

SN74LS240, SN74LS244

Octal Buffer/Line Driver with 3-State Outputs

The SN74LS240 and SN74LS244 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
- Input Clamp Diodes Limit High-Speed Termination Effects

GUARANTEED OPERATING RANGES

| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|-------------------------------------|------|-----|------|------|
| V_{CC} | Supply Voltage | 4.75 | 5.0 | 5.25 | V |
| T_A | Operating Ambient Temperature Range | 0 | 25 | 70 | °C |
| I_{OH} | Output Current – High | | | -3.0 | mA |
| | | | | -15 | mA |
| I_{OL} | Output Current – Low | | | 24 | mA |

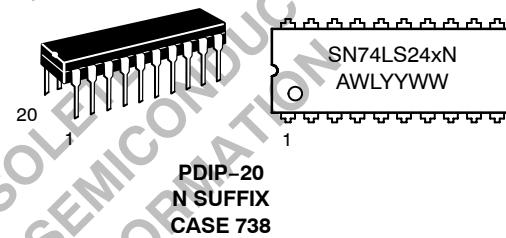


ON Semiconductor

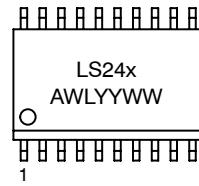
<http://onsemi.com>

LOW
POWER
SCHOTTKY

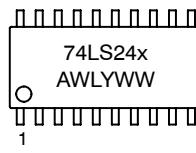
MARKING DIAGRAMS



PDIP-20
N SUFFIX
CASE 738



SOIC-20
DW SUFFIX
CASE 751D



SOIAJ-20
M SUFFIX
CASE 967

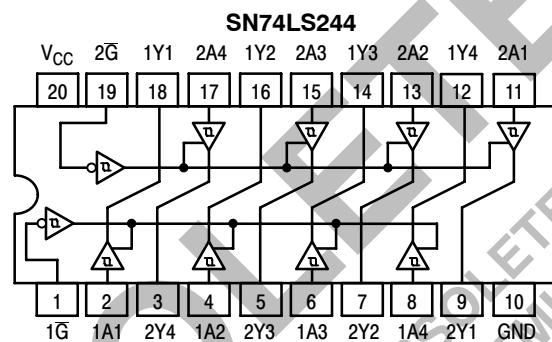
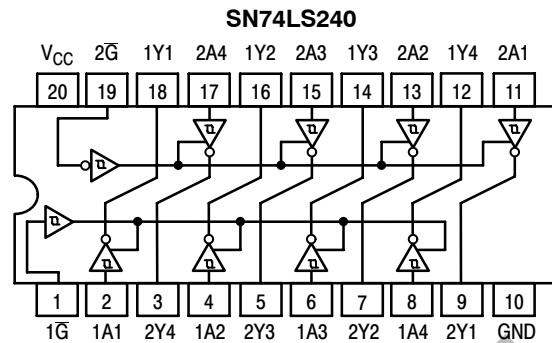
x = 0 or 4
A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

SN74LS240, SN74LS244

LOGIC AND CONNECTION DIAGRAMS DIP (TOP VIEW)



TRUTH TABLES

SN74LS240

| INPUTS | | OUTPUT |
|--------|---|--------|
| 1G, 2G | D | |
| L | L | H |
| L | H | L |
| H | X | (Z) |

SN74LS244

| INPUTS | | OUTPUT |
|--------|---|--------|
| 1G, 2G | D | |
| L | L | L |
| L | H | H |
| H | X | (Z) |

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

SN74LS240, SN74LS244

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol | Parameter | Limits | | | Unit | Test Conditions |
|-----------------|---|--------|-------|------|---------------|---|
| | | Min | Typ | Max | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | | | 0.8 | V | Guaranteed Input LOW Voltage for All Inputs |
| $V_{T+}-V_{T-}$ | Hysteresis | 0.2 | 0.4 | | V | $V_{CC} = \text{MIN}$ |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}, I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 2.4 | 3.4 | | V | $V_{CC} = \text{MIN}, I_{OH} = -3.0 \text{ mA}$ |
| | | 2.0 | | | V | $V_{CC} = \text{MIN}, I_{OH} = \text{MAX}$ |
| V_{OL} | Output LOW Voltage | | 0.25 | 0.4 | V | $I_{OL} = 12 \text{ mA}$ |
| | | | 0.35 | 0.5 | V | $I_{OL} = 24 \text{ mA}$ |
| I_{OZH} | Output Off Current HIGH | | | 20 | μA | $V_{CC} = \text{MAX}, V_{OUT} = 2.7 \text{ V}$ |
| I_{OZL} | Output Off Current LOW | | | -20 | μA | $V_{CC} = \text{MAX}, V_{OUT} = 0.4 \text{ V}$ |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}, V_{IN} = 2.7 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}, V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.2 | mA | $V_{CC} = \text{MAX}, V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Output Short Circuit Current (Note 1) | -40 | | -225 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current Total, Output HIGH | | | 27 | mA | $V_{CC} = \text{MAX}$ |
| | Total, Output LOW | LS240 | | 44 | | |
| | LS244 | | | 46 | | |
| | Total at HIGH Z | LS240 | | 50 | | |
| | LS244 | | | 54 | | |

1. Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS ($T_A = 25^\circ\text{C}$, $V_{CC} = 5.0 \text{ V}$)

| Symbol | Parameter | Limits | | | Unit | Test Conditions |
|-----------|---|--------|-----------|----------|------|--|
| | | Min | Typ | Max | | |
| t_{PLH} | Propagation Delay, Data to Output LS240 | | 9.0 12 | 14 18 | ns | $C_L = 45 \text{ pF}$, $R_L = 667 \Omega$ |
| t_{PHL} | Propagation Delay, Data to Output LS244 | | 12 | 18 18 | ns | |
| t_{PZH} | Output Enable Time to HIGH Level | | 15 | 23 | ns | |
| t_{PZL} | Output Enable Time to LOW Level | | 20 | 30 | ns | |
| t_{PLZ} | Output Disable Time from LOW Level | | 15 | 25 | ns | $C_L = 5.0 \text{ pF}$, $R_L = 667 \Omega$ |
| t_{PHZ} | Output Disable Time from HIGH Level | | 10 | 18 | ns | |

SN74LS240, SN74LS244

AC WAVEFORMS

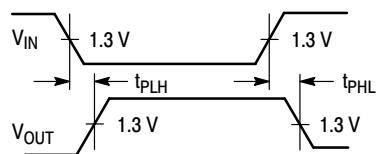


Figure 1.

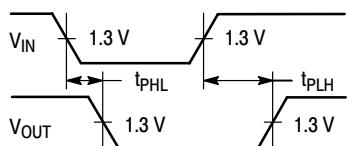


Figure 2.

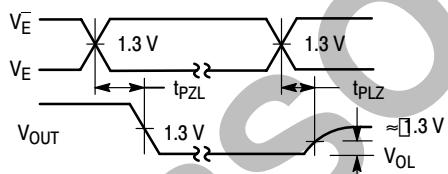


Figure 3.

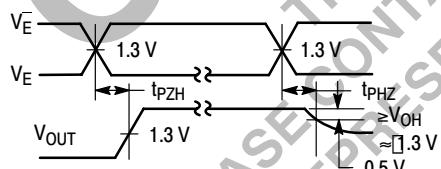


Figure 4.

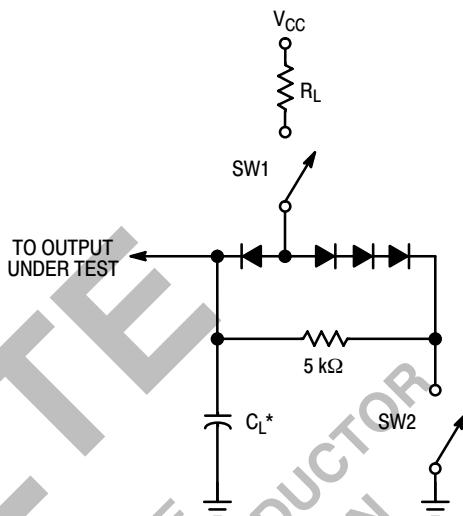


Figure 5.

SWITCH POSITIONS

| SYMBOL | SW1 | SW2 |
|-----------|--------|--------|
| t_{PZH} | Open | Closed |
| t_{PZL} | Closed | Open |
| t_{PLZ} | Closed | Closed |
| t_{PHZ} | Closed | Closed |

SN74LS240, SN74LS244

DEVICE ORDERING INFORMATION

| Device Order Number | Package Type | Tape and Reel Size |
|---------------------|--------------|--------------------|
| SN74LS240N | PDIP-20 | 1440 Units/Box |
| SN74LS240DW | SOIC-WIDE | 38 Units/Rail |
| SN74LS240DWR2 | SOIC-WIDE | 2500/Tape and Reel |
| SN74LS240M | SOEIAJ-20 | See Note 2 |
| SN74LS240MEL | SOEIAJ-20 | See Note 2 |
| SN74LS244N | PDIP-20 | 1440 Units/Box |
| SN74LS244DW | SOIC-WIDE | 38 Units/Rail |
| SN74LS244DWR2 | SOIC-WIDE | 2500/Tape and Reel |
| SN74LS244M | SOEIAJ-20 | See Note 2 |
| SN74LS244MEL | SOEIAJ-20 | See Note 2 |

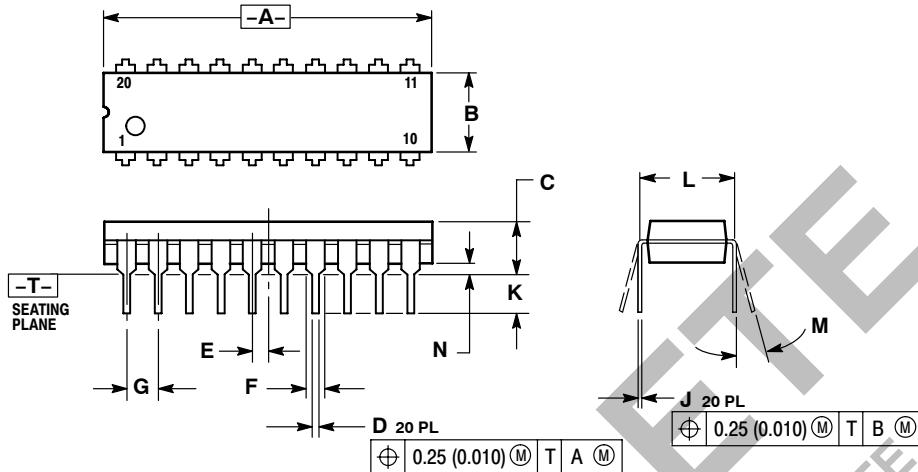
2. For ordering information on the EIAJ version of the SOIC package, please contact your local ON Semiconductor representative.

OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

SN74LS240, SN74LS244

PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 738-03
ISSUE E

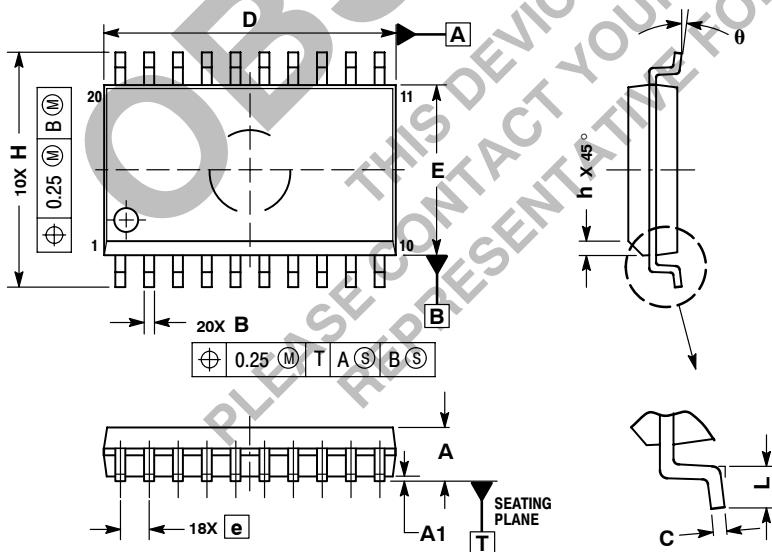


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.010 | 1.070 | 25.66 | 27.17 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.150 | 0.180 | 3.81 | 4.57 |
| D | 0.015 | 0.022 | 0.39 | 0.55 |
| E | 0.050 | BSC | 1.27 | BSC |
| F | 0.050 | 0.070 | 1.27 | 1.77 |
| G | 0.100 | BSC | 2.54 | BSC |
| J | 0.008 | 0.015 | 0.21 | 0.38 |
| K | 0.110 | 0.140 | 2.80 | 3.55 |
| L | 0.300 | BSC | 7.62 | BSC |
| M | 0° | 15° | 0° | 15° |
| N | 0.020 | 0.040 | 0.51 | 1.01 |

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751D-05
ISSUE F



NOTES:

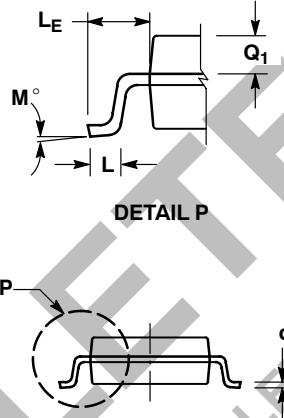
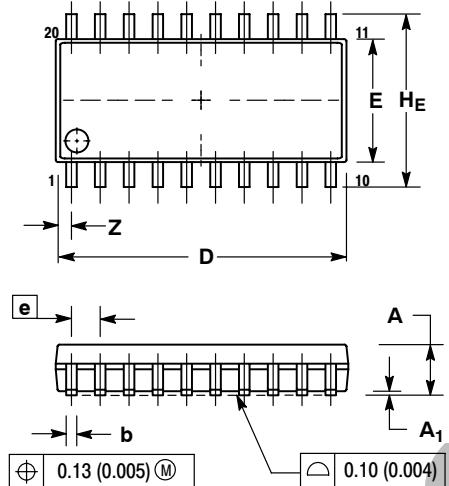
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 2.35 | 2.65 |
| A1 | 0.10 | 0.25 |
| B | 0.35 | 0.49 |
| C | 0.23 | 0.32 |
| D | 12.65 | 12.95 |
| E | 7.40 | 7.60 |
| e | 1.27 | BSC |
| H | 10.05 | 10.55 |
| h | 0.25 | 0.75 |
| L | 0.50 | 0.90 |
| θ | 0° | 7° |

SN74LS240, SN74LS244

PACKAGE DIMENSIONS

M SUFFIX
SOEIAJ PACKAGE
CASE 967-01
ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

| DIM | MILLIMETERS | | INCHES | |
|----------------|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | --- | 2.05 | --- | 0.081 |
| A ₁ | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 0.35 | 0.50 | 0.014 | 0.020 |
| c | 0.18 | 0.27 | 0.007 | 0.011 |
| D | 12.35 | 12.80 | 0.486 | 0.504 |
| E | 5.10 | 5.45 | 0.201 | 0.215 |
| e | 1.27 BSC | | 0.050 BSC | |
| H _E | 7.40 | 8.20 | 0.291 | 0.323 |
| L | 0.50 | 0.85 | 0.020 | 0.033 |
| L _E | 1.10 | 1.50 | 0.043 | 0.059 |
| M | 0 ° | 10 ° | 0 ° | 10 ° |
| Q ₁ | 0.70 | 0.90 | 0.028 | 0.035 |
| Z | --- | 0.81 | --- | 0.032 |

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