

The SN54LS07 and SN74LS17 are obsolete and are no longer supplied.

# SN54LS07, SN74LS07, SN74LS17 HEX BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS021C – MAY 1990 – REVISED FEBRUARY 2004

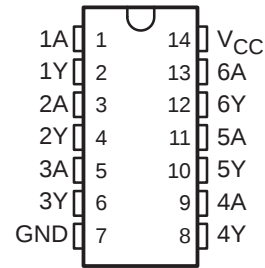
- Convert TTL Voltage Levels to MOS Levels
- High Sink-Current Capability
- Input Clamping Diodes Simplify System Design
- Open-Collector Driver for Indicator Lamps and Relays

## description/ordering information

These hex buffers/drivers feature high-voltage open-collector outputs to interface with high-level circuits or for driving high-current loads. They are also characterized for use as buffers for driving TTL inputs. The 'LS07 devices have a rated output voltage of 30 V, and the SN74LS17 has a rated output voltage of 15 V. The maximum sink current is 30 mA for the SN54LS07 and 40 mA for the SN74LS07 and SN74LS17.

These circuits are compatible with most TTL families. Inputs are diode-clamped to minimize transmission-line effects, which simplifies design. Typical power dissipation is 140 mW, and average propagation delay time is 12 ns.

SN54LS07 . . . J PACKAGE  
SN74LS07, SN74LS17 . . . D, DB, N, OR NS PACKAGE  
(TOP VIEW)

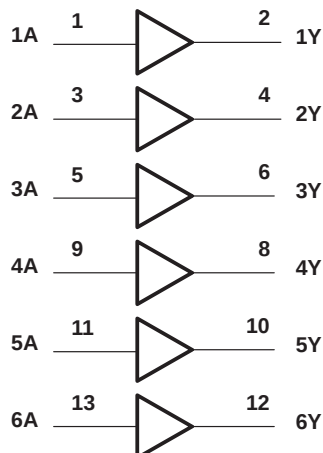


## ORDERING INFORMATION

| T <sub>A</sub> | PACKAGE <sup>†</sup> |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|----------------------|---------------|-----------------------|------------------|
| 0°C to 70°C    | PDIP – N             | Tube          | SN74LS07N             | SN74LS07N        |
|                |                      | Tube          | SN74LS07D             | LS07             |
|                | SOIC – D             | Tape and reel | SN74LS07DR            |                  |
|                |                      | Tape and reel | SN74LS07NSR           | 74LS07           |
|                |                      | Tape and reel | SN74LS07DBR           | LS07             |

<sup>†</sup> 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).

## logic diagram (positive logic)



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**TEXAS  
INSTRUMENTS**

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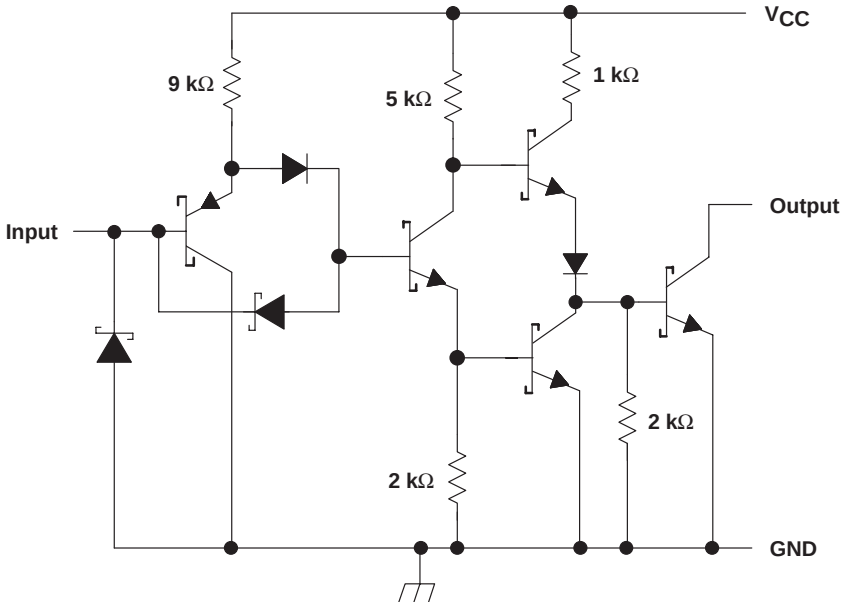
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**SN54LS07, SN74LS07, SN74LS17**  
**HEX BUFFERS/DRIVERS**  
**WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS**

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The SN54LS07 and SN74LS17 are  
obsolete and are no longer supplied.

**schematic (each gate)**



Resistor values shown are nominal.

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                                  |                |
|------------------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                         | 7 V            |
| Input voltage, $V_I$ (see Note 1)                                | 7 V            |
| Output voltage, $V_O$ (see Notes 1 and 2): SN54LS07, SN74LS07    | 30 V           |
| SN74LS17                                                         | 15 V           |
| Package thermal impedance, $\theta_{JA}$ (see Note 3): D package | 86°C/W         |
| DB package                                                       | 96°C/W         |
| N package                                                        | 80°C/W         |
| NS package                                                       | 76°C/W         |
| Storage temperature range, $T_{stg}$                             | –65°C to 150°C |

<sup>†</sup> 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. All voltage values are with respect to GND.  
2. This is the maximum voltage that should be applied to any output when it is in the off state.  
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4)

|                 |                                |          | SN54LS07 |     |     | SN74LS07<br>SN74LS17 |     |      | UNIT |    |
|-----------------|--------------------------------|----------|----------|-----|-----|----------------------|-----|------|------|----|
|                 |                                |          | MIN      | NOM | MAX | MIN                  | NOM | MAX  |      |    |
| V <sub>CC</sub> | Supply voltage                 |          | 4.5      | 5   | 5.5 | 4.75                 | 5   | 5.25 | V    |    |
| V <sub>IH</sub> | High-level input voltage       |          | 2        |     |     | 2                    |     |      | V    |    |
| V <sub>IL</sub> | Low-level input voltage        |          | 0.8      |     |     | 0.8                  |     |      | V    |    |
| V <sub>OH</sub> | High-level output voltage      | 'LS07    | 30       |     |     | 30                   |     |      | V    |    |
|                 |                                | SN74LS17 |          |     |     | 15                   |     |      |      |    |
| I <sub>OL</sub> | Low-level output current       |          | 30       |     |     | 40                   |     |      | mA   |    |
| T <sub>A</sub>  | Operating free-air temperature |          | −55      |     |     | 0                    |     |      | 70   | °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.

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

| PARAMETER        | TEST CONDITIONS†                               |                                  | SN54LS07 |     | SN74LS07<br>SN74LS17 |     | UNIT |
|------------------|------------------------------------------------|----------------------------------|----------|-----|----------------------|-----|------|
|                  |                                                |                                  | MIN      | MAX | MIN                  | MAX |      |
| V <sub>IK</sub>  | V <sub>CC</sub> = MIN, I <sub>I</sub> = –12 mA |                                  | –1.5     |     | –1.5                 |     | V    |
| I <sub>OH</sub>  | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V   | 'LS07, V <sub>OH</sub> = 30 V    | 0.25     |     | 0.25                 |     | mA   |
|                  |                                                | SN74LS17, V <sub>OH</sub> = 15 V |          |     | 0.25                 |     |      |
| V <sub>OL</sub>  | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V | I <sub>OL</sub> = 16 mA          | 0.4      |     | 0.4                  |     | V    |
|                  |                                                | I <sub>OL</sub> = MAX§           | 0.7      |     | 0.7                  |     |      |
| I <sub>I</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V    |                                  | 1        |     | 1                    |     | mA   |
| I <sub>IH</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V  |                                  | 20       |     | 20                   |     | µA   |
| I <sub>IL</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V  |                                  | –0.2     |     | –0.2                 |     | mA   |
| I <sub>CCH</sub> | V <sub>CC</sub> = MAX                          |                                  | 14       |     | 14                   |     | mA   |
| I <sub>CCL</sub> | V <sub>CC</sub> = MAX                          |                                  | 45       |     | 45                   |     | mA   |

† For conditions shown as MIN or MAX, use the appropriate value specified under *recommended operating conditions*.

§ I<sub>OL</sub> = 30 mA for SN54 series parts and 40 mA for SN74 series parts.

switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see Figure 1)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS         |                        | MIN | TYP | MAX | UNIT |
|------------------|-----------------|----------------|-------------------------|------------------------|-----|-----|-----|------|
| t <sub>PLH</sub> | A               | Y              | R <sub>L</sub> = 110 Ω, | C <sub>L</sub> = 15 pF |     | 6   | 10  | ns   |
| t <sub>PHL</sub> |                 |                |                         |                        |     | 19  | 30  |      |

# SN54LS07, SN74LS07, SN74LS17

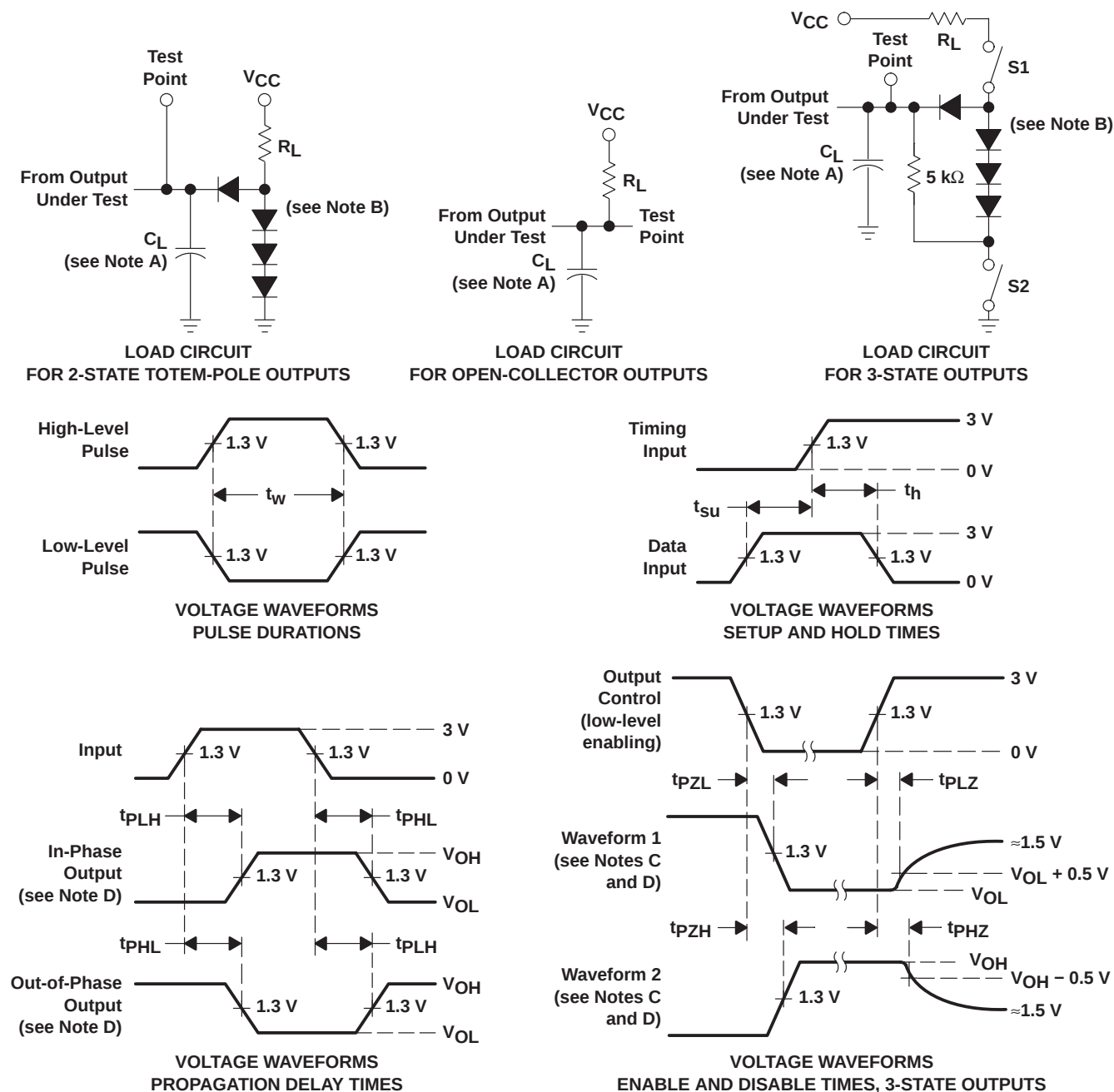
## HEX BUFFERS/DRIVERS

### WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS021C – MAY 1990 – REVISED FEBRUARY 2004

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#### PARAMETER MEASUREMENT INFORMATION



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - All diodes are 1N3064 or equivalent.
  - 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.
  - S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PLZ}$ ; S1 is open and S2 is closed for  $t_{PZH}$ ; S1 is closed and S2 is open for  $t_{PZL}$ .
  - Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ,  $t_r \leq 1.5$  ns,  $t_f \leq 2.6$  ns.
  - The outputs are measured one at a time, with one input transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

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**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> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LS07D        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DBLE     | OBSOLETE              | SSOP         | DB              | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS07DBR      | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DBRE4    | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DBRG4    | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DE4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DG4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DRE4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07DRG4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS07NE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS07NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07NSRE4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS07NSRG4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS17D        | OBSOLETE              | SOIC         | D               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS17N        | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |

<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.

**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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**TAPE AND REEL INFORMATION**



\*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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS07DBR | SSOP         | DB              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LS07DR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LS07NSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



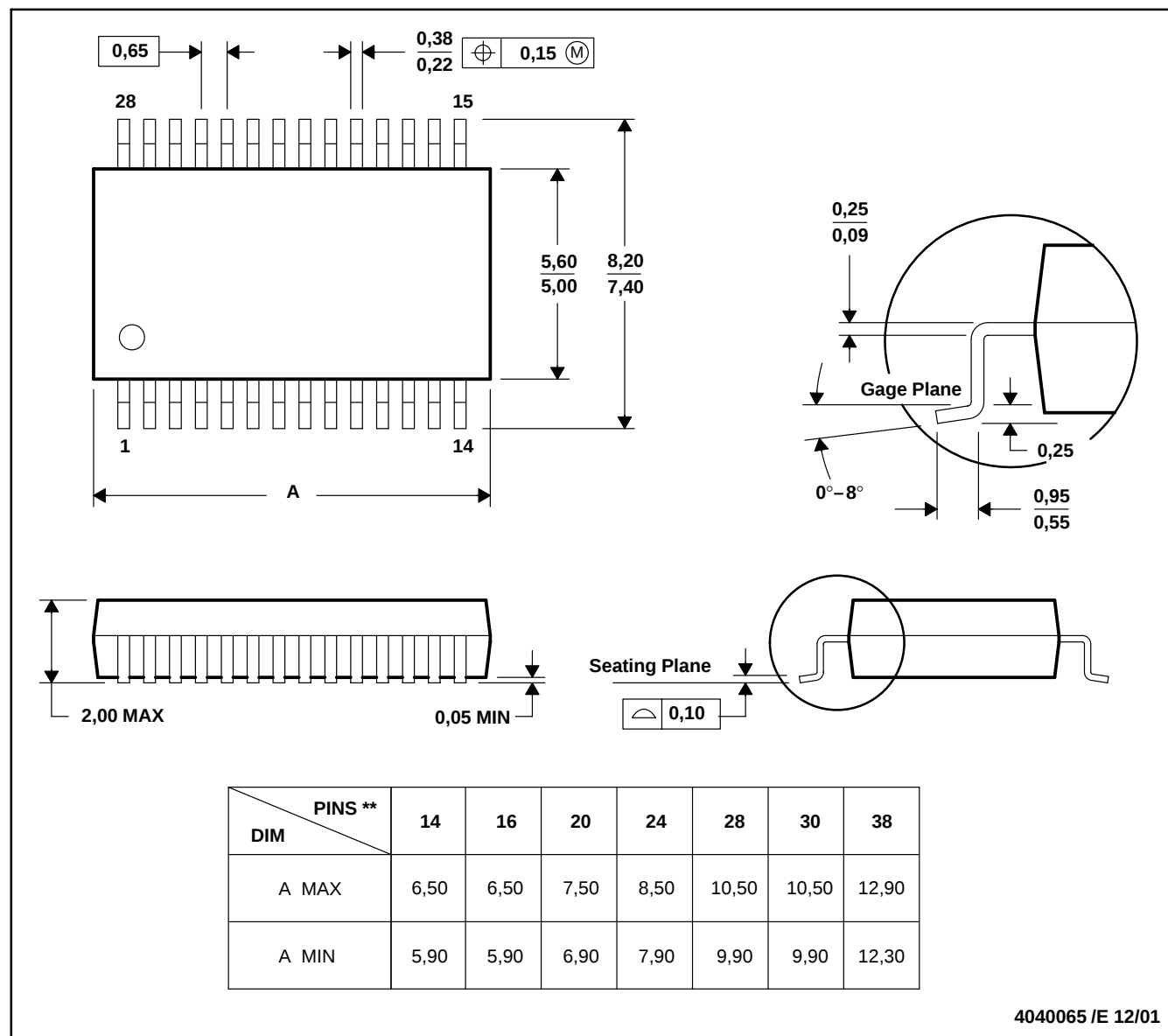
\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS07DBR | SSOP         | DB              | 14   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LS07DR  | SOIC         | D               | 14   | 2500 | 346.0       | 346.0      | 33.0        |
| SN74LS07NSR | SO           | NS              | 14   | 2000 | 346.0       | 346.0      | 33.0        |

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

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



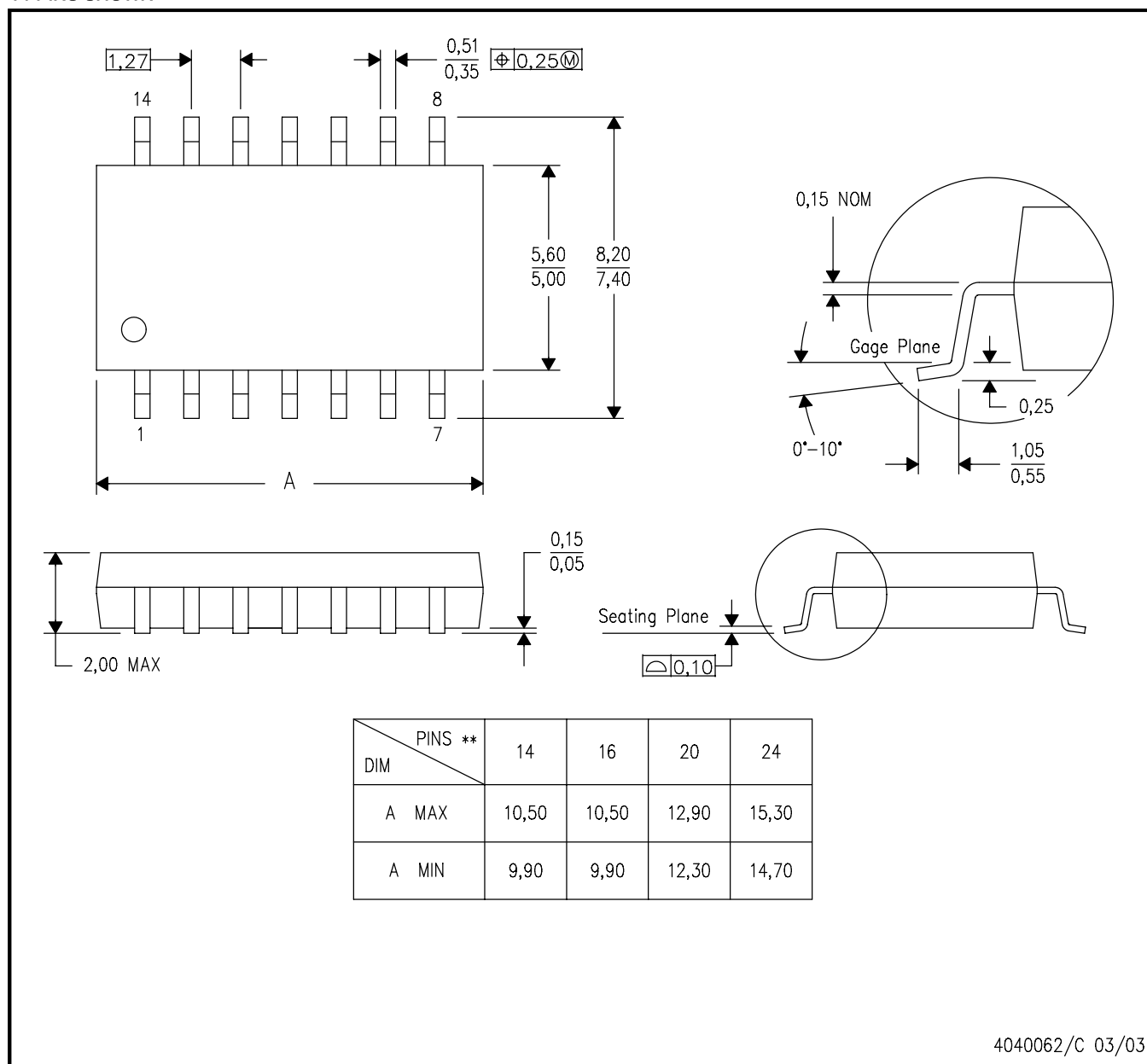
- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

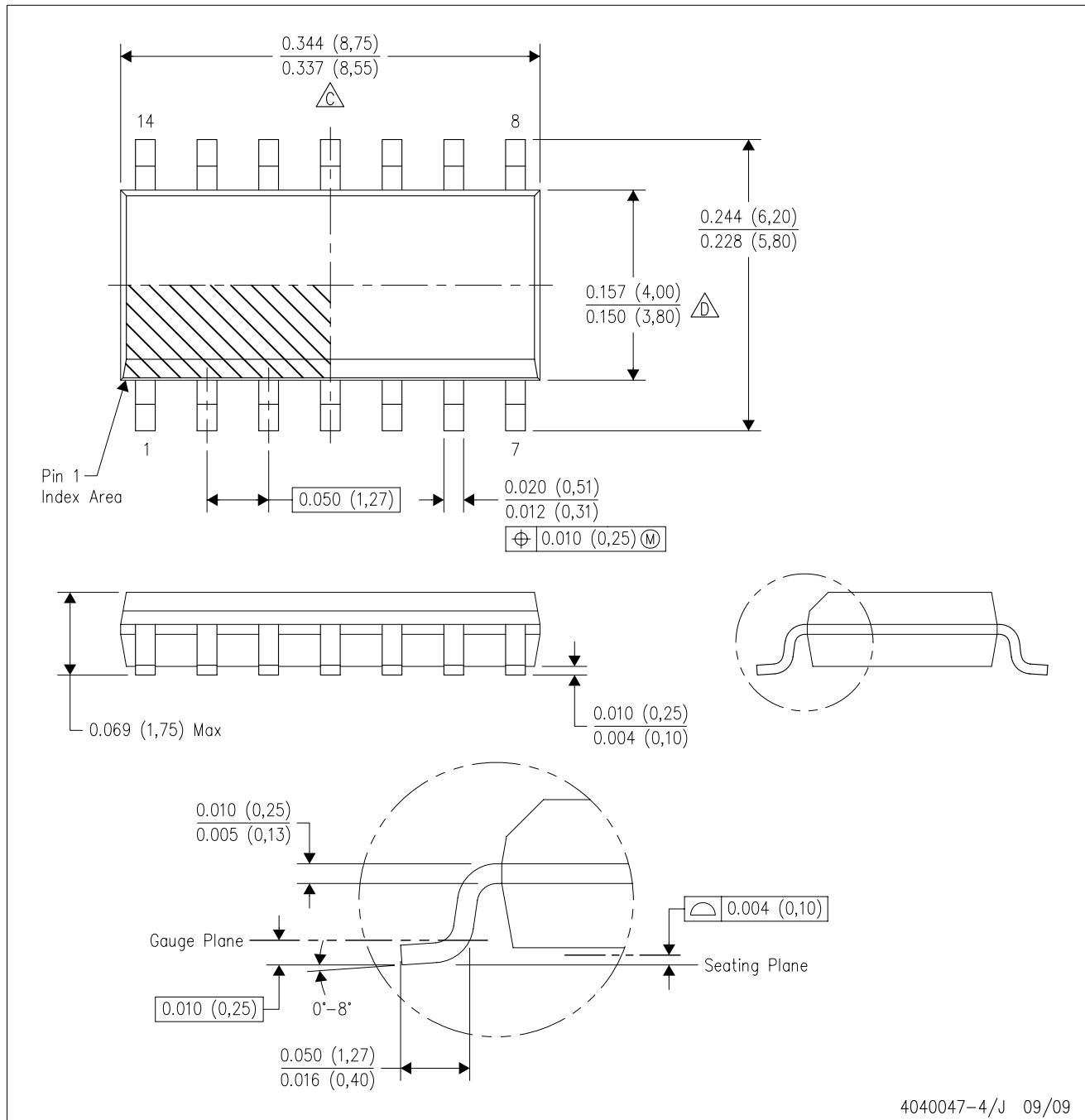
14-PINS SHOWN



- 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.

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



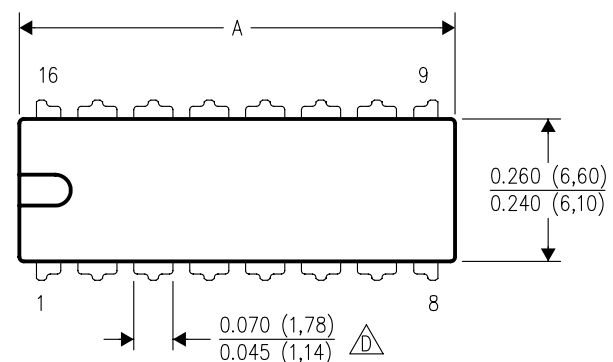
4040047-4/J 09/09

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. 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.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AB.

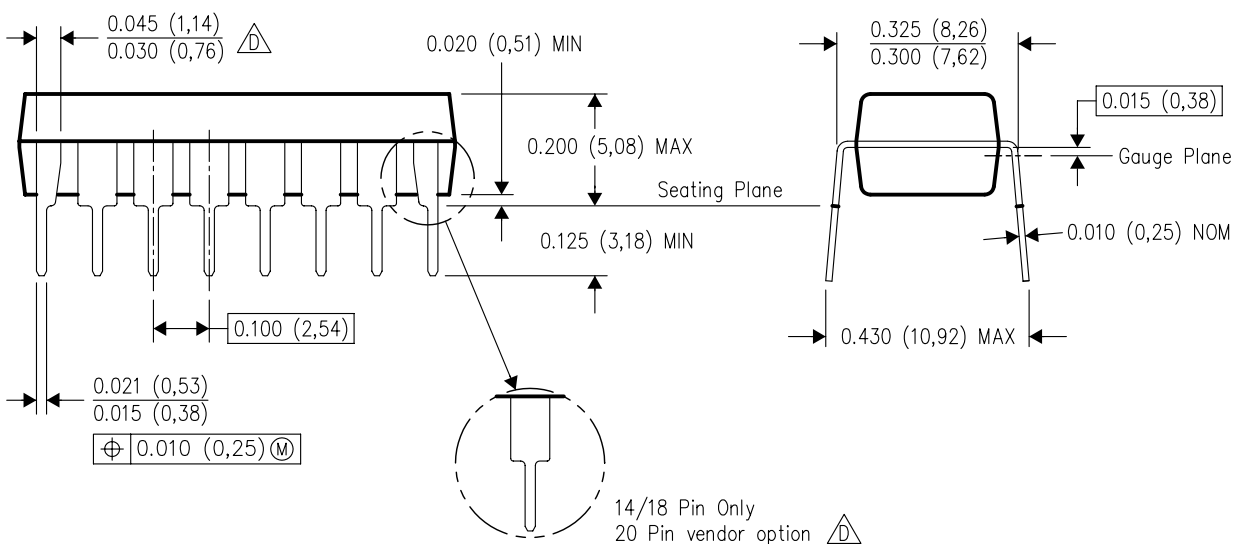
## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - D. The 20 pin end lead shoulder width is a vendor option, either half or full width.