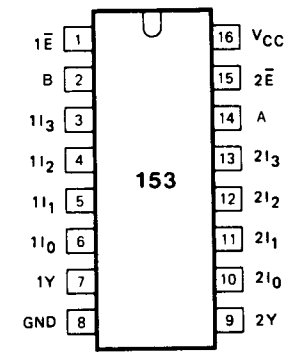
# GD54/74HC153, GD54/74HCT153

## DUAL 4-TO-1 LINE SELECTORS/MULTIPLEXERS

### General Description

These devices are identical in pinout to the 54/74LS153. They contain two multiplexers, where each multiplexer is selected by two-bit address. Each multiplexer has a select input which enables it when taken to a low logic level. When a high logic level is applied to a select input, the output of its associated multiplexer is taken low. The HC/HCT 153 is similar in function to the HC/HCT 253 which has 3-state outputs. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

### Pin Configuration




Suffix-Blank : Plastic Dual In Line Package
Suffix-J : Ceramic Dual In Line Package
Suffix-D : Small Outline Package

### Features

- Low Power consumption characteristic of CMOS devices
- Output drive capability: 10 LS TTL 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

### Logic Diagram

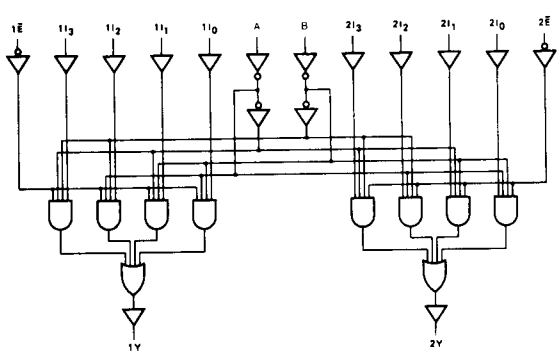



**Fig. 1** Logic diagram

### Function Table

| SELECT INPUTS | | DATA INPUTS | | | | OUTPUT ENABLE | OUTPUT |
|---|---|---|---|---|---|---|---|
| A | B | $nI_0$ | $nI_1$ | $nI_2$ | $nI_3$ | $n\bar{E}$ | nY |
| X | X | X | X | X | X | H | L |
| 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 |

H=HIGH voltage level
L=LOW voltage level
X=don't care

## 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 $-0.5V < V_O < V_{CC}+0.5V$ | | \|25\| | mA |
| $I_{CC}$ | DC $V_{CC}$ or GND current | | | \|50\| | 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 | 2 | 6 | V |
| GD54/74HCT Types | 4.5 | 5.5 | |
| DC Input or Output Voltage $V_I$, $V_O$ | 0 | $V_{CC}$ | V |
| Operating Temperature $T_A$: GD74 Types | −40 | +85 | °C |
| GD54 Types | −55 | +125 | |
| Input Rise and Fall times $t_r$, $t_f$: GD54/74HC Types at 2V | | 1000 | ns |
| at 4.5V | | 500 | |
| at 6V | | 400 | |
| GD54/74HCT Types at 4.5 V | | 500 | |

## DC Electrical Characteristics for HC

| SYMBOL | PARAMETER | TEST CONDITION | | $V_{CC}$ (V) | $T_A$=25°C | | | GD74HC153 | | GD54HC153 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN. | TYP. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| $V_{IH}$ | HIGH level input Voltage | | | 2.0<br>4.5<br>6.0 | 1.5<br>3.15<br>4.2 | | | 1.5<br>3.15<br>4.2 | | 1.5<br>3.15<br>4.2 | | V |
| $V_{IL}$ | LOW level input voltage | | | 2.0<br>4.5<br>6.0 | | | 0.3<br>0.9<br>1.2 | | 0.3<br>0.9<br>1.2 | | 0.3<br>0.9<br>1.2 | V |
| $V_{OH}$ | HIGH level output voltage | $V_{IN}$=$V_{IH}$ or $V_{IL}$ | $I_{OH}$=−20μA | 2.0<br>4.5<br>6.0 | 1.9<br>4.4<br>5.9 | 2.0<br>4.5<br>6.0 | | 1.9<br>4.4<br>5.9 | | 1.9<br>4.4<br>5.9 | | V |
| | | | $I_{OH}$=−4mA<br>$I_{OH}$=−5.2mA | 4.5<br>6.0 | 3.98<br>5.48 | 4.3<br>5.2 | | 3.84<br>5.34 | | 3.7<br>5.2 | | |
| $V_{OL}$ | LOW level output voltage | $V_{IN}$=$V_{IH}$ or $V_{IL}$ | $I_{OL}$=20μA | 2.0<br>4.5<br>6.0 | | | 0.1<br>0.1<br>0.1 | | 0.1<br>0.1<br>0.1 | | 0.1<br>0.1<br>0.1 | V |
| | | | $I_{OL}$=4mA<br>$I_{OL}$=5.2mA | 4.5<br>6.0 | | 0.17<br>0.15 | 0.26<br>0.26 | | 0.33<br>0.33 | | 0.4<br>0.4 | |
| $\|I_{IN}\|$ | Input leakage Current | $V_{IN}$=$V_{CC}$ or GND | | 6.0 | | | 0.1 | | 1.0 | | 1.0 | μA |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$=$V_{CC}$ or GND<br>$I_{out}$=0μA | | 6.0 | | | 8 | | 80 | | 160 | μA |

## DC Electrical Characteristics for HCT

| SYMBOL | PARAMETER | TEST CONDITION | | $V_{CC}$ (V) | $T_A$=25°C | | | GD74HCT153 | | GD54HCT153 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN. | TYP. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| $V_{IH}$ | HIGH level input Voltage | | | 4.5<br>to<br>5.5 | 2.0 | | | 2.0 | | 2.0 | | V |
| $V_{IL}$ | LOW level input voltage | | | 4.5<br>to<br>5.5 | | | 0.8 | | 0.8 | | 0.8 | V |
| $V_{OH}$ | HIGH level output voltage | $V_{IN}$=$V_{IH}$ | $I_{OH}$=−20μA | 4.5 | 4.4 | 4.5 | | 4.4 | | 4.4 | | V |
| | | or $V_{IL}$ | $I_{OH}$=−4mA | 4.5 | 3.98 | 4.3 | | 3.84 | | 3.7 | | |
| $V_{OL}$ | LOW level output voltage | $V_{IN}$=$V_{IH}$ | $I_{OL}$=20μA | 4.5 | | | 0.1 | | 0.1 | | 0.1 | V |
| | | or $V_{IL}$ | $I_{OL}$=4mA | 4.5 | | 0.17 | 0.26 | | 0.33 | | 0.4 | |
| $\|I_{IN}\|$ | Input leakage Current | $V_{IN}$=$V_{CC}$or GND | | 5.5 | | | 0.1 | | 1.0 | | 1.0 | μA |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$=$V_{CC}$ or GND<br>$I_{out}$=0μA | | 5.5 | | | 8 | | 80 | | 160 | μA |

## AC Characteristics for HC: $t_r=t_f=6ns$ $C_L=05$ pF

| SYMBOL | PARAMETER | $V_{CC}$ (V) | $T_A=25°C$ | | | GD74HC153 | | GD54HC153 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN. | TYP. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| $t_{PLH}$ / $t_{PHL}$ | Propagation Delay Time A or B to nY | 2.0 | | 50 | 150 | | 190 | | 225 | ns |
| | | 4.5 | | 18 | 30 | | 38 | | 45 | |
| | | 6.0 | | 14 | 26 | | 33 | | 38 | |
| $t_{PLH}$ / $t_{PHL}$ | Propagation Delay Time Data ($nI_n$) to nY | 2.0 | | 47 | 145 | | 180 | | 220 | ns |
| | | 4.5 | | 17 | 29 | | 36 | | 44 | |
| | | 6.0 | | 14 | 26 | | 31 | | 38 | |
| $t_{PLH}$ / $t_{PHL}$ | Propagation Delay Time $\overline{E}$ to nY | 2.0 | | 33 | 100 | | 125 | | 150 | ns |
| | | 4.5 | | 12 | 20 | | 25 | | 30 | |
| | | 6.0 | | 10 | 17 | | 21 | | 26 | |
| $t_{TLH}$ / $t_{THL}$ | Output Transition Time | 2.0 | | 19 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | 7 | 15 | | 19 | | 22 | |
| | | 6.0 | | 6 | 13 | | 16 | | 19 | |

## AC Characteristics for HCT: $t_r=t_f=6ns$ $C_L=50$ pF

| SYMBOL | PARAMETER | $V_{CC}$ (V) | $T_A=25°C$ | | | GD74HCT153 | | GD54HCT153 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN. | TYP. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| $t_{PLH}$ / $t_{PHL}$ | Propagation Delay Time A or B to nY | 4.5 | | 18 | 34 | | 43 | | 51 | ns |
| | | 5.5 | | | | | | | | |
| $t_{PLH}$ / $t_{PHL}$ | Propagation Delay Time Data ($nI_n$) to nY | 4.5 | | 16 | 34 | | 43 | | 51 | ns |
| | | 5.5 | | | | | | | | |
| $t_{PLH}$ / $t_{PHL}$ | Propagation Delay Time $\overline{E}$ to nY | 4.5 | | 14 | 27 | | 34 | | 41 | ns |
| | | 5.5 | | | | | | | | |
| $t_{TLH}$ / $t_{THL}$ | Output Transition Time | 4.5 | | 7 | 15 | | 19 | | 22 | ns |
| | | 5.5 | | | | | | | | |

## AC Waveforms

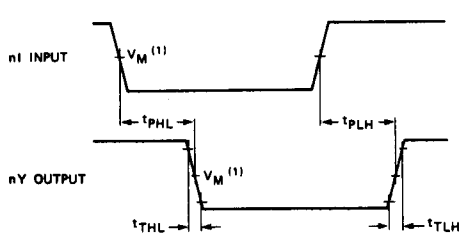



**Fig. 2** Waveforms showing the input ($1I_n$, $2I_n$) to output (1Y, 2Y) propagation delays and the output transition times.

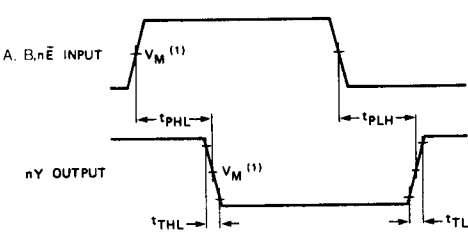



**Fig. 3** Waveforms showing the select input (A, B) and the output enable input ($\overline{E}$) to output (1Y, 2Y) propagation delays and the output transition times.