

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 C²MOS technology.

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

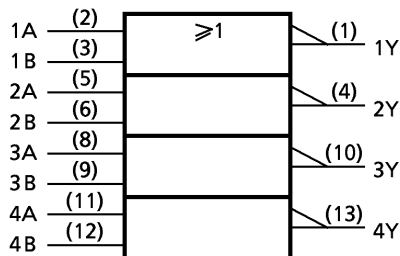
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

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

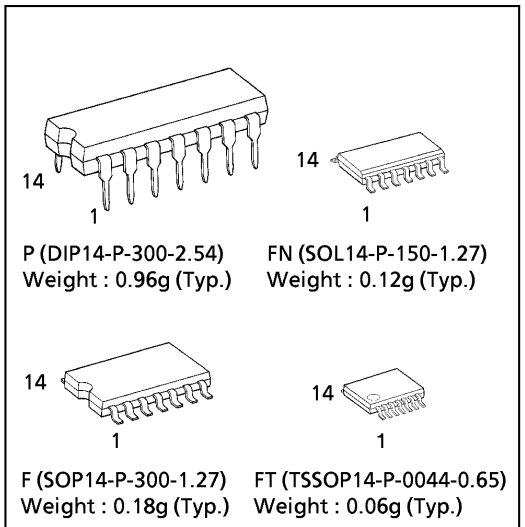
FEATURES :

- High Speed..... $t_{pd} = 4.6ns$ (typ.) 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 50Ω transmission lines.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F02

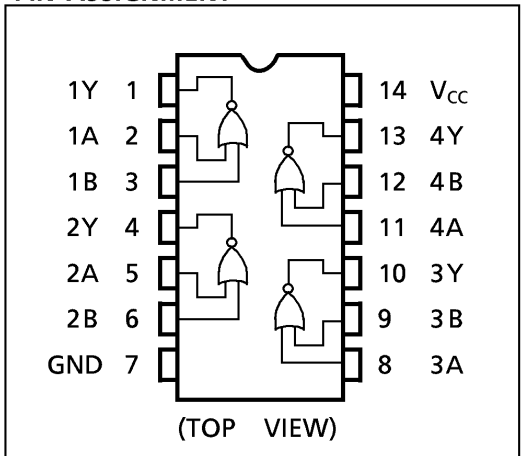
IEC LOGIC SYMBOL



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



PIN ASSIGNMENT



TRUTH TABLE

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

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

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 _{CC} (V) | MIN. | TYP. | MAX. | MIN. | | MAX. |
| Propagation Delay Time | t_{pLH} t_{pHL} | | 5.0 ± 0.5 | — | 5.3 | 8.3 | 1.0 | 9.5 | ns |
| Input Capacitance | C _{IN} | | — | 5 | 10 | — | 10 | pF | |
| Power Dissipation Capacitance | C _{PD} (1) | | — | 22 | — | — | — | | |

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)

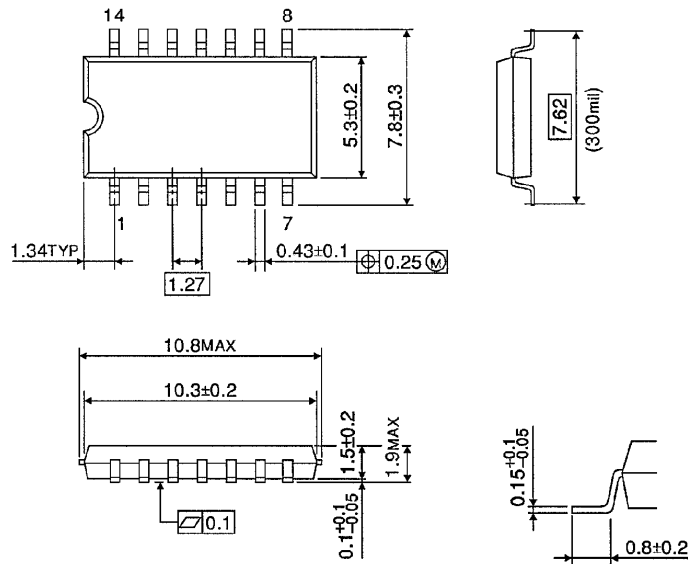
Unit in mm



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

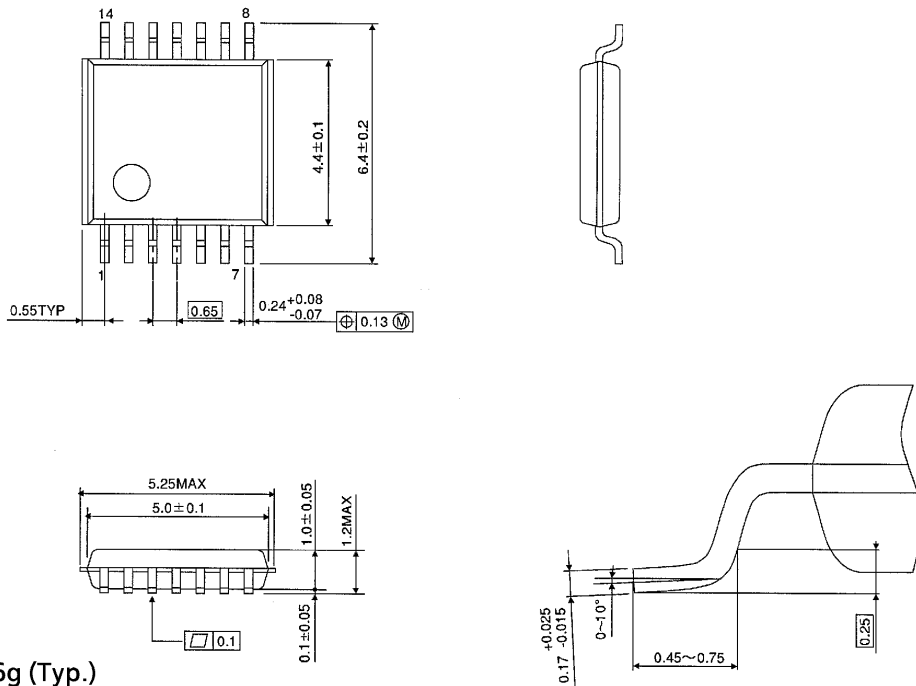
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

TSSOP 14PIN (170mil BODY) PACKAGE DIMENSIONS (TSSOP14-P-0044-0.65)

Unit in mm



Weight : 0.06g (Typ.)

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