# HD74BC645A

## Octal Bus Transceivers With 3 State Outputs

REJ03D0291–0200Z
(Previous ADE-205-027 (Z))
Rev.2.00
Jul.16.2004

## Description

The HD74BC645A provides high drivability and operation equal to or better than high speed bipolar standard logic IC by using Bi-CMOS process. The device features low power dissipation that is about 1/5 of high speed bipolar logic IC. When the frequency is 10 MHz. The device has eight bus transceivers with three state outputs in a 20 pin package. Each device has an active low enable input ($\overline{G}$) and a direction control input, DiR. When DiR is high, data flows from the A inputs to the B outputs. When DiR is high, data flows from the B inputs to the A outputs. When enable inputs ($\overline{G}$) is high, disables both A and B ports by placing then in a high impedance.

## Features

- Input/Output are at high impedance state when power supply is off.
- Input pins can be open, when not used, owing to built in input pull up circuit.
- Input is TTL level.
- Wide operating temperature range
  Ta = –40 to +85°C.
- Ordering Information

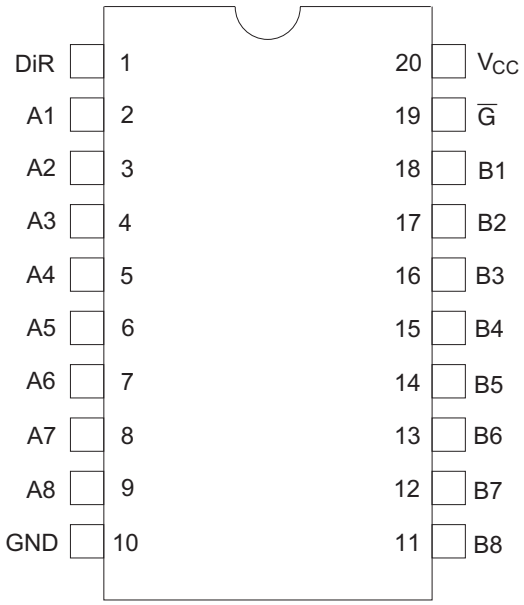
| Part Name | Package Type | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|---|---|---|---|---|
| HD74BC645AFPEL | SOP-20 pin (JEITA) | FP-20DAV | FP | EL (2,000 pcs/reel) |

## Function Table

| Control Inputs | | Operation |
|---|---|---|
| $\overline{G}$ | DIR | |
| L | L | B data to A bus |
| L | H | A data to B bus |
| H | X | Z |

H : High level
L : Low level
X : Immaterial
Z : High impedance

## Pin Arrangement




(Top view)

## Absolute Maximum Ratings

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | –0.5 to +7.0 | V |
| Input diode current | $I_{IK}$ | ±30 | mA |
| Input voltage | $V_{IN}$ | –0.5 to +7.5 | V |
| Output voltage | $V_{OUT}$ | –0.5 to +7.5 | V |
| Off state output voltage | $V_{OUT(off)}$ | –0.5 to +5.5 | V |
| Storage temperature | Tstg | –65 to +150 | °C |

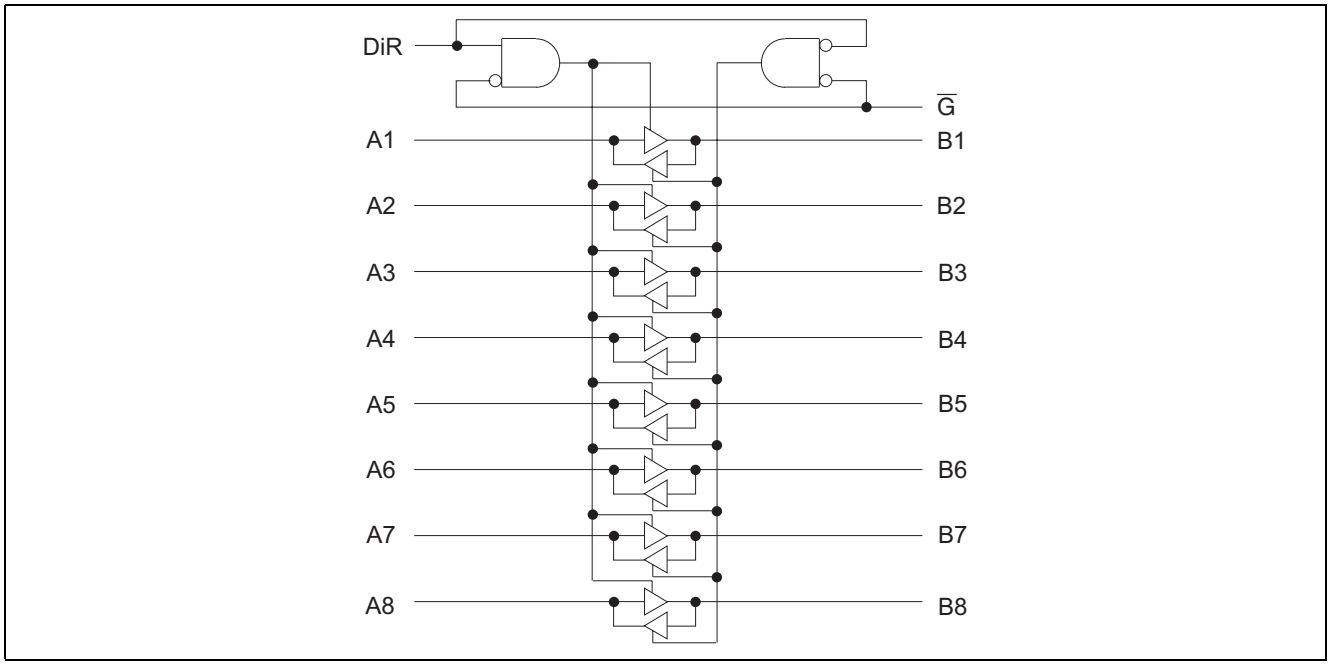
Note: 1. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

## Recommended Operating Conditions

| Item | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | 4.5 | 5.0 | 5.5 | V |
| Input voltage | $V_{IN}$ | 0 | — | $V_{CC}$ | V |
| Ouput voltage | $V_{OUT}$ | 0 | — | $V_{CC}$ | V |
| Operating temperature | Topr | –40 | — | 85 | °C |
| Input rise/fall time*[1] | $t_r$, $t_f$ | 0 | — | 8 | ns/V |

Note: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.

## Logic Diagram




## Electrical Characteristics (Ta = –40 to +85°C)

| Item | Symbol | $V_{CC}$ (V) | Min | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Input voltage | $V_{IH}$ | | 2.0 | — | V | |
| | $V_{IL}$ | | — | 0.8 | V | |
| Output voltage | $V_{OH}$ | 4.5 | 2.4 | — | V | $I_{OH}$ = –3 mA |
| | | 4.5 | 2.0 | — | V | $I_{OH}$ = –15 mA |
| | $V_{OL}$ | 4.5 | — | 0.5 | V | $I_{OL}$ = 48 mA |
| | | 4.5 | — | 0.55 | V | $I_{OL}$ = 64 mA |
| Input diode voltage | $V_{IK}$ | 4.5 | — | –1.2 | V | $I_{IN}$ = –18 mA |
| Input current | $I_I$ | 5.5 | — | –250 | µA | $V_{IN}$ = 0 V |
| | | 5.5 | — | 100 | µA | An or Bn, $V_{IN}$ = 5.5 V |
| | | 5.5 | — | 1.0 | µA | DiR or $\overline{G}$, $V_{IN}$ = 5.5 V |
| | | 5.5 | — | 100 | µA | DiR or $\overline{G}$, $V_{IN}$ = 7 V |
| Output short circuit current*[1] | $I_{OS}$ | 5.5 | –100 | –225 | mA | $V_O$ = 0 V, $V_{IN}$ = 0 or 5.5 V |
| Off state output current | $I_{OZH}$ | 5.5 | — | –100 | µA | $V_O$ = 2.7 V |
| | $I_{OZL}$ | 5.5 | — | –250 | µA | $V_O$ = 0.5 V |
| Supply current | $I_{CCL}$ | 5.5 | — | 31.5 | mA | $V_{IN}$ = 0 or 5.5 V<br>All outputs is “L” |
| | $I_{CCH}$ | 5.5 | — | 0.5 | mA | $V_{IN}$ = 0 or 5.5 V<br>All outputs is “H” |
| | $I_{CCZ}$ | 5.5 | — | 4.5 | mA | $V_{IN}$ = 0 or 5.5 V<br>All outputs is “Z” |
| | $I_{CCT}$*[2] | 5.5 | — | 1.5 | mA | $V_{IN}$ = 3.4 or 0.5 V |

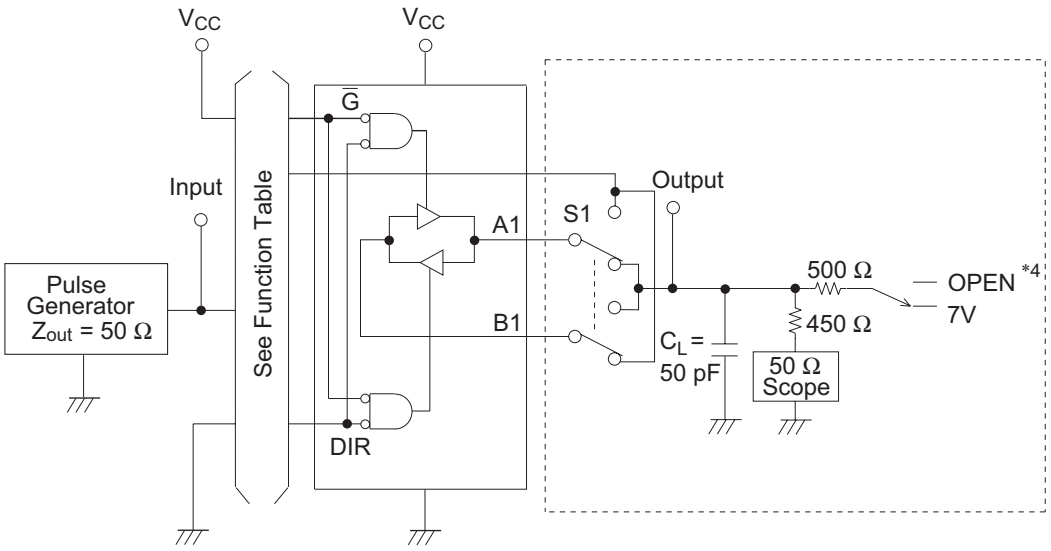
Notes: 1. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

2. When input by the TTL level, it shows $I_{CC}$ increase at per one input pin.

## Switching Characteristics ($C_L$ = 50 pF)

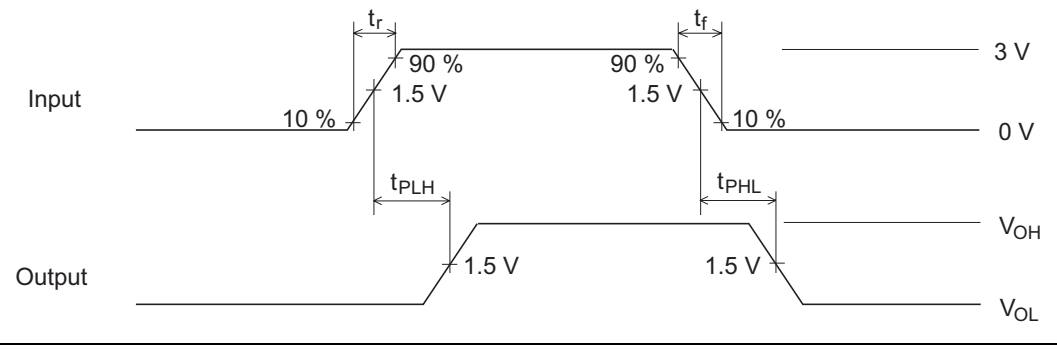
| Item | Symbol | Ta = 25°C $V_{CC}$ = 5.0 V | | Ta = –40 to +85°C $V_{CC}$ = 5.0 V ±10% | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | | |
| Propagation delay time | $t_{PLH}$ | 3.0 | 6.0 | 3.0 | 7.0 | ns | An to Bn |
| | $t_{PHL}$ | 3.0 | 6.0 | 3.0 | 7.0 | | |
| | $t_{PLH}$ | 3.0 | 6.0 | 3.0 | 7.0 | ns | Bn to An |
| | $t_{PHL}$ | 3.0 | 6.0 | 3.0 | 7.0 | | |
| Output enable time | $t_{ZH}$ | 3.0 | 9.0 | 3.0 | 11.0 | ns | $\overline{G}$ to Bn |
| | $t_{ZL}$ | 3.0 | 9.0 | 3.0 | 11.0 | | |
| | $t_{ZH}$ | 3.0 | 9.0 | 3.0 | 11.0 | ns | $\overline{G}$ to An |
| | $t_{ZL}$ | 3.0 | 9.0 | 3.0 | 11.0 | | |
| Output disable time | $t_{HZ}$ | 3.0 | 8.0 | 3.0 | 10.0 | ns | $\overline{G}$ to Bn |
| | $t_{LZ}$ | 3.0 | 8.0 | 3.0 | 10.0 | | |
| | $t_{HZ}$ | 3.0 | 8.0 | 3.0 | 10.0 | ns | $\overline{G}$ to An |
| | $t_{LZ}$ | 3.0 | 8.0 | 3.0 | 10.0 | | |
| Input capacitance | $C_{IN}$ | 3.0 (Typ) | | — | | pF | $V_{IN}$ = $V_{CC}$ or GND |
| Output capacitance | $C_{I/O}$ | 15.0 (Typ) | | — | | pF | $V_{I/O}$ = $V_{CC}$ or GND |

## Test Circuit

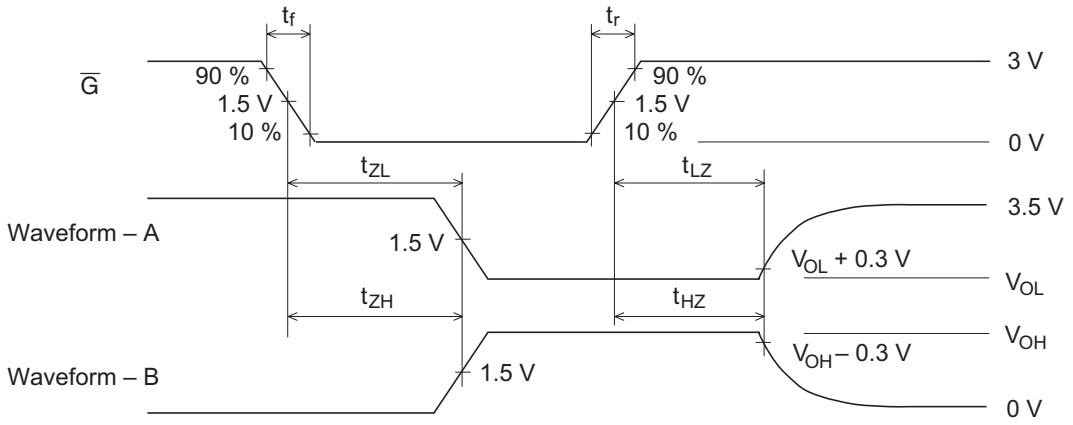



Notes:
1. $C_L$ includes probe and jig capacitance.
2. A2-B2 to A8-B8 are identical to above load circuit.
3. S1: Input-Output change switch.
4. Open: $t_{PLH}$, $t_{PHL}$, $t_{ZH}$ $t_{HZ}$
   7 V: $t_{ZL}$, $t_{LZ}$

## Waveforms-1



## Waveforms-2

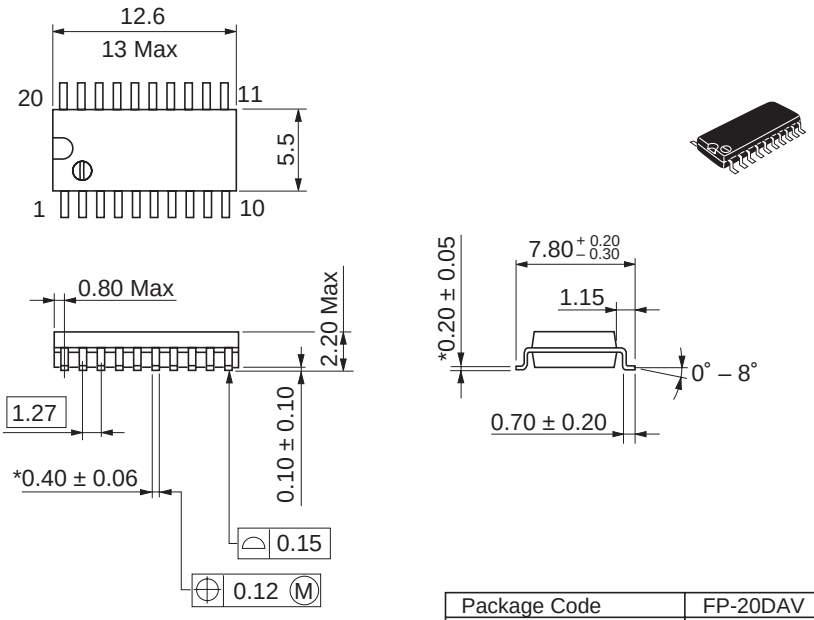



Notes:
1. $t_r$ = 2.5 ns, $t_f$ = 2.5 ns
2. Input waveforms: PRR = 1 MHz, duty cycle 50%
3. Waveform-A shows input conditions such that the output is “L” level when enable by the output control.
4. Waveform-B shows input conditions such that the output is “H” level when enable by the output control.

## Package Dimensions

As of January, 2003

Unit: mm




*Ni/Pd/Au plating

| | |
|---|---|
| Package Code | FP-20DAV |
| JEDEC | — |
| JEITA | Conforms |
| Mass (reference value) | 0.31 g |

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