

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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# HD74LV2GU04A

## Triple Unbuffered Inverters



ADE-205-341B (Z)

Rev.2  
Feb. 2003

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### Description

The HD74LV2GU04A has triple unbuffered inverters in a 8 pin package. 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.

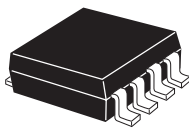
### Features

- 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 HD74LVU04A  
Supply voltage range : 1.65 to 5.5 V  
Operating temperature range : -40 to +85°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 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)
- Ordering Information

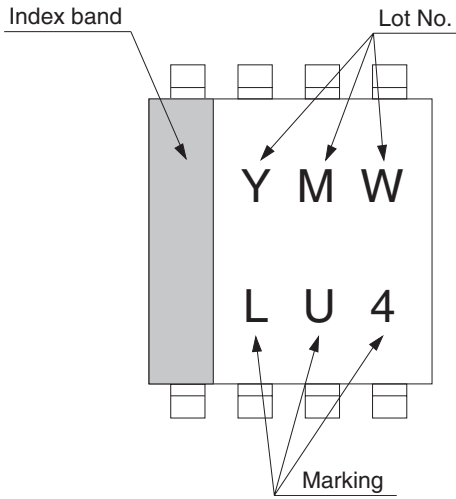
Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV2GU04AUSE	SSOP-8 pin	TTP-8DBV	US	E (3,000 pcs/reel)

Outline and Article Indication

- HD74LV2GU04A



SSOP-8



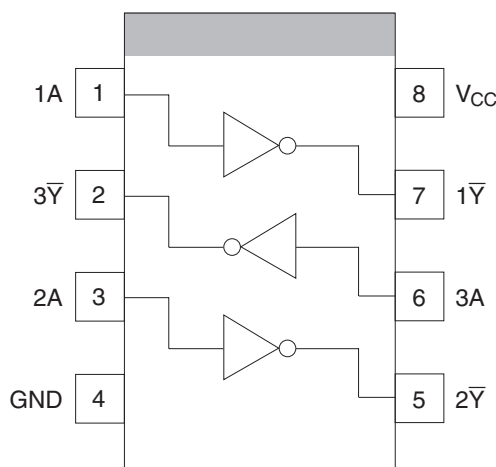
Y : Year code  
(the last digit of year)  
M : Month code  
W : Week code

Function Table

Input A	Output $\bar{Y}$
H	L
L	H

H : High level  
L : Low level

## Pin Arrangement



(Top view)

## 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 $V_{CC} + 0.5$	V	Output : H or L
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	$I_O$	±25	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	±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	°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.

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	
Output current	$I_{OL}$	—	1	mA	$V_{CC} = 1.65 \text{ to } 1.95 \text{ V}$
		—	2		$V_{CC} = 2.3 \text{ to } 2.7 \text{ V}$
		—	6		$V_{CC} = 3.0 \text{ to } 3.6 \text{ V}$
		—	12		$V_{CC} = 4.5 \text{ to } 5.5 \text{ V}$
	$I_{OH}$	—	−1		$V_{CC} = 1.65 \text{ to } 1.95 \text{ V}$
		—	−2		$V_{CC} = 2.3 \text{ to } 2.7 \text{ V}$
		—	−6		$V_{CC} = 3.0 \text{ to } 3.6 \text{ V}$
		—	−12		$V_{CC} = 4.5 \text{ to } 5.5 \text{ V}$
Operating free-air temperature	$T_a$	−40	85	°C	

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

## Electrical Characteristic

- $T_a = -40$  to  $85^\circ\text{C}$

Item	Symbol	$V_{cc}$ (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	$V_{IH}$	1.65 to 1.95	$V_{cc} \times 0.85$	—	—	V	
		2.3 to 2.7	$V_{cc} \times 0.8$	—	—		
		3.0 to 3.6	$V_{cc} \times 0.8$	—	—		
		4.5 to 5.5	$V_{cc} \times 0.8$	—	—		
	$V_{IL}$	1.65 to 1.95	—	—	$V_{cc} \times 0.15$		
		2.3 to 2.7	—	—	$V_{cc} \times 0.2$		
		3.0 to 3.6	—	—	$V_{cc} \times 0.2$		
		4.5 to 5.5	—	—	$V_{cc} \times 0.2$		
Output voltage	$V_{OH}$	Min to Max	$V_{cc} - 0.1$	—	—	V	$I_{OH} = -50 \mu\text{A}$
		1.65	1.4	—	—		$I_{OH} = -1 \text{ mA}$
		2.3	2.0	—	—		$I_{OH} = -2 \text{ mA}$
		3.0	2.48	—	—		$I_{OH} = -6 \text{ mA}$
		4.5	3.8	—	—		$I_{OH} = -12 \text{ mA}$
	$V_{OL}$	Min to Max	—	—	0.1		$I_{OL} = 50 \mu\text{A}$
		1.65	—	—	0.3		$I_{OL} = 1 \text{ mA}$
		2.3	—	—	0.4		$I_{OL} = 2 \text{ mA}$
		3.0	—	—	0.44		$I_{OL} = 6 \text{ mA}$
		4.5	—	—	0.55		$I_{OL} = 12 \text{ mA}$
Input current	$I_{IN}$	0 to 5.5	—	—	$\pm 1$	$\mu\text{A}$	$V_{IN} = 5.5 \text{ V or GND}$
Quiescent supply current	$I_{CC}$	5.5	—	—	10	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND, $I_o = 0$
Input capacitance	$C_{IN}$	3.3	—	4.0	—	pF	$V_{IN} = V_{CC}$ 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	$t_{PLH}$	—	8.0	15.0	1.0	18.0	ns	$C_L = 15 \text{ pF}$	A	$\bar{Y}$
	$t_{PHL}$	—	15.2	24.0	1.0	27.0		$C_L = 50 \text{ pF}$		

- $V_{CC} = 2.5 \pm 0.2 \text{ V}$

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	$t_{PLH}$	—	6.0	10.9	1.0	14.0	ns	$C_L = 15 \text{ pF}$	A	$\bar{Y}$
	$t_{PHL}$	—	9.5	13.4	1.0	16.0		$C_L = 50 \text{ pF}$		

- $V_{CC} = 3.3 \pm 0.3 \text{ V}$

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	$t_{PLH}$	—	5.0	8.9	1.0	10.5	ns	$C_L = 15 \text{ pF}$	A	$\bar{Y}$
	$t_{PHL}$	—	7.5	11.4	1.0	13.0		$C_L = 50 \text{ pF}$		

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

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	$t_{PLH}$	—	3.5	5.5	1.0	6.5	ns	$C_L = 15 \text{ pF}$	A	$\bar{Y}$
	$t_{PHL}$	—	5.0	7.0	1.0	8.0		$C_L = 50 \text{ pF}$		

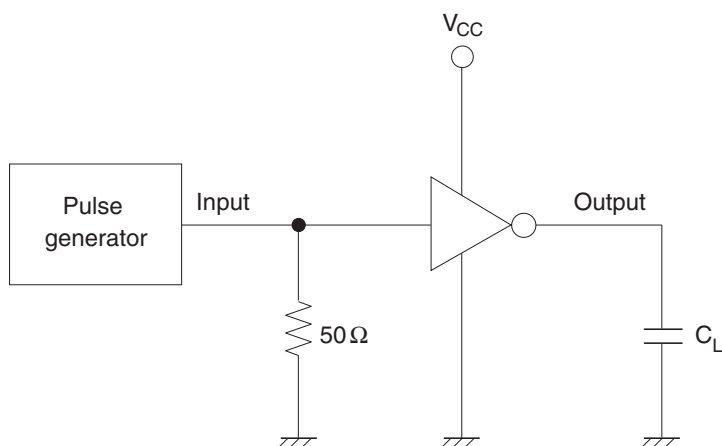
**Operating Characteristics**

- $C_L = 50 \text{ pF}$

Item	Symbol	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation	$C_{PD}$	3.3	—	4.0	—	pF	$f = 10 \text{ MHz}$
capacitance		5.0	—	5.0	—		

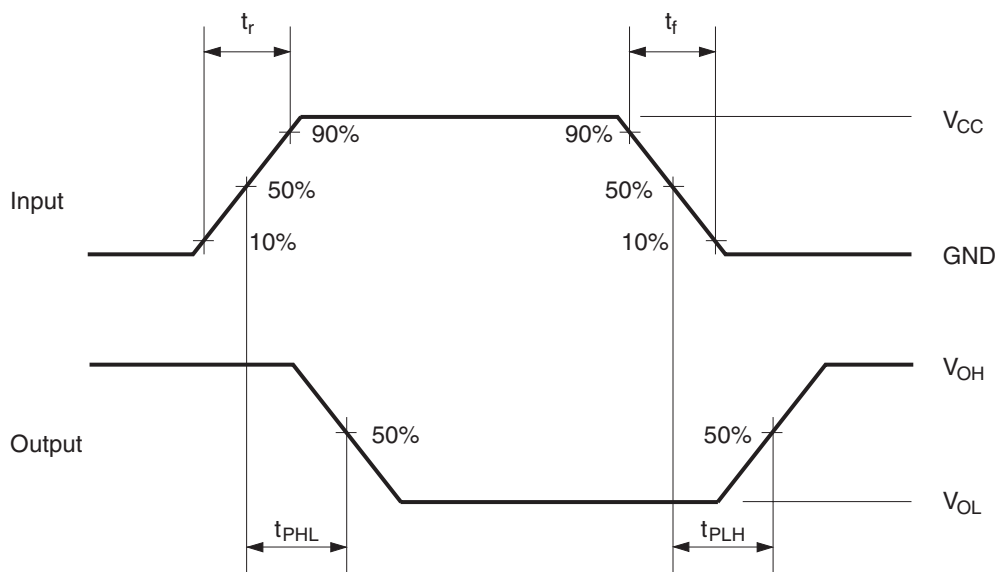


# Test Circuit



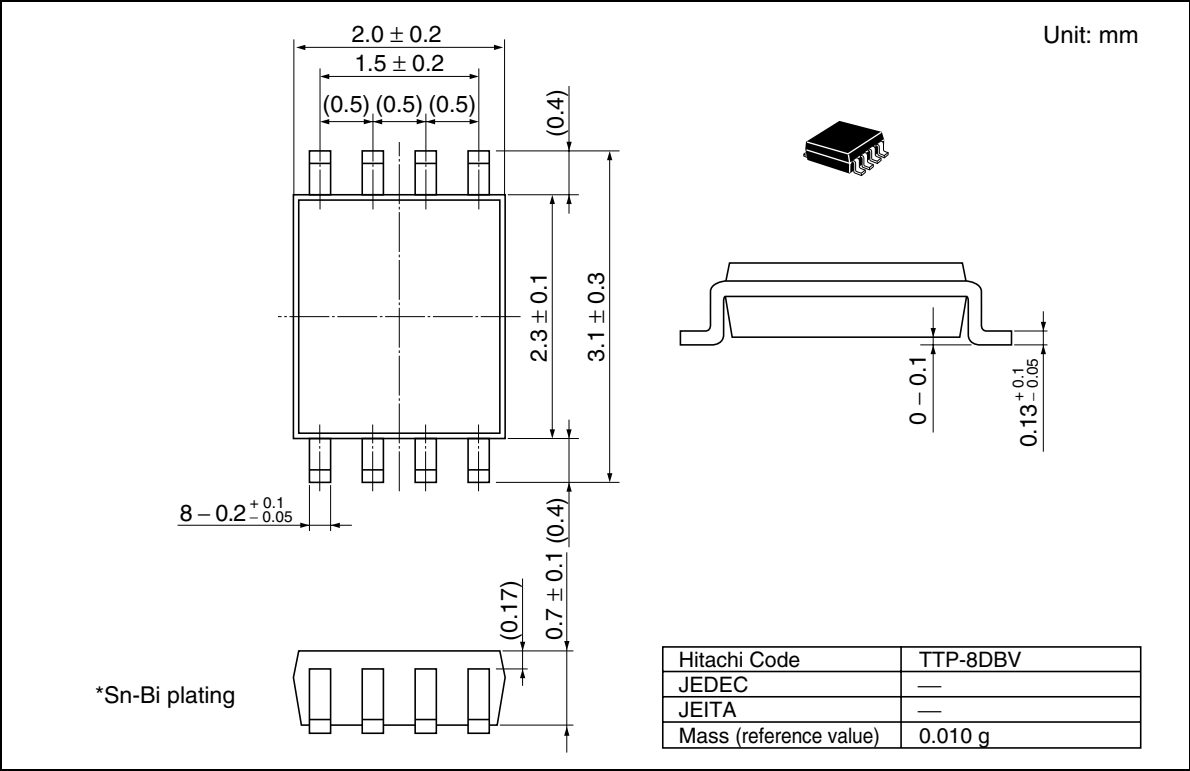
Note: 1.  $C_L$  includes probe and jig capacitance.

## • Waveforms



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. The output are measured one at a time with one transition per measurement.

Package Dimensions



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