

SUPERSEDES DATA OF MARCH 1988

OCTAL SCHMITT TRIGGER BUFFER/LINE DRIVER; 3-STATE

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.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t _{PHL} / t _{PLH}	propagation delay A _n to Y _n	C _L = 15 pF V _{CC} = 5 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

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

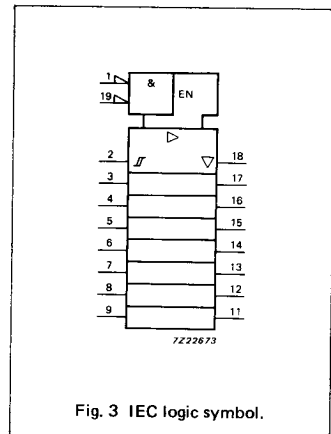
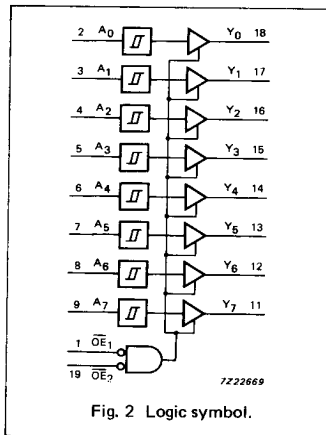
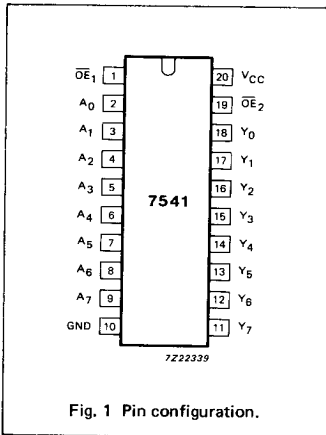
Notes

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

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

20-lead DIL; plastic (SOT146).
20-lead mini-pack; plastic (SO20; SOT163A).



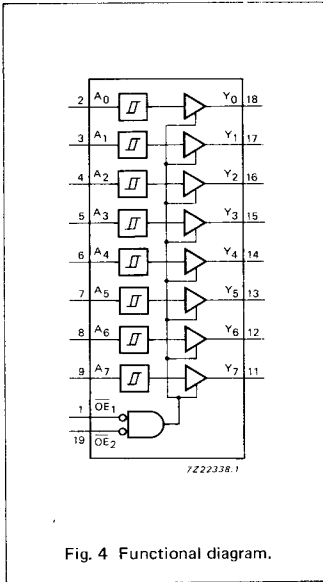


Fig. 4 Functional diagram.

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

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

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

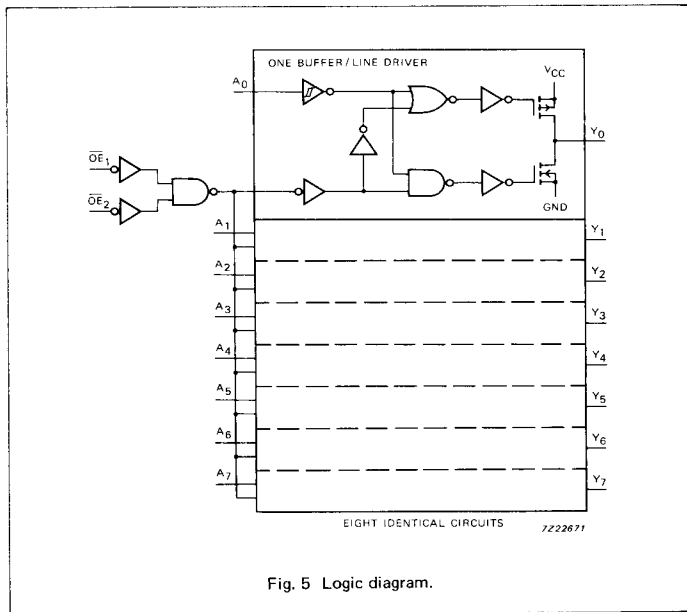


Fig. 5 Logic diagram.

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications". 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. 9	
$t_{PHZ}/$ 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. 9	
$t_{THL}/$ 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

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications". Transfer characteristics are given below (not applicable for 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
OE ₁	1.30
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 OE _n to Y _n		18	32		40		48	ns	4.5	Fig. 9
t _{pHZ} / t _{PLZ}	3-state output disable time OE _n to Y _n		20	32		40		48	ns	4.5	Fig. 9
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

TRANSFER CHARACTERISTIC WAVEFORMS

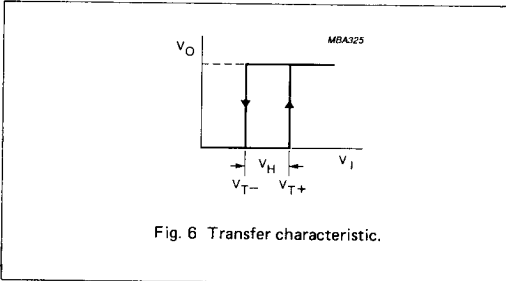


Fig. 6 Transfer characteristic.

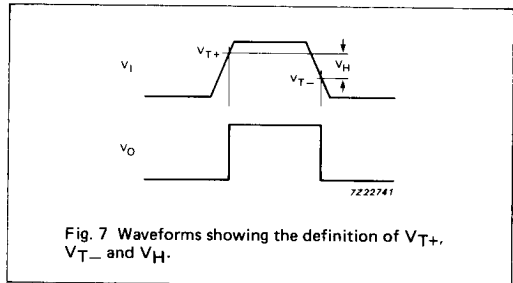


Fig. 7 Waveforms showing the definition of V_{T+} , V_{T-} and V_H .

AC WAVEFORMS

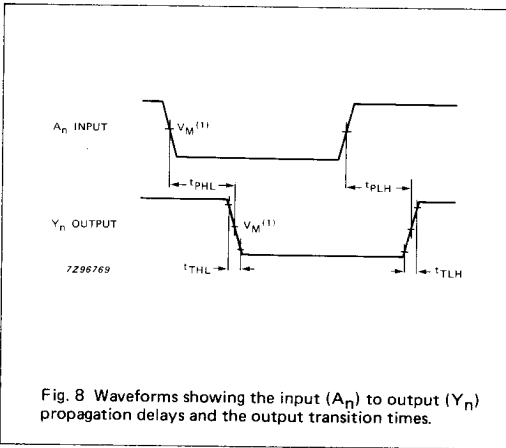


Fig. 8 Waveforms showing the input (A_n) to output (Y_n) propagation delays and the output transition times.

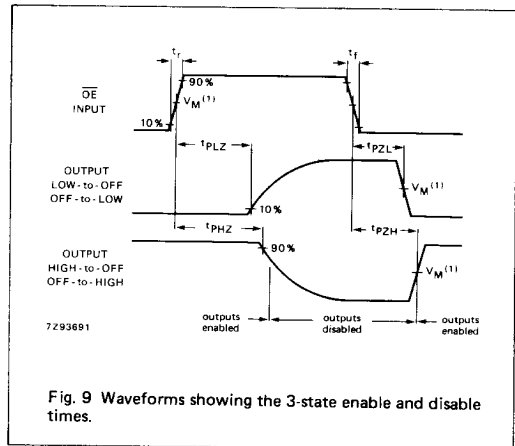


Fig. 9 Waveforms showing the 3-state enable and disable times.

Note to AC waveforms

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