

TC74VHCT32AF, TC74VHCT32AFN, TC74VHCT32AFT

QUAD 2-INPUT OR GATE

The TC74VHCT32A is an advanced high speed CMOS 2-INPUT OR 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 internal circuit is composed of 4 stages including buffer output, which provide high noise immunity and stable output. 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.

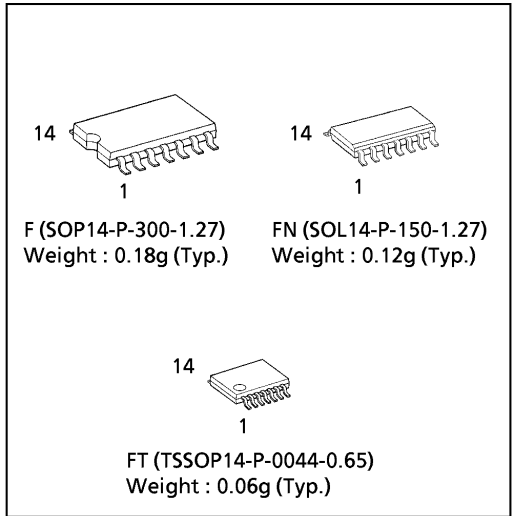
Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output*1 pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input/output voltages such as battery back up, hot board insertion, etc.

*1: V_{CC}=0V

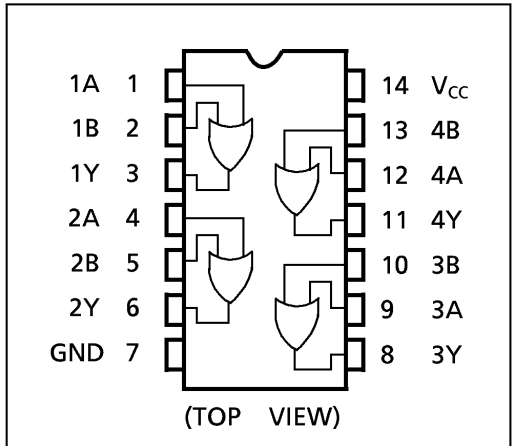
FEATURES :

- High Speed.....t_{pd} = 3.8ns (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.) 32 type.

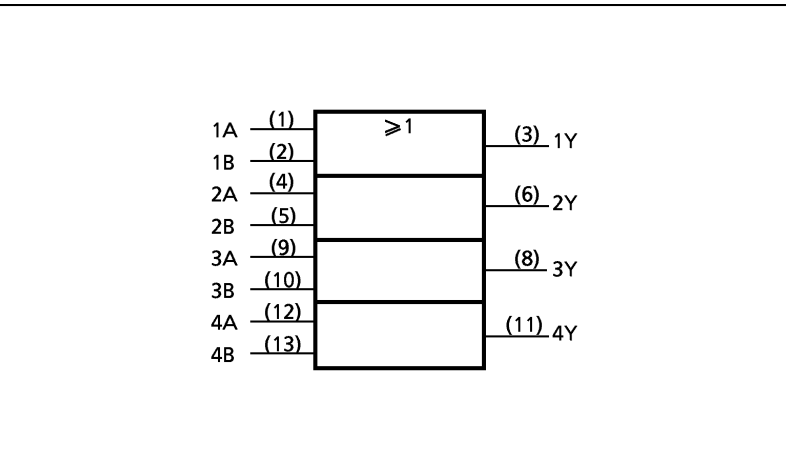
(Note) The JEDEC SOP (FN) is not available in Japan.



PIN ASSIGNMENT



IEC LOGIC SYMBOL



TRUTH TABLE

| A | B | Y |
|---|---|---|
| H | H | H |
| L | H | H |
| H | L | H |
| L | L | 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 | $^{\circ}C$ |

(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 | $^{\circ}C$ |
| 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 _{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 | mA | |
| 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} | 5.0 ± 0.5 | 15 | — | 3.8 | 5.5 | 1.0 | 6.5 | ns |
| | t _{pHL} | | 50 | — | 5.3 | 7.5 | 1.0 | 8.5 | |
| Input Capacitance | C _{IN} | | | — | 4 | 10 | — | 10 | pF |
| Power Dissipation Capacitance | C _{PD} | (Note 6) | | — | 14 | — | — | — | |

(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 :

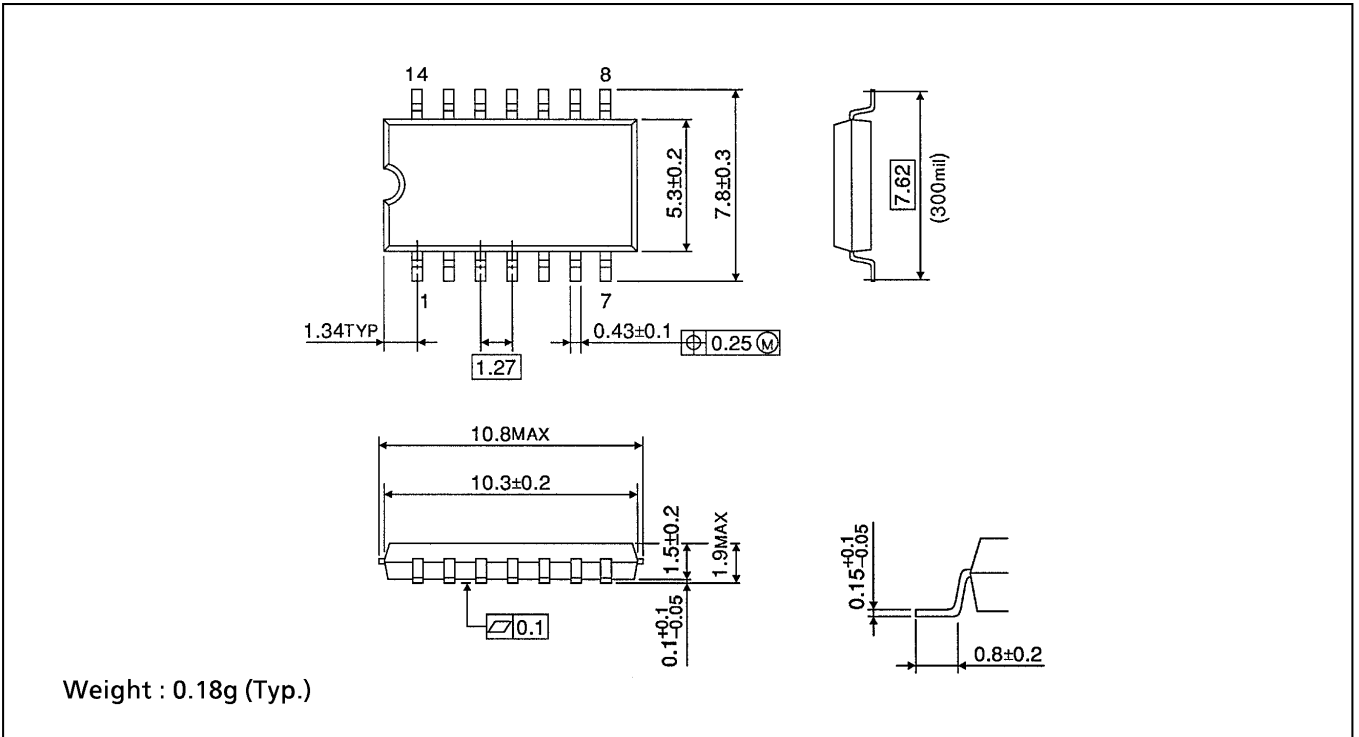
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per Gate)}$$

NOISE CHARACTERISTICS (Input t_r = t_f = 3ns)

| PARAMETER | SYMBOL | TEST CONDITION | | Ta = 25°C | | UNIT |
|--|------------------|-----------------------|-----|-----------|-------|------|
| | | V _{CC} (V) | | TYP. | LIMIT | |
| 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)

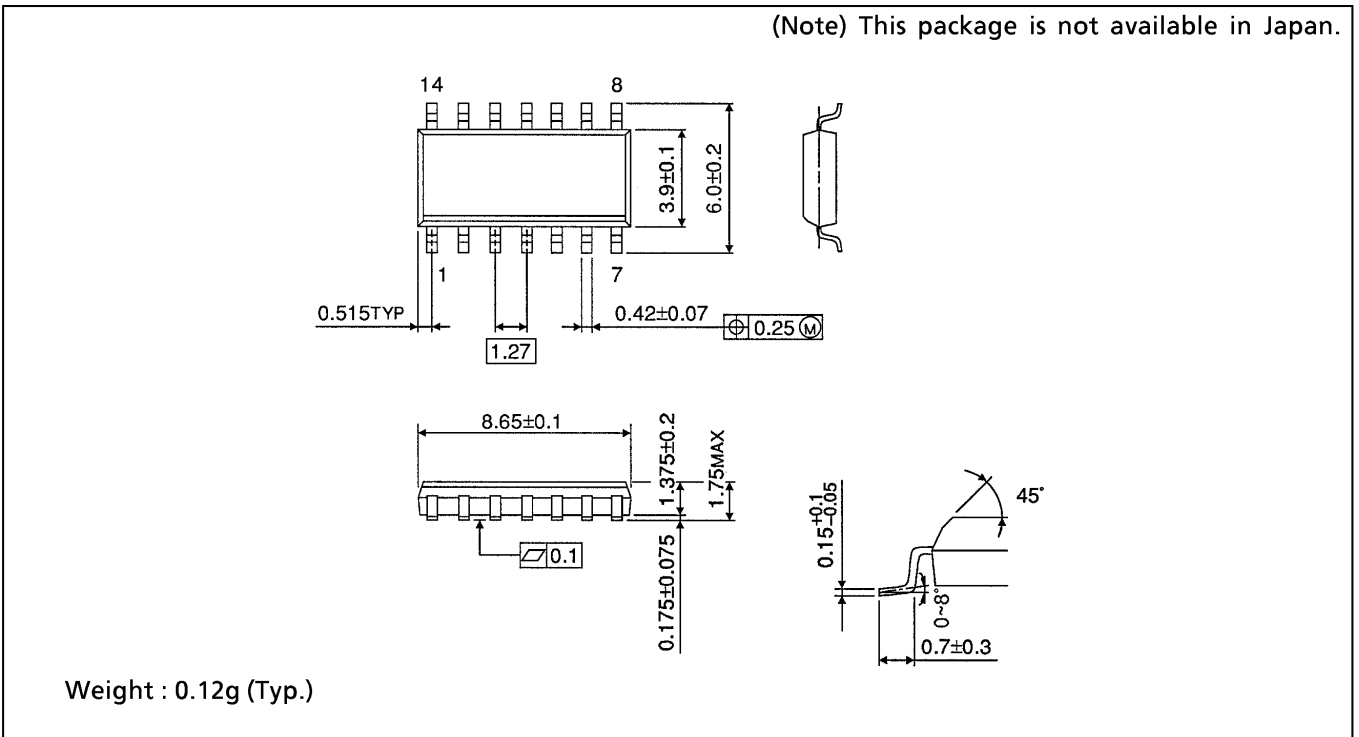
Unit in mm



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

Unit in mm

(Note) This package is not available in Japan.



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

Unit in mm

