

# TC74ACT86P, TC74ACT86F, TC74ACT86FN

## Quad Exclusive OR Gate

The TC74ACT86 is an advanced high speed CMOS QUAD EXCLUSIVE OR 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.

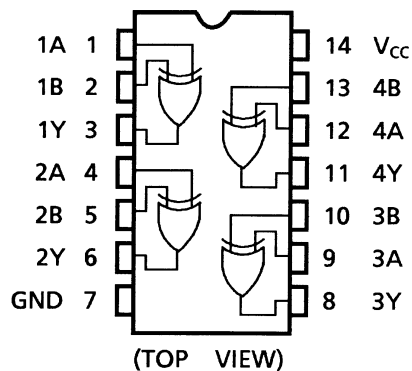
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels. The internal circuit includes an output buffer, which provides high noise immunity and stable output.

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

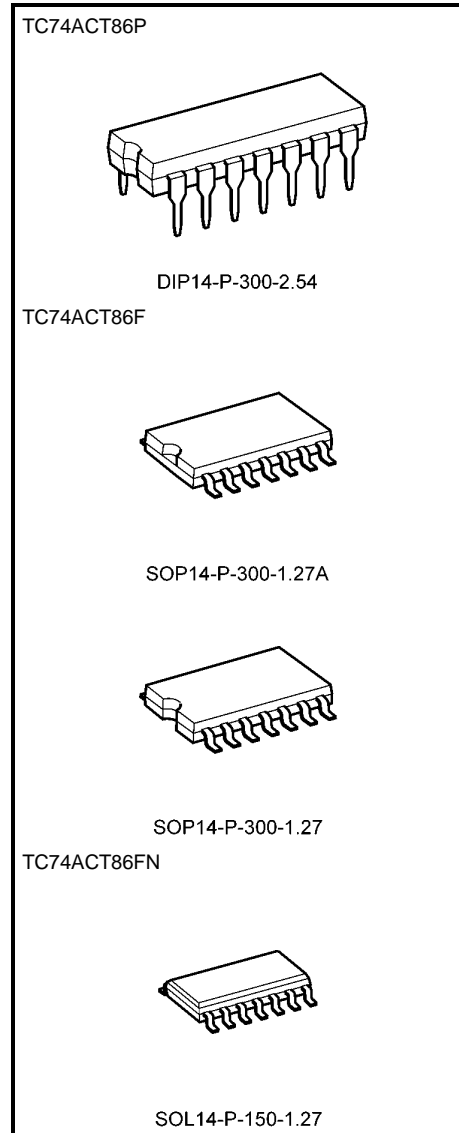
### Features

- High speed:  $t_{pd} = 5.0 \text{ ns}$  (typ.) at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 4 \mu\text{A}$  (max) at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs:  $V_{IL} = 0.8 \text{ V}$  (max)  
 $V_{IH} = 2.0 \text{ V}$  (min)
- Symmetrical output impedance:  $|I_{OH}| = I_{OL} = 24 \text{ mA}$  (min)  
Capability of driving  $50 \Omega$  transmission lines.
- Balanced propagation delays:  $t_{pLH} \approx t_{pHL}$
- Pin and function compatible with 74F86

### Pin Assignment

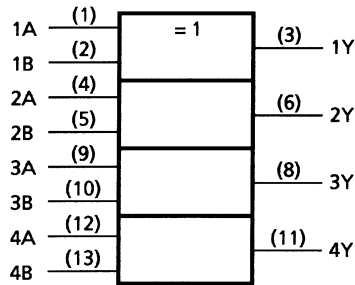


Note: xxxFN (JEDEC SOP) is not available in Japan.



|                   |                 |
|-------------------|-----------------|
| Weight            |                 |
| DIP14-P-300-2.54  | : 0.96 g (typ.) |
| SOP14-P-300-1.27A | : 0.18 g (typ.) |
| SOP14-P-300-1.27  | : 0.18 g (typ.) |
| SOL14-P-150-1.27  | : 0.12 g (typ.) |

## IEC Logic Symbol



## Truth Table

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

## Absolute Maximum Ratings (Note 1)

| Characteristics             | Symbol    | Rating                       | 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         | $I_{IK}$  | $\pm 20$                     | mA          |
| Output diode current        | $I_{OK}$  | $\pm 50$                     | mA          |
| DC output current           | $I_{OUT}$ | $\pm 50$                     | mA          |
| DC $V_{CC}$ /ground current | $I_{CC}$  | $\pm 100$                    | mA          |
| Power dissipation           | $P_D$     | 500 (DIP) (Note 2)/180 (SOP) | mW          |
| Storage temperature         | $T_{stg}$ | -65~150                      | $^{\circ}C$ |

Note1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note2: 500 mW in the range of  $T_a = -40\sim 65^{\circ}C$ . From  $T_a = 65$  to  $85^{\circ}C$  a derating factor of  $-10$  mW/ $^{\circ}C$  should be applied up to 300 mW.

## Recommended Operating Conditions (Note)

| Characteristics          | Symbol    | Rating      | 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      | $^{\circ}C$ |
| Input rise and fall time | dt/dV     | 0~10        | ns/V        |

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

## Electrical Characteristics

### DC Characteristics

| Characteristics           | Symbol          | Test Condition  |                                 | Ta = 25°C           |      |      | Ta = -40~85°C |      | Unit |     |
|---------------------------|-----------------|---|---------------------------------|---------------------|------|------|---------------|------|------|-----|
|                           |                 |   |                                 | V <sub>CC</sub> (V) | Min  | Typ. | Max           | Min  |      | Max |
| High-level input voltage  | V <sub>IH</sub> | —   |                                 | 4.5~5.5             | 2.0  | —    | —             | 2.0  | —    | V   |
| Low-level input voltage   | V <sub>IL</sub> | —   |                                 | 4.5~5.5             | —    | —    | 0.8           | —    | 0.8  | V   |
| High-level output voltage | V <sub>OH</sub> | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                      | I <sub>OH</sub> = -50 μA        | 4.5                 | 4.4  | 4.5  | —             | 4.4  | —    | V   |
|                           |                 |   | I <sub>OH</sub> = -24 mA        | 4.5                 | 3.94 | —    | —             | 3.80 | —    |     |
|                           |                 |   | I <sub>OH</sub> = -75 mA (Note) | 5.5                 | —    | —    | —             | 3.85 | —    |     |
| Low-level output voltage  | V <sub>OL</sub> | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                      | I <sub>OL</sub> = 50 μA         | 4.5                 | —    | 0.0  | 0.1           | —    | 0.1  | V   |
|                           |                 |   | I <sub>OL</sub> = 24 mA         | 4.5                 | —    | —    | 0.36          | —    | 0.44 |     |
|                           |                 |   | I <sub>OL</sub> = 75 mA (Note)  | 5.5                 | —    | —    | —             | —    | 1.65 |     |
| Input leakage current     | I <sub>IN</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND                                  |                                 | 5.5                 | —    | —    | ±0.1          | —    | ±1.0 | μA  |
| Quiescent supply current  | I <sub>CC</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND                                  |                                 | 5.5                 | —    | —    | 4.0           | —    | 40.0 | μA  |
|                           | I <sub>C</sub>  | Per input: V <sub>IN</sub> = 3.4 V<br>Other input: V <sub>CC</sub> or GND |                                 | 5.5                 | —    | —    | 1.35          | —    | 1.5  | mA  |

Note: This spec indicates the capability of driving 50 Ω transmission lines.

One output should be tested at a time for a 10 ms maximum duration.

### AC Characteristics (C<sub>L</sub> = 50 pF, R<sub>L</sub> = 500 Ω, input: t<sub>r</sub> = t<sub>f</sub> = 3 ns)

| Characteristics               | 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>          | —              |  | 5.0 ± 0.5           | —   | 5.7  | 10.5          | 1.0 | 12.0 | ns  |
|                               | t <sub>pHL</sub>          | —              |  |                     |     |      |               |     |      |     |
| Input capacitance             | C <sub>IN</sub>           | —              |  | —                   | 5   | 10   | —             | 10  | pF   |     |
| Power dissipation capacitance | C <sub>PD</sub><br>(Note) | —              |  | —                   | 23  | —    | —             | —   | pF   |     |

Note: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

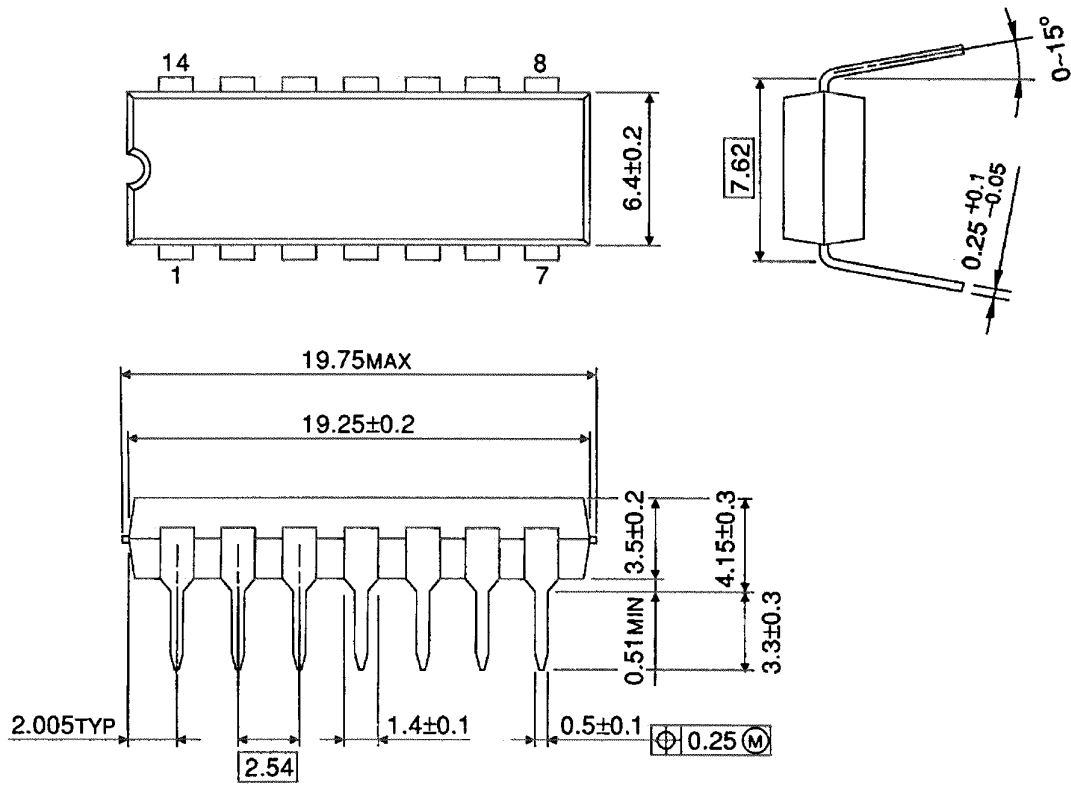
Average operating current can be obtained by the equation:

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

## Package Dimensions

DIP14-P-300-2.54

Unit : mm

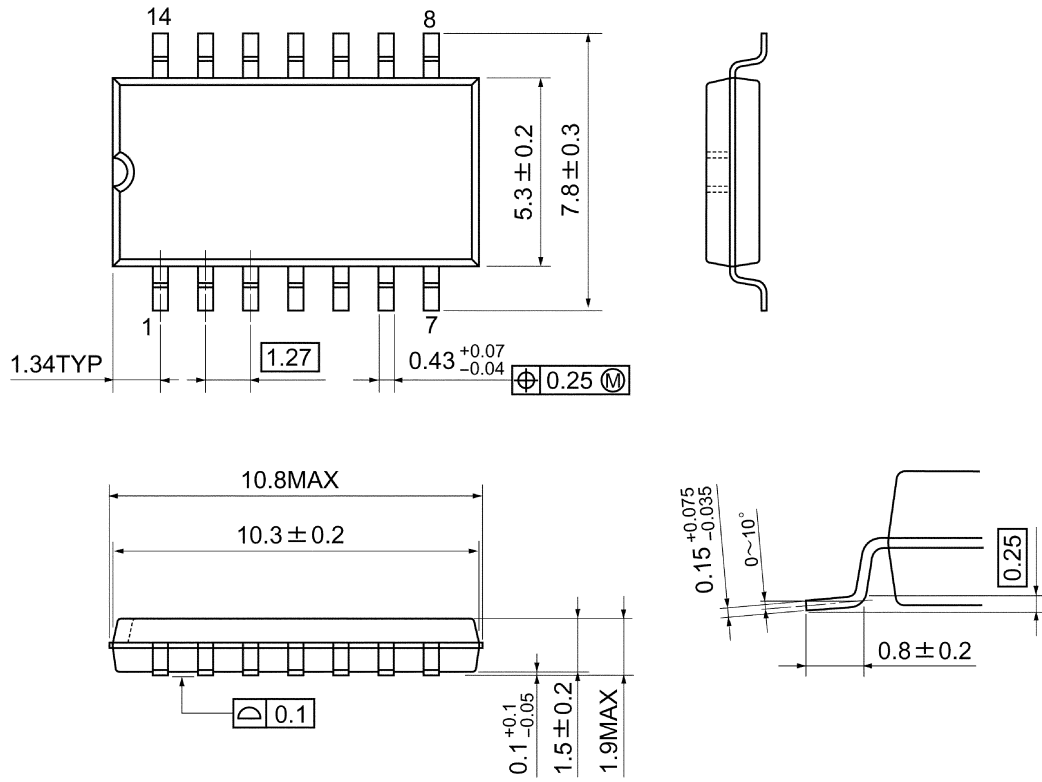


Weight: 0.96 g (typ.)

## Package Dimensions

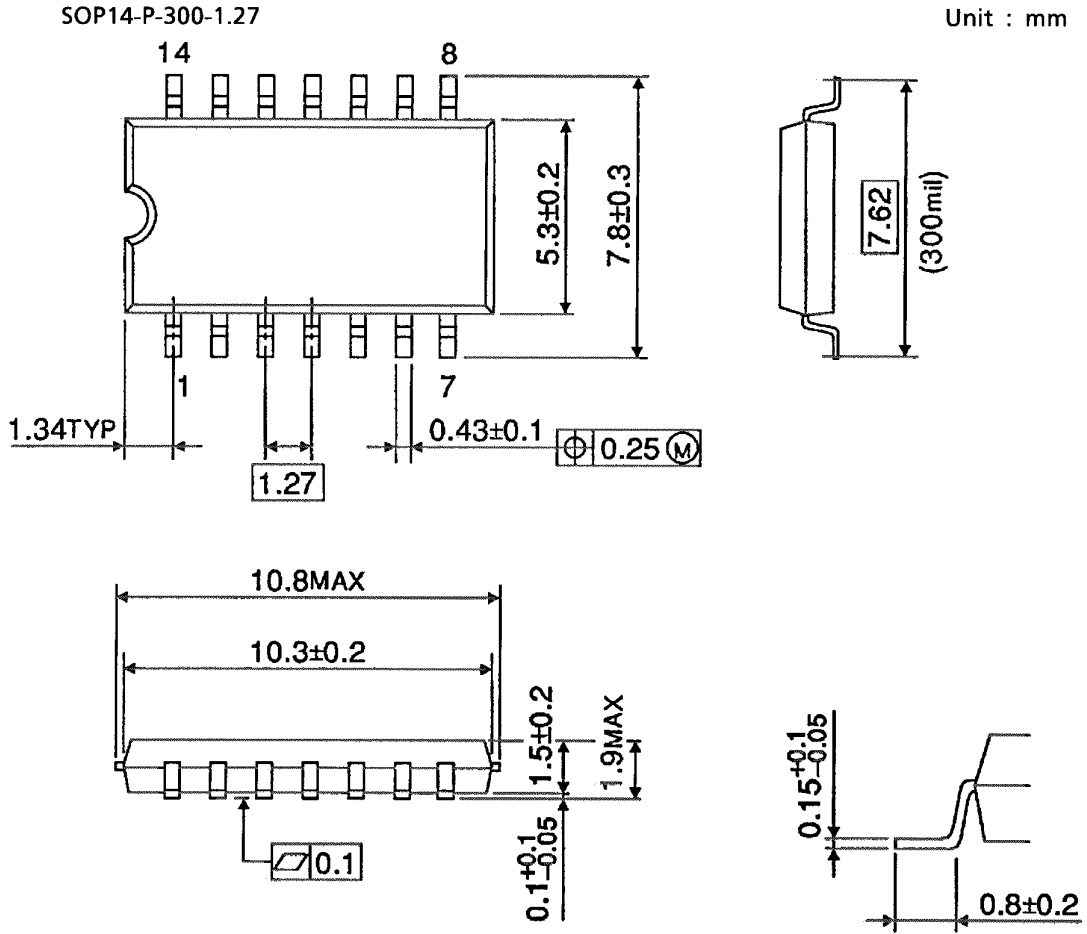
SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

**Package Dimensions**

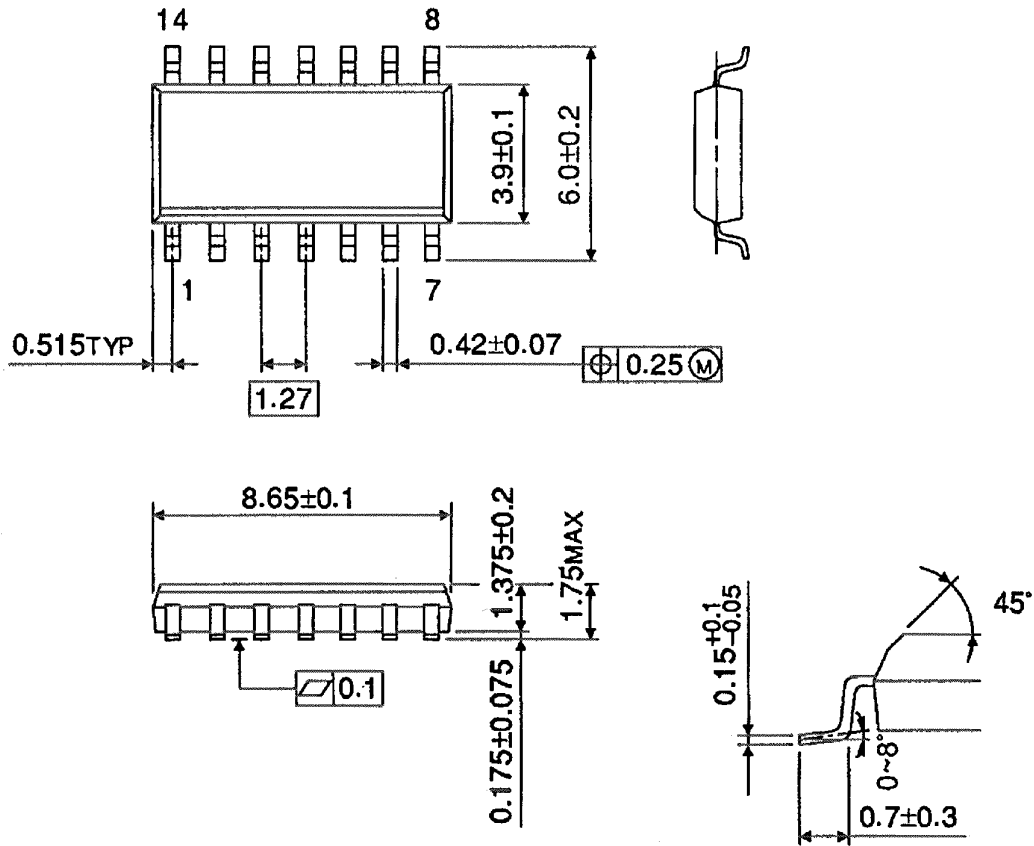


Weight: 0.18 g (typ.)

## Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

**Note: Lead (Pb)-Free Packages****DIP14-P-300-2.54 SOP14-P-300-1.27A SOL14-P-150-1.27****RESTRICTIONS ON PRODUCT USE**

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