
HD74LVC373A

Octal D-type Transparent Latches with 3-state Outputs

HITACHI

ADE-205-112B(Z)

3rd Edition
December 1996

Description

The HD74LVC373A has eight D type latches with three state outputs in a 20 pin package. When the latch enable input is high, the Q outputs will follow the D inputs. When the latch enable goes low, data at the D inputs will be retained at the outputs until latch enable returns high again. When a high logic level is applied to the output control input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements. 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 $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$

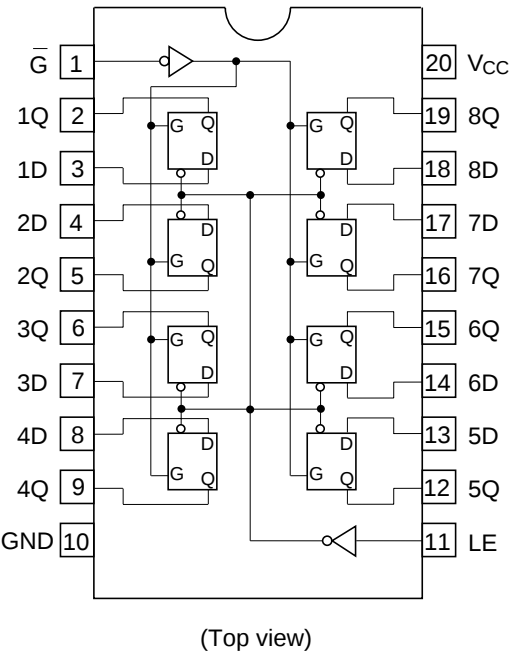
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Function Table

Inputs			Output Q
G	LE	D	
H	X	X	Z
L	H	L	L
L	H	H	H
L	L	X	Q ₀

H : High level
L : Low level
X : Immaterial
Z : High impedance
Q₀: Level of Q before the indicated steady input conditions were established.

Pin Arrangement



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	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5$ V
		50	mA	$V_O = V_{CC}+0.5$ V
Output voltage	V_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	T_{stg}	-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 hold
		2.0 to 5.5	V	At operation
Input / output voltage	V_I	0 to 5.5	V	G, LE, D
	V_O	0 to V_{CC}	V	Output "H" or "L"
		0 to 5.5	V	Output "Z" or V_{CC} :OFF
Operating temperature	T_a	-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 $\leq 50\%$

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Electrical Characteristics

Item	Symbol	V _{CC} (V)	Ta = -40 to 85°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} ×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 _{CC} 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

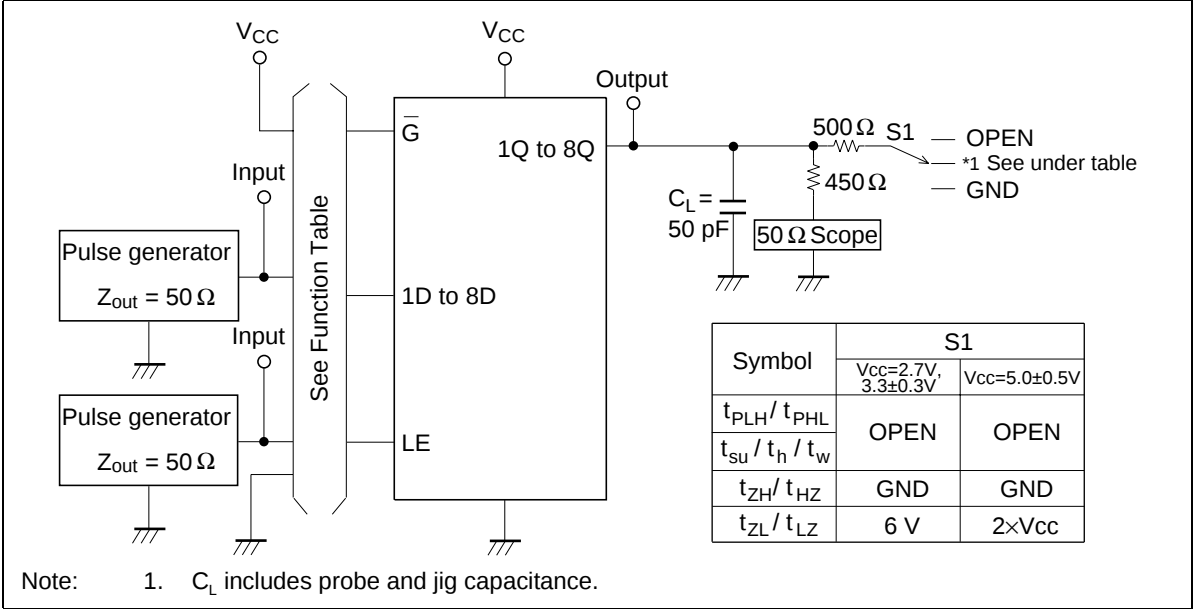
Item	Symbol	V _{CC} (V)	Ta = -40 to 85°C				From (Input)	To (Output)
			Min	Typ	Max	Unit		
Propagation delay time	t _{PLH}	2.7	—	—	9.0	ns	D	Q
		3.3±0.3	1.5	—	8.0	ns		
		5.0±0.5	—	—	6.5	ns		
	t _{PHL}	2.7	—	—	9.5	ns	LE	Q
		3.3±0.3	2.0	—	8.5	ns		
		5.0±0.5	—	—	7.0	ns		
Output enable time	t _{ZH}	2.7	—	—	9.5	ns	G	Q
	t _{ZL}	3.3±0.3	1.5	—	8.5	ns		
		5.0±0.5	—	—	7.0	ns		
Output disable time	t _{HZ}	2.7	—	—	8.5	ns	G	Q
	t _{LZ}	3.3±0.3	1.5	—	7.5	ns		
		5.0±0.5	—	—	6.5	ns		
Setup time	t _{su}	2.7	2.0	—	—	ns		
		3.3±0.3	2.0	—	—	ns		
		5.0±0.5	2.0	—	—	ns		
Hold time	t _h	2.7	1.5	—	—	ns		
		3.3±0.3	1.5	—	—	ns		
		5.0±0.5	1.5	—	—	ns		
Pulse width	t _w	2.7	3.3	—	—	ns		
		3.3±0.3	3.3	—	—	ns		
		5.0±0.5	3.3	—	—	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.

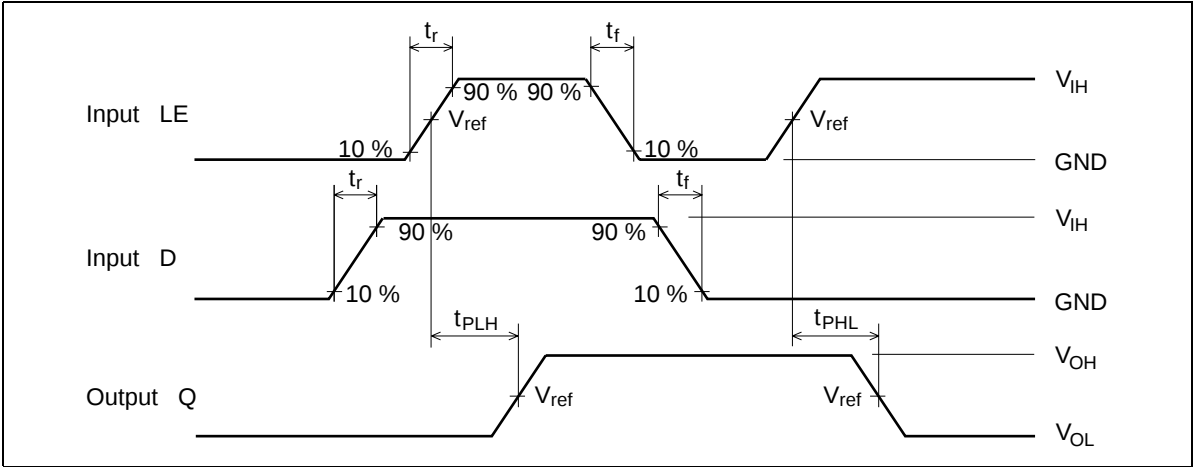
$$tos_{LH} = |t_{PLHm} - t_{PLHn}|, tos_{HL} = |t_{PHLm} - t_{PHLn}|$$

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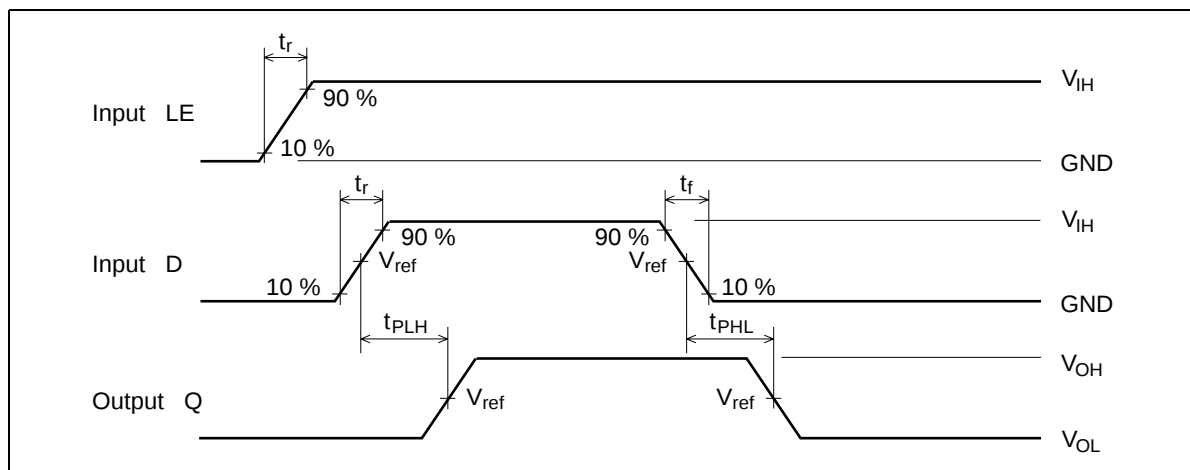
Test Circuit



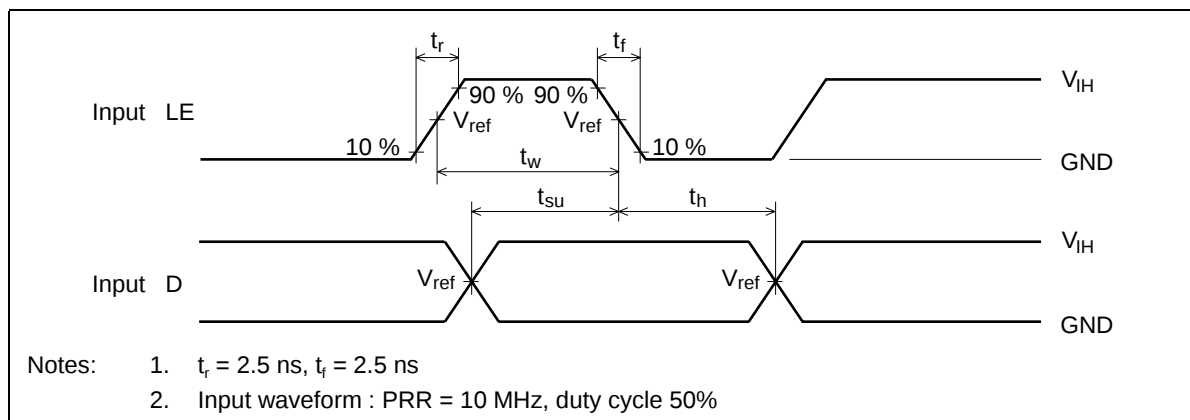
Waveforms – 1



Waveforms – 2

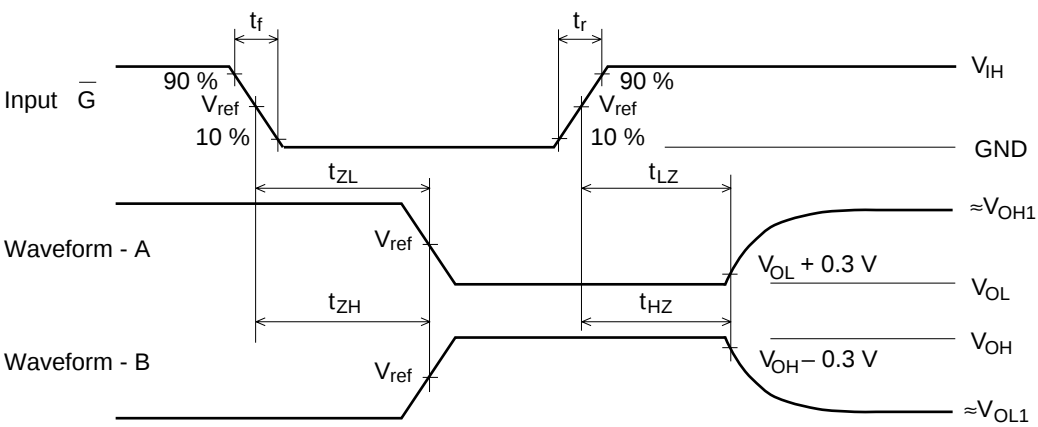


Waveforms – 3



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Waveforms – 4

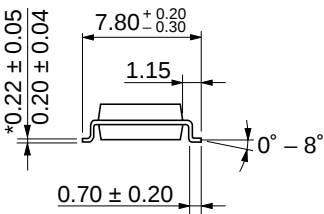
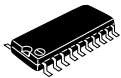
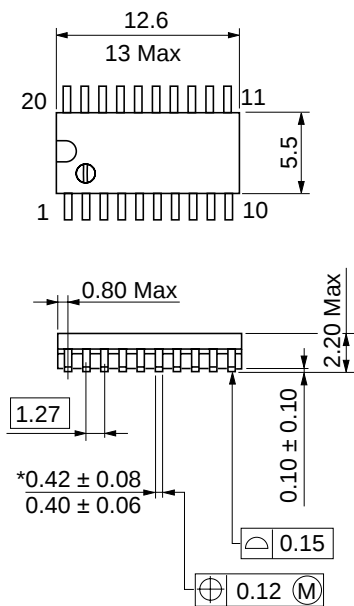


TEST	$V_{CC}=2.7V, 3.3\pm0.3V$	$V_{CC}=5.0\pm0.5V$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	50% V_{CC}
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

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

Package Dimensions

Unit: mm

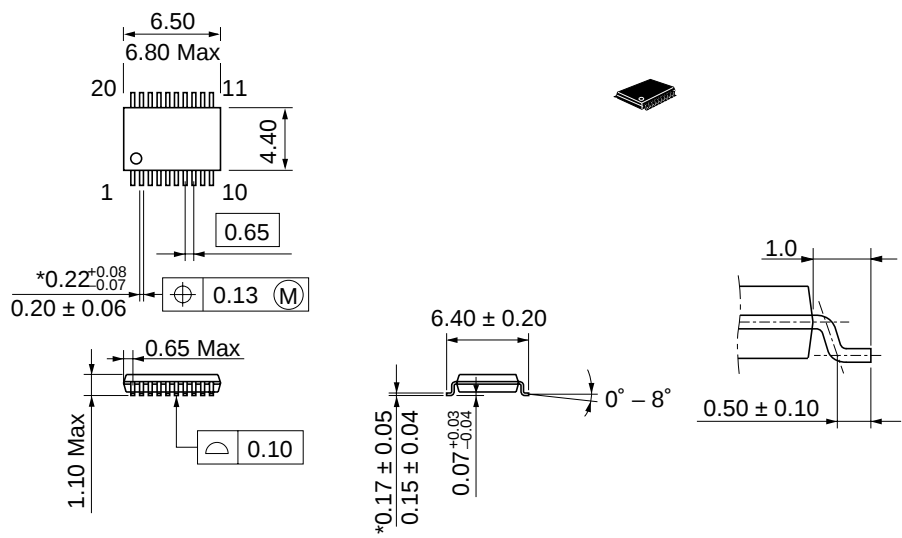


*Dimension including the plating thickness
Base material dimension

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

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Unit: mm



*Dimension including the plating thickness
Base material dimension

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

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