

## Description

The 74LV00A provides provides four independent 2-input NAND gates with standard push-pull outputs. The device is designed for operation with a power supply range of 2.0V to 5.5V.

The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output preventing damaging current backflow when the device is powered down.

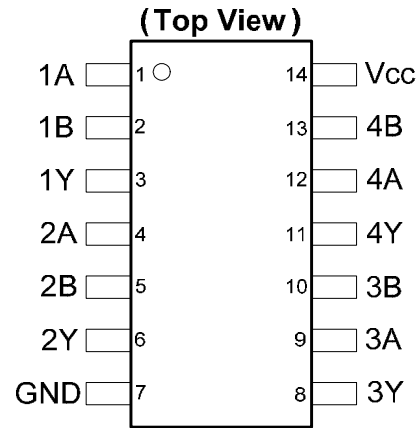
The gates perform the Boolean function:

$$Y = \overline{A \bullet B} \text{ or } Y = \overline{A} + \overline{B}$$

## Features

- Wide Supply Voltage Range from 2.0V to 5.5V
- Sinks or sources 12mA at V<sub>CC</sub> = 4.5V
- CMOS low power consumption
- I<sub>OFF</sub> Supports Partial -Power Down Operation
- Inputs or Outputs accept up to 5.5V
- Inputs can be driven by 3.3V or 5V allowing for voltage translation applications.
- Schmitt Trigger Action at All Inputs
- ESD Protection Tested per JESD 22
  - Exceeds 200-V Machine Model (A115)
  - Exceeds 2000-V Human Body Model (A114)
  - Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Pin Assignments



**SO-14 / TSSOP-14**

## Applications

- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
  - PCs, networking, notebooks, ultrabooks, netbooks
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box

Notes:

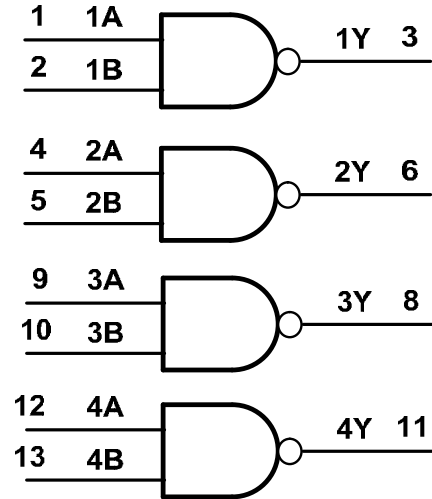
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

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**Pin Descriptions**

Pin Number	Pin Name	Description
1	1A	Data Input
2	1B	Data Input
3	1Y	Data Output
4	2A	Data Input
5	2B	Data Input
6	2Y	Data Output
7	GND	Ground
8	3Y	Data Output
9	3A	Data Input
10	3B	Data Input
11	4Y	Data Output
12	4A	Data Input
13	4B	Data Input
14	V <sub>CC</sub>	Supply Voltage

**Logic Diagram**



**Function Table**

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

**Absolute Maximum Ratings** (Note 4) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
V <sub>CC</sub>	Supply Voltage Range	-0.5 to +7.0	V
V <sub>I</sub>	Input Voltage Range note 4	-0.5 to +7.0	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> < 0V	-20	mA
I <sub>OK</sub>	Output Clamp Current V <sub>O</sub> < -0V	-50	mA
I <sub>O</sub>	Continuous Output Current - 0.5V < V <sub>O</sub> < V <sub>CC</sub> + 0.5V	±25	mA
I <sub>CC</sub>	Continuous Current Through V <sub>CC</sub>	50	mA
I <sub>GND</sub>	Continuous Current Through GND	-50	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
P <sub>TOT</sub>	Total Power Dissipation	500	mW

Note: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

**Recommended Operating Conditions** (Note 5) (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	Supply Voltage	—	2.0	5.5	V
$V_I$	Input Voltage	—	0	5.5	V
$V_O$	Output Voltage	—	0	$V_{CC}$	V
$I_{OH}$	High-Level Output Current	2.0V	—	-50	mA
		2.3V to 2.7V	—	-2	$\mu\text{A}$
		3.0V to 3.6V	—	-6	mA
		4.5V to 5.5V	—	-12	mA
$I_{OL}$	Low-Level Output Current	2.0V	—	50	$\mu\text{A}$
		2.3V to 2.7V	—	2	mA
		3.0V to 3.6V	—	6	mA
		4.5V to 5.5V	—	12	mA
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	2.3V to 2.7V	—	200	ns/V
		3.0V to 3.6V	—	100	
		4.5V to 5.5V	—	20	
$T_A$	Operating Free-Air Temperature	—	-40	+125	$^\circ\text{C}$

 Note: 5. Unused inputs should be held at  $V_{CC}$  or Ground.

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	$V_{CC}$	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C to } +125^\circ\text{C}$		Unit
				Min	Max	Min	Max	
$V_{IH}$	High-Level Input Voltage	—	2.0V	1.5	—	1.5	—	V
		—	2.3V to 2.7V	$V_{CC} \times 0.7$	—	$V_{CC} \times 0.7$	—	
		—	3.0V to 3.6V	$V_{CC} \times 0.7$	—	$V_{CC} \times 0.7$	—	
		—	4.5V to 5.5V	$V_{CC} \times 0.7$	—	$V_{CC} \times 0.7$	—	
$V_{IL}$	Low-Level Input Voltage	—	2.0V	—	0.5	—	0.5	V
		—	2.3V to 2.7V	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$	
		—	3.0V to 3.6V	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$	
		—	4.5V to 5.5V	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$	
$V_{OH}$	High-Level Output Voltage	$I_{OH} = -50\mu\text{A}$	2.0V to 5.5V	$V_{CC}-0.1$	—	$V_{CC}-0.1$	—	V
		$I_{OH} = -2\text{mA}$	2.3V	2.0	—	2.0	—	
		$I_{OH} = -6\text{mA}$	3.0V	2.48	—	2.48	—	
		$I_{OH} = -12\text{mA}$	4.5V	3.8	—	3.8	—	
$V_{OL}$	Low-Level Output Voltage	$I_{OL} = 50\mu\text{A}$	2.0V to 5.5V	—	0.1	—	0.1	V
		$I_{OL} = 2\text{mA}$	2.3V	—	0.4	—	0.4	
		$I_{OL} = 6\text{mA}$	3.0V	—	0.44	—	0.44	
		$I_{OL} = 12\text{mA}$	4.5V	—	0.55	—	0.55	
$I_{OFF}$	Power Down Leakage Current	$V_I$ or $V_O = 0$ to 5.5V	0V	—	5	—	5	$\mu\text{A}$
$I_I$	Input Current	$V_I = \text{GND}$ or 5.5V	0 to 5.5V	—	$\pm 1$	—	$\pm 1$	$\mu\text{A}$
$I_{CC}$	Supply Current	$V_I = \text{GND}$ or $V_{CC}$ $I_O = 0$	5.5V	—	20	—	20	$\mu\text{A}$

### Switching Characteristics

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	T <sub>A</sub> = +25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>PD</sub>	Propagation Delay A <sub>N</sub> to Y <sub>N</sub>	Figure 1 C <sub>L</sub> = 15pF	2.5V ± 0.2V	—	7.1	12.9	1	15	1	16	ns
			3.3V ± 0.3V	—	5	7.9	1	9.5	1	10.5	
			5.0V ± 0.5V	—	3.6	5.5	1	6.5	1	7.5	
		Figure 1 C <sub>L</sub> = 50pF	2.5V ± 0.2V	—	9.6	16.6	1	20	1	21	ns
			3.3V ± 0.3V	—	6.9	11.4	1	13	1	14	
			5.0V ± 0.5V	—	4.9	7.5	1	8.5	1	9.5	

### Operating Characteristics

 T<sub>A</sub> = +25°C

Parameter		Test Conditions	V <sub>CC</sub>	Typ	Unit
C <sub>pd</sub>	Power Dissipation Capacitance per Gate	F = 10 MHz C <sub>L</sub> = 50pF	3.3V	9.5	pF
			5.0V	11	

### Noise Characteristics

 V<sub>CC</sub> = 3V, C<sub>L</sub> = 50pF, T<sub>A</sub> = +25°C

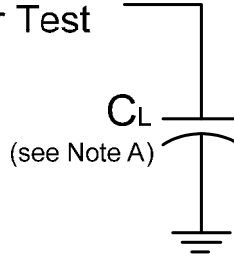
Symbol	Parameter	Min	Typ	Max	Unit
V <sub>OL(p)</sub>	Quiet output, maximum dynamic V <sub>OL</sub>	—	0.2	0.8	V
V <sub>OL(v)</sub>	Quiet output, minimum dynamic V <sub>OL</sub>	—	-0.1	-0.8	V
V <sub>OH(v)</sub>	Quiet output, minimum dynamic V <sub>OH</sub>	—	3.1	—	V
V <sub>IH(D)</sub>	High Level dynamic input voltage	2.31	—	—	V
V <sub>IL(D)</sub>	Low Level dynamic input voltage	—	—	0.99	V

### Package Characteristics

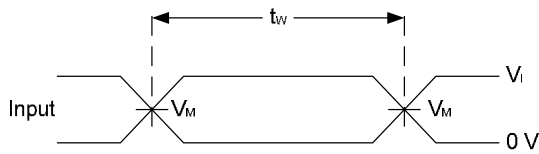
Symbol	Parameter	Test Conditions	V <sub>CC</sub>	Min	Typ	Max	Unit
C <sub>i</sub>	Input Capacitance	V <sub>i</sub> = V <sub>CC</sub> – or GND	2.0 to 5.5V	—	3.3	10	pF

**Parameter Measurement Information**

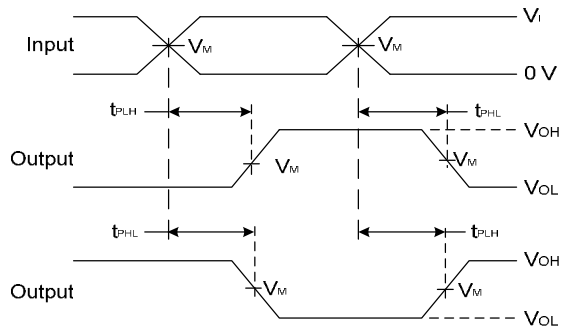
From Output Under Test



V <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>		
2.0V to 5.5V	V <sub>CC</sub>	<3ns	V <sub>CC</sub> /2	15pF or 50pF



**Voltage Waveform  
Pulse Duration**



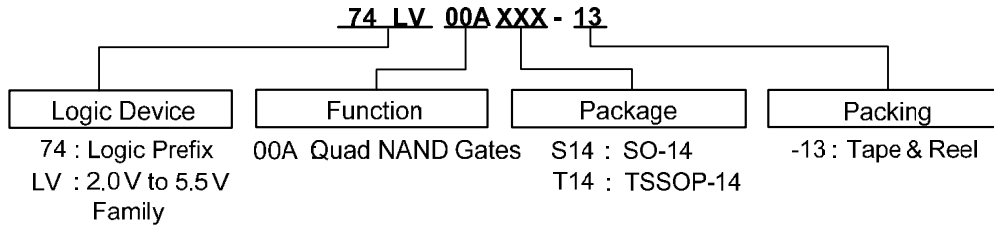
**Voltage Waveform  
Propagation Delay Times  
Inverting and Non Inverting Outputs**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. All pulses are supplied at pulse repetition rate ≤ 10MHz
  - C. Inputs are measured separately one transition per measurement
  - D. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>PD</sub>

**Figure 1 Load Circuit and Voltage Waveforms**

NEW PRODUCT

**Ordering Information**

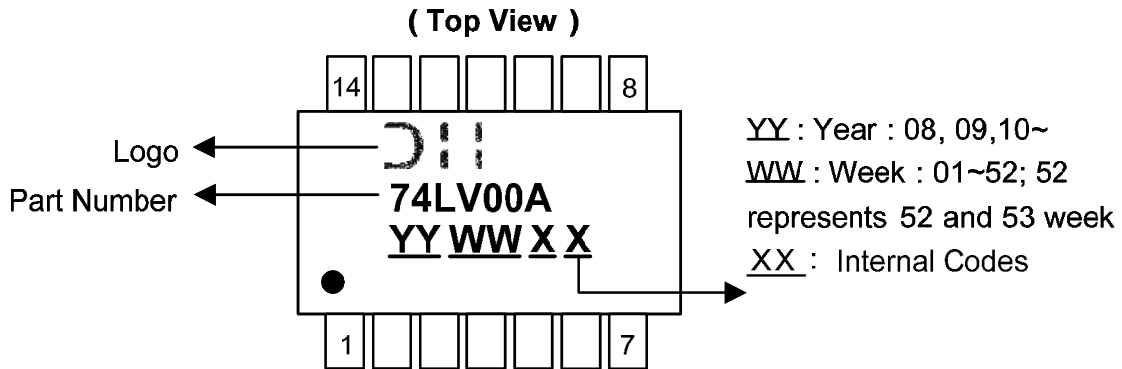


Device	Package Code	Packaging (Note 6)	13" Tape and Reel	
			Quantity	Part Number Suffix
74LV00AS14-13	S14	SO-14	2500/Tape & Reel	-13
74LV00AT14-13	T14	TSSOP-14	2500/Tape & Reel	-13

Note: 6. The taping orientation and tape details can be found at <http://www.diodes.com/datasheets/ap02007.pdf>

**Marking Information**

(1) SO14, TSSOP14



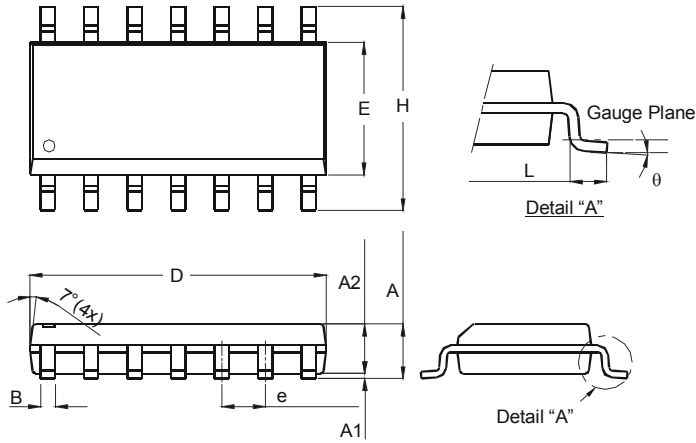
Part Number	Package
74LV00AS14	SO-14
74LV00AT14	TSSOP-14

NEW PRODUCT

**Package Outline Dimensions** (All Dimensions in mm)

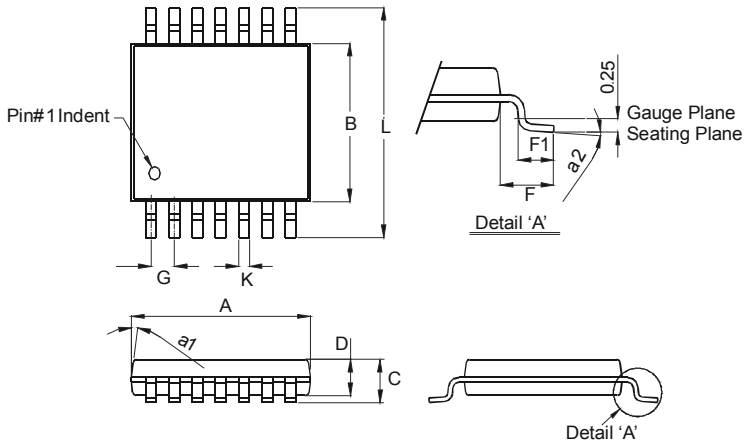
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**Package Type: SO-14**



SO-14		
Dim	Min	Max
A	1.47	1.73
A1	0.10	0.25
A2	1.45 Typ	
B	0.33	0.51
D	8.53	8.74
E	3.80	3.99
e	1.27 Typ	
H	5.80	6.20
L	0.38	1.27
$\theta$	0°	8°
All Dimensions in mm		

**Package Type: TSSOP-14**

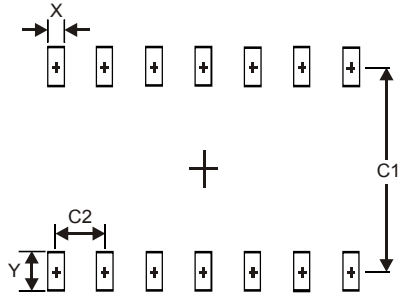


TSSOP-14		
Dim	Min	Max
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
All Dimensions in mm		

**Suggested Pad Layout**

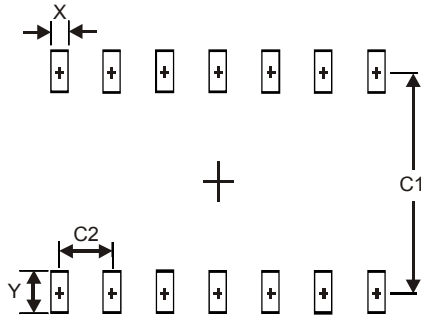
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

Package Type: SO-14



Dimensions	Value (in mm)
X	0.60
Y	1.50
C1	5.4
C2	1.27

Package Type: TSSOP-14



Dimensions	Value (in mm)
X	0.45
Y	1.45
C1	5.9
C2	0.65



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