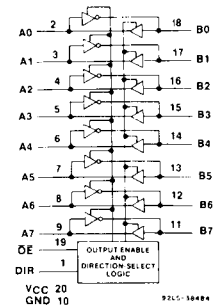
# CD54HC643/3A
# CD54HCT643/3A Octal Bus Transceiver, 3-State, True/Inverting

The RCA-CD54HC643 and CD54HCT643 silicon-gate CMOS 3-state bidirectional buffers are intended for two-way asynchronous communication between data buses. They have high drive current outputs which enable high-speed operation when driving large bus capacitances. These circuits possess the low power dissipation of CMOS circuits and have speeds comparable to low-power Schottky TTL circuits. They can drive 15 LSTTL loads.

The CD54HC643 and CD54HCT643 are true/inverting buffers.

The direction of data flow (A to B, B to A) is controlled by the DIR input.

Outputs are enabled by a low on the Output Enable input ($\overline{OE}$); a high $\overline{OE}$ puts these devices in the high impedance mode.




FUNCTIONAL DIAGRAM

## Package Specifications

See Section 11, Fig. 13

## Static Electrical Characteristics (Limits with black dots (•) are tested 100%) — Bus Type

| CHARACTERISTICS | | TEST CONDITIONS HC/HCT $V_{DD}$ | $V_O$ | $I_O$ | $V_{CC}$ or GND | $V_{IN}$ HC $V_{IL}$ or $V_{IH}$ | $V_{IN}$ HCT $V_{IL}$ or $V_{IH}$ | LIMITS MIN. | LIMITS MAX. | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| Output High (Source) Current $I_{OH}$ Min. - TTL Load | 25°C | 4.5 | 3.98 | — | — | 0, 4.5 | 0, 4.5 | -6• | — | mA |
| | -55°C / +125°C | 4.5 | 3.70 | — | — | 0, 4.5 | 0, 4.5 | -6• | — | |
| Output Low (Sink) Current $I_{OL}$ Min. - TTL Load | 25°C | 4.5 | 0.26 | — | — | 0, 4.5 | 0, 4.5 | 6• | — | |
| | -55°C / +125°C | 4.5 | 0.40 | — | — | 0, 4.5 | 0, 4.5 | 6• | — | |
| High Level Output Voltage $V_{OH}$ - TTL Load | 25°C | 4.5 | — | -6 | — | 1.35, 3.15 | 0.8, 2.0 | 3.98• | — | V |
| | -55°C / +125°C | 4.5 | — | -6 | — | 1.35, 3.15 | 0.8, 2.0 | 3.70• | — | |
| Low Level Output Voltage $V_{OL}$ - TTL Load | 25°C | 4.5 | — | 6 | — | 1.35, 3.15 | 0.8, 2.0 | — | 0.26• | |
| | -55°C / +125°C | 4.5 | — | 6 | — | 1.35, 3.15 | 0.8, 2.0 | — | 0.40• | |
| Quiescent Device Current $I_{CC}$ | 25°C | 6 | — | — | 6, 0 | — | — | — | 8• | μA |
| | -55°C / +125°C | 6 | — | — | 6, 0 | — | — | — | 160• | |

The complete static electrical test specification consists of the above by-type static tests combined with the standard static tests in the beginning of this section.

**HCT INPUT LOADING TABLE**

| INPUT | UNIT LOAD* |
|---|---|
| DIR | 0.9 |
| $\overline{OE}$, A | 1.5 |
| B | 0.4 |

*Unit load is $\Delta I_{CC}$ limit specified in Static Characteristics Chart, e.g., 360 $\mu$A max. @ 25°C.

## Switching Speed (Limits with black dots (•) are tested 100%.)

**SWITCHING CHARACTERISTICS ($C_L$ = 50 pF, Input $t_r$, $t_f$ = 6 ns)**

| CHARACTERISTIC | SYMBOL | $V_{CC}$ | 25°C | | | | -55°C to +125°C | | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HC | | HCT | | 54HC | | 54HCT | | |
| | | V | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| Propagation Delay | | 2 | — | 90 | — | — | — | 135 | — | — | |
| A → $\overline{B}$ | | 4.5 | — | 18 | — | 22 | — | 27 | — | 33 | |
| B → $\overline{A}$ | $t_{PLH}$ | 6 | — | 15 | — | — | — | 23 | — | — | |
| | $t_{PHL}$ | 2 | — | 110 | — | — | — | 165 | — | — | |
| B → A | | 4.5 | — | 22• | — | 26• | — | 33• | — | 39• | |
| | | 6 | — | 19 | — | — | — | 28 | — | — | |
| Output High Z: | | 2 | — | 150 | — | — | — | 225 | — | — | |
| To High Level | $t_{PZH}$ | 4.5 | — | 30• | — | 33• | — | 45• | — | 50• | ns |
| To Low Level | $t_{PZL}$ | 6 | — | 26 | — | — | — | 38 | — | — | |
| Output High Level | | 2 | — | 150 | — | — | — | 225 | — | — | |
| Output Low Level | $t_{PHZ}$ | 4.5 | — | 30• | — | 30• | — | 45• | — | 45• | |
| to High Z | $t_{PLZ}$ | 6 | — | 26 | — | — | — | 38 | — | — | |
| Output Transition | | 2 | — | 60 | — | — | — | 90 | — | — | |
| Time | $t_{TLH}$ | 4.5 | — | 12 | — | 12 | — | 18 | — | 18 | |
| | $t_{THL}$ | 6 | — | 10 | — | — | — | 15 | — | — | |
| Input Capacitance | $C_I$ | — | — | 10 | — | 10 | — | 10 | — | 10 | pF |
| 3-State Output Capacitance | $C_o$ | — | — | 20 | — | 20 | — | 20 | — | 20 | |

## Burn-In Test-Circuit Connections (Use Static II for /3A burn-in and Dynamic for Life Test.)

| Static | STATIC BURN-IN I | | | STATIC BURN-IN II | | |
|---|---|---|---|---|---|---|
| | OPEN | GROUND | $V_{CC}$ (6V) | OPEN | GROUND | $V_{CC}$ (6V) |
| CD54HC/HCT643 | 2-9 | 1,10-19 | 20 | — | 10 | 1-9,11-18,19,20 |
| **Dynamic** | **OPEN** | **GROUND** | **1/2 $V_{CC}$ (3V)** | **$V_{CC}$ (6V)** | **OSCILLATOR** | |
| | | | | | **50 kHz** | **25 kHz** |
| CD54HC/HCT643 | — | 10 | 11-18 | 1,20 | 2-9 | 19 |

NOTE: Each pin except $V_{CC}$ and Gnd will have a resistor of 2k-47k ohms.