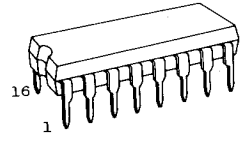
TC4501BP TRIPLE GATE (Dual 4-Input NAND Gate and 2-Input NOR/OR Gate or 8-Input AND/NAND Gate)

The TC4501BP is a combined gate which contains dual 4-input NAND gate and 2-input NOR/OR gate in one package.

Since all the outputs of these gates are provided with the buffers of inverters, the input/output transmission characteristics have been improved and the noise immunity has been elevated. Further, an increase in propagation delay time caused by an increase in load capacity is kept to a minimum.

The TC4501BP can be used as 8-input positive AND/NAND gate by externally connecting the output of NAND gate to the input of NOR/OR gate.

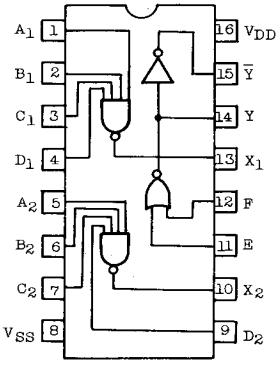



DIP16(3D16A-P)

ABSOLUTE MAXIMUM RATINGS

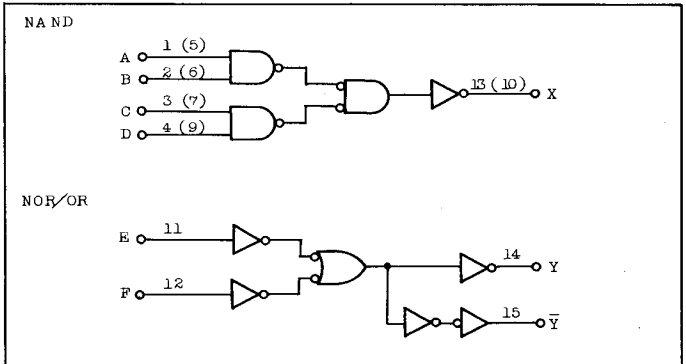
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| DC Supply Voltage | $V_{DD}$ | $V_{SS}-0.5 \sim V_{SS}+20$ | V |
| Input Voltage | $V_{IN}$ | $V_{SS}-0.5 \sim V_{DD}+0.5$ | V |
| Output Voltage | $V_{OUT}$ | $V_{SS}-0.5 \sim V_{DD}+0.5$ | V |
| DC Input Current | $I_{IN}$ | ±10 | mA |
| Power Dissipation | $P_D$ | 300 | mW |
| Operating Temperature Range | $T_A$ | -40 ∼ 85 | °C |
| Storage Temperature Range | $T_{stg}$ | -65 ∼ 150 | °C |
| Lead Temp./Time | $T_{sol}$ | 260°C · 10 sec | |

PIN ASSIGNMENT




(TOP VIEW)

LOGIC DIAGRAM



RECOMMENDED OPERATING CONDITIONS ($V_{SS}$=0V)

| CHARACTERISTIC | SYMBOL | | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| DC Supply Voltage | $V_{DD}$ | | 3 | - | 18 | V |
| Input Voltage | $V_{IN}$ | | 0 | - | $V_{DD}$ | V |

STATIC ELECTRICAL CHARACTERISTICS ($V_{SS}$=0V)

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | $V_{DD}$ (V) | -40°C MIN. | -40°C MAX. | 25°C MIN. | 25°C TYP. | 25°C MAX. | 85°C MIN. | 85°C MAX. | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High-Level Output Voltage | $V_{OH}$ | $\|I_{OUT}\|$<1μA | 5 | 4.95 | - | 4.95 | 5.00 | - | 4.95 | - | V |
| | | $V_{IN}=V_{SS}$, $V_{DD}$ | 10 | 9.95 | - | 9.95 | 10.00 | - | 9.95 | - | |
| | | | 15 | 14.95 | - | 14.95 | 15.00 | - | 14.95 | | |
| Low-Level Output Voltage | $V_{OL}$ | $\|I_{OUT}\|$<1μA | 5 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | |
| | | $V_{IN}=V_{SS}$, $V_{DD}$ | 10 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | |
| | | | 15 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | |
| Output High Current | $I_{OH}$ | $V_{OH}$=4.6V | 5 | -0.61 | - | -0.51 | -1.0 | - | -0.42 | - | mA |
| | | $V_{OH}$=2.5V | 5 | -2.5 | - | -2.1 | -4.0 | - | -1.7 | - | |
| | | $V_{OH}$=9.5V | 10 | -1.5 | - | -1.3 | -2.2 | - | -1.1 | - | |
| | | $V_{OH}$=13.5V | 15 | -4.0 | - | -3.4 | -9.0 | - | -2.8 | - | |
| | | $V_{IN}=V_{SS}$, $V_{DD}$ | | | | | | | | | |
| Output Low Current | $I_{OL}$ | $V_{OL}$=0.4V | 5 | 0.61 | - | 0.51 | 1.5 | - | 0.42 | - | |
| | | $V_{OL}$=0.5V | 10 | 1.5 | - | 1.3 | 3.8 | - | 1.1 | - | |
| | | $V_{OL}$=1.5V | 15 | 4.0 | - | 3.4 | 15.0 | - | 2.8 | - | |
| | | $V_{IN}=V_{SS}$, $V_{DD}$ | | | | | | | | | |
| Input High Voltage | $V_{IH}$ | $V_{OUT}$=0.5V, 4.5V | 5 | 3.5 | - | 3.5 | 2.75 | - | 3.5 | - | |
| | | $V_{OUT}$=1.0V, 9.0V | 10 | 7.0 | - | 7.0 | 5.5 | - | 7.0 | - | |
| | | $V_{OUT}$=1.5V,13.5V | 15 | 11.0 | - | 11.0 | 8.25 | - | 11.0 | - | |
| | | $\|I_{OUT}\|$<1μA | | | | | | | | | |
| Input Low Voltage | $V_{IL}$ | $V_{OUT}$=0.5V, 4.5V | 5 | - | 1.5 | - | 2.25 | 1.5 | - | 1.5 | |
| | | $V_{OUT}$=1.0V, 9.0V | 10 | - | 3.0 | - | 4.5 | 3.0 | - | 3.0 | |
| | | VOUT=1.5V,13.5V | 15 | - | 4.0 | - | 6.75 | 4.0 | - | 4.0 | |
| | | $\|I_{OUT}\|$<1μA | | | | | | | | | |
| Input Current "H" Level | $I_{IH}$ | $V_{IH}$=18V | 18 | - | 0.1 | - | $10^{-5}$ | 0.1 | - | 1.0 | μA |
| Input Current "L" Level | $I_{IL}$ | $V_{IL}$=0V | 18 | - | -0.1 | - | $-10^{-5}$ | -0.1 | - | -1.0 | μA |
| Quiescent Device Current | $I_{DD}$ | $V_{IN}=V_{SS}$, $V_{DD}$ | 5 | - | 0.25 | - | 0.001 | 0.25 | - | 3.8 | μA |
| | | | 10 | - | 0.5 | - | 0.001 | 0.5 | - | 7.5 | |
| | | * | 15 | - | 1.0 | - | 0.002 | 1.0 | - | 15 | |

* All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, $V_{SS}$=0V, $C_L$=50pF)

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | $V_{DD}$(V) | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|---|---|
| Output Transition Time (Low to High) | | $t_{TLH}$ | | 5 | – | 80 | 200 | ns |
| | | | | 10 | – | 50 | 100 | |
| | | | | 15 | – | 40 | 80 | |
| Output Transition Time (High to Low) | | $t_{THL}$ | | 5 | – | 80 | 200 | |
| | | | | 10 | – | 50 | 100 | |
| | | | | 15 | – | 40 | 80 | |
| NAND | Propagation Delay Time (Low to High) | $t_{pLH}$ | | 5 | – | 80 | 260 | |
| | | | | 10 | – | 50 | 140 | |
| | | | | 15 | – | 40 | 100 | |
| | Propagation Delay Time (High to Low) | $t_{pHL}$ | | 5 | – | 80 | 260 | |
| | | | | 10 | – | 50 | 140 | |
| | | | | 15 | – | 40 | 100 | |
| NOR | Propagation Delay Time (Low to High) | $t_{pLH}$ | | 5 | – | 100 | 230 | |
| | | | | 10 | – | 50 | 130 | |
| | | | | 15 | – | 40 | 90 | |
| | Propagation Delay Time (High to Low) | $t_{pHL}$ | | 5 | – | 100 | 230 | |
| | | | | 10 | – | 50 | 130 | |
| | | | | 15 | – | 40 | 90 | |
| NOR-Inverter | Propagation Delay Time (Low to High) | $t_{pLH}$ | | 5 | – | 130 | 260 | |
| | | | | 10 | – | 70 | 140 | |
| | | | | 15 | – | 50 | 100 | |
| | Propagation Delay Time (High to Low) | $t_{pHL}$ | | 5 | – | 130 | 260 | |
| | | | | 10 | – | 70 | 140 | |
| | | | | 15 | – | 50 | 100 | |
| Input Capacitance | | $C_{IN}$ | | | – | 5 | 7.5 | pF |

CIRCUIT AND WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS