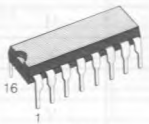
SGS-THOMSON MICROELECTRONICS

M54HC153/253
M74HC153/253

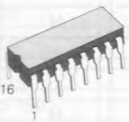
HC153 DUAL 4-CHANNEL MULTIPLEXER
HC253 DUAL 4-CHANNEL MULTIPLEXER 3-STATE OUTPUT

PRELIMINARY DATA

- HIGH SPEED
  t_{PD} = 14 ns (Typ) at V_{CC} = 5V
- LOW POWER DISSIPATION
  I_{CC} = 4 μA (MAX.) at T_A = 25°C
- 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 mA (MIN.)
- BALANCED PROPAGATION DELAYS
  $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE
  V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE
  WITH 54/74LS153/253



B1N
Plastic Package



F1
Ceramic Frit Seal Package

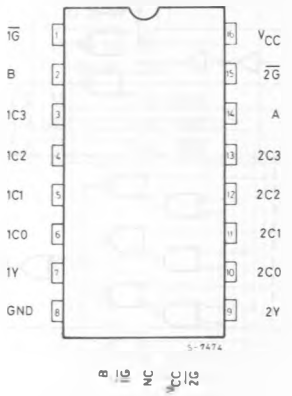
M1
Micro Package

C1
Plastic Chip Carrier

ORDERING NUMBERS:

M54HCXXX F1
M74HCXXX B1N
M74HCXXX F1
M74HCXXX M1
M74HCXXX C1

PIN CONNECTION (top view)



NC = No Internal Connection

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 ($1\overline{G}$, $2\overline{G}$) are provided for each of the two four-line sections. The strobe input ($\overline{G}$) 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 a high impedance, while the strobe input is heid low.

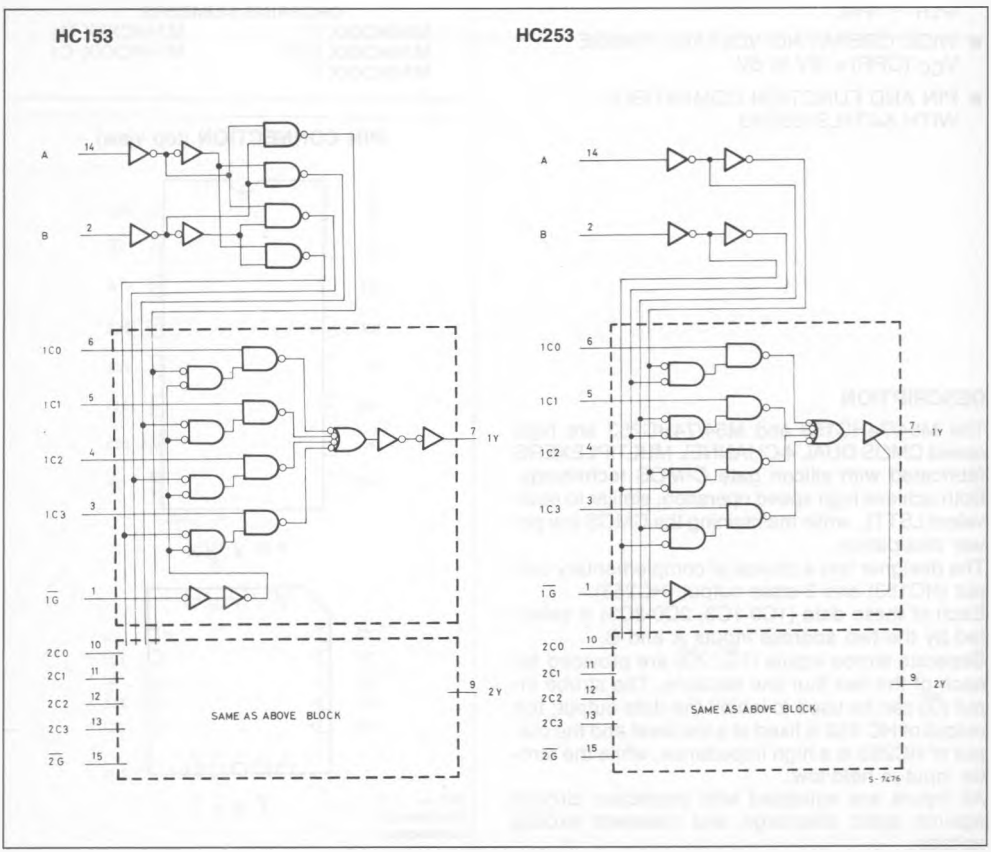
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

TRUTH TABLE

SELECT INPUTS		DATA INPUTS				STROBE	OUTPUT Y	
B	A	C_0	C_1	C_2	C_3	$\overline{G}$	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

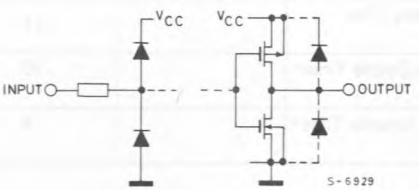
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: ≅ 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	−40 to 85		°C
		54HC Series	−55 to 125		
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2 V	0 to 1000		ns
		V_{CC} = 4.5 V	0 to 500		
		V_{CC} = 6 V	0 to 400		

INPUT AND OUTPUT EQUIVALENT CIRCUIT



DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{CC}*	Test Condition		$T_A = 25°C$ 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			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	—	4.4	—	
		6.0			5.9	6.0	—	5.9	—	5.9	—	
		4.5		– 4.0 mA	4.18	4.31	—	4.13	—	4.10	—	
		6.0		– 5.2 mA	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	—	0.17	0.26	—	0.33	—	0.40	
		6.0		5.2 mA	—	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(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 ($V_{CC} = 5V$, $T_A = 25°C$, $C_L = 15pF$, Input $t_r = t_f = 6ns$)

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) ($\overline{G}$-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

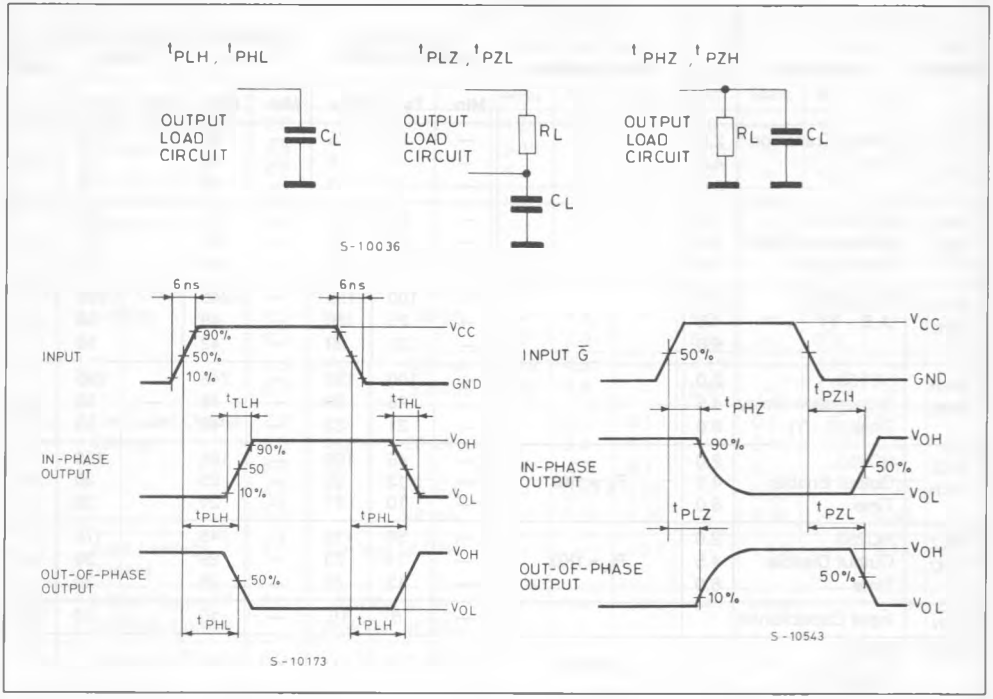
AC ELECTRICAL CHARACTERISTICS ($C_L = 50pF$, Input $t_r = t_f = 6ns$)

Symbol	Parameter	V_{CC}	Test Condition	T_A = 25°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		—	25	75	—	95		110	ns
		4.5		—	9	15	—	19		22	
		6.0		—	8	13	—	16		19	
t_{PLH} t_{PHL}	HC153/253 Propagation Delay Time (C_n-Y)	2.0		—	68	130	—	165		195	ns
		4.5		—	17	26	—	33		39	
		6.0		—	14	22	—	28		33	
t_{PLH} t_{PHL}	HC153/253 (A,B - Y)	2.0		—	100	195	—	245		295	ns
		4.5		—	25	39	—	49		59	
		6.0		—	21	33	—	42		50	
t_{PLH} t_{PHL}	HC153 Propagation Delay Time ($\overline{G}$ - Y)	2.0		—	100	195	—	245		295	ns
		4.5		—	25	39	—	49	—	59	
		6.0		—	21	33	—	42	—	50	
t_{PZL} t_{PZH}	HC253 Output Enable Time	2.0	$R_L = 1K\Omega$	—	46	100	—	125		150	ns
		4.5		—	12	20	—	25		30	
		6.0		—	10	17	—	21		26	
t_{PLZ} t_{PHZ}	HC253 Output Disable Time	2.0	$R_L = 1K\Omega$	—	56	115	—	145		175	ns
		4.5		—	14	23	—	29		35	
		6.0		—	12	22	—	25		30	
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:
$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$ (per Circuit)

SWITCHING CHARACTERISTICS TEST WAVEFORM



TEST CIRCUIT I_{CC} (Opr.)