

# HD74BC541A

## Octal Buffers/Line Drivers With 3 State Outputs

REJ03D0286-0200Z  
(Previous ADE-205-023 (Z))  
Rev.2.00  
Jul.16.2004

### Description

The HD74BC541A 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 inverter drivers with three state outputs in a 20 pin package. When  $\overline{G1}$  and  $\overline{G2}$  is low level, this drivers set up output is enable.

### Features

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

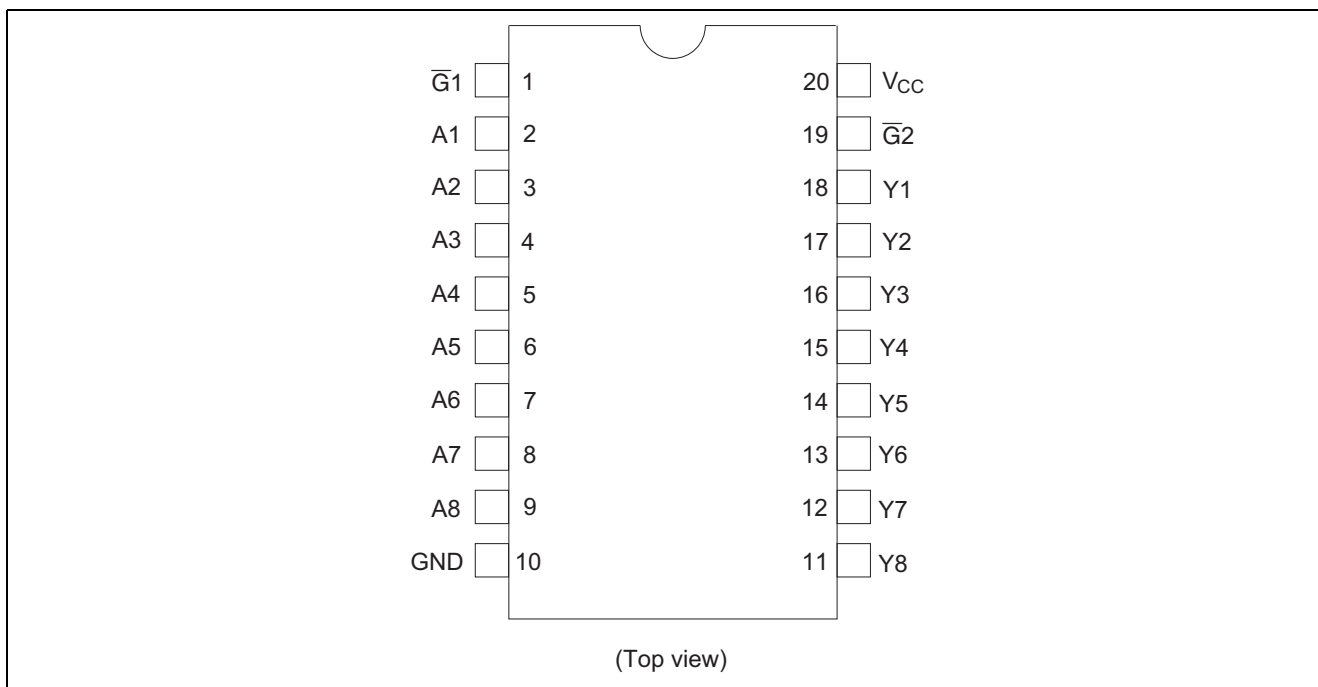
| Part Name      | Package Type       | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|----------------|--------------------|--------------|----------------------|--------------------------------|
| HD74BC541AFPEL | SOP-20 pin (JEITA) | FP-20DAV     | FP                   | EL (2,000 pcs/reel)            |

### Function Table

| Inputs          |                 |   | Output Y |
|-----------------|-----------------|---|----------|
| $\overline{G1}$ | $\overline{G2}$ | A |          |
| L               | L               | L | L        |
| L               | L               | H | H        |
| H               | X               | X | Z        |
| X               | H               | X | Z        |

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

## Pin Arrangement



## Absolute Maximum Ratings

| Item                     | Symbol         | Rating       | Unit        |
|--------------------------|----------------|--------------|-------------|
| Supply voltage           | $V_{CC}$       | -0.5 to +7.0 | V           |
| Input diode current      | $I_{IK}$       | $\pm 30$     | 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      | $T_{stg}$      | -65 to +150  | $^{\circ}C$ |

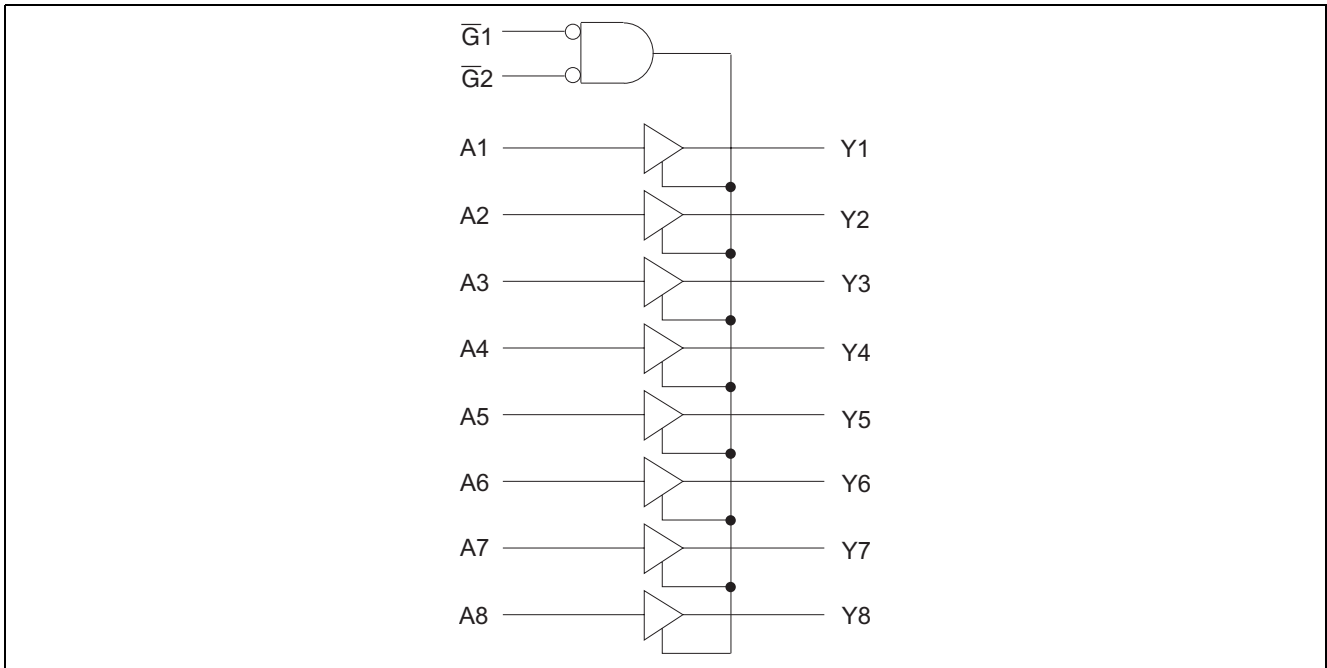
Note: 1. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

## 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           |
| Output voltage         | $V_{OUT}$  | 0   | —   | $V_{CC}$ | V           |
| Operating temperature  | $T_{opr}$  | -40 | —   | 85       | $^{\circ}C$ |
| 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 <sub>CC</sub> (V) | Min  | Max  | Unit | Test Conditions  |
|--------------------------------|---------------------|---------------------|------|------|------|--|
| Input voltage                  | V <sub>IH</sub>     |                     | 2.0  | —    | V    |  |
|                                | V <sub>IL</sub>     |                     | —    | 0.8  | V    |  |
| Output voltage                 | V <sub>OH</sub>     | 4.5                 | 2.4  | —    | V    | I <sub>OH</sub> = -3 mA  |
|                                |                     | 4.5                 | 2.0  | —    | V    | I <sub>OH</sub> = -15 mA                                       |
|                                | V <sub>OL</sub>     | 4.5                 | —    | 0.5  | V    | I <sub>OL</sub> = 48 mA  |
|                                |                     | 4.5                 | —    | 0.55 | V    | I <sub>OL</sub> = 64 mA  |
| Input diode voltage            | V <sub>IK</sub>     | 4.5                 | —    | -1.2 | V    | I <sub>IN</sub> = -18 mA                                       |
| Input current                  | I <sub>I</sub>      | 5.5                 | —    | -250 | μA   | V <sub>IN</sub> = 0 V  |
|                                |                     | 5.5                 | —    | 1.0  | μA   | V <sub>IN</sub> = 5.5 V  |
|                                |                     | 5.5                 | —    | 100  | μA   | V <sub>IN</sub> = 7.0 V  |
| Short circuit output current*1 | I <sub>OS</sub>     | 5.5                 | -100 | -225 | mA   | V <sub>IN</sub> = 0 or 5.5 V                                   |
| Off state output current       | I <sub>OZH</sub>    | 5.5                 | —    | 50   | μA   | V <sub>O</sub> = 2.7 V   |
|                                | I <sub>OZL</sub>    | 5.5                 | —    | -50  | μA   | V <sub>O</sub> = 0.5 V   |
| Supply current                 | I <sub>CCL</sub>    | 5.5                 | —    | 29.5 | mA   | V <sub>IN</sub> = V <sub>CC</sub> or GND<br>All outputs is "L" |
|                                | I <sub>CCH</sub>    | 5.5                 | —    | 0.5  | mA   | V <sub>IN</sub> = V <sub>CC</sub> or GND<br>All outputs is "H" |
|                                | I <sub>CCZ</sub>    | 5.5                 | —    | 2.5  | mA   | V <sub>IN</sub> = V <sub>CC</sub> or GND<br>All outputs is "Z" |
|                                | I <sub>CCT</sub> *2 | 5.5                 | —    | 1.5  | mA   | V <sub>IN</sub> = 3.4V or 0.5V                                 |

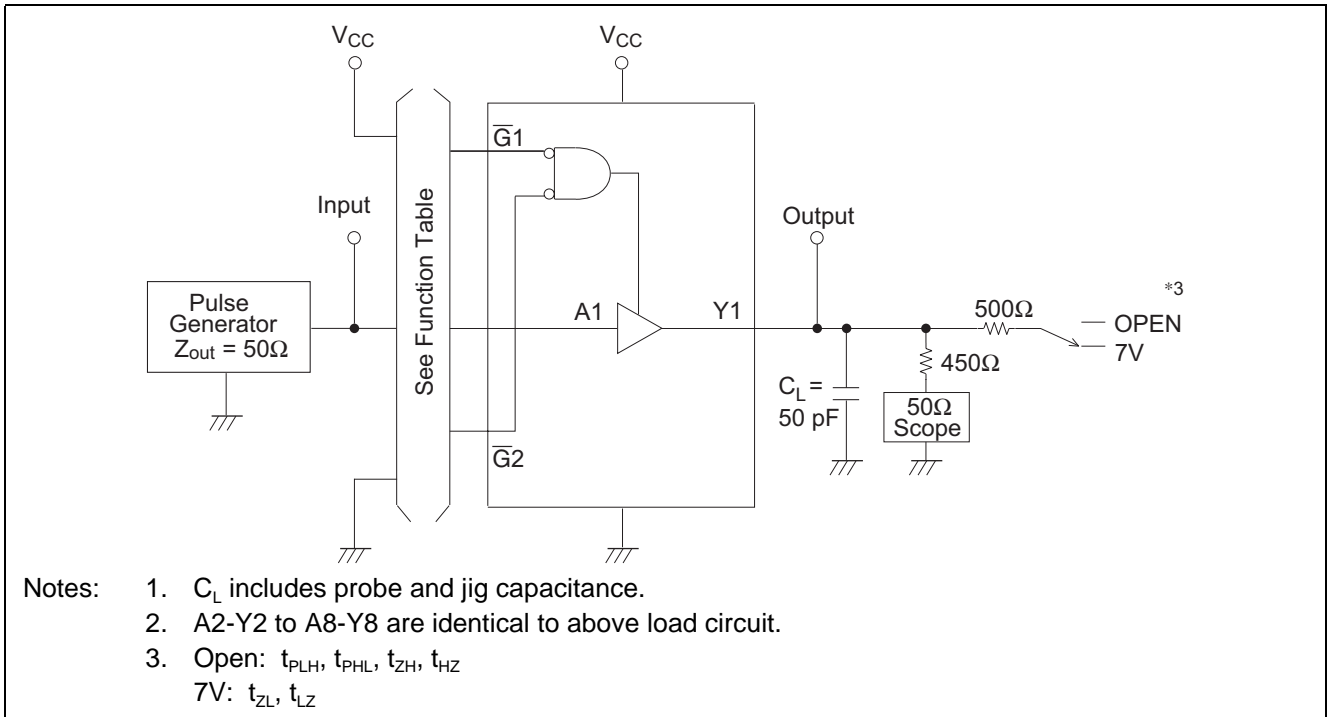
Notes: 1. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

2. When input by the TTL level, it shows I<sub>CC</sub> increase at per one input pin.

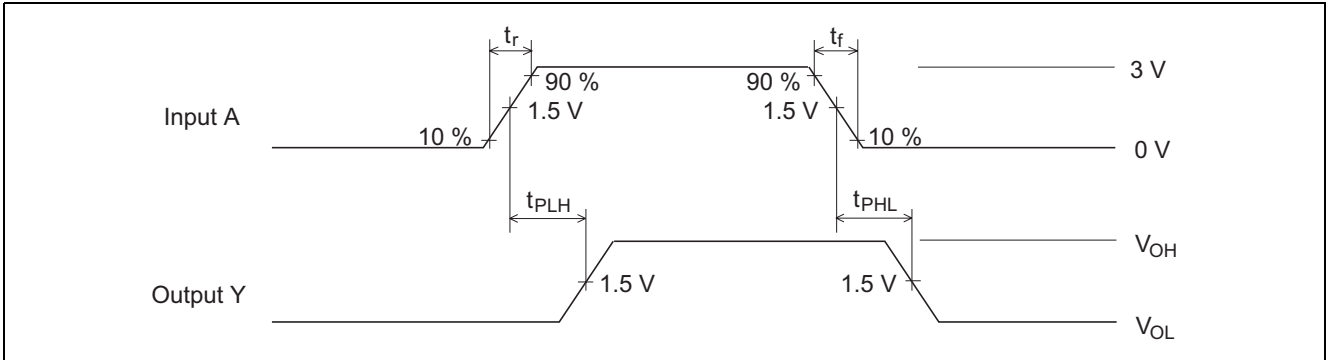
Switching Characteristics (C<sub>L</sub> = 50 pF)

| Item                   | Symbol           | Ta = 25°C<br>V <sub>CC</sub> = 5.0 V |     | Ta = -40 to +85°C<br>V <sub>CC</sub> = 5.0 V ±10% |      | Unit | Test Conditions  |  |
|------------------------|------------------|--------------------------------------|-----|---|------|------|------------------|--|
|                        |                  | Min                                  | Max | Min   | Max  |      |                  |  |
| Propagation delay time | t <sub>PLH</sub> | 3.0                                  | 6.0 | 3.0   | 7.0  | ns   | See under figure |  |
|                        | t <sub>PHL</sub> | 3.0                                  | 6.0 | 3.0   | 7.0  |      |                  |  |
| Output enable time     | t <sub>ZH</sub>  | 3.0                                  | 9.0 | 3.0   | 11.0 | ns   |                  |  |
|                        | t <sub>ZL</sub>  | 3.0                                  | 9.0 | 3.0   | 11.0 |      |                  |  |
| Output disable time    | t <sub>HZ</sub>  | 3.0                                  | 8.0 | 3.0   | 10.0 | ns   |                  |  |
|                        | t <sub>LZ</sub>  | 3.0                                  | 8.0 | 3.0   | 10.0 |      |                  |  |
| Input capacitance      | C <sub>IN</sub>  | 3.0 (Typ)                            |     | —   |      | pF   |                  | V <sub>IN</sub> = V <sub>CC</sub> or GND |
| Output capacitance     | C <sub>O</sub>   | 15.0 (Typ)                           |     | —   |      | pF   |                  | V <sub>O</sub> = V <sub>CC</sub> or GND  |

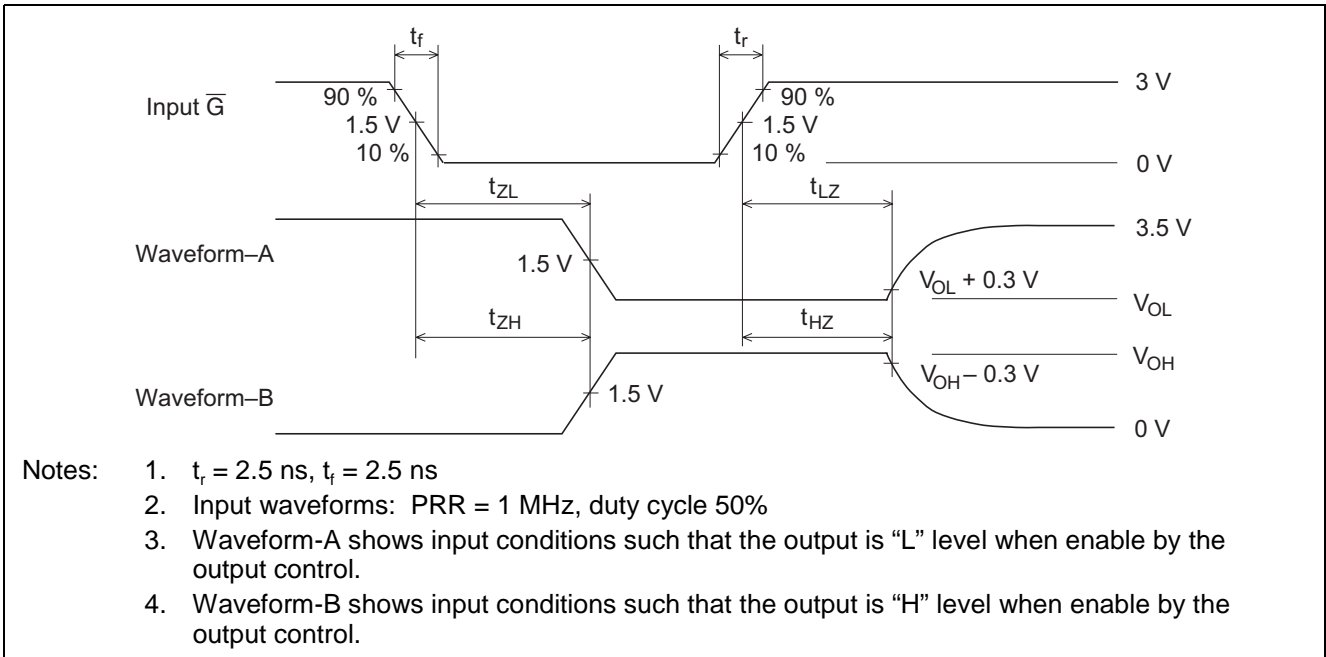
Test circuit



Waveforms-1



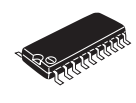
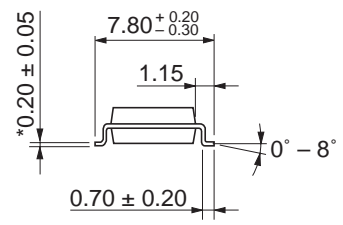
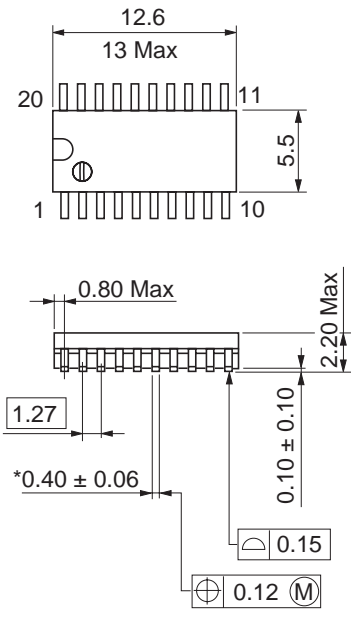
Waveforms-2



- Notes:
1.  $t_r = 2.5 \text{ ns}$ ,  $t_f = 2.5 \text{ ns}$
  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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