

CMOS Digital Integrated Circuits Silicon Monolithic

Features

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

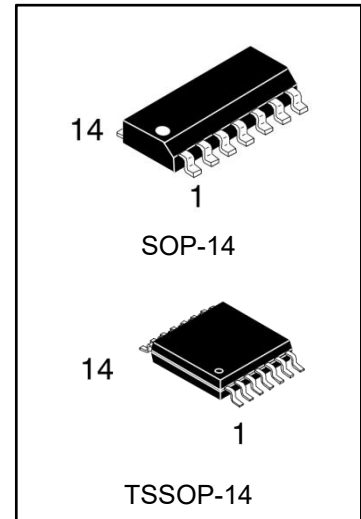
Low power dissipation: $I_{CC} = 4.0 \mu\text{A}$ (max) at $T_a = 25$

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

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

Functional Description

- 8-Channel Multiplexer



Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
74HC151M/TR	SOP-14	74HC151	REEL	2500pcs/reel
74HC151MT/TR	TSSOP-14	74HC151	REEL	2500pcs/reel

General Description

The 74HC151 is a high speed CMOS 8-CHANNEL MULTIPLEXER fabricated with silicon gate C2MOS technology.

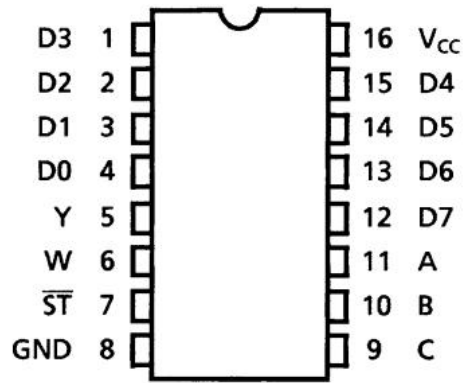
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

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.

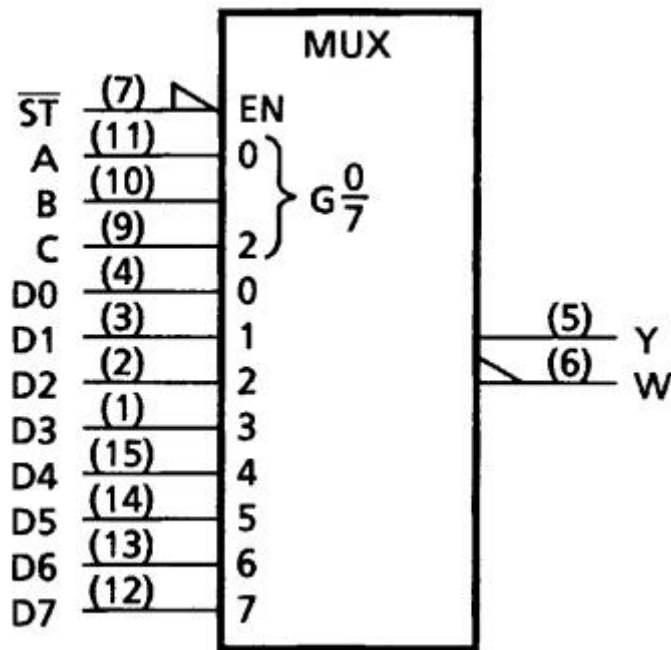
Pin Assignment



(TOP VIEW)

SOP14/TSSOP14

IEC Logic Symbol

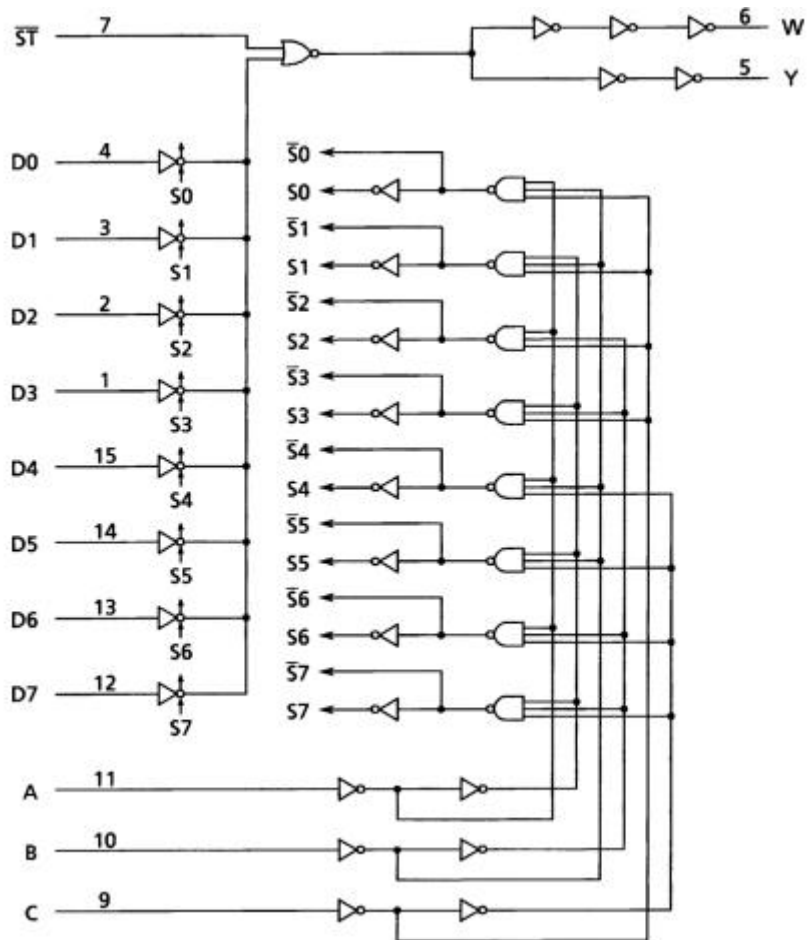


Truth Table

Inputs				Outputs	
Select			Strobe	Y	W
C	B	A	ST		
X	X	X	H	L	H
L	L	L	L	D0	$\bar{D}0$
L	L	H	L	D1	$\bar{D}1$
L	H	L	L	D2	$\bar{D}2$
L	H	H	L	D3	$\bar{D}3$
H	L	L	L	D4	$\bar{D}4$
H	L	H	L	D5	$\bar{D}5$
H	H	L	L	D6	$\bar{D}6$
H	H	H	L	D7	$\bar{D}7$

X: Don't care

System Diagram



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
VCC/ground current	I_{CC}		50	mA
Power dissipation	P_D	(Note 1)	500	mW
Storage temperature	Tstg		-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

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 85	°C
Input rise and fall times	$t_{r,tf}$		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 VCC or GND.

Electrical Characteristics

DC Characteristics (Unless otherwise specified, Ta = 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} = -20μA	2.0	1.9	2.0	V	
				4.5	4.4	4.5		
			I _{OH} = -4 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} = 20μA	2.0		0.0	V	
				4.5		0.0		0.1
			I _{OL} = 4 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			±0.1	μA	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND	6.0			4.0	μA	

DC Characteristics (Unless otherwise specified, Ta = -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} = -20μA	2.0	1.9		V
				4.5	4.4		
			I _{OH} = -4 mA	4.5	4.13		
				6.0	5.63		
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20μA	2.0		0.1	V
				4.5		0.1	
			I _{OL} = 4 mA	4.5		0.33	
				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

AC Characteristics

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

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

AC Characteristics

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

Characteristics	Symbol	Note	$V_{CC} \text{ (V)}$	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.

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

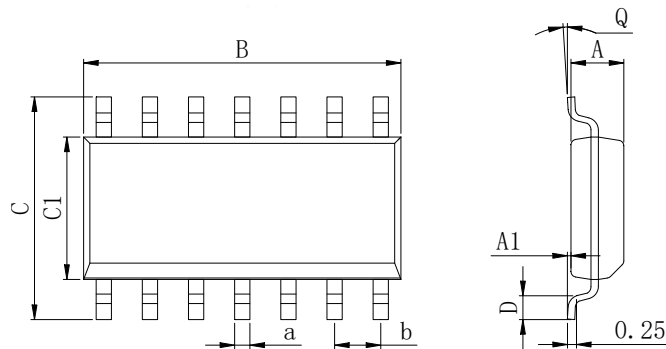
AC Characteristics

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

Characteristics	Symbol	$V_{CC} \text{ (V)}$	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	

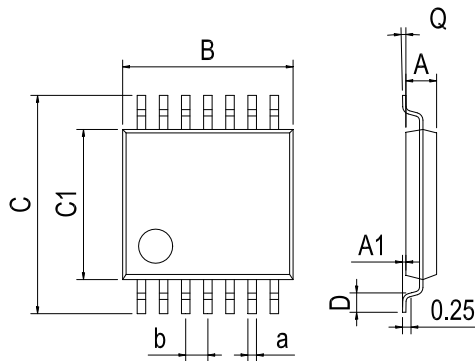
Physical Dimensions

SOP14



Dimensions In Millimeters(SOP14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	

TSSOP14



Dimensions In Millimeters(TSSOP14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

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