

## Description

The 74AHC04 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 gates perform the Boolean function:

$$Y = \bar{A}$$

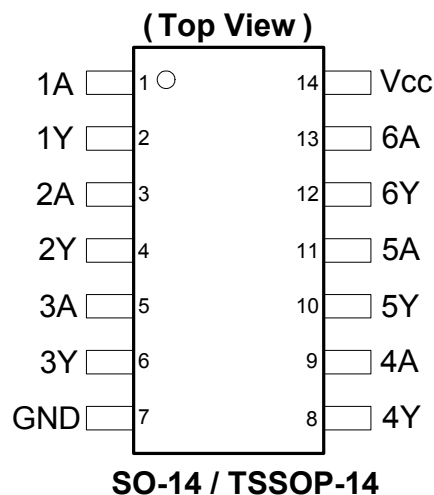
## Features

- Wide Supply Voltage Range from 2.0V to 5.5V
- Outputs Sink or Source 8 mA at  $V_{CC} = 4.5V$
- CMOS Low Power Consumption
- Schmitt Trigger Action at All Inputs
- Inputs can be driven by 3.3V or 5.5V allowing for voltage translation applications.
- ESD Protection Exceeds JESD 22
  - 200-V Machine Model (A115-A)
  - 2000-V Human Body Model (A114-A)
  - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 250mA per JESD 78, Class II
- Range of Package Options SO-14 and TSSOP-14
- **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

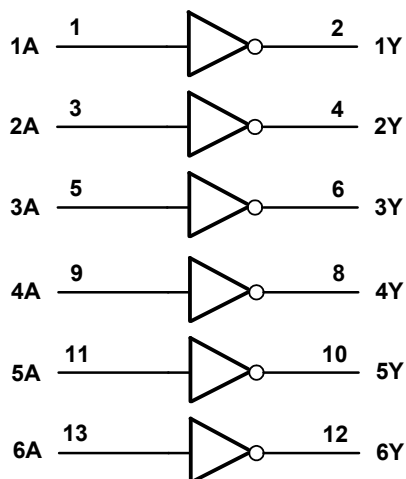
- General Purpose Logic
- Wide array of products such as:
  - PCs, Networking, Notebooks, Netbooks
  - Computer Peripherals, Hard Drives, CD/DVD ROM
  - TV, DVD, DVR, Set Top Box

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### Pin Descriptions

Pin Number	Pin Name	Function
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
L	H
H	L

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

Symbol	Description	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	-0.5 to +7.0	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> < -0.5V	-20	mA
I <sub>OK</sub>	Output Clamp Current V <sub>O</sub> < -0.5V	-20	mA
I <sub>OK</sub>	Output Clamp Current V <sub>O</sub> > V <sub>CC</sub> + 0.5V	25	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>	75	mA
I <sub>GND</sub>	Continuous Current Through GND	-75	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

Notes: 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
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CC} = 3.0\text{V to } 3.6\text{V}$		100	ns/V
		$V_{CC} = 4.5\text{V to } 5.5\text{V}$		20	
$T_A$	Operating Free-Air Temperature		-40	+125	$^\circ\text{C}$

 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
			3.0V	2.1		2.1		
			5.5V	3.85		3.85		
$V_{IL}$	Low-Level Input Voltage		2.0V		0.5		0.5	V
			3.0V		0.9		0.9	
			5.5V		1.65		1.65	
$V_{OH}$	High-Level Output Voltage	$I_{OH} = -50\mu\text{A}$	2.0V	1.9		1.9		V
		$I_{OH} = -50\mu\text{A}$	3.0V	2.9		2.9		
		$I_{OH} = -50\mu\text{A}$	4.5V	4.4		4.4		
		$I_{OH} = -4\text{mA}$	3.0V	2.48		2.40		
		$I_{OH} = -8\text{mA}$	4.5V	3.80		3.70		
$V_{OL}$	Low-Level Output Voltage	$I_{OL} = 50\mu\text{A}$	2.0V		0.1		0.1	V
		$I_{OL} = 50\mu\text{A}$	3.0V		0.1		0.1	
		$I_{OL} = 50\mu\text{A}$	4.5V		0.1		0.1	
		$I_{OL} = 4\text{mA}$	3.0V		0.44		0.55	
		$I_{OL} = 8\text{mA}$	4.5V		0.44		0.55	
$I_I$	Input Current	$V_I = \text{GND to } 5.5\text{V}$	3.6V		$\pm 1$		$\pm 2$	$\mu\text{A}$
$I_{CC}$	Supply Current	$V_I = \text{GND or } V_{CC}, I_O = 0$	3.6V		20		40	$\mu\text{A}$

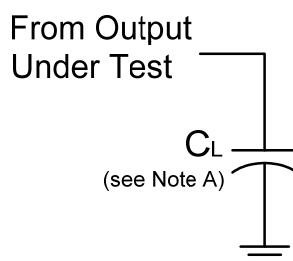
**Operating Characteristics**

Parameter		Test Conditions	$V_{CC} = 2.0\text{V}$	$V_{CC} = 3.3\text{V}$	$V_{CC} = 5\text{V}$	Unit
			Typ	Typ	Typ	
$C_{pd}$	Power Dissipation Capacitance per Gate	$f = 1\text{MHz}$	9.7	11.2	15	pF
$C_i$	Input Capacitance	$V_I = V_{CC} \text{ -- or } \text{GND}$	4.0	4.0	4.0	pF

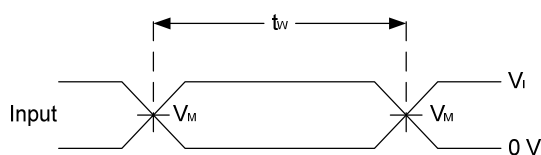
### Switching Characteristics

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	3.0V to 3.6V	0.5	4.0	8.5	0.5	10.5	0.5	11.0	ns
			4.5V to 5.5V	0.5	3.0	5.5	0.5	6.5	0.5	7.0	
		Figure 1 C <sub>L</sub> = 50pF	3.0V to 3.6V	0.5	6.0	11.4	0.5	13.0	0.5	14.5	
			4.5V to 5.5V	0.5	4.5	7.5	0.5	8.5	0.5	9.5	

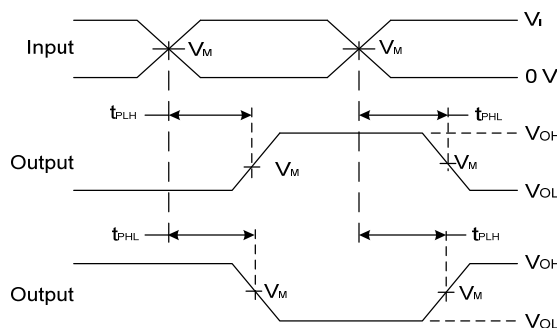
### Parameter Measurement Information



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>		
3.3V -3.6V	V <sub>CC</sub>	3ns	V <sub>CC</sub> /2	15pF, 50pF
4.5V to 5.5V	V <sub>CC</sub>	3ns	V <sub>CC</sub> /2	15pF, 50pF



**Voltage Waveform  
Pulse Duration**

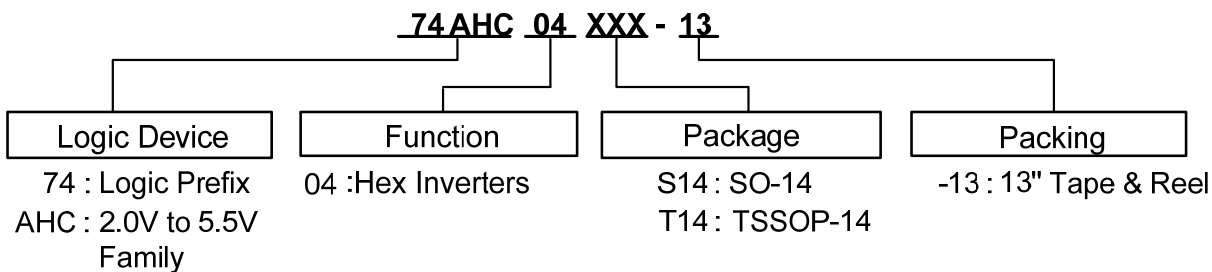


**Voltage Waveform  
Propagation Delay Times  
Inverting and Non Inverting Outputs**

**Figure 1 Load Circuit and Voltage Waveforms**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. All pulses are supplied at pulse repetition rate ≤ 1 MHz.
  - 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>.

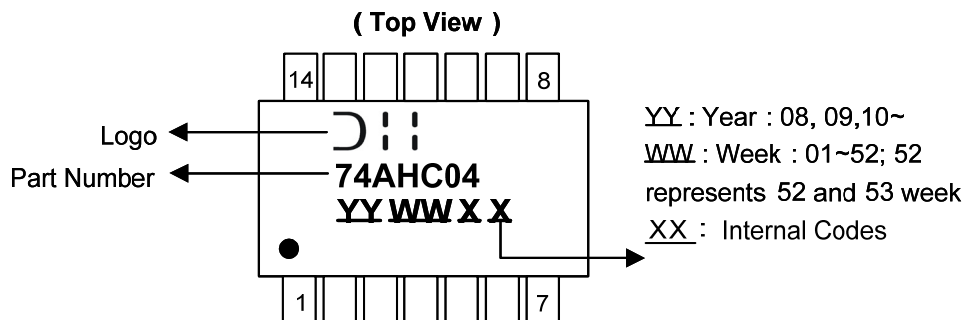
**Ordering Information**



Device	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74AHC04S14-13	S14	SO-14	2500/Tape & Reel	-13
74AHC04T14-13	T14	TSSOP-14	2500/Tape & Reel	-13

**Marking Information**

(1) SO-14, TSSOP-14

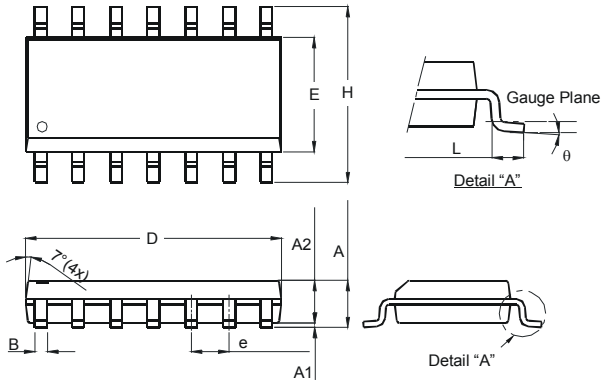


Part Number	Package
74AHC04S14	SO-14
74AHC04T14	TSSOP-14

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

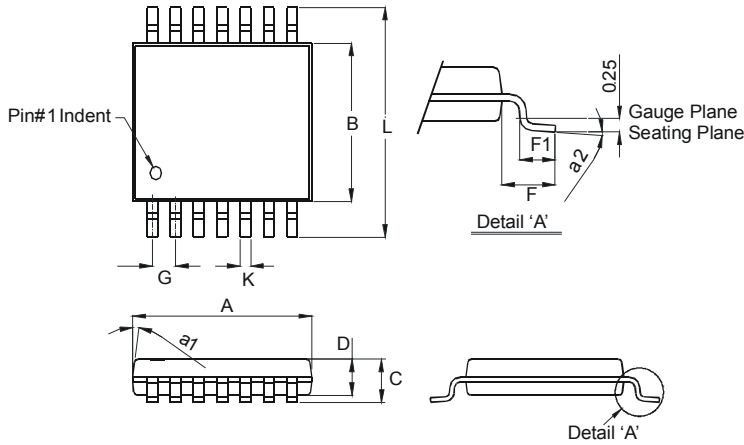
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**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°
<b>All Dimensions in mm</b>		

**Package Type: TSSOP-14**

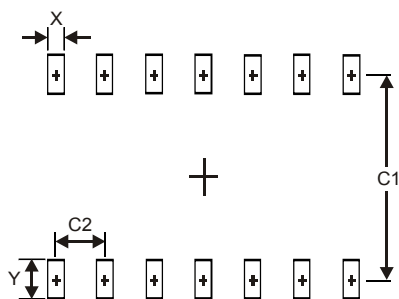


TSSOP-14		
Dim	Min	Max
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
<b>All Dimensions in mm</b>		

## Suggested Pad Layout

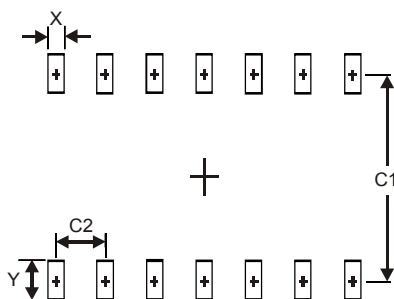
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### 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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