# LOW-VOLTAGE 10-BIT BUS SWITCH WITH PRECHARGED OUTPUTS

## IDT74CBTLV6800

## FEATURES:

- Functionally equivalent to QS3800
- 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)
- Available in QSOP and TSSOP packages

## APPLICATIONS:

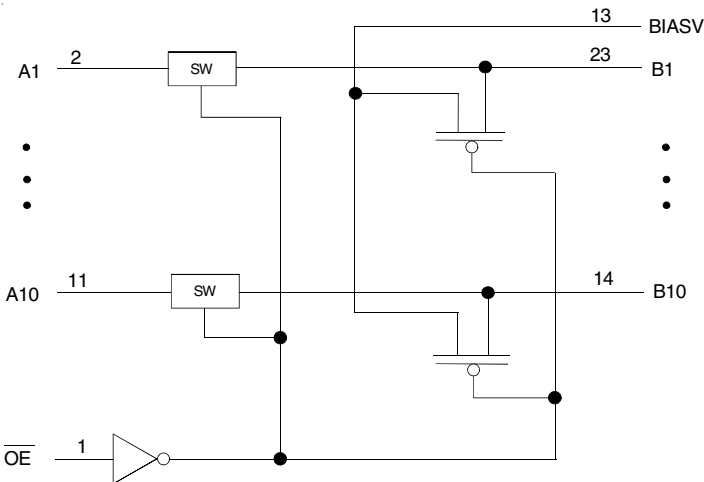- 3.3V High Speed Bus Switching and Bus Isolation

## DESCRIPTION:

The CBTLV6800 provides 10-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 also precharges the B port to a user-selectable bias voltage (BIASV) to minimize live-insertion noise.
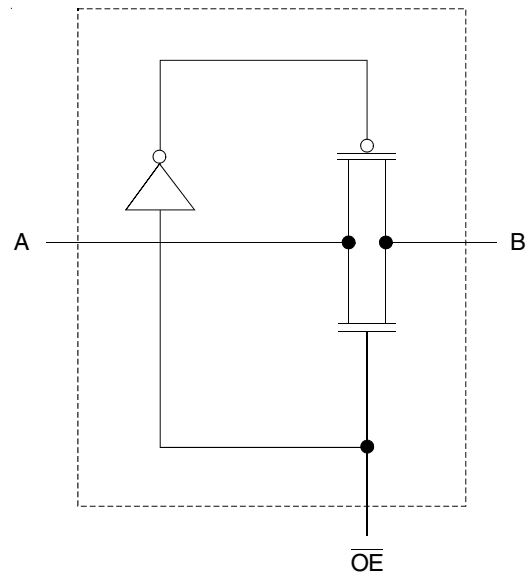
The CBTLV6800 is organized as a single 10-bit bus switch with a single output-enable ($\overline{OE}$) input. When $\overline{OE}$ is low, the 10-bit bus switch is on and port A is connected to port B. When $\overline{OE}$ is high, the switch is open, and a high impedance state exists between the two ports, and port B is precharged to BIASV through the equivalent of a 10-kΩ resistor.

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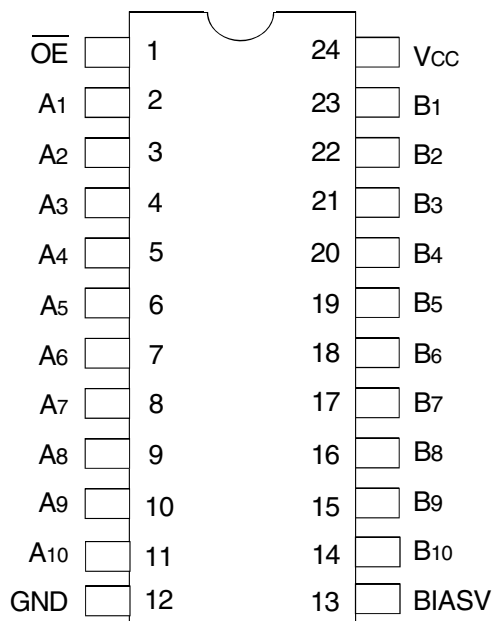
## FUNCTIONAL BLOCK DIAGRAM

## SIMPLIFIED SCHEMATIC, EACH SWITCH

INDUSTRIAL TEMPERATURE RANGE

DECEMBER 2014

DSC-5739/5

## PIN CONFIGURATION

| | | |
|---|---|---|
| $\overline{OE}$ | 1 | 24 | $V_{CC}$ |
| $A_1$ | 2 | 23 | $B_1$ |
| $A_2$ | 3 | 22 | $B_2$ |
| $A_3$ | 4 | 21 | $B_3$ |
| $A_4$ | 5 | 20 | $B_4$ |
| $A_5$ | 6 | 19 | $B_5$ |
| $A_6$ | 7 | 18 | $B_6$ |
| $A_7$ | 8 | 17 | $B_7$ |
| $A_8$ | 9 | 16 | $B_8$ |
| $A_9$ | 10 | 15 | $B_9$ |
| $A_{10}$ | 11 | 14 | $B_{10}$ |
| GND | 12 | 13 | BIASV |

QSOP / TSSOP
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS[1]

| Symbol | Description | Max | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage Range | –0.5 to +4.6 | V |
| $V_I$ | Input Voltage Range | –0.5 to +4.6 | V |
| | Continuous Channel Current | 128 | mA |
| $I_{IK}$ | Input Clamp Current, $V_{I/O} < 0$ | –50 | mA |
| $T_{STG}$ | 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[1]

| Input $\overline{OE}$ | Inputs/Outputs |
|---|---|
| L | A Port = B Port |
| H | A Port = Z<br>B Port = BIASV |

NOTE:
1. H = HIGH Voltage Level
   L = LOW Voltage Level
   Z = High-Impedance

## OPERATING CHARACTERISTICS, $T_A = 25°C$[1]

| Symbol | Parameter | Test Conditions | Min. | Max. | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | | 2.3 | 3.6 | V |
| BIASV | Bias Voltage | | 1.3 | $V_{CC}$ | V |
| $V_{IH}$ | High-Level Control Input Voltage | $V_{CC}$ = 2.3V to 2.7V | 1.7 | — | V |
| | | $V_{CC}$ = 2.7V to 3.6V | 2 | — | |
| $V_{IL}$ | Low-Level Control Input Voltage | $V_{CC}$ = 2.3V to 2.7V | — | 0.7 | V |
| | | $V_{CC}$ = 2.7V to 3.6V | — | 0.8 | |
| $T_A$ | Operating Free-Air Temperature | | –40 | 85 | °C |

NOTE:
1. All unused control inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation.

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Operating Conditions: $T_A = -40°C$ to $+85°C$

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Control Inputs, Data Inputs | $V_{CC} = 3V$, $I_I = -18mA$ | | — | — | −1.2 | V |
| $I_I$ | Control Inputs | $V_{CC} = 3.6V$, $V_I = V_{CC}$ or GND | | — | — | ±1 | µA |
| $I_{OZ}$ | Data I/O | $V_{CC} = 3.6V$, $V_O = 0$ or 3.6V, switch disabled | | — | — | ±20 | µA |
| $I_{OFF}$ | | $V_{CC} = 0$, $V_I$ or $V_O = 0$ to 3.6V | | — | — | 50 | µA |
| $|I_O|$ | | $V_{CC} = 3V$, BIASV = 2.4V, $V_O = 0$, $\overline{OE} = V_{CC}$ | | 0.25 | — | — | mA |
| $I_{CC}$ | | $V_{CC} = 3.6V$, $I_O = 0$, $V_I = V_{CC}$ or GND | | — | — | 10 | µA |
| $\Delta I_{CC}$[1] | Control Inputs | $V_{CC} = 3.6V$, one input at 3V, other inputs at $V_{CC}$ or GND | | — | — | 300 | µA |
| $C_I$ | Control Inputs | $V_I = 3V$ or 0 | | — | 4 | — | pF |
| $C_{IO(OFF)}$ | | $V_O = 3V$ or 0, switch OFF, BIASV = Open, $\overline{OE} = V_{CC}$ | | — | 7 | — | pF |
| $R_{ON}$[2] | $V_{CC} = 2.3V$ Typ. at $V_{CC} = 2.5V$ | $V_I = 0$ | $I_I = 64mA$ | — | 5 | 8 | Ω |
| | | | $I_I = 24mA$ | — | 5 | 8 | |
| | | $V_I = 1.7V$ | $I_I = 15mA$ | — | 27 | 40 | |
| | $V_{CC} = 3V$ | $V_I = 0$ | $I_I = 64mA$ | — | 5 | 7 | |
| | | | $I_I = 24mA$ | — | 5 | 7 | |
| | | $V_I = 2.4V$ | $I_I = 15mA$ | — | 10 | 15 | |

NOTES:
1. The increase in supply current is attributable to each current that is at the specified voltage level rather than $V_{CC}$ or GND.
2. 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 A to B or B to A | – | 0.15 | – | 0.25 | ns |
| $t_{PZH}$ $t_{PZL}$ | BIASV = 3V or GND $\overline{OE}$ to A or B | 1 | 4.8 | 1 | 4.5 | ns |
| $t_{PHZ}$ $t_{PLZ}$ | BIASV = 3V or GND $\overline{OE}$ to A or B | 1 | 5.6 | 1 | 5.5 | 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 driven by an ideal voltage source (zero output impedance).

# TEST CIRCUITS AND WAVEFORMS

## TEST CONDITIONS

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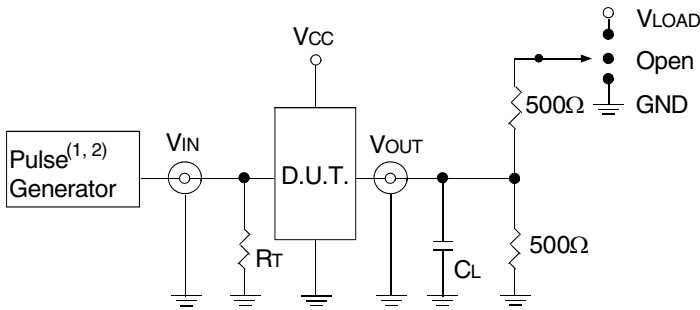


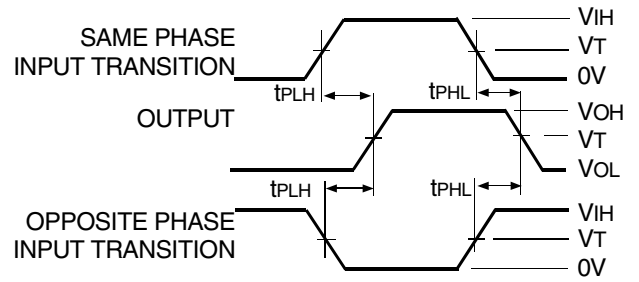*Test Circuits for All Outputs*

DEFINITIONS:
$C_L$ = Load capacitance: includes jig and probe capacitance.
$R_T$ = Termination resistance: should be equal to $Z_{OUT}$ of the Pulse Generator.
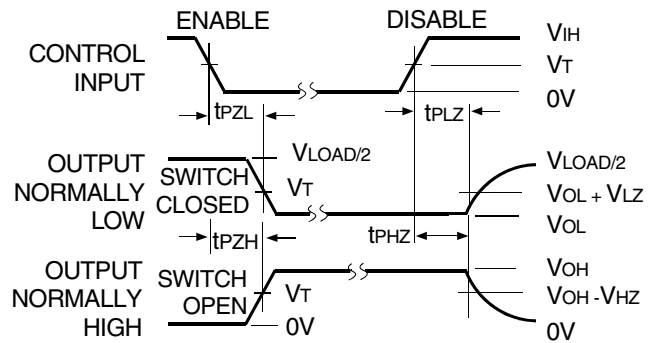
NOTES:
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; $t_F$ ≤ 2.5ns; $t_R$ ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; $t_F$ ≤ 2ns; $t_R$ ≤ 2.5ns.

## SWITCH POSITION

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



*Propagation Delay*



*Enable and Disable Times*

## ORDERING INFORMATION

<u>XX</u>   CBTLV <u>XXX</u>   <u>XX</u>   <u>X</u>
Temp. Range      Device Type  Package

| | |
|---|---|
| Blank | Tube or Tray |
| 8 | Tape and Reel |

| | |
|---|---|
| QG | Quarter-size Small Outline Package - Green |
| PGG | Thin Shrink Small Outline Package - Green |

| | |
|---|---|
| 6800 | Low-Voltage 10-Bit Bus Switch with Precharged Outputs |

| | |
|---|---|
| 74 | –40°C to +85°C |
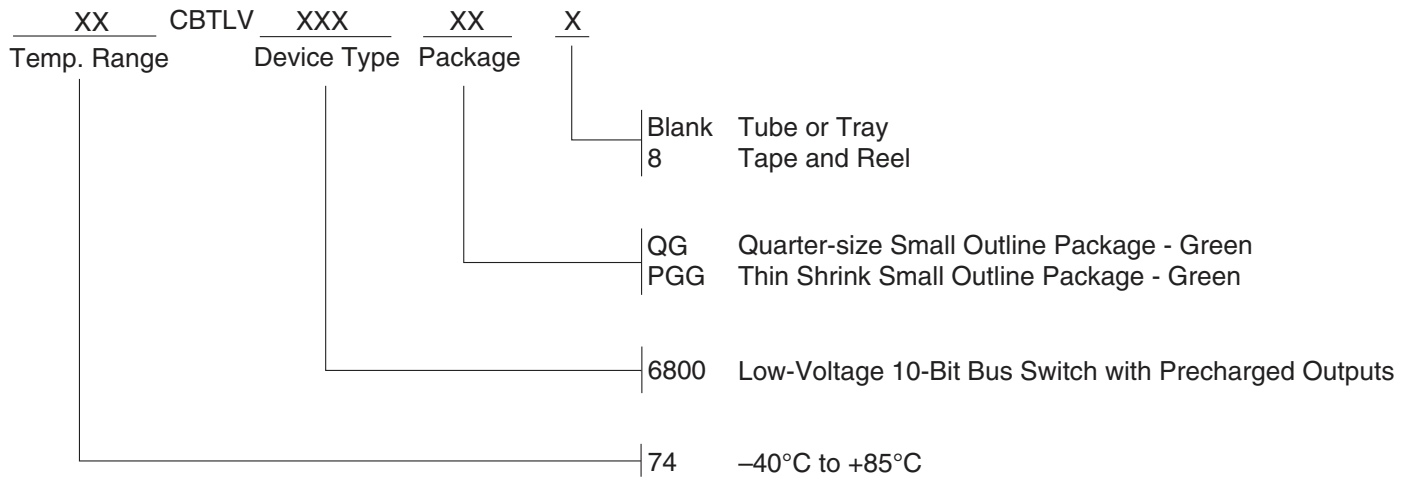
## Datasheet Document History

12/18/2014    Pg. 5    Updated the ordering information by removing the "IDT" notation, non RoHS part and by adding Tape and Reel information.