

# MC74LVX132

## Product Preview

### Quad 2-Input NAND Schmitt Trigger

The MC74LVX132 is an advanced high speed CMOS Schmitt NAND trigger fabricated with silicon gate CMOS technology.

Pin configuration and function are the same as the MC74LVX00, but the inputs have hysteresis.

The internal circuit is composed of multiple stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7V, allowing the interface of 5V systems to 3V systems.

- High Speed:  $t_{PD} = 5.8\text{ns}$  (Typ) at  $V_{CC} = 3.3\text{V}$
- Low Power Dissipation:  $I_{CC} = 2\mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- Power Down Protection Provided on Inputs
- Low Noise:  $V_{OLP} = 0.5\text{V}$  (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 2000V; Machine Model > 200V

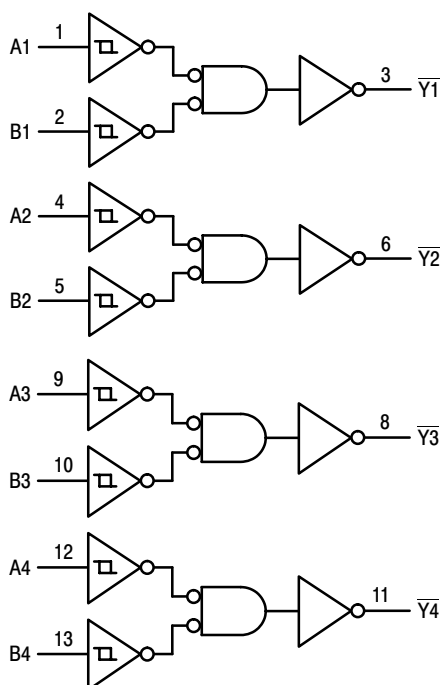


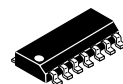
Figure 1. Logic Diagram

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

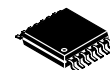


ON Semiconductor

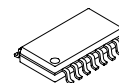
<http://onsemi.com>



14-LEAD SOIC  
D SUFFIX  
CASE 751A



14-LEAD TSSOP  
DT SUFFIX  
CASE 948G



14-LEAD SOIC EIAJ  
M SUFFIX  
CASE 965

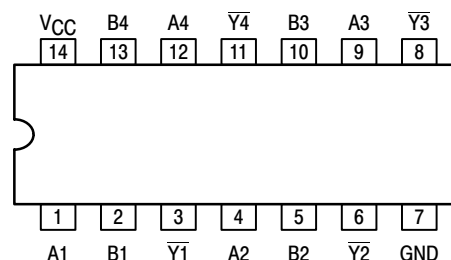


Figure 2. Pin Connection and Marking Diagram (Top View)

For detailed package marking information, see the Marking Diagram section on page 350 of this data sheet.

#### ORDERING INFORMATION

| Device       | Package   | Shipping      |
|--------------|-----------|---------------|
| MC74LVX132D  | SOIC      | 55 Units/Rail |
| MC74LVX132DT | TSSOP     | 96 Units/Rail |
| MC74LVX132M  | SOIC EIAJ | 50 Units/Rail |

#### FUNCTION TABLE

| A Input | B Input | $\bar{Y}$ Output |
|---------|---------|------------------|
| L       | L       | H                |
| L       | H       | H                |
| H       | L       | H                |
| H       | H       | L                |

# MC74LVX132

## MAXIMUM RATINGS

| Symbol                | Parameter                                                                                                        | Value                          | Unit |
|-----------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------|------|
| V <sub>CC</sub>       | DC Supply Voltage                                                                                                | − 0.5 to + 7.0                 | V    |
| V <sub>IN</sub>       | DC Input Voltage                                                                                                 | − 0.5 to + 7.0                 | V    |
| V <sub>OUT</sub>      | DC Output Voltage                                                                                                | − 0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>       | DC Input Diode Current<br>V <sub>I</sub> < GND                                                                   | − 20                           | mA   |
| I <sub>OK</sub>       | DC Output Diode Current<br>V <sub>O</sub> < GND                                                                  | ± 20                           | mA   |
| I <sub>OUT</sub>      | DC Output Sink Current                                                                                           | ± 25                           | mA   |
| I <sub>CC</sub>       | DC Supply Current per Supply 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<br>SOIC<br>TSSOP                                                                              | 250                            | °C/W |
| P <sub>D</sub>        | Power Dissipation in Still Air at 85°C<br>SOIC<br>TSSOP                                                          | 250                            | mW   |
| MSL                   | Moisture Sensitivity                                                                                             | Level 1                        |      |
| F <sub>R</sub>        | Flammability Rating<br>Oxygen Index: 30% – 35%                                                                   | UL–94–VO (0.125 in)            |      |
| V <sub>ESD</sub>      | ESD Withstand Voltage<br>Human Body Model (Note 1.)<br>Machine Model (Note 2.)<br>Charged Device Model (Note 3.) | > 2000<br>> 200<br>N/A         | V    |
| I <sub>Latch-Up</sub> | Latch-Up Performance<br>Above V <sub>CC</sub> and Below GND at 85°C (Note 4.)                                    | ± 300                          | mA   |

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1. Tested to EIA/JESD22–A114–A.
2. Tested to EIA/JESD22–A115–A.
3. Tested to JESD22–C101–A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter                                                             | Min  | Max   | Unit |
|-----------------|-----------------------------------------------------------------------|------|-------|------|
| V <sub>CC</sub> | Supply Voltage                                                        | 2.0  | 3.6   | V    |
| V <sub>I</sub>  | Input Voltage<br>(Note 5.)                                            | 0    | 5.5   | V    |
| V <sub>O</sub>  | Output Voltage<br>(HIGH or LOW State)                                 | 0    | 5.5   | V    |
| T <sub>A</sub>  | Operating Free–Air Temperature                                        | − 40 | + 125 | °C   |
| Δt/ΔV           | Input Transition Rise or Fall Rate<br>V <sub>CC</sub> = 3.0 V ± 0.3 V | 0    | 100   | ns/V |

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

# MC74LVX132

## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter                                                                                 | Test Conditions                                                                 | V <sub>CC</sub><br>V | T <sub>A</sub> = 25°C |                      |                      | T <sub>A</sub> = ≤ 85°C |                      | T <sub>A</sub> = ≤ 125°C |                      | Unit |
|-----------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------|-----------------------|----------------------|----------------------|-------------------------|----------------------|--------------------------|----------------------|------|
|                 |                                                                                           |                                                                                 |                      | Min                   | Typ                  | Max                  | Min                     | Max                  | Min                      | Max                  |      |
| V <sub>T+</sub> | Positive Threshold Voltage (5)                                                            |                                                                                 | 2.0<br>3.0<br>3.6    | 1.15<br>1.50<br>1.70  | 1.31<br>1.82<br>2.12 | 1.60<br>2.25<br>2.60 | 1.15<br>1.50<br>1.70    | 1.60<br>2.25<br>2.60 | 1.15<br>1.50<br>1.70     | 1.60<br>2.25<br>2.60 | V    |
| V <sub>T−</sub> | Negative Threshold Voltage (5)                                                            |                                                                                 | 2.0<br>3.0<br>3.6    | 0.30<br>0.75<br>1.00  | 0.64<br>1.13<br>1.46 | 0.9<br>1.45<br>1.90  | 0.30<br>0.75<br>1.00    | 0.90<br>1.45<br>1.90 | 0.30<br>0.75<br>1.00     | 0.90<br>1.45<br>1.90 | V    |
| V <sub>H</sub>  | Hysteresis Voltage (5)                                                                    |                                                                                 | 2.0<br>3.0<br>3.6    | 0.30<br>0.30<br>0.35  | 0.70<br>0.76<br>0.69 | 1.30<br>1.50<br>1.60 | 0.30<br>0.30<br>0.35    | 1.30<br>1.50<br>1.60 | 0.30<br>0.30<br>0.35     | 1.30<br>1.50<br>1.60 | V    |
| V <sub>OH</sub> | Minimum High-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = − 50μA<br>I <sub>OH</sub> = − 50μA<br>I <sub>OH</sub> = − 4mA | 2.0<br>3.0<br>3.0    | 1.9<br>2.9<br>2.58    | 2.0<br>3.0           |                      | 1.9<br>2.9<br>2.48      |                      | 1.9<br>2.9<br>2.34       |                      | V    |
| V <sub>OL</sub> | Maximum Low-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  | I <sub>OL</sub> = 50μA<br>I <sub>OL</sub> = 50μA<br>I <sub>OL</sub> = 4mA       | 2.0<br>3.0<br>3.0    |                       | 0.0<br>0.0           | 0.1<br>0.1<br>0.36   |                         | 0.1<br>0.1<br>0.44   |                          | 0.1<br>0.1<br>0.52   | V    |
| I <sub>in</sub> | Maximum Input Leakage Current                                                             | V <sub>in</sub> = 5.5V or GND                                                   | 3.6                  |                       |                      | ± 0.1                |                         | ± 1.0                |                          | ± 1.0                | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current                                                          | V <sub>in</sub> = V <sub>CC</sub> or GND                                        | 3.6                  |                       |                      | 2.0                  |                         | 20                   |                          | 20                   | μA   |

## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns)

| Symbol                                   | Parameter                                         | Test Conditions                                                                  | T <sub>A</sub> = 25°C |             |              | T <sub>A</sub> = ≤ 85°C |              | T <sub>A</sub> = ≤ 125°C |              | Unit |
|------------------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------|-----------------------|-------------|--------------|-------------------------|--------------|--------------------------|--------------|------|
|                                          |                                                   |                                                                                  | Min                   | Typ         | Max          | Min                     | Max          | Min                      | Max          |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub>   | Maximum Propagation Delay,<br>A or B to $\bar{Y}$ | V <sub>CC</sub> = 2.7V      C <sub>L</sub> = 15pF<br>C <sub>L</sub> = 50pF       |                       | 7.0<br>10.0 | 11.0<br>16.0 | 1.0<br>1.0              | 13.0<br>18.7 | 1.0<br>1.0               | 15.0<br>20.0 | ns   |
|                                          |                                                   | V <sub>CC</sub> = 3.3 ± 0.3V      C <sub>L</sub> = 15pF<br>C <sub>L</sub> = 50pF |                       | 5.8<br>8.3  | 10.6<br>15.4 | 1.0<br>1.0              | 12.5<br>17.5 | 1.0<br>1.0               | 14.5<br>19.5 |      |
| t <sub>OSHL</sub> ,<br>t <sub>OSLH</sub> | Output to Output Skew<br>(Note 6.)                | V <sub>CC</sub> = 2.7V      C <sub>L</sub> = 50pF                                |                       |             | 1.5          |                         | 1.5          |                          | 1.5          | ns   |
|                                          |                                                   | V <sub>CC</sub> = 3.3 ± 0.3V      C <sub>L</sub> = 50pF                          |                       |             | 1.5          |                         | 1.5          |                          | 1.5          |      |
| C <sub>in</sub>                          | Maximum Input Capacitance                         |                                                                                  |                       | 4           | 10           |                         | 10           |                          | 10           | pF   |
| C <sub>PD</sub>                          | Power Dissipation Capacitance (Note 6.)           | Typical @ 25°C, V <sub>CC</sub> = 5.0 V                                          |                       |             |              |                         |              |                          |              | pF   |
|                                          |                                                   | 11                                                                               |                       |             |              |                         |              |                          |              |      |

6. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>/4 (per gate). C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

## NOISE CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns, C<sub>L</sub> = 50pF, V<sub>CC</sub> = 5.0 V)

| Symbol           | Characteristic                               | T <sub>A</sub> = 25°C |      | Unit |
|------------------|----------------------------------------------|-----------------------|------|------|
|                  |                                              | Typ                   | Max  |      |
| V <sub>OLP</sub> | Quiet Output Maximum Dynamic V <sub>OL</sub> | 0.3                   | 0.5  | V    |
| V <sub>OLV</sub> | Quiet Output Minimum Dynamic V <sub>OL</sub> | −0.3                  | −0.5 | V    |
| V <sub>IHD</sub> | Minimum High Level Dynamic Input Voltage     |                       | 2.0  | V    |
| V <sub>ILD</sub> | Maximum Low Level Dynamic Input Voltage      |                       | 0.8  | V    |

# MC74LVX132

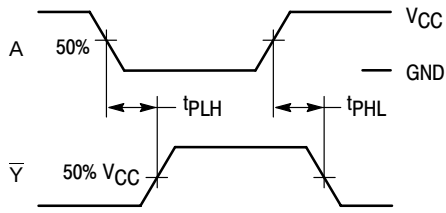
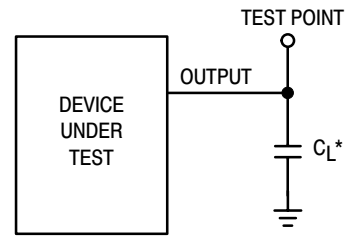


Figure 3. Switching Waveforms



\*Includes all probe and jig capacitance

Figure 4. Test Circuit

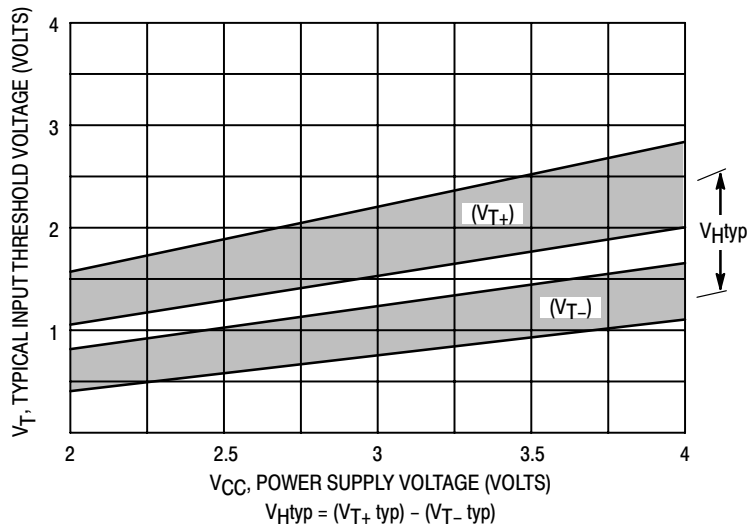


Figure 5. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  versus Power Supply Voltage

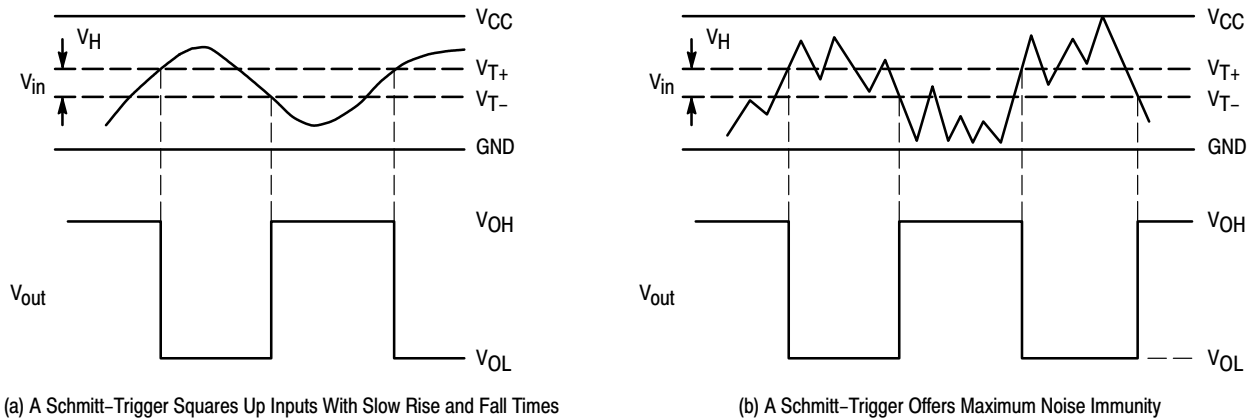


Figure 6. Typical Schmitt-Trigger Applications

## MC74LVX132

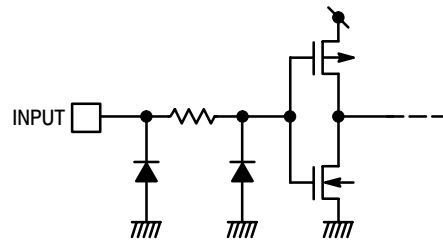
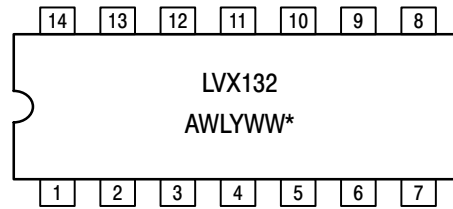
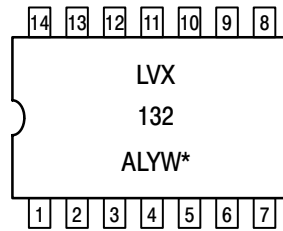


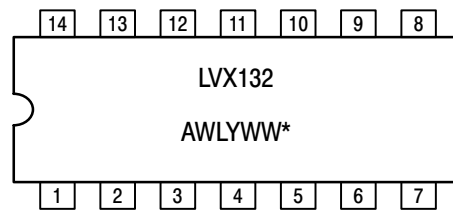
Figure 7. Input Equivalent Circuit



14-LEAD SOIC  
D SUFFIX  
CASE 751A



14-LEAD TSSOP  
DT SUFFIX  
CASE 948G



14-LEAD SOIC EIAJ  
M SUFFIX  
CASE 965

\*See Applications Note #AND8004/D for date code and traceability information.

Figure 8. Marking Diagrams  
(Top View)