



# LOW-VOLTAGE 10-BIT BUS SWITCH WITH ACTIVE HIGH AND LOW ENABLES

**IDT74CBTLV3862**

## FEATURES:

- 5Ω A/B bi-directional switch
- Isolation Under Power-Off Conditions
- Over-voltage tolerant
- Latch-up performance exceeds 100mA
- V<sub>CC</sub> = 2.3V - 3.6V, normal range
- ESD >2000V per MIL-STD-883, Method 3015; >200V using machine model (C = 200pF, R = 0)
- Available in SSOP, QSOP, and TSSOP packages

## APPLICATIONS:

- 3.3V High Speed Bus Switching and Bus Isolation

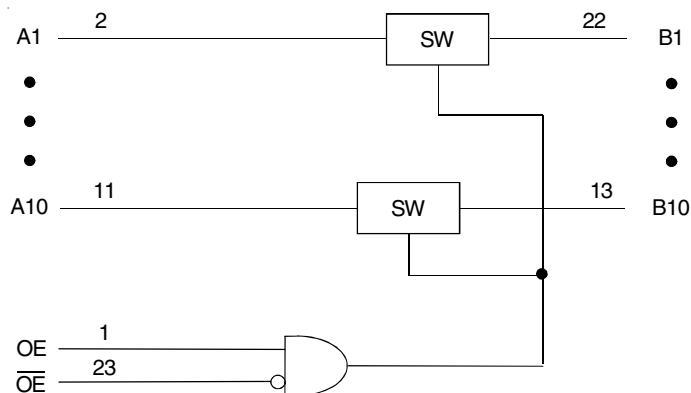
## DESCRIPTION:

The CBTLV3862 provides ten bits of high-speed bus switching with low on-state resistance of the switch allowing connections to be made with minimal propagation delay.

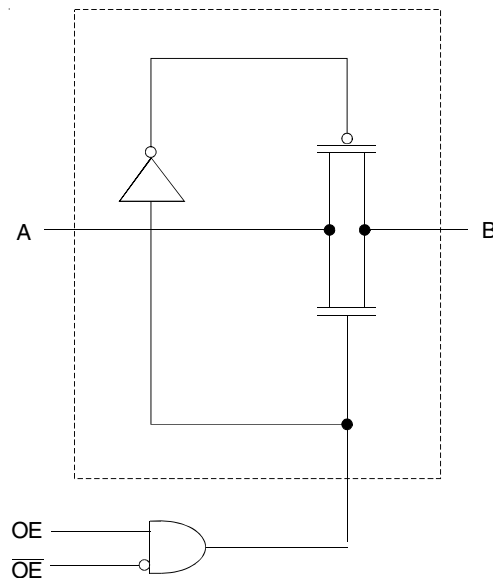
The device is organized as one 10-bit bus switch. The switches are controlled by independent active-low enable ( $\overline{OE}$ ) and active-high enable (OE) controls.

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

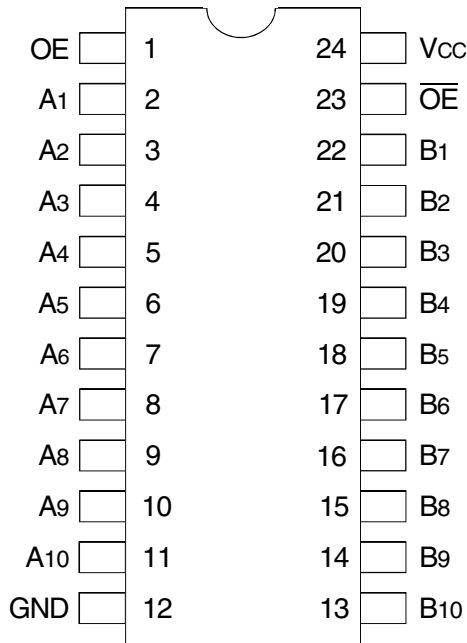
## FUNCTIONAL BLOCK DIAGRAM



## SIMPLIFIED SCHEMATIC, EACH SWITCH



PIN CONFIGURATION



SSOP/ QSOP/ TSSOP  
 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 Range                 | -65 to +150 | °C   |

NOTE:

- 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>

| Inputs |                 | Function        |
|--------|-----------------|-----------------|
| OE     | $\overline{OE}$ |                 |
| L      | L               | Disconnect      |
| L      | H               | Disconnect      |
| H      | L               | A Port = B Port |
| H      | H               | Disconnect      |

NOTE:

- H = HIGH Voltage Level  
 L = LOW Voltage Level

OPERATING CHARACTERISTICS<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:

- 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 Condition: TA = -40°C to +85°C

| Symbol                          | Parameter  | Test Conditions   | Min.                  | Typ. <sup>(1)</sup> | Max. | Unit |   |
|---------------------------------|--|---|-----------------------|---------------------|------|------|---|
| V <sub>IK</sub>                 | Control Inputs, Data I/O                                 | V <sub>CC</sub> = 3V, I <sub>I</sub> = -18mA  | —                     | —                   | -1.2 | V    |   |
| I <sub>I</sub>                  | Control Inputs, Data I/O                                 | V <sub>CC</sub> = 3.6V, V <sub>I</sub> = V <sub>CC</sub> or GND                     | —                     | —                   | ±1   | μA   |   |
| I <sub>OZ</sub>                 | Data I/O   | V <sub>CC</sub> = 3.6V, V <sub>O</sub> = 0V or 3.6V switch disabled                 | —                     | —                   | 5    | μA   |   |
| I <sub>OFF</sub>                |  | V <sub>CC</sub> = 0V, V <sub>I</sub> or V <sub>O</sub> = 0V or 3.6V                 | —                     | —                   | 50   | μA   |   |
| I <sub>CC</sub>                 |  | V <sub>CC</sub> = 3.6V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND | —                     | —                   | 10   | μA   |   |
| ΔI <sub>CC</sub> <sup>(2)</sup> | Control Inputs   | V <sub>CC</sub> = 3.6V, one input at 3V, other inputs at V <sub>CC</sub> or GND     | —                     | —                   | 300  | μA   |   |
| C <sub>I</sub>                  | Control Inputs   | V <sub>I</sub> = 3V or 0  | —                     | 4                   | —    | pF   |   |
| C <sub>I(OFF)</sub>             |  | V <sub>O</sub> = 3V or 0 (switch off)   | —                     | 6                   | —    | pF   |   |
| R <sub>ON</sub> <sup>(3)</sup>  | V <sub>CC</sub> = 2.3V<br>Typ. at V <sub>CC</sub> = 2.5V | V <sub>I</sub> = 0  | I <sub>O</sub> = 64mA | —                   | 5    | 8    | Ω |
|                                 |  |   | I <sub>O</sub> = 24mA | —                   | 5    | 8    |   |
|                                 |  | V <sub>I</sub> = 1.7V   | I <sub>O</sub> = 15mA | —                   | 27   | 40   |   |
|                                 | V <sub>CC</sub> = 3V                                     | V <sub>I</sub> = 0  | I <sub>O</sub> = 64mA | —                   | 5    | 7    |   |
|                                 |  |   | I <sub>O</sub> = 24mA | —                   | 5    | 7    |   |
|                                 |  | V <sub>I</sub> = 2.4V   | I <sub>O</sub> = 15mA | —                   | 10   | 15   |   |

### NOTES:

1. Typical Values are at V<sub>CC</sub> = 3.3V, +25°C ambient.
2. The increase in supply current is attributable to each input that is at the specified voltage level rather than V<sub>CC</sub> or GND.
3. This is measured by the voltage drop between the A and B terminals at the indicated current through the switch.

## SWITCHING CHARACTERISTICS

| Symbol                         | Parameter  | V <sub>CC</sub> = 2.5V ± 0.2V |      | V <sub>CC</sub> = 3.3V ± 0.3V |      | Unit |
|--------------------------------|--|-------------------------------|------|-------------------------------|------|------|
|                                |  | Min.                          | Max. | Min.                          | Max. |      |
| t <sub>PD</sub> <sup>(1)</sup> | Propagation Delay<br>A to B or B to A            | —                             | 0.15 | —                             | 0.25 | ns   |
| t <sub>EN</sub>                | Output Enable Time<br>$\overline{OE}$ to A or B  | 1                             | 4.5  | 1                             | 4.2  | ns   |
| t <sub>DIS</sub>               | Output Disable Time<br>$\overline{OE}$ to A or B | 1                             | 5    | 1                             | 5    | ns   |
| t <sub>EN</sub>                | Output Enable Time<br>OE to A or B               | 1                             | 4.5  | 1                             | 4.2  | ns   |
| t <sub>DIS</sub>               | Output Disable Time<br>OE to A or B              | 1                             | 5    | 1                             | 6    | ns   |

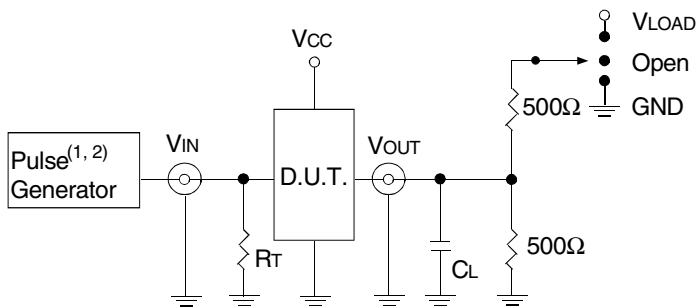
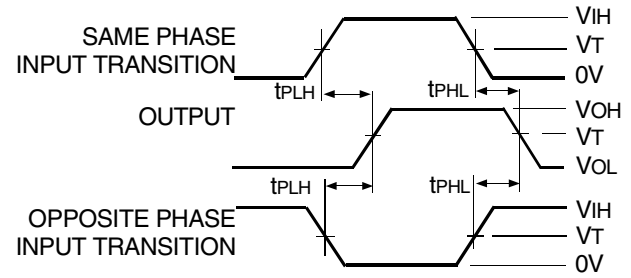
### NOTE:

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

## TEST CIRCUITS AND WAVEFORMS

### TEST CONDITIONS

| Symbol     | $V_{CC}^{(1)} = 3.3V \pm 0.3V$ | $V_{CC}^{(2)} = 2.5V \pm 0.2V$ | Unit |
|------------|--------------------------------|--------------------------------|------|
| $V_{LOAD}$ | 6                              | $2 \times V_{CC}$              | V    |
| $V_{IH}$   | 3                              | $V_{CC}$                       | V    |
| $V_T$      | 1.5                            | $V_{CC} / 2$                   | V    |
| $V_{LZ}$   | 300                            | 150                            | mV   |
| $V_{HZ}$   | 300                            | 150                            | mV   |
| $C_L$      | 50                             | 30                             | pF   |



Test Circuits for All Outputs

#### DEFINITIONS:

$C_L$  = Load capacitance: includes jig and probe capacitance.  
 $R_T$  = Termination resistance: should be equal to  $Z_{out}$  of the Pulse Generator.

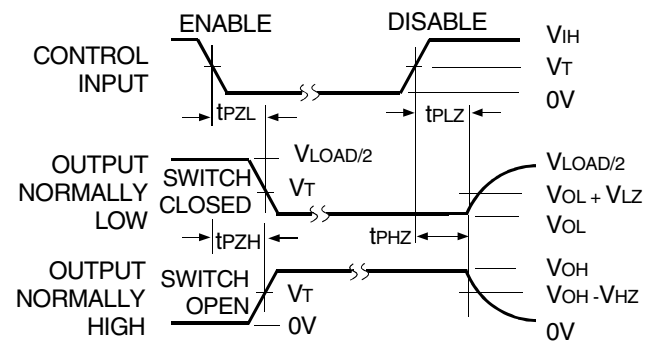
#### NOTES:

1. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_r \leq 2.5\text{ns}$ ;  $t_f \leq 2.5\text{ns}$ .
2. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_r \leq 2\text{ns}$ ;  $t_f \leq 2\text{ns}$ .

### SWITCH POSITION

| Test              | Switch     |
|-------------------|------------|
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND        |
| $t_{PD}$          | Open       |

### Propagation Delay

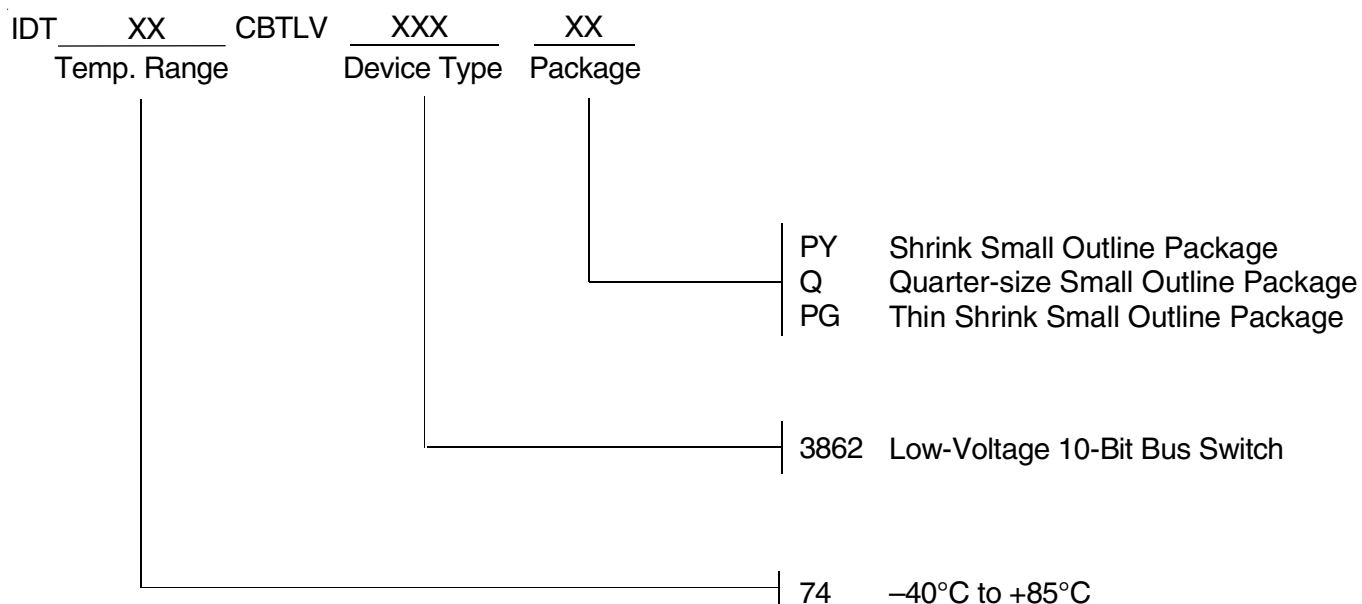


#### NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

### Enable and Disable Times

### ORDERING INFORMATION



### DATA SHEET DOCUMENT HISTORY

4/10/2002                      Changed OE characteristics



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