# HEX BUFFER/LINE DRIVER; 3-STATE; INVERTING

## FEATURES

- Inverting outputs
- Output capability: bus driver
- $I_{CC}$ category: MSI

## GENERAL DESCRIPTION

The 74HC/HCT368 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT368 are hex inverting buffer/line drivers with 3-state outputs. The 3-state outputs ($n\overline{Y}$) are controlled by the output enable inputs ($1\overline{OE}$, $2\overline{OE}$).

A HIGH on $n\overline{OE}$ causes the outputs to assume a high impedance OFF-state.

The "368" is identical to the "367" but has inverting outputs.

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | UNIT |
|---|---|---|---|---|---|
| | | | HC | HCT | |
| $t_{PHL}/t_{PLH}$ | propagation delay nA to $n\overline{Y}$ | $C_L$ = 15 pF; $V_{CC}$ = 5 V | 9 | 11 | ns |
| $C_I$ | input capacitance | | 3.5 | 3.5 | pF |
| $C_{PD}$ | power dissipation capacitance per buffer | notes 1 and 2 | 30 | 30 | pF |

GND = 0 V; $T_{amb}$ = 25 °C; $t_r = t_f$ = 6 ns

**Notes**

1. $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in $\mu$W):
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   $f_i$ = input frequency in MHz
   $f_o$ = output frequency in MHz
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs
   $C_L$ = output load capacitance in pF
   $V_{CC}$ = supply voltage in V
2. For HC the condition is $V_I$ = GND to $V_{CC}$
   For HCT the condition is $V_I$ = GND to $V_{CC}$ − 1.5 V

## PACKAGE OUTLINES

16-lead DIL; plastic (SOT38Z).
16-lead mini-pack; plastic (SO16; SOT109A).

## PIN DESCRIPTION

| PIN NO. | SYMBOL | NAME AND FUNCTION |
|---|---|---|
| 1, 15 | $1\overline{OE}$, $2\overline{OE}$ | output enable inputs (active LOW) |
| 2, 4, 6, 10, 12, 14 | 1A to 6A | data inputs |
| 3, 5, 7, 9, 11, 13 | $1\overline{Y}$ to $6\overline{Y}$ | data outputs |
| 8 | GND | ground (0 V) |
| 16 | $V_{CC}$ | positive supply voltage |

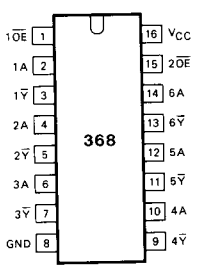


Fig. 1 Pin configuration.

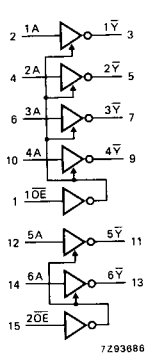


Fig. 2 Logic symbol.

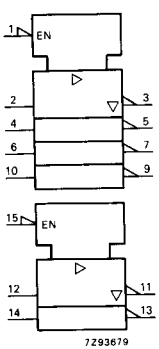


Fig. 3 IEC logic symbol.

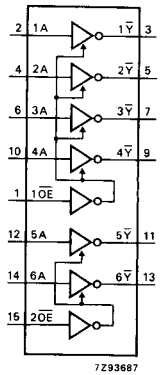


Fig. 4 Functional diagram.

**FUNCTION TABLE**

| INPUTS | | OUTPUTS |
|---|---|---|
| $n\overline{OE}$ | nA | $n\overline{Y}$ |
| L | L | H |
| L | H | L |
| H | X | Z |

H = HIGH voltage level
L = LOW voltage level
X = don't care
Z = high impedance OFF-state



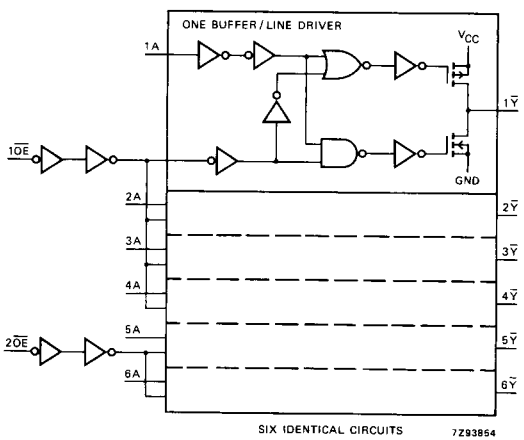


Fig. 5 Logic diagram.

## DC CHARACTERISTICS FOR 74HC

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output capability: bus driver
$I_{CC}$ category: MSI

## AC CHARACTERISTICS FOR 74HC

GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF

| SYMBOL | PARAMETER | $T_{amb}$ (°C) | | | | | | | UNIT | TEST CONDITIONS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 74HC | | | | | | | | $V_{CC}$ V | WAVEFORMS |
| | | +25 | | | −40 to +85 | | −40 to +125 | | | | |
| | | min. | typ. | max. | min. | max. | min. | max. | | | |
| $t_{PHL}$/ $t_{PLH}$ | propagation delay nA to nȲ | | 30<br>11<br>9 | 95<br>19<br>16 | | 120<br>24<br>20 | | 145<br>29<br>25 | ns | 2.0<br>4.5<br>6.0 | Fig. 6 |
| $t_{PZH}$/ $t_{PZL}$ | 3-state output enable time nOE to nȲ | | 41<br>15<br>12 | 150<br>30<br>26 | | 190<br>38<br>33 | | 225<br>45<br>38 | ns | 2.0<br>4.5<br>6.0 | Fig. 7 |
| $t_{PHZ}$/ $t_{PLZ}$ | 3-state output disable time nOE to nȲ | | 55<br>20<br>16 | 150<br>30<br>26 | | 190<br>38<br>33 | | 225<br>45<br>38 | ns | 2.0<br>4.5<br>6.0 | Fig. 7 |
| $t_{THL}$/ $t_{TLH}$ | output transition time | | 14<br>5<br>4 | 60<br>12<br>10 | | 75<br>15<br>13 | | 90<br>18<br>15 | ns | 2.0<br>4.5<br>6.0 | Fig. 6 |



## DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output capability: bus driver
$I_{CC}$ category: MSI

### Note to HCT types

The value of additional quiescent supply current ($\Delta I_{CC}$) for a unit load of 1 is given in the family specifications.
To determine $\Delta I_{CC}$ per input, multiply this value by the unit load coefficient shown in the table below.

| INPUT | UNIT LOAD COEFFICIENT |
|---|---|
| 1$\overline{OE}$ | 1.00 |
| 2$\overline{OE}$ | 0.90 |
| nA | 1.00 |

## AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF

| SYMBOL | PARAMETER | $T_{amb}$ (°C) | | | | | | | UNIT | TEST CONDITIONS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 74HCT | | | | | | | | $V_{CC}$ V | WAVEFORMS |
| | | +25 | | | −40 to +85 | | −40 to +125 | | | | |
| | | min. | typ. | max. | min. | max. | min. | max. | | | |
| $t_{PHL}/t_{PLH}$ | propagation delay nA to n$\overline{Y}$ | | 13 | 24 | | 30 | | 36 | ns | 4.5 | Fig. 6 |
| $t_{PZH}/t_{PZL}$ | 3-state output enable time n$\overline{OE}$ to n$\overline{Y}$ | | 17 | 35 | | 44 | | 53 | ns | 4.5 | Fig. 7 |
| $t_{PHZ}/t_{PLZ}$ | 3-state output disable time n$\overline{OE}$ to n$\overline{Y}$ | | 20 | 35 | | 44 | | 53 | ns | 4.5 | Fig. 7 |
| $t_{THL}/t_{TLH}$ | output transition time | | 5 | 12 | | 15 | | 18 | ns | 4.5 | Fig. 6 |

## AC WAVEFORMS



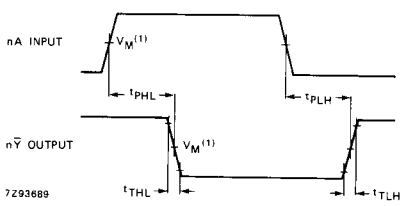


Fig. 6 Waveforms showing the input (nA) to output (n$\overline{Y}$) propagation delays and the output transition times.

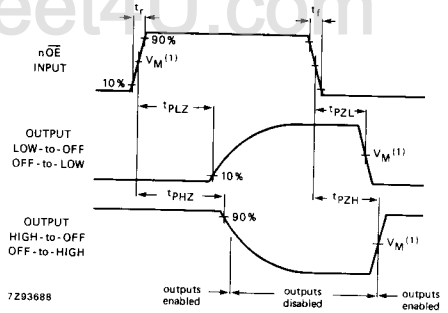


Fig. 7 Waveforms showing the 3-state enable and disable times.

**Note to AC waveforms**

(1) HC : $V_M$ = 50%; $V_I$ = GND to $V_{CC}$.
HCT: $V_M$ = 1.3 V; $V_I$ = GND to 3 V.