

# TC74HC10AP, TC74HC10AF, TC74HC10AFN

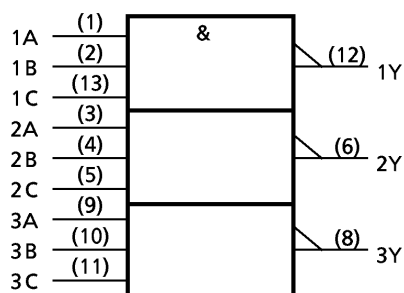
## TRIPLE 3-INPUT NAND GATE

The TC74HC10A is a high speed CMOS 3-INPUT NAND GATE fabricated with silicon gate C<sup>2</sup>MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

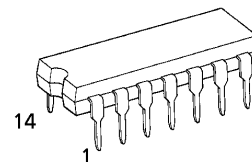
### FEATURES:

- High Speed..... $t_{pd} = 6\text{ns}(\text{typ.})$  at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 1\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Output Drive Capability..... 10 LSTTL Loads
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 4\text{mA}(\text{Min.})$
- Balanced Propagation Delays.....  $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range...  $V_{CC} (\text{opr.}) = 2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 74LS10

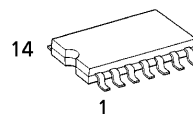
### IEC LOGIC SYMBOL



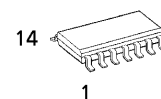
(Note) The JEDEC SOP (FN) is not available in Japan.



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

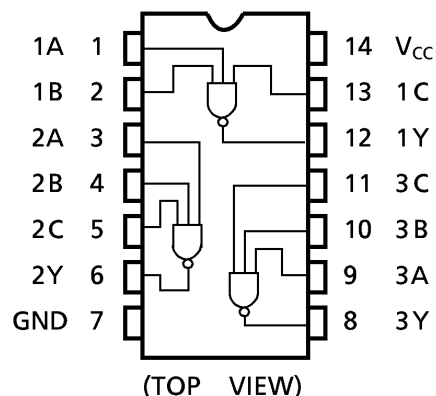


F (SOP14-P-300-1.27)  
Weight : 0.18g (Typ.)



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

### PIN ASSIGNMENT



### TRUTH TABLE

| A | B | C | Y |
|---|---|---|---|
| L | X | X | H |
| X | L | X | H |
| X | X | L | H |
| H | H | H | L |

X : Don't Care

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                    | SYMBOL    | VALUE                    | UNIT               |
|------------------------------|-----------|--------------------------|--------------------|
| Supply Voltage Range         | $V_{CC}$  | $-0.5 \sim 7$            | V                  |
| DC Input Voltage             | $V_{IN}$  | $-0.5 \sim V_{CC} + 0.5$ | V                  |
| DC Output Voltage            | $V_{OUT}$ | $-0.5 \sim V_{CC} + 0.5$ | V                  |
| Input Diode Current          | $I_{IK}$  | $\pm 20$                 | mA                 |
| Output Diode Current         | $I_{OK}$  | $\pm 20$                 | mA                 |
| DC Output Current            | $I_{OUT}$ | $\pm 25$                 | mA                 |
| DC $V_{CC}$ / Ground Current | $I_{CC}$  | $\pm 50$                 | mA                 |
| Power Dissipation            | $P_D$     | 500 (DIP)* / 180 (SOP)   | mW                 |
| Storage Temperature          | $T_{stg}$ | $-65 \sim 150$           | $^{\circ}\text{C}$ |

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL     | VALUE                                                                                                              | UNIT               |
|--------------------------|------------|--------------------------------------------------------------------------------------------------------------------|--------------------|
| Supply Voltage           | $V_{CC}$   | $2 \sim 6$                                                                                                         | V                  |
| Input Voltage            | $V_{IN}$   | $0 \sim V_{CC}$                                                                                                    | V                  |
| Output Voltage           | $V_{OUT}$  | $0 \sim V_{CC}$                                                                                                    | V                  |
| Operating Temperature    | $T_{opr}$  | $-40 \sim 85$                                                                                                      | $^{\circ}\text{C}$ |
| Input Rise and Fall Time | $t_r, t_f$ | $0 \sim 1000 (V_{CC} = 2.0\text{V})$<br>$0 \sim 500 (V_{CC} = 4.5\text{V})$<br>$0 \sim 400 (V_{CC} = 6.0\text{V})$ | ns                 |

## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                   | SYMBOL   | TEST CONDITION                       | $V_{CC}$<br>(V)                                        | $T_a = 25^{\circ}\text{C}$ |                   |                      | $T_a = -40 \sim 85^{\circ}\text{C}$ |                      | UNIT          |
|-----------------------------|----------|--------------------------------------|--------------------------------------------------------|----------------------------|-------------------|----------------------|-------------------------------------|----------------------|---------------|
|                             |          |                                      |                                                        | MIN.                       | TYP.              | MAX.                 | MIN.                                | MAX.                 |               |
| High - Level Input Voltage  | $V_{IH}$ |                                      | 2.0<br>4.5<br>6.0                                      | 1.50<br>3.15<br>4.20       | —<br>—<br>—       | —<br>—<br>—          | 1.50<br>3.15<br>4.20                | —<br>—<br>—          | V             |
| Low - Level Input Voltage   | $V_{IL}$ |                                      | 2.0<br>4.5<br>6.0                                      | —<br>—<br>—                | —<br>—<br>—       | 0.50<br>1.35<br>1.80 | —<br>—<br>—                         | 0.50<br>1.35<br>1.80 | V             |
| High - Level Output Voltage | $V_{OH}$ | $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OH} = -20\mu\text{A}$                              | 2.0<br>4.5<br>6.0          | 1.9<br>4.4<br>5.9 | 2.0<br>4.5<br>6.0    | —<br>—<br>—                         | 1.9<br>4.4<br>5.9    | V             |
|                             |          |                                      | $I_{OH} = -4 \text{ mA}$<br>$I_{OH} = -5.2 \text{ mA}$ | 4.5<br>6.0                 | 4.18<br>5.68      | 4.31<br>5.80         | —<br>—                              | 4.13<br>5.63         |               |
| Low - Level Output Voltage  | $V_{OL}$ | $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OL} = 20\mu\text{A}$                               | 2.0<br>4.5<br>6.0          | —<br>—<br>—       | 0.0<br>0.0<br>0.0    | 0.1<br>0.1<br>0.1                   | —<br>—<br>—          | V             |
|                             |          |                                      | $I_{OL} = 4 \text{ mA}$<br>$I_{OL} = 5.2 \text{ mA}$   | 4.5<br>6.0                 | —<br>—            | 0.17<br>0.18         | 0.26<br>0.26                        | —<br>—               |               |
| Input Leakage Current       | $I_{IN}$ | $V_{IN} = V_{CC} \text{ or GND}$     | 6.0                                                    | —                          | —                 | $\pm 0.1$            | —                                   | $\pm 1.0$            | $\mu\text{A}$ |
| Quiescent Supply Current    | $I_{CC}$ | $V_{IN} = V_{CC} \text{ or GND}$     | 6.0                                                    | —                          | —                 | 1.0                  | —                                   | 10.0                 |               |

AC ELECTRICAL CHARACTERISTICS (  $C_L = 15\text{pF}$ ,  $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , Input  $t_r = t_f = 6\text{ns}$  )

| PARAMETER              | SYMBOL                 | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------------|------------------------|----------------|------|------|------|------|
| Output Transition Time | $t_{TLH}$<br>$t_{THL}$ |                | —    | 4    | 8    | ns   |
| Propagation Delay Time | $t_{pLH}$<br>$t_{pHL}$ |                | —    | 6    | 12   |      |

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$  )

| PARAMETER                     | SYMBOL                               | TEST CONDITION | Ta = 25°C           |      |      |      | Ta = -40~85°C |      | UNIT |
|-------------------------------|--------------------------------------|----------------|---------------------|------|------|------|---------------|------|------|
|                               |                                      |                | V <sub>CC</sub> (V) | MIN. | TYP. | MAX. | MIN.          | MAX. |      |
| Output Transition Time        | t <sub>TLH</sub><br>t <sub>THL</sub> |                | 2.0                 | —    | 25   | 75   | —             | 95   | ns   |
|                               |                                      |                | 4.5                 | —    | 7    | 15   | —             | 19   |      |
|                               |                                      |                | 6.0                 | —    | 6    | 13   | —             | 16   |      |
| Propagation Delay Time        | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0                 | —    | 27   | 75   | —             | 95   |      |
|                               |                                      |                | 4.5                 | —    | 9    | 15   | —             | 19   |      |
|                               |                                      |                | 6.0                 | —    | 8    | 13   | —             | 16   |      |
| Input Capacitance             | C <sub>IN</sub>                      |                |                     | —    | 5    | 10   | —             | 10   | pF   |
| Power Dissipation Capacitance | C <sub>PD</sub> (1)                  |                |                     | —    | 23   | —    | —             | —    |      |

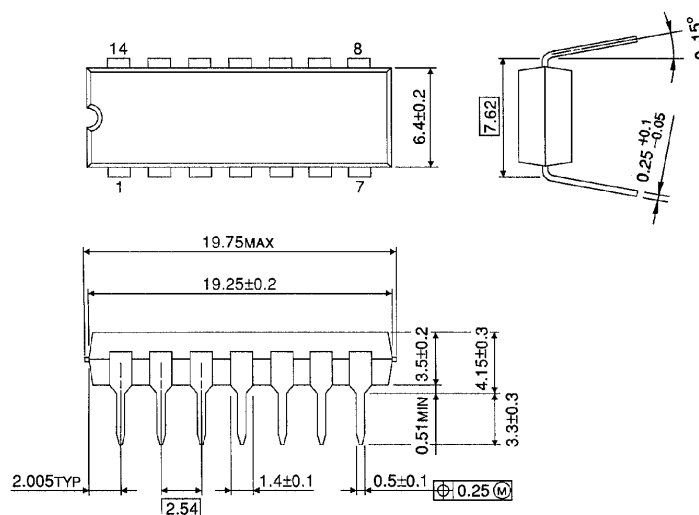
Note (1)  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ ( per Gate )}$$

## DIP 14PIN PACKAGE DIMENSIONS ( DIP14-P-300-2.54 )

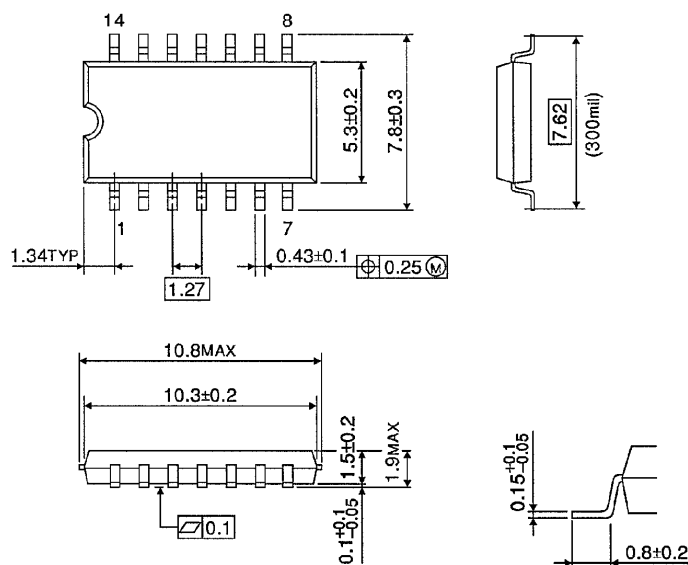
Unit in mm



Weight : 0.96g (Typ.)

## SOP 14PIN ( 200mil BODY ) PACKAGE DIMENSIONS ( SOP14-P-300-1.27 )

Unit in mm

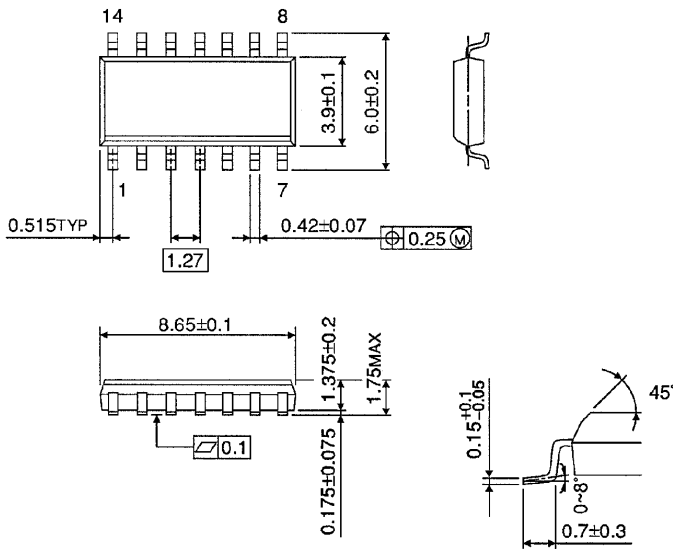


Weight : 0.18g (Typ.)

SOP 14PIN ( 150mil BODY ) PACKAGE DIMENSIONS ( SOL14-P-150 -1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

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000707EBA

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