

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.

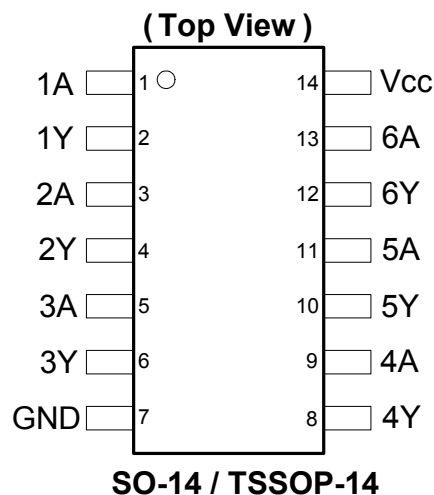
The gates perform the Boolean function:

$$Y = \bar{A}$$

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:

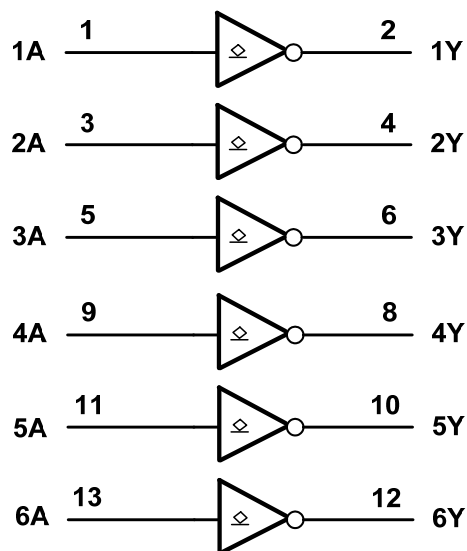
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

[Click for Ordering Information](#)

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 |

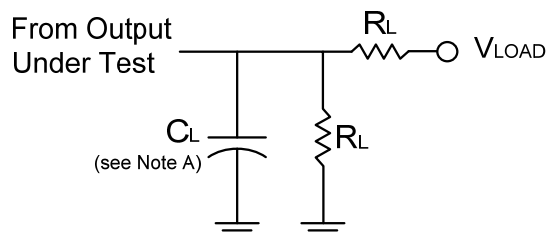
Operating Characteristics

| 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 |

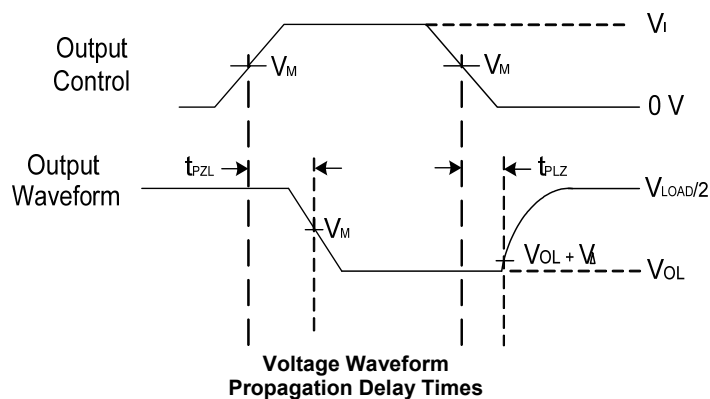
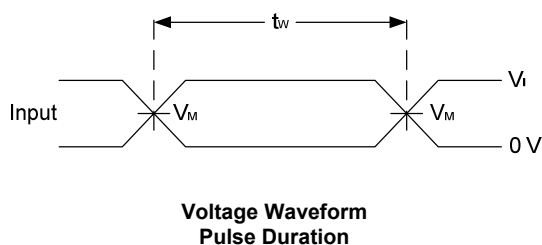
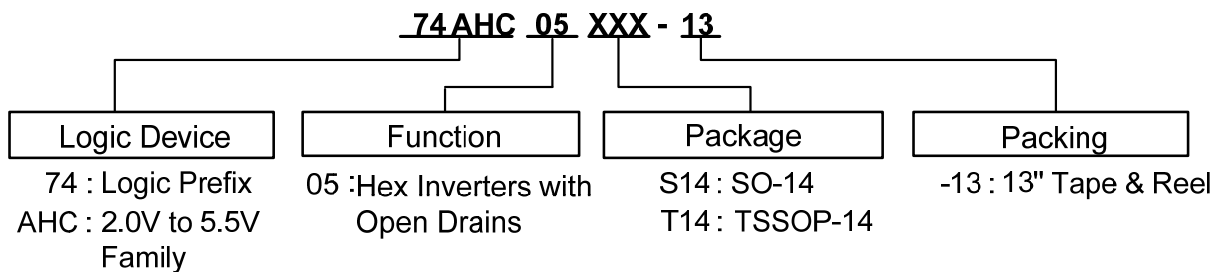


Figure 1. Load Circuit and Voltage Waveforms

- 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 $V_{OL} + V_{\Delta}$.

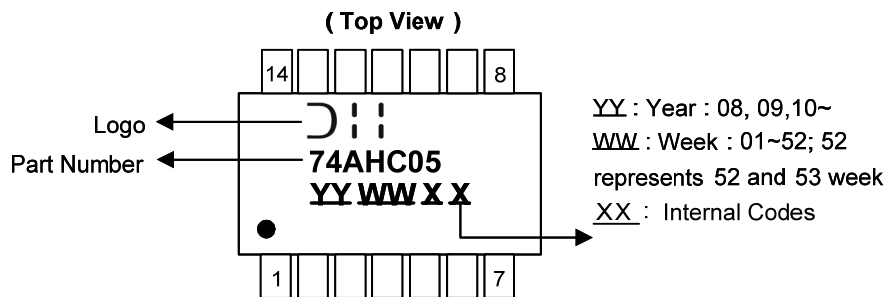
Ordering Information



| 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

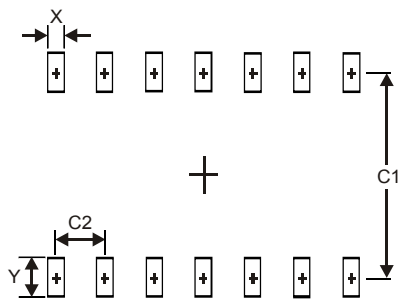


| TSSOP-14 | | |
|----------------------|----------|------|
| Dim | Min | Max |
| a1 | 7° (4X) | |
| a2 | 0° | 8° |
| A | 4.9 | 5.10 |
| B | 4.30 | 4.50 |
| C | — | 1.2 |
| D | 0.8 | 1.05 |
| F | 1.00 Typ | |
| F1 | 0.45 | 0.75 |
| G | 0.65 Typ | |
| K | 0.19 | 0.30 |
| L | 6.40 Typ | |
| All Dimensions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

Suggested Pad Layout

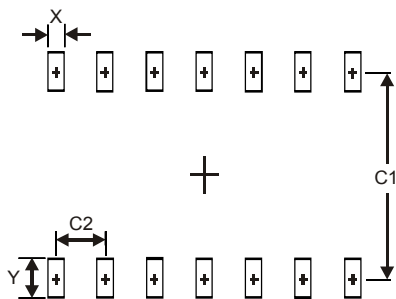
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

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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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А