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/HCT564

Octal D-type flip-flop; positive-edge trigger; 3-state; inverting

Product specification
File under Integrated Circuits, IC06

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Philips
Semiconductors

PHILIPS

Octal D-type flip-flop; positive-edge trigger; 3-state; inverting

74HC/HCT564

FEATURES

- 3-state inverting outputs for bus oriented applications
- 8-bit positive-edge triggered register
- Common 3-state output enable input
- Independent register and 3-state buffer operation
- Output capability: bus driver
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT564 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/HCT564 are octal D-type flip-flops featuring separate D-type inputs for each flip-flop and inverting 3-state outputs for bus oriented applications. A clock (CP) and an output enable ($\overline{OE}$) input are common to all flip-flops.

The 8 flip-flops will store the state of their individual D-inputs that meet the set-up and hold times requirements on the LOW-to-HIGH CP transition.
When $\overline{OE}$ is LOW, the contents of the 8 flip-flops are available at the outputs.
When $\overline{OE}$ is HIGH, the outputs go to the high impedance OFF-state. Operation of the $\overline{OE}$ input does not affect the state of the flip-flops.

The “564” is functionally identical to the “574” but has inverting outputs. The “564” is functionally identical to the “534”, but has a different pinning.

QUICK REFERENCE DATA

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/ t_{PLH}	propagation delay CP to $\overline{Q}_n$	C_L = 15 pF; V_{CC} = 5 V	15	16	ns
f_{max}	maximum clock frequency		127	62	MHz
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per flip-flop	notes 1 and 2	27	27	pF

Notes

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

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

See *“74HC/HCT/HCU/HCMOS Logic Package Information”*.

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1	$\overline{OE}$	3-state output enable input (active LOW)
2, 3, 4, 5, 6, 7, 8, 9	D_0 to D_7	data inputs
10	GND	ground (0 V)
11	CP	clock input (LOW-to-HIGH, edge-triggered)
19, 18, 17, 16, 15, 14, 13, 12	$\overline{Q}_0$ to $\overline{Q}_7$	3-state flip-flop outputs
20	V_{CC}	positive supply voltage

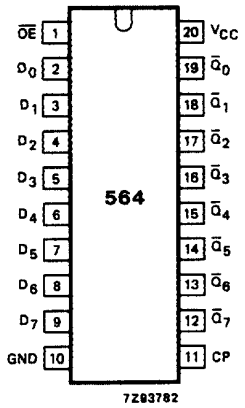


Fig.1 Pin configuration.

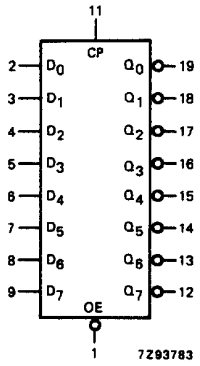


Fig.2 Logic symbol.

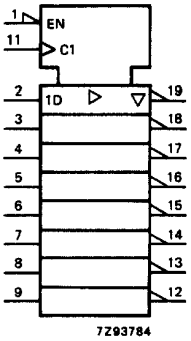


Fig.3 IEC logic symbol.

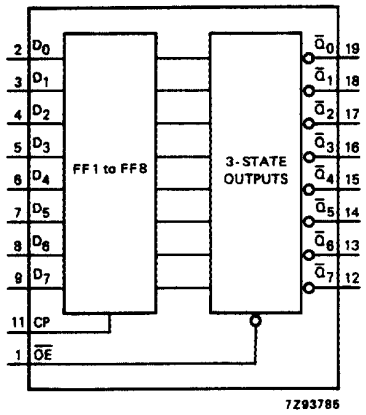


Fig.4 Functional diagram.

FUNCTION TABLE

OPERATING MODES	INPUTS			INTERNAL FLIP-FLOPS	OUTPUTS
	$\overline{OE}$	CP	D_n		$\overline{Q}_0$ to $\overline{Q}_7$
load and read register	L	↑	l	L	H
	L	↑	h	H	L
load register and disable outputs	H	↑	l	L	Z
	H	↑	h	H	Z

Notes

1. H = HIGH voltage level
   h = HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition
   L = LOW voltage level
   l = LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition
   Z = high impedance OFF-state
   ↑ = LOW-to-HIGH clock transition

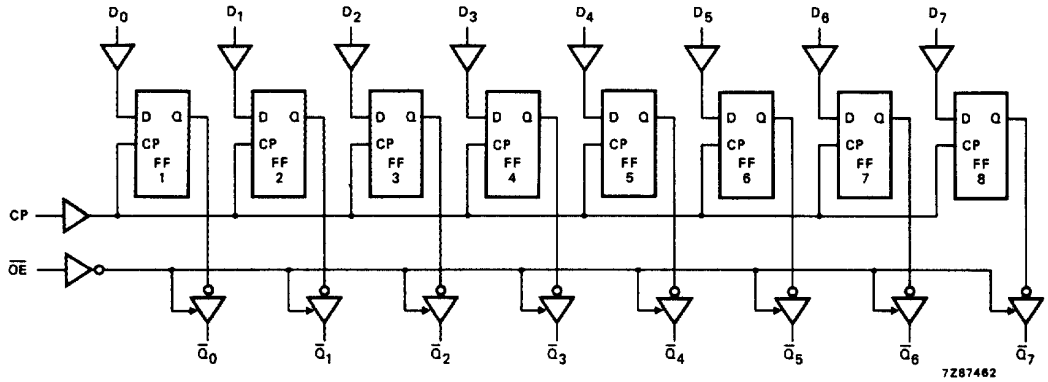


Fig.5 Logic diagram.

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic 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)							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 CP to $\overline{Q}_n$		50 18 14	165 33 28		205 41 35		250 50 43	ns	2.0 4.5 6.0	Fig.6
t_{PZH}/ t_{PZL}	3-state output enable time $\overline{OE}$ to $\overline{Q}_n$		44 16 13	140 28 24		175 35 30		210 42 36	ns	2.0 4.5 6.0	Fig.8
t_{PHZ}/ t_{PLZ}	3-state output disable time $\overline{OE}$ to $\overline{Q}_n$		50 18 14	135 27 23		170 34 29		205 41 35	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.6
t_W	clock pulse width HIGH or LOW	80 16 14	14 5 4		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.6
t_{su}	set-up time D_n to CP	60 12 10	6 2 2		75 15 13		90 18 15		ns	2.0 4.5 6.0	Fig.7
t_h	hold time D_n to CP	5 5 5	0 0 0		5 5 5		5 5 5		ns	2.0 4.5 6.0	Fig.7
f_{max}	maximum clock pulse frequency	6.0 30 35	38 115 137		4.8 24 28		4.0 20 24		MHz	2.0 4.5 6.0	Fig.6

DC CHARACTERISTICS FOR 74HCT

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

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.

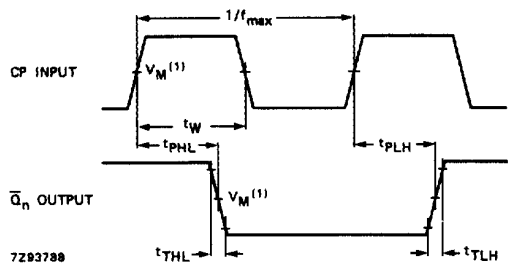
INPUT	UNIT LOAD COEFFICIENT
$\overline{OE}$	0.80
D_0 to D_7	0.25
CP	1.00

AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

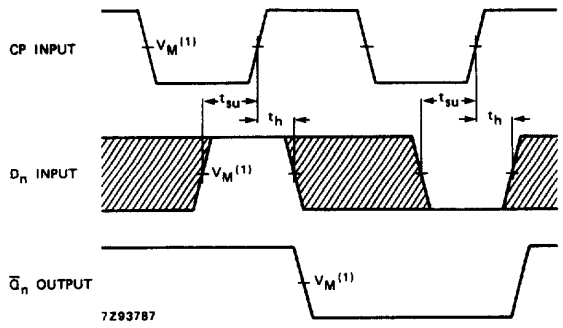
SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay CP to $\overline{Q}_n$		19	35		44		53	ns	4.5	Fig.6
t_{PZH}/ t_{PZL}	3-state output enable time $\overline{OE}$ to $\overline{Q}_n$		19	35		44		53	ns	4.5	Fig.8
t_{PHZ}/ t_{PLZ}	3-state output disable time $\overline{OE}$ to $\overline{Q}_n$		19	30		38		45	ns	4.5	Fig.8
t_{THL}/ t_{TLH}	output transition time		5	12		15		18	ns	4.5	Fig.6
t_W	clock pulse width HIGH or LOW	18	8		23		27		ns	4.5	Fig.6
t_{su}	set-up time D_n to CP	12	3		15		18		ns	4.5	Fig.7
t_h	hold time D_n to CP	3	−2		3		3		ns	4.5	Fig.7
f_{max}	maximum clock pulse frequency	27	56		22		18		MHz	4.5	Fig.6

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.

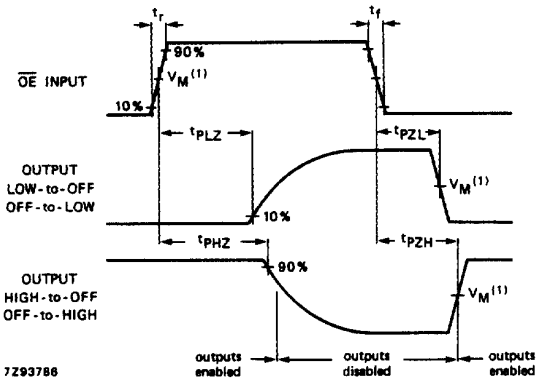
Fig.6 Waveforms showing the clock (CP) to output ($\overline{Q}_n$) propagation delays, the clock pulse width, the output transition times and the maximum clock pulse frequency.



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

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

Fig.7 Waveforms showing the data set-up and hold times for the data input (D_n).



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

Fig.8 Waveforms showing the 3-state enable and disable times.

PACKAGE OUTLINES

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

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Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А