

# 74HC151D

## 1. Functional Description

- 8-Channel Multiplexer

## 2. General

The 74HC151D is a high speed CMOS 8-CHANNEL MULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

One of eight data input signals (D0-D7) is selected by decoding of the three-bit address input (A, B, C). The selected data appears on two outputs: non-inverting (Y) and inverting (W).

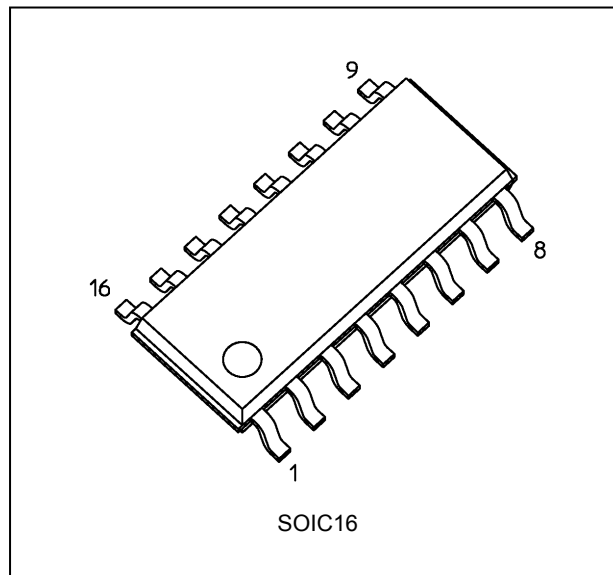
The strobe input provides two output conditions; a low level on the strobe input transfers the selected data to the outputs. A high level on the strobe input sets the Y output low and the W output high without regard to the data or select input conditions.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

## 3. Features

- (1) High speed:  $t_{pd} = 15 \text{ ns}$  (typ.) at  $V_{CC} = 5 \text{ V}$
- (2) Low power dissipation:  $I_{CC} = 4.0 \mu\text{A}$  (max) at  $T_a = 25 \text{ }^\circ\text{C}$
- (3) Balanced propagation delays:  $t_{PLH} \approx t_{PHL}$
- (4) Wide operating voltage range:  $V_{CC(opr)} = 2.0 \text{ to } 6.0 \text{ V}$

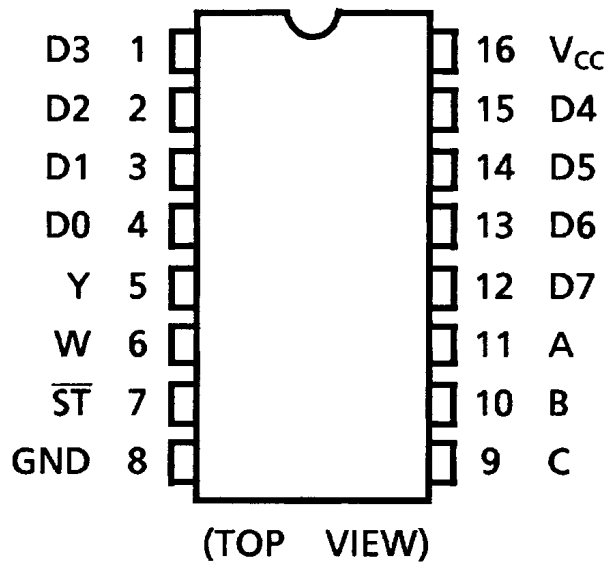
## 4. Packaging



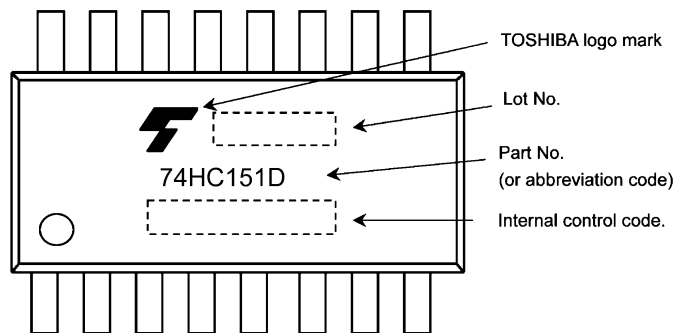
Start of commercial production

2016-05

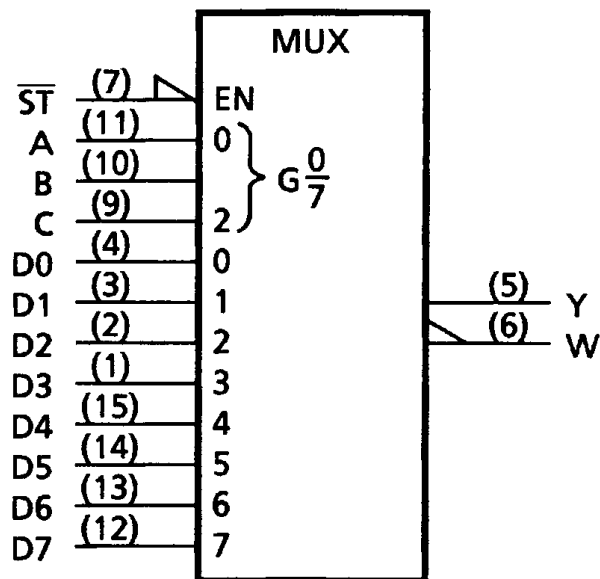
5. Pin Assignment



6. Marking



7. IEC Logic Symbol

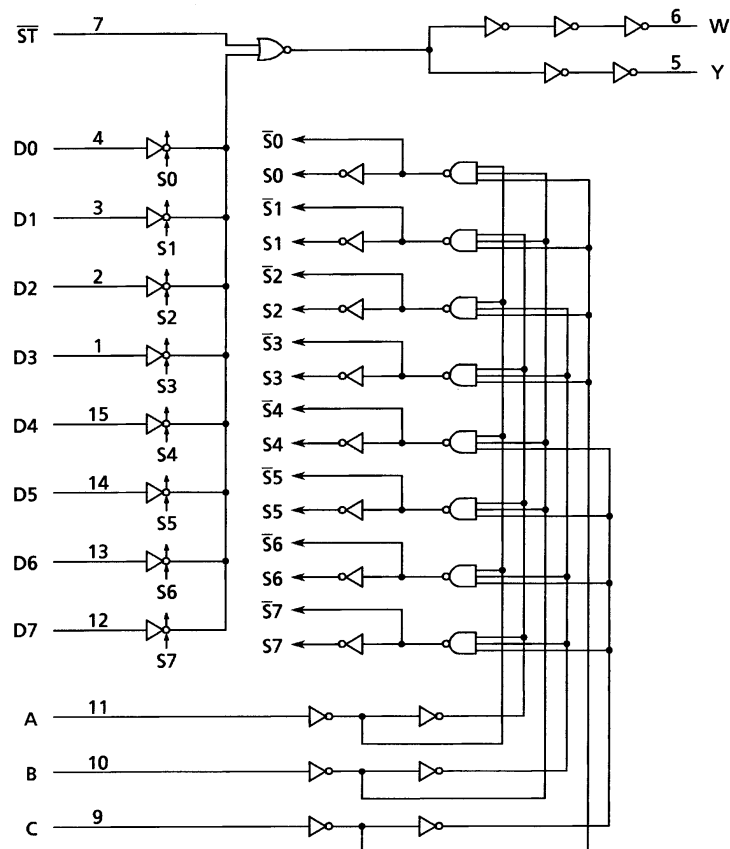


**8. Truth Table**

Inputs				Outputs	
Select			Strobe	Y	W
C	B	A	$\overline{S_T}$		
X	X	X	H	L	H
L	L	L	L	D0	$\overline{D_0}$
L	L	H	L	D1	$\overline{D_1}$
L	H	L	L	D2	$\overline{D_2}$
L	H	H	L	D3	$\overline{D_3}$
H	L	L	L	D4	$\overline{D_4}$
H	L	H	L	D5	$\overline{D_5}$
H	H	L	L	D6	$\overline{D_6}$
H	H	H	L	D7	$\overline{D_7}$

X: Don't care

**9. System Diagram**



## 10. Absolute Maximum Ratings (Note)

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	$V_{CC}$		-0.5 to 7.0	V
Input voltage	$V_{IN}$		-0.5 to $V_{CC} + 0.5$	V
Output voltage	$V_{OUT}$		-0.5 to $V_{CC} + 0.5$	V
Input diode current	$I_{IK}$		$\pm 20$	mA
Output diode current	$I_{OK}$		$\pm 20$	mA
Output current	$I_{OUT}$		$\pm 25$	mA
$V_{CC}$ /ground current	$I_{CC}$		$\pm 50$	mA
Power dissipation	$P_D$	(Note 1)	500	mW
Storage temperature	$T_{stg}$		-65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1:  $P_D$  derates linearly with -8 mW/°C above 85 °C

## 11. Operating Ranges (Note)

Characteristics	Symbol	Test Condition	Rating	Unit
Supply voltage	$V_{CC}$	—	2.0 to 6.0	V
Input voltage	$V_{IN}$	—	0 to $V_{CC}$	V
Output voltage	$V_{OUT}$	—	0 to $V_{CC}$	V
Operating temperature	$T_{opr}$	—	-40 to 125	°C
Input rise and fall times	$t_r, t_f$	—	0 to 50	$\mu s$

Note: The operating ranges must be maintained to ensure the normal operation of the device.

Unused inputs must be tied to either  $V_{CC}$  or GND.

**12. Electrical Characteristics**

**12.1. DC Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^\circ\text{C}$ )**

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Typ.	Max	Unit	
High-level input voltage	$V_{IH}$	—	2.0	1.50	—	—	V	
			4.5	3.15	—	—		
			6.0	4.20	—	—		
Low-level input voltage	$V_{IL}$	—	2.0	—	—	0.50	V	
			4.5	—	—	1.35		
			6.0	—	—	1.80		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\text{ }\mu\text{A}$	2.0	1.9	2.0	—	V
				4.5	4.4	4.5	—	
			$I_{OH} = -4\text{ mA}$	4.5	4.18	4.31	—	
				6.0	5.68	5.80	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\text{ }\mu\text{A}$	2.0	—	0.0	0.1	V
				4.5	—	0.0	0.1	
				6.0	—	0.0	0.1	
			$I_{OL} = 4\text{ mA}$	4.5	—	0.17	0.26	
				6.0	—	0.18	0.26	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	$\pm 0.1$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	4.0	$\mu\text{A}$	

**12.2. DC Characteristics (Unless otherwise specified,  $T_a = -40$  to  $85\text{ }^\circ\text{C}$ )**

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IH}$	—	2.0	1.50	—	V	
			4.5	3.15	—		
			6.0	4.20	—		
Low-level input voltage	$V_{IL}$	—	2.0	—	0.50	V	
			4.5	—	1.35		
			6.0	—	1.80		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\text{ }\mu\text{A}$	2.0	1.9	—	V
				4.5	4.4	—	
			$I_{OH} = -4\text{ mA}$	4.5	4.13	—	
				6.0	5.63	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\text{ }\mu\text{A}$	2.0	—	0.1	V
				4.5	—	0.1	
				6.0	—	0.1	
			$I_{OL} = 4\text{ mA}$	4.5	—	0.33	
				6.0	—	0.33	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	40.0	$\mu\text{A}$	

**12.3. DC Characteristics (Unless otherwise specified,  $T_a = -40$  to  $125$  °C)**

Characteristics	Symbol	Test Condition		$V_{CC}$ (V)	Min	Max	Unit
High-level input voltage	$V_{IH}$	—		2.0	1.50	—	V
				4.5	3.15	—	
				6.0	4.20	—	
Low-level input voltage	$V_{IL}$	—		2.0	—	0.50	V
				4.5	—	1.35	
				6.0	—	1.80	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20 \mu A$	2.0	1.9	—	V
				4.5	4.4	—	
			6.0	5.9	—		
			$I_{OH} = -4$ mA	4.5	3.7	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20 \mu A$	2.0	—	0.1	V
				4.5	—	0.1	
				6.0	—	0.1	
			$I_{OL} = 4$ mA	4.5	—	0.4	
			$I_{OL} = 5.2$ mA	6.0	—	0.4	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND		6.0	—	$\pm 1.0$	$\mu A$
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND		6.0	—	160.0	$\mu A$

**12.4. AC Characteristics**

(Unless otherwise specified,  $C_L = 15$  pF,  $V_{CC} = 5$  V,  $T_a = 25$  °C, Input:  $t_r = t_f = 6$  ns)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$	—	—	4	8	ns
Propagation delay time (D-Y)	$t_{PLH}, t_{PHL}$	—	—	15	24	ns
Propagation delay time (D-W)	$t_{PLH}, t_{PHL}$	—	—	15	24	ns
Propagation delay time (ST-Y)	$t_{PLH}, t_{PHL}$	—	—	10	17	ns
Propagation delay time (ST-W)	$t_{PLH}, t_{PHL}$	—	—	10	17	ns
Propagation delay time (A, B, C-Y)	$t_{PLH}, t_{PHL}$	—	—	19	31	ns
Propagation delay time (A, B, C-W)	$t_{PLH}, t_{PHL}$	—	—	19	31	ns

**12.5. AC Characteristics**

(Unless otherwise specified,  $C_L = 50 \text{ pF}$ ,  $T_a = 25 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	Note	$V_{CC}$ (V)	Min	Typ.	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$		2.0	—	30	75	ns
			4.5	—	8	15	
			6.0	—	7	13	
Propagation delay time (D-Y)	$t_{PLH}, t_{PHL}$		2.0	—	65	140	ns
			4.5	—	18	28	
			6.0	—	15	24	
Propagation delay time (D-W)	$t_{PLH}, t_{PHL}$		2.0	—	65	140	ns
			4.5	—	18	28	
			6.0	—	15	24	
Propagation delay time (ST-Y)	$t_{PLH}, t_{PHL}$		2.0	—	36	100	ns
			4.5	—	12	20	
			6.0	—	10	17	
Propagation delay time (ST-W)	$t_{PLH}, t_{PHL}$		2.0	—	36	100	ns
			4.5	—	12	20	
			6.0	—	10	17	
Propagation delay time (A, B, C-Y)	$t_{PLH}, t_{PHL}$		2.0	—	80	180	ns
			4.5	—	23	36	
			6.0	—	19	31	
Propagation delay time (A, B, C-W)	$t_{PLH}, t_{PHL}$		2.0	—	80	180	ns
			4.5	—	23	36	
			6.0	—	19	31	
Input capacitance	$C_{IN}$		—	—	3	—	pF
Power dissipation capacitance	$C_{PD}$	(Note 1)	—	—	15	—	pF

Note 1:  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation.

$$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$$

**12.6. AC Characteristics**

(Unless otherwise specified,  $C_L = 50 \text{ pF}$ ,  $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	$V_{CC}$ (V)	Min	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$	2.0	—	95	ns
		4.5	—	19	
		6.0	—	16	
Propagation delay time (D-Y)	$t_{PLH}, t_{PHL}$	2.0	—	175	ns
		4.5	—	35	
		6.0	—	30	
Propagation delay time (D-W)	$t_{PLH}, t_{PHL}$	2.0	—	175	ns
		4.5	—	35	
		6.0	—	30	
Propagation delay time (ST-Y)	$t_{PLH}, t_{PHL}$	2.0	—	125	ns
		4.5	—	25	
		6.0	—	21	
Propagation delay time (ST-W)	$t_{PLH}, t_{PHL}$	2.0	—	125	ns
		4.5	—	25	
		6.0	—	21	
Propagation delay time (A, B, C-Y)	$t_{PLH}, t_{PHL}$	2.0	—	225	ns
		4.5	—	45	
		6.0	—	38	
Propagation delay time (A, B, C-W)	$t_{PLH}, t_{PHL}$	2.0	—	225	ns
		4.5	—	45	
		6.0	—	38	

**12.7. AC Characteristics**

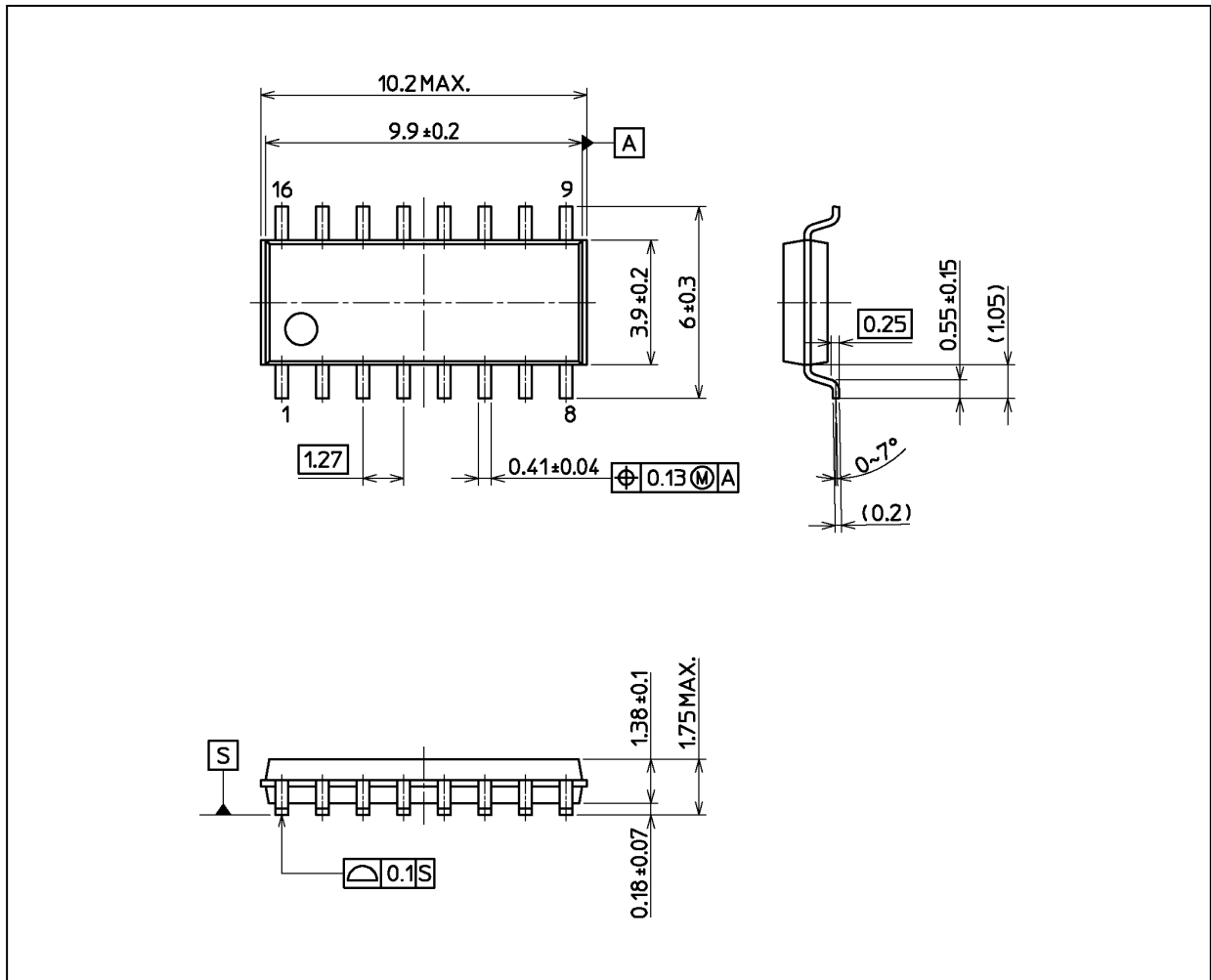
(Unless otherwise specified,  $C_L = 50 \text{ pF}$ ,  $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	$V_{CC}$ (V)	Min	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$	2.0	—	110	ns
		4.5	—	22	
		6.0	—	19	
Propagation delay time (D-Y)	$t_{PLH}, t_{PHL}$	2.0	—	210	ns
		4.5	—	42	
		6.0	—	36	
Propagation delay time (D-W)	$t_{PLH}, t_{PHL}$	2.0	—	210	ns
		4.5	—	42	
		6.0	—	36	
Propagation delay time (ST-Y)	$t_{PLH}, t_{PHL}$	2.0	—	150	ns
		4.5	—	30	
		6.0	—	26	
Propagation delay time (ST-W)	$t_{PLH}, t_{PHL}$	2.0	—	150	ns
		4.5	—	30	
		6.5	—	26	
Propagation delay time (A, B, C-Y)	$t_{PLH}, t_{PHL}$	2.0	—	270	ns
		4.5	—	54	
		6.5	—	46	
Propagation delay time (A, B, C-W)	$t_{PLH}, t_{PHL}$	2.0	—	270	ns
		4.5	—	54	
		6.0	—	46	



Package Dimensions

Unit: mm



Weight: 0.15 g (typ.)

Package Name(s)
Nickname: SOIC16

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