SUPERSEDES DATA OF MARCH 1988

OCTAL SCHMITT TRIGGER BUFFER/LINE DRIVER; 3-STATE; INVERTING

FEATURES

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

GENERAL DESCRIPTION

The 74HC/HCT7540 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/HCT7540 are octal Schmitt trigger 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 "7540" is identical to the "540" but has hysteresis on the data inputs.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/t_{PLH}	propagation delay A_n to $\overline{Y}_n$	C_L = 15 pF; V_{CC} = 5 V	11	16	ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per buffer	notes 1 and 2	29	31	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):
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ 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

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

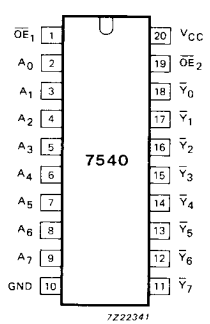

Fig. 1 Pin configuration.

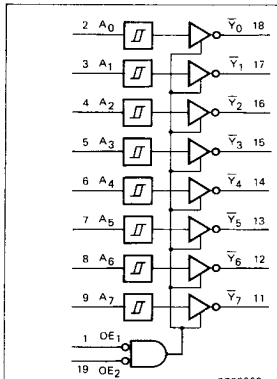

Fig. 2 Logic symbol.

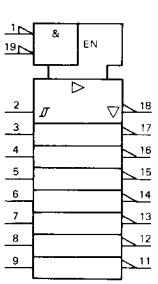

Fig. 3 IEC logic symbol.

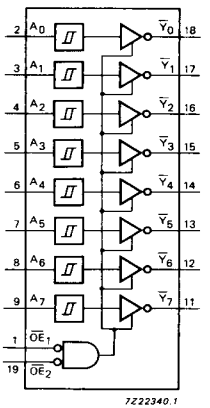

Fig. 4 Functional diagram.

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	$\overline{Y}_0$ to $\overline{Y}_7$	bus outputs
20	V_{CC}	positive supply voltage

FUNCTION TABLE

INPUTS			OUTPUTS
$\overline{OE}_1$	$\overline{OE}_2$	A_n	$\overline{Y}_n$
L	L	L	H
L	L	H	L
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

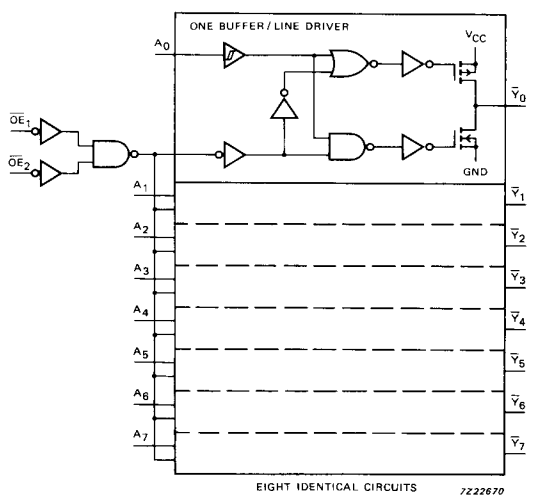

Fig. 5 Logic diagram.

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 $\overline{Y}_n$		39 14 11	120 24 20		150 30 26		180 36 31	ns	2.0 4.5 6.0	Fig. 8
t_{PZH}/t_{PZL}	3-state output enable time $\overline{OE}_n$ to $\overline{Y}_n$		41 15 12	150 30 26		190 38 33		225 45 38	ns	2.0 4.5 6.0	Fig. 9
t_{PHZ}/t_{PLZ}	3-state output disable time $\overline{OE}_n$ to $\overline{Y}_n$		52 19 15	150 30 26		190 38 33		225 45 38	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 refered 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 $\overline{OE}_n$ 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 $\overline{Y}_n$		19	32		40		48	ns	4.5	Fig. 8
t_{PZH}/t_{PZL}	3-state output enable time $\overline{OE}_n$ to $\overline{Y}_n$		19	32		40		48	ns	4.5	Fig. 9
t_{PHZ}/t_{PLZ}	3-state output disable time $\overline{OE}_n$ to $\overline{Y}_n$		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 refered 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

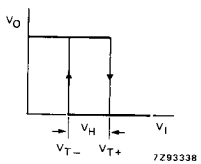

Fig. 6 Transfer characteristic.

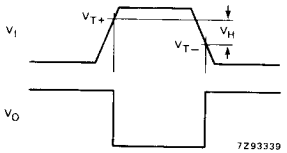

Fig. 7 Waveforms showing the definition of V_{T+}, V_{T-} and V_H.

AC WAVEFORMS

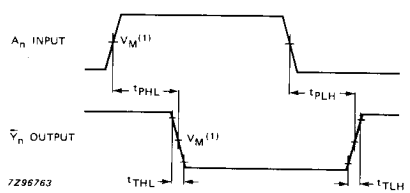

Fig. 8 Waveforms showing the input (A_n) to output ($\overline{Y}_n$) propagation delays and the output transition times.

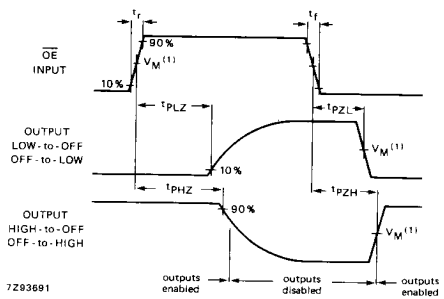

Fig. 9 Waveforms showing the 3-state enable and disable times.

Note to AC waveforms

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