

**TC74ACT02P, TC74ACT02F, TC74ACT02FN, TC74ACT02FT**

**QUAD 2 - INPUT NOR GATE**

The TC74ACT02 is an advanced high speed CMOS 2-INPUT NOR GATE fabricated with silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

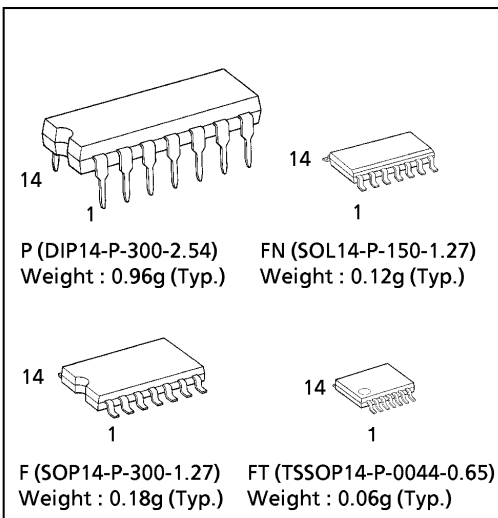
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

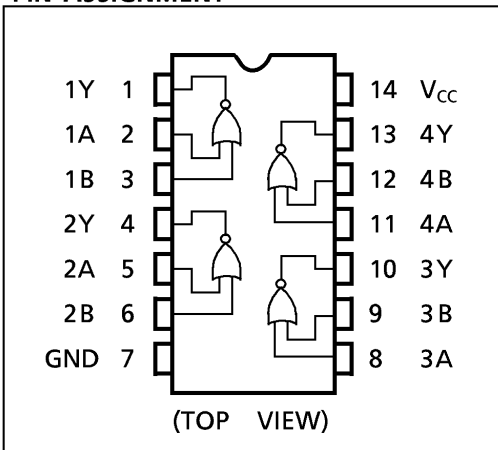
**FEATURES :**

- High Speed..... $t_{pd} = 4.6ns(yp.)$  at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(Max.)$  at  $T_a = 25^{\circ}C$
- Compatible with TTL outputs...  $V_{IL} = 0.8V (Max.)$   
 $V_{IH} = 2.0V (Min.)$
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24mA(Min.)$   
Capability of driving  $50\Omega$  transmission lines.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F02

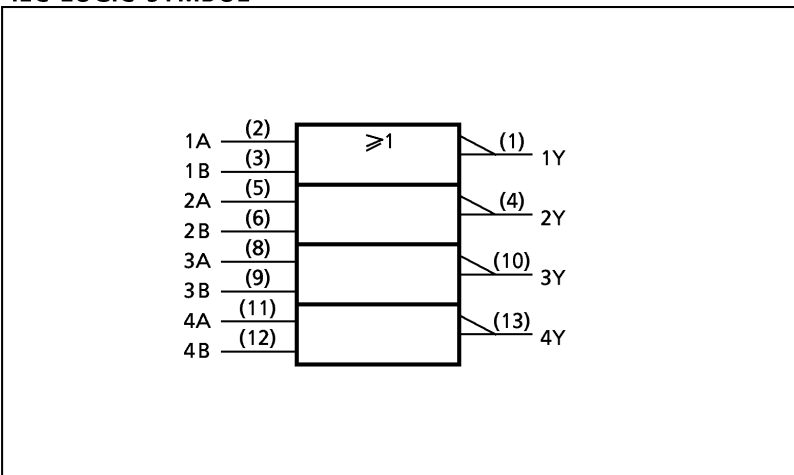
(Note) The JEDEC SOP (FN) is not available in Japan.



**PIN ASSIGNMENT**



**IEC LOGIC SYMBOL**



**TRUTH TABLE**

| A | B | Y |
|---|---|---|
| L | L | H |
| L | H | L |
| H | L | L |
| H | H | L |

961001EBA2

● 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.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                   | SYMBOL    | VALUE                        | UNIT |
|-----------------------------|-----------|------------------------------|------|
| Supply Voltage Range        | $V_{CC}$  | -0.5~7.0                     | V    |
| DC Input Voltage            | $V_{IN}$  | -0.5~ $V_{CC} + 0.5$         | V    |
| DC Output Voltage           | $V_{OUT}$ | -0.5~ $V_{CC} + 0.5$         | V    |
| Input Diode Current         | $I_{IK}$  | ±20                          | mA   |
| Output Diode Current        | $I_{OK}$  | ±50                          | mA   |
| DC Output Current           | $I_{OUT}$ | ±50                          | mA   |
| DC $V_{CC}$ /Ground Current | $I_{CC}$  | ±100                         | mA   |
| Power Dissipation           | $P_D$     | 500 (DIP)* / 180 (SOP/TSSOP) | mW   |
| Storage Temperature         | $T_{stg}$ | -65~150                      | °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  $-10\text{mW}/^{\circ}\text{C}$  should be applied up to 300mW.

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL    | VALUE       | UNIT   |
|--------------------------|-----------|-------------|--------|
| Supply Voltage           | $V_{CC}$  | 4.5~5.5     | V      |
| Input Voltage            | $V_{IN}$  | 0~ $V_{CC}$ | V      |
| Output Voltage           | $V_{OUT}$ | 0~ $V_{CC}$ | V      |
| Operating Temperature    | $T_{opr}$ | -40~85      | °C     |
| Input Rise and Fall Time | dt / dV   | 0~10        | ns / V |

## 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  | $V_{IH}$ |   | 4.5<br>}<br>5.5   | 2.0                        | —                | —             | 2.0                                 | —                   | V                   |   |
| Low - Level Input Voltage   | $V_{IL}$ |   | 4.5<br>}<br>5.5   | —                          | —                | 0.8           | —                                   | 0.8                 | V                   |   |
| High - Level Output Voltage | $V_{OH}$ | $V_{IN} = V_{IL}$   | $I_{OH} = -50\mu\text{A}$<br>$I_{OH} = -24\text{mA}$<br>$I_{OH} = -75\text{mA}^*$ | 4.5<br>4.5<br>5.5          | 4.4<br>3.94<br>— | 4.5<br>—<br>— | —<br>—<br>—                         | 4.4<br>3.80<br>3.85 | —<br>—<br>—         | V |
| Low - Level Output Voltage  | $V_{OL}$ | $V_{IN} = V_{IH}$ or $V_{IL}$                                       | $I_{OL} = 50\mu\text{A}$<br>$I_{OL} = 24\text{mA}$<br>$I_{OL} = 75\text{mA}^*$    | 4.5<br>4.5<br>5.5          | —<br>—<br>—      | 0.0<br>—<br>— | 0.1<br>0.36<br>—                    | —<br>—<br>—         | 0.1<br>0.44<br>1.65 | V |
| Input Leakage Current       | $I_{IN}$ | $V_{IN} = V_{CC}$ or GND  | 5.5   | —                          | —                | ±0.1          | —                                   | ±1.0                | $\mu\text{A}$       |   |
| Quiescent Supply Current    | $I_{CC}$ | $V_{IN} = V_{CC}$ or GND  | 5.5   | —                          | —                | 4.0           | —                                   | 40.0                |                     |   |
|                             | $I_C$    | PER INPUT : $V_{IN} = 3.4\text{V}$<br>OTHER INPUT : $V_{CC}$ or GND | 5.5   | —                          | —                | 1.35          | —                                   | 1.5                 | mA                  |   |

\* : This spec indicates the capability of driving 50Ω transmission lines.  
One output should be tested at a time for a 10ms maximum duration.

961001EBA2'

- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ ,  $R_L = 500\ \Omega$ , Input  $t_r = t_f = 3\text{ns}$  )

| PARAMETER                     | SYMBOL                               | TEST CONDITION | Ta = 25°C           |      |      | Ta = -40~85°C |      | UNIT |      |
|-------------------------------|--------------------------------------|----------------|---------------------|------|------|---------------|------|------|------|
|                               |                                      |                | V <sub>CC</sub> (V) | MIN. | TYP. | MAX.          | MIN. |      | MAX. |
| Propagation Delay Time        | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 5.0 ± 0.5           | —    | 5.3  | 8.3           | 1.0  | 9.5  | ns   |
| Input Capacitance             | C <sub>IN</sub>                      |                | —                   | 5    | 10   | —             | 10   | pF   |      |
| Power Dissipation Capacitance | C <sub>PD</sub> (1)                  |                | —                   | 22   | —    | —             | —    |      |      |

Note (1) C<sub>PD</sub> 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 OUTLINE DRAWING (DIP14-P-300-2.54)**

Unit in mm



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

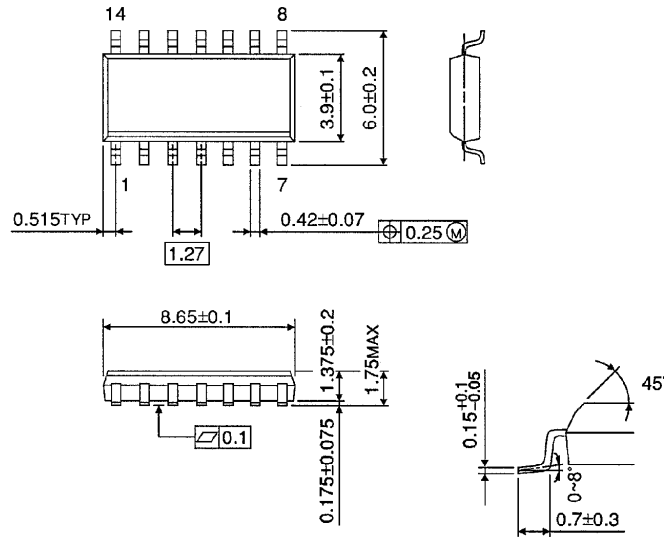
Unit in mm



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

Unit in mm

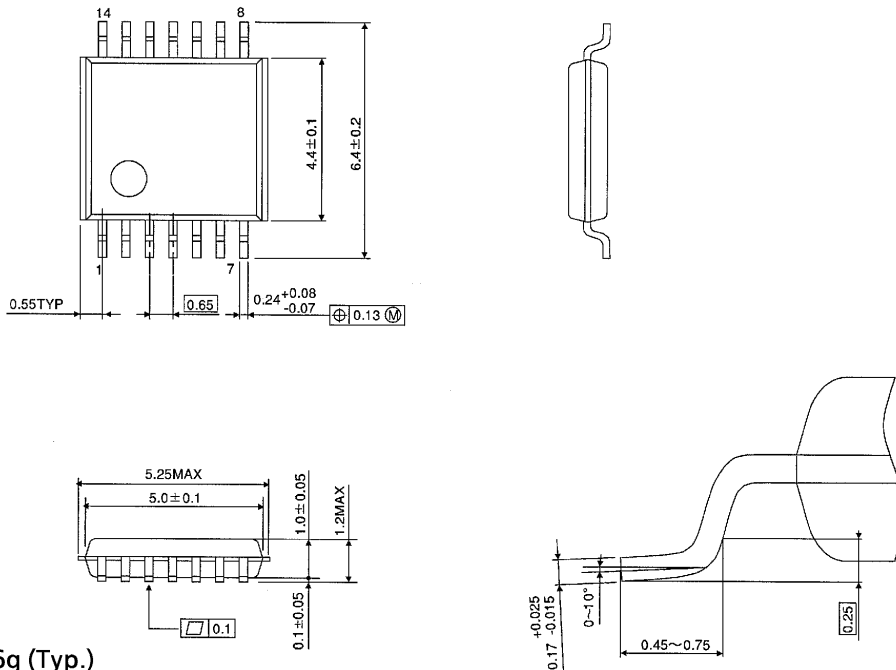
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

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

Unit in mm



Weight : 0.06g (Typ.)