

# MC74AC132, MC74ACT132

## Quad 2-Input NAND Schmitt Trigger

### High-Performance Silicon-Gate CMOS

The MC74AC/74ACT132 contains four 2-input NAND gates which are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have greater noise margin than conventional NAND gates.

Each circuit contains a 2-input Schmitt trigger. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input threshold is determined by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

#### Features

- Schmitt Trigger Inputs
- Outputs Source/Sink 24 mA
- 'ACT132 Has TTL Compatible Inputs
- These are Pb-Free Devices

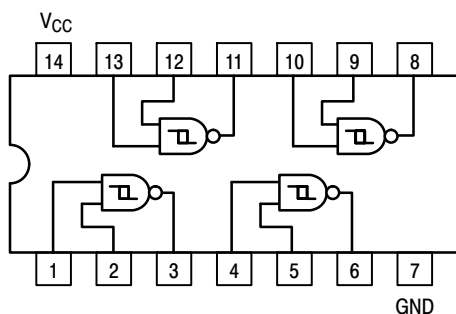


Figure 1. Pinout; 14-Lead Packages Conductors  
(Top View)

#### FUNCTION TABLE

| Inputs |   | Output         |
|--------|---|----------------|
| A      | B | $\overline{Y}$ |
| L      | L | H              |
| L      | H | H              |
| H      | L | H              |
| H      | H | L              |

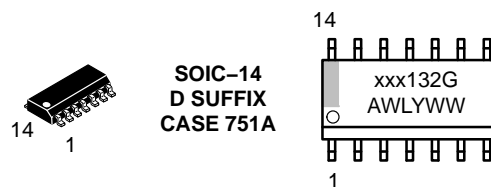
H = HIGH Voltage Level L = LOW Voltage Level



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#### MARKING DIAGRAM



xxx = AC or ACT  
A = Assembly Location  
WL = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# MC74AC132, MC74ACT132

## MAXIMUM RATINGS

| Symbol                | Parameter  | Value  | Unit |
|-----------------------|--|--|------|
| V <sub>CC</sub>       | DC Supply Voltage  | − 0.5 to +7.0                                  | V    |
| V <sub>I</sub>        | DC Input Voltage   | − 0.5 ≤ V <sub>I</sub> ≤ V <sub>CC</sub> + 0.5 | V    |
| V <sub>O</sub>        | DC Output Voltage (Note 1)   | − 0.5 ≤ V <sub>O</sub> ≤ V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>       | DC Input Diode Current   | ± 20   | mA   |
| I <sub>OK</sub>       | DC Output Diode Current  | ± 50   | mA   |
| I <sub>O</sub>        | DC Output Sink/Source Current  | ± 50   | mA   |
| I <sub>CC</sub>       | DC Supply Current per Output Pin   | ± 50   | mA   |
| I <sub>GND</sub>      | DC Ground Current per Output Pin   | ± 50   | mA   |
| T <sub>STG</sub>      | Storage Temperature Range  | − 65 to + 150                                  | °C   |
| T <sub>L</sub>        | Lead temperature, 1 mm from Case for 10 Seconds  | 260  | °C   |
| T <sub>J</sub>        | Junction temperature under Bias  | + 150  | °C   |
| θ <sub>JA</sub>       | Thermal Resistance (Note 2)  | 125  | °C/W |
| P <sub>D</sub>        | Power Dissipation in Still Air at 85°C   | 125  | mW   |
| MSL                   | Moisture Sensitivity   | Level 1  |      |
| F <sub>R</sub>        | Flammability Rating Oxygen Index: 30% – 35%  | UL 94 V–0 @ 0.125 in                           |      |
| V <sub>ESD</sub>      | ESD Withstand Voltage Human Body Model (Note 3)<br>Machine Model (Note 4)<br>Charged Device Model (Note 5) | > 2000<br>> 200<br>> 1000                      | V    |
| I <sub>Latch-Up</sub> | Latch-Up Performance Above V <sub>CC</sub> and Below GND at 85°C (Note 6)                                  | ± 100  | mA   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. I<sub>O</sub> absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD51–7.
3. Tested to EIA/JESD22–A114–A.
4. Tested to EIA/JESD22–A115–A.
5. Tested to JESD22–C101–A.
6. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                             | Parameter   | Min                     | Typ | Max             | Unit |
|------------------------------------|---|-------------------------|-----|-----------------|------|
| V <sub>CC</sub>                    | Supply Voltage  | 'AC                     | 2.0 | 5.0             | V    |
|                                    |   | 'ACT                    | 4.5 | 5.0             |      |
| V <sub>in</sub> , V <sub>out</sub> | DC Input Voltage, Output Voltage (Ref. to GND)                          | 0                       | –   | V <sub>CC</sub> | V    |
| t <sub>r</sub> , t <sub>f</sub>    | Input Rise and Fall Time (Note 1)<br>'AC Devices except Schmitt Inputs  | V <sub>CC</sub> @ 3.0 V | –   | 150             | ns/V |
|                                    |   | V <sub>CC</sub> @ 4.5 V | –   | 40              |      |
|                                    |   | V <sub>CC</sub> @ 5.5 V | –   | 25              |      |
| t <sub>r</sub> , t <sub>f</sub>    | Input Rise and Fall Time (Note 2)<br>'ACT Devices except Schmitt Inputs | V <sub>CC</sub> @ 4.5 V | –   | 10              | ns/V |
|                                    |   | V <sub>CC</sub> @ 5.5 V | –   | 8.0             |      |
| T <sub>J</sub>                     | Junction Temperature (PDIP)   | –                       | –   | 140             | °C   |
| T <sub>A</sub>                     | Operating Ambient Temperature Range                                     | –40                     | 25  | 85              | °C   |
| I <sub>OH</sub>                    | Output Current – High   | –                       | –   | –24             | mA   |
| I <sub>OL</sub>                    | Output Current – Low  | –                       | –   | 24              | mA   |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

1. V<sub>in</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V<sub>in</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

# MC74AC132, MC74ACT132

## DC CHARACTERISTICS

| Symbol           | Parameter                            | V <sub>CC</sub><br>(V) | 74AC                   |                   | 74AC                                  | Unit | Conditions  |
|------------------|--------------------------------------|------------------------|------------------------|-------------------|---------------------------------------|------|---|
|                  |                                      |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>–40°C to<br>+85°C |      |   |
|                  |                                      |                        | Typ                    | Guaranteed Limits |                                       |      |   |
| V <sub>OH</sub>  | Minimum High Level<br>Output Voltage | 3.0                    | 2.99                   | 2.9               | 2.9                                   | V    | I <sub>OUT</sub> = –50 μA   |
|                  |                                      | 4.5                    | 4.49                   | 4.4               | 4.4                                   |      |   |
|                  |                                      | 5.5                    | 5.49                   | 5.4               | 5.4                                   |      |   |
|                  |                                      | 3.0                    | –                      | 2.56              | 2.46                                  | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>–12 mA<br>I <sub>OH</sub> –24 mA<br>–24 mA |
|                  |                                      | 4.5                    | –                      | 3.86              | 3.76                                  |      |   |
|                  |                                      | 5.5                    | –                      | 4.86              | 4.76                                  |      |   |
| V <sub>OL</sub>  | Maximum Low Level<br>Output Voltage  | 3.0                    | 0.002                  | 0.1               | 0.1                                   | V    | I <sub>OUT</sub> = 50 μA  |
|                  |                                      | 4.5                    | 0.001                  | 0.1               | 0.1                                   |      |   |
|                  |                                      | 5.5                    | 0.001                  | 0.1               | 0.1                                   |      |   |
|                  |                                      | 3.0                    | –                      | 0.36              | 0.44                                  | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>12 mA<br>I <sub>OL</sub> 24 mA<br>24 mA    |
|                  |                                      | 4.5                    | –                      | 0.36              | 0.44                                  |      |   |
|                  |                                      | 5.5                    | –                      | 0.36              | 0.44                                  |      |   |
| I <sub>IN</sub>  | Maximum Input<br>Leakage Current     | 5.5                    | –                      | ±0.1              | ±1.0                                  | μA   | V <sub>I</sub> = V <sub>CC</sub> , GND  |
| I <sub>OLD</sub> | †Minimum Dynamic<br>Output Current   | 5.5                    | –                      | –                 | 75                                    | mA   | V <sub>OLD</sub> = 1.65 V Max   |
| I <sub>OHD</sub> |                                      | 5.5                    | –                      | –                 | –75                                   | mA   | V <sub>OHD</sub> = 3.85 V Min   |
| I <sub>CC</sub>  | Maximum Quiescent<br>Supply Current  | 5.5                    | –                      | 4.0               | 40                                    | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND  |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V<sub>CC</sub>.

## AC CHARACTERISTICS

| Symbol           | Parameter         | V <sub>CC</sub> *<br>(V) | 74AC   |        |             | 74AC   |              | Unit | Fig.<br>No. |
|------------------|-------------------|--------------------------|--|--------|-------------|--|--------------|------|-------------|
|                  |                   |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |        |             | T <sub>A</sub> = −40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |              |      |             |
|                  |                   |                          | Min  | Typ    | Max         | Min  | Max          |      |             |
| t <sub>PLH</sub> | Propagation Delay | 3.3<br>5.0               | 2.0<br>2.0                                       | –<br>– | 13.0<br>9.0 | 1.5<br>1.5   | 14.0<br>10.0 | ns   | 3–5         |
| t <sub>PHL</sub> | Propagation Delay | 3.3<br>5.0               | 2.0<br>2.0                                       | –<br>– | 13.5<br>9.0 | 1.5<br>1.5   | 15.0<br>10.0 | ns   | 3–5         |

\*Voltage Range 3.3 V is 3.3 V ±0.3 V.

Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC132, MC74ACT132

## DC CHARACTERISTICS

| Symbol            | Parameter                              | V <sub>CC</sub><br>(V) | 74ACT                  |                   | 74ACT                                 |    | Unit  | Conditions |
|-------------------|--|------------------------|------------------------|-------------------|---------------------------------------|----|---|------------|
|                   |  |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>–40°C to<br>+85°C |    |   |            |
|                   |  |                        | Typ                    | Guaranteed Limits |                                       |    |   |            |
| V <sub>OH</sub>   | Minimum High Level<br>Output Voltage   | 4.5                    | 4.49                   | 4.4               | 4.4                                   | V  | I <sub>OUT</sub> = –50 μA   |            |
|                   |  | 5.5                    | 5.49                   | 5.4               | 5.4                                   |    |   |            |
|                   |  | 4.5                    | –                      | 3.86              | 3.76                                  | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>–24 mA<br>I <sub>OH</sub> –24 mA |            |
|                   | 5.5                                    | –                      | 4.86                   | 4.76              |                                       |    |   |            |
| V <sub>OL</sub>   | Maximum Low Level<br>Output Voltage    | 4.5                    | 0.001                  | 0.1               | 0.1                                   | V  | I <sub>OUT</sub> = 50 μA  |            |
|                   |  | 5.5                    | 0.001                  | 0.1               | 0.1                                   |    |   |            |
|                   |  | 4.5                    | –                      | 0.36              | 0.44                                  | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>24 mA<br>I <sub>OL</sub> 24 mA   |            |
|                   | 5.5                                    | –                      | 0.36                   | 0.44              |                                       |    |   |            |
| I <sub>IN</sub>   | Maximum Input<br>Leakage Current       | 5.5                    | –                      | ±0.1              | ±1.0                                  | μA | V <sub>I</sub> = V <sub>CC</sub> , GND  |            |
| ΔI <sub>CCT</sub> | Additional Max. I <sub>CC</sub> /Input | 5.5                    | 0.6                    | –                 | 1.5                                   | mA | V <sub>I</sub> = V <sub>CC</sub> – 2.1 V  |            |
| I <sub>OLD</sub>  | †Minimum Dynamic<br>Output Current     | 5.5                    | –                      | –                 | 75                                    | mA | V <sub>OLD</sub> = 1.65 V Max   |            |
| I <sub>OHD</sub>  |  | 5.5                    | –                      | –                 | –75                                   | mA | V <sub>OHD</sub> = 3.85 V Min   |            |
| I <sub>CC</sub>   | Maximum Quiescent<br>Supply Current    | 5.5                    | –                      | 4.0               | 40                                    | μA | V <sub>IN</sub> = V <sub>CC</sub> or GND  |            |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

## AC CHARACTERISTICS

| Symbol           | Parameter         | V <sub>CC</sub> *<br>(V) | 74ACT  |     |      | 74ACT  |      | Unit | Fig.<br>No. |
|------------------|-------------------|--------------------------|--|-----|------|--|------|------|-------------|
|                  |                   |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = −40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |      |      |             |
|                  |                   |                          | Min  | Typ | Max  | Min  | Max  |      |             |
| t <sub>PLH</sub> | Propagation Delay | 5.0                      | 3.0  | –   | 11.5 | 2.5  | 13.0 | ns   | 3–6         |
| t <sub>PHL</sub> | Propagation Delay | 5.0                      | 3.0  | –   | 11.0 | 2.5  | 12.5 | ns   | 3–5         |

\*Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC132, MC74ACT132

## INPUT CHARACTERISTICS (unless otherwise specified)

| Symbol              | Parameter                  | V <sub>CC</sub><br>(V) | 74AC              | 74ACT | Unit | Test Conditions             |
|---------------------|----------------------------|------------------------|-------------------|-------|------|-----------------------------|
| V <sub>t+</sub>     | Maximum Positive Threshold | 3.0<br>4.5<br>5.5      | 2.2<br>3.2<br>3.9 | 2.0   | V    | T <sub>A</sub> = Worst Case |
| V <sub>t-</sub>     | Minimum Negative Threshold | 3.0<br>4.5<br>5.5      | 0.5<br>0.9<br>1.1 | 0.8   | V    | T <sub>A</sub> = Worst Case |
| V <sub>h(max)</sub> | Maximum Hysteresis         | 3.0<br>4.5<br>5.5      | 1.2<br>1.4<br>1.6 | 1.2   | V    | T <sub>A</sub> = Worst Case |
| V <sub>h(min)</sub> | Minimum Hysteresis         | 3.0<br>4.5<br>5.5      | 0.3<br>0.4<br>0.5 | 0.4   | V    | T <sub>A</sub> = Worst Case |

## CAPACITANCE

| Symbol          | Parameter                     | Value<br>Typ | Unit | Test Conditions         |
|-----------------|-------------------------------|--------------|------|-------------------------|
| C <sub>IN</sub> | Input Capacitance             | 4.5          | pF   | V <sub>CC</sub> = 5.0 V |
| C <sub>PD</sub> | Power Dissipation Capacitance | 30           | pF   | V <sub>CC</sub> = 5.0 V |

## ORDERING INFORMATION

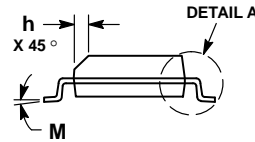
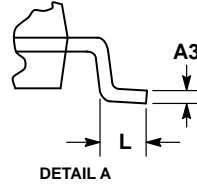
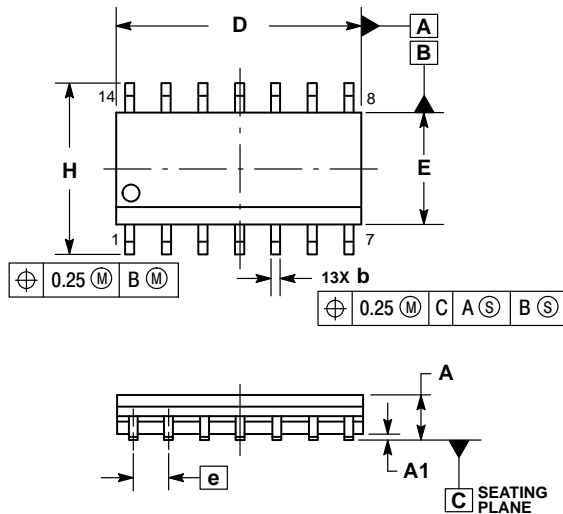
| Device         | Package              | Shipping <sup>†</sup> |
|----------------|----------------------|-----------------------|
| MC74AC132DG    | SOIC-14<br>(Pb-Free) | 55 Units/Rail         |
| MC74AC132DR2G  | SOIC-14<br>(Pb-Free) | 2500/Tape & Reel      |
| MC74ACT132DG   | SOIC-14<br>(Pb-Free) | 55 Units/Rail         |
| MC74ACT132DR2G | SOIC-14<br>(Pb-Free) | 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.

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## PACKAGE DIMENSIONS

SOIC-14 NB  
CASE 751A-03  
ISSUE K

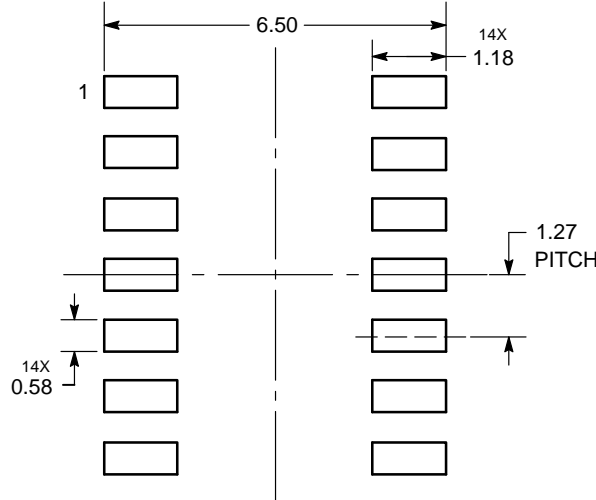


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.


| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 1.35        | 1.75 | 0.054     | 0.068 |
| A1  | 0.10        | 0.25 | 0.004     | 0.010 |
| A3  | 0.19        | 0.25 | 0.008     | 0.010 |
| b   | 0.35        | 0.49 | 0.014     | 0.019 |
| D   | 8.55        | 8.75 | 0.337     | 0.344 |
| E   | 3.80        | 4.00 | 0.150     | 0.157 |
| e   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 5.80        | 6.20 | 0.228     | 0.244 |
| h   | 0.25        | 0.50 | 0.010     | 0.019 |
| L   | 0.40        | 1.25 | 0.016     | 0.049 |
| M   | 0°          | 7°   | 0°        | 7°    |

### 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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