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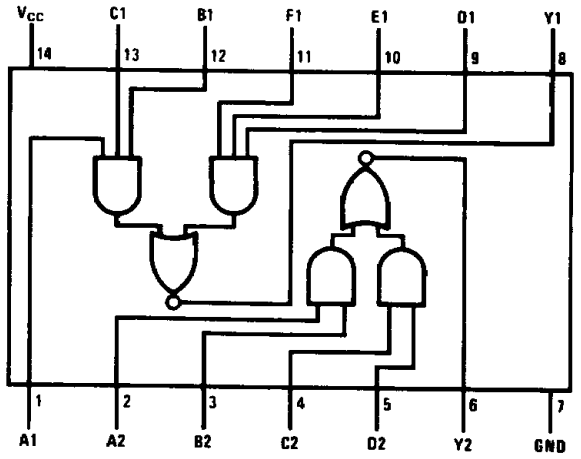
# 54LS51/DM74LS51 Dual 2-Wide 2-Input, 2-Wide 3-Input AND-OR-INVERT Gates

## General Description

This device contains two independent combinations of gates each of which performs the logic AND-OR-INVERT function. Each package contains one 2-wide 2-input and one 2-wide 3-input AND-OR-INVERT gates.

## Connection Diagram

**Dual-In-Line Package**




TL/F/6369–1

**Order Number 54LS51DMQB, 54LS51FMQB, 54LS51LMQB, DM74LS51M or DM74LS51N**
**See NS Package Number E20A, J14A, M14A, N14A or W14B**

## Function Table

$$Y1 = \overline{(A1)(B1)(C1) + (D1)(E1)(F1)}$$

| Inputs | | | | | | Output |
|---|---|---|---|---|---|---|
| A1 | B1 | C1 | D1 | E1 | F1 | Y1 |
| H | H | H | X | X | X | L |
| X | X | X | H | H | H | L |
| Other Combinations | | | | | | H |

$$Y2 = \overline{((A2)(B2) + (C2)(D2))}$$

| Inputs | | | | Output |
|---|---|---|---|---|
| A2 | B2 | C2 | D2 | Y2 |
| H | H | X | X | L |
| X | X | H | H | L |
| Other combinations | | | | H |

H = High Logic Level

L = Low Logic Level

X = Either Low or High Logic Level

## Absolute Maximum Ratings (Note)

**If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.**

| | |
|---|---|
| Supply Voltage | 7V |
| Input Voltage | 7V |
| Operating Free Air Temperature Range | |
| 54LS | −55°C to +125°C |
| DM74LS | 0°C to +70°C |
| Storage Temperature Range | −65°C to +150°C |

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

## Recommended Operating Conditions

| Symbol | Parameter | 54LS51 | | | DM74LS51 | | | Units |
|---|---|---|---|---|---|---|---|---|
| | | 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 |
| $T_A$ | Free Air Operating Temperature | −55 | | 125 | 0 | | 70 | °C |

## Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

| Symbol | Parameter | Conditions | | Min | Typ (Note 1) | Max | Units |
|---|---|---|---|---|---|---|---|
| $V_I$ | Input Clamp Voltage | $V_{CC}$ = Min, $I_I$ = −18 mA | | | | −1.5 | V |
| $V_{OH}$ | High Level Output Voltage | $V_{CC}$ = Min, $I_{OH}$ = Max, $V_{IL}$ = Max | 54LS | 2.5 | | | V |
| | | | DM74 | 2.7 | 3.4 | | |
| $V_{OL}$ | Low Level Output Voltage | $V_{CC}$ = Min, $I_{OL}$ = Max, $V_{IH}$ = Min | 54LS | | | 0.4 | V |
| | | | DM74 | | 0.35 | 0.5 | |
| | | $I_{OL}$ = 4 mA, $V_{CC}$ = Min | | | 0.25 | 0.4 | |
| $I_I$ | Input Current @ Max Input Voltage | $V_{CC}$ = Max, $V_I$ = 10V (54LS) | | | | 0.1 | mA |
| $I_{IH}$ | High Level Input Current | $V_{CC}$ = Max, $V_I$ = 2.7V | | | | 20 | μA |
| $I_{IL}$ | Low Level Input Current | $V_{CC}$ = Max, $V_I$ = 0.4V | 54LS | | | −0.40 | mA |
| | | | DM74 | | | −0.36 | |
| $I_{OS}$ | Short Circuit Output Current | $V_{CC}$ = Max (Note 2) | 54LS | −20 | | −100 | mA |
| | | | DM74 | −20 | | −100 | |
| $I_{CCH}$ | Supply Current with Outputs High | $V_{CC}$ = Max | | | 0.8 | 1.6 | mA |
| $I_{CCL}$ | Supply Current with Outputs Low | $V_{CC}$ = Max | | | 1.4 | 2.8 | mA |

**Note 1:** All typicals are at $V_{CC}$ = 5V, $T_A$ = 25°C.

**Note 2:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

## Switching Characteristics at $V_{CC}$ = 5V and $T_A$ = 25°C (See Section 1 for Test Waveforms and Output Load)

| Symbol | Parameter | 54LS51 | | DM74LS51 | | Units |
|---|---|---|---|---|---|---|
| | | $C_L$ = 15 pF, $R_L$ = 2 kΩ | | $C_L$ = 50 pF, $R_L$ = 2 kΩ | | |
| | | Min | Max | Min | Max | |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | | 20 | 4 | 18 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | | 20 | 3 | 15 | ns |