

TC74HCT02AFN

Quad 2-Input NOR Gate

The TC74HCT02A is a high speed CMOS 2-INPUT NOR GATE fabricated with silicon gate C²MOS technology.

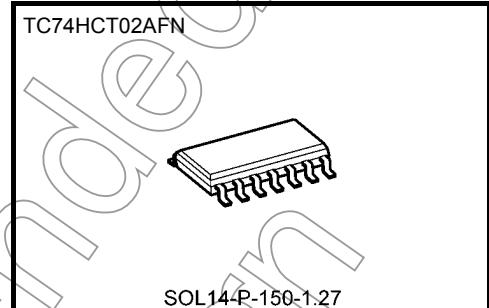
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

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 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.

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

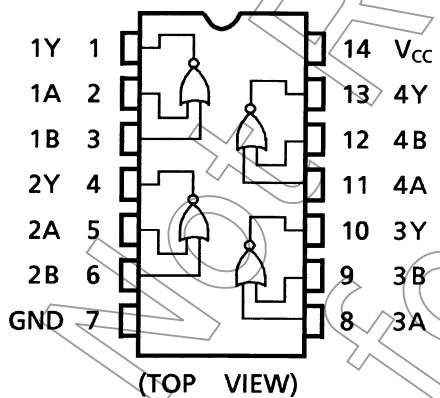


Weight
SOL14-P-150-1.27 : 0.12 g (typ.)

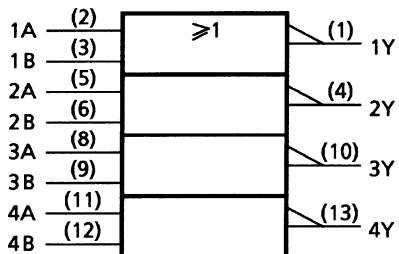
Features

- High speed: $t_{pd} = 9$ ns (typ.) at $V_{CC} = 5$ V
- Low power dissipation: $I_{CC} = 1$ μ A (max) at $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs: $V_{IH} = 2$ V (min)
 $V_{IL} = 0.8$ V (max)
- Wide interfacing ability: LSTTL, NMOS, CMOS
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 4$ mA (min)
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Pin and function compatible with 74LS02

Pin Assignment



IEC Logic Symbol



Truth Table

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

Absolute Maximum Ratings (Note)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|----------------------|------|
| Supply voltage range | V_{CC} | -0.5~7 | 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} | ± 20 | mA |
| DC output current | I_{OUT} | ± 25 | mA |
| DC V_{CC} /ground current | I_{CC} | ± 50 | mA |
| Power dissipation | P_D | 180 | mW |
| Storage temperature | T_{STG} | -65~150 | °C |

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

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Operating Ranges (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 | °C |
| Input rise and fall time | t_r, t_f | 0~500 | ns |

Note: The operating ranges must be maintained 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 | V _{CC} (V) | Ta = 25°C | | | Ta = -40~85°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 _{IH} or V _{IL} | I _{OH} = -20 μ A | 4.5 | 4.4 | 4.5 | — | 4.4 | V |
| | | | I _{OH} = -4 mA | 4.5 | 4.18 | 4.31 | — | 4.13 | |
| Low-level output voltage | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 20 μ A | 4.5 | — | 0.0 | 0.1 | — | V |
| | | | I _{OL} = 4 mA | 4.5 | — | 0.17 | 0.26 | — | |
| Input leakage current | I _{IN} | V _{IN} = V _{CC} or GND | 5.5 | — | — | ±0.1 | — | ±1.0 | μ A |
| Quiescent supply current | I _{CC} | V _{IN} = V _{CC} or GND | 5.5 | — | — | 1.0 | — | 10.0 | μ A |
| | I _C | Per input: V _{IN} = 0.5 V or 2.4 V Other input: V _{CC} or GND | 5.5 | — | — | 2.0 | — | 2.9 | mA |

AC Characteristics (C_L = 15 pF, V_{CC} = 5 V, Ta = 25°C, input: t_r = t_f = 6 ns)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|------------------------|--------------------------------------|----------------|-----|------|-----|------|
| Output transition time | t _{TLH} t _{THL} | — | — | 6 | 12 | ns |
| Propagation delay time | t _{pLH} t _{pHL} | — | — | 9 | 15 | ns |

AC Characteristics (C_L = 50 pF, input: t_r = t_f = 6 ns)

| Characteristics | Symbol | Test Condition | V _{CC} (V) | Ta = 25°C | | | Ta = -40~85°C | | Unit |
|-------------------------------|--------------------------------------|----------------|---------------------|-----------|------|-----|---------------|-----|------|
| | | | | Min | Typ. | Max | Min | Max | |
| Output transition time | t _{TLH} t _{THL} | — | 4.5 | — | 8 | 15 | — | 19 | ns |
| | | | 5.5 | — | 7 | 13 | — | 16 | |
| Propagation delay time | t _{pLH} t _{pHL} | — | 4.5 | — | 12 | 18 | — | 23 | ns |
| | | | 5.5 | — | 11 | 16 | — | 20 | |
| Input capacitance | C _{IN} | — | — | — | 5 | 10 | — | 10 | pF |
| Power dissipation capacitance | C _{PD} (Note) | — | — | — | 18 | — | — | — | pF |

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

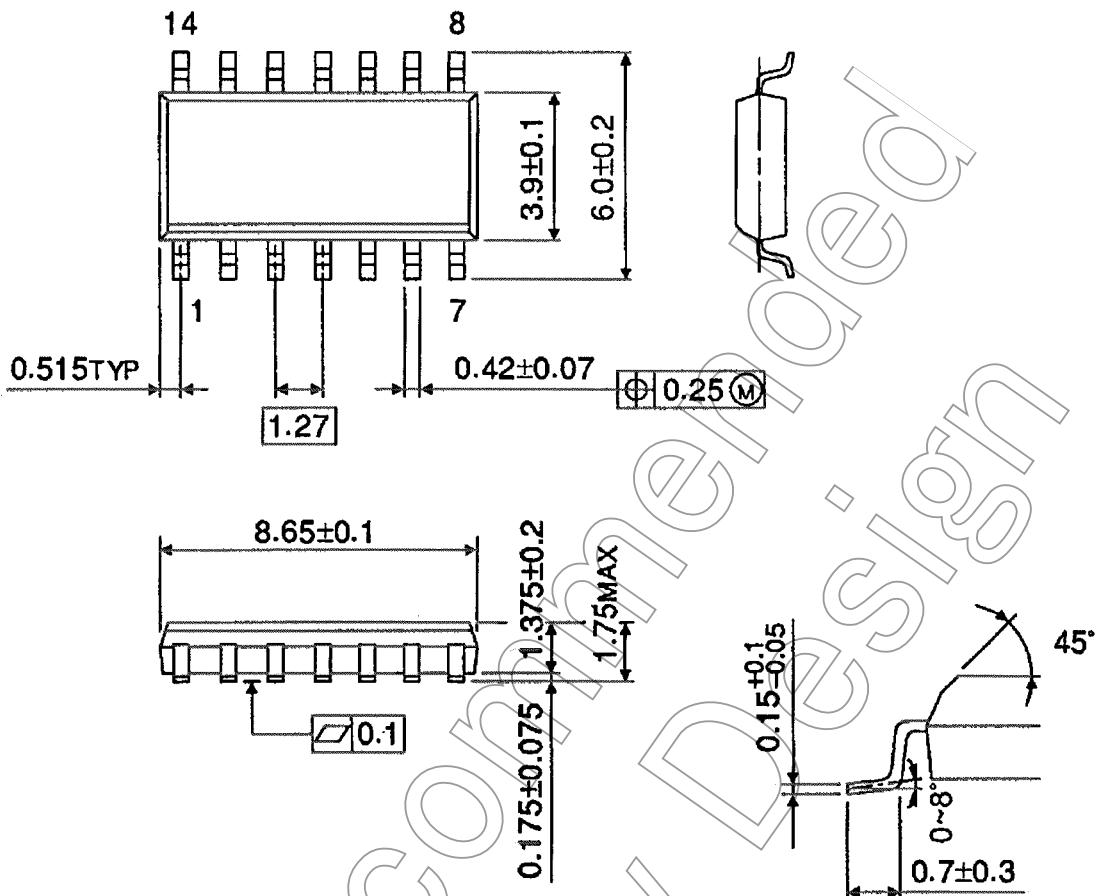
Average operating current can be obtained by the equation:

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

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

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