

SN54AHCT157, SN74AHCT157 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

SCLS347B – MAY 1996 – REVISED NOVEMBER 1996

- Inputs Are TTL-Voltage Compatible
- **EPIC™** (Enhanced-Performance Implanted CMOS) Process
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

These quadruple 2-line to 1-line data selectors/multiplexers are designed for 4.5-V to 5.5-V V_{CC} operation.

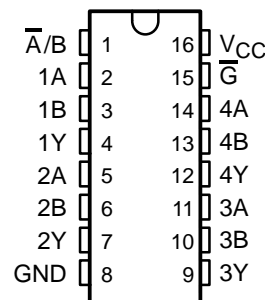
The 'AHCT157 feature a common strobe (\bar{G}) input. When the strobe is high, all outputs are low. When the strobe is low, a 4-bit word is selected from one of two sources and is routed to the four outputs. The devices provide true data.

The SN54AHCT157 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AHCT157 is characterized for operation from -40°C to 85°C .

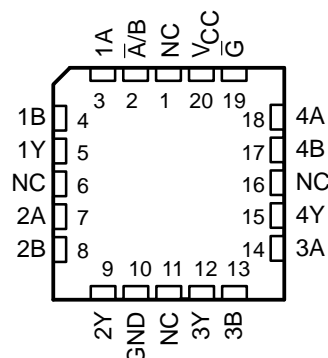
FUNCTION TABLE

| INPUTS | | | | OUTPUT Y |
|-----------|-------------------|---|---|-------------|
| \bar{G} | \bar{A}/\bar{B} | A | B | |
| H | X | X | X | L |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | H | H |

SN54AHCT157 . . . J OR W PACKAGE
SN74AHCT157 . . . D, DB, N, OR PW PACKAGE
(TOP VIEW)



SN54AHCT157 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

**TEXAS
INSTRUMENTS**

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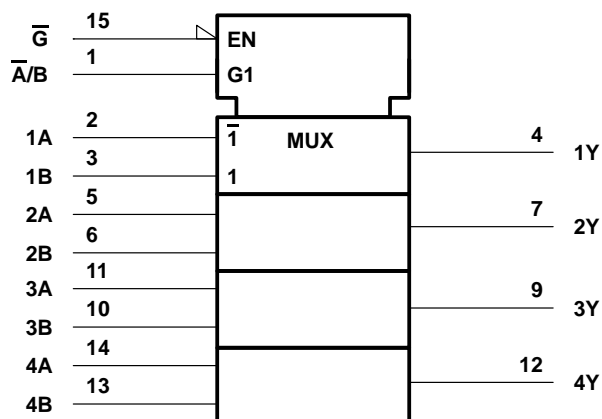
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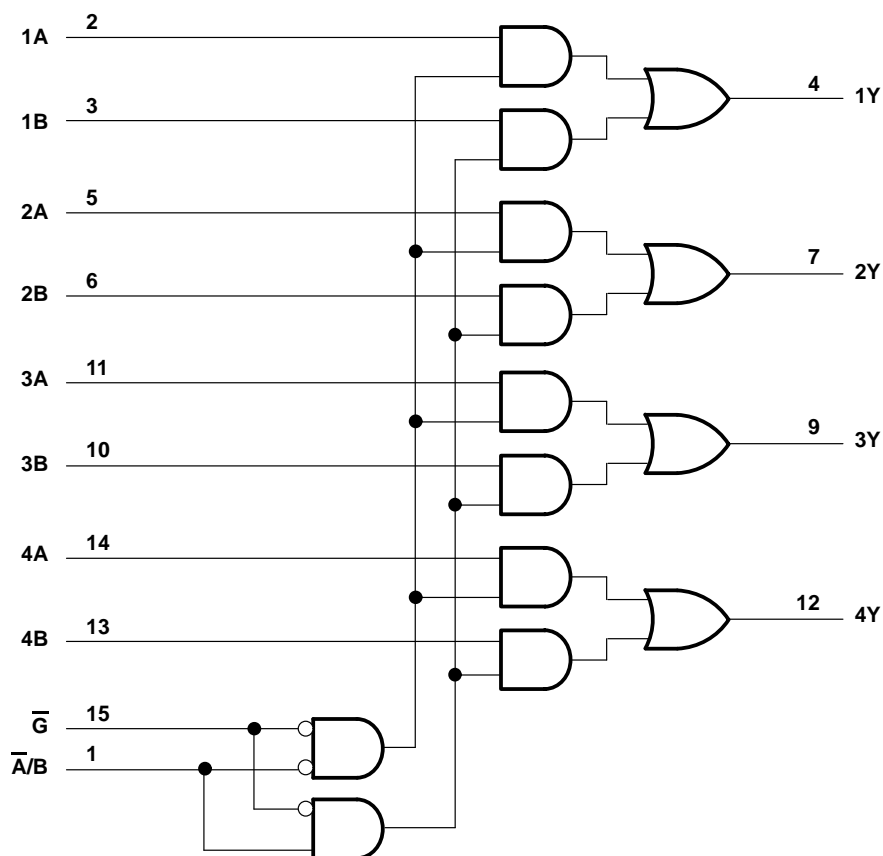
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logic symbol†



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

logic diagram (positive logic)



Pin numbers shown are for the D, DB, J, N, PW, and W packages.

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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 V to 7 V |
| Output voltage range, V_O (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$) | –20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | –20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±25 mA |
| Continuous current through V_{CC} or GND | ±50 mA |
| Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): | |
| D package | 1.3 W |
| DB package | 0.55 W |
| N package | 1.1 W |
| PW package | 0.5 W |
| Storage temperature range, T_{stg} | –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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions (see Note 3)

| | SN54AHCT157 | | SN74AHCT157 | | UNIT |
|--|-------------|----------|-------------|----------|------|
| | MIN | MAX | MIN | MAX | |
| V_{CC} Supply voltage | 4.5 | 5.5 | 4.5 | 5.5 | V |
| V_{IH} High-level input voltage | 2 | | 2 | | V |
| V_{IL} Low-level input voltage | | 0.8 | | 0.8 | V |
| V_I Input voltage | 0 | 5.5 | 0 | 5.5 | V |
| V_O Output voltage | 0 | V_{CC} | 0 | V_{CC} | V |
| I_{OH} High-level output current | | –8 | | –8 | mA |
| I_{OL} Low-level output current | | 8 | | 8 | mA |
| $\Delta t/\Delta v$ Input transition rise or fall time | | 20 | | 20 | ns/V |
| T_A Operating free-air temperature | –55 | 125 | –40 | 85 | °C |

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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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 | | | SN54AHCT157 | | SN74AHCT157 | | UNIT |
|-------------------------------|---|-----------------|-----------------------|-----|------|-------------|------|-------------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | I _{OH} = -50 µA | 4.5 V | 4.4 | 4.5 | | 4.4 | | 4.4 | | V |
| | I _{OH} = -8 mA | | 3.94 | | | 3.8 | | 3.8 | | |
| V _{OL} | I _{OL} = 50 µA | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | V |
| | I _{OL} = 8 mA | | | | 0.36 | | 0.44 | | 0.44 | |
| 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 | | | 2 | | 20 | | 20 | µA |
| ΔI _{CC} [†] | One input at 3.4 V, Other inputs at V _{CC} or GND | 5.5 V | | | 1.35 | | 1.5 | | 1.5 | mA |
| C _i | V _I = V _{CC} or GND | 5 V | | 4.5 | | | | | | pF |

[†] This is the increase in supply current for each input at one of the specified TTL voltage levels rather than 0 V or V_{CC}.

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) | LOAD CAPACITANCE | SN54AHCT157 | | | | UNIT | |
|--------------------|------------------|----------------|------------------------|-----------------------|------|-----|------|------|-----|
| | | | | T _A = 25°C | | | MIN | | MAX |
| | | | | MIN | TYP | MAX | | | |
| t _{PLH} * | A or B | Y | C _L = 15 pF | 4.1 | 6.4 | 1 | 7.5 | ns | |
| t _{PHL} * | | | | 4.1 | 6.4 | 1 | 7.5 | | |
| t _{PLH} * | \overline{A}/B | Y | C _L = 15 pF | 5.3 | 8.1 | 1 | 9.5 | ns | |
| t _{PHL} * | | | | 5.3 | 8.1 | 1 | 9.5 | | |
| t _{PLH} * | \overline{G} | Y | C _L = 15 pF | 5.6 | 8.6 | 1 | 10 | ns | |
| t _{PHL} * | | | | 5.6 | 8.6 | 1 | 10 | | |
| t _{PLH} | A or B | Y | C _L = 50 pF | 5.6 | 8.4 | 1 | 9.5 | ns | |
| t _{PHL} | | | | 5.6 | 8.4 | 1 | 9.5 | | |
| t _{PLH} | \overline{A}/B | Y | C _L = 50 pF | 6.8 | 10.1 | 1 | 11.5 | ns | |
| t _{PLH} | | | | 6.8 | 10.1 | 1 | 11.5 | | |
| t _{PLH} | \overline{G} | Y | C _L = 50 pF | 7.1 | 10.6 | 1 | 12 | ns | |
| t _{PHL} | | | | 7.1 | 10.6 | 1 | 12 | | |

* On products compliant to MIL-PRF-38535, this parameter is ensured but not production tested.

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | SN74AHCT157 | | | | UNIT | |
|------------------|------------------|----------------|------------------------|-----------------------|------|-----|------|------|-----|
| | | | | T _A = 25°C | | | MIN | | MAX |
| | | | | MIN | TYP | MAX | | | |
| t _{PLH} | A or B | Y | C _L = 15 pF | 4.1 | 6.4 | 1 | 7.5 | ns | |
| t _{PHL} | | | | 4.1 | 6.4 | 1 | 7.5 | | |
| t _{PLH} | \overline{A}/B | Y | C _L = 15 pF | 5.3 | 8.1 | 1 | 9.5 | ns | |
| t _{PHL} | | | | 5.3 | 8.1 | 1 | 9.5 | | |
| t _{PLH} | \overline{G} | Y | C _L = 15 pF | 5.6 | 8.6 | 1 | 10 | ns | |
| t _{PHL} | | | | 5.6 | 8.6 | 1 | 10 | | |
| t _{PLH} | A or B | Y | C _L = 50 pF | 5.6 | 8.4 | 1 | 9.5 | ns | |
| t _{PHL} | | | | 5.6 | 8.4 | 1 | 9.5 | | |
| t _{PLH} | \overline{A}/B | Y | C _L = 50 pF | 6.8 | 10.1 | 1 | 11.5 | ns | |
| t _{PLH} | | | | 6.8 | 10.1 | 1 | 11.5 | | |
| t _{PLH} | \overline{G} | Y | C _L = 50 pF | 7.1 | 10.6 | 1 | 12 | ns | |
| t _{PHL} | | | | 7.1 | 10.6 | 1 | 12 | | |

noise characteristics $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 4)

| PARAMETER | | SN74AHCT157 | | UNIT |
|-------------|--|-------------|-----|------|
| | | MIN | MAX | |
| $V_{OL(P)}$ | Quiet output, maximum dynamic V_{OL} | | 0.8 | V |
| $V_{OL(V)}$ | Quiet output, minimum dynamic V_{OL} | -0.8 | | V |
| $V_{OH(V)}$ | Quiet output, minimum dynamic V_{OH} | | | V |
| $V_{IH(D)}$ | High-level dynamic input voltage | 2 | | V |
| $V_{IL(D)}$ | Low-level dynamic input voltage | | 0.8 | V |

NOTE 4: Characteristics are determined during product characterization and ensured by design for surface-mount packages only.

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|-----------|-----------------------------|-----|------|
| C_{pd} | No load, $f = 1\text{ MHz}$ | 26 | pF |

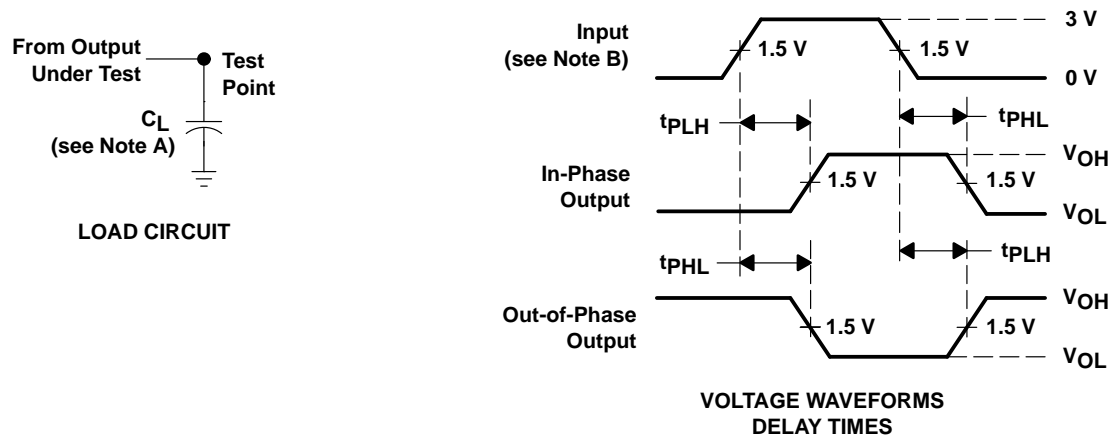
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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 3$ 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

PRODUCT PREVIEW

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