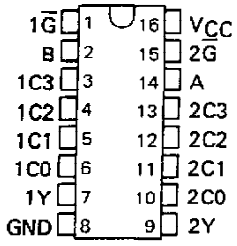
# SN54153, SN54LS153, SN54S153
# SN74153, SN74LS153, SN74S153
# DUAL 4-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

DECEMBER 1972 – REVISED MARCH 1988

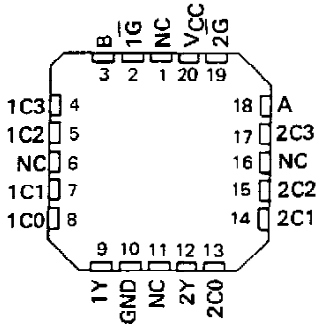
- Permits Multiplexing from N lines to 1 line
- Performs Parallel-to-Serial Conversion
- Strobe (Enable) Line Provided for Cascading (N lines to n lines)
- High-Fan-Out, Low-Impedance, Totem-Pole Outputs
- Fully Compatible with most TTL Circuits

| TYPE | TYPICAL AVERAGE PROPAGATION DELAY TIMES | | | TYPICAL POWER DISSIPATION |
|---|---|---|---|---|
| | FROM DATA | FROM STROBE | FROM SELECT | |
| '153 | 14 ns | 17 ns | 22 ns | 180 mW |
| 'LS153 | 14 ns | 19 ns | 22 ns | 31 mW |
| 'S153 | 6 ns | 9.5 ns | 12 ns | 225 mW |

SN54153, SN54LS153, SN54S153 . . . J OR W PACKAGE
SN74153 . . . N PACKAGE
SN74LS153, SN74S153 . . . D OR N PACKAGE
(TOP VIEW)




SN54LS153, SN54S153 . . . FK PACKAGE
(TOP VIEW)




NC – No internal connection

## description

Each of these monolithic, data selectors/multiplexers contains inverters and drivers to supply fully complementary, on-chip, binary decoding data selection to the AND-OR gates. Separate strobe inputs are provided for each of the two four-line sections.

FUNCTION TABLE

| SELECT INPUTS | | DATA INPUTS | | | | STROBE | OUTPUT |
|---|---|---|---|---|---|---|---|
| B | A | C0 | C1 | C2 | C3 | $\overline{G}$ | Y |
| X | X | X | X | X | X | H | L |
| L | L | L | X | X | X | L | L |
| L | L | H | X | X | X | L | H |
| L | H | X | L | X | X | L | L |
| L | H | X | H | X | X | L | H |
| H | L | X | X | L | X | L | L |
| H | L | X | X | H | X | L | H |
| H | H | X | X | X | L | L | L |
| H | H | X | X | X | H | L | H |

Select inputs A and B are common to both sections.
H = high level, L = low level, X = irrelevant

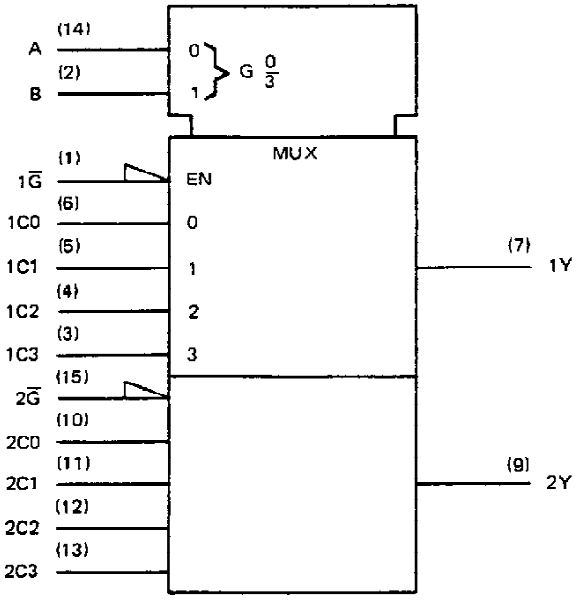
## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (See Note 1) . . . . . 7 V
Input voltage: '153, 'S153 . . . . . 5.5 V
'LS153 . . . . . 7 V
Operating free-air temperature range: SN54' . . . . . −55°C to 125°C
SN74' . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

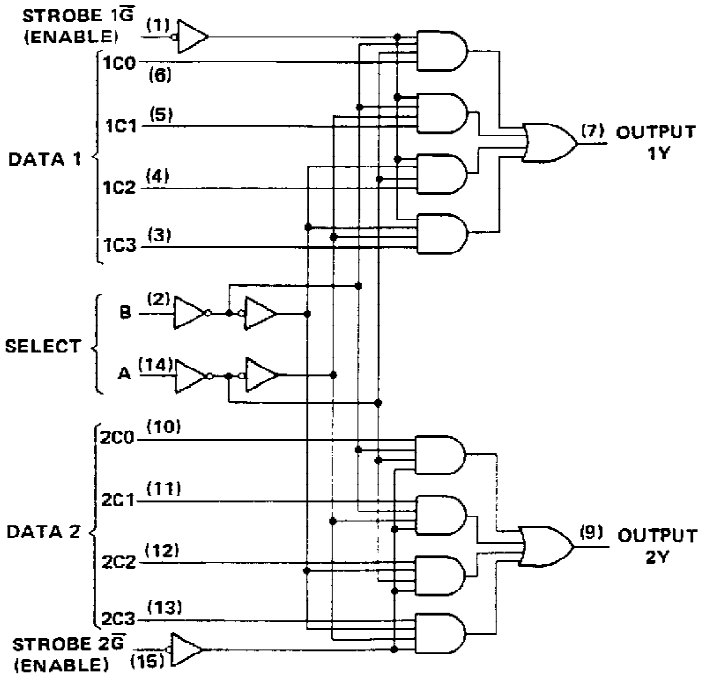
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

## logic symbol†




†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

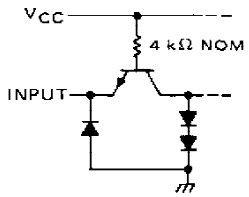
## logic diagrams (positive logic)



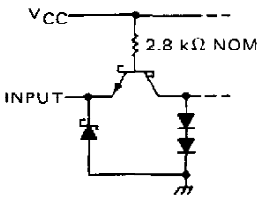

Pin numbers shown are for D, J, N, and W packages.

schematics of inputs and outputs

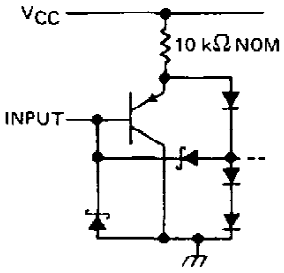
EQUIVALENT OF INPUTS OF '153



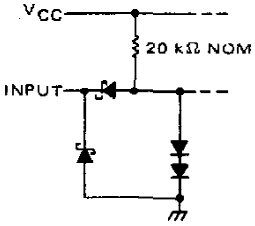

EQUIVALENT OF INPUTS OF 'S153



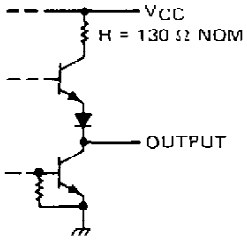

EQUIVALENT OF $1\overline{G}$, $2\overline{G}$ INPUTS OF LS153



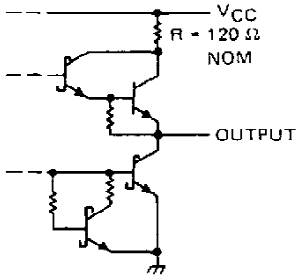

EQUIVALENT OF ALL OTHER INPUTS OF 'LS153



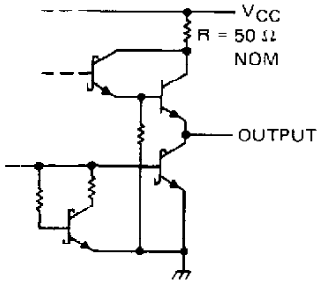

TYPICAL OF OUTPUTS OF '153




TYPICAL OF OUTPUTS OF 'LS153




TYPICAL OF OUTPUTS OF 'S153



## recommended operating conditions

| | SN54153 | | | SN74153 | | | UNIT |
|---|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| Supply voltage, $V_{CC}$ | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| High-level output current, $I_{OH}$ | | | −800 | | | −800 | μA |
| Low-level output current, $I_{OL}$ | | | 16 | | | 16 | mA |
| Operating free-air temperature, $T_A$ | −55 | | 125 | 0 | | 70 | °C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | SN54153 | | | SN74153 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IH}$ | High-level input voltage | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | 0.8 | | | 0.8 | V |
| $V_{IK}$ | Input clamp voltage | $V_{CC}$ = MIN, $I_I$ = −12 mA | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | High-level output voltage | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OH}$ = −800 μA | 2.4 | 3.4 | | 2.4 | 3.4 | | V |
| $V_{OL}$ | Low-level output voltage | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OL}$ = 16 mA | | 0.2 | 0.4 | | 0.2 | 0.4 | V |
| $I_I$ | Input current at maximum input voltage | $V_{CC}$ = MAX, $V_I$ = 5.5 V | | | 1 | | | 1 | mA |
| $I_{IH}$ | High-level input current | $V_{CC}$ = MAX, $V_I$ = 2.4 V | | | 40 | | | 40 | μA |
| $I_{IL}$ | Low-level input current | $V_{CC}$ = MAX, $V_I$ = 0.4 V | | | −1.6 | | | −1.6 | mA |
| $I_{OS}$ | Short-circuit output current§ | $V_{CC}$ = MAX | −20 | | −55 | −18 | | −57 | mA |
| $I_{CCL}$ | Supply current, output low | $V_{CC}$ = MAX, See Note 2 | | 36 | 52 | | 36 | 60 | mA |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§Not more than one output should be shorted at a time.
NOTE 2: $I_{CCL}$ is measured with the outputs open and all inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER¶ | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{PLH}$ | Data | Y | $C_L$ = 30 pF, $R_L$ = 400 Ω, See Note 3 | | 12 | 18 | ns |
| $t_{PHL}$ | Data | Y | | | 15 | 23 | ns |
| $t_{PLH}$ | Select | Y | | | 22 | 34 | ns |
| $t_{PHL}$ | Select | Y | | | 22 | 34 | ns |
| $t_{PLH}$ | Strobe $\overline{G}$ | Y | | | 19 | 30 | ns |
| $t_{PHL}$ | Strobe $\overline{G}$ | Y | | | 15 | 23 | ns |

¶$t_{PLH}$ = propagation delay time, low-to-high-level output
$t_{PHL}$ = propagation delay time, high-to-low-level output
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## recommended operating conditions

| | | SN54LS153 | | | SN74LS153 | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| $V_{IH}$ | High-level input voltage | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.7 | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | −0.4 | | | −0.4 | mA |
| $I_{OL}$ | Low-level output current | | | 4 | | | 8 | mA |
| $T_A$ | Operating free-air temperature | −55 | | 125 | 0 | | 70 | °C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | SN54LS153 | | | SN74LS153 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IK}$ | | $V_{CC}$ = MIN, $I_I$ = −18 mA | | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = MAX, $I_{OH}$ = −0.4 mA | | 2.5 | 3.4 | | 2.7 | 3.4 | | V |
| $V_{OL}$ | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = MAX, | $I_{OL}$ = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | | $I_{OL}$ = 8 mA | | | | | 0.35 | 0.5 | |
| $I_I$ | | $V_{CC}$ = MAX, $V_I$ = 7 V | | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | | $V_{CC}$ = MAX, $V_I$ = 2.7 V | | | | 20 | | | 20 | μA |
| $I_{IL}$ | $\overline{1G}$, $\overline{2G}$ | $V_{CC}$ = MAX, $V_I$ = 0.4 V | | | | −0.2 | | | −0.2 | mA |
| | All other | | | | | −0.4 | | | −0.4 | |
| $I_{OS}$§ | | $V_{CC}$ = MAX | | −20 | | −100 | −20 | | −100 | mA |
| $I_{CCL}$ | | $V_{CC}$ = MAX, See Note 2 | | | 6.2 | 10 | | 6.2 | 10 | mA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ Not more than one output should be shorted at a time.
NOTE 2: $I_{CCL}$ is measured with the outputs open and all inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER¶ | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{PLH}$ | Data | Y | $C_L$ = 15 pF, $R_L$ = 2 kΩ, See Note 3 | | 10 | 15 | ns |
| $t_{PHL}$ | Data | Y | | | 17 | 26 | ns |
| $t_{PLH}$ | Select | Y | | | 19 | 29 | ns |
| $t_{PHL}$ | Select | Y | | | 25 | 38 | ns |
| $t_{PLH}$ | Strobe $\overline{G}$ | Y | | | 16 | 24 | ns |
| $t_{PHL}$ | Strobe $\overline{G}$ | Y | | | 21 | 32 | ns |

¶ $t_{PLH}$ = propagation delay time, low-to-high-level output
$t_{PHL}$ = propagation delay time, high-to-low-level output
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## recommended operating conditions

| | SN54S153 | | | SN74S153 | | | UNIT |
|---|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| Supply voltage, $V_{CC}$ | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| High-level output current, $I_{OH}$ | | | −1 | | | −1 | mA |
| Low-level output current, $I_{OL}$ | | | 20 | | | 20 | mA |
| Operating free-air temperature, $T_A$ | −55 | | 125 | 0 | | 70 | °C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | MIN | TYP‡ | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $V_{IH}$ | High-level input voltage | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | | 0.8 | V |
| $V_{IK}$ | Input clamp voltage | $V_{CC}$ = MIN, $I_I$ = −18 mA | | | | −1.2 | V |
| $V_{OH}$ | High-level output voltage | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OH}$ = −1 mA | Series 54S | 2.5 | 3.4 | | V |
| | | | Series 74S | 2.7 | 3.4 | | |
| $V_{OL}$ | Low-level output voltage | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OL}$ = 20 mA | | | | 0.5 | V |
| $I_I$ | Input current at maximum input voltage | $V_{CC}$ = MAX, $V_I$ = 5.5 V | | | | 1 | mA |
| $I_{IH}$ | High-level input current | $V_{CC}$ = MAX, $V_I$ = 2.7 V | | | | 50 | μA |
| $I_{IL}$ | Low-level input current | $V_{CC}$ = MAX, $V_I$ = 0.5 V | | | | −2 | mA |
| $I_{OS}$ | Short-circuit output current§ | $V_{CC}$ = MAX | | −40 | | −100 | mA |
| $I_{CCL}$ | Supply current, low-level output | $V_{CC}$ = MAX, See Note 2 | | | 45 | 70 | mA |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§Not more than one output should be shorted at a time and duration of short-circuit should not exceed one second.
NOTE 2: $I_{CCL}$ is measured with the outputs open and all inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER¶ | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{PLH}$ | Data | Y | $C_L$ = 15 pF, $R_L$ = 280 Ω, See Note 3 | | 6 | 9 | ns |
| $t_{PHL}$ | Data | Y | | | 6 | 9 | ns |
| $t_{PLH}$ | Select | Y | | | 11.5 | 18 | ns |
| $t_{PHL}$ | Select | Y | | | 12 | 18 | ns |
| $t_{PLH}$ | Strobe $\overline{G}$ | Y | | | 10 | 15 | ns |
| $t_{PHL}$ | Strobe $\overline{G}$ | Y | | | 9 | 13.5 | ns |

¶$t_{PLH}$ = propagation delay time, low-to-high-level output
$t_{PHL}$ = propagation delay time, high to-low level output
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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