



# LOW-VOLTAGE 10-BIT BUS SWITCH

## IDT74CBTLV3384 PRELIMINARY

### FEATURES:

- 5Ω A/B bi-directional switch
- Isolation under Power-Off Conditions
- Over-voltage tolerant
- Latch-up performance exceeds 100mA
- VCC = 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

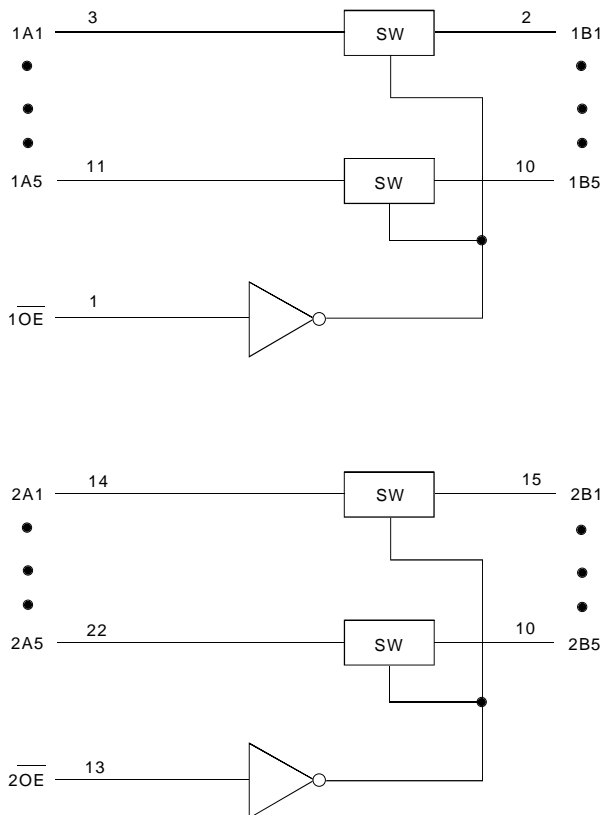
### DESCRIPTION:

The CBTLV3384 is a ten bit high-speed bus switch with low on-state resistance of the switch allowing connections to be made with minimal propagation delay.

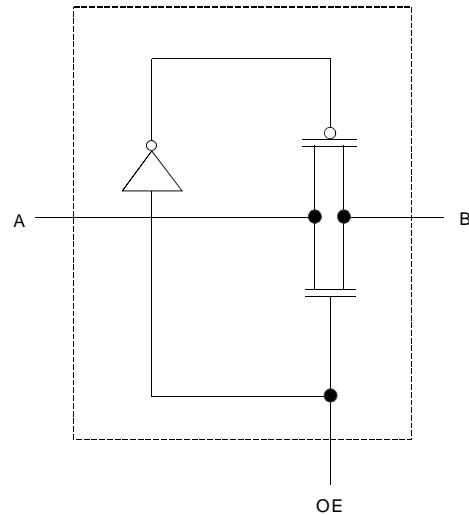
The device is organized as dual 5-bit bus switches with separate output-enable ( $\overline{OE}$ ) inputs, to allow use as two 5-bit bus switches or one 10-bit bus switch. When  $\overline{OE}$  is low, the associated 5-bit bus switch is on and A port is connected to B port. When  $\overline{OE}$  is high, the switch is open, and a high-impedance state exists between the two ports.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to VCC 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

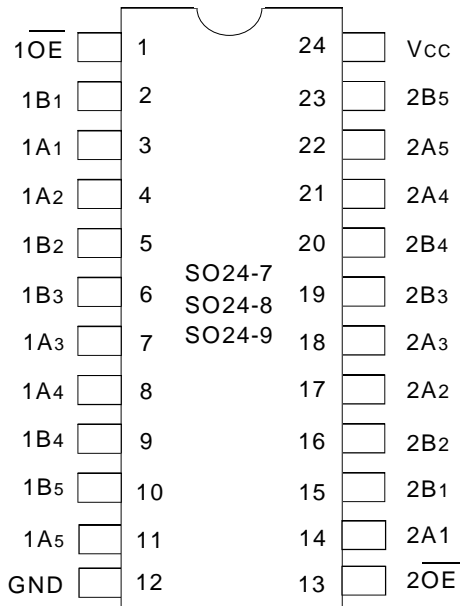


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**INDUSTRIAL TEMPERATURE RANGE**

**SEPTEMBER 2001**

### PIN CONFIGURATION



SSOP/ QSOP/ TSSOP  
TOP VIEW

### ABSOLUTE MAXIMUM RATINGS (1)

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:**

- 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.

### FUNCTIONAL TABLE (1)

Inputs		Inputs/Outputs	
1OE	2OE	1B1-1B5	2B1-2B5
L	L	1A1-1A5	2A1-2A5
L	H	1A1-1A5	Z
H	L	Z	2A1-2A5
H	H	Z	Z

**NOTE:**

- H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care  
Z = High-Impedance

### OPERATING CHARACTERISTICS, T<sub>A</sub> = 25°C

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$V_{IK}$	Control Inputs, Data I/O	$V_{CC} = 3V, I_I = -18\text{mA}$	—	—	-1.2	V	
$I_I$	Control Inputs, Data I/O	$V_{CC} = 3.6V, V_I = V_{CC}$ 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	$\mu\text{A}$	
$\Delta I_{CC}^{(1)}$	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 $0, \overline{OE} = V_{CC}$	—	7	—	pF	
$R_{ON}^{(2)}$	Max at $V_{CC} = 2.3V$ Typ at $V_{CC} = 2.5V$	$V_I = 0$	$I_O = 64\text{mA}$	—	5	8	$\Omega$
			$I_O = 24\text{mA}$	—	5	8	
	$V_I = 1.7V$	$I_O = 15\text{mA}$	—	27	40		
	$V_{CC} = 3V$	$V_I = 0$	$I_O = 64\text{mA}$	—	5	7	
			$I_O = 24\text{mA}$	—	5	7	
		$V_I = 2.4V$	$I_O = 15\text{mA}$	—	10	15	

### NOTES:

- The increase in supply current is attributable to each input 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 A to B or B to A	—	0.15	—	0.25	ns
$t_{EN}$	Output Enable Time $\overline{OE}$ to A or B	1	5	1	4.3	ns
$t_{DIS}$	Output Disable Time $\overline{OE}$ to A or B	1	5.5	1	5.5	ns

### NOTE:

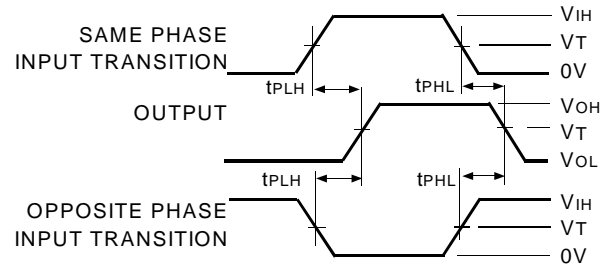
- The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance when driven by an ideal voltage source (zero output impedance).

## TEST CIRCUITS AND WAVEFORMS

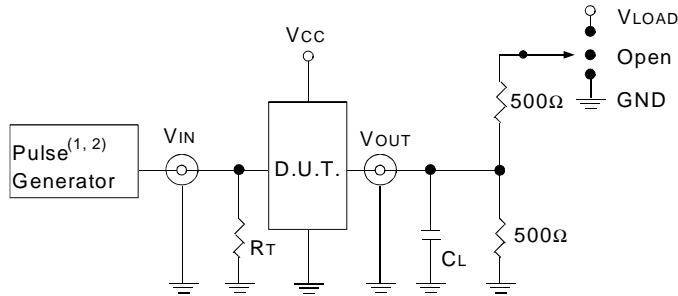
### TEST CONDITIONS

Symbol	V <sub>CC</sub> (1) = 3.3V ± 0.3V	V <sub>CC</sub> (2) = 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

### PROPAGATION DELAY



### TEST CIRCUITS FOR ALL OUTPUTS



#### NOTES:

1. Pulse generator for all pulses: Rate ≤ 10MHz; t<sub>F</sub> ≤ 2.5ns; t<sub>R</sub> ≤ 2.5ns.
2. Pulse generator for all pulses: Rate ≤ 10MHz; t<sub>F</sub> ≤ 2ns; t<sub>R</sub> ≤ 2ns.

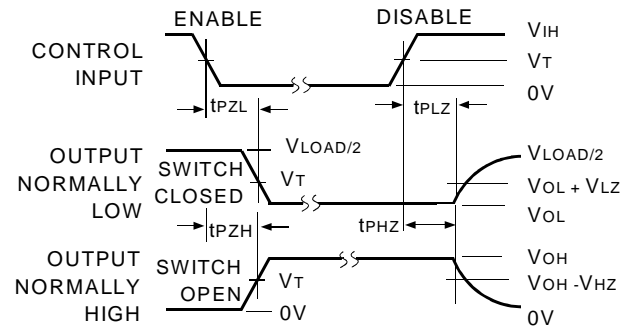
#### DEFINITIONS:

1. C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.
2. R<sub>T</sub> = Termination Resistance: Should be equal to Z<sub>OUT</sub> of the pulse generator.

### 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

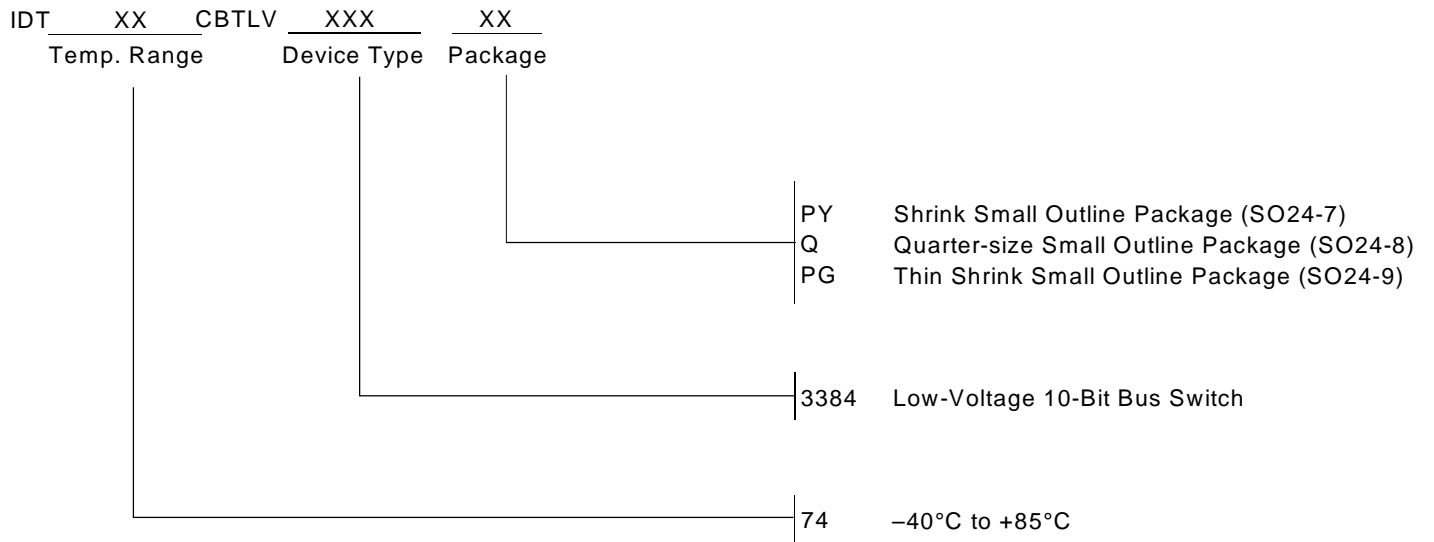
### ENABLE AND DISABLE TIMES



#### NOTES:

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

## ORDERING INFORMATION



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