# 54S/74S240 • 54LS/74LS240
# 54S/74S241 • 54LS/74LS241
# 54LS/74LS244

## OCTAL BUFFER/LINE DRIVER

(With 3-State Outputs)

**DESCRIPTION** — The '240, '241 and '244 are octal buffers and line drivers designed to be employed as memory address drivers, clock drivers and bus oriented transmitters/receivers which provide improved PC board density.

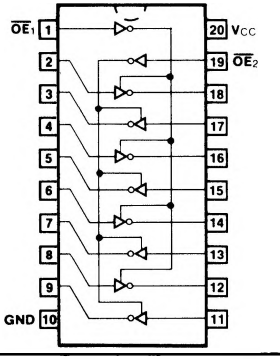
- **HYSTERESIS AT INPUTS TO IMPROVE NOISE MARGINS**
- **3-STATE OUTPUTS DRIVE BUS LINES OR BUFFER MEMORY ADDRESS REGISTERS**
- **OUTPUTS SINK 24 mA (74LS) OR 40 mA(74S)**
- **15 mA SOURCE CURRENT**
- **INPUT CLAMP DIODES LIMIT HIGH SPEED TERMINATION EFFECTS**
- **FULLY TTL AND CMOS COMPATIBLE**

**ORDERING CODE:** See Section 9

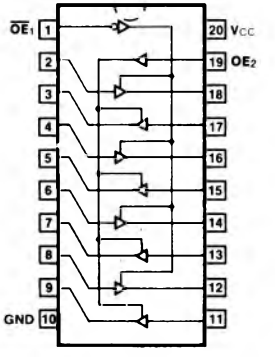
| PKGS | PIN OUT | COMMERCIAL GRADE $V_{CC}$ = +5.0 V, ±5%, $T_A$ = 0°C to +70°C | MILITARY GRADE $V_{CC}$ = +5.0 V, ±10%, $T_A$ = -55°C to +125°C | PKG TYPE |
|---|---|---|---|---|
| Plastic DIP (P) | A | 74S240PC, 74LS240PC | | 9Z |
| | B | 74S241PC, 74LS241PC | | |
| | C | 74LS244PC | | |
| Ceramic DIP (D) | A | 74S240DC, 74LS240DC | 54S240DM, 54LS240DM | 4E |
| | B | 74S241DC, 74LS241DC | 54S241DM, 54LS241DM | |
| | C | 74LS244DC | 54LS244DM | |
| Flatpak (F) | A | 74S240FC, 74LS240FC | 54S240FM, 54LS240FM | 4F |
| | B | 74S241FC, 74LS241FC | 54S241FM, 54LS241FM | |
| | C | 74LS244FC | 54LS244FM | |

**CONNECTION DIAGRAMS**

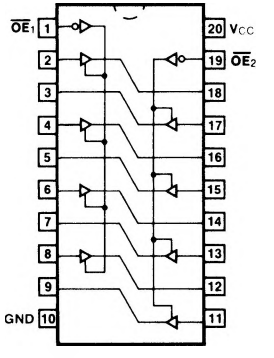
PINOUT A




PINOUT B




PINOUT C




**INPUT LOADING/FAN-OUT:** See Section 9

| PIN NAMES | DESCRIPTION | 54/74S (U.L.) HIGH/LOW | 54/74LS (U.L.) HIGH/LOW |
|---|---|---|---|
| $\overline{OE}_1$, $\overline{OE}_2$ | 3-State Output Enable (Active LOW) | 1.25/1.25 | 0.5/0.25 |
| $OE_2$ | 3-State Output Enable (Active HIGH) | 1.25/1.25 | 0.5/0.25 |
| | Inputs | 1.25/0.25 | 0.5/0.125 |
| | Outputs | 75/40 (30) | 75/15 (7.5) |

## TRUTH TABLES

**'S240, 'LS240**

| INPUTS | | | OUTPUT |
|---|---|---|---|
| $\overline{OE_1}$, $\overline{OE_2}$ | | D | |
| L | | L | H |
| L | | H | L |
| H | | X | Z |

**'S241, 'LS241**

| INPUTS | | | OUTPUT |
|---|---|---|---|
| $\overline{OE_1}$ | $OE_2$ | D | |
| L | H | L | L |
| L | H | H | H |
| H | L | X | Z |

**'LS244**

| INPUTS | | | OUTPUT |
|---|---|---|---|
| $\overline{OE_1}$, $\overline{OE_2}$ | | D | |
| L | | L | L |
| L | | H | H |
| H | | X | Z |

H = HIGH Voltage Level  L = LOW Voltage Level  X = Immaterial  Z = High Impedance

**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE** (unless otherwise specified)

| SYMBOL | DESCRIPTION | | | | 54/74S Min | 54/74S Max | 54/74LS Min | 54/74LS Max | UNITS | CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|---|
| $V_{OH}$ | Output HIGH Voltage | | | XM | 2.0 | | 2.0 | | V | $I_{OH}$ = -12 mA, $V_{IH}$ = 2.0 V, $V_{IL}$ = 0.5 V |
| | | | | XC | 2.0 | | 2.0 | | V | $I_{OH}$ = -15 mA, $V_{CC}$ = Min |
| | | | | XM | 2.4 | | 2.4 | | V | $V_{CC}$ = Min, $V_{IH}$ = 2.0 V, $V_{IL}$ = Max, $I_{OH}$ = -3.0 mA |
| | | | | XC | 2.4 | | 2.4 | | V | |
| | | | | XC | 2.7 | | 2.7 | | V | $V_{CC}$ = Min, $V_{IH}$ = 2.0 V, $V_{IL}$ = Max, $I_{OH}$ = -1.0 mA |
| $V_{OL}$ | Output LOW Voltage | | | XM | | | | 0.4 | V | $I_{OL}$ = 12 mA, $V_{CC}$ = Min |
| | | | | XC | | | | 0.4 | V | $I_{OL}$ = 12 mA, $V_{CC}$ = Min |
| | | | | XC | | | | 0.5 | V | $I_{OL}$ = 24 mA, $V_{CC}$ = Min |
| | | | | XM | | 0.55 | | | V | $I_{OL}$ = 48 mA, $V_{CC}$ = Min |
| | | | | XC | | 0.55 | | | V | $I_{OL}$ = 64 mA, $V_{CC}$ = Min |
| $I_{OS}$ | Output Short Circuit Current | | | | -50 | -225 | -40 | -225 | mA | $V_{CC}$ = Max |
| $I_{CC}$ | Power Supply Current | HIGH | ('240) | XM | | 123 | | 23 | mA | $V_{CC}$ = Max |
| | | | | XC | | 135 | | 23 | | |
| | | | ('241) | XM | | 147 | | 23 | | |
| | | | | XC | | 160 | | 23 | | |
| | | | ('244) | XM | | | | 23 | | |
| | | | | XC | | | | 23 | | |
| | | LOW | ('240) | XM | | 145 | | 44 | mA | $V_{CC}$ = Max |
| | | | | XC | | 150 | | 44 | | |
| | | | ('241) | XM | | 170 | | 46 | | |
| | | | | XC | | 180 | | 46 | | |
| | | | ('244) | XM | | | | 46 | | |
| | | | | XC | | | | 46 | | |
| | | OFF | ('240) | XM | | 145 | | 50 | mA | $V_{CC}$ = Max |
| | | | | XC | | 150 | | 50 | | |
| | | | ('241) | XM | | 170 | | 54 | | |
| | | | | XC | | 180 | | 54 | | |
| | | | ('244) | XM | | | | 54 | | |
| | | | | XC | | | | 54 | | |

**AC CHARACTERISTICS:** $V_{CC}$ = +5.0 V, $T_A$ = +25°C (See Section 3 for waveforms and load configurations)

| SYMBOL | PARAMETER | 54/74S | | 54/74LS | | UNITS | CONDITIONS |
|---|---|---|---|---|---|---|---|
| | | $C_L$ = 50 pF, $R_L$ = 90 Ω | | $C_L$ = 50 pF | | | |
| | | Min | Max | Min | Max | | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>Data to Output ('240) | | 7.0<br>7.0 | | 14<br>18 | ns | Figs. 3-1, 3-4 |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>Data to Output ('241) | | 9.0<br>9.0 | | 18<br>18 | ns | Figs. 3-1, 3-5 |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>Data to Output ('244) | | | | 18<br>18 | ns | |
| $t_{PZH}$<br>$t_{PZL}$ | Output Enable Time<br>('S240) | | 10<br>15 | | | ns | Figs. 3-3, 3-11, 3-12 |
| $t_{PZH}$<br>$t_{PZL}$ | Output Enable Time<br>('LS240, 'LS241, 'S241) | | 12<br>15 | | 23<br>30 | ns | Figs. 3-3, 3-11, 3-12<br>$R_L$ = 667 Ω ('LS) |
| $t_{PLZ}$<br>$t_{PHZ}$ | Output Disable Time | | 15<br>9.0 | | 25<br>18 | ns | Figs. 3-3, 3-11, 3-12<br>$R_L$ = 667 Ω, $C_L$ = 5 pF ('LS) |