

# HD74LVC245A

Octal Bidirectional Transceivers with 3-state Outputs

## HITACHI

ADE-205-111B(Z)  
3rd Edition  
December 1996

### Description

The HD74LVC245A has eight buffers with three state outputs in a 20 pin package. When ( $T/\bar{R}$ ) is high, data flows from the A inputs to the B outputs, and when ( $T/\bar{R}$ ) is low, data flows from the B inputs to the A outputs. A and B bus are separated by making enable input ( $\overline{OE}$ ) high level. Low voltage and high speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

### Features

- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs  $V_{IH}(\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V to }5.5\text{ V})$
- All input outputs  $V_{IO}(\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V or output off state})$
- Typical  $V_{OL}$  ground bounce  $< 0.8\text{ V} (@V_{CC} = 3.3\text{ V, }T_a = 25^\circ\text{C})$
- Typical  $V_{OH}$  undershoot  $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V, }T_a = 25^\circ\text{C})$
- High output current  $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$

### Function Table

$\overline{OE}$	Inputs		Operation
	$T/\bar{R}$		
L	L		B data to A bus
L	H		A data to B bus
H	X		Z

H: High level

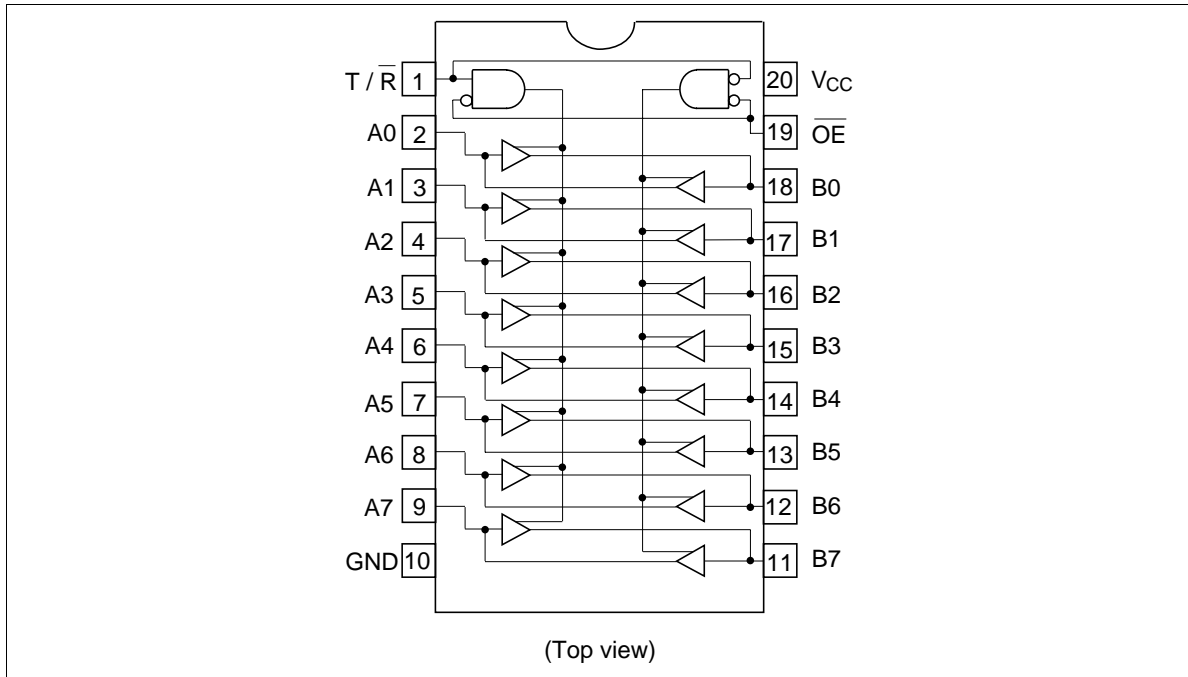
L: Low level

X: Immaterial

Z: High impedance

# HD74LVC245A

## Pin Arrangement



## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	-0.5 to 6.0	V	
Input diode current	$I_{IK}$	-50	mA	$V_I = -0.5\text{ V}$
Input voltage	$V_I$	-0.5 to 6.0	V	$T / \bar{R}, \bar{OE}$
Output diode current	$I_{OK}$	-50	mA	$V_O = -0.5\text{ V}$
		50	mA	$V_O = V_{CC} + 0.5\text{ V}$
Input / output voltage	$V_{IO}$	-0.5 to $V_{CC} + 0.5$	V	Output "H" or "L"
		-0.5 to 6.0	V	Output "Z" or $V_{CC}:OFF$
Output current	$I_O$	$\pm 50$	mA	
$V_{CC}$ , GND current / pin	$I_{CC}$ or $I_{GND}$	100	mA	
Storage temperature	Tstg	-65 to 150	$^{\circ}C$	

Note: 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	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	1.5 to 5.5	V	Data retention
		2.0 to 5.5	V	At operation
Input / output voltage	$V_I$	0 to 5.5	V	T / $\overline{R}$ , $\overline{OE}$
	$V_{IO}$	0 to $V_{CC}$	V	Output "H" or "L"
		0 to 5.5	V	Output "Z" or $V_{CC}$ :OFF
Operating temperature	$T_a$	-40 to 85	°C	
Output current	$I_{OH}$	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 <sup>2</sup>	mA	$V_{CC} = 3.0\text{ V to }5.5\text{ V}$
	$I_{OL}$	12	mA	$V_{CC} = 2.7\text{ V}$
		24 <sup>2</sup>	mA	$V_{CC} = 3.0\text{ V to }5.5\text{ V}$
Input rise / fall time <sup>1</sup>	$t_r, t_f$	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform : Refer to test circuit of switching characteristics.

2. duty cycle  $\leq$  50%

## HD74LVC245A

### Electrical Characteristics

Item	Symbol	$V_{CC}$ (V)	Ta = -40 to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	$V_{IH}$	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	$V_{CC} \times 0.7$	—	V	
	$V_{IL}$	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	$V_{CC} \times 0.3$	V	
Output voltage	$V_{OH}$	2.7 to 5.5	$V_{CC} - 0.2$	—	V	$I_{OH} = -100 \mu A$
		2.7	2.2	—	V	$I_{OH} = -12 \text{ mA}$
		3.0	2.4	—	V	
		3.0	2.2	—	V	$I_{OH} = -24 \text{ mA}$
		4.5	3.8	—	V	
	$V_{OL}$	2.7 to 5.5	—	0.2	V	$I_{OL} = 100 \mu A$
		2.7	—	0.4	V	$I_{OL} = 12 \text{ mA}$
		3.0	—	0.55	V	$I_{OL} = 24 \text{ mA}$
		4.5	—	0.55	V	
Input current	$I_{IN}$	0 to 5.5	—	$\pm 5.0$	$\mu A$	$V_{IN} = 5.5 \text{ V or GND}$
Off state output current	$I_{OZ}$	2.7 to 5.5	—	$\pm 5.0$	$\mu A$	$V_{IN} = V_{CC}, \text{ GND}$ $V_{OUT} = 5.5 \text{ V or GND}$
Output leak current	$I_{OFF}$	0	—	20	$\mu A$	$V_{IN} / V_{OUT} = 5.5 \text{ V}$
Quiescent supply current	$I_{CC}$	2.7 to 3.6	—	$\pm 10$	$\mu A$	$V_{IN} / V_{OUT} = 3.6 \text{ to } 5.5 \text{ V}$
		2.7 to 5.5	—	10	$\mu A$	$V_{IN} = V_{OUT} \text{ or GND}$
	$\Delta I_{CC}$	3.0 to 3.6	—	500	$\mu A$	$V_{IN} = \text{one input at } (V_{CC} - 0.6) \text{ V,}$ other inputs at $V_{CC}$ or GND

**Switching Characteristics**

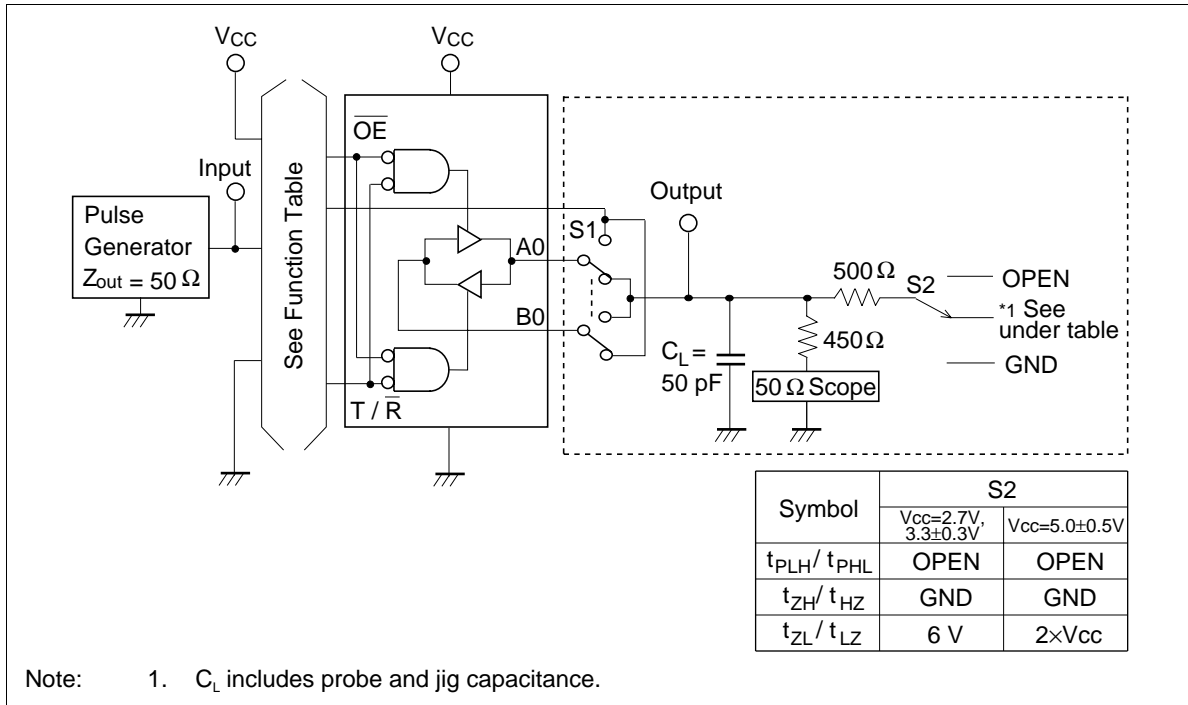
Item	Symbol	V <sub>cc</sub> (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t <sub>PLH</sub>	2.7	—	—	8.0	ns	A or B	B or A
	t <sub>PHL</sub>	3.3±0.3	1.5	—	7.0	ns		
		5.0±0.5	—	—	5.5	ns		
Output enable time	t <sub>ZH</sub>	2.7	—	—	9.5	ns	$\overline{\text{OE}}$	A or B
	t <sub>ZL</sub>	3.3±0.3	1.5	—	8.5	ns		
		5.0±0.5	—	—	7.0	ns		
Output disable time	t <sub>ZH</sub>	2.7	—	—	8.5	ns	$\overline{\text{OE}}$	A or B
	t <sub>LZ</sub>	3.3±0.3	1.5	—	7.5	ns		
		5.0±0.5	—	—	6.5	ns		
Between output pins skew <sup>*1</sup>	t <sub>OSLH</sub>	2.7	—	—	—	ns		
	t <sub>OSHL</sub>	3.3±0.3	—	—	1.0	ns		
		5.0±0.5	—	—	1.0	ns		
Input capacitance	C <sub>IN</sub>	2.7	—	3.0	—	pF		
Output capacitance	C <sub>O</sub>	2.7	—	15.0	—	pF		

Note: 1. This parameter is characterized but not tested.

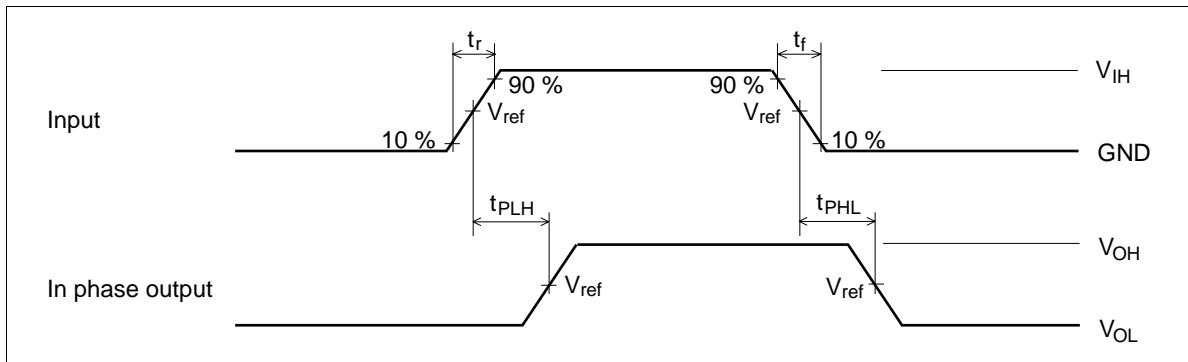
$$t_{\text{OSLH}} = |t_{\text{PLHm}} - t_{\text{PLHn}}|, \quad t_{\text{OSHL}} = |t_{\text{PHLm}} - t_{\text{PHLn}}|$$

# HD74LVC245A

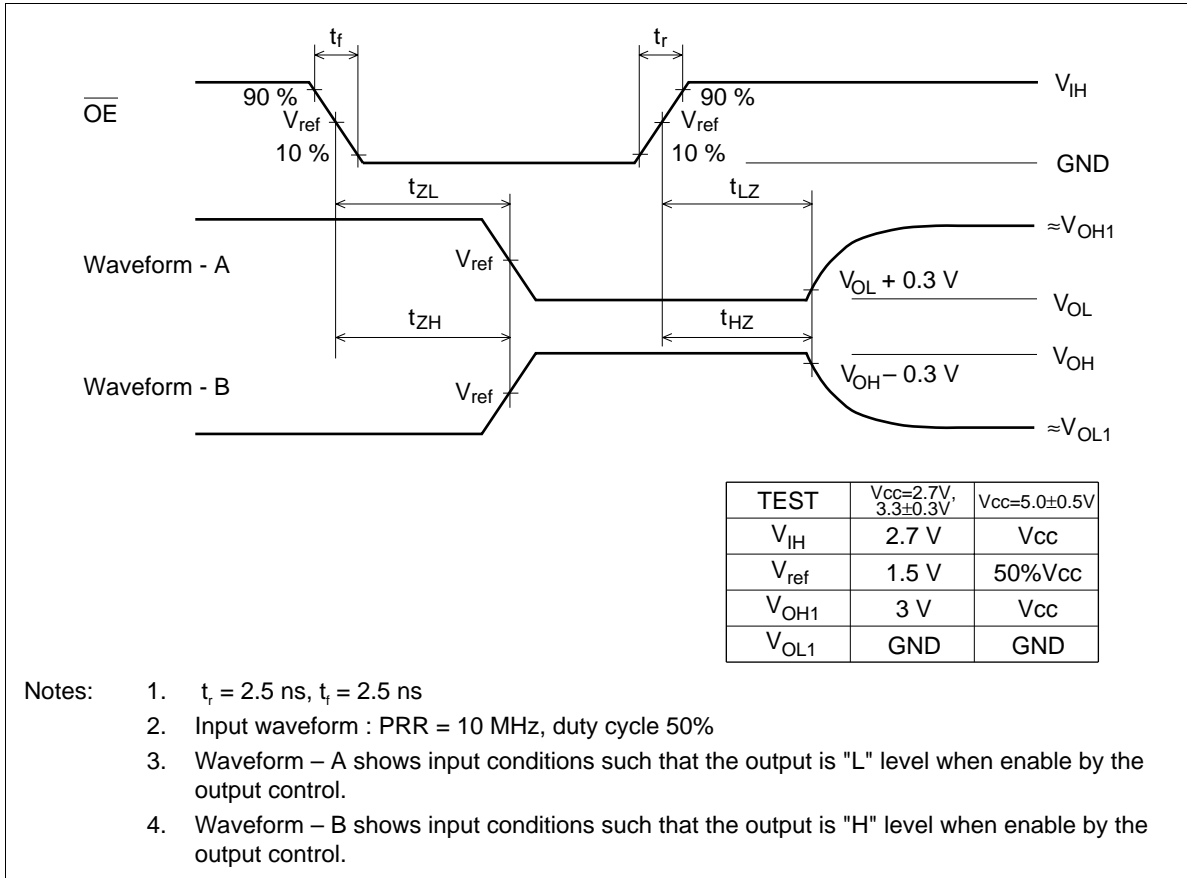
## Test Circuit



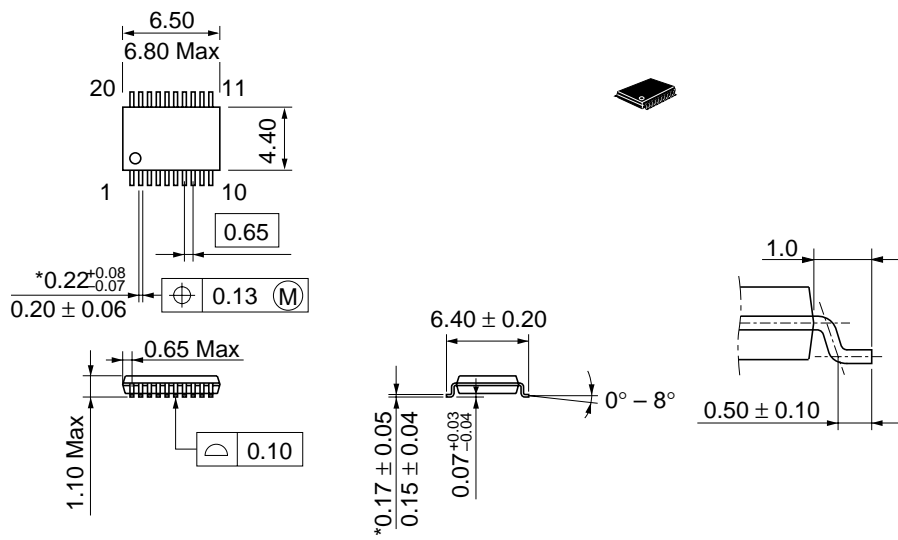
## Waveforms – 1



Waveforms – 2



Unit: mm





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