

74151, LS151, S151 Multiplexers

8-Input Multiplexer Product Specification

Logic Products

FEATURES

- Multifunction capability
- Complementary outputs
- See '251 for 3-state version

DESCRIPTION

The '151 is a logical implementation of a single-pole, 8-position switch with the switch position controlled by the state of three Select inputs, S_0, S_1, S_2 . True (Y) and Complement ($\bar{Y}$) outputs are both provided. The Enable input (E) is active LOW. When $\bar{E}$ is HIGH, the Y output is HIGH and the Y output is LOW, regardless of all other inputs. The logic function provided at the output is:

$$Y = \bar{E} \cdot (I_0 \cdot \bar{S}_0 \cdot \bar{S}_1 \cdot \bar{S}_2 + I_1 \cdot \bar{S}_0 \cdot \bar{S}_1 \cdot S_2 + I_2 \cdot \bar{S}_0 \cdot S_1 \cdot \bar{S}_2 + I_3 \cdot \bar{S}_0 \cdot S_1 \cdot S_2 + I_4 \cdot S_0 \cdot \bar{S}_1 \cdot \bar{S}_2 + I_5 \cdot S_0 \cdot \bar{S}_1 \cdot S_2 + I_6 \cdot S_0 \cdot S_1 \cdot \bar{S}_2 + I_7 \cdot S_0 \cdot S_1 \cdot S_2)$$

In one package the '151 provides the ability to select from eight sources of data or control information. The device can provide any logic function of four variables and its negation with correct manipulation.

TYPE	TYPICAL PROPAGATION DELAY (ENABLE TO $\bar{Y}$)	TYPICAL SUPPLY CURRENT (TOTAL)
74151	18ns	29mA
74LS151	12ns	6mA
74S151	9ns	45mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N74151N, N74LS151N, N74S151N
Plastic SO	N74LS151D, N74S151D

NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

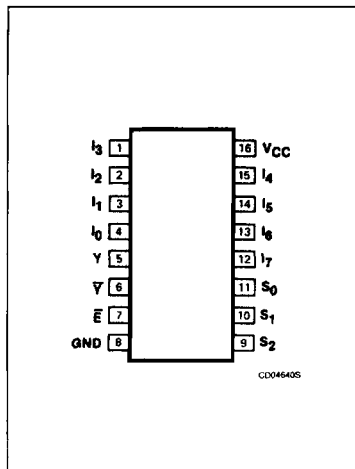
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74	74S	74LS
All	Inputs	1uI	1SuI	1LSuI
All	Outputs	10uI	10SuI	10LSuI

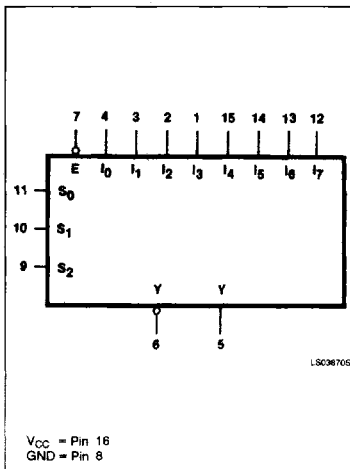
NOTE:

Where a 74 unit load (uI) is understood to be $40\mu A$ I_{IH} and $-1.6mA$ I_{IL} , a 74S unit load (SuI) is $50\mu A$ I_{IH} and $-2.0mA$ I_{IL} , and 74LS unit load (LSuI) is $20\mu A$ I_{IH} and $-0.4mA$ I_{IL} .

PIN CONFIGURATION

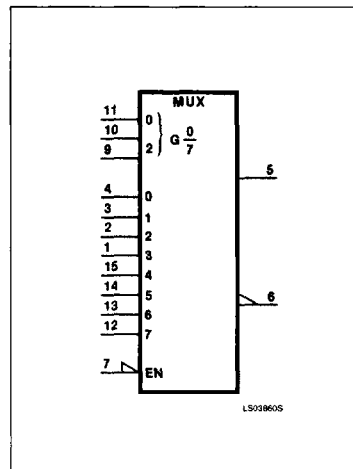


LOGIC SYMBOL



V_{CC} = Pin 16
GND = Pin 8

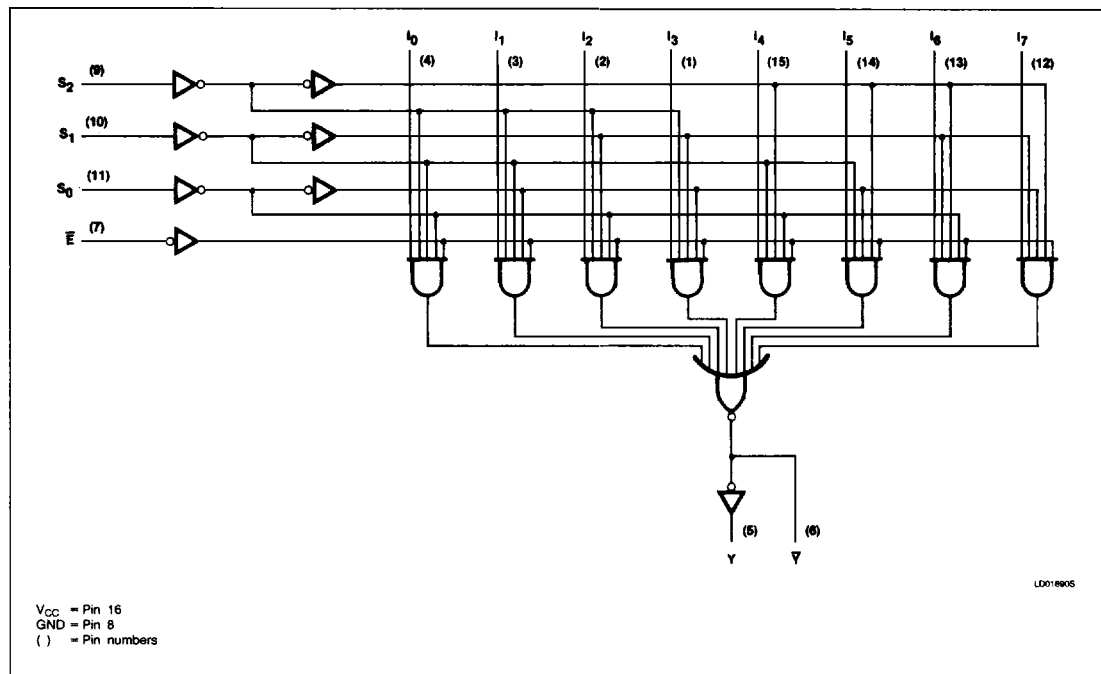
LOGIC SYMBOL (IEEE/IEC)



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LOGIC DIAGRAM



FUNCTION TABLE

[illegible]

H = HIGH voltage level
L = LOW voltage level
X = Don't care

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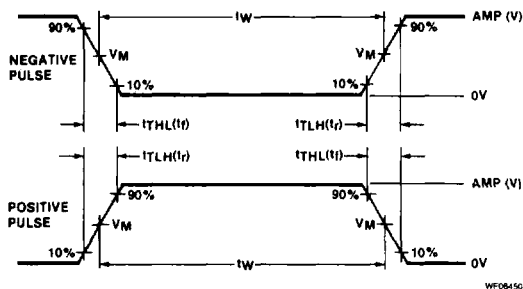
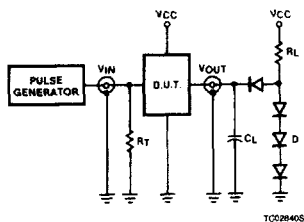
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ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER	74	74LS	74S	UNIT
V_{CC} Supply voltage	7.0	7.0	7.0	V
V_{IN} Input voltage	-0.5 to +5.5	-0.5 to +7.0	-0.5 to +5.5	V
I_{IN} Input current	-30 to +5	-30 to +1	-30 to +5	mA
V_{OUT} Voltage applied to output in HIGH output state	-0.5 to V_{CC}	-0.5 to V_{CC}	-0.5 to V_{CC}	V
T_A Operating free-air temperature range	0 to 70			°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	74			74LS			74S			UNIT
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	
V_{CC} Supply voltage	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	V
V_{IH} HIGH-level input voltage	2.0			2.0			2.0			V
V_{IL} LOW-level input voltage			+0.8			+0.8			+0.8	V
I_{IK} Input clamp current			-12			-18			-18	mA
I_{OH} HIGH-level output current			-800			-400			-1000	μA
I_{OL} LOW-level output current			16			8			20	mA
T_A Operating free-air temperature	0		70	0		70	0		70	°C

TEST CIRCUITS AND WAVEFORMS

$V_M = 1.3V$ for 74LS; $V_M = 1.5V$ for all other TTL families.

Test Circuit For 74 Totem-Pole Outputs**DEFINITIONS**

R_L = Load resistor to V_{CC} ; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

t_{TLH} , t_{THL} Values should be less than or equal to the table entries.

Input Pulse Definition

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t_{TLH}	t_{THL}
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

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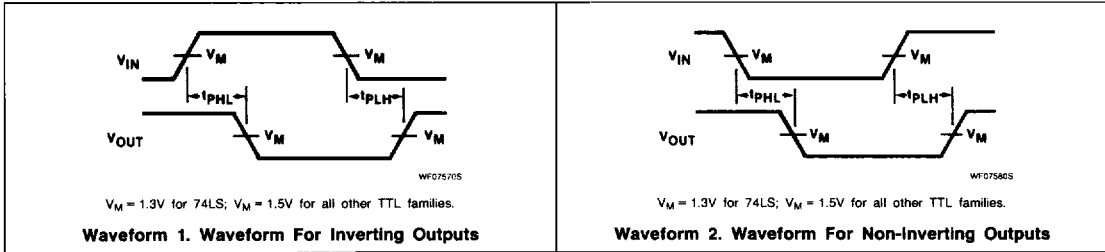
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DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS ¹	74151			74LS151			74S151			UNIT
		Min	Typ ²	Max	Min	Typ ²	Max	Min	Typ ²	Max	
V _{OH}	HIGH-level output voltage V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX, I _{OH} = MAX	2.4	3.4		2.7	3.4		2.7	3.4		V
V _{OL}	LOW-level output voltage V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX	I _{OL} = MAX				0.35	0.5			0.5	V
		I _{OL} = 4mA (74LS)				0.25	0.4				V
V _{iK}	Input clamp voltage V _{CC} = MIN, I _I = I _{iK}			-1.5			-1.5			-1.2	V
I _I	Input current at maximum input voltage V _{CC} = MAX	V _I = 5.5V								1.0	mA
		V _I = 7.0V					0.1				mA
I _{IH}	HIGH-level input current V _{CC} = MAX	V _I = 2.4V									μA
		V _I = 2.7V					20			50	μA
I _{IL}	LOW-level input current V _{CC} = MAX	V _I = 0.4V					-0.4				mA
		V _I = 0.5V								-2.0	mA
I _{OS}	Short-circuit output current ³ V _{CC} = MAX	-18		-55	-20		-100	-40		-100	mA
I _{CC}	Supply current ⁴ (total) V _{CC} = MAX		29	48		6	10		45	70	mA

- NOTES:
- 1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
 - 2. All typical values are at V_{CC} = 5V, T_A = 25°C.
 - 3. I_{OS} is tested with V_{OUT} = +0.5V and V_{CC} = V_{CC} MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
 - 4. Measure I_{CC} on the 74151 with $\bar{E}$ and S₀ - S₂ at 4.5V, all other inputs and outputs open. Measure I_{CC} on the 74LS151 and 74S151 with all inputs at 4.5V and outputs open.

AC WAVEFORMS



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AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

PARAMETER		TEST CONDITIONS	74		74LS		74S		UNIT
			$C_L = 15\text{pF}, R_L = 400\Omega$		$C_L = 15\text{pF}, R_L = 2\text{k}\Omega$		$C_L = 15\text{pF}, R_L = 280\Omega$		
			Min	Max	Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay Select to Y output	Waveform 2		52 30		43 30		18 18	ns
t_{PLH} t_{PHL}	Propagation delay Select to $\bar{Y}$ output	Waveform 1		35 33		23 32		15 13.5	ns
t_{PLH} t_{PHL}	Propagation delay Enable to Y output	Waveform 1		52 30		42 32		16.5 18	ns
t_{PLH} t_{PHL}	Propagation delay Enable to $\bar{Y}$ output	Waveform 2		24 30		24 30		13 12	ns
t_{PLH} t_{PHL}	Propagation delay Data to Y output	Waveform 2		29 24		32 26		12 12	ns
t_{PLH} t_{PHL}	Propagation delay Data to $\bar{Y}$ output	Waveform 1		20 14		21 20		7.0 7.0	ns