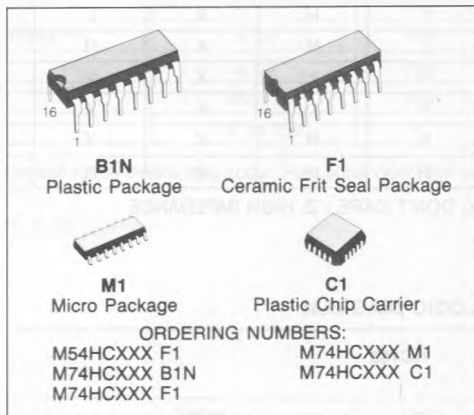


HC153 DUAL 4-CHANNEL MULTIPLEXER HC253 DUAL 4-CHANNEL MULTIPLEXER 3-STATE OUTPUT

PRELIMINARY DATA

- **HIGH SPEED**
 $t_{PD} = 14 \text{ ns (Typ)}$ at $V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu A \text{ (MAX.)}$ at $T_A = 25^\circ C$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- **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**
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS153/253



DESCRIPTION

The M54/74HC153 and M54/74HC253 are high speed CMOS DUAL 4-CHANNEL MULTIPLEXERS fabricated with silicon gate C²MOS technology. Both achieve high speed operation, similar to equivalent LSTTL, while maintaining the CMOS low power dissipation.

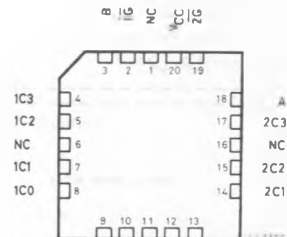
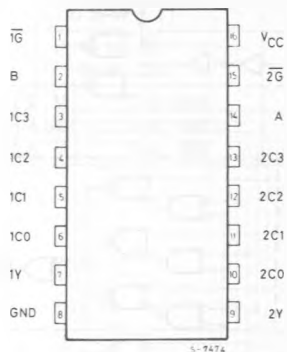
The designer has a choice of complementary output (HC153) and 3-state output (HC253).

Each of these data (1C0-1C3, 2C0-2C3) is selected by the two address inputs A and B.

Separate strobe inputs (1G, 2G) are provided for each of the two four-line sections. The strobe input (G) can be used to inhibit the data output; the output of HC153 is fixed at a low level and the output of HC253 is a high impedance, while the strobe input is held low.

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

PIN CONNECTION (top view)



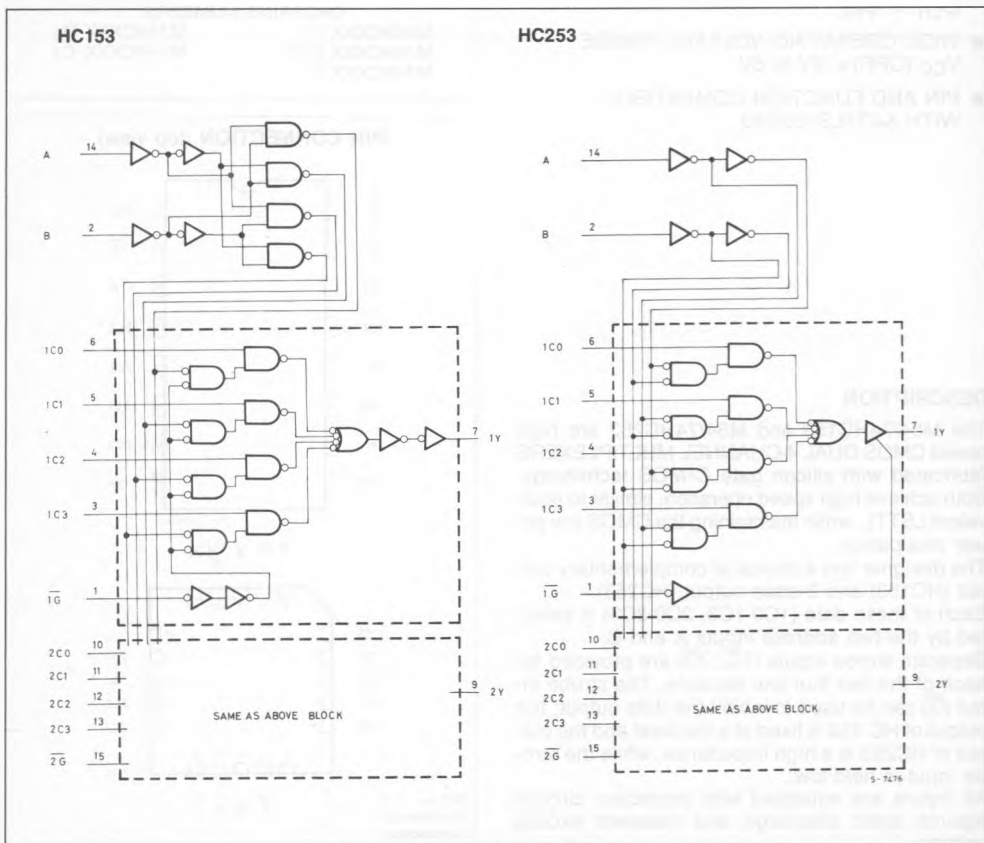
NC =
No Internal
Connection

TRUTH TABLE

SELECT INPUTS		DATA INPUTS				STROBE	OUTPUT Y	
B	A	C ₀	C ₁	C ₂	C ₃	G	HC153	HC253
X	X	X	X	X	X	H	L	Z
L	L	L	X	X	X	L	L	L
L	L	H	X	X	X	L	H	H
L	H	X	L	X	X	L	L	L
L	H	X	H	X	X	L	H	H
H	L	X	X	L	X	L	L	L
H	L	X	X	H	X	L	H	H
H	H	X	X	X	L	L	L	L
H	H	X	X	X	H	L	H	H

X: DON'T CARE - Z: HIGH IMPEDANCE

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	°C

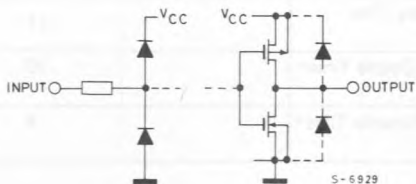
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: $\cong$ 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°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	$V_{CC} \begin{cases} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5 \text{ V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{cases}$	ns

INPUT AND OUTPUT EQUIVALENT CIRCUIT



DC ELECTRICAL CHARACTERISTICS

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.	
V_{IH}	High Level Input Voltage	2.0 4.5 6.0		1.5 3.15 4.2	— — —	— — —	1.5 3.15 4.2	— — —	1.5 3.15 4.2	— — —	V
V_{IL}	Low Level Input Voltage	2.0 4.5 6.0		— — —	— — —	0.5 1.35 1.8	— 1.35 1.8	— 1.35 1.8	— — —	0.5 1.35 1.8	V
V_{OH}	High Level Output Voltage	2.0	V_I	1.9	2.0	—	1.9	—	1.9	—	V
		4.5	V_{IH} or V_{IL}	4.4	4.5	—	4.4	—	4.4	—	
		6.0		5.9	6.0	—	5.9	—	5.9	—	
		4.5 6.0	— 4.0 mA — 5.2 mA	4.18 5.68	4.31 5.8	— —	4.13 5.63	— —	4.10 5.60	— —	
V_{OL}	Low Level Output Voltage	2.0	V_{IH} or V_{IL}	—	0.0	0.1	—	0.1	—	0.1	V
		4.5		—	0.0	0.1	—	0.1	—	0.1	
		6.0	20 μA	—	0.0	0.1	—	0.1	—	0.1	
		4.5 6.0		— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	— —	0.40 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 ⁽¹⁾ 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	—	—	4	—	40	—	80	μA

Note: 1. Applied only for M54/74HC253

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

Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t_{TLH} t_{THL}	Output Transition Time		4	8	ns
t_{PLH} t_{PHL}	Propagation Delay Time ($C_n - Y$)		14	23	ns
t_{PLH}	Propagation Delay Time (A, B-Y) (G-Y)		21	33	ns
t_{pZH} t_{pZL}	3-State Output Enable Time*		10	17	ns
t_{pHZ} t_{pLZ}	3-State Output Disable Time*		8	14	ns

* Only HC253

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

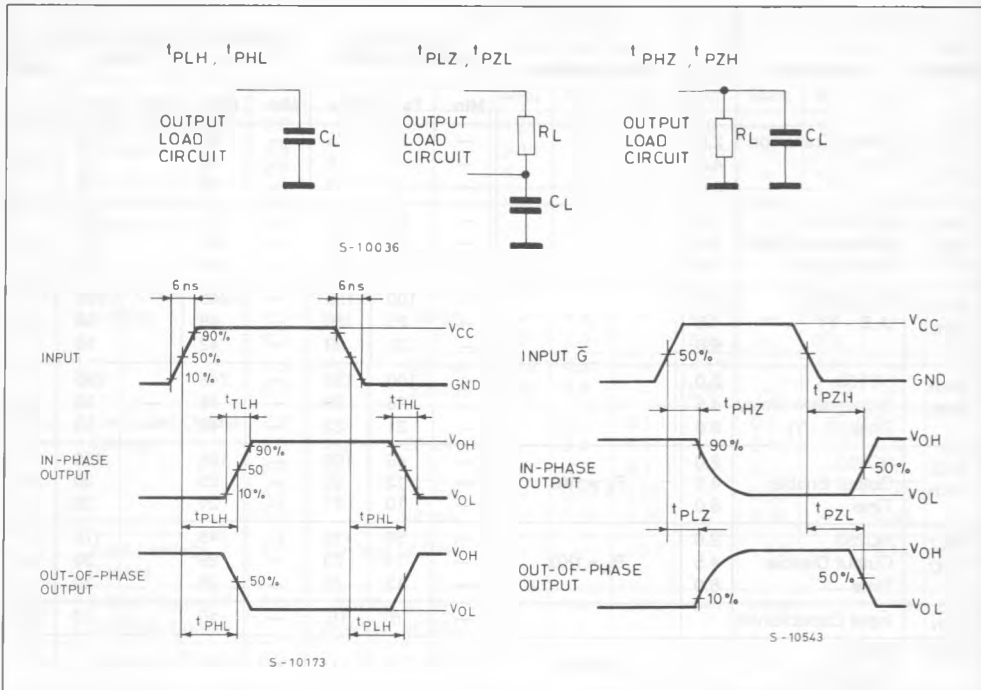
Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40\text{ to }85^\circ\text{C}$ 74HC		$-55\text{ to }125^\circ\text{C}$ 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	25 9 8	75 15 13	— — —	95 19 16		110 22 19	ns
t_{PLH} t_{PHL}	HC153/253 Propagation Delay Time ($C_n - Y$)	2.0 4.5 6.0		— — —	68 17 14	130 26 22	— — —	165 33 28		195 39 33	ns
t_{PLH} t_{PHL}	HC153/253 (A, B - Y)	2.0 4.5 6.0		— — —	100 25 21	195 39 33	— — —	245 49 42		295 59 50	ns
t_{PLH} t_{PHL}	HC153 Propagation Delay Time ($G - Y$)	2.0 4.5 6.0		— — —	100 25 21	195 39 33	— — —	245 49 42		295 59 50	ns
t_{PZL} t_{PZH}	HC253 Output Enable Time	2.0 4.5 6.0	$R_L = 1\text{K}\Omega$	— — —	46 12 10	100 20 17	— — —	125 25 21		150 30 26	ns
t_{PLZ} t_{PHZ}	HC253 Output Disable Time	2.0 4.5 6.0	$R_L = 1\text{K}\Omega$	— — —	56 14 12	115 23 22	— — —	145 29 25		175 35 30	ns
C_{IN}	Input Capacitance			—	5	10	—	10		10	pF
C_{OUT}	Output Capacitance		HC253	—	7	—	—	—			
$C_{PD} (*)$	Power Dissipation Capacitance		HC123	—	56	—	—	—			pF
			HC253	—	56	—	—	—			

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.

Average operating current can be obtained by the following equation hereunder:

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \text{ (per Circuit)}$$

SWITCHING CHARACTERISTICS TEST WAVEFORM

TEST CIRCUIT I_{CC} (Opr.)