

# SN54LV07A, SN74LV07A HEX BUFFERS/DRIVERS WITH OPEN-DRAIN OUTPUTS

SCES337F – MAY 2000 – REVISED JULY 2003

- 2-V to 5.5-V  $V_{CC}$  Operation
- 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,  $T_A = 25^\circ\text{C}$
- Outputs Are Disabled During Power Up and Power Down With Inputs Tied to  $V_{CC}$
- Support Mixed-Mode Voltage Operation on All Ports
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- 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

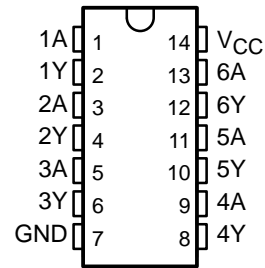
These hex buffers/drivers are designed for 2-V to 5.5-V  $V_{CC}$  operation.

The 'LV07A devices perform the Boolean function  $Y = A$  in positive logic.

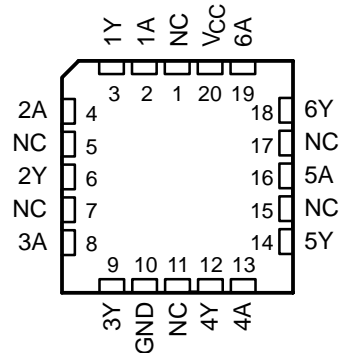
The open-drain outputs require pullup resistors to perform correctly and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

SN54LV07A . . . J OR W PACKAGE  
SN74LV07A . . . D, DB, DGV, NS, OR PW PACKAGE  
(TOP VIEW)



SN54LV07A . . . 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    | SN74LV07AD            | LV07A            |
|                |              | Reel of 2500  | SN74LV07ADR           |                  |
|                | SOP – NS     | Reel of 2000  | SN74LV07ANSR          | 74LV07A          |
|                | SSOP – DB    | Reel of 2000  | SN74LV07ADBR          | LV07A            |
|                | TSSOP – PW   | Tube of 90    | SN74LV07APW           | LV07A            |
|                |              | Reel of 2000  | SN74LV07APWR          |                  |
|                |              | Reel of 250   | SN74LV07APWT          |                  |
| TVSOP – DGV    | Reel of 2000 | SN74LV07ADGVR | LV07A                 |                  |
| –55°C to 125°C | CDIP – J     | Tube of 25    | SNJ54LV07AJ           | SNJ54LV07AJ      |
|                | CFP – W      | Tube of 150   | SNJ54LV07AW           | SNJ54LV07AW      |
|                | LCCC – FK    | Tube of 55    | SNJ54LV07AFK          | SNJ54LV07AFK     |

† 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  
INSTRUMENTS**

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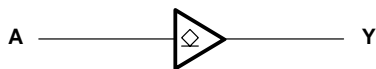
**SN54LV07A, SN74LV07A  
HEX BUFFERS/DRIVERS  
WITH OPEN-DRAIN OUTPUTS**

SCES337F – MAY 2000 – REVISED JULY 2003

**FUNCTION TABLE  
(each buffer/driver)**

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | H           |
| L          | L           |

**logic diagram, each buffer/driver (positive logic)**



**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, $V_O$<br>(see Note 1) ..... | -0.5 V to 7 V  |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....   | -20 mA         |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....                                      | -50 mA         |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....  | -35 mA         |
| Continuous current through $V_{CC}$ or GND .....  | $\pm 50$ mA    |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): 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 voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

**SN54LV07A, SN74LV07A**  
**HEX BUFFERS/DRIVERS**  
**WITH OPEN-DRAIN OUTPUTS**  
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**recommended operating conditions (see Note 3)**

|                 |                                    | SN54LV07A                        |                       | SN74LV07A             |     | 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                                | 5.5                   | 0                     | 5.5 | V    |
| 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   | 8                     | 8                     |     |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 16                    | 16                    |     |      |
| 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 3: 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.

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

| PARAMETER        | TEST CONDITIONS  | V <sub>CC</sub> | SN54LV07A |     |      | SN74LV07A |     |      | UNIT |
|------------------|--|-----------------|-----------|-----|------|-----------|-----|------|------|
|                  |  |                 | MIN       | TYP | MAX  | MIN       | TYP | MAX  |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 50 μA  | 2 V to 5.5 V    |           |     | 0.1  |           |     | 0.1  | V    |
|                  | I <sub>OL</sub> = 2 mA   | 2.3 V           |           |     | 0.4  |           |     | 0.4  |      |
|                  | I <sub>OL</sub> = 8 mA   | 3 V             |           |     | 0.44 |           |     | 0.44 |      |
|                  | I <sub>OL</sub> = 16 mA  | 4.5 V           |           |     | 0.55 |           |     | 0.55 |      |
| I <sub>I</sub>   | V <sub>I</sub> = 5.5 V or GND  | 0 to 5.5 V      |           |     | ±1   |           |     | ±1   | μA   |
| I <sub>OH</sub>  | V <sub>I</sub> = V <sub>IH</sub> , V <sub>OH</sub> = V <sub>CC</sub> | 5.5 V           |           |     | ±2.5 |           |     | ±2.5 | μA   |
| I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0          | 5.5 V           |           |     | 20   |           |     | 20   | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V                        | 0               |           |     | 5    |           |     | 5    | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                              | 3.3 V           |           | 1.6 |      |           | 1.6 |      | pF   |

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# SN54LV07A, SN74LV07A HEX BUFFERS/DRIVERS WITH OPEN-DRAIN OUTPUTS

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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |       |     | SN54LV07A |     | SN74LV07A |     | UNIT |
|-----------|--------------|-------------|----------------------|--------------------------|-------|-----|-----------|-----|-----------|-----|------|
|           |              |             |                      | MIN                      | TYP   | MAX | MIN       | MAX | MIN       | MAX |      |
| $t_{PLH}$ | A            | Y           | $C_L = 15\text{ pF}$ | 6.6*                     | 10.4* | 1*  | 13*       | 1   | 13        | ns  |      |
| $t_{PHL}$ | A            | Y           |                      | 7.5*                     | 10.4* | 1*  | 13*       | 1   | 13        |     |      |
| $t_{PLH}$ | A            | Y           | $C_L = 50\text{ pF}$ | 11.1                     | 15.2  | 1   | 18        | 1   | 18        | ns  |      |
| $t_{PHL}$ | A            | Y           |                      | 9.6                      | 15.2  | 1   | 18        | 1   | 18        |     |      |

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

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |      |     | SN54LV07A |     | SN74LV07A |     | UNIT |
|-----------|--------------|-------------|----------------------|--------------------------|------|-----|-----------|-----|-----------|-----|------|
|           |              |             |                      | MIN                      | TYP  | MAX | MIN       | MAX | MIN       | MAX |      |
| $t_{PLH}$ | A            | Y           | $C_L = 15\text{ pF}$ | 5*                       | 7.1* | 1*  | 8.5*      | 1   | 8.5       | ns  |      |
| $t_{PHL}$ | A            | Y           |                      | 5*                       | 7.1* | 1*  | 8.5*      | 1   | 8.5       |     |      |
| $t_{PLH}$ | A            | Y           | $C_L = 50\text{ pF}$ | 8.2                      | 10.6 | 1   | 12        | 1   | 12        | ns  |      |
| $t_{PHL}$ | A            | Y           |                      | 6.6                      | 10.6 | 1   | 12        | 1   | 12        |     |      |

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

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |      |     | SN54LV07A |     | SN74LV07A |     | UNIT |
|-----------|--------------|-------------|----------------------|--------------------------|------|-----|-----------|-----|-----------|-----|------|
|           |              |             |                      | MIN                      | TYP  | MAX | MIN       | MAX | MIN       | MAX |      |
| $t_{PLH}$ | A            | Y           | $C_L = 15\text{ pF}$ | 3.8*                     | 5.5* | 1*  | 6.5*      | 1   | 6.5       | ns  |      |
| $t_{PHL}$ | A            | Y           |                      | 3.4*                     | 5.5* | 1*  | 6.5*      | 1   | 6.5       |     |      |
| $t_{PLH}$ | A            | Y           | $C_L = 50\text{ pF}$ | 5.7                      | 7.5  | 1   | 8.5       | 1   | 8.5       | ns  |      |
| $t_{PHL}$ | A            | Y           |                      | 4.5                      | 7.5  | 1   | 8.5       | 1   | 8.5       |     |      |

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

noise characteristics,  $V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 4)

| PARAMETER   |  | SN74LV07A |      |      | UNIT |
|-------------|--|-----------|------|------|------|
|             |  | MIN       | TYP  | MAX  |      |
| $V_{OL(P)}$ | Quiet output, maximum dynamic $V_{OL}$ |           | 0.4  | 0.8  | V    |
| $V_{OL(V)}$ | Quiet output, minimum dynamic $V_{OL}$ |           | -0.1 | -0.8 | V    |
| $V_{OH(V)}$ | Quiet output, minimum dynamic $V_{OH}$ |           | 3.2  |      | V    |
| $V_{IH(D)}$ | High-level dynamic input voltage       | 2.31      |      |      | V    |
| $V_{IL(D)}$ | Low-level dynamic input voltage        |           | 0.99 |      | V    |

NOTE 4: Characteristics are for surface-mount packages only.

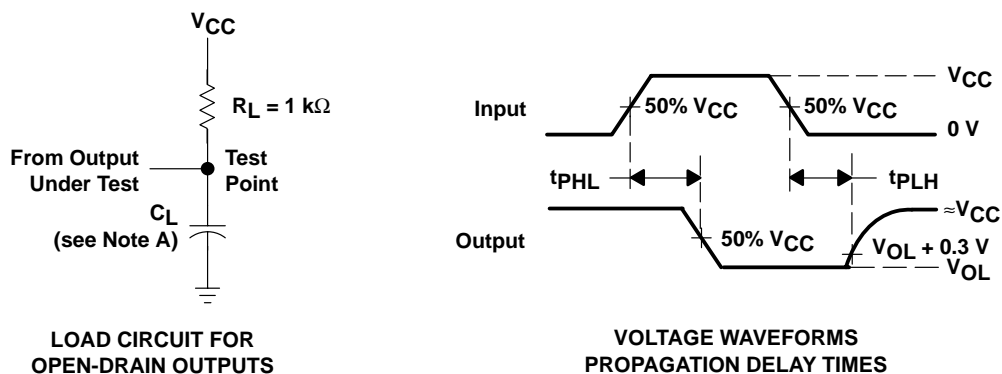
operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS                            | $V_{CC}$ | TYP | UNIT |
|-----------|-------------------------------|--|----------|-----|------|
| $C_{pd}$  | Power dissipation capacitance | $C_L = 50\text{ pF}$ , $f = 10\text{ MHz}$ | 3.3 V    | 2.9 | pF   |
|           |                               |  | 5 V      | 5.3 |      |

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### PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .  
C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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

PLASTIC SMALL-OUTLINE

24 PINS SHOWN

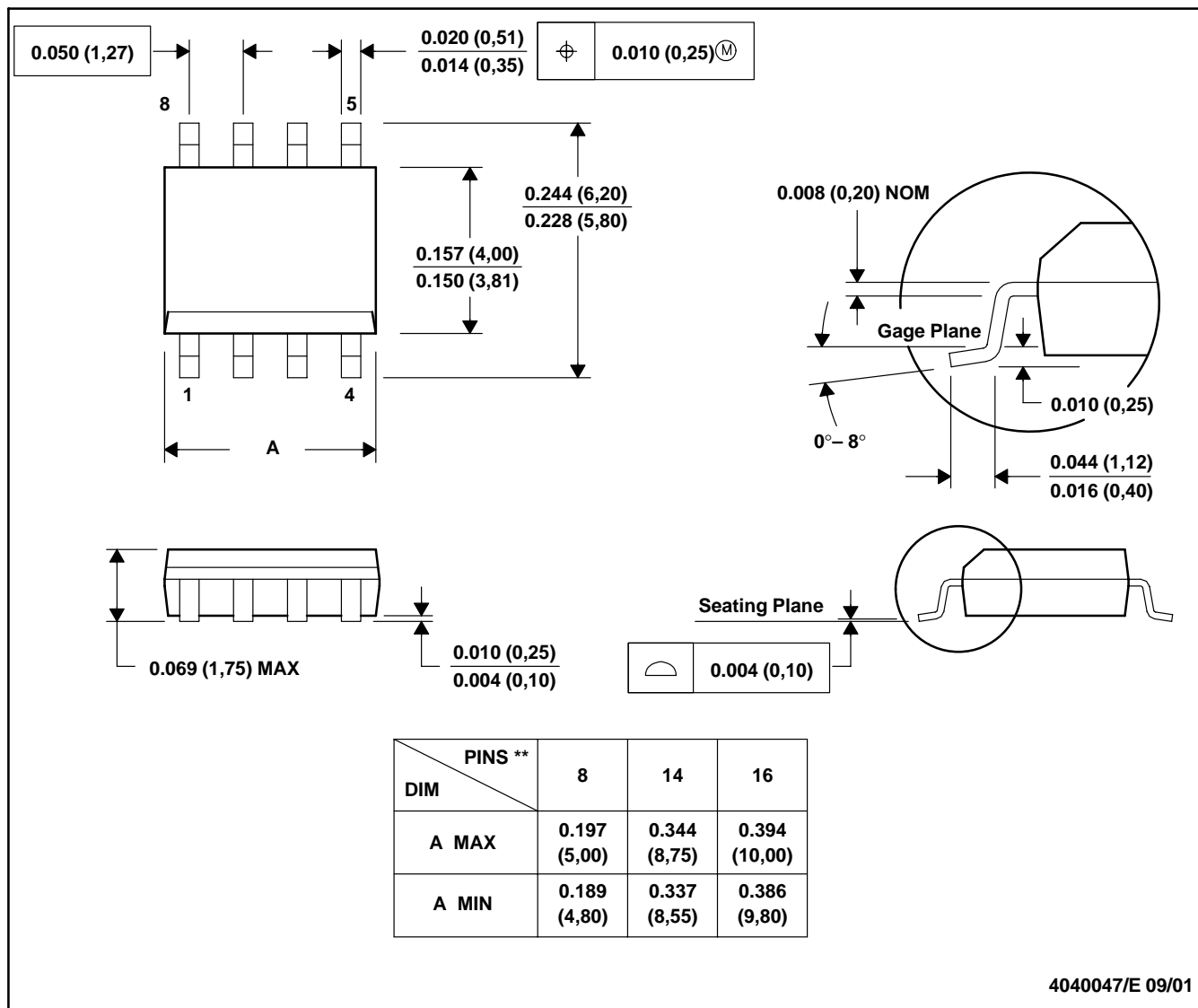


- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

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

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



4040047/E 09/01

- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).  
 D. Falls within JEDEC MS-012

# 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.

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

PLASTIC SMALL-OUTLINE

28 PINS SHOWN

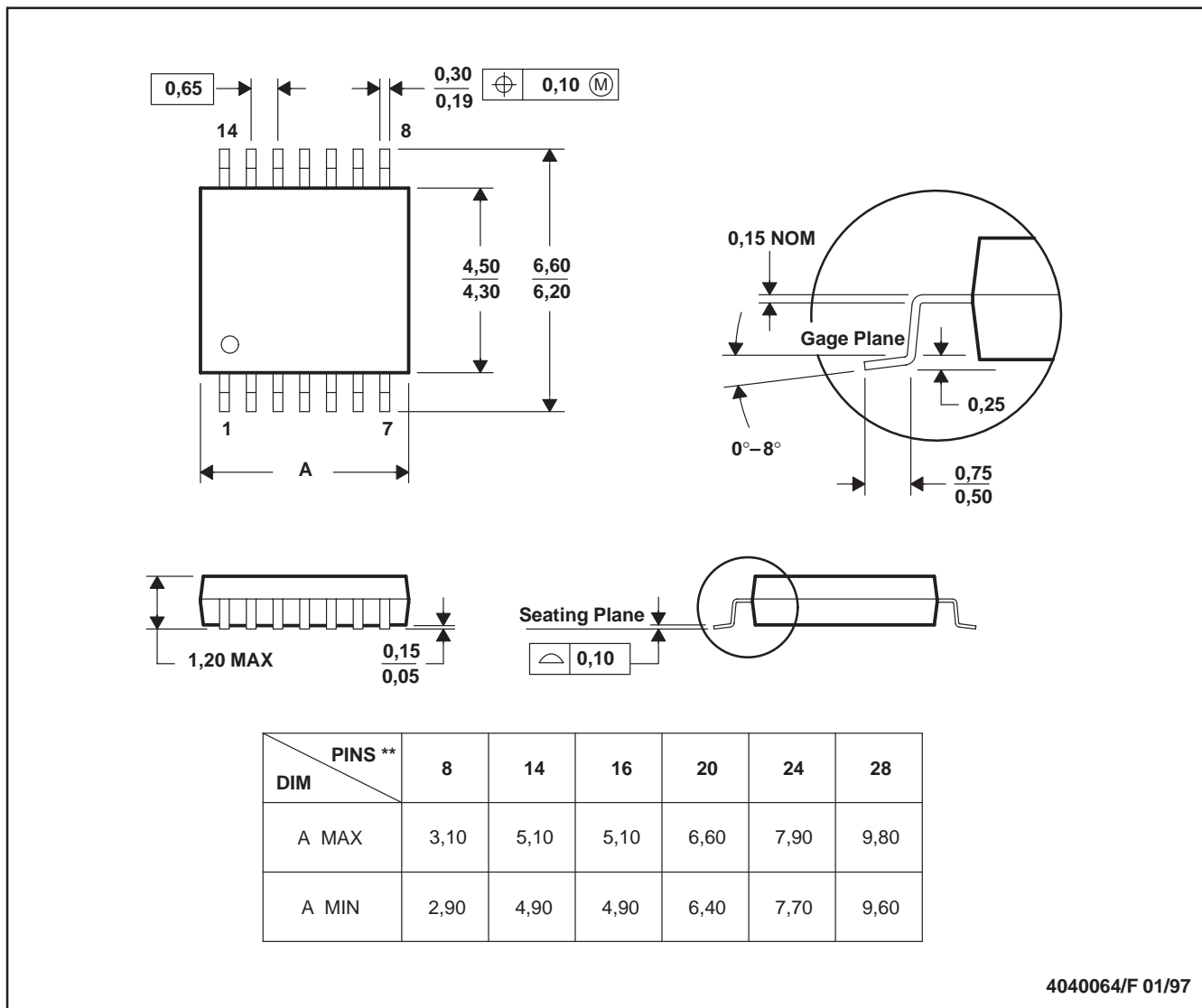


- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
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 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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