



# HD74LV2GT04A

## Triple Inverters / CMOS Logic Level Shifter

REJ03D0139-0200Z  
 (Previous ADE-205-664A (Z))  
 Rev.2.00  
 Oct.14.2003

### Description

The HD74LV2GT04A has triple inverters in an 8 pin package. The input protection circuitry on this device allows over voltage tolerance on the input, allowing the device to be used as a logic-level translator from 3.0 V CMOS Logic to 5.0 V CMOS Logic or from 1.8 V CMOS logic to 3.0 V CMOS Logic while operating at the high-voltage power supply. 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.

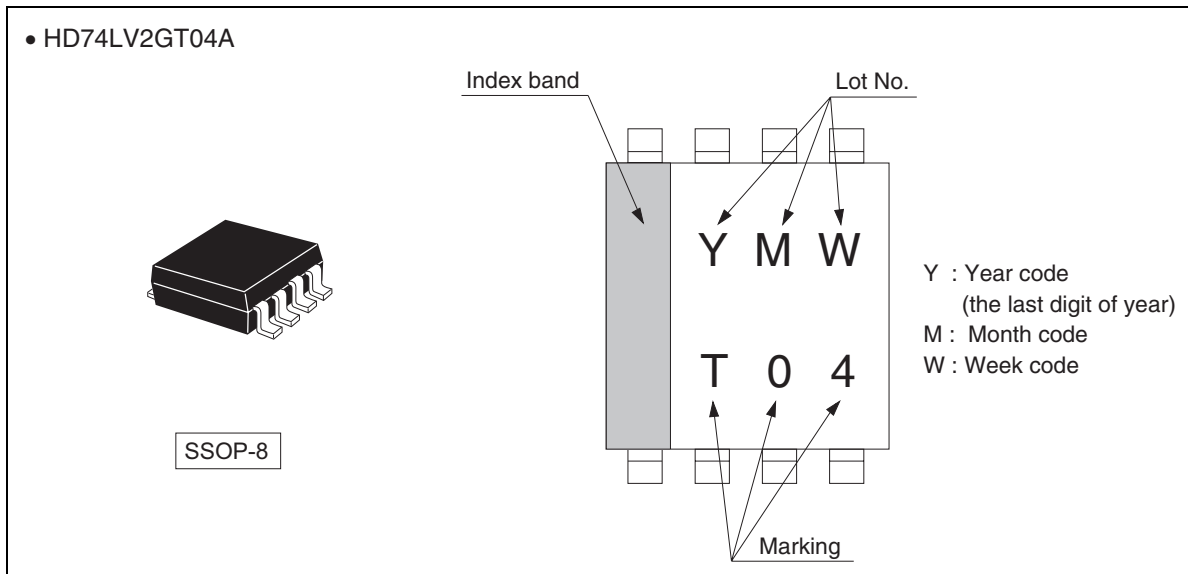
### Features

- The basic gate function is lined up as Renesas uni logic series.
- Supplied on emboss taping for high-speed automatic mounting.
- TTL compatible input level.  
 Supply voltage range : 3.0 to 5.5 V  
 Operating temperature range : -40 to +85°C
- Logic-level translate function  
 3.0 V CMOS logic → 5.0 V CMOS logic (@V<sub>CC</sub> = 5.0 V)  
 1.8 V or 2.5 V CMOS logic → 3.3 V CMOS logic (@V<sub>CC</sub> = 3.3 V)
- All inputs V<sub>IH</sub> (Max.) = 5.5 V (@V<sub>CC</sub> = 0 V to 5.5 V)  
 All outputs V<sub>O</sub> (Max.) = 5.5 V (@V<sub>CC</sub> = 0 V)
- Output current ±6 mA (@V<sub>CC</sub> = 3.0 V to 3.6 V), ±12 mA (@V<sub>CC</sub> = 4.5 V to 5.5 V)
- All the logical input has hysteresis voltage for the slow transition.
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV2GT04AUSE	SSOP-8 pin	TTP-8DBV	US	E (3,000 pcs/reel)

## HD74LV2GT04A

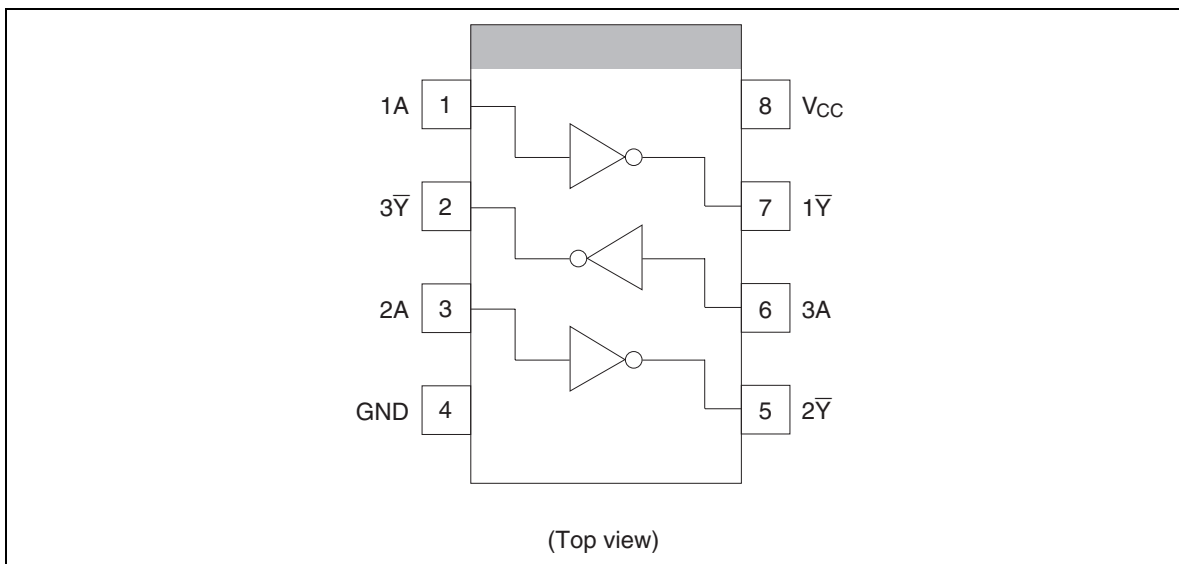
### Outline and Article Indication



### Function Table

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

H : High level  
L : Low level

**HD74LV2GT04A****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
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	$T_{stg}$	-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 $^\circ\text{C}$ .

**HD74LV2GT04A****Recommended Operating Conditions**

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	$V_{CC}$	3.0	5.5	V	
Input voltage range	$V_I$	0	5.5	V	
Output voltage range	$V_O$	0	$V_{CC}$	V	
Output current	$I_{OL}$	—	6	mA	$V_{CC} = 3.0$ to $3.6$ V
		—	12		$V_{CC} = 4.5$ to $5.5$ V
	$I_{OH}$	—	-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	100	ns / V	$V_{CC} = 3.0$ 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**

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

Item	Symbol	$V_{CC}$ (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	$V_{IH}$	3.0 to 3.6	1.5	—	—	V	
		4.5 to 5.5	2.0	—	—		
	$V_{IL}$	3.0 to 3.6	—	—	0.6		
		4.5 to 5.5	—	—	0.8		
Hysteresis voltage	$V_H$	3.3	—	0.10	—	V	$V_T^+ - V_T^-$
		5.0	—	0.15	—		
Output voltage	$V_{OH}$	Min to Max	$V_{CC}-0.1$	—	—	V	$I_{OH} = -50$ $\mu\text{A}$
		3.0	2.48	—	—		$I_{OH} = -6$ mA
		4.5	3.8	—	—		$I_{OH} = -12$ mA
	$V_{OL}$	Min to Max	—	—	0.1		$I_{OL} = 50$ $\mu\text{A}$
		3.0	—	—	0.44		$I_{OL} = 6$ mA
		4.5	—	—	0.55		$I_{OL} = 12$ mA
Input current	$I_{IN}$	0 to 5.5	—	—	$\pm 1$	$\mu\text{A}$	$V_{IN} = 5.5$ V or GND
Quiescent supply current	$I_{CC}$	5.5	—	—	10	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND, $I_O = 0$
		$\Delta I_{CC}$	5.5	—	—	1.5	mA
Output leakage current	$I_{OFF}$	0	—	—	5	$\mu\text{A}$	$V_I$ or $V_O = 0$ to $5.5$ V
Input capacitance	$C_{IN}$	5.0	—	3.0	—	pF	$V_{IN} = V_{CC}$ or GND

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

## HD74LV2GT04A

### Switching Characteristics

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

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	6.5	12.0	1.0	14.0	ns	$C_L = 15$ pF	A	$\bar{Y}$
	$t_{PHL}$	—	11.0	15.0	1.0	17.0		$C_L = 50$ pF		

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

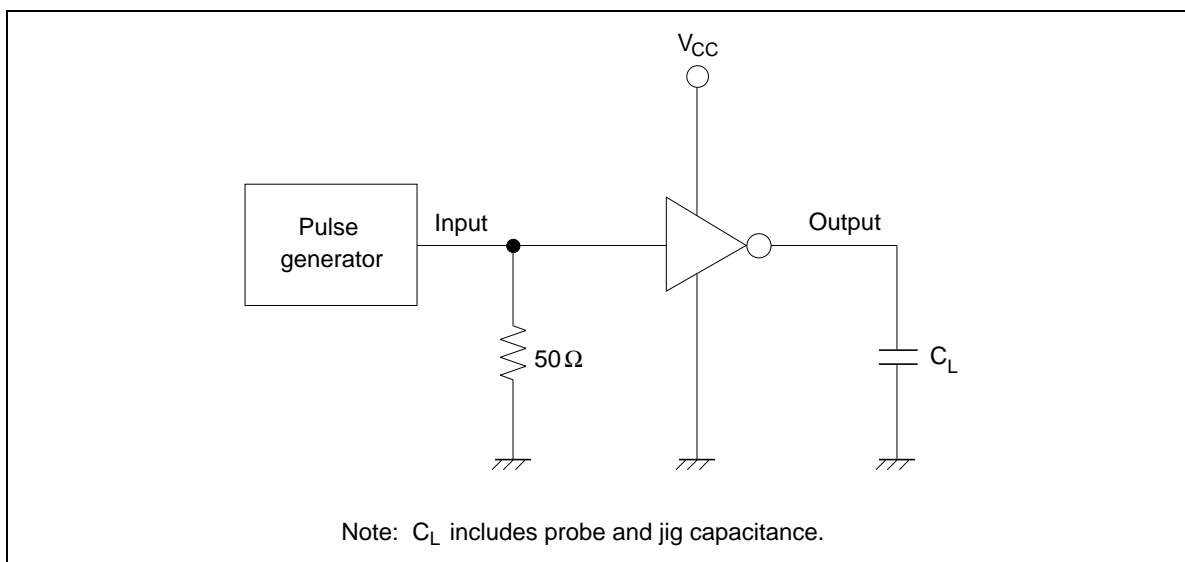
Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	5.0	7.0	1.0	8.0	ns	$C_L = 15$ pF	A	$\bar{Y}$
	$t_{PHL}$	—	8.0	10.5	1.0	12.0		$C_L = 50$ pF		

### Operating Characteristics

- $C_L = 50$  pF

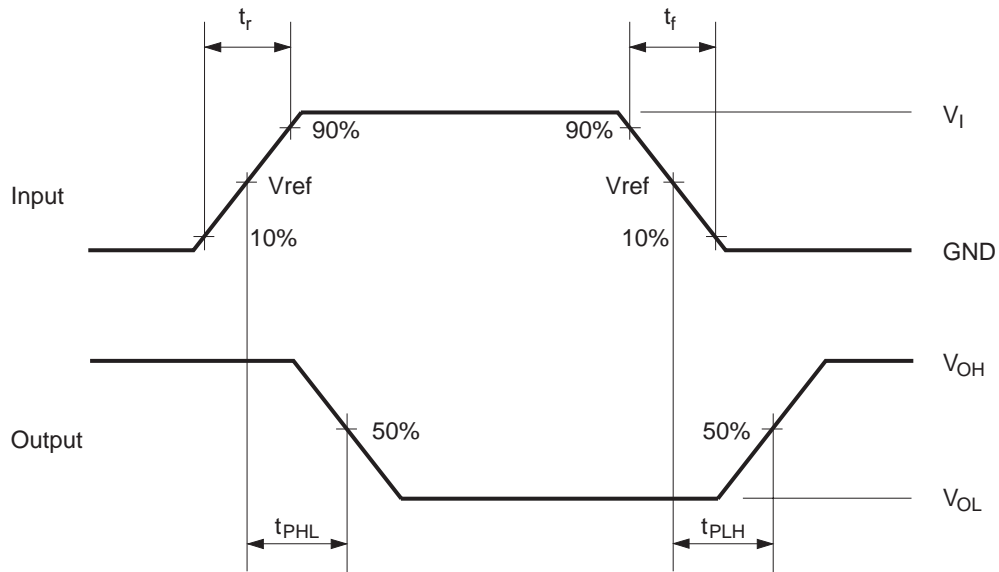
Item	Symbol	$V_{CC}$ (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	$C_{PD}$	5.0	—	10.0	—	pF	f = 10 MHz

### Test Circuit



**HD74LV2GT04A**

• Waveforms

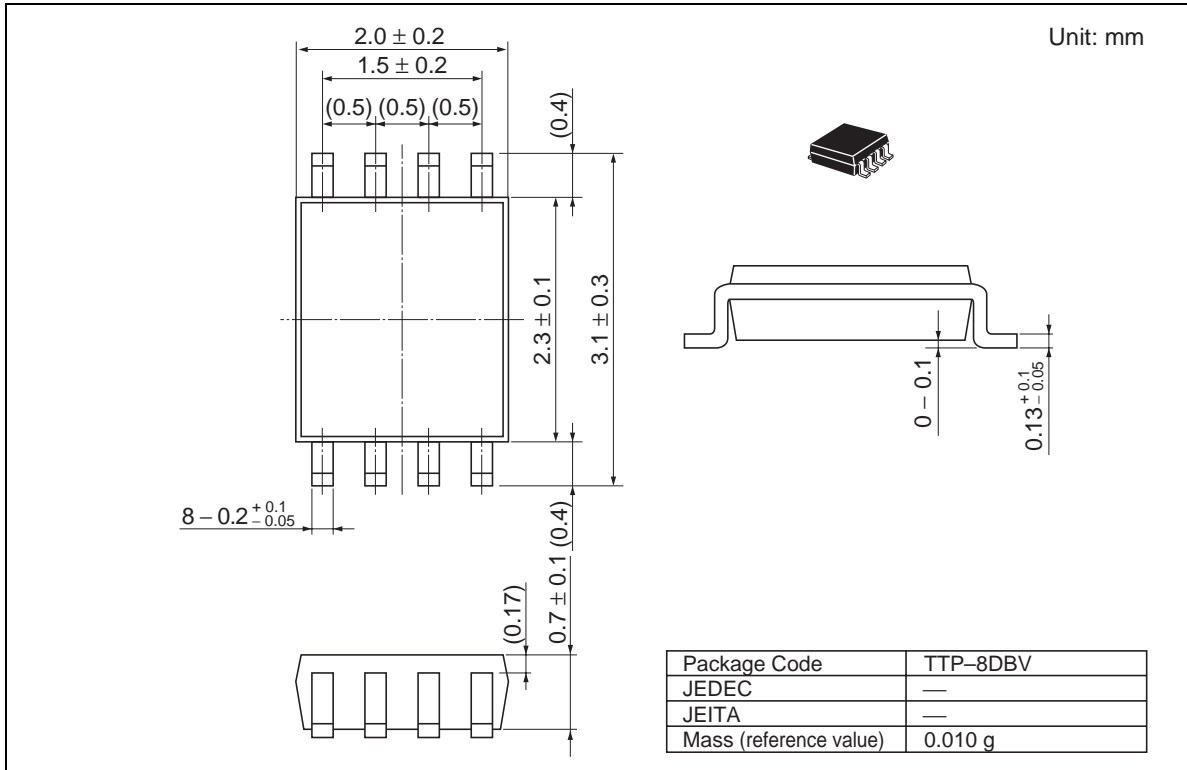


$V_{CC}$ (V)	INPUTS		Vref
	$V_I$	$t_r / t_f$	
$3.3 \pm 0.3$	2.5 V	$\leq 3.0$ ns	50%
$5.0 \pm 0.5$	3 V	$\leq 3.0$ ns	1.5 V

- Notes: 1. Input waveform : PRR  $\leq$  1 MHz,  $Z_o = 50 \Omega$ .  
 2. The output are measured one at a time with one transition per measurement.

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**Package Dimensions**



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