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 / $\overline{R}$) is high, data flows from the A inputs to the B outputs, and when (T / $\overline{R}$) 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 V to 5.5 V
- All inputs V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)
- All input outputs $V_{I/O}$ (Max.) = 5.5 V (@V_{CC} = 0 V or output off state)
- Typical V_{OL} ground bounce < 0.8 V (@V_{CC} = 3.3 V, Ta = 25°C)
- Typical V_{OH} undershoot > 2.0 V (@V_{CC} = 3.3 V, Ta = 25°C)
- High output current ±24 mA (@V_{CC} = 3.0 V to 5.5 V)

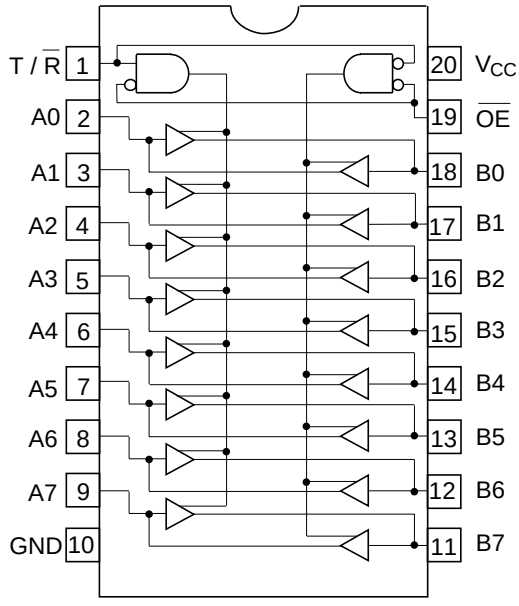
Function Table

Inputs		
$\overline{OE}$	T / $\overline{R}$	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

Hitachi semiconductor

Pin Arrangement



(Top view)

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 V
Input voltage	V_I	–0.5 to 6.0	V	T / $\overline{R}$, $\overline{OE}$
Output diode current	I_{OK}	–50	mA	V_O = –0.5 V
		50	mA	V_O = V_{CC} +0.5 V
Input / output voltage	$V_{I/O}$	–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	°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 / $\overline{R}$, $\overline{OE}$
	$V_{I/O}$	0 to V_{CC}	V	Output "H" or "L"
		0 to 5.5	V	Output "Z" or V_{CC}:OFF
Operating temperature	Ta	–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 ≤ 50%

Electrical Characteristics

			Ta = –40 to 85°C			
Item	**Symbol**	**V_{CC} (V)**	**Min**	**Max**	**Unit**	**Test Conditions**
Input voltage	V_{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	V_{CC}×0.7	—	V	
	V_{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	V_{CC}×0.3	V	
Output voltage	V_{OH}	2.7 to 5.5	V_{CC} –0.2	—	V	I_{OH} = –100 µA
		2.7	2.2	—	V	I_{OH} = –12 mA
		3.0	2.4	—	V	
		3.0	2.2	—	V	I_{OH} = –24 mA
		4.5	3.8	—	V	
	V_{OL}	2.7 to 5.5	—	0.2	V	I_{OL} = 100 µA
		2.7	—	0.4	V	I_{OL} = 12 mA
		3.0	—	0.55	V	I_{OL} = 24 mA
		4.5	—	0.55	V	
Input current	I_{IN}	0 to 5.5	—	±5.0	µA	V_{IN} = 5.5 V or GND
Off state output current	I_{OZ}	2.7 to 5.5	—	±5.0	µA	V_{IN} = V_{CC}, GND V_{OUT} = 5.5 V or GND
Output leak current	I_{OFF}	0	—	20	µA	V_{IN} / V_{OUT} = 5.5 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)V, other inputs at V_{CC} or GND

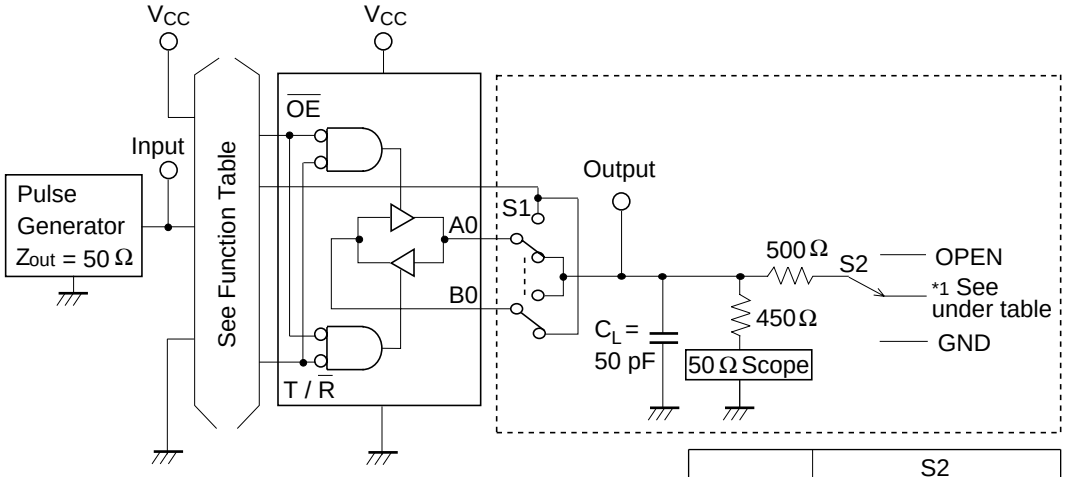
Switching Characteristics

			Ta = –40 to 85°C					
Item	**Symbol**	**V_{cc} (V)**	**Min**	**Typ**	**Max**	**Unit**	**From (Input)**	**To (Output)**
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_{LZ}	3.3±0.3	1.5	—	7.5	ns		
		5.0±0.5	—	—	6.5	ns		
Between outut pins skew [*1]	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.

$tos_{LH} = | t_{PLHm} - t_{PLHn} |$, $tos_{HL} = | t_{PHLm} - t_{PHLn} |$

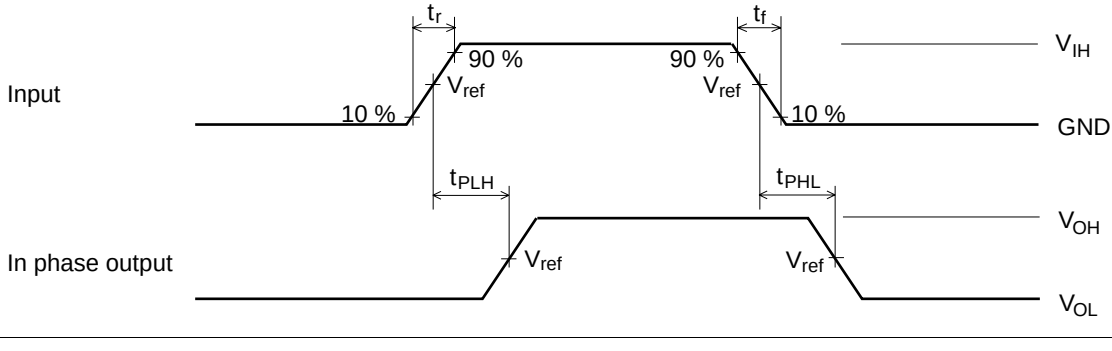
Test Circuit



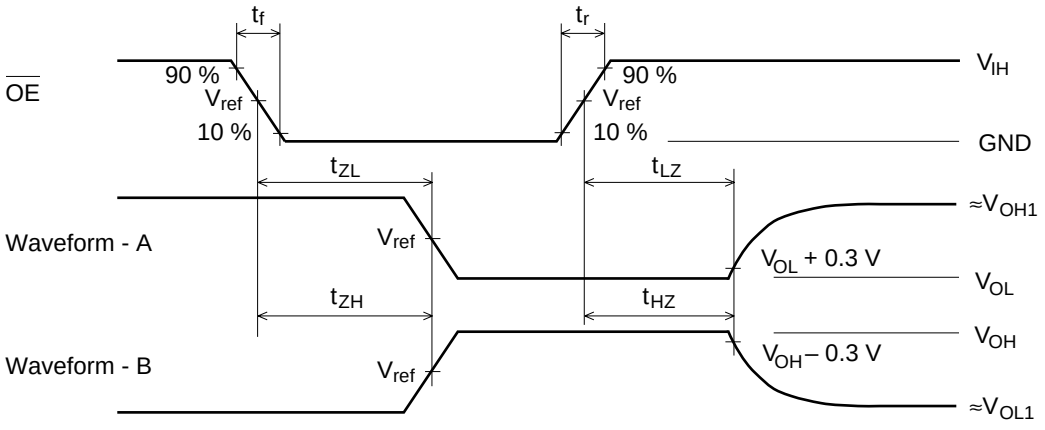
Symbol	S2	
	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±0.5V
t_{PLH}/ t_{PHL}	OPEN	OPEN
t_{ZH}/ t_{HZ}	GND	GND
t_{ZL} / t_{LZ}	6 V	2×Vcc

Note: 1. C_L includes probe and jig capacitance.

Waveforms – 1



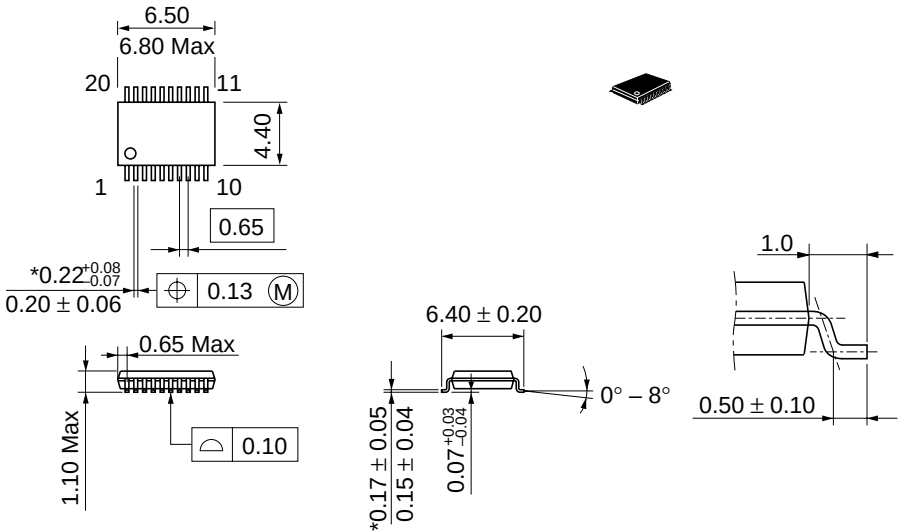
Waveforms – 2



TEST	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±0.5V
V_{IH}	2.7 V	Vcc
V_{ref}	1.5 V	50%Vcc
V_{OH1}	3 V	Vcc
V_{OL1}	GND	GND

Notes:
1. t_r = 2.5 ns, t_f = 2.5 ns
2. Input waveform : PRR = 10 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.

Unit: mm



Hitachi Code	TTP-20DA
JEDEC	—
EIAJ	—
Weight (reference value)	0.07 g

*Dimension including the plating thickness
Base material dimension

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