

# MC74LVX132

## 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 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

### Features

- 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 300 mA
- ESD Performance: Human Body Model > 2000 V;  
Machine Model > 200 V
- These Devices are Pb-Free and are RoHS Compliant

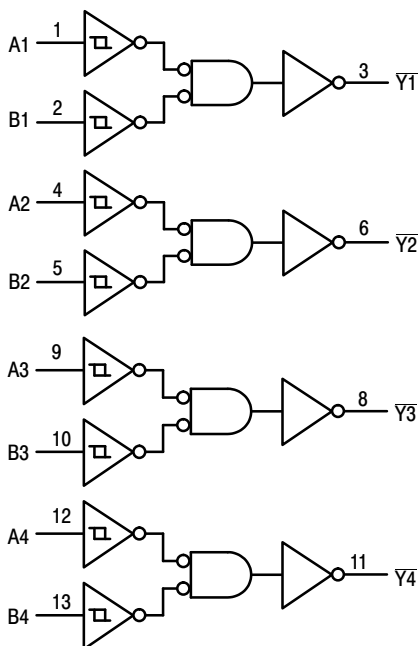


Figure 1. Logic Diagram

### FUNCTION TABLE

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



ON Semiconductor®

<http://onsemi.com>

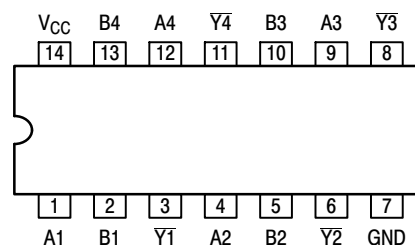


SOIC-14 NB  
D SUFFIX  
CASE 751A



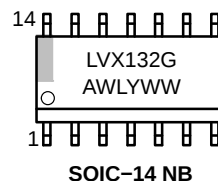
TSSOP-14  
DT SUFFIX  
CASE 948G

### PIN ASSIGNMENT

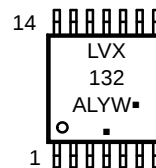


14-Lead (Top View)

### MARKING DIAGRAMS



SOIC-14 NB



TSSOP-14

LVX132 = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot  
Y = Year  
WW, W = Work Week  
G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

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

# MC74LVX132

## MAXIMUM RATINGS

| Symbol        | Parameter                                                                                                     | Value                  | Unit |
|---------------|---------------------------------------------------------------------------------------------------------------|------------------------|------|
| $V_{CC}$      | DC Supply Voltage                                                                                             | -0.5 to +7.0           | V    |
| $V_{IN}$      | DC Input Voltage                                                                                              | -0.5 to +7.0           | V    |
| $V_{OUT}$     | DC Output Voltage                                                                                             | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IK}$      | DC Input Diode Current<br>$V_I < GND$                                                                         | -20                    | mA   |
| $I_{OK}$      | DC Output Diode Current<br>$V_O < GND$                                                                        | ±20                    | mA   |
| $I_{OUT}$     | DC Output Sink Current                                                                                        | ±25                    | mA   |
| $I_{CC}$      | DC Supply Current per Supply Pin                                                                              | ±50                    | 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<br>SOIC<br>TSSOP                                                                           | 250                    | °C/W |
| $P_D$         | Power Dissipation in Still Air at 85°C<br>SOIC<br>TSSOP                                                       | 250                    | mW   |
| MSL           | Moisture Sensitivity                                                                                          | Level 1                |      |
| $F_R$         | Flammability Rating<br>Oxygen Index: 30% – 35%                                                                | UL 94-V0 @ 0.125 in    |      |
| $V_{ESD}$     | 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    |
| $I_{Latchup}$ | Latchup Performance<br>Above $V_{CC}$ and Below GND at 85°C (Note 4)                                          | ±300                   | 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. 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 |
|---------------------|--------------------------------------------------------------------------------|-----|------|------|
| $V_{CC}$            | Supply Voltage                                                                 | 2.0 | 3.6  | V    |
| $V_I$               | Input Voltage<br>(Note 5)                                                      | 0   | 5.5  | V    |
| $V_O$               | Output Voltage<br>(HIGH or LOW State)                                          | 0   | 5.5  | V    |
| $T_A$               | Operating Free-Air Temperature                                                 | -40 | +125 | °C   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate<br>$V_{CC} = 3.0\text{ V} \pm 0.3\text{ V}$ | 0   | 100  | ns/V |

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.

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<br>(Figure 4)                                                  |                                                                                    | 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<br>(Figure 4)                                                  |                                                                                    | 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<br>(Figure 4)                                                          |                                                                                    | 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> = - 50 μA<br>I <sub>OH</sub> = - 50 μA<br>I <sub>OH</sub> = - 4 mA | 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> = 50 μA<br>I <sub>OL</sub> = 50 μA<br>I <sub>OL</sub> = 4 mA       | 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> = 5.5 V 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   |

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.

## 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

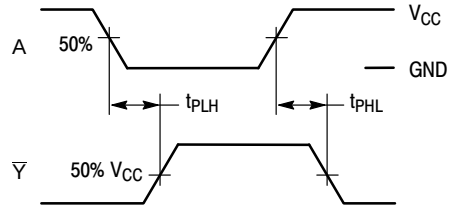
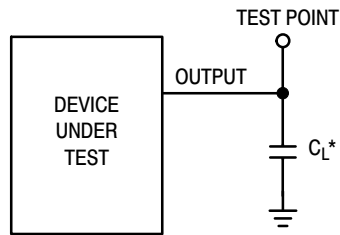


Figure 2. Switching Waveforms



\*Includes all probe and jig capacitance

Figure 3. Test Circuit

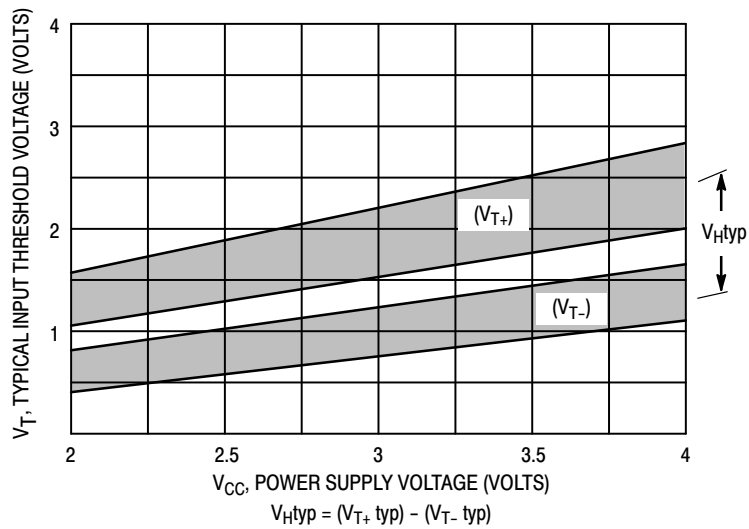


Figure 4. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  versus Power Supply Voltage

## MC74LVX132

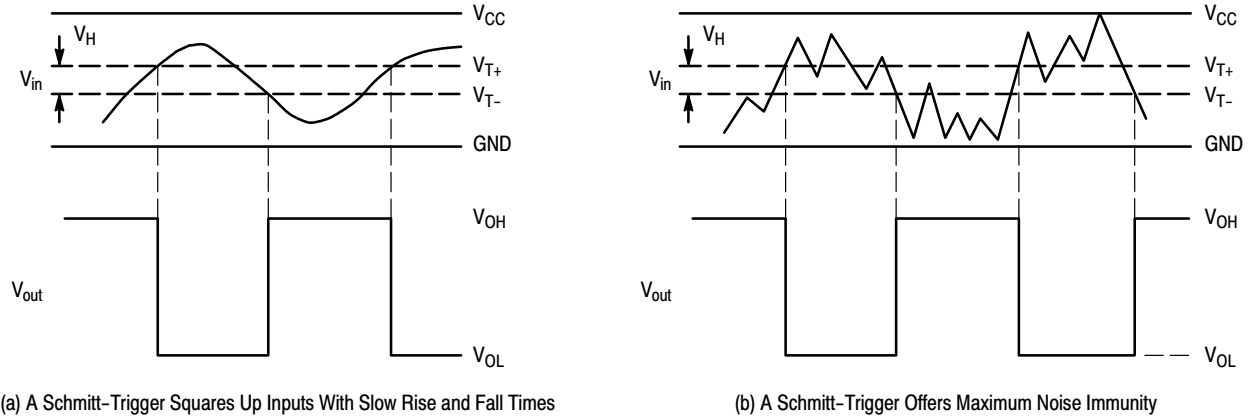


Figure 5. Typical Schmitt-Trigger Applications

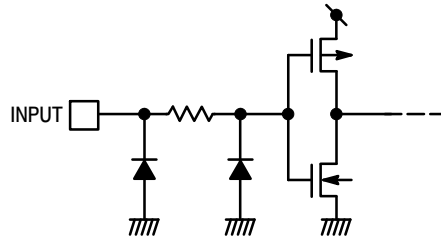


Figure 6. Input Equivalent Circuit

### ORDERING INFORMATION

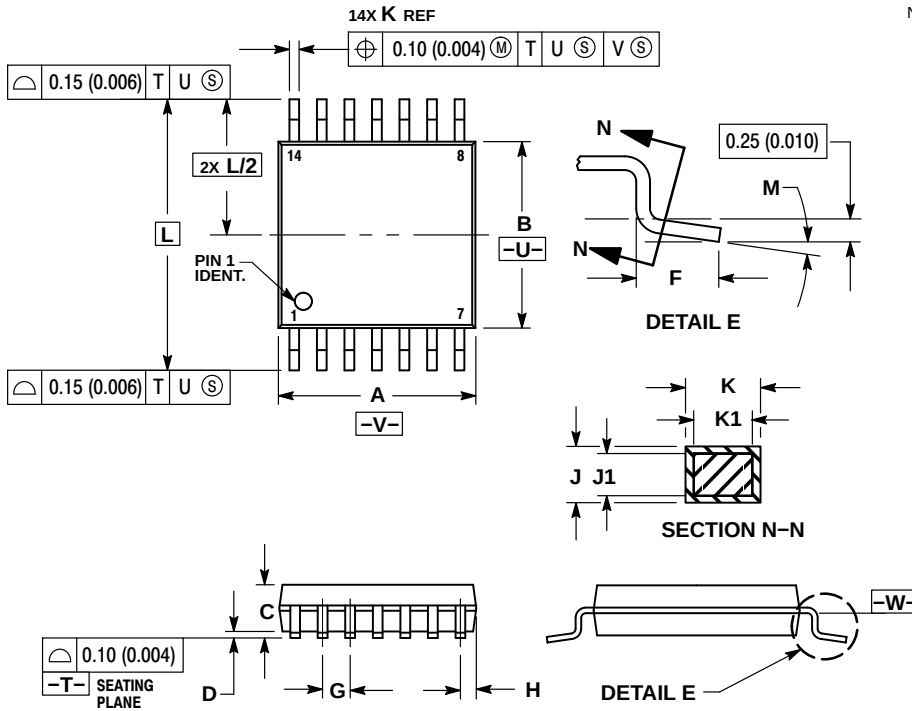
| Device          | Package                 | Shipping <sup>†</sup> |
|-----------------|-------------------------|-----------------------|
| MC74LVX132DR2G  | SOIC-14 NB<br>(Pb-Free) | 2500 Tape & Reel      |
| MC74LVX132DTG   | TSSOP-14<br>(Pb-Free)   | 96 Units / Rail       |
| MC74LVX132DTR2G | TSSOP-14<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.

# MC74LVX132

## PACKAGE DIMENSIONS

**TSSOP-14**  
CASE 948G  
ISSUE B

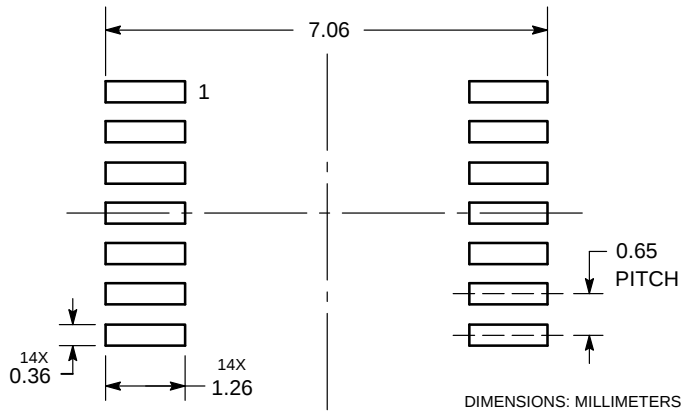


### NOTES:

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\*

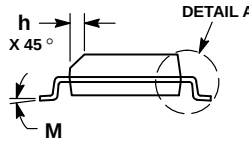
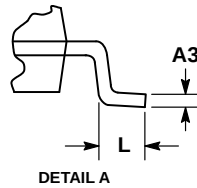
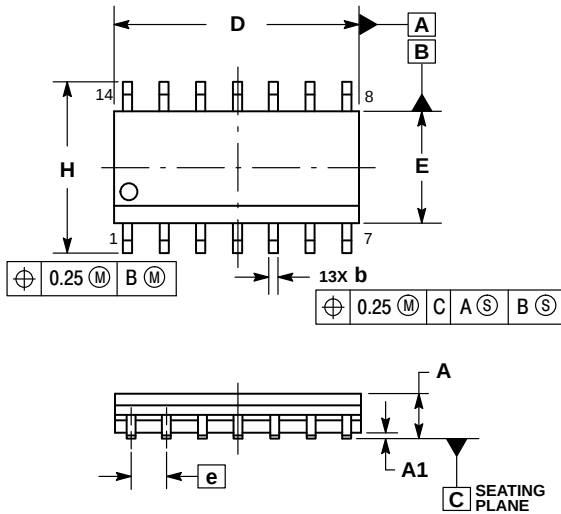


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC74LVX132

## PACKAGE DIMENSIONS

### SOIC-14 NB CASE 751A-03 ISSUE K

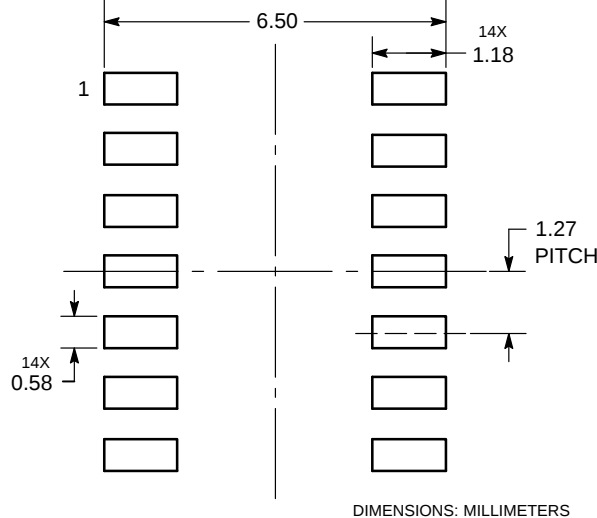


#### NOTES:

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.

ON Semiconductor and the  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries. SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative