

# MC74VHC1G132

## 2-Input NAND Schmitt-Trigger

The MC74VHC1G132 is a single gate CMOS Schmitt NAND trigger fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output.

The MC74VHC1G132 input structure provides protection when voltages up to 7 V are applied, regardless of the supply voltage. This allows the MC74VHC1G132 to be used to interface 5 V circuits to 3 V circuits.

The MC74VHC1G132 can be used to enhance noise immunity or to square up slowly changing waveforms.

### Features

- High Speed:  $t_{PD} = 3.6 \text{ ns}$  (Typ) at  $V_{CC} = 5 \text{ V}$
- Low Power Dissipation:  $I_{CC} = 1.0 \mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Chip Complexity: FETs = 68; Equivalent Gates = 16
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

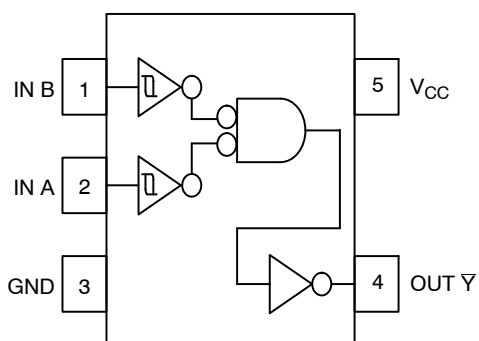


Figure 1. Pinout (Top View)

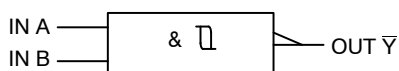


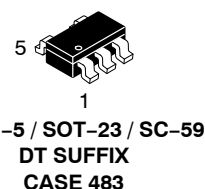
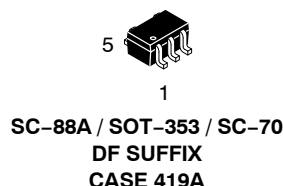
Figure 2. Logic Symbol



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### MARKING DIAGRAMS



VD = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### PIN ASSIGNMENT

| Pin | Function      |
|-----|---------------|
| 1   | IN B          |
| 2   | IN A          |
| 3   | GND           |
| 4   | OUT $\bar{Y}$ |
| 5   | $V_{CC}$      |

### FUNCTION TABLE

| Inputs |   | Output    |
|--------|---|-----------|
| A      | B | $\bar{Y}$ |
| 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 4 of this data sheet.

# MC74VHC1G132

## 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                          | -20  | mA   |
| I <sub>OK</sub>      | DC Output Diode Current                         | ±20  | mA   |
| I <sub>OUT</sub>     | DC Output Sink Current                          | ±12.5  | mA   |
| I <sub>CC</sub>      | DC Supply Current per Supply Pin                | ±25  | 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                              | SC70-5/SC-88A (Note 1)<br>TSOP-5<br>350<br>230   | °C/W |
| P <sub>D</sub>       | Power Dissipation in Still Air at 85°C          | SC70-5/SC-88A<br>TSOP-5<br>150<br>200  | mW   |
| MSL                  | Moisture Sensitivity                            | Level 1  |      |
| F <sub>R</sub>       | Flammability Rating                             | Oxygen Index: 28 to 34<br>UL 94 V-0 @ 0.125 in   |      |
| V <sub>ESD</sub>     | ESD Withstand Voltage                           | Human Body Model (Note 2)<br>Machine Model (Note 3)<br>Charged Device Model (Note 4)<br>> 2000<br>> 200<br>N/A | V    |
| I <sub>LATCHUP</sub> | Latchup Performance                             | Above V <sub>CC</sub> and Below GND at 125°C (Note 5)<br>±500  | 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. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                          | Parameter                   | Min  | Max                  | Unit |
|---------------------------------|-----------------------------|--|----------------------|------|
| V <sub>CC</sub>                 | DC Supply Voltage           | 2.0  | 5.5                  | V    |
| V <sub>IN</sub>                 | DC Input Voltage            | 0.0  | 5.5                  | V    |
| V <sub>OUT</sub>                | DC Output Voltage           | 0.0  | V <sub>CC</sub>      | V    |
| T <sub>A</sub>                  | Operating Temperature Range | -55  | +125                 | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time    | V <sub>CC</sub> = 3.3 V ± 0.3 V<br>V <sub>CC</sub> = 5.0 V ± 0.5 V | No Limit<br>No Limit | ns/V |

## Device Junction Temperature versus Time to 0.1% Bond Failures

| Junction Temperature °C | Time, Hours | Time, Years |
|-------------------------|-------------|-------------|
| 80                      | 1,032,200   | 117.8       |
| 90                      | 419,300     | 47.9        |
| 100                     | 178,700     | 20.4        |
| 110                     | 79,600      | 9.4         |
| 120                     | 37,000      | 4.2         |
| 130                     | 17,800      | 2.0         |
| 140                     | 8,900       | 1.0         |

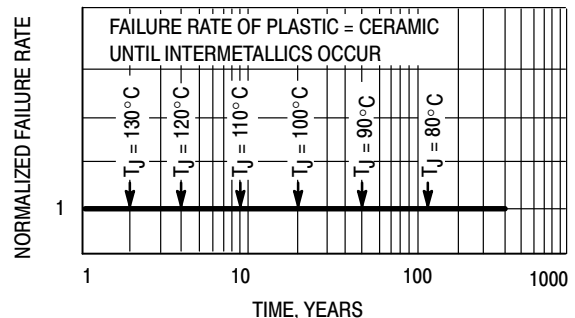


Figure 3. Failure Rate vs. Time Junction Temperature

# MC74VHC1G132

## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter  | Test Conditions  | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> ≤ 85°C |      | -55 ≤ T <sub>A</sub> ≤ 125°C |      | Unit |
|-----------------|--|--|---------------------|-----------------------|------|------|-----------------------|------|------------------------------|------|------|
|                 |  |  |                     | Min                   | Typ  | Max  | Min                   | Max  | Min                          | Max  |      |
| V <sub>T+</sub> | Positive Threshold Voltage                                   |  | 3.0                 | 1.50                  | 1.88 | 2.25 | 1.50                  | 2.25 | 1.50                         | 2.25 | V    |
|                 |  |  | 4.5                 | 2.35                  | 2.66 | 3.10 | 2.35                  | 3.10 | 2.35                         | 3.10 |      |
|                 |  |  | 5.5                 | 2.80                  | 3.21 | 3.70 | 2.80                  | 3.70 | 2.80                         | 3.70 |      |
| V <sub>T-</sub> | Negative Threshold Voltage                                   |  | 3.0                 | 0.65                  | 1.03 | 1.40 | 0.65                  | 1.40 | 0.65                         | 1.40 | V    |
|                 |  |  | 4.5                 | 1.10                  | 1.62 | 2.10 | 1.10                  | 2.10 | 1.10                         | 2.10 |      |
|                 |  |  | 5.5                 | 1.45                  | 2.02 | 2.60 | 1.45                  | 2.60 | 1.45                         | 2.60 |      |
| V <sub>H</sub>  | Hysteresis Voltage   |  | 3.0                 | 0.30                  | 0.85 | 1.60 | 0.30                  | 1.60 | 0.30                         | 1.60 | V    |
|                 |  |  | 4.5                 | 0.40                  | 1.05 | 2.00 | 0.40                  | 2.00 | 0.40                         | 2.00 |      |
|                 |  |  | 5.5                 | 0.50                  | 1.20 | 2.25 | 0.50                  | 2.25 | 0.50                         | 2.25 |      |
| V <sub>OH</sub> | Minimum High-Level Output Voltage<br>I <sub>OH</sub> = -50μA | V <sub>IN</sub> = V <sub>CC</sub> or GND   | 2.0                 | 1.9                   | 2.0  |      | 1.9                   |      | 1.9                          |      | V    |
|                 |  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OH</sub> = -50 μA | 3.0                 | 2.9                   | 3.0  |      | 2.9                   |      | 2.9                          |      |      |
|                 |  | I <sub>OH</sub> = -4 mA<br>I <sub>OH</sub> = -8 mA                               | 3.0                 | 2.58                  |      |      | 2.48                  |      | 2.34                         |      |      |
| V <sub>OL</sub> | Maximum Low-Level Output Voltage                             | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OL</sub> = 50 μA  | 2.0                 |                       | 0.0  | 0.1  |                       | 0.1  |                              | 0.1  | V    |
|                 |  |  | 3.0                 |                       | 0.0  | 0.1  |                       | 0.1  |                              | 0.1  |      |
|                 |  |  | 4.5                 |                       | 0.0  | 0.1  |                       | 0.1  |                              | 0.1  |      |
|                 |  | I <sub>OL</sub> = 4 mA<br>I <sub>OL</sub> = 8 mA                                 | 3.0                 |                       |      | 0.36 |                       | 0.44 |                              | 0.52 | V    |
|                 |  |  | 4.5                 |                       |      | 0.36 |                       | 0.44 |                              | 0.52 |      |
| I <sub>IN</sub> | Maximum Input Leakage Current                                | V <sub>IN</sub> = 5.5 V or GND   | 0 to 5.5            |                       |      | ±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   | 5.5                 |                       |      | 1.0  |                       | 20   |                              | 40   | μA   |

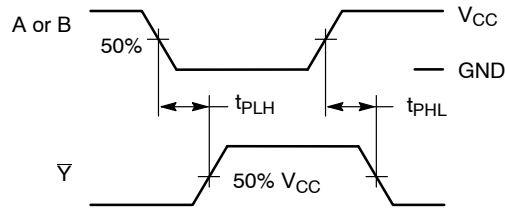
## AC ELECTRICAL CHARACTERISTICS C<sub>load</sub> = 50 pF, Input t<sub>r</sub>/t<sub>f</sub> = 3.0 ns

| Symbol                                 | Parameter                                      | Test Conditions  | T <sub>A</sub> = 25°C |     |      | T <sub>A</sub> ≤ 85°C |      | -55 ≤ 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, A or B to $\bar{Y}$ | V <sub>CC</sub> = 3.3 ± 0.3 V C <sub>L</sub> = 15 pF<br>C <sub>L</sub> = 50 pF |                       | 4.6 | 11.9 | 1.0                   | 14.0 | 1.0                          | 16.1 | ns   |
|  |  |  |                       | 6.1 | 15.4 | 1.0                   | 17.5 | 1.0                          | 19.6 |      |
|  |  | V <sub>CC</sub> = 5.0 ± 0.5 V C <sub>L</sub> = 15 pF<br>C <sub>L</sub> = 50 pF |                       | 3.6 | 7.7  | 1.0                   | 9.0  | 1.0                          | 10.3 |      |
|  |  |  |                       | 4.3 | 9.7  | 1.0                   | 11.0 | 1.0                          | 12.3 |      |
| C <sub>IN</sub>                        | Maximum Input Capacitance                      |  |                       | 5.5 | 10   |                       | 10   |                              | 10   | pF   |

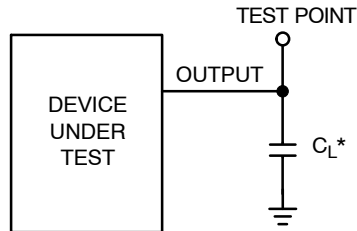
|                 |  | Typical @ 25°C, V <sub>CC</sub> = 5.0 V |  |
|-----------------|--|---|--|
| C <sub>PD</sub> | Power Dissipation Capacitance (Note 6) | 11                                      |  |
|                 |  | pF                                      |  |

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>. 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>.

## MC74VHC1G132



**Figure 4. Switching Waveforms**



\*Includes all probe and jig capacitance

**Figure 5. Test Circuit**

### ORDERING INFORMATION

| Device            | Package                            | Shipping†                |
|-------------------|------------------------------------|--------------------------|
| M74VHC1G132DFT1G  | SC70-5/SC-88A/SOT-353<br>(Pb-Free) | 3000 Units / Tape & Reel |
| NLVVHC1G132DFT1G* |                                    |                          |
| M74VHC1G132DFT2G  |                                    |                          |
| NLVVHC1G132DFT2G* |                                    |                          |
| M74VHC1G132DTT1G  | SOT23-5/TSOP-5SC59-5<br>(Pb-Free)  |                          |
| NLVVHC1G132DTT1G* |                                    |                          |

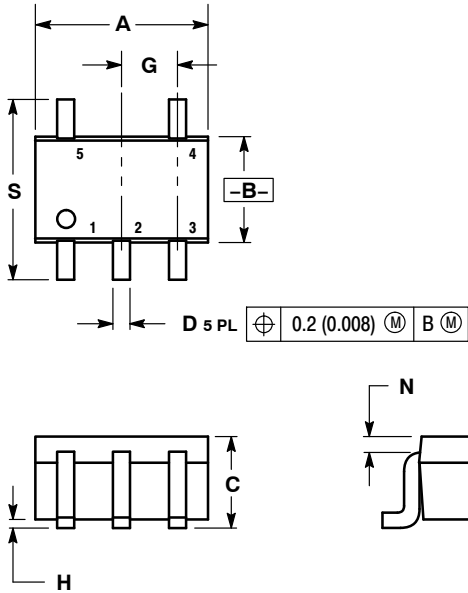
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

# MC74VHC1G132

## PACKAGE DIMENSIONS

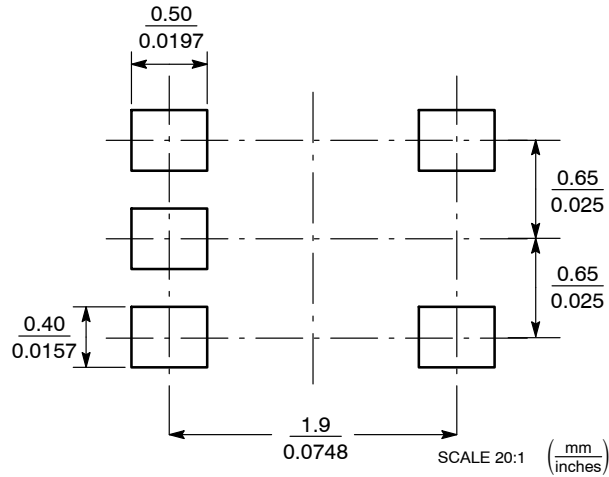
SC-88A (SC-70-5/SOT-353)  
CASE 419A-02  
ISSUE L



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
  4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.071     | 0.087 | 1.80        | 2.20 |
| B   | 0.045     | 0.053 | 1.15        | 1.35 |
| C   | 0.031     | 0.043 | 0.80        | 1.10 |
| D   | 0.004     | 0.012 | 0.10        | 0.30 |
| G   | 0.026 BSC |       | 0.65 BSC    |      |
| H   | ---       | 0.004 | ---         | 0.10 |
| J   | 0.004     | 0.010 | 0.10        | 0.25 |
| K   | 0.004     | 0.012 | 0.10        | 0.30 |
| N   | 0.008 REF |       | 0.20 REF    |      |
| S   | 0.079     | 0.087 | 2.00        | 2.20 |

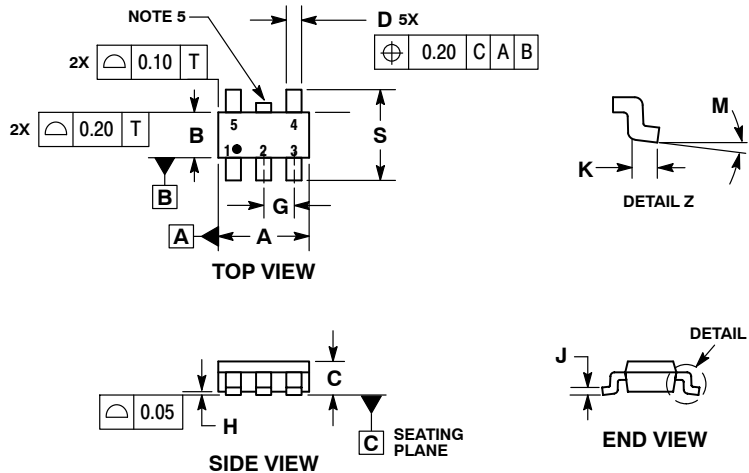
## SOLDER FOOTPRINT



# MC74VHC1G132

## PACKAGE DIMENSIONS

### TSOP-5 CASE 483-02 ISSUE K

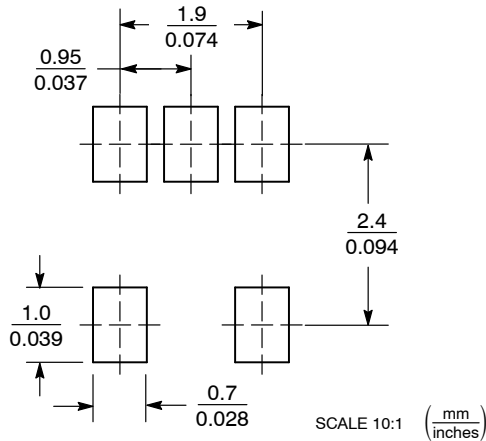


#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSION A.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 3.00        | BSC  |
| B   | 1.50        | BSC  |
| C   | 0.90        | 1.10 |
| D   | 0.25        | 0.50 |
| G   | 0.95        | BSC  |
| H   | 0.01        | 0.10 |
| J   | 0.10        | 0.26 |
| K   | 0.20        | 0.60 |
| M   | 0°          | 10°  |
| S   | 2.50        | 3.00 |

#### 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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