

HD74LVC245A

Octal Bidirectional Transceivers with 3-state Outputs

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

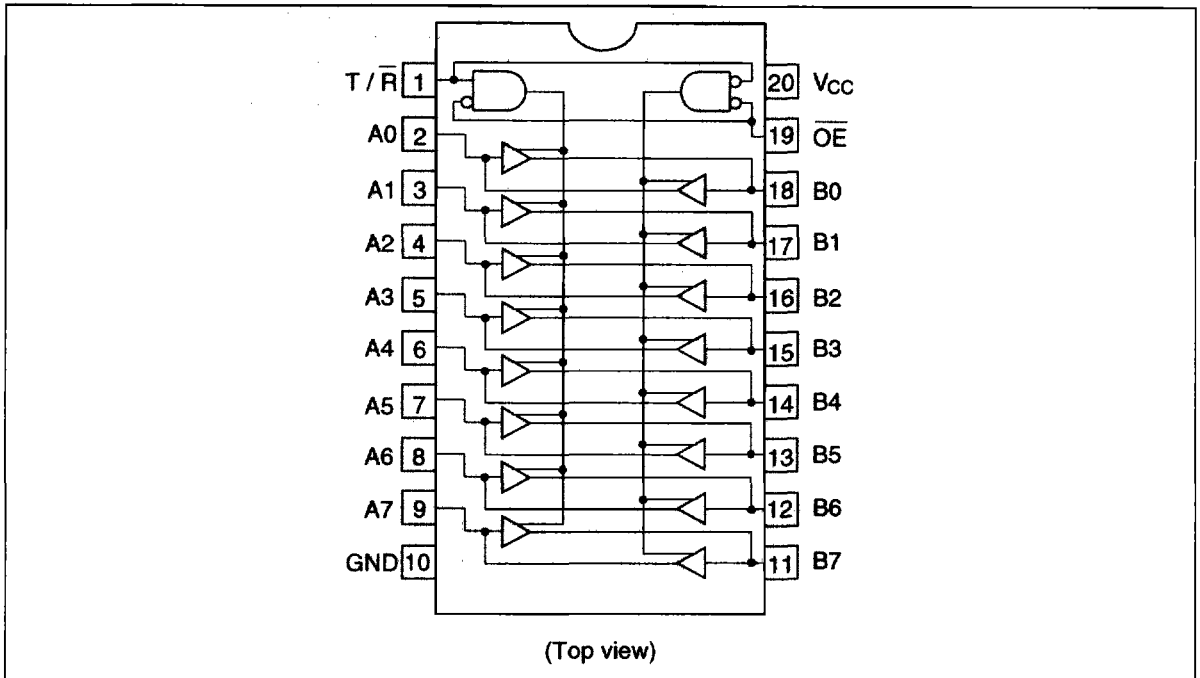
- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V}$ ($@V_{CC} = 0\text{ V to }5.5\text{ V}$)
- All input outputs $V_{IO}(\text{Max.}) = 5.5\text{ V}$ ($@V_{CC} = 0\text{ V}$ or output off state)
- Typical V_{OL} ground bounce $< 0.8\text{ V}$ ($@V_{CC} = 3.3\text{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

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

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

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} , \overline{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_{VO}	-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	± 50	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	100	mA	
Storage temperature	Tstg	-65 to 150	$^{\circ}\text{C}$	

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.

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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 / \bar{R} , \bar{OE}
	V_{VO}	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	$V_{CC} = 2.7$ V
		-24 ²	mA	$V_{CC} = 3.0$ V to 5.5 V
	I_{OL}	12	mA	$V_{CC} = 2.7$ V
		24 ²	mA	$V_{CC} = 3.0$ V to 5.5 V
Input rise / fall time ¹	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%

Electrical Characteristics

Item	Symbol	V_{CC} (V)	$T_a = -40$ 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	$I_{OH} = -100 \mu\text{A}$
		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	$I_{OL} = 100 \mu\text{A}$
		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	—	± 5.0	μA	$V_{IN} = 5.5 \text{ V or GND}$
Off state output current	I_{OZ}	2.7 to 5.5	—	± 5.0	μA	$V_{IN} = V_{CC}, \text{ GND}$ $V_{OUT} = 5.5 \text{ V or GND}$
Output leak current	I_{OFF}	0	—	20	μA	$V_{IN} / V_{OUT} = 5.5 \text{ V}$
Quiescent supply current	I_{CC}	2.7 to 3.6	—	± 10	μA	$V_{IN} / V_{OUT} = 3.6$ to 5.5 V
		2.7 to 5.5	—	10	μA	$V_{IN} = V_{OUT}$ or GND
	ΔI_{CC}	3.0 to 3.6	—	500	μA	$V_{IN} =$ one input at $(V_{CC} - 0.6)\text{V}$, other inputs at V_{CC} or GND

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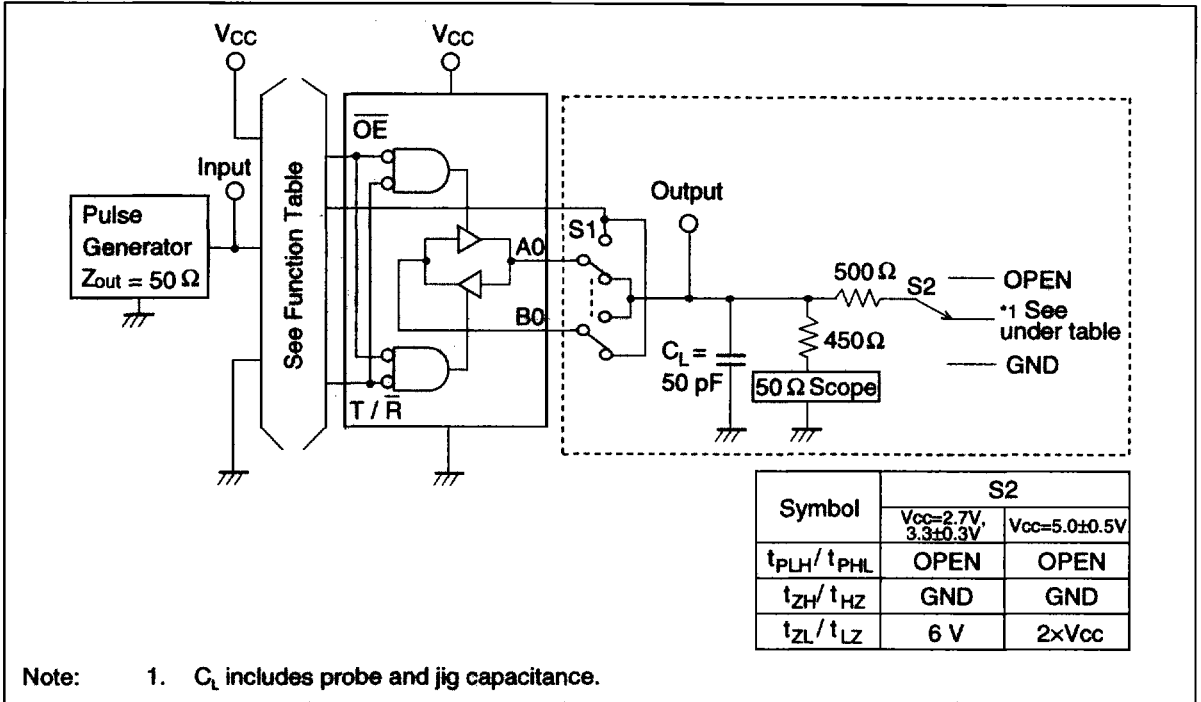
Switching Characteristics

Item	Symbol	V _{cc} (V)	T _a = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t _{PLH}	2.7	—	—	8.0	ns	A or B	B or A
	t _{PHL}	3.3±0.3	1.5	—	7.0	ns		
		5.0±0.5	—	—	5.5	ns		
Output enable time	t _{ZH}	2.7	—	—	9.5	ns	\overline{OE}	A or B
	t _{ZL}	3.3±0.3	1.5	—	8.5	ns		
		5.0±0.5	—	—	7.0	ns		
Output disable time	t _{ZH}	2.7	—	—	8.5	ns	\overline{OE}	A or B
	t _{ZL}	3.3±0.3	1.5	—	7.5	ns		
		5.0±0.5	—	—	6.5	ns		
Between outut pins skew ^{††}	t _{OSLH}	2.7	—	—	—	ns		
	t _{OSHL}	3.3±0.3	—	—	1.0	ns		
		5.0±0.5	—	—	1.0	ns		
Input capacitance	C _{IN}	2.7	—	3.0	—	pF		
Output capacitance	C _O	2.7	—	15.0	—	pF		

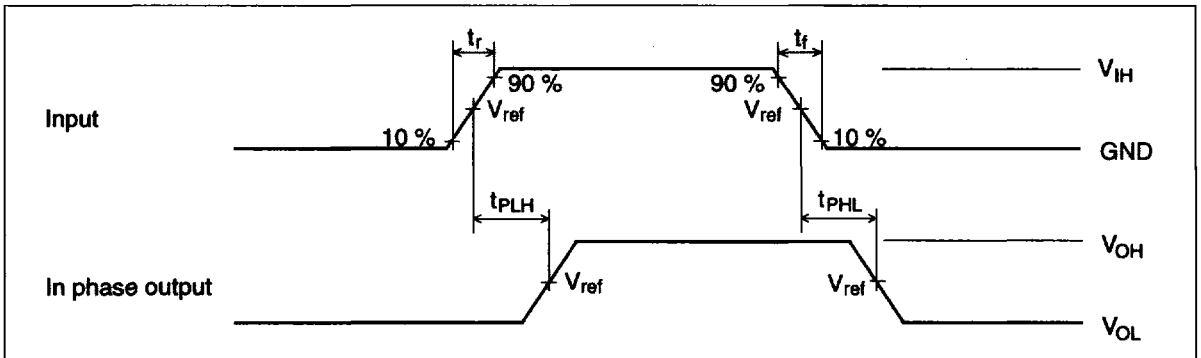
Note: 1. This parameter is characterized but not tested.

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

Test Circuit

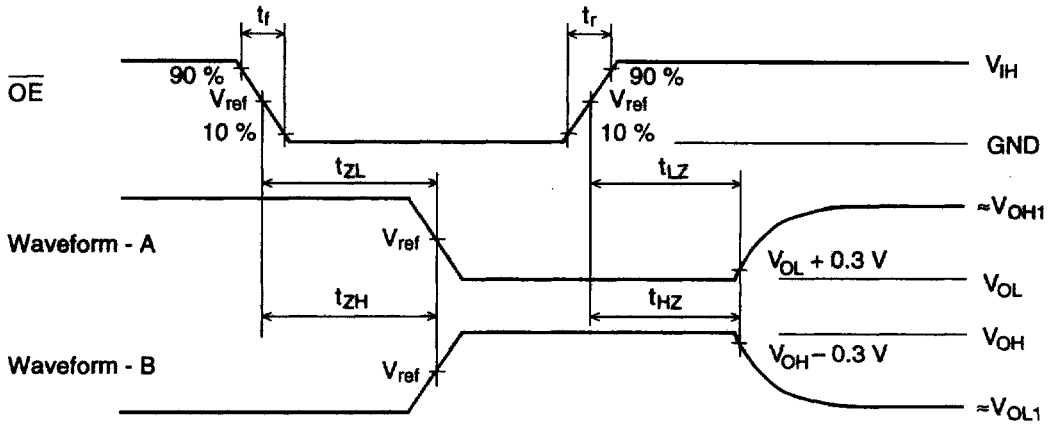


Waveforms - 1



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Waveforms - 2



TEST	$V_{CC}=2.7V$, $3.3\pm 0.3V$	$V_{CC}=5.0\pm 0.5V$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	$50\%V_{CC}$
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

- Notes:
- $t_f = 2.5 \text{ ns}$, $t_r = 2.5 \text{ ns}$
 - Input waveform : PRR = 10 MHz, duty cycle 50%
 - Waveform - A shows input conditions such that the output is "L" level when enable by the output control.
 - Waveform - B shows input conditions such that the output is "H" level when enable by the output control.