

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_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

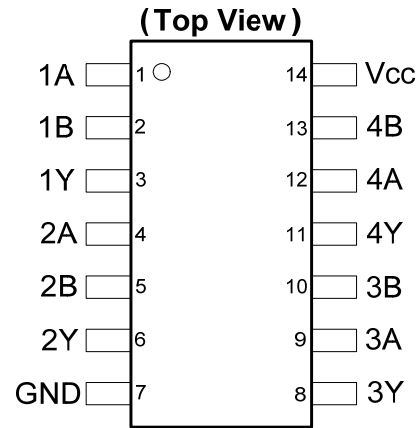
The gates perform the Boolean function:

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

Features

- Wide Supply Voltage Range from 2.0V to 5.5V
- Sinks or sources 12mA at V_{CC} = 4.5V
- CMOS low power consumption
- I_{OFF} 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 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.

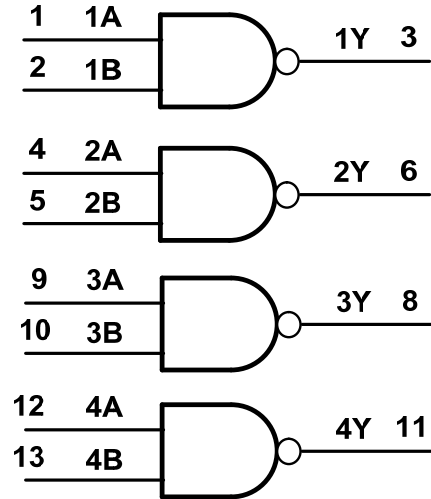
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Pin Descriptions

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 _{CC}	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_A = +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 _{CC}	Supply Voltage Range	-0.5 to +7.0	V
V _I	Input Voltage Range note 4	-0.5 to +7.0	V
I _{IK}	Input Clamp Current V _I < 0V	-20	mA
I _{OK}	Output Clamp Current V _O < -0V	-50	mA
I _O	Continuous Output Current - 0.5V < V _O < V _{CC} + 0.5V	±25	mA
I _{CC}	Continuous Current Through V _{CC}	50	mA
I _{GND}	Continuous Current Through GND	-50	mA
T _J	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C
P _{TOT}	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	μA
		3.0V to 3.6V	—	-6	mA
		4.5V to 5.5V	—	-12	mA
I_{OL}	Low-Level Output Current	2.0V	—	50	μA
		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	μA
I_I	Input Current	$V_I = \text{GND}$ or 5.5V	0 to 5.5V	—	± 1	—	± 1	μA
I_{CC}	Supply Current	$V_I = \text{GND}$ or V_{CC} $I_O = 0$	5.5V	—	20	—	20	μA

Switching Characteristics

Symbol	Parameter	Test Conditions	V _{CC}	T _A = +25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PD}	Propagation Delay A _N to Y _N	Figure 1 C _L = 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 _L = 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_A = +25°C

Parameter		Test Conditions	V _{CC}	Typ	Unit
C _{pd}	Power Dissipation Capacitance per Gate	F = 10 MHz C _L = 50pF	3.3V	9.5	pF
			5.0V	11	

Noise Characteristics

 V_{CC} = 3V, C_L = 50pF, T_A = +25°C

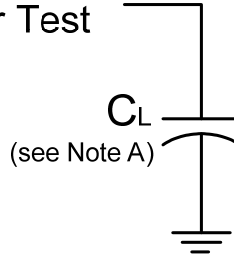
Symbol	Parameter	Min	Typ	Max	Unit
V _{OL(p)}	Quiet output, maximum dynamic V _{OL}	—	0.2	0.8	V
V _{OL(V)}	Quiet output, minimum dynamic V _{OL}	—	-0.1	-0.8	V
V _{OH(V)}	Quiet output, minimum dynamic V _{OH}	—	3.1	—	V
V _{IH(D)}	High Level dynamic input voltage	2.31	—	—	V
V _{IL(D)}	Low Level dynamic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

Package Characteristics

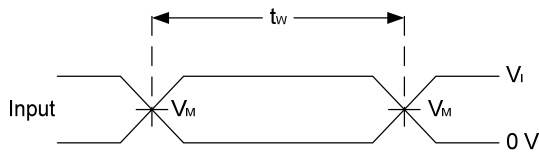
Symbol	Parameter	Test Conditions	V _{CC}	Min	Typ	Max	Unit
C _i	Input Capacitance	V _i = V _{CC} – or GND	2.0 to 5.5V	—	3.3	10	pF

Parameter Measurement Information

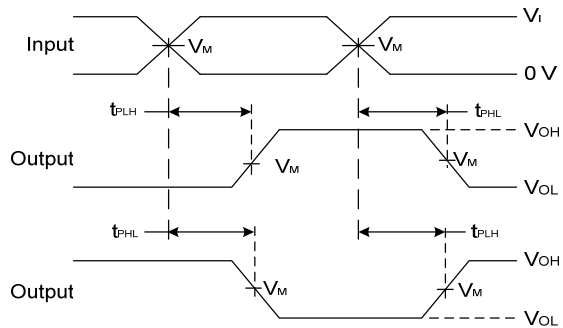
From Output Under Test



V _{CC}	Inputs		V _M	C _L
	V _I	t _r /t _f		
2.0V to 5.5V	V _{CC}	<3ns	V _{CC} /2	15pF or 50pF



**Voltage Waveform
Pulse Duration**



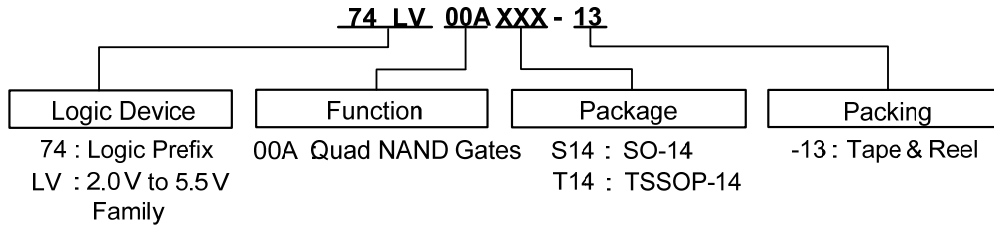
**Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs**

- 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_{PLH} and t_{PHL} are the same as t_{PD}

Figure 1 Load Circuit and Voltage Waveforms

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Ordering Information

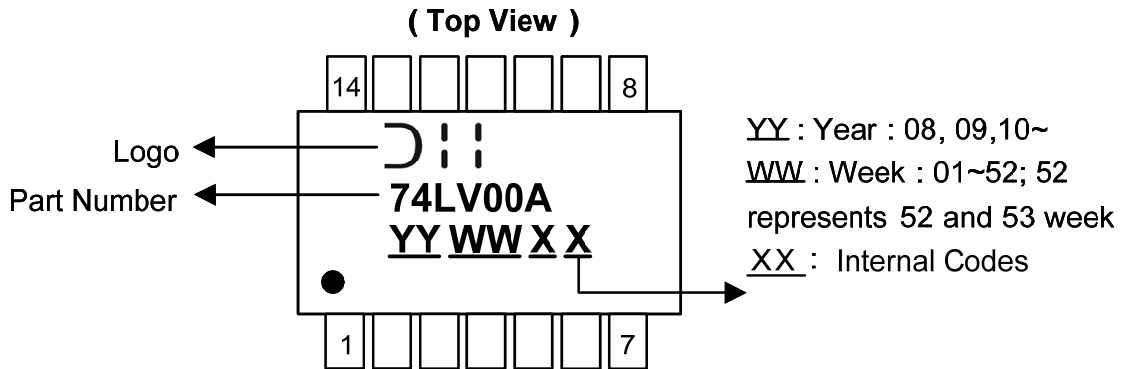


Device	Package Code	Packaging (Note 6)	13" Tape and Reel	
			Quantity	Part Number Suffix
74LV00AS14-13	S14	SO-14	2500/Tape & Reel	-13
74LV00AT14-13	T14	TSSOP-14	2500/Tape & Reel	-13

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

Marking Information

(1) SO14, TSSOP14



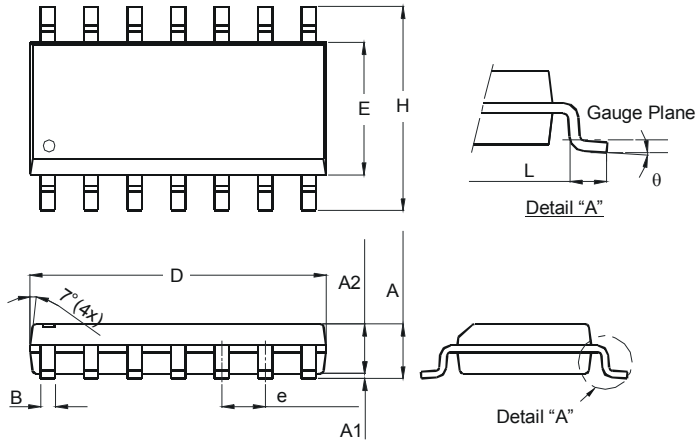
Part Number	Package
74LV00AS14	SO-14
74LV00AT14	TSSOP-14

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Package Outline Dimensions (All Dimensions in mm)

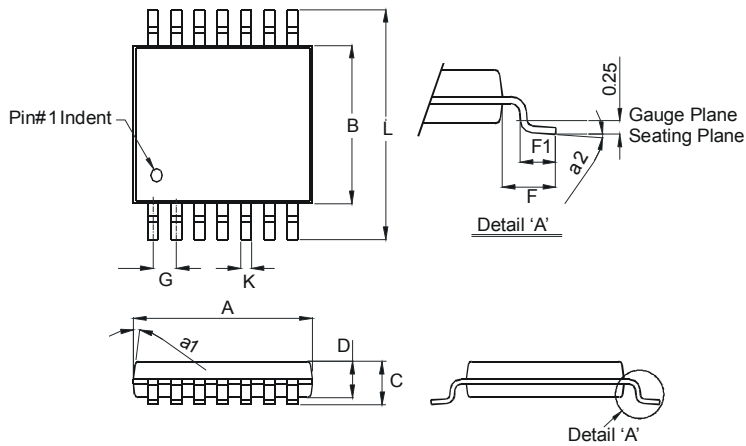
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

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
θ	0°	8°
All Dimensions in mm		

Package Type: TSSOP-14

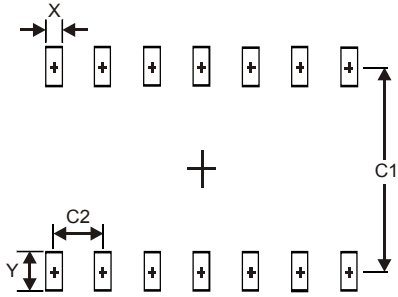


TSSOP-14		
Dim	Min	Max
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
All Dimensions in mm		

Suggested Pad Layout

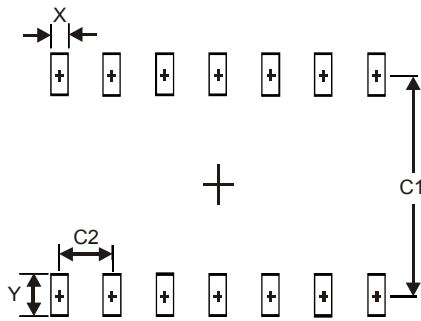
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

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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