National Semiconductor

# 54LS367A/DM54LS367A/DM74LS367A Hex TRI-STATE® Buffers

## General Description

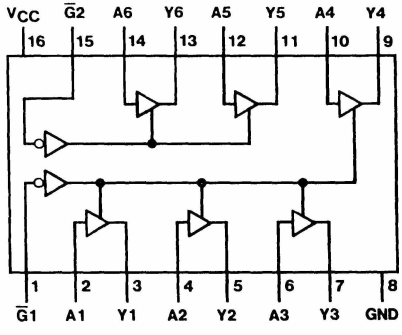
This device contains six independent gates each of which performs a non-inverting buffer function. The outputs have the TRI-STATE feature. When enabled, the outputs exhibit the low impedance characteristics of a standard LS output with additional drive capability to permit the driving of bus lines without external resistors. When disabled, both the output transistors are turned off presenting a high-impedance state to the bus line. Thus the output will act neither as a significant load nor as a driver. To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the disable time is shorter than the enable time of the outputs.

## Features

- Alternate military/aerospace device (54LS367A) is available. Contact a National Semiconductor sales office/distributor for specifications.

## Connection Diagram

**Dual-In-Line Package**

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**Order Number 54LS367ADMQB, 54LS367AFMQB, 54LS367ALMQB, DM54LS367AJ, DM54LS367AW, DM74LS367AM or DM74LS367AN**
**See NS Package Number E20A, J16A, M16A, N16E or W16A**

## Function Table

$Y = A$

| Inputs | | Output |
|---|---|---|
| A | $\overline{G}$ | Y |
| L | L | L |
| H | L | H |
| X | H | Hi-Z |

H = High Logic Level
L = Low Logic Level
X = Either Low or High Logic Level
Hi-Z = TRI-STATE (Outputs are disabled)

## 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 | |
| DM54LS | −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 | DM54LS367A | | | DM74LS367A | | | 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 | | | −1 | | | −2.6 | mA |
| $I_{OL}$ | Low Level Output Current | | | 12 | | | 24 | 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, $V_{IH}$ = Min | | 2.4 | 3.4 | | V |
| $V_{OL}$ | Low Level Output Voltage | $V_{CC}$ = Min, $I_{OL}$ = Max, $V_{IL}$ = Max, $V_{IH}$ = Min | DM54 | | 0.25 | 0.4 | V |
| | | | DM74 | | 0.35 | 0.5 | |
| | | $I_{OL}$ = 12 mA, $V_{CC}$ = Min | DM74 | | 0.25 | 0.4 | |
| $I_I$ | Input Current @ Max Input Voltage | $V_{CC}$ = Max, $V_I$ = 7V | | | | 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, $V_I$ = 0.5V (Note 4) | A Input | | | −20 | μA |
| | | $V_{CC}$ = Max, $V_I$ = 0.4V (Note 5) | A Input | | | −0.4 | mA |
| | | $V_{CC}$ = Max, $V_I$ = 0.4V | $\overline{G}$ Input | | | −0.4 | |
| $I_{OZH}$ | Off-State Output Current with High Level Output Voltage Applied | $V_{CC}$ = Max, $V_O$ = 2.4V, $V_{IH}$ = Min, $V_{IL}$ = Max | | | | 20 | μA |
| $I_{OZL}$ | Off-State Output Current with Low Level Output Voltage Applied | $V_{CC}$ = Max, $V_O$ = 0.4V, $V_{IH}$ = Min, $V_{IL}$ = Max | | | | −20 | μA |
| $I_{OS}$ | Short Circuit Output Current | $V_{CC}$ = Max (Note 2) | DM54 | −20 | | −100 | mA |
| | | | DM74 | −20 | | −100 | |
| $I_{CC}$ | Supply Current | $V_{CC}$ = Max (Note 3) | | | 14 | 24 | 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.

**Note 3:** $I_{CC}$ is measured with the DATA inputs grounded and the OUTPUT CONTROLS at 4.5V.

**Note 4:** Both $\overline{G}$ inputs are at 2V.

**Note 5:** Both $\overline{G}$ inputs at 0.4V.

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

| Symbol | Parameter | $R_L$ = 667Ω | | | | Units |
|---|---|---|---|---|---|---|
| | | $C_L$ = 50 pF | | $C_L$ = 150 pF | | |
| | | Min | Max | Min | Max | |
| $t_{PLH}$ | Propagation Delay Time Low to High Level Output | | 16 | | 25 | ns |
| $t_{PHL}$ | Propagation Delay Time High to Low Level Output | | 16 | | 25 | ns |
| $t_{PZH}$ | Output Enable Time to High Level Output | | 30 | | 40 | ns |
| $t_{PZL}$ | Output Enable Time to Low Level Output | | 30 | | 40 | ns |
| $t_{PHZ}$ | Output Disable Time from High Level Output (Note 6) | | 20 | | | ns |
| $t_{PLZ}$ | Output Disable Time from Low Level Output (Note 6) | | 20 | | | ns |

**Note 6:** $C_L$ = 5 pF.