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CMOS Digital Integrated Circuits Silicon Monolithic

74HC151D

1. Functional Description

- 8-Channel Multiplexer

2. General

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

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

One of eight date 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

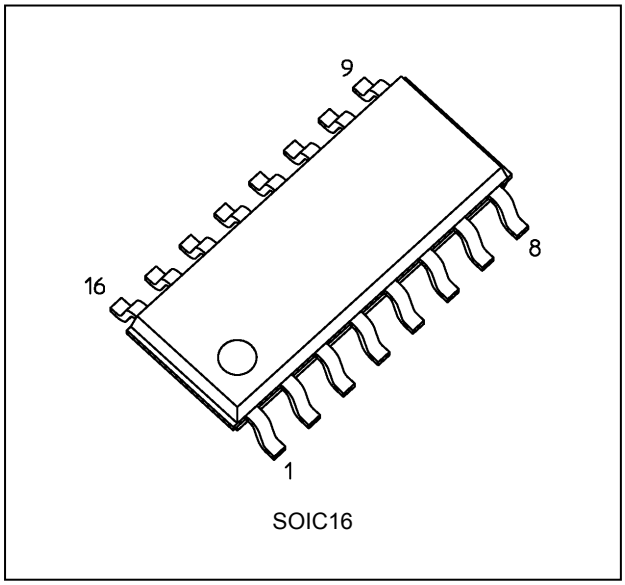
(1) High speed: t_{pd} = 15 ns (typ.) at V_{CC} = 5 V

(2) Low power dissipation: I_{CC} = 4.0 μA (max) at T_a = 25 °C

(3) Balanced propagation delays: $t_{PLH} \approx t_{PHL}$

(4) Wide operating voltage range: $V_{CC(opr)}$ = 2.0 to 6.0 V

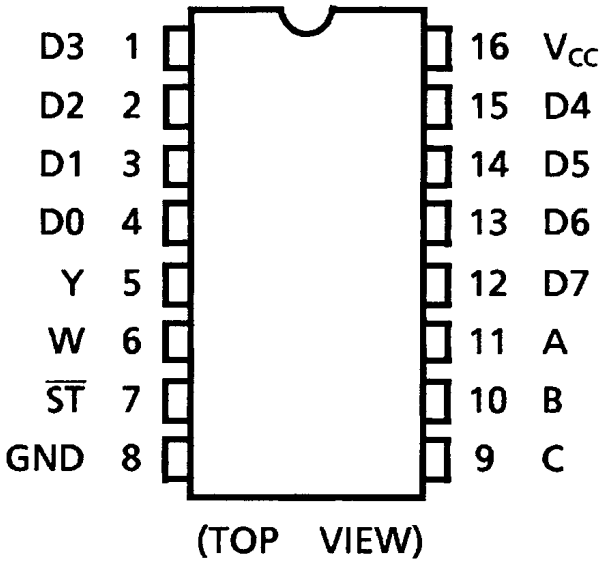
4. Packaging



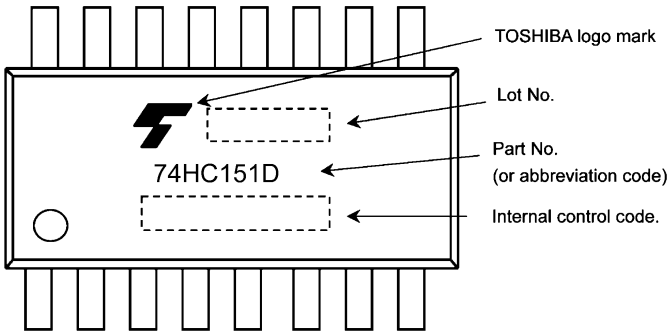
SOIC16

Start of commercial production
2016-05

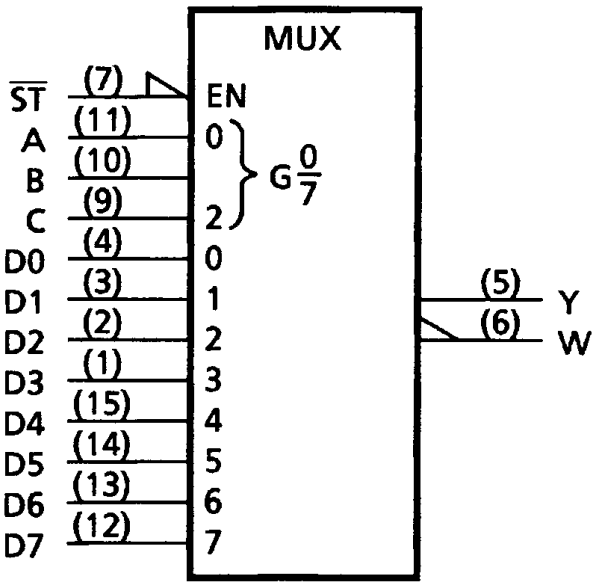
5. Pin Assignment



6. Marking



7. IEC Logic Symbol

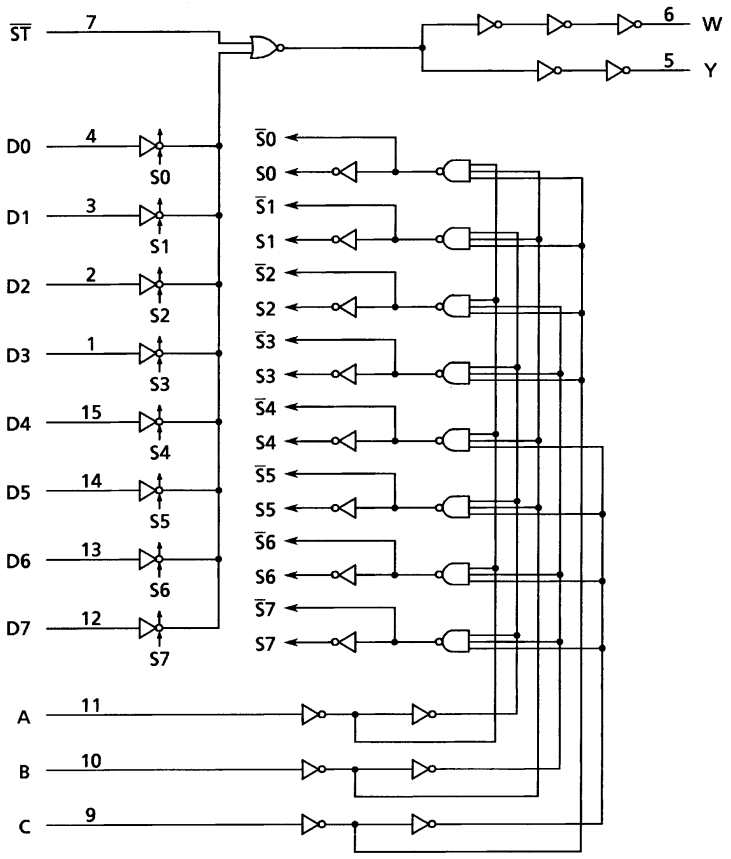


8. Truth Table

Inputs				Outputs	
Select			Strobe	Y	W
C	B	A	$\overline{ST}$		
X	X	X	H	L	H
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

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}		±20	mA
Output diode current	I_{OK}		±20	mA
Output current	I_{OUT}		±25	mA
V_{CC}/ground current	I_{CC}		±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	μs

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 °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 μA	2.0	1.9	2.0	—	V
				4.5	4.4	4.5	—	
				6.0	5.9	6.0	—	
			I_{OH} = -4 mA	4.5	4.18	4.31	—	
			I_{OH} = -5.2 mA	6.0	5.68	5.80	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	2.0	—	0.0	0.1	V
				4.5	—	0.0	0.1	
				6.0	—	0.0	0.1	
			I_{OL} = 4 mA	4.5	—	0.17	0.26	
			I_{OL} = 5.2 mA	6.0	—	0.18	0.26	
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	—	—	±0.1	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	—	4.0	μA

12.2. DC Characteristics (Unless otherwise specified, T_a = -40 to 85 °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 μA	2.0	1.9	—	V
				4.5	4.4	—	
				6.0	5.9	—	
			I_{OH} = -4 mA	4.5	4.13	—	
			I_{OH} = -5.2 mA	6.0	5.63	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	2.0	—	0.1	V
				4.5	—	0.1	
				6.0	—	0.1	
			I_{OL} = 4 mA	4.5	—	0.33	
			I_{OL} = 5.2 mA	6.0	—	0.33	
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	40.0	μA

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 μA	2.0	1.9	—	V
				4.5	4.4	—	
				6.0	5.9	—	
			I_{OH} = -4 mA	4.5	3.7	—	
			I_{OH} = -5.2 mA	6.0	5.2	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	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	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	160.0	μA

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 ($\overline{ST}$-Y)	t_{PLH},t_{PHL}	—	—	10	17	ns
Propagation delay time ($\overline{ST}$-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 pF, T_a = 25 °C, Input: $t_r = t_f$ = 6 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 ($\overline{ST}$-Y)	t_{PLH},t_{PHL}		2.0	—	36	100	ns
			4.5	—	12	20	
			6.0	—	10	17	
Propagation delay time ($\overline{ST}$-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 pF, T_a = -40 to 85 °C, Input: $t_r = t_f$ = 6 ns)

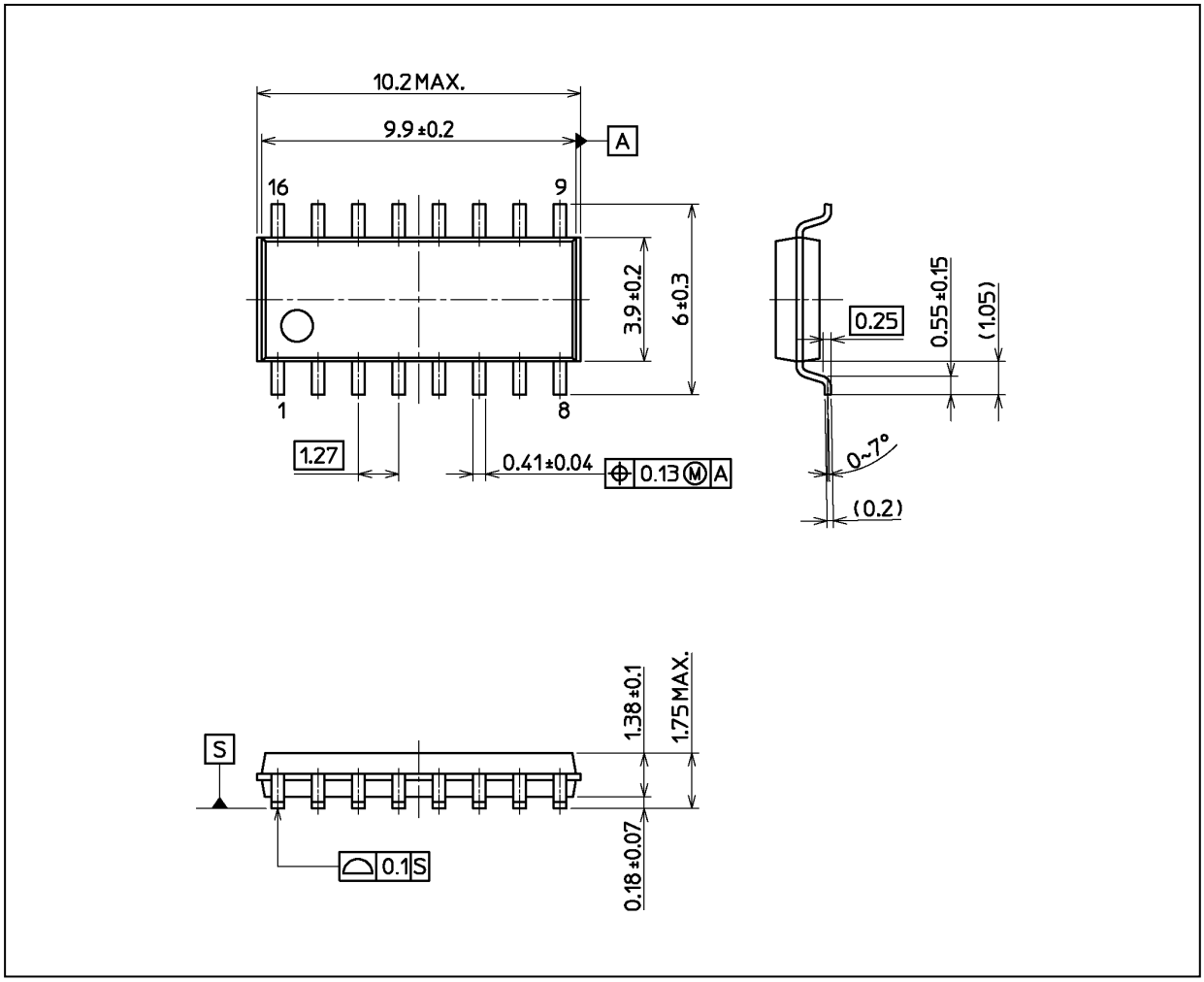
Characteristics	Symbol	V_{CC} (V)	Min	Max	Unit
Output transition time	t_{TLH},t_{THL}	2.0	—	95	ns
		4.5	—	19	
		6.0	—	16	
Propagation delay time (D-Y)	t_{PLH},t_{PHL}	2.0	—	175	ns
		4.5	—	35	
		6.0	—	30	
Propagation delay time (D-W)	t_{PLH},t_{PHL}	2.0	—	175	ns
		4.5	—	35	
		6.0	—	30	
Propagation delay time ($\overline{ST}$-Y)	t_{PLH},t_{PHL}	2.0	—	125	ns
		4.5	—	25	
		6.0	—	21	
Propagation delay time ($\overline{ST}$-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 pF, T_a = -40 to 125 °C, Input: $t_r = t_f$ = 6 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 ($\overline{ST}$-Y)	t_{PLH},t_{PHL}	2.0	—	150	ns
		4.5	—	30	
		6.0	—	26	
Propagation delay time ($\overline{ST}$-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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