

## SN74AHC132 Quadruple Positive-NAND Gates with Schmitt-Trigger Inputs

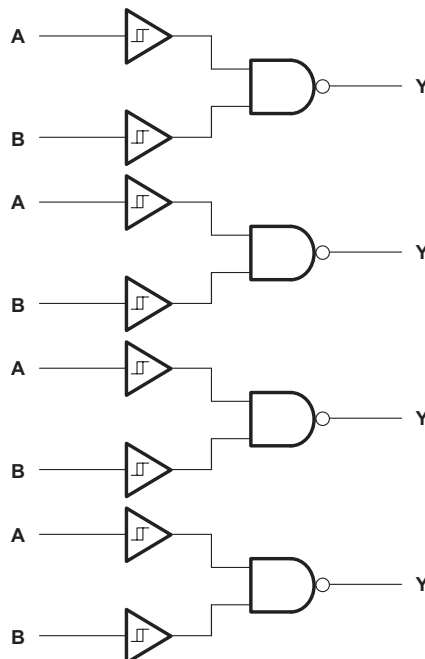
### 1 Features

- Operating Range 2-V to 5.5-V  $V_{CC}$
- Operation From Very Slow Input Transitions
- Temperature-Compensated Threshold Levels
- High Noise Immunity
- Same Pinouts as SNx4AHC00
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model
  - 200-V Machine Model
  - 1000-V Charged-Device Model

### 2 Applications

- Electronic Points of Sale
- Telecom Infrastructure
- Network Switches
- Tests and Measurements

### 4 Simplified Schematic



### 3 Description

The SN74AHC132 device is a quadruple positive-NAND gate designed for 2-V to 5.5-V  $V_{CC}$  operation. This device performs the Boolean function  $Y = \overline{A \times B}$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

#### Device Information<sup>(1)</sup>

| PART NUMBER | PACKAGE    | BODY SIZE (NOM)   |
|-------------|------------|-------------------|
| SNx4AHC132  | SOIC (14)  | 8.65 mm x 3.91 mm |
|             | SSOP (14)  | 6.20 mm x 5.30 mm |
|             | TVSOP (14) | 3.60 mm x 4.40 mm |
|             | TSSOP (14) | 5.00 mm x 4.40 mm |
|             | VQFN (14)  | 3.50 mm x 3.50 mm |

(1) For all available packages, see the orderable addendum at the end of the data sheet.



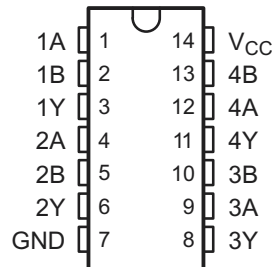
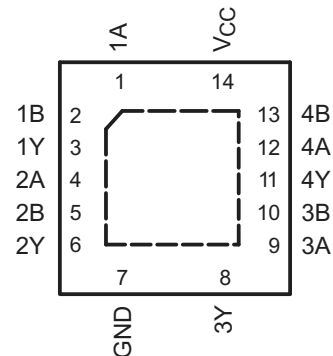
## Table of Contents

|   |          |  |           |
|---|----------|--|-----------|
| <b>1 Features</b> .....   | <b>1</b> | <b>9 Detailed Description</b> .....                              | <b>8</b>  |
| <b>2 Applications</b> .....   | <b>1</b> | 9.1 Overview .....   | 8         |
| <b>3 Description</b> .....  | <b>1</b> | 9.2 Functional Block Diagram .....                               | 8         |
| <b>4 Simplified Schematic</b> .....   | <b>1</b> | 9.3 Feature Description .....                                    | 8         |
| <b>5 Revision History</b> .....   | <b>2</b> | 9.4 Device Functional Modes .....                                | 8         |
| <b>6 Pin Configuration and Functions</b> .....                                | <b>3</b> | <b>10 Application and Implementation</b> .....                   | <b>9</b>  |
| <b>7 Specifications</b> .....   | <b>3</b> | 10.1 Application Information .....                               | 9         |
| 7.1 Absolute Maximum Ratings .....  | 3        | 10.2 Typical Application .....                                   | 9         |
| 7.2 Handling Ratings .....  | 4        | <b>11 Power Supply Recommendations</b> .....                     | <b>10</b> |
| 7.3 Recommended Operating Conditions .....                                    | 4        | <b>12 Layout</b> .....   | <b>10</b> |
| 7.4 Thermal Information .....   | 4        | 12.1 Layout Guidelines .....                                     | 10        |
| 7.5 Electrical Characteristics .....  | 4        | 12.2 Layout Example .....  | 10        |
| 7.6 Switching Characteristics, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ ..... | 5        | <b>13 Device and Documentation Support</b> .....                 | <b>11</b> |
| 7.7 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ .....   | 5        | 13.1 Trademarks .....  | 11        |
| 7.8 Noise Characteristics .....   | 5        | 13.2 Electrostatic Discharge Caution .....                       | 11        |
| 7.9 Operating Characteristics .....   | 6        | 13.3 Glossary .....  | 11        |
| 7.10 Typical Characteristics .....  | 6        | <b>14 Mechanical, Packaging, and Orderable Information</b> ..... | <b>11</b> |
| <b>8 Parameter Measurement Information</b> .....                              | <b>7</b> |  |           |

## 5 Revision History

| Changes from Revision G (September 2002) to Revision H   | Page |
|--|------|
| • Updated document to new TI data sheet format .....   | 1    |
| • Deleted Ordering Information table. ....   | 1    |
| • Deleted SN54AHC132 device from data sheet. ....  | 1    |
| • Added Applications .....   | 1    |
| • Added Pin Functions table .....  | 3    |
| • Added Handling Ratings table .....   | 4    |
| • Changed MAX operating temperature to 125°C in Recommended Operating Conditions table. ....             | 4    |
| • Added Thermal Information table .....  | 4    |
| • Added –40°C to 125°C range for SN74AHC132 in Electrical Characteristics table .....                    | 4    |
| • Added $T_A = -40^\circ\text{C}$ to 125°C for SN74AHC132 in both Switching Characteristics tables ..... | 5    |
| • Added Typical Characteristics .....  | 6    |
| • Added Detailed Description section .....   | 8    |
| • Added Application and Implementation section .....   | 9    |
| • Added Power Supply Recommendations and Layout sections .....   | 10   |

## 6 Pin Configuration and Functions

**SN74AHC132 . . . D, DB, DGV, N, NS,  
OR PW PACKAGE  
(TOP VIEW)**

**SN74AHC132 . . . RGY PACKAGE  
(TOP VIEW)**


### Pin Functions

| NAME            | PIN        |                            | I/O | DESCRIPTION |
|-----------------|------------|----------------------------|-----|-------------|
|                 | SN74AHC132 | D, DB, DGV, N, NS, PW, RGY |     |             |
| 1A              | 1          | 14                         | I   | 1A Input    |
| 1B              | 2          | 13                         | I   | 1B Input    |
| 1Y              | 3          | 12                         | O   | 1Y Output   |
| 2A              | 4          | 11                         | I   | 2A Input    |
| 2B              | 5          | 10                         | I   | 2B Input    |
| 2Y              | 6          | 9                          | O   | 2Y Output   |
| 3Y              | 8          | 8                          | O   | 3Y Output   |
| 3A              | 9          | 9                          | I   | 3A Input    |
| 3B              | 10         | 10                         | I   | 3B Input    |
| 4Y              | 11         | 11                         | O   | 4Y Output   |
| 4A              | 12         | 12                         | I   | 4A Input    |
| 4B              | 13         | 13                         | I   | 4B Input    |
| GND             | 7          | 7                          | —   | Ground Pin  |
| V <sub>CC</sub> | 14         | 14                         | —   | Power Pin   |

## 7 Specifications

### 7.1 Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

|                 |   | MIN  | MAX                   | UNIT |
|-----------------|---|--|-----------------------|------|
| V <sub>CC</sub> | Supply voltage range                              | −0.5   | 7                     | V    |
| V <sub>I</sub>  | Input voltage range <sup>(2)</sup>                | −0.5   | 7                     | V    |
| V <sub>O</sub>  | Output voltage range <sup>(2)</sup>               | −0.5   | V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub> | Input clamp current                               | V <sub>I</sub> < 0                                     |                       | −20  |
| I <sub>OK</sub> | Output clamp current                              | V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> |                       | ±20  |
| I <sub>O</sub>  | Continuous output current                         | V <sub>O</sub> = 0 to V <sub>CC</sub>                  |                       | ±25  |
|                 | Continuous current through V <sub>CC</sub> or GND |  |                       | ±50  |

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## 7.2 Handling Ratings

|             |                           | MIN  | MAX  | UNIT |
|-------------|---------------------------|--|------|------|
| $T_{stg}$   | Storage temperature range | -65  | 150  | °C   |
| $V_{(ESD)}$ | Electrostatic discharge   | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>              |      | V    |
|             |                           | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup> |      |      |
|             |                           | 0  | 2000 |      |
|             |                           | 0  | 1000 |      |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

## 7.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|          |                                | SN74AHC132                               |          | UNIT |
|----------|--------------------------------|--|----------|------|
|          |                                | MIN                                      | MAX      |      |
| $V_{CC}$ | Supply voltage                 | 2  | 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      | $V_{CC} = 2\text{ V}$                    |          | -50  |
|          |                                | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |          | -4   |
|          |                                | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$   |          | -8   |
| $I_{OL}$ | Low-level output current       | $V_{CC} = 2\text{ V}$                    |          | 50   |
|          |                                | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |          | 4    |
|          |                                | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$   |          | 8    |
| $T_A$    | Operating free-air temperature | -40                                      | 125      | °C   |

(1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs (SCBA004)*.

## 7.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> | SN74AHC132                                   |      |       |      |      |      |       |      | UNIT |
|-------------------------------|--|------|-------|------|------|------|-------|------|------|
|                               | D  | DB   | DR    | N    | NS   | PW   | RGY   |      |      |
|                               | 14 PINS                                      |      |       |      |      |      |       |      |      |
| $R_{\theta JA}$               | Junction-to-ambient thermal resistance       | 90.6 | 107.1 | 90.6 | 57.4 | 90.7 | 122.6 | 57.5 | °C/W |
| $R_{\theta JC(top)}$          | Junction-to-case (top) thermal resistance    | 50.9 | 59.6  | 50.9 | 44.9 | 48.3 | 51.4  | 57.5 |      |
| $R_{\theta JB}$               | Junction-to-board thermal resistance         | 44.8 | 54.4  | 44.8 | 37.2 | 49.4 | 64.4  | 33.6 |      |
| $\Psi_{JT}$                   | Junction-to-top characterization parameter   | 14.7 | 20.5  | 14.7 | 30.1 | 14.6 | 6.7   | 3.4  |      |
| $\Psi_{JB}$                   | Junction-to-board characterization parameter | 44.5 | 53.8  | 44.5 | 37.1 | 49.1 | 63.8  | 33.7 |      |
| $R_{\theta JC(bot)}$          | Junction-to-case (bottom) thermal resistance | —    | —     | —    | —    | —    | —     | 13.9 |      |

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report ([SPRA953](#)).

## 7.5 Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER  | TEST CONDITIONS | $V_{CC}$ | $T_A = 25^\circ\text{C}$ |     |      | SN74AHC132 |      | -40°C to 125°C<br>SN74AHC132 |      | UNIT |
|--|-----------------|----------|--------------------------|-----|------|------------|------|------------------------------|------|------|
|  |                 |          | MIN                      | TYP | MAX  | MIN        | MAX  | MIN                          | MAX  |      |
| $V_{T+}$<br>Positive-going input threshold voltage |                 | 3 V      | 1.2                      |     | 2.2  | 1.2        | 2.2  | 1.2                          | 2.2  | V    |
|  |                 | 4.5 V    | 1.75                     |     | 3.15 | 1.75       | 3.15 | 1.75                         | 3.15 |      |
|  |                 | 5.5 V    | 2.15                     |     | 3.85 | 2.15       | 3.85 | 2.15                         | 3.85 |      |

## Electrical Characteristics (continued)

over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER   | TEST CONDITIONS   | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |      | SN74AHC132 |      | –40°C to 125°C<br>SN74AHC132 |      | UNIT |
|---|---|-----------------|-----------------------|-----|------|------------|------|------------------------------|------|------|
|   |   |                 | MIN                   | TYP | MAX  | MIN        | MAX  | MIN                          | MAX  |      |
| V <sub>T-</sub><br>Negative-going<br>input threshold<br>voltage       |   | 3 V             | 0.9                   |     | 1.9  | 0.9        | 1.9  | 0.9                          | 1.9  | V    |
|   |   | 4.5 V           | 1.35                  |     | 2.75 | 1.35       | 2.75 | 1.35                         | 2.75 |      |
|   |   | 5.5 V           | 1.65                  |     | 3.35 | 1.65       | 3.35 | 1.65                         | 3.35 |      |
| ΔV <sub>T</sub><br>Hysteresis<br>(V <sub>T+</sub> – V <sub>T-</sub> ) |   | 3 V             | 0.3                   |     | 1.2  | 0.3        | 1.2  | 0.3                          | 1.2  | V    |
|   |   | 4.5 V           | 0.4                   |     | 1.4  | 0.4        | 1.4  | 0.4                          | 1.4  |      |
|   |   | 5.5 V           | 0.5                   |     | 1.6  | 0.5        | 1.6  | 0.5                          | 1.6  |      |
| V <sub>OH</sub>   | I <sub>OH</sub> = –50 μA                                      | 2 V             | 1.9                   | 2   |      | 1.9        |      | 1.9                          |      | V    |
|   |   | 3 V             | 2.9                   | 3   |      | 2.9        |      | 2.9                          |      |      |
|   |   | 4.5 V           | 4.4                   | 4.5 |      | 4.4        |      | 4.4                          |      |      |
|   | I <sub>OH</sub> = –4 mA                                       | 3 V             | 2.58                  |     |      | 2.48       |      | 2.48                         |      |      |
|   | I <sub>OH</sub> = –8 mA                                       | 4.5 V           | 3.94                  |     |      | 3.8        |      | 3.8                          |      |      |
| V <sub>OL</sub>   | I <sub>OL</sub> = 50 μA                                       | 2 V             |                       |     | 0.1  |            | 0.1  |                              | 0.1  | V    |
|   |   | 3 V             |                       |     | 0.1  |            | 0.1  |                              | 0.1  |      |
|   |   | 4.5 V           |                       |     | 0.1  |            | 0.1  |                              | 0.1  |      |
|   | I <sub>OL</sub> = 4 mA  | 3 V             |                       |     | 0.36 |            | 0.44 |                              | 0.44 |      |
|   | I <sub>OL</sub> = 8 mA  | 4.5 V           |                       |     | 0.36 |            | 0.44 |                              | 0.44 |      |
| I <sub>I</sub>  | V <sub>I</sub> = 5.5 V or GND                                 | 0 V to<br>5.5 V |                       |     | ±0.1 |            | ±1   |                              | ±1   | μA   |
| I <sub>CC</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND<br>I <sub>O</sub> = 0 | 5.5 V           |                       |     | 2    |            | 20   |                              | 20   | μA   |
| C <sub>i</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND                       | 5 V             |                       | 1.9 | 10   |            | 10   |                              | 10   | pF   |

### 7.6 Switching Characteristics, V<sub>CC</sub> = 3.3 V ± 0.3 V

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 3)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE    | T <sub>A</sub> = 25°C |                    |                     | SN74AHC132 |      | T <sub>A</sub> = –40°C to 125°C<br>SN74AHC132 |     | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|--------------------|---------------------|------------|------|---|-----|------|
|                  |                 |                |                        | MIN                   | TYP                | MAX                 | MIN        | MAX  | MIN   | MAX |      |
| t <sub>PLH</sub> | A or B          | Y              | C <sub>L</sub> = 15 pF |                       | 5.6 <sup>(1)</sup> | 11.9 <sup>(1)</sup> | 1          | 14   | 1   | 15  | ns   |
| t <sub>PHL</sub> |                 |                |                        |                       | 5.6 <sup>(1)</sup> | 11.9 <sup>(1)</sup> | 1          | 14   | 1   | 15  |      |
| t <sub>PLH</sub> | A or B          | Y              | C <sub>L</sub> = 50 pF |                       | 7.6                | 15.4                | 1          | 17.5 | 1   | 19  | ns   |
| t <sub>PHL</sub> |                 |                |                        |                       | 7.6                | 15.4                | 1          | 17.5 | 1   | 19  |      |

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### 7.7 Switching Characteristics, V<sub>CC</sub> = 5 V ± 0.5 V

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 3)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE    | T <sub>A</sub> = 25°C |                    |                    | SN74AHC132 |     | T <sub>A</sub> = –40°C to 125°C<br>SN74AHC132 |     | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|--------------------|--------------------|------------|-----|---|-----|------|
|                  |                 |                |                        | MIN                   | TYP                | MAX                | MIN        | MAX | MIN   | MAX |      |
| t <sub>PLH</sub> | A or B          | Y              | C <sub>L</sub> = 15 pF |                       | 3.9 <sup>(1)</sup> | 7.7 <sup>(1)</sup> | 1          | 9   | 1   | 10  | ns   |
| t <sub>PHL</sub> |                 |                |                        |                       | 3.9 <sup>(1)</sup> | 7.7 <sup>(1)</sup> | 1          | 9   | 1   | 10  |      |
| t <sub>PLH</sub> | A or B          | Y              | C <sub>L</sub> = 50 pF |                       | 5.3                | 9.7                | 1          | 11  | 1   | 12  | ns   |
| t <sub>PHL</sub> |                 |                |                        |                       | 5.3                | 9.7                | 1          | 11  | 1   | 12  |      |

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### 7.8 Noise Characteristics

V<sub>CC</sub> = 5 V, C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C<sup>(1)</sup>

(1) Characteristics are for surface-mount packages only.

## Noise Characteristics (continued)

 $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}^{(1)}$ 

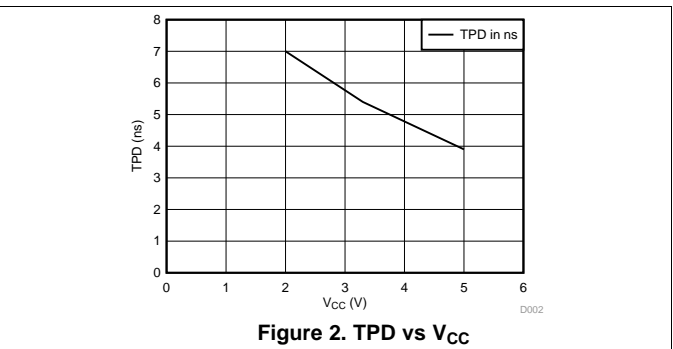
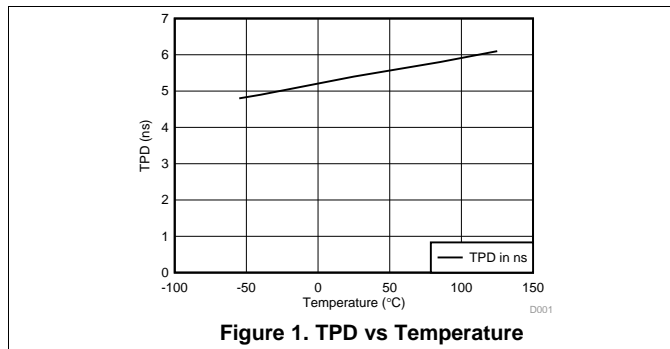
| PARAMETER   |  | SN74AHC132 |       |      | UNIT |
|-------------|--|------------|-------|------|------|
|             |  | MIN        | TYP   | MAX  |      |
| $V_{OL(P)}$ | Quiet output, maximum dynamic $V_{OL}$ |            | 0.45  | 0.8  | V    |
| $V_{OL(V)}$ | Quiet output, minimum dynamic $V_{OL}$ |            | -0.35 | -0.8 | V    |
| $V_{OH(V)}$ | Quiet output, minimum dynamic $V_{OH}$ |            | 4.8   |      | V    |
| $V_{IH(D)}$ | High-level dynamic input voltage       | 3.5        |       |      | V    |
| $V_{IL(D)}$ | Low-level dynamic input voltage        |            |       | 1.5  | V    |

## 7.9 Operating Characteristics

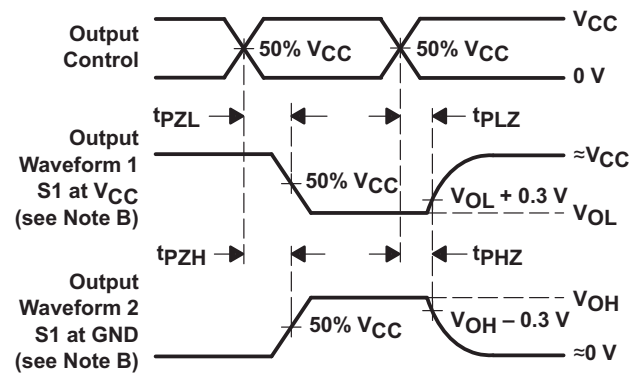
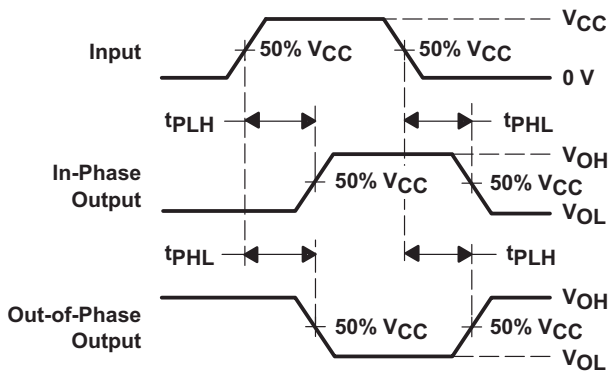
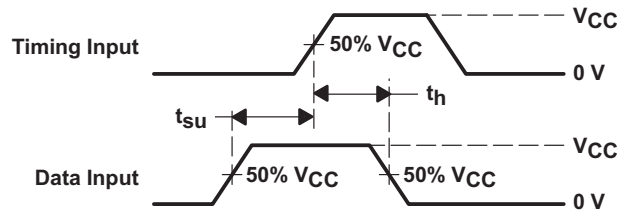
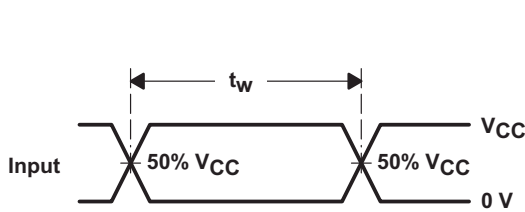
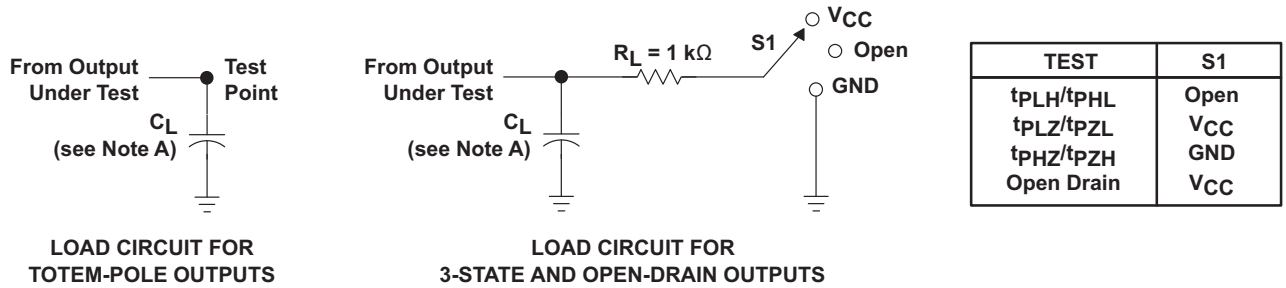
 $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ 

| PARAMETER | TEST CONDITIONS             | TYP | UNIT |
|-----------|-----------------------------|-----|------|
| $C_{pd}$  | No load, $f = 1\text{ MHz}$ | 11  | pF   |

## 7.10 Typical Characteristics



## 8 Parameter Measurement Information



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns.  
 D. The outputs are measured one at a time with one input transition per measurement.  
 E. All parameters and waveforms are not applicable to all devices.

Figure 3. Load Circuit and Voltage Waveforms

## 9 Detailed Description

### 9.1 Overview

The SN74AHC132 is a quadruple 2-input positive-NAND gate with low drive that produces slow rise and fall times. This reduces ringing on the output signal.

Each circuit functions as a NAND gate, but because of the Schmitt action, it has different input threshold levels for positive- and negative-going signals.

These circuits are temperature compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals.

### 9.2 Functional Block Diagram

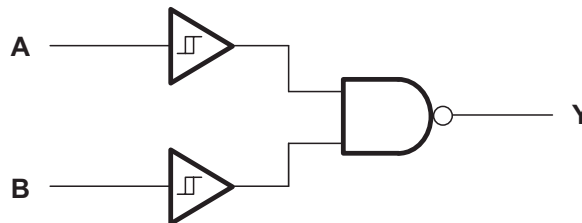


Figure 4. Logic Diagram, Each Gate (Positive Logic)

### 9.3 Feature Description

- Wide operating voltage range
  - Operates from 2 V to 5.5 V
- Allows down voltage translation
  - Inputs accept voltages to 5.5 V

### 9.4 Device Functional Modes

Table 1. Function Table  
(Each Gate)

| INPUTS |   | OUTPUT<br>Y |
|--------|---|-------------|
| A      | B |             |
| H      | H | L           |
| L      | X | H           |
| X      | L | H           |



## 10 Application and Implementation

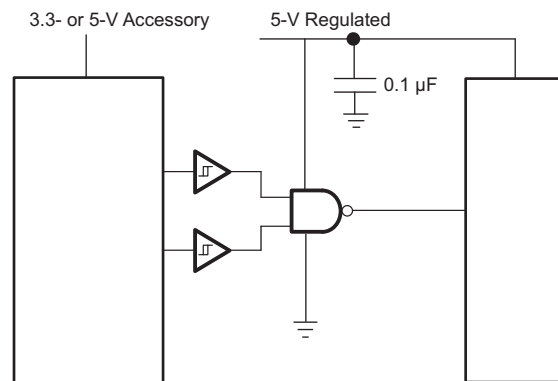
### NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

### 10.1 Application Information

The SN74AHC132 is a low-drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs. The inputs can accept voltages to 5.5 V at any valid  $V_{CC}$ , thus making the device ideal for down translation.

### 10.2 Typical Application



**Figure 5. Typical Application Schematic**

#### 10.2.1 Design Requirements

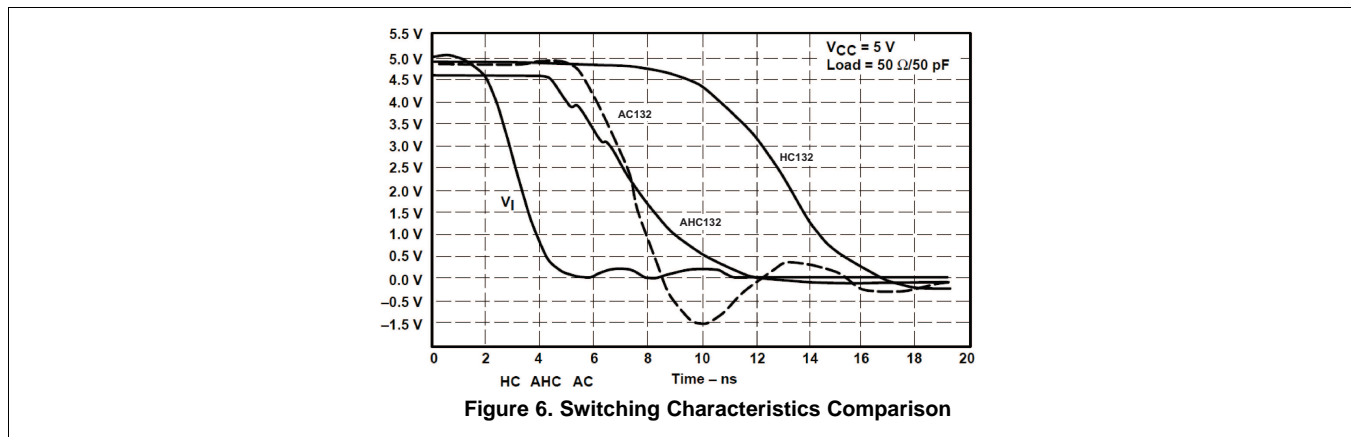
This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

#### 10.2.2 Detailed Design Procedure

1. Recommended Input Conditions:
  - For rise time and fall time specifications, see  $\Delta t/\Delta V$  in the [Recommended Operating Conditions](#) table.
  - For specified high and low levels, see  $V_{IH}$  and  $V_{IL}$  in the [Recommended Operating Conditions](#) table.
  - Inputs are overvoltage tolerant allowing them to go as high as 5.5 V at any valid  $V_{CC}$ .
2. Recommend Output Conditions:
  - Load currents should not exceed 25 mA per output and 50 mA total for the part.
  - Outputs should not be pulled above  $V_{CC}$ .

## Typical Application (continued)

### 10.2.3 Application Curves



## 11 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply-voltage rating located in the [Recommended Operating Conditions](#) table.

Each  $V_{CC}$  pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 $\mu$ F is recommended. If there are multiple  $V_{CC}$  pins then a 0.01  $\mu$ F or a 0.022  $\mu$ F is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1  $\mu$ F and a 1  $\mu$ F are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

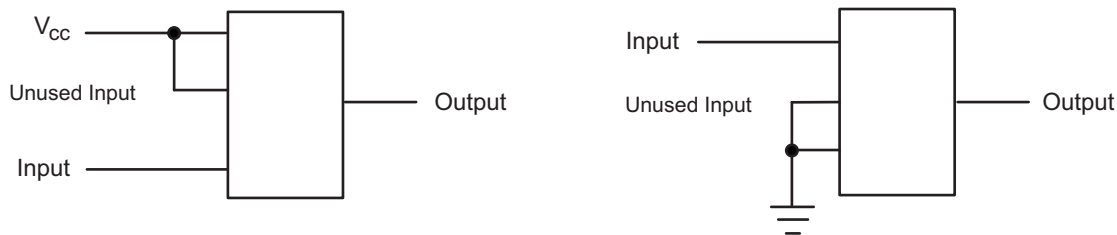
## 12 Layout

### 12.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states.

Specified in the [Figure 7](#) are rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or  $V_{CC}$ , whichever makes more sense or is more convenient. It is acceptable to float outputs unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the outputs section of the part when asserted. This will not disable the input section of the I/Os so they also cannot float when disabled.

### 12.2 Layout Example



**Figure 7. Layout Diagram**

## 13 Device and Documentation Support

### 13.1 Trademarks

All trademarks are the property of their respective owners.

### 13.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 13.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 14 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)         | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74AHC132D      | ACTIVE        | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | AHC132                  | <a href="#">Samples</a> |
| SN74AHC132DBR    | ACTIVE        | SSOP         | DB              | 14   | 2000        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | HA132                   | <a href="#">Samples</a> |
| SN74AHC132DGVR   | ACTIVE        | TVSOP        | DGV             | 14   | 2000        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | HA132                   | <a href="#">Samples</a> |
| SN74AHC132DR     | ACTIVE        | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | AHC132                  | <a href="#">Samples</a> |
| SN74AHC132DRE4   | ACTIVE        | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | AHC132                  | <a href="#">Samples</a> |
| SN74AHC132N      | ACTIVE        | PDIP         | N               | 14   | 25          | Green (RoHS & no Sb/Br) | NIPDAU                  | N / A for Pkg Type   | -40 to 125   | SN74AHC132N             | <a href="#">Samples</a> |
| SN74AHC132NSR    | ACTIVE        | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | AHC132                  | <a href="#">Samples</a> |
| SN74AHC132PW     | ACTIVE        | TSSOP        | PW              | 14   | 90          | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | HA132                   | <a href="#">Samples</a> |
| SN74AHC132PWR    | ACTIVE        | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | HA132                   | <a href="#">Samples</a> |
| SN74AHC132PWRG4  | ACTIVE        | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 125   | HA132                   | <a href="#">Samples</a> |
| SN74AHC132RGYR   | ACTIVE        | VQFN         | RGY             | 14   | 3000        | Green (RoHS & no Sb/Br) | NIPDAU                  | Level-2-260C-1 YEAR  | -40 to 125   | HA132                   | <a href="#">Samples</a> |

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

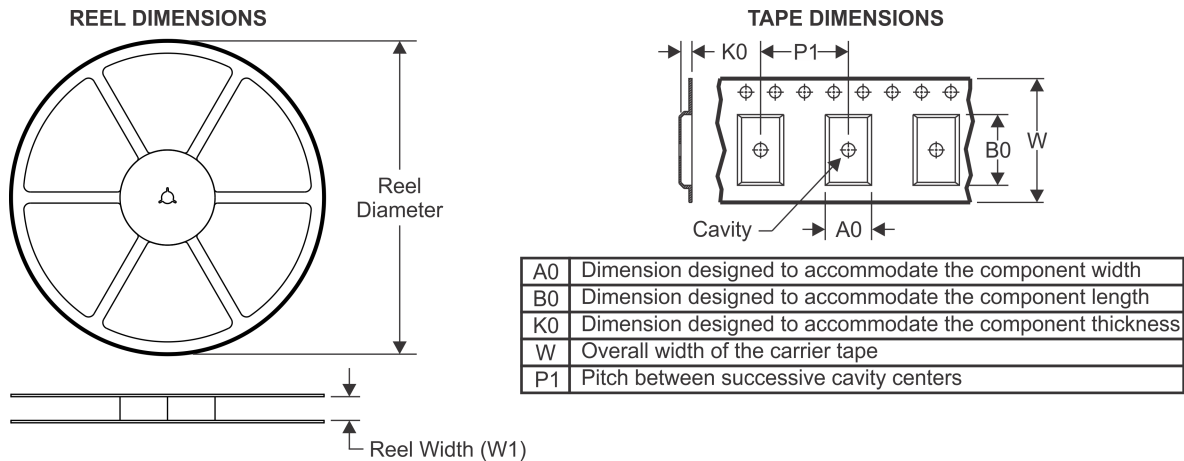
**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

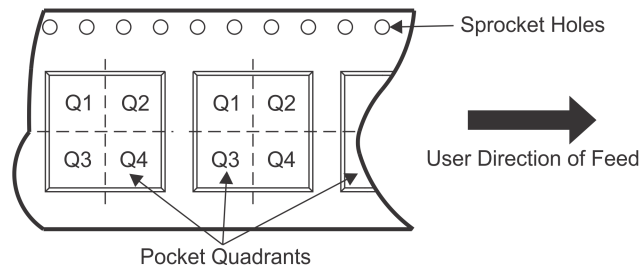
**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TAPE AND REEL INFORMATION

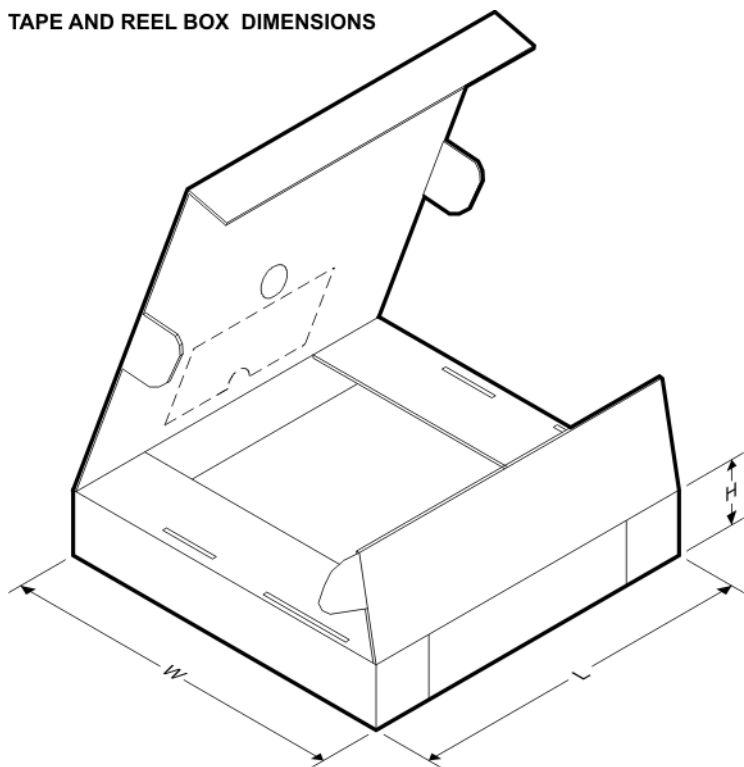


### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC132DGVR | TVSOP        | DGV             | 14   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHC132DR   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74AHC132NSR  | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74AHC132PWR  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHC132RGYR | VQFN         | RGY             | 14   | 3000 | 330.0              | 12.4               | 3.75    | 3.75    | 1.15    | 8.0     | 12.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC132DGVR | TVSOP        | DGV             | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74AHC132DR   | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| SN74AHC132NSR  | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| SN74AHC132PWR  | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74AHC132RGYR | VQFN         | RGY             | 14   | 3000 | 367.0       | 367.0      | 35.0        |

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale ([www.ti.com/legal/termsofsale.html](http://www.ti.com/legal/termsofsale.html)) or other applicable terms available either on [ti.com](http://ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2020, Texas Instruments Incorporated