

# SN54LV86A, SN74LV86A QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

SCLS392F – APRIL 1998 – REVISED APRIL 2005

- 2-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 8 ns at 5 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $>2.3$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Voltage Operation on All Ports
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

## description/ordering information

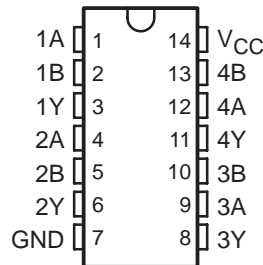
The 'LV86A devices are quadruple 2-input exclusive-OR gates designed for 2-V to 5.5-V  $V_{CC}$  operation.

These devices contain four independent 2-input exclusive-OR gates. They perform the Boolean function

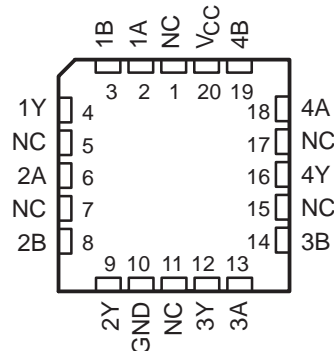
$$Y = A \oplus B \text{ or } Y = \bar{A}B + A\bar{B} \text{ in positive logic.}$$

A common application is as a true/complement element. If one of the inputs is low, the other input is reproduced in true form at the output. If one of the inputs is high, the signal on the other input is reproduced inverted at the output.

SN54LV86A . . . J OR W PACKAGE  
SN74LV86A . . . D, DB, DGV, NS, OR PW PACKAGE  
(TOP VIEW)



SN54LV86A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## ORDERING INFORMATION

| $T_A$          | PACKAGE†     |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|--------------|---------------|-----------------------|------------------|
| -40°C to 85°C  | SOIC – D     | Tube of 50    | SN74LV86AD            | LV86A            |
|                |              | Reel of 2500  | SN74LV86ADR           |                  |
|                | SOP – NS     | Reel of 2000  | SN74LV86ANSR          | 74LV86A          |
|                | SSOP – DB    | Reel of 2000  | SN74LV86ADBR          | LV86A            |
|                | TSSOP – PW   | Tube of 90    | SN74LV86APW           | LV86A            |
|                |              | Reel of 2000  | SN74LV86APWR          |                  |
|                |              | Reel of 250   | SN74LV86APWT          |                  |
| TVSOP – DGV    | Reel of 2000 | SN74LV86ADGVR | LV86A                 |                  |
| -55°C to 125°C | CDIP – J     | Tube of 25    | SNJ54LV86AJ           | SNJ54LV86AJ      |
|                | CFP – W      | Tube of 150   | SNJ54LV86AW           | SNJ54LV86AW      |
|                | LCCC - FK    | Tube of 55    | SNJ54LV86AFK          | SNJ54LV86AFK     |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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 **TEXAS  
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# SN54LV86A, SN74LV86A QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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FUNCTION TABLE  
(each gate)

| INPUTS |   | OUTPUT |
|--------|---|--------|
| A      | B | Y      |
| L      | L | L      |
| L      | H | H      |
| H      | L | H      |
| H      | H | L      |

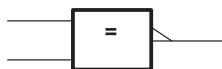
## exclusive-OR logic

An exclusive-OR gate has many applications, some of which can be represented better by alternative logic symbols.



These are five equivalent exclusive-OR symbols valid for an 'LV86A gate in positive logic; negation can be shown at any two ports.

Logic-Identity Element



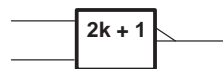
The output is active (low) if all inputs stand at the same logic level (i.e.,  $A = B$ ).

Even-Parity Element



The output is active (low) if an even number of inputs (i.e., 0 or 2) are active.

Odd-Parity Element



The output is active (high) if an odd number of inputs (i.e., only 1 of the 2) are active.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

|  |                            |
|--|----------------------------|
| Supply voltage range, $V_{CC}$ .....   | -0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 1) .....  | -0.5 V to 7 V              |
| Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1) ..... | -0.5 V to 7 V              |
| Output voltage range, $V_O$ (see Notes 1 and 2) .....  | -0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....  | -20 mA                     |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....   | -50 mA                     |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....                                       | $\pm 25$ mA                |
| Continuous current through $V_{CC}$ or GND .....   | $\pm 50$ mA                |
| Package thermal impedance, $\theta_{JA}$ (see Note 3): D package .....                                 | 86°C/W                     |
| DB package .....   | 96°C/W                     |
| DGV package .....  | 127°C/W                    |
| NS package .....   | 76°C/W                     |
| PW package .....   | 113°C/W                    |
| Storage temperature range, $T_{stg}$ .....   | -65°C to 150°C             |

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
  2. This value is limited to 5.5 V maximum.
  3. The package thermal impedance is calculated in accordance with JESD 51-7.

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## recommended operating conditions (see Note 4)

|                 |                                    | SN54LV86A                        |                       | SN74LV86A             |                 | UNIT |
|-----------------|------------------------------------|----------------------------------|-----------------------|-----------------------|-----------------|------|
|                 |                                    | MIN                              | MAX                   | MIN                   | MAX             |      |
| V <sub>CC</sub> | Supply voltage                     | 2                                | 5.5                   | 2                     | 5.5             | V    |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 2 V            | 1.5                   | 1.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.7 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.7 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.7 | V <sub>CC</sub> × 0.7 |                 |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 2 V            | 0.5                   | 0.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.3 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.3 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.3 | V <sub>CC</sub> × 0.3 |                 |      |
| V <sub>I</sub>  | Input voltage                      | 0                                | 5.5                   | 0                     | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                     | 0                                | V <sub>CC</sub>       | 0                     | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 2 V            |                       | -50                   | -50             | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V |                       | -2                    | -2              | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   |                       | -6                    | -6              |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V |                       | -12                   | -12             |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 2 V            |                       | 50                    | 50              | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V |                       | 2                     | 2               | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   |                       | 6                     | 6               |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V |                       | 12                    | 12              |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 2.3 V to 2.7 V |                       | 200                   | 200             | ns/V |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   |                       | 100                   | 100             |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V |                       | 20                    | 20              |      |
| T <sub>A</sub>  | Operating free-air temperature     | -55                              | 125                   | -40                   | 85              | °C   |

NOTE 4: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN54LV86A, SN74LV86A QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER        | TEST CONDITIONS   | V <sub>CC</sub> | SN54LV86A            |     |     | SN74LV86A            |     |     | UNIT |
|------------------|---|-----------------|----------------------|-----|-----|----------------------|-----|-----|------|
|                  |   |                 | MIN                  | TYP | MAX | MIN                  | TYP | MAX |      |
| V <sub>OH</sub>  | I <sub>OH</sub> = -50 μA                                    | 2 V to 5.5 V    | V <sub>CC</sub> -0.1 |     |     | V <sub>CC</sub> -0.1 |     |     | V    |
|                  | I <sub>OH</sub> = -2 mA                                     | 2.3 V           | 2                    |     |     | 2                    |     |     |      |
|                  | I <sub>OH</sub> = -6 mA                                     | 3 V             | 2.48                 |     |     | 2.48                 |     |     |      |
|                  | I <sub>OH</sub> = -12 mA                                    | 4.5 V           | 3.8                  |     |     | 3.8                  |     |     |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 50 μA                                     | 2 V to 5.5 V    |                      |     |     | 0.1                  |     |     | V    |
|                  | I <sub>OL</sub> = 2 mA                                      | 2.3 V           |                      |     |     | 0.4                  |     |     |      |
|                  | I <sub>OL</sub> = 6 mA                                      | 3 V             |                      |     |     | 0.44                 |     |     |      |
|                  | I <sub>OL</sub> = 12 mA                                     | 4.5 V           |                      |     |     | 0.55                 |     |     |      |
| I <sub>I</sub>   | V <sub>I</sub> = 5.5 V or GND                               | 0 to 5.5 V      |                      |     |     | ±1                   |     |     | μA   |
| I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 5.5 V           |                      |     |     | 20                   |     |     | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V               | 0               |                      |     |     | 5                    |     |     | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 3.3 V           | 1.4                  |     |     | 1.4                  |     |     | pF   |

switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 2.5 V ± 0.2 V (unless otherwise noted) (see Figure 1)

| PARAMETER       | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE       | T <sub>A</sub> = 25°C |       |     | SN54LV86A |     | SN74LV86A |     | UNIT |
|-----------------|--------------|-------------|------------------------|-----------------------|-------|-----|-----------|-----|-----------|-----|------|
|                 |              |             |                        | MIN                   | TYP   | MAX | MIN       | MAX | MIN       | MAX |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> = 15 pF | 7.9*                  | 17.6* | 1*  | 21*       | 1   | 21        | ns  |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> = 50 pF | 10.5                  | 22.6  | 1   | 26.5      | 1   | 26.5      | ns  |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

| PARAMETER       | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE       | T <sub>A</sub> = 25°C |      |     | SN54LV86A |     | SN74LV86A |     | UNIT |
|-----------------|--------------|-------------|------------------------|-----------------------|------|-----|-----------|-----|-----------|-----|------|
|                 |              |             |                        | MIN                   | TYP  | MAX | MIN       | MAX | MIN       | MAX |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> = 15 pF | 5.5*                  | 11*  | 1*  | 13*       | 1   | 13        | ns  |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> = 50 pF | 7.4                   | 14.5 | 1   | 16.5      | 1   | 16.5      | ns  |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

| PARAMETER       | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE       | T <sub>A</sub> = 25°C |      |     | SN54LV86A |     | SN74LV86A |     | UNIT |
|-----------------|--------------|-------------|------------------------|-----------------------|------|-----|-----------|-----|-----------|-----|------|
|                 |              |             |                        | MIN                   | TYP  | MAX | MIN       | MAX | MIN       | MAX |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> = 15 pF | 3.7*                  | 6.8* | 1*  | 8*        | 1   | 8         | ns  |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> = 50 pF | 5.3                   | 8.8  | 1   | 10        | 1   | 10        | ns  |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



# SN54LV86A, SN74LV86A QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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**noise characteristics,  $V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 5)**

| PARAMETER  | SN74LV86A |      |      | UNIT |
|--|-----------|------|------|------|
|  | MIN       | TYP  | MAX  |      |
| $V_{OL(P)}$ Quiet output, maximum dynamic $V_{OL}$ |           | 0.2  | 0.8  | V    |
| $V_{OL(V)}$ Quiet output, minimum dynamic $V_{OL}$ |           | -0.1 | -0.8 | V    |
| $V_{OH(V)}$ Quiet output, minimum dynamic $V_{OH}$ |           | 3.1  |      | V    |
| $V_{IH(D)}$ High-level dynamic input voltage       | 2.31      |      |      | V    |
| $V_{IL(D)}$ Low-level dynamic input voltage        |           |      | 0.99 | V    |

NOTE 5: Characteristics are for surface-mount packages only.

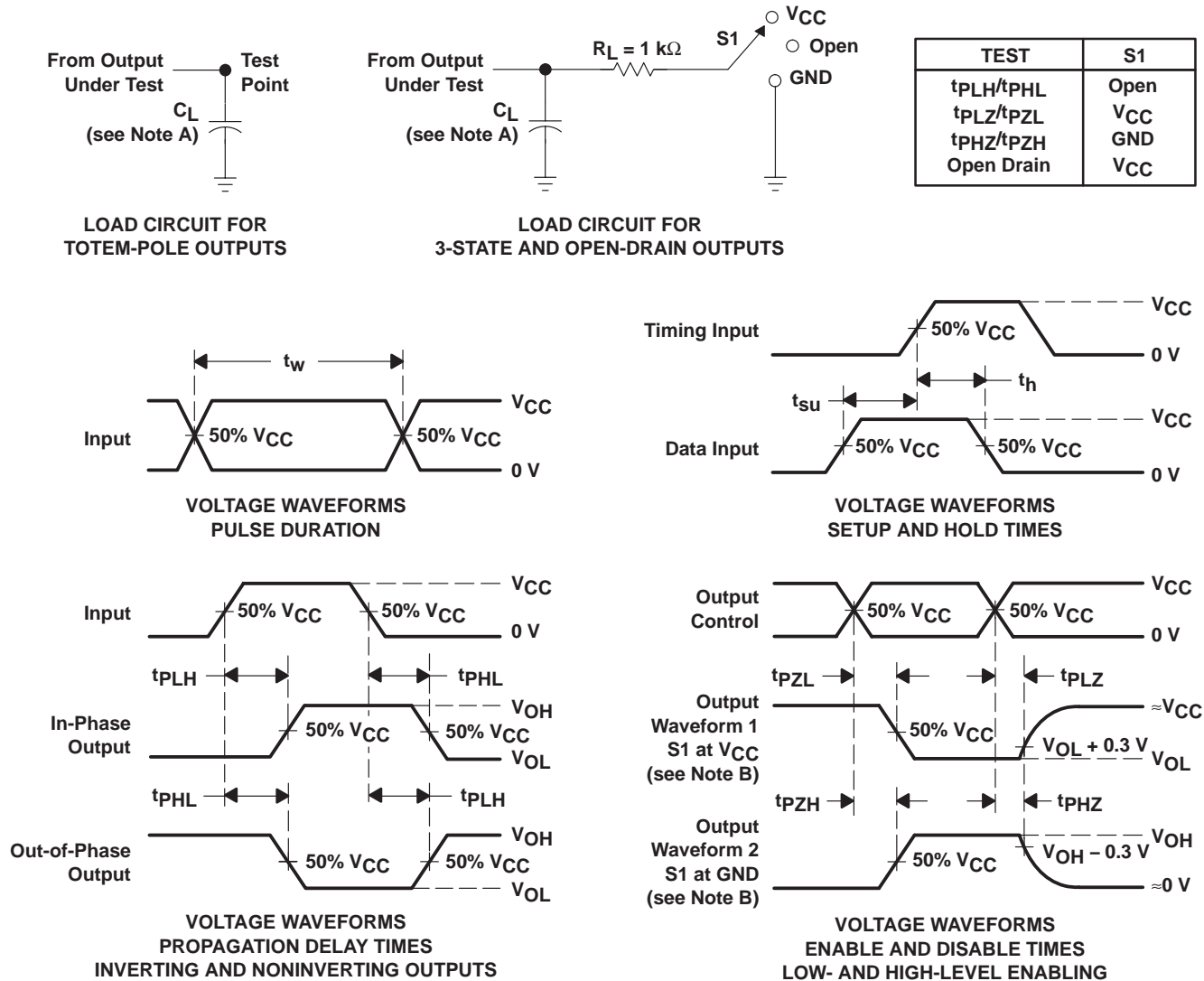
**operating characteristics,  $T_A = 25^\circ\text{C}$**

| PARAMETER                              | TEST CONDITIONS                            | $V_{CC}$ | TYP | UNIT |
|--|--|----------|-----|------|
| $C_{pd}$ Power dissipation capacitance | $C_L = 50\text{ pF}$ , $f = 10\text{ MHz}$ | 3.3 V    | 8.4 | pF   |
|  |  | 5 V      | 8.8 |      |

# SN54LV86A, SN74LV86A QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
  - D. The outputs are measured one at a time, with one input transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
  - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LV86AD       | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADBR     | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADBRG4   | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADE4     | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADG4     | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADGVR    | ACTIVE                | TVSOP        | DGV             | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADGVRE4  | ACTIVE                | TVSOP        | DGV             | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADGVRG4  | ACTIVE                | TVSOP        | DGV             | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADR      | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADRE4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ADRG4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ANSR     | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ANSRE4   | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86ANSRG4   | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APW      | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWE4    | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWG4    | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWR     | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWRE4   | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWRG4   | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWT     | ACTIVE                | TSSOP        | PW              | 14   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWTE4   | ACTIVE                | TSSOP        | PW              | 14   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV86APWTG4   | ACTIVE                | TSSOP        | PW              | 14   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

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**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**OTHER QUALIFIED VERSIONS OF SN74LV86A :**

- Automotive: [SN74LV86A-Q1](#)
- Enhanced Product: [SN74LV86A-EP](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications



**TAPE AND REEL INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LV86ADBR  | SSOP         | DB              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LV86ADGVR | TVSOP        | DGV             | 14   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV86ADR   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LV86ANSR  | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LV86APWR  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LV86ADBR  | SSOP         | DB              | 14   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LV86ADGVR | TVSOP        | DGV             | 14   | 2000 | 346.0       | 346.0      | 29.0        |
| SN74LV86ADR   | SOIC         | D               | 14   | 2500 | 346.0       | 346.0      | 33.0        |
| SN74LV86ANSR  | SO           | NS              | 14   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LV86APWR  | TSSOP        | PW              | 14   | 2000 | 346.0       | 346.0      | 29.0        |

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN

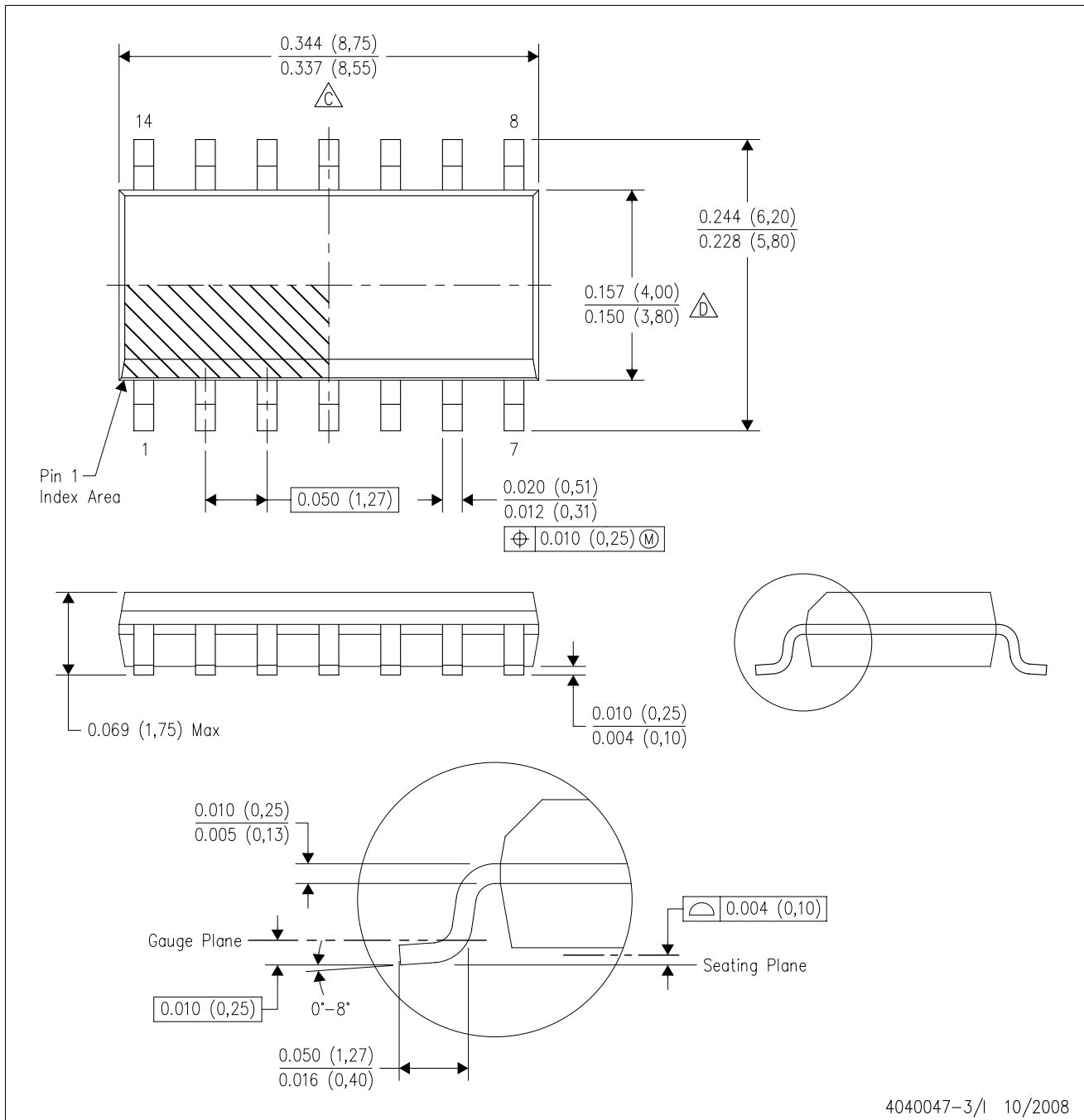


4073251/E 08/00



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



4040047-3/1 10/2008

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  -  Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AB.

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