

4-TO-16 LINE DECODER/DEMULTIPLEXER WITH INPUT LATCHES

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 (A₀ to A₃), with latches, a latch enable input (LE), and an active LOW enable input ($\bar{E}$). The 16 outputs (Q₀ to Q₁₅) 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 $\bar{E}$ is LOW, the selected output, determined by the contents of the latch, is HIGH. At $\bar{E}$ HIGH, all outputs are LOW. The enable input ($\bar{E}$) does not affect the state of the latch.

When the "4514" is used as a demultiplexer, $\bar{E}$ is the data input and A₀ to A₃ are the address inputs.

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

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 μ W):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f_i = input frequency in MHz

C_L = output load capacitance in pF

f_o = output frequency in MHz

V_{CC} = supply voltage in V

$\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

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

24-lead DIL; plastic (SOT101A).

24-lead mini-pack; plastic (SO24; SOT137A).

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	$\bar{E}$	enable input (active LOW)
24	V _{CC}	positive supply voltage

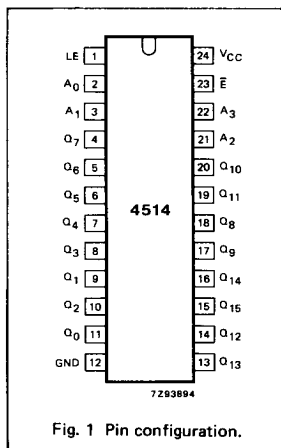


Fig. 1 Pin configuration.

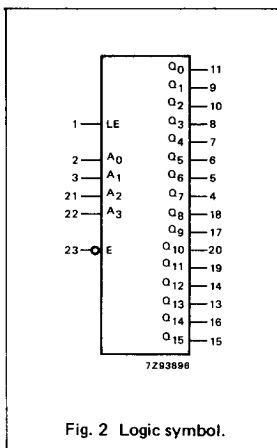


Fig. 2 Logic symbol.

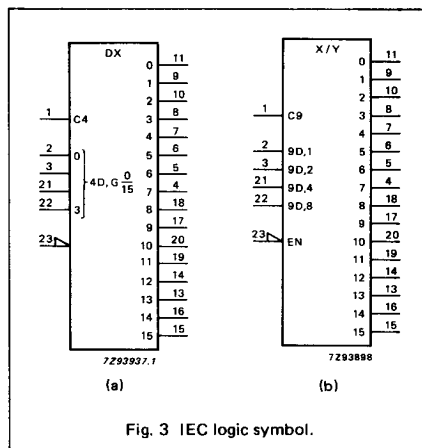
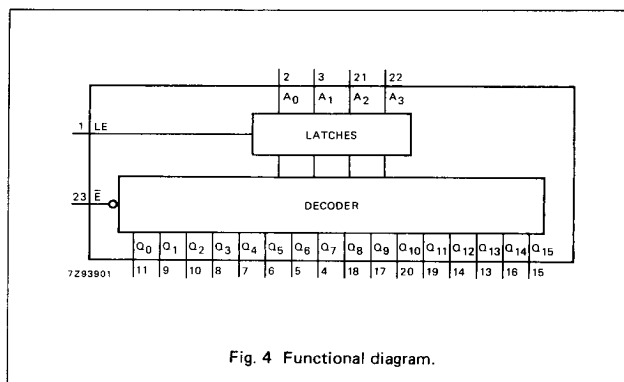


Fig. 3 IEC logic symbol.



APPLICATIONS

- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding

FUNCTION TABLE

INPUTS					OUTPUTS																
$\bar{E}$	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	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	

LE = HIGH

H = HIGH voltage level

L = LOW voltage level

X = don't care

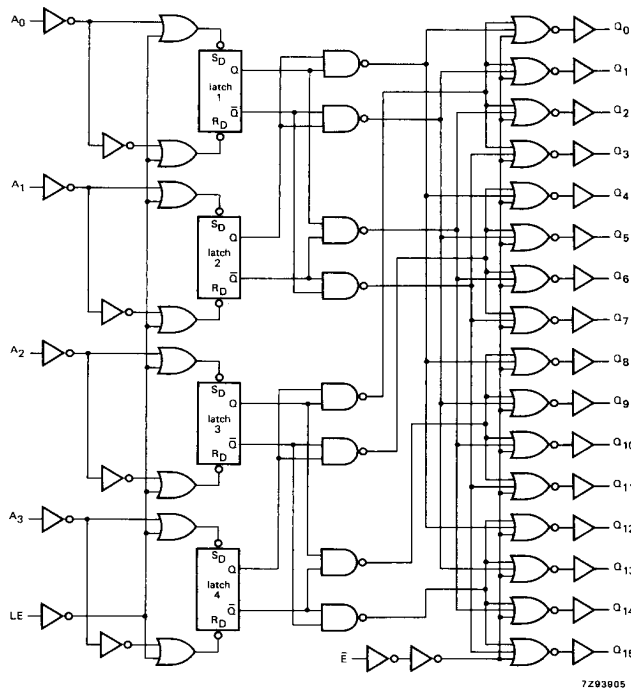


Fig. 5 Logic diagram.

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see 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 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 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 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.

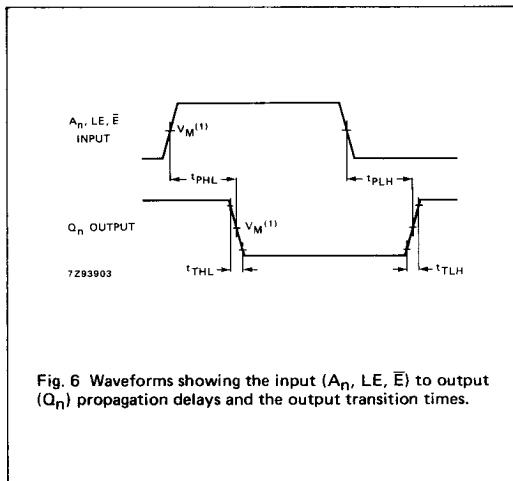
INPUT	UNIT LOAD COEFFICIENT
A _n	0.65
LE	1.40
E	1.00

AC CHARACTERISTICS FOR 74HCT

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

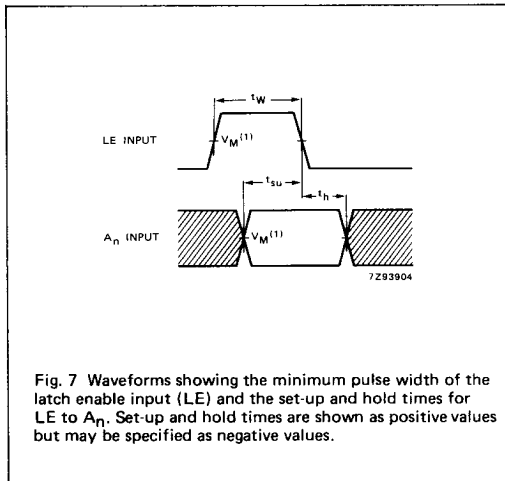
SYMBOL	PARAMETER	T _{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V _{CC} V	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t _{PHL} / t _{PLH}	propagation delay A _n to Q _n		30	55		69		83	ns	4.5	Fig. 6
t _{PHL} / t _{PLH}	propagation delay LE to Q _n		29	50		63		75	ns	4.5	Fig. 6
t _{PHL} / t _{PLH}	propagation delay 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



Note to AC waveforms

- (1) HC : $V_M = 50\%$; $V_L = \text{GND to } V_{CC}$.
HCT: $V_M = 1.3 \text{ V}$; $V_L = \text{GND to } 3 \text{ V}$.



Note to Fig. 7

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

APPLICATION INFORMATION

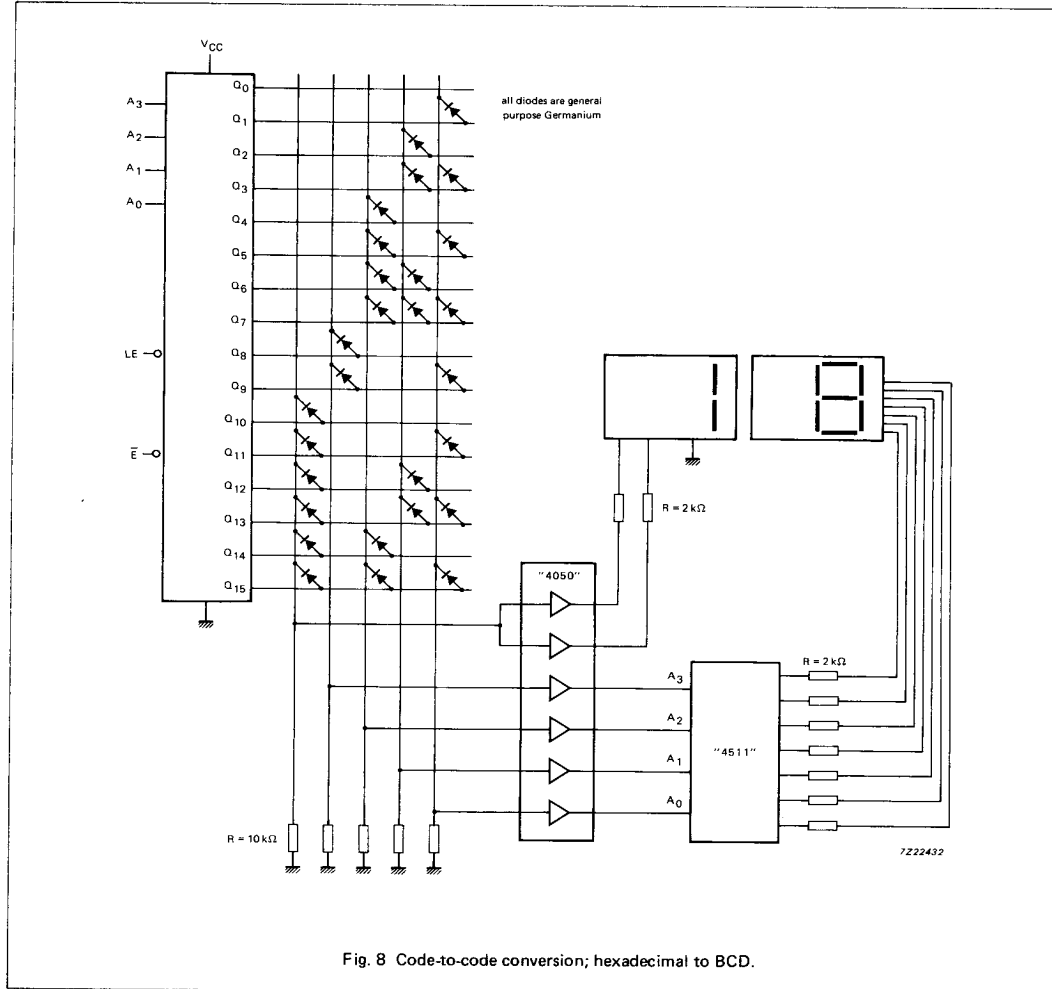


Fig. 8 Code-to-code conversion; hexadecimal to BCD.