

TC74VHCT00AF, TC74VHCT00AFN, TC74VHCT00AFT

QUAD 2-INPUT NAND GATE

The TC74VHCT00A is an advanced high speed CMOS 2-INPUT NAND GATE fabricated with silicon gate C²MOS technology.

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

The input voltage are compatible with TTL output voltage. This device may be used as a level converter for interfacing 3.3V to 5V system.

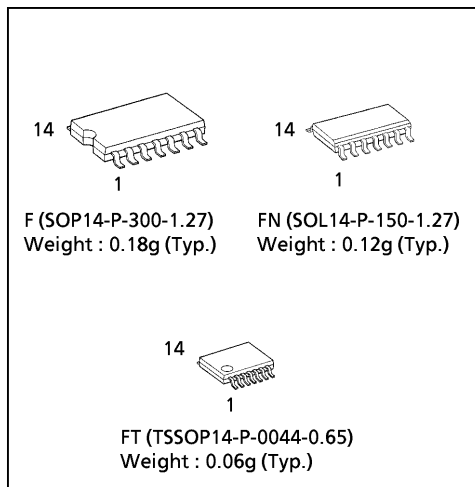
Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output*1 pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input/output voltages such as battery back up, hot board insertion, etc.

*1: V_{CC}=0V

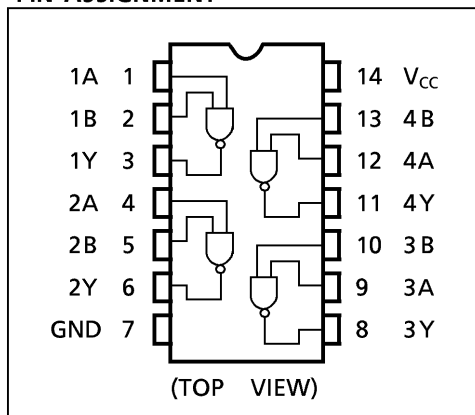
FEATURES :

- High Speed.....t_{pd} = 5.0ns(typ.) at V_{CC} = 5V
- Low Power Dissipation.....I_{CC} = 2μA(Max.) at Ta = 25°C
- Compatible with TTL outputs....V_{IL} = 0.8V (Max.)
V_{IH} = 2.0V (Min.)
- Power Down Protection is provided on all inputs and outputs.
- Balanced Propagation Delays.....t_{pLH} ≈ t_{pHL}
- Low NoiseV_{OLP} = 0.8V (Max.)
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 00 type.

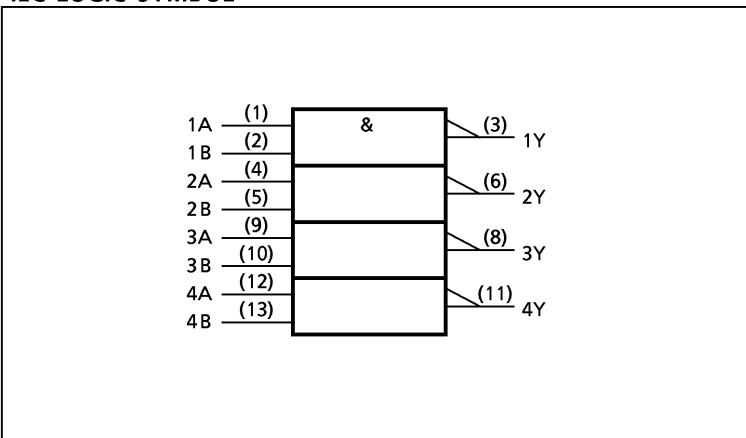
(Note) The JEDEC SOP (FN) is not available in Japan.



PIN ASSIGNMENT



IEC LOGIC SYMBOL



TRUTH TABLE

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

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ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | VALUE | UNIT |
|-----------------------|-----------|-------------------------------|------|
| Supply Voltage Range | V_{CC} | -0.5~7.0 | V |
| DC Input Voltage | V_{IN} | -0.5~7.0 | V |
| DC Output Voltage | V_{OUT} | -0.5~7.0 (Note 1) | V |
| | | -0.5~ $V_{CC} + 0.5$ (Note 2) | |
| Input Diode Current | I_{IK} | -20 | mA |
| Output Diode Current | I_{OK} | ±20 (Note 3) | mA |
| DC Output Current | I_{OUT} | ±25 | mA |
| DC Vcc/Ground Current | I_{CC} | ±50 | mA |
| Power Dissipation | P_D | 180 | mW |
| Storage Temperature | T_{stg} | -65~150 | °C |

(Note 1) $V_{CC} = 0V$

(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.

(Note 3) $V_{OUT} < GND, V_{OUT} > V_{CC}$

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | VALUE | UNIT |
|--------------------------|-----------|----------------------|------|
| Supply Voltage | V_{CC} | 4.5~5.5 | V |
| Input Voltage | V_{IN} | 0~5.5 | V |
| Output Voltage | V_{OUT} | 0~5.5 (Note 4) | V |
| | | 0~ V_{CC} (Note 5) | |
| Operating Temperature | T_{opr} | -40~85 | °C |
| Input Rise and Fall Time | dt/dV | 0~20 | ns/V |

(Note 4) $V_{CC} = 0V$

(Note 5) High or Low State

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DC ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | CONDITON | | Ta = 25°C | | | Ta = -40~85°C | | UNIT | |
|-----------------------------|------------------|--|-------------------------|---------------------|------|------|---------------|------|------|------|
| | | | | V _{CC} (V) | 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} = -50μA | 4.5 | 4.40 | 4.50 | — | 4.40 | — | V |
| | | | I _{OH} = -8mA | 4.5 | 3.94 | — | — | 3.80 | — | |
| Low - Level Output Voltage | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 50μA | 4.5 | — | 0.0 | 0.1 | — | 0.1 | V |
| | | | I _{OL} = 8mA | 4.5 | — | — | 0.36 | — | 0.44 | |
| Input Leakage Current | I _{IN} | V _{IN} = 5.5V or GND | | 0~5.5 | — | — | ±0.1 | — | ±1.0 | μA |
| Quiescent Supply Current | I _{CC} | V _{IN} = V _{CC} or GND | | 5.5 | — | — | 2.0 | — | 20.0 | |
| | I _{CCT} | PER INPUT : V _{IN} = 3.4V OTHER INPUT : V _{CC} or GND | | 5.5 | — | — | 1.35 | — | 1.50 | |
| Output Leakage Current | I _{OPD} | V _{OUT} = 5.5V | | 0 | — | — | 0.5 | — | 5.0 | μA |

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3ns$)

| PARAMETER | SYMBOL | TEST CONDITION | Ta = 25°C | | | Ta = -40~85°C | | UNIT | | |
|-------------------------------|--------------------------------------|----------------|---------------------|---------|------|---------------|------|------|------|------|
| | | | V _{CC} (V) | CL (pF) | MIN. | TYP. | MAX. | | MIN. | MAX. |
| Propagation Delay Time | t _{pLH} t _{pHL} | | 5.0 ± 0.5 | 15 | — | 5.0 | 6.9 | 1.0 | 8.0 | ns |
| | | | | 50 | — | 5.5 | 7.9 | 1.0 | 9.0 | |
| Input Capacitance | C _{IN} | | | — | 4 | 10 | — | 10 | pF | |
| Power Dissipation Capacitance | C _{PD} | (Note 6) | | — | 17 | — | — | — | | |

(Note 6) 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 :

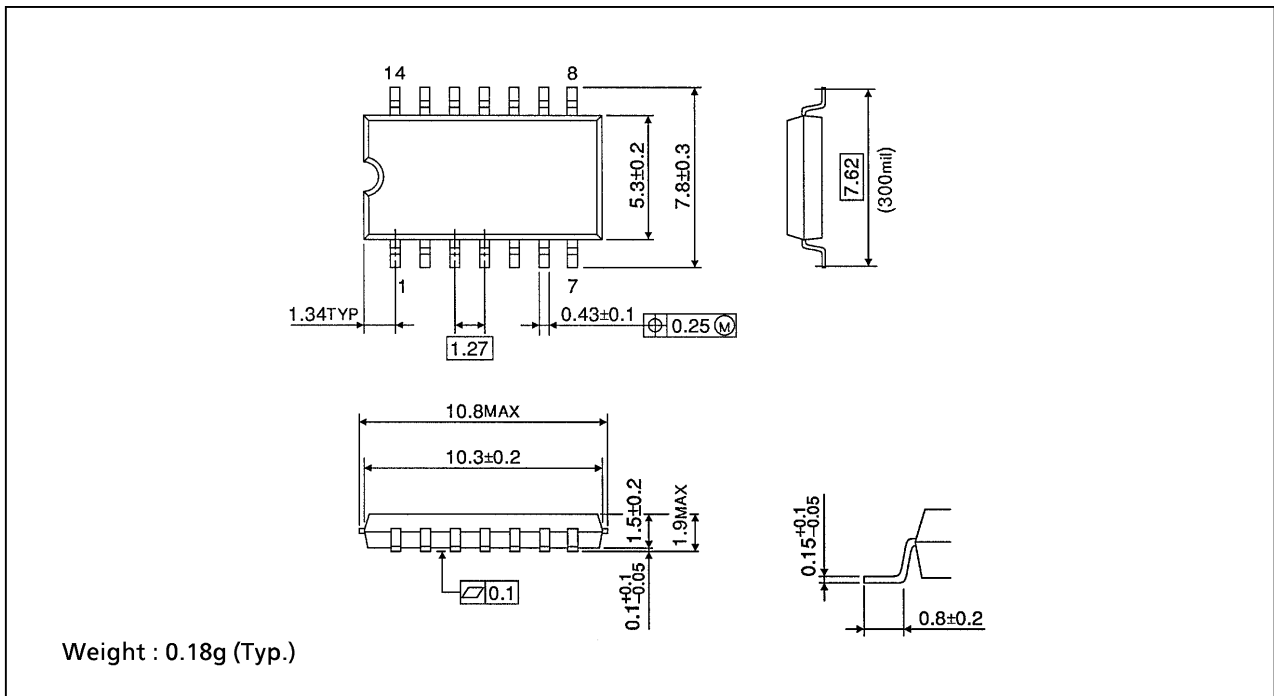
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per gate)}$$

NOISE CHARACTERISTICS (Input $t_r = t_f = 3ns$)

| PARAMETER | SYMBOL | TEST CONDITION | Ta = 25°C | | | UNIT |
|---|------------------|-----------------------|---------------------|------|------|------|
| | | | V _{CC} (V) | TYP. | MAX. | |
| Quiet Output Maximum Dynamic V _{OL} | V _{OLP} | C _L = 50pF | 5.0 | 0.4 | 0.8 | V |
| Quiet Output Minimum Dynamic V _{OL} | V _{OLV} | C _L = 50pF | 5.0 | -0.4 | -0.8 | V |
| Minimum High Level Dynamic Input Voltage | V _{IHD} | C _L = 50pF | 5.0 | — | 2.0 | V |
| Maximum Low Level Dynamic Input Voltage | V _{ILD} | C _L = 50pF | 5.0 | — | 0.8 | V |

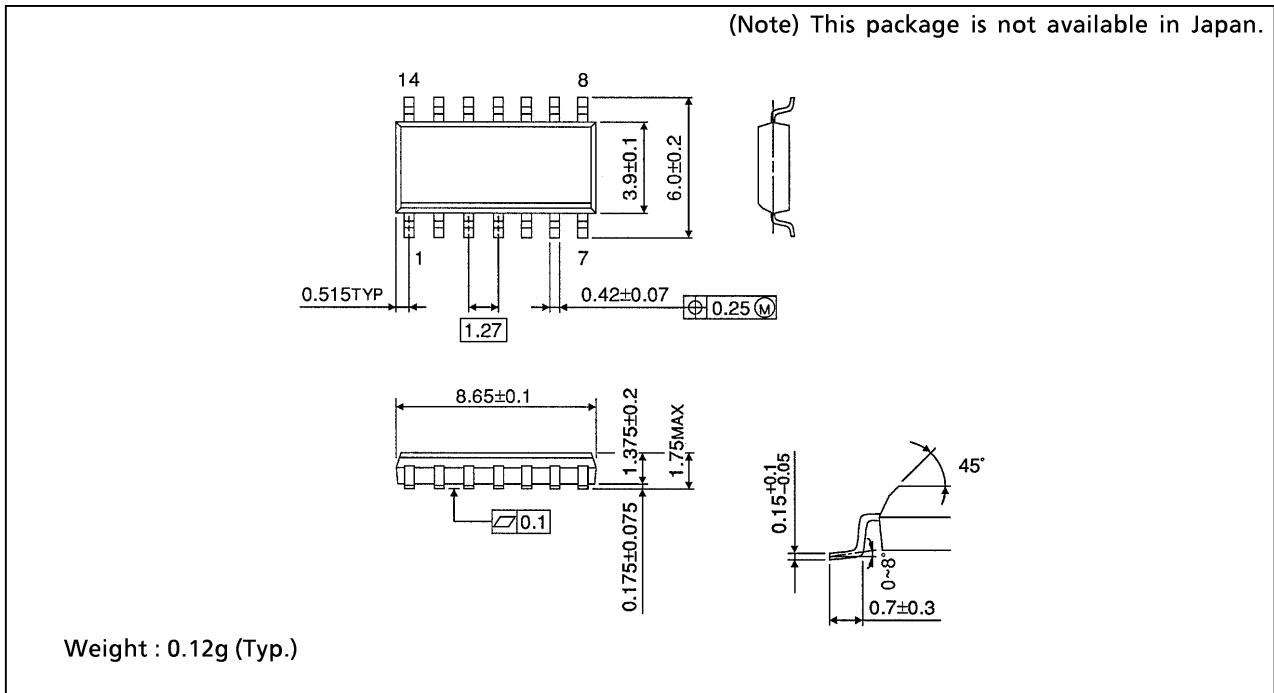
SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27)

Unit in mm



SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOP14-P-150-1.27)

Unit in mm



TSSOP 14PIN OUTLINE DRAWING (TSSOP14-P-0044-0.65)

Unit in mm

