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# HD74LV1G125A

Bus Buffer Gate with 3–state Output

## HITACHI

ADE-205-323C (Z)  
4th. Edition  
April 2001

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### Description

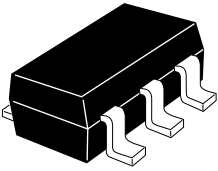
The HD74LV1G125A has a bus buffer gate with 3–state output in a 5 pin package. Output is disabled when the associated output enable ( $\overline{OE}$ ) input is high. To ensure the high impedance state during power up or power down,  $\overline{OE}$  should be connected to  $V_{CC}$  through a pull-down resistor; the minimum value of the resistor is determined by the current sourcing capability of the driver. Low voltage and high speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

### Features

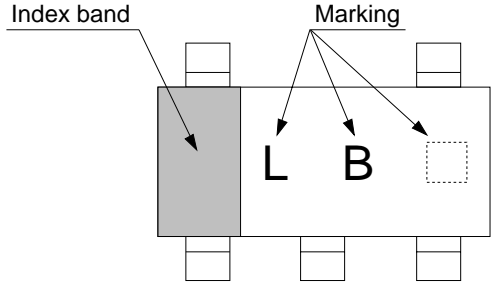
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74LV125A  
Supply voltage range : 1.65 to 5.5 V  
Operating temperature range :  $-40$  to  $+85^{\circ}\text{C}$
- All inputs  $V_{IH}$  (Max.) = 5.5 V (@  $V_{CC} = 0$  V to 5.5 V)  
All outputs  $V_O$  (Max.) = 5.5 V (@  $V_{CC} = 0$  V, Output : Z)
- Output current  $\pm 6$  mA (@  $V_{CC} = 3.0$  V to 3.6 V),  $\pm 12$  mA (@  $V_{CC} = 4.5$  V to 5.5 V)
- All the logical input has hysteresis voltage for the slow transition.

## Outline and Article Indication

- HD74LV1G125A

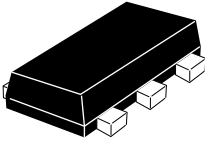


CMPAK-5

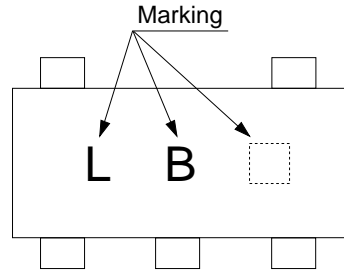


□ = Control code  
( — or blank)

- HD74LV1G125A



VSON-5



□ = Control code

**Function Table**

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

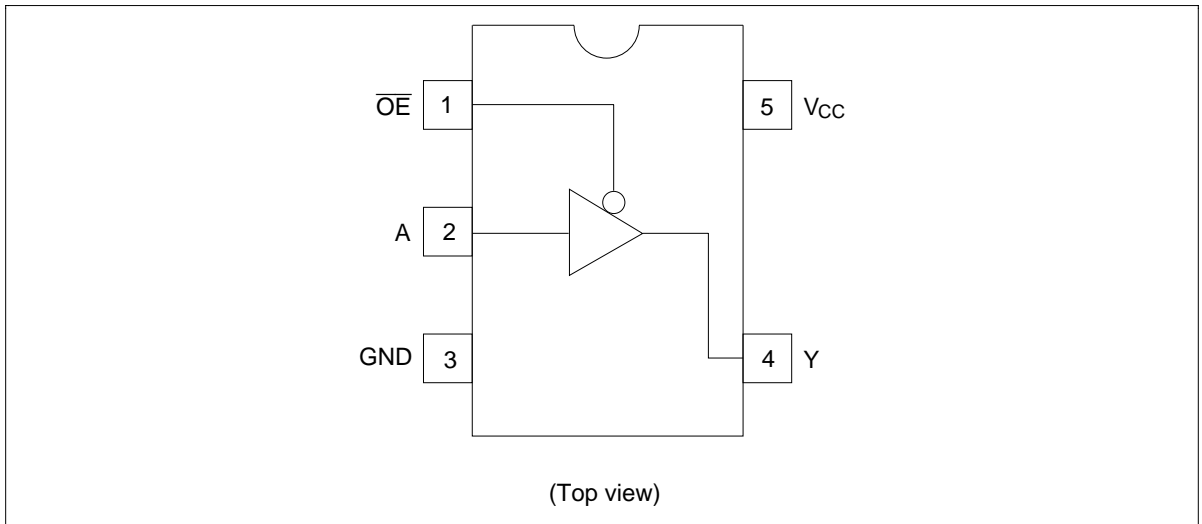
H : High level

L : Low level

X : Immaterial

Z : High impedance

**Pin Arrangement**



**Absolute Maximum Ratings**

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	$V_{CC}$	-0.5 to 7.0	V	
Input voltage range <sup>*1</sup>	$V_I$	-0.5 to 7.0	V	
Output voltage range <sup>*1,2</sup>	$V_O$	-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	$I_{OK}$	$\pm 50$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 25$	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	$\pm 50$	mA	
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) <sup>*3</sup>	$P_T$	200	mW	
Storage temperature	Tstg	-65 to 150	$^\circ\text{C}$	

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 $^\circ\text{C}$ .

## Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	$V_{CC}$	1.65	5.5	V	
Input voltage range	$V_I$	0	5.5	V	
Output voltage range	$V_O$	0	$V_{CC}$	V	
		0	5.5		Output : Z
Output current	$I_{OL}$	—	1	mA	$V_{CC} = 1.65$ to $1.95$ V
		—	2		$V_{CC} = 2.3$ to $2.7$ V
		—	6		$V_{CC} = 3.0$ to $3.6$ V
		—	12		$V_{CC} = 4.5$ to $5.5$ V
	$I_{OH}$	—	-1		$V_{CC} = 1.65$ to $1.95$ V
		—	-2		$V_{CC} = 2.3$ to $2.7$ V
		—	-6		$V_{CC} = 3.0$ to $3.6$ V
		—	-12		$V_{CC} = 4.5$ to $5.5$ V
Input transition rise or fall rate	$\Delta t / \Delta v$	0	300	ns / V	$V_{CC} = 1.65$ to $1.95$ V
		0	200		$V_{CC} = 2.3$ 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.

## Electrical Characteristic

• Ta = -40 to 85°C

Item	Symbol	V <sub>CC</sub> (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	V <sub>IH</sub>	1.65 to 1.95	V <sub>CC</sub> ×0.75	—	—	V	
		2.3 to 2.7	V <sub>CC</sub> ×0.7	—	—		
		3.0 to 3.6	V <sub>CC</sub> ×0.7	—	—		
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—	—		
	V <sub>IL</sub>	1.65 to 1.95	—	—	V <sub>CC</sub> ×0.25		
		2.3 to 2.7	—	—	V <sub>CC</sub> ×0.3		
		3.0 to 3.6	—	—	V <sub>CC</sub> ×0.3		
		4.5 to 5.5	—	—	V <sub>CC</sub> ×0.3		
Hysteresis voltage	V <sub>H</sub>	1.8	—	0.25	—	V	V <sub>T</sub> <sup>+</sup> - V <sub>T</sub> <sup>-</sup>
		2.5	—	0.30	—		
		3.3	—	0.35	—		
		5.0	—	0.45	—		
Output voltage	V <sub>OH</sub>	Min to Max	V <sub>CC</sub> -0.1	—	—	V	I <sub>OH</sub> = -50 μA
		1.65	1.4	—	—		I <sub>OH</sub> = -1 mA
		2.3	2.0	—	—		I <sub>OH</sub> = -2 mA
		3.0	2.48	—	—		I <sub>OH</sub> = -6 mA
		4.5	3.8	—	—		I <sub>OH</sub> = -12 mA
	V <sub>OL</sub>	Min to Max	—	—	0.1		I <sub>OL</sub> = 50 μA
		1.65	—	—	0.3		I <sub>OL</sub> = 1 mA
		2.3	—	—	0.4		I <sub>OL</sub> = 2 mA
		3.0	—	—	0.44		I <sub>OL</sub> = 6 mA
		4.5	—	—	0.55		I <sub>OL</sub> = 12 mA
Input current	I <sub>IN</sub>	0 to 5.5	—	—	±1	μA	V <sub>IN</sub> = 5.5 V or GND
Off state output current	I <sub>OZ</sub>	Min to Max	—	—	±5	μA	V <sub>O</sub> = 5.5 V or GND
Quiescent supply current	I <sub>CC</sub>	5.5	—	—	10	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0
Output leakage current	I <sub>OFF</sub>	0	—	—	5	μA	V <sub>IN</sub> or V <sub>O</sub> = 0 to 5.5 V
Input capacitance	C <sub>IN</sub>	3.3	—	3.0	—	pF	V <sub>IN</sub> = V <sub>CC</sub> or GND

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

**Switching Characteristics**

•  $V_{CC} = 1.8 \pm 0.15 \text{ V}$

Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	13.5	23.5	1.0	26.0	ns	$C_L = 15 \text{ pF}$	A	Y
	$t_{PHL}$	—	19.0	33.0	1.0	36.0		$C_L = 50 \text{ pF}$		
Enable time	$t_{ZH}$	—	13.7	26.5	1.0	29.0	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
	$t_{ZL}$	—	20.5	36.0	1.0	38.0		$C_L = 50 \text{ pF}$		
Disable time	$t_{HZ}$	—	8.3	20.0	1.0	22.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
	$t_{LZ}$	—	13.0	29.5	1.0	32.0		$C_L = 50 \text{ pF}$		

•  $V_{CC} = 2.5 \pm 0.2 \text{ V}$

Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	6.8	13.0	1.0	15.5	ns	$C_L = 15 \text{ pF}$	A	Y
	$t_{PHL}$	—	8.7	16.5	1.0	18.5		$C_L = 50 \text{ pF}$		
Enable time	$t_{ZH}$	—	7.0	13.0	1.0	15.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
	$t_{ZL}$	—	8.8	16.5	1.0	18.5		$C_L = 50 \text{ pF}$		
Disable time	$t_{HZ}$	—	5.1	14.7	1.0	17.0	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
	$t_{LZ}$	—	7.3	18.2	1.0	20.5		$C_L = 50 \text{ pF}$		

•  $V_{CC} = 3.3 \pm 0.3 \text{ V}$

Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	4.8	8.0	1.0	9.5	ns	$C_L = 15 \text{ pF}$	A	Y
	$t_{PHL}$	—	6.1	11.5	1.0	13.0		$C_L = 50 \text{ pF}$		
Enable time	$t_{ZH}$	—	4.8	8.0	1.0	9.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
	$t_{ZL}$	—	6.2	11.5	1.0	13.0		$C_L = 50 \text{ pF}$		
Disable time	$t_{HZ}$	—	4.1	9.7	1.0	11.5	ns	$C_L = 15 \text{ pF}$	$\overline{OE}$	Y
	$t_{LZ}$	—	5.5	13.2	1.0	15.0		$C_L = 50 \text{ pF}$		

# HD74LV1G125A

## Switching Characteristics (cont)

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

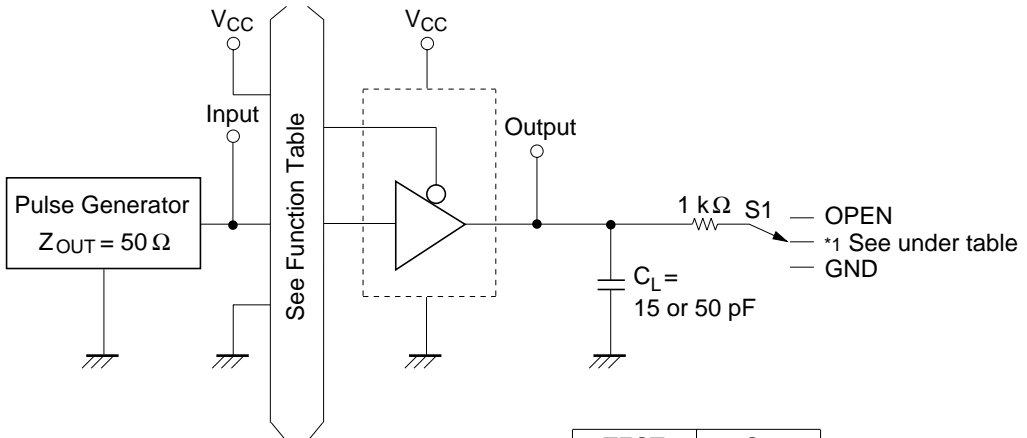
Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	3.4	5.5	1.0	6.5	ns	$C_L = 15$ pF	A	Y
	$t_{PHL}$	—	4.3	7.5	1.0	8.5		$C_L = 50$ pF		
Enable time	$t_{ZH}$	—	3.4	5.1	1.0	6.0	ns	$C_L = 15$ pF	$\overline{OE}$	Y
	$t_{ZL}$	—	4.4	7.1	1.0	8.0		$C_L = 50$ pF		
Disable time	$t_{HZ}$	—	3.2	6.8	1.0	8.0	ns	$C_L = 15$ pF	$\overline{OE}$	Y
	$t_{LZ}$	—	4.0	8.8	1.0	10.0		$C_L = 50$ pF		

## Operating Characteristics

- $C_L = 50$  pF

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	$C_{PD}$	3.3	—	10.5	—	pF	$f = 10$ MHz
		5.0	—	11.5	—		

## Test Circuit

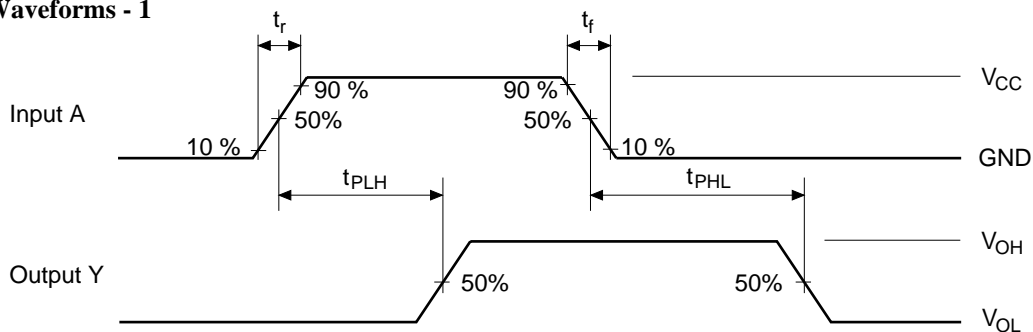


TEST	S1
$t_{PLH}/t_{PHL}$	OPEN
$t_{ZH}/t_{HZ}$	GND
$t_{ZL}/t_{LZ}$	$V_{CC}$

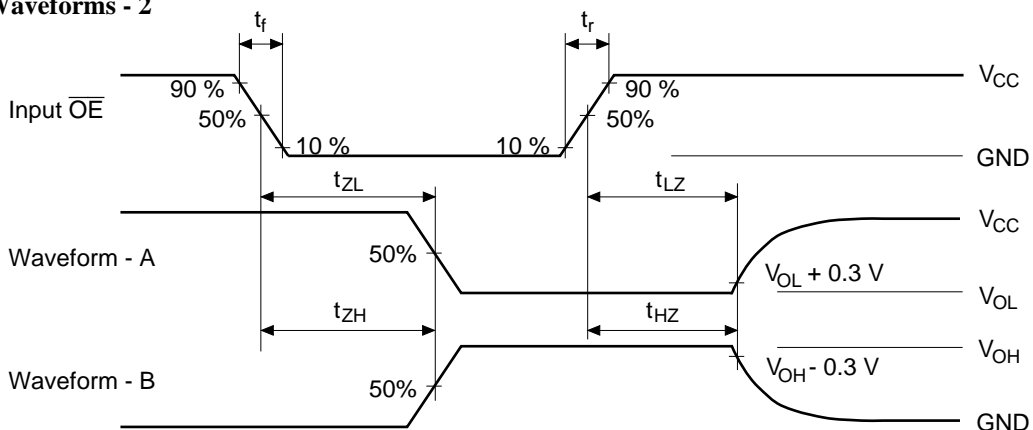
Note: 1.  $C_L$  includes probe and jig capacitance.



• Waveforms - 1



• Waveforms - 2

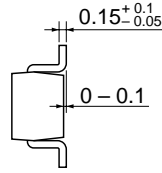
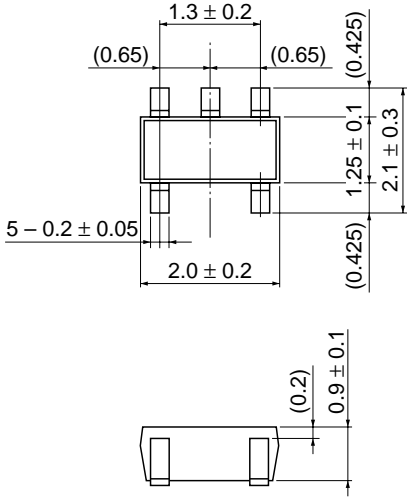


- Notes:
1. Input waveform :  $PRR \leq 1 \text{ MHz}$ ,  $Z_o = 50 \Omega$ ,  $t_r \leq 3 \text{ ns}$ ,  $t_f \leq 3 \text{ ns}$ .
  2. Waveform - A is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform - B is for an output with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

As of January, 2001

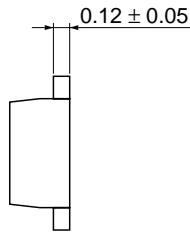
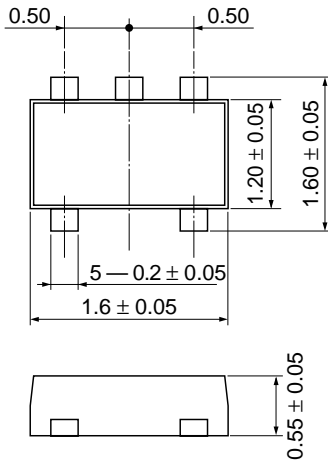
Unit: mm



Hitachi Code	CMPAK-5
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.006 g

As of January, 2001

Unit: mm



Hitachi Code	TNP-5D
JEDEC	—
EIAJ	—
Mass (reference value)	—

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