

HD74LV245A

Octal Bus Transceivers with 3-state Outputs

HITACHI

ADE-205-247 (Z)

1st Edition

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Description

The HD74LV245A has eight buffers with three-state outputs in a 20-pin package. When DIR is high, data is transferred from the A inputs to the B outputs, and when DIR is low, data is transferred from the B inputs to the A outputs. The A and B buses are separated by making the enable input ($\overline{\text{OE}}$) high level. Low-voltage operation is suitable for battery-powered products (e.g., notebook computers), and the low power consumption extends the battery life.

Features

- $V_{\text{CC}} = 2.0 \text{ V}$ to 5.5 V operation
- All inputs V_{IH} (Max.) = 5.5 V (@ $V_{\text{CC}} = 0 \text{ V}$ to 5.5 V)
- All outputs V_{O} (Max.) = 5.5 V (@ $V_{\text{CC}} = 0 \text{ V}$)
- Typical V_{OL} ground bounce $< 0.8 \text{ V}$ (@ $V_{\text{CC}} = 3.3 \text{ V}$, $T_{\text{a}} = 25^{\circ}\text{C}$)
- Typical V_{OH} undershoot $> 2.3 \text{ V}$ (@ $V_{\text{CC}} = 3.3 \text{ V}$, $T_{\text{a}} = 25^{\circ}\text{C}$)
- Output current $\pm 8 \text{ mA}$ (@ $V_{\text{CC}} = 3.0 \text{ V}$ to 3.6 V), $\pm 16 \text{ mA}$ (@ $V_{\text{CC}} = 4.5 \text{ V}$ to 5.5 V)

Function Table

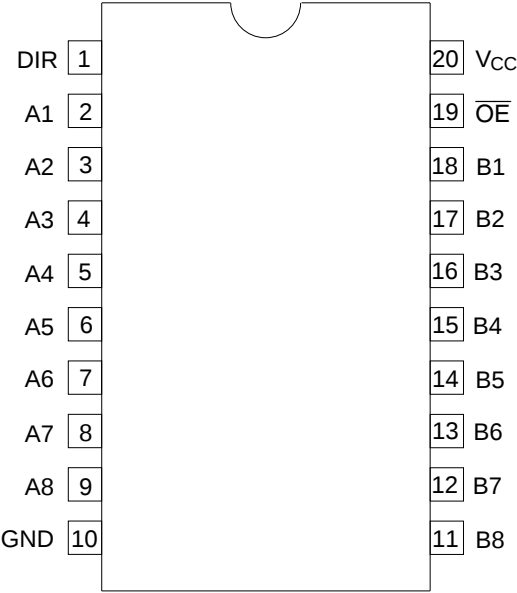
Inputs		
$\overline{\text{OE}}$	DIR	Operation
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

Note: H: High level

L: Low level

X: Immaterial

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	V _{CC}	−0.5 to 7.0	V	
Input voltage range* ¹	V _I	−0.5 to 7.0	V	
Output voltage range* ^{1, *2}	V _O	−0.5 to V _{CC} + 0.5 −0.5 to 7.0	V	Output: H or L V _{CC} : OFF or Output: Z
Input clamp current	I _{IK}	−20	mA	V _I < 0
Output clamp current	I _{OK}	±50	mA	V _O < 0 or V _O > V _{CC}
Continuous output current	I _O	±35	mA	V _O = 0 to V _{CC}
Continuous current through V _{CC} or GND	I _{CC} or I _{GND}	±70	mA	
Maximum power dissipation at Ta = 25°C (in still air)* ³	P _T	835 757	mW	SOP TSSOP
Storage temperature	Tstg	−65 to 150	°C	

Notes: 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..

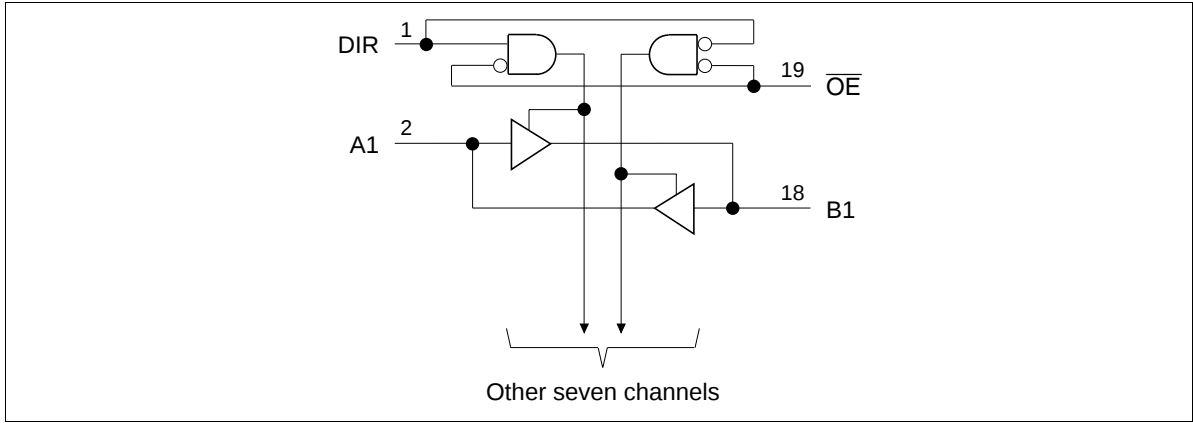
- 1. The input and output voltage ratings may be exceeded even if the input and output clamp-current ratings are observed.
- 2. This value is limited to 5.5 V maximum.
- 3. The data above are measured by ΔV_{BE} method mounting on glass epoxy board (40 × 40 × 1.6 mm) with 10% of wiring density.

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V _{CC}	2.0	5.5	V	
Input voltage range	V _I	0	5.5	V	
Output voltage range	V _O	0	V _{CC}	V	Output: H or L
		0	5.5		High impedance state
Output current	I _{OH}	—	−50	μA	V _{CC} = 2.0 V
		—	−2	mA	V _{CC} = 2.3 to 2.7 V
		—	−8		V _{CC} = 3.0 to 3.6 V
		—	−16		V _{CC} = 4.5 to 5.5 V
	I _{OL}	—	50	μA	V _{CC} = 2.0 V
		—	2	mA	V _{CC} = 2.3 to 2.7 V
		—	8		V _{CC} = 3.0 to 3.6 V
		—	16		V _{CC} = 4.5 to 5.5 V
Input transition rise or fall rate	Δt / Δv	0	200	ns/V	V _{CC} = 2.3 to 2.7 V
		0	100		V _{CC} = 3.0 to 3.6 V
		0	20		V _{CC} = 4.5 to 5.5 V
Operating free-air temperature	T _a	−40	85	°C	

Note: Unused or floating inputs must be held high or low.

Logic Diagram



DC Electrical Characteristics

• Ta = -40 to 85°C

Item	Symbol	V _{CC} (V)* ¹	Min	Typ	Max	Unit	Test Conditions
Input voltage	V _{IH}	2.0	1.5	—	—	V	
		2.3 to 2.7	V _{CC} × 0.7	—	—		
		3.0 to 3.6	V _{CC} × 0.7	—	—		
		4.5 to 5.5	V _{CC} × 0.7	—	—		
	V _{IL}	2.0	—	—	0.5		
		2.3 to 2.7	—	—	V _{CC} × 0.3		
		3.0 to 3.6	—	—	V _{CC} × 0.3		
		4.5 to 5.5	—	—	V _{CC} × 0.3		
Output voltage	V _{OH}	Min to Max	V _{CC} - 0.1	—	—	V	I _{OH} = -50 μA
		2.3	2.0	—	—		I _{OH} = -2 mA
		3.0	2.48	—	—		I _{OH} = -8 mA
		4.5	3.8	—	—		I _{OH} = -16 mA
	V _{OL}	Min to Max	—	—	0.1		I _{OL} = 50 μA
		2.3	—	—	0.4		I _{OL} = 2 mA
		3.0	—	—	0.44		I _{OL} = 8 mA
		4.5	—	—	0.55		I _{OL} = 16 mA
Input current	I _{IN}	0 to 5.5	—	—	±1	μA	V _{IN} = 5.5 V or GND
Off-state output current	I _{OZ} * ²	5.5	—	—	±5	μA	V _O = V _{CC} or GND
Quiescent supply current	I _{CC}	5.5	—	—	20	μA	V _{IN} = V _{CC} or GND, I _O = 0
Output leakage current	I _{OFF}	0	—	—	5	μA	V _O = 5.5 V
Input capacitance	C _{IN}	3.3	—	3.0	—	pF	V _I = V _{CC} or GND
Output capacitance	C _O	3.3	—	5.5	—	pF	V _O = V _{CC} or GND

Notes: 1. For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.
2. For I/O ports, the parameter I_{OZ} includes the input leakage current.

Switching Characteristics

• $V_{CC} = 2.5 \pm 0.2 \text{ V}$

		Ta = 25°C			Ta = -40 to 85°C					
Item	Symbol	Min	Typ	Max	Min	Max	Unit	Test Conditions	FROM (Input)	TO (Output)
Propagation delay time	t_{PLH}	—	8.3	13.0	1.0	15.0	ns	$C_L = 15 \text{ pF}$	A or B	B or A
	t_{PHL}	—	11.2	15.9	1.0	18.0		$C_L = 50 \text{ pF}$		
Enable time	t_{ZH}	—	11.8	19.9	1.0	22.0	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	A or B
	t_{ZL}	—	14.1	22.7	1.0	26.0		$C_L = 50 \text{ pF}$		
Disable time	t_{HZ}	—	11.8	18.1	1.0	20.0	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	A or B
	t_{LZ}	—	17.6	23.1	1.0	25.0		$C_L = 50 \text{ pF}$		

• $V_{CC} = 3.3 \pm 0.3 \text{ V}$

		Ta = 25°C			Ta = -40 to 85°C					
Item	Symbol	Min	Typ	Max	Min	Max	Unit	Test Conditions	FROM (Input)	TO (Output)
Propagation delay time	t_{PLH}	—	5.9	8.4	1.0	10.0	ns	$C_L = 15 \text{ pF}$	A or B	B or A
	t_{PHL}	—	7.9	11.9	1.0	13.5		$C_L = 50 \text{ pF}$		
Enable time	t_{ZH}	—	8.2	13.2	1.0	15.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	A or B
	t_{ZL}	—	9.9	16.7	1.0	19.0		$C_L = 50 \text{ pF}$		
Disable time	t_{HZ}	—	9.6	16.5	1.0	19.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	A or B
	t_{LZ}	—	13.9	19.8	1.0	22.0		$C_L = 50 \text{ pF}$		

Switching Characteristics (cont)

- $V_{CC} = 5.0 \pm 0.5 \text{ V}$

Item	Symbol	Ta = 25°C			Ta = −40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t _{PLH}	—	4.3	5.5	1.0	6.5	ns	C _L = 15 pF	A or B	B or A
	t _{PHL}	—	5.6	7.5	1.0	8.5		C _L = 50 pF		
Enable time	t _{ZH}	—	5.7	8.5	1.0	10.0	ns	C _L = 15 pF	$\overline{OE}$	A or B
	t _{ZL}	—	7.0	10.6	1.0	12.0		C _L = 50 pF		
Disable time	t _{HZ}	—	7.8	12.8	1.0	14.2	ns	C _L = 15 pF	$\overline{OE}$	A or B
	t _{LZ}	—	10.9	14.7	1.0	16.0		C _L = 50 pF		

Output-skew Characteristics

- $C_L = 50\text{ pF}$

Item	Symbol	$V_{CC}\text{ (V)}$	$T_a = 25^\circ\text{C}$		$T_a = -40\text{ to }85^\circ\text{C}$		Unit
			Min	Max	Min	Max	
Output skew	$t_{sk(O)}$	2.3 to 2.7	—	2.0	—	2.0	ns
		3.0 to 3.6	—	1.5	—	1.5	
		4.5 to 5.5	—	1.0	—	1.0	

Note: Skew between any outputs of the me package switching in the same direction. This parameter is warranted but not production tested.

Operating Characteristics

- $C_L = 50\text{ pF}$

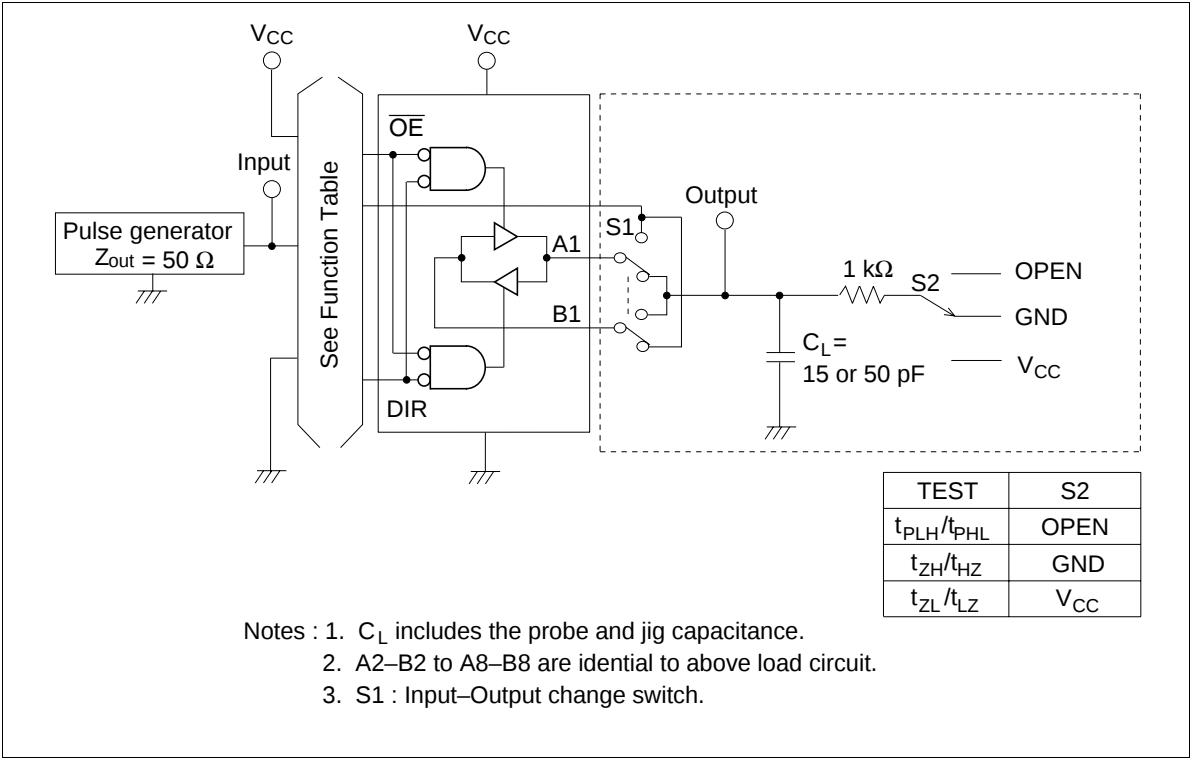
Item	Symbol	$V_{CC}\text{ (V)}$	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	3.3	—	20.0	—	pF	$f = 10\text{ MHz}$
		5.0	—	25.0	—		

Noise Characteristics

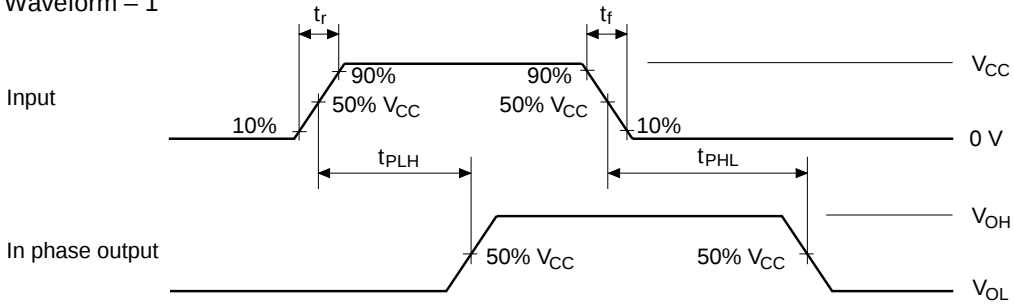
- $C_L = 50\text{ pF}$

Item	Symbol	$V_{CC}\text{ (V)}$	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Quiet output, maximum dynamic V_{OL}	$V_{OL(P)}$	3.3	—	0.5	0.8	V	
Quiet output, minimum dynamic V_{OL}	$V_{OL(V)}$	3.3	—	−0.4	−0.8		
Quiet output, minimum dynamic V_{OH}	$V_{OH(V)}$	3.3	—	2.9	—		
High-level dynamic input voltage	$V_{IH(D)}$	3.3	2.31	—	—	V	
Low level dynamic inout voltage	$V_{IL(D)}$	3.3	—	—	0.99		

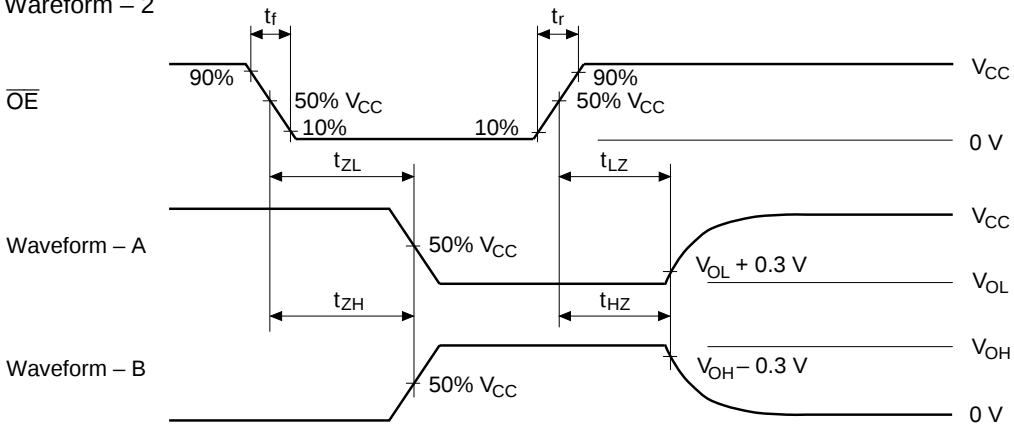
Test Circuit



• Waveform – 1



• Waveform – 2



Notes: 1. Input waveform: $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 3 \text{ ns}$, $t_f \leq 3 \text{ ns}$

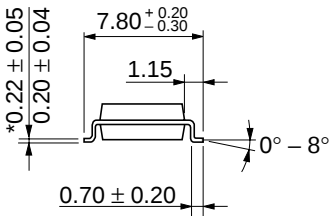
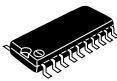
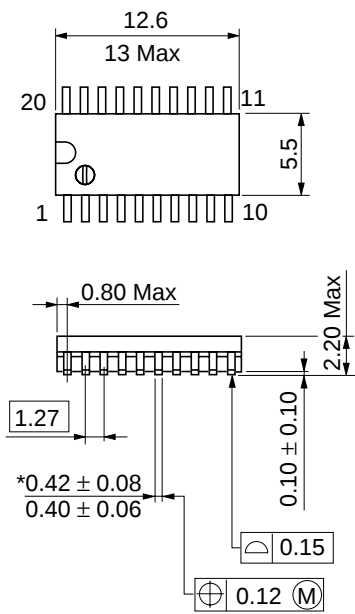
2. Waveform-A is for an output with internal conditions such that the output is low except when disabled by the output control.

3. Waveform-B is for an output with internal conditions such that the output is high except when disabled by the output control.

4. The output are measured one at a time with one transition per measurement.

Package Dimensions

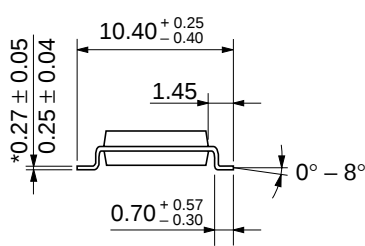
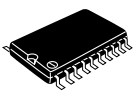
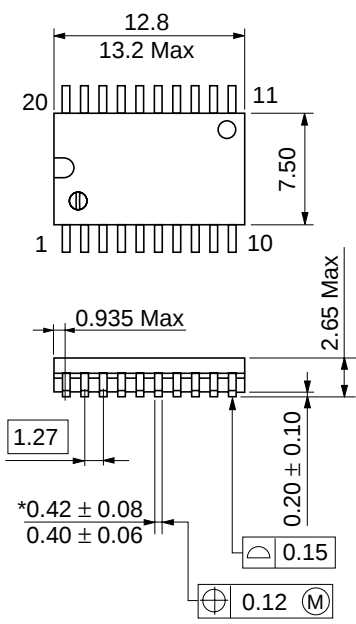
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-20DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.31 g

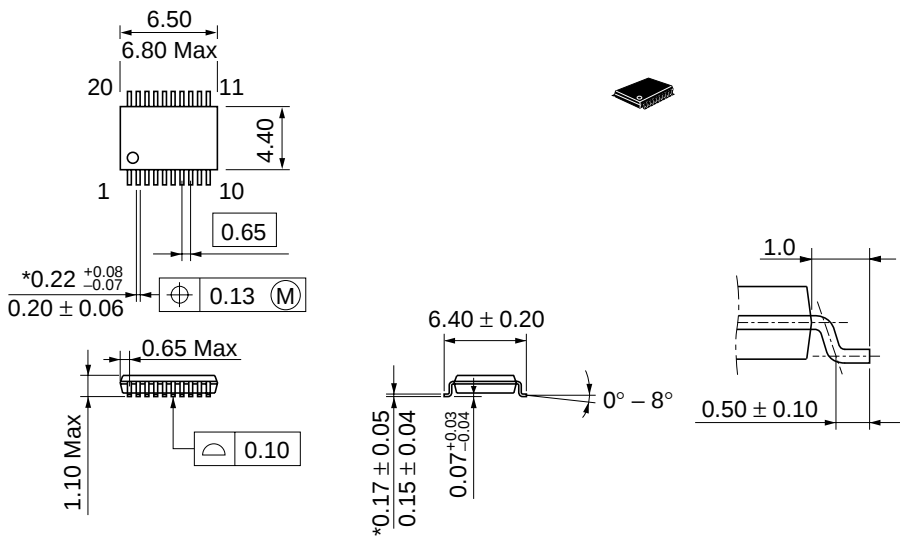
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-20DB
JEDEC	Conforms
EIAJ	—
Weight (reference value)	0.52 g

Unit: mm



*Dimension including the plating thickness
Base material dimension

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

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