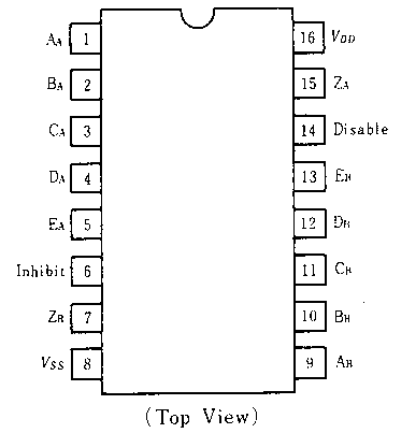# HD14506B

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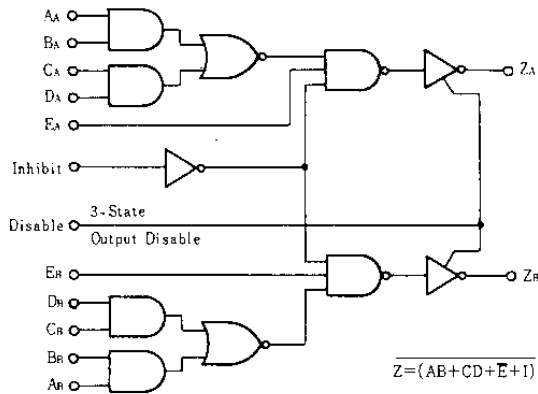
■ FEATURES
- Quiescent Current = 2nA/pkg typ. @5V
- 3-state Output
- Separate Inhibit Line
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
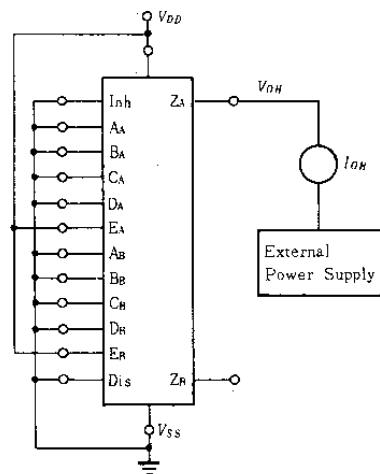
■ PIN ARRANGEMENT

(Top View)

■ LOGIC DIAGRAM

$$\overline{Z} = (AB + CD + \overline{E} + I)$$

■ 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

■ DC CHARACTERISTIC TEST CIRCUIT

● I_{OH}

● I_{OL}

● HITACHI

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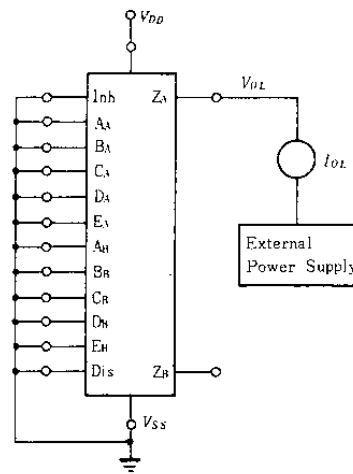
■ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	-40°C min	-40°C max	25°C min	25°C typ	25°C max	85°C min	85°C 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	$V_{OH}=2.5V$	-1.0	—	-0.8	-1.7	—	-0.6	—	mA
		5.0	$V_{OH}=4.6V$	-0.2	—	-0.16	-0.36	—	-0.12	—	
		10	$V_{OH}=9.5V$	-0.5	—	-0.4	-0.9	—	-0.3	—	
		15	$V_{OH}=13.5V$	-1.4	—	-1.2	-3.5	—	-1.0	—	
	I_{OL}	5.0	$V_{OL}=0.4V$	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL}=0.5V$	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL}=1.5V$	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

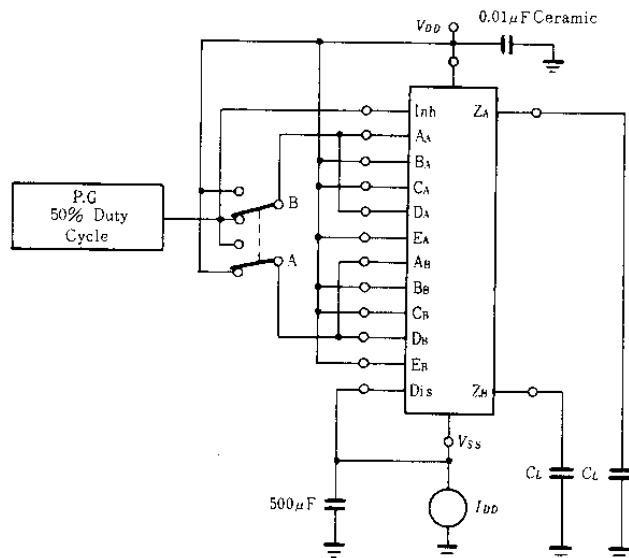* To calculate total supply current at frequency other than 1kHz.

@ $V_{DD}=5.0V$ $I_T=(0.6μA/kHz)f+I_{DD}$, @ $V_{DD}=10V$ $I_T=(1.1μA/kHz)f+I_{DD}$, @ $V_{DD}=15V$ $I_T=(1.7μA/kHz)f-I_{DD}$

■DC CHARACTERISTIC TEST CIRCUIT

● I_{TL}
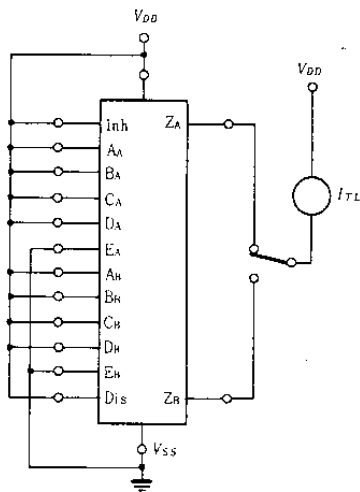
■POWER DISSIPATION TEST CIRCUIT

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● HITACHI

■SWITCHING CHARACTERISTICS ($C_L = 50 \text{pF}$, $Ta = 25°C$)

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	

◎ **HITACHI**

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■ SWITCHING TIME TEST CIRCUIT

● t_{PLH}, t_{PHL}
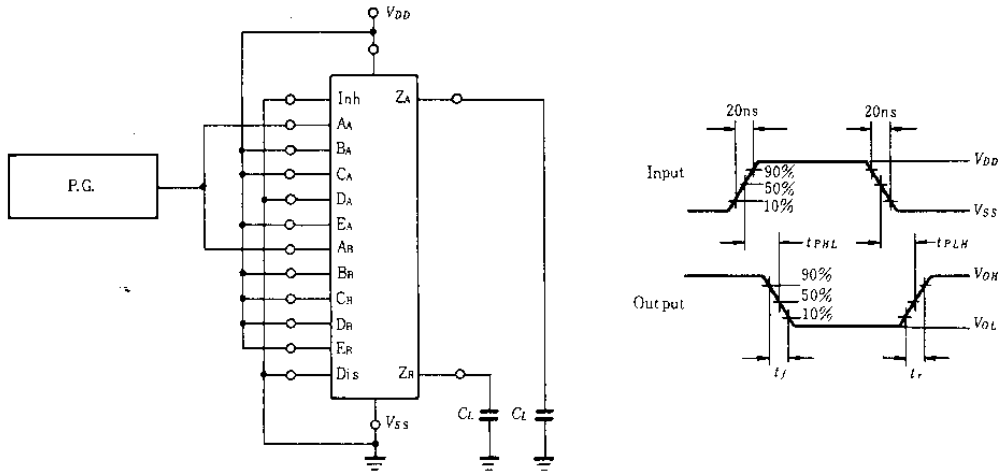
● t_{HZ}, t_{LZ}, t_{ZH}, t_{ZL}
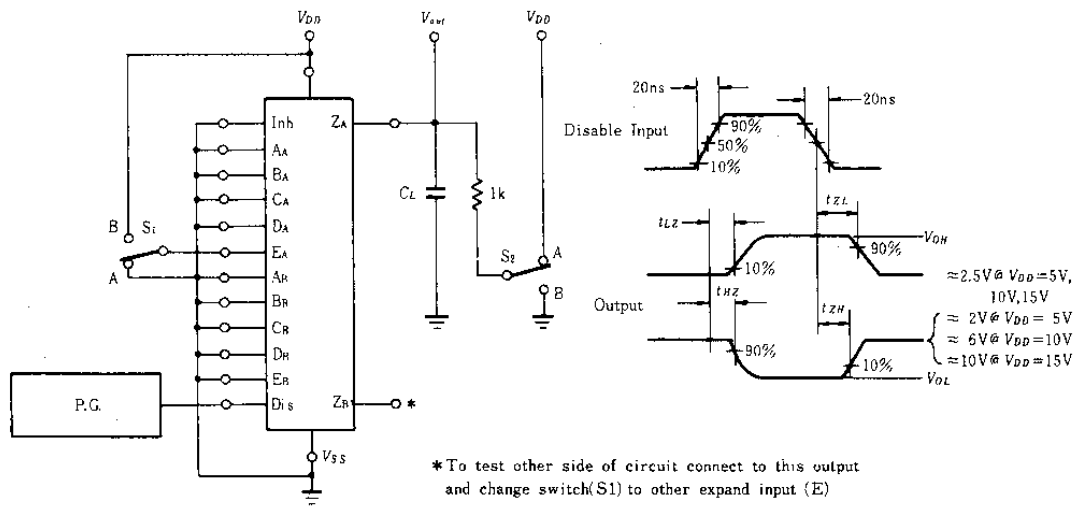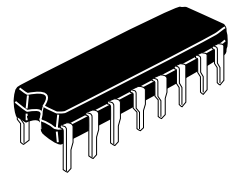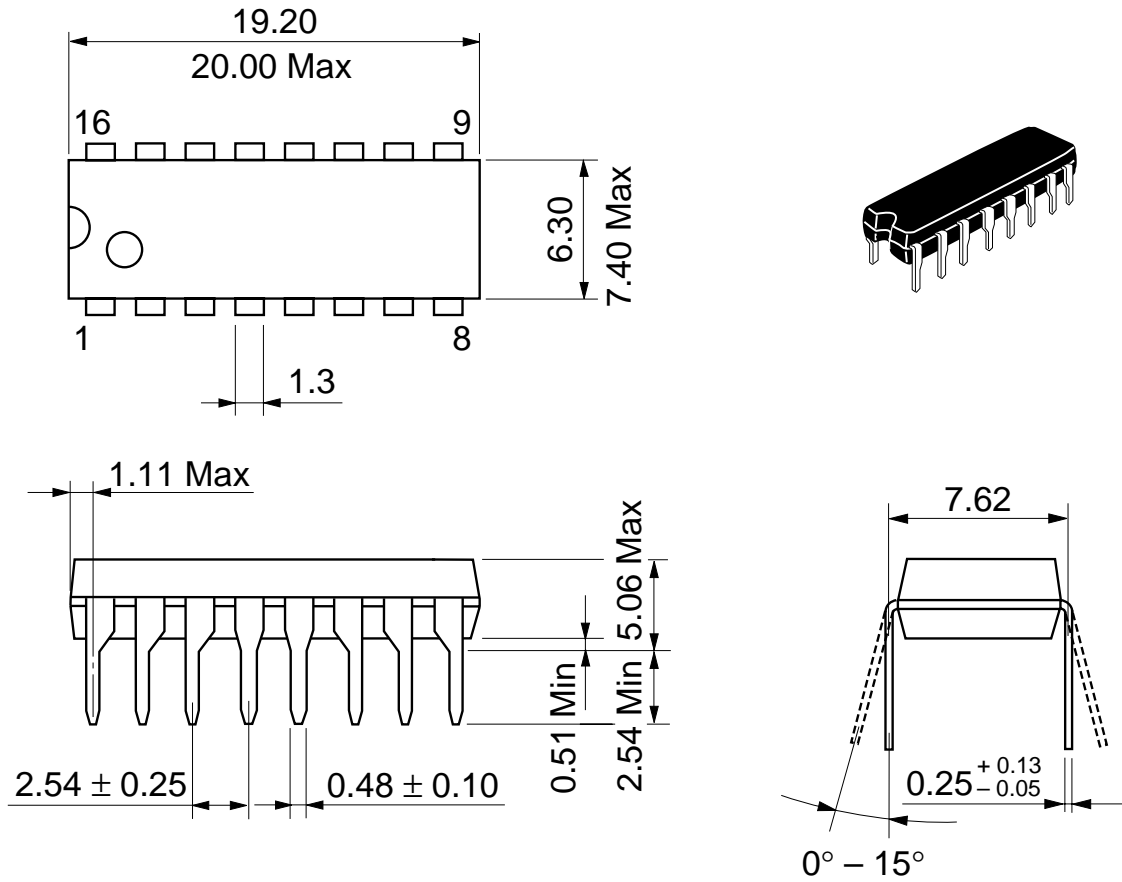

*To test other side of circuit connect to this output and change switch(S1) to other expand input (E)

Switch Positions

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

◎ HITACHI

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

$0.25 ^{+\,0.13}_{-\,0.05}$

$0° - 15°$

Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

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