

# 74HC132

## Quad 2-Input NAND Gate with Schmitt-Trigger Inputs

### High-Performance Silicon-Gate CMOS

The 74HC132 is identical in pinout to the LS132. The device inputs are compatible with standard CMOS outputs; with pull-up resistors, they are compatible with LSTTL outputs.

The HC132 can be used to enhance noise immunity or to square up slowly changing waveforms.

#### Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0  $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements as Defined by JEDEC Standard No. 7A
- ESD Performance: HBM > 2000 V; Machine Model > 200 V
- Chip Complexity: 72 FETs or 18 Equivalent Gates
- These are Pb-Free Devices

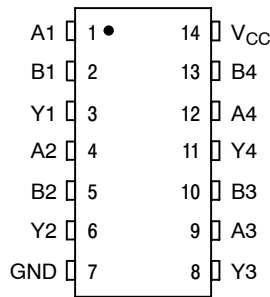


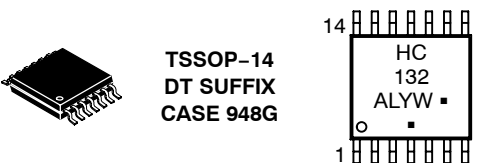
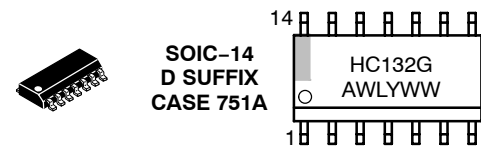
Figure 1. Pin Assignment



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#### MARKING DIAGRAMS



HC132 = Device Code  
 A = Assembly Location  
 L, WL = Wafer Lot  
 Y = Year  
 W, WW = Work Week  
 G or ■ = Pb-Free Package  
 (Note: Microdot may be in either location)

#### FUNCTION TABLE

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

## 74HC132

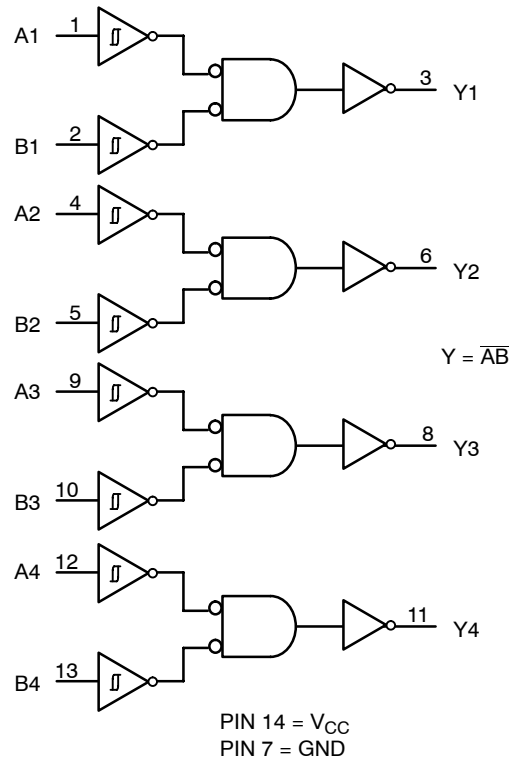


Figure 2. Logic Diagram

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
74HC132DR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel
74HC132DTR2G	TSSOP-14*	2500 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*This package is inherently Pb-Free.

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## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	Positive DC Supply Voltage	- 0.5 to + 7.0	V
$V_{IN}$	Digital Input Voltage	- 0.5 to + 7.0	V
$V_{OUT}$	DC Output Voltage Output in 3-State High or Low State	- 0.5 to + 7.0 - 0.5 to $V_{CC}$ + 0.5	V
$I_{IK}$	Input Diode Current	- 20	mA
$I_{OK}$	Output Diode Current	± 20	mA
$I_{OUT}$	DC Output Current, per Pin	± 25	mA
$I_{CC}$	DC Supply Current, $V_{CC}$ and GND Pins	± 75	mA
$I_{GND}$	DC Ground Current per Ground Pin	± 75	mA
$T_{STG}$	Storage Temperature Range	- 65 to + 150	°C
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
$T_J$	Junction Temperature Under Bias	+ 150	°C
$\theta_{JA}$	Thermal Resistance 14-SOIC 14-TSSOP	125 170	°C/W
$P_D$	Power Dissipation in Still Air at 85°C SOIC TSSOP	500 450	mW
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating Oxygen Index: 30% - 35%	UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage Human Body Model (Note 1) Machine Model (Note 2)	> 2000 > 200	V
$I_{Latchup}$	Latchup Performance Above $V_{CC}$ and Below GND at 85°C (Note 3)	± 300	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.
3. Tested to EIA/JESD78.

4. For high frequency or heavy load considerations, see Chapter 2the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
$V_{IN}, V_{OUT}$	DC Input Voltage, Output Voltage (Referenced to GND)	0	$V_{CC}$	V
$T_A$	Operating Temperature, All Package Types	- 55	+ 125	°C
$t_r, t_f$	Input Rise and Fall Time (Figure 3)	-	No Limit (Note 5)	ns

5. When  $V_{IN} \sim 0.5 V_{CC}$ ,  $I_{CC} \gg$  quiescent current.

6. Unused inputs may not be left open. All inputs must be tied to a high-logic voltage level or a low-logic input voltage level.

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## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V <sub>CC</sub> (V)	Guaranteed Limit			Unit
				-55°C to 25°C	≤ 85°C	≤ 125°C	
V <sub>T+</sub> max	Maximum Positive-Going Input Threshold Voltage (Figure 5)	V <sub>OUT</sub> = 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	1.5	1.5	1.5	V
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V <sub>T+</sub> min	Minimum Positive-Going Input Threshold Voltage (Figure 5)	V <sub>OUT</sub> = 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	1.0	0.95	0.95	V
			4.5	2.3	2.25	2.25	
			6.0	3.0	2.95	2.95	
V <sub>T-</sub> max	Maximum Negative-Going Input Threshold Voltage (Figure 5)	V <sub>OUT</sub> = V <sub>CC</sub> - 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	0.9	0.95	0.95	V
			4.5	2.0	2.05	2.05	
			6.0	2.6	2.65	2.65	
V <sub>T-</sub> min	Minimum Negative-Going Input Threshold Voltage (Figure 5)	V <sub>OUT</sub> = V <sub>CC</sub> - 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	0.3	0.3	0.3	V
			4.5	0.9	0.9	0.9	
			6.0	1.2	1.2	1.2	
V <sub>H</sub> max (Note 7)	Maximum Hysteresis Voltage (Figure 5)	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	1.2	1.2	1.2	V
			4.5	2.25	2.25	2.25	
			6.0	3.0	3.0	3.0	
V <sub>H</sub> min (Note 7)	Minimum Hysteresis Voltage (Figure 5)	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>OUT</sub>   ≤ 20 μA	2.0	0.2	0.2	0.2	V
			4.5	0.4	0.4	0.4	
			6.0	0.5	0.5	0.5	
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>IN</sub> ≤ V <sub>T-</sub> min or V <sub>T+</sub> max  I <sub>OUT</sub>   ≤ 20 μA	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
		V <sub>IN</sub> ≤ -V <sub>T-</sub> min or V <sub>T+</sub> max  I <sub>OUT</sub>   ≤ 4.0 mA  I <sub>OUT</sub>   ≤ 5.2 mA	4.5	3.98	3.84	3.7	
			6.0	5.48	5.34	5.2	
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>IN</sub> ≥ V <sub>T+</sub> max  I <sub>OUT</sub>   ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
		V <sub>IN</sub> ≥ V <sub>T+</sub> max  I <sub>OUT</sub>   ≤ 4.0 mA  I <sub>OUT</sub>   ≤ 5.2 mA	4.5	0.26	0.33	0.4	
			6.0	0.26	0.33	0.4	
I <sub>IN</sub>	Maximum Input Leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current (per Package)	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0 μA	6.0	2.0	20	40	μA

7. V<sub>H</sub>min > (V<sub>T+</sub>min) - (V<sub>T-</sub>max); V<sub>H</sub>max = (V<sub>T+</sub>max) + (V<sub>T-</sub>min).

8. Information on typical parametric values can be found in the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

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## AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input $t_r = t_f = 6.0 \text{ ns}$ )

Symbol	Parameter	$V_{CC}$ (V)	Guaranteed Limit			Unit
			$-55^\circ\text{C}$ to $25^\circ\text{C}$	$\leq 85^\circ\text{C}$	$\leq 125^\circ\text{C}$	
$t_{PLH}$ , $t_{PHL}$	Maximum Propagation Delay, Input A or B to Output Y (Figures 3 and 4)	2.0 4.5 6.0	125 25 21	155 31 26	190 38 32	ns
$t_{TLH}$ , $t_{THL}$	Maximum Output Transition Time, Any Output (Figures 3 and 4)	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	ns
$C_{in}$	Maximum Input Capacitance	—	10	10	10	pF

9. For propagation delays with loads other than 50 pF, and information on typical parametric values, see the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

$C_{PD}$	Power Dissipation Capacitance (per Gate) (Note 10)	Typical @ $25^\circ\text{C}$ , $V_{CC} = 5.0 \text{ V}$		pF
		24		

10. Used to determine the no-load dynamic power consumption:  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ . For load considerations, see the ON Semiconductor High-Speed CMOS Data Book (DL129/D).

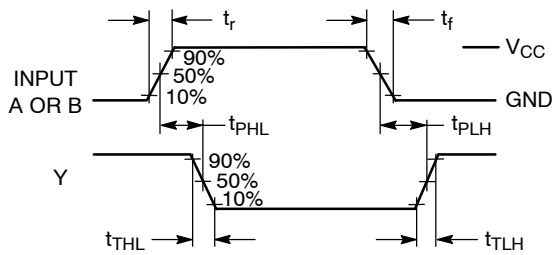
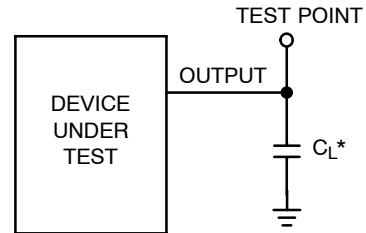


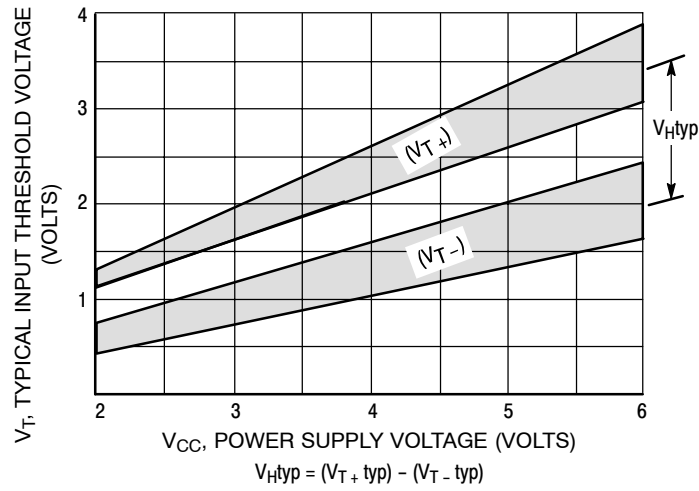
Figure 3. Switching Waveforms



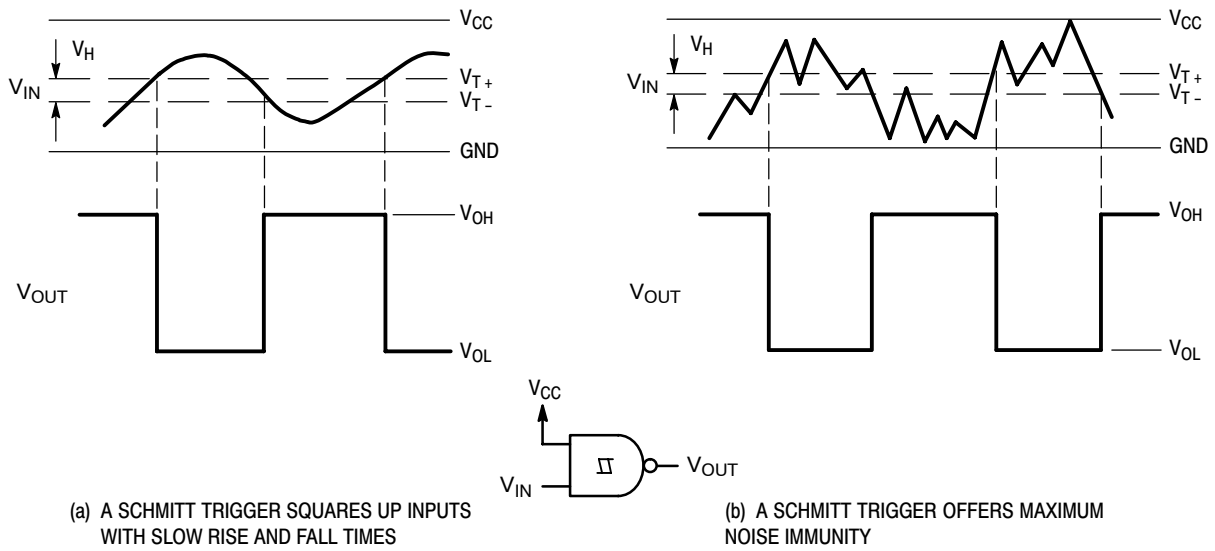
\*Includes all probe and jig capacitance

Figure 4. Test Circuit

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**Figure 5. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  Versus Power Supply Voltage**



**Figure 6. Typical Schmitt-Trigger Applications**

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## PACKAGE DIMENSIONS

SOIC-14  
CASE 751A-03  
ISSUE H



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

**SOLDERING FOOTPRINT\***



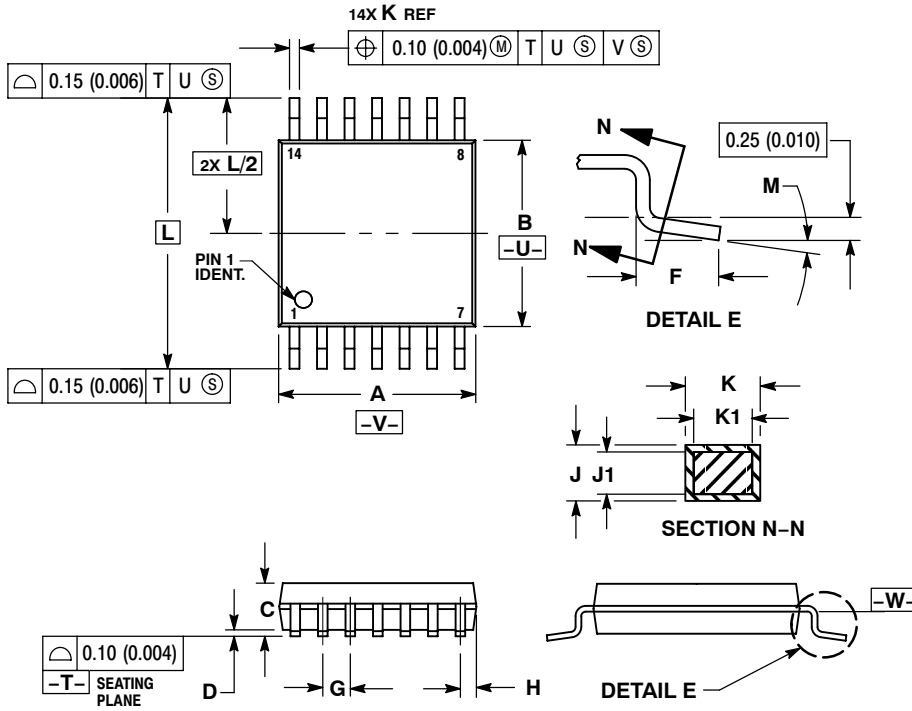
DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

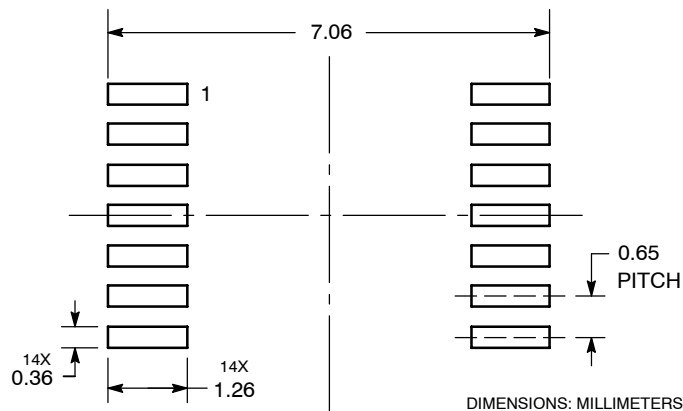
TSSOP-14  
CASE 948G-01  
ISSUE B



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE  $-W-$ .

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0° 8°		0° 8°	

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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