QUADRUPLE 2-INPUT NAND GATES

NEW PRODUCT

Description

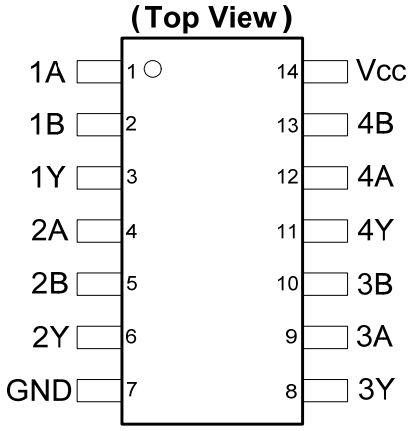
The 74LV00A provides provides four independent 2-input NAND gates with standard push-pull outputs. The device is designed for operation with a power supply range of 2.0V to 5.5V.

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:

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

Pin Assignments



SO-14 / TSSOP-14

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)**

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.

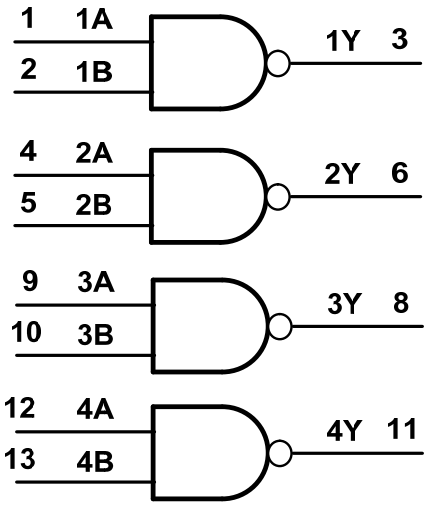
Click for Ordering Information

NEW PRODUCT

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.

NEW PRODUCT

Recommended Operating Conditions (Note 5) (@T_A = +25°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
Δt/ΔV	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	°C

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

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC}	T_A = -40°C to +85°C		T_A = -40°C to +125°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} X 0.7	—	V_{CC} X 0.7	—	
		—	3.0V to 3.6V	V_{CC} X 0.7	—	V_{CC} X 0.7	—	
		—	4.5V to 5.5V	V_{CC} X 0.7	—	V_{CC} X 0.7	—	—
V_{IL}	Low-Level Input Voltage	—	2.0V	—	0.5	—	0.5	V
		—	2.3V to 2.7V	—	V_{CC} X 0.3	—	V_{CC} X 0.3	
		—	3.0V to 3.6V	—	V_{CC} X 0.3	—	V_{CC} X 0.3	
		—	4.5V to 5.5V	—	V_{CC} X 0.3	—	V_{CC} X 0.3	—
V_{OH}	High-Level Output Voltage	I_{OH} = -50µA	2.0V to 5.5V	V_{CC}-0.1	—	V_{CC}-0.1	—	V
		I_{OH} = -2mA	2.3V	2.0	—	2.0	—	
		I_{OH} = -6mA	3.0V	2.48	—	2.48	—	
		I_{OH} = -12mA	4.5V	3.8	—	3.8	—	
V_{OL}	Low-Level Output Voltage	I_{OL} = 50µA	2.0V to 5.5V	—	0.1	—	0.1	V
		I_{OL} = 2mA	2.3V	—	0.4	—	0.4	
		I_{OL} = 6mA	3.0V	—	0.44	—	0.44	
		I_{OL} = 12mA	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 = GND or 5.5V	0 to 5.5V	—	±1	—	±1	µA
I_{CC}	Supply Current	V_I = GND or V_{CC} I_O = 0	5.5V	—	20	—	20	µA

NEW PRODUCT

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

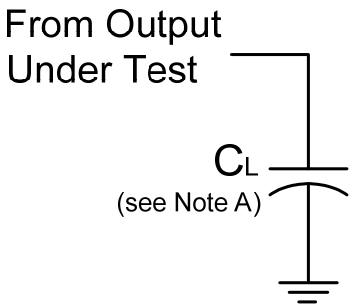
Symbol	Parameter	Min	Typ	Max	Unit
$V_{OL(p)}$	Quiet output, maximum dynamic V_{OL}	—	0.2	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}	—	-0.1	-0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}	—	3.1	—	V
$V_{IH(D)}$	High Level dynamic input voltage	2.31	—	—	V
$V_{IL(D)}$	Low Level dynamic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

Package Characteristics

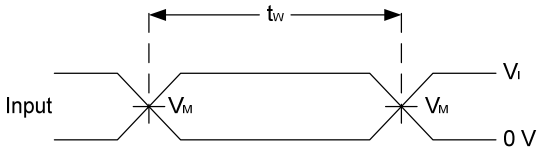
Symbol	Parameter	Test Conditions	V_{CC}	Min	Typ	Max	Unit
C_i	Input Capacitance	V_i = V_{CC} – or GND	2.0 to 5.5V	—	3.3	10	pF

NEW PRODUCT

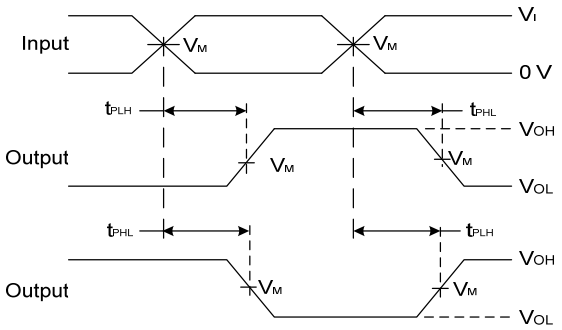
Parameter Measurement Information



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



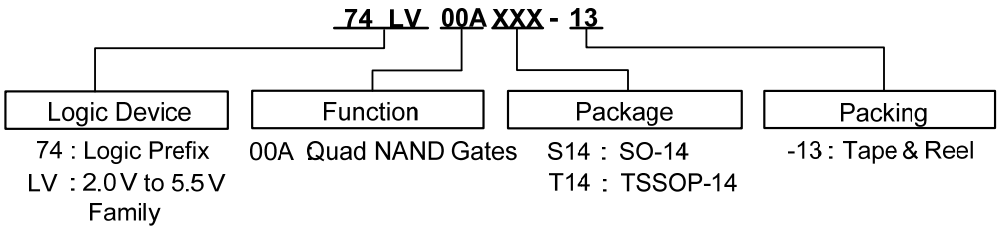
Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs

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

NEW PRODUCT

Ordering Information

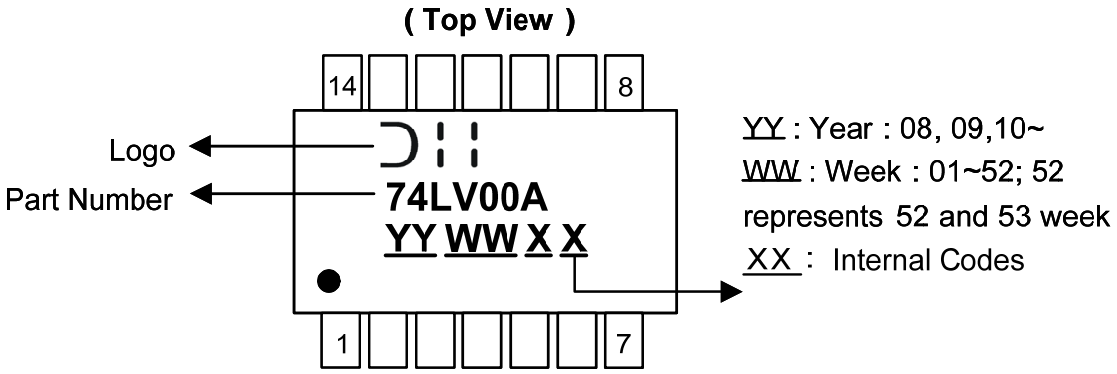


Device	Package Code	Packaging (Note 6)	13" Tape and Reel	
			Quantity	Part Number Suffix
74LV00AS14-13	S14	SO-14	2500/Tape & Reel	-13
74LV00AT14-13	T14	TSSOP-14	2500/Tape & Reel	-13

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

Marking Information

(1) SO14, TSSOP14



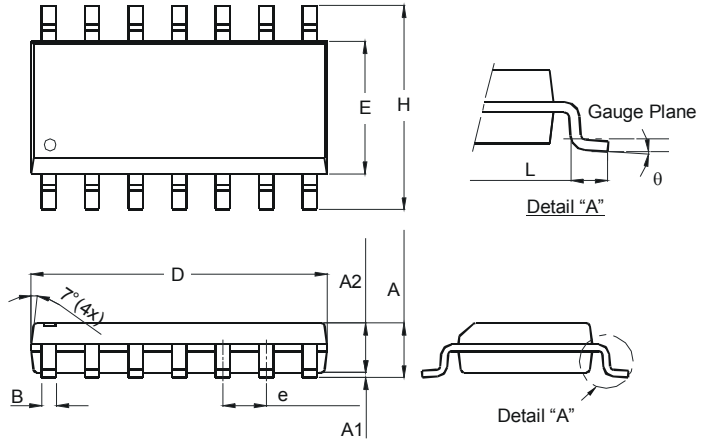
Part Number	Package
74LV00AS14	SO-14
74LV00AT14	TSSOP-14

NEW PRODUCT

Package Outline Dimensions (All Dimensions in mm)

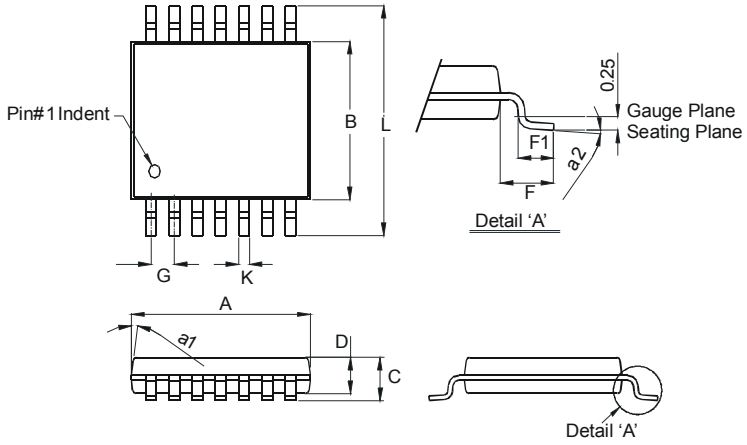
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

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
θ	0°	8°
All Dimensions in mm		

Package Type: TSSOP-14



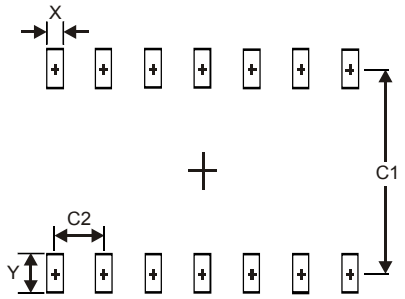
TSSOP-14		
Dim	**Min**	**Max**
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
All Dimensions in mm		

NEW PRODUCT

Suggested Pad Layout

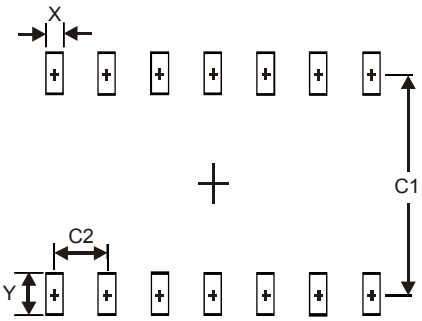
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

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

NEW PRODUCT

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331