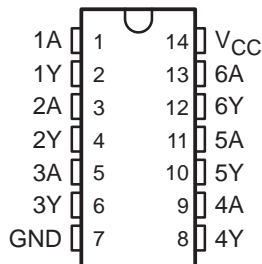


SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

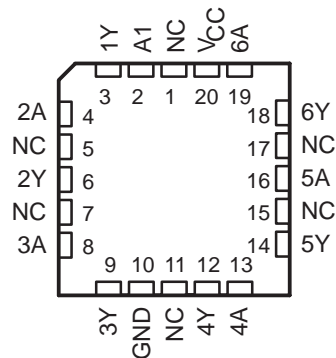
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- 2-V to 6-V V_{CC} Operation
- Inputs Accept Voltages to 6 V
- Max t_{pd} of 9.5 ns at 5 V

SN54AC14 ... J OR W PACKAGE
SN74AC14 ... D, DB, N, NS, OR PW PACKAGE
(TOP VIEW)



SN54AC14 ... FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

These Schmitt-trigger devices contain six independent inverters. They perform the Boolean function $Y = \bar{A}$. Because of the Schmitt action, they have different input threshold levels for positive-going (V_{T+}) and for negative-going (V_{T-}) signals.

These circuits are temperature compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals. They also have a greater noise margin than conventional inverters.

ORDERING INFORMATION

| T_A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------|---------------|-----------------------|------------------|
| -40°C to 85°C | PDIP – N | Tube | SN74AC14N | SN74AC14N |
| | SOIC – D | Tube | SN74AC14D | AC14 |
| | | Tape and reel | SN74AC14DR | |
| | SOP – NS | Tape and reel | SN74AC14NSR | AC14 |
| | SSOP – DB | Tape and reel | SN74AC14DBR | AC14 |
| | TSSOP – PW | Tube | SN74AC14PW | AC14 |
| | | Tape and reel | SN74AC14PWR | |
| -55°C to 125°C | CDIP – J | Tube | SNJ54AC14J | SNJ54AC14J |
| | CFP – W | Tube | SNJ54AC14W | SNJ54AC14W |
| | LCCC – FK | Tube | SNJ54AC14FK | SNJ54AC14FK |

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



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 **TEXAS
INSTRUMENTS**

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SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

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FUNCTION TABLE
(each inverter)

| INPUT A | OUTPUT Y |
|------------|-------------|
| H | L |
| L | H |

logic diagram, each inverter (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 $V_{CC} + 0.5$ V |
| Output voltage range, V_O (see Note 1) | -0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) | ±20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ±20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±50 mA |
| Continuous current through V_{CC} or GND | ±200 mA |
| Package thermal impedance, θ_{JA} (see Note 2): | |
| D package | 86°C/W |
| DB package | 96°C/W |
| N package | 80°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.

recommended operating conditions (see Note 3)

| | | SN54AC14 | | SN74AC14 | | UNIT |
|----------|--------------------------------|------------------|----------|----------|----------|------|
| | | MIN | MAX | MIN | MAX | |
| V_{CC} | Supply voltage | 2 | 6 | 2 | 6 | V |
| V_I | Input voltage | 0 | V_{CC} | 0 | V_{CC} | V |
| V_O | Output voltage | 0 | V_{CC} | 0 | V_{CC} | V |
| I_{OH} | High-level output current | $V_{CC} = 3$ V | | -12 | -12 | mA |
| | | $V_{CC} = 4.5$ V | | -24 | -24 | |
| | | $V_{CC} = 5.5$ V | | -24 | -24 | |
| I_{OL} | Low-level output current | $V_{CC} = 3$ V | | 12 | 12 | mA |
| | | $V_{CC} = 4.5$ V | | 24 | 24 | |
| | | $V_{CC} = 5.5$ V | | 24 | 24 | |
| T_A | Operating free-air temperature | -55 | 125 | -40 | 85 | °C |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | SN54AC14 | | SN74AC14 | | UNIT |
|---|---|-----------------|-----------------------|-----|------|----------|------|----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{T+} Positive-going threshold | | 3 V | 0.8 | 1.8 | 2.2 | 0.8 | 2.2 | 0.8 | 2.2 | V |
| | | 4.5 V | 1.5 | 2.6 | 3.2 | 1.5 | 3.2 | 1.5 | 3.2 | |
| | | 5.5 V | 1.6 | 3.2 | 3.9 | 1.6 | 3.9 | 1.6 | 3.9 | |
| V _{T-} Negative-going threshold | | 3 V | 0.5 | 0.8 | 1 | 0.5 | 1 | 0.5 | 1 | V |
| | | 4.5 V | 0.9 | 1.4 | 1.8 | 0.9 | 1.8 | 0.9 | 1.8 | |
| | | 5.5 V | 1.1 | 1.8 | 2.3 | 1.1 | 2.3 | 1.1 | 2.3 | |
| ΔV _T Hysteresis (V _{T+} - V _{T-}) | | 3 V | 0.3 | 1 | 1.2 | 0.3 | 1.2 | 0.3 | 1.2 | V |
| | | 4.5 V | 0.4 | 1.2 | 1.4 | 0.4 | 1.4 | 0.4 | 1.4 | |
| | | 5.5 V | 0.5 | 1.4 | 1.6 | 0.5 | 1.6 | 0.5 | 1.6 | |
| V _{OH} | I _{OH} = -50 μA | 3 V | 2.9 | | | 2.9 | | 2.9 | | V |
| | | 4.5 V | 4.4 | | | 4.4 | | 4.4 | | |
| | | 5.5 V | 5.4 | | | 5.4 | | 5.4 | | |
| | I _{OH} = -12 mA | 3 V | 2.56 | | | 2.4 | | 2.48 | | |
| | | 4.5 V | 3.86 | | | 3.7 | | 3.8 | | |
| | I _{OH} = -24 mA | 4.5 V | 3.86 | | | 3.7 | | 3.8 | | |
| | | 5.5 V | 4.86 | | | 4.7 | | 4.8 | | |
| I _{OH} = -50 mA [†] | 5.5 V | | | | 3.85 | | | | | |
| I _{OH} = -75 mA [†] | 5.5 V | | | | | | 3.85 | | | |
| V _{OL} | I _{OL} = 50 μA | 3 V | 0.002 | | 0.1 | 0.1 | | 0.1 | | V |
| | | 4.5 V | 0.001 | | 0.1 | 0.1 | | 0.1 | | |
| | | 5.5 V | 0.001 | | 0.1 | 0.1 | | 0.1 | | |
| | I _{OL} = 12 mA | 3 V | | | | 0.36 | | 0.5 | | |
| | | 4.5 V | | | | 0.36 | | 0.5 | | |
| | I _{OL} = 24 mA | 4.5 V | | | | 0.36 | | 0.5 | | |
| | | 5.5 V | | | | 0.36 | | 0.5 | | |
| I _{OL} = 50 mA [†] | 5.5 V | | | | | | 1.65 | | | |
| I _{OL} = 75 mA [†] | 5.5 V | | | | | | 1.65 | | | |
| I _I | V _I = V _{CC} or GND | 5.5 V | ±0.1 | | | ±1 | | ±1 | | μA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | 2 | | | 40 | | 20 | | μA |
| C _i | V _I = V _{CC} or GND | 5 V | 4.5 | | | | | | | pF |

[†] Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | T _A = 25°C | | | SN54AC14 | | SN74AC14 | | UNIT |
|------------------|-----------------|----------------|-----------------------|-----|------|----------|-----|----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} | A | Y | 1.5 | 6 | 13.5 | 1 | 16 | 1.5 | 15 | ns |
| t _{PHL} | | | 1.5 | 6 | 11.5 | 1 | 14 | 1.5 | 13 | |



SN54AC14, SN74AC14 HEX SCHMITT-TRIGGER INVERTERS

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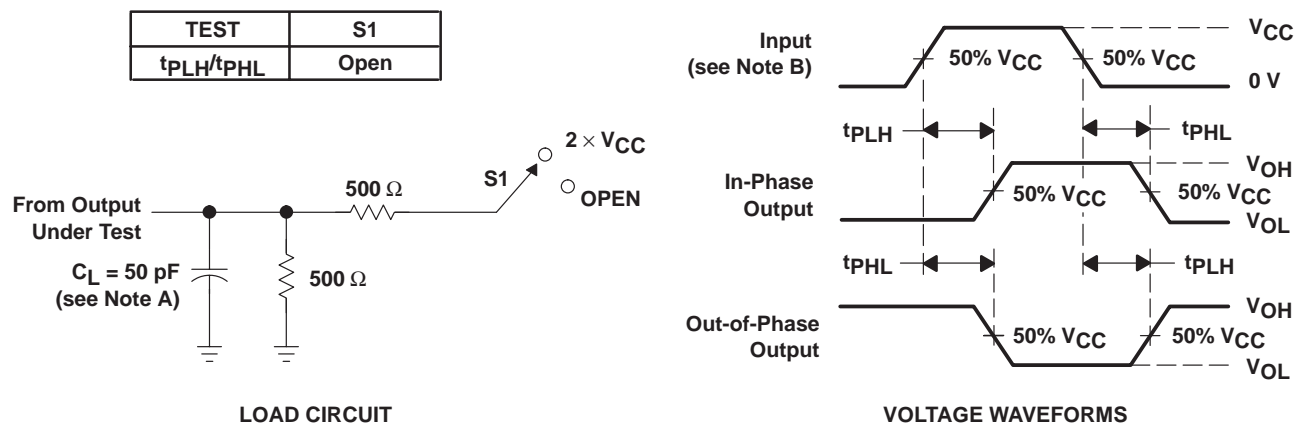
switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A = 25^\circ\text{C}$ | | | SN54AC14 | | SN74AC14 | | UNIT |
|-----------|--------------|-------------|--------------------------|-----|-----|----------|-----|----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | Y | 1.5 | 5 | 10 | 1.5 | 12 | 1.5 | 11 | ns |
| t_{PHL} | | | 1.5 | 5 | 8.5 | 1.5 | 10 | 1.5 | 9.5 | |

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|---|-----|------|
| C_{pd} Power dissipation capacitance | $C_L = 50\text{ pF}$, $f = 1\text{ MHz}$ | 25 | pF |

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |



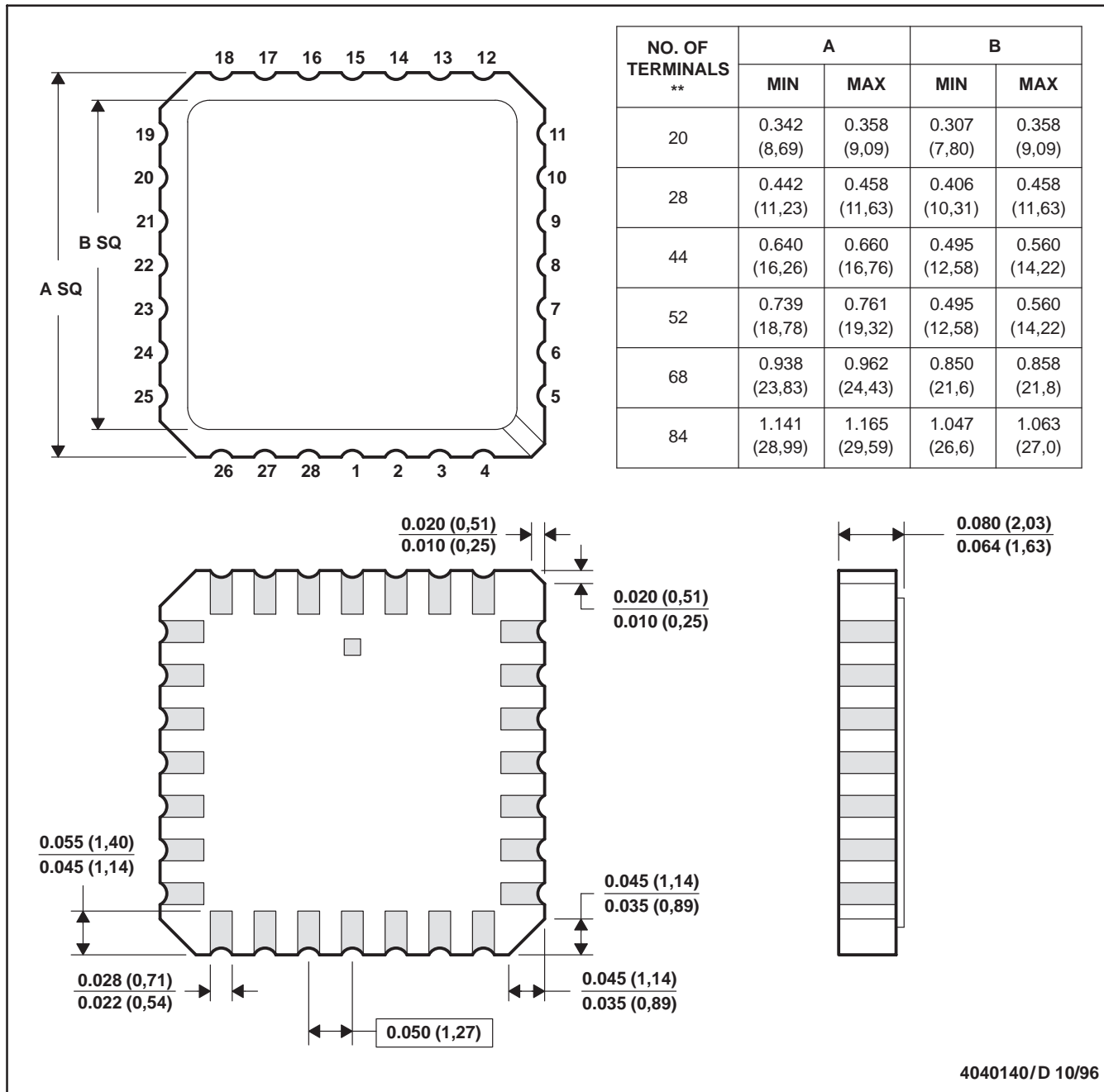
4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

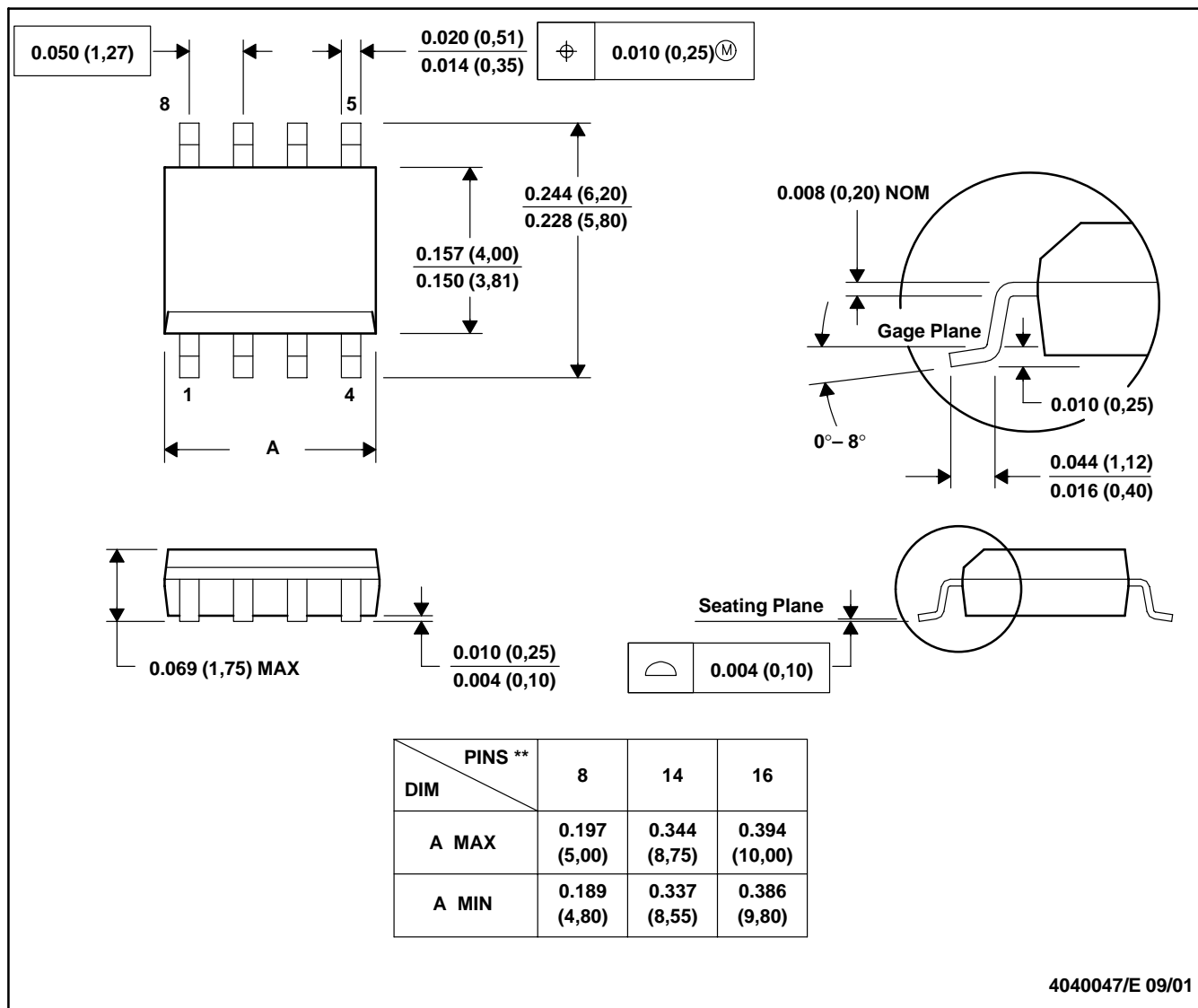


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



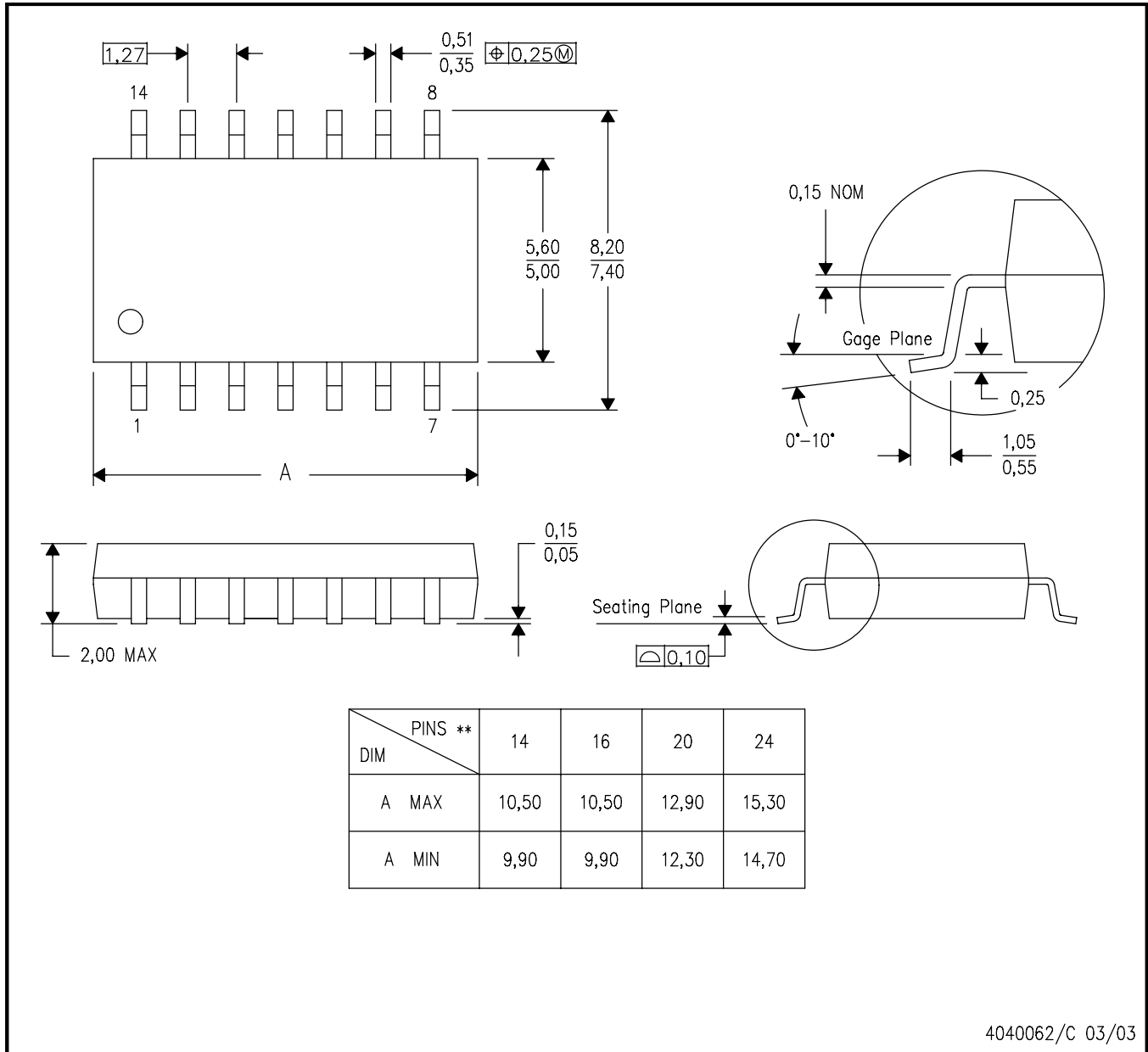
- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
 D. Falls within JEDEC MS-012

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.
 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

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