



## LOW-VOLTAGE DUAL 1-OF-4 MULTIPLEXER/ DEMULTIPLEXER

**IDT74CBTLV3253**

### FEATURES:

- Functionally equivalent to QS3253
- 5Ω Switch Connection between Two Ports
- 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 SSOP, QSOP, and TSSOP packages

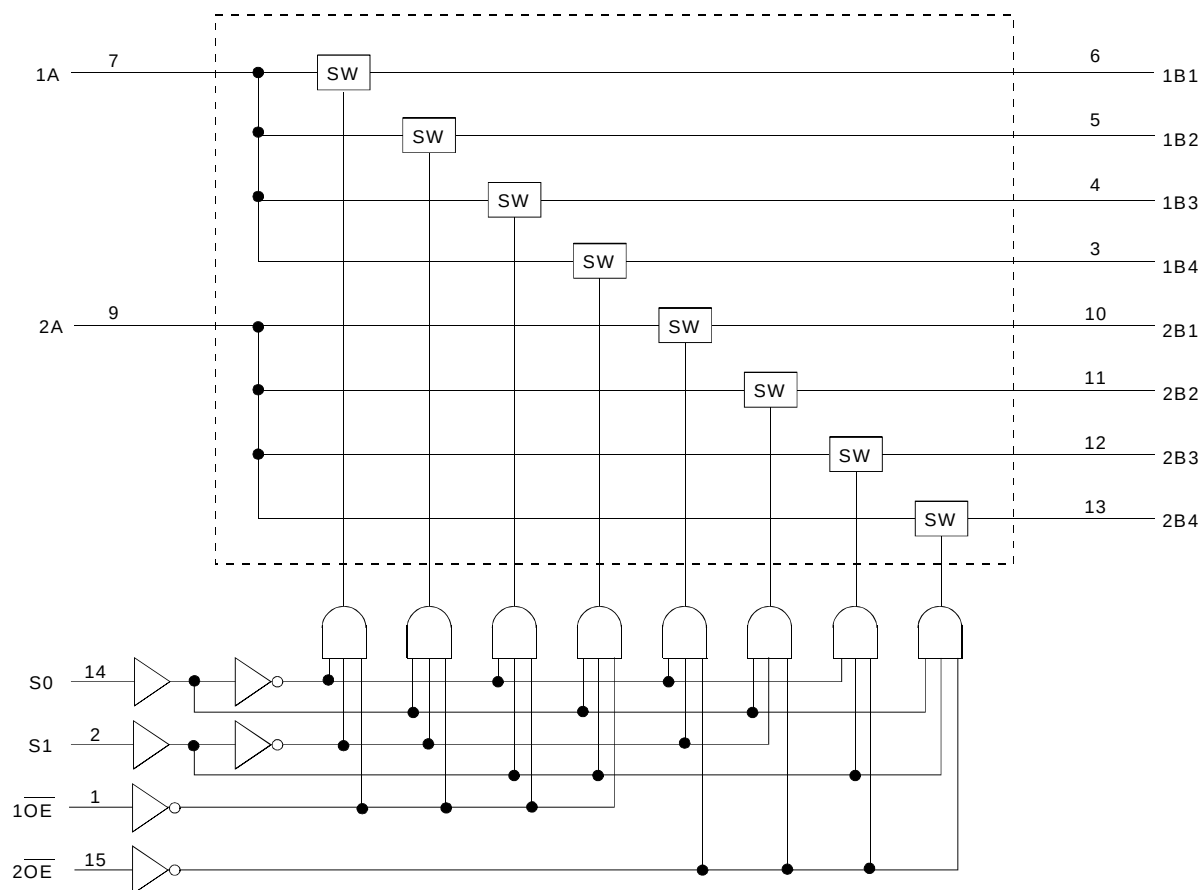
### DESCRIPTION:

The CBTLV3253 is a dual 1-of-4 high-speed multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The select (S0, S1) input controls the data flow. The multiplexer/demultiplexer switches are disabled when the output-enable ( $\overline{OE}$ ) input is high.

To ensure that the device is in 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

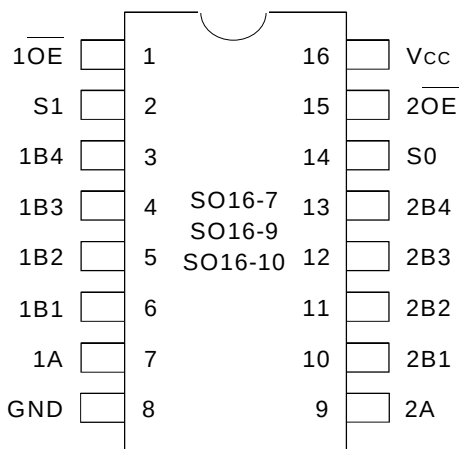


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**INDUSTRIAL TEMPERATURE RANGE**

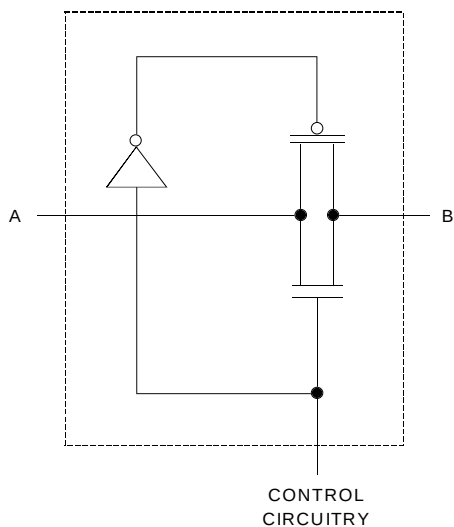
**MARCH 2001**

## PIN CONFIGURATION



SSOP/ QSOP/ TSSOP  
TOP VIEW

## SIMPLIFIED SCHEMATIC, EACH SWITCH



## 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.

## FUNCTION TABLE (1)

### ONE OF TWO 1:4 MUX/DEMUX BANKS

| Inputs |    |    | Function         |
|--------|----|----|------------------|
| OE     | S1 | S0 |                  |
| L      | L  | L  | A Port = B1 Port |
| L      | L  | H  | A Port = B2 Port |
| L      | H  | L  | A Port = B3 Port |
| L      | H  | H  | A Port = B4 Port |
| H      | X  | X  | Disconnect       |

### NOTE:

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

## OPERATING CHARACTERISTICS (1)

| 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 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. <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> = 0 or 3.6V, switch disabled                 |                       | —    | —                   | 5     | μA   |
| I <sub>OFF</sub>                |                                                                | V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> = 0 to 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>IO(OFF)</sub>            | A port                                                         | V <sub>O</sub> = 3V or 0, $\overline{OE}$ = V <sub>CC</sub> = 3.3V                  |                       | —    | 20                  | —     | pF   |
|                                 | B port                                                         |                                                                                     |                       | —    | 6                   | —     |      |
| R <sub>ON</sub> <sup>(3)</sup>  | Max at 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  $V_{CC} = 3.3\text{V}$ ,  $+25^{\circ}\text{C}$  ambient.
2. The increase in supply current is attributable to each input that is at the specified voltage level rather than  $V_{CC}$  or GND.
3. 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                                 | $V_{CC} = 2.5\text{V} \pm 0.2\text{V}$ |      | $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$ |      | Unit |
|----------------|-------------------------------------------|----------------------------------------|------|----------------------------------------|------|------|
|                |                                           | Min.                                   | Max. | Min.                                   | Max. |      |
| $t_{PD}^{(1)}$ | Propagation Delay<br>A to B or B to A     | —                                      | 0.15 | —                                      | 0.25 | ns   |
| $t_{SEL}$      | Select Time<br>S to A or B                | 1                                      | 4.8  | 1                                      | 4.5  | ns   |
| $t_{EN}$       | Enable Time<br>S to B                     | 1                                      | 4.8  | 1                                      | 4.5  | ns   |
| $t_{DIS}$      | Disable Time<br>S to B                    | 1                                      | 5.1  | 1                                      | 5.3  | ns   |
| $t_{EN}$       | Enable Time<br>$\overline{OE}$ to A or B  | 1                                      | 5    | 1                                      | 4.8  | ns   |
| $t_{DIS}$      | Disable Time<br>$\overline{OE}$ to A or B | 1                                      | 5.5  | 1                                      | 5.4  | ns   |

### NOTE:

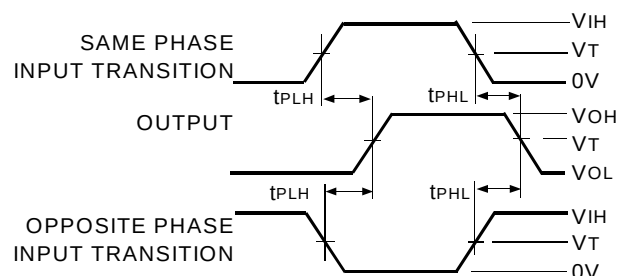
1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance when driven by an ideal voltage source (zero output impedance).

## TEST CIRCUITS AND WAVEFORMS

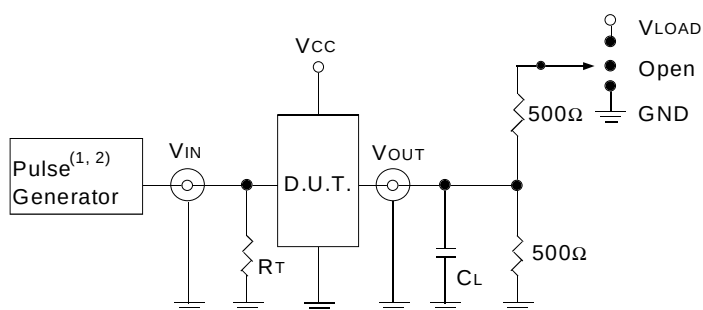
### TEST CONDITIONS

| 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   |

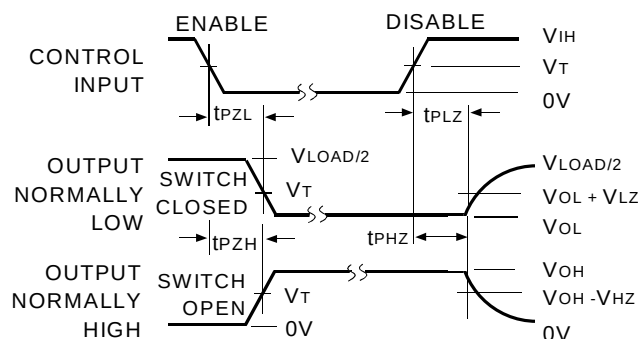
### PROPAGATION DELAY/ SELECT TIME



### TEST CIRCUITS FOR ALL OUTPUTS



### ENABLE AND DISABLE TIMES



#### NOTES:

1. Pulse generator for all pulses: Rate  $\leq 10\text{MHz}$ ;  $t_F \leq 2.5\text{ns}$ ;  $t_R \leq 2.5\text{ns}$ .
2. Pulse generator for all pulses: Rate  $\leq 10\text{MHz}$ ;  $t_F \leq 2\text{ns}$ ;  $t_R \leq 2\text{ns}$ .

#### DEFINITIONS:

1.  $C_L$  = Load capacitance: includes jig and probe capacitance.
2.  $R_T$  = Termination Resistance: Should be equal to  $Z_{OUT}$  of the pulse generator.

#### NOTES:

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

### SWITCH POSITION

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

## ORDERING INFORMATION

| IDT         | XX | CBTLV | XXX         | XX      |                                                   |
|-------------|----|-------|-------------|---------|---------------------------------------------------|
| Temp. Range |    |       | Device Type | Package |                                                   |
|             |    |       |             | Q       | Quarter-Size Small Outline Package (SO16-7)       |
|             |    |       |             | PY      | Shrink Small Outline Package (SO16-9)             |
|             |    |       |             | PG      | Thin Shrink Small Outline Package (SO16-10)       |
|             |    |       |             | 3253    | Low-Voltage Dual 1-of-4 Multiplexer/Demultiplexer |
|             |    |       |             | 74      | −40°C to +85°C                                    |



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