

HD74LV27A

Triple 3-input Positive NOR Gates

HITACHI

ADE-205-256 (Z)
1st Edition
March 1999

Description

The HD74LV27A performs the Boolean functions $Y = \overline{A \cdot B \cdot C}$ or $Y = \overline{A+B+C}$ in positive logic. 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

- $V_{CC} = 2.0 \text{ V}$ to 5.5 V operation
- All inputs $V_{IH} (\text{Max.}) = 5.5 \text{ V}$ ($@V_{CC} = 0 \text{ V}$ to 5.5 V)
- All outputs $V_O (\text{Max.}) = 5.5 \text{ V}$ ($@V_{CC} = 0 \text{ V}$)
- 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 $> 2.3 \text{ V}$ ($@V_{CC} = 3.3 \text{ V}$, $T_a = 25^\circ\text{C}$)
- Output current $\pm 6 \text{ mA}$ ($@V_{CC} = 3.0 \text{ V}$ to 3.6 V), $\pm 12 \text{ mA}$ ($@V_{CC} = 4.5 \text{ V}$ to 5.5 V)

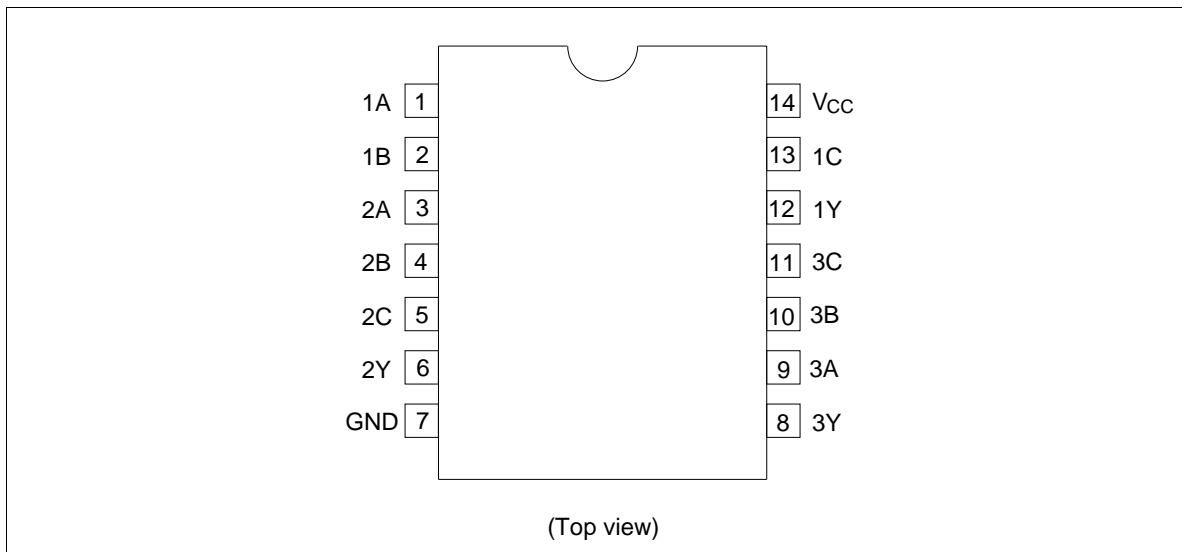
Function Table

Inputs			Output Y
A	B	C	
H	X	X	L
X	H	X	L
X	X	H	L
L	L	L	H

Note: H: High level
L: Low level
X: Immaterial

HD74LV27A

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	V_{CC}	-0.5 to 7.0	V	
Input voltage range* ¹	V_I	-0.5 to 7.0	V	
Output voltage range* ^{1, 2}	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}	± 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)* ³	P_T	785	mW	SOP
		500		TSSOP
Storage temperature	T_{stg}	-65 to 150	$^\circ\text{C}$	

Notes: The absolute maximum ratings are values which must not be 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 even 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.

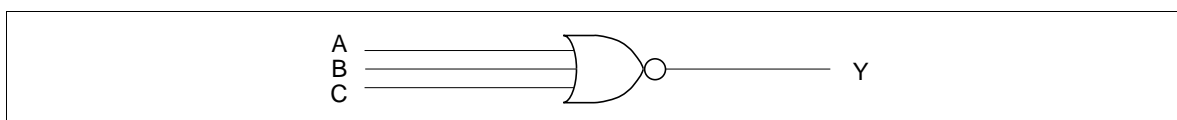
HD74LV27A

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	2.0	5.5	V	
Input voltage range	V_I	0	5.5	V	
Output voltage range	V_O	0	V_{CC}	V	
Output current	I_{OH}	—	-50	μA	$V_{CC} = 2.0 V$
		—	-2	mA	$V_{CC} = 2.3 \text{ to } 2.7 V$
		—	-6		$V_{CC} = 3.0 \text{ to } 3.6 V$
		—	-12		$V_{CC} = 4.5 \text{ to } 5.5 V$
	I_{OL}	—	50	μA	$V_{CC} = 2.0 V$
		—	2	mA	$V_{CC} = 2.3 \text{ to } 2.7 V$
		—	6		$V_{CC} = 3.0 \text{ to } 3.6 V$
		—	12		$V_{CC} = 4.5 \text{ to } 5.5 V$
Input transition rise or fall rate	$\Delta t / \Delta v$	0	200	ns/V	$V_{CC} = 2.3 \text{ to } 2.7 V$
		0	100		$V_{CC} = 3.0 \text{ to } 3.6 V$
		0	20		$V_{CC} = 4.5 \text{ to } 5.5 V$
Operating free-air temperature	T_a	-40	85	$^{\circ}C$	

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

Logic Diagram



DC Electrical Characteristics

• Ta = -40 to 85°C

Item	Symbol	V _{CC} (V)*	Min	Typ	Max	Unit	Test Conditions
Input voltage	V _{IH}	2.0	1.5	—	—	V	
		2.3 to 2.7	V _{CC} × 0.7	—	—		
		3.0 to 3.6	V _{CC} × 0.7	—	—		
		4.5 to 5.5	V _{CC} × 0.7	—	—		
	V _{IL}	2.0	—	—	0.5		
		2.3 to 2.7	—	—	V _{CC} × 0.3		
		3.0 to 3.6	—	—	V _{CC} × 0.3		
		4.5 to 5.5	—	—	V _{CC} × 0.3		
Output voltage	V _{OH}	Min to Max	V _{CC} - 0.1	—	—	V	I _{OH} = -50 μA
		2.3	2.0	—	—		I _{OH} = -2 mA
		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 μA
		2.3	—	—	0.4		I _{OL} = 2 mA
		3.0	—	—	0.44		I _{OL} = 6 mA
		4.5	—	—	0.55		I _{OL} = 12 mA
Input current	I _{IN}	0 to 5.5	—	—	±1	μA	V _{IN} = 5.5 V or GND
Quiescent supply current	I _{CC}	5.5	—	—	20	μA	V _{IN} = V _{CC} or GND, I _O = 0
Output leakage current	I _{OFF}	0	—	—	5	μA	V _O = 5.5 V
Input capacitance	C _{IN}	3.3	—	3.5	—	pF	V _I = V _{CC} or GND

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

HD74LV27A

Switching Characteristics

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

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max	Max				
Propagation delay time	t_{PLH}	—	8.3	13.8	1.0	16.0	ns	$C_L = 15 \text{ pF}$	A, B, or C	Y	
	t_{PHL}	—	10.0	17.5	1.0	21.0					$C_L = 50 \text{ pF}$

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

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max	Max				
Propagation delay time	t_{PLH}	—	6.2	8.8	1.0	10.5	ns	$C_L = 15 \text{ pF}$	A, B, or C	Y	
	t_{PHL}	—	8.7	12.3	1.0	14.0					$C_L = 50 \text{ pF}$

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

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C			Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max	Max				
Propagation delay time	t_{PLH}	—	4.1	5.9	1.0	7.0	ns	$C_L = 15 \text{ pF}$	A, B, or C	Y	
	t_{PHL}	—	5.6	7.9	1.0	9.0					$C_L = 50 \text{ pF}$

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 capacitance	C_{PD}	3.3	—	9.5	—	pF	f = 10 MHz
		5.0	—	11.0	—		

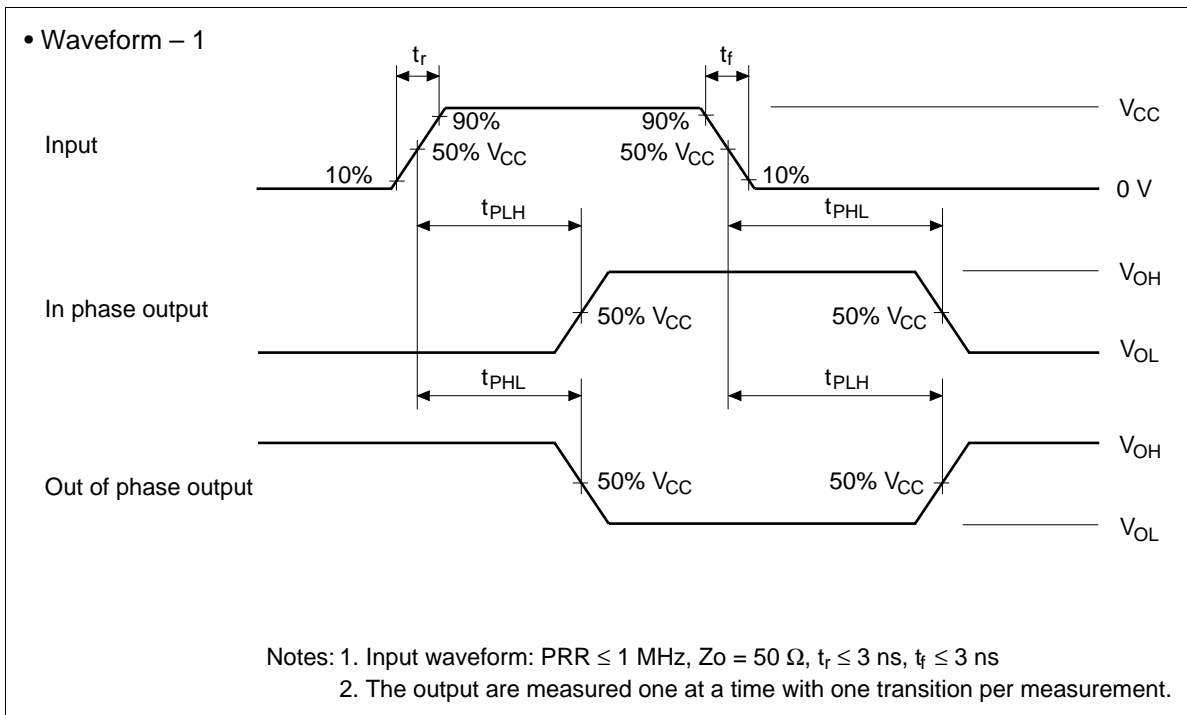
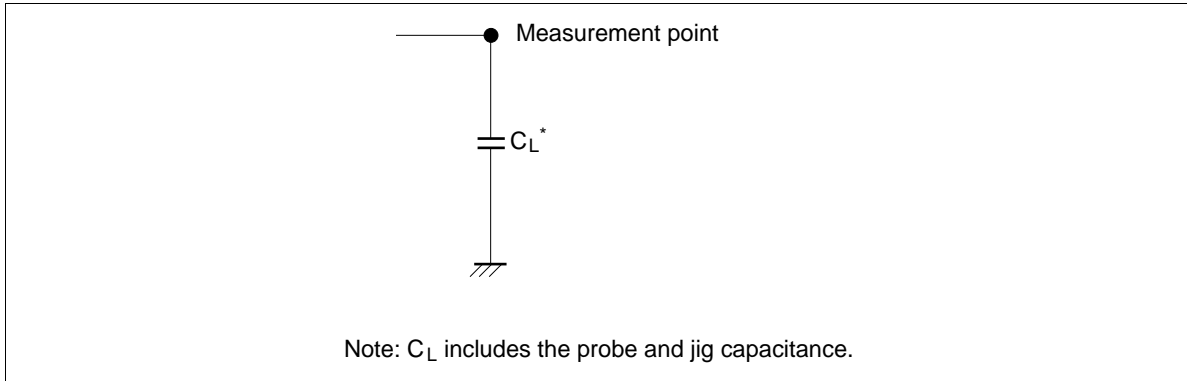
Noise Characteristics

- $C_L = 50 \text{ pF}$

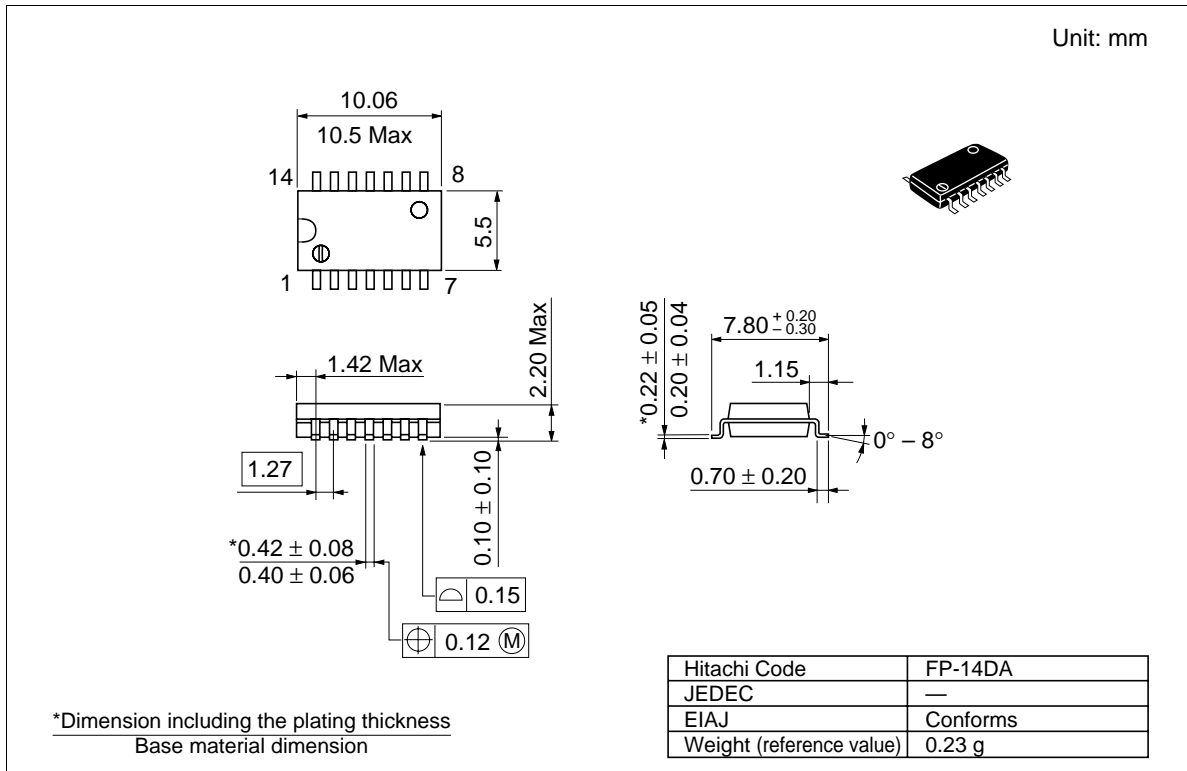
Item	Symbol	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Quiet output, maximum dynamic V_{OL}	$V_{OL(P)}$	3.3	—	0.2	0.8	V	
Quiet output, minimum dynamic V_{OL}	$V_{OL(V)}$	3.3	—	-0.1	-0.8		
Quiet output, minimum dynamic V_{OH}	$V_{OH(V)}$	3.3	—	3.2	—		
High-level dynamic input voltage	$V_{IH(D)}$	3.3	2.31	—	—	V	
Low-level dynamic input voltage	$V_{IL(D)}$	3.3	—	—	0.99		

HD74LV27A

Test Circuit

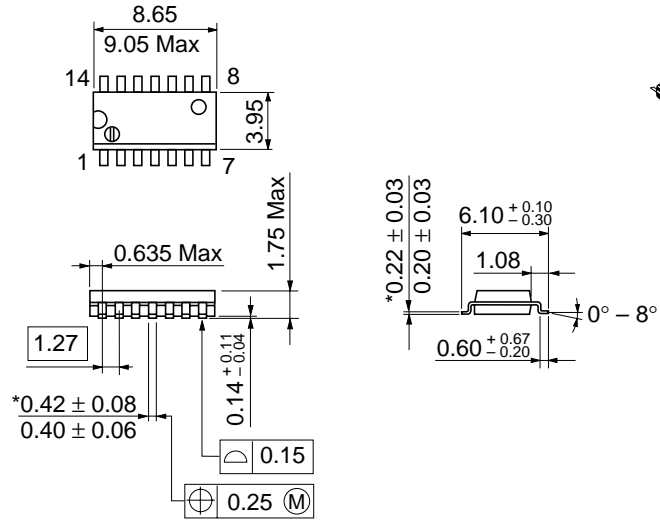


Package Dimensions



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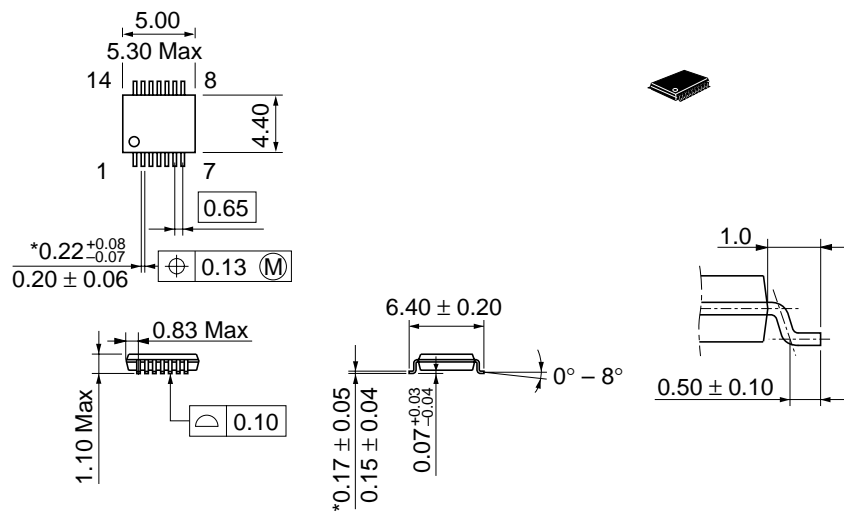
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-14DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.13 g

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-14D
JEDEC	—
EIAJ	—
Weight (reference value)	0.05 g

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