

---

# HD74BC645A

## Octal Bus Transceivers With 3 State Outputs

# HITACHI

ADE-205-027 (Z)

Rev.0

June 1993

---

### 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 them 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.

### Function Table

#### Control Inputs

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

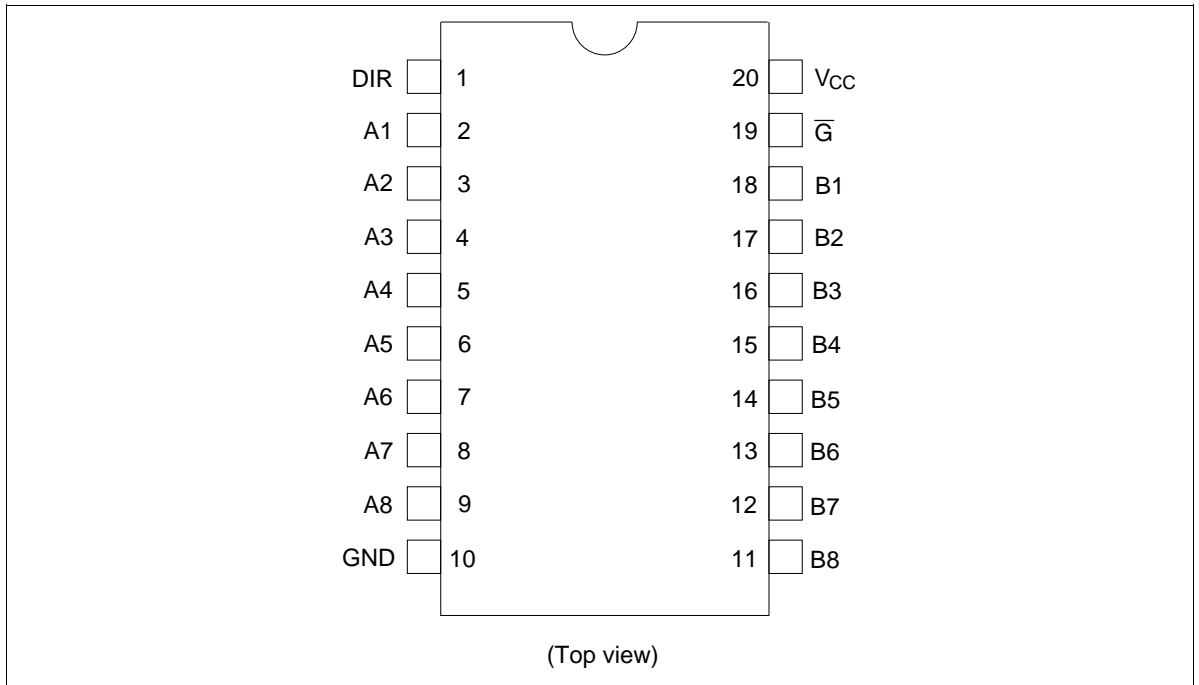
H : High level

L : Low level

X : Immaterial

Z : High impedance

## Pin Arrangement



## 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	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.

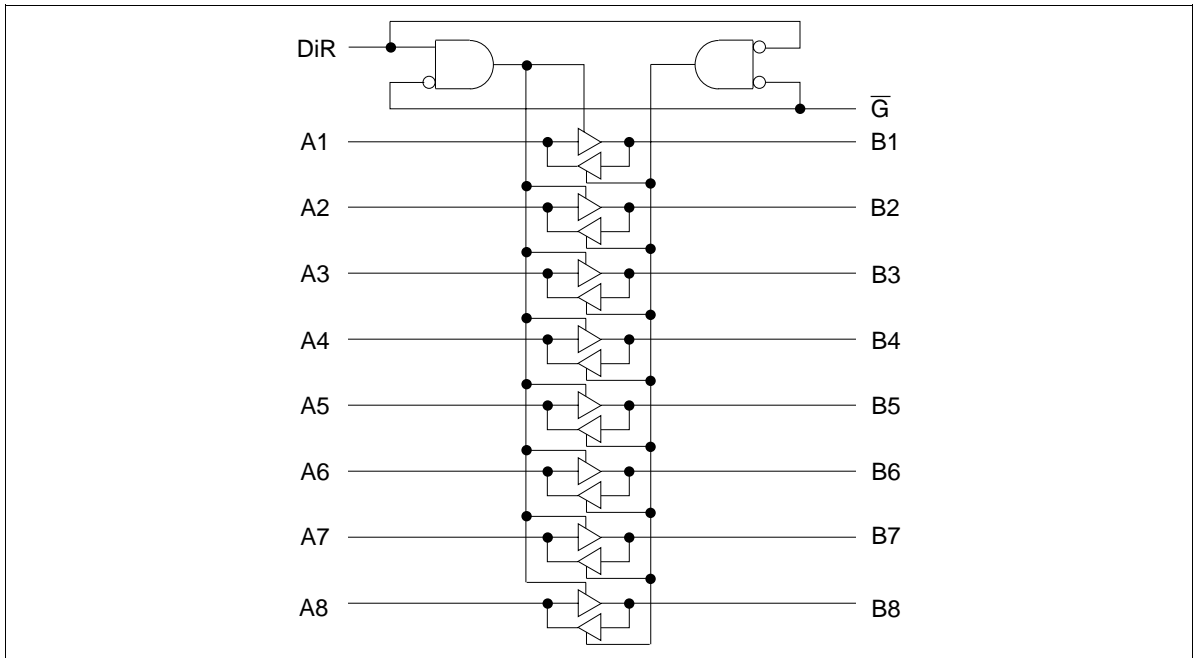
**Recommended Operating Conditions**

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**



# HD74BC645A

## 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	—	100	μA	An or Bn, V <sub>IN</sub> = 5.5 V
		5.5	—	1.0	μA	DiR or $\overline{G}$ , V <sub>IN</sub> = 5.5 V
		5.5	—	100	μA	DiR or $\overline{G}$ , V <sub>IN</sub> = 7 V
Output short circuit current* <sup>1</sup>	I <sub>OS</sub>	5.5	-100	-225	mA	V <sub>O</sub> = 0 V, V <sub>IN</sub> = 0 or 5.5 V
Off state output current	I <sub>OZH</sub>	5.5	—	-100	μA	V <sub>O</sub> = 2.7 V
	I <sub>OZL</sub>	5.5	—	-250	μA	V <sub>O</sub> = 0.5 V
Supply current	I <sub>CCL</sub>	5.5	—	31.5	mA	V <sub>IN</sub> = 0 or 5.5 V All outputs is "L"
	I <sub>CCH</sub>	5.5	—	0.5	mA	V <sub>IN</sub> = 0 or 5.5 V All outputs is "H"
	I <sub>CCZ</sub>	5.5	—	4.5	mA	V <sub>IN</sub> = 0 or 5.5 V All outputs is "Z"
	I <sub>CCT</sub> * <sup>2</sup>	5.5	—	1.5	mA	V <sub>IN</sub> = 3.4 or 0.5 V

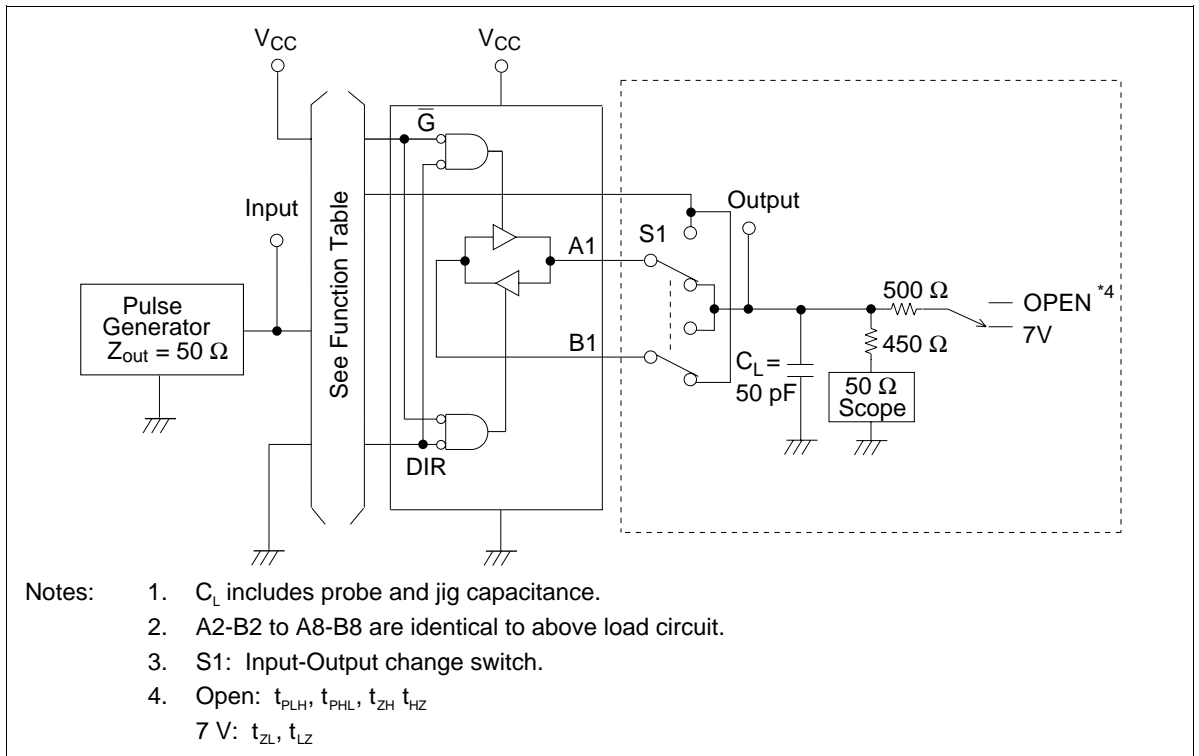
Notes: 1. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

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

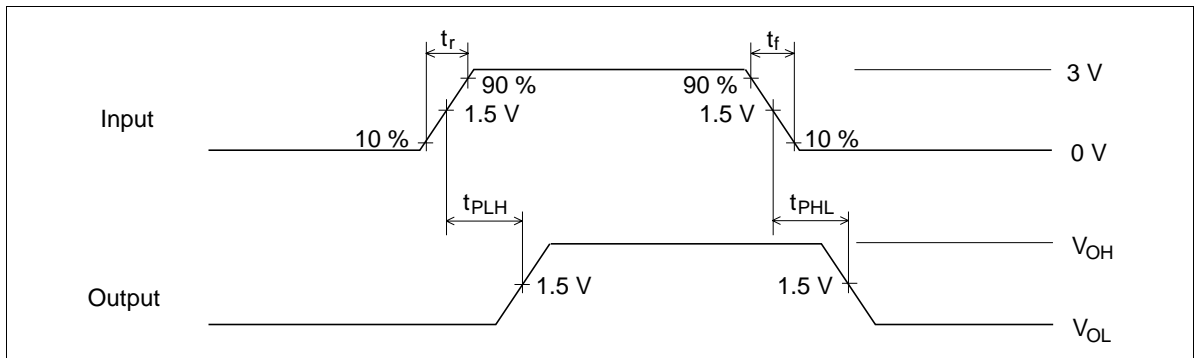
**Switching Characteristics ( $C_L = 50 \text{ pF}$ )**

Item	Symbol	$T_a = 25^\circ\text{C}$ $V_{CC} = 5.0 \text{ V}$		$T_a = -40 \text{ to } +85^\circ\text{C}$ $V_{CC} = 5.0 \text{ V} \pm 10\%$		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	$C_{IO}$	15.0 (Typ)		—		pF	$V_{IO} = V_{CC}$ or GND

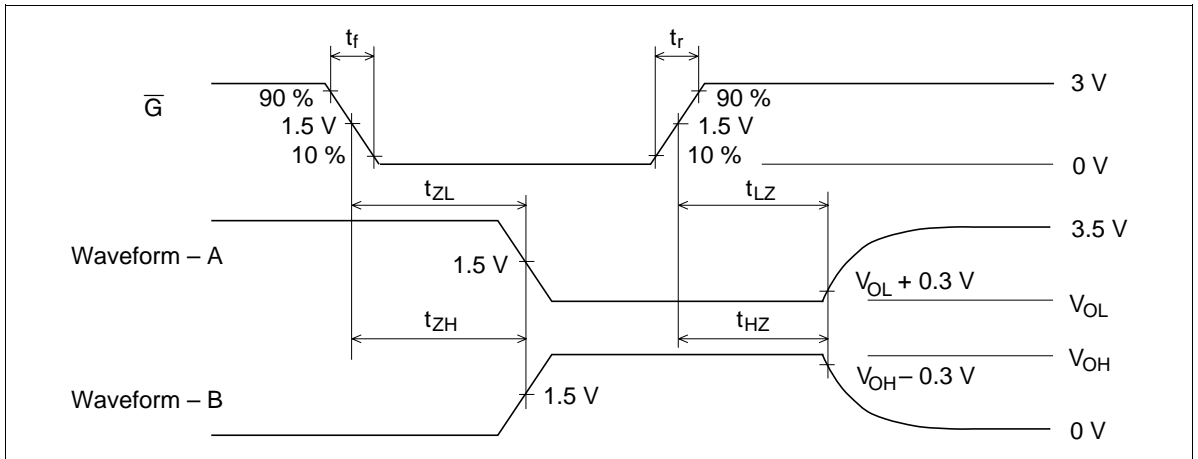
## Test Circuit



## 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.

---

# HD74BC645A

---

## Package Dimensions

Unit: mm





## Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

# HITACHI

## Hitachi, Ltd.

Semiconductor & Integrated Circuits.  
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL      North America      : <http://semiconductor.hitachi.com/>  
             Europe                : <http://www.hitachi-eu.com/hel/ecg>  
             Asia (Singapore)      : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>  
             Asia (Taiwan)            : [http://www.hitachi.com.tw/E/Product/SICD\\_Frame.htm](http://www.hitachi.com.tw/E/Product/SICD_Frame.htm)  
             Asia (HongKong)        : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>  
             Japan                        : <http://www.hitachi.co.jp/Sicd/indx.htm>

## For further information write to:

Hitachi Semiconductor  
(America) Inc.  
179 East Tasman Drive,  
San Jose, CA 95134  
Tel: <1> (408) 433-1990  
Fax: <1> (408) 433-0223

Hitachi Europe GmbH  
Electronic components Group  
Dornacher Straße 3  
D-85622 Feldkirchen, Munich  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
Electronic Components Group.  
Whitebrook Park  
Lower Cookham Road  
Maidenhead  
Berkshire SL6 8YA, United Kingdom  
Tel: <44> (1628) 585000  
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.  
16 Collyer Quay #20-00  
Hitachi Tower  
Singapore 049318  
Tel: 535-2100  
Fax: 535-1533

Hitachi Asia Ltd.  
Taipei Branch Office  
3F, Hung Kuo Building, No.167,  
Tun-Hwa North Road, Taipei (105)  
Tel: <886> (2) 2718-3666  
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower, World Finance Centre,  
Harbour City, Canton Road, Tsim Sha Tsui,  
Kowloon, Hong Kong  
Tel: <852> (2) 735 9218  
Fax: <852> (2) 730 0281  
Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.

**HITACHI**