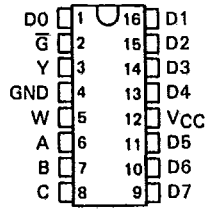
T-67-21-51

# 54AC11151, 74AC11151
# 1 OF 8 DATA SELECTORS/MULTIPLEXERS

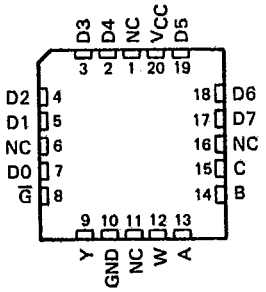
TI0105—D3348, JUNE 1989—REVISED JANUARY 1990

- 8-Line to 1-Line Multiplexers can Perform as: Boolean Function Generators, Parallel-to-Serial Converters, Data Source Selectors
- Flow-Through Architecture to Optimize PCB Layout
- Center-Pin $V_{CC}$ and GND Configurations to Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1-μm Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

54AC11151 ... J PACKAGE
74AC11151 ... D OR N PACKAGE
(TOP VIEW)




54AC11151 ... FK PACKAGE
(TOP VIEW)




## description

These monolithic data selectors/multiplexers provide full binary decoding to select one of eight data sources. The strobe input ($\overline{G}$) must be at a low logic level to enable the inputs. A high level at the strobe terminal forces the W output high and the Y output low.

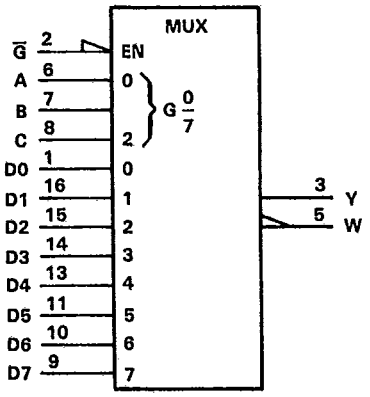
The 54AC11151 is characterized for operation over the full military temperature range of −55°C to 125°C. The 74AC11151 is characterized for operation from −40°C to 85°C.

FUNCTION TABLE

| INPUTS | | | | OUTPUTS | |
|---|---|---|---|---|---|
| SELECT | | | STROBE | Y | W |
| C | B | A | $\overline{G}$ | | |
| X | X | X | H | L | H |
| 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 level, L = low level,
X = irrelevant.
D0, D1, ... D7 = the level of the respective D input.

## logic symbol†




† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, and N packages.

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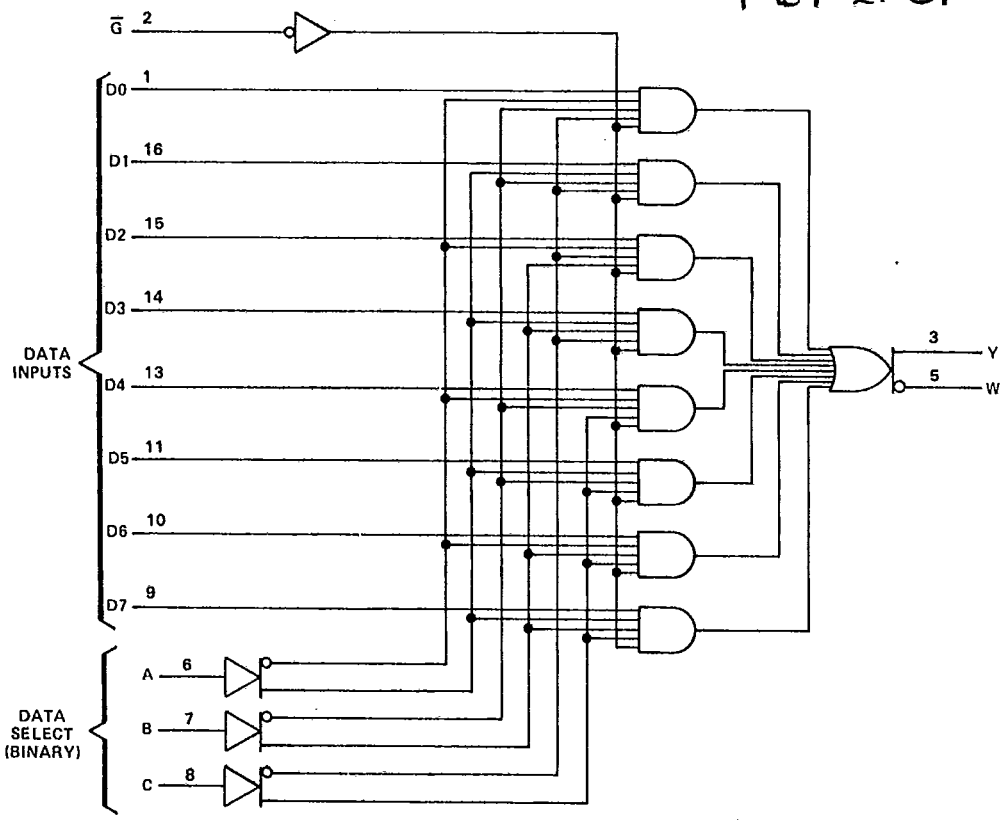
TI0105—D3348, JUNE 1989—REVISED JANUARY 1990

T-67-21-51

## logic diagram (positive logic)




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

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# 1 OF 8 DATA SELECTORS/MULTIPLEXERS

T-67-21-51

D3348, JUNE 1989—REVISED JANUARY 1990—TI0105

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

Supply voltage range, $V_{CC}$ ..... −0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) ..... −0.5 to $V_{CC}$ + 0.5 V
Output voltage range, $V_O$ (see Note 1) ..... −0.5 to $V_{CC}$ + 0.5 V
Input clamp current, $I_{IK}$ ($V_I$ < 0 or $V_I$ > $V_{CC}$) ..... ±20 mA
Output clamp current, $I_{OK}$ ($V_O$ < 0 or $V_O$ > $V_{CC}$) ..... ±50 mA
Continuous output current, $I_O$ ($V_O$ = 0 to $V_{CC}$) ..... ±50 mA
Continuous current through $V_{CC}$ or GND pins ..... ±100 mA
Storage temperature range ..... −65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## recommended operating conditions

| | | | 54AC11151 | | | 74AC11151 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 3 | 5 | 5.5 | 3 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 3 V | 2.1 | | | 2.1 | | | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | | | 3.15 | | | |
| | | $V_{CC}$ = 5.5 V | 3.85 | | | 3.85 | | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 3 V | | | 0.9 | | | 0.9 | V |
| | | $V_{CC}$ = 4.5 V | | | 1.35 | | | 1.35 | |
| | | $V_{CC}$ = 5.5 V | | | 1.65 | | | 1.65 | |
| $V_I$ | Input voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $V_O$ | Output voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | $V_{CC}$ = 3 V | | | −4 | | | −4 | mA |
| | | $V_{CC}$ = 4.5 V | | | −24 | | | −24 | |
| | | $V_{CC}$ = 5.5 V | | | −24 | | | −24 | |
| $I_{OL}$ | Low-level output current | $V_{CC}$ = 3 V | | | 12 | | | 12 | mA |
| | | $V_{CC}$ = 4.5 V | | | 24 | | | 24 | |
| | | $V_{CC}$ = 5.5 V | | | 24 | | | 24 | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | | 0 | | 10 | 0 | | 10 | ns/V |
| $T_A$ | Operating free-air temperature | | −55 | | 125 | −40 | | 85 | °C |





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

| PARAMETER | TEST CONDITIONS | $V_{CC}$ | $T_A$ = 25°C | | | 54AC11151 | | 74AC11151 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $I_{OH}$ = −50 μA | 3 V | 2.9 | | | 2.9 | | 2.9 | | V |
| | | 4.5 V | 4.4 | | | 4.4 | | 4.4 | | |
| | | 5.5 V | 5.4 | | | 5.4 | | 5.4 | | |
| | $I_{OH}$ = −4 mA | 3 V | 2.58 | | | 2.4 | | 2.48 | | |
| | $I_{OH}$ = −24 mA | 4.5 V | 3.94 | | | 3.7 | | 3.8 | | |
| | | 5.5 V | 4.94 | | | 4.7 | | 4.8 | | |
| | $I_{OH}$ = −50 mA† | 5.5 V | | | | 3.85 | | | | |
| | $I_{OH}$ = −75 mA† | 5.5 V | | | | | | 3.85 | | |
| $V_{OL}$ | $I_{OL}$ = 50 μA | 3 V | | | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | | 5.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | $I_{OL}$ = 12 mA | 3 V | | | 0.36 | | 0.5 | | 0.44 | |
| | $I_{OL}$ = 24 mA | 4.5 V | | | 0.36 | | 0.5 | | 0.44 | |
| | | 5.5 V | | | 0.36 | | 0.5 | | 0.44 | |
| | $I_{OL}$ = 50 mA† | 5.5 V | | | | | 1.65 | | | |
| | $I_{OL}$ = 75 mA† | 5.5 V | | | | | | | 1.65 | |
| $I_I$ | $V_I$ = $V_{CC}$ or GND | 5.5 V | | | ±0.1 | | ±1 | | ±1 | μA |
| $I_{CC}$ | $V_I$ = $V_{CC}$ or GND, $I_O$ = 0 | 5.5 V | | | 8 | | 160 | | 80 | μA |
| $C_i$ | $V_I$ = $V_{CC}$ or GND | 5 V | | 3.5 | | | | | | pF |

† Not more than one output should be tested at a time and the duration of the test should not exceed 10 ms.

**switching characteristics over recommended operating free-air temperature range, $V_{CC}$ = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A$ = 25°C | | | 54AC11151 | | 74AC11151 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A, B, or C | Y | 3.2 | 8.9 | 10.7 | 3.2 | 12.9 | 3.2 | 12 | ns |
| $t_{PHL}$ | | | 3.4 | 8.9 | 10.8 | 3.4 | 12.9 | 3.4 | 12.1 | |
| $t_{PLH}$ | A, B, or C | W | 3.2 | 8.6 | 10.3 | 3.2 | 12.4 | 3.2 | 11.6 | ns |
| $t_{PHL}$ | | | 3.1 | 8.7 | 10.7 | 3.1 | 12.9 | 3.1 | 12 | |
| $t_{PLH}$ | Any D | Y | 1.9 | 6.5 | 8.1 | 1.9 | 9.8 | 1.9 | 9.2 | ns |
| $t_{PHL}$ | | | 1.9 | 6.4 | 8.1 | 1.9 | 9.4 | 1.9 | 8.9 | |
| $t_{PLH}$ | Any D | W | 1.7 | 6.1 | 7.7 | 1.7 | 9.1 | 1.7 | 8.6 | ns |
| $t_{PHL}$ | | | 1.9 | 6.4 | 8 | 1.9 | 9.5 | 1.9 | 8.8 | |
| $t_{PLH}$ | $\overline{G}$ | Y | 1.3 | 4.0 | 5.5 | 1.3 | 6.3 | 1.3 | 6 | ns |
| $t_{PHL}$ | | | 1.6 | 4.5 | 5.9 | 1.6 | 6.9 | 1.6 | 6.5 | |
| $t_{PLH}$ | $\overline{G}$ | W | 2 | 5.2 | 6.7 | 2 | 7.8 | 2 | 7.4 | ns |
| $t_{PHL}$ | | | 1.7 | 4.7 | 6.2 | 1.7 | 7 | 1.7 | 6.7 | |

T-67-21-51

D3348, JUNE 1989—REVISED JANUARY 1990—TI0105

**switching characteristics over recommended operating free-air temperature range, $V_{CC}$ = 5 V ± 0.5 V unless otherwise noted (see Figure 1)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A$ = 25°C | | | 54AC11151 | | 74AC11151 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A, B, or C | Y | 2.5 | 5.4 | 7.3 | 2.5 | 8.9 | 2.5 | 8.3 | ns |
| $t_{PHL}$ | | | 2.7 | 5.6 | 7.5 | 2.7 | 9.1 | 2.7 | 8.5 | |
| $t_{PLH}$ | A, B, or C | W | 2.6 | 5.3 | 7.2 | 2.6 | 8.6 | 2.6 | 8.1 | ns |
| $t_{PHL}$ | | | 2.6 | 5.4 | 7.4 | 2.6 | 9.1 | 2.6 | 8.4 | |
| $t_{PLH}$ | Any D | Y | 1.5 | 4.1 | 5.8 | 1.5 | 6.9 | 1.5 | 6.5 | ns |
| $t_{PHL}$ | | | 1.5 | 4.0 | 5.7 | 1.5 | 6.8 | 1.5 | 6.4 | |
| $t_{PLH}$ | Any D | W | 1.4 | 3.7 | 5.5 | 1.4 | 6.4 | 1.4 | 6 | ns |
| $t_{PHL}$ | | | 1.6 | 4.1 | 5.8 | 1.6 | 6.9 | 1.6 | 6.4 | |
| $t_{PLH}$ | $\overline{G}$ | Y | 1.1 | 2.7 | 4.2 | 1.1 | 4.8 | 1.1 | 4.6 | ns |
| $t_{PHL}$ | | | 1.4 | 3.1 | 4.6 | 1.4 | 5.3 | 1.4 | 5 | |
| $t_{PLH}$ | $\overline{G}$ | W | 1.7 | 3.5 | 5.1 | 1.7 | 6 | 1.7 | 5.6 | ns |
| $t_{PHL}$ | | | 1.4 | 3.1 | 4.6 | 1.4 | 5.3 | 1.4 | 5 | |

**operating characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C**

| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance | $C_L$ = 50 pF, f = 1 MHz | 52 | pF |





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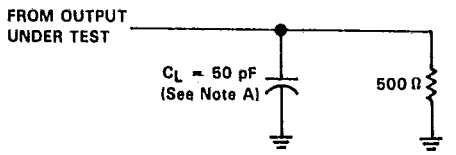
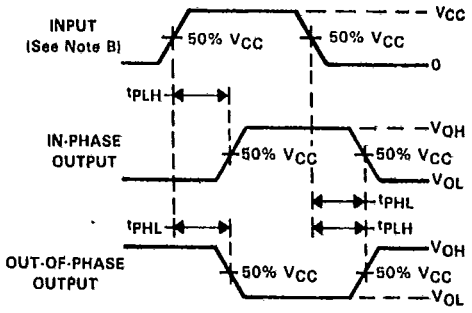
T-67-21-51

## PARAMETER MEASUREMENT INFORMATION




LOAD CIRCUIT




PROPAGATION DELAY TIMES

NOTES: A. $C_L$ includes probe and jig capacitance.
B. Input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, $t_r$ = 3 ns, $t_f$ = 3 ns.
C. The outputs are measured one at a time with one input transition per measurement.

**FIGURE 1. LOAD CIRCUIT AND VOLTAGE WAVEFORMS**