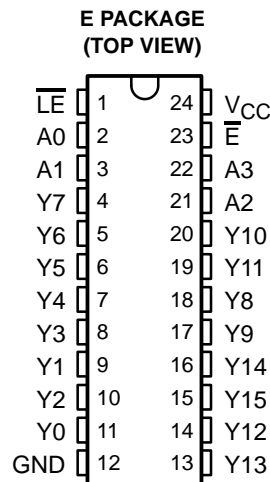


# CD74HCT4514, CD74HCT4515 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS WITH INPUT LATCHES

SCHS314C – MAY 2002 – REVISED MAY 2003

- 4.5-V to 5.5-V  $V_{CC}$  Operation
- Fanout (Over Temperature Range)
  - Standard Outputs . . . 10 LSTTL Loads
  - Bus-Driver Outputs . . . 15 LSTTL Loads
- Wide Operating Temperature Range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- Balanced Propagation Delays and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- HCT Types
  - Direct LSTTL Input Logic Compatibility,  $V_{IL} = 0.8\text{ V (Max)}$ ,  $V_{IH} = 2\text{ V (Min)}$
  - CMOS Input Compatibility,  $I_I \leq 1\text{ }\mu\text{A}$  at  $V_{OL}$ ,  $V_{OH}$



## description/ordering information

The CD74HCT4514 and CD74HCT4515 are high-speed silicon-gate devices consisting of a 4-bit strobed latch and a 4-line to 16-line decoder. The selected output is enabled by a low on the enable ( $\overline{E}$ ) input. A high on  $\overline{E}$  inhibits selection of any output. Demultiplexing is accomplished by using  $\overline{E}$  as the data input and the select inputs (A0–A3) as addresses.  $\overline{E}$  also serves as a chip select when these devices are cascaded.

When the latch enable ( $\overline{LE}$ ) is high, the output follows changes in the inputs (see decode function table). When  $\overline{LE}$  is low, the output is isolated from changes in the input and remains at the level (high for the '4514, low for the '4515) it had before the latch was enabled.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
$-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$	PDIP – E	Tube	CD74HCT4514E	CD74HCT4514E
			CD74HCT4515E	CD74HCT4515E

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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CD74HCT4514, CD74HCT4515  
 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS  
 WITH INPUT LATCHES

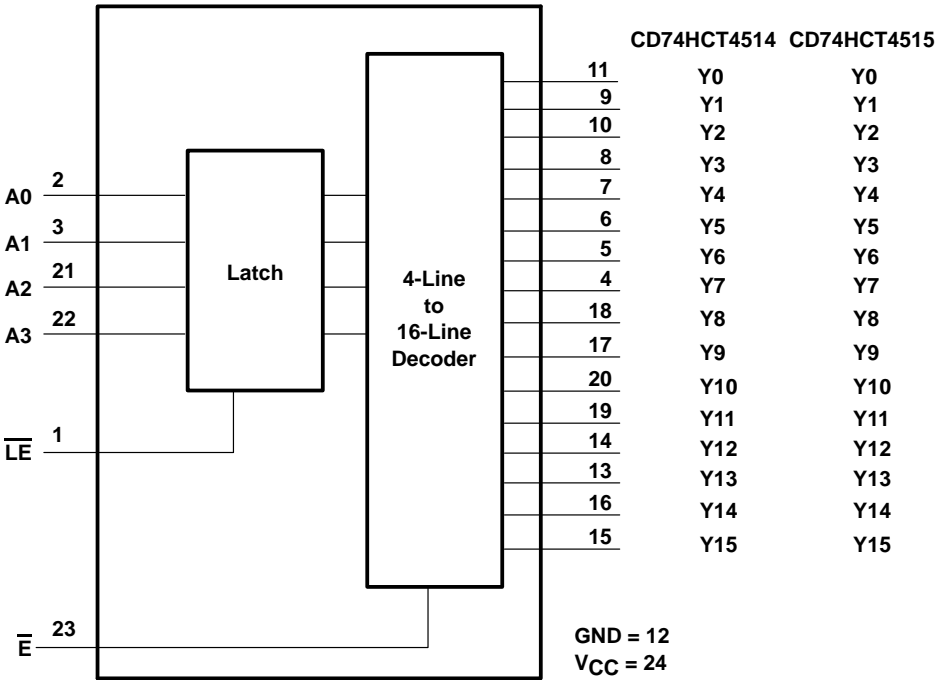
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DECODE FUNCTION TABLE  
 ( $\overline{LE}$  = H)

$\overline{E}$	DECODER INPUTS				ADDRESSED OUTPUT CD74HCT4514 = H CD74HCT4515 = L
	A3	A2	A1	A0	
L	L	L	L	L	Y0
L	L	L	L	H	Y1
L	L	L	H	L	Y2
L	L	L	H	H	Y3
L	L	H	L	L	Y4
L	L	H	L	H	Y5
L	L	H	H	L	Y6
L	L	H	H	H	Y7
L	H	L	L	L	Y8
L	H	L	L	H	Y9
L	H	L	H	L	Y10
L	H	L	H	H	Y11
L	H	H	L	L	Y12
L	H	H	L	H	Y13
L	H	H	H	L	Y14
L	H	H	H	H	Y15
H	X	X	X	X	All outputs = L, CD74HCT4514 All outputs = H, CD74HCT4515

H = high, L = low, X = don't care

logic diagram (positive logic)



# CD74HCT4514, CD74HCT4515

## 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS

### WITH INPUT LATCHES

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#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1)	±20 mA
Continuous output drain current per output, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous output source or sink current per output, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous current through $V_{CC}$ or GND	±50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2)	67°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	265°C
Storage temperature range, $T_{stg}$	–65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-3.

#### recommended operating conditions (see Note 3)

		$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO $125^\circ\text{C}$		$T_A = -40^\circ\text{C}$ TO $85^\circ\text{C}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5	4.5	5.5	V
$V_{IH}$	High-level input voltage	2		2		2		V
$V_{IL}$	Low-level input voltage		0.8		0.8		0.8	V
$V_I$	Input voltage	0	$V_{CC}$	0	$V_{CC}$	0	$V_{CC}$	V
$V_O$	Output voltage	0	$V_{CC}$	0	$V_{CC}$	0	$V_{CC}$	V
$\Delta t/\Delta v$	Input transition rise or fall rate		500		500		500	ns

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

#### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		$V_{CC}$	$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO $125^\circ\text{C}$		$T_A = -40^\circ\text{C}$ TO $85^\circ\text{C}$		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\ \mu\text{A}$	4.5 V	4.4		4.4		4.4		V
		$I_{OH} = -4\ \text{mA}$		3.98		3.7		3.84		
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\ \mu\text{A}$	4.5 V		0.1		0.1		0.1	V
		$I_{OL} = 4\ \text{mA}$			0.26		0.4		0.33	
$I_I$	$V_I = V_{CC}$ or 0		5.5 V		±0.1		±1		±1	μA
$I_{CC}$	$V_I = V_{CC}$ or 0, $I_O = 0$		5.5 V		8		160		80	μA
$\Delta I_{CC}^\ddagger$	One input at $V_{CC} - 2.1\ \text{V}$ , Other inputs at 0 or $V_{CC}$		4.5 V to 5.5 V		360		490		450	μA
$C_i$					10		10		10	pF

‡ Additional quiescent supply current per input pin, TTL inputs high, 1 unit load. For dual-supply systems, theoretical worst-case ( $V_I = 2.4\ \text{V}$ ,  $V_{CC} = 5.5\ \text{V}$ ) specification is 1.8 mA.

# CD74HCT4514, CD74HCT4515

## 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS

### WITH INPUT LATCHES

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HCT INPUT LOADING TABLE

INPUT	UNIT LOAD
A0–A3	0.15
$\overline{\text{LE}}$	0.85
$\overline{\text{E}}$	0.3

Unit load is  $\Delta I_{CC}$  limit specified in electrical characteristics table (e.g., 360  $\mu\text{A}$  max at 25°C).

timing requirements over recommended operating free-air temperature range,  $V_{CC} = 4.5\text{ V}$ ,  $C_L = 15\text{ pF}$  (unless otherwise noted) (see Figure 1)

		$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO $125^\circ\text{C}$		$T_A = -40^\circ\text{C}$ TO $85^\circ\text{C}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$t_w$	Pulse duration, $\overline{\text{LE}}$ high	30		45		38		ns
$t_{su}$	Setup time, data before $\overline{\text{LE}}\downarrow$	20		30		25		ns
$t_h$	Hold time, data after $\overline{\text{LE}}\downarrow$	5		5		5		ns

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 4.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T <sub>A</sub> = 25°C		T <sub>A</sub> = −55°C TO 125°C		T <sub>A</sub> = −40°C TO 85°C		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A0–A3	Y	C <sub>L</sub> = 50 pF	55		83		69		ns
	$\overline{\text{LE}}$			50		75		63		
	$\overline{\text{E}}$			40		60		50		
t <sub>t</sub>		Y	C <sub>L</sub> = 50 pF	15		22		19		ns

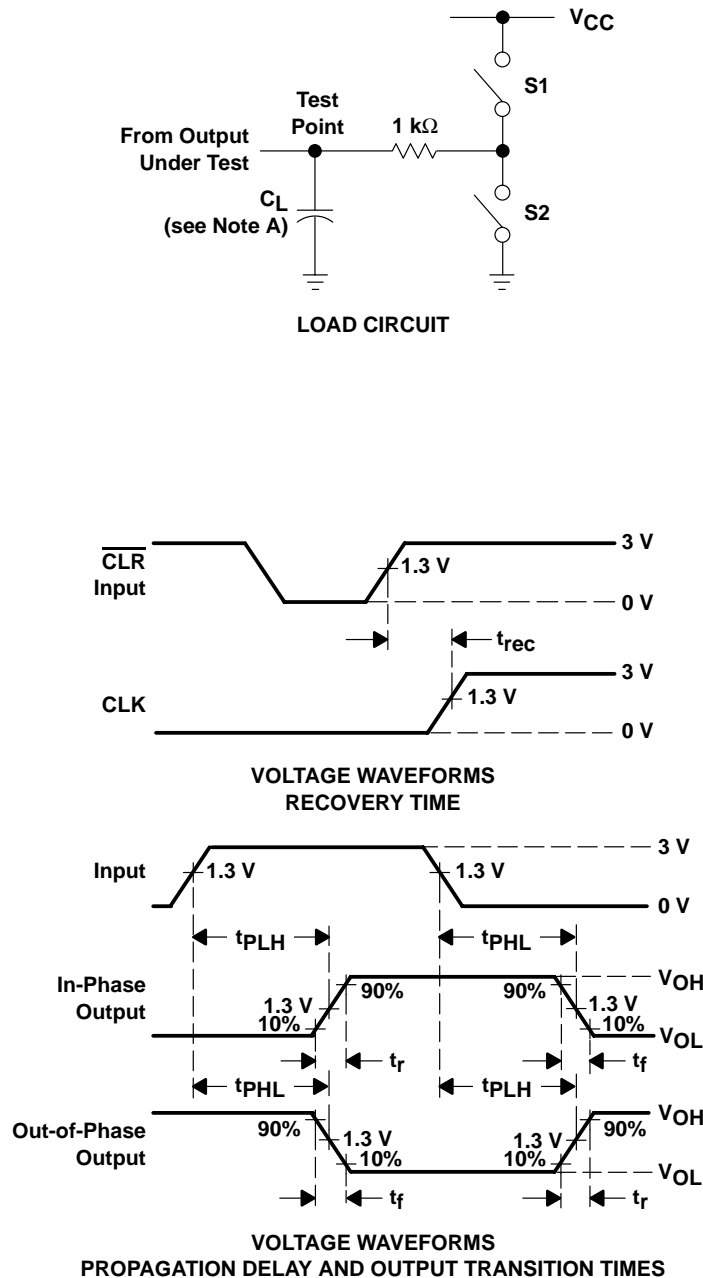
operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	75	pF

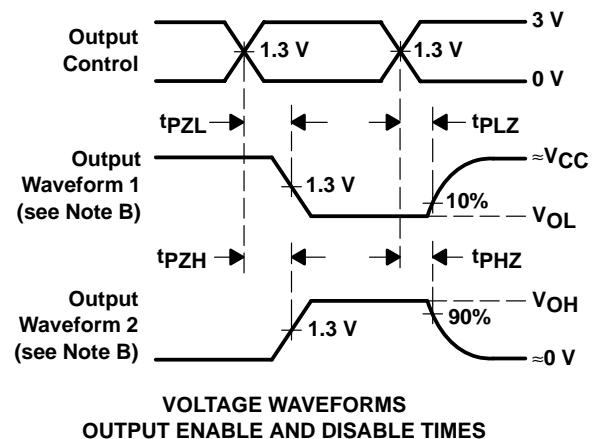
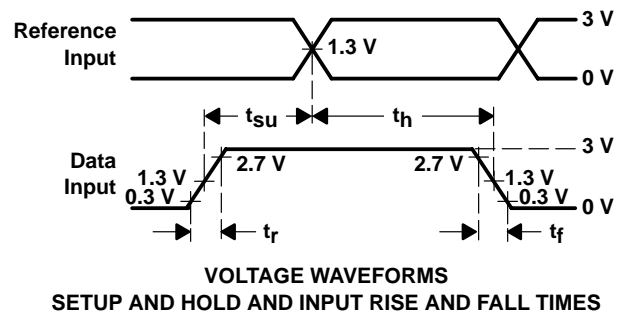
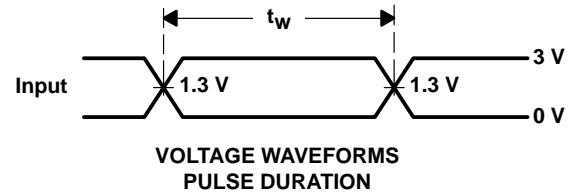
# CD74HCT4514, CD74HCT4515 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS WITH INPUT LATCHES

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## PARAMETER MEASUREMENT INFORMATION



PARAMETER		S1	S2
t <sub>en</sub>	t <sub>pZH</sub>	Open	Closed
	t <sub>pZL</sub>	Closed	Open
t <sub>dis</sub>	t <sub>PHZ</sub>	Open	Closed
	t <sub>PLZ</sub>	Closed	Open
t <sub>pd</sub> or t <sub>t</sub>		Open	Open

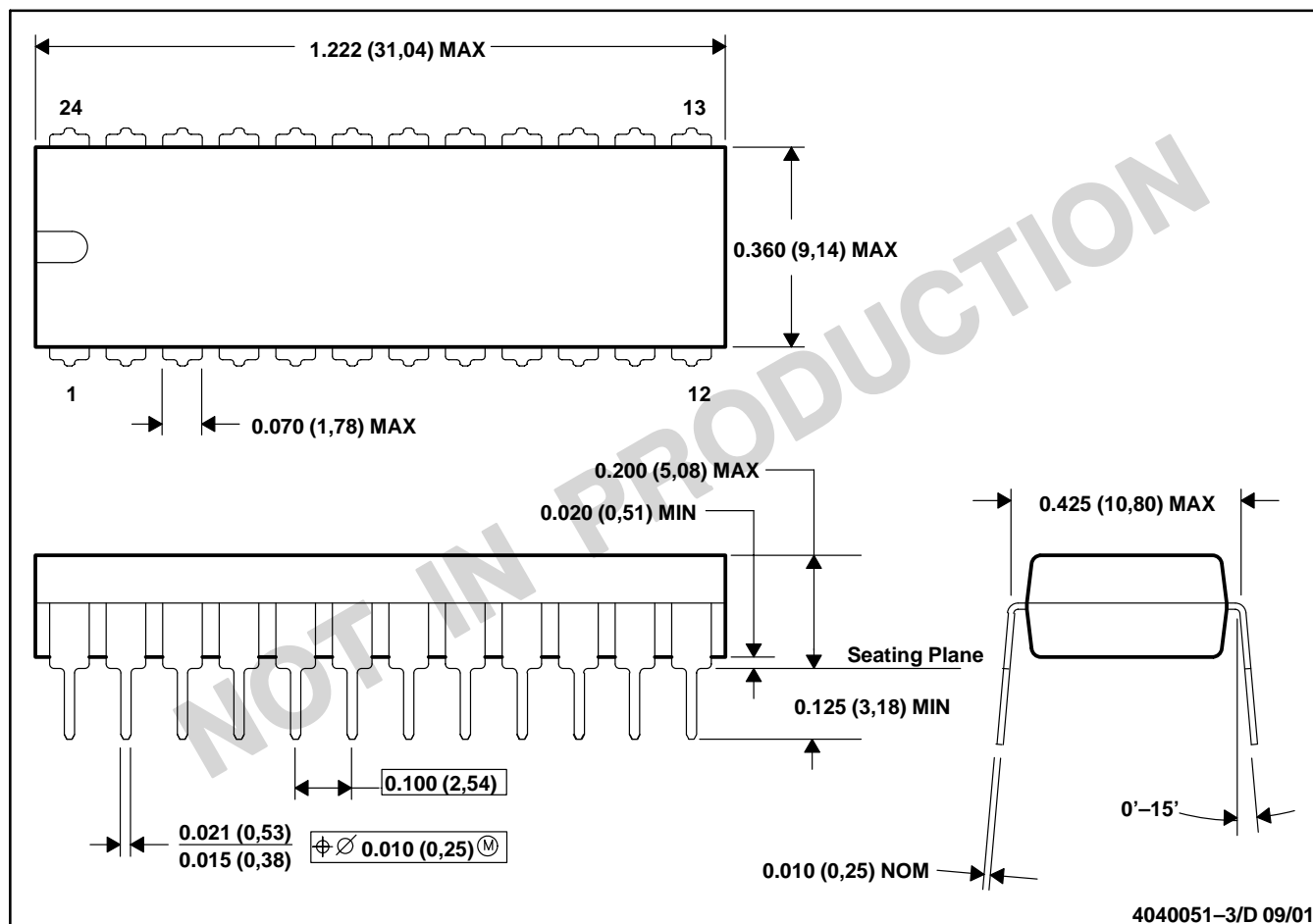


- NOTES:
- C<sub>L</sub> includes probe and test-fixture capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z<sub>O</sub> = 50 Ω, t<sub>r</sub> = 6 ns, t<sub>f</sub> = 6 ns.
  - For clock inputs, f<sub>max</sub> is measured with the input duty cycle at 50%.
  - The outputs are measured one at a time with one input transition per measurement.
  - t<sub>pLZ</sub> and t<sub>pHZ</sub> are the same as t<sub>dis</sub>.
  - t<sub>pZL</sub> and t<sub>pZH</sub> are the same as t<sub>en</sub>.
  - t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>pd</sub>.

Figure 1. Load Circuit and Voltage Waveforms

N (R-PDIP-T24)

PLASTIC DUAL-IN-LINE



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-010

## PLASTIC DUAL-IN-LINE PACKAGE

**PINS \*\***

DIM \ PINS **	24	28	32	40	48	52
A MAX	1.270 (32,26)	1.450 (36,83)	1.650 (41,91)	2.090 (53,09)	2.450 (62,23)	2.650 (67,31)
A MIN	1.230 (31,24)	1.410 (35,81)	1.610 (40,89)	2.040 (51,82)	2.390 (60,71)	2.590 (65,79)

**4040053/B 04/95**

- NOTES: A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.  
C. Falls within JEDEC MS-011  
D. Falls within JEDEC MS-015 (32 pin only)

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