



Distributor of Texas Instruments: Excellent Integrated System Limited

Datasheet of CD4503BE - IC BUFF TRI-ST HEX N-INV 16DIP

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Data sheet acquired from Harris Semiconductor
 SCHS068C - Revised October 2003

CMOS Hex Buffer

High-Voltage Types (20-Volt Rating)

3-State Non-Inverting Type

■ CD4503B is a hex noninverting buffer with 3-state outputs having high sink- and source-current capability. Two disable controls are provided, one of which controls four buffers and the other controls the remaining two buffers.

The CD4503B types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline packages (M, M96, MT, and NSR suffixes), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

Features:

- 1 TTL-load output drive capability
- 2 output-disable controls
- 3-state outputs
- Pin compatible with industry types MM80C97, MC14503, and 340097
- 5-V, 10-V, and 15-V parametric ratings
- Maximum input current of 1 μ A at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

Applications:

- 3-state hex buffer for interfacing IC's with data buses
- CMOS to TTL hex buffer

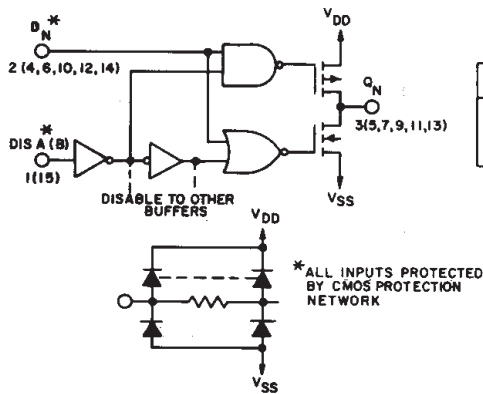
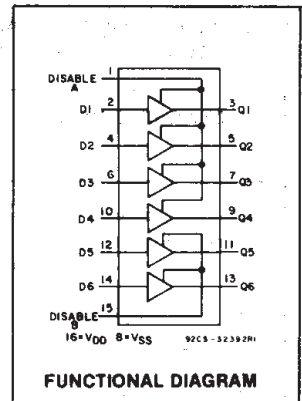


Fig. 1—Logic diagram of 1 to 6 identical buffers.

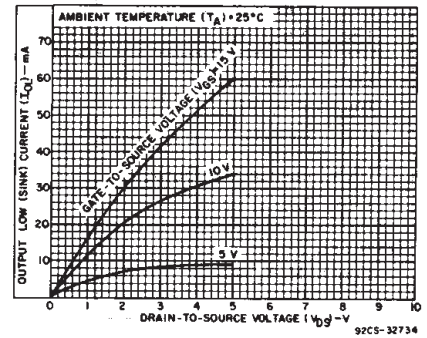


Fig. 2—Typical n-channel output low (sink) current characteristics.

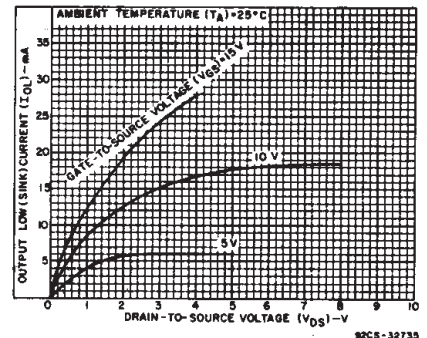
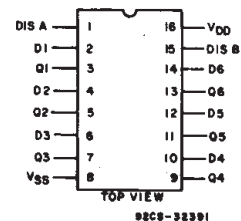


Fig. 3—Minimum n-channel output low (sink) current characteristics.

MAXIMUM RATINGS, Absolute-Maximum Values:

- DC SUPPLY-VOLTAGE RANGE, (V_{DD})
 Voltages referenced to V_{SS} Terminal -0.5V to +20V
- INPUT VOLTAGE RANGE, ALL INPUTS -0.5V to V_{DD} + 0.5V
- DC INPUT CURRENT, ANY ONE INPUT \pm 10mA
- POWER DISSIPATION PER PACKAGE (P_D):
 For T_A = -55°C to +100°C 500mW
 For T_A = +100°C to +125°C Derate Linearly at 12mW/°C to 200mW
- DEVICE DISSIPATION PER OUTPUT TRANSISTOR
 FOR T_A = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) 100mW
- OPERATING-TEMPERATURE RANGE (T_A) -55°C to +125°C
- STORAGE TEMPERATURE RANGE (T_{stg}) -65°C to +150°C
- LEAD TEMPERATURE (DURING SOLDERING):
 At distance 1/16 \pm 1/32 inch (1.59 \pm 0.79mm) from case for 10s max +265°C



TERMINAL ASSIGNMENT

CD4503B Types

STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC | CONDITIONS | | | LIMITS AT INDICATED TEMPERATURES (°C) | | | | | | | UNITS |
|---|--------------------|---------------------|---------------------|---------------------------------------|-------|------|------|-------|-------------------|------|-------|
| | V _O (V) | V _{IN} (V) | V _{DD} (V) | -55 | -40 | +85 | +125 | +25 | | | |
| | | | | | | | | Min. | Typ. | Max. | |
| Quiescent Device Current, I _{DD} Max. | — | 0,5 | 5 | 1 | 1 | 30 | 30 | — | 0.02 | 1 | μA |
| | — | 0,10 | 10 | 2 | 2 | 60 | 60 | — | 0.02 | 2 | |
| Output Low (Sink) Current I _{OL} Min. | 0.4 | 0 | 5 | 2.6 | 2.5 | 1.4 | 1.3 | 2.1 | 2.3 | — | mA |
| | 0.5 | 0 | 10 | 6.5 | 6.4 | 3.9 | 3.8 | 5.5 | 6.2 | — | |
| Output High (Source) Current, I _{OH} Min. | 1.5 | 0 | 15 | 19.2 | 18.9 | 11.4 | 11.2 | 16.1 | 23 | — | mA |
| | 4.6 | 5 | 5 | -1.2 | -1.16 | -0.7 | -0.7 | -1.02 | -1.9 | — | |
| Output Voltage: Low-Level, V _{OL} Max. | — | 0,5 | 5 | 0.05 | | | | — | 0 | 0.05 | V |
| | — | 0,10 | 10 | 0.05 | | | | — | 0 | 0.05 | |
| Output Voltage: High-Level, V _{OH} Min. | — | 0,5 | 5 | 4.95 | | | | 4.95 | 5 | — | V |
| | — | 0,10 | 10 | 9.95 | | | | 9.95 | 10 | — | |
| Input Low Voltage, V _{IL} Max. | 0.5,4.5 | — | 5 | 1.5 | | | | — | — | 1.5 | V |
| | 1,9 | — | 10 | 3 | | | | — | — | 3 | |
| Input High Voltage, V _{IH} Min. | 0.5,4.5 | — | 5 | 3.5 | | | | 3.5 | — | — | V |
| | 1,9 | — | 10 | 7 | | | | 7 | — | — | |
| Input Current I _{IN} Max. | — | 0,18 | 18 | ±0.1 | ±0.1 | ±1 | ±1 | — | ±10 ⁻⁵ | ±0.1 | μA |
| 3-State Output Leakage Current, I _{OUT} Max. | 0,18 | 0,18 | 18 | ±0.4 | ±0.4 | ±12 | ±12 | — | ±10 ⁻⁴ | ±0.4 | μA |

RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC | LIMITS | | UNITS |
|--|--------|------|-------|
| | Min. | Max. | |
| Supply-Voltage Range (For T _A = Full Package-Temperature Range) | 3 | 18 | V |

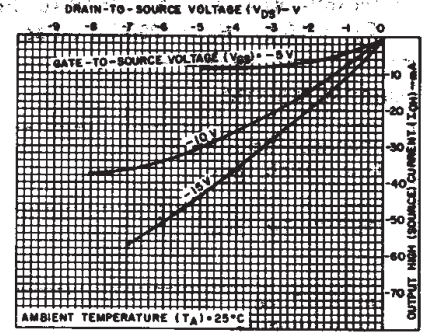


Fig. 4—Typical p-channel output high (source) current characteristics.

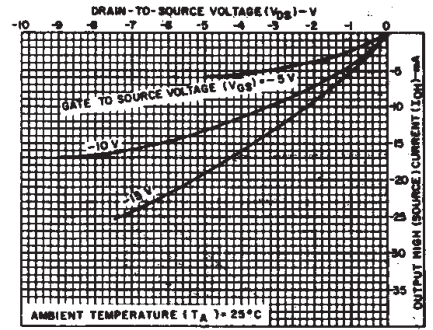


Fig. 5—Minimum p-channel output high (source) current characteristics.

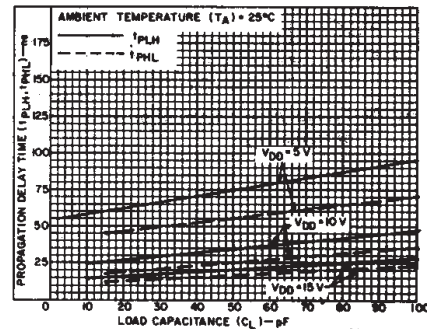


Fig. 6—Typical propagation delay time as a function of load capacitance.

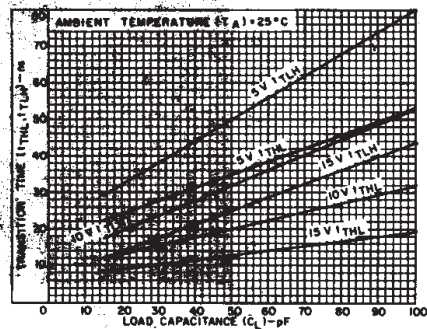


Fig. 7—Typical transition time as a function of load capacitance.

3
COMMERCIAL CMOS
HIGH VOLTAGE ICs

CD4503B Types

DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$; input $t_r, t_f = 20\text{ ns}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}\Omega$ unless otherwise specified.

| CHARACTERISTIC | V_{DD} (V) | LIMITS | | UNITS |
|--|--------------|--------|------|-------|
| | | Typ. | Max. | |
| Propagation Delay Time: Low-to-High, t_{PLH} | 5 | 75 | 150 | ns |
| | 10 | 35 | 70 | |
| | 15 | 25 | 50 | |
| High-to-Low, t_{PHL} | 5 | 55 | 110 | ns |
| | 10 | 25 | 50 | |
| | 15 | 17 | 35 | |
| Transition Time: Low-to-High, t_{TLH} | 5 | 50 | 90 | ns |
| | 10 | 30 | 45 | |
| | 15 | 25 | 35 | |
| High-to-Low, t_{THL} | 5 | 35 | 70 | ns |
| | 10 | 20 | 40 | |
| | 15 | 13 | 25 | |
| 3-State Propagation Delay Time: $R_L = 1\text{ k}\Omega$ t_{PHZ}, t_{PZH} | 5 | 70 | 140 | ns |
| | 10 | 30 | 60 | |
| | 15 | 25 | 50 | |
| t_{PZL}, t_{PLZ} | 5 | 90 | 180 | ns |
| | 10 | 40 | 80 | |
| | 15 | 35 | 70 | |

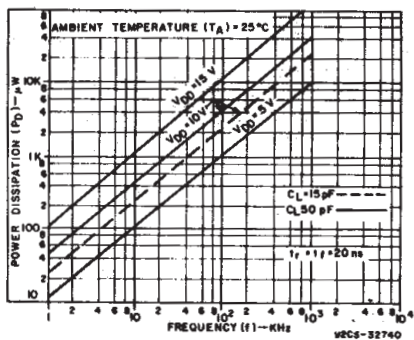


Fig. 8—Typical power dissipation as a function of frequency.

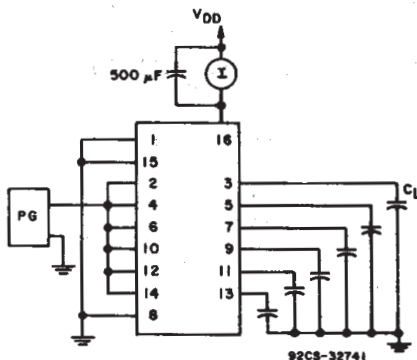


Fig. 9—Dynamic power dissipation test circuit.

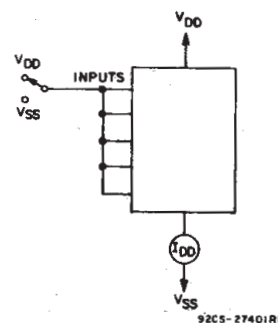


Fig. 10—Quiescent device current test circuit.

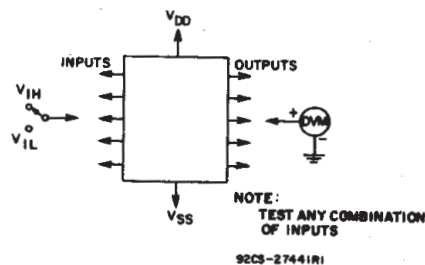


Fig. 11—Input voltage test circuit.

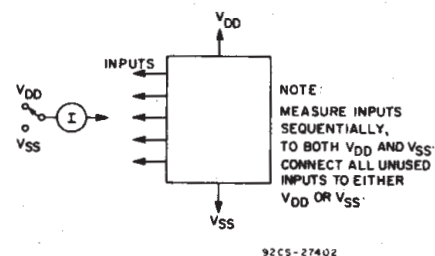
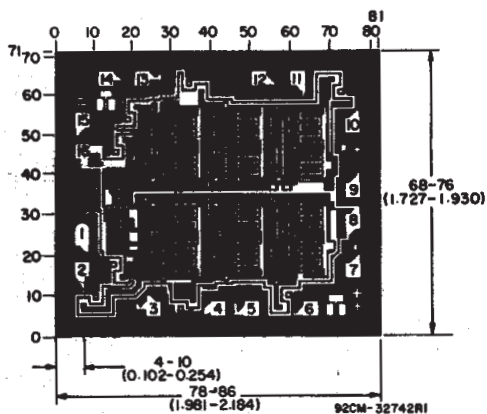


Fig. 12—Input current test circuit.



Dimensions and pad layout for CD4503BH

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10^{-3} inch).

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4503BE | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -55 to 125 | CD4503BE | Samples |
| CD4503BEE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -55 to 125 | CD4503BE | Samples |
| CD4503BF | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | CD4503BF | Samples |
| CD4503BF3A | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | CD4503BF3A | Samples |
| CD4503BM | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4503BM | Samples |
| CD4503BM96 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4503BM | Samples |
| CD4503BNSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4503B | Samples |
| CD4503BPW | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CM503B | Samples |
| CD4503BPWE4 | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CM503B | Samples |

(1) 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.

(2) 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)

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



⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF CD4503B, CD4503B-MIL :

● Catalog: [CD4503B](#)

● Military: [CD4503B-MIL](#)

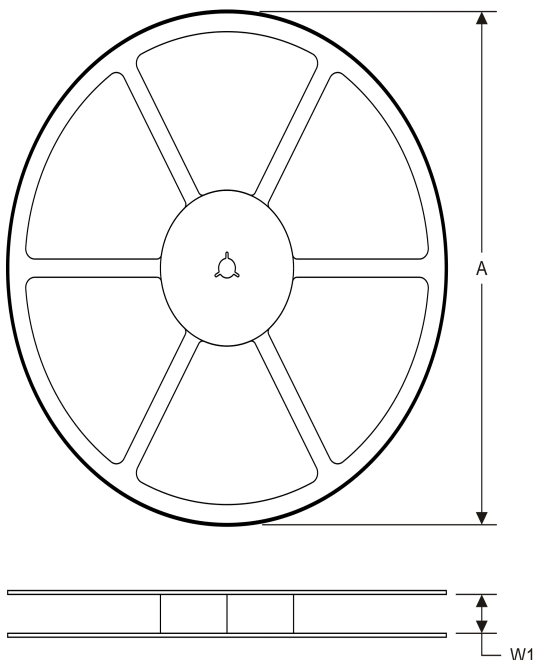
NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

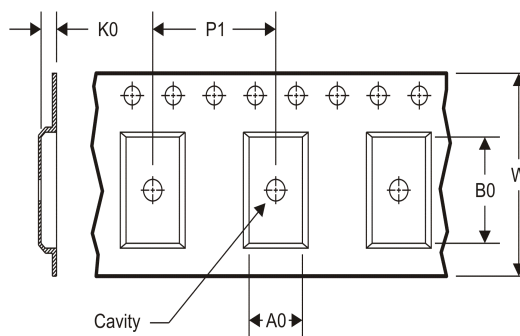
● Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



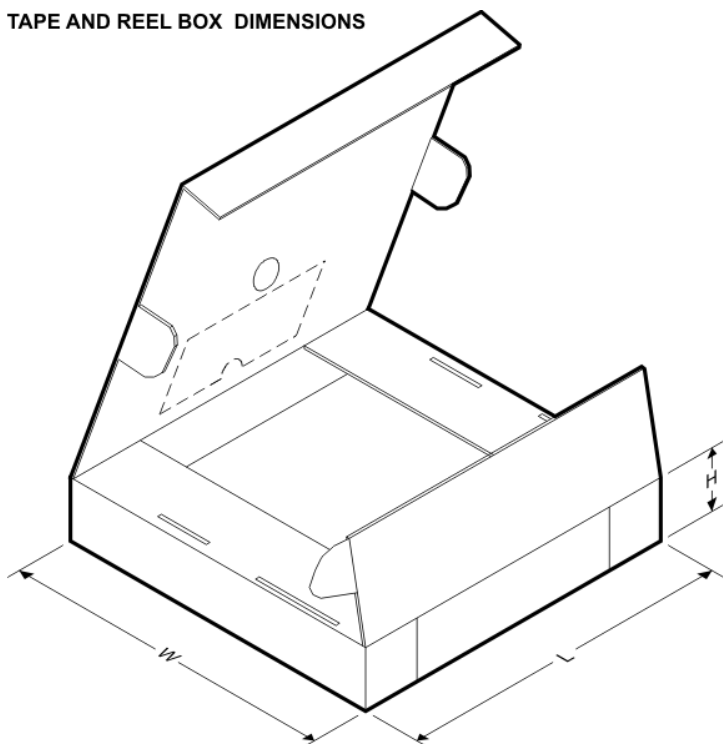
| | |
|----|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

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 |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4503BM96 | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4503BNSR | SO | NS | 16 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



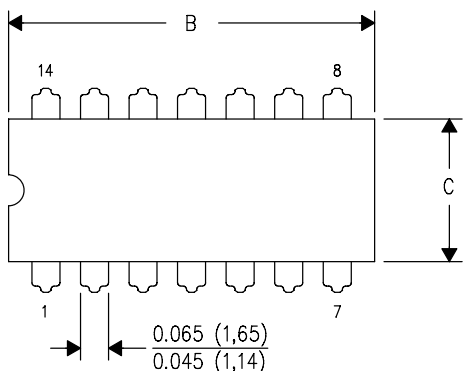
*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4503BM96 | SOIC | D | 16 | 2500 | 333.2 | 345.9 | 28.6 |
| CD4503BNSR | SO | NS | 16 | 2000 | 367.0 | 367.0 | 38.0 |

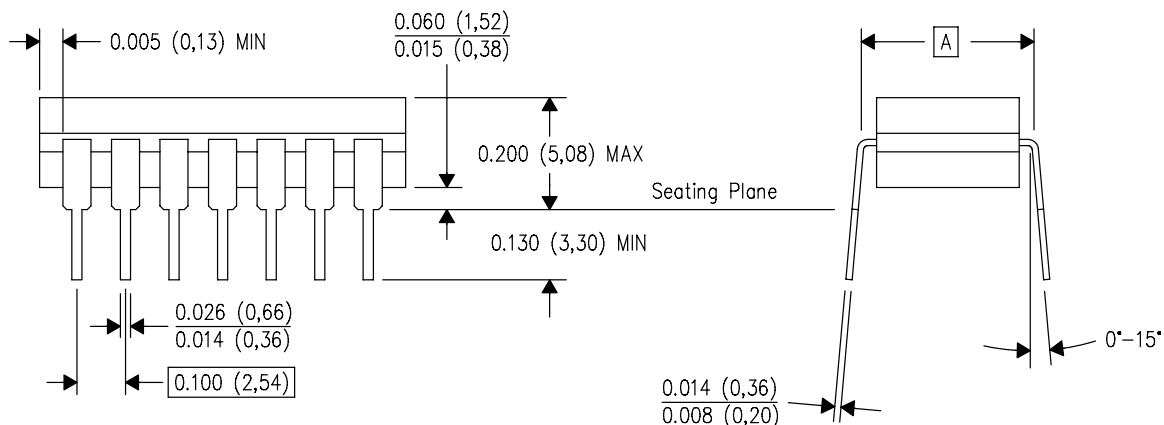
J (R-GDIP-T**)

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

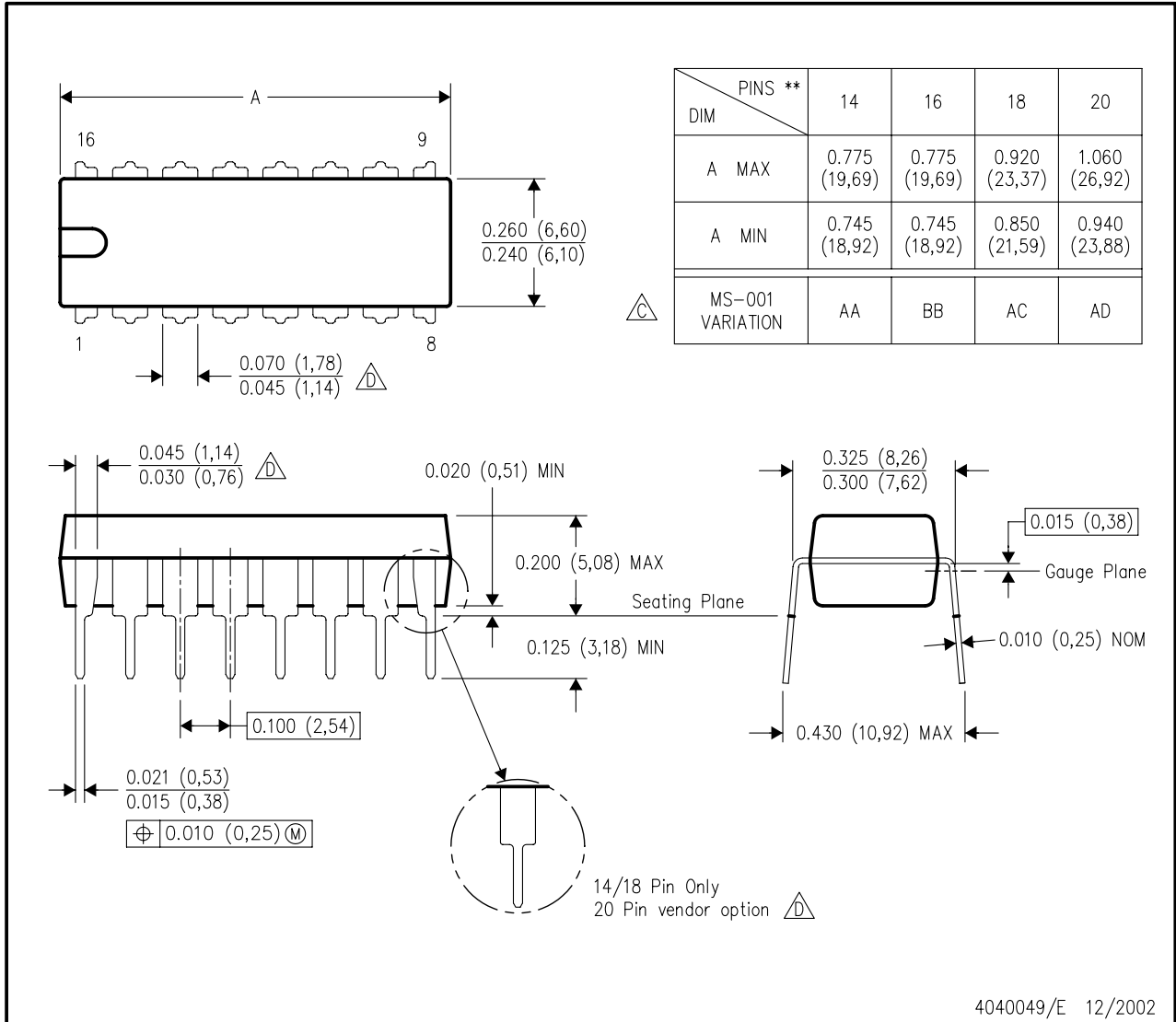
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal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

MECHANICAL DATA

N (R-PDIP-T)**

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



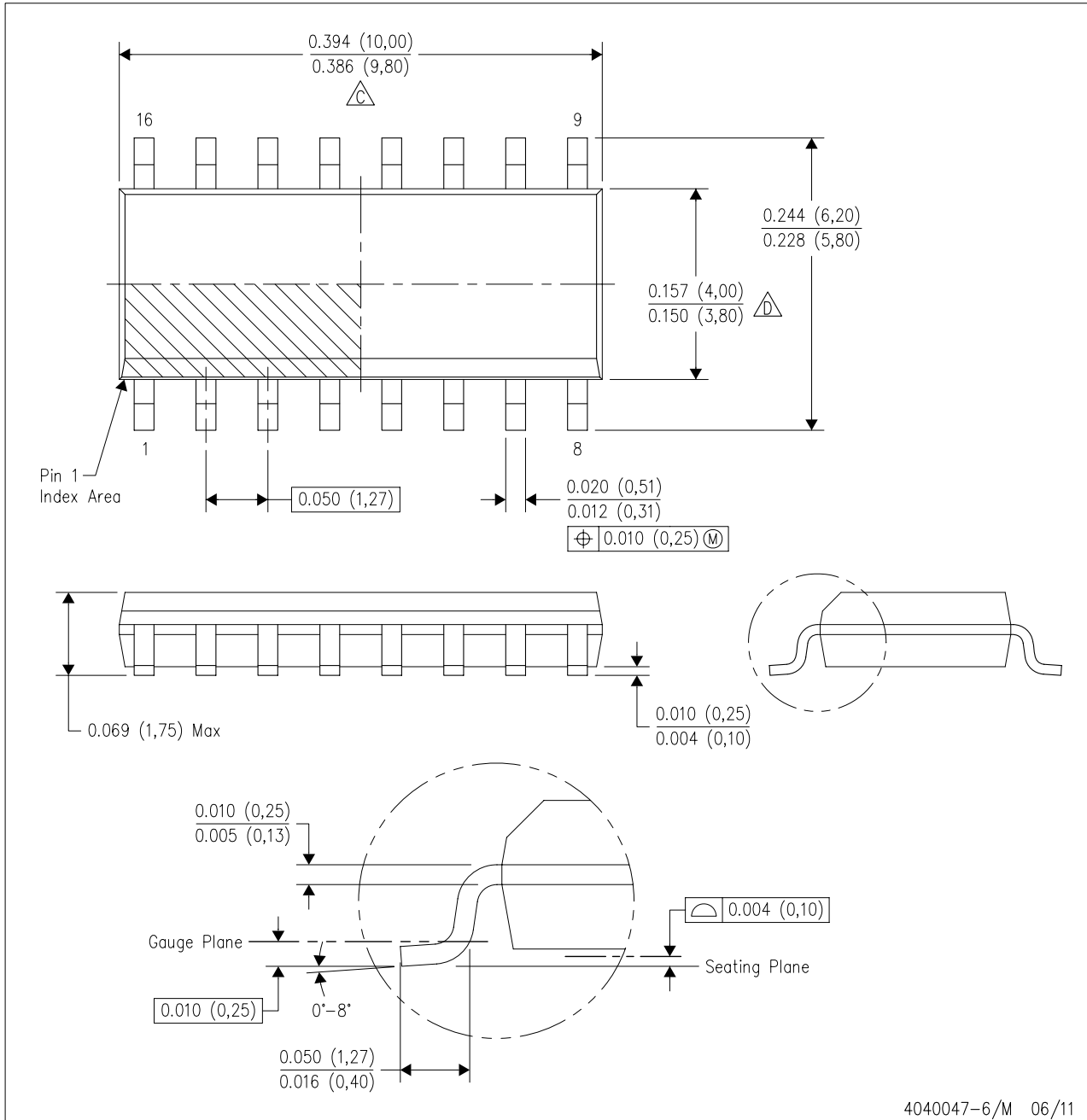
4040049/E 12/2002

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

MECHANICAL DATA

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE

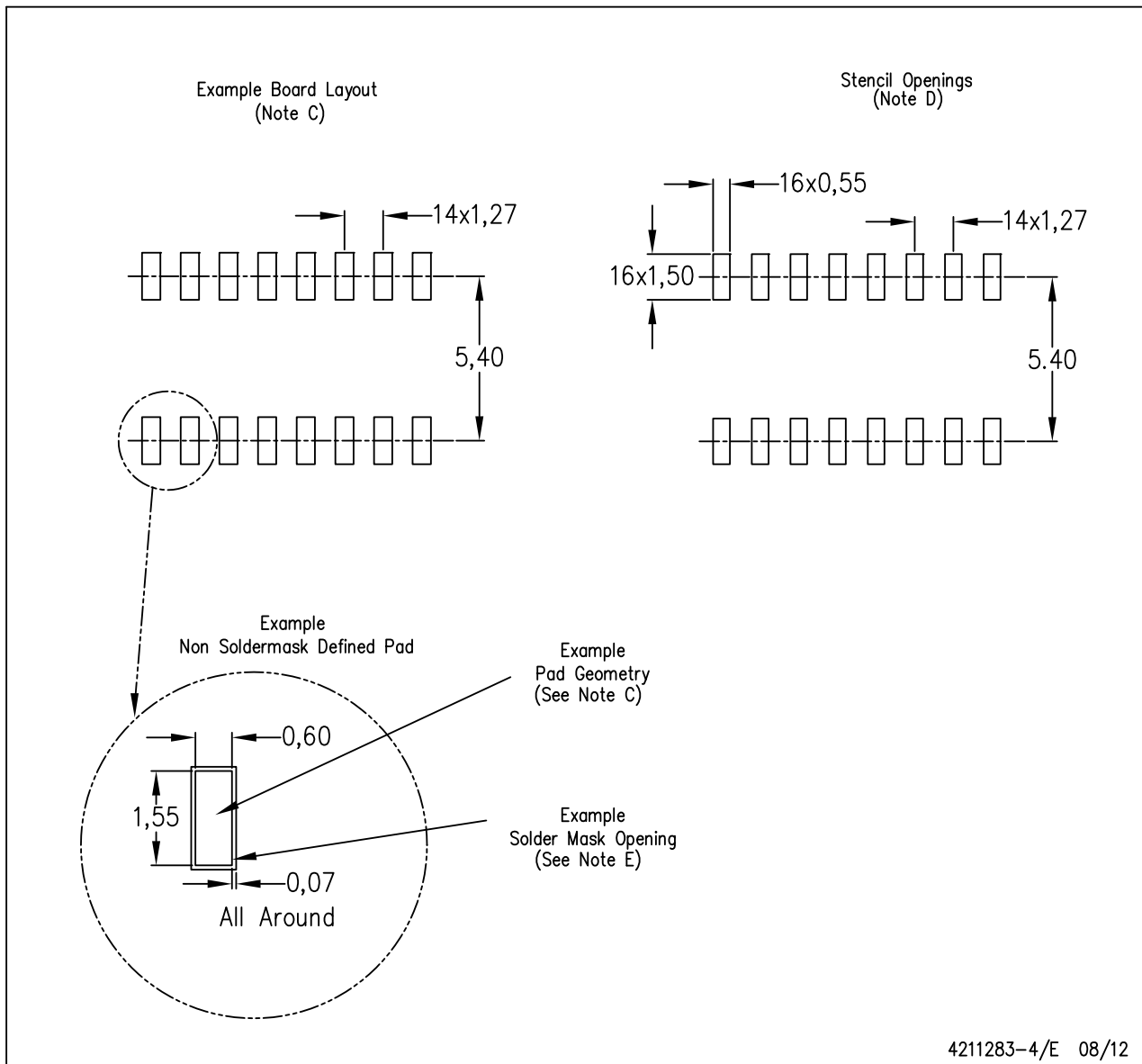


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AC.

LAND PATTERN DATA

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE

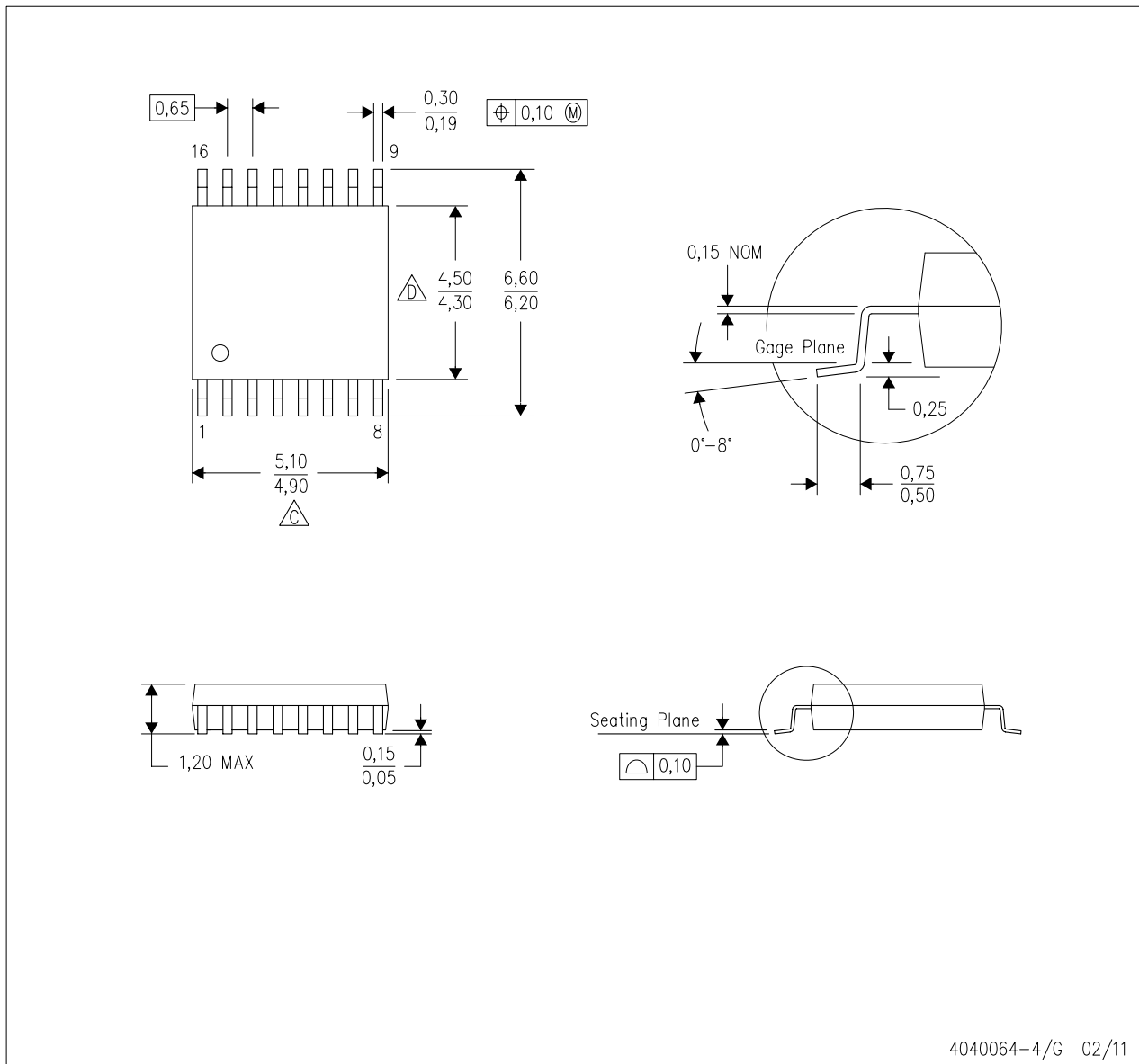


- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



MECHANICAL DATA

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



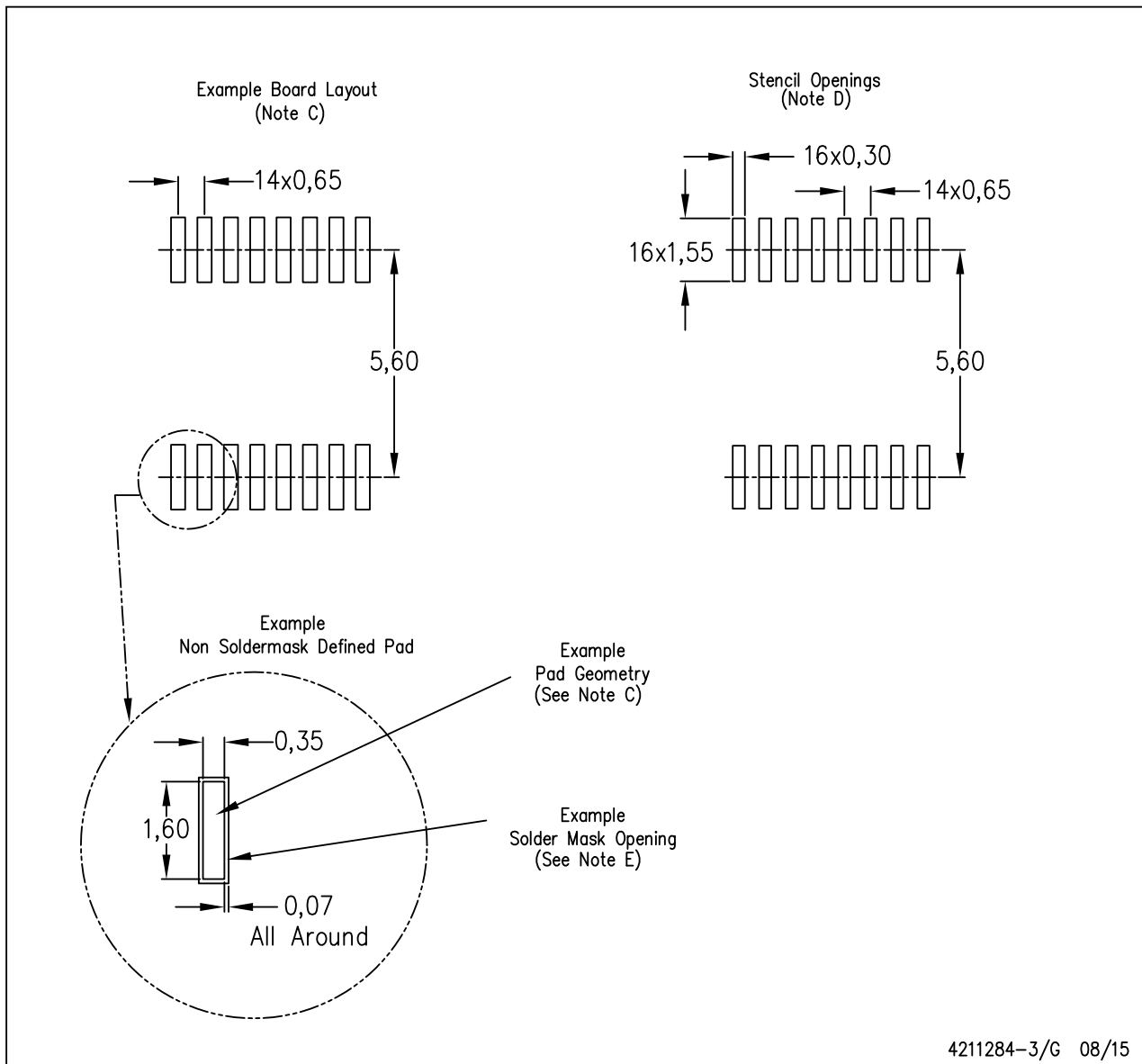
4040064-4/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 0,15 each side.
 -  Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

LAND PATTERN DATA

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4211284-3/G 08/15

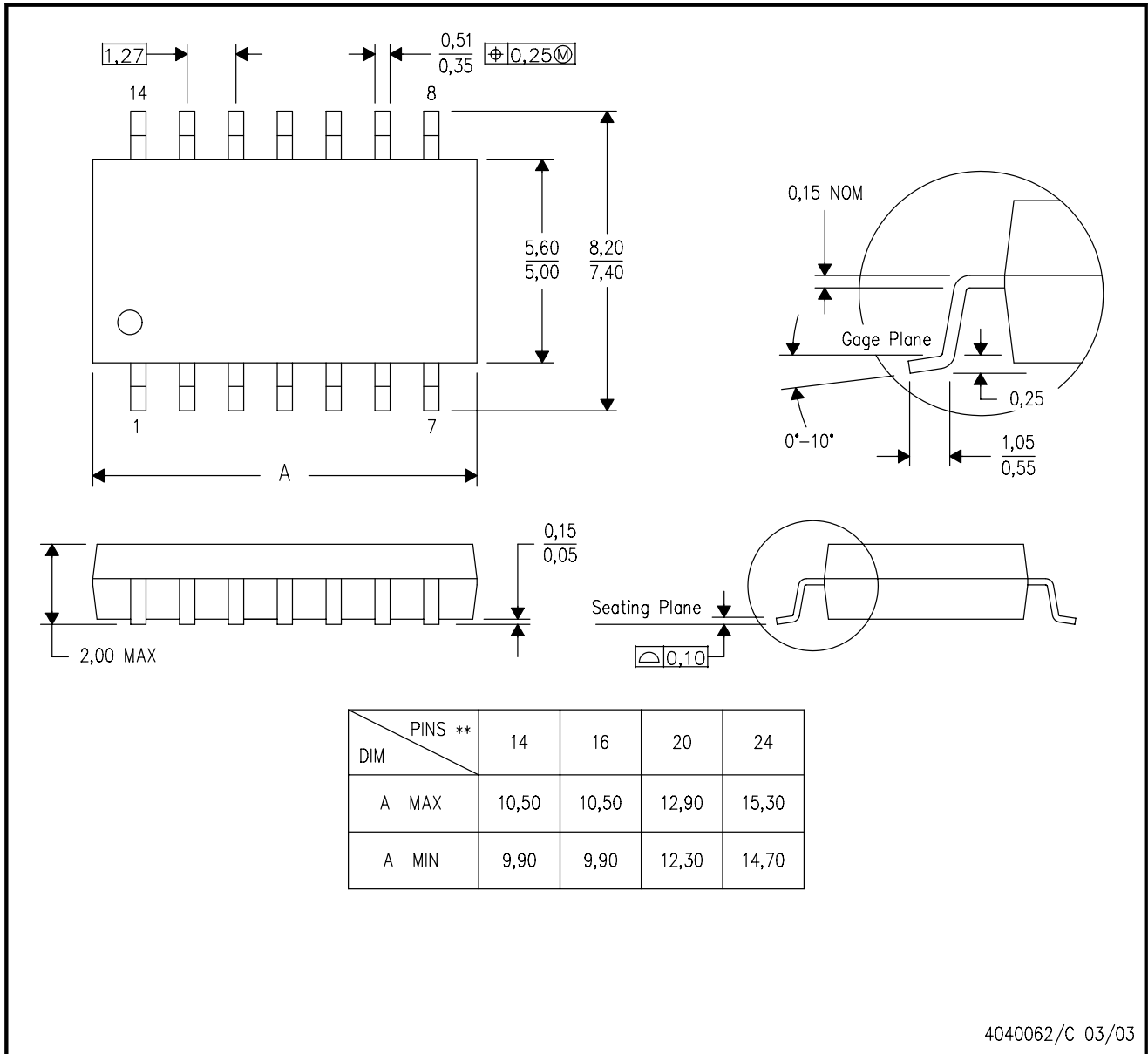
- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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.

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