

## Description

The 74AHC08 provides provides four independent 2-input AND gates 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:

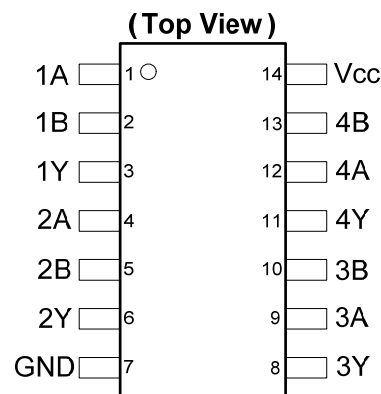
$$Y = A \bullet B \text{ or } Y = \overline{\overline{A} + \overline{B}}$$

## Features

- Wide Supply Voltage Range from 2.0V to 5.5 V
- 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



**SO-14 / TSSOP-14**

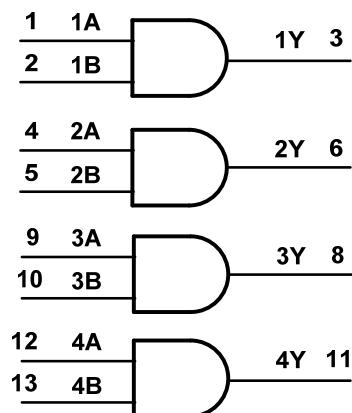
## Applications

- 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

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

**Pin Descriptions**

| Pin Number | Pin Name        | Function       |
|------------|-----------------|----------------|
| 1          | 1A              | Data Input     |
| 2          | 1B              | Data Input     |
| 3          | 1Y              | Data Output    |
| 4          | 2A              | Data Input     |
| 5          | 2B              | Data Input     |
| 6          | 2Y              | Data Output    |
| 7          | GND             | Ground         |
| 8          | 3Y              | Data Output    |
| 9          | 3A              | Data Input     |
| 10         | 3B              | Data Input     |
| 11         | 4Y              | Data Output    |
| 12         | 4A              | Data Input     |
| 13         | 4B              | Data Input     |
| 14         | V <sub>CC</sub> | Supply Voltage |

**Logic Diagram**

**Function Table**

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | L      |
| L      | H | L      |
| H      | L | L      |
| H      | H | H      |

**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   |

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    |               |
| $V_{OH}$ | 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      | $\mu\text{A}$ |

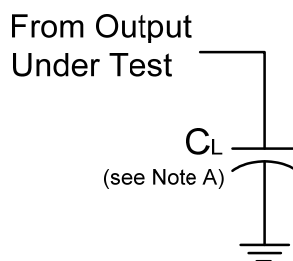
**Operating Characteristics**

| 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                    | 11.0                   | 15                   | pF   |
| $C_i$     | Input Capacitance                      | $V_I = V_{CC} \text{ or GND}$ | 4.0                    | 4.0                    | 4.0                  | pF   |

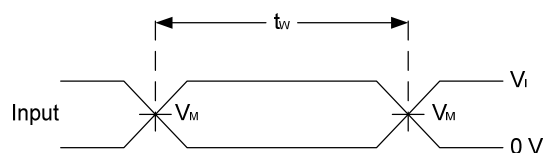
### Switching Characteristics

| Symbol          | Parameter  | Test Conditions                   | V <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<br>C <sub>L</sub> = 15pF | 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<br>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  |      |

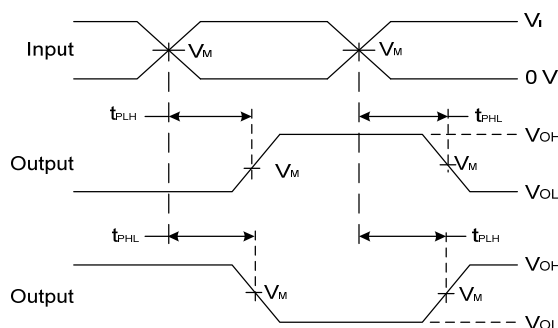
### Parameter Measurement Information



| 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**

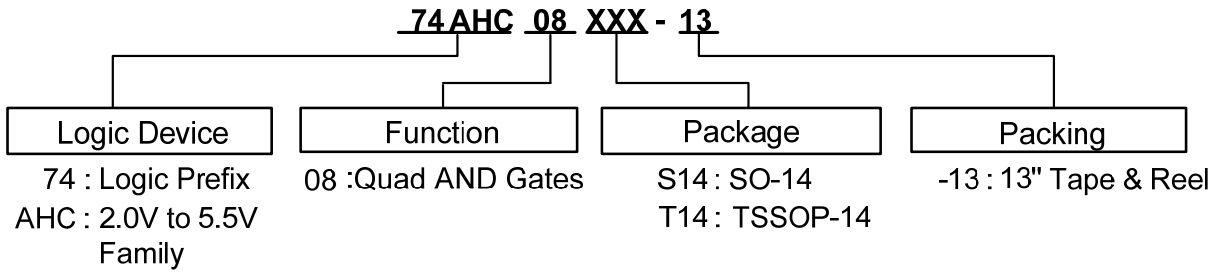


**Voltage Waveform  
Propagation Delay Times  
Inverting and Non Inverting Outputs**

**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>.

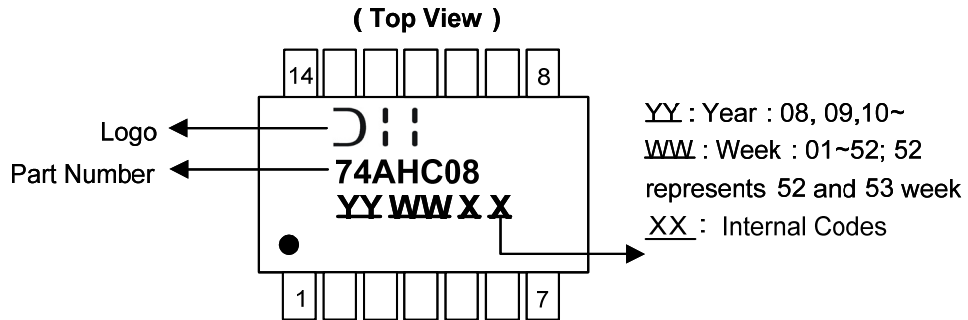
**Ordering Information**



| Device        | Package Code | Packaging | 7" Tape and Reel |                    |
|---------------|--------------|-----------|------------------|--------------------|
|               |              |           | Quantity         | Part Number Suffix |
| 74AHC08S14-13 | S14          | SO-14     | 2500/Tape & Reel | -13                |
| 74AHC08T14-13 | T14          | TSSOP-14  | 2500/Tape & Reel | -13                |

**Marking Information**

(1) SO-14, TSSOP-14



| Part Number | Package  |
|-------------|----------|
| 74AHC08S14  | SO-14    |
| 74AHC08T14  | TSSOP-14 |

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

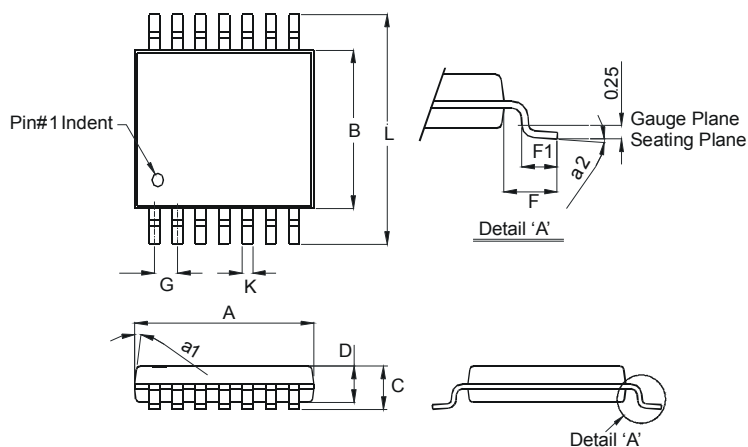
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**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

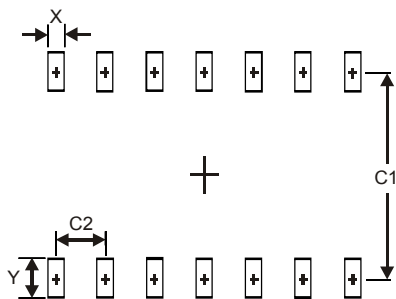
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### 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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