TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC74VHCT367AF, TC74VHCT367AFN, TC74VHCT367AFT

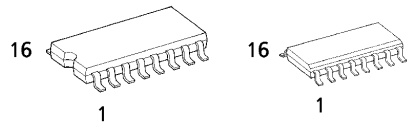
**HEX BUS BUFFER**
**TC74VHCT367 AF / AFN / AFT NON - INVERTED, 3 - STATE OUTPUTS**

The TC74VHCT367A is advanced high speed CMOS HEX BUS BUFFERs fabricated with silicon gate C²MOS technology.
They achieve the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.
They contain six buffers ; four buffers are controlled by an enable input ($\overline{G}1$), and the other two buffers are controlled by another enable input ($\overline{G}2$). The outputs of each buffer group are enabled when $\overline{G}1$ and / or $\overline{G}2$ inputs are held low ; if held high, these outputs are in a high impedance state.
The TC74VHCT367A is a non - inverting output type.
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: output in off-state

FEATURES :

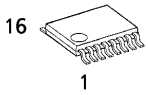
- High Speed ····· $t_{pd}$ = 5.5ns (typ.) at $V_{CC}$ = 5V
- Low Power Dissipation ····· $I_{CC}$ = 4$\mu$A (Max.) at Ta = 25°C
- Compatible with TTL outputs ··· $V_{IL}$ = 0.8V (Max.)
  $V_{IH}$ = 2.0V (Min.)
- Power Down Protection is provided on all inputs and outputs
- Balanced Propagation Delays ····· $t_{pLH} \simeq t_{pHL}$
- Low Noise ····· $V_{OLP}$ = 0.8V (Max.)
- Pin and Function Compatible with the 74ALS367.



F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)

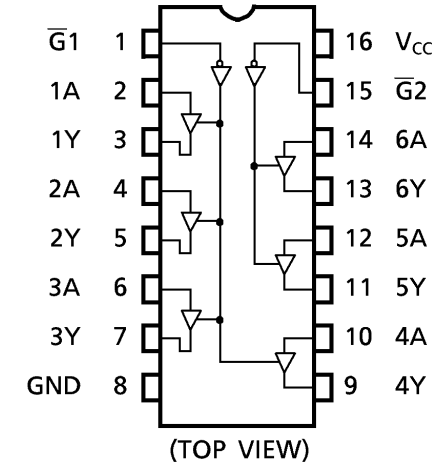


FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)



FT (TSSOP16-P-0044-0.65)
Weight : 0.06g (Typ.)

**PIN ASSIGNMENT**

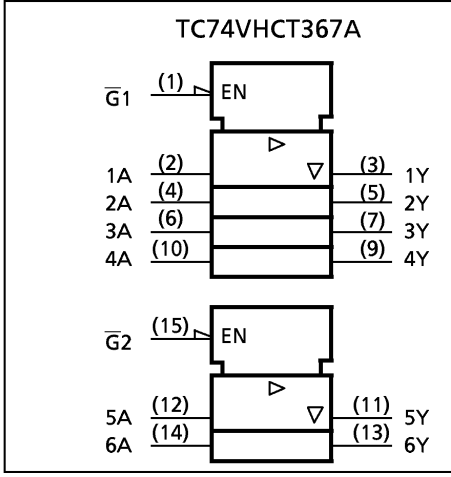



**TRUTH TABLE**

| INPUTS | | OUTPUTS |
|---|---|---|
| $\overline{G}$ | A | Y |
| L | L | L |
| L | H | H |
| H | X | Z |

X : Don't Care
Z : High Impedance

**IEC LOGIC SYMBOL**




961001EBA2

**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~VCC + 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 | $I_{CC}$ | ±75 | 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~VCC (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

**DC ELECTRICAL CHARACTERISTICS**

| PARAMETER | SYMBOL | CONDITON | | $V_{CC}$ (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 $V_{IL}$ | $I_{OH}$ = −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 | 0.10 | — | 0.10 | V |
| | | | $I_{OL}$ = 8mA | 4.5 | — | — | 0.36 | — | 0.44 | |
| 3 - State Output Off - State Current | $I_{OZ}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$<br>$V_{OUT}$ = $V_{CC}$ or GND | | 5.5 | — | — | ±0.25 | — | ±2.50 | μA |
| Input Leakage Current | $I_{IN}$ | $V_{IN}$ = 5.5V or GND | | 0~5.5 | — | — | ±0.1 | — | ±1.0 | |
| Quiescent Supply Current | $I_{CC}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | — | 4.0 | — | 40.0 | |
| | $I_{CCT}$ | PER INPUT : VIN = 3.4V<br>OTHER INPUT : VCC 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) | $C_L$ (pF) | MIN. | TYP. | MAX. | MIN. | MAX. | |
| Propagation Delay Time | $t_{pLH}$ $t_{pHL}$ | | 5.0 ± 0.5 | 15 | − | 4.7 | 7.4 | 1.0 | 8.5 | ns |
| | | | | 50 | − | 5.2 | 8.4 | 1.0 | 9.5 | |
| 3-State Output Enable Time | $t_{pZL}$ $t_{pZH}$ | $R_L$ = 1kΩ | 5.0 ± 0.5 | 15 | − | 4.9 | 10.4 | 1.0 | 12.0 | |
| | | | | 50 | − | 5.4 | 11.4 | 1.0 | 13.0 | |
| 3-State Output Disable Time | $t_{pLZ}$ $t_{pHZ}$ | $R_L$ = 1kΩ | 5.0 ± 0.5 | 50 | − | 6.3 | 11.4 | 1.0 | 13.0 | |
| Output to Output Skew | $t_{osLH}$ $t_{osHL}$ | (Note 6) | 5.0 ± 0.5 | 50 | − | − | 1.0 | − | 1.0 | |
| Input Capacitance | $C_{IN}$ | | | | − | 4 | 10 | − | 10 | pF |
| Output Capacitance | $C_{OUT}$ | | | | − | 9 | − | − | − | |
| Power Dissipation Capacitance (Note 7) | $C_{PD}$ | TC74VHCT367A | | | − | 16 | − | − | − | |

(Note 6) Parameter guaranteed by design. $t_{osLH} = |t_{pLH\,m} - t_{pLHn}|$, $t_{osHL} = |t_{pHL\,m} - t_{pHLn}|$

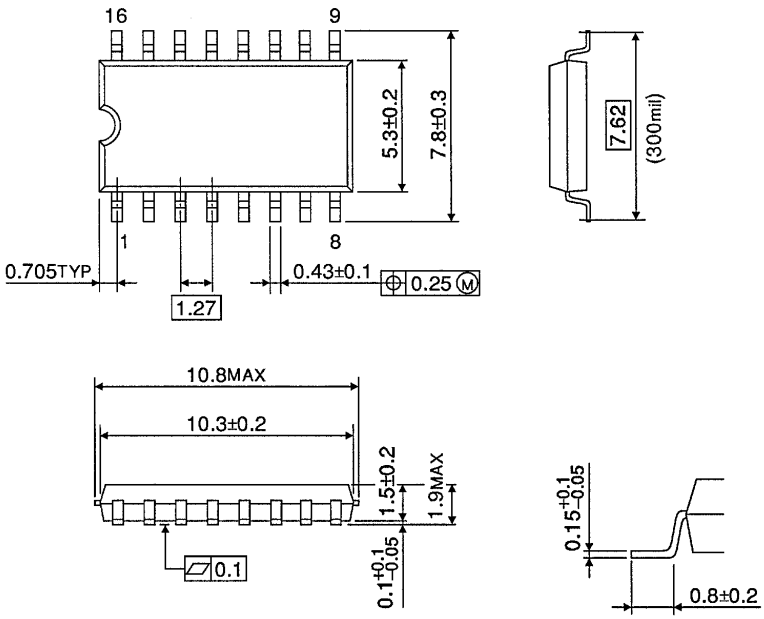
(Note 7) $C_{PD}$ is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation:

$$I_{CC\,(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 6 \text{ ( per bit )}$$

**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 | 0.6 | 0.8 | V |
| Quiet Output Minimum Dynamic $V_{OL}$ | $V_{OLV}$ | $C_L$ = 50pF | 5.0 | −0.6 | −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 |

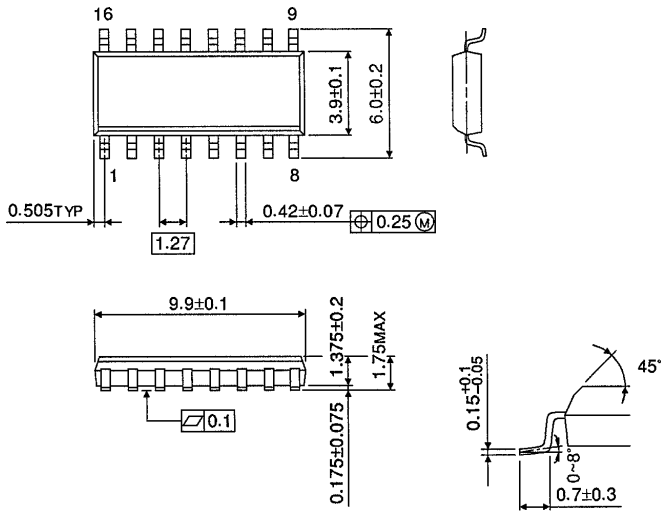
**SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)** Unit in mm




Weight : 0.18g (Typ.)

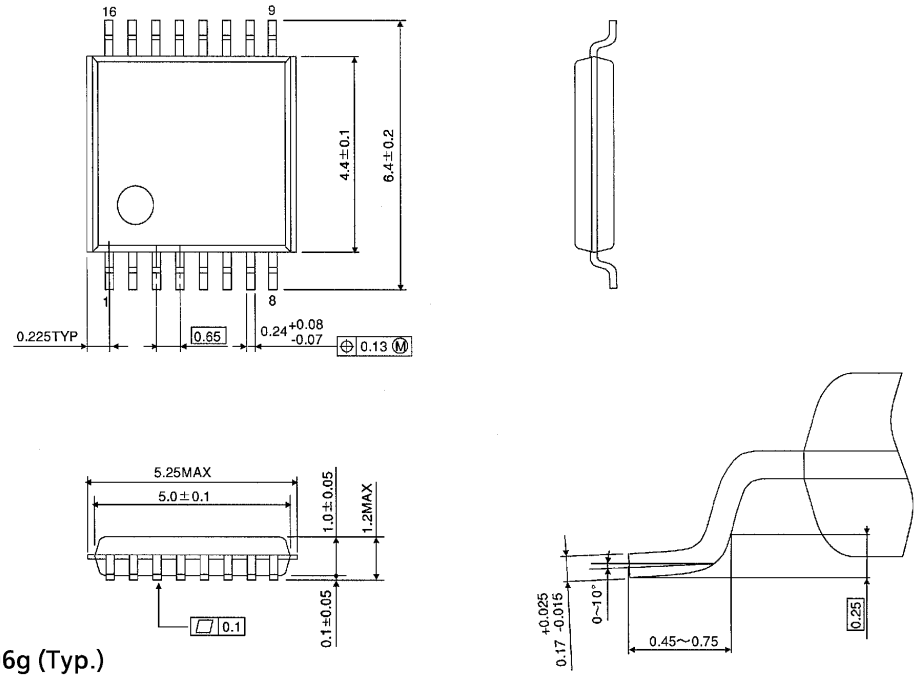
**SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150-1.27)** Unit in mm

(Note) This package is not available in Japan.




Weight : 0.13g (Typ.)

**TSSOP 16PIN OUTLINE DRAWING (TSSOP16-P-0044-0.65)** Unit in mm




Weight : 0.06g (Typ.)