

HD74LV240A

Octal Buffers / Drivers with 3-state Outputs

HITACHI

ADE-205-272 (Z)

1st Edition

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Description

The HD74V240A has eight inverter drivers with three-state outputs in a 20-pin package. Four inverters are included in one circuit. Each circuit can be independently controlled by the enable signal $\overline{1OE}$ or $\overline{2OE}$, which enables outputs when receiving a low-level signal. Low-voltage operation is suitable for battery-powered products (e.g., notebook computers), and the low-power consumption extends the battery life.

Features

- $V_{CC} = 2.0\text{ V}$ to 5.5 V operation
- All inputs V_{IH} (Max.) = 5.5 V (@ $V_{CC} = 0\text{ V}$ to 5.5 V)
- All outputs V_O (Max.) = 5.5 V (@ $V_{CC} = 0\text{ V}$)
- 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 $> 2.3\text{ V}$ (@ $V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- Output current $\pm 8\text{ mA}$ (@ $V_{CC} = 3.0\text{ V}$ to 3.6 V), $\pm 16\text{ mA}$ (@ $V_{CC} = 4.5\text{ V}$ to 5.5 V)

Function Table

Inputs

$\overline{OE}$	A	Output Y
L	H	L
L	L	H
H	X	Z

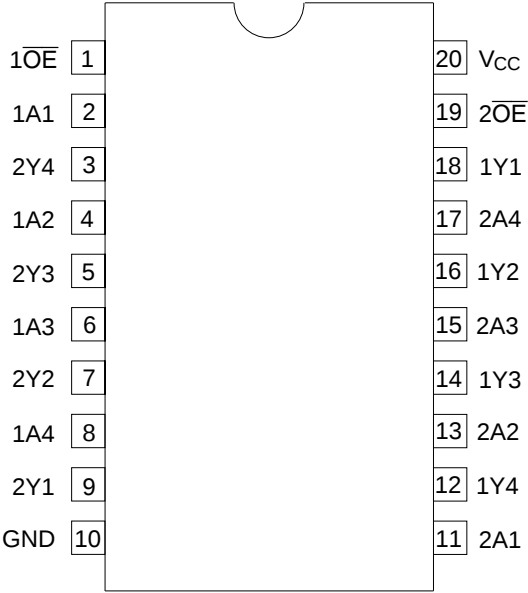
Note: H: High level

L: Low level

X: Immaterial

Z: High impedance

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.

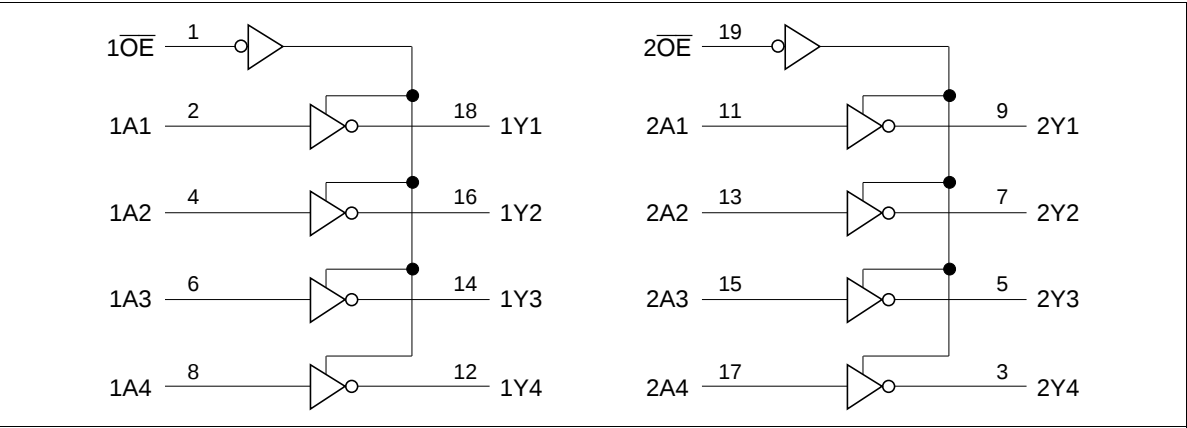
- 1. The input and output voltage ratings may be exceeded even if the input and output clamp-current ratings are observed.
- 2. This value is limited to 5.5 V maximum.
- 3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

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	H or L
		0	5.5		High impedance state
Output current	I_{OH}	—	−50	μA	$V_{CC} = 2.0\text{ V}$
		—	−2	mA	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		—	−8		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		—	−12		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
	I_{OL}	—	50	μA	$V_{CC} = 2.0\text{ V}$
		—	2	mA	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		—	8		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		—	12		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
Input transition rise or fall rate	$\Delta t / \Delta v$	0	200	ns/V	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		0	100		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		0	20		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
Operating free-air temperature	T_a	−40	85	$^{\circ}C$	

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

Logic Diagram



DC Electrical Characteristics

- $T_a = -40$ to 85°C

Item	Symbol	V_{CC} (V)*	Min	Typ	Max	Unit	Test Conditions
Input voltage	V_{IH}	2.0	1.5	—	—	V	
		2.3 to 2.7	$V_{CC} \times 0.7$	—	—		
		3.0 to 3.6	$V_{CC} \times 0.7$	—	—		
		4.5 to 5.5	$V_{CC} \times 0.7$	—	—		
	V_{IL}	2.0	—	—	0.5		
		2.3 to 2.7	—	—	$V_{CC} \times 0.3$		
		3.0 to 3.6	—	—	$V_{CC} \times 0.3$		
		4.5 to 5.5	—	—	$V_{CC} \times 0.3$		
Output voltage	V_{OH}	Min to Max	$V_{CC} - 0.1$	—	—	V	$I_{OH} = -50\ \mu\text{A}$
		2.3	2.0	—	—		$I_{OH} = -2\ \text{mA}$
		3.0	2.48	—	—		$I_{OH} = -8\ \text{mA}$
		4.5	3.8	—	—		$I_{OH} = -16\ \text{mA}$
	V_{OL}	Min to Max	—	—	0.1		$I_{OL} = 50\ \mu\text{A}$
		2.3	—	—	0.4		$I_{OL} = 2\ \text{mA}$
		3.0	—	—	0.44		$I_{OL} = 8\ \text{mA}$
		4.5	—	—	0.55		$I_{OL} = 16\ \text{mA}$
Input current	I_{IN}	0 to 5.5	—	—	± 1	μA	$V_{IN} = 5.5\ \text{V}$ or GND
Off-state output current	I_{OZ}	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	$V_O = 5.5\ \text{V}$
Input capacitance	C_{IN}	3.3	—	2.3	—	pF	$V_I = V_{CC}$ or GND

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

• $V_{CC} = 2.5 \pm 0.2 \text{ V}$

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} t_{PHL}	—	6.3	11.6	1.0	14.0	ns	$C_L = 15 \text{ pF}$	A	Y
		—	8.2	14.4	1.0	17.0		$C_L = 50 \text{ pF}$		
Enable time	t_{ZH} t_{ZL}	—	8.5	14.6	1.0	17.0	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
		—	10.3	17.8	1.0	21.0		$C_L = 50 \text{ pF}$		
Disable time	t_{HZ} t_{LZ}	—	9.7	14.1	1.0	16.0	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
		—	14.2	19.2	1.0	21.0		$C_L = 50 \text{ pF}$		

• $V_{CC} = 3.3 \pm 0.3 \text{ V}$

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} t_{PHL}	—	4.6	7.5	1.0	9.0	ns	$C_L = 15 \text{ pF}$	A	Y
		—	5.9	11.0	1.0	12.5		$C_L = 50 \text{ pF}$		
Enable time	t_{ZH} t_{ZL}	—	6.2	10.6	1.0	12.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
		—	7.5	14.1	1.0	16.0		$C_L = 50 \text{ pF}$		
Disable time	t_{HZ} t_{LZ}	—	8.3	12.5	1.0	13.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
		—	11.8	15.0	1.0	17.0		$C_L = 50 \text{ pF}$		

Switching Characteristics (cont)

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

		Ta = 25°C			Ta = -40 to 85°C				FROM (Input)	TO (Output)
Item	Symbol	Min	Typ	Max	Min	Max	Unit	Test Conditions		
Propagation delay time	t _{PLH}	—	3.4	5.5	1.0	6.5	ns	C _L = 15 pF	A	Y
	t _{PHL}	—	4.4	7.5	1.0	8.5		C _L = 50 pF		
Enable time	t _{ZH}	—	4.6	7.3	1.0	8.5	ns	C _L = 15 pF	$\overline{OE}$	Y
	t _{ZL}	—	5.6	9.3	1.0	10.5		C _L = 50 pF		
Disable time	t _{HZ}	—	7.4	12.2	1.0	13.5	ns	C _L = 15 pF	$\overline{OE}$	Y
	t _{LZ}	—	9.7	14.2	1.0	15.5		C _L = 50 pF		

Output-skew Characteristics

- $C_L = 50\text{ pF}$

Item	Symbol	$V_{CC}\text{ (V)}$	Ta = 25°C		Ta = -40 to 85°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 same package switching in the same direction. This parameter is warranted but not production tested.

Operating Characteristics

- $C_L = 50\text{ pF}$

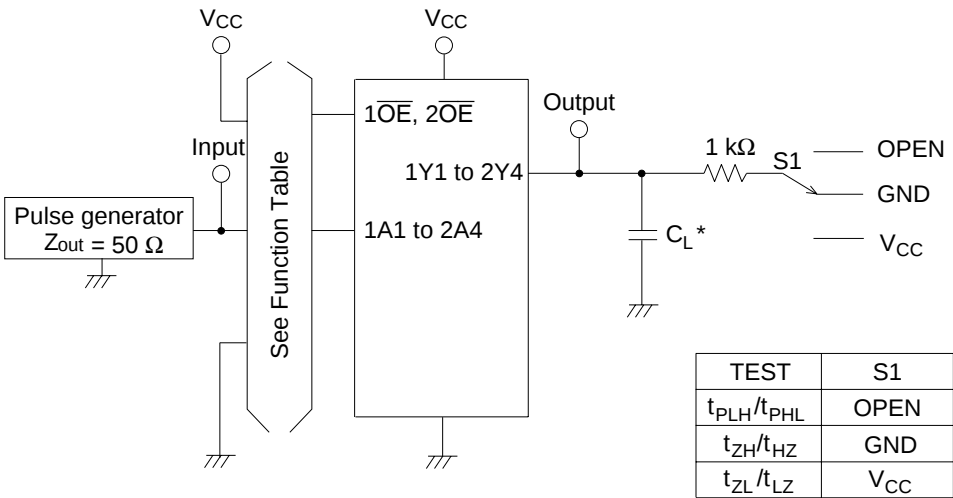
Item	Symbol	$V_{CC}\text{ (V)}$	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	3.3	—	14.0	—	pF	f = 10 MHz
		5.0	—	16.4	—		

Noise Characteristics

- $C_L = 50\text{ pF}$

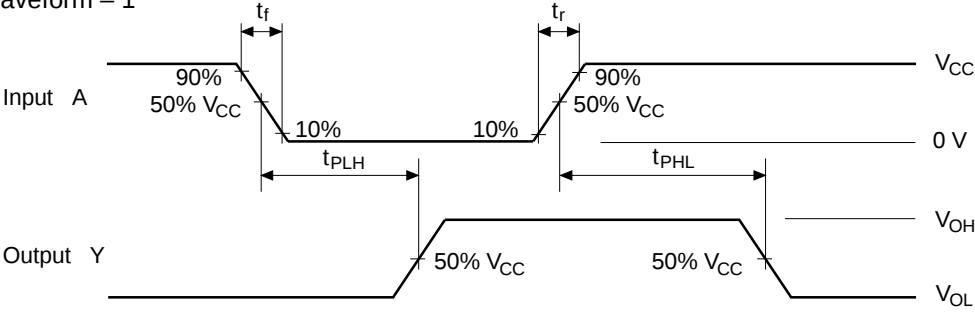
Item	Symbol	$V_{CC}\text{ (V)}$	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Quiet output, maximum dynamic V_{OL}	$V_{OL(P)}$	3.3	—	0.6	0.8	V	
Quiet output, minimum dynamic V_{OL}	$V_{OL(V)}$	3.3	—	-0.5	-0.8		
Quiet output, minimum dynamic V_{OH}	$V_{OH(V)}$	3.3	—	2.8	—		
High-level dynamic input voltage	$V_{IH(D)}$	3.3	2.31	—	—	V	
Low-level dynamic inout voltage	$V_{IL(D)}$	3.3	—	—	0.99		

Test Circuit

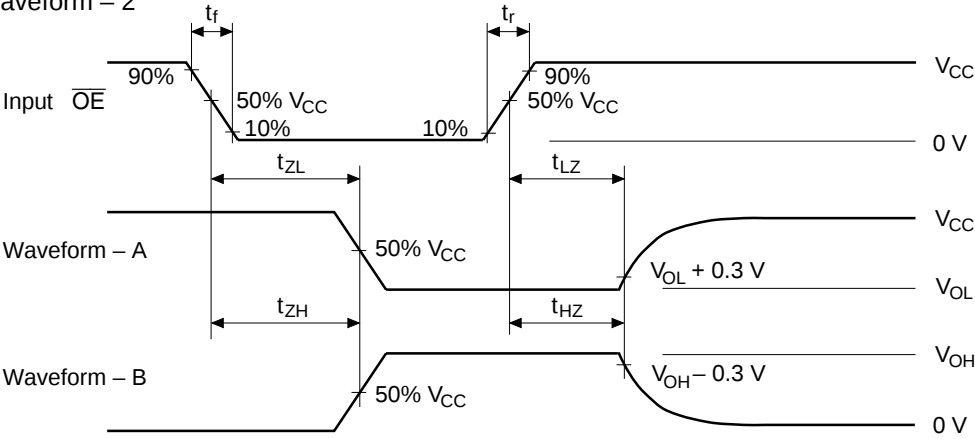


Note: C_L includes the probe and jig capacitance.

• Waveform – 1



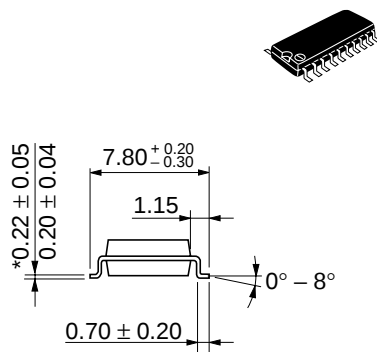
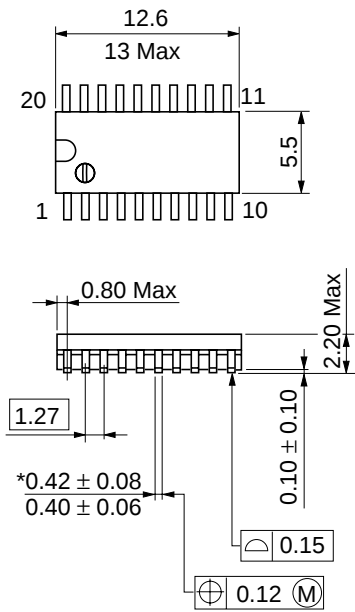
• Waveform – 2



- 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

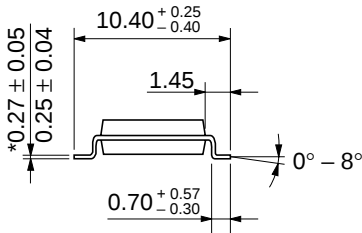
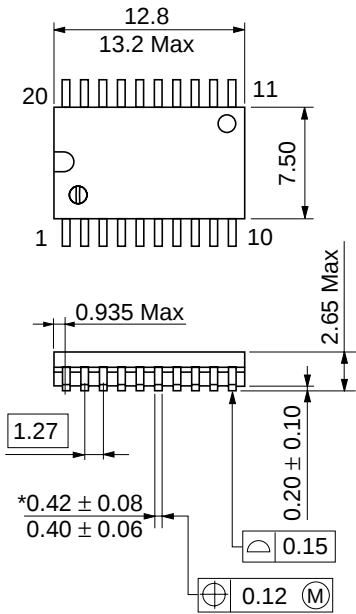
Unit: mm



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

*Dimension including the plating thickness
Base material dimension

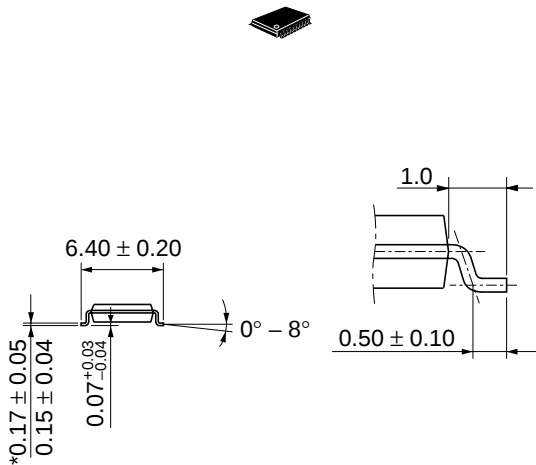
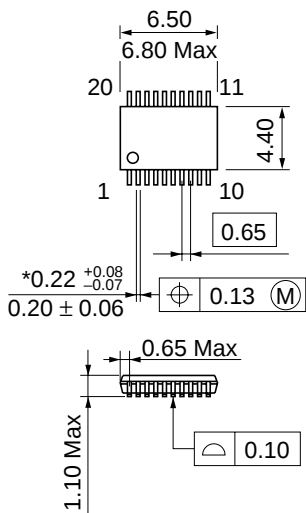
Unit: mm



*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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