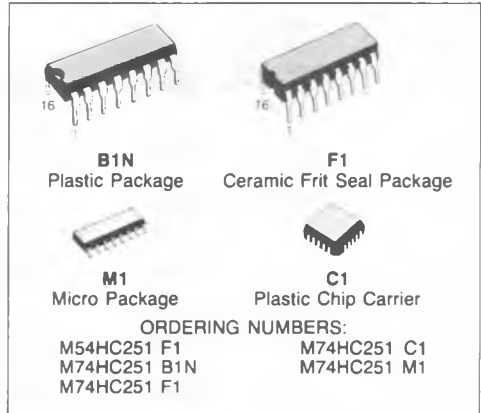


8-CHANNEL MULTIPLEXER (3-STATE)

- **HIGH SPEED**
 $t_{PD} = 18 \text{ ns (TYP.)}$ at $V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu\text{A (MAX.)}$ at $T_A = 25^\circ\text{C}$ 6V
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN).
- **OUTPUT DRIVE CAPABILITY**
 10 LSTTL LOADS
- **SYMMETRICAL OUTPUT IMPEDANCE**
 $|I_{OH}| = I_{OL} = 4 \text{ mA (MIN.)}$
- **BALANCED PROPAGATION DELAYS**
 $t_{PLH} = t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE**
 V_{CC} (OPR) = 2V to 6V
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS251



DESCRIPTION

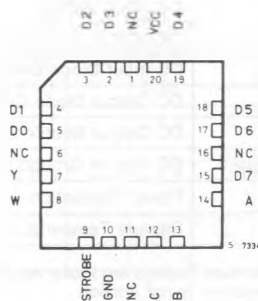
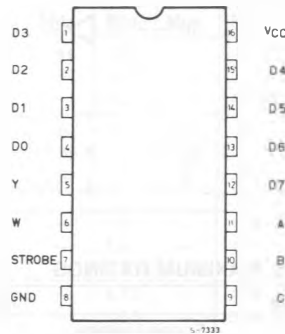
The M54/74HC251 is a high speed CMOS 8-CHANNEL MULTIPLEXER (3-STATE) fabricated in silicon gate CMOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. This multiplexer features both true (Y) and complement (W) outputs as well as a STROBE input. The STROBE must be at a low logic level to enable this device. When the STROBE input is high, both outputs are in the high impedance state. When enabled, address information on the data select inputs determines which data input is routed to Y and W. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

TRUTH TABLE

INPUTS				OUTPUTS	
SELECT			STROBE	Y	W
C	B	A	S		
X	X	X	H	Z	Z
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	$\overline{D7}$

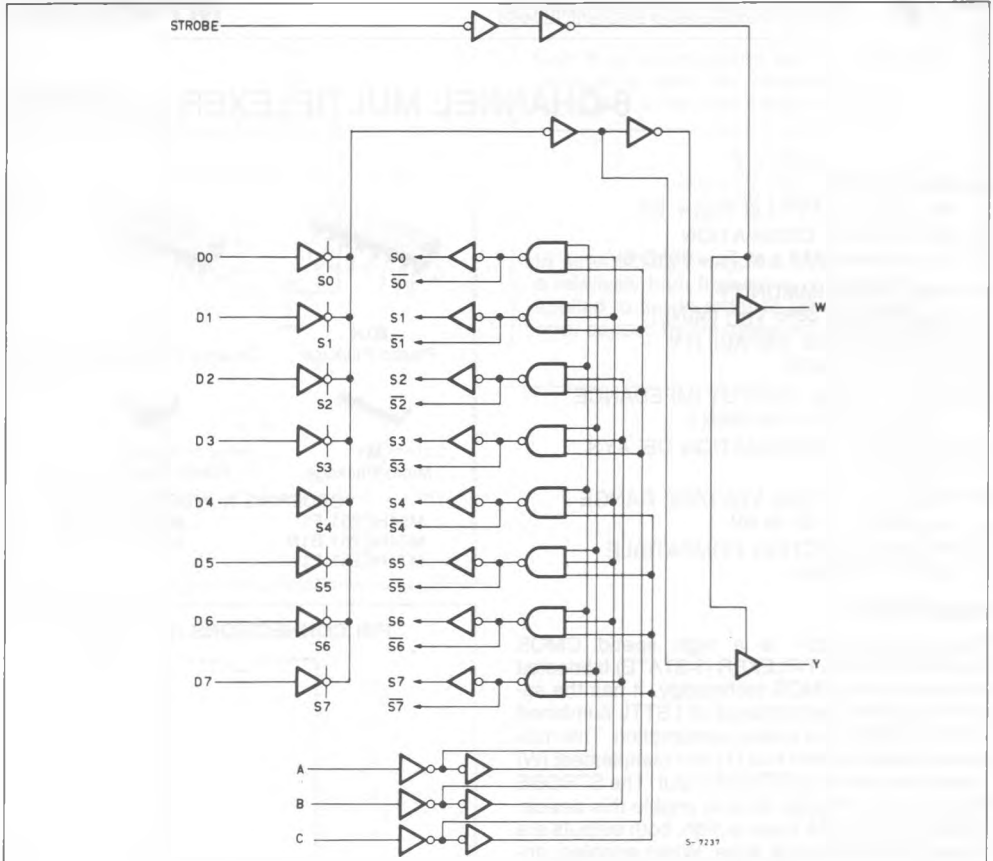
Z: HIGH IMPEDANCE X: DON'T CARE

PIN CONNECTIONS (top view)



NC =
No Internal
Connection

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to 7	V
V_I	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
V_O	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to 150	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: \equiv 65 $^{\circ}C$ derate to 300 mW by 10 mW/ $^{\circ}C$: 65 $^{\circ}C$ to 85 $^{\circ}C$.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit	
V_{CC}	Supply Voltage	2 to 6	V	
V_I	Input Voltage	0 to V_{CC}	V	
V_O	Output Voltage	0 to V_{CC}	V	
T_A	Operating Temperature	74HC Series 54HC Series	-40 to 85 -55 to 125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} $\begin{cases} 2 \text{ V} \\ 4.5 \text{ V} \\ 6 \text{ V} \end{cases}$	$\begin{cases} 0 \text{ to } 1000 \\ 0 \text{ to } 500 \\ 0 \text{ to } 400 \end{cases}$	ns

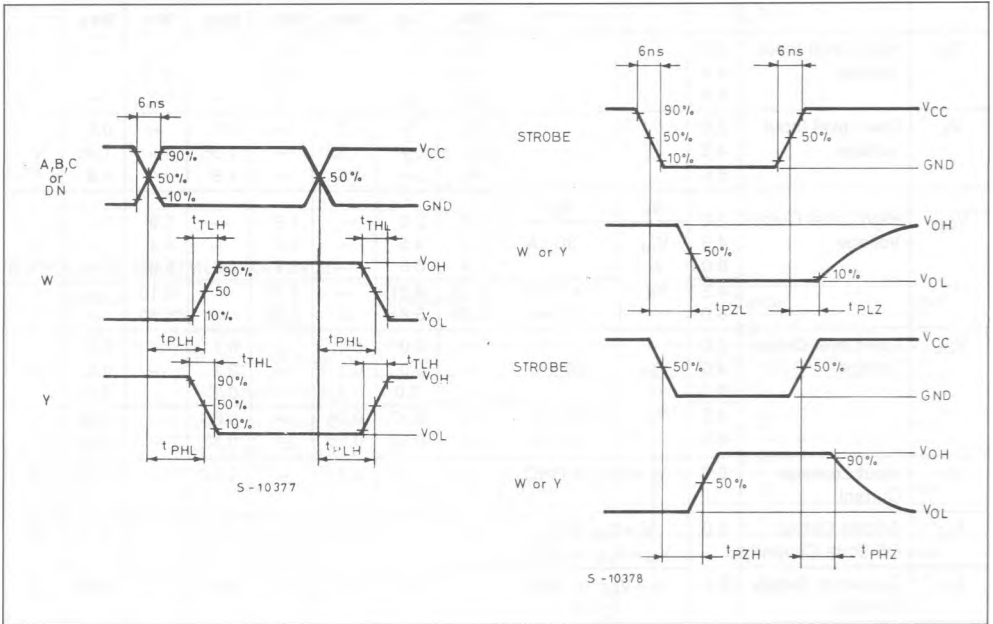
DC SPECIFICATIONS

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40 \text{ to } 85^\circ\text{C}$ 74HC		$-55 \text{ to } 125^\circ\text{C}$ 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V_{IH}	High Level Input Voltage	2.0		1.5	—	—	1.5	—	1.5	—	V	
		4.5		3.15	—	—	3.15	—	3.15	—		
		6.0		4.2	—	—	4.2	—	4.2	—		
V_{IL}	Low Level Input Voltage	2.0		—	—	0.5	—	0.5	—	0.5	V	
		4.5		—	—	1.35	—	1.35	—	1.35		
		6.0		—	—	1.8	—	1.8	—	1.8		
V_{OH}	High Level Output Voltage	2.0	V_I	I_O	1.9	2.0	—	1.9	—	1.9	—	V
		4.5			V_{IH} or V_{IL}	-20 μA	4.4	4.5	—	4.4	—	
		6.0	5.9	6.0			—	5.9	—	5.9	—	
		4.5	-4.0 mA -5.2 mA	4.18	4.31	—	4.13	—	4.10	—		
6.0	5.68	5.8		—	5.63	—	5.60	—				
V_{OL}	Low Level Output Voltage	2.0	V_{IH} or V_{IL}	20 μA	—	0.0	0.1	—	0.1	—	0.1	V
		4.5			—	0.0	0.1	—	0.1	—	0.1	
		6.0	—	0.0	0.1	—	0.1	—	0.1			
		4.5	4.0 mA 5.2 mA	—	0.17	0.26	—	0.33	—	0.40		
6.0	—	0.18		0.26	—	0.33	—	0.40				
I_I	Input Leakage Current	6.0	$V_I = V_{CC}$ or GND	—	—	± 0.1	—	± 1.0	—	± 1.0	μA	
I_{OZ}	3-State Output Off-State Current	6.0	$V_I = V_{IH}$ or V_{IL} $V_O = V_{CC}$ or GND	—	—	± 0.5	—	± 5.0	—	± 10	μA	
I_{CC}	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND $I_O = 0$	—	—	4	—	40	—	80	μA	

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5V$, $T_A = 25^\circ C$, $C_L = 15pF$, Input $t_r = t_f = 6ns$)

Symbol	Parameter	C_L (pF)	54HC and 74HC			Unit
			Min.	Typ.	Max.	
t_{TLH} t_{THL}	Output Transition Time	15		4	8	ns
t_{PLH} t_{PHL}	Propagation Delay Time (D - W)	15		18	29	ns
t_{PLH} t_{PHL}	Propagation Delay Time (D - Y)	15		17	27	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B, C - W)	15		22	35	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B, C - Y)	15		21	33	ns
t_{PZH} t_{PZL}	3-State Output Enable Time	15		11	18	ns
t_{PHZ} t_{PLZ}	3-State Output Disable Time	5		9	15	ns

SWITCHING CHARACTERISTICS TEST WAVEFORM



AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			-40 to 85°C 74HC		-55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	30 8 7	75 15 13	— — —	95 19 16	— — —	110 22 19	ns
t_{PLH} t_{PHL}	Propagation Delay Time (D - W)	2.0 4.5 6.0		— — —	76 19 16	165 33 28	— — —	205 41 35	— — —	250 50 43	ns
t_{PLH} t_{PHL}	Propagation Delay Time (D - Y)	2.0 4.5 6.0		— — —	76 19 16	160 32 27	— — —	200 40 34	— — —	240 48 41	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B, C - W)	2.0 4.5 6.0		— — —	96 24 20	205 41 35	— — —	255 51 43	— — —	310 62 53	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B, C, - Y)	2.0 4.5 6.0		— — —	96 24 20	195 39 34	— — —	245 49 42	— — —	295 59 50	ns
t_{PZL} t_{PZH}	3 State Output Enable Time	2.0 4.5 6.0		— — —	52 13 11	105 21 18	— — —	130 26 22	— — —	160 32 27	ns
t_{PLZ} t_{PHZ}	3 State Output Disable Time	2.0 4.5 6.0		— — —	60 15 13	105 21 18	— — —	130 26 22	— — —	160 32 27	ns
C_{IN}	Input Capacitance			—	5	10	—	10	—	10	pF
C_{OUT}	Output Capacitance			—	10	—	—	—	—	—	pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	100	—	—	—	—	—	pF

Note (*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to test Circuit)

Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

TEST WAVEFORM I_{CC} (Opr.)