

DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

74HC/HCT7541

Octal Schmitt trigger buffer/line driver; 3-state

Product specification
Supersedes data of March 1988
File under Integrated Circuits, IC06

December 1990

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74HC/HCT7541

FEATURES

- Non-inverting outputs
- Schmitt trigger action on all data inputs
- Output capability: bus driver
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT7541 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/HCT7541 are octal Schmitt trigger non-inverting buffer/line drivers with 3-state outputs. The 3-state outputs are controlled by the output enable inputs \overline{OE}_1 and \overline{OE}_2 .

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

The Schmitt trigger action in the data inputs transforms slowly changing input signals into sharply defined jitter-free output signals.

The "7541" is identical to the "541" but has hysteresis on the data inputs.

QUICK REFERENCE DATA

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

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | UNIT |
|-------------------|---|--|---------|-----|------|
| | | | HC | HCT | |
| t_{PHL}/t_{PLH} | propagation delay A_n to \overline{Y}_n | $C_L = 15\text{ pF}$; $V_{CC} = 5\text{ V}$ | 10 | 16 | ns |
| C_I | input capacitance | | 3.5 | 3.5 | pF |
| C_{PD} | power dissipation capacitance per buffer | notes 1 and 2 | 30 | 32 | pF |

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

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

f_i = input frequency in MHz

f_o = output frequency in MHz

$\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

C_L = output load capacitance in pF

V_{CC} = supply voltage in V

2. For HC the condition is $V_I = \text{GND to } V_{CC}$
For HCT the condition is $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$

ORDERING INFORMATION

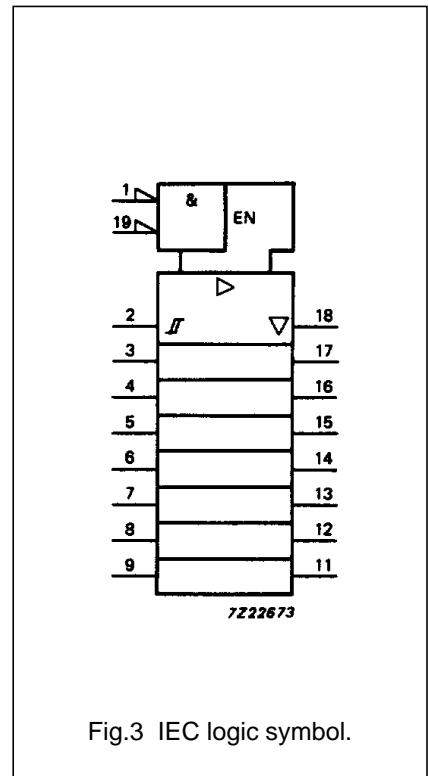
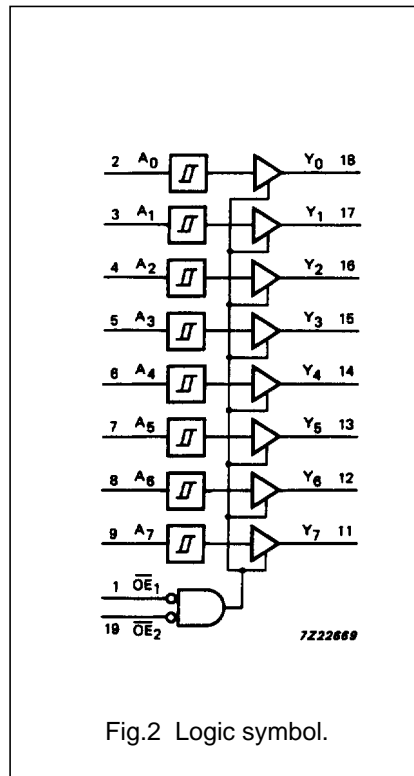
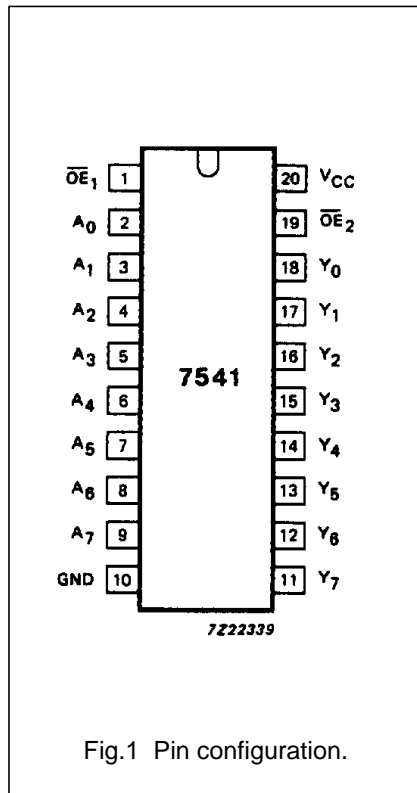
See "74HC/HCT/HCU/HCMOS Logic Package Information".

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PIN DESCRIPTION

| PIN NO. | SYMBOL | NAME AND FUNCTION |
|--------------------------------|------------------------------------|-----------------------------------|
| 1, 19 | $\overline{OE}_1, \overline{OE}_2$ | output enable inputs (active LOW) |
| 2, 3, 4, 5, 6, 7, 8, 9 | A_0 to A_7 | data inputs |
| 10 | GND | ground (0 V) |
| 18, 17, 16, 15, 14, 13, 12, 11 | Y_0 to Y_7 | bus outputs |
| 20 | V_{CC} | positive supply voltage |



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FUNCTION TABLE

| INPUTS | | | OUTPUTS |
|-------------------|-------------------|-------|---------|
| \overline{OE}_1 | \overline{OE}_2 | A_n | Y_n |
| L | L | L | L |
| L | L | H | H |
| X | H | X | Z |
| H | X | X | Z |

Notes

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

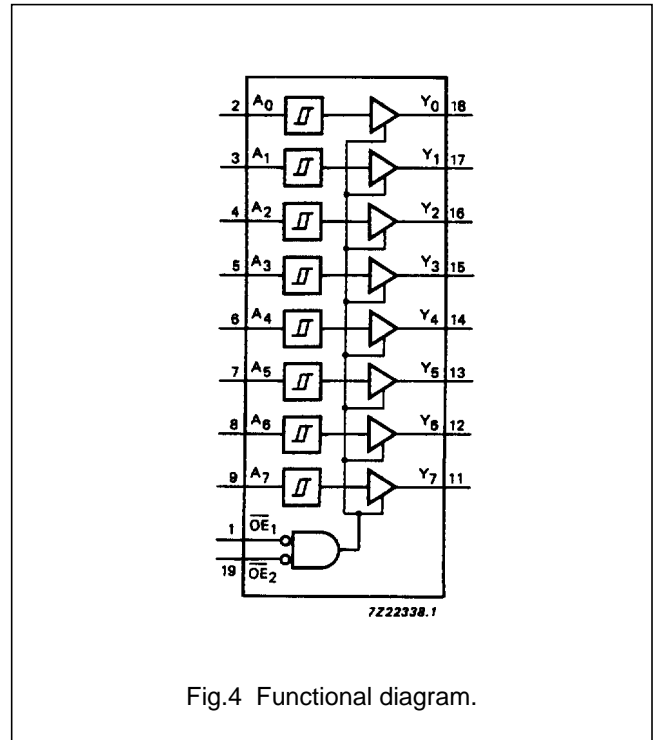


Fig.4 Functional diagram.

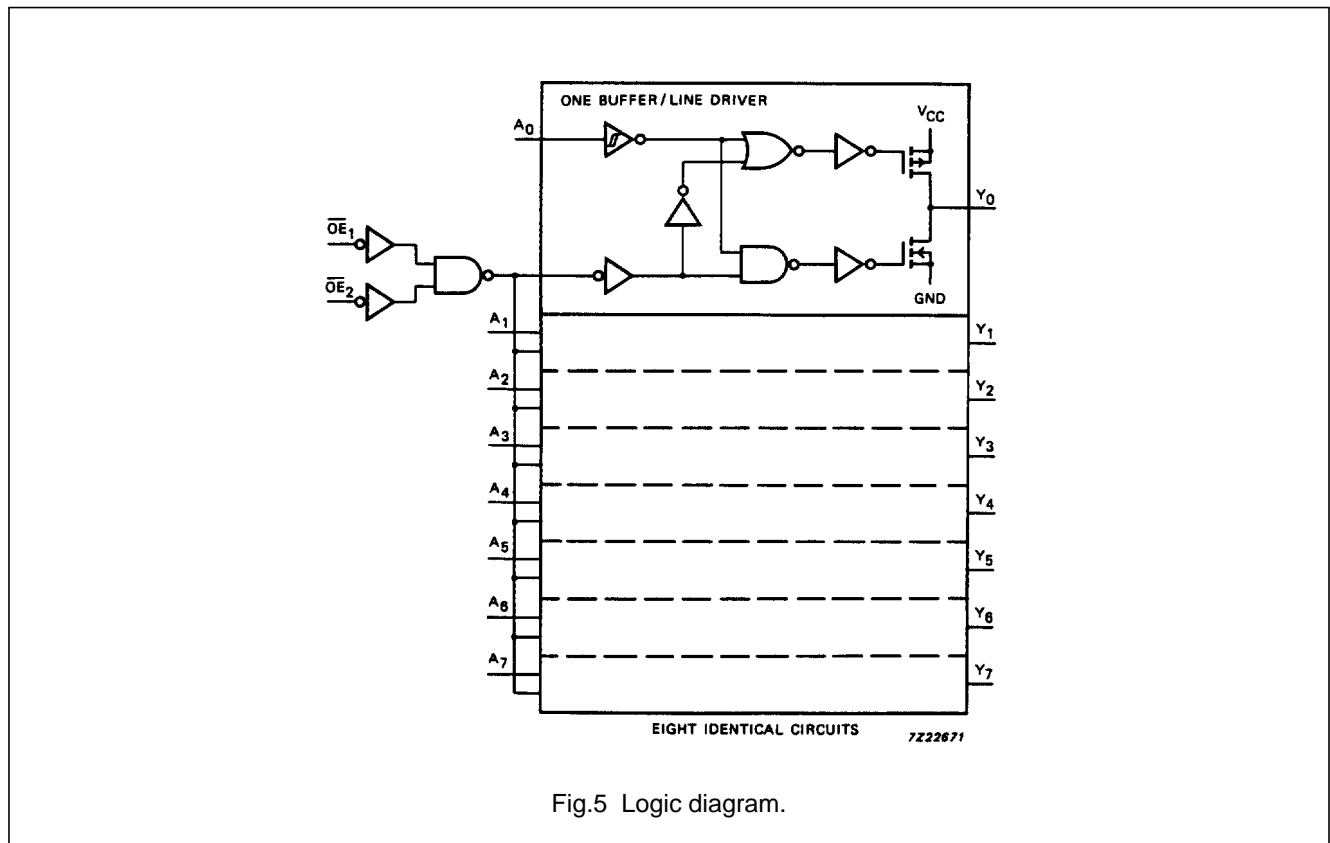


Fig.5 Logic diagram.

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DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Transfer characteristics are given below (not applicable for \overline{OE}_n inputs).

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 A_n to Y_n | | 39 14 11 | 120 24 20 | | 150 30 26 | | 180 36 32 | ns | 2.0 4.5 6.0 | Fig.8 |
| t_{PZH}/t_{PZL} | 3-state output enable time \overline{OE}_n to Y_n | | 44 16 13 | 160 32 27 | | 200 40 34 | | 240 48 41 | ns | 2.0 4.5 6.0 | Fig.8 |
| t_{PHZ}/t_{PLZ} | 3-state output disable time \overline{OE}_n to Y_n | | 58 21 17 | 160 32 27 | | 200 40 34 | | 240 48 41 | ns | 2.0 4.5 6.0 | Fig.8 |
| 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.8 |

TRANSFER CHARACTERISTICS FOR 74HC

Voltages are referred to GND (ground = 0 V)

| 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. |
| V_{T+} | positive-going threshold | | | 1.50 3.15 4.20 | | 1.50 3.15 4.20 | | 1.50 3.15 4.20 | V | 2.0 4.5 6.0 | Figs 6 and 7 |
| V_{T-} | negative-going threshold | 0.30 1.35 1.80 | | | 0.30 1.35 1.80 | | 0.30 1.35 1.80 | | V | 2.0 4.5 6.0 | Figs 6 and 7 |
| V_H | hysteresis ($V_{T+} - V_{T-}$) | 0.10 0.25 0.30 | 0.20 0.40 0.50 | | 0.10 0.25 0.30 | | 0.10 0.25 0.30 | | V | 2.0 4.5 6.0 | Figs 6 and 7 |

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DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Transfer characteristics are given below (not applicable for \overline{OE}_n inputs).

Output capability: bus driver

I_{CC} category: MSI

Note to HCT types

The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given in the family specifications.

To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

| INPUT | UNIT LOAD COEFFICIENT |
|-------------------|-----------------------|
| \overline{OE}_1 | 1.30 |
| \overline{OE}_2 | 1.30 |
| A_n | 0.20 |

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 A_n to Y_n | | 19 | 32 | | 40 | | 48 | ns | 4.5 | Fig.8 |
| t_{PZH}/t_{PZL} | 3-state output enable time \overline{OE}_n to Y_n | | 18 | 32 | | 40 | | 48 | ns | 4.5 | Fig.8 |
| t_{PHZ}/t_{PLZ} | 3-state output disable time \overline{OE}_n to Y_n | | 20 | 32 | | 40 | | 48 | ns | 4.5 | Fig.8 |
| t_{THL}/t_{TLH} | output transition time | | 5 | 12 | | 15 | | 18 | ns | 4.5 | Fig.8 |

TRANSFER CHARACTERISTICS FOR 74HCT

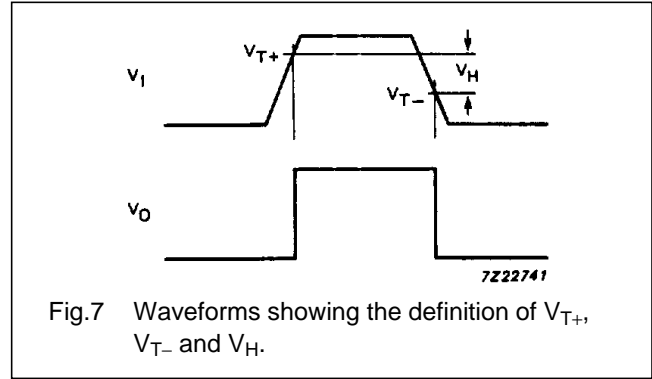
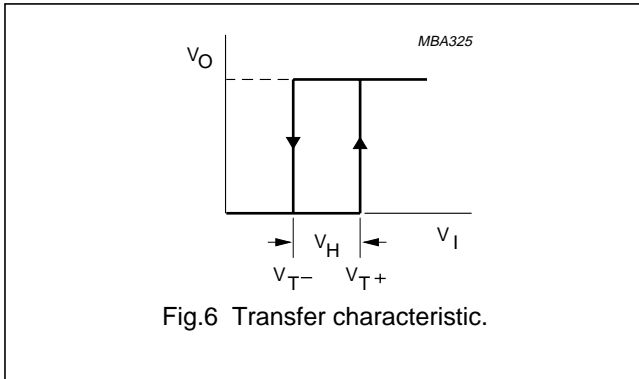
Voltages are referred to GND (ground = 0 V)

| 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. | | | |
| V_{T+} | positive-going threshold | | | 2.0 2.1 | | 2.0 2.1 | | 2.0 2.1 | V | 4.5 5.5 | Figs 6 and 7 |
| V_{T-} | negative-going threshold | 0.70 0.80 | | | 0.64 0.74 | | 0.60 0.70 | | V | 4.5 5.5 | Figs 6 and 7 |
| V_H | hysteresis ($V_{T+} - V_{T-}$) | 0.17 0.17 | 0.23 0.23 | | | | | | V | 4.5 5.5 | Figs 6 and 7 |

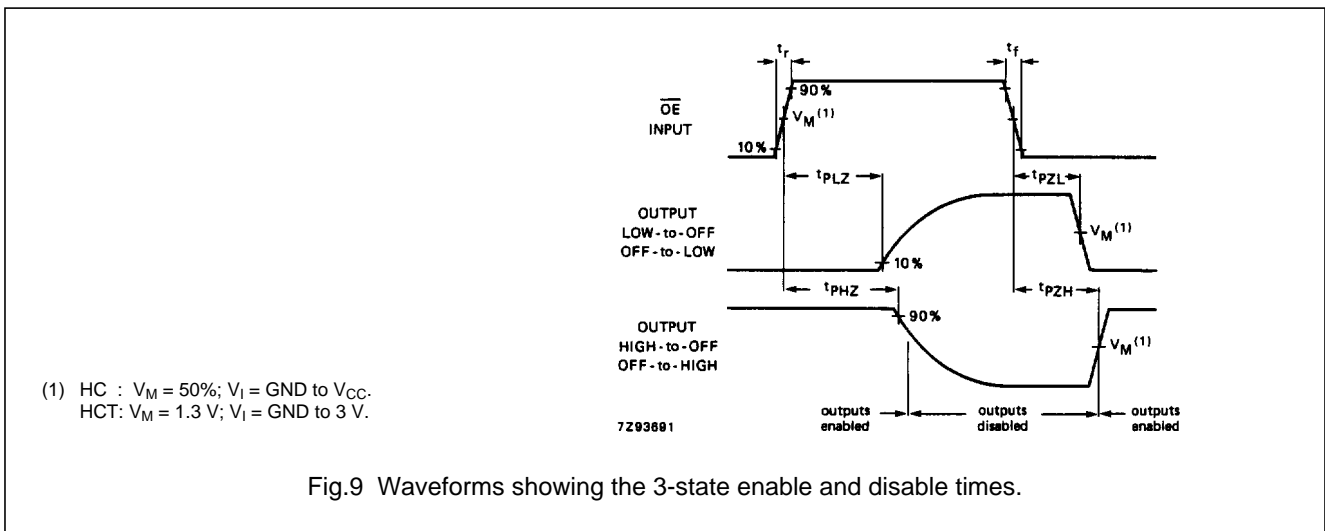
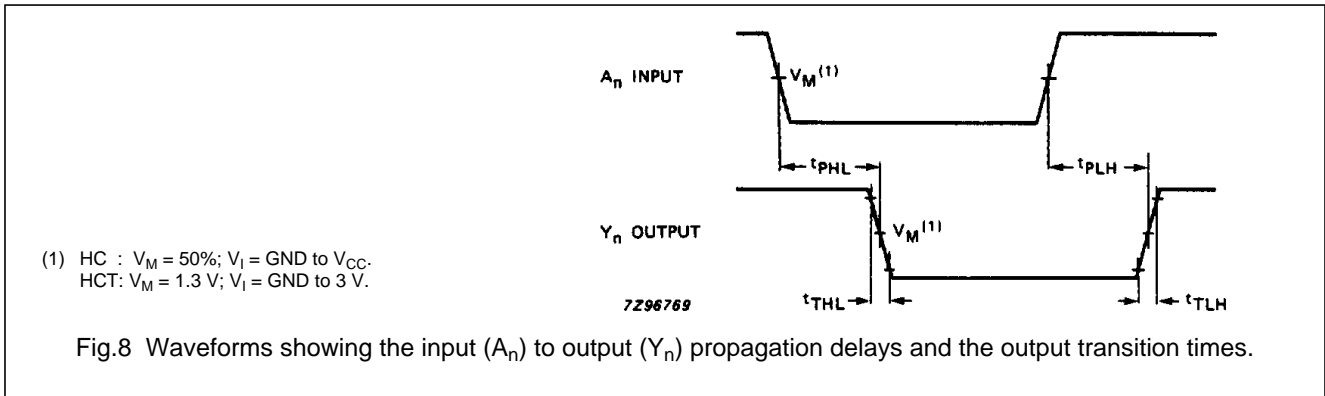
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TRANSFER CHARACTERISTIC WAVEFORMS



AC WAVEFORMS



PACKAGE OUTLINES

See "74HC/HCT/HCU/HCMOS Logic Package Outlines".