

Description

The 74LV04A provides provides six independent inverters 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:

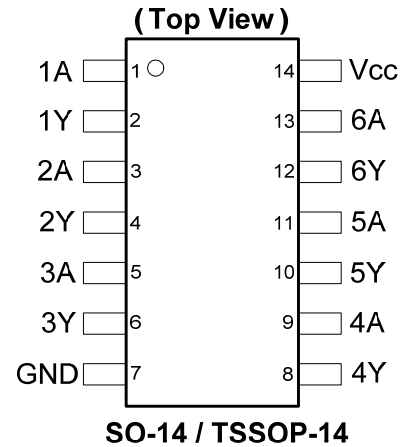
$$Y = \overline{A}$$

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)**

- 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> 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.

Pin Assignments



Applications

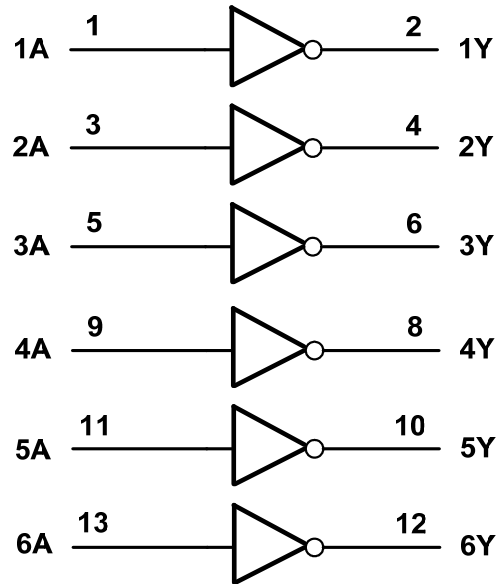
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
 - PCs, networking, notebooks, ultrabooks, netbooks
 - Computer peripherals, hard drives, CD/DVD ROM
 - TV, DVD, DVR, set top box

[Click here for ordering information, located at the end of datasheet](#)

Pin Descriptions

Pin Number	Pin Name	Description
1	1A	Data Input
2	1Y	Data Output
3	2A	Data Input
4	2Y	Data Output
5	3A	Data Input
6	3Y	Data Output
7	GND	Ground
8	4Y	Data Output
9	4A	Data Input
10	5Y	Data Output
11	5A	Data Input
12	6Y	Data Output
13	6A	Data Input
14	Vcc	Supply Voltage

Logic Diagram



Function Table

Input	Output
A	Y
H	L
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	11.7	1	14	1	14	ns
			3.3V ± 0.3V	—	5.1	7.1	1	8.5	1	8.5	
			5.0V ± 0.5V	—	3.6	5.5	1	6.5	1	6.5	
		Figure 1 C _L = 50 pF	2.5V ± 0.2V	—	10	15.5	1	18	1	18	ns
			3.3V ± 0.3V	—	7.3	10.6	1	12	1	12	
			5.0V ± 0.5V	—	5.1	7.5	1	8.5	1	8.5	

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

Parameter		Test Conditions	V _{CC}	Typ	Unit
C _{pd}	Power Dissipation Capacitance per Gate	F = 10 MHz C _L = 50pF	3.3V	9.6	pF
			5.0V	11.4	

Noise Characteristics

V_{CC} = 3V, C_L = 50pF T_A = +25°C

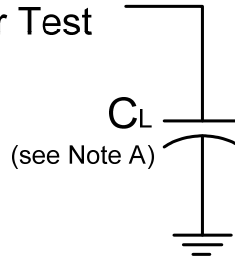
Symbol	Parameter	Min	Typ	Max	Unit
V _{OL(p)}	Quiet output, maximum dynamic V _{OL}	—	0.2	0.8	V
V _{OL(v)}	Quiet output, minimum dynamic V _{OL}	—	-0.1	-0.8	V
V _{OH(v)}	Quiet output, minimum dynamic V _{OH}	—	3.1	—	V
V _{IH(D)}	High Level dynamic input voltage	2.31	—	—	V
V _{IL(D)}	Low Level dynamic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

Package Characteristics

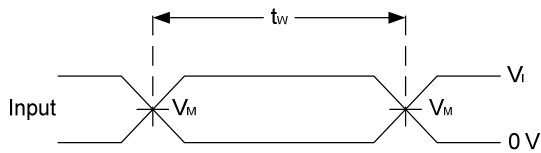
Symbol	Parameter	Test Conditions	V _{CC}	Min	Typ	Max	Unit
C _i	Input Capacitance	V _i = V _{CC} – or GND	2.0 to 5.5V		3.3	10	pF

Parameter Measurement Information

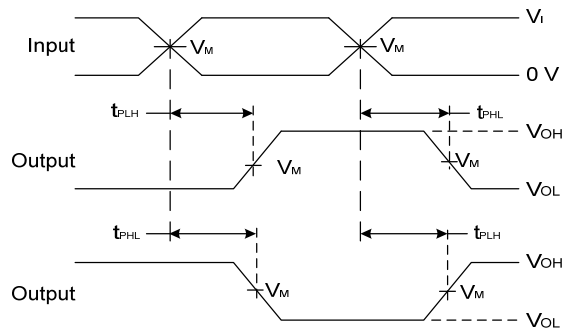
From Output Under Test



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

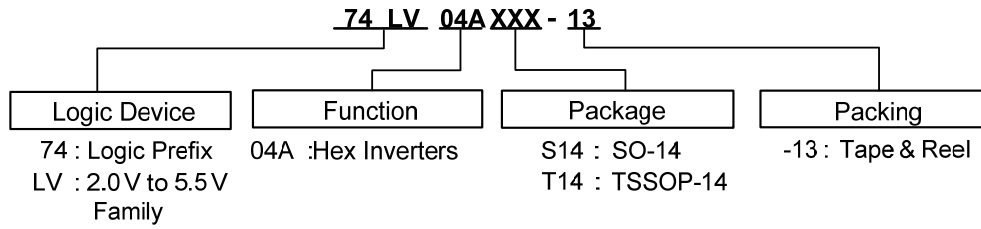


Voltage Waveform Propagation Delay Times Inverting and Non Inverting Outputs

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - 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

Ordering Information

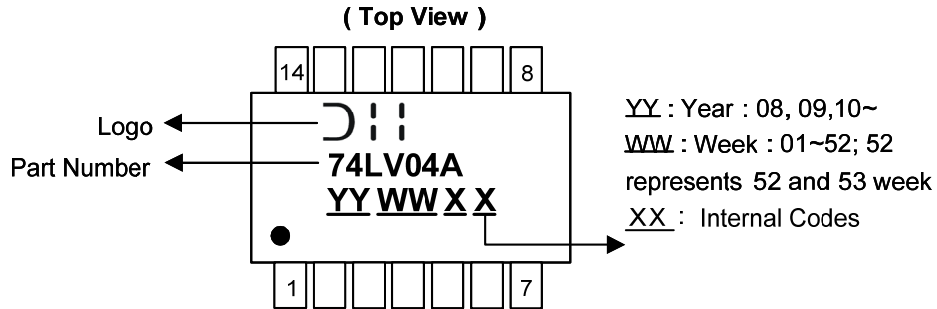


Device	Package Code	Packaging (Note 6)	13" Tape and Reel	
			Quantity	Part Number Suffix
74LV04AS14-13	S14	SO-14	2500/Tape & Reel	-13
74LV04AT14-13	T14	TSSOP-14	2500/Tape & Reel	-13

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

Marking Information

(1) SO14, TSSOP14

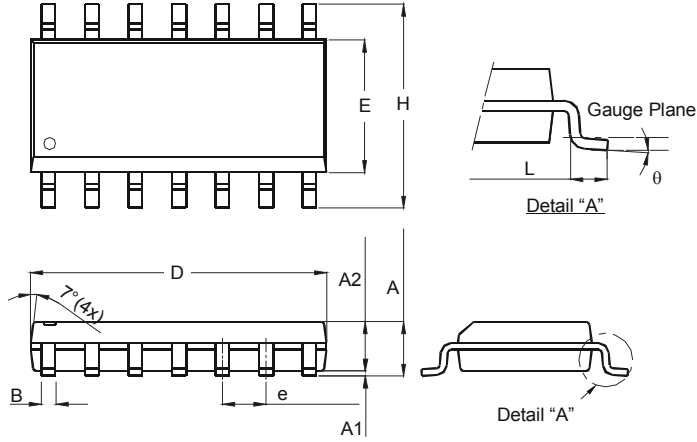


Part Number	Package
74LV04AS14	SO-14
74LV04AT14	TSSOP-14

Package Outline Dimensions (All dimensions in mm.)

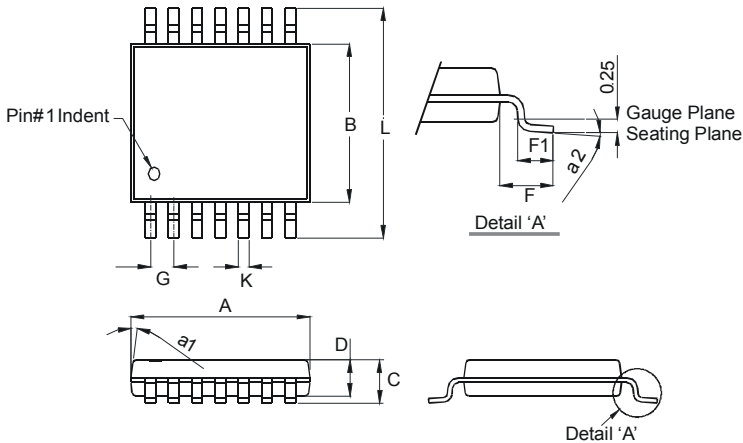
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

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

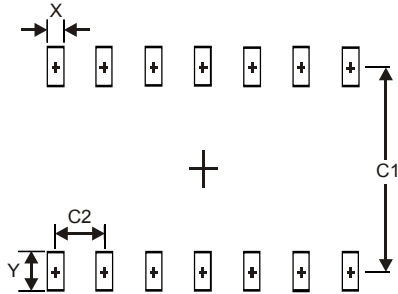


TSSOP-14		
Dim	Min	Max
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
All Dimensions in mm		

Suggested Pad Layout

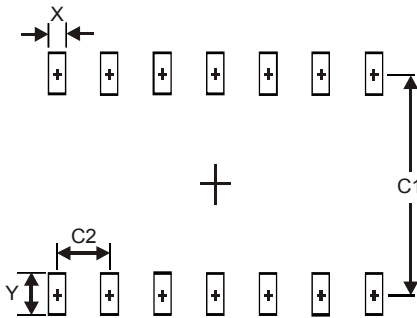
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

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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