

Description

The 74LV08A 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 device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

The gates perform the Boolean function:

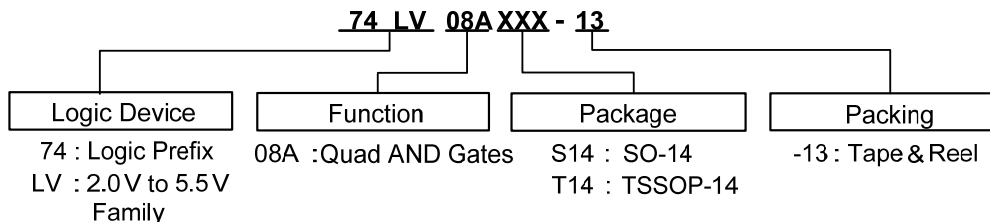
$$Y = A \bullet B \text{ or } Y = \overline{\overline{A} + \overline{B}}$$

Features

- Wide Supply Voltage Range from 2.0V to 5.5V
- Sinks or Sources 12mA at V_{CC} = 4.5V
- CMOS Low Power Consumption
- IOFF Supports Partial-Power Down Operation
- Inputs or Outputs accept up to 5.5V
- Inputs Can Be Driven by 3.3V or 5V Allowing for Voltage Translation Applications
- Schmitt Trigger Action at All Inputs
- ESD Protection Tested per JESD 22
 - Exceeds 200-V Machine Model (A115)
 - Exceeds 2000-V Human Body Model (A114)
 - Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- **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/quality/lead_free.html 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.

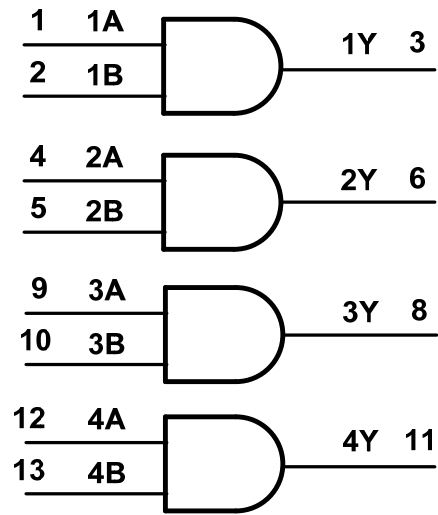
Ordering Information



Pin Descriptions

| Pin Number | Pin Name | Description |
|------------|----------|----------------|
| 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 | Vcc | Supply Voltage |

Logic Diagram



Function Table

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

Absolute Maximum Ratings (Note 5) (@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 < 0V | -20 | mA |
| I _{OK} | Output Clamp Current V _O < -0V | -50 | mA |
| I _O | Continuous Output Current -0.5V < V _O < V _{CC} + 0.5V | ±25 | mA |
| I _{CC} | Continuous Current Through V _{CC} | 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 |

Note: 5. 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 6) (@T_A = +25°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 |
| I _{OH} | High-Level Output Current | 2.0V | — | -50 | mA |
| | | 2.3V to 2.7V | — | -2 | μA |
| | | 3.0V to 3.6V | — | -6 | mA |
| | | 4.5V to 5.5V | — | -12 | mA |
| I _{OL} | Low-Level Output Current | 2.0V | — | 50 | μA |
| | | 2.3V to 2.7V | — | 2 | mA |
| | | 3.0V to 3.6V | — | 6 | mA |
| | | 4.5V to 5.5V | — | 12 | mA |
| Δt/ΔV | Input Transition Rise or Fall Rate | 2.3V to 2.7V | — | 200 | ns/V |
| | | 3.0V to 3.6V | — | 100 | |
| | | 4.5V to 5.5V | — | 20 | |
| 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 to +85°C | | T _A = -40 to +125°C | | Unit |
|------------------|----------------------------|---|-----------------|-------------------------------|-----------------------|--------------------------------|-----------------------|------|
| | | | | Min | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | — | 2.0V | 1.5 | — | 1.5 | — | V |
| | | — | 2.3V to 2.7V | V _{CC} X 0.7 | — | V _{CC} X 0.7 | — | |
| | | — | 3.0V to 3.6V | V _{CC} X 0.7 | — | V _{CC} X 0.7 | — | |
| | | — | 4.5V to 5.5V | V _{CC} X 0.7 | — | V _{CC} X 0.7 | — | |
| V _{IL} | Low-Level Input Voltage | — | 2.0V | — | 0.5 | — | 0.5 | V |
| | | — | 2.3V to 2.7V | — | V _{CC} X 0.3 | — | V _{CC} X 0.3 | |
| | | — | 3.0V to 3.6V | — | V _{CC} X 0.3 | — | V _{CC} X 0.3 | |
| | | — | 4.5V to 5.5V | — | V _{CC} X 0.3 | — | V _{CC} X 0.3 | |
| V _{OH} | High-Level Output Voltage | I _{OH} = -50μA | 2.0V to 5.5V | V _{CC} -0.1 | — | V _{CC} -0.1 | — | V |
| | | I _{OH} = -2mA | 2.3V | 2.0 | — | 2.0 | — | |
| | | I _{OH} = -6mA | 3.0V | 2.48 | — | 2.48 | — | |
| | | I _{OH} = -12mA | 4.5V | 3.8 | — | 3.8 | — | |
| V _{OL} | Low-Level Output Voltage | I _{OL} = 50μA | 2.0V to 5.5V | — | 0.1 | — | 0.1 | V |
| | | I _{OL} = 2mA | 2.3V | — | 0.4 | — | 0.4 | |
| | | I _{OL} = 6mA | 3.0V | — | 0.44 | — | 0.44 | |
| | | I _{OL} = 12mA | 4.5V | — | 0.55 | — | 0.55 | |
| I _{OFF} | Power Down Leakage Current | V _I or V _O = 0 to 5.5V | 0V | — | 5 | — | 5 | μA |
| I _I | Input Current | V _I = GND or 5.5V | 0 to 5.5V | — | ±1 | — | ±1 | μA |
| I _{CC} | Supply Current | V _I = GND or V _{CC} I _O = 0 | 5.5V | — | 20 | — | 20 | μA |

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 | Min | Max | Min | Max | |
| t _{PD} | Propagation Delay A _N to Y _N | Figure 1 C _L = 15pF | 2.5V ± 0.2V | — | 7.9 | 13.8 | 1 | 16 | 1 | 17 | ns |
| | | | 3.3V ± 0.3V | — | 5.6 | 8.8 | 1 | 10.5 | 1 | 11.5 | |
| | | | 5.0V ± 0.5V | — | 4.1 | 5.9 | 1 | 7 | 1 | 8 | |
| | | Figure 1 C _L = 50 pF | 2.5V ± 0.2V | — | 10.5 | 17.3 | 1 | 20 | 1 | 21 | ns |
| | | | 3.3V ± 0.3V | — | 7.5 | 12.5 | 1 | 14 | 1 | 15 | |
| | | | 5.0V ± 0.5V | — | 5.5 | 7.9 | 1 | 9 | 1 | 10 | |

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

| Parameter | | Test Conditions | V _{CC} | Typ | Unit |
|-----------------|--|-----------------------------------|-----------------|-----|------|
| C _{pd} | Power Dissipation Capacitance per Gate | F= 10 MHz C _L =50pF | 3.3V | 8 | pF |
| | | | 5.0V | 10 | |

Noise Characteristics

V_{CC} = 3V, C_L = 50pF T_A = +25°C

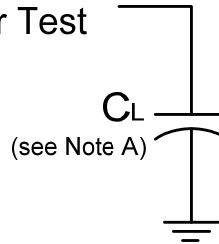
| Symbol | Parameter | Min | Typ | Max | Unit |
|--------------------|---|------|------|------|------|
| V _{OL(p)} | Quiet Output, Maximum Dynamic V _{OL} | — | 0.2 | 0.8 | V |
| V _{OL(v)} | Quiet Output, Minimum Dynamic V _{OL} | — | -0.1 | -0.8 | V |
| V _{OH(v)} | Quiet Output, Minimum Dynamic V _{OH} | — | 3.1 | — | V |
| V _{IH(D)} | High Level Dynamic Input Voltage | 2.31 | — | — | V |
| V _{IL(D)} | Low Level Dynamic Input Voltage | — | — | 0.99 | V |

Package Characteristics

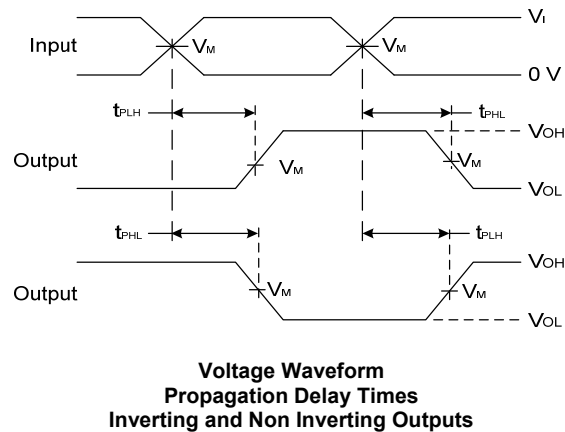
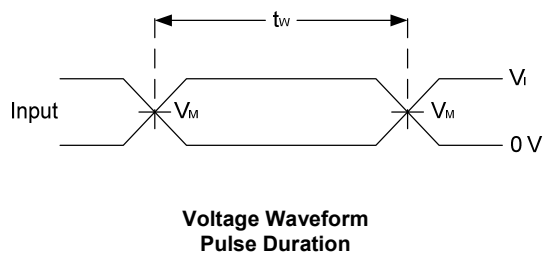
| Symbol | Parameter | Test Conditions | V _{CC} | Min | Typ | Max | Unit |
|----------------|-------------------|---|-----------------|-----|-----|-----|------|
| C _i | Input Capacitance | V _i = V _{CC} – or GND | 2.0V to 5.5V | — | 3.3 | 10 | pF |

Parameter Measurement Information

From Output Under Test



| V _{CC} | Inputs | | V _M | C _L |
|-----------------|-----------------|--------------------------------|--------------------|----------------|
| | V _I | t _r /t _f | | |
| 2.0V to 5.5V | V _{CC} | <3ns | V _{CC} /2 | 15pF or 50pF |

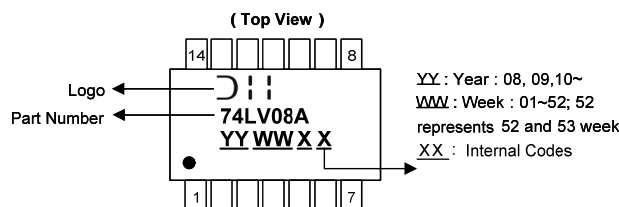


- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10MHz
 - C. Inputs are measured separately one transition per measurement
 - D. t_{PLH} and t_{PHL} are the same as t_{PD}

Figure 1 Load Circuit and Voltage Waveforms

Marking Information

(1) SO14, TSSOP14



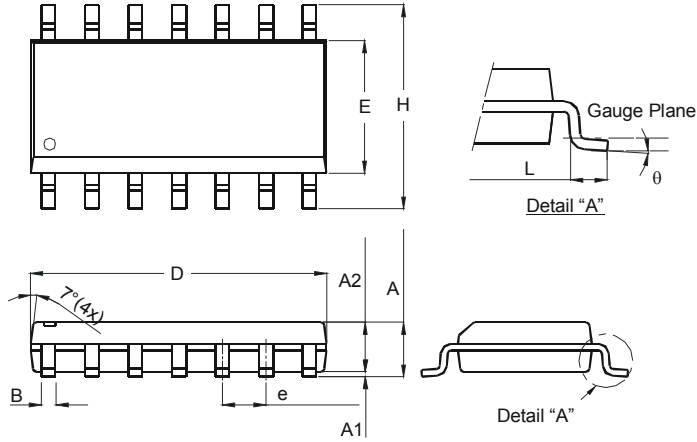
| Part Number | Package |
|-------------|---------|
|-------------|---------|

| | |
|------------|----------|
| 74LV08AS14 | SO-14 |
| 74LV08AT14 | TSSOP-14 |

Package Outline Dimensions (All dimensions in mm.)

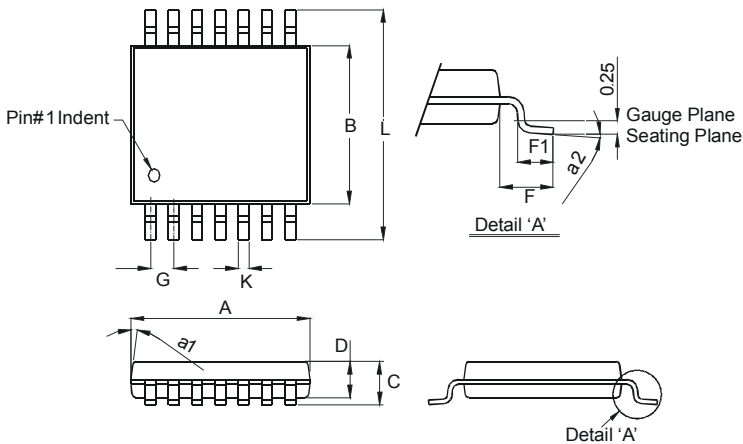
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

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

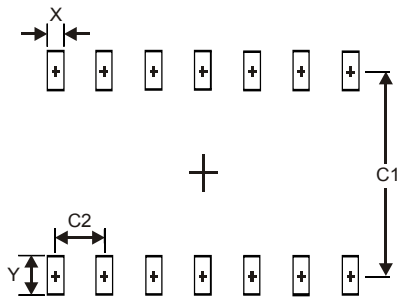


| TSSOP-14 | | |
|-----------------------------|----------|------|
| Dim | Min | Max |
| a1 | 7° (4X) | |
| a2 | 0° | 8° |
| A | 4.9 | 5.10 |
| B | 4.30 | 4.50 |
| C | — | 1.2 |
| D | 0.8 | 1.05 |
| F | 1.00 Typ | |
| F1 | 0.45 | 0.75 |
| G | 0.65 Typ | |
| K | 0.19 | 0.30 |
| L | 6.40 Typ | |
| All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

Suggested Pad Layout

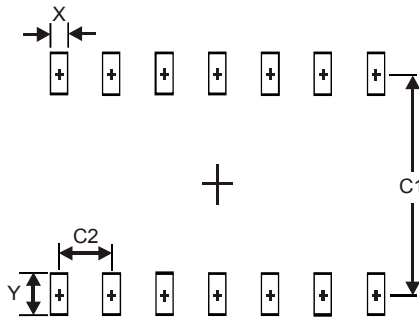
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

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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