**FAIRCHILD**

SEMICONDUCTOR™

# DM74LS251
# 3-STATE 1-of-8 Line Data Selector/Multiplexer

## General Description

These data selectors/multiplexers contain full on-chip binary decoding to select one-of-eight data sources, and feature a strobe-controlled 3-STATE output. The strobe must be at a low logic level to enable these devices. The 3-STATE outputs permit direct connection to a common bus. When the strobe input is HIGH, both outputs are in a high-impedance state in which both the upper and lower transistors of each totem-pole output are OFF, and the output neither drives nor loads the bus significantly. When the strobe is LOW, the outputs are activated and operate as standard TTL totem-pole outputs.

To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output control circuitry is designed so that the average output disable time is shorter than the average output enable time.

## Features

■ 3-STATE version of DM74LS151
■ Interface directly with system bus
■ Perform parallel-to-serial conversion
■ Permit multiplexing from N-lines to one line
■ Complementary outputs provide true and inverted data
■ Maximum number of common outputs: 129
■ Typical propagation delay time (D to Y): 17 ns
■ Typical power dissipation: 35 mW

## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| DM74LS251M | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow |
| DM74LS251N | N16E | 16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.
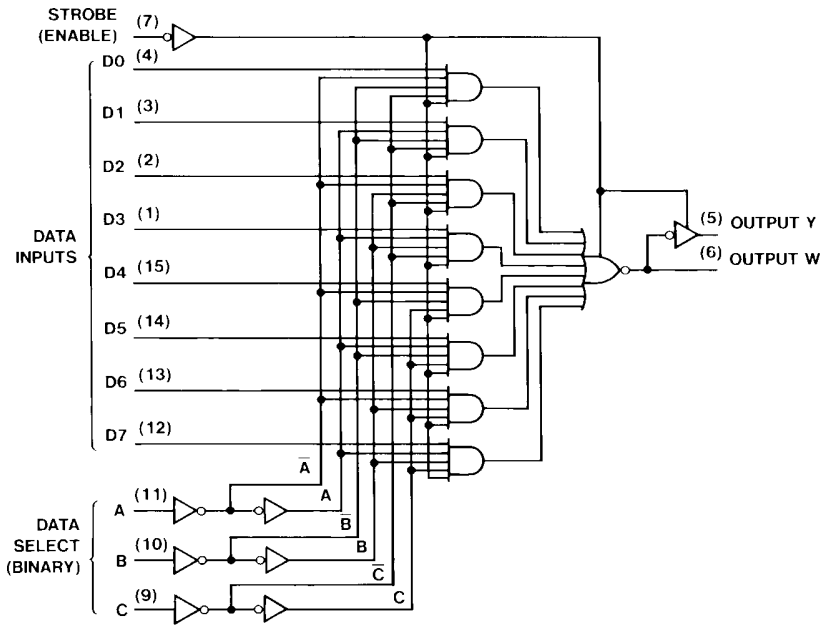
## Connection Diagram
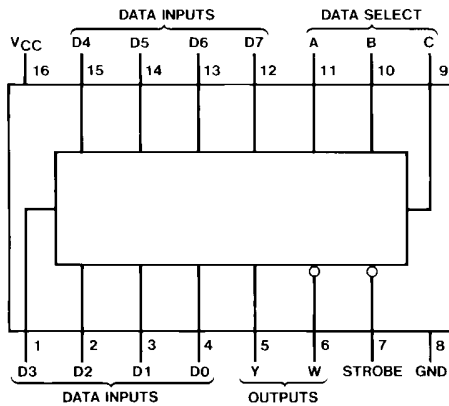


## Function Table

| Inputs | | | | Outputs | |
|---|---|---|---|---|---|
| Select | | | Strobe | Y | W |
| C | B | A | S | | |
| X | X | X | H | Z | Z |
| L | L | L | L | D0 | $\overline{D0}$ |
| L | L | H | L | D1 | $\overline{D1}$ |
| L | H | L | L | D2 | $\overline{D2}$ |
| L | H | H | L | D3 | $\overline{D3}$ |
| H | L | L | L | D4 | $\overline{D4}$ |
| H | L | H | L | D5 | $\overline{D5}$ |
| H | H | L | L | D6 | $\overline{D6}$ |
| H | H | H | L | D7 | $\overline{D7}$ |

H = HIGH Logic Level
L = LOW Logic Level
X = Don't Care
Z = High Impedance (OFF)
D0, D1…D7 = The level of the respective D input

## Logic Diagram

STROBE (ENABLE) (7)

DATA INPUTS
D0 (4)
D1 (3)
D2 (2)
D3 (1)
D4 (15)
D5 (14)
D6 (13)
D7 (12)

$\overline{A}$
A
$\overline{B}$
B
$\overline{C}$
C

DATA SELECT (BINARY)
A (11)
B (10)
C (9)

(5) OUTPUT Y
(6) OUTPUT W

## Absolute Maximum Ratings(Note 1)

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

**Note 1:** 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 | Min | Nom | Max | Units |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | 4.75 | 5 | 5.25 | V |
| $V_{IH}$ | HIGH Level Input Voltage | 2 | | | V |
| $V_{IL}$ | LOW Level Input Voltage | | | 0.8 | V |
| $I_{OH}$ | HIGH Level Output Current | | | −2.6 | mA |
| $I_{OL}$ | LOW Level Output Current | | | 24 | mA |
| $T_A$ | Free Air Operating Temperature | 0 | | 70 | °C |

## Electrical Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ (Note 2) | 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 | 3.1 | | V |
| $V_{OL}$ | LOW Level Output Voltage | $V_{CC}$ = Min, $I_{OL}$ = Max | | 0.35 | 0.5 | V |
| | | $V_{IL}$ = Max, $V_{IH}$ = Min | | | | |
| | | $I_{OL}$ = 12 mA, $V_{CC}$ = Min | | 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, $V_I$ = 0.4V | | | −0.4 | mA |
| $I_{OZH}$ | Off-State Output Current with HIGH Level Output Voltage Applied | $V_{CC}$ = Max, $V_O$ = 2.7V $V_{IH}$ = 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 3) | −20 | | −100 | mA |
| $I_{CC1}$ | Supply Current | $V_{CC}$ = Max (Note 4) | | 6.1 | 10 | mA |
| $I_{CC2}$ | Supply Current | $V_{CC}$ = Max (Note 5) | | 7.1 | 12 | mA |

**Note 2:** All typicals are at $V_{CC}$ = 5V, $T_A$ = 25°C.

**Note 3:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

**Note 4:** $I_{CC1}$ is measured with the outputs open, STROBE grounded, and all other inputs at 4.5V.

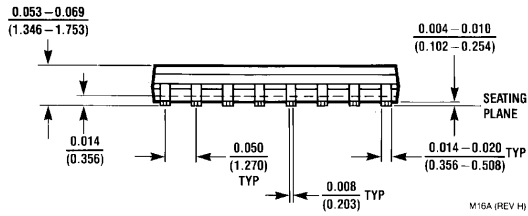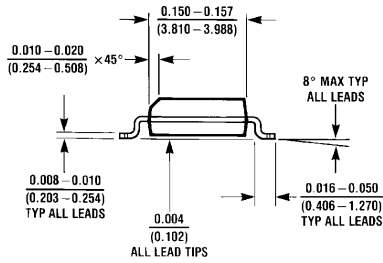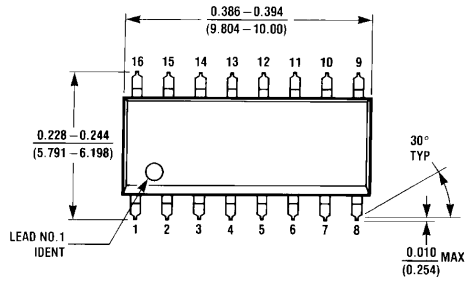**Note 5:** $I_{CC2}$ is measured with the outputs open and all inputs at 4.5V.

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**DM74LS251**

## Switching Characteristics

at $V_{CC}$ = 5V and $T_A$ = 25°C

| Symbol | Parameter | From (Input) to (Output) | $R_L$ = 667Ω | | | | Units |
|---|---|---|---|---|---|---|---|
| | | | $C_L$ = 45 pF | | $C_L$ = 150 pF | | |
| | | | Min | Max | Min | Max | |
| $t_{PLH}$ | Propagation Delay Time LOW-to-HIGH Level Output | A, B, C (4 Levels) to Y | | 45 | | 53 | ns |
| $t_{PHL}$ | Propagation Delay Time HIGH-to-LOW Level Output | A, B, C (4 Levels) to Y | | 45 | | 53 | ns |
| $t_{PLH}$ | Propagation Delay Time LOW-to-HIGH Level Output | A, B, C (3 Levels) to W | | 33 | | 38 | ns |
| $t_{PHL}$ | Propagation Delay Time HIGH-to-LOW Level Output | A, B, C (3 Levels) to W | | 33 | | 42 | ns |
| $t_{PLH}$ | Propagation Delay Time LOW-to-HIGH Level Output | D to Y | | 28 | | 35 | ns |
| $t_{PHL}$ | Propagation Delay Time HIGH-to-LOW Level Output | D to Y | | 28 | | 38 | ns |
| $t_{PLH}$ | Propagation Delay Time LOW-to-HIGH Level Output | D to W | | 15 | | 25 | ns |
| $t_{PHL}$ | Propagation Delay Time HIGH-to-LOW Level Output | D to W | | 15 | | 25 | ns |
| $t_{PZH}$ | Output Enable Time to HIGH Level Output | Strobe to Y | | 45 | | 60 | ns |
| $t_{PZL}$ | Output Enable Time to LOW Level Output | Strobe to Y | | 40 | | 51 | ns |
| $t_{PHZ}$ | Output Disable Time from HIGH Level Output (Note 6) | Strobe to Y | | 45 | | | ns |
| $t_{PLZ}$ | Output Disable Time from LOW Level Output (Note 6) | Strobe to Y | | 25 | | | ns |
| $t_{PZH}$ | Output Enable Time to HIGH Level Output | Strobe to W | | 27 | | 40 | ns |
| $t_{PZL}$ | Output Enable Time to LOW Level Output | Strobe to W | | 40 | | 47 | ns |
| $t_{PHZ}$ | Output Disable Time from HIGH Level Output (Note 6) | Strobe to W | | 55 | | | ns |
| $t_{PLZ}$ | Output Disable Time from LOW Level Output (Note 6) | Strobe to W | | 25 | | | ns |

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

**Physical Dimensions** inches (millimeters) unless otherwise noted

0.386 − 0.394
(9.804 − 10.00)

16  15  14  13  12  11  10  9

0.228 − 0.244
(5.791 − 6.198)

LEAD NO.1
IDENT

1  2  3  4  5  6  7  8

30°
TYP

0.010 MAX
(0.254)

0.150 − 0.157
(3.810 − 3.988)

0.010 − 0.020
(0.254 − 0.508)  ×45°

8° MAX TYP
ALL LEADS

0.008 − 0.010
(0.203 − 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 − 0.050
(0.406 − 1.270)
TYP ALL LEADS

0.053 − 0.069
(1.346 − 1.753)

0.004 − 0.010
(0.102 − 0.254)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.008 TYP
(0.203)

0.014 − 0.020 TYP
(0.356 − 0.508)

M16A (REV H)

**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow**
**Package Number M16A**

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## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



**16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide**
**Package Number N16E**
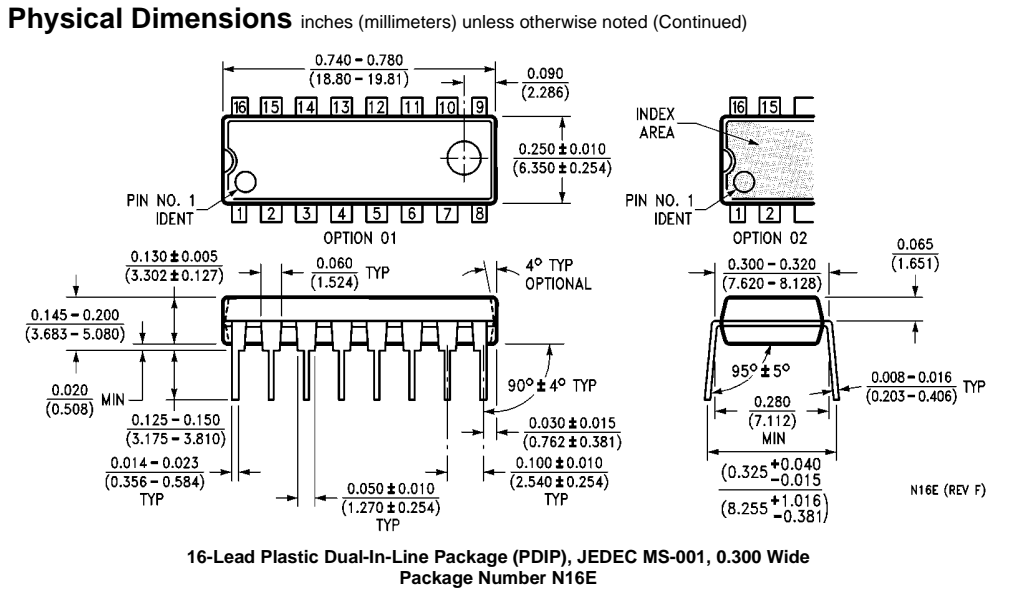
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