QUAD BISTABLE TRANSPARENT LATCH

FEATURES

- Complementary Q and $\overline{Q}$ outputs
- V_{CC} and GND on the centre pins
- Output capability: standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT75 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. 7.

The 74HC/HCT75 have four bistable latches. The two latches are simultaneously controlled by one of two active HIGH enable inputs (LE_{1-2} and LE_{3-4}). When LE_{n-n} is HIGH, the data enters the latches and appears at the nQ outputs. The nQ outputs follow the data inputs (nD) as long as LE_{n-n} is HIGH (transparent). The data on the nD inputs one set-up time prior to the HIGH-to-LOW transition of the LE_{n-n} will be stored in the latches. The latched outputs remain stable as long as the LE_{n-n} is LOW.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/t_{PLH}	propagation delay D_n to Q_n, $\overline{Q}_n$ LE_{n-n} to Q_n, $\overline{Q}_n$	C_L = 15 pF V_{CC} = 5 V	11 11	12 11	ns ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per latch	notes 1 and 2	42	42	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

ORDERING INFORMATION/PACKAGE OUTLINES

PC74HC/HCT75P: 16-lead DIL; plastic (SOT-38Z).
PC74HC/HCT75T: 16-lead mini-pack; plastic (SO-16; SOT-109A).

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 14, 11, 8	$1\overline{Q}$ to $4\overline{Q}$	complementary latch outputs
2, 3, 6, 7	1D to 4D	data inputs
4	LE_{3-4}	latch enable input, latches 3 and 4 (active HIGH)
5	V_{CC}	positive supply voltage
12	GND	ground (0 V)
13	LE_{1-2}	latch enable input, latches 1 and 2 (active HIGH)
16, 15, 10, 9	1Q to 4Q	latch outputs

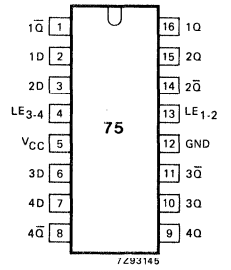

Fig. 1 Pin configuration.

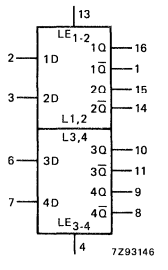

Fig. 2 Logic symbol.

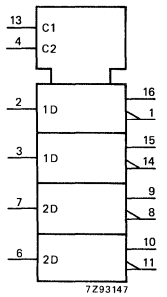

Fig. 3 IEC logic symbol.

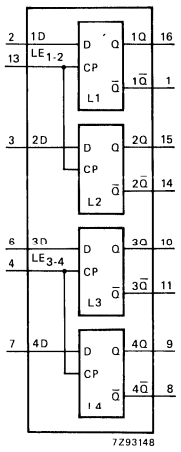

Fig. 4 Functional diagram.

FUNCTION TABLE

OPERATING MODES	INPUTS		OUTPUTS	
	$LE_{n\text{-}n}$	nD	nQ	$n\overline{Q}$
data enabled	H H	L H	L H	H L
data latched	L	X	q	$\overline{q}$

H = HIGH voltage level
L = LOW voltage level
q = lower case letters indicate the state of the referenced output one set-up time prior to the LOW-to-HIGH $LE_{n\text{-}n}$ transition
X = don't care

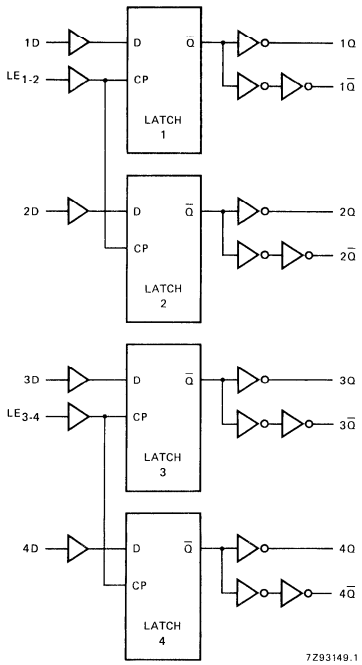

Fig. 5 Logic diagram.

DC CHARACTERISTICS FOR 74HC

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

Output capability: standard
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 nD to nQ		33 12 10	110 22 19		140 28 24		165 33 28	ns	2.0 4.5 6.0	Fig. 6
t_{PHL}/t_{PLH}	propagation delay nD to $n\overline{Q}$		39 14 11	120 24 20		150 30 26		180 36 31	ns	2.0 4.5 6.0	Fig. 7
t_{PHL}/t_{PLH}	propagation delay $LE_{n\text{-}n}$ to nQ		33 12 10	120 24 20		150 30 26		180 36 31	ns	2.0 4.5 6.0	Fig. 8
t_{PHL}/t_{PLH}	propagation delay $LE_{n\text{-}n}$ to $n\overline{Q}$		39 14 11	125 25 21		155 31 26		190 38 32	ns	2.0 4.5 6.0	Fig. 8
t_{THL}/t_{TLH}	output transition time		19 7 6	75 15 13		95 19 16		110 22 19	ns	2.0 4.5 6.0	Figs 6 and 7
t_W	enable pulse width HIGH	80 16 14	19 7 6		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig. 8
t_{su}	set-up time nD to $LE_{n\text{-}n}$	60 12 10	14 5 4		75 15 13		90 18 15		ns	2.0 4.5 6.0	Fig. 9
t_h	hold time nD to $LE_{n\text{-}n}$	3 3 3	−8 −3 −2		3 3 3		3 3 3		ns	2.0 4.5 6.0	Fig. 9

DC CHARACTERISTICS FOR 74HCT

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

Output capability: standard
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
nD	0.75
LE_{n-n}	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 nD to nQ		15	28		35		42	ns	4.5	Fig. 6
t_{PHL}/t_{PLH}	propagation delay nD to $n\overline{Q}$		15	28		35		42	ns	4.5	Fig. 7
t_{PHL}/t_{PLH}	propagation delay LE_{n-n} to nQ		13	28		35		42	ns	4.5	Fig. 8
t_{PHL}/t_{PLH}	propagation delay LE_{n-n} to $n\overline{Q}$		15	30		38		45	ns	4.5	Fig. 8
t_{THL}/t_{TLH}	output transition time		7	15		19		22	ns	4.5	Figs 6 and 7
t_W	enable pulse width HIGH	16	6		20		24		ns	4.5	Fig. 8
t_{su}	set-up time nD to LE_{n-n}	12	4		15		18		ns	4.5	Fig. 9
t_h	hold time nD to LE_{n-n}	3	−2		3		3		ns	4.5	Fig. 9

AC WAVEFORMS

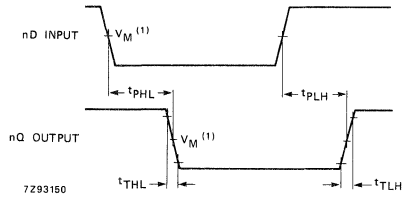

Fig. 6 Waveforms showing the data input (nD) to output (nQ) propagation delays and the output transition times.

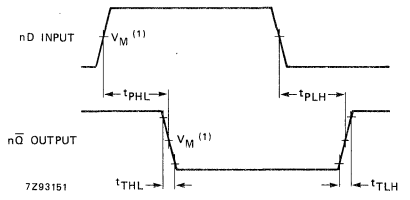

Fig. 7 Waveforms showing the data input (nD) to output (nQ) propagation delays and the output transition times.

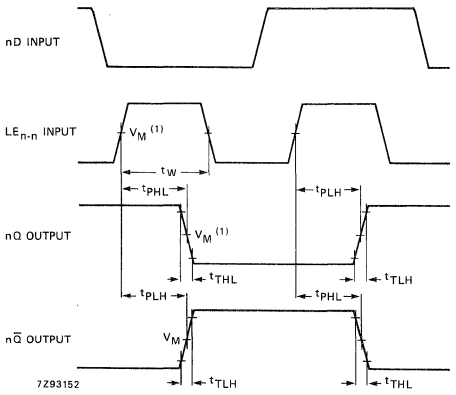

Fig. 8 Waveforms showing the latch enable input (LE_{n-n}) pulse width, the latch enable input to outputs (nQ, $n\overline{Q}$) propagation delays and the output transition times.

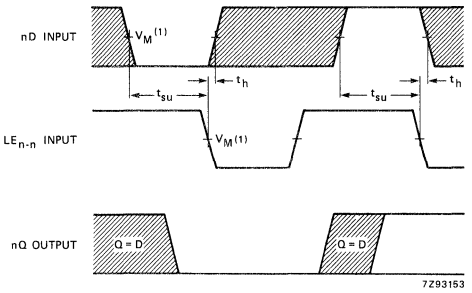

Fig. 9 Waveforms showing the data set-up and hold times for nD input to LE_{n-n} input.

Note to Fig. 9

The shaded areas indicate when the input is permitted to change for predictable output performance.

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.