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/HCT7597
8-bit shift register with input latches

Product specification
File under Integrated Circuits, IC06

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Philips
Semiconductors

PHILIPS

8-bit shift register with input latches 74HC/HCT7597

FEATURES

- 8-bit parallel input latches
- Shift register has direct overriding load and clear
- Output capability: standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT7597 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/HCT7597 both consist of an 8-bit storage latch feeding a parallel-in, serial-out 8-bit shift register.

When $\overline{LE}$ is LOW, data at the D_n inputs enter the latches. In this condition the latches are transparent, i.e. a latch output will change state each time its corresponding D-input changes.

When $\overline{LE}$ is HIGH the latches store the information that was present at the D-inputs, a set-up time preceding the LOW-to-HIGH transition of $\overline{LE}$.

The shift register has a positive edge-triggered clock, direct load (from storage) and clear inputs.

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	C_L = 15 pF; V_{CC} = 5 V			
	SH_{CP} to Q		15	17	ns
	$\overline{LE}$ to Q		22	27	ns
	$\overline{PL}$ to Q		20	23	ns
	D_7 to Q		20	24	ns
f_{max}	maximum clock frequency SH_{CP}		99	79	MHz
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per package	notes 1, 2	29	30	pF

Notes

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

   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ 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 = 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
8	GND	ground (0 V)
9	Q	serial data output
10	$\overline{MR}$	asynchronous reset input (active LOW)
11	SH_{CP}	shift clock input (LOW-to-HIGH, edge-triggered)
12	$\overline{LE}$	latch enable input (active LOW)
13	$\overline{PL}$	parallel load input (active LOW)
14	D_S	serial data input
15, 1, 2, 3, 4, 5, 6, 7	D_0 to D_7	parallel data inputs
16	V_{CC}	positive supply voltage

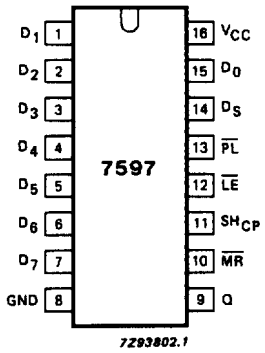


Fig.1 Pin configuration.

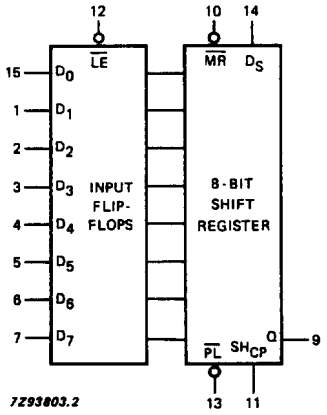


Fig.2 Logic symbol.

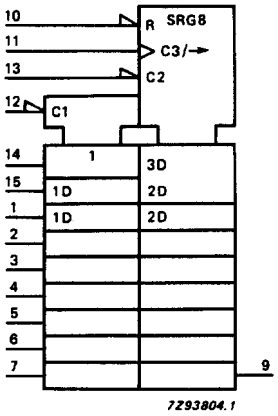


Fig.3 IEC logic symbol.

FUNCTION TABLE

$\overline{LE}$	SH_{CP}	$\overline{PL}$	$\overline{MR}$	FUNCTION
L	X	X	X	data enabled to input latches (transparent)
H	X	X	X	data stored into latches (non-transparent)
X	X	L	H	data transferred from input latches to shift register
X	X	L	L	invalid logic, state of shift register indeterminate when signals removed
X	X	H	L	shift register cleared
X	↑	H	H	shift register clocked $Q_n = Q_{n-1}$, $Q_0 = D_S$

Notes

1. H = HIGH voltage level
   L = LOW voltage level
   X = don't care
   ↑ = LOW-to-HIGH CP transition

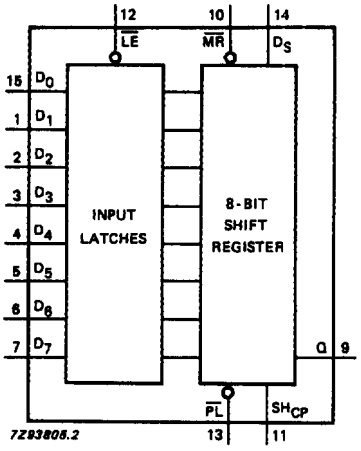


Fig.4 Functional diagram.

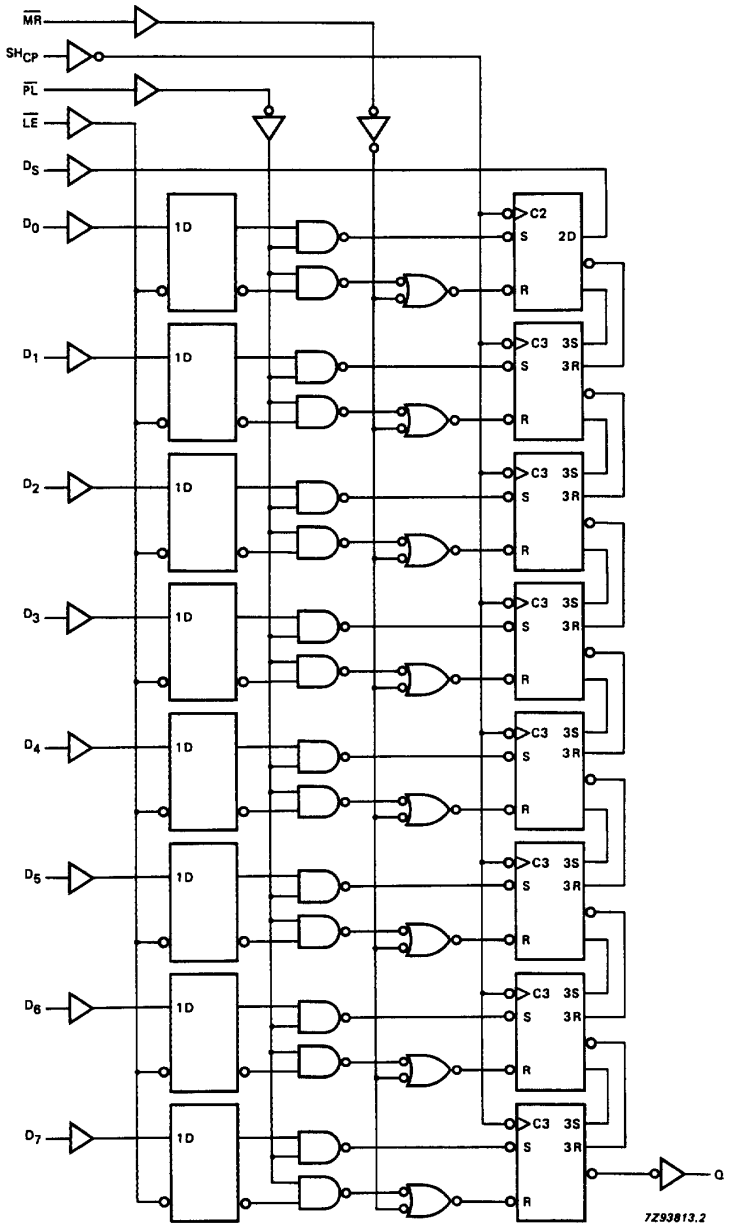


Fig.5 Logic diagram.

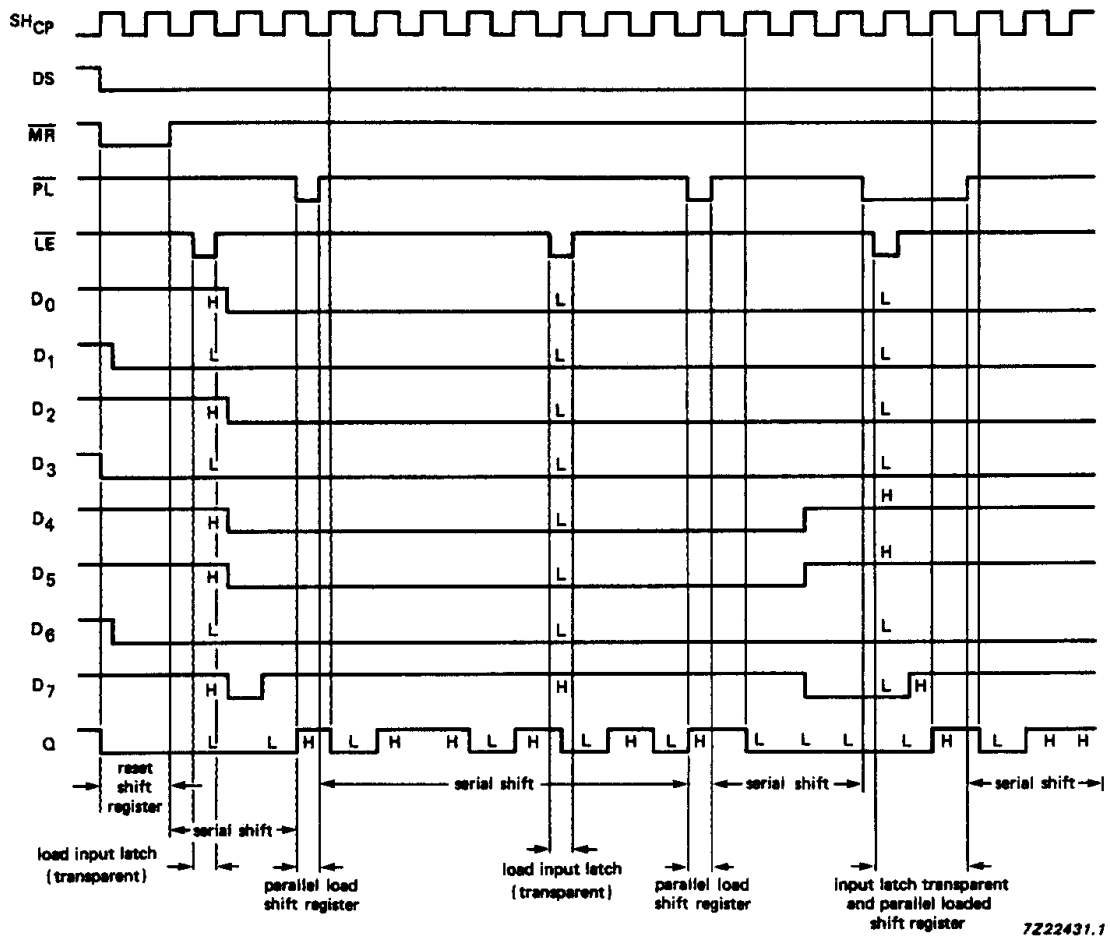


Fig.6 Timing diagram.

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic 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 SH_{CP} to Q		50 18 14	175 35 30		220 44 37		265 53 45	ns	2.0 4.5 6.0	Fig.7
t_{PHL}	propagation delay $\overline{MR}$ to Q		52 19 15	175 35 30		220 44 37		265 53 45	ns	2.0 4.5 6.0	Fig.7
t_{PHL}/ t_{PLH}	propagation delay $\overline{LE}$ to Q		72 26 21	250 50 43		315 63 54		375 75 64	ns	2.0 4.5 6.0	Fig.7
t_{PHL}/ t_{PLH}	propagation delay $\overline{PL}$ to Q		63 23 18	190 38 32		240 48 41		285 57 48	ns	2.0 4.5 6.0	Fig.7
t_{PHL}/ t_{PLH}	propagation delay D_7 to Q		63 23 18	190 38 32		240 48 41		285 57 48	ns	2.0 4.5 6.0	Fig.7
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	Fig.7
t_W	SH_{CP} pulse width HIGH or LOW	80 16 14	11 4 3		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_W	$\overline{LE}$ pulse width LOW	80 16 14	11 4 3		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_W	$\overline{MR}$ pulse width LOW	80 16 14	17 6 5		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_W	$\overline{PL}$ pulse width LOW	80 16 14	17 6 5		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_{rem}	removal time $\overline{MR}$ to SH_{CP}	50 10 9	−3 −1 −1		65 13 11		75 15 13		ns	2.0 4.5 6.0	Fig.7

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_{rem}	removal time $\overline{MR}$ to $\overline{PL}$	100 20 17	22 8 6		125 25 21		150 30 26		ns	2.0 4.5 6.0	Fig.7
t_{su}	set-up time D_n to $\overline{LE}$	80 16 14	6 2 2		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_{su}	set-up time D_S to SH_{CP}	80 16 14	11 4 3		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_{su}	set-up time $\overline{PL}$ to SH_{CP}	80 16 14	8 3 2		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_h	hold time D_n to $\overline{LE}$	4 4 4	−3 −1 −1		4 4 4		4 4 4		ns	2.0 4.5 6.0	Fig.7
t_h	hold time D_S to SH_{CP}	2 2 2	−8 −3 −2		2 2 2		2 2 2		ns	2.0 4.5 6.0	Fig.7
t_h	hold time $\overline{PL}$ to SH_{CP}	2 2 2	−8 −3 −2		2 2 2		2 2 2		ns	2.0 4.5 6.0	Fig.7
f_{max}	maximum pulse frequency SH_{CP}	6.0 30 35	30 90 107		4.8 24 28		4.0 20 24		MHz	2.0 4.5 6.0	Fig.7

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic 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
D_S	0.25
D_n	0.40
$\overline{PL}$, $\overline{MR}$	1.50
$\overline{LE}$, SH_{CP}	1.50

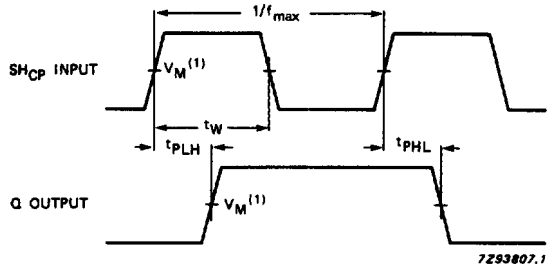
AC CHARACTERISTICS FOR 74HCT

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 SH_{CP} to Q		20	35		44		53	ns	4.5	Fig.7
t_{PHL}	propagation delay $\overline{MR}$ to Q		25	42		53		63	ns	4.5	Fig.7
t_{PHL}/ t_{PLH}	propagation delay $\overline{LE}$ to Q		31	53		66		80	ns	4.5	Fig.7
t_{PHL}/ t_{PLH}	propagation delay $\overline{PL}$ to Q		27	46		58		69	ns	4.5	Fig.7
t_{PHL}/ t_{PLH}	propagation delay D_7 to Q		28	49		61		74	ns	4.5	Fig.7
t_{THL}/ t_{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.7
t_W	SH_{CP} pulse width HIGH or LOW	16	6		20		24		ns	4.5	Fig.7
t_W	$\overline{LE}$ pulse width LOW	16	7		20		24		ns	4.5	Fig.7
t_W	$\overline{MR}$ pulse width LOW	20	11		25		30		ns	4.5	Fig.7
t_W	$\overline{PL}$ pulse width LOW	18	9		23		27		ns	4.5	Fig.7
t_{rem}	removal time $\overline{MR}$ to SH_{CP}	10	–1		13		15		ns	4.5	Fig.7
t_{rem}	removal time $\overline{MR}$ to $\overline{PL}$	20	9		25		30		ns	4.5	Fig.7

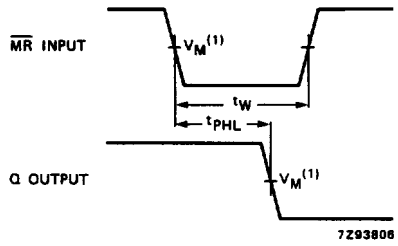
SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{su}	set-up time D_n to $\overline{LE}$	16	5		20		24		ns	4.5	Fig.7
t_{su}	set-up time D_S to SH_{CP}	16	5		20		24		ns	4.5	Fig.7
t_{su}	set-up time $\overline{PL}$ to SH_{CP}	16	3		20		24		ns	4.5	Fig.7
t_h	hold time D_n to $\overline{LE}$	4	−2		4		4		ns	4.5	Fig.7
t_h	hold time D_S to SH_{CP}	2	−4		2		2		ns	4.5	Fig.7
t_h	hold time $\overline{PL}$ to SH_{CP}	2	−3		2		2		ns	4.5	Fig.7
f_{max}	maximum pulse frequency SH_{CP}	30	72		24		20		MHz	4.5	Fig.7

AC WAVEFORMS



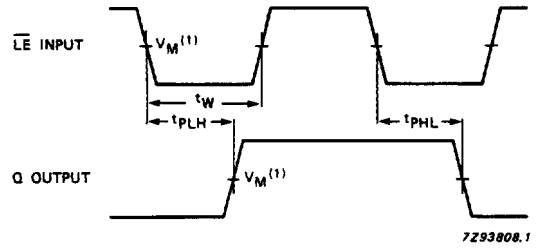
(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.7 Waveforms showing the SH_{CP} input to Q output propagation delays, the SH_{CP} pulse width and maximum clock pulse frequency.



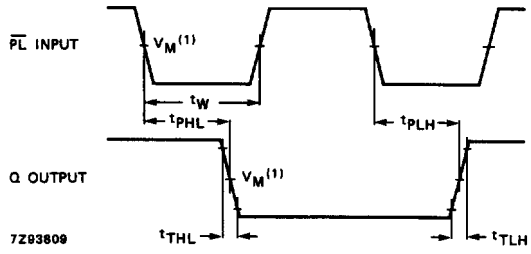
(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.8 Waveforms showing the $\overline{MR}$ input to Q output propagation delay and the $\overline{MR}$ pulse width.



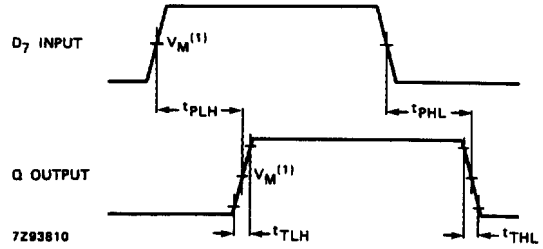
(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.9 Waveforms showing the $\overline{LE}$ input to Q output propagation delays and the $\overline{LE}$ pulse width.



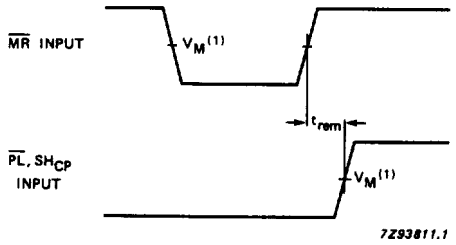
(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.10 Waveforms showing the $\overline{PL}$ input to Q output propagation delays, $\overline{PL}$ pulse width and output transition times.



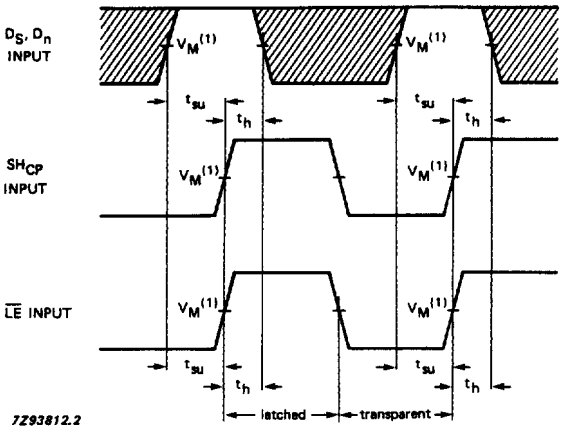
(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.11 Waveforms showing the D_7 input to Q output propagation delays and output transition times.



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

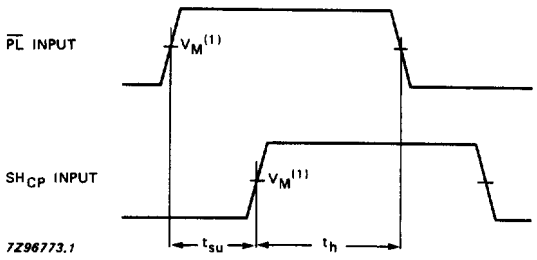
Fig.12 Waveforms showing the $\overline{MR}$ input to $\overline{PL}$, SH_{CP} removal times.



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.13 Waveforms showing hold and set-up times for D_S, D_n inputs to SH_{CP}, $\overline{LE}$ inputs.



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

Fig.14 Waveforms showing set-up and hold times for $\overline{PL}$ input to SH_{CP} input.

PACKAGE OUTLINES

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