

641955 (153)  
541957 (253)

# HS-C<sup>2</sup>MOS™ INTEGRATED CIRCUITS

## PRELIMINARY DATA

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

#### DESCRIPTION

The M54/74HC153 and M54/74HC253 are high speed CMOS DUAL 4-CHANNEL MULTIPLEXERS fabricated with silicon gate C<sup>2</sup>MOS technology. Both achieve the 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 input 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 HC 153 is fixed at a low level and the output of HC253 is disabled to be high impedance unconditionally, while the strobe input is held low. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

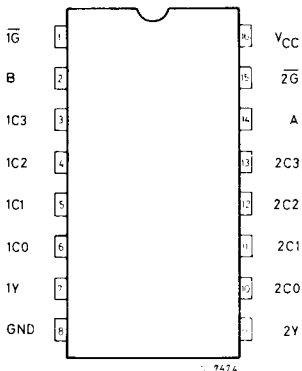
**B1** Plastic Package      **F1** Ceramic Package      **C1** Chip Carrier

ORDERING NUMBERS: M54HCXXX F1  
M74HCXXX B1  
M74HCXXX F1  
M74HCXXX C1

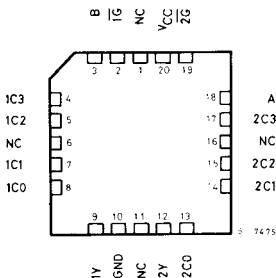
#### FEATURES

- 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

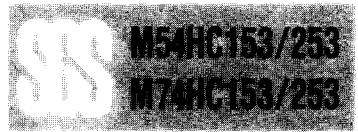
#### PIN CONNECTIONS (top view)



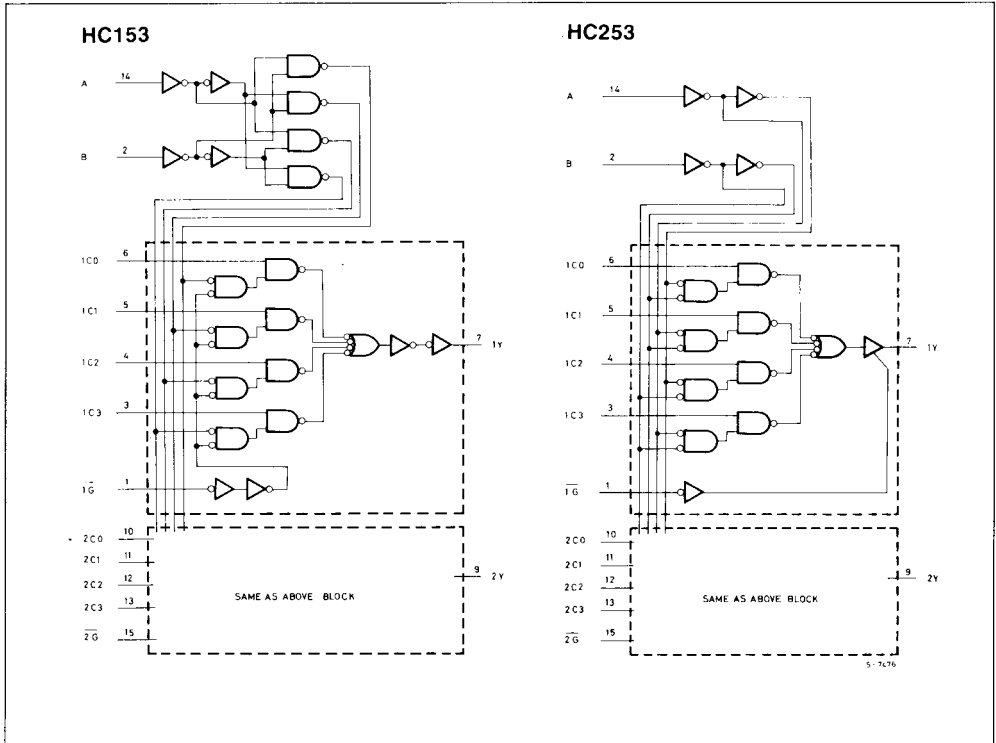
#### Dual in line CHIP CARRIER



NC = No Internal Connection



## LOGIC DIAGRAM



## TRUTH TABLE

SELECT INPUTS		DATA INPUTS				STROBE	OUTPUT Y	
B	A	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	$\bar{G}$	HC153	HC253
*	*	*	*	*	*	H	L	Z
L	L	L	*	*	*	L	L	L
L	L	H	*	*	*	L	H	H
L	H	*	L	*	*	L	L	L
L	H	*	H	*	*	L	H	H
H	L	*	*	L	*	L	L	L
H	L	*	*	H	*	L	H	H
H	H	*	*	*	L	L	L	L
H	H	*	*	*	H	L	H	H

\* Don't Care - Z: High Impedance



## 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	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Source Sink Current Per Output Pin	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	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:  $\cong$  65 $^{\circ}C$  derate to 300 mW by 10 mW/ $^{\circ}C$ : 65 $^{\circ}C$  to 85 $^{\circ}C$ .

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limit	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	$^{\circ}C$						
$t_r, t_f$	Input Rise and Fall Time	$V_{CC}$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>2 V</td> <td>0 to 1000</td> </tr> <tr> <td>4.5V</td> <td>0 to 500</td> </tr> <tr> <td>6 V</td> <td>0 to 400</td> </tr> </table>	2 V	0 to 1000	4.5V	0 to 500	6 V	0 to 400	ns
2 V	0 to 1000								
4.5V	0 to 500								
6 V	0 to 400								

### DC SPECIFICATIONS

Symbol	Parameter	V <sub>CC</sub>	Test Condition	T <sub>A</sub> = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V <sub>IH</sub>	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 <sub>IL</sub>	Low Level Input Voltage	2.0 4.5 6.0		— — —	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8		0.5 1.35 1.8	V	
V <sub>OH</sub>	High Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V <sub>I</sub>	I <sub>O</sub>	1.9	2.0	—	1.9	—	1.9		V
			V <sub>IH</sub> or V <sub>IL</sub>	-20 μA	4.4	4.5	—	4.4	—	4.4		
				-4.0 mA -5.2 mA	4.18	4.31	—	4.13	—	4.10		
					5.68	5.8	—	5.63	—	5.60		
V <sub>OL</sub>	Low Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V <sub>IH</sub> or V <sub>IL</sub>	20 μA	—	0	0.1	—	0.1		0.1	V
						—	0	0.1	—	0.1		
				4.0 mA 5.2 mA	—	0.17	0.26	—	0.33		0.40	
					—	0.18	0.26	—	0.33		0.40	
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	±0.1	—	±1		±1	μA	
I <sub>OZ</sub>	3-State Output* Off-State Current	6.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	—	—	±0.5	—	±5.0		±10	μA	
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND I <sub>O</sub> = 0	—	—	4	—	40		80	μA	

\*Note: Applied only for M54/74HC253

### AC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

Symbol	Parameter	CL (pF)	54HC and 74HC			Unit
			MIN.	TYP.	MAX.	
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	15		4	8	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (C <sub>n</sub> - Y)	15		14	23	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (A, B - Y)	15		21	33	ns
t <sub>PZH</sub> t <sub>PZL</sub>	3-State Output Enable Time*	15		10	17	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	3-State Output Disable Time*	5		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			$-40$ to $85^\circ\text{C}$ 74HC		$-55$ to $125^\circ\text{C}$ 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0		—	25	75	—	90			ns
		4.5		—	9	15	—	18			
		6.0		—	8	13	—	16			
$t_{PLH}$ $t_{PHL}$	HC153/253 Propagation Delay Time ( $C_n - Y$ )	2.0		—	60	130	—	160			ns
		4.5		—	17	26	—	32			
		6.0		—	14	22	—	27			
$t_{PLH}$ $t_{PHL}$	HC153/253 (A, B - Y)	2.0		—	92	195	—	235			ns
		4.5		—	25	39	—	47			
		6.0		—	21	33	—	40			
$t_{PLH}$ $t_{PHL}$	HC153 Propagation Delay Time ( $\bar{G} - Y$ )	2.0		—	92	195	—	235			ns
		4.5		—	25	39	—	47			
		6.0		—	21	33	—	40			
$t_{PZL}$ $t_{PZH}$	HC253 Output Enable Time	2.0		—	40	100	—	120			ns
		4.5		—	12	20	—	24			
		6.0		—	10	17	—	21			
$t_{PLZ}$ $t_{PHZ}$	HC253 Output Disable Time	2.0		—	25	115	—	140			ns
		4.5		—	14	23	—	28			
		6.0		—	13	22	—	26			
$C_{IN}$	Input Capacitance			—	5	10	—	10			
$C_{OUT}$	Output Capacitance		HC253	—	7	—	—	—			
$C_{PD} (*)$	Power Dissipation Capacitance		HC123	—	56	—	—	—			
			HC253	—	56	—	—	—			

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

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

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