

# SN54F241, SN74F241 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDFS090 – MARCH 1987 – REVISED OCTOBER 1993

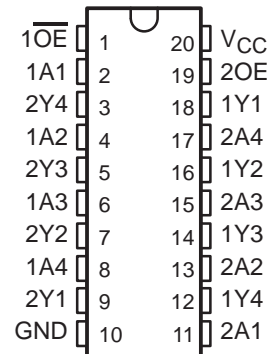
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Plastic and Ceramic DIPs

## description

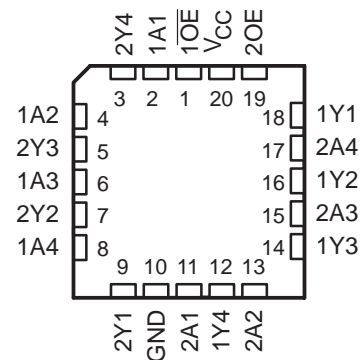
These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Taken together with the 'F240 and 'F244, these devices provide the choice of selected combinations of inverting and noninverting outputs, symmetrical  $\overline{OE}$  (active-low output-enable) inputs, and complementary OE and  $\overline{OE}$  inputs.

The SN54F241 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74F241 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54F241 . . . J PACKAGE  
SN74F241 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54F241 . . . FK PACKAGE  
(TOP VIEW)



## FUNCTION TABLES

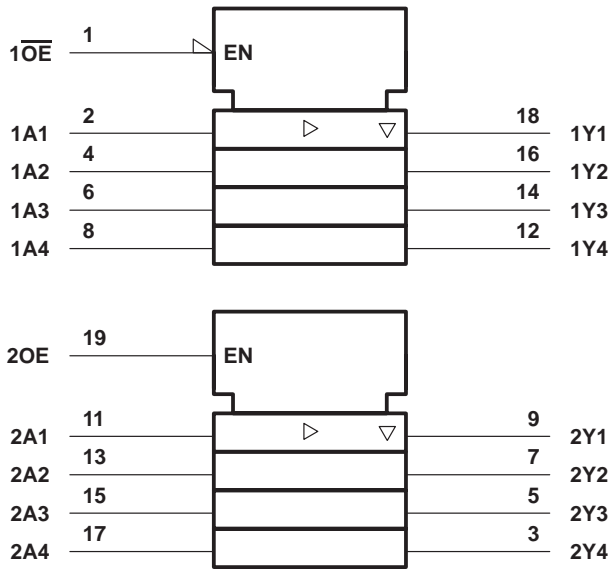
| INPUTS           |    | OUTPUT |
|------------------|----|--------|
| $\overline{1OE}$ | 1A | 1Y     |
| H                | X  | Z      |
| L                | H  | H      |
| L                | L  | L      |

| INPUTS |    | OUTPUT |
|--------|----|--------|
| 2OE    | 2A | 2Y     |
| H      | H  | H      |
| H      | L  | L      |
| L      | X  | Z      |

# SN54F241, SN74F241 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

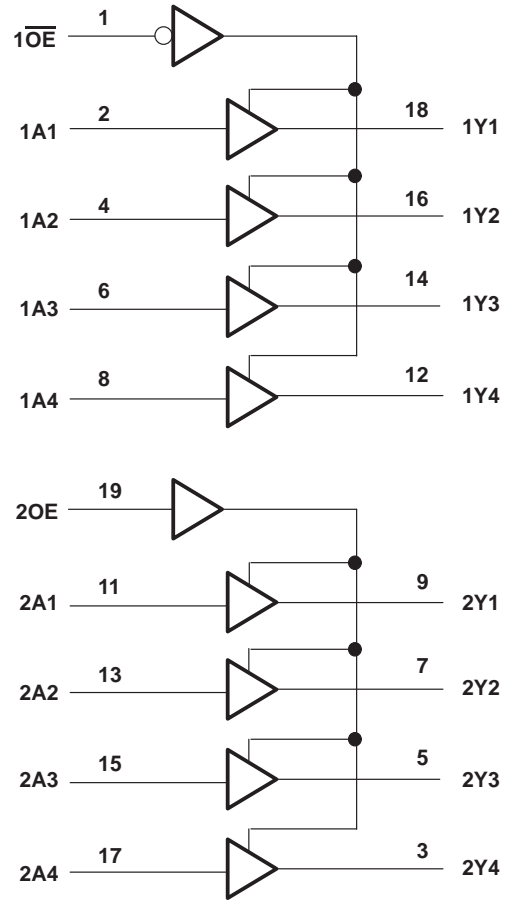
SDFS090 – MARCH 1987 – REVISED OCTOBER 1993

## logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagram (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)                                | –1.2 V to 7 V      |
| Input current range  | –30 mA to 5 mA     |
| Voltage range applied to any output in the disabled or power-off state | –0.5 V to 5.5 V    |
| Voltage range applied to any output in the high state                  | –0.5 V to $V_{CC}$ |
| Current into any output in the low state: SN54F241                     | 96 mA              |
| SN74F241   | 128 mA             |
| Operating free-air temperature range: SN54F241                         | –55°C to 125°C     |
| SN74F241   | 0°C to 70°C        |
| Storage temperature range  | –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.

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

# SN54F241, SN74F241 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDFS090 – MARCH 1987 – REVISED OCTOBER 1993

## recommended operating conditions

|          |                                | SN54F241 |     |     | SN74F241 |     |     | UNIT |
|----------|--------------------------------|----------|-----|-----|----------|-----|-----|------|
|          |                                | MIN      | NOM | MAX | MIN      | NOM | MAX |      |
| $V_{CC}$ | Supply voltage                 | 4.5      | 5   | 5.5 | 4.5      | 5   | 5.5 | V    |
| $V_{IH}$ | High-level input voltage       | 2        |     |     | 2        |     |     | V    |
| $V_{IL}$ | Low-level input voltage        |          |     | 0.8 |          |     | 0.8 | V    |
| $I_{IK}$ | Input clamp current            |          |     | -18 |          |     | -18 | mA   |
| $I_{OH}$ | High-level output current      |          |     | -12 |          |     | -15 | mA   |
| $I_{OL}$ | Low-level output current       |          |     | 48  |          |     | 64  | mA   |
| $T_A$    | Operating free-air temperature | -55      |     | 125 | 0        |     | 70  | °C   |

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

| PARAMETER | TEST CONDITIONS                                       | SN54F241  |      |      | SN74F241 |      |      | UNIT |    |
|-----------|---|---|------|------|----------|------|------|------|----|
|           |   | MIN   | TYP† | MAX  | MIN      | TYP† | MAX  |      |    |
| $V_{IK}$  | $V_{CC} = 4.5\text{ V}$ ,<br>$I_I = -18\text{ mA}$    |   |      | -1.2 |          |      | -1.2 | V    |    |
| $V_{OH}$  | $V_{CC} = 4.5\text{ V}$                               | $I_{OH} = -3\text{ mA}$                           | 2.4  | 3.3  | 2.4      | 3.3  |      | V    |    |
|           |   | $I_{OH} = -12\text{ mA}$                          | 2    | 3.2  |          |      |      |      |    |
|           |   | $I_{OH} = -15\text{ mA}$                          |      |      | 2        | 3.1  |      |      |    |
|           | $V_{CC} = 4.75\text{ V}$ ,<br>$I_{OH} = -3\text{ mA}$ |   |      |      | 2.7      |      |      |      |    |
| $V_{OL}$  | $V_{CC} = 4.5\text{ V}$                               | $I_{OL} = 48\text{ mA}$                           | 0.38 | 0.55 |          |      |      | V    |    |
|           |   | $I_{OL} = 64\text{ mA}$                           |      |      |          | 0.42 | 0.55 |      |    |
| $I_{OZH}$ | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 2.7\text{ V}$     |   |      | 50   |          |      | 50   | μA   |    |
| $I_{OZL}$ | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 0.5\text{ V}$     |   |      | -50  |          |      | -50  | μA   |    |
| $I_I$     | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 7\text{ V}$       |   |      | 0.1  |          |      | 0.1  | mA   |    |
| $I_{IH}$  | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 2.7\text{ V}$     |   |      | 20   |          |      | 20   | μA   |    |
| $I_{IL}$  | OE or $\overline{OE}$<br>Any A                        | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 0.5\text{ V}$ |      |      | -1       |      |      | -1   | mA |
|           |   |   |      |      | -1.6     |      |      | -1.6 |    |
| $I_{OS}‡$ | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 0$                | -100  |      | -225 | -100     |      | -225 | mA   |    |
| $I_{CC}$  | $V_{CC} = 5.5\text{ V}$                               | Outputs high                                      | 40   | 60   | 40       | 60   |      | mA   |    |
|           |   | Outputs low                                       | 60   | 90   | 60       | 90   |      |      |    |
|           |   | Outputs disabled                                  | 60   | 90   | 60       | 90   |      |      |    |

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

**SN54F241, SN74F241**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

SDFS090 – MARCH 1987 – REVISED OCTOBER 1993

**switching characteristics (see Note 2)**

| PARAMETER        | FROM<br>(INPUT)              | TO<br>(OUTPUT) | V <sub>CC</sub> = 5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω,<br>T <sub>A</sub> = 25°C |     |     | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     |          |     | UNIT |
|------------------|------------------------------|----------------|---|-----|-----|---|-----|----------|-----|------|
|                  |                              |                | 'F241   |     |     | SN54F241  |     | SN74F241 |     |      |
|                  |                              |                | MIN   | TYP | MAX | MIN   | MAX | MIN      | MAX |      |
| t <sub>PLH</sub> | Any A                        | Y              | 1.7   | 3.6 | 5.2 | 1.2   | 6.5 | 1.7      | 6.2 | ns   |
| t <sub>PHL</sub> |                              |                | 1.7   | 3.6 | 5.2 | 1.2   | 7   | 1.7      | 6.5 |      |
| t <sub>PZH</sub> | $\overline{\text{OE}}$ or OE | Y              | 1.2   | 3.9 | 5.7 | 1.2   | 7   | 1.2      | 6.7 | ns   |
| t <sub>PZL</sub> |                              |                | 1.2   | 5   | 7   | 1.2   | 8.5 | 1.2      | 8   |      |
| t <sub>PHZ</sub> | $\overline{\text{OE}}$ or OE | Y              | 1.2   | 4.1 | 6   | 1.2   | 7   | 1.2      | 7   | ns   |
| t <sub>PLZ</sub> |                              |                | 1.2   | 4.1 | 6   | 1.2   | 7.5 | 1.2      | 7   |      |

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

NOTE 2: Load circuits and waveforms are shown in Section 1.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)         | Lead/Ball Finish | MSL Peak Temp<br>(3) | Samples<br>(Requires Login) |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|------------------|----------------------|-----------------------------|
| 5962-86874012A   | ACTIVE        | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Call TI              |                             |
| 5962-8687401RA   | ACTIVE        | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Call TI              |                             |
| 5962-8687401SA   | ACTIVE        | CFP          | W               | 20   | 1           | TBD                     | Call TI          | Call TI              |                             |
| JM38510/33202B2A | ACTIVE        | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type   |                             |
| JM38510/33202BRA | ACTIVE        | CDIP         | J               | 20   | 1           | TBD                     | A42              | N / A for Pkg Type   |                             |
| JM38510/33202BSA | ACTIVE        | CFP          | W               | 20   | 1           | TBD                     | Call TI          | N / A for Pkg Type   |                             |
| M38510/33202B2A  | ACTIVE        | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type   |                             |
| M38510/33202BRA  | ACTIVE        | CDIP         | J               | 20   | 1           | TBD                     | A42              | N / A for Pkg Type   |                             |
| M38510/33202BSA  | ACTIVE        | CFP          | W               | 20   | 1           | TBD                     | Call TI          | N / A for Pkg Type   |                             |
| SN54F241J        | ACTIVE        | CDIP         | J               | 20   | 1           | TBD                     | A42              | N / A for Pkg Type   |                             |
| SN74F241DW       | ACTIVE        | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   |                             |
| SN74F241DWE4     | ACTIVE        | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   |                             |
| SN74F241DWG4     | ACTIVE        | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   |                             |
| SN74F241DWRE4    | OBSOLETE      | SOIC         | DW              | 20   |             | TBD                     | Call TI          | Call TI              |                             |
| SN74F241DWRG4    | OBSOLETE      | SOIC         | DW              | 20   |             | TBD                     | Call TI          | Call TI              |                             |
| SN74F241N        | ACTIVE        | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type   |                             |
| SN74F241NE4      | ACTIVE        | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type   |                             |
| SN74F241NSR      | ACTIVE        | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   |                             |
| SN74F241NSRE4    | ACTIVE        | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   |                             |
| SN74F241NSRG4    | ACTIVE        | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   |                             |
| SNJ54F241FK      | ACTIVE        | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type   |                             |
| SNJ54F241J       | ACTIVE        | CDIP         | J               | 20   | 1           | TBD                     | A42              | N / A for Pkg Type   |                             |
| SNJ54F241W       | ACTIVE        | CFP          | W               | 20   | 1           | TBD                     | Call TI          | N / A for Pkg Type   |                             |

(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.

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**OTHER QUALIFIED VERSIONS OF SN54F241, SN74F241 :**

● Catalog: [SN74F241](#)

● Military: [SN54F241](#)

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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74F241NSR | SO           | NS              | 20   | 2000 | 330.0              | 24.4               | 8.2     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |

TAPE AND REEL BOX DIMENSIONS



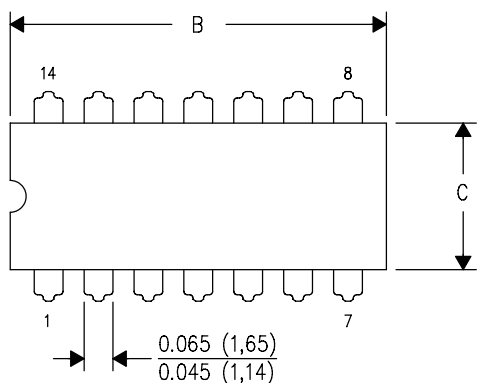
\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74F241NSR | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |

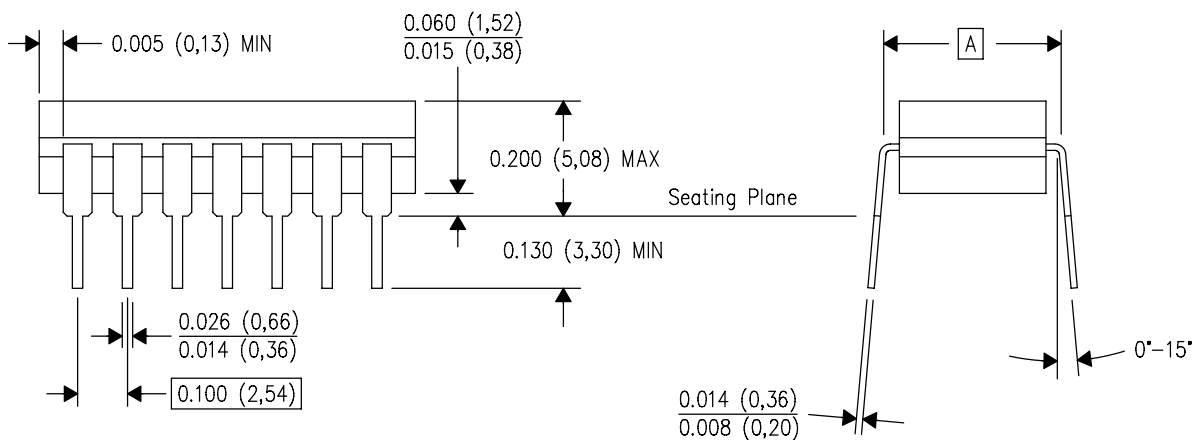
J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

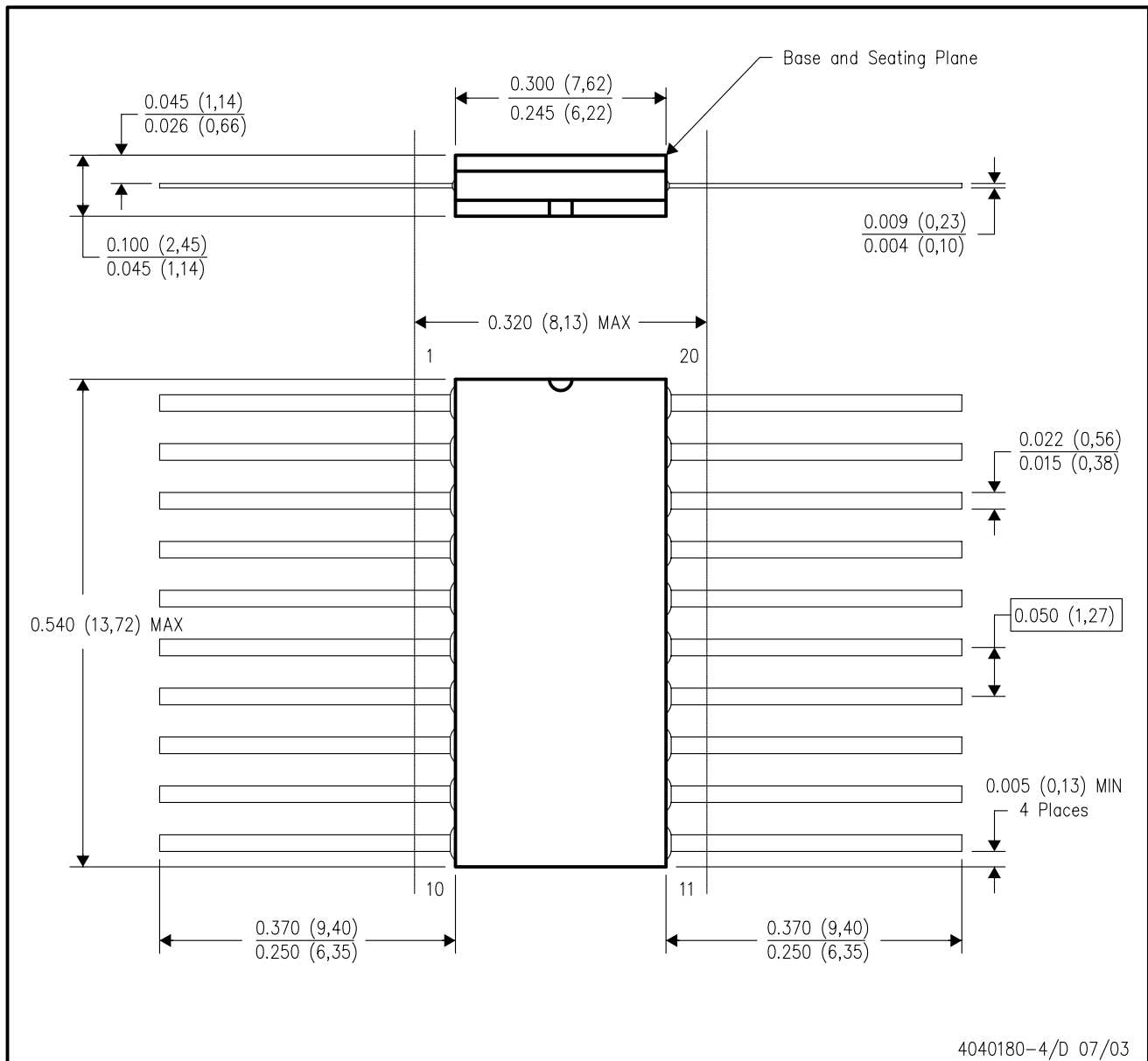


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- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal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

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK

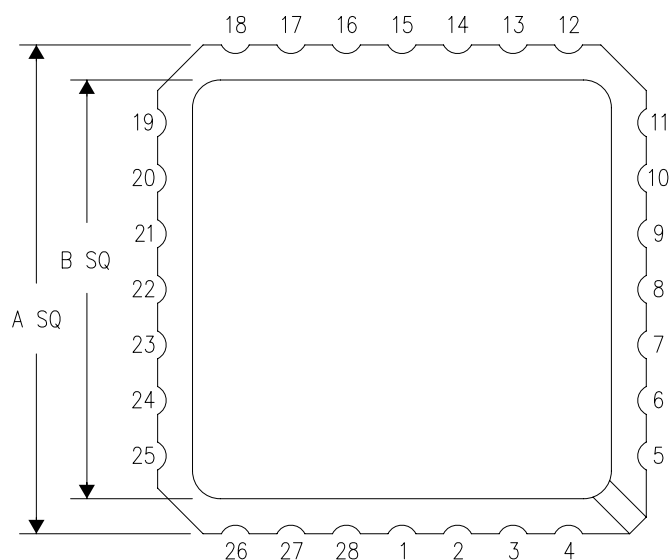


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within Mil-Std 1835 GDFP2-F20

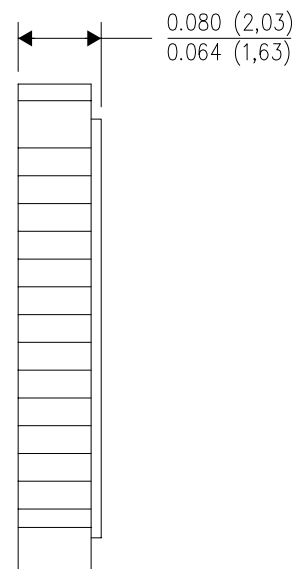
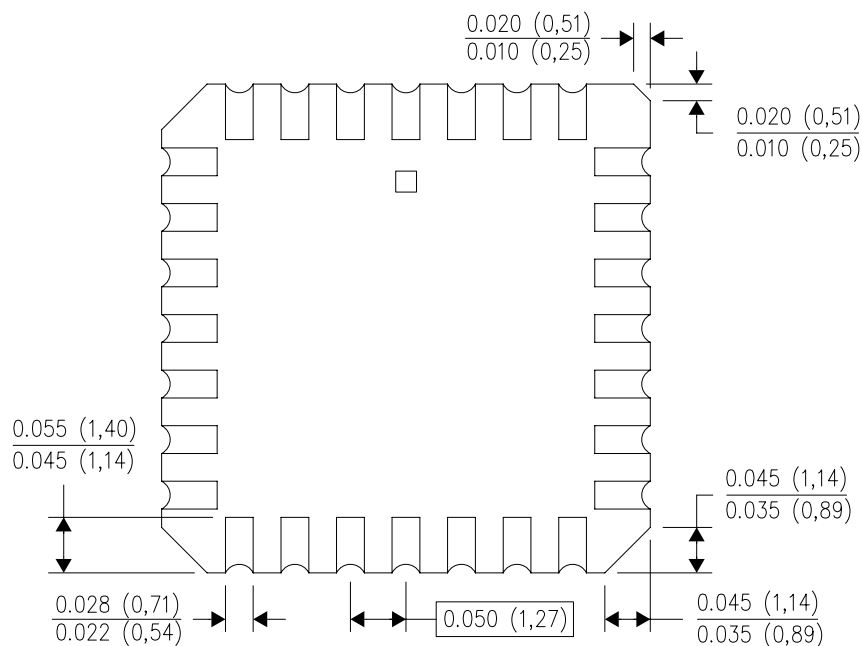
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF TERMINALS ** | A                |                  | B                |                  |
|---------------------|------------------|------------------|------------------|------------------|
|                     | MIN              | MAX              | MIN              | MAX              |
| 20                  | 0.342<br>(8,69)  | 0.358<br>(9,09)  | 0.307<br>(7,80)  | 0.358<br>(9,09)  |
| 28                  | 0.442<br>(11,23) | 0.458<br>(11,63) | 0.406<br>(10,31) | 0.458<br>(11,63) |
| 44                  | 0.640<br>(16,26) | 0.660<br>(16,76) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 52                  | 0.740<br>(18,78) | 0.761<br>(19,32) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 68                  | 0.938<br>(23,83) | 0.962<br>(24,43) | 0.850<br>(21,6)  | 0.858<br>(21,8)  |
| 84                  | 1.141<br>(28,99) | 1.165<br>(29,59) | 1.047<br>(26,6)  | 1.063<br>(27,0)  |



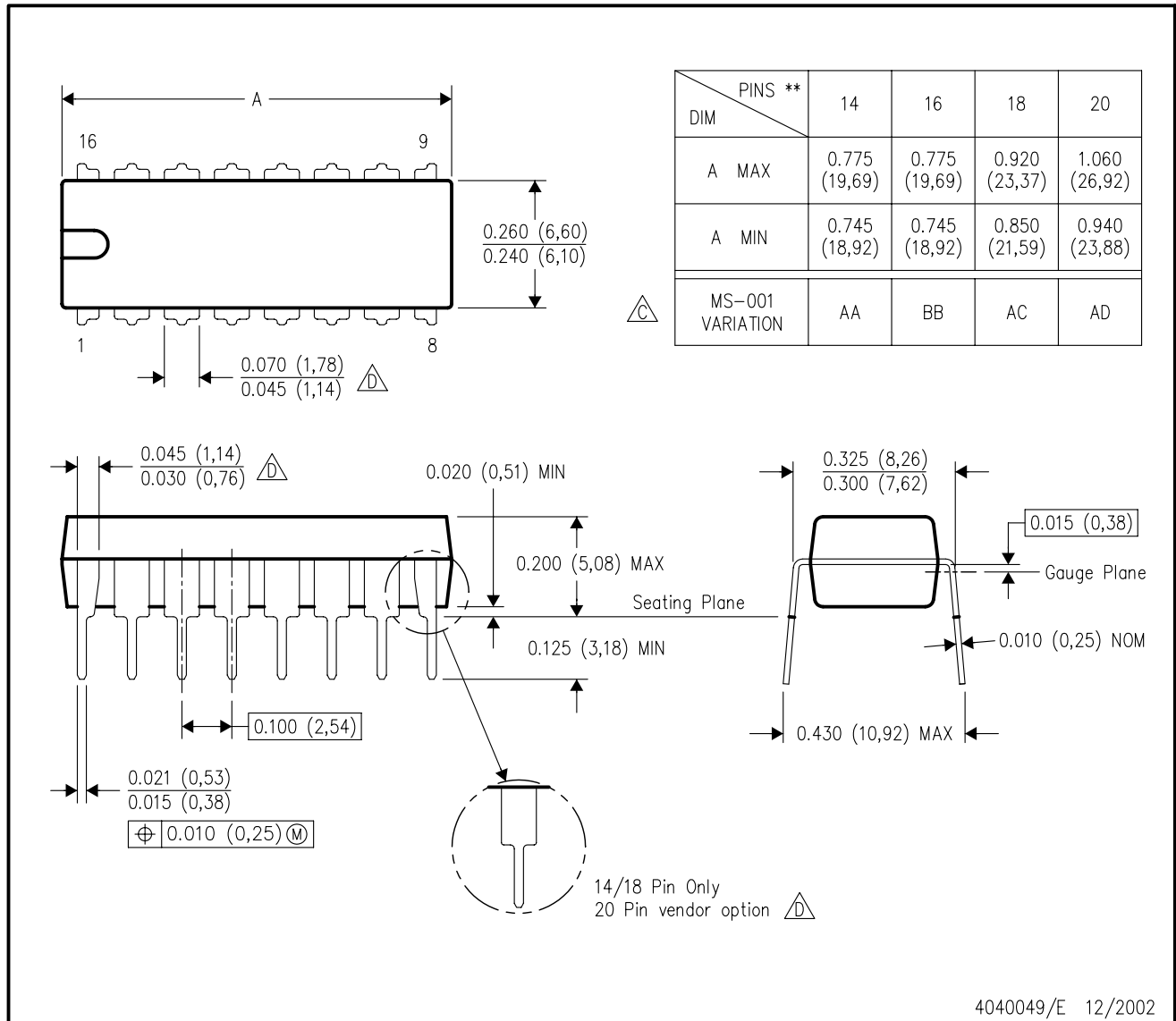
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- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

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

PLASTIC DUAL-IN-LINE PACKAGE

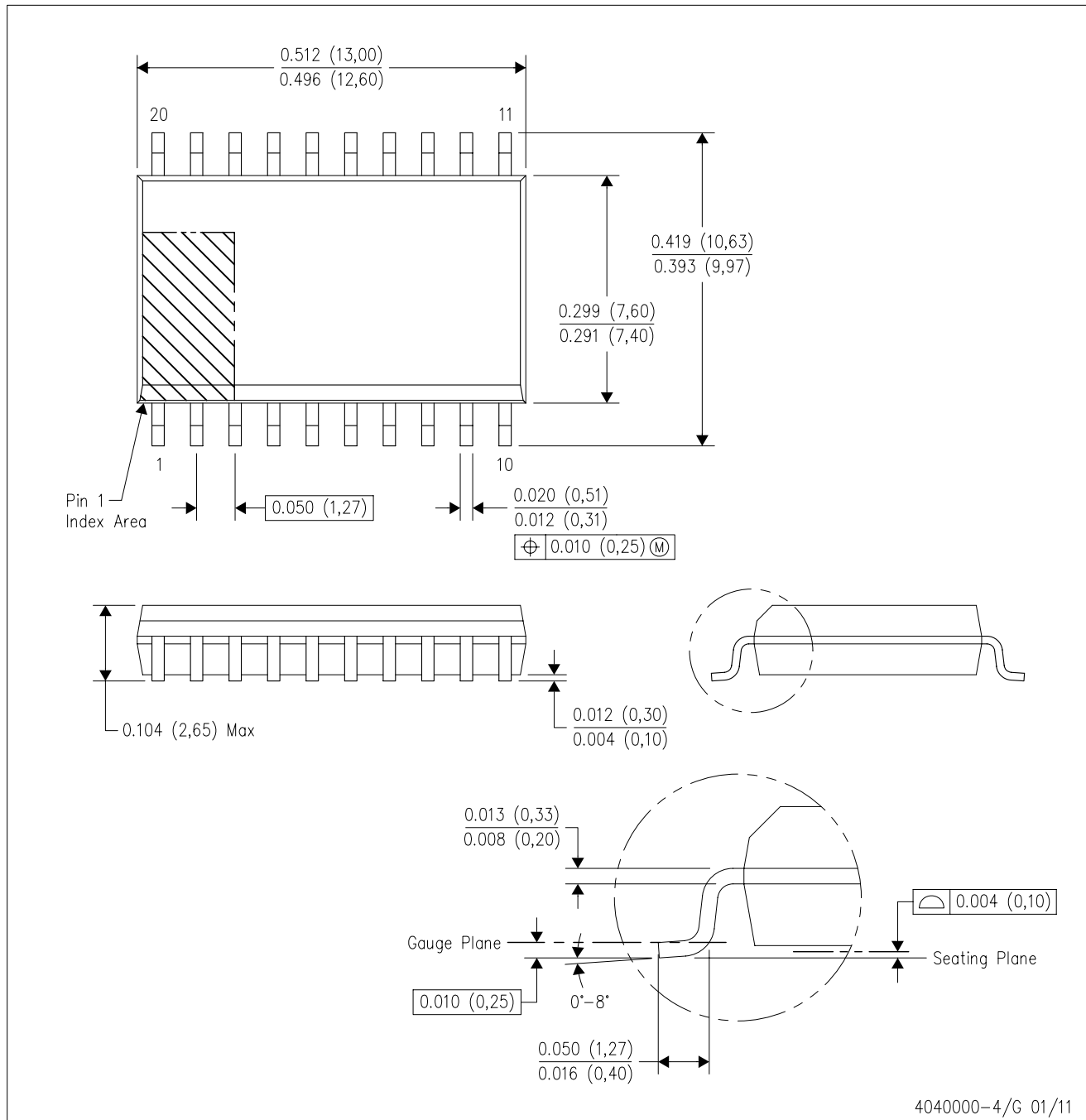
16 PINS SHOWN



- 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.

DW (R-PDSO-G20)

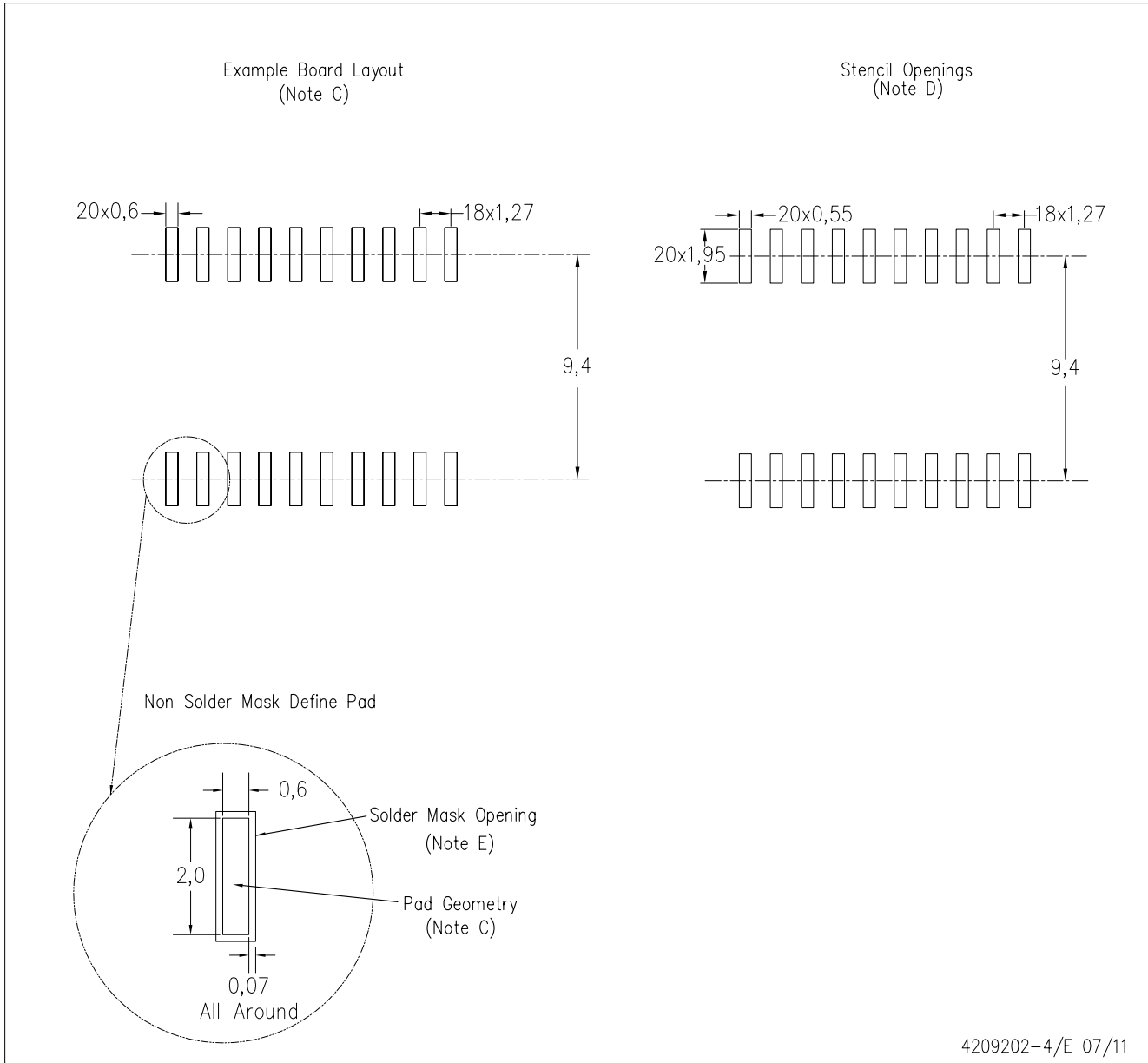
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/E 07/11

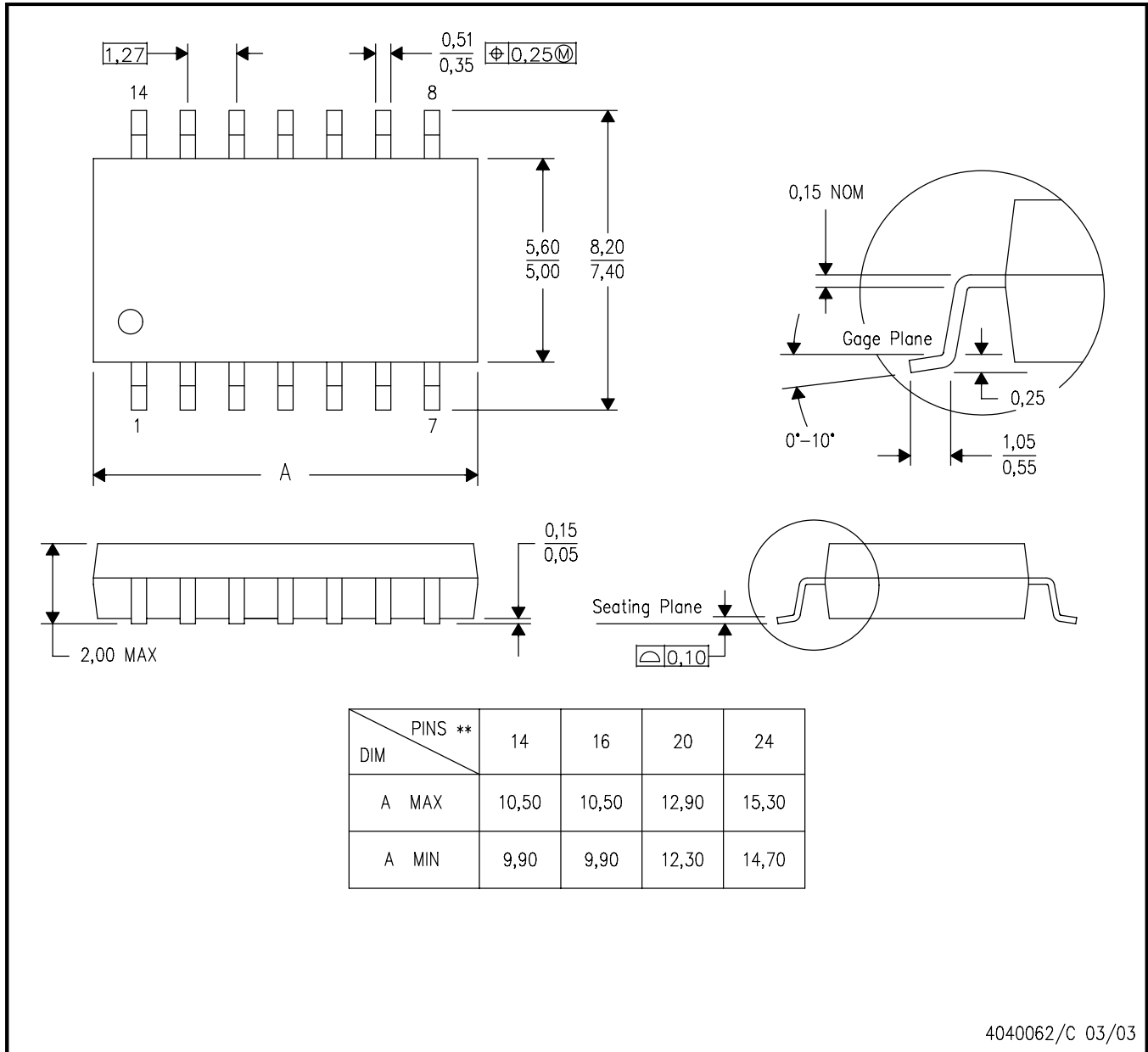
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
  - E. 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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