

# MM54HC151/MM74HC151 8-Channel Digital Multiplexer

## General Description

This high speed Digital multiplexer utilizes advanced silicon-gate CMOS technology. Along with the high noise immunity and low power dissipation of standard CMOS integrated circuits, it possesses the ability to drive 10 LS-TTL loads. The MM54HC151/MM74HC151 selects one of the 8 data sources, depending on the address presented on the A, B, and C inputs. It features both true (Y) and complement (W) outputs. The STROBE input must be at a low logic level to enable this multiplexer. A high logic level at the STROBE forces the W output high and the Y output low.

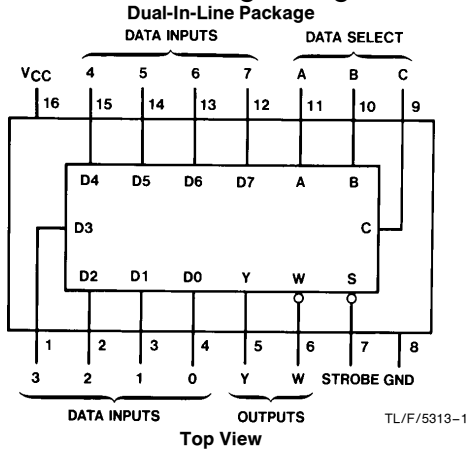
The 54HC/74HC logic family is functionally as well as pin-out compatible with the standard 54LS/74LS logic family.

All inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

## Features

- Typical propagation delay data select to output Y: 26 ns
- Wide operating supply voltage range: 2–6V
- Low input current: 1  $\mu$ A maximum
- Low quiescent supply current: 80  $\mu$ A maximum (74HC)
- High output drive current: 4 mA minimum

## Connection and Logic Diagrams

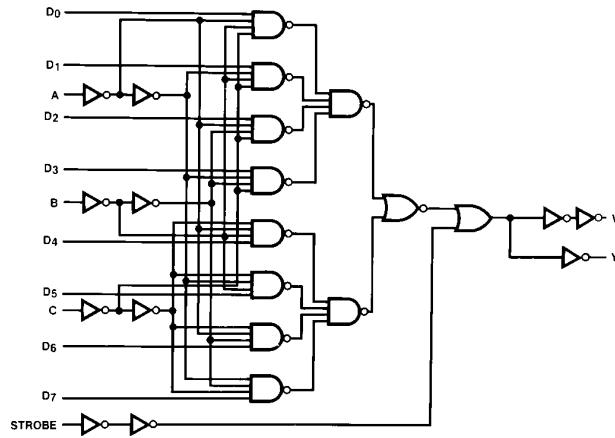


## Truth Table

Inputs			Strobe S	Outputs	
Select C	B	A		Y	W
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	$\overline{D7}$

H = High Level, L = Low Level, X = Don't Care  
D0, D1...D7 = the level of the respective D input

## Order Number MM54HC151 or MM74HC151



## Absolute Maximum Ratings (Notes 1 & 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC} + 1.5V$
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC} + 0.5V$
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA
DC Output Current, per pin ( $I_{OUT}$ )	$\pm 25$ mA
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	$\pm 50$ mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation ( $P_D$ ) (Note 3)	600 mW
S.O. Package only	500 mW
Lead Temp. ( $T_L$ ) (Soldering 10 seconds)	260°C

## Operating Conditions

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	2	6	V
DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Operating Temp. Range ( $T_A$ )			
MM74HC	-40	+85	°C
MM54HC	-55	+125	°C
Input Rise or Fall Times ( $t_r, t_f$ )			
$V_{CC} = 2.0V$		1000	ns
$V_{CC} = 4.5V$		500	ns
$V_{CC} = 6.0V$		400	ns

## DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ C$		74HC $T_A = -40$ to $85^\circ C$		54HC $T_A = -55$ to $125^\circ C$		Units
				Typ	Guaranteed Limits					
$V_{IH}$	Minimum High Level Input Voltage		2.0V		1.5	1.5	1.5		V	
			4.5V		3.15	3.15	3.15	V		
			6.0V		4.2	4.2	4.2	V		
$V_{IL}$	Maximum Low Level Input Voltage**		2.0V		0.5	0.5	0.5	V		
			4.5V		1.35	1.35	1.35	V		
			6.0V		1.8	1.8	1.8	V		
$V_{OH}$	Minimum High Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	2.0	1.9	1.9	1.9	V		
			4.5V	4.5	4.4	4.4	4.4	V		
			6.0V	6.0	5.9	5.9	5.9	V		
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0$ mA $ I_{OUT}  \leq 5.2$ mA	4.5V	4.2	3.98	3.84	3.7	V		
			6.0V	5.7	5.48	5.34	5.2	V		
$V_{OL}$	Maximum Low Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	0	0.1	0.1	0.1	V		
			4.5V	0	0.1	0.1	0.1	V		
			6.0V	0	0.1	0.1	0.1	V		
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0$ mA $ I_{OUT}  \leq 5.2$ mA	4.5V	0.2	0.26	0.33	0.4	V		
			6.0V	0.2	0.26	0.33	0.4	V		
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu A$		
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$	6.0V		8.0	80	160	$\mu A$		

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C; ceramic "J" package: -12 mW/°C from 100°C to 125°C.

**Note 4:** For a power supply of  $5V \pm 10\%$  the worst case output voltages ( $V_{OH}$  and  $V_{OL}$ ) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case  $V_{IH}$  and  $V_{IL}$  occur at  $V_{CC} = 5.5V$  and 4.5V respectively. (The  $V_{IH}$  value at 5.5V is 3.85V.) The worst case leakage current ( $I_{IN}$ ,  $I_{CC}$ , and  $I_{OZ}$ ) occur for CMOS at the higher voltage and so the 6.0V values should be used.

\*\* $V_{IL}$  limits are currently tested at 20% of  $V_{CC}$ . The above  $V_{IL}$  specification (30% of  $V_{CC}$ ) will be implemented no later than Q1, CY'89.

### AC Electrical Characteristics $V_{CC}=5V, T_A=25^{\circ}C, C_L=15\text{ pF}, t_r=t_f=6\text{ ns}$

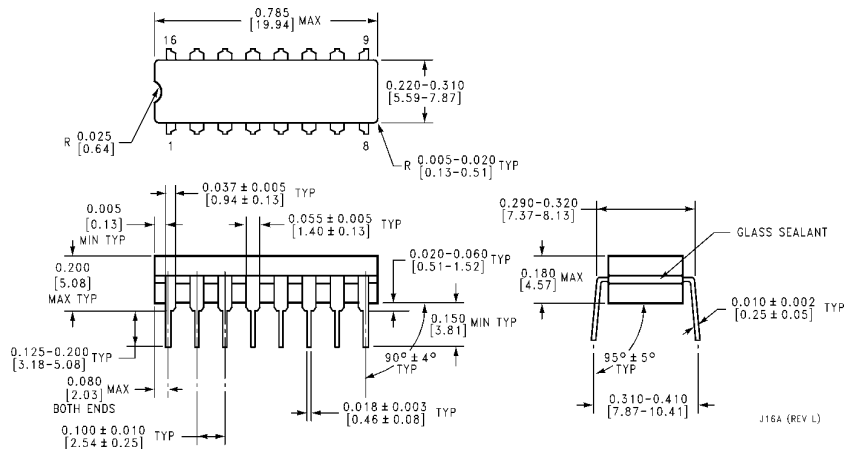
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay A, B or C to Y		26	35	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay A, B or C to W		27	35	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Any D to Y		22	29	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay any D to W		24	32	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Strobe to Y		17	23	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Strobe to W		16	21	ns

### AC Electrical Characteristics $C_L=50\text{ pF}, t_r=t_f=6\text{ ns}$ (unless otherwise specified)

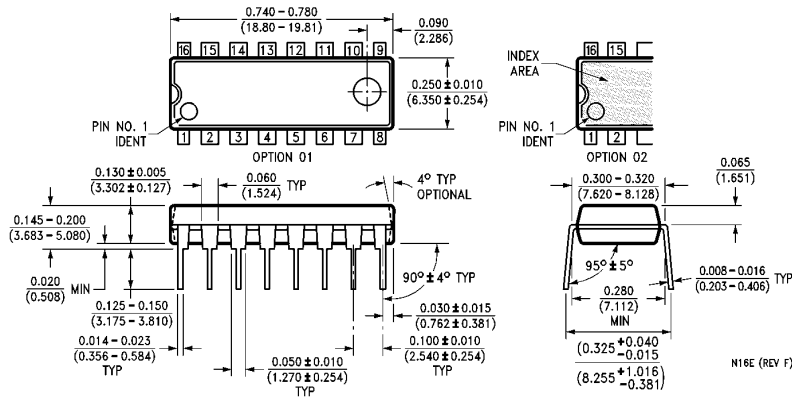
Symbol	Parameter	Conditions	$V_{CC}$	$T_A=25^{\circ}C$		74HC $T_A=-40\text{ to }85^{\circ}C$		54HC $T_A=-55\text{ to }125^{\circ}C$		Units
				Typ	Guaranteed Limits					
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay A, B or C to Y		2.0V	90	205	256		300		ns
			4.5V	31	41	51		60		ns
			6.0V	26	35	44		51		ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay A, B or C to W		2.0V	95	205	256		300		ns
			4.5V	32	41	51		60		ns
			6.0V	27	35	44		51		ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay any D to Y		2.0V	70	195	244		283		ns
			4.5V	27	39	49		57		ns
			6.0V	23	33	41		48		ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay any D to W		2.0V	75	185	231		268		ns
			4.5V	29	37	46		54		ns
			6.0V	25	32	40		46		ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Strobe to Y		2.0V	50	140	175		203		ns
			4.5V	21	28	35		41		ns
			6.0V	18	24	30		35		ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Strobe to W		2.0V	45	127	159		185		ns
			4.5V	20	25	32		37		ns
			6.0V	17	22	28		32		ns
$t_{TLH}, t_{THL}$	Maximum Output Rise and Fall Time		2.0V	30	75	95		110		ns
			4.5V	8	15	19		22		ns
			6.0V	7	13	16		19		ns
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(per package)		110					pF	
$C_{IN}$	Maximum Input Capacitance			5	10	10		10		pF

**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

**Physical Dimensions** inches, (millimeters)



**Order Number MM54HC151J or MM74HC151J**  
NS Package J16A



**Order Number MM74HC151N**  
NS Package N16E

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