Description

The 74HCT04 provides provides six independent inverters with standard push-pull outputs. The device is designed for operation with a power supply range of 4.5V to 5.5V.

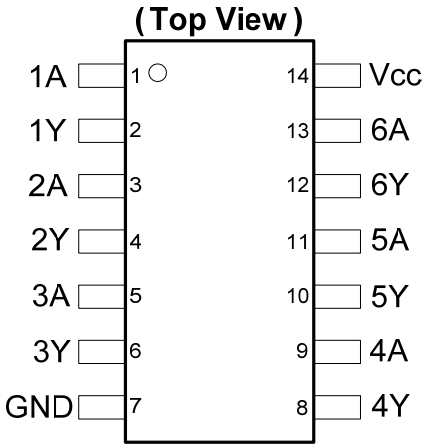
The gates perform the Boolean function:

$Y = \overline{A}$

Features

- Wide Supply Voltage Range from 4.5V to 5.5V
- Pin Compatible with Low Power Schottky (LSTTL)
- Inputs Are TTL Voltage Level Compatible
- Sinks or Sources 4mA at V_{CC} = 4.5V
- CMOS Low Power Consumption
- Schmitt Trigger Action at All Inputs
- 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)
- 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)**

Pin Assignments



SO-14 / TSSOP-14

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

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.

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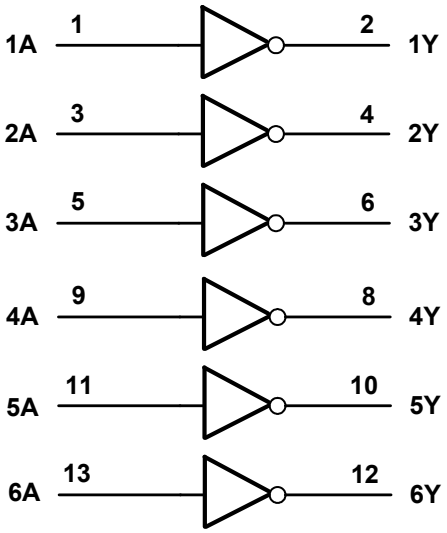
Pin Descriptions

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	V_{CC}	Supply Voltage

Logic Diagram



Function Table

Input	Output
A	**Y**
H	L
L	H

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Absolute Maximum Ratings (Note 4) (@T_A = +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_{CC}	Supply Voltage Range	-0.5 to +7.0	V
V_I	Input Voltage Range (Note 5)	-0.5 to +7.0	V
I_{IK}	Input Clamp Current V_I < -0.5V or Vi > V_{CC} +0.5V	±20	mA
I_{OK}	Output Clamp Current V_O < -0.5V or V_O > V_{CC} +0.5V	±20	mA
I_O	Continuous Output Current -0.5V < V_O V_{CC} +0.5V	+/- 25	mA
I_{CC}	Continuous Current Through Vcc	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

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.
5. Input Voltage cannot exceed V_{CC} to the extent the Maximum clamp current is exceeded.

Recommended Operating Conditions (Note 6) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage		4.5	5.5	V
V_I	Input Voltage		0	V_{CC}	V
V_O	Output Voltage		0	V_{CC}	V
Δt/ΔV	Input Transition Rise or Fall Rate	V_{CC} = 4.5V to 5.5V	—	500	ns/V
T_A	Operating Free-Air Temperature		-40	+125	°C

Note: 6. 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		4.5V to 5.5V	2.0		2.0	—	V
V_{IL}	Low-Level Input Voltage		4.5V to 5.5V	—	0.8	—	0.8	V
V_{OH}	High-Level Output Voltage	I_{OH} = -20μA	4.5V	4.4	—	4.4	—	V
		I_{OH} = -4mA	4.5V	3.80	—	3.70	—	
V_{OL}	Low-Level Output Voltage	I_{OL} = 20μA	4.5V	—	0.1	—	0.1	V
		I_{OL} = 5.2mA	6.0V	—	0.33	—	0.4	
I_I	Input Current	V_I = GND to 6.0V	6.0V	—	± 1	—	± 1	μA
I_{CC}	Supply Current	V_I = GND or V_{CC}, I_O = 0	6.0V	—	20	—	40	μA
ΔI_{CC}	Additional Supply Current	One input at V_{CC} -2.1V Other pins at V_{CC} or GND	4.5V to 5.5V	—	675	—	735	μA

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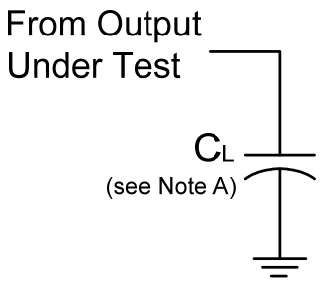
Switching Characteristics

Symbol	Parameter	Test Conditions	V_{CC}	T_A = +25°C			-40°C to +85°C	-40°C to +125°C	Unit
				Min	Typ	Max	Max	Max	
t_{PD}	Propagation Delay A_N to Y_N	Figure 1 C_L = 50pF	4.5V	—	12	22	24	29	ns
t_t	Transition time	Figure 1 C_L = 50pF	4.5V	—	7	29	29	29	ns

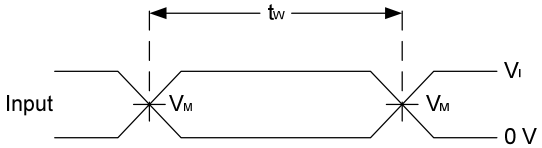
Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions	V_{CC} = 5.5V	Unit
			Typ	
C_{pd}	Power Dissipation Capacitance per Gate	f = 1MHz	22	pF
C_I	Input Capacitance	V_I = V_{CC} – or GND	4	pF

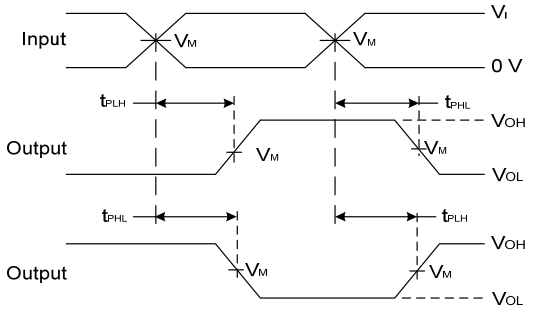
Parameter Measurement Information



Vcc	Inputs		V_M	C_L
	V_I	t_r/t_f		
4.5V	3.0V	3ns	1.5V	$V_{OH}/2$



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 ≤ 1 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

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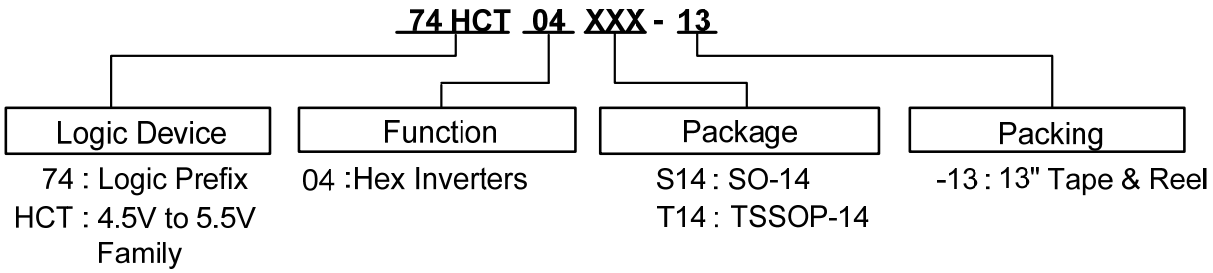
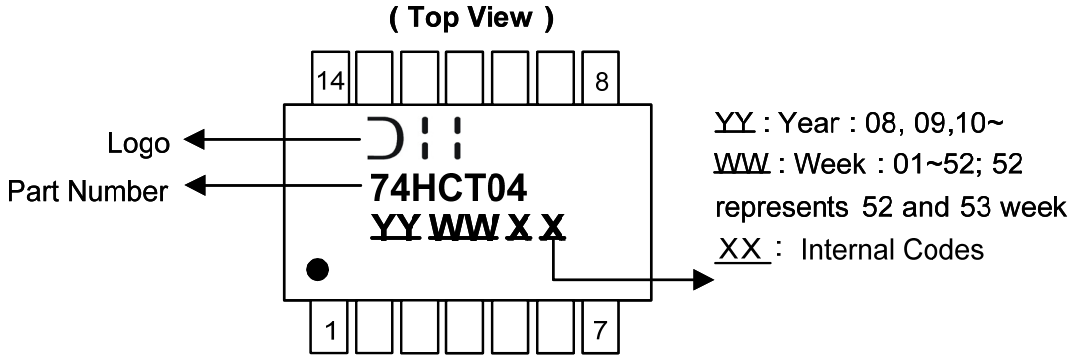
Ordering Information



Device	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74HCT04S14-13	S14	SO-14	2500/Tape & Reel	-13
74HCT04T14-13	T14	TSSOP-14	2500/Tape & Reel	-13

Marking Information

(1) SO-14, TSSOP-14



Part Number	Package
74HCT04S14	SO-14
74HCT04T14	TSSOP-14

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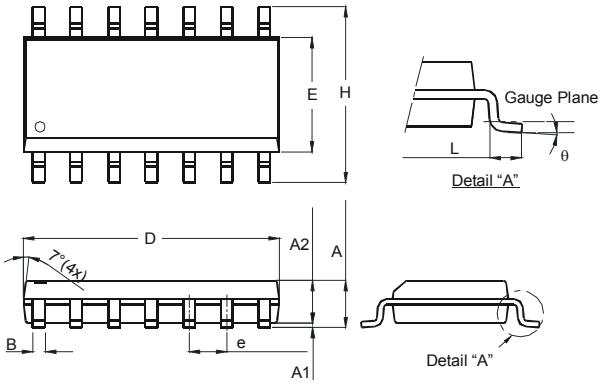
Package Outline Dimensions (All dimensions in mm.)

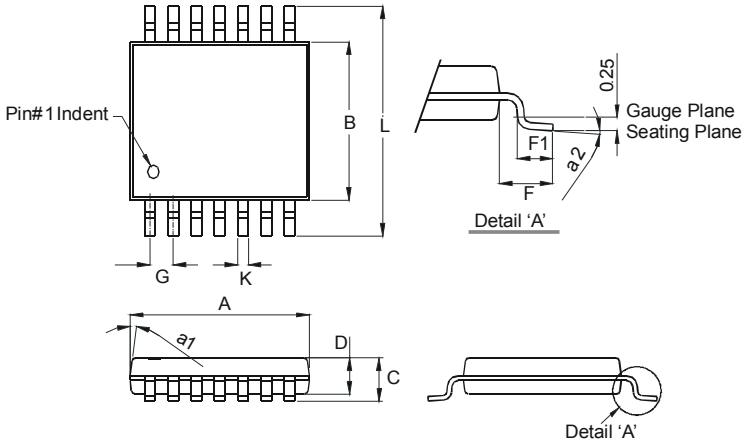
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

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		

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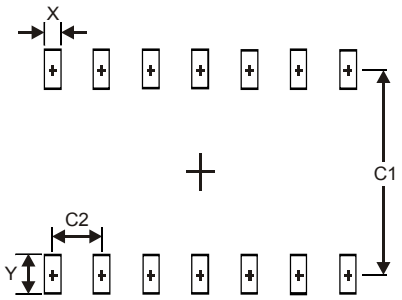
Suggested Pad Layout

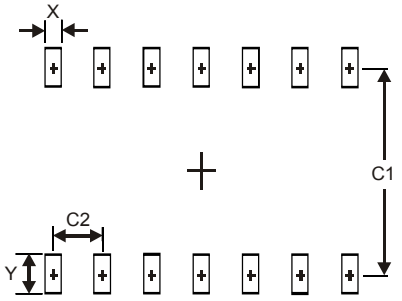
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for latest version.

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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