
HD74LV540A

Octal Inverted Buffers / Drivers with 3-state Outputs

HITACHI

ADE-205-277 (Z)

1st Edition
April 1999

Description

The HD74LV540A has eight inverter drivers with three state outputs in a 20 pin package. When OE1 and OE2 is low level, this drivers set up output is enable. 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

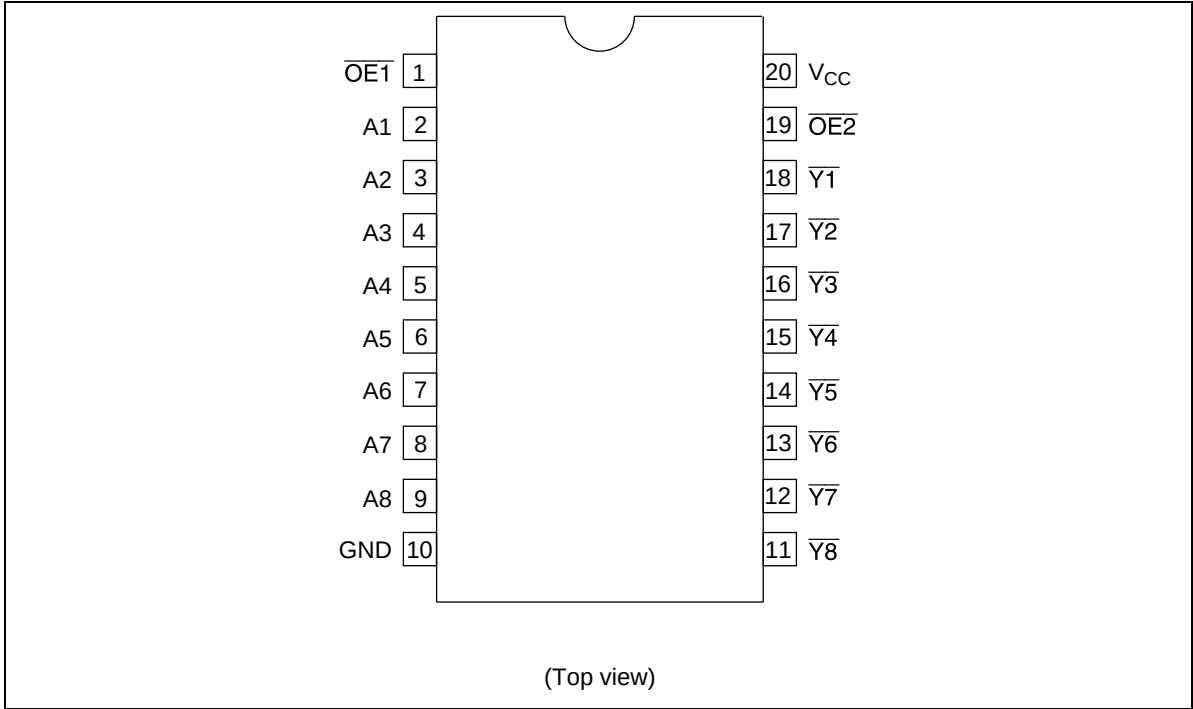
Inputs

OE1	OE2	A	Output Y
L	L	L	H
L	L	H	L
H	X	X	Z
X	H	X	Z

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

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Pin Arrangement



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 $T_a = 25^\circ\text{C}$ (in still air) ^{*3}	P_T	835	mW	SOP
		757		TSSOP
Storage temperature	T_{stg}	−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 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.

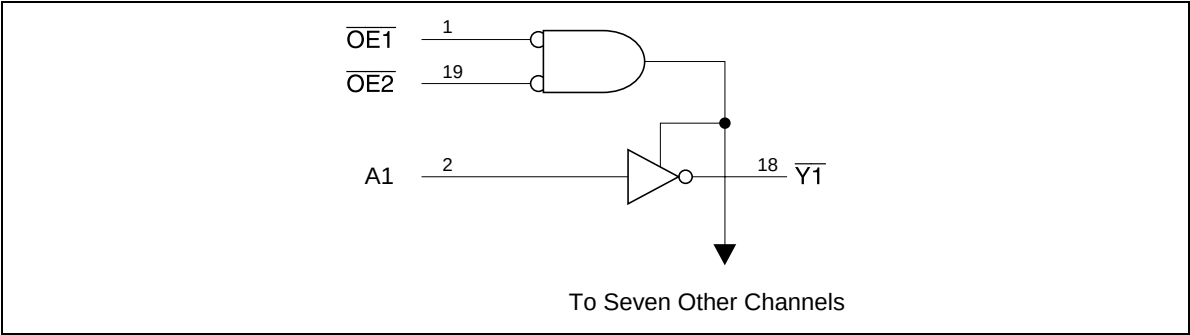
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Recommended Operating Conditions

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 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

$T_a = -40$ 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_I or $V_O = 0\ \text{V}$ to $5.5\ \text{V}$
Input capacitance	C_{IN}	3.3	—	3	—	pF	$V_I = V_{CC}$ or GND

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

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Switching Characteristics

V_{CC} = 2.5 ± 0.2 V

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propa- gation delay time	t _{PLH}	—	7.4	12.0	1.0	14.5	ns	C _L = 15 pF	A	Y
	t _{PHL}	—	9.3	16.8	1.0	18.5		C _L = 50 pF		
Enable time	t _{ZH}	—	8.2	17.4	1.0	21.0	ns	C _L = 15 pF	OE	Y
	t _{ZL}	—	9.6	22.2	1.0	25.5		C _L = 50 pF		
Disable time	t _{HZ}	—	7.5	16.0	1.0	19.0	ns	C _L = 15 pF	OE	Y
	t _{LZ}	—	10.5	22.3	1.0	25.5		C _L = 50 pF		

V_{CC} = 3.3 ± 0.3 V

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propa- gation delay time	t _{PLH}	—	5.3	7.0	1.0	8.5	ns	C _L = 15 pF	A	Y
	t _{PHL}	—	6.8	10.5	1.0	12.0		C _L = 50 pF		
Enable time	t _{ZH}	—	6.2	10.5	1.0	12.5	ns	C _L = 15 pF	OE	Y
	t _{ZL}	—	7.6	14.0	1.0	16.0		C _L = 50 pF		
Disable time	t _{HZ}	—	5.3	10.5	1.0	12.5	ns	C _L = 15 pF	OE	Y
	t _{LZ}	—	7.0	15.4	1.0	17.5		C _L = 50 pF		

Switching Characteristics (cont)

V_{CC} = 5.0 ± 0.5 V

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propa- gation delay time	t _{PLH}	—	3.8	5.0	1.0	6.0	ns	C _L = 15 pF	A	Y
	t _{PHL}	—	5.0	7.0	1.0	8.0		C _L = 50 pF		
		—	5.8	9.2	1.0	10.5		C _L = 50 pF		
Enable time	t _{ZH}	—	4.6	7.2	1.0	8.5	ns	C _L = 15 pF	OE	Y
	t _{ZL}	—	5.8	9.2	1.0	10.5		C _L = 50 pF		
		—	5.3	8.8	1.0	10.0		C _L = 50 pF		
Disable time	t _{HZ}	—	3.6	6.8	1.0	8.0	ns	C _L = 15 pF	OE	Y
	t _{LZ}	—	5.3	8.8	1.0	10.0		C _L = 50 pF		
		—	5.3	8.8	1.0	10.0		C _L = 50 pF		

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Output-skew Characteristics

Item	Symbol	V _{CC} = (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 pF

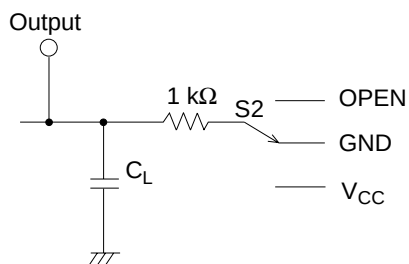
Item	Symbol	V _{CC} = (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C _{PD}	3.3	—	23.0	—	pF	f = 10 MHz
		5.0	—	27.5	—		

Noise Characteristics

C_L = 50 pF

Item	Symbol	V _{CC} = (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Quiet output, maximum dynamic V _{OL}	V _{OL (P)}	3.3	—	0.4	0.8	V	
Quiet output, minimum dynamic V _{OL}	V _{OL (V)}	3.3	—	-0.3	-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 input voltage	V _{IL (D)}	3.3	—	—	0.99		

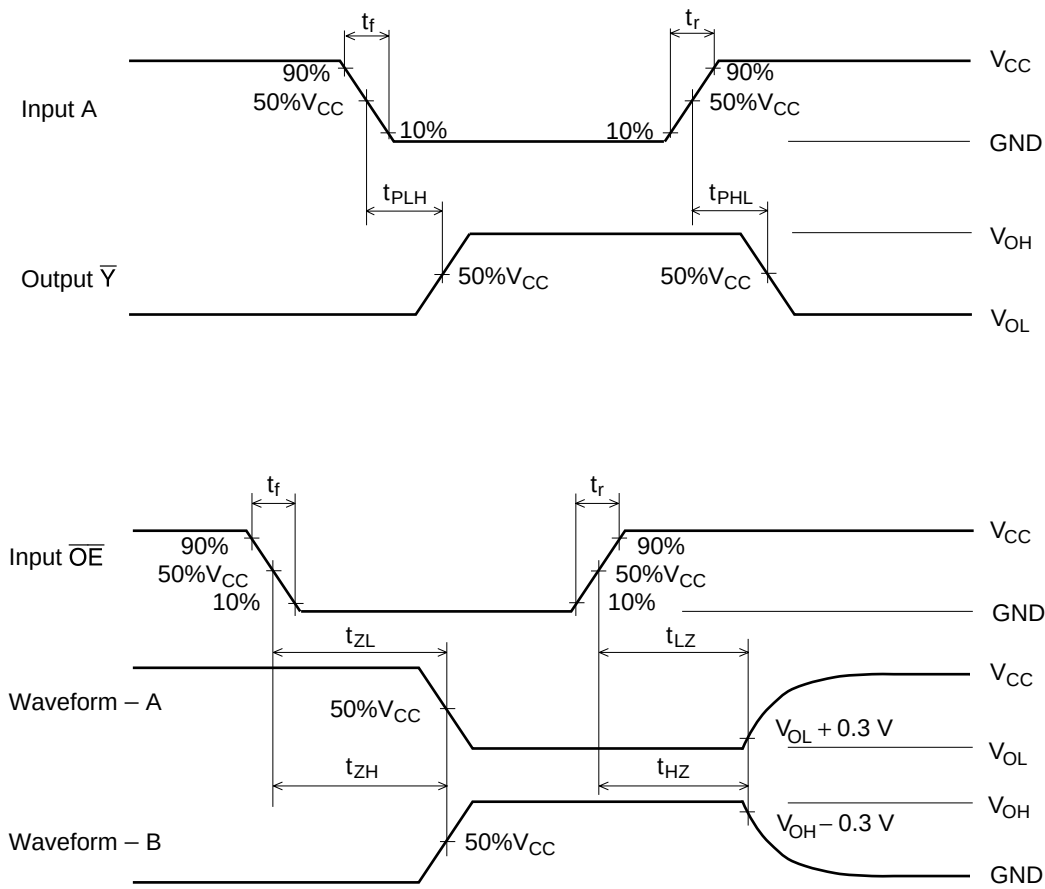
Test Circuit



TEST	S2
t_{PLH}/t_{PHL}	OPEN
t_{ZH}/t_{HZ}	GND
t_{ZL}/t_{LZ}	V_{CC}

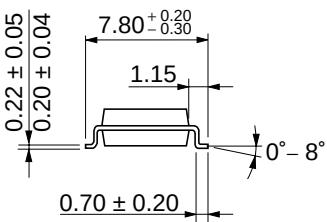
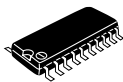
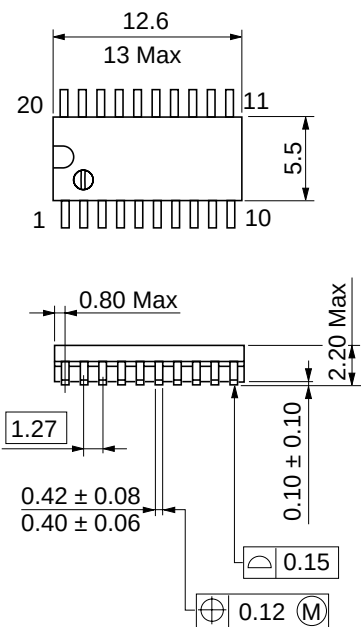
Note: C_L includes the probe and jig capacitance.

• Waveform



- Notes:
- 1. $t_f \leq 3 \text{ ns}$, $t_r \leq 3 \text{ ns}$
 - 2. Input waveform: $\text{PRR} \leq 1 \text{ MHz}$, duty cycle 50%
 - 3. Waveform-A is for an output with internal conditions such that the output is low except when disabled by the output control.
 - 4. Waveform-B is for an output with internal conditions such that the output is high except when disabled by the output control.

Package Dimensions

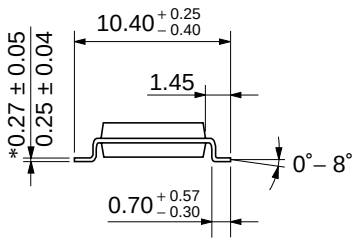
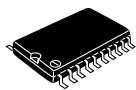
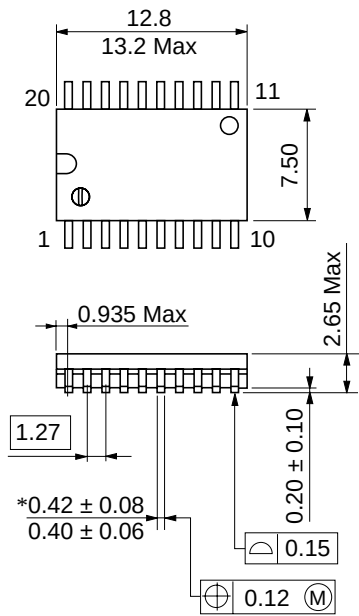


Dimension including the plating thickness
Base material dimension

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

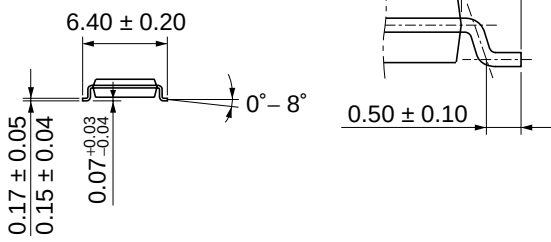
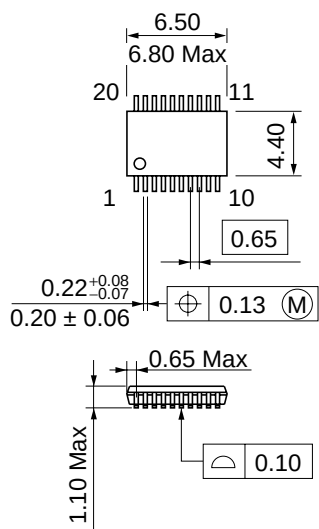
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Unit: mm



*Dimension including the plating thickness
Base material dimension

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



Dimension including the plating thickness
Base material dimension

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

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