

# GD54/74HC253, GD54/74HCT253

## DUAL 4-TO-1 LINE SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

### General Description

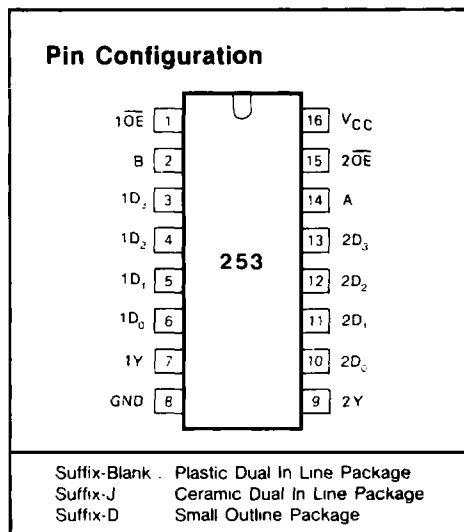
These devices are identical in pinout to the 54/74LS253. They contain two multiplexers, where each multiplexer is selected by two-bit address. Each multiplexer has an enable input which enables it when taken to a low logic level. When a high logic level is applied to an enable input, the outputs of its associated multiplexer are sent into a high impedance state. The HC/HCT253 are similar in function to the HC/HCT153 which do not have 3-state outputs. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

### Features

- Low Power consumption characteristic of CMOS devices
- Output drive capability: 15 LSTTL Loads Min.
- Operating speed superior to LS TTL
- Wide operating voltage range: for HC 2 to 6 volts  
for HCT 4.5 to 5.5 volts
- Low input current: 1  $\mu$ A Max.
- Low quiescent current: 80  $\mu$ A Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

### Function Table

SELECT INPUTS		DATA INPUTS				OUTPUT ENABLE	OUTPUT
A	B	nD <sub>0</sub>	nD <sub>1</sub>	nD <sub>2</sub>	nD <sub>3</sub>	n $\overline{OE}$	nY
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
H	L	X	L	X	X	L	L
H	L	X	H	X	X	L	H
L	H	X	X	L	X	L	L
L	H	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H



Logic Diagram

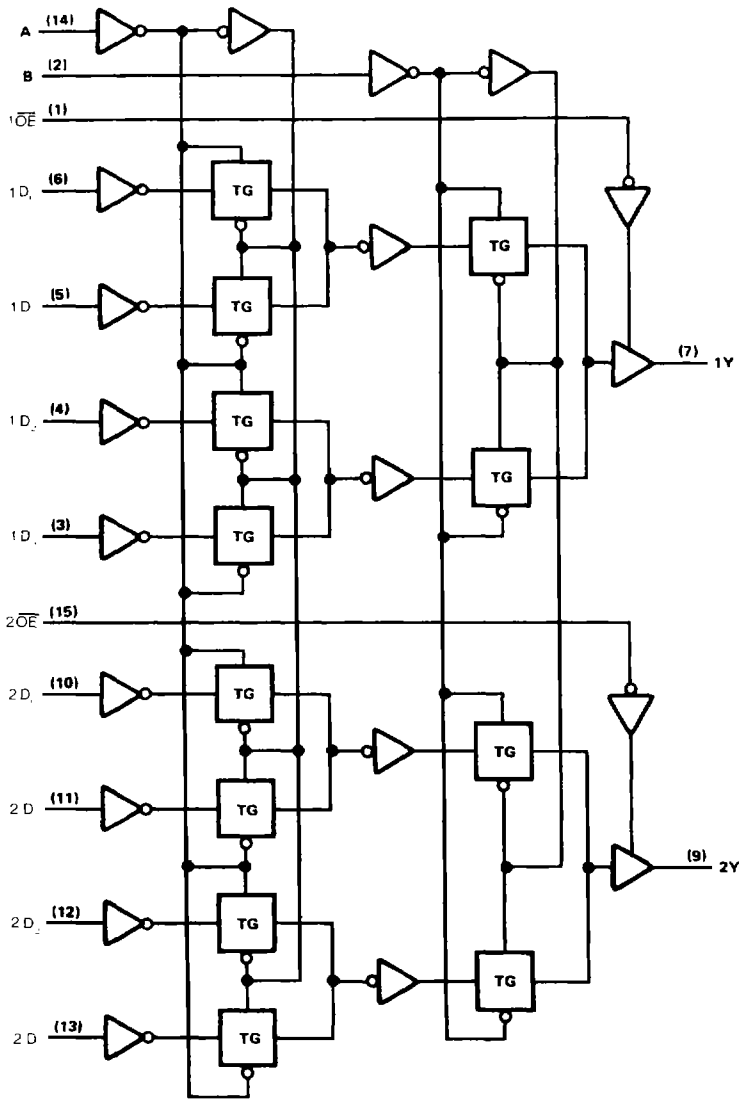


Fig. 1 Logic diagram.

**Absolute Maximum Ratings**

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
$V_{CC}$	DC Supply voltage		-0.5	+7	V
$I_{IK}, I_{OK}$	DC input or output diode current	for $V_I < -0.5$ or $V_I > V_{CC} + 0.5V$		20	mA
$I_O$	DC output source or sink current	for $-0.5V < V_O < V_{CC} + 0.5V$		35	mA
$I_{CC}$	DC $V_{CC}$ or GND current			70	mA
$T_{stg}$	Storage temperature range		-65	150	°C
$P_D$	Power dissipation per package	above +70°C. derate linearly with 8mW/K		500	mW
$T_L$	Lead temperature	At distance 1.16 ± 1/32 in from case for 60 sec(CERAMIC) 10 sec(PLASTIC)		300 260	°C

**Recommended Operating Conditions**

CHARACTERISTIC	LIMITS		UNITS
	MIN	MAX	
Supply-Voltage Range $V_{CC}$ GD54/74HC Types GD54/74HCT Types	2 4.5	6 5.5	V
DC Input or Output Voltage $V_I, V_O$	0	$V_{CC}$	V
Operating Temperature $T_A$ GD74 Types GD54 Types	-40 -55	+85 +125	°C
Input Rise and Fall times $t_r, t_f$ GD54/74HC Types at 2V at 4.5V at 6V GD54/74HCT Types at 4.5V		1000 500 400 500	ns

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			GD74HC253		GD54HC253		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>IH</sub>	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 <sub>IL</sub>	LOW level input voltage		2.0			0.3		0.3		0.3	V
			4.5			0.9		0.9		0.9	
			6.0			1.2		1.2		1.2	
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20μA	2.0	1.9	2.0		1.9		1.9	V
				4.5	4.4	4.5		4.4		4.4	
			6.0	5.9	6.0		5.9		5.9		
			I <sub>OH</sub> = -6mA	4.5	3.98	4.3		3.84		3.7	
6.0	5.48	5.2			5.34		5.2				
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20μA	2.0			0.1		0.1		V
				4.5			0.1		0.1		
			6.0			0.1		0.1		0.1	
			I <sub>OL</sub> = 6mA	4.5		0.17	0.26		0.33		
6.0		0.15		0.26		0.33		0.4			
I <sub>IN</sub>	Input leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0			0.1		1.0		1.0	μA
I <sub>OZ</sub>	Three-State leakage current	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	6.0		0.01	0.5		5.0		10.0	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0μA	6.0			8		80		160	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			GD74HCT253		GD54HCT253		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>IH</sub>	HIGH level input Voltage		4.5 to 5.0	2.0			2.0		2.0		V
V <sub>IL</sub>	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20μA	4.5	4.4	4.5		4.4		4.4	V
			I <sub>OH</sub> = -6mA	4.5	3.98	4.3		3.84		3.7	
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20μA	4.5			0.1		0.1		V
			I <sub>OL</sub> = 6mA	4.5		0.17	0.26		0.33		
I <sub>IN</sub>	Input leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5			0.1		1.0		1.0	μA
I <sub>OZ</sub>	Three-State leakage current	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	5.5		0.01	0.5		5.0		10.0	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0μA	5.5			8		80		160	μA

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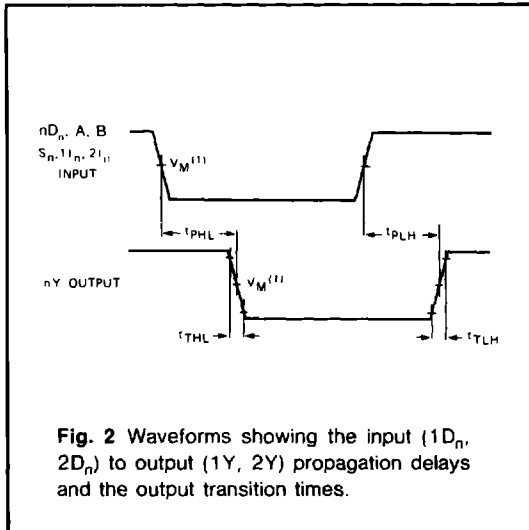
## AC Characteristics for HC: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER	$V_{CC}$	$T_A=25^\circ\text{C}$			GD74HC253		GD54HC253		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}$ / $t_{PHL}$	Propagation Delay Time A, B to nY	2.0		55	175		190		225	ns
		4.5		19	30		38		45	
		6.0		15	26		32		38	
$t_{PLH}$ / $t_{PHL}$	Propagation Delay Time $nD_n$ to nY	2.0		54	126		175		210	ns
		4.5		16	28		35		42	
		6.0		13	23		30		36	
$t_{PZH}$ / $t_{PZL}$	3-state Output Enable Time $\overline{nOE}$ to nY	2.0		28	100		125		150	ns
		4.5		11	20		25		30	
		6.0		9	17		21		26	
$t_{PLZ}$ / $t_{PHZ}$	3-state Output Disable Time $n\overline{OE}$ to nY	2.0		29	135		170		203	ns
		4.5		14	30		38		45	
		6.0		12	25		31		38	
$t_{TLH}$ / $t_{THL}$	Output Transition Time	2.0		28	60		75		90	ns
		4.5		7	12		15		18	
		6.0		6	10		13		15	

## AC Characteristics for HC: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER	$V_{CC}$	$T_A=25^\circ\text{C}$			GD74HCT253		GD54HCT253		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}$ / $t_{PHL}$	Propagation Delay Time A, B to nY	4.5		22	40		50		60	ns
$t_{PLH}$ / $t_{PHL}$	Propagation Delay Time $nD_n$ to nY	4.5		20	38		48		57	ns
$t_{PZH}$ / $t_{PZL}$	3-state Output Enable Time $n\overline{OE}$ to nY	4.5		15	25		30		35	ns
$t_{PLZ}$ / $t_{PHZ}$	3-state Output Disable Time $n\overline{OE}$ to nY	4.5		19	35		42		50	ns
$t_{TLH}$ / $t_{THL}$	Output Transition Time	4.5		7	12		15		18	ns

AC Waveforms



Note to AC waveforms

- (1) HC :  $V_M = 50\%$ ,  $V_I = \text{GND to } V_{CC}$ .
- HCT :  $V_M = 1.3V$ ,  $V_I = \text{GND to } 3V$

