

# CD74HC151, CD74HCT151

## High Speed CMOS Logic 8-Input Multiplexer

September 1997

### Features

- Complementary Data Outputs
- Buffered inputs and Outputs
- Fanout (Over Temperature Range)
  - Standard Outputs ..... 10 LSTTL Loads
  - Bus Driver Outputs ..... 15 LSTTL Loads
- Wide Operating Temperature Range ... -55°C to 125°C
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- Alternate Source is Philips/Signetics
- HC Types
  - 2V to 6V Operation
  - High Noise Immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5V$
- HCT Types
  - 4.5V to 5.5V Operation
  - Direct LSTTL Input Logic Compatibility,  $V_{IL} = 0.8V$  (Max),  $V_{IH} = 2V$  (Min)
  - CMOS Input Compatibility,  $I_I \leq 1\mu A$  at  $V_{OL}$ ,  $V_{OH}$

### Description

The Harris CD74HC151 and CD74HCT151 are single 8-channel digital multiplexers having three binary control inputs, S0, S1 and S2 and an active low enable (E) input. The three binary signals select 1 of 8 channels. Outputs are both inverting ( $\bar{Y}$ ) and non-inverting (Y).

### Ordering Information

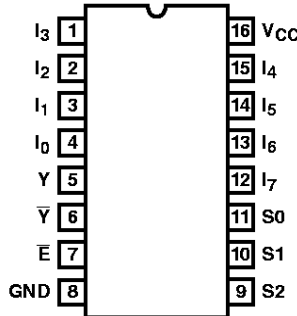
PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
CD74HC151E	-55 to 125	16 Ld PDIP	E16.3
CD74HCT151E	-55 to 125	16 Ld PDIP	E16.3
CD74HC151M	-55 to 125	16 Ld SOIC	M16.15
CD74HCT151M	-55 to 125	16 Ld SOIC	M16.15

#### NOTES:

1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Wafer or die for this part number is available which meets all electrical specifications. Please contact your local sales office or Harris customer service for ordering information.

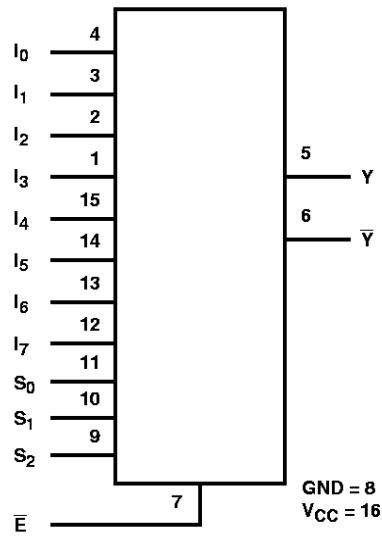
### Pinout

CD74HC151, CD74HCT151  
(PDIP, SOIC)  
TOP VIEW



# CD74HC151, CD74HCT151

## Functional Diagram



TRUTH TABLE

SELECT INPUTS			DATA INPUTS								ENABLE	OUTPUT	
S <sub>2</sub>	S <sub>1</sub>	S <sub>0</sub>	I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	I <sub>5</sub>	I <sub>6</sub>	I <sub>7</sub>	E <sub>bar</sub>	Y <sub>bar</sub>	Y
X	X	X	X	X	X	X	X	X	X	X	H	H	L
L	L	L	L	X	X	X	X	X	X	X	L	H	L
L	L	L	H	X	X	X	X	X	X	X	L	L	H
L	L	H	X	L	X	X	X	X	X	X	L	H	L
L	L	H	X	H	X	X	X	X	X	X	L	L	H
L	H	L	X	X	L	X	X	X	X	X	L	H	L
L	H	L	X	X	H	X	X	X	X	X	L	L	H
L	H	H	X	X	X	L	X	X	X	X	L	H	L
L	H	H	X	X	X	H	X	X	X	X	L	L	H
H	L	L	X	X	X	X	L	X	X	X	L	H	L
H	L	L	X	X	X	X	H	X	X	X	L	L	H
H	L	H	X	X	X	X	X	L	X	X	L	H	L
H	L	H	X	X	X	X	X	H	X	X	L	L	H
H	H	L	X	X	X	X	X	X	L	X	L	H	L
H	H	L	X	X	X	X	X	X	H	X	L	L	H
H	H	H	X	X	X	X	X	X	X	L	L	H	L
H	H	H	X	X	X	X	X	X	X	H	L	L	H

NOTE: H = High Voltage Level, L = Low Voltage Level, X = Don't Care

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## Absolute Maximum Ratings

DC Supply Voltage, $V_{CC}$ .....	-0.5V to 7V
DC Input Diode Current, $I_{IK}$	
For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$ .....	$\pm 20mA$
DC Output Diode Current, $I_{OK}$	
For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$ .....	$\pm 20mA$
DC Output Source or Sink Current per Output Pin, $I_O$	
For $V_O > -0.5V$ or $V_O < V_{CC} + 0.5V$ .....	$\pm 25mA$
DC $V_{CC}$ or Ground Current, $I_{CC}$ or $I_{GND}$ .....	$\pm 50mA$

## Thermal Information

Thermal Resistance (Typical, Note 3)	$\theta_{JA}$ (°C/W)
PDIP Package .....	90
SOIC Package .....	115
Maximum Junction Temperature .....	150°C
Maximum Storage Temperature Range .....	-65°C to 150°C
Maximum Lead Temperature (Soldering 10s) .....	300°C
(SOIC - Lead Tips Only)	

## Operating Conditions

Temperature Range ( $T_A$ ) .....	-55°C to 125°C
Supply Voltage Range, $V_{CC}$	
HC Types .....	2V to 6V
HCT Types .....	4.5V to 5.5V
DC Input or Output Voltage, $V_I$ , $V_O$ .....	0V to $V_{CC}$
Input Rise and Fall Time	
2V .....	1000ns (Max)
4.5V .....	500ns (Max)
6V .....	400ns (Max)

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.*

### NOTE:

- $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

## DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		$V_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		$V_I$ (V)	$I_O$ (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HC TYPES</b>												
High Level Input Voltage	$V_{IH}$	-	-	2	1.5	-	-	1.5	-	1.5	-	V
				4.5	3.15	-	-	3.15	-	3.15	-	V
				6	4.2	-	-	4.2	-	4.2	-	V
Low Level Input Voltage	$V_{IL}$	-	-	2	-	-	0.5	-	0.5	-	0.5	V
				4.5	-	-	1.35	-	1.35	-	1.35	V
				6	-	-	1.8	-	1.8	-	1.8	V
High Level Output Voltage CMOS Loads	$V_{OH}$	$V_{IH}$ or $V_{IL}$	-0.02	2	1.9	-	-	1.9	-	1.9	-	V
			-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
			-0.02	6	5.9	-	-	5.9	-	5.9	-	V
High Level Output Voltage TTL Loads	$V_{OH}$	$V_{IH}$ or $V_{IL}$	-	-	-	-	-	-	-	-	-	V
			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
			-5.2	6	5.48	-	-	5.34	-	5.2	-	V
Low Level Output Voltage CMOS Loads	$V_{OL}$	$V_{IH}$ or $V_{IL}$	0.02	2	-	-	0.1	-	0.1	-	0.1	V
			0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
			0.02	6	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads	$V_{OL}$	$V_{IH}$ or $V_{IL}$	-	-	-	-	-	-	-	-	-	V
			4	4.5	-	-	0.26	-	0.33	-	0.4	V
			5.2	6	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	$I_I$	$V_{CC}$ or GND	-	6	-	-	$\pm 0.1$	-	$\pm 1$	-	$\pm 1$	$\mu A$
Quiescent Device Current	$I_{CC}$	$V_{CC}$ or GND	0	6	-	-	8	-	80	-	160	$\mu A$

## CD74HC151, CD74HCT151

### DC Electrical Specifications (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS		V <sub>CC</sub> (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HCT TYPES</b>												
High Level Input Voltage	V <sub>IH</sub>	-	-	4.5 to 5.5	2	-	-	2	-	2	-	V
Low Level Input Voltage	V <sub>IL</sub>	-	-	4.5 to 5.5	-	-	0.8	-	0.8	-	0.8	V
High Level Output Voltage CMOS Loads	V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub>	-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
High Level Output Voltage TTL Loads			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
Low Level Output Voltage CMOS Loads	V <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub>	0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			4	4.5	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I <sub>I</sub>	V <sub>CC</sub> and GND	0	5.5	-	-	±0.1	-	±1	-	±1	μA
Quiescent Device Current	I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	-	-	8	-	80	-	160	μA
Additional Quiescent Device Current Per Input Pin: 1 Unit Load	ΔI <sub>CC</sub>	V <sub>CC</sub> -2.1	-	4.5 to 5.5	-	100	360	-	450	-	490	μA

NOTE: For dual-supply systems theoretical worst case (V<sub>I</sub> = 2.4V, V<sub>CC</sub> = 5.5V) specification is 1.8mA.

### HCT Input Loading Table

INPUT	UNIT LOADS
Select	1.5
Data	0.45
Enable	0.3

NOTE: Unit Load is ΔI<sub>CC</sub> limit specified in DC Electrical Table, e.g., 360μA max at 25°C.

### Switching Specifications Input t<sub>r</sub>, t<sub>f</sub> = 6ns

PARAMETER	SYMBOL	TEST CONDITIONS	V <sub>CC</sub> (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HC TYPES</b>											
Propagation Delay (Figure 1) Any Data Input to Y	t <sub>PLH</sub> , t <sub>PHL</sub>	C <sub>L</sub> = 50pF	2	-	-	170	-	215	-	255	ns
			4.5	-	-	34	-	43	-	51	ns
		C <sub>L</sub> = 15pF	5	-	14	-	-	-	-	-	ns
		C <sub>L</sub> = 50pF	6	-	-	29	-	37	-	43	ns

## CD74HC151, CD74HCT151

### Switching Specifications Input $t_r, t_f = 6\text{ns}$ (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS	$V_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Any Data Input to $\bar{Y}$	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	2	-	-	185	-	230	-	280	ns
			4.5	-	-	37	-	46	-	56	ns
		$C_L = 15\text{pF}$	5	-	15	-	-	-	-	-	ns
		$C_L = 50\text{pF}$	6	-	-	31	-	39	-	48	ns
Any Select to Y	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	2	-	-	185	-	230	-	280	ns
			4.5	-	-	37	-	46	-	56	ns
		$C_L = 15\text{pF}$	5	-	15	-	-	-	-	-	ns
		$C_L = 50\text{pF}$	6	-	-	31	-	39	-	48	ns
Any Select to $\bar{Y}$	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	2	-	-	205	-	255	-	310	ns
			4.5	-	-	41	-	51	-	62	ns
		$C_L = 15\text{pF}$	5	-	17	-	-	-	-	-	ns
		$C_L = 50\text{pF}$	6	-	-	35	-	43	-	53	ns
Enable to Y	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	2	-	-	140	-	175	-	210	ns
			4.5	-	-	28	-	35	-	42	ns
		$C_L = 15\text{pF}$	5	-	11	-	-	-	-	-	ns
		$C_L = 50\text{pF}$	6	-	-	24	-	30	-	36	ns
Enable to $\bar{Y}$	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	2	-	-	145	-	180	-	220	ns
			4.5	-	-	29	-	36	-	44	ns
		$C_L = 15\text{pF}$	5	-	12	-	-	-	-	-	ns
		$C_L = 50\text{pF}$	6	-	-	25	-	31	-	38	ns
Output Transition Time (Figure 1)	$t_{TLH}, t_{THL}$	$C_L = 50\text{pF}$	2	-	-	75	-	95	-	110	ns
			4.5	-	-	15	-	19	-	22	ns
			6	-	-	13	-	16	-	19	ns
Input Capacitance	$C_{IN}$	-	-	-	10	-	10	-	10	pF	
Power Dissipation Capacitance (Notes 4, 5)	$C_{PD}$	-	5	-	59	-	-	-	-	pF	

#### HCT TYPES

Propagation Delay (Figure 2) Any Data Input to Y	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	4.5	-	-	38	-	48	-	57	ns
		$C_L = 15\text{pF}$	5	-	16	-	-	-	-	-	ns
Any Data Input to $\bar{Y}$	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	4.5	-	-	36	-	45	-	54	ns
		$C_L = 15\text{pF}$	5	-	15	-	-	-	-	-	ns
Any Select to Y	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	4.5	-	-	41	-	51	-	62	ns
		$C_L = 15\text{pF}$	5	-	17	-	-	-	-	-	ns
Any Select to $\bar{Y}$	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	4.5	-	-	43	-	54	-	65	ns
		$C_L = 15\text{pF}$	5	-	18	-	-	-	-	-	ns
Enable to Y	$t_{PLH}, t_{PHL}$	$C_L = 50\text{pF}$	4.5	-	-	29	-	36	-	44	ns
		$C_L = 15\text{pF}$	5	-	12	-	-	-	-	-	ns

## CD74HC151, CD74HCT151

### Switching Specifications Input $t_r, t_f = 6\text{ns}$ (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS	$V_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Enable to $\bar{Y}$	$C_L = 50\text{pF}$	$C_L = 50\text{pF}$	4.5	-	-	36	-	46	-	54	ns
	$C_L = 15\text{pF}$	$C_L = 15\text{pF}$	5	15	-	-	-	-	-	-	ns
Output Transition Time	$t_{TLH}, t_{THL}$	$C_L = 50\text{pF}$	4.5	-	-	15	-	19	-	22	ns
Input Capacitance	$C_{IN}$	-	-	-	-	10	-	10	-	10	pF
Power Dissipation Capacitance (Notes 4, 5)	$C_{PD}$	-	5	-	58	-	-	-	-	-	pF

**NOTES:**

4.  $C_{PD}$  is used to determine the dynamic power consumption, per gate.
5.  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = input frequency,  $C_L$  = output load capacitance,  $V_{CC}$  = supply voltage.

### Test Circuit and Waveform

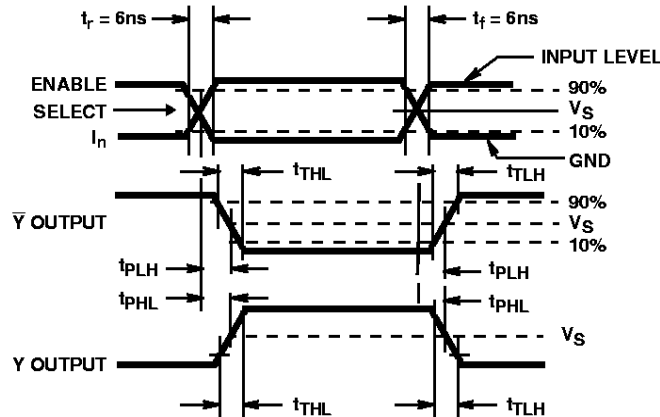


FIGURE 1.

All Harris Semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

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