

# HD74LVC540A

Octal Buffers / Line Drivers with 3-state Outputs

## HITACHI

ADE-205-114B(Z)

3rd Edition

December 1996

### Description

The HD74LVC540A has eight inverter drivers with three state outputs in a 20 pin package. When  $\overline{G1}$  and  $\overline{G2}$  is low level, this drivers set up output is enable. 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			Output $\overline{Y}$
$\overline{G1}$	$\overline{G2}$	A	
L	L	L	H
L	L	H	L
H	X	X	Z
X	H	X	Z

H : High level

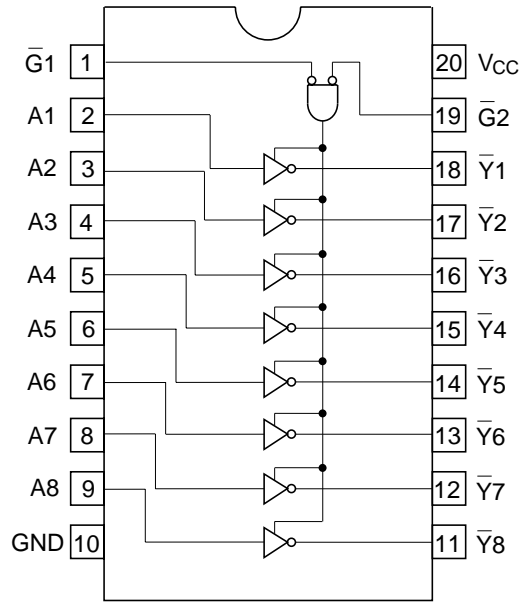
L : Low level

X : Immaterial

Z : High impedance

# HD74LVC540A

## 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	$V_I = -0.5$ 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	$I_O$	$\pm 50$	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	$\overline{G1}$ , $\overline{G2}$ , A
		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 <sup>*2</sup>	mA	$V_{CC} = 3.0$ V to 5.5 V
	$I_{OL}$	12	mA	$V_{CC} = 2.7$ V
		24 <sup>*2</sup>	mA	$V_{CC} = 3.0$ V to 5.5 V
Input rise / fall time <sup>*1</sup>	$t_r, t_f$	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  $\leq 50\%$

## Electrical Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	V <sub>IH</sub>	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—	V	
	V <sub>IL</sub>	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	V <sub>CC</sub> ×0.3	V	
Output voltage	V <sub>OH</sub>	2.7 to 5.5	V <sub>CC</sub> -0.2	—	V	I <sub>OH</sub> = -100 μA
		2.7	2.2	—	V	I <sub>OH</sub> = -12 mA
		3.0	2.4	—	V	
		3.0	2.2	—	V	I <sub>OH</sub> = -24 mA
		4.5	3.8	—	V	
	V <sub>OL</sub>	2.7 to 5.5	—	0.2	V	I <sub>OL</sub> = 100 μA
		2.7	—	0.4	V	I <sub>OL</sub> = 12 mA
		3.0	—	0.55	V	I <sub>OL</sub> = 24 mA
		4.5	—	0.55	V	
Input current	I <sub>IN</sub>	0 to 5.5	—	±5.0	μA	V <sub>IN</sub> = 5.5 V or GND
Off state output current	I <sub>OZ</sub>	2.7 to 5.5	—	±5.0	μA	V <sub>IN</sub> = V <sub>CC</sub> , GND V <sub>OUT</sub> = 5.5 V or GND
Output leak current	I <sub>OFF</sub>	0	—	20	μA	V <sub>IN</sub> / V <sub>OUT</sub> = 5.5 V
Quiescent supply current	I <sub>CC</sub>	2.7 to 3.6	—	±10	μA	V <sub>IN</sub> / V <sub>OUT</sub> = 3.6 to 5.5 V
		2.7 to 5.5	—	10	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
	ΔI <sub>CC</sub>	3.0 to 3.6	—	500	μA	V <sub>IN</sub> = one input at (V <sub>CC</sub> -0.6)V, other inputs at V <sub>CC</sub> or GND

Switching Characteristics

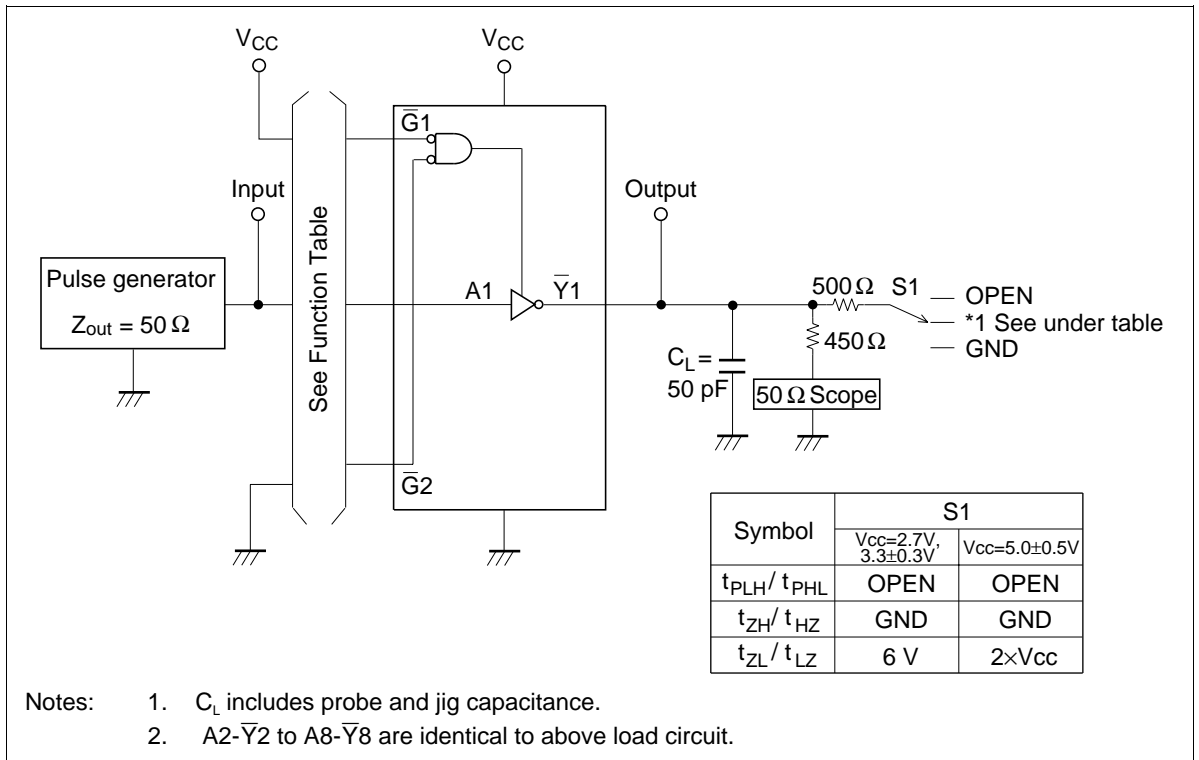
Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t <sub>PLH</sub>	2.7	—	—	7.5	ns	A	$\bar{Y}$
	t <sub>PHL</sub>	3.3±0.3	1.5	—	6.5	ns		
		5.0±0.5	—	—	5.0	ns		
Output enable time	t <sub>ZH</sub>	2.7	—	—	9.5	ns	$\bar{G}1$ or $\bar{G}2$	$\bar{Y}$
	t <sub>ZL</sub>	3.3±0.3	1.5	—	8.5	ns		
		5.0±0.5	—	—	7.0	ns		
Output disable time	t <sub>HZ</sub>	2.7	—	—	8.5	ns	$\bar{G}1$ or $\bar{G}2$	$\bar{Y}$
	t <sub>LZ</sub>	3.3±0.3	1.5	—	7.5	ns		
		5.0±0.5	—	—	6.5	ns		
Between output pins skew <sup>*1</sup>	t <sub>OSLH</sub>	2.7	—	—	—	ns		
	t <sub>OSHL</sub>	3.3±0.3	—	—	1.0	ns		
		5.0±0.5	—	—	1.0	ns		
Input capacitance	C <sub>IN</sub>	2.7	—	3.0	—	pF		
Output capacitance	C <sub>O</sub>	2.7	—	15.0	—	pF		

Note: 1. This parameter is characterized but not tested.

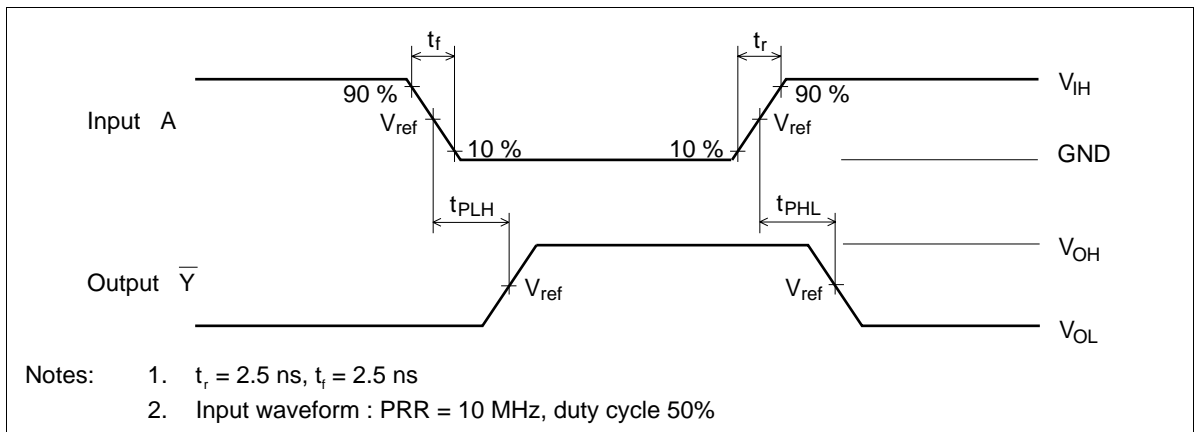
$$tos_{LH} = |t_{PLHm} - t_{PLHn}|, tos_{HL} = |t_{PHLm} - t_{PHLn}|$$

# HD74LVC540A

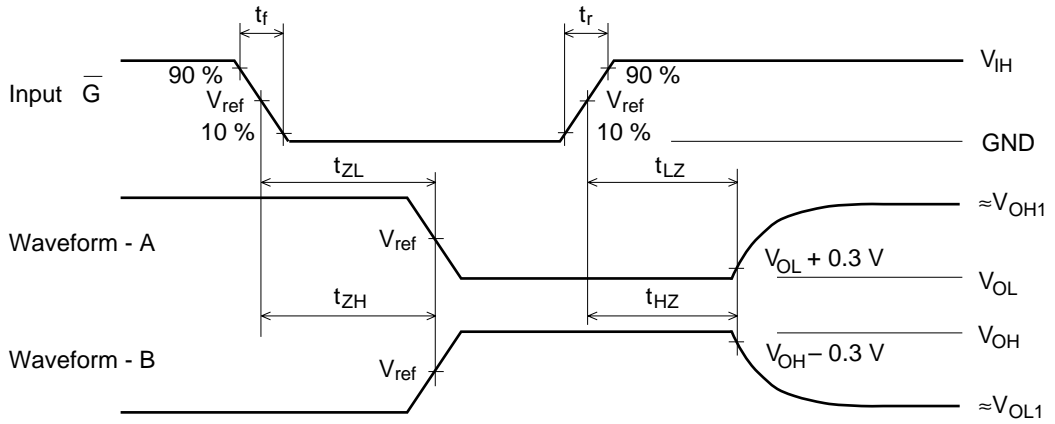
## Test Circuit



## 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:
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.



\*Dimension including the plating thickness  
Base material dimension

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



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