V _{SS} | -0.35 | | -0.3 | -1.2 | | -0.24 | | mA |
| I _I Input Current | | | | | 10 | | | | pA |

AC Electrical Characteristics

$T_A = 25^\circ\text{C}$, $C_L = 15\text{ pF}$, and input rise and fall times = 20 ns.
Typical temperature coefficient for all values of $V_{DD} = 0.3\%/^\circ\text{C}$

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--|------------------------|------|------|------|-------|
| CD4025M | | | | | |
| t_{PHL} Propagation Delay Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 35 | 50 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 40 | ns |
| t_{PLH} Propagation Delay Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 35 | 40 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 70 | ns |
| t_{THL} Transition Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 65 | 125 | ns |
| | $V_{DD} = 10\text{V}$ | | 35 | 70 | ns |
| t_{TLH} Transition Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 65 | 175 | ns |
| | $V_{DD} = 10\text{V}$ | | 35 | 75 | ns |
| C_i Input Capacitance | Any Input | | 5.0 | | pF |

| | | | | | |
|--|------------------------|--|-----|-----|----|
| CD4025C | | | | | |
| t_{PHL} Propagation Delay Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 35 | 80 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 55 | ns |
| t_{PLH} Propagation Delay Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 35 | 120 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 65 | ns |
| t_{THL} Transition Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 65 | 200 | ns |
| | $V_{DD} = 10\text{V}$ | | 35 | 115 | ns |
| t_{TLH} Transition Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 65 | 300 | ns |
| | $V_{DD} = 10\text{V}$ | | 35 | 125 | ns |
| C_i Input Capacitance | Any Input | | 5.0 | | pF |

AC Electrical Characteristics

$T_A = 25^\circ\text{C}$, $C_L = 15\text{ pF}$, and input rise and fall times = 20 ns.
Typical temperature coefficient for all values of $V_{DD} = 0.3\%/^\circ\text{C}$

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--|------------------------|------|------|------|-------|
| CD4023M | | | | | |
| t_{PHL} Propagation Delay Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 50 | 75 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 40 | ns |
| t_{PLH} Propagation Delay Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 50 | 75 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 40 | ns |
| t_{THL} Transition Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 75 | 125 | ns |
| | $V_{DD} = 10\text{V}$ | | 50 | 75 | ns |
| t_{TLH} Transition Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 75 | 100 | ns |
| | $V_{DD} = 10\text{V}$ | | 40 | 60 | ns |
| C_i Input Capacitance | Any Input | | 5.0 | | pF |

| | | | | | |
|--|------------------------|--|-----|-----|----|
| CD4023C | | | | | |
| t_{PHL} Propagation Delay Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 50 | 100 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 50 | ns |
| t_{PLH} Propagation Delay Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 50 | 100 | ns |
| | $V_{DD} = 10\text{V}$ | | 25 | 50 | ns |
| t_{THL} Transition Time High to Low Level | $V_{DD} = 5.0\text{V}$ | | 75 | 150 | ns |
| | $V_{DD} = 10\text{V}$ | | 50 | 100 | ns |
| t_{TLH} Transition Time Low to High Level | $V_{DD} = 5.0\text{V}$ | | 75 | 125 | ns |
| | $V_{DD} = 10\text{V}$ | | 40 | 75 | ns |
| C_i Input Capacitance | Any Input | | 5.0 | | pF |