



**THE DATASHEET OF
74LV132AS14-13**



QUADRUPLE 2-INPUT NAND GATES WITH SCHMITT TRIGGER INPUTS

Description

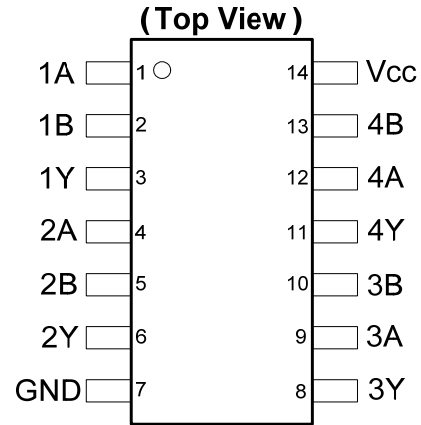
The 74LV132A provides provides four independent 2-input NAND gates with standard push-pull outputs. Each input is a Schmitt Trigger device with a significant amount of hysteresis suiting the device for noisy environments. The device is designed for operation with a power supply range of 2.0V to 5.5V.

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:

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

Pin Assignments



SO-14 / TSSOP-14

Features

- Wide Supply Voltage Range from 2.0V to 5.5V
- Sinks or sources 12mA at V_{CC} = 4.5V
- CMOS low power consumption
- I_{OFF} 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)**

Applications

- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
 - PCs, networking, notebooks, ultrabooks, netbooks
 - Computer peripherals, hard drives, CD/DVD ROM
 - TV, DVD, DVR, set top box

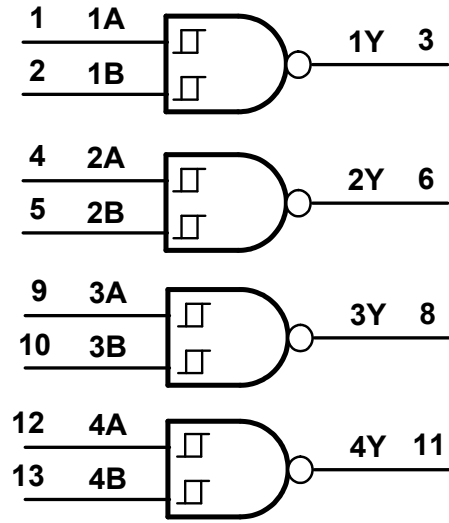
Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free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

[Click for 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 |
| H | H | L |
| L | X | H |
| X | L | H |

Absolute Maximum Ratings (Note 4)

| 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 4 | -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 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 |

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)

| 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 |
| T _A | Operating Free-Air Temperature | – | -40 | +125 | °C |

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics

| Symbol | Parameter | Test Conditions | V _{CC} | T _A = -40 to +85°C | | T _A = -40 to +125°C | | Unit |
|------------------|---|---|-----------------|-------------------------------|------|--------------------------------|------|------|
| | | | | Min | Max | Min | Max | |
| V _{T+} | Positive Going Threshold | – | 2.5 V | 1 | 1.75 | 1 | 1.75 | V |
| | | – | 3.3 V | 1.31 | 2.31 | 1.31 | 2.31 | |
| | | – | 5.0 V | 1.95 | 3.5 | 1.95 | 3.5 | |
| V _{T-} | Negative Going Threshold | – | 2.5 V | 0.75 | 1.5 | 0.75 | 1.5 | – |
| | | – | 3.3 V | 0.99 | 2.07 | 0.99 | 2.07 | |
| | | – | 5.0 V | 1.5 | 3.05 | 1.5 | 3.05 | |
| V _H | Hysteresis (V _{T+} - V _{T-}) | – | 2.5 V | 0.25 | 1 | 0.25 | 1 | V |
| | | – | 3.3 V | 0.33 | 1.32 | 0.33 | 1.32 | |
| | | – | 5.0 V | 0.5 | 2 | 0.5 | 2 | |
| 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 to +85°C | | -40 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 | 16.5 | 1 | 18.5 | 1 | 18.5 | ns |
| | | | 3.3V ± 0.3V | – | 5.6 | 11.9 | 1 | 14 | 1 | 14 | |
| | | | 5.0V ± 0.5V | – | 3.9 | 7.7 | 1 | 9 | 1 | 9 | |
| | | Figure 1 C _L =50 pF | 2.5V ± 0.2V | – | 10.8 | 20.2 | 1 | 23 | 1 | 23 | ns |
| | | | 3.3V ± 0.3V | – | 7.6 | 15.4 | 1 | 17.5 | 1 | 17.5 | |
| | | | 5.0V ± 0.5V | – | 5.3 | 9.7 | 1 | 11 | 1 | 11 | |

Operating Characteristics

T_A = +25°C

| Parameter | | Test Conditions | V _{CC} | TYP | Unit |
|-----------------|--|-----------------------------------|-----------------|------|------|
| C _{pd} | Power Dissipation Capacitance per Gate | F= 10 MHz C _L =50pF | 3.3V | 7.5 | pF |
| | | | 5.0V | 11.2 | |

Noise Characteristics

V_{CC} = 3V, C_L = 50pF, T_A = +25°C

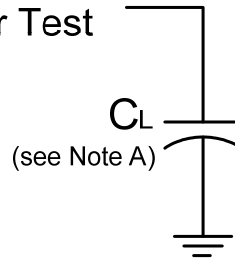
| Symbol | Parameter | Min | Typ. | Max | Unit |
|--------------------|---|------|------|------|------|
| V _{OL(p)} | Quiet output, maximum dynamic V _{OL} | – | 0.2 | 0.8 | V |
| V _{OL(V)} | Quiet output, minimum dynamic V _{OL} | – | -0.1 | -0.8 | V |
| V _{OH(V)} | Quiet output, minimum dynamic 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

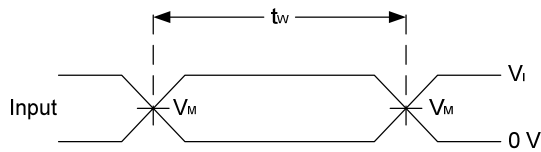
| Symbol | Parameter | Test Conditions | V _{CC} | Min | Typ. | Max | Unit |
|----------------|-------------------|---|-----------------|-----|------|-----|------|
| C _i | Input Capacitance | V _i = V _{CC} – or GND | 2.0 to 5.5V | – | 3.3 | 10 | pF |

Parameter Measurement Information

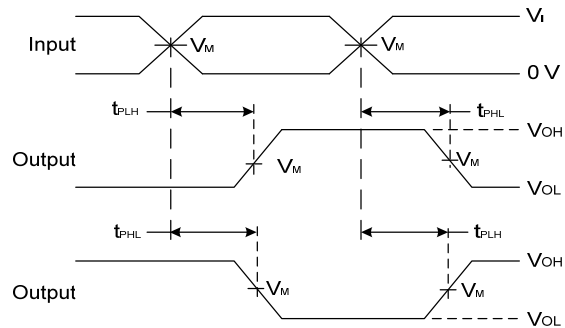
From Output Under Test



| 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 |



Voltage Waveform Pulse Duration

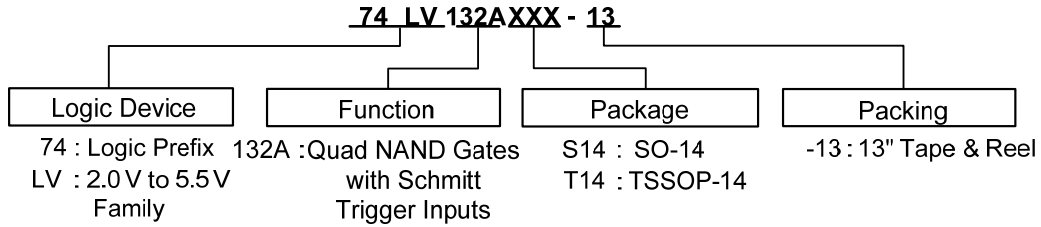


Voltage Waveform Propagation Delay Times Inverting and Non Inverting Outputs

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate $\leq 10\text{MHz}$
 - 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

Ordering Information

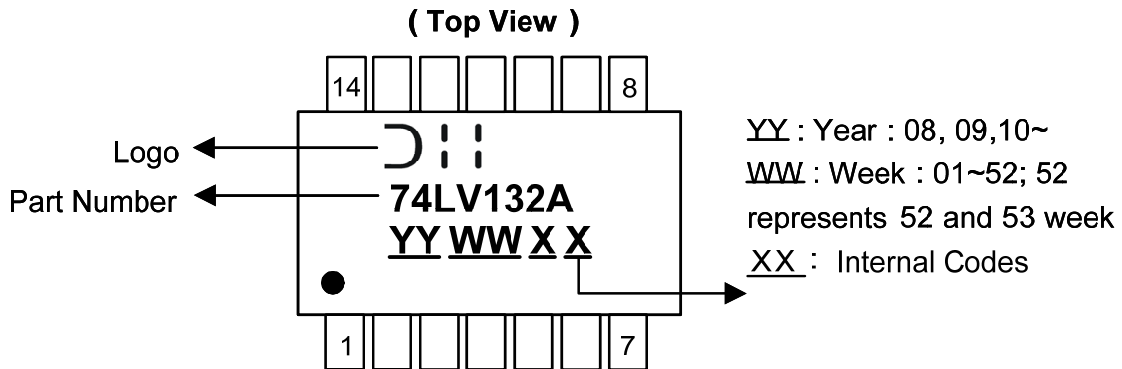


| Device | Package Code | Packaging (Note 6) | 13" Tape and Reel | |
|----------------|--------------|-----------------------|-------------------|--------------------|
| | | | Quantity | Part Number Suffix |
| 74LV132AS14-13 | S14 | SO-14 | 2500/Tape & Reel | -13 |
| 74LV132AT14-13 | T14 | TSSOP-14 | 2500/Tape & Reel | -13 |

Note: 6. The taping orientation and tape details can be found at <http://www.diodes.com/datasheets/ap02007.pdf>

Marking Information

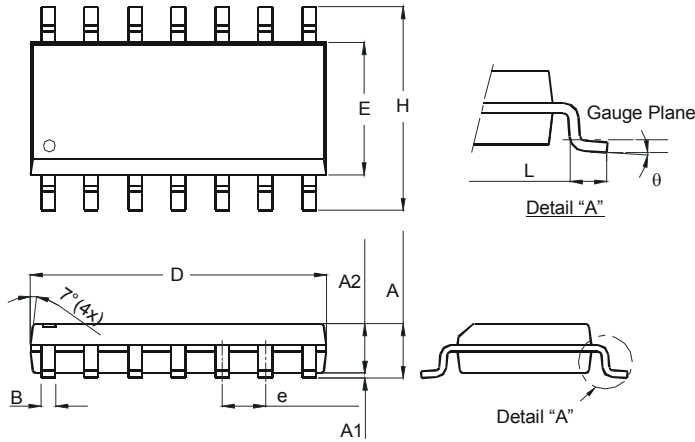
(1) SO14, TSSOP14



| Part Number | Package |
|-------------|----------|
| 74LV132AS14 | SO-14 |
| 74LV132AT14 | TSSOP-14 |

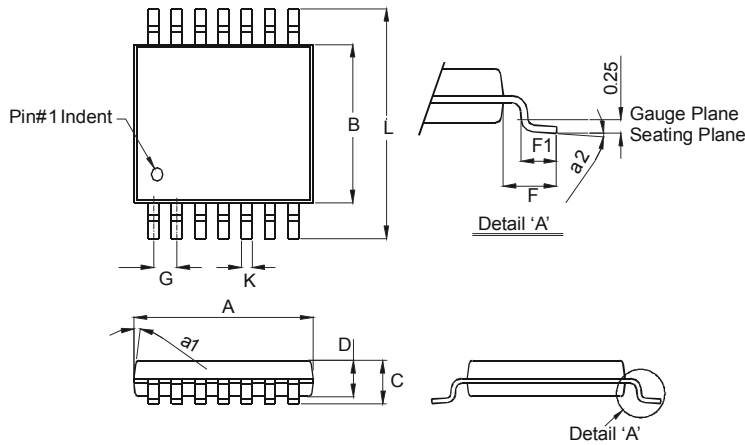
Package Outline Dimensions (All Dimensions in mm)

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 | | |

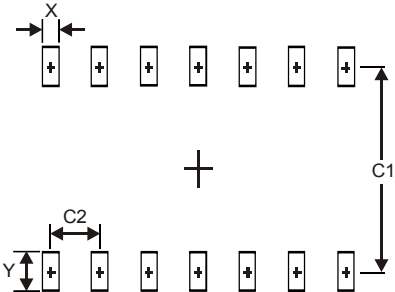
Package Type: TSSOP-14



| 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 | | |

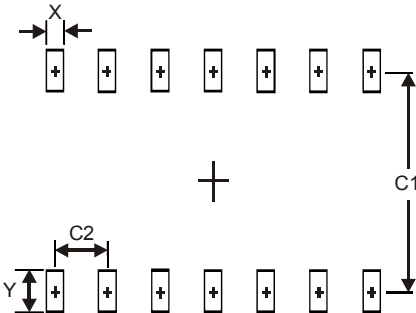
Suggested Pad Layout

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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