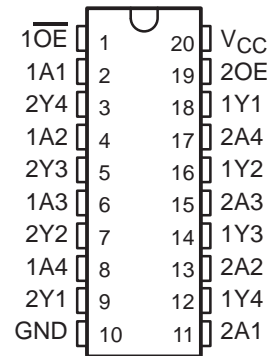- **3-State Outputs Drive Bus Lines or Buffer Memory Address Registers**
- **Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Plastic and Ceramic DIPs**
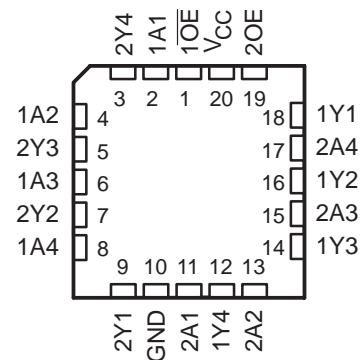
## description

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 $\overline{\text{OE}}$ (active-low output-enable) inputs, and complementary OE and $\overline{\text{OE}}$ inputs.

The SN54F241 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74F241 is characterized for operation from 0°C to 70°C.

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

| | | | |
|---|---|---|---|
| 1$\overline{\text{OE}}$ | 1 | 20 | V$_{CC}$ |
| 1A1 | 2 | 19 | 2OE |
| 2Y4 | 3 | 18 | 1Y1 |
| 1A2 | 4 | 17 | 2A4 |
| 2Y3 | 5 | 16 | 1Y2 |
| 1A3 | 6 | 15 | 2A3 |
| 2Y2 | 7 | 14 | 1Y3 |
| 1A4 | 8 | 13 | 2A2 |
| 2Y1 | 9 | 12 | 1Y4 |
| GND | 10 | 11 | 2A1 |

**SN54F241 . . . FK PACKAGE**
**(TOP VIEW)**

Pins top: 2Y4, 1A1, 1$\overline{\text{OE}}$, V$_{CC}$, 2OE (3, 2, 1, 20, 19)

| Left | | Right | |
|---|---|---|---|
| 1A2 | 4 | 18 | 1Y1 |
| 2Y3 | 5 | 17 | 2A4 |
| 1A3 | 6 | 16 | 1Y2 |
| 2Y2 | 7 | 15 | 2A3 |
| 1A4 | 8 | 14 | 1Y3 |

Pins bottom: 2Y1, GND, 2A1, 1Y4, 2A2 (9, 10, 11, 12, 13)

**FUNCTION TABLES**

| INPUTS | | OUTPUT |
|---|---|---|
| 1$\overline{\text{OE}}$ | 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 |

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**logic symbol†**

**logic diagram (positive logic)**
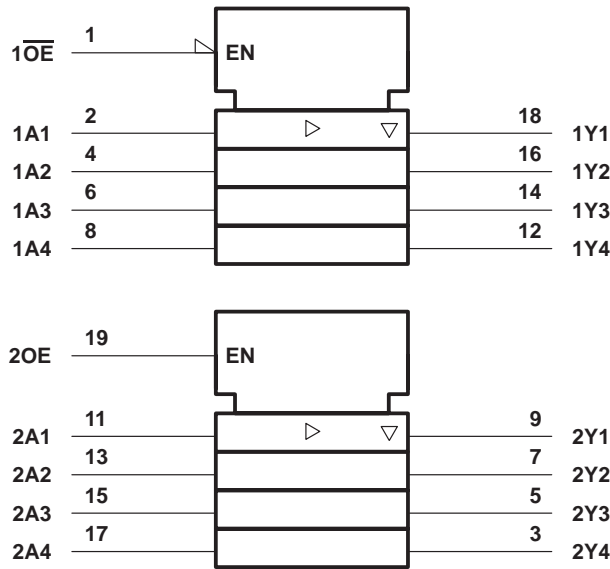


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
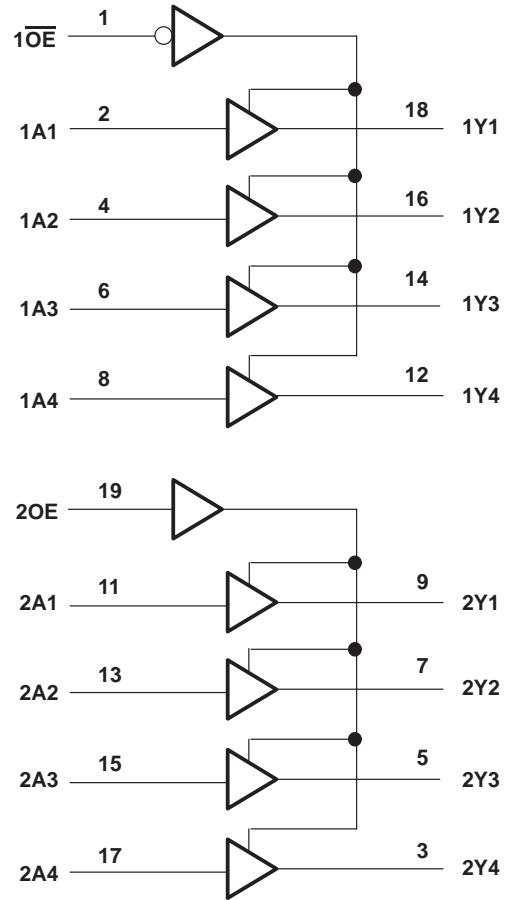
## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

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.

## recommended operating conditions

| PARAMETER | | 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 | |
| $V_{IK}$ | | $V_{CC} = 4.5$ V, | $I_I = −18$ mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | | $V_{CC} = 4.5$ V | $I_{OH} = −3$ mA | 2.4 | 3.3 | | 2.4 | 3.3 | | V |
| | | | $I_{OH} = −12$ mA | 2 | 3.2 | | | | | |
| | | | $I_{OH} = −15$ mA | | | | 2 | 3.1 | | |
| | | $V_{CC} = 4.75$ V, | $I_{OH} = −3$ mA | | | | 2.7 | | | |
| $V_{OL}$ | | $V_{CC} = 4.5$ V | $I_{OL} = 48$ mA | | 0.38 | 0.55 | | | | V |
| | | | $I_{OL} = 64$ mA | | | | | 0.42 | 0.55 | |
| $I_{OZH}$ | | $V_{CC} = 5.5$ V, | $V_O = 2.7$ V | | | 50 | | | 50 | µA |
| $I_{OZL}$ | | $V_{CC} = 5.5$ V, | $V_O = 0.5$ V | | | −50 | | | −50 | µA |
| $I_I$ | | $V_{CC} = 5.5$ V, | $V_I = 7$ V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | | $V_{CC} = 5.5$ V, | $V_I = 2.7$ V | | | 20 | | | 20 | µA |
| $I_{IL}$ | OE or $\overline{OE}$ | $V_{CC} = 5.5$ V, | $V_I = 0.5$ V | | | −1 | | | −1 | mA |
| | Any A | | | | | −1.6 | | | −1.6 | |
| $I_{OS}$‡ | | $V_{CC} = 5.5$ V, | $V_O = 0$ | −100 | | −225 | −100 | | −225 | mA |
| $I_{CC}$ | | $V_{CC} = 5.5$ 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 $V_{CC} = 5$ V, $T_A = 25$°C.

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

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## switching characteristics (see Note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = 25°C | | | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX† | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 'F241 | | | SN54F241 | | SN74F241 | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | Any A | Y | 1.7 | 3.6 | 5.2 | 1.2 | 6.5 | 1.7 | 6.2 | ns |
| $t_{PHL}$ | | | 1.7 | 3.6 | 5.2 | 1.2 | 7 | 1.7 | 6.5 | |
| $t_{PZH}$ | $\overline{OE}$ or OE | Y | 1.2 | 3.9 | 5.7 | 1.2 | 7 | 1.2 | 6.7 | ns |
| $t_{PZL}$ | | | 1.2 | 5 | 7 | 1.2 | 8.5 | 1.2 | 8 | |
| $t_{PHZ}$ | $\overline{OE}$ or OE | Y | 1.2 | 4.1 | 6 | 1.2 | 7 | 1.2 | 7 | ns |
| $t_{PLZ}$ | | | 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.

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# PACKAGE OPTION ADDENDUM

## PACKAGING INFORMATION

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| 5962-86874012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 5962-8687401RA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-8687401SA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | N / A for Pkg Type |
| 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 |
| 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 |
| SN74F241DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74F241DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74F241DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 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

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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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## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

Reel Diameter

Reel Width (W1)

**TAPE DIMENSIONS**

K0 — P1

Cavity — A0

B0 — W

| 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 |

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**

Sprocket Holes

| Q1 | Q2 |
|----|----|
| Q3 | Q4 |

| Q1 | Q2 |
|----|----|
| Q3 | Q4 |

User Direction of Feed

Pocket Quadrants

*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 |
|--------|--------------|-----------------|------|-----|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74F241DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| 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) |
|---|---|---|---|---|---|---|---|
| SN74F241DWR | SOIC | DW | 20 | 2000 | 346.0 | 346.0 | 41.0 |
| SN74F241NSR | SO | NS | 20 | 2000 | 346.0 | 346.0 | 41.0 |

J (R−GDIP−T**)
14 LEADS SHOWN

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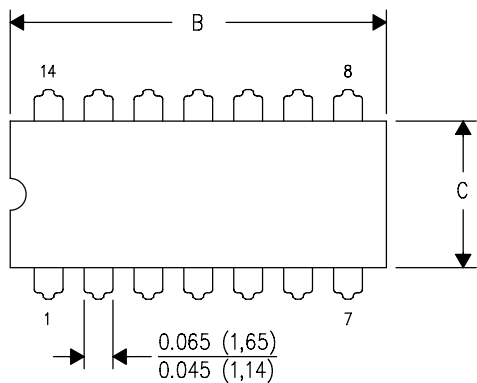
| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B  MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B  MIN | —— | —— | —— | —— |
| C  MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87)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

B

14    8

1    7

0.065 (1,65)
0.045 (1,14)

C

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)

A

0°−15°

0.014 (0,36)
0.008 (0,20)
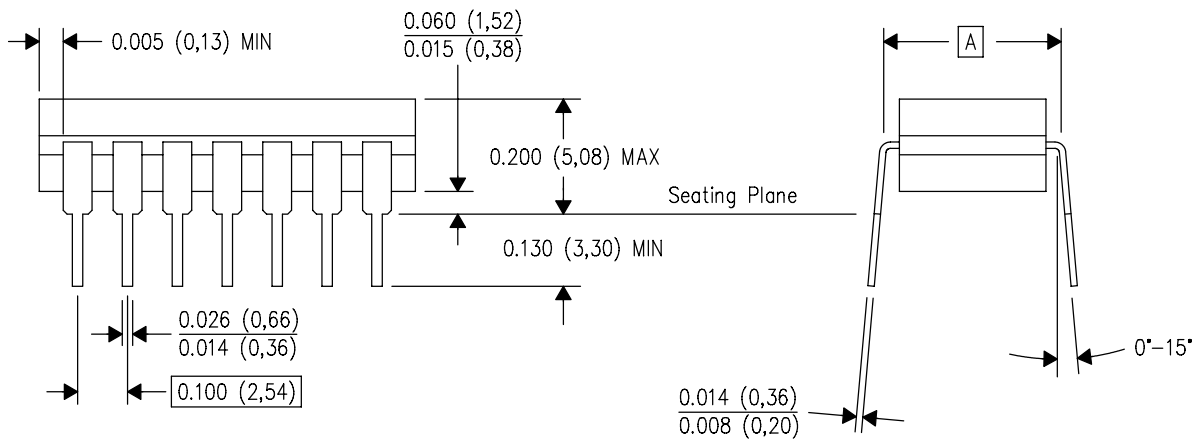
4040083/F 03/03

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.

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

**28 TERMINAL SHOWN**

**LEADLESS CERAMIC CHIP CARRIER**
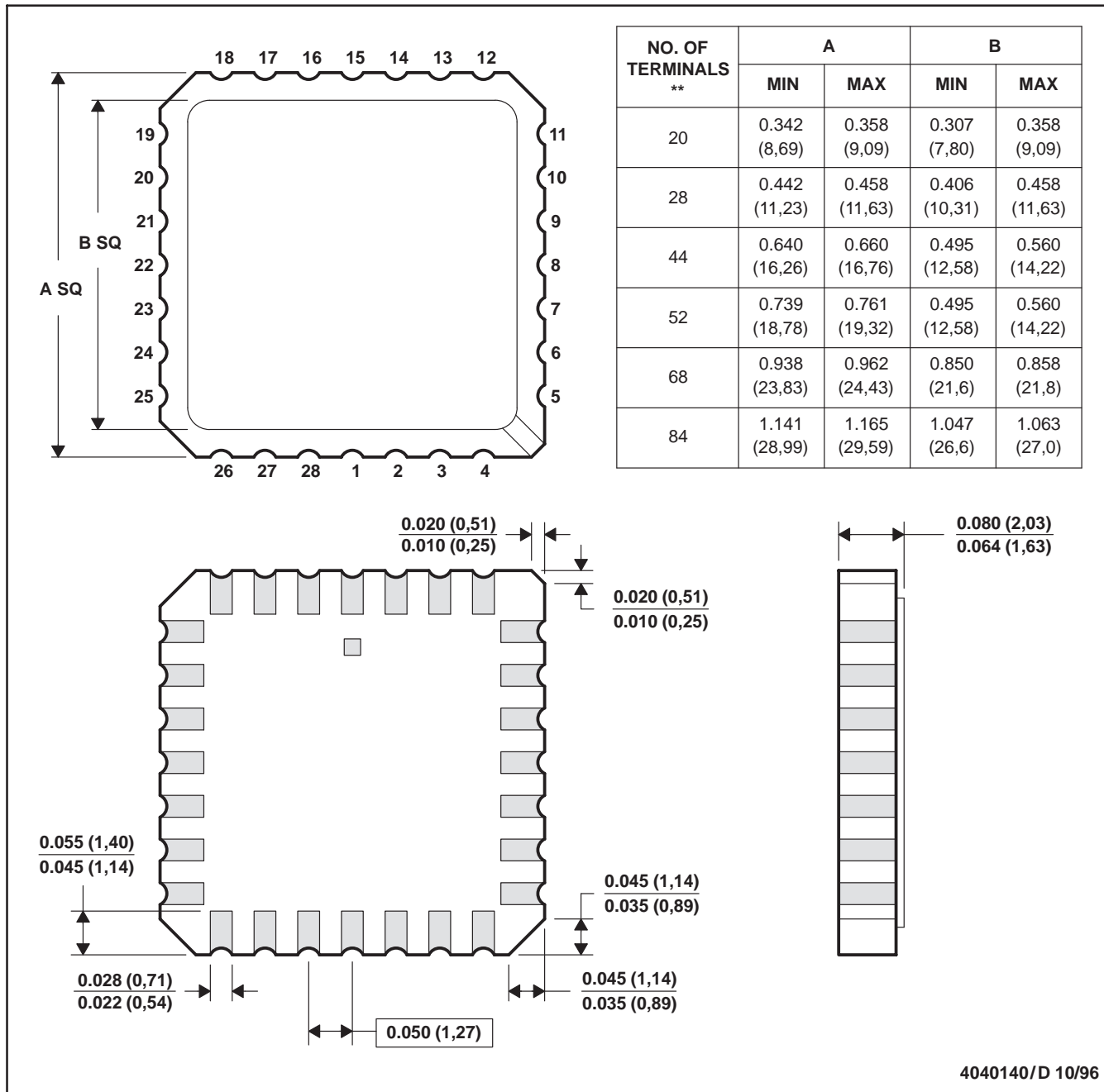
| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.739 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |

0.020 (0,51) / 0.010 (0,25)

0.020 (0,51) / 0.010 (0,25)

0.080 (2,03) / 0.064 (1,63)

0.055 (1,40) / 0.045 (1,14)

0.045 (1,14) / 0.035 (0,89)

0.028 (0,71) / 0.022 (0,54)

0.045 (1,14) / 0.035 (0,89)

0.050 (1,27)

**4040140/D 10/96**

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

# MECHANICAL DATA

| | PINS ** | 14 | 16 | 20 | 24 |
|---|---|---|---|---|---|
| DIM | | | | | |
| A | MAX | 10,50 | 10,50 | 12,90 | 15,30 |
| A | MIN | 9,90 | 9,90 | 12,30 | 14,70 |

4040062/C 03/03
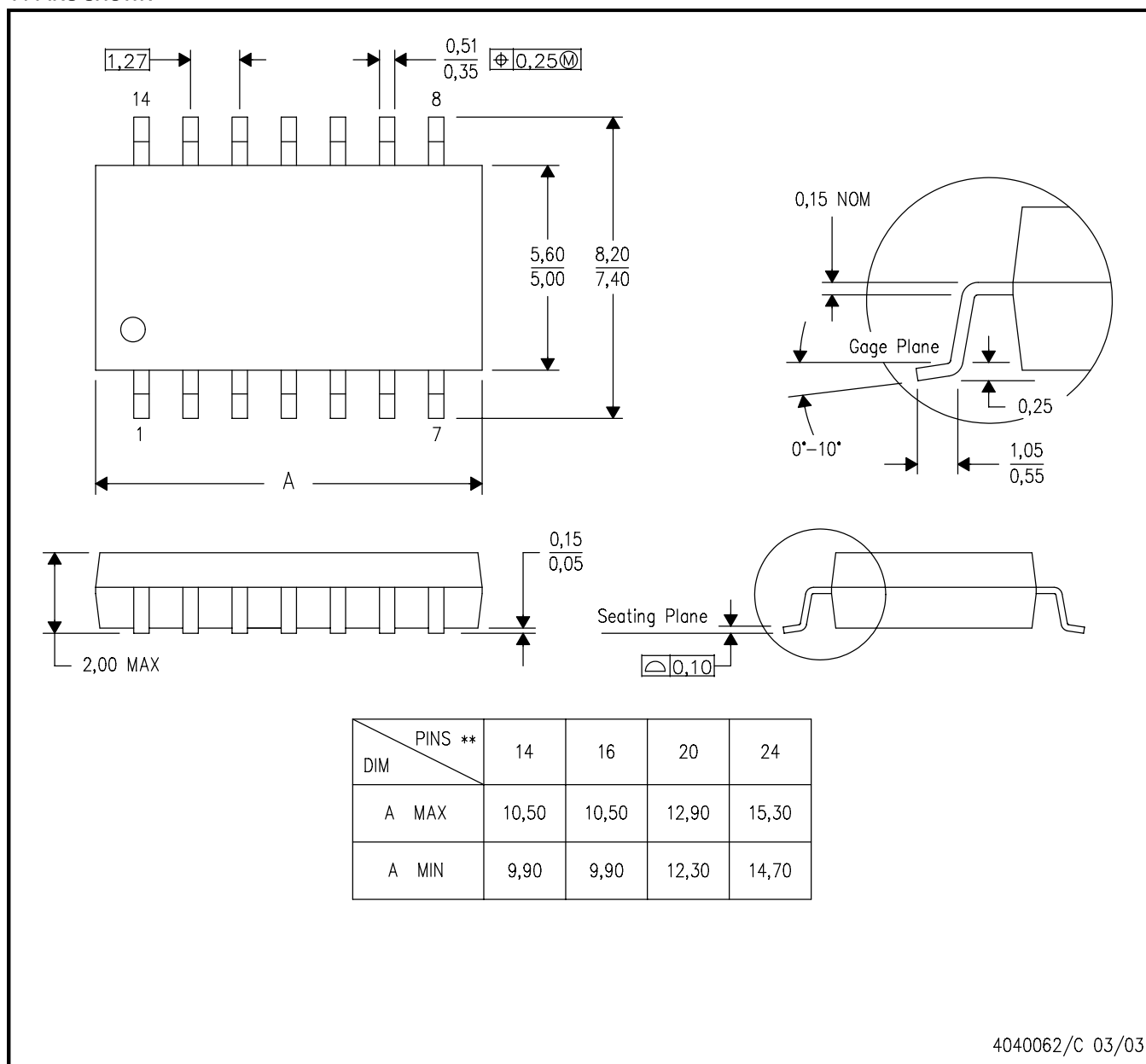
NOTES:  A.  All linear dimensions are in millimeters.
        B.  This drawing is subject to change without notice.
        C.  Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

**W (R−GDFP−F20)**                                          **CERAMIC DUAL FLATPACK**
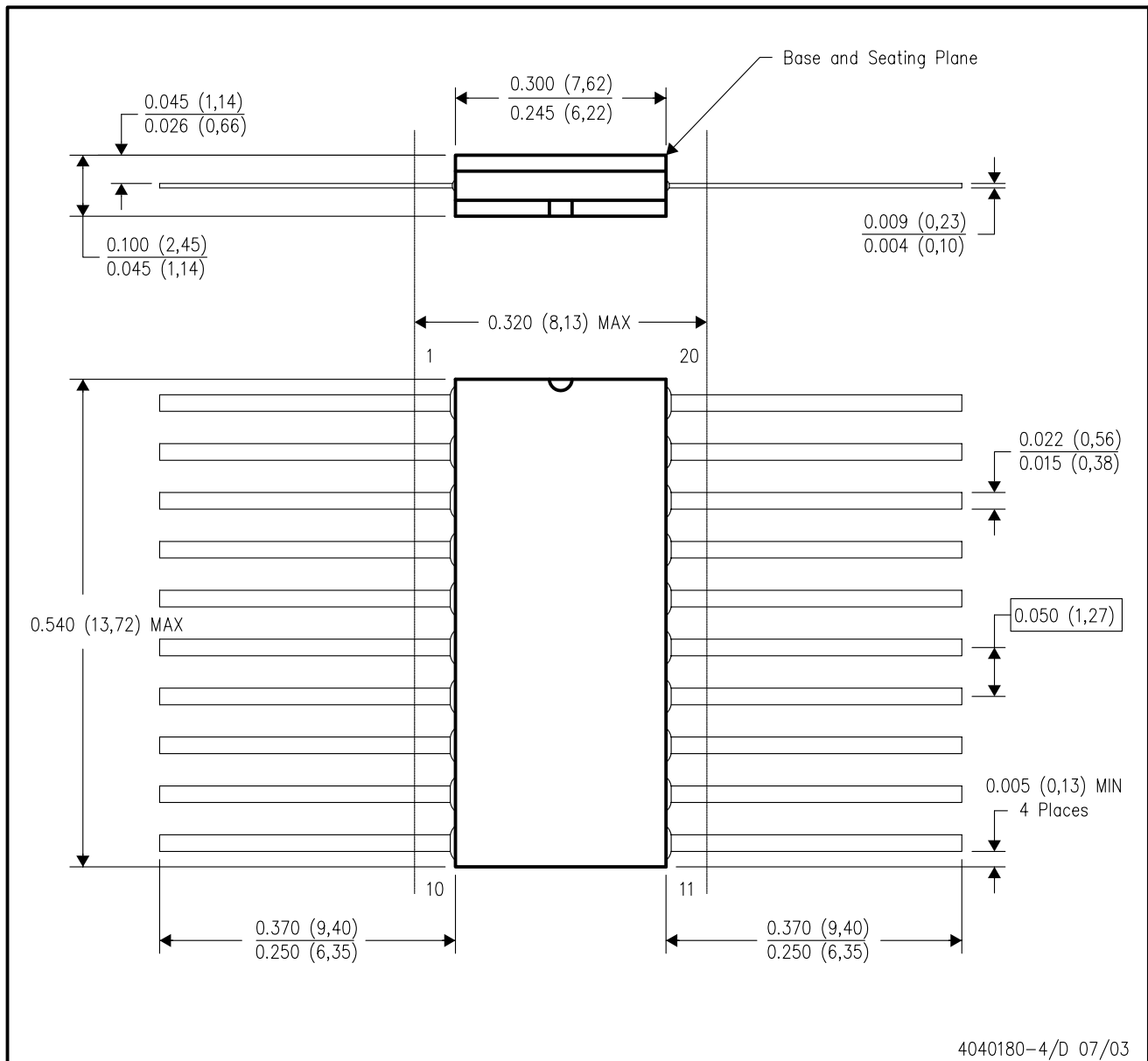
Base and Seating Plane

0.300 (7,62)
0.245 (6,22)

0.045 (1,14)
0.026 (0,66)

0.009 (0,23)
0.004 (0,10)

0.100 (2,45)
0.045 (1,14)

0.320 (8,13) MAX

1          20

0.022 (0,56)
0.015 (0,38)

0.050 (1,27)

0.540 (13,72) MAX

0.005 (0,13) MIN
4 Places

10          11

0.370 (9,40)
0.250 (6,35)

0.370 (9,40)
0.250 (6,35)

4040180−4/D 07/03

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

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## DW (R−PDSO−G20)                    PLASTIC SMALL−OUTLINE PACKAGE
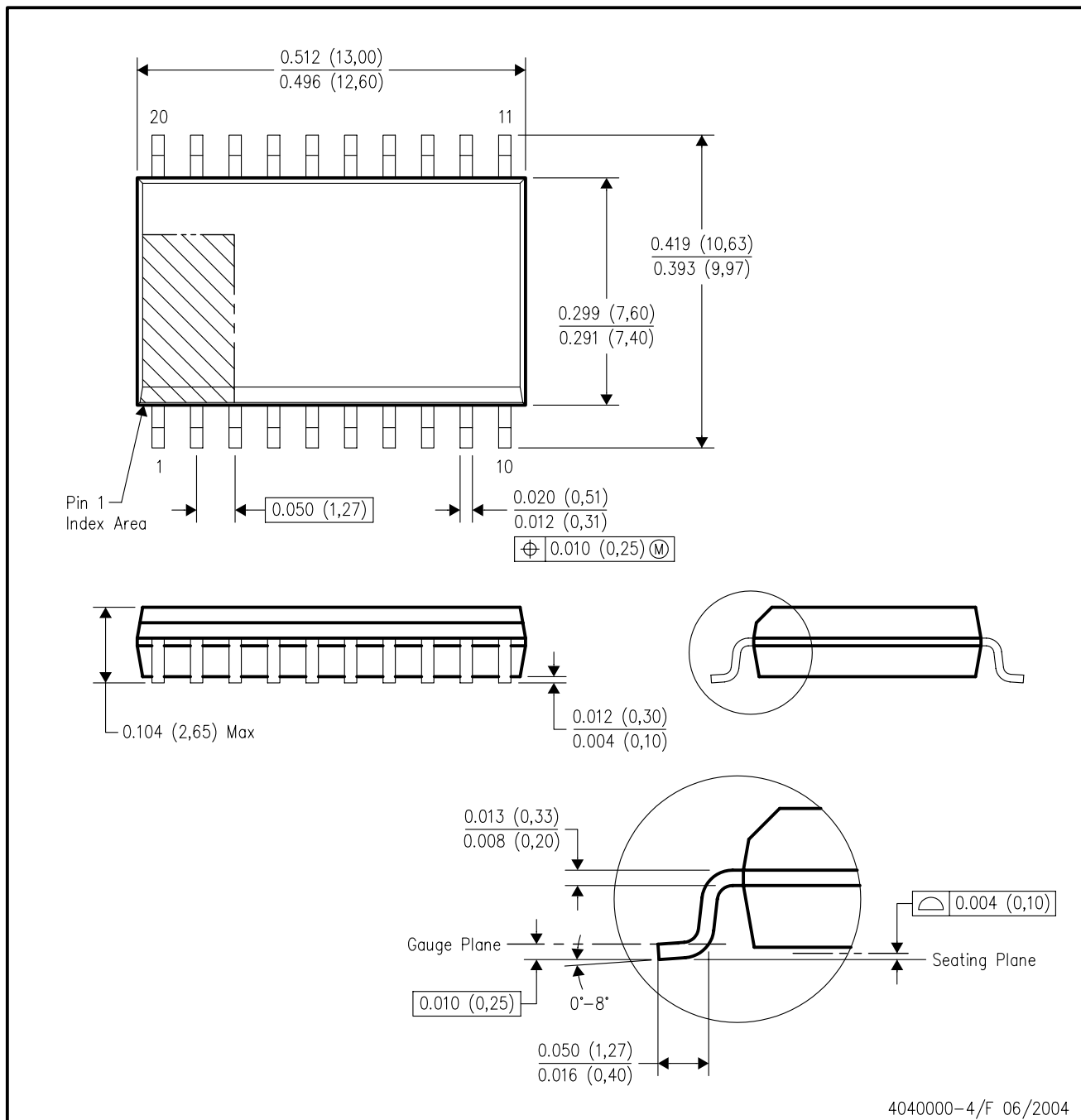


$\frac{0.512\ (13,00)}{0.496\ (12,60)}$

20

11

$\frac{0.419\ (10,63)}{0.393\ (9,97)}$

$\frac{0.299\ (7,60)}{0.291\ (7,40)}$

1

10

Pin 1
Index Area

0.050 (1,27)

$\frac{0.020\ (0,51)}{0.012\ (0,31)}$

⊕ | 0.010 (0,25) Ⓜ

0.104 (2,65) Max

$\frac{0.012\ (0,30)}{0.004\ (0,10)}$

$\frac{0.013\ (0,33)}{0.008\ (0,20)}$

⌒ | 0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)

0°−8°

$\frac{0.050\ (1,27)}{0.016\ (0,40)}$

4040000−4/F 06/2004

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−013 variation AC.
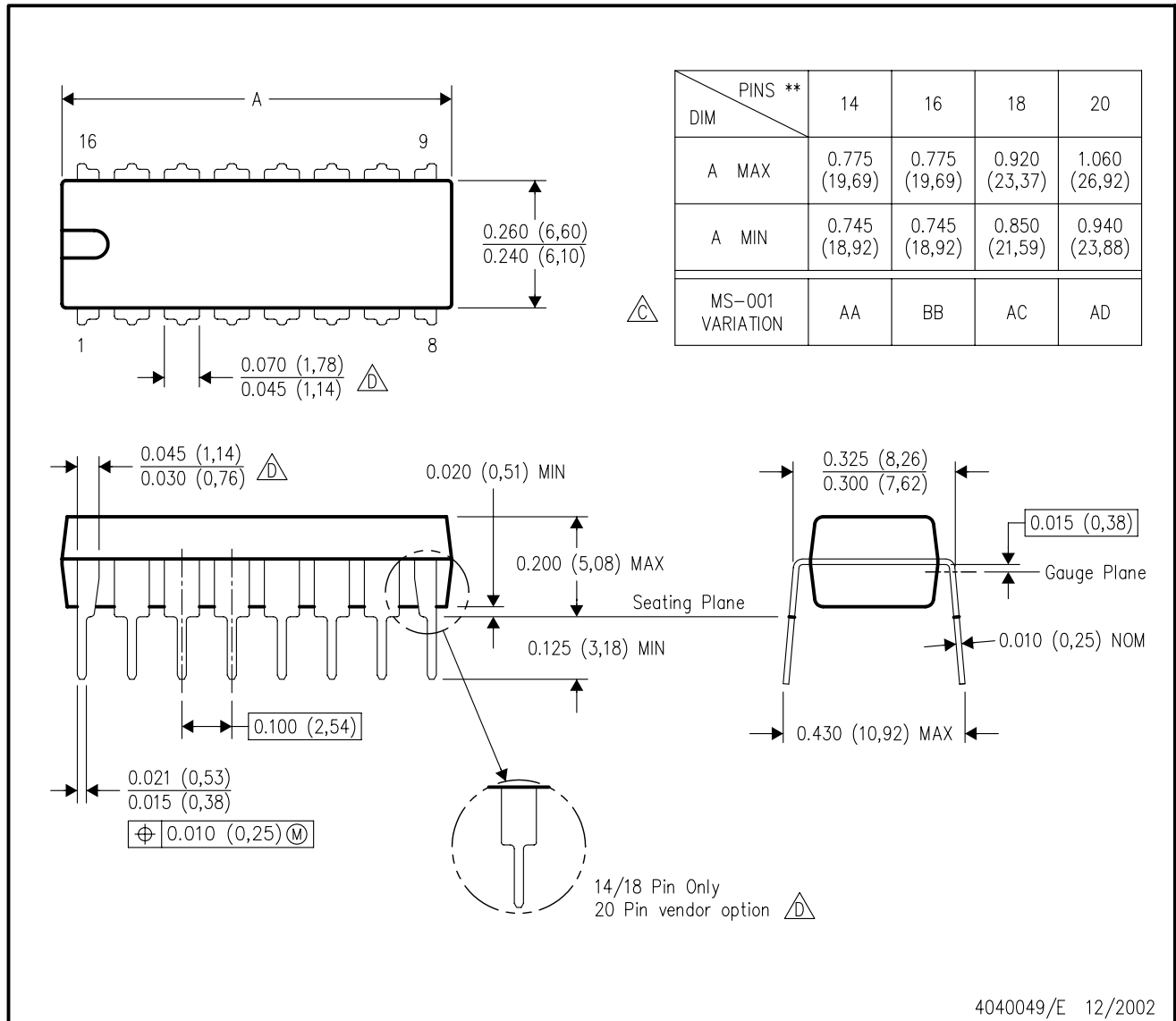
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## N (R−PDIP−T**)
16 PINS SHOWN

## PLASTIC DUAL−IN−LINE PACKAGE

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

A

16          9

0.260 (6,60)
0.240 (6,10)

1          8

0.070 (1,78)
0.045 (1,14)  D

0.045 (1,14)
0.030 (0,76)  D

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0.021 (0,53)
0.015 (0,38)

⊕ 0.010 (0,25) M

14/18 Pin Only
20 Pin vendor option  D

0.325 (8,26)
0.300 (7,62)

0.015 (0,38)

Gauge Plane

0.010 (0,25) NOM

0.430 (10,92) MAX

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.

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