

SN54HCT240, SN74HCT240 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SCLS174C – MARCH 1984 – REVISED FEBRUARY 2000

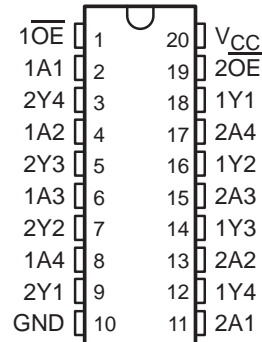
- Inputs Are TTL-Voltage Compatible
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- High-Current Outputs Drive up to 15 LSTTL Loads
- Package Options Include Plastic Small-Outline (DW), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs

description

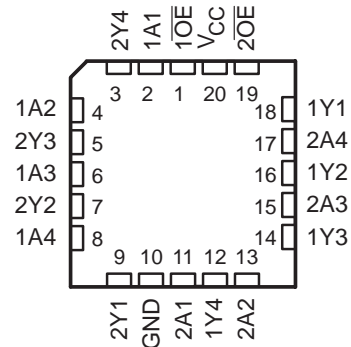
These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The 'HCT240 devices are organized as two 4-bit buffers/drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the device passes inverted data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

The SN54HCT240 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HCT240 is characterized for operation from -40°C to 85°C .

SN54HCT240 . . . J OR W PACKAGE
SN74HCT240 . . . DW, N, OR PW PACKAGE
(TOP VIEW)



SN54HCT240 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each buffer/driver)

| INPUTS | | OUTPUT |
|-----------------|---|--------|
| \overline{OE} | A | Y |
| L | H | L |
| L | L | H |
| H | X | Z |



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2000, Texas Instruments Incorporated
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54HCT240, SN74HCT240 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SCLS174C – MARCH 1984 – REVISED FEBRUARY 2000

recommended operating conditions (see Note 3)

| | | SN54HCT240 | | | SN74HCT240 | | | UNIT | |
|-----------------|---------------------------------------|----------------------------------|-----------------|-----|------------|-----------------|-----|------|----|
| | | MIN | NOM | MAX | MIN | NOM | MAX | | |
| V _{CC} | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V | |
| V _{IH} | High-level input voltage | V _{CC} = 4.5 V to 5.5 V | | 2 | 2 | | V | | |
| V _{IL} | Low-level input voltage | V _{CC} = 4.5 V to 5.5 V | | 0 | 0.8 | | V | | |
| V _I | Input voltage | 0 | V _{CC} | | 0 | V _{CC} | | V | |
| V _O | Output voltage | 0 | V _{CC} | | 0 | V _{CC} | | V | |
| t _t | Input transition (rise and fall) time | 0 | 500 | | 0 | 500 | | ns | |
| T _A | Operating free-air temperature | -55 | | 125 | | -40 | | 85 | °C |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | SN54HCT240 | | SN74HCT240 | | UNIT |
|-------------------------------|--|-----------------|--------------------------|------|-------|------------|-----|------------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | V _I = V _{IH} or V _{IL} | 4.5 V | I _{OH} = -20 μA | | 4.4 | 4.499 | 4.4 | 4.4 | V | |
| | | | I _{OH} = -6 mA | | 3.98 | 4.3 | 3.7 | 3.84 | | |
| V _{OL} | V _I = V _{IH} or V _{IL} | 4.5 V | I _{OL} = 20 μA | | 0.001 | 0.1 | 0.1 | 0.1 | V | |
| | | | I _{OL} = 6 mA | | 0.17 | 0.26 | 0.4 | 0.33 | | |
| I _I | V _I = V _{CC} or 0 | 5.5 V | ±0.1 | ±100 | ±1000 | ±1000 | nA | | | |
| I _{OZ} | V _O = V _{CC} or 0, V _I = V _{IH} or V _{IL} | 5.5 V | ±0.01 | ±0.5 | ±10 | ±5 | μA | | | |
| I _{CC} | V _I = V _{CC} or 0, I _O = 0 | 5.5 V | 8 | | 160 | 80 | μA | | | |
| ΔI _{CC} [†] | One input at 0.5 V or 2.4 V, Other inputs at 0 or V _{CC} | 5.5 V | 1.4 | 2.4 | 3 | 2.9 | mA | | | |
| C _i | | 4.5 V to 5.5 V | 3 | 10 | 10 | 10 | pF | | | |

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

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} | T _A = 25°C | | | SN54HCT240 | | SN74HCT240 | | UNIT |
|------------------|------------------------|-------------|-----------------|-----------------------|-----|-----|------------|-----|------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{pd} | A | Y | 4.5 V | 13 | 25 | 37 | 32 | ns | | | |
| | | | 5.5 V | 12 | 23 | 33 | 29 | | | | |
| t _{en} | $\overline{\text{OE}}$ | Y | 4.5 V | 21 | 35 | 53 | 44 | ns | | | |
| | | | 5.5 V | 19 | 32 | 48 | 40 | | | | |
| t _{dis} | $\overline{\text{OE}}$ | Y | 4.5 V | 19 | 35 | 53 | 44 | ns | | | |
| | | | 5.5 V | 18 | 32 | 48 | 40 | | | | |
| t _t | | Y | 4.5 V | 8 | 12 | 18 | 15 | ns | | | |
| | | | 5.5 V | 7 | 11 | 16 | 14 | | | | |



SN54HCT240, SN74HCT240
OCTAL BUFFERS AND LINE DRIVERS
WITH 3-STATE OUTPUTS

SCLS174C – MARCH 1984 – REVISED FEBRUARY 2000

switching characteristics over recommended operating free-air temperature range, $C_L = 150 \text{ pF}$
(unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V_{CC} | $T_A = 25^\circ\text{C}$ | | | SN54HCT240 | | SN74HCT240 | | UNIT |
|-----------|-----------------|----------------|----------|--------------------------|-----|-----|------------|-----|------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t_{pd} | A | Y | 4.5 V | 20 | 42 | 63 | 53 | ns | | | |
| | | | 5.5 V | 19 | 38 | 56 | 48 | | | | |
| t_{en} | \overline{OE} | Y | 4.5 V | 25 | 52 | 79 | 65 | ns | | | |
| | | | 5.5 V | 22 | 47 | 71 | 59 | | | | |
| t_t | | Y | 4.5 V | 17 | 42 | 63 | 53 | ns | | | |
| | | | 5.5 V | 14 | 38 | 57 | 48 | | | | |

operating characteristics, $T_A = 25^\circ\text{C}$

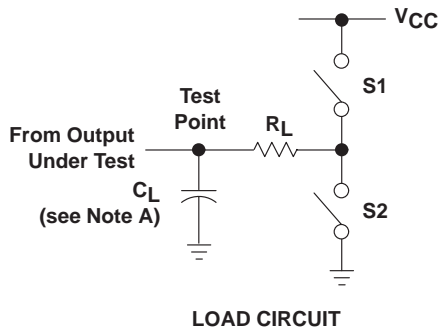
| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------|-----|------|
| C_{pd} Power dissipation capacitance | No load | 40 | pF |



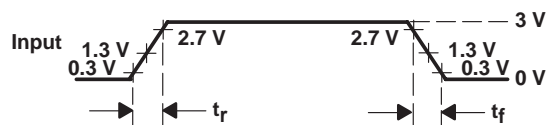
SN54HCT240, SN74HCT240 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SCLS174C – MARCH 1984 – REVISED FEBRUARY 2000

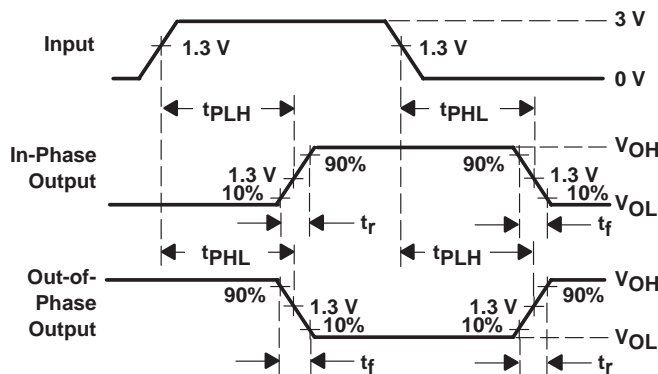
PARAMETER MEASUREMENT INFORMATION



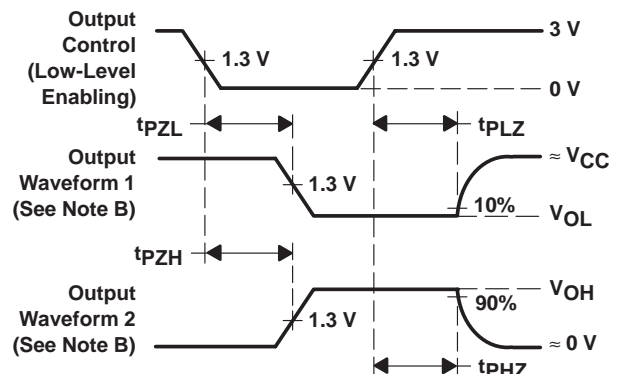
| PARAMETER | R_L | C_L | S1 | S2 |
|-------------------|--------------|-----------------|--------|--------|
| t_{en} | 1 k Ω | 50 pF or 150 pF | Open | Closed |
| | | | Closed | Open |
| t_{dis} | 1 k Ω | 50 pF | Open | Closed |
| | | | Closed | Open |
| t_{pd} or t_t | — | 50 pF or 150 pF | Open | Open |



VOLTAGE WAVEFORM
INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

- NOTES: A. C_L includes probe and test-fixture capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
D. The outputs are measured one at a time with one input transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
F. t_{PZL} and t_{PZH} are the same as t_{en} .
G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

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 acknowledgement, 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.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

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.