
HD74LVC16245A

16-bit Bus Transceivers with 3-state Outputs

HITACHI

ADE-205-120B(Z)
3rd Edition
December 1996

Description

The HD74LVC16245A has sixteen two direction buffers, for the fittest at two direction bus lines with three state outputs. A direction control input, DIR. When DIR is high, data flows from the A inputs to the B outputs. When DIR is high, data flows from the B inputs to the A outputs. When enable inputs (\bar{G}) is high, disables both A and B ports by placing them in a high impedance. 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 outputs $V_{OUT}(\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V or output off state})$
- 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 $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$

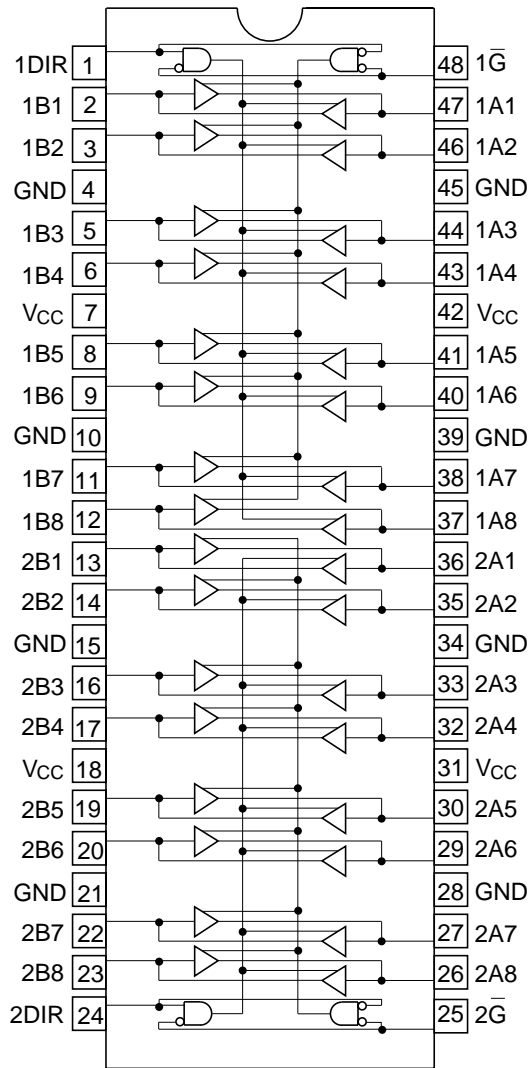
Function Table

Inputs		Operation
\bar{G}	DIR	
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

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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	$V_I = -0.5\text{ V}$
Input voltage	V_I	-0.5 to 6.0	V	\overline{G} , DIR
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 $V_{CC}:\text{OFF}$
Output current	I_O	± 50	mA	
V_{CC} , GND current / pin	I_{CC} or I_{GND}	100	mA	
Storage temperature	T_{stg}	-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.

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	\overline{G} , DIR
	V_{IO}	0 to V_{CC}	V	Output "H" or "L"
		0 to 5.5	V	Output "Z" or $V_{CC}:\text{OFF}$
Operating temperature	T_a	-40 to 85	$^{\circ}\text{C}$	
Output current	I_{OH}	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24^{*2}	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
	I_{OL}	12	mA	$V_{CC} = 2.7\text{ V}$
		24^{*2}	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
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 $\leq 50\%$

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Electrical Characteristics

Item	Symbol	V_{CC} (V)	$T_a = -40 \text{ to } 85^\circ\text{C}$		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	—	± 20	μA	$V_{IN} / V_{OUT} = 3.6 \text{ to } 5.5 \text{ V}$
		2.7 to 5.5	—	20	μA	$V_{IN} = V_{CC} \text{ or GND}$
	ΔI_{CC}	3.0 to 3.6	—	500	μA	$V_{IN} = \text{one input at } (V_{CC} - 0.6)\text{V},$ other inputs at $V_{CC} \text{ or GND}$

Switching Characteristics

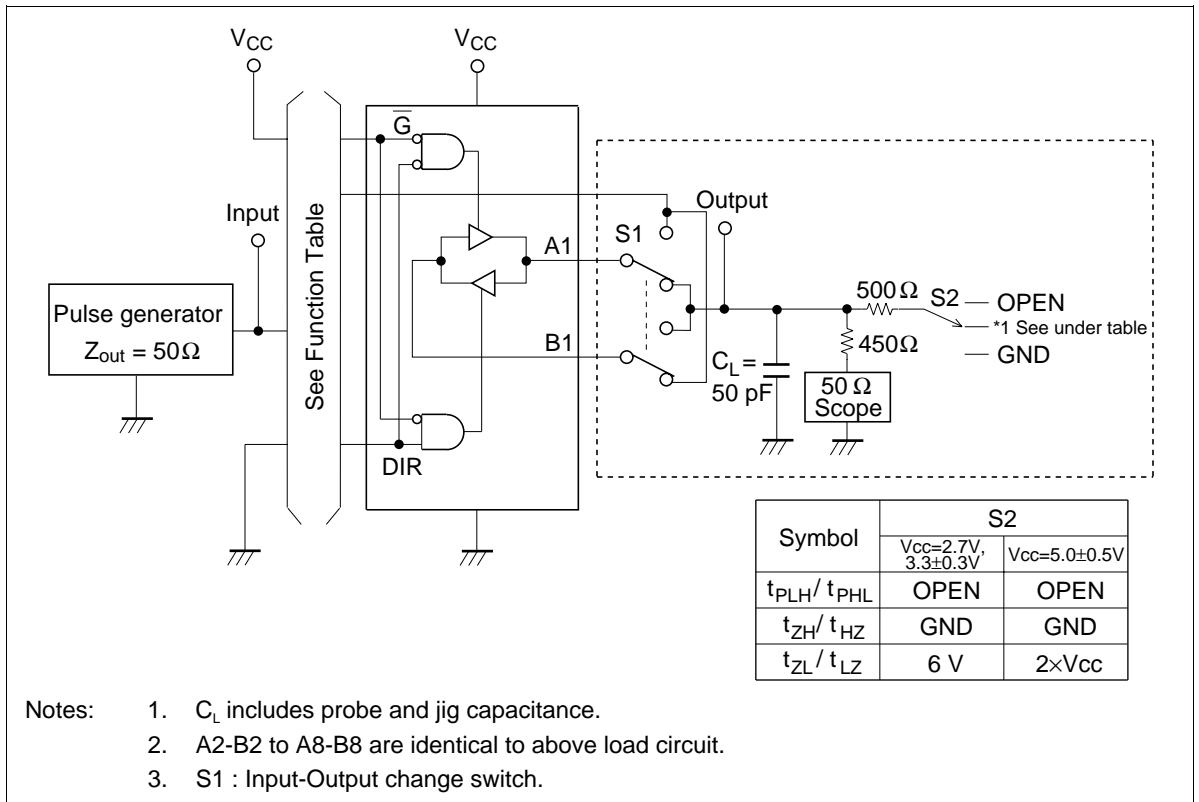
Item	Symbol	V _{CC} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t _{PLH}	2.7	—	—	5.8	ns	A or B	B or A
	t _{PHL}	3.3±0.3	1.5	—	5.2	ns		
		5.0±0.5	—	—	4.5	ns		
Output enable time	t _{ZH}	2.7	—	—	8.0	ns	\overline{G}	B or A
	t _{ZL}	3.3±0.3	1.5	—	7.2	ns		
		5.0±0.5	—	—	6.0	ns		
Output disable time	t _{HZ}	2.7	—	—	8.0	ns	\overline{G}	B or A
	t _{LZ}	3.3±0.3	1.5	—	7.2	ns		
		5.0±0.5	—	—	6.0	ns		
Between output 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.

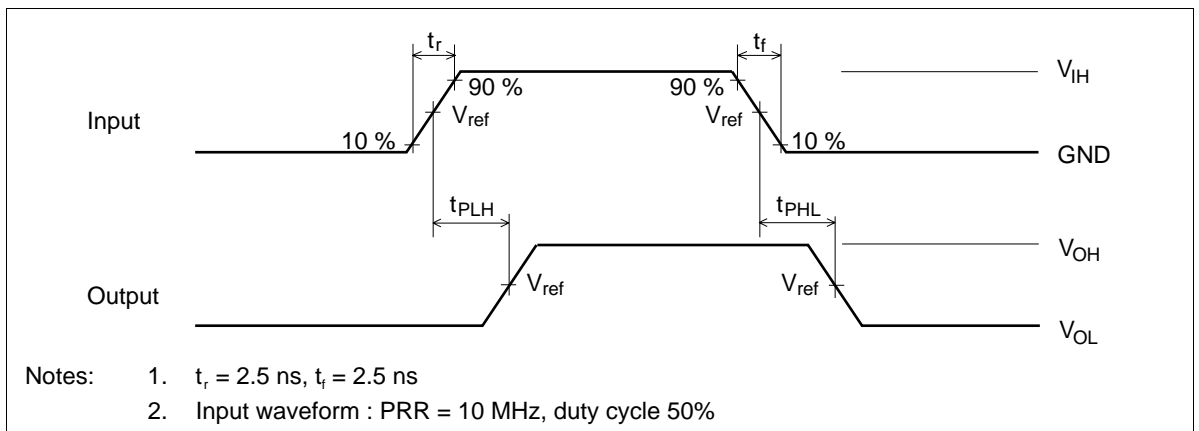
$$tos_{LH} = |t_{PLHm} - t_{PLHn}|, tos_{HL} = |t_{PHLm} - t_{PHLn}|$$

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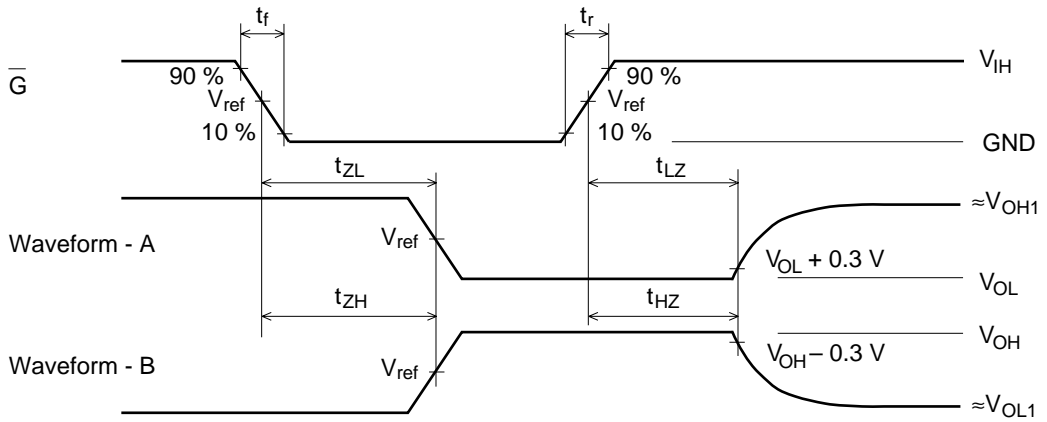
Test Circuit



Waveforms – 1

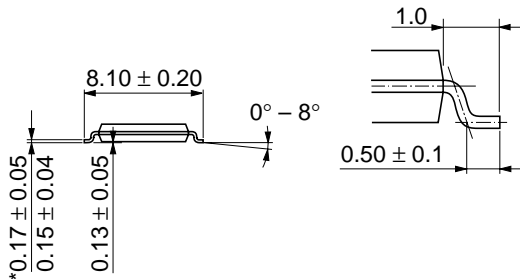
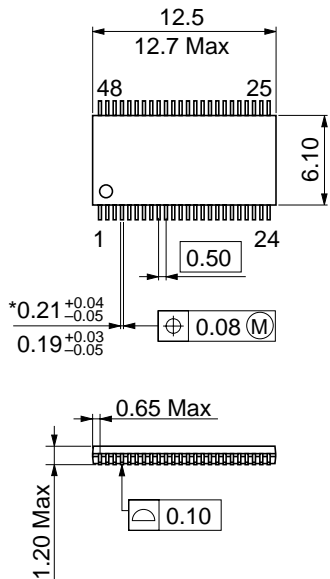


Waveforms – 2



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:
- $t_r = 2.5 \text{ ns}$, $t_f = 2.5 \text{ ns}$
 - 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.



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-48DB
JEDEC	—
EIAJ	—
Weight (reference value)	0.20 g

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