

# TC4011BP, TC4011BF, TC4011BFN, TC4011BFT

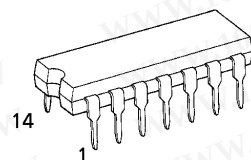
## TC4011B QUAD 2 INPUT NAND GATE

The TC4011B is 2-input positive logic NAND gate respectively.

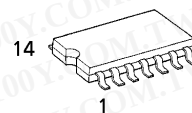
Since all the outputs of these gates are provided with the inverters as buffers, the input/output characteristics have been improved and the variation of propagation delay time due to the increase in load capacity is kept down to the minimum.

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

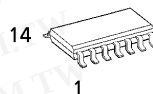
(Note) The JEDEC SOP (FN) is not available in Japan.



P (DIP14-P-300-2.54)  
Weight : 0.96g (Typ.)



F (SOP14-P-300-1.27)  
Weight : 0.18g (Typ.)



FN (SOL14-P-150-1.27)  
Weight : 0.12g (Typ.)

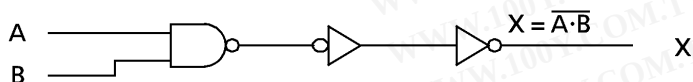


FT (TSSOP14-P-0044-0.65)  
Weight : 0.06g (Typ.)

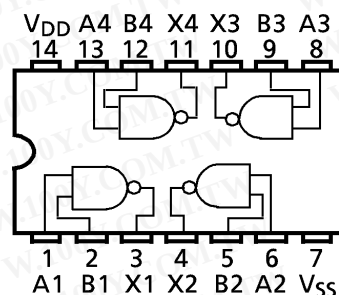
## MAXIMUM RATINGS

| 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            | $I_{IN}$  | $\pm 10$                         | mA                 |
| Power Dissipation           | $P_D$     | 300 (DIP) / 180 (SOIC)           | mW                 |
| Operating Temperature Range | $T_{opr}$ | $-40 \sim 85$                    | $^{\circ}\text{C}$ |
| Storage Temperature Range   | $T_{stg}$ | $-65 \sim 150$                   | $^{\circ}\text{C}$ |

## LOGIC DIAGRAM



## PIN ASSIGNMENT (TOP VIEW)



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● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

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

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

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

| CHARACTERISTIC            | SYM-BOL   | TEST CONDITION                                    | $V_{DD}$<br>(V) | -40°C |      | 25°C  |       |            | 85°C  |      | UNIT    |
|---------------------------|-----------|---------------------------------------------------|-----------------|-------|------|-------|-------|------------|-------|------|---------|
|                           |           |                                                   |                 | MIN.  | MAX. | MIN.  | TYP.  | MAX.       | MIN.  | MAX. |         |
| High-Level Output Voltage | $V_{OH}$  | $ I_{OUT}  < 1\mu A$<br>$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}  < 1\mu A$<br>$V_{IN} = V_{SS}, 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       | $I_{OH}$  | $V_{OH} = 4.6V$                                   | 5               | -0.61 | —    | -0.51 | -1.0  | —          | -0.42 | —    | mA      |
|                           |           | $V_{OH} = 2.5V$                                   | 5               | -2.50 | —    | -2.10 | -4.0  | —          | -1.70 | —    |         |
|                           |           | $V_{OH} = 9.5V$                                   | 10              | -1.50 | —    | -1.30 | -2.2  | —          | -1.10 | —    |         |
|                           |           | $V_{OH} = 13.5V$                                  | 15              | -4.00 | —    | -3.40 | -9.0  | —          | -2.80 | —    |         |
|                           |           | $V_{IN} = V_{SS}, V_{DD}$                         |                 |       |      |       |       |            |       |      |         |
| Output Low Current        | $I_{OL}$  | $V_{OL} = 0.4V$                                   | 5               | 0.61  | —    | 0.51  | 1.2   | —          | 0.42  | —    | mA      |
|                           |           | $V_{OL} = 0.5V$                                   | 10              | 1.50  | —    | 1.30  | 3.2   | —          | 1.10  | —    |         |
|                           |           | $V_{OL} = 1.5V$                                   | 15              | 4.00  | —    | 3.40  | 12.0  | —          | 2.80  | —    |         |
|                           |           | $V_{IN} = V_{DD}$                                 |                 |       |      |       |       |            |       |      |         |
| Input High Voltage        | $V_{IH}$  | $V_{OUT} = 0.5V$                                  | 5               | 3.5   | —    | 3.5   | 2.75  | —          | 3.5   | —    | V       |
|                           |           | $V_{OUT} = 1.0V$                                  | 10              | 7.0   | —    | 7.0   | 5.50  | —          | 7.0   | —    |         |
|                           |           | $V_{OUT} = 1.5V$                                  | 15              | 11.0  | —    | 11.0  | 8.25  | —          | 11.0  | —    |         |
|                           |           | $ I_{OUT}  < 1\mu A$                              |                 |       |      |       |       |            |       |      |         |
| Input Low Voltage         | $V_{IL}$  | $V_{OUT} = 4.5V$                                  | 5               | —     | 1.5  | —     | 2.25  | 1.5        | —     | 1.5  | V       |
|                           |           | $V_{OUT} = 9.0V$                                  | 10              | —     | 3.0  | —     | 4.50  | 3.0        | —     | 3.0  |         |
|                           |           | $V_{OUT} = 13.5V$                                 | 15              | —     | 4.0  | —     | 6.75  | 4.0        | —     | 4.0  |         |
|                           |           | $ I_{OUT}  < 1\mu A$                              |                 |       |      |       |       |            |       |      |         |
| Input Current             | "H" Level | $I_{IH}$                                          | $V_{IH} = 18V$  | 18    | —    | 0.1   | —     | $10^{-5}$  | 0.1   | —    | $\mu A$ |
|                           | "L" Level | $I_{IL}$                                          | $V_{IL} = 0V$   | 18    | —    | -0.1  | —     | $-10^{-5}$ | -0.1  | —    |         |
| Quiescent Supply Current  | $I_{DD}$  | $V_{IN} = V_{SS}, V_{DD}^*$                       | 5               | —     | 0.25 | —     | 0.001 | 0.25       | —     | 7.5  | $\mu A$ |
|                           |           |                                                   | 10              | —     | 0.50 | —     | 0.001 | 0.50       | —     | 15.0 |         |
|                           |           |                                                   | 15              | —     | 1.00 | —     | 0.002 | 1.00       | —     | 30.0 |         |

\* All valid input combinations.

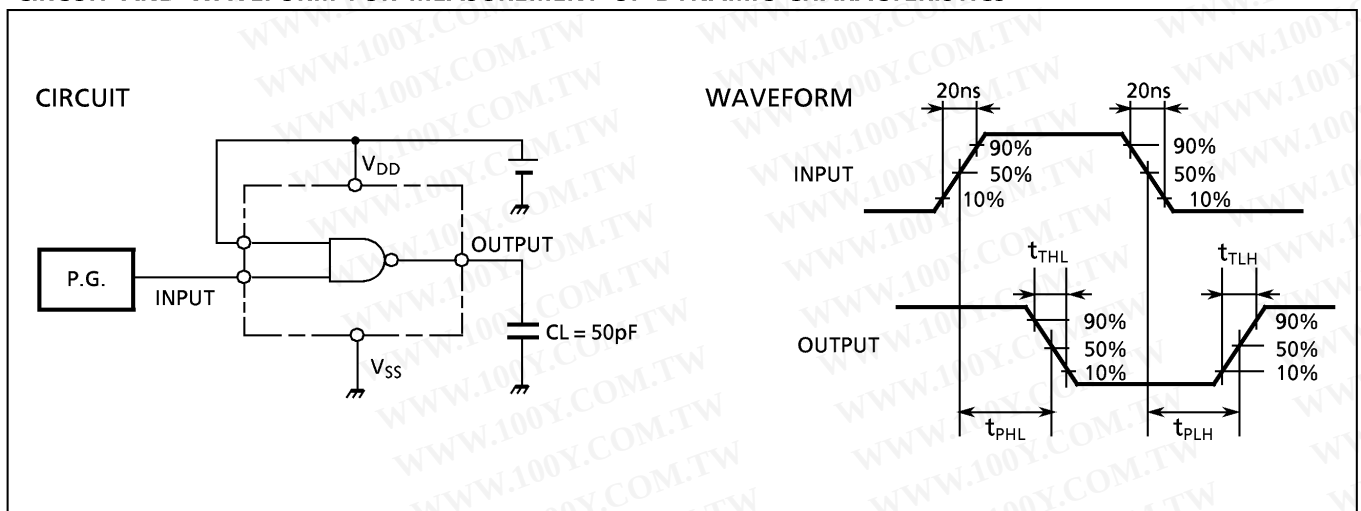
980910EBA2'

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DYNAMIC ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ ,  $V_{SS} = 0\text{V}$ ,  $C_L = 50\text{pF}$ )

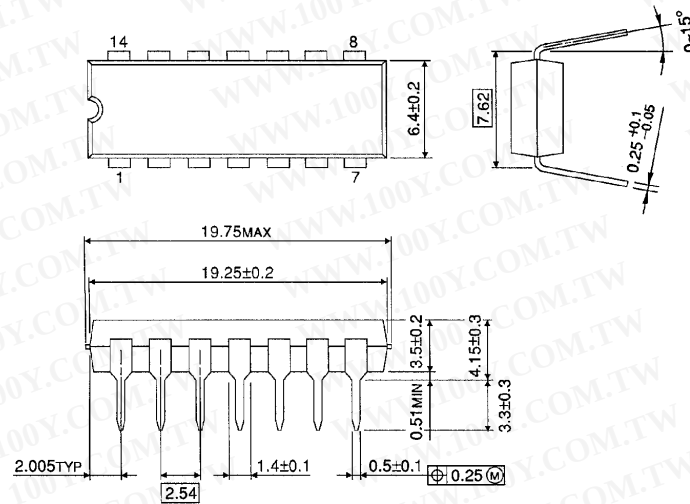
| CHARACTERISTIC         | SYMBOL    | TEST CONDITION | $V_{DD}(\text{V})$ | MIN. | TYP. | MAX. | UNIT |
|------------------------|-----------|----------------|--------------------|------|------|------|------|
| Output Transition Time | $t_{TLH}$ |                | 5                  | —    | 70   | 200  | ns   |
|                        |           |                | 10                 | —    | 35   | 100  |      |
|                        |           |                | 15                 | —    | 30   | 80   |      |
| Output Transition Time | $t_{THL}$ |                | 5                  | —    | 70   | 200  |      |
|                        |           |                | 10                 | —    | 35   | 100  |      |
|                        |           |                | 15                 | —    | 30   | 80   |      |
| Propagation Delay Time | $t_{pLH}$ |                | 5                  | —    | 65   | 200  |      |
|                        |           |                | 10                 | —    | 30   | 100  |      |
|                        |           |                | 15                 | —    | 25   | 80   |      |
| Propagation Delay Time | $t_{pHL}$ |                | 5                  | —    | 65   | 200  |      |
|                        |           |                | 10                 | —    | 30   | 100  |      |
|                        |           |                | 15                 | —    | 25   | 80   |      |
| Input Capacitance      | $C_{IN}$  |                |                    | —    | 5    | 7.5  | pF   |

## CIRCUIT AND WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS



### DIP 14PIN OUTLINE DRAWING (DIP14-P-300-2.54)

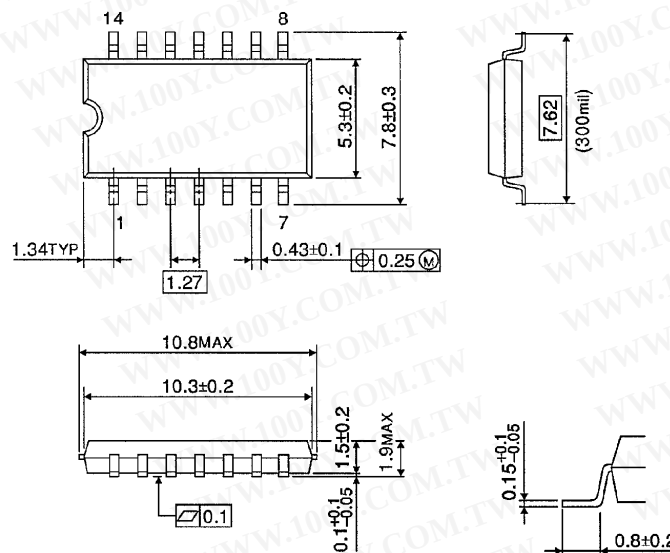
Unit in mm



Weight : 0.96g (Typ.)

### SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27)

Unit in mm

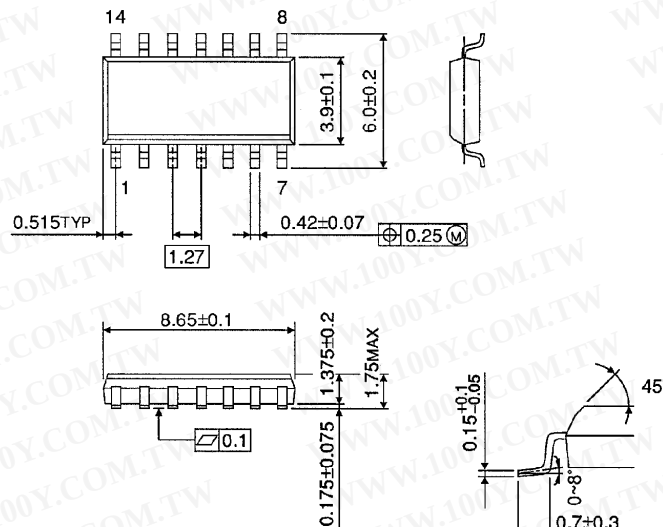


Weight : 0.18g (Typ.)

**SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOL14-P-150 -1.27)**

Unit in mm

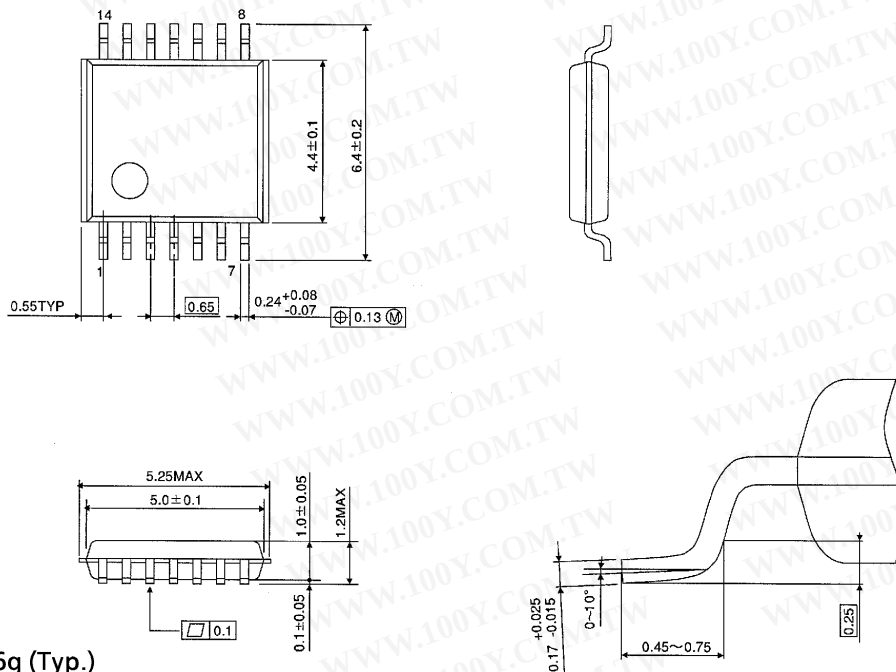
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

**TSSOP 14PIN (170mil BODY) OUTLINE DRAWING (TSSOP14-P-0044-0.65)**

Unit in mm



Weight : 0.06g (Typ.)