

Features

- Buffered Inputs
- Typical Propagation Delay
 - 6ns at $V_{CC} = 5V$, $T_A = 25^{\circ}C$, $C_L = 50pF$
- Exceeds 2kV ESD Protection MIL-STD-883, Method 3015
- SCR-Latchup-Resistant CMOS Process and Circuit Design
- Speed of Bipolar FAST™/AS/S with Significantly Reduced Power Consumption
- Balanced Propagation Delays
- AC Types Feature 1.5V to 5.5V Operation and Balanced Noise Immunity at 30% of the Supply
- $\pm 24mA$ Output Drive Current
 - Fanout to 15 FAST™ ICs
 - Drives 50 Ω Transmission Lines

Description

The CD74AC151 and 'ACT151 are 8-input digital multiplexers that utilize Advanced CMOS Logic technology. They have three binary control inputs (S0, S1, and S2) and an active-LOW Enable (E) input. The three binary inputs select 1 of 8 channels. The output is both inverting (\bar{Y}) and non-inverting (Y).

Ordering Information

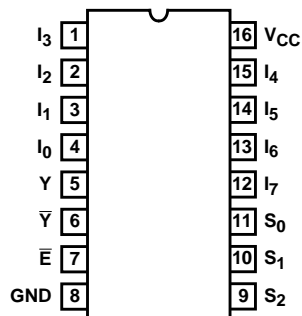
| PART NUMBER | TEMP. RANGE ($^{\circ}C$) | PACKAGE |
|---------------|---|--------------|
| CD74AC151E | 0 to 70 $^{\circ}C$, -40 to 85, -55 to 125 | 16 Ld PDIP |
| CD74AC151M96 | 0 to 70 $^{\circ}C$, -40 to 85, -55 to 125 | 16 Ld SOIC |
| CD54ACT151F3A | -55 to 125 | 16 Ld CERDIP |
| CD74ACT151E | 0 to 70 $^{\circ}C$, -40 to 85, -55 to 125 | 16 Ld PDIP |
| CD74ACT151M96 | 0 to 70 $^{\circ}C$, -40 to 85, -55 to 125 | 16 Ld SOIC |

NOTES:

1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Wafer and die for this part number is available which meets all electrical specifications. Please contact your local TI sales office or customer service for ordering information.

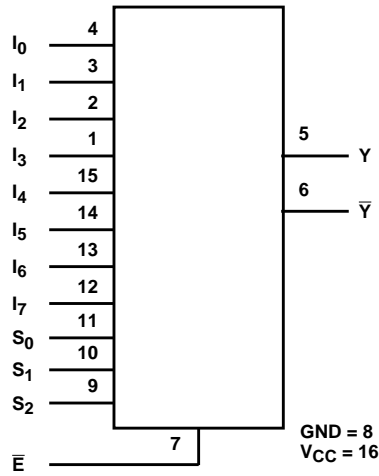
Pinout

CD54ACT151
(CERDIP)
CD74AC151, CD74ACT151
(PDIP, SOIC)
TOP VIEW



CD74AC151, CD54/74ACT151

Functional Diagram



TRUTH TABLE

| INPUTS | | | | | | | | | | | | OUTPUTS | |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------|-----|
| \bar{E} | S_2 | S_1 | S_0 | I_0 | I_1 | I_2 | I_3 | I_4 | I_5 | I_6 | I_7 | \bar{Y} | Y |
| H | X | X | X | X | X | X | X | X | X | X | X | H | L |
| L | L | L | L | L | X | X | X | X | X | X | X | H | L |
| L | L | L | L | H | X | X | X | X | X | X | X | L | H |
| L | L | L | H | X | L | X | X | X | X | X | X | H | L |
| L | L | L | H | X | H | X | X | X | X | X | X | L | H |
| L | L | H | L | X | X | L | X | X | X | X | X | H | L |
| L | L | H | L | X | X | H | X | X | X | X | X | L | H |
| L | L | H | H | X | X | X | L | X | X | X | X | H | L |
| L | L | H | H | X | X | X | H | X | X | X | X | L | H |
| L | H | L | L | X | X | X | X | L | X | X | X | H | L |
| L | H | L | L | X | X | X | X | H | X | X | X | L | H |
| L | H | L | H | X | X | X | X | X | L | X | X | H | L |
| L | H | L | H | X | X | X | X | X | H | X | X | L | H |
| L | H | H | L | X | X | X | X | X | X | L | X | H | L |
| L | H | H | H | X | X | X | X | X | X | X | L | H | L |
| L | H | H | H | X | X | X | X | X | X | X | H | L | H |

H = HIGH voltage level, L = LOW voltage level, X = Don't Care

CD74AC151, CD54/74ACT151

Absolute Maximum Ratings

| | |
|---|-------------|
| DC Supply Voltage, V_{CC} | -0.5V to 6V |
| DC Input Diode Current, I_{IK} | |
| For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$ | $\pm 20mA$ |
| DC Output Diode Current, I_{OK} | |
| For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$ | $\pm 50mA$ |
| DC Output Source or Sink Current per Output Pin, I_O | |
| For $V_O > -0.5V$ or $V_O < V_{CC} + 0.5V$ | $\pm 50mA$ |
| DC V_{CC} or Ground Current, I_{CC} or I_{GND} (Note 3) | $\pm 100mA$ |

Thermal Information

| | |
|--|----------------------------------|
| Thermal Resistance (Typical, Note 5) | θ_{JA} ($^{\circ}C/W$) |
| PDIP Package | 90 |
| SOIC Package | 160 |
| Maximum Junction Temperature (Plastic Package) | $150^{\circ}C$ |
| Maximum Storage Temperature Range | $-65^{\circ}C$ to $150^{\circ}C$ |
| Maximum Lead Temperature (Soldering 10s) | $300^{\circ}C$ |

Operating Conditions

| | |
|---|----------------------------------|
| Temperature Range, T_A | $-55^{\circ}C$ to $125^{\circ}C$ |
| Supply Voltage Range, V_{CC} (Note 4) | |
| AC Types | 1.5V to 5.5V |
| ACT Types | 4.5V to 5.5V |
| DC Input or Output Voltage, V_I , V_O | 0V to V_{CC} |
| Input Rise and Fall Slew Rate, dt/dv | |
| AC Types, 1.5V to 3V | 50ns (Max) |
| AC Types, 3.6V to 5.5V | 20ns (Max) |
| ACT Types, 4.5V to 5.5V | 10ns (Max) |

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

3. For up to 4 outputs per device, add $\pm 25mA$ for each additional output.
4. Unless otherwise specified, all voltages are referenced to ground.
5. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

DC Electrical Specifications

| PARAMETER | SYMBOL | TEST CONDITIONS | | V_{CC} (V) | 25 $^{\circ}C$ | | -40 $^{\circ}C$ TO 85 $^{\circ}C$ | | -55 $^{\circ}C$ TO 125 $^{\circ}C$ | | UNITS | |
|---------------------------|--------------------|----------------------|--------------------|--------------------|----------------|------|-----------------------------------|------|------------------------------------|------|-------|---|
| | | V_I (V) | I_O (mA) | | MIN | MAX | MIN | MAX | MIN | MAX | | |
| AC TYPES | | | | | | | | | | | | |
| High Level Input Voltage | V_{IH} | - | - | 1.5 | 1.2 | - | 1.2 | - | 1.2 | - | V | |
| | | | | 3 | 2.1 | - | 2.1 | - | 2.1 | - | V | |
| | | | | 5.5 | 3.85 | - | 3.85 | - | 3.85 | - | V | |
| Low Level Input Voltage | V_{IL} | - | - | 1.5 | - | 0.3 | - | 0.3 | - | 0.3 | V | |
| | | | | 3 | - | 0.9 | - | 0.9 | - | 0.9 | V | |
| | | | | 5.5 | - | 1.65 | - | 1.65 | - | 1.65 | V | |
| High Level Output Voltage | V_{OH} | V_{IH} or V_{IL} | -0.05 | -0.05 | 1.5 | 1.4 | - | 1.4 | - | 1.4 | - | V |
| | | | -0.05 | -0.05 | 3 | 2.9 | - | 2.9 | - | 2.9 | - | V |
| | | | -0.05 | -0.05 | 4.5 | 4.4 | - | 4.4 | - | 4.4 | - | V |
| | | | -4 | -4 | 3 | 2.58 | - | 2.48 | - | 2.4 | - | V |
| | | | -24 | -24 | 4.5 | 3.94 | - | 3.8 | - | 3.7 | - | V |
| | | | -75 (Note 6, 7) | -75 (Note 6, 7) | 5.5 | - | - | 3.85 | - | - | - | V |
| -50 (Note 6, 7) | -50 (Note 6, 7) | 5.5 | - | - | - | - | 3.85 | - | V | | | |

CD74AC151, CD54/74ACT151

DC Electrical Specifications (Continued)

| PARAMETER | SYMBOL | TEST CONDITIONS | | V _{CC} (V) | 25°C | | -40°C TO 85°C | | -55°C TO 125°C | | UNITS |
|---|------------------|------------------------------------|---------------------|---------------------|------|------|---------------|------|----------------|------|-------|
| | | V _I (V) | I _O (mA) | | MIN | MAX | MIN | MAX | MIN | MAX | |
| Low Level Output Voltage | V _{OL} | V _{IH} or V _{IL} | 0.05 | 1.5 | - | 0.1 | - | 0.1 | - | 0.1 | V |
| | | | 0.05 | 3 | - | 0.1 | - | 0.1 | - | 0.1 | V |
| | | | 0.05 | 4.5 | - | 0.1 | - | 0.1 | - | 0.1 | V |
| | | | 12 | 3 | - | 0.36 | - | 0.44 | - | 0.5 | V |
| | | | 24 | 4.5 | - | 0.36 | - | 0.44 | - | 0.5 | V |
| | | | 75 (Note 6, 7) | 5.5 | - | - | - | 1.65 | - | - | V |
| | | | 50 (Note 6, 7) | 5.5 | - | - | - | - | - | 1.65 | V |
| Input Leakage Current | I _I | V _{CC} or GND | - | 5.5 | - | ±0.1 | - | ±1 | - | ±1 | μA |
| Quiescent Supply Current MSI | I _{CC} | V _{CC} or GND | 0 | 5.5 | - | 8 | - | 80 | - | 160 | μA |
| ACT TYPES | | | | | | | | | | | |
| High Level Input Voltage | V _{IH} | - | - | 4.5 to 5.5 | 2 | - | 2 | - | 2 | - | V |
| Low Level Input Voltage | V _{IL} | - | - | 4.5 to 5.5 | - | 0.8 | - | 0.8 | - | 0.8 | V |
| High Level Output Voltage | V _{OH} | V _{IH} or V _{IL} | -0.05 | 4.5 | 4.4 | - | 4.4 | - | 4.4 | - | V |
| | | | -24 | 4.5 | 3.94 | - | 3.8 | - | 3.7 | - | V |
| | | | -75 (Note 6, 7) | 5.5 | - | - | 3.85 | - | - | - | V |
| | | | -50 (Note 6, 7) | 5.5 | - | - | - | - | 3.85 | - | V |
| Low Level Output Voltage | V _{OL} | V _{IH} or V _{IL} | 0.05 | 4.5 | - | 0.1 | - | 0.1 | - | 0.1 | V |
| | | | 24 | 4.5 | - | 0.36 | - | 0.44 | - | 0.5 | V |
| | | | 75 (Note 6, 7) | 5.5 | - | - | - | 1.65 | - | - | V |
| | | | 50 (Note 6, 7) | 5.5 | - | - | - | - | - | 1.65 | V |
| Input Leakage Current | I _I | V _{CC} or GND | - | 5.5 | - | ±0.1 | - | ±1 | - | ±1 | μA |
| Quiescent Supply Current MSI | I _{CC} | V _{CC} or GND | 0 | 5.5 | - | 8 | - | 80 | - | 160 | μA |
| Additional Supply Current per Input Pin TTL Inputs High 1 Unit Load | ΔI _{CC} | V _{CC} -2.1 | - | 4.5 to 5.5 | - | 2.4 | - | 2.8 | - | 3 | mA |

NOTES:

6. Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.
7. Test verifies a minimum 50Ω transmission-line-drive capability at 85°C, 75Ω at 125°C.

ACT Input Load Table

| INPUT | UNIT LOAD |
|-----------|-----------|
| I (All) | 1 |
| \bar{E} | 1 |
| S | 1 |

NOTE: Unit load is ΔI_{CC} limit specified in DC Electrical Specifications Table, e.g., 2.4mA max at 25°C.

CD74AC151, CD54/74ACT151

Switching Specifications Input $t_r, t_f = 3\text{ns}$, $C_L = 50\text{pF}$ (Worst Case)

| PARAMETER | SYMBOL | V_{CC} (V) | -40°C TO 85°C | | | -55°C TO 125°C | | | UNITS |
|--|-----------------------|-----------------|---------------|-----|------|----------------|-----|------|-------|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| AC TYPES | | | | | | | | | |
| Propagation Delay, Any Data to Y | t_{PLH}, t_{PHL} | 1.5 | - | - | 152 | - | - | 169 | ns |
| | | 3.3 (Note 9) | 4.9 | - | 17.1 | 4.7 | - | 18.9 | ns |
| | | 5 (Note 10) | 3.5 | - | 12.3 | 3.4 | - | 13.5 | ns |
| Propagation Delay, Any Data to \bar{Y} | t_{PLH}, t_{PHL} | 1.5 | - | - | 169 | - | - | 186 | ns |
| | | 3.3 | 5.4 | - | 19 | 5.2 | - | 20.9 | ns |
| | | 5 | 3.8 | - | 13.5 | 3.7 | - | 14.9 | ns |
| Propagation Delay, Any Select to Y | t_{PLH}, t_{PHL} | 1.5 | - | - | 207 | - | - | 228 | ns |
| | | 3.3 | 6.6 | - | 23.2 | 6.4 | - | 25.5 | ns |
| | | 5 | 4.7 | - | 16.5 | 4.6 | - | 18.2 | ns |
| Propagation Delay, Any Select to \bar{Y} | t_{PLH}, t_{PHL} | 1.5 | - | - | 223 | - | - | 245 | ns |
| | | 3.3 | 7.1 | - | 24.9 | 6.9 | - | 27.4 | ns |
| | | 5 | 5.1 | - | 17.8 | 4.9 | - | 19.6 | ns |
| Propagation Delay, Any $\bar{\text{Enable}}$ to Y | t_{PLH}, t_{PHL} | 1.5 | - | - | 139 | - | - | 153 | ns |
| | | 3.3 | 4.4 | - | 15.5 | 4.3 | - | 17.1 | ns |
| | | 5 | 3.1 | - | 11.1 | 3.1 | - | 12.2 | ns |
| Propagation Delay, Any $\bar{\text{Enable}}$ to \bar{Y} | t_{PLH}, t_{PHL} | 1.5 | - | - | 153 | - | - | 169 | ns |
| | | 3.3 | 4.9 | - | 17.2 | 4.7 | - | 18.9 | ns |
| | | 5 | 3.5 | - | 12.3 | 3.4 | - | 13.5 | ns |
| Input Capacitance | C_I | - | - | - | 10 | - | - | 10 | pF |
| Power Dissipation Capacitance | C_{PD} (Note 11) | - | - | 120 | - | - | 120 | - | pF |
| ACT TYPES | | | | | | | | | |
| Propagation Delay, Any Data to Y | t_{PLH}, t_{PHL} | 5 (Note 10) | 4 | - | 14.1 | 3.9 | - | 15.5 | ns |
| Propagation Delay, Any Data to \bar{Y} | t_{PLH}, t_{PHL} | 5 | 4.4 | - | 15.4 | 4.2 | - | 16.9 | ns |
| Propagation Delay, Any Select to Y | t_{PLH}, t_{PHL} | 5 | 5.2 | - | 18.4 | 5.1 | - | 20.2 | ns |
| Propagation Delay, Any Select to \bar{Y} | t_{PLH}, t_{PHL} | 5 | 5.6 | - | 19.6 | 5.4 | - | 21.6 | ns |
| Propagation Delay, Any $\bar{\text{Enable}}$ to Y | t_{PLH}, t_{PHL} | 5 | 3.1 | - | 11 | 3 | - | 12.1 | ns |
| Propagation Delay, Any $\bar{\text{Enable}}$ to \bar{Y} | t_{PLH}, t_{PHL} | 5 | 3.5 | - | 12.3 | 3.4 | - | 13.5 | ns |
| Input Capacitance | C_I | - | - | - | 10 | - | - | 10 | pF |
| Power Dissipation Capacitance | C_{PD} (Note 11) | - | - | 120 | - | - | 120 | - | pF |

NOTES:

8. Limits tested at 100%.
9. 3.3V Min at 3.6V, Max at 3V.
10. 5V Min at 5.5V, Max at 4.5V.
11. C_{PD} is used to determine the dynamic power consumption per device.
 AC: $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$
 ACT: $P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC}$ where f_i = input frequency, C_L = output load capacitance, V_{CC} = supply voltage.

CD74AC151, CD54/74ACT151

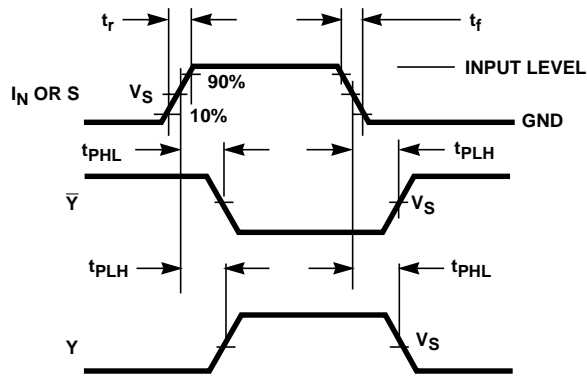


FIGURE 1. INPUTS OR SELECT TO OUTPUT PROPAGATION DELAYS

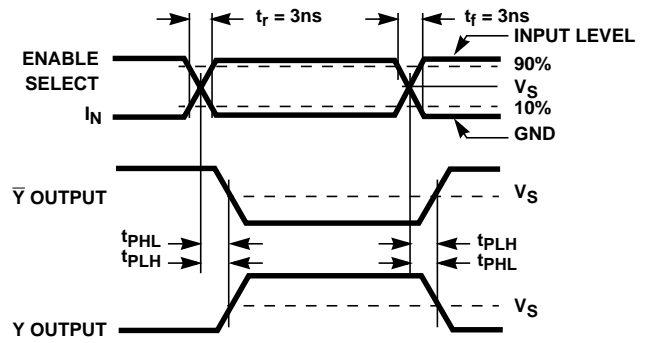
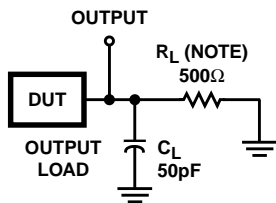


FIGURE 2. ENABLE TO OUTPUT PROPAGATION DELAYS



NOTE: For AC Series Only: When $V_{CC} = 1.5V$, $R_L = 1k\Omega$.

| | AC | ACT |
|---------------------------------|--------------|--------------|
| Input Level | V_{CC} | 3V |
| Input Switching Voltage, V_S | $0.5 V_{CC}$ | 1.5V |
| Output Switching Voltage, V_S | $0.5 V_{CC}$ | $0.5 V_{CC}$ |

FIGURE 3. PROPAGATION DELAY TIMES

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.