

# 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

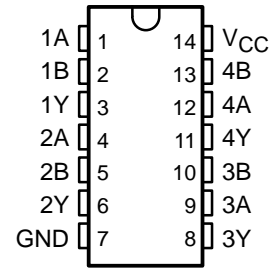
The 'AHCT132 devices are quadruple positive-NAND gates.

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

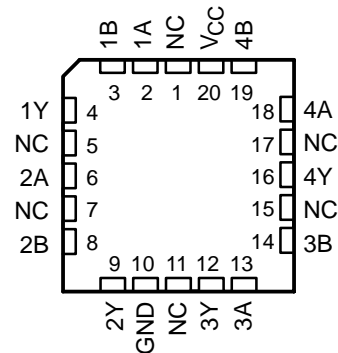
Each circuit functions as a NAND gate, but because of the Schmitt action, it has different input threshold levels for positive- and negative-going signals.

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
–55°C to 125°C	TVSOP – DGV	Tape and reel	SN74AHCT132DGVR	HB132
	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).



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**TEXAS  
INSTRUMENTS**

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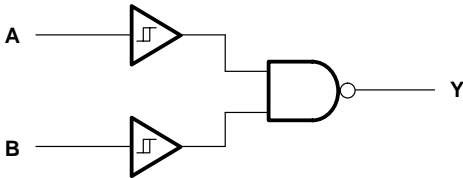
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FUNCTION TABLE  
 (each gate)

INPUTS		OUTPUT Y
A	B	
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)<sup>†</sup>

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 $V_O > V_{CC}$ )	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous current through $V_{CC}$ or GND	±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

<sup>†</sup> 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.

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## recommended operating conditions (see Note 3)

		SN54AHCT132		SN74AHCT132		UNIT
		MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage	4.5	5.5	4.5	5.5	V
$V_I$	Input voltage	0	5.5	0	5.5	V
$V_O$	Output voltage	0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$	High-level output current		–8		–8	mA
$I_{OL}$	Low-level output current		8		8	mA
$T_A$	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: 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*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54AHCT132		SN74AHCT132		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{T+}$ Positive-going input 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	
$V_{T-}$ Negative-going input 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	
$\Delta V_T$ Hysteresis ( $V_{T+} - V_{T-}$ )		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	
$V_{OH}$	$I_{OH} = -50\ \mu\text{A}$	4.5 V	4.4	4.5		4.4		4.4		V
	$I_{OH} = -8\ \text{mA}$		3.94			3.8		3.8		
$V_{OL}$	$I_{OL} = 50\ \mu\text{A}$	4.5 V			0.1		0.1		0.1	V
	$I_{OL} = 8\ \text{mA}$				0.36		0.5		0.44	
$I_I$	$V_I = 5.5\ \text{V}$ or GND	0 V to 5.5 V			$\pm 0.1$		$\pm 1^*$		$\pm 1$	$\mu\text{A}$
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			2		20		20	$\mu\text{A}$
$\Delta I_{CC}^\dagger$	One input at 3.4 V, Other inputs at $V_{CC}$ or GND	5.5 V			1.35		1.5		1.5	mA
$C_i$	$V_I = V_{CC}$ or GND	5 V			2				10	pF

\* On products compliant to MIL-PRF-38535, this parameter is not production tested at  $V_{CC} = 0\ \text{V}$ .

† This is the increase in supply current for each input at one of the specified TTL voltage levels rather than 0 V or  $V_{CC}$ .

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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.

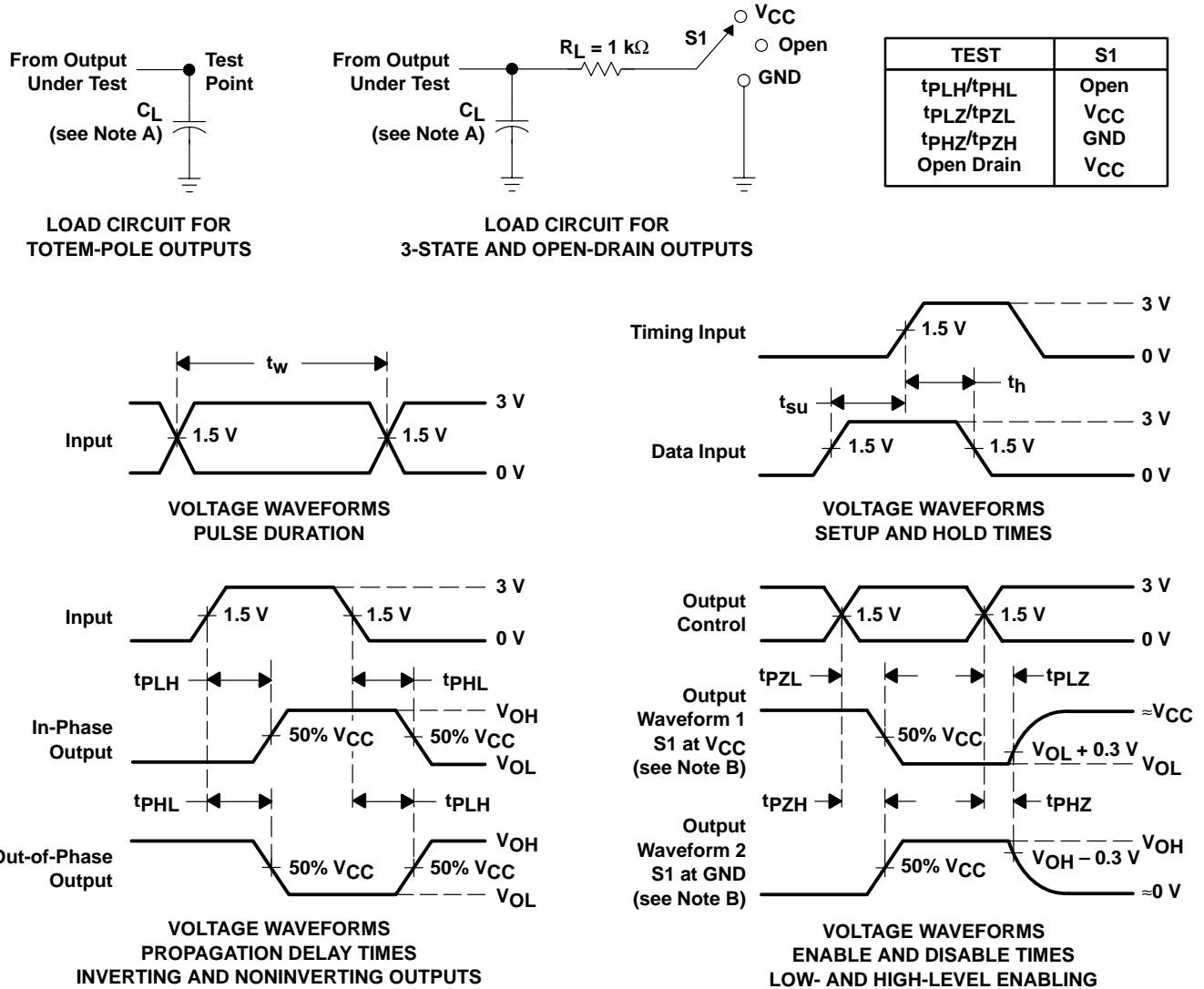
operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

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

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## 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:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
- 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 (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (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>
SN74AHCT132DGVR	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.

**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 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.

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## TAPE AND REEL INFORMATION



\*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	356.0	356.0	35.0
SN74AHCT132DGVR	TVSOP	DGV	14	2000	356.0	356.0	35.0
SN74AHCT132DR	SOIC	D	14	2500	356.0	356.0	35.0
SN74AHCT132NSR	SO	NS	14	2000	356.0	356.0	35.0
SN74AHCT132PWR	TSSOP	PW	14	2000	356.0	356.0	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

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