

Description

The 74AHC05 provides provides six independent inverters with open drain 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.

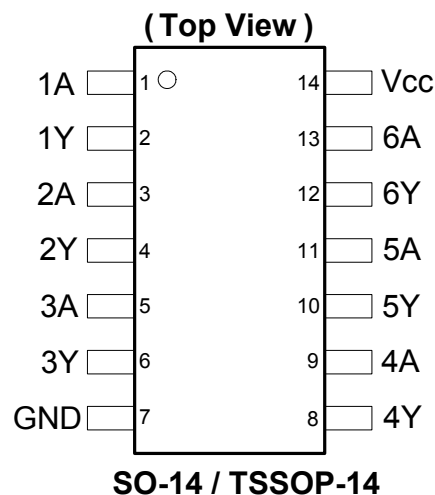
The gates perform the Boolean function:

$$Y = \bar{A}$$

Features

- Wide Supply Voltage Range from 2.0V to 5.5V
- Outputs Sink 8 mA at $V_{CC} = 4.5V$
- CMOS Low Power Consumption
- Schmitt Trigger Action at All Inputs
- Inputs can be driven by 3.3 V 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)**

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

Notes:

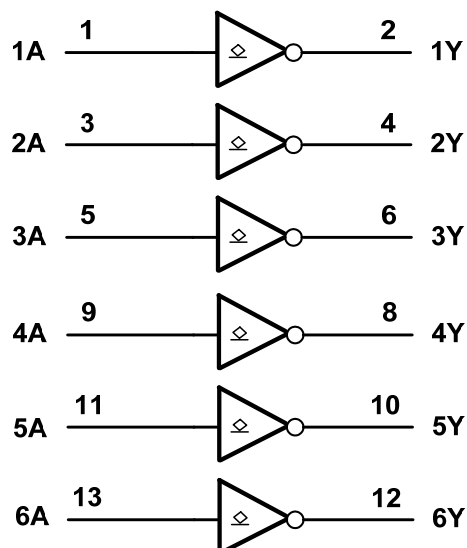
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined 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
L	Z
H	L

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	-0.5 to +7.0	V
I _{IK}	Input Clamp Current V _I < -0.5V	-20	mA
I _{OK}	Output Clamp Current V _O < -0.5V	-20	mA
I _{OK}	Output Clamp Current V _O > V _{CC} + 0.5V	25	mA
I _O	Continuous Output Current -0.5V < V _O < V _{CC} + 0.5V	+/- 25	mA
I _{CC}	Continuous Current Through V _{CC}	75	mA
I _{GND}	Continuous Current Through GND	-75	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
$\Delta t/\Delta V$	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	$^\circ\text{C}$

 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
			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_{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_{OZ}	Z State Leakage Current	$V_O = 0 \text{ to } 5.5\text{V}$	5.5V		± 2.5		± 10	μA
I_I	Input Current	$V_I = \text{GND to } 5.5\text{V}$	3.6V		± 1		± 2	μA
I_{CC}	Supply Current	$V_I = \text{GND or } V_{CC}, I_O = 0$	3.6V		20		40	μA

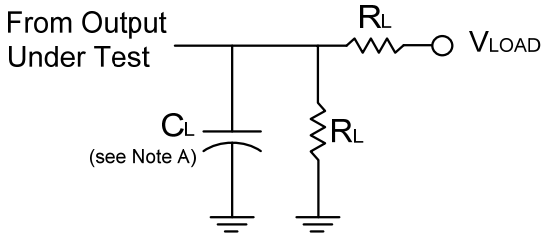
Operating Characteristics

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	$f = 1 \text{ MHz}$	4.3	4.8	5.6	pF
C_i	Input Capacitance	$V_I = V_{CC} \text{ - or GND}$	4.0	4.0	4.0	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	V_{CC}	$T_A = +25^\circ\text{C}$			$-40^\circ\text{C to }+85^\circ\text{C}$		$-40^\circ\text{C to }+125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{PD}	Propagation Delay $A_N \text{ to } Y_N$	Figure 1 $C_L = 15\text{pF}$	3.0V to 3.6V	0.5	4.5	7.9	0.5	9.5	0.5	10.0	ns
			4.5V to 5.5V	0.5	3.2	5.5	0.5	6.5	0.5	7.0	
		Figure 1 $C_L = 50\text{pF}$	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



TEST	Condition
t_{PLZ} (see Notes D and E)	Vload
t_{PZL} (see Notes D and F)	Vload

V_{CC}	Inputs		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$3.3V \pm 0.3V$	3 V	$\leq 3ns$	$V_{CC}/2$	$2 \times V_{CC}$	15,50pF	2K Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 3ns$	$V_{CC}/2$	$2 \times V_{CC}$	15,50pF	2K Ω	0.3V

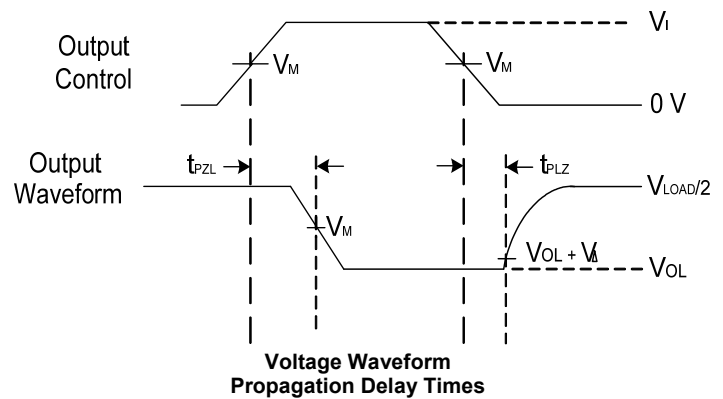
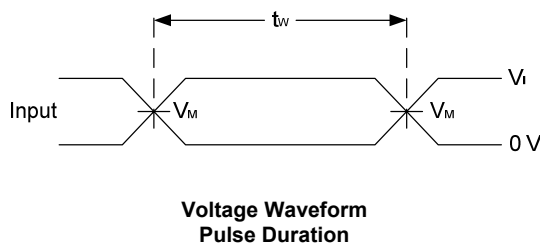
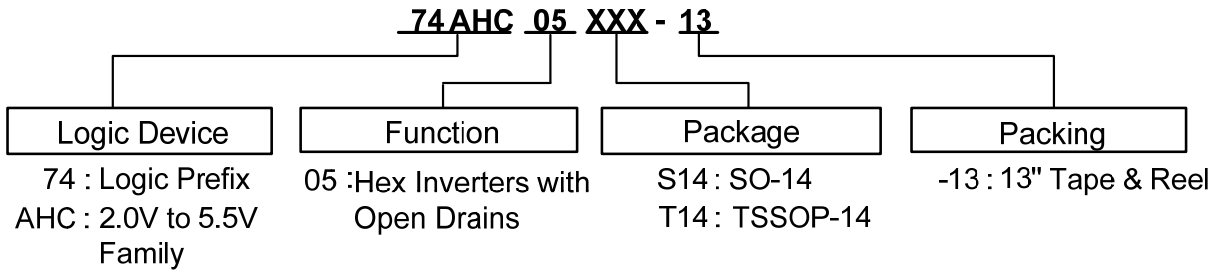


Figure 1. Load Circuit and Voltage Waveforms

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 1 MHz.
 - C. The inputs are measured one at a time with one transition per measurement.
 - D. For the open drain device t_{PLZ} and t_{PZL} are the same as t_{PD} .
 - E. t_{PZL} is measured at V_M .
 - D. t_{PLZ} is measured at $V_{OL} + V_{\Delta}$.

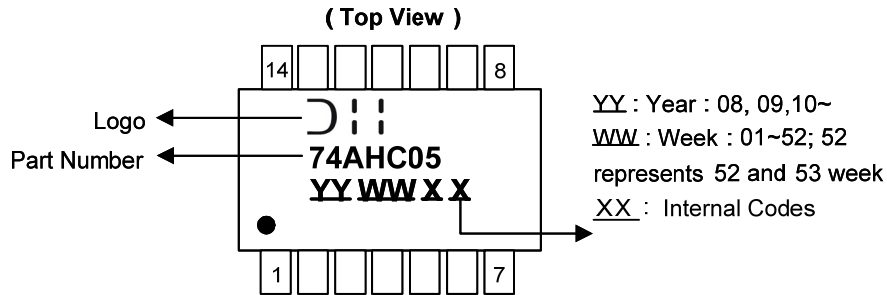
Ordering Information



Device	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74AHC05S14-13	S14	SO-14	2500/Tape & Reel	-13
74AHC05T14-13	T14	TSSOP-14	2500/Tape & Reel	-13

Marking Information

(1) SO-14, TSSOP-14



Part Number	Package
74AHC05S14	SO-14
74AHC05T14	TSSOP-14

Package Outline Dimensions (All dimensions in mm.)

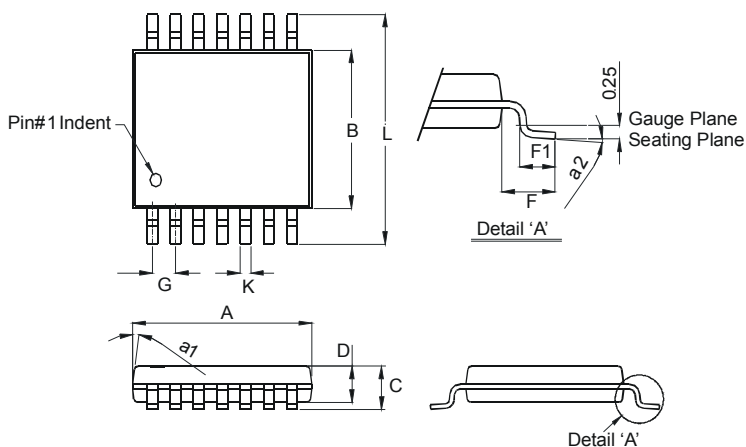
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

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

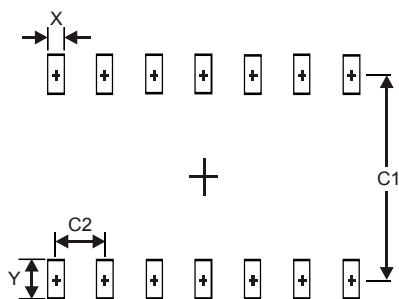


TSSOP-14		
Dim	Min	Max
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
All Dimensions in mm		

Suggested Pad Layout

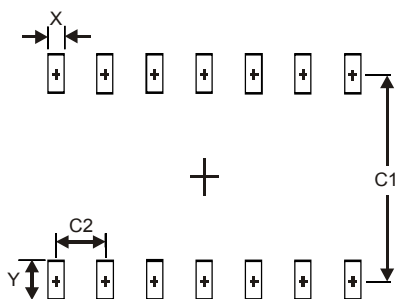
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

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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