

TC4011BP/TC4011BF QUAD 2 INPUT NAND GATE
TC4012BP/TC4012BF DUAL 4 INPUT NAND GATE
TC4023BP/TC4023BF TRIPLE 3 INPUT NAND GATE

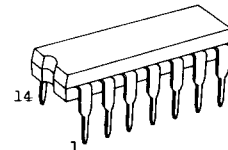
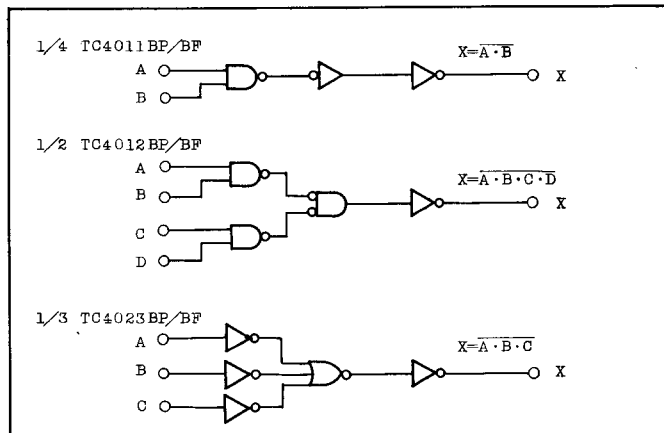
The TC4011BP/BF, TC4023BP/BF, and TC4012BP/BF are 2-input, 3-input, and 4-input positive logic NAND gates respectively.

Since all the outputs of these gates are provided with the inverters as buffers, the input/output characteristics have been improved and the variation of propagation delay time due to the increase in load capacity is kept down to the minimum.

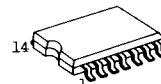
ABSOLUTE MAXIMUM RATINGS

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|-----------------------------|------------------|---|------|
| DC Supply Voltage | V _{DD} | V _{SS} -0.5 ~ V _{SS} +20 | V |
| Input Voltage | V _{IN} | V _{SS} -0.5 ~ V _{DD} +0.5 | V |
| Output Voltage | V _{OUT} | V _{SS} -0.5 ~ V _{DD} +0.5 | V |
| DC Input Current | I _{IN} | ±10 | mA |
| Power Dissipation | P _D | 300(DIP)/180(MFP) | 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 | |

LOGIC DIAGRAM



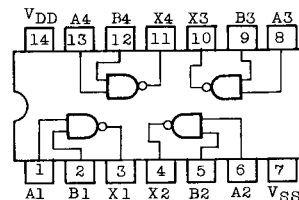
DIP14 (3D14A-P)



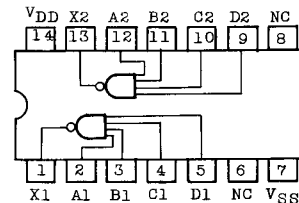
MFP14 (F14GB-P)

PIN ASSIGNMENT (TOP VIEW)

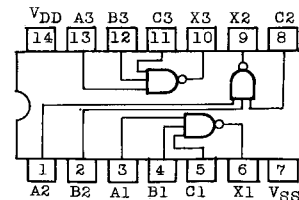
TC4011BP/BF



TC4012BP/BF



TC4023BP/BF



TC4011BP/BF, TC4012BP/BF, TC4023BP/BF

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 CONDITION | V _{DD} (V) | -40°C | | 25°C | | | 85°C | | UNITS | |
|---------------------------|-----------------|---|------------------------|-------|------|-------|-------|-------------------|-------|------|-------|----|
| | | | | MIN. | MAX. | MIN. | TYP. | MAX. | MIN. | MAX. | | |
| High-Level Output Voltage | V _{OH} | I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD} | 5 | 4.95 | - | 4.95 | 5.00 | - | 4.95 | - | V | |
| | | | 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 V _{IN} =V _{DD} | 5 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | V | |
| | | | 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 V _{OH} =2.5V V _{OH} =9.5V V _{OH} =13.5V V _{IN} =V _{SS} , V _{DD} | 5 | -0.61 | - | -0.51 | -1.0 | - | -0.42 | - | mA | |
| | | | 5 | -2.5 | - | -2.1 | -4.0 | - | -1.7 | - | | |
| | | | 10 | -1.5 | - | -1.3 | -2.2 | - | -1.1 | - | | |
| | | | 15 | -4.0 | - | -3.4 | -9.0 | - | -2.8 | - | | |
| Output Low Current | I _{OL} | V _{OL} =0.4V V _{OL} =0.5V V _{OL} =1.5V V _{IN} =V _{DD} | 5 | 0.61 | - | 0.51 | 1.2 | - | 0.42 | - | mA | |
| | | | 10 | 1.5 | - | 1.3 | 3.2 | - | 1.1 | - | | |
| | | | 15 | 4.0 | - | 3.4 | 12.0 | - | 2.8 | - | | |
| | | | | | | | | | | | | |
| Input High Voltage | V _{IH} | V _{OUT} =0.5V, 4.5V V _{OUT} =1.0V, 9.0V V _{OUT} =1.5V, 13.5V I _{OUT} < 1μA | 5 | 3.5 | - | 3.5 | 2.75 | - | 3.5 | - | V | |
| | | | 10 | 7.0 | - | 7.0 | 5.5 | - | 7.0 | - | | |
| | | | 15 | 11.0 | - | 11.0 | 8.25 | - | 11.0 | - | | |
| | | | | | | | | | | | | |
| Input Low Voltage | V _{IL} | V _{OUT} =4.5V V _{OUT} =9.0V V _{OUT} =13.5V I _{OUT} < 1μA | 5 | - | 1.5 | - | 2.25 | 1.5 | - | 1.5 | V | |
| | | | 10 | - | 3.0 | - | 4.5 | 3.0 | - | 3.0 | | |
| | | | 15 | - | 4.0 | - | 6.75 | 4.0 | - | 4.0 | | |
| | | | | | | | | | | | | |
| Input Current | "H" Level | I _{IH} | V _{IH} =18V | 18 | - | 0.1 | - | 10 ⁻⁵ | 0.1 | - | 1.0 | μA |
| | "L" Level | I _{IL} | V _{IL} =0V | 18 | - | -0.1 | - | -10 ⁻⁵ | -0.1 | - | -1.0 | |
| Quiescent Device Current | I _{DD} | V _{IN} =V _{SS} , V _{DD} * | 5 | - | 0.25 | - | 0.001 | 0.25 | - | 7.5 | μA | |
| | | | 10 | - | 0.5 | - | 0.001 | 0.5 | - | 15 | | |
| | | | 15 | - | 1.0 | - | 0.002 | 1.0 | - | 30 | | |

* All valid input combinations.

TC4011BP/BF, TC4012BP/BF, TC4023BP/BF

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, VSS=0V, CL=50pF)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | V _{DD} (V) | MIN. | TYP. | MAX. | UNITS |
|--|------------------|----------------|---------------------|------|------|------|-------|
| | | | | | | | |
| Output Transition Time (TC4012BP/BF) | t _{TLH} | | 5 | - | 80 | 200 | ns |
| | | | 10 | - | 50 | 100 | |
| | | | 15 | - | 40 | 80 | |
| Output Transition Time (TC4012BP/BF) | t _{THL} | | 5 | - | 80 | 200 | |
| | | | 10 | - | 50 | 100 | |
| | | | 15 | - | 40 | 80 | |
| Output Transition Time (TC4011BP/BF) (TC4023BP/BF) | t _{TLH} | | 5 | - | 70 | 200 | |
| | | | 10 | - | 35 | 100 | |
| | | | 15 | - | 30 | 80 | |
| Output Transition Time (TC4011BP/BF) (TC4023BP/BF) | t _{THL} | | 5 | - | 70 | 200 | |
| | | | 10 | - | 35 | 100 | |
| | | | 15 | - | 30 | 80 | |
| Propagation Delay Time (TC4011BP/BF) | t _{pLH} | | 5 | - | 65 | 200 | |
| | | | 10 | - | 30 | 100 | |
| | | | 15 | - | 25 | 80 | |
| Propagation Delay Time (TC4011BP/BF) | t _{pHL} | | 5 | - | 65 | 200 | |
| | | | 10 | - | 30 | 100 | |
| | | | 15 | - | 25 | 80 | |
| Propagation Delay Time (TC4012BP/BF) | t _{pLH} | | 5 | - | 95 | 250 | |
| | | | 10 | - | 45 | 120 | |
| | | | 15 | - | 30 | 90 | |
| Propagation Delay Time (TC4012BP/BF) | t _{pHL} | | 5 | - | 95 | 250 | |
| | | | 10 | - | 45 | 120 | |
| | | | 15 | - | 30 | 90 | |
| Propagation Delay Time (TC4023BP/BF) | t _{pLH} | | 5 | - | 90 | 250 | |
| | | | 10 | - | 45 | 100 | |
| | | | 15 | - | 35 | 80 | |
| Propagation Delay Time (TC4023BP/BF) | t _{pHL} | | 5 | - | 90 | 250 | |
| | | | 10 | - | 45 | 100 | |
| | | | 15 | - | 35 | 80 | |
| Input Capacitance | C _{IN} | | | - | 5 | 7.5 | pF |

CIRCUIT AND WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

