# HEX BUFFER/LINE DRIVER; 3-STATE

## FEATURES

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

## GENERAL DESCRIPTION

The 74HC/HCT365 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/HCT365 are hex non-inverting buffer/line drivers with 3-state outputs. The 3-state outputs (nY) are controlled by the output enable inputs ($\overline{OE}_1$, $\overline{OE}_2$).

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

The "365" is identical to the "366" but has non-inverting outputs.

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | UNIT |
|--------|-----------|------------|---------|-----|------|
| | | | HC | HCT | |
| $t_{PHL}/$ $t_{PLH}$ | propagation delay nA to nY | $C_L = 15\ pF$ $V_{CC} = 5\ V$ | 9 | 11 | ns |
| $C_I$ | input capacitance | | 3,5 | 3,5 | pF |
| $C_{PD}$ | power dissipation capacitance per buffer | notes 1 and 2 | 40 | 40 | pF |

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

### Notes

1. $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in $\mu W$):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)\text{ where:}$$

$f_i$ = input frequency in MHz $\qquad$ $C_L$ = output load capacitance in pF
$f_o$ = output frequency in MHz $\qquad$ $V_{CC}$ = supply voltage in V
$\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

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 | $\overline{OE}_1$, $\overline{OE}_2$ | output enable inputs (active LOW) |
| 2, 4, 6, 10, 12, 14 | 1A to 6A | data inputs |
| 3, 5, 7, 9, 11, 13 | 1Y to 6Y | data outputs |
| 8 | GND | ground (0 V) |
| 16 | $V_{CC}$ | positive supply voltage |
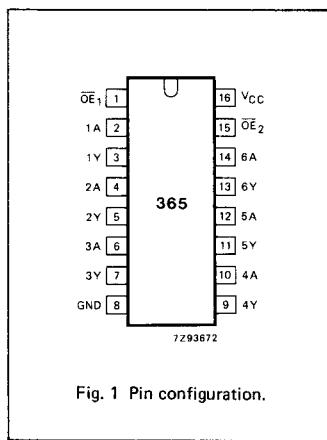


Fig. 1 Pin configuration.
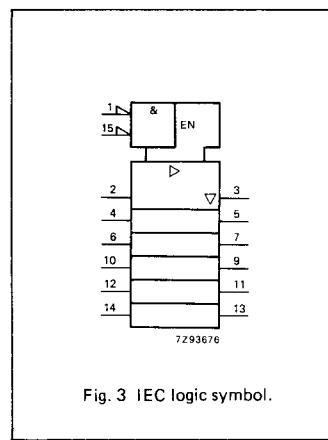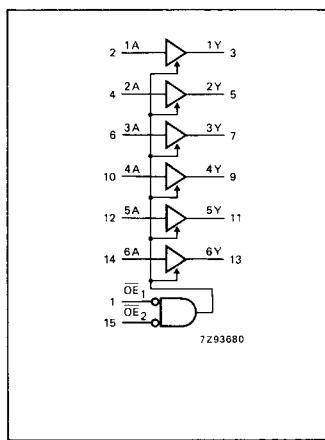




Fig. 3 IEC logic symbol.
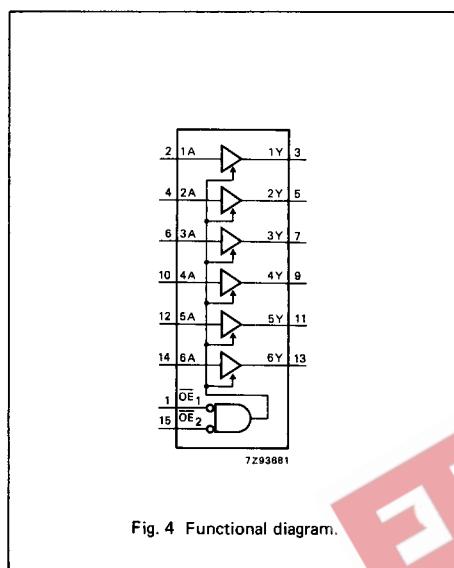
Fig. 4 Functional diagram.

**FUNCTION TABLE**

| INPUTS | | | OUTPUT |
|---|---|---|---|
| $\overline{OE}_1$ | $\overline{OE}_2$ | nA | nY |
| L | L | L | L |
| L | L | H | H |
| X | H | X | Z |
| H | X | 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) 74HC +25 min. | +25 typ. | +25 max. | −40 to +85 min. | −40 to +85 max. | −40 to +125 min. | −40 to +125 max. | UNIT | $V_{CC}$ V | WAVEFORMS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $t_{PHL}$/ $t_{PLH}$ | propagation delay nA to nY | | 30 11 9 | 95 19 16 | | 120 24 20 | | 145 29 25 | ns | 2.0 4.5 6.0 | Fig. 6 |
| $t_{PZH}$/ $t_{PZL}$ | 3-state output enable time $\overline{OE}_n$ to nY | | 47 17 14 | 150 30 26 | | 190 38 33 | | 225 45 38 | ns | 2.0 4.5 6.0 | Fig. 7 |
| $t_{PHZ}$/ $t_{PLZ}$ | 3-state output disable time $\overline{OE}_n$ to nY | | 61 22 18 | 150 30 26 | | 190 38 33 | | 225 45 38 | ns | 2.0 4.5 6.0 | Fig. 7 |
| $t_{THL}$/ $t_{TLH}$ | output transition time | | 14 5 4 | 60 12 10 | | 75 15 13 | | 90 18 15 | ns | 2.0 4.5 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 |
|---|---|
| $\overline{OE}_1$ | 1.00 |
| $\overline{OE}_2$ | 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) 74HCT +25 min. | typ. | max. | −40 to +85 min. | max. | −40 to +125 min. | max. | UNIT | $V_{CC}$ V | WAVEFORMS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $t_{PHL}$/ $t_{PLH}$ | propagation delay nA to nY | | 14 | 25 | | 31 | | 38 | ns | 4.5 | Fig. 6 |
| $t_{PZH}$/ $t_{PZL}$ | 3-state output enable time $\overline{OE}_n$ to nY | | 18 | 35 | | 44 | | 53 | ns | 4.5 | Fig. 7 |
| $t_{PHZ}$/ $t_{PLZ}$ | 3-state output disable time $\overline{OE}_n$ to nY | | 23 | 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
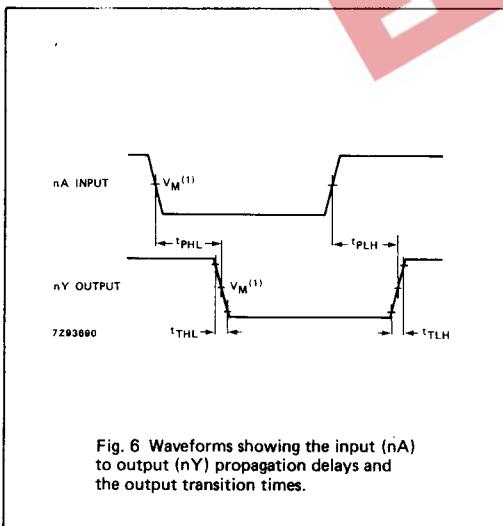


Fig. 6 Waveforms showing the input (nA) to output (nY) propagation delays and the output transition times.
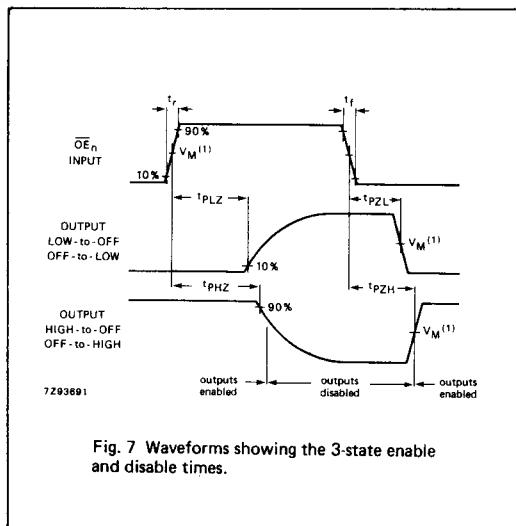


Fig. 7 Waveforms showing the 3-state enable and disable times.

**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.