

# SN54AHCT132, SN74AHCT132 QUADRUPLE POSITIVE-NAND GATES WITH SCHMITT-TRIGGER INPUTS

SCLS366G – MAY 1997 – REVISED APRIL 2002

- Inputs Are TTL-Voltage Compatible
- Operation From Very Slow Input Transitions
- Temperature-Compensated Threshold Levels
- High Noise Immunity
- Same Pinouts as 'AHCT00
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

## description

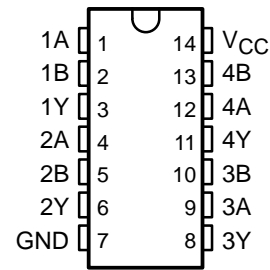
The 'AHCT132 devices are quadruple positive-NAND gates.

These devices perform the Boolean function  $Y = \overline{A \cdot B}$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

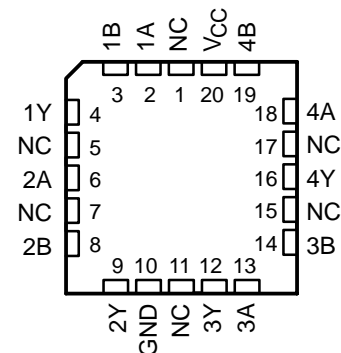
Each circuit functions as a NAND gate, but because of the Schmitt action, it has different input threshold levels for positive- and negative-going signals.

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

SN54AHCT132 . . . J OR W PACKAGE  
SN74AHCT132 . . . D, DB, DGV, N, NS, OR PW PACKAGE  
(TOP VIEW)



SN54AHCT132 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## ORDERING INFORMATION

| T <sub>A</sub> | PACKAGE†      |                | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|---------------|----------------|-----------------------|------------------|
| –40°C to 85°C  | PDIP – N      | Tube           | SN74AHCT132N          | SN74AHCT132N     |
|                | SOIC – D      | Tube           | SN74AHCT132D          | AHCT132          |
|                |               | Tape and reel  | SN74AHCT132DR         |                  |
|                | SOP – NS      | Tape and reel  | SN74AHCT132NSR        | AHCT132          |
|                | SSOP – DB     | Tape and reel  | SN74AHCT132DBR        | HB132            |
|                | TSSOP – PW    | Tape and reel  | SN74AHCT132PWR        | HB132            |
| TVSOP – DGV    | Tape and reel | SN74AHCT132DGV | HB132                 |                  |
| –55°C to 125°C | CDIP – J      | Tube           | SNJ54AHCT132J         | SNJ54AHCT132J    |
|                | CFP – W       | Tube           | SNJ54AHCT132W         | SNJ54AHCT132W    |
|                | LCCC – FK     | Tube           | SNJ54AHCT132FK        | SNJ54AHCT132FK   |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2002, Texas Instruments Incorporated

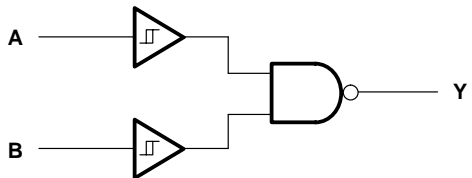
# SN54AHCT132, SN74AHCT132 QUADRUPLE POSITIVE-NAND GATES WITH SCHMITT-TRIGGER INPUTS

SCLS366G – MAY 1997 – REVISED APRIL 2002

FUNCTION TABLE  
(each gate)

| INPUTS |   | OUTPUT |
|--------|---|--------|
| A      | B | Y      |
| H      | H | L      |
| L      | X | H      |
| X      | L | H      |

## logic diagram, each gate (positive logic)



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

|  |                            |
|--|----------------------------|
| Supply voltage range, $V_{CC}$ .....                                 | -0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 1) .....                        | -0.5 V to 7 V              |
| Output voltage range, $V_O$ (see Note 1) .....                       | -0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....                    | -20 mA                     |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) ..... | $\pm 20$ mA                |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....     | $\pm 25$ mA                |
| Continuous current through $V_{CC}$ or GND .....                     | $\pm 50$ mA                |
| Package thermal impedance, $\theta_{JA}$ (see Note 2):               |                            |
| D package .....  | 86°C/W                     |
| DB package .....   | 96°C/W                     |
| DGV package .....  | 127°C/W                    |
| N package .....  | 80°C/W                     |
| NS package .....   | 76°C/W                     |
| PW package .....   | 113°C/W                    |
| Storage temperature range, $T_{stg}$ .....                           | -65°C to 150°C             |

† 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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

# SN54AHCT132, SN74AHCT132 QUADRUPLE POSITIVE-NAND GATES WITH SCHMITT-TRIGGER INPUTS

SCLS366G – MAY 1997 – REVISED APRIL 2002

## recommended operating conditions (see Note 3)

|                 |                                | SN54AHCT132 |                 | SN74AHCT132 |                 | UNIT |
|-----------------|--------------------------------|-------------|-----------------|-------------|-----------------|------|
|                 |                                | MIN         | MAX             | MIN         | MAX             |      |
| V <sub>CC</sub> | Supply voltage                 | 4.5         | 5.5             | 4.5         | 5.5             | V    |
| V <sub>I</sub>  | Input voltage                  | 0           | 5.5             | 0           | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                 | 0           | V <sub>CC</sub> | 0           | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current      |             | -8              |             | -8              | mA   |
| I <sub>OL</sub> | Low-level output current       |             | 8               |             | 8               | mA   |
| T <sub>A</sub>  | Operating free-air temperature | -55         | 125             | -40         | 85              | °C   |

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER   | TEST CONDITIONS   | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |      | SN54AHCT132 |     | SN74AHCT132 |      | UNIT |
|---|---|-----------------|-----------------------|-----|------|-------------|-----|-------------|------|------|
|   |   |                 | MIN                   | TYP | MAX  | MIN         | MAX | MIN         | MAX  |      |
| V <sub>T+</sub><br>Positive-going input<br>threshold voltage          |   | 4.5 V           | 0.9                   |     | 1.9  | 0.9         | 1.9 | 0.9         | 1.9  | V    |
|   |   | 5.5 V           | 1                     |     | 2.1  | 1           | 2.1 | 1           | 2.1  |      |
| V <sub>T-</sub><br>Negative-going input<br>threshold voltage          |   | 4.5 V           | 0.5                   |     | 1.5  | 0.5         | 1.5 | 0.5         | 1.5  | V    |
|   |   | 5.5 V           | 0.6                   |     | 1.7  | 0.6         | 1.7 | 0.6         | 1.7  |      |
| ΔV <sub>T</sub><br>Hysteresis<br>(V <sub>T+</sub> - V <sub>T-</sub> ) |   | 4.5 V           | 0.3                   |     | 1.4  | 0.3         | 1.4 | 0.3         | 1.4  | V    |
|   |   | 5.5 V           | 0.3                   |     | 1.5  | 0.3         | 1.5 | 0.3         | 1.5  |      |
| V <sub>OH</sub>   | I <sub>OH</sub> = -50 μA                                      | 4.5 V           | 4.4                   | 4.5 |      | 4.4         |     | 4.4         |      | V    |
|   | I <sub>OH</sub> = -8 mA                                       |                 | 3.94                  |     |      | 3.8         |     | 3.8         |      |      |
| V <sub>OL</sub>   | I <sub>OL</sub> = 50 μA                                       | 4.5 V           |                       |     | 0.1  |             |     | 0.1         |      | V    |
|   | I <sub>OL</sub> = 8 mA  |                 |                       |     | 0.36 |             |     | 0.5         | 0.44 |      |
| I <sub>I</sub>  | V <sub>I</sub> = 5.5 V or GND                                 | 0 V to 5.5 V    |                       |     | ±0.1 |             |     | ±1*         |      | μA   |
| I <sub>CC</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0   | 5.5 V           |                       |     | 2    |             |     | 20          |      | μA   |
| ΔI <sub>CC</sub> †  | One input at 3.4 V,<br>Other inputs at V <sub>CC</sub> or GND | 5.5 V           |                       |     | 1.35 |             |     | 1.5         |      | mA   |
| C <sub>i</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND                       | 5 V             |                       | 2   | 10   |             |     |             | 10   | pF   |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested at V<sub>CC</sub> = 0 V.

† This is the increase in supply current for each input at one of the specified TTL voltage levels rather than 0 V or V<sub>CC</sub>.

# SN54AHCT132, SN74AHCT132 QUADRUPLE POSITIVE-NAND GATES WITH SCHMITT-TRIGGER INPUTS

SCLS366G – MAY 1997 – REVISED APRIL 2002

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |     |     | SN54AHCT132 |     | SN74AHCT132 |     | UNIT |
|-----------|--------------|-------------|----------------------|--------------------------|-----|-----|-------------|-----|-------------|-----|------|
|           |              |             |                      | MIN                      | TYP | MAX | MIN         | MAX | MIN         | MAX |      |
| $t_{PLH}$ | A or B       | Y           | $C_L = 15\text{ pF}$ | 5.5*                     | 8*  | 1*  | 9*          | 1   | 9           | ns  |      |
| $t_{PHL}$ |              |             |                      | 4.5*                     | 6*  | 1*  | 7*          | 1   | 7           |     |      |
| $t_{PLH}$ | A or B       | Y           | $C_L = 50\text{ pF}$ | 6.5                      | 9   | 1   | 10          | 1   | 10          | ns  |      |
| $t_{PHL}$ |              |             |                      | 5.5                      | 7   | 1   | 8           | 1   | 8           |     |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

noise characteristics,  $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 4)

| PARAMETER  | SN74AHCT132 |      |     | UNIT |
|--|-------------|------|-----|------|
|  | MIN         | TYP  | MAX |      |
| $V_{OL(P)}$ Quiet output, maximum dynamic $V_{OL}$ | 0.5         | 0.8  |     | V    |
| $V_{OL(V)}$ Quiet output, minimum dynamic $V_{OL}$ | -0.28       | -0.8 |     | V    |
| $V_{OH(V)}$ Quiet output, minimum dynamic $V_{OH}$ | 5           |      |     | V    |
| $V_{IH(D)}$ High-level dynamic input voltage       | 2           |      |     | V    |
| $V_{IL(D)}$ Low-level dynamic input voltage        |             |      | 0.8 | V    |

NOTE 4: Characteristics are for surface-mount packages only.

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

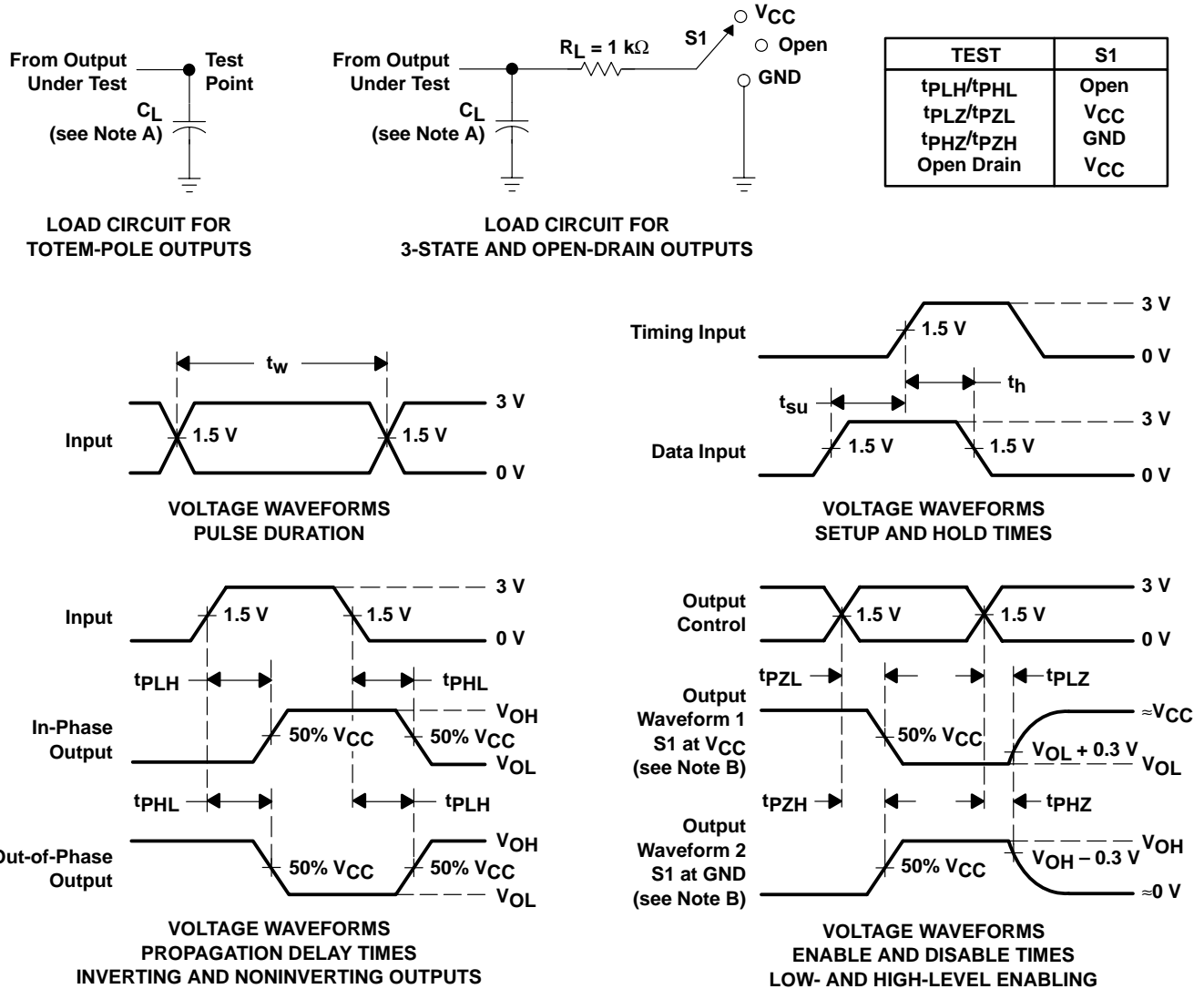
| PARAMETER                              | TEST CONDITIONS             | TYP | UNIT |
|--|-----------------------------|-----|------|
| $C_{pd}$ Power dissipation capacitance | No load, $f = 1\text{ MHz}$ | 15  | pF   |

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

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.

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74AHCT132D     | ACTIVE        | SOIC         | D               | 14   | 50          | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | AHCT132                 | <a href="#">Samples</a> |
| SN74AHCT132DBR   | ACTIVE        | SSOP         | DB              | 14   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | HB132                   | <a href="#">Samples</a> |
| SN74AHCT132DG4   | ACTIVE        | SOIC         | D               | 14   | 50          | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | AHCT132                 | <a href="#">Samples</a> |
| SN74AHCT132DGV   | ACTIVE        | TVSOP        | DGV             | 14   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | HB132                   | <a href="#">Samples</a> |
| SN74AHCT132DR    | ACTIVE        | SOIC         | D               | 14   | 2500        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | AHCT132                 | <a href="#">Samples</a> |
| SN74AHCT132DRG4  | ACTIVE        | SOIC         | D               | 14   | 2500        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | AHCT132                 | <a href="#">Samples</a> |
| SN74AHCT132N     | ACTIVE        | PDIP         | N               | 14   | 25          | RoHS & Green    | NIPDAU                               | N / A for Pkg Type   | -40 to 85    | SN74AHCT132N            | <a href="#">Samples</a> |
| SN74AHCT132NSR   | ACTIVE        | SO           | NS              | 14   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | AHCT132                 | <a href="#">Samples</a> |
| SN74AHCT132PWR   | ACTIVE        | TSSOP        | PW              | 14   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | HB132                   | <a href="#">Samples</a> |
| SN74AHCT132PWRE4 | ACTIVE        | TSSOP        | PW              | 14   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | HB132                   | <a href="#">Samples</a> |
| SN74AHCT132PWRG4 | ACTIVE        | TSSOP        | PW              | 14   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | HB132                   | <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.

**OBSELETE:** 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.

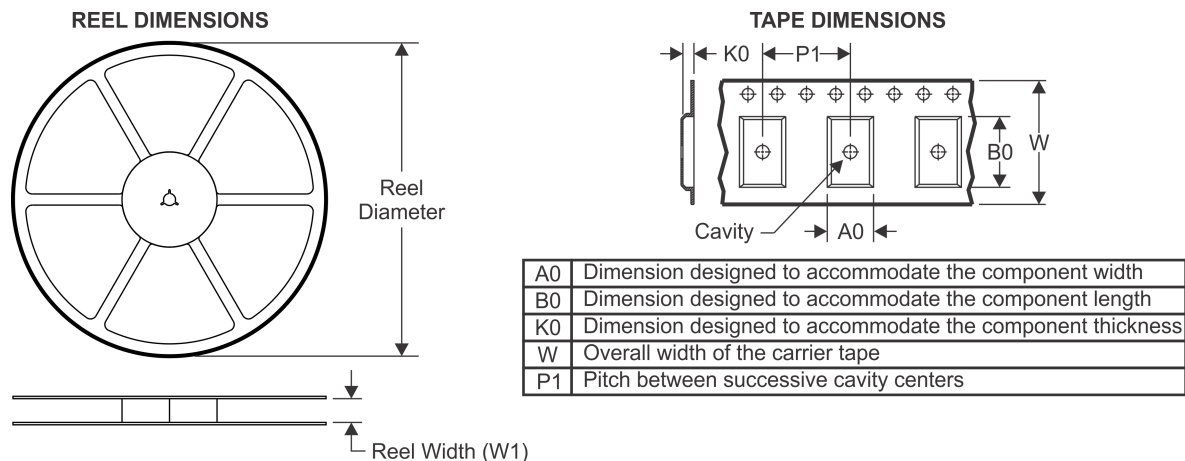
**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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 finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material 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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHCT132DBR  | SSOP         | DB              | 14   | 2000 | 330.0              | 16.4               | 8.35    | 6.6     | 2.4     | 12.0    | 16.0   | Q1            |
| SN74AHCT132DGVR | TVSOP        | DGV             | 14   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHCT132DR   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74AHCT132NSR  | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74AHCT132PWR  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 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) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHCT132DBR  | SSOP         | DB              | 14   | 2000 | 853.0       | 449.0      | 35.0        |
| SN74AHCT132DGVR | TVSOP        | DGV             | 14   | 2000 | 853.0       | 449.0      | 35.0        |
| SN74AHCT132DR   | SOIC         | D               | 14   | 2500 | 853.0       | 449.0      | 35.0        |
| SN74AHCT132NSR  | SO           | NS              | 14   | 2000 | 853.0       | 449.0      | 35.0        |
| SN74AHCT132PWR  | TSSOP        | PW              | 14   | 2000 | 853.0       | 449.0      | 35.0        |

**TUBE**


\*All dimensions are nominal

| Device         | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74AHCT132D   | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74AHCT132DG4 | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74AHCT132N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), 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, regulatory 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](#) or other applicable terms available either on [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.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2022, Texas Instruments Incorporated