

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74VHCT125AF, TC74VHCT125AFN, TC74VHCT125AFT**  
**TC74VHCT126AF, TC74VHCT126AFN, TC74VHCT126AFT**
**TC74VHCT125AF / AFN / AFT QUAD BUS BUFFER**  
**TC74VHCT126AF / AFN / AFT QUAD BUS BUFFER**

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

The TC74VHCT125A / 126A are high speed CMOS QUAD BUS BUFFERS fabricated with silicon gate C<sup>2</sup>MOS technology.

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

The TC74VHCT125A requires the 3-state control input  $\overline{G}$  to be set high to place the output into the high impedance state, whereas the TC74VHCT126A requires the control input  $G$  to be set low to place the output into high impedance.

The input voltage are compatible with TTL output voltage.

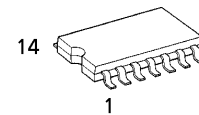
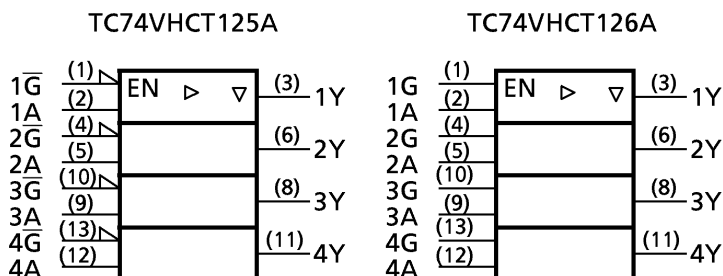
This device may be used as a level converter for interfacing 3.3 V to 5 V system.

Input protection and output circuit ensure that 0 to 5.5 V 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.

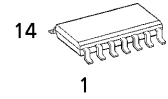
\*1:  $V_{CC} = 0\text{ V}$

**FEATURES:**

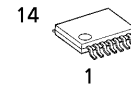
- High Speed.....  $t_{pd} = 3.8\text{ ns (typ.) at } V_{CC} = 5\text{ V}$
- Low Power Dissipation.....  $I_{CC} = 4\text{ }\mu\text{A (Max.) at } T_a = 25^\circ\text{C}$
- Compatible with TTL outputs....  $V_{IL} = 0.8\text{ V (Max.)}$   
 $V_{IH} = 2.0\text{ V (Min.)}$
- Power Down Protection is provided on all inputs and outputs.
- Balanced Propagation Delays.....  $t_{PLH} \approx t_{PHL}$
- Low Noise .....  $V_{OLP} = 0.8\text{ V (Max.)}$
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 125 / 126 type.

**IEC LOGIC SYMBOL**

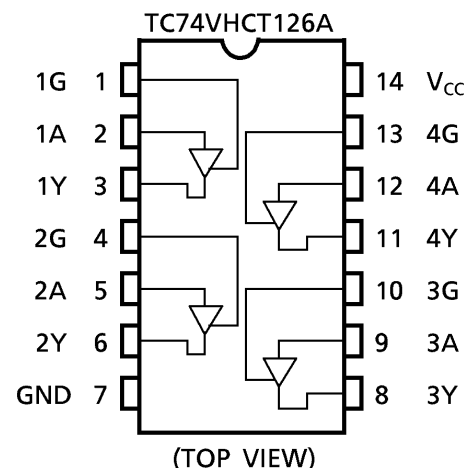
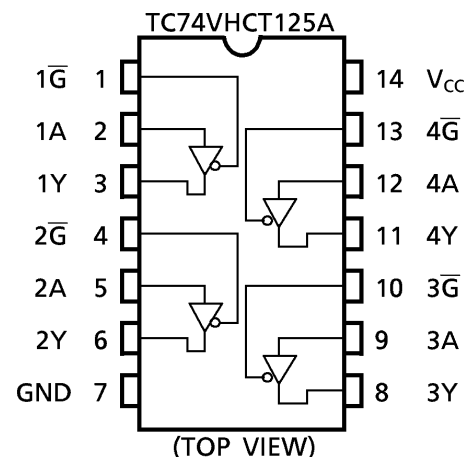
F (SOP14-P-300-1.27)  
Weight : 0.18 g (Typ.)



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



FT (TSSOP14-P-0044-0.65)  
Weight : 0.06 g (Typ.)

**PIN ASSIGNMENT**

## TRUTH TABLE

| TC74VHCT125A |   |         | TC74VHCT126A |   |         |
|--------------|---|---------|--------------|---|---------|
| INPUTS       |   | OUTPUTS | INPUTS       |   | OUTPUTS |
| $\bar{G}$    | A | Y       | G            | A | Y       |
| H            | X | Z       | L            | X | Z       |
| L            | L | L       | H            | L | L       |
| L            | H | H       | H            | H | H       |

X: Don't Care  
Z: High Impedance

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Z: High Impedance

## 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) : Output in Off-State

(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) : Output in Off-State

(Note 5) : High or Low State

## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                        | SYMBOL           | CONDITON                                                                                          |                           | 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> =<br>V <sub>IH</sub> or V <sub>IL</sub>                                           | I <sub>OH</sub> = - 50 μA | 4.5                 | 4.40 | 4.50 | —              | 4.40 | —      | V    |
|                                  |                  |                                                                                                   | I <sub>OH</sub> = - 8 mA  | 4.5                 | 3.94 | —    | —              | 3.80 | —      |      |
| Low - Level Output Voltage       | V <sub>OL</sub>  | V <sub>IN</sub> =<br>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> = 8 mA    | 4.5                 | —    | —    | 0.36           | —    | 0.44   |      |
| Input Leakage Current            | I <sub>IN</sub>  | V <sub>IN</sub> = 5.5 V or GND                                                                    |                           | 0~5.5               | —    | —    | ± 0.1          | —    | ± 1.0  | μA   |
| 3-State Output Off-state Current | I <sub>OZ</sub>  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>OUT</sub> = V <sub>CC</sub> or GND |                           | 5.5                 | —    | —    | ± 0.25         | —    | ± 2.50 |      |
| Quiescent Supply Current         | I <sub>CC</sub>  | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                          |                           | 5.5                 | —    | —    | 4.0            | —    | 40.0   |      |
|                                  | I <sub>CCT</sub> | PER INPUT : V <sub>IN</sub> = 3.4 V<br>OTHER INPUT : V <sub>CC</sub> or GND                       |                           | 5.5                 | —    | —    | 1.35           | —    | 1.50   | mA   |
| Output Leakage Current           | I <sub>OPD</sub> | V <sub>OUT</sub> = 5.5 V                                                                          |                           | 0                   | —    | —    | 0.5            | —    | 5.0    | μA   |

AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 3\text{ ns}$ )

| PARAMETER                                 | SYMBOL                                 | TEST CONDITION |                     |         | Ta = 25°C |      |      | Ta = - 40~85°C |      | UNIT |
|-------------------------------------------|----------------------------------------|----------------|---------------------|---------|-----------|------|------|----------------|------|------|
|                                           |                                        |                | V <sub>CC</sub> (V) | CL (pF) | MIN.      | TYP. | MAX. | MIN.           | MAX. |      |
| Propagation Delay Time                    | t <sub>pLH</sub>                       |                | 5.0 ± 0.5           | 15      | —         | 3.8  | 5.5  | 1.0            | 6.5  | ns   |
|                                           | t <sub>pHL</sub>                       |                |                     | 50      | —         | 5.3  | 7.5  | 1.0            | 8.5  |      |
| Output Enable Time                        | t <sub>pZL</sub>                       | RL = 1 kΩ      | 5.0 ± 0.5           | 15      | —         | 3.6  | 5.1  | 1.0            | 6.0  |      |
|                                           | t <sub>pZH</sub>                       |                |                     | 50      | —         | 5.1  | 7.1  | 1.0            | 8.0  |      |
| Output Disable Time                       | t <sub>pLZ</sub><br>t <sub>pHZ</sub>   | RL = 1 kΩ      | 5.0 ± 0.5           | 50      | —         | 6.1  | 8.8  | 1.0            | 10.0 |      |
| Output to Output Skew                     | t <sub>osLH</sub><br>t <sub>osHL</sub> | (Note 6)       | 5.0 ± 0.5           | 50      | —         | —    | 1.0  | —              | 1.0  |      |
| Input Capacitance                         | C <sub>IN</sub>                        |                |                     |         | —         | 4    | 10   | —              | 10   | pF   |
| Output Capacitance                        | C <sub>OUT</sub>                       |                |                     |         | —         | 6    | —    | —              | —    |      |
| Power Dissipation<br>Capacitance (Note 7) | C <sub>PD</sub>                        | TC74VHCT125A   |                     |         | —         | 14   | —    | —              | —    |      |
|                                           |                                        | TC74VHCT126A   |                     |         | —         | 15   | —    | —              | —    |      |

(Note 6) : Parameter guaranteed by design.  $t_{osLH} = |t_{pLHm} - t_{pLHn}|$ ,  $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

(Note 7) : 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 :

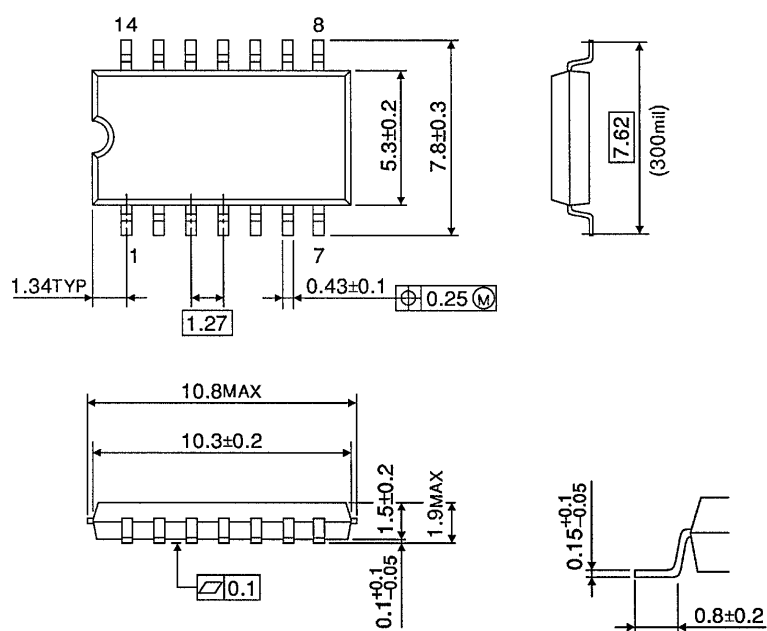
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per Gate)}$$

NOISE CHARACTERISTICS (Input  $t_r = t_f = 3\text{ ns}$ )

| PARAMETER                                       | SYMBOL           | TEST CONDITION         | Ta = 25°C           |               | UNIT |
|-------------------------------------------------|------------------|------------------------|---------------------|---------------|------|
|                                                 |                  |                        | V <sub>CC</sub> (V) | TYP.<br>LIMIT |      |
| Quiet Output<br>Maximum Dynamic V <sub>OL</sub> | V <sub>OLP</sub> | C <sub>L</sub> = 50 pF | 5.0                 | 0.5<br>0.8    | V    |
| Quiet Output<br>Minimum Dynamic V <sub>OL</sub> | V <sub>OLV</sub> | C <sub>L</sub> = 50 pF | 5.0                 | -0.5<br>-0.8  | V    |
| Minimum High Level<br>Dynamic Input Voltage     | V <sub>IHD</sub> | C <sub>L</sub> = 50 pF | 5.0                 | —<br>2.0      | V    |
| Maximum Low Level<br>Dynamic Input Voltage      | V <sub>ILD</sub> | C <sub>L</sub> = 50 pF | 5.0                 | —<br>0.8      | V    |

## SOP 14 PIN (200 mil BODY) PACKAGE DIMENSIONS (SOP14-P-300-1.27)

Unit in mm

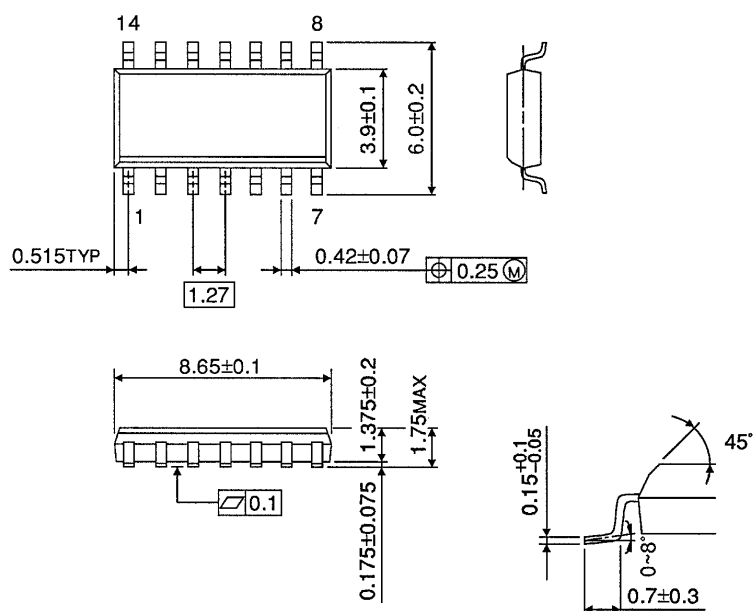


Weight : 0.18 g (Typ.)

## SOP 14 PIN (150 mil BODY) PACKAGE DIMENSIONS (SOP14-P-150-1.27)

Unit in mm

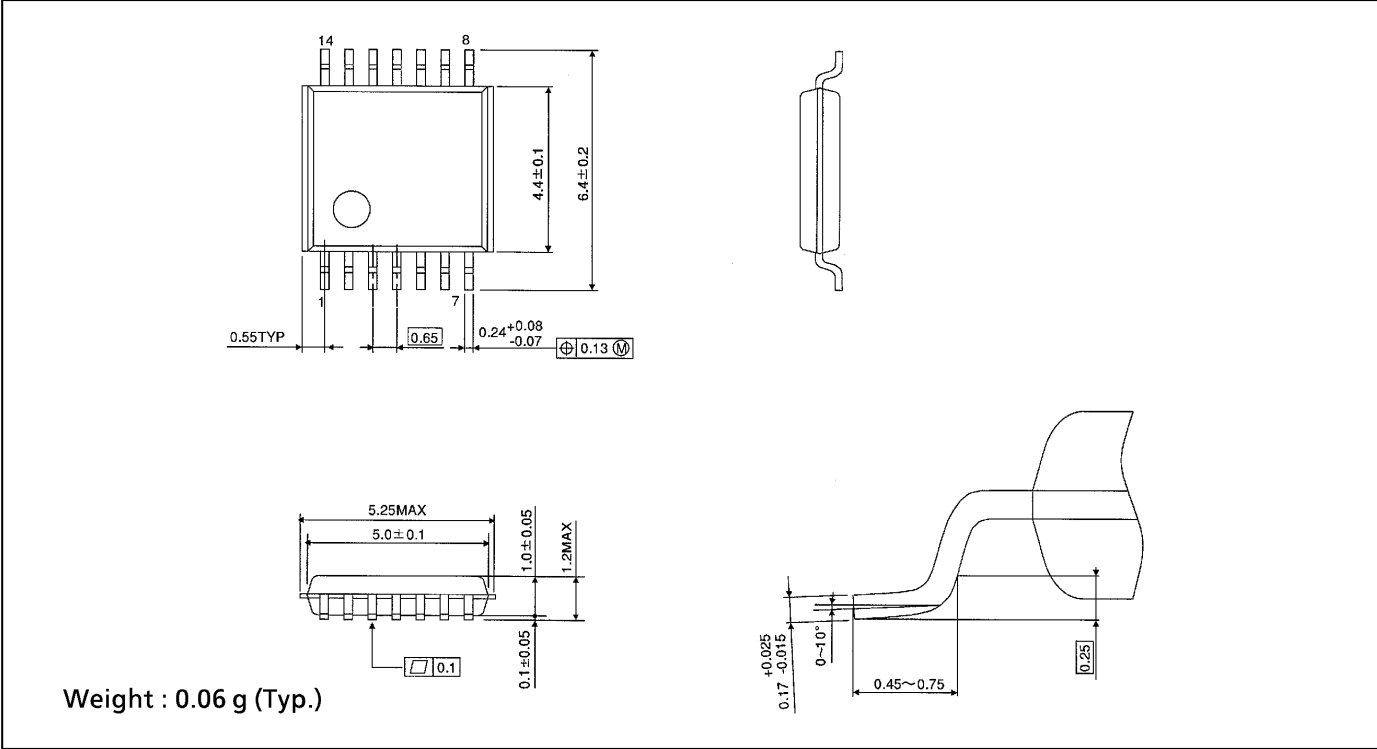
(Note) : This package is not available in Japan.



Weight : 0.12 g (Typ.)

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

Unit in mm



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000707EBA

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