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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/HCT4514
4-to-16 line decoder/demultiplexer with input latches

Product specification
File under Integrated Circuits, IC06

September 1993

Philips Semiconductors

PHILIPS

4-to-16 line decoder/demultiplexer with input latches

74HC/HCT4514

FEATURES

- Non-inverting outputs
- Output capability: standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT4514 are high-speed Si-gate CMOS devices and are pin compatible with "4514" of the "4000B" series. They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT4514 are 4-to-16 line decoders/demultiplexers having four binary weighted address inputs (A_0 to A_3), with latches, a latch enable input (LE), and an active LOW enable input ($\overline{E}$). The 16 outputs (Q_0 to Q_{15}) are mutually exclusive active HIGH. When LE is HIGH, the selected output is determined by the data on A_n. When LE goes LOW, the last data present at A_n are stored in the latches and the outputs remain stable. When $\overline{E}$ is LOW, the selected output, determined by the contents of the latch, is HIGH. At $\overline{E}$ HIGH, all outputs are LOW. The enable input ($\overline{E}$) does not affect the state of the latch.

When the "4514" is used as a demultiplexer, $\overline{E}$ is the data input and A_0 to A_3 are the address 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 A_n to Q_n	C_L = 15 pF; V_{CC} = 5 V	23	26	ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per package	notes 1 and 2	44	45	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	LE	latch enable input (active HIGH)
2, 3, 21, 22	A_0 to A_3	address inputs
11, 9, 10, 8, 7, 6, 5, 4, 18, 17, 20, 19, 14, 13, 16, 15	Q_0 to Q_{15}	multiplexer outputs (active HIGH)
12	GND	ground (0 V)
23	$\overline{E}$	enable input (active LOW)
24	V_{CC}	positive supply voltage

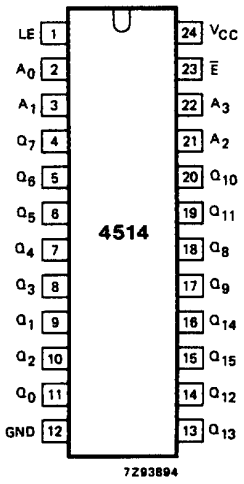

Fig.1 Pin configuration.

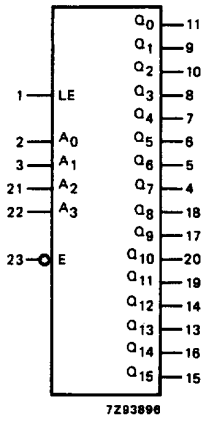

Fig.2 Logic symbol.

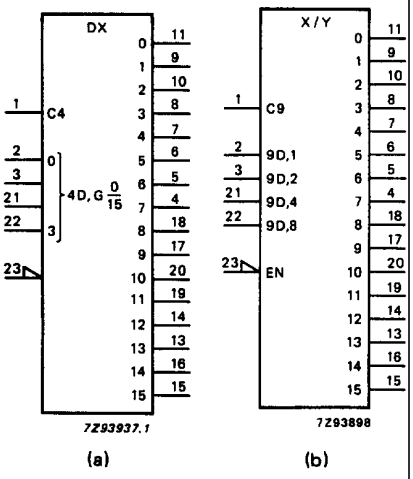

Fig.3 IEC logic symbol.

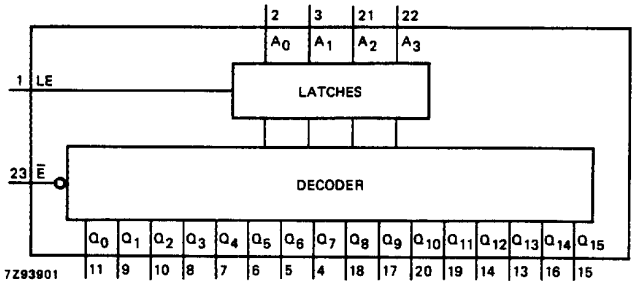

Fig.4 Functional diagram.

APPLICATIONS

- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding

FUNCTION TABLE

INPUTS					OUTPUTS														
$\overline{E}$	A_0	A_1	A_2	A_3	Q_0	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7	Q_8	Q_9	Q_{10}	Q_{11}	Q_{12}	Q_{13}	Q_{14}	Q_{15}
H	X	X	X	X	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L
L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L
L	L	H	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L
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L	L	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L
L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H

Notes

1. LE = HIGH
   H = HIGH voltage level
   L = LOW voltage level
   X = don't care

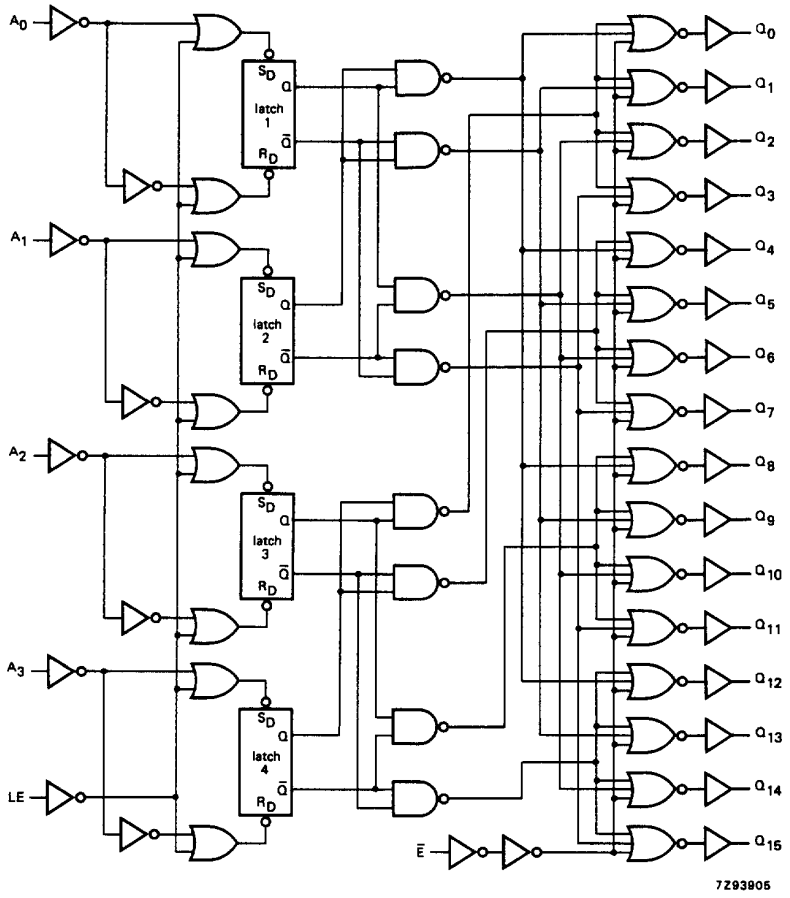


Fig.5 Logic diagram.

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 A_n to Q_n		74 27 22	230 46 39		290 58 49		345 69 59	ns	2.0 4.5 6.0	Fig.6
t_{PHL}/ t_{PLH}	propagation delay LE to Q_n		74 27 22	230 46 39		290 58 49		345 69 59	ns	2.0 4.5 6.0	Fig.6
t_{PHL}/ t_{PLH}	propagation delay $\overline{E}$ to Q_n		41 15 12	175 35 30		220 44 37		265 53 45	ns	2.0 4.5 6.0	Fig.6
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.6
t_W	latch enable pulse width HIGH	80 16 14	14 5 4		100 20 17		120 24 20		ns	2.0 4.5 6.0	Fig.7
t_{su}	set-up time A_n to LE	90 18 15	25 9 7		115 23 20		135 27 23		ns	2.0 4.5 6.0	Fig.7
t_h	hold time A_n to LE	1 1 1	−11 −4 −3		1 1 1		1 1 1		ns	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.

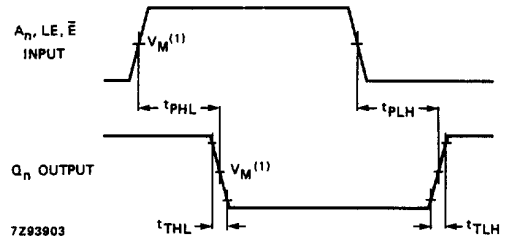
INPUT	UNIT LOAD COEFFICIENT
A_n	0.65
LE	1.40
$\overline{E}$	1.00

AC CHARACTERISTICS FOR 74HCT

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

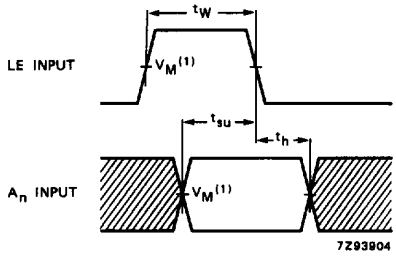
SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay A_n to Q_n		30	55		69		83	ns	4.5	Fig.6
t_{PHL}/ t_{PLH}	propagation delay LE to Q_n		29	50		63		75	ns	4.5	Fig.6
t_{PHL}/ t_{PLH}	propagation delay $\overline{E}$ to Q_n		17	40		50		60	ns	4.5	Fig.6
t_{THL}/ t_{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.6
t_W	latch enable pulse width HIGH	16	4		20		24		ns	4.5	Fig.7
t_{su}	set-up time A_n to LE	18	9		23		27		ns	4.5	Fig.7
t_h	hold time A_n to LE	3	−3		3		3		ns	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.6 Waveforms showing the input (A_n, LE, $\overline{E}$) to output (Q_n) propagation delays and the output transition 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.7 Waveforms showing the minimum pulse width of the latch enable input (LE) and the set-up and hold times for LE to A_n. Set-up and hold times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

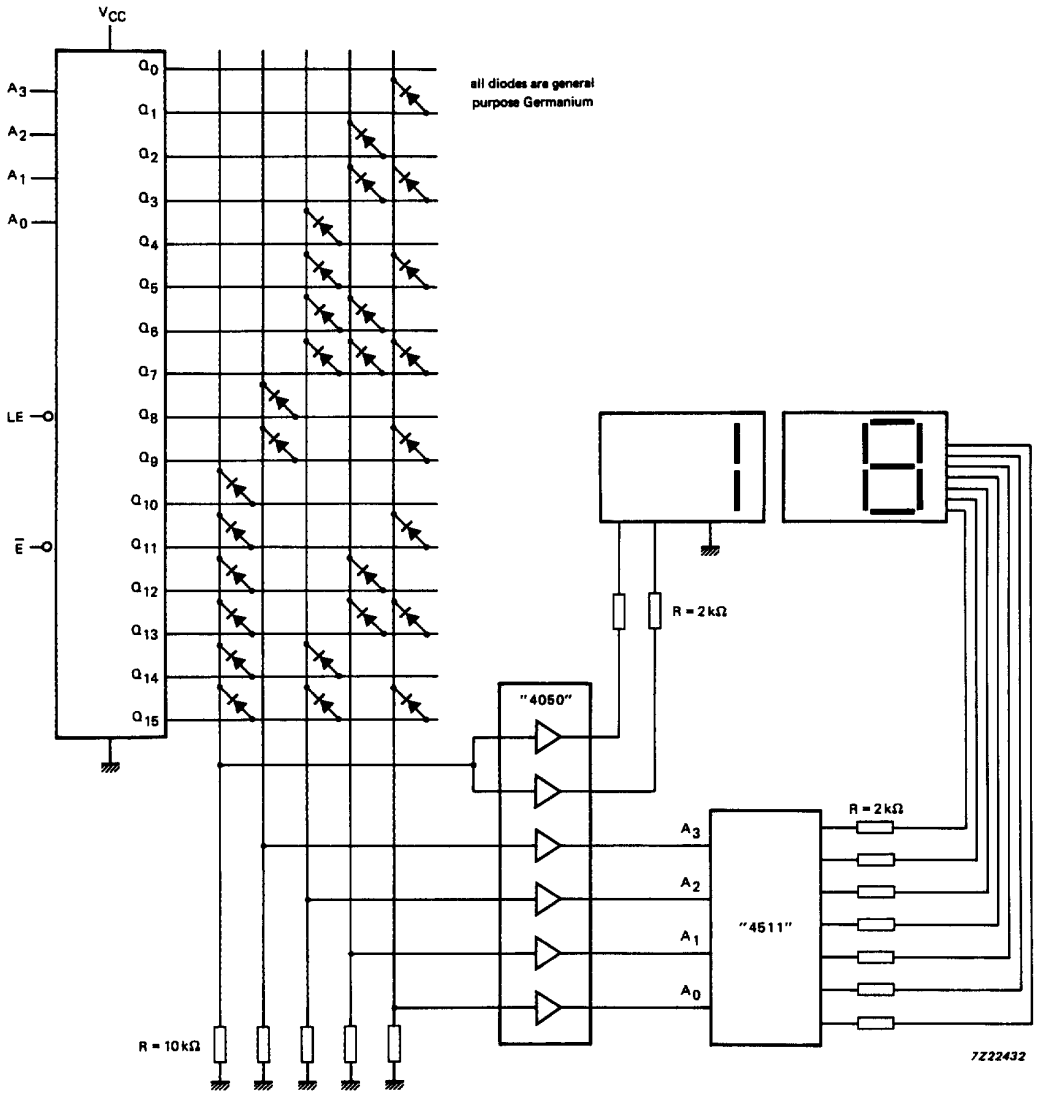


Fig.8 Code-to-code conversion; hexadecimal to BCD.

PACKAGE OUTLINES

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