

TTL/MSI 93150/54150, 74150 93151/54151, 74151 • 93152/54152, 74152

16-INPUT AND 8-INPUT MULTIPLEXER

DESCRIPTION – The 93150/54150, 74150 is a 16-Input Multiplexer which features active LOW strobe and internal select decoding. A HIGH at the strobe input forces the output HIGH regardless of input conditions.

The 93151/54151, 74151 is an 8-Input Multiplexer with active LOW strobe, internal select decoding and complementary outputs.

The 93152/54152, 74152 is an 8-Input Multiplexer with internal select decoding and a single inverted output.

In each of the multiplexers data is routed from a particular input to the output according to the binary code applied to the select inputs.

Typical power dissipations are: 93150/54150, 74150 – 200 mW; 93151/54151, 74151 – 145 mW; 93152/54152, 74152 – 130 mW.

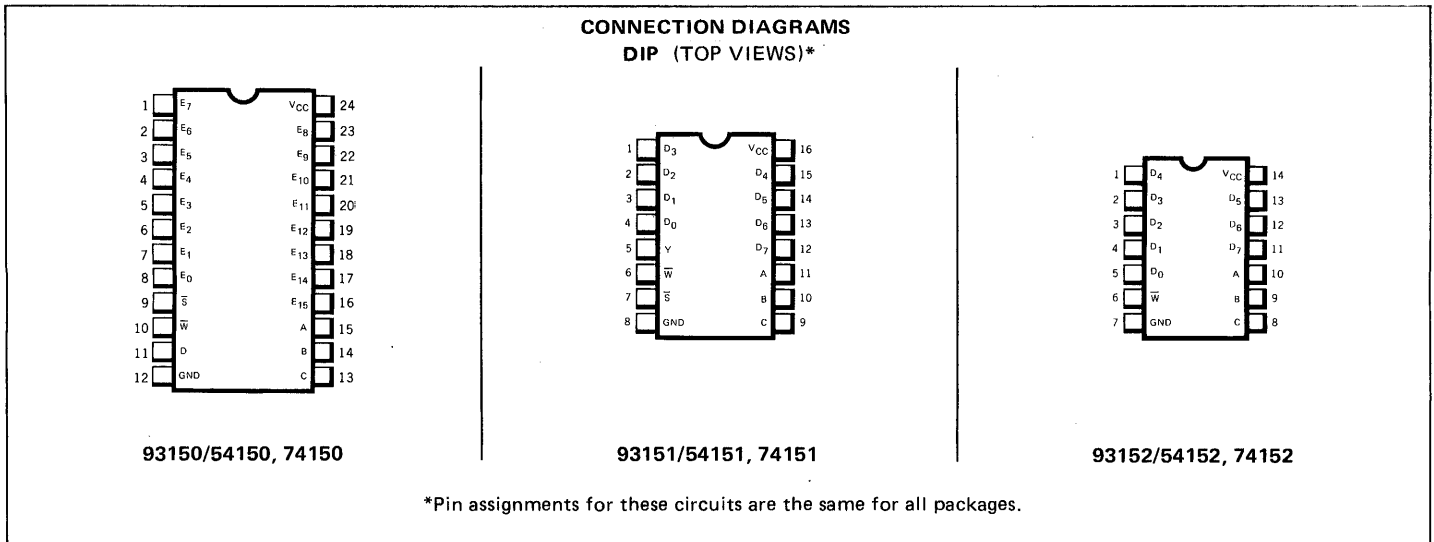
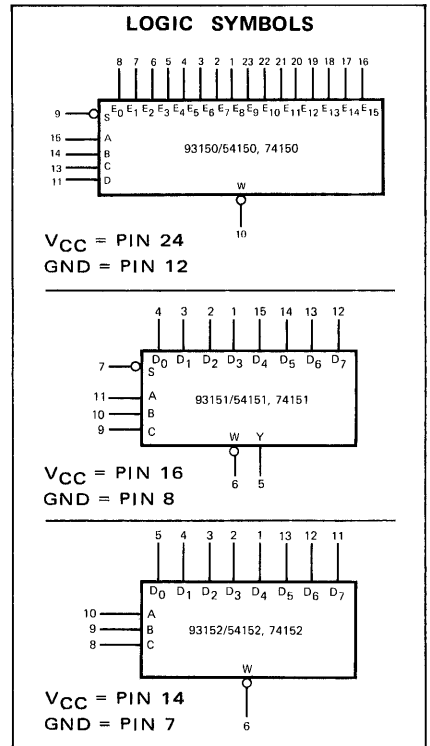
PIN NAMES

E ₀ to E ₁₅	Data Inputs
D ₀ to D ₇	Data inputs
\bar{S}	Strobe (Enable) Input
A, B, C, D	Data Select Inputs
\bar{W}	Data Output
Y	Data Output

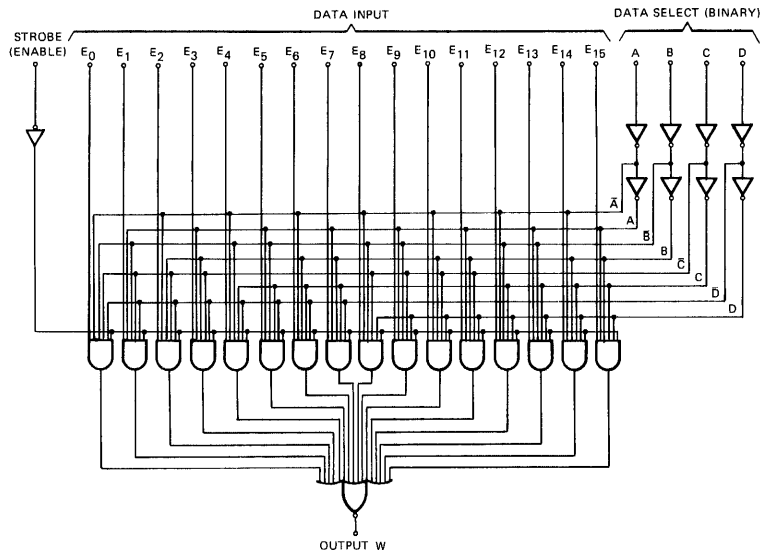
LOADING

1 U.L.
1 U.L.
1 U.L.
1 U.L.
10 U.L.
10 U.L.

NOTE: 1 U.L. = 40 μ A HIGH/1.6 mA LOW.



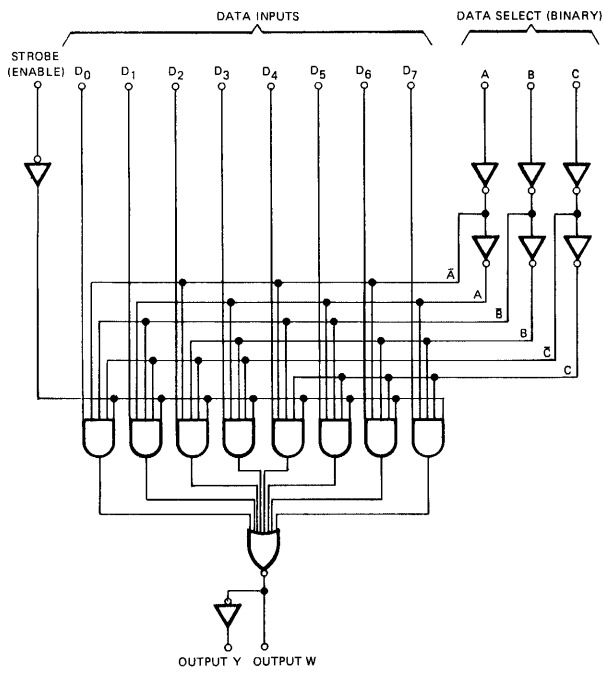
LOGIC DIAGRAMS
93150/54150, 74150



Positive Logic

$$W = S(\bar{A}\bar{B}\bar{C}\bar{D}E_0 + \bar{A}\bar{B}\bar{C}\bar{D}E_1 + \bar{A}\bar{B}\bar{C}\bar{D}E_2 + \bar{A}\bar{B}\bar{C}\bar{D}E_3 + \bar{A}\bar{B}\bar{C}\bar{D}E_4 + \bar{A}\bar{B}\bar{C}\bar{D}E_5 + \bar{A}\bar{B}\bar{C}\bar{D}E_6 + \bar{A}\bar{B}\bar{C}\bar{D}E_7 + \bar{A}\bar{B}\bar{C}\bar{D}E_8 + \bar{A}\bar{B}\bar{C}\bar{D}E_9 + \bar{A}\bar{B}\bar{C}\bar{D}E_{10} + \bar{A}\bar{B}\bar{C}\bar{D}E_{11} + \bar{A}\bar{B}\bar{C}\bar{D}E_{12} + \bar{A}\bar{B}\bar{C}\bar{D}E_{13} + \bar{A}\bar{B}\bar{C}\bar{D}E_{14} + \bar{A}\bar{B}\bar{C}\bar{D}E_{15})$$

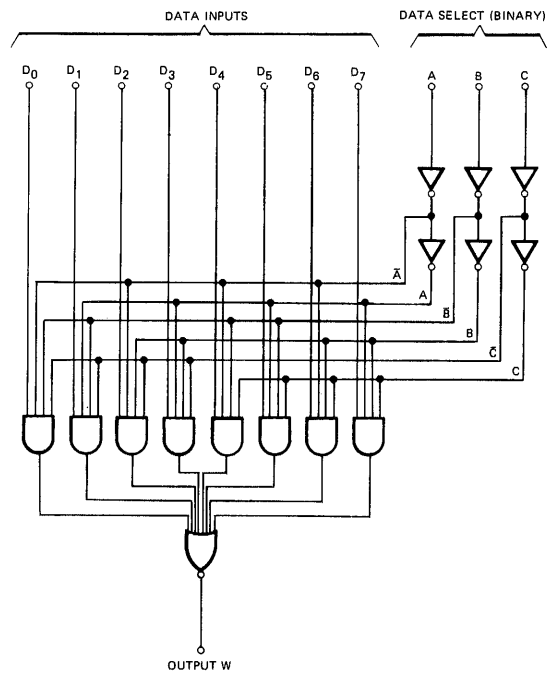
93151/54151, 74151



Positive Logic

$$Y = \bar{S}(\bar{A}\bar{B}\bar{C}D_0 + \bar{A}\bar{B}\bar{C}D_1 + \bar{A}\bar{B}\bar{C}D_2 + \bar{A}\bar{B}\bar{C}D_3 + \bar{A}\bar{B}\bar{C}D_4 + \bar{A}\bar{B}\bar{C}D_5 + \bar{A}\bar{B}\bar{C}D_6 + \bar{A}\bar{B}\bar{C}D_7) \quad W = \bar{Y}$$

93152/54152, 74152



Positive Logic

$$W = (\bar{A}\bar{B}\bar{C}D_0 + \bar{A}\bar{B}\bar{C}D_1 + \bar{A}\bar{B}\bar{C}D_3 + \bar{A}\bar{B}\bar{C}D_4 + \bar{A}\bar{B}\bar{C}D_5 + \bar{A}\bar{B}\bar{C}D_6 + \bar{A}\bar{B}\bar{C}D_7)$$

TRUTH TABLES

93150/54150, 74150

				INPUTS															OUTPUT			
D	C	B	A	STROBE	E ₀	E ₁	E ₂	E ₃	E ₄	E ₅	E ₆	E ₇	E ₈	E ₉	E ₁₀	E ₁₁	E ₁₂	E ₁₃	E ₁₄	E ₁₅	W	
X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	L	L	L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	L	L	L	L	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	L	L	H	L	X	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	L	H	L	L	X	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	H	L	L	L	X	X	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	H	L	L	L	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	H	H	L	L	X	X	X	L	X	X	X	X	X	X	X	X	X	X	X	X	X
L	L	H	H	L	L	X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X
L	L	H	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	L	L	L	L	X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X
L	H	L	L	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	L	L	H	L	X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X
L	H	L	H	L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	L	L	X	X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L	H	H	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

When used to indicate an input condition, X = LOGICAL H or LOGICAL L.

93151/54151, 74151 AND 93152/54152, 74152

				INPUTS								OUTPUTS	
C	B	A	STROBE(1)	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	Y(1)	W
X	X	X	H	X	X	X	X	X	X	X	X	L	H
L	L	L	L	L	X	X	X	X	X	X	X	L	H
L	L	L	L	L	H	X	X	X	X	X	X	H	L
L	L	H	L	L	X	L	X	X	X	X	X	L	H
L	L	H	L	L	X	H	X	X	X	X	X	H	L
L	L	H	L	L	L	X	X	L	X	X	X	L	H
L	L	H	L	L	L	X	X	H	X	X	X	H	L
L	L	H	L	L	L	X	X	X	L	X	X	L	H
L	H	L	L	L	X	X	X	H	X	X	X	H	L
L	H	L	L	L	X	X	X	X	L	X	X	L	H
L	H	L	L	L	X	X	X	X	H	X	X	H	L
L	H	L	L	L	X	X	X	X	X	L	X	L	H
L	H	L	L	L	X	X	X	X	X	X	H	X	L
L	H	H	L	L	X	X	X	X	X	X	L	L	H
L	H	H	L	L	X	X	X	X	X	X	H	L	H
L	H	H	L	L	X	X	X	X	X	X	L	L	H
L	H	H	L	L	X	X	X	X	X	X	H	L	L

NOTES:
 1. 54151, 74151 only.
 2. When used to indicate an input, X = Irrelevant.

ABSOLUTE MAXIMUM RATINGS (above which the useful life may be impaired)

- Storage Temperature: -65°C to +150°C
- Temperature (Ambient) Under Bias: -55°C to +125°C
- V_{CC} Pin Potential to Ground Pin: -0.5 V to +7.0 V
- *Input Voltage (dc): -0.5 V to +5.5 V
- *Input Current (dc): -30 mA to +5.0 mA
- Voltage Applied to Outputs (Output HIGH): -0.5 V to +V_{CC} value
- Output Current (dc) (Output LOW): +30 mA

*Either Input Voltage limit or Input Current limit is sufficient to protect the inputs.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	93150XM/54150XM 93151XM/54151XM 93152XM/54152XM			93150XC/74150XC 93151XC/74151XC 93152XC/74152XC			UNITS
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Supply Voltage V_{CC}	4.5	5.0	5.5	4.75	5.0	5.25	Volts
Operating Free Air Temperature Range	-55	25	125	0	25	70	°C
Normalized Fan Out from Each Output, N	LOW Level		10			10	U.L.
	HIGH Level		20			20	

X = package type; F for Flatpak, D for Ceramic Dip, P for Plastic Dip. See Packaging Information Section for packages available on this product.

ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (Unless Otherwise Noted)

SYMBOL	PARAMETER	LIMITS			UNITS	TEST CONDITIONS (Note 1)	TEST FIGURE
		MIN.	TYP. (Note 2)	MAX.			
V_{IH}	Input HIGH Voltage	2.0			Volts	Guaranteed Input HIGH Threshold Voltage	1
V_{IL}	Input LOW Voltage			0.8	Volts	Guaranteed Input LOW Threshold Voltage	2
V_{OH}	Output HIGH Voltage	2.4			Volts	$V_{CC} = \text{MIN.}$, $I_{OH} = -800 \mu\text{A}$, $V_{IH} = 2.0 \text{ V}$, $V_{IL} = 0.8 \text{ V}$	1 & 2
V_{OL}	Output LOW Voltage			0.4	Volts	$V_{CC} = \text{MIN.}$, $I_{OL} = 16 \text{ mA}$, $V_{IH} = 2.0 \text{ V}$, $V_{IL} = 0.8 \text{ V}$	1 & 2
I_{IH}	Input HIGH Current (Each Input)			40	μA	$V_{CC} = \text{MAX.}$, $V_{IN} = 2.4 \text{ V}$	3
				1.0	mA	$V_{CC} = \text{MAX.}$, $V_{IN} = 5.5 \text{ V}$	
I_{IL}	Input LOW Current (Each Input)			-1.6	mA	$V_{CC} = \text{MAX.}$, $V_{IN} = 0.4 \text{ V}$	3
I_{OS}	Output Short Circuit Current (Note 3)	-20		-55	mA	93150/54150, 93151/54151, 93152/54152, $V_{CC} = \text{MAX.}$, $V_{out} = 0\text{V}$	4
		-18		-55	mA	93150/74150, 93151/74151, 93152/74152, $V_{CC} = \text{MAX.}$, $V_{out} = 0\text{V}$	
I_{CC}	Supply Current		40	68	mA	93150/54150, 74150	5
			29	48	mA	93151/54151, 74151	
			26	43	mA	93152/54152, 74152	

SWITCHING CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

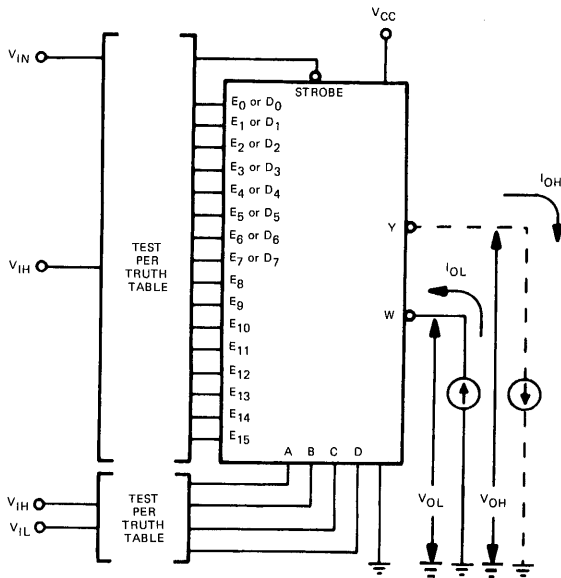
SYM-BOL	PARAMETER	LIMITS			UNITS	TEST CONDITIONS	TEST FIGURE
		MIN.	TYP.	MAX.			
t_{PHL}	A, B, or C Input to Y Output, 4 Levels		20	30	ns	$V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ $R_L = 400 \Omega$	A
t_{PLH}			35	52	ns		
t_{PHL}	A, B, C, or D Input to W Output, 3 Levels		22	33	ns		
t_{PLH}			22	35	ns		
t_{PHL}	Strobe Input to Y Output		19	30	ns		
t_{PLH}			35	52	ns		
t_{PHL}	Strobe Input to W Output		21	30	ns		
t_{PLH}			15.5	24	ns		
t_{PHL}	D_0 thru D_7 Input to Y Output		16	24	ns		
t_{PLH}			19	29	ns		
t_{PHL}	E_0 thru E_{15} , D_0 thru D_7 Input to W Output		8.5	14	ns		
t_{PLH}			13	20	ns		

NOTES:

- (1) For conditions shown as MIN. or MAX., use the appropriate value specified under recommended operating conditions for the applicable device type.
- (2) Typical limits are at $V_{CC} = 5.0 \text{ V}$, 25°C .
- (3) Not more than one output of the 93151/54151, 74151 should be shorted at a time.

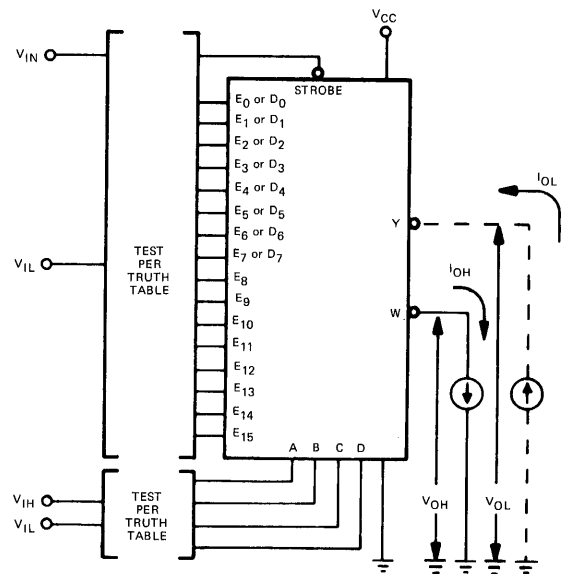
PARAMETER MEASUREMENT INFORMATION

DC TEST CIRCUITS*



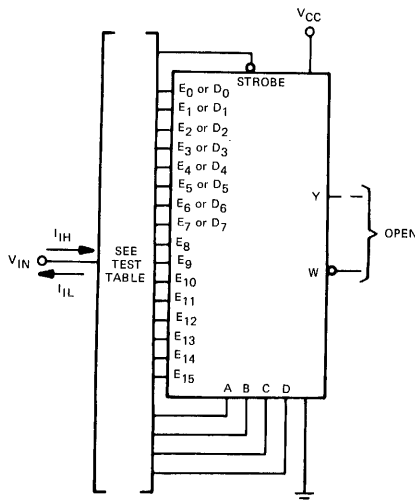
1. V_{IL} is applied to STROBE; 8-4-2-1 code is applied to A, B, C, D; and input/output condition is tested for each step of the code.
2. V_{IH} is applied to STROBE at which time V_{OL} is measured at Y and V_{OH} is measured at W.

Fig. 1



1. V_{IL} is applied to STROBE; 8-4-2-1 is applied to A, B, C, D; and input/output condition is tested for each step of the code.

Fig. 2



INPUT CONDITIONS				TEST	
A	B	C	D	I_{IL}	I_{IH}
L	L	L	L	E ₀ or D ₀	E ₁₅ or D ₇
H	L	L	L	E ₁ or D ₁	E ₁₄ or D ₆
L	H	L	L	E ₂ or D ₂	E ₁₃ or D ₅
H	H	L	L	E ₃ or D ₃	E ₁₂ or D ₄
L	L	H	L	E ₄ or D ₄	E ₁₁ or D ₃
H	L	H	L	E ₅ or D ₅	E ₁₀ or D ₂
L	H	H	L	E ₆ or D ₆	E ₉ or D ₁
H	H	H	L	E ₇ or D ₇	E ₈ or D ₀
L	L	L	H	E ₈	E ₇
H	L	L	H	E ₉	E ₆
L	H	L	H	E ₁₀	E ₅
H	H	L	H	E ₁₁	E ₄

INPUT CONDITIONS				TEST	
A	B	C	D	I_{IL}	I_{IH}
L	L	H	H	E ₁₂	E ₃
H	L	H	H	E ₁₃	E ₂
L	H	H	H	E ₁₄	E ₁
H	H	H	H	E ₁₅	E ₀
L				A	
	L			B	
		L		C	
			L	D	
H					A
	H				B
		H			C
			H		D

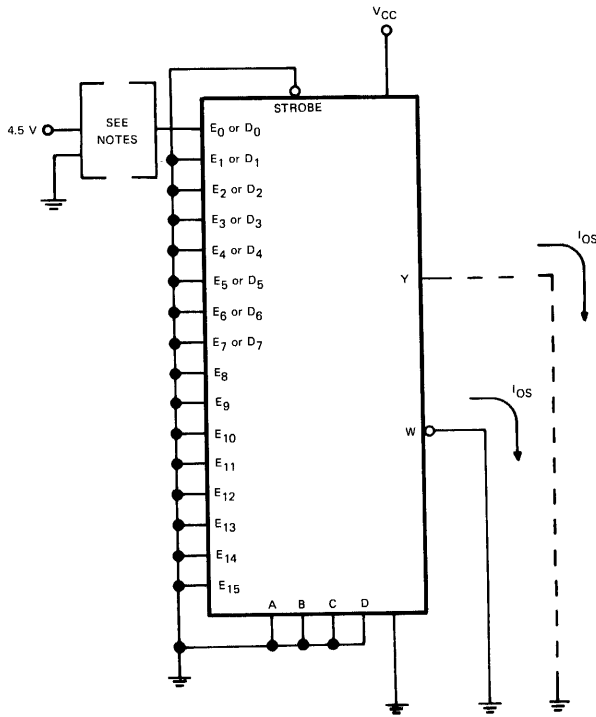
1. When testing strobe input, all other inputs are open.

Fig. 3

*Arrows indicate actual direction of current flow. Tests as shown, are for the 93150/54150, 74150. Identical tests as applicable are performed for the 93151/54151, 74151 and 93152/54152, 74152.

PARAMETER MEASUREMENT INFORMATION

DC TEST CIRCUITS* (Continued)



1. When testing W output, apply GND to D₀ and E₀ input.
2. When testing Y output of 93151/54151, 74151 apply 4.5 V to D₀ and measure I_{OS}.

Fig. 4

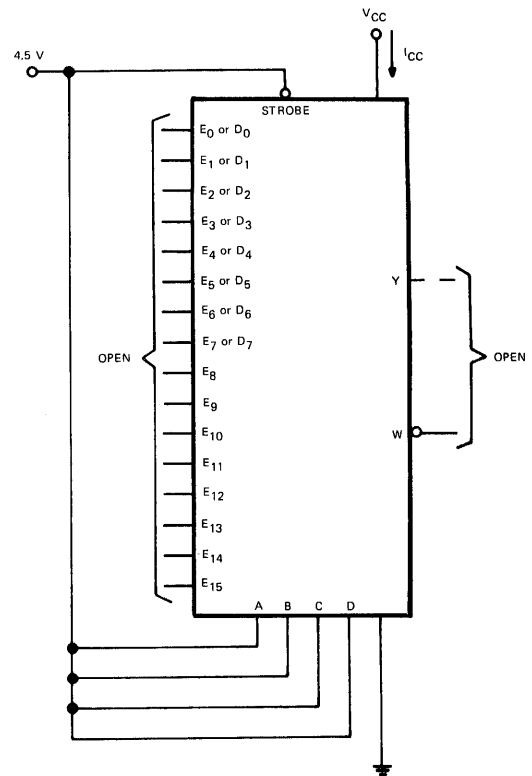
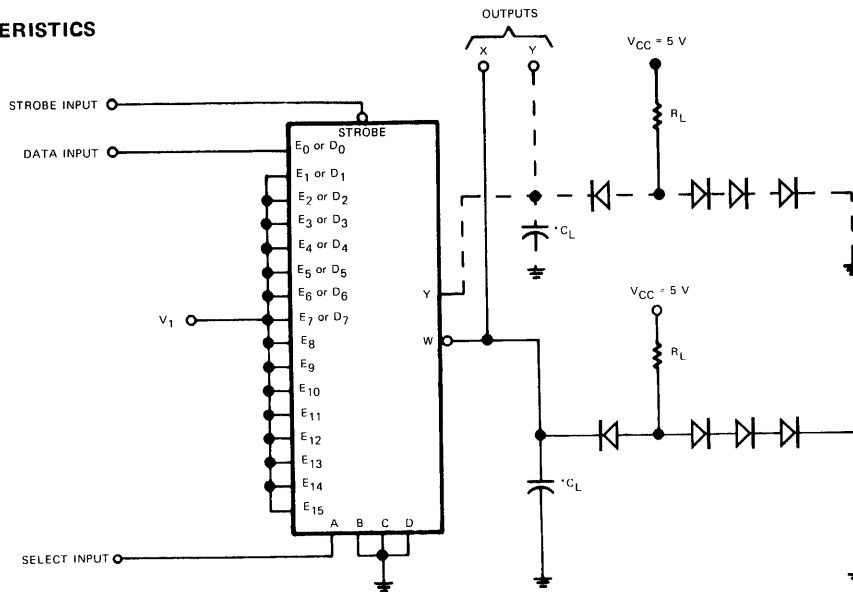


Fig. 5

*Arrows indicate actual direction of current flow. Tests as shown, are for the 93150/54150, 74150. Identical tests as applicable are performed for the 93151/54151, 74151 and 93152/54152, 74152.

SWITCHING CHARACTERISTICS

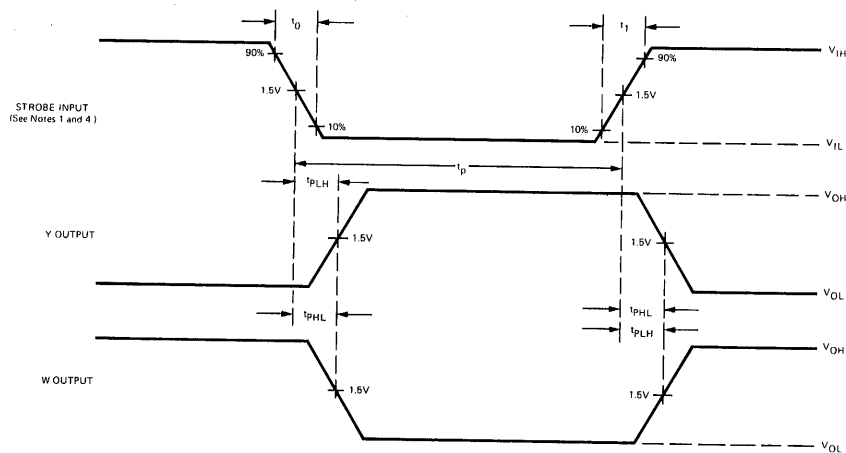


*C_L Includes probe and jig capacitance.

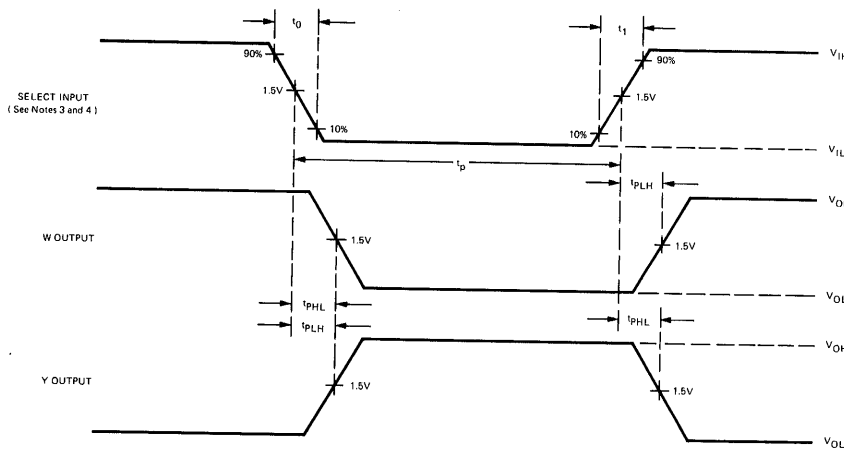
Fig. A SWITCHING TIMES

PARAMETER MEASUREMENT INFORMATION

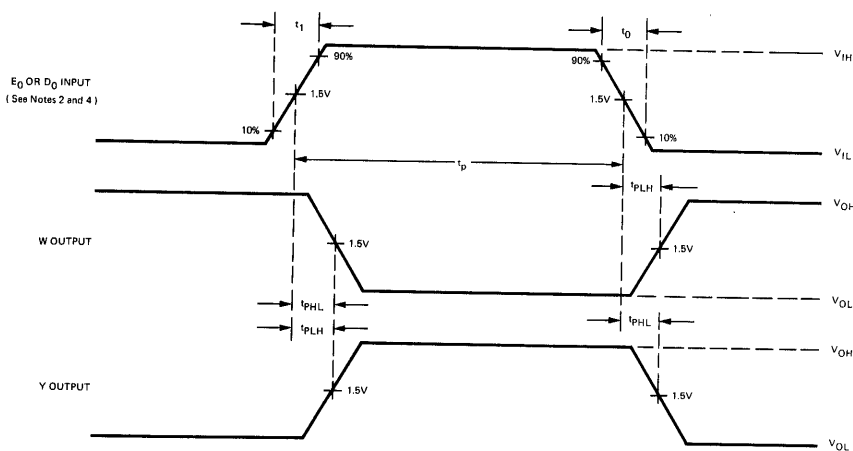
SWITCHING CHARACTERISTICS (cont'd)



STROBE-TO-OUTPUT VOLTAGE WAVEFORMS



SELECT INPUT-TO-OUTPUT VOLTAGE WAVEFORMS



NOTES:

1. When measuring strobe to output times select input is at a LOW level, E_0 or D_0 is at a HIGH level, $V_1 = 4.5$ V.
2. When measuring data input-to-output times strobe and select inputs are at a LOW level and $V_1 = 4.5$ V.
3. When measuring select input-to-output times strobe input is at a LOW level, data input is at a HIGH level and $V_1 = 0$.
4. The input pulse has the following V_{IL} characteristics: $V_{IH} = 3$ V, $V_{IL} = 0$ V; $t_1 = t_0 = 10$ ns, PRR = 1 MHz, duty cycle = 50%, and generator $Z_{out} \approx 50\Omega$.

DATA INPUT-TO-OUTPUT VOLTAGE WAVEFORMS

Fig. A SWITCHING TIMES

[†]Tests, as shown, are for the 93150/54150, 74150. Identical tests as applicable are performed for the 93151/54151, 74151 and 93152/54152, 74152.