HD14506B

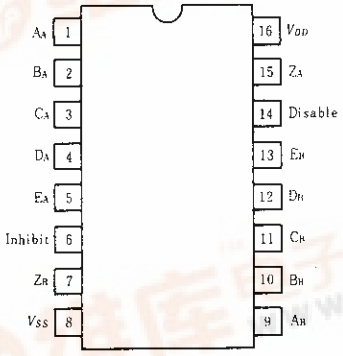
Dual 2-wide 2-input Expandable AND-OR-INVERT Gate

The HD14506B is an expandable AND-OR-INVERT gate with inhibit and 3-state output. The expand option allows cascading with any other gate, which may be carried as far as desired as long as the propagation delay added with each gate is considered. For example, the second AOI gate in this device may be used to expand the first gate, giving an expanded 4-wide, 2-input AOI gate. This device is useful in data control and digital multiplexing applications.

■ FEATURES

- Quiescent Current = 2nA/pkg typ. @5V
- 3-state Output
- Separate Inhibit Line
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

■ PIN ARRANGEMENT



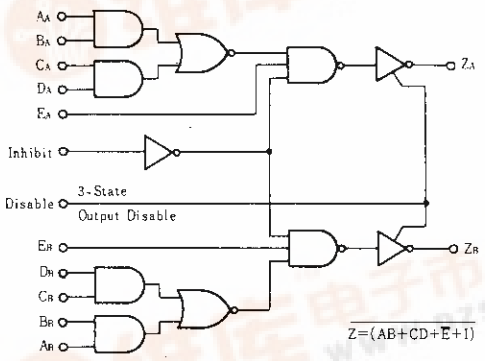
(Top View)

■ TRUTH TABLE

A	B	C	D	E	Inhibit	Disable	Z
0	0	0	0	1	0	0	1
0	×	0	×	1	0	0	1
0	×	×	0	1	0	0	1
×	0	0	×	1	0	0	1
×	0	×	0	1	0	0	1
1	1	×	×	×	×	0	0
×	×	1	1	×	×	0	0
×	×	×	×	0	×	0	0
×	×	×	×	×	1	0	0
×	×	×	×	×	×	1	High Impedance

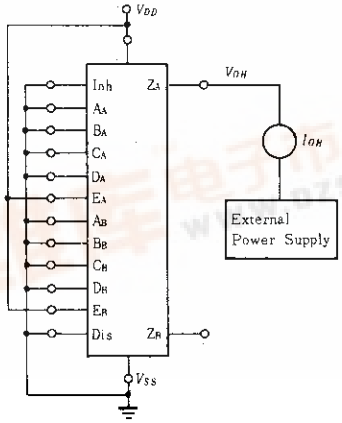
x=Don't Care

■ LOGIC DIAGRAM

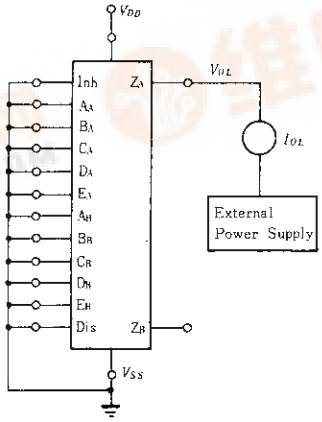


■ DC CHARACTERISTIC TEST CIRCUIT

● I_{OH}



● I_{OL}



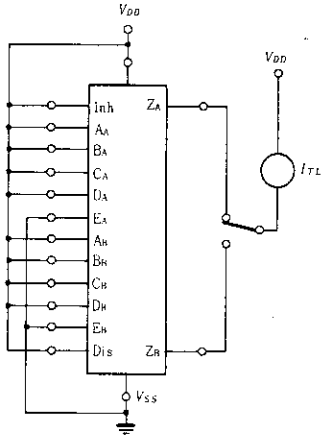
■ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40℃ min	−40℃ max	25℃ min	25℃ typ	25℃ max	85℃ min	85℃ max	Unit
Output Voltage	V_{OL}	5.0	$V_{in}=V_{DD}$ or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	V_{OH}	5.0	$V_{in}=0$ or V_{DD}	4.95	—	4.95	5.0	—	4.95	—	V
		10		9.95	—	9.95	10	—	9.95	—	
		15		14.95	—	14.95	15	—	14.95	—	
Input Voltage	V_{IL}	5.0	$V_{out}=4.5$ or 0.5V	—	1.5	—	2.25	1.5	—	1.5	V
		10	$V_{out}=9.0$ or 1.0V	—	3.0	—	4.50	3.0	—	3.0	
		15	$V_{out}=13.5$ or 1.5V	—	4.0	—	6.75	4.0	—	4.0	
	V_{IH}	5.0	$V_{out}=0.5$ or 4.5V	3.5	—	3.5	2.75	—	3.5	—	V
		10	$V_{out}=1.0$ or 9.0V	7.0	—	7.0	5.50	—	7.0	—	
		15	$V_{out}=1.5$ or 13.5V	11.0	—	11.0	8.25	—	11.0	—	
Output Drive Current	I_{OH}	5.0	$V_{OH}=2.5$V	−1.0	—	−0.8	−1.7	—	−0.6	—	mA
		5.0	$V_{OH}=4.6$V	−0.2	—	−0.16	−0.36	—	−0.12	—	
		10	$V_{OH}=9.5$V	−0.5	—	−0.4	−0.9	—	−0.3	—	
		15	$V_{OH}=13.5$V	−1.4	—	−1.2	−3.5	—	−1.0	—	
	I_{OL}	5.0	$V_{OL}=0.4$V	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL}=0.5$V	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL}=1.5$V	3.6	—	3.0	8.8	—	2.4	—	
Input Current	I_{in}	15		—	±0.3	—	±0.00001	±0.3	—	±1.0	μA
Input Capacitance	C_{in}		$V_{in}=0$	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	I_{DD}	5.0	Zero Signal, Per Package	—	4.0	—	0.002	4.0	—	30	μA
		10		—	8.0	—	0.004	8.0	—	60	
		15		—	16	—	0.006	16	—	120	
Total Supply Current*	I_T	5.0	Dynamic+I_{DD},	—	—	—	0.6	—	—	—	μA
		10	Per Gate	—	—	—	1.1	—	—	—	
		15	C_L=50pF, f=1kHz	—	—	—	1.7	—	—	—	
Three-State Output Leakage Current	I_{TL}	15		—	±1.0	—	±0.00001	±1.0	—	±7.5	μA

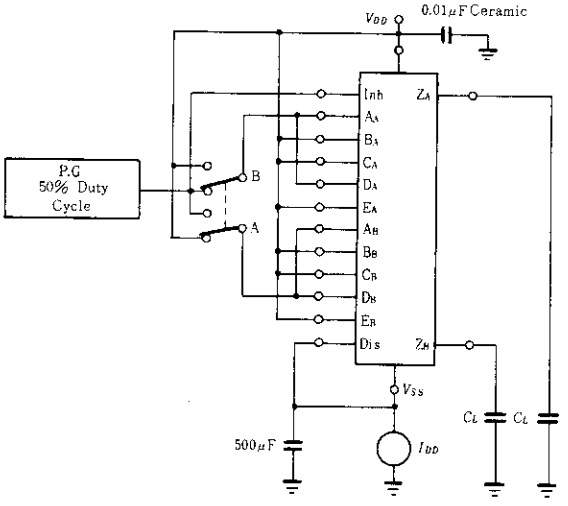
* To calculate total supply current at frequency other than 1kHz.
@V_{DD}=5.0V $I_T=(0.6\mu A/kHz)f+I_{DD}$, @$V_{DD}$=10V $I_T=(1.1\mu A/kHz)f+I_{DD}$, @$V_{DD}$=15V $I_T=(1.7\mu A/kHz)f+I_{DD}$

■DC CHARACTERISTIC TEST CIRCUIT

●I_{TL}



■POWER DISSIPATION TEST CIRCUIT

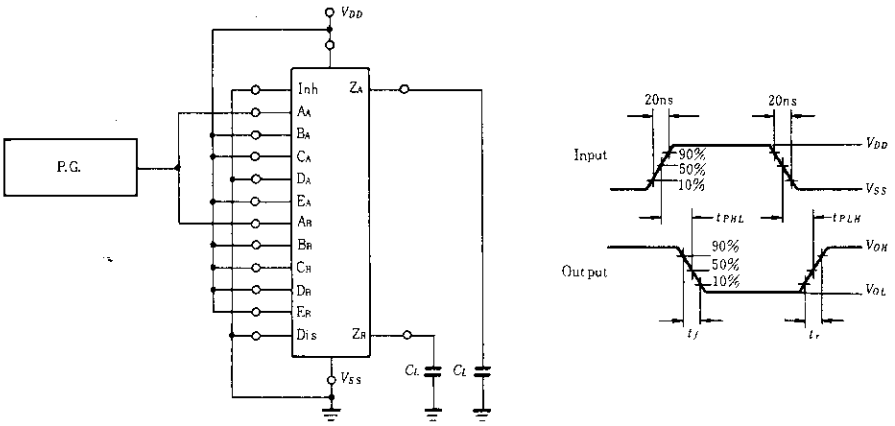


■SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25°C)

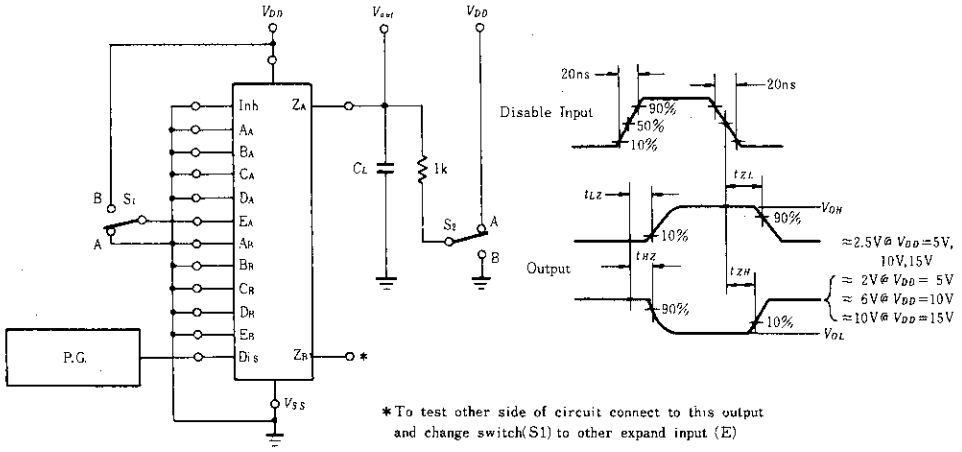
Characteristic		Symbol	V_{DD} (V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		t_f	5.0	—	100	200	ns
			10	—	50	100	
			15	—	37	80	
Propagation Delay Time	Data	t_{PLH}	5.0	—	295	580	ns
			10	—	110	225	
			15	—	75	180	
		t_{PHL}	5.0	—	270	480	ns
			10	—	95	175	
			15	—	65	140	
	Expand	t_{PLH}	5.0	—	180	430	ns
			10	—	75	160	
			15	—	50	125	
		t_{PHL}	5.0	—	200	330	ns
			10	—	80	110	
			15	—	55	90	
	Inhibit	t_{PLH}	5.0	—	220	500	ns
			10	—	100	225	
			15	—	65	160	
		t_{PHL}	5.0	—	230	400	ns
			10	—	95	175	
			15	—	60	150	
Output Disable Time		t_{HZ}	5.0	—	60	150	ns
			10	—	45	110	
			15	—	35	90	
		t_{LZ}	5.0	—	90	225	ns
			10	—	55	140	
			15	—	40	100	
Output Enable Time		t_{ZH}	5.0	—	110	300	ns
			10	—	50	125	
			15	—	40	100	
		t_{ZL}	5.0	—	170	425	ns
			10	—	70	175	
			15	—	50	125	

■ SWITCHING TIME TEST CIRCUIT

● t_{PLH}, t_{PHL}



● t_{HZ}, t_{LZ}, t_{ZH}, t_{ZL}

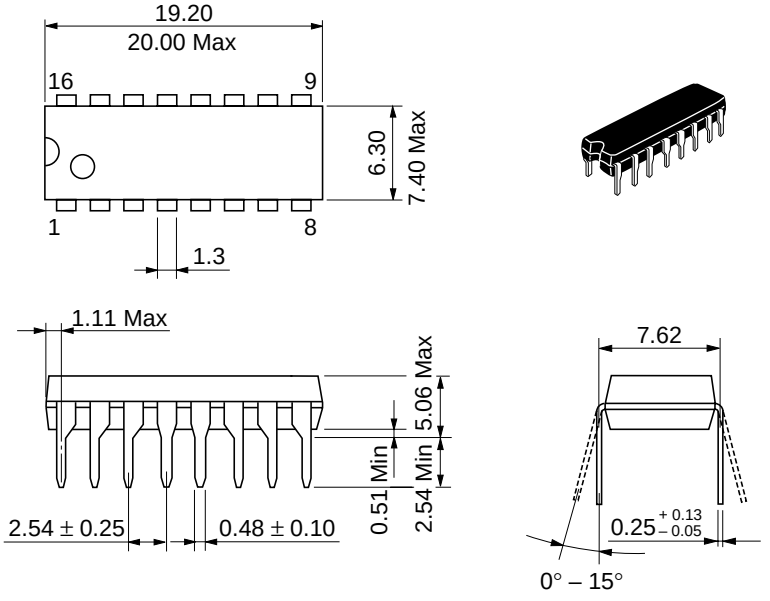


*To test other side of circuit connect to this output and change switch(S1) to other expand input (E)

Switch Positions

Test	S_1	S_2
t_{LZ}	A	A
t_{HZ}	B	B
t_{ZL}	A	A
t_{ZH}	B	B

Unit: mm


19.20
20.00 Max
16
9
6.30
7.40 Max
1
8
1.3
1.11 Max
5.06 Max
0.51 Min
2.54 Min
2.54 ± 0.25
0.48 ± 0.10
7.62
0.25 + 0.13 − 0.05
0° – 15°

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
NorthAmerica : 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
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 Stra§e 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