



# LOW-VOLTAGE QUADRUPLE BUS SWITCH

## IDT74CBTLV3126

### FEATURES:

- Pin-out compatible with standard '126 Logic products
- 5Ω A/B bi-directional switch
- Isolation under power-off conditions
- Over-voltage tolerant
- Latch-up performance exceeds 100mA
- $V_{CC} = 2.3V - 3.6V$ , Normal Range
- ESD > 2000V per MIL-STD-883, Method 3015;  
> 200V using machine model (C = 200pF, R = 0)
- Output enable, active high
- Available in QSOP and TSSOP packages

### APPLICATIONS:

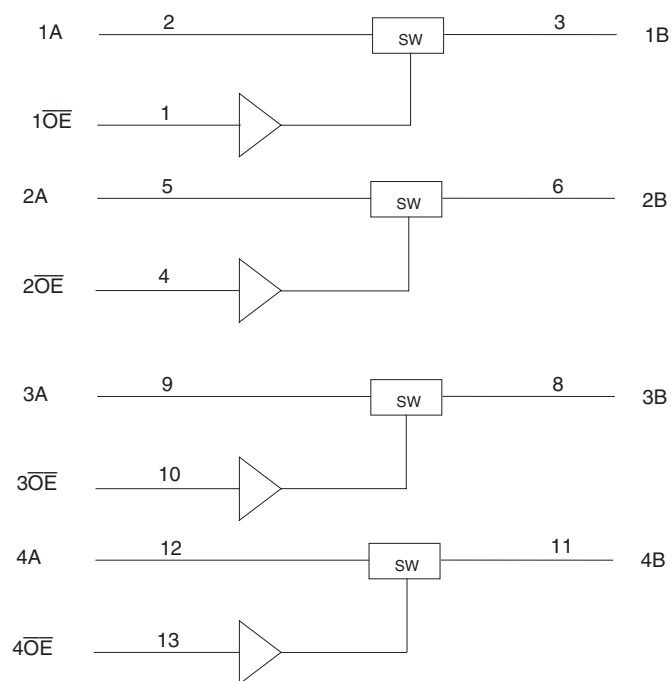
- 3.3V High Speed Bus Switching and Bus Isolation

### DESCRIPTION:

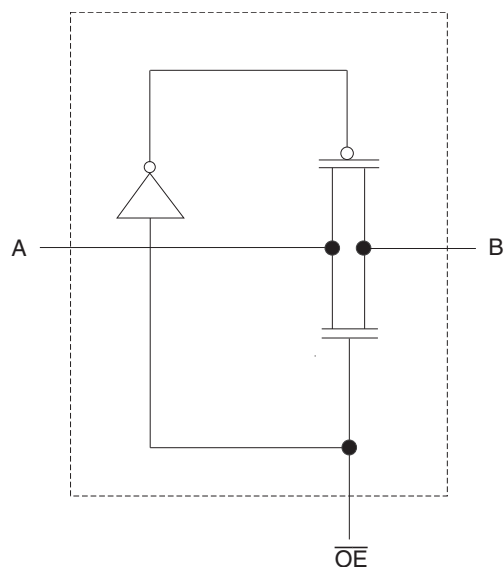
The CBTLV3126 features four independent switches. Each switch is enabled when the associated output-enable ( $\overline{OE}$ ) input is high.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

### FUNCTIONAL BLOCK DIAGRAM



### SIMPLIFIED SCHEMATIC, EACH SWITCH



### NOTE:

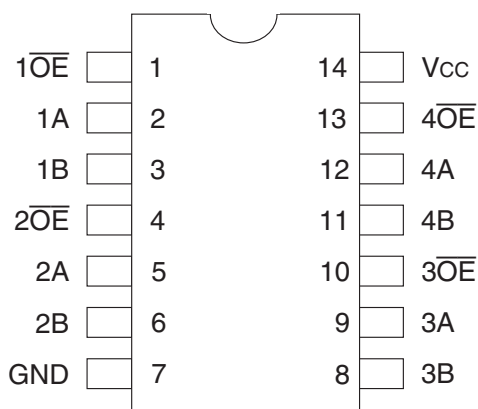
1. Pin numbers shown apply to the 14-pin TSSOP package.

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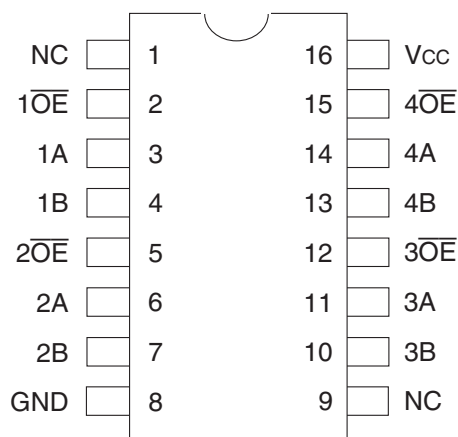
INDUSTRIAL TEMPERATURE RANGE

JULY 2008

## PIN CONFIGURATION



TSSOP  
TOP VIEW



QSOP  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

| Symbol           | Description                               | Max          | Unit |
|------------------|---|--------------|------|
| V <sub>CC</sub>  | Supply Voltage Range                      | -0.5 to +4.6 | V    |
| V <sub>I</sub>   | Input Voltage Range                       | -0.5 to +4.6 | V    |
|                  | Continuous Channel Current                | 128          | mA   |
| I <sub>IK</sub>  | Input Clamp Current, V <sub>I/O</sub> < 0 | -50          | mA   |
| T <sub>STG</sub> | Storage Temperature                       | -65 to +150  | °C   |

**NOTE:**

1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## FUNCTION TABLE<sup>(1)</sup>

| Input OE | Inputs/Outputs  |
|----------|-----------------|
| H        | A Port = B Port |
| L        | Disconnect      |

**NOTE:**

1. H = HIGH Voltage Level  
L = LOW Voltage Level

## OPERATING CHARACTERISTICS, T<sub>A</sub> = 25°C<sup>(1)</sup>

| Symbol          | Parameter                        | Test Conditions                | Min. | Max. | Unit |
|-----------------|----------------------------------|--------------------------------|------|------|------|
| V <sub>CC</sub> | Supply Voltage                   |                                | 2.3  | 3.6  | V    |
| V <sub>IH</sub> | High-Level Control Input Voltage | V <sub>CC</sub> = 2.3V to 2.7V | 1.7  | —    | V    |
|                 |                                  | V <sub>CC</sub> = 2.7V to 3.6V | 2    | —    |      |
| V <sub>IL</sub> | Low-Level Control Input Voltage  | V <sub>CC</sub> = 2.3V to 2.7V | —    | 0.7  | V    |
|                 |                                  | V <sub>CC</sub> = 2.7V to 3.6V | —    | 0.8  |      |
| T <sub>A</sub>  | Operating Free-Air Temperature   |                                | -40  | 85   | °C   |

**NOTE:**

1. All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation.

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Conditions:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

| Symbol                | Parameter                                  | Test Conditions   |                     | Min.                | Typ. <sup>(1)</sup> | Max.    | Unit          |    |
|-----------------------|--|---|---------------------|---------------------|---------------------|---------|---------------|----|
| $V_{IK}$              | Control Inputs, Data Inputs                | $V_{CC} = 3V, I_I = -18\text{mA}$                                     |                     | —                   | —                   | -1.2    | V             |    |
| $I_I$                 | Control Inputs                             | $V_{CC} = 3.6V, V_I = V_{CC}$ or GND                                  |                     | —                   | —                   | $\pm 1$ | $\mu\text{A}$ |    |
| $I_{OZ}$              | Data I/O                                   | $V_{CC} = 3.6V, V_O = 0$ or $3.6V$ , switch disabled                  |                     | —                   | —                   | 5       | $\mu\text{A}$ |    |
| $I_{OFF}$             |  | $V_{CC} = 0, V_I$ or $V_O = 0$ to $3.6V$                              |                     | —                   | —                   | 50      | $\mu\text{A}$ |    |
| $I_{CC}$              |  | $V_{CC} = 3.6V, I_O = 0, V_I = V_{CC}$ or GND                         |                     | —                   | —                   | 10      | $\mu\text{A}$ |    |
| $\Delta I_{CC}^{(2)}$ | Control Inputs                             | $V_{CC} = 3.6V$ , one input at $3V$ , other inputs at $V_{CC}$ or GND |                     | —                   | —                   | 300     | $\mu\text{A}$ |    |
| $C_I$                 | Control Inputs                             | $V_I = 3V$ or $0$   |                     | —                   | 4                   | —       | pF            |    |
| $C_{IO(OFF)}$         |  | $V_O = 3V$ or $0, OE = V_{CC}$  |                     | —                   | 6                   | —       | pF            |    |
| $R_{ON}^{(3)}$        | $V_{CC} = 2.3V$<br>Typ. at $V_{CC} = 2.5V$ | $V_I = 0$   | $I_O = 64\text{mA}$ | —                   | 5                   | 8       | $\Omega$      |    |
|                       |  |   | $I_O = 24\text{mA}$ | —                   | 5                   | 8       |               |    |
|                       | $V_{CC} = 3V$                              | $V_I = 1.7V$  | $I_O = 15\text{mA}$ | —                   | 27                  | 40      |               |    |
|                       |  |   | $V_I = 0$           | $I_O = 64\text{mA}$ | —                   | 5       |               | 7  |
|                       |  |   |                     | $I_O = 24\text{mA}$ | —                   | 5       |               | 7  |
|                       |  |   | $V_I = 2.4V$        | $I_O = 15\text{mA}$ | —                   | 10      |               | 15 |

### NOTES:

- Typical values are at  $V_{CC} = 3.3V, +25^{\circ}\text{C}$  ambient.
- The increase in supply current is attributable to each current that is at the specified voltage level rather than  $V_{CC}$  or GND.
- This is measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

## SWITCHING CHARACTERISTICS

| Symbol         | Parameter                             | $V_{CC} = 2.5V \pm 0.2V$ |      | $V_{CC} = 3.3V \pm 0.3V$ |      | Unit |
|----------------|---------------------------------------|--------------------------|------|--------------------------|------|------|
|                |                                       | Min.                     | Max. | Min.                     | Max. |      |
| $t_{PD}^{(1)}$ | Propagation Delay<br>A to B or B to A | —                        | 0.15 | —                        | 0.25 | ns   |
| $t_{EN}$       | Output Enable Time<br>OE to A or B    | 1                        | 4.5  | 1                        | 4.2  | ns   |
| $t_{DIS}$      | Output Disable Time<br>OE to A or B   | 1                        | 4.7  | 1                        | 4.8  | ns   |

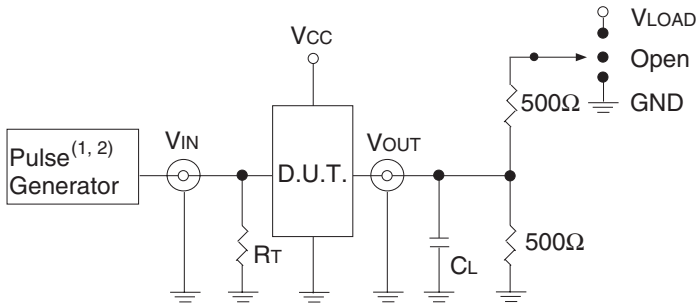
### NOTE:

- The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance driven by an ideal voltage source (zero output impedance).

TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

| Symbol            | V <sub>CC</sub> <sup>(1)</sup> = 3.3V±0.3V | V <sub>CC</sub> <sup>(2)</sup> = 2.5V±0.2V | Unit |
|-------------------|--|--|------|
| V <sub>LOAD</sub> | 6  | 2 x V <sub>CC</sub>                        | V    |
| V <sub>IH</sub>   | 3  | V <sub>CC</sub>                            | V    |
| V <sub>T</sub>    | 1.5  | V <sub>CC</sub> / 2                        | V    |
| V <sub>LZ</sub>   | 300  | 150  | mV   |
| V <sub>HZ</sub>   | 300  | 150  | mV   |
| C <sub>L</sub>    | 50   | 30   | pF   |



Test Circuits for All Outputs

DEFINITIONS:

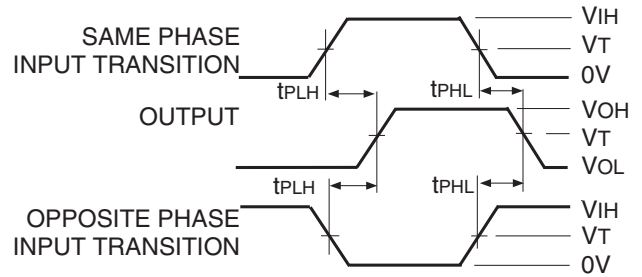
C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.  
R<sub>T</sub> = Termination resistance: should be equal to Z<sub>OUT</sub> of the Pulse Generator.

NOTES:

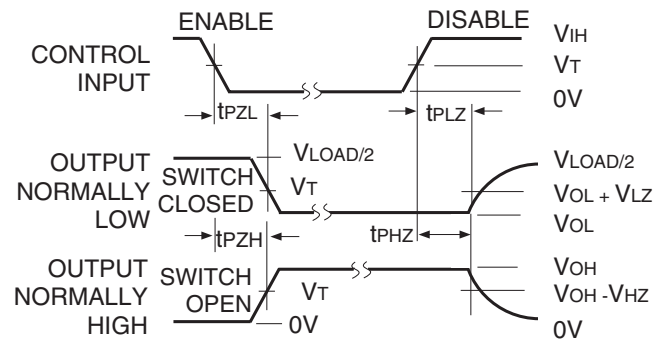
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2.5ns; t<sub>f</sub> ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2ns; t<sub>f</sub> ≤ 2.5ns.

SWITCH POSITION

| Test                               | Switch            |
|------------------------------------|-------------------|
| t <sub>PLZ</sub> /t <sub>PZL</sub> | V <sub>LOAD</sub> |
| t <sub>PHZ</sub> /t <sub>PZH</sub> | GND               |
| t <sub>PD</sub>                    | Open              |

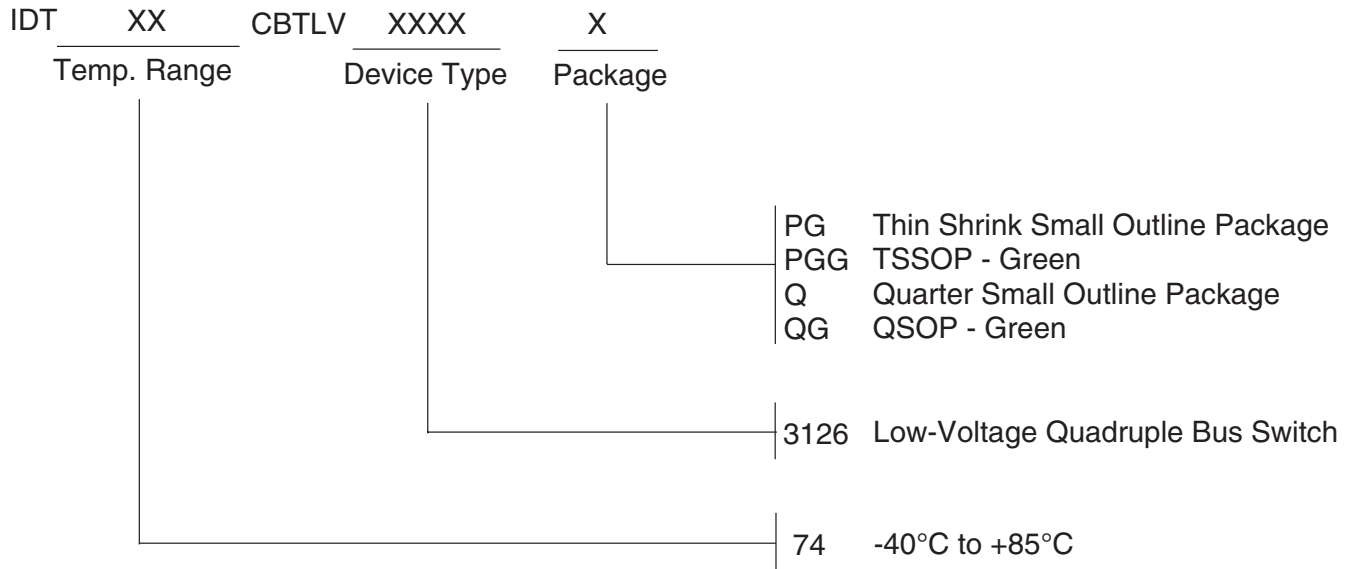


Propagation Delay



Enable and Disable Times

## ORDERING INFORMATION



## DATASHEET DOCUMENT HISTORY

07/14/2008 pg. 1.



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