

# MC74LVX126

## Quad Bus Buffer

### With 5V-Tolerant Inputs

The MC74LVX126 is an advanced high speed CMOS quad bus buffer. The inputs tolerate voltages up to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

The MC74LVX126 requires the 3-state control input (OE) to be set Low to place the output into the high impedance state.

#### Features

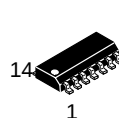
- High Speed:  $t_{PD} = 4.4$  ns (Typ) at  $V_{CC} = 3.3$  V
- Low Power Dissipation:  $I_{CC} = 4$   $\mu$ A (Max) at  $T_A = 25^\circ\text{C}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Low Noise:  $V_{OLP} = 0.5$  V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: Human Body Model >2000 V  
Machine Model >200 V



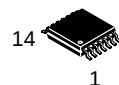
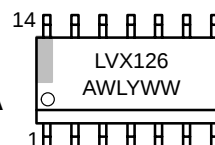
ON Semiconductor®

<http://onsemi.com>

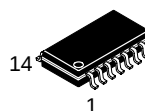
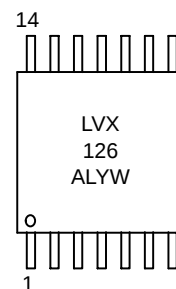
#### MARKING DIAGRAMS



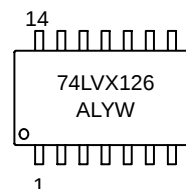
SOIC-14  
D SUFFIX  
CASE 751A



TSSOP-14  
DT SUFFIX  
CASE 948G



SOEIAJ-14  
M SUFFIX  
CASE 965



A = Assembly Location  
L, WL = Wafer Lot  
Y = Year  
W, WW = Work Week

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

# MC74LVX126

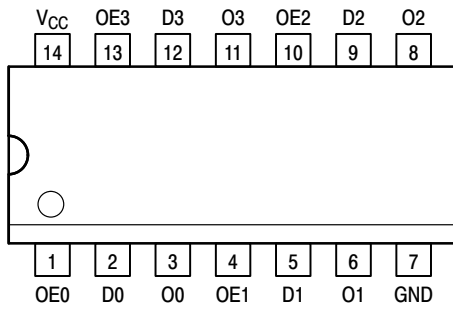


Figure 1. 14-Lead Pinout (Top View)

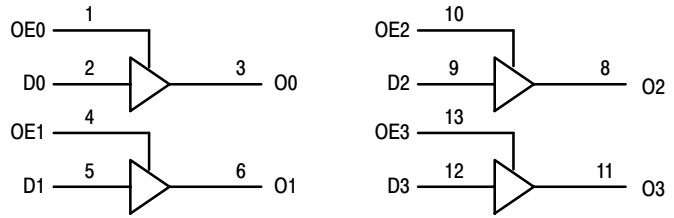


Figure 2. Logic Diagram

## PIN NAMES

| Pins | Function             |
|------|----------------------|
| OEn  | Output Enable Inputs |
| Dn   | Data Inputs          |
| On   | 3-State Outputs      |

## FUNCTION TABLE

| INPUTS |    | OUTPUTS |
|--------|----|---------|
| OEn    | Dn | On      |
| H      | L  | L       |
| H      | H  | H       |
| L      | X  | Z       |

H = High Voltage Level; L = Low Voltage Level; Z = High Impedance State; X = High or Low Voltage Level and Transitions Are Acceptable, for  $I_{CC}$  reasons, DO NOT FLOAT Inputs

## MAXIMUM RATINGS

| Symbol    | Parameter                                | Value                 | Unit |
|-----------|------------------------------------------|-----------------------|------|
| $V_{CC}$  | DC Supply Voltage                        | -0.5 to +7.0          | V    |
| $V_{in}$  | DC Input Voltage                         | -0.5 to +7.0          | V    |
| $V_{out}$ | DC Output Voltage                        | -0.5 to $V_{CC}$ +0.5 | V    |
| $I_{IK}$  | Input Diode Current                      | -20                   | mA   |
| $I_{OK}$  | Output Diode Current                     | ±20                   | mA   |
| $I_{out}$ | DC Output Current, per Pin               | ±25                   | mA   |
| $I_{CC}$  | DC Supply Current, $V_{CC}$ and GND Pins | ±50                   | mA   |
| $P_D$     | Power Dissipation                        | 180                   | mW   |
| $T_{stg}$ | Storage Temperature                      | -65 to +150           | °C   |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

## RECOMMENDED OPERATING CONDITIONS

| Symbol              | Parameter                                | Min | Max      | Unit |
|---------------------|------------------------------------------|-----|----------|------|
| $V_{CC}$            | DC Supply Voltage                        | 2.0 | 3.6      | V    |
| $V_{in}$            | DC Input Voltage                         | 0   | 5.5      | V    |
| $V_{out}$           | DC Output Voltage                        | 0   | $V_{CC}$ | V    |
| $T_A$               | Operating Temperature, All Package Types | -40 | +125     | °C   |
| $\Delta t/\Delta V$ | Input Rise and Fall Time                 | 0   | 100      | ns/V |

# MC74LVX126

## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter                                                                            | Test Conditions                                                                                   | V <sub>CC</sub><br>V | T <sub>A</sub> = 25°C |            |                    | T <sub>A</sub> = ≤ 85°C |                    | T <sub>A</sub> = ≤ 125°C |                    | Unit |
|-----------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------|-----------------------|------------|--------------------|-------------------------|--------------------|--------------------------|--------------------|------|
|                 |                                                                                      |                                                                                                   |                      | Min                   | Typ        | Max                | Min                     | Max                | Min                      | Max                |      |
| V <sub>IH</sub> | High-Level Input Voltage                                                             |                                                                                                   | 2.0<br>3.0<br>3.6    | 1.5<br>2.0<br>2.4     |            |                    | 1.5<br>2.0<br>2.4       |                    | 1.5<br>2.0<br>2.4        |                    | V    |
| V <sub>IL</sub> | Low-Level Input Voltage                                                              |                                                                                                   | 2.0<br>3.0<br>3.6    |                       |            | 0.5<br>0.8<br>0.8  |                         | 0.5<br>0.8<br>0.8  |                          | 0.5<br>0.8<br>0.8  | V    |
| V <sub>OH</sub> | High-Level Output Voltage<br>(V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> ) | I <sub>OH</sub> = -50 μA<br>I <sub>OH</sub> = -50 μA<br>I <sub>OH</sub> = -4 mA                   | 2.0<br>3.0<br>3.0    | 1.9<br>2.9<br>2.58    | 2.0<br>3.0 |                    | 1.9<br>2.9<br>2.48      |                    |                          | 1.9<br>2.9<br>2.34 | V    |
| V <sub>OL</sub> | Low-Level Output Voltage<br>(V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> )  | I <sub>OL</sub> = 50 μA<br>I <sub>OL</sub> = 50 μA<br>I <sub>OL</sub> = 4 mA                      | 2.0<br>3.0<br>3.0    |                       | 0.0<br>0.0 | 0.1<br>0.1<br>0.36 |                         | 0.1<br>0.1<br>0.44 |                          | 0.1<br>0.1<br>0.52 | V    |
| I <sub>in</sub> | Input Leakage Current                                                                | V <sub>in</sub> = 5.5 V or GND                                                                    | 3.6                  |                       |            | ±0.1               |                         | ±1.0               |                          | ±1.0               | μA   |
| I <sub>OZ</sub> | Maximum Three-State Leakage Current                                                  | V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>out</sub> = V <sub>CC</sub> or GND | 3.6                  |                       |            | ±0.25              |                         | ±2.5               |                          | ±5.0               | μA   |
| I <sub>CC</sub> | Quiescent Supply Current                                                             | V <sub>in</sub> = V <sub>CC</sub> or GND                                                          | 3.6                  |                       |            | 4.0                |                         | 40                 |                          | 40                 | μA   |

## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0 ns)

| Symbol                                 | Parameter                            | Test Conditions                                                                                              | T <sub>A</sub> = 25°C |            |             | T <sub>A</sub> = ≤ 85°C |              | T <sub>A</sub> = ≤ 125°C |              | Unit |
|----------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------|------------|-------------|-------------------------|--------------|--------------------------|--------------|------|
|                                        |                                      |                                                                                                              | Min                   | Typ        | Max         | Min                     | Max          | Min                      | Max          |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Propagation Delay<br>Input to Output | V <sub>CC</sub> = 2.7 V    C <sub>L</sub> = 15 pF                                                            |                       | 5.5        | 10.1        | 1.0                     | 13.5         | 1.0                      | 15.0         | ns   |
|                                        |                                      | V <sub>CC</sub> = 3.3 ± 0.3 V    C <sub>L</sub> = 50 pF                                                      |                       | 7.5        | 13.6        | 1.0                     | 17.0         | 1.0                      | 19.0         |      |
| t <sub>PZL</sub> ,<br>t <sub>PZH</sub> | Output Enable Time<br>OE to O        | V <sub>CC</sub> = 2.7 V    C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 1 kΩ    C <sub>L</sub> = 50 pF         |                       | 5.3<br>7.8 | 9.3<br>12.8 | 1.0<br>1.0              | 12.5<br>16.0 | 1.0<br>1.0               | 15.5<br>18.5 | ns   |
|                                        |                                      | V <sub>CC</sub> = 3.3 ± 0.3 V    C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 1 kΩ    C <sub>L</sub> = 50 pF   |                       | 4.0<br>6.5 | 5.6<br>9.1  | 1.0<br>1.0              | 7.5<br>11.0  | 1.0<br>1.0               | 9.5<br>13.0  |      |
| t <sub>PLZ</sub> ,<br>t <sub>PHZ</sub> | Output Disable Time<br>OE to O       | V <sub>CC</sub> = 2.7 V    C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 1 kΩ                                   |                       | 10.0       | 15.7        | 1.0                     | 19.0         | 1.0                      | 21.0         | ns   |
|                                        |                                      | V <sub>CC</sub> = 3.3 ± 0.3 V    C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 1 kΩ                             |                       | 8.3        | 11.2        | 1.0                     | 13.0         | 1.0                      | 15.0         |      |
| t <sub>OSSL</sub><br>t <sub>OSLH</sub> | Output-to-Output Skew<br>(Note 1)    | V <sub>CC</sub> = 2.7 V    C <sub>L</sub> = 50 pF<br>V <sub>CC</sub> = 3.3 ± 0.3 V    C <sub>L</sub> = 50 pF |                       |            | 1.5<br>1.5  |                         | 1.5<br>1.5   |                          | 1.5<br>1.5   | ns   |

1. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t<sub>OSSL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>); parameter guaranteed by design.

## CAPACITIVE CHARACTERISTICS

| Symbol           | Parameter                              | T <sub>A</sub> = 25°C |     |     | T <sub>A</sub> = ≤ 85°C |     | T <sub>A</sub> = ≤ 125°C |     | Unit |
|------------------|----------------------------------------|-----------------------|-----|-----|-------------------------|-----|--------------------------|-----|------|
|                  |                                        | Min                   | Typ | Max | Min                     | Max | Min                      | Max |      |
| C <sub>in</sub>  | Input Capacitance                      |                       | 4   | 10  |                         | 10  |                          | 10  | pF   |
| C <sub>out</sub> | Maximum Three-State Output Capacitance |                       | 6   |     |                         |     |                          |     | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance (Note 2) |                       | 14  |     |                         |     |                          |     | pF   |

2. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>/4 (per bit). C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

# MC74LVX126

**NOISE CHARACTERISTICS** (Input  $t_r = t_f = 3.0$  ns,  $C_L = 50$  pF,  $V_{CC} = 3.3$  V, Measured in SOIC Package)

| Symbol    | Characteristic                           | $T_A = 25^\circ\text{C}$ |      | Unit |
|-----------|------------------------------------------|--------------------------|------|------|
|           |                                          | Typ                      | Max  |      |
| $V_{OLP}$ | Quiet Output Maximum Dynamic $V_{OL}$    | 0.3                      | 0.5  | V    |
| $V_{OLV}$ | Quiet Output Minimum Dynamic $V_{OL}$    | -0.3                     | -0.5 | V    |
| $V_{IHD}$ | Minimum High Level Dynamic Input Voltage |                          | 2.0  | V    |
| $V_{ILD}$ | Maximum Low Level Dynamic Input Voltage  |                          | 0.8  | V    |

## ORDERING INFORMATION

| Device        | Package   | Shipping <sup>†</sup> |
|---------------|-----------|-----------------------|
| MC74LVX126D   | SOIC-14   | 55 Units / Rail       |
| MC74LVX126M   | SOEIAJ-14 | 50 Units / Rail       |
| MC74LVX126MEL | SOEIAJ-14 | 2000 Tape & Reel      |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## SWITCHING WAVEFORMS

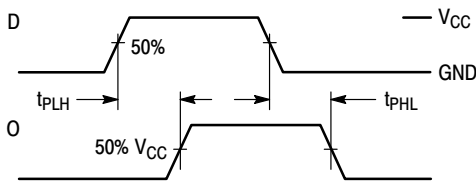


Figure 3.

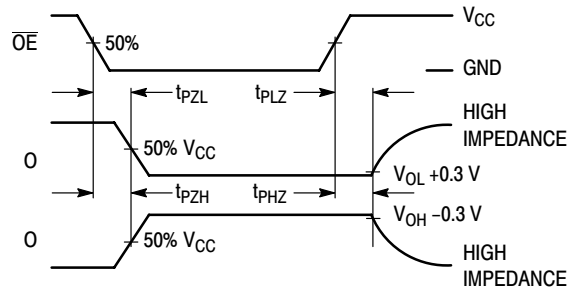
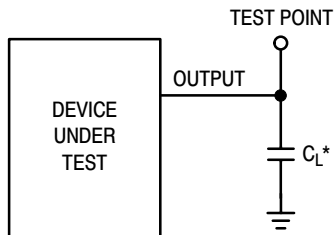


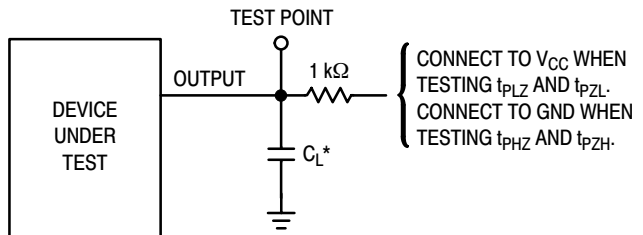
Figure 4.

## TEST CIRCUITS



\*Includes all probe and jig capacitance

Figure 5. Propagation Delay Test Circuit



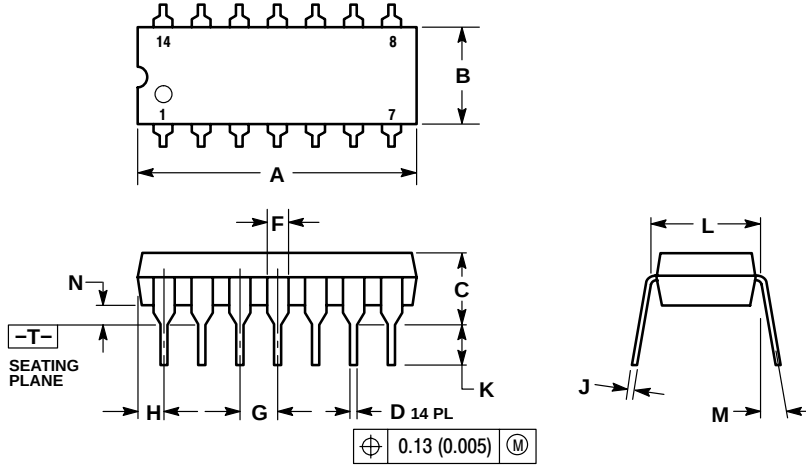
\*Includes all probe and jig capacitance

Figure 6. Three-State Test Circuit

# MC74LVX126

## PACKAGE DIMENSIONS

PDIP-14  
P SUFFIX  
CASE 646-06  
ISSUE N

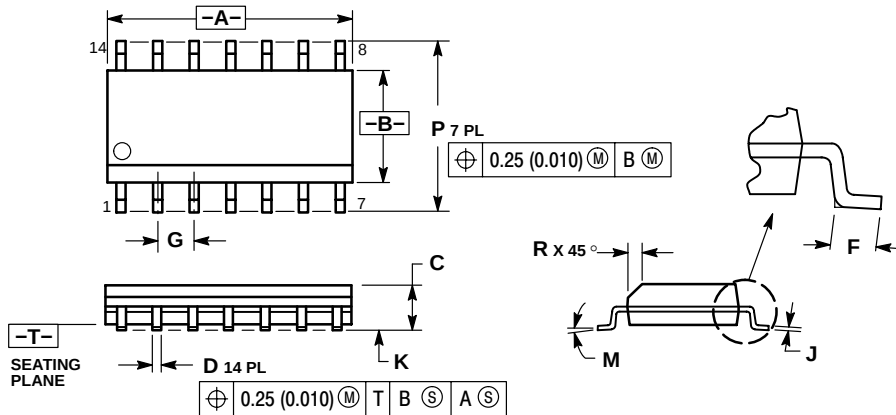


### NOTES:

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

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.715     | 0.770 | 18.16       | 18.80 |
| B   | 0.240     | 0.260 | 6.10        | 6.60  |
| C   | 0.145     | 0.185 | 3.69        | 4.69  |
| D   | 0.015     | 0.021 | 0.38        | 0.53  |
| F   | 0.040     | 0.070 | 1.02        | 1.78  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.052     | 0.095 | 1.32        | 2.41  |
| J   | 0.008     | 0.015 | 0.20        | 0.38  |
| K   | 0.115     | 0.135 | 2.92        | 3.43  |
| L   | 0.290     | 0.310 | 7.37        | 7.87  |
| M   | 10 °      |       | 10 °        |       |
| N   | 0.015     | 0.039 | 0.38        | 1.01  |

SOIC-14  
D SUFFIX  
CASE 751A-03  
ISSUE G



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 8.55        | 8.75 | 0.337     | 0.344 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.054     | 0.068 |
| D   | 0.35        | 0.49 | 0.014     | 0.019 |
| F   | 0.40        | 1.25 | 0.016     | 0.049 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| J   | 0.19        | 0.25 | 0.008     | 0.009 |
| K   | 0.10        | 0.25 | 0.004     | 0.009 |
| M   | 0 °         | 7 °  | 0 °       | 7 °   |
| P   | 5.80        | 6.20 | 0.228     | 0.244 |
| R   | 0.25        | 0.50 | 0.010     | 0.019 |