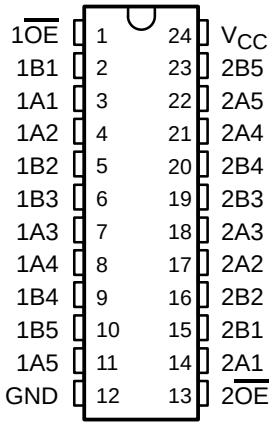
SCDS024E – MAY 1995 – REVISED MARCH 1997

- **Functionally Equivalent to QS3384 and QS3L384**
- **5-Ω Switch Connection Between Two Ports**
- **TTL-Compatible Input and Output Levels**
- **Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), Quarter-Size Small-Outline (DBQ), and Thin Shrink Small-Outline (PW) Packages**

**DB, DBQ, DW, OR PW PACKAGE**
**(TOP VIEW)**




## description

The SN74CBTS3384 provides ten bits of high-speed TTL-compatible bus switching with Schottky diodes on the I/Os to clamp undershoot. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

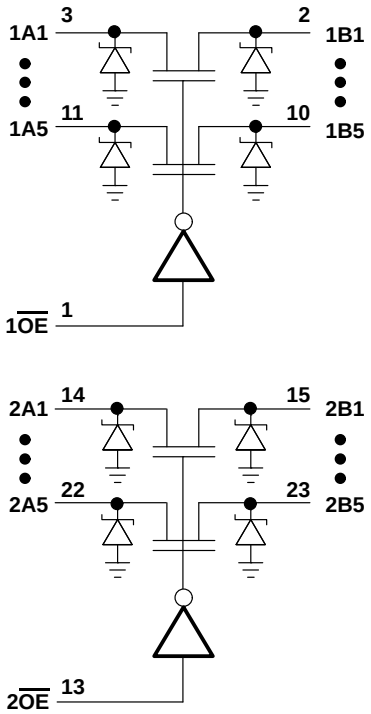
The device is organized as two 5-bit bus switches with separate output-enable ($\overline{OE}$) inputs. When $\overline{OE}$ is low, the switch is on and port A is connected to port B. When $\overline{OE}$ is high, the switch is open and a high-impedance state exists between the two ports.

The SN74CBTS3384 is characterized for operation from –40°C to 85°C.

**FUNCTION TABLE**

| $1\overline{OE}$ | $2\overline{OE}$ | 1B1–1B5 | 2B1–2B5 |
|---|---|---|---|
| L | L | 1A1–1A5 | 2A1–2A5 |
| L | H | 1A1–1A5 | Z |
| H | L | Z | 2A1–2A5 |
| H | H | Z | Z |

## logic diagram




## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, $V_{CC}$ . . . . . –0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) . . . . . –0.3 V to 7 V
Continuous channel current . . . . . 128 mA
Input clamp current, $I_{IK}$ ($V_{I/O} < 0$) . . . . . –50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package . . . . . 104°C/W
DBQ package . . . . . 113°C/W
DW package . . . . . 81°C/W
PW package . . . . . 120°C/W
Storage temperature range, $T_{stg}$ . . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51.

## recommended operating conditions

| | | MIN | MAX | UNIT |
|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | 4 | 5.5 | V |
| $V_{IH}$ | High-level control input voltage | 2 | | V |
| $V_{IL}$ | Low-level control input voltage | | 0.8 | V |
| $T_A$ | Operating free-air temperature | –40 | 85 | °C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP† | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_{IK}$ | | $V_{CC}$ = 4.5 V, | $I_I$ = –18 mA | | | | –0.6 | V |
| $I_I$ | $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = GND | | | | –1 | µA |
| | $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 5.5 V | | | | 150 | µA |
| $I_{CC}$ | | $V_{CC}$ = 5.5 V, | $I_O$ = 0, | $V_I$ = $V_{CC}$ or GND | | | 3 | µA |
| $\Delta I_{CC}$‡ | Control pins | $V_{CC}$ = 5.5 V, | One input at 3.4 V, | Other inputs at $V_{CC}$ or GND | | | 2.5 | mA |
| $C_i$ | Control pins | $V_I$ = 3 V or 0 | | | | 6 | | pF |
| $C_{io(OFF)}$ | | $V_O$ = 3 V or 0, | $\overline{OE}$ = $V_{CC}$ | | | 6.5 | | pF |
| $r_{on}$§ | | $V_{CC}$ = 4 V, | $V_I$ = 2.4 V, | $I_I$ = 15 mA | | 14 | 20 | Ω |
| | | $V_{CC}$ = 4.5 V | $V_I$ = 0, | $I_I$ = 64 mA | | 5 | 7 | |
| | | | $V_I$ = 0, | $I_I$ = 30 mA | | 5 | 7 | |
| | | | $V_I$ = 2.4 V, | $I_I$ = 15 mA | | 10 | 15 | |

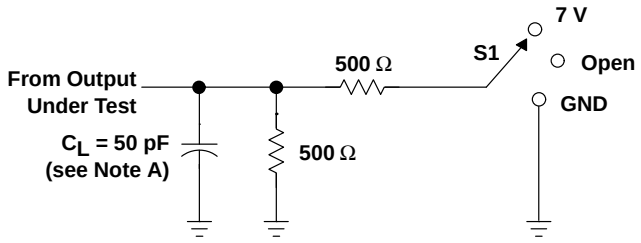
† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡ This is the increase in supply current for each input that is at the specified TTL voltage level rather than $V_{CC}$ or GND.
§ Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lowest voltage of the two (A or B) terminals.

## switching characteristics over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 5 V ± 0.5 V | | $V_{CC}$ = 4 V | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | MIN | MAX | |
| $t_{pd}$¶ | A or B | B or A | | 0.25 | | 0.25 | ns |
| $t_{en}$ | $\overline{OE}$ | A or B | 1.9 | 5.7 | | 6.2 | ns |
| $t_{dis}$ | $\overline{OE}$ | A or B | 2.1 | 5.2 | | 5.5 | ns |

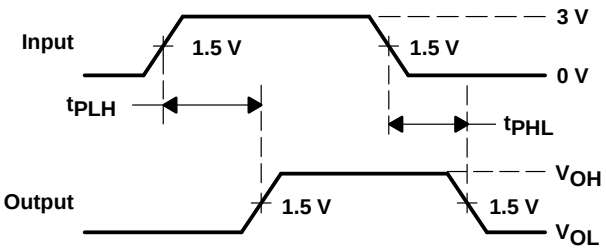
¶ This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical on-state resistance of the switch and a load capacitance of 50 pF, when driven by an ideal voltage source (zero output impedance).

## PARAMETER MEASUREMENT INFORMATION

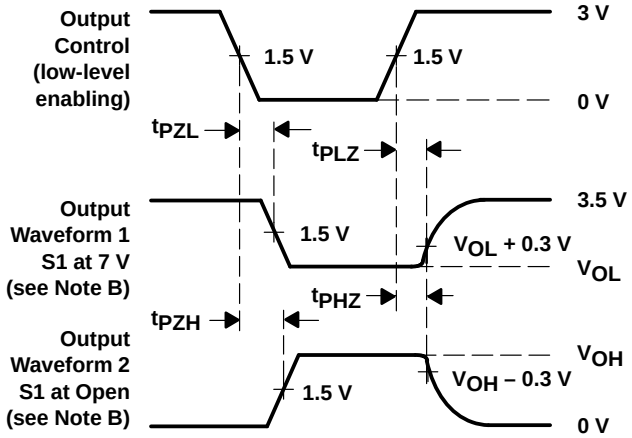



LOAD CIRCUIT

| TEST | S1 |
|---|---|
| $t_{pd}$ | Open |
| $t_{PLZ}/t_{PZL}$ | 7 V |
| $t_{PHZ}/t_{PZH}$ | Open |




VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES




VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

NOTES: A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, $t_r$ ≤ 2.5 ns, $t_f$ ≤ 2.5 ns.
D. The outputs are measured one at a time with one transition per measurement.
E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
F. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.
G. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.

**Figure 1. Load Circuit and Voltage Waveforms**

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